Neutrino 2014

Contributions book

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Contribution ID : 5

Cosmological and astrophysical constraints on Goldstone bosons as fractional cosmic neutrinos

Content :

Recently, Weinberg proposed a scenario where Goldstone bosons may be masquerading as fractional cosmic neutrinos. We discuss the cosmological and astrophysical constraints on this scenario. We also study the implication of this scenario to the formation of large scale structures.

Primary authors : Prof. NG, Kin-Wang (Academia Sinica)

Co-authors :

Presenter : Prof. NG, Kin-Wang (Academia Sinica)

Session classification : Poster Session I

Track classification : Cosmic Neutrinos

Type : Poster

Contribution ID : 6

Natural radioactivity and related background in Daya Bay experiment

Content :

In low background neutrino experiments, natural radioactivity makes the largest contribution to single event rate, and the related 13C(α,n)16O background can mimic anti-neutrino signal if the detector is liquid scintillator or Gd-doped liquid scintillator based.
In the poster, we first discuss the natural radioactivity event rate in the Gd-LS based Daya Bay anti-neutrino detector, which is studied with the cascade decays in the 238U, 232Th and 227Ac decay chains. The properties, such as half-life time of the cascade decays measured at Daya Bay are also shown. Event rate of 210Pb, which is from the decay of 222Rn in the air, is studied via spectrum fitting.
Then we discuss the 13C(α,n)16O background rate calculation, which is induced by the interaction between alpha from natural radioactivity and 13C in the liquid scintillator. Background spectrum is also calculated, and systematic uncertainty of rate and spectrum are estimated.

Primary authors : Dr. YU, Zeyuan (Institute of High Energy Physics, China)

Co-authors :

Presenter : Dr. YU, Zeyuan (Institute of High Energy Physics, China)

Session classification : Poster Session I

Track classification : Reactor Neutrino Oscillations

Type : Poster

Contribution ID : 7

Contribution to the neutrino form factors coming from the charged Higgs of a two Higgs doublet model in presence of magnetic fields

Content :

The presence of a charged Higgs in the two Higgs doublet model in presence of magnetic field induces aditional corrections to the neutrino form factors. We calculate and analyze such contributions in the parameter space of the two Higgs doublet model type I and type II. The characterization of the neutrino form factors could discriminate between Majorana and Dirac neutrinos.

Primary authors : Prof. GOMEZ TARAZONA, Carlos (Universidad Nacional de Colombia)

Co-authors : Dr. DIAZ SANCHEZ, Rodolfo Alexander (Universidad Nacional de Colombia) ; Dr. MORALES, Jhon (Universidad Nacional de Colombia) ; Prof. CASTILLO RAMIREZ, Andrés Fernando (Universidad Nacional de Colombia)

Presenter : Prof. GOMEZ TARAZONA, Carlos (Universidad Nacional de Colombia)

Session classification : Poster Session I

Track classification : Theory / Phenomenology

Type : Poster

Contribution ID : 8

Unitarity constraints for Yukawa couplings in the SU (2)L × U (1)Y × U (1)B−L model

Content :

Constraints from unitarity perturbativity are studied in the Yukawa sector of a SU (2)L × U (1)Y × U (1)B−L model. In this scenario, besides three right handed neutrinos which are included to cancel chiral anomalies, it is also postulated a complex scalar singlet for the spontaneous symmetry breaking of the extended gauge sector U (1)B−L and to give mass to the associated Z ′ boson. From different scattering processes involved neutrinos and Higgs states, exclusion regions are obtained for neutrino masses and mixing angles.

Primary authors : Prof. CASTILLO RAMIREZ, Andrés Fernando (Universidad Nacional de Colombia)

Co-authors : Prof. GOMEZ TARAZONA, Carlos (Universidad Nacional de Colombia) ; Dr. DIAZ, Rodolfo (Associated Professor at Universidad Nacional de Colombia) ; Dr. MORALES APONTE, John (Associated Professor at Universidad Nacional de Colombia)

Presenter : Prof. CASTILLO RAMIREZ, Andrés Fernando (Universidad Nacional de Colombia)

Session classification : Poster Session I

Track classification : Theory / Phenomenology

Type : Poster

Contribution ID : 10

Oscillation of high energy neutrinos in Choked GRBs

Content :

It is believed that choked gamma-ray bursts (CGRBs) are the potential candidates for the production of high energy neutrinos in GeV-TeV energy range. These CGRBs out number the successful GRBs by many orders. So it is important to observe neutrinos from these cosmological objects with the presently operating neutrino telescope IceCube. We study the three flavor neutrino oscillation of these high energy neutrinos in the presupernova star environment which is responsible for the CGRB. For the presupernova star we consider three different models and calculate the neutrino oscillation probabilities, as well as neutrino flux on the surface of these star. The matter effect modifies the neutrino flux of different flavors on the surface of the star. We have also calculated the flux of these high energy neutrinos on the surface of the Earth. We found that for neutrino energies below about 10 TeV the flux ratio does not amount to 1:1:1, whereas for higher energy neutrinos it does.

Primary authors : Dr. SAHU, Sarira (Instituto de Ciencias Nucleares, UNAM)

Co-authors : Dr. OSORIO OLIVEROS, Andres (Universidad de Los Andes, Bogota, Colombia) ; Dr. SANABRIA, Juan Carlos (Universidad de Los Andes, Bogota, Colombia)

Presenter : Dr. SAHU, Sarira (Instituto de Ciencias Nucleares, UNAM)

Session classification : Poster Session I

Track classification : Cosmic Neutrinos

Type : Poster

Contribution ID : 11

Probing Lorentz Invariance Violation with Neutrino Factories

Content :

We show the modification in the number of neutrino events (nu_mu+anti-nu_mu) caused by Lorentz Invariant Violation (LIV), sigma = 5 x10^{-24} and 10^{-23}, in neutrino oscillation for a neutrino factory at a distance of 7500 km. The momentum of the muons can vary from 10-50~GeV and we consider 2 x 10^{20} decays per year. The modifications in the number of events caused by this sigma LIV parameter could be a strong signal of new physics in a future neutrino factory.

Primary authors : Dr. ROSSI TORRES, Fernando (Instituto de Fisica Gleb Wataghin - State University of Campinas - SP - Brazil)

Co-authors :

Presenter : Dr. ROSSI TORRES, Fernando (Instituto de Fisica Gleb Wataghin - State University of Campinas - SP - Brazil)

Session classification : Poster Session II

Track classification : Short Baseline Oscillations / Sterile Neutrinos / Non-standard Oscillations

Type : Poster

Contribution ID : 12

Measurement of geo-neutrinos detected in the Borexino experiment at the Laboratory Nazionali del Gran Sasso

Content :

This work presents a measurement of geo-neutrinos detected in the Borexino experiment at the Laboratory Nazionali del Gran Sasso in central Italy. Geo-neutrinos are electron anti-neutrinos produced in our planet by beta decays of naturally occurring radioactive isotopes; they provide a new tool to directly probe the interior of the Earth. The present measurement, obtained from 1353 days of data, corresponds to an exposure of (3.69 +/-0.16) x 10^31 proton x year. After all selection cuts and background subtraction made in the analysis, the number of detected geo-neutrino (assuming a fixed chondritic Th/U mass ratio of 3.9), is of (14.3 +/- 4.4 events). The corresponding geo-neutrino signal is S_geo = (38.8 +/-12.0) TNU. If U and Th contributions are left as free parameters in the fit, central values of S_Th = (10.6 +/-12.7) TNU and S_U = (26.5 +/- 19.5) TNU are obtained. The Borexino data are compatible with a mantle geo-neutrino signal of (15.4 +/- 12.3) TNU. The combination of the Borexino and the KamLAND data allows to extract a geo-neutrino mantle signal of (14.1 +/-8.1) TNU.

Primary authors : Dr. MIRAMONTI, Lino (Milano University and INFN)

Co-authors :

Presenter : Dr. MIRAMONTI, Lino (Milano University and INFN)

Session classification : Poster Session I

Track classification : Geo-neutrinos

Type : Poster

Contribution ID : 13

Effective Spectral Function for Quasielastic Scattering on Nuclei

Content :

Spectral functions that are used in modeling of quasi elastic scattering in neutrino event generators such as GENIE, NEUT, NUANCE and NUWRO, and GiBUU include Fermi gas, local Fermi gas, Bodek-Ritche Fermi gas with high momentum tail, and the Benhar Fantoni two dimensional spectral function. We find that the $\frac{d\sigma}{d\nu}$ predictions for these models are in disagreement with the prediction of ψ' superscaling function which is good extracted from fits to quasielastic electron scattering data on nuclear targets. It is known that spectral functions do not fully describe quasielastic scattering because they only model the initial state. Final state interactions distort the shape of the quasi elastic peak, reduce the cross section at the peak and increase the cross section at the tail of the distribution for large energy transfer to final state nucleons. We show that the kinematic distributions predicted by the ψ' superscaling formalism can be well described by the predictions using a modified "effective spectral function". }

Primary authors : Prof. BODEK, Arie (University of Rochester)

Co-authors : Prof. CHRISTY, Eric (Hampton University) ; Mr. COOPERSMITH, Brian (University of Rochester)

Presenter : Prof. BODEK, Arie (University of Rochester)

Session classification : Poster Session I

Track classification : Neutrino Interactions

Type : Poster

Contribution ID : 15

Search for Non-Standard Interactions by atmospheric neutrino

Content :

It is known that neutral current Non-Standard Interactions (NSI) in propagation cause additional matter effect for neutrinos and that large NSI, which is comparable in strength to those in the Standard Model, can be consistent with the existing data. We investigate the effects of NSI in propagation to atmospheric neutrino experiments such as Super-Kamiokande and Hyper-Kamiokande. With the ansatz where the parameters which have strong constraints from other experiments are neglected, we show how these experiments put constraints on the remaining parameters of the Non-Standard Interactions.

Primary authors : Mr. FUKASAWA, Shinya (Tokyo Metropolitan University)

Co-authors : Prof. YASUDA, Osamu (Tokyo Metropolitan University)

Presenter : Mr. FUKASAWA, Shinya (Tokyo Metropolitan University)

Session classification : Poster Session I

Track classification : Atmospheric Neutrinos

Type : Poster

Contribution ID : 16

Track reconstruction for CHIPS

Content :

CHerenkov detectors In mine PitS (CHIPS) is an R project aiming to develop large cost-effective neutrino detectors for future studies. We propose to deploy a water Cherenkov detector with total fiducial mass of 100 kton in the NuMI beam, submerged in a flooded mine pit in Northern Minnesota, at 7 mrad off-axis. Built in stages starting with a 10 kton module, it will deliver physics results to help constrain the value of CP violating phase until the start of LBNE operation, when it can be moved to observe the second oscillation maximum in the new beam. This poster presents the CHIPS concept and describes a preliminary track reconstruction algorithm. Based on a Geant4 simulation of the detector, this maximum-likelihood method will serve to optimise the design for maximum signal-background discrimination.

Primary authors : Mr. PFUTZNER, Maciej (University College London)

Co-authors : Mr. PERCH, Andrew (UCL)

Presenter : Mr. PFUTZNER, Maciej (University College London)

Session classification : Poster Session II

Track classification : Long Baseline Oscillations

Type : Poster

Contribution ID : 17

Sensitivity of ICAL at INO to Lorentz and CPT violation

Content :

arXiv:1402.6265
We study the sensitivity of the Iron Calorimeter (ICAL) at the India-Based Neutrino Observatory (INO) to Lorentz and CPT violation in the neutrino sector. Its ability to identify the charge of muons in addition to their direction and energy makes ICAL a useful tool in putting constraints on these fundamental symmetries. Using resolution, efficiencies, errors and uncertainties obtained from ICAL detector simulations, we determine senstivities to del b31, which parametrizes the violations in the muon neutrino sector. We carry out calculations for three generic cases representing mixing in the CPT violating part of the hamiltonian, specifically, when the mixing is 1) small,2) large, 3) the same as that in PMNS matrix. We find that for both types of hierarchy, ICAL at INO should be sensitive to del b31> 4x10^-23 GeV at 99% C.L. for 500 kt-yr exposure, unless the mixing in the CPT sector is small.

Primary authors : Mr. CHATTERJEE, Animesh (Harish Chandra Research Institute)

Co-authors : Prof. GANDHI, Raj (Harish Chandra Research Institute) ; Dr. SINGH, Jyotsna (University of Lucknow)

Presenter : Dr. SINGH, Jyotsna (University of Lucknow)

Session classification : Poster Session II

Track classification : Short Baseline Oscillations / Sterile Neutrinos / Non-standard Oscillations

Type : Poster

Contribution ID : 18

Solar neutrinos experiment using torsion balance with sapphire crystal

Content :

Considering only the coherence scattering of neutrinos(antineutrinos)on stiff crystals, an experiment with a torsion balance is proposed. The balance is coupled to an optical autocollimator which measures small rotation angles of about 0.1arcsec. The period of the torsion balance is about 1140s. A diurnal effect is expected for solar neutrinos, due to the rotation of the Earth around its own axis. Neutrinos interact with the torsion balance with a force between 10^-5 and 10^-8 dyn, comparable with that reported by J.Weber [1]. In our experiment the mass of sapphire and lead is identical (25g). The results show a very large cross section for neutrinos incident on infinitely stiff crystals.The construction and testing of this kind of high sensitivity torsion balance designed and built at the "Horia-Hulubei" National Institute for R in Physics and Nuclear Engineering-Bucharest are presented and discussed.

[1]Apparent observation of abnormally large coherent scattering cross section using keV and MeV range antineutrinos, and solar neutrinos, J.Weber, Physical Review D Vol.38,No.1, July 1988, pp.32-40.

Primary authors : Dr. CRUCERU, Madalina ("Horia-Hulubei" National institute for R in Physics and Nuclear Engineering (IFIN-HH Bucharest))

Co-authors : Dr. CRUCERU, ILIE (IFIN-HH, Bucharest) ; Dr. NICOLESCU, George (IFIN-HH, Bucharest)

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Session classification : Poster Session I

Track classification : Solar Neutrinos

Type : Poster

Contribution ID : 19

TROITSK NU-MASS: from electron to sterile neutrinos

Content :

After successful 20 year long program to set an upper limit for the electron antineutrino mass the Troitsk experiment gets a new breath. Tritium beta-decay allows to search for a new physics - a possible contribution of sterile neutrinos to the electron spectrum. Sterile neutrino in keV mass range is a good candidate for the Warm Dark Matter. Our new goal is to measure beta-spectrum in the wide energy range from 10 keV to the maximum allowed energy of about 19 keV. We already performed a search for a sign of an additional neutrino mass state in the beta-electron spectrum by using old data, which were re-analyzed in the range of the last 175 eV from the spectrum end point. The lowest value at 95% C.L. upper limit for the mixing angle was found to be about or less than 0.01 for masses above 20 eV. New measurements are about to start this year. We hope to improve the existing limits by two-tree orders of magnitude in the mass range up to 10 keV.

[1] A.I. Belesev et al., "An upper limit on additional neutrino mass eigenstate in 2 to 100 eV region from 'Troitsk nu-mass' data", JETP Lett. 97 (2013) 67. arXiv:1211.7193

[2] A.I. Belesev et al., "A search for an additional neutrino mass eigenstate in 2 to 100 eV region from "Troitsk nu-mass" data - detailed analysis", Journal of Physics G – Nuclear and Particle Physics", 41 (2014) 015001. arXiv:1307.5687

Primary authors : Dr. PANTUEV, Vladislav (Institute for Nuclear Research, RAS, Moscow)

Co-authors :

Presenter : Dr. PANTUEV, Vladislav (Institute for Nuclear Research, RAS, Moscow)

Session classification : Poster Session II

Track classification : Short Baseline Oscillations / Sterile Neutrinos / Non-standard Oscillations

Type : Poster

Contribution ID : 20

The AmC Calibration Source Induced Background at Daya Bay Experiment

Content :

The Daya Bay experiment has made the most precise measurement of the neutrino mixing angle theta13 and the first independent measurement of the effective mass splitting in the electron anti-neutrino disappearance channel utilizing measured reactor anti-neutrino rate and spectral shape. A thorough understanding of backgrounds is crucial for the measurement. Among all the backgrounds at Daya Bay, one comes from the AmC calibration source parked on top of the anti-neutrino detectors, which is an especially major background contributor at the far site. Many efforts have been made to better evaluate this background and constrain related systematics, including an in-situ measurement using a much stronger AmC source to directly measure the background spectra and benchmark our simulations. Details of the measurement and evaluation of the AmC background will be presented in this poster.

Primary authors : LI, Gaosong (Shanghai Jiao Tong University)

Co-authors :

Presenter : LI, Gaosong (Shanghai Jiao Tong University)

Session classification : Poster Session I

Track classification : Reactor Neutrino Oscillations

Type : Poster

Contribution ID : 21

Light yield and Scintillation Decay Time Constants of Te-loaded Liquid Scintillator for the SNO+ Experiment

Content :

The SNO+ experiment is the follow-up to the Sudbury Neutrino Observatory (SNO). The heavy water that was in SNO will be replaced with a liquid scintillator of linear alkylbenzene. SNO+ will have a broad physics program which will include solar neutrinos, detecting geo-neutrinos, studying reactor neutrino oscillations, serving as a supernova neutrino detector, and carrying out a search for neutrinoless double beta decay by loading 2.3 tons of natural tellurium into the liquid scintillator.
Since energy resolution is of profound importance for the experiment, it is extremely important to accurately measure the light yield of the liquid scintillator. In addition, since pulse shape discrimination is extremely important for background rejection, it is also critical to measure the scintillation decay times for alpha and beta electron excitations. A series of measurements of the liquid scintillator light yield and scintillation decay timing profiles for both Te-loaded and unloaded configurations will be described.

Primary authors : GRULLON, Sean (University of Pennsylvania)

Co-authors :

Presenter : GRULLON, Sean (University of Pennsylvania)

Session classification : Poster Session I

Track classification : Solar Neutrinos

Type : Poster

Contribution ID : 22

Non-Standard Neutrino Interactions in the mu tau sector

Content :

This research focuses on Non-Standard Interactions (NSI) and their effects on neutrino oscillations. In particular, we focus on the effects of the parameter εμτ on muon neutrino survival probability and the number of muons measured in IceCube's DeepCore (ICDC) detector. Furthermore, the effects are found to be sign asymmetric and an analytic model is presented that predicts points of maximum sign asymmetry.

Primary authors : Mr. WRIGHT, Warren (Pennsylvania State University)

Co-authors :

Presenter : Mr. WRIGHT, Warren (Pennsylvania State University)

Session classification : Poster Session I

Track classification : Cosmic Neutrinos

Type : Poster

Contribution ID : 23

CHerenkov detectors In mine PitS (CHIPS)

Content :

The CHerenkov detectors In mine PitS (CHIPS) Project seeks to substantially lower the cost per kiloton of neutrino detectors by instrumenting existing deep bodies of water located in long baseline neutrino beams. The initial location for CHIPS is the Wentworth Mine Pit 2W located near Hoyt Lakes MN, 7 mr off-axis in the NuMI Beam, ~710 km from Fermilab. The pit is ~1250 m by ~750 m by ~60 m deep. Initial water chemistry and velocity measurements for CHIPS were made in Summer 2013. Plans for Summer 2014 include deployment of a ~100 m^3 prototype detector near the bottom of the Wentworth pit. This device would use an aluminum frame, a fabric liner to isolate the detector water and five photomultiplier Digital Optical Modules (DOMs) borrowed from the ICECUBE Collaboration. Future CHIPS possibilities include larger detectors in the NuMI beam and a CHIPS-type detector behind a Missouri River dam at the second oscillation maximum of the proposed LBNE beam.

Primary authors : Prof. MARSHAK, Marvin (University of Minnesota)

Co-authors :

Presenter : Prof. MARSHAK, Marvin (University of Minnesota)

Session classification : Poster Session II

Track classification : Long Baseline Oscillations

Type : Poster

Contribution ID : 24

Supernova Early Warning in the Daya Bay Reactor Neutrino Experiment

Content :

Supernova Early Warning in the Daya Bay Reactor Neutrino Experiment
Hanyu Wei, Tsinghua University, China
On behalf of the Daya Bay Collaboration

Providing an early warning of a galactic supernova using neutrino signals is of importance in studying both supernova dynamics and neutrino physics. The Daya Bay Reactor Neutrino Experiment, with the unique feature of multiple liquid scintillator detectors separated in space, is sensitive to the full energy spectrum of supernova burst electron-antineutrinos. By utilizing 8 Antineutrino Detectors (ADs) in three separate experimental halls, we obtain a more powerful and prompt rejection to muon spallation backgrounds than single-detector experiments. A dedicated supernova online trigger system has been installed to detect a coincidence of neutrinos via inverse-beta-decay (IBD) signals within a 10-second window, thus providing a robust early warning of a supernova occurrence within the Milky Way. In addition, more than half a year tests of the communication with the Supernova Early Warning System (SNEWS, an international organization) show that the promptness (about 10s delay) and robustness of the supernova online trigger system in Daya Bay perform perfectly. As a result, a golden trigger threshold, i.e. with a false alarm rate < 1/year, can be set as low as 6 candidates among the 8 detectors, leading to a 100% detection probability for all 1987A type supernova bursts at the distance to the Milky Way center and a 95% detection probability to those at the edge of the Milky Way. The schematic view, trigger methodology, unique features and the supernova explosion detection probability of the supernova online trigger system in Daya Bay will be presented in this poster.

Primary authors : Mr. WEI, Hanyu (Center for High Energy Physics, Tsinghua University)

Co-authors :

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Session classification : Poster Session I

Track classification : Supernova Neutrinos

Type : Poster

Contribution ID : 25

Astrophysical Tau Neutrino Search with the IceCube Neutrino Observatory

Content :

Most models predict neutrinos to be produced in astrophysical sources such as Active Galactic Nuclei (AGN) and Gamma Ray Bursts (GRB). Because of the very long baselines from these sources to the Earth a 1:1:1 (electron neutrino:muon neutrino:tau neutrino) flavor ratio is expected at the Earth. The IceCube Neutrino Observatory is a cubic kilometer Cherenkov detector, located deep within the Antarctic ice, built to detect all flavors of neutrinos. Contrary to the case for the two other neutrino flavors, tau neutrino background from atmospheric origin is negligible. The identification of a tau neutrino in IceCube would therefore be strong evidence for the existence of an astrophysical neutrino flux. At sufficiently high energies (above about 1 PeV) the incoming tau neutrino generates in a charged current interaction a tau lepton that can travel far enough before decaying for it to be distinguished from the other flavors. Depending on the track length and decay mode of the tau lepton and the interaction positions, tau neutrinos can lead to several different signatures in the detector. The case where both interactions occur within the detection volume and the tau lepton decays hadronically or to an electron is nicknamed a “Double Bang”. Recent results from the IceCube Collaboration show evidence of the presence of a flux of extraterrestrial neutrinos up to energies where tau neutrino detection via this signature would become feasible. The current status of a search for tau neutrinos via the Double Bang signature in IceCube will be presented.

Primary authors : Mr. VRAEGHE, Matthias (Universiteit Gent)

Co-authors :

Presenter : Mr. VRAEGHE, Matthias (Universiteit Gent)

Session classification : Poster Session I

Track classification : Cosmic Neutrinos

Type : Poster

Contribution ID : 26

A 20 ton double phase LAr TPC for LBNO

Content :

Double phase liquid argon time projection chambers are an exciting new technology for neutrino detectors. This technology is known to provide excellent tracking and calorimetry performance that can outperform other techniques. In this context GLACIER is a proposed giant double phase liquid argon underground neutrino observa- tory scalable to masses of 100 kton. As proposed by the future European Long Baseline Neutrino Oscillation program (LBNO), a neutrino beam from CERN with GLACIER as far detector would allow to precisely measure the neutrino mixing parameters, determine the neutrino mass hierarchy and test the existence of the CP-violating phase. At the same time, the detector could conduct astroparticle experiments of unprecedented sensitivity. GLACIER relies on novel technologies which are currently being tested on smaller scale prototypes. After the successful operations of a 3 liter and a 250 liter chamber we are now constructing a detector with a 3 × 1 × 1 m^3 active volume (~20 ton total). The chamber would explicitly test many of the detector components envisaged for GLACIER such as the membrane insulation, charge readout, signal and high voltage feedthroughs etc.. This poster will describe the LBNO physics potential and provide an overview of the ongoing R towards giant double phase liquid argon detectors. A detailed description of the 3 × 1 × 1 m^3 chamber will be presented.

Primary authors : Dr. MURPHY, Sebastien (ETH Zurich)

Co-authors :

Presenter : Dr. MURPHY, Sebastien (ETH Zurich)

Session classification : Poster Session II

Track classification : Long Baseline Oscillations

Type : Poster

Contribution ID : 27

New results and future capabilities of the Double Chooz reactor antineutrino experiment

Content :

We present a new measurement of the neutrino oscillation parameter sin^2 2theta_{13} derived from two years of data taken with the Double Chooz far detector. This result, drawn from twice the data used in our previous gadolinium-based analysis, is the most precise Double Chooz measurement to date. Along with increased statistics, the analysis features an improved energy scale, reduced backgrounds, and a unique background constraint from reactor-off data. Additionally, we report the precision we expect to achieve when the Double Chooz near detector begins taking data within the next year.

Primary authors : CARR, Rachel (Columbia University) ; Dr. NOVELLA, Pau (CIEMAT) ; Dr. LUCHT, Sebastian (RWTH Aachen University)

Co-authors :

Presenter : CARR, Rachel (Columbia University) ; Dr. NOVELLA, Pau (CIEMAT) ; Dr. LUCHT, Sebastian (RWTH Aachen University)

Session classification : Poster Session I

Track classification : Reactor Neutrino Oscillations

Type : Poster

Contribution ID : 28

The ECHo neutrino mass experiment

Content :

The Electron-Capture-163Ho experiment, ECHo, aims to investigate the electron neutrino mass in the sub-eV range by means of the analysis of the calorimetrically measured electron capture spectrum of 163Ho. Arrays of low temperature metallic magnetic calorimeters having the 163Ho source embedded in the absorber will be used. A precise description of the expected spectrum will be achieved by theoretical calculations in parallel with dedicated experimental investigations. Independent measurements of the QEC-value will be performed using high precision Penning traps. For the QEC measurements as well as for the calorimetric measurement of the 163Ho spectrum, high purity 163Ho sources will be produced. Detailed studies of the background and of methods to reduce it will be performed. We discuss how the possibility to reach the sub-eV sensitivity on the electron neutrino mass is tightly bound to the results achieved in the different aspects mentioned above.
After the successful results achieved by measuring two single pixels with implanted 163Ho, a pilot experiment consisting of about 100 detectors grouped in arrays which are read out with the microwave multiplexing technique is under preparation. The activity per pixel will be between 1 and 10 Bq. We discuss the challenges regarding detector development, background rejection and parameterization of the spectrum for this experiment.

Primary authors : Dr. GASTALDO, Loredana (Kirchhoff Institute for Physics, Heidelberg University, INF 227, 69120 Heidelberg, Germany,)

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Presenter : Dr. GASTALDO, Loredana (Kirchhoff Institute for Physics, Heidelberg University, INF 227, 69120 Heidelberg, Germany,)

Session classification : Poster Session I

Track classification : Neutrino Mass

Type : Poster

Contribution ID : 29

The physics programme of next MICE Step IV

Content :

The International Muon Ionisation Cooling Experiment is progressing towards full demonstration of the feasibility of this cooling technology decisive for neutrino physics and muon colliders. Its next step IV should provide the first precise measurements of emittances and first evidence of cooling. Spectrometer solenoids, muon trackers and absober-FC (focus coil) modules are being assembled to make this possible in 2015. The physics programme of ionization cooling Step IV measurements will be described in detail, with Li-H and a few other promising absorber materials of different shapes. It relies on progress of the hardware being detailed in a separate poster. The longer term final step V and step VI complete demonstration measurements being simultaneously prepared (re accelerating RFCC modules, RF cavities inside their own focusing CC ("coupling" coils) will also be outlined.

Primary authors : RAJARAM, Durga (Illinois Institute of Technology)

Co-authors :

Presenter : RAJARAM, Durga (Illinois Institute of Technology)

Session classification : Poster Session II

Track classification : Neutrino Beam Flux

Type : Poster

Contribution ID : 30

Improvements for IceCube's Supernova Search System

Content :

The IceCube Neutrino Observatory was designed to detect neutrinos at energies greater than 100 GeV.
Due to subfreezing temperatures, the photomultipliers' dark noise rates are particularly low. This enables IceCube to search
for neutrinos from galactic supernovae by measuring an increase in the overall hit number (scalers) in the detector coming from the Cerenkov light of interactions of MeV neutrinos in the ice .
A new feature to the standard DAQ, called HitSpooling, is running in IceCube since 2013.
By buffering the un-triggered hit information of the photomultipliers we have access to the full raw data stream of the detector in case of a supernova.
In combination with the standard scaler data, the HitSpooling feature leads to a better understanding of background processes coming from
atmospheric muons and instrumental noise.
Furthermore, the status of the galactic supernova search as well as systematic and detector stability studies are presented.

Primary authors : Mr. HEEREMAN, David (IIHE ULB-VUB)

Co-authors :

Presenter : Mr. HEEREMAN, David (IIHE ULB-VUB)

Session classification : Poster Session I

Track classification : Supernova Neutrinos

Type : Poster

Contribution ID : 31

Charged Pion Cross section measurement at MINERvA

Content :

The charged pion production by neutrinos interacting on heavy nuclei is of great interest to high energy and nuclear physics and increasingly important for neutrino oscillation experiments. MINERvA is a few GeV neutrino-nucleus scattering experiment that employs a fine grained detector running in the NuMi neutrino beam at Fermilab. We present a measurement of the differential cross-sections for muon-neutrino charged current charged pion production in the MINERvA active plastic target.

Primary authors : Mr. RAKOTONDRAVOHITRA, Laza (Fermilab/University of Antananarivo)

Co-authors : Mr. EBERLY, Brandon (University of Pittsburgh)

Presenter : Mr. RAKOTONDRAVOHITRA, Laza (Fermilab/University of Antananarivo)

Session classification : Poster Session I

Track classification : Neutrino Interactions

Type : Poster

Contribution ID : 32

Search for "kaon plus nothing" at MINERvA

Content :

Supersymmetric Grand Unified Theories predict proton decay with p -> K+ anti-nu as the dominant channel. Searches in water Cherenkov detectors like Super-Kamiokande are complicated by the fact that the K+ is below threshold. Since only the K+ decay products are observed, backgrounds arise from K+ production by atmospheric neutrinos where all primary final state particles are below threshold. MINERvA identifies these events by reconstructing the time difference between the kaon and its decay products, and expects to be able to constrain the rate of such neutrino-induced backgrounds.
The current status of this analysis is presented.

Primary authors : MARSHALL, Chris (University of Rochester)

Co-authors :

Presenter : MARSHALL, Chris (University of Rochester)

Session classification : Poster Session I

Track classification : Neutrino Interactions

Type : Poster

Contribution ID : 33

Low-ν Flux and Total Charged-current Cross Sections in MINERνA

Content :

The MINERνA measures neutrino and antineutrino interaction cross sections on carbon and nuclear targets which are of interest to ongoing and future accelerator oscillation experiments. Cross section measurements require accurate knowledge of incident neutrino flux. The low-ν flux technique uses a standard-candle cross section for events with low energy transfer to the hadronic system to determine the incident flux. MINERνA will use low-ν fluxes to tune production models in beam simulations and to extract total charged-current interaction cross sections. This poster will present the low-ν flux technique adapted for the MINERνA data samples and present prospects for low energy total charged-current cross section measurements from MINERνA.

Primary authors : Ms. REN, Lu (University of Pittsburgh) ; Prof. NAPLES, Donna (University of Pittsburgh)

Co-authors :

Presenter : Ms. REN, Lu (University of Pittsburgh)

Session classification : Poster Session I

Track classification : Neutrino Interactions

Type : Poster

Contribution ID : 34

Development of various liquid scintillators for the next generation neutrino experiments

Content :

Liquid scintillator (LS), which is a mixture of a base solvent plus a scintillating solute, has been used to detect neutrinos coming from atmospheric, solar, accelerator beam and reactor experiments. Then metals such as Cd, Gd, Li, B, Yb, Tn, etc, are loaded into LS. In all neutrino experiments, researchers have tried to develop their LS and metal-loaded LS to achieve a long attenuation length, high light output as well as chemical and optical stability over several years. It is also important to have chemical compatibility between the metal-loaded LS with acrylic and other LS construction materials. Safety concerns for the environment and human body must also be satisfied. We have developed several oil-based and water-based liquid scintillators using various surfactants, then loaded with metals. In this poster, we will summarize all the characteristics of the various liquid scintillators for the future neutrino experiments.

Primary authors : Mr. KIM, Seungchan (Department of Physics, Chonnam National University, Korea)

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Presenter : Mr. KIM, Seungchan (Department of Physics, Chonnam National University, Korea) ; Ms. SONG, Sookhyung (Department of Physics, Chonnam National University, Korea)

Session classification : Poster Session I

Track classification : Other / Global Projects

Type : Poster

Contribution ID : 35

Calorimetric measurement of the 163Ho spectrum in ECHo

Content :

The Electron Capture 163Ho experiment (ECHo) will investigate the electron neutrino mass in the sub-eV range by the kinematical analysis of the calorimetrically measured 163Ho spectrum. Low temperature metallic magnetic micro-calorimeters with 163Ho embedded in the absorber will be used for this experiment.

We have performed a series of preliminary tests with two magnetic micro-calorimeters having 163Ho ions implanted in the absorber. The electron capture spectrum of 163Ho that we have measured is presently the most accurate one showing an energy resolution of ΔEFWHM = 7.6 eV. The measured signal rise time is as fast as τ = 130 ns. We discuss the performance of single pixels and the analysis of the measured 163Ho spectrum.

For the next middle-scale experiment we have developed a novel 64-pixel detector consisting of two 32-pixel arrays which are read-out by means of the microwave multiplexing technique. We present the new detector design, describe the read-out scheme and discuss the achievable performance.

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Session classification : Poster Session I

Track classification : Neutrino Mass

Type : Poster

Contribution ID : 36

Development of liquid scintillator contaning zirconium complex for neutrinoless double beta decay experiment

Content :

An organic liquid scintillator containing zirconium complex was studied for neutrinosless double beta decay experiment. A ^{96}Zr nuclei has a large Q-value (3.35MeV), and no experiment is planned to use as a target. In order to realize ton scale target isotope with good energy resolution (4\%@2.5MeV), we have used zirconium beta-diketon complex which has huge solubility (over 10w.t.\%) to the Anisole. However, the absorption wavelength of diketon ligand overlaps with the luminescence from Anisole. Therefore, the light yield of liquid scintillator decreased in proportion to the concentration of beta-diketon complex. In order to avoid this problem, we synthesized beta-keto ester complex introducing $-OC_3H_7$ or $-OC_2H_5$ substituent groups in the beta-diketon complex. These complexes have shorter absorption wavelength (245nm) than the emission wavelength of Anisole (275nm). The scintillation light yield recovered about double, however, did not reach at the expected value, because the residual absorption around the 275nm still exists. We have found that those were caused by the impurities of beta-keto ester complex and it will be solved by the purifying the complex. We obtained that the light yield was about 30\% with respect to the original cocktail, and the energy resolution was 13\%@1MeV even though 8.5\% of PMT photo coverage. We have also found that a diethyl malonate ligand shifted the absorption peak to around 210nm, and the complex will have no quenching for the Anisole based liquid scintillator. Here we will report the present status.

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Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 37

Development of photon and phonon detectors for rare-event experiments

Content :

We developed photon and phonon sensors based on metallic magnetic calorimeters to be applied in scintillator-based experiments searching for neutrinoless double beta decay (AMoRE with $CaMoO_4$, and LUMINEU with $ZnMoO_4$ crystal scintillators) and in experiments searching for dark matter such as weakly interacting massive particles (WIMPs). This research is motivated by the need to reduce the background of such experiments by increasing the discrimination among different types of particles and to lower the energy threshold. We expect to achieve an energy resolution below 100 eV (FWHM) and a signal rise-time of less than 200 microseconds in the phonon detector while for the photon detector we expect an energy resolution between 3 eV and 10 eV (FWHM) and a signal rise-time below 50 microseconds. We discuss the design and fabrication issues of the combined photon and phonon detector.

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Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 38

High energy neutrinos from active galactic nuclei

Content :

The first evidence of an astrophysical high-energy neutrino signal as recently reported by the IceCube experiment now starts to open a new window towards astronomy with elementary particles. The detected excess in the diffuse neutrino flux leaves the concrete sources unknown at this point, but provides the opportunity to start constraining possible emission scenarios. In this paper, we investigate if the signal can be generated by proton-proton interactions in active galactic nuclei (AGN). We show what conditions need to be present
in the AGN sub-class FR-I and FR-II radio jets in order to have those sources explain the IceCube signal via proton-proton interactions.
While FR-II lobes have too low column depths, the derived condition is met by the knots in FR-I jets, which makes it possible to single them out as the possible sources for the IceCube signal and at the same time as promising acceleration sites for cosmic rays above the ankle.

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Presenter : Dr. EICHMANN, Björn (Ruhr-University Bochum, TP4)

Session classification : Poster Session I

Track classification : Cosmic Neutrinos

Type : Poster

Contribution ID : 39

The Origin of IceCube Astrophysical Neutrinos

Content :

Recent detection of high-energy neutrinos (approximately 30 TeV - 1PeV range), most likely from astrophysical sources, by IceCube neutrino observatory ushers the era of Neutrino Astronomy. Poor angular resolutions of the dominantly cascade-type events prohibit identification of the sources, however. A cluster of 5 cascade events near the Galactic Center, although statistically not significant with current data, and an additional 3 cascade events correlated with the Fermi Bubbles hint plausible Galactic origin of a subset of the neutrino events detected by IceCube. An additional, most likely extragalactic, flux component is required to explain the full published data set. Together with neutrino fluxes from the Galactic Center activity and the resulting Fermi Bubbles it will be shown that an extragalactic neutrino flux, most likely from relativistic blast waves of exploding stars, could explain IceCube detection in a multi-source-class scenario.

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Co-authors :

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Session classification : Poster Session I

Track classification : Cosmic Neutrinos

Type : Poster

Contribution ID : 40

Feasibility study of measuring the neutrino mass hierarchy with a deep underwater Cherenkov detector: KM3NeT - ORCA

Content :

Following the measurement of the θ13 mixing parameter, the determination of the neutrino mass hierarchy (normal: m1 < m2 < m3 or inverted: m3 < m1 < m2) has become a central goal in upcoming and next-generation neutrino physics experiments.
Atmospheric neutrino experiments have emerged as a promising pathway to this measurement, through the exploitation of Earth-induced matter effects in the GeV energy range.
ORCA (Oscillation Research with Cosmics in the Abyss) is a proposal to conduct such a measurement of the neutrino mass hierarchy with atmospheric neutrinos (and possibly also with a neutrino beam) using a large underwater Cherenkov detector.
It is being developed in the framework of the KM3NeT Collaboration, which aims at deploying a multi-km3 Cherenkov neutrino telescope in the Mediterranean Sea to complement and extend the reach of the IceCube detector at the South Pole.
The current status of the ORCA feasibility study will be presented, based on a reference detector of 1000 optical modules (OM) distributed on 50 lines, with typical interline spacing of 20m and inter-OM spacing of 6m, corresponding to an instrumented water mass of 1.8 Mton. The optimization of the final geometry is part of the study. The performances of the selection and reconstruction algorithms developed for track-like events (muon neutrinos) will be presented, together with the latest sensitivity estimates. Assuming a 30% (20%) Gaussian uncertainty on the neutrino energy, the sensitivity already rises to ~3.8σ (4.5σ) over 6 years for the reference detector. This could be significantly enhanced by combining with the results obtained with cascade-like events (mostly electron neutrinos). The latest achievements in this respect will be presented as well.

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Session classification : Poster Session I

Track classification : Atmospheric Neutrinos

Type : Poster

Contribution ID : 41

Systematic search for step-like anomalies in the tritium β-decay spectrum in the Troitsk-ν-mass experiment

Content :

The issue of step-like anomalies in the tritium β-decay spectrum as measured in the Troitsk-ν-mass experiment is addressed in the context of the new analysis in a systematic fashion using efficient statistical tests specifically derived for the purpose.

It is demonstrated how the method of quasi-optimal weights can be applied to searches of anomalies in experimental data. As an example, a convenient statistical criterion is derived for step-like anomalies in cumulative β-decay spectra in the direct neutrino mass measurement experiments. It is almost as powerful as the locally most powerful one and appreciably excels the conventional chi2 and Kolmogorov-Smirnov tests. It is also compared with an ad hoc criterion of «pairwise correlations of neighbours»; the latter is seen to be less powerful even if more sensitive to more general anomalies. As a realistic example, the criteria are applied to the Troitsk-ν-mass data.

It is concluded that the presence of the anomaly cannot be statistically asserted with a high confidence level.

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Session classification : Poster Session II

Track classification : Short Baseline Oscillations / Sterile Neutrinos / Non-standard Oscillations

Type : Poster

Contribution ID : 43

Measuring the 14C content in liquid scintillators

Content :

In order to detect solar neutrinos from the pp-chain (with the maximum neutrino energy
of approximately 400 keV) requires that the intrinsic 14C content in a liquid scintillator is at extremely low level.

In the Borexino detector, a 300-ton liquid scintillation detector at Gran Sasso, Italy, the
ratio of 14C to 12C of approximately 2 x 10^{-18} has been achieved. It is the lowest value ever measured, but too large for observing solar pp-neutrinos. The detector situates 1200 metres underground.

14C cannot be removed from liquid scintillators by chemical methods, or by other methods in large quantities (liters). In principle, the older is the oil or gas source that the liquid scintillator is made of and the deeper it situates, the smaller should be the 14C-to-12C ratio. This, however, is not generally the case, and the ratio depends on the activity (U and Th content) in the environment of the source.

We are starting a series of measurements where the 14C-to-12C ratio will be measured from liquid scintillator samples. The measurements take place in the Pyhasalmi mine, Finland, at the depth of 1400 meters (4000 mwe). There will be half-a-dozen samples with the known origin, each of them approximately 3 litres. The liquid scintillator vessel, light quides and low-active PMTs will be shielded with thick layers of electrolytically manufactured copper and parafine, and perhaps lead. The setup needs also a radon filter (nitrogen flow) and perhaps a muon veto detectors.

The aim is to measure ratios smaller than 10^{-18}, if such samples exists. One measurement takes several weeks.

It is planned that later this setup will be scaled up, up to approximately 100 litres of liquid scintillator, for half-life measurements of double beta-decaying isotopes (2nu-mode).

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Session classification : Poster Session I

Track classification : Solar Neutrinos

Type : Poster

Contribution ID : 44

Status of RED experiment

Content :

The RED-100 (Russian Emission Detector) is being constructed for the experiment on detection of neutrino elastic coherent scattering off atomic nuclei. The detector details and the current status are given.
The RED-100 is an emission two-phase xenon detector containing 200 kg of the liquid Xe (~ 100 kg in a fiducial volume). One of the possible sites of the experiment is SNS, Oak Ridge National Laboratory. The energy spectrum of neutrinos produced at the SNS source extends up to ~ 50 MeV that gives the kinetic energies of Xe recoils up to a few tens of keV. For these energies of Xe recoils the response of the LXe is well known from neutron calibrations of dark matter detectors. Possible detector locations at the SNS are under consideration now. One of them is underground at a distance of 40 meters from a target and in a 20-m deep well. For this location, the count rate of signals with a magnitude of more than two electrons from nu-nucleus coherent scattering is expected to be ~1500 events/year. Our simulations predict less then 300 events/year from all background sources at these conditions.

Primary authors : Dr. AKIMOV, Dmitri (ITEP, Moscow)

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Presenter : Dr. AKIMOV, Dmitri (ITEP, Moscow)

Session classification : Poster Session I

Track classification : Neutrino Interactions

Type : Poster

Contribution ID : 45

Updated three-neutrino oscillation parameters from global fits

Content :

In this work we present an updated global fit to neutrino oscillation data within the three-flavour framework. The most recent data from solar and atmospheric neutrino experiments are included in our analysis together with the latest results from the long-baseline accelerator experiments T2K and MINOS and the recent measurements of reactor neutrino disappearance reported by Double Chooz, Daya Bay and RENO.

Primary authors : Dr. TORTOLA, Mariam (IFIC - CSIC / Universitat de Valencia)

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Session classification : Poster Session I

Track classification : Theory / Phenomenology

Type : Poster

Contribution ID : 46

Testing new physics with current reactor neutrino experiments

Content :

Reactor neutrino experiments have successfully measured the last unknown mixing angle with very good precision. In this work we investigate the sensitivity of current reactor data to the presence of new physics in the neutrino sector.

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Presenter : Mr. VANEGAS FORERO, David (University of Valencia/IFIC)

Session classification : Poster Session I

Track classification : Reactor Neutrino Oscillations

Type : Poster

Contribution ID : 47

Physics potential of the LAGUNA/LBNO project

Content :

The LAGUNA/LBNO collaboration proposes a next generation neutrino experiment to address fundamental questions in particle and astroparticle physics.
The experiment consists of a far detector, LAr double phase TPC, the fiducial mass of the detector is set to 20 kt in its first stage. The detector will be situated at 2300 km from CERN: this long baseline provides a unique opportunity to study the neutrino flavour oscillations over the first and second oscillation maxima and to explore the L/E behaviour. The near detector is based on a high-pressure argon gas TPC situated at CERN.
The poster will show the physics potential of this experiment for determining without ambiguity the mass hierarchy (MH) in its first stage and discovering CP-violation (CPV) using the CERN SPS beam with a power of 750 kw.
The impact of the assumptions on the knowledge of the oscillation parameters and the systematic errors are very important and will be shown in detail to prove the force of the experiment assuming realistic and conservative parameter values.

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Co-authors :

Presenter : Mr. AGOSTINO, LUCA (APC Paris)

Session classification : Poster Session II

Track classification : Long Baseline Oscillations

Type : Poster

Contribution ID : 48

Higher multiplet scalars and neutrino mass generation

Content :

In this poster, I will introduce two mechanisms to generate neutrino masses via the higher multiplet scalars. The first mechanism is a two-loop generating model and the second mechanism is tree level generation also named cascade seesaw mechanism in the literature. I will explain these mechanisms and their main predictions. A LHC phenomenology study on these two mechanisms will be shown, including the correlation between HIggs decays into diphoton and Z\gamma channels, the coexistence of both Type-II and Type-III seesaw signatures in cascade seesaw models, and a novel 8 charged leptons final states without missing energy. The implications on low energy physics such as flavor changing processes and neutrinoless double beta decays in both scenarios will be mentioned.

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Session classification : Poster Session I

Track classification : Theory / Phenomenology

Type : Poster

Contribution ID : 49

Direct measurement of the NuMI Flux with Neutrino-Electron Scattering in MINERvA

Content :

An accurate neutrino flux prediction is important for neutrino oscillation experiments as well as a normalization for absolute cross-section measurements in MINERvA. A measurement of neutrino-electron scattering provides a constraint on the overall flux normalization and it compliments a flux prediction using external hadron production data. Identification of neutrino-electron scattering relies on the excellent angular resolution in
MINERvA's fine-grained tracker. In addition, dE/dx at the beginning of electromagnetic showers is used to reject photon background. With the increased statistics this method of direct flux measurement will be more important in the higher energy neutrino beam configuration.

Primary authors : Mr. PARK, Jaewon (University of Rochester)

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Session classification : Poster Session I

Track classification : Neutrino Interactions

Type : Poster

Contribution ID : 50

Solar models, solar neutrinos and helioseismology: a quantitative analysis of the solar composition problem (00h20')

Content :

We perform a quantitative analysis of the solar composition problem by using a statistical approach that allows us to combine the information provided by helioseimic and solar neutrino data in an effective way. We include in our analysis the measurments of 7Be and 8B neutrino fluxes; the helioseismic determinations of the surface helium abundance and of the depth of the convective envelope; the sound speed profile inferred from helioseismic frequencies.
We apply the proposed approach to infer the chemical composition of the Sun from observational data and to discuss the adequacy of Standard Solar Model assumptions.
We discuss the role of the (possible) CNO neutrino measurements in present and future liquid scintillator detectors and emphasize their importance for clarifying the problem.

Primary authors : Dr. VILLANTE, Francesco (University of L'Aquila)

Co-authors :

Presenter : Dr. VILLANTE, Francesco (University of L'Aquila)

Session classification : Poster Session I

Track classification : Solar Neutrinos

Type : Poster

Contribution ID : 51

Kassiopeia: A Modern, Extensible C++ Particle Tracking Package

Content :

The Kassiopeia particle tracking framework is an object-oriented software package utilizing modern C++ techniques, originally written to meet the needs of the KATRIN neutrino mass experiment. Kassiopeia features a new algorithmic paradigm for particle tracking simulations which targets experiments containing complex geometries and electromagnetic fields, with high priority put on calculation efficiency, customizability, extensibility, and ease of use for novice programmers. Kassiopeia has been well validated and widely used within the KATRIN collaboration, playing a primary role in several theses and refereed publications. This work presents the latest version, which is already seeing use in the Project8 collaboration and will be released to the larger physics community in the summer of 2014.

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Session classification : Poster Session I

Track classification : Neutrino Mass

Type : Poster

Contribution ID : 52

Measurement of reactor neutrinos with neutron captures on hydrogen at RENO

Content :

RENO has been taking data since August, 2011 and successfully measured the smallest neutrino mixing angle, theta_13. This measurement was based on reactor neutrino events with neutron captures on gadolinium and thus quite low backgrounds. RENO can also measure the theta_13 in the reactor neutrino sample with neutron captures on hydrogen, due to manageable accidental-background. This is possible because of ultra-low radioactivity in the photomultiplier tubes, and successful purification of liquid scintillator and detector materials. By employing this neutron-capture-on-hydrogen detection method, we can make use of ~2.7 times more target protons than earlier gadolinium measurement. This independent measurement provides a valuable cross-check on the systematic uncertainties of the earlier theta_13 results. In this poster, we present the results from the hydrogen capture analysis.

Primary authors : Dr. PARK, Jungsic (Seoul National University)

Co-authors :

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Session classification : Poster Session I

Track classification : Reactor Neutrino Oscillations

Type : Poster

Contribution ID : 53

Cosmic Neutrino Detection from the International Space Station

Content :

Quite recently the IceCube Collaboration has reported clear evidence for neutrinos of cosmic origin. Here we ask whether the proposed first generation of space-based cosmic ray detectors will be sensitive to the cosmic neutrino flux. We consider proposed scenarios for ultra-high energy cosmic ray detectors to be deployed aboard the International Space Station and estimate the expected rates for cosmic neutrino detection over different energy regimes.

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Presenter : Prof. ANCHORDOQUI, Luis (University of Wisconsin Milwaukee)

Session classification : Poster Session I

Track classification : Cosmic Neutrinos

Type : Poster

Contribution ID : 54

Low Energy Neutrino Studies and Backgrounds at Hyper-Kamiokande

Content :

Hyper-Kamiokande (Hyper-K) is a next generation underground water Cherenkov detector.
The baseline design is based on Super-Kamiokande (Super-K) detector and contains
enlarged fiducial volume of 0.56 Mt, which is 25 times of Super-K.
Hyper-K will play a considerable role in the next neutrino physics frontier.
Here, the physics potential of Hyper-K in the neutrino astrophysics is studied.
The photo-coverage of Hyper-K will be 20%, a half of Super-K, and the cosmic
background will be somewhat increased because of the location.
These conditions must be considered.
First, we investigated the cosmic muon flux and spallation background at Hyper-K
candidate sites, which is a dominant background at the low energy analysis.
Then, the effect on the analysis is evaluated, applying the recent background
reduction technique.
As the result, the Hyper-K's possibility for solar neutrino, supernova neutrino and
supernova relic neutrino are obtained.
We will discuss about these results.
The Hyper-K's possibility with gadolinium doping will be also discussed.

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Presenter : Dr. YANO, Takatomi (Kobe Univ.)

Session classification : Poster Session II

Track classification : Long Baseline Oscillations

Type : Poster

Contribution ID : 55

Physics Potential of the Jiangmen Underground Neutrino Observatory

Content :

The Jiangmen Underground Neutrino Observatory (JUNO) is designed as a 20 kt liquid scintillator detector with unprecedented energy resolution (3%/sqrt{E}) and sited in an underground lab with 700 meters rock overburden. Primary goals are to determine the neutrino mass hierarchy and measure three oscillation parameters (theta_{12}, Delta m^2_{21}, Delta m^2_{31}) to better than 1%.

We review the physics potential of JUNO for 1) the neutrino mass hierarchy, 2) precision measurements, 3) supernova neutrinos, 4 solar neutrinos, 5) geo-neutrinos, and other applications. Capabilities for the measurement of fundamental oscillation parameters and observation of the neutrino events from the astrophysical and geophysical environment are reviewed with suitable statistical assessments. Finally, the requirements on the detector design parameters for different physics goals will be presented.

Primary authors : Dr. LI, Yu-Feng (IHEP)

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Presenter : Dr. LI, Yu-Feng (IHEP)

Session classification : Poster Session I

Track classification : Solar Neutrinos

Type : Poster

Contribution ID : 56

The HOLMES experiment

Content :

The European Research Council has recently funded HOLMES, a new experiment to directly measure the neutrino mass. HOLMES will perform a calorimetric measurement of the energy released in the decay of 163Ho. The calorimetric measurement eliminates systematic uncertainties arising from the use of external beta sources, as in experiments with beta spectrometers. This measurement was proposed in 1982 by A. De Rujula and M. Lusignoli, but only recently the detector technological progress allowed to design a sensitive experiment. HOLMES will deploy a large array of low temperature microcalorimeters with implanted 163Ho nuclei. The resulting mass sensitivity will be as low as 0.4eV. HOLMES will be an important step forward in the direct neutrino mass measurement with a calorimetric approach as an alternative to spectrometry. It will also establish the potential of this approach to extend the sensitivity down to 0.1eV. We outline here the project with its technical challenges and perspectives.

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Session classification : Poster Session I

Track classification : Neutrino Mass

Type : Poster

Contribution ID : 57

On the relevance of the electron-to-proton ratio for high-energy neutrino fluxes

Content :

The calculation of the cosmic ray spectrum of a certain source is very difficult as direct observation is not possible in most cases. A common technique uses synchrotron radiation produced in leptonic processes: From the synchrotron measurement, the electron spectrum can be derived, which in astrophysical sources is expected to have a similar spectral behavior to the proton spectrum. Thus, if the electron-proton luminosity ratio K is theoretically known, it is possible to estimate the proton spectrum from leptonic data.

In most literature this ratio is assumed to be approximately K=10-100, which is true in the case of equal spectral indices of proton- and electron-momentumdistribution. Dropping this assumption and using more detailed calculations it turned out that even for slightly different indices, the exact value of K deviates by about one order of magnitude from the conventional ratio with increasing energies.

These new results are of particular importance for different neutrino flux models, in which the observed synchrotron radiation is used to estimate the flux of neutrinos from hadronic interactions. This flux usually scales proportional to K, and therefore, the exact choice of K is very important for those calculations. On our poster, we discuss the consequences of our calculations for neutrino flux predictions and the interpretation of model-dependent neutrino flux limits presented by IceCube.

Primary authors : Mr. MERTEN, Lukas (Ruhruniversität Bochum) ; Prof. BECKER TJUS, Julia (Ruhruniversität Bochum)

Co-authors :

Presenter : Mr. MERTEN, Lukas (Ruhruniversität Bochum)

Session classification : Poster Session II

Track classification : Neutrino Beam Flux

Type : Poster

Contribution ID : 58

Improvements on Monte Carlo Simulation and Studies of Absolute Detection Efficiency at Daya Bay

Content :

The Daya Bay experiment has made the most precise measurement of neutrino mixing angle theta13 and the first direct measurement of the nu_e_bar mass-squared difference dm^2_ee through the relative measurements between near and far detectors. In addition, efforts are made toward the absolute reactor flux and spectra measurement, which require a precise understanding of the absolute detection efficiency and detector energy response. The Monte Carlo simulation plays a crucial role in understanding the detector performance. A Geant4-based full detector simulation software has been built under the Gaudi framework, and is tuned with various data sets. This poster will describe details of the improvements on Monte Carlo Simulation and studies of the absolute detection efficiency at Daya Bay.

Primary authors : Dr. CAO, Guofu (IHEP, China)

Co-authors :

Presenter : Dr. CAO, Guofu (IHEP, China)

Session classification : Poster Session I

Track classification : Reactor Neutrino Oscillations

Type : Poster

Contribution ID : 59

R for neutrinoless double beta decay with Borexino

Content :

Poster presented on behalf of the Borexino Collaboration.

The discovery of neutrino oscillations have proved that the three Standard Model neutrinos are mixed and not massless. Being the only neutral fermions of the theory, their mass term is not uniquely defined.
The only known and practical way to investigate the mass term, and therefore distinguish between Dirac and Majorana neutrinos, is the search of neutrinoless double beta decay.

Since the beginning of the Borexino project in the early nineties, the idea to perform a neutrinoless double beta decay experiment with 136Xe dissolved in the scintillator was considered (Ref. [1, 2]). The beautiful results obtained by the Borexino experiment [3, 4], which achieved a purity far exceeding design goals, and a new concept for dissolving large quantities of Xe in the scintillator, make this possibility even more interesting for a third generation experiment in the next decade.

The developed purification techniques allowed to reach an exceptional radio-purity (238U<6x10e-18 g/g and 232Th<5x10e-18 g/g, Ref. [3]) and consequently, almost zero background coming from impurities in the region of interest. Taking advantage of Henry's law (the solubility of a gas in a liquid increases with its pressure) by increasing the pressure of the xenon dissolved in the scintillator, it is possible to reach an active mass of 10-15 tons and possibly even more.

In this poster, we present the ongoing R studies to look for the neutrinoless double beta decay using liquid scintillators. More precisely, we show the status and the main results about the characterization of the optical properties of the Borexino scintillator when xenon is dissolved in large quantity and with high pressure.
We measured the light yield of the compound xenon-scintillator with respect to the pure Borexino scintillator case at different pressures.
Our setup consists in a 50 liters chamber able to reach the pressure of 5 bar.
Besides keeping under control the system, we can measure the amount of scintillator inside the chamber, the gaseous xenon partial pressure, and the amount of xenon dissolved in the scintillator.
By dissolving xenon at the pressure of 1 bar in the scintillator, we measured a light yield 15% lower than the Borexino light yield, while at 5 bar the decrease is about 45%.

In the next future, we are planning to fully characterize this mixture by also measuring the attenuation length and testing the pulse shape discrimination capability. Besides, we will characterize the light yield loss as a function of the fluor concentration. We will also study the behavior of other liquid scintillators and wavelength shifters.

[1] Phys. Rev. Lett. 112, 068103 (1994);
[2] Borexino Proposal edited by G. Bellini and R. Raghavan (1991);

[3] arXiv:1308.0443 [hep-ex];
[4] Phys. Rev. Lett. 108, 051302 (2012).

Primary authors : Dr. CAMINATA, Alessio (Dipartimento di Fisica, Università e INFN, Genova 16146, Italy) ; Dr. DI DOMIZIO, Sergio (Dipartimento di Fisica, Università e INFN, Genova 16146, Italy) ; Mr. FERNANDES, Guido (Dipartimento di Fisica, Università e INFN, Genova 16146, Italy) ; Dr. LOMBARDI, Paolo (Dipartimento di Fisica, Università degli Studi e INFN, Milano 20133, Italy) ; Mr. MARCOCCI, Simone (Gran Sasso Science Institute (INFN), L'Aquila, Italy) ; Prof. PALLAVICINI, Marco (INFN and University of Genova) ; Dr. TESTERA, Gemma (Dipartimento di Fisica, Università e INFN, Genova 16146, Italy) ; Dr. ZAVATARELLI, Sandra (Dipartimento di Fisica, Università e INFN, Genova 16146, Italy)

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Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 60

Status of the BEST* project (Baksan Experiment on Sterile Transitions)

Content :

The very short-baseline neutrino oscillation experiment BEST is currently under construction at the Baksan Neutrino Observatory of the Institute for Nuclear Research RAS. The experiment will use an upgraded Gallium-Germanium Neutrino Telescope (GGNT) and an artificial 51Cr neutrino source with activity ~ 3 MCi to search for transitions of active neutrinos to sterile states with Δm2 ~ 1 eV2. The sensitivity to disappearance of electron neutrinos is expected to be a few percent.
Construction of a set of new facilities, including a two-zone tank for irradiation of 50 tons of Ga metal with the intense 51Cr source, as well as additional modules of the GGNT counting and extraction systems, is close to completion. Before beginning Ga measurements with a 51Cr source the new facilities will be used for SAGE solar neutrino measurements. Agreement of the results of these measurements with the results obtained in the long-term measurements of the solar neutrino capture rate by SAGE will serve as an independent check of the new systems.

Primary authors : Prof. GAVRIN, Vladimir (INR RAS)

Co-authors : Prof. CLEVELAND, Bruce (SNOLAB, Canada) ; Dr. GORBACHEV, Valery (INR RAS) ; Dr. GORBUNOV, Dmitry (INR RAS) ; Dr. IBRAGIMOVA, Tatiana (INR RAS) ; Dr. KOZLOVA, Joulia (INR RAS) ; Prof. MATVEEV, Victor (INR RAS) ; Dr. MIRMOV, Ilya (INR RAS) ; Dr. NICO, Jeffrey (NIST, USA) ; Dr. SHIKHIN, Alexander (INR RAS) ; Prof. SINCLAIR, David (Carleton University, Canada) ; Dr. VERETENKIN, Evgeny (INR RAS)

Presenter : Dr. IBRAGIMOVA, Tatiana (INR RAS)

Session classification : Poster Session II

Track classification : Short Baseline Oscillations / Sterile Neutrinos / Non-standard Oscillations

Type : Poster

Contribution ID : 61

An effective theory of neutrino: New physics contribution to neutrinoless double beta decay and its origin

Content :

It is expected that currently on-going experiments (and more planned in near future) will reveal various aspects of neutrino mass: Precision cosmology in the post WMAP era places a strong constraint on gravitational property of neutrino. Neutrinoless double beta decay experiments aim at identifying its basic nature (Dirac or Majorana). With long baseline oscillation experiments, we have a chance to know the type of mass hierarchy. All of them are going to test the standard three-generation neutrino framework. If the experimental results will make a conflict with each other, we will need some new physics beyond "the standard neutrino model".

In this presentation, we discuss a new physics contribution to neutrinoless double beta decay process, which can be parametrized as effective operators. With "the exhaustive bottom-up approach" we explore systematically the relation between the effective operators and their high energy (TeV scale) completions.

We also discuss the possible relation between the neutrinoless double beta decay operators and the origin of neutrino mass.

Primary authors : Dr. OTA, Toshihiko (Saitama University)

Co-authors :

Presenter : Dr. OTA, Toshihiko (Saitama University)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 62

Status and perspectives of the COBRA experiment

Content :

COBRA is a neutrinoless double-beta-decay experiment using an array of Cadmium-Zinc-Telluride semiconductor detectors, the isotop of interest being 116-Cd with a Q-value of 2814 keV. To investigate the experimental challenges of operating CdZnTe detectors in low background mode and to identify potential background components, a demonstrator setup is operated at the Gran Sasso underground laboratory (LNGS) in Italy, while additional studies are proceeding in surface laboratories. The experiment consists of monolithic, calorimetric detectors of coplanar grid design (CPG detectors). These detectors have a size of 1x1x1 cm^3 and are arranged in four 4x4 layers. An overview of the current status and future perspectives are given. Results of pulse-shape analyses are presented as well as background estimates and exclusion limits from the data collected so far.

Primary authors : Dr. WONSAK, Bjoern (University of Hamburg)

Co-authors :

Presenter : Dr. WONSAK, Bjoern (University of Hamburg)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 63

Commissioning of the KATRIN Main Spectrometer

Content :

Neutrino properties and especially the determination of the neutrino mass play an important role at the intersections of cosmology, particle physics and astroparticle physics.
The KArlsruhe TRItium Neutrino experiment (KATRIN) investigates single beta decay electrons close to their kinematic endpoint in order to determine the neutrino mass by a model-independent method.
Applying an ultra-luminous molecular windowless gaseous tritium source and an integrating high-resolution spectrometer of MAC-E filter type, KATRIN allows beta spectroscopy close to the kinematic endpoint with unprecedented precision and will reach a sensitivity of 200 meV/c2 (90% C.L.) on the neutrino mass.
The poster summarizes the hardware commissioning of the KATRIN Main Spectrometer and Detector Section including vacuum conditioning and high voltage operation. This work is supported by the German Federal Ministry BMBF, the Helmholtz Alliance for Astroparticle Physics HAP, and the Department of Energy DOE.

Primary authors : Mr. KRAUS, Marcel (Karlsruhe Institute of Technology (KIT)) ; Dr. THUEMMLER, Thomas (Karlsruhe Institute of Technology (KIT))

Co-authors :

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Session classification : Poster Session I

Track classification : Neutrino Mass

Type : Poster

Contribution ID : 64

First measurements with the KATRIN main spectrometer

Content :

The KATRIN experiment is designed to probe the absolute neutrino mass scale from the kinematics of tritium β-decay. Therefore it will analyze the shape of the tritium β-spectrum in a narrow region close to the tritium endpoint. To reach the design sensitivity of 200 meV, a high energy resolution, high signal count rates and especially an ultra-low background rate of 0.01 cps are required.
In mid 2013 the combined spectrometer and detector section has been commissioned. The aim was to test all the hardware and slow control components and to demonstrate that the main spectrometer works as a MAC-E filter, while at the same time operating at a very low background level.
This poster will present first results from this measurement phase, focusing on the investigation of the background and transmission properties.
This work is supported by the German Federal Ministry BMBF, the Helmholtz Alliance for Astroparticle Physics HAP, and the Department of Energy DOE.

Primary authors : Mr. GROH, Stefan (Karlsruhe Institute of Technology (KIT)) ; Dr. WANDKOWSKY, Nancy (Karlsruhe Institute of Technology (KIT))

Co-authors :

Presenter : Mr. GROH, Stefan (Karlsruhe Institute of Technology (KIT)) ; Dr. WANDKOWSKY, Nancy (Karlsruhe Institute of Technology (KIT))

Session classification : Poster Session I

Track classification : Neutrino Mass

Type : Poster

Contribution ID : 65

Predictions from High Scale Mixing Unification Hypothesis

Content :

Starting with 'High Scale Mixing Unification' hypothesis, we investigate the renormalization group evolution of mixing parameters and masses for both Dirac and Majorana type neutrinos. Following this hypothesis, the PMNS mixing parameters are taken to be identical to the CKM ones at a unifying high scale. Then, they are evolved to a low scale using MSSM renormalization-group equations. For both type of neutrinos, the renormalization group evolution "naturally" results in a non-zero and small value of leptonic mixing angle θ13. One of the important predictions of this analysis is that, in both cases, the mixing angle θ23 is non-maximal and lies only in the second octant. We also elaborate on the important differences between Dirac and Majorana neutrinos within our framework and how to experimentally distinguish between the two scenarios. Furthermore, for both cases, we also derive constraints on the allowed parameter range for the SUSY breaking and unification scales, for which this hypothesis works. The results are novel and can be tested by present and future experiments.

Primary authors : Dr. SRIVASTAVA, Rahul (Institute of Mathematical Sciences)

Co-authors : Dr. GUPTA, Saurabh (Institute of Mathematical Sciences) ; Prof. RAJASEKARAN, G (Institute of Mathematical Sciences) ; Dr. ABBAS, Gauhar (Instituto de Física Corpuscular, CSIC, University of Valencia)

Presenter : Dr. SRIVASTAVA, Rahul (Institute of Mathematical Sciences)

Session classification : Poster Session I

Track classification : Theory / Phenomenology

Type : Poster

Contribution ID : 66

Commissioning and Monitoring of the NOvA Far Detector

Content :

NO□vA, the NuMI O ft-axis □Electron Neutrino Appearance experiment will study □□nu_u->nu_e oscillations, characterized by the mixing angle □theta_13. A complementary pair of detectors are being constructed □14 mrad off beam axis to optimize the energy profi le of the neutrinos. The far detector is a surface based 14 kTon liquid scintillator tracking volume located 810 km from the main injector source (NuMI) in Ash River, Minnesota. The first neutrinos to the Ash River site arrived in August 2014 following Fermilab accelerator upgrades with a partially instrumented far detector operating. Since then, the beam intensity has increased and the full detector has been completed. This poster
highlights the commissioning and data quality monitoring e fforts which have been crucial to understanding the initial performance characteristics of detector. Based on feedback from this work, the detector performance was improved and first neutrino events have been observed.

Primary authors : Dr. MUETHER, Mathew (Fermilab)

Co-authors :

Presenter : Dr. MUETHER, Mathew (Fermilab)

Session classification : Poster Session II

Track classification : Long Baseline Oscillations

Type : Poster

Contribution ID : 67

Current status and perspectives of the LUCIFER experiment

Content :

A convincing detection claim of neutrinoless double beta decay 0nuDBD demands for detectors with excellent energy resolution and zero background in the energy region of interest.
For this purpose, the LUCIFER project is developing a detector that combines the calorimetric signal and the scintillation light produced by ZnSe scintillating bolometers.
The identification and rejection of the alpha interactions, as well as the large Q-value of the emitter,
that lies well above the 2.6 MeV line of {208}^Tl, guarantee a very low background in the energy region of the {82}^Se 0nuDBD.
Despite the small mass of ~17 kg, LUCIFER will reach a 90% CL sensitivity of 0.6 10^{26} y on the half-life of the decay.
In this poster we will present the current status and perspectives of the project.

Primary authors : Dr. SCHAEFFNER, Karoline (INFN - LNGS)

Co-authors :

Presenter : Dr. SCHAEFFNER, Karoline (INFN - LNGS)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 68

Muon Neutrino Disappearance Measurement at T2K

Content :

In this poster, we present the T2K numu-disappearance analysis using the Run1-4 T2K data (6.57e20 protons on target). T2K is a long-baseline neutrino oscillation experiment, where a beam of mostly muon neutrinos travels 295 km west from the J-PARC facility to Super-Kamiokande, a water Cherenkov detector with 22.5 ktonnes fiducial mass. One of the experiment's aims is to measure the amount of numu-disappearance. To this end, an analysis was performed on 120 events observed at Super-K assuming the full three-flavor oscillation framework. This analysis finds that the best fit numu-disappearance parameters are sin^2(\theta_{23})=0.514^{+0.055}_{-0.056} (0.511\pm0.055) and dm^2_{32}=(2.51\pm0.10)x10^{-3} eV^2 (dm^2_{13}=(2.41\pm.010)x10^{-3} eV^2) for the normal (inverted) hierarchy. This analysis puts the current best constraints on the value of the mixing angle \sin^2(\theta_{23}).

Primary authors : WONGJIRAD, Taritree (Duke University)

Co-authors :

Presenter : WONGJIRAD, Taritree (Duke University)

Session classification : Poster Session II

Track classification : Long Baseline Oscillations

Type : Poster

Contribution ID : 69

Fast Neutron Detection with the Double Chooz Time Projection Chamber

Content :

The Double Chooz Time Projection Chamber (DCTPC) is a directional fast neutron detector that measures background neutron production at the Double Chooz reactor-based neutrino oscillation experiment's near (120 mwe) and far (300 mwe) halls. DCTPC will provide data at modest depths, tying near-surface measurements to those from deep underground laboratories. DCTPC will be used to search for a correlation between fast neutron production and rainfall and will provide valuable neutron measurements as a function of depth, direction, and energy. Calibration data will be presented, as well as preliminary findings from operation at Double Chooz.

Primary authors : MOULAI, Marjon (Massachusetts Institute of Technology)

Co-authors :

Presenter : MOULAI, Marjon (Massachusetts Institute of Technology)

Session classification : Poster Session I

Track classification : Reactor Neutrino Oscillations

Type : Poster

Contribution ID : 70

Magnetic horn optimization

Content :

The magnetic horn, invented by Simon van der Meer over 50 years ago, has been used in essentially every neutrino beam line since its invention. Analytical calculation and some simulation work has been applied to horn design over the years. In this paper we show how, for the first time, computer-automated horn design optimization can be studied for implementation in a pion beam line like that in nuSTORM. The simulation uses new coding concepts and a massively-parallel computing environment.

Primary authors : Prof. BROSS, Alan (Fermilab)

Co-authors : Dr. NEUFFER, David (Fermilab) ; Dr. ADEY, David (Fermilab) ; Dr. STRIGANOV, Sergei (Fermilab)

Presenter : Prof. BROSS, Alan (Fermilab)

Session classification : Poster Session I

Track classification : Neutrino Beam Flux

Type : Poster

Contribution ID : 71

Spectrum Unfolding and Generic Reactor Antineutrino Spectrum Study at Daya Bay

Content :

The 'reactor antineutrino anomaly' was raised when the measured fluxes of short baseline reactor antineutrino experiments were normalized to the Mueller et al. prediction, which used revised reactor isotope models. Not only the fluxes, but also the spectrum shapes of different predictions were not identical. To replace these models for prediction of the flux and energy spectrum, a model-independent reactor antineutrino spectrum is extracted from ~300,000 inverse beta decay events measured by the Daya Bay experiment. This poster will describe spectrum unfolding for the estimation of the antineutrino energy spectrum from the measured spectrum of positrons from inverse beta decay. A method to predict the antineutrino flux and spectrum for reactors of differing fuel composition will also be presented.

Primary authors : Mr. ZHAO, Qingwang (Institute of High Energy Physics)

Co-authors :

Presenter : Mr. ZHAO, Qingwang (Institute of High Energy Physics)

Session classification : Poster Session I

Track classification : Reactor Neutrino Oscillations

Type : Poster

Contribution ID : 72

Search for a 4th light neutrino state with a 5 PBq 144Ce-144Pr electron antineutrino generator next to a large liquid scintillator detector

Content :

The reactor neutrino and gallium anomalies can be tested with a 5 PBq (100 kCi scale) 144Ce-144Pr antineutrino beta-source deployed at the center or next to a large low-background liquid scintillator detector. The antineutrino generator will be produced by the Russian reprocessing plant PA Mayak in 2014, transported to the detector site, and deployed as early as 2015. We will describe the challenge of producing an intense 144Ce-based antineutrino generator, the expected L/E signal, and the expected backgrounds. Borexino's target volume provides a suitable environment to measure the energy and position dependence of the detected neutrino flux. A characteristic oscillation pattern would be visible for a baseline of about 10 m or less, providing a very clean signal of neutrino disappearance into a yet-unknown, sterile neutrino state. This will provide a comprehensive test of the electron dissaperance neutrino anomalies and could lead to the discovery of a 4th neutrino state for Delta_m^2 > 0.1 eV^2 and sin^2(2theta) > 0.05.

Primary authors : Dr. LASSERRE, thierry (CEA)

Co-authors :

Presenter : Dr. LASSERRE, thierry (CEA)

Session classification : Poster Session II

Track classification : Short Baseline Oscillations / Sterile Neutrinos / Non-standard Oscillations

Type : Poster

Contribution ID : 73

Energy Calibration of the EXO-200 Detector

Content :

The first stage of the Enriched Xenon Observatory (EXO), EXO-200, consists of an extremely low background time projection chamber containing ~150 kg of enriched liquid Xe-136 (LXe). The EXO-200 currently holds the most sensitive search for neutrinoless double beta decay in LXe. This search strongly relies on features presented in the energy spectrum of the measured events. The stringent requirements on the energy calibration are attained by frequent monitoring of the detector response. The energy resolution has been improved to an average of σ/E = 1.53% at the Q-value (2458 keV). This poster will focus on the energy calibration system of the EXO-200 detector along with the offline techniques applied to calibrate the data.

Primary authors : Dr. LICCIARDI, Caio (Carleton University)

Co-authors :

Presenter : Dr. LICCIARDI, Caio (Carleton University)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 74

The isotopic double-beta decay source for SuperNEMO

Content :

SuperNEMO exploits the tracking-calorimetry technique pioneered by NEMO3. The key feature of SuperNEMO is its unique capability to fully reconstruct the kinematic of the event. This allows to reduce the backgrounds and to discriminate among different mechanisms behind the possible double beta decays. SuperNEMO will be able to measure different isotopes at the same time. 48Ca, 82Se and 150Nd are currently under consideration.
In the demonstrator phase, the source of double-beta decay is made of enriched 82Se powder shaped in thin foils to minimise the energy loss of the out-coming particles and placed in the middle of the detector. To eliminate background events due to impurities in the source foil, the required radio-purity level for 208Tl and 214Bi are 2 µBq/kg and 10 µBq/kg respectively. The NEMO collaboration is conducting an R activity to strike the best materials and the optimal design of the source foil. Radio-purity measurements of each material under consideration for the foil production are ongoing using HPGe and BiPo detectors. This poster describes in detail the foil production procedure and the different designs currently under consideration. Preliminary results of the radio-purity measurements of different candidate materials for the foil construction will presented.

Primary authors : Dr. REMOTO, Alberto (Laboratoire d'Annecy-le-Vieux de Physique des Particules (LAPP))

Co-authors :

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Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 75

Calculating PINGU's Sensitivity to the Neutrino Mass Hierarchy

Content :

The Precision IceCube Next Generation Upgrade (PINGU) is planned as an infill to the IceCube array at the geographic South Pole. Every year, PINGU will record several ten thousands of atmospheric neutrinos with energies above 3 GeV. With these unprecendented statistics, PINGU will have sensitivity to the neutrino mass hierarchy (NMH).

To calculate the physics potential of PINGU, we have set up an effective detector simulation using parametrizations of the detector response. A multitude of systematic parameters is incorporated in the simulation.

We predict a median NMH significance of 3 sigma after three years of lifetime including systematics. Using our toolbox, we (can also) add constraints from other experiments and thus explore a variety of scenarios. Expected precisions for other measurements, such as the atmospheric mixing parameters, and the impact of systematics are evaluated as well.

Primary authors : Mr. SCHULTE, Lukas (Universität Bonn)

Co-authors : Dr. BÖSER, Sebastian (Universität Bonn) ; Prof. KOWALSKI, Marek (Universität Bonn)

Presenter : Mr. SCHULTE, Lukas (Universität Bonn) ; Dr. BÖSER, Sebastian (Universität Bonn)

Session classification : Poster Session I

Track classification : Cosmic Neutrinos

Type : Poster

Contribution ID : 76

The status of the construction of MICE Step IV

Content :

The International Muon Ionisation Cooling Experiment, decisive for the performance of a Neutrino Factory, in its next step IV will provide the first precise measurements of emittances and first evidence of cooling in 2015. The pair of MICE "emittometers" must be in place for this, upstream and downstream of the ionization cooling module. Each required the construction of a tracker (sci-fibers) measuring muon helices in solenoid coils that surround it. Solenoid coils confine muons to spiral in all components of an ionization cooling module. The first of these, that is now ready for Step IV, will be the first of three AFC (absorber-focus coil) modules: a Li-H vessel inside its own FC "focusing" coils. Li-H
and other simpler, possibly competitive, liquid and solid absorber samples are also being
prepared. The assembly process is in progress. Construction, performances, lessons learned will be described. Final step V and step VI demonstration requires two more AFC modules and two re-accelerating modules, RFCC's made of RF cavities inside their own focusing CC ("coupling" coils). The choices made and challenges being faced in this longer term construction efforts simultaneously in progress will also briefly be pointed to.

Primary authors : LEONOVA, Maria (Fermilab)

Co-authors :

Presenter : LEONOVA, Maria (Fermilab)

Session classification : Poster Session II

Track classification : Neutrino Beam Flux

Type : Poster

Contribution ID : 77

nEXO : The next phase of EXO on searching Neutrinoless Double Beta Decay

Content :

The Enriched Xenon Observatory (EXO) is an experimental program searching for neutrino-less double beta decay using 136Xe. The current stage of the experiment, EXO-200, consists of an ultra-low background TPC filled with ~175kg of xenon enriched to ~80% in the isotope 136Xe. EXO-200 has been taking data since May 2011, and producing some of the most competitive results in the field. The collaboration first discovered, and recently reported an improved measurement of the two-neutrino double beta decay of 136Xe, which is now the most precisely measured two-neutrino double beta decay half-life. In February 2014, with 99.8 kg•yr of 136Xe exposure and determined background rate of (1.7±0.2)×10^{-3} /keV/kg/yr in the ±2 sigma region of interest around the endpoint, the collaboration obtained a 90% CL sensitivity of 1.9×10^25 yr on neutrinoless double beta decay half-life. Building on the success of EXO-200, the collaboration is actively performing feasibility studies and R for the next phase multi-ton scale experiment named nEXO. The current detector conceptual design, background estimation, as well as sensitivity and discovery potential for nEXO will be described.

Primary authors : WEN, Liangjian (Institute of High Energy Physics, Beijing)

Co-authors :

Presenter : WEN, Liangjian (Institute of High Energy Physics, Beijing)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 79

NOvA Near Detector Assembly and Installation

Content :

NOvA is a long baseline neutrino experiment with a 300-ton near detector on the Fermilab site and a 14,000-ton far detector in northern Minnesota. The NOvA experiment will study neutrino and antineutrino oscillations in both disappearance and appearance channels to determine the neutrino mass hierarchy, to constrain the CP phase, and more. The near detector plays a critical role in understanding the composition of the unoscillated beam and helping reducing systematic uncertainties. The poster will present the procedures of assembly and installation of the NOvA near detector at Fermilab, including the detector assembly and transportation, mechanical installation, and electronics installation.

Primary authors : Dr. BU, Xuebing (Fermilab)

Co-authors :

Presenter : Dr. BU, Xuebing (Fermilab)

Session classification : Poster Session I

Track classification : Long Baseline Oscillations

Type : Poster

Contribution ID : 80

The PMNS matrix in the minimal 3-3-1 Model

Content :

The so called 3-3-1 models, with gauge symmetry SU(3)c X SU(3)L X U(1)x, are interesting extensions of the standard model (SM). The main feature of these models is that, by choosing appropriately the representation content, the triangle anomalies cancel out and the number of families has to be a multiple of three, moreover because of the asymptotic freedom this number is just three. In particular, the minimal version of this class of models (m3-3-1 for short) has other interesting predictions: it explains why sin2(w)< 1/4 is observed and at the same time, when sin2(w) =1/4 it implies the existence of a Landau-like pole at energies of the order of few TeVs; the existence of this Landau-like pole also stabilizes the electroweak scale avoiding the hierarchy problem; the model allows the quantization of electric charge independently of the nature of the massive neutrinos. One important feature, that distinguishes the model from any other one, is the prediction of extra singly charged and doubly charged gauge boson bileptons and also exotic charged quarks, while the lepton sector is the same as that of the SM. Right-handed neutrinos are optional in the model. They are not needed neither to generate light active neutrinos nor the Pontecorvo-Maki-Nakagawa-Sakata (PMNS) mixing matrix. Those exotic charged particles may have effect on the two photon decay of the SM-like Higgs scalar.

The three lepton generations trasnform under the 3-3-1 symmetry as a = (a la lac)LT ~ (1, 3,0), and we do not introduce right-handed neutrinos. The yukawa interactions in the Lepton sector have two main yukawa matrices: one antisymmetric ando one symmetric, and couples to the same field , which couples to quarks and couples also with a sextet S, S ~ (1, 6, 0) which does not couple to quarks. Under SU(2)L X U(1)y the sextet transforms as S = 1+2+3 and we see that there is a doublet and a triplet wich gives mass to charged leptons and active left-handed neutrinos, respectively. However, although the sextet is enough to give Majorana to the neutrinos and Dirac mass to the charged leptons, it does not give the PMNS mixing matrix (VPMNS = ULł U), since when only the sextet is the sorce of the lepton mass we have that UL = U, once the interactions with the triplet is mandatory, and this is fixed by the quaks mass and mixing.

Therefore, if this is the only way to obtain the leptons mass and mixing in the minimal 3-3-1 model, we've excluded the model, But we are able to prove that is possible adjust the lepton mixing and mass if a dimension five operator allowed by symmetry and matter content is taken into consideration, this operator ensures that the 331 model is not excluded by the data and can even lead to new interactions.

Primary authors : Dr. BRUNO MACHADO, Ana Carolina (IFT-UNESP)

Co-authors : Dr. PLEITEZ, Vicente (IFT-UNESP)

Presenter : Dr. BRUNO MACHADO, Ana Carolina (IFT-UNESP)

Session classification : Poster Session I

Track classification : Theory / Phenomenology

Type : Poster

Contribution ID : 81

The NOvA electron neutrino appearance analysis

Content :

The NOvA experiment will observe the oscillation of muon neutrinos into electron neutrinos between the Near Detector at Fermilab and the Far Detector at Ash River, Minnesota. With the ability to run neutrino and antineutrino beam, and with the the longest baseline of any accelerator neutrino experiment, NOvA aims to measure the ordering of the neutrino mass states and probe CP violation in the lepton sector.

This poster gives an overview of the techniques used in the electron neutrino analysis, and presents sensitivities for the determination of the mass hierarchy, theta23 octant, and the CP violating phase delta.

Primary authors : Dr. BACKHOUSE, Christopher (Caltech)

Co-authors :

Presenter : Dr. BACKHOUSE, Christopher (Caltech)

Session classification : Poster Session II

Track classification : Long Baseline Oscillations

Type : Poster

Contribution ID : 82

The MAJORANA DEMONSTRATOR assay program and background summary

Content :

The MAJORANA DEMONSTRATOR will perform a search for neutrinoless double-beta decay in 76Ge. The experiment is currently under construction at the Sanford Underground Research Facility in South Dakota, USA. It will use an array of 40kg of germanium detectors, 30kg of which will be enriched.
The sensitivity of a neutrinoless double-beta decay search increases with the exposure of the experiment, but is ultimately limited by the achieved background level. The major goal of the demonstrator is to reach a background level of < 3 cts/ROI/t-y to prove the feasibility of a tonne-scale experiment.
This poster presents the strategy for achieving this background goal in the MAJORANA DEMONSTRATOR. The material assay program and a summary of the expected background contributions will be presented.

Primary authors : Dr. MERTENS, Susanne (Lawrence Berkeley National Laboratory)

Co-authors :

Presenter : Dr. MERTENS, Susanne (Lawrence Berkeley National Laboratory)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 83

Method of Fission Product Beta Spectra Measurements for Predicting Reactor Anti-neutrino Emission

Content :

The flux of anti-neutrinos emanating from reactors has been used for a range of experiments studying neutrino properties. Results from these experiments are in tension with models that have mixing only among the three active neutrino flavors of the Standard Model. Knowledge of reactor anti-neutrino flux is based on inversion of total reactor beta spectra measured at the Institut Laue Langevin in the 1980s.
Recent reanalysis of that data has resulted in a 3% upward shift in the anti-neutrino flux. We explore the possibility that the present situation could be improved with a new measurement of the underlying reactor beta spectrum. Possibilities are considered to improve knowledge of the beta source by using fission foils activated in a neutron beam tailored to the energy spectrum found in a reactor core, and magnetic beta spectroscopy with tracking to suppress backgrounds and control systematics.

Primary authors : Dr. KOS, Marek (Pacific Northwest National Laboratory)

Co-authors : Dr. ASNER, David (PNNL) ; Dr. BURNS, Kim (PNNL) ; Dr. GREENFIELD, Bryce (PNNL) ; Dr. CAMPBELL, Luke (PNNL) ; Dr. ORRELL, John (PNNL) ; Dr. SCHRAM, Malachi (PNNL) ; Dr. VANDEVENDER, Brent (PNNL) ; Dr. WOOD, Lynn (PNNL) ; Dr. WOOTAN, David (PNNL)

Presenter : Dr. KOS, Marek (Pacific Northwest National Laboratory)

Session classification : Poster Session I

Track classification : Reactor Neutrino Oscillations

Type : Poster

Contribution ID : 84

Measurement of the Multiplicity and Energy Spectrum of γ-rays from the Thermal Neutron Capture Reaction Gd(n, γ)

Content :

Gadolinium (Gd) has the largest thermal neutron capture cross section among all stable nuclei. Gd has been used in liquid- scintillator neutrino detectors for neutron tagging. In this application, anti-electron neutrinos interacting on protons are identified by requiring both the prompt positron signal and the delayed gamma-ray signal from Gd neutron capture. Recently, a 200-ton Cherenkov detector (EGADS), loaded with 0.2% Gadolinium sulfate,
has been completed and started operation in the Kamioka Mine.
The neutron capture reaction is expected to produce 3-4 gamma-rays with total energy of 8MeV. However, how many gamma-rays are produced, how much energy they have, and how they are distributed spacially are not well known. We have conducted an experiment to measure the multiplicity and the energy spectum of gamma-rays using the JPARC pulsed neutron beam and a Germanium Spectrometer (ANNRI). We will present the new data and also show the comparison between data and the GEANT4 MC simulation, which is commonly used in the neutrino experiments. Our new data will improve the neutron tagging method and thus the anti-neutrino tagging method.

Primary authors : Mr. OU, Iwa (Okayama University)

Co-authors : Mr. YAMADA, Yoshiyuki (Okayama University) ; Mr. KAYANO, Tsubasa (Okayama University) ; Prof. HARADA, Hideo (Japan Atomic Energy Agency) ; Prof. KIMURA, Atsushi (Japan Atomic Energy Agency) ; Prof. SAKUDA, Makoto (Okayama University) ; Dr. YANO, Takatomi (Okayama Univ.)

Presenter : Mr. OU, Iwa (Okayama University)

Session classification : Poster Session II

Track classification : Cosmology And Neutrinos

Type : Poster

Contribution ID : 85

Simulation of the detector response of the 1-kton option of WATCHMAN

Content :

WATCHMAN (WATer CHerenkov Monitoring of AntiNeutrinos) is a new US based experiment that will exploit the low energy antineutrino signal from reactors, supernova and decay-at-rest antineutrino beams to pursue a broad physics program. WATCHMAN aims to be the first detector in the world to detect low energy antineutrinos in water, by adding a gadolinium dopant that increases the efficiency for the final-state neutron arising from the antineutrino interactions on protons in the water. An overview of the expected detector response to the different low-energy physics - including reactor antineutrinos, fast-neutron contamination, radionuclide contamination and U/Th contamination. The expected rates for each of these processes at the current preferred underground installation-site, the Fairport mine in Painesville Ohio, will also be presented. A focus on the unique advantages of the gadolinium dopant will be presented, this dopant enables WATCHMAN to significantly reduce the background contamination and allows a lower energy threshold compared to other Water Cherenkov Imaging detectors.

Primary authors : Dr. BERGEVIN, Marc (UC Davis)

Co-authors :

Presenter : Dr. BERGEVIN, Marc (UC Davis)

Session classification : Poster Session I

Track classification : Reactor Neutrino Oscillations

Type : Poster

Contribution ID : 86

An independent measurement of theta_13 using Hydrogen neutron capture at Daya Bay

Content :

The Daya Bay Experiment can make an independent measurement of reactor antineutrino disappearance using interactions identified by neutron capture on Hydrogen (n-H). Six 20-ton Gd-loaded and six 22-ton undoped scintillating targets provide nearly the same statistical precision using n-H interactions as the existing Gadolinium neutron capture result from Daya Bay. Several new techniques were developed to meet the challenges from the higher background and different systematics due to the lower neutron capture energy (2.2 MeV), the longer capture time (200 us), and the larger energy loss at the detector boundary. With the statistical and the major systematic uncertainties independent from the previous Gd capture study, this work allows for strong and independent evidence of reactor antineutrino disappearance. With the disappearance attributed to oscillation, theta_13 can be estimated with precision comparable to the existing Daya Bay measurement using neutron capture on Gadolinium. The combined Hydrogen and Gadolinium results should provide the most sensitive measurement of the neutrino mixing angle theta_13.

Primary authors : Ms. HU, Bei-Zhen (on behalf of the Daya Bay collaboration- Institute of Physics, National Chiao Tung University, Hsinchu)

Co-authors :

Presenter : Ms. HU, Bei-Zhen (on behalf of the Daya Bay collaboration- Institute of Physics, National Chiao Tung University, Hsinchu)

Session classification : Poster Session I

Track classification : Reactor Neutrino Oscillations

Type : Poster

Contribution ID : 87

Complete Simulation of the Angra Neutrino Project

Content :

The Angra Neutrino Project aims to measure neutrinos from the Angra Power Plant/Rio de Janeiro for safeguard purposes. The detector is under deployment at Centro Brasileiro de Pesquisas Físicas (CBPF) to be soon installed in Angra. After the project overview we present its complete simulation, including the effects of electronic noise. Expected neutrino detection efficiencies, backgrounds and signal over noise ratios are then discussed. Finally we show the status of construction and tests.

Primary authors : Prof. CHIMENTI, Pietro (UFABC)

Co-authors : Dr. ANJOS, Joao (CBPF - Centro Brasileiro de Pesquisas Físicas) ; Prof. VALDIVIESSO, Gustavo (Universidade Federal de Alfenas) ; Mr. NASCIMENTO SOUZA, Marcelo Jorge (CBPF)

Presenter : Prof. CHIMENTI, Pietro (UFABC)

Session classification : Poster Session I

Track classification : Reactor Neutrino Oscillations

Type : Poster

Contribution ID : 88

Energy calibration and slow control monitoring at RENO

Content :

The RENO(Reactor Experiment for Neutrino Oscillation) is an experiment to measure the smallest neutrino mixing angle theta_13 using anti-neutrinos emitted from the Hanbit nuclear power plant in Korea.
A slow control and monitoring system has been installed for PMT high voltage suppliers, water level of a veto detector component, temperatures, moisture in air, etc. We will present the performance of the system during the 3 year data-taking period. The energy response of the RENO detector was studied with an MC simulation, using several radioactive sources to obtain energy calibration constants for the prompt energy of reactor neutrinos.
We will present an improved energy calibration method and results to be used for the recent theta_13 measurement.

Primary authors : Dr. CHOI, JUNE HO (Dongshin University)

Co-authors :

Presenter : Dr. CHOI, JUNE HO (Dongshin University)

Session classification : Poster Session I

Track classification : Reactor Neutrino Oscillations

Type : Poster

Contribution ID : 89

Recent Progress of EGADS

Content :

Evaluating Gadolinium's Action on Detector Systems (EGADS) is a facility to test the feasibility of anti-electron neutrino detection by a gadolinium (Gd)-doped water Cherenkov detector. It is located in the Kamioka mine near Super-Kamiokande (SK). The addition of Gd allows a large background reduction, taking a coincidence of positron and gamma cascade of 8.0 MeV total energy from a captured neutron on Gd in the inverse beta decay reaction. The addition of Gd in SK can enable us to observe supernova relic neutrino signals for the first time.
We have installed 240 photo-sensors in the EGADS detector tank in the summer of 2013, after confirming that the attenuation length of the purified Gd-water in the empty stainless steel tank is maintained high. First with pure water only, the detector took data with various calibration sources. Gd has recently been loaded, making EGADS a fully functional anti-electron neutrino detector. The effects of Gd on the detector materials will also be studied. We present the recent status and progress of EGADS including the calibration results.

Primary authors : KIBAYASHI, Atsuko (Okayama University)

Co-authors :

Presenter : KIBAYASHI, Atsuko (Okayama University)

Session classification : Poster Session I

Track classification : Supernova Neutrinos

Type : Poster

Contribution ID : 90

Improving the accuracy of neutrino energy reconstruction in charged-current quasielastic scattering off nuclear targets

Content :

Neutrino oscillation studies in accelerator experiments rely on reconstruction of neutrino energy in charged-current (CC) quasielastic (QE) scattering, typically performed from the measured kinematics of the charged lepton only.

The correct interpretation of their outcome requires an accurate estimate of neutrino cross sections for the nuclear targets of interest.

We develop an approach based on the impulse approximation formalism, suitable to provide an estimate of the CC QE cross section over a broad range of neutrino energy, between 0.1 and 10 GeV, relevant to accelerator neutrino experiments. Our model uses the target spectral function obtained from realistic description of nuclear dynamics, and accounts for the effects of final-state interactions between the spectator system an the struck nucleon.

Comparisons to precise electron scattering data allow us to understand and quantify the uncertainties of our calculations, which can be employed to improve the accuracy of the energy reconstruction in CC QE interactions.

Primary authors : Dr. ANKOWSKI, Artur (INFN and Department of Physics,``Sapienza'' Universita' di Roma)

Co-authors : Prof. SAKUDA, Makoto (Okayama University) ; BENHAR, Omar (INFN - Rome)

Presenter : Dr. ANKOWSKI, Artur (INFN and Department of Physics,``Sapienza'' Universita' di Roma)

Session classification : Poster Session I

Track classification : Neutrino Interactions

Type : Poster

Contribution ID : 91

Development of a high sensitive radon detector in Kamioka

Content :

Radon is one of major background sources in the underground neutrino experiments. Our group has been working to develop a high sensitive radon detector, especially for Super-Kamiokande and XMASS experiments in Kamioka. Recently, we are trying to make a new vacuum-tight electrostatic-collection radon detector with 80 litter volume. In this poster, we will report the basic performances of the new 80-L radon detector and possible applications to the underground neutrino experiments.

Primary authors : Dr. TAKEUCHI, Yasuo (Dept. of Physics, Grad. School of Science, Kobe Univ.)

Co-authors : Mr. HOSOKAWA, Keishi (Kobe Univ.) ; Mr. NAKANO, Yuuki (ICRR, Univ. of Tokyo) ; Mr. ONISHI, Yosuke (Dept. of physics, Kobe university) ; Dr. SEKIYA, Hiroyuki (Kamioka Observatory, ICRR, Univ. of Tokyo) ; Prof. TASAKA, Shigeki (Information and Multimedia Center, Gifu University)

Presenter : Dr. TAKEUCHI, Yasuo (Dept. of Physics, Grad. School of Science, Kobe Univ.)

Session classification : Poster Session II

Track classification : Other / Global Projects

Type : Poster

Contribution ID : 92

Monitoring stability of Gd-loaded liquid scintillator at RENO

Content :

Reactor experiment for neutrino oscillation (RENO) began data-taking from August 2011. It successfully observed reactor anti-neutrino disappearance in April 2012 to measure the smallest mixing angle of theta13. Two identical detectors, one at near location and the other at far location, are constructed at the Yonggwang nuclear power plant in South Korea, to compare the observed reactor neutrino fluxes. The RENO detector consists of four concentric cylindrical layers: the target, the gamma-catcher, the buffer, and the veto. Each RENO detector is filled with 16 mass tons of Gadolinium-loaded liquid scintillator (GdLS) in the neutrino target region, and with 28 mass tons of unloaded liquid scintillator (LS) in the gamma-catcher region surrounding the target. LS was developed to satisfy chemical, physical, optical properties, and safety requirements. Linear alkyl benzene (LAB) was chosen as a solvent because of its high flash-point, sufficient light yield, and being environmentally friendly. GdLS is carefully developed to keep a long attenuation length and high light yield for a longtime period. GdLS has not shown any hint of degradation or instability for more than 2 years. In this poster, characteristics and mass production of the RENO LS and GdLS will be reviewed.

Primary authors : Ms. SO, Sunheang (Chonnam National University)

Co-authors : Ms. SONG, Sookhyung (chonnam National University) ; Mr. KO, Youngju (Chung Ang University) ; Prof. KIM, Wooyoung (Kyungpook National University) ; Prof. KIM, Soobong (Seoul National University) ; Mr. KIM, Sangyoung (Seoul National University) ; Mr. CHOI, Juneho (Dongshin University) ; Mr. SUN, Younggeun (Kyungpook National University) ; Mrs. JANG, Jeeseung (Gwangju Institute of Scinence and Technology) ; Prof. PARK, Ingon (Gyeongsang National University) ; Prof. PAC, Myoungyoul (Dongshin University) ; Prof. JANG, Hanil (Seoyeong University) ; Dr. PARK, Jungsic (Seoul National University) ; Dr. SEO, Seonhee (Seoul National University) ; Dr. SEO, Hyunkwan (Seoul National University) ; Dr. LEE, Byounghon (Seoul National University) ; Mr. LEE, Sungyu (Seoul National University) ; Mr. CHOI, Woonkuk (Seoul National University) ; Mr. YANG, Janghee (Sungkyunkwan University) ; Prof. YU, Intea (Sungkyunkwan University) ; Prof. CHOI, Youngil (Sungkyunkwan University) ; Prof. KIM, Yeongduk (IBS/Sejong University) ; Dr. JEON, Eunju (IBS/Sejong University) ; Mr. KIM, Baro (Chonnam National University) ; Mr. KIM, Seungchan (Chonnam National University) ; Mr. PARK, Ryunggyun (Chonnam National University) ; Prof. KIM, Jaeyool (Chonnam National University) ; Prof. CHOI, Sunho (Seoul National University) ; Mr. SHIN, Changdong (Chonnam National University) ; Mr. YEO, Insung (Chonnam National University) ; Prof. LIM, Inteak (Chonnam National University) ; Prof. JOO, Kyungkwang (Chonnam National University) ; Prof. KIM, Hyunsoo (Chonbuk National University) ; Prof. KIM, Siyeon (Chung Ang University)

Presenter : Ms. SO, Sunheang (Chonnam National University)

Session classification : Poster Session I

Track classification : Reactor Neutrino Oscillations

Type : Poster

Contribution ID : 93

Prediction of the Reactor Antineutrino Flux and Spectrum for the Daya Bay experiment

Content :

Prediction of the Reactor Antineutrino Flux and Spectrum for the Daya Bay experiment

Xubo Ma North China Electric Power University, China
On behalf of the Daya Bay Collaboration

In this poster, we present the calculations of the predicted antineutrino flux and spectrum as well as their uncertainties in the Daya Bay Experiment. The isotope models of Huber [1], Mueller [2], ILL [3] and Vogel [4], are used in the prediction. Using the operational history and simulation information from the nuclear power plant (NPP), including power, burn-up and fission fractions, the expected antineutrino spectrum and total flux at each antineutrino detector is obtained. To precisely compare with measurement, the contributions of spent nuclear fuel and off-equilibrium corrections to total flux and spectrum are simulated with the input of NPP information. The fission energy, fission fractions of each isotope, and correlation matrix of fission fractions are calculated and compared with previous results. All the uncorrelated and correlated uncertainties between cores, isotopes and energy bins are evaluated.

References:

[1] P. Huber, Phys. Rev. C 84, 024617 (2011), 85, 029901(E) (2012)
[2] T. Mueller et al. Phys. Rev. C 83, 054615 (2011)
[3] K. Schreckenbach et al., Phys. Lett. B. 160, 325 (1985), F. von Feilitzsch, A. A. Hahn and K. Schreckenbach, Phys. Lett. B. 118, 162 (1982), A. A. Hahn et al. Phys. Lett. B 218, 365 (1989)
[4] P. Vogel, G. K. Schenter, F. M. Mann, and R. E. Schenter, Phys. Rev. C 24, 1543 (1981)

Primary authors : Dr. XUBO, Ma (North China Electric Power University)

Co-authors :

Presenter : Dr. XUBO, Ma (North China Electric Power University)

Session classification : Poster Session I

Track classification : Reactor Neutrino Oscillations

Type : Poster

Contribution ID : 94

Progress in Barium Tagging for nEXO

Content :

The "ideal" next generation neutrinoless double beta decay experiment would have large fiducial mass, on the tonne scale, and a method of perfectly discriminating against all background events. 136Xe is a unique isotope for double beta decay because it can be operated conveniently as the detector medium in a liquid or gas TPC. As a transparent non-solid medium, it could be breached by lasers or a probe. Thus it is conceivable, and perhaps possible, to eliminate all background, except rare 2ν decays, in a 136Xe TPC by detecting, or "tagging", the 136Ba daughter atom or ion at the site of the decay, identified by the charge and scintillation signals. It is projected that the next generation 136Xe experiment, nEXO, would be able to begin to probe the region of normal neutrino mass hierarchy with the implementation of barium daughter tagging in its second stage of operation.

Within the EXO Collaboration, efforts are underway to demonstrate barium atom tagging for a liquid xenon detector using laser fluorescence of single Ba atoms captured in solid xenon on an optical probe or laser ablation and resonance ionization of single Ba atoms captured on a metal or semiconductor tip. Probe manipulation studies in a test TPC and thermal ionization detection methods are also being pursued. Research on barium tagging for a xenon gas TPC includes methods of extraction of single Ba ions from high pressure Xe gas and transport to an ion trap for detection by laser fluorescence. Some of the progress in these barium tagging efforts will be highlighted in this paper.

Primary authors : Prof. FAIRBANK, William (Colorado State University)

Co-authors :

Presenter : Prof. FAIRBANK, William (Colorado State University)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 95

The AMoRE project: Search for neutrinoless double beta decay of 100Mo using cryogenic 40Ca100MoO4 detectors

Content :

The AMoRE (Advanced Mo based Rare process Experiment) project is an international experiment to search for neutrinoless double beta decay of 100Mo using cryogenic scintillating crystals. The detector is composed of 40Ca100MoO4 crystals (depleted in 48Ca and enriched in 100Mo) and metallic magnetic calorimeters as the target and sensor materials in the concept of source-equals-detector. It is scheduled to build a large scale experiment with 200 kg 40Ca100MoO4 crystals in the next 8 years. The proposed experiment is expected to be sensitive to effective Majorana Neutrino masses of 0.02-0.05 eV. An overview of the current status will be presented.

Primary authors : Dr. KIM, Yong-Hamb (Institute for Basic Science)

Co-authors :

Presenter : Dr. KIM, Yong-Hamb (Institute for Basic Science)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 96

Cosmogenic Neutron Backgrounds for EXO-200

Content :

The Enriched Xenon Observatory (EXO) is an experimental program searching for neutrino-less double beta decay in xenon-136. The current experiment, EXO-200, has achieved excellent sensitivity by minimizing radioactive backgrounds in a cleanroom environment, and by building the detector with carefully selected materials. However, backgrounds induced by neutrons produced by cosmic ray muons are not reducible by cleanliness and shielding alone. These backgrounds are studied in EXO-200 by selecting data shortly after the muon veto detectors are triggered. Muon showers are rich in neutrons, making a "neutron enriched" data sample. This data is then checked against Monte Carlo simulations of these backgrounds, and the neutron capture gamma background models can be validated. A technique for tagging and vetoing cosmogenic xenon-137 backgrounds for future experiments, such as nEXO, is presented.

Primary authors : Dr. ALBERT, Joshua (Indiana University)

Co-authors :

Presenter : Dr. ALBERT, Joshua (Indiana University)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 97

DCBA experiments searching for neutrinoless double beta decay

Content :

One of the most important points in searching for neutrinoless double beta decay (0nu2beta) events is to eliminate many backgrounds coming from natural radiative decay chains, cosmic-ray events and gamma-ray sources such as the neutron capture of nuclei. Drift Chamber Beta-ray Analyzer (DCBA) and Magnetic Tracking Detector (MTD) are momentum analyzers using drift chamber trackers installed in a uniform magnetic field. Thin decay-source plates such as Nd-150, Mo-100 and Se-82 are interleaved in trackers. Backgrounds are efficiently eliminated by the identification of electron and the determination of decay vertex point. Energy of each electron from 0nu2beta is obtained from its momentum which is measured by the information of an electron helical track. DCBA is an R project for the future experiment MTD which can accommodate a large amount of decay source. Testing prototype called DCBA-T2.5 has been constructed and now in data taking at KEK for measuring the half-life of conventional two neutrino double beta decay (2nu2beta) for Mo-100. The construction of a large scale tracker for MTD is in progress at KEK. Present statuses of DCBA and MTD will be presented.

Primary authors : Dr. IWASE, Hirosshi (KEK)

Co-authors : Dr. KAKUNO, Hidekazu (Tokyo Metropolitan University) ; Dr. KATO, Yoshiaki (SCTEC) ; Mr. KOICHI, Tanaka (SCTEC) ; Dr. ISHIHARA, Nobuhiro (KEK) ; Dr. OHAMA, Taro (KEK) ; Dr. TAKAHASHI, Kasuke (KEK)

Presenter : Dr. IWASE, Hirosshi (KEK)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 98

The need for an early anti-neutrino run of NOvA

Content :

The moderately large value of theta_{13}, measured recently by reactor experiments, is very welcome news for the future neutrino experiments. In particular, the NOvA experiment, with 3 years of nu run followed by an equal anti-nu run, will be able to determine the mass hierarchy if one of the following two favorable combinations is true: normal hierarchy with -180° <= deltaCP <= 0 or inverted hierarchy with 0 <= deltaCP <= 180°. In this report, we study the hierarchy reach of the first 3 years of NOvA data. Since sin^2(2 theta_{23}) is measured to be non-maximal, theta_{23} can be either in the lower or higher octant. Pure nu data is affected by theta_{13}-hierarchy and octant-hierarchy degeneracies, which limit the hierarchy sensitivity of such data. A combination of nu and anti-nu data is not subject to these degeneracies and hence has much better hierarchy discrimination capability. We find that, with a 3 year nu run, hierarchy determination is possible for only two of the four octant-hierarchy combinations. Equal 1.5 year runs in nu and anti-nu modes give good hierarchy sensitivity for all the four combinations.

Primary authors : Mr. RAHAMAN, Ushak (Indian Institute of Technology Bombay)

Co-authors : Dr. PRAKASH, Suprabh (Harish-Chandra Research Institute) ; Prof. SANKAGIRI, Uma Sankar (Indian Institute of Technology Bombay)

Presenter : Dr. PRAKASH, Suprabh (Harish-Chandra Research Institute)

Session classification : Poster Session II

Track classification : Long Baseline Oscillations

Type : Poster

Contribution ID : 99

Unfolding of the Muon Neutrino Energy Spectrum with IceCube

Content :

We present preliminary results on the energy unfolding of muon neutrinos with the IceCube Neutrino Observatory in its 79-string configuration. For the unfolding we derived a sample of high-quality muon neutrinos with a purity of above 99.2% using a random forest. Within the software TRUEE the unfolding was performed with a Tikhonov regularization and it covers an energy range of more than 4 decades from 125GeV up to 3.2PeV.

Primary authors : Mr. SCHMITZ, Martin (TU Dortmund)

Co-authors :

Presenter : Mr. SCHMITZ, Martin (TU Dortmund)

Session classification : Poster Session I

Track classification : Cosmic Neutrinos

Type : Poster

Contribution ID : 100

Search for Supernova Neutrino Bursts at LVD

Content :

We report the results of a search for neutrino bursts from supernova explosions with the Large Volume Detector (LVD) at the INFN Gran Sasso National Laboratory.
LVD is sensitive to core-collapse supernova explosions via neutrino outburst detection with 100% efficiency over our own entire Galaxy. No evidence of supernova explosion is found over 7335 live days spanning from June 1992 to December 2013. The 90% C.L. upper limit on the rate of core-collapse supernova explosions out to distances of 25 kpc is found to be 0.114 event/year.

Primary authors : Dr. VIGORITO, Carlo (Dipartimento di Fisica & INFN, via P. Giuria 1, 10125 Torino) ; Dr. FULGIONE, Walter (OATO & INFN, via P. Giuria 1, 10125 Torino Italia) ; Dr. MOLINARIO, Andrea (INFN Torino, via P. Giuria 1, 10125 Torino Italia)

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Session classification : Poster Session I

Track classification : Supernova Neutrinos

Type : Poster

Contribution ID : 101

TITUS: An Intermediate Distance Detector for the Tokai-to-Hyper-Kamiokande Neutrino Beam

Content :

The Tokai Intermediate Tank for Unoscillated Spectrum (TITUS) detector is a proposed near detector for the Hyper-Kamiokande (Hyper-K) experiment, located approximately 2 km from the J-PARC neutrino beam. The design consists of a 2 kton Gd-doped water Cherenkov tank, surrounded by a muon range detector on the sides and downstream. The downstream part could potentially be magnetized, resulting in a MIND-type detector.
The target material (water) and location (~2 km) were chosen so that the neutrino interactions and beam spectrum at TITUS would match those of Hyper-K. Including a 0.1% Gd concentration enhances tagging of neutrino interactions, based on their neutron multiplicity. The primary goal of TITUS is to reduce the systematic uncertainty of the long-baseline oscillation physics program at Hyper-K and enhance its sensitivity to CP violation. TITUS can also be used for physics unrelated to the J-PARC beam, such as measuring the neutron rate to improve Hyper-K proton decay searches and functioning as an independent detector for supernova neutrino bursts.

Primary authors : Dr. MALEK, Matthew (Imperial College London)

Co-authors :

Presenter : Dr. MALEK, Matthew (Imperial College London)

Session classification : Poster Session II

Track classification : Long Baseline Oscillations

Type : Poster

Contribution ID : 102

The NOvA data driven trigger

Content :

The NOνA experiment is a second generation long-baseline neutrino oscillation experiment situated in the Fermilab NuMI beam line. The NOνA experiment consists of a 300-ton near detector and a 14-kiloton far detector separated by a 810 km baseline. The experiment is designed to measure the nu_e and nu_mu content of the NuMI beam before and after oscillation with the aim of making high precision measurements the neutrino mixing parameters and determining the neutrino mass hierarchy.

NOνA uses a novel data acquisition system based on a continuous deadtime-less readout of the front-end electronics, extended buffering of the data stream and asynchronous software triggering. In this system each of the more than 340,000 detector cells is constantly sampled and buffered for real time analysis by the "data-driven trigger" (DDT) system. Using this system, the decision to record or discard time windows in the data streams can be based on complex event topologies. The system operates highly asynchronously, allowing for the delayed triggering and extraction of data corresponding to a beam spill time window, and can even use inputs from external sources like the supernovae early warning system (SNEWS) to trigger the data long after its initial collection. The flexibility of this system allows NOνA to collect enhanced samples of important backgrounds, good calibration data and even to search for new exotic particles.

This poster will present the system design, details of its deployment, operation and performance as well as an early look at the triggered data collected by the NOνA DDT on the soon to be completed far-detector.

Primary authors : Dr. TAMSETT, Matthew (University of Sussex)

Co-authors :

Presenter : Dr. TAMSETT, Matthew (University of Sussex)

Session classification : Poster Session II

Track classification : Long Baseline Oscillations

Type : Poster

Contribution ID : 103

Event selection and background estimation for the reactor neutrinos in RENO

Content :

The RENO experiment has measured the smallest neutrino mixing angle theta_13 by detecting reactor anti-neutrino via inverse beta decay reaction (IBD). We have accumulated ~800 days of data through December, 2013, with two identical near and far RENO detectors at Hanbit nuclear power plant, since August, 2011. The coincidence of a prompt positron signal and a delayed signal from neutron capture by Gadolinium provides a distinctive IBD signature against several known backgrounds. The mixing angle theta_13 has been precisely measured based on the ~800 data sample. In this presentation, we describe how to select the IBD signal events and how to estimate the background rates and shapes in RENO.

Primary authors : Mr. CHOI, Wonqook (Seoul National University)

Co-authors : Mr. RENO, Collaboration (RENO)

Presenter : Mr. CHOI, Wonqook (Seoul National University)

Session classification : Poster Session I

Track classification : Reactor Neutrino Oscillations

Type : Poster

Contribution ID : 104

Precise measurement of reactor neutrino flux and spectrum at RENO

Content :

The RENO experiment has been taking data since Aug. 2011 to measure the smallest neutrino mixing angle theta_13 at Hanbit nuclear power plant. It is essential to compare the observed and expected fluxes of reactor anti-neutrinos for determining their disappearance. The reactor neutrino flux is calculated from the reactor thermal power and the fission rate of individual fuel isotope. Based on the precisely measured baselines we can calculate the baseline dependent reduction of reactor neutrino fluxes in better than 0.1% at near and far detectors.
Time-dependent fuel composition changes not only neutrino fluxes but also the anti-neutrino spectrum. The precise prediction of the spectrum is critical to a shape analysis. In this presentation, we describe how to obtain the expected reactor neutrino fluxes and spectra in near and far detectors, and present their comparison with ones observed at RENO.

Primary authors : Dr. LEE, Byounghoon (Seoul National University)

Co-authors : Mr. RENO, Collaboration (RENO)

Presenter : Dr. LEE, Byounghoon (Seoul National University)

Session classification : Poster Session I

Track classification : Reactor Neutrino Oscillations

Type : Poster

Contribution ID : 105

Status of the CANDLES project

Content :

Neutrino less double beta decay is the only practical way to prove the Majorana nature of the neutrino. CANDLES is a 48Ca double beta decay experiment with CaF2 scintillator. The CANDLES III (U.G.) detector is currently running with 300kg CaF2 crystals in the Kamioka underground observatory, Japan. New light collection system was installed in 2012, and accordingly photo-coverage has been enlarged by about 80%. Further improvement will be expected in 2014 by installing a detector cooling system in order to increase light emission from CaF2 crystals. We present the detail of the latest CANDLES III (U.G.) system and its performance obtained from the data taken until 2013, as well as future prospect of the CANDLES project.

Primary authors : Dr. IIDA, Takashi (Osaka University)

Co-authors :

Presenter : Dr. IIDA, Takashi (Osaka University)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 106

Background measurement for neutrino less double beta decay with CANDLES

Content :

CANDLES is a neutrino less double beta decay ($0\nu\beta\beta$) experiment using 48Ca in CaF2 crystals. A distinctive characteristic of 48Ca is the highest Q value (4.3 MeV) among isotope candidates for $0\nu\beta\beta$. In principle, it enables us to measure signals in small background contribution. The background candidates in interested energy region are β/γ rays from 208Tl (Q = 5.0 MeV), and 212Bi-212Po coincidence (E_beta = 2.2 MeV, visible E_alpha = 3.1 MeV) which decays in a short time window (T_1/2 = 299 nsec). In addition, we found that gamma rays from neutron captures on materials surrounding detector can be dominant background. Here we discuss these background estimation and prospects of backgrounds shielding.

Primary authors : Dr. NAKAJIMA, Kyohei (Osaka University)

Co-authors :

Presenter : Dr. NAKAJIMA, Kyohei (Osaka University)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 107

Event reconstruction of high-energy neutrino interactions in large liquid scintillator detectors

Content :

Plans to utilize large Liquid Scintillator (LSc) detectors for the determination of mass hierarchy with beams like CN2PY proposed by LAGUNA-LBNO require rudimentary flavor sensitivity and basic track reconstruction especially in the 1-10 GeV range.
At these energies neutrino induced events cannot be considered as point-like and the reconstruction of event topology gains importance in flavor discrimination.
Consequently the tracking capabilities of the detector become the key parameter in reliable energy determination, discrimination of the flavor of the interacting neutrino and in separation between charged current and neutral current interactions.
This poster summarizes the results of our studies on the tracking of high-energy charged particles and highlights their implications on the physics potential of next-generation LSc detectors.

Primary authors : Mr. LOO, Kai (University of Jyvaskyla)

Co-authors :

Presenter : Mr. LOO, Kai (University of Jyvaskyla)

Session classification : Poster Session II

Track classification : Long Baseline Oscillations

Type : Poster

Contribution ID : 108

High resolution low background Calorimeter for SuperNEMO

Content :

The SuperNEMO double beta decay project is a modular tracker-calorimeter based experiment that will reach about 10^26 years for neutrinoless double beta decay corresponding to 50-100meV in terms of Majorana neutrino mass. It will scrutinize a hundred of kilograms of 82Se double beta decay isotope.
The first module is under construction and will be installed early 2015 in the LSM (Laboratoire Souterrain de Modane) underground laboratory. The calorimeter is based on Optical Modules made of large volume plastic scintillators (10L) coupled with large area photomultipliers (Hamamatsu R5912-Mod and R6594). They are assembled in walls that surround the isotope foil and the tracking volume.
One of the main goals is to reach an energy resolution as low as (8% (FWHM))/√(E(MeV)) for the most sensitive parts of the calorimeter with a 4π coverage in terms of gamma tagging for background suppression. The other cornerstone of the success of the calorimeter is to reach the radiopurity requirements for its construction materials and detecting parts.

Primary authors : Dr. CERNA, Cedric (Centre d'Études Nucléaires de Bordeaux Gradignan (CENBG))

Co-authors :

Presenter : Dr. CERNA, Cedric (Centre d'Études Nucléaires de Bordeaux Gradignan (CENBG))

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 109

Time Synchronization and Energy Calibration in the NOvA Detector

Content :

The NuMI Off-Axis nu_e Appearance (NOvA) experiment has been commissioning and operating its Far Detector in Ash River, MN for over a year. Upon completion this summer, the 14 kT detector will consist of more than 340,000 4x6 cm^2 x 15 m cells of extruded PVC plastic filled with liquid scintillator and read out through avalanche photo-diodes (APDs). NOvA's neutrino oscillation analyses require precise correlation of events in the detector with the narrow 10 μs NuMI neutrino beam pulses. The technique to calibrate the timing system uses the abundant cosmic-ray muon flux at the detector's surface location to establish a precise network of timing offsets between the detector components spread over the 64 m spatial extent of the detector. Cosmic-rays are also used to measure the light yield and attenuation length within the detector cells and to establish the absolute energy scale of the detector. This poster will discuss results from the time synchronization and energy calibration performed with the cosmic-ray flux.

Primary authors : Mr. NINER, Evan (Indiana University)

Co-authors :

Presenter : Mr. NINER, Evan (Indiana University)

Session classification : Poster Session II

Track classification : Long Baseline Oscillations

Type : Poster

Contribution ID : 110

Invisible Nucleon Decay in SNO+

Content :

The SNO+ experiment aims to explore several topics in neutrino physics, including neutrinoless double beta decay and low energy solar neutrinos. This will use the existing Sudbury Neutrino Observatory (SNO) detector, replacing the heavy water with liquid scintillator. Upgrades have been made to the electronics to deal with the lower thresholds and higher data rates expected and a hold-down rope net has been installed to support the inner vessel in position.
For its initial commissioning phase, SNO+ will fill its inner vessel with light water and run to evaluate the performance of the detector and electronics. During this water-fill phase, it will have a unique model independent sensitivity to certain modes of invisible nucleon decay, in which the nucleon decays to a mode in which the decay products are not detected, e.g. n-> 3nu. With just a couple of months of water running, SNO+ is expected to set an improved limit on the current bounds.

Primary authors : Dr. COULTER, Ian (University of Pennsylvania)

Co-authors :

Presenter : Dr. COULTER, Ian (University of Pennsylvania)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 111

Charged Current Coherent Pion Production in MINERvA

Content :

MINERvA is a neutrino scattering experiment in the 1-10 GeV range using the NuMI neutrino beam at Fermilab. MINERvA will constrain neutrino-nucleus interaction cross sections which are a significant source of uncertainty in neutrino oscillation measurements. This poster presents the analysis of neutrino and antineutrino Charged Current Coherent Pion Production in MINERvA including the methods used to differentiate signal from background and distributions from the candidate event samples.

Primary authors : Mr. MISLIVEC, Aaron (University of Rochester)

Co-authors :

Presenter : Mr. MISLIVEC, Aaron (University of Rochester)

Session classification : Poster Session I

Track classification : Neutrino Interactions

Type : Poster

Contribution ID : 112

Constraining single pion production in the NEUT generator

Content :

Neutrino-induced pion production is a major background in neutrino oscillation experiments, both in the appearance and disappearance channels, and so must be reliably modeled. We have updated the pion production model used in the NEUT generator based on available neutrino-nucleon data along with more recent measurements of pion production in scattering of neutrinos from medium-A nuclei, producing a set of model parameters and uncertainties suitable for use in T2K oscillation analyses.

Primary authors : Dr. RODRIGUES, Philip (University of Rochester)

Co-authors : Mr. BERCELLIE, Aaron (University of Rochester)

Presenter : Dr. RODRIGUES, Philip (University of Rochester)

Session classification : Poster Session I

Track classification : Neutrino Interactions

Type : Poster

Contribution ID : 113

The OPERA Target Tracker – large surface plastic scintillator detector for neutrino experiments.

Content :

The Target Tracker detector (TT) of the OPERA experiment was successfully used for the on-line neutrino events registration and the location of the neutrino events in the target bricks. The TT is built of 496 modules combined in 62 walls of 6.7 x 6.7 m2 which provide X-Y coordinates for particles registered in the detector. Each module is made of 64 plastic scintillator strips. Scintillator light is collected by wavelength shifting fibers and registered by multichannel PMTs at both sides. Thanks to the high quality of the polystyrene, the TT registration efficiency for MIP is about 99% with registration at both sides of the strip (at the threshold of 0.3 p.e.). The TT performance was monitored with muon tracks during the whole lifetime of the experiment since 2007. Only a small decrease (< 1.5%/year) in the signal amplitude was observed causing no degradation in MIP registration efficiency. In 2015 the decommissioning of the OPERA detector will start. Given its high performance, module structure and a large total surface of ~5500 m2 , the TT apparatus can be moved to another site and used in one of the next generation neutrino experiments as a veto or external muon tracker. The detailed features and performance of the TT detector are provided as well as suggestions of its possible future use.

Primary authors : Dr. GORNUSHKIN, Yury (JINR)

Co-authors :

Presenter : Dr. GORNUSHKIN, Yury (JINR)

Session classification : Poster Session II

Track classification : Long Baseline Oscillations

Type : Poster

Contribution ID : 114

SoLid: Search for Oscillations with Lithium-6 Detector at the SCK•CEN BR2 reactor

Content :

Sterile neutrinos have been considered as a possible explanation for the recent reactor and Gallium anomalies arising from reanalysis of reactor flux and calibration data of previous neutrino experiments. A way to test this hypothesis is to look for distortions of the anti-neutrino energy caused by oscillation from active to sterile neutrino at close stand-off (~ 6-8m) of a compact reactor core. Due to the low rate of anti-neutrino interactions the main challenge in such measurement is to control the high level of gamma rays and neutron background.
The SoLid experiment is a proposal to search for active-to-sterile anti-neutrino oscillation at very short baseline of the SCK•CEN BR2 research reactor.
This experiment uses a novel approach to anti-neutrino detection with a highly segmented detector based on Lithium-6. High experimental sensitivity can be achieved compared to other state-of-the-art technology with the combination of high granularity, high neutron-gamma discrimination using 6LiF:ZnS(Ag) and precise localisation of the Inverse Beta Decay products. This compact system requires minimum passive shielding allowing for very close stand off to the reactor. This poster will introduce the BR2 reactor and experiment set up of the SoLid experiment. The principle of detection and detector design with expected performance will be described and the expected sensitivity to new oscillations will be presented.

Primary authors : Dr. VACHERET, Antonin (University of Oxford)

Co-authors : Mr. RYDER, Nicholas (University of Oxford) ; Prof. WEBER, Alfons (University of Oxford and STFC/RAL) ; Dr. SCOVELL, Paul (University of Oxford)

Presenter : Dr. VACHERET, Antonin (University of Oxford)

Session classification : Poster Session II

Track classification : Short Baseline Oscillations / Sterile Neutrinos / Non-standard Oscillations

Type : Poster

Contribution ID : 115

Development of a Photon Detection System in Liquid Argon for the Long-Baseline Neutrino Experiment

Content :

The Long-Baseline Neutrino Experiment (LBNE) will be a premier facility for exploring long-standing questions about the boundaries of the standard model. Acting in concert with the liquid argon time projection chambers underpinning the far detector design, the LBNE photon detection system will capture ultraviolet scintillation light in order to provide valuable timing information for event reconstruction. The team at Indiana University is exploring a design based on acrylic waveguides coated with a wavelength-shifting compound, combined with silicon photomultipliers, to collect and record scintillation light from liquid argon. Large-scale tests of this design are being conducted at the "TallBo" liquid argon dewar facility at Fermilab alongside similar designs from other groups. Performance studies with cosmic ray events are helping steer decisions for the final detector design. We present an overview of the design and function of this photon detection system and the latest results from the analysis of data collected during these tests.

Primary authors : Dr. WHITTINGTON, Denver (Indiana University) ; MUFSON, Stuart (Indiana U)

Co-authors :

Presenter : Dr. WHITTINGTON, Denver (Indiana University)

Session classification : Poster Session II

Track classification : Long Baseline Oscillations

Type : Poster

Contribution ID : 116

Backgrounds and sensitivity of the NEXT double beta decay experiment

Content :

The NEXT experiment will search for the neutrinoless double beta decay (bb0nu) of Xe-136 using an electroluminescent high-pressure xenon gas time projection chamber. Such a detector boasts two important technological advantages for bb0nu searches: excellent energy resolution (better than 1% FWHM at the Q value of Xe-136) and event topology reconstruction to identify signal and background. The experiment is approved for operation at the Laboratorio Subterráneo de Canfranc (LSC), in Spain. In this poster, we describe the background model of the experiment, which makes use of a detailed detector simulation and the results of material screening to predict a background rate, 5E-4 counts/(keV kg yr), which is among the lowest in the field. This translates into excellent sensitivity to the effective Majorana neutrino mass, exploring the degenerate region of neutrino masses down to 100 meV after a 5-years run.

Primary authors : MARTÍN-ALBO, Justo (IFIC (CSIC & Universitat de Valencia))

Co-authors : FERRARIO, Paola (IFIC (CSIC & Universitat de Valencia)) ; MUÑOZ VIDAL, Javier (IFIC (CSIC & Universitat de Valencia)) ; NEBOT GUINOT, Miquel (IFIC (CSIC & Universitat de Valencia)) ; GOMEZ-CADENAS, J.J. (IFIC (CSIC & Universitat de Valencia))

Presenter : MARTÍN-ALBO, Justo (IFIC (CSIC & Universitat de Valencia))

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 117

LArIAT

Content :

Liquid Argon Time Projection Chambers offer very good 3D and calorimetric resolution and allow relatively easy construction of large mass detectors, making them a prime candidate for future precision neutrino measurements. Surprisingly, there has been relatively little effort in calibrating the response of these detectors. The LArIAT (Liquid Argon In A Testbeam) experiment aims to fill that gap. Running in the Fermilab testbeam facility on a beam of charged particles of known momentum, it will seek to measure and refine the LArTPC's particle identification capabilities, including the electron-gamma separation, electron recombination parameters, and non-magnetic muon sign determination, amongst others. The status of the construction of the first phase of the experiment, which will reuse the ArgoNeuT TPC, will be presented, as well as plans for the second phase which will examine containment of EM and hadronic showers.

Primary authors : Dr. ST. JOHN, Jason (University of Cincinnati)

Co-authors :

Presenter : Dr. ST. JOHN, Jason (University of Cincinnati)

Session classification : Poster Session II

Track classification : Short Baseline Oscillations / Sterile Neutrinos / Non-standard Oscillations

Type : Poster

Contribution ID : 118

Liquid Argon Time Projection Chambers: MicroBooNE and Future Prospects for Neutrino Oscillation Physics

Content :

MicroBooNE—the latest in a series of Booster Beam experiments located at Fermilab—is a Liquid Argon Time Projection Chamber (LArTPC) that will investigate the low energy neutrino excess seen by its predecessor, MiniBooNE. Cherenkov detectors, such as MiniBooNE, are limited by their inability to distinguish between single electrons and photons, a task LArTPCs are well suited for. With the high precision reconstruction capabilities of a LArTPC, MicroBooNE will be able to determine with high statistical certainty whether electrons or photons caused the anomalous MiniBooNE low energy excess. Of further interest to MicroBooNE are neutrino-nucleon cross-sections. Cross sections have accounted for much of the uncertainty in recent results from a variety of neutrino experiments, and sensitive measurements by MicroBooNE will lead to improved nuclear models and rate predictions. Beyond MicroBooNE, LArTPCs will continue to play a notable role in oscillation physics. LAr1-ND will act as a baseline for improving systematic uncertainties in MicroBooNE and investigating the nature of the MiniBooNE excess, while also acting a small-scale phase experiment for future, bigger LArTPCs such as LAr1 and LBNE. This poster will explore the LArTPC as used in MicroBooNE and future experiments.

Primary authors : HACKENBURG, Ariana (Student)

Co-authors :

Presenter : HACKENBURG, Ariana (Student)

Session classification : Poster Session II

Track classification : Short Baseline Oscillations / Sterile Neutrinos / Non-standard Oscillations

Type : Poster

Contribution ID : 119

The Sanford Underground Research Facility at Homestake

Content :

The former Homestake gold mine in Lead, South Dakota has been transformed into a dedicated laboratory to pursue underground research in rare-process physics, as well as offering research opportunities in other disciplines such as biology, geology and engineering. A key component of the Sanford Underground Research Facility (SURF) is the Davis Campus, which is in operation at the 4850-foot level (4300 m.w.e.) and currently hosts two main projects: the LUX dark matter experiment, the MAJORANA DEMONSTRATOR neutrinoless double-beta decay experiment. Screening capabilities are also coming online with installation of the CUBED and Berkeley (formerly Oroville) low background counters at the Davis Campus. Plans for possible future experiments at SURF are well underway and include long baseline neutrino oscillation experiments, future dark matter experiments as well as nuclear astrophysics accelerators. Facility upgrades to accommodate some of these future projects have already started. SURF is a dedicated facility with significant capacity for expansion, and applications from other experiments are welcome.

Primary authors : Dr. HEISE, Jaret (Sanford Underground Research Facility)

Co-authors :

Presenter : Dr. HEISE, Jaret (Sanford Underground Research Facility)

Session classification : Poster Session II

Track classification : Other / Global Projects

Type : Poster

Contribution ID : 120

Hadron Production Measurements with the T2K Replica Target in the NA61/SHINE Experiment for the T2K Neutrino Flux Prediction

Content :

We present latest results of the measurements of hadron production with the T2K replica target in the NA61/SHINE experiment at CERN SPS. They aim to further improve the precision on the T2K neutrino flux prediction.

The current method applied in the T2K experiment to reduce uncertainties on the flux predictions is based on re-weighting of hadron cross sections in the interaction vertices. As an input, this method uses data for 31~GeV/c protons on thin carbon target (4% interaction length) measured by NA61/SHINE. This allows to constrain ~60% of the neutrino flux, the other 40% being due to re-interactions within the target material and in surrounding support structure, thus model dependent. Direct measurements of the hadrons exiting from the surface of the T2K replica target (1.9 interaction length) should allow to constrain up to 90% of the flux. These measurements are the ultimate goal in order to achieve precise neutrino flux predictions.
Comparisons of the flux predictions tuned with thin target data and the T2K replica target data will provide information on the re-interatcions of particles in the target.

Three different data-sets were recorded.
The pilot data-set taken in 2007 demonstrated the capabilities of the spectrometer with the T2K replica target and was analyzed to establish analysis techniques, while 2009 and 2010 runs have been used in order to record much higher statistics.
The latest 2009 results on pion spectra are presented in this poster. The experimental data are compared to model predictions.

Primary authors : Mr. HAESLER, Alexis (University of Geneva)

Co-authors :

Presenter : Mr. HAESLER, Alexis (University of Geneva)

Session classification : Poster Session II

Track classification : Neutrino Beam Flux

Type : Poster

Contribution ID : 121

Searching for Sterile Neutrinos with MINOS

Content :

MINOS is a two-detector on-axis experiment based at Fermilab. The NuMI neutrino beam encounters the MINOS Near Detector 1 km downstream before travelling 734 km through the Earth's crust, to reach the Far Detector located at the Soudan Underground Laboratory in Northern Minnesota. By searching for oscillations driven by a large mass splitting, MINOS is sensitive to the existence of sterile neutrinos. This poster will present results of a search for sterile neutrinos that is sensitive to the parameter space suggested by LSND and MiniBooNE. Both charged current muon neutrino and neutral current neutrino interactions are analysed in a 3+1 model. This MINOS search for disappearance complements other previous experimental searches for sterile neutrinos in the muon neutrino to electron neutrino appearance channel

Primary authors : Mr. TIMMONS, Ashley (University of Manchester)

Co-authors :

Presenter : Mr. TIMMONS, Ashley (University of Manchester)

Session classification : Poster Session II

Track classification : Short Baseline Oscillations / Sterile Neutrinos / Non-standard Oscillations

Type : Poster

Contribution ID : 122

First measurements with the SoLid experiment's prototype anti-neutrino detector

Content :

The SoLid collaboration aim to probe the reactor neutrino anomaly by searching for anti-neutrino oscillations between 5-10 m from the core of the BR2 reactor at SCK-CEN. The SoLid experiment is using a new detector concept based on segmented plastic scintillator with layers containing a mixture of lithium-6 and Zinc Sulphide scintillator. The detector uses the two different scintillators to detect and identify both the positron and the neutron from inverse beta decay events. An 8 kg prototype detector was constructed and deployed at the BR2 reactor in 2013. This small system has been taking data during a number of reactor on/off cycles. The data is being used to study the detector response, the environmental conditions and background signals at the site where the full scale experiment will be installed. The poster will introduce the SoLid experiment's design and present the first measurements made with the prototype detector.

Primary authors : Dr. RYDER, Nicholas (University of Oxford)

Co-authors : Dr. VACHERET, Antonin (University of Oxford) ; Prof. WEBER, Alfons (University of Oxford and STFC/RAL) ; Dr. SCOVELL, Paul (University of Oxford)

Presenter : Dr. RYDER, Nicholas (University of Oxford)

Session classification : Poster Session I

Track classification : Reactor Neutrino Oscillations

Type : Poster

Contribution ID : 123

Recent results from the NEXT-DEMO prototype

Content :

NEXT is a high-pressure gas xenon TPC which has been designed to measure the ββ0ν mode of Xe-136. The detector will use the electroluminescence of the gas to amplify the signal from deposited charge using a region of increased electric field in the last 0.5 cm before the anode. The light produced will be detected in a fine grained tracking plane made up of silicon photomultipliers and positioned 2 mm behind the anode as well as in PMTs at the opposite end of the light tube. The stability and performance of the detector design have been tested using NEXT-DEMO, a 30 cm drift TPC of the same design with a fiducial volume containing 1.5 kg of natural xenon. This poster will present the most recent results from NEXT-DEMO, detailing the reconstruction algorithms used to identify signal and equalise the detector's energetic response. The measured energy resolution for the reconstruction of the traces left by the interaction of gammas from various radioactive sources will be presented along with the predicted resolution at the Qββ of Xe-136.

Primary authors : Dr. LAING, Andrew (Instituto de Física Corpuscular)

Co-authors : Dr. FERRARIO, Paola (Instituto de Física Corpuscular) ; Dr. SOREL, Michel (IFIC (CSIC - Valencia University)) ; Prof. GÓMEZ-CADENAS, Juan José (Instituto de Física Corpuscular) ; Dr. LIUBARSKY, Igor (Instituto de Física Corpuscular) ; Dr. LOPEZ-MARCH, Neus (Instituto de Física Corpuscular) ; Mr. LORCA, David (Instituto de Física Corpuscular) ; MARTÍN-ALBO, Justo (IFIC (CSIC & Universitat de Valencia)) ; Mr. MONRABAL, Francesc (IFIC) ; Mr. SERRA, Luis (Instituto de Física Corpuscular) ; Mr. SIMÓN, Ander (Instituto de Física Corpuscular)

Presenter : Dr. LAING, Andrew (Instituto de Física Corpuscular)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 124

Development of NEW, towards the first physics results of NEXT

Content :

The NEXT $\beta\beta0\nu$ experiment will use a high-pressure gas electroluminescent TPC to search for the decay of Xe-136. The development, construction and installation of NEXT-WHITE (NEW), the first radio-pure version of NEXT, will take place this year at Laboratorio Subterráneo de Canfranc. NEW will run initially using 10 kg of natural xenon during which time NEXT technology will be validated and the topological reconstruction algorithms refined. Moreover, the background model will be benchmarked using data. A second run will use enriched xenon and will make a first measurement of the two neutrino channel ($\beta\beta2\nu$) by NEXT.
This poster will present the various technical aspects of the detector detailing the radio-pure solutions for a low backgorund experiment and the low noise, high resolution measurement of both energy and position.

Primary authors : Mr. MONRABAL, Francesc (IFIC)

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Presenter : Dr. LAING, Andrew (Instituto de Física Corpuscular) ; MARTÍN-ALBO, Justo (IFIC (CSIC & Universitat de Valencia))

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 125

The NEXT-100 Radiopurity campaign: measurements and results

Content :

NEXT-100 is a double beta decay neutrino-less (2β0ν) experiment that uses a time projection chamber with 100kg of high-pressure xenon gas (15 bar) enriched in the 136Xe isotope to 90%. It is currently under construction. It will be running in the Canfranc Underground Laboratory (LSC) under the Pyrenees in Spain.

NEXT-100 has to operate with extremely low levels of background from radioactivity. This poster will present the experiment's radiopurity screening campaign. It is based mainly on measurements with the High Purity Germanium detector farm of the LSC; frequent complementary studies using GDMS and ICPMS techniques are also made. The campaign is well advanced. We will summarize the results so far detailing those most relevant to the physics of NEXT-100. The latter includes the measurements program of its 60 very low background PMTs Hamamatsu R11410-10.

Primary authors : Mr. PEREZ PEREZ, Javier (Universidad Autonoma de Madrid)

Co-authors :

Presenter : Mr. PEREZ PEREZ, Javier (Universidad Autonoma de Madrid)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 126

PTOLEMY Project: A Quest for Relic Neutrinos from Big Bang

Content :

Since the discovery of Cosmic Microwave Background(CMB), measurements on CMB have shaped our modern understanding of the Universe. CMB dates back to the surface of last scattering approximately 300,000 years after matter-radiation equality in the Universe according to Big Band cosmology. However, the time-scale of the decoupling for neutrinos is predicted to predate the onset of nucleosynthesis. Located at Princeton Plasma Physics Lab(PPPL), the Princeton Tritium Observatory for Light, Early-Universe, Massive-neutrino Yield(PTOLEMY) aims to detect these relic neutrinos via tritium capture and measurement of the resultant electrons. To achieve the required sensitivity, PTOLEMY project is developing new experimental technologies including large-scale nano-fabrication of graphene tritium cells and massively multiplexed SQUID readout of ultra-high precision micro-calorimetry. Adsorption of tritium to graphene surface by weak bonding is expected to reduce the binding energy to sub-eV range compared to tritium-tritium bonding at eV range, reducing the uncertainties in the energy of electrons from neutrino capture(currently under experimental measurement). To cope with beta-decay endpoint electrons, a MAC-E filter-based time-of-flight spectroscopy is under design. At this stage, a prototype with a partially completed MAC-E filter is in operation at PPPL. In the future, the full-scale PTOLEMY will provide a roadmap to challenge one of the most fundamental predictions of the Big Bang, potentially revealing new interactions and properties of the neutrinos and searching for the existence of a species of light dark matter known as relic sterile neutrinos.

Primary authors : SUERFU, Junast (Princeton University)

Co-authors :

Presenter : SUERFU, Junast (Princeton University)

Session classification : Poster Session I

Track classification : Cosmic Neutrinos

Type : Poster

Contribution ID : 127

A Very Intense Neutrino Super Beam Experiment for Leptonic CP Violation Discovery based on the European Spallation Source Linac

Content :

The European Spallation Source (ESS) linac with 5 MW proton power has the potential to become the proton driver of - in addition to the world's most intense pulsed spallation neutron source - the world's most intense neutrino beam. The physics performance of that neutrino Super Beam in conjunction with a megaton Water Cherenkov neutrino detector installed 1000 m down in a mine at a distance of about 500 km from ESS will be described. In particular, the superior potential of such a neutrino experiment placed at the 2nd oscillation maximum to discover the lepton CP violation in order to explain the matter-antimatter asymmetry in Universe and also the neutrino mass hierarchy will be presented. In addition, the choice of such detector will extent the physics program to proton-decay, atmospheric neutrinos and astrophysics searches. The ESS proton linac, the target station optimization and the physics potential will be described.

Primary authors : Dr. DRACOS, Marcos (IPHC-IN2P3/CNRS)

Co-authors : Prof. EKELOF, Tord (Uppsala University)

Presenter : Dr. DRACOS, Marcos (IPHC-IN2P3/CNRS) ; Prof. EKELOF, Tord (Uppsala University)

Session classification : Poster Session II

Track classification : Neutrino Beam Flux

Type : Poster

Contribution ID : 128

Atmospheric Neutrino Oscillations Measured at the MINOS Far Detector

Content :

This poster presents an analysis of the atmospheric neutrino sample collected with the MINOS Far Detector. Data from the first 8 months of MINOS+ is added to the full data set collected with MINOS, adding a factor of 30% to the 2011 analysis. The analysis uses a three flavor framework, with a four layer model for the Earth's matter density. Matter effects for atmospheric neutrinos traversing the earth greatly enhance the sensitivity to three flavor effects compared to the beam-only sample. The magnetized MINOS Far Detector uniquely enables charge sign separation in the reconstructed tracks, distinguishing neutrino events from antineutrinos.

Primary authors : Mr. PERCH, Andrew (UCL)

Co-authors :

Presenter : Mr. PERCH, Andrew (UCL)

Session classification : Poster Session II

Track classification : Long Baseline Oscillations

Type : Poster

Contribution ID : 129

Study of Neutrino Quasielastic Scattering on Iron in the MINOS Near Detector

Content :

A sample of 1,400,000 charged-current interactions on iron has been extracted from exposures of the MINOS Near Detector to the NuMI low energy ν_{μ} beam. A sample of 220,000 events enriched in quasielastics is isolated using simple selections. Backgrounds are evaluated using other, independently selected reference samples.
We use a conventional Fermi gas model treatment of the nuclear medium and fit to the shape of the Q^2 distribution of the quasielastic enriched sample. In this way an effective axial-vector mass value for quasielastic ν_{μ}\,Fe^{56} scattering is determined.
Final results will be reported.

Primary authors : Dr. GRAF, Nicholas (University of Pittsburgh)

Co-authors :

Presenter : Dr. GRAF, Nicholas (University of Pittsburgh)

Session classification : Poster Session I

Track classification : Neutrino Interactions

Type : Poster

Contribution ID : 130

NSI sensitivity for MINOS/MINOS+

Content :

With the increasing precision of neutrino oscillation measurements, Non Standard Interactions (NSI) have received growing interest and attention in the community as an additional alternative explanation of neutrino/antineutrino disappearance. The parameters governing non-standard interactions have been thus far difficult to measure in neutrino oscillation experiments due to short baselines limiting the amount of matter traversed by neutrinos, or by limited detector performance. These limitations, however, are mitigated due to the recent discovery of a large theta_{13} angle in one hand, and to future long-baseline neutrino oscillation experiments with improved neutrino detectors on the other hand. Long-baseline neutrino experiments may be able to probe the presence of NSI, in particular in the e-tau sector by measuring the nu_mu -> nu_e conversion probability, and in the e-mu sector by measuring muon neutrino/antineutrino disappearance. The Main Injector Neutrino Oscillation (MINOS) experiment, with a baseline of 735 km, can be used to search for the epsilon_{e-tau} and epsilon_{mu-tau} NSI parameters, by looking for deviations from the three-flavor oscillation scenario. We present the MINOS sensitivity to epsilon_{e-tau} using the complete MINOS beam neutrino data set taken between 2005 and 2012, and show prospects for searches of epsilon_{mu-tau} with MINOS+ using a higher-energy, doubled-intensity neutrino beam.

Primary authors : Dr. KIVENI, Joseph M. (Fermilab)

Co-authors : Dr. SCHRECKENBERGER, Adam (University of Texas)

Presenter : Dr. KIVENI, Joseph M. (Fermilab)

Session classification : Poster Session II

Track classification : Short Baseline Oscillations / Sterile Neutrinos / Non-standard Oscillations

Type : Poster

Contribution ID : 131

Neutrino and Antineutrino Oscillations in MINOS and MINOS+

Content :

MINOS+, a continuation of the MINOS experiment using a higher energy and more intense neutrino beam provided by the upgraded NuMI facility at Fermilab, started taking data in the fall of 2013. This poster presents the first results on oscillations from MINOS+. We report a measurement of neutrino and antineutrino oscillation parameters using the complete, nine year, data set taken by MINOS and the first 8 months of data from MINOS+. For this measurement, we combine three kinds of data samples: disappearance of numu and appearance of nue from the numu beam, and atmospheric (anti)neutrinos recorded in the Far Detector.

Primary authors : Ms. MESQUITA DE MEDEIROS, Michelle (Federal University of Goias) ; O'CONNOR, Joseph (University College London)

Co-authors :

Presenter : Ms. MESQUITA DE MEDEIROS, Michelle (Federal University of Goias) ; O'CONNOR, Joseph (University College London)

Session classification : Poster Session II

Track classification : Long Baseline Oscillations

Type : Poster

Contribution ID : 132

MINOS+ Appearance Searches

Content :

MINOS was among the first long baseline experiments to measure nu_mu -> nu_e appearance by using a 5.4 kiloton steel-scintillator tracking calorimeter located in the Soudan Mine in Northern Minnesota. With the shift to a higher energy beam configuration in the MINOS+ era, there is a renewed effort to explore the possibilities of an electron neutrino appearance search. The multivariate selection technique has been retuned for the new beam configuration. We will outline the improvements made to the selector, present the signal-to-background rates in the standard oscillation framework, and investigate the potential of a sterile neutrino search in the nu_e appearance channel.

Primary authors : Dr. SCHRECKENBERGER, Adam (The Unversity of Texas at Austin)

Co-authors :

Presenter : Dr. SCHRECKENBERGER, Adam (The Unversity of Texas at Austin)

Session classification : Poster Session II

Track classification : Long Baseline Oscillations

Type : Poster

Contribution ID : 133

Beam Flux Fits and Systematics in MINOS+

Content :

MINOS+ is a long baseline neutrino oscillation experiment that utilizes the Fermilab NuMI (Neutrinos at the Main Injector) neutrino beam. Historically, MINOS operated in the lowest available beam energy configuration; however, in the new MINOS+ era, a medium energy neutrino beam spectrum is being produced. An understanding of the beam flux and systematic uncertainties is essential to the MINOS+ oscillation analyses, in particular the search for sterile neutrino generations. The impact of the beam systematics has now been studied in this new medium-energy configuration. Building upon the beam fitting framework used in MINOS, we have developed a beam fit for MINOS+ that tunes the simulation to the Near Detector data. We present our study of the predominant systematics, the first results of the beam fit, and the steps being taken to evolve the fitting framework to handle sterile neutrino generations.

Primary authors : Dr. SCHRECKENBERGER, Adam (The Unversity of Texas at Austin) ; Mr. RADOVIC, Alexander (University College London) ; Dr. HOLIN, Anna (University College London)

Co-authors :

Presenter : Dr. SCHRECKENBERGER, Adam (The Unversity of Texas at Austin) ; Mr. RADOVIC, Alexander (University College London) ; Dr. HOLIN, Anna (University College London)

Session classification : Poster Session II

Track classification : Neutrino Beam Flux

Type : Poster

Contribution ID : 134

Towards a Neutrino Mass Measurement: the Project 8 Experiment

Content :

The Project 8 experiment aims to measure the neutrino mass using tritium beta decays. Beta-decay electron energies will be measured using the beta-decay electrons' cyclotron radiation: as the electrons travel in a uniform magnetic field, the frequency of the cyclotron radiation is inversely proportional to their total relativistic energies. By observing the cyclotron radiation we can make a precise measurement of the electron energies. The advantages of this technique include scalability, excellent energy resolution, and low backgrounds. The Project 8 Collaboration is using a prototype experiment to study the feasibility of the technique with a ^{83m}Kr source. Demonstrating the ability to see the 17.8~keV and 30.2~keV conversion electrons from ^{83m}Kr will show that it is possible to measure tritium beta-decay electron energies ($Q \approx 18.6$~keV) with their cyclotron radiation. This poster highlights the progress on the prototype device, the signal-extraction techniques under investigation, and future plans for the experiment. This research is supported in part by DOE grant DE-FG02-97ER41020, the National Science Foundation, and the Laboratory Directed Research and Development Program at Pacific Northwest National Laboratory.

Primary authors : Dr. OBLATH, Noah (MIT) ; Mr. LAROQUE, Benjamin (UC Santa Barbara) ; Dr. VANDEVENDER, Brent (Pacific Northwest National Laboratory)

Co-authors :

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Session classification : Poster Session I

Track classification : Neutrino Mass

Type : Poster

Contribution ID : 135

Muon-induced spallation backgrounds for MeV astrophysical neutrino signals in Super-Kamiokande

Content :

When muons travel through matter, their energy losses lead to nuclear breakup (``spallation'') processes. The subsequent decays of unstable daughter nuclei produced by cosmic-ray muons are important backgrounds for low-energy astrophysical neutrino experiments. Even though Super-Kamiokande has strong cuts to reduce these spallation-induced backgrounds, the remaining rate is much larger than the signal rates for energies 8 - 18 MeV. We show how muons induce showers in water, produce secondary particles, and how these secondaries produce isotopes. We outline how to implement more effective background rejection techniques using this information. This could lead to new physics results, as both solar and Diffuse Supernova Neutrino Background studies are background-limited, and reducing backgrounds by even a factor of a few could quickly lead to new discoveries. This work appeared in arXiv:1402.4687.

Primary authors : LI, Weishi (Ohio State University)

Co-authors : Prof. BEACOM, John (Ohio State University)

Presenter : LI, Weishi (Ohio State University)

Session classification : Poster Session I

Track classification : Solar Neutrinos

Type : Poster

Contribution ID : 136

Neutral current events from supernova neutrinos

Content :

The next galactic core-collapse supernova will provide an unparalleled number of neutrino observations here on Earth. The flavor content of this signal is expected to be very different from the one emitted by the proto-neutron-star, due to the explosion dynamics as well as the properties of the neutrino. The plethora of complex information carried by these little messengers, thus, need to be carefully teased out. Using the neutral current events in water Cherenkov and scintillator detectors to establish a baseline for the neutrino signal, will allow us to disentangle the multiple threads of information. We have used SNOwGLoBES in combination with a Markov Chain Monte Carlo algorithm to investigate how well one can reconstruct the values, at emission, of the neutrino luminosities and energies, their decay time scales, and the spectral pinch parameter, from an observed neutral current neutrino signal. When combined with information from inverse beta decay events, these reconstructed values will allow us to extract information on neutrino mixings, the mass hierarchy and the explosion dynamics.

Primary authors : Dr. LUND, Tina (North Carolina State University)

Co-authors : Dr. KNELLER, James P. (North Carolina State University)

Presenter : Dr. LUND, Tina (North Carolina State University)

Session classification : Poster Session I

Track classification : Supernova Neutrinos

Type : Poster

Contribution ID : 137

The SuperNEMO tracking detector

Content :

The SuperNEMO detector, which builds on the highly successful NEMO project, will search for neutrinoless double beta decay at the Modane Underground Laboratory on the French-Italian border. If observed, neutrinoless double beta decay would show that the neutrino is its own antiparticle, would be the first evidence for total lepton number violation, and would allow a measurement of the absolute neutrino mass. With an eventual goal of \unit[100]{kg} of source material, a sensitivity to a half life of \unit[10^{26}]{years} can be achieved. The unique characteristic of the SuperNEMO detector design is that it allows complete topological reconstruction of the double beta decay event. In the event of a discovery, such topological measurements will be vital in determining the nature of the lepton number violating process. This topological reconstruction is also key in allowing excellent levels of background rejection. The topological reconstruction will be performed by a gaseous tracking detector, consisting of 2,034 drift cells working in Geiger mode. This tracking detector is currently under construction in the UK. With the elimination of all radioactive impurities being vital, the drift cells must be produced in a high-class cleanroom with minimal human intervention. To enable this, a robot has been developed to produce the cells. This poster will present the design of of the tracker and the construction procedure; it will also present the status of the construction and testing of the tracker cells.

Primary authors : Dr. EVANS, Justin (University of Manchester)

Co-authors :

Presenter : Dr. EVANS, Justin (University of Manchester)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 138

NuMI-X: An Inter-Collaboration NuMI Beam Working Group

Content :

NuMI-X is a consortium comprising Fermilab neutrino experiments collaborating on the modeling of NuMI beam. Its goal is to develop and maintain the best knowledge about NuMI neutrino fluxes relevant to all NuMI experiments. In this poster, we describe the upgraded NuMI facility and show the exposure expected at the NOvA and MINOS+ detectors in early running. The full NuMI beam modelling chain using Monte Carlo generators is outlined. Finally, we discuss the general plans to constrain hadron production across the different NuMI experiments.

Primary authors : SCHROETER, Raphael (Harvard University) ; Mr. RADOVIC, Alexander (University College London)

Co-authors : Dr. ANGHEL, Ioana (Iowa State)

Presenter : SCHROETER, Raphael (Harvard University)

Session classification : Poster Session II

Track classification : Neutrino Beam Flux

Type : Poster

Contribution ID : 139

LUMINEU: a search for neutrinoless double beta decay based on ZnMoO4 scintillating bolometers

Content :

The “Luminescent Underground Molybdenum Investigation for NEUtrino mass and nature” (LUMINEU) aims at setting the bases for a next-generation neutrinoless double beta decay experiment capable to explore deeply the inverted hierarchy region of the neutrino mass pattern by means of a large array of scintillating bolometers based on ZnMoO4 crystals containing the favorable isotope 100Mo. These hybrid detectors, able to measure both the scintillation light and the heat generated by an interacting particle, are in fact very promising tools in double beta decay search in terms of efficiency, energy resolution and alpha-background rejection capability. Simulations and preliminary results confirm that the LUMINEU technology can reach zero background in the region of interest (around 3 MeV) with exposures of the order of hundreds kg x y. In this contribution we present the LUMINEU concepts and the experimental results achieved aboveground and underground with large-mass natural and enriched crystals. In particular, the performance of a 300 g single-module detector is described in detail. The measured energy resolution (a few keV at the double beta decay transition energy), the alpha/beta discrimination power and the radioactive internal contamination are all within the specifications for the projected final LUMINEU sensitivity. Detectors based on enriched crystals have been tested as well, confirming the excellent results obtained with the natural ones and showing deterioration of none of the crucial detector parameters. LUMINEU's next steps are illustrated, in particular a pilot experiment containing at least 1 kg of isotope. Finally, an immediate LUMINEU follow-up is discussed, consisting of an array of about 40 elements containing 10 kg of enriched molybdenum. The sensitivity of this set-up is similar to the one of the current major double-beta decay experiments and already approaches the onset of the inverted hierarchy region.

Primary authors : Dr. GIULIANI, Andrea (CNRS/IN2P3/CSNSM Orsay) ; Mr. MANCUSO, Michele (CSNSM - CNRS - Université Paris-Sud 11 - Università degli studi dell'Insubria)

Co-authors :

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Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 140

Production and characterization of high-purity natural and enriched ZnMoO4 crystals to search for neutrinoless double beta decay of 100Mo

Content :

Radiopure zinc molybdate (ZnMoO4) crystals operated underground as cryogenic scintillating bolometers are promising devices for highly sensitive double-beta-decay searches, as the one under development in the LUMINEU program. Growth of high-quality radiopure crystals is a complex task, since there are no commercially available molybdenum compounds with the required levels of purity and radioactive contamination. This contribution discusses approaches developed at the Nikolaev Institute of Inorganic Chemistry (NIIC, Novosibirsk, Russia) to purify the initial molybdenum oxide and to synthesize the compound required for the growth of high-quality radiopure ZnMoO4 crystals. A combination of double sublimation (with addition of zinc molybdate) with subsequent recrystallization in aqueous solutions (using zinc molybdate as a collector) was used. Zinc molybdate crystals up to 1.5 kg were grown at NIIC by the low-thermal-gradient Czochralski technique. Their optical, luminescent, diamagnetic, thermal and bolometric properties were tested. The developed purification, synthesis and growth techniques were used also to produce enriched Zn100MoO4 crystals, which were operated successfully as scintillating bolometers in a dedicated aboveground facility at Centre de Sciences Nucléaires et de Science de la Matière (CSNSM, Orsay, France). The results achieved by the enriched detectors are described in detail. They show encouraging performance in view of their use in future double beta decay experiments.

Primary authors : Dr. GIULIANI, Andrea (CNRS/IN2P3/CSNSM Orsay)

Co-authors :

Presenter : Dr. GIULIANI, Andrea (CNRS/IN2P3/CSNSM Orsay)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 141

Studying GeV neutrino Interactions in a Scintillation Detector

Content :

A neutrino directionality and flavor discrimination algorithm has been developed and employed
to look at T2K events and high energy atmospheric neutrinos in the KamLAND liquid scintillator detector.
The directionality algorithm uses a simple center of inverse PMT first-hit-time and center of square root of PMT charge.
The flavor discrimination algorithm utilizes a deep-neural network to distinguish electron-type and muon-type neutrinos.
Atmospheric data fitted with these tools will be used to constrain indirect dark matter search prospects.

Primary authors : Prof. LEARNED, John (University of Hawaii) ; Mr. SAKAI, Michinari (University of Hawaii)

Co-authors :

Presenter : Mr. SAKAI, Michinari (University of Hawaii)

Session classification : Poster Session I

Track classification : Atmospheric Neutrinos

Type : Poster

Contribution ID : 142

Prospects for a Sterile Neutrino Search at MINOS+

Content :

The MINOS+ experiment operates the MINOS detector in the recently upgraded NuMI muon neutrino beam. The increased beam intensity and energy will enable the MINOS+ experiment to collect high statistics in the 4−10GeV energy range, which is particularly useful for new physics searches. We present the prospects for a search for sterile neutrinos with mass splittings in the range from ~10-2eV^2 to ~10eV^2 using beam in both the muon neutrino mode and the anti-neutrino enhance mode. In addition, we present the MINOS+ sensitivity combined with that of the disappearance reactor experiment Bugey. This combined sensitivity will be compared to the LSND and MiniBooNE appearance signal.

Primary authors : Dr. AURISANO, Adam (University of Cincinnati) ; Mr. POONTHOTTATHIL, Navaneeth Poonthottathil (CUSAT/Fermilab)

Co-authors :

Presenter : Dr. AURISANO, Adam (University of Cincinnati) ; Mr. POONTHOTTATHIL, Navaneeth Poonthottathil (CUSAT/Fermilab)

Session classification : Poster Session II

Track classification : Short Baseline Oscillations / Sterile Neutrinos / Non-standard Oscillations

Type : Poster

Contribution ID : 143

Constrains on the flux of kaons produced at the NuMI target

Content :

The NOvA long–baseline neutrino oscillations experiment built a prototype detector on the surface at Fermilab, 6 degrees off the NuMI beam axis, to test the various systems of the experiment. At this angle, the muon neutrinos with energies higher than 2 GeV come predominantly from the decay of kaons which were produced from the proton beam at the NuMI target. I present here a study of charged current interactions involving muon neutrinos with energies between 2 GeV and 4 GeV used to constrain the flux of 7 GeV/c kaons from the NuMI target.

Primary authors : Mr. ARRIETA DIAZ, Enrique (Michigan State University)

Co-authors :

Presenter : Mr. ARRIETA DIAZ, Enrique (Michigan State University)

Session classification : Poster Session II

Track classification : Neutrino Beam Flux

Type : Poster

Contribution ID : 144

Search for sterile neutrino mixing at Daya Bay

Content :

The Daya Bay Reactor Neutrino Experiment is designed to measure the neutrino mixing angle θ_{13} with unprecedented precision. The experiment detects antineutrinos from the Daya Bay reactor complex with eight functionally identical Antineutrino Detectors, which are distributed among three experimental halls. Since December 2011, we have recorded more than one million reactor antineutrino interactions.
This high-statistics data set allows us to not only make precise measurement of oscillation parameters, but also to search for new physical phenomena beyond the standard model, such as sterile neutrino mixing.
We have made the most precise measurements of $\sin^22\theta_{13}$ and the first direct measurement of the effective mass splitting, Δm^2_{ee}, from relative comparisons of antineutrino rate and spectra. A signature of sterile neutrino mixing would appear as an additional spectral distortion of a different frequency. A number of improvements are made to our oscillation analysis framework in order to search for this subtle spectral distortion. In this poster, we will discuss the current status of sterile neutrino searches at Daya Bay.

Primary authors : Dr. NAKAJIMA, Yasuhiro (Lawrence Berkeley National Laboratory)

Co-authors :

Presenter : Dr. NAKAJIMA, Yasuhiro (Lawrence Berkeley National Laboratory)

Session classification : Poster Session II

Track classification : Short Baseline Oscillations / Sterile Neutrinos / Non-standard Oscillations

Type : Poster

Contribution ID : 145

Solar neutrino analysis of SK-IV

Content :

Super-Kamiokande (SK), a 50 kton water Cherenkov detector in Japan, observes ^{8}B solar neutrinos with neutrino-electron elastic scattering. The main motivation of solar neutrino measurements with SK is to observe the MSW effect through a solar neutrino energy spectrum distortion induced by the matter in the Sun, and through a day/night solar neutrino flux asymmetry induced by the matter in the Earth.

A recent analysis of SK data provides an indication that the elastic scattering rate in the SK detector is larger when the neutrinos pass through the Earth during nighttime.

The combined energy spectrum and the day/night solar neutrino flux asymmetry from SK-I to SK-IV will be presented.
A global oscillation analysis using SK-I,II,III, and SK-IV data and combined with the results of other solar neutrino experiments as well as KamLAND reactor experiment has been carried out. The results of this global analysis will also be presented as well.

Primary authors : NAKANO, Yuuki (The Univ. of Tokyo)

Co-authors :

Presenter : NAKANO, Yuuki (The Univ. of Tokyo)

Session classification : Poster Session I

Track classification : Solar Neutrinos

Type : Poster

Contribution ID : 146

Pulse shape analysis studies for the Majorana Demonstrator

Content :

The Majorana Collaboration is constructing the Majorana Demonstrator, an ultra-low background, 40-kg modular HPGe detector array to search for neutrinoless double beta decay in ^{76}Ge. In view of the next generation of tonne-scale Ge-based 0νββ decay searches that will probe the neutrino mass scale in the inverted-hierarchy region, a major goal of the Majorana Demonstrator is to demonstrate a path forward to achieving a background rate at or below 1 count/tonne/year in the 4 keV region of interest around the Q-value at 2039 keV. The P-Type Point Contact design of the Demonstrator's germanium detectors allows for significant reduction of background through pulse shape analysis. The background suppression techniques to be applied to the data using pulse shape analysis will be described. These techniques allow, for instance, single-site events such as 0νββ decay to be distinguished from multi-site background events in germanium detectors.

Primary authors : Dr. CUESTA, Clara (University of Washington)

Co-authors :

Presenter : Dr. CUESTA, Clara (University of Washington)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 147

End to the Cosmic Neutrino Spectrum?

Content :

There exists a seeming high-energy cutoff of neutrino events in IceCube data. In particular, IceCube does not observe the Standard Model Glashow-resonance events expected at 6.3 PeV. There are also no higher-energy neutrino signatures in the ANITA and Auger experiments. This absence of high-energy neutrino events motivates models having a fundamental restriction on neutrino energies above a few PeV. The simplest scenario to terminate the neutrino spectrum is the Lorentz-Invariance violating, limiting neutrino velocity formulated by Coleman and Glashow in 1998. Either the neutrino itself, or its parent charged-pion, can be assigned a maximal velocity. In an alternative mechanism, we may postulate that the pion becomes stable above some velocity. Implications of these hypotheses for other physics, beginning with the end of hope for UHE neutrino astronomy, can hardly be overstated. Testable repercussions will be outlined in this presentation. Of course, the hypothesis of a cutoff near the PeV energies of the current trio of IceCube events can be invalidated by observation of higher-energy neutrinos.

Primary authors : ANCHORDOQUI, Luis (University of Wisconsin Milwaukee)

Co-authors : Prof. GOLDBERG, Haim (Northeastern University) ; Prof. LEARNED, John (University of Hawaii) ; Prof. MARFATIA, Danny (University of Hawaii) ; Prof. PAKVASA, Sandip (University of Hawaii) ; Dr. PAUL, Thomas (University of Wisconsin Milwaukee) ; Prof. WEILER, Thomas (Vanderbilt University) ; Prof. BARGER, Vernon (University of Wisconsin)

Presenter : ANCHORDOQUI, Luis (University of Wisconsin Milwaukee)

Session classification : Poster Session I

Track classification : Theory / Phenomenology

Type : Poster

Contribution ID : 148

Waveform Denoising in EXO-200

Content :

Neutrinoless double-beta decay experiments search for a rare mono-energetic decay process. Their sensitivity is determined in part by their energy resolution. The EXO-200 experiment searches for neutrinoless double-beta decay of xenon-136 and has a resolution which is limited by noise in the scintillation channel. Here we present a new technique for denoising the scintillation waveforms in offline analysis, improving our time-averaged energy resolution by more than 20% to an average 1.53% sigma/E at 2458 keV. Application of this technique results in a 90% CL half-life limit of 1.1e25 years, corresponding to a Majorana mass limit of 190-450 meV. (Submitted on behalf of the EXO-200 collaboration.)

Primary authors : DAVIS, Clayton G. (University of Maryland)

Co-authors :

Presenter : DAVIS, Clayton G. (University of Maryland)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 149

Studying Neutrinos with a Desktop Detector

Content :

The miniTimeCube (mTC) is the world's smallest neutrino detector. The two liter plastic scintillator target is viewed by 24 Photonis 64 anode PMTs (1536 pixels in total), has a single pulse resolution of <100ps with waveform recording up to 12 microseconds. Analysis of data from the UH manufactured PMT mounted digitization electronics will provide critical event discrimination. Tests at NIST, Gaithersburg, MD are underway. The detector's special characteristics include studies of neutron scatters via elastic scattering and electron anti-neutrino detection via inverse beta decay. Applications range from reactor monitoring to sterile neutrino searches. We will report the latest results and prospects for further development.

Primary authors : Prof. LEARNED, John Gregory (University of Hawaii)

Co-authors : Mr. ANDREW, Matt (University of Hawaii) ; Prof. MCDONOUGH, William (University of Maryland) ; Dr. MUMM, Hans-Pieter (NIST, Gaithersburg) ; Mr. NEGRASHOV, Serge (University of Hawaii) ; Ms. RITTER, Lisa (University of Hawaii) ; Mr. ROSEN, Marc (University of Hawaii) ; Mr. SAKAI, Michinari (University of Hawaii) ; Ms. SMITH, Stefanie (University of Hawaii) ; Mr. USMAN, Shawn (Johns Hopkins University) ; Prof. VARNER, Gary (University of Hawaii) ; Mr. CARPENTER, Andrew (University of Hawaii) ; Mr. DORRILL, Ryan (University of Hawaii) ; Mr. DUVALL, Mark (University of Hawaii) ; Prof. DYE, Stephen (Hawaii Pacific University) ; Mr. JOCHER, Glenn (Integrity Applications Incorporated) ; Mr. LI, Viacheslav (University of Hawaii) ; Dr. MACCHIARULO, Luca (University of Hawaii) ; Dr. MATSUNO, Shigenobu (University of Hawaii)

Presenter : Prof. LEARNED, John Gregory (University of Hawaii)

Session classification : Poster Session I

Track classification : Reactor Neutrino Oscillations

Type : Poster

Contribution ID : 150

Supernova detection in SNO+

Content :

SNO+ is a neutrinoless double beta decay experiment which reuses the SNO detector by filling it with tellurium-loaded liquid scintillator. It is also sensitive to galactic core-collapse supernovae and will participate in the Supernova Early Warning System (SNEWS). For a supernova at 10kpc, SNO+ will observe around 700 events. It can measure both the total flux of all neutrino species, through proton elastic scattering interactions, and also the electron anti-neutrinos separately via inverse beta decay. The largest number of events is in the elastic scattering channel, but due to quenching in the scintillator these are peaked at very low visible energy. To maximize the number observed, we use a two level trigger scheme. The DAQ's level-1 trigger runs at a low threshold, sufficient to see nearly all supernova events. We retain all of these events in a week-long buffer while also using a level-2 software filter to produce a reduced dataset for non-supernova analyses. In the same nearline processing chain, we search for supernova-like event bursts with a goal of being able to identify a supernova within one minute of the first events. We will be able to efficiently tag inverse beta decay events due to the clear delayed-coincidence signal in scintillator; this enhances the ability to identify supernova bursts with high confidence.

Primary authors : STRAIT, Matthew (University of Chicago)

Co-authors : LABE, Kevin (University of Chicago)

Presenter : STRAIT, Matthew (University of Chicago) ; LABE, Kevin (University of Chicago)

Session classification : Poster Session I

Track classification : Supernova Neutrinos

Type : Poster

Contribution ID : 151

Experimental challenges in determining the neutrino mass hierarchy with the Juno experiment

Content :

The Jiangmen Underground Neutrino Observatory (Juno) is one of the largest proposed liquid scintillator detectors aimed at detecting reactor antineutrinos. Its two main physics goals are 1) to determine the neutrino mass hierarchy, and 2) to measure with high precision
some of the oscillations parameters (Delta m^2(12), Delta m^2(23), sin^2 (theta_12)) in order to test the unitarity of the PMNS matrix at the few percent level. The large target mass (20 kt), the large target volume (2.3 x 10^4 m^3) and the required energy resolution (3% / sqrt(E)) pose unprecedented experimental challenges. This poster reviews the proposed solutions to face three among the most important of such challenges, that is, how to reject background events arising from long-lived cosmogenic isotopes, how to read-out and store efficiently the output of 15x10^3 channels, and how to constrain the detector response to be linear within ~1%. All these solutions have been investigated using dedicated MC simulations, whose details are also provided within the poster.

NB. The pdf version of this abstract properly showing symbols and formulas is available at https://db.tt/YWbdnugZ

Primary authors : GRASSI, Marco (Institute Of High Energy Physics - Chinese Academy Of Sciences)

Co-authors :

Presenter : GRASSI, Marco (Institute Of High Energy Physics - Chinese Academy Of Sciences)

Session classification : Poster Session I

Track classification : Reactor Neutrino Oscillations

Type : Poster

Contribution ID : 152

Flux precision at the neutrinos from stored muons facility - nuSTORM

Content :

The neutrinos from stored muons (nuSTORM) facility aims to provide a beam of electron and muon neutrinos with precisely known flavour content and with a flux precision of less than 1% per 50MeV energy bin. This s achieved by utilising both the 5 GeV/c pion beam that is injected into the decay ring and the stored muon beam at 3.8GeV/c. These beams can service both short- and long-baseline oscillation physics experiments, and neutrino interaction experiments at a near detector site.

The unprecedented precision on the neutrino flux is achieved by detailed knowledge of the stored muon beam within the storage lattice (both FODO and FFAG) and existing beam diagnostics capabilities. An overview of nuSTORM and its aims, along with the simulation results illustrating the flux precision will be presented.

Primary authors : Dr. ADEY, David (Fermilab)

Co-authors :

Presenter : Dr. ADEY, David (Fermilab)

Session classification : Poster Session II

Track classification : Neutrino Beam Flux

Type : Poster

Contribution ID : 153

Monitoring PMT performance at RENO

Content :

At RENO, we have been taking data since August 2011 and monitoring the performance of RENO detectors using several radioactive sources which are deployed periodically into the detectors. For more than 800 days of data, we have found the decreasing quantum efficiency (QE) of photomultiplier tubes (PMT) due to light–flashing PMTs. In this talk, we present an observation of the PMT QE decrease in correlation with the PMT flashing rate.

Primary authors : Mr. LEE, DongHa , for the RENO collaboration (Seoul National University)

Co-authors :

Presenter : Mr. LEE, DongHa , for the RENO collaboration (Seoul National University)

Session classification : Poster Session I

Track classification : Reactor Neutrino Oscillations

Type : Poster

Contribution ID : 154

RENO-50: Neutrino Mass hierarchy and Neutrino Observatory

Content :

RENO-50 is an underground reactor neutrino detector about 50 km away from the Hanbit reactor array (16.8 GWth) in Younggwang, Korea. The default detector would consist of 18 kton ultra-low radioactivity liquid scintillator in a cylindrical vessel (Diameter: 30m, Height: 30 m) surrounded by mineral oil buffer where 15,000 PMTs (20 inch) are attached to collect photons coming out as a result of the Inverse Beta Decay (IBD) process. The main goals of RENO-50 are to determine neutrino mass hierarchy and precise measurements of neutrino mixing parameters. Additionally RENO-50 can study neutrinos from the Earth, the Sun, and Supernova, therefore it can serve as a long term neutrino observatory. We would like to introduce RENO-50 and the status of our MC study in this poster.

Primary authors : SEO, Seon-Hee (Seoul National University)

Co-authors : COLLABORATION, RENO-50 (RENO-50)

Presenter : SEO, Seon-Hee (Seoul National University)

Session classification : Poster Session I

Track classification : Reactor Neutrino Oscillations

Type : Poster

Contribution ID : 155

135 kton Liquid Scintillator Detector

Content :

Liquid scintillator (LSc) detectors continue to play an important role in neutrino physics as demonstrated by KamLAND, Borexino, Double Chooz, Daya Bay, and Reno experiments. Advancements in electronics and signal processing have recently added flavor sensitivity and tracking for high energy neutrinos to the long list of advantages of this robust, cost effective, and well-proven technology. In particular LSc became a viable choice for mass hierarch determination with long baseline neutrino beams (CN2PY) and for measuring CP violation phase using the Daedalus scheme. The only drawback so far was the limited size. The largest proposed LSc detector (LENA) has 50 kton fiducial mass. Now we present the option for a 135 kton (fiducial) detector intended for the Pyhäsalmi mine in Finland. Regardless of tripling of the mass the performance and the physics scope of the detector would not be compromised. During decommissioning half of the total investment costs would be recuperated from the sale of the scintillator liquid (LAB).

Primary authors : TRZASKA, Wladyslaw Henryk (Jyvaskyla University)

Co-authors :

Presenter : TRZASKA, Wladyslaw Henryk (Jyvaskyla University)

Session classification : Poster Session II

Track classification : Long Baseline Oscillations

Type : Poster

Contribution ID : 156

Supernova detection study; Investigation of progenitor core rotation with Gravitational Wave and Neutrino detector.

Content :

Core-collapse supernova is one of the most energetic phenomenon in the universe and when it happens in our galaxy,
various detectors would detect gravitational waves (GWs) and neutrinos.
Current numerical simulations of supernova explosion are succeeded to introduce multi-dimensional effects, SASI and asymmetric convection.
But the explosion mechanism is not understood well.
One of the main key point to understand is the identification of the progenitor star core conditions(ex: mass, mass density profile, rotation rate).
By using a consistent model for both GW and neutrino, we are discussing how supernova signals are observed, especially focusing on the time correlation variation between GW waveform and electron neutrinos/anti-electron neutrinos flux.
The GW detector is assumed to advanced detectors, mainly based on KAGRA detector which is the 3km laser interferometric detector located in Kamioka mine.
The neutrino detector is assumed to EGADS detector, which is 200 ton water Cherenkov detector with 0.1% Gd loading.
The characteristics of EGADS detector is the 90% neutron capture probability, which can identify observed event as from inverse beta decay or other interactions.
We devised the method of extraction of the start time of GW emitting, t_start_gw and the neutronization burst time, t_nburst.
And to compare them, we calculated the possibility of progenitor core is rotated or not from observation.
Our simulation results show that we can judge about 100% no core rotation for the no core rotation model, and about 90% core rotation for the strong core rotation model when the close supernova(<1kpc) is occurred.

Primary authors : Dr. YOKOZAWA, Takaaki (Osaka City University, Japan)

Co-authors : Mr. ASANO, Mitsuhiro (Osaka City University) ; Mr. KAYANO, Tsubasa (Okayama University) ; Prof. KANDA, Nobuyuki (Osaka City University) ; Prof. SUWA, Yudai (YITP, Kyoto University) ; Prof. KOSHIO, Yusuke (Okayama University) ; Prof. VAGINS, Mark (IPMU)

Presenter : Dr. YOKOZAWA, Takaaki (Osaka City University, Japan)

Session classification : Poster Session I

Track classification : Supernova Neutrinos

Type : Poster

Contribution ID : 157

Advantages of a Second Detector in the Neutrino Mass Hierarchy Determination

Content :

In the next decade, a number of experiments will attempt to determine the neutrino mass hierarchy. I will show that a second detector can significantly improve the precision of the hierarchy determination in reactor neutrino experiments at intermediate baselines, breaking the degeneracy with a shift of \Delta M_23 and reducing the impact of the non-linear response.
Moreover, with the addiction of one cyclotron complex, it will be possible to measure the CP-violating phase with good precision.
I will also show that, since the two hierarchies are nonnested hypothesis, the statistic delta chi^2 does not follow a one-degree-of-freedom chi^2 distribution and so the confidence in the hierarchy determination cannot be estimated by taking the square root of the expected delta chi^2; I will present the correct formula for the confidence.

Primary authors : Dr. CIUFFOLI, Emilio (IHEP, CAS)

Co-authors :

Presenter : Dr. CIUFFOLI, Emilio (IHEP, CAS)

Session classification : Poster Session II

Track classification : Long Baseline Oscillations

Type : Poster

Contribution ID : 158

Search for magnetic monopoles with the NOvA far detector

Content :

The NOvA far detector, due to its surface proximity, large size, good timing resolution, and large energy dynamic range, is sensitive to the detection of magnetic monopoles over a large range of velocities and masses. Two different algorithms have been developed to trigger the candidate monopole events: one targeting on relativistic and highly ionizing monopoles, the other on non-relativistic monopoles. Both have been tested using a detailed Monte Carlo simulation of the detector and the large cosmic-ray background. In this poster, we present the detector's response to simulated monopoles, the trigger efficiencies of both algorithms, the reconstruction of candidate monopole events of cosmic data from far detector, and our expected sensitivity for the full NOvA far detector exposure.

Primary authors : Mr. WANG, Zukai (university of virginia)

Co-authors :

Presenter : Mr. WANG, Zukai (university of virginia)

Session classification : Poster Session II

Track classification : Short Baseline Oscillations / Sterile Neutrinos / Non-standard Oscillations

Type : Poster

Contribution ID : 159

Constraining Large Extra Dimensions with MINOS/MINOS+

Content :

We present the sensitivity of MINOS/MINOS+ to large extra dimensions using muon neutrino disappearance in the NuMI beam. Employing a model in which sterile neutrinos can propagate in a large compactified extra dimension while standard model left-handed neutrinos are confined to a 4-dimensional brane (e.g., Machado et al., Phys.Rev.D84:013003, 2011), we constrain the size of large extra dimensions as a function of the lightest neutrino mass. Mixing between active and sterile neutrinos occurring in the MINOS/MINOS+ baseline is treated as a perturbation to the standard oscillation scenario.

Primary authors : HUANG, Junting (University of Texas at Austin)

Co-authors :

Presenter : HUANG, Junting (University of Texas at Austin)

Session classification : Poster Session II

Track classification : Short Baseline Oscillations / Sterile Neutrinos / Non-standard Oscillations

Type : Poster

Contribution ID : 160

Joint Appearance and Disappearance Analysis for the T2K Long-Baseline Neutrino Experiment

Content :

T2K oscillation physics results using an analysis which for the first time simultaneously fits the T2K dataset of νμ → νe appearance and νμ → νμ disappearance are shown. The precise T2K constraints on the four relevant oscillation parameters (sin^22θ_13, δ_CP , sin^2θ_23, and Δm^2_32) are all correctly accounted for in this fit. In this analysis, the systematic errors are implemented in a simple manner, where all errors are encoded in a single systematic error covariance matrix, and confidence intervals are evaluated either at constant levels of Δχ2 assuming Gaussian errors, or using frequentist methods.

Primary authors : Dr. FRIEND, Megan (High Energy Accelerator Research Organization (KEK))

Co-authors : Dr. IKEDA, Motoyasu (University of Tokyo, ICRR) ; KIKAWA, Tatsuya (University of Kyoto)

Presenter : Dr. FRIEND, Megan (High Energy Accelerator Research Organization (KEK))

Session classification : Poster Session II

Track classification : Long Baseline Oscillations

Type : Poster

Contribution ID : 161

Building and characterizing strings of Ge detectors for the Majorana Demonstrator

Content :

The Majorana collaboration is currently constructing the Demonstrator, which will search for neutrinoless double beta decay 0nu2beta) in germanium-76. The experiment will consist of 40 kg of germanium, 30 kg of which will be 87% enriched in 76Ge. The material will be divided into individual p-type point contact (PPC) detectors, each around 1 kg. The detectors are to be deployed as 'strings' of four to five in a vertical stack, with seven strings inside each cryostat. Because the Demonstrator aims for a stringent background limit of < 3 counts/tonne-year in the 4-keV-wide region of interest for 0nu2beta, the collaboration has developed a rigorous procedure for string building using radiopure materials in a glove box maintained as a class 10 clean room environment with a liquid nitrogen boil-off radon purge. Once assembled, each string in the Demonstrator will undergo a set of characterization measurements, meant to ensure that backgrounds, resolutions, and thresholds are within acceptable limits. This poster will describe string building and present characterization data for the strings currently in commissioning for the first stage of the Demonstrator.

Primary authors : SHANKS, Benjamin (University of North Carolina at Chapel Hill)

Co-authors :

Presenter : SHANKS, Benjamin (University of North Carolina at Chapel Hill)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 162

New calibration methods for IceCube, DeepCore and PINGU

Content :

To achieve precision measurements with the current IceCube/DeepCore setup and future extensions, systematic uncertainties would need to be reduced. The current primary systematic uncertainties arise from the ice properties and the optical acceptance of the digital optical modules. Improved calibration is not only mandatory for the planned low energy extension, called PINGU, but the current detector array will gain, providing a path to e.g. precision measurements of neutrino oscillation parameters.
We will discuss the development of two potential calibration improvements: (i) an in-situ self-calibrated light source, the "POCAM" module, and (ii) utilizing Michel electrons from decaying stopped muons as source of Cherenkov light with a known energy profile.

Primary authors : Dr. JURKOVIC, Martin (Technische Universität München)

Co-authors : Prof. RESCONI, Elisa (Technische Universität München)

Presenter : Dr. JURKOVIC, Martin (Technische Universität München)

Session classification : Poster Session I

Track classification : Cosmic Neutrinos

Type : Poster

Contribution ID : 163

The PICO Dark Matter Experiment

Content :

Recently a new collaboration formed by merging the PICASSO and COUPP efforts to use superheated liquids for dark matter searches. The collaboration is currently operating two bubble chambers at SNOLAB and is planning to design and build a new, large 250 l detector in the coming years.
The status of the current runs and the reach of the new detector will be reported.

Primary authors : Mr. KRAUSS, Carsten (University of Alberta)

Co-authors :

Presenter : Mr. KRAUSS, Carsten (University of Alberta)

Session classification : Poster Session II

Track classification : Dark Matter And Neutrinos

Type : Poster

Contribution ID : 164

The Majorana Demonstrator Neutrinoless Double-Beta Decay Experiment

Content :

Neutrinoless double-beta decay searches play a major role in determining the nature of neutrinos, the existence of a lepton violating process, and the effective Majorana neutrino mass. The Majorana Collaboration is assembling an array of HPGe detectors to search for neutrinoless double-beta decay in Ge-76. The Majorana Demonstrator is currently being constructed at the Sanford Underground Research Facility in Lead, South Dakota. The goals are to demonstrate the required background and scalability of a Ge-based, tonne-scale experiment. The status and potential physics reach of the Majorana Demonstrator experiment is presented.

Primary authors : GUISEPPE, Vincente (Univ. of South Carolina)

Co-authors :

Presenter : GUISEPPE, Vincente (Univ. of South Carolina)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 165

Characterizing the Energy Response of the Daya Bay Antineutrino Detectors

Content :

The Daya Bay reactor antineutrino experiment has provided the most precise measurement of the neutrino oscillation amplitude sin^2 2θ_13 = 0.090 +0.008 −0.009 as well as the first direct measurement of the mass-squared difference |Δm^2_{ee}| = (2.59 +0.19 −0.20) × 10^{-3} eV^2 by measuring relative differences in antineutrino interaction rates and spectral shapes between near and far detectors. In addition, the tremendous rate of antineutrinos collected by the four near detectors enables a precision measurement of the reactor ν_e spectra.

These spectral measurements require an accurate understanding of the detector response to e+ , e− and γ, including energy resolution, non-uniformity with vertex position and non-linearity. The scintillator response is non-linear due to Birks' quenching and Cherenkov light absorption and reemission with detectable wavelength. Additional energy non-linearity arises from the interaction of the scintillation light time profile and the charge collection of the readout electronics. This poster presents the analyses to characterize the energy response using various detector calibration data as well as benchtop measurements.

Primary authors : Dr. JETTER, Soeren (Institute of High Energy Physics, Beijing)

Co-authors :

Presenter : Dr. JETTER, Soeren (Institute of High Energy Physics, Beijing)

Session classification : Poster Session I

Track classification : Reactor Neutrino Oscillations

Type : Poster

Contribution ID : 166

CALDER: cryogenic light detectors for background free searches

Content :

The achievement of zero background has become crucial for bolometric experiments searching for neutrino-less double beta decay (0nDBD) and Dark Matter interactions.
The CUORE experiment, that will study the 130Te 0nDBD,
could take advantage from the measurement of the tiny Cherenkov light emitted by electrons to reject alpha interactions, that are the dominant background source for 0nDBD.
The LUCIFER experiment, whose main goal is the search for the 0nDBD of 82Se, could reach a competitive sensitivity also on Dark Matter interactions if equipped with light detectors enabling the identification of the background due to electrons.
The interest in sensitive cryogenic light detectors gave birth to the CALDER project, that will exploit the Kinetic Inductance Detector's technology to develop wide area devices with RMS baseline resolution lower than 20 eV, wide temperature range of operation, and multiplexed read-out, that will be essential for next generation experiments with hundreds of channels.
In this poster we present the current status of CALDER and its applications.

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Presenter : Dr. CARDANI, Laura (Sapienza, University of Roma)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 167

Systematic Uncertainty in LBNE Measurements of Long-Baseline Neutrino Oscillation

Content :

Excellent control of systematic uncertainty will be critical to LBNE's success in the study of long-baseline neutrino oscillation. Discovery level sensitivity to CP violation across a significant fraction of the allowed parameter space requires thousands of fully reconstructed and well characterized events, low background, and exposures of hundreds of kt-MW-years. Systematic uncertainties are required to be below statistical uncertainties so as not to limit the discovery potential. In this poster, we present ideas for the analysis strategy LBNE will employ to minimize the impact of systematic uncertainty, an estimate of expected systematic uncertainties based on experience with recent neutrino-oscillation experiments, and the status of studies using LBNE-specific tools to evaluate systematic uncertainty and physics sensitivity in LBNE.

Primary authors : WORCESTER, Elizabeth (BNL)

Co-authors :

Presenter : WORCESTER, Elizabeth (BNL)

Session classification : Poster Session II

Track classification : Long Baseline Oscillations

Type : Poster

Contribution ID : 168

Calibrating MINOS+: Current Methods, Recent Updates, and Planned Upgrades

Content :

The MINOS+ experiment utilizes the existing MINOS detectors, which are exposed to the higher energy, higher intensity upgraded NuMI muon neutrino beam. With this setup, MINOS+ hopes to conduct both precision measurements of neutrino oscillation, as well as searches for new physics. To carry out these studies, it is necessary to understand the energy scales of the detectors as precisely as possible. I present the current scheme by which the MINOS detectors are calibrated, primarily via cosmic ray muons and an in-situ light injection system. The poster discusses recent improvements to the calibration, such as the removal of an angular dependence in the energy scale calculated from cosmic muons. Finally, it will also present proposed future improvements to the calibration, which can further reduce the level of systematic error in the MINOS+ energy scale.

Primary authors : Dr. TONER, Ruth (Harvard University)

Co-authors :

Presenter : Dr. TONER, Ruth (Harvard University)

Session classification : Poster Session II

Track classification : Long Baseline Oscillations

Type : Poster

Contribution ID : 169

Calibrating the SNO+ Detector

Content :

SNO+ is a scintillator experiment at SNOLAB searching for neutrino-less double-beta decay in Tellurium-130, as well as detecting low energy solar neutrinos, and reactor- and geo-antineutrinos. Detailed understanding of our energy response is crucial, especially for the double beta decay measurement. SNO+ will deploy radioactive calibration sources to study the detector's response to different particle types, position and energy reconstruction, and energy resolution at the double-beta endpoint. I will focus on the development and simulation of a new AmBe source and upgrading the existing SNO calibration hardware to a closed, airtight system, both of which are needed to for compatibility with our new LAB-based scintillator.

Primary authors : Dr. CADEN, Erica (Laurentian University)

Co-authors :

Presenter : Dr. CADEN, Erica (Laurentian University)

Session classification : Poster Session I

Track classification : Solar Neutrinos

Type : Poster

Contribution ID : 170

Development of Cryogenic CaMoO4 Crystal Detectors for the AMoRE Double Beta Decay Project

Content :

The AMoRE (Advanced Mo-based Rare process Experiment) project is an international experiment to search for neutrinoless double beta decay of 100Mo. High energy resolution and efficient particle-type discrimination are essential to improve the experimental sensitivity in neutrinoless double beta decay search experiments. Here we report performances of cryogenic detectors with CaMoO4 crystals and metallic magnetic calorimeters that were operated at tens of milli-Kelvin temperatures. An energy resolution 10 keV (FWHM) was obtained for 2615 keV gamma quanta, and less than 1 ms of pulses rise-time was achieved at 40 mK. This is a relatively fast value compared with other cryogenic detectors using resistive thermistors. It may improve rejection ability for random coincidences of two-neutrino double beta decay events that could be one of the major background sources in cryogenic neutrinoless double beta decay experiments with 100Mo. Moreover, pulse shape discrimination of single phonon sensor was successful to separate the electron and alpha induced events with 7.7σ discrimination power.

Primary authors : Mr. KIM, Geon-Bo (Institute for Basic Science, Republic of Korea)

Co-authors :

Presenter : Mr. KIM, Geon-Bo (Institute for Basic Science, Republic of Korea)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 171

Status of SBL Experiment

Content :

SBL is a Short-BaseLine reactor neutrino experiment for searching sterile neutrinos, which will be performed using research reactor HANARO in Daejeon, Korea. HANARO has 30MW thermal power and detector will be placed at the distance of about 6m away from reactor. Currently prototype detector which has 50L of Gd-loaded LS as target is constructed and tested in several places with different overburden to understand background caused by cosmic muon and neutron. We compare background data from prototype detector and monte carlo simulation, and we make an effort to reduce background for main detector.

Primary authors : Mr. KIM, Jinyu (IBS, Sejong University)

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Presenter : Mr. KIM, Jinyu (IBS, Sejong University)

Session classification : Poster Session II

Track classification : Short Baseline Oscillations / Sterile Neutrinos / Non-standard Oscillations

Type : Poster

Contribution ID : 172

Pattern recognition and track reconstruction in SuperNEMO and NEMO-3

Content :

Following the unique strategy pionereed by NEMO-3, the SuperNEMO experiment can identify the neutrinoless double beta ($\beta\beta$) decay of enriched isotopes by combining the measurement of the energy of each emitted electron in the calorimeter and the characteristic topology detected for their trajectories in the magnetized wire chamber: two tracks of negative charge ejected at the same time by a common vertex on the source.

The full kinematical reconstruction of the event allows to reject radioactive backgrounds and constrain the theoretical model behind a neutrinoless $\beta\beta$-decay. A suite of techniques has been developed to convert the collection of hits detected by the drift cells operated in Geiger mode into sets of tracks belonging to charged particles (e^-, e^+, α^{++}). First, the wire hits are clustered based on requirements of continuity and boundary conditions to match the hits on the surrounding calorimeter; each cluster is then explored for pattern recognition, leading to identification of broken-lines (with cellular automaton technique), straight lines and helices (with the method of Legendre transform); finally a coherent scenario of tracks is assembled from these structures. The reconstruction of an event topology allows to give tracks an id, find their generation and disappearence point, associate them with energy (as measured by the calorimeter) and calculate their time-of-flight.

Primary authors : Mr. NOVA, Federico (University of Texas at Austin)

Co-authors :

Presenter : Mr. NOVA, Federico (University of Texas at Austin)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 173

An Assay of Radiopurity and Radon Emanation of the SuperNEMO Detector

Content :

SuperNEMO is a 0⊠⊠⊠ experiment designed to reach a half-life sensitivity of 10^26 years corresponding to an effective Majorana neutrino mass of ⊠m_ββ ⊠ < 50 − 100 meV. To ensure radiopurity of the detector, dedicated facilities have been established for screening and selection of construction materials. Gamma ray spectroscopy using high-purity germanium (HPGe) detectors offers a standard method for the measurement of material contamination. We will discuss sensitivities of HPGe detectors at Modane and Boulby underground laboratories and results obtained from screening of SuperNEMO detector materials and components.

Radon is one of the most dangerous backgrounds for SuperNEMO and most other low background experiments. To reach the target sensitivity, the 222Rn concentration inside the SuperNEMO tracker volume must be less than 0.15 mBq/m3. We will describe the design and performance of a 'Radon Concentration Line' which has been developed to make more sensitive measurements in large gas volumes than standard detectors. The apparatus has been commissioned and is capable of measuring radon levels in large gas volumes down to ~10 μBq/m3. We will also describe Rn detection systems developed by the collaboration to measure radon emanation from large samples and to measure radon diffusion properties through different materials. Radon mitigation methods developed for SuperNEMO and applicable to other low background experiments will be presented.

Primary authors : Mr. LIU, Xin Ran (University College London)

Co-authors :

Presenter : Mr. LIU, Xin Ran (University College London)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 174

The Calibration Source Deployment and Light Injection Monitoring Systems for the SuperNEMO Experiment

Content :

SuperNEMO is a next generation tracking-calorimeter style detector and successor to NEMO-3 which will continue to search for neutrinoless double beta decay.
To exploit the full power of the detector and its technique, the SuperNEMO calorimeter, consisting of photomultiplier tubes coupled to scintillator blocks for a total of 712 optical modules, needs to be continuously monitored and calibrated to within 1%. The long exposure times typical of double beta decay searches also necessitate long term measurement of the stability of the calorimeter.
A robust system has been developed to achieve these goals with minimal impact to data collection. It consists of two parts: the calibration source deployment and light injection monitoring systems. The deployment system introduces a 207-Bi source of conversion electrons that illuminate the calorimeter to make absolute energy calibrations up to 1 MeV. The light injection system will then monitor the stability and linearity of each optical module up to higher energies via the injection of pulsed LED light. An external reference optical module will monitor the LED light levels against an 241-Am calibration source to aid in the long term tracking. This poster will describe the details of this system.

Primary authors : Mr. CESAR, John (The University of Texas at Austin)

Co-authors : Mr. SALAZAR, Ramon (The University of Texas at Austin)

Presenter : Mr. CESAR, John (The University of Texas at Austin)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 175

EXO-200 detector performance and lessons for nEXO

Content :

The EXO-200 detector, a 175 kg single phase liquid xenon time projection chamber, is the most sensitive experiment in the Xe-136 neutrino-less double beta decay search. Its success bodes well for the future multi-ton scale next phase, nEXO. The abilities to achieve energy resolution of $\sigma/E = 1.53\%$ at the Q-value of 2458 keV and reduce α and γ-ray backgrounds make it feasible to improve sensitivity via scaling up in mass. EXO-200 also demonstrates technological achievements such as in situ xenon purification and the construction of a TPC from only low background materials, while experiencing challenges such as high voltage breakdown in liquid xenon. We describe the EXO-200 detector performance over three years of running and highlight the lessons applied to nEXO design.

Primary authors : Dr. YEN, Yung-Ruey Yen (Drexel University) ; Prof. DOLINSKI, Michelle (Drexel University) ; Ms. SMITH, Erica (Drexel University) ; Ms. LIN, Yi-Hsuan (Drexel University) ; Mr. JEWELL, Michael (Drexel University)

Co-authors :

Presenter : Dr. YEN, Yung-Ruey Yen (Drexel University) ; Prof. DOLINSKI, Michelle (Drexel University) ; Ms. SMITH, Erica (Drexel University) ; Ms. LIN, Yi-Hsuan (Drexel University)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 176

SUNLAB laboratory in Poland

Content :

The Sieroszowice Underground Laboratory in Poland, SUNLAB, had been discussed in a framework of the FP7 design study LAGUNA as an option for the realization of a next-generation large-volume neutrino observatory in Europe. The SUNLAB location is not under consideration in the LAGUNA-LBNO project, the follower of LAGUNA. However, the capability studies of the SUNLAB laboratory have been performed within the project UMO-2011/03/N/ST2/01971 of the Polish National Science Centre. They include sensitivity calculations, focused on the delta CP measurement and performed using the GLOBES package, for a large LArTPC detector at a distance of 950 km from CERN in a long baseline neutrino experiment. For this purpose we have simulated the neutrino beam based on the SPS proton accelerator at CERN and used the latest LAr data to simulate the detector response.
Apart from the anhydrite rock, considered in Laguna to locate the giant LAr detector, the geological structure in this region includes salt-rock characterized by extremely low level of natural radioactivity. This offers good conditions for a smaller very low background SUNLAB laboratory. Several detectors have been developed to be used in SUNLAB. For example, a low background Ge detector constructed at IFJ PAN in Kraków will be tested in the Sieroszowice mine in July this year.

Primary authors : HARANCZYK, Malgorzata (Institute of Nuclear Physics PAN, Krakow, Poland)

Co-authors :

Presenter : HARANCZYK, Malgorzata (Institute of Nuclear Physics PAN, Krakow, Poland)

Session classification : Poster Session II

Track classification : Other / Global Projects

Type : Poster

Contribution ID : 177

Millicharged neutrino with anomalous magnetic moment in rotating magnetized matter

Content :

New exact solutions of the modified Dirac equation describing a neutrino with nontrivial electromagnetic properties in extreme background conditions are obtained. Within the quasi-classical treatment the effective Lorentz force that describes the neutrino propagation in the magnetized rotating matter is introduced. We predict the effect of the spatial separation of different types of relativistic neutrinos and antineutrinos (different in flavors and energies) by the magnetized rotating matter of a star. Low energy neutrinos can be even trapped inside the star. We also predict two new phenomena: a new type of the neutrino electromagnetic radiation (termed ``Light of (milli)Charged Neutrino'', LC\nu and a new mechanism of the star angular velocity shift due to neutrinos escaping the star (termed ``Neutrino Star Turning" mechanism, nu S T). The possible impact of the nu S T mechanism on a supernova explosion yields a new astrophysical limit on the neutrino millicharge q_{nu}< 1.3 x 10^{-19}e_0. This limit is stronger than many other constraints known in literature. In addition, the nu S T mechanism can be also used to explain the origin of pulsar ``anti-glitches'' and ordinary glitches as well.

1. A.Studenikin, I.Tokarev, Nucl. Phys. B Proc. Suppl. “New effects of nonzero neutrino electric charge”, 237–238 (2013) 317–319
2. A.Studenikin, I.Tokarev, “Neutrino electromagnetic properties and new physics” PoS HEP 2013 (2014) 531
3. A.Studenikin, I.Tokarev, “Millicharged neutrino with anomalous magnetic moment in rotating magnetized matter”, e-print arxiv: 1209.3245v3, 20 December 2013.

Primary authors : Mr. TOKAREV, Ilya (Faculty of Physics, Moscow State University)

Co-authors : Prof. STUDENIKIN, Alexander (Department of Theoretical Physics, Moscow State University)

Presenter : Mr. TOKAREV, Ilya (Faculty of Physics, Moscow State University)

Session classification : Poster Session I

Track classification : Cosmic Neutrinos

Type : Poster

Contribution ID : 178

New Prospects and Improvements in the Analysis for Low Energy Neutrinos in LENA

Content :

As a concept of a next generation large liquid scintillator detector LENA (Low Energy Neutrino Astronomy) has been proposed with a mass of 50 kt. The low energy threshold and large target mass of such a detector allow for a high statistic measurement of low energy neutrinos from astrophysical and terrestrial sources. An update on the analyses is presented showing among others the potential of determining the neutrino mass hierarchy using supernova neutrinos and the capability to establish a neutrino mass limit from such a neutrino burst. LENA offers the opportunity of a first time detection of the diffuse supernova neutrino background and we present an improved analysis covering the atmospheric NC background. The capability of a high statistic measurement of the B8 solar neutrino flux offers the potential to investigate the vacuum-matter transition region of the MSW effect.

Primary authors : Dr. BICK, Daniel (Universität Hamburg)

Co-authors :

Presenter : Dr. BICK, Daniel (Universität Hamburg)

Session classification : Poster Session I

Track classification : Solar Neutrinos

Type : Poster

Contribution ID : 179

Beam Simulations for the Long-Baseline Neutrino Experiment

Content :

The design of accelerator-based neutrino experiments relies heavily on neutrino beam simulations. The Long Baseline Neutrino Experiment (LBNE) uses a GEANT4-based simulation of the LBNE beamline. We present the current status of this simulation as well as efforts to characterize the LBNE beam. In particular, we discuss a recent study aimed at understanding the size and impact of flux uncertainties arising from the alignment of beamline elements.

The LBNE beam simulation has also been used to identify beam designs that maximize the potential for a discovery of CP violation. The optimization strategy involves maximizing the low energy flux in order to improve the L/E range and better resolve the second appearance peak while also reducing the high energy flux that can contribute to the neutral current and charged current tau neutrino background. A quantitative method to compare the discovery potential of various beam designs has been developed. We have used this method to study effects of changes such as the inclusion of a beam plug and varied horn current, proton energy, decay pipe length, and off axis angle. Changes to the beam configuration to support 1.2 Megawatt operation, including horn and target redesigns, have also been considered. We present preliminary results from these studies.

Primary authors : BASHYAL, Amit (University of Texas at Arlingon)

Co-authors : Dr. FIELDS, Laura (Northwestern University) ; LOSECCO, John (Notre Dame) ; Dr. PARK, Seongtae (University of Texas, Arlington) ; Prof. YU, Jaehoon (University of Texas at Arlington) ; Dr. LEBRUN, Paul L. G. (Fermilab)

Presenter : BASHYAL, Amit (University of Texas at Arlingon)

Session classification : Poster Session II

Track classification : Neutrino Beam Flux

Type : Poster

Contribution ID : 180

Methods for active background removal in the KATRIN experiment

Content :

The KATRIN experiment will measure the mass of the electron-antineutrino with a sensitivity of 200 meV/c^2 (90% C.L.) by determining the electron energy spectrum of the Tritium beta-decay in the end-point region. To reach this sensitivity, an ultra-low background level of < 0.01 counts per second is mandatory. The energy analysis of the decay electrons is achieved by an electrostatic spectrometer which follows the principle of the MAC-E filter.

While cooling down via ionization of residual gas molecules, stored electrons produce hundreds of secondary electrons, which can reach the detector and contribute to background in the signal region. In order to suppress this background component, several active methods are investigated to remove stored electrons, such as the application of an electric dipole field and the application of magnetic pulses inside the main spectrometer.

This poster presentation introduces the theory of background production mechanisms due to stored electrons and the removal by active methods in the main spectrometer. In context of the spectrometer- and detector-commissioning phase in summer 2013, the poster will also summarize first measurement results from the application of both active methods.

This work was supported by the BMBF under grant no. 05A11VK3 and by the Helmholtz Association.

Primary authors : Mr. BEHRENS, Jan David (University of Muenster (WWU)) ; Mr. HILK, Daniel (Karlsruhe Institute of Technology, Germany)

Co-authors :

Presenter : Mr. BEHRENS, Jan David (University of Muenster (WWU)) ; Mr. HILK, Daniel (Karlsruhe Institute of Technology, Germany)

Session classification : Poster Session I

Track classification : Neutrino Mass

Type : Poster

Contribution ID : 181

Atmospheric Heavy Neutrino Decay in Super-Kamiokande

Content :

Sterile right-handed neutrinos may exist and take part in neutrino mixing, producing various observable effects depending on the mass-scale. A MeV-scale heavy mass state containing even a small flavoured component would have decay channels that result in observable decay products. Due to copious neutrino production in the atmosphere and its long running period, the Super-Kamiokande water Cherenkov detector is able to perform a search competitive with current limits on sterile neutrino mixing parameters in the 10 to 100 MeV range. The preliminary results of this search are reported.

Primary authors : Mr. RICHARD, Euan (U. Tokyo ICRR)

Co-authors :

Presenter : Mr. RICHARD, Euan (U. Tokyo ICRR)

Session classification : Poster Session I

Track classification : Atmospheric Neutrinos

Type : Poster

Contribution ID : 182

Determining the leptonic CP phase with future atmospheric neutrino detectors

Content :

We explore possibility to determine the leptonic CP phase using large atmospheric neutrino detectors. We show that sensitivity to the CP phase improves substantially with decrease of energy threshold below 1 - 2 GeV, and there is no significant averaging out of the CP effect due to poor angular reconstruction. The sensitivity of the proposed PINGU detector to CP phases is marginal but future upgrade with (0.2 - 0.3) GeV energy threshold will allow to determine the phase with accuracy $\sim 0.2 \pi$. This upgrade can also be used for Proton decay searches.

Primary authors : Prof. RAZZAQUE, Soebur (University of Johannesburg)

Co-authors : Prof. SMIRNOV, A. Yu. (Abdus Salam ICTP)

Presenter : Prof. RAZZAQUE, Soebur (University of Johannesburg)

Session classification : Poster Session I

Track classification : Atmospheric Neutrinos

Type : Poster

Contribution ID : 183

Baseline optimization in a long-baseline neutrino oscillation experiment

Content :

Next-generation long-baseline electron neutrino appearance experiments will seek to discover CP violation, determine the mass hierarchy and resolve the theta_{23} octant. In light of the recent precision measurements of theta_{13}, we consider the sensitivity of these measurements in a study to determine the optimal baseline, including practical considerations regarding beam and detector performance. We conclude that a detector at a baseline of at least 1000~km in a wide-band muon neutrino beam is the optimal configuration.

Primary authors : WHITEHEAD, Lisa (University of Houston)

Co-authors :

Presenter : WHITEHEAD, Lisa (University of Houston)

Session classification : Poster Session I

Track classification : Long Baseline Oscillations

Type : Poster

Contribution ID : 184

PMT Triggering and Readout for the MicroBooNE Experiment

Content :

This poster presents the proposed PMT readout and triggering system that will be used in the MicroBooNE LArTPC experiment. The triggering scheme has been designed to study beam neutrino events as well as fully characterize cosmic rays. In addition, exploration of important physics applications including the use of "late" scintillation light in argon for particle identification and Michel electrons from muon decay will be possible. Various types of triggers and how they will be implemented in the combined PMT+TPC readout electronics system will be discussed.

Primary authors : Mr. KALEKO, David (Columbia University/Nevis Labs)

Co-authors :

Presenter : Mr. KALEKO, David (Columbia University/Nevis Labs)

Session classification : Poster Session II

Track classification : Short Baseline Oscillations / Sterile Neutrinos / Non-standard Oscillations

Type : Poster

Contribution ID : 185

Readout Electronics for the Time Projection Chamber in the Microboone Experiment

Content :

MicroBooNE is a Liquid Argon Time Projection Chamber (LArTPC) neutrino detector which will be located in the Booster Neutrino Beamline at Fermilab. MicroBooNE aims to explore the low-energy excess in the nu_e spectrum recorded in MiniBooNE and serves as an R experiment for future LArTPC detectors.
This poster presents an overview of the readout for the MicroBooNE TPC. Signals read out from the TPC will measure ionization generated by particles, allowing for spacial and calorimetric reconstruction of events. MicroBooNE data will be read out in two modes: one triggering on the neutrino beam, and one continuously acquiring data in order to record potential supernova neutrino events. For the latter readout mode, a compression scheme will be implemented to maintain manageable data rates while preserving data quality. Examples of such compression schemes are also presented in this poster.

Primary authors : CARATELLI, David (Columbia University)

Co-authors :

Presenter : CARATELLI, David (Columbia University)

Session classification : Poster Session II

Track classification : Short Baseline Oscillations / Sterile Neutrinos / Non-standard Oscillations

Type : Poster

Contribution ID : 186

Electron neutrino cross-section on carbon using the T2K near detector

Content :

Current and future long-baseline oscillation experiments have the potential to determine how much the lepton sector violates CP symmetry by studying nu_e appearance in a nu_\mu beam. Intrinsic nu_e from the beam are the largest background for these measurements, and nu_e from oscillations are the signal. Differences between the nu_e and nu_\mu cross-sections are theoretically predicted, but have not yet been measured. Constraining these differences is critical to reducing systematic uncertainties in the hunt for CP violation. This poster presents the first measurement of the nu_e CC cross-section on carbon for GeV-scale neutrinos, using ND280, the T2K near detector. Differential cross-sections in electron momentum, electron angle and Q^2 are presented, along with the total flux-averaged cross-section.

Primary authors : Mr. SMITH, Benjamin (Imperial College London)

Co-authors :

Presenter : Mr. SMITH, Benjamin (Imperial College London)

Session classification : Poster Session I

Track classification : Neutrino Interactions

Type : Poster

Contribution ID : 187

Search for sterile neutrinos with the T2K near detector

Content :

In the last decades, several anomalies in different neutrino experiments have been observed
that could be explained assuming the existence of sterile neutrinos.
Sterile neutrinos are right handed particles %, with a mass at the eV scale
that do not interact via the electroweak force but can mix with the Standard Model active neutrinos.
A first search for sterile neutrino oscillations at the T2K near detector
(ND280), located at 280~m from the target, through the nu_e disappearance channel (nu_e
-> \nu_s) is presented.
nu_e interactions at ND280 are selected exploiting the combined
particle identification performances of a Time Projection Chamber and of a set of electromagnetic calorimeters.
A 3+1 sterile neutrino model that can lead to nu_e
disappearance has been tested. All the data collected up to summer 2013, corresponding to an
exposure of 5.9 x 10^{20} protons on target
(~10% of T2K final goal) have been analysed.
Exclusion regions are built as a function of the oscillation amplitude
(sin^2{2theta}) and the squared mass splitting between the new state and the SM neutrinos (Delta m^2).
The region sin^2{2theta} > 0.2 and Delta
m^2 > 8 eV^2 is excluded at 95% CL.

Primary authors : Mr. SGALABERNA, Davide (ETH Zurich)

Co-authors : Mr. GIGANTI, Claudio (LPNHE Paris) ; Mr. CARAVACA, Javier (IFAE Barcelona)

Presenter : Mr. SGALABERNA, Davide (ETH Zurich)

Session classification : Poster Session II

Track classification : Short Baseline Oscillations / Sterile Neutrinos / Non-standard Oscillations

Type : Poster

Contribution ID : 188

Towards Measuring the NuMu Charged Current Quasielastic Cross Section on Water using T2K's Near Detector

Content :

A measurement of the numu charged current quasielastic cross section on water would provide additional constraints for T2K's oscillation analysis and serve to guide future neutrino--nuclear interaction models. We present a selection of numu charged current events using the Pi-Zero Detector (P0D) and the Tracker of T2K's near detector. An analysis that includes Data/MC comparisons and several systematic uncertainties has been completed. In addition, by separating the data sets into time periods when the P0D is filled with water and when it is empty, we propose a subtraction method that can provide an isolated sample of numu interactions on water only. In this way, we plan to provide a measurement of the numu CCQE cross section on water.

Primary authors : Mr. YUAN, Tianlu (University of Colorado, Boulder)

Co-authors : Mr. CLIFTON, Alex (Colorado State University) ; Mr. DAS, Raj (Colorado State University) ; Mr. JOHNSON, Rob (University of Colorado, Boulder (past)) ; Mr. LOPEZ, Jeremy (University of Colorado, Boulder) ; Mrs. MARINO, Alysia (University of Colorado, Boulder) ; Mr. REINHERZ-ARONIS, Erez (Colorado State University) ; Mr. TOKI, Walter (Colorado State University)

Presenter : Mr. YUAN, Tianlu (University of Colorado, Boulder)

Session classification : Poster Session I

Track classification : Neutrino Interactions

Type : Poster

Contribution ID : 189

Neutrinoless double beta decay and non-standard neutrino interactions in nuclear medium

Content :

We discuss a novel effect in neutrinoless double beta decay related with the fact that its underlying mechanisms take place in the nuclear matter environment. We study the neutrino exchange mechanism and demonstrate the possible impact of nuclear medium via Lepton Number Violating (LNV) 4-fermion scalar-type interactions of neutrino with the quarks from decaying nucleus. The net effect of these interactions is generation of an effective in-medium Majorana neutrino mass matrix.
The gradually improving cosmological and single beta decay neutrino mass limits may lead in the future to apparent incompatibility of observation of the neutrinoless double beta decay with the value of the neutrino mass constrained by the single beta decay and cosmological data. In such a case, the new physics would be mandatory. It can be represented, in particular, by the new effective scalar-type TeV scale neutrino-quark interactions enhanced in the neutrinoless double beta decay in the nuclear mean field. If the dominant mechanism of the neutrinoless double beta decay is Majorana neutrino exchange, the scenario which we present here will provide the most direct explanation for the above mentioned possible incompatibility between the experiments.
The effective neutrino masses and mixing are calculated for the complete set of the relevant 4-fermion neutrino-quark operators. Using experimental data on the neutrinoless double beta decay in combination with the single beta decay and cosmological data we evaluate the characteristic scales of the LNV operators (> 2.4 TeV).

Literature:

1. Kovalenko S. , Krivoruchenko M. I., Simkovic F.
Neutrino propagation in nuclear medium and neutrinoless double-beta decay, e-Print: arXiv:1311.4200 [hep-ph], accepted in Phys. Rev. Lett.

Primary authors : Prof. SIMKOVIC, Fedor (Comenius University)

Co-authors : Prof. KRIVORUCHENKO, Mikhail (ITEP Moscow) ; Prof. KOVALENKO, Sergey (Universidad Tecnica Federico Santa Maria)

Presenter : Prof. SIMKOVIC, Fedor (Comenius University)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 190

Measurement of the nu_e component and plans to measure the anti-nu_e component in the T2K beam with the ND280 Tracker

Content :

The main irreducible background in the T2K electron-neutrino appearance analysis is the nu_e contamination in the nu_{mu} beam. In order to quantify this background, a selection of nu_e charged-current (CC) interactions in the near detector (ND280) Tracker region was developed by combining the particle identification abilities of the time projection chambers and electromagnetic calorimeters. We measured a data/Monte Carlo ratio of 1.01 +- 0.10 for the electron-neutrino component of the beam providing an important confirmation of our predictions of the expected backgrounds to the oscillation analyses. In 2014 the T2K experiment will reverse the polarity of the magnetic horns and begin running with an anti-neutrino beam for the first time. Differences in the oscillation probabilities between neutrinos and anti-neutrinos may provide insight into charge-parity violation in the leptonic sector. The current ND280 Tracker nu_e CC selection has been used as a starting point for the anti-nu_e CC selection.
The additional challenges and selection criteria of the anti-nu_e selection will be presented.

Primary authors : Mr. SOUTHWELL, Luke (Lancaster University)

Co-authors :

Presenter : Mr. SOUTHWELL, Luke (Lancaster University)

Session classification : Poster Session II

Track classification : Neutrino Beam Flux

Type : Poster

Contribution ID : 192

Geoneutrinos and reactor antineutrinos expected in SNO+ and JUNO

Content :

Geoneutrinos , i.e. neutrinos produced by beta decays occurring in natural 238U and 232Th decay chains, are a unique direct probe of our planet's interior. They instantaneously bring to the Earth's surface information on the total amount and distribution of U and Th in the crust and in the mantle, which are thought to be the main reservoirs of these elements.

Geoneutrinos are presently detected in KamLAND and Borexino experiments. New measurements are highly awaited from SNO+ and from future experiments,as JUNO (Jiangmen Underground Neutrino Observatory). The main background in geoneutrino measurements is due to the electron antineutrinos produced by nuclear power plants. The energy spectrum of reactor antineutrinos extends beyond the end point of the geoneutrino one. As a consequence, in the geoneutrino energy window (1.8 – 3.3 MeV) we observe an overlap between geoneutrino and reactor antineutrino signals. Therefore, a careful analysis of the expected reactor antineutrino event rate at a given experimental site is mandatory.

In this framework, we estimate the expected reactor antineutrino signals all over the world, with a particular focus on SNOLab and on the site candidate for hosting the JUNO experiment.In our calculation we take into account the three neutrino oscillation mechanisms in vacuum, the most updated reactor antineutrino spectra and standard fuel compositions. According to the International Atomic Energy Agency (IAEA) database, we use detailed information on the locations and on the monthly time profiles of the thermal power for each nuclear core.
In particular, by using the 2012 IAEA database, we find that the ratio between the expected reactor antineutrino signal in the geoneutrino energy window (RG) and the expected geoneutrino signal (G) is 0.9 for SNO+ and 0.7 for JUNO. We also calculate the ratio RG/G all over the world in order to produce a RG/G map.

Primary authors : RICCI, barbara (Ferrara University and INFN- Ferrara)

Co-authors : LUDHOVA, Livia (INFN- Milano) ; ZAVATARELLI, Sandra (INFN- Genova) ; BALDONCINI, Marica (University of Ferrara and INFN-Ferrara) ; MANTOVANI, Fabio (University of Ferrara and INFN-Ferrara) ; STRATI, Virginia (University of Ferrara and INFN-Ferrara)

Presenter : RICCI, barbara (Ferrara University and INFN- Ferrara)

Session classification : Poster Session I

Track classification : Geo-neutrinos

Type : Poster

Contribution ID : 195

The LBNE Fast Monte Carlo

Content :

The LBNE Fast MC offers a simulation of accelerator-neutrino interactions using the official LBNE flux predictions, the GENIE neutrino event generator, and a parameterized detector response and reconstruction. Analysis samples used to estimate measurements of ν_{μ}-disappearance and ν_{e}-appearance are identified, and used to predict the sensitivity of LBNE to the neutrino oscillation parameters of the PMNS matrix. Detailed flux, cross section, and detector response systematic uncertainties are propagated to these sensitivity estimates allowing for detailed studies of design optimizations in order maximize the experimental capabilities of LBNE.

Primary authors : Dr. CHERDACK, Daniel (Colorado State University)

Co-authors : WORCESTER, Elizabeth (Brookhaven) ; GRAN, Richard (University of Minnesota - Duluth) ; Dr. TIAN, Xinchun (Univeristy of South Carolina)

Presenter : WORCESTER, Elizabeth (Brookhaven) ; Dr. TIAN, Xinchun (Univeristy of South Carolina)

Session classification : Poster Session II

Track classification : Long Baseline Oscillations

Type : Poster

Contribution ID : 196

Gadolinium in water Cherenkov detectors improves detection of supernova ν_e

Content :

Detecting supernova nu_e is essential for testing supernova and neutrino physics, but the yields are small and the backgrounds from other channels large, e.g., ~10^2 and ~10^4 events, respectively, in Super-Kamiokande. We develop a new way to isolate supernova nu_e, using gadolinium-loaded water Cherenkov detectors. The forward-peaked nature of nu_e + e- -> nu_e + e- allows an angular cut that contains the majority of events. Even in a narrow cone, near-isotropic inverse beta events, anti-nu_e + p -> e+ + n, are a large background. With neutron detection by radiative capture on gadolinium, the background events can be individually identified with high efficiency. The remaining backgrounds are smaller and can be measured separately, so they can be statistically subtracted. Super-Kamiokande with gadolinium could measure the total and average energy of supernova nu_e with ~ 20% precision or better each (90% C.L.). Hyper-Kamiokande with gadolinium could improve this by a factor of ~5. This precision will allow powerful tests of supernova neutrino emission, neutrino mixing, and exotic physics. Unless very large liquid argon or liquid scintillator detectors are built, this is the only way to guarantee precise measurements of supernova nu_e.

Primary authors : Mr. LAHA, Ranjan (The Ohio State University)

Co-authors : Prof. BEACOM, John (Ohio State University)

Presenter : Mr. LAHA, Ranjan (The Ohio State University)

Session classification : Poster Session I

Track classification : Supernova Neutrinos

Type : Poster

Contribution ID : 197

Argon spectral function implementation for LBNE/MicroBooNE

Content :

The neutrino-nucleus cross-section will be measured using Liquid Argon Time Projection Chamber (LArTPC) in MicroBooNE and long baseline neutrino experiment (LBNE) at Fermi Lab. This poster will discuss the nuclear model implementation based on the realistic Argon spectral function (SF) in the GENIE neutrino event generator. The SF can better describe the lepton-nucleus interaction and thus yields a more precise prediction of the cross-section than the relativistic Fermi Gas model (RFGM) by comparing to electron data. Besides improving the RFGM description in GENIE, our scheme involves a new prescription for Q^2 selection. That helps efficiently enforce the energy momentum conservation. Our simulated results are already validated through the comparison to electron data. They were obtained for a variety of target nuclei, ranging from carbon to argon, under the interested kinematic region where the QE scattering is the dominant reaction mechanism. We also analyze the influence of the adopted nuclear model on the determination of neutrino oscillation parameters.

Primary authors : Dr. JEN, Chun-Min (Virginia Polytechnic Institute and State University)

Co-authors : Prof. BENHAR, Omar (INFN - Rome & Dipartimento di Fisica, Universita` "La Sapienza") ; Dr. ANKOWSKI, Artur (Okayama-JSPS/INFN-Rome) ; Prof. MARIANI, Camillo (Virginia Polytechnic Institute and State University) ; Dr. KALOUSIS, Leonidas (Virginia Polytechnic Institute and State University)

Presenter : Dr. JEN, Chun-Min (Virginia Polytechnic Institute and State University)

Session classification : Poster Session II

Track classification : Long Baseline Oscillations

Type : Poster

Contribution ID : 199

Investigating Surge Protection Devices to Protect Against Transient Over-voltages in Liquid Argon Time Projection Chambers

Content :

In this poster we report the investigation of various methods to control transient high voltages that may occur in Liquid Argon Time Projection Chambers (LArTPC's). Recent studies of the electrical properties of a LArTPC's suggest that over-voltages may occur during a spark discharge and damage sensitive components of the detector. Tests of surge protection devices were performed to determine the suitability for their use in the MicroBooNE neutrino experiment , a 170 ton total volume LArTPC, which will begin operations in 2014. Two possible devices which are shown to mitigate transient high voltage conditions in cryogenic temperatures are gas discharge tubes (GDT's) and metal oxide varistors. We report the behaviour of both of these devices and their application at liquid argon temperatures.

Primary authors : Dr. ASAADI, Jonathan (Syracuse University)

Co-authors :

Presenter : Dr. ASAADI, Jonathan (Syracuse University)

Session classification : Poster Session II

Track classification : Short Baseline Oscillations / Sterile Neutrinos / Non-standard Oscillations

Type : Poster

Contribution ID : 200

Neutrinoless double beta decay search with SNO+ Detector

Content :

The SNO+ detector is a multi-purpose neutrino experiment in the final phase of construction. It is situated at SNOLAB and succeeding to the SNO experiment by replacing heavy water with liquid scintillator. Its main scientific goal is to search for neutrinoless double beta decay. SNO+ will use Te-loaded organic liquid scintillator to search for this process. The advantage of SNO+ is the possibility of loading large quantities of double beta decay isotope in an extremely low background environment. In the initial phase of the experiment, we are going to load the scintillator with 0.3% Te concentration. In this poster, the neutrinoless double beta decay physics reach of SNO+ and recent research and development of Te-loaded liquid scintillator will be presented.

Primary authors : Dr. FATEMIGHOMI, Nasim (Postdoc at Queen's Unversity)

Co-authors :

Presenter : Dr. FATEMIGHOMI, Nasim (Postdoc at Queen's Unversity)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 201

A TeO2 bolometer with Cherenkov signal tagging

Content :

TeO2 crystals are currently used as bolometers in the search for neutrinoless double beta decay: CUORE, an array of 988 TeO2 bolometers, is about to be one of the most sensitive experiments searching for this process. The sensitivity of this experiment could be further improved by removing the background from alpha particles generated by natural radioactivity of the copper structure holding the crystals.
This goal can be achieved detecting the Cherenkov light emitted from beta particles and not by alpha ones. For the first time we measured the Cherenkov light emitted by a CUORE crystal, and found it to be 100 eV at the Q-value of the decay. The signal is however small, at the same level of the noise of the bolometric light detectors we are using. We point out that an alternative light detector technology must be developed to obtain TeO2 bolometric experiments able to probe the inverted hierarchy of neutrino masses.

Primary authors : Mr. CASALI, Nicola (Laboratori Nazionali del Gran Sasso)

Co-authors :

Presenter : Mr. CASALI, Nicola (Laboratori Nazionali del Gran Sasso)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 202

Hyper-Kamiokande detector

Content :

Hyper-Kamiokande (Hyper-K) is a next generation underground water Cherenkov detector. It will serve as a far detector of a long baseline neutrino oscillation experiment envisioned for the upgraded J-PARC, and as a detector capable of observing -- far beyond the sensitivity of the Super-Kamiokande detector -- proton decays, atmospheric neutrinos, solar neutrinos, supernova neutrinos, and dark matter. I will discuss Hyper-K detector design and current project status.

Primary authors : Dr. TANAKA, Hide-Kazu (ICRR, University of Tokyo)

Co-authors :

Presenter : Dr. TANAKA, Hide-Kazu (ICRR, University of Tokyo)

Session classification : Poster Session II

Track classification : Long Baseline Oscillations

Type : Poster

Contribution ID : 203

Development of High Pressure Xenon Detectors for Dark Matter and Neutrino-less Double Beta Decay

Content :

At present, some of the most sensitive dark matter and neutrino-less double beta decay search experiments use liquid xenon as the detection medium. However, at the expense of larger volumes and bulkier containment vessels, operation in the gas phase at room temperature and high pressure offers multiple important advantages and new opportunities. Molecules that enhance the performance (such as in-gas wavelength shifting for improved light measurement or columnar recombination enhancement for dark matter directionality measurement) can be easily added to the gas. Other advantages include the proven 6x (six times) better energy resolution and the demonstrated ability to do track imaging in pure high-pressure xenon and the potential of improved nuclear-recoil/electron-recoil discrimination with respect to the liquid.

At LBNL, as part of the NEXT Collaboration, we are measuring neutron-induced nuclear recoils and gamma-ray-induced electron recoils in pure gaseous xenon and its mixtures with neon and TMA in two dedicated R detectors to explore these prospects. In addition we have developed a detailed recombination simulation to assess the nuclear recoil directionality sensitivity in high-pressure xenon and its admixtures.

Primary authors : Mr. GOLDSCHMIDT, Azriel (Lawrence Berkeley National Lab)

Co-authors : Dr. GEHMAN, Victor (Lawrence Berkeley National Laboratory) ; LONG, Megan (Lawrence Berkeley National Laboratory) ; Dr. MATIS, Howard (LBNL) ; MILLER, Tom (Lawrence Berkeley National Laboratory) ; Dr. NAKAJIMA, Yasuhiro (Lawrence Berkeley National Laboratory) ; NYGREN, David (Lawrence Berkeley National Laboratory) ; OLIVEIRA, Carlos (Lawrence Berkeley national Laboratory) ; RENNER, Joshua (Lawrence Berkeley national Laboratory) ; SHUMAN, Derek (Lawrence Berkeley national Laboratory)

Presenter : Mr. GOLDSCHMIDT, Azriel (Lawrence Berkeley National Lab)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 204

Production of muon-induced radioactive isotopes at Daya Bay Experiment

Content :

Cosmic-ray muon-induced radioactive isotopes are common backgrounds to various rare-event experiments, such as neutrino oscillation experiments, double beta-decay experiments and dark matter searches. Understanding the properties of such isotopes is particularly important for future experiments with higher sensitivities than the current generation. We study the relative production rate of the cosmogenic isotopes in the Daya Bay Reactor Neutrino Experiment. The production rates were measured by fitting the decay time and the beta energy spectrum of the isotopes respectively. The recent progress will be shown in the poster.
We acknowledge support of the Hong Kong RGC grant No. CUHK3/CRF/10.

Primary authors : Ms. LIU, Sishuo (Department of Physics, The University of Hong Kong)

Co-authors : Mr. CHAN, Yat Long (Department of Physics, The Chinese University of Hong Kong) ; Mr. LI, Shengchao (Department of Physics, The University of Hong Kong) ; Prof. LUK, Kam-Biu (Lawrence Berkeley National Laboratory; Department of Physics, University of California) ; Dr. NGAI, Ho Yin (Department of Physics, The University of Hong Kong) ; Dr. PUN, Chun Shing Jason (Department of Physics, The University of Hong Kong) ; Dr. WONG, Chan Fai (Department of Physics, The Chinese University of Hong Kong) ; Mr. XU, Jianyi (Department of Physics, The Chinese University of Hong Kong) ; Prof. CHU, Ming Chung (Department of Physics, The Chinese University of Hong Kong) ; Mr. CUI, Kexi (Department of Physics, The University of Hong Kong) ; Mr. FUNG, Ka Yu (Department of Physics, The University of Hong Kong) ; Mr. KWAN, Soap (Department of Physics, The Chinese University of Hong Kong) ; Mr. KWOK, Man Wai (Department of Physics, The Chinese University of Hong Kong) ; Dr. KWOK, Talent (Department of Physics, The University of Hong Kong) ; Dr. LEUNG, John Kon Chong (Department of Physics, The University of Hong Kong) ; Ms. LEUNG, Kar Yee (Department of Physics, The University of Hong Kong)

Presenter : Ms. LIU, Sishuo (Department of Physics, The University of Hong Kong)

Session classification : Poster Session I

Track classification : Reactor Neutrino Oscillations

Type : Poster

Contribution ID : 206

Development of a Rn removal system for future Xe-based neutrino detectors using resonant ionization

Content :

Radon is one of the major background sources in low energy neutrinoexperiments. Accordingly it is essential to suppress radon events in future large-scale xenon detectors aiming for neutrino-less double beta decay and pp solar neutrino measurements. Although the removal of radon from air using adsorption on activated charcoal is well established, because its chemical properties are similar to those of radon this technique cannot be used with xenon; Xenon itself adsorbs to charcoal and thereby deteriorates its radon absorption efficacy.
We propose a new radon removal method for xenon using a resonance-enhanced multiphoton ionization process.A tunable laser is used to promote radon atoms to an electronically excited state via resonant single- or multiple-photon absorption and these excited radon atoms are then ionized by the introduction of another photon (from the same laser or another laser). With this method radon impurities can be selectively ionized and removed with an applied electric field.
In this Poster we report details of the removal method and present the status of ongoing research and development.

Primary authors : Dr. SEKIYA, Hiroyuki (ICRR, University of Tokyo)

Co-authors : Dr. IWATA, Yoshihiro (Japan Atomic Energy Agency) ; Prof. ITO, Chikara (Japan Atomic Energy Agency)

Presenter : Dr. SEKIYA, Hiroyuki (ICRR, University of Tokyo)

Session classification : Poster Session II

Track classification : Other / Global Projects

Type : Poster

Contribution ID : 207

Near to Far extrapolation for the NOvA muon neutrino disappearance analysis.

Content :

The NOvA long-baseline neutrino experiment is currently under construction and consists of two highly active, finely segmented, liquid scintillator detectors located 14 mrad off Fermilab's NuMI beam axis, with a Near Detector located at Fermilab, and a Far Detector located 810 km at Ash River, MI.
This poster will present the methods developed to predict the Far Detector spectra as extrapolated from the observed Near Detector data and its application to the NOvA measurements of theta(23) and delta m^2_(32) through the observation of muon neutrino and muon antineutrino disappearance.

Primary authors : Dr. SUTER, Louise (Argonne)

Co-authors :

Presenter : Dr. SUTER, Louise (Argonne)

Session classification : Poster Session II

Track classification : Long Baseline Oscillations

Type : Poster

Contribution ID : 208

Muon Neutrino Disappearance with MicroBooNE and LAr1-ND

Content :

LAr1-ND (the Liquid Argon Near Detector) is a proposed near detector for the short-baseline neutrino oscillation program on the Fermilab Booster Neutrino Beam. Located 100m from the target, LAr1-ND will run concurrent with the MicroBooNE detector and will provide a detailed characterization of the intrinsic beam content, allowing for a near-to-far extrapolation between the two detectors and precision measurements of neutrino appearance and disappearance. We will present the expected sensitivities for the observation of eV mass-scale sterile neutrinos through the disappearance of muon neutrinos for this two-detector setup.

Primary authors : Dr. ZENNAMO, Joseph (University of Chicago)

Co-authors :

Presenter : Dr. ZENNAMO, Joseph (University of Chicago)

Session classification : Poster Session II

Track classification : Short Baseline Oscillations / Sterile Neutrinos / Non-standard Oscillations

Type : Poster

Contribution ID : 209

Light readout system tests and simulations on the way towards light - augmented calorimteric reconstruction and PID in LArIAT.

Content :

With the ongoing construction, commissioning and proposals of new detectors as well as R efforts, it is evident, that liquid argon Time Projection Chambers (TPCs) are starting to become a crucial technology in the US neutrino program. Their scope of use in the near and more distant future covers such urgent problems in weak interaction physics as the search for sterile neutrinos, the neutrino mass hierarchy or CP violation in the neutrino sector. For these to be resolved, there is a pressing need for precise measurements. To make them possible, the technology has to be thoroughly understood e.g by calibration in a controlled environment. To achieve this goal, the LArIAT test beam experiment will operate the former ArgoNeuT LAr TPC in the Fermilab Testbeam Facility (FTBF). The detection capabilities of the chamber will be enhanced by a photomultiplier - based light readout system (LRS), composed of standard and high quantum efficiency PMTs, as well as SIPMs together with wavelength shifter (TPB) covered walls. This is a novel approach to the light detection in LArTPCs as it will aim to implement a Dark Matter search-like system in order to use the scintillation light to augment the particle identification algorithms and a calorimetric reconstruction. To optimize its performance, detailed studies of light collection were performed using the improved version of the LArSOFT software package. The results of these simulation, including among others the necessary coverage of the TPB wavelength shifter on the full chamber walls as well as the light yield uniformity study will be presented. To assure the proper hardware functioning, before commissioning of the full detector, the PMT setup was tested in a small chamber at the University of Chicago. The results of these tests, also presented in this poster, were then used to validate and refine simulations of the full detector.

Primary authors : KRYCZYNSKI, Pawel (Fermilab)

Co-authors : Dr. SZELC, Andrzej (Yale University) ; FOREMAN, William (University of Chicago)

Presenter : KRYCZYNSKI, Pawel (Fermilab)

Session classification : Poster Session II

Track classification : Short Baseline Oscillations / Sterile Neutrinos / Non-standard Oscillations

Type : Poster

Contribution ID : 210

Measurement of Neutral Current single pi0 production of neutrino interaction on water using the T2K Pi-zero Detector

Content :

We present a measurement of the neutral current single pi0 production (NC1pi0) cross section using Runs 1-4 of T2K data corresponding to 3.74 x 10^{20} protons on target. Selection criteria are applied to reconstructed events to enhance the signal pi0 invariant mass distribution, which is fitted using an extended likelihood method to extract the number of signal events. These are used to obtain the ratio of the NC1pi0 cross section to the NEUT Monte Carlo prediction for both the water-filled and emptied pi0 detector. The on-water NC1pi0 cross section for the J-PARC neutrino beam can be obtained through a statistical subtraction of water-filled and emptied data.
The calculated on-water rate can be used to constrain the neutral pion background at Super-Kamiokande for the oscillation analysis of nu_e appearance from a nu_mu beam.

Primary authors : GILJE, Karin (Stony Brook University)

Co-authors :

Presenter : GILJE, Karin (Stony Brook University)

Session classification : Poster Session I

Track classification : Neutrino Interactions

Type : Poster

Contribution ID : 211

Nuclear Structure, Double-Beta Decay, and Physics Beyond the Standard Model

Content :

Nutrinoless double-beta decay, if observed, would signal physics beyond the Standard Model that could be discovered at energies significantly lower than those at which the relevant degrees of freedom could be excited. Therefore, it might be difficult to further use the neutrinoless double-beta decay observations to distinguish between many beyond Standard Model competing mechanisms to this process [1]. Accurate nuclear structure calculation of the nuclear matrix elements (NME) necessary to analyze the decay rates could be helpful to narrow down the list of competing mechanisms, and to better identify the more exotic properties of the neutrinos. In my talk I will analyze the status of the NME shell model calculations [2-8], and their relevance to the discrimination of the possible competing mechanisms to the neutrinoless double-beta decay process.

U.S. DoE grant DE-SC0008529 and U.S. NSF grant PHY-1068217 are acknowledged.

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[8] M. Horoi, S. Stoica, and B.A. Brown, Phys. Rev. C 75, 034303 (2007).

Primary authors : Prof. HOROI, Mihai (Central Michigan University)

Co-authors :

Presenter : Prof. HOROI, Mihai (Central Michigan University)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 212

Searches for Exotic Oscillations in Atmospheric Neutrinos

Content :

We use 4,438 live-days of atmospheric data from the Super-Kamiokande experiment to search for modifications of standard three-flavor neutrino oscillations due to sterile neutrino mixing and Lorentz violation. For the sterile neutrino analysis, we search for fast oscillations driven by an eV^2-scale mass splitting and oscillations into sterile neutrinos instead of tau neutrinos at the atmospheric mass splitting. No evidence of sterile oscillations is seen and we set limits on |U_mu4|^2 and |U_{tau4}|^2. The nature of the experiment makes these limits independent of the number of additional sterile neutrinos and the precise value of the mass splitting.
For the Lorentz violation analysis, the non-perturbative Standard Model Extension is used in addition to standard three-flavor oscillations, allowing the use of the full range of neutrino path lengths, ranging from 15 to 12,800 km, and energies ranging from 100 MeV to more than 100 TeV in the search. No significant evidence of Lorentz violation was observed, so limits are set on the renormalizable isotropic SME coefficients, improving the existing limits by up to seven orders of magnitude in the e-mu and e-tau sectors, and setting limits for the first time in the mu-tau sector.

Primary authors : Dr. HIMMEL, Alexander (Duke University)

Co-authors :

Presenter : Dr. HIMMEL, Alexander (Duke University)

Session classification : Poster Session I

Track classification : Atmospheric Neutrinos

Type : Poster

Contribution ID : 213

Sensitivity to nu_tau appearance at DeepCore and PINGU

Content :

Neutrino oscillations, and in particular the nu_mu disappearance, have been verified several times over and with increasing precision. However to paint a complete picture of neutrino oscillations it is essential to also measure the nu_tau appearance at a very significant level to evaluate the unitarity of the mixing matrix.

The current DeepCore detector, part of the IceCube Neutrino Observatory, that has already been taking data for several years, should have already on tape a high statistics neutrino sample at the energy corresponding to the first maximum of nu_tau appearance. Using the more advanced reconstruction tools that have been put together recently for IceCube/DeepCore we expect to have a good enough event reconstruction to make a statistically significant measurement of nu_tau appearance at 20GeV scale.

In addition to that, the proposed the low energy extension for IceCube/DeepCore, PINGU, would give us an even better potential for measuring nu_tau appearance at its first maxima due to the lower energy threshold and the improvement on the event reconstruction quality from the additional optical modules in the DeepCore volume.

In this poster we discuss both the current status towards this measurement using DeepCore data as well as the potential for such measurement in PINGU.

Primary authors : Dr. ATHAYDE MARCONDES DE ANDRÉ, João Pedro (Penn State University)

Co-authors :

Presenter : Dr. ATHAYDE MARCONDES DE ANDRÉ, João Pedro (Penn State University)

Session classification : Poster Session I

Track classification : Cosmic Neutrinos

Type : Poster

Contribution ID : 214

Observation of ortho-Positronium formation in Double Chooz

Content :

The Double Chooz experiment measures the neutrino mixing angle θ13 by detecting the reactor electron anti-ν via inverse beta decay. The positron-neutron delayed coincidence yields a sizable background suppression; a further contribution might come from the development of techniques for an efficient identification of positrons. Pulse shape discrimination, a well-established technique for background rejection in liquid scintillator detectors, fails in separating them from electrons, as they give rise to identical light pulses. However, in some cases the positron decay is delayed by the formation of a positron-electron metastable bound state, called ortho-positronium (o-Ps), which introduces a delay between the light signal from the positron energy deposition in the scintillator and the one from the annihilation gammas. The consequent deformation in the positron-induced light pulse can be exploited to identify positrons with the pulse shape discrimination.
In Double Chooz, we observed the o-Ps formation using the data sets resulting from neutron capture on Gd. We performed the first o-Ps formation tagging on an event-by-event basis and we could also measure the o-Ps formation probability and its lifetime, finding (42 ± 13)% and (3.68 ± 0.23) ns respectively. These values are in good agreement with independent measurements obtained with a dedicated setup.

Primary authors : Dr. PERASSO, Stefano (Laboratoire APC - Université Paris 7 Diderot, CNRS) ; MINOTTI, Alessandro (IPHC - Université de Strasbourg)

Co-authors :

Presenter : Dr. PERASSO, Stefano (Laboratoire APC - Université Paris 7 Diderot, CNRS)

Session classification : Poster Session I

Track classification : Reactor Neutrino Oscillations

Type : Poster

Contribution ID : 215

Long-term solar neutrino flux and geological 205Pb assay

Content :

LOREX, the acronym for LORandite EXperiment, attempts the determination of the solar neutrino flux by measuring the 205Pb content in the thallium-bearing mineral lorandite, TlAsS2, from the mine of Allchar, FYR Macedonia. 205Pb is formed there via the neutrino-capture reaction 205Tl + νe → 205Pb + e-. This geochemical detector offers the lowest threshold among all the detectors of only 52 keV for solar pp-neutrinos. The final step of LOREX, which is now underway, is the extraction of lorandite, while the ensuing quantitative determination of the ratio of 205Pb / 205Tl atoms would provide the product of solar neutrino flux and neutrino-capture cross section, integrated over the age of the lorandite of 4.3 · 106 yr. The cosmogenic 205Pb produced by fast muons, which constitutes the main background, is strongly depth-dependent and very sensitive to the long-term erosion history of the field area. It is estimated that, depending on paleo-depth, 10kg of lorandite contains about 3.5 −11.6 x 105 atoms of 205Pb. This report presents new data on the accurate geological age of the minerals at Allchar, as well as the recent results for erosion rates at two lorandite rich locations. These are based on accelerator mass spectrometry determinations of 10Be, 26Al, 36Cl and 53Mn in characteristic samples as well as on the independent geo-morphological studies. Provided that thus determined high values of erosion rates are corroborated by remaining measurements of additional samples, the experiment is expected to reach an acceptable signal-to-background ratio. We also discuss the pending measurement of the lifetime for the bound beta decay of the completely ionized 205Tl, which is aimed at finding the still unknown capture probability of solar pp-neutrinos on 205Tl.
Separation and identification of the 205Pb nuclei (T1/2~15mio years) from stable lead isotopes and the 205Tl isobar are significant challenges at the trace-element level expected (~ 10-14 to 10-15). The approach chosen is accelerator mass spectrometry (AMS) at the high energies sufficient for full stripping. Injection into a high-energy ion-storage ring has allowed single-particle identification in such settings (Experimental Storage RING (ESR) at the GSI facility). A major challenge remains the overall isotope detection efficiency, which is marginal for the expected total sample size. We have explored alternatives including atom trap trace analysis (ATTA) with an optical trap. However, we have not been able to identify suitable optical transitions. A promising improvement is expected from the RIKEN mass ring, an ion storage ring similar to the ESR but with super-fast pre-injection particle ID which allows a fast kicker to inject individual ions onto the main orbit. This is expected to provide a one order-of-magnitude higher detection efficiency.

Primary authors : Prof. HENNING, F. Walter (TU Munich)

Co-authors : Prof. AMTHAUER, Georg (University of Salzburg) ; Dr. PEJOVIC, Vladan (University of Belgrade) ; Dr. UESAKA, Tomohiro (RIKEN Nishina Center for ABS) ; Prof. WEISS, Achim (MPI of Astrophysics) ; Prof. ANICIN, Ivan (University of Belgrade) ; Prof. BOEV, Blazo (University of Stip) ; Prof. BOSCH, Fritz (GSI Darmstadt) ; Dr. BRUECHLE, Willy (GSI Darmstadt) ; Prof. CVETKOVIC, Vladica (University of Belgrade) ; Dr. FAESTERMANN, Thomas (TU Munich) ; Dr. NIEDERMANN, Samuel (GFZ Potsdam) ; Prof. PAVICECIV, K. Miodrag (University of Salzburg)

Presenter : Prof. AMTHAUER, Georg (University of Salzburg)

Session classification : Poster Session I

Track classification : Solar Neutrinos

Type : Poster

Contribution ID : 216

Searches for purely leptonic 3-body proton decay channels p -> enunu and p -> mununu as well as p->eX and p->muX at the Super-Kamiokande experiment.

Content :

A unique test of GUT scale physics unreachable by accelerators, nucleon decay is a vital component of BSM searches. Given exclusion of the minimal SU(5) unification by current proton lifetime limits, it is of high significance to test other unification scenarios. Results from first 3 body decay search at SuperK of p -> enunu and p -> mununu will be presented. Such tri-lepton modes could arise from a Pati-Salam partial unification model, potentially originating from an SO(10) breaking chain, with limits demonstrated here providing
strong constraints to some scenarios. A novel technique to approximate charge lepton spectra from these decays will be shown. Additionally, we will also demonstrate first results of SuperK on decay modes of p -> eX and p ->muX, X being an invisible particle,
with significantly improved bounds compared to those of previous searches.

Primary authors : TAKHISTOV, Volodymyr (University of California, Irvine)

Co-authors :

Presenter : TAKHISTOV, Volodymyr (University of California, Irvine)

Session classification : Poster Session I

Track classification : Other / Global Projects

Type : Poster

Contribution ID : 217

Muon Neutrino Disappearance Measurements at NOvA

Content :

The NOvA long-baseline neutrino experiment is uniquely positioned to measure a multitude of important neutrino parameters in both the appearance and disappearance channels, including constraints on or even determination of the mass hierarchy. With its 810 km baseline and 14 kton liquid scintillator far detector, study of muon neutrino disappearance will give NOvA competitive sensitivity to θ_{23} and the atmospheric mass squared difference, as well as potential determination of the octant. Numerous analysis techniques are employed to optimize this analysis, including isolation of quasi elastic events and novel algorithms for background reduction and energy estimation. An overview of the entire analysis chain is detailed within.

Primary authors : Mr. BAYS, Kirk (Caltech)

Co-authors :

Presenter : Mr. BAYS, Kirk (Caltech)

Session classification : Poster Session II

Track classification : Long Baseline Oscillations

Type : Poster

Contribution ID : 218

Status of the Double Chooz detectors

Content :

The Double Chooz experiment is aimed to measure the value of the neutrino oscillation parameter θ_13, taking advantage of anti-neutrinos generated by a nuclear power plant in Chooz, France. The experiment relies on neutrino flux measurement by identical detectors at two different locations: one far away from the reactors (1.05 km) to observe the neutrino disappearance, and one closer (400 m) to estimate the non-oscillated flux. Although Double Chooz is currently running with the far detector only since 2011, the collaboration reported a non-zero value for θ_13 by 2.9 σ significance and confirmed it with multiple analysis techniques.

Started last year, the construction of the near detector is on-going. Early 2014, most of the inner PMTs were installed, leaving the place for the integration of acrylic vessels. The first “near data” are foreseen by summer 2014, with an expected neutrino detection rate of 300 per day. The far detector is now running with an upgraded electronics and DAQ system, as a preparation work for the near detector.

Highly anticipated by the collaboration, the two detectors running configuration will lead to a final sensitivity of 0.01 on $\sin^2(2\theta\_13)$.

Primary authors : Dr. CHAUVEAU, Emmanuel (Tohoku University) ; Mr. PRONOST, Guillaume (Subatech) ; Mr. RYBOLT, Ben (University of Tennessee)

Co-authors :

Presenter : Dr. CHAUVEAU, Emmanuel (Tohoku University) ; Mr. PRONOST, Guillaume (Subatech) ; Mr. RYBOLT, Ben (University of Tennessee)

Session classification : Poster Session I

Track classification : Reactor Neutrino Oscillations

Type : Poster

Contribution ID : 219

Accelerator design and modeling for the decay-at-rest neutrino experiments DAEδALUS and IsoDAR

Content :

The proposed Decay-At-rest Experiment for δ_CP violation At the Laboratory for Underground Science (DAEδALUS) and the Isotope Decay-At-Rest experiment (IsoDAR) search for CP violation in the neutrino sector and sterile (non-interacting) neutrinos. Both are short baseline experiments that use proton driver beams. In the IsoDAR case, a 60 MeV proton beam will impinge on a high purity lithium/beryllium target to produce isotope decay-at-rest and in DAEδALUS, 800 MeV protons will hit a carbon target to produce pion/muon decay-at-rest. The drivers are cyclotrons, because they are comparatively cheap, compact, and well-established. In order to obtain the necessary high neutrino fluxes, the primary proton beam current needs to be higher than current state-of-the-art machines have demonstrated. This has led to a substantial R effort on the accelerator side of these projects. In this contribution, we will report on the latest design and the challenges we are faced in creating, transporting, and accelerating high intensity beams.

Primary authors : Dr. WINKLEHNER, Daniel (Massachusetts Institute of Technology)

Co-authors :

Presenter : Dr. WINKLEHNER, Daniel (Massachusetts Institute of Technology)

Session classification : Poster Session I

Track classification : Short Baseline Oscillations / Sterile Neutrinos / Non-standard Oscillations

Type : Poster

Contribution ID : 220

Search for Neutrinos from GRBs with IceCube

Content :

This poster presents the results of a search for neutrinos of all flavors associated with gamma-ray bursts (GRBs) using the IceCube Neutrino Observatory. Charged-current interactions of electron and tau neutrinos along with neutral current interactions of all neutrino flavors result in a spherical hit pattern of Cherenkov light called a "cascade." The search looks for cascade events time-correlated with gamma-ray emission observed in satellite detectors, and is the first IceCube GRB-neutrino coincidence search not optimized for charged-current muon neutrino interactions which produce extended hit patterns called "tracks." We expect comparable sensitivity in the all-sky cascade search to that of the northern hemisphere track search. Results from the cascade only search, as well as preliminary combined cascade and track search limits on GRBs as high-energy neutrino sources, are discussed.

Primary authors : Mr. HELLAUER, Robert (University of Maryland, College Park)

Co-authors :

Presenter : Mr. HELLAUER, Robert (University of Maryland, College Park)

Session classification : Poster Session I

Track classification : Cosmic Neutrinos

Type : Poster

Contribution ID : 221

The CAPTAIN LArTPC

Content :

CAPTAIN (Cryogenic Apparatus for Precision tests of Argon Interactions with Neutrinos) is a five tons liquid Argon Time Projection Chamber experiment with N institutions being lead by Los Alamos National Laboratory. CAPTAIN was initiated as part of LANL Laboratory Directed Research and Development project. It is deployed in a portable cryostat and is designed to make measurements of scientific importance to long-baseline neutrino physics and physics topics that will be explored by large underground detectors. In the initial phases of the experiment, three separate measurements are currently being planned. The first phase is the first measurement of the neutron cross section on Argon at energies relevant to neutrino energy reconstruction. The second phase is planned to be a measurement of the electron neutrino cross section on argon below 50 MeV. The third phase under consideration is a measurement of the muon neutrino cross section on argon in the NuMI beam. The hope is that these measurements will be completed in the next five years, and further measurements are possible after that point. This poster describes the CAPTAIN detector, as well as the expected run plans.

Primary authors : Dr. MAUGER, Christopher (LANL)

Co-authors :

Presenter : Dr. MAUGER, Christopher (LANL)

Session classification : Poster Session I

Track classification : Neutrino Interactions

Type : Poster

Contribution ID : 222

Measuring the ^{40}Ar(n,p)^{40}Cl cross-section above 15 MeV for future liquid Argon neutrino detectors

Content :

Next generation neutrino experiments, such as the Long-Baseline Neutrino Experiment (LBNE), will build liquid Argon time projection chambers (LAr TPCs) deep underground in order to enhance the feasibility of detecting neutrinos coming from a supernova burst within our galaxy. A supernova burst (SNB) at 10 kpc from Earth would produce roughly 1000 neutrino interactions inside a 10 kton LAr TPC. Most of the signal is expected to occur via the charged-current interaction of electron-neutrinos with 40Ar, emitting an outgoing electron and gammas accompanying the decay of 40K*. With respect to the outgoing particles and deposited energy, the signal produced from such an interaction is almost identical to the background produced by fast neutrons (> 6.9 MeV) undergoing the 40Ar(n,p)40Cl reaction. Currently, the only available experimental data for the 40Ar(n,p)40Cl cross-section exists between 9-15 MeV. The lack of data above 15 MeV results in a large uncertainty in the background estimations for SNB neutrino detection. The CAPTAIN collaboration proposes to measure this cross-section as a function of energy up to 65 MeV by exposing samples of Argon in a neutron beam at the Crocker Nuclear Laboratory 76-inch cyclotron.

Primary authors : Dr. MAUGER, Christopher (LANL)

Co-authors :

Presenter : Dr. MAUGER, Christopher (LANL)

Session classification : Poster Session I

Track classification : Supernova Neutrinos

Type : Poster

Contribution ID : 223

The CAPTAIN LAr TPC: Stopped Pion Opportunities

Content :

With the increased interest in liquid argon time projection chambers (LAr TPC), the CAPTAIN project was conceived as a study of the technological and systematic uncertainties associated with liquid argon detectors in event reconstruction. The Cryogenic Apparatus for Precision Tests of Argon Interactions with Neutrino (CAPTAIN) program consists of three-staged detectors- a primary 5-ton LArTPC, a prototype LArTPC for configuration testing and a liquid argon scintillation-testing chamber. While the smaller detectors will test various system designs, the primary CAPTAIN LArTPC will measure background neutron and muon yields and examine neutrino interactions with liquid argon. This poster compares three possible sites for the measurement of low-energy neutrinos with the CAPTAIN detector- namely the Spallation Neutron Source (SNS) at Oakridge National Laboratory (ORNL), the Booster Neutrino Beam (BNB) at Fermi National Accelerator Laboratory (FNAL) and the Lujan center (Target-1) at Los Alamos National Laboratory (LANL). Preliminary studies indicate that while SNS clearly has a higher neutrino flux, both BNB and Lujan have better duty cycles.

Primary authors : Dr. MAUGER, Christopher (LANL)

Co-authors :

Presenter : Dr. MAUGER, Christopher (LANL)

Session classification : Poster Session I

Track classification : Neutrino Interactions

Type : Poster

Contribution ID : 224

Measuring Neutron Cross Sections on Argon with the CAPTAIN detector

Content :

CAPTAIN (Cryogenic Apparatus for Precision tests of Argon Interactions with Neutrinos) is a five tons liquid Argon Time Projection Chamber currently being built at Los Alamos National Laboratory. The detector is designed to make measurements of scientific importance to long-baseline neutrino physics and physics topics that will be explored by large underground detectors. The first stage of the program involves impinging a well-characterized neutron beam on the detector to take neutron data in a liquid Argon TPC for the first time. CAPTAIN will take advantage of the proximity of the Los Alamos Neutron Science Center (LANSCE) to the CAPTAIN commissioning hall. LANSCE has a beam line with a well-characterized neutron energy spectrum with an endpoint close to 800 MeV kinetic energy. This poster provides a discussion of the physics measurements that CAPTAIN will perform in the LANSCE neutron beam.

Primary authors : Dr. MAUGER, Christopher (LANL)

Co-authors :

Presenter : Dr. MAUGER, Christopher (LANL)

Session classification : Poster Session I

Track classification : Neutrino Interactions

Type : Poster

Contribution ID : 225

A study of medium energy neutrino interactions with the CAPTAIN detector.

Content :

At the baseline of LBNE, 1300 km, the neutrino energies in the first oscillation maximum range from 1.5 GeV to 5 GeV. Neutrino cross sections are poorly understood on any nuclear target in this energy regime. A detailed study of neutrino interactions in this energy regime is crucial to LBNE physics. The experiment simply will not work without it. Running the CAPTAIN liquid argon detector at Fermilab's NuMI beamline provides an important and unique opportunity to fulfill such request. This program expect to collect many complicated events from deep inelastic scattering and resonance production, which is in complementary to another liquid argon detector experiment - MicroBooNE - running at Fermilab's Booster Neutrino Beam in a lower energy regime.

Primary authors : Dr. MAUGER, Christopher (LANL)

Co-authors :

Presenter : Dr. MAUGER, Christopher (LANL)

Session classification : Poster Session I

Track classification : Neutrino Interactions

Type : Poster

Contribution ID : 226

Neutrino directionality measurement with the Double Chooz experiment

Content :

Double Chooz is a reactor neutrino oscillation experiment which studies anti-nu_e emitted from the two nuclear reactors of the Chooz power plant, in the French Ardennes. Its main purpose is to measure the neutrino mixing angle theta_{13} by observing the anti-nu_e disappearance.

Double Chooz has the ability to test the feasibility of neutrino directionality measurement by liquid scintillator detector. The directionality information could, in principle, be applied when looking at particular sources such as core-collapse supernovae, when searching for geo-neutrinos, with the possibility to discriminate between crust and mantle, or for nuclear monitoring.

The neutrino detection relies on the signature of the inverse beta decay (IBD) interactions anti-nu_e + p -> e+ + n where the positron (``prompt'' signal) is followed by the neutron capture on Gadolinium (Gd) or Hydrogen (H) (``delayed'' signal). The initial neutrino direction is then deduced from the reconstructed positions of the prompt and delayed vertices.

Since we know that our anti-nu_e are coming from the two nuclear reactors, we are able to verify the precison of our method. Even if the neutron capture physics is different on Gd or H, we have demonstrated for the first time the validity of our method when the neutron is captured on H. We have achieved a similar resolution to neutron capture on Gd, which could be of interest for future large-scale detector. This poster will present our studies with the Double Chooz far detector.

Primary authors : RONCIN, Romain (APC - Université Paris Diderot)

Co-authors : FISCHER, Vincent (CEA Saclay) ; NIKITENKO, Yaroslav (INR RAS)

Presenter : RONCIN, Romain (APC - Université Paris Diderot)

Session classification : Poster Session I

Track classification : Reactor Neutrino Oscillations

Type : Poster

Contribution ID : 227

Neutrinos and Abelian Gauge Symmetries

Content :

We present the intimate connection between neutrinos and abelian gauge symmetries U(1)', starting from the observation that the full global symmetry group of the Standard Model G = U(1)_{B-L} x U(1)_{L_e - L_mu} x U(1)_{L_mu - L_tau} can be promoted to a local symmetry group by introducing three right-handed neutrinos---automatically making neutrinos massive and thereby alleviating one of the major shortcomings of the Standard Model. The unflavored part U(1)_{B-L} is linked to the Dirac vs. Majorana nature of neutrinos, and can give rise to the novel framework of lepton-number-violating Dirac neutrinos. Flavored U(1)' ⊂ G can shed light on the mass ordering and peculiar mixing pattern displayed by neutrinos, in an economic and testable manner. Beyond G, even abelian symmetries in an additional dark matter sector can influence neutrino physics, for example by providing a naturally light sterile neutrino, which mixes with the active neutrinos and can resolve some long-standing experimental anomalies.

Primary authors : Mr. HEECK, Julian (Max Planck Institute for Nuclear Physics, Heidelberg)

Co-authors :

Presenter : Mr. HEECK, Julian (Max Planck Institute for Nuclear Physics, Heidelberg)

Session classification : Poster Session I

Track classification : Theory / Phenomenology

Type : Poster

Contribution ID : 228

Muon Monitors for the Long-Baseline Neutrino Experiment

Content :

The proposed Long-Baseline Neutrino Experiment (LBNE) will use a new neutrino beamline at Fermilab to send an intense beam composed primarily of muon neutrinos (antineutrinos),while focusing positive (negative) mesons into the decay region, to a massive detector in South Dakota. A suite of muon detectors is being proposed to characterize the flux of muons that exit the decay tunnel. These measurements are designed to provide data on the pulse-to-pulse variation of the beam to monitor beam and to constrain the neutrino flux at the near and far detectors. The current designs for ionization detectors, stopped muon detectors, and a threshold gas Cherenkov detector will be presented. Prototypes of some of these designs have been deployed in the muon alcoves of the NuMI beamline at Fermilab and preliminary results from these devices will be shown.

Primary authors : Dr. MARINO, Alysia (University of Colorado)

Co-authors : Dr. ZIMMERMAN, Eric (University of Colorado Boulder) ; Prof. LANE, Charles (Drexel University) ; Dr. MILLS, Geoffrey (LANL) ; Mr. BOISSEVAIN, Jan (LANL)

Presenter : Dr. MARINO, Alysia (University of Colorado)

Session classification : Poster Session II

Track classification : Long Baseline Oscillations

Type : Poster

Contribution ID : 229

Liquid Argon Scintillation Studies with the Bo Test Stand

Content :

The Bo test stand at Fermilab is a high purity liquid argon R detector, used to study argon scintillation physics and light collection technologies. This poster will review several measurements made in the Bo test stand which are of importance to future large scale liquid argon detectors. These include a measurement of the absorption caused by nitrogen contamination in argon, a study of the effects of dissolved methane in argon, investigations of the time structure of argon scintillation light, and characterizations of the optical systems of the MicroBooNE experiment.

Primary authors : Mr. JONES, Benjamin (MIT)

Co-authors :

Presenter : Mr. JONES, Benjamin (MIT)

Session classification : Poster Session II

Track classification : Short Baseline Oscillations / Sterile Neutrinos / Non-standard Oscillations

Type : Poster

Contribution ID : 230

Reactor antineutrino detection in the Double-Chooz experiment: New techniques for background reduction, residual rates and spectra

Content :

The Double-Chooz reactor neutrino experiment aims for a precision measurement of the mixing angle θ_{13}. A cornerstone of this analysis is the thorough investigation of the various backgrounds assailing this measurement: neutrino-like coincidence signals are imitated by accidental coincidences of single events as well as correlated events induced by cosmic muons, including stopped muons, fast neutrons and the spallation isotopes Li-9/He-8. In addition, background events resulting from spontaneous light emission by the PMTs have to be considered.

This contribution presents the current state of investigations for these background sources in the Double-Chooz far detector. It lays out several novel techniques devised for identification of the corresponding events. Based on these, efficient veto techniques have been developed that limit the impact of the backgrounds on the result of the oscillation analysis. As a consequence of these efforts, the current uncertainty on the background rate has been reduced by about a factor 2 compared to earlier publications and can be even further constrained by including the spectral information of the final fit. The detailed understanding of the background sources will be crucial for a future near+far detector oscillation analysis in which the correlated background will remain as the main source of systematic uncertainty.

Primary authors : Ms. CARR, Rachel (Columbia University) ; Ms. CONOVER, Emily (University of Chicago) ; Mr. HOURLIER, Adrien (APC - Université Paris Diderot) ; Mr. KITAZAWA, Makoto (Niigata University) ; Mr. LOPEZ CASTAÑO, Jose Mariano (CIEMAT) ; Mr. PRONOST, Guillaume (Subatech) ; Mr. RONCIN, Romain (APC - Université Paris Diderot) ; Ms. SHARANKOVA, Ralitsa (Tokyo Institute of Technology) ; Mr. STOCKES, Lee (University of Tübingen) ; Dr. WURM, Michael (University of Mainz)

Co-authors :

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Session classification : Poster Session I

Track classification : Reactor Neutrino Oscillations

Type : Poster

Contribution ID : 231

Search for Neutrinoless Double-Beta Decay of 100Mo with the NEMO-3 Detector

Content :

We report the results of a search for the neutrinoless double-beta decay
(0 nu beta beta) of 100Mo, using the NEMO-3 detector to
reconstruct the full topology of the final state events. With an exposure of
34.7 kg.y, no
evidence for the 0 nu beta beta signal has been found, yielding a
limit for the light Majorana neutrino mass mechanism of
T{1/2} 0 nu beta beta >1.1 x 10^24 years (90% C.L.)
once both statistical and systematic uncertainties are taken into
account. Depending on the Nuclear Matrix Elements this corresponds to an upper
limit on the Majorana effective neutrino mass of m{nu} < 0.3-0.9$~eV~(90%~C.L.).
Constraints on other lepton number violating mechanisms of
0 nu beta beta decays are also given. Searching for high-energy
double electron events in all suitable sources of the detector, no event in the
energy region [3.2-10] MeV is observed for an exposure of 47 kg.y.

Primary authors : Dr. SIMARD, Laurent (LAL, Orsay)

Co-authors : Dr. PIQUEMAL, Fabrice (CENBG, Bordeaux-Gradignan)

Presenter : Dr. PIQUEMAL, Fabrice (CENBG, Bordeaux-Gradignan)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 232

Sensitivity of Quasi-Elastic Scattering in the LBNE Near Detector

Content :

We present sensitivity studies of the ν_μ-induced Charged-Current Quasi-Elastic (CCQE) interactions in the Fine-Grained Tracker (FGT) which is the LBNE Near Detector. Efficiency and purity of QE selection is presented in energy bins spanning 0.5 to 25 GeV.
Constraints on nuclear effects such as initial state pair wise correlations and final state interactions that can be obtained from the CCQE data are discussed.

Primary authors : Dr. TIAN, Xinchun (University of South Carolina)

Co-authors : Prof. MISHRA, Sanjib (University of South Carolina)

Presenter : Dr. TIAN, Xinchun (University of South Carolina)

Session classification : Poster Session I

Track classification : Neutrino Interactions

Type : Poster

Contribution ID : 233

Fine-Grained Tracker as a Near Detector for LBNE

Content :

The reference design of the near detector for the LBNE experiment
is a Fine-Grained Tracker (FGT) capable of precisely measuring all four species of
neutrinos: nu_mu, nu_e, anti-nu_mu and anti-nu_e. The FGT is composed of a Straw-Tube
Tracker (STT) with transition-radiation capability surrounded by a high resolution
electromagnetic calorimeter (ECAL) and embedded in a dipole magnet. Muon-ID detectors
instrument the iron-yoke of the magnet and the downstream and upstream stations
outside the magnet. The STT is instrumented with Ar and other nuclear targets.
The goal of the FGT is to constrain systematic errors below the statistical error in
all oscillation studies in the far detector. The FGT will also conduct a panoply of
precision measurements and searches.

Primary authors : Dr. TIAN, Xinchun (University of South Carolina)

Co-authors : Prof. MISHRA, Sanjib (University of South Carolina)

Presenter : Dr. TIAN, Xinchun (University of South Carolina)

Session classification : Poster Session II

Track classification : Long Baseline Oscillations

Type : Poster

Contribution ID : 236

Methods for the detection of short-lived particles in the OPERA experiment

Content :

The OPERA experiment has recorded physics data for five years, from 2008 to 2012. The main goal of OPERA is to search for the appearance of tau neutrinos in the CNGS, a quasi pure muon neutrino beam from CERN to the Gran Sasso laboratory in Italy. The tau neutrino CC interactions are identified through the detection of tau lepton decays in the so-called Emulsion Cloud Chambers (ECC), made of passive lead plates interleaved with nuclear emulsion films.
The special procedures used to locate the neutrino interaction vertices in ECC and to detect the decays of short-lived particles (within ~1 mm) are described and their application to the search for neutrino charm production is presented.

Primary authors : Dr. GULER, Ali Murat (Middle East Technical University) ; Mr. KAMI■ÇIO■LU, Mustafa (Middle East Technical University)

Co-authors :

Presenter : Dr. GULER, Ali Murat (Middle East Technical University)

Session classification : Poster Session I

Track classification : Neutrino Interactions

Type : Poster

Contribution ID : 249

Atmospheric neutrino flux measurement by Super-Kamiokande

Content :

Directional-integated fluxes of atmospheric electron and muon neutrinos
are measured in the energy range from sub-GeV to seveal TeV
using Super-Kamiokande detector.
Super-Kamiokande is the largest detector in the world which has
sensitivity in this energy range, and excellent capabilities to
distinguish nu_mu and nu_e by particle identification of out-going leptons.
The energy spectrum is reconstructed using unfolding technique
with the estimation of the systematic uncertainties,
and compared with the existing flux calculation models.
We will also discuss about the possibile relevant physics
which will be available by performing
comprehensive analysis including other flux measurements in higher energies.

Primary authors : Dr. OKUMURA, Kimihiro (ICRR, Univ. of Tokyo)

Co-authors : Mr. RICHARD, Euan (ICRR, Univ. of Tokyo)

Presenter : Dr. OKUMURA, Kimihiro (ICRR, Univ. of Tokyo)

Session classification : Poster Session I

Track classification : Atmospheric Neutrinos

Type : Poster

Contribution ID : 250

Joint Analysis of Muon Neutrino Disappearance and Electron Neutrino Appearance using Markov Chain Monte Carlo

Content :

The Tokai-to-Kamioka (T2K) experiment is an accelerator-based long baseline neutrino experiment with sensitivity to both muon neutrino disappearance and muon neutrino to electron neutrino appearance oscillation modes. While the two modes are primarily sensitive to different oscillation parameters, correlations between the parameters can have significant effects in the analysis. Analyzing the two modes jointly can correctly take into account these correlations; this poster discusses such an analysis of the two neutrino oscillation modes using a Markov Chain Monte Carlo, including results in combination with reactor neutrino experiments. Novel computing techniques for this method are also discussed.

Primary authors : Dr. KABOTH, Asher (Imperial College London)

Co-authors :

Presenter : Dr. KABOTH, Asher (Imperial College London)

Session classification : Poster Session II

Track classification : Long Baseline Oscillations

Type : Poster

Contribution ID : 279

Underground Muon Flux in Daya Bay and JUNO experiments

Content :

Muon induced background is one of the main backgrounds of the Daya Bay experiment and is also critical for JUNO background estimation, sensitivity studies and detector design. This background can be estimated by the muon flux at each experimental site, which is estimated by simulation with MUSIC, the Daya Bay mountain profile and a modified Gaisser formula at sea level. The underground muon fluxes were measured by different Daya Bay detectors, which cross check each other and are validated by the simulation. Based on the Daya Bay results and the simulation method, the muon flux of the JUNO experiment at -700 meter underground is obtained using the JUNO mountain profile.

Primary authors : Dr. XU, Jilei (IHEP, China)

Co-authors :

Presenter : Dr. XU, Jilei (IHEP, China)

Session classification : Poster Session I

Track classification : Reactor Neutrino Oscillations

Type : Poster

Contribution ID : 303

Monitoring of the high voltage stability in the KATRIN experiment

Content :

The KArlsruhe TRItium Neutrino (KATRIN) experiment aims to achieve a sensitivity on the effective electron antineutrino mass of 200 meV/c2 (90% C.L.). The experimental spectroscopy technique, based on a MAC-E filter (magnetic adiabatic collimation with electrostatic filter), relies on stability of the spectrometer retarding high voltage. Precise monitoring of the stability in the region of about -18 kV is challenging even with present day techniques. Therefore, two independent methods will be applied. Firstly, the high voltage will be scaled down by the KATRIN K35 and K65 high-precision voltage dividers to values which will be measured by precise voltmeters. Secondly, the same high voltage will be applied to another MAC-E filter, called the monitor spectrometer, which will measure monoenergetic conversion electrons emitted from a nuclear standard. Any shift in the electron energy will point to an instability in the high voltage system of KATRIN. We present data analysis methods and results of energy stability measurements of the conversion electrons performed at the monitor spectrometer.

Primary authors : Mr. SLEZAK, Martin (Nuclear Physics Institute ASCR, Rez near Prague, Czech Republic) ; Mr. ERHARD, Moritz (Karlsruhe Institute of Technology, Karlsruhe, Germany)

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Session classification : Poster Session I

Track classification : Neutrino Mass

Type : Poster

Contribution ID : 304

Double beta decay analysis with CUORE continuous data and CUORE data monitoring tools

Content :

The CUORE (Cryogenic Underground Observatory for Rare Events) experiment will search for neutrinoless double beta decay of Te-130. CUORE large-mass bolometer array will consist of 988 tellurium oxide bolometer modules and a total of 206 kg of Te-130 in one single cryostat at 10 mK. With the relatively low bandwidth of the bolometer signals, we sample at 125 to 1000 S/s. In addition to the triggered data, we can afford to store continuously sampled data. In this poster, we present the novel physics analysis algorithms implemented with the continuously sampled data stream, and discuss their advantages and challenges. Another crucial aspect of future CUORE data taking is automated monitoring of the performance of 988 modules in real time. We have developed a set of browser-based data monitoring tools for this purpose, which will be presented here as well.

Primary authors : Dr. HAN, Ke (LBNL)

Co-authors :

Presenter : Dr. HAN, Ke (LBNL)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 305

Sensitivity and Physics Reach of CUORE-0 and CUORE

Content :

CUORE-0 is a cryogenic detector that uses an array of tellurium dioxide bolometers to search for neutrinoless double-beta decay of 130Te. CUORE-0 is located at the Laboratori Nazionali del Gran Sasso in Italy and has been taking data since March 2013. I will present the sensitivity of CUORE-0 based on the measured background rate and energy resolution in the region of interest. The CUORE-0 half-life sensitivity is expected to surpass the observed lower bound of Cuoricino, a predecessor experiment, with one year of live time. I will also discuss the prospects of CUORE, which has a 130Te mass 19 times greater than that of CUORE-0. CUORE is currently under construction and scheduled to begin data- taking in 2015. I will discuss the physics potential of CUORE-0 and CUORE, including the measurement of two-neutrino double-beta decay and a dark matter search.

Primary authors : Ms. LIM, Kyungeun (Yale University)

Co-authors :

Presenter : Ms. LIM, Kyungeun (Yale University)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 306

Reactor monitoring using a segmented antineutrino detector (PANDA)

Content :

We have developed a small antineutrino detector, PANDA (Plastic Anti-Neutrino Detector Array), for the purpose of IAEA's safeguard against proliferation of nuclear weapons. PANDA has a segmented structure made of plastic scintillators, and three prototypes of PANDA were developed until now. The second prototype PANDA36 measured the difference in the reactor antineutrino flux between reactor ON and OFF above the ground outside the reactor building at Ohi Power Station. The latest result of PANDA36 analysis is reported in this poster. Besides, it describes the status of the third prototype PANDA64, which has been developed and tested for the next experiment.

Primary authors : Mr. KATO, Yo (The University of Tokyo)

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Presenter : Mr. KATO, Yo (The University of Tokyo)

Session classification : Poster Session I

Track classification : Reactor Neutrino Oscillations

Type : Poster

Contribution ID : 307

Viability Test of 20-cm Hybrid Photodetector in a Water Cherenkov Detector

Content :

New photodetectors utilizing semiconductor electronics or improved detection efficiency are expected to increase physics sensitivity in future neutrino experiments. In order to assess the usability of the new photodetectors in a water Cherenkov detector, we started a viability test with a hybrid photodetector (HPD).
The HPD has a 20-cm diameter, and is
equipped with an avalanche diode. In addition to the HPD, we are testing a high quantum efficiency (HQE) 50-cm photomultiplier tube (PMT), model R3600, manufactured for Super-Kamiokande by Hamamatsu Photonics K.K.

From the summer in 2013, the primary test started with eight 20-cm HPDs and five HQE 50-cm PMTs, installed in a 200-ton water tank in the Kamioka mine, Japan. These were compared with the standard PMTs used in Super-Kamiokande. The performance, stability and usability of the new photodectors are being tested in a long term operation of a few years. Our goal is to establish a technique to operate the photodetectors safely over ten years without failure. The measurements and test status after half a year are presented.

Based on these initial test results, a 50-cm diameter HQE HPD is also under development and will be tested soon in the same water tank. These evaluations will be completed by 2016 ready for future neutrino experiments.

Primary authors : Dr. NISHIMURA, Yasuhiro (RCCN, ICRR, The University of Tokyo)

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Presenter : Dr. NISHIMURA, Yasuhiro (RCCN, ICRR, The University of Tokyo)

Session classification : Poster Session I

Track classification : Atmospheric Neutrinos

Type : Poster

Contribution ID : 308

Detector design and R for Water/CH Neutrino Cross Section Measurement

Content :

For a precise study of neutrino oscillation, a good understanding of neutrino interactions on nucleus is indispensable. In order to reduce the uncertainty in the neutrino interaction, we propose a new experiment at the J-PARC neutrino beamline to measure the ratio of charged current neutrino cross sections between water and plastic (CH) with an accuracy of a few percent. The energy of the neutrino is around 600 MeV. This measurement may reduce major systematic errors in neutrino oscillation analysis of the T2K experiment. The T2K near detector adopts plastic scintillators as a main target material of neutrino interactions, while the far detector, Super-Kamiokande, adopts water. The difference of the target materials induces a systematic uncertainty on neutrino cross section that is one of the major systematic errors in neutrino oscillation analysis. We will present the design of the new detector optimized by using the Monte Carlo simulation and R of detector components, grid-like plastic scintillators placed in water and low noise MPPCs manufactured by Hamamatsu Photonics.

Primary authors : KOGA, Taichiro (University of Tokyo)

Co-authors : BONNEMAISON, A. (Ecole Polytechnique) ; KHABIBULLIN, M. (Institute for Nuclear Research of the Russian Academy of Sciences) ; KHOTJANTSEV, A. (Institute for Nuclear Research of the Russian Academy of Sciences) ; KUDENKO, Y. (Institute for Nuclear Research of the Russian Academy of Sciences) ; MARTYNENKO, S. (Institute for Nuclear Research of the Russian Academy of Sciences) ; MEFODIEV, A. (Institute for Nuclear Research of the Russian Academy of Sciences) ; MINEEV, O. (Institute for Nuclear Research of the Russian Academy of Sciences) ; OVSJANNIKOVA, T. (Institute for Nuclear Research of the Russian Academy of Sciences) ; SUVOROV, S. (Institute for Nuclear Research of the Russian Academy of Sciences) ; YERSHOV, N. (Institute for Nuclear Research of the Russian Academy of Sciences) ; HAYASHINO, T. (Kyoto University) ; DRAPIER, O. (Ecole Polytechnique) ; ICHIKAWA, A. (Kyoto University) ; MINAMINO, A. (Kyoto University) ; NAKAMURA, K. (Kyoto University) ; NAKAYA, T. (Kyoto University) ; YOSHIDA, K. (Kyoto University) ; SEIYA, Y. (Osaka City University) ; WAKAMATSU, K. (Osaka City University) ; YAMAMOTO, K. (Osaka City University) ; CHIKUMA, N. (University of Tokyo) ; YOKOYAMA, M. (University of Tokyo) ; FERREIRA, O. (Ecole Polytechnique) ; HAYATO, Y. (University of Tokyo) ; GONIN, M. (Ecole Polytechnique) ; MUELLER, Th. (Ecole Polytechnique) ; QUILAIN, B. (Ecole Polytechnique) ; AYZENBERG, I. (Institute for Nuclear Research of the Russian Academy of Sciences) ; IZMAYLOV, A. (Institute for Nuclear Research of the Russian Academy of Sciences) ; KARPIKOV, I. (Institute for Nuclear Research of the Russian Academy of Sciences)

Presenter : KOGA, Taichiro (University of Tokyo)

Session classification : Poster Session I

Track classification : Neutrino Interactions

Type : Poster

Contribution ID : 309

Limit on neutrinos absolute mass scale from the Planck satellite

Content :

Massive neutrinos leave peculiar imprints in the different cosmological data sets allowing cosmology to test their absolute mass scale.

The cosmic microwave background (CMB) anisotropies has always been considered a powerful probe in this sense and the recent full sky measurement from the Planck satellite provide a unique tool.

Planck has a wide frequency coverage designed to provide accurate discrimination of the Galactic emission from primordial anisotropies and it measures a wide range of angular scales.

This unprecedented precision has triggered the search for fine effects in CMB due to the slightly different expansion history and structures formation in the presence of massive neutrinos.

A careful statistical analysis is required for obtaining robust results.

For both the standard cosmological model and its extensions that include massive neutrinos, we compare the traditional Bayesian approach based on Markov chains (MCMC) with a frequentist approach that uses profile likelihood. The comparison is particularly interesting due to the asymmetry induced by the physical constraint for the masses to be positive.

We show that results from the two methods are remarkably consistent and that this study allows a better understanding of some important subtleties in the limits that are set.

Primary authors : Ms. SPINELLI, Marta (Universite de Paris Sud)

Co-authors :

Presenter : Ms. SPINELLI, Marta (Universite de Paris Sud)

Session classification : Poster Session I

Track classification : Neutrino Mass

Type : Poster

Contribution ID : 310

The Low-Energy Neutrino Spectrometer (LENS) and miniLENS: Progress Toward a Precision Solar Neutrino Measurement

Content :

The Low-Energy Neutrino Spectrometer (LENS) experiment will perform a precision measurement of the solar neutrino spectrum above 115 keV. This will allow for a precision determination of the solar luminosity via neutrinos rather than photons, probe the transition region between vacuum and matter dominated neutrino oscillations, help resolve the solar metalicity problem, and provide tests for physics beyond the standard model. The LENS detector employs a charged-current capture reaction of electron neutrinos on In-115 with the outgoing electron having a kinetic energy equal to the energy of the incident neutrino minus the Q-value. The residual isomeric state of the Sn-115 nucleus has a mean lifetime of 4.76 μs and decays with the emission of two gamma rays providing a unique tag for neutrino events in the LENS detector. Despite the fact that In-115 is a beta emitter and produces substantial background in the pp region of the spectrum, a signal to background ratio of approximately 3 to 1 can be achieved through the use of the spatial and temporal coincidence of a neutrino event and tag. To demonstrate key components and technology for LENS, the miniLENS prototype is being designed and constructed. This poster will present the LENS experiment, its background rejection techniques, and the development of the miniLENS prototype.

Primary authors : Mr. YOKLEY, Zachary (Virginia Tech)

Co-authors :

Presenter : Mr. YOKLEY, Zachary (Virginia Tech)

Session classification : Poster Session I

Track classification : Solar Neutrinos

Type : Poster

Contribution ID : 311

Neutrino and cosmic ray production in an evolving GRB fireball

Content :

Neutrino astronomy is currently presenting us a fascinating new addition to multi-messenger astrophysics and allows for ever better constraints on astrophysical source models such as those for gamma-ray bursts (GRBs). The non-detection of neutrinos from GRBs so far is challenging the concept of GRBs as sources of ultra-high energy cosmic rays (UHECR). We therefore reconsider the particle emission from internal shocks inside a GRB under the premise of an evolving fireball. By combining an approach for the calculation of synthetic light-curves from the collision of several shells with our treatment of photohadronic interactions, we are able to model neutrinos, UHECR, and the maximal energy of the escaping photons on basis of individual collisions. We show that the neutrino production, the maximal UHECR energies, and the maximal photon energies all peak at different collision radii. Moreover, we test how this affects neutrino flux predictions compared to the commonly used models using a fixed collision radius.

Primary authors : BAERWALD, Philipp (Pennsylvania State University) ; BUSTAMANTE, Mauricio (Universität Würzburg) ; MURASE, Kohta (Institute for Advanced Study) ; WINTER, Walter (Wuerzburg)

Co-authors :

Presenter : BAERWALD, Philipp (Pennsylvania State University)

Session classification : Poster Session II

Track classification : Cosmology And Neutrinos

Type : Poster

Contribution ID : 312

Cryogenic verification of the CUORE Detector Calibration System

Content :

The Cryogenic Underground Observatory for Rare Events (CUORE) is a ton-scale cryogenic experiment designed to search for neutrinoless double beta decay ($0\nu\beta\beta$) of 130Te. The experiment consists of 988 ultracold TeO2 bolometers, which act as both the source and detector of this decay. Energy calibration of the detector is crucial for the detection of $0\nu\beta\beta$, which is expected to appear as a monoenergetic peak at the Q-value of this decay. Due to the large number of crystals and extensive shielding around the detector, calibration sources must be placed inside the CUORE cryostat during calibration to uniformly irradiate the bolometers. In addition, these sources must removed during data-taking runs. I will present the design and results of a cryogenic test of the CUORE Detector Calibration System, which confirm that we can deploy radioactive source strings into the cryostat and successfully cool these sources from room temperature to 4 K with only minimal effects on the cryostat.

Primary authors : CUSHMAN, Jeremy S. (Yale University)

Co-authors :

Presenter : CUSHMAN, Jeremy S. (Yale University)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 313

The 35-Ton Liquid Argon TPC Prototype for the Long-Baseline Neutrino Experiment

Content :

The Long-Baseline Neutrino Experiment will employ a multi-kTon Liquid Argon Time Projection Chamber (LArTPC) as its far detector located at the Homestake mine in South Dakota. This will require a volume scale-up of roughly a factor of 50 compared to the Icarus T600, which is the largest LArTPC built to date. To achieve this scale-up, a number of novel design elements will need to be employed. Rather than using a conventional cryostat that is built in a factory and shipped to the site, LBNE will use a modular "membrane" cryostat with factory-built pieces that are assembled in place onto the walls of the underground cavern. This yields a low-cost structure with high fiducial volume. Similarly, the wire-plane arrays will be factory-built as modules that are then installed into the cryostat. The analog and digital electronics will be both mounted on the wire planes inside the cryostat in order to reduce the electronic noise and the number of signal cables needed. The scintillation photon detectors will employ light collection paddles to reduce the required photo-cathode area. Since each of these new elements has not yet been tested in a large-scale TPC, a prototype is needed to demonstrate their viability. In the recently completed "Phase 1", the 35-ton prototype was filled with LAr and successfully demonstrated the suitability of membrane cryostat technology for use with LArTPC's. "Phase 2" will install an actual TPC into the volume and test each of the other new design elements with a cosmic ray run in 2015. This poster presents the results of Phase 1 and status and plans for Phase 2.

Primary authors : Dr. DJURCIC, Zelimir (Argonne National Laboratory) ; Dr. CONVERY, Mark (SLAC)

Co-authors :

Presenter : Dr. DJURCIC, Zelimir (Argonne National Laboratory)

Session classification : Poster Session II

Track classification : Long Baseline Oscillations

Type : Poster

Contribution ID : 314

Double Beta Decay Excited State Transitions in 76Ge with GERDA Phase I

Content :

The GERmanium Detector Array, GERDA, is located in the Laboratori Nazionali del Gran Sasso in Italy and investigates double beta decays of 76Ge. GERDA finished its first phase of data taking last year and obtained an improved half-life limit for neutrinoless double beta decay with an unprecedented low background environment.

Apart from decays into the ground state of 76Se, also double beta transitions into excited states are of interest and provide valuable input for nuclear matrix element calculations. The detector array of GERDA allows for a coincidence analysis, when triggering on the de-excitation gammas of the excited states and thus further suppressing the background. In this poster a coincidence analysis technique searching for excited state transitions of 76Ge with GERDA Phase I data is presented.

Primary authors : Mr. LEHNERT, Bjoern (TU-Dresden)

Co-authors :

Presenter : Mr. LEHNERT, Bjoern (TU-Dresden)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 315

Solid xenon bolometers for neutrinoless double beta decay

Content :

Cryogenic liquid xenon detectors have become a popular technology in the search for rare events, such as neutrinoless double beta decay and dark matter interactions. The power of the liquid xenon detector technology is in the combination of the ionization and scintillation signals, resulting in particle discrimination and improved energy resolution over the ionization-only signal. In comparison macrobolometers, which can be made from a variety of materials, have been shown to have an order of magnitude better energy resolution in the phonon channel. Solid xenon bolometers, under development at Drexel University, offer an opportunity to combine excellent energy resolution in the phonon channel with a scintillation or ionization signal for background rejection. This would be a powerful future detector technology in the search for neutrinoless double beta decay of Xe-136.

Primary authors : Prof. DOLINSKI, Michelle (Drexel University)

Co-authors :

Presenter : Prof. DOLINSKI, Michelle (Drexel University)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 318

The Visible Energy of the Double Chooz Experiment

Content :

Double Chooz (DC) is a neutrino experiment aiming to measure θ_{13} with high precision using both the deficit and the spectral distortion expected from the manifestation of neutrino oscillations. The cosmogenic backgrounds are expected to have the largest impact on the sensitivity of θ_{13} shape information in the final phase of the experiment, after multi-detector systematic cancellation. Those backgrounds can be measured in-situ without the use of energy spectral information, as well as via reactor-OFF data. However, when measuring θ_{13}, the combined rate and full background shape information can be used to further constrain background systematics leading to a significantly improvement of the overall precision of the result. Thus, the DC analysis requires an excellent control of the e$^+$ energy scale systematics, otherwise deteriorating both rate and shape information on θ_{13}.

The proposed poster aims to describe the definition of the reconstructed energy of DC, named ``visible energy'', which is based on the calorimetric sum of the charges as measured, upon reconstruction, from the PMT light pulses digitised by FADC electronics. The calorimetric measure of charge is then anchored to the PMT hit multiplicity providing a robust digital-like energy definition of the photo electron (PE) scale, including the correction of a PE non-linearity arising from digitisation artefacts. The PE scale is then anchored to the MeV scale using the 2.2 MeV gamma peak from the H-neutron capture, upon applying corrections on the uniformity, stability and linearity of response. Several artificial sources (^{252}Cf and γ-sources) as well as natural calibration sources such as spallation neutrons are used to cross-check the performance of the energy scale and estimate systematics. The artificial sources were deployed in all the active volumes by means of dedicated systems. Being still a one detector experiment, the energy systematics are evaluated as the specific bias of the calibrated data against the calibrated MC providing the un-oscillated energy spectrum reference. The calibrated MC has followed the same energy definition and calibration scheme, as if it was an independent detector. The overall normalisation and shape systematics due the energy definition are very small and, in addition, they are expected to further reduce upon the use of the near detector.

Primary authors : Mr. PRONOST, Guillaume (Subatech)

Co-authors : ABE, Yosuke (Tokyo Institute of Technology) ; REINHOLD, Bernd (University of Hawaii) ; REICHENBACHER, Juergen (University of Alabama) ; WAGNER, Stefan (MPIK Heidelberg) ; STOKES, Lee (Universität Tübingen)

Presenter : Mr. PRONOST, Guillaume (Subatech)

Session classification : Poster Session I

Track classification : Reactor Neutrino Oscillations

Type : Poster

Contribution ID : 319

The Stereo Project

Content :

Recent work on the reactor neutrino flux prediction, and the re-analysis of former short baseline experiments that followed, revealed the so called reactor anti-neutrino anomaly. The observed deficit of detected rates could be interpreted as an oscillation toward a new neutrino state, triggering thus a new interest for the search of light sterile neutrinos. The Stereo project aims to evidence—or discard—such a short baseline oscillation near the ILL research reactor (Grenoble, France) by the observation of an E/L dependent distortion induced in the energy spectrum, typical of such a phenomenon. The Stereo detector consists of six identical cells filled with gadolinium loaded liquid scintillator in which neutrino interactions are identified through the inverse beta decay. This fiducial volume is surrounded by an outer layer of liquid scintillator non doped in gadolinium in order to enhance both the homogeneity of the energy response and the detection efficiency. This poster will present the design of the Stereo detector, the simulation performed to characterize its response, the background studies as well as the sensitivity of the experiment.

Primary authors : Dr. COLLIN, Antoine (Max-Planck-Institut für Kernphysik)

Co-authors :

Presenter : Dr. COLLIN, Antoine (Max-Planck-Institut für Kernphysik)

Session classification : Poster Session II

Track classification : Short Baseline Oscillations / Sterile Neutrinos / Non-standard Oscillations

Type : Poster

Contribution ID : 320

Leptogenesis and dark matter in a radiative neutrino mass model

Content :

It is known that the standard model has serious problems from experimental and observational standpoints: neutrino mass, existence of dark matter and baryon asymmetry of the universe.
The radiative neutrino mass model is known as a candidate which could explain tiny neutrino masses and existence of dark matter simultaneously. In addition, in this model, the sufficient baryon number asymmetry could be generated through resonant leptogenesis consistently with all the data of neutrino oscillation experiments. We estimate the baryon number asymmetry and discuss the prospects in the dark matter direct search experiments.

Primary authors : Mr. KASHIWASE, Shoichi (Kanazawa University) ; Prof. SUEMATSU, Daijiro (Kanazawa University)

Co-authors :

Presenter : Mr. KASHIWASE, Shoichi (Kanazawa University)

Session classification : Poster Session II

Track classification : Dark Matter And Neutrinos

Type : Poster

Contribution ID : 321

Event Reconstruction with the NOvA Experiment

Content :

The NOvA experiment is a long baseline neutrino oscillation experiment based out of Fermilab that uses the newly upgraded NuMI beam line and two functionally identical detectors to measure the neutrino rates at a near location, and 810 km away at a far location. The detector at the far location has a target mass of 14 kton and is composed of 344,064 cells filled with liquid scintillator each of which is 4 cm x 6 cm x 15 m, which presents a solution to the problem of achieving high granularity with a large target mass. This poster will present the algorithms used to identify particle tracks and showers, locate interaction vertices, and assign particle types and momenta to the final-state particles resulting from neutrino interactions in the detector. The poster will also present performance metrics based on simulations and examples drawn from NuMI neutrino beam events.

Primary authors : Mr. BAIRD, Michael (Indiana University)

Co-authors :

Presenter : Mr. BAIRD, Michael (Indiana University)

Session classification : Poster Session II

Track classification : Long Baseline Oscillations

Type : Poster

Contribution ID : 322

Upper bound on neutrino mass with T2K

Content :

The Tokai to Kamioka (T2K) long-baseline neutrino experiment has conclusively demonstrated the appearance of electron neutrinos in a nearly pure beam of muon neutrinos. The T2K experiment also performed precise measurements of neutrino oscillation parameters in the muon neutrino dis-appearance channel and cross-section measurements with the near detector.
The present work utilizes the T2K event time stamping capabilities at the near and far detectors to study neutrino time of flight as function of neutrino energy. The sub-GeV neutrino beam in conjunction with timing precision of order tens of ns provide sensitivity to neutrino mass in the few MeV range. We describe T2K's GPS based time stamping system and its performance as well as the data selection and analysis. Our preliminary results will be presented and placed into context of other published upper bounds on neutrino mass obtained by similar techniques.

Primary authors : KUTTER, Thomas (LSU) ; Dr. PEREVOZCHIKOV, Oleg (LSU)

Co-authors :

Presenter : KUTTER, Thomas (LSU)

Session classification : Poster Session I

Track classification : Neutrino Mass

Type : Poster

Contribution ID : 323

Determination of the detection systematics in the Double Chooz experiment

Content :

The Double Chooz experiment aims for a precision measurement of the neutrino mixing angle θ_{13} at the Chooz nuclear power plant in France. The reactor antineutrino flux is detected via inverse beta decay reaction in a gadolinium-loaded liquid scintillator. In the near future two identical detectors located at different distances from the reactor cores will search for an oscillation pattern in the relative deficit of the measured neutrino rate and energy spectra. As a consequence the detection uncertainty will constitute one of the largest contributions to the systematic uncertainty of θ_{13}. Currently running with one detector, the experiment utilizes Monte Carlo simulations to derive the expected neutrino flux, requiring a high accuracy of the predicted spectrum.
This poster presents the measurement of the detection effects which account for the dominant contribution to the detection related normalization systematics on the θ_{13} measurement. Two analyses using both ^{252}Cf fission neutrons and the inverse beta decay signal, have shown independently how the revised Double Chooz signal selection criteria lead to a remarkable agreement between measured and predicted detection efficiencies, thus having negligible impact on the overall systematics budget. The dominant component of uncertainty emerging from the fraction of neutron captures on Gadolinium has been estimated by means of ^{252}Cf calibration source data. This measurement was cross-checked with two other data samples: inverse beta decay neutrons as well as spallation neutron background, giving consistent results. Different low energy neutron modelings in the Monte Carlo allowed to study boundary effects due to neutron migration. In this way, a reduction by a factor 2 of the total detection systematic uncertainty to a few per mil was achieved, leading to an improved measurement of θ_{13} and preparing the ground for a high precision result in the two detector phase.

Primary authors : Dr. COLLIN, Antoine (Max-Planck-Institut für Kernphysik) ; CRESPO ANADON, Jose Ignacio (CIEMAT) ; HASER, Julia (Max-Planck-Institut fuer Kernphysik) ; YANG, Guang (Argonne National Lab/ Illinois Inst. of Tech.)

Co-authors :

Presenter : HASER, Julia (Max-Planck-Institut fuer Kernphysik)

Session classification : Poster Session I

Track classification : Reactor Neutrino Oscillations

Type : Poster

Contribution ID : 324

Using Fast Photosensors in Massive Water Cherenkov Neutrino Detectors

Content :

Future experiments rely on the precision measurements of rare events with low cross section, such as neutrino interactions and proton decay. Using very large detectors and new advances in photosensor technology are both important towards the achievement of high sensitivity to these measurements. New photodetectors based on micro-channel plates are being developed by the Large-Area Picosecond Photo Detector (LAPPD) Collaboration. These photosensors have been shown to have excellent spatial and timing resolution. Using these devices can enable better capabilities in massive megaton-scale water Cherenkov detectors by resolving track features to within a few centimeters and enhancing background rejection for neutrino oscillation experiments. We present preliminary results on the reconstruction capabilities for single particles in water Cherenkov detectors using fast photosensors.

Primary authors : Dr. ANGHEL, Ioana (Iowa State University/Argonne National Lab)

Co-authors : CATANO-MUR, Erika (Iowa State University) ; Prof. SANCHEZ, Mayly (Iowa State University) ; Dr. WETSTEIN, Matthew (University of Chicago) ; XIN, Tian (Iowa State University)

Presenter : Dr. ANGHEL, Ioana (Iowa State University/Argonne National Lab)

Session classification : Poster Session I

Track classification : Neutrino Interactions

Type : Poster

Contribution ID : 325

The windowless gaseous tritium source WGTS of the KATRIN experiment

Content :

The KATRIN experiment is currently being assembled at the Karlsruhe Institute of Technology to measure the absolute value of the electron antineutrino mass with a sensitivity of 200 meV/c2 (90% C.L.).
The energy of electrons from the tritium beta-decay is measured close to the endpoint of the spectrum with an integrating electrostatic spectrometer (MAC-E-filter). The neutrino mass is extracted by fitting simulated spectra to the measured data. For a neutrino mass sensitivity of 200 meV/ c2 both high statistics and small systematic uncertainties are mandatory. Both values depend not only on the spectrometer, but also on a well-designed and understood high statistics tritium source.
The windowless gaseous tritium source (WGTS) is a stainless steel tube with a length of 10m and a diameter of 90 mm. It is operated at 30 K with a high temperature stability of better than 3 mK/h. Tritium is injected through small orifices in the middle of the tube and pumped out by turbo molecular pumps at both ends, providing a permanent activity of 1011 Bq. The beta-electrons are guided adiabatically to the spectrometer by the magnetic fields of super-conducting solenoids.
This poster will present the mechanical design and key parameters of the WGTS as well as important systematic effects due to gas composition, gas dynamics, final state distributions and temperature stability.
This work was supported by the BMBF under grant no. 05A11VK3 and by the Helmholtz Association.

Primary authors : Mrs. KUCKERT, Laura (Karlsruhe Institute of Technology (KIT))

Co-authors :

Presenter : Mrs. KUCKERT, Laura (Karlsruhe Institute of Technology (KIT))

Session classification : Poster Session I

Track classification : Neutrino Mass

Type : Poster

Contribution ID : 326

The Majorana neutrino mass matrix indicated by the current data

Content :

The Majorana neutrino mass matrix combines information from the neutrino masses and the leptonic mixing in the flavor basis. Its invariance under some transformation matrices indicates the existence of certain residual symmetry. We offer an intuitive display of the structure of the Majorana neutrino mass matrix, using the whole set of the oscillation data. The structure is revealed in dependence on the lightest neutrino mass. We find that there are three regions with distinct characteristics of structure. A group effect and the mu-tau exchange symmetry are observed. Implications for flavor models are discussed.

Primary authors : Ms. ZHANG, Xinyi (Peking University)

Co-authors : Prof. MA, Bo-Qiang (Peking University)

Presenter : Ms. ZHANG, Xinyi (Peking University)

Session classification : Poster Session I

Track classification : Neutrino Mass

Type : Poster

Contribution ID : 327

The Atmospheric Neutrino Neutron Interaction Experiment (ANNIE)

Content :

Neutron tagging in Gadolinium-doped water may play a significant role in reducing backgrounds from atmospheric neutrinos in next generation proton-decay searches using megaton-scale Water Cherenkov detectors. Similar techniques might also be useful in the detection of supernova neutrinos. Accurate determination of neutron tagging efficiencies will require a detailed understanding of the number of neutrons produced by neutrino interactions in water as a function of momentum transferred. We propose an experiment to be built on the Fermilab Booster Neutrino Beam, the Atmospheric Neutrino Neutron Interaction Experiment (ANNIE). It is designed to measure the neutron yield of atmospheric neutrino interactions in gadolinium-doped water. An innovative aspect of the ANNIE design is the use of precision timing to localize interaction vertices in the small fiducial volume of the detector. We plan to achieve this by using early production of the Large Area Picosecond Photodetectors (LAPPDs). This experiment will be a first application of these devices demonstrating their feasibility for Water Cherenkov neutrino detectors.

Primary authors : Prof. SANCHEZ, Mayly (Iowa State University)

Co-authors : Dr. WETSTEIN, Matt (University of Chicago/ANL)

Presenter : Prof. SANCHEZ, Mayly (Iowa State University)

Session classification : Poster Session I

Track classification : Neutrino Interactions

Type : Poster

Contribution ID : 328

Cosmic ray rates at the Fermilab Liquid Argon Test Facility

Content :

The MicroBooNE neutrino detector is currently being installed in the Liquid Argon Test Facility at Fermi National Accelerator Lab. The liquid-argon, time-projection chamber has an event-readout time of about 5 milliseconds, during which many cosmic-ray muons will cross the large active volume. We present an estimate for this rate, based on a combination of measurements made in the experimental hall and a CRY/GEANT4 simulation.

Primary authors : PAPAVASSILIOU, Vassili (NMSU)

Co-authors : PATE, Stephen (NMSU) ; MICELI, Tia (NMSU) ; WOODRUFF, Katherine (NMSU)

Presenter : PAPAVASSILIOU, Vassili (NMSU)

Session classification : Poster Session II

Track classification : Short Baseline Oscillations / Sterile Neutrinos / Non-standard Oscillations

Type : Poster

Contribution ID : 329

Future prospects of geo-neutrino measurement with KamLAND

Content :

The Kamioka Liquid-Scintillator Antineutrino Detector (KamLAND) is marked by the ability to detect anti-neutrino signals at 1,000 ton of ultra pure liquid scintillator. We reported the results of the first study of electron antineutrinos produced within the Earth in 2005. The recent long-term shutdown of Japanese nuclear reactors has resulted in a significantly reduced reactor antineutrino flux at KamLAND, and this condition improves sensitivity for geo-neutrinos.
To improve the ability to discriminate between Earth models, we are planning to upgrade KamLAND detector. This poster presents the ongoing studies for future improvement.

Primary authors : Dr. WATANABE, Hiroko (Tohoku University)

Co-authors :

Presenter : Dr. WATANABE, Hiroko (Tohoku University)

Session classification : Poster Session I

Track classification : Geo-neutrinos

Type : Poster

Contribution ID : 330

Development of new 50-cm diameter photodetectors for Hyper-Kamiokande

Content :

Hyper-Kamiokande is a proposed future neutrino experiment with physics goals such as the discovery of leptonic CP violation, nucleon decay, supernova neutrino, and so on, using a 1 Mton water Cherenkov detector.
Considering the cost fraction of photodetectors in Hyper-Kamiokande detector, more cost-effective and higher performance large-area (50-cm diameter in the current plan) photodetectors than those of Super-Kamiokande are desired.
Two types of photodetectors, Box-and-Line photomultiplier tube (PMT) and Hybrid photodetector (HPD), have been developed to improve the physics sensitivity of Hyper-Kamiokande.
These photosensors have also been considered to use the photocathode with higher quantum efficiency than those of Super-Kamiokande.

The Box-and-Line PMT uses a different dynode type from that of Super-Kamiokande. It has a better photon collection efficiency and faster time response than Super-Kamiokande PMT.
On the other hand, the HPD consists of a phototube and an avalanche diode.
The manufacturing cost of the HPD is expected to be low because of its simple inner structure. Furthermore, its fast drift time of electron and large bombardment gain bring a good timing resolution and photoelectron detection ability.

Some prototypes of those 50-cm diameter Box-and-Line PMT and HPD have been newly developed and the evaluations of these prototypes have been started from 2014. In this conference, I will describe the first evaluation of timing resolution, single photoelectron, charge resolution, and the other performance of them.

Primary authors : Mr. OKAJIMA, Yuji (Tokyo Institute of Technology)

Co-authors : Prof. AIHARA, Hiroaki (Department of Physics, University of Tokyo) ; Dr. NAKAYAMA, Shoei (Kamioka Observatory, Institute for Cosmic Ray Research, University of Tokyo) ; Dr. NISHIMURA, Yasuhiro (RCCN, ICRR, The University of Tokyo) ; Mr. OHMURA, Takayuki (Hamamatsu Photonics K.K.) ; Dr. SHIOZAWA, Masato (Kamioka Observatory, Institute for Cosmic Ray Research, University of Tokyo) ; Mr. SUDA, Yusuke (Department of Physics, University of Tokyo) ; Mr. SUZUKI, Masatoshi (Hamamatsu Photonics K.K) ; Dr. TAKETA, Akimichi (Earthquake Research Institute, University of Tokyo) ; Dr. TANAKA, Hidekazu (Kamioka Observatory, Institute for Cosmic Ray Research, University of Tokyo) ; Dr. YOKOYAMA, Masashi (Department of Physics, University of Tokyo) ; Dr. HAYATO, Yoshinari (Kamioka Observatory, Institute for Cosmic Ray Research, University of Tokyo) ; Ms. HIROTA, Seiko (Department of Physics, Kyoto University) ; Dr. ISHITSUKA, Masaki (Department of Physics, Tokyo Institute of Technology) ; Mr. JIANG, Miao (Department of Physics, Kyoto University) ; Dr. KAWAI, Yoshihiko (Hamamatsu Photonics K.K.) ; Dr. KUZE, Masahiro (Department of Physics, Tokyo Institute of Technology) ; Dr. MINAMINO, Akihiro (Department of Physics, Kyoto University) ; Prof. NAKAYA, tsuyoshi (Department of Physics, Kyoto University)

Presenter : Mr. OKAJIMA, Yuji (Tokyo Institute of Technology)

Session classification : Poster Session II

Track classification : Long Baseline Oscillations

Type : Poster

Contribution ID : 331

Status and performance of the CUORE-0 detector

Content :

CUORE-0 is the most sensitive experiment currently searching for the 0nu2beta decay of 130Te. The CUORE-0 setup consists in an array of 52 tellurium dioxide crystals, operated as bolometers at a temperature of ~10mK, with a total mass of about 39 kg of TeO_2. It has been built to test and demonstrate the performance of the upcoming CUORE experiment. CUORE-0 is running in the Gran Sasso National Laboratory (Italy) since March 2013. Here will be presented the most recent results, including the background rate, the detector performance and the sensitivity.

Primary authors : Dr. CANONICA, Lucia (INFN LNGS)

Co-authors :

Presenter : Dr. CANONICA, Lucia (INFN LNGS)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 332

A Bayesian approach for counting experiment statistics applied to a neutrino point source analysis

Content :

We present a model independent analysis to analyze data obtained from generic counting experiments. The method is based on Bayesian inference and tailored for sources emitting at a steady rate. As an example we apply this model to the search for cosmic neutrinos emitted from Active Galactic Nuclei using the public IceCube-40 data set. A test-statistic based on Bayesian evidence is used and the signal significance is determined following a frequentist procedure. The latter has been used to enable a detailed comparison between our test-statistic and the widely used method developed by Li & Ma. Furthermore, using Bayesian inference allows us to incorporate prior information in our analysis to obtain the full signal and background probability density functions. An upper limit on the neutrino flux from 10 nearby Blazars (a specific type of AGN) is found using the full signal probability density function and compared to the upper limit obtained using frequentist methods developed by Feldman and Cousins. The obtained value is in good agreement with the upper limit for a diffuse particle flux obtained by the IceCube collaboration, using the same data set.

Primary authors : BOSE, Debanjan (Vrije Universiteit Brussel / Sungkyunkwan University) ; BRAYEUR, Lionel (Vrije Universiteit Brussel) ; CASIER, Martin (Vrije Universiteit Brussel) ; DE VRIES, Krijn D (Vrije Universiteit Brussel) ; GOLUP, Geraldina (Vrije Universiteit Brussel) ; VAN EIJNDHOVEN, Nick (Vrije Universiteit Brussel)

Co-authors :

Presenter : DE VRIES, Krijn D (Vrije Universiteit Brussel)

Session classification : Poster Session I

Track classification : Cosmic Neutrinos

Type : Poster

Contribution ID : 333

The nuPRISM detector: An experimental solution to the neutrino energy measurement problem

Content :

The frequency with which a neutrino oscillates is dictated by its energy. Therefore, in order to determine neutrino oscillation parameters, experiments must accurately measure the energy of each neutrino. Unfortunately, the neutrino energy is not directly observable, and, instead, experiments can only measure the outgoing charged lepton from a charged current neutrino interaction, and perhaps some constraint on the energy of the final state hadrons. To translate these measurements to neutrino energy, it is necessary to rely on theoretical models of neutrino interactions with atomic nuclei.

In recent years, neutrino interaction models have undergone drastic modifications. Many models now predict that neutrinos interact with correlated sets of nucleons within the nucleus, which causes large biases in reconstructed neutrino energy for 20-30% of interactions at neutrino energies near 1 GeV. These effects were not included in the state of the art neutrino models just 5 years ago. These nucleon correlation effects are difficult to calculate, and large discrepancies exist between currently available models. Existing neutrino experiments cannot uniquely determine the cross section and final state kinematics for these correlated nucleon processes, hence uncertainties on the modeling of these effects are a potentially dominant systematic uncertainty for future precision oscillation parameter measurements.

In the nuPRISM concept, a detector is placed ~1 km from the neutrino production source and spans a range of off-axis angles relative to the neutrino beam direction. As the off-axis angle changes, the beam energy changes, which can provide a direct, data-driven constraint on the relationship between neutrino energy and experimental observables. This technique is currently being pursued as a near detector upgrade for the T2K experiment, but it is generally applicable to all long-baseline neutrino experiments.

Primary authors : Prof. HARTZ, Mark (Kavli IPMU (WPI), University of Tokyo/TRIUMF)

Co-authors :

Presenter : Prof. HARTZ, Mark (Kavli IPMU (WPI), University of Tokyo/TRIUMF)

Session classification : Poster Session II

Track classification : Neutrino Beam Flux

Type : Poster

Contribution ID : 334

Prediction of Leptonic CP Violation

Content :

We propose a possibility to predict the (Dirac-type) CP phase
in terms of two or three neutrino mixing angles in case that the neutrinos are
Majorana particles.
This can be achieved by the relations, expressed in terms of neutrino mixing angles
and the CP phase in the standard parametrization.
And the expressions are derived from the equivalence between the standard
parametrization of the neutrino mixing matrix and modified tribimaximal or bimaximal
mixing matrices with appropriate CP phases.
Carrying out numerical analysis based on the current experimental results for
neutrino mixing angles, we can predict the values of the (Dirac-type) CP phase for
several possible cases.

Primary authors : Prof. KANG, Sin Kyu (Seoul National University of Science and Technology)

Co-authors :

Presenter : Prof. KANG, Sin Kyu (Seoul National University of Science and Technology)

Session classification : Poster Session I

Track classification : Theory / Phenomenology

Type : Poster

Contribution ID : 335

π+ and π- mutliplicities measured in p+C interactions at 31GeV/c in NA61/SHINE for the T2K experiment.

Content :

The T2K (Tokai-to-Kamioka) is a second generation long baseline neutrino oscillation experiment which, for the first time in the world, was able to detect νμ−>νe appearance [1] and as a result the oscillation parameter θ13 could be measured.
The T2K neutrino beam predictions require knowledge of the hadron production in proton-carbon interactions at 31 GeV/c. The NA61/SHINE (SHINE = SPS Heavy Ion and Neutrino Experiment) comes into importance as in the first stage of data taking (2007-2010) it aimed to deliver data needed for the T2K. This experiment is a large acceptance hadron spectrometer located in the North Area H2 beam line of the CERN SPS. The main tracking and particle identification devices are large volume Time Projection Chambers (TPCs) and Time-of-Flight detectors (ToF).
Multiplicities and differential cross sections of charged pions measured with NA61/SHINE data collected during the 2009 run will be presented. The analysis is based on energy loss (dE/dx) measurement in the active volume of the TPCs. The results are presented as a function of laboratory momentum in 11 intervals of the laboratory polar angle covering the range from 0 up to 420~mrad. These spectra are compared with limited in statistics results from the 2007 run [2] as well as with the results obtained on the 2009 data using different analysis techniques.
Measurements for π+ and K+ from 2007 were already used by the T2K experiment to tune neutrino beam simulations and reduce uncertainties [3]. Complementary results from the NA61/SHINE 2009 data analyses with smaller statistical and systematic errors will allow for further reduction of neutrino and antineutrino flux uncertainties in T2K.

References

[1]. K. Abe et al. [T2K Collaboration], Observation of Electron Neutrino Appearance in a Muon Neutrino Beam, Phys.Rev.Lett. 112, 061802 (2014).
[2]. N. Abgrall et al., [NA61/SHINE Collaboration], Measurements of Cross Sections and Charged Pion Spectra in Proton--Carbon Interactions at 31GeV/c, Phys. Rev. C84, 034604, (2011).
[3]. K. Abe et al.[T2K Collaboration], The T2K Neutrino Flux Prediction , Phys.Rev. D87, 012001 (2013).

Primary authors : Dr. POSIADALA, Magdalena (University of Warsaw)

Co-authors :

Presenter : Dr. POSIADALA, Magdalena (University of Warsaw)

Session classification : Poster Session II

Track classification : Neutrino Beam Flux

Type : Poster

Contribution ID : 336

Charge Coupled Devices for Detection of Coherent Neutrino-Nucleus Scattering

Content :

We present the main features of a new instrument for low energy neutrino detection using CCDs. Improvements in the CCD's fabrication processes has allowed the development of devices with larger masses (1g to 10g are available nowadays), which together with other good features such as their extremely low energy threshold (~5.5eV RMS) and their good spatial resolution (15um), make them a perfect candidate for neutrinos detection. Mainly, by the detection of the coherent neutrino-nucleus scattering interaction which has never been detected. This new technique opens a new window in neutrino detection techniques because it allows the construction of small size neutrino detectors where the reduction in the event rate because of the smaller volume is fully compensated by the detection of additional very low energy events. The poster is intended to cover the mayor features of the CCD-based detector, the event discrimination algorithm, and the first measurements at Fermilab previous to its shipment to the nuclear plant. The system is planned to be running at Almirante Alvaro Alberto Nuclear Plant, Angra dos Reis, Brazil, starting in August 2014.

Primary authors : Mr. FERNANDEZ MORONI, Guillermo (Fermilab)

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Presenter : Mr. FERNANDEZ MORONI, Guillermo (Fermilab)

Session classification : Poster Session I

Track classification : Neutrino Interactions

Type : Poster

Contribution ID : 337

Matter Neutrino Resonance above a Black Hole Accretion Disk

Content :

We present a novel type of neutrino flavor tranformation behavior in the context of accretion disks above compact object mergers. These neutrino environments differ from supernovas, the sun and the early universe and are thus home to neutrino flavor transitions unseen elsewhere. We compute neutrino oscillation including self-interaction effects for merger disks with realistic energy and flux hierarchies for different neutrino flavors. We use a single energy model to explain the transitions.

Primary authors : MALKUS, Annelise (North Carolina State University)

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Presenter : MALKUS, Annelise (North Carolina State University)

Session classification : Poster Session I

Track classification : Supernova Neutrinos

Type : Poster

Contribution ID : 338

Liquid Scintillator Development Facility for Large-scale Neutrino Experiment

Content :

The BNL Neutrino and Nuclear Chemistry group is well-known for its world-leading expertise in metal-doped and water-based liquid scintillator (a novel development that has been initiated since 2009) and has the state-of-art scintillator development facility that is capable of formulating various scintillator detectors for different nuclear and particle physics experiments. Different chemical elements doped in various organic scintillators have a variety of applications in neutrino detection. On the other hand, the newly developed, water-based liquid scintillator is a new cost-effective detection medium for future massive detectors with the unique capability of exploring physics below the Cherenkov threshold and has the ability of loading any (hydrophilic) metallic ions of interest for neutron tagging or other physics enhancements. The same water-based detector could also serve as the near detector for long baseline neutrino beam monitoring or be used for detection of diffuse neutrino flux from distant past supernovae. The applications of liquid scintillator to a variety of future experiments including double-beta decay, dark matter search, reactor neutrino and beam physics will be presented.

Primary authors : Dr. YEH, Minfang (Brookhaven National Laboratory)

Co-authors : Dr. HANS, Sunej (Brookhaven National Lab) ; Mr. ROSERO, Richard (Brookhaven National Laboratory) ; HU, Liangming (Brookhaven National Laboratory)

Presenter : Dr. HANS, Sunej (Brookhaven National Lab) ; Mr. ROSERO, Richard (Brookhaven National Laboratory) ; HU, Liangming (Brookhaven National Laboratory)

Session classification : Poster Session II

Track classification : Long Baseline Oscillations

Type : Poster

Contribution ID : 339

Neutrino mass spectrum from the seesaw mechanism with the second Higgs doublet added

Content :

Neutrino oscillation experiments showed that neutrinos have tiny but non-zero masses. The seesaw mechanism is the most fruitful explanation of the light neutrino masses and mixings, which connects the tiny neutrino masses with heavy right-handed neutrino masses. After spontaneous symmetry breaking of the Standard Model gauge group one obtains a (n_L+n_R) x (n_L+n_R) Majorana mass matrix M_nu for the neutrinos. The mixing between the n_R right-handed singlet fermions and the neutral parts of the n_L lepton doublets gives masses to the neutrinos which are of the size expected from neutrino oscillations.

The diagonalization of the mass matrix gives rise to a split spectrum consisting of heavy and light states of neutrinos given by U^T M_nu U=diag(m^{light}_{n_L}, m^{heavy}_{n_R}). We analyse two cases of the minimal extension of the Standard Model when one or two right-handed fields are added to the three left-handed fields. A second Higgs doublet is included in our model.

We calculate the one-loop radiative corrections to the mass parameters which produce mass terms for the neutral leptons. In both cases we numerically analyse light neutrino masses as functions of the heavy neutrino masses. Parameters of the model are varied to find light neutrino masses that are compatible with experimental data of solar Delta m^2_⊠ and atmospheric Delta m^2_atm neutrino mass differences for normal and inverted hierarchy. We choose values for the parameters of the tree-level by numerical scans, where we look for the best agreement between computed and experimental neutrino oscillation angles. Different mixing angles between the Higgs fields give different mass spectra of light neutrinos and different distributions of neutral Higgs masses.

Primary authors : Dr. JURCIUKONIS, Darius (Vilnius University, Institute of Theoretical Physics and Astronomy)

Co-authors : Dr. GAJDOSIK, Thomas (Vilnius University, Physics Faculty) ; Dr. JUODAGALVIS, Andrius (Vilnius University, Institute of Theoretical Physics and Astronomy)

Presenter : Dr. JURCIUKONIS, Darius (Vilnius University, Institute of Theoretical Physics and Astronomy)

Session classification : Poster Session I

Track classification : Theory / Phenomenology

Type : Poster

Contribution ID : 340

Results from the NEMO-Phase2 Tower in Capo Passero Site

Content :

In March 2013, the Nemo Phase-2 tower has been successfully installed at 100 km off-shore Capo Passero (Italy) and 3500 m depth, as part of the program for the construction of a cubic kilometer scale Cherenkov Neutrino detector in the Mediterranean Sea. This 8-floor Tower hosts 32 10-inch PMT's and is a prototype of the Towers that will be installed as part of the KM3NeT detector in Italy. Results from long term optical background measurements are presented. Collected data show very stable PMT's rates compatible with the contribution of 40K radiative decay to the Cherenkov photons background, with a small percentage of light bursts due to bioluminescence. All these features are a confirmation of the stability and good optical nature of the site. The atmospheric muons flux Depth-Intensity Relation, evaluated with PMT's data collected at 3500m depth, will also be shown.

Primary authors : Prof. CAPONE, Antonio (Physics Department University "La Sapienza" and INFN - Roma)

Co-authors :

Presenter : Prof. CAPONE, Antonio (Physics Department University "La Sapienza" and INFN - Roma)

Session classification : Poster Session I

Track classification : Cosmic Neutrinos

Type : Poster

Contribution ID : 341

The observation of gamma rays after neutral current interactions at Super-Kamiokande by using the T2K neutrino beam

Content :

We report the first measurement of the neutral current quasi-elastic (NCQE) cross section on oxygen by observing nuclear de-excitation gamma rays with the T2K neutrino beam. These interactions from atmospheric neutrinos are one of the main backgrounds in supernova relic neutrino searches. These gamma rays are observed in the Super-Kamiokande (SuperK) water Cherenkov detector. We select candidate events by using the T2K beam timing, dramatically reducing the background of natural radioactivity. We observed 43 events in the 4-30 MeV reconstructed energy region, compared with the MC prediction 55.7 with an estimated NCQE signal efficiency of about 70%. We observed an NCQE cross section of 1.35X10^-38(cm^2) with a 68% confidence interval of (1.06, 1.94)X10^-38(cm^2).

Primary authors : Mr. HUANG, Huang Kunxian for T2K collaboration (Kyoto University)

Co-authors :

Presenter : Mr. HUANG, Huang Kunxian for T2K collaboration (Kyoto University)

Session classification : Poster Session I

Track classification : Neutrino Interactions

Type : Poster

Contribution ID : 342

Measurement Of The Absolute Reactor νe Flux And Spectrum At Daya Bay

Content :

The Daya Bay reactor νe experiment has provided the most sensitive measurement of the neutrino mixing parameter θ13, sin22θ13 = 0.089±0.09, by measuring relative differences in neutrino interaction rates between near and far detectors. In addition, the Daya Bay experiment can make a high-statistics measurement of the absolute reactor νe flux and spectrum with its near site detectors. Daya Bay's first absolute flux and spectral measurement results are presented in this poster along with comparisons to predictions based on reactor antineutrino models and knowledge of the Daya Bay reactor cores and detector responses. This measurement provides a check on the existence of the 'reactor anomaly', as well as a high-precision test of existing reactor models.

Primary authors : Mr. LITTLEJOHN, Bryce (University of Cincinnati) ; DAYA BAY COLLABORATION, - (-)

Co-authors :

Presenter : Mr. LITTLEJOHN, Bryce (University of Cincinnati)

Session classification : Poster Session I

Track classification : Reactor Neutrino Oscillations

Type : Poster

Contribution ID : 343

Electromagnetic Design Improvements for the Rear Section of the KATRIN Experiment

Content :

The aim of the KATRIN experiment is to determine the neutrino mass by the model independent kinematic investigation of the tritium-beta-decay with a sensitivity of 200meV/c^2 (90% C.L.). The experiment consists of a windowless gaseous tritium source, multiple-stage pumping sections, a system of two electrostatic spectrometers and a multi-pixel semiconductor detector. At the upstream end the setup is completed by the so-called "rear section".
The rear section, on one hand, is designed as a vacuum-tight closure of the tritium-bearing volume of the experiment, which at the same time defines the electrostatic potential inside the beam tube of the source. On the other hand, it houses essential calibration and monitoring instruments. For calibration purposes an electron gun provides a beam of quasi monoenergetic electrons which are magnetically guided through all KATRIN components. In order to precisely investigate systematic effects at KATRIN, it is important to minimize the beamspot size as well as the angular and energy distribution width of the electron gun. Therefore detailed simulations on the electromagnetic design of the rear section have been performed.
This poster presents how existing simulations have been improved and the optimized configuration has been implemented in the comprehensive KATRIN simulation framework.

Primary authors : Mr. HEIZMANN, Florian (KIT)

Co-authors : Mr. BABUTZKA, Martin (KIT) ; Ms. VALERIUS, Kathrin (FAU Erlangen-Nürnberg)

Presenter : Mr. HEIZMANN, Florian (KIT)

Session classification : Poster Session I

Track classification : Neutrino Mass

Type : Poster

Contribution ID : 344

PRIDE – Passive Radio Ice Depth Experiment - An Instrument to Measure Outer Planet Lunar Ice Depths from Orbit using EHE Neutrinos

Content :

We describe a potential confluence between EeV neutrino detection and planetary science: a concept for an instrument to measure the thickness of the ice shell on a planetary body, such as Jupiter's moon Europa or Saturn's moon Enceladus, by making use of the Askaryan Effect RF signal from EHE neutrinos observed from an orbiting spacecraft. Unlike a large high powered active device, i.e., an ice-penetrating radar, this instrument is a passive receiver of the naturally occurring signal generated by interactions of deep penetrating cosmic ray neutrinos in the extremely thick, cold ice layer encasing outer solar system moons. It is therefore potentially less massive and requires less power, making it very attractive for interplanetary missions. Measuring the ice sheet thickness on such moons is a first step toward exploring potential oceans below, and is a very high scientific priority for outer planet missions, so new and economical approaches to this measurement are of great interest. We discuss the basic concept, including the correlations of event rate and direction distribution with ice sheet thickness, and consider the instrument design requirements from the perspective of a NASA Outer Planet Orbiter Mission. We show results [1] of simulations, compare signal-to-noise estimates, and examine possible components and configurations for the antenna, receiver, and electronics. We note some options that can be used to reduce mass and power. Finally, we identify issues that would need further study to produce a more concrete design.

[1] Miller, T., Schaefer, R.K., and Sequeira, H.B., Icarus, 220, 877-888, 2012.

Primary authors : Dr. MILLER, Timothy (Johns Hopkins University Applied Physics Lab)

Co-authors : Prof. BARWICK, Steven (UC Irvine) ; Mrs. CONNOLLY, Amy (OSU) ; Prof. KLEINFELDER, Stuart (UC Irvine) ; Dr. SCHAEFER, Robert (JHU Applied Physics Lab) ; Dr. SEQUEIRA, Brian (JHU Applied Physics Lab) ; Dr. PATTERSON, Gerald (JHU Applied Physics Lab) ; Prof. BESSON, David (Kansas) ; Dr. ROMERO-WOLF, Andrew (JPL)

Presenter : Dr. MILLER, Timothy (Johns Hopkins University Applied Physics Lab)

Session classification : Poster Session I

Track classification : Cosmic Neutrinos

Type : Poster

Contribution ID : 345

nuSTORM to long baselines: a hybrid neutrino factory

Content :

The neutrinos from stored muons (nuSTORM) facility aims to use a muon storage ring fed by the Fermilab main injector and a new target station to yield a neutrino beam from muon decay. This flavor-pure beam with a flux certainty of less than 1% / 50MeV provides unprecedented precision for neutrino interaction physics and sterile neutrino searches.

In addition, the neutrino beam produced from the initial pion decay has significant advantages over traditional neutrino beams due to charge and momentum selection after the target-capture equipment. This provides a muon neutrino beam with comparable flux at the first oscillation maximum at ~1000km baselines, whilst eliminating wrong-sign and high-energy backgrounds entirely.

The simulation of the nuSTORM pion-decay beam will be presented along with the resulting flux at currently proposed baselines.

Primary authors : Dr. ADEY, David (Fermilab)

Co-authors :

Presenter : Dr. ADEY, David (Fermilab)

Session classification : Poster Session II

Track classification : Neutrino Beam Flux

Type : Poster

Contribution ID : 346

Optical calibration of SNO+

Content :

This poster describes the status of the optical calibration programme for SNO+, which has as its main goal the search for neutrinoless double-beta decay of 130Te. This isotope is mixed into the 780-tonne liquid scintillator target. As the radio-purity requirements for SNO+ are much more stringent than for SNO, several new optical calibration systems have been developed in order to provide a detailed understanding of the detector response. The new optical calibration is primarily done using external sources. Here we describe these systems, the overall programme and show results from commissioning data that has been acquired recently.

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Co-authors :

Presenter : Dr. PEETERS, Simon (University of Sussex)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 347

Liquid Processing and Assay Systems for the SNO+ Experiment

Content :

The SNO+ detector is a renewal of the Sudbury Neutrino Observatory (SNO)heavy water Cherenkov detector in which the heavy water in the detector core is replaced by an organic liquid scintillator (linear alkyl benzene or LAB) for the study of neutrinoless double beta decay, low energy solar neutrinos, geo-neutrinos and other topics. The science program requires extremely low levels of high-energy beta and gamma ray background activities from 214Bi, 212Bi and 210Bi all from the naturally-occurring 238U and 232Th decay chains and from 40K.
The LAB scintillator processing facility, including distillation, water-LAB extraction, functional group metal scavenger columns and nitrogen/steam stripping modules, is currently being installed in the SNOLAB underground laboratory. Ex-situ LAB radio-purity assay procedures have been developed using the metal scavenger columns and gas stripping radon detection methods. Target radio-purities for the LAB are 1.6 x 10^-17 g 238U/g LAB, 6.8 x 10^-18 g 232Th/g LAB and <1.3 x 10^-18 g 40K/g LAB.
The processing and assay systems used for the outer shielding water in the SNO detector have been refurbished. Processing techniques include vacuum degassing and reverse osmosis. Radio-purity assays utilize Ra adsorption on hydrous titanium oxide (HTiO) adsorption filters followed by coincident alpha-beta counting, along with cryogenic deposition and decay counting of Rn. Target radio-purities for the water in the cavity are the same as those achieved for the SNO experiment - 2.06 x 10^-13 g 238U/g H2O and 5.2 x 10^-14 g 232Th/g H2O.
Recent measurements of the efficiency and sensitivity of selected purification and assay techniques are outlined.

Primary authors : Dr. HALLMAN, Doug (Laurentian University, Sudbury Canada)

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Presenter : Dr. HALLMAN, Doug (Laurentian University, Sudbury Canada)

Session classification : Poster Session I

Track classification : Solar Neutrinos

Type : Poster

Contribution ID : 348

Radio Assay for nEXO

Content :

The next Enriched Xenon Observatory (nEXO) is building on the knowledge gained from the EXO-200 experiment. In the February 2014 paper with 99.8 kg*yr of Xe-136 exposure a background rate of (1.7±0.2)10^{-3} keV/kg/yr in the ±2 sigma region of interest around the Q-value of the Xe-136 decay. To achieve this low rate a radio assay of material was carried out (Nucl.Instrum.Meth, A591, pg 490-509), nEXO looks to improve on EXO-200 backgrounds, to do this the material needs to be screen for potential elements that could be a background near the Xe-136 Q-value.
To do this we use a multitude of methods, including: above ground counting on high resolution Ge detectors above (sensitivity of 500 ppt) and below ground (sensitivity of 50 ppt); neutron activation analysis which has a sensitivity of 0.5 ppt; GDMS (sensitivity of 10 ppt); ICPMS and radon detection.

Primary authors : Dr. AUTY, David (Unversity of Alabama)

Co-authors :

Presenter : Dr. AUTY, David (Unversity of Alabama)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 349

PROSPECT: A Precision Reactor Neutrino Oscillation and Spectrum Experiment

Content :

Experiments near reactors provide an excellent opportunity to study neutrino oscillations and measure the flux and spectrum of antineutrinos from fission products in the reactor core. PROSPECT is a precision reactor neutrino experiment at short baselines of ~5-20m near a US research reactor. The goal of the experiment is to search for short-baseline oscillation, probe the reactor anomaly, and make a measurement of the antineutrino spectrum from a highly enriched uranium core. We will describe the design and experimental strategy of PROSPECT along with its sensitivity and physics potential.

Primary authors : Prof. HEEGER, Karsten (Yale University)

Co-authors :

Presenter : Prof. HEEGER, Karsten (Yale University)

Session classification : Poster Session I

Track classification : Reactor Neutrino Oscillations

Type : Poster

Contribution ID : 350

Toward a realistic model of quarks and leptons, leptonic CP violation and neutrinoless double-beta decay

Content :

We combine a discrete flavor symmetry for quarks and leptons with the Froggatt-Nielsen mechanism to build a model that describes the pattern of quarks and lepton masses and mixings: a milder hierarchy and two large mixing angles for leptons, and a stronger hierarchy and one large mixing angle for quarks. Our model makes restrictive predictions for the effective neutrinoless double-beta-decay Majorana mass and can be fully tested by current and upcoming experiments like GERDA, MAJORANA, CUORE, T2K, NOvA, and others. In addition, our model also contains the Dirac CP-violating phase to a range compatible with flavorless primordial leptogenesis.

Primary authors : Prof. GONDOLO, Paolo (University of Utah)

Co-authors : Dr. AHN, Y.H. (Korean Institute for Advanced Science)

Presenter : Prof. GONDOLO, Paolo (University of Utah)

Session classification : Poster Session I

Track classification : Theory / Phenomenology

Type : Poster

Contribution ID : 351

Cosmic Ray Muon Data in the NOvA Far Detector

Content :

NOvA is a long-baseline neutrino oscillation experiment in Fermilab's NuMI beam. The experiment consists of two functionally identical detectors, a Near Detector (ND) at Fermilab and a Far Detector (FD) at Ash River in Northern Minnesota. Both detectors are almost fully constructed and are being commissioned. The FD is located on the surface under 14 radiation lengths of barite and concrete overburden. The abundant cosmic rays passing through the FD are an ideal tool for calibration, but also present a unique challenge in cosmic ray background rejection. The 15 m x 15 m x 63 m volume detects a cosmic ray muon at approximately 120 kHz. The NOvA FD has recorded cosmic ray data since March 2013 in a partially active detector configuration. In this poster, we show cosmic ray muon data compared to the Monte Carlo simulation. We also demonstrate preliminary cosmic ray muon background rejection capabilities using current particle ID algorithms.

Primary authors : Dr. DAVIES, Gavin (Iowa State University)

Co-authors : Dr. BIAN, Jianming (University of Minnesota) ; Mr. XIN, Tian (Iowa State University)

Presenter : Dr. DAVIES, Gavin (Iowa State University)

Session classification : Poster Session II

Track classification : Long Baseline Oscillations

Type : Poster

Contribution ID : 352

Neutrinos from Gamma-ray Burst Revisited

Content :

Gamma-ray bursts (GRB) were proposed as a leading candidate for the high energy cosmic ray source and therefore, neutrinos. However, the null result from the recent search with GRBs by IceCube had challenged this scenario. Here we revisit both the conventional fireball shock model and new GRB models, such as a dissipative photospheric model, baryonic or magnetic models, with a more refined calculation. The result shows that the current non-detection of GRB neutrinos is in fact not surprising. With ten years of operation by IceCube and new experiments covering a even broader energy band, the high energy neutrinos should be able to tell us the correct GRB model from above, or rule all of them out.

Primary authors : Mr. GAO, Shan (Penn State)

Co-authors :

Presenter : Mr. GAO, Shan (Penn State)

Session classification : Poster Session I

Track classification : Cosmic Neutrinos

Type : Poster

Contribution ID : 353

Multicomponent scenario dark matter in the radiative seesaw model

Content :

The existence of dark matter is almost certain from the cosmological observation. But it is unknown whether dark matter consists of single-component or multi-component. We consider Z_2 x Z_2 symmetry as a simple example of the symmetry stabilizing several dark matter particles. In this case, the dark matter annihilation can be classified to three types, standard annihilation, dark matter conversion, and semiannihilation. In this presentation, we consider the general expression of Z_2 x Z_2 conserving model and discuss about the effects of the non-standard annihilation processes to their thermal relic densities. And I will introduce some examples of radiative seesaw model as multicomponent dark matter existing scenario.

Primary authors : Dr. HIROSHI, Takano (Kavli IPMU, the University of Tokyo)

Co-authors : Prof. KUBO, jisuke (Kanazawa University) ; Dr. AOKI, Mayumi (Kanazawa University)

Presenter : Dr. HIROSHI, Takano (Kavli IPMU, the University of Tokyo)

Session classification : Poster Session II

Track classification : Dark Matter And Neutrinos

Type : Poster

Contribution ID : 354

Non Oscillation Physics in NOvA

Content :

The NOvA experiment will illuminate aspects of neutrino oscillation parameters which are currently unknown, including the octant of θ_{23}, the Dirac CP phase, and the neutrino mass hierarchy. However NOvA also has capabilities for clarifying other properties and scattering phenomena involving neutrinos. This Poster will describe two such measurements to be carried out using the NOvA Near Detector which illustrate the latter capabilities of the experiment. These measurements are: 1) limit-setting or determination of the ν_{μ} magnetic moment using ν_{μ}-electron scattering; and 2) measurement of charged- current neutrino-carbon cross sections into final states of low hadronic multiplicity. In particular, quasi-elastic scattering on carbon can be examined for evidence of nuclear medium effects such as meson exchange currents and multi-nucleon correlations.

Primary authors : Dr. MAYER, Nathan (Tufts University)

Co-authors :

Presenter : Dr. MAYER, Nathan (Tufts University)

Session classification : Poster Session I

Track classification : Neutrino Interactions

Type : Poster

Contribution ID : 355

An Exercise in Frugality, what do we know about the PMNS Matrix?

Content :

We investigate precisely what can be extracted from the current appearance and disappearance oscillation data in regards the 3x3 PMNS matrix, without explicitly assuming unitarity. Our cannonical model of this unitarity violation is an added sterile neutrino, whose mass and mixing are not fully resolvable in current generation experiments, or does not take part in oscillations. Further constraints on deviations from unitarity from lepton universality and rare lepton decays are discussed to further bound the lepton mixing matrix, and future experiments that can improve the situation are investigated.

Primary authors : Mr. ROSS-LONERGAN, Mark (IPPP Durham University)

Co-authors :

Presenter : Mr. ROSS-LONERGAN, Mark (IPPP Durham University)

Session classification : Poster Session I

Track classification : Theory / Phenomenology

Type : Poster

Contribution ID : 356

Collective Neutrino Oscillations

Content :

99% of the energy emitted by core collapse supernovae is in the form of neutrinos. Highly non-linear effects, due to neutrino self-interactions, that are present only in the dense environments such as a supernova core offers an unique opportunity to study neutrino properties. We demonstrate a new technique for calculating probability of collective neutrino oscillations.

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Co-authors : Prof. DUAN, Huaiyu (Univsersity of New Mexico)

Presenter : Dr. SHALGAR, Shashank (Univsersity of New Mexico)

Session classification : Poster Session I

Track classification : Supernova Neutrinos

Type : Poster

Contribution ID : 357

The deep-sea Neutrino telescope KM3NeT - Timing and Readout

Content :

KM3NeT is large scale deep-sea neutrino telescope to be deployed and operated in the Mediterranean Sea. Neutrino induced muons are detected by measuring their Cherenkov light in sea-water using photomultiplier-tubes inside transparent and pressure resistant housings.
KM3NeT aims at instrumenting a large volume of several cubic-km with tens of thousands of optical sensors, each one interconnected with the shore through electro-optical cables with distances up to 100km.
The KM3NeT collaboration has successfully developed, as an optical sensor the Digital Optical Module (DOM), by placing multiple 31 3" photomultipliers (PMTs) in a 17" glass sphere including the power and readout electronics, providing the basic detection unit for the telescope. The DOM concept allows to maximize the photo-cathode area inside the sphere while the segmentation provided by individual PMTs allows better rejection of the ubiquitous K40 photon background in the sea.
To ensure a high level of flexibility with minimal bias in the observations, all data from each DOM is sent to shore for on-line analysis. While the shore receives from each DOM continuously digitized data, each DOM needs to be synchronized with a global shore clock at the nano-second level. To make best use of the resources for power and data transfer in KM3NeT we have adopted an integrated timing and readout scheme between each DOM and the shore station , by employing synchronous Gbit-Ethernet link, and precision-time protocol and clock phase tracking, in a transparent way, through the open source hardware implementation "White Rabbit".

Here we present the PMTs readout in a single DOM and the time synchronization scheme at the nano-second level for all DOMs in the deep-sea neutrino telescope KM3NeT.

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Co-authors :

Presenter : Dr. BELIAS, Anastasios (NCSR-Demokritos)

Session classification : Poster Session I

Track classification : Cosmic Neutrinos

Type : Poster

Contribution ID : 358

A Community Material Assay Database

Content :

The physics community possesses a wealth of knowledge on the radiopurity of materials, which has been acquired laboriously during the design and construction of generations of ultra-low background experiments. To the extent that this information has been shared, it has been done so through databases of limited scope or availability, through publications and through informal exchanges. The aim of the Community Material Assay Database is to consolidate these data into a single comprehensive repository, in which the data is stored in a concise and flexible data format, and is accessible through a powerful web interface. This open-source database is built using the CouchDB NoSQL database engine. Assays are encoded and stored as JSON documents, and searched and edited using a client-side AJAX web application stored within the database itself. The software can also be used as a stand-alone application by experimental collaborations or counting facilities. The initial public release is accessible at http://radiopurity.org.

Primary authors : Dr. LOACH, James (Shanghai Jiao Tong University)

Co-authors : Prof. COOLEY, Jodi (SMU) ; POON, Alan (LBNL)

Presenter : Dr. LOACH, James (Shanghai Jiao Tong University)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 359

Background Assessment for the PROSPECT Short-Baseline Reactor Experiment

Content :

PROSPECT is a U.S.-based, multi-phase, 2-detector reactor antineutrino experiment whose primary goals are to probe short-baseline oscillations and perform a precise measurement of the reactor antineutrino spectrum. Potential detector deployment locations 4-20m from compact research reactor cores have been identified at three U.S. research reactor facilities. While these facilities have many attractive features including 235U cores and frequent on-off cycles allowing many background measurement opportunities, they also present several experimental challenges. These include little-to-no cosmic ray attenuating overburden and the potential for reactor correlated neutron and gamma ray backgrounds. The PROSPECT Collaboration has conducted an extensive background survey of multiple locations at each of the three sites. Several important sources of background have been identified, as well as variations amongst the sites. In this poster we detail the measurements conducted, the results obtained, and describe background mitigation strategies thus developed.

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Primary authors : BOWDEN, Nathaniel (LLNL)

Co-authors :

Presenter : BOWDEN, Nathaniel (LLNL)

Session classification : Poster Session I

Track classification : Reactor Neutrino Oscillations

Type : Poster

Contribution ID : 360

Development of novel scintillator for the PROSPECT Short-Baseline Neutrino Experiment

Content :

Segmented antineutrino detectors placed near a compact research reactor provide an excellent opportunity to probe short-baseline neutrino oscillations and precisely measure the reactor antineutrino spectrum.
Close proximity to a reactor combined with minimal overburden yield a high background environment that must be managed through shielding and detector technology.
This poster will focus on the development of novel loaded scintillator for PROSPECT capable of neutron/gamma pulse shape discrimination and neutron capture tagging.
These enhancements improve the ability to identify neutrino inverse-beta decays and reject background events in analysis.
Results from these efforts will be covered along with their implications for an oscillation search and a precision spectrum measurement.

Primary authors : Dr. LANGFORD, Thomas (Yale University)

Co-authors :

Presenter : Dr. LANGFORD, Thomas (Yale University)

Session classification : Poster Session I

Track classification : Reactor Neutrino Oscillations

Type : Poster

Contribution ID : 361

A Relative Rate and Shape Measurement of Neutrino Oscillation at the Daya Bay Experiment

Content :

A major goal of the Daya Bay Reactor Neutrino Experiment is the precise measurement of the neutrino oscillation via the disappearance of the reactor electron antineutrinos. This technique provides the most precise determination of the neutrino mixing angle theta_{13} and the larger mass-squared difference Delta m^2_{ee} (~Delta m^2_{31}). The experiment consists of eight identical detectors placed at two near and one far underground experimental halls. A relative measurement can reduce the uncertainty due to the imperfect modeling of the reactor antineutrino flux. We have developed a method effectively independent of reactor models. This is achieved by predicting the antineutrino rate and energy spectrum of the far detectors directly from the measurement of the near detectors, with corrections for backgrounds, acceptance and oscillation. This poster will describe in detail the method and merits of our approach, as well as the estimated values of sin^2(2theta_{13}) and Delta m^2_{ee} that we obtain.

Primary authors : Mr. WONG, Hin Lok Henoch (UC Berkeley)

Co-authors :

Presenter : Mr. WONG, Hin Lok Henoch (UC Berkeley)

Session classification : Poster Session I

Track classification : Reactor Neutrino Oscillations

Type : Poster

Contribution ID : 362

The DEAP3600 Dark Matter Search

Content :

The DEAP-3600 experiment is located at SNOLAB, 2 km underground in Sudbury, Ontario. It is a single-phase detector, which will search for dark matter particle interactions with 1 tonne fiducial mass of liquid argon target. Construction of the detector is nearly complete, and commissioning of the detector will start in mid-2014. The projected sensitivity to spin-independent scattering of Weakly Interacting Massive Particles (WIMPs) on nucleons is 10^-46 cm2, a factor of 20 improvement in sensitivity over current searches at 100 GeV WIMP mass. The overview of the project and the status of construction at SNOLAB will be presented.

Primary authors : Prof. BOULAY, Mark (Queens University)

Co-authors :

Presenter : Prof. BOULAY, Mark (Queens University)

Session classification : Poster Session II

Track classification : Dark Matter And Neutrinos

Type : Poster

Contribution ID : 363

Calibration of the DEAP3600 Direct Detection Dark Matter Experiment

Content :

The DEAP-3600 experiment is located at SNOLAB, 2 km underground in Sudbury, Ontario. It is a single-phase detector, which will search for dark matter particle interactions with 1 tonne fiducial mass of liquid argon target. Construction of the detector is nearly complete, and calibration commissioning of the detector is beginning. The projected sensitivity to spin-independent scattering of Weakly Interacting Massive Particles (WIMPs) on nucleons is 10^-46 cm2, a factor of 20 improvement in sensitivity over current searches at 100 GeV WIMP mass. The calibration systems for DEAP3600 and the status of commissioning at SNOLAB will be presented.

Primary authors : Dr. PEETERS, Simon (University of Sussex)

Co-authors :

Presenter : Dr. PEETERS, Simon (University of Sussex)

Session classification : Poster Session II

Track classification : Dark Matter And Neutrinos

Type : Poster

Contribution ID : 364

Direct Search of Warm Dark Matter keV Neutrinos In Next Generation Tritium Beta Decay Experiments

Content :

In this poster a sensitivity study of detecting sterile keV neutrinos in tritium beta decay will be presented. Relic sterile neutrinos in the keV range are classical candidates for the so-called Warm Dark Matter. They can explain mass distributions in the sub-galactic scale and thereby resolve the tensions in purely Cold Dark Matter scenarios, while being consistent with observations of the large scale structures.

This work shows that from a purely statistical point of view a future KATRIN-like experiment can reach a sensitivity of a mixing angle down to sin2Q ~ 10-8, probing the cosmologically favored parameter space. We investigate the effect of theoretical and experimental uncertainties using different analysis techniques based on spectral fits, covariance matrix approach and discrete wavelet transform.

Primary authors : Dr. LASSERRE, thierry (CEA) ; Dr. MERTENS, Susanne (Lawrence Berkeley National Laboratory)

Co-authors :

Presenter : Dr. LASSERRE, thierry (CEA) ; Dr. MERTENS, Susanne (Lawrence Berkeley National Laboratory)

Session classification : Poster Session II

Track classification : Dark Matter And Neutrinos

Type : Poster

Contribution ID : 365

Search for Exotic Double Track Signatures in IceCube

Content :

Physics theories beyond the Standard Model like Supersymmetry and models with extra dimensions often invoke Z_2 symmetries in order to avoid new couplings that lead to unobserved new physics, like unnaturally fast proton decay. This gives rise to the possibility of heavy, new particles being produced in pairs with the lightest of them being (meta-)stable.
Recently IceCube observed high energy neutrinos in the PeV range. Under favorable conditions such neutrinos produce pairs of exotic, charged particles that can be seen in km3-sized detectors like IceCube as two parallel tracks with a track separation of a few hundred meters. We discuss an ongoing search for such events, including the simulation and reconstruction of double tracks and how to separate them from other air shower or neutrino-induced (coincident) muon events in a model independent way. We show how to interpret any results in more explicit frameworks like Supersymmetry.

Primary authors : Mr. KOPPER, Sandro (BU Wuppertal)

Co-authors : Dr. HICKFORD, Stephanie (BU Wuppertal)

Presenter : Dr. HICKFORD, Stephanie (BU Wuppertal)

Session classification : Poster Session I

Track classification : Cosmic Neutrinos

Type : Poster

Contribution ID : 366

Calibration of Antineutrino Detectors at Daya Bay

Content :

The Daya Bay experiment aims to provide the most precise measurement of the mixing angle theta13 and the mass-squared difference dm^2_ee. The experiment consists of eight functionally identical antineutrino detectors deployed in three experimental halls at different baselines from three groups of nuclear reactors. The calibration of the various aspects of the detector response is an essential ingredient for reducing and quantifying the relative systematic uncertainties. Various calibration methods, relying on radioactive sources and in-situ data, will be presented.

Primary authors : Dr. TSANG, Ka Vang (Lawrence Berkeley National Lab)

Co-authors :

Presenter : Dr. TSANG, Ka Vang (Lawrence Berkeley National Lab)

Session classification : Poster Session I

Track classification : Reactor Neutrino Oscillations

Type : Poster

Contribution ID : 368

Event reconstruction and particle identification for low energy events in DeepCore and PINGU

Content :

We report on the algorithm and expected performance of an event reconstruction tailored for lower-energy neutrino events detected by IceCube/DeepCore and PINGU. The new reconstruction enables a precision measurement of nu_mu disappearance and nu_tau appearance using DeepCore data, and a measurement of the neutrino mass hierarchy by PINGU (see talk by D. Grant, et al. and posters by L. Schulte, et al., and J.P.A.M. de Andre, et al.).

While there are existing IceCube reconstructions that allow the measurement of nu_mu disappearance with DeepCore (see talk by JP Yanez, et al), these algorithms have low efficiencies that limit the size of the signal sample. Substantial improvements in efficiency and/or reconstruction quality are realized using the charge and timing information of all detected photons in a likelihood based reconstruction. For PINGU, the new reconstruction provides the neutrino zenith and energy resolutions required to measure the neutrino mass hierarchy using atmospheric neutrino events in the 5-15 GeV energy range, as well as the ability to perform particle identification that distinguishes between cascade-like events (mainly composed of nu_e CC interactions) and track-like events (mainly composed of nu_mu CC interactions).

Primary authors : Dr. ARLEN, Timothy (Penn State University) ; Dr. ATHAYDE MARCONDES DE ANDRÉ, João Pedro (Penn State University)

Co-authors :

Presenter : Dr. ARLEN, Timothy (Penn State University) ; Dr. ATHAYDE MARCONDES DE ANDRÉ, João Pedro (Penn State University)

Session classification : Poster Session I

Track classification : Cosmic Neutrinos

Type : Poster

Contribution ID : 369

Potential Neutrino Mass Bound from Supernova Neutronization Burst using a 34~kton Liquid Argon Detector

Content :

This work presents an upper bound on the neutrino mass using the emission of nu_e from the neutronization burst of a supernova at 10~kpc of distance and 15~M⊠. The detection of these neutrinos is done using 34~kton liquid Argon detector, crudely similar to the one that will be build by the Long Baseline Neutrino Experiment (LBNE), but with 80% of detection efficiency. From a very simple Monte Carlo simulation of the number of events in 5~ms bins in this kind of detector, we obtained, at 95% C.L, m_nu<2.25 eV and m_nu<1.16 eV, assuming normal hierarchy and inverted hierarchy, respectively.

Primary authors : Dr. ROSSI TORRES, Fernando (Instituto de Fisica Gleb Wataghin - State University of Campinas - SP - Brazil)

Co-authors : Prof. GUZZO, M. M. (Instituto de Fisica Gleb Wataghin - State University of Campinas - SP - Brazil)

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Session classification : Poster Session I

Track classification : Supernova Neutrinos

Type : Poster

Contribution ID : 370

EXO-200 event reconstruction

Content :

EXO-200 utilizes dual liquid xenon time projection chambers (TPCs) to observe the double beta (bb) decay of Xe-136. Each TPC yields 37 scintillation channel waveforms and 38 each of ionization and charge induction channel waveforms; all of which are are 2 ms in length and sampled at 1 MHz. In order to observe bb decay and suppress residual radio active backgrounds from otherwise radio quiet detector component materials, the data is reconstructed using a custom built algorithm. This process includes signal finding and signal parameter estimation---from the individual channel waveforms---and a global signal clustering that assembles the found signals into individual charge deposits colocated in space and time. The resulting position of, and energy deposited in, each cluster forms the observed topology of an event. The details of EXO-200 event reconstruction applied to EXO-200 data, both to observe the standard model double beta decay of Xe-136 and in the search for the neutrinoless mode, will be presented.

Primary authors : Dr. MACLELLAN, Ryan (SLAC)

Co-authors :

Presenter : Dr. MACLELLAN, Ryan (SLAC)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 371

Latest results from global 3+n sterile neutrino fits

Content :

Anomalies in the results from short baseline neutrino experiments suggests that there may be one or more additional mass splittings. This can be interpreted as the addition of one or more non-interacting (sterile) neutrinos to the current model. I will present the latest results from an analysis that fits models of one, two and three sterile neutrinos in the ~1eV^2 range to global data sets of short baseline neutrino experiments.

Primary authors : Mr. COLLIN, Gabriel (MIT)

Co-authors :

Presenter : Mr. COLLIN, Gabriel (MIT)

Session classification : Poster Session II

Track classification : Theory / Phenomenology

Type : Poster

Contribution ID : 372

Neutrino Portal in the Icecube Data

Content :

A scenario will be presented in which a hidden sector is coupled to the Standard Model fields via neutrino mixing. Phenomenological implications of, and constraints on, this framework will be discussed. Collider experiments, rare meson decays, and recent CMB measurements from Planck will be analyzed. The recent Icecube data will be shown to give the best bounds.

Primary authors : FRIEDLAND, Alexander (Los Alamos National Lab)

Co-authors :

Presenter : FRIEDLAND, Alexander (Los Alamos National Lab)

Session classification : Poster Session I

Track classification : Theory / Phenomenology

Type : Poster

Contribution ID : 373

Production and Acceptance Testing of Enriched Ge Detectors for the Majorana Demonstrator

Content :

The MAJORANA DEMONSTRATOR is a neutrinoless double-beta decay experiment utilizing 76Ge as both source and detector in the form of high-purity germanium crystals. The enriched germanium crystal production, delivery, acceptance and characterization programs have been organized to minimize exposure to cosmic muons to lower the impact of induced backgrounds. This is required by the strict experiment background goal of 3counts/(ROI-t-y). As another aspect of background mitigation, it is important to ensure proper crystal performance and have well characterized crystal detectors. For this a program of testing crystal properties has been implemented both at the manufacturer and at the detector site in Lead, South Dakota at the Sanford Underground Research Facility. Results of the completed testing program will be presented.

Primary authors : Dr. WHITE, Brandon (Oak Ridge National Laboratory)

Co-authors :

Presenter : Dr. WHITE, Brandon (Oak Ridge National Laboratory)

Session classification : Poster Session II

Track classification : Neutrinoless Double Beta Decay

Type : Poster

Contribution ID : 374

Measuring particle momenta via Multiple Coulomb Scattering with the MicroBooNE Time Projection Chamber

Content :

Liquid Argon Time Projection Chambers (LArTPCs) are a novel detector concept, well-suited for neutrino physics experiments.
MicroBooNE will be the largest LArTPC ever to be built in the United States. The main motivation for designing and constructing MicroBooNE is the investigation of the low-energy excess observed by MiniBooNE and further advancement of the LArTPC technology. Additionally, MicroBooNE will be able to perform precise and detailed neutrino cross section measurements on argon and study the backgrounds relevant to proton decay searches with LArTPCs. The energy of those particles that stop in the MicroBooNE TPC (fully contained events) can be determined from calorimetric information on the collection anode wires.
In this poster, alternative techniques to measure particle momenta via Multiple Coulomb Scattering will be presented.
These methods will be most important in the study of partially contained events.

Primary authors : Dr. KALOUSIS, Leonidas (Virginia Tech)

Co-authors :

Presenter : Dr. KALOUSIS, Leonidas (Virginia Tech)

Session classification : Poster Session II

Track classification : Short Baseline Oscillations / Sterile Neutrinos / Non-standard Oscillations

Type : Poster

Contribution ID : 375

Electron Neutrino Appearance with Multiple LArTPCS on the Booster Neutrino Beam

Content :

The MicroBooNE experiment at Fermilab - to begin taking data this year - will be the largest Liquid Argon Time Projection Chamber (LArTPC) yet constructed in the US. With its full 3 year data set of Booster Neutrino Beam events, MicroBooNE will address its goal of confirming and investigating the Low Energy Neutrino Excess observed by MiniBooNE. At the same time, the LAr1-ND collaboration plans to construct a new LArTPC at the source of the Booster Neutrino Beam and will collect a year of data in conjunction with the final year of MicroBooNE's run. These two detectors offer the opportunity to make a combined near/far comparison of the appearance of electron neutrinos in the booster beam that can determine the nature of the MiniBooNE excess while also interpreting any observed excess as a true oscillation signal. If the excess is not due to an oscillation, LAr1-ND will have the statistical sensitivity to make precision measurements of any observed, beam intrinsic phenomenon. In both detectors, the crucial task is to select and reconstruct electron neutrinos with high efficiency while rejecting single photon background, a task ideal for LArTPCs. This poster will present the combined, 2 detector analysis that will be possible for electron type neutrinos as well as the important steps in reconstruction and background rejection that will be performed.

Primary authors : Mr. ADAMS, Corey (Yale Unversity)

Co-authors :

Presenter : Mr. ADAMS, Corey (Yale Unversity)

Session classification : Poster Session II

Track classification : Short Baseline Oscillations / Sterile Neutrinos / Non-standard Oscillations

Type : Poster

Contribution ID : 377

WATCHMAN: Reactor Monitoring and Neutrino Physics with a Gadolinium Doped Water Detector

Content :

WATCHMAN (WATer CHerenkov Monitoring of AntiNeutrinos) is a new US based experiment that will exploit the low energy antineutrino signal from reactors, supernova and decay-at-rest antineutrino beams to pursue a broad physics program. WATCHMAN aims to be the first detector in the world to detect low energy antineutrinos in water, by adding a gadolinium dopant that increases the efficiency for the final-state neutron arising from the antineutrino interactions on protons in the water. WATCHMAN will also serve as the world's first demonstration detector of remote reactor monitoring for nonproliferation applications, using a scalable water-based technology. In this poster, I will provide an overview of the physics potential of WATCHMAN, and explain the overlap of its nonproliferation and fundamental science goals.

Primary authors : Dr. DAZELEY, Steven (LLNL)

Co-authors :

Presenter : Dr. DAZELEY, Steven (LLNL)

Session classification : Poster Session I

Track classification : Reactor Neutrino Oscillations

Type : Poster

Contribution ID : 378

A Search for dinucleon decay into pions at Super-Kamiokande

Content :

It is important to study possible baryon number violating processes from a variety of contexts. In this poster I will discuss processes that violate baryon number by two units, starting with two bound nucleons and ending with multiple pions. These will be discussed in the context of the Super-Kamiokande water Cherenkov detector, which has typically focused on single-nucleon decays. Searches for the modes pp->pi+pi+, pn->pi+pi0, and nn->pi0pi0 are discussed, and preliminary results are presented.

Primary authors : Mr. GUSTAFSON, Jeffrey (Boston University)

Co-authors :

Presenter : Mr. GUSTAFSON, Jeffrey (Boston University)

Session classification : Poster Session I

Track classification : Other / Global Projects

Type : Poster

Contribution ID : 379

MuSun experiment: precision measurement for Muon capture on the deuteron rate

Content :

The goal of the MuSun experiment is to measure the rate of muon capture on the deuteron with a precision of 1.5%. This rate will be used to fix the low-energy constant that describes the two-nucleon weak axial current in Chiral perturbation theory. It will therefore calibrate evaluations of solar proton-proton fusion and neutrino-deuteron scattering (SNO experiment). MuSun is the part of the systematic program to achieve a new level of precision in confronting the theories of weak interactions, QCD and few body physics, and inherits some of the well developed techniques and apparatus from successful MuCap measurement of the rate for muon capture on the proton. We are using the muon beamline supplied from Paul Sherrer Institute, and our target is the cryogenic time projection chamber (TPC) filled with the deuterium gas at 30K, to optimize the molecular kinetics. Progress of the hardware improvement and data analysis for high statistics run in 2013 will be presented.

Primary authors : Ms. LUO, Xiao (Boston University)

Co-authors : Ms. IBANEZ, Luis (Boston University)

Presenter : Ms. LUO, Xiao (Boston University)

Session classification : Poster Session II

Track classification : Other / Global Projects

Type : Poster