IPA 2015

Report of Contributions

https://events.icecube.wisc.edu/e/ipa2015

Contribution ID: **71** Type: **not specified**

On Extensions of IceTop to Veto Air Showers for Neutrino Astronomy with IceCube

Monday, 4 May 2015 16:30 (20 minutes)

ceCube is the world's largest high-energy neutrino observatory, built at the geographic South Pole. For neutrino astronomy, a large background-free sample of well-reconstructed astrophysical neutrinos is essential. The main background for this signal are muons and neutrinos which are produced in cosmic-ray air showers in the Earth's atmosphere. The coincident detection of these air showers by the surface detector IceTop has been proven to be a powerful veto for atmospheric neutrinos and muons in the field of view of the southern hemisphere. This motivates a significant extension of IceTop. First estimates indicate that such a veto detector will more than double the discovery potential of current point source analyses. Here, we present the motivation and capabilities of different technologies based on simulations and measurements.

Primary author: AUFFENBERG, Jan (o=uwmad,ou=Institutions,dc=icecube,dc=wisc,dc=edu)

Presenter: AUFFENBERG, Jan (o=uwmad,ou=Institutions,dc=icecube,dc=wisc,dc=edu)

Session Classification: Neutrino Astrophysics

Track Classification: Neutrino Astrophysics

Contribution ID: **72** Type: **not specified**

Theory benchmarks for IceCube-Gen2

Tuesday, 5 May 2015 15:00 (20 minutes)

We discuss quantitative benchmarks from theoretical models for the optimization of the next generation volume upgrade of IceCube. Examples include the perspectives for flavor identification, the searches for GRBs, and the potential to use the Glashow resonance to discriminate pp from pgamma interactions.

Primary author: Dr WINTER, Walter (DESY)

Presenter: Dr WINTER, Walter (DESY)

Session Classification: Neutrino Astrophysics

Track Classification: Neutrino Astrophysics

Contribution ID: **73** Type: **not specified**

Understanding the anisotropy of cosmic rays at TeV and PeV energies

Monday, 4 May 2015 16:15 (15 minutes)

The anisotropy in cosmic-ray arrival directions in the TeV-PeV energy range shows both large and small-scale structures. While the large-scale anisotropy may arise from diffusive propagation of cosmic rays, the origin of the small-scale structures remains unclear. We perform three-dimensional Monte-Carlo test-particle simulations, in which the particles propagate in both magnetostatic and electromagnetic turbulence derived from a three-dimensional isotropic power spectrum. However, in contrast to earlier studies, we do not use a backtracking method for the computation of the particle trajectories, and hence anisotropy must build up from a large-scale isotropic (or dipole) boundary condition. It has been recently argued that the turbulent
magnetic field itself generates the small-scale structures of the anisotropy if a global cosmic-ray dipole moment is present. Our code is well suited to test that hypothesis.

Primary author: POHL, Martin (DESY)

Co-author: RETTIG, Robert (University Potsdam)

Presenter: POHL, Martin (DESY)

Session Classification: Cosmic Rays

Track Classification: Cosmic Rays (Theory / Experiment)

Contribution ID: **74** Type: **not specified**

Ultra-high-energy emission from an evolving gamma-ray burst: neutrinos, cosmic rays, and gamma rays

Tuesday, 5 May 2015 16:12 (12 minutes)

Gamma-ray bursts (GRBs) are potential sources of ultra-high-energy neutrinos and, arguably, constitute the object class within which neutrino point sources may sooner be identified. For that reason, it is important to have a clear idea of what signals to expect from them. We present a model where the neutrino, gamma ray, and cosmic ray emission from the burst is made up of the superposition of emission from individual internal collisions, each one occurring at different sites within the relativistic jet of the burst, and at different stages of its evolution. As a result, collisions take place under a range of physical conditions, and we find that neutrino production through proton-photon interactions occurs predominantly in collisions around the photospheric radius, where the particle densities are higher; cosmic ray production occurs mainly in the central regions of the jet; and gamma-ray emission comes from collisions at large radii, where the optical depth is low enough for photons to be able to escape. We compute a new and robust minimal diffuse GRB neutrino flux prediction, which, in contrast to the calculations based on a single representative internal collision, is largely independent of GRB parameters other than the total energy emitted in gamma-rays and the fraction of that energy that is carried by cosmic-ray protons. While the current IceCube configuration will not be able to probe this flux, it might be within the reach of a high-energy extension of the detector.

Primary author: Dr BUSTAMANTE, Mauricio (CCAPP Ohio State University)

Co-authors: Dr MURASE, Kohta (Institute for Advanced Study); Dr BAERWALD, Philipp (Pennsylvania State University); Dr WINTER, Walter (DESY)

Presenter: Dr BUSTAMANTE, Mauricio (CCAPP Ohio State University)

Session Classification: Multi-Messenger

Track Classification: Multi-Messenger

Contribution ID: **75** Type: **not specified**

On Observing Anisotropy of Cosmic Neutrinos

Tuesday, 5 May 2015 14:40 (20 minutes)

The angular distribution of neutrino events provides constraints on the sources. One specific observable is the angular power spectrum. This presentation outlines new formal results that clarify the path toward measuring angular power spectra of cosmic neutrinos. We'll discuss the source information that such measurements would reveal.

Primary author: CAMPBELL, Sheldon (The Ohio State University)

Presenter: CAMPBELL, Sheldon (The Ohio State University)

Session Classification: Neutrino Astrophysics

Track Classification: Neutrino Astrophysics

Contribution ID: **76** Type: **not specified**

Astrophysical Sources of the IceCube Cosmic Neutrino Events

Tuesday, 5 May 2015 16:00 (20 minutes)

IceCube Neutrino Observatory has recently detected over 30 very high-energy neutrino events which are most likely of cosmic origin. Due to poor angular resolution of cascade-type events, which dominate the event list, identification of astrophysical source(s) as origin of these neutrino events is proving to be difficult. I will present a scenario where the detected cosmic neutrinos originate from Galactic and extragalactic sources.

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

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

Session Classification: Neutrino Astrophysics

Track Classification: Neutrino Astrophysics

Contribution ID: **77** Type: **not specified**

Search for Gamma-Ray Emission from DES Dwarf Spheroidal Galaxy Candidates with Fermi-LAT Data

Monday, 4 May 2015 15:30 (20 minutes)

Due to their proximity, high dark matter content, and apparent absence of non-thermal processes, Milky Way dwarf spheroidal satellite galaxies (dSphs) are excellent targets for the indirect detection of dark matter. Recently, eight new dSph candidates were discovered using the first year of data from the Dark Energy Survey (DES). We searched for gamma-ray emission coincident with the positions of these new objects in six years of Fermi Large Area Telescope data. We found no significant excesses of gamma-ray emission. Under the assumption that the DES candidates are dSphs with dark matter halo properties similar to the known dSphs, we computed individual and combined limits on the velocity-averaged dark matter annihilation cross section for these new targets. If confirmed, they will constrain the annihilation cross section to lie below the thermal relic cross section for dark matter particles with masses < 20 GeV annihilating via the b-bbar or tau+tau- channels.

Primary author: BECHTOL, Keith (KICP, University of Chicago)

Presenter: BECHTOL, Keith (KICP, University of Chicago)

Session Classification: Gamma Rays

Track Classification: High-Energy Gamma-Ray Astrophysics

Contribution ID: **78** Type: **not specified**

The Greenland Neutrino Observatory

Tuesday, 5 May 2015 14:00 (20 minutes)

The goals of the proposed Greenland Neutrino Observatory (GNO) are to measure the flux of ultra-high energy neutrinos and use this particle beam for tests of fundamental physics at energy scales that cannot be easily achieved on the Earth. The GNO concept exploits the Askaryan effect and the radio-transparency of glacial ice, which together enable hundred-cubic-kilometer volumes of ice to be monitored with sparse instrumentation. GNO will consist of an array of radio antenna stations deployed near Summit Station in central Greenland, atop a 3 km deep ice sheet. Analysis of field measurements indicate a radio attenuation length of approximately 1000 m at 300 MHz in the upper 1.5 km of ice. We are currently investigating the logistics of operating at Summit Station, assembling a prototype station to be deployed in summer 2015, and are developing simulation tools to optimize the design and configuration of the antenna stations.

Primary author: BECHTOL, Keith (KICP, University of Chicago)

Presenter: BECHTOL, Keith (KICP, University of Chicago)

Session Classification: Neutrino Astrophysics

Track Classification: Neutrino Astrophysics

Contribution ID: **79** Type: **not specified**

Detecting high-energy neutrinos with RADAR

Tuesday, 5 May 2015 14:20 (20 minutes)

Recently IceCube for the first time in history discovered high-energy cosmic neutrinos with energies up to several PeV, where at higher energies IceCube runs out of statistics. At even higher energies in the EeV region, even though no detection has been claimed so-far, the Askaryan radio detectors start to become sensitive. We discuss the radar detection technique as a new method to detect a high-energy neutrino induced particle cascade in ice. It is shown that using this method, it is feasible to detect high-energy neutrino induced particle cascades in ice with an primary neutrino energy threshold of several PeV. Therefore, the radar detection technique provides a very promising means to cover the currently existing sensitivity gap between several PeV where IceCube runs out of statistics and several EeV where the Askaryan radio detectors become sensitive.

Primary authors: O'MURCHADHA, Aongus (ULB/IIHE); HANSON, Kael (UW Madision / ULB); DE VRIES, Krijn (VUB/IIHE); MEURES, Thomas (ULB/IIHE)

Presenters: O'MURCHADHA, Aongus (ULB/IIHE); DE VRIES, Krijn (VUB/IIHE)

Session Classification: Neutrino Astrophysics

Track Classification: Neutrino Astrophysics

Contribution ID: **80** Type: **not specified**

The cosmic-ray air shower signal in Askaryan radio detectors

Monday, 4 May 2015 15:45 (15 minutes)

Recently it has been shown that the radio detection technique can be used as a new and complementary detection method for the detection of high-energy cosmic-ray-induced air showers. Along with the detection of the radio emission from air showers, it is shown that the emission can be predicted in great detail establishing the radio emission models. A cosmic-ray air shower hitting a surface, for example an ice-sheet, before it dies out in air will next to the in-air emission also induce a strong transition radiation component. We derived an analytical expression for this coherent transition radiation. This allows us to calculate the radio emission from high-energy cosmic-ray air showers hitting the ice before the shower dies out in air. This signal can be observed by the currently operating Askaryan radio detectors, like e.g. ARA or Arianna, where it is shown that without directional information or surface veto techniques it will be very hard to distinguish the air shower signal from an in-ice neutrino induced particle cascade of similar energy.

Primary author: DE VRIES, Krijn (VUB/IIHE)

Co-authors: VAN EIJNDHOVEN, Nick (VUB/IIHE); AONGUS, O'Murchadha (ULB/IIHE); SCHOLTEN, Olaf (KVI-CART/RUG/VUB/IIHE); BUITINK, Stijn (VUB); MEURES, Thomas (ULB/IIHE)

Presenter: DE VRIES, Krijn (VUB/IIHE)

Session Classification: Cosmic Rays

Track Classification: Cosmic Rays (Theory / Experiment)

Contribution ID: **81** Type: **not specified**

SIBYLL 2.3 and MCEq, a customizable numerical solver for atmospheric lepton fluxes

Tuesday, 5 May 2015 14:23 (23 minutes)

The precision of atmospheric lepton flux calculations is limited by various factors. One source of uncertainty is the parameterization of the primary cosmic ray flux. Typically, calculations are performed for a single atmospheric profile, approximating either a global atmosphere or one specific location. The control of uncertainties arising from hadronic interaction models is the most challenging part of these calculations. We have created an updated version of popular multi-purpose event generator SIBYLL, employing recent accelerator data together with atmospheric lepton measurements in the development process. It contains a model for production of charm quarks and it is thus tailored to the particular needs of current astroparticle physics research. The matrix cascade equation (MCEq) program is an open-source code for numerical calculations of the atmospheric muon and neutrino flux. The open-source code allows users to calculate fluxes in very high speed, using custom or pre-defined parameterizations of the primary cosmic-ray spectrum/composition and arbitrary atmospheric profiles. We will use this code to discuss inclusive lepton fluxes calculated with the current version of SIBYLL.

Primary author: FEDYNITCH, Anatoli (CERN/KIT)

Co-authors: RIEHN, Felix (KIT); ENGEL, Ralph (KIT); GAISSER, Thomas (University of Delaware); Dr STANEV, Todor (Bartol Research Institute, Dept of Physics and Astronomy, University of Delaware)

Presenter: FEDYNITCH, Anatoli (CERN/KIT)

Session Classification: Cosmic Rays

Track Classification: Cosmic Rays (Theory / Experiment)

Contribution ID: **83** Type: **not specified**

The Ordinary and the Wondrous: Neutrinos from Star-Forming Galaxies and from Extraterrestrial Megaprojects

Tuesday, 5 May 2015 15:09 (23 minutes)

Star-forming galaxies (SFGs) are among the most numerous extragalactic sources. I describe my results in calculating the extragalactic radiation from SFGs at all energies. I construct very simple models of galaxies using empirical relations like the Schmidt law to estimate the properties of galaxies, and then use basic one-zone models of radiative transfer to calculate the stellar, dust, supernovae, and nonthermal emission. My approach allows for a self-consistent calculation that allows me to compare the energetics of the gamma-ray and TeV/PeV neutrino backgrounds with the UV/IR and the MeV supernova neutrino backgrounds. I discuss the energetics issues that make it hard for SFGs to explain all of the IceCube PeV neutrino background.

Extraterrestrial beings (ETs) are among the most spectacular possible discoveries imaginable. If ETs wish to experimentally test Grand Unified or Planck scale physics, they could end up building particle accelerators bigger and brighter than stars. These could radiate high energy neutrinos, perhaps of far higher energy than ultra high energy cosmic rays. I describe current limits on Planck energy neutrinos from experiments and an indirect "W-burst" limit, and consider how we might build a much bigger effective YeV neutrino detection experiment. These limits indicate that particle accelerators (natural or artificial) with galaxy-scale luminosities are very rare, hosted by perhaps less than 1 in 10^4 SFGs.

Primary author: Dr LACKI, Brian (Institute for Advanced Study)

Presenter: Dr LACKI, Brian (Institute for Advanced Study)

Session Classification: Cosmic Rays

Track Classification: Cosmic Rays (Theory / Experiment)

Contribution ID: **84** Type: **not specified**

Neutrino Portal Dark Matter: From Dwarf Galaxies to IceCube

Tuesday, 5 May 2015 14:00 (23 minutes)

It has been suggested that the baseline scenario of collisionless cold dark matter over-predicts the numbers of satellite galaxies, as well as the dark matter (DM) densities in galactic centers. This apparent lack of structure at small scales can be accounted for if one postulates neutrino-DM and DM-DM interactions mediated by light O(MeV) force carriers. We consider a simple, consistent model of neutrinophilic DM with these features where DM and a "secluded" SM-singlet neutrino species are charged under a new U(1) gauge symmetry. An important ingredient of this model is that the secluded sector couples to the Standard Model fields only through neutrino mixing. We observe that the secluded and active neutrinos recouple, leading to a large relic secluded neutrino population. This relic population can prevent small-scale halos from collapsing, while at the same time significantly modifying the optical depth of ultra-high-energy neutrinos recently observed at Icecube. We find that the bulk of the parameter space accommodating an (a)symmetric thermal relic has potentially observable consequences for the IceCube high energy signal, with some of the parameter space already ruled out by the existing data. Future data may confirm this mechanism if either spectral absorption features or correlations with nearby sources are observed.

Primary authors: Dr FRIEDLAND, Alexander (LANL); Dr SHOEMAKER, Ian (CP3); Dr CHERRY, JJ (LANL)

Presenter: Dr CHERRY, JJ (LANL)

Session Classification: Dark Matter

Track Classification: Dark Matter (Theory / Experiment)

Contribution ID: **85** Type: **not specified**

Wave-Packet Treatment for Detection of Accelerator Neutrinos

Tuesday, 5 May 2015 15:10 (18 minutes)

Neutrinos are treated as point particles in Monte Carlo simulations for predicting detector counting rate. In this talk, a theoretical study on possible conflict between point-particle and wave-packet pictures in accelerator neutrino experiments will be presented. It is a quantum-mechanical phenomenon that neutrino wave packets spread as they propagate in space. The effect of longitudinal spreading on neutrino oscillation probabilities has been studied in various theoretical frameworks. However, comparatively less attention has been paid to the implication of transverse spreading of neutrino wave packets. In accelerator neutrino experiments, Lorentz boost restricts neutrinos from spreading in the forward direction, while the transverse spreading tends to "defocus" neutrinos from their classical paths. As a consequence, the transverse spreading smears the kinematic distribution of neutrinos from pion decay and could distort the measured neutrino energy spectrum. Our approach treats neutrinos as wave packets, for which the detector counting rate is derived using simple quantum-mechanical treatment. Considering the geometric setup and beam profile similar to the MINOS and NOvA experiments, we demonstrate that the transverse spreading of neutrino wave packets would result in a shifted energy spectrum from that predicted in point particle scenario if the wave packet acquires an initial transverse width less than approximately 10 fm from pion decay. Absence of such spectral shift in current or future near detector data could in turn constrain the initial transverse width of a neutrino wave packet from pion decay.

Primary author: Mr LI, Cheng-Hsien (University of Minnesota, Twin Cities)

Co-author: Prof. QIAN, Yongzhong (University of Minnesota, Twin Cities)

Presenter: Mr LI, Cheng-Hsien (University of Minnesota, Twin Cities)

Session Classification: Accelerator-Based Neutrino

Track Classification: Accelerator-Based Neutrino Physics

Contribution ID: **86** Type: **not specified**

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

Monday, 4 May 2015 16:30 (15 minutes)

High energy cosmic ray muons not only are backgrounds for high energy astrophysical neutrinos, they also produce serious background for low energy neutrino searches. When muons interact in detectors, their energy losses lead to nuclear breakup ("spallation") processes. The subsequent beta decays of unstable daughter nuclei mimic MeV neutrino signals. This background has been understudied in water detectors. We show how muons produce these spallations through showers, and 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 is in collaboration with Prof. John Beacom.

Primary author: LI, Shirley (The Ohio State University)

Presenter: LI, Shirley (The Ohio State University)

Session Classification: Cosmic Rays

Track Classification: Cosmic Rays (Theory / Experiment)

Contribution ID: **87** Type: **not specified**

MicroBooNE - a not-so-micro LArTPC

Wednesday, 6 May 2015 11:00 (30 minutes)

MicroBooNE is a short baseline neutrino experiment with a liquid argon time projection chamber (LArTPC) located 470m downstream of the proton target in the Fermilab Booster Neutrino Beam. The LArTPC detection technology delivers bubble-chamber image quality of the neutrino interaction with a fully automated triggering, readout and reconstruction chain. With sensitivity in the neutrino energy region between 100 MeV and 2 GeV, MicroBooNE is about to deliver a large statistic sample for interaction processes in the quasi-elastic and resonance regimes, much in demand for the theoretical understanding of neutrino interactions and how they are influenced by nuclear effects. The setup of MicroBooNE in an L/E region similar to the LSND and MiniBooNE experiments will further investigate their electron neutrino appearance measurements, potentially being an indication for the existence of sterile neutrino flavors. In particular, MicroBooNE will be able to resolve the nature of the yet unexplained excess of electron-like events in the energy region of 200 to 475 MeV observed by MiniBooNE.
MicroBooNE is also serving as a technology demonstrator for future liquid-argon experiments, such as the next long-distance neutrino oscillation experiment ELBNF, and it represents the first detector of Fermilab's short-baseline neutrino program (SBN).

Primary author: SCHUKRAFT, Anne (Fermilab)

Presenter: SCHUKRAFT, Anne (Fermilab)

Session Classification: MicroBooNE - a not-so-micro LArTPC

Track Classification: MicroBooNE - a not-so-micro LArTPC, Anne Schukraft, Fermilab

Contribution ID: **88** Type: **not specified**

Signatures of dark matter sterile neutrinos in core-collapse supernovae

Tuesday, 5 May 2015 14:23 (22 minutes)

The nature of dark matter and the explosion mechanism of core-collapse supernovae may both be explained by the presence of a sterile neutrino. Observations of galaxies and galaxy clusters are indicative of a ∼keV mass sterile neutrino. Oscillations between an electron neutrino and a sterile neutrino in the ∼keV mass range may provide an efficient energy transport mechanism between the proto-neutron star and stalled shock wave. We have performed simulations of core-collapse supernovae for a range of sterile neutrino masses and mixing angles that are consistent with dark matter. We have found that, for many choices of mass and mixing angle, the presence of a sterile neutrino is sufficient to enhance the neutrino reheating and result in a successful explosion.

Primary author: WARREN, MacKenzie (University of Notre Dame)

Co-authors: Prof. MATHEWS, Grant (University of Notre Dame); Dr HIDAKA, Jun (National Astronomical Observatory of Japan); Dr MEIXNER, Matthew (University of Notre Dame); Prof. KAJINO, Toshitaka (National Astronomical Observatory of Japan)

Presenter: WARREN, MacKenzie (University of Notre Dame)

Session Classification: Dark Matter

Track Classification: Dark Matter (Theory / Experiment)

Contribution ID: **89** Type: **not specified**

A measurement of the diffuse astrophysical muon neutrino flux using multiple years of IceCube data.

Monday, 4 May 2015 16:10 (20 minutes)

The IceCube Collaboration measured an all-flavor, high-energy astrophysical neutrino flux. In order to identify the sources of this flux, high-energy muon neutrinos are ideal messenger particles because of their excellent angular resolution. However, the first step is to confirm the observed flux in the muon neutrino channel using IceCube data from 2009 through 2014. The main background for this search are cosmic-ray-induced atmospheric muon neutrinos. High-purity neutrino event samples will be analyzed using a two-dimensional likelihood approach, taking full advantage of the information of neutrino energies and arrival directions with a consistent treatment of systematic uncertainties. The results of this analysis initially using IceCube data from 2009 through 2012 will be presented.

Primary authors: Mr RAEDEL, Leif (o=rwth,ou=Institutions,dc=icecube,dc=wisc,dc=edu); Mr SCHOENEN, Sebastian (o=rwth,ou=Institutions,dc=icecube,dc=wisc,dc=edu)

Presenter: Mr SCHOENEN, Sebastian (o=rwth,ou=Institutions,dc=icecube,dc=wisc,dc=edu)

Session Classification: Neutrino Astrophysics

Track Classification: Neutrino Astrophysics

Contribution ID: **90** Type: **not specified**

AMON Searches for Jointly-Emitting Neutrino + Gamma-Ray Transients

Tuesday, 5 May 2015 16:36 (12 minutes)

We present the results of archival coincidence analyses between public neutrino data from the 40-string and 59-string configurations of IceCube (IC40 and IC59) with contemporaneous public gamma-ray data from Fermi LAT and Swift. Our analyses have the potential to discover statistically significant coincidences between high-energy neutrinos and gamma-ray signals, and hence, possible jointly-emitting neutrino/gamma-ray transients. This work is an example of more general multimessenger studies that the Astrophysical Multimessenger Observatory Network (AMON) aims to perform. AMON, currently under development at Penn State, will link multiple current and future sensitive high-energy neutrino, cosmic rays and follow-up observatories as well as gravitational wave facilities. This single network enables near real-time coincidence searches for multimessenger astrophysical transients and their electromagnetic counterparts. During the talk, we will present the component high-energy neutrino and gamma-ray datasets, the statistical approaches that we used, and the results of analyses of the IC40/59+LAT and IC40/59+Swift datasets.

Primary author: KEIVANI, Azadeh (The Pennsylvania State University)

Presenter: KEIVANI, Azadeh (The Pennsylvania State University)

Session Classification: Multi-Messenger

Track Classification: Multi-Messenger

Contribution ID: **92** Type: **not specified**

The Present and Future of Long Baseline Neutrino Oscillations with T2K and DUNE

Wednesday, 6 May 2015 11:30 (30 minutes)

Neutrinos oscillate among flavors as they travel because a neutrino of a particular flavor is a also a superposition of multiple neutrinos with slightly different masses. The interferometric nature of oscillations allows this mixing the be measured, but it requires powerful neutrino sources and massive detectors. T2K, with the J-PARC neutrino beam and Super-Kamiokande as far detector, uses a narrow band, off-axis beam to make measurements of neutrino oscillations at an L/E precisely tuned to atmospheric-sector oscillations. DUNE (formerly ELBNF) will use an even more powerful, wide band, on-axis beam from Fermilab and a massive, underground liquid argon time projection chamber to measure atmospheric oscillations with unprecedented precision. Here I will present the latest oscillation results from the T2K experiment as well as the status of DUNE, and its prospects for addressing the questions which the current generation of experiments cannot.

Primary author: Dr HIMMEL, Alexander (Duke University)

Presenter: Dr HIMMEL, Alexander (Duke University)

Session Classification: The Present and Future of Long Baseline Neutrino Oscillations with T2K and DUNE

Track Classification: The Present and Future of Long Baseline Neutrino Oscillations with T2K and DUNE, Alexander Himmel, Duke

Contribution ID: **93** Type: **not specified**

Ultra-Fast Magnetic Sensing for Large-Area Detection of High Energy Particles

Monday, 4 May 2015 15:30 (15 minutes)

Cascades from high-energy particles produce a brief current and associated magnetic fields. Even sub-nanosecond duration magnetic fields can be detected with a relatively low bandwidth system by latching image currents on a capacitor. At accelerators, this technique is employed routinely by beam-current monitors, which work for pulses even as fast as femtoseconds. We discuss scaling up these instruments in size, to 100 meters and beyond, to serve as a new kind of ground- and space-based high-energy particle detector which can instrument large areas relatively inexpensively. This new technique may be used to detect and/or veto ultra-high energy cosmic-ray showers. It may also be applied to searches for hypothetical highly charged particles. In addition, these detectors may serve to search for extremely short magnetic field pulses of any origin, faster than other detectors by orders of magnitude.

Summary

A new large-area detection method is proposed, which is based on magentic detection.

Primary authors: Prof. SALTZBERG, David (University of California, Los Angeles); Mr SUN, Peihao (University of California, Los Angeles)

Presenter: Prof. SALTZBERG, David (University of California, Los Angeles)

Session Classification: Cosmic Rays

Track Classification: Cosmic Rays (Theory / Experiment)

Contribution ID: **94** Type: **not specified**

AMON: transition to real-time operations

Tuesday, 5 May 2015 16:48 (12 minutes)

The Astrophysical Multimessenger Observatory Network (AMON) will link the world's leading high-energy neutrino, cosmic-ray, gamma-ray and gravitational wave observatories by performing real-time coincidence searches for multimessenger sources from observatory subthreshold data streams. The resulting coincidences will be distributed to interested parties in the form of electronic alerts for real-time follow-up observation. We will present the science case, design elements, current and projected partner observatories, and status of the AMON project. Observatories that already signed the AMON Memorandum of Understanding (MoU) include the IceCube and ANTARES Neutrino Observatories, the HAWC and VERITAS gamma-ray observatories, the Pierre Auger Cosmic Ray Observatory and the Swift satellite experiment. AMON is an open network seeking new triggering and follow-up observatories, as well as collaborators interested in the scientific goals of AMON. The prototype of the AMON server has been online since August 2014 and processing archival data. Currently, we are deploying new high-uptime servers and will be ready to start issuing alerts as early as summer 2015. We will also discuss the primary results of implementing a new real-time analysis of the IceCube high-energy starting events (HESE) at the South Pole that will relay event positions for high-energy events to AMON.

Primary author: TEŠIĆ, Gordana (o=psu,ou=Institutions,dc=icecube,dc=wisc,dc=edu)

Presenter: TEŠIĆ, Gordana (o=psu,ou=Institutions,dc=icecube,dc=wisc,dc=edu)

Session Classification: Multi-Messenger

Track Classification: Multi-Messenger

Contribution ID: **95** Type: **not specified**

Searching for primordial black hole evaporation signal with AMON

Tuesday, 5 May 2015 16:24 (12 minutes)

Primordial black holes (PBHs) are expected to explode violently during the last few seconds of their lives, producing jets of high energy particles. These particles could be detected in coincidence by several observatories with large fields of view, such as IceCube and ANTARES (neutrinos), HAWC and Fermi LAT (gamma rays) and Pierre Auger (neutrons). The short temporal structure of the anticipated PBH evaporation signal provides a very low false positive rate for any possible detection. We will present the discovery potential of the Astrophysical Multimessenger Observatory Network (AMON) for PBH evaporation events. AMON aims to discover multimessenger transient sources by performing real-time and archival coincidence searches from multiple observatory subthreshold data streams. In this approach, a distinctive PBH evaporation signature may be probed by conducting coincidence analysis from a few years of subthreshold neutrino, gamma-ray and neutron data. Detection of PBHs would be a scientific breakthrough confirming Hawking's hypothesis of black hole radiation and cosmological models of phase transitions, and would allow us to probe physics at the highest energy scale as well as quantum gravity.

Primary author: TEŠIĆ, Gordana (o=psu,ou=Institutions,dc=icecube,dc=wisc,dc=edu)

Presenter: TEŠIĆ, Gordana (o=psu,ou=Institutions,dc=icecube,dc=wisc,dc=edu)

Session Classification: Multi-Messenger

Track Classification: Multi-Messenger

Contribution ID: **96** Type: **not specified**

Gamma Rays from Cosmic Ray Collisions with the Sun Observed with Fermi

Monday, 4 May 2015 16:10 (20 minutes)

The Sun is a bright gamma ray source due to interactions between cosmic rays and the solar atmosphere. These gamma rays were detected from 0.1 to 10 GeV by Fermi with 18 months of data, and were found to be in disagreement with theoretical predictions. In this work we update the measurement using 6 years of Fermi data. The improved statistics allow us to detect the gamma rays up to 100 GeV and discover new features in the gamma ray spectrum. This provides a solid basis for revisiting the theoretical modeling of cosmic ray interactions with the Sun. Thorough understanding of the hadronic gamma ray production process helps predicting the corresponding neutrino flux, which may allow the Sun to be detectable by IceCube.

Primary author: Mr NG, Kenny, Chun Yu (CCAPP, The Ohio State University)

Co-authors: Prof. PETER, Annika (CCAPP, The Ohio State University); ROTT, Carsten (Sungkyunkwan University); Prof. BEACOM, John (CCAPP, The Ohio State University)

Presenter: Mr NG, Kenny, Chun Yu (CCAPP, The Ohio State University)

Session Classification: Gamma Rays

Track Classification: High-Energy Gamma-Ray Astrophysics

Contribution ID: **97** Type: **not specified**

The status of Himalayan Gamma Ray Observatory (HiGRO)

Monday, 4 May 2015 16:30 (25 minutes)

Work on VHE gamma-ray astronomy using the Atmospheric Cherenkov Technique started in India way back in 1969,soon after the discovery of pulsars. The latest in this series of experiments is the HiGRO project located at very high altitude (4.3km), at Hanle in the Ladakh region of Himalayas. In the first phase of this project 7 telescope array called HAGAR was installed the year 2008. It is an array of wavefront sampling non-imaging telescopes having a threshold energy of about 200 GeV for gamma-rays. It is the first ACT array operating at very high altitudes. A 21-m imaging telescope (called MACE), built by BARC group, will be commissioned at the same site adjascent to HAGAR array in this year. With MACE, the threshold energy of gamma-rays is expec to be about a few tens of GeV. Regular observations of galactic and extra galactic objects using HAGAR are going on since October 2008. I shall describe the current status the HiGRO project at Hanle.

(on behalf of HiGRO Collaboration)

Primary author: Prof. ACHARYA, B. S. (WIPAC and Tata Institute of Fundamental Research)

Presenter: Prof. ACHARYA, B. S. (WIPAC and Tata Institute of Fundamental Research)

Session Classification: Gamma Rays

Track Classification: High-Energy Gamma-Ray Astrophysics

Contribution ID: **98** Type: **not specified**

The status of India-based Neutrino Observatory (INO)

Tuesday, 5 May 2015 16:45 (15 minutes)

In this talk I shall narrate our plans of building a new underground laboratory facility in southern India called India-based neutrino observatory (INO). A 50 kilo-ton magnetised Iron CALorimeter (ICAL)is one of the first experiments proposed to be housed in this observatory for the study of neutrino properties like mass hierarchy, precision measurement of oscillation parameters etc. using the atmospheric neutrinos. The details of this ICAL project and its present status will also be covered in this talk.

(on behalf of INO-ICAL Collaboration)

Primary author: Prof. ACHARYA, B. S. (WIPAC and Tata Institute of Fundamental Research)

Presenter: Prof. ACHARYA, B. S. (WIPAC and Tata Institute of Fundamental Research)

Session Classification: Non-Accelerator-Based Neutrino

Track Classification: Non-Accelerator-Based Neutrino Physics

Contribution ID: **99** Type: **not specified**

Origin of the ankle in the ultra-high energy cosmic ray spectrum and extragalactic protons below it

Tuesday, 5 May 2015 14:46 (23 minutes)

The sharp change in slope of the ultra-high energy cosmic ray (UHECR) spectrum around 10^9.6 GeV (the ankle), combined with evidence of a light but extragalactic component near and below the ankle and intermediate composition above, has proved exceedingly challenging to understand theoretically. We propose a mechanism whereby photo-disintegration of ultra-high energy nuclei in the region surrounding a UHECR accelerator naturally accounts for the observed spectrum and inferred composition at Earth. We discuss the conditions required to reproduce the spectrum above 10^8.5 GeV and the composition, which – in our model – consists below the ankle of extragalactic protons and the high energy tail of Galactic cosmic rays, and above the ankle of surviving nuclei from the extended source. Predictions for the spectrum and flavors of neutrinos resulting from this process will be presented, and also implications for candidate sources.

Primary authors: FARRAR, Glennys (New York University); ANCHORDOQUI, Luis (City University of New York); UNGER, Michael (New York University)

Presenter: ANCHORDOQUI, Luis (City University of New York)

Session Classification: Cosmic Rays

Track Classification: Cosmic Rays (Theory / Experiment)

Contribution ID: **100** Type: **not specified**

Waxman and Bahcall meet Auger in a single energy bin

Monday, 4 May 2015 15:30 (20 minutes)

Cosmic neutrinos with energies near 10^9 GeV and above are detectable with the Surface Detector array of the Pierre Auger Observatory. We report here on searches through Auger data from 1 January 2004 until 20 June 2013. No neutrino candidates were found, yielding a limit to the diffuse flux of ultra-high energy neutrinos that challenges the Waxman-Bahcall benchmark predictions.

Primary authors: ANCHORDOQUI, Luis (City University of New York); COLLABORATION, Pierre Auger (Av. San Mart´ın Norte 306, 5613 Malargu¨e, Mendoza, Argentina)

Presenter: ANCHORDOQUI, Luis (City University of New York)

Session Classification: Neutrino Astrophysics

Track Classification: Neutrino Astrophysics

Contribution ID: **101** Type: **not specified**

Atmospheric neutrinos from perturbative charm production and decay

Tuesday, 5 May 2015 14:00 (23 minutes)

The high energy atmospheric neutrino flux is dominated by charm production by cosmic ray interactions in the atmosphere, followed by their prompt decays. Using next-to-leading order QCD and several cosmic ray flux parameterizations, the prompt atmospheric neutrino flux is discussed, along with uncertainties associated with the perturbative evaluation.

Primary authors: Prof. STASTO, Anna (Pennsylvania State University); Dr BHATTACHARYA, Atri (University of Arizona); Prof. SARCEVIC, Ina (University of Arizona); Prof. RENO, Mary Hall (University of Iowa); Prof. ENBERG, Rikard (University of Uppsala)

Presenter: Prof. RENO, Mary Hall (University of Iowa)

Session Classification: Cosmic Rays

Track Classification: Cosmic Rays (Theory / Experiment)

Contribution ID: **102** Type: **not specified**

High-energy neutrinos from a nearby newborn pulsar

Tuesday, 5 May 2015 16:20 (20 minutes)

The electromagnetic wind of a fast-spinning pulsar provides favorable sites for cosmic ray acceleration from PeV to ultrahigh energies. We show that high-energy neutrinos are guaranteed to be produced in this system, when the accelerated particles interact with the dense baryons of the supernova ejecta. We study the light curves and energy spectrum of the neutrinos using both numerical and analytical methods. We find that the neutrino spectral index varies from 1.5 to 2, as a result of the interplay between the pulsar spin-down and the evolution of the supernova environment. We then discuss the impact of the chemical composition of the parent cosmic rays on the neutrino production. Moreover, we apply to the scenario to existing nearby young pulsars and find the corresponding neutrino flux consistent with the current non-detections. Finally, we explore the detectability of the high-energy neutrinos from future newborn pulsars in the Local Universe in light of current and next generation neutrino telescopes.

Primary author: FANG, Ke (University of Chicago)

Presenter: FANG, Ke (University of Chicago)

Session Classification: Neutrino Astrophysics

Track Classification: Neutrino Astrophysics

Contribution ID: **103** Type: **not specified**

Neutrinos from Galactic Microquasars

Tuesday, 5 May 2015 16:40 (20 minutes)

Motivated by recent IceCube observations we re-examine the idea that microquasars are high energy neutrino emitters. By stretching to the maximum the parameters of the Fermi engine we show that the nearby high-mass X-ray binary LS 5039 could accelerate protons up to above about 20 PeV. These highly relativistic protons could subsequently interact with the plasma producing neutrinos up to the maximum observed energies. After that we adopt the spatial density distribution of high-mass X-ray binaries obtained from the deep INTEGRAL Galactic plane survey and we assume LS 5039 typifies the microquasar population to demonstrate that these powerful compact sources could provide a dominant contribution to the diffuse neutrino flux recently observed by IceCube.

Primary author: Mr DA SILVA, Luiz (University of Wisconsin - Milwaukee)

Presenter: Mr DA SILVA, Luiz (University of Wisconsin - Milwaukee)

Session Classification: Neutrino Astrophysics

Track Classification: Neutrino Astrophysics

Contribution ID: **104** Type: **not specified**

First cosmogenic neutrino limits from the ARA detector at the South Pole

Monday, 4 May 2015 15:50 (20 minutes)

The Askaryan Radio Array (ARA) is an ultra-high energy (>100 PeV) cosmic neutrino detector which is in phased construction near the South Pole. ARA searches for radio Cherenkov-like emission from particle cascades induced by neutrino interactions in the ice using radio frequency antennas (~150-800MHz) deployed at a design depth of 200m in the Antarctic ice. A prototype ARA Testbed station was deployed at ~30m depth in the 2010-2011 season and the first three full ARA stations were deployed in the 2011-2012 and 2012-2013 seasons. We present the first neutrino search with ARA using data taken in 2011-2012 with the ARA Testbed, and 2011-2014 with the first full ARA stations along with the resulting constraints on the neutrino flux from 100 PeV to 100 EeV.

Primary author: Ó MURCHADHA, Aongus (o=ulb,ou=Institutions,dc=icecube,dc=wisc,dc=edu)

Presenter: Ó MURCHADHA, Aongus (o=ulb,ou=Institutions,dc=icecube,dc=wisc,dc=edu)

Session Classification: Neutrino Astrophysics

Track Classification: Neutrino Astrophysics

Contribution ID: **105** Type: **not specified**

Toward the Identification of the Cosmic Neutrino Origin

Tuesday, 5 May 2015 16:00 (12 minutes)

To reveal the origin of diffuse PeV neutrinos observed in IceCube, we need to identify a single source. I discuss various possibilities in light of current and future neutrino detectors, and show that many of the proposed scenarios including dark matter models can be critically tested. A natural and intriguing possibility is that >0.1 PeV neutrinos originate from cosmic-ray reservoirs like starburst galaxies and galaxy clusters. We emphasize that identifying gamma-ray counterparts is necessary to establish that they are neutrino emitters.

Primary author: Dr MURASE, Kohta (Institute for Advanced Study)

Presenter: Dr MURASE, Kohta (Institute for Advanced Study)

Session Classification: Multi-Messenger

Track Classification: Multi-Messenger

Contribution ID: **106** Type: **not specified**

Ultra-high energy cosmic rays

Tuesday, 5 May 2015 12:00 (30 minutes)

In this talk I will present recent results on the flux, composition and arrival directions of ultra-high energy cosmic rays from the Pierre Auger Observatory and the Telescope Array.
Furthermore, I will discuss the plans and prospects for astroparticle research at ultra-high energies within the next decade.

Primary author: Dr UNGER, Michael (New York University)

Presenter: Dr UNGER, Michael (New York University)

Session Classification: Ultra-High-Energy Cosmic Rays

Track Classification: Ultra-High-Energy Cosmic Rays, Michael Unger, NYU

Contribution ID: **107** Type: **not specified**

TeV Astrophysics at the HAWC Observatory

Monday, 4 May 2015 11:00 (30 minutes)

The field of TeV gamma-ray astrophysics is currently dominated by two types of air shower experiments: imaging air Cherenkov telescopes (IACTs), which conduct very sensitive but low-uptime pencil-beam surveys of the gamma-ray sky; and surface arrays, which are moderately sensitive but carry out synoptic surveys with high uptime. The High Altitude Water Cherenkov Observatory, or HAWC, is a surface array of 300 water Cherenkov detectors deployed 4100 m above sea level in Sierra Negra, Mexico. It is sensitive to cosmic rays and gamma rays between 100 GeV and 100 TeV, and observes two-thirds of the sky each day. HAWC is uniquely suited to study very high energy sources of cosmic rays and search for regions of extended gamma-ray emission. Because of its high uptime, HAWC will also play a crucial role in triggering multi-wavelength and multi-messenger studies of active galactic nuclei, gamma-ray bursts, and other transient sources. The observatory was completed in January 2015, but observations with the partially-finished detector began in July 2013. We will describe the first year of data collected with HAWC, which includes the observation of TeV emission from the Galactic Plane and other known Galactic sources, a number of AGN, and the anisotropy of cosmic rays at 1 TeV. We will also discuss the prospects for a robust multi-wavelength and multi-messenger program with HAWC.

Primary author: BENZVI, Segev (University of Rochester)

Presenter: BENZVI, Segev (University of Rochester)

Session Classification: TeV Astrophysics at the HAWC Observatory

Track Classification: TeV Astrophysics at the HAWC Observatory, Segev BenZvi, U of Rochester

Contribution ID: **108** Type: **not specified**

Stability Analysis of DM-Ice17

Tuesday, 5 May 2015 15:00 (15 minutes)

DM-Ice17, a 17 kg sodium iodide prototype detector for the proposed DM-Ice experiment, was deployed in the Antarctic Ice at the geographic South Pole in December 2010, and has been in operation since January 2011. I will present a stability analysis of three years of data, with a focus on sources of noise and time-dependent effects that could mimic or obfuscate a dark matter modulation. Due to the small mass of the detector, the analysis does not significantly probe dark matter regions of interest but does provide further evidence that the Antarctic ice provides an ideal location for dark matter annual modulation searches.

Primary author: PIERPOINT, Zachary (UW-Madison)

Presenter: PIERPOINT, Zachary (UW-Madison)

Session Classification: Dark Matter

Track Classification: Dark Matter (Theory / Experiment)

Contribution ID: **109** Type: **not specified**

Background from Cosmogenic Activation in the DM-Ice Dark Matter Experiment

Tuesday, 5 May 2015 14:45 (15 minutes)

DM-Ice is a quarter-ton-scale dark matter experiment planned for deployment deep in the ice at the South Pole. This experiment will search for the expected annual modulation signature in the dark matter signal using low-background NaI(Tl) scintillating crystals. Cosmogenic activation of the detectors during transport to and storage at the South Pole (altitude 9,301 feet) has the potential to produce long-lived radioisotopes which will add a significant source of background and threaten the discovery potential of this experiment. In data from the presently operating DM-Ice17 detectors, we examine decaying regions of the spectrum to identify activated isotopes and estimate activation effects. We compare these activation estimates to our simulation for the DM-Ice17 detectors and discuss the effects on the full-scale DM-Ice experiment.

Primary author: Mr PETTUS, Walter (University of Wisconsin - Madison)

Presenter: Mr PETTUS, Walter (University of Wisconsin - Madison)

Session Classification: Dark Matter

Track Classification: Dark Matter (Theory / Experiment)

Contribution ID: **110** Type: **not specified**

Muon-Induced Backgrounds in DM-Ice NaI(Tl) Dark Matter Detectors

Tuesday, 5 May 2015 15:15 (15 minutes)

DM-Ice is a NaI(Tl) experiment searching for an annually-modulating dark matter signal. The DM-Ice17 detector has successfully operated in the South Pole ice for three years, and R&D efforts for the full-scale detector are underway at FNAL and the Boulby Underground Laboratory. I present an analysis of the muon background in DM-Ice, including long-lived phosphorescence observed in both DM-Ice17 and DM-Ice37. The DM-Ice17 muon analysis also includes events that are coincident with IceCube. The expected annual modulation in the rate of muons is observed.

Primary author: HUBBARD, Antonia (University of Wisconsin, Madison)

Presenter: HUBBARD, Antonia (University of Wisconsin, Madison)

Session Classification: Dark Matter

Track Classification: Dark Matter (Theory / Experiment)

Contribution ID: **111** Type: **not specified**

Implications of IceCube's neutrino discoveries for ultrahigh-energy cosmic rays

Tuesday, 5 May 2015 17:12 (12 minutes)

The discovery by IceCube of the first high-energy neutrinos with plausible extraterrestrial origins is likely informing us about some of the most extreme environments in the Universe. I will discuss from a theoretical perspective what this new flux has already told us about the inner workings of the sources of extragalactic cosmic rays. Additionally, I will touch upon connections with a variety of other observations along with how these can be strengthened in coming years.

Primary author: Dr KISTLER, Matt (Stanford University)

Presenter: Dr KISTLER, Matt (Stanford University)

Session Classification: Multi-Messenger

Track Classification: Multi-Messenger

Contribution ID: **112** Type: **not specified**

Measurement of Muon Neutrino Disappearance with IceCube/DeepCore

Tuesday, 5 May 2015 16:15 (15 minutes)

New event reconstruction techniques have resulted in a high statistics atmospheric neutrino sample from the first three years of data from the complete IceCube Neutrino Observatory. The more densely instrumented DeepCore sub-array, with an energy threshold around 10 GeV, is very sensitive to the first atmospheric oscillation minima. I will present the current constraints on oscillation parameters θ_{23} and Δm_{32} from IceCube.

Primary author: DUNKMAN, Matt (o=psu,ou=Institutions,dc=icecube,dc=wisc,dc=edu)

Presenter: DUNKMAN, Matt (o=psu,ou=Institutions,dc=icecube,dc=wisc,dc=edu)

Session Classification: Non-Accelerator-Based Neutrino

Track Classification: Non-Accelerator-Based Neutrino Physics

Contribution ID: **113** Type: **not specified**

Star-Forming Galaxies as Sources of High Energy Neutrinos

Tuesday, 5 May 2015 17:00 (20 minutes)

We discuss the production of high energy neutrinos and gamma-rays in intensely star-forming galaxies. With our semi-analytic physical model of cosmic ray interactions, we analyze the radio and gamma-ray properties of nearby starburst galaxies using simplified astrophysical assumptions. Key physical processes in the models include pion production & decay, inverse Compton scattering, photon-photon interactions, and synchrotron emission. Results for nearby starburst galaxies demonstrate the utility of the model in predicting cosmic ray interaction rates and the subsequent production of energetic particles. These results also establish that even the most extreme star-forming systems are unlikely to be point sources of neutrinos, unless their cosmic ray spectrum flattens at high energies.

Primary author: YOAST-HULL, Tova (University of Wisconsin-Madison)

Co-authors: ZWEIBEL, Ellen (UW-Madison); GALLAGHER, J. S. (University of Wisconsin-Madison)

Presenter: YOAST-HULL, Tova (University of Wisconsin-Madison)

Session Classification: Neutrino Astrophysics

Track Classification: Neutrino Astrophysics

Contribution ID: **114** Type: **not specified**

Neutrinoless double beta decay with EXO-200

Tuesday, 5 May 2015 16:00 (15 minutes)

The Enriched Xenon Observatory (EXO-200) is one of the most sensitive searches for neutrinoless double beta decay (bb0v) in the world. With 175 kg of enriched liquid xenon (80% Xe-136) as both the source of decay and the detection medium, the experiment uses an ultralow background time projection chamber installed at the Waste Isolation Pilot Plant, a salt mine with a 1600 m water equivalent overburden. The EXO-200 detector has demonstrated excellent energy resolution and background rejection capabilities in setting a limit of 1.1x10^25 yr at 90% C.L. on the bb0v half-life of Xe-136. The current results from the two years of data-taking will be presented. Due to the success of EXO-200, the tonne scale next generation experiment, nEXO, is being developed with a target sensitivity to bb0v half-life of Xe-136 of 5x10^27 yr.

Summary

Talk on the status of the EXO-200 experiment and a little bit on nEXO.

Primary author: Dr YEN, Yung-Ruey (Drexel University)

Presenter: Dr YEN, Yung-Ruey (Drexel University)

Session Classification: Non-Accelerator-Based Neutrino

Track Classification: Non-Accelerator-Based Neutrino Physics

Contribution ID: **116** Type: **not specified**

Cosmology overview

Monday, 4 May 2015 14:00 (30 minutes)

Neutrinos produced in the early universe leave their imprint on the cosmic microwave background and on large scale structure. Current measurements add to our constraints on neutrino physics, and ambitious surveys over the coming decade aim to measure the sum of the neutrino masses. Beyond these goals, observations can detect cracks in the 3-neutrino paradigm and might even resolve long-standing cosmological anomalies.

Primary author: DODELSON, Scott (Fermilab/Chicago)

Presenter: DODELSON, Scott (Fermilab/Chicago)

Session Classification: Cosmology Overview

Track Classification: Cosmology Overview, Scott Dodelson, Fermilab/UChicago

Contribution ID: **117** Type: **not specified**

Status of the NOvA Experiment

Wednesday, 6 May 2015 12:00 (30 minutes)

The NOvA long-baseline neutrino oscillation experiment at Fermilab has transitioned from construction to operation, with the 14-kton Far Detector and the 0.3-kton Near Detector now collecting neutrino data. With it's full planned exposure, NOvA will make the most precise measurements to date of the atmospheric neutrino sector, and NOvA's 810-km baseline gives it a unique sensitivity among existing experiments for measuring the neutrino mass hierarchy, a critical missing piece of the neutrino framework. I will summarize the construction and commissioning of NOvA, current analysis activities, and the physics outlook of the experiment.

Primary author: PATTERSON, Ryan (California Institute of Technology)

Presenter: PATTERSON, Ryan (California Institute of Technology)

Session Classification: Status of the NOvA Experiment

Track Classification: Status of the NOvA Experiment, Ryan Patterson, CalTech

Contribution ID: **118** Type: **not specified**

Diffuse Neutrinos & Gamma Rays - Complementary Views on the High-Energy Universe.

Monday, 4 May 2015 14:30 (30 minutes)

Non-thermal processes in our cosmos have been studied for several decades through the observation of individual sources and diffuse emission in γ rays. However, the universe is transparent to γ rays only at MeV and GeV energies. Above 100 GeV, they are increasingly absorbed in interactions with the omnipresent radiation background from stars and the CMB. At TeV energies γ-ray observations are restricted to our local cosmic environment, at hundreds of TeV even to our own Galaxy.

Neutrinos fortunately do not have this limitation. They can travel cosmological distances and escape from dense environments without significant absorption. They are therefore our only direct probe of non-thermal processes above tens of TeV for most of the volume of our universe, and since their discovery by IceCube in 2013 available as an additional cosmic messenger.

I will review the current status of the observations of extragalactic γ rays and astrophysical neutrinos, followed by a discussion of what we can learn from these observations about the sites of cosmic-ray acceleration and the physics processes involved.

Primary author: ACKERMANN, Markus (o=desy-zeuthen,ou=Institutions,dc=icecube,dc=wisc,dc=edu)

Presenter: ACKERMANN, Markus (o=desy-zeuthen,ou=Institutions,dc=icecube,dc=wisc,dc=edu)

Session Classification: Diffuse Neutrinos & Gamma Rays - Complementary Views on the High-Energy Universe

Track Classification: Diffuse Neutrinos & Gamma Rays - Complementary Views on the High-Energy Universe, Markus Ackermann, DESY

Contribution ID: **119** Type: **not specified**

PROSPECT: a short-baseline reactor antineutrino measurement

Tuesday, 5 May 2015 16:30 (15 minutes)

There has been increasing tension between direct reactor antineutrino measurements and models of antineutrino production.
As a result, several collaborations have proposed to make high-resolution measurements of the reactor neutrino spectrum at a short baseline.
One such collaboration is PROSPECT (the Precision Reactor Oscillation SPECTrum measurement).
The goal is two-fold: a precision reactor antineutrino spectrum measurement and a sterile neutrino search.
The detector will be installed near the High Flux Isotope Reactor (HFIR) at Oak Ridge National Laboratory.
HFIR uses Highly Enriched Uranium which means a pure U-235 antineutrino spectrum.
An absolute measurement of this spectrum will constrain the current and future reactor models and improve our understanding of the total reactor antineutrino spectrum.
Additionally, the planned detector is sufficiently large to perform a search for sterile neutrinos on the eV scale.
Over the last year, PROSPECT has constructed and installed several prototypes in preparation for the final 2-ton Lithium-doped liquid scintillator detector.
This talk will describe the status of PROSPECT in its various stages and the predicted sensitivity of its measurements.

Primary author: Dr GILJE, Karin (Illinois Institute of Technology)

Presenter: Dr GILJE, Karin (Illinois Institute of Technology)

Session Classification: Non-Accelerator-Based Neutrino

Track Classification: Non-Accelerator-Based Neutrino Physics

Contribution ID: **120** Type: **not specified**

Fermi Results on High-Energy Gamma-Ray Sources

Monday, 4 May 2015 11:30 (30 minutes)

The Fermi Gamma-Ray Space Telescope has detected a variety of gamma-ray sources in the range 30 MeV to 300 GeV, many of which may be accelerating particles to PeV energies. I will review the results of observations of Galactic sources of high-energy gamma-rays such as pulsars and their nebulae, supernova remnants and gamma-ray binaries, as well as extragalactic sources such as active galaxies, starburst galaxies and gamma-ray bursts. Which of these may be sources of high-energy neutrinos will also be discussed.

Primary author: Dr HARDING, Alice (NASA Goddard Space Flight Center)

Presenter: Dr HARDING, Alice (NASA Goddard Space Flight Center)

Session Classification: Fermi Results on High-Energy Gamma-Ray Sources

Track Classification: Fermi Results on High-Energy Gamma-Ray Sources, Alice Harding, NASA GSFC

Contribution ID: **121** Type: **not specified**

Anisotropy in Cosmic Ray Arrival Directions Using IceCube and IceTop

Monday, 4 May 2015 16:00 (15 minutes)

We provide an update on the continued observation of anisotropy in the arrival direction distribution of cosmic rays in the southern hemisphere. The IceCube neutrino observatory recorded more than 250 billion events between May 2009 and May 2014. Subtracting dipole and quadrupole fit maps, we can use these increased statistics to see significant small-scale structure that approaches our median angular resolution of 3° . The expanded dataset also allows for a more detailed study of the anisotropy for various cosmic-ray median energies. The large-scale structure observed at median eneries near 20 TeV appears to shift around 100 TeV, with the high-energy skymap showing a strong deficit also present in IceTop maps of similar energies.

Primary author: MCNALLY, Frank (IceCube)

Presenter: MCNALLY, Frank (IceCube)

Session Classification: Cosmic Rays

Track Classification: Cosmic Rays (Theory / Experiment)

Contribution ID: **122** Type: **not specified**

Overview of JUNO

Wednesday, 6 May 2015 09:30 (30 minutes)

The Jiangmen Underground Neutrino Observatory (JUNO) is a multipurpose neutrino experiment aiming to determine the neutrino mass hierarchy and precisely measure the neutrino oscillation parameters by detecting reactor antineutrinos at ~50 km baselines using a 20-kiloton liquid scintillator detector placed at 1800-m.w.e deep underground. JUNO is also capable of observing supernova neutrinos, studying the atmospheric neutrinos, solar neutrinos, geoneutrinos, and other physics. The international collaboration of JUNO was established in 2014 and the civil construction has started in 2015. JUNO is planning to start data taking around 2020. The scientific opportunities and the status of JUNO will be presented in this talk.

Primary author: Dr ZHANG, Chao (Brookhaven National Laboratory)

Presenter: Dr ZHANG, Chao (Brookhaven National Laboratory)

Session Classification: Overview of JUNO

Track Classification: JUNO

Contribution ID: **123** Type: **not specified**

Neutrinoless Double Beta Decay: Status and Prospects of CUORE and KamLAND-Zen

Tuesday, 5 May 2015 11:30 (30 minutes)

Neutrinoless double beta decay ($0\nu\beta\beta$) is theoretically motivated but has never been observed. Its discovery would demonstrate lepton number violation, establish neutrinos are Majorana fermions and possibly constrain the absolute neutrino-mass\
scale.
The last decade has seen tremendous experimental progress in the search for this decay but to push the frontier forward improved detectors combining excellent energy resolution, extremely low background, and ton-yr exposures are required.
CUORE and KamLAND-Zen are meeting this challenge in two very different ways; the former with ^{130}Te in TeO_2 bolometers and the latter with ^{136}Xe-loaded liquid scintillator. In this talk I will give a brief overview of both these experiments\
and their status. In particular I will present recent results from CUORE-0, a single-tower prototype of the CUORE experiment and describe the onging Phase-II of KamLAND-Zen.

Primary author: Dr ODONNELL, Thomas (UC Berkeley and Lawrence Berkeley National Lab)

Presenter: Dr ODONNELL, Thomas (UC Berkeley and Lawrence Berkeley National Lab)

Session Classification: Neutrinoless Double Beta Decay

Track Classification: CUORE, Scott O'Donnell

Contribution ID: **124** Type: **not specified**

Liquid Argon TPCs for Neutrino Detection

Wednesday, 6 May 2015 10:00 (30 minutes)

As neutrino physics transitions into an era of precision measurements we need scaleable detectors which provide a detailed picture of how neutrinos interact with matter. Liquid Argon Time Projection Chambers (LArTPC) are one such detector technology, that combines both bubble chamber quality images with fine grained calorimetry. I will discuss how these detectors work and enable us to study a wide range of neutrino properties.

Primary author: Dr ZENNAMO, Joseph (University of Chicago)

Session Classification: Liquid Argon / NBNF

Track Classification: Liquid Argon / NBNF, Joseph Zennamo, UChicago

Contribution ID: **125** Type: **not specified**

Status of the Project 8 Experiment

Tuesday, 5 May 2015 14:36 (18 minutes)

Project 8 is developing a new approach to the tritium-endpoint method of direct neutrino mass measurement. First results from a proof-of-principle system demonstrate the Cyclotron Radiation Emission Spectroscopy technique by measuring the conversion electron spectrum of krypton-83m. I will provide an overview of the technique and released results, as well as future prospects.

Primary author: Mr LAROQUE, Benjamin (UC Santa Barbara)

Presenter: Mr LAROQUE, Benjamin (UC Santa Barbara)

Session Classification: Accelerator-Based Neutrino

Track Classification: Accelerator-Based Neutrino Physics

Contribution ID: **126** Type: **not specified**

Radio Detection of the Highest Energy Neutrinos

Monday, 4 May 2015 09:30 (30 minutes)

Ultra-high energy neutrino astronomy sits at the boundary between particle physics and astrophysics. Through neutrino astrophysics, we can probe the nature of the ultra-high energy universe in a unique way and test our understanding of particle physics at energies much greater than those achievable at particle colliders. The future of ultra-high energy neutrino detection lies with ground-based radio arrays, which would represent an enormous leap in sensitivity. I will discuss designs and plans for radio detection experiments that would discover cosmogenic neutrinos (peaking at ~100 PeV) even in the most pessimistic of GZK production models, and how to design a detector that would extend the IceCube detection of PeV astrophysical neutrinos to higher energies by using a radio phased array.

Primary author: VIEREGG, Abigail (o=research,ou=Institutions,dc=icecube,dc=wisc,dc=edu)

Presenter: VIEREGG, Abigail (o=research,ou=Institutions,dc=icecube,dc=wisc,dc=edu)

Session Classification: Radio Detection of the Highest-Energy Neutrinos

Contribution ID: **127** Type: **not specified**

Results from Telescope Array

Tuesday, 5 May 2015 10:00 (30 minutes)

I will present the latest results from Telescope Array including measurements of UHECR composition and anisotropy. I will present preliminary results at lower energies from TALE. Finally, I will present plans for TAx4 and for the Non-Imaging Cherenkov array (NICHE). NICHE and TALE provide the possibility of doing Cherenkov hybrid measurements in the energy region just above the Knee.

Primary author: Prof. BERGMAN, Douglas (University of Utah)

Presenter: Prof. BERGMAN, Douglas (University of Utah)

Session Classification: Telescope Array

Track Classification: Telescope Array, U of Utah

Contribution ID: **128** Type: **not specified**

Monitoring TeV Gamma-ray Sources for Flaring States with HAWC

Monday, 4 May 2015 15:50 (20 minutes)

The flux of many TeV gamma-ray emitters exhibits time variability. Detection of these flaring states across multiple wavelengths will lead to a better understanding of the acceleration processes occurring in the source. The High-Altitude Water Cherenkov (HAWC) Observatory is an extensive air-shower detector located near Pico de Orizaba in Mexico which is sensitive to TeV gamma rays. Designed as a survey instrument, the HAWC detector has a large field of view and nearly 100% uptime. This makes HAWC an ideal instrument to monitor sources for transient flaring states. We will present a method of monitoring sources using a Bayesian blocks algorithm to detect changes in the flux and report alerts in real time. We also discuss the sensitivity of the method using data from the construction phase of HAWC.

Primary author: Mr WISHER, Ian (University of Wisconsin - Madison)

Presenter: Mr WISHER, Ian (University of Wisconsin - Madison)

Session Classification: Gamma Rays

Track Classification: High-Energy Gamma-Ray Astrophysics

Contribution ID: **129** Type: **not specified**

KPipe: A Short-Baseline Muon-Neutrino Disappearance Experiment using Neutrinos from Kaon Decay-at-rest

Tuesday, 5 May 2015 14:54 (16 minutes)

Recently, anomalies consistent with neutrino oscillations with mass splittings on the order of 1 eV2 have been observed. These anomalies have been seen in experiments measuring nue appearance and nue/nue-bar disappearance, while no corresponding evidence for muon neutrino disappearance has been detected. A common interpretation of the anomalies involves postulating the existence of one or more "sterile" neutrinos that, unlike the three Standard Model neutrinos, do not interact via the electroweak force. While models with sterile neutrinos can explain the current data, they all require that some amount of muon neutrino disappearance must occur, with several models indicating that evidence for the process might have been just below the sensitivities of past experiments. In this talk, I present a new type of experiment that will search for muon neutrino disappearance at the Materials and Life Science Facility (MLF), which is a part of the JPARC accelerator complex in Tokai, Japan. The facility features a high intensity, pulsed beam of 3 GeV protons used to produce neutron, muons, and neutrinos for various experiments. In our proposal, we would measure mono-energetic neutrinos coming from kaon decay-at-rest with a detector consisting of a 3 m diameter by 90 m long pipe filled with liquid scintillator. This setup would aim to measure directly the L/E oscillation wave in the event rate along the length of the detector. Such a signal would provide convincing evidence for a sterile neutrino and avoids some of the difficulties in past experiments in characterizing the incoming neutrino flux and modeling neutrino-nucleus interaction cross sections.

Primary author: WONGJIRAD, Taritree (MIT)

Co-authors: CONRAD, Janet (MIT); SHAEVITZ, Michael (Columbia University)

Presenter: WONGJIRAD, Taritree (MIT)

Session Classification: Accelerator-Based Neutrino

Track Classification: Accelerator-Based Neutrino Physics

Contribution ID: **130** Type: **not specified**

Coherent Elastic Neutrino-Nucleus Scattering (CEvNS)

Tuesday, 5 May 2015 14:18 (18 minutes)

Low-energy neutrinos can have de Broglie wavelengths that are larger than target nuclei.
At these energies, coherent elastic neutrino-nucleus scattering (CEvNS) is predicted to be the dominant interaction, yet it remains unseen.
Measuring CEvNS is difficult because elastic scattering deposits very little energy in a detector and neutron backgrounds are difficult to control, especially at accelerators.
Nevertheless, a discovery measurement is the first part in a larger program to use the CEvNS interaction to understand supernova dynamics and detection, probe the weak interaction, and search for non-standard interactions and neutrino magnetic moments.
In this talk, I will highlight the physics motivations for measuring CEnuNS and two experimental efforts to discover it at accelerators.
The CENNS collaboration plans to use a large liquid argon detector near the Fermilab Booster Neutrino Beam in a far-off-axis configuration, and the COHERENT collaboration will use a number of low-energy-threshold detector technologies to measure CEvNS in a basement location at the Oak Ridge National Laboratory Spallation Neutron Source.

Primary author: Dr COOPER, Robert (Indiana University)

Presenter: Dr COOPER, Robert (Indiana University)

Session Classification: Accelerator-Based Neutrino

Track Classification: Accelerator-Based Neutrino Physics

Contribution ID: **131** Type: **not specified**

Recent results from MINERvA

Tuesday, 5 May 2015 14:00 (18 minutes)

Fermilab's MINERvA experiment is designed to make precision measurements of muon neutrino scattering cross sections on a variety of nuclear targets. Its 1-20 GeV energy range (which has since been increased for our current data-taking) should be of particular interest to PINGU. After introducing the MINERvA detector, I will describe several recently-published results that are already being used by the neutrino community to improve their modeling of neutrino interactions. There will also be a chance to look at interesting analyses that will be published in the coming months, and at the plans for MINERvA's longer-term future.

Primary author: PATRICK, Cheryl (Northwestern University)

Presenter: PATRICK, Cheryl (Northwestern University)

Session Classification: Accelerator-Based Neutrino

Track Classification: Accelerator-Based Neutrino Physics

Contribution ID: **132** Type: **not specified**

Neutrino Astronomy in the Mediterranean: Past, Present and Future

Monday, 4 May 2015 10:00 (30 minutes)

Efforts to exploit the waters of the Mediterranean Sea for neutrino
astronomy have been ongoing for about two decades. After a brief recognition of early history, some recent results of Antares will be presented, with a focus on the complementarity to the IceCube neutrino observatory. The Antares neutrino telescope has demonstrated that a nanosecond precision timing combined with the good optical properties of sea water can lead to high-precision all-flavour neutrino astronomy.
The first phase of a new generation deep-sea neutrino
telescope, KM3NeT, is being constructed and will consist
of 24 800 m high detection units, instrumented with 18 multi-PMT Digital Optical Modules (DOMs). The innovative design of the DOMs allow for good photon counting capabilities and a large angular acceptance. Subsequent phases (ARCA, phase-2) are foreseen to culminate in a multi-cubic kilometer scale neutrino detector in the Mediterranean. Current progress, including results from prototype lines, will be presented.

Primary author: Dr BRUIJN, Ronald (Universiteit van Amsterdam/Nikhef)

Presenter: Dr BRUIJN, Ronald (Universiteit van Amsterdam/Nikhef)

Session Classification: Nu Astronomy in the Mediterranean: Past, Present and Future

Track Classification: Km3Net, Roland Bruijn

Contribution ID: **133** Type: **not specified**

IceCube Present and Future

Monday, 4 May 2015 09:00 (25 minutes)

Presenter: Prof. BOTNER, Olga (Uppsala university)

Session Classification: IceCube Plenary

Track Classification: IceCube, Olga Botner, Uppsala

Contribution ID: **134** Type: **not specified**

Neutrinos from Gamma Ray Bursts in the IceCube and ARA Era

Tuesday, 5 May 2015 09:00 (25 minutes)

Session Classification: Neutrinos and GRBs

Track Classification: Neutrinos & GRBs, Dafne Guetta, ORT-Braude Carmiel OAR-INAF

Contribution ID: **135** Type: **not specified**

IceCube neutrinos: What we have learned

Tuesday, 5 May 2015 09:30 (30 minutes)

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Primary author: Prof. WAXMAN, Eli (Weizmann Inst.)

Presenter: Prof. WAXMAN, Eli (Weizmann Inst.)

Session Classification: IceCube's neutrinos: What have we learned?

Track Classification: IceCube's Neutrinos: What have we learned?, Eli Waxman, Weizmann Institute

Contribution ID: **136** Type: **not specified**

Reactor Neutrinos: Recent Results and Future Prospects

Wednesday, 6 May 2015 09:00 (30 minutes)

Presenter: Prof. HEEGER, Karsten (Yale University)

Session Classification: Reactor Neutrino Experiments

Track Classification: Reactor Neutrino Experiments, Karsten Heeger, Yale