2012 Users' Meeting Poster Session

Tuesday 12 June 2012 - Tuesday 12 June 2012

Fermilab

Book of abstracts

An updated search for electron neutrino and antineutrino appearance in MINOS

Board: 1

Presenter: SCHRECKENBERGER, Adam (University of Minnesota)

MINOS is a long-baseline neutrino oscillation experiment situated along Fermilab's high-intensity NuMI neutrino beam. MINOS is capable of searching for muon neutrino to electron neutrino transitions, observations of which would indicate a nonzero value for the neutrino mixing angle theta-13. A new study will analyze an additional 3.4e20 protons-on-target of mostly antineutrino data to look for the oscillation of muon antineutrinos to electron antineutrinos. A planned joint fit will also combine these antineutrino results with the full set of MINOS neutrino data, for the most sensitive MINOS measurement of theta-13 to date. The latest results for this analysis will be presented.

The NOvA Experiment

Board: 2

Presenter: LIU, Ji (College of William and Mary)

The NOvA experiment is designed to search for oscillations of muon neutrinos to electron neutrinos by comparing measurements of the NuMI beam composition in two detectors, a near detector at Fermilab and a far detector 810 kilometers away. These neutrino oscillations occur because the flavor eigenstates are rotated with respect to the mass eigenstates. By observing muon to electron neutrino transitions, we measure the parameter θ13. Additionally, NOvA can begin to study the mass ordering and search for the effects of the CP violating phase. NOvA is particularly well suited to the study of the mass ordering due to the large amount of earth between the neutrino source and the detector. In this poster, I will review the status of the experiment including updates on the construction as well as recent data from the NOvA Near Detector Prototype.

Long Term Performance of the MINOS Calibration Procedure

Board: 3

Presenter: SHARMA, Richa (Panjab University, Chandigarh/ Fermilab)

The MINOS detectors are steel-scintillator sampling tracking calorimeters
and are calibrated using an in-situ light-injection system and cosmic ray muons. The MINOS near and far detectors have been operating almost continuously since 2003 and 2005, providing opportunity to quantify the behavior of the various detector components, many of which are used in the next generation neutrino oscillation experiments, under long-term experimental operation. We will report on the calibration procedure and its stability, as well as the time and temperature dependencies of the scintillator, wavelength-shifting fibers and photo-multiplier tubes.

The MINERvA Test Beam Experiment

Board: 4

Presenter: MARSHALL, Chris (University of Rochester)

The MINERvA experiment aims to make precision measurements of low energy neutrino interactions, both in support of neutrino oscillation experiments and as a pure weak probe of the nuclear medium. Hence the MINERvA Test Beam (TB) experiment was designed to serve as a calibration for the calorimetric observables used in the analysis of interactions in MINERvA. A low-energy tertiary beam line was especially designed for this experiment and is now part of the Fermilab Test Beam Facility. The beam line provided identified charged particles (muons, pions and protons) within a momentum range of 0.4-1.2 GeV. The TB detector, a replica of the MINERvA detector on a smaller scale, took data in this beam line from June-July 2010, in two different configurations - tracking and calorimetric.

The goal is to provide MINERvA with a precise calibration of the hadronic response. In this poster, we present preliminary results on the calibrations of the TB detector from data taken during the 2010 detector run. We also report on the in-situ calibration of the MINERvA detector and how the TB energy scale measurements help set the energy scale of the neutrino detector.

Calibration and Reconstruction in the NOvA Detectors

Board: 5

Presenter: ARRIETA DIAZ, Enrique (Michigan State University)

The NOvA long-baseline neutrino experiment will study electron neutrino appearance using two high-resolution, fully active scintillator detectors: a Near Detector at Fermilab and a Far Detector at Ash River MN. Precision measurements of neutrino oscillations with these detectors require careful calibration and sophisticated event reconstruction techniques. This poster presents the detector energy calibration scheme and discusses the strategy planned for the reconstruction of neutrino events. The performance of these routines will be demonstrated using cosmic and neutrino data collected in the Near Detector On the Surface prototype currently taking data at Fermilab.

Combined Measurement of the Beam and Atmospheric Neutrino Oscillation Parameters from the MINOS Experiment

Board: 6

Presenter: MESQUITA DE MEDEIROS, Michelle (Federal University of Goias)

The Main Injector Neutrino Oscillation Search (MINOS) experiment at Fermilab uses a long-baseline neutrino beam in order to study neutrino oscillations. The near detector is placed 1 km from the target while the far detector is situated 735 km away from the target. Both detectors are magnetized allowing the charge determination of the particle being detected. The far detector is also used for the study of atmospheric neutrinos created by cosmic ray interactions in the atmosphere. Analyses from both beam and atmospheric neutrino and anti-neutrino data have been published by the MINOS collaboration. A combination of all these data will yield improved confidence limits on the oscillation parameters. Here, we present preliminary results from a combined oscillation analysis of the MINOS atmospheric and beam neutrino data. The final goal of this analysis is the combination of all MINOS atmospheric and beam data into a four-parameter oscillation analysis.

Environmental Effects on TPB Wavelength Shifting Coatings

Board: 7

Presenter: CHIU, Christie (MIT)

The future neutrino detector MicroBooNE at Fermilab will rely on liquid argon scintillation of wavelength 128 nm for the trigger, as well as for determining the time and location of neutrino events. To better detect this light, we use tetraphenyl butadiene (TPB) embedded in polystyrene which shifts the light to a peak wavelength of 425 nm. Although we would like to store TPB for several weeks at a time, we have observed that they degrade significantly after only one day. We examined environmental effects on TPB degradation by tracking the performance of several plates placed in different conditions with varying light exposure and humidity levels. Several preventative measures were also evaluated; the results of each study and recommendations for proper TPB storage are presented.

Search for Dark Matter and Large Extra Dimensions in Monojet Events in pp Collisions at sqrt(s)=7 TeV

Board: 8

Presenter: VERGILI, Mehmet (Cukurova University)

A search for dark matter particles and large extra dimensions in events with an energetic jet and an imbalance in transverse momentum is performed in a sample of pp collision data corresponding to an integrated luminosity of 5.0 fb-1collected at a center-of-mass energy of 7 TeV with the CMS detector at the LHC. The data are in good agreement with the expected contributions from standard model processes. Constraints on the dark matter-nucleon scattering cross sections are determined in models relevant to spin-independent and spin-dependent interactions. For the spin independent model, these are the most constraining limits for a dark matter particle with mass below 3.5 GeV/c2, a region unexplored by direct detection experiments. For the spin-dependent model, these are the most stringent constraints over the 1–400 GeV/c2 mass range. The constraints on the Arkani-Hamed, Dimopoulos, and Dvali model parameters MD determined as a function of the number of extra dimensions are also an improvement over the previous results.

Search for Higgs Boson Produced in Association with a Vector Boson Using Like-Sign Dilepton Events at CDF

Board: 9

Presenter: YAMATO, Daisuke (Osaka City University)

We present a search for the neutral Higgs boson produced in associated with a vector boson using high-p_{T} isolated like-sign dilepton events in $p\bar{p}$ collisions at $\sqrt{s}$ = 1.96 TeV. The data were collected with the CDF-II detector at the Fermilab Tevatron collider. We employ the Boosted Decision Tree technique for separating the backgrounds from signal events to improve the search sensitivity. No signal is observed in the CDF data and we set limits on the production rate of the Higgs boson in the standard model and in an alternative fermiophobic scenario.

Search for high mass resonances decaying to ttbar in the lepton+jets channel

Board: 10

Presenter: KHALATYAN, Samvel (University of Illinois at Chicago)

We perform a model-independent search for the production of heavy resonances with mass greater than 1 TeV decaying to top quark pairs. Using data samples corresponding to ~5.0 fb−1 of integrated luminosity of pp collision data recorded with the CMS experiment in 2011 at sqrt(s) = 7TeV, we select events containing one lepton (electron or muon) and at least two jets and look for excesses above standard model background prediction in the top quark pair invariant mass spectrum. The high transverse momenta of the top quarks originating from such decays result in an event topology which requires a dedicated event selection and reconstruction of the invariant top quark pair mass. We use a $\chi 2$ method in the reconstruction and selection of top quark pairs and apply b-tagging to improve sensitivity. In the absence of evidence for a signal, we evaluate 95% CL. upper limits on $\sigma(pp \rightarrow Z' \rightarrow t\ tbar) \cdot BR$ as a function of the invariant mass of the resonance.

Nuclear Physics with MINERvA

Board: 11

Presenter: Mr. TICE, Brian (Rutgers, The State University of New Jersey)

The MINERvA experiment is a precision neutrino experiment designed to improve our understanding of the neutrino-nucleus interaction. The experiment uses a fully active scintillation detector to allow full event reconstruction and includes passive targets helium, water, carbon, iron and lead. Ratios of inclusive charged current event rates in carbon, iron, lead and scintillator will be show.

Measurement of B_c lifetime

Board: 12

Presenter: SONG, Hao (University of Pittsburgh)

The lifetime of the B_{c}^{-} meson is measured using the exclusive $B_{c}^{-} \rightarrow J/\psi~\pi^{-}$} decay with data from $p\overline{p}$ collisions with an integrated luminosity of 6.7~fb^{-1} recorded by the CDF detector at the Fermilab Tevatron. This is the first measurement of the B_{c}^{-} meson lifetime in a fully-reconstructed hadronic channel, and the result is in agreement with previous results. The lifetime of the B_{c}^{-} meson is measured to be: $c\tau$(\bc) = 136~$\pm$~14(stat)~$\pm$~8(syst)~μm

Particle Production Measurements using the MIPP Detector at Fermilab

Board: 13

Presenter: MAHAJAN, Sonam (Panjab University, Chandigarh, India)

The Main Injector Particle Production (MIPP) Experiment at Fermilab is a hadron production experiment which uses 120 GeV/c primary protons from the Main Injector to produce secondary beams of charged pions, kaons, proton and anti-proton from 5 GeV/c to 90 GeV/c. It was designed to measure the total charged particle production of pions, kaons, protons and anti-protons using beams of charged pions, kaons, proton and anti-proton on nuclear targets. The MIPP measures particle production cross sections off various nuclei including Hydrogen, MINOS target and thin targets of Beryllium, Carbon, Bismuth and Uranium. It is a full acceptance spectrometer which provides charged particle identification for particles from 0.1 to 120 GeV/c using Time Projection Chamber (TPC), Time of Flight (ToF), multicell Cherenkov (CKOV), and Ring Imaging Cherenkov (RICH) detectors and Calorimeter for neutrons.
We will describe the physics motivation to perform such cross section measurements and highlight the impact of hadronic interaction data on neutrino physics such as accelerator-based neutrino measurements with MINOS. Recent results on the analysis of NuMI target and forward neutron cross sections are presented. We will also present preliminary inelastic cross section measurements for interaction of proton at different energies with Liquid Hydrogen target and Carbon target having 2 % interaction length. We describe a new method to correct for low multiplicity inefficiencies in the interaction trigger using KNO scaling. Cross sections as a function of multiplicity and total cross sections are also presented for these two targets. The cross sections measured from the MIPP data are compared with the cross sections predicted from the Monte Carlo.

Study of K$_{S}^{0}$, Λ and $\bar{\Lambda}$ production at the Main Injector Particle Production Experiment at Fermilab

Board: 14

Presenter: SINGH, Amandeep (Department of Physics, Panjab University, Chandigarh)

The Main Injector Particle Production (MIPP) experiment at Fermilab is a full acceptance spectrometer to measure hadronic particle production using beams of $\pi^{\pm}$, $\rm{K^{\pm}}$, p and $\rm{\bar{p}}$ ranging in momentum from 5 to 120 GeV/c on several targets, for example liquid Hydrogen, Beryllium, Carbon, Bismuth, Uranium and NuMI. The experiment has excellent charged particle identification for particles of momentum from 0.1 to 120 GeV/c using Time Projection Chamber (TPC), Time of Flight (ToF), multicell Cherenkov, RICH detector and Calorimeters. A technique to reconstruct K$_{S}^{0}$, Λ and $\bar{\Lambda}$ has been developed and is being studied. This poster describes the method for V-finder, fitter and presents the preliminary results from the interaction of 58 GeV/c $\pi^{\pm}$, $\rm{K^{\pm}}$, p and $\rm{\bar{p}}$ on liquid Hydrogen target and 120 GeV/c protons on Carbon target.

SeaQuest - Overview and Current status

Board: 15

Presenter: TADEPALLI, Arun (Rutgers, The State University of New Jersey)

The E906/SeaQuest experiment is a fixed target experiment that uses the 120 GeV proton beam extracted from the Main Injector at Fermilab. It is the newest Drell-Yan measurement that is aimed at enriching our knowledge about the sea structure of the nucleon. In a Drell-Yan process, a quark from a proton beam annihilates with an anti-quark from a proton target producing a virtual photon, which decays into a di-muon pair. The SeaQuest forward spectrometer is optimized for detecting the high rate oppositely charged muons and thus measures the Drell-Yan cross section with an improved luminosity. Comparison of the Drell-Yan cross section from proton-proton and proton-deuterium reactions is our tool for probing the anti-quark asymmetry in the nucleon sea. The current measurements were tuned to improve the previous dbar/ubar asymmetry measurements and extended them to high Bjorken-x. The Spectrometer was commissioned between March and April 2012, and hence finished the first period of data-taking before the scheduled Fermilab accelerator upgrade. In my poster, I will be presenting an overview of the experiment and the current status of the commissioning.

The MicroBooNE Experiment at Fermilab

Board: 16

Presenter: KLEIN, Ellen (Yale)

MicroBooNE is a 170 ton Liquid Argon Time Projection Chamber (LArTPC) that will take data in the Booster Neutrino Beam at Fermilab starting in 2014. The experiment's design and physics goals, including resolution of the MiniBooNE low energy excess are presented. Research and design goals for a proposed, large-scale LArTPC are also presented.

The EMC Effect and Database Storage at SeaQuest

Board: 17

Presenter: DANNOWITZ, Bryan (University of Illinois at Urbana-Champaign)

The E-906/SeaQuest experiment is a fixed-target experiment at Fermilab that hopes to shed some light on the decades-old mystery of the EMC effect via analysis of the high-x Drell-Yan process. In this poster, I briefly discuss the background of the EMC effect, our projected results range, and the centralized SQL database structure we've assembled for data storage and analysis.

Charged-Current Quasi-Elastic Neutrino Scattering in MINERvA

Board: 18

Presenter: CHVOJKA, Jesse (University of Rochester)

MINERνA (Main INjector Experiment for ν-A) is a neutrino scattering experiment in the NuMI high-intensity neutrino beam at the Fermi National Accelerator Laboratory. MINERvA was designed to make precision measurements of low energy neutrino and antinuetrino cross sections on a variety of different materials (plastic scintillator, C, Fe, Pb, He and H2 O). We present the current status of the charge current quasi-elastic scattering in plastic scintillator as well as muon reconstruction efficiencies.

The Advanced Superconducting Test Accelerator at Fermilab

Board: 19

Presenter: Mr. PROKOP, Christopher (Northern Illinois University)

The Advanced Superconducting Test Accelerator (ASTA) at Fermilab is a superconducting linear electron accelerator currently undergoing construction at FNAL's New Muon Laboratory is planned to support a variety of user and Advanced Accelerator R (AARD) experiments. First beam is scheduled for 2012, and the beamline will be upgraded over the course of several years.

Studies of the Twin Helix Parametric-Resonance Ionization Cooling Channel with COSY INFINITY

Board: 20

Presenter: MALONEY, James (Northern Illinois University)

A primary technical challenge to the design of a high luminosity muon collider is an effective beam cooling system. An epicyclic twin-helix channel utilizing parametric-resonance ionization cooling (EPIC) has been proposed for the final 6D cooling stage. A proposed design of this twin-helix channel is presented that utilizes correlated optics between the horizontal and vertical betatron periods to simultaneously focus transverse motion of the beam in both planes. Parametric resonance is induced in both planes via a system of helical quadrupole harmonics. Ionization cooling is achieved via periodically placed wedges of absorbing material, with bi-periodic rf cavities restoring longitudinal momentum necessary to maintain stable orbit of the beam. COSY INFINITY is utilized to simulate the theory at first order. The motion of particles around a hyperbolic fixed point is tracked. Comparison is made between the EPIC cooling channel and standard ionization cooling effects. Cooling effects are measured, after including stochastic effects, for both a single particle and a distribution of particles.

High Brigtness Electron Source Laboratory

Board: 21

Presenter: PANUGANTI, Harsha (Northern Illinois University)

High Brightness Electron Source Laboratory (HBESL) is scheduled to be constructed by re-configuring the A0 Photo-injector at Fermi Lab in collaboration with NIU. The goal of the facility is to produce high brightness electron beams from photoemission using ultra-short laser pulses (few femtoseconds). The applications of high brightness electron beams include but not limed to the medical, industrial and biochemistry fields of research. Construction of ultra-fast lasers and characterization, electron beam diagnosis and numerical simulation of electron beams through beam line components are an integral part of HBESL.

Building the Next Generation of Particle Accelerators: Atomic Scale Insight to the Mechanisms of Cavity Limitation

Board: 22

Presenter: FORD, Denise (Fermilab and Northwestern University)

Linear particle accelerators composed of superconducting radio-frequency cavities will be used in future high energy physics projects, such as Project-X and the International Linear Collider, and can be used for other applications, such as neutron sources and nuclear waste management. The materials science of the particle accelerator is at the core of optimizing both the performance of the accelerating structure and its production procedure. For example, impurities can be absorbed into a cavity's surface during chemical processing and form structures that affect the cavity's quality factor. My research involves building atomic scale models of niobium, which composes niobium superconducting radio-frequency cavities, and analyzing their properties via density functional theory calculations. The studies that will be presented provide insight to the effects that cavity production processes, such as electropolishing and low temperature baking, have on the cavity's structure and resulting performance.

The Muon Ionization Cooling Experiment

Board: 23

Presenter: LANE, Peter (Illinois Institute of Technology)

The Muon Ionization Cooling Experiment (MICE) aims to demonstrate the feasibility of preparing a high brilliance muon beam, a key prerequisite for future neutrino factories and muon colliders. Given the muon rest-frame lifetime of 2.2 μs, the only practical method for preparing such beams is ionization cooling. This uses an energy absorbing material to reduce the emittance (size) of a muon beam while maintaining relativistic speeds along the beam axis using RF cavities for re-acceleration. MICE is an accelerator physics experiment which relies on particle physics detectors to measure and identify the muons one by one. The first stage of the experiment comprised of just the detectors is complete and initial beam emittances have been measured. The next stage will include absorbers with first emittance reduction results anticipated in 2013. To fully characterize ionization cooling, a suite of simulation software tools is being developed that will allow detailed comparisons of reconstructed beam characteristics with measurements. This software will also be vital during the design of the aforementioned neutrino factories and muon colliders.

Possible Beam Driven Dielectric Wakefield Acceleration at ASTA

Board: 24

Presenter: LEMERY, Francois (Northern Illinois University)

Wakefield acceleration has recently received much interest due to large acceleration gradients and cost effectiveness. We present experimental plans to use the unique pulse shaping capabilities of ASTA, to study slab-symmetric dielectric lined waveguides with flat and longitudinally ramped drive bunches. We present simulation results and a preliminary experimental setup.

Development of a 10 Picosecond Resolution Time-of-flight Detector

Board: 25

Presenter: HOWLEY, Ian (UT-Arlington)

At the University of Texas, Arlington, we have been leading the development of an ultra-precise timing detector as part of the ATLAS Forward Proton detector (AFP), which is part of the recently approved ATLAS Phase I upgrade.
The AFP system incorporates position and timing detectors into specialized movable beam pipe sections upstream and downstream from ATLAS, and along with the LHC magnets forms a set of high resolution momentum spectrometers, enhancing the physics capabilities of ATLAS. This timing detector has unprecedented accuracy on the 10 ps scale, providing rejection against the combinatoric background arising from the overlap of several proton-proton collisions in the same bunch crossing. We give an overview of the Cherenkov-based fast timing detector, describe the micro-channel plate photomultipliers under development, and present results from beam and laser tests.

Studies of Variation of Rated For Nuclear Decay

Board: 26

Presenter: CANCELO, Martina (Fermi National Accelerator Laboratory)

Neu-Rad is an experiment set up to investigate observed variation in isotope decay rates correlated with the earth-sun distance and solar flares. Isotope decay rates will be observed near high flux neutrino sources with energies similar to what is observed from the sun. The isotope decay rates are recorded using a Ge detector. Initial measurements using a Sr-90 source in the laboratory will be shown.

Study of multiple partonic interactions in D0

Board: 27

Presenter: GOLOVANOV, Georgy (JINR, Dubna, Russia)

Samples of photon+3jet and photon+2jet events collected by the D0 experiment
are used to study processes with multiple parton interactions. The obtained data sets allow us to measure (a) fraction of events with double and triple parton interactions; (b) effective cross section, a scale parameter related to the parton density inside the nucleon; and (c) cross sections of photon+2(3)jets events as a function of the angle between transverse momentum of the photon+leading jet and momentum of one (two) other jets.

Search for Higgs boson in final states with lepton, missing energy, and at least two jets using b-jet identification in 9.7 fb−1 of Tevatron data

Board: 28

Presenter: LI, Dikai (Paris U., VI-VII)

We present a search for the Higgs boson in final states with a charged lepton missing energy, and two or three jets using b-jet identification in data corresponding to 9.7 fb−1 of integrated luminosity collected with the D0 detector at the Fermilab Tevatron. The search is primarily sensitive to WH to lvbb production, though all Higgs contributions are considered. For MH = 115 GeV we set a 95% C.L. upper limit on the production of a standard model Higgs boson of 3.96* SM cross section, while we expect a set a limit of 3.15× SM cross section.

Measurement of Triple Differential Photon Plus Jet Cross Section in ppbar Collisions at 1.96 TeV in D0

Board: 29

Presenter: VERKHEEV, Alexander (JINR)

A measurement of triple differential cross sections for the production of a photon plus a jet is presented for a photon transverse momenta in the range of 20-400 GeV with photon rapidities of |y^gamma|< 1.0 and 1.5<|y^gamma| < 2.5 and four jet rapidities up to |y^jet| < 3.2. The results are based on a data sample of 9 fb-1 of integrated luminosity accumulated during June 2006 – September 2011 in ppbar collisions at sqrt(s) =1.96 TeV and recorded with the DØ detector at the Fermilab Tevatron Collider. The measured triple differential cross section should allow to check a gluon PDF in a wide x-Q^2 kinematical range.

Measurement of the Forward-Backward charge asymmetry using Zee events @ D0

Board: 30

Presenter: YANG, Siqi (University of Science and Technology of China)

We present a measurement of the forward- backward charge asymmetry for dielectron produced via an intermediate Z/gamma* boson with mass between 50~1000GeV, using about 5fb-1 data collected by the D0 detector in ppbar collisons. And also extract the weak mixing angle and Z-light quark couplings.

New Nuclear Technology to Produce Inexpensive Diesel Fuel from Natural Gas and Renewable Carbon

Board: 31

Presenter: Dr. FLANAGAN, Gene (Muons, Inc.)

The long-range goal of this project is to sell intrinsically safe and versatile nuclear reactors to address world energy needs. The first application is an Accelerator-Driven Subcritical Reactor that burns non-enriched Uranium, Thorium, or spent fuel from conventional nuclear reactors in a molten salt fuel to produce high-temperature heat to convert Natural Gas and Carbon into liquid fuel for vehicles. This green technology uses only domestic sources and reduces the carbon footprint of all vehicles, where construction and operating expenses imply diesel fuel production at $2/gallon. The project involves the development and interfacing between known technologies that 1) use a superconducting RF accelerator to produce an intense source of neutrons to 2) generate process heat in a molten-salt-fueled subcritical nuclear reactor to 3) prepare natural gas and renewable carbon for the Fischer-Tropsch generation of petroleum products. The project includes 1) reducing accelerator construction and operating expenses, 2) integration of the molten-salt reactor technology developed at ORNL with an internal spallation neutron target, 3) construction and test of a molten-salt to gas process heat transfer model device and 4) attracting private funding and DOD interest to build the first plant.

Helical Muon Beam Cooling Channel Engineering Design

Board: 32

Presenter: Dr. FLANAGAN, Gene (Muons, Inc.)

The Helical Cooling Channel (HCC), a novel technique for six-dimensional (6D) ionization cooling of muon beams, has shown considerable promise based on analytic and simulation studies. However, the implementation of this revolutionary method of muon cooling requires new techniques for the integration of hydrogen-pressurized, high-power RF cavities into the low-temperature superconducting magnets of the HCC. We present the progress toward a conceptual design for the integration of 805 MHz RF cavities into a 10 T Nb3Sn based HCC test section. We include discussions on the pressure and thermal barriers needed within the cryostat to maintain operation of the magnet at 4.2 K while operating the RF and energy absorber at a higher temperature. Additionally, we include progress on the Nb3Sn helical solenoid design.

Complete Muon Cooling Channel Design and Simulations

Board: 33

Presenter: Dr. YOSHIKAWA, Cary (Muons, Inc.)

Considerable progress has been made in developing promising subsystems for muon beam cooling channels to provide the extraordinary reduction of emittances required for an energy-frontier muon collider. However, it has not yet been demonstrated that the various proposed cooling subsystems can be consolidated into an integrated end-to-end design. Presented here are concepts to address the matching of emittances between subsystems through an extension of the theoretical framework of the Helical Cooling Channel (HCC), which allows a general analytical approach to guide the transition from one set of cooling channel parameters to another.

Bunch Coalescing in a Helical Channel

Board: 34

Presenter: Dr. YOSHIKAWA, Cary (Muons, Inc.)

A high-luminosity Muon Collider requires bunch recombination for optimal luminosity. We take advantage of the large slip factor attainable in a helical transport channel (HTC) to coalesce bunches of muons into a single one over a shorter distance than can be achieved over a straight channel.

Bethe-Heitler Muon Backgrounds at a Muon Collider

Board: 35

Presenter: Dr. KAHN, Stephen (Muons, Inc.)

Multi-TeV muon colliders are an important option for a future energy frontier lepton collider. Muon decays are a major source of beam induced backgrounds that can affect the physics seen in a muon collider. Beam induced backgrounds from muon decays include hadrons from photo-nuclear interactions, coherent and incoherent beam-beam pair production and Bethe-Heitler (B-H) muon production. The B-H muons can penetrate the collider ring magnets and shielding and can enter into the detector region.

MINOS+: Running the MINOS Detectors with the Medium Energy NuMI Beam

Board: 37

Presenter: Dr. PAHLKA, Benton (Fermilab PPD/Neutrino)

MINOS+ is a neutrino oscillation experiment that will utilize the two MINOS detectors and the NuMI neutrino beam to probe sterile neutrino physics, measure neutrino time-of-flight, search for tau neutrino appearance, test for non-standard neutrino interactions, and probe for extra dimensions. It will expand on the successful MINOS physics program by running in the medium-energy setting of the NuMI beam which is projected to deliver about 18x10^{20} protons on target during the first three years of operation in the 4-10 GeV energy range. This experiment offers unprecedented and unique opportunities to explore physics beyond the three-neutrino mixing model. We describe the physics reach of MINOS+ and present results of sensitivity studies to the aforementioned topics as well as the standard neutrino mixing parameters.

Improved Time-Keeping for Neutrino Time-of-Flight Measurements

Board: 38

Presenter: Dr. PAHLKA, Benton (Fermi National Accelerator Laboratory)

Measurement of the particle time of flight involves knowing the transit distance traveled and knowing the transit time. The transit time in turn depends upon time-keeping and time-stamping devices located at widely the separated detectors which mark the start and finish location for the transit. The MINOS experiment has recently upgraded the time-keeping and time-stamping devices to improve upon the neutrino time of flight measurement reported in 2007. The new system provides the ability to constantly measure, monitor and record the delays, phases and stability of the time-stamping devices. A procedure for "loop" calibration of time-keeping devices is also utilized.

Non-oscillation measurement with NOvA detectors

Board: 39

Presenter: Dr. NOWAK, Jaroslaw (Univeristy of Minnesota)

The NuMI Off-Axis electron neutrino Appearance experiment (NOvA) is a long-baseline neutrino oscillation experiment and the flagship project of the Intensity Frontier initiative of the Fermi National Laboratory. The NOvA experiment has started taking data with a near detector prototype placed in a surface building in November 2010. The far detector of the NOvA experiment is currently under construction and will be located in Ash River, 810 km away from Femilab and 14 mrad off the beam axis. The totally active scintillator detector is designed to identify electron neutrinos that result from the oscillation of beam muon neutrinos.
Besides the main physics goals of measuring oscillation parameters NOvA detectors are sensitive to make a number of non-oscillation measurements e.g. supernovae, magnetic monopoles, atmospheric neutrinos, neutrino magnetic moment, axion-like particle (ALP), hidden section photons. Some of the non-oscillation measurements require special data-driven triggers, which select signal candidates to be safe for later analysis.
The algorithm for the data-driven triggers and examples of NOvA detectors sensitivities for non-oscillation measurements will be presented.

CMS Fast Simulation

Board: 40

Presenter: Dr. RAHMAT, Rahmat (University of Mississippi)

A framework for Fast Simulation of particle interactions in the CMS detector has been developed and implemented in the overall simulation, reconstruction and analysis framework of CMS. It produces data samples in the same format as the one used by the Geant4-based (henceforth Full) Simulation and Reconstruction chain; the output of the Fast Simulation of CMS can therefore be used in the analysis in the same way as other ones. The Fast Simulation has been used already for several physics analyses in CMS, in particular those requiring a generation of many samples to scan an extended parameter space of the physics model (e.g. SUSY). Other use cases dealt with by the Fast Simulation of CMS are those involving the generation of large cross-section backgrounds, and samples of manageable size can only be produced by events skimming based on the final reconstructed objects, or those for which in general a large computation time is foreseen. An important issue, related with the high luminosity achieved by the LHC accelerator, is the pileup. The Fast Simulation of CMS can further take into account the superposition of as many pileup events as the ones provided now or even expected in the LHC upgrades, in an extremely shorter computation time than the one required by the Full Simulation for the same task, with just a few shortcuts which will be also discussed here. Comparisons of the Fast Simulation results both with the Full Simulation and CMS data will also be shown, to demonstrate the level of accuracy achieved so far.

The Dark Energy Camera (DECam) and Spectroscopic Instrument (DESpec)

Board: 41

Presenter: Dr. DIEHL, Tom (Fermilab)

The Dark Energy Survey (DES) is a next generation optical survey aimed at understanding the expansion rate of the universe using four complementary methods: weak gravitational lensing, galaxy cluster counts, baryon acoustic oscillations, and Type Ia supernovae. To perform the survey, the DES Collaboration is building the Dark Energy Camera (DECam), a 3 square degree, 520 Megapixel CCD camera that will be mounted at the prime focus of the Blanco 4-meter telescope at the Cerro Tololo Inter-American Observatory (CTIO). The construction of DECam is nearly finished. Integration and testing has commenced at Fermilab with the camera mounted on a “Telescope Simulator”. Some components have already been received at CTIO. In addition, members of the DES Collaboration have been evaluating the physics prospects and design options of the Dark Energy Survey Upgrade, for which the instrument is a multi-fiber spectrometer, called DESpec. This poster will concentrate on the present status of DECam and the expected start of survey operations and describe initial concepts for DESpec.

NOvA Electron Neutrino Appearance Measurement

Board: 42

Presenter: NINER, Evan (Indiana University)

One of the main goals of the NOvA experiment is measuring the appearance of electron (anti)neutrinos in a muon (anti)neutrino beam. The Daya Bay and RENO experiments have recently provided significant constraints on this oscillation parameter, measuring it to be non-zero in excess of 5σ with a global average of $\sin^2 2\theta_{13} = 0.092 \pm 0.012$. In light of these results this poster will show NOvA’s projected sensitivity to measuring electron neutrino appearance in the current run plan. Through this oscillation channel NOvA has some reach in determining the mass hierarchy and the cp violating phase factor. The experiment’s sensitivity to these parameters will also be shown.

Updated results on sterile neutrinos at MINOS

Board: 43

Presenter: Dr. MATHIS, Mark (College of William and Mary)

The phenomenon of neutrino oscillations is the first evidence for physics beyond the standard model. Some experiments have shown hints of oscillations involving a fourth, sterile neutrino flavor. In long baseline experiments such as MINOS, oscillations involving sterile neutrinos could cause a deficit in the neutral current event rate. In this poster we describe measurements of the neutral current energy spectrum in two detectors separated by 735km and interpret the results in a neutrino mixing framework with 3 active + 1 sterile neutrino.

Using Large-Area Picosecond Photo Detector in the Water Cherenkov Detector

Board: 44

Presenter: XIN, Tian (Iowa State University)

The next generation of neutrino experiments will require massive and/or high resolution detectors to reach the sensitivity needed to measure CP violation in the lepton sector and the neutrino mass hierarchy. The Large-Area Picosecond Photo Detector (LAPPD) Collaboration is developing new methods to fabricate 8in-square thin planar micro channel plate photosensors, which have shown to have excellent spatial and timing resolution. By using these devices in Water Cherenkov detector, people could significantly improve the background rejection and the vertex reconstruction. We present preliminary results on the reconstruction capabilities for single particles in Water Cherenkov detectors.

400MeV H- Beam Profile Measurement at MTA using Chromox-6 Scintillation Screen and CCD Camera

Board: 45

Presenter: Dr. JANA, Mukti (Fermi National Accelerator Laboratory)

High intensity, low emittance muon beams are essential requirements for Muon Colliders and Neutrino Factories. Low emittance muon beams can be produced by Ionization Cooling process. This consists of passing muon beams through low-Z ionization absorber material (H), to reduce all components momentum and replacing only longitudinal momentum using RF cavity. In the same time to keep muon beam focused, both the absorbing material and RF cavity are placed inside strong magnetic field provided by superconducting solenoid. One of the beam cooling schemes is under development at MuCool Test Area (MTA), Fermilab using highly pressurized hydrogen gas RF cavity. Experiment has been done to study the Beam loading effect in High Pressure RF (HPRF) cavity with 400 MeV H- beam. When the energetic proton beam passes through the cavity, it ionizes the inside gas and produces the electrons. These electrons consume RF power inside the cavity. Number of electrons produced per cm inside the cavity (at 950 psi Hydrogen gas) per incident proton is ~ 1200. The measurement of beam position and profile are essential requirement in this experiment. MTA is flammable gas (Hydrogen) hazard zone and no energized beam monitor device can be use when magnet is ON due to safety reason. We have developed a passive beam diagnostic system using Chromox-6 scintillation screen and CCD camera. This paper shall present quantitative information about beam position and beam profile. Neutral density filter was used to avoid saturation of CCD camera. Image data is filtered and fitted with Gaussian function to compute the beam size. The beam profile obtained from scintillation screen shall be compared with multi-wire beam profile.

Muon Neutrino Physics with NOvA

Board: 46

Presenter: ZIRNSTEIN, Jan (University of Minnesota)

The NuMI Off-axis electron neutrino Appearance (NOvA) experiment provides a powerful tool for examining exotic neutrino-matter effects, as well as precision measurements of traditional oscillation parameters. Its 810 km baseline, from FNAL to Ash River, MN, off-axis location, and run plan, uniquely position it to measure differences in oscillation probabilities of muon neutrinos and muon antineutrinos traversing matter. Shown in the poster are sensitivities of NOvA to the asymmetry of those parameters. In addition, the muon neutrino analysis will give precision measurements of the magnitude of the mass splitting and theta23, possibly aiding in determining the mass hierarchy and CP violating phase angle.

Measurement of the Neutrino Time of Flight at MINOS

Board: 47

Presenter: Dr. ANGHEL, Ioana (Argonne Lab/Iowa State University)

The MINOS experiment uses two detectors separated by 734km between Fermilab and the Soudan Underground Laboratory. A new measurement of the neutrino Time of Flight (TOF) was conducted between the two detectors. This analysis extends the initial measurement based on Run I data published in PhysRevD in 2007, benefitting from the statistics accumulated during 6 years of data taking. The systematics of the published analysis are reevaluated and the recent detailed studies of the timing system and of its performance significantly improved the precision of the measurement. We present the results of the neutrino TOF measurement obtained with two different analysis methods: the first one essentially identical to the one adopted in 2007, and a second one that fits the relative time and resolution to a distribution resulting from folding over the booster batches in the NuMI spill.

Measurement of the top quark mass in ppbar collisions using events with two leptons

Board: 48

Presenter: LIU, Huanzhao (Southern Methodist University)

We present a measurement of the top quark mass in ppbar collisions at sqrt(s)=1.96 TeV using ttbar events with two leptons and accompanying jets in 4.3 fb-1 of data collected with the D0 detector at the Fermilab Tevatron collider. We analyze the kinematically underconstrained dilepton events by integrating over their neutrino rapidity distributions. We reduce the dominant systematic uncertainties from the calibration of jet energy using a correction obtained from ttbar-->lepton+jets events. We also correct jets in simulated events to replicate the quark flavor dependence of the jet response in data. In combination with our previous analysis we measure mtop=174.0+/-2.4(stat)+/-1.4(syst) GeV.

Search for ZH-->llbb production in ppbar collisions at D0

Board: 49

Presenter: JIANG, Peng (USTC Hefei, China)

We present a search for a standard model (SM) Higgs boson produced in association with a Z boson in 9.7 fb−1 of ppbar collisions, collected with the D0 detector at the Fermilab Tevatron at sqrt(s)=1.96 TeV. Selected events contain one reconstructed Z-->ee or Z-->mumu candidate and at least two jets, including at least one b-tagged jet. The data are consistent with the background expected from other SM processes. Upper limits at 95% C.L. on the ZH production cross section times branching ratio are set for Higgs boson masses 100 < MH < 150 GeV. The observed (expected) limit for MH = 115 GeV is a factor of 3.7 (4.2) larger than the SM prediction.