The State of the Standard Model and Higgs Searches

JOHN HOBBS
Stony Brook University — The Standard Model of particle physics successfully describes the large number of experimental measurements related to the electroweak interaction. The status of Standard Model parameters are summarized, highlighting recent results from the CDF and D0 experiments at the Tevatron p+p collider. The constraints these impose on the as yet undiscovered Higgs boson are described. Recent results from the Standard Model Higgs boson search currently underway at the Fermilab Tevatron are presented.

LAURA REINA
Florida State University — A theoretical overview of Higgs boson physics based on ongoing Tevatron searches and existing LHC studies will be presented, with emphasis on the interplay and complementarity of the two colliders in elucidating the nature of electroweak symmetry breaking.

STEVE MCMAHON
Science and Technology Facilities Council, UK — In this talk I will review the prospects for Standard Model and Higgs Physics in both the ATLAS and CMS experiments at the LHC. I will also mention the timeline for the start of the LHC machine and operational plans for the next few years.

Studies of First Tracks in the CMS Pixel Detector

ANDREW YORK
US CMS — During 2008 the silicon pixel detector of the CMS experiment at LHC has participated in cosmic particle measurements which provided several 100 millions of charged muon tracks. This allowed commissioning of the reconstruction software and extensive data quality monitoring. Afterwards, detector alignment properties such as pixel residuals and pixel efficiencies were determined. I will discuss the detector studies during this talk.

Advantages of Digital Calorimetry

EDWIN NORBECK
BURAK BILKI
YASAR ONEL
University of Iowa, DHCAL COLLABORATION — A sampling calorimeter has absorber plates interleaved with particle detectors. Good energy resolution requires a large sampling fraction and detectors with excellent energy resolution. However, for a minimum ionizing particle (MIP) the energy lost in an absorber plate and detector is known. In this case the detector needs only to indicate the passage of the particle, a “1” or a zero, hence the name “digital calorimeter.” The transverse position resolution must be good enough so that usually only one MIP hits a detector pixel. If a MIP interacts to produce several MIPs, a computer program will track the particles back to the vertex to determine the number of MIPs in pixels near the vertex. A single MIP may be on the edge between two pixels and register in both, or it may be below threshold and pass through a pixel without being recorded. Elaborate computer programs, including particle flow algorithms, are needed to extract the energy from the digital data. A calorimeter with a shape of a cubic meter is being constructed that will consist of 40 layers with 10,000 pixels in each detector, for a total of 400,000 single-bit channels. This is an “imaging” calorimeter that will measure jet energies better than is possible with a conventional analog calorimeter.

CMS-ECAL detector performance with 2008 data

JASON HAUPT
University of Minnesota — The precision timing of the CMS-ECAL detector was determined and verified from 2008 beam data and with a laser monitoring system. This talk will discuss the data and the methods employed to accurately time in the detector with respect to collisions.

Techniques for the Identification of Cosmic and Beam Halo Muons in the CMS ECAL Detector

MICHAEL BALAZS
University of Virginia, CMS COLLABORATION — Energetic cosmic muons or muons from beam halo can produce photons as they pass through the CMS Electromagnetic Calorimeter (ECAL) and fake secondaries from beam-beam interactions. The pattern of photons or secondaries in the ECAL is different from the pattern of light produced by secondaries. Secondaries from the interaction point hit a crystal approximately perpendicular to the face because the crystals in the ECAL are rotated such that they point back approximately to the interaction point. Muons from the beam halo, on the other hand, will transverse multiple crystals producing a distinctive pattern of light. In addition to the shower pattern, shower timing can be used to distinguish muon signals from the secondaries. The photons from cosmic muons will be asynchronous with the beam allowing them to removed while photons from beam halo muons will have a very specific time distribution determined by geometric factors with respect to the interaction time. These techniques will be discussed in this talk.

Application of a Novel Multi-Pixel Solid State Photon Detector to the T2K P0D

DANIEL RUTERBORIES
BRUCE BERGER
DAVID WARNER
ROBERT WILSON
Colorado State University — The Pi-Zero sub-detector (P0D) of the T2K off-axis near detector (ND280) will utilize novel silicon-based photosensors. The MPPCs (Multi-Pixel Photon Counters) are a custom design manufactured for T2K by Hamamatsu Photonics. The P0D is designed to measure muon neutrino interactions on a water target. It is a highly-segmented detector with 10,400 photosensors instrumenting the fiber readout of 80 layers of plastic scintillator. In this presentation, we describe the photosensor performance manufactured for T2K by Hamamatsu Photonics. The P0D is designed to measure muon neutrino interactions on a water target. It is a highly-segmented detector with 10,400 photosensors instrumenting the fiber readout of 80 layers of plastic scintillator. In this presentation, we describe the photosensor performance manufactured for T2K by Hamamatsu Photonics.

Alignment of the ATLAS Inner Detector tracking system

JOHN ALISON
University of Pennsylvania, ATLAS COLLABORATION — The CERN’s Large Hadron Collider (LHC) is the world largest particle accelerator. It will collide two proton beams at an unprecedented center of mass energy of 14 TeV. ATLAS is equipped with a charge particle tracking system built on two technologies: silicon and drift tube based detectors, composing the ATLAS Inner Detector (ID). The alignment of the tracking system poses a challenge as one should solve a linear equation with almost 36,000 degrees of freedom. The required precision for the alignment of the most sensitive coordinates of the silicon sensors is just few microns. This limit comes from the requirement that the misalignment should not worsen the resolution of the track parameter measurements by more than 10%. So far the proposed alignment algorithms are tested on several applications. We will present the outline of the alignment approach and results from Cosmic Ray runs and large scale computer simulation of physics samples mimicking the ATLAS operation during real data taking. The full alignment chain is tested using that stream and alignment constants are produced and validated within 24 hours. Cosmic ray data serves to produce an early alignment of the real ATLAS Inner Detector even before the LHC starts.
12:09PM B9.00008 Tracking Performance of the ATLAS Inner Detector, TOMPKINS LAUREN, BEATE HEINEMANN, UC Berkeley, ATLAS COLLABORATION — The ATLAS experiment is one of the large scale experiments designed to explore high energy collisions at the Large Hadron Collider, a proton-proton accelerator with a center of mass energy of 14 TeV. Tracking of the individual particle trajectories in the ATLAS experiment is provided by the Inner Detector. It consists of three layers of silicon pixel detectors, four layers of silicon strip detectors, and a transition radiation tracker comprised of straw proportional tubes, which provides both tracking and transition radiation detection. In preparation for collision data the ATLAS experiment has taken large amounts of cosmic ray data that have been used to calibrate and align the tracking detectors. In this presentation we will show the observed tracking performance of the Inner Detector in cosmic ray data and compare it to the expected performance for collisions using simulated data. We will examine resolutions, efficiencies and mis-identification rates to paint a picture of the tracking performance in both early data and at the detector’s design luminosity.

12:21PM B9.00009 Commissioning of CMS Endcap Muon System, ELIZABETH BROWNELL, Northeastern University — This talk is as an overview of the evolution and current state of commissioning work on the CMS endcap muon system. I intend to highlight the progress in operating the detector, some problems encountered and solutions developed, lessons learned in the process, points which still require action to be taken, and data taking results.

12:33PM B9.00010 Calibration and Rate Measurements of a Digital Hadron Calorimeter, BURAK BILKI, EDWIN NORBECK, YASAR ONEL, University of Iowa, JOSE REPOND, LEI XIA, Argonne National Laboratory, CALICE/DHCAL COLLABORATION — The calibration procedure of a finely granulated Digital Hadron Calorimeter (DHCAL) with Resistive Plate Chambers (RPCs) as active element is performed with a stack of nine layers exposed to the Fermilab test beam. The broad-band muon beam is used for calibration. Measurement of rate capability of RPCs is performed with proton beams of variable intensity. Performance parameters of the RPCs such as the efficiency and the pad multiplicity are investigated as a function of beam and detector specifications.

Saturday, May 2, 2009 1:30PM - 3:18PM — Session C2 DPF: The State of Neutrino Physics Plaza D

1:30PM C2.00001 The State of the Neutrino Mass Spectrum, MORGAN WASCKO, Imperial College London — The discovery of neutrino flavor oscillation has definitively shown that neutrinos have non-zero mass, in contradiction to the Standard Model of particle physics. However, oscillation experiments can only reveal the differences between the mass states, not the absolute values of the masses. A full understanding of neutrino mass requires a broad suite of experiments. Measuring the absolute mass values of neutrinos is of fundamental importance to particle physics, astrophysics and cosmology. In this talk, we will review the current state of neutrino mass measurements from neutrino oscillation experiments, beta decay endpoint experiments and neutrinoless double beta decay searches.

2:06PM C2.00002 Some Recent Developments in Theoretical Neutrino Physics, BELEN GAVELA, Universidad Autonoma de Madrid — This abstract is not available.

2:42PM C2.00003 The State of the Neutrino Mixing Matrix, PATRICIA VAHLE, College of William and Mary — The observation of neutrino flavor oscillation proves that the neutrino must have mass and implies that the description of the neutrino does not just involve the three familiar neutrino states, \( \nu_e, \nu_\mu, \) and \( \nu_\tau, \) but must also incorporate mass states, \( \nu_1, \nu_2, \) and \( \nu_3, \) which are related to the flavor states by a mixing matrix. By measuring each of the elements of the mixing matrix, neutrino physicists rigorously test the physics behind neutrino oscillations, probe physics beyond our current understanding, and could uncover charge-parity violation in the neutrino sector. Violation of this symmetry is an important component of the nature of the weak interaction and is hoped to explain the observed excess of matter over antimatter in our Universe. In this talk, we review the accelerator and reactor experiments that provide measurements of the elements of the mixing matrix and review the prospects of future experiments to measure the remaining unknown elements.

Saturday, May 2, 2009 1:30PM - 3:18PM — Session C9 DPF: Charm and Kaon Physics Governor’s Square 11

1:30PM C9.00001 Measurement of \( D^0-\bar{D}^0 \) Mixing Using \( D^0 \to K^+\pi^-\pi^+\pi^- \) Decays, RAY F. COWAN, Massachusetts Institute of Technology, BABAR COLLABORATION — We present preliminary results from a measurement of \( D^0-\bar{D}^0 \) mixing using the decays \( D^0 \to K^+\pi^-\pi^+\pi^- \) in 480 fb\(^{-1} \) of data collected with the BABAR detector at the PEP-II \( e^+e^- \) colliding-beam storage rings at SLAC. We report results for the mixing parameters \( x^2 \), \( y^f \), and the doubly Cabibbo-suppressed decay rate \( R_D \). We present results with and without assuming CP conservation.

1:42PM C9.00002 Leptonic \( D_S \) Decays, JONATHON COLEMAN, SLAC, BABAR COLLABORATION — We present preliminary studies towards the measurement of the branching fraction of the \( D_S \) meson to leptonic final states using data collected with the BABAR detector at the SLAC PEP-II asymmetric-energy \( e^+e^- \) storage rings. This report will focus upon the final data set, covering the full range of leptonic decay modes.

1:54PM C9.00003 Search for \( D^-\bar{D}^0 \) mixing and CP violation, JORDI GARRA TICO, Univ. de Barcelona, BABAR COLLABORATION — Experimental results of charm mixing and CP violation searches in the BABAR experiment at the PEP-II \( e^+e^- \) asymmetric-energy collider at SLAC will be presented. Though evidence of CP violation in the \( D^0 \) decay, mixing or interference has never been found, compelling evidence for mixing in the \( D^0 \) sector has been found in \( D^0 \to K^+\pi^- \) and \( D^0 \to K^+K^-,\pi^+\pi^- \) events. The talk will focus on time dependent analyses of two and three body \( D \) meson decays, which provide the opportunity to measure the mixing parameters \( x \) and \( y \) directly.

2:06PM C9.00004 Measurement of the \( D^0 \to \phi\eta, D^0 \to \omega\eta \) and \( D^0 \to K^*\eta \) Branching Fractions, KATIE MALONE, Ohio State, BABAR COLLABORATION — We present updates on the searches for three \( D^0 \to V\eta \) decays, where the \( D^0 \) comes from the decay \( D\to V \) and \( V \) is a \( \phi, \omega \) or \( K^* \) vector meson. These results use a 467 fb\(^{-1} \) data sample collected with the BABAR detector at SLAC.
2:18PM C9.00005 Measurement of CP Asymmetries in $D^0 \rightarrow h^+ h^-$ Decays with the CDF Detector, ANGELO DI CANTO, INFN and University of Pisa, CDF COLLABORATION — The CDF experiment has now collected more than 4 fb$^{-1}$ of data and has access to the largest samples of $D^+ \rightarrow D^0 \pi^0$ decays currently available where $D^0$ decays as $D^0 \rightarrow h^+ h^-$. The measurement of decay rates in these channels are sensitive to CP violation and flavor mixing in the charm sector but require a careful analysis to separate signals from one another and from the background with the needed accuracy. We use a multivariate likelihood fit that combines kinematic and particle identification information to accurately determine the composition of the sample in terms of Cabibbo-favored, Cabibbo-suppressed and doubly-Cabibbo-suppressed decays. We apply this technique to a precision measurement of direct CP violating asymmetries in $D^0 \rightarrow \pi^+ \pi^-$ and $D^0 \rightarrow K^+ K^-$ decays.

2:30PM C9.00006 Search for the Rare Decay $K_L \rightarrow \pi^0 \pi^0 \mu^+ \mu^-$, DAVID G. PHILLIPS II, University of Virginia, KTEV COLLABORATION — Using data collected by the KTEV Experiment at Fermi National Accelerator Laboratory in Batavia, Illinois, this study will be the first experimental analysis of $K_L \rightarrow \pi^0 \pi^0 \mu^+ \mu^-$. Although this decay mode is possible within the Standard Model, it is limited to a very narrow band of phase space. The HyperCP Experiment has recently observed three $\Sigma^+ \rightarrow p\mu^+\mu^-$ events within a narrow dimuon mass range of 213.8 MeV/$c^2$ to 214.8 MeV/$c^2$. This suggests that the process could occur via a neutral intermediary particle, $\Sigma^+ \rightarrow pX^{0} \rightarrow p\mu^+\mu^-$. With an X$^0$ mass of 214.3 MeV/$c^2$ ± 0.5 MeV/$c^2$. Since the $X^0$ has a light mass and a low interaction probability, then it is most likely a new neutral boson that exists beyond the Standard Model. Recent theoretical predictions suggest that the decay mode $K_L \rightarrow \pi^0 \pi^0 \mu^+ \mu^-$ can also occur via the aforementioned neutral boson: $K_L \rightarrow \pi^0 \pi^0 X^0 \rightarrow \pi^0 \pi^0 \mu^+ \mu^-$. Therefore, in addition to a Standard Model measurement, the search for $K_L \rightarrow \pi^0 \pi^0 \mu^+ \mu^-$ is also carried out in an effort to address the viability of $X^0$ in explaining the HyperCP phenomena.

2:42PM C9.00007 Study of Semileptonic Decays $D \rightarrow K/\pi e^+\nu_e$ at CLEO-c$^1$, BO XIN, Purdue University, CLEO COLLABORATION — Using data collected at the ψ(3770) resonance with the CLEO-c detector, we measure absolute branching fractions as a function of $q^2$, the invariant mass of the $e^+\nu_e$ pair, for $D^0 \rightarrow K^- e^+\nu_e$, $D^0 \rightarrow \pi^- e^+\nu_e$, $D^+ \rightarrow K^0 e^+\nu_e$, and $D^+ \rightarrow \pi^0 e^+\nu_e$. Our measurements of branching fractions, and most of our form factor measurements are the most precise to date. Using unquenched Lattice QCD calculations of the form factor magnitudes we extract the CKM matrix elements $|V_{cd}|$ and $|V_{ub}|$. Our measurement of $|V_{cd}|$ is the most precise direct determination to date.

3:06PM C9.00009 Radiative Decays of Charmonium$^1$, DAVID BESSON, University of Kansas, CLEO COLLABORATION — We report studies of inclusive, and exclusive production of direct photons in charmonium decay. We find that the ratio of widths $\Gamma(\psi(2S) \rightarrow gg\gamma)/\Gamma(\psi(2S) \rightarrow ggg)$ is approximately half of the corresponding value for the $J/\psi$. We also report measurements of exclusive charmonium decays to $\eta\gamma$ and $\eta'\gamma$, and comment on the suppression of $\psi(2S) \rightarrow \eta'\gamma$.

1Supported by the Department of Energy

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1Supported by the National Science Foundation

Saturday, May 2, 2009 1:30PM - 3:06PM – Session C13 DPF: W and Z Physics 1 Plaza Court 3

1:30PM C13.00001 Search for a scalar or vector particle decaying into $Zg$ in $p\bar{p}$ collisions at $\sqrt{S} = 1.96$ TeV, RUSS AVERIN, Augastana College, D0 COLLABORATION — We present a search for a narrow scalar or vector resonance decaying into $Zg$ with subsequent $Z$ decay into a pair of electrons or muons. The data for this search were collected with the D0 detector at the Fermilab Tevatron ppbar collider at a center of mass energy of 1.96 TeV. Using about 1 fb$^{-1}$ of data, we observe 49 (50) candidate events in the electron (muon) channel, in good agreement with the standard model prediction. From the combination of both channels we derive 95% C.L. upper limits on the cross section times branching fraction into $Zg$. These limits range from 0.19 (0.20) pb for a scalar (vector) resonance mass of 600 GeV/$c^2$ to 2.5 (3.1) pb for a mass of 140 GeV/$c^2$.

1:42PM C13.00002 Measurement of the ZZ/WZ/WW Diboson cross section in MET+jets final states at CDF, GENE FLANAGAN, Purdue University, VADIM RUSU, SASHA PRONKO, Fermilab — We present the first measurement of the Di-boson production cross section in the MET+2-jet channel in 2.5 fb$^{-1}$ of integrated luminosity of the Fermilab Tevatron’s proton-antiproton collisions taken by the CDF II detector. We select events with two jets with $E_T > 25$ GeV and significant missing transverse energy, MET. The measurement in this signature is very challenging due to presence of large QCD multi-jet background with fake MET. We use advance techniques to suppress this background by removing events where MET has low significance compared to signal. The MET significance is calculated on event by event basis and takes into account jet energy resolution.

1:54PM C13.00003 A study of $Z \rightarrow b\bar{b}$ at Tevatron, SUENEEL DUTT, SUMAN BALA, Panjab University, PER JONSSON, Imperial Collage London, D0 COLLABORATION — The energy measurement of b-quark jets suffers from biases due to the peculiarities of hadronization and decay of originating B-hadron. The impact of these effects can be estimated by reconstructing the mass of $Z \rightarrow b\bar{b}$. From the sample of 2 fb$^{-1}$ of Data collected by D0 experiment $p\bar{p}$ collisions at Tevatron, we will show how Z signal can be identified and measured. The measurement of reconstructed mass of Z can be used to determine the jet energy scale factors for b-quark jets which allows a reduction of uncertainty in high $p_T$ physics analysis. This analysis can help to explore suitable triggering and other necessary tools for Low mass Higgs discovery at Tevatron.
2:06PM C13.00004 Vetoing Two Photon Backgrounds with the BeamCal at the ILC

Jack Gill, University of Colorado at Boulder, Uriel Naumenberg, Gleyb Oleinik, Silicon Detector Design Study Collaboration — \( \tau^+ \tau^- \) production is a benchmark reaction for ILC detectors. \( \tau^+ \tau^- \) decays can result in two lepton final states. The same final state can be produced by Standard Model \( \gamma^* \gamma^* \) processes. This makes vetoing \( \gamma^* \gamma^* \) events important for any \( \tau^+ \tau^- \) reconstruction. Three types of background are considered, and cuts presented which lead to vetoing of these backgrounds. The efficacy of the veto is considered in the light of adding MIP sensitivity to the BeamCal.

1LCRD program supported by DOE under grant # DE-FG02-04ER41383.

2:18PM C13.00005 ABSTRACT WITHDRAWN

2:30PM C13.00006 Electroweak backgrounds in Di-Photon Analyses at CMS

Bernadette Heyburn, University of Colorado, Andrew Askev, Yuri Gershtein, Rutgers University, Gail Hansen, Robert Stringer, University of California, Riverside, Uriel Naumenberg, Shilei Zang, University of Colorado, Daniele Del Re, Shahram Rahatlou, Universita di Roma “La Sapienza”, Michael Balazs, Brad Cox, University of Virginia, CMS Collaboration — New physics could be revealed in a final state with two high \( E_T \) photons and large missing transverse energy, for example in Gauge Mediated SUSY breaking theories. Here we present a strategy for coping with the relevant electroweak backgrounds. Electroweak backgrounds are primarily from \( W \gamma \) and \( Wj \) events where the \( W \) decays into an electron and neutrino. If an electron track is not reconstructed, the electron will pass the photon identification. By determining the photon identification efficiency from \( Z \) reconstructed, the electron will pass the photon identification. By determining the photon identification efficiency from \( Z \) reconstructed, the electron will pass the photon identification. By determining the photon identification efficiency from \( Z \) reconstructed, the electron will pass the photon identification. By determining the photon identification efficiency from \( Z \) reconstructed, the electron will pass the photon identification. By determining the photon identification efficiency from \( Z \) reconstructed, the electron will pass the photon identification. By determining the photon identification efficiency from \( Z \) reconstructed, the electron will pass the photon identification. By determining the photon identification efficiency from \( Z \) reconstructed, the electron will pass the photon identification. By determining the photon identification efficiency from \( Z \) reconstructed, the electron will pass the photon identification. By determining the photon identification efficiency from \( Z \) reconstructed, the electron will pass the photon identification.

We will discuss the different corrections needed in this method and compare them with the standard method of \( W \) mass measurement. Preliminary results of the measured \( W \) boson mass and the uncertainties will be given.

2:42PM C13.00007 Measurement of \( W \) boson mass using the ratio method at D0

Feng Guo, SUNY–Stony Brook, D0 Collaboration — We measure the ratio of the \( W \) and \( Z \) boson mass using data collected in the D0 Run II at Fermilab Tevatron collider. Our method uses scaled transverse mass spectrum \( M_T \) of the \( Z \) boson as templates. The \( M_T \) mass ratio is extracted by fitting to the templates. We will discuss the different corrections needed in this method and compare them with the standard method of \( W \) mass measurement. Preliminary results of the measured \( W \) boson mass and the uncertainties will be given.

2:54PM C13.00008 Search for \( WW \) and \( WZ \) Production Using the K Nearest Neighbor in Charged Lepton Neutrino Plus Jets Final State at CDF

Viviana Calabrese, University of Siena, CDF Collaboration — We present a search for \( WW \) and \( WZ \) production in charged lepton-neutrino plus jets final states produced in pp collisions with \( \sqrt{s} = 1.96 \) TeV at Fermilab Tevatron, using approximately 3 \( fb^{-1} \) of data with the CDF II detector. This channel is yet to be observed at hadron colliders. We make use of a new statistical technique (K-nearest neighbour algorithm) to disentangle this process from the large single W plus jets background. This technique takes advantage of the full available information on each event exploiting all the available statistic without rejecting any event. The associated production of a Higgs boson with \( W \) boson is topologically similar to our final states and the technique developed in this analysis can also be applied to that search.

Saturday, May 2, 2009 3:30PM - 5:18PM – Session D2 DPF: The State of HEP Theory Plaza D

3:30PM D2.00001 Flavor Physics, Yuval Grossman, Cornell University — No abstract available.

4:06PM D2.00002 Recent Developments in Lattice QCD, Andreas Kronfeld, Fermi National Accelerator Laboratory — Recent results in lattice QCD are reviewed, including the first complete calculations of the nucleon mass, and several results essential to flavor physics. We shall also discuss the decay of a \( D_s \) meson to a lepton and neutrino, where the standard model (relying on a lattice QCD calculation) disagrees with corresponding experimental measurements at the 3 \( \sigma \) level.

4:42PM D2.00003 Extra dimensional models for TeV scale physics, Csaba Csaki, Cornell University — I will review the various extra dimensional models relevant for the physics of the TeV scales. These models include the realistic Randall-Sundrum model, composite Higgs models (models of gauge-Higgs unifications) and higgsless theories. I will review the electroweak precision and flavor constraints on these models, and briefly comment on theories with Universal Extra Dimensions and KK dark matter.

Saturday, May 2, 2009 3:30PM - 5:18PM – Session D9 DPF: Mini-Symposium on Standard Model and Higgs Physics Governor’s Square 11

3:30PM D9.00001 Status and prospects for Higgs searches at the Tevatron, Daniele Bortoletto, Purdue University — The Tevatron has delivered more than 5.5 inverse femtobarns of proton-antiproton collisions to the DZero and CDF experiments. The two collaborations are developing novel advanced analyses techniques to search for the Higgs boson. The search exploits different production mechanisms for the Higgs boson according to its mass. The analyses search for the Higgs boson produced in association with either a \( W \) or \( Z \) boson for MH < 135 GeV/c^2 where the Higgs boson is expected to decay primarily to a bottom-antibottom quark pair. In the higher mass range, 130 < MH < 200 GeV/c^2, the analyses search for the Higgs Boson produce singly and decaying to a pair of vector bosons, primarily WW. This talk reviews the current status of the Tevatron searches and presents the current production cross section limits, including the combined limits using the different search channels and the results from both CDF and DZero. The prospects for future improvements based on projected data sample sizes and novel experimental techniques are also discussed.
4:06PM D9.00002 Search for Associated Production of W and Higgs Bosons in the all Hadronic Decay Mode in pp Collisions at $\sqrt{s}=1.96$ TeV, JUSTACE CLUTTER, University of Kansas, D0 COLLABORATION — We present a search for a low mass standard model Higgs Boson, produced in association with a W boson, in the all hadronic decay channel at a center-of-mass energy of $\sqrt{s}=1.96$ TeV, using 1 fb$^{-1}$ of data collected with the D0 detector at the Fermilab Tevatron collider. The Higgs boson is required to decay to two $b$-quarks and the $W$ boson to two light quarks. This channel is potentially very powerful but is extremely challenging because of the large multijet background. A two dimensional fit to the invariant mass of the two $b$-quark jets and the invariant mass of the remaining two light quark jets is explored as a technique to determine a limit on the production cross section of the Standard Model Higgs boson.

4:18PM D9.00003 Search for $ZH$ in the $\ell\ell b\bar{b}$ Final State using a Neural Network Discriminant at CDF, SHALHOUT SHALHOUT, Wayne State University, CDF COLLABORATION — We report on a search for a Higgs boson produced in association with a $Z$ boson using 2.7 fb$^{-1}$ of CDF II data collected at $\sqrt{s}=1.96$ TeV based on the $\ell\ell b\bar{b}$ final state. To maximize signal acceptance we impose loose lepton and $b$-quark jet identification requirements. We correct the measured energies of the jets using an artificial neural network which assigns any observed missing transverse energy between the two jets. In order to maintain signal efficiency and improve signal discrimination, we employ an additional neural network trained to discriminate events based on differences in the event kinematics for $ZH$ events and those for the main $Z$ plus jets and $t\bar{t}$ backgrounds. We set 95% Confidence Level upper limits on the production cross section times branching ratio for potential Higgs boson masses between 100 and 150 GeV/c$^2$.

4:30PM D9.00004 Search for the Higgs Boson in $WW^{(*)}\rightarrow\ell\ell\nu\nu$ Decays in pp Collisions at $\sqrt{s}=1.96$ TeV, BJÖRN PENNING, Physikalisches Institut, Universität Freiburg, D0 COLLABORATION — We present a search for the standard model Higgs boson produced via the $H\rightarrow WW^{(*)}\rightarrow \ell\ell\nu\nu$ process at a center-of-mass energy of $\sqrt{s}=1.96$ TeV with the D0 detector at the Fermilab Tevatron collider. A Higgs particle with a mass greater than 140 GeV primarily decays into a pair of $W$-bosons and the leptonic decay channels of the $W$ provide a clear signature. This channel is one of the most sensitive to the Higgs at the Tevatron. As well as the inclusion of the full data set, up to 4 fb$^{-1}$, recent improvements to the sensitivity will be discussed.

4:42PM D9.00005 Improved search for a Higgs boson in the $H\rightarrow\tau\tau$ decay channel at CDF, ANDREY ELAGIN, Texas A&M University, CDF COLLABORATION — We present an improved search for a Higgs boson in the channel $gg\rightarrow H\rightarrow \tau\tau$ based on data collected with the CDF detector at the Tevatron collider. Improvements include optimization of the signal fitting procedure and increased signal acceptance resulting from a better identification technique for hadronic $\tau$ lepton decays. The latter is based on a likelihood-based algorithm which gives superior energy resolution, better definition of other identification variables such as jet invariant mass, and a direct estimate of the uncertainty in the energy measurement for each individual hadronic $\tau$ candidate.

4:54PM D9.00006 Search for Associated Production of $Z$ and Higgs Bosons in $\nu\nu b\bar{b}$ Final States in $pp$ Collisions at $\sqrt{s}=1.96$ TeV, GABRIEL FACINI, Northeastern University, D0 COLLABORATION — We present the search for a low mass standard model Higgs boson produced in association with a $Z$ boson decaying invisibly into a pair of neutrinos at a center-of-mass energy of $\sqrt{s}=1.96$ TeV with the D0 detector at the Fermilab Tevatron collider. The final state is characterised by the presence of two $b$-tagged jets from the Higgs boson decay and a large imbalance in the transverse energy of the event. This channel is very powerful because of the large $Z\rightarrow \nu\nu$ branching ratio, but is experimentally very challenging because of the large QCD backgrounds and absence of visible leptons in the final state. As well as the inclusion of the full data set, up to 4 fb$^{-1}$, recent improvements to the sensitivity will be discussed.

5:06PM D9.00007 Combined Upper Limit on Standard Model Higgs Boson Production at D0 in pp Collisions at $\sqrt{s}=1.96$ TeV, MICHAEL KIRBY, Northeastern University, D0 COLLABORATION — We present the combination of the searches for the Standard Model Higgs boson at a center-of-mass energy of $\sqrt{s}=1.96$ TeV, using up to 4 fb$^{-1}$ of data collected with the D0 detector at the Fermilab Tevatron collider. The major contributing processes include associated production ($WH\rightarrow\ell\nu b\bar{b}$, $ZH\rightarrow\nu\nu b\bar{b}$, $ZH\rightarrow\ell\ell b\bar{b}$, and $WH\rightarrow WW^{(*)}$) and gluon fusion ($gg\rightarrow H\rightarrow WW^{(*)}$). The significant improvements across the full mass range resulting from the larger data sets, improved analyses and inclusion of additional channels are discussed.

Sunday, May 3, 2009 8:30AM - 10:18AM –
Session G2 DPF: The State of the Top Quark Plaza D

8:30AM G2.00001 Top Quark: Theory Perspective, TIM M.P. TAIT, Argonne National Laboratory and Northwestern University — I will present a theoretical perspective on the top quark, the newest and most massive ingredient of the Standard Model of particle physics. I will explain how the top fits into the Standard Model, where its large mass gives it a special role, and may be a clue that top could act as a portal to physics beyond the Standard Model. I’ll explore how current and future measurements will test the Standard Model expectations for the properties of top, and may reveal the truth about the top quark.

9:06AM G2.00002 The State of the Top Quark Physics: recent results from the Tevatron, VERONICA SORIN — The top quark, discovered in 1995 at Fermilab, is the heaviest elementary particle observed to date. Measurements of its properties are a direct test of the Standard Model (SM) and could provide hints of new physics beyond the SM. The CDF and D0 collaborations have a large effort devoted to the study of this intriguing particle. A large data sample collected from the ongoing Run II at the Tevatron, and advance analysis techniques, have allowed these experiments to measure the top quark properties with an impressive precision. In this talk, recent results and a review of the status and prospects of the top quark physics at the Tevatron, will be presented.

9:42AM G2.00003 Stating the Case for Top at the LHC, KENNETH BLOOM, University of Nebraska-Lincoln — The top quark will be a fundamental element of the early physics program at the Large Hadron Collider. Thanks to the excellent work of the Tevatron experiments, top is now a reasonably well-understood standard model particle, and its production and decay, while often complex, are predictable. As such, the top quark will be a crucial instrument for the commissioning the ATLAS and CMS detectors and the experiments’ tools for physics analysis. Once the top-quark signal has been established, the experiments will be able to use it to further probe the standard model, and to begin the search for new physics that the LHC is almost certain to deliver. Standard-model studies will be based around high-statistics measurements of top-quark properties (mass, branching fractions, decay dynamics). New-physics exploration will be in topologies that are similar to those of top decay, and in channels where top production is an important background process. I will discuss the plans that CMS and ATLAS have to pursue this physics program, and the expected performance of the experiments, with a focus on what can be done in the earliest period of LHC operations.
Session G9 DPF: Running and Near Term Neutrino Experiments  Governor’s Square 11

8:30AM G9.00001 A Nearest Neighbors Approach for Electron Neutrino Event Selection in MINOS, JUAN PEDRO OCHOA, Caltech, MINOS COLLABORATION — The reach of the search for electron-neutrino appearance in the MINOS far detector, a process which would manifest a non-zero value of the $\theta_{13}$ mixing angle, depends primarily on the ability to separate the signal from the backgrounds. MINOS is using two different approaches for event classification. In this talk I will review a new highly effective method for selecting electron neutrino events where each event in the data is compared to very large libraries of simulated signal and background events, and a discriminant is constructed from the properties of the N best matches. The method effectively reduces the problem of event identification to that of pattern recognition. By making a more complete use of all the available information in each event the new method increases MINOS' reach in $\theta_{13}$.

8:42AM G9.00002 Neutrino Oscillations in MINOS$^1$, JASMINE MA, University of Texas at Austin, MINOS COLLABORATION — The MINOS experiment is a two detector experiment to study the phenomenon of neutrino oscillations, with the Near detector located at Fermilab, near Chicago and the Far detector located 734 km away, at the Soudan Underground Laboratory in Minnesota. A precision measurement of the neutrino oscillation parameters $\sin^2 \theta_{23}$ and $\Delta m_{23}^2$ can be accomplished using charged current neutrino events, which record both the neutrino flavor and energy. A deficit of events in the Far detector relative to that expected from the Near detector is seen, especially at low energy. In this talk we will discuss the neutrino oscillation measurement, the techniques utilized to select charged current events, as well as the expected backgrounds from neutral current neutrino scattering. Most recent results from a data set corresponding to $3.3 \times 10^{20}$ protons on target will be given.

$^1$On behalf of the MINOS Collaboration

8:54AM G9.00003 Antineutrino Physics at MINOS, ALEXANDER HIMMEL, California Institute of Technology, MINOS COLLABORATION — We present two new measurements of antineutrino properties based on a data sample corresponding to $3.2 \times 10^{20}$ protons-on-target, exploiting MINOS' unique ability to distinguish positive and negative muons and thus separate charged current neutrino and antineutrino interactions event-by-event. The first measurement takes advantage of the 6% antineutrino component of the NuMI neutrino beam to measure antineutrino oscillations between the near and far detectors, which leads to improved constraints on the oscillation parameters of antineutrinos relative to the results from previous world data. We also present a search for neutrino-antineutrino transitions $\nu_i \rightarrow \bar{\nu}_j$, which would result in an excess of antineutrino events in the Far Detector relative to the rate expected from the intrinsic antineutrino component in the neutrino beam.

9:06AM G9.00004 Monitoring the Double Chooz experiment, GLENN HORTON-SMITH, Kansas State University — The Double Chooz experiment will be sensitive to electron antineutrino disappearance due to $\sin^2 (2 \theta_{13})$ in the $0.02 - 0.03$ range, improving on the CHOOZ bound by about an order of magnitude. Reliable and efficient monitoring of temperatures, fields, the conditions of electronics, and other factors plays a critical role in achieving stability in target volume and efficiency to achieve the experiment's sensitivity goals. An description of the Double Chooz physical environment monitoring system will be presented.

9:18AM G9.00005 The Double Chooz Outer Veto$^1$, MATTHEW TOUPS, Columbia University, DOUBLE CHOOZ COLLABORATION — Measuring a non-zero value for the neutrino mixing angle $\theta_{13}$ sets the scale for future precision measurements in the lepton sector such as CP violation. The Double Chooz experiment will begin taking data later this year with a sensitivity to $\sin^2 (2 \theta_{13})$ in the $0.02 - 0.03$ range, improving on the CHOOZ bound by about an order of magnitude. Efficient rejection of backgrounds induced by cosmic muons is essential to achieving this sensitivity. The Double Chooz Outer Veto plays a crucial role in vetoing and tagging these muons. An update on the status of the Double Chooz Outer Veto will be presented.

$^1$This work is supported by NSF grant PHY-0758118.

9:30AM G9.00006 Muon Neutrino Charged Current Inclusive Cross Section on Iron at SciBooNE, MORGAN WASCKO, Imperial College London, SCIBOONE COLLABORATION — The SciBooNE experiment at Fermilab is measuring neutrino and antineutrino cross sections near 1 GeV with fine grained resolution and unprecedented precision. A measurement of the charged current inclusive cross section on iron will be presented.

9:42AM G9.00007 Neutrino and antineutrino disappearance in the Booster Neutrino Beamline, KENDALL MAHN, Columbia University, MINIBOONE COLLABORATION, SCIBOONE COLLABORATION — To search for neutrino oscillations in the few $\text{eV}^2$ $\Delta m^2$ region, the MiniBooNE experiment can either look for electron neutrino appearance or muon neutrino disappearance. Disappearance measurements are an uniquely sensitive probe of oscillations to sterile neutrinos or other exotic processes such as neutrino decay. The 74% pure, high statistics CCQE muon neutrino sample in MiniBooNE can be used to make sensitive searches for disappearance of muon neutrinos and for the first time antineutrino disappearance in the few $\text{eV}^2$ $\Delta m^2$ range. By combining MiniBooNE with SciBooNE, a near detector recently added to the beamline, even better sensitivity to disappearance can be achieved. Results for the MiniBooNE neutrino and antineutrino disappearance measurements will be presented along with the prospects for a combined MiniBooNE/SciBooNE measurements.

9:54AM G9.00008 Electron Neutrino Appearance in the MINOS Experiment, JOSHUA BOEHM, Harvard University, MINOS COLLABORATION — The MINOS experiment has the potential to observe the appearance of electron neutrinos in a muon neutrino beam, thereby measuring or further limiting the value of the $\theta_{13}$ of the PMNS mixing matrix. This angle is the remaining unknown element of the matrix and is intimately linked to the ability to measure charge-parity violation in the neutrino sector, a symmetry violation that could explain the dominance of matter over antimatter in our universe. The techniques developed to perform this two detector oscillation analysis, including background prediction, derivation of signal efficiency, and systematic uncertainties will be presented as will the prospects for future analyses.

Sunday, May 3, 2009 8:30AM - 10:30AM –
Session G12 DPF: Higgs II  Plaza Court 2
8:30AM G12.00001 Search for a Higgs Boson in Decays to $WW^*$ at CDF, BRITNEY RUTHERFORD, Fermi National Accelerator Laboratory, CDF COLLABORATION — We present a search for Standard Model Higgs production in $p\bar{p}$ collisions at $\sqrt{s} = 1.96$ TeV using approximately 4 fb$^{-1}$ of data collected with the CDF II detector. We consider the diboson decay channel, $H \rightarrow WW^*$, which is the dominant decay mode for Higgs boson masses above 140 GeV/c$^2$. We further require both $W$ bosons to decay leptonically. Both single and associated Higgs production modes are considered. In order to maximize sensitivity, a combined Matrix Element method and Neural Network approach is utilized to distinguish signal from background processes. Cross-section limits are presented for Higgs mass hypothesis between 110 GeV/c$^2$ and 200 GeV/c$^2$.

8:42AM G12.00002 Search for the Higgs Boson in $WW$ Decays Involving Taus in $p\bar{p}$ Collisions at $\sqrt{s}=1.96$ TeV, RUCHIKA NAYYAR, Delhi University, Delhi, India, D0 COLLABORATION — We present a search for the standard model Higgs boson produced via the $H \rightarrow W^+W^-$ process in which one of the $W$'s decays to a hadronic tau and the other to a muon at a center-of-mass energy of $\sqrt{s} =1.96$ TeV with the D0 detector at the Fermilab Tevatron collider. A Higgs particle with a mass greater than 140 GeV primarily decays into a pair of $W$-bosons and the leptonic decay channels of the $W$ provide a clean signature. Additional sensitivity beyond that achieved with electron and muon decays can be achieved by considering tau decays. As well as the inclusion of the full data set, up to 4 fb$^{-1}$, improvements to the sensitivity will be discussed.

8:54AM G12.00003 Search for Associated Production of a $W$ and Higgs Boson in the $\tau\nu b\bar{b}$ Final State at CDF, ELISABETTA PIANORI, Universit\'a di Pennsylvania, CDF COLLABORATION — We present results of a search for associated production of $W$ and Higgs bosons based on 2 fb$^{-1}$ of data collected with the CDF II detector from $p\bar{p}$ collisions at $\sqrt{s}=1.96$ TeV. The search is performed using events with two jets, a hadronically decaying $\tau$ lepton, and missing transverse energy originating from the $H \rightarrow b\bar{b}$ and $W \rightarrow \tau\nu$ decay modes. We present the status of the search focusing on techniques for triggering on and identifying hadronic tau decays.

9:06AM G12.00004 Higgs/$ZZ$ searches in the 3 leptons + X channels, AZEDDINE KASMI, Southern Methodist University, ATLAS COLLABORATION — The mechanism of spontaneously broken symmetries is one of the key problems in particle physics. Hence understanding the Higgs mechanism, by which the fundamental particles gain mass, is one of the primary goals of the LHC. Another area of great interest is ZZ diboson production. In the Standard Model(SM), the triple neutral gauge couplings ($ZZZ$ and $ZZ\gamma$) are absent and ZZ searches provide a test for any gauge-coupling anomalies and hence possible new physics beyond the SM. Production of ZZ dibosons is an irreducible background for the Higgs production with a 4-lepton decay mode (particularly at high mass). To maximize the sensitivity of Higgs searches, the $3\ell + X$ channels were considered as they have higher acceptance than the 4$\ell$ channel due to inefficiencies in lepton reconstruction. I pursued an exclusive search for the Higgs/ZZ signal in the $3\ell + X$ channel using clustering algorithms for finding unidentified electrons. The motivations for a cluster based algorithm are: 1) no assumption of a cluster width is required 2) the cluster centric based algorithm has greater $\eta$ coverage than the standard electron identification methods and 3) the cluster based algorithm does not split the cluster in the crack regions. The background in the $3\ell + X$ channel is very challenging. In this work, I present a set of selection criteria along with a likelihood method for particle identification to achieve an acceptable signal-over-background.

9:18AM G12.00005 Search for Standard Model $H \rightarrow \tau\tau$ Decays using a new $\tau$ identification algorithm, PIERLUIGI TOTARO, INFN, Trieste (Italy), CDF COLLABORATION — Clean and efficient identification of $\tau$ leptons is required for a number of CDF Run II analyses such as $W \rightarrow \tau\nu$ and $Z \rightarrow \tau\tau$ production cross section measurements, top quark dilepton studies, and searches for both SUSY particles and MSSM Higgs bosons. Improved $\tau$ lepton identification can also be used to help improve the sensitivity of standard model Higgs boson searches by increasing the number of final states available to the analyses. We present a new $\tau$ lepton identification method based on a Boosted Decision Tree (BDT) approach, which like other multivariate methods can provide higher selection efficiency as a function of the associated fake rate with respect to what one obtains using a rectangular set of selection criteria. The performance of the new algorithm, which gives an improvement on order of 15% over the current CDF $\tau$ identification algorithm, will be shown.

9:30AM G12.00006 Multivariate techniques for $VH \rightarrow MET + b\bar{b}$ Searches at CDF, DOUG SHAEFER, Ohio State University, CDF COLLABORATION — We present improved techniques applicable to searches for a Higgs boson in events with missing transverse energy and two b-quark jets at CDF. This sample includes substantial contributions from both $ZH$ and $WH$ final states, as well as substantial backgrounds originating from QCD multi-jets, $t\bar{t}$ production, heavy diboson production, and instrumental backgrounds. Multivariate techniques have been shown to be extremely important in increasing the experimental sensitivity in this channel. We investigate the use of multivariate methods targeted toward rejection of specific backgrounds and how to combine these methods to form a single overall discriminant. We present expected improvements in Higgs search sensitivity using these new techniques.

9:42AM G12.00007 Search for a Standard Model Higgs Boson in Events with Missing Transverse Energy and Jets at CDF, KAROLOS POTAMIANOS, Purdue University, CDF COLLABORATION — We present a search for a standard model Higgs boson produced in association with a $W$ or $Z$ boson in $p\bar{p}$ collisions at 1.96 TeV center of mass energy. The data collected with the CDF II detector at the Tevatron collider at Fermilab correspond to an integrated luminosity of 2.1 fb$^{-1}$. We investigate the scenario where the Higgs boson decays into a $b\bar{b}$ pair and where either the $Z$ decays into neutrinos or the lepton from the $W$-decay escapes detection giving an expected event signature of two b-quark jets, no leptons, and missing transverse energy. We present preliminary results from this search and discuss potential future improvements. A data-driven model of the QCD multi-jet background and advanced analysis techniques used in increasing sensitivity of the search are also discussed.

9:54AM G12.00008 ABSTRACT WITHDRAWN —

10:06AM G12.00009 CMS Discovery Potential of Standard Model Higgs Boson in the Vector Boson Fusion Process, HAIFENG PI, CMS COLLABORATION — The discovery potential of standard model Higgs boson in the vector boson fusion process with CMS detector is presented. We use cut-based strategy to establish the baseline reconstruction and the analysis scenario. The neural network technique is used to further increase the discovery potential by studying the complicated correlation among various observables. Dedicated techniques of jet energy correction, missing Et correction, hadronic W and Z reconstruction, and lepton isolation are studied and tuned to maximize S/B in the lepton+MET+multi-jet final states. Data driven strategy is used to control the systematic uncertainty from the measurement of background cross section, various detector level and instrumental effects. The Monte Carlo study shows that the 5-sigma discovery for the wide mass range of SM Higgs Boson will be achieved with 1-5 fb$^{-1}$ of LHC data in the vector boson fusion process.
10:18AM G12.00010 Search for Associated Production of Z and Higgs Bosons in the $\mu\mu bb$ Final State in $p\bar{p}$ Collisions at $\sqrt{s}=1.96$ TeV. LUCIAN ANCU, Radboud University Nijmegen, D0 COLLABORATION — We present a search for a low mass standard model Higgs boson produced in association with a $Z$ boson decaying to two muons at a center-of-mass energy of $\sqrt{s}=1.96$ TeV with the D0 detector at the Fermilab Tevatron collider. The search is performed in events containing one or two b-tagged jets with order 4 fb$^{-1}$ of data. As well as the inclusion of the full data set, recent improvements to the sensitivity will be discussed.

Sunday, May 3, 2009 8:30AM - 10:18AM –
Session G13 DPF: B Physics I Plaza Court 3

8:30AM G13.00001 Precision Measurement of the Exclusive $B^0 \rightarrow D^{*+}\ell^+\nu$ Branching Fraction, PETER SONNEK, LUCIEN CREMALDI, University of Mississippi, ROMULUS GODANG, University of South Alabama, BABAR COLLABORATION — We report on a time-dependent Dalitz-plot analysis of the decay $B^0 \rightarrow D^{*+}\ell^+\nu$ branching fraction using data collected with the BABAR detector at the PEP-II asymmetric-energy $e^+e^-$ storage rings at SLAC running on the $\Upsilon(4S)$ resonance. Using a data sample of approximately 470 million $BB$ pair events we isolate those with the prompt lepton and slow pions from the $D^{*+} \rightarrow D^0\pi_{slow}$ cascade decay. A partial reconstruction technique is used in which the $D^*$ four-momentum is inferred from the slow pion, $\pi_{slow}$. This allows for a much higher statistical precision on this important branching fraction as well as an overall systematic error competitive with full reconstruction techniques.

8:42AM G13.00002 Search for $B_s$ Mesons Using the $B_s \rightarrow B^0 X$ Decay Channel at CDF, EDWIN ROGERS, University of Illinois, Urbana-Champaign, CDF COLLABORATION — To date, the $B_s$ meson has only been observed in $B_s \rightarrow J/\psi\pi$ and $J/\psi\ell X$ final states, while the dominant decay modes are expected to be in the $B_s \rightarrow B^0 X$ channel. We present the results of a first search for the $B_s$ meson through $B_s \rightarrow B^0 X$. The measurement uses 3 fb$^{-1}$ of data collected with the CDF II detector during Run II of the Fermilab Tevatron in $p\bar{p}$ collisions at $\sqrt{s}=1.96$ TeV. The analysis is based on a neural network selection and combines the $B_s^0$ decay modes into $J/\psi\phi$, $D_s^2\pi$, and $D_s^0\pi_0$.

8:54AM G13.00003 ABSTRACT WITHDRAWN –

9:06AM G13.00004 Time-dependent Dalitz-plot analysis of $B^0 \rightarrow K_S^0\pi^+\pi^-$, JELENA ILIC, University of Warwick, BABAR COLLABORATION — We report on a time-dependent Dalitz-plot analysis of the decay $B^0 \rightarrow K_S^0\pi^+\pi^-$ performed by the BABAR experiment. An isobar model including scalar, vector and tensor components is fitted to the data and the Unitarity Triangle (UT) angle $\beta_{eff}$ is extracted for the modes $B^0 \rightarrow f_0 K_S$ and $B^0 \rightarrow f^0 K_S$. In addition, the phase difference between $B^0 \rightarrow K^+\pi^-$ and $B^0 \rightarrow K^-\pi^+$ is determined. This phase difference is a critical input for a recently developed method for extracting the UT angle $\gamma$.

9:18AM G13.00005 Measurement of Correlations in $b$ Quark Pair Production at the Tevatron, JASON GALLYARDT, Carnegie Mellon University, CDF COLLABORATION — We present an analysis of $b\bar{b}$ pair production correlations, using dimuon-triggered data collected with the Collider Detector at Fermilab in $p\bar{p}$ collisions at $\sqrt{s}=1.96$ TeV during Run II of the Tevatron. The leading order (LO) and next-to-leading order (NLO) $b\bar{b}$ quark production processes are discriminated by the angular and momentum correlations between the $b\bar{b}$ pair. Track-level jets containing a muon are classified by $b$ quark content and used to estimate the momentum vector of the progenitor $b$ quark. The theoretical distributions given by the MC@NLO event generator are tested against the data, and the ratio of LO to NLO processes as a function of $\hat{s}$ is measured.

9:30AM G13.00006 ABSTRACT WITHDRAWN –

9:42AM G13.00007 Measurement of Branching Fractions in $B \rightarrow K\nu\bar{\nu}$ Decays, CARL VUOSALO, University of Wisconsin, Madison, BABAR COLLABORATION — Flavor changing neutral-current transitions such as $b \rightarrow s\gamma$ are absent at tree level in the Standard Model and can only occur via loop diagrams. Several new physics models may enhance the rate of these transitions. We will present searches for the exclusive decays $B^\pm \rightarrow K^{\pm}\nu\bar{\nu}$ and $B^{0} \rightarrow K^{0}\nu\bar{\nu}$. Due to the presence of two neutrinos in the final state, we require the full reconstruction of one $B$-meson in the semileptonic decay channel $B^{\pm} \rightarrow D^{(*)}\ell\nu$ and search in the recoil for our decay modes. This analysis uses approximately 430 fb$^{-1}$ or 470 million $BB$ pairs collected with the BABAR detector at the Tevatron II B-factory.

9:54AM G13.00008 Multipole Moments in Radiative Transitions of Charmonia$^1$, JAMES LEDOUX, Cornell University, CLEO COLLABORATION — Using 24 million $\psi(2S)$ decays created from $e^+e^-$ collisions collected with the CLEO-c detector, we search for the multipole moments M2 and E3 of the radiative transitions in charm. The multipole moments are identified by an unbinned maximum likelihood fit to the joint angular distribution of the photons in the decay sequences $\psi(2S) \rightarrow \gamma\chi_{c}(1,2c), \chi_{c}(1,2c) \rightarrow \gamma J/\psi, J/\psi \rightarrow \ell^+\ell^-$.  

$^1$Supported by the National Science Foundation

10:06AM G13.00009 Measurement of $B_{c}^{+} \rightarrow J/\psi\mu^{+}\nu$ Cross Section Times Branching Ratio Relative to $B^{+} \rightarrow J/\psi K^{+}$ with the CDF II Detector, TURGUN NIGMANOV, University of Michigan, CDF COLLABORATION — The production cross section times branching ratio for $B_{c}^{+} \rightarrow J/\psi\mu^{+}\nu$ relative to $B^{+} \rightarrow J/\psi K^{+}$ is measured using an inclusive $J/\psi$ trigger stream with an integrated luminosity of 1 fb$^{-1}$. The results are an update of earlier work by the CDF Collaboration that used an integrated luminosity of 360 pb$^{-1}$. The measurement is made in the kinematic region $-1.0 < \eta < 1.0$ for both $p_T(B_c) > 4$ and 6 GeV/c. The new results along with a comparison with earlier results will be presented.

Sunday, May 3, 2009 8:30AM - 10:18AM –
Session G14 DPF: Future HEP Experiments Plaza Court 4
8:30AM G14.00001 Supernova Neutrino Physics at a Large Water Cherenkov Detector, KATE SCHOLBERG, Duke University, DUSEL LONG BASELINE COLLABORATION — The planned 300 kton scale water Cherenkov detector for the Deep Underground Science and Engineering Laboratory will have unprecedented capability for detection of neutrinos from core collapse supernovae. This talk will describe the supernova neutrino physics sensitivity of this detector, on its own and in combination with other detectors worldwide.

8:42AM G14.00002 Correlations between cosmic muon tracks in the ATLAS inner detector and the muon spectrometer, LASHKAR KASHIF, Harvard University, ATLAS COLLABORATION — Installation of the ATLAS detector at the CERN Large Hadron Collider is now complete and it is ready to take data. A substantial amount of cosmic muon data was collected in September-October 2008. To verify that all components of the detector are working properly, it is important to establish that we see the same tracks in all subdetectors. I will present a study of the correlations between cosmic tracks seen in the ATLAS inner detector and the muon spectrometer. I will discuss differences in track reconstruction in the two subdetectors, and show track parameter distributions in each. The main result is the correlation between track momentum and track phi and theta coordinates measured in the inner detector and the muon spectrometer. We see a high degree of correlation for all three parameters. Additionally, I will discuss the efficiency of the muon spectrometer with respect to the inner detector for cosmic muon tracks.

8:54AM G14.00003 Cosmic Muon Analysis with the CMS Detector, CHANG LIU, Purdue University, CMS COLLABORATION — Despite of the delay of physics collisions at the Large Hadron Collider (LHC), induced by the incidence in September 2008, the CMS collaboration is utilizing the commissioned detector to take large amounts of cosmic data. About 300 million cosmic events were recorded with the full detector and a magnetic field of 3.8 T turned on. The effort has provided significant statistics to study the detector performance and analyze the physics of cosmic rays. We present recent results from the cosmic muon analysis activities that were conducted using real data and dedicated cosmic Monte Carlo samples. These focused on testing the performance of the CMS muon charge ratio, the energy loss in the detector, the flux measurement, as well as other interesting studies were performed using dedicated reconstruction tools and have demonstrated good agreement between the real data and Monte Carlo samples. The cosmic muon analysis effort is not only a rehearsal for physics analysis at the LHC, but also provides interesting links to astrophysics and helps to validate the sophisticated simulation tools used.

9:06AM G14.00004 The Electron Detection Efficiency of the BeamCal at the Simulated ILC, GLEB OLENIK, URIEL NAUENBERG, JACK GILL, University of Colorado at Boulder, SILICON DETECTOR DESIGN STUDY COLLABORATION — We have produced measurements of the detection efficiency for electrons incident to the BeamCal in the forward region of the latest Silicon Detector (SiD) concept. SiD is an ongoing study that aims to create a detector concept to be incorporated into the International Linear Collider (ILC). We have employed the GEANT4 physics simulator to conduct in-depth simulations of the current SiD design, examining in particular its robustness in detecting events in the forward region. We require good detection efficiency in the forward region in order to veto two-photon events, which constitute a major background for several supersymmetric events. Obtaining good efficiency in this region is complicated by the massive beamstrahlung depositions there. Therefore, we have created several clustering algorithms designed to cluster the hits of the beamstrahlung and to detect and measure the showers of electrons produced by two-photon events. We now have results for the detection efficiency with these algorithms.

9:18AM G14.00005 Beam Tests of an ILC Tail Catcher/Muon Tracker Prototype Based on Scintillator/SiPMs, KURT FRANCIS, Northern Illinois University, CALICE COLLABORATION — The International Linear Collider (ILC), an electron-positron colliding beam accelerator for high energy physics, has been proposed as a new particle accelerator to complement the Large Hadron Collider (LHC). The high precision of the ILC will enable physicists to study in greater detail new physics discovered at the LHC. To help define the optimum design for a detector for the ILC, the Northern Illinois Center for Accelerator and Detector Development (NICADD) is a participant in the Calorimeter for the Linear Collider Experiment (CALICE) Collaboration’s detector prototype. The CALICE detector includes a tail catcher/muon tracker (TCM), designed and built at NIU, that is designed to test the use of a tail-catching subsystem to improve the resolution of the complete detector and to test new technologies such as extruded plastic scintillators and Silicon Photomultipliers(SiPM). This presentation demonstrates that the new technology represented by the SiPMs and the addition of a TCM subsystem successfully captures energy lost due to practical limitations to the hadron calorimeters.

9:30AM G14.00006 Using constant fraction discrimination techniques to improve time resolution in CUORE, THOMAS BLOXHAM, LBNL, CUORE COLLABORATION — The CUORE experiment is a bolometric search for neutrinoless double beta decay to be based at LNGS in Italy. Both it, and the prototype Couririno whose operation has just been concluded, use Tellurium Oxide bolometers as their active detectors. These bolometers are characterized by a slow pulse shape, across almost 4 seconds, and thus a poor reconstruction of initial event times. Using constant fraction discrimination techniques, it is possible to vastly improve the time resolution, and to reconstruct events or background occurring across multiple bolometers in a useful way.

9:42AM G14.00007 The Neutrino Beam for the Homestake-DUSEL Long Baseline Experiment, MARY BISHAI, Brookhaven National Laboratory, DUSEL COLLABORATION — The proposed very long baseline neutrino oscillation experiment utilizing massive detectors at the deep Underground Science and Engineering Laboratory (DUSEL) requires a neutrino beam that is well matched to the physics goals and the performance of the DUSEL detectors. Fermi National Accelerator Laboratory (Fermilab) is located 1300km from the DUSEL location in Homestake Mine SD. This baseline has been shown to be well matched to the physics requirements of a next generation neutrino oscillation experiment. We present preliminary designs and performance studies for a high power DUSEL neutrino beam utilizing the 120 GeV Main Injector (MI) proton accelerator at Fermilab. These studies are based on the experience gained from the design and operation of the NuMI neutrino beamline which has been operating at the MI since 2005.

9:54AM G14.00008 Prospects for a Low Threshold Neutrino Experiment at the SNS, TARITREE WONGJIRAD, Duke University, CLEAR COLLABORATION — A low-threshold neutrino scattering experiment at a high intensity stopped-pion neutrino source has the potential to measure coherent neutral current neutrino-nucleus elastic scattering. This promising proposal for this experiment is through a proposed noble-liquid-detector experiment, dubbed CLEAR (Coherent Low Energy A(Nuclear) Recoils), at the Spallation Neutron Source. This talk will describe the CLEAR detector, our study of backgrounds, and the experiment’s physics reach.

10:06AM G14.00009 Long baseline neutrino oscillation experiments with massive detectors at DUSEL, TO BE DETERMINED, DUSEL COLLABORATION — We review the prospects of a very long baseline neutrino oscillation experiment based at the Deep Underground Science and Engineering Laboratory in Homestake, SD. The experiment is designed to utilize a high power neutrino beam from Fermi National Accelerator Laboratory at a baseline of 1300km. We present updated experimental sensitivities to CP violation effects in the neutrino sector and precision measurements of neutrino mixing matrix parameters from a simulation of the proposed 300 kton scale DUSEL water Cherenkov detector.
Sunday, May 3, 2009 10:45AM - 12:33PM –
Session H2 DPF: The State of QCD  Plaza D

10:45AM H2.00001 QCD at the Tevatron: Jets & Photons plus Jets, MICHAEL STRAUSS, University of Oklahoma — Recent results on the production of jets and photons at the Tevatron Collider are reviewed. The production of jets and photons dominates the hard scattering cross section at the Tevatron. These results can be used to probe the parton content of the proton, to look for physics beyond the standard model, and to characterize the predominant background for the study of many other processes. New results from D0 and CDF include the di-jet mass production cross section, inclusive photon cross section, the production of photons plus jets with heavy flavor, and the di-jet angular distribution.

11:21AM H2.00002 QCD aspects of hadron collider physics, KIRILL MELNIKOV, Johns Hopkins University — Particle physics enters the new exciting era with the start of experiments at the Large Hadron Collider (LHC) later this year. There is high hope in the high-energy physics community that the LHC will take us to a new territory of physics beyond the Standard Model. Quantum Chromodynamics (QCD) will play an important role in this journey since it allows us to describe quantitatively the outcome of hadronic collisions and provides solid foundations for New Physics searches. In this talk I will review the status of QCD as applied to problems in hadron collider physics and describe how recent advances in understanding physics of strong interactions may help in discovering physics beyond the Standard Model.

11:57AM H2.00003 Recent QCD Results from the Tevatron, SEBASTIAN GRINSTEIN — With its center of mass energy of 1.96 TeV, the proton-antiproton Tevatron collider at Fermilab allows to study the Standard Model in previously unexplored energy regions. With large cross sections and little backgrounds, measurements of QCD processes are used to test the perturbative calculations, constrain the parton density functions of the proton and study phenomenological models. Recent Run II QCD measurements will be presented.

Sunday, May 3, 2009 10:45AM - 12:33PM –
Session H6 CSWP DPF: Women in Experimental High Energy Physics: Science and Career Paths  Governor’s Square 16

10:45AM H6.00001 Silicon detectors and their impact on hadron collider physics, DANIELA BOR-TOLETTI, Purdue University — Silicon detectors are playing a critical role in extracting physics from the complex collisions at hadron colliders. They have been essential for the discovery of the top quark, searches for the standard model Higgs, and the determination of the proton and study phenomenological models. Recent Run II QCD measurements will be presented.

11:21AM H6.00002 Quark Mixing, Neutrino Mixing, Charged Lepton non-Mixing, MARJORIE CORCORAN, Rice University — The mixing of flavor and mass eigenstates in the quark sector is by now well-known and well-measured through the CKM matrix. We also know that the neutrino flavor and mass eigenstates mix (but with a strikingly different mixing pattern) though the MNS matrix. The puzzle is not so much why these mixings occur, but rather why the charged leptons apparently do not mix. Despite many sensitive searches, flavor mixing of the charged leptons has never been observed. New experiments will push these searches to unprecedented levels. Perhaps charged lepton mixing will finally be observed, perhaps not. In either case the results will shed light on the nature of leptons and the existence and nature of Supersymmetry.

11:57AM H6.00003 The MINERvA Experiment: getting a closer look at neutrinos, DEBORAH HARRIS, Fermilab — The discovery that neutrinos oscillate and therefore have mass has led to a broad new program of long baseline neutrino experiments. However, there is still much that we don’t know about the way neutrinos themselves interact in nuclei, and this could ultimately limit how well we can measure oscillation probabilities. The MINERVA experiment will use a fine-grained hermetic detector to measure precisely the many ways that few GeV neutrinos interact in different nuclei, using the NuMI beamline at Fermilab. This talk will discuss the physics justification for the MINERvA experiment, give a brief overview of the detector and the status of its construction and commissioning.

Sunday, May 3, 2009 10:45AM - 12:33PM –
Session H9 DPF: Mini-Symposium on Single Top  Governor’s Square 11

10:45AM H9.00001 Measurements of single top, ELIZAVETA SHABALINA, II. Physikalisches Institut, Universität Göttingen — We present a status of the single top quark search at the Fermilab Tevatron proton-antiproton collider. We review multivariate techniques used by the D0 and CDF collaborations to separate a small signal from the background and present results obtained with their combination. We also present the searches beyond the standard model performed using single top events.

11:21AM H9.00002 Using Boosted Decision Trees to Search for Single Top Quark Events at the DZero Experiment, ANN HEINSON, University of California, Riverside, D0 COLLABORATION — We present the results of a search for single top quark production at the DZero experiment at the Fermilab Tevatron proton-antiproton collider using boosted decision trees to separate signal from background.

11:33AM H9.00003 Using Bayesian Neural Networks to Search for Single Top Quark Events at the DZero Experiment, CECILIA GERBER, University of Illinois at Chicago, D0 COLLABORATION — We present the results of a search for single top quark production at the DZero experiment at the Fermilab Tevatron proton-antiproton collider using Bayesian neural networks to separate signal from background.

11:45AM H9.00004 Using Matrix Elements to Search for Single Top Quark Events at the DZero Experiment, MONICA PANGILINAN, Brown University, D0 COLLABORATION — We present the results of a search for single top quark production at the DZero experiment at the Fermilab Tevatron proton-antiproton collider using matrix elements to separate signal from background.
11:57AM H9.00005 Search for Anomalous Top Quark Couplings at D0 , REINHARD SCHWENHORST, Michigan State University, D0 COLLABORATION — Anomalous Wtb couplings modify the angular correlations of the top quark decay products and change the single top quark production cross section. We present limits on anomalous top quark couplings by combining information from W boson helicity measurements in top quark decays and anomalous coupling searches in the single top quark final state. We set limits on right-handed vector couplings as well as left-handed and right-handed tensor couplings based on data collected by the D0 experiment.

12:09PM H9.00006 Measurement of the polarization of singly-produced top quarks in CDF , JI-EUN JUNG, Seoul National University, CDF COLLABORATION — We present a measurement of the polarization of singly-produced top quarks in pp collisions using 3 fb^{-1} of data collected with the CDF detector. Single top quarks are expected to be produced via virtual W' boson exchange in t-channel and s-channel processes. The standard model predicts a left-handed vector coupling at the W'th vertex, but extensions allow a right-handed vector coupling. We measure separately the left- and right-handed couplings, and thus the polarization, by measuring the angular distributions of the top quark's decay products.

12:21PM H9.00007 Measurement of the single top cross section , BRUNO CASAL, Universidad de Cantabria, Spain, CDF COLLABORATION — We present recent results from searches for single-top-quark production and single-top-polarization studies using 3.2 fb^{-1} of data accumulated with the CDF detector at the Fermilab Tevatron. We select events with one charged lepton, large missing transverse energy, and two or three jets, where at least one jet is identified as a b-quark jet using displaced secondary-vertex information from the CDF silicon detector. We employ a boosted decision tree analysis technique and a neural-network jet-flavor separator to improve separation of signal and background and greatly improve the sensitivity of our search.

Sunday, May 3, 2009 1:30PM - 3:18PM –

Session J2 DPF: The State of Heavy Flavor Plaza D

1:30PM J2.00001 30 Years of the Cornell Electron Storage Ring , DAVID G. CASSEL, Cornell University — The Cornell Electron Storage Ring (CESR) began operation in 1979 with two experiments, CLEO and CUSB. Initially, CLEO and CUSB saw the \( \Upsilon(1S) \) and \( \Upsilon(2S) \) states that were discovered at Fermilab and confirmed at DESY, confirmed the \( \Upsilon(3S) \) state, and demonstrated that it was narrow. Then the two collaborations discovered the \( \Upsilon(4S) \) and found that it was significantly broader than the lower \( \Upsilon \) states. This observation and CLEO’s discovery of enhanced lepton production at the \( \Upsilon(4S) \) demonstrated that a new quark-antiquark threshold had been crossed and suggested that \( \Upsilon(4S) \rightarrow BB \) was the dominant decay mode of this new state. These discoveries ushered in the program of \( B \) physics pursued successfully at DESY, CERN, Fermilab, SLAC, and KEK, as well as at CESR. As BaBar and Belle took over the field of \( B \) physics at the \( \Upsilon(4S) \), the CLEO collaboration turned its attention to the charm threshold region. I will describe some early discoveries at CESR, highlights of CLEO’s \( B \) physics program with CESR at the \( e^+e^- \) luminosity frontier, and recent CLEO results on charmonium and \( D \) physics. Much of this report is based on a draft of an invited paper on this subject by Karl Berkelman, who tragically passed away before this conference. This paper is dedicated to his memory.


2:42PM J2.00003 State of Heavy Flavor , KAREN GIBSON, University of Pittsburgh — I present recent results in heavy flavor physics from the CDF and D0 experiments at the Fermilab Tevatron. An overview of heavy flavor lifetime, spectroscopy, and CP violation results will be shown, with an intention to highlight the breadth of heavy flavor results from the CDF and D0 experiments. I will also indicate new and improved results which can be anticipated in the final years of Run II.

Sunday, May 3, 2009 1:30PM - 1:57PM – Session J5 DPF: Heinemann Prize Session Governor’s Square 15

1:30PM J5.00001 Dannie Heineman Prize Talk: The BRST Symmetry at the Simplest Quantum Mechanical Level , C.M. BECCHI, Università di Genova, Dipartimento di Fisica e I.N.F.N. Sezione di Genova. — We analyze, at the simplest quantum mechanical level, the compensation mechanism of degrees of freedom ensured by the BRST symmetry. This analysis puts into evidence the role of a quartet of Bose-Fermi oscillators.

Sunday, May 3, 2009 1:30PM - 3:18PM – Session J9 DPF: Top Mass Governor’s Square 11

1:30PM J9.00001 New Method For Extracting the Mass of the Top Quark From All-Jets Events , GIANLUCA PETRILLO, University of Rochester, D0 COLLABORATION — Six-jet events, arising from decays of \( t\bar{t} \) pairs in which both tops decay into a W boson and a b quark, and both W’s decay into quark-antiquark pairs, constitute a potentially rich source of completely reconstructable top quarks for mass extraction analyses. However, even when two of the jets are tagged as originating from b-quarks, the mass analysis is complicated by uncertainties in assigning the four other jets to their originating partons when assembling the \( t\bar{t} \) pairs. We introduce and describe a new top mass extraction technique that directly addresses this complication, and present preliminary results from applying this technique to data recorded by the D0 experiment at the Fermilab Tevatron.

1:42PM J9.00002 A matrix element analysis measurement of the top quark mass in the lepton + jets channel with an in situ jet energy scale measurement , DARYL HARE, Rutgers University, CDF COLLABORATION — We measure the top quark mass from \( jj\) collisions at 1.96 TeV at CDF in the lepton + jets channel with at least 3 \( fb^{-1} \) of data. Events require a single lepton, missing transverse energy, and 4 jets of which at least one must be tagged as a b jet. We use a 2D unbinned likelihood fit based on per-event probabilities calculated from leading-order signal (\( tt \)) and background (W + jets) matrix elements. Our measurement is dependent upon the energy scale of calorimeter jets, so we measure this scale in-situ by constraining the invariant mass of the two jets from to the W boson mass.
1:54PM J9.00003 Measurement of the Mass Difference between Top and Antitop, MICHAEL WANG, University of Rochester, D0 COLLABORATION — We discuss a measurement of the mass difference ($\Delta m_t$) between $t$ and $\bar{t}$ quarks in lepton+jets final states of $t\bar{t}$ events in data collected with the D0 detector at Fermilab's Tevatron. $\Delta m_t$ is measured using the Matrix Element approach developed at D0. We report the most likely $\Delta m_t$, and an upper limit on $\Delta m_t$ at 95% confidence. This is the first measurement of a mass difference between a quark and its antiquark.

2:06PM J9.00004 ABSTRACT WITHDRAWN

2:18PM J9.00005 Measurement of the top quark mass using quantities that are independent of the jet energy scale, FORD GARBERSON, University of California, Santa Barbara, CDF COLLABORATION — We will present two techniques for measuring the top quark mass in the lepton plus jets channel using quantities independent of the jet energy scale uncertainty. One technique exploits the correlation of the transverse decay length of $b$-tagged jets with the top mass, and the other exploits the correlation of the transverse momentum of the lepton in the same events with the top mass. While these results are still statistically limited, their precision will improve with added data at the Tevatron and the LHC. Further, since their correlation to more conventional top mass measurement techniques is small, they will help to reduce the overall uncertainty on the top mass in combination with other results.

2:30PM J9.00006 ABSTRACT WITHDRAWN

2:42PM J9.00007 Top quark mass measurement in the lepton+jets and dilepton channels at CDF using $m_T^2$, JIAN TANG, University of Chicago, CDF COLLABORATION — A measurement of top quark mass at CDF will be presented using a 3.0 fb$^{-1}$ data sample in both lepton+jets and dilepton channels. In the lepton+jets channel, we determine the reconstructed top quark mass by minimizing the $x^2$ for the overconstrained kinematic system, and we also measure the hadronically decaying W boson mass to provide an in-situ improvement in the determination of jet energy scale. In the dilepton channel, we replace our old observable $H_T$, which is the scalar sum of transverse energy of all particles in one event, with a new observable $m_{T2}^2$, which is used in $W$ mass measurements and SUSY searches. We find a satisfying improvement in our result of top quark mass measurement using this new observable.

2:54PM J9.00008 Plans for Jet Energy Corrections at CMS, KALANAND MISHRA, Fermi National Accelerator Laboratory, CMS COLLABORATION — We present a plan for Jet Energy Corrections at CMS. Jet corrections at CMS will come initially from simulation tuned on test beam data, directly from collision data when available, and ultimately from a simulation tuned on collision data. The corrections will be factorized into a fixed sequence of sub-corrections associated with different detector and physics effects. The following three factors are minimum requirements for most analysis: offset corrections for pile-up and noise; correction for the response of the calorimeter as a function of jet pseudorapidity relative to the barrel; correction for the absolute response as a function of transverse momentum in the barrel. The required correction gives a jet Lorentz vector equivalent to the sum of particles in the jet cone emanating from a QCD hard collision. We discuss the status of these corrections, the planned data-driven techniques for their derivation, and their anticipated evolution with the stages of the CMS experiment.

3:06PM J9.00009 Background studies and spin correlation expectations in $t\bar{t}$ events in the $e\mu$ decay channel at the LHC, ALAETTIN SERHAN METE, Iowa State University, ATLAS COLLABORATION — One of the many interesting features of the top quark is its extraordinarily short lifetime. One consequence of this short lifetime is that the spin information of a decaying top quark is inherited by the decay products. Thus the spin information of the decaying top-antitop pairs can be extracted by examining the final state particles. A requisite step in such an analysis is the selection of a clean sample of $t\bar{t}\rightarrow e\mu$ events and this can be done by a careful examination of the background processes. We lay out a cut based method to enhance the signal versus the background in $t\bar{t}$ events in the $e\mu$ decay channel using Monte Carlo events and we also map out a method to investigate $t\bar{t}$ spin correlation at the ATLAS experiment at the LHC.

Sunday, May 3, 2009 3:30PM - 5:18PM —
Session L2 DPF: On the Threshold of the LHC Plaza D

3:30PM L2.00001 The LHC and Cosmology, HITOSHI MURAYAMA, IPMU Tokyo and Univ of California - Berkeley — No abstract available.

4:06PM L2.00002 The Role of US Groups in LHC Physics, DANIEL GREEN, Fermilab — U.S. groups have been involved in the LHC for the last fifteen years and have participated in the design, construction, installation and commissioning of the ATLAS and CMS detectors and the LHC accelerator. During this period U.S. groups have been integral to the overall effort and indeed comprise the largest national group within the detector collaborations. In the future these groups will take on operations tasks and R&D plans for detector upgrades. Thus, the U.S. effort will be an extended commitment, decades long. Nevertheless, the methods whereby U.S. groups will play a proportionate role in the physics analyses are less clear. LHC data and computing resources will be spread worldwide. What collaborative tools will allow U.S. groups to fully participate in the expected rich LHC physics? Should there be multiple analysis centers within the large and distributed ATLAS and CMS collaborations? As high energy physics looks ahead to having fewer energy frontier facilities similar issues will arise in the future which makes these questions of more general interest.

4:42PM L2.00003 Exploring the Energy Frontier: Looking Beyond LHC Discoveries, JAMES BRAU, University of Oregon, Eugene — The Large Hadron Collider (LHC) at CERN will soon deliver long awaited data at the Terascale (TeV energy scale). Discoveries are expected to illuminate the nature of electroweak symmetry breaking and the origin of mass, and could reveal other new phenomena such as dark matter particles, extra spatial dimensions, and advances toward grand unification. The LHC data will guide the direction of future exploration, motivating the next facilities. If the energy scale of new physics is within its reach, as widely expected, the International Linear Collider (ILC), with its characteristic precision, should be the next machine for particle physics. I will review the physics opportunity of the ILC, the world-wide effort to realize it, and the detector R&D program to develop the needed new capabilities for the precision measurements. Should Nature be unyielding at the LHC, higher energy lepton colliders might provide the needed complementarity. This will also be discussed.

Sunday, May 3, 2009 3:30PM - 5:18PM —
Session L3 DPF: Sakurai Prize Session Plaza E
describing the data quality, kinematics, and dynamics will be shown.

Production of mesons. The resulting data contains the world’s largest 3 enhanced levels compared to that found in pion production. To that end, the CLAS g12 run was recently completed at Jefferson Lab, using a liquid hydrogen especially those obtained in the three-pion system. Prior theoretical work indicates that in photoproduction one should find gluonic hybrids at significantly

permits many other possibilities in meson spectra, such as gluonic hybrids, glueballs, and tetraquarks. Experimental discovery and study of these exotic states

provides insight on the nonperturbative regime of QCD. Over the past twenty years, some searches for exotic mesons have met with controversial results, never found free, a phenomenon known as confinement. Since gluons carry colour charge, they cause the formation of chromoelectric flux tubes, which may yield unusual objects such as glueballs or hybrids. In certain models the latter can be produced with quantum numbers not allowed in the simple quark model physics is the nature and behaviour of the “glue” which holds the quarks together. The puzzling feature of this quark-gluon interaction is that quarks are

properties. I review the nature of factorization, how it arose from the parton model, and current issues in its development. This talk will be coordinated with the one by Soper.

Many important cross sections in high-energy collisions are analyzed using factorization properties. I review the nature of factorization, how it arose from the parton model, and current issues in its development. This talk will be coordinated with the one by Collins.

Supported by the U.S. Department of Energy

from the Tevatron to the LHC, R. KEITH ELLIS, Fermilab — Recent progress in perturbative QCD is described, with special emphasis on one-loop corrections to processes with large numbers of jets. These processes constitute important backgrounds for new physics searches at hadron colliders.

photoproduction dataset, with 3 events numbering in the millions. Early results

Session L6 DPB DPF: Future Accelerators for Particle Physics Governor’s Square 16

- The proposed FNAL high intensity proton complex, known as Project X, is designed to provide high power proton beams for neutrino oscillation experiments, muon to electron conversion experiments, possible kaon experiments, and an upgrade path to a higher power front end to a neutrino factory/muon collider complex. I will address the accelerator challenges of the initial configuration, possible alternatives, and how it increases the scientific reach of experimental programs.

- An accelerator complex that can produce ultra-intense beams of muons presents many opportunities to explore new physics. These facilities are unique in that, in a relatively straightforward way, they can present a physics program that can be staged and thus move forward incrementally, addressing exciting new physics at each step. Ultimately an intense cooled low-energy muon source could be accelerated to very-high energy to do energy-frontier physics with a muon collider. This talk will give an introduction to the physics capabilities of a muon collider, outline the accelerator physics of the facility and will then explore some of the limiting technologies that must be developed in order to make this “concept” a reality.

- The GlueX experiment will provide for the detailed spectroscopy necessary to map out the hybrid meson spectrum, which is essential for an understanding of the confinement mechanism and the nature of the gluon in QCD. It will be housed in the new experimental hall (Hall D) which will be constructed as part of the 12 GeV upgrade. The physics motivating the search and the status of the experiment will be reviewed.

- An initial state gluon radiation study can be done by using Drell-Yan events to understand the effect of ISR produced in proton-proton collisions at the LHC, it is important to account for the effect of initial state gluon radiation (ISR). In order to study ISR at the LHC, we will use a method that has been pioneered by CDF using Drell-Yan events to understand the effect of ISR in top-quark production at the Tevatron. The Drell-Yan process is well suited for ISR studies as it does not suffer from additional final state radiation contributions. We lay out a method in which we determine systematic uncertainties due to ISR by comparing Monte Carlo simulated events to initial data from the ATLAS experiment expected to be taken later this year.

- The D0 detector. This measurement utilizes 0.7 fb$^{-1}$ of integrated luminosity collected in proton-antiproton collisions during Run IIa of the Fermilab Tevatron. We correct the data back to particle level and compare it to parton-level theory to which fragmentation and underlying event corrections have been added.

- The search for exotic mesons in the 3π system in photoproduction with CLAS. CRAIG BOOKWALTER, Florida State University, CLAS COLLABORATION — In addition to ordinary q̅q pairs, quantum chromodynamics (QCD) permits many other possibilities in meson spectra, such as gluonic hybrids, glueballs, and tetraquarks. Experimental discovery and study of these exotic states provides insight on the nonperturbative regime of QCD. Over the past twenty years, some searches for exotic mesons have met with controversial results, especially those obtained in the three-pion system. Prior theoretical work indicates that in photoproduction one should find gluonic hybrids at significantly enhanced levels compared to that found in pion production. To that end, the CLAS g12 run was recently completed at Jefferson Lab, using a liquid hydrogen target and tagged photons from a 5.71 GeV electron beam. The CLAS experimental apparatus was modified to maximize forward acceptance for peripheral production of mesons. The resulting data contains the world’s largest 3π photoproduction dataset, with 3π events numbering in the millions. Early results describing the data quality, kinematics, and dynamics will be shown.
4:18PM L9.00005 Towards 4-quark states with 2 heavy quarks. R.R. SILBAR, T. GOLDMAN, Los Alamos National Laboratory — We study the changes in the relativistic wave functions of quarks in a linear confining potential as a function of quark mass and the effect of color Coulomb contributions. Our goal is to delineate the uncertainties in phenomenological estimates of the masses of multiquark (molecular) states that are expected in QCD.

1 NNSA of the DOE, Contract DE-AC52-06NA25396

4:30PM L9.00006 Jet identification and energy scale corrections in a high-luminosity environment at the LHC. DAVID MILLER, Stanford Linear Accelerator Center, ATLAS COLLABORATION — The LHC physics program will ultimately probe not only the highest energies ever produced in the laboratory but also the most numerous and frequent collisions between hadronic particles ever. These luminosities will produce hadronic jets from simultaneous proton-proton collisions in unprecedented numbers, presenting extreme challenges for jet identification, calibration and missing energy (E_{miss}) measurements. We present a unified jet energy scale program designed to account for these uncorrelated soft interactions using the advanced technique of associating calorimeter jets to reconstructed primary vertices using tracks. This approach suppresses the background contributions from these “pile-up” interactions and allows for jet-by-jet energy scale corrections for multiple interactions. This approach is shown to be vital for coping with the unparalleled luminosity of the LHC.

Sunday, May 3, 2009 3:30PM - 5:06PM –
Session L12 DAP DPF GPMFC: Dark Matter Searches I: Indirect Searches Plaza Court 2

3:30PM L12.00001 Overview of Dark Matter Searches with Fermi-LAT. SIMONA MURGIA, KIPAC-SLAC, Stanford University, REPRESENTING THE FERMI-LAT COLLABORATION — The Fermi Large Area Telescope (LAT) has been successfully launched from Cape Canaveral on 11 June 2008. It is exploring the gamma ray sky in the energy range between 20 MeV and 300 GeV with unprecedented sensitivity. One of the most exciting science questions that the Fermi LAT will address is the nature of dark matter. Several theoretical models have been proposed that predict the existence of Weakly Interacting Massive Particles (WIMPs) that are excellent dark matter candidates. The Fermi LAT will investigate the existence of WIMPs primarily through their annihilation or decay into photons and into electrons. I will present an overview of the dark matter search strategy with the LAT and summarize the current status of the searches.

3:42PM L12.00002 Preliminary Results for Fermi-LAT Milky Way High Energy Gamma Line Limits. YVONNE EDMONDS, ELLIOTT BLOOM, KIPAC-SLAC, Stanford University, REPRESENTING THE FERMI-LAT COLLABORATION — The Fermi-LAT Collaboration Dark Matter and New Physics Working group has been developing approaches for the indirect astrophysical detection of dark matter by its annihilation or decay products. Our work is motivated by the hypothesis that a significant component of dark matter is Weakly Interacting Massive Particles (WIMPs). The annihilation of two WIMPs or WIMP decay usually results in the production of many γ rays that if present, can be well measured in the LAT. There is also the possibility to observe γ lines from annihilation or decay into γ-γ and/or γ-Z final states. Detection of these high energy γ lines would give convincing evidence for the existence of WIMPs and a measurement of the WIMP mass. We present preliminary work that will ultimately lead to 1-year upper limits on γ lines. The 1-year analysis will be a “blind” analysis developed on the first two months of Fermi-LAT data and Monte Carlo simulations. Limits will be given independent of the WIMP and dark matter structure models.

1 SLAC DOE contract DE-AC03-76SF00515

3:54PM L12.00003 The Search for Dark Matter in the Milky Way Halo with Fermi-LAT. ROBERT JOHNSON, U.C. Santa Cruz — The Fermi Gamma-ray Space Telescope (FGST) successfully launched June 11th, 2008. Its improved sensitiviy and spectral coverage compared to its predecessor, EGRET, offers the opportunity to search for new physics with photon energies up to about 300 GeV, giving access to a scale where Weakly Interacting Massive Particles (WIMPs) masses have yet to be ruled out. We present a method for the indirect detection of Weakly Interacting Massive Particles (WIMPs) through annihilation into gamma rays in the Milky Way halo, by fitting the FGST data to a combination of models for galactic diffuse emission and dark matter annihilation. We present our current sensitivity for this search, discuss systematic issues, including uncertainties in the diffuse emission model, and explore prospects for the future.

On behalf of the Fermi-LAT collaboration

4:06PM L12.00004 The Search for Dark Matter Galactic Satellites with Fermi-LAT. PING WANG, ELLIOTT BLOOM, KIPAC-SLAC, Stanford University, REPRESENTING THE FERMI-LAT COLLABORATION — LCDM model computer simulations predict a large number of as yet unobserved dark matter (DM) galactic satellites (DM-GS) in our galaxy. Our work assumes that a significant component of DM is Weakly Interacting Massive Particle (WIMP) in the 100 GeV mass range. The annihilation or decay of WIMPs results in many high energy gamma rays that can be well measured by the Fermi Large Area Space Telescope (Fermi-LAT). The WIMP produced spectrum from the putative DM-GS are considerably harder than most astrophysical sources, are not power laws, there are no counterparts, and the emission has no time variability. This talk will focus on the blind analysis we plan to perform on about 1 year of Fermi-LAT data in our search for DM-GS, which has been developed using the first 2 months of Fermi-LAT data and Monte Carlo simulations. Preliminary limits from this analysis using the first 2 months of Fermi-LAT data will be also discussed.

Work supported by DoE contract DE-AC03-76SF00515

4:18PM L12.00005 Search for the Gamma-Ray Signature of Dark Matter with VERITAS. MATTHEW WOOD, UCLA, VERITAS COLLABORATION — A leading candidate for astrophysical dark matter (DM) is a massive particle with a mass in the range from 50 GeV to greater than 10 TeV and an interaction cross section on the weak scale. The self-annihilation of such particles in astrophysical regions of high DM density can generate stable secondary particles including VHE gamma rays with energies up to the DM particle mass. Dwarf spheroidal galaxies of the Local Group are attractive targets to search for the annihilation signature of DM due to their proximity and large DM content. We report on gamma-ray observations taken with the Very Energetic Radiation Imaging Telescope Array System (VERITAS) of several dwarf galaxy targets. We discuss the implications of these measurements for the parameter space of DM particle models.

4:30PM L12.00006 ABSTRACT WITHDRAWN —
4:42PM L12.00007 Study of indirect detection of Axion-Like-Particles with the Fermi-LAT instrument and Imaging Atmospheric Cherenkov Telescopes1, DAVID PANEQUE, KIPAC-SLAC, Stanford University, ELLIOTT BLOOM, KIPAC-SLAC, Stanford University, Representing the Fermi-LAT Collaboration, MIGUEL SANCHEZ-CONDE, Instituto de Astrofísica de Andalucía — Axion like Particles (ALPs) are predicted to couple with photons in the presence of magnetic fields. This effect may lead to a significant change in the observed spectra of VHE sources such as AGNs. We performed a study that considers both the photon/axion mixing that takes place in the gamma-ray source and the mixing expected to occur via the intergalactic magnetic fields between the source and the Earth. An efficient photon/axion mixing in the source always means attenuation in the photon flux, whereas the mixing in the intergalactic medium may result in a decrement and/or enhancement of the photon flux, depending on the distance of the source and the energy considered. We also predict an attenuation in the intensity spectrum of distant sources, which occurs at an energy that only depends on the properties of the ALPs and the intensity of the intergalactic magnetic field, and thus is independent of the AGN source being observed. In the presentation we will provide a prescription for the indirect detection of ALPs with gamma-ray instruments and will present preliminary results derived from AGN spectra using published IACT and Fermi-LAT data.

3:54PM L14.00003 Measurement of the WZ diboson cross section at D0, JON GUO, SUNY–Stony Brook, D0 COLLABORATION — We used the data collected by the D0 Run II detector during the 2002-2006 period of the Fermilab Tevatron Collider to determine the mass of the W boson, with an integrated luminosity of 1 fb−1. We will present the result for the direct measurement using the electron decay channel.

4:42PM L12.00008 Shedding Light on Dark Matter: A Faraday Rotation Experiment to Limit a Dark Magnetic Moment1, SUSAN GARDNER, Fermilab/University of Kentucky — I describe a new possibility for the direct detection of dark matter. That is, if dark matter consists, in part, of cold, neutral particles with a non-zero magnetic moment, then, in the presence of an external magnetic field, a measurable gyromagnetic Faraday effect becomes possible. A Faraday rotation experiment can set limits on the magnetic moment of a electrically-neutral, dark-matter particle, and the limits increase in stringency as the candidate mass decreases. I describe how such could be realized and determine the limits on the magnetic moment as a function of mass which follow given demonstrated experimental capacities.

3:30PM L14.00001 Measurement of W boson mass at D0, JUN GUO, SUNY–Stony Brook, D0 COLLABORATION — We used the data collected by the D0 Run II detector during the 2001-2006 period of the Fermilab Tevatron Collider to determine the mass of the W boson, with an integrated luminosity of 1 fb−1. We will present the result for the direct measurement using the electron decay channel.

4:06PM L14.00004 Measurement of the ZZ/WZ Diboson cross section in leptons+jets final states at CDF, WESLEY KETCHUM, ZAID ALAWI, University of Chicago, CDF COLLABORATION — We study the properties of the Z + photon production from proton and anti-proton collisions at the Center-of-Mass of 1.96 TeV at the Fermilab Tevatron using the CDF II detector. We analyze a sample corresponding to an integrated luminosity of 3.1 fb−1. We select events in which the Z boson decays leptonically by requiring two electrons or two muons to be identified in the detector, while also requiring the presence of an additional photon. We compare this selection to the expected Standard Model contribution, and compare various kinematic variables between the data and the Standard Model predictions.

4:42PM L14.00007 In-Situ Calorimeter Calibration at the ATLAS Detector with \( Z \to ee \) Events, KATHRYN TSCHANN-GRIMM, Stony Brook University, ATLAS COLLABORATION — This presentation will describe the in-situ calibration of the ATLAS electromagnetic calorimeter using \( Z \to ee \) events. The method is based on constraining the invariant mass distribution of the two decay electrons to the known Z-boson line shape. Monte carlo results will be presented showing that this \( Z \to ee \) calibration method can achieve a long-range calorimeter resolution term of 0.5%, the value calculated as necessary to achieve the ATLAS experiment’s physics goals (such as detection \( H \to \gamma\gamma \)). Performance and comparison of different methods to extract the calibration constants will be shown.

1 acknowledge partial support from the U.S. Department of Energy under contract DE-FG02-96ER40989

Sunday, May 3, 2009 3:30PM - 5:18PM – Session L14 DPF: W and Z Physics II Plaza Court 4
4:54PM L14.00008 Studies of final-state photon radiation in the process \( p\bar{p} \to W^\pm \to \ell^\pm \nu \), CATHERINE BERNACIAK, DOREEN WACKEROTH, University at Buffalo, The State University of New York — We study the effects of multiple soft, collinear photon radiation off a final state lepton in the process \( p\bar{p} \to W^\pm \to \ell^\pm \nu \), as implemented in the MC program WGRAD3. EW virtual effects as well as up to two hard photons radiating off a final-state lepton are also included. These effects are compared with the MC program HORACE which also includes the complete O(\alpha) EW radiative corrections to \( p\bar{p} \to W^\pm \to \ell^\pm \nu \) and multiple photon radiation.

This work is supported by the NSF, PHY0705682, through the LHC Theory Initiative Fellowship.

5:06PM L14.00009 A precision measurement of the mass of the W boson at the DZero experiment, JYOTSNA OSTA, University of Notre Dame, D0 COLLABORATION — The D0 experiment’s measurement of the mass of the W boson in the electron decay channel is currently in its final stages. This precision measurement is the result of an analysis of 1.0 fb\(^{-1}\) of the Tevatron data taken between 2002 and 2006. One of the potential sources of significant systematic error in this measurement lies in the modeling of the hadronic recoil. We present the salient features and results of this analysis with an emphasis on the recoil.

Monday, May 4, 2009 10:45AM - 12:33PM
Session Q2 DNP DPF: Recent Progress at the Neutrino Frontier

Plaza D

10:45AM Q2.00001 Recent Solar Neutrino Results and Future Prospects, MARK CHEN, Queen’s University — The original solar neutrino problem was solved when measurements were made by the Sudbury Neutrino Observatory that revealed that the flux of solar electron neutrinos was lower than the flux of solar neutrinos of all flavors. This demonstrated that neutrino flavor mixing, consistent with matter-enhanced neutrino oscillations, takes place. Though SNO has completed collecting data there is still much that can be learned from solar neutrinos, particularly at lower energies. Recent results from the Borexino experiment are the measured rate of \(^{10}\)Be solar neutrinos and lower energy \(^{8}\)B solar neutrinos. The most recent data analysis by SNO has also lowered the threshold for the detection of \(^{10}\)Be solar neutrinos using charged-current reactions of neutrinos on deuterium. Future measurements of the pep and CNO solar neutrinos are a goal of the SNO+ experiment. By looking at lower energy solar neutrinos, precision studies of neutrino oscillations can be continued. The original intent of solar neutrino experiments — using neutrinos to study solar physics — will also be revisited by future experiments. Neutrinos will help in understanding the metallicity in the solar core that appears to clash with recent interpretations of solar surface chemical abundances. This talk will present recent solar neutrino results and future prospects.

11:21AM Q2.00002 Determining the Reach of Neutrinoless Double Beta Decay, JONATHAN ENGEL, University of North Carolina — The rate of neutrinoless double beta decay depends not only on a linear combination of neutrino masses, but also on the structure of the initial and final nuclear states. To determine the sensitivity of an experiment to neutrino physics, one must calculate the matrix element between those states of a nuclear two-body decay operator. In the last few years, theorists have worked to increase the accuracy of these calculations — and hence to reduce the uncertainty in experimental sensitivity — in a number of important nuclei. I discuss recent progress and remaining challenges.

11:57AM Q2.00003 Neutrino Mass and the Origin of Matter, RABINDRA MOHAPATRA, University of Maryland — Discovery of neutrino masses and the possibility that the neutrinos are their own anti-particles has provided a new way to resolve a long standing puzzle of cosmology i.e. why the universe consists only of matter and no anti-matter. In this talk, I explore this connection between neutrino mass and matter-anti-matter asymmetry. At the heart of this approach is the so-called “seesaw mechanism” which provides a way to understand why neutrino masses are so much smaller than the masses of other standard model particles by postulating the existence of heavy right handed (RH) neutrinos. The decay of these heavy RH neutrinos in the early universe can provide the seed for the observed matter-anti-matter asymmetry. I discuss possible tests of this idea in upcoming neutrino experiments. Since the masses of the right handed neutrinos are not known, it is quite possible that they are light enough to be produced at the Large Hadron Collider; in this case, they instead of being “creators” can be “destroyers” of matter-anti-matter asymmetry pointing to other ways for understanding this asymmetry. Their search at LHC can therefore throw light on the moment of matter creation.

Monday, May 4, 2009 10:45AM - 12:33PM
Session Q9 DPF: Mini-Symposium on Heavy Flavor: CP Violation and Rare Decays

Governor’s Square 11

10:45AM Q9.00001 Rare B Decays and CP Violation from BaBar and Belle, WILLIAM WISNIEWSKI, Stanford Linear Accelerator Center — No abstract available.

11:21AM Q9.00002 Amplitude Analysis of the Decay \( B^0 \to K^+\pi^-\pi^0 \), ANDREW WAGNER, SLAC, BABAR COLLABORATION — We report an updated amplitude analysis of the charmless hadronic decays of neutral B mesons to \( K^+\pi^-\pi^0 \). With a sample of 454 million \( \Upsilon(4S) \to B^0\bar{B}^0 \) decays collected by the \( B_{ABAR} \) detector at the PEP-II asymmetric-energy B Factory at SLAC, we measure the magnitudes and phases of the intermediate resonant and nonresonant amplitudes for \( B \to K\pi \). Our analysis, as implemented in the MC program WGRAD3, EW virtual effects as well as up to two hard photons radiating off a final-state lepton are also included. These effects are compared with the MC program HORACE which also includes the complete O(\alpha) EW radiative corrections to \( B^0 \to K^+\pi^-\pi^0 \) and multiple photon radiation.

11:33AM Q9.00003 Search for two-body \( B \)-meson decays with a \( b \) meson and a \( \rho \) or \( K^* \) meson, ANGEL CHAVEZ, University of Colorado, BABAR COLLABORATION — We present results of a search for \( B \)-meson decays to a \( b \) meson in combination with a vector meson \( \rho \to \pi\pi \) or \( K^* \to K\pi \). The analysis was performed on a data sample consisting of 465\times10^{-6} \( B\bar{B} \) pairs collected with the \( B_{ABAR} \) detector at the PEP-II asymmetric-energy B Factory at SLAC.

11:45AM Q9.00004 Recent Results in Rare Charmless Three-body Hadronic \( B \)-meson Decays, EUGENIA PUCCIO, University of Warwick, BABAR COLLABORATION — We report recent results from the BABAR experiment on the rare three-body charmless hadronic decays of charged and neutral \( B \) mesons. These results have been obtained using the full \( B_{ABAR} \) dataset of around 470 million \( B\bar{B} \) pairs.
11:57AM Q9.00005 Study of the Decays $B^0 \rightarrow K^+ K^- K_S^0$ and $B^+ \rightarrow K^+ K^- K^+$, Brian Lindquist, SLAC, BABAR Collaboration — We study the decays $B^0 \rightarrow K^+ K^- K_S^0$ and $B^+ \rightarrow K^+ K^- K^+$ using a sample of 459 million $\Upsilon (4S) \rightarrow BB$ events collected with the BABAR detector at the PEP-II B Factory. We use a Dalitz plot analysis to measure the magnitudes and phases of intermediate resonant and nonresonant amplitudes, and to measure CP-violating parameters.

12:09PM Q9.00006 Study of $B$-meson decays to an $\omega$ meson and a light vector meson, Evan W. Thomas, University of Colorado, BABAR Collaboration — We present measurements of branching fractions, polarization, and CP-violation charge asymmetries for $B$-meson decays to two-body final states containing an $\omega$ meson and a low-mass $\pi\pi$ or $K\pi$ system. The analysis was performed on a data sample consisting of $465 \times 10^6 BB$ pairs collected with the BABAR detector at the PEP-II asymmetric-energy $B$ Factory at SLAC. We obtained improved measurements for the previously observed decay $B \rightarrow \omega p^+$, and evidence or observation of new modes with $\omega$ and $K^*(892)$, $K_S^0(1430)$, and $K_d^0(1430)$.

12:21PM Q9.00007 Measurement of the Time-Dependent CP asymmetries in $B^0 \rightarrow K_S K_S K_S$, Simon Sitt, Univ. Paris VI et VII, BABAR Collaboration — We present a measurement of the time-dependent CP asymmetry in the channel $B^0 \rightarrow K_S K_S K_S$ using the full $\Upsilon (4S)$ dataset of the BABAR experiment corresponding to 465 million $BB$ pairs events. This mode is of particular interest, as it is a theoretically clean penguin mode and potentially sensitive to new physics effects. We use an extended likelihood fit to determine the $S$ and $C$ parameters of the CP asymmetry simultaneously in the modes $B^0 \rightarrow K_S p(p^-) K_S(p^-) K_S(p^-)$ and $B^0 \rightarrow K_S(p^+) p^- K_S(p^-) K_S(p^0)\pi^0$.

Monday, May 4, 2009 1:30PM - 3:18PM –
Session R2 DAP DPF: New Eyes on the Universe II Plaza D

1:30PM R2.00001 The VERITAS gamma-ray observatory: Recent observations and status, Simon Swordy, University of Chicago — VERITAS, an imaging atmospheric Cherenkov array for gamma-ray astronomy in the GeV - TeV range, has recently completed its first season of observations with a full array of four telescopes. A number of astrophysical gamma-ray sources have been detected, both galactic and extragalactic, including sources previously unknown at TeV energies. We shall discuss the present status of VERITAS, and present a number of results from recent observations.

2:06PM R2.00002 Milagro Observations of the TeV Sky, John Pretz, Los Alamos National Lab — The Milagro air shower array in the Jemez mountains above Los Alamos was decommissioned in June 2008 after four years of operation at full sensitivity. The central Milagro 80x60 meter water pond was instrumented with 723 Photo-multiplier Tubes and was operated since 1999. In 2004 an array of 176 outrigger water tanks, each hosting a single PMT, was added, completing the detector. Milagro was the first experiment to use water-Cherenkov technology to measure atmospheric TeV gamma rays and complements IACT observations with it’s large duty factor and wide field of view. The Milagro Collaboration has previously announced discovery of new discrete TeV gamma-ray sources and measurement of diffuse TeV fluxes from the Galactic plane and the Cygnus region of the galaxy. The final analysis of the full Milagro dataset will be presented, focusing on the measured energy spectra of Milagro gamma-ray sources. Two unexpected localized excesses of cosmic rays will also be shown. These cosmic-ray excesses are particularly interesting because they cannot be explained with conventional understanding of the local and galactic magnetic fields and may suggest the presence of a nearby accelerator. Finally these observations will be discussed in the context of the search for the origin of cosmic rays.

1 For the Milagro Collaboration

2:42PM R2.00003 Recent Results from IceCube1, Teresa Montaruli, University of Wisconsin - Madison — In two more construction seasons IceCube, the first cubic-kilometer neutrino telescope, will be completed according to the initial schedule. The instrumentation of this extremely large volume allows to measure neutrinos in the energy range from about 100 GeV up to energies larger than $10^{17}$ eV. When complete, IceCube will reach sensitivities well below expected neutrino fluxes from astrophysical sources accelerating hadrons. A ground-based extensive air-shower, IceTop, measuring showers induced by primaries of energy between $10^{15} - 10^{17}$ eV, enriches the physics potential of this observatory at the South Pole operating standalone and in coincidence with the deep ice detector. The current results of IceCube in incomplete configurations and the physics reach of the full detector will be discussed as well as the low energy extension DeepCore and possible high energy extensions.

1 http://www.icecube.wisc.edu

Monday, May 4, 2009 1:30PM - 3:18PM –
Session R4 DAP DPF: Dark Matter Plaza F

1:30PM R4.00001 A DEAP & CLEAN Program for the Direct Detection of Dark Matter, Andrew Hime, Physics Division, Los Alamos National Lab — On behalf of the DEAP/CLEAN Collaboration, I will discuss our efforts to exploit liquid argon (LAr) and liquid neon (LNe) in a single-phase, scintillation detector for the direct detection of dark matter and low-energy solar neutrinos. The unique properties of LAr and LNe allow for a conceptually simple, economic, and scalable detector when operated in the single phase. Target exchange between LAr and LNe allows the capability of a “Beam On - Beam Off” test of a positive dark matter signal versus some unknown source of background. At the multi-ton scale, the single-phase approach offers unprecedented sensitivity to WIMP dark matter and the simultaneous detection of the dominant and low-energy (pp-fusion) solar neutrino spectrum. I will discuss this program, including a status report from DEAP-1 presently operating underground at SNOLAB, our plans to construct and commission the Mini-CLEAN detector, and our vision to move to the multi-ton target scale. This presentation will be complemented by a number of contributed papers.

2:06PM R4.00002 Studies of cosmic antiparticles with PAMELA1, Marc Pearce, KTH, Stockholm — The PAMELA satellite experiment was launched into low earth orbit on June 15th 2006. The combination of a permanent magnet silicon strip spectrometer, and a silicon-tungsten imaging calorimeter allows precision studies of the charged cosmic radiation to be conducted over a wide energy range (~100 MeV - ~200 GeV). A primary scientific goal is to search for dark matter particle annihilations by measuring the energy spectra of cosmic ray antiparticles. Recent results from the PAMELA experiment will be reviewed with a particular focus on cosmic ray antiprotons and positrons.

1 On behalf of The PAMELA Collaboration
2:42PM R4.00003 The Hunt for Dark Matter, DAN HOOPER, Fermi National Accelerator Laboratory — For seventy years, we have had evidence that much of the Universe’s mass is non-luminous, but still today we have not identified what makes up this mysteriously dark substance. Many experimental programs are underway, however, which hope to change this state of affairs. Deep underground detectors, gamma-ray telescopes, neutrino and cosmic ray detectors, as well as particle colliders, are all searching for clues of dark matter’s identity. Possible dark matter candidates include supersymmetric particles or even ordinary particles traveling through extra dimensions of space. With the new technologies needed to observe these particles rapidly developing, the hunt to discover dark matter’s identity has now truly begun.

Monday, May 4, 2009 1:30PM - 3:18PM –
Session R9 DPF: Mini-Symposium on Searches I Governor’s Square

1:30PM R9.00001 Physics Beyond the Standard Model, DAVID TOBACK, Texas A&M University — I will present an overview of searches for non-standard model phenomena. The focus will be on the recent results from Fermilab Tevatron, using 1–3 fb$^{-1}$ of data collected with the CDF and D0 detectors. Both signature-based searches and searches driven by models will be discussed. Models include supersymmetry, extra dimension, lepton-quark, extra heavy gauge bosons, technicolor, etc.

2:06PM R9.00002 The Dijet Mass Spectrum and a Search for Quark Compositeness at CDF, MANOJ JHA, University of Bologna, CDF COLLABORATION — The standard model (SM) gives a good description of nature in terms of the fundamental fermions and their interactions via gauge bosons. However, the SM is not expected to be a complete theory. For example, it does not explain the number of fermion families or their mass hierarchy. It also does not provide a unified description of all gauge symmetries. Compositeness models postulate constituents of the SM fermions and new strong dynamics that bind these constituents. We search for quark compositeness by measuring dijet mass differential cross section in a few regions of rapidity magnitude ($|y|$) using about 3 fb$^{-1}$ of data collected by the CDF experiment. The signal is expected in the region with small $|y|$.

2:18PM R9.00003 Search for charged massive long-lived particles at D0, YUNHE XIE, Brown University, D0 COLLABORATION — We report on a new search for charged massive long-lived particles (CMLLP) by the D0 Experiment at Fermilab’s Tevatron. CMLLP are predicted in many theories beyond Standard Model. Time-of-flight information was used in the search for pair-produced CMLLPs, based on the signature of two particles, reconstructed as muons, with speed and invariant mass inconsistent with beam-produced muons. The analysis was done with the data taken by D0 detector in Run II corresponding to an integrated luminosity of 3 fb$^{-1}$. Limits on the pair production of CMLLPs are presented quasi-model independently.

2:30PM R9.00004 Search for scalar top decaying into charm and neutralino at CDF, MIGUEL VIDAL, CIEMAT, CDF COLLABORATION — Using the CDF detector in the Run II of the Tevatron, we have analyzed events containing two or more jets and missing transverse energy in order to look for the presence of new physics. At least one of the jets was required to be tagged as originating from a heavy-flavor quark in order to enhance the presence of c-jets. The analysis was optimized for the search for a scalar top decaying into charm and neutralino. Preliminary results will be presented as well as future plans for the search for a light scalar top in this channel.

2:42PM R9.00005 Setting Limits on Gauge Mediated Supersymmetry Breaking Models with Photons at CDF, EUNSIN LEE, Texas A&M University, CDF COLLABORATION — Models of supersymmetry predict new heavy, neutral particles, known as a neutralino, that can decay to a photon and the lightest supersymmetric particle, the gravitino. We present a search for these particles in proton-proton collisions at $\sqrt{s}=1.96$ TeV at the Collider Detector at Fermilab. After years of data taking we find no evidence for this process and set the world’s best limits on models of Gauge Mediated Supersymmetry Breaking.

2:54PM R9.00006 ABSTRACT HAS BEEN MOVED TO J14.00005

3:06PM R9.00007 Search for trilepton SUSY signal at CDF, MARCELO VOGEL, JOHN STROLOGAS, MICHAEL GOLD, University of New Mexico, CDF COLLABORATION — The production of chargino-neutralino and their subsequent leptonic decay is one of the most promising supersymmetry (SU5) signatures at the Tevatron collider. We present a complete CDF search for trileptons and missing transverse energy associated with this process. To increase our sensitivity to SUSY signals (or any other new phenomena) we include low-pT electrons and muons ($p_T>5$ GeV/$c$), low dilepton masses ($M_{ll}<10$ GeV/$c^2$), forward leptons ($|y|>1$), loose leptons (isolated tracks that do not pass ordinary lepton selection) and tau-jets from hadronic tau decays. Special care is taken for the light-flavor and heavy-flavor QCD background that is significant in some of the kinematic regions we explore.

Monday, May 4, 2009 1:30PM - 3:18PM –
Session R12 DPF: Mini-Symposium on Heavy Flavor: Future of Heavy Flavor Physics

1:30PM R12.00001 Measurement of the Differential Production Cross Section of $J/\Psi \rightarrow \mu^+\mu^-$ in Proton-Proton Collisions at $\sqrt{s}=10$ TeV with Simulated Data, YU ZHENG, IAN SHIPSEY, CMS COLLABORATION — We present several methods for measuring the differential production cross section of $J/\Psi \rightarrow \mu^+\mu^-$ in proton-proton collisions at $\sqrt{s} = 10$ TeV, using simulated samples of $J/\Psi$ corresponding to data to be collected in the first LHC run by the CMS detector. We show the reconstruction and trigger performance of the CMS detector for single muons and $J/\Psi \rightarrow \mu^+\mu^-$, discussing reconstruction efficiencies and trigger efficiencies. We also separate prompt $J/\Psi$ from those produced in the decay of B-hadrons by exploiting the long lifetime of beauty particles. About thirteen thousand reconstructed prompt $J/\Psi$ events pass the dedicated $J/\Psi$ trigger in a simulated data sample corresponding to an integrated luminosity of 1 pb$^{-1}$.

1:42PM R12.00002 An overview of the b-Tagging algorithms in the CMS Offline software, JEFFREY CARBERSON, University of California Santa Barbara, CMS COLLABORATION — The CMS Offline software contains a widespread set of algorithms to identify jets originating from the weak decay of b-quarks. Different physical properties of b-hadron decays like lifetime information, secondary vertices and soft leptons are exploited. The variety of selection algorithms range from simple and robust ones, suitable for early data-taking and online environments as the trigger system, to highly discriminating ones, exploiting all the information available.
1:54PM R12.00003 Prospects for B Physics at the LHC , THOMAS RUF, CERN — The LHC is not only a machine for the high energy frontier but also a super b-factory. I will review the theoretical background how b-physics, i.e. flavour physics in general, can help to detect and explore new physics in a complementary way compared to direct searches. Discuss the challenges of b-physics at an hadron collider and how the experiments deal with it. Expected results with first data and long term perspective are also presented.

2:30PM R12.00004 Search for $\xi(2230)$ in Radiative $J/\psi$ Decays , BERTRAND ECHENARD, California Institute of Technology, BABAR COLLABORATION — A search has been made for $\xi(2230)$ production in radiative $J/\psi \rightarrow \gamma K^+K^-$ and $J/\psi \rightarrow \gamma K_sK_s$ decays. This search is performed on 464 fb$^{-1}$ of data collected at $\sqrt{s}$ = 10 TeV as a function of the $J/\psi$ transverse momentum. The study is based on simulated samples of $J/\psi$ candidate events corresponding to 1 pb$^{-1}$ of data expected to be collected by the CMS detector in early LHC running. We use Monte Carlo pseudo-experiments to study potential biases in the fit procedure used to extract the polarization parameter, $\alpha$, and in the determination of our expected sensitivity. These measurements are expected to provide some insight into the current observed disagreement between the non-relativistic QCD theory and recent CDF $J/\psi$ polarization measurements made using data collected at the Tevatron collider.

2:42PM R12.00005 Feasibility study for measuring $J/\psi$ polarization using early LHC data collected with the CMS detector , ZHEN HU, ERIC JAMES, SIJIN QIAN, PEKING UNIVERSITY TEAM, FERMILAB LPC TEAM — We present a feasibility study for measuring the polarization of prompt $J/\psi$ mesons produced in proton-proton collisions at $\sqrt{s}$ = 10 TeV as a function of the $J/\psi$ transverse momentum. The study is based on simulated samples of $J/\psi$ candidate events corresponding to 1 pb$^{-1}$ of data expected to be collected by the CMS detector in early LHC running. We use Monte Carlo pseudo-experiments to study potential biases in the fit procedure used to extract the polarization parameter, $\alpha$, and in the determination of our expected sensitivity. These measurements are expected to provide some insight into the current observed disagreement between the non-relativistic QCD theory and recent CDF $J/\psi$ polarization measurements made using data collected at the Tevatron collider.

3:06PM R12.00007 Feasibility Study of the Measurement of the Differential Production Cross Section of $\Upsilon \rightarrow \mu^+\mu^-$ with the CMS detector in Early LHC Data , ZOLTAN GECSE, IAN SHIPSEY, Purdue University, Boulder, Colorado, CMS COLLABORATION — We present a feasibility study of the measurement of the differential production cross-section of $\Upsilon \rightarrow \mu^+\mu^-$ in early proton-proton collision data produced by the LHC accelerator at $\sqrt{s} = 10$ TeV and collected by the CMS detector. About two thousand reconstructed $\Upsilon \rightarrow \mu^+\mu^-$ candidates events corresponding to 1 pb$^{-1}$ of data expected to be collected by the CMS detector in early LHC running. We use Monte Carlo pseudo-experiments to study potential biases in the fit procedure used to extract the polarization parameter, $\alpha$, and in the determination of our expected sensitivity. These measurements are expected to provide some insight into the current observed disagreement between the non-relativistic QCD theory and recent CDF $J/\psi$ polarization measurements made using data collected at the Tevatron collider.

Monday, May 4, 2009 1:30PM - 3:06PM —
Session R14 DPF: QCD Physics Plaza Court 4

1:30PM R14.00001 Multi-jet studies at CMS in LHC , SUVADEEP BOSE, Tata Institute of Fundamental Research, CMS COLLABORATION — Prospects of QCD studies with multi-jet events at the CMS experiment at the Large hadron Collider are presented. Kinematic distributions of 3-jet and 4-jet events reveal the vector nature of gluon and gluon self coupling which are essential features of QCD. Monte Carlo simulations at 10 TeV of proton-proton center of mass energy are used to study the selection of the multi-jet samples and to measure the various multi-jet kinematic and topological distributions involving corrections due to detector effects. The various sources of systematic uncertainties are examined. For three and four jet events, the kinematic and topological variables discussed are the energy fractions carried by the leading jets and the angles between the planes containing the jets.

1:42PM R14.00002 Measurements of Multijet Production at $\sqrt{s} = 1.96$ TeV in the D0 experiment , SCOTT ATKINS, Louisiana Tech University, D0 COLLABORATION — We analyze the data set corresponding to an integrated luminosity of 0.7 fb$^{-1}$ taken with the DZero detector at the Fermilab Tevatron collider. Recent measurements on multijet production in hadron collisions at $\sqrt{s} = 1.96$ TeV are presented. The measured observables are dijet angular distributions and the ratio of 3-jet to 2-jet cross-sections (R3/2). Dijet angular distributions are measured in different regions of dijet mass and are used to set limits on new physics models like quark compositeness and extra spatial dimensions. The ratio R3/2 is measured as a function of transverse jet momentum.

1:54PM R14.00003 Inclusive Jet Production in Z+jets final states , STEFANO CAMARDA, IFAE-Barcelona, CDF COLLABORATION — We present preliminary results on inclusive $Z$+jets production in $pp$ collisions at $\sqrt{s} = 1.96$ TeV. The measurements are based on 3.3 fb$^{-1}$ of data collected by the CDF experiment in Run II, and both the electron and muon $Z$-decay channels are considered. The measured cross sections are corrected for detector effects back to the hadron level and compared to NLO parton-level pQCD prediction including non-pQCD corrections. The analysis is performed in the context of studies on irreducible backgrounds in searches for new physics.

2:06PM R14.00004 ABSTRACT WITHDRAWN —

2:18PM R14.00005 ABSTRACT WITHDRAWN —

2:30PM R14.00006 Measurement of the top pair production cross section in the dilepton decay channel at CDF , CHANG-SEONG MOON, Seoul National University, CDF COLLABORATION — We present a measurement of the $t\bar{t}$ production cross section in $pp$ collisions at $\sqrt{s} = 1.96$ TeV using 2.8 fb$^{-1}$ of data collected by the CDF detector at the Fermilab Tevatron. We use $t\bar{t}$ dilepton events reconstructed with missing transverse energy and jets assuming top quark mass $m_t = 175$ GeV/c$^2$. We measure $\sigma_{t\bar{t}} = 6.13 \pm 0.88_{\text{stat}} \pm 0.40_{\text{syst}} \pm 0.38_{\text{theory}}$ pb.

2:42PM R14.00007 ABSTRACT WITHDRAWN —
2:54PM T2.00008 Measurement of the ttbar Production Cross Section in the Lepton+Jets Channel with Lifetime Tagging

DOOKEE CHO, Boston University, SEHWOOK LEE, Iowa State University, D0 COLLABORATION — We present a measurement of the production cross section at a center-of-mass energy of 1.96 TeV. This analysis is based on the selection of events with one charged lepton (electron or muon), missing transverse energy, and 3 or more jets. We utilize the e+jets and mu+jets data samples corresponding to integrated luminosities of 4 fb$^{-1}$ collected using the D0 detector. To help distinguish the signal from the background processes, we use a neural network algorithm that uses lifetime information to identify the b-quark jets that are associated with top quark decays. We require at least one b-tagged jet to be identified in this analysis.


3:30PM T2.00001 State of Tevatron Searches Beyond the Standard Model

DAVID HEDIN, Northern Illinois University — Experimental data on particle interactions are well-described by the standard model. However it is expected that some new physics has to appear at energy scales of a few TeV. The CDF and D0 experiments have used data from proton-antiproton interactions at the Tevatron Collider at Fermilab to search for this new physics. Latest results using integrated luminosities of over 5 inverse femtobarns will be reviewed including searches for a range of possible signals such as heavy gauge bosons, supersymmetric particles, leptoquarks, and the effects of extra dimensions.

3This work is supported by the NSF.

4:06PM T2.00002 Searches Beyond the Standard Model at the LHC

YURI GERSHTEIN, Rutgers University — There are many reasons to believe that a glimpse of a more fundamental theory will be revealed by exploring the electroweak energy scale. This exploration is the LHC’s raison d’etre. ATLAS and CMS detectors have accumulated a lot of expertise in running the detectors as well as triggering on and analyzing cosmic rays and beam halo from September 2008 LHC run. When the collisions come, discoveries could soon follow. I will describe the strategies and preparations for new physics searches at the LHC, concentrating on what can be achieved with the early data.

4:42PM T2.00003 The State of Searches Beyond the Standard Model- Theoretical Aspects

JAY WACKER, SLAC — No abstract available.

Monday, May 4, 2009 3:30PM - 5:18PM – Session T9 DPF: B Physics II Governor’s Square 11

3:30PM T9.00001 Measurement of the $B^0$ Mixing Phase $\beta_s$ with the CDF II Detector

ELISA PUESCHEL, Carnegie Mellon University, CDF COLLABORATION — We present the latest CDF results on the determination of the $B^0_s$ mixing phase $\beta_s$, based on an angular- and time-dependent analysis of the $B^0_s \to J/\psi \phi$ decay mode, including determination of the flavor of the $B^0_s$ meson at production. We discuss the compatibility of the result with Standard Model predictions as well as combination with other results and give prospects for further improved precision measurements.

3:42PM T9.00002 ABSTRACT WITHDRAWN –

3:54PM T9.00003 Study of the $B^0 \to \phi \phi$ Decay and Measurement of its Branching Ratio with CDF

LORENZO ORTOLAN, INFN Trieste, CDF COLLABORATION — We present a measurement of the $B^0_L \to \phi \phi$ branching ratio using approximately 2.9 fb$^{-1}$ of data collected with the CDF II detector at the Fermilab Tevatron. The first measurement of this decay mode was performed at CDF in 2005 using a 180 pb$^{-1}$ data sample where eight signal events were seen. We select events in the displaced track trigger sample and optimize the event selection requirements. The procedure to optimize the selection and estimates of the expected background are described. The preliminary result for the branching ratio is in agreement with theoretical predictions and the previous analysis. It is now dominated by the experimental uncertainty in the $B^0 \to J/\psi \phi$ branching ratio which is used for normalization.

4:06PM T9.00004 ABSTRACT WITHDRAWN –

4:18PM T9.00005 ABSTRACT WITHDRAWN –

4:30PM T9.00006 Measurement of $\Gamma_s$ and $\Delta \Gamma_s$ from $B^0_s \to J/\psi \phi$ at CDF

LOUISE OAKES, University of Oxford, CDF COLLABORATION — We measure the mean lifetime, $\tau_s = \frac{1}{2}(\Gamma_L + \Gamma_H)$, and the width difference, $\Delta \Gamma_s = \Gamma_L - \Gamma_H$, of the light and heavy mass eigenstates of the $B^0_s$ meson in $B^0_s \to J/\psi \phi$ decays. The analysis is based on $\sim 4$ fb$^{-1}$ of $p\bar{p}$ collisions collected with the CDF II detector at the Fermilab Tevatron.

4:42PM T9.00007 ABSTRACT WITHDRAWN –

4:54PM T9.00008 ABSTRACT WITHDRAWN –

5:06PM T9.00009 Measurement of Branching Fraction and $CP$ Asymmetry in $B^- \to D^0_{DCS} \pi^-$

PAOLA GAROSI, Universita’ di Siena and INFN Pisa, CDF COLLABORATION — The CKM angle $\gamma$ can be cleanly determined from $CP$ asymmetries in suppressed $B^- \to D^0 K^-$ decays, where it enters at tree-level. The decays where the $D^0$ goes into the doubly Cabibbo-suppressed mode $D^0 \to K^- \pi^+$ are particularly useful in this respect, but they are very rare and have not yet been observed, while only a few tens of events have been reconstructed for the less rare $B^- \to D^0_{DCS} \pi^-$ decay mode. We present the first analysis of these modes performed in $p\bar{p}$ collisions, using a sample of about 2 fb$^{-1}$ of data collected by the CDF Collaboration with an impact-parameter trigger. We report preliminary measurements of the branching fraction and $CP$ asymmetry for the $B^- \to D^0_{DCS} \pi^-$ decay mode.
3:30PM T12.00001 Results from and Future Prospects for the Axion Dark Matter eXperiment

, S. ASZTALOS, XIA, LLC, R. BRADLEY, Natl. Radio Astronomical Observatory, G. CAROSI, Lawrence Livermore National Laboratory, M. HOTHZ, Univ. of Washington, J. HWANG, Univ. of Florida, D. KINNION, Lawrence Livermore National Laboratory, L. ROSENBERG, G. RYBKA, Univ. of Washington, P. SIKIVIE, D. TANNER, Natl. Radio Astronomical Observatory, Florida, K. VAN BIBBER, Lawrence Livermore National Laboratory, ADMX COLLABORATION — The Axion Dark Matter experiment (ADMX) at LLNL searches for dark-matter axions through their Primakoff conversion to microwave photons, resonantly enhanced in a high-Q cavity permeated by a strong magnetic field. ADMX remains the world’s quietest spectral receiver in the GHz regime, capable of detecting a single RF photon per minute above cavity blackbody and amplifier noise. ADMX has previously covered a frequency range of 460 to 812 MHz (1.9 × 3.4 micro-eV); over that octave of mass range axions were excluded as the Milky Way halo dark matter for well-motivated models of the coupling of the axion to two photons. An upgrade of ADMX has since been completed, which replaced the previous HFET amplifiers with SQUID amplifiers. This talk will describe the upgrade, including SQUID amplifier technology, recent results, and discuss plans for a second-phase upgrade to further reduce the systems noise temperature to ~ 100 mK.

3:30PM T12.00002 Dark Matter Searches using a Free-Electron Laser (FEL)

, JAMES R. BOYCE, Jefferson Lab, A. AFANASEV, Hampton Univ., O.K. BAKER, Yale Univ., K.B. BEARD, Muons, Inc., G. BIALLAS, Jefferson Lab, M. MINARNI, Yale Univ., R. RAMDON, Hampton Univ., M. SHINN, Jefferson Lab., P. SLOCUM, Yale Univ., LIPSS COLLABORATION — Photon coupling to light neutral bosons in the meV mass range has been predicted and searched for by several international collaborations. Using the “light shining through a wall” technique, light from Jefferson Lab’s high average power Free-Electron Laser (FEL) was passed through a strong magnetic field upstream of an optical beam dump; regenerated photons were then searched for downstream of a second magnetic field regionically shielded from the former. While our initial results show no evidence for scalar coupling in this region of parameter space, the results establish new coupling boundaries. New constraints on the hypothetical para-photon particles were also obtained. We describe the experimental setup, the initial scalar boson results, and present experiments that include searching for para-photon and chameleon particles. Notice: Authored by Jefferson Science Associates, LLC under U.S. DOE Contract No. DE-AC05-06OR23177. The U.S. Government retains a non-exclusive, paid-up, irrevocable, world-wide license to publish or reproduce this manuscript for U.S. Government purposes.

3:42PM T12.00003 Dark matter search at SNOLAB with DEAP-1 and DEAP-3600

, MARK BOULAY, BEI CAI, Queen’s University, Canada, DEAP/CLEAN COLLABORATION — The DEAP/CLEAN experiment will search for WIMPs (Weakly Interacting Massive Particles) through elastic scattering on liquid argon. The first generation detector (DEAP-1) with a 7-kg liquid argon target mass is currently operating underground at SNOLAB. An overview of that experiment, including pulse-shape discrimination (PSD) results for reducing γ/β backgrounds, will be presented. A larger detector (DEAP-3600) containing a total of 3600 kg of liquid argon will allow a sensitivity to spin-independent scattering on nucleons of $10^{-46}$ cm$^2$. Several hundred times more sensitive than current dark matter experiments. Construction activities are planned for SNOLAB in 2009, with data taking planned to commence in 2011. The design and construction status of DEAP-3600 will be outlined.

4:06PM T12.00004 Depleted Argon as a Dark Matter Detector at DUSEL

, JASON SPAANS, DONGMING MEI, CHRISTINA KELLER, YONGCHEN SUN, University of South Dakota, ANDREW HIME, Los Alamos National Laboratory, RICHARD FORD, SNOLAB, CRISTIANO GALBIATI, Princeton University, DEAP/CLEAN COLLABORATION, DARTPC COLLABORATION — The purpose of this project is to provide argon depleted from 38Ar either by collection from underground sources or by isotopic separation. The depleted argon can then be used as a target material for next generation dark matter detectors at DUSEL. The Princeton group has demonstrated the existence of depleted argon in underground gas fields. This project aims at the characterization of 38Ar in underground water sources, kept in isolation from the atmosphere for thousands of years. To do so, we have built a gas extracting system and extracted gas from a water well at Wall, SD. This paper will present the preliminary results of our research. A second approach under investigation relies on isotopic separation by hot-water thermal diffusion. We built a hot-water thermal diffusion column, composed of a tungsten wire, a copper column, and a water cooling bath at USD. This paper will illustrate the current status of the effort.

4:18PM T12.00005 Measurements of liquid neon scintillation properties for use in current and future dark matter detectors

, HUGH LIPPINCOTT, Yale University, DEAP/CLEAN COLLABORATION — The DEAP/CLEAN program is a series of detectors designed to search for WIMP dark matter and pp solar neutrinos using liquid argon and liquid neon as target materials. The sensitivity of these detectors is limited by the energy threshold and the ability to discriminate between electronic and nuclear recoils in the detector, a discrimination that is possible due to the different scintillation timing signatures of the two classes of events. The energy threshold is set by the scintillation light yield of each target material. I present measurements of discrimination power and scintillation light yields for neon using the microCLEAN detector, a 4 kg prototype detector operating at Yale. In addition, I discuss simulations of a 40 tonne scale detector based on the measured scintillation parameters.

4:30PM T12.00006 Temperature-Controlled Cooling Tests of Photomultiplier Tubes for the miniCLEAN Dark Matter Search

, VICTOR GEHMAN, Los Alamos National Laboratory, MINICLEAN COLLABORATION — The miniCLEAN experiment will search for WIMP dark matter with a WIMP-neucleon cross section sensitivity of $10^{-46}$ cm$^2$. The detector has a fiducial volume of over 100 kg of liquid argon with the capability to be changed to liquid neon for background studies. The miniCLEAN experiment will be located at SNOLAB in Sudbury, Canada in late 2009. It will use position reconstruction and the time structure of scintillation light pulses to distinguish signals from backgrounds on an event-by-event basis. Because of the use of the time structure of scintillation light for background discrimination, careful understanding of the performance of photomultiplier tubes deployed in the experiment is important for successful operation. We have undertaken a program at Los Alamos National Laboratory aimed at characterizing miniCLEAN photomultipliers as a function of bias voltage at a variety of temperatures ranging from room temperature down to near the boiling point of neon (27 K). Specifically our efforts have centered on: gain, efficiency, dark current, and linearity. Recent progress and future plans for this test bench as well as its place in the overall miniCLEAN photomultiplier tube characterization program will be presented.
The guidance for the design of the shielding.

We report preliminary results about muon flux and the integrated neutron flux at different levels in Homestake Mine. These results can be sued as the guidance for the design of the shielding.

ZHANG, The University of South Dakota — External sources of background, particularly fast neutrons and cosmogenic radioactivity from muon-induced bremsstrahlung. The measured flux will be compared to the prediction by the Monte Carlo simulation.

1 This work is supported by NSF grant 0758120. Many thanks to Sanford Lab.

Gamma-ray Flux at Different Levels in the Homestake Mine

The gamma-ray flux in four categories:

1) below 3 MeV, the spectrum is expected to be dominated by radioactivities from the rocks;
2) between 3 and 5.5 MeV, the shape of the spectrum should be well explained by U, Th and daughters, which are internal contamination in the NaI crystals;
3) between 5.5 to 10 MeV, the gamma-rays flux is dominated by neutron capture on surrounding materials; and 4) the gamma-ray flux above 10 MeV is induced by muon bremsstrahlung. The measured flux will be compared to the prediction by the Monte Carlo simulation.

The NaI crystals; 3) between 5.5 to 10 MeV, the gamma-rays flux is dominated by neutron capture on surrounding materials; and 4) the gamma-ray flux above 10 MeV is induced by muon bremsstrahlung. The measured flux will be compared to the prediction by the Monte Carlo simulation.

This work is supported by NSF-PHY-0758120, the Office of Research at USD, and the LANL Directed Research and Development Program.

Monday, May 4, 2009 3:30PM - 5:18PM –

Session T14 DPF: New Directions in Particle Theory Plaza Court 4

Upgrading Tensors , DOUGLAS SWEETSER, none — The covariant derivative of the standard model has 3 parts: a coupling strength, a group generator, and a potential. Constrained to 4 dimensions, tensors can be equipped with multiplication and division via an isomorphism to quaternions. U(1) symmetry is then a normalized quaternion, SU(2) a unit quaternion, and SU(3) the product of two normalized quaternions. One tensor can house the 3 symmetries of the standard model: $D_\mu \rightarrow \left( \frac{1}{i\alpha} \exp(A - A^\dagger) \right) D_\mu \exp(B - B^\dagger) \nabla$.

Symmetries of the Dirac Operator , BOJAN TUNGUZ, Wabash College — In relativistic wave mechanics and quantum field theory the most fundamental invariance group is the Poincaré group of transformations: the group spatial and temporal translations, rotations and relativistic boosts. The wave functions in that view belong to an infinite-dimensional representation of the Poincaré group, and the generators are represented with first-order differential and spin operators. The only major difference between different infinite-dimensional representations is in the number of spin degrees of freedom that are being represented in addition to spatiotemporal degrees of freedom. In this work we build upon our previous work on the invariance of the quantum-mechanical Hamiltonian and look at all the higher order differential operators that commute with the Dirac operator. We construct the most general group that leaves the Dirac operator invariant. This group will be generated by the operators that act on both the spin and spatiotemporal degrees of freedom. We show how the Poincaré group fits within this group, and how this group fits within the most general group of invariances of the Dirac field.

Optimal spin quantization axes for the polarization of dileptons and quarkonium , DAEKYOUNG KANG, ERIC BRAATEN, The Ohio State University, JUNGIL LEE, CHAEHYUN YU, Korea University — The leading-order parton processes that produce a dilepton with large transverse momentum predict that the transverse polarization should increase with the transverse momentum for almost any choice of the quantization axis. We propose axes that optimize that rate of approach. They are determined by the momentum of the dilepton and the direction of the jet that provides most of the balancing transverse momentum. This method also is applied to the polarization of quarkonium.

This research was supported in part by the Department of Energy under grants DE-FG02-05ER15715 and DEFC02-07ER41457, by the KOSEF under grant R01- 2008-000-10378-0, and by the Korea Research Foundation under grant KRF-2006-311-C00020.

This project is supported by NSF-PHY-0758120, the Office of Research at USD, and the LANL Directed Research and Development Program.

Light Baryons Spectroscopy in the Field Correlator Method , R. YA. KEZERASHVILI, Physics Department, New York University, CUNY, USA, I.M. NARODETSKIY, Physics Department, New York City College of Technology, CUNY, USA and Institute of Theoretical and Experimental Physics, Russia, A.I. VESELOV, Institute of Theoretical and Experimental Physics, Russia — The ground and P-wave excited states of $\Lambda_1$, $\Xi_0$, $\Xi_1$, and $\Xi_0^-$ baryons are studied in the framework of the Field Correlator Method using the running strong coupling constant in the Coulomb- like part of the three-quark potential. The running coupling is calculated up to two loops in the background perturbation theory. The three-quark problem has been solved using the hyperspherical functions method. The masses of the $S$- and $P$-wave baryons are presented. Our approach reproduces and improves the previous results for the baryon masses obtained for the freezing value of the coupling constant. The string correction for the confinement potential of the orbitally excited baryons, which is the leading contribution of the proper inertia of the rotating strings, is estimated. This correction gives a negative contribution of about 50 - 60 MeV to the masses of $P$-wave states, leaving the $S$-wave states intact.
4:18PM T14.00005 Why Right-Handed Neutrinos Do Not Exist, ROBERT CLOSE — Ever since the discovery that weak interactions are preferentially left-handed, physicists have sought an explanation as to why certain mirror phenomena, such as right-handed neutrinos, are never observed. One possibility is that the theoretical parity operator which predicts such mirror phenomena is incorrect. We examine the conventional derivation of the Dirac parity operator and find that it is based on a speculative relativistic argument unrelated to Lorentz invariance. An illusory functional dependence of the probability density $\langle \psi^0 | \psi \rangle$ on the matrix $\gamma^0$ incorrectly requires that $\gamma^0$ preserve its sign under spatial reflection. The resulting parity operator $P$ yields a mixed-parity vector space, defined relative to velocity, which is otherwise isomorphic to the spatial axes. We derive a new spatial reflection operator $\mathcal{M}$ (for mirroring) by requiring that for any set of orthogonal basis vectors, all three have the same parity. The $\mathcal{M}$ operator is a symmetry of the Dirac equation. It exchanges matter and antimatter eigenfunctions, consistent with all experimental evidence of mirror symmetry between matter and antimatter. This result provides a simple and compelling reason for the lack of mirror-like phenomena which do not exchange matter and antimatter.

4:30PM T14.00006 Quarkesynthesis Binding Energy, BILL WEBB, Webb Model Scientific — Quarkesynthesis shows that the binding energy of a nucleus is the difference between the relativistic kinetic energies of its threesome of Jumbo Quarks and that of its building block quarks from neutrons and protons. There is no involvement of a nuclear strong force or gluon material.

4:42PM T14.00007 Transluminal Energy Quantum (TEQ) Model of the Electron, RICHARD GAUTHIER, Santa Rosa Junior College, California — A transluminal energy quantum (TEQ) is proposed that forms an electron by its circulatory motion. The TEQ is particle-like with a helical wave-like motion. It carries electric charge, energy, momentum and angular momentum but no mass, and easily passes through the speed of light $c$. An electron is modeled as a $-e$ charged TEQ circulating at $1.2 \times 10^{20}$ Hz, the Compton frequency $mc^2/h$, in a closed double-looped helical trajectory whose circular axis' double-looped length is one Compton wavelength $h/mc$. In the electron model the TEQ’s speed is superluminal 57% of the time and subluminal 43% of the time, passing through $c$ twice in each trajectory cycle. The TEQ’s maximum speed in the electron model’s rest frame is $2.515c$ and its minimum speed is $0.707c$. The TEQ’s spatio-temporal helical parameters for the electron model produce the Dirac equation's electron spin $\delta$ and internal forward speed $c$, while the TEQ’s two helicities correspond to the electron and the positron. In the electron model, the TEQ moves on the mathematical surface of a self-intersecting torus (spindle torus). http://www.superluminalquantum.org

4:54PM T14.00008 New Generally Covariant Generalization of the Dirac Equation Not Requiring Gauges, DAVID MAKER, mda — We introduce a new pde ($\sum_{k=1}^{3} \gamma_k \partial_k \psi / (2h_{\nu} - \omega) = 0$) with spherically symmetric diagonalized $\delta_{00} = 1 - \mu \frac{\hbar}{\mu c^2}$ this new pde reduces to the standard Dirac equation as $r \rightarrow \infty$. Next we solve this equation directly using separation of variables (e.g., 2P, 2S, 1S terms). Note metric time component $\kappa_{00} = 0$ at $r = r_M$ and so clocks slow down with baryon stability the result. Note also that near $r_M$ the 2P/2S state for this new Dirac equation gives a non-spherical trilobum, 3 lobe shape; so this $\text{ONE}$ charge (so don’t need color to guarantee this) spends 1/3 of its time in each lobe (fractionally charged lobes), the lobe structure is locked into the center of mass (asymptotic freedom), there are six 2P states (corresponding to the 6 flavors); the W wave scattering gives the jets, all these properties together constituting the main properties of quarks! without invoking the many free parameters, gauge conditions of QCD. Also the 2S/2L is the tauon and the 1S/1L is the muon here. The S matrix of this new pde gives the W and Z as resonances and does not require renormalization counterterms or free parameters. Thus we get nuclear, weak and E&M phenomenology as one step solutions of this new pde, not requiring the standard method’s pathology of adhoc assumptions such as gauges and counterterms, 19 free parameters (you can vary any way you want) that have confused, blocked the progress of theoretical physics for the past 30 years.

5:06PM T14.00009 Precision Measurement of the Electron/Muon Gyromagnetic Factors, AYO-ODEJI AWOBODE, University of Illinois at Urbana-Champaign — Clear, persuasive arguments are brought forward to motivate the need for high precision measurements of the electron/muon orbital g, i.e. $g_L$, as a test of QED. It is demonstrated, using the data of Kusch & Foley on the measurement of $(\delta_{-2} - \delta_{+2})$ together with the modern precise measurements of the electron $g_S (g_S \equiv g_S - 2)$, that $\delta_L$ may be a small ($0.6 \times 10^{-4}$), non-zero quantity, where we have assumed Russel-Saunders (LS) coupling and proposed, along with Kusch and Foley, that $g_S = 2 + \delta_S$ and $g_L = 1 + \delta_L$. Therefore, there is probable evidence from experimental data that $g_L$ is not equal to 1 exactly; the expectation that quantum effects will significantly modify the classical value of the orbital g is therefore reasonable. It is significant that available spectroscopic data indicate that $g_S$ and $g_L$ are probably modified such that $g_S$ is increased by $\delta_S$ while $g_L$ is decreased by $\delta_L$. Modern, high precision measurements of the electron and muon orbital $g_L$ are therefore required, in order to properly determine by experiments the true value of $g_L = 1$, perhaps to about one part in a trillion as was recently done for $g_S - 2$.

Tuesday, May 5, 2009 10:45AM - 12:33PM –
Session W2 DP: Bouchet Award and Panofsky Prize Session Plaza D
10:45AM W2.00001 Edward A. Bouchet Award Talk, GASTON GUTIERREZ, Fermilab — This abstract not available.

11:21AM W2.00002 W. K. H. Panofsky Prize Talk: The Silicon vertex detector at CDF, ALDO MENZIONE, INFN, Pisa — I will make an historical overview of the conception and design of the device and some more details on the construction and commissioning of the detector. Then I will point out some highlights on the physics that has been done with it, in particular the role of the system in the discovery of the top quark.

11:57AM W2.00003 W. K. H. Panofsky Prize Talk: The Silicon Vertex Trigger, LUCIANO RISTORI, Istituto Nazionale di Fisica Nucleare — I will discuss the importance of real-time selection of events at a hadron collider, the ideas that led to the conception of the Silicon Vertex Trigger (SVT) and some historical notes on its construction and commissioning. I will also highlight some remarkable results obtained by CDF with the data selected by the SVT.

Tuesday, May 5, 2009 10:45AM - 12:33PM –
Session W9 DP: Top and Higgs Physics Governor’s Square 11
10:45AM W9.00001 Search for non-standard model top antitop resonance production in the all-hadronic channel at CDF, YURI OKSUZIAN, University of Florida, CDF COLLABORATION — We present an updated result of a search for resonant top-antitop pair production and subsequent decay in the all-hadronic channel. We examine the top-antitop invariant mass spectrum observed in CDF data from 1.96 TeV $p\bar{p}$ collisions at the Fermilab Tevatron. We apply a powerful reconstruction technique where the observed event kinematics are constrained according to the full standard model top-antitop production and decay matrix element. This technique provides excellent mass resolution. Also, probability densities from the per-event matrix element calculation are used as discriminants to reduce and control the large backgrounds of the all-hadronic channel.

10:57AM W9.00002 Search for Charged Higgs Bosons in Decays of Top Quarks, DIEGO MENEZES, Northern Illinois University, D0 COLLABORATION — We present a search for charged Higgs bosons in the mass range 80 < $m_{H^\pm}$ < 155 GeV, assuming the decay $H^+ \rightarrow \tau^+ \nu_\tau$ (and its charge conjugate). Using 0.9 fb$^{-1}$ of lepton+jets data collected by the D0 detector, at the Fermilab Tevatron $p\bar{p}$ collider, we find no evidence for signal, and exclude branching ratios $B(t \rightarrow H^+ b)$ at 95% confidence level.

11:09AM W9.00003 Search for Neutral Supersymmetric Higgs Bosons in b$\bar{b}$ (b) Final States in $p\bar{p}$ Collisions at $\sqrt{s}$=1.96 TeV, PROLAY MAL, University of Washington, D0 COLLABORATION — We present a search for Higgs bosons in the boson-boson (b$\bar{b}$) and b(b$\bar{b}$) channels at a center-of-mass energy of $\sqrt{s}$=1.96 TeV using up to 4 fb$^{-1}$ of data collected with the D0 detector. In many supersymmetric models the cross section for production of neutral Higgs bosons in association with bottom quarks is greatly enhanced compared to the Standard Model, and over much of the parameter space the dominant decay process is $b\bar{b}$. We search for an excess of events above the multijet background in events with 3 and 4 b-jets. Understanding the multijet background in this channel is particularly challenging.

11:21AM W9.00004 Measurement of the $W$ boson helicity fractions in $t\bar{t}$ production in dilepton channel at CDF, ROMAN LYSAK, IEP SAS, Slovakia, CDF COLLABORATION — We analyze $W$ boson helicity fractions of $t\bar{t}$ candidates selected from final states where both $W$ bosons are decaying leptonically. The analysis is based on 3 fb$^{-1}$ of data collected with the CDF detector at the Tevatron. The $W$ boson helicity fractions are determined by a comparison of angular distributions of leptons in the $W$ rest-frame with templates corresponding to left-handed, right-handed and longitudinal fractions exclusively. This is the first measurement of $W$ helicity fractions in this channel using kinematic reconstruction at CDF.

11:33AM W9.00005 Measurement of forward-backward asymmetry in top quark production at CDF, GLENN STRYCKER, University of Michigan, CDF COLLABORATION — We measure a forward-backward charge asymmetry in the rapidities of top quarks produced in $pp$ collisions at $\sqrt{s}$=1.96 TeV. The $t\bar{t}$ kinematics are reconstructed in 800 lepton+jets events collected in a 3 fb$^{-1}$ exposure with CDF detector at Fermilab. We present two independent techniques—a model independent unfold and a likelihood fit to a linear asymmetry in the production angle (1 + $A_{FB}(\phi)\phi$) — that give consistent results for the parton level asymmetry in both the laboratory and $t\bar{t}$ rest frames. The results are compared to the small charge asymmetry expected in QCD at NLO.

11:45AM W9.00006 Measurement of The Top Quark Electric Charge, JEONG KU LIM, Korea University, D0 COLLABORATION — In the Standard Model, the decay of the top quark: $t \rightarrow bW^+$ gives an electric charge of 2/3 for the top quark. However the decay $t \rightarrow bW^+$ does not violate any fundamental laws and it predicts a top quark charge of 4/3. We provide a measurement of the electric charge of the top quark using $t\bar{t}$ events in the lepton + 4 jets final state using events 4 fb$^{-1}$ of D0 data.

11:57AM W9.00007 Search for a Light NMSSM Higgs Boson at CDF, SCOTT WILBUR, University of Chicago, CDF COLLABORATION — We present a search for an NMSSM Higgs boson as proposed by Dermisek and Gunion [1]. This model invokes a very light Higgs Doublet Model in which one of the two Higgs doublets has no couplings to fermions. Previous fermiophobic Higgs searches have not been able to exclude a very light $h_1$ in the region of large $tan\beta$ (the ratio between the two vacuum expectation values in the theoretical model). We describe results of searches using the $pp \rightarrow H^+ h_1 \rightarrow W^+ h_2 h_1 \rightarrow t\bar{t}$ + X production and decay channel which we expect to be sensitive to this previously unexplored region.

12:09PM W9.00008 Search for Neutral Supersymmetric Higgs Bosons in b$\tau$ Final States in $p\bar{p}$ Collisions at $\sqrt{s}$=1.96 TeV, SARAH SCHLOBOHM, University of Washington, ARAN GARCIA-BELLIDO, University of Rochester, D0 COLLABORATION — We present a search for Higgs bosons produced via the associated $pp \rightarrow h + b$ process at a center-of-mass energy of $\sqrt{s}$=1.96 TeV using up to 4 fb$^{-1}$ of data collected with the D0 detector at the Fermilab Tevatron collider. In supersymmetric models Higgs boson production cross sections can be significantly enhanced compared to the Standard Model; additionally the Higgs boson has a significant branching ratio to tau leptons at all masses. This hybrid "b-tau" channel complements the di-tau search channel, in particular providing sensitivity around the $Z$ mass. Particular focus will be given to the case where one of the taus decays hadronically and the other to an electron.

12:21PM W9.00009 Search for Fermiophobic Higgs in $4\gamma + X$ Final State at CDF, ATSUNARI HAMAGUCHI, Osaka City University (Japan), CDF COLLABORATION — We present a search for a fermiophobic Higgs boson ($h_1$) based on the Type I Two Higgs Doublet Model in which one of the two Higgs doublets has no couplings to fermions. Previous fermiophobic Higgs searches have not been able to exclude a very light $h_1$ in the region of large $tan\beta$ (the ratio between the two vacuum expectation values in the theoretical model). We describe results of searches using the $pp \rightarrow H^+ h_1 \rightarrow W^+ h_2 h_1 \rightarrow \tau\tau + X$ production and decay channel which we expect to be sensitive to this previously unexplored region.

Tuesday, May 5, 2009 10:45AM - 12:33PM –
Session W12 DAP DPF GPMFC: Dark Matter Searches III Plaza Court 2

10:45AM W12.00001 Current Status of the XENON100 Dark Matter Experiment\(^1\), UWE OBERLACK, Rice University, XENON100 COLLABORATION — Non-baryonic Dark Matter makes up ~85% of all matter in the universe. A plausible theoretical class of candidates are Weakly Interacting Massive Particles (WIMPs). XENON100, located at the Gran Sasso National Laboratory in Italy, is a liquid/gas xenon time projection chamber for direct detection of WIMP-nucleon recoils. XENON100 is the successor of the highly successful XENON10 experiment, featuring 10 times greater sensitive mass (~50 kg fiducial) and 100 times lower background. The expected sensitivity is $10^{-45}$ cm$^2$ for spin-independent interactions. XENON100 has been installed and has started operating. I will report on the present status of XENON100 and its expected physics reach.

\(^1\)Supported by NSF.
environment in order to develop a deposition model. Results from this test stand and the resulting deposition model will be presented.

A test stand has been constructed to deposit radon daughters on various surfaces under a controlled environment in order to develop a deposition model. Results from this test stand and the resulting deposition model will be presented.

11:09AM W12.00003 Position reconstruction with the XENON100 TPC based on least-squares fitting, YUAN MEI, Rice University, XENON100 COLLABORATION — The determination of interaction locations is a key feature of dual-phase Time Projection Chambers (TPCs) for Dark Matter search. XENON100 is a liquid/gas xenon TPC, searching for Weakly Interacting Massive Particles at the Gran Sasso National Laboratory. While the z-coordinate of an event is determined by the drift time of electrons with regard to a scintillation light trigger, the x/y position is reconstructed using the distribution of proportional light on the top PMT array. Previously, for the relatively small TPC of XENON10, a exhaustive search procedure was developed to perform the least-squares fitting. However, for the larger TPC of current detector Xenon100, the very procedure becomes impractically slow. In this work, we present the development of a new procedure which searches for the minimum of chi-square between real signal and simulated data efficiently. The procedure performed on a Monte Carlo generated data-set yields millimeter resolution of x-y position. The performance on real signals employing proper uncertainties from various sources is also discussed.

11:21AM W12.00004 Relative scintillation efficiency of Xenon for low energy nuclear recoils, ANGEL MANZUR, ALESSANDRO CURIONI, LOUIS KASTENS, DANIEL MCKINSEY, Yale University, KAIXUAN NI, Columbia University, TARIJEE WONGJIRAD, Duke University — In the past few years, experiments using liquid xenon as a medium for detecting Cold Dark Matter have given competitive upper limits on the elastic WIMP-nucleon cross section. However, the dominant uncertainty in these limits is due to the uncertainty in the nuclear scintillation efficiency for xenon (E_{eff}). The E_{eff} is defined as the amount of scintillation produced by nuclear recoils, divided by the amount of scintillation produced by electron recoils of the same energy. Previous experiments measuring the E_{eff} gave inconsistent extrapolations at recoil energies below 20 keV, an energy window crucial for dark matter searches. In this talk we report a new E_{eff} measurement for energies below 10 keV, done with monoenergetic neutron scattering of a liquid xenon detector.

11:33AM W12.00005 The Cryogenic Dark Matter Search and Carrier Transport in 40 MilliKelvin Germanium, KYLE SUNDQVIST, University of California, Berkeley, THE CRYOGENIC DARK MATTER SEARCH COLLABORATION — The Cryogenic Dark Matter Search (CDMS) is searching for Weakly Interacting Massive Particles (WIMPs) via their interactions in Ge and Si detectors at a temperature of 40 mK. Measuring the ionized charge and non-thermalized phonons from particle interactions enables CDMS to discriminate candidate WIMP interactions from electromagnetic background. Operation at such low temperature represents a unique regime for electron and hole transport processes. As these carriers are always hot, typical assumptions of thermal equilibrium are no longer valid. We have simulated transport processes of charge carriers in germanium <100> at a temperature of 40 mK. We will present how this new understanding is beneficial to future detector development.

11:45AM W12.00006 Active Neutron Shielding for Dark Matter Searches, JOCELYN MONROE, RICHARD YAMAMOTO, PETER FISHER, MIT, BRETT CORNELL, Harvard, MAREENA ROBINSON, FAMU, DIANNA COWERN, RICHARD EYERS, SHAWN HENDERSON, MIT — Neutrons are a dangerous background to direct dark matter detection searches because they can mimic exactly the signal signature. Recent studies find that the few existing underground neutron measurements of the fast, muon-induced neutron flux disagree at the 30%-50% level with predictions. Given this level of uncertainty, it is desirable to measure the neutron flux in-situ, as well as to reduce the number of neutrons incident on a dark matter detector. Towards these ends, we are developing a neutron veto system for both active and passive shielding. The goals of this R&D are (i) a measurement of the neutron energy spectrum underground above 10 MeV neutron kinetic energies, and (ii) measurements of the attenuation vs. energy of these neutrons in 1 meter of water, concrete, and liquid scintillator. These measurements will provide valuable input for simulation and design of shields for low-background experiments underground.

12:09PM W12.00008 A radon daughter deposition model for low background experiments, K. RIELAGE, V.E. GUSEPPE, A. MASTBAUM, S.R. ELLIOTT, A. HIME, Los Alamos National Laboratory — The next generation low-background detectors operating underground, such as dark matter searches and neutrinoless double-beta decay, aim for unprecedented low levels of radioactive backgrounds. Although the radioactive decays of airborne radon (particularly 222Rn) and its subsequent daughters present in an experiment are potential backgrounds, more troublesome is the deposition of radon daughters on detector materials. Exposure to radon at any stage of assembly of an experiment can result in surface contamination by daughters supported by the long half life (22 y) of 210Pb on sensitive locations of a detector. An understanding of the potential surface contamination will enable requirements of radon-reduced air and clean room environments for the assembly of low background experiments. It is known that there are a number of environmental factors that govern the deposition of daughters onto surfaces. However, existing results have not explored the impact of these environmental factors important for low background experiments. A test stand has been constructed to deposit radon daughters on various surfaces under a controlled environment in order to develop a deposition model. Results from this test stand and the resulting deposition will be presented.
12:21PM W12.00009 Radon as a Source of External Background at Homestake Mine — KEENAN THOMAS, DONGMING MEI, CHAO ZHANG, University of South Dakota, FRED GRAY, Regis University, RICHARD GAITSKELL, SIMON FIORUCCI, Brown University — External sources of radioactivity are important concerns for experiments planned for DUSEL at the Homestake Mine in Lead, South Dakota. Radon emanation and deposition is a major threat to the targeted sensitivity of low background experimentation such as double beta decay detection and dark matter searches. Methods to reduce and mitigate these measured levels will need to be developed to prevent experimental signals from contamination through airborne radon decays as well as the deposition of radon daughters. Radon levels were measured at various depths at the Homestake Mine in December of 2008, January and March of 2009. These measurements will be useful in the development of an underground ventilation system to dilute radon concentrations in the air and subsequent systems to provide radon-free air to clean rooms, as well as preparing researchers for the hazards they pose to their experiments. In addition, the measured radon level will be used to understand the radon emanation from different types of rock.

Tuesday, May 5, 2009 10:45AM - 12:21PM – Session W14 DPF: Searches II Plaza Court 4

10:45AM W14.00001 Finding Supersymmetry without using Missing Transverse Energy — JEFF HAAS, Florida State University — Missing transverse energy (MET) is a measure of the transverse momentum of particles that escape detection. One needs a complete understanding of the characteristics of the detector to obtain an accurate measurement of MET. Experience at the Tevatron suggests that it may take considerable time and effort to gain such an understanding. Therefore, it is of interest to investigate strategies to search for supersymmetry that do not rely on MET. I will investigate the supersymmetric (SUSY) parameter space accessible with rather low integrated luminosity, 0.1-1.0 fb$^{-1}$, at the Compact Muon Solenoid (CMS) experiment. If SUSY particles are relatively light, then the production cross sections can be huge, in the range $10^{4-5}$ fb, and a discovery in the early stages of running the Large Hadron Collider (LHC) may be possible. For gluino and squarks with masses $m_{\tilde{g}} \sim m_{\tilde{q}} \sim 400-750$ GeV the expected production cross sections are of the order $10^{4-6}$ fb for a signal with $>3$ jets and $>2$ isolated leptons.

10:57AM W14.00002 ATLAS sensitivity to leptoquarks and heavy Majorana neutrinos in final states with high-$pt$ dileptons and jets with early LHC data — VIKAS BANSAL, University of Pittsburgh, ATLAS COLLABORATION — Dilepton-jet final states are used to study physical phenomena not predicted by the standard model. ATLAS discovery potential to leptoquarks and Majorana neutrinos is presented with fully-simulated ATLAS detector at the Large Hadron Collider (LHC) at CERN. The study is motivated by leptoquarks’ role in Grand Unification of fundamental forces and the See-saw mechanism that explains the masses of the observed neutrinos. The analysis algorithms are presented, background sources are discussed and the estimates of sensitivity and discovery potential to these processes are reported.

11:09AM W14.00003 Searching for 100 GeV Majorana Neutrinos at the LHC Using Same Sign Dilepton Final State — WARREN CLARIDA, YASAR ONEL, TAYLAN YETKIN, U. of Iowa, RICK VIDAL, WEIMIN WU, Fermilab, TAO HAN, U. of Wisconsin, HAIFENG PI, UCSD, EFE YAZGEN, TTU, CMS COLLABORATION — The Standard Model can be extended to include massive neutrinos as observed in the recent oscillation experiments. One model introduces a new neutrino with a Majorana nature with an unknown mass. In this study we presented the potential for the discovery of a Majorana neutrino during the first year of data collection from the Large Hadron Collider. We considered the production of a muon and Majorana neutrino that subsequently decays into a muon and W boson. Since the muons have the same sign and there is no missing energy this signal’s signature is a lepton number violating final state, which cannot occur in the Standard Model. The signal and background events were produced and analyzed using MADGRAPH software. In this study we used muon triggers, a combination of jet energy corrections, b-tagging, and an examination of the combinatorial background. The neutrino mass was found by using one of the muons with the partons from the W decay. We found that the mass can be reconstructed reasonably well using one of the isolated muons and two jets with proper jet corrections; whereas the contribution from the various backgrounds was small. We concluded that discovery potential can be reached in the first year of running at the LHC.

11:21AM W14.00004 Trigger study for GMSB with photons — SHI-LEI ZANG, URIEL NAUENBERG, BERNADETTE HEYBURN, University of Colorado at Boulder, CMS COLLABORATION — We present a trigger study for the gauge-mediated SUSY breaking (GMSB) searches at CMS. As a result of the study, we propose to use two new high level triggers based on the electromagnetic calorimeter: EM-high-$\pT$ and EM-very-high-$\pT$, along with the existing double-photon trigger. As a result of the study, we developed a new method for optimization of the trigger thresholds, which uses $\log(\epsilon)/\log(b)$ as the optimization criteria, where $\epsilon$ ($b$) is the trigger efficiency for signal (background).

11:33AM W14.00005 MUSiC - A Generic Search for Deviations from Monte Carlo Predictions in CMS — CARSTEN HOF, RWTH Aachen University, THE CMS COLLABORATION — We present a model independent analysis approach, systematically scanning the data for deviations from the Standard Model Monte Carlo expectation. Such an analysis can contribute to the understanding of the CMS detector and the tuning of the event generators. Furthermore, due to the minimal theoretical bias this approach is sensitive to a variety of models of new physics, including those not yet thought of. Events are classified into event classes according to their particle content (muons, electrons, photons, jets and missing transverse energy). A broad scan of various distributions is performed, identifying significant deviations from the Standard Model simulation. We outline the importance of systematic uncertainties which are taken into account rigorously within the algorithm. Possible detector effects and generator issues, as well as models involving supersymmetry and new heavy gauge bosons have been used as an input to the search algorithm.

11:45AM W14.00006 Triggering for Hadronically Decaying Tau Leptons at CMS in the Super-LHC Era — MICHAEL MASON, ALEXEI SAFONOVI, Texas A&M University — Signals involving hadronically decaying taus in the final state will remain very important for physics reach of the Large Hadron Collider in the Super-LHC era. Greatly increased instantaneous luminosity will lead to an average of up to 200-400 pile-up events per bunch crossing making triggering extremely challenging. To address these challenges, we study various options for extending existing CMS Level-1 tau trigger setup to achieve acceptable trigger rates while preserving high triggering efficiency in the high pile-up environment. We use simulations to evaluate performance of the extended algorithms and compare it to the existing schema. We also discuss potential improvements to trigger performance if tracking capabilities were to become available in the upgraded CMS Level 1 trigger.

11:57AM W14.00007 ATLAS Jet Calibration: layer/cell weighting — BELEN SALVACHUA, Argonne National Laboratory, ATLAS COLLABORATION — The LHC will provide a very rich jet phenomenology for both standard model and beyond the standard model physics. Jet calibration is essential for understanding the present SM limits and claims on future discoveries. As part of its function, the jet calibration accounts for the intrinsic difference between the hadronic and the electromagnetic cascade development. We present a Monte Carlo based jet calibration that combines two different approaches: the so called H1 method which is based on the jet energy density distribution and the so called sampling method, which is based on the longitudinal energy distribution of the jets. First results show good performance for both jet energy resolution and linearity.

3This paper is supported by NSF grant 0758120. Many thanks to Sanford Laboratory.
Tuesday, May 5, 2009 1:30PM - 3:18PM –
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1:30PM X9.00001 Study of $B^0 \rightarrow D^{(*)}\bar{p}p \eta \pi^0$, $n=0,1,2$ decays, TAE MIN HONG, UC, Santa Barbara, BABAR COLLABORATION — Using a data sample of about 414 fb$^{-1}$ collected with the BABAR detector at the $\Upsilon(4S)$ resonance, consisting of $455 \times 10^6$ $B\bar{B}$ pairs, we measure the branching fractions for ten Cabibbo-favored $B$ decays to final states of the form $B^0, B^- \rightarrow D^{(*)}\bar{p}p \eta \pi^0$, $n=0,1,2$ and study their decay dynamics.

1:42PM X9.00002 Polarization of $\Upsilon$ Mesons Produced in $p\bar{p}$ Collisions at $\sqrt{s} = 1.96$ TeV, JAMES THOME, Carnegie Mellon University, CDF COLLABORATION — We measure the polarization of $\Upsilon$ mesons in the $\Upsilon(1S), \Upsilon(2S)$ and $\Upsilon(4S)$ states as a function of their transverse momentum $p_T$ in the $s$-channel helicity frame. The analysis uses $\Upsilon$ mesons produced in the rapidity range $|y| < 0.6$. The measurement is performed using a data sample of $p\bar{p}$ collisions at $\sqrt{s} = 1.96$ TeV with an integrated luminosity of $>3$ fb$^{-1}$ collected with the CDF II detector at the Fermilab Tevatron. The results are compared to theoretical predictions.

1:54PM X9.00003 Strategies for leveraging calibration data using at CMS, PRATIMA JINDAL, Purdue University Calumet, CMS COLLABORATION — A reliable estimate of the performance of b-jet Identification algorithms is crucial for a wide range of physics processes like the decay of top quarks, Higgs boson searches, and various supersymmetric processes. CMS has prepared several strategies to extract efficiencies and rejection rates from data, and which should work even on the first data (10 kHz). Three methods are being presented here. The first extracts rejection rates from light quarks looking at tracks with negative impact parameter, and using these distributions to model the mistag rate due to detector effects like resolutions and badly reconstructed tracks. The second method uses jet samples with reconstructed muons, by tagging a b-jet and selection based on the $p_T$ of the muon relative to the jet, a system of equations can be constructed which will lead to the direct extraction of efficiencies and rejections. The third method uses $t\bar{t}$ events with semi leptonic or fully leptonic $W$ decays, and uses likelihood-based and event counting based methods to estimate the efficiencies. The strategies described here are studying taking into account the possible startup scenarios of LHC, and are currently being expanded to take into account the miscalibration scenarios which CMS can show at the startup.

2:06PM X9.00004 ABSTRACT WITHDRAWN –

2:18PM X9.00005 Observation of Resonances in the $\Lambda_b^0 \rightarrow \Lambda^+_c \pi^+ \pi^- \pi^0$ Decay Mode at CDF II, PATRIZIA BARRIA, University of Siena, CDF COLLABORATION — In a sample of events, collected with a displaced secondary vertex trigger at the CDF II experiment and corresponding to about 2.4 fb$^{-1}$ of integrated luminosity, the decay $\Lambda_b^0 \rightarrow \Lambda^+_c \pi^+ \pi^- \pi^0$ is observed. In addition, the $\Lambda_c^+ \pi^+ \pi^- \pi^0$ final state is studied and clear signals of the following exclusive decay channels are observed: $\Lambda_b^0 \rightarrow \Lambda_c^*++(2593, 2625)[\Lambda_b^0 \rightarrow \Sigma^0 [\Lambda^+_c \pi^- \pi^- \pi^0] \rightarrow \Sigma^0 [\Lambda^+_c \pi^- \pi^-] \rightarrow \Lambda_b^0 \rightarrow \Sigma^0 [\Lambda^+_c \pi^- \pi^-] \rightarrow \Lambda_b^0 \rightarrow \Sigma^0 [\Lambda^+_c \pi^- \pi^-]$, and $\Lambda_b^0 \rightarrow \Lambda_c^0 \rho^0 \pi^0$. The observation of such exclusive decay modes will allow for additional interesting measurements in the $\Lambda_b^0$ sector.

2:30PM X9.00006 A Model Independent Measurement of the Branching Fraction of $\Upsilon(4S)$ Decays to Neutral $B$ Pairs, ROMULUS GODANG, University of South Alabama, LUCIEN CREMALDI, DON SUMMERS, University of Mississippi, BABAR COLLABORATION — Isospin violation in $\Upsilon(4S) \rightarrow B\bar{B}$ decays induces a difference in the branching fractions $f_{B^0} = B(\Upsilon(4S) \rightarrow B^0 B^0)$, and $f_{B^+} = B(\Upsilon(4S) \rightarrow B^+ B^-)$. These branching fractions are important inputs for many $B$ meson measurements at $B$ factories. Isospin violation in the $\Upsilon(4S)$ resonance decays may be at the level of a few percent mostly due to electromagnetic interactions and the mass difference between the up and the down quarks. We discuss a model independent measurement of the $f_{B^0}$ branching fraction based on a data sample of $\sim 470$ million $BB$ pairs collected at the $\Upsilon(4S)$ resonance with the BABAR detector. We reconstruct neutral $B$ meson in the channel $B^0 \rightarrow D^{(*)} l^- \nu_l$ using a partial reconstruction technique.

2:42PM X9.00007 Search for the transition $\chi_{b0} \rightarrow \Upsilon(1S)\gamma$, PETER LEWIS, RAFE SCHINDLER, SLAC, BABAR COLLABORATION — We present the results of the search for the transition $\chi_{b0} \rightarrow \Upsilon(1S)\gamma$ in the exclusive reconstruction $\Upsilon(2S) \rightarrow \chi_{b0}\gamma$; $\chi_{b0} \rightarrow \Upsilon(1S)\gamma$; $\Upsilon(1S) \rightarrow \mu^+\mu^-$. Our results use 14 pb$^{-1}$ of data collected at the $\Upsilon(2S)$ resonance with the BABAR detector at the PEP-II $e^+e^-$ storage rings.

2:54PM X9.00008 Study of the $\Sigma_b$ Baryon with the CDF Detector, CONSTANTINO CALANCHA, CIEMAT, Madrid, CDF COLLABORATION — We present a measurement of properties of the $\Sigma_b$ baryon in proton-antiproton collisions at a center-of-mass energy of 1.96 TeV. Using 2.9 fb$^{-1}$ of data collected with the CDF II detector, we observe four $\Lambda_b\pi$ resonances in the fully reconstructed decay mode $\Lambda_b \rightarrow J/\psi\Lambda$ with $J/\psi \rightarrow \mu^+\mu^-$ and $\Lambda \rightarrow \pi\pi\pi$. In addition, we combine the selected $\Lambda_b$ signal from $\Lambda_b \rightarrow J/\psi\Lambda$ with events from the $\Lambda_b \rightarrow \Lambda_c\pi$ decay mode, with $\Lambda_c \rightarrow pK\pi$, to measure the $\Lambda_b$ polarization.

3:06PM X9.00009 Study of $B \rightarrow \pi\ell\nu$ and $B \rightarrow \rho\ell\nu$ Decays and Determination of $|V_{ub}|$, H. WULSIN, SLAC, BABAR COLLABORATION — We present an analysis of exclusive charmless semileptonic $B$- meson decays based on 343 million $BB$ pairs recorded with the BABAR detector at the $\Upsilon(4S)$ resonance. We measure branching fractions $B(B \rightarrow \pi\ell\nu)$ and $B(B \rightarrow \rho\ell\nu)$. We compare the measured distribution in $q^2$, the momentum- transfer squared, with theoretical predictions for the form factors from lattice QCD, light-cone sum rules, and quark model calculations. We also extract the CKM matrix element $|V_{ub}|$ from the measurement of $B \rightarrow \pi\ell\nu$ decays.
1:30PM X14.00001 Search for a NMSSM \( h \to aa \to \mu\mu\mu\mu \) at the LHC. SERGEY SENKIN, JAMES PIVARSKI, Texas A&M University, ALEXANDER BELYAEV, Heriot-Watt University, ALEKSEI SAFONOVI. Texas A&M University — We investigate the feasibility of a search for a Next-to-MSSM Higgs boson \((h)\) decaying to two light pseudoscalars \((a)\) followed by the decay of the pseudoscalar to four muons. The NMSSM scenario escapes the stringent experimental limit on low Higgs mass by providing new decay modes, thereby lowering branching fractions relative to the conventional search channels. The analysis proposed in this contribution is sensitive to NMSSM Higgs production with the mass of the pseudoscalar in the range below twice the tau mass, even for relatively low integrated luminosity. The advantage of the four-muon mode is low background in the final state, which allows us to use Higgs bosons produced in gluon fusion, the dominant production mechanism at the LHC. We describe the analysis and calculate the amount of data needed for discovery and achievable exclusion limits in the case of no signal.

1:42PM X14.00002 Effect of Relaxing \( b \)-quark Tagging Requirements in \( WH \) Searches at CDF. CHIARA FERRAZZA, INFN, Pisa (Italy), CDF COLLABORATION — Significant increases in sensitivity have recently been obtained for Higgs searches at CDF based on increases in integrated luminosity and development of sophisticated analysis techniques. For a low mass standard model Higgs boson \((m_H < 135 \text{ GeV}/c^2)\), production in association with a vector boson \((W \text{ or } Z)\) with subsequent decays of \( H \to b\bar{b} \) and either \( W \to \ell \nu \), \( Z \to \nu \nu \), or \( Z \to \ell \ell \) lead to final states that provide the best separation between signal and backgrounds. Typically, some multivariate technique is applied to the subset of events in which at least one of the \( b \)-quark jets is identified by the presence of a displaced, secondary vertex. Here, we present results of studies showing the potential gains in sensitivity that can be obtained by relaxing requirements used to identify these secondary vertices.

1:54PM X14.00003 ABSTRACT WITHDRAWN —

2:06PM X14.00004 Search for WH Production at \( \sqrt{s} = 1.96 \text{ TeV} \) with 2.7 fb\(^{-1}\) of Data. QICHUN XU, University of Michigan, D0 COLLABORATION — A search for WH production in \( pp \) collisions at a center of mass energy of \( \sqrt{s} = 1.96 \text{ TeV} \) is presented. The data correspond to an integrated luminosity of 2.7 fb\(^{-1}\) as accumulated by the D0 experiment. Events containing one lepton, missing transverse energy and one or two b-tagged jets are analysed using advanced analysis techniques (neural network and matrix element discriminants) to enhance the potential W H signal over the standard model background. Recent improvements to the sensitivity will be discussed.

2:18PM X14.00005 Search for Associated Production of Z and Higgs Bosons in the \( ee\bar{b}\bar{b} \) Final State in \( pp \) Collisions at \( \sqrt{s}=1.96 \text{ TeV} \). MICHAEL KIRBY, Fermilab, D0 COLLABORATION — We present a search for a low mass standard model Higgs boson produced in association with a Z boson decaying to two electrons at a center-of-mass energy of \( \sqrt{s} = 1.96 \text{ TeV} \) with the D0 detector at the Fermilab Tevatron collider. The search is performed in events containing one or two b-tagged jets with order 4 fb\(^{-1}\) of data. As well as the inclusion of the full data set, recent improvements to the sensitivity will be discussed.

2:30PM X14.00006 A Combined Search for \( WH \) Production in the \( \ell\nu b\bar{b} \) Decay Channel at CDF. MARTIN FRANK, Baylor University, CDF COLLABORATION — Two independent methods are being used to search for a standard model Higgs boson produced in association with a W boson using data collected with the CDF II detector from \( p\bar{p} \) collisions at \( \sqrt{s} = 1.96 \text{ TeV} \). The searches are performed using events in the \( \ell\nu b\bar{b} \) final state from a data sample corresponding to an integrated luminosity of 2.7 fb\(^{-1}\). The two search methods differ in terms of multivariate techniques used to separate signal from background: one uses an artificial neural network and the other uses a boosted decision tree with additional inputs derived from matrix element calculations. We present the method used to combine the results of these searches and its effect on the overall sensitivity.

2:42PM X14.00007 Search for a Light Higgs Boson in Radiative \( \Upsilon \) Decays. ARAFAT MOKHTAR, SLAC, BABAR COLLABORATION — We have collected \( \sim 30 \text{ fb}^{-1} \) of data with the BABAR detector at the PEPII asymmetric \( e^+e^- \) collider operating at a center-of-mass energy of 10.355 GeV. This data sample contains approximately 122 million \( \Upsilon(3S) \) candidates. We will present a search for light Higgs in the decays \( \Upsilon(3S) \to \gamma A^0 \). We will present the techniques and methods, as well as the results and conclusions from this search.

2:54PM X14.00008 Search for Dimuon Decays of a Light Scalar in Radiative Transitions \( \Upsilon \to \gamma A^0 \). ERIK PETIGURA, UC Berkeley and LBNL, BABAR COLLABORATION — We report on a search for evidence of a light Higgs boson in the radiative decays of the narrow \( \Upsilon \) resonances: \( \Upsilon \to \gamma A^0 \), \( A^0 \to \mu^+\mu^- \), using data collected by the BABAR detector. Such an object appears in extensions of the Standard Model, where a light CP-odd Higgs boson naturally couples strongly to \( b \)-quarks.

3:06PM X14.00009 Search for Lepton-Flavor Violation in Narrow \( \Upsilon \) Resonance Decays. BENJAMIN HOEBERMAN, UC Berkeley and LBNL, BABAR COLLABORATION — Charged lepton-flavor violating processes are extremely rare in the Standard Model, but they are predicted to occur in several beyond-the-Standard Model theories, including Supersymmetry or models with leptoquarks or compositeness. We present searches for such processes in narrow \( \Upsilon \) resonance decays. From a sample of 117 million \( \Upsilon(3S) \) decays recorded with the BABAR detector, we place upper limits on the branching fractions \( B(\Upsilon(3S) \to e\tau) < 5.0 \times 10^{-6} \) and \( B(\Upsilon(3S) \to \mu\tau) < 4.1 \times 10^{-6} \) at 90% confidence level. These results are used to place lower limits on the mass scale of beyond-the-Standard Model physics contributing to lepton-flavor violating decays of the \( \Upsilon(3S) \).