Session PS5 : Electroweak Precision Measurements

I- Experiments from FermiLab

1- Frank Lehner, FNAL, Batavia, IL, USA.

Title: W, Z production at the Tevatron.

Abstract: The two experiments DZERO and CDF at the Tevatron Collider at Fermilab have analysed W/Z events produced in ppbar collisions to study and test a variety of QCD predictions. The properties of W/Z production at Fermilab is reviewed and recent results on the transverse momentum distribution of W/Z bosons and the angular distribution of electrons from W-decays are presented.

2-Jaehoon Yu, FNAL, Batavia, IL, USA.

Title: Recent Electroweak Results from nu-N scattering at NuTeV.

Abstract: NuTeV is a neutrino-nucleon deep inelastic scattering experiment which took its data during the 1996-1997 Fermilab fixed target run. NuTeV utilized a sign selected neutrino beam facility to minimize large systematic uncertainties identified in previous weak mixing angle measurements. This new facility allowed the use of Paschos-Wolfenstein technique in measuring weak mixing angle.

The resulting uncertainty of the mass of the W boson, deduced from the weak mixing angle measurement, is comparable to those from collider measurements. The experiment also performs other electroweak measurements, using the same data. In this paper, we present precision measurement of the weak mixing angle and its interpretation as well as other electroweak measurements from the NuTeV experiment.

II-Experiments from CERN

3- Krzysztof Sliwa, Tufts University, Medford, MA, USA.

Title: Electroweak physics at ATLAS.

Abstract: A number of topics in electroweak physics have been recently studied by the ATLAS collaboration in the context of work for the "Detector and Physics Performance" Technical Design Report and the LHCC Standard Model Workshop. The LHC should measure the top mass to better than 2GeV and the W mass to 15 MeV. Calorimetric coverage down to $|\eta| = 4.9$ should allow competitive measurements of $\Delta \sin^2 \theta_{eff}^{lept}$ 0.0001 per lepton channel, by using forward-backward asymmetries in $Z \to \ell\ell$ decays. Triple gauge couplings of the vector bosons, namely those associated with the $WW\gamma$ and WWZ vertices, should be measured with precision between the percent and permill after only one year of operation. Tests of dynamical symmetry breaking will come from studies of vector boson

scattering at high energies. If the Higgs boson is not found, ATLAS will be placed to search for alternative symmetry breaking mechanisms, such as those provided by Technicolour.

4- Gideon Bella, Tel Aviv University, Tel Aviv, Israel.

Title: W and Z couplings and cross-sections.

Abstract: In the last few years the centre-of-mass energy of the LEP e+e- collider has exceeded the threshold energies for the production of W- and Z-pairs. The total integrated luminosity per experiment at these energies exceedsnow the design goal of 500 /pb corresponding to 6700 (180) W (Z) pair candidates observed by each of the four LEP experiments, ALEPH, DELPHI, L3 and OPAL. The measured total and differential W-pair and Z-pair cross-sections are used to set limits on anomalous triple gauge boson couplings WWγ, WWZ, ZZγ and ZZZ. Also the processes of single W and single photon production are used to constrain the WWγ couplings. Limits are also set on the Z$\gamma\gamma$ and ZγZ couplings using the Zγ production process. Finally, anomalous WW$\gamma\gamma$, WWγZ and ZZ$\gamma\gamma$ quartic gauge boson couplings are constrained using production of WWγ, $\nu\nu\gamma\gamma$ and Z$\gamma\gamma$ final states. All results are consistent with the predictions of the Standard Model.

5- Leonardo Bellucci, Universita' di Firenze, Italy .

Title: Bose-Einstein correlations and colour reconnection effects in W^+W^- events at LEP.

Abstract: Recent results on Bose–Einstein correlations and colour reconnection effects in hadronic decays of W bosons at LEP at center–of–mass energies up to 202 GeV are reviewed. Bose–Einstein correlations between particles are studied both in semi-leptonic and in fully-hadronic W^+W^- events. The analysis of colour reconnection effects is based on a comparison of charged particle multiplicities in hadronic and semileptonic W decays and on the study of particle and energy flow in the regions between the jets associated to the same and to the two opposite W bosons in fully hadronic W^+W^- events. The results are preliminary.

6- Andrea Venturi, Universita' di Pisa, Italy.

Title: W boson mass measurement at LEP 2.

Abstract: The mass of the W boson is determined by the direct reconstruction of W decays in WW $\rightarrow$ qqbar qqbar, WW $\rightarrow \ell\nu$ qqbar and WW $\rightarrow \ell\nu\ell\nu$ events produced at LEP running at center of mass energies above the WW pair production threshold. The presently available results of the four LEP Collaborations are presented focusing on the systematic uncertainties and on the future perspectives

of this measurement.

7- Frans Verbeure, Universiteit Antwerpen, Antwerpen, Belgium.

Title: Bose-Einstein correlations in WW events at LEP.

Abstract: Bose-Einstein correlations have been observed in electron-positron annihilations at LEP, at the Z-zero and also in WW pairs. The question whether there exist Bose-Einstein correlations between pairs of pions from DIFFERENT W's is important because, as shown in some analyses, these could change the measured mass of the W by an amount larger than the other systematic errors. A review will be given of the results of the 4 LEP experiments.

IV-Theory Talks

8- Charles Nelson, SUNY at Binghamton, Binghamton, NY, USA.

Title: Testing for New Couplings in Top Quark Decay.

Abstract: Tests of the Lorentz structure of $t \to Wb$ decay will be carried out at the Tevatron, and later at the LHC and at a NLC. To assay future measurements of competing observables, we consider the $g_(V-A)$ coupling values of the helicity decay parameters versus "(V-A) + single additional Lorentz structures". Three phase-type ambiguities exist, but measurement of the sign of the large interference between the W longitudinal/transverse amplitudes will exclude the two due dynamically to additional (S+P) and $(f_M + f_E)$ couplings. Sizable direct T-violation signatures can occur for low-effective mass scales ($\leq$ 220 GeV), but in most cases can be more simply excluded by 10-percent precision measurement of the probabilities P(W_L) and P(b_L). CP-violation signatures, Λ_b polarimetry, and the possible presence of T-violation associated with the phase-type ambiguities will be discussed.

9- Nguyen Anh Ky, Institut of Physics, Hanoi, Vietnam.

Title: Mass bounds of new gauge bosons in the 331 models(Nguyen Anh Ky, Hoang Ngoc Long and Dang Van Soa, Institut of Physics, Hanoi).

Abstract: Contributions from new gauge bosons in the 331 models to anomalous magnetic moment of muon, mass differences of kaon systems and rare kaon decays are calculated and numerically estimated. Bounds on masses of new gauge bosons (bileptons and Z') are derived.

11- Claudio Verzegnassi, INFN Trieste, Italy.

Title: Are weak interactions still weak in the LC regime?

12- Guangshu Huang, IHEP of CAS, Beijing, China.

Title: Measurement of R in the energy region of 2-5 GeV

Abstract: R value is the ratio of the cross section of hadron production from the annihilation of e^+e^- into virtual γ to that for muon pairs in the lowest order. The QED running coupling constant $\alpha(s)$ and the anomalous magnetic moment of muon a_μ are two fundamental quantities for the precision test of the Standard Model. The current uncertainties on $\alpha(s)$ and a_μ are dominated by the contribution from the poor R values with uncertainties of $15 \sim 20\%$ in the energy region of $1 \sim 5$GeV. An improved uncertainty for R value would help to determine $\alpha(s)$ and therefore result in improved constraint on parameters of the Standard Model, also contribute to the interpretation of a_μ. The upgraded BEPC/BES measured R values between 2.0 to 5.0 GeV in two runs of experiment carried out in 1998/1999. 6 energy points were scaned in the first run, and 85 points in the second run. The systematic uncertainty of R value in the energy region is reduced by a factor of 2.