Summary and Outlook - DIS 99

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Precision !
More Precision !
Even More Precision !

The main impact of the DIS99 Conference here in Zeuthen is the very high quality precision data which has been presented extending both the Q^2 and x range to very large values dominated by electroweak physics and to very low values of Q^2 and x dominated by photoproduction. Excellent reviews have been given of the current status of the physics of ZEUS - B. Löhr [DESY], H1 - T. Carli [MPI, Munich]. Q.C.D. - W. van Neerven [Leiden University], and Spin - R. Windmolders [Mons University] in these proceedings and also in the summary sessions of the working groups.

- The quality and precisions of the single arm DIS has shown that there is no need for any additional contributions other than those given by DGLAP.
- The data on jets from HERA and FNAL allow precision measurements of the gluon structure function or a determination of α_s.
- Charm in DIS is consistent with NLO QCD calculations whereas beauty production is much larger than predicted by LO QCD.
- Charm in Diffraction is different between H1 and ZEUS, but is produced in different kinematic regions. However, there is an inconsistency in the extraction of the charm content in H1 by different methods which has to be resolved.
- Photon structure measurements at LEP and HERA have now reached sufficient precision that the gluon content of the photon can be established. As the photon virtuality increases, photon shrinkage is clearly observed for the first time.
- Very new spin structure and fragmentation function measurements from SLAC and DESY [HERMES], but no clear indication yet of the size of the different spin components of the nucleon. Size of ΔG, the gluon spin content still undetermined.
- Precision Electroweak data from H1 and ZEUS consistent with Standard Model predictions and do not show any evidence for anomalous space-like behaviour.
- Very precise data on the top mass and the W mass from CDF and D0 at FNAL have been used within the context of the Standard Model to constrain the Higgs mass to low values, but with large errors.
- No evidence for contact interactions, lepton flavour violating leptoquarks, R-party violating SUSY particles at HERA in either experiment.
- H1 sees evidence for events with isolated leptons [$5\mu^{\pm}$ events, $1e^{-}$ event] all produced in $e^{+}p$ interactions with large transverse momentum in the hadronic system. More statistics required using both electron and positron incident beams.

Overall, it is clear that there has been much progress in testing the Standard Model with precision. Recently there has been more progress

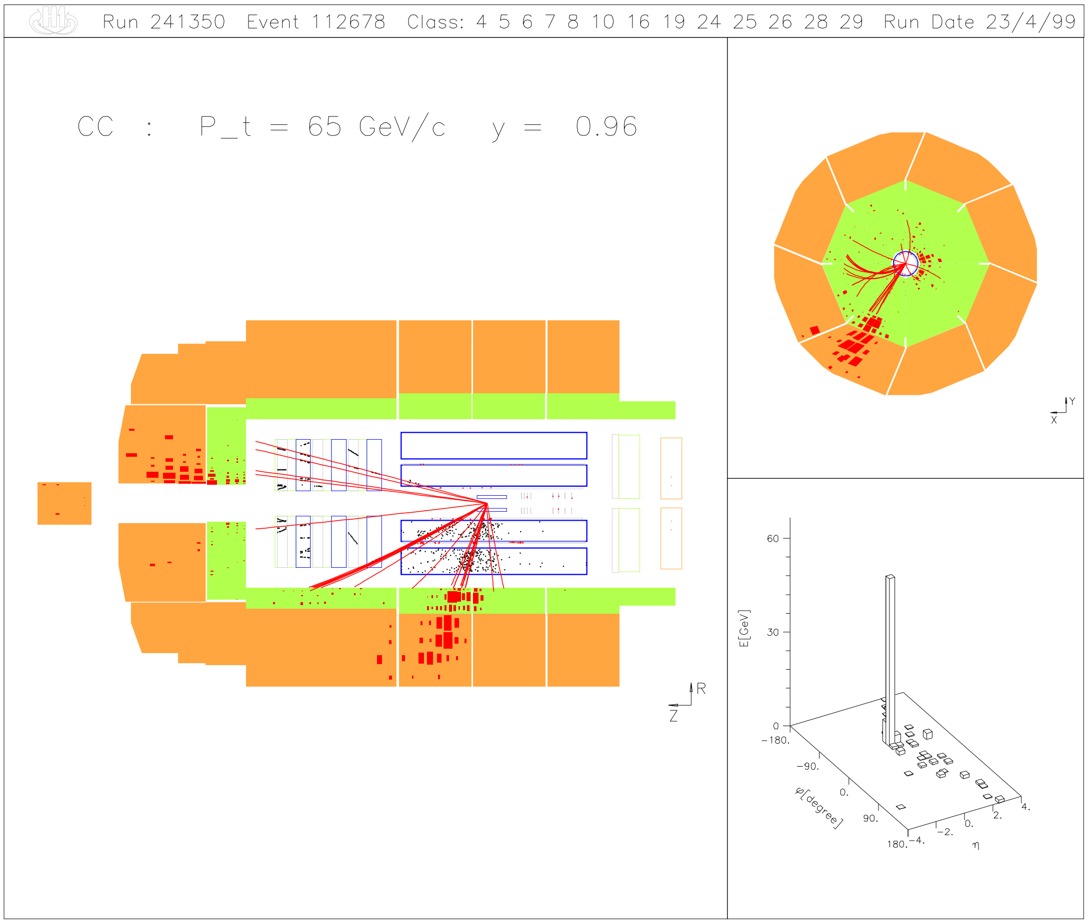

Figure 1. Charged current event with the highest ever Q^2 recorded by H1 on 23/4/99.

in testing the Standard Model with more precision. In the future with the planned upgrades for HERA [DESY] and TEVATRON [FNAL] together with their detectors, then it will be possible to test the Standard Model with even more precision and look for new phenomena. In order to prove my point, the H1 detector has recorded an event very close to the kinematic limit of HERA early this morning and I offer it to the conference. (Figure 1)