HZTOOL: A Package for Monte Carlo – Data Comparison at HERA (Version 1.0)

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Abstract: A library of generic routines (HZTOOL) has been established to allow easy reproduction, by Monte Carlo generators, of the experimental distributions and accessibility to the published data. This package contains a comprehensive collection of published data from H1 and ZEUS .

Many of the physics conclusions and analyses at HERA are limited due to the inability of the Monte Carlo generators to describe some of the distributions published by H1 and ZEUS in the fields of photoproduction and deep inelastic scattering. This is exacerbated by the large range of variations between the models available. This large variation can hinder in the planning of future physics studies. In comparison to the LEP results, the agreement between Monte Carlo event generators for HERA and the experimental data is significantly worse.

Difficulties with the tuning of the event generators arise with the model builders not understanding the experimentalists' cuts and the experimentalists not understanding the generators' various parameters. A consequence of this is a selective tuning of just a few of the available physics distributions. To help remove these problems the HZTOOL project was initiated to provide an easy-to-use environment in which the generators could be tuned and compared to a comprehensive range of the published experimental hadronic final state data, both deep inelastic scattering (DIS) and photoproduction, from the H1 and ZEUS experiments.

The HZTOOL package is fully documented in [1]. It incorporates a collection of jet algorithms commonly used at HERA and a series of tools that allows Monte Carlo studies and comparisons to be made in an uniform environment irrespective of the generator being used. A series of routines are provided that initialize, fill and manipulate the histograms from the published data and creates generator comparisons with the correct experimental cuts. HZTOOL may also be used as a repository for *suggested* measurements where data is not yet available. This enables easy comparison between predictions from different models and may also facilitate the communication between model builders and experimentalists. There are currently five Monte Carlo generators supported in the package: ARIADNE [2], HERWIG [3], LEPTO [4], PYTHIA [5] and PHOJET [6]. The results of the tuning of these programs, using this package, are discussed in these proceedings [7].

The authors intend to maintain this package and include future hadronic final state distributions produced by H1 or ZEUS. The source code is available on WWW at `http://dice2.desy.de/~h01rtc/hztool.html`.

References

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