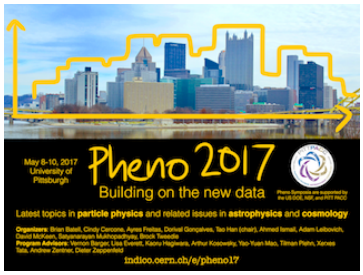

Contribution ID: **432** Type: **parallel talk**

Electroweak Splitting Functions and High Energy Showering

Tuesday, 9 May 2017 17:15 (15 minutes)

We derive the electroweak (EW) collinear splitting functions for the Standard Model, including the massive fermions, gauge bosons and the Higgs boson. We first present the splitting functions in the limit of unbroken SU(2)_L × U(1)_Y and discuss their general features in the collinear and soft-collinear regimes. These are the leading contributions at a splitting scale (k_T) far above the EW scale (v). We then systematically incorporate EW symmetry breaking (EWSB), which leads to the emergence of additional "ultra-collinear"splitting phenomena and naive violations of the Goldstone-boson Equivalence Theorem. We suggest a particularly convenient choice of non-covariant gauge (dubbed "Goldstone Equivalence Gauge") that disentangles the effects of Goldstone bosons and gauge fields in the presence of EWSB, and allows trivial book-keeping of leading power corrections in v/k_T. We implement a comprehensive, practical EW showering scheme based on these splitting functions using a Sudakov evolution formalism. Novel features in the implementation include a complete accounting of ultra-collinear effects, matching between shower and decay, kinematic back-reaction corrections in multi-stage showers, and mixed-state evolution of neutral bosons (gamma/Z/h) using density-matrices. We employ the EW showering formalism to study a number of important physical processes at O(1-10 TeV) energies. They include (a) electroweak partons in the initial state as the basis for vector-boson-fusion; (b) the emergence of "weak jets" such as those initiated by transverse gauge bosons, with individual splitting probabilities as large as O(35%); (c) EW showers initiated by top quarks, including Higgs bosons in the final state; (d) the occurrence of O(1) interference effects within EW showers involving the neutral bosons; and (e) EW corrections to new physics processes, as illustrated by production of a heavy vector boson (W') and the subsequent showering of its decay products.

Summary

Primary author: CHEN, Junmou (University of Pittsburgh)

Presenter: CHEN, Junmou (University of Pittsburgh)

Session Classification: Future Colliders