Electroweak precision observables at FCC-ee

Supervisors

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The Standard Model of Particle Physics (SM) describes the elementary physics interactions and has passed many experimental tests among which particle colliders are of special importance, with its most prominent example, the Large Hadron Collider (LHC) at CERN. Although the SM well describes interactions up to $\mathcal{O}(100\ \text{GeV})$ energy scale, it has several shortcomings. The next energy scale of new physics is unknown.
Pushing the limits forward, the future circular collider (FCC) with its colliding electron and positron beams is expected to tighten constraints on beyond SM (BSM) theories. A precise reconstruction of the particles produced in the collision and, in particular the determination of their kinematics, therefore becomes one of the most important challenge to extract these constraints.

It has already been shown, that a novel approach using exclusively reconstructed b-hadron decays as a hemisphere tagger can be applied for the measurement of R_b, the ratio of the Z-boson coupling to b-quarks to its coupling to all quarks, as well as the b-quark forward-backward asymmetry (A_{FB}^b). By focusing on the identification and reconstruction of b-hadrons exclusively within one hemisphere of an event, the technique aims to enhance the purity of the b-quark sample and improve the precision of these measurements as important tests of the Standard Model's parameters.

The focus of this internship project is the extension of the tagging technique to the measurement of R_c and A_{FB}^c. It would require the exclusive reconstruction of c-hadrons and the test of the purity in reach by applying kinematic cuts taking background topology information from other Z-decays into account.

Basics in the field of particle physics are required as well as basics in programming languages like `C++` and/or `python`.