

E-p combination for electrons in ATLAS

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This talk focuses on the likelihood-based combination of the measured cluster energy in the electromagnetic calorimeter with the measured momentum at the track perigee in the Inner Detector for electrons. The primary motivation for performing a combination of the track momentum and cluster energy is to improve electron energy resolution, particularly as it pertains to soft particles that leave tracks in the Inner Detector. Furthermore, the ID resolution improves at low momentum, whereas the calorimeter gives its best for high-momentum leptons. The combination also stands to benefit energy resolution in problematic parts of the ECAL, such as the crack region.

Summary

The track and cluster combination is exploited using a maximum-likelihood fit. Such a method uses Monte Carlo modelling to generate profile PDF's of track and cluster transverse momentum relative to truth information, and forms a combined measurement based on the maximization of a likelihood function derived from these profiles. The performance of the method is evaluated and compared using data and Monte Carlo samples of J/ψ and Z dielectron resonances, as well as Monte Carlo samples of gluon fusion-mediated $H \rightarrow ZZ \rightarrow 4l$ decays, and single electrons.

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