Contribution ID: **339** Type: **not specified**

Electron Reconstruction and Identification with the ATLAS Detector

The understanding of the reconstruction of electrons will be one of the key issues at the start-up of data-taking with the ATLAS experiment at the LHC in 2009. The first signals from prompt electrons are expected in direct J/psi and Upsilon production and in semi-leptonic decays of heavy flavour. They will be accompanied of course by W to enu and Z to ee decays, which will be used for a detailed and complete understanding of the performance of the trigger and offline algorithms once the accumulated statistics will be adequate.

The energy measurement of electrons is based on the electromagnetic calorimetry over most of the relevant energy range (10 GeV to a few TeV). The electromagnetic calorimeter cluster algorithm starting from electronically
calibrated calorimeter cells will be described. Local position and energy variations are corrected for. A refined calibration procedure, developed and validated over years of test-beam data-taking and analysis, strives to identify all sources of energy losses upstream of the calorimeter and outside the cluster and corrects for them one by one (using Monte-Carlo).

The construction tolerances and the calibration system ensure that the calorimeter response is locally uniform to ~ 0.5%.
Z to ee events, using the precisely known Z-boson mass as a constraint, will be used for in-situ calibration to achieve the desired global constant term of 0.7%. To achieve this the material in front of the calorimeter will have to be mapped out precisely using other methods.

The electron reconstruction relies on two algorithms, one which is calorimeter-seeded and the second one which is track-seeded. The former is optimised mostly for high-pT isolated electrons whereas the latter is optimised more for low-pT electrons, including those which are not isolated.

The electron identification is based on the shower shapes in the calorimeter and relies on the tracker and combined tracker/calo information to achieve the required rejection of 10^5 against QCD jets for a reasonably clean inclusive electron spectrum in the moderate pT region of 10 to 50 GeV. The required rejection factor is closer to a thousand per jet to cleanly extract the signal expected from di-electron resonances in the TeV mass range. The electron identification methods and their performance will be discussed. While the baseline identification will rely initially on simple cut-based analyses, powerful multivariate techniques, such as LogLikelihood and the H-matrix, have also been explored and the gain expected from them has been quantified.

Finally tag-and-probe methods, using Z to ee decays, have been developed in order to determine the efficiency of the electron trigger, reconstruction and identification from data alone. Good agreement was obtained in comparing the results of these methods with the estimations from Monte-Carlo truth. The large statistics expected in early data at low luminosity from J/psi and Upsilon to ee decays will extend the use of this method over the full pT range of interest for searches (Higgs-boson decays to electrons, electrons produced in cascade decays of SUSY particles, etc).

Primary author: Prof. ANNA, Di Ciaccio (University of Roma Tor Vergata and INFN)

Presenter: Mr KERSCHEN, Nicolas (CERN)

Track Classification: Poster session