

**Title:** Monte Carlo Simulations of the Tile Calorimeter and Measurement of the  $Z \rightarrow \tau\tau$  Cross Section with the ATLAS Detector

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**Abstract:** The Monte Carlo simulations of the Tile calorimeter in the ATLAS experiment at the LHC, especially the electronic noise and multiple interactions (co-called pile-up), are discussed in the thesis. A good agreement in the cell energy distribution between data and Monte Carlo simulations is found. The cross section measurement of  $Z \rightarrow \tau\tau$  events with the  $\tau\tau$  invariant mass between 66 and 116 GeV with the ATLAS experiment is described in the next part of the thesis. Data samples collected during 2011 corresponding to the integrated luminosity of  $1.34 - 1.55 \text{ fb}^{-1}$  are used for the analysis. The measurements are performed in three different final states depending on the decay mode of the  $\tau$  leptons. The measurement in the channel with one  $\tau$  lepton decaying leptonically into the electron + neutrinos (schematically  $\tau \rightarrow e + \nu_e + \nu_\tau$ ) and the other one hadronically (schematically  $\tau \rightarrow \text{hadrons} + \nu_\tau$ ), especially the calculation of the nominal cross section and the evaluation of the systematic uncertainties, is discussed in details in the thesis.

**Keywords:** Tile calorimeter, Z boson, tau lepton, cross section