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Titolo	ENERGY CALIBRATION AND OBSERVATION OF THE HIGGS BOSON IN THE DIPHOTON DECAY WITH THE ATLAS EXPERIMENT [Tesi di dottorato]
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Sommario	ATLAS is one of the four main experiments at the LHC proton-proton accelerator at CERN. This thesis describes two correlated topics: the observation for the Higgs boson in the diphoton channel and the Monte Carlo calibration of electrons and photons. The Higgs boson is a particle predicted by the Standard Model to explain the mechanism for electroweak symmetry breaking, giving masses to the particles. A particle compatible with the SM Higgs boson has been discovered by the ATLAS and CMS experiments in 2012. If this new boson is the Higgs boson, all fundamental parameters of the SM are known and, for the first time, it is possible to overconstrain the SM at the electroweak scale and to evaluate its validity. The proton-proton collision datasets used for the diphoton analysis correspond to integrated luminosities of 4.8 fb-1 collected at sqrt(s) = 7 TeV and 13.0 fb-1 collected at sqrt(s) = 8 TeV. The results, for the first time, establish the observation in the diphoton channel alone. The observation has a local significance of 6.1 standard deviations with a measured mass of 126.6 +/- 0.3 (stat) +/- 0.7 (syst) GeV. The fitted number of signal events is found to be 1.80 +/- 0.30 (stat) +0.21 -0.15 (syst) +0.20 -0.14 (theory) times the value predicted by the Standard Model. Two energy calibrations of electromagnetic particles are presented, a simpler method already used by all the ATLAS analyses and a new method based on a multivariate

	technique. Single particle Monte Carlo simulations have been used for the optimization. Electrons, unconverted photons and converted photons have been optimized separately. To improve the calibration of converted photons a dedicated correction has been developed. The MVA calibration was developed to introduce more input variables. The improvement is visible in all the energy ranges and in all the pseudorapidity regions and for all the particle hypotheses. The improvement on the Higgs invariant mass resolution in the diphoton channel is about 4%.
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