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Sommario

The topic of this thesis is the search for resonances in the di-photon invariant mass spectrum. These resonances are predicted by several models beyond the Standard Model. The analysis of data provided by the ATLAS detector during the Run-2 (years 2015-2016) of LHC will be presented. The di-photon decay channel is used both for precision measurement, for example for the measurement of the Higgs boson mass, and for discovery of BSM physics, like search for Gravitons in the extra dimension context and Higgs bosons in the Two Higgs doublet model context. In the ATLAS detector photons are reconstructed combining the information from the tracker and the electromagnetic calorimeter: the energy of the photons is measured in the calorimeter while the inner detector is used to reconstruct conversions. Their signature is quite simple and they are reconstructed and measured with a good energy resolution, purity and selection efficiency. The main background in photon-related analyses is coming from jets mis-identified as photons, therefore rectangular selection cuts are applied on the shower shapes of the photons. Furthermore an additional selection based on the isolation of the candidates is applied. The di-photon channel was proven to be a very interesting channel and it led to the discovery of the Higgs boson. It has a number of good features like the clean experimental

	signature, the excellent di-photon mass resolution, and modest jet background. Only particles with integer spin (but different than 1) can decay in a couple of photons. An excess in the di-photon spectrum at high-energy, together with a spin analysis, could be interpreted as the decay of a Graviton (spin-2) or an exotic Higgs boson (spin-0).
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