



*Character Profile of the Higgs Boson*

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Elementary particle physics describes and measures the properties of the smallest, most fundamental particles that make up the universe. The Standard Model of elementary particle physics provides a fundamental description of particles, their dynamics and interactions. The particles embedded into the theory are, a priori, massless, while observed particles have mass. In order to explain the origin of the elementary particle masses, the Brout-Englert-Higgs mechanism is introduced. The mechanism introduces the existence of one real scalar field, with the Higgs boson as excitation, however it does not predict its mass. To verify that the Higgs mechanism is the origin of elementary particle masses is one of the main goals of the Large Hadron Collider (LHC) programs at CERN.

Higgs physics at the ATLAS detector has reached an exciting new phase of precision measurements, but the analyses are still mostly set up for conducting searches. The research shown in this thesis has provided measurements in the Higgs sector, placed limits on new physics, and, with the Analytic Lagrangian Morphing tool, opened the door for precision measurements of Higgs physics at the LHC. Searches for extensions to the standard model can also be performed with this tool. This thesis includes reinterpretations of the Run 1 results, results of the ongoing Run 2 and prospects for the full second run and the High Luminosity LHC. An exciting, interesting and productive new phase of precision measurements in Higgs physics at the ATLAS detector has started.