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ATLAS results on the Higgs boson properties in the decay channel $H \rightarrow ZZ \rightarrow 4\ell$

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This contribution will review the latest ATLAS results on the properties of the Higgs boson in the decay channel $H \rightarrow ZZ \rightarrow 4\ell$ using approximately 25 fb⁻¹ of pp collision data collected during the LHC Run1 at 7 TeV and 8 TeV. The measurements of the mass and the couplings of the newly discovered boson are presented together with the spin-parity analysis results.

Summary

Since the discovery of a Higgs-like boson by the ATLAS and CMS experiments at the LHC, the emphasis has shifted towards measurements of its properties. A review of the latest ATLAS results on the properties of the Higgs boson in the decay channel $H \rightarrow ZZ \rightarrow 4\ell$ channel using approximately 25 fb⁻¹ of pp collision data collected during the LHC Run1 at 7 TeV and 8 TeV, is presented.

In the four lepton final state a clear excess of events over the background is observed at $m_H = 124.3$ GeV with a significance of 6.6 standard deviations.

Thanks to the very good lepton's energy resolution was possible to perform a mass measurement which is found to be $m_H = 124.3^{+0.6-0.5}$ (stat) $^{+0.5-0.3}$ (syst) GeV, and the signal strength (the ratio of the observed cross section to the expected SM cross section) at this mass is found to be $\mu = 1.7^{+0.5-0.4}$.

Moreover, a study of Higgs boson production mechanisms allows a first measurement of couplings with this channel. A spin-parity analysis is also performed on the events with reconstructed four-lepton invariant mass $m_{4\ell}$ satisfying $115 \text{ GeV} < m_{4\ell} < 130 \text{ GeV}$. The Higgs-like boson is found to be compatible with the SM expectation of 0^+ when compared pair-wise with 0^- , 1^+ , 1^- , 2^+ , and 2^- . The 0^- and 1^+ states are excluded at the 97.8% confidence level or higher using CLS in favour of 0^+ .

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