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Determination of the off-shell Higgs boson signal strength in the high-mass ZZ and WW final states with the ATLAS detector

Measurements of the ZZ and WW final states in the mass range above the $2m_Z$ and $2m_W$ thresholds provide a unique opportunity to measure the off-shell coupling strength of the Higgs boson. This poster presents a determination of the off-shell Higgs boson event yields normalised to the Standard Model prediction (signal strength) in the $ZZ \rightarrow 4\ell$, $ZZ \rightarrow 2\ell 2\nu$ and $WW \rightarrow e\nu\mu\nu$ final states. The result is based on pp collision data collected by the ATLAS experiment at the LHC, corresponding to an integrated luminosity of 20.3 fb^{-1} at a collision energy of $\sqrt{s}=8 \text{ TeV}$. Using the CLs method, the observed 95% confidence level (CL) upper limit on the off-shell signal strength is in the range 5.1–8.6, with an expected range of 6.7–11.0. In each case the range is determined by varying the unknown $gg \rightarrow ZZ$ and $gg \rightarrow WW$ background K-factor from higher-order QCD corrections between half and twice the value of the known signal K-factor. Assuming the relevant Higgs boson couplings are independent of the energy scale of the Higgs production, a combination with the on-shell measurements yields an observed (expected) 95% CL upper limit on Γ_H/TSMH in the range 4.5–7.5 (6.5–11.2) using the same variations of the background K-factor. Assuming that the unknown $gg \rightarrow VV$ background K-factor is equal to the signal K-factor, this translates into an observed (expected) 95% CL upper limit on the Higgs boson total width of 22.7 (33.0) MeV.

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