

Test of CP invariance in vector-boson fusion production of the Higgs boson using $H \rightarrow \tau\tau$ decays at the ATLAS experiment

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Violation of CP invariance is one of the Sakharov conditions needed to explain the observed baryon asymmetry in our universe. While CP violation is already realised in the Standard Model (SM) via the CKM matrix, its strength is not sufficient to explain the amount of observed baryon asymmetry. Hence, it is important to search for new sources of CP violation in the Higgs sector.

The vector-boson fusion production allows to investigate the CP structure of the Higgs-boson coupling to electroweak gauge bosons.

The ansatz considered is an Effective Field Theory, where the SM Lagrangian is augmented by CP-odd operators of mass dimension six. The magnitude of CP violation is then parametrised by a single parameter \tilde{d} . Thus, any non-vanishing value of \tilde{d} directly corresponds to a violation of CP-invariance in the interaction.

The CP-odd Optimal Observable can be used to measure the value of \tilde{d} . This observable is given by the ratio of the CP-odd interference term in the squared matrix element over the squared SM matrix element. It provides the highest sensitivity to determine \tilde{d} for small values of this parameter.

By performing a likelihood fit to the Optimal Observable distribution for different coupling scenarios exclusion limits can be derived.

The talk discusses the test of CP invariance in the vector-boson fusion production of the Higgs boson using $H \rightarrow \tau\tau$ decays with the ATLAS detector.

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