Contribution ID: **153** Type: **not specified**

Higgs pair production in vector-boson fusion at the LHC and beyond

Tuesday, 4 April 2017 12:40 (15 minutes)

The production of pairs of Higgs bosons at hadron colliders provides unique information on the Higgs sector and on the mechanism underlying electroweak symmetry breaking (EWSB). Most studies have concentrated on the gluon fusion production mode which has the largest cross section. However, despite its small production rate, the vector-boson fusion channel can also be relevant since even small modifications of the Higgs couplings to vector bosons induce a striking increase of the cross section as a function of the invariant mass of the Higgs boson pair. In this work, we exploit this unique signature to propose a strategy to extract the hhVV quartic coupling and provide model-independent constraints on theories where EWSB is driven by new strong interactions. We take advantage of the higher signal yield of the 4b final state and make extensive use of jet substructure techniques to reconstruct signal events with a boosted topology, characteristic of large partonic energies, where each Higgs boson decays to a single collimated jet . Our results demonstrate that the hhVV coupling can be measured with up to 20% precision at the LHC, while a 1% precision can be achieved at a 100 TeV collider.

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Session Classification: WG3 Higgs and BSM Physics in Hadron Collisions

Track Classification: WG3) Higgs and BSM Physics in Hadron Collisions