Contribution ID: **1250** Type: **Parallel session talk**

Impact of the trilinear Higgs self-coupling on resonant and non-resonant di-Higgs production

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The process of Higgs pair production at the LHC is of particular interest since it sensitively depends on the trilinear Higgs self-coupling of the detected Higgs boson and therefore provides experimental access to the Higgs potential and important information about the electroweak phase transition in the early Universe. In this talk both resonant and non-resonant di-Higgs production will be discussed. For resonant di-Higgs production, using the example of the Two Higgs Doublet Model (2HDM), it is demonstrated that potentially large higher-order corrections to the trilinear couplings and interference effects between the non-resonant and the resonant contributions have a strong impact on the shape of the invariant mass distribution and on the result for the total cross section. It is pointed out that neglecting the non-resonant contributions, as it is done by the experimental collaborations up to now, can lead to unreliable results for the exclusion limits. While the present bounds from non-resonant di-Higgs production are still relatively weak, it is shown that they already provide a new way for probing so far unconstrained parameter regions of extended Higgs sectors. The parameter region of extended Higgs sectors giving rise to a strong first-order electroweak phase transition in the early Universe and potentially detectable gravitational wave signals is typically correlated with a certain mass splitting among the additional Higgs bosons, giving rise both to to a significant enhancement of the trilinear Higgs-boson self-coupling compared to the SM value and to a characteristic "smoking gun"signature in the search for additional Higgs boson. The public tool anyH3, which provides predictions for the trilinear Higgs coupling to full one-loop order within arbitrary renormalisable theories, is briefly discussed in this context.

Alternate track

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