## Phenomenology 2018 Symposium



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## Resonant Di-Higgs Production in the bbWW channel: Probing the Electroweak Phase Transition at the LHC

Tuesday 8 May 2018 15:00 (15 minutes)

With the discovery of Standard Model (SM) Higgs boson at the LHC, exploring the thermal history associated with electroweak symmetry-breaking (EWSB) has taken on heightened interest. In particular, the process of the electroweak phase transition (EWPT) in early Universe provides conditions able to explain the observed cosmic matter-antimatter asymmetry, if the transition were of first order and sufficiently strong. The prospects for resonant di-Higgs production searches at LHC in the context of probing the EWPT in Higgs portal extension of the SM will be illustrated. Particular attention will be given to the bbWW channel (with W leptonic decays), where the presence of neutrinos in the final state does not allow the reconstruction of the invariant mass of the heavy scalar. I will present a novel technique [1], called Heavy Mass Estimator (HME), that allows to fully reconstruct the kinematic of the process, and therefore to reconstruct the heavy Higgs invariant mass. We proved that, using the HME technique, this channel can be sensitive as much as bbbb,  $bb\gamma\gamma$ , and  $bb\tau\tau$  channels, leading to a potential discovery of resonant di-Higgs production with the datasets accumulated in High Luminosity phase of LHC, foreseen in 2035.

[1] https://journals.aps.org/prd/abstract/10.1103/PhysRevD.96.035007

## Summary

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