Contribution ID: **54** Type: **Parallel Talk**

Collider probes of a first order electroweak phase transition

Monday 10 June 2024 18:25 (25 minutes)

In this talk we investigate the capability of the new ATLAS searches for $A \to ZH$ decays in $ell^+\ell^- t\bar{t}$ and $\nu\nu b\bar{b}$ final states to probe the electroweak phase transition in the early Universe. In the framework of the Two Higgs Doublet Model (2HDM), we investigate the impact of the new searches on the 2HDM parameter space, paying special attention to parameter space regions that predict a strong first order electroweak phase transition. We discuss the complementarity with other LHC searches, and we analyze the interplay of collider searches and space based gravitational wave experiments. We furthermore show that the 3σ excess observed at $m_A = 650$˜GeV and $m_H = 450$˜GeV can be described in the 2HDM, where the preferred parameter space falls within the region suitable for a realization of a strong first-order phase transition. The GW signal produced during the transition in the early universe might be in reach of LISA. Finally, we present a python package for the exploration of the 2HDM parameter space that can be used to confront the model with the most significant theoretical and experimental constraints.

Authors: WEIGLEIN, Georg Ralf (Deutsches Elektronen-Synchrotron (DE)); NO, Jose Miguel (IFT-UAM/CSIC); RADCHENKO SERDULA, Kateryna (DESY); OLEA ROMACHO, Maria Olalla; HEINEMEYER, Sven (CSIC (Madrid, ES)); BIEKOETTER, Thomas

Presenter: RADCHENKO SERDULA, Kateryna (DESY)

Session Classification: Higgs: theory and experiment

Track Classification: Higgs: theory and experiment