

# Multi-Higgs production and the Electroweak Phase Transition through TRSM

*Monday 29 July 2024 14:00 (1 hour)*

Exploring the Higgs sector via multi-Higgs production searches is a main goal for run-3 and high-lumi LHC. Can these searches inform us about the electroweak phase transition and matter-antimatter asymmetry? We address this question in the context of the TRSM (Two-Real-Singlet Model), which has known benchmark points enhancing multi-Higgs production.

We update the triple-Higgs production benchmark points to include refined perturbativity bounds and explore the type of electroweak phase transition that occurs in the early universe; whether continuous or the first-order discontinuous phase transition desired for matter-antimatter asymmetry.

After presenting our work, I outline lessons on correlating the type of electroweak phase transition and the enhancement of di-Higgs or triple Higgs production, highlighting the importance of the theory's vacuum expectation value of today and the symmetries of the model.

**Primary authors:** Dr PAPAESTATHIOU, Andreas (Kennesaw State University, GA, USA); TETLALMATZI-X-OLOCOTZI, Gilberto (Siegen University); VAN DE VIS, Jorinde Marjolein; POSTMA, Marieke; KARKOUT, Osama (Nikhef National institute for subatomic physics (NL)); DU PREE, Tristan Arnoldus (Nikhef National institute for subatomic physics (NL))

**Presenter:** KARKOUT, Osama (Nikhef National institute for subatomic physics (NL))