

# Whispers from the Dark Universe - Particles & Fields in the Gravitational Wave Era

CLUSTER OF EXCELLENCE  
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DESY THEORY WORKSHOP

## WHISPERS FROM THE DARK UNIVERSE – PARTICLES & FIELDS IN THE GRAVITATIONAL WAVE ERA

HELMHOLTZ

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## Di-Higgs production in the RxSM at the HL-LHC taking into account 1-loop corrections to the trilinear Higgs couplings in a SFOEWPT scenario

*Wednesday 25 September 2024 14:00 (15 minutes)*

We explore the real-singlet extension of the Standard Model without a  $Z_2$  symmetry (RxSM), as a model to reconstruct the Higgs potential and explain the baryon asymmetry of the Universe. First, we determine regions of parameter space that allow a Strong First-Order Electroweak Phase Transition (SFOEWPT) using the public tools CosmoTransitions and TransitionListener, including also relevant theoretical constraints as well as experimental constraints using HiggsTools. Then, we compute the one-loop corrections to the trilinear Higgs couplings that enter di-Higgs production ( $hhh$  and  $hhH$ ) using the public code anyH3. Finally, we compute the di-Higgs production cross section at the (HL-)LHC in the regions of the RxSM parameter space allowing a SFOEWPT, taking into account the one-loop corrections to the trilinear Higgs couplings. We compare this new result with the results in the SM and in the RxSM at tree level, highlighting the impact of the loop corrections to the trilinear couplings.

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