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Higgs Mass Predictions in the CP-Violating High-Scale NMSSM

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In a supersymmetric theory, large mass hierarchies can lead to large uncertainties in fixed-order calculations of the SM-like Higgs mass. A reliable prediction is then obtained by performing the calculation in an effective field theory (EFT) framework, involving the matching to the full supersymmetric theory at the high scale to include contributions from the heavy particles, and a subsequent renormalization-group running down to the low scale.

In my talk, I report on the prediction of the SM-like Higgs mass within the CP-violating Next-to-Minimal Supersymmetric extension of the SM in a scenario where all non-SM particles feature TeV-scale masses. The matching conditions are calculated at full one-loop order using two approaches. These are the matching of the quartic Higgs couplings as well as of the SM-like Higgs pole masses of the low- and high-scale theory. A comparison between the two methods allows for an estimate of the size of terms suppressed by the heavy mass scale that are neglected in a pure EFT calculation as given by the quartic-coupling matching. The calculation is implemented in a new version of the public program package NMSSMCALC.

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