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Precision Calculations in the Next-to-Minimal Supersymmetric Standard Model (NMSSM) and Phenomenological Implications

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While the Standard Model (SM) cannot solve all our open questions, supersymmetry (SUSY) still remains an attractive and viable option to give answers to unsolved puzzles as e.g. the nature of Dark Matter. The Higgs sector of the next-to-minimal supersymmetric extension of the SM (NMSSM) contains two complex Higgs doublets and a singlet field, leading to a rich phenomenology. In SUSY models, the Higgs masses are computed from the SUSY input parameters. The comparsion of precision predictions for the SM-like SUSY Higgs boson mass value with the experimentally measured Higgs mass of 125 GeV hence allows to indirectly constrain the NMSSM parameter space. In this talk, I present our precision predictions at two-loop order for the NMSSM Higgs boson masses as well as for the trilinear Higgs self-couplings in the CP-violating NMSSM. The latter are directly linked to the mass values through the Higgs potential, and their measurement gives important insights into the mechanism of electroweak symmetry breaking. I furthermore present the impact of our calculated two-loop corrections to the rho parameter and their effect on the W boson mass as well as the muon anomalous magnetic moment (AMM). Finally, the leptonic AMM and the electric dipole moment will be discussed in a variant of the NMSSM which includes the inverse seesaw mechanism. The talk highlights the importance of the interplay between precision calculations in SUSY extensions of the SM and the indirect constraints that can be derived on the allowed parameter space through the comparison with the experimental results.

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