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Quantum Field Theory in Beyond Standard Model Physics and Supersymmetry

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Abstract: *Quantum Field Theory provides the fundamental mathematical framework for describing particle interactions and the dynamics of quantum fields. While the Standard Model has successfully explained electromagnetic, weak, and strong interactions, it fails to address several unresolved issues such as dark matter, neutrino masses, hierarchy problem, and gravity. Beyond Standard Model physics extends QFT principles to explore new symmetries and particles. Among these frameworks, Supersymmetry stands as one of the most prominent and mathematically consistent extensions. This review examines the role of QFT in BSM physics, focusing on supersymmetry, its theoretical foundations, phenomenological implications, experimental searches, and current challenges.*

Keywords: Quantum Field Theory, Beyond Standard Model, Supersymmetry