Séminaire commun

Quantum Gravity Bounds on Four-Dimensional Effective Theories with Minimal Supersymmetry

Timo Weigand

U. Hamburg

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Résumé

According to the Swampland idea, quantum gravity effects put severe constraints on effective field theories beyond the usual consistency conditions from quantum field theory such as absence of gauge or gravitational anomalies. In this talk, we propose such constraints for four-dimensional N=1 supergravities based on consistency of certain axionic, or EFT, strings. These are certain strings which are magnetically charged under the axionic components of the chiral N=1 superfields ; their existence follows from the Completeness Conjecture in quantum gravity. The key observation is that anomaly inflow from the four-dimensional theory to the string worldsheet induces anomalies on the string which must be cancelled by local anomalies on the string. This results in various quantisation conditions as well as bounds on the signs of axionic couplings in the supergravity, including the sign of the Gauss-Bonnet term, and also bounds on the rank of the gauge group in terms of these Gauss-Bonnet couplings. These constraints can rule out supergravity theories which otherwise look perfectly healthy as effective field theories of quantum gravity. We also test the proposed constraints by comparing them with explicit string models, in particular with F-theory compactifications to four dimensions.