

# Séminaire de matrices, cordes et géométries aléatoires

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Mercredi 04/09/2019, 14h15-15h15

Orme des Merisiers Salle Claude Itzykson, Bât. 774

## A Tower Weak Gravity Conjecture from Infrared Consistency

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We analyze infrared consistency conditions of 3D and 4D effective field theories with massive scalars or fermions charged under multiple  $U(1)$  gauge fields. At low energies, one can integrate out the massive particles and thus obtain a one-loop effective action for the gauge fields. In the regime where charge-independent contributions to higher-derivative terms in the action are sufficiently small, it is then possible to derive constraints on the charge-to-mass ratios of the massive particles from requiring that photons propagate causally and have an analytic S-matrix. We thus find that the theories need to contain bifundamentals and satisfy a version of the weak gravity conjecture known as the convex-hull condition. Demanding self-consistency of the constraints under Kaluza-Klein compactification, we furthermore show that, for scalars, they imply a stronger version of the weak gravity conjecture in which the charge-to-mass ratios of an infinite tower of particles are bounded from below. We find that the tower must again include bifundamentals but does not necessarily have to occupy a charge (sub-)lattice.

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