

Formulating the Weak Gravity Conjecture in AdS Space

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We recently proposed a version of the Weak Gravity Conjecture that applies to AdS spacetime. We find that the condition on the charge-to-mass ratio of a charged particle in AdS spacetime is corrected compared to the one in Minkowski spacetime by contributions that depends on the AdS scale and the horizon radius of the extremal Reissner–Nordström black hole charged under the same gauge theory. We motivate our proposal from the viewpoint of extremal black hole decay and show that the bound on the particle spectrum is given by the critical charge-to-mass ratio beyond which the Schwinger effect can take place. This quantum effect shares the same condition as requiring a particle to satisfy a repulsive force condition at the black hole horizon, so that the extremal black hole can decay without reabsorbing the particle. We also comment on the generalization in the case of multiple U(1) gauge theories, providing evidence for a convex hull condition in AdS background.

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