EXCISING CAUCHY HORIZONS WITH NONLINEAR ELECTRODYNAMICS

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Abstract

Charged and/or rotating black holes in General Relativity feature Cauchy horizons, which indicate a breakdown of predictability in the theory. Focusing first on spherically symmetric charged black holes, we remark that the inevitability of Reissner-Nordström Cauchy horizon is due to the divergent electromagnetic self-energy of point charges. We demonstrate that any causal theory of nonlinear electrodynamics that regularizes the point charge self-energy also eliminates Cauchy horizons for weakly charged black holes. These black holes feature one (event) horizon and a spacelike singularity, analogous to the Schwarzschild metric. An example with Born-Infeld electrodynamics illustrates how this gives rise to an upper bound on the charge, which we compare with known bounds. Generalization to a rotating case will also be briefly discussed.