Abstract Submitted
for the APR16 Meeting of
The American Physical Society

Nonlinear evolution and final fate of (charged) superradiant instability STEPHEN GREEN, PABLO BOSCH, LUIS LEHNER, Perimeter Institute for Theoretical Physics — We describe the full nonlinear development of the superradiant instability for a charged massless scalar field, coupled to general relativity and electromagnetism, in the vicinity of a Reissner-Nordstrom-AdS black hole. The presence of the negative cosmological constant provides a natural context for considering perfectly reflecting boundary conditions and studying the dynamics as the scalar field interacts repeateadly with the black hole. At early times, small superradiant perturbations grow as expected from linearized studies. Backreaction then causes the black hole to lose charge and mass until the perturbation becomes non-superradiant, with the final state described by a stable hairy black hole. For large gauge coupling, the instability extracts a large amount of charge per unit mass, resulting in greater entropy increase. We discuss the implications of the observed behavior for the general problem of superradiance in black hole spacetimes.

Stephen Green
Perimeter Institute for Theoretical Physics

Date submitted: 07 Jan 2016 Electronic form version 1.4