

Gravitational collapse in spherical symmetry: price's law, mass inflation, and strong cosmic censorship

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Abstract

Two aspects of the widely accepted heuristic picture of the final state of gravitational collapse are the so-called Price law tails, describing the asymptotics of the exterior region of the black hole that forms, and the mass inflation scenario, describing the internal structure of the black hole. (The latter scenario, if valid, would indicate in particular that the maximal development of initial data fails to be inextendible as a C^0 metric, putting into question the validity of the so-called strong cosmic censorship conjecture.) It turns out that these two aspects are in fact closely related to each other. In this talk, we will discuss the Einstein-Maxwell-scalar field system under spherical symmetry. This model captures much of the physics of the late stages of gravitational collapse, as the charge provides a spherically symmetric substitute for the repulsive force of angular momentum. Mathematically, this model reduces to the global study of a system of quasilinear hyperbolic p.d.e.'s in 1+1 dimensions. In the context of this model, it is established rigorously that Price law decay for the scalar field and the mass inflation scenario both hold.