

Contributed Talk

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Title: Black-hole microstate spectroscopy: ringdown, quasinormal modes, and echoes

Abstract: Deep conceptual problems associated with classical black holes can be addressed in string theory by the "fuzzball" paradigm, which provides a microscopic description of a black hole in terms of a thermodynamically large number of regular, horizonless, geometries with much less symmetry than the corresponding black hole. Motivated by the tantalizing possibility to observe quantum gravity signatures near astrophysical compact objects in this scenario, we perform the first numerical simulations of a scalar field propagating on a large class of multicenter geometries with no spatial isometries arising from $\mathcal{N}=2$ four-dimensional supergravity. We identify the prompt response to the perturbation and the ringdown modes associated with the photon sphere, which are similar to the black-hole case, and the appearance of echoes at later time, which is a smoking gun of the absence of a horizon and of the regular interior of these solutions. The response is in agreement with an analytical model based on geodesic motion in these complicated geometries. Our results provide the first numerical evidence for the dynamical linear stability of fuzzballs, and pave the way for an accurate discrimination between fuzzballs and black holes using gravitational-wave spectroscopy.