

# Exotic compact objects: Ergoregion instability, ringdown and echoes

Gravitational waves allow us to understand the nature of compact objects, potentially probing microscopic corrections at the horizon scale of black holes. Some quantum-gravity models of exotic compact objects replace the event horizon by a partially reflective surface. Spinning horizonless compact objects with these properties may be unstable against the so-called ergoregion instability.

In this talk, we investigate a Kerr-like exotic compact object with a perfectly reflecting surface. We analyse its stability under scalar, electromagnetic and gravitational perturbations. We present the quasi-normal mode frequencies and the instability timescale of unstable modes. We show that a partial absorption of about 60% at the surface would quench the instability completely for any kind of perturbation. Furthermore, we present an analytical template which describes the gravitational-wave echoes in the ringdown of Kerr-like exotic compact objects with a partially absorbing surface.