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Gravitational-wave echoes

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Gravitational wave (GW) astronomy allows us for unprecedented tests of the nature of dark compact objects and to probe into outstanding foundational issues, such as the fate of spacetime singularities and the loss of unitarity in Hawking evaporation. In this context, I will discuss a striking signature of new physics at the horizon scale: GW "echoes"in the postmerger ringdown phase of a binary coalescence. The ringdown waveform of exotic ultracompact objects is initially identical to that of a black hole, and putative corrections at the horizon scale appear only at later times as a modulated and distorted train of echoes of the modes of vibration associated with the photon sphere. These corrections display a universal logarithmic dependence on the location of the surface in the black-hole limit, allowing to probe even Planckian corrections. I will discuss challenges in modelling this signal and the ability of present and future GW detectors to measure this effect.

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