General Relativity and Quantum Cosmology

# Gravitational-wave signatures of the absence of an event horizon. II. Extreme mass ratio inspirals in the spacetime of a thin-shell gravastar

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We study gravitational-wave emission from the quasi-circular, extreme mass ratio inspiral of compact objects of mass m0 into massive objects of mass M>>m0 whose external metric is identical to the Schwarzschild metric, except for the absence of an event horizon. To be specific we consider one of the simplest realizations of such an object: a nonrotating thin-shell gravastar. The power radiated in gravitational waves during the inspiral shows distinctive peaks corresponding to the excitation of the polar oscillation modes of the gravastar. For ultra-compact gravastars the frequency of these peaks depends mildly on the gravastar compactness. For masses M~10^6Msun the peaks typically lie within the optimal sensitivity bandwidth of LISA, potentially providing a unique signature of the horizonless nature of the central object. For relatively modest values of the gravastar compactness the radiated power has even more peculiar features, carrying the signature of the microscopic properties of the physical surface replacing the event horizon.

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