

# Scalarization by matter effect around black hole mimickers

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Various theories predict the existence of light scalar particles. When considering the finite temperature and density corrections to the scalar potential, scalar fields can be sourced by a variety of stellar objects and mediate additional long-range scalar forces. Since the scalar field is only sourced in certain environments, this provides a complementary way to probe the parameter space compared to the fifth force constraints. In this study, we investigate the possibility of sourcing a light scalar field from various stellar objects through finite temperature and density effects. Particularly, we consider horizonless ultracompact object, 2-2-holes, an interesting candidate of black hole mimickers. Their interiors feature trans-Planckian temperature and ultra-high density, providing an extreme environment for generating this phenomenon. For the simple scalar model considered, we find that the scalar charge of ordinary star is extremely small in the allowed parameter space, while it could be large for 2-2-hole for certain types of scalar models. The induced force and scalar radiation could be detected by gravitational wave observations of binaries formed by 2-2-holes.

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