

Gravitational waves from subsolar compact objects: implications for cosmology and high-density nuclear physics

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The detection of a subsolar-mass gravitational wave event would have significant implications for both cosmology and nuclear physics. In this study, we investigate the potential impact of such a discovery, which may occur during the ongoing or future LIGO-Virgo-KAGRA observing runs. The nature of a subsolar binary system—whether composed of light neutron stars, primordial black holes, or other exotic compact objects—can be identified with high statistical confidence through the analysis of tidal deformability effects on the gravitational wave signal. A primordial black hole detection could suggest a connection to dark matter and provide evidence for primordial stellar-mass mergers. Alternatively, observing a subsolar neutron star would offer critical insights into the equation of state of high-density nuclear matter and help determine the existence of quark-based strange stars.

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