

Imprints of ultralight axions on the gravitational wave and pulsar timing measurement

We study the new observational effects of ultralight axion-like particles by the space-borne gravitational wave detector and the radio telescope. Taking the neutron star-black hole binary as an example, we demonstrate that the gravitational waveform could be obviously modified by the slow depletion of the axion cloud around the black hole formed through the superradiance process. We compare these new effects on the binary with the well-studied effects from dynamical friction with dark matter and dipole radiation in model-independent ways. Finally, we discuss the constraints from LIGO/Virgo and study the detectability of the ultralight axion particles at LISA and TianQin.

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