

From Ultralight to Macroscopic Dark Matter: A Window into the Dark Sector with Gravitational Waves

Sunday, 8 November 2026 14:00 (30)

Dark matter may leave observable signatures in gravitational-wave detectors through a remarkably broad range of physical mechanisms. In this talk, I will discuss recent searches using data from the fourth observing run of the LIGO–Virgo–KAGRA detector network. First, I will present a direct search for ultralight dark matter, in which coherently oscillating scalar, vector, and tensor fields can produce characteristic signals in gravitational-wave interferometers. I will then discuss searches for gravitational waves from inspiraling planetary-mass and asteroid-mass ultra-compact objects, which could be primordial black holes. Finally, I will discuss how related continuous-wave searches can probe ultralight bosons through gravitational radiation from boson clouds surrounding rotating black holes. Together, these searches illustrate how gravitational-wave detectors can function not only as observatories of conventional astrophysical sources, but also as sensitive experiments for exploring the nature of dark matter.

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Session Classification : Parallel-Cosmology