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Multi-Messenger Search for Neutrino and Gravitational-Wave Emissions from Binary Black Holes Near Active Galactic Nuclei

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Binary black holes (BBHs) in the vicinity of Active Galactic Nuclei (AGNs) are particularly interesting systems from both a cosmological and astrophysical point of view. Matter and radiation fields within the dense AGN environment could produce electromagnetic and neutrino emission in addition to gravitational waves (GWs). Moreover, interactions between BBHs and AGN accretion disks are expected to influence BBH formation channels and merger rates. Understanding these sources could help explain the unexpectedly high BBH masses observed through GWs by the LIGO-Virgo-KAGRA collaborations. We present a search for coincident gravitational-wave and neutrino emission from AGNs. Our new innovative approach combines information from gravitational-wave data, neutrino observations, and AGN optical catalogs to increase the chances of identifying potential sources and studying their properties. We assess the sensitivity of the search using subthreshold gravitational-wave candidates from LIGO-Virgo-KAGRA data and neutrino event candidates from public IceCube Neutrino Observatory data. A confident detection of such an event would mark a breakthrough in multi-messenger astronomy.

Collaboration(s)

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