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IceCube Search for MeV Neutrinos from Mergers using Gravitational Wave Catalogs

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We report on a search using the IceCube Neutrino Observatory for MeV neutrinos from compact binary mergers detected through gravitational waves during the LIGO-Virgo-KAGRA (LVK) O1, O2, and O3 observing runs. The search focuses on events involving at least one neutron star, such as binary neutron star (BNS) and neutron star–black hole (NSBH) mergers, which may produce a burst of thermal neutrinos due to the hot and dense conditions created during the merger. We looked for short-time increases in IceCube's detector activity around each gravitational-wave event, using four time windows centered on the merger time. We also performed a binomial test for two populations, those with and without at least one Neutron Star. No significant excess of neutrinos was found. We set upper limits on the MeV neutrino flux for each event, and we place constraints on MeV neutrino emission from mergers that have at least one Neutron Star. We showcase upper limits for GW170817, the first confirmed BNS merger, providing one of the strongest limits to date on MeV neutrino emission from such sources.

Collaboration you are representing

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