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Cosmic neutrino searches with the KM3NeT neutrino detector: a multi-messenger approach

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Multi-messenger astronomy is an emerging field that aims to combine the information carried by different cosmic messengers (cosmic rays, photons, neutrinos, and gravitational waves) originating at a common source. Neutrinos, being stable and neutral particles, are especially valuable as they can escape dense environments. Furthermore, they are not absorbed during propagation to Earth and constitute an unambiguous signature for hadronic processes at the source.
KM3NeT is a deep-sea infrastructure currently under construction at the bottom of the Mediterranean Sea, hosting a 3-dimensional array of light sensors designed to detect the Cherenkov light induced by neutrino interactions. Two separate arrays are already operational using partial configurations: ORCA, optimised for the GeV-TeV energy range, and ARCA, optimised for the TeV-PeV energy range. In this talk, the latest results of the real-time follow-up searches for neutrino counterparts in coincidence with external triggers are presented, with special emphasis on the follow-up to gravitational wave events. In addition to these real-time studies, a stacking search for cosmic neutrinos coming from gamma-ray bursts is also presented, conducted using data from the period when ARCA was operational with 21 detection lines.

Abstract

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