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Timing and pointing to the next Core Collapse Supernova with neutrinos and the participation of KM3NeT

A multi-messenger observation of the next Galactic Core Collapse Supernova (CCSN) will help understanding the different physical phenomena involved in these energetic explosions. Measuring the time of arrival of neutrinos with a good precision is crucial for the identification of the CCSN, the reconstruction of its sky location and thus the rapid identification of an electromagnetic and/or gravitational-wave counterpart. In this contribution, we will discuss the estimation of the time of arrival of the neutrino signal and its uncertainty for the KM3NeT detectors using a model-independent method based on the analysis of the first events of the detected neutrino light curve.

We will also discuss a new approach for the determination of the delay of the arrival times of the neutrino signals between different detectors by combining their experimental light-curves. The time delay between detectors will feed a triangulation algorithm used to determine the localization of the CCSN. Its performances will be presented for the currently running and nearly coming detectors. This tool can be implemented into SNEWS for a real-time analysis allowing a fast pointing response in case of a CCSN neutrino alert.

Related session

Multi-messenger

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