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Exploring the Potential of Multi-Detector Analyses for Core-Collapse Supernova Neutrino Detection

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The core-collapse supernova (CCSN) SN1987A has been the first extragalactic transient source observed in neutrinos, and the 25 events detected by the neutrino telescopes running at the time marked the beginning of neutrino astronomy. Despite the very large number of CCSNs detected in the electromagnetic spectrum since 1987, neutrino telescopes could not perform another observation due to the far distances of the sources. It is thus of primary importance to optimize the detection channel of sensitive detectors in anticipation of a forthcoming Galactic CCSN. Beyond being used as an early warning of a close-by CCSN, neutrinos can provide unique information on the explosion mechanisms, and can be used to probe neutrino flavor evolution in dense environments. In this contribution, we will present the potential of multi-detector analyses to enhance the scientific outputs from the next close-by CCSN. Combining the expected light curves in neutrino detectors sensitive to different flavors, we will study the constraints that could be set on the properties of the progenitor itself, such as its mass, as well as on the neutrino oscillation parameters. We will also present the results of a triangulation algorithm using a prior source map in the definition of the region of interest.

Keywords

Core-collapse supernova; Neutrino; Light curve

Collaboration

other Collaboration

Subcategory

Experimental Methods & Instrumentation

Primary author: Mrs BENDAHMAN, Meriem (Laboratoire AstroParticule et Cosmologie (APC) - Université de Paris , Faculté des Sciences Laboratoire (ESMAR)- Université Mohammed V à Rabat)

Co-authors: Mrs COLEIRO, Alexis (Laboratoire Astroparticules et Cosmologie, Université de Paris, Paris); Mrs COLOMER MOLLA, Marta (Laboratoire Astroparticules et Cosmologie, Université de Paris, Paris); Mrs DAWSON, Jaime (Laboratoire Astroparticules et Cosmologie, Université de Paris, Paris); Mrs DE WASSEIGE, Gwenhaël (Laboratoire Astroparticules et Cosmologie, Université de Paris, Paris); Mr FOGLIZZO, Thierry (CEA Saclay, Department of Astrophysics); Mr FRANCO, Davide (Laboratoire Astroparticules et Cosmologie, Université de Paris, Paris); Mr GUILET, Jérôme (CEA Saclay, Department of Astrophysics); Mr KOUCHNER, Antoine (Laboratoire Astroparticules et Cosmologie, Université de Paris, Paris); Mr BUGLI , Matteo (CEA Saclay, Department of Astrophysics); Mr NOVAK, Jérôme (Laboratoire Univers et Théories (LUTH), Observatoire de Paris); Mrs OERTEL, Micaela (Laboratoire Univers et Théories (LUTH), Observatoire de Paris); Mr PASCAL, Aurélien (Laboratoire Univers et Théories (LUTH), Observatoire de Paris); Mr PATZAK, Thomas (Laboratoire Astroparticules et Cosmologie, Université de Paris, Paris); Mrs SACERDOTI, Sabrina (Laboratoire Astroparticules et Cosmologie, Université de Paris, Paris); Mr TAYALATI, Yahya (Faculty of Sciences, Mohammed V University, Rabat); Mrs TONAZZO, Alessandra (Laboratoire Astroparticules et Cosmologie, Université de Paris, Paris); Mrs VAN ELEWYCK, Véronique (Laboratoire Astroparticules et Cosmologie, Université de Paris, Paris); Mrs VOLPE, Maria Cristina (Laboratoire Astroparticules et Cosmologie, Université de Paris, Paris)

Presenter: Mrs BENDAHMAN, Meriem (Laboratoire AstroParticule et Cosmologie (APC) - Université de Paris , Faculté des Sciences Laboratoire (ESMAR)- Université Mohammed V à Rabat)

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