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Gamma-ray counterpart searches to neutrino astrophysical sources with the Cherenkov Telescope Array Observatory: simulations and performance studies

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Gamma-ray counterparts to astrophysical neutrino sources is a topic of big interest, being the contemporary observation of both these messengers a smoking gun for cosmic-ray production.
The Cherenkov Telescope Array Observatory (CTAO) will be the next major observatory in the Very High Energy gamma-ray band. Based on the imaging atmospheric Cherenkov technique, it will reach unprecedented performances with respect to the current generation of instruments. In particular CTAO will be a leading observatory of the gamma-ray transient sky, given both its sensitivity at short timescales and its rapid repointing system, with a very fast slewing to and from anywhere in the observable sky of the order of 1 minute.
In this work, we explore CTAO performances combined with capabilities of current and future neutrino observatories, like IceCube and Km3NeT.
In particular, we investigate the CTAO ability to detect gamma-ray counterparts to neutrino simulated extragalactic sources, by exploiting the open-source simulation software called FIRESONG. Two types of populations are considered: steady sources and transient "flaring blazar-like"ones . Neutrino simulations are selected by considering IceCube and Km3NeT discovery potentials. The CTAO performance under different configurations and array layouts is finally computed, giving the detection probability of gamma-ray counterparts for both CTAO sites.

Primary authors: ROSALES DE LEON, Alberto (Sorbonne Université & Observatoire de Paris); Prof. BROWN, Anthony (Durham University); Prof. MARSELLA, Giovanni (University of Palermo and INFN Catania, Italy); CICCIARI, Gloria M. (University of Palermo and INFN Catania, Italy); Dr MALLAMACI, Manuela (University Palermo and INFN Catania, Italy)

Co-authors: FAI TUNG, Chun (Georgia Institute of Technology); Dr FERRARA, Giovanna (University of Catania and INFN Catania, Italy); TABOADA, Ignacio (Georgia Institute of Technology); SATALECKA, Konstancja

Presenter: Dr MALLAMACI, Manuela (University Palermo and INFN Catania, Italy)

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