Contribution ID: **1** Type: **Talk**

Investigating Cherenkov Telescope Array Observatory capability to detect gamma-ray emission from simulated neutrino sources identified by KM3NeT

Monday, 26 May 2025 16:45 (15 minutes)

Gamma-ray observations of astrophysical neutrino sources are crucial for understanding neutrino production in extreme cosmic environments. The Cherenkov Telescope Array Observatory (CTAO), the first open-access ground-based gamma-ray observatory, is under construction in both hemispheres, CTAO-North in La Palma (Spain) and CTAO-South in the Atacama Desert (Chile). Covering an energy range from 20 GeV to 300 TeV, CTAO will offer unprecedented sensitivity to transient multi-messenger sources.

In this study, we use the open-source Python code FIRESONG (FIRst Extragalactic Simulation Of Neutrino and Gamma-ray) to simulate a population of neutrino-emitting sources, including both steady and flaring blazars sources. The simulations incorporate various astrophysical input parameters, such as local source density, neutrino luminosity and stellar evolution models. We then assess CTAO's capability to identify gamma-ray counterparts to these simulated neutrino sources, which may also be detectable by KM3NeT, another next-generation instrument. The KM3NeT collaboration is deploying the ARCA neutrino telescope in the Mediterranean Sea, 80 km off Capo Passero, Italy, at a depth of 3,500 m, to enhance sensitivity to high-energy neutrinos in the Southern Sky.

A previous study by CTAO's Neutrino Target of Opportunity program, based on IceCube data, provided valuable insights into possible neutrino sources in the northern sky. Our simulations suggest that the combined capabilities of CTAO and KM3NeT significantly increase the chances of identifying multi-messenger sources in the entire sky for the first time. In particular, the southern sky, which has been less explored with IceCube, will benefit greatly from the increased sensitivity of the Large Telescopes (LSTs) planned for CTAO-South.

This study is an important step in evaluating for the first time the potential of CTAO in detecting the very high-energy gamma-ray counterparts of neutrino sources in the entire sky.

Primary author: CICCIARI, Gloria Maria (Istituto Nazionale di Fisica Nucleare)

Presenter: CICCIARI, Gloria Maria (Istituto Nazionale di Fisica Nucleare)

Session Classification: Rapid talks