Contribution ID: **90** Contribution code: **GAL** Type: **Oral**

Young Massive Star Clusters as Galactic PeVatrons

Wednesday 4 September 2024 15:15 (15 minutes)

PeVatrons constitute a fascinating class of astrophysical objects capable of accelerating particles up to PeV energies (1 PeV = 1015 eV). However, their nature and their acceleration mechanisms are still uncertain. The accelerated particles interact with the surrounding interstellar medium and background radiation fields to produce secondary ultra-high-energy gamma rays (>100 TeV), which are the main signature of both leptonic and hadronic PeVatrons. The air shower observatory LHAASO detected >100 TeV photons from 43 sources in the Galactic Plane, proving the existence of PeVatrons within the Milky Way. In particular, one of the detections was a 1.4 PeV photon in spatial correspondence with Cygnus OB2, providing strong hint that Young Massive Star Clusters (YMSCs) could act as PeVatrons.
The next-generation ground-based Cherenkov imaging telescopes like ASTRI-Mini Array and the CTAO will have energy resolutions of ~ 5 – 10% and angular resolutions of a few arcmin at 1 TeV. Therefore, both observatories will be able to resolve spatially the YMSCs better than LHAASO. We studied a sample of 5 YMSCs and their surrounding regions visible above 1 TeV from either hemisphere by the CTAO or ASTRI Mini-Array, modeling the secondary gamma-ray emission and simulating observations with the ASTRI and the CTAO instrument response functions. We study the morphology of the gamma-ray emission by using different target distribution: either a uniform hydrogen distribution around the sources or a non-uniform distribution based on molecular clouds positions as derived from multiple CO lines surveys data.

Primary author: BONOLLO, Alberto (Istituto Nazionale di Astrofisica (INAF))

Co-authors: Dr GIULIANI, Andrea (Istituto Nazionale di Astrofisica (INAF)); GALANTI, Giorgio (Istituto Nazionale di Astrofisica (INAF)); RIGOSELLI, Michela (Istituto Nazionale di Astrofisica (INAF)); Prof. ESPOSITO, Paolo (IUSS Pavia); Dr MEREGHETTI, Sandro (Istituto Nazionale di Astrofisica (INAF)); CRESTAN, Silvia (Istituto Nazionale di Astrofisica (INAF))

Presenter: BONOLLO, Alberto (Istituto Nazionale di Astrofisica (INAF))

Session Classification: Parallel 1