

Multiwavelength investigation of LHAASO J1908+0621: an unidentified galactic PeVatron

Tuesday, 5 July 2022 17:00 (15 minutes)

Recently LHAASO has detected more than a dozen of ultra-high energy (UHE) γ -ray sources in our Galaxy. Many of these seem to be connected with PWNe or SNRs (see Cao et al., 2021).

Among these sources, one of the best PeVatron candidates is LHAASO J1908+0621, a remarkable source for its hard spectrum extending beyond 100 TeV and with no evidence of a cutoff. This source was also detected by other γ -ray instruments as HAWC, VERITAS and HESS.

Due to the complexity of the morphological structure of the source and the limited angular resolution, the origin of its γ -ray emission has not yet been unambiguously identified. There are several objects in the region which could serve as counterparts to the TeV emission, including a supernova remnant (SNR G40.5-0.5) and various pulsars, precluding a firm identification of the extreme accelerator and making it difficult to distinguish between a hadronic or leptonic nature of the emission. Additionally, the LHAASO source is associated with an ICECUBE neutrino hotspot, although the significance is still too low (see Aartsen et al., 2020).

We performed a multi-wavelength analysis of LHAASO J1908+0621 to investigate its nature and the origin of its ultra high-energy emission (see Crestan

et al., 2021). Using the Nobeyama Radio Observatory data on ^{12}CO and ^{13}CO molecular line emission, we found evidence of dense molecular clouds spatially correlated with the source region. Moreover, the 12-year analysis of Fermi-LAT data stresses the presence of a counterpart with a hard spectrum between 10 GeV and 1 TeV. Our new analysis of the XMM-Newton data translates into better constraints on the X-ray flux from this source. Thanks to the multi-wavelength approach, we showed that a single zone model cannot explain the whole set of multi-wavelength data, regardless of whether it accelerates protons or electrons, but a 2-component model is needed to explain the emission from LHAASO J1908+0621. The UHE emission appears most likely the superposition of a TeV PWN powered by PSR J1907+0602, in the southern part, and of the interaction between the supernova remnant G40.5-0.5 and the molecular clouds towards the northern region.

Primary authors: CRESTAN, Silvia (INAF-IASF Milano); Dr GIULIANI, Andrea (INAF - IASF Milano); Dr MEREGHETTI, Sandro (INAF - IASF Milano); Dr SIDOLI, Lara (INAF - IASF Milano); Dr PINTORE, Fabio (IASF - INAF Milano); Dr LA PALOMBARA, Nicola (INAF - IASF Milano)

Presenters: CRESTAN, Silvia (INAF-IASF Milano); Dr GIULIANI, Andrea (INAF - IASF Milano); Dr MEREGHETTI, Sandro (INAF - IASF Milano); Dr SIDOLI, Lara (INAF - IASF Milano); Dr PINTORE, Fabio (IASF - INAF Milano); Dr LA PALOMBARA, Nicola (INAF - IASF Milano)

Session Classification: Contributed Talks