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Search for enhanced TeV gamma ray emission from Giant Molecular Clouds using H.E.S.S.

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Large scale diffuse gamma ray emission, originating from cosmic-ray interactions in the interstellar medium, has now been detected at very high energies (VHE) by various instruments (High Energy Stereoscopic System (H.E.S.S.; 2014), Milagro (Abdo et al. 2008), and the ARGO-YBJ (Bartoli 2015). The gamma ray emission from giant molecular clouds (GMCs) is a direct tracer of the cosmic ray density and the matter density inside the clouds. Detection of enhanced TeV emission from GMCs, i.e., an emission significantly larger than what is expected from the average Galactic cosmic rays illuminating the cloud, can imply a variation in the local cosmic ray density, due to, for example, the presence of a recent accelerator inside the cloud.

Such gamma-ray observations can be crucial in probing the cosmic ray distribution across our Galaxy, but are complicated to perform with present generation Imaging Atmospheric Cherenkov Telescopes (IACTs). The limited field of view (FoV) and the strong hadronic background of IACTs make the detection of large scale structures challenging. Moreover, such studies require a proper modelling of the large scale diffuse emission component as well.

In this contribution, we use HESS data collected over 16 years to search for TeV emission from GMCs in the inner molecular galacto-centric ring of our Galaxy. We implement a three dimensional FoV likelihood technique, and simultaneously model the hadronic background, the galactic diffuse emission and the emission expected from known VHE sources to probe for excess TeV gamma ray emission from GMCs.

Keywords

diffuse emission; high background; 3D FoV likelihood; Giant Molecular Clouds; IACT; cosmic rays

Collaboration

H.E.S.S.

other Collaboration

Subcategory

Experimental Results

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