

Galactic cosmic ray sources

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The origin of cosmic rays has been debated ever since the first detection by Victor Hess 100 years ago. Due to their transport through cosmic magnetic fields, the observed spectrum is largely distributed in arrival directions, with no direct possibility to observe the sources. Theoretical arguments like the required total energy budget and maximum energies connected to cosmic rays can be used to assign the flux up to the cosmic ray knee to Galactic sources, while the flux above the knee is usually assumed to be extragalactic. In this talk, we will focus on Galactic sources of cosmic rays. Indirect methods like the search for hadronic interactions resulting in the neutral decay products neutrinos and gamma-rays will be reviewed. The measurement of gamma-ray emission from Galactic supernova remnants (SNRs) provides a unique possibility to investigate them as cosmic ray sources. Here, a comparison with leptonic processes like Inverse Compton scattering and Bremsstrahlung emission is necessary, as those processes can dominate in a comparable energy range. Here, all known SNRs with sufficient information on their SED up to GeV energies are presented in order to have a first sample of statistical nature. In addition, other possible emitters of cosmic rays will be discussed. Those do not necessarily have to account for the entire cosmic ray flux, but could give secondary contributions. One example is the acceleration of particles in wind-wind collisions of massive binary systems. A prominent example is Eta Carinae, which recent Fermi measurements reveal as a gamma-ray emitter.