INTEGRAL legacy for cosmic-ray physics

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Abstract

It is widely believed that the bulk of Galactic cosmic rays are accelerated in the expanding shock waves produced by supernova explosions. While diffusive shock acceleration provides a well-established framework for this process, important questions remain concerning the injection of particles - electrons in particular - into the acceleration process, the acceleration efficiency, and the escape and subsequent transport of cosmic rays in the interstellar medium. The cosmic-ray composition and the presence of cosmic rays of likely Galactic origin at PeV energies also point to the possible contribution of Galactic sources other than supernova remnants. The INTEGRAL observatory has made important contributions to these questions through its observations of hard X-ray and soft gamma-ray emission from a variety of sources. These include supernova remnants, but also novae, the massive binary system Eta Carinae, and the diffuse emission from the Milky Way. This presentation aims to review these observations and the advances in cosmic-ray physics they have enabled.

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