

Astrophysics > High Energy Astrophysical Phenomena

H I spin temperature in the Fermi-LAT era

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The diffuse high-energy gamma-ray emission of the Milky Way arises from interactions of cosmic-rays (CRs) with interstellar gas and radiation field in the Galaxy. The neutral hydrogen (H I) gas component is by far the most massive and broadly distributed component of the interstellar medium. Using the 21-cm emission line from the hyperfine structure transition of atomic hydrogen it is possible to determine the column density of H I if the spin temperature (T_s) of the emitting gas is known. Studies of diffuse gamma-ray emission have generally relied on the assumption of a fixed, constant spin temperature for all H I in the Milky Way. Unfortunately, observations of H I in absorption against bright background sources has shown it to vary greatly with location in the Milky Way. We will discuss methods for better handling of spin temperatures for Galactic diffuse emission modeling using the Fermi-LAT data and direct observation of the spin temperature using H I absorption.

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