
Cosmic Ray Tomography using Low Radio Frequency Observations

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Abstract

In the low frequency radio regime, the Milky way emission is dominated by synchrotron radiation from low energy cosmic rays. This radiation is directly related to the Galactic cosmic ray density and in mapping this emission we will gain further knowledge of these cosmic rays. In this same low frequency regime, HII regions can be seen in absorption regions against the Galactic background radiation. By observing these regions with an interferometer we will be able to quantify the synchrotron emission being emitted behind the HII regions. Effectively, these HII regions divide the line of sight into multiple parts helping us gain dimensional information. Combining all lines of sight gives us a map with the synchrotron emissivity in a large part of the Milky Way. This map can be used to fit simple models and can be compared to existing models. And with appropriate assumptions for values of the Galactic magnetic field, this synchrotron emissivity map can be transformed into a map of cosmic ray density.

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