

Imaging Spectroscopy of hard x-ray sources in solar flares using regularized analysis of source visibilities

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Abstract

A new method for the reconstruction of electron maps at different energies from X-ray solar data is described. The method is based on the analysis of visibilities, which are samples of the Fourier transform of the flux source in the Sun and which have been first introduced in the processing of radio-astronomical data. In this approach a regularized inversion for the synthesis of electron visibility spectra is applied and imaging techniques are utilized for the reconstruction of two-dimensional electron flux maps. The effectiveness of the method is shown in the analysis of X-ray data detected by the Reuven Ramaty High Energy Solar Spectroscopic Imager (RHESSI), launched by NASA in 2002 with the specific intent of investigating the physical processes occurring during solar flares.