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Early results on STIX imaging

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The Spectrometer/Telescope for Imaging X-rays (STIX) is the remote sensing instrument onboard Solar Orbiter dedicated to the observation of the X-ray emission during solar flares. The goal of the instrument is to provide information about the electron acceleration at the Sun through the measurement of the photons emitted by bremsstrahlung or by thermal mechanisms. The telescope consists of 30 subcollimators, i.e. couples of tungsten grids mounted in front of a detector. The photon flux incident on the instrument is modulated by the grids and it gives rise to Moire patterns on the detector surfaces. The measurements of these patterns can be interpreted as Fourier components of the photon flux, named *visibilities*. Therefore, the imaging problem for STIX is the one of reconstructing the emitted radiation from a very sparse sampling of its angular Fourier transform. In this talk we present the first results concerning the image reconstruction problem from semi-calibrated STIX data consisting of visibility amplitudes only. We addressed this problem by using parameterized source shapes and by retrieving their parameters with forward fitting methods. Specifically, we present the results obtained via Particle Swarm Optimization (PSO) and Sequential Monte Carlo (SMC) and we also show how these algorithms give quantitative estimates of the reconstructed parameters. Moreover, we overview the problem of the visibility phase calibration and we give some insights about imaging methods used during the calibration process. We validate the reliability of our results by comparing them to other maps of the same events obtained with instruments such as the Extreme Ultraviolet Imager (EUI) within Solar Orbiter, and the Atmospheric Imaging Assembly onboard the Solar Dynamics Observatory (SDO/AIA).

Email

massa.p@dima.unige.it

Primary authors: MASSA, Paolo (Dipartimento di Matematica, Università degli Studi di Genova, Via Dodecaneso 35, 16146 Genova, Italy); Dr PERRACCHIONE, Emma (CNR-SPIN, Via Dodecaneso 33, 16146 Genova, Italy); Dr GARBARINO, Sara (Dipartimento di Matematica, Università degli Studi di Genova, Via Dodecaneso 35, 16146 Genova, Italy); Mr BATTAGLIA, A.F. (University of Applied Sciences and Arts Northwestern Switzerland, ETH Zürich); Dr BENVENUTO, Federico (Dipartimento di Matematica, Università degli Studi di Genova, Via Dodecaneso 35, 16146 Genova, Italy); Prof. MASSONE, Anna Maria (Dipartimento di Matematica, Università degli Studi di Genova, Via Dodecaneso 35, 16146 Genova, Italy); Prof. PIANA, Michele (Dipartimento di Matematica, Università degli Studi di Genova, Via Dodecaneso 35, 16146 Genova, Italy); Dr HURFORD, Gordon (Space Sciences Laboratory, University of California, Berkeley); Prof. KRUCKER, S. (University of Applied Sciences and Arts Northwestern Switzerland, Space Sciences Laboratory, University of California)

Presenter: MASSA, Paolo (Dipartimento di Matematica, Università degli Studi di Genova, Via Dodecaneso 35, 16146 Genova, Italy)

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