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The Large Imaging Spectrometer for Solar Accelerated Nuclei (LISSAN): A Next-Generation Solar gamma-ray Spectroscopic Imaging Instrument Concept

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We present the large imaging spectrometer for solar accelerated nuclei (LISSAN), a new solar-dedicated satellite instrument concept. LISSAN relies on an indirect Fourier imaging technique valid over an energy range of 40 keV up to 100 MeV. Spatial information is encoded into 15 moiré patterns by 15 pairs of slightly offset grids (bigrids) separated by a fixed distance enabling a predicted spatial resolution of 10". The time, location, and energy of each incoming photon is recorded via a pixelated gadolinium aluminum gallium garnet (GAGG) crystal scintillator detector placed in alignment with each bigrid, therefore providing simultaneous imaging and spectroscopy from the same imaging system. X-ray and gamma-ray emission are key diagnostics of electron and ion acceleration, respectively. However, despite being a fundamental process that occurs throughout the Universe, particularly in the solar atmosphere, only one resolved gamma-ray image of ion acceleration in a solar flare has ever been achieved. LISSAN will shed new light on this process by providing spectral resolution better than 1.5% FWHM at 6.1 MeV, an imaging effective area at 2.2 MeV of 100 cm^2 (more than 25 times greater than past missions such as RHESSI) and a 10 second cadence. Thanks to these significant advances over the previous satellite-based solar detectors, LISSAN will provide reliable imaging and the spectral characterization of both electron and ion acceleration in solar eruptive events simultaneously for the first time, enabling to it to answer several important open questions regarding solar particle acceleration and the initiation of space weather events.

Collaboration

LISSAN Collaboration

Role of Submitter

I am the presenter

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