

The High Energy Solar Spectroscopic Imager (HESSI) Mission

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The Sun is the most powerful particle accelerator in the solar system, accelerating ions up to tens of GeV and electrons to hundreds of MeV. The primary scientific objective of HESSI Small Explorer mission, planned for launch in 2001, is to investigate the physics of particle acceleration and energy release in solar flares, where the accelerated ~ 10 - 100 keV electrons (and possibly \sim MeV ions) appear to contain $>\sim 10$ - 50 % of the energy released. HESSI utilizes rotating modulator collimators together with cooled germanium detectors to image X-rays/gamma-rays from ~ 3 keV to ~ 17 MeV. It will provide the first hard X-ray imaging spectroscopy (~ 2 arcsec, ~ 1 keV), the first high resolution (~ 1 - 5 keV) spectroscopy of solar gamma-ray lines, and the first imaging (~ 36 arcsec) of solar gamma-ray lines and continuum. HESSI will also obtain hard X-ray imaging of the Crab Nebula with ~ 2 arcsec resolution, and provide high spectral resolution hard X-ray/gamma-ray all-sky monitoring of diffuse galactic nuclear line emission, and of transient emission from cosmic gamma-ray bursts, novae, accreting black holes, and terrestrial bursts from relativistic electron precipitation, aurora, and lightning.