

The Spectrometer on INTEGRAL (SPI): Instrument Response Characteristics and Data Analysis Methods

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The International Gamma-Ray Astrophysics Laboratory (INTEGRAL) is an ESA managed mission scheduled for a 2001 launch. The INTEGRAL Spectrometer or "SPI", is a high-resolution cooled-germanium instrument covering the approximate 20 keV to 10 MeV energy range with an energy resolution of about 500. We offer a brief overview of SPI and its anticipated capabilities, with an emphasis Monte Carlo simulations and exploration of data analysis techniques being carried out at the NASA Goddard Space Flight Center which is one of the SPI consortium institutions. We describe our current model of the instrument and present results of recent simulations. The unique nature of the instrument, 19 separate detector elements viewing the sky through a coded mask aperture, poses a number of difficulties. For example, a typical observation consists of multiple pointing directions (dithering) with an instrument response that is highly directional. Multiple sources within the nominal 16-degree FoV are likely to be common, and most high-energy point sources are variable over observable time scales. Each of the detectors may have individual characteristics as well, thus a typical deconvolution of the detector count-rate data involves a complex global minimization problem over large data and parameter spaces. Strategies for dealing with these difficulties, are discussed and some preliminary results based on simulated data are presented. Insight into the anticipated capabilities of SPI, and speculation on its scientific impact is also offered.