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Simulated spectrum of the OGRE X-ray camera system

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The X-ray astronomical telescopes in use today, such as Chandra and XMM Newton, use X-ray grating spectrometers to probe the high energy physics of the Universe. These instruments typically use reflective optics for focussing onto gratings that disperse incident X-rays across a detector, often a Charge-Coupled Device (CCD). The X-ray energy is determined from the position that it was detected on the CCD. Improved technology for the next generation of X-ray grating spectrometers has been developed and will be tested on a sounding rocket experiment known as the Off-plane Grating Rocket Experiment (OGRE).
OGRE aims to capture the most accurate soft X-ray spectrum of Capella, a well-known astronomical X-ray source, during an observation period of approximately 5 minutes whilst proving the performance and suitability of three key components. These three components consist of a telescope made from Iridium coated silicon mirrors, gold coated silicon X-ray diffraction gratings and a camera that comprises of four Electron-Multiplying (EM)-CCDs that will be arranged to observe the soft X-rays dispersed by the gratings.

EM-CCDs have an architecture similar to standard CCDs, with the addition of an EM gain register where the electron signal is amplified so that the effective signal-to-noise ratio of the imager is improved. On OGRE, this improved detector performance allows for easier identification of low energy X-rays and fast readouts due to the amplified signal charge making readout noise almost negligible.

A simulation that applies the OGRE instrument performance to the Capella soft X-ray spectrum has been developed that allows the distribution of X-rays onto the EM-CCDs to be predicted. The pixelated X-ray events will be simulated according to the detector architecture to demonstrate the order separation capabilities of the instrument and produce sample images expected from in-flight operation on which X-ray event identification algorithms can be developed.

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