

Subpixel Event Reposition Algorithms for Chandra X-Ray Imaging

Abstract:

Subpixel event repositioning (SER) techniques were designed to improve the already unprecedented spatial resolution of Chandra X-ray imaging with the Advanced CCD Imaging Spectrometer (ACIS). Chandra CCD SER techniques are based on the premise that the impact position of events can be refined, based on the distribution of charge among affected CCD pixels. SER methods have been modified, from original corner-split events only model, to static SER (including 2-pixel and single pixel events), energy-dependent SER, and charge-split dependent SER, for both backside-illuminated (BI) and frontside-illuminated (FI) CCDs. Both simulated and observation data demonstrate the improvement for various SER methods and, overall, BI applications benefit more from angular resolution improvement after applying SER techniques. The best performance after applying SER techniques can be as much as 62%, i.e., very close to theoretically available improvement, depending on applied SER method, source spectrum, off-axis angle, and employed CCD type.

Biography:

Dylan (Jingqiang) Li received his BS in Optical Engineering from Beijing Institute of Technology and his MSEE in Signal Processing from Chinese Academy of Sciences in 1996 and 1999, respectively. Dylan has been Imaging Science since September 1999, completing his PhD thesis on Digital Image Processing. He has been working with Professor Joel Kastner to develop subpixel resolution algorithms for Chandra X-ray imaging. His research interests include digital imaging and digital camera solutions.