Introduction

• The oxygen-rich supernova remnant (SNR) E0102-7219 has been extensively imaged throughout the Chandra X-ray Observatory’s mission as a calibration source for ACIS.

• Through a comprehensive cross-calibration effort among several X-ray observatories, the spectrum of E0102 has been well modeled. Using the high-resolution grating instruments on-board XMM-Newton and the CXO, we have developed a consistent model which can be used to fit the lower resolution CCD.

• In addition to its effectiveness as a calibration tool, this model also provides a useful diagnostic tool for measuring spectral differences spatially within the remnant in an effort to identify the forward and reverse shock regions and to constrain ionization timescale and temperature measurements.

• Using 7 ACIS subarray observations taken between 2003 and 2009, together with a contour binning algorithm to define spectral extraction regions based on surface brightness, we explore spatial and temporal changes in both the physical structure and overall spectral properties of the remnant.

Data & Model

• Due to the effects of pileup on the full-frame ACIS observations, we focus this analysis on the 7 subarray observations listed in Table 1.

• Each dataset was processed using CIAO & CALDB 4.1.2 including CTI and time dependent gain corrections.

• The model consists of two APEC “no line” components for the continuum along with two “tbabs” absorption components for galactic and SMC nH and 52 gaussians for the line emission between 0.2 and 2.0 keV. Figure 2 shows the model.

• In an effort to reduce the free parameters, the temperature and normalization of the continuum, and the absorption components are frozen to values derived from XMM MOS and pn fits. With the exception of O and Ne, all line energies, widths and normalizations are frozen to grating derived values.

Spatial Variations

• Figure 5 to the right shows the region numbers corresponding to the spectra shown in the figures below.

• The spectral shape shows significant variation with position in the remnant, most notably in region 6 where the ratio of the Ne lines is significantly different.

Table 1: ACIS subarray observations of E0102.

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Conclusions

• A spatial/temporal analysis of the SMC SNR E0102 was presented using contour binning to define spectral extraction regions based on a surface brightness variations.

• Using the spectacular resolution of Chandra, we see a great diversity in the ratios of the Oxygen and Neon lines extracted from various regions of the remnant.

• Within 90% confidence limits, we do not see evidence for any spectral variations over time within this 6 year sample of data.

• Future work on this project will include exploring more of the parameter space within the model by allowing the underlying continuum temperature to vary. We also intend to account for the effects of pileup in the full frame data and make use of the larger volume of available data.

References & Acknowledgements


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