

Laboratory Astrophysics

with a High-Resolution XRS X-ray Microcalorimeter

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We have recently deployed an XRS (the X-ray Spectrometer on the Astro-E mission) engineering model microcalorimeter at the electron beam ion traps (EBIT I/II) at Lawrence Livermore National Laboratory [1] [2]. The EBIT I/II can produce well defined astrophysically interesting plasmas for a wide range of plasma conditions. The XRS engineering model was mated with a 32 element XRS x-ray microcalorimeter array and integrated into a laboratory cryostat. The microcalorimeter array has a composite resolution of 8 eV at 1 keV and 11 eV at 6 keV. During the past 1.5 years of operation, we have performed a number of high resolution, broad band observations including: K and L shell Fe with single ionization energies from 1 – 8 keV, Maxwellian distributions of Fe with $\langle kT \rangle = 0.5 - 3$ keV, non-equilibrium states of Fe with very fine time resolution for $\eta = 10^9 - 10^{12} s cm^{-3}$ [3]. The total observation time to date for the campaign is over 100 Ms and the analysis is ongoing. We will present here an overview of the instrument, a few of the preliminary results, and our plans for a permanent, user friendly microcalorimeter facility at the LLNL EBIT I.

References:

- [1] F. S. Porter, *et al.*, in “Proceedings of the 45th annual SPIE meeting on Optical Science and Technology,” 2000.
- [2] F. S. Porter *et al.*, in “Proceedings of the 9th International Conference on Low Temperature Detectors,” 2002.
- [3] H. Chen, *et al.*, *ApJ* submitted (2002).

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