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High Resolution X-ray Spectroscopy of Astrophysical Plasmas with X-ray Microcalorimeters

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High spectral resolution X-ray spectroscopy of cosmic sources is reviewed. Unprecedented non-dispersion energy resolution of ~5 eV in FWHM at 6 keV was achieved with an X-ray microcalorimeter onboard the Japanese Hitomi satellite in orbit. The Hitomi satellite shown in figure 1 is 2.7 tons and 14 m after an extended optical bench is deployed in space.

In spite of its short life time of about 1 month due to an unexpected incident, the Hitomi SXS provided us with high resolution spectra of astrophysical plasmas. For example, as shown in figure 2, dynamics of plasma in the core of the Perseus cluster and the origin of the plasma from abundance ratios were successfully constrained with the highest accuracy ever achieved[1-2]. The X-ray microcalorimeter worked in space as we expected[3-4].

Now we plan to launch the X-ray Astronomy Recovery Mission (XARM) around 2021 in order to recover science capability opened up with Hitomi. The same type of detector as the SXS will be onboard. In this talk, I review the results obtained with the Hitomi SXS and show future prospects with XARM and beyond.

Figure 1. Hitomi satellite before launch.

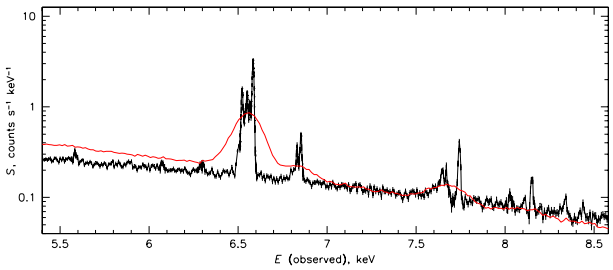

Figure 2. Hitomi SXS spectrum of the Perseus cluster core. A CCD spectrum is overlaid in red. Fe XXV He α is clearly resolved.

References

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