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Independent science with the XSM (X-ray Solar Monitor) onboard SMART-1

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Abstract. XSM is a calibration subinstrument of D-CIXS onboard the SMART-1 technology mission to the Moon. SMART-1 was launched in September 2003 from Kourou, French Guyana, and the instruments onboard are now scientifically operational at the time of writing. XSM provides a 52 degree field of view in the energy range of 1-20keV. We have cross calibrated XSM with GOES, and the fidelity of XSM data seems highly likely.

1. Results

The primary purpose of XSM is to provide the X-ray spectrum of the Sun to D-CIXS for calibration purposes. The secondary purpose of XSM is to provide X-ray measurements for independent solar and stellar science. XSM is characterised by three motivation drivers for independent solar stellar science: 1) XSM sees the Sun as a star. Therefore it is possible to directly compare solar data with other stars, observed by e.g. XMM-Newton, Chandra and other instruments, treating Sun as a similar star. Figure 1 shows the raw commissioning spectrum of the Sun recorded 19th February. 2) Complementary observations of the Sun with GOES and RHESSI, and other satellites. Figures 2 and 3 show concurrent observations with XSM and GOES, respectively. 3) Independent spectral fitting science. Figure 4 shows a strong Fe-line emission recorded with XSM during a flare.

We have verified the in-flight energy scale of the detector to operate with satisfactory fidelity with our onboard calibration source. However, some difficulties remain in defining the filter response in the 1-2keV interval and energy resolution. Despite these difficulties we have successfully performed spectral modelling of the data using a Raymond-Smith model. At one of the most recent observations (26-4-2004 0300 UTC) a Raymond-Smith profile of temperature kT=0.51 keV was encountered, corresponding to $T = 6 * 10^6 K$. The XSM flux from this measurement of $9.18 * 10^-8 W m^-2$ (1.9 keV-5.0 keV) was cross-calibrated with GOES, and the fluxes agreed to within a sensible margin taking into account slight differences in the bands of analysis.

We look forward to receiving 100 days of scientifically important data from XSM. We will deliver the data to ESA (European Space Agency) and first data sets should be publicly available from ESA and its designated sources in the beginning of 2005.

References

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B.H. Foing et al. 2003 *Advances in Space Research* **31**,Issue 11, 2323–2333.

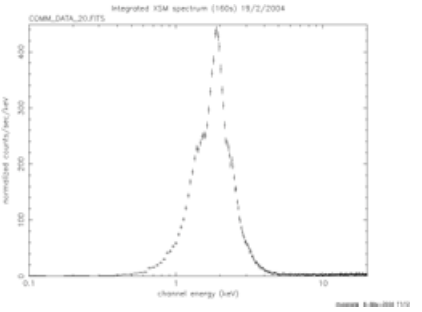

Figure 1. XSM commissioning spectrum

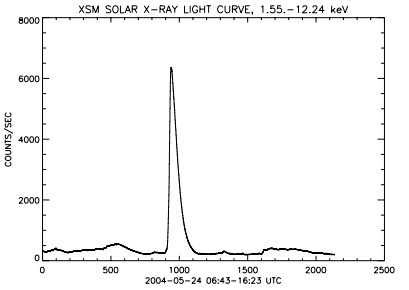

Figure 2. Concurrent XSM light curve

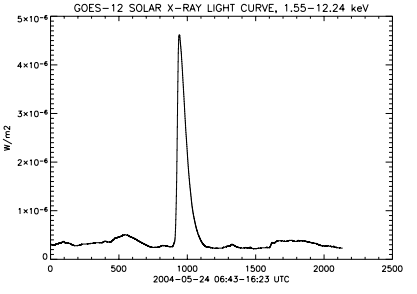

Figure 3. concurrent GOES light curve

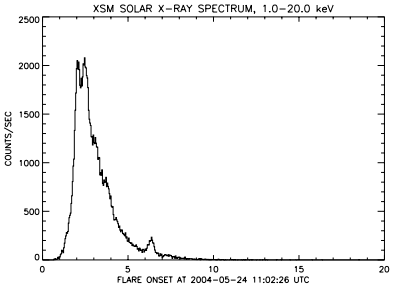

Figure 4. Flare observed with XSM showing a strong Fe-line at 6.4 keV

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