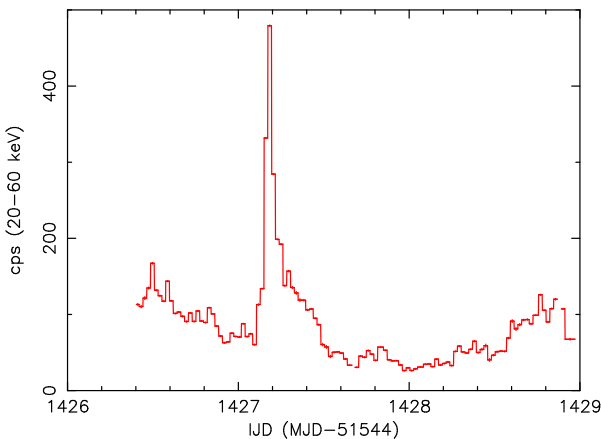


*INTEGRAL* observations of Vela X-1 have shown flares of previously unknown strength with luminosity increases up to a factor of  $\sim 10$ , but small changes in the high-energy spectra. Other observations during a calm phase have led to the first actual measurement of the width of the cyclotron line feature at  $\sim 53$  keV due to the high energy resolution of the *INTEGRAL* spectrometer *SPI*.

The wind-accreting X-ray binary pulsar Vela X-1 has been observed extensively during *INTEGRAL* Core Program observations of the Vela region in June-July and November-December 2003. While in summer the source was mostly calm, the winter observations showed several large flares, possibly the largest ever observed. Unfortunately, due to the observation strategy not centered on Vela X-1, the *INTEGRAL* monitors did not cover the source during the flares. Ditto for the *RXTE-ASM*.

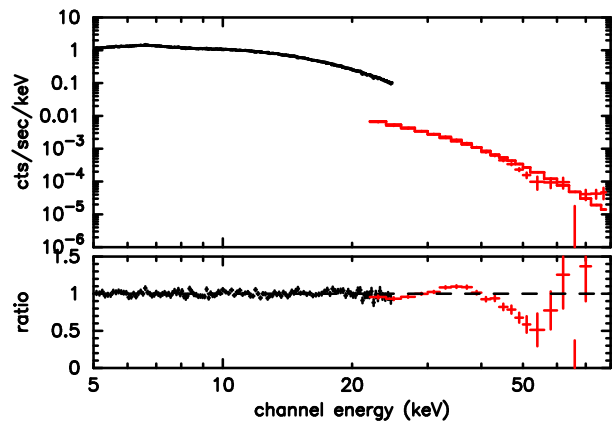
Vela X-1 ISGRI imaging fluxes



The first huge flare seen by *INTEGRAL*.

Spectral analysis of *ISGRI* and *SPI* spectra from before and during the flare shown in Fig. 1 yields a flux increase by a factor of about 10 and a softening of the high energy spectra. Using a typical power law with exponential cutoff model, the parameter “folding energy”, which can be seen as a measure of temperature, decreases by 1–1.5 keV during the flare. Otherwise the spectra are very similar, indicating only minor changes in the emission region geometry.

In long-term averaged spectra for the summer observations from *SPI* and *JEM-X* the known cyclotron line feature above 50 keV is evident in the fit residuals for *SPI*. It can be fitted by including a cyclotron scattering feature at  $E \approx 54$  keV with  $\sigma \approx 7$  keV. Since the *SPI* energy resolution at these energies is  $\sim 1.6$  keV, the line shape can actually be resolved in spite of low statistical quality at the higher end. The line width is consistent with that expected from thermal broadening; the lack of substructure supports the interpretation as harmonic. The calibration uncertainties do not allow to determine the indicated line feature at  $\sim 25$  keV.



Combined *JEM-X* and *SPI* averaged spectra

Parameter	<i>JEM-X</i> + <i>SPI</i>
photon index	$0.51^{+0.10}_{-0.20}$
folding energy	$11.3^{+0.7}_{-1.3}$ keV
line center	$53.6^{+3.4}_{-1.8}$ keV
line $\sigma$	$7.3^{+1.8}_{-1.3}$ keV
line depth	$0.63^{+0.13}_{-0.08}$
$\chi^2_{\text{red}}$ with line	1.19
$\chi^2_{\text{red}}$ w/o line	1.85