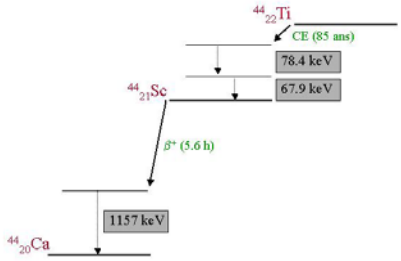
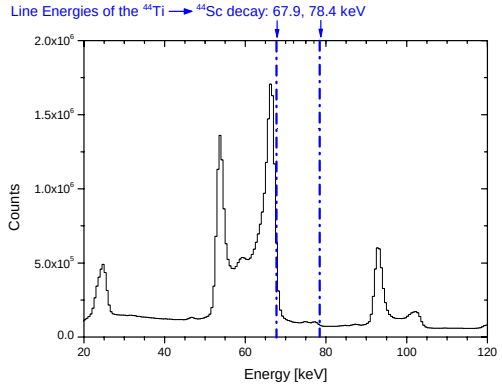
Search for ^{44}Ti emission from GRO J0852-4642

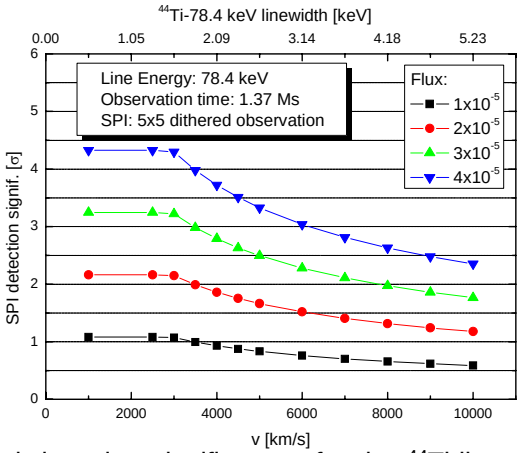
The gamma-ray source GRO J0852-4642, discovered by COMPTEL, is a possible counterpart of the supernova remnant RX J0852-4622. Detection of radioactive decay from ^{44}Ti nuclei would prove it to be the youngest and nearest supernova remnant known so far. During the first year of the *INTEGRAL* core program, the Vela region was observed twice in all for more than 2000 ks. Among other nucleosynthesis studies, one of the most important scientific goals of this observation is the detection of ^{44}Ti gamma-ray lines expected at 68 keV, 78 keV and 1157 keV. For this purpose the *INTEGRAL* Spectrometer (SPI), with its very high energy resolution is the key instrument, permitting a precise determination of gamma-ray line intensities and profiles. The upper limit for the 78.4 keV ^{44}Ti gamma-ray line emission derived from the first analysis is 1.1×10^{-4} γ cm^{-2}s^{-1}. This value is mainly dominated by systematic uncertainties in the treatment of the instrumental background. By accumulating more observation time in the next years of the mission and by improving the background understanding, a reliable ^{44}Ti flux for GRO J0852-4642 or an upper limit which constrains the COMPTEL flux can be expected.



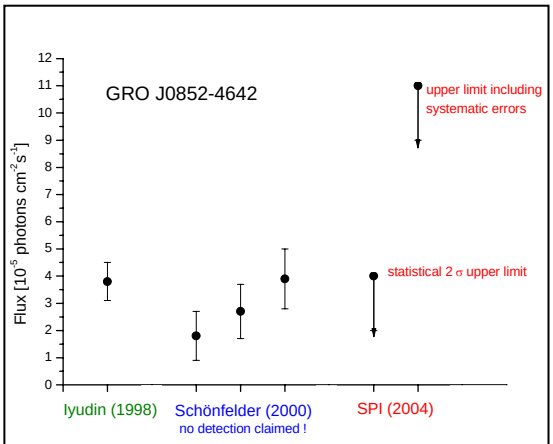
^{44}Ti → ^{44}Sc→ ^{44}Ca decay scheme



Low-energy part of a typical spectrum of SPI's germanium detectors. SPI's sensitivity at 67.9 keV is worsened due to a strong background line complex. At high energies (1.157 MeV) it is expected that the sensitivity is deteriorated by strong Doppler line broadening. The most promising results can be expected for the line at 78.4 keV.



Expected detection significances for the ^{44}Ti-line at 78.4 keV for source fluxes ranging from 1 to 4 × 10^{-5} γ cm^{-2} s^{-1}.



In this Figure the upper limits derived from the current analysis of the SPI Vela observation are compared with flux values quoted for GROJ0852-4642 in the literature. Without improving the systematic uncertainties the SPI result will not confirm the COMPTEL measurements.

References:

- Aschenbach, B., et al. 1998, Nature, 396, 141
- Iyudin, A., et al. 1998, Nature, 396, 142
- von Kienlin, A., et al. 2004, Proc. 5th INTEGRAL Workshop
- Schönfelder, V., et al. 2000, AIP, 510 54

A. v. Kienlin, R. Diehl, G. Lichti, V. Schönfelder, A. Strong, et al.