X-Ray Spectra of the Supernova Remnant RX J0852-4622

Sections of the 2° diameter supernova remnant (SNR) RX J0852-4622 were observed with XMM-Newton. The spectra of the bright north-western (NW) and of the southern rim cover for the first time photon energies up to 10 keV. The NW rim is resolved in 2 filaments (c.f. Fig. 1) best described by a pure powerlaw whereas the southern rim spectrum shows an additional low temperature component. The line feature at ∼4.1 keV indicated in the ASCA SIS spectrum of the NW rim appears in the EPIC-pn and MOS spectra as well. This line is most likely related to the decay of radioactive ^{44}Ti previously discovered by COMPTEL via 1.157 MeV γ-ray line emission. The fluxes of the X-ray line and γ-ray line are consistent with each other.

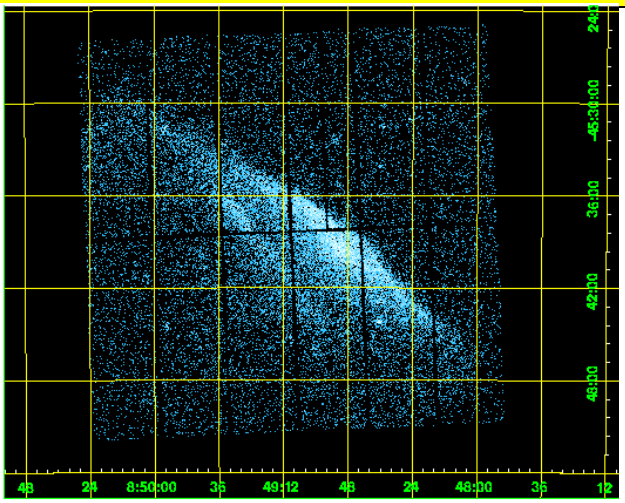

Fig. 1. The XMM-Newton EPIC-pn image of the bright NW part of the RX J0852-4622 shell discovered by ROSAT (Aschenbach 1998).

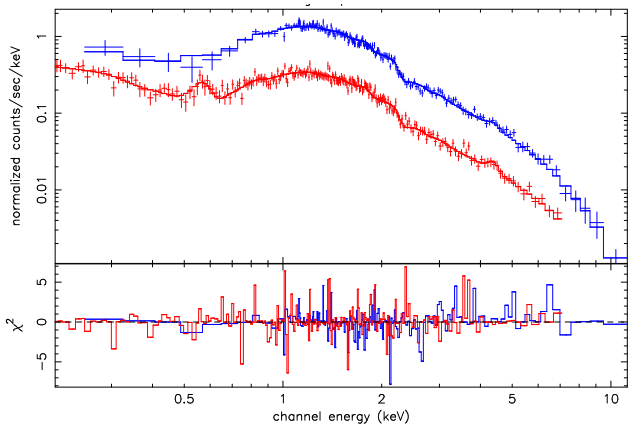

Fig. 2. X-ray spectra of the RX J0852-4622 derived for the region1 of the NW (blue crosses and solid line) and of the Southern (red crosses and solid line) rims with EPIC-pn camera. One σ error bars are also plotted. The excess emission above the "synchrotron" plus "vmekal" continuum emission model at the energy of ∼4.4 keV was fitted with a gaussian (Iyudin et al. 2002).

- The analysis of the XMM-Newton data confirm that for $E_x \geq 1$ keV a power-law with photon index of ∼–2.6 provides an acceptable fit for the SNR NW and Southern rims, while for ≤ 1 keV a thermal component is to be added.
- Improved fits for $E_x \geq 1.0$ keV are obtained by dedicated synchrotron models with emission from shock wave accelerated high-energy electrons. For the high energy part of the SNR rims the spectra are well represented by the "sresc" model (Iyudin et al. 2002).
- The emission line feature at ∼4.1 keV reported by Tsunemi et al. (2000) in the NW rim spectrum of SNR shows up also in XMM-Newton data (Fig. 2). The line centroid is at $E_{line}=4.24^{+0.18}_{-0.14}$ keV for a *power-law* continuum model, and $E_{line}=4.44\pm0.11$ keV for the same region and a *sresc* model. The MOS spectra of the two rims are consistent with that of the EPIC-pn. Our values of the line energy are slightly higher than Tsunemi's et al. (2000), but still consistent with the ASCA SIS spectrum (Fig. 4 in Tsunemi et al. 2000). The line flux derived is $\sim 5\times10^{-6}$ ph cm^{-2} s^{-1}.
- For the line origin two hypotheses are plausible: (1) - the line is a result of the ^{44}Ti electron capture decay, which produces a vacation in the K-shell of the daughter nucleus of ^{44}Sc; (2) - the line is a blend of lines emitted by Ca and Ti;
- The high abundance of Ca and Ti in the outer layers of the SNR inferred form the line fluxes point to sub-Chandrasekhar type Ia SN ejecta (Iyudin & Aschenbach 2001; Livne and Arnett 1995; Woosley and Weaver 1994).

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A. F. Iyudin, B. Aschenbach, F. Haberl, M. Freyberg, D. Grupe