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XMM-Newton observation of the composite SNR G0.9+0.1 and the discovery of a new transient source

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Abstract. We present the preliminary results of a *XMM-Newton* observation of the composite supernova remnant G0.9+0.1 located in the Galactic Center region. The spectrum of the extended pulsar wind nebula can be well fit with a single power–law with a photon index of 1.9 and a large absorbing column density of 1.4×10^{23} cm^{-2}. We confirm the X–ray emission previously discovered from the radio shell. We serendipitously discovered a new transient source, likely a new low mass X–ray binary probably located in the Galactic Center region.

Key words. SNR – G0.9+0.1

1. Introduction

G0.9+0.1 is a composite supernova remnant located in the Galactic Center region. The high interstellar absorption prevented its detection at X–rays (except for a marginal detection with the *Einstein* Observatory, Helfand & Becker 1987) up to the BeppoSAX observation of the region (Mereghetti et al. 1998; Sidoli et al. 1999), where X–ray of non-thermal origin were observed from the radio core of the remnant.

This emission was interpreted as produced by the pulsar wind nebula (PWN) of G0.9+0.1. During a recent *Chandra* observation, the PWN could be spatially resolved. No X–ray pulsations were detected, making the identification of the supposed pulsar embedded in the center of the remnant, rather uncertain. Indeed, two possible X–ray sources could host the central neutron star: a faint X–ray source, called CXOU J174722.8-280915, or a clump of X–ray emission coincident with the radio core (Gaensler et al. 2001).

During the first *XMM-Newton* observation of G0.9+0.1 evidence for X–ray emission from the radio shell was found (Porquet et al. 2003). Here we report the preliminary results of the deepest X–ray observation ever performed of this SNR.

2. X–ray Emission from the Pulsar Wind Nebula

The entire X–ray emission from the PWN has been studied extracting counts from MOS and

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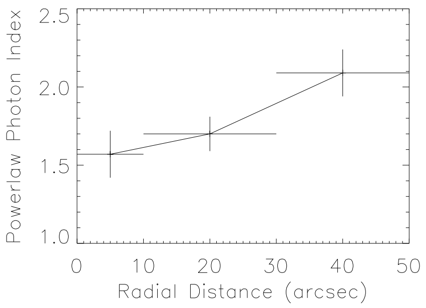

Fig. 1. Spectral softening of the PWN spectrum at larger distances from the core of the nebula

PN cameras. The fit with an absorbed power–law gave $\Gamma\sim1.9$, $N_{\rm H} = 1.4\times10^{23}$ cm^{-2}, and flux F= 4.8×10^{-12} erg cm^{-2} s^{-1} (2–10 keV, corrected for interstellar absorption), translating into a luminosity of $L_X\sim5 \times 10^{34}$ erg s^{-1} (for a distance of 10 kpc).

A spectral analysis of three different annular regions centered on the PWN peak confirms a softening of the spectrum at larger distance from the peak of the PWN (see Fig. 1).

3. X–ray Emission from the Shell

The extraction of counts from a region spatially coincident with the radio shell confirms the presence of net rate from it (after subtracting from a background extracted from the same image and appropriately corrected for the different area and the vignetting).

The fit with an absorbed powerlaw resulted in a steep spectrum with a photon index of ∼3, and a flux corrected for the absorption of $\sim3\times10^{-12}$ erg cm^{-2} s^{-1} (2–10 keV). Fitting with a hot plasma model (MEKAL in XSPEC) resulted in a very high temperature of 3 keV (high if compared with the typical temperature of SNR shells).

4. A new X–ray Transient

During this *XMM-Newton* observation we serendipitously discovered a new X–ray source (Sidoli & Mereghetti 2003) at the sky position $R.A. = 17h\ 47m\ 16.0s, Dec. = -28^\circ\ 10'\ 45''$ (J2000, 5″ error).

The spectrum of this new source is well fit with an absorbed power-law with photon index 2.1±0.1 and a high column density of $(8.9 \pm 0.5) \times 10^{22}$ cm^{-2}. This suggests that the transient source is located at the GC distance. In this case, its luminosity is about 5×10^{34} erg s^{-1} (2–10 keV, corrected for the absorption). The source was not visible in the previous *XMM-Newton* observation performed on September 23, 2000 (Porquet et al. 2003), implying a flux at least a factor 80 fainter.

These properties suggest that this source is a new transient low mass X–ray binary located in the GC region.

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