Three black-hole binaries observed with XMM-Newton: XTE J1817-330, XTE J1856+053 and GRS 1915+105

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**XTE J1817-330**

The black-hole candidate XTE J1817-330, discovered on 26 January 2006 with RXTE (Remillard et al. Atel#714), was observed by XMM-Newton on 2006 March 15.

**Black-hole mass**

The low temperature of the accretion disk points to a black hole as accreting object.

The normalization of the accretion disk is similar to the black hole mass $M$, the distance to the source $D$ and the inclination of the disk $i$:

$$L_{\text{in}} \approx 0.06 \times 10^{38} \left(\frac{M}{M_\odot}\right)^{0.51} \left(\frac{D}{10^{22} \text{ cm}}\right)^{0.97} \left(\frac{1-\sin i}{0.8}\right)^{0.15} \left(\frac{D}{10^{22} \text{ cm}}\right)^{-0.88}$$

where $L_{\text{in}}$ is the luminosity at the innermost stable orbit. The accretion rate depends on $M$ and $L_{\text{in}}$. We plot below:

- Accretion rate vs. black-hole mass derived from the fit to RXTE spectra.
- Assuming it was at $L_{\text{in}}$ at maximum in RXTE light-curve, corresponding $M$ at time of RXTE observation (assumed to be June, 1997).
- Assuming it was at a lower limit of 30% of $L_{\text{in}}$ at maximum, corresponding $M$ at time of RXTE observation (30% $L_{\text{in}}$).

**Oxygen absorption features** in the RXTE spectra (in units of $10^{19}$ cm$^{-2}$) are shown on top.

**XMM-Newton: OM, EPIC-pn and RGS spectra**

OM, U filter
OM UVW1 filter
EPIC-pn, Burst mode

**RGS, order 1**

**RGS, order 2**

**Interstellar oxygen lines in the RGS spectra**

The observed column density is compatible with the average galactic column density in the source direction (Dickey & Lockman 1990, ARA&A, 28, 215) the source is behind the Galactic disk by minimum distance 1 kpc.

Unabs. $L_{\text{in}}$ (at 1 kpc) $= 2.7 \times 10^{38} \left(\frac{D}{10^{22} \text{ cm}}\right)^{0.4} \left(\frac{1-\sin i}{0.8}\right) \text{ erg s}^{-1}$

**XTE J1856+053**


**XMM-Newton: EPIC-pn and RGS spectra**

Absorbed model $\chi^2 = 70.8$ (goodness $33\%$)

**EPIC-pn, Timing mode**

**RGS**

**Reduction-3**

The disk temperature favors a black hole as accreting object.

Unabsorbed $L_{\text{in}} (1-10\text{ keV}) = 2.7 \times 10^{38} \left(\frac{D}{10^{22} \text{ cm}}\right)^{0.4} \left(\frac{1-\sin i}{0.8}\right) \text{ erg s}^{-1}$

**GRS 1915+105**

On 24, 26, 28 and 30 September 2007 a program of high time resolution simultaneous observations with XMM-Newton (with EPIC-pn in Burst mode) and VLT/ISAAC (with 14 ms exposures) was performed. In addition, RXTE, Swift and radio data (at RATAN-600) were obtained. The analysis of the multi-$i$ data is in progress. Here we show the XMM/EPIC-pn light-curves.

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