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Intermediate mass BH candidate HLX-1 in ESO 243-49: detection of a possible high/hard state with the Swift-XRT

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Using our currently on-going Swift GI monitoring of HLX-1, we report on the detection of a possible high/hard state in the best intermediate mass black hole candidate (IMBH) ESO 243-49 HLX-1 (Hyper Luminous X-ray source 1 - Farrell et al. 2009; Wiersema et al. 2010). This is the first time such a spectral state is seen for this source. Since the start of the outburst on 2015 January 08, the source 0.3-10 keV count rate peaked at 2.7e-2 counts/s. During the decay part of the present outburst, at least three flares are visible, the first two lasting for a couple of days.

The spectral behavior of the present outburst appears to be different from what was observed in previous outbursts. Indeed, the source seems to become harder when it brightens, while the source seems to become softer when fading. This is most evident for the latest flare starting on 2015 March 06. On 2015 March 05 (~1.8 ks), the spectrum could be fitted by an absorbed diskbb with kT = 0.18 +0.13/-0.08 keV and an observed 0.3-10 keV flux of < 2e-13 erg/cm^2/s. On 2015 March 06 (~2 ks), the source spectrum hardened and it could be fitted by an absorbed powerlaw with Gamma = 2.4 +/-0.7 and an observed 0.3-10 keV flux of (5 +2.9/-2.3)e-13 erg/cm^2/s. If we use an absorbed diskbb, then we find kT ~ 0.4 keV. In all our fits, the absorption column is fixed to 4e20 cm^-2 (see Godet et al. 2012). The current behavior of HLX-1 might indicate that the source is experiencing the same flaring activity as sometimes seen in GRS 1915+105 near its outburst peak (Greiner et al. 1996, Belloni et al. 2000). Such flaring activity in GRS 1915+105 is associated with discrete jet ejection episodes detected in radio (Fender at al. 1999, Klein-Wolt et al. 2002).

In addition to the source hardening and brightening, we notice a line feature around 0.65 keV at the 2 sigma confidence level in the data collected on 2015 March 06. A line feature in a similar energy range was also detected in previous XMM/RGS data (see Godet et al. 2012). When using an unresolved Gaussian to fit this feature, we find an equivalent width of 0.560 +1.410/-0.144 keV. This feature is not seen in the data collected on 2015 March 05, indicating that the emitting material is located less than 1 light-day from the central engine.

We thank the Swift team for scheduling these observations through the Swift GI program (PI: O. Godet). Further Swift-XRT data are planned. Follow-up observations at other wavelengths are encouraged, in particular in radio.

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