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Swift detection of a type-I X-ray burst from Swift J1922.7-1716

ATel #3741; ***N. Degenaar, Y. J. Yang, R. Wijnands (University of Amsterdam)***
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Barthelmy et al. (2011; GCN #12522) report a Swift/BAT trigger on the transient X-ray source Swift J1922.7-1716, which is currently in outburst (ATels #3548, #3567 and #3740). We have investigated the Swift BAT and XRT data to asses the nature of the BAT trigger. The source was detected for about 30 s in the BAT data (see also GCN #12522) and we summed those data to obtain a BAT spectrum. This averaged spectrum can be fitted with a blackbody model with a temperature of kT~2.4 keV, resulting in an averaged bolometric flux of ~6.4E-8 erg cm-2 s-1. These properties suggest that the BAT trigger was caused by a thermonuclear burst (i.e., a type-I X-ray burst) from Swift J1922.7-1716. The BAT lightcurve shows a double-peaked structure (see also GCN #12522), which may be a signature of a photospheric radius expansion phase, although the limited data statistics prohibit a confirmation using spectral analysis. Using a count rate to flux conversion deduced from the fit to average BAT spectrum, we estimate a bolometric peak flux of ~1.1E-7 erg cm-2 s-1. Assuming that the peak reached the empirical Eddington limit of He X-ray bursts (~3.8E38 erg s-1; Kuulkers et al. 2003, A&A 399, 663), we can constrain the distance towards the source to be D<5.4 kpc.

XRT follow-up observations commenced ~136 s after the BAT trigger. The XRT data show a clear decay in count rate in the first ~300 s of the observation. The spectrum during this interval can be adequately fitted with a blackbody model that evolves from kT~0.81 +/- 0.05 keV in the first 75 s to kT~0.71 +/- 0.04 keV in the last 225 s of the decay (for a fixed hydrogen column density of Nh=1.8E21 cm-2; see below). These temperatures are consistent with the cooling tail of a type-I X-ray burst, supporting the suggestion that the BAT triggered on a thermonuclear event from Swift J1922.7-1716. The total duration was nearly 8 min, which is unusually long for regular type-I X-ray bursts. The count rate light curve can be described by a power law decay function with an index of -2.1 +/- 0.2, or an exponential decay with a decay time of 107 +/- 8 s. Combining the BAT and the XRT data, we estimate a total fluence of ~2E-6 erg cm-2, which corresponds to a radiated energy of ~7E39 erg for an assumed distance of 5.4 kpc.

After the initial decay of ~300 s, the XRT data shows an approximately constant count rate for the remainder of the observation (~ 1.5 ks). The spectrum of this persistent emission can be described by a simple absorbed power-law model with a hydrogen column density of Nh=(1.8 +/- 0.1)E21 cm-2 and a photon index of 2.0 +/- 0.1. These spectral parameters are consistent with the results obtained for the 2005 outburst of Swift J1922.7-1716 (Falanga et al. 2006, A&A 456, L5), as well as recent reports on the current outburst (ATel #3567). The 2-10 keV unabsorbed flux inferred from our fit is 3.0E-10 erg cm-2 s-1, which results in a 2-10 keV luminosity of 1.0E36 erg s-1 (assuming D=5.4 kpc).

The above presented results strongly suggest that Swift J1922.7-1716 harbors a neutron star that accretes from a low-mass donor, i.e., that the source is a neutron star low-mass X-ray binary. The inferred 2-10 keV outburst luminosity of only ~1.0E36 erg s-1 classifies the source as a faint X-ray transient (see Wijnands et al. 2006, A&A 449, 1117).

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