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[ Previous | Next | ADS ]

# Radio luminosity upper limits of the transient neutron star low-mass X-ray binary GRO J1744-28

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Following the new outburst of the Galactic neutron star low-mass X-ray binary and 2.1 Hz X-ray pulsar GRO J1744-28 (ATels #10073, #10079), we performed target of opportunity observations of this source with the Australia Telescope Compact Array (ATCA).

We observed GRO J1744-28 between 16:49 UT and 20:26 UT on 2017 Feb 17 (MJD 57801.78 +/- 0.08) at 5.5 and 9 GHz, with a bandwidth of 2 GHz at each frequency. The array was in its extended 6D configuration, providing angular resolutions of 6.7"x1.3" and 5.1"x1.0" at 5.5 and 9 GHz, respectively. Data were reduced in Miriad (Sault et al. 1995, ASPC 77, 433S) following standard procedures.

To minimise effects from the Galactic centre (22' away), the shortest ATCA baselines were not included in the images (where uv-distances <18 klambda at 5GHz and <10 klambda at 9 GHz were removed). We did not detect any significant radio emission at the position of GRO J1744-28 at either frequency, with 3-sigma upper limits of 45 uJy/beam (5.5 GHz) and 33 uJy/beam (9 GHz), corresponding to radio luminosity upper limits of 1.9E28 erg/s and 2.3E28 erg/s (assuming 8 kpc), respectively. By stacking the two images we reach a 3-sigma upper limit of 30 microJy/beam (1.7E27 erg/s at 8 kpc).

To determine the X-ray luminosity of GRO J1744-28 close to the time of our ATCA radio observations, we used Swift/XRT (WT mode) data obtained on February 17 (03:28-03:33 UT; ~300 s exposure time) and 18 (00:05-01:46; ~750 s exposure time). The two individual XRT light curves show a constant count rate during the observations (i.e. there were no X-ray bursts detected). The X-ray spectra, extracted using the online XRT repository (Evans et al. 2009, MNRAS 397, 1177), can be described by a simple power law with NH=(8.7+/-0.7)E22 cm-2 and a photon index of gamma=1.2+/-0.2. The resulting unabsorbed 2-10 keV fluxes translate into X-ray luminosities of (2.9+/-0.2)E36 and (1.9+/-0.1)E36 erg/s (8 kpc) on February 17 and 18, respectively.

At similar X-ray luminosities neutron star X-ray binaries generally exhibit radio luminosities between ~5E27 erg/s and ~6E28 erg/s (see e.g. Tetarenko+2016, MNRAS 460, 345, for a recent overview). Therefore, while GRO J1744-28 was not detected in our radio observations, our limits lie within the expected luminosity range. This was the first deep search for the radio counterpart

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of GRO J1744-28 during outburst, where the only other radio observations taken during outburst (GCNs #6307 #6323) appeared to be inconsistent with the current Chandra source position (Wijnands & Wang 2002, ApJ 568, L93; offset by 1.43').

We have one further ATCA observation planned, which will occur at the anticipated peak of the outburst (~1E38 erg/s, assuming that the source will become as bright as during its previous outbursts).

We would like to thank the ATCA schedulers for making these observations possible.

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