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Radio detection of the transient neutron star LMXB 1RXS J180408.9-342058

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on 19 Mar 2015; 20:11 UT

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1

We have observed the transient neutron star low-mass X-ray binary 1RXS J180408.9-342058 with the Karl G. Jansky Very Large Array (VLA) on March 17, 2015. 1RXS J180408.9-342058 has been in outburst since January 22, 2015 (ATels #7039, #6997) and has been the subject of Swift monitoring since emerging from Sun constraint in early February (ATel #7039).

Our 8-12 GHz radio observation spanned a total duration of 1 hour, with 33 minutes on-source, and measured the flux density of 1RXS J180408.9-342058 to be 0.230 mJy at a reference frequency of 10 GHz, with a statistical uncertainty of 0.004 mJy. The absolute flux density scale uncertainty is estimated to be at most 10%. The spectral index α is measured to be 0.1 ± 0.1 , where flux density is proportional to ν^α . Assuming a flat spectrum and a 5.8 kpc distance (ATel #4050), we estimate the 8.5 GHz radio luminosity to be $7e28$ erg s⁻¹. No variability was detected on timescales of 5 minutes, and we constrain any variability to be < 10%. VLA monitoring of the source is ongoing.

The radio position is:

RA: 18:04:08.3745 +/- 0.0004 s (0.006 arcsec) Dec: -34:20:51.19 +/- 0.02 arcsec

which is consistent with, but more precise than, the most recent optical (ATel #7100) and X-ray (ATel #7039) positions. The positional errors given are purely statistical, but the calibrator used was J1806-3722, which has sub-milliarcsecond positional accuracy and is separated from the target by only 3 degrees, so any systematic offsets should be small.

1RXS J180408.9-342058 was observed by Swift for approximately 1 ks on March 16, with the XRT operating in WT-mode. The X-ray spectrum can be described by a simple absorbed power-law with an index of 1.14 ± 0.03 and a hydrogen column density of $(4.9 \pm 0.4)e21$ cm⁻² (90% confidence errors). The resulting unabsorbed 2-10 keV flux is $(1.40 \pm 0.03)e-9$ erg cm⁻² s⁻¹. At a distance of 5.8 kpc (ATel #4050), this translates into a luminosity of $5.6e36$ erg s⁻¹. The source flux has remained rather stable around this level in the past 5 weeks, varying up to a factor of ~2 between individual observations. Swift monitoring of 1RXS J180408.9-342058 is ongoing.

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Using the quasi-simultaneous radio and X-ray information, we find that the current location of 1RXS J180408.9-342058 in the radio/X-ray luminosity plane is consistent with that of other hard-state neutron star LMXBs (e.g. 4U 1728-34; Migliari & Fender, 2006, MNRAS, 366, 79).

The VLA observations were made under the Director's Discretionary Time proposal 15A-455. The National Radio Astronomy Observatory is a facility of the National Science Foundation operated under cooperative agreement by Associated Universities, Inc. The X-ray data was supplied by the UK Swift Science Data Centre at the University of Leicester.

[**Telegram Index**]

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