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Russell, T.D.; Miller-Jones, J.C.A.; Sivakoff, G.R.; Tetarenko, A.J.

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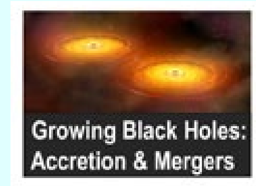

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ATCA radio detection of the new X-ray transient MAXI J0637-430

ATel #13275; ***T. D. Russell (UvA), J. C. A. Miller-Jones (ICRAR/Curtin), G. R. Sivakoff (UAlberta), A. J. Tetarenko (EAO)***
on ***7 Nov 2019; 03:11 UT***
Credential Certification: Thomas Russell (t.d.russell@uva.nl)

Subjects: Radio, Black Hole, Neutron Star, Transient

Referred to by ATel #: 13296

Following the discovery of the new X-ray transient MAXI J0637-430 (ATels #13256, #13257, #13260) we observed the field with the Australia Telescope Compact Array (ATCA) on 2019-11-06 between 17:23 UT and 19:55 UT (MJD 58793.78 +/- 0.05). Observations were recorded simultaneously at central frequencies of 5.5 and 9 GHz, with 2 GHz of bandwidth at each frequency. Primary bandpass and flux calibration was done using PKS 0823-500, while PKS 0629-418 was used for secondary phase calibration. The telescope was in its 750m configuration, although its isolated 6km antenna was used for this analysis. Data were edited for RFI, calibrated, and imaged following standard procedures within CASA (v5.1; McMullin et al. 2007). Imaging was carried out with a Briggs robust parameter of 0 to balance sensitivity and resolution, which provided synthesised beams of 9"x1" and 6"x0.6" at 5.5 and 9 GHz, respectively, with a position angle of 10 degrees E of N for both frequencies.

We detected a radio source coincident with the Swift/XRT position (ATel #13257). Fitting for a point source in the image plane, we measure flux densities of 66 +/- 15 μJy at 5.5 GHz and 60 +/- 10 μJy at 9 GHz. The radio emission implies a spectral index of $\alpha = -0.2 \pm 0.8$ (where $S_\nu \propto \nu^\alpha$). Therefore, our radio detection does not discriminate between emission from a compact jet (where $\alpha \geq 0$), or from a discrete ejection event in a transient jet (where $\alpha \sim -0.7$).

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We measure a 9 GHz radio position of:
R.A. (J2000): 06:36:23.7 +/- 0.2"
Dec. (J2000): -42:52:04.1 +/- 0.7",
where the R.A. and Dec. errors are statistical and systematic errors added in quadrature. While our radio source position is within the errors of the reported Swift/XRT position (1.2" away), due to the uncertain nature of the radio emission, our measured position may not indicate the true source position as transient ejecta can be detected several arcseconds away from their origin.

Our radio flux densities translate to a 5 GHz radio luminosity of ~7E27 $(D/4kpc)^2$ erg s^{-1} ($L_r = 4 \pi d^2 \nu S_\nu$). The closest in-time reported X-ray observation of MAXI J0637-430 was taken by NuSTAR on 2019-11-05 between about 14:30 and 17:30 UT, providing a 2-10 keV X-ray luminosity of ~3.6E36 $(D/4kpc)^2$ erg s^{-1} (ATel #13270). The X-ray spectrum at this time (about 1 day prior to our radio observation) is soft and the rough X-ray timing characteristics are consistent with soft-state accretion around a black hole (ATel #13270). While we are unable to determine the nature of the radio jet and, therefore, cannot use the radio/X-ray plane to classify the source, from the brightness of the radio and X-ray emission MAXI J0637-430 may either be a black hole X-ray binary in a soft state (where the radio emission arises from a discrete ejection event), or a relatively radio-faint (X-ray bright) neutron star system. However, the soft X-ray state indicated by the earlier X-ray observations (ATel #13256, #13257) favour the former.

We thank Jamie Stevens and ATCA staff for rapidly scheduling these observations.

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