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### Extremely Bright Radio and (Sub-)Millimetre Detections of MAXI J1535-571

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## Extremely Bright Radio and (Sub-)Millimetre Detections of MAXI J1535-571

ATel #10745; *A. J. Tetarenko (UAlberta), T. D. Russell (UvA), J. C. A. Miller-Jones (ICRAR-Curtin), G. R. Sivakoff (UAlberta), and the JACPOT XRB collaboration*  
on 14 Sep 2017; 14:35 UT

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Subjects: Radio, Millimeter, Sub-Millimeter, X-ray, Black Hole, Transient

Referred to by ATel #: [10761](#), [10768](#), [10816](#), [11020](#)

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We performed target of opportunity observations on the newly discovered candidate black hole X-ray binary, MAXI J1535-571 (GCN #[21788](#), ATels #[10699](#), #[10700](#), #[10702](#), #[10708](#)), with the Atacama Large Millimetre/Sub-Millimetre Array (ALMA) and the Australia Telescope Compact Array (ATCA), as part of the JACPOT XRB project.

Our ALMA observations occurred on 2017 September 11, with scans on source from 21:34:16-23:54:05 UTC (MJD=58007.8988-58007.9959), while the array was in the C40-8 configuration. We observed sequentially in Bands 3, 4, and 6, at 97, 140, and 230 GHz, respectively. MAXI J1535-571 was significantly detected as a point source (as expected) in all bands, with preliminary flux measurements of 220.4 +/- 1.8 mJy at 97 GHz, 226.8 +/- 1.3 mJy at 140 GHz, and 57.7 +/- 1.3 mJy at 230 GHz (statistical errors only). We note that there were sub-optimal weather conditions during the Band 6 observation, and thus more uncertainty is associated with this flux measurement. This marks MAXI J1535-571 as one of the brightest sub-mm X-ray binary detections, behind only GRS 1915+105 (Fender & Pooley, 2000, MNRAS, 318, L1) and V404 Cyg (Tetarenko et al. 2017, MNRAS, 469, 3141).

Our ATCA observations occurred on 2017 September 12, with scans on source from 13:30:20 - 13:41:20 UTC (MJD= 58008.5627 - 58008.5704), while the array was in its H168 configuration. We observed simultaneously at 17 and 19 GHz. MAXI J1535-571 was significantly detected in both bands, with preliminary flux measurements of 133.5 +/- 0.6 mJy at 17 GHz, and 141.6 +/- 0.8 mJy at 19 GHz. We note that these are statistical errors only, and estimate a flux calibration uncertainty of 10%. The radio flux has risen dramatically since our previous ATCA observations on 2017 September 05 (ATel #[10711](#)), which showed ~7 mJy at 5 GHz.

Radio and sub-mm detections of black hole X-ray binaries typically arise from a compact synchrotron jet, characterized by a flat to slightly inverted, optically thick spectrum ( $S_{\nu}$  proportional to  $\nu^{\alpha}$ , spectral index  $\alpha > 0$ ), originating from overlapping self-absorbed synchrotron contributions from different regions along the jet. At higher frequencies, the emission

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breaks to an optically thin ( $\alpha \sim -0.7$ ) spectrum. Given our radio and sub-mm fluxes, the MAXI J1535-571 jet spectrum is consistent with a single power-law (spectral index of  $0.25 \pm 0.003$ ) extending from the radio band up to  $\sim 140$  GHz, with the spectral break occurring between the 140-230 GHz range. Please note that as a caveat we have not searched for intra-observation variability in our data; such variability, if present, could affect our interpretation of the spectrum.

We will continue to monitor the source at radio and sub-mm frequencies.

We thank ALMA and ATCA for rapidly scheduling our observations.

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