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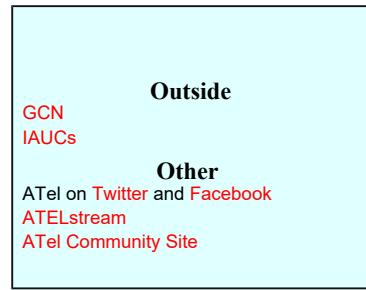
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Radio non-detection during nearly-simultaneous Swift/XRT observations of MAXI J0911-635/Swift J0911.9-6452 in NGC 2808

ATel #8914; *V. Tudor (ICRAR-Curtin), A. Bahramian, G. Sivakoff (Alberta), L. Chomiuk (Michigan State), C. Heinke (Alberta), R. Li (Michigan State), T. Maccarone (Texas Tech), J. Miller-Jones, R. Plotkin, T. Russell (ICRAR-Curtin), J. Strader (Michigan State), A. Tetarenko (Alberta), E. Tremou (Michigan State)*

on 6 Apr 2016; 09:09 UT

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Subjects: Radio, X-ray, Binary, Globular Cluster, Neutron Star, Transient

Referred to by ATel #: [8971](#), [8986](#), [9738](#), [10425](#)

We report nearly-simultaneous radio and X-ray observations of the newly discovered X-ray transient MAXI J0911-635/Swift J0911.9-6452 in the globular cluster NGC 2808 (ATel #[8872](#), #[8884](#)). These observations indicate the accretor is likely a neutron star.

Following its detection, we triggered a NAPA program on the ATCA (C2902, PI:Sivakoff) and requested contemporaneous Swift observations. We carried out ATCA observations between 05:22 UT and 07:57 UT on 2016 April 4, for a total on-source integration time of 2.1h, using two 2-GHz basebands centred at 5.5 and 9 GHz. The array was in a compact configuration (H214), with a resolution of 4.2"x0.7" on the longest baselines. No source was detected within the 90% Swift/XRT error circle (ATel #[8884](#)), down to a 5 sigma upper limit of 70 μ Jy. Assuming a flat radio spectrum, this upper limit corresponds to a 5 GHz luminosity of 4.5×10^{28} erg/s ($L = 4 \pi d^2 v S_v$) at the distance of NGC 2808 (10.4kpc; Correnti et al. 2016, arXiv:1603.05254).

Our Swift/XRT observation was taken an hour after the ATCA observations, between 08:52:29 and 09:00:58 UT in WT mode, with the source having a 0.5-10 keV count rate of 3.72 ± 0.10 cnt/s. The spectrum can be well fit by an absorbed power-law, typical of X-ray binaries in a hard accretion state. We find an absorption column density $N_H = (7.7 \pm 1.5) \times 10^{21}$ cm $^{-2}$ (abundances from Wilms et al., 2000, ApJ 542, 914; cross sections from Verner et al., 1996, ApJ, 465, 487), photon index 1.85 ± 0.16 , and unabsorbed 1-10 keV X-ray flux of $(2.40 \pm 0.15) \times 10^{-10}$ erg cm $^{-2}$ s $^{-1}$

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(90% confidence; $\chi_{\text{red}}^2 = 0.9$, 46 dof). This corresponds to an X-ray luminosity of $\sim 3.1 \times 10^{36}$ erg/s in the 1-10 keV band at 10.4 kpc, or $\sim 1.8\%$ of the Eddington limit of a 1.4 solar mass neutron star.

Since the expected absorption column density towards NGC 2808 is $N_{\text{H}} = 1.9 \times 10^{21} \text{ cm}^{-2}$ (following Bahramian et al. 2015, MNRAS, 452, 3475), our X-ray spectrum indicates that either the source is intrinsically absorbed or that the spectrum is not an absorbed power-law. We therefore tried an absorbed disk blackbody model (more consistent with soft/thermal state accretion), finding an absorption column density $N_{\text{H}} = (3.8 \pm 1.0) \times 10^{21} \text{ cm}^{-2}$, disk temperature of 1.5 ± 0.2 keV, and unabsorbed 1-10 keV X-ray flux of $(1.9 \pm 0.1) \times 10^{-10} \text{ erg cm}^{-2} \text{s}^{-1}$. The fit is statistically better ($\chi_{\text{red}}^2 = 0.8$ for 46 dof) than the powerlaw fit. The implied projected inner disk radius is small (1.4 ± 0.3 km), which would imply a high inclination angle. The flux corresponds to an X-ray luminosity of $\sim 2.5 \times 10^{36}$ erg/s in the 1-10 keV band at 10.4 kpc, or $\sim 1.4\%$ of the Eddington limit of a 1.4 solar mass neutron star.

Typical soft-to-hard transitions occur at bolometric luminosities of 2% of the Eddington luminosity (Maccarone 2003, A&A, 409, 697). Hard-to-soft transitions generally occur near the peaks of outbursts, except in the case of outbursts that do not have soft states. The luminosity here is slightly below 2% Eddington, albeit without bolometric corrections. Additionally, soft states are more susceptible to inclination angle effects than hard states, and this could be an indication that the source is a high inclination angle system. If the source continues to rise in X-ray flux, that would argue against this scenario, and instead favor a hard state with some absorption intrinsic to the source.

From the most recent plot of the radio/X-ray correlation for black hole and neutron star systems (Deller et al., 2015, ApJ, 809, 13) and the radio upper limit, we suggest that MAXI J0911-635 is either a typical neutron star low-mass X-ray binary or a radio-quiet accreting millisecond pulsar.

Further radio observations are planned.

We thank the ATNF and Swift staff for the rapid scheduling of the observations.

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