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LOFAR observations of the recent outburst from Cygnus X-3

ATel #12764; *Jess Broderick (ICRAR/Curtin), Thomas Russell (UvA), Joe Bright (Oxford), Rob Fender (Oxford), Antonia Rowlinson (UvA, ASTRON), Jaiverdhan Chauhan (ICRAR/Curtin)*

on 15 May 2019; 15:40 UT

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Subjects: Radio, Binary, Black Hole, Transient

Referred to by ATel #: **12880**

Following reports of the recent flaring activity from Cygnus X-3 (ATels #12668, #12677, #12678, #12700, #12701 and #12741), we have been monitoring this source with the Low-Frequency Array (LOFAR). Our first observation, a 48-min scan, took place on 2019 May 2 (MJD 58605), starting at 07:52 UTC. This was followed by a 10-min observation of the calibrator 3C48. We used the high-band antennas (HBA; bandwidth 115-189 MHz).

A very preliminary data reduction was carried out with the Prefactor pipeline (e.g. van Weeren et al. 2016, ApJS, 223, 2) on a subset of data spanning the frequency range 146-152 MHz. We then imaged with WSClean (Offringa et al. 2014, MNRAS, 444, 606) using a maximum projected baseline of 1500 lambda. A point source is detected in our map at the ~10 sigma level at the position of Cygnus X-3. The image has an angular resolution of 2.24' x 1.55' (beam position angle -88.6 deg east of north).

One potential cause for concern regarding the reliability of the LOFAR flux density is that a relatively large correction factor (roughly 3) was needed to bootstrap our flux density scale to that of the 150-MHz TGSS survey (Intema et al. 2017, A&A, 598, A78). Hence, we very tentatively report a 150-MHz flux density for Cygnus X-3 of roughly 1.5 Jy after bootstrapping (~510 mJy before bootstrapping). This is a particularly challenging field due to the proximity of the very bright radio source Cygnus A, and a more complete analysis, including direction-dependent calibration, is needed. We have not attempted to estimate the possible effects of source blending due to the known extended radio emission in the vicinity of Cygnus X-3 (Sánchez-Sutil et al. 2008, A&A, 479, 523).

Additional 48-min HBA observations have since taken place on 2019 May 3, 4, 5, 6, 7 and 10,

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with a final run currently scheduled for 2019 May 16 at 05:30 UTC.

We thank the ASTRON Radio Observatory for promptly scheduling our observations and pre-processing the data.

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