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## Simultaneous LOFAR and AMI-LA observations of MAXI J1820+070

ATel #11609; *Jess Broderick (ASTRON), Joe Bright (Oxford), Thomas Russell (UvA), Antonia Rowlinson (ASTRON, UvA), Rob Fender (Oxford), Chris Done (Durham)*  
on 4 May 2018; 15:07 UT

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Subjects: Radio, Binary, Black Hole, Transient

Referred to by ATel #: [11723](#), [11887](#)

We report on the detection of MAXI J1820+070 (e.g. ATel #[11399](#), #[11418](#), #[11420](#)) with the Low-Frequency Array (LOFAR). Observations in the high band (115-189 MHz) were carried out from 2018 April 27 02:32:33.0-04:32:33.0 UTC (MJD 58235.106-58235.189). Using data from 115-166 MHz and the Prefactor calibration pipeline (e.g. van Weeren et al. 2016, ApJS, 223, 2), we generated a preliminary map with angular resolution 34.5" x 20.3" (beam position angle 33.2 deg). We detect an unresolved point source at the fitted position RA 18:20:21.9, Dec. +07:11:07, after initial first-order corrections for potential systematics in the astrometry. Moreover, the preliminary 140-MHz flux density is 42 +/- 5 mJy, determined with the MIRIAD task IMFIT; the fitting error and an estimated 10 per cent calibration error were combined in quadrature to obtain the overall uncertainty. The flux density scale is that of Scaife & Heald 2012 (MNRAS, 423, L30). Our LOFAR flux density further constrains the shape of the radio spectrum in the metre-wavelength regime, with our measurement being close in value to the VLITE detection at 339 MHz on 2018 April 12 (ATel #[11540](#)).

MAXI J1820+070 was also observed by the Arcminute Microkelvin Imager Large Array (AMI-LA), simultaneously with LOFAR, between 2018 April 27 02:07:27.3-05:05:12.5 UTC (MJD 58235.089-58235.212). The observation was performed over a 5-GHz bandwidth (4096 channels), with a central frequency of 15.5 GHz. The data were then binned into 8 broad frequency channels, and flagged and calibrated using the custom reduction pipeline `reduce_dc` (e.g. Perrott et al. 2013, MNRAS, 429, 3330). Additional flagging, and then cleaning, was done in CASA using natural weighting and a gain factor of 0.1. MAXI J1820+070 is clearly detected as an unresolved source in the image at RA 18:20:22, Dec. +07:11:11 (the synthesised beam major and minor axes are 60" and 30", respectively, with a beam position angle of 10.2 deg), with a flux density of 50 +/- 2 mJy determined using the CASA task IMFIT. The uncertainty includes the statistical fitting error and a 5 per cent calibration error.

The instantaneous two-point spectral index,  $\alpha$ , between 140 MHz and 15.5 GHz is therefore 0.04 +/- 0.03 (flux density  $S_\nu$  proportional to  $\nu^\alpha$ ), a value that is consistent with previous reports of a near-flat radio spectrum (e.g. ATel #[11439](#), #[11539](#)).

## Related

- 12608 [Optical spectroscopy and photometry of MAXI J1820+070 \(ASASSN-18ey\) during the large multi-wavelength re-brightening of March 2019](#)
- 12596 [Optical observations of MAXI J1820+070 confirm the rebrightening](#)
- 12577 [AMI-LA and Swift confirm the multi-wavelength rebrightening of MAXI J1820+070](#)
- 12573 [Swift observation of the rebrightening in MAXI J1820+070](#)
- 12567 [Rebrightening of ASASSN-18ey = MAXI J1820+070](#)
- 12534 [MAXI J1820+070 is close to quiescence](#)
- 12157 [MAXI 1820+070 has completed the decline from the recent optical re-brightening following the soft to hard transition](#)
- 12128 [Optical brightening of MAXI J1820+070 over the soft to hard transition observed with LCO and the Al Sadeem Observatory](#)
- 12068 [MAXI J1820+070 continuing its rapid evolution toward the hard state](#)
- 12064 [Swift observes MAXI J1820+070 in transition from the soft to the hard-intermediate state](#)
- 12061 [AMI radio detection of the black hole candidate MAXI J1820+070 during the soft to hard transition.](#)
- 12057 [MAXI/GSC detection of a rapid increase in the hard X-ray flux of MAXI J1820+070](#)
- 11951 [Detection of a 55 Hz high-frequency QPO in MAXI J1820+070 with NICER](#)
- 11936 [Optical timing observations of MAXI J1820+070 with IFI+IQUEYE and AQUEYE+ soon after state transition](#)
- 11899 [Short-lived episodes of emission line splitting in the candidate black hole X-ray binary MAXI 1820+070](#)
- 11887 [LOFAR observations of MAXI J1820+070 \(ASASSN-](#)

We thank the ASTRON Radio Observatory for promptly scheduling our LOFAR observations and pre-processing the data. We also thank the MRAO staff for carrying out the AMI-LA observations.

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