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A bright mid-infrared excess in MAXI J1820+070

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*on **12 Apr 2018; 20:57 UT***
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Referred to by ATel #: 11539, 11540, 11723, 12128, 12534

MAXI J1820+070 (ASASSN-18ey) is a black hole candidate X-ray binary (e.g. ATel #11399, #11418, #11420). It is currently in a bright, hard spectral state (ATel #11423, #11427, #11439). Here, we report photometric mid-IR (5-12 μm) observations of the source with the VLT Imager and Spectrometer for the mid-InfraRed (VISIR; Lagage et al. 2004, The Messenger, 117, 12) mounted on UT3 of ESO's Very Large Telescope. The observations were made on 2018 April 8 (07:21-08:08 UTC) and April 9 (08:54-09:41 UTC) in clear conditions (MJD 58216-7). We also report on contemporaneous radio and optical data. MAXI J1820+070 is clearly detected (S/N > 200) in all four mid-IR filters. The following preliminary observed flux densities (F_ν) were calculated using observations of standard stars taken on the same nights:

Filter - Wavelength(μm) - F_ν(mJy; Apr 8) - F_ν(mJy; Apr 9)
B11.7 - 11.52 - 376 - 378
B10.7 - 10.65 - 353 - 368
J8.9 - 8.72 - 303 - 297
M-band - 4.85 - 292 - 271

Photometric errors are small but systematic errors are up to ~5-15% due to the limited number of available standard stars. These mid-IR flux densities are amongst the brightest reported in a transient low-mass X-ray binary.

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 rebrigtening 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-

The Arcminute Microkelvin Imager Large Array (AMI-LA) observed MAXI J1820+070 (ATel #11420) on 2018 April 8 (06:43-10:46 UTC) at 15.5 GHz. We reduced the data using the reduce_dc pipeline. We then performed cleaning (with natural weighting) and additional flagging in CASA. Using IMFIT in CASA, we measured a flux density of the unresolved point source of 42 +- 2 mJy.

The Al Sadeem Observatory (Owner/Co-founder Thabet Al Qaissieh, Director/Co-founder Alejandro Palado, Resident Astronomer Aldrin B. Gabuya) is located in Al Wathba South, outside the city of Abu Dhabi in the United Arab Emirates. We observed MAXI J1820+070 on 2018 April 7 (22:21-22:34 UTC) with the Meade LX850 16-inch (41-cm) telescope with an SBIG STT-8300 camera. 20 images (each 30 sec.) were taken in the 'green' Baader LRGB CCD-Filter (similar bandpass to Johnson V-band). The images were bias/dark-subtracted and flat fielded. We measured a brightness of V = 12.05 +- 0.04 mag, calibrated using several APASS stars in the field. From our Las Cumbres Observatory (LCO) optical monitoring (ATel #11418) we measure magnitudes (using PanStarrs calibration) of g' = 12.09 +- 0.02, r' = 12.14 +- 0.03, i' = 12.09 +- 0.04, y = 12.08 +- 0.16 on 2018 April 8 (~7 UTC).

We de-reddened the above flux densities using an extinction of E(B-V)=0.163 (ATel #11418), and constructed the broadband, radio to optical spectral energy distribution (SED; figure linked below). For comparison, we also include a radio, near-IR and optical SED from 2018 March 18 (data from ATel #11439, #11458 and LCO). The mid-IR fluxes clearly represent an excess over the optical emission, and appear to lie close to the extrapolation of the near-IR excess previously reported in ATel #11458. The SED is similar to those of GX 339-4 (Gandhi et al. 2011, ApJ, 740, L13) and MAXI J1836-194 (Russell et al. 2014, MNRAS, 439, 1390) in which the IR was shown to be produced by synchrotron emission from the jet. The SED shape suggests that the jet break between optically thin and partially self-absorbed synchrotron may reside within the mid-IR to far-IR range. Assuming a simple power law, the radio to mid-IR spectral index is $\alpha \sim +0.3$ (where $F_\nu \propto \nu^\alpha$). By fitting the April 8 VISIR data and y-band point, we obtain $\alpha \sim -0.7$.

We encourage coordinated observations during the outburst decay to track the evolution of this spectrum. The LCO observations are part of an on-going monitoring campaign of ~ 40 low-mass X-ray binaries (Lewis et al. 2008) with LCO and the Faulkes Telescopes.

MAXI J1820+070 light curves and SEDs

evolution from the early stages of the outburst

11480 ePESSTO spectroscopic classification of optical transients

11478 INTEGRAL observations of MAXI J1820+070

11462 Near Infrared JHKs observations of the transient MAXI J1820+070 / ASASSN-18ey: Erratum on 2MASS counterpart designation

11458 Near Infrared JHKs observations of the transient MAXI J1820+070 / ASASSN-18ey

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11445 First measurements of linear polarization of MAXI J1820+070

11440 NOEMA Sub-millimetre Detection of MAXI J1820+070

11439 A flat radio spectrum of MAXI J1820+070

11437 Red sub-second optical flaring in MAXI J1820+070 observed by ULTRACAM/NTT

11432 Correlated Optical/X-ray Timing Variations in MAXI J1820+070 found by Swift UVOT and XRT

11427 The hard X-ray spectrum of MAXI J1820+070 observed by Swift/BAT

11426 Detection of 10-msec scale optical flares in the black-hole binary candidate MAXI J1820+070 (ASASSN-18ey)

11425 Optical Spectra of MAXI J1820+070 with Keck

11424 SOAR/Goodman optical spectroscopy of MAXI J1820+070

11423 NICER observations of MAXI J1820+070 suggest a rapidly-brightening black hole X-ray binary in the hard state

11421 Fast optical flaring in the suspected black-hole binary MAXI J1820+070 (ASASSN-18ey)

11420 AMI radio observations of the black hole candidate MAXI J1820+070

11418 Optical observations of MAXI J1820+070 suggest it is a black hole X-ray binary

11406 MAXI J1820+070: Errata and updated XRT Position

11404 MAXI J1820+070: Swift/UVOT counterpart correction

11403 Swift detection of MAXI J1820+070

11400 Optical follow-up of MAXI J1820+070 and possible identity with ASASSN-18ey

11399 MAXI/GSC detection of a probable new X-ray transient MAXI J1820+070

10459 Ongoing radio monitoring of Cyg X-1 with the RATAN-600 radio telescope

10446 Change in radio behaviour of Cygnus X-1

10322 Unusual soft X-ray activity of Cygnus X-1 detected with MAXI/GSC

9089 New RATAN-600 data for Cygnus X-1

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3546 The RATAN observations of Cygnus X-1

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