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New optical and IR counterpart of MAXIJ1816-195

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*on **28 Jun 2022; 17:33 UT***
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Subjects: Infra-Red, Optical, Binary, Neutron Star, Transient, Pulsar

Referred to by ATel #: 15501

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After the new Swift/XRT localization (ATel #15467) of the accreting millisecond X-ray pulsar MAXIJ1816-195 (Atel #15431), on June 25, 2022 (MJD 59755) we observed the field with the 3.6-m Telescopio Nazionale Galileo (TNG) in the optical (g,r,i,z-bands) and in the near-IR (K-band) with the DOLORES and NICS imagers, respectively. The near-IR observations were performed starting at 03:22UT acquiring two mosaic-images with 900s integration time each. The g,r,i,z-band exposures were acquired starting at 04:25UT with 80s, 100s, 115s and 320s integration times, respectively.

We find, in the co-added K-band image, four sources within or at the edge of the 2.2" radius of the Swift/XRT error circle, including UGPS J181652.34-193755.7 in the UKIDSS-DR6 Galactic Plane Survey (GPS) and reported as a likely IR counterpart in ATel #15467. The sources found are:

Source_1(*) : RA(J2000)= 274.218372, DEC(J2000)= -19.633281 K= 15.31+/-0.03 identified as UGPSJ181652.40-193759.8
Source_2(**) : RA(J2000)= 274.218091, DEC(J2000)= -19.632157 K= 15.80+/-0.04 identified as UGPSJ181652.34-193755.7
Source_3(***) : RA(J2000)= 274.218000, DEC(J2000)= -19.632447 K= ---
Source_4(****): RA(J2000)= 274.218333, DEC(J2000)= -19.632583 K= 16.36+/-0.11

Notes:
Accuracy in the position is +/-0.3".
(*): at the southern edge of the XRT error circle
(**): at 1.42" from XRT position
(***): too blended with Source_2 to obtain a meaningful magnitude value
(****): at 0.4" from XRT position. Not present in the UKIDSS GPS catalogue

Source_3 and Source_4 are not detected in the UKIDSS GPS down to K=18.7 (Lucas et al. 2012) although Source_3 is barely seen in the UKIDSS K-band image. Magnitudes were calibrated against 2MASS and UKIDSS catalogues in the Vega system. The field of

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MAXIJ1816-195 as observed with NICS instrument and in the UKIDSS archive is displayed in the figure below.

None of the sources is detected in the g-band and r-band images with the exception of Source_1 found at r=21.66+/-0.13 (AB magnitudes). We derive 3-sigma upper limits of g>22.55 and r>23.45 in these bands. Sources 1,2 and 4 are instead detected in i and z-band images. We find Source_1 at i= 20.53+/-0.04 and z= 19.73+/-0.03, Source_2 at i=22.09+/-0.17 and z=20.70+/-0.06 and Source_4 at i=21.96+/-0.16 and z=21.28 +/-0.13. Magnitudes were calibrated against the Pan-STARRS (PS1) survey catalog (Chambers et al. 2016). Source_1 and Source_2 are identified in the Pan-STARRS survey as PSOJ274.2184-19.6333 and PSOJ274.2181-19.6322, respectively. They are found at the same magnitude level as observed on June 25, 2022 in the i and z-bands, while Source_4 is not identified in the Pan-STARRS survey in any band.

The detection of the new Source_4 at about 0.4" from the updated Swift/XRT position and the lack of variability of the other sources in the Pan-STARRS and UKIDSS archives strongly indicates that Source_4 is the optical/nIR counterpart of MAXIJ1816-195.

We acknowledge the Telescopio Nazionale Galileo and director for granting the execution of programme A45DDT6.

Near-IR images of MAXI J1816-195

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