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<b>Authors</b>	DE MARTINO, Domitilla, D'AVANZO, Paolo, AMBROSINO, Filippo, MIRAVAL ZANON, ARIANNA, PAPITTO, ALESSANDRO, CAMPANA, Sergio, Baglio, Maria Cristina, SANNA, ANDREA
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## New optical and IR counterpart of MAXIJ1816-195

ATel #15479; **D. de Martino (INAF-OANa), P. D'Avanzo (INAF-OAB), F. Ambrosino, A. Miraval Zanon, A. Papitto (INAF-OAR), S. Campana (INAF-OAB), M. C. Baglio (NYU Abu Dhabi), A. Sanna (Univ. Cagliari)**

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Credential Certification: Domitilla de Martino ([domitilla.demartino@inaf.it](mailto:domitilla.demartino@inaf.it))

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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  $r=21.66\pm 0.13$  (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  $i=20.53\pm 0.04$  and  $z=19.73\pm 0.03$ , Source\_2 at  $i=22.09\pm 0.17$  and  $z=20.70\pm 0.06$  and Source\_4 at  $i=21.96\pm 0.16$  and  $z=21.28\pm 0.13$ . 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.

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*Near-IR images of MAXI J1816-195*

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R. E. Rutledge, Editor-in-Chief  
Derek Fox, Editor

**rrutledge@astronomerstelegam.org**  
**dfox@astronomerstelegam.org**