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Serendipitous detection of a new outburst of the HMXB IGR J19294+1816 with XMM-Newton

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Subjects: X-ray, Binary, Neutron Star, Transient, Pulsar

Referred to by ATel #: [13480](#)

IGR J19294+1816 is an accreting pulsar in high-mass X-ray binary that was discovered by Integral on 31st of March 2009 (ATel #1997). Further studies using Swift/XRT data have found pulsation period of ~ 12.45 s (ATel #1998; #2002) and that it falls within the region of pulse period vs. orbital period parameter space expected for a Be X-ray binary system (ATel #2008).

Here we report the serendipitous detection of an X-ray re-brightening of IGR J19294+1816, during XMM-Newton observation carried out on the 13th of October 2019 in which the source was located in the field of view.

Following Tsygankov et al. (2018), we perform a preliminary fit of the EPIC-pn spectrum using XSPEC's model containing Galactic absorption, a thermal disk component, comptonized emission, and a Gaussian iron line: $tbabs \times (nthcomp + gauss + diskbb)$. We fit the spectrum between 1 and 10 keV, obtaining a good fit with reduced chi-squared of 0.997 (for 137 degrees of freedom). We find an absorption column density of $N_H \sim (5.09 \pm 0.06) \times 10^{22} \text{ cm}^{-2}$, power law

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index $\Gamma < 1.05$ at 1-sigma upper limit, and disk temperature $kT \sim 0.20 \pm 0.01$. The iron line has a centroid energy of $E \sim 6.374 \pm 0.07$ keV and a width of $\sim (5.48 \pm 0.01)e-2$ keV.

Using the convolution model cflux, we measure an unabsorbed 2-10 keV flux of $(2.70 \pm 0.01)e-10$ erg/s/cm². Assuming an 11 kpc distance (Tsygankov et al. 2018), this translates to an X-ray luminosity of $(3.91 \pm 0.01)e36$ erg/s.

The onset of the outburst coincides with periastron passage similar to previously reported outburst (ATel #5104). The current periastron passage was predicted to occur on October 16, 2019 (MJD 58772.8), following the ephemeris reported in Tsygankov et al. (2018). Therefore, this outburst is likely a Type-I outburst. The source is also detected in the Swift/BAT data and since our XMM-Newton observation, the source has continued to brighten in the Swift BAT hard X-ray monitor.

To search for pulsations in the XMM-Newton observation, we extracted a barycentred light curve with a 1-second time resolution and folded it on trial periods between 12.3 and 12.6 seconds. We find a spin period of 12.492 ± 0.001 seconds, where we calculated the error following the method in Brumback et al. (2018a, ApJ, 852, 132; 2018b ApJL, 861, L7). This period is slightly longer than the last reported measurement from 2013 (e.g. 12.457 ± 0.002 second; ATel #5104).

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2005	Palomar Transient Factory: Discovery and Follow-Up of 25 Transients
2002	IGR J19294+1816 is an X-ray Pulsar
1999	Swift/BAT detection of IGR J19294+1816
1998	Swift archival observations of the field around the new INTEGRAL source IGR J19294+1816
1997	INTEGRAL discovers the new hard X-ray source IGR J19294+1816
1980	Fourteen SN Candidates from CRTS
1937	SN Candidates from CRTS
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