We request Director's Discretionary time so that K2 can study the new intermediate polar (IP) 1RXSJ180431.1-273932 during Campaign 9 (microlensing field). An IP is a cataclysmic variable where the magnetic white dwarf is accreting from a companion star and the spin of the primary is not synchronized with the orbital period.

The X-ray source 1RXSJ180431.1-273932 (hereafter RX1804) was first discovered as a ROSAT bright source (Voges et al. 1999) and later observed in more detail with XMM-Newton (Nucita et al. 2007). The latter authors identified the optical source near the X-ray position with a red giant of spectral type M6III and found an X-ray periodicity of 494 seconds. This led to the idea that this source was a possible rare symbiotic X-ray binary with a red giant accreting onto a neutron star. However, optical imaging and spectroscopy by Masetti et al. (2012) provided a better picture of the X-ray error circle and they found a candidate closer to the center with a V magnitude of about 17.3. Spectra showed Balmer emission lines as well as strong high excitation HeII 468.6 nm emission. This spectrum, along with the X-ray flux is indicative of a magnetic white dwarf accreting from a low mass companion. The observed X-ray period would be compatible with the spin period of the white dwarf, making this object an intermediate polar (IP). Besides the spin period, Masetti et al. (2012) and Nucita et al. (2007) both found a decrease in the X-ray count rate throughout the XMM observation, as well as variability on a timescale of hours.

Kepler and K2 data are only available for one IP so far (FO Aqr) from field 3 of K2. Our analysis of the spin period of FO Aqr (Figure 1 & 2) shows a rich power-spectrum of the spin period beating against the orbital period and many harmonics. There is variation in pulse shape that can be attributed to the changing accretion curtain geometry over the orbital period. Analysis of the 494 sec spin period of RX1804 over the baseline of the K2-9 field can provide the information that is needed to confirm this source as a IP (if the spin period remains constant over the 2 months) and to determine a possible cause of the X-ray decline and variability (is it due to a periodic orbital modulation or to large sporadic changes in the accretion rate of the system). We request fast cadence (1 minute) observations if possible.

References

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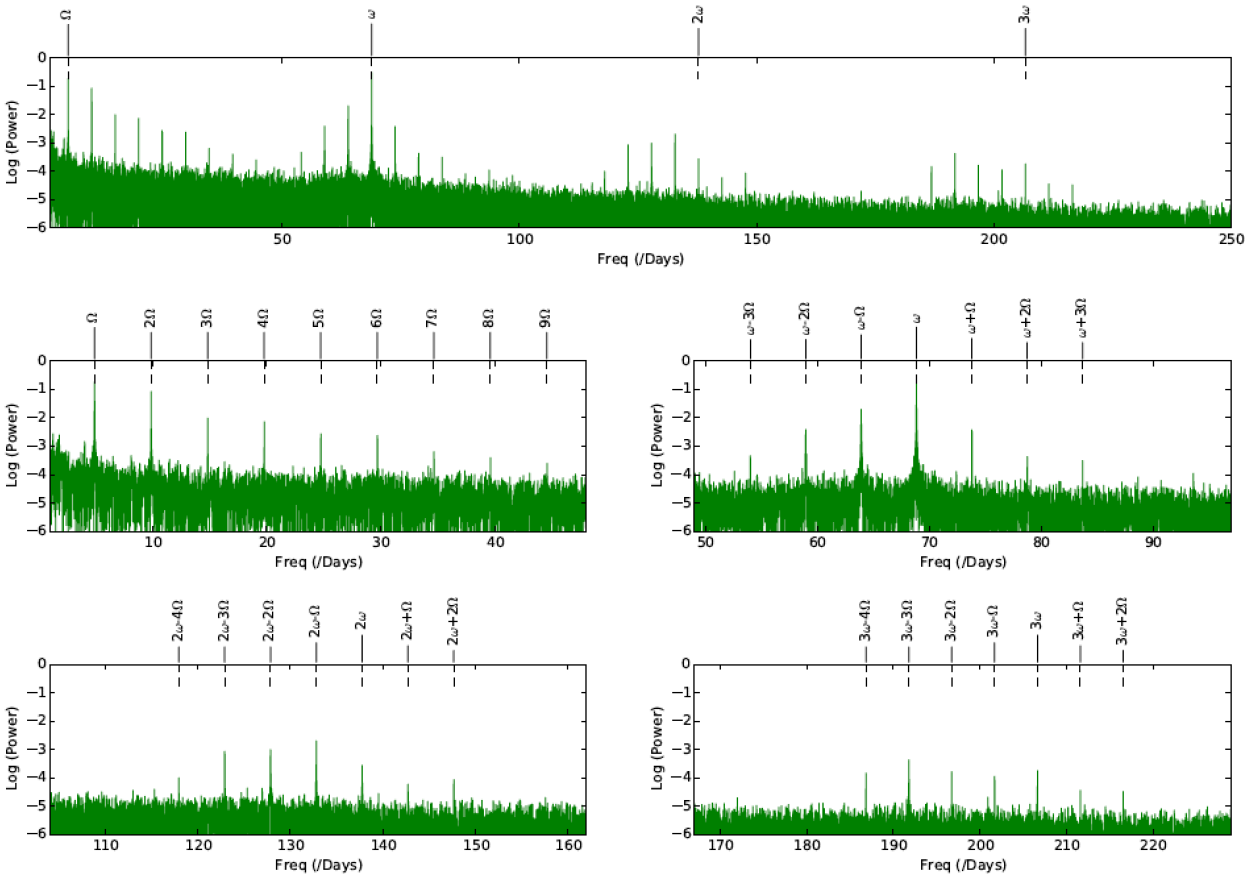

Figure 1 – The power-spectrum of the intermediate polar FO Aqr from K2 observations during Campaign 3.

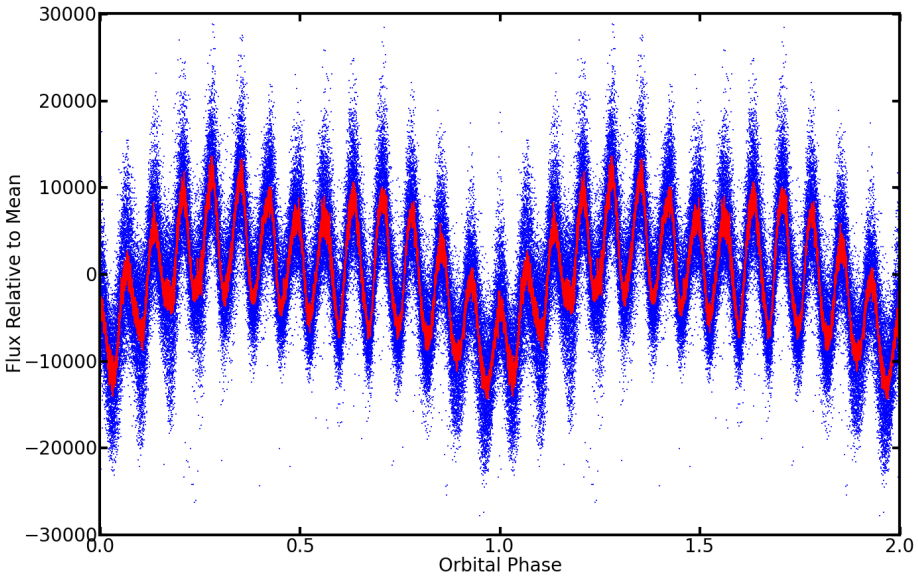

Figure 2 – The light curve of FO Aqr showing the spin modulation as a function of orbital phase. The red points are median values of phase bins.