

Intermediate Polars in a New (Optical) Light

Unprecedented Signal Detected in V709 Cas

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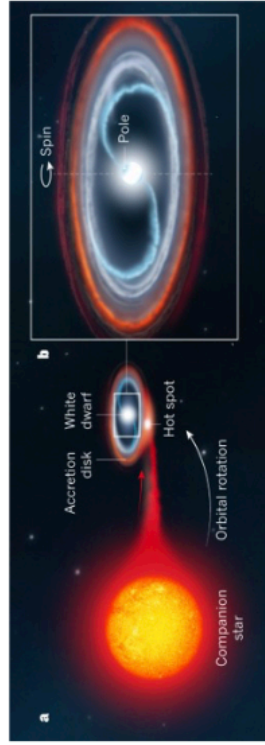


1. TESS

- Transiting Exoplanet Survey Satellite (TESS) was launched to discover thousands of planets orbiting our nearest, brightest stars [1].
- By the end of 2021, 5000 exoplanet candidates had been detected [2].
- TESS has enabled the general scientific public to request specific targets for extraneous research. Consequentially, data on millions of different objects has been made accessible .

2. Intermediate Polars (IPs)

- A binary system containing a white dwarf (WD) with a weak magnetic field, and a sun-like star that donates matter onto the white dwarf.



3. V709 Cas

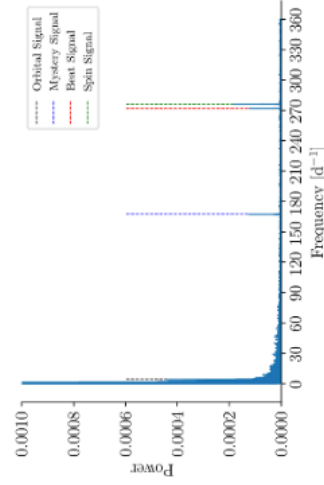
Periods:

Orbital = 5.3330 hr

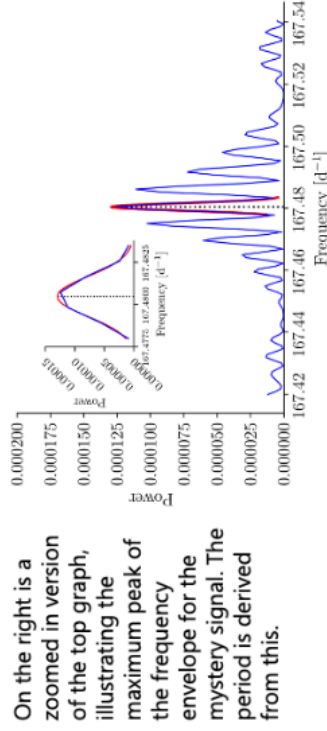
Beat = 5.29878 min

Spin = 5.21247 min

Mystery = 8.59802 min



V709 Cas is an IP that TESS monitored with incredible resolution. Extensive research has been completed on this target before TESS, so one would expect it to be understood comprehensively.



On the right is a zoomed in version of the top graph, illustrating the maximum peak of the frequency for the envelope for the mystery signal. The period is derived from this.

4. What is this Mystery Signal?

- Through excluding certain mechanics that cannot be responsible for this new period, we propose that we are observing the **first-ever** detection of the secondary star in an intermediate polar.
- 8.60 minutes is very close to p-mode oscillations recorded in solar-like stars such as 16 Cyg A [3].

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References

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 - [2] N. Guerrero, 'TESS Science Office at MIT hits milestone of 5,000 exoplanet candidates', <https://tess.mit.edu/news/> (accessed Aug. 02, 2022).
 - [3] R. A. Garcia and J. Ballot, 'Astero-seismology of solar-type stars', *Living Rev. Sol. Phys.*, 16, 1, p. 10, (2019), doi: 10.1007/s41116-019-0020-1.
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