

A 6.103-day eclipsing binary candidate: TIC 422108500

Sean League

Tustin, California. 28 October 2026. Not submitted to VSX.

Abstract

TESS Quick-Look Pipeline photometry of TIC 422108500 ($V = 11.82$) shows a repeating eclipse that is not one of the catalogued variables in a 5-arcmin VSX cone. 21 primary minima in sectors 16, 17, 56, 57, 83 and 84 give

$$\text{BJD}_{\text{TDB}} = 2460560.80094 + 6.103105 E$$

with an rms O–C of 9.4 minutes. The ring search had quoted BTJD $3560.807 + 6.103240 E$, a primary of 0.24 mag lasting about 3.8 hours, and a secondary of 0.043 mag at phase 0.738 lasting about an hour. On these 21 times that quoted period leaves an rms of 29 minutes. The least-squares period leaves 9.4 minutes, so this note uses the fit. The primary, measured against the local continuum, is 0.244 mag and stays below 98 percent of normal light for 4.0 hours. The half-depth width is 2.5 hours. The folded 200-second curve is deepest off primary at phase 0.739, at 3.3 percent (0.036 mag), not 0.043 mag, and that dip stays below a 1.5 percent deficit for 2.9 hours, not one hour. Nothing in this note has been submitted to VSX.

1. How the star was found

Public TESS QLP light curves of 357 stars brighter than $V = 12.5$ in the ring from 1.50 to 1.60 degrees around V345 Lac were screened for dips, brightenings and periods. TIC 422108500 lies 1.498 degrees, 90 arcmin, northeast of V345 Lac. Sectors 16 and 17 are 30-minute cadence (KSPSAP_FLUX). Sectors 56, 57, 83 and 84 are 200-second cadence (DET_FLUX). Cadences with a nonzero quality flag were removed and each sector was divided by its median. No new observations were obtained.

2. The star

TIC 422108500 is TYC 3986-01954-1, Gaia DR3 2006040414935614336, 2MASS J2225823+5602477, UCAC4 731-084104. TIC v8.2 J2000 position, from MAST on 28 October 2026: 22h 22m 58.24s, $+56^\circ 02' 47.7''$ (RA 335.742652° , Dec 56.046581°). TIC: $V = 11.82 \pm 0.029$, $B = 11.659$, $T = 11.312$, contamination ratio 0.205, $l = 103.23^\circ$, $b = -1.04^\circ$. TIC quotes the Gaia DR2 parallax, 0.829 ± 0.037 mas, and proper motion -2.02 , -1.58 mas yr $^{-1}$. Gaia DR3, queried from the ESA TAP service on 28 October 2026, measures parallax 0.711 ± 0.017 mas and proper motion -1.70 , -1.58 mas yr $^{-1}$, with $G = 11.427$, $BP = 11.524$, $RP = 11.235$ and RUWE 0.92 (Gaia Collaboration 2023). The DR3 parallax is the one used here. The TIC position and the DR3 source agree to 0.04 arcsec.

3. The ephemeris

A primary is a run of quality-zero flux below 0.88 of the sector median. Dips whose bottom is only a few percent down are left out, so the shallow minimum is not mixed into the clock. The mid-time is the vertex of a parabola fit to the bottom. A linear fit to 21 primaries gives

$$T_0 = 3560.80094 \text{ BTJD}, P = 6.103105 \pm 0.000012 \text{ d.}$$

BTJD is $\text{BJD}_{\text{TDB}} - 2457000$. The formal error on T_0 is 3.1 minutes. The rms of the residuals is 9.4 minutes and the largest is 13.6 minutes. The median of the sector-normalized bottoms is flux 0.816. Against a local continuum on the 200-second sectors the depth is 0.244 mag, 20 percent of the light. The time below 98 percent of normal light is 4.0 hours. The time below half depth is 2.5 hours.

At phase 0.739 the 200-second fold falls by 3.3 percent, 0.036 mag. A box of 0.008 in phase, stepped across the fold outside the primary, finds that same phase. The noise of that box away from the feature is 0.03 percent. The ring-search secondary phase, 0.738, is this minimum. The depth is 0.036 mag, not 0.043 mag. On the folded 200-second curve that secondary stays below a 1.5 percent deficit

for 2.9 hours. The ring search called it about one hour. The fold is longer than that, and this note uses 2.9 hours. Two minima of unequal depth, one of them well off phase 0.5, are the signature of an eccentric Algol-type binary.

Sector	Cycle	Mid-eclipse (BTJD)	UTC	Min. flux	O–C (min)
16	-298	1742.0762	2019-09-15 13:44	0.821	+0.7
16	-296	1754.2847	2019-09-27 18:44	0.815	+3.9
16	-295	1760.3888	2019-10-03 21:14	0.813	+5.5
17	-294	1766.4930	2019-10-09 23:44	0.822	+7.0
17	-293	1772.5971	2019-10-16 02:14	0.823	+8.5
17	-291	1784.8053	2019-10-28 07:14	0.816	+11.3
56	-120	2828.4189	2022-09-05 21:58	0.813	-13.6
56	-119	2834.5225	2022-09-12 00:27	0.813	-12.9
56	-118	2840.6254	2022-09-18 02:55	0.815	-13.2
56	-117	2846.7286	2022-09-24 05:23	0.814	-13.1
56	-116	2852.8316	2022-09-30 07:52	0.814	-13.2
57	-113	2871.1412	2022-10-18 15:17	0.817	-12.8
57	-112	2877.2447	2022-10-24 17:47	0.814	-12.3
83	0	3560.8047	2024-09-07 07:13	0.810	+5.4
83	1	3566.9078	2024-09-13 09:42	0.814	+5.3
83	2	3573.0119	2024-09-19 12:11	0.811	+6.9
83	3	3579.1149	2024-09-25 14:40	0.812	+6.7
84	4	3585.2182	2024-10-01 17:08	0.816	+7.0
84	5	3591.3215	2024-10-07 19:37	0.817	+7.3
84	7	3603.5278	2024-10-20 00:34	0.818	+7.4
84	8	3609.6315	2024-10-26 03:04	0.818	+8.2

Table 1. Primary minima of TIC 422108500. UTC = BJD_TDB - light time - 69.184 s. O–C is from the ephemeris above. Cycle 0 is the minimum nearest the quoted epoch, in sector 83.

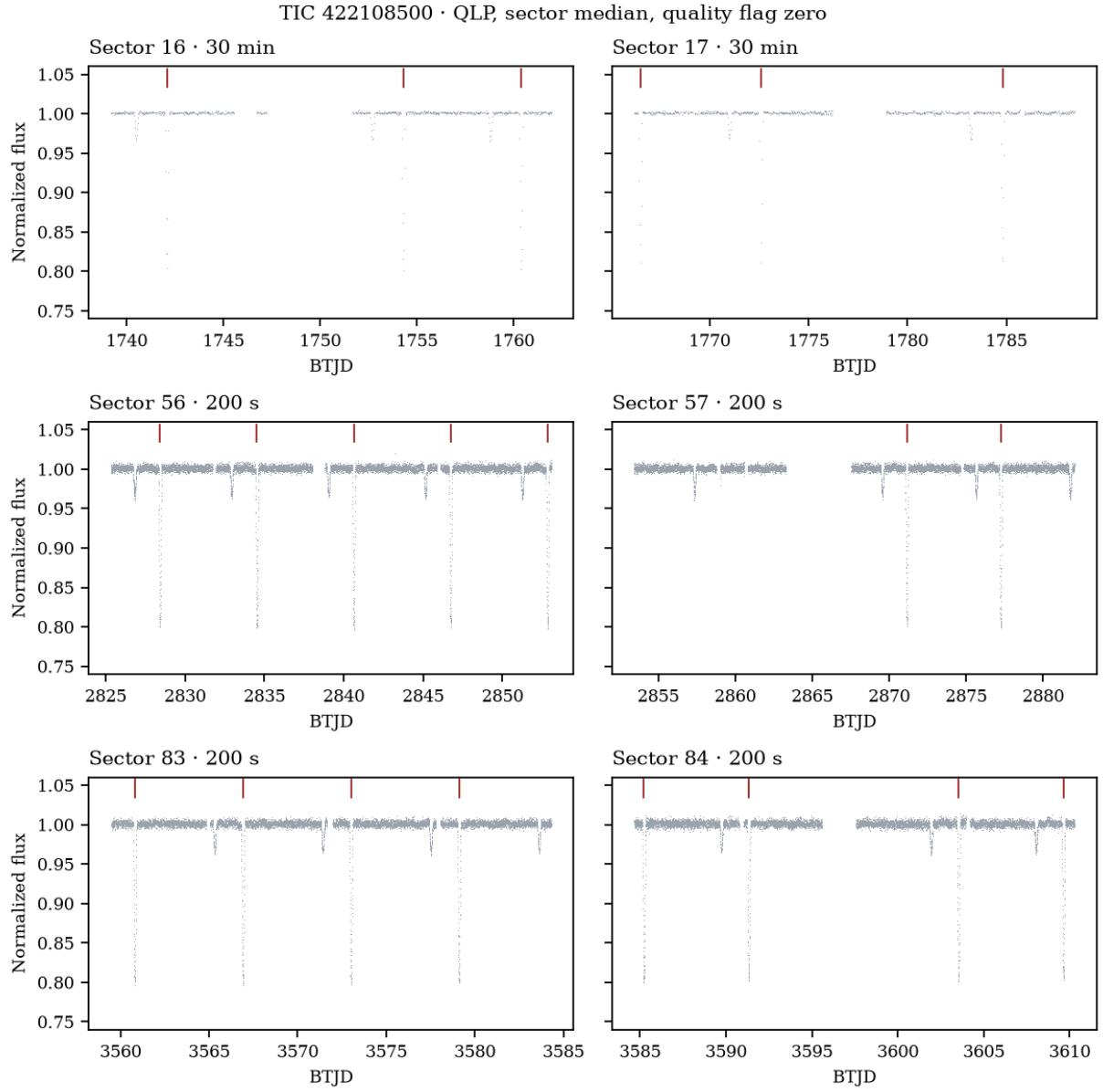


Figure 1. QLP light curves, quality-zero cadences, sector median. Red ticks are measured primary minima.

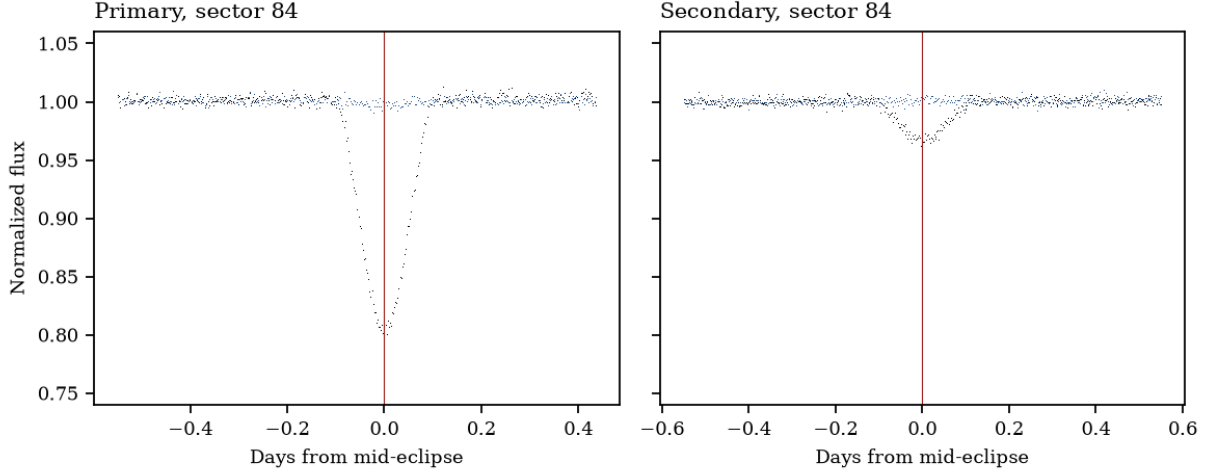


Figure 2. One primary and the phase-0.739 minimum in sector 84. Black is TIC 422108500. Blue is TIC 422108575, 108 arcsec away, which stays at full light.

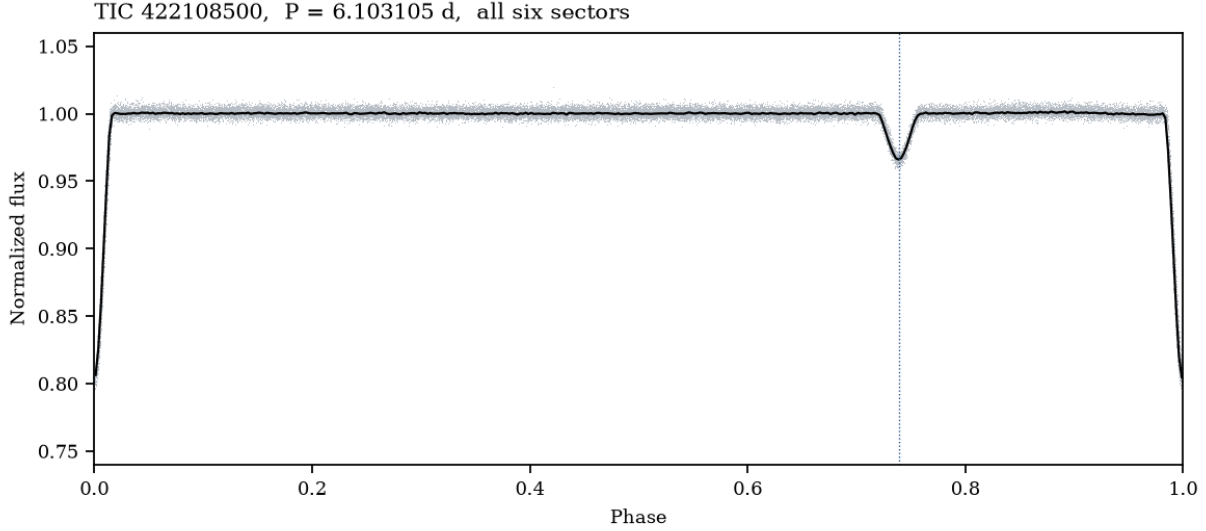


Figure 3. All six sectors folded on the period above. The line is a median in 0.0025 phase bins. The dotted line marks the secondary.

4. The eclipse belongs to this star

The QLP centroid during primary eclipse was compared with the out-of-eclipse centroid in each sector. The shifts are 0.04 to 0.40 arcsec, and the direction changes from sector to sector. In every sector the shift is inside the out-of-eclipse scatter, which runs from 0.27 to 0.92 arcsec. The contamination ratio is 0.205, so other stars contribute about 17 percent of the aperture light. Removing every contaminant at once would drop the aperture by about 0.20 mag. The observed drop is 0.244 mag, so the missing light is not a faint neighbor vanishing. The nearest Gaia star brighter than $G = 16$ is 2.3 mag fainter and 34 arcsec away (Gaia DR3 2006039659021373696, $G = 13.68$). Even a total eclipse of that star is too small to be this minimum. TIC 422108575 ($V = 12.13$), 108 arcsec away, stays at 0.999 of its normal light at the primary times, and so do TIC 422227590 (155 arcsec) and TIC 422108665 (150 arcsec).

An AAVSO VSX cone of 5 arcmin, queried 28 October 2026, does not contain this star. The nearest entry is Gaia DR3 2006039590301899904, an RS star 49 arcsec away. The next entries are 76 arcsec and farther, including an eclipsing star 116 arcsec away with a 7.36-day period that is not this clock.

5. Status

Not submitted to VSX. A new VSX account can have only one new star in review, and TIC 330739083 is the one entry in review. TIC 422108500 is a candidate for a later submission. It has not been checked from the ground.

6. The other new stars in this ring

The same screen of 357 stars produced three more notes, written with this one. TIC 328546841 has minima of 0.12 and 0.084 mag every 8.385 days. TIC 415460747 and TIC 2015971564, 0.75 arcsec apart, fade together by about 0.13 mag every 4.534 days, and the host is not assigned. TIC 328548852 fades by 0.05 mag every 2.829 days and is labeled a candidate because the aperture is contaminated. The two stars from the ring just inside this one, TIC 467474053 and TIC 415156807, already have notes.

7. The next minima

Predictions below use the ephemeris in Section 3 and the secondary at phase 0.739. They are counted from 2026-10-29 04:25 UTC.

- secondary: BTJD 4346.5085, 2026-11-02 00:07 UTC, 2026-11-01 16:07 PT
- primary: BTJD 4348.1015, 2026-11-03 14:21 UTC, 2026-11-03 06:21 PT
- secondary: BTJD 4352.6117, 2026-11-08 02:36 UTC, 2026-11-07 18:36 PT
- primary: BTJD 4354.2046, 2026-11-09 16:49 UTC, 2026-11-09 08:49 PT
- secondary: BTJD 4358.7148, 2026-11-14 05:04 UTC, 2026-11-13 21:04 PT
- primary: BTJD 4360.3077, 2026-11-15 19:18 UTC, 2026-11-15 11:18 PT
- secondary: BTJD 4364.8179, 2026-11-20 07:33 UTC, 2026-11-19 23:33 PT

The formal period error, carried to November 2026, is a few minutes. The largest O–C in Table 1 is 14 minutes. The primary lasts about 4 hours below 98 percent, so a series from about 3 hours before to 3 hours after mid-eclipse covers it.

References

- Gaia Collaboration, 2023, A&A, 674, A1 (DR3). Cone from the ESA Gaia TAP service, 28 October 2026.
- Huang C. X. et al., 2020, RNAAS, 4, 204 (QLP)
- Stassun K. G. et al., 2019, AJ, 158, 138 (TIC). Row from MAST, 28 October 2026.
- Watson C., Henden A., Price A., 2006–, AAVSO VSX. Cone of 5 arcmin, 28 October 2026.