

A 2.99-day minimum in a blended aperture: TIC 422224891

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Tustin, California. Research note from the 1.005–1.105 degree ring around V345 Lac, 15 October 2026.
Nothing in this note has been submitted to VSX.

Abstract

TESS QLP photometry of TIC 422224891 shows a minimum every 2.98922 days. 46 times in sectors 16, 17, 56, 57, 83 and 84 give an O–C scatter of 10 minutes. The minimum falls to 0.928 of the sector median, 0.08 mag. A star 38 arcsec away, TIC 316948586, fades by about the same amount on the same clock. A star 113 arcsec away stays at full light. The TIC contamination ratio is 0.63. The eclipse is not assigned to one star, and this note is not a VSX submission.

1. How the star was found

Public TESS Quick-Look Pipeline light curves around V345 Lacertae were searched on stars brighter than about $V = 12.5$. This star is 1.073° from V345 Lac, in the ring from 1.005° to 1.105° (241 stars). A dip was kept when quality-zero cadences fell about 1.2 percent or more below the local median, stayed down for several cadences, and did not bounce straight back. The same pass recovered known variables. Those are not given new notes here. Sectors 16 and 17 are 30-minute cadence and use KSPSAP_FLUX. Sectors 56, 57, 83 and 84 are 200-second cadence and use DET_FLUX where that column is present. Sectors 76 and 77 have no QLP v01 file for these TICs. Cadences with a nonzero quality flag were removed, including the QLP poor-quality bit. Each sector was divided by its own median. Catalog values are from the TESS Input Catalog, Gaia DR3, 2MASS and AllWISE. No new observations were obtained.

2. The star

TIC 422224891 is TYC 3986-02730-1, Gaia DR3 2005211898564062080, 2MASS J22240323+5525237, at 22h 24m 03.23s, $+55^\circ 25' 23.6''$. It is 64 arcmin northeast of V345 Lac. The TIC lists $V = 12.38$, $T = 12.03$, $B = 12.61$, and a contamination ratio of 0.63. 2MASS gives $J, H, K_s = 11.565, 11.471, 11.468$. AllWISE gives $W1, W2 = 11.300, 11.362$. The TIC lists $T_{\text{eff}} = 8215$ K and a radius of 2.11 solar radii. Those values are copied as published. Gaia DR3 on this source has $\text{RUWE} = 19.6$ and a parallax of 0.11 ± 0.22 mas, which is consistent with zero, so no distance is adopted and the GSP-Phot temperature is not used. The TIC parallax, 1.41 ± 0.92 mas, is not used either.

3. The ephemeris

A minimum is the vertex of a parabola on quality-zero flux inside a window of the trial clock, kept when the flux falls below 0.970. 46 minima give

$$\text{Min} = \text{BTJD } 2863.1503 + 2.98922 \text{ E}$$

BTJD is $\text{BJD}_{\text{TDB}} - 2457000$. The period is 2.989217 ± 0.000004 d. The formal error on this epoch is 1.4 minutes. The rms of the residuals is 9.6 minutes and the largest is 25 minutes. No minimum was rejected by the clip. Every predicted time that lands on quality-zero data is faint enough to be in the table. 4 other predicted times fall inside a sector but on too few quality-zero points to time. The median minimum is flux 0.928, 0.08 mag. The median time below halfway from full light to the minimum is 2.1 hours, and the median time below the outer level used for the width is 3.1 hours. Odd and even cycles have median fluxes 0.928 and 0.928, so twice the period is not required by a depth difference. The phase bin outside the minimum, the deepest one between phase 0.08 and 0.92, is flux 0.994 at phase 0.445. That is not a second eclipse.

Sector	Cycle	Mid-eclipse	UTC	Min. flux	O–C (min)
16	-375	1742.196	2019-09-15 16:36	0.934	+2.3
16	-374	1745.186	2019-09-18 16:22	0.930	+3.2
16	-371	1754.149	2019-09-27 15:29	0.931	-2.5
16	-370	1757.140	2019-09-30 15:16	0.935	+0.4
16	-369	1760.128	2019-10-03 14:58	0.932	-2.1
17	-366	1769.098	2019-10-12 14:15	0.938	+1.6

Sector	Cycle	Mid-eclipse	UTC	Min. flux	O–C (min)
17	-365	1772.086	2019-10-15 13:58	0.934	-0.6
17	-364	1775.070	2019-10-18 13:35	0.936	-8.4
17	-362	1781.055	2019-10-24 13:13	0.930	+0.9
17	-361	1784.047	2019-10-27 13:02	0.934	+5.7
17	-360	1787.033	2019-10-30 12:42	0.935	+0.9
56	-12	2827.272	2022-09-04 18:26	0.928	-11.0
56	-11	2830.266	2022-09-07 18:17	0.923	-4.7
56	-10	2833.263	2022-09-10 18:13	0.924	+6.8
56	-9	2836.251	2022-09-13 17:56	0.926	+5.9
56	-8	2839.231	2022-09-16 17:27	0.920	-7.5
56	-7	2842.224	2022-09-19 17:17	0.928	-2.0
56	-6	2845.207	2022-09-22 16:52	0.924	-10.8
56	-5	2848.208	2022-09-25 16:54	0.922	+5.0
56	-4	2851.200	2022-09-28 16:42	0.932	+9.8
57	-3	2854.196	2022-10-01 16:36	0.929	+19.3
57	-2	2857.171	2022-10-04 16:00	0.927	-0.9
57	-1	2860.150	2022-10-07 15:30	0.928	-15.8
57	0	2863.145	2022-10-10 15:23	0.930	-7.2
57	2	2869.120	2022-10-16 14:47	0.931	-11.9
57	3	2872.120	2022-10-19 14:47	0.928	+3.2
57	4	2875.099	2022-10-22 14:17	0.931	-12.4
57	5	2878.106	2022-10-25 14:27	0.926	+13.5
57	6	2881.099	2022-10-28 14:17	0.926	+18.9
83	233	3559.630	2024-09-06 03:02	0.923	-11.6
83	234	3562.632	2024-09-09 03:04	0.925	+6.5
83	235	3565.606	2024-09-12 02:27	0.927	-14.6
83	236	3568.604	2024-09-15 02:24	0.925	-2.3
83	237	3571.591	2024-09-18 02:05	0.938	-5.7
83	238	3574.584	2024-09-21 01:55	0.932	-0.4
83	239	3577.574	2024-09-24 01:41	0.928	+1.5
83	240	3580.557	2024-09-27 01:16	0.927	-7.0
83	241	3583.558	2024-09-30 01:18	0.928	+9.9
84	242	3586.535	2024-10-03 00:44	0.924	-8.6
84	243	3589.547	2024-10-06 01:02	0.924	+24.6
84	244	3592.517	2024-10-09 00:18	0.928	-3.1
84	245	3595.517	2024-10-12 00:18	0.926	+12.5
84	246	3598.506	2024-10-15 00:03	0.924	+12.0
84	247	3601.493	2024-10-17 23:44	0.931	+9.3
84	248	3604.474	2024-10-20 23:17	0.926	-2.4
84	249	3607.451	2024-10-23 22:44	0.930	-20.1

Table 1. Minima used in the fit. Cycle zero is the epoch in the equation.

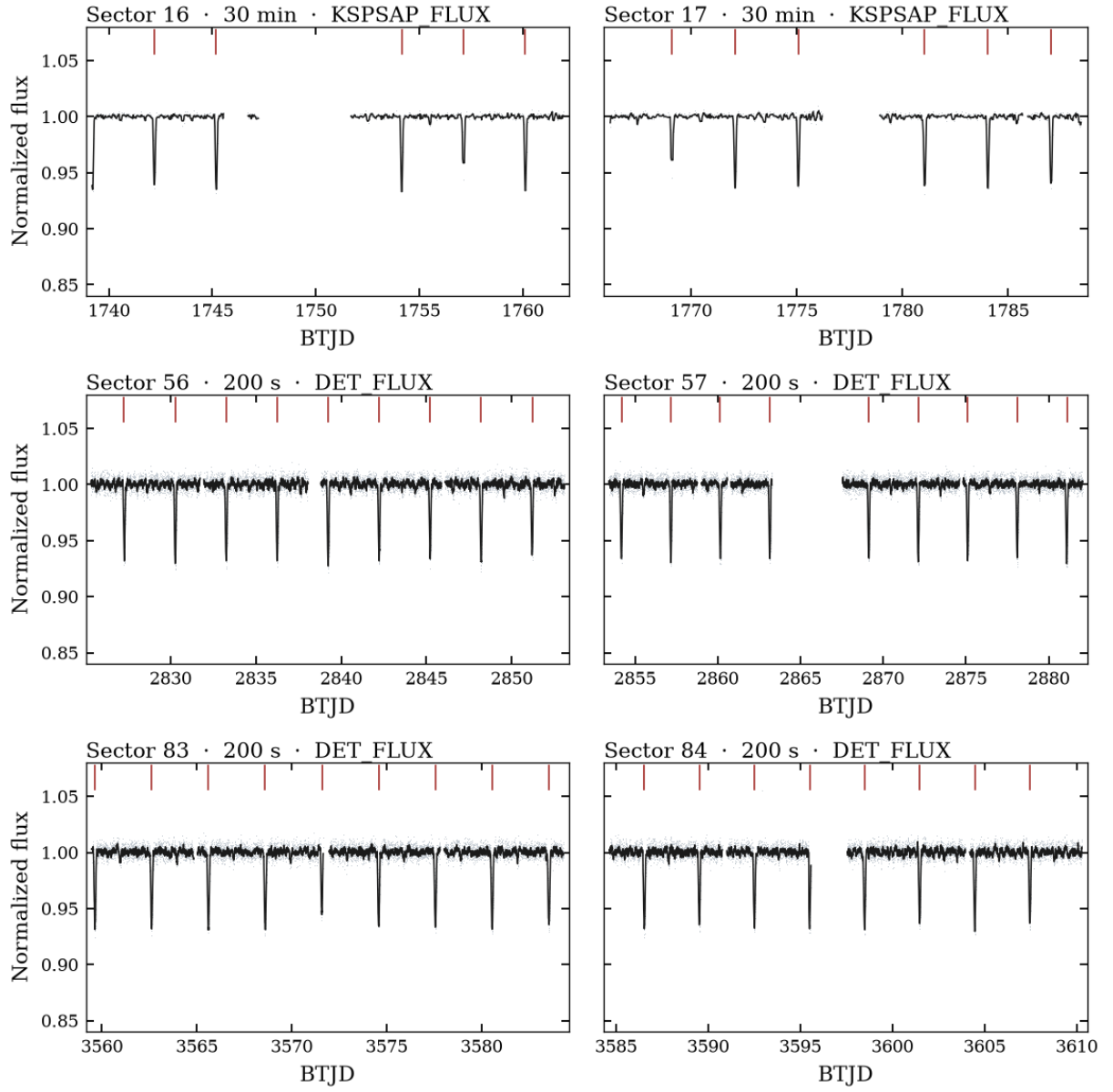


Figure 1. Six sectors. Red ticks are the minima in Table 1.

Same clock. Black is the target. Blue is 38 arcsec away. Green is 113 arcsec away.

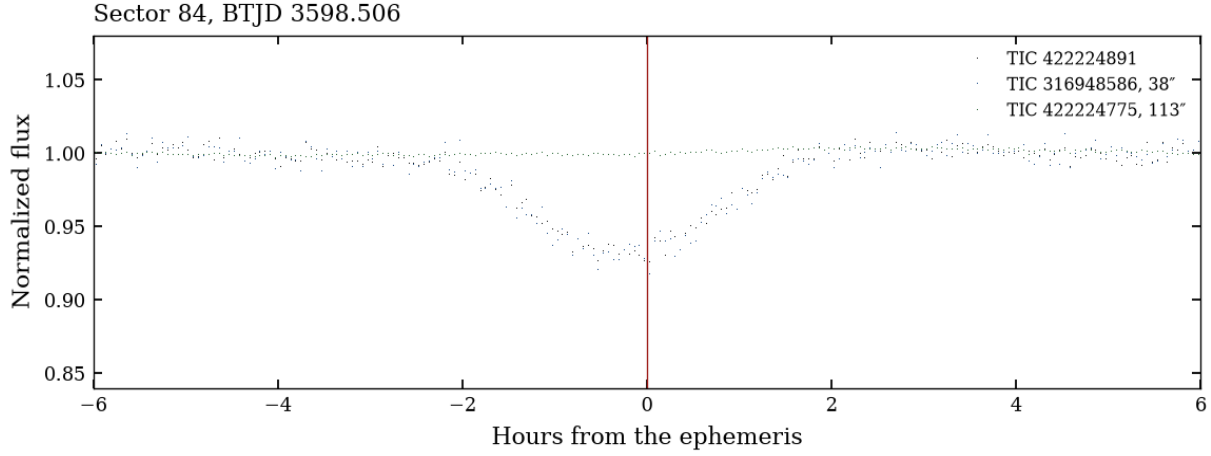


Figure 2. One minimum. TIC 316948586, 38 arcsec away, fades with the target. TIC 422224775, 113 arcsec away and two magnitudes brighter, does not.

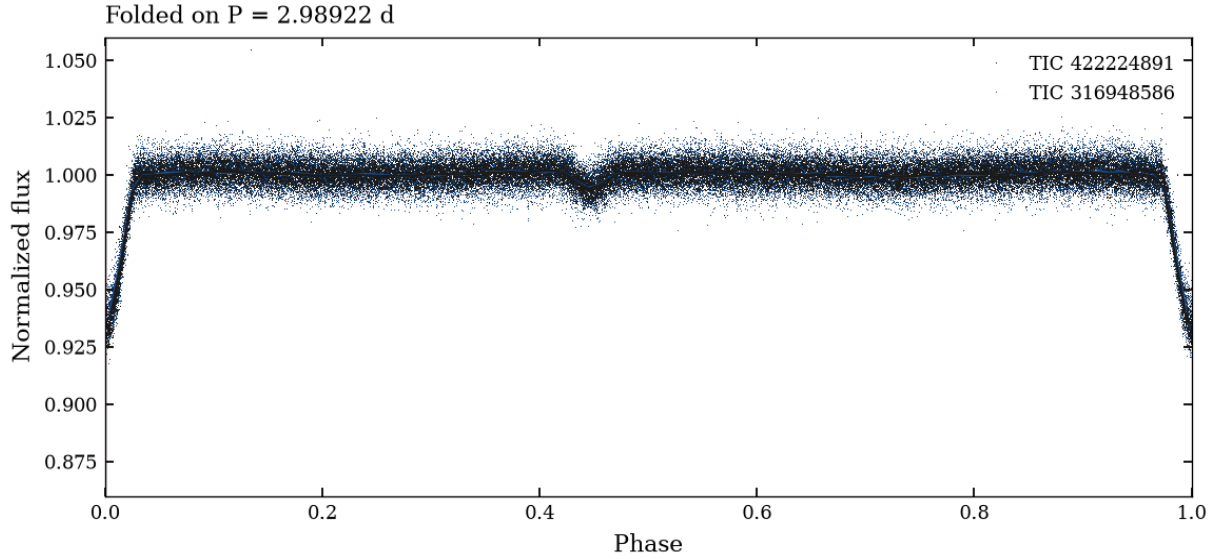


Figure 3. Both stars folded on the period in section 3. Phase 0 is the epoch.

4. The eclipse is not assigned

TIC 316948586 is 38 arcsec away, $V = 13.47$, $T = 12.36$, $G = 13.17$, Gaia DR3 2005211829844770944. On the same epochs its QLP minimum has median flux 0.930 (46 events). The target's median is 0.928. The two extractions fade together, by about the same fraction, so the missing light cannot be given to one of them from TESS alone. TIC 422224775, the $V = 9.56$ star 113 arcsec away, has median flux 0.998 at these times and is not the variable. TIC 422224892 at 13 arcsec and TIC 422224907 at 17 arcsec have no QLP v01 file, so they were not tested (no file, no file). The centroid of the target moves by a few hundredths of a pixel in some sectors and stays inside the out-of-eclipse scatter in others. It is not used to pick the star. A ground measurement needs separate apertures on TIC 422224891 and TIC 316948586.

Across the six sectors the in-eclipse centroid shift relative to phases 0.15–0.35 is sector 16: -15, -40 millipixels (scatter 7, 23), sector 17: +11, -11 millipixels (scatter 10, 10), sector 56: +7, +2 millipixels (scatter 27, 21), sector 57: -3, -4 millipixels (scatter 38, 26), sector 83: +8, +1 millipixels (scatter 20, 14), sector 84: +8, -5 millipixels (scatter 11, 13). Shifts of that size, and not all larger than the scatter, do not identify the star.

5. Catalogs, and what was not done

Queried on 15 October 2026. VSX has no object on these coordinates. The nearest entry inside 2 arcmin is Gaia DR3 2005211486247198720, type ROT, 80 arcsec away, $G = 15.76$ to 15.80 . That is not this star and not TIC 316948586. This note has not been submitted to VSX. The eclipse is real in the TESS apertures and the period is measured. It is not ready to file while two stars 38 arcsec apart fade together and the contamination ratio is 0.63. The next two times the aperture should fade are BTJD 4330.856, 2026-10-17 08:27 UTC, and BTJD 4333.845, 2026-10-20 08:11 UTC. The clock is good to about 25 minutes, the size of the largest residual. The fade lasts a few hours. Which star is fading is the open question.

References

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