A 5.374- or 10.748-day eclipsing-binary candidate: TIC 64079704

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Tustin, California. Research note from the 2.4 degree repeating-dip scan around V345 Lac, 18 November 2026.

Status: New candidate, period unsettled. Found 18 Nov 2026. Not filed. Not yet checked from the ground.

Abstract

TESS Quick-Look Pipeline photometry of TIC 64079704 shows one eclipse shape that repeats every 5.373966 days. The star is not in the AAVSO Variable Star Index, and no catalogued variable lies within 60 arcsec. It was found by a new 12-harmonic period search with a box least-squares cross-check. Twenty-five eclipses in sectors 16, 17, 57, 76, 77, 83 and 84 give

$$\text{Min} = \text{BTJD } 1742.88248 + 5.373966\ E, \quad P \pm 0.000004 \text{ d}$$

with an O−C scatter of 4.0 minutes. In the 200-second sectors the light falls to about 0.78 of normal, about 22 percent or 0.27 mag. Odd and even cycles have the same depth, and phase 0.5 is flat, so the true period is either 5.373966 days or twice that, 10.74793 days. The period is not settled. A difference-image centroid puts the dip on the target. The star is 1.958 degrees from V345 Lac, in the 1.80–2.00 degree ring. Nothing in this note has been submitted to VSX.

1. How the star was found

A repeating-dip scan of TESS stars around V345 Lacertae (TIC 421726141) ran on 18 November 2026. It covered every TESS Input Catalog star within 2.4 degrees of V345 Lac with a TESS magnitude of 13.0 or brighter, 20,840 stars. The light curves are QLP SAP_FLUX, cadences with a quality flag of exactly zero, each sector divided by its own median. The period search uses the multiharmonic χ^2 periodogram approach of Rutkowski & Poleski (2026), run with 12 harmonics: a 12-term Fourier series is fitted at every trial frequency. Rutkowski & Poleski (2026) also introduced the fast Toeplitz-solver technique that accelerates this periodogram (their Toeplitz-LS code). The scan did not run the Toeplitz-LS code. It computed the same 12-harmonic periodogram with the finufft_chi2 backend of nifty-ls (Garrison et al. 2024), a separate package, which matched the Toeplitz-LS results in a test on our own TESS eclipsing binaries on 17 November 2026 and ran about twice as fast. The trial periods run from 0.4 to 30 days, with a frequency step of 1/(10T), where T is the time span of the light curve. The periodogram uses the median-normalized flux with no detrending. A box least-squares (BLS) search (Kovács, Zucker & Mazeh 2002), as implemented in Astropy, is the cross-check. It runs on a copy divided by a one-day running median and binned to 30 minutes, with trial durations of 1.5, 3, 5 and 8 hours. A star is kept as a candidate when at least two separate eclipses fall on the adopted period, the folded eclipse has a signal-to-noise ratio of at least 8, and the depth is at least 0.2 percent.

For TIC 64079704 the scan light curve held sectors 16, 17, 57, 83 and 84. The 12-harmonic periodogram and BLS both peaked at 5.374114 days, and the scan kept the star as a new candidate with no VSX or Gaia DR3 eclipsing-binary match. The earlier ring search around V345 Lac used stars brighter than V = 12.5. At V = 13.2 this star was outside that sample.

The measurements below are made again from the public QLP light curves (Huang et al. 2020; Kunimoto et al. 2021). Sectors 16 and 17 are 30-minute cadence. Sectors 57, 76, 77, 83 and 84 are 200-second cadence. Sector 56 has no QLP file for this TIC. SAP_FLUX is used with the quality flag exactly zero, and each sector is divided by its own median. No detrending

is applied. Catalog values are from the TESS Input Catalog (Stassun et al. 2019) and Gaia DR3 (Gaia Collaboration 2023). No new observations were obtained.

2. The star

TIC 64079704 is Gaia DR3 2006670400733005696, 2MASS J22310252+5531470 and UCAC4 728-090177. It has no Tycho match in the TIC. The TIC v8.2 position, fetched from MAST on 18 November 2026, is 22h 31m 02.52s, +55° 31′ 46.9″ (J2000), RA 337.76050°, Dec +55.52971°. The TIC lists V = 13.205 ± 0.114 (from UCAC4), T = 12.690, T_{eff} = 7682 K, R = 4.43 $R_{\odot}$, and a contamination ratio of 0.215. Gaia DR3 gives G = 13.07, BP − RP = 0.77, parallax 0.372 ± 0.011 mas, about 2.7 kpc, and a renormalized unit-weight error of 0.96. Those values assume a single star and are copied as published.

From the TIC positions of this star and of V345 Lac, the separation is 1.9577 degrees, 117.5 arcmin, at position angle 63°, to the east-northeast. On the band convention of the V345 Lac pages the star sits in the 1.80–2.00 degree ring.

3. The ephemeris

Each eclipse is normalized to a straight line through the light more than 0.2 day from its middle. The mid-time is the time that makes the two halves of the eclipse mirror each other. Twenty-five mid-times, on cycles 0 through 347, are fit by linear least squares:

$$T_0 = 1742.88248 \pm 0.00111 \text{ BTJD}, \quad P = 5.373966 \pm 0.000004 \text{ d}.$$

BTJD is BJD_{TDB} − 2457000. The rms of the 25 residuals is 4.0 minutes. The largest is -8.37 minutes, on cycle 211 in sector 57. In the 200-second sectors the binned eclipse reaches 0.782 of the light. It stays below 98 percent of normal light for about 5.0 hours and below half its depth for about 2.9 hours. The ten odd cycles in those sectors average a minimum of 0.777 ± 0.007, and the nine even cycles 0.775 ± 0.005. The 30-minute sectors average 0.822, because each cadence averages over the short bottom.

Sector	Cycle	Mid-eclipse (BTJD)	UTC	Min. flux	O−C (min)
16	0	1742.8833	2019-09-16 09:06	0.816	+1.1
16	2	1753.6311	2019-09-27 03:03	0.819	+1.0
16	3	1759.0063	2019-10-02 12:03	0.821	+2.8
17	5	1769.7547	2019-10-13 06:01	0.825	+3.5
17	6	1775.1271	2019-10-18 14:57	0.827	+1.2
17	7	1780.5008	2019-10-23 23:55	0.823	+0.9
57	207	2855.2883	2022-10-02 18:49	0.781	-7.4
57	210	2871.4096	2022-10-18 21:44	0.775	-8.2
57	211	2876.7835	2022-10-24 06:42	0.769	-8.4
76	303	3371.1945	2024-03-01 16:42	0.781	+0.4
76	304	3376.5679	2024-03-07 01:40	0.779	-0.3
76	305	3381.9372	2024-03-12 10:32	0.770	-7.1
76	306	3387.3144	2024-03-17 19:35	0.781	-2.4
76	307	3392.6927	2024-03-23 04:40	0.790	+3.8
77	308	3398.0643	2024-03-28 13:35	0.767	+0.3
77	309	3403.4369	2024-04-02 22:32	0.769	-1.6
77	312	3419.5583	2024-04-19 01:27	0.769	-2.3
83	339	3564.6590	2024-09-11 03:43	0.771	+2.8
83	340	3570.0319	2024-09-16 12:40	0.768	+1.4
83	341	3575.4068	2024-09-21 21:40	0.776	+2.7
83	342	3580.7807	2024-09-27 06:38	0.777	+2.6
84	343	3586.1547	2024-10-02 15:37	0.778	+2.6
84	344	3591.5296	2024-10-08 00:36	0.779	+3.9
84	346	3602.2773	2024-10-18 18:33	0.781	+3.6
84	347	3607.6509	2024-10-24 03:31	0.783	+3.1

Table 1. The 25 timed eclipses of TIC 64079704. The mid-time is the mirror-symmetry center of the eclipse. UTC is at the geocenter, after removing the barycentric light time. O−C is the residual from T_0 = 1742.88248 and P = 5.373966 d. Sectors 16 and 17 are 30-minute cadence, so their minima read shallower.

4. The period

Phase 0.5 on 5.373966 days is flat to within 0.05 percent, so half that period, 2.687 days, is ruled out. Two periods remain. At 5.373966 days there is one eclipse per orbit and no clear secondary. A dip of about 0.7 percent at phase 0.456 shows in the fold. It is the deepest feature between phases 0.30 and 0.70, but that part of the fold scatters by about 0.16 percent, so the dip is not confirmed. At 10.74793 days the two stars would be nearly equal, and each conjunction would give the same eclipse. The equal odd and even depths allow that. Both periods put an eclipse at every time on the 5.373966-day clock, so the predicted times in section 7 are eclipses either way. A radial-velocity orbit or a confirmed secondary eclipse would settle the period.

5. The eclipse belongs to this star

The TIC contamination ratio of 0.215 means other stars add 21.5 percent of the target’s flux inside the catalog aperture. If all of that light vanished, the aperture would fall by at most 0.215/1.215, about 18 percent. The observed eclipse is about 22 percent, so the target must take part in the fade. TESScut difference images, eclipse minus out-of-eclipse, put the centroid of the missing light 1.8 arcsec from the target in sector 57 and 4.0 arcsec in sector 83, well inside one 21-arcsec TESS pixel. That is a simple centroid, not a full pixel model. A ground series in a resolved aperture is the check that remains.

6. What the catalogs already say

Checked on 18 November 2026. No VSX, SIMBAD, Gaia, ZTF, ATLAS or TESS eclipsing-binary catalog entry lies within 60 arcsec of TIC 64079704. The nearest catalogued

eclipsing binary is Gaia DR3 2006647100519820800, G = 18.4, period 2.318 days, 93 arcsec away. The star has not been filed with VSX, and this note is not a VSX submission.

7. Follow-up items and the next minima

Timing pattern. The eclipse timings show a sector-dependent pattern. All three sector 57 eclipses come 7 to 8 minutes early (-7.4, -8.2, -8.4 minutes), while sectors 16–17 and 83–84 come 1 to 4 minutes late. Sectors 76 and 77 fall in between, from -7.1 to +3.8 minutes. That calls for follow-up, with a possible non-linear ephemeris fit or a check for a third star through the light-travel-time effect. The published period is not changed by this note.

Observing request. Cover four hours before and four hours after each predicted eclipse time. That takes in the whole five-hour eclipse, about 1.5 hours of normal light on each side, and the sector-to-sector timing shifts above. At V = 13.2 the 0.27 mag eclipse is within reach of a small telescope with longer exposures. The times in Table 2 are eclipses on both possible periods.

Cycle	BTJD	UTC middle	Watch from (UTC)	Watch to (UTC)
488	4365.3779	2026-11-20 20:59	2026-11-20 16:59	2026-11-21 00:59
489	4370.7519	2026-11-26 05:58	2026-11-26 01:58	2026-11-26 09:58
490	4376.1259	2026-12-01 14:57	2026-12-01 10:57	2026-12-01 18:57
491	4381.4998	2026-12-06 23:56	2026-12-06 19:56	2026-12-07 03:56
492	4386.8738	2026-12-12 08:55	2026-12-12 04:55	2026-12-12 12:55
493	4392.2478	2026-12-17 17:54	2026-12-17 13:54	2026-12-17 21:54
494	4397.6217	2026-12-23 02:53	2026-12-22 22:53	2026-12-23 06:53
495	4402.9957	2026-12-28 11:52	2026-12-28 07:52	2026-12-28 15:52

Table 2. Predicted minima from the ephemeris above, with the four-hour watch window on each side. UTC at the geocenter. A middle can be off by several minutes.

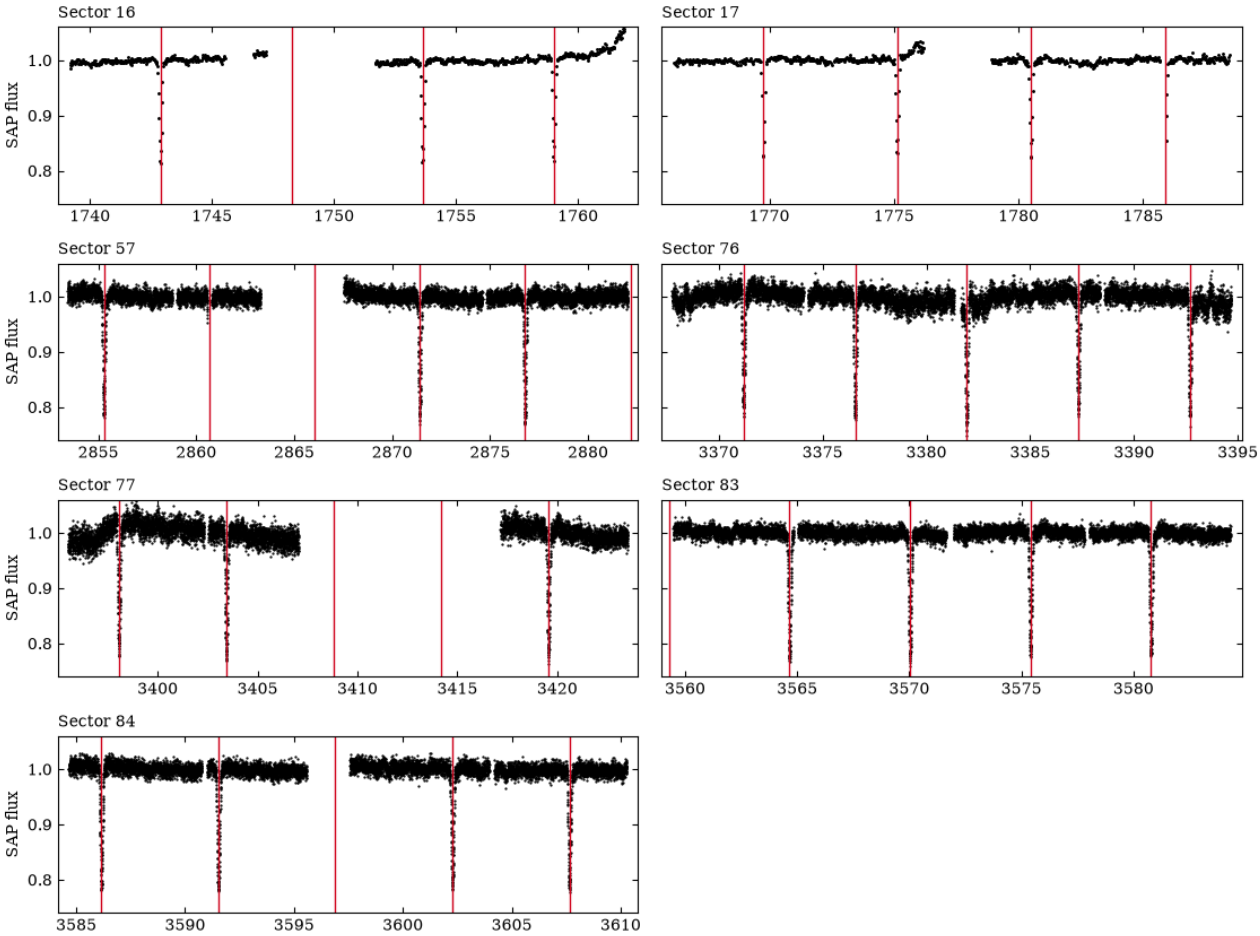


Figure 1. QLP SAP light curves of TIC 64079704, quality flag zero, each sector on its own median. Red ticks are the eclipses on the 5.373966-day ephemeris.

TIC 64079704. Four of the 25 timed eclipses.

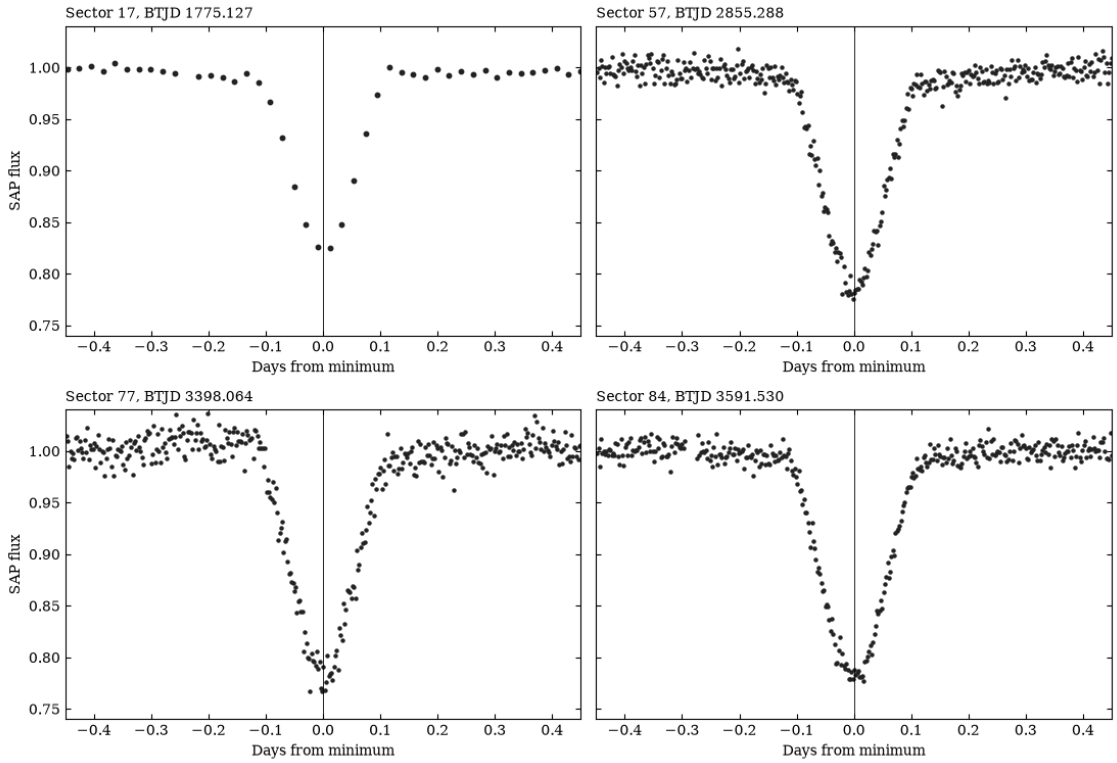


Figure 2. Four of the 25 timed eclipses, each normalized to a line through the nearby light. Sector 17 is 30-minute cadence. The others are 200-second cadence.

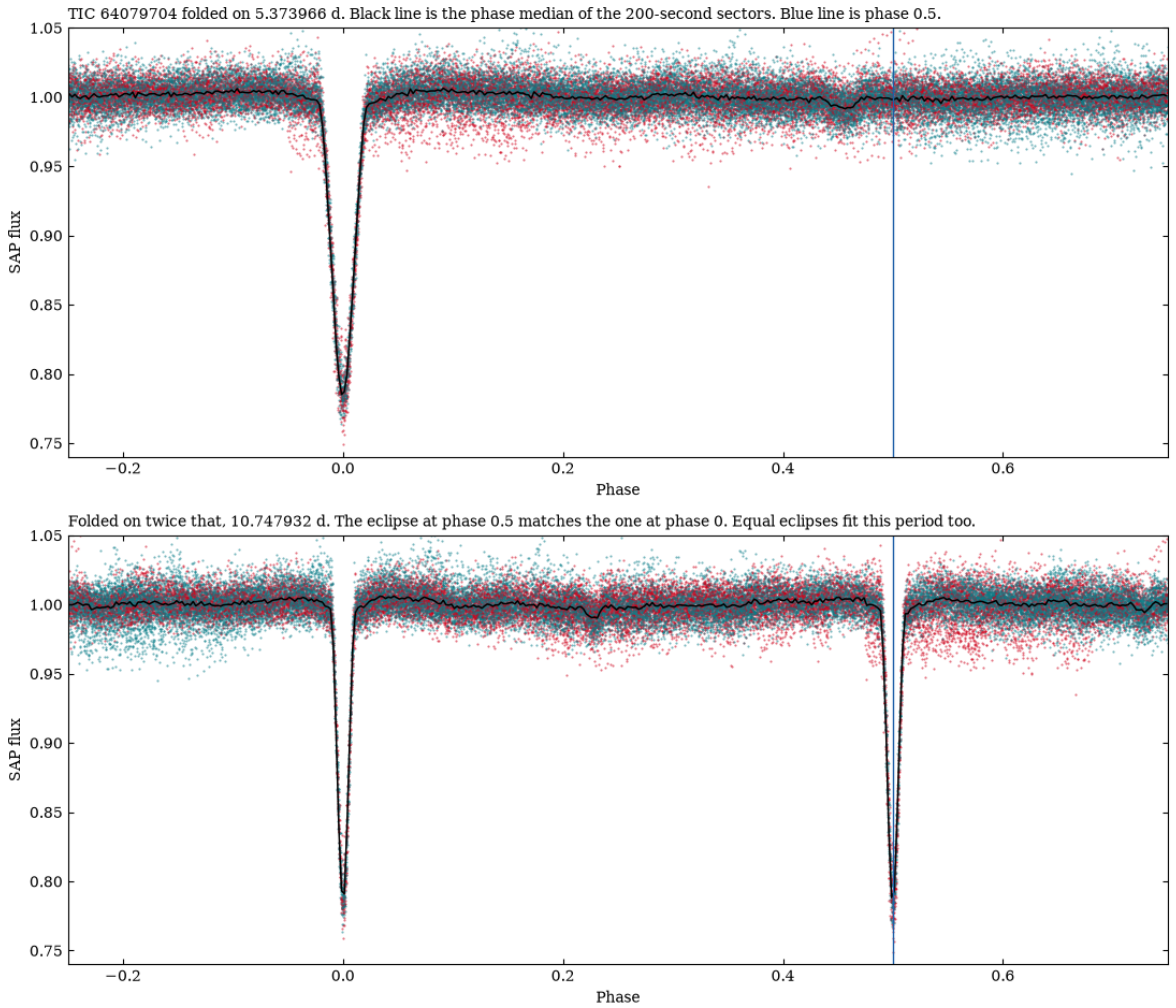
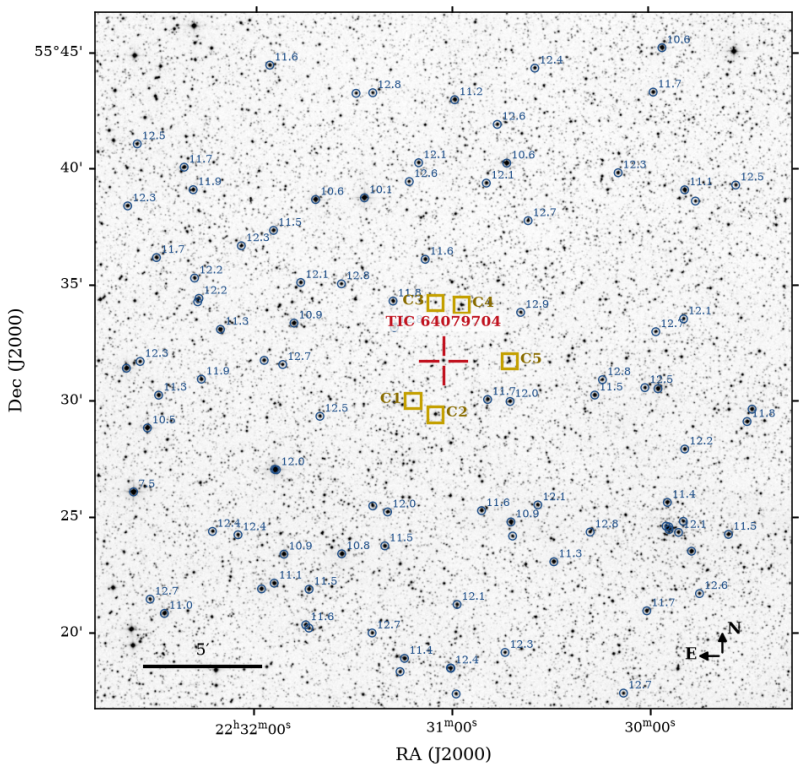


Figure 3. Top: folded on P = 5.373966 d. Black is the phase median of the 200-second sectors, and blue marks phase 0.5. Bottom: folded on 2P = 10.74793 d. The two eclipses match.

TIC 64079704 — wide finder, 30′ × 30′

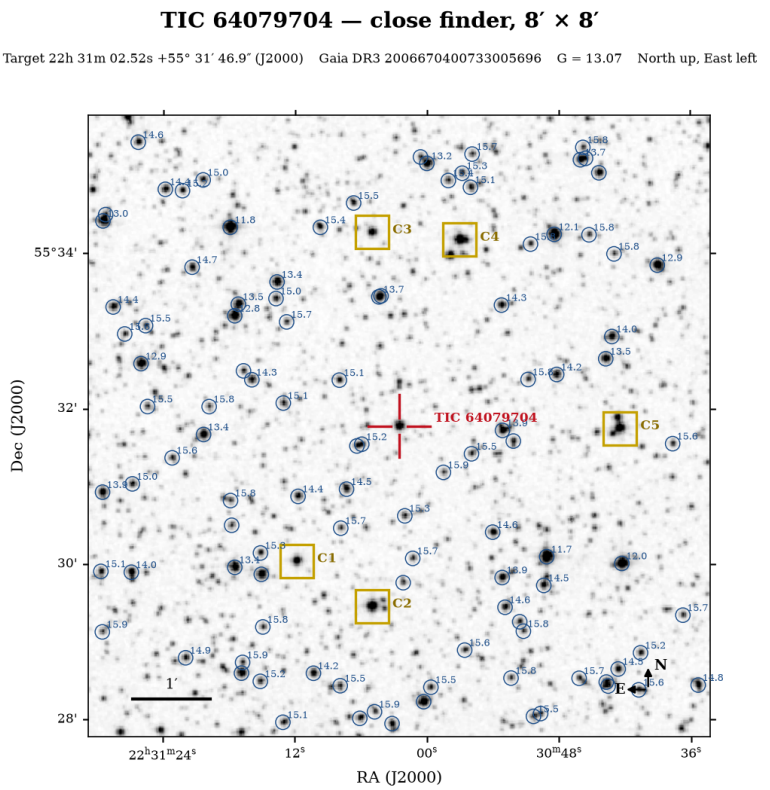
Target 22h 31m 02.52s +55° 31′ 46.9″ (J2000) Gaia DR3 2006670400733005696 G = 13.07 North up, East left



	Gaia DR3	RA, Dec (J2000)	G	BP	RP	BP−RP	dist
T	2006670400733005696	22:31:02.5 +55:31:46.9	13.07	13.37	12.60	0.77	—
C1	2006482693483822720	22:31:11.9 +55:30:02.6	13.31	13.60	12.83	0.77	2.2′
C2	2006482624764225152	22:31:05.0 +55:29:27.6	12.25	12.49	11.86	0.63	2.3′
C3	2006671534604361344	22:31:05.0 +55:34:16.5	13.65	13.93	13.20	0.74	2.5′
C4	2006671500244618752	22:30:57.0 +55:34:10.8	12.59	12.83	12.19	0.65	2.5′
C5	2006647895103946880	22:30:42.4 +55:31:45.1	12.83	13.26	12.23	1.03	2.8′

Red ticks = target (T). Gold squares = comparison stars C1–C5: Gaia G within 1 mag of the target, RUWE < 1.4, no Gaia variability flag, no VSX entry within 10″, not a star on these pages, and no Gaia star within 4″ within 3 mag. 5 of the 5 are within 0.30 of the target in BP−RP. Blue circles: Gaia DR3 stars G < 12.9, labeled with G.
Image: DSS2 red (POSS-II, STScI Digitized Sky Survey) via NASA SkyView. The mosaic header has no plate date.
Stars: ESA Gaia DR3 (VizieR I/355), positions shifted from epoch 2016.0 to J2000. Variables: AAVSO VSX (VizieR B/vsx), 18 Nov 2026.
Sean's Astronomy Shop, 18 November 2026.

Figure 4. Wide finder, DSS2 red via NASA SkyView. The red marks are TIC 64079704. Gold squares C1 to C5 are comparison stars from Gaia DR3.



	Gaia DR3	RA, Dec (J2000)	G	BP	RP	BP−RP	dist
T	2006670400733005696	22:31:02.5 +55:31:46.9	13.07	13.37	12.60	0.77	—
C1	2006482693483822720	22:31:11.9 +55:30:02.6	13.31	13.60	12.83	0.77	2.2′
C2	2006482624764225152	22:31:05.0 +55:29:27.6	12.25	12.49	11.86	0.63	2.3′
C3	2006671534604361344	22:31:05.0 +55:34:16.5	13.65	13.93	13.20	0.74	2.5′
C4	2006671500244618752	22:30:57.0 +55:34:10.8	12.59	12.83	12.19	0.65	2.5′
C5	2006647895103946880	22:30:42.4 +55:31:45.1	12.83	13.26	12.23	1.03	2.8′

Red ticks = target (T). Gold squares = comparison stars C1–C5: Gaia G within 1 mag of the target, RUWE < 1.4, no Gaia variability flag, no VSX entry within 10″, not a star on these pages, and no Gaia star within 4″ within 3 mag. 5 of the 5 are within 0.30 of the target in BP−RP. Blue circles: Gaia DR3 stars G < 15.9, labeled with G. Image: DSS2 red (POSS-II, STScI Digitized Sky Survey) via NASA SkyView. The mosaic header has no plate date. Stars: ESA Gaia DR3 (VizieR I/355), positions shifted from epoch 2016.0 to J2000. Variables: AAVSO VSX (VizieR B/vsx), 18 Nov 2026. Sean's Astronomy Shop, 18 November 2026.

Figure 5. Close finder, 8 by 8 arcmin, DSS2 red, to pick out the target.

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