TIC 64564609: likely δ Scuti star, possibly a δ Scuti–γ Doradus hybrid

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

Status: Variable star candidate, not an eclipsing binary. Found 18 Nov 2026 scan. Not filed with VSX. Not checked from the ground.

Abstract

TIC 64564609 (Tmag 10.052) showed 63 clean dips of at least 0.5 percent in TESS Quick-Look Pipeline photometry, so the 18 November 2026 scan around V345 Lac listed it among stars with repeated dips and no fold. A Lomb-Scargle amplitude spectrum of the full light curve, up to 50 cycles per day, shows that the dips are the low points of continuous variability, not separate eclipses. The strongest frequency is 28.555 c/d (3.0 ppt). The best guess from these data alone is: likely δ Scuti star, possibly a δ Scuti–γ Doradus hybrid. Nothing here has been checked from the ground or filed with VSX. The star is 2.141 degrees from V345 Lac, in the 2.10–2.20 degree ring.

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 scan searched each light curve with a 12-harmonic χ^2 periodogram (the multiharmonic approach of Rutkowski & Poleski 2026, computed with the finufft_chi2 backend of nifty-ls, Garrison et al. 2024) and a box least-squares (BLS) cross-check (Kovács, Zucker & Mazeh 2002). It also counted individual dips: at least five times the point scatter, at least three points, more than 0.3 days from a data gap, and not at a time when many stars dip together. TIC 64564609 did not pass as a periodic eclipse candidate, but it had 63 such dips of at least 0.5 percent. Its median dip depth was small enough that, on a star of its TIC radius, the body causing it could be under two Jupiter radii, so it first appeared in the planet-sized section of the "Possible planetary dips" page. A closer look at the light curve, below, moved it to the "Pulsating variables" page.

2. The star

TIC v8.2 gives RA 338.36768°, Dec +54.93530° (J2000), 22h 33m 28.24s, +54° 56′ 07.1″, Tmag = 10.052, T_{eff} = 8086 K and R = 2.16 $R_{\odot}$, with a contamination ratio of 0.609. From the scan positions of this star and of V345 Lac, the separation is 2.141 degrees, 128.4 arcmin, at position angle 82°, to the east. In 0.1-degree rings around V345 Lac it sits in the 2.10–2.20 degree ring. There is no VSX entry within 10 arcsec and no Gaia DR3 eclipsing binary within 5 arcsec. A VSX entry lies 10 to 30 arcsec away, Gaia DR3 2006392499172436992 (E), 25" away. At that distance it shares TESS pixels with this star.

3. What the scan measured

Quantity	Value
TESS sectors	16, 17, 57, 83, 84
12-harmonic χ^2 periodogram peak	0.42020 d, SNR 318
BLS peak	0.67878 d, SNR 94.8, depth 0.19%
Adopted fold and its box depth	0.67878 d, 0.15%
Raw spread (1st to 99th percentile)	1.49%
Point scatter, detrended	0.137% per cadence
Dip events (all; not near a gap)	69; 66
Clean dips ≥ 0.5%, off systematic times	63, depths 0.69–0.98%, median 0.76%
Spacing of consecutive clean dips	median 9.3 h (10th–90th percentile 6.7–66.0 h)
Scan flags	equal_minima_at_0.5(P/2 ambiguity); broad_dips(EW/ellipsoidal/rotation-like); chi2_peak

Table 1. Scan quantities for TIC 64564609, from the scan's own result file. Depths are not corrected for light from other stars.

4. Light-curve check

The light curve is the scan's cached QLP SAP flux, quality flag zero, each sector divided by its median, with no detrending. A Lomb-Scargle periodogram (Lomb 1976; Scargle 1982), as implemented in Astropy (Astropy Collaboration 2022), was computed from 0.05 to 50 cycles per day with a step of one fifth of the inverse time span. The strongest frequency was fitted with a sine wave and removed, and the search was repeated six times. The signal-to-noise ratio of each frequency is its amplitude divided by the mean amplitude of the residual spectrum within 1 c/d of it. Frequencies below about 0.2 c/d are near the TESS orbit and sector length and are treated as instrumental.

#	Frequency (c/d)	Period (d)	Amplitude (ppt)	SNR
1	28.5550	0.03502	3.02	190
2	2.9465	0.33939	2.01	44
3	3.2330	0.30932	1.08	29
4	3.1350	0.31898	0.85	25
5	3.0364	0.32934	0.75	23
6	0.1520	6.57722	0.57	11

Table 2. Frequencies of TIC 64564609 from iterative prewhitening, in the order found. Amplitudes are semi-amplitudes of the raw flux in parts per thousand.

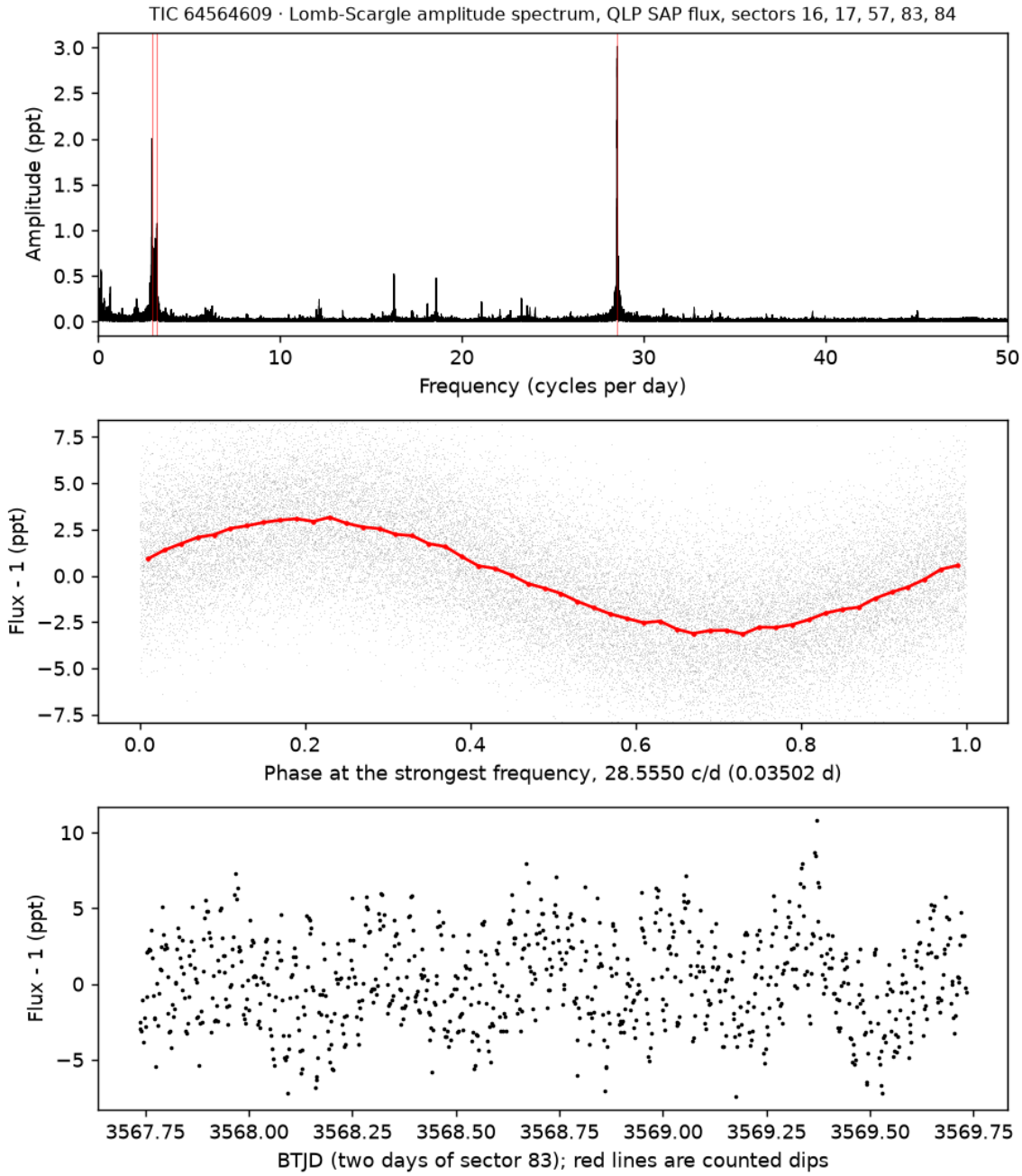


Figure 1. TIC 64564609. Top: amplitude spectrum to 50 c/d, with the three strongest frequencies marked. Middle: all data phased on the strongest frequency, with 50-bin medians in red. Bottom: two days of the best-sampled sector, with the counted dips marked. The dips sit at the low points of a continuous signal.

5. Best-guess classification

Likely δ Scuti star, possibly a δ Scuti–γ Doradus hybrid. The strongest frequency is 28.555 c/d (3.0 ppt), far above any eclipse or rotation timescale, with further power at 2.946, 3.233 and 3.135 c/d (0.9 to 2.0 ppt). High-frequency p-mode power plus low-frequency g-mode power in a star with a TIC temperature of 8086 K is the pattern of a δ Scuti star with γ Doradus modes. The fold on the scan period of 0.67878 days is a smooth wave. A VSX eclipsing binary 25 arcsec away shares TESS pixels with this star, but an eclipsing binary cannot make a 28.6 c/d signal.

This classification uses the TESS light curve and catalog values only. TESS pixels are 21 arcseconds wide, so the variability could come from a neighbor, and the TIC temperature and radius are photometric estimates. The amplitudes are not corrected for light from other stars. None of this has been checked from the ground.

6. Follow-up

This is not a request to time eclipses. Useful next steps are a few hours of time-series photometry with a small telescope to confirm the main frequency on the target itself, and a low-resolution spectrum for the spectral type. Results would decide whether the star belongs in VSX and under which type. Nothing in this note has been submitted to VSX.

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