

A search for periodic and quasi-periodic photometric behavior in the cataclysmic variable TT arietis

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Abstract

Observations of TT Ari obtained at 11 observatories (campaign TT Ari-94) during 258 hr were carried out to study optical variability on timescales from minutes to weeks. The best-fit primary photometric period determined from 16 nights of data obtained at the Dushak-Eregdag station of the Odessa State University is $P = 0d.133160 \pm 0d.000004$ with a mean amplitude of 0.0513 ± 0.0008 mag. This new primary photometric period is larger than that obtained during the TT Ari-88 campaign and is well outside the range of estimates published since 1961. Contrary to previous findings, the "5-7 hr" secondary photometric period is not seen. Our observations do show evidence for periods of 2d.916 and 0d.3040 with amplitudes of 43 and 25 mmag, respectively. The beat period between the spectroscopic and photometric periods is not seen. No coherent oscillations in the range $f = 10$ -2500 cycles day⁻¹ are found. The highest peaks in the power spectrum cover the wide range of 24-139 cycles day⁻¹. In the mean periodogram, the highest peak corresponds to 21 and 30 minutes for the largest sets of observations, i.e., those obtained at Odessa and Krakow Universities, respectively. In the instrumental B system, variations with an amplitude exceeding 0.011 mag occur 8 times (from 33 runs) at 24 minutes. We conclude that quasi-periodic variations occur at a few preferred timescales rather than at a relatively stable period with a secular decrease. In the frequency range 90-900 cycles day⁻¹, the power spectrum obeys a power law with a slope ranging from $\gamma = 1.3$ to 2.6 for different runs.

Keywords

Binaries: close, Stars: individual (TT Arietis), Stars: oscillations, Stars: variables: other