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SZ Lyn: New pulsational and orbital elements based on old and recent photometric observations

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SZ Lyncis (=HD 67390) is a high amplitude δ Scuti star, discovered by Hoffmeister in 1949. Van Genderen (1967) noticed that the residuals in the O-C diagrams followed a sinusoidal variation with a period of P_{orb} = 3.091 years. Several years later, Barnes & Moffett (1975) improved this period to P_{orb} = 3.138 years and suggested that the sinusoidal variations in the O-C diagrams, observed by van Genderen (1967), originate from the light travel time effect, since SZ Lyn is a member of a binary system. This hypothesis was confirmed by Bardin & Imbert (1984) with measurements of radial velocities. Soliman et al. (1986) found the pulsation period to be 0.120534896 days and the orbital period 1173.5 days.

From BVRI observations during the period January 1975 - March 1979, Moffett et al. (1988) estimated the pulsational period as 0.12052115 days, which is shorter than earlier determinations. The latest research was made by Paparo et al. (1988), who determined the pulsational and orbital elements of the system even better, using all available data from 1961 until 1988. In this paper we present the results of new CCD time-series photometry carried out at the University of Athens Observatory. Our new BVRI CCD photometric observations and those obtained by Derekas et al. (2003) and Hipparcos (ESA 1997) extended the time base of the data from 27 to 42 years (or from 8 to 14 revolutions of the system). The 165 times of maxima observed between 1961 and 2003 were used to calculate the pulsational and orbital elements of the binary system. A new ephemeris was calculated with the new times of maxima, derived from our light curves: t_{max}(HJD) = 2452776.289(10) + 0^d.1205349(41)×E;

From a least squares fit to all available O-C values we were able to calculate more precise values of the following parameters: the linear change in the star's pulsational period (β=2.90±0.22 × 10^{-12} days/cycle), the orbital period (P_{orb}=1179.3±2 days), the semimajor axis ($a \sin i$=0.998±0.04 AU), the eccentricity (e=0.205±0.010), the longitude and time of the periastron passage (ω=87.6±1.1 degrees and $T(HJD)$=2445699.8436±0.022) and the mass function $f(M)$=0.095±0.008.

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