

PULSATIONAL MODE IDENTIFICATION OF DELTA-SCUTI STAR-SZ LYN USING HIGH-RESOLUTION SPECTROSCOPY

D.A.D.D. Dissanayake¹, M.L.C. Attygalle^{1*} and J. Adassuriya²

¹*Department of Physics, University of Sri Jayewardenepura, Nugegoda, Sri Lanka.*

²*Department of Physics, University of Colombo, Colombo, Sri Lanka.*

*lattygalle@sjp.ac.lk

SZ Lyn (HD 67390) is a high-amplitude δ -Scuti type pulsating star in the constellation Lynx. A high-resolution spectroscopic study was conducted to identify radial and non-radial pulsation modes of the star. The high-resolution spectra were obtained with a spectral resolution of about 85,000 using the high efficiency and resolution mercator echelle spectrograph (HERMES) mounted on the 1.2 m Mercator telescope at the Roque de los Muchachos Observatory, La Palma, Spain. Three unblended metallic spectral lines, Ti II 4501.28 Å, Fe I 4957.59 Å and Fe II 4508.29 Å, were analysed using the FAMIAS software. Multiple analysis techniques were applied, including Fourier transforms, based on pixel-by-pixel analysis, computation of line moments, and least-squares fitting of line profiles to extract the pulsational properties of the star. The mode identification techniques, the Fourier parameter fit (FPF) method, and the moment method were applied to identify the pulsation modes. The Fourier parameter fit method indicated that the dominant pulsation mode of SZ Lyn was radial, with spherical degree $l = 0$ and azimuthal order $m = 0$. The result, supported with chi-squares values for the $l = 0$ and $m = 0$ combination, was obtained as 20.8493 for Ti II 4501.28 Å, 264.756 for Fe I 4957.59 Å and 10.091 for Fe II 4508.29 Å. The pulsational behavior of SZ Lyn was represented by the radial velocity curves and radius variation over phase. The findings confirmed the primary pulsation of SZ Lyn as a radial mode and demonstrated the significance of high-resolution spectroscopy in determining properties of the interior of the star.

Keywords: δ -Scuti stars, Fourier parameter fit method, High-resolution spectroscopy, Moment method, Pulsation modes