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SPECTRAL INVESTIGATIONS OF THE SYMBIOTIC STAR CH CYGNI IN 2014-2020

Abstract

The work is devoted to the investigation and analysis of possible long (about 15.4 years) and relatively short (about 2 years) periods in the variations of the radiation velocities of selected absorption lines in the spectrum of the CH Cyg symbiotic binary system. The spectra of the star CH Cyg were obtained in 2014-2020 with 14000 and 28000 resolutions at the 2-m telescope of the Shamakhi Astrophysical Observatory named after N.Tusi. In addition to these spectra, the ARAS spectral database was also used in the investigation of the 2-year period. In the investigation of the long period, the measured radial velocities of the absorption lines were used in the spectra obtained for the period of 60 years (1960-2020). By applying Fourier analysis, two periods were found in the orbital movement of the CH Cyg symbiotic system: a long period of 5670 days and a short period of 751 days. Currently, the working model of the CH Cyg star accepted by most researchers is a binary system model consisting of M6-7 cold red giant as the main component surrounded by a nebular shroud and a hot white dwarf acting as a satellite. Absorption lines characterize the main component of the symbiotic system - the quiet cold giant. Thus, a long period is a manifestation of the orbital motion of a giant star. There are two hypotheses regarding the nature of the short period of 751 days. According to the first hypothesis, the short period is the pulsation period of a giant star. According to the second hypothesis, the short period of 751 days can be the period of the 3rd star in the invisible inner orbit of a symbiotic pair of M giant and hot stars with a long period of 15.4 years. Still, both hypotheses retain the right to life. Using photometric observational material obtained from the AAVSO database. A period of 750 days was also found in the brightness of CH Cyg star. In the active phases of the brightness of the star CH Cyg – in 2015 and 2017, absorption jets of hydrogen accompanied by strong fluctuations in $H\alpha$, $H\beta$, $H\gamma$, as well as on the purple wing of the HeI5876 lines, the speeds of which reached (2500-3000) km/h were observed.