

FREQUENCY ANALYSIS OF DELTA SCUTI VARIABLE STARS. II.

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ABSTRACT. The Fourier analyses performed for photoelectric observations of two delta Scuti stars V1162 Ori and AV Cet show that these stars are multiperiodic with most significant frequencies identified as radial mode overtones and their linear combinations.

Key words: Stars: δ Scuti, RR Lyrae types, Fourier analysis.

I. V 1162 Ori (BD -7° 1108).

The star was discovered by P. Lampens (1985) at the research of Am stars. Then it was observed by T. Poretti et al. (1990). For seven nights 324 B-observations were obtained at the observatory Merato. These authors specify obvious presence of main frequency $f_1=12.71$ c/d and its harmonic $2f_1$. After they had been subtracted the power spectrum showed rather a complex structure about a centre with the frequency $f_2=11.28$ c/d. In taking account of this frequency gives no appreciable improvement of the root-mean-square remains. The deviations of individual curves from synthetic ones were considered to be rather random than systematic, and a conclusion was drawn that the star has a monopерiodic nature.

The author has recalculated these observations. Main frequency and two its significant harmonics were taken into account: $f_0=12.709$ (A=0.126 mag), $2f_0=25.418$ (A=0.015) and $3f_0=38.127$ (A=0.007). After their subtraction some more frequencies were identified: $1.5f_0=19.062$ (A=0.008) and $f_1=11.278$ (A=0.007). Other frequencies are present too, but their amplitudes are less than a standard deviation of one observation (0.005).

Thus, this delta Sct type star is multiperiodic. In addition to the main frequency, identified as the frequency $f_g=1.5$ fundamental one introduced by us earlier (Bezdenezhnyi, 1994), and two its harmonics $2f_g$ and $3f_g$ (as well as $1.5f_g$), there is one more frequency of the first overtone $f_{1H}=f_1$ as well as, probably, the harmonic of fundamental frequency $6f_F=50.832$ (A=0.005). Taking into account all this, it is clear, why the remains after the subtraction $f_0=f_g$ and $2f_0=2f_g$ were not reduced to one period ($P_1=P_{1H}$).

II. AV Cet (=HR401=44 Cet).

AV Cet was found as a short-periodic variable star of δ Sct type by Jorgensen et al. (1971). They have determined the amplitude of its light curve variations about 0.2 mag and approximate period of 0.07 days. Then the star was observed at 0.84-m Mexico telescope by Gonzalez-Bedolla et al. (1990) in V-system during four nights for 6 days' interval. 221 observations of the star were obtained with the average time between successive ones about 6 minutes. The authors of the above work have confirmed the light variation of AV Cet as δ Sct type star. They have done Fourier analysis of the observations and have found the main frequency $f_1=14.5930$ (P=0.0685), i.e. have confirmed and specified the uncertain period, given by their predecessors. After subtracting this frequency from the given observation data they have found the second frequency $f_2=19.1862$ ($P_2=0.0521$). The pulsational constants $Q_1=0.032$ and $Q_2=0.024$ have been calculated for the main period in a fundamental mode and for the first overtone, respectively.

Their ratio $Q_2/Q_1=0.75$, is close to that of two periods: $P_2/P_1=0.76$.

The author has analysed these observations too, and the following frequencies have been found: $f_F=14.598$ ($A=0.0045$), $f_{1H}=19.184$ ($A=0.0024$), the third frequency $f_g=1.5f_F=21.883$ ($A=0.0015$) being main at V1162 Ori. The ratio of fundamental frequency to the first overtone frequency $f_F/f_{1H}=0.761$. Besides, two more frequencies are found: probably, nonradial mode $f_{nr}=14.878$ ($A=0.0028$) and its multiple frequency $1/6f_{nr}=2.452$ ($A=0.0018$). The ratio of nonradial frequency to the fundamental one $f_{nr}/f_F=1.020$ coincides with that for the first two frequencies from five found for the $\theta 2$ Tau star (Breger et al., 1989): $f_2/f_1=1.019$.

Thus, AV Cet is a multiperiodic δ Sct type variable star.

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