

Six High-Amplitude Double-Mode Delta Scuti Variables

[A. V. Khruslov](#)
Tula, Russia

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(E-mail for contact: khruslov@bk.ru)

#	Name	Other	Coord (J2000)	Type	Max	Min	System	Period	Epoch (JD)	type	Sp	Comment	L.Curve	Find.Chart	Data
1		TYC 0075 01143 1	04 26 05.90, +01 26 26.2	DSCT(B)	12.2	12.75	V	(see Comments)	(see Comments)	max		Comm. 1	1.PNG		ASAS 042606+0126.4 NSVS 12210319
2		GSC 6009-00089	08 18 06.98, -22 14 07.7	DSCT(B)	12.05	12.8	V	(see Comments)	(see Comments)	max		Comm. 2	2.PNG		ASAS 081807-2214.1
3		TYC 8177 00131 1, HD 77906	09 03 13.34, -52 02 28.7	DSCT(B)	9.60	9.95	V	(see Comments)	(see Comments)	max	A9V	Comm. 3	3.PNG		ASAS 090313-5202.5
4		TYC 7909 00809 1	18 25 36.26, -42 13 35.8	DSCT(B)	11.43	12.0	V	(see Comments)	(see Comments)	max		Comm. 4	4.PNG		ASAS 182536-4213.6
5		TYC 8769 01343 1	19 22 27.39, -56 22 28.1	DSCT(B)	11.64	12.08	V	(see Comments)	(see Comments)	max		Comm. 5	5.PNG		ASAS 192227-5622.5
6		TYC 1103 01012 1, BD+08 4583	20 58 49.64, +08 54 05.3	DSCT(B)	10.21	10.51	V	(see Comments)	(see Comments)	max	F0	Comm. 6	6.PNG		ASAS 205850+0854.1 NSVS 11548864 NSVS 14320267

Comments:

1. Type EC/DSCT (contact binary or Delta Scuti star) with the period of 0.07443 days in the ASAS-3 catalog. Actually it is a DSCT(B) star.

Mode	Frequency, c/d	Semi-amplitude V, mag	Period, days	Epoch, JD
f_0	13.43542	0.126	0.0744301	2453600.043
f_1	17.27023	0.062	0.0579031	2453600.049

The period ratio of the first overtone and fundamental modes is $P_1/P_0 = 0.7780$. $B-V = 0.320$ (Tycho2), $J-H = 0.204$ (2MASS). ROTSE-I/NSVS data gives similar results.

2. Type DSCT with the period of 0.228712 days in the ASAS-3 catalog. Actually it is a DSCT(B) star.

Mode	Frequency, c/d	Semi-amplitude V, mag	Period, days	Epoch, JD
f_0	4.372259	0.213	0.2287147	2453600.173
f_1	5.739401	0.071	0.1742342	2453600.055
$f_1 + f_0$	10.11165	0.039	0.0988958	2453600.097
$f_1 - f_0$	1.36715	0.029	0.73145	2453600.390
$f_1 + 2f_0$	14.48392	0.023	0.0690421	2453600.056

The period ratio of the first overtone and fundamental modes is $P_1/P_0 = 0.7618$. $J-H = 0.184$ (2MASS).

3. Type DSCT with the period of 0.077459 days in the ASAS-3 catalog. Actually it is a DSCT(B) star.

Mode	Frequency, c/d	Semi-amplitude V, mag	Period, days	Epoch, JD
f_1	12.91006	0.128	0.0774590	2453600.046
f_2	16.01309	0.017	0.0624489	2453600.022
$f_2 + f_1$	28.92313	0.008	0.0345744	2453600.038

The period ratio of the second and first overtone modes is $P_2/P_1 = 0.8062$. $B-V = 0.414$ (Tycho2), $J-H = 0.127$ (2MASS).

4. Type DSCT with the period of 0.107193 days in the ASAS-3 catalog. Actually it is a DSCT(B) star.

Mode	Frequency, c/d	Semi-amplitude V, mag	Period, days	Epoch, JD
f_0	9.328933	0.180	0.1071934	2453600.038
f_1	12.171210	0.051	0.0821611	2453600.018
$f_1 + f_0$	21.50015	0.025	0.0465113	2453600.024
$f_1 - f_0$	2.842290	0.013	0.351829	2453600.300

The period ratio of the first overtone and fundamental modes is $P_1/P_0 = 0.7665$. $B-V = 0.417$ (Tycho2), $J-H = 0.172$ (2MASS).

5. Type DSCT with the period of 0.149089 days in the ASAS-3 catalog. Actually it is a DSCT(B) star.

Mode	Frequency, c/d	Semi-amplitude V, mag	Period, days	Epoch, JD
f_0	6.707367	0.091	0.1490898	2453600.025
f_1	8.867599	0.066	0.1127701	2453600.011
$f_1 + f_0$	15.57492	0.021	0.0642058	2453600.013

The period ratio of the first overtone and fundamental modes is $P_1/P_0 = 0.7564$. $B-V = 0.402$ (Tycho2), $J-H = 0.148$ (2MASS).

6. Type DSCT with the period of 0.176448 days in the ASAS-3 catalog. Actually it is a DSCT(B) star.

Mode	Frequency, c/d	Semi-amplitude V, mag	Period, days	Epoch, HJD
f_1	5.66738	0.071	0.1764484	2453745.115
f_2	7.10332	0.055	0.1407792	2453745.077
$f_1 + f_2$	12.77076	0.010	0.0783039	2453745.012

The period ratio of the second and first overtone modes is $P_2/P_1 = 0.7978$. $B-V = 0.399$ (Tycho2), $J-H = 0.149$ (2MASS). The ROTSE-I/NSVS data (Wozniak et al. 2004) with photometric correction flags (usually rejected) were kept for the analysis.

Remarks:

I present an investigation of six known DSCT variables. The variability of these stars was reported by Pojmanski (2002).

I re-analysed ASAS-3 and NSVS data using the period-search software developed by Dr. V.P. Goranskij for Windows environment. According to ASAS-3 (Pojmanski 2002) and ROTSE-I/NSVS (Wozniak et al. 2004) data, the variables are high-amplitude double-mode Delta Scuti stars.

The period ratios P_1/P_0 and P_2/P_1 are typical for radially pulsating high-amplitude double-mode Delta Scuti stars (Petersen & Christensen-Dalsgaard 1996). In certain cases, multiple frequencies or frequencies connected with interactions between the two main modes were found (see the Comments).

References:

- Petersen, J.O., Christensen-Dalsgaard, J., 1996, *Astron. and Astrophys.*, 312, 463
Pojmanski, G., 2002, *Acta Astronomica*, 52, 397
Wozniak, P.R., Vestrand, W.T., Akerlof, C.W., et al., 2004, *Astron. J.*, 127, 2436