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THE DOUBLE-MODE CEPHEID BQ Ser

Wenzel (1966) and Szabados (1975) observed the double-mode Cepheid BQ Ser in the UBV system, but did not publish the data. Because only twelve such stars are known to exist, it is important that a reddening be accurately determined so that the star can be placed in the H-R diagram. For this purpose, we observed BQ Ser in the Johnson UBV and Kron-Cousins VRI systems with the 0.5-m reflector of the South African Astronomical Observatory (Table I). As standards we used HD171367 (V = 7.644, B-V = 1.165, U-B = 1.009, V-R = 0.624, V-I = 1.215) and HD172365 (V = 6.373, B-V = 0.794, U-B = 0.502, V-R = 0.442, V-I = 0.856). The magnitudes and colours of these two stars were obtained by observing E-region standards.

Power spectrum analysis confirmed the periods already obtained for this star: we find P_0 = 4.283 and P_1 = 3.012 days. Because the older data are not published. these periods could not be refined. Fourier analysis gives the following amplitudes and phases:

m	m_0	A_0	ϕ_0	A_1	ϕ_1
V	9.499	0.183	-0.249	0.107	0.238
B-V	1.446	0.079	-0.221	0.047	0.267
U-B	1.039	0.075	-0.201	0.047	0.283
V-R	0.876	0.045	-0.198	0.026	0.290
V-I	1.732	0.074	-0.212	0.044	0.267

where $m = m_0 + A_0\cos 2\pi(t/P_0+\phi_0) + A_1\cos 2\pi(t/P_1+\phi_1)$ and the time t is measured from JD2445000.000.

Using the relations given in Dean, Warren and Cousins (1978), we obtain $\langle B-V\rangle_0$ = 0.626, $\langle V-I\rangle_0$ = 0.656. The star is very heavily reddened with E_{B-V} = 0.82. Caldwell's (1983) PLC relationship gives M_V = -2.90. This places BQ Ser very near the red edge of the instability strip and shows that it is considerably cooler than any of the other double-mode Cepheids.

Table I

Observations of BQ Ser.

HJD-2445000	V	B-V	U-B	V-R	V-I
823.660	9.581	1.502		0.887	1.758
825.663	9.183	1.314		0.797	1.598
828.662	9.534	1.447		0.867	1.731
829.669	9.314	1.338		0.834	
859.624	9.265	1.337		0.849	1.659
860.623	9.549	1.481		0.925	1.788
861.617	9.635	1.497		0.922	1.791
862.620	9.516	1.444		0.911	1.755
866.623	9.757	1.528		0.974	1.853
892.425	9.543	1.452		0.882	1.747
893.420	9.470	1.435	1.029	0.843	1.677
897.410	9.506	1.416	0.992	0.860	1.714
922.375	9.557	1.442	1.023	0.875	1.743
923.358	9.407	1.408	1.016	0.840	1.698
924.395	9.451	1.422	0.995	0.859	1.714
925.380	9.497	1.454	1.055	0.889	1.737
926.357	9.649	1.508	1.122	0.902	1.799
927.324	9.557	1.450	1.015		
929.373	9.548	1.485	1.076	0.891	1.773
930.276	9.759	1.575	1.149	0.921	1.829
936.307	9.407			0.848	1.693
939.323	9.776	1.558	1.149	0.903	1.792
940.316	9.233	1.320	0.942	0.770	1.580
957.248	9.576	1.451	1.035	0.885	1.763
958.266	9.223	1.327	0.950	0.805	1.630

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