

Be AND SHELL STARS OBSERVED WITH THE THIRTEEN-COLOR PHOTOMETRIC SYSTEM. II.

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RESUMEN

Se presentan medidas fotométricas individuales de 13-colores para 89 estrellas Be y estrellas con envoltante (shell stars) observadas en el observatorio en San Pedro Mártir. Se discuten procedimientos observacionales, técnicas de reducción y problemas de transformación para varios colores. 22 estrellas definitivamente muestran variabilidad fotométrica usando estos nuevos datos.

ABSTRACT

Individual 13-color photometric measurements for 89 Be and shell stars observed at the observatory at San Pedro Mártir are presented. Observing procedures, reduction techniques and transformation problems for several colors are discussed. 22 stars show definite photometric variability using this new data.

Key Words: STARS-Be – 13-COLOR PHOTOMETRY – VARIABILITY

I. INTRODUCTION

In Schuster and Alvarez (1983, Paper I) average 13-color data for 86 Be and shell stars as well as a discussion of the spectral-energy changes of the 16 most variable stars were presented. In that paper, and in Alvarez and Schuster (1981, 1982), the usefulness of the 13-color photometric system for studying Be and shell stars has been shown. The 13 filters range in effective wavelength from 3370 Å to 1.1 μm and provide good measures of the stars' ultraviolet, visible, red and near-infrared continuum variabilities. There are photometric indices which span the Balmer and Paschen jumps and which give the slopes of the Balmer, Paschen and Brackett continua while avoiding most of the strong line features in the spectra of early-type stars.

In addition, intrinsic 13C colors have been derived for normal B stars (Schuster 1984a) providing a basis for the study of color excesses of Be and shell stars. Methods for separating the intrinsic color excesses from interstellar reddening are being studied and once completed will allow more detailed analyses of the physical emission processes in the stellar envelopes. Preliminary results (Alvarez and Schuster 1981) indicate that the stars are most variable at wavelengths where the intrinsic excesses are largest. Probably the same processes, such as H^- free-free and bound-free emission and Balmer and Paschen continuum emission, are responsible for both the intrinsic excesses and variability.

Also, in Schuster (1984a) it has been shown that the 13C system can be used to obtain intrinsic colors, reddening values, approximate MK spectral types, effective temperatures, absolute visual magnitudes, surface gravities, distances and angular and linear diameters for normal B stars. With only a few assumptions most of these techniques can be applied to Be and shell stars. More detailed descriptions of the 13C photometric system and its uses are given in Johnson, Mitchell, and Latham (1967), Mitchell and Johnson (1969), Johnson and Mitchell (1975), and Schuster (1982a).

In this paper are presented new, individual observations for 89 Be and shell stars made during the years 1980 to 1983. 79 stars were observed using the red (6RC) photometer with the original filters and 64 with the new filter set No. 1. For 27 stars the 13C photometry has been completed by observing also with the blue (8C) photometer using the new filter set No. 1. However, the 6RC and 8C observations were not made simultaneously; the 8C data was taken in March 1981 and April 1983 and the 6RC data during several observing runs from September 1980 to April 1983.

II. OBSERVING AND REDUCTION TECHNIQUES

The observing procedures were those of Schuster (1982a). Generally the 84-cm and 1.5-m telescopes of

the San Pedro Mártir observatory and the D.C. amplifier No. 1 were used for these observations. For two nights of 6RC observing (19/20 and 20/21 September 1982) the amplifier No. 4 was substituted. Many of the β Lyrae (BS 7106) observations and three nights of 8C observations (23/24, 24/25 and 27/28 March 1981) were made with the 2.12-m telescope. The original photometers and photomultipliers were always employed, and until February 1981 also the original filters. Starting in March 1981 the original filters were replaced by the new filter set No. 1.

Data taken with the original filters were reduced totally and easily using the procedures of Schuster (1982a). The preliminary reductions of the data observed with the new filters also followed these precepts, but the final reductions were carried out according to the ideas discussed in Schuster and Guichard (1984), forcing the mean color coefficients from their Table 3. In the re-reductions of the 8C photometry the standard stars were used to calculate solely the zero points of the transformation and the corrections to the mean extinction. For the 6RC data only the standard stars and color coefficients measured at the same high voltage as the program stars were included in the re-reductions. For the years 1981 and 1983 mean annual atmospheric extinction values were used, but during 1982 the extinction was more variable, and the nightly extinction values of the preliminary reductions were forced in the final 6RC solutions.

The above iterative process was necessary since the natural photometric systems of several of the new 13C colors, namely (33 - 52), (40 - 52) and especially (37 - 52), did not transform linearly onto the standard 13C system. In Schuster and Guichard (1984) an analysis of the transformation residuals for the new 13C filter set No. 1 has been made for the early-type stars as a function of the stellar effective temperatures and surface gravities (or luminosities). These analyses were based upon the multiple, independent observations of the primary 13C standard stars (Table 1, Schuster 1982a) used to reduce the individual nights and upon the observations of 33 secondary standard stars from the lists of Johnson and Mitchell (1975) and Schuster (1976, 1979 and 1984b) re-observed during two nights of April 1983. The Be stars were not included.

For each primary or secondary standard star the transformation residuals from the better photometric nights were averaged. Each residual was the difference between the standard or old 13C value and a new value measured with the new filters and reduced iteratively as described. For the B stars equations of the form $\langle \text{Res} \rangle = a\ell + b\tau + c$ were solved by least-squares, where $\langle \text{Res} \rangle$ are the average residuals, and $\ell = (37 - 45) - 0.467(40 - 58)$ and $\tau = (35 - 40) - 0.304(40 - 58)$ are the reddening-free luminosity and temperature indices of Schuster (1984a), respectively. For the spectral and luminosity range of the classical Be stars, B0-B9 and V-III,

the following solutions give the best fits to the transformation residuals:

- (a) For 33 - 52: $a = 0, b = -0.0202, c = -0.0110,$
- (b) For 37 - 52: $a = 0, b = -0.0699, c = -0.0377,$
- and
- (c) For 40 - 52: $a = 0, b = +0.0328, c = +0.0178.$

(This is solution 5 of Schuster and Guichard 1984). More general solutions which include A-type and supergiant (Ib) stars but which do not fit as well the lower luminosity B-type stars are the following:

- (a) For 33 - 52: $a = -0.0237, b = -0.0031, c = -0.0099,$
- (b) For 37 - 52: $a = -0.1322, b = 0.0247, c = -0.0309,$ and
- (c) For 40 - 52: $a = +0.0417, b = -0.0064, c = +0.0165.$

Residuals, or corrections, calculated using the above coefficients should be added to the 8C values given below in Table 1 to more nearly transform onto the standard 13C system.

In Figures 1 and 2 the (37 - 52) values of 16 Be stars observed with the new filters are plotted without and with the corrections of the first solution above, respectively, and against their original (37 - 52) values (Schuster and Alvarez 1983). The photometrically most varia-

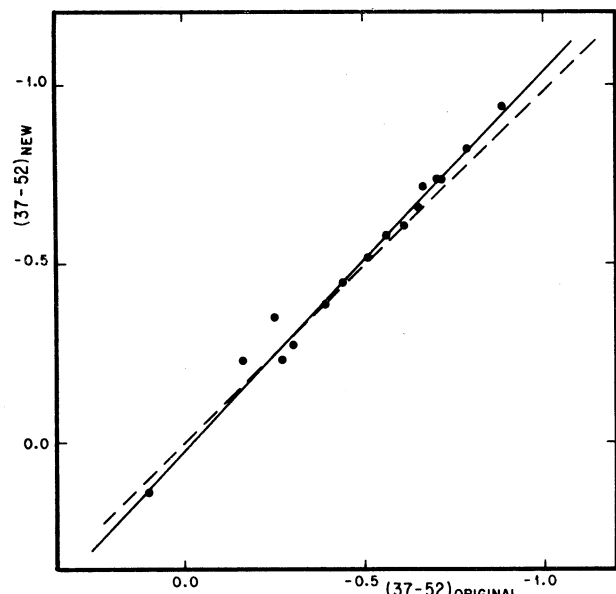


Fig. 1. The average values of (37 - 52) observed with the new 13C filters (set No. 1) are plotted against the original (37 - 52) values of Schuster and Alvarez (1983) for 16 Be stars. The photometrically most variable Be stars of Alvarez and Schuster (1982) have been excluded. The dashed line has a slope of unity, and the solid line is a least-squares fit to the data.

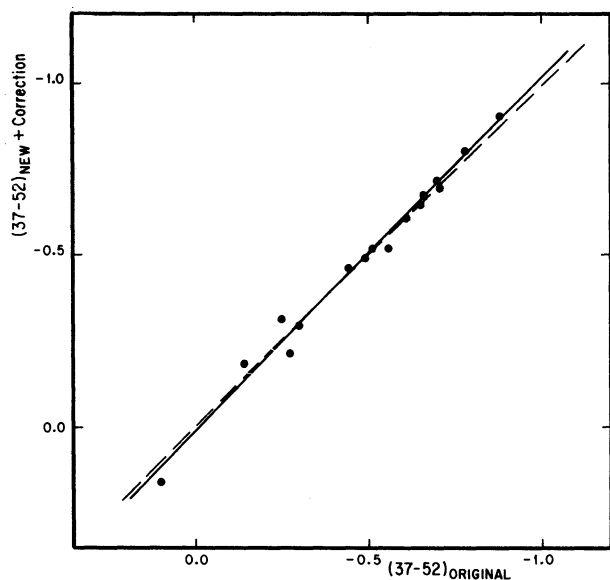


Fig. 2. The same as Figure 1 except that the new $(37 - 52)$ values have been corrected using the first solution given in the text. This is the solution number 5 of Schuster and Guichard (1984) which corrects the transformation residuals of normal B-type stars, luminosity classes V-III.

ble Be stars from Alvarez and Schuster (1982) have not been included. The emission lines only slightly affect the $(37 - 52)$ color and the ℓ and τ indices, even for the strongest emission-line stars (Hubert-Delplace and Hubert 1979), and so the transformation corrections for $(37 - 52)$, calculated using normal B stars, should improve even the data for Be stars. In Figures 1 and 2 the dashed lines have slopes of unity, and the solid lines show least-squares adjustments to the data. Obviously, the agreement between photometric values taken with the original and new filters is better when the above corrections are applied.

The $(33 - 52)$ color also is only slightly affected by the emission lines, but $(40 - 52)$ somewhat more. With only one exception (the 63 filter) the wavelengths and band-passes of the original 13C filters were chosen such that they avoid the principal emission lines of the Be stars, $H\alpha$, $H\beta$, and $H\gamma$. All other emission lines are weak compared to these. $H\delta$ emission, if any, enters into the 40 measurement, the He I line at 5876 \AA affects slightly the 58 photometry, and weaker iron and other emission lines contribute to a small degree to other filter measures (Hubert-Delplace and Hubert 1979). The transformation corrections for $(33 - 52)$ and $(40 - 52)$ are smaller than those of $(37 - 52)$ and cannot be accurately tested with only a small sample of Be stars. Also, $(33 - 52)$ measures the Balmer jump which is one of the more variable features of the Be and shell stars (Schuster and Alvarez 1983).

The Be star observations were not included in the solutions for the transformation residuals due to the

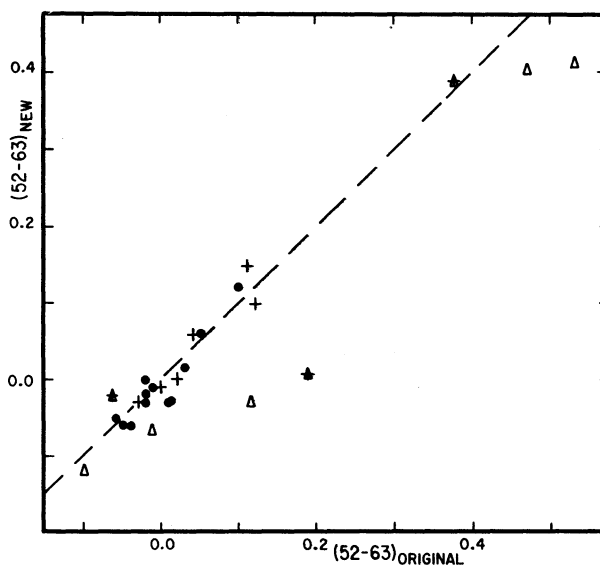


Fig. 3. The $(52 - 63)$ values observed with the new 13C filters are plotted against the original $(52 - 63)$ values of Schuster and Alvarez (1983). Be stars with strong emission lines (Hubert-Delplace 1976) are shown as triangles, the photometrically more variable Be stars (Alvarez and Schuster 1982) by pluses, and other Be or shell stars by circles.

possible photometric variability of most Be stars (Feinstein and Marraco 1979; Alvarez and Schuster 1981). In addition, filters that measure spectral regions with emission lines might have transformation problems different from those detected for the normal B stars. For the colors $(33 - 52)$, $(37 - 52)$ and $(40 - 52)$ such differences have not been detected with the present data, and the given corrections should be applied to the Be star photometry. However, for one other color the Be stars do have a transformation problem unlike the normal B-type stars.

In Figure 3, $(52 - 63)$ values observed with the new filters are plotted against the original values. The original 63 filter is a long-pass glass filter, and the long wavelength side of the filter-detector response function is defined strictly by the falling sensitivity of the 1P21 detector. The 10% level of the response function occurs approximately at a wavelength of 6700 \AA . The new 63 filter is an interference filter which cuts more sharply on the long wavelength side; the 10% level falls at about 6450 \AA . For Be stars with strong $H\alpha$ emission, which are not uncommon, the original $(52 - 63)$ values contain significant effects of the line emission while values measured with the new 63 filter do not. This is clearly seen in Figure 3 for several Be stars classified as having strong emission lines (Hubert-Delplace 1976). This type of transformation problem is not correctable using only our 13C continuum photometry, but one should be aware of the effect in this new data. The new 63 filter gives a cleaner measure of the stellar continuum radiation of Be stars than does the original filter.

III. THE DATA

Tables 1, 2 and contain our most recent 13C observations of Be stars made during the years 1980-1983. Table 1 holds the reduced photometry from the new 8C filters, Table 2 from the old 6RC filters and Table 3 from the

new 6RC filters. The transformation corrections should be calculated and added to the (33 - 52), (37 - 52) and (40 - 52) values of Table 1. Observations taken with the new 6RC filters transform well onto the standard 13C system without correction (Schuster and Guichard 1984).

TABLE 1
8C PHOTOMETRY OF Be STARS - NEW FILTERS

Number of Star	Cat.	52		33 - 52		35 - 52		37 - 52		40 - 52		Air Mass		Julian Date				
		58	52	52	58	52	58	52	58	52	58	52	58	52	58	52	58	
45314	HD	7.160	-1.297	-1.204	-0.750	-0.514	-0.135	-0.059	1.886	15444.6825	04133	BS	3.858	-1.501	-1.371	-0.948	-0.200	15441.7790
45314	HD	7.152	0.005	0.031	0.067	-0.067	-0.069	-0.059	1.886	15444.6825	04133	BS	3.919	-0.063	-0.081	-0.014	-0.109	15441.7790
45314	HD	7.224	-1.303	-1.198	-0.755	-0.063	-0.063	-0.063	1.750	15446.6679	04133	BS	3.847	-1.470	-1.346	-0.932	-0.188	15443.7578
45314	HD	7.230	-0.008	-0.019	0.062	-0.079	-0.079	-0.079	1.750	15446.6679	04133	BS	3.884	-0.040	-0.053	-0.067	-0.100	15443.7578
02568	BS	5.841	-0.700	-0.641	-0.514	-0.135	-0.135	-0.135	1.482	15440.7081	04287	BS	3.775	-0.832	-0.781	-0.605	-0.161	15467.8539
02568	BS	5.861	-0.018	-0.033	-0.007	-0.044	-0.044	-0.044	1.482	15440.7081	04287	BS	3.811	-0.036	-0.024	-0.005	-0.172	15467.8539
02568	BS	5.899	-0.705	-0.646	-0.512	-0.137	-0.137	-0.137	1.523	15441.7112	04287	BS	3.816	-0.036	-0.024	-0.005	-0.172	15467.8539
02568	BS	5.855	-0.704	-0.632	-0.519	-0.138	-0.138	-0.138	1.523	15441.7112	04287	BS	3.770	-0.918	-0.885	-0.616	-0.153	15450.7564
02568	BS	5.879	-0.023	-0.024	-0.004	-0.037	-0.037	-0.037	1.532	15443.7067	04287	BS	3.810	-0.039	-0.031	-0.017	-0.015	15450.7564
51480	HD	7.038	-0.626	-0.595	-0.368	-0.283	-0.283	-0.283	1.943	15443.6568	04787	BS	3.822	-0.035	-0.032	-0.008	-0.021	15451.7461
51480	HD	6.847	0.186	0.400	0.224	-0.018	-0.018	-0.018	1.943	15443.6568	05778	BS	4.123	-0.903	-0.814	-0.593	-0.173	15468.0181
51480	HD	6.970	-0.454	-0.463	-0.328	-0.288	-0.288	-0.288	2.022	15444.6595	05778	BS	4.163	-0.040	-0.062	-0.033	-0.068	15468.0181
51480	HD	6.772	0.194	0.402	0.236	0.021	0.021	0.021	2.022	15444.6595	05778	BS	4.130	-0.903	-0.825	-0.585	-0.181	154691.8858
51480	HD	7.129	-0.636	-0.603	-0.345	-0.326	-0.326	-0.326	2.461	15446.6761	05778	BS	4.170	-0.040	-0.076	-0.036	-0.064	154691.8858
51480	HD	6.943	0.181	0.419	0.248	-0.014	-0.014	-0.014	2.461	15446.6761	05778	BS	4.112	-0.891	-0.804	-0.571	-0.170	15440.9405
53367	HD	7.148	-0.680	-0.712	-0.277	0.381	0.381	0.381	2.030	15443.6675	05778	BS	4.142	-0.029	-0.051	-0.031	-0.072	15440.9405
53367	HD	7.034	-0.260	-0.710	-0.272	0.364	0.364	0.364	2.030	15443.6675	05778	BS	4.126	-0.890	-0.799	-0.575	-0.178	15440.9405
53367	HD	7.034	-0.260	-0.710	-0.272	0.364	0.364	0.364	2.030	15443.6675	05778	BS	4.141	-0.048	-0.093	-0.050	-0.106	15441.8784
53367	HD	6.814	0.214	0.419	0.306	0.047	0.047	0.047	2.097	15444.6688	05778	BS	4.153	-0.824	-0.750	-0.560	-0.160	15441.8784
53367	HD	7.198	-0.686	-0.710	-0.248	0.380	0.380	0.380	2.553	15446.6841	05778	BS	4.127	-0.042	-0.042	-0.015	-0.072	15443.8943
53367	HD	6.982	0.210	0.403	0.310	0.044	0.044	0.044	2.553	15446.6841	05778	BS	4.127	-0.042	-0.042	-0.015	-0.072	15443.8943
02817	BS	6.446	-1.359	-1.236	-0.826	-0.254	-0.254	-0.254	1.464	15440.6981	141569	HD	7.151	0.083	0.070	0.182	0.088	15440.9489
02817	BS	6.534	-0.089	-0.123	-0.064	-0.099	-0.099	-0.099	1.464	15440.6981	141569	HD	7.089	0.066	0.114	0.046	0.014	15440.9489
02817	BS	6.502	-1.379	-1.254	-0.833	-0.262	-0.262	-0.262	1.400	15441.6872	141569	HD	7.134	0.092	0.084	0.200	0.103	15443.9113
02817	BS	6.592	-0.091	-0.129	-0.057	-0.104	-0.104	-0.104	1.400	15441.6872	141569	HD	7.068	0.069	0.127	0.054	0.008	15443.9113
02817	BS	6.460	-1.374	-1.244	-0.832	-0.269	-0.269	-0.269	1.532	15443.6975	05938	BS	5.710	-0.606	-0.569	-0.461	-0.152	14687.9208
02817	BS	6.527	-0.068	-0.112	-0.064	-0.107	-0.107	-0.107	1.532	15443.6975	05938	BS	5.736	-0.026	-0.041	-0.027	-0.021	14687.9208
04123	BS	5.854	-0.235	-0.209	-0.238	-0.036	-0.036	-0.036	1.650	15441.6786	05938	BS	5.715	-0.621	-0.574	-0.452	-0.154	14691.9023
04123	BS	5.661	-0.006	0.006	-0.006	-0.023	-0.023	-0.023	1.640	15441.7696	05938	BS	5.745	-0.029	-0.047	-0.033	-0.026	15461.8761
04123	BS	5.638	-0.207	-0.187	-0.225	-0.080	-0.080	-0.080	1.519	15443.7422	162428	HD	7.144	-0.013	-0.020	-0.016	-0.044	15440.9853
04123	BS	5.630	0.012	0.021	0.006	-0.015	-0.015	-0.015	1.519	15443.7422	162428	HD	7.112	-0.798	-0.750	-0.462	-0.125	15443.9909
04123	BS	5.630	0.012	0.021	0.006	-0.015	-0.015	-0.015	1.519	15443.7422	162428	HD	7.098	0.013	0.020	-0.035	-0.007	15443.9909
04133	BS	3.809	-1.498	-1.380	-0.966	-0.200	-0.200	-0.200	1.163	15467.8189	06664	BS	6.702	-0.646	-0.572	-0.548	-0.187	15440.9960
04133	BS	3.853	-0.048	-0.065	-0.098	-0.087	-0.087	-0.087	1.163	15467.8189	06664	BS	6.727	-0.023	-0.042	-0.029	-0.062	15440.9960
04133	BS	3.851	-1.498	-1.389	-0.972	-0.211	-0.211	-0.211	1.124	15468.8013	06664	BS	6.728	-0.631	-0.566	-0.543	-0.180	15443.9863
04133	BS	3.887	-0.040	-0.052	-0.014	-0.084	-0.084	-0.084	1.124	15468.8013	06664	BS	6.686	-0.007	-0.025	-0.032	-0.052	15443.9863
04133	BS	3.853	-1.467	-1.357	-0.934	-0.195	-0.195	-0.195	1.184	15440.7653	06984	BS	6.101	-0.931	-0.840	-0.548	-0.166	15441.0041
04133	BS	3.897	-0.047	-0.069	-0.007	-0.105	-0.105	-0.105	1.184	15440.7653	06984	BS	6.118	-0.017	-0.033	-0.032	-0.076	15441.0041

Be AND SHELL STARS

TABLE 1 (CONTINUED)

Number of Star	Cat.	52 58	33-52 52-58	35-52 52-63	37-52 45-52	40-52 33-35	Air Mass	Julian Date	Number of Star	Cat.	52 58	33-52 52-58	35-52 52-63	37-52 45-52	40-52 33-35	Air Mass	Julian Date
06984	BS	6.080	-0.905	-0.828	-0.550	-0.167	1.030	15443.9752	07106	BS	4.245	-0.652	-0.658	-0.544	0.015	1.207	14850.7666
06984	BS	6.088	-0.009	-0.015	-0.031	-0.062	1.030	15443.9752	07106	BS	4.138	0.106	0.125	0.087	0.023	1.207	14850.7666
173371	HD	6.919	-0.481	-0.439	-0.373	-0.057	1.174	15441.0120	07106	BS	3.616	-0.772	-0.778	-0.590	-0.051	1.096	15140.7807
173371	HD	6.887	-0.033	0.055	0.026	-0.033	1.174	15441.0120	07106	BS	3.522	0.092	0.099	0.049	0.024	1.096	15140.7807
173371	HD	6.896	-0.470	-0.436	-0.371	-0.064	1.176	15444.0017	07106	BS	3.672	-0.786	-0.793	-0.617	-0.076	1.174	15142.7507
173371	HD	6.844	0.052	0.072	0.026	-0.025	1.176	15444.0017	07106	BS	3.581	0.089	0.098	0.034	0.028	1.174	15142.7507
07106	BS	3.741	-0.776	-0.784	-0.608	-0.061	1.002	14778.8594	07106	BS	3.503	-0.825	-0.823	-0.605	-0.058	1.130	15143.7608
07106	BS	3.650	0.087	0.089	0.032	0.032	1.002	14778.8594	07106	BS	3.424	0.077	0.097	0.046	-0.002	1.130	15143.7608
07106	BS	3.854	-0.792	-0.800	-0.611	-0.058	1.002	14779.8588	07106	BS	3.470	-0.791	-0.781	-0.574	-0.032	1.006	15441.0188
07106	BS	3.766	0.085	0.096	0.032	0.032	1.002	14779.8588	07106	BS	3.371	0.095	0.122	0.059	0.003	1.006	15441.0188
07106	BS	3.603	-0.827	-0.821	-0.621	-0.071	1.001	14780.8446	07106	BS	3.414	-0.779	-0.765	-0.568	-0.029	1.033	15443.9825
07106	BS	3.517	0.083	0.091	0.030	0.017	1.001	14780.8446	07106	BS	3.317	0.093	0.130	0.063	-0.001	1.033	15443.9825
07106	BS	3.448	-0.778	-0.766	-0.599	-0.055	1.214	14848.7736	184279	HD	7.066	-1.068	-1.000	-0.641	0.012	1.177	15450.9951
07106	BS	3.398	0.050	0.066	0.047	0.009	1.214	14848.7736	184279	HD	6.961	0.101	0.153	0.112	-0.048	1.177	15450.9951
07106	BS	3.723	-0.695	-0.683	-0.574	-0.039	1.185	14849.7640	184279	HD	7.038	-1.075	-1.009	-0.620	0.014	1.193	15451.9837
07106	BS	3.669	0.055	0.061	0.057	0.005	1.185	14849.7640	184279	HD	6.944	0.089	0.145	0.108	-0.046	1.193	15451.9837

TABLE 2

6RC PHOTOMETRY OF Be STARS - OLD FILTERS

Number of Star	Cat.	58 58	58-80 58-72	58-86 99-110	58-99 --	58-110 --	Air Mass	Julian Date	Number of Star	Cat.	58 58	58-80 58-72	58-86 99-110	58-99 --	58-110 --	Air Mass	Julian Date
0 698	HD	7.010	0.300	0.332	0.330	0.363	1.161	14503.8850	01087	BS	4.255	0.041	0.015	0.000	0.000	1.055	14502.9984
0 698	HD	7.010	0.205	0.035	0.000	0.000	1.161	14503.8850	01087	BS	4.306	0.087	0.075	-0.004	0.016	1.048	14504.9782
0 698	HD	7.072	0.294	0.341	0.321	0.389	1.140	14504.8637	01087	BS	4.305	0.045	0.023	0.000	0.000	1.048	14504.9782
0 698	HD	7.072	0.205	0.069	0.000	0.000	1.140	14504.8637	01180	BS	5.204	-0.055	-0.020	-0.027	-0.042	1.024	14503.0127
0 193	BS	4.438	0.100	0.067	0.006	0.010	1.277	14500.9851	01180	BS	5.204	-0.038	-0.012	0.000	0.000	1.024	14503.0127
0 193	BS	4.437	0.058	0.009	0.000	0.000	1.277	14500.9851	01180	BS	5.214	-0.048	-0.021	-0.033	-0.049	1.028	14504.0132
0 193	BS	4.465	0.106	0.059	0.002	0.003	1.062	14502.8880	01180	BS	5.217	-0.036	-0.011	0.000	0.000	1.028	14504.0132
0 193	BS	4.464	0.064	0.005	0.000	0.000	1.062	14502.8880	01180	BS	5.216	-0.055	-0.027	-0.030	-0.07	1.020	14505.0027
0 193	BS	4.489	0.111	0.075	0.010	0.038	1.048	14503.8628	01180	BS	5.216	-0.044	0.007	0.000	0.000	1.020	14505.0027
0 193	BS	4.489	0.076	0.032	0.000	0.000	1.048	14503.8628	01191	BS	5.753	0.041	0.023	-0.046	-0.064	1.007	14503.9992
0 193	BS	4.511	0.109	0.067	-0.005	-0.009	1.054	14504.8723	01191	BS	5.753	0.023	-0.014	0.000	0.000	1.007	14503.9992
0 193	BS	4.510	0.060	0.000	0.000	0.000	1.054	14504.8723	01191	BS	5.768	0.051	0.024	-0.033	-0.029	1.018	14505.0109
0 335	BS	4.221	0.004	0.002	-0.030	-0.048	1.234	14500.9921	01191	ES	5.767	0.030	0.008	0.000	0.000	1.018	14505.0109
0 335	BS	4.221	-0.003	-0.012	0.000	0.000	1.234	14500.9921	01209	BS	6.402	0.401	0.389	0.328	0.437	1.009	14504.0063
0 335	BS	4.246	-0.005	-0.008	-0.043	-0.055	1.050	14502.8971	01209	BS	6.402	0.273	0.109	0.000	0.000	1.009	14504.0063
0 335	BS	4.246	-0.006	-0.008	0.000	0.000	1.050	14502.8971	01209	BS	6.416	0.400	0.389	0.333	0.439	1.004	14504.9954
0 335	BS	4.219	-0.005	-0.014	-0.035	-0.053	1.051	14503.8959	01209	BS	6.415	0.270	0.106	0.000	0.000	1.004	14504.9954
0 335	BS	4.278	-0.004	-0.005	-0.050	-0.066	1.044	14504.8813	01273	BS	3.996	0.107	0.087	0.021	0.041	1.045	14503.0055
0 335	BS	4.278	-0.016	-0.012	0.000	0.000	1.044	14504.8813	01273	BS	3.995	0.063	0.023	0.000	0.000	1.045	14503.0055
09709	HD	7.065	0.017	0.010	-0.037	-0.001	1.027	14503.9045	01273	BS	4.006	0.112	0.093	0.016	0.037	1.053	14504.0193
09709	HD	7.366	0.023	0.040	0.000	0.000	1.027	14503.9045	01273	BS	4.005	0.066	0.025	0.000	0.000	1.053	14504.0193
09709	HD	7.120	0.019	-0.018	-0.062	-0.040	1.023	14504.8916	01273	BS	4.004	0.113	0.089	0.024	0.041	1.054	14505.0173
09709	HD	7.120	0.003	0.026	0.000	0.000	1.023	14504.8916	01273	BS	4.003	0.062	0.021	0.000	0.000	1.054	14505.0173
0 496	BS	4.016	0.199	0.123	0.016	0.086	1.194	14500.9993	01273	BS	4.036	0.110	0.110	0.031	0.043	1.283	14656.7021
0 496	BS	4.015	0.117	0.073	0.000	0.000	1.194	14500.9993	01273	BS	4.035	0.061	0.103	0.000	0.000	1.283	14656.7021
0 496	BS	4.015	0.190	0.114	0.009	0.087	1.189	14502.9922	01273	BS	4.006	0.111	0.102	0.036	0.071	1.544	14657.7440
0 496	BS	4.014	0.110	0.080	0.000	0.000	1.189	14502.9922	01273	BS	4.005	0.061	0.036	0.000	0.000	1.544	14657.7440
0 496	BS	4.060	0.188	0.112	-0.001	0.078	1.063	14504.9015	01273	BS	4.035	0.103	0.097	0.019	0.042	1.189	14659.6682
0 496	BS	4.079	0.106	0.082	0.000	0.000	1.063	14504.9015	01273	BS	4.033	0.049	0.022	0.000	0.000	1.189	14659.6682
0 627	BS	6.286	0.393	0.455	0.510	0.555	1.118	14503.9173	01423	BS	5.507	0.056	-0.062	-0.213	-0.169	1.804	14656.6893
0 627	BS	6.266	0.280	0.046	0.000	0.000	1.118	14503.9173	01423	BS	5.505	0.014	0.042	0.000	0.000	1.804	14656.6893
0 627	BS	6.297	0.396	0.458	0.494	0.557	1.117	14504.9103	01423	BS	5.549	0.066	-0.061	-0.184	-0.139	1.535	14657.6493
0 627	BS	6.297	0.272	0.063	0.000	0.000	1.117	14504.9103	01423	BS	5.547	0.020	0.048	0.000	0.000	1.535	14657.6493
0 654	BS	6.364	0.327	0.359	0.372	0.430	1.115	14503.9308	01423	BS	5.484	0.047	-0.057	-0.218	-0.149	1.650	14658.6659
0 654	BS	6.364	0.230	0.059	0.000	0.000	1.115	14503.9308	01423	BS	5.482	0.008	0.066	0.000	0.000	1.650	14658.6659
0 654	BS	6.404	0.326	0.356	0.372	0.439	1.113	14504.9205	01500	BS	6.082	0.133	0.167	0.160	0.197	1.210	14656.7118
0 654	BS	6.404	0.230	0.069	0.000	0.000	1.113	14504.9205	01500	BS	6.082	0.087	0.037	0.000	0.000	1.210	14656.7118
0 696	BS	6.178	0.356	0.395	0.412	0.478	1.116	14503.9550	01500	BS	6.055	0.127	0.156	0.170	0.186	1.432	14657.7510
0 696	BS	6.179	0.263	0.067	0.000	0.000	1.116	14503.9550	01500	BS	6.054	0.085	0.018	0.000	0.000	1.432	14657.7510
0 696	BS	6.208	0.357	0.381	0.403	0.452	1.108	14504.9316	01500	BS	6.070	0.129	0.152	0.152	0.171		

TABLE 2 (CONTINUED)

Number of Star	Cat.	58 58	58-80 58-72	58-86 99-110	58-99 --	58-110 --	Air Mass	Julian Date	Number of Star	Cat.	58 58	58-80 58-72	58-86 99-110	58-99 --	58-110 --	Air Mass	Julian Date
01789	BS	4.901	0.068	-0.025	-0.156	-0.112	1.535	14659.7350	71072	HD	6.956	-0.089	-0.099	-0.181	-0.207	1.819	14657.8527
01789	BS	4.899	0.030	0.042	0.000	0.000	1.535	14659.7350	71072	HD	6.956	-0.053	-0.022	0.000	0.000	1.819	14657.8527
01910	BS	3.051	-0.033	-0.028	-0.120	-0.103	1.494	14656.7816	71072	HD	6.927	-0.100	-0.115	-0.196	-0.191	1.764	14658.8444
01910	BS	3.051	-0.037	0.016	0.000	0.000	1.494	14656.7816	71072	HD	6.927	-0.071	0.004	0.000	0.000	1.764	14658.8444
01910	BS	3.019	-0.038	-0.038	-0.131	-0.131	1.139	14657.7157	71072	HD	6.920	-0.091	-0.109	-0.205	-0.225	1.812	14659.8467
01910	BS	3.017	-0.045	0.003	0.000	0.000	1.139	14657.7157	71072	HD	6.920	-0.091	-0.109	-0.205	-0.225	1.812	14659.8467
01910	BS	3.020	-0.038	-0.038	-0.133	-0.121	1.111	14659.7009	89884	HD	7.162	-0.052	-0.075	-0.154	-0.169	1.617	14656.8813
01910	BS	3.018	-0.051	0.011	0.000	0.000	1.111	14659.7009	89884	HD	7.162	-0.042	-0.015	0.000	0.000	1.617	14656.8813
01961	BS	6.249	0.041	0.020	-0.073	-0.043	1.515	14656.7904	89884	HD	7.167	-0.032	-0.034	-0.113	-0.110	1.671	14657.8901
01961	BS	6.248	0.012	0.030	0.000	0.000	1.515	14656.7904	89884	HD	7.166	-0.031	0.007	0.000	0.000	1.671	14657.8901
01961	BS	6.257	0.044	0.017	-0.070	-0.059	1.141	14657.7231	89884	HD	7.165	-0.034	-0.037	-0.117	-0.102	1.559	14658.8582
01961	BS	6.256	0.024	0.013	0.000	0.000	1.141	14657.7231	89884	HD	7.165	-0.033	-0.039	-0.119	-0.140	1.570	14659.8592
01961	BS	6.248	0.046	0.015	-0.065	-0.044	1.113	14659.7084	89884	HD	7.165	-0.031	-0.021	0.000	0.000	1.570	14659.8592
01961	BS	6.248	0.024	0.020	0.000	0.000	1.113	14659.7084	04123	BS	5.617	-0.007	0.009	0.031	0.030	1.523	14656.8973
38010	HD	6.728	0.291	0.218	0.153	0.256	1.592	14656.8009	04123	BS	5.618	0.000	-0.001	0.000	0.000	1.523	14656.8973
38010	HD	6.726	0.184	0.101	0.000	0.000	1.592	14656.8009	04123	BS	5.601	-0.011	0.013	0.021	0.029	1.561	14657.9027
38010	HD	6.760	0.300	0.225	0.154	0.248	1.168	14657.7333	04123	BS	5.601	-0.003	0.011	0.000	0.000	1.561	14657.9027
38010	HD	6.759	0.197	0.093	0.000	0.000	1.168	14657.7333	04123	BS	5.590	-0.001	0.018	0.019	0.008	1.442	14658.8677
38010	HD	6.757	0.303	0.225	0.150	0.255	1.138	14659.7193	04123	BS	5.590	-0.003	-0.012	0.000	0.000	1.442	14658.8677
38010	HD	6.755	0.191	0.103	0.000	0.000	1.138	14659.7193	04123	BS	5.599	0.005	0.026	0.025	0.036	1.456	14659.8706
02142	BS	5.218	0.184	0.166	0.073	0.130	1.298	14657.6864	04123	BS	5.599	0.000	0.011	0.000	0.000	1.456	14659.8706
02142	BS	5.217	0.110	0.057	0.000	0.000	1.298	14657.6864	04133	BS	3.861	-0.105	-0.145	-0.291	-0.295	1.243	14656.8830
02142	BS	5.221	0.183	0.172	0.072	0.112	1.356	14658.7052	04133	BS	3.863	-0.054	-0.006	0.000	0.000	1.243	14656.8830
02142	BS	5.219	0.109	0.040	0.000	0.000	1.356	14658.7052	04133	BS	3.878	-0.086	-0.127	-0.251	-0.280	1.321	14657.9402
02148	BS	4.938	0.922	1.137	1.465	1.747	1.545	14657.6937	04133	BS	3.878	-0.060	-0.026	0.000	0.000	1.321	14657.9402
02148	BS	4.932	0.558	0.273	0.000	0.000	1.545	14657.6937	04133	BS	3.845	-0.091	-0.126	-0.258	-0.287	1.109	14658.8752
02148	BS	4.936	0.918	1.129	1.458	1.712	1.634	14658.7120	04133	BS	3.845	-0.066	-0.030	0.000	0.000	1.109	14658.8752
02148	BS	4.930	0.554	0.256	0.000	0.000	1.634	14658.7120	04133	BS	3.858	-0.096	-0.137	-0.264	-0.295	1.129	14659.8830
02284	BS	5.478	0.266	0.189	0.107	0.176	1.410	14657.7016	04133	BS	3.857	-0.075	-0.032	0.000	0.000	1.129	14659.8830
02284	BS	5.477	0.165	0.070	0.000	0.000	1.410	14657.7016	162428	HD	7.125	0.018	0.013	-0.062	-0.087	1.326	14503.6909
02284	BS	5.461	0.254	0.180	0.098	0.162	1.480	14658.7199	162428	HD	7.124	0.006	-0.021	0.000	0.000	1.326	14503.6909
02284	BS	5.460	0.162	0.063	0.000	0.000	1.480	14658.7199	162428	HD	7.119	0.019	0.020	-0.087	-0.079	1.319	14504.6870
45314	HD	7.005	0.146	0.139	0.045	0.089	1.722	14656.8282	162428	HD	7.118	0.010	0.012	0.000	0.000	1.319	14504.6870
45314	HD	7.005	0.095	0.043	0.000	0.000	1.722	14656.8282	06664	ES	6.749	-0.082	-0.066	-0.128	-0.163	1.326	14503.7009
45314	HD	7.062	0.164	0.163	0.061	0.114	1.659	14657.8205	06664	ES	6.750	-0.048	-0.029	0.000	0.000	1.326	14503.7009
45314	HD	7.063	0.117	0.054	0.000	0.000	1.659	14657.8205	06664	BS	6.717	-0.097	-0.085	-0.140	-0.180	1.316	14504.6961
45314	HD	6.974	0.155	0.133	0.057	0.065	1.460	14659.7950	06664	BS	6.817	-0.056	-0.034	0.000	0.000	1.316	14504.6961
45314	HD	6.974	0.099	0.008	0.000	0.000	1.460	14659.7950	06720	BS	6.493	-0.011	-0.028	-0.053	-0.059	1.205	14503.6686
45910	HD	6.681	0.685	0.855	0.989	1.206	1.966	14657.8292	06720	BS	6.493	-0.012	-0.002	0.000	0.000	1.205	14503.6686
45910	HD	6.681	0.471	0.213	0.000	0.000	1.966	14657.8292	06720	BS	6.480	-0.036	-0.042	-0.076	-0.122	1.255	14504.6766
45910	HD	6.718	0.720	0.868	1.032	1.220	1.693	14659.8048	06720	BS	6.480	-0.020	-0.041	0.000	0.000	1.255	14504.6766
45910	HD	6.717	0.497	0.188	0.000	0.000	1.693	14659.8048	06873	BS	6.106	0.037	0.023	-0.021	-0.034	1.527	14503.6777
5 83	HD	6.921	0.231	0.221	0.124	0.228	1.914	14657.8394	06873	BS	6.107	0.036	-0.009	0.000	0.000	1.527	14503.6777
5 83	HD	6.920	0.143	0.105	0.000	0.000	1.914	14657.8394	06873	BS	6.131	0.014	-0.006	-0.056	-0.076	1.245	14504.6592
5 83	HD	6.941	0.261	0.248	0.156	0.201	1.655	14659.8147	06873	BS	6.131	0.008	-0.016	0.000	0.000	1.245	14504.6592
5 83	HD	6.940	0.167	0.044	0.000	0.000	1.655	14659.8147	06971	BS	6.544	-0.038	-0.061	-0.119	-0.184	1.319	14503.7258
02568	BS	5.877	-0.024	-0.015	-0.073	-0.087	1.403	14656.8421	06971	BS	6.544	-0.021	-0.060	0.000	0.000	1.319	14503.7258
02568	BS	5.877	-0.021	-0.014	0.000	0.000	1.403	14656.8421	06971	BS	6.487	-0.013	-0.041	-0.119	-0.156	1.230	14504.7061
02568	BS	5.875	-0.020	-0.016	-0.077	-0.079	1.690	14657.8764	06971	BS	6.486	-0.020	-0.032	0.000	0.000	1.230	14504.7061
02568	BS	5.875	-0.021	0.001	0.000	0.000	1.690	14657.8764	06984	BS	6.134	-0.060	-0.088	-0.149	-0.206	1.384	14503.7398
02568	BS	5.859	-0.035	-0.025	-0.076	-0.068	1.988	14658.8987	06984	BS	6.134	-0.043	-0.052	0.000	0.000	1.384	14503.7398
02568	BS	5.859	-0.030	0.007	0.000	0.000	1.988	14658.8987	06984	BS	6.121	-0.065	-0.095	-0.176	-0.201	1.259	14504.7156
02568	BS	5.874	-0.014	-0.020	-0.078	-0.083	1.349	14659.8243	06984	BS	6.120	-0.050	-0.020	0.000	0.000	1.259	14504.7156
02568	BS	5.875	-0.009	-0.005	0.000	0.000	1.349	14659.8243	173371	HD	6.863	0.010	0.039	0.034	0.080	1.218	14503.6801
51480	HD	6.969	0.711	0.835	0.957	1.126	1.239	14657.7859	173371	HD	6.863	0.015	0.050	0.000	0.000	1.218	14503.6801
51480	HD	6.970	0.502	0.164	0.000	0.000	1.239	14657.7859	173371	HD	6.872	0.022	0.043	0.033	0.047	1.133	14504.6486
51480	HD	6.850	0.655	0.787	0.902	1.071	1.399	14658.7282	173371	HD	6.871	0.012	0.018	0.000	0.000	1.133	14504.6486
51480	HD	6.850	0.464	0.169	0.000	0.000	1.399	14658.7282	07084	BS							

TABLE 2 (CONTINUED)

Number of Star	Cat.	58-58	58-80-58-72	58-86-99-110	58-99--	58-110--	Air Mass	Julian Date	Number of Star	Cat.	58-58	58-80-58-72	58-86-99-110	58-99--	58-110--	Air Mass	Julian Date
07415	BS	6.022	0.039	0.082	0.062	0.090	1.196	14499.6978	205060	HD	7.175	0.051	0.058	0.004	0.042	1.269	14501.8493
07415	BS	6.022	0.030	0.033	0.000	0.000	1.196	14499.6978	205060	HD	7.173	0.014	0.036	0.000	0.000	1.269	14501.8493
07415	BS	6.027	0.025	0.059	0.060	0.070	1.165	14500.6815	206773	HD	6.710	0.514	0.442	0.433	0.574	1.402	14499.8815
07415	BS	6.027	0.025	0.015	0.000	0.000	1.165	14500.6815	206773	HD	6.710	0.341	0.140	0.000	0.000	1.402	14499.8815
07415	BS	5.951	0.036	0.058	0.060	0.057	1.168	14501.6799	206773	HD	6.685	0.518	0.443	0.446	0.604	1.315	14500.8571
07415	BS	5.951	0.019	-0.004	0.000	0.000	1.168	14501.6799	206773	HD	6.683	0.339	0.157	0.000	0.000	1.315	14500.8571
184279	HD	7.170	0.100	0.176	0.160	0.184	1.215	14499.7081	206773	HD	6.711	0.529	0.455	0.447	0.575	1.334	14501.8595
184279	HD	7.170	0.075	0.028	0.000	0.000	1.215	14499.7081	206773	HD	6.710	0.355	0.128	0.000	0.000	1.334	14501.8595
184279	HD	7.194	0.123	0.178	0.164	0.216	1.179	14500.6919	206773	HD	6.749	0.534	0.439	0.442	0.609	1.154	14503.7796
184279	HD	7.194	0.077	0.055	0.000	0.000	1.179	14500.6919	206773	HD	6.747	0.349	0.165	0.000	0.000	1.154	14503.7796
184279	HD	7.160	0.127	0.184	0.180	0.245	1.181	14501.6900	206773	HD	6.717	0.522	0.438	0.422	0.580	1.161	14504.7822
184279	HD	7.160	0.083	0.064	0.000	0.000	1.181	14501.6900	206773	HD	6.716	0.348	0.157	0.000	0.000	1.161	14504.7822
184279	HD	7.153	0.097	0.165	0.148	0.178	1.397	14504.7348	08438	BS	5.772	-0.030	-0.045	-0.104	-0.099	1.579	14499.9083
184279	HD	7.152	0.055	0.033	0.000	0.000	1.397	14504.7348	08438	BS	5.772	-0.020	0.012	0.000	0.000	1.579	14499.9083
07565	BS	4.959	-0.099	-0.129	-0.247	-0.269	1.073	14499.7185	08438	BS	5.754	-0.035	-0.054	-0.100	-0.114	1.463	14500.8931
07565	BS	4.959	-0.069	-0.014	0.000	0.000	1.073	14499.7185	08438	BS	5.754	-0.027	-0.008	0.000	0.000	1.463	14500.8931
07565	BS	4.959	-0.101	-0.145	-0.247	-0.288	1.046	14500.7010	08438	BS	5.720	-0.031	-0.051	-0.100	-0.091	1.412	14501.8840
07565	BS	4.958	-0.081	-0.033	0.000	0.000	1.046	14500.7010	08438	BS	5.719	-0.028	0.007	0.000	0.000	1.412	14501.8840
07565	BS	4.923	-0.095	-0.143	-0.239	-0.271	1.049	14501.7001	08539	BS	4.503	0.271	0.151	0.070	0.186	1.675	14499.8946
07565	BS	4.922	-0.076	-0.034	0.000	0.000	1.049	14501.7001	08539	BS	4.502	0.170	0.118	0.000	0.000	1.675	14499.8946
07708	BS	4.952	-0.026	-0.082	-0.210	-0.214	1.073	14499.7393	08539	BS	4.772	0.272	0.155	0.079	0.179	1.467	14500.8685
07708	BS	4.951	-0.033	0.003	0.000	0.000	1.073	14499.7393	08539	BS	4.481	0.278	0.154	0.075	0.159	1.480	14501.8677
07708	BS	5.046	-0.010	-0.079	-0.193	-0.196	1.039	14500.7171	08539	BS	4.480	0.168	0.112	0.070	0.000	1.480	14501.8677
07708	BS	5.044	-0.031	0.004	0.000	0.000	1.039	14500.7171	08539	BS	4.514	0.277	0.160	0.072	0.181	1.344	14504.8375
07708	BS	4.969	-0.001	-0.076	-0.185	-0.179	1.047	14501.7193	08539	BS	4.512	0.168	0.110	0.030	0.009	1.344	14504.8375
07708	BS	4.968	-0.022	0.004	0.000	0.000	1.047	14501.7193	08603	BS	5.743	-0.058	-0.120	-0.251	-0.246	1.378	14499.9189
193009	HD	7.129	0.279	0.318	0.236	0.338	1.314	14499.8085	08603	BS	5.742	-0.039	0.013	0.000	0.000	1.378	14499.9189
193009	HD	7.128	0.345	0.104	0.000	0.000	1.314	14499.8085	08603	BS	5.712	-0.055	-0.123	-0.257	-0.264	1.307	14500.9041
193009	HD	7.189	0.609	0.307	0.242	0.307	1.075	14500.7432	08603	BS	5.711	-0.051	0.001	0.000	0.000	1.307	14500.9041
193009	HD	7.187	0.256	0.067	0.000	0.000	1.075	14500.7432	08603	BS	5.691	-0.049	-0.119	-0.252	-0.293	1.263	14501.8925
193009	HD	7.147	0.399	0.309	0.225	0.350	1.088	14501.7458	08603	BS	5.690	-0.045	-0.043	0.000	0.000	1.263	14501.8925
193009	HD	7.145	0.247	0.124	0.000	0.000	1.088	14501.7458	08682	BS	6.155	-0.033	-0.051	-0.127	-0.121	1.479	14499.9425
193182	HD	6.548	-0.038	-0.007	-0.053	-0.063	1.088	14499.7499	08682	BS	6.156	-0.014	0.013	0.000	0.000	1.479	14499.9425
193182	HD	6.547	-0.031	-0.003	0.000	0.000	1.088	14499.7499	08682	BS	6.122	-0.034	-0.060	-0.121	-0.174	1.449	14500.9424
193182	HD	6.565	-0.052	-0.022	-0.053	-0.081	1.050	14500.7264	08682	BS	6.122	-0.025	-0.046	0.000	0.000	1.493	14500.9424
193182	HD	6.565	-0.036	-0.021	0.000	0.000	1.050	14500.7264	08682	BS	6.096	-0.029	-0.053	-0.115	-0.131	1.443	14501.9298
193182	HD	6.499	-0.041	-0.023	-0.050	-0.049	1.058	14501.7290	08682	BS	6.095	-0.027	-0.018	0.000	0.000	1.443	14501.9298
193182	HD	6.498	-0.039	-0.001	0.000	0.000	1.058	14501.7290	08731	BS	5.260	-0.011	-0.007	-0.073	-0.052	1.366	14499.9322
07763	BS	4.647	0.409	0.485	0.573	0.787	1.235	14499.7956	08731	BS	5.260	-0.009	0.027	0.000	0.000	1.366	14499.9322
07763	BS	4.647	0.291	0.210	0.000	0.000	1.235	14499.7956	08731	BS	5.255	-0.009	-0.013	-0.072	-0.058	1.281	14500.9113
07763	BS	4.642	0.409	0.471	0.562	0.781	1.071	14500.7344	08731	BS	5.254	-0.018	0.020	0.000	0.000	1.281	14500.9113
07763	BS	4.641	0.275	0.217	0.000	0.000	1.071	14500.7344	08731	BS	5.253	0.008	-0.009	-0.070	-0.038	1.250	14501.9008
07763	BS	4.636	0.420	0.478	0.577	0.797	1.082	14501.7378	08731	BS	5.251	-0.010	0.031	0.000	0.000	1.250	14501.9008
07763	BS	4.636	0.288	0.220	0.000	0.000	1.082	14501.7378	08731	BS	5.284	-0.013	-0.017	-0.081	-0.062	1.076	14503.8224
07763	BS	4.636	0.288	0.220	0.000	0.000	1.082	14501.7378	08731	BS	5.283	-0.018	0.022	0.000	0.000	1.076	14503.8224
07763	BS	4.680	0.424	0.485	0.565	0.789	1.193	14504.7711	08731	BS	5.304	-0.005	-0.018	-0.085	-0.087	1.082	14504.8242
07763	BS	4.680	0.295	0.222	0.000	0.000	1.193	14504.7711	08731	BS	5.302	-0.026	0.002	0.000	0.000	1.082	14504.8242
07836	BS	6.023	0.002	0.027	0.045	0.046	1.516	14499.8181	08773	BS	4.515	-0.075	-0.090	-0.163	-0.154	1.444	14499.9011
07836	BS	6.023	0.005	0.007	0.000	0.000	1.516	14499.8181	08773	BS	4.515	-0.049	0.017	0.000	0.000	1.444	14499.9011
07836	BS	6.045	0.014	0.024	0.041	0.046	1.225	14500.7689	08773	BS	4.511	-0.061	-0.062	-0.138	-0.178	1.338	14500.8810
07836	BS	6.045	0.016	0.010	0.000	0.000	1.225	14500.7689	08773	BS	4.510	-0.048	-0.032	0.000	0.000	1.338	14500.8810
07836	BS	6.011	0.013	0.018	0.036	0.042	1.233	14501.7679	08773	BS	4.493	-0.066	-0.090	-0.149	-0.170	1.321	14501.8751
07836	BS	6.010	0.006	0.004	0.000	0.000	1.233	14501.7679	08773	BS	4.492	-0.055	-0.023	0.000	0.000	1.321	14501.8751
199356	HD	7.088	0.444	0.392	0.344	0.447	1.316	14499.8390	08773	BS	4.536	-0.071	-0.093	-0.157	-0.167	1.243	14504.8487
199356	HD	7.087	0.298	0.104	0.000	0.000	1.316	14499.8390	08773	BS	4.535	-0.057	-0.005	0.000	0.000	1.243	14504.8487
199356	HD	7.039	0.439	0.374	0.338	0.431	1.205	14500.8120	218393	HD	6.923	0.568	0.669	0.779	0.900	1.662	14499.9822
199356	HD	7.038	0.284	0.094	0.000	0.000	1.205	14500.8120	218393	HD	6.923	0.389	0.117	0.000	0.000	1.662	14499.9822
199356	HD	7.031	0.437	0.379	0.335	0.438	1.199	14501.8079	218393	HD	6.913	0.579	0.670	0.776	0.913	1.341	14500.9307
199356	HD	7.030	0.288	0.102	0.000	0.000	1.199	14501.8079	218393	HD	6.913	0.394	0.134	0.000	0.000	1.341	14500.9307
08047	BS	4.874	0.066	-0.018	-0.150	-0.137	1.343	14499.8469	218393	HD	6.879	0.586	0.675	0.788	0.915	1.309	14501.9209
08047	BS	4.874	0.043	0.020	0.000	0.000	1.343	14499.8469	218393	HD	6.878	0.391	0.129	0.000	0.000	1.309	14501.9209
08047	BS	4.860	0.063	-0.022	-0.136	-0.121	1.244	14500.8218	218674	HD	6.743	0.049	0.029	-0.026	-0.040	1.561	14499.9712
08047	BS	4.859	0.025	0.021	0.000	0.000	1.244	14500.8218	218674	HD	6.744	0.044	-0.006	0.000	0.000	1.561	14499.9712
08047	BS	4.836	0.067	-0.015	-0.142	-0.103	1.236	14501.8170	218674	HD	6.706	0.045					

TABLE 3
6RC PHOTOMETRY OF Be STARS - NEW FILTERS

Table with columns for Star Cat., filters (58, 58-80, 58-86, 58-99, 58-110), Air Mass, Julian Date, and photometric data. The table lists multiple stars with their respective measurements across different filters and air masses.

Be AND SHELL STARS

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TABLE 3 (CONTINUED)

f Star	Cat.	58	58-80	58-86	58-99	58-110	Air	Julian	Number	58	58-80	58-86	58-99	58-110	Air	Julian	
		58	58-72	99-110	---	---	Mass	Date	of Star	58	58-72	99-110	---	---	Mass	Date	
16175	BS	2.543	0.077	0.065	-0.027	-0.028	1.336	14738.8654	07106	BS	3.463	0.047	0.053	0.000	0.000	1.002	14738.9515
16175	BS	2.543	0.052	0.005	0.000	0.000	1.336	14738.8654	07106	BS	3.469	0.100	0.119	0.062	0.089	1.001	14742.9462
16175	BS	2.547	0.067	0.058	-0.035	-0.052	1.342	14739.8798	07106	BS	3.468	0.058	0.031	0.000	0.000	1.001	14742.9462
16175	BS	2.546	0.032	-0.010	0.000	0.000	1.342	14739.8798	07106	BS	3.370	0.085	0.096	0.058	0.110	1.001	14783.8364
16175	BS	2.530	0.086	0.066	-0.025	-0.025	1.338	14742.8658	07106	BS	3.370	0.061	0.054	0.000	0.000	1.001	14783.8364
16175	BS	2.530	0.060	0.006	0.000	0.000	1.338	14742.8658	07106	BS	3.635	0.069	0.088	0.052	0.098	1.032	14830.7557
2428	HD	7.194	0.002	-0.027	-0.109	-0.120	1.013	14738.8988	07106	BS	3.635	0.038	0.051	0.000	0.000	1.032	14830.7557
2428	HD	7.192	-0.022	-0.004	0.000	0.000	1.013	14738.8988	07106	BS	3.331	0.080	0.092	0.060	0.107	1.152	14833.7986
2428	HD	7.200	0.024	-0.011	-0.098	-0.115	1.159	14742.8145	07106	BS	3.331	0.044	0.051	0.000	0.000	1.152	14833.7986
2428	HD	7.199	-0.011	-0.011	0.000	0.000	1.159	14742.8145	07106	BS	3.485	0.097	0.116	0.059	0.083	1.003	15133.8665
2428	HD	7.158	0.008	-0.022	-0.111	-0.108	1.014	14830.6895	07106	BS	3.485	0.071	0.025	0.000	0.000	1.003	15133.8665
2428	HD	7.157	-0.012	0.011	0.000	0.000	1.014	14830.6895	07106	BS	3.593	0.104	0.124	0.089	0.147	1.002	15136.8795
2428	HD	7.145	0.005	-0.017	-0.064	-0.090	1.016	14833.6832	07106	BS	3.593	0.065	0.061	0.000	0.000	1.002	15136.8795
2428	HD	7.144	-0.006	0.002	0.000	0.000	1.016	14833.6832	07106	BS	3.420	0.118	0.129	0.069	0.103	1.117	15137.7815
2428	HD	7.153	0.005	-0.008	-0.122	-0.157	1.009	15447.9666	07106	BS	3.421	0.089	0.036	0.000	0.000	1.117	15137.7815
2428	HD	7.152	-0.015	-0.022	0.000	0.000	1.009	15447.9666	07106	BS	3.380	0.094	0.108	0.057	0.094	1.119	15138.7781
2428	HD	7.175	0.008	-0.006	-0.095	-0.217	1.038	15448.9307	07106	BS	3.379	0.058	0.040	0.000	0.000	1.119	15138.7781
2428	HD	7.175	-0.009	-0.107	0.000	0.000	1.038	15448.9307	07106	BS	3.422	0.127	0.148	0.078	0.107	1.005	15448.0010
2428	HD	7.119	-0.024	-0.036	-0.129	-0.161	1.009	15449.9831	07106	BS	3.421	0.082	0.038	0.000	0.000	1.005	15448.0010
2428	HD	7.118	-0.032	-0.020	0.000	0.000	1.009	15449.9831	07106	BS	3.345	0.125	0.142	0.055	0.086	1.004	15449.0005
2428	HD	7.118	-0.032	-0.020	0.000	0.000	1.009	15449.9831	07106	BS	3.344	0.078	0.041	0.000	0.000	1.004	15449.0005
2428	HD	7.118	-0.032	-0.020	0.000	0.000	1.009	15449.9831	07106	BS	3.343	0.102	0.125	0.062	0.064	1.002	15450.0051
2428	HD	7.118	-0.032	-0.020	0.000	0.000	1.009	15449.9831	07106	BS	3.342	0.064	0.031	0.000	0.000	1.002	15450.0051
36664	BS	6.861	-0.115	-0.106	-0.168	-0.201	1.048	14738.9110	07106	BS	3.342	0.064	0.031	0.000	0.000	1.002	15450.0051
36664	BS	6.861	-0.093	-0.025	0.000	0.000	1.048	14738.9110	07106	BS	3.342	0.064	0.031	0.000	0.000	1.002	15450.0051
36664	BS	6.837	-0.109	-0.100	-0.184	-0.235	1.139	14739.8328	07249	BS	5.588	-0.010	-0.024	-0.094	-0.097	1.883	14830.8044
36664	BS	6.837	-0.109	-0.100	-0.184	-0.235	1.139	14739.8328	07249	BS	5.588	-0.010	-0.024	-0.094	-0.097	1.883	14830.8044
36664	BS	6.868	-0.099	-0.087	-0.159	-0.196	1.097	14741.8486	07249	BS	5.588	-0.010	-0.024	-0.094	-0.097	1.883	14830.8044
36664	BS	6.868	-0.099	-0.087	-0.159	-0.196	1.097	14741.8486	07249	BS	5.582	-0.011	0.007	0.000	0.000	1.573	14833.7271
36664	BS	6.868	-0.077	-0.029	0.000	0.000	1.097	14741.8486	07249	BS	5.582	-0.011	0.007	0.000	0.000	1.573	14833.7271
36664	BS	6.847	-0.097	-0.100	-0.174	-0.194	1.048	14742.9023	07249	BS	5.582	-0.011	0.007	0.000	0.000	1.573	14833.7271
36664	BS	6.847	-0.097	-0.100	-0.174	-0.194	1.048	14742.9023	07249	BS	5.582	-0.011	0.007	0.000	0.000	1.573	14833.7271
36664	BS	6.769	-0.093	-0.088	-0.133	-0.179	1.252	14830.7823	179343	HD	6.904	0.156	0.206	0.248	0.296	1.346	14830.8153
36664	BS	6.769	-0.093	-0.088	-0.133	-0.179	1.252	14830.7823	179343	HD	6.904	0.156	0.206	0.248	0.296	1.346	14830.8153
36664	BS	6.769	-0.064	-0.036	0.000	0.000	1.252	14830.7823	179343	HD	6.904	0.156	0.206	0.248	0.296	1.346	14830.8153
36664	BS	6.769	-0.064	-0.036	0.000	0.000	1.252	14830.7823	179343	HD	6.893	0.125	0.187	0.238	0.245	1.148	14833.7382
36664	BS	6.769	-0.064	-0.036	0.000	0.000	1.252	14830.7823	179343	HD	6.893	0.125	0.187	0.238	0.245	1.148	14833.7382
36664	BS	6.802	-0.070	-0.067	-0.161	-0.263	1.027	15447.9421	07403	BS	6.315	0.064	0.006	-0.104	-0.083	1.324	14830.8726
36664	BS	6.802	-0.070	-0.067	-0.161	-0.263	1.027	15447.9421	07403	BS	6.315	0.064	0.006	-0.104	-0.083	1.324	14830.8726
36664	BS	6.811	-0.058	-0.063	-0.164	-0.251	1.060	15448.9436	07403	BS	6.314	0.031	0.028	0.000	0.000	1.324	14830.8726
36664	BS	6.811	-0.058	-0.063	-0.164	-0.251	1.060	15448.9436	07403	BS	6.346	0.063	0.006	-0.088	-0.072	1.367	14833.8716
36664	BS	6.771	-0.080	-0.081	-0.148	-0.221	1.050	15449.9580	07403	BS	6.345	0.025	0.023	0.000	0.000	1.367	14833.8716
36664	BS	6.771	-0.080	-0.081	-0.148	-0.221	1.050	15449.9580	07403	BS	6.345	0.025	0.023	0.000	0.000	1.367	14833.8716
36664	BS	6.771	-0.055	-0.060	0.000	0.000	1.050	15449.9580	07415	BS	6.049	0.036	0.067	0.083	0.108	1.339	14830.8290
36664	BS	6.771	-0.055	-0.060	0.000	0.000	1.050	15449.9580	07415	BS	6.050	0.033	0.030	0.000	0.000	1.339	14830.8290
36664	BS	6.771	-0.055	-0.060	0.000	0.000	1.050	15449.9580	07415	BS	6.022	0.039	0.071	0.073	0.080	1.137	14833.7483
36664	BS	6.771	-0.055	-0.060	0.000	0.000	1.050	15449.9580	07415	BS	6.022	0.025	0.013	0.000	0.000	1.137	14833.7483
36664	BS	6.771	-0.055	-0.060	0.000	0.000	1.050	15449.9580	07415	BS	6.022	0.025	0.013	0.000	0.000	1.137	14833.7483
66720	BS	6.551	-0.026	-0.031	-0.086	-0.099	1.052	14738.8828	07415	BS	6.049	0.036	0.067	0.083	0.108	1.339	14830.8290
66720	BS	6.551	-0.026	-0.031	-0.086	-0.099	1.052	14738.8828	07415	BS	6.050	0.033	0.030	0.000	0.000	1.339	14830.8290
66720	BS	6.553	-0.023	-0.036	-0.076	-0.104	1.163	14742.8274	07415	BS	6.022	0.025	0.013	0.000	0.000	1.137	14833.7483
66720	BS	6.553	-0.023	-0.036	-0.076	-0.104	1.163	14742.8274	07415	BS	6.022	0.025	0.013	0.000	0.000	1.137	14833.7483
66720	BS	6.553	-0.030	-0.021	0.000	0.000	1.163	14742.8274	07415	BS	6.022	0.025	0.013	0.000	0.000	1.137	14833.7483
66720	BS	6.521	-0.018	-0.026	-0.066	-0.066	1.031	14830.7000	184279	HD	6.985	0.140	0.164	0.166	0.207	1.495	14830.8557
66720	BS	6.522	-0.005	-0.001	0.000	0.000	1.031	14830.7000	184279	HD	6.986	0.109	0.045	0.000	0.000	1.495	14830.8557
66720	BS	6.502	-0.020	-0.043	-0.054	-0.067	1.032	14833.6929	184279	HD	6.983	0.147	0.173	0.161	0.218	1.141	14833.7576
66720	BS	6.501	-0.018	-0.005	0.000	0.000	1.032	14833.6929	184279	HD	6.983	0.094	0.061	0.000	0.000	1.141	14833.7576
66720	BS	6.501	-0.018	-0.005	0.000	0.000	1.032	14833.6929	184279	HD	6.990	0.161	0.173	0.101	0.175	1.191	15448.9925
66873	BS	6.159	0.024	0.012	-0.046	-0.040	1.109	14738.9417	184279	HD	6.990	0.111	0.080	0.000	0.000	1.191	15448.9925
66873	BS	6.158	0.006	0.012	0.000	0.000	1.109	14738.9417	184279	HD	6.983	0.180	0.161	0.138	0.202	1.178	15449.9951
66873	BS	6.171	0.006	0.008	-0.045	-0.033	1.143	14742.9694	184279	HD	6.983	0.124	0.071	0.000	0.000	1.178	15449.9951
66873	BS	6.172	0.007	0.017	0.000	0.000	1.143	14742.9694	184279	HD	6.983	0.124	0.071	0.000	0.000	1.178	15449.9951
66873	BS	6.112	0.030	0.015	-0.033	-0.041	1.117	14830.7092	07565	BS	4.838	-0.028	-0.083	-0.189	-0.202	1.255	14830.8645
66873	BS	6.113	0.025	-0.001	0.000	0.000	1.117	14830.7092	07565	BS	4.						

TABLE 3 (CONTINUED)

Number of Star	Cat.	58 58	58-80 58-72	58-86 99-110	58-99 ---	58-110 ---	Air Mass	Julian Date	Number of Star	Cat.	58 58	58-80 58-72	58-86 99-110	58-99 ---	58-110 ---	Air Mass	Julian Date
08103	BS	6.769	-0.030	-0.018	-0.093	-0.081	1.542	14833.9702	08731	BS	5.280	-0.070	-0.068	-0.163	-0.181	1.060	15232.805
08103	BS	6.768	-0.028	0.018	0.000	0.000	1.542	14833.9702	08731	BS	5.280	-0.052	-0.008	0.000	0.000	1.060	15232.805
203699	HD	6.937	-0.044	-0.061	-0.110	-0.106	1.347	14890.7680	08731	BS	5.362	-0.050	-0.044	-0.174	-0.176	1.050	15233.781
203699	HD	6.937	-0.029	0.010	0.000	0.000	1.347	14890.7680	08731	BS	5.362	-0.043	0.008	0.000	0.000	1.050	15233.781
203699	HD	6.971	-0.052	-0.049	-0.125	-0.139	1.075	14892.6707	08758	BS	6.579	-0.058	-0.080	-0.172	-0.186	1.148	14890.815
203699	HD	6.971	-0.037	-0.006	0.000	0.000	1.075	14892.6707	08758	BS	6.580	-0.039	-0.007	0.000	0.000	1.148	14890.815
205060	HD	7.226	0.034	0.030	0.018	0.000	1.336	14830.9615	08758	BS	6.578	-0.074	-0.104	-0.196	-0.251	1.030	14892.753
205060	HD	7.226	0.023	-0.010	0.000	0.000	1.336	14830.9615	08758	BS	6.578	-0.050	-0.045	0.000	0.000	1.030	14892.753
205060	HD	7.235	0.036	0.042	0.024	0.016	1.372	14833.9598	08773	BS	4.538	-0.081	-0.104	-0.171	-0.170	1.607	14831.013
205060	HD	7.235	0.024	-0.002	0.000	0.000	1.372	14833.9598	08773	BS	4.537	-0.061	0.010	0.000	0.000	1.607	14831.013
206773	HD	6.883	0.464	0.387	0.383	0.522	1.223	14890.7582	08773	BS	4.564	-0.055	-0.085	-0.141	-0.154	1.588	14834.003
206773	HD	6.882	0.293	0.137	0.000	0.000	1.223	14890.7582	08773	BS	4.563	-0.041	-0.005	0.000	0.000	1.588	14834.003
206773	HD	6.854	0.429	0.388	0.368	0.504	1.119	14892.6491	08773	BS	4.519	-0.073	-0.090	-0.146	-0.145	1.229	14890.787
206773	HD	6.854	0.290	0.135	0.000	0.000	1.119	14892.6491	08773	BS	4.519	-0.056	0.007	0.000	0.000	1.229	14890.787
08438	BS	5.790	-0.026	-0.035	-0.080	-0.066	1.263	14890.7957	08773	BS	4.606	-0.067	-0.083	-0.149	-0.176	1.165	14892.673
08438	BS	5.790	-0.024	0.019	0.000	0.000	1.263	14890.7957	08773	BS	4.606	-0.052	-0.019	0.000	0.000	1.165	14892.673
08438	BS	5.817	-0.028	-0.047	-0.103	-0.129	1.018	14892.6934	08773	BS	4.482	-0.088	-0.127	-0.166	-0.194	1.130	15232.796
08438	BS	5.817	-0.024	-0.019	0.000	0.000	1.018	14892.6934	08773	BS	4.481	-0.069	-0.017	0.000	0.000	1.130	15232.796
08539	BS	4.499	0.269	0.141	0.066	0.183	1.336	14890.7794	08773	BS	4.529	-0.054	-0.086	-0.158	-0.160	1.126	15232.775
08539	BS	4.497	0.159	0.118	0.000	0.000	1.336	14890.7794	08773	BS	4.529	-0.034	0.008	0.000	0.000	1.126	15232.775
08539	BS	4.563	0.278	0.131	0.065	0.139	1.162	14892.6670	218393	HD	6.066	0.559	0.669	0.783	0.924	1.325	14890.855
08539	BS	4.563	0.168	0.077	0.000	0.000	1.162	14892.6670	218393	HD	6.965	0.377	0.134	0.000	0.000	1.325	14890.855
08539	BS	4.465	0.241	0.103	0.046	0.116	1.711	15232.7867	218393	HD	6.897	0.509	0.614	0.704	0.814	1.058	14892.723
08539	BS	4.464	0.147	0.075	0.000	0.000	1.171	15232.7867	218393	HD	6.897	0.347	0.106	0.000	0.000	1.058	14892.723
08539	BS	4.507	0.271	0.139	0.050	0.139	1.154	15233.7655	218393	HD	7.066	0.491	0.599	0.659	0.822	1.071	15232.811
08539	BS	4.506	0.175	0.095	0.000	0.000	1.154	15233.7655	218393	HD	7.046	0.361	0.129	0.000	0.000	1.071	15232.811
08603	BS	5.781	-0.069	-0.138	-0.272	-0.317	1.176	14890.8066	218393	HD	7.102	0.510	0.623	0.671	0.798	1.068	15233.811
08603	BS	5.781	-0.069	-0.036	0.000	0.000	1.176	14890.8066	218674	HD	6.794	0.061	0.057	0.014	-0.008	1.279	14890.851
08603	BS	5.766	-0.109	-0.149	-0.291	-0.333	1.044	14892.7450	218674	HD	6.794	0.036	-0.017	0.000	0.000	1.279	14890.851
08603	BS	5.766	-0.082	-0.032	0.000	0.000	1.044	14892.7450	218674	HD	6.859	0.044	0.040	-0.008	-0.033	1.055	14892.714
08682	BS	6.155	-0.033	-0.046	-0.091	-0.103	1.458	14890.8708	218674	HD	6.859	0.023	-0.019	0.000	0.000	1.055	14892.714
08682	BS	6.155	-0.027	-0.006	0.000	0.000	1.458	14890.8708	218674	HD	6.844	0.003	0.004	-0.046	-0.077	1.076	15232.824
08682	BS	6.169	-0.055	-0.077	-0.131	-0.180	1.130	14892.7640	218674	HD	6.845	0.010	-0.022	0.000	0.000	1.076	15232.824
08682	BS	6.169	-0.047	-0.041	0.000	0.000	1.130	14892.7640	218674	HD	6.856	0.022	0.030	-0.087	-0.081	1.057	15233.800
08731	BS	5.244	-0.009	-0.014	-0.105	-0.107	1.273	14831.0057	218674	HD	6.856	0.020	0.015	0.000	0.000	1.057	15233.800
08731	BS	5.244	-0.014	0.005	0.000	0.000	1.273	14831.0057	09068	BS	6.540	-0.060	-0.079	-0.139	-0.133	1.323	14890.891
08731	BS	5.237	-0.027	-0.034	-0.110	-0.129	1.224	14833.9846	09068	BS	6.540	-0.051	0.012	0.000	0.000	1.323	14890.891
08731	BS	5.237	-0.034	-0.012	0.000	0.000	1.224	14833.9846	09068	BS	6.541	-0.069	-0.077	-0.160	-0.207	1.015	14892.781
08731	BS	5.244	-0.012	-0.022	-0.104	-0.108	1.210	14890.8249	09068	BS	6.541	-0.050	-0.038	0.000	0.000	1.015	14892.781
08731	BS	5.243	-0.030	0.002	0.000	0.000	1.210	14890.8249	09070	BS	6.596	-0.008	-0.027	-0.101	-0.105	1.254	14890.881
08731	BS	5.289	-0.033	-0.040	-0.132	-0.138	1.049	14892.7029	09070	BS	6.595	-0.024	0.002	0.000	0.000	1.254	14890.881
08731	BS	5.289	-0.042	0.002	0.000	0.000	1.049	14892.7029	09070	BS	6.558	-0.041	-0.054	-0.155	-0.160	1.043	14892.771
									09070	BS	6.557	-0.045	0.002	0.000	0.000	1.043	14892.771

The columns of Tables 1, 2, and 3 are self-explanatory. Two lines are used for each night's observation, and 2 430 000 should be added to the 'Julian Date' to derive the actual Julian Date of the observations.

In column 8 of Tables 1, 2 and 3 it is seen that a few of the Be stars were observed at the end of an observing season, at larger than normal air masses ($2.0 < X < 3.0$). However, Schuster (1982a) and Schuster and López (1976) have demonstrated that it is not uncommon to obtain good photometric precision to three air masses at the observatory at San Pedro Mártir. The large air-mass observations of Tables 1, 2 and 3 are in fact in good agreement with other independent observations.

In Table 4 are listed Be stars that are photometrically variable according to this new data. Columns 1 and 2 give the HD and Bright-Star (Hoffleit and Jaschek 1982) numbers of the stars respectively, column 3 indicates the degree of variability according to this latest comparison, column 4 the colors and magnitudes which are most variable, and column 5 our previous assignment of variability (Schuster and Alvarez 1983). In columns 3 and 5 "PV" means possibly variable, "V" means variable and "V++" very variable. The new observations were compared within each table, between Tables 2 and 3, and with the values of Schuster and Alvarez (1983).

Quantitatively, variations greater than approximately ± 0.05 mag lead to a PV classification, greater than approximately ± 0.08 mag to V, and greater than or equal to ± 0.15 mag to V++. The criteria of Schuster and Alvarez (1983; also Alvarez and Schuster 1981) were slightly different. The 58 magnitude of 6RC photometry the (58-110) color, and observations made at large air masses were given less weight than the other magnitude and colors in the detection of variability. Generally, an assignment of variability did not result from only single measurement but from several disparate values more than one magnitude or color. Six new Be stars in the category V++ have been identified: BS 2817, BS 2921, BS 6984, BS 7565, HD 206773 and HD 218674. Altogether 22 Be or shell stars are seen to be variable according to this new data.

In column 4 of this last table four different types of photometric variability can be distinguished. For 80 observations changes in the Balmer jump, colors (33-52 and 35-52), and variations in the visible magnitudes 52 and 58, are the largest and most frequent. In the red and near-infrared, the energy distributions vary most often at the wavelengths of filters 80 and 86 due either to Paschen continuum emission or to H⁻ processes (Schild 1978). Finally, another type of near-infrared

TABLE 4
VARIABLE Be AND SHELL STARS

Star		Variability	Colors and Magnitudes Most Variable	Previous Variability
HD	BS			
4180	193	V	58 - 72, 58 - 80, 58 - 86	V
5439	1789	V++	58, 58 - 72, 58 - 80, 58 - 86, 58 - 99, 58 - 110	V++
5314	...	V++	{52, 40 - 52, 45 - 52, 52 - 58 58, 58 - 72, 58 - 80, 58 - 86, 58 - 99, 58 - 110}	V++
1480	...	PV	52, 33 - 52, 35 - 52, 37 - 52, 58 - 86, 58 - 99, 58 - 110	V
3367	...	PV	52, 33 - 52, 35 - 52, 37 - 52, 58, 58 - 110	V
8050	2817	V++	58, 58 - 72, 58 - 80, 58 - 86, 58 - 99, 58 - 110	PV
0855	2921	V++	52, 58, 58 - 72, 58 - 80, 58 - 86, 58 - 99, 58 - 110	V
2367	...	V	52, 33 - 52, 35 - 52, 37 - 52	PV
9387	4787	V++	{52, 33 - 52, 35 - 52, 58, 58 - 72, 58 - 80, 58 - 86, 58 - 99, 58 - 110}	V++
2983	5941	V++	52, 33 - 52, 35 - 52, 58, 58 - 80, 58 - 86, 58 - 99, 58 - 110	V++
8184	6118	V++	52, 33 - 52, 35 - 52, 58	V++
2428	...	V++	33 - 52, 35 - 52, 58, 58 - 99, 58 - 110	V++
2732	6664	V++	52, 33 - 52, 35 - 52	V++
1780	6984	V++	52, 33 - 52, 35 - 52, 58, 58 - 80, 58 - 86, 58 - 99, 58 - 110	V
4237	7084	PV	58 - 72, 58 - 80, 58 - 86	
4638	7106	V++	52, 33 - 52, 35 - 52, 58, 58 - 99, 58 - 110	V++
34279	...	V++	58, 58 - 72, 58 - 80, 58 - 86, 58 - 99, 58 - 110	V++
87811	7565	V++	58, 58 - 72, 58 - 80, 58 - 86, 58 - 99, 58 - 110	V
91610	7708	V	58, 58 - 80, 58 - 110	V
93237	7763	V++	58, 58 - 110	V++
00120	8047	V++	58, 58 - 72, 58 - 86, 58 - 99, 58 - 110	V++
06773	...	V++	58, 58 - 80, 58 - 86, 58 - 99, 58 - 110	PV
14167	8603	PV	58, 58 - 80	PV
17050	8731	V++	58, 58 - 80, 58 - 86, 58 - 99, 58 - 110	V++
18393	...	V++	58, 58 - 80, 58 - 99, 58 - 110	V++
18674	...	V++	58	PV

riability, which increases with wavelength having its maximum fluctuation at the 1.1 μm limit of the 13C photometry, is common.

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