Photometry JH

Photometry JH

Photometry JH is any integral part of SSP4Dataq2.exe and is used with the SSP-4 photometer to reduce raw data to standard J magnitude and J-H index It has five main sections which are:

Comparison/Variable Star Database and Editor	Stores magnitude, color indices, location, spectral type and catalog (variable, comparison or transformation star). The other calculator modules get the pertinent data from this database. There are three separate databases for Variable/Comp stars, Transformation stars and SOE Blue/Red star pairs.
Extinction Coefficient module	computes K' for the j and h magnitudes
Transformation Coefficients module	computes the transformation coefficients used to derive the finished magnitudes and color indices from the instrument values
SOE Coefficient module	computes K"jh from the observation of Blue-Red star pairs.
Final Data Reduction module	computes the finished magnitudes and color indices
Plot Data module	plots JH, color index data and fast file data with basic analytic tools for finding time of minimum, O-C parameter, phase plots and Fourier analysis. In addition, it can generate AAVSO extended format data files for uploading to the *WebObs* site.

Check the SSPDataq.com website for the most current version of SSP4Dataq2 and Photometry JH

The Photometry JH programs are written in Liberty Basic version 4.03. For more information about this basic compiler go to : Liberty Basic Home Page

This help file was written for Photometry JH version 1.0.

Requirements

Photometry JH installs with SSP4Dataq2. See the help file for SSP4Dataq2 for more details.

The program should run on any Windows based computer from WIN 95 to Windows 7. The program uses very little of the system resources and should not interfere with any other operating programs. While is is not necessary to have the SSP-4 photometer to use Photometry JH, the user would have to create some separate data entry program in order to input raw data in the proper columns format. SSP4Dataq2 creates the proper formatted raw data files when used with the SSP-4 photometer to acquire photometric data.

Installing

Installing the Software

The various files that make up Photometry JH are installed with SSP4Dataq2. See "Installing the Software" in the SSP4Dataq2 help file for the proper procedure to install the program and a description of the dlls and runtime program.

The default directory path for the installed files is: C:\SSP4Dataq2

Problem with Computers set for Asian Regions

It is necessary that the PC be set for English localization. Computers set for Chinese, Korean or Japanese language localization will not work with this program.

Description of Files

In addition to the files listed for SSPDataq3, the following apply to Photometry2:

`Star Database JH.tkn` is a program extension that allows you to enter and edit position and magnitude values for the variable/comparison, SOE (Second Order Extinction) and transformation stars.

`Extinction JH.tkn` program extension that allows you to reduce a raw data file containing comparison star observational data to derive the extinction coefficients.

`SOE JH.tkn` program extension that allows you to reduce a raw data file containing Blue/Red star pair observational data to derive the K"jh extinction coefficient.

`Transformation JH.tkn` a program extension that allows you to reduce a raw data file containing transformation star observational data to derive the transformation coefficients.

`Reduction JH.tkn` program extension that allows you to reduce a raw data file containing comparison and variable star observational data to derive standard J magnitude and J-H color index.

`ShowData JH.tkn` program extension that is used to display reduced data in graphical format. It also has facilities to produce AAVSO formatted files for submission to the AAVSO. Data files have a .var extension.

`PPparms_JH.txt` is a text file that contains observer location, extinction and transformation coefficients.

`Star Database JH.txt` is a text file that contains Comparison and Variable star data such as name, type, RA/DEC, J magnitude andJ-H index.

`Transformation Database JH.txt` is a text file that contains star name, type, RA/DEC, J magnitude and J-H color index for stars used in the calculation of transformation coefficients.

`SOE Database JH.txt` is a text file that contains star name, type, RA/DEC, J magnitude and J-H color index for stars used in the calculation of the SOE coefficients K"jh.

`Photometry JH.chm` this help file.

`Photometry2 JH.pdf` this help file in pdf format. Some diagrams are cut off in width

`Star Database JH.old` is a backup text file that contains position and magnitude information for comparison and variable stars. It is created each time the Data Editor is entered and data saved.

`SOE Database JH.old` is a backup text file that contains position and magnitude information for the SOE stars. It is created each time the Data Editor is entered and data saved

`Transformation Database JH.old` is a backup text file that contains position and magnitude information for the Transformation stars. It is created each time the Data Editor is entered and data saved.

`Sample Extinction JH.raw` is a sample raw data file to demonstrate use of the Extinction and Reduction Photometry modules.

`Sample Standard Variable.raw` a sample raw data file.

`Sample Standard Variable.var`

`Sample Standard Variable.txt` This is the AAVSO compatible file for uploading to their web site data from
`Sample Standard Variable.var.` The file is generated by the Plot Data module in Photometry JH.

`Sample SOE.raw` is a sample raw data file that contains observations of a Blue/Red star pair over several hours to derive K"jh. .

`Sample Transformation.raw` is a sample raw data file to demonstrate use of the Transformation module.

Starting

The various photometry modules are launched with the SSP4Dataq2 program launch window. Any or all of the modules can be opened at the same time.

Methodology/Procedures

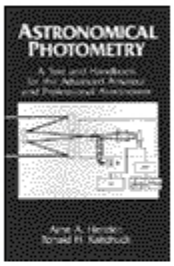
Original Source Document

The principals and methods used in the data reduction are mostly derived from "Astronomical Photometry" by Arne A. Henden and Ronald H. Kaitchuck. The book is published by William-Bell, Inc. and is in its second printing. It is strongly recommended that the user obtain this comprehensive handbook about the subject and read it before attempting to use this software. Both William-Bell (804-320-7016) and Optec have many books on the shelve ready to be delivered to the scientifically inclined.

Astronomical Photometry

The single most import book for any photometrist

ASTRONOMICAL PHOTOMETRY A Text and Handbook for the Advanced Amateur and Professional Astronomer, Henden and Kaitchuck, 9.50" by 6.00", 392 pages, hardbound, Stock No. 17330, $29.95.



Photometry, the measurement of light flux, is one of the most fundamental and oldest research techniques employed in astronomy. It is also an area where valuable contributions can be made by amateur astronomers using small telescopes. Most people who do photometry have learned the hard way, because how-to books in this field are very few and often incomplete. This book is intended to fill this gap for both amateur and professional astronomers who wish to learn the techniques of photoelectric photometry. It begins with an overview of photometry and its history, followed by an explanation of photometric systems and how they are defined. There are three chapters dealing with statistics, required calculations and the processing of the observational data. These chapters, and their related appendices, contain many worked examples to aid the beginner. There are step-by-step instructions on the design and constriction of the photometer head, and two chapters on the associated electronics. The book ends with outlines of some practical observing techniques, suggestions for research projects, and useful appendices of difficult to find information. This book will be an excellent self-contained reference for interested amateur astronomers, astronomy graduate students, or professional astronomers learning photoelectric photometry for the first time.

Procedures Standard Slow Variable

The program is limited to differential photometry for J and H colors only. This methods requires the user to take measurements of the variable star bracketed by measurements of a nearby comparison star. Because extinction K' and K" is used in the calculation to derive exoatmospheric magnitudes, it is not necessary that the comparison and variable star be very close together. Usually, 5 to 10 degrees is sufficient. For example, using the J and H filters the following format is suggested for a quick observation:

SKYj SKYh Cj Ch Vj Vh Cj Ch SKYj SKYh

where C is the comparison star measured with the J and H filters and V is the variable star measured with the same filters. There always needs to be paired readings with the J and H filters. Any unpaired readings will cause the program to stop and post an error message. Proper photometry technique requires both J and H filter to be used in an observation.

Example: Cj Ch Vj Vh Vh Cj Ch will not work because of the extra Vh

Since the raw data file is in standard text format, any errors can be easily repaired with NOTEPAD. With the above example, the user would just delete the line with the extra unpaired Vh measurement. Do not use Word or any other editor that will insert control codes into the file unless you want to ruin it.

Tip: The order of colors is not important for JH photometry . Cj Ch or Ch Cj give the same results.

Check star measurements are ignored in the reduction as long as they are not marked with a C in the catalog column. Normally, they are marked with a Q.

There are three types of SKYs to use on Photometry2: SKYNEXT, SKY and SKYLAST. SKYNEXT applies to all variable or comparison star measurements that come after to the next SKY or SLYLAST. SKY is applied to all measurements that come before and after. SKYLAST is applied to all measurements that come before. Straight line interpolation as described in equations 3.23-3.26 in "Astronomical Photometry" are used to calculate the sky value to be applied to each comparison or variable star measurement based on time. Using the same J and H example above, an ideal order for taking a quick variable star reading would look as follows:

SKYNEXTj SKYNEXTh Cj Ch Vj Vh SKYj SKYh Cj Ch Vj Vh Cj Ch SKYLASTj SKYLASTh

All magnitudes and indices in the tables are reported to 2 decimal places, 0.01 magnitude. The final results are reported to 3 decimal places.

A raw data file can contain multiple variable and comparison star readings as long as they are bracketed properly with the appropriate SKYs. The reduction module will allow the user to associate the appropriate comparison star to each variable. Once reduced, the finished standard magnitude can be appended to the variable star data file.

The standard error is not calculated when using this procedure since not enough data is available for the calculation. See Procedures Slow Variable with Error Limits for a procedure which allows for standard error to be calculated.

Is is always necessary to take both J and H readings since the proper reduction to finished magnitudes cannot be made with just one filter reading.

Procedures Slow Variable with Error Limits

In order for the standard error σ to be calculated at least three variable star observations are needed in a sequence. A suggested sequence for JH photometry would be

SKYNEXTj SKYNEXTh Cj Ch Vj Vh Vj Vh SKYj SKYh Vj Vh Vj Vh Cj Ch SKYLASTj SKYLASTh

There are four variable star readings in this sequence and this is commonly referred to as the STANDARD method.

Procedure for SOE stars

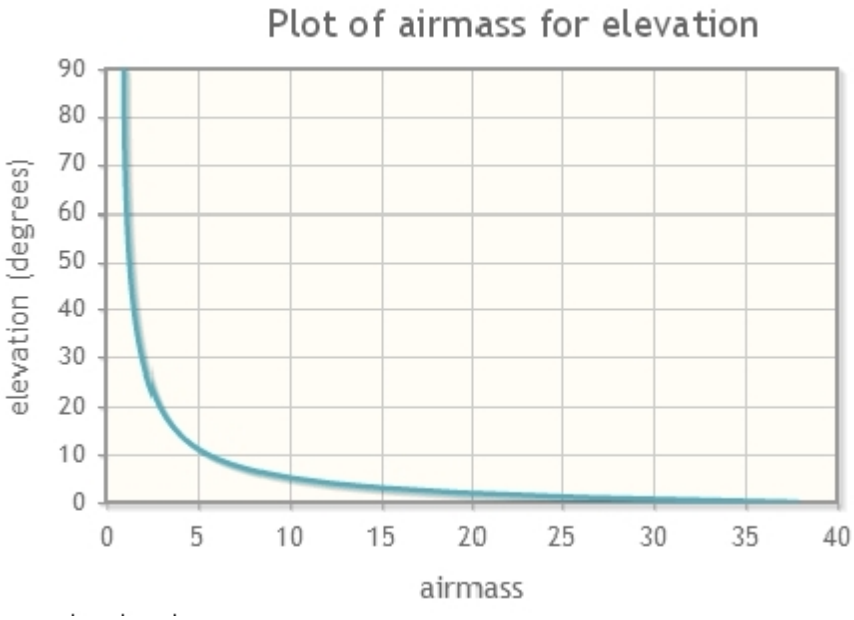
To observe SOE star pairs no Johnson standard comparison stars need to be observed since the calculation is done only with instrument b and v magnitude. Only star pairs 1 degree or closer with widely differing spectral class are necessary since the calculation is done only with instrument b and v magnitude. The blue star should have a spectral class of A or B and the red star should be F or G. It is necessary to separate every Blue-Red observation with a SKY reading. It is suggested that the SKY reading be done directly after the observation of b and v for the two stars. See example below.

SKYNEXTj SKYNEXTh Blue-j Blue-h Red-j Red-h SKYj SKYh Blue-j Blue-h Red-j Red-h ....(observe star pair every 20 minutes until sufficient differential air mass is accumulated) . . . . . SKYLASTj SKYLASTh

where Blue-x is the blue star and Red-x is the red star.

It is not necessary to do the b magnitude reading first or to do the blue star first but it was done this way in the sample file `Sample SOE.raw.`

Usually, it will take about three hours of observing to get a good K"jh. Start with the star pair at 20 degrees altitude to get around 2.5 air mass to start and continue observing until the altitude is near 60 degrees or above.



About Time

All dates are calculated in Julian (J2000.0) epoch format and reported to 4 decimal places. The SSP4Dataq2 data acquisition program uses the PC clock for time-stamping the data. A time zone addition or subtraction is used to convert the local PC time to GMT or UT. Normally, the PC clock is synchronized to a internet time standard for UTC (Coordinate Universal Time) using one of the many "atomic" clock programs available. I use the one freely available from the NIST Internet time Service (ITS).

I use the term UT (Universal Time) which really should be referred to as UT1 the principal form of Universal time based on observation of distant quasars instead of the sun. See wikipedia for more information about time standards.

The wide variety of time standards in the world makes using a "standard" some what difficult in a program of this nature. The AAVSO uses UT time (really UT1) and Julian date based on the number of days and fractions of a day since January 1, 4713 BC Greenwich noon. For February 11, 2010, 22:51:0.0 (Hr:Min:Sec) (UTC time reference) the Julian number is 2455239.45208. To simplify the writing of such a large number, the IAU decided at the General Assembly in 1976 that the new standard equinox J2000.0 should be used starting in 1984. This standard epoch defines day zero to be started at January 1, 2000, noon (Terrestrial Time). Thus, the above sample date is 3694.45208 a slightly easier number to manage.

Tip: To convert the J2000 date reported in SSPDataq3 to the long version, add 2451545.0 to the result.

The difference between UT and UTC is slight but meaningful for some scientific pursuits. By international convention, the difference between the two time scales should not exceed 0.9 seconds. For most purposes this difference should not matter for users of this program.

Another source of error, is that the algorithm used in this program to compute J2000 from UT time and date does not take into account the 2 leap seconds that have been added to UTC since the year 2000. However, the program only reports J2000 dates to a resolution of 0.0001 days which is equivalent to 8.6 seconds. So, a 2 second error should not matter in the end results. The raw data files report the UT (really UTC time if synchronized to time signals) to 0.001 seconds so that other program could make use of the better time resolution.

Heliocentric Julian Date

Both the Julian and Calendar dates/time used in the RAW files is current earth centric time as described above. The AAVSO will accept uploaded files in the extended format using JD (Julian Date) or HCD (Heliocentric Julian Date). If using a service other than the AAVSO, it would be necessary to report the time of observations in HJD which is the commonly accepted format. In the Data Reduction module, it is possible to select this option in the Edit Coefficients window. Selecting HJD will convert the JD date to HJD and write the VAR file using that protocol. The calendar date in the VAR file is still left in current JD and not converted. The difference between JD and JHD is only about 16 minutes maximum depending on the position of earth in our orbit when the observation is taken. There is nothing in the VAR file to designate whether JD or JHD is used so it is necessary that the user be careful and not switch between formats on a whim. The PPparms2.txt file stores the selection of JD or JHD.

About Filters/Colors

SSP4dataq2 is designed to work with colors in the standard JH systems of Mauna Kea Observatories (MKO).

Filter Specifications:

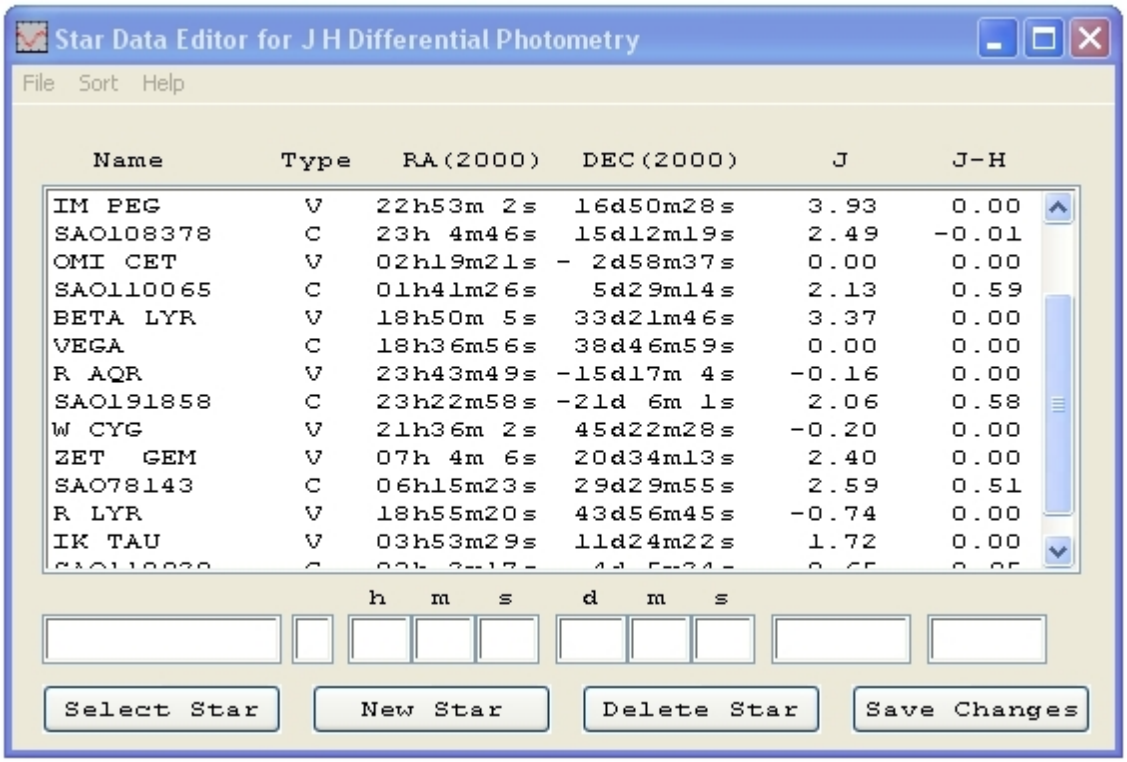
FILTER	Center Wavelength	passband
J	1.250 microns	0.20 microns
H	1.650 microns	0.30 microns

Comp/Variable Star Data Editor

All VARiable, COMParison, Check (Q'Check), SOE and TRANSformation stars need to be entered in the Star Data database if they are going to be observed. The entered parameters for position, magnitude and color indices are used in the reduction process to obtained standard V magnitude, U-B, B-V, V-R, and V-I index.

In the Photometry2 menu selection of SSPDataq3, select **Variable/Comp Star Data Editor**. When the data editor window opens select from the File menu either the **Variable/Comp/Check, Transformation** or **SOE** star database.

The Star Data Editor module with the `Star Database JH.txt` database opened showing comparison and variable stars is shown below.



Open Variable/Comp Star Data

Select a star to edit by double clicking on the line in the list box. The information for that star will then be copied to the edit text boxes located just below the listbox. The user can then type over any information if necessary with new parameters.

A comparison star is indicated by a C in the Type column and a variable star is indicated by a V.

Important: Every star must be designated by a C or a V in the Type column.

It is strongly suggested that all RA and DEC coordinates be for Epoch 2000. Most sky and telescope control programs such as GUIDE 9.0, most beloved by this user, can be set for this Epoch.

Position for RA is entered in hours, minutes and seconds with seconds rounded to the nearest whole number.

Position for DEC is entered in degrees, minutes and seconds with seconds rounded to the nearest whole number. If the DEC position is south of the equator, enter a minus sign in the degrees box preceding the value. A "-0" is acceptable for

stars just south of the equator.

For the comparison stars, enter the accepted V magnitude and as many color indices that you care to record Enter data to the nearest 0.01 magnitude. It is not necessary to enter this data for the variable stars, but an approximate magnitude and color index entry could be made for informational purposes.

Once the star has been edited, select the **Save Changes** button to copy the changes back to the listbox. The star data will remain in the edit boxes until another star is selected for edit or a new star is added to the list.

To delete a star, bring the contents of the star into the edit boxes as described above and the select the **Delete Star** button.

To enter a new star, press the **Enter New Star** button. The text "NEW STAR" will be printed in the star name box. At this point, continue to type new parameters into the boxes including typing over the "NEW STAR" text with the actual star name. Names are limited to 12 characters only. When the boxes are completed, press the **Save Changes** button to copy the contents to the list box. Initially, the new star will be added to the bottom of the list. Once the Star Data Editor is closed and then reopened, the new star will be listed in proper alpha/numeric order.

Important: The Save Changes button only copies the contents of the edit boxes to the listbox. The information is not saved to disk yet.

Open Transformation Star Data

Stars used to find the rho and lambda coefficients are listed in this database. Since the methods used in Photometry JH are for differential photometry, the cluster method is highly suggested. That is, all the stars observed should be close together.

There are many standard star catalogs to choose from but not all are based on MKO stars. Also, many of the published catalogs are for stars that are too faint for use with this instrumentation. Sky atlas programs such as Guide 9.0 can also be used to find standard magnitudes of stars. At the end of this help file, there are several pages which can be of help finding appropriate standard stars.

Edit, delete and enter new stars as described in Variable/Comp Star Data. The only real difference is that Type refers to spectral type and is entered for informational purposes only and could be left blank if so desired.

Open SOE Star Data

Blue/Red star pairs used to find the K"jh coefficient are listed in this database. These stars should be spectral type A or B for the blue star and G or K for the red star. They should also show little or no variability of course and be close to the same magnitude. Most important the star pairs should have a separation of 1 degree or less for best results.

Edit, delete and enter new stars as described in Variable/Comp Star Data. The only real difference is that Type refers to spectral type and, unlike the Transformation Star Database, is important to enter correctly. The Spectral type is used to sort the stars into Blue and Red pairs during the data reduction in the SOE Coefficient Module.

Important: Every star must be designated by a Spectral Code in the Type column. Only A & B types can be used for the Blue star and G & K types for the red star.

Saving Data to Disk

As mentioned above, pressing the Save Changes button only copies the contents of the edit boxes to the listbox. The data is not saved to disk.

Important: Select Save Data File from the File menu in order to save your changes to the Star Data.txt file. The old file is saved and renamed Star Data.old in case you screw up.

UBVRIJKL Catalog

The following are scanned views of Table 2 as presented in Communication No. 63 of the *Communications of the Lunar and Planetary Laboratory.* The original work was done under a National Science Foundation, NASA and Office of Naval

Research grants so the images are not copyright protected. Higher resolution images of these pages are available in the folder UBVRIJKL Cat.

BRIGHT STAR PHOTOMETRY

B.S.	R	V	U-V	B-V	V-R	V-I	V-J	V-K	V-L	SP.	V	R	K	S
3		4.61	1.91	1.04	0.78	1.32	1.66	2.36	2.43	K1 III	3	3	3	1
15		2.06	-0.58	-0.11	-0.03	-0.13	-0.28	-0.34	.	B9p (III)	6	4	3	1
21		2.27	0.46	0.34	0.31	0.51	0.62	0.79	.	F2 IV	9	4	3	1
25		3.88	1.87	1.03	0.75	1.27	.	.	.	K0 III	6	1	0	2
27		5.04	0.66	0.40	0.42	0.71	0.99	1.23	.	F2 II	2	2	1	1
39		2.84	-1.09	-0.23	-0.10	-0.29	-0.50	-0.68	-0.69	B2 IV	9	8	3	1
45		4.80	3.50	1.57	1.34	2.47	3.11	4.17	4.35	M2 III	9	9	9	1
48	V	4.46	3.61	1.66	1.40	2.54	.	.	.	(gM1)	2	2	0	1
63		4.61	0.11	0.06	0.08	0.09	.	.	.	A2 V	9	2	0	1
68		4.52	0.12	0.05	0.08	0.08	.	.	.	A2 V	6	2	0	1
74		3.55	2.39	1.22	0.85	1.44	1.89	2.60	2.69	K2 III	2	2	4	1
77		4.23	0.60	0.58	0.49	0.83	.	.	.	G2 V	3	4	0	4
90	V	7.39	3.22	1.97	2.94	5.09	6.22	7.79	8.63	S6+6e(M7e)	JD2439056			
98		2.80	0.73	0.62	0.50	0.84	.	.	.	G1 IV	3	2	0	4
99		2.40	1.97	1.09	0.81	1.40	.	.	.	K0 III	6	1	0	2
100		3.94	0.27	0.17	0.14	0.22	.	.	.	A7 Vn	6	1	0	2
105	V	4.81	3.45	1.64	1.59	2.97	.	.	.	(M5)	3	1	0	2
113		5.94	-0.35	0.01	.	.	0.03	0.18	.	(B9)	9	0	2	1
123	D	4.73	-0.46	-0.10	0.00	-0.12	.	.	.	(B8)	3	3	0	1
130		4.16	-0.66	0.14	0.14	0.20	0.17	0.24	0.25	B1 Ia	9	6	4	1
153		3.66	-1.08	-0.19	-0.08	-0.29	-0.58	-0.74	-0.79	B2.5 IV	4	4	2	1
154		4.36	-0.71	-0.16	-0.04	-0.16	.	.	.	B5 V	2	2	0	1
163		4.38	1.34	0.87	0.68	1.19	1.54	2.17	.	G8 IIIp	4	2	3	1
165		3.28	2.76	1.28	0.92	1.58	2.04	2.80	2.98	K3 III	4	2	4	1
166		5.86	1.43	0.85	0.65	1.04	1.40	1.89	.	K0 V	5	5	1	3
168		2.23	2.29	1.17	0.78	1.38	1.81	2.48	2.69	K0 II-III	7	4	3	1
175		5.33	1.49	0.89	0.71	1.17	.	.	.	G8 III	7	4	0	1
179		4.81	-0.76	-0.10	-0.01	-0.13	-0.21	-0.32	-0.22	B2 V	3	3	3	1
180		4.59	1.69	0.97	0.75	1.27	.	.	.	G8 III	6	4	0	2
188		2.02	1.89	1.01	0.72	1.23	1.63	2.27	.	K1 III	6	3	3	1
193		4.50	-0.59	-0.06	0.05	0.00	-0.09	-0.13	-0.14	B2 V	3	3	1	1
194		4.75	1.84	1.00	0.74	1.25	.	.	.	K0 III	4	4	0	1
215	V	4.06	1.99	1.12	0.85	1.44	1.87	2.54	.	K1 II	3	3	3	1
219	D	3.44	0.60	0.58	0.50	0.86	1.08	1.47	.	G0 V	4	2	3	1
222		5.76	1.46	0.88	0.77	1.24	.	.	.	K2 V	4	2	0	3
224		4.44	3.39	1.51	1.17	2.04	2.66	3.61	.	K5 III	2	2	3	1
226		4.53	-0.73	-0.15	-0.03	-0.18	.	.	.	B5 V	7	2	0	1
235		5.20	0.49	0.50	0.46	0.74	.	.	.	F8 V	6	4	0	1
244		4.82	0.65	0.53	0.48	0.78	.	.	.	F8 V	3	3	0	1
248		4.78	3.49	1.57	1.23	2.14	.	.	.	M0 III	2	2	0	1
253		4.84	2.48	1.22	0.92	1.53	.	.	.	K2 III	2	2	0	1
264	V	2.39	-1.21	-0.10	0.07	-0.01	-0.08	0.19	0.39	B0 IV:e	3	3	4	1
265		4.64	1.66	0.96	0.77	1.27	.	.	.	G8 III-IV	2	2	0	1
269		3.87	0.27	0.12	0.15	0.23	.	.	.	A4 III	2	2	0	1
271		4.42	1.63	0.94	0.73	1.21	.	.	.	G8 III-IV	6	2	0	1
276		6.32	1.48	0.90	0.67	1.13	.	.	.	G5 III	7	4	0	1
280		4.27	-0.75	-0.18	-0.03	-0.16	.	.	.	B8 IIIp	2	5	0	1
285		4.26	2.54	1.21	0.89	1.49	.	.	.	K2 III	3	3	0	1
290		5.98	0.25	0.16	0.18	0.23	.	.	.	A7 V	6	4	0	1
294		4.28	1.67	0.96	0.78	1.30	1.68	2.28	.	K0 III	4	4	2	1
315		6.12	1.86	1.01	0.73	1.26	.	.	.	K0 III	5	3	0	1
321		5.18	0.78	0.69	0.63	1.04	.	.	.	G5 Vp	9	4	0	3
322	D	3.31	1.46	0.90	0.71	1.23	.	.	.	G8 III	3	4	0	2
330		5.53	0.33	0.34	0.35	0.53	.	.	.	F2 V	8	2	0	1
334		3.45	2.35	1.16	0.83	1.41	1.87	2.62	.	K3 III	5	3	2	1
335	D	4.25	-0.41	-0.07	0.03	-0.02	.	.	.	B7 V	4	4	0	1
337		2.05	3.53	1.57	1.24	2.24	2.87	3.88	.	M0 III	4	2	2	1
343		4.34	0.30	0.17	0.18	0.25	.	.	.	A7 V	9	3	0	1
351		4.66	1.84	1.03	0.76	1.30	.	.	.	G8 III	2	2	0	1
352		4.51	2.10	1.10	0.82	1.40	.	.	.	K0 III-IV	2	2	0	1

BRIGHT STAR PHO

B.S.	R	V	U-V	B-V	V-R	V-I	V-J
360		4.66	1.87	1.03	0.75	1.28	1.65
370		4.96	0.68	0.58	0.49	0.85	.
378		5.17	0.15	0.07	0.11	0.14	.
382		4.99	1.17	0.68	0.64	1.20	1.52
383		4.76	0.13	0.03	0.08	0.13	.
390		4.90	2.05	1.08	0.81	1.34	.
399		4.74	1.97	1.04	0.78	1.30	.
402		3.59	1.98	1.06	0.76	1.32	1.75
403	V	2.68	0.26	0.13	0.15	0.24	0.27
417		4.83	0.42	0.42	0.41	0.64	.
423	V	5.77	.	3.83	2.05	3.43	4.33
424		2.02	0.98	0.60	0.49	0.80	.
429	V	3.41	3.41	1.57	1.26	2.24	.
434		4.84	2.90	1.38	1.06	1.80	2.42
437		3.62	1.71	0.97	0.72	1.22	1.59
440		3.95	1.69	0.99	0.75	1.26	.
442		4.72	1.76	1.00	0.77	1.30	.
458		4.10	0.60	0.54	0.46	0.75	0.93
461		5.56	2.81	1.38	0.97	1.68	.
464		3.57	2.72	1.28	0.96	1.61	2.04
472		(0.47)	.	-0.15	-0.03	-0.10	.
477		4.94	-0.50	-0.09	-0.01	-0.08	.
483		4.96	0.73	0.62	0.53	0.86	1.08
485		5.99	1.89	1.01	0.77	1.23	.
486		5.07	.	0.88	0.69	1.17	.
489		4.44	2.92	1.36	1.06	1.77	2.31
493		5.24	1.33	0.84	0.69	1.12	.
496	V	4.06	-0.96	-0.04	0.16	0.18	0.23
509		3.50	0.93	0.72	0.62	1.09	1.34
510		4.26	1.64	0.96	0.74	1.22	1.57
511		5.63	1.21	0.81	0.64	1.03	.
519		5.49	.	1.59	1.49	2.76	3.51
530	D	5.86	1.24	0.74	0.68	1.17	.
531		4.68	0.35	0.32	0.29	0.45	.
534		5.94	0.28	0.30	0.33	0.50	.
539		3.72	2.20	1.14	0.80	1.35	1.80
542		3.38	-0.77	-0.15	-0.04	-0.16	-0.29
544		3.42	0.54	0.48	0.42	0.70	0.89
545/6		3.88	-0.17	-0.04	0.01	-0.04	.
549		4.63	1.64	0.94	0.73	1.20	.
553		2.65	0.23	0.13	0.14	0.22	0.18
555		4.41	3.30	1.59	1.73	3.24	.
558		5.11	-0.20	-0.06	0.02	-0.04	.
569		4.79	0.37	0.28	0.28	0.44	.
574		4.83	1.39	0.88	0.70	1.15	.
575		4.54	0.22	0.16	0.18	0.26	.
580		3.98	0.03	-0.01	0.06	0.06	.
585		4.01	3.45	1.56	1.26	2.30	2.90
590		5.04	-0.40	-0.08	0.03	-0.02	.
595/6		3.82	-0.07	0.02	0.08	0.08	.
599		5.50	0.09	0.03	0.06	0.09	.
602		5.14	3.31	1.49	1.22	2.11	2.62
603/4		2.10	2.13	1.21	0.94	1.62	2.08
612		4.69	-0.68	-0.17	-0.04	-0.18	-0.32
617		2.00	2.28	1.15	0.84	1.46	1.90
618		5.67	0.60	0.61	0.59	1.09	1.40
620		4.83	0.26	0.12	0.14	0.21	.
622		3.00	0.26	0.14	0.14	0.22	0.22
627		6.35	-0.10	0.33	0.34	0.60	.
641		6.43	0.84	0.60	0.55	1.06	.

BRIGHT STAR PHOTOMETRY

B.S.	R	V	U-V	B-V	V-R	V-I	V-J	V-K	V-L	SP.	V	R	K	S
647		6.06	0.33	0.40	0.38	0.63	.	.	.	F5 V	4	3	0	1
648		5.70	3.50	1.55	1.24	2.21	2.88	3.80	.	M0 III	5	3	2	1
649		4.37	1.49	0.88	0.67	1.16	1.51	2.06	.	G8 II	2	2	2	1
654		6.48	-0.38	0.28	0.34	0.53	.	.	.	B1 Iab	5	4	0	1
656		5.79	0.48	0.44	0.40	0.61	.	.	.	(dF3)	3	6	0	1
664		4.01	0.04	0.02	0.03	0.03	.	.	.	A0 V	3	3	0	1
681	max	3.04	2.51	1.42	2.01	3.91	4.84	6.04	6.69	M4.5(gM6e)	JD2439130			
681	min	8.65	1.30	1.60	4.49	7.91	9.49	10.84	11.53	M7 (gM6e)	JD2438670			
695		5.20	.	0.60	0.54	0.90	.	.	.	G1 V	3	6	0	4
696		6.25	-0.31	0.30	0.33	0.52	0.61	0.77	0.87	B2 Ia	9	4	8	1
699		4.70	3.43	1.53	1.18	2.05	.	.	.	K4 III	3	3	0	1
707	D	4.53	0.19	0.13	0.16	0.22	.	.	.	A5p	4	4	0	1
708		4.89	-0.07	-0.02	-0.02	-0.05	.	.	.	B9 V	3	3	0	1
710		5.83	0.23	0.14	0.12	0.16	.	.	.	A7p	5	4	0	1
718		4.29	-0.17	-0.06	0.02	-0.03	-0.12	-0.14	0.04	B9 III	9	9	1	1
721		4.25	-0.64	-0.14	-0.03	-0.16	-0.29	-0.39	.	B5 III	6	4	1	2
740		4.75	0.44	0.45	0.41	0.68	.	.	.	F5 IV-V	3	2	0	1
749	D	4.89	-0.20	-0.06	0.02	-0.05	.	.	.	(B9)	2	6	0	1
753		5.82	1.76	0.97	0.83	1.36	.	.	.	K3 V	9	9	0	1
754		4.86	1.39	0.86	0.65	1.14	.	.	.	G8 III	4	3	0	1
779		4.06	-1.09	-0.21	-0.07	-0.28	.	.	.	B2 IV	2	2	0	1
788		4.92	0.73	0.59	0.50	0.80	.	.	.	F9 V	3	2	0	1
789		4.75	0.12	0.06	0.10	0.11	.	.	.	A2 V	6	4	0	2
794		4.11	1.76	1.02	0.79	1.35	.	.	.	K0 III	9	4	0	2
797		6.30	0.12	0.06	0.05	0.07	.	.	.	A2 V	4	3	0	1
799		4.13	0.49	0.49	0.46	0.76	.	.	.	F7 V	5	3	0	1
801		4.67	-0.76	-0.13	-0.02	-0.15	.	.	.	B3 V	3	3	0	1
804	D	3.47	0.16	0.09	0.11	0.15	0.17	0.24	.	A2 V	9	3	3	1
811		4.25	-0.59	-0.14	-0.02	-0.16	.	.	.	B7 V	4	4	0	1
813		4.27	0.38	0.31	0.30	0.49	.	.	.	F0 IV	5	3	0	1
818		4.46	0.48	0.48	0.43	0.70	.	.	.	F6 V	2	2	0	1
824		4.52	2.14	1.11	0.80	1.38	1.82	2.50	.	K1 III	2	2	3	1
825		6.26	1.39	0.88	0.82	1.58	.	.	.	A5 Ia	9	7	0	1
834		3.79	3.59	1.69	1.23	2.12	2.74	3.70	3.88	K3 Ib+B9 V	2	2	4	1
838		3.63	-0.48	-0.10	-0.02	-0.13	.	.	.	B8 V	4	4	0	1
840		4.23	0.42	0.34	0.30	0.53	.	.	.	F2 III	5	3	0	1
841		4.46	1.68	0.99	0.76	1.30	.	.	.	G6 III	6	4	0	2
843		4.53	3.48	1.56	1.21	2.16	2.77	3.75	.	K5 III	4	4	2	1
850		4.77	1.51	0.90	0.70	1.17	.	.	.	K0 III	3	3	0	1
854		3.95	1.21	0.75	0.62	1.06	1.40	1.94	.	G4 III+A4 V	3	3	2	1
857		6.05	1.43	0.87	0.71	1.16	.	.	.	K0 V	4	3	0	3
874		3.87	2.10	1.12	0.79	1.37	1.80	2.47	.	K1 III-IV	3	3	4	1
875		5.17	0.13	0.08	0.11	0.16	.	.	.	A1 V	9	9	0	1
878		5.80	0.42	0.41	0.38	0.58	.	.	.	(dF4)	3	6	0	1
879		4.70	0.18	0.06	0.10	0.14	.	.	.	A2 V	2	2	0	1
882		4.94	2.53	1.25	0.89	1.53	.	.	.	K2 III	2	2	0	1
887		4.63	0.12	0.04	0.05	0.07	.	.	.	A2 V	4	3	0	1
896		4.70	-0.57	-0.12	-0.03	-0.14	.	.	.	B5 III	3	3	0	1
897/8		2.91	0.24	0.12	0.14	0.22	0.12	0.20	.	A3 V	6	4	2	2
906		5.95	0.24	0.15	0.13	0.20	.	.	.	A7m	4	3	0	1
911		2.53	3.57	1.64	1.35	2.51	3.13	4.21	4.27	M2 III	6	3	2	1
915		2.93	1.15	0.70	0.59	1.04	1.40	1.95	.	G8 III;+A3;	6	2	3	1
919		4.09	0.24	0.16	0.13	0.22	.	.	.	A4 V	6	2	0	1
921	V	3.39	3.44	1.65	1.80	3.42	4.17	5.32	5.53	M4 IIIa	5	2	8	1
932		4.88	0.07	0.02	0.08	0.07	.	.	.	A0 V	3	3	0	1
936	V	2.12	-0.42	-0.05	0.04	0.01	-0.04	-0.12	.	B8 V	8	3	2	1
937		4.05	0.71	0.60	0.53	0.82	1.00	1.34	.	G4 V	8	2	4	1
941		3.81	1.81	0.98	0.74	1.24	1.58	2.16	.	K0 III	3	3	3	1
947		4.64	2.13	1.11	0.83	1.40	.	.	.	K0 III	3	3	0	1
951		4.37	1.89	1.03	0.77	1.28	1.68	2.29	.	K2 III	3	2	4	1

BRIGHT STAR PHOTOME

B.S.	R	V	U-V	B-V	V-R	V-I	V-J	V-K
963	D	3.85	0.56	0.51	0.46	0.77	1.00	1.3
972		4.89	-0.03	-0.02	0.06	0.03	.	.
977	*V	5.74	.	2.27	1.89	3.27	4.36	5.7
984		4.80	0.32	0.23	0.22	0.33	.	.
985		4.85	-0.92	-0.15	-0.03	-0.16	.	.
991		4.82	3.04	1.49	1.07	1.83	2.36	3.2
996		4.84	0.87	0.68	0.57	0.93	.	.
999		4.47	3.31	1.54	1.20	2.08	.	.
1002		4.95	0.11	0.04	0.08	0.08	.	.
1003		3.70	3.43	1.62	1.58	3.04	3.77	4.6
1006		5.54	.	0.64	0.54	0.88	.	.
1008		4.27	0.93	0.71	0.62	1.02	.	.
1010		5.24	.	0.60	0.49	0.83	.	.
1016		5.52	1.47	0.88	0.66	1.13	.	.
1017		1.79	0.87	0.48	0.45	0.78	0.92	1.2
1030		3.60	1.51	0.89	0.68	1.13	1.46	2.0
1034		4.98	-0.65	-0.10	0.01	-0.09	.	.
1035	D	4.21	0.18	0.41	0.37	0.75	0.98	1.2
1038		3.75	-0.42	-0.09	-0.01	-0.10	.	.
1040		4.54	0.45	0.56	0.51	1.01	1.32	1.6
1044		4.67	-0.66	-0.09	0.02	-0.09	.	.
1046	D	5.10	0.09	0.04	0.09	0.08	.	.
1052		4.38	2.87	1.34	1.09	1.83	2.31	3.1
1066		4.10	2.15	1.13	0.77	1.31	1.73	2.3
1069		5.32	0.39	0.41	0.41	0.63	0.87	0.9
1070		4.73	-0.36	-0.09	-0.01	-0.09	.	.
1084	*	3.73	1.46	0.88	0.72	1.19	1.49	2.0
1087		4.23	-0.62	-0.06	0.10	0.09	.	.
1088		4.28	-0.47	-0.12	0.00	-0.12	.	.
1101		4.28	0.65	0.57	0.49	0.81	1.00	1.2
1106		4.58	1.81	1.04	0.84	1.41	1.81	2.4
1122		3.01	-0.63	-0.12	0.02	-0.09	-0.23	-0.2
1129		4.79	1.06	0.81	0.74	1.27	.	.
1131		3.83	-0.70	0.05	0.12	0.12	.	.
1134		5.00	-0.76	-0.16	-0.05	-0.20	.	.
1135		3.77	0.74	0.42	0.41	0.67	0.85	1.0
1136		3.54	1.59	0.92	0.72	1.22	1.58	2.0
1138		5.44	0.21	0.09	0.11	0.14	.	.
1140		5.46	-0.37	-0.04	0.06	0.01	0.01	-0.0
1142		3.70	-0.52	-0.12	-0.01	-0.11	-0.18	-0.2
1144		5.65	-0.43	-0.07	0.03	-0.04	-0.12	-0.0
1145		4.30	-0.57	-0.11	-0.01	-0.10	-0.15	-0.2
1148		4.66	0.10	0.03	0.13	0.17	.	.
1149		3.87	-0.47	-0.07	0.04	-0.02	-0.06	-0.0
1151		5.76	-0.27	-0.04	0.06	0.02	-0.04	-0.0
1152		6.43	-0.17	-0.02	0.04	0.02	.	.
1155	V	4.48	4.01	1.88	1.71	3.13	3.97	5.0
1156		4.18	-0.48	-0.06	0.07	0.03	0.02	0.0
1162		4.42	3.63	1.62	1.34	2.39	3.08	4.2
1165		2.87	-0.44	-0.09	0.03	-0.01	-0.08	-0.1
1172		5.45	-0.39	-0.07	0.05	-0.01	-0.13	-0.2
1173		4.23	0.43	0.42	0.39	0.61	.	.
1178		3.62	-0.45	-0.09	0.01	-0.04	-0.12	-0.2
1180	V	5.09	-0.36	-0.08	0.07	0.01	-0.02	0.0
1183		6.17	-0.24	-0.05	0.03	-0.02	.	.
1185		6.07	-0.33	-0.01	0.07	0.06	.	.
1189/90		4.27	-0.05	-0.01	0.02	-0.02	.	.
1195		4.17	1.63	0.95	0.71	1.21	1.52	2.1
1201		5.97	0.34	0.34	0.33	0.50	.	.
1203		2.85	-0.66	0.12	0.14	0.23	0.20	0.2

BRIGHT STAR PHOTOMETRY

B.S.	R	V	U-V	B-V	V-R	V-I	V-J	V-K	V-L	SP.	V	R	K	S
1204		5.04	-0.26	-0.10	0.07	-0.01	.	.	.	B9 V	2	3	0	1
1211/2		4.45	1.10	0.68	0.59	0.99	.	.	.	A1 V/G5III	3	3	0	1
1213		4.65	-0.61	-0.13	-0.03	-0.17	.	.	.	B5 V	3	4	0	1
1220		2.89	-1.18	-0.18	-0.07	-0.25	-0.47	-0.66	-0.65	B0.5 V	8	3	4	1
1228		4.04	-0.91	0.02	0.16	0.15	0.08	0.03	0.09	O7	9	3	6	1
1231		2.94	3.58	1.60	1.26	2.26	2.87	3.87	3.94	M0 III	6	3	3	1
1233		6.37	0.42	0.42	0.38	0.60	.	.	.	F5 V	4	4	0	1
1238		5.89	0.37	0.32	0.32	0.49	.	.	.	F1 V	2	5	0	1
1239	V	3.41	-0.75	-0.12	-0.03	-0.12	-0.25	-0.24	-0.19	B3 V+A4 IV	3	3	3	1
1240		4.66	-0.55	-0.14	0.02	-0.11	.	.	.	A0 III	3	3	0	1
1242		5.08	0.99	0.50	0.51	0.90	1.15	1.32	.	F0 II	3	3	1	1
1251		3.91	0.09	0.03	0.08	0.08	.	.	.	A1 V	3	4	0	1
1254		5.46	0.36	0.36	0.37	0.58	.	.	.	F3 V	3	5	0	1
1256		4.37	2.02	1.07	0.79	1.32	1.74	2.40	.	K0 III	3	3	3	1
1261		4.29	-0.02	0.02	0.08	0.10	.	.	.	B9 V	3	3	0	1
1273		4.03	-0.58	-0.03	0.12	0.10	.	.	.	B3 Vp	7	3	0	1
1279	D	6.01	0.42	0.40	0.38	0.59	.	.	.	F3 V	3	4	0	1
1292		5.73	0.35	0.36	0.35	0.54	.	.	.	F4 V	3	8	0	1
1298		4.05	0.48	0.33	0.31	0.47	.	.	.	F2 II-III	3	2	0	1
1302		4.93	0.40	0.33	0.35	0.56	0.63	0.90	.	(gF0)	3	3	3	2
1303		4.15	1.59	0.95	0.79	1.33	1.67	2.22	2.32	G0 Ib	4	4	5	1
1306		4.71	1.65	1.01	0.80	1.37	.	.	.	G5 Ib+A2	3	3	0	1
1309		5.29	0.36	0.36	0.35	0.54	0.74	0.89	.	F3 V	3	3	1	1
1311	D	4.84	1.31	0.80	0.66	1.11	.	.	.	(gG5)	4	4	0	1
1318	D	4.86	2.32	1.18	0.85	1.42	1.92	2.63	.	K2 III+G2 V	4	2	2	1
1319		6.32	0.42	0.40	0.38	0.59	.	.	.	F3 V	2	4	0	1
1320		4.30	-0.56	-0.05	0.05	-0.01	.	.	.	B3 V	2	2	0	1
1324		4.61	0.07	0.04	0.15	0.20	.	.	.	(A2)	9	3	0	1
1325		4.43	1.26	0.82	0.69	1.14	1.48	2.03	.	K1 V	9	4	3	1
1326		3.86	2.11	1.10	0.86	1.45	1.81	2.48	.	K1 III	3	3	3	2
1327		5.27	1.28	0.81	0.64	1.07	1.36	1.86	1.92	G5 III	6	3	3	1
1329		4.94	0.37	0.26	0.26	0.37	.	.	.	A m	3	3	0	1
1331		5.65	0.35	0.28	0.28	0.44	.	.	.	A8 V	3	4	0	1
1346		3.65	1.80	0.99	0.73	1.20	1.58	2.14	.	K0 III	9	7	3	1
1347		3.56	-0.49	-0.12	-0.01	-0.12	-0.29	-0.31	.	B8.5 V	6	3	3	2
1350		4.86	-0.56	-0.02	0.09	0.04	.	.	.	B6 III	2	2	0	1
1351		5.59	0.36	0.28	0.28	0.44	.	.	.	F0 V	2	4	0	1
1354		6.11	0.40	0.37	0.37	0.57	.	.	.	F2 V	2	8	0	1
1355		4.44	2.15	1.08	0.83	1.38	1.87	2.47	.	(sgK5)	6	3	4	2
1356		5.26	0.32	0.22	0.23	0.35	.	.	.	A9 V	2	4	0	1
1358		6.17	0.48	0.46	0.42	0.67	.	.	.	F6 V	2	5	0	1
1368		5.72	0.42	0.32	0.31	0.48	.	.	.	F m	2	4	0	1
1373		3.26	1.81	0.99	0.73	1.20	1.53	2.12	2.21	K1 III	9	6	6	1
1376		5.64	0.43	0.30	0.27	0.43	.	.	.	A m	2	4	0	1
1380		4.80	0.28	0.15	0.16	0.23	.	.	.	A7.5 V	5	8	0	1
1381		5.12	0.18	0.07	0.10	0.15	.	.	.	(A2)	4	3	0	1
1383		5.17	0.16	0.08	0.10	0.13	.	.	.	A1 V	3	3	0	1
1385		5.97	0.41	0.37	0.38	0.60	.	.	.	F4 Vs	2	4	0	1
1387		4.22	0.27	0.13	0.16	0.21	.	.	.	A7 V	6	7	0	1
1388		5.28	0.34	0.25	0.26	0.40	.	.	.	A7 V	4	3	0	1
1389		4.28	0.12	0.04	0.09	0.10	.	.	.	A3 V	4	7	0	1
1391		6.46	0.51	0.49	0.45	0.70	.	.	.	F7 V	2	4	0	1
1392		4.28	0.41	0.26	0.27	0.41	.	.	.	A8 Vn	7	8	0	1
1393		3.96	3.29	1.49	1.17	2.00	2.51	3.45	.	M1 III	6	3	3	2
1394		4.50	0.39	0.25	0.27	0.42	.	.	.	F0 V	4	7	0	1
1396		4.69	1.70	0.98	0.72	1.23	.	.	.	G8 III	3	4	0	1
1403		5.72	0.37	0.27	0.25	0.39	.	.	.	(dA8n)	3	4	0	1
1408		5.90	0.38	0.32	0.31	0.50	.	.	.	F0 V	3	4	0	1
1409		3.54	1.88	1.01	0.73	1.23	1.60	2.21	.	K1 III	9	9	3	1
1411		3.83	1.67	0.95	0.71	1.18	1.54	2.10	.	G9 III	9	9	3	1

BRIGHT STAR PHOTOM

B.S.	R	V	U-V	B-V	V-R	V-I	V-J	V-
1412		3.39	0.30	0.18	0.18	0.27	0.32	0.
1414		5.03	0.35	0.23	0.20	0.28	.	.
1422		5.58	0.42	0.32	0.32	0.51	.	.
1427		4.78	0.30	0.17	0.17	0.24	.	.
1428		5.48	0.36	0.26	0.24	0.36	.	.
1430		5.41	0.36	0.26	0.26	0.40	.	.
1432		6.02	0.37	0.34	0.33	0.53	.	.
1436		6.40	0.41	0.41	0.38	0.63	.	.
1437		4.91	2.74	1.31	0.94	1.61	.	.
1444		4.65	0.33	0.25	0.24	0.36	.	.
1448		5.68	0.17	0.05	0.12	0.16	.	.
1453		4.51	1.69	0.98	0.75	1.29	1.65	2.
1454		4.27	2.01	1.22	0.98	1.67	2.18	2.
1457	*	0.86	3.46	1.54	1.23	2.17	2.70	3.
1458		4.26	0.30	0.18	0.19	0.29	.	.
1459		6.02	0.40	0.38	0.37	0.58	.	.
1463		3.92	-1.09	-0.21	-0.10	-0.29	.	.
1464		3.82	1.70	0.98	0.75	1.24	1.52	2.
1472		5.79	0.37	0.31	0.31	0.47	.	.
1473		4.27	0.25	0.12	0.14	0.19	.	.
1479		4.70	0.28	0.14	0.18	0.25	.	.
1480		5.39	0.37	0.25	0.23	0.35	.	.
1481	D	3.87	2.12	1.09	0.84	1.40	1.86	2.
1496	V	4.34	3.39	1.61	1.59	2.97	3.65	4.
1497		4.29	-0.71	-0.14	-0.03	-0.17	.	.
1502		4.45	0.34	0.34	0.34	0.55	0.59	0.
1507		5.40	0.33	0.25	0.25	0.38	.	.
1517		6.01	2.53	1.21	0.88	1.51	.	.
1519		5.37	0.31	0.19	0.18	0.26	.	.
1520		4.02	-0.76	-0.16	-0.06	-0.20	.	.
1532		5.51	.	0.64	0.55	0.89	.	.
1542		4.29	-0.85	0.03	0.11	0.11	.	.
1543		3.19	0.45	0.46	0.42	0.68	0.80	1.
1544		4.35	0.04	0.01	0.06	0.06	.	.
1547		5.11	0.33	0.21	0.22	0.34	.	.
1551		4.77	2.99	1.41	1.09	1.87	.	.
1552		3.68	-0.97	-0.16	-0.05	-0.21	-0.38	-0.
1560		4.40	0.41	0.23	0.32	0.49	.	.
1566		6.37	0.36	0.29	0.28	0.44	.	.
1567	V	3.73	-1.01	-0.19	-0.06	-0.26	.	.
1568	D	4.47	-0.04	-0.02	0.09	0.08	.	.
1570		4.67	0.17	0.08	0.11	0.14	.	.
1577		2.69	3.31	1.53	1.06	1.88	2.42	3.
1580		4.06	2.25	1.15	0.88	1.51	1.94	2.
1592	D	4.95	0.06	0.05	0.05	0.08	.	.
1601		4.49	2.96	1.40	1.05	1.75	.	.
1603		4.03	1.56	0.93	0.70	1.15	1.42	1.
1605	V*	2.99	0.87	0.54	0.52	0.97	1.17	1.
1611		4.78	0.43	0.26	0.28	0.42	.	.
1612	V	3.75	1.60	1.22	1.13	2.00	2.65	3.
1614		6.21	2.06	1.06	0.85	1.34	.	.
1617		4.81	-0.94	-0.19	-0.08	-0.27	.	.
1620		4.64	0.30	0.16	0.16	0.25	.	.
1621		4.92	-0.19	-0.05	0.02	-0.03	.	.
1637		5.00	0.33	0.34	0.31	0.51	.	.
1638		4.68	-0.15	-0.05	0.04	0.02	.	.
1641		3.18	-0.85	-0.18	-0.05	-0.22	-0.43	-0.
1648	V	6.17	.	3.44	2.32	3.80	4.73	6.
1652	D	4.55	2.39	1.20	0.91	1.56	1.97	2.
1654		3.19	3.23	1.46	1.10	1.91	2.52	3.

BRIGHT STAR PHOTOMETRY

B.S.	R	V	U-V	B-V	V-R	V-I	V-J	V-K	V-L	SP.	V	R	K	S
1657		5.14	-0.24	-0.06	0.01	-0.09	.	.	.	(B9)	2	1	0	1
1663		5.01	.	1.46	1.20	2.11	2.61	3.53	.	M2 III	3	3	3	2
1666		2.79	0.23	0.13	0.14	0.22	0.28	0.41	.	A3 III	9	3	3	1
1670		6.01	0.31	0.27	0.25	0.39	.	.	.	A m	2	5	0	1
1672		5.43	0.39	0.24	0.20	0.32	.	.	.	A2p	2	4	0	1
1674		4.72	0.48	0.52	0.48	0.78	.	.	.	F8 V	6	7	0	4
1676		4.82	0.50	0.32	0.32	0.51	.	.	.	F2 IV	4	3	0	1
1679		4.27	-1.10	-0.20	-0.08	-0.28	.	.	.	B2 IV	3	3	0	1
1689		4.88	0.28	0.18	0.19	0.29	.	.	.	A m	3	3	0	1
1690		6.67	-0.41	-0.07	0.02	-0.11	.	.	.	B8 V	2	2	0	1
1696		4.44	-0.49	-0.09	-0.02	-0.11	.	.	.	B8 V	3	3	0	1
1698	D	4.45	2.33	1.19	0.85	1.44	1.89	2.61	.	K3 III	4	4	3	1
1702		3.29	-0.51	-0.11	-0.01	-0.13	-0.21	-0.28	.	B9 III(p)	4	3	3	1
1705	D	4.36	-0.44	-0.10	-0.01	-0.10	.	.	.	B8 V	3	3	0	1
1708		0.08	1.25	0.80	0.60	1.04	1.37	1.86	1.95	G8 III:+F	6	2	9	1
1713		0.13	-0.68	-0.03	0.01	-0.01	-0.09	-0.07	-0.04	B8 Ia	6	4	9	1
1724		6.42	0.01	-0.02	0.05	0.02	.	.	.	A0 V	2	2	0	1
1726		4.54	2.54	1.27	0.98	1.69	.	.	.	K3 III	3	3	0	1
1729		4.71	0.75	0.62	0.53	0.85	1.07	1.42	.	G0 V	5	6	3	1
1735		3.59	-0.58	-0.12	-0.02	-0.13	.	.	.	B5 III	3	4	0	1
1743		4.83	1.79	1.00	0.74	1.29	1.71	2.36	.	K0 IV	6	3	2	2
1748		6.35	-0.85	-0.11	0.01	-0.13	-0.31	-0.39	-0.23	B1.5 V	3	2	4	1
1756		4.29	-1.26	-0.25	-0.12	-0.40	.	.	.	B0.5 IV	2	3	0	1
1761	*	6.65	-0.54	-0.08	0.04	0.00	.	.	.	B5p	2	2	0	1
1762	D	4.71	-0.15	-0.05	0.05	0.00	.	.	.	A0 V	2	3	0	1
1763		5.80	-1.01	-0.13	0.01	-0.12	-0.35	-0.48	-0.50	B1 V	3	3	5	1
1764		5.69	-0.77	-0.11	-0.02	-0.17	.	.	.	B3 V	3	3	0	1
1765		4.74	-0.95	-0.16	-0.05	-0.23	-0.35	-0.48	-0.48	B2 IV	7	5	3	1
1770	D	5.00	-1.02	-0.15	-0.05	-0.23	-0.36	-0.56	-0.66	B1 V	5	5	2	1
1781		5.70	-1.09	-0.21	-0.08	-0.27	.	.	.	B2 V	9	9	0	1
1784		4.12	1.66	0.96	0.72	1.22	1.60	2.22	.	G8 III	2	3	3	1
1786		6.32	-0.78	-0.15	-0.05	-0.21	.	.	.	B5 V	3	3	0	1
1788	DV	3.35	-1.10	-0.17	-0.09	-0.30	-0.47	-0.59	-0.64	B0.5 V	6	5	7	1
1789		4.96	-1.13	-0.20	-0.08	-0.30	.	.	.	B1 V:pe	5	6	0	1
1790		1.64	-1.10	-0.22	-0.09	-0.31	-0.54	-0.70	-0.71	B2 III	9	5	5	1
1791		1.65	-0.62	-0.13	-0.01	-0.11	-0.32	-0.40	.	B7 III	9	2	3	1
1803		6.16	-0.93	-0.18	-0.06	-0.25	.	.	.	B3 V	3	3	0	1
1806		6.23	-0.28	-0.05	0.01	-0.04	.	.	.	B9 V:	2	2	0	1
1810		4.89	-0.91	-0.14	-0.05	-0.20	.	.	.	B3 V	3	3	0	1
1811	D	4.59	-1.14	-0.20	-0.10	-0.33	.	.	.	B2 IV	5	5	0	1
1820		6.44	-0.92	-0.17	-0.07	-0.25	.	.	.	B2 V	2	2	0	1
1829		2.84	1.29	0.82	0.65	1.09	1.43	1.95	.	G5 III	4	2	3	1
1830		5.78	2.14	1.15	0.83	1.40	1.88	2.60	.	(gG8)	2	2	9	1
1833		5.78	-1.05	-0.20	-0.06	-0.26	.	.	.	B1.5 V	4	4	0	1
1839	D	4.20	-0.69	-0.13	-0.06	-0.20	-0.37	-0.44	-0.43	B5 IV	6	6	3	1
1840		6.32	-1.03	-0.19	-0.08	-0.25	.	.	.	B1.5 V	3	3	0	1
1842	D	5.46	-0.99	-0.17	-0.04	-0.26	-0.46	-0.53	-0.49	B1.5 V	3	3	4	1
1843		4.77	-0.09	0.35	0.37	0.64	.	.	.	B5 Iab	2	2	0	1
1845	V	4.35	4.27	2.06	1.76	3.21	4.03	5.24	5.60	M2 Ib	3	3	7	1
1848		6.21	-0.92	-0.18	-0.06	-0.23	.	.	.	B2 V	2	2	0	1
1852	V	2.24	-1.28	-0.22	-0.08	-0.30	-0.49	-0.66	-0.65	O9.5 II	8	5	9	1
1855		4.62	-1.33	-0.26	-0.12	-0.38	-0.67	-0.90	-1.03	B0 V	9	9	4	1
1861		5.35	-1.12	-0.19	-0.05	-0.24	.	.	.	B1 V	9	9	0	1
1862		3.87	2.22	1.14	0.82	1.42	1.87	2.59	.	(gK1)	6	3	2	2
1863	*D	6.53	-0.74	-0.10	0.00	-0.12	-0.28	-0.35	-0.36	B3 V	2	2	5	1
1865		2.57	0.45	0.20	0.22	0.43	0.52	0.70	.	F0 Ib	5	3	4	1
1868	V	5.34	-1.09	-0.18	-0.05	-0.25	-0.46	-0.57	-0.69	B1 V	8	7	4	1
1871		6.58	-0.96	-0.16	-0.07	-0.28	.	.	.	B2 V	4	4	0	1
1872		5.36	0.12	0.05	0.08	0.12	.	.	.	(A2)	3	3	0	1
1873		6.20	-0.97	-0.16	-0.05	-0.23	.	.	.	B3 V	3	3	0	1

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B.S.	R	V	U-V	B-V	V-R	V-I	V-J
1876		4.41	-1.12	-0.15	-0.01	-0.18	-0.40
1879/80		3.39	-1.22	-0.19	-0.07	-0.24	-0.39
1886		5.67	-1.15	-0.24	-0.07	-0.28	.
1887		4.79	-1.26	-0.25	-0.11	-0.36	.
1890		6.57	-0.90	-0.13	-0.06	-0.19	.
1891		6.25	-0.85	-0.15	-0.01	-0.18	.
1892	D	4.59	-1.13	-0.19	-0.08	-0.26	.
1893		6.72	-0.86	0.00	0.31	0.52	.
1895		5.13	-0.95	0.00	0.22	0.40	.
1896		6.70	-0.74	0.08	0.29	0.48	.
1893-6		4.58	-0.81	0.05	0.22	0.43	0.44
1897		5.08	-1.05	-0.11	0.11	0.10	0.06
1898		6.31	-0.84	-0.13	-0.02	-0.18	.
1899	D	2.77	-1.32	-0.24	-0.07	-0.26	-0.54
1900		6.40	-0.76	-0.12	-0.01	-0.13	.
1901		5.27	0.40	0.23	0.29	0.43	.
1903	V	1.69	-1.21	-0.18	-0.07	-0.24	-0.38
1905		5.54	0.32	0.22	0.21	0.33	.
1907		4.09	1.61	0.95	0.76	1.31	1.74
1908		5.90	3.53	1.60	1.19	2.13	2.75
1910		3.03	-0.81	-0.19	-0.03	-0.12	-0.17
1911		5.74	-1.13	-0.22	-0.06	-0.31	.
1918		6.06	-1.13	-0.21	-0.07	-0.32	.
1925		6.23	1.35	0.84	0.69	1.12	.
1931	D	3.80	-1.25	-0.24	-0.08	-0.32	-0.53
1934		4.59	-0.86	-0.11	0.02	-0.08	-0.16
1937		4.81	0.24	0.13	0.15	0.21	.
1938		6.04	-0.16	0.05	0.11	0.16	0.21
1946	D	4.86	-0.75	-0.12	-0.01	-0.13	.
1948/9		1.77	-1.27	-0.21	-0.08	-0.28	-0.44
1956		2.64	-0.59	-0.12	-0.02	-0.12	-0.17
1963		4.90	2.23	1.17	0.88	1.49	2.01
1971		5.47	0.10	0.03	0.08	0.09	.
1977	V	6.96	.	3.03	2.21	3.73	4.70
1983		3.60	0.48	0.47	0.45	0.71	0.90
1995		4.53	1.63	0.94	0.73	1.22	1.61
1998		3.55	0.16	0.10	0.12	0.15	.
2004		2.05	-1.20	-0.18	-0.02	-0.20	-0.41
2010		4.91	-0.23	-0.07	0.02	-0.06	.
2011		4.74	3.55	1.62	1.36	2.43	3.01
2012		3.97	2.23	1.14	0.82	1.38	1.79
2018		6.25	3.77	1.75	1.55	2.94	3.76
2029		5.00	0.17	0.05	0.09	0.11	.
2034		4.59	0.01	-0.02	0.04	0.04	.
2035		3.85	1.69	0.98	0.86	1.42	1.80
2040		3.12	2.37	1.16	0.85	1.43	1.88
2047		4.41	0.67	0.59	0.51	0.82	.
2056		4.87	-0.71	-0.15	-0.07	-0.22	-0.27
2061	V	0.42	3.96	1.84	1.64	2.92	3.44
2077		3.72	1.90	0.99	0.77	1.27	1.66
2084		4.82	-1.00	-0.06	0.06	-0.05	.
2085		3.72	0.33	0.33	0.33	0.49	0.61
2088	V	1.90	0.07	0.03	0.08	0.07	0.01
2091	V	4.25	3.55	1.72	1.69	3.17	3.91
2095	D	2.62	-0.26	-0.08	0.00	-0.06	-0.11
2106		4.36	-0.84	-0.18	-0.07	-0.24	-0.31
2113		4.52	2.43	1.22	0.93	1.60	2.11
2120		3.96	2.22	1.14	0.82	1.40	1.88
2124	D	4.13	0.27	0.16	0.19	0.27	.
2128		4.94	-0.70	-0.12	-0.03	-0.12	.

BRIGHT STAR PHOTOMETRY

B.S.	R	V	U-V	B-V	V-R	V-I	V-J	V-K	V-L	SP.	V	R	K	S
2134		4.15	1.39	0.87	0.68	1.13	1.44	2.02	.	(gG5)	2	2	3	1
2135		4.63	-0.39	0.28	0.31	0.53	0.56	0.72	0.87	B2 Ia	6	4	5	1
2155		4.67	0.05	0.05	0.09	0.09	.	.	.	A1 V	3	3	0	1
2159		4.42	-0.82	-0.15	-0.06	-0.22	.	.	.	B3 V	2	2	0	1
2198		4.92	-0.71	-0.12	-0.02	-0.16	.	.	.	B5 V	2	2	0	1
2199		4.48	-0.83	-0.17	-0.05	-0.21	-0.33	-0.46	-0.53	B3 V	3	2	1	1
2209		4.80	0.03	0.03	0.07	0.06	.	.	.	A0 V	4	3	0	1
2216	V	3.28	3.27	1.61	1.49	2.80	3.51	4.59	.	M3 III	3	3	3	1
2219		4.35	1.82	1.01	0.80	1.34	1.76	2.41	.	G8 III	7	3	3	1
2227		3.96	2.73	1.31	0.97	1.61	2.13	2.91	.	K3 III	3	3	3	1
2228		6.52	0.36	0.27	0.27	0.41	.	.	.	F0 V	3	3	0	1
2230		6.09	1.52	0.90	0.69	1.18	.	.	.	G5 III	3	3	0	1
2238		4.48	0.04	0.01	0.06	0.05	.	.	.	A2 V	4	4	0	1
2240		6.25	0.06	0.45	0.47	0.87	.	.	.	B3 Ia	6	1	0	1
2244		5.01	-0.33	-0.09	0.02	-0.03	.	.	.	B8 V	2	3	0	1
2256		4.37	1.83	1.00	0.73	1.24	1.55	2.15	.	G8 III	6	8	3	2
2261		5.09	1.05	0.72	0.61	0.93	.	.	.	G5 V	6	5	0	4
2282		3.02	-0.90	-0.18	-0.05	-0.23	.	.	.	B2.5 V	3	3	0	1
2286		2.87	3.50	1.64	1.57	2.95	3.67	4.76	.	M3 III	3	3	3	1
2291		5.64	0.36	0.24	0.22	0.32	.	.	.	A5m	3	3	0	1
2294		1.97	-1.20	-0.24	-0.14	-0.38	-0.56	-0.69	.	B1 II-III	8	3	3	1
2296		3.85	1.40	0.88	0.67	1.14	1.44	1.98	.	(gG4)	6	8	3	2
2298/9		4.31	0.34	0.20	0.19	0.29	.	.	.	A5 IV /gF4	2	3	0	1
2308	V	6.23	5.84	2.34	1.83	3.11	4.13	5.53	.	C6,2	2	2	3	1
2326		-0.75	.	0.15	0.24	0.44	0.38	0.56	.	F0 Ib-II	2	2	3	2
2343		4.14	-0.63	-0.14	-0.03	-0.14	.	.	.	B7 IV	3	3	0	1
2344		5.05	-0.95	-0.18	-0.10	-0.27	.	.	.	B2 V	3	3	0	1
2356-8		3.76	-0.89	-0.15	-0.01	-0.17	.	.	.	B3 Vpe	2	3	0	1
2361		4.48	-0.78	-0.17	-0.06	-0.22	-0.23	-0.45	.	(B5)	6	8	1	2
2382		5.83	1.78	1.00	0.72	1.25	.	.	.	K0 III	9	1	0	1
2385		4.50	-0.18	0.00	0.10	0.14	.	.	.	A0 Ib	7	3	0	1
2387		4.33	-1.22	-0.24	-0.12	-0.39	.	.	.	B0.5 IV	3	3	0	1
2392		6.24	1.88	1.11	0.75	1.23	1.64	2.21	.	Ba II (K0p)	2	2	1	1
2405		5.29	.	2.60	1.97	3.40	4.36	6.00	.	C5,3 (N3)	5	4	2	2
2414		4.54	-0.07	-0.06	0.04	0.02	.	.	.	A0 V	3	3	0	1
2421		1.92	0.05	0.00	0.06	0.05	0.02	0.02	.	A0 IV	9	4	3	1
2427		4.79	2.53	1.23	0.90	1.50	2.00	2.74	.	K3 II-III	4	2	2	1
2429		3.92	2.04	1.05	0.79	1.30	1.67	2.32	.	K1 IV	2	2	3	1
2443		4.42	2.19	1.15	0.86	1.46	1.88	2.61	.	K1 II-III	6	3	2	1
2450		4.81	3.17	1.49	1.03	1.76	.	.	.	K3 III	2	3	0	1
2451		3.17	-0.52	-0.11	0.00	-0.07	-0.22	-0.24	.	B8 III	3	7	1	2
2456	D	4.66	-1.31	-0.24	-0.11	-0.33	-0.63	-0.66	.	O7	9	8	1	1
2467		6.37	-0.99	-0.05	0.07	0.02	.	.	.	O6	8	2	0	1
2470	D	4.87	0.15	0.08	0.12	0.15	.	.	.	(A2n)	2	3	0	1
2473		2.98	2.86	1.40	0.96	1.57	1.99	2.76	.	G8 Ib	7	3	3	1
2478		4.49	2.33	1.16	0.86	1.46	1.92	2.65	.	K1 III	3	3	3	1
2484		3.36	0.49	0.43	0.39	0.62	0.79	1.06	.	F5 IV	5	3	3	1
2491		-1.46	-0.05	0.00	0.00	-0.03	-0.12	-0.15	-0.17	A1 V	5	4	9	1
2506		4.46	2.15	1.11	0.79	1.34	.	.	.	K0 III	6	2	0	1
2527		4.55	3.02	1.36	1.02	1.73	.	.	.	K4 III	3	3	0	1
2538		3.95	-1.16	-0.23	-0.10	-0.30	.	.	.	B2 Ve	2	4	0	1
2540		3.60	0.24	0.10	0.10	0.18	.	.	.	A3 III	6	2	0	1
2560	D	4.35	1.36	0.85	0.65	1.09	1.46	2.02	.	G5 III-IV	3	3	3	1
2564	D	4.65	0.38	0.30	0.32	0.52	.	.	.	F0 Vp	3	3	0	1
2571		4.83	-1.17	-0.21	-0.12	-0.34	.	.	.	B1 IV	3	4	0	1
2574		4.08	3.12	1.43	1.13	1.91	2.48	3.42	.	K4 III	6	3	3	1
2580		3.92	3.71	1.71	1.17	1.99	2.66	3.47	.	K3 Iab	3	3	3	1
2585		4.90	0.08	0.03	0.05	0.06	.	.	.	A2 V	7	4	0	1
2590	D	4.69	0.42	0.36	0.38	0.57	.	.	.	(gF2)	2	3	0	1
2591		6.32	.	2.24	1.73	3.03	3.94	5.44	.	C8,2 (N)	5	5	2	2

BRIGHT STAR PHOT

B.S.	R	V	U-V	B-V	V-R	V-I	V-J
2596		4.37	-0.76	-0.06	0.05	-0.02	.
2608		4.95	3.61	1.69	1.48	2.66	3.29
2618		1.50	-1.14	-0.21	-0.09	-0.30	-0.47
2646		3.43	3.59	1.72	1.32	2.32	2.93
2648		5.00	-1.13	-0.20	-0.06	-0.25	.
2653		3.01	-0.88	-0.08	0.01	-0.08	-0.19
2657		4.12	-0.59	-0.11	-0.01	-0.11	.
2667/8		5.28	.	0.66	0.23	0.57	.
2693		1.84	1.21	0.67	0.51	0.84	1.04
2697		4.42	2.66	1.26	0.96	1.59	2.04
2701		4.92	1.81	1.03	0.79	1.31	1.73
2702		4.83	-0.87	-0.18	-0.07	-0.22	-0.38
2714		4.15	0.04	0.00	0.06	0.07	.
2740		4.49	0.31	0.32	0.32	0.54	0.62
2745	V	4.65	-0.89	-0.20	0.01	-0.08	-0.13
2748	V	5.10	.	1.56	2.72	5.09	5.50
2749		3.82	-0.92	-0.18	0.02	-0.08	-0.41
2751		5.05	0.17	0.08	0.15	0.21	.
2762		4.76	-0.39	-0.10	-0.01	-0.09	-0.15
2763		3.58	0.21	0.12	0.12	0.17	.
2764		4.78	3.57	1.70	1.32	2.28	.
2766		4.60	3.50	1.60	1.48	2.73	3.30
2773		2.70	2.87	1.62	1.24	2.15	2.79
2777	D	3.53	0.38	0.34	0.35	0.54	0.67
2781	V	4.95	-1.15	-0.15	0.00	-0.13	.
2782		4.40	-1.14	-0.15	-0.04	-0.22	.
2787		4.67	-0.89	-0.10	0.10	0.05	.
2790		5.11	-0.83	-0.16	-0.06	-0.27	.
2812		4.96	-0.43	-0.05	0.06	0.02	.
2818		4.64	-0.04	-0.02	-0.01	-0.06	.
2821		3.79	1.88	1.04	0.77	1.27	1.71
2827		2.44	-0.80	-0.09	0.07	0.01	-0.11
2828		4.99	1.79	1.01	0.73	1.23	.
2845		2.89	-0.37	-0.09	-0.01	-0.07	-0.17
2852		4.18	0.30	0.32	0.32	0.51	0.60
2854		4.30	2.96	1.43	1.11	1.90	2.50
2864		4.55	2.66	1.29	0.90	1.54	.
2874		4.84	0.43	0.24	0.27	0.54	.
2878		3.25	3.29	1.52	1.21	2.13	2.69
2881		4.65	1.56	0.93	0.67	1.14	1.43
2890/1		1.58	0.05	0.04	0.06	0.05	0.03
2905		4.06	3.48	1.54	1.24	2.15	2.81
2906		4.45	0.58	0.51	0.51	0.78	.
2922		4.61	-0.55	-0.12	-0.03	-0.14	.
2930		4.91	0.51	0.40	0.39	0.61	.
2937		4.53	-0.40	-0.09	-0.02	-0.09	-0.18
2943		0.37	0.45	0.42	0.42	0.65	0.77
2944	D	4.70	-0.46	-0.11	0.01	-0.08	.
2946		4.99	0.17	0.08	0.18	0.22	.
2948/9		3.80	-0.75	-0.19	-0.04	-0.20	.
2961		4.85	-0.84	-0.19	-0.08	-0.24	-0.41
2967		5.56	3.55	1.64	1.60	3.02	.
2970		3.93	1.90	1.02	0.77	1.29	1.68
2973		4.29	2.09	1.12	0.92	1.50	1.94
2974		6.56	2.01	1.18	0.87	1.54	.
2985	D	3.57	1.62	0.92	0.71	1.16	1.55
2990		1.14	1.86	1.00	0.75	1.25	1.63
2993		4.59	3.61	1.63	1.31	2.28	2.82
2996		3.95	0.13	0.18	0.26	0.48	.
3003		4.87	3.22	1.46	1.15	1.98	2.59

BRIGHT STAR PHOTOMETRY

B.S.	R	V	U-V	B-V	V-R	V-I	V-J	V-K	V-L	SP.	V	R	K	S
3017		3.61	3.43	1.73	1.35	2.35	2.93	4.08	.	(cK)	3	3	1	2
3034		4.52	-1.07	-0.05	0.15	0.13	.	.	.	B0 Vipe	3	6	0	1
3045		3.35	2.43	1.25	0.88	1.43	1.85	2.47	.	G3 Ib	3	3	3	1
3046		4.71	1.98	1.06	0.76	1.33	1.73	2.40	.	K0 III	6	4	1	2
3055		4.11	-1.19	-0.18	-0.08	-0.25	.	.	.	B0.5 III	6	4	0	2
3064		5.16	0.66	0.60	0.52	0.88	.	.	.	G1 V	3	3	0	1
3067		4.98	0.20	0.09	0.13	0.18	.	.	.	A4 V	5	2	0	1
3080		3.73	1.80	1.05	0.81	1.37	.	.	.	G5 III	3	7	0	1
3084		4.49	-0.88	-0.19	-0.08	-0.24	.	.	.	B3 V	6	4	0	2
3089		4.63	-1.15	-0.23	-0.13	-0.34	.	.	.	B2 III	6	3	0	2
3090		4.24	-1.13	-0.14	-0.02	-0.14	.	.	.	B1 Ib	6	4	0	2
3102		4.20	1.16	0.72	0.59	0.96	.	.	.	F8 II	9	4	0	1
3113		4.79	0.31	0.15	0.20	0.35	0.42	0.64	.	A2 V	6	5	3	2
3131		4.61	0.16	0.08	0.15	0.21	.	.	.	A3 V	7	4	0	1
3141		4.67	3.26	1.49	1.17	2.00	.	.	.	K4 III	4	4	0	1
3145		4.38	2.53	1.25	0.99	1.66	2.16	2.97	.	K2 III	6	4	3	1
3165		2.25	-1.36	-0.27	-0.12	-0.34	-0.55	-0.68	.	O5f	8	6	6	1
3173		4.84	0.05	0.05	0.11	0.11	.	.	.	A2 V	3	3	0	1
3185	V	2.81	0.62	0.43	0.35	0.56	0.72	0.93	.	F6 IIp	5	3	3	1
3188		4.32	1.69	0.97	0.73	1.19	1.50	2.04	.	G2 Ib	4	4	3	1
3192		4.40	-0.75	-0.15	-0.03	-0.17	.	.	.	B5 V	4	4	0	1
3206		4.27	.	-0.24	-0.11	-0.29	.	.	.	(B3n)	5	5	0	2
3207		1.83	-1.19	-0.25	-0.02	-0.17	-0.28	-0.14	.	WC7+O7:	3	8	4	2
3211		4.72	1.73	0.96	0.73	1.21	1.56	2.15	.	K0 III	3	3	3	1
3225		4.45	3.47	1.62	1.20	2.10	2.73	3.70	.	(cK)	3	3	4	2
3226		4.75	0.25	0.18	0.24	0.46	0.59	0.75	.	(A3p)	9	3	4	2
3237		4.77	-1.09	-0.11	0.09	0.00	0.06	0.40	.	B3p	6	3	1	2
3243		4.44	2.26	1.17	0.84	1.48	1.96	2.70	.	(gK0)	3	3	4	2
3249		3.53	3.25	1.48	1.12	1.90	2.44	3.37	3.52	K4 III	9	9	9	1
3270		4.45	0.33	0.22	0.21	0.34	0.33	0.45	.	A7 III	6	3	1	2
3275		4.25	3.46	1.55	1.20	2.08	2.69	3.67	3.86	K5 III	4	4	6	1
3279		5.58	1.27	0.77	0.64	1.09	.	.	.	G2 III + A	3	3	0	1
3282		4.83	3.05	1.45	1.00	1.75	2.33	3.18	.	M0 III	6	3	4	2
3294	D	4.82	-0.99	-0.15	-0.04	-0.17	-0.32	-0.35	.	B1 V	6	3	1	2
3306		5.13	1.58	0.94	1.25	1.19	.	.	.	G8 II	3	1	0	4
3314		3.90	-0.05	-0.02	0.03	-0.02	.	.	.	A0 V	9	3	0	1
3319		5.50	3.52	1.60	1.62	3.03	3.80	4.96	5.19	(gM3)	6	4	5	2
3323		3.36	1.37	0.85	0.69	1.11	1.38	1.92	.	G5 III	4	3	3	1
3391		5.64	0.69	0.62	0.52	0.85	.	.	.	G0 V	3	4	0	1
3403		4.51	2.33	1.17	0.89	1.52	.	.	.	K2 III	3	3	0	1
3407		5.01	2.71	1.33	0.97	1.65	2.18	2.99	.	(gG7)	6	3	4	2
3410		4.17	0.02	0.00	0.04	0.05	.	.	.	A0 V	4	3	0	1
3418		4.43	2.48	1.20	0.89	1.45	1.90	2.64	.	K2 III	3	3	3	1
3426		4.14	0.23	0.10	0.15	0.31	0.36	0.50	.	A9 II	6	3	1	2
3427		6.39	1.81	0.98	0.72	1.19	1.64	2.16	2.19	K0 III	9	9	2	1
3428		6.44	1.92	1.02	0.74	1.23	1.65	2.25	2.42	K0 III	5	4	2	1
3429		6.30	0.33	0.17	0.17	0.23	.	.	.	A6 III	3	4	0	1
3438		3.98	1.58	0.93	0.66	1.14	.	.	.	G5 III	6	3	0	2
3441		4.88	1.99	1.07	0.82	1.35	.	.	.	K1 III	8	6	0	1
3445		3.83	0.98	0.70	0.63	1.23	.	.	.	F2 Ia	3	3	0	2
3447		3.60	-0.80	-0.18	-0.06	-0.24	.	.	.	B3 III	6	3	0	4
3449		4.66	0.03	0.02	0.06	0.06	.	.	.	A1 V	4	4	0	1
3452		4.77	0.24	0.12	0.21	0.40	.	.	.	A5 II	6	3	0	2
3454		4.30	-0.94	-0.20	-0.07	-0.26	.	.	.	B3 V	9	9	0	1
3459		4.61	1.35	0.84	0.65	1.09	.	.	.	G2 Ib	4	4	0	1
3461		3.94	2.07	1.08	0.78	1.32	1.75	2.43	.	K0 III	3	4	3	1
3464		6.13	1.57	0.94	0.70	1.19	.	.	.	G5 III	3	4	0	1
3468		3.69	-1.05	-0.18	-0.08	-0.24	.	.	.	B2 II	6	3	0	2
3474/5		4.02	1.81	1.03	0.75	1.24	1.56	2.14	.	G8 II/A3 V	4	4	3	1
3477		4.07	1.39	0.87	0.63	1.13	.	.	.	(sgG5)	6	3	0	2

BRIGHT STAR PHO

B.S.	R	V	U-V	B-V	V-R	V-I	V-J
3482	D	3.38	1.05	0.68	0.60	0.99	1.33
3484		4.32	1.54	0.90	0.68	1.14	1.55
3485	D	1.96	0.11	0.04	0.05	0.09	.
3487		3.91	-0.05	0.00	0.05	0.18	.
3492		4.37	-0.10	-0.05	0.05	-0.02	.
3518		4.01	2.66	1.26	0.95	1.62	2.11
3527		5.10	-1.19	-0.21	-0.08	-0.24	.
3541	V	6.64	.	3.36	2.28	3.65	4.54
3547		3.10	1.82	1.00	0.71	1.20	1.62
3556		4.89	0.23	0.10	0.13	0.18	.
3569		3.14	0.26	0.19	0.22	0.29	0.39
3572		4.26	0.28	0.13	0.14	0.18	.
3576		4.76	3.41	1.53	1.47	2.73	3.43
3579		3.97	0.49	0.43	0.40	0.62	.
3591		4.45	1.03	0.65	0.55	0.96	.
3594		3.60	0.01	0.00	0.07	0.08	.
3595		5.46	-0.13	-0.03	0.02	-0.02	.
3612		4.56	1.85	1.04	0.75	1.24	.
3614		3.75	2.41	1.20	0.82	1.42	1.86
3616	D	4.81	0.51	0.49	0.45	0.73	.
3619		4.48	0.39	0.27	0.27	0.38	.
3624		4.67	0.50	0.35	0.32	0.45	.
3628		4.56	3.48	1.61	1.24	2.14	2.75
3634		2.21	3.46	1.65	1.24	2.18	2.77
3654		5.00	-0.35	0.22	0.29	0.51	0.54
3662		4.84	0.27	0.18	0.25	0.34	.
3665		3.88	-0.19	-0.07	-0.01	-0.06	.
3682		4.94	2.17	1.11	0.79	1.36	1.85
3684		4.62	0.55	0.45	0.38	0.66	0.75
3685		1.68	0.03	0.00	0.07	0.09	.
3690	D	3.82	0.11	0.06	0.12	0.15	.
3705		3.13	3.50	1.55	1.23	2.13	2.74
3706		4.81	1.54	0.93	0.72	1.19	.
3709		4.79	1.61	0.94	0.70	1.14	.
3718		4.72	3.64	1.61	1.40	2.48	3.14
3731		4.46	2.54	1.23	0.91	1.54	2.04
3733		4.68	1.54	0.91	0.71	1.18	1.49
3734		2.50	-0.93	-0.18	-0.04	-0.24	.
3748		1.97	3.17	1.45	1.04	1.81	2.30
3749		4.68	2.30	1.13	0.88	1.44	.
3751		4.30	3.20	1.48	1.13	1.87	.
3757		3.67	0.43	0.33	0.34	0.52	0.66
3759		4.61	0.46	0.45	0.43	0.65	.
3765		4.51	3.12	1.44	1.01	1.77	2.29
3771		4.57	1.10	0.77	0.66	1.07	1.41
3773		4.31	3.43	1.54	1.23	2.13	2.71
3775		3.18	0.49	0.46	0.44	0.71	0.90
3786	D	3.60	0.29	0.36	0.36	0.58	0.62
3787		4.57	0.20	0.10	0.16	0.22	.
3799		4.51	0.04	0.00	0.09	0.10	.
3800		4.55	1.55	0.92	0.71	1.17	.
3809		4.81	1.75	0.99	0.76	1.29	.
3815		5.41	1.21	0.77	0.62	0.99	.
3834		4.68	2.77	1.32	1.06	1.77	2.31
3836		4.35	0.29	0.17	0.15	0.25	0.27
3845		3.91	2.77	1.32	0.99	1.66	2.18
3849		5.05	-0.73	-0.15	-0.07	-0.22	.
3852		3.52	0.70	0.49	0.41	0.64	0.84
3858		4.78	-0.70	-0.12	0.02	-0.07	.
3871		4.79	0.86	0.50	0.47	0.79	1.10

BRIGHT STAR PHOTOMETRY

B.S.	R	V	U-V	B-V	V-R	V-I	V-J	V-K	V-L	SP.	V	R	K	S
3873		2.98	1.27	0.81	0.65	1.05	1.35	1.83	.	G0 II	8	4	4	1
3881		5.10	0.70	0.62	0.53	0.87	1.05	1.38	.	G1 V	2	2	2	1
3888		3.81	0.38	0.29	0.34	0.50	0.57	0.81	.	F2 IV	8	4	3	1
3894	D	4.60	0.11	0.03	0.10	0.10	.	.	.	(A3s)	3	4	0	1
3903		4.11	1.57	0.92	0.69	1.16	1.55	2.09	.	G8 III	5	2	3	1
3905		3.88	2.62	1.22	0.91	1.49	1.95	2.66	.	K2 III	4	4	3	1
3912		4.58	2.19	1.20	0.83	1.46	1.87	2.58	.	(gG4)	6	5	1	2
3950		4.70	3.52	1.60	1.43	2.51	3.16	4.20	4.37	M2 III	4	5	7	1
3970		4.59	-0.37	-0.10	-0.01	-0.10	.	.	.	B8 V	4	4	0	1
3974		4.49	0.25	0.18	0.18	0.25	.	.	.	A7 V	9	9	0	1
3975		3.53	-0.25	-0.04	0.09	0.11	0.09	0.10	.	A0 Ib	4	4	3	1
3980		4.37	3.20	1.45	1.13	1.90	2.46	3.33	.	K4 III	3	2	3	1
3981		4.50	-0.10	-0.04	0.06	0.01	.	.	.	A0 III	3	3	0	1
3982		1.35	-0.47	-0.11	-0.02	-0.12	-0.20	-0.27	-0.25	B7 V	9	8	9	1
3994		3.61	1.92	1.00	0.77	1.25	1.64	2.20	.	K0 III	5	5	3	1
3998		6.44	0.48	0.46	0.41	0.68	.	.	.	F6 V	3	4	0	1
4023		3.85	0.13	0.05	0.02	0.04	0.08	0.11	.	A2 V	6	4	3	2
4031		3.44	0.50	0.31	0.31	0.50	0.63	0.82	.	F0 III	9	5	3	1
4033		3.45	0.09	0.03	0.08	0.07	0.05	0.07	.	A2 IV	9	5	3	1
4039		5.82	0.45	0.50	0.48	0.75	0.96	1.38	.	(dF3)	6	3	1	1
4054		4.80	0.46	0.45	0.45	0.68	.	.	.	F6 IV	9	3	0	1
4057/8		1.98	2.15	1.15	0.85	1.47	1.89	2.66	2.76	K0 III/G7 III	16	4	9	1
4069		3.05	3.48	1.59	1.28	2.24	2.96	3.93	4.08	M0 III	6	4	6	1
4072		4.99	-0.22	-0.07	0.04	-0.02	.	.	.	A0p	3	3	0	1
4080		4.83	2.21	1.12	0.80	1.38	1.82	2.43	.	K1 III	6	5	3	2
4090		4.74	0.43	0.25	0.26	0.40	.	.	.	F0 V	7	4	0	1
4092		5.56	3.38	1.52	1.25	2.20	2.84	3.79	.	M0 III	5	3	3	1
4094		3.79	3.30	1.48	1.11	1.94	2.49	3.42	3.54	K4 III	3	3	7	1
4100	D	4.21	1.55	0.90	0.69	1.15	1.49	2.05	.	G8 III-IV	2	2	3	1
4104		4.25	3.08	1.45	1.10	1.89	2.47	3.41	.	M0 III	6	5	3	2
4112		4.84	0.51	0.52	0.48	0.76	.	.	.	F8 V	9	3	0	1
4119		5.70	-0.67	-0.14	-0.03	-0.17	.	.	.	B6 V	6	5	0	1
4132		4.75	0.31	0.23	0.20	0.29	.	.	.	A7 IV	3	3	0	1
4133		3.85	-1.09	-0.14	-0.05	-0.21	-0.33	-0.47	.	B1 Ib	9	5	6	1
4141		5.16	0.32	0.34	0.33	0.50	.	.	.	F1 V	6	4	0	1
4153		5.38	.	2.88	2.11	3.48	.	.	.	(Nb)	4	4	0	2
4163	*V	4.82	8.47	2.69	1.77	3.04	4.00	5.57	6.00	C7,3	2	2	9	1
4166		4.72	1.36	0.81	0.68	1.06	.	.	.	G3 II:	5	5	0	1
4167	D	3.84	0.37	0.30	0.25	0.41	0.57	0.72	.	F4IV,F4V,A1V	6	4	2	2
4195	*V	6.00	7.18	2.41	1.74	3.01	3.96	5.58	6.07	C6,3	3	3	9	1
4199		2.76	-1.22	-0.22	-0.11	-0.34	.	.	.	B0 Vp	3	2	0	4
4216	D	2.69	1.47	0.90	0.68	1.17	1.56	2.10	.	G5 III	6	4	2	2
4232		3.11	2.51	1.24	0.93	1.57	2.04	2.83	2.95	K2 III	3	3	8	1
4247		3.83	1.96	1.04	0.83	1.37	1.76	2.44	.	K0 III-IV	5	3	2	1
4248		4.71	-0.11	-0.05	0.05	0.01	.	.	.	A1 V	3	3	0	1
4259/60		4.32	0.03	0.02	0.10	0.09	.	.	.	A1 V	4	5	0	1
4273		4.60	1.87	1.03	0.75	1.28	1.66	2.29	.	G5 III	6	4	3	2
4278		6.00	3.51	1.59	1.49	2.78	.	.	.	M2 III	2	4	0	1
4287		4.07	2.07	1.09	0.80	1.35	1.78	2.45	.	K0 III	5	3	3	1
4293		4.39	0.23	0.11	0.13	0.20	0.31	0.34	.	A2 IV	6	4	2	2
4295		2.37	-0.02	-0.02	0.06	0.02	0.02	0.02	.	A1 V	7	4	3	1
4299		4.75	3.54	1.62	1.33	2.29	2.90	3.92	4.08	K5 III	5	5	7	1
4300		4.42	0.10	0.05	0.06	0.04	.	.	.	A1 V	3	4	0	1
4301		1.79	1.99	1.07	0.81	1.39	1.74	2.44	2.57	K0 III	8	5	5	1
4310		4.63	0.41	0.33	0.33	0.50	.	.	.	F2 III-IV	8	5	0	1
4335		3.01	2.26	1.14	0.84	1.41	1.85	2.57	2.69	K1 III	5	2	7	1
4343		4.48	0.08	0.03	0.07	0.09	.	.	.	A2 III-IV	4	4	0	1
4357		2.56	0.23	0.12	0.13	0.16	0.27	0.31	.	A4 V	6	3	2	1
4359		3.35	0.06	-0.02	0.05	0.02	0.01	0.05	.	A2 V	3	3	3	1
4362		4.63	3.51	1.66	1.56	2.87	3.51	4.63	4.84	M3 III	3	2	7	1

BRIGHT STAR PHOT

B.S.	R	V	U-V	B-V	V-R	V-I	V-J
4368		4.47	0.36	0.21	0.27	0.38	.
4371		5.18	3.36	1.52	1.27	2.21	2.85
4374/5		3.79	0.64	0.59	0.54	0.88	1.13
4377		3.49	2.95	1.40	1.06	1.76	2.31
4380		4.79	0.15	0.12	0.11	0.14	.
4382		3.56	2.10	1.11	0.83	1.43	1.87
4386		4.05	-0.19	-0.06	0.02	-0.05	.
4392		5.00	1.78	0.98	0.75	1.21	1.64
4399	D	3.94	0.48	0.41	0.39	0.60	.
4405	D	4.08	0.31	0.21	0.23	0.34	.
4418		4.95	1.80	1.00	0.75	1.25	.
4434		3.85	3.59	1.62	1.31	2.30	2.98
4450		3.54	1.63	0.93	0.70	1.18	1.54
4456		5.95	-0.81	-0.16	-0.06	-0.24	.
4468		4.70	-0.24	-0.08	0.01	-0.06	.
4471		4.30	1.75	1.01	0.72	1.24	1.68
4494		4.70	-0.29	-0.07	0.01	-0.04	-0.05
4496		5.34	0.97	0.74	0.61	0.97	1.35
4514		4.72	1.71	0.97	0.73	1.21	.
4517		4.04	3.28	1.50	1.26	2.27	2.91
4518		3.72	2.34	1.18	0.88	1.48	2.00
4527	D	4.53	0.83	0.55	0.53	0.89	.
4534		2.14	0.16	0.08	0.06	0.08	0.11
4540		3.60	0.66	0.55	0.48	0.76	0.97
4546		4.46	2.76	1.30	0.94	1.61	2.10
4550		6.45	0.92	0.75	0.66	1.11	1.51
4552	D	4.28	-0.43	-0.10	0.01	-0.07	-0.08
4554		2.44	0.03	0.00	0.00	-0.03	0.04
4589		4.67	0.23	0.13	0.16	0.20	.
4608		4.12	1.63	0.99	0.74	1.23	1.64
4618		4.47	-0.82	-0.15	-0.09	-0.26	.
4621		2.65	.	-0.09	0.04	-0.08	.
4623		4.02	0.30	0.32	0.30	0.48	.
4630		2.98	2.81	1.34	0.93	1.57	2.07
4633		6.04	0.18	0.11	0.13	0.16	.
4638		3.96	-0.76	-0.15	-0.10	-0.26	.
4660		3.31	0.15	0.08	0.06	0.06	0.20
4662		2.58	-0.46	-0.11	-0.04	-0.13	-0.17
4684		6.48	0.27	0.18	0.17	0.24	.
4685		6.27	0.31	0.17	0.13	0.15	.
4689		3.90	0.09	0.02	0.08	0.08	.
4694		6.15	0.38	0.30	0.28	0.42	.
4695		4.96	2.31	1.16	0.89	1.50	2.04
4697		4.74	1.80	1.01	0.79	1.31	.
4705		6.20	-0.05	0.00	0.00	-0.03	.
4707		4.81	0.76	0.49	0.47	0.80	0.53
4708		6.40	0.68	0.60	0.43	0.71	.
4716		4.80	1.49	0.87	0.70	1.14	.
4717		5.18	0.18	0.08	0.07	0.09	.
4719		6.42	0.34	0.27	0.23	0.33	.
4725		6.03	2.10	1.10	0.79	1.35	.
4732		4.82	.	-0.14	-0.11	-0.26	.
4733		4.95	0.45	0.27	0.25	0.40	.
4737		4.37	2.28	1.13	0.83	1.35	1.82
4738		5.00	0.21	0.08	0.09	0.11	.
4743		3.91	-0.96	-0.19	-0.11	-0.31	-0.46
4750		6.54	0.29	0.18	0.15	0.24	.
4751		6.65	0.30	0.22	0.15	0.23	.
4752		5.29	-0.16	-0.06	0.02	-0.06	.
4757		2.94	-0.14	-0.05	-0.05	-0.09	-0.09

BRIGHT STAR PHOTOMETRY

B.S.	R	V	U-V	B-V	V-R	V-I	V-J	V-K	V-L	SP.	V	R	K	S
4766		5.46	0.15	0.05	0.06	0.03	.	.	.	A2p	5	6	0	1
4775		4.32	0.39	0.37	0.38	0.56	.	.	.	F0 IV	7	6	0	1
4780		6.29	0.20	0.11	0.09	0.12	.	.	.	A4 V	2	5	0	1
4785		4.27	0.64	0.59	0.54	0.85	1.04	1.43	.	G0 V	9	3	3	1
4786		2.64	1.53	0.88	0.61	1.05	1.40	1.94	2.00	G5 III	2	2	6	1
4787		3.89	-0.71	-0.14	0.05	-0.03	0.03	0.14	0.46	B5 IIIe	3	3	5	1
4789		4.81	-0.01	0.00	0.06	0.04	.	.	.	A0 III	7	7	0	1
4802		3.86	0.08	0.05	0.05	0.09	.	.	.	A2 V	6	4	0	2
4803		5.45	0.35	0.32	0.31	0.50	.	.	.	F2 V	4	4	0	1
4807		5.71	3.42	1.60	1.56	2.98	3.61	4.64	4.94	(gM3)	3	4	3	2
4813		4.67	2.58	1.22	0.90	1.51	.	.	.	K2 III	4	4	0	1
4817		4.64	-0.48	-0.08	-0.02	-0.11	-0.22	-0.01	.	B8 IV	6	5	1	2
4819	D	2.17	-0.02	-0.01	0.03	0.03	0.04	-0.01	.	A0 III	3	5	1	2
4825/6		2.74	0.33	0.36	0.29	0.48	0.65	0.86	0.93	F0 V	9	7	7	1
4828		4.88	0.12	0.09	0.08	0.10	0.05	-0.01	.	A1 V	4	4	1	1
4831		4.66	2.11	1.10	0.75	1.32	1.73	2.38	.	(gK1)	6	5	1	2
4837		5.93	1.33	0.86	0.67	1.16	.	.	.	G8 IIIp	2	4	0	1
4845		5.95	0.52	0.55	0.54	0.83	1.04	1.39	1.79	G0 V	6	3	1	1
4846	V	4.87	9.16	2.54	1.75	3.13	4.01	5.73	6.39	C5.4	2	2	9	1
4848		4.65	-0.79	-0.16	-0.11	-0.32	.	.	.	B3 IV	3	2	0	2
4853		1.25	-1.22	-0.23	-0.13	-0.39	.	.	.	B0.5 IV	3	3	0	4
4865		5.70	0.09	0.02	0.04	0.03	.	.	.	A2 V	3	4	0	1
4867		5.85	0.42	0.46	0.44	0.72	.	.	.	F6 V	3	3	0	1
4883		4.94	0.87	0.67	0.55	0.90	1.18	1.56	.	G0 III	5	2	2	1
4888		4.33	2.95	1.37	0.98	1.73	2.29	3.11	.	(gK2)	6	5	1	2
4889		4.27	0.33	0.21	0.20	0.34	0.53	0.63	.	A7 III	6	5	1	2
4898		4.03	-0.92	-0.17	-0.14	-0.41	.	.	.	B5 Ve	3	2	0	2
4900		6.25	0.32	0.27	0.25	0.40	.	.	.	A7p	3	4	0	1
4902		4.80	3.14	1.59	1.57	2.85	3.56	4.67	4.87	M3 III	5	5	6	1
4905		1.77	-0.01	-0.02	-0.02	-0.05	0.05	0.02	.	A0p	7	4	3	1
4910		3.38	3.38	1.59	1.53	2.86	3.55	4.63	4.81	M3 III	6	6	7	1
4914		5.60	0.31	0.34	0.24	0.47	0.76	0.91	0.84	F0 V	2	2	3	3
4915		2.89	-0.44	-0.12	-0.13	-0.19	-0.15	-0.29	.	B9.5p:	2	2	3	3
4914/5		2.84	-0.43	-0.10	-0.04	-0.12	.	.	.	B9.5p:+F0 V	3	3	0	1
4920		4.79	3.52	1.56	1.35	2.30	2.94	3.91	4.10	M1 III	4	4	5	1
4931	D	4.93	0.37	0.36	0.37	0.58	.	.	.	F2 V	9	5	0	1
4932		2.84	1.68	0.94	0.64	1.09	1.48	2.04	2.09	G9 II-III	5	4	6	1
4940		4.71	-0.71	-0.14	-0.06	-0.19	.	.	.	B5 V	6	5	0	2
4942		4.27	-0.95	-0.19	-0.09	-0.28	.	.	.	B2 V	6	5	0	2
4949		5.60	3.22	1.59	1.97	3.76	4.67	5.83	6.10	M5 III	5	3	4	2
4954		4.82	3.32	1.45	1.18	1.99	.	.	.	K5 III	4	4	0	1
4955		5.19	2.26	1.14	0.82	1.40	.	.	.	K1 III	3	4	0	1
4963	D	4.38	0.00	-0.01	0.05	0.05	.	.	.	A1 V	5	5	0	1
4979		4.85	1.01	0.70	0.57	0.93	1.21	1.58	.	(dG3)	6	5	1	2
4983		4.26	0.66	0.58	0.49	0.79	1.02	1.36	1.49	G0 V	9	9	9	1
5017		4.73	0.50	0.30	0.25	0.40	.	.	.	F0 II-IIIp	7	3	0	1
5019		4.74	0.97	0.71	0.58	0.94	.	.	.	G6 V	9	9	0	1
5020		3.00	1.58	0.92	0.60	1.07	1.46	2.02	2.21	G8 III	7	3	6	1
5026		5.49	.	-0.13	-0.08	-0.23	.	.	.	B5 III	3	3	0	2
5028		2.73	0.04	0.03	0.05	0.04	0.02	-0.04	.	A2 V	3	5	1	1
5054/5		2.06	0.05	0.02	-0.04	-0.06	-0.04	-0.05	.	A2 V+A2 V	6	2	3	1
5056	V	0.97	-1.17	-0.23	-0.09	-0.33	-0.53	-0.71	-0.70	B1 V	9	9	9	1
5062		4.02	0.24	0.16	0.17	0.24	.	.	.	A5 V	9	5	0	1
5068		4.75	2.16	1.10	0.79	1.32	.	.	.	K1 III	3	3	0	1
5072		4.98	0.97	0.71	0.61	1.00	.	.	.	G5 V	9	3	0	1
5080	max	4.97	2.29	1.61	2.70	5.12	6.30	7.63	8.05	M6 (gM7e)	JD2438564			
5089	D	3.88	2.20	1.16	0.84	1.43	1.88	2.56	.	G8 III	2	7	1	1
5095		4.69	3.56	1.60	1.46	2.62	3.28	4.36	4.55	M2 III	5	4	5	1
5105		4.94	0.02	0.02	0.08	0.05	.	.	.	A2p	8	5	0	1
5107		3.38	0.20	0.12	0.07	0.13	0.18	0.27	.	A3 Vn	4	4	3	1

BRIGHT STAR PHO

B.S.	R	V	U-V	B-V	V-R	V-I	V-J
5110		4.98	0.45	0.40	0.41	0.71	.
5112		4.70	0.23	0.12	0.11	0.13	.
5127	D	4.83	0.32	0.23	0.27	0.40	.
5132		2.30	-1.14	-0.22	-0.15	-0.40	.
5154		4.66	3.59	1.63	1.40	2.52	3.19
5165		5.60	1.22	0.81	0.64	1.09	.
5168		4.23	0.38	0.38	0.33	0.54	0.62
5185		4.50	0.53	0.48	0.41	0.65	.
5190		3.41	-1.07	-0.22	-0.12	-0.33	.
5191		1.86	-0.87	-0.19	-0.12	-0.30	-0.41
5192		4.19	2.96	1.50	2.13	4.00	4.66
5193	V	2.94	.	-0.16	0.03	-0.06	.
5200		4.07	3.39	1.52	1.20	2.07	2.72
5210/1		4.32	-0.73	-0.13	-0.05	-0.18	.
5214		6.65	0.19	0.12	0.08	0.09	.
5217		5.89	.	0.01	0.06	0.06	.
5219		4.75	3.61	1.65	1.54	2.82	3.51
5221	D	4.73	-0.70	-0.14	-0.04	-0.17	.
5226		4.66	3.46	1.57	1.61	2.97	3.70
5231		2.55	-1.13	-0.22	-0.14	-0.34	-0.54
5235		2.68	0.78	0.58	0.44	0.73	0.98
5248		3.83	-1.04	-0.21	-0.13	-0.35	.
5249		3.87	-1.00	-0.20	-0.14	-0.35	.
5260		4.34	0.88	0.60	0.48	0.84	.
5264		4.26	0.23	0.10	0.15	0.21	.
5285		4.36	-0.96	-0.19	-0.11	-0.33	.
5287		3.28	2.16	1.12	0.87	1.42	1.85
5288		2.06	1.89	0.99	0.76	1.29	.
5291		3.65	-0.13	-0.05	-0.03	-0.10	.
5299		5.28	3.24	1.58	1.85	3.51	4.48
5304		4.83	0.61	0.54	0.44	0.73	.
5313		5.02	-0.56	-0.12	-0.08	-0.21	.
5315		4.21	2.79	1.32	1.07	1.82	2.34
5328/9		4.41	0.30	0.20	0.17	0.29	.
5338		4.09	0.54	0.51	0.50	0.77	.
5340		-0.05	2.51	1.23	0.97	1.62	2.13
5343		5.98	0.31	0.26	0.23	0.35	.
5350		4.75	0.26	0.20	0.15	0.24	.
5351		4.18	0.13	0.08	0.02	0.05	.
5354		3.55	-0.90	-0.18	-0.10	-0.24	.
5359		4.52	0.22	0.13	0.10	0.14	.
5361		4.81	1.98	1.06	0.76	1.29	.
5365		5.41	0.35	0.38	0.34	0.53	.
5367		4.05	-0.14	-0.03	-0.01	-0.03	.
5370		4.86	2.63	1.23	0.89	1.49	.
5373		6.33	0.10	0.05	0.06	0.03	.
5378		4.42	-0.92	-0.18	-0.11	-0.28	.
5381		4.75	2.84	1.31	0.97	1.64	.
5384		6.27	0.71	0.63	0.56	0.88	1.13
5395		4.56	-0.94	-0.15	-0.10	-0.21	.
5396	D	4.35	0.61	0.43	0.41	0.76	.
5404		4.06	0.51	0.50	0.42	0.67	.
5409		4.82	0.95	0.74	0.58	0.95	.
5429		3.59	2.74	1.30	0.92	1.57	2.13
5430		4.25	3.14	1.44	1.05	1.80	.
5435		3.02	0.31	0.19	0.14	0.22	0.35
5440		2.31	-1.01	-0.19	-0.10	-0.28	.
5447		4.47	0.29	0.37	0.34	0.53	0.69
5453		4.05	-0.71	-0.15	-0.09	-0.20	.
5463		3.19	0.36	0.24	0.23	0.33	.

BRIGHT STAR PHOTOMETRY

B.S.	R	V	U-V	B-V	V-R	V-I	V-J	V-K	V-L	SP.	V	R	K	S
5469		2.30	-1.08	-0.20	-0.09	-0.26	.	.	.	B1 V	3	3	0	2
5471		4.00	-0.86	-0.17	-0.11	-0.26	.	.	.	B3 V	3	3	0	2
5475/6		4.54	-0.36	-0.04	0.07	0.05	.	.	.	B9 IIIp/A m	2	2	0	1
5477/8		3.78	0.10	0.05	0.02	0.01	.	.	.	A2 III	8	4	0	1
5485		4.05	2.88	1.35	1.01	1.74	.	.	.	K5 III	3	4	0	2
5487		3.88	0.37	0.38	0.40	0.62	0.73	0.99	.	F3 IV	5	3	3	1
5489		4.92	-0.02	0.01	0.06	0.08	.	.	.	(A0n)	3	3	0	2
5490	V	4.81	3.60	1.66	1.49	2.71	3.50	4.60	4.81	(gM3)	4	4	5	1
5492		6.25	0.40	0.41	0.37	0.57	.	.	.	F2 IV	4	4	0	1
5502		4.60	1.73	0.98	0.73	1.21	1.58	2.17	.	K0 III	5	4	3	1
5505/6		2.37	1.70	0.97	0.75	1.27	1.72	2.37	2.42	K0 II-III+A	4	5	4	1
5511		3.73	-0.04	-0.01	0.07	0.05	.	.	.	A0 V	9	3	0	1
5526		4.41	2.87	1.40	1.07	1.83	.	.	.	(gK4)	3	9	0	1
5528		4.33	-0.75	-0.14	-0.05	-0.16	.	.	.	B6 III:	3	4	0	2
5530		5.16	0.37	0.41	0.38	0.57	0.77	1.03	.	F5 IV	7	7	2	3
5531		2.75	0.24	0.15	0.14	0.18	0.23	0.31	.	A3 V	9	3	2	1
5544	D	4.54	1.06	0.77	0.63	1.06	.	.	.	G8 V	6	3	0	1
5563		2.08	3.24	1.47	1.11	1.87	.	.	.	K4 III	6	3	0	1
5568		5.71	2.17	1.11	0.99	1.53	1.87	2.65	2.92	K5 V	4	2	2	1
5570		4.49	0.36	0.32	0.32	0.49	.	.	.	F0 IV	9	5	0	1
5571		2.68	-1.07	-0.22	-0.10	-0.27	.	.	.	B2 IV	3	3	0	2
5576		3.13	-0.98	-0.20	-0.08	-0.24	.	.	.	B2 V	3	3	0	2
5586	V	4.93	-0.11	0.00	0.08	0.09	.	.	.	(A0)	3	3	0	1
5589	V	4.59	3.18	1.59	1.86	3.57	4.37	5.54	5.73	M5 III	3	3	4	1
5600		4.82	3.33	1.50	1.19	1.98	.	.	.	K4 III	3	3	0	1
5601		4.40	1.91	1.04	0.81	1.35	1.79	2.45	.	K0 III	4	4	3	1
5602		3.50	1.68	0.97	0.65	1.09	1.57	2.16	.	G8 III	3	3	3	1
5603		3.27	3.67	1.71	1.53	2.82	3.53	4.67	4.86	M4 III	5	7	8	1
5605/6		3.89	-0.72	-0.14	-0.10	-0.21	.	.	.	B5 IV	3	3	0	2
5616		4.55	2.57	1.23	0.93	1.58	2.14	2.91	.	K2 III	3	3	3	1
5625		5.85	.	-0.12	-0.07	-0.20	.	.	.	B7: Vnn	3	4	0	2
5626	D	4.05	-0.86	-0.18	-0.08	-0.23	.	.	.	B3 V	6	3	0	2
5634		4.93	0.41	0.43	0.40	0.61	0.72	1.03	1.04	F5 V	9	4	2	1
5646/7		3.70	-0.15	-0.03	-0.05	-0.06	.	.	.	B9 V	6	2	0	2
5651		4.82	-0.84	-0.17	-0.10	-0.26	.	.	.	B3 III	6	2	0	2
5652		4.54	-0.46	-0.08	-0.04	-0.13	.	.	.	B9 IV (Si)	3	3	0	1
5660		4.91	0.66	0.37	0.36	0.67	.	.	.	F0 I	3	3	0	2
5681		3.49	1.63	0.95	0.73	1.24	1.62	2.27	2.53	G8 III	5	2	3	1
5683	D	4.27	-0.46	-0.09	-0.02	-0.06	.	.	.	(B8n)	3	2	0	2
5685		2.61	-0.48	-0.11	-0.04	-0.14	-0.20	-0.25	.	B8 V	9	9	9	1
5686		4.33	2.17	1.10	0.81	1.37	1.59	2.27	2.36	(gK0)	2	1	1	2
5694		5.06	0.60	0.54	0.41	0.68	.	.	.	F8 IV-V	5	3	0	3
5695		3.22	-1.09	-0.22	-0.11	-0.33	.	.	.	B2 IV	3	6	0	2
5705		3.56	3.41	1.54	1.19	2.06	.	.	.	K5 III	3	2	0	2
5708	D	3.37	-0.91	-0.18	-0.11	-0.27	.	.	.	B3 IV	3	2	0	2
5712		4.54	-0.77	-0.15	-0.06	-0.20	.	.	.	B5 V	3	2	0	2
5721		6.12	0.31	0.26	0.24	0.36	.	.	.	F0 V	3	4	0	1
5727/8		4.98	0.62	0.58	0.48	0.76	.	.	.	G2 V	3	4	0	1
5733		4.32	0.37	0.31	0.30	0.45	.	.	.	F0 IV	5	3	0	1
5735		3.05	0.16	0.05	0.08	0.14	.	.	.	A3 II-III	3	3	0	1
5736		5.45	.	-0.15	-0.09	-0.26	.	.	.	B5 V	4	4	0	2
5744		3.29	2.39	1.16	0.78	1.38	1.91	2.61	2.75	K2 III	5	3	5	1
5747		3.68	0.40	0.29	0.18	0.23	0.28	0.38	0.48	F0 IIIp	5	4	4	1
5763		5.02	3.50	1.59	1.27	2.20	.	.	.	K5 III	3	4	0	1
5764		5.50	.	-0.14	-0.09	-0.26	.	.	.	B2 Vnn	3	3	0	2
5774	D	5.02	0.18	0.07	0.15	0.19	.	.	.	(A2n)	3	3	0	1
5776	D	2.78	-1.02	-0.20	-0.14	-0.38	.	.	.	B2 Vn	3	5	0	2
5777		4.62	1.86	1.01	0.77	1.29	1.74	2.37	.	K1 IV	5	3	3	1
5778		4.13	-0.68	-0.13	-0.05	-0.16	.	.	.	B7nn	3	3	0	1
5780		5.18	-0.54	-0.09	-0.04	-0.16	.	.	.	B7 IV:	3	1	0	2

BRIGHT STAR PHO

B.S.	R	V	U-V	B-V	V-R	V-I	V-J
5781	D	4.54	-0.86	-0.18	-0.15	-0.37	.
5787		3.91	1.76	1.02	0.71	1.26	1.75
5788/9		3.80	0.38	0.26	0.22	0.33	.
5793	V	2.24	-0.05	-0.02	0.03	-0.01	-0.01
5794		3.57	2.98	1.39	1.00	1.71	.
5797		4.33	3.15	1.43	1.03	1.76	.
5812		3.65	-0.87	-0.18	-0.11	-0.30	.
5820		4.67	1.73	1.00	0.68	1.17	.
5824		4.96	2.84	1.33	0.96	1.64	2.07
5825		4.64	0.38	0.40	0.35	0.55	.
5830		5.75	0.34	0.36	0.33	0.51	.
5838		4.72	3.52	1.58	1.28	2.22	.
5839		4.75	-0.68	-0.14	-0.10	-0.26	.
5840		6.01	1.51	0.90	0.69	1.15	.
5842	D	4.53	0.07	0.05	0.04	0.03	.
5843		5.33	0.09	0.04	0.05	0.01	.
5849	D	3.85	-0.05	-0.01	-0.03	-0.05	.
5854		2.64	2.42	1.17	0.81	1.37	1.88
5859		5.58	0.07	0.04	0.04	0.03	.
5867		3.67	0.14	0.06	0.06	0.09	.
5868		4.43	0.70	0.60	0.51	0.83	1.05
5879		4.09	3.57	1.62	1.25	2.23	3.01
5881		3.53	-0.14	-0.04	-0.01	-0.06	.
5883		3.95	-0.18	-0.04	-0.02	-0.09	.
5885		4.68	-0.79	-0.06	0.01	-0.09	.
5888		5.23	1.84	1.02	0.77	1.30	.
5889		4.63	1.17	0.80	0.63	1.05	.
5892		3.70	0.25	0.16	0.08	0.13	.
5897		2.85	0.34	0.29	0.32	0.47	.
5899		4.78	3.42	1.54	1.22	2.07	.
5901		4.82	1.87	1.00	0.76	1.25	.
5902		5.03	.	-0.01	0.01	-0.04	.
5903		4.32	0.09	0.04	0.06	0.07	.
5904	D	4.59	-0.73	-0.06	-0.02	-0.11	.
5906		5.39	.	-0.02	0.01	-0.01	.
5907		5.43	.	-0.04	0.01	-0.04	.
5908		4.16	1.83	1.01	0.72	1.24	1.67
5914		4.62	0.57	0.57	0.48	0.80	1.10
5915	D	5.93	.	-0.02	0.02	-0.01	.
5924		5.44	3.53	1.59	1.26	2.23	2.88
5928		3.86	-1.02	-0.20	-0.11	-0.31	.
5932		5.38	3.61	1.64	1.49	2.74	3.56
5933		3.86	0.45	0.48	0.49	0.73	0.92
5941		4.87	-0.26	-0.10	-0.04	-0.09	.
5944		2.91	-1.09	-0.20	-0.09	-0.29	.
5947		4.15	2.51	1.23	0.89	1.51	2.06
5948	D	3.41	-1.06	-0.22	-0.14	-0.35	.
5953		2.32	-1.02	-0.12	-0.05	-0.18	-0.26
5960		4.95	0.30	0.26	0.23	0.37	.
5962		4.65	1.55	0.92	0.67	1.14	.
5967		4.89	-0.71	-0.14	-0.07	-0.21	.
5971		4.98	-0.27	-0.07	0.01	-0.07	.
5972		4.83	0.12	0.07	0.10	0.11	.
5977/8		4.17	0.48	0.47	0.37	0.61	.
5980		4.72	0.38	0.23	0.20	0.33	.
5982		4.76	-0.43	-0.11	0.02	-0.08	.
5984/5		2.59	-0.94	-0.08	-0.02	-0.11	-0.07
5986		4.03	0.62	0.52	0.45	0.70	.
5987		4.23	-0.86	-0.18	-0.10	-0.27	.
5993		3.97	-0.87	-0.05	0.06	-0.02	-0.03

BRIGHT STAR PHOTOMETRY

B.S.	R	V	U-V	B-V	V-R	V-I	V-J	V-K	V-L	SP.	V	R	K	S
5997		4.33	1.35	0.84	0.65	1.08	1.48	2.00	.	(gG2)	2	3	2	1
6018		4.76	1.88	1.01	0.75	1.29	1.68	2.38	2.62	K0 III	6	4	3	1
6023		4.27	-0.35	-0.07	0.00	-0.09	.	.	.	B9p	2	3	0	1
6027	D	4.01	-0.61	0.03	0.11	0.14	0.20	0.24	0.26	B2 IV-V	5	5	4	1
6028		4.59	-0.90	-0.16	-0.05	-0.22	.	.	.	B2.5 Ve	4	5	0	1
6031		4.93	0.19	0.09	0.12	0.14	.	.	.	A2 V	3	3	0	1
6056		2.75	3.55	1.59	1.29	2.32	2.95	3.97	4.11	M1 III	4	5	5	1
6070		4.77	0.01	0.02	0.08	0.03	.	.	.	A0 V	3	3	0	1
6072		4.02	2.25	1.08	0.78	1.36	.	.	.	G8 III	3	1	0	2
6074		5.78	0.17	0.07	0.07	0.07	.	.	.	A3 V	3	4	0	1
6075		3.23	1.73	0.98	0.70	1.19	1.63	2.24	2.27	G9 III	3	4	4	1
6076		6.28	1.84	1.07	0.83	1.45	.	.	.	K5 III	4	3	0	1
6081		4.57	1.50	0.84	0.87	1.71	.	.	.	A5 II	3	3	0	1
6084	V	2.88	-0.56	0.13	0.20	0.31	0.41	0.47	0.45	B1 III	5	5	4	1
6092		3.90	-0.72	-0.15	-0.09	-0.26	-0.28	-0.51	-0.46	B5 IV	9	9	3	1
6093		4.82	0.36	0.34	0.31	0.46	.	.	.	F0 V	4	4	0	1
6095		3.76	0.46	0.27	0.29	0.43	0.60	0.80	0.94	A9 III	7	5	3	1
6098		4.91	0.58	0.55	0.54	0.82	.	.	.	G0 V	3	6	0	4
6103		4.85	1.77	0.97	0.73	1.19	.	.	.	K0 III	4	4	0	1
6104		4.50	1.87	1.03	0.78	1.28	1.73	2.31	.	K0 III	2	2	2	1
6112/3		4.63	-0.33	0.22	0.36	0.67	.	.	.	B3 IV/B3 V	2	2	0	1
6115		4.47	-0.60	-0.07	0.04	0.00	.	.	.	B3: V	3	1	0	2
6117		4.58	-0.05	-0.01	0.07	0.03	.	.	.	A1p	7	5	0	1
6118	V	4.43	-0.48	0.28	0.46	0.70	.	.	.	B2 Ve	3	3	0	1
6129		4.63	0.22	0.16	0.16	0.23	.	.	.	A m	5	5	0	1
6132		2.74	1.61	0.91	0.61	1.07	1.57	2.15	2.30	G8 III	4	3	5	1
6134	V	0.91	3.17	1.84	1.55	2.78	3.55	4.69	4.95	M1-M2 Iab	9	4	4	1
6141		4.79	-0.86	-0.07	-0.06	-0.20	.	.	.	B2 V	2	2	0	1
6143		4.23	-0.96	-0.16	-0.06	-0.21	.	.	.	B2 IV	6	1	0	2
6146	V	5.01	2.69	1.52	2.52	4.75	5.77	7.02	7.21	M6 III	3	2	3	1
6147		4.27	1.63	0.92	0.65	1.09	1.35	1.96	2.02	G8 III	2	2	3	1
6148		2.77	1.63	0.94	0.64	1.11	1.56	2.17	.	G8 III	5	5	2	1
6149	D	3.83	0.03	0.01	-0.01	-0.02	.	.	.	A1 V	4	3	0	1
6153		4.45	0.24	0.11	0.13	0.15	.	.	.	A7p	3	3	0	1
6159		4.85	3.31	1.49	1.20	2.06	2.64	3.64	3.78	K4 III	5	3	2	1
6161		5.01	-0.17	-0.06	0.05	0.03	.	.	.	B9 IV	2	2	0	1
6165		2.81	-1.26	-0.25	-0.12	-0.37	.	.	.	B0 V	3	4	0	1
6166		4.16	3.51	1.57	1.20	2.20	.	.	.	(gK6)	3	2	0	2
6168		4.20	-0.11	-0.01	0.03	0.02	.	.	.	B9 V	3	3	0	1
6171		5.74	1.26	0.81	0.61	1.00	.	.	.	K0 V	3	5	0	3
6175		2.56	-0.83	0.02	0.10	0.06	-0.05	-0.08	-0.06	O9.5 V	9	6	9	1
6212	D	2.81	0.86	0.65	0.51	0.83	1.11	1.51	1.67	G0 IV	7	4	3	1
6220		3.50	1.53	0.92	0.67	1.15	1.52	2.15	2.25	G7 III-IV	3	3	3	1
6237		4.84	0.33	0.39	0.35	0.56	.	.	.	F2 V	3	3	0	1
6241		2.29	2.32	1.16	0.86	1.46	.	.	.	K2 III-IV	3	1	0	2
6243		4.66	0.54	0.47	0.45	0.70	.	.	.	F5 IV-V	3	3	0	1
6247	V	3.03	.	-0.22	-0.12	-0.31	.	.	.	B1.5 V	2	2	0	2
6252		3.57	-1.05	-0.21	-0.13	-0.35	.	.	.	B2 IV	6	2	0	2
6254		4.82	0.11	0.09	0.10	0.11	.	.	.	A2p	6	3	0	1
6271		3.59	2.97	1.36	1.12	1.80	.	.	.	K5 III	1	1	0	1
6281		4.38	-0.40	-0.08	-0.09	-0.17	.	.	.	B8 IV	2	2	0	1
6292		6.08	1.54	0.92	0.70	1.18	.	.	.	G5 III	3	3	0	1
6299		3.20	2.32	1.16	0.84	1.38	1.85	2.56	2.64	K2 III	3	3	3	1
6315		4.90	0.45	0.48	0.45	0.72	.	.	.	F6 V	5	2	0	1
6322	V	4.23	1.45	0.90	0.70	1.17	.	.	.	G5 III	4	4	0	1
6324		3.92	-0.12	-0.01	-0.01	-0.05	.	.	.	B9.5 V	3	3	0	1
6334		4.87	-0.43	0.26	0.28	0.45	.	.	.	B1 Iab	6	2	0	2
6337		4.98	3.53	1.60	1.44	2.65	3.39	4.46	4.54	M3 III	7	5	3	1
6355		4.91	0.18	0.12	0.12	0.14	.	.	.	A3 IV	3	3	0	1
6378	D	2.42	0.14	0.05	0.03	0.04	0.12	0.15	.	A2.5 V	3	3	3	1

B.S.	R	V	U-V	B-V	V-R	V-I	V-J
6380		3.34	0.49	0.40	0.36	0.56	.
6396		3.17	-0.54	-0.11	-0.06	-0.18	-0.24
6401/2		4.32	1.35	0.86	0.70	1.14	.
6406*	DV	3.06	2.46	1.45	2.10	4.24	5.32
6410		3.13	0.16	0.08	0.05	0.08	0.19
6415	D	4.72	2.26	1.15	0.80	1.39	.
6416		5.48	1.18	0.80	0.72	1.18	.
6418		3.16	3.10	1.44	0.96	1.68	2.31
6426		5.91	1.86	1.04	0.94	1.53	.
6431	V	4.78	-0.91	-0.15	-0.05	-0.24	.
6436		4.66	0.02	0.05	0.09	0.09	.
6445		4.38	0.35	0.41	0.37	0.59	.
6446		4.31	0.07	0.03	0.06	0.06	.
6453		3.26	-1.08	-0.23	-0.12	-0.33	-0.49
6484/5		4.17	-0.05	0.00	0.02	0.01	.
6486		4.16	0.40	0.28	0.29	0.41	.
6492		4.27	0.48	0.40	0.33	0.51	.
6493		4.54	0.33	0.41	0.38	0.59	.
6498		4.33	3.08	1.50	1.10	1.87	2.45
6508		2.68	-1.04	-0.23	-0.14	-0.37	.
6510		2.95	-0.86	-0.17	-0.10	-0.34	.
6519		4.81	-0.06	0.00	0.07	0.09	.
6526		4.41	3.12	1.44	1.04	1.79	2.37
6527		1.63	-1.11	-0.22	-0.17	-0.45	.
6536		2.78	1.63	1.00	0.68	1.16	1.49
6537		4.59	-0.12	-0.02	-0.01	-0.06	.
6546		4.29	1.99	1.09	0.75	1.30	.
6553		1.87	0.62	0.40	0.35	0.55	.
6554		4.88	0.29	0.26	0.24	0.37	.
6555		4.88	0.31	0.27	0.24	0.37	.
6556		2.07	0.25	0.15	0.14	0.22	0.29
6561		3.52	0.36	0.24	0.20	0.33	.
6567		4.63	-0.07	0.11	0.18	0.29	.
6569		4.77	0.36	0.40	0.29	0.51	.
6580		2.41	-1.09	-0.21	-0.08	-0.30	.
6581		4.24	0.19	0.08	0.08	0.10	.
6588		3.80	-0.87	-0.18	-0.10	-0.27	.
6592		6.36	2.38	1.20	0.92	1.51	.
6595		4.87	0.44	0.47	0.41	0.65	.
6596		4.80	0.42	0.43	0.41	0.63	.
6603		2.77	2.41	1.17	0.82	1.39	1.85
6623		3.42	1.14	0.75	0.53	0.91	1.24
6629		3.75	0.08	0.04	0.04	0.04	.
6636		4.58	0.44	0.43	0.38	0.61	.
6685		5.45	0.61	0.34	0.32	0.53	.
6688		3.75	2.39	1.18	0.83	1.42	1.95
6695		3.87	2.81	1.35	0.90	1.53	2.04
6698		3.34	1.86	0.99	0.71	1.19	1.66
6700		4.75	-0.08	-0.05	0.05	0.03	.
6703		3.70	1.64	0.94	0.69	1.15	1.51
6705		2.22	3.40	1.52	1.14	1.99	2.61
6707		4.41	0.54	0.39	0.40	0.63	0.86
6710		4.62	0.98	0.39	0.33	0.52	.
6712		4.60	-0.83	-0.02	0.13	0.11	.
6713		4.68	2.48	1.27	0.87	1.46	.
6714		3.97	-0.63	0.02	0.10	0.10	.
6723		4.42	0.06	0.04	0.07	0.08	.
6736		5.97	-0.89	0.00	0.25	0.27	0.19
6746		2.99	1.78	1.01	0.73	1.24	1.68
6752	D	4.03	1.37	0.86	0.65	1.11	1.54

BRIGHT STAR PHOTOMETRY

B.S.	R	V	U-V	B-V	V-R	V-I	V-J	V-K	V-L	SP.	V	R	K	S
6766		4.55	1.71	0.95	0.66	1.18	.	.	.	(Gp)	2	3	0	1
6770		4.63	1.70	0.97	0.69	1.19	.	.	.	G8 III-IV	3	3	0	1
6771		3.73	0.21	0.12	0.14	0.19	.	.	.	A4 V	3	3	0	1
6779		3.83	-0.09	-0.02	0.03	0.03	.	.	.	B9.5 III	3	3	0	1
6783		4.53	1.79	1.01	0.70	1.18	.	.	.	G5 III	6	1	0	2
6787		4.35	-0.96	-0.15	-0.06	-0.24	.	.	.	B2 V	3	3	0	1
6789		4.36	0.05	0.02	0.05	0.04	.	.	.	A1 V	8	3	0	1
6806		6.40	1.46	0.87	0.77	1.26	.	.	.	K2 V	4	4	0	3
6812	V	3.85	-0.25	0.22	0.27	0.47	.	.	.	B8 Iap	2	2	0	1
6832		3.11	3.26	1.56	1.56	2.88	.	.	.	M3 II	3	1	0	2
6842		4.63	3.46	1.66	1.21	2.14	.	.	.	(gK5)	3	4	0	1
6859		2.70	2.93	1.38	1.00	1.68	.	.	.	K2 III	6	4	0	1
6866		4.84	1.52	0.91	0.69	1.14	.	.	.	G8 III	4	4	0	1
6868		4.96	3.58	1.58	1.34	2.34	.	.	.	M0 III	2	2	0	1
6869		3.25	1.59	0.94	0.70	1.20	1.60	2.20	.	K0 III-IV	6	3	2	1
6872		4.34	2.36	1.17	0.86	1.41	1.85	2.60	.	K2 III	2	2	2	1
6879		1.85	-0.16	-0.03	0.00	-0.01	.	.	.	A0 V	3	1	0	2
6884		4.68	1.66	0.94	0.72	1.19	.	.	.	K0 III	2	2	0	1
6895		3.84	2.34	1.18	0.85	1.45	1.92	2.68	2.82	K2 III	4	2	3	1
6896	D	4.81	2.23	1.30	1.10	1.94	.	.	.	K2 II	3	3	0	1
6897		3.51	-0.82	-0.17	-0.13	-0.34	.	.	.	B3 III	6	1	0	2
6913		2.81	1.94	1.04	0.75	1.31	1.77	2.43	.	K2 III	6	4	1	1
6917		5.83	0.16	0.07	0.08	0.12	.	.	.	A2 V	4	3	0	1
6918	VD	5.21	0.71	0.50	0.49	0.87	.	.	.	G0 III+A6 V	4	3	0	1
6920	D	4.22	-0.43	-0.10	-0.04	-0.14	.	.	.	ADp	3	3	0	1
6923	D	4.99	0.13	0.08	0.05	0.07	.	.	.	A1 V	2	2	0	1
6927		3.58	0.43	0.49	0.44	0.75	.	.	.	F7 V	6	3	0	1
6930		4.71	0.11	0.07	0.08	0.13	.	.	.	A3 V	3	3	0	1
6945		4.82	2.30	1.19	0.86	1.49	.	.	.	K2 III	3	3	0	1
6951		4.64	1.78	1.02	0.69	1.19	.	.	.	G5 III	6	1	0	2
6973		3.83	2.87	1.34	0.97	1.65	.	.	.	K3 III	4	2	0	1
6978		4.80	1.05	0.61	0.53	0.84	.	.	.	F7 Ib	2	2	0	1
6993		5.74	0.12	0.06	0.07	0.11	.	.	.	(A2)	7	4	0	1
7001		0.03	0.00	0.00	-0.04	-0.07	0.01	0.01	0.05	A0 V	9	5	9	1
7020	V	4.72	0.51	0.35	0.30	0.49	.	.	.	F3 III-IV	2	2	0	1
7029		4.87	-0.89	-0.18	-0.14	-0.30	.	.	.	B3 V	6	1	0	2
7039		3.16	-0.47	-0.11	-0.01	-0.12	.	.	.	B8 III	5	4	0	1
7056		4.36	0.35	0.19	0.15	0.23	.	.	.	A m	5	4	0	1
7059		5.64	0.22	0.14	0.13	0.20	.	.	.	A2m	5	4	0	1
7061		4.19	0.48	0.46	0.39	0.65	.	.	.	F6 V	6	2	0	1
7063		4.22	1.93	1.09	0.79	1.36	1.80	2.48	.	G5 II	2	2	3	1
7064		4.84	2.42	1.20	0.88	1.49	.	.	.	K3 III	2	2	0	1
7066	V	5.20	3.10	1.47	1.06	1.83	2.36	3.12	3.64	G0eIa-K0pIb	JD2438639			
7069		4.36	0.20	0.12	0.09	0.10	.	.	.	A3 V	3	3	0	1
7106	V	3.42	-0.57	0.00	0.11	0.13	0.18	0.36	.	B pe	3	3	3	1
7116		4.83	2.68	1.40	1.01	1.70	.	.	.	(cK2)	3	3	0	1
7120		4.98	2.82	1.32	0.94	1.60	2.13	2.91	3.08	K3 III	5	4	3	1
7121		2.03	-0.97	-0.22	-0.11	-0.32	.	.	.	B2 V	6	4	0	1
7125		4.67	2.23	1.19	0.90	1.54	.	.	.	K0 II-III	4	3	0	1
7133	D	4.60	1.28	0.78	0.64	1.10	1.44	2.04	.	G4 III+A6 V	2	2	3	1
7137		4.93	1.47	0.90	0.68	1.13	.	.	.	G8 III	3	3	0	1
7139		4.30	3.32	1.67	1.78	3.41	4.32	5.53	5.75	M4 II	3	3	7	1
7141/2		4.07	0.26	0.17	0.17	0.24	.	.	.	A5 V	2	3	0	1
7150		3.51	2.31	1.18	0.80	1.39	1.80	2.52	2.66	K1 III	6	3	3	1
7157	V	4.00	3.00	1.59	2.05	3.96	4.86	6.09	6.35	M5 III	3	3	8	1
7172		5.22	0.60	0.53	0.42	0.72	.	.	.	F8 IV	6	4	0	1
7176		4.02	2.12	1.08	0.76	1.28	1.69	2.33	2.47	K2 III	3	3	3	1
7178		3.24	-0.13	-0.05	-0.03	-0.04	0.01	0.00	0.07	B9 III	9	6	3	1
7180		4.82	2.25	1.15	0.85	1.41	.	.	.	K0 III	4	3	0	1
7193		4.02	2.13	1.09	0.79	1.33	1.79	2.51	2.58	K1 III	4	3	3	1

BRIGHT STAR PHO

B.S.	R	V	U-V	B-V	V-R	V-I	V-J
7194	D	2.59	0.13	0.08	0.05	0.06	.
7215		5.02	0.28	0.19	0.21	0.30	.
7217		3.77	1.86	1.00	0.72	1.25	1.66
7234		3.31	2.34	1.20	0.87	1.46	.
7235		2.99	0.00	0.01	0.01	0.01	0.06
7236		3.43	-0.36	-0.09	-0.03	-0.12	-0.21
7254		4.11	0.13	0.04	0.04	0.04	.
7259		4.11	2.27	1.20	0.82	1.43	.
7264		2.88	0.58	0.34	0.34	0.58	0.74
7292	D	4.83	0.87	0.55	0.49	0.83	.
7298		4.38	-0.81	-0.14	-0.10	-0.25	.
7306		4.77	-0.59	-0.04	0.01	-0.06	.
7310		3.07	1.78	1.00	0.70	1.21	1.64
7312		5.14	0.31	0.31	0.31	0.48	.
7314		4.37	2.48	1.25	0.87	1.46	2.00
7317		6.06	3.00	1.43	1.12	1.95	2.56
7328		3.76	1.71	0.97	0.63	1.10	1.51
7340		3.93	0.36	0.22	0.19	0.29	.
7342		4.61	-0.43	0.10	0.27	0.40	.
7352		4.45	2.70	1.25	0.90	1.48	2.00
7358		5.18	-0.65	-0.12	-0.04	-0.20	.
7371		4.59	0.08	0.02	0.04	0.01	.
7372		4.97	-0.81	-0.09	0.02	-0.12	.
7377		3.36	0.36	0.32	0.25	0.41	0.61
7387		4.67	1.11	0.60	0.51	0.97	.
7405		4.45	3.32	1.50	1.21	2.18	2.90
7417		3.08	1.75	1.13	0.87	1.53	2.07
7420		3.79	0.25	0.14	0.11	0.18	.
7426		4.74	-0.80	-0.13	0.01	-0.15	.
7429		4.45	2.42	1.18	0.91	1.52	1.95
7437		4.99	-0.50	-0.07	-0.01	-0.10	.
7440		4.60	-0.21	-0.06	-0.03	-0.09	.
7446		4.96	-0.87	0.00	0.06	0.02	-0.13
7447		4.36	-0.53	-0.09	0.02	-0.06	.
7451		5.74	0.48	0.48	0.46	0.74	.
7462		4.69	1.17	0.80	0.65	1.06	1.37
7469		4.47	0.37	0.39	0.35	0.56	.
7478		4.70	1.74	0.95	0.68	1.15	.
7479		4.37	1.20	0.77	0.57	0.94	1.29
7488		4.37	1.94	1.05	0.71	1.21	1.63
7503		5.95	0.84	0.64	0.45	0.78	1.04
7504		6.20	0.87	0.66	0.44	0.78	1.16
7525		2.72	3.20	1.52	1.07	1.82	2.42
7528		2.87	-0.12	-0.02	-0.01	-0.03	0.05
7546	D	5.00	0.16	0.10	0.14	0.20	.
7536		3.83	2.37	1.41	1.44	2.73	3.46
7557		0.76	0.31	0.22	0.14	0.28	0.37
7564	max	4.23	2.78	1.82	2.42	4.22	5.43
7564	min	2.61	2.50	1.90	5.36	9.51	11.86
7565		4.96	-0.81	-0.12	-0.02	-0.16	.
7582	D	3.82	1.41	0.89	0.64	1.12	1.57
7589		5.62	-1.04	-0.07	0.10	-0.02	.
7592		4.58	-0.19	-0.06	0.03	-0.02	.
7595		4.68	1.94	1.05	0.76	1.33	.
7597		4.70	1.07	0.75	0.59	0.96	.
7602		3.72	1.35	0.86	0.66	1.15	1.46
7604		4.50	3.02	1.46	1.02	1.75	.
7613		4.95	-0.61	-0.09	0.01	-0.09	.
7615		3.93	1.91	1.03	0.74	1.26	1.65
7618		4.82	1.43	0.89	0.65	1.12	.

BRIGHT STAR PHOTOMETRY

B.S.	R	V	U-V	B-V	V-R	V-I	V-J	V-K	V-L	SP.	V	R	K	S
7619	D	4.92	0.18	0.12	0.10	0.16	.	.	.	A3 IV	3	3	0	1
7635		3.47	3.50	1.57	1.20	2.12	2.68	3.63	3.83	K5 III	3	3	3	1
7650		4.59	3.46	1.65	1.87	3.43	.	.	.	M4 III	3	3	0	1
7653		4.65	0.34	0.18	0.16	0.25	.	.	.	A m	3	3	0	1
7665		3.56	1.22	0.76	0.61	0.95	.	.	.	G8 V	6	3	0	4
7678		5.65	0.08	0.54	0.52	0.94	1.15	1.54	.	B1.5 Ia+	5	2	3	1
7685		4.50	2.81	1.31	0.93	1.58	2.14	2.93	.	K3 III	3	3	3	1
7703		5.32	.	0.87	0.75	1.24	.	.	.	K3 V	6	4	0	4
7708		4.92	-0.90	-0.12	0.03	-0.08	.	.	.	B3 V	4	4	0	1
7710		3.22	-0.19	-0.07	-0.07	-0.12	-0.19	-0.19	-0.16	B9.5 III	6	3	4	1
7722		5.73	1.52	0.88	0.71	1.16	.	.	.	K0 V	3	4	0	3
7724		4.95	0.10	0.09	0.10	0.10	.	.	.	A2 V	3	3	0	1
7730		4.83	0.25	0.09	0.16	0.24	.	.	.	A3 III	2	2	0	1
7735	V	3.80	1.70	1.28	0.97	1.73	2.39	3.31	.	K2 II+B3 V	3	3	3	1
7736		4.99	0.11	0.12	0.20	0.27	.	.	.	A2 III	3	3	0	1
7739		4.77	-0.91	-0.18	-0.08	-0.28	.	.	.	B3 V	3	3	0	1
7740		4.30	0.19	0.11	0.12	0.18	.	.	.	A3 IV,V	5	5	0	1
7741		5.15	1.75	1.04	0.74	1.22	.	.	.	G2 Ib	3	3	0	1
7744		4.52	2.37	1.26	0.96	1.67	.	.	.	K3 III	4	3	0	1
7746		6.12	1.96	1.04	0.77	1.30	.	.	.	K1 III	7	4	0	1
7747		4.26	1.89	1.08	0.79	1.32	1.71	2.34	2.48	G3 Ib	2	2	3	1
7750	D	4.39	-0.14	-0.05	-0.02	-0.08	.	.	.	B9 III	3	3	0	1
7751	V	3.98	2.56	1.52	1.20	2.12	2.79	3.82	.	K3 Ib-II+B	3	3	3	1
7754		3.58	1.64	0.95	0.69	1.16	1.51	2.10	2.28	G9 III	2	2	2	1
7763	V	4.82	-0.16	0.42	0.54	0.80	1.04	1.51	1.95	B1ep	5	2	4	1
7767	D	5.84	-0.67	0.10	0.15	0.16	.	.	.	O8	9	9	0	1
7770		5.17	1.12	0.65	0.57	0.99	.	.	.	F5 Ib	3	3	0	1
7773		4.76	-0.15	-0.04	0.01	-0.05	.	.	.	B9 V	3	3	0	1
7776		3.08	1.06	0.79	0.55	1.05	1.54	2.17	2.24	F8 V(+A0)	5	2	3	1
7781		5.76	0.14	0.12	0.13	0.19	.	.	.	(A2)	6	4	0	1
7784		6.23	0.09	0.06	0.06	0.09	.	.	.	A1 V	6	4	0	1
7790		1.94	-0.91	-0.20	-0.09	-0.25	.	.	.	B3 IV	3	3	0	4
7796		2.23	1.21	0.67	0.49	0.83	1.07	1.51	1.56	F8 Ib	2	2	3	1
7806		4.44	2.83	1.33	1.01	1.68	2.15	3.00	3.12	K3 III	6	4	3	1
7822	D	4.81	0.42	0.37	0.35	0.54	.	.	.	F2 IV	2	3	0	1
7834		4.02	0.70	0.40	0.36	0.59	.	.	.	F5 II	3	3	0	1
7844		4.95	-0.72	-0.09	0.03	-0.08	.	.	.	B2 V	3	3	0	1
7847		6.18	1.75	1.01	0.85	1.54	2.01	2.64	2.86	F5 Iab	5	2	5	1
7850		4.22	0.36	0.20	0.17	0.26	.	.	.	A m	3	3	0	1
7852		4.04	-0.60	-0.12	-0.02	-0.13	.	.	.	B6 III	2	2	0	1
7866		4.63	2.36	1.61	1.30	2.29	.	.	.	K2 Ib+B	2	2	0	1
7871		4.69	0.22	0.11	0.13	0.18	.	.	.	A3 V	2	2	0	1
7882	D	3.63	0.52	0.44	0.40	0.64	0.74	0.98	.	F5 IV	3	2	3	1
7884		4.33	1.65	0.96	0.67	1.13	1.48	2.05	.	G8 III	3	3	3	1
7891		4.82	-0.09	-0.02	0.03	-0.01	.	.	.	B9.5 V	3	3	0	1
7906		3.77	-0.27	-0.06	0.00	-0.04	.	.	.	B9 V	9	9	0	1
7924		1.25	-0.14	0.09	0.11	0.21	0.25	0.36	0.47	A2 Ia	9	5	9	1
7928		4.44	0.42	0.32	0.26	0.43	.	.	.	A7p III	3	3	0	1
7936		4.13	0.47	0.43	0.36	0.56	.	.	.	F5 V	3	3	0	1
7939		4.91	2.37	1.19	0.85	1.43	1.89	2.63	2.80	K2 III	4	2	3	1
7942		4.23	1.94	1.06	0.77	1.30	1.67	2.36	2.56	K0 III	3	3	4	1
7947/8		3.91	1.36	0.85	0.68	1.16	.	.	.	F8IV-V/K2IV	3	3	0	1
7949		2.46	1.90	1.03	0.73	1.27	1.69	2.35	2.46	K0 III	8	5	9	1
7950		3.77	0.02	0.00	0.07	0.07	.	.	.	A1 V	9	3	0	1
7951		4.44	3.60	1.67	1.47	2.78	3.45	4.62	4.79	M3 III	3	3	3	1
7955		4.52	0.64	0.54	0.47	0.75	.	.	.	F8 IV-V	2	2	0	1
7957		3.43	1.53	0.92	0.67	1.16	1.53	2.15	2.24	K0 IV	5	2	3	1
7963	D	4.54	-0.61	-0.11	-0.04	-0.15	.	.	.	B5 V	3	3	0	1
7977		4.86	-0.03	0.42	0.45	0.76	.	.	.	B3 Ia	3	2	0	1
7980		4.12	3.54	1.63	1.25	2.19	.	.	.	M1 III	6	3	0	1

BRIGHT STAR PH

B.S.	R	V	U-V	B-V	V-R	V-I	V-J
7990		4.73	0.42	0.32	0.28	0.42	.
7995		4.61	1.28	0.82	0.68	1.14	.
8001		4.77	-0.72	-0.14	-0.07	-0.20	.
8020		5.67	0.14	0.47	0.48	0.87	.
8028		3.94	0.02	0.02	0.05	0.05	.
8034		5.23	0.48	0.46	0.32	0.60	.
8047		4.75	-0.98	-0.04	0.13	0.12	.
8060		4.84	0.23	0.18	0.16	0.23	.
8075		4.07	0.00	-0.01	0.01	-0.01	.
8079		3.70	3.45	1.65	1.20	2.10	2.70
8080		4.49	3.50	1.60	1.28	2.26	.
8085		5.22	2.28	1.17	1.03	1.68	2.07
8086		6.03	2.60	1.37	1.17	2.00	2.48
8089		4.56	3.29	1.56	1.17	1.99	.
8093		4.52	1.61	0.94	0.69	1.15	1.51
8097		4.68	0.35	0.26	0.25	0.36	.
8115		3.20	1.75	0.99	0.70	1.18	1.55
8123	D	4.49	0.49	0.50	0.43	0.71	.
8130	D	3.73	0.43	0.40	0.35	0.59	0.74
8131		3.90	0.82	0.52	0.44	0.79	.
8143		4.23	-0.26	0.13	0.15	0.29	0.28
8146		4.42	-0.92	-0.10	0.05	-0.03	.
8151		4.82	-0.05	0.02	0.09	0.13	.
8162		2.45	0.33	0.22	0.21	0.32	0.34
8167		4.27	1.47	0.91	0.62	1.10	1.44
8170		6.40	0.53	0.53	0.47	0.81	.
8173		4.09	2.16	1.11	0.79	1.33	1.74
8181		4.22	0.35	0.48	0.47	0.77	.
8204		3.74	1.60	1.00	0.64	1.07	1.37
8207		5.78	3.18	1.44	1.05	1.81	.
8213		4.51	1.51	0.91	0.68	1.15	1.46
8225		4.57	3.55	1.62	1.25	2.34	.
8232		2.87	1.41	0.84	0.61	1.02	1.30
8238	DV	3.23	-1.18	-0.22	-0.10	-0.32	-0.55
8252		4.02	1.45	0.89	0.71	1.21	1.47
8255		4.91	2.08	1.08	0.82	1.36	1.82
8260		4.72	-0.74	-0.16	-0.04	-0.12	.
8262	V	5.38	2.83	1.59	2.35	4.49	5.46
8263		6.25	0.11	0.06	0.08	0.10	.
8264		4.69	0.32	0.19	0.17	0.27	.
8278		3.67	0.53	0.32	0.23	0.36	0.51
8279		4.73	-0.24	0.30	0.31	0.49	0.44
8288		4.73	1.39	0.88	0.67	1.16	.
8291		6.11	0.15	0.07	0.11	0.16	.
8297	*V	6.05	7.82	2.52	1.83	3.21	4.11
8301		4.67	-0.81	-0.12	-0.02	-0.15	.
8305		4.34	-0.16	-0.05	-0.01	-0.04	.
8308		2.39	3.22	1.52	1.05	1.81	2.36
8309/10		4.51	0.50	0.49	0.38	0.66	.
8313		4.31	2.14	1.18	0.80	1.36	1.79
8315	D	4.12	0.47	0.44	0.37	0.62	.
8316	V	4.17	4.71	2.26	2.10	3.86	4.69
8317		4.57	2.19	1.10	0.84	1.38	.
8322	V	2.83	0.39	0.29	0.24	0.40	0.49
8327		5.94	-0.33	0.31	0.28	0.45	0.53
8334		4.29	0.65	0.52	0.50	0.94	1.15
8335		4.24	-0.84	-0.12	-0.05	-0.17	.
8353		3.01	-0.49	-0.12	-0.05	-0.11	.
8371		5.80	0.70	0.72	0.68	1.28	.
8383	V	4.90	2.13	1.75	1.71	3.05	3.83

BRIGHT STAR PHOTOMETRY

B.S.	R	V	U-V	B-V	V-R	V-I	V-J	V-K	V-L	SP.	V	R	K	S
8387		4.69	2.05	1.06	0.88	1.44	.	.	.	K5 V	6	2	0	4
8402		4.69	-0.47	-0.05	-0.01	-0.05	.	.	.	B8 V	3	3	0	1
8407		5.60	-0.13	-0.02	0.03	0.02	.	.	.	B9p	6	4	0	1
8410		5.31	0.38	0.23	0.18	0.28	.	.	.	A5m	6	4	0	1
8411		4.46	3.03	1.37	1.00	1.78	.	.	.	M0 III	6	1	0	2
8413		4.84	3.24	1.44	1.07	1.83	2.43	3.26	.	K4 III	5	3	3	1
8414		2.93	1.74	0.97	0.66	1.13	1.45	1.97	.	G2 Ib	4	2	3	1
8417	D	4.29	0.43	0.34	0.32	0.45	.	.	.	A m	3	3	0	1
8418		4.25	-0.34	-0.07	-0.05	-0.14	.	.	.	B8 V	2	2	0	1
8421		6.12	3.37	1.60	1.66	3.22	4.01	5.14	5.35	(gM8)	4	4	4	1
8425		1.74	-0.60	-0.13	-0.08	-0.14	.	.	.	B5 V	3	1	0	2
8428		5.11	-0.75	0.08	0.16	0.19	0.09	0.17	.	O9.5 Ib	6	3	2	1
8430		3.76	0.41	0.44	0.40	0.65	0.76	1.11	.	F5 V	9	2	3	1
8431		4.50	0.11	0.05	0.07	0.12	.	.	.	A2 V	6	1	0	2
8450		3.55	0.17	0.07	0.05	0.09	.	.	.	A2 V	2	2	0	1
8454		4.29	0.64	0.46	0.39	0.66	.	.	.	F5 II-III	5	2	0	1
8461		5.95	1.68	0.95	0.72	1.21	.	.	.	K1 III	6	4	0	1
8465		3.35	3.27	1.55	1.08	1.86	2.38	3.24	3.35	K1 Ib	6	3	3	1
8468		4.79	1.53	0.92	0.69	1.17	.	.	.	G8 III	3	3	0	1
8469		5.05	-0.50	0.24	0.28	0.43	0.43	-0.47	0.65	O6f	9	5	7	1
8473		6.37	-0.23	-0.06	0.00	-0.07	.	.	.	(A0)	6	3	0	1
8485		4.49	2.83	1.39	1.01	1.75	2.29	3.18	.	K3 III	3	3	2	1
8494		4.19	0.32	0.28	0.27	0.42	.	.	.	F0 IV	7	3	0	1
8498		4.13	3.08	1.46	1.00	1.72	2.27	3.08	.	K3 II-III	3	3	2	1
8499		4.15	1.79	0.99	0.70	1.18	1.57	2.14	.	G8 III-IV	4	3	2	1
8518		3.84	-0.19	-0.06	0.04	0.00	.	.	.	B9 III	3	2	0	1
8520		4.99	-0.91	-0.10	-0.07	-0.21	.	.	.	B2 V	2	2	0	1
8521	V*	6.62	.	2.01	3.44	6.08	7.28	8.73	.	S4.7	4	4	3	2
8522		4.81	-0.19	0.00	0.09	0.08	.	.	.	B8 III	3	3	0	1
8523		4.56	-0.60	-0.10	-0.02	-0.13	.	.	.	B6 IV	2	2	0	1
8538		4.44	1.79	1.02	0.75	1.32	1.75	2.37	.	G9 III	3	3	2	1
8539		4.64	-1.00	-0.04	0.16	0.16	.	.	.	B1 Vpe	3	2	0	1
8541		4.58	-0.25	0.09	0.13	0.23	0.27	0.34	0.31	B9 Iab	2	2	2	1
8551		4.80	1.94	1.06	0.78	1.34	1.81	2.46	2.58	K0 III	5	3	3	1
8556		3.97	1.84	1.03	0.73	1.34	.	.	.	(gG5)	3	1	0	2
8558/9		3.66	0.37	0.38	0.39	0.62	.	.	.	F2 IV	2	2	0	1
8560		4.11	3.27	1.57	1.73	3.32	.	.	.	(gM6)	3	1	0	2
8572	D	4.37	2.78	1.68	1.39	2.46	3.18	4.21	.	M0 Iab+B	4	3	3	1
8573		4.81	-0.22	-0.08	0.00	-0.04	.	.	.	A0 IV	3	3	0	1
8576	D	4.29	0.03	0.01	0.02	0.04	.	.	.	A0 V	3	1	0	2
8579		4.51	-0.83	-0.09	-0.01	-0.12	.	.	.	B2 IV	8	3	0	1
8585		3.77	0.01	0.01	0.00	-0.03	.	.	.	A2 V	3	3	0	1
8597		4.00	-0.38	-0.10	-0.06	-0.13	.	.	.	B8 V	2	2	0	1
8613		4.83	0.35	0.24	0.22	0.36	.	.	.	A7 IV	3	3	0	1
8622		4.88	-1.25	-0.20	-0.09	-0.30	-0.53	-0.67	-0.62	O9 V	9	9	9	1
8628		4.16	-0.46	-0.12	-0.06	-0.16	.	.	.	B8 V	3	3	0	1
8632		4.46	2.69	1.33	0.92	1.60	2.10	2.95	.	K3 III	3	3	3	1
8634		3.40	-0.33	-0.09	-0.04	-0.11	.	.	.	B8 V	3	2	0	1
8636		2.11	3.22	1.62	1.91	3.68	.	.	.	M3 II	6	1	0	2
8641		4.79	-0.02	-0.01	0.04	0.02	.	.	.	A1 V	3	2	0	1
8644		4.85	1.84	1.03	0.76	1.41	.	.	.	(G5)	3	1	0	2
8649		4.69	2.92	1.36	0.97	1.69	.	.	.	K4 III	6	5	0	1
8650		2.95	1.43	0.86	0.64	1.12	1.49	2.02	.	G2 II-III+F?	5	3	3	1
8665		4.19	0.48	0.50	0.43	0.74	.	.	.	F7 V	6	3	0	1
8667		3.94	1.99	1.08	0.76	1.27	1.69	2.29	.	G8 II-III	3	3	3	1
8679		3.98	3.53	1.59	1.19	2.14	2.78	3.76	.	M0 III	3	4	3	1
8684		3.48	1.62	0.94	0.68	1.15	1.47	2.05	.	G8 III	3	3	2	1
8694		3.53	1.95	1.05	0.83	1.34	1.71	2.34	.	K1 III	3	3	4	1
8695	D	4.46	-0.18	-0.04	0.02	0.04	.	.	.	A0 V	6	1	0	2
8698		3.79	3.41	1.65	1.42	2.61	3.36	4.49	.	M2 III	3	3	2	1

BRIGHT STAR PHO

B.S.	R	V	U-V	B-V	V-R	V-I	V-J
8702		4.74	2.61	1.26	0.94	1.61	.
8704		5.81	-0.40	-0.08	0.01	-0.04	.
8709		3.28	0.13	0.05	0.07	0.11	.
8717		4.90	0.00	0.00	0.04	0.02	.
8720		4.21	1.67	0.97	0.74	1.35	.
8721		6.49	2.12	1.10	0.95	1.54	.
8726		4.94	3.72	1.77	1.35	2.40	3.07
8728		1.16	0.15	0.09	0.06	0.08	0.14
8729		5.50	0.87	0.67	0.54	0.88	1.13
8737		6.43	0.80	0.64	0.53	0.89	.
8748		4.72	3.13	1.43	1.09	1.82	.
8752	V	5.13	2.88	1.55	1.17	2.02	2.61
8762		3.62	-0.62	-0.09	0.01	-0.07	.
8773		4.52	-0.62	-0.12	-0.02	-0.15	.
8775	V	2.42	3.63	1.67	1.50	2.82	3.52
8780		4.66	1.94	1.06	0.74	1.31	.
8781		2.48	-0.10	-0.04	0.01	-0.02	-0.04
8789		4.48	1.49	0.90	0.71	1.20	.
8795		4.51	3.46	1.58	1.26	2.28	2.87
8796		4.77	2.50	1.35	0.97	1.65	.
8797		4.86	-0.90	-0.03	0.10	-0.01	.
8804		5.33	3.13	1.41	1.02	1.77	.
8808	D	6.25	-0.61	-0.01	0.05	-0.01	-0.01
8812		3.64	2.45	1.23	0.84	1.44	1.94
8817		4.68	1.02	0.64	0.54	0.90	.
8819	D	4.42	1.27	0.82	0.65	1.08	.
8820		3.90	1.88	1.02	0.75	1.31	.
8830		4.53	0.34	0.30	0.29	0.45	.
8832		5.57	1.89	1.00	0.83	1.36	1.70
8834		4.22	3.42	1.55	1.28	2.36	3.04
8841		4.25	2.12	1.11	0.79	1.35	1.78
8852		3.69	1.48	0.91	0.72	1.23	1.63
8858		4.40	-0.68	-0.14	-0.07	-0.20	.
8860		4.86	3.64	1.67	1.46	2.72	3.40
8863		4.41	2.19	1.13	0.84	1.47	.
8872	D	4.76	1.33	0.84	0.65	1.10	.
8880		4.60	0.27	0.17	0.21	0.30	.
8892		3.98	2.05	1.10	0.82	1.42	1.93
8905		4.41	0.75	0.61	0.54	0.86	1.04
8906		4.40	3.27	1.47	1.13	1.94	2.52
8911		4.94	0.00	0.04	0.07	0.04	.
8916		4.30	2.11	1.08	0.80	1.33	1.76
8923		4.56	1.68	0.94	0.74	1.19	1.56
8926	V	4.94	-0.76	-0.12	0.01	-0.13	.
8937		4.37	-0.45	-0.09	0.00	-0.07	.
8939		4.72	0.03	0.02	0.07	0.10	.
8947		5.59	0.18	0.10	0.12	0.18	.
8949		4.71	0.15	0.08	0.12	0.19	.
8959		4.74	0.17	0.08	0.11	0.16	.
8961	V	3.82	1.72	1.02	0.78	1.35	1.85
8965		4.29	-0.39	-0.11	0.00	-0.09	.
8969		4.13	0.51	0.51	0.44	0.75	.
8974		3.21	1.98	1.03	0.75	1.26	.
8976		4.14	-0.32	-0.08	-0.01	-0.08	.
8982		4.84	1.30	0.81	0.62	1.04	.
8984		4.51	0.28	0.21	0.18	0.28	.
8988		4.51	-0.17	-0.04	0.02	-0.03	.
8997	D	4.93	1.59	0.96	0.71	1.19	.
9004	V	5.04	6.11	2.61	1.87	3.22	4.12
9016		4.57	-0.01	0.00	0.04	0.02	.

TABLE 2 UBVRIJKL PHOTOMETRY OF BRIGHT ST

BRIGHT STAR PHOTOMETRY

B.S.	R	V	U-V	B-V	V-R	V-I	V-J	V-K	V-L	SP.
9030		5.79	3.39	1.66	0.26	0.80	.	.	.	(gM3)
9045	V	4.59	2.41	1.26	0.96	1.70	2.00	2.56	2.79	G0 Iap
9064		4.66	3.26	1.59	1.46	2.80	3.54	4.63	4.86	M3 III
9071	D	4.88	-0.89	-0.06	0.04	-0.07	.	.	.	B1 V
9072		4.01	0.49	0.42	0.38	0.62	.	.	.	F4 IV
9089		4.41	3.47	1.63	1.56	2.97	3.75	4.88	5.06	M3 III
9091		5.00	-0.73	-0.16	-0.05	-0.19	.	.	.	B5 III
9098		4.56	-0.16	-0.04	0.03	-0.01	.	.	.	B9 IV

AAVSO near-IR primary standards

Table 1. The AAVSO near-IR primary standards.

HD	*RA (2000)*	*Dec*	*pmra mas/yr*	*pmdec mas/yr*	*Sp.Cl.*	*V*	*J*	*H*	*K*	*L*	*L'*	*no*
358	00h 08m 23s.26	+29° 05' 25".6	135.68	-162.95	B8IV	2.06	2.30	2.33	2.36	2.39	—	3
1013	00 14 36.16	+20 12 24.1	90.66	1.88	M2III	4.82	1.63	0.81	0.63	0.45	—	3
6860	01 09 43.92	+35 37 14.0	175.59	-112.23	M0III	2.06	-0.92	-1.73	-1.87	-2.01	-2.02	1
12929	02 07 10.41	+23 27 44.7	190.73	-145.77	K2III	2.00	0.09	-0.52	-0.63	-0.74	—	3
14818	02 25 16.03	+56 36 35.4	-0.39	-0.65	B2Iae	6.25	5.58	5.43	5.33	5.32	5.30	1
15318	02 28 09.54	+08 27 36.2	41.72	-14.46	B9III	4.28	4.41	4.42	4.43	4.43	4.41	1
20902	03 24 19.37	+49 51 40.2	24.11	-26.01	F5I	1.82	0.87	0.62	0.56	0.47	—	3
23288	03 44 48.22	+24 17 22.1	20.73	-44.00	B7IV	5.46	5.52	5.50	5.51	-5.64	—	1
29139	04 35 55.24	+16 30 33.5	62.78	-189.35	K5III	0.85	-1.86	-2.64	-2.80	-2.98	-2.93	1
30836	04 51 12.36	+05 36 18.4	-3.62	1.03	B2III	3.69	4.04	4.09	4.14	4.15	4.16	1
31398	04 56 59.62	+33 09 57.9	3.63	-18.54	K3II	2.69	0.21	-0.51	-0.66	-0.85	—	3
34085	05 14 32.27	-08 12 05.9	1.87	-0.56	B8Iae	0.12	0.23	0.22	0.21	0.15	0.08	1
34029	05 16 41.36	+45 59 52.8	75.52	-427.11	G4III	0.08	-1.34	-1.73	-1.81	-1.87	-1.87	1
37763	05 31 53.02	-76 20 27.5	143.19	287.74	K2III	5.17	3.28	2.76	2.66	2.58	—	2
48915	06 45 08.92	-16 42 58.0	-546.05	-1223.14	A1V	-1.46	-1.30	-1.32	-1.32	-1.35	-1.37	1
60178	07 34 35.86	+31 53 17.8	-206.33	-148.18	A2V	1.59	1.55	1.54	1.53	1.51	—	3
61421	07 39 18.12	+05 13 30.0	-716.58	-1034.60	F5IV	0.34	-0.41	-0.61	-0.65	-0.68	—	3
62509	07 45 18.95	+28 01 34.3	-625.69	-45.96	K0IIIb	1.14	-0.51	-0.99	-1.11	-1.15	-1.19	1
69267	08 16 30.92	+09 11 08.0	-46.80	-48.65	K4III	3.54	1.05	0.30	0.16	0.01	—	3
84999	09 50 59.36	+59 02 19.4	-294.44	-151.75	F2IV	3.80	3.14	3.02	2.99	2.97	2.93	1
85444	09 51 28.69	-14 50 47.8	18.68	-21.88	G7III	4.12	2.61	2.12	2.04	—	—	1
87901	10 08 22.31	+11 58 01.9	-249.40	4.91	B7V	1.35	1.57	1.58	1.61	1.61	—	3

(Table 1 continued on following pages)

Table 1. The AAVSO near-IR primary standards, continued.

HD	RA (2000)	Dec	pmra mas/yr	pmdec mas/yr	Sp.Cl.	V	J	H	K	L	L'	no
89484	10 19 58.43	+19 50 28.5	294.9	-154.0	K1III	2.61	0.10	-0.50	-0.58	-0.75	—	3
89758	10 22 19.74	+41 29 58.3	-80.47	34.10	M0III	3.05	0.12	-0.68	-0.82	-0.94	-1.00	1
102647	11 49 03.58	+14 34 19.4	-499.02	-113.78	A3V	2.14	2.02	1.99	1.98	—	—	1
103095	11 52 58.77	+37 43 07.2	4003.69	-5814.64	G8Vp	6.45	4.87	4.46	4.38	4.34	—	2
107259	12 19 54.36	-00 40 00.5	-59.14	-23.13	A2IV	3.89	3.79	3.78	3.77	3.77	3.77	1
113415	13 03 46.12	-20 35 00.6	142.13	5.14	F7V	5.58	4.60	4.28	4.26	—	—	1
114710	13 11 52.39	+27 52 41.5	-801.95	882.68	G0V	4.26	3.19	2.92	2.88	2.87	2.87	1
121370	13 54 41.08	+18 23 51.8	-60.95	-358.10	G0IV	2.68	1.71	1.41	1.37	1.33	—	3
124897	14 15 39.67	+19 10 56.7	-1093.43	-1999.43	K1III	-0.04	-2.21	-2.90	-2.99	-3.10	-3.08	1
128167	14 34 40.82	+29 44 42.5	188.32	132.72	F2V	4.46	3.70	3.51	3.49	3.47	3.47	1
135742	15 17 00.41	-09 22 58.5	-96.39	-20.76	B8V	2.61	2.76	2.79	2.80	2.84	2.85	1
147165	16 21 11.32	-25 35 34.1	-10.03	-18.03	B2III	2.89	2.49	2.44	2.42	2.42	2.41	1
147394	16 19 44.44	+46 18 48.1	-13.15	39.31	B5IV	3.89	4.20	4.27	4.30	—	4.35	1
148513	16 28 33.98	+00 39 54.0	6.97	-67.95	K4IIIp	5.39	2.83	2.16	2.02	1.87	—	1
148786	16 31 08.37	-16 36 45.8	-44.57	-38.04	G8III	4.28	2.76	2.32	2.26	2.18	2.20	1
156014	17 14 38.88	+14 23 25.0	-7.0	31.0	M5Ib	3.48	-2.29	-3.14	-3.37	-3.71	-3.70	1
161096	17 43 28.35	+04 34 02.3	-40.67	158.80	K2III	2.77	0.90	0.40	0.21	0.15	—	1
164136	17 58 30.15	+30 11 21.4	-0.48	3.23	F2II	4.41	3.46	3.25	3.21	3.15	3.17	1
172167	18 36 56.34	+38 47 01.3	201.03	287.47	A0V	0.03	0.00	0.00	0.00	0.00	0.00	1
175190	18 55 07.14	-22 40 16.8	110.34	-30.79	K3II	4.99	2.73	2.10	2.02	1.91	—	1
186791	19 46 15.58	+10 36 47.7	15.72	-3.08	K3II	2.72	0.32	-0.38	-0.55	—	—	1
188947	19 56 18.37	+35 05 00.3	-34.00	-27.60	K0III	3.89	2.16	1.70	1.63	1.52	1.54	1

(Table 1 continued on following page)

Table 1. The AAVSO near-IR primary standards, continued.

HD	RA (2000)	Dec	pmra mas/yr	pmdec mas/yr	Sp.Cl.	V	J	H	K	L	L'	note
197345	20 41 25.91	+45 16 49.2	1.56	1.55	A2Iae	1.25	0.99	0.91	0.89	0.80	—	3
197989	20 46 12.68	+33 58 12.9	356.17	330.28	K0III	2.50	0.73	0.19	0.10	0.02	—	3
202850	21 17 24.95	+39 23 40.9	0.43	-3.61	B9I	4.23	3.87	3.83	3.80	3.73	3.72	1
203387	21 22 14.80	-16 50 04.4	30.83	5.26	G8III	4.28	2.84	2.38	2.24	—	2.18	1
212593	22 24 30.99	+49 28 35.0	-5.12	-3.37	B9I	4.57	4.30	4.27	4.25	4.23	4.22	1
212943	22 27 51.52	+04 41 44.4	77.29	-307.35	K0III	4.79	2.93	2.37	2.30	2.22	2.21	1
216956	22 57 39.05	-29 37 20.1	329.22	-164.21	A3V	1.16	1.04	1.03	1.00	1.00	0.96	1
217906	23 03 46.46	+28 04 58.0	187.76	137.61	M2II	2.42	-1.19	-2.05	-2.22	-2.39	-2.38	1
218045	23 04 45.65	+15 12 19.0	61.10	-42.56	B9V	2.49	2.52	2.52	2.52	2.50	—	3

1 UKIRT bright standard http://www.jach.hawaii.edu/JACpublic/UKIRT/astronomy/calib/bright_stds.html
2 Elias, et al., 1982 Astron. J., 87, 1029
3 Vrba, Joyce, and Strom 1981, private communication

UKIRT Bright Standards

VERY BRIGHT STANDARD STARS - OUTDATED

copied from: http://www.jach.hawaii.edu/UKIRT/astronomy/calib/phot_cal/bright_stds.html

The table below lists data that have been outdated by more recent results. See other links available from the calibrations homepage for further information on how the current system relates to previous UKIRT photometric systems, colours, choice of standard stars, etc. The stars listed here are generally too bright for modern work at JHK and the data were obtained using filters sets that are quite different from current filters.

An asterisk after the BS number denotes a Mauna Kea (primary standard);
JHKLL'M magnitudes for these objects should be accurate to +/- 0.01 mag.
Magnitudes of other stars are derived from the NASA catalogue and should be
accurate to +/- 0.05 mag. - 6 October 1994

BS#	RA (2000)	Dec	Sp.Cl.	V	J	H	K	L	L'	M	N	Q
9088	0 02 10.1	+27 04 56	G2V	5.75	4.37	3.95	3.87					
3	0 05 20.1	-5 42 27	K1III	4.61	2.88	2.34	2.21	2.18	2.08	2.18		
15	0 08 23.2	+29 05 26	B8IV	2.06	2.33	2.33	2.37	2.39		2.41	2.46	
27	0 10 19.2	+46 04 20	F2II	5.03	4.05	3.84	3.81	3.75	3.74			
33	0 11 15.8	-15 28 05	F7V	4.89	3.95	3.68	3.63	3.59	3.58			
39	0 13 14.1	+15 11 01	B2IV	2.83	3.40	3.43	3.50	3.50	3.49	3.57		
74	0 19 25.6	-8 49 26	K1II	3.56	1.67	1.12	0.98	0.80		1.08	-0.44	
88	0 22 51.7	-12 12 34	G2V	6.39	5.32	5.00	4.90			4.92		
153	0 36 58.2	+55 53 49	B2IV	3.66	4.24		4.40	4.45				
163	0 38 33.3	+29 18 43	G8III	4.37	2.84	2.33	2.21					
168	0 40 30.4	+56 32 15	K0III	2.23	0.42		-0.25	-0.46				
193	0 44 43.5	+48 17 04	B5IIIe	4.54	4.66	4.71	4.75	4.73				
219	0 49 06.0	+57 48 58	G0V	3.44	2.35	2.02	1.96					
269	0 56 45.1	+38 29 58	A5V	3.87	3.57	3.50	3.49		3.48			
321	1 08 16.3	+54 55 14	G5V	5.17	3.80	3.40	3.34	3.30				
337*	1 09 43.9	+35 37 14	M0III	2.06	-0.92	-1.73	-1.87	-2.01	-2.02	-1.76	-2.04	-2.09
343	1 11 06.1	+55 09 00	A7V	4.33	4.02		3.97		3.79			
382	1 20 04.8	+58 13 34	F0Ia	4.98	3.47	3.12	3.10	2.91		2.83	2.79	
458	1 36 47.8	+41 24 20	F8V	4.09	3.11		2.84		2.80			
489	1 41 25.8	+5 29 15	K3III	4.44	2.13	1.44	1.26	1.12				
531*	1 49 35.0	-10 41 11	F3III	4.67		3.90	3.89		3.84	3.84		
544	1 53 04.8	+29 34 44	F6IV	3.41	2.51		2.25		2.21			
553	1 54 38.3	+20 48 29	A5V	2.64	2.50	2.43	2.38					
603	2 03 53.9	+42 19 47	K3IID	2.26	0.02	-0.70	-0.81	-0.88	-0.75	-0.60	-1.20	-0.70
612	2 04 29.4	-29 17 49	B9.5p	4.69	5.01	5.05	5.10	5.07				
617	2 07 10.3	+23 27 45	K2III	2.00	0.10	-0.49	-0.64	-0.74	-0.66	-0.6	-0.84	-0.85
620	2 08 29.2	+37 51 33	A5IV-V	4.82	4.55		4.48		4.51			
696*	2 25 15.9	+56 36 37	B2Iae	6.25	5.58	5.43	5.33	5.32	5.30			
718*	2 28 09.5	+8 27 36	B9III	4.28	4.41	4.42	4.43	4.43	4.41	4.37		
740	2 32 05.1	-15 14 01	F4IV	4.75	3.87	3.63	3.58	3.54	3.54			
788	2 42 14.9	+40 11 38	F9V	4.91	3.97	3.69	3.60	3.53				
799	2 44 11.9	+49 13 43	F8V	4.12	3.34	3.07	2.98	2.96				
818	2 45 06.1	-18 34 21	F6V	4.47	3.62	3.38	3.34	3.38				
911	3 02 16.7	+4 05 23	M1III	2.53	-0.65	-1.6	-1.65	-1.76		-1.57	-1.70	
921	3 05 10.5	+38 50 25	M4II	3.39	-0.78		-1.93	-2.13		-1.9	-2.0	-2.5
937	3 09 04.0	+49 36 48	G0V	4.05	2.97		2.66	2.63				
996	3 19 21.6	+3 22 13	G5V	4.83	3.64	3.35	3.27		3.19			
1017	3 24 19.3	+49 51 41	F5Ib	1.79	0.87	0.60	0.56	0.50				
1040	3 29 54.8	+58 52 44	A0Iae	4.54	3.22		2.87	2.78		2.64	2.55	
1084	3 32 55.8	-9 27 30	K2V	3.73	2.25	1.77	1.69	1.60		1.67		
1101	3 36 52.3	+0 24 06	F9V	4.28	3.22		2.90		2.84			

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1112  3 42 42.6 +59 58 10 K4Ib   5.76 2.74 1.89 1.68 1.47
1140* 3 44 48.1 +24 17 22 B7IV   5.46 5.52 5.50 5.51      5.64 5.64
1144  3 45 09.7 +24 50 21 B8V    5.64 5.78 5.81 5.84
1165  3 47 29.0 +24 06 18 B7IIIe 2.87 2.93 2.94 2.94 2.92      2.92
1203  3 54 07.9 +31 53 01 B1Ib   2.85 2.65 2.65 2.66 2.66      2.56  2.55
1231  3 58 01.7 -13 30 31 M0III  2.95 0.10-0.72-0.92-1.00     -0.7  -1.4

BS#     RA (2000) Dec    Sp.Cl.  V    J    H    K    L    L'    M     N    Q

1302  4 10 50.5 -41 59 37 A9V    4.93 4.29 4.11 4.08 4.07
1318  4 14 23.6 -10 15 23 K3III  4.87 2.97 2.39 2.28 2.17
1380  4 24 05.7 +17 26 38 A7V    4.80 4.48 4.43 4.43      4.39
1457* 4 35 55.2 +16 30 33 K5III  0.85-1.86-2.64-2.80-2.98 2.93-2.77 -3.03 -3.09
1473  4 38 09.4 +12 30 39 A6V    4.27 4.02      3.96      3.93
1543  4 49 50.3  +6 57 41 F6V    3.19 2.35 2.15 2.07 2.05
1552* 4 51 12.3  +5 36 18 B2III  3.69 4.04 4.09 4.14 4.15 4.16


1641* 5 06 30.8 +41 14 04 B3V    3.17      3.65 3.68 3.70 3.74 3.76
1656  5 07 27.0 +18 38 42 G4V    5.00 3.79 3.42 3.37 3.26
1713* 5 14 32.2  -8 12 06 B8Iae  0.12 0.23 0.22 0.21 0.15 0.08 0.05  0.06 -0.3
1708* 5 16 41.3 +45 59 53 G4III  0.08-1.34-1.73-1.81-1.87-1.87-1.80 -1.94 -1.93
1729  5 19 08.4 +40 05 57 G2IV   4.71 3.62 3.33 3.28
1765  5 21 45.7  -0 22 57 B2IV-V 4.73 5.08      5.22 5.22
1790  5 25 07.8  +6 20 59 B2III  1.64 2.17 2.23 2.30 2.32 2.29 2.35
1791  5 26 17.5 +28 36 27 B7III  1.65 1.96 1.99 2.03
1852  5 32 00.3  -0 17 57 B0III  2.23 2.75 2.84 2.90 2.90      2.95
1855  5 31 55.8  -7 18 06 B0V    4.62 5.15 5.29 5.40 5.55
1865  5 32 43.7 -17 49 20 F0Ib   2.58 2.08 1.95 1.88 1.81      1.87
1903  5 36 12.7  -1 12 07 B0Iae  1.70 2.08 2.1  2.19 2.13      2.2
1931  5 33 43.5  -2 39 28 O9V    3.81 4.41 4.45 4.52 4.57
1937  5 38 53.0  -7 12 47 A4V    4.80 4.53      4.47      4.35
1948  5 40 45.5  -1 56 34 O9I    2.05 2.21 2.28 2.31 2.30      2.29
1983  5 44 27.8 -22 26 54 F6V    3.60 2.69 2.47 2.42 2.40 2.36
2007  5 48 34.9  -4 05 40 G4V    5.97 4.83 4.53 4.45
2047  5 54 22.9 +20 16 34 G0V    4.41 3.39 3.06 3.02 2.92
2061* 5 55 10.3  +7 24 25 M2Ia   0.50               -4.48     -4.24 -5.13 -5.70
2085  5 56 24.2 -14 10 04 F1III  3.71 3.10 2.95 2.90 2.87


2216  6 14 52.6 +22 30 24 M3III  3.28-0.37-1.20-1.41-1.64     -1.44 -1.7  -1.9
2219  6 15 22.6 +29 29 53 G8III  4.35 2.59 2.08 1.94 1.82
2286  6 22 57.6 +22 30 49 M3IIIab2.88-0.80-1.70-1.88-2.02     -1.8  -2.2  -2.3
2318  6 24 43.9 -28 46 48 G0V    6.39 5.29 5.00 4.94 4.87 4.92
2421  6 37 42.7 +16 23 57 A0IV   1.93 1.90 1.88 1.90
2491* 6 45 08.9 -16 42 58 A1V   -1.46-1.30-1.32-1.32-1.35-1.37-1.38 -1.42 -1.36
2540  6 52 47.3 +33 57 40 A3III  3.60 3.30 3.23 3.17
2560* 6 57 16.5 +58 25 21 G5III  4.34      2.37 2.31 2.27 2.24 2.38


2643  7 03 30.4 +29 20 14 G4V    5.93 4.89 4.55 4.52
2653  7 03 01.4 -23 50 00 B3Iab  3.02 3.21 3.25 3.26 3.20      3.27
2693  7 08 23.4 -26 23 35 F8Ia   1.84 0.78 0.53 0.41 0.32 0.27       0.06
2827  7 24 05.6 -29 18 11 B5Ia   2.45 2.57 2.57 2.58 2.54      2.54
2845  7 27 09.0  +8 17 21 B8Ve   2.90 3.00 3.07 3.04
2852  7 29 06.6 +31 47 04 F0V    4.18 3.50      3.32      3.27
2882  7 30 42.3 -37 20 23 G4V    6.65 5.55 5.24 5.16
2890* 7 34 35.9 +31 53 18 A2V    1.58 1.53      1.52 1.52
2930  7 39 09.9 +34 35 04 F3III  4.90 4.06      3.85      3.82
2943* 7 39 18.1  +5 13 30 F5IV   0.38-0.44-0.57-0.65-0.66     -0.66 -0.76 -0.73
2990* 7 45 18.9 +28 01 34 K0IIIb 1.14-0.51-0.99-1.11-1.15-1.19-1.09 -1.24 -1.21
3034  7 48 05.1 -25 56 14 B0Ve   4.50 4.38 4.26 4.09 3.72      3.60
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3113  7 57 40.1 -30 20 04 A2V    4.79 4.34 4.23 4.21 4.15

BS#     RA (2000) Dec    Sp.Cl.  V    J    H    K    L    L'    M    N    Q

3176  8 07 45.8 +21 34 54 G1V    6.14 4.14 3.91 3.83 3.75
3185  8 07 32.6 -24 18 15 F6II   2.81 2.11 1.98 1.93 1.91 1.93
3188* 8 08 35.6  -2 59 02 G2Ib   4.34      2.39 2.32 2.22 2.20 2.30
3249  8 16 30.9  +9 11 08 K4III  3.52 1.08 0.30 0.16-0.01
3314  8 25 39.6  -3 54 23 A0V    3.90 3.92 3.92 3.93 3.93 3.94
3398  8 35 28.1  -7 58 56 A1     5.72 5.80 5.81 5.81
3454  8 41 05.2  +3 23 55 B3V    4.30 4.70 4.82 4.87      5.05 5.03
3465  8 44 45.0 +10 04 54 A1     5.66 5.83 5.85 5.89
3522  8 52 35.8 +28 19 51 G8V    5.95 4.59 4.14 4.07 3.98
3569  8 59 12.4 +48 02 30 A7IV   3.14 2.84 2.77 2.71
3578  8 58 43.8 -16 07 58 F6V    5.86 4.71 4.41 4.38


3650  9 12 17.5 +14 59 46 G9V    6.51 5.17 4.75 4.69 4.59
3748* 9 27 35.2  -8 39 31 K3II   1.98                              -1.44 -1.49
3842  9 38 01.4 -43 11 27 G8II   5.50 4.00 3.51 3.39      3.33
3871  9 44 12.1 -27 46 10 A8V+F7 4.79 3.72 3.35 3.26 3.19 3.15
3873  9 45 51.0 +23 46 27 G1II   2.98 1.63      1.15
3881  9 48 35.3 +46 01 15 G0.5V  5.09 4.04 3.71 3.67
3888* 9 50 59.3 +59 02 19 F2IV   3.80 3.14 3.02 2.99 2.97 2.93 2.93
3903* 9 51 28.6 -14 50 48 G7III  4.12 2.61 2.12 2.04           2.01


3982*10 08 22.3 +11 58 02 B7V    1.35 1.53      1.60 1.62
4013 10 13 24.7 -33 01 55 G1V    6.38 5.35 5.07 5.01
4023 10 14 44.1 -42 07 19 A2V    3.85 3.81 3.76 3.75 3.69 3.69 3.72
4030 10 16 32.2 +23 30 11 G2IV   5.97 4.79 4.46 4.40 4.32 4.42
4039 10 17 14.5 +23 06 22 F8V    5.82 4.80 4.52 4.49
4069*10 22 19.7 +41 29 58 M0III  3.05 0.12-0.68-0.82-0.94-1.00-0.64 -1.03 -1.08
4101 10 27 38.9  +9 45 45 A0     6.04 6.08 6.10 6.12
4127 10 32 11.7 +14 08 14 M1III  5.46 2.10 1.25 1.02 0.90
4133 10 32 48.6  +9 18 24 B1Ib   3.85 4.18 4.22 4.26 4.27      4.22  4.1
4232 10 49 37.4 -16 11 37 K2III  3.11 1.06 0.42 0.27 0.17

4295*11 01 50.4 +56 22 56 A1V    2.37                              2.33  2.23
4357 11 14 06.4 +20 31 25 A4V    2.56 2.34 2.30 2.27 2.29
4369 11 16 58.1  -7 -8 07 A8IV   6.14 5.91 5.77 5.79 5.72
4382 11 19 20.4 -14 46 43 G8III  3.56 1.68 1.07 0.94 0.85
4432 11 30 18.8  -3 00 13 K3III  4.77 2.10 1.33 1.16 1.08      1.31
4471 11 36 56.9  -0 49 26 G8III  4.30 2.57 2.12 2.04 1.97      2.06
4517 11 45 51.5  +6 31 46 M1III  4.03 1.05 0.25 0.08-0.05      0.20
4523 11 46 31.0 -40 30 01 G5V    4.91 3.76 3.39 3.32      3.24 3.35
4534*11 49 03.5 +14 34 19 A3V    2.14 2.02 1.99 1.98                1.84  1.83
4540 11 50 41.6  +1 45 53 F9V    3.61 2.63      2.33
4550 11 52 58.7 +37 43 08 G8V    6.45 4.92 4.44 4.38 4.34 4.34 4.41
4554*11 53 49.8  +0 33 07 AOVe   2.44                4.33           2.32  2.47


4608 12 05 12.5  +8 43 59 G8III  4.12 2.43 1.95 1.89
4689*12 19 54.3  -0 40 00 A2IV   3.89 3.79 3.78 3.77 3.77 3.77 3.77
4757 12 29 51.8 -16 30 56 B9V    2.95 3.01 3.03 3.03 3.02
4785 12 33 44.5 +41 21 27 G0V    4.26 3.23 2.95 2.84
4786 12 34 23.2 -23 23 48 G5II   2.65 1.23 0.81 0.70 0.63      0.77  0.62  0.55
4825 12 41 39.5  -1 26 58 F0V    3.65 2.05 1.90 1.85 1.84
4828*12 41 53.0 +10 14 08 A0V    4.88      4.69 4.68      4.69 4.68
4845 12 44 59.4 +39 16 44 G0V    5.95 4.91 4.55 4.50
4883 12 51 41.8 +27 32 26 G0III  4.94 3.71 3.44 3.34 3.31 3.24 3.34
4902 12 54 21.1  -9 32 20 M3III  4.79 1.19 0.32 0.14-0.02      0.27
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4905	12 54 01.7	+55 57 35	A0	1.77	1.72	1.73	1.75			1.75				
4915	12 56 01.6	+38 18 06	A0	2.90	3.07		3.17		3.27					

BS#	RA (2000)	Dec	Sp.Cl.	V	J	H	K	L	L'	M	N	Q
4935*13	03 46.0	-20 34 59	F7V	5.58	4.60	4.28	4.26					
4983*13	11 52.3	+27 52 41	G0V	4.26	3.19	2.92	2.88	2.87	2.87	2.87		
5028	13 20 35.7	-36 42 44	A2V	2.75	2.71	2.72	2.72	2.68	2.70			
5054*13	23 55.5	+54 55 31	A1V	2.27							2.24	2.28
5056	13 25 11.5	-11 09 41	B1III	0.98	1.51	1.58	1.68	1.68	1.70			
5072	13 28 25.7	+13 46 43	G2.5V	4.98	3.71	3.32	3.25		3.21			
5110	13 34 47.7	+37 10 57	F02IV	4.98	3.93	3.61	3.53	3.47	3.44			
5107*13	34 41.5	-0 35 46	A3V	3.37		3.08	3.06		3.06	3.11		
5191*13	47 32.3	+49 18 48	B3V	1.86		2.32	2.37	2.35				
5192	13 49 26.6	-34 27 02	M5III	4.19	-0.50		-1.66					
5235	13 54 41.0	+18 23 52	G0IV	2.68	1.70	1.40	1.35	1.31		1.33		
5270	14 02 31.7	+9 41 11	F8IV	6.20	4.33	3.77	3.69					
5287	14 06 22.2	-26 40 56	K2III	3.27	1.42	0.84	0.72	0.60				
5288	14 06 40.8	-36 22 12	K0III	2.06	0.40	-0.10	-0.21	-0.34		-0.21		
5301	14 10 50.4	-16 18 07	M2III	4.91	1.60	0.78	0.55	0.41		0.65		
5304	14 10 23.9	+25 05 30	F9IV	4.83	3.87		3.54		3.47			
5315	14 12 53.7	-10 16 25	K3III	4.19	1.84	1.16	1.02	0.91		1.13		
5329	14 13 28.9	+51 47 24	A8IV	4.54	4.08	3.99	3.98	3.94		3.95		
5340*14	15 39.6	+19 10 57	K1III	-0.04	-2.21	-2.90	-2.99	-3.10	-3.08	-2.92	-3.17	-3.13
5384	14 23 15.2	+1 14 30	G1V	6.27	5.13	4.74	4.68	4.61	4.61	4.62		
5404	14 25 11.7	+51 51 03	F7V	4.05	3.08	2.85	2.82	2.80				
5435	14 32 04.6	+38 18 29	A7III	3.03	2.65	2.58	2.55	2.53		2.51		
5447*14	34 40.7	+29 44 42	F2V	4.46	3.70	3.51	3.49	3.47	3.47	3.46		
5471	14 41 57.5	-37 47 37	B3V	4.00	4.40	4.47	4.51	4.55				
5487	14 43 03.5	-5 39 30	F2III	3.12	2.92	2.88	2.86	2.84				
5511	14 46 14.9	+1 53 34	A0V	3.72	3.70		3.67		3.67			
5530	14 50 41.1	-15 59 50	F4IV	5.15	4.41	4.19	4.16	4.10		4.13		
5531	14 50 52.6	-16 02 31	A3IV	2.75	2.50	2.45	2.41	2.35				
5568	14 57 27.9	_21 24 56	K4V	5.74	3.83	3.24	3.17	3.08				
5570	14 57 10.9	-4 20 47	F0V	4.49	3.88		3.67		3.63			
5586	15 00 58.3	-8 31 08	B9.5V	4.92		4.68	4.68	4.66				
5602	15 01 56.6	+40 23 26	G8III	3.50	1.89	1.43	1.34	1.28		1.37		
5634	15 07 18.0	+24 52 09	F5V	4.93	4.12	3.90	3.88	3.89				
5685*15	17 00.3	-9 22 59	B8V	2.61	2.76	2.79	2.80	2.84	2.85	2.87		
5712	15 23 09.2	-36 51 30	B4V	4.54	4.90	4.95	5.00	5.02				
5747	15 27 49.7	+29 06 20	F0p	3.68	3.36	3.28	3.27	3.23	3.28			
5793*15	34 41.2	+26 42 53	A0V	2.23							2.19	2.04
5867	15 46 11.2	+15 25 18	A2IV	3.67	3.47		3.42		3.41			
5868	15 46 26.5	+7 21 11	G0V	4.43	3.38	3.04	3.00	2.95				
5914	15 52 40.4	+42 27 06	F8V	4.62	3.50	3.16	3.13		3.07			
5928	15 56 53.0	-29 12 50	B2IV-V	3.88	4.35	4.42	4.47	4.50				
5933	15 56 27.1	+15 39 42	F6V	3.85	2.93	2.64	2.65	2.63		2.64		

BS#	RA (2000)	Dec	Sp.Cl.	V	J	H	K	L	L'	M	N	Q
5953	16 00 19.9	-22 37 18	B0IV	2.32	2.61	2.61	2.69	2.71		2.75		
5993	16 06 48.3	-20 40 09	B1V	3.96	4.02		4.09		4.14			
5996	16 07 03.3	-14 04 16	G4IV-V	6.32	5.24	4.93	4.87					
6084*16	21 11.2	-25 35 34	B2III	2.89	2.49	2.44	2.42	2.42	2.41	2.41		
6092*16	19 44.4	+46 18 48	B5IV	3.89	4.20	4.27	4.30		4.35	4.37		
6094	16 24 01.2	-39 11 35	G5V	5.40	4.32	4.01	3.94					
6095	16 21 55.1	+19 09 11	A9III	3.75	3.19		3.02		2.98			
6117	16 25 24.9	+14 02 00	B9p	4.57		4.59	4.52	4.53				

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6136*16 28 33.8  +0 39 14 K4IIIp 5.39 2.83 2.16 2.02 1.87
6134*16 29 24.4 -26 25 55 M1Iab  0.96               -4.17     -3.84 -4.54 -4.70
6141 16 30 12.4 -25 06 54 B2V    4.79 5.02 5.08 5.11 5.19
6147*16 31 08.2 -16 36 46 G8III  4.28 2.76 2.32 2.26 2.18 2.20 2.27
6165 16 35 52.9 -28 12 58 B0V    2.82 3.55 3.51 3.59 3.56
6171 16 36 21.3  -2 19 29 K2V    5.75 4.34 3.91 3.86
6175 16 37 09.4 -10 34 02 O9V    2.56 2.60 2.62 2.63 2.68      2.60
6212 16 41 17.1 +31 36 10 G0IV   2.81 1.68 1.34 1.32 1.30
6272 16 54 35.9 -41 09 04 O8If   5.77 5.22 5.03 5.00 4.64


6324 17 00 17.3 +30 55 35 A0V    3.92 3.94      3.94      3.92
6353 17 05 32.1  -0 53 32 B1V    5.64 5.28 5.33 5.29 5.35
6378 17 10 22.6 -15 43 29 A2V    2.43 2.29 2.25 2.25 2.24
6406*17 14 38.8 +14 23 25 M5Ib   3.48-2.29-3.14-3.37-3.71-3.70-3.45 -3.94 -4.17
6410 17 15 01.8 +24 50 21 A3IV   3.14 2.97      2.88      2.87
6441 17 20 34.1 -19 19 58 G3IV   6.52 5.52 5.24 5.17
6506 17 26 46.0 +34 41 45 A0V    5.94 5.95      5.95      5.95
6538 17 32 00.9 +34 16 15 G5V    6.56 5.44 5.12 5.06 5.06
6548 17 34 36.6  +9 35 12 A2V    5.81 5.72      5.65      5.66
6556 17 34 56.0 +12 33 36 A5III  2.08 1.71 1.64 1.63 1.61      1.62
6601 17 43 46.9  -7 04 46 B1.5V  6.30 5.56 5.41 5.35 5.29
6603*17 43 28.3  +4 34 02 K2III  2.77 0.90 0.40 0.21 0.15
6601 17 43 46.9  -7 04 46 B1V    6.30 5.55 5.41 5.31
6616 17 47 33.5 -27 49 51 F7II   4.54 3.00 2.65 2.56
6623 17 46 27.5 +27 43 15 G5IV   3.42 2.15 1.81 1.75 1.73      1.79
6629 17 47 53.5  +2 42 26 A0V    3.75 3.65 3.64 3.64      3.68
6698 17 59 01.5  -9 46 25 K0III  3.34 1.75 1.27 1.15 1.05 1.07 1.24
6705*17 56 36.3 +51 29 20 K5III  2.23                              -1.50 -1.56
6707*17 58 30.1 +30 11 22 F2II   4.41 3.46 3.25 3.21 3.15 3.17 3.16


6746 18 05 48.4 -30 25 27 K0III  2.99 1.29 0.80 0.66 0.55 0.57 0.70
6748 18 06 23.6 -36 01 11 G5V    5.95 4.92 4.63 4.57
6758 18 05 43.2 +12 00 14 A7     7.04 6.91 6.81 6.87 7.01
6771 18 07 20.9  +9 33 50 A4IV   3.73 3.48      3.42      3.36
6806 18 09 37.4 +38 27 27 K2V    6.40 4.77 4.29 4.24 4.16
6823 18 15 12.8 -20 23 17 O9II   5.95 5.92 5.89 5.90 5.90
6869 18 21 18.5  -2 53 56 K2III  3.26 1.60 1.11 1.03 0.96      1.06
6913 18 27 58.1 -25 25 18 K1III  2.81 0.94 0.43 0.38 0.30      0.42
6917 18 25 58.7 +29 49 44 A2IV   5.83 5.67      5.64     5.59
7001*18 36 56.2 +38 47 01 A0V    0.03 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00
7061 18 45 39.6 +20 32 47 F6V    4.19 3.32      3.06      3.03
7120*18 55 07.0 -22 40 17 K3II   4.99 2.73 2.10 2.02 1.91      2.11
7167 18 58 46.8 +13 54 24 F0     5.89 5.47 5.38 5.35 5.36 5.34 5.34
7178 18 58 56.5 +32 41 22 B9III  3.24 1.23 3.19 3.19 3.18      3.19

BS#     RA (2000) Dec    Sp.Cl.  V    J    H    K    L    L'    M     N    Q

7230 19 05 41.0 -15 39 37 B9V    5.97 5.97 5.98 5.97 5.97
7235 19 05 24.5 +13 51 48 A0V    2.99 2.91      2.90      2.89 2.90
7236 19 06 14.8  -4 52 57 B9V    3.44 3.64 3.64 3.65 3.62 3.62 3.68
7264 19 09 45.7 -21 01 25 F2II   2.89 2.12 1.91 1.84 1.76
7314 19 16 22.0 +38 08 01 K0II   4.36 2.35 1.73 1.66 1.52
7330 19 21 29.8 -34 59 02 G5V    6.48 5.38 5.05 4.97
7340 19 21 40.3 -17 50 50 F0IV   3.93 3.50 3.41 3.36 3.35 3.35
7345 19 19 38.8 +37 19 50 G8V    6.31 5.13 4.82 4.75
7377 19 25 29.8  +3 03 53 F3IV   3.36 2.70 2.55 2.52 2.51      2.50
7429 19 34 05.3  +7 22 44 K3III  4.45 2.56 2.01 1.83 1.70      1.85
7469 19 36 26.4 +50 13 16 F4V    4.48 3.75      3.52      3.47
7477 19 37 56.6 +49 17 04 G6V    6.47 4.78 4.23 4.15 4.12
7488 19 41 02.9 +17 28 33 G8III  4.37 2.74 2.21 2.13 2.00      1.89
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7503 19 41 48.8 +50 31 31 G1III  5.96 4.85 4.53 4.50 4.40      4.50
7504 19 41 51.8 +50 31 03 G2.5V  6.20 5.06 4.75 4.67 4.64 4.63 4.69
7525*19 46 15.5 +10 36 48 K3II   2.72 0.32-0.38-0.55          -0.62 -0.78 -0.82
7557 19 50 46.9  +8 52 06 A7V    0.77 0.39 0.25 0.22 0.20      0.20
7602 19 55 18.7  +6 24 24 G8IV   3.71 2.19 1.72 1.65 1.62      1.71
7615*19 56 18.3 +35 05 00 K0III  3.89 2.16 1.70 1.63 1.52 1.54 1.65


7710 20 11 18.2  -0 49 17 B9III  3.23 3.40 3.38 3.39 3.34      3.41
7736 20 14 31.9 +36 48 23 A2V    4.97 4.58 4.46 4.47      4.43 4.50
7773 20 20 39.7 -12 45 33 B9V    4.76 4.83 4.86 4.85 4.85 4.85
7776 20 21 00.6 -14 46 53 F8V+A0 3.08 1.45 0.98 0.89 0.81      0.95
7779 20 22 27.4 -42 02 59 A0V    5.59 5.58 5.58 5.58
7796 20 22 13.6 +40 15 24 F8I    2.20 1.16 0.78 0.72 0.67
7834 20 29 23.6 +30 22 07 F5II   4.01 3.21      2.94      2.87
7847 20 30 59.1 +36 56 09 F5I    6.19 4.15      3.51 3.32 3.28 3.44
7906 20 39 38.2 +15 54 43 B9IV   3.77 3.85      3.88      3.84
7914 20 40 45.1 +19 56 07 G5V    6.45 5.36 5.02 4.97
7924*20 41 25.8 +45 16 49 A2Iae  1.25 0.98 0.93 0.87 0.80      0.80
7949*20 46 12.6 +33 58 13 K0III  2.46 0.75 0.27 0.09 0.02
7950 20 47 40.5  -9 29 45 A1V    3.77 3.71 3.70 3.69 3.67 3.69 3.67
8028*20 57 10.3 +41 10 02 A1V    3.94                      3.79 3.76


8085 21 06 53.7 +38 44 57 K5V    5.21 3.10 2.44 2.35
8086 21 06 55.2 +38 44 30 K7V    6.03 3.53 2.83 2.70
8097 21 10 20.5 +10 07 53 F0p    4.69 4.28 4.18 4.13 4.12 4.13
8115 21 12 56.1 +30 13 37 G8III  3.20      1.16 1.09 0.98      1.15
8130 21 14 47.4 +38 02 44 F2IV        2.99      2.70
8143*21 17 24.9 +39 23 41 B9I    4.23 3.87 3.83 3.80 3.73 3.72 3.68
8146 21 17 55.0 +34 53 49 B2V    4.43 4.40 4.32 4.15 3.86
8167*21 22 14.7 -16 50 05 G8III  4.28 2.84 2.38 2.24      2.18 2.25
8204 21 26 39.9 -22 24 41 G4I    3.74 2.35 1.98 1.87 1.82 1.76 1.90
8206 21 24 55.4 +49 19 24 B9     6.58 6.50      6.55      6.56 6.58
8255 21 34 46.5 +38 32 03 K0III  4.90 3.09 2.61 2.44
8278 21 40 05.4 -16 39 45 F0p    3.68 3.20 3.07 3.04 3.03 3.02 3.06
8283 21 41 32.8 -14 02 51 G1V+G0V5.18 4.11 3.75 3.65 3.57 3.72
8316*21 43 30.3 +58 46 48 M2Iae  4.08               -2.24-2.27-2.15 -3.84 -4.59
8371 21 54 53.0 +56 36 41 B8I    5.80           3.91

BS#     RA (2000) Dec    Sp.Cl.  V    J    H    K    L    L'    M     N    Q

8402 22 03 18.7  -2 09 19 B7IV   4.69 4.83 4.84 4.80
8414 22 05 46.9  -0 19 11 G2I    2.96 1.48 1.09 0.97 0.86
8430 22 07 00.6 +25 20 42 F5V    3.76 2.97 2.78 2.69 2.59 2.59 2.70
8431 22 08 22.9 -32 59 19 A2V    4.50 4.38 4.35 4.35 4.34
8454 22 09 59.2 +33 10 42 F5III  4.29 3.35      3.10      3.09
8477 22 14 38.5 -41 22 54 G5V    6.23 5.09 4.76 4.70      4.68 4.75
8498 22 15 58.1 +37 44 56 K3II   4.13      1.12 1.01
8499 22 16 49.9  -7 47 00 G8III  4.16 2.61 2.12 2.03 1.92
8538 22 23 33.5 +52 13 45 G8III  4.43 2.69 2.21 2.07 1.95
8541*22 24 30.9 +49 28 35 B9I    4.57 4.30 4.27 4.25 4.23 4.22 4.22
8551*22 27 51.5  +4 41 44 K0III  4.79 2.93 2.37 2.30 2.22 2.21 2.31
8573 22 30 38.7 -10 40 41 A0IV   4.82 4.95 4.97 4.95 4.96
8574 22 30 01.7 +32 34 22 B9.5V  5.63 5.69      5.70      5.69
8576 22 31 30.3 -32 20 46 A0V    4.29 4.27 4.27 4.26
8585 22 31 17.4 +50 16 57 A1V    3.77 3.75      3.75      3.75
8597 22 35 21.3  -0 07 03 B9IV-V 4.02 4.18      4.22      4.22 4.21
8634 22 41 27.6 +10 49 53 B8V    3.40 3.51      3.56      3.59 3.62
8641 22 41 45.3 +29 18 27 A1IV   4.79 4.81      4.82
8665 22 46 41.5 +12 10 22 F6III-IV4.2 3.22      2.92      2.86
8709 22 54 38.9 -15 49 15 A3V    3.27 3.11 3.10 3.07      3.05 3.06
```

```
8717 22 55 13.6  +8 48 58 A1V    4.90 4.90      4.90      4.93
8728*22 57 39.0 -29 37 20 A3V    1.16 1.04 1.03 1.00 1.00 0.96 0.94
8729 22 57 27.9 +20 46 08 G2IV   5.49 4.36 4.03 3.97


8775*23 03 46.4 +28 04 58 M2II   2.42-1.19-2.05-2.22-2.39-2.38-2.19 -2.54 -2.61
8781*23 04 45.6 +15 12 19 B9V    2.49 2.50 2.51 2.52 2.53      2.53
8830 23 12 32.9 +49 24 23 F0V    4.52 3.95      3.77      3.71
8832 23 13 16.9 +57 10 07 K3V    5.56 3.86      3.21 3.18
8892 23 22 58.1 -20 06 02 K0III  3.97 2.06 1.48 1.36 1.31
8905*23 25 22.7 +23 24 15 F8III  4.40      3.07 3.00      2.97 2.97
8911 23 26 55.9  +1 15 20 A0     4.94 4.91 4.97 4.98 4.97
8965 23 38 08.1 +43 16 05 B8V    4.29 4.50 4.47 4.55 4.58
8984 23 42 02.7  +1 46 48 A7V    4.50 4.10      4.00      3.94
9045 23 54 23.0 +57 29 58 G2     4.54           2.10
9088 00 02 10.1 +27 04 56 G2V    5.75 4.35 3.95 3.87

 BS#     RA (2000) Dec    Sp.Cl.  V    J    H    K    L    L'    M     N    Q
```

Finding Standard Star Magnitude with Guide

Guide 9.0 is an excellent program for telescope control, target identification and resource for astronomical data.

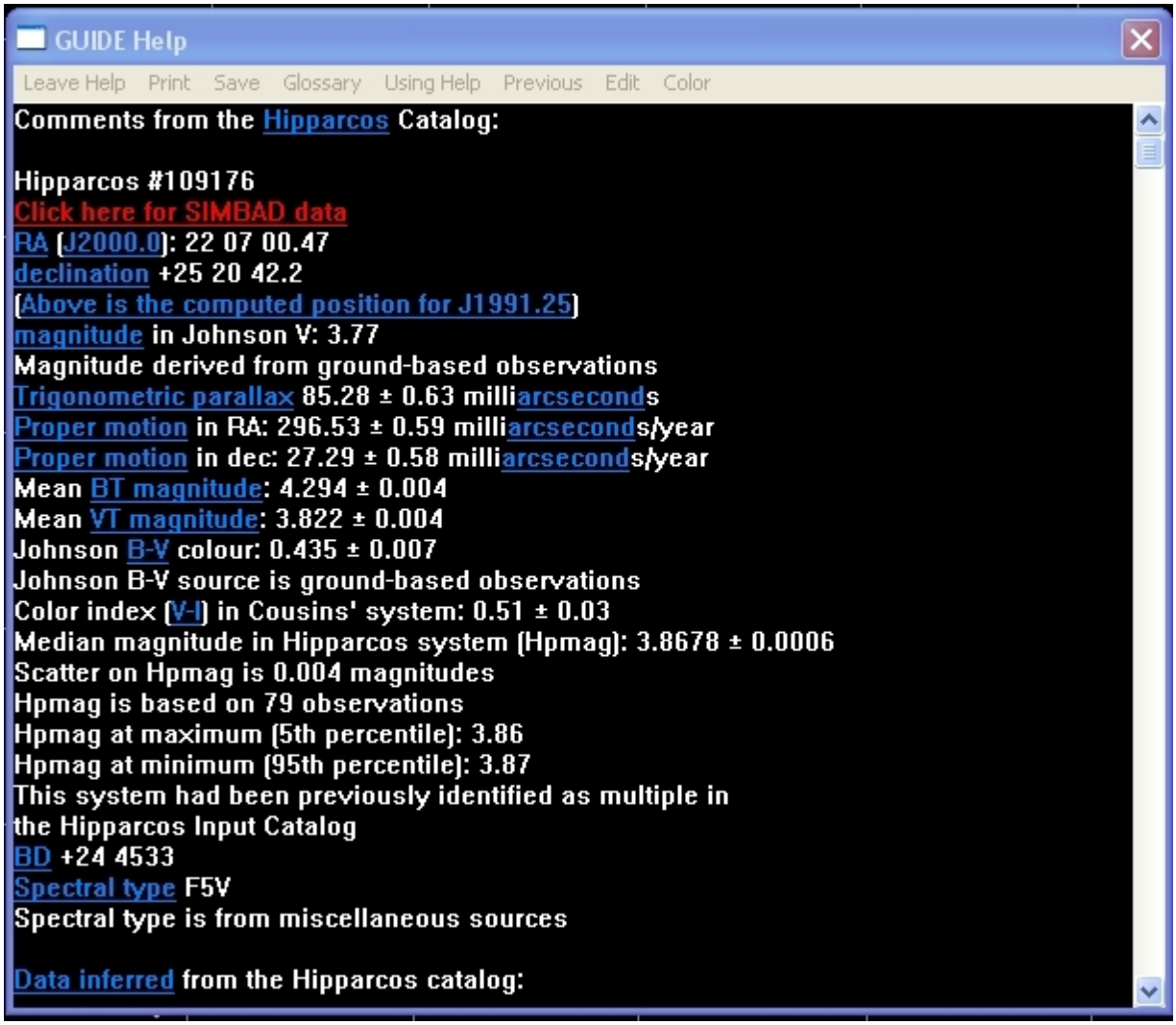
For the bright stars in the Bright Star Cataolg (HR, BSC or BS prefix), one can use the resources in Guide 9.0 to find V magnitude U-B, B-V, Rc-Ic and V-Ic indices in the Johnson-Cousins system and with links to find J and H magnitudes.

1: Select Go to - -> Star --> Yale(Bright Star)

2: Enter the Bright Star Number and hit Enter

3: Right click on the star and select More Information

4: Note the Color V magnitude, B-V and V-Ic index.



5: Click on Click Here for SIMBAD data which will bring up the **SIMBAD Astronomical Database** (http://simbad.u-strasbg.fr/simbad/)

If you don't have or want to get Guide 9.0, then you can access the SIMBAD query web page directly at: http://simbad.u-strasbg.fr/simbad/sim-fid

6: Scroll down to the external archives section and select the link that has the 2MASS prefix for the star name. This will bring up a data page that will give IR magnitudes and color indicies.

IMPORTANT: I have found that the JH magnitudes listed under the 2MASS database do not always agree with the UKIRT standards. The filter transmissions for J & H filters used in the 2MASS instrument are reasonable close to the Optec JH filters so I'm not sure of the reason why. Use this source with caution.

External archives :

Archive data at HEASARC - High-Energy Astrophysics Science Archive Research Center

Data at NED - NASA/IPAC Extragalactic Database

Catalogue information from VizieR :

Generic search by coordinates (radius: 6 arcsec)

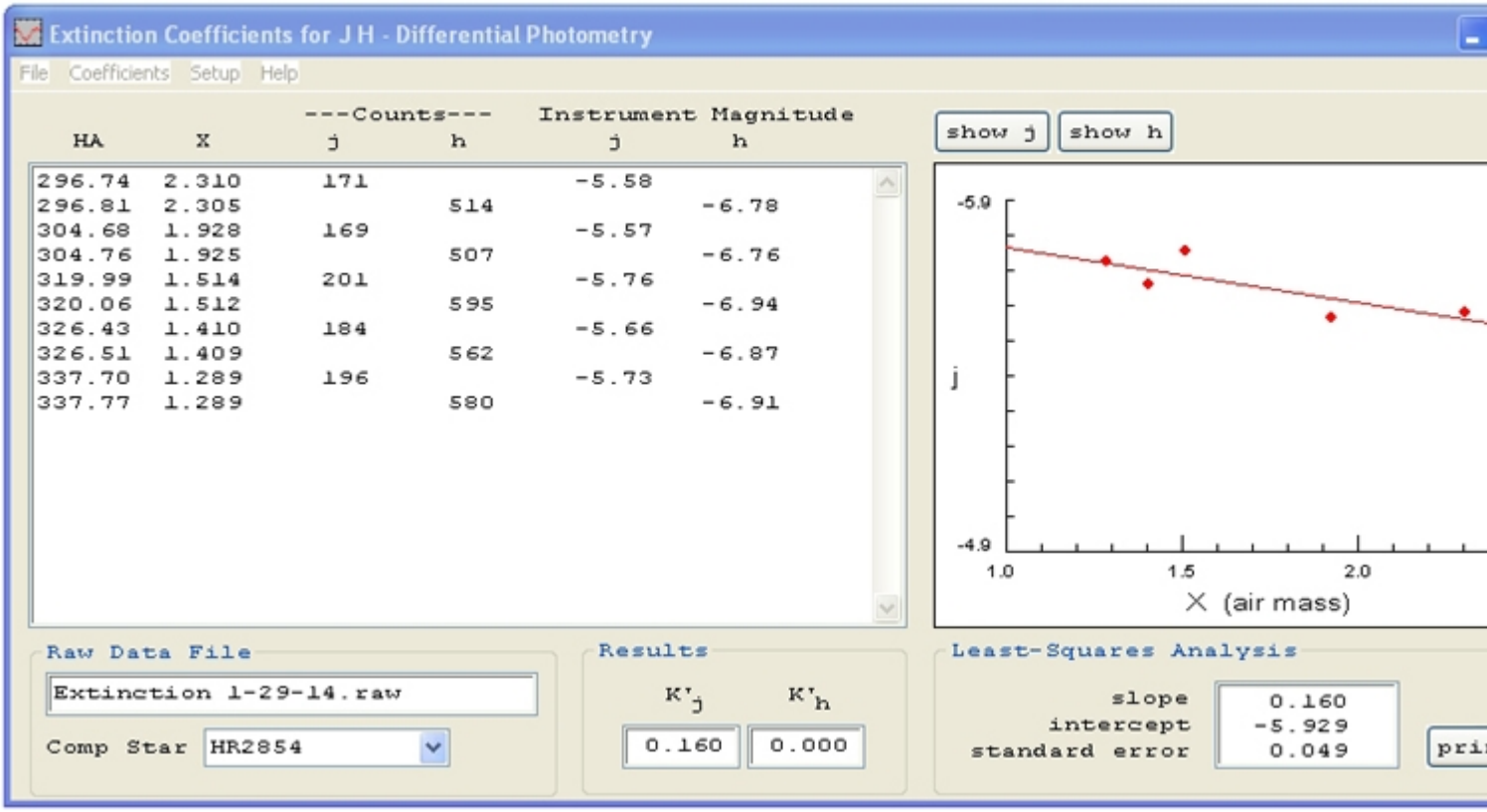
AG+25 2653	BD+24 4533	CCDM J22070+2520A	FK5 831	GJ 848
HD 210027	HIC 109176	HIP 109176	HR 8430	IRAS 220
IRC +30485	LSPM J2207+2520	2MASS J22070067+2520424	NLTT 52972	NSV 1403
PPM 114048	1RXS J220700.9+252045	SAO 90238	TYC 2208-2471-1	USNO-B1.
WDS J22070+2521A				

Extinction Coefficients

The atmospheric extinction coefficients for j and h magnitudes are derived in this program module using the methods described in Appendix G.1 of "Astronomical Photometry". A single comparison star is observed through differing air mass as the star moves in time. The comparison star need not be associated with a variable star observation but could be observed separately and still be part of the raw data file. K'j and K'h are computed from the data K'jh is found by subtraction in the other reduction programs.

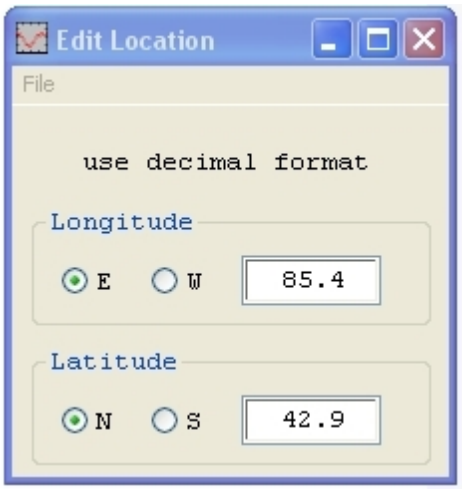
It is first necessary to enter any extinction stars into the Star Database JH.txt file using the Star Data Editor. Use "C" for the Type entry. Magnitude and index entries can be left blank. Accurate magnitudes entries are not necessary but could still be made if the use wishes to use it for a comparison star.

The Extinction Coefficient module with a sample star loaded and plotted is shown below.



Setup

The only setup parameter that needs to be entered is the observer's location on this planet. Select **Setup** in the menu bar and then select **Location**. Enter exactly as shown in the dialog box the observers Longitude and Latitude.



Example: N42.2 is a valid location entry for latitude. Do not use + or - for North and South latitude.

Example: W87.0 is a valid location entry for longitude

Open File

Select **File** in the menu bar and then select **Open File**.

All of the comparison stars used in the raw data file will be listed in the combobox labeled Comp Star. Select the comparison star intended for deriving the extinction coefficients. The Table will fill with values in similar fashion to TABLE G.1 in *Astronomical Photometry*. The user is referred to that text for a complete description of the columns. The only significant difference is that the hour angle (HA) column in *Astronomical Photometry* is in units of hours and the same column in this program is in units of degrees.

The file `Sample Extinction.raw` file can be opened to see how this module operates.

Tip : Hour angles measured east of the meridian would be from 359.99 to 270.00 (horizon) degrees and 0.00 to 90.00 (horizon) degrees west of the meridian.

Extinction Plots

Select either the **show j** or **show h** buttons to display a plot of the instrument magnitude verses air mass. These plots are similar to Figure G.1 in *Astronomical Photometry* and the user is referred to the text for a more detailed understanding of them.

Once plotted, the slope, intercept and standard error are listed in the Least-Squares Analysis box located below the plot. The slope is equal to K' for the associated colors of j and h. Since the methods used in this program are for differential photometry, the intercept value is ignored in the later data reduction. The standard error is a measure on how good the data set is. Smaller is better.

Results

If the extinction results shown in the plots look good and the user wishes to use them in the further reduction process, then select **Send Computed Coefficients to Results** found in the Coefficients menu. This control will move the plotted slopes for j and h to the Results box.

Tip: The show j and h buttons must be selected in order to calculate the associated extinction coefficient.

To save these values to the PPparms JH.txt file, again select Coefficients in the menu bar and select **Save Coefficients in Results to PPparms JH**. This is necessary if the user wishes to use these extinction coefficients in reducing the raw data file further. However, if the results don't look good then the existing coefficients already stored in PPparms JH.txt should be used. The new calculated values can be edited by typing over them in the Results box if you wish to fudge them a little (not recommended).

Second Order Coefficients

Normally for differential photometry, the second order term K" for j-h is set to zero which is the default value for Photometry JH. However, if the user has determined by other means a different value, enter it here. The SOE Coefficient module in Photometry JH can be used to find the true value of K"jh and save it to PPparms JH.txt.

Print Graphics

After the data is reduced and printed to the graphics box, the **Print** button will be enabled to allow output to a printer. The current graph displayed along with the values in the least-squares analysis is printed.

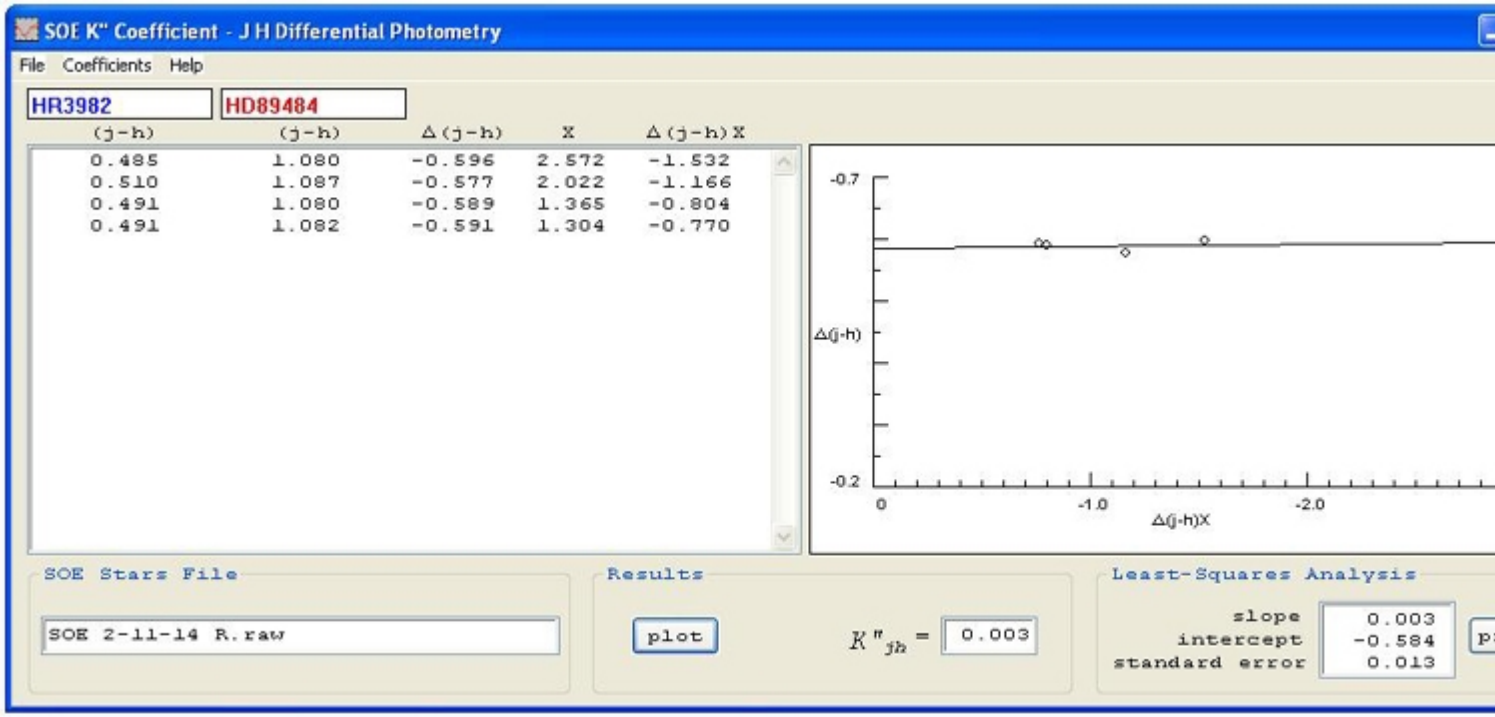
SOE Coefficent

The atmospheric second order extinction coefficient K" for j-h color index are derived in this program module using the methods described in Appendix G.3 of "Astronomical Photometry". A Blue-Red pair of stars is observed through differing air mass as the star moves in time. A list of blue-red pairs is available in Appendix B of "Astronomical Photometry". For convenience, a subset of this list plus some stars in higher declinations are available in the `SOE Database JH.txt` database file.

The mathematical explanation for this coefficient is explained in section 4.4c of "Astronomical Photometry" starting on page 90.

The default value for K"jh in PPparms JH is 0 and this value is used in later reductions unless a new value is calculated with this module and stored in PPparms JH.txt.

A screen capture of the SOE K" Coefficient module with a sample star loaded and plotted is shown below.



Open SOE Stars File

The SOE coefficient program module works much like the extinction module. From the File menu selection open the raw data file for the observed SOE star pair. The file is processed immediately and the results are posted in the listbox in similar fashion to TABLE G.4 of *Astronomical Photometry*. The user is referred to that text for a more complete description of the columns.

The blue star is first found and the b-v instrumental color index data is used in column 1. Like wise, the red star j-h instrumental data is used in column 2.

The file `Sample SOE JH.raw` can be opened to see how this module works. The stars used in this example are (enter star) (blue star) and (enter star) (red star).

Derive Coefficient

In order to calculate the K"jh, press the **plot** button. A plot of Δ(j-h)X verses Δ(j-h) is show with the observational data points plotted. In addition, the slope, intercept and standard error are displayed in the Least-Squares Analysis box.

The slope (K"jh) is also displayed in the text box for Results.

Results

To save these values to the PPparms JH.txt file, select Coefficient in the menu bar and select **Save Coefficient in Results to PPparms**. This is necessary if the user wishes to use this coefficient in reducing the raw data file further. However, if the results don't look good then the existing coefficients already stored in PPparms JH.txt should be used. The new calculated values can be edited by typing over them in the Results box if you wish to fudge them a little (not recommended).

The menu selection **See Saved K" Coefficient** shows the currently saved value of K"jh in PPparms JH.txt. This value would be exchanged for the new value in the Results box once you select **Save Coefficient in Results to PPparms.**

Print SOE Graphic

After the data is reduced and printed to the graphics box, the **Print** button will be enabled to allow output to a printer. The current graph displayed along with the values in the least-squares analysis is printed.

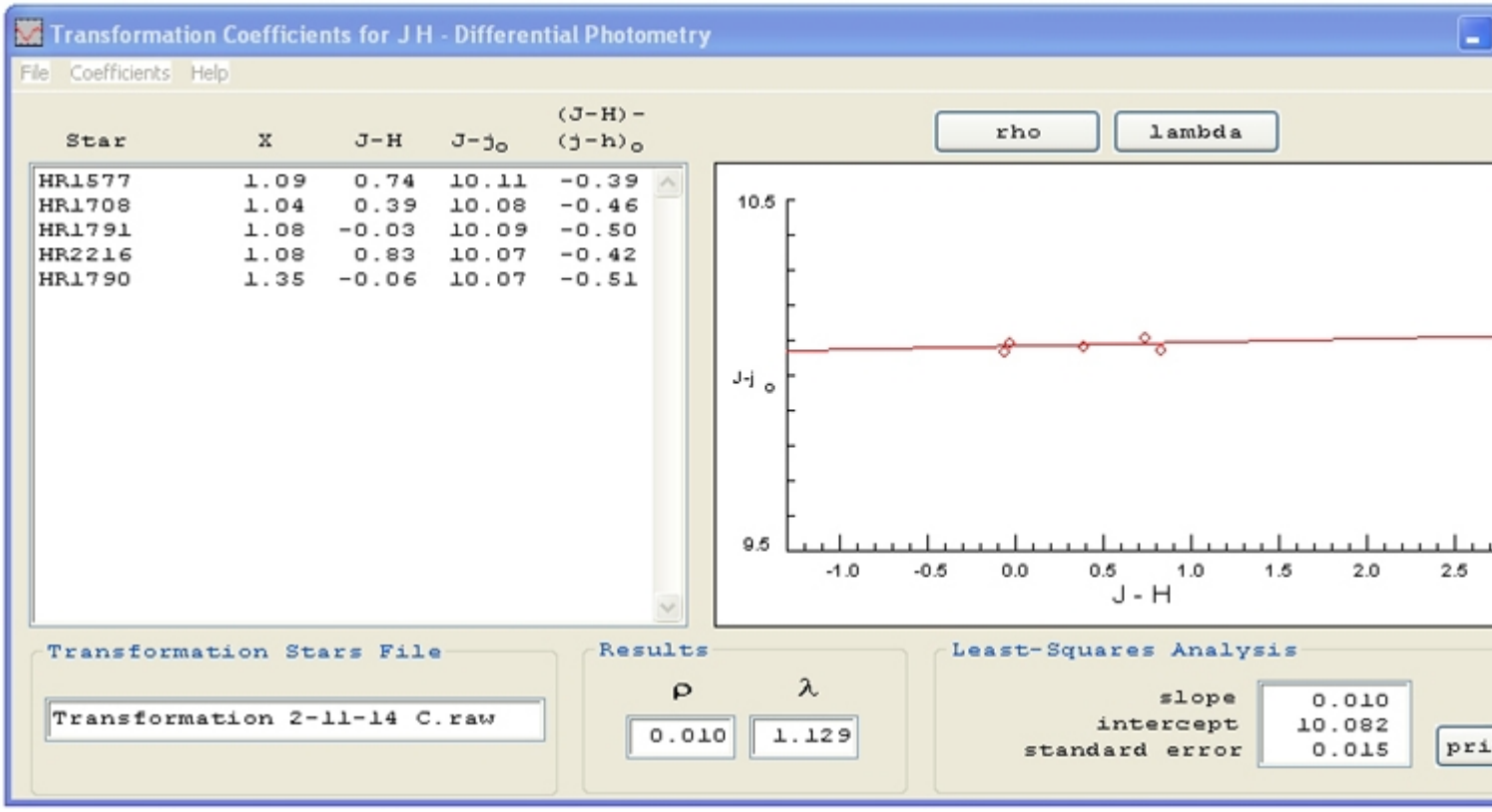
Transformation Coefficients

The transformation coefficients for J magnitude and J-H color indicex are derived in this program module using the methods described in Appendix H of *Astronomical Photometry*. A set of standard stars with differing indices and located close together are observed. The cluster should also be near zenith to reduce the effects of air mass. Normally, the observation of stars to derive the coefficients are done infrequently. Since, the transmission for filters and the spectral response of the detector usually change with temperature, a summer and winter set of coefficients would be a good idea.

Important: All stars observed should be listed in the Transformation Data Version 2 database which is accessed by the Comp/Variable Star Editor

Important: Make sure you have valid extinction coefficients in the PPparms JH.txt file before processing the transformation stars. These parameters are computed and stored using the extinction module.

The Transformation Coefficients module with a sample star file loaded and plotted is shown below.



The default sample files `Transformation Database JH.txt` use standard data from the Johnson system.

Open Transformation Stars File

The transformation coefficients program module works much like the extinction module. From the File menu selection open the raw data file for the transformation stars. The file is processed immediately and the results are posted in the listbox in similar fashion to TABLE H.6 of *Astronomical Photometry*. The user is referred to that text for a more complete description of the columns. Some of the columns have been omitted due to the size of the resulting table magnitude.

The file `Sample Transformation JH.raw` can be opened to see how this module works. The coefficients generated by this file are the default parameters used in the `PPparms JH.txt` file.

Derive Coefficients

In order to calculate the transformation epsilon, press the **show rho** button. A plot of $J-j_o$ verses J-H is show with the observational data plotted. In addition, the slope, intercept and standard error are displayed in the Least-Squares Analysis box.

In similar fashion, press the **show lambda** button to show a plot of (J-H) - $(j-h)_o$ verses B-V. The slope, intercept and standard error are also listed in the Least-Squares Analysis box.

Results

If the data looks good, select **Transfer Computed Coefficients to Results** from the Coefficients menu selection. The values in the Results box can be edited by the user at this point but this is not suggested unless the user judges fudging as OK.

Select **Save Coefficients in Results to PPparms2** in the Coefficient menu selection to store these results. The new results write over any previous results stored in `PPparms JH.txt`.

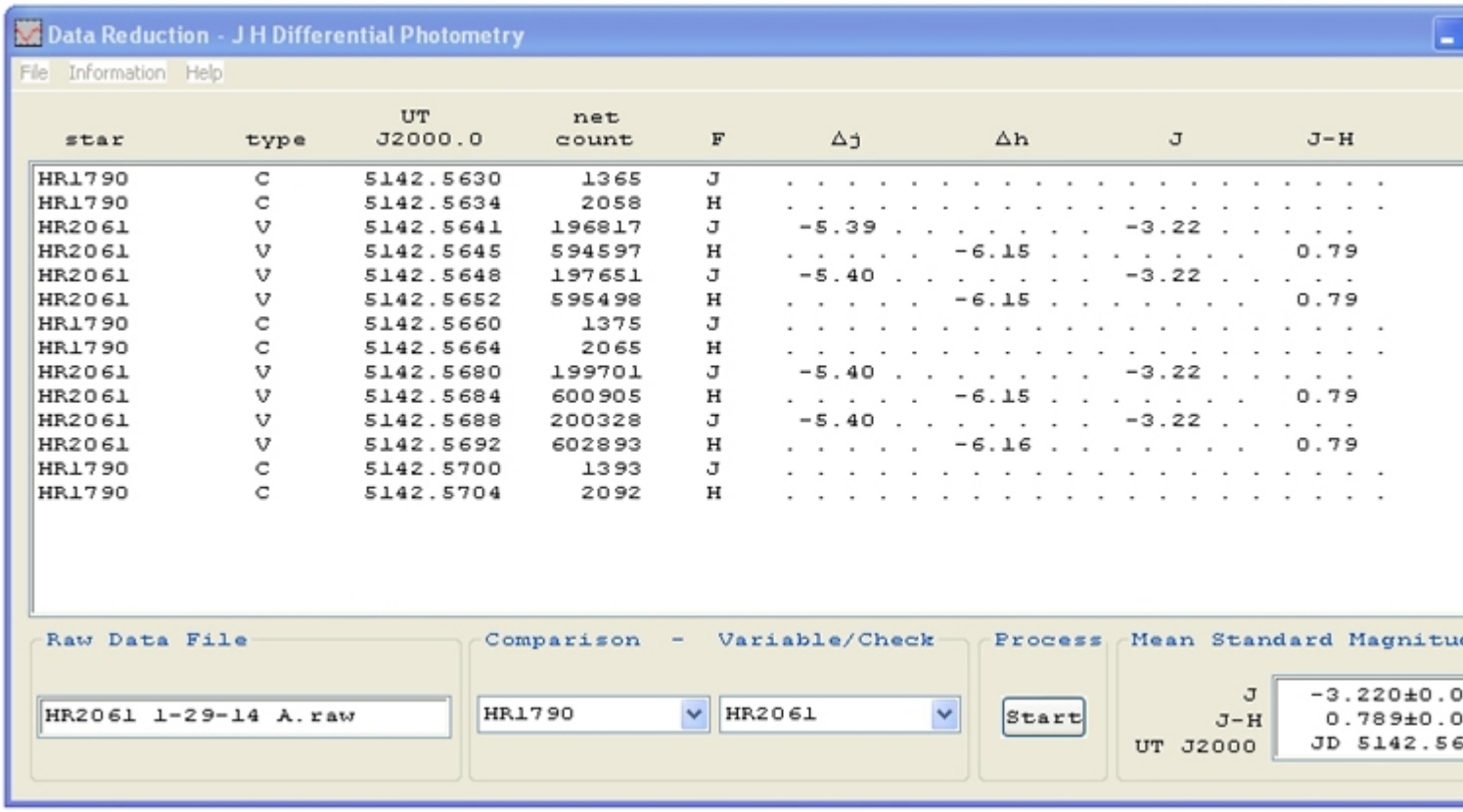
Print Graphics

After the data is reduced and printed to the graphics box, the **Print** button will be enabled to allow output to a printer. The current graph displayed along with the values in the least-squares analysis is printed.

Data Reduction

The final step in the reduction process is running the Data Reduction program module. If the proper differential photometry procedure has been used in the observations and the coefficients have been correctly obtained, the reduction to finished V magnitude and color index is reduced to the ultimate simplicity. The methods and results are similar to those described in section 4.8 of *Astronomical Photometry*. The user is referred to that text for a more complete description of the process

The Data Reduction module with a sample stardata file loaded and reduced is shown below.



Open Raw Data File

From the **File** selection in the menu bar, select **Open File** and choose the appropriate raw data file containing your variable and comparison stars. The raw file can contain more than one set of observations of the same or different variable/comparison stars. After opening the file, select the variable and the associated comparison star from the comboboxes contained within the Variable - Comparison group box near the bottom of the window.

Tip: Make sure the correct variable - comparison star pair is chosen or the reduction process will give funny results.

Select the **Start** button to reduce the observations. The intermediate results are posted in the list box in similar fashion as shown in TABLE 4.1 of *Astronomical Photometry.* Unlike the table in the book, the table in Photometry2 has "- - -" listed in place of blanks. The last five columns list the standard reduced magnitude J and color indices J-H. Finally, the mean standard magnitude with standard error, mean color index with standard error and the mean Julian Date (J2000.0) are posted in the Mean Standard Magnitude box.

Tip: If an observation consists of only one or two readings of the variable star, the error tolerance is posted as 0.000.

If a check star (Q Type) is also part of the RAW file data, it's magnitude can be computed as if it was a variable star. The resulting magnitude and color indices can then be compared to the catalog values to see if they agree. If there is a

significant difference from the catalog values, then the comparison star might be a suspected variable.

Under the **Information** pull down, the data in the Star Database can be retrieved for the stars included in the RAW data file and the data compared to the results.

Save Data

If the reduced variable star data looks good, it can be saved to a new file or appended to an existing file. Either the intermediate results or the mean results or both can be saved. While the mean results would be the likely data to save for most long period variables, the intermediate results would be appropriate for a binary occultation or other short period event.

Tip: Name new data files after the variable star and append data as you finish observations and reduction.

The default extension for the variable star saved data is `fileName.var`. However, any file extension can be used if it doesn't clash with some other program association. The file is written in simple text so that it can be opened and edited with NOTEPAD or any other text editor. Don't use Word!

The format for the saved data file is:

Column	Data	Description
1	Calendar Date	DD/MM/YYYY
2	Time	HH:MM:SS
3	JD or HJD	J2000.0 to four decimal places
4	J	standard magnitude to 0.001
5	σ_J	standard error, left blank if intermediate results are saved
6	J-H	standard color index to 0.001
7	σ_{J-H}	standard error, left blank if intermediate results are saved

The exact character format is:

```
#,1,COMP STAR, VARIABLE STAR
DD/MM/YYYY  HH:MM:SS  JJJJ.JJJJ  JJJ.000   0.000  JH.000   0.000
```

The file header contains information that is important to the file for further processing. The start character "#" denotes the beginning of the header line. The second character denotes either Julian Date "1" or Heliocentric Julian Date "0" is used for the time and date.

Heliocentric Julian Date or Julian Date

The AAVSO will accept uploaded files in the extended format using JD (Julian Date) or HCD (Heliocentric Julian Date). If using a service other than the AAVSO, it would be necessary to report the time of observations in HJD which is the commonly accepted format. In the Data Reduction module, it is possible to select this option in the Edit Coefficients module. Selecting HJD in Edit Coefficients window will convert the JD date to HJD and write the VAR file using that protocol. The calendar date in the VAR file is still left in current JD and not converted. The difference between JD and JHD is only about 16 minutes maximum depending on the position of earth in our orbit when the observation is taken. There is nothing in the VAR file to designate whether JD or JHD is used so it is necessary that the user be careful and not switch between formats on a whim. The `PPparms JH.txt` file stores the selection of JD or JHD.

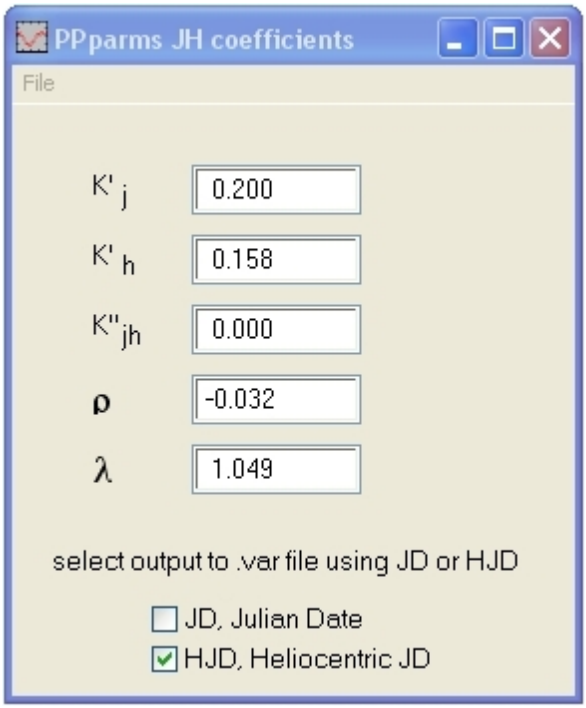
A Suggestion

Many different file naming conventions are possible. I suggest one consider naming and saving a single variable star reading as `star name + date.var` and then saving again by appending the data to a file with the `star name.var` only. In this way, you can examine all the data plots of the variable by opening the `star name.var` file in the Plot module to see if the data is reasonable first. Once you verify that the data is good, you can the open the `star name + date.var` file in the Plot module in order to produce the AAVSO compatible file for uploading.

It is also suggested that the extinction and raw files be named with the star name and date in a similar fashion so that they can be matched to the finished var file. Sometimes it is necessary to be able to reprocess the data if an error is found in the reduction due to an input error.

Edit Coefficients

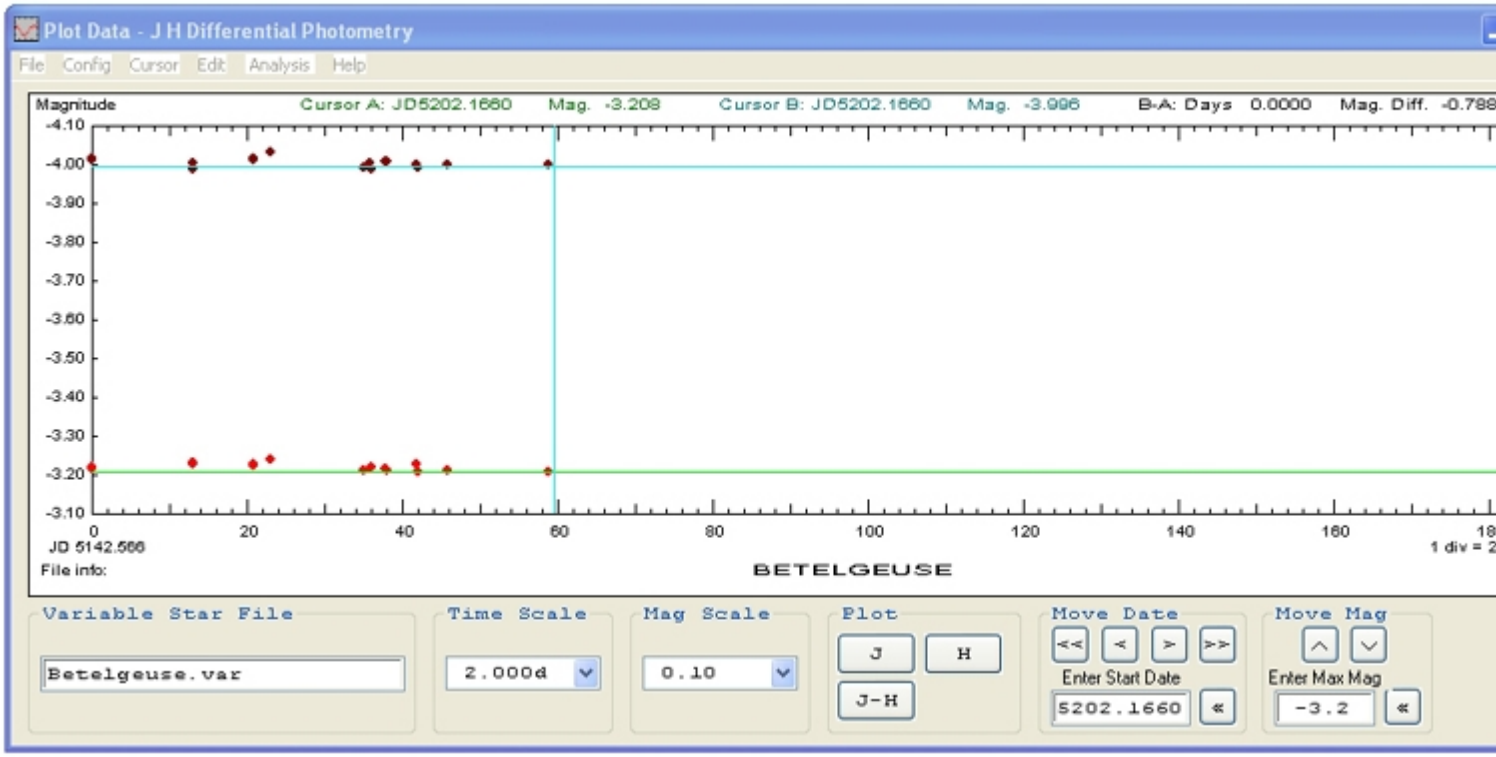
All of the values in `PPparms JH.txt` can be examined and changed using the PPparms2 coefficients window available when selecting the **Coefficients** pull down in the Reduction module. Type in the text box to change coefficients and save using the **File** selection.



Plotting Data

Data is displayed in graphical format with magnitude or counts making the Y-axis and Time making the X-axis such as with a chart recorder.

The Plot Data module with the Betelgeuse.var data file loaded and plotted for J and H magnitudes is shown below.



To graphically analyze a data file, complete the following steps in order:

Time Scale

The X-axis is time in days:minutes:seconds format for defining each division of time. If **1.000h** is selected for example, each small division is equal to 1 hour and 95 hours of data is visible in the graphic box. Depending on which file type is chosen (variable or Fast) the available time scale selections are customized for selection.

Slow Time Scale
1.000m
2.000m
5.000m
10.000m
1.000h
2.000h
5.000h
10.000h
1.000d
2.000d
5.000d
10.000d
20.000d

Mag Scale

Each division of the Y-axis is equal to the magnitude value that is selected in the Mag Scale pull down. The available selections are show in the following table.

Slow Time Scale	0.01
	0.05
	0.10
Magnitude for each division	0.50
	1.00

PLOT

After a data file is loaded, the two large buttons located near the bottom center of the window will show a label depending on the type of data file. If a slow data file is opened, a **J** will show on the top button for plotting J magnitude and **Index** for plotting the color index will show on the bottom button.

When the **Index** button is selected, the available color indices in the data file will enable the associated buttons in the Plot group box. Selecting any of those buttons will plot the color index data. Color Index and individual magnitude cannot be plotted at the same time.

Move Date

The time scale (x-axis) can be moved either right or left by pressing the arrow buttons in this box. The **<** or **>** buttons move the scale by 10 divisions. The **<<** or **>>** buttons move the time scale by 50 divisions. A specific start date can me entered manually in the text box. The format for entering the date is dependent on if slow or fast mode plotting is used. In the case of slow mode, the format should be J2000 date (XXXX.xxxx). For fast mode, enter the time only not date in UT format (HR:MIN:SEC.xxx). Make sure to include the colons that separate HR:MIN and MIN:SEC.xxx. Seconds can be entered to three decimal places.

Move Mag

Similar to Move Date, the up and down arrow buttons move the magnitude or count scale (y-axis) up or down. The maximum magnitude or count can also be entered manually in the text box.

Plot JH

If there are data for the JH pass bands in the opened file, the associated buttons will be enabled. After plotting the J magnitude, select the Plot **H** button and that data will be displayed. If the chart is moved in time or magnitude only the J magnitude data will be shown. It will be necessary to select the Plot **H** button again.

Plotting the color index work the same way as the Plot JH buttons. The color index button are only enabled when the **Index** button is selected. Single color magnitudes cannot be plotted when the color index data is viewed.

Config Pull Down Menu

The pull down menu labeled Config allows the user to configure the way the data is plotted. Normally, the data is shown as small dots that are not connected. If **Plot Lines** is selected, the data dots are connected by straight lines. This sometimes makes the data more appealing visually. **Plot Dots** returns the data to unconnected dots. After a selection is made, it is necessary to select the Plot **H** button to regenerate the graph.

When error limit data is available in the file for J magnitude and color index values, that information can be plotted when **Plot Std Error** item is selected. The error is shown as a vertical bar running through the data point. The length of the line represents the error value when read with the y-axis scale.

Cursor Pull Down Menu

Information about each data point can be seen by left clicking the mouse control on the point of interest. When this is done, crossed lines are drawn on the plot with the intersection given by the cursor position. The magnitude(count) and the

date are displayed above the graph.

There are two cursor modes available: **Cursor A** and **Cursor B**. Both cursor A and B show the magnitude(count) and date above the graph but, if Cursor B is used, the magnitude(count) difference and time difference are also displayed on the right side.

When **Cursor A** is used, the date and magnitude are also written to the **Enter Start Date** and **Enter Max Magnitude** boxes. This feature can be used to manipulate the graph to expand the date or magnitude scale around some interesting feature of the light curve. Select the button to the left of these boxes to change the x-y origin of the graph.

Cursor C is used to mark the time for a minimum or maximum. It is primarily used in the Eclipsing Binary Analysis.

The cursor intersecting lines are erased by right clicking the mouse control

---

Edit Pull Down Menu

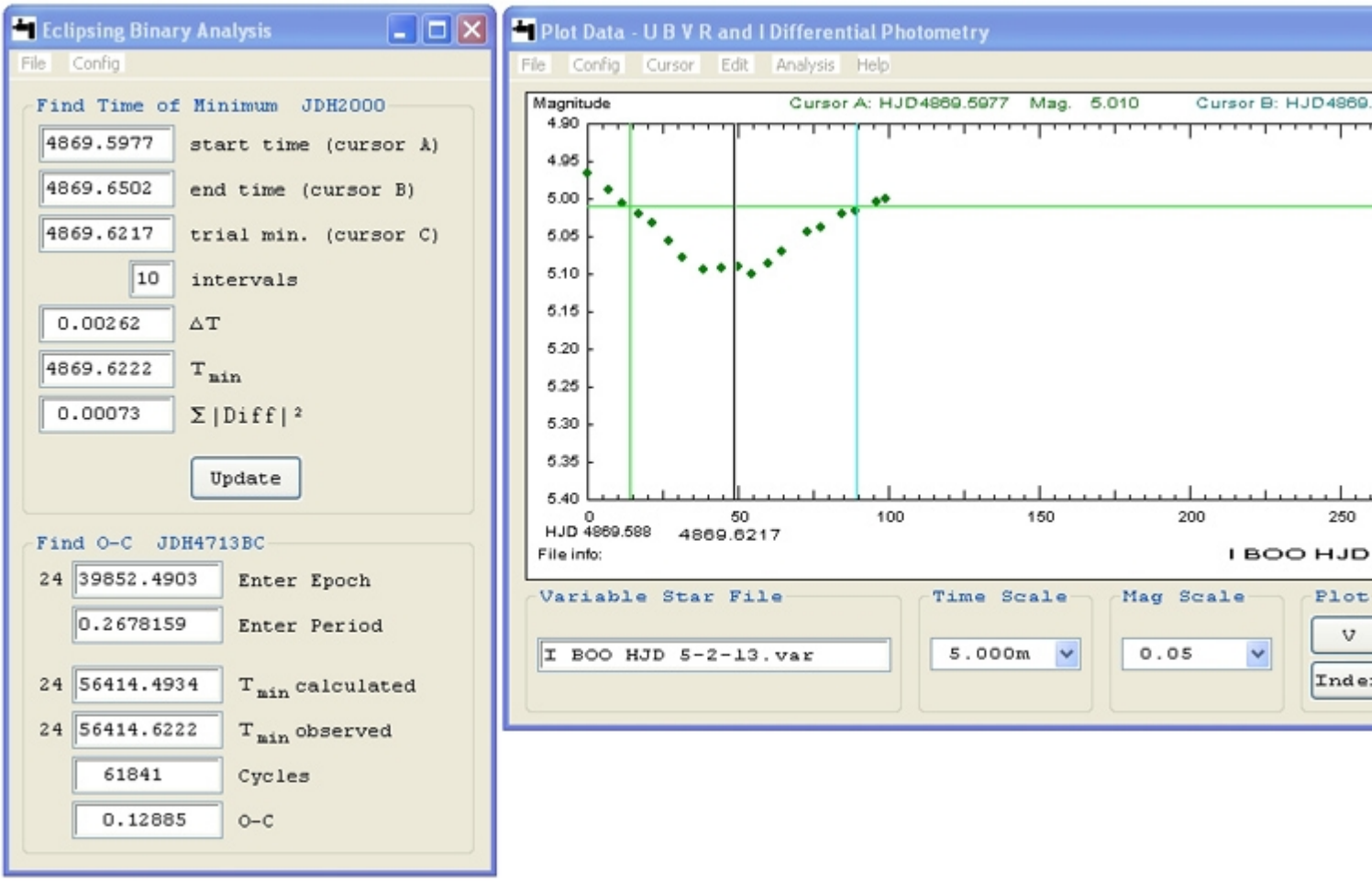
Normally, the title of the graph is the file name. By selecting **Edit Title**, the user can change the title for printing purposes. Additional information can be added to the plot by selecting the **File Edit Info** and then entering additional information. This information is not saved but only shown on the plot for printing purposes or for saving the plot image.

A label can be added anywhere in the plot area by selecting **Add Label** and then entering the appropriate label. This label is placed where the active Cursor (A or B) is positioned. It is necessary to place the cursor first before adding a label. The label can be deleted by selecting **Undo Label** from this pull down. The **Undo Label** item can be selected repeatedly to remove labels created since the beginning.

Eclipsing Binary Analysis

This page is from SSPDataq3 (SSP-3 & SSP-5 Photometers) but is similar for the SSP-4. This page will be updated to include actual J data.

The time of minimum and the O-C parameter for eclipsing binary stars can be found with this module. As described in *Astronomical Photometry* on pages 266 to 269, the method of E. Hertzprung (1928, *Bul Astr. Inst. Neth*. 4, 179) is used to derive the exact time of minimum for an eclipse observation. The example shown below is for I Boo (44 Boo) which has a period of 0.2678159 days and an initial "working" Epoch of HJD 2439852.4903. **The Eclipsing Binary Analysis module only works with V data.**



The dip in the light curve showing the minimum is bracketed with the A and B cursors as shown. Make sure there is good data beyond the cursor limits otherwise the results will be poor. The C cursor is used to pick the best minimum by eye. When all three cursors are set, select the **Update** button to calculate time of mid eclipse. A gray line is drawn on the light curve to indicate the position of the minimum. You can at this time, place the C cursor at this point and recalculate the minimum to get a better determination. Intervals can be adjusted to higher values to improve accuracy but this depends on the quantity and quality of the original data. See the text in *Astronomical Photometry* to gain a better understanding of this method and what the values mean. All time calculated and displayed for JD2000 epoch as in keeping with the other photometry modules. For the O-C calculation, the appropriate time protocol is for the original JD4713BC epoch but in the reduced form: HJD - 2,400,0000.

After a good time of minimum is found, the O-C parameter can be calculated if the Epoch and Period are known. These parameters for many eclipsing binary stars can be found at the Bob Nelson O-C page on the AAVSO web site. The current link is: http://www.aavso.org/bob-nelsons-o-c-files.

Enter the Epoch and Period values in the appropriate text box and press the **Update** button again. The number of cycles since the Epoch date and the O-C parameter are displayed

It is important to keep in mind the appropriate selection of Julian date. The default mode for Photometry2 is JD which would be find for binaries which have a period of many days or years but would not be the correct choice for short period binaries such as our I Boo example. In this case, the selection should be HJD (Heliocentric Julian Day) which is made during the time of data reduction. The HJD flag is written to PPparms and the Plot Data module will pick that up and display HJD along the time line. The Pull down menu Config would allow you to use JD2000 dates for entry and display in the O-C boxes. When selected, the "24" in front of each box will be hidden. It is doubtful that this selection would be made since all Julian dates for binary minimums are in the epoch 4713BC, but it is included for completeness.

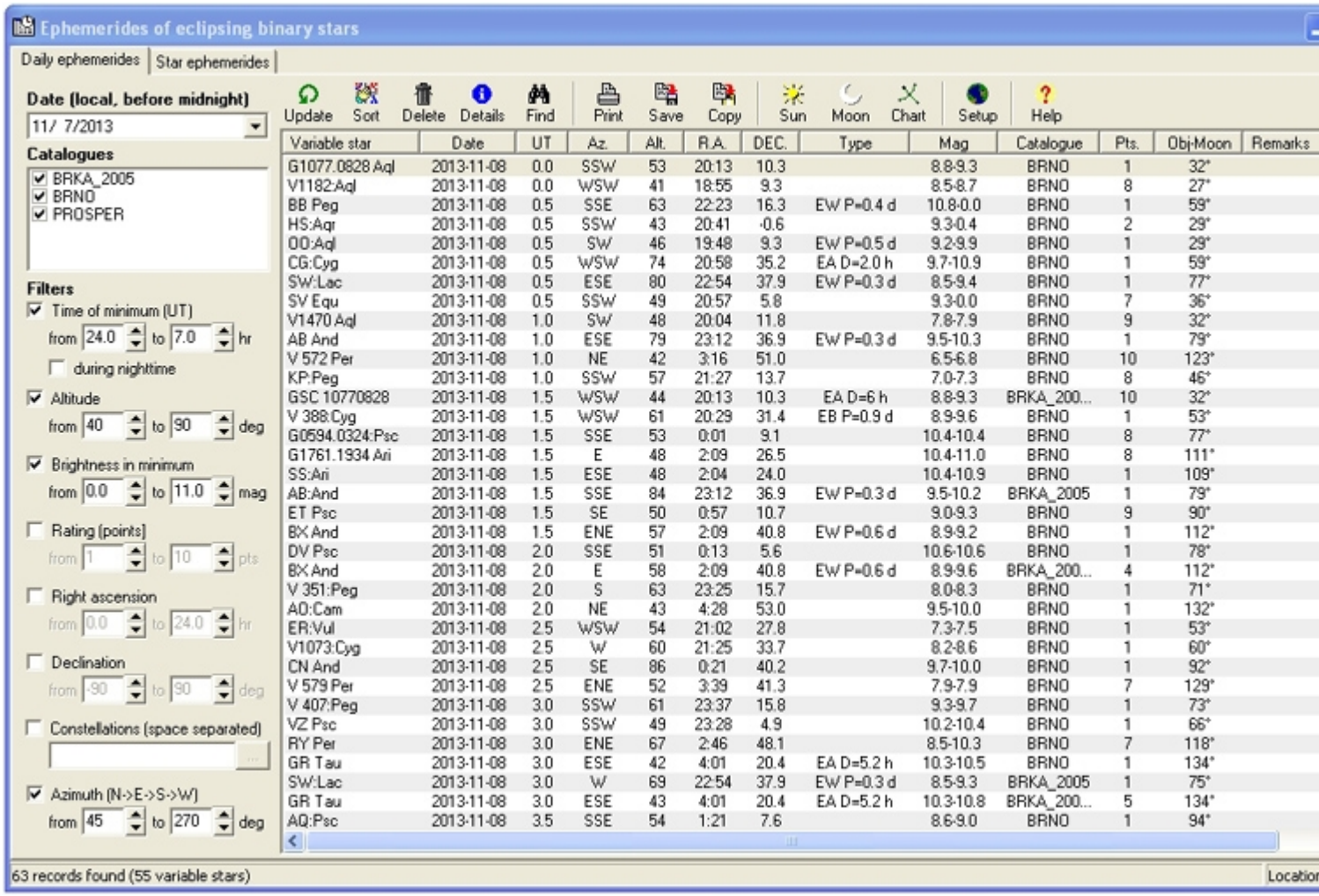
Side Note
In the example of I Boo, the O-C parameter would seem to large but, considering that the original epoch and period were first determined 45 years ago, the result is reasonable. The excel spread sheet found on the Bob Nelson O-C web page

shows that the period has been changing over the years in a non-linear way. The current ephemeris for I Boo gives 55352.45676 for the epoch and 0.267819 for the period. Using these values in the Find O-C calculator results in 3966 cycles and a O-C value of -0.00461. This star needs to be followed.

Eclipsing Binary Ephemerides

A free Eclipsing Binary Ephemeris calculator giving timely information about upcoming minimum can be found at: http://www.motl.cz/dmotl/predpovedi/

For a particular observing site, many events can be displayed for selection. This program makes it hard to miss an important eclipse.

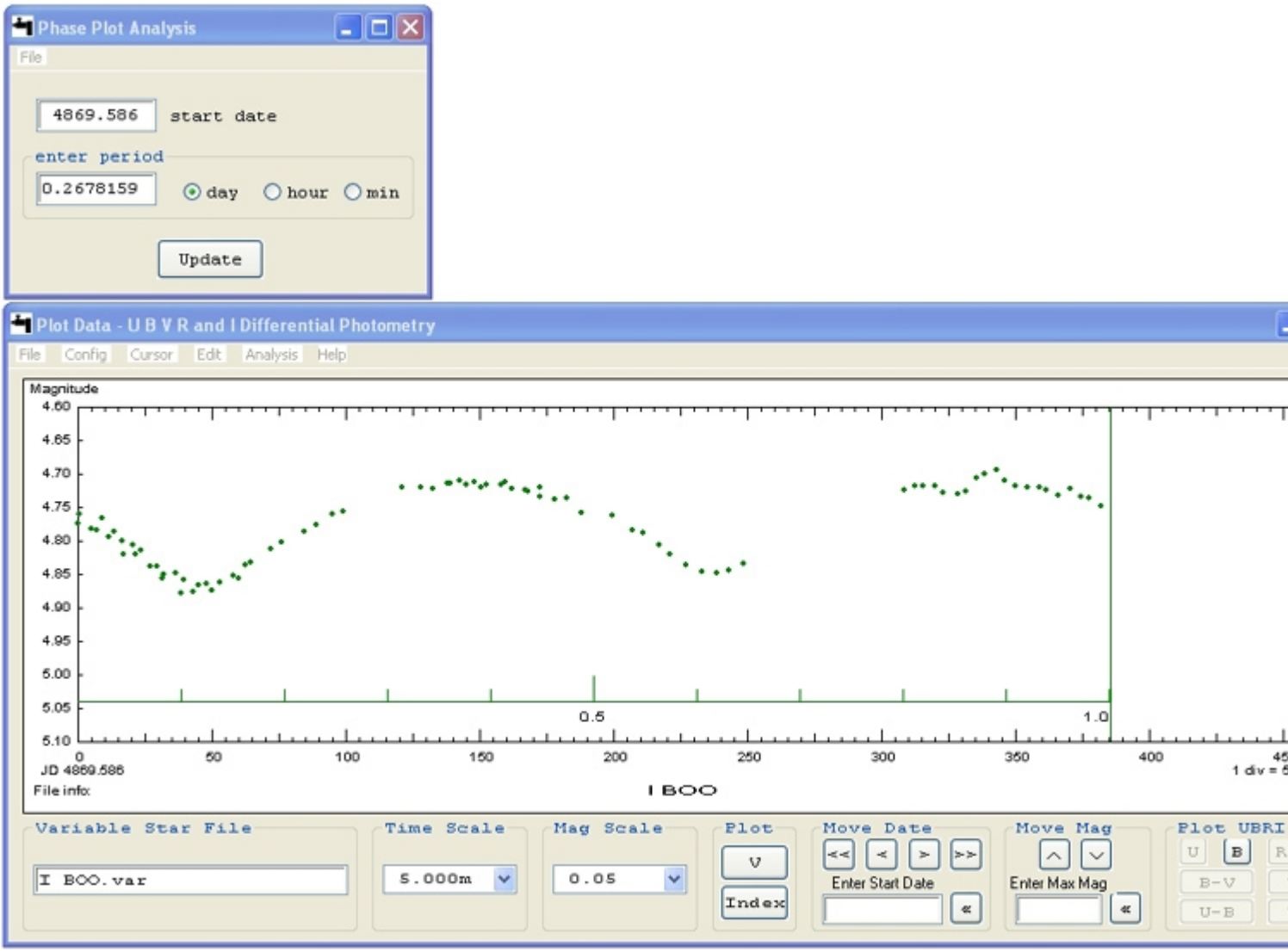


An important web site with accurate ephemerides for many binary stars can be found at the Mt. Suhora Astronomical Observatory. In addition, they have a page for submission of observed time of minimum data. Click on the banner below:

Phase Plot

This page is from SSPDataq3 (SSP-3 & SSP-5 Photometers) but is similar for the SSP-4. This page will be updated to include actual J data.

Most times it is impossible to obtain a complete light curve in a single observing session. With Phase Plot module, it is possible to stack the varied segments of a light curve if an accurate or even approximate estimate of the period is known. The example below of I Boo is the result of 4 different observing sessions which almost gives a complete light curve showing the primary and secondary eclipse. The var file should contain the complete data set since multiple files cannot be read. If necessary, use NOTEPAD to cut and paste the various data sets to make one complete var file in chronological order. **The Phase Plot module only works with V data.**



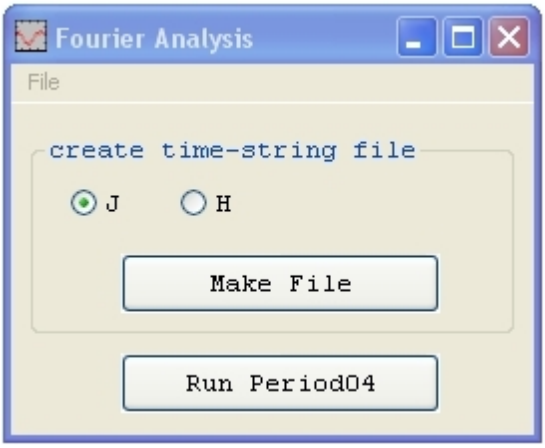
Load and display the file in the usual way and then open the Phase Plot Analysis window. The start date should already be entered and, if you wish to change it, use the cusors A control to move the data set and establish a new start date. The period should be available from Bob Nelson's web page at the AAVSO: http://www.aavso.org/bob-nelsons-o-c-files.

Fourier Analysis

The Fourier Analysis module is a link to a powerful tool for extracting period information from time series observations containing gaps as common with PEP observations. The module allows for the extraction of a 2-dimensional array file that contains time and associated magnitude information from .var files of any of the available colors J & H. These files are then imported as "time-strings" into the program Period04 written by Patrick Lenz, Institute of Astronomy, University of Vienna, for analysis. The Help file in Period04 is comprehensive and you are referred to it for further information about its use. In addition there are tutorials in the folder labeled **Period Tutorials** along with a manual in pdf format.

Important: In order to run Period04 it is necessary that the Java Runtime Environment (JRE) is installed. In case it isn't installed on your computer, the free version can be downloaded from: http://java.com/en/download/index.jsp

To use, open a .var file into the main window of the Plot module and then select a color as shown below and press the **Make File** button. You can save the file as a .txt or any other type desired. After the file is made and saved, press the **Run Period04** button to bring up the Period04 program window and use the **Import Time String** button to bring in your data.



The Period04 Homepage for news and updates is at: http://www.univie.ac.at/tops/Period04/

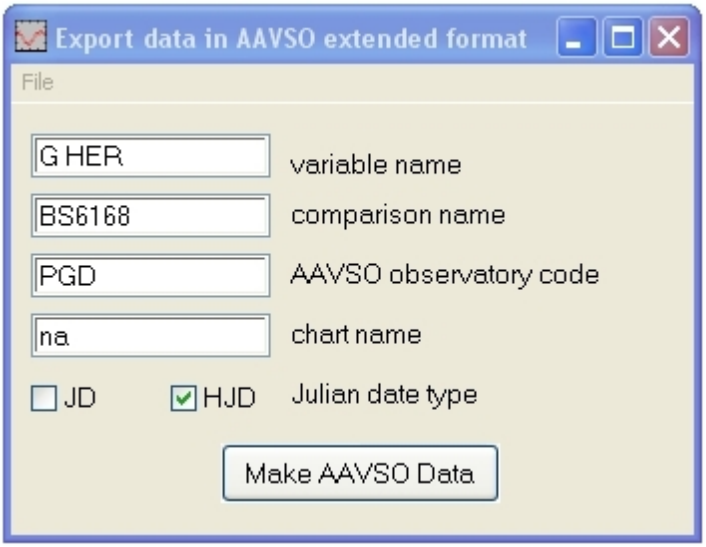
Copyright notice

Export AAVSO format

To upload your finished results to the AAVSO (American Association of Variable Star Observers), the data needs to be in the official AAVSO extended format. When in this format, the data can by uploaded via the WebObs Batch Upload Tool.

For detail information concerning this format and uploading data see: Official AAVSO Extended Format

Under the file pull down menu, you have the option to convert the SSP4Dataq2 data file "`variableName.var`" to the AAVSO format by selecting **Export AAVSO format**.



Enter the variable star name, the comparison star name, your observing code supplied by the AAVSO, and the AAVSO chart if used in the text boxes shown in the popup window. By default, the file name stripped of the var type is used for the variable star name. If this is what is intended for the appropriate AAVSO file name, the correct variable star name can be typed in the text box. Since the comparison star, observatory code and chart name information is not contained in the `variableName.var` file, these items have to be entered manually. Once entered, the observatory code is saved to the `PPparms.txt` file and entered automatically next time..

The export routine writes six parameter items at the head of the export file per AAVSO Extended format specification. These are:

```
#TYPE=EXTENDED              ' specified by AAVSO
#OBSCODE=                   ' observer identifier supplied by AAVSO

#SOFTWARE=SSPDATAQ3 VX.XX   ' version X.XX entered automatically current with SSPDataq3
program
#DELIM=,                    ' the comma is most often used to delimit fields in the
record
#DATE=JD or JHD             ' 2451545 is added to the J2000 epoch day used in the VAR
file
#OBSTYPE=PEP                ' Photo-Electric Photometry
G HER,2456525.6200,6.799,0.004,J,YES,STD,BS6168,na,na,na,na,1,na,na
G HER,2456525.6200,5.125,0.002,H,YES,STD,BS6168,na,na,na,na,1,na,na
.
.
.
```

The sample file `Sample Standard g HER JH.txt` is an example of this format.

Troubleshooting

IREX.txt

During the reduction process, certain intermediate results are written to a temporary file called `IREX.txt`. The file is overwritten each time a reduction program module is run and no backups are made. If your reduced data looks funny, you may want to examine the file for clues about why.

If contacting tech support, it would be a good idea if you submit the IREX.txt file or files along with a statement of the problem.

The contents of the file have no importance to the reduction process and are for diagnostic use only.

Common Problems

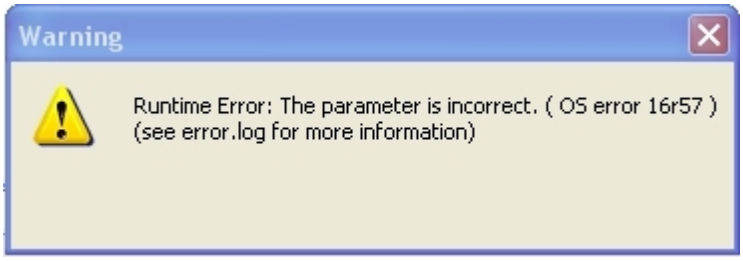
The number one problem for all programs like this is "if S..T goes in then S..T comes out". Good raw data is a must.

Errors in the raw files can jam the reduction process. These errors may be corrected using Notepad or similar text editing program. Be careful to align all the columns the same and do not enter any control or other unprintable ASCII character.

A good understanding of the photometry reduction process is necessary. The book *Astronomical Photometry* by Henden and Kaitchuck is a must have. Another good book on the topic is *Photoelectric Photometry of Variable Stars* by Hall and Genet. These books and others are available from Optec, Inc. Organizations such as the AAVSO or the The Society for Astronomical Sciences also have important information concerning photometry. For additional information and resources about photometry go to Optec's Astronomical Photometry Resources page.

File Length Problem

The filedialog command in Liberty Basic V4.03 has a bug that limits the length of a file name with path to 127 characters. If this length is exceeded the program will crash. The error code is shown bellow:



There is no solution at this time except to limit the file name length to 127 characters. New versions of Liberty Basic may solve this problem when they are released.

Resources

The SSP-4 was developed with a grant from the AAVSO in 2002. Below is a random list of resources that can be used to further your understanding of the instrument.

AAVSO web page describing their Infrared observing program:

http://www.aavso.org/infrared-photoelectric-photometry-program

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Doug West was the key player in getting Optec, Inc. and the AAVSO together in the development of the SSP-4. His web site describing his applications with an estimate of the precision of the instrument can be found at:

http://www.bellatrixobservatory.org/cvaaI/28/

Jeff Hopkins is an active and accomplished observer who has used the SSP-4 in several observing programs . His web site is full of usefull information:

http://www.hposoft.com/astro/IR.html

Arne Henden now Director of the AAVSO wrote a very comprehensive paper titled JHK Standards for Small Telescopes. A listing of Standard Stars for V, J, H, L, and K magnitudes is included. The link below to the SAO/NASA Astrophysics Data System has the full text copy:

http://articles.adsabs.harvard.edu//full/2002JAVSO..31...11H/0000011.000.html

A pdf copy of this paper is on the install CD.

Other interesting links:

http://arxiv.org/ftp/arxiv/papers/0805/0805.3739.pdf

http://www.aavso.org/files/publications/staff_pubs/templeton_ir_aas.pdf

https://docs.google.com/viewer?a=v&q=cache:hg-pgP29YkYJ:hastingswireless.homeip.net/redmine/attachments/download/9/SSP-4Docs.pdf+ssp-4+photometer+optec&hl=en&gl=us&pid=bl&srcid=ADGEESinJw4V3kB_IeHytcnsEhwGHqNOkgjnXzexrPmqLdbT77A4reHpzldHOCSsHuraz0kLbICQR9-7Nb5nt6Xv2c4rDm5QoGEgHeVW6v5p5HZBmJdnrAHG0mXZvXtg6yvy7eTCYgdg&sig=AHIEtbQf2S35NFfVFQs9zE8KquO_yoTJqQ