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UBV PHOTOMETRY OF EF Boo

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EF Boo (BD +51°1929, SAO 29189) was first reported in the Tycho catalog (Høg et al., 1997). It was discovered as a part of the Hipparcos program by Perryman et al. (1997). The system has a spectral type of G5 and an EB-type light curve with an amplitude of 0^m587 ranging from 9^m401 to 9^m988 in *V* (HIPPARCOS, ESA, 1998). Samec et al. (1999) have carried out the first ground based photometric observations of the system in *U*, *B* and *V* bands and obtained the following improved ephemeris:

$$\text{H.J.D. Min I} = 2451283.6774(1) + 0^{\text{d}}42060833(7) \times E. \quad (1)$$

They have characterized the light curve as a typical W UMa type with spot activity.

New photometric observations of EF Boo were made on 3 nights during 2000 observing season with a 30-cm Maksutov telescope at the Ankara University Observatory. The observations were secured by using a single channel OPTEC SSP-5A photometer head which contains a side on R-1414 Hamamatsu photomultiplier and the *UBV* filter set close to the standard system. Differential observations, in the sense variable minus comparison, were corrected for the atmospheric extinction and the light time effect. The same star of Samec et al. (1999) was selected as comparison (SAO 29183 = BD +51°1927 = HD 127807). Their check star was rejected since they have reported that it is a variable star. The standard errors of our observations are about 0^m024, 0^m015, and 0^m016 in *U*, *B* and *V* filters, respectively.

Two new minima times were obtained from our observations by using the well known method of Kwee and van Woerden (1956). A list of all available minima times, together with ours, are given in Table 1. A new *O – C* curve was formed by using all these epochs and the following improved light element was derived by fitting a linear function:

$$\text{H.J.D. Min I} = 2448500.3016(5) + 0^{\text{d}}42051309(0) \times E. \quad (2)$$

New light and color curves are shown in Figure 1 together with the Hipparcos light curve. Although the light curve is EW type, it was noted to be EB type in HIPPARCOS (ESA, 1998) due to a single erroneous observation in mid-primary eclipse. No significant phase dependence of the color curves in Figure 1 indicates contact configuration for the system. The light levels estimated by averaging data around the maxima and minima (by taking a $\Delta\Phi = \pm 0.03$ interval) and their differences are listed in Table 2. The errors in the estimates are slightly lower than the standard errors of the respective observations.

Table 1: All available minima times of EF Boo. The $O - C$ values were calculated by using Equation (2)

JD Hel. 2400000 +	Min	Filter	$O - C$	Reference
48500.30180	I		0.0002	HIPPARCOS ESA (1998)
51282.8356(6)	I	<i>UBV</i>	-0.0011	Samec et al. (1999)
51283.6776(1)	I	<i>UBV</i>	-0.0002	"
51283.8889(1)	II	<i>UBV</i>	0.0009	"
51284.7290(1)	II	<i>UBV</i>	-0.0001	"
51284.9386(6)	I	<i>UBV</i>	-0.0007	"
51712.391(17)	II	<i>UBV</i>	0.0003	This work
51719.330(04)	I	<i>UBV</i>	0.0007	This work

Table 2: The light levels and their differences in the light curves of EF Boo

	<i>u</i>	<i>b</i>	<i>v</i>	HIP
Max. light at 0.75	0.120	0.480	0.789	9.401
Max. light at 0.25	0.131	0.486	0.781	9.401
Min. light at 0.00	0.703	1.032	1.328	9.988
Min. light at 0.50	0.684	1.000	1.310	9.896
$\Delta_{\max} (m_{0.75} - m_{0.25})$	-0.011	-0.006	0.008	0.0
$\Delta_{\min} (m_{0.00} - m_{0.50})$	0.019	0.032	0.018	0.092
Depth of Min. I	0.578	0.549	0.543	0.587
Depth of Min. II	0.559	0.517	0.525	0.495

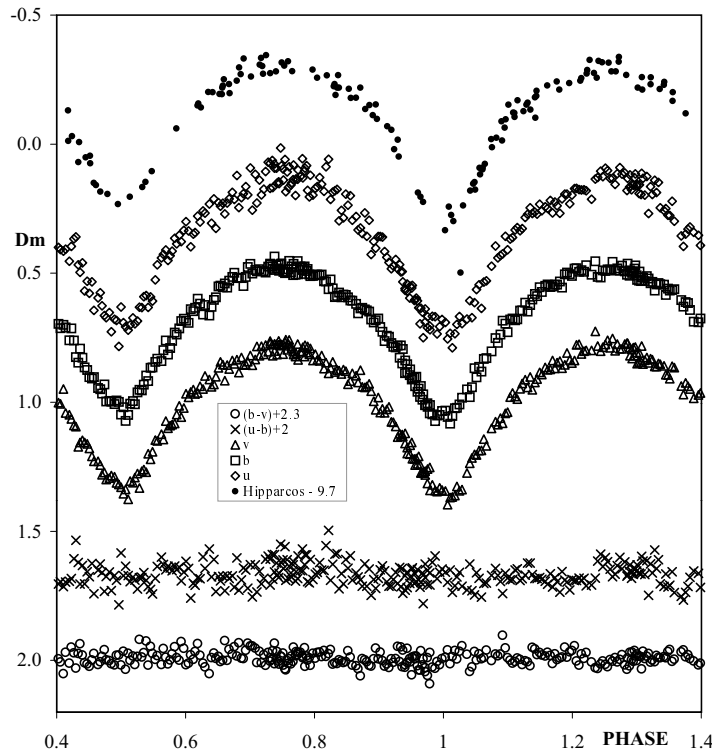


Figure 1. The light and color curves of EF Boo

A comparison of the light levels shows no sign of any asymmetry and O'Connell effect. However a comparison with HIP light curve reveals that the primary eclipse is slightly shallower while the secondary eclipse is slightly deeper in our light curves (see Table 2).

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