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PHOTOELECTRIC OBSERVATIONS OF THE FLARE STAR
BD +16^o2708 IN 1973, 1974

Continuous photoelectric monitoring of the flare star BD +16^o2708 has been carried out at the Stephanion Observatory ($\lambda = -22^{\circ}49'44''$, $\varphi = +37^{\circ}45'15''$) during the years 1973, 1974 using the 30 inch Cassegrain reflector of the Department of Geodetic Astronomy, University of Thessaloniki. Observations have been made with a Johnson dual channel photoelectric photometer in the B colour of the international UBV system. The telescope and photometer will be described elsewhere. Here we mention only that the transformation of our instrumental ubv system to the international UBV system is given by the following equations:

for the time interval from 6-5-1973 to 6-6-1973

$$\begin{aligned}V &= v_o + 0.070(b-v)_o + 1.865, \\B-V &= 0.753 + 1.030(b-v)_o, \\U-B &= -1.379 + 1.021(u-b)_o.\end{aligned}$$

for the time interval from 11-5-1974 to 31-5-1974

$$\begin{aligned}V &= v_o - 0.011(b-v)_o + 2.445, \\B-V &= 0.848 + 0.992(b-v)_o, \\U-B &= -1.632 + 0.999(u-b)_o.\end{aligned}$$

The monitoring intervals in UT as well as the total monitoring time for each night are given in the Tables Ia, Ib. Any interruption of more than one minute has been noted. In the fourth column of Tables Ia, Ib the standard deviation of random noise fluctuation $\sigma(\text{mag}) = 2.5 \log(I_o + \sigma) / I_o$ for different times (UT) of the corresponding monitoring interval is given.

During the 40.18 hours of monitoring time 1 flare was observed the characteristics of which are given in Table II. For this flare following characteristics (Andrews et.al. 1969) are given:

Table Ia
Monitoring Intervals in 1973

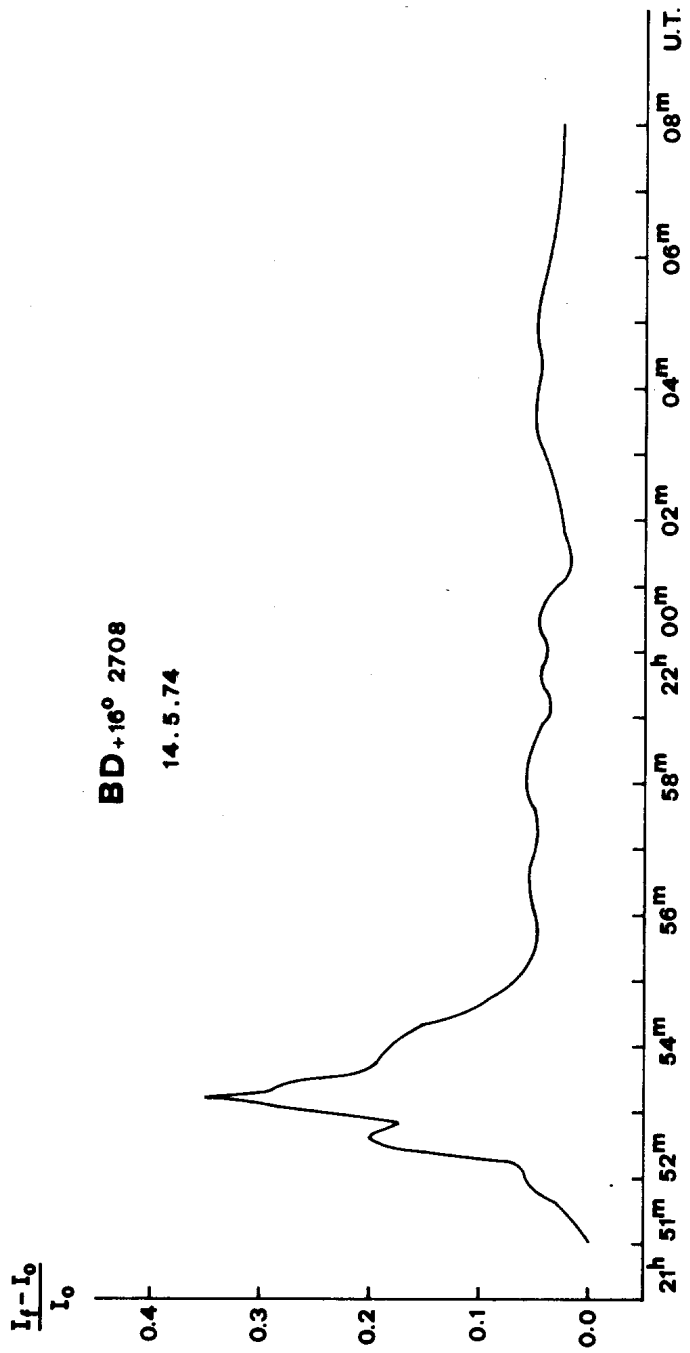
Date	Monitoring Intervals (U.T.)	Total Monitoring Time	σ (U.T.)
1973			
May			
6-7	20 ^h 50 ^m -21 ^h 24 ^m 21 ^h 28 ^m -22 ^h 00 ^m 2208-2233, 2329-2338, 2340-2351, 2357-0008, 0010-0021, 0034-0040, 0042-0058, 0108-0119, 0121-0131.	02 ^h 56 ^m	0.012 (21 ^h 17 ^m), 0.021 (21 32), 0.021 (22 18), 0.015 (22 33), 0.019 (00 01), 0.016 (00 50) 0.016 (01 16).
7-8	2046-2106, 2110-2138, 2142-2153, 2155-2206, 2215-2238, 2330-2334, 2337-2346, 2348-2357, 0002-0010, 0012-0022, 0027-0036, 0039-0048, 0051-0101, 0109-0117, 0119-0128, 0133-0143, 0145-0152.	03 15	0.019 (20 59), 0.023 (21 26), 0.019 (21 47), 0.018 (22 22), 0.014 (23 42), 0.016 (00 16), 0.021 (00 32), 0.018, (01 21), 0.028 (01 38).
8-9	2025-2039, 2041, 2053, 2058-2130, 2133-2144, 2146-2200, 2202-2211, 2256-2331, 2334-2355, 0000-0011, 0013-0025, 0033-0046, 0048-0058.	03 14	0.032 (20 46), 0.025 (21 07), 0.020 (21 56), 0.020 (23 25), 0.017 (23 50), 0.021 (00 17), 0.017 (00 44).
10-11	2040-2106, 2109-2140, 2143-2157, 2159-2210, 2259-2308, 2310-2323, 2327-2336, 2339-2348, 2351-2358, 0002-0010, 0015-0025, 0036-0045, 0047-0055, 0102-0111, 0114-0123.	03 02	0.020 (21 00), 0.028 (21 23), 0.022 (22 02), 0.019 (23 16), 0.019 (23 44), 0.015 (00 18), 0.020 (00 41), 0.017 (01 16).
11-12	2040-2107, 2110-2146, 2149-2212, 2258-2321, 2325-2331, 2335-2343, 2347-2354, 0000-0008, 0015-0114, 0118-0129, 0132-0136.	03 01	0.028 (20 47), 0.024 (21 43), 0.029 (21 52), 0.015 (23 05), 0.022 (23 39).
21-22	2008-2020, 2022-2030, 2033-2048, 2049-2051, 2053-2108, 2111-2136, 2138-2140, 2228-2238, 2241-2305, 2309-2317, 2319-2340, 2343-2354, 2356-0011, 0019-0042.	03 11	0.021 (20 23), 0.023 (20 58), 0.024 (21 25), 0.034 (22 55), 0.031 (23 34), 0.037 (23 49), 0.035 (00 34).
June			
1-2	2016-2047, 2049-2100, 2102-2114, 2116-2123, 2213-2222, 2223-2229, 2231-2242, 2246-2302, 2303-2318, 2323-2332, 2334-2347, 2348-2357, 0005-0015, 0017-0027, 0030-0035, 0038-0113.	03 29	0.018 (20 28), 0.021 (21 04), 0.021 (22 36), 0.022 (23 06), 0.025 (23 35), 0.027 (00 18), 0.026 (01 04).
5-6	2245-2254, 2256-2306, 2310-2318, 2319-2329, 2331-2334, 2338-2345, 2348-2356, 2358-0005, 0015-0024, 0026-0035, 0037-0042, 0045-0055, 0057-0105.	01 43	0.019 (23 01), 0.018 (23 15), 0.019 (23 41), 0.023 (00 28), 0.028 (00 59).
	Total	23 ^h 51 ^m	

Table Ib
Monitoring Intervals in 1974

Time	Monitoring Intervals (U.T.)	Total Monitoring Time	σ (U.T.)
1974			
May			
11-12	23 ^h 42 ^m -23 ^h 45 ^m , 23 ^h 47 ^m -00 ^h 00 ^m , 0002-0011, 0015-0028, 0030-0042, 0046-0058, 0101-0113, 0130-0140, 0142-0147.	01 ^h 29 ^m	0.019 (23 ^h 57 ^m), 0.020 (00 18), 0.025 (00 51), 0.027 (01 37).
12-13	2226-2229, 2230-2247, 2248-2303, 2306-2318, 2319-2327, 2329-2340, 2344-2355, 2357-0013.	01 33	0.015 (22 43), 0.017 (23 24), 0.021 (00 02).
14-15	2141-2210, 2216-2227, 2229-2245, 2249-2302, 2303-2315, 2317-2331, 2347-2356, 2359-0007, 0009-0019, 0026-0036, 0040-0050, 0053-0058.	02 27	0.012 (21 42), 0.017 (22 22), 0.015 (22 51), 0.016 (00 02), 0.021 (00 32).
16-17	2124-2139, 2140-2147.	22	0.013 (21 33).
21-22	1938-1949, 1951-2010, 2038-2044, 2046-2053, 2058-2118, 2121-2131, 2204-2219, 2221-2244, 2341-2353, 0028-0036, 0039-0046.	02 18	0.017 (19 53), 0.016 (20 49), 0.013 (21 09), 0.014 (22 16), 0.018 (23 43), 0.016 (00 32).
22-23	2103-2125, 2131-2140, 2147-2200, 2250-2300, 2315-2324.	01 03	0.015 (21 14), 0.013 (21 50), 0.012 (22 54).
23-24	2138-2158, 2203-2215, 2220-2229, 2231-2246, 2252-2300, 2302-2309, 2311-2323, 2348-2358, 0000-0009, 0012-0021, 0027-0031, 0034-0040, 0100-0106, 0110-0118.	02 15	0.014 (21 53), 0.015 (22 25), 0.014 (23 04), 0.017 (00 05), 0.019 (00 36), 0.019 (01 04).
24-25	0029-0037, 0039-0046, 0048-0056,	23	0.014 (00 41).
25-26	2205-2220, 2222-2233, 2235-2245, 2250-2300, 2303-2316, 2323-2333, 2336-2341, 2344-2355, 0011-0020.	01 34	0.016 (22 27), 0.014 (23 06), 0.013 (23 40), 0.018 (00 16).
26-27	2126-2147, 2148-2201, 2204-2239, 2242-2254, 2255-2305, 2307-2320, 2334-2347, 2348-2359, 0001-0011.	02 18	0.016 (21 54), 0.014 (22 08), 0.015 (23 00), 0.018 (23 52).
28-29	2227-2240, 2242-2254, 2301-2313, 2315-2332, 2340-2350, 2356-0005, 0028-0032, 0034-0042, 0047-0054.	01 32	0.022 (22 33), 0.015 (23 07), 0.018 (23 59), 0.017 (00 36).
30-31	1953-1959, 2002-2020, 2022-2036, 2040-2108.	01 06	0.026 (20 14), 0.028 (20 47).
	Total	18 ^h 20 ^m	

Table II
Characteristics of the Flare Observed

Date	UT	t_b	t_a	Duration	$(I_f - I_0)/I_0$	P	Δm	σ	Air
1974	max.	min.	min.	min.	max.	min.	mag.	mag.	Mass
May									
14	21 ^h 53 ^m 2	2.2	14.8	17.0	0.35	1.53	0.33	0.012	1.08



a) the date and universal time of flare maximum, b) the duration before and after the maximum (t_b and t_a , respectively), as well as the total duration of the flare, c) the value of the ratio $(I_f - I_0)/I_0$ corresponding to flare maximum, where I_0 is the intensity deflection less sky background of the quiet star and I_f is the total intensity deflection less sky background of the star plus flare, d) the integrated intensity of the flare over its total duration, including pre-flares, if present, $p = \int (I_f - I_0)/I_0 dt$, e) the increase of the apparent magnitude of the star at flare maximum $\Delta m(b) = 2.5 \log(I_f/I_0)$, where b is the blue magnitude of the star in the instrumental system, f) the standard deviation of random noise fluctuation $\sigma(\text{mag}) = 2.5 \log(I_0 + \sigma)/I_0$ during the quiet state phase immediately preceding the beginning of the flare and g) the air mass at flare maximum. The light curve of the observed flare in the b colour is shown in Fig.1.

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