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**FLARE STAR SEARCH IN THE ALPHA PERSEI CLUSTER**

Parallel with the programme for the investigation of low-mass members in the open cluster Alpha Persei ( $\sim 8 \times 10^7$  years) of Prosser (1991, 1992) on the basis of their proper motion determination the monitoring flare star observations were carried out at the Rozhen Observatory, Bulgarian Academy of Sciences. The monitoring has an aim to independently identify new red dwarf members of the cluster and to determine the flare activity of the stars in this intermediate-age cluster.

For the monitoring observations we used the 50/70/172 cm Rozhen Schmidt telescope. In the period November 1990 - March 1993, 98 monitoring multiple exposure plates (emulsion ORWO ZU21) with the centre - the star BD +48°920 (03<sup>h</sup>24<sup>m</sup>29<sup>s</sup>.1, 48°53' 25" (1950)) were obtained. The total effective observational time is 93<sup>h</sup>44<sup>m</sup>. The data of the observing material are given in Table 1.

**Table 1.** Flare Star Monitoring in the Alpha Persei cluster.

Year	Number of plates	Total Exp Time	Number of exposures	Duration of the exposure	Light/Filter
1990	1	1 <sup>h</sup> 00 <sup>m</sup>	6	10 <sup>m</sup> 1 <sup>n</sup>	Pg/-
1991	39	38 20	230	10	U/UG1
	7	3 54	39	6	Pg/-
1992	26	25 30	153	10	U/UG1
1993	25	25 00	150	10	U/UG1
Total	98	93 44	578		

After the visual inspection of the observational material with CARL ZEISS blink-comparator we found two new flare stars in the cluster region, different from the known UV Cet type stars (Sediakina 1971 and Wang 1993). The data of the newly discovered flare stars are listed in Table 2. It seems that the low flare activity is characteristic for this cluster.

**Table 2.** New Flare Stars in the Alpha Persei Cluster.

No.	R. A.	DEC.	Magnitude in		Magnitude in
	1950	1950	Minimum	Maximum	Maximum
			mag(V)	mag(I)	mag(U)
1.	3 <sup>h</sup> 25 <sup>m</sup> 17 <sup>s</sup> .6	50°05' 55"	16 <sup>m</sup> 17	13 <sup>m</sup> 91	14 <sup>m</sup> 1
2.	3 23 46.7	47 47 02	18.7	15.3	12.7

The photometric CCD V,I -magnitudes (Kron system) in quiescence of the new flare stars were obtained with the Whipple Observatory 1.2 m telescope on Mt. Hopkins, Arizona. The (V, V-I) photometry of both flare stars makes them acceptable for membership in the cluster. Neither FS1 nor FS2 had been previously identified as candidate cluster members from proper motion surveys. Based on their photometry, FS1 appears to be a late K or early M dwarf, while FS2 is probably M5 or later. FS2 is therefore one of the lowest-mass candidate members of the Alpha Persei cluster identified to date.

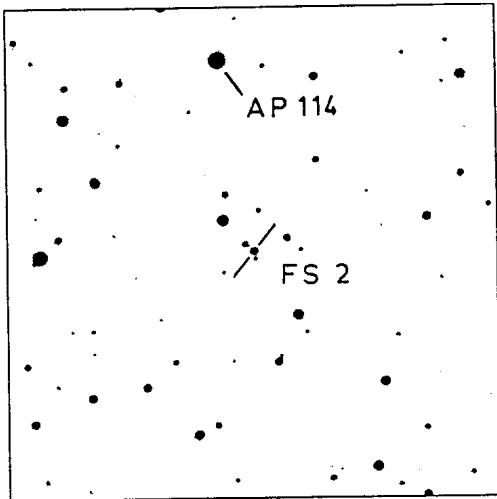
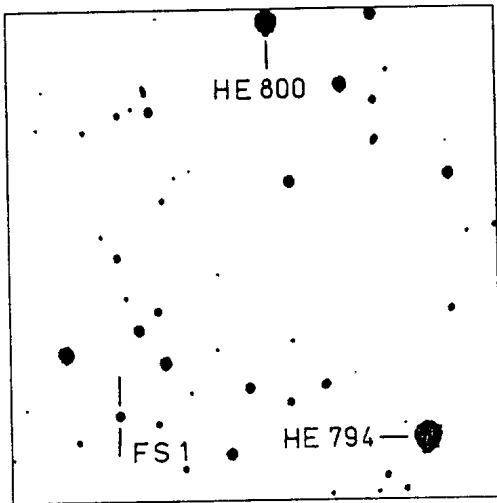
The rough photographic B-magnitude of FS1 in minimum measured on the direct plate obtained with the Rozhen Schmidt telescope is  $17^m5$  (B). The magnitude of FS2 estimated on the Palomar Observatory Sky Survey O-print is about  $20^m4$  (Bp).

The amplitudes of FS1 and FS2 flare events registered, with the correspondence of their standard U-B colours (for spectral types M0 and M5) are  $4^m6$  (U) and  $\sim 9^m0$  (U) magnitudes. The very big amplitude of FS2 seems to be not exception for such active faint M-dwarfs, when we compare with similar flare stars in the Pleiades cluster (Haro et al. 1982).

**Table 3.** Photographic Photometry of the Discovered Flare Events.

FS No.	Plate No.	Exposure No.	J. D.	Magnitude mag (U)
1	5987	1	2448510.4257	>15.5
1	5987	2	.4330	>15.5
1	5987	3	.4403	>15.5
1	5987	4	.4476	>15.5
1	5987	5	.4549	14.8
1	5987	6	.4622	14.1
1	5988	1	.4716	14.2
1	5988	2	.4789	14.4
1	5988	3	.4861	14.7
1	5988	4	.4934	14.7
1	5988	5	.5007	14.6
1	5988	6	.5080	14.8
1	5989	1	.5174	15.0
1	5989	2	.5247	15.3
1	5989	3	.5320	>15.5
1	5989	4	.5393	>15.5
1	5989	5	.5466	>15.5
1	5989	6	.5539	>15.5
2	6134	1	2448628.3049	>15.5
2	6134	2	.3122	12.7
2	6134	3	.3195	13.0
2	6134	4	.3268	13.9
2	6134	5	.3341	13.6
2	6134	6	.3413	13.7

The identification maps of the FS1 and FS2 reproduced from the CCD I-frames (5 arcmin on a side) are given in Figures 1a and 1b. North is on the top, East - on the left.



Figures 1a, 1b. Identification maps of the new flare stars.

The future digitization of the observational material for an automatic detection of the flare- and other type variable stars is planned.

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## REFERENCES

- Haro, G., Chavira, E., Gonzales, G., 1982, *Boll. Inst. Tonantzintla*, **3**, No. 1, 3.  
Prosser, Ch. F., 1991, *Ph.D. thesis*, University of California, Santa Cruz, CA.  
Prosser, Ch. F., 1992, *AJ*, **103**, 488.  
Sediakina, A. N., 1971, *Perem. Zvezdy*, **18**, 218.  
Wang, Jun-jie, 1993, *IBVS*, No. 3836.