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FLARE STAR SEARCH IN THE ALPHA PERSEI CLUSTER. II.

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In the frame of the flare star search programme the monitoring observations in the region of Alpha Persei cluster with the 50/70/172 cm Schmidt telescope of the National Astronomical Observatory of the Bulgarian Academy of Sciences were continued in the period August 1993 - November 1995. New 60 multiple exposure plates (emulsion ORWO ZU 21 with UG 1 filter or without filter) centred at the star BD +48°920 (R.A.(2000) = $03^h28^m02\overset{s}{.}4$, DEC.(2000) = +49°03′54″) were obtained. There are 6 exposures on each plate with duration of the single exposure 10 minutes. The observational log is presented in Table 1.

Table 1. Observational log for the new flare star monitoring

Year	Number of plates	Total exp. time	Number of exposures	Duration of the exposure	Band/ Filter
1993	17	17^h	102	10^m	U/UG1
1994	17	17^h	102	10^m	U/UG1
	2	2^h	12	10^m	Pg/–
1995	20	20^h	120	10^m	U/UG1
	4	4^h	24	10^m	Pg/–
Total	60	60^h	360		

The plates were checked with a CARL ZEISS blink-comparator. Two flare-ups of previously unknown flare stars were found. The designation of the new flare stars started by Semkov et al. (1993) is continued. The coordinates and photometric data in minimum and maximum brightness of the newly discovered flare stars are listed in Table 2. The new flare star referred to as FS 4 coincides with the star AP 78 in the list of members of Alpha Persei cluster from Stauffer et al. (1985).

Table 2. New flare stars in the region of Alpha Persei cluster

No.	R.A. (2000)	DEC. (2000)	Magnitude in minimum			Magnitude in maximum
			(U)	(V)	(V–I)	(U)
3	$3^h15^m44\overset{s}{.}3$	+50°28′56″	$14\overset{m}{.}9$	$11\overset{m}{.}02$	$1\overset{m}{.}92$	$13\overset{m}{.}9$
4	$3^h29^m26\overset{s}{.}0$	+49°20′42″	$14\overset{m}{.}5$	$13\overset{m}{.}60$	$1\overset{m}{.}02$	$13\overset{m}{.}1$

For the identification charts (10 arcmin on a side) of the newly discovered flare stars (Figure 1) images from the Digitized Sky Survey of the Space Telescope Science Institute have been used.

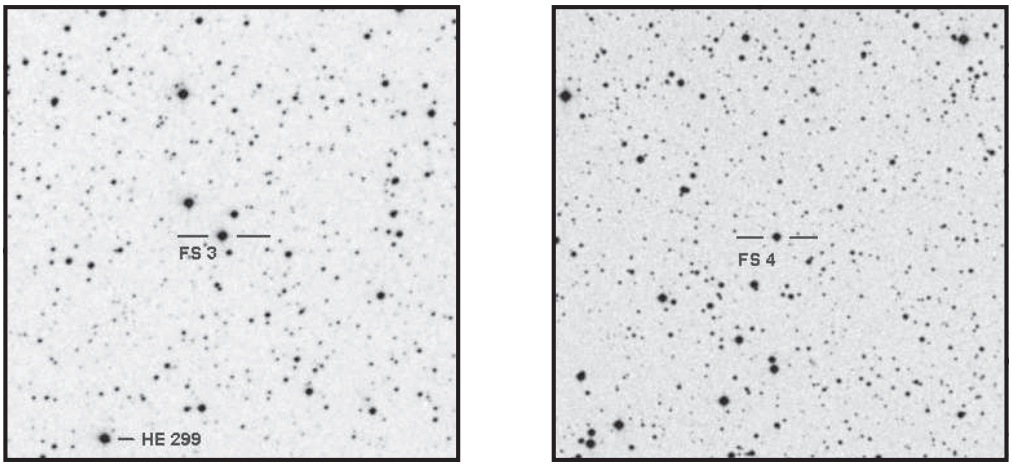

Figure 1. Identification maps of the discovered new flare stars

The (V, V−I) CCD photometry of the flare star FS 3 in minimum was made on August 7, 1994 with an ST6 CCD camera attached to the 2 m RCC telescope of the National Astronomical Observatory of the Bulgarian Academy of Sciences. All exposures were reduced in the same manner as described in Georgiev et al. (1994). The photoelectric photometry of the star FS 4=AP 78 in quiet state is given according to Stauffer et al. (1985). The photographic photometry in U light in quiet state (Table 2) and during the flare-up (Table 3) is made with an iris-photometer Ascoris using the existing standards of Mitchell (1960) in the region. The mean square error of the calibration curves is $0\overset{m}{.}2$ due to the quality of the monitoring photographic plates.

From the positions of the new flare stars on the V/V−I colour-magnitude diagram of Prosser (1994) it is obvious that FS 3 has a photometric behaviour which is unacceptable for cluster membership. The nearest known member of the cluster is the star HE 299 from the first complete proper motion survey of the region up to $12\overset{m}{.}0$ (pg) by Heckmann et al. (1956). On the positional basis the star might be associated with the red star ROSS 347=LTT 11060 from the Luyten Catalogue of stars with proper motions larger than $0\overset{''}{.}2$/yr and First Supplement. Such bright star as FS 3 showing flare-ups and which is not member of the cluster might be a representative of the foreground field UV Cet stars.

The star FS 4 lies on the same V/V−I colour-magnitude diagram quite well on the cluster sequence as can be expected from its cluster membership derived already by Stauffer et al. (1985).

Table 3. Photographic photometry of the newly discovered flare stars during their flare-ups

FS No.	Plate. No.	Exposure No.	J.D.	Magnitude mag(U)
3	6972	1	2449340.4646	14.7
3	6972	2	.4719	13.9
3	6972	3	.4792	14.1
3	6972	4	.4865	14.5
3	6972	5	.4938	14.8
3	6972	6	.5010	14.9
4	7133	1	2449576.5208	14.5
4	7133	2	.5281	13.3
4	7133	3	.5354	13.1
4	7133	4	.5427	13.5
4	7133	5	.5500	13.8
4	7133	6	.5573	14.2

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References:

Georgiev, Ts., Getov, R., Semkov, E., Mutafov, A., Todorova, H., 1994, *Working group on "Wide-field imaging"*, Newsletter 6, 21

Heckmann, V. O., Dieckvoss W., Kox H., 1956, *Astr. Nachr.*, **283**, 109

Mitchell, R. I., 1960, *ApJ*, **132**, 68

Prosser, Ch. F., 1994, *AJ*, **107**, 1422

Semkov, E. H., Tsvetkova, K. P., Tsvetkov, M. K., Prosser, Ch. F., 1993, *IBVS*, No. 3917

Stauffer, J. R., Hartmann, L. W., Burnham, J. N., 1985, *ApJ*, **289**, 247