On the variability of EL Sagittae

1. INTRODUCTION

The variability of EL Sge was first noted by Lange [1], while observing the EW-type variable CW Sge. He observed visually the star, classified it as an EW-type eclipsing binary, and, by 7 primary and 6 secondary minima (not published in his paper), gave the following ephemeris:

Min = 2 437 144. 310 + 0. 332 8 * E (1)

He established an amplitude of 0.6 mag (10.7 - 11.3 v), and gave an identification chart.

In a subsequent paper [2], Lange published only 5 minima and gave a slightly different ephemeris:

Min = 2 437 193. 561 + 0. 332 76 * E (2)

It's important to note that Lange twice observed two consecutive minima (a primary and a secondary one) during the same nights.

The GCVS ('69) quoted the ephemeris (1), together with the other elements given by Lange's first paper.
These elements were used by several astronomers for works on eclipsing binaries [3],[4],[5].

As much as we know, no other observation of EL Sge has been published until now.

2. OBSERVATIONS

EL Sge was first observed at GEOS by Boistel [6], whose visual estimates showed that Lange's period was wrong. Boistel observed some variations, but he emphasized the difficulties of the observation, due to the elongation of the comparison star labelled "C" (see fig. 1).

After Boistel's note, EL Sge was intensively monitored by GEOS observers. Here we will discuss in particular only the more reliable observations, that is the ones made by more observers at the same time. This is very useful to discriminate true variations from subjective and instrumental effects that can arise during visual observation.

The star was selected as one of the targets of GEOS visual camps at Pic du Midi (Bagneres, France) in 1985, and Logarghena (Massa, Italy) in 1986. The observational methods of camps such these are described in other GEOS Circulars [7]. All

estimates were made using Argelander method.

During the first camp, at Observatoire du Pic du Midi et de Toulouse, EL Sge was monitored by 2 observers (see table 1) using an 80 mm refractor, for three nights in September 1985.

TABLE 1.

Observer	*Number of estimates* SEP 12	SEP 13	SEP 14	*total*
S. Ferrand (Bougival - F)	11	53	9	73
A. Figer (Paris - F)	16	34	8	48
total	27	87	17	

These observations did not show any variation greater than 0.2 mag (the probable error in visual estimates). During the night of September 13, the star was observed for 7 hours, corresponding to the 90% of the supposed period, but no minimum was observed (see fig. 2). We must remember that, for an EW-type variable, one should observe two minima of nearly equal magnitude during a period.

During the two other nights of monitoring, too, no variation was evident.

During the second camp, at Logarghena, EL Sge was observed visually by 5 observers, during 4 nights in August 1986 (see tab. 2), using a 114 mm reflector and a 114 mm refractor. After the first night, the comparison star "C", noted by Boistel to be too elongated, was no longer used, replaced by comparison "D".

TABLE 2.

Observer	*Number of estimates* AUG 4	AUG 5	AUG 6	AUG 7	*total*
M. Aluigi (Genova - I)	12	29	28	-	69
P. Baruffetti (Massa - I)	12	37	11	12	72
A. Manna (Locarno - CH)	-	9	20	9	38
A. Maraziti (Catanzaro - I)	6	30	30	13	79
G. Nigro (Genova - I)	5	25	28	9	67
total	35	130	117	43	325

Even in this case, no minimum was observed, though during

two nights (AUG 5 and AUG 6) the period of the star was almost totally covered (fig. 3). The observers who noted slight variations (always less than 0.3 magnitudes) did not agree the one with the other, as one can expect for spurious variations, due to "position effect", weather changes, sunset light and other subjective effects. When phased according to the supposed period, these slight variations appeared to be in total disagreement with it.

We must emphasize that, during the same two camps, the variation of other faint, small-amplitude eclipsing binaries were fairly evident to all observers.

Besides of these observations, EL Sge was monitored by A. Figer in 1985 (15 nights, 45 hours of monitoring) and by the writer in 1986 (6 nights, 15 hours). These estimates showed no significant variation (fig. 4).

Figer's observations cover almost three months (from 20 JUN to 14 SEP), so even a long time-scale variation seems to be excluded.

3: CONCLUSION

The visual observations discussed in this paper clearly show that Lange's ephemeris for EL Sge is wrong, as the supposed period was almost totally covered during several nights whithout observing any minimum. This seems to invalidate the whole work of Lange, because the eventuality of a longer period which fits Lange's minima is excluded by his observation of two consecutive minima in the same night.

Moreover, during more than 90 hours of monitoring, no variation greater than 0.3 mag was observed, and simultaneous observation show that these slight variations are probably not real, even though a small doubt might still exist.

As there is no other evidence for the variability of EL Sge but Lange's observations, we are led to the conclusion that the variations of EL Sge, if they exist, are too small to be evidenced visually. This conjecture needs more observational material (namely, photoelectrical measures) to be properly investigated.

ACKNOWLEDGEMENTS

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A. Maraziti

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[2]: G. A. Lange, AU 217, 12 (1960), "Epochs of Minima and Elements of some eclipsing variables".
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[5]: G. Giuricin, F. Mardirossian, M. Mezzetti, Astron. Astrophys., Suppl. Ser. 54, 211-220, "Statistics of cathegorized eclipsing binary systems. Lightcurve shapes, periods; and spectral types".
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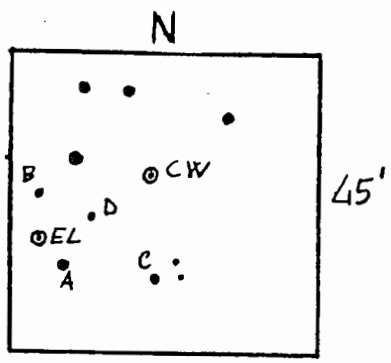
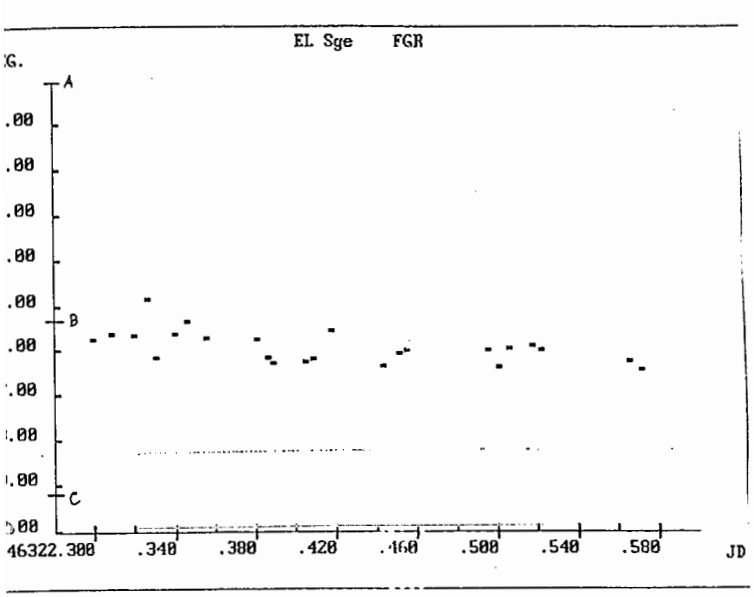
[7]: A. Figer, GEOS Circular RR 3, "133 times of maximum and first ephemeris for the RRc star VZ Dra".

(NDLR) :Rappelons que dans la GEOS NC 536, A. Figer signale que EL Sge est donnée comme constante dans le 3° volume du GCVS (1987). L'étoile est notée de magnitude B= 11.4 avec un spectre F5.

Fig.1 : Chart of EL Sge used at GEOS. The magnitude of comparison stars is unknown. Rough estimates made by the writer on the basis of Argelander degrees give the following differences in magnitudes:

A - B = 0.8 mag
B - C = 0.5 mag
C - D = 0.3 mag





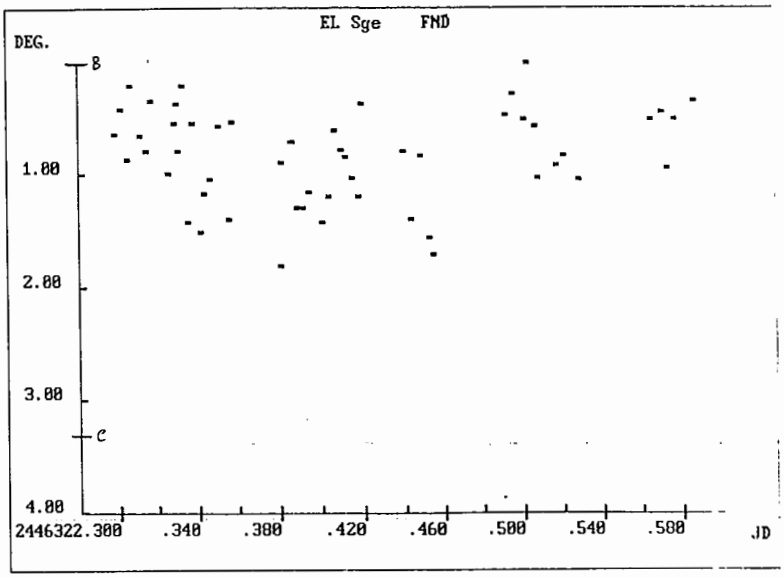
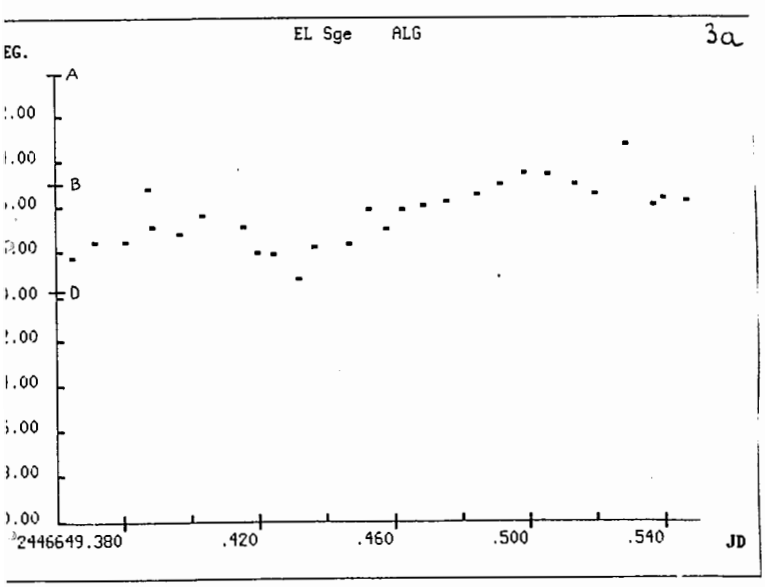
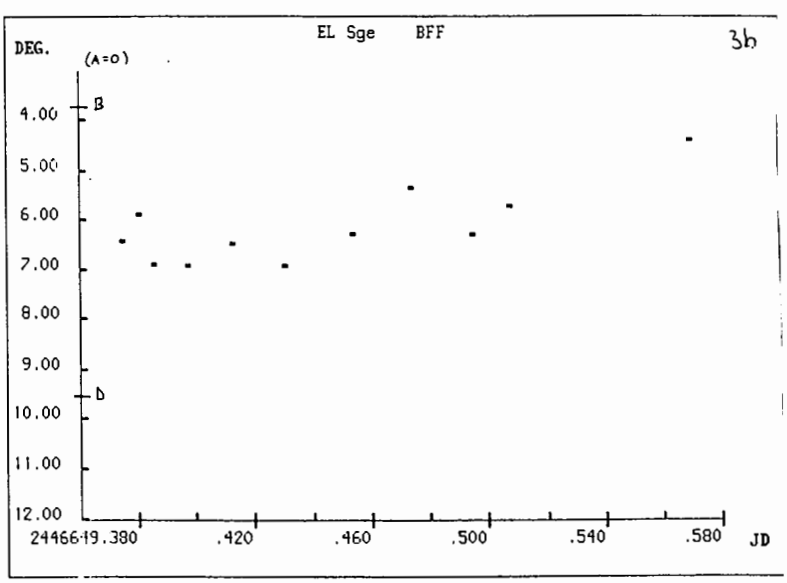
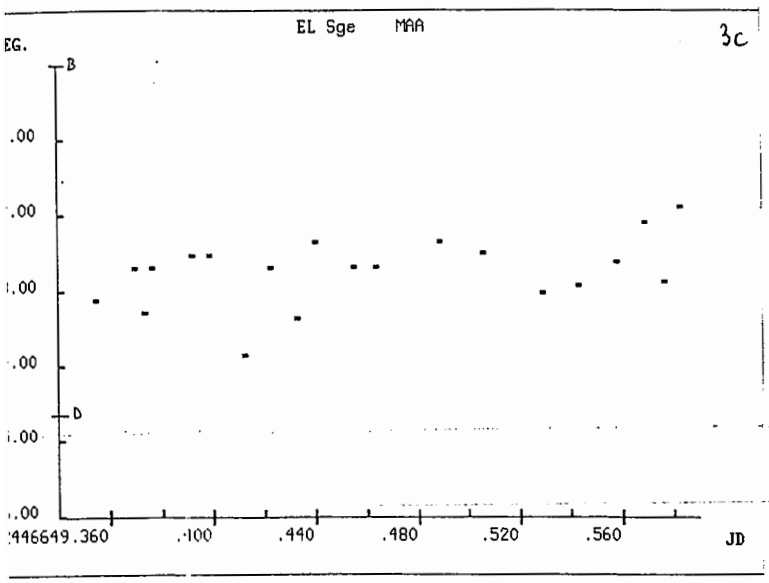


Fig. 2 (a,b): Light curves obtained by S. Ferrand and A. Figer on SEP 13, 1985. The scale of magnitudes is in Argelander degrees, referred to the comparison stars, so it is different for each observer. The value of magnitude in degrees of comparison stars is marked on vertical scales. From the approssimate values of magnitude of comparison stars, it is possible to estimate the variation observed, which results to be less than 0.2 mags. in both cases. The name of the observer is quoted as a three-letter abbreviation.

Fig. 3 (a-h): Light curves obtained by 5 observers on AUG 6, 1986. Also in this case, the scale of magnitudes is in degrees. Figures a to e show the light curves obtained by all observers on AUG 6, while figures f, g, and h show all estimates of three observers phased according to the supposed period.



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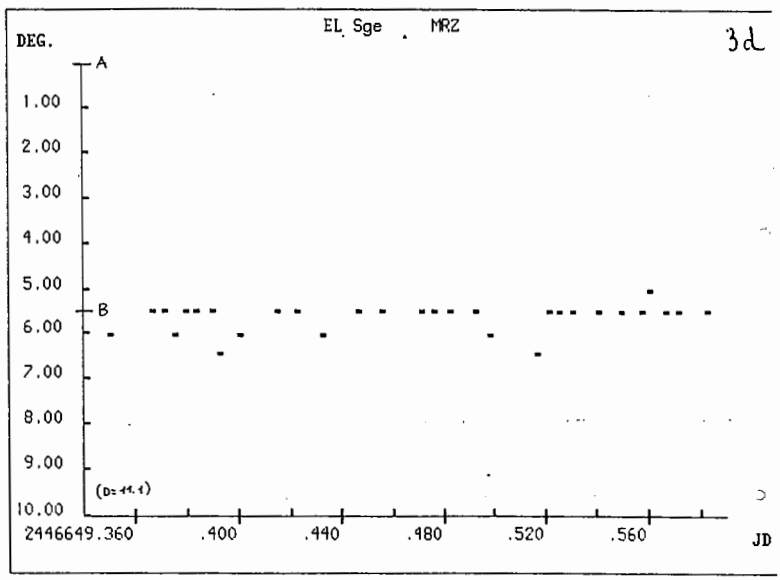
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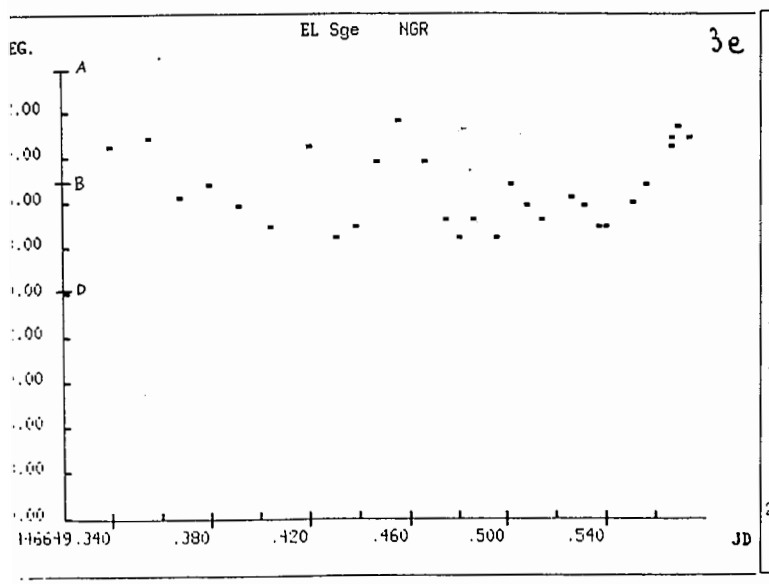
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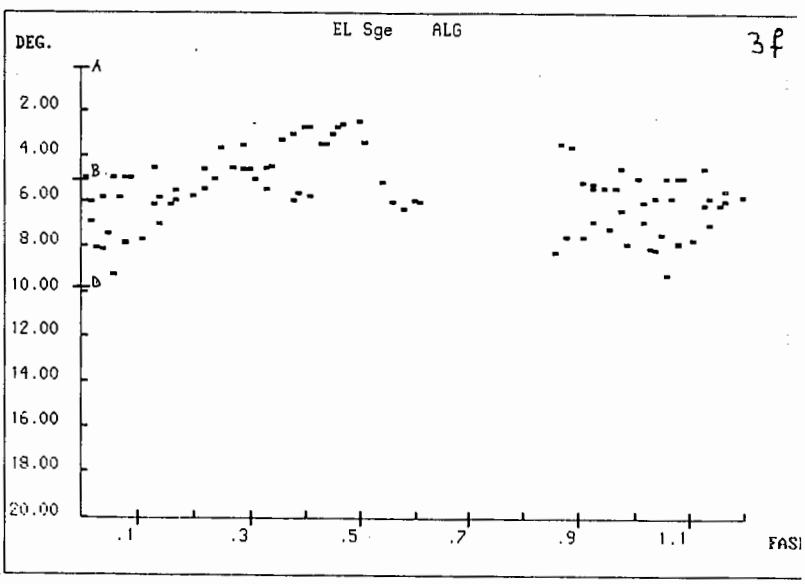
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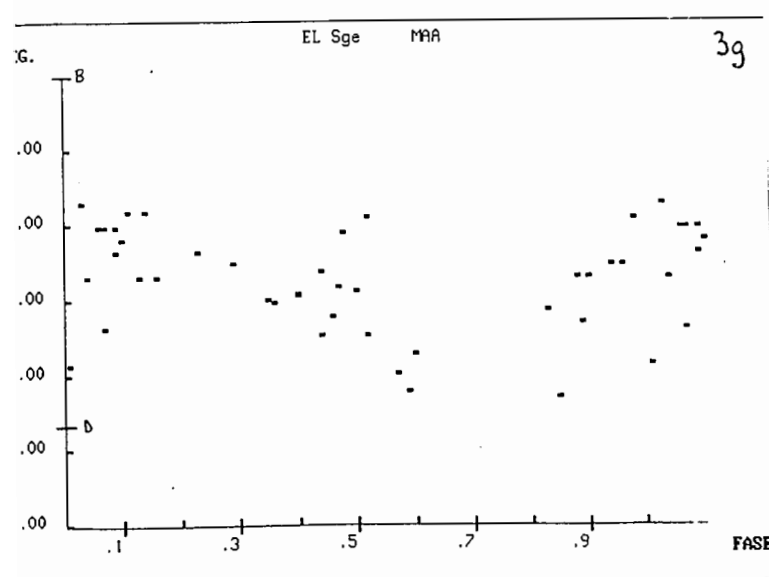
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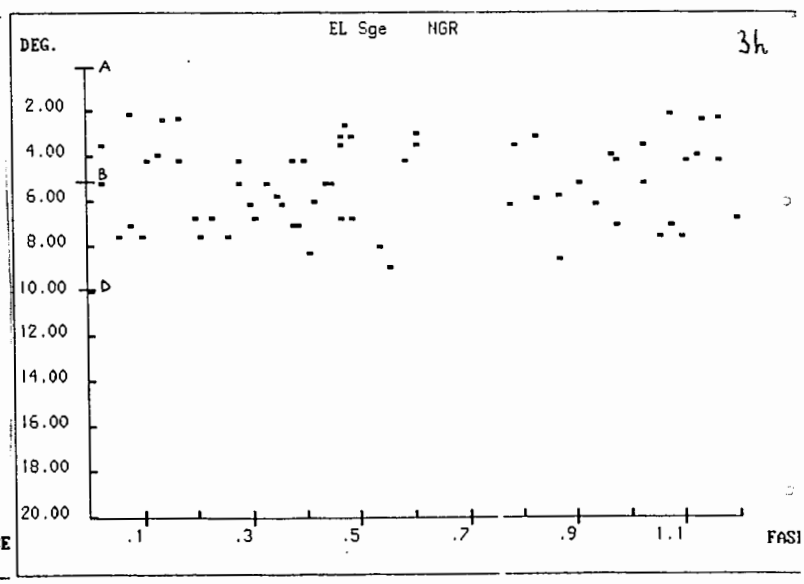
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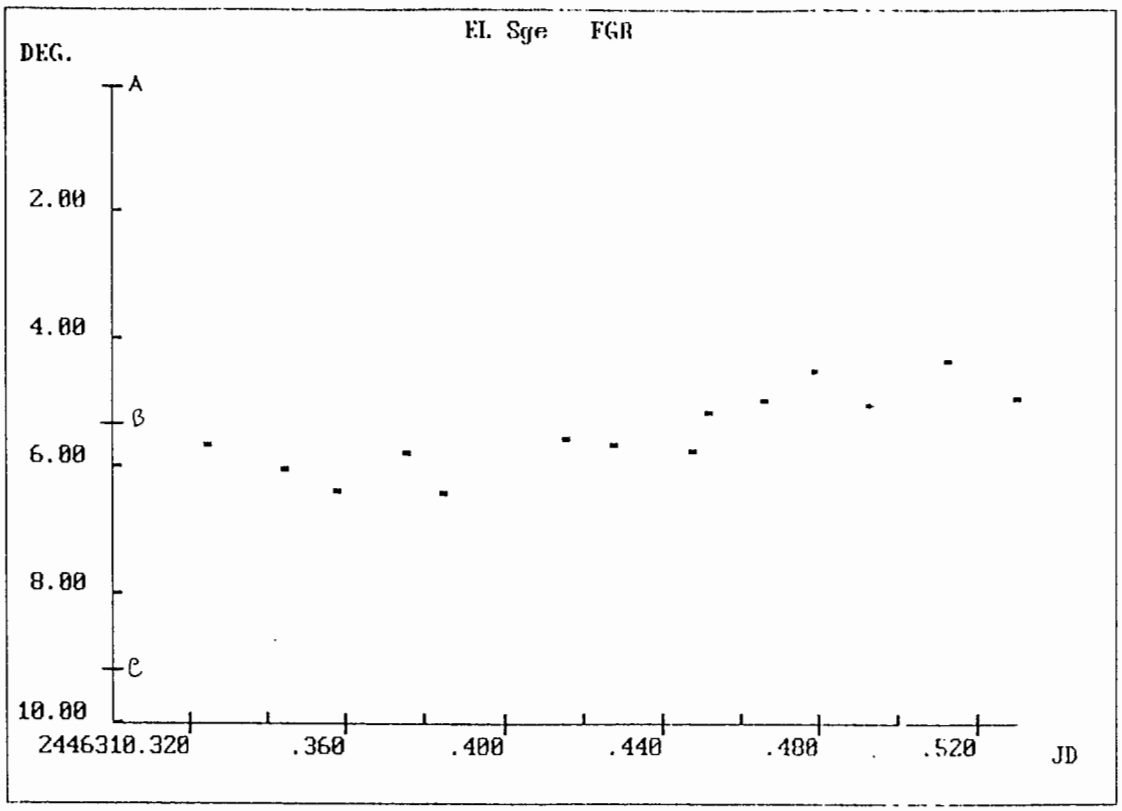

Fig. 4 : Light curve obtained by A. Figer during one of his 15 nights of monitoring of EL Sge.