

**PERIODIC LIGHT VARIATION IN B416
A LUMINOUS BLUE STAR IN M33**

O. SHEMMER, E.M. LEIBOWITZ

Wise Observatory, Tel-Aviv University, Tel-Aviv 69978, Israel, e-mail: ohad@wise.tau.ac.il

In a search program for potential SS433-like candidates in M33, carried out at the Wise Observatory in 1986 and 1987, we discovered periodic light variations in one of our program stars. It is a blue star designated B416 in the M33 bright blue and red stars catalogue of Humphreys & Sandage (1980). The star is an H α emitter, and it is No. 24 130e in field I of the H α survey of Calzetti et al. (1995), who give its 1950 coordinates as:

$$\text{RA}=01^{\text{h}}31^{\text{m}}17^{\text{s}}.370; \text{DEC}=+30^{\circ}26'26''.26$$

According to Calzetti et al., the magnitude of the star is $m_V=16.76$ and the EW of its H α emission is 109.1Å. With the distance modulus of $\mu=24.5$ for M33, and taking into account a foreground extinction towards this galaxy of $A_V=0.22$ (Van Den Bergh 1991), we obtain an estimated absolute magnitude of $M_V=-7.96$, making this star a highly luminous object.

The measurements in 1987 were performed with the Wise Observatory 320 \times 520 pixel, thinned RCA CCD camera, with no filter (Clear), in 23 nights spread over an interval of 60 days. The power spectrum of the light curve shows a clear dominant peak at the frequency corresponding to the period $P=8.55$ days. The amplitude of the variation is 0.026 mag.

The star was monitored again in the 1997-98 season using the Wise Observatory 1024 \times 1024 pixel, back-illuminated Tektronics CCD camera in Clear, V and B filters. The power spectrum of 51 Clear measurements, taken in 51 nights spread over an interval of 180 days is shown in Figure 1. It has a clear peak at $P=8.13$ days, which is statistically significant at a 99% confidence level. Figure 2 shows the light curve, folded on this period. It is rather sinusoidal with an amplitude of 0.026 mag. The power spectrum of a combined light curve, consisting of 74 Clear nightly measurements in 1987 and 1997/98 has a prominent peak at $P=8.13$ days. The same periodicity is also apparent in the light curves in the V and B filters.

We suspect that the coherent photometric variations indicate binarity, and that the 8.13 day periodicity, or possibly twice this value, is the binary period of the system.

References:

- Calzetti, D., Kinney, A.L., Ford, H., Doggett, J., Long, K.S., 1995, *AJ*, **110**, 2739
Humphreys, R.M., Sandage, A., 1980, *ApJ Suppl.*, **44**, 319
Van Den Bergh, S., 1991, *PASP*, **103**, 609

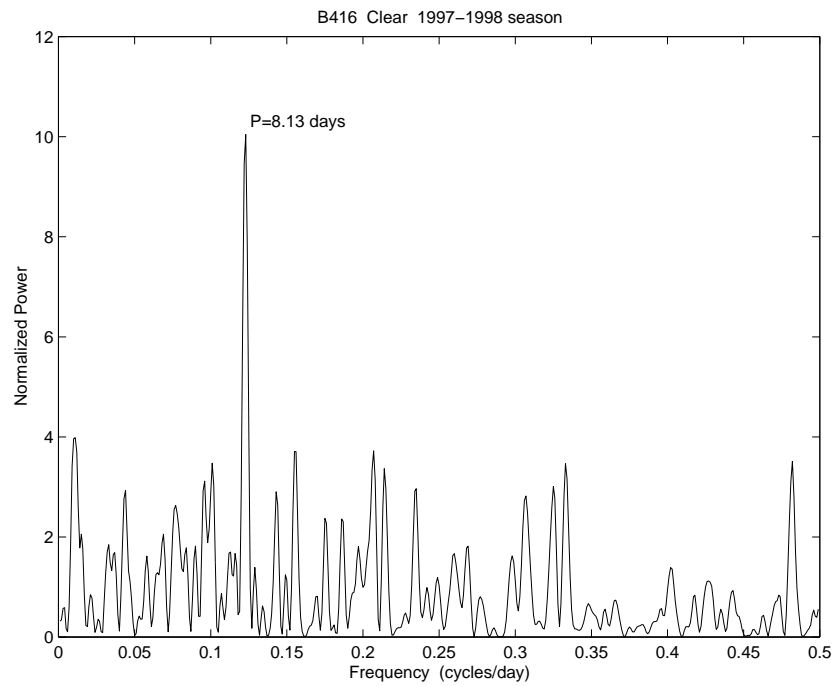


Figure 1. Power spectrum of the 1997/98 light curve of B416, consisting of 51 Clear data points. The high peak indicates a period of 8.13 days

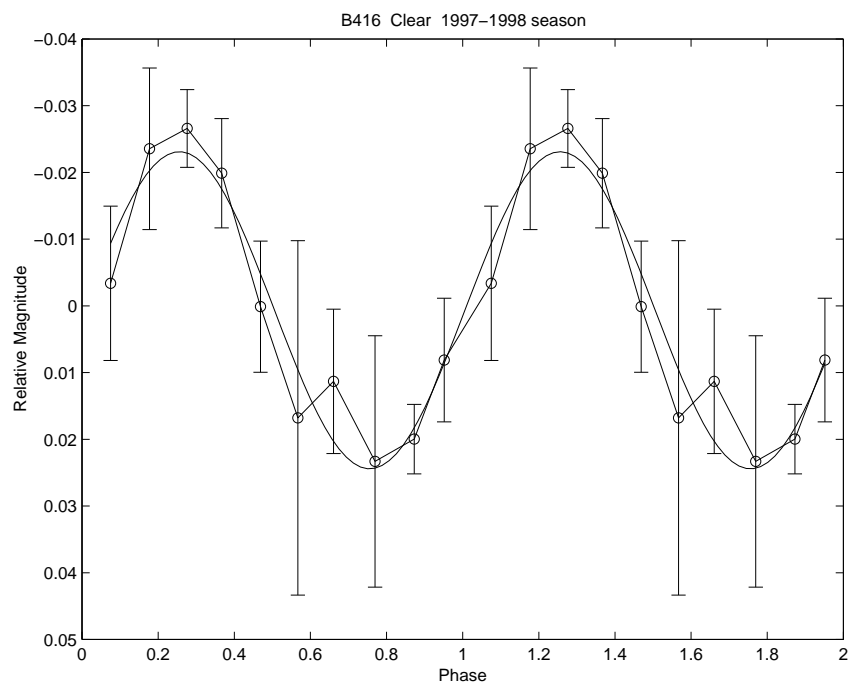


Figure 2. Phase diagram of the 51 Clear data points of 1997/98, folded on the period of 8.13 days and divided into 10 bins per cycle (open circles). A sine wave with this period is fitted by least squares to the folded data (solid line). The vertical bars represent the error bars of the binned light curve