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G327 - A NEW HORIZONTAL BRANCH VARIABLE STAR BLUEWARD OF THE RR LYRAE  
 GAP IN M4

G327 (Greenstein 1939) = A64 (Alcaino 1975) = L3315 (Lee 1977) is a horizontal branch star blueward of the RR Lyrae instability strip in the globular cluster M4 (see Fig.1). The proper motion study (Cudworth 1990) shows that G327 is a cluster member (Pc=0.99). The magnitudes and colors of this star given by different authors are:

V=13.29, B-V=0.35 (Alcaino 1975)  
 13.23, 0.43 (Lee 1977)  
 13.24, 0.47 (Cudworth 1990)

We have pointed out the variability of G327 long ago(1979). Due to the low accuracy of the photographic photometry and the unfavourable observation conditions in China, we failed to find out its period. Thanks to the use of the CCD camera, the preliminary periods have now been obtained. The observations were made with the coated GEC CCD #2 attached to the Cassegrain focus of the 60-cm reflector at the Mount Stromlo and Siding Spring Observatory on 20 and 21 July 1990. The detector contains 383 X 577 useful pixels at a scale of about 0".42/pixel, thus covering a ~2.5 X 4' field. A total of 64 frames (60 visual, 4 blue) were obtained with the exposure time of 5 minutes, and the seeing was between 2".1 and 3".5 (FWHM). Because no guiding device can be used at the 60-cm reflector during exposing, 3 frames must be discarded due to the much elongated images.

Some of the data were reduced at the Anglo-Australian Observatory with the  $\mu$  Vax 3800 and the others at the Nanjing University in China with the Sun 4 workstation. Only the aperture photometry routine of the DAOPHOT (Stetson 1987) was used to reduce the data because it is not a crowded star field. G298 (V=12.68, B-V=0.59) was used as the comparison star. Comparing with the star G300 it is shown that the constancy of G298 is better than  $\pm 0.005$  mag. Scargle's (1982) modified periodogram was used to analyse the unevenly sampled data because it can detect even faint signals in noisy (low signal to noise ratio) data. The frequency interval to be searched was from 0.8 to 26. After the data were prewhitened with the previous frequency, the same procedure was run again. Three frequencies were thus found and Breger's (1991) program PERIOD was used to improve the values of the frequencies found above simultaneously. The results so obtained are:

$$m(t) = \text{ZEROPOINT} + \sum_{i=1}^3 a_i \sin(2\pi t/P_i + 2\pi\phi_i)$$

Here P1=0.3435, a1=0.01030,  $\phi_1=0.1586$ ,  
 P2=0.1101, a2=0.00606,  $\phi_2=0.0942$ ,  
 P3=0.0550, a3=0.00577,  $\phi_3=0.3398$ ,  
 ZEROPOINT = 0.643

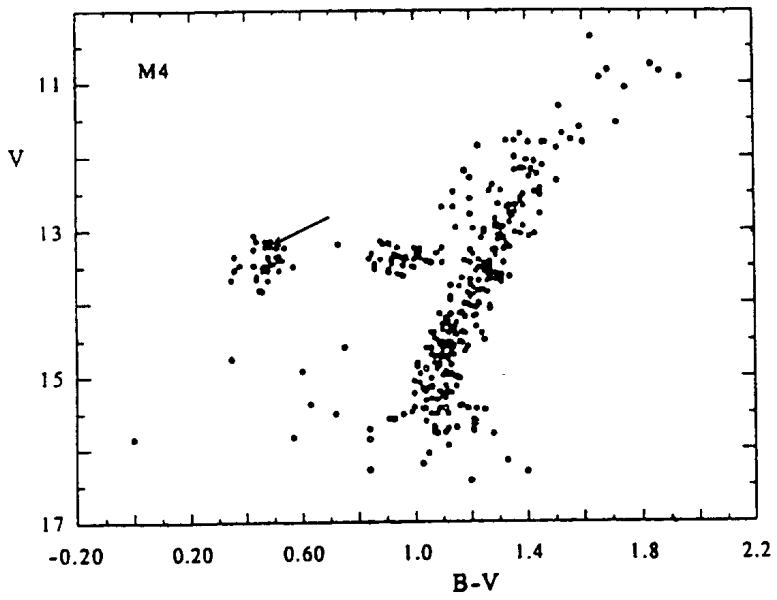


Figure 1

G327-G298

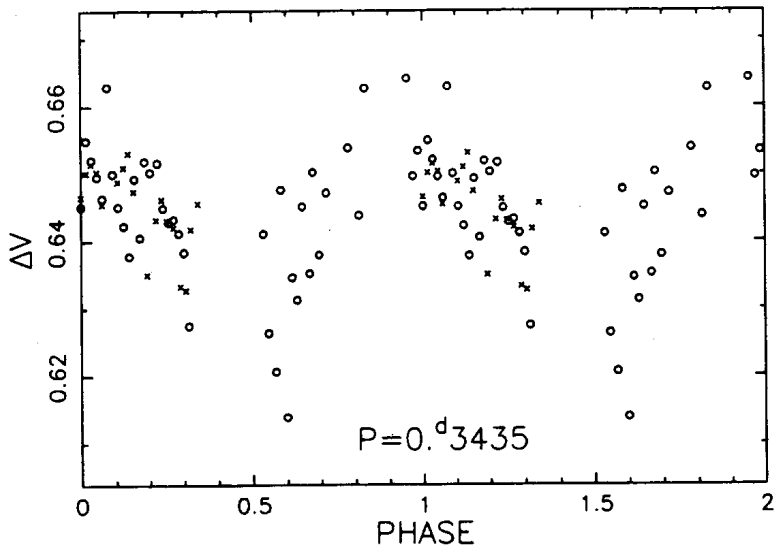


Figure 2

3

G327-G298

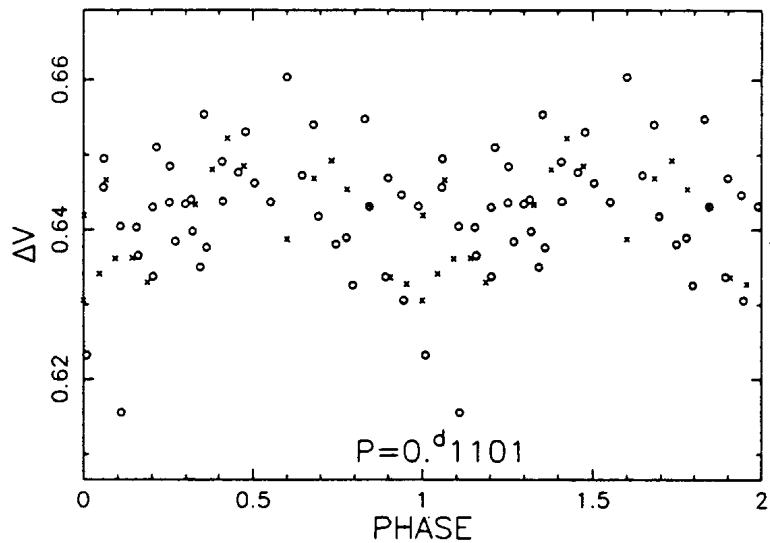


Figure 3

G327-G298

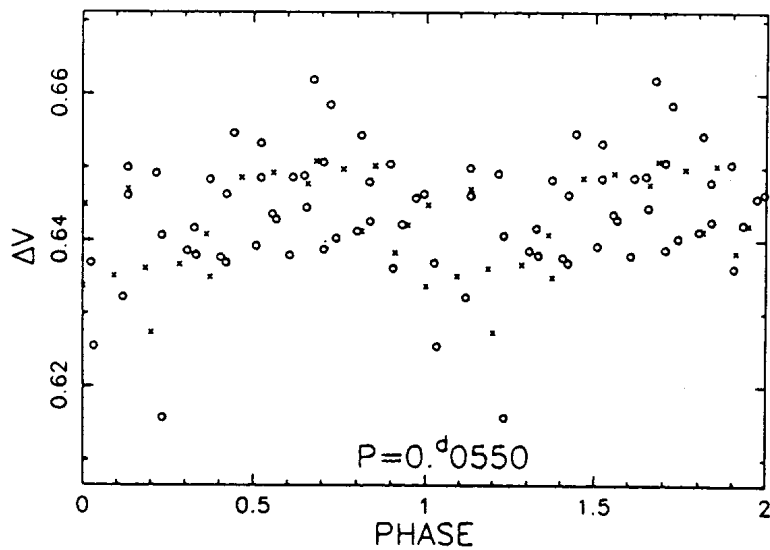


Figure 4

The folded light curves are given in Fig.2,3 and 4. Each light curve is plotted with the data prewhitened with the other two frequencies. G327 is the third horizontal branch variable star in M4 which is located blueward of the RR Lyrae gap and checked with the CCD photometry by us (Yao 1987). Is it possible that G327 pulsates both in the first-overtone and second-overtone?

However,  $P_1=0.5158^d$  seems to fit the observations too because the data are limited. Obviously, further observations are needed to determine the periods accurately.

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