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NEW RAPID PHOTOMETRY OF BQ Cnc USING CCDs

δ Scuti stars are a well known type of variable stars placed in the instability strip of the HR diagram. Periods are normally between half an hour and five hours. Although many studies have been made on δ Scuti stars (see e.g. Belmonte *et al.* 1991) both theoretical and observational, a lot of questions remain unsolved. κ mechanism is commonly adopted as the excitation mechanism (Chevalier 1971), but the fact that a concrete mode appears and disappears, after its lifetime has passed, is not completely understood. Only a few modes have been detected for each star and in some cases they may disappear before the star is observed again.

In this communication we present the results of new observations of the δ Scuti BQ Cnc. Variability of this star was discovered by Breger (1973), who reported a period of 0.074 ± 0.014 days, with an amplitude of 0.1 magnitude, corresponding to a peak of 150 μHz in the amplitude spectrum. Only three hours of observation were obtained in this occasion.

Our BQ Cnc observations were conducted on 19−22 January 1991 at the 1m Jacobus Kapteyn Telescope at 'El Roque de los Muchachos', (La Palma, Canary Islands, Spain). The detector was a CCD camera, with 400×590 pixel GEC detector. We defocussed the stars to spread the photons over a large number of pixels without reaching saturation, as we wanted to get as many photons as possible in order to increase the signal to noise ratio. We only obtained three nights of data because of bad weather, with a total of 1296 integrations of 50 seconds each, along 80 hours of observations (see Table 1).

Table 1: Journal of observations:

date (1991)	series longitude (hours)	number of integrations	atmospheric quality (1=perfect)
19 Jan	7.1	450	0.8(thin cirrus)
20 Jan	3.5	250	0.5(dust)
22 Jan	9	596	1.

Aperture photometry was used to reduce 1296 CCD frames because of defocussing. We used the aperture photometry part of DAOphot routine (Stetson 1987), although ours was not a crowded field. We applied an Iterative Sinewave fitting algorithm (Ponman 1981) to compute amplitude spectra of residual series since it has been proved to be a goood method of harmonic analysis with non-homogeneous sampling (Belmonte *et al* 1991). Results are shown in Figure 1 (a,b). Three peaks can be distinguished in the amplitude spectrum:

Frequency (mHz) (mHz)	Amplitude millimag.	Phase	Period hours
0.025	11.9	−1.0297	11.11
0.119	4.3	1.7451	2.334
0.174	4.1	0.3314	1.596

The first peak, corresponding to 11.11 hours is probably a harmonic of a day periodicity (1/2 day) due to minor atmospheric transparency and color effects, caused by the comparison star we used. This comparison star was fainter than BQ Cnc and with a different color index (it was the best we could get in the field), so corrections of the transparency are not as accurate as we would have desired. We have eliminated this effect by subtracting the peak from the amplitude spectrum. Pre-whitening of the other two frequency peaks was applied as well. Pre-whitened spectrum is presented in Figure 1c. Maybe some other peaks in the spectrum could be considered as possible real peaks. However they are too close to noise level to be confident on them. Ratio between these two possible oscillation frequencies is 0.68. With a resolution in the spectrum of 0.002 mHz, it could be the ratio $\nu_{0,1}/\nu_{1,1}\simeq 0.73$. Besides, there might be a $1d^{-1}$ aliasign misinterpretation.

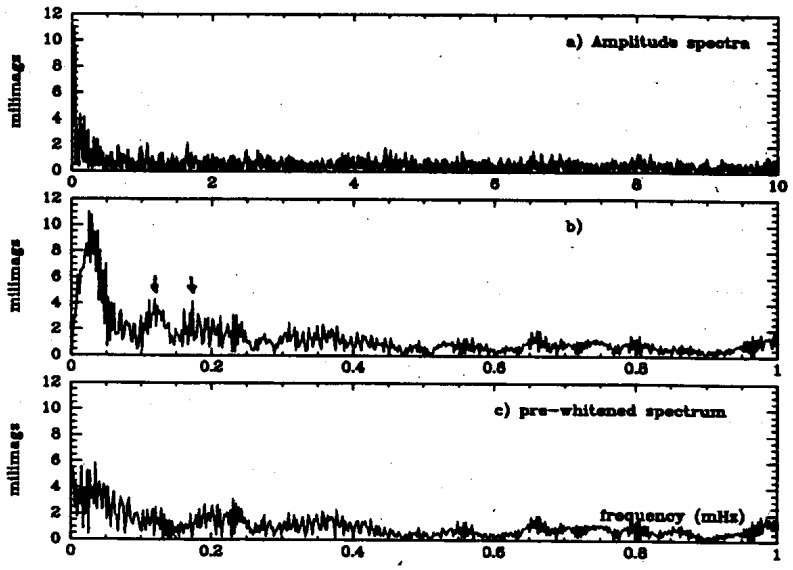

Figure 1: a) and b) Amplitude spectra of BQ Cnc, c) pre-whitened spectrum.

With these new observations, it seems possible that the frequency peak at 150 μHz discovered by Breger were, in fact, two separate peaks that he could not resolve due to the poor sampling. Resolution for this series in the amplitude spectrum was 92 μHz, and the separation between peaks found in this analysis is 68 μHz.

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