Summary of the results section of the BSc dissertation titled:

LIGHT CURVE ANALYSIS AND FINDING THE FUNDAMENTAL MODE FREQUENCY OF THE SX PHE STARS: CY AQR, KZ HYA & XX CYG, COMPARED WITH RECENT PUBLICATIONS ON THESE STARS.

An attempt was made to gather data using Shiraz University's Biruni observatory, featuring a 20-inch Cassegrain reflector telescope and photometer but after a preliminary analysis and data collection, it was observed that the due to the proximity of the observatory to the city of Shiraz and some repairs to the photometer at the time, the errors were much more than anticipated, thus the data were collected from the American Association of Variable Stars Observers (AAVSO) database and the objective of this study was shifted to comparing the AAVSO data base with published papers as a test of the reliability of this data base.

CY Aqr:

The light curve of this star is shown in Figure 1, there are 361 observational data obtained in 47 nights by three people using the AAVSO data. The Nyquist frequency, which is the highest statistical meaningful frequency, for this data set was 623.77 cycles per day. Through Fourier transform the frequency 16.3818 cycles per day with amplitude 0.2942 was obtained for CY Aqr. After applying Period04's least square fit ability, the same frequency was obtained with slightly modified amplitude: 0.2888. A phase of 0.4036 was also obtained in the above procedure. The graph of CY Aqr Fourier calculation can be viewed in figure 2.

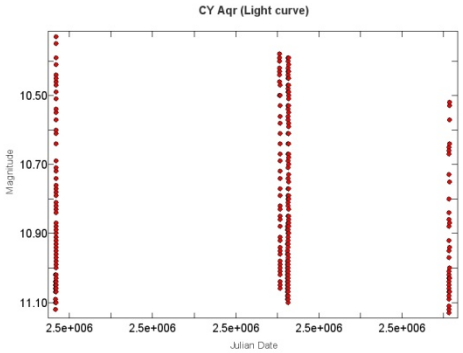

Figure 1

In their paper, McNamara et al. 1996, had obtained the frequency of 88 minutes or 16.3636 cycles per day for this star. This shows a very high similarity with the obtained result in this study (0.02 cycles per day difference). In figure 3, parts of the plotted graph obtained by this frequency are fitted onto the data.

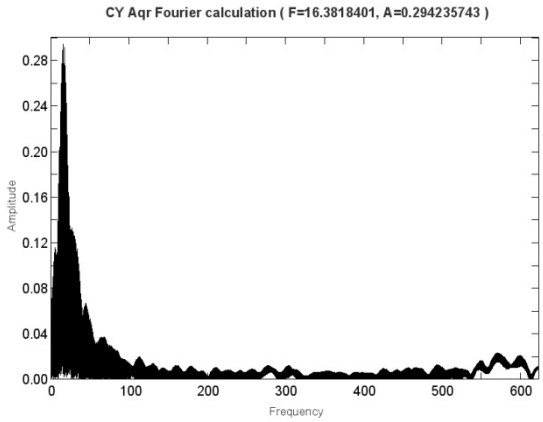

Figure 2

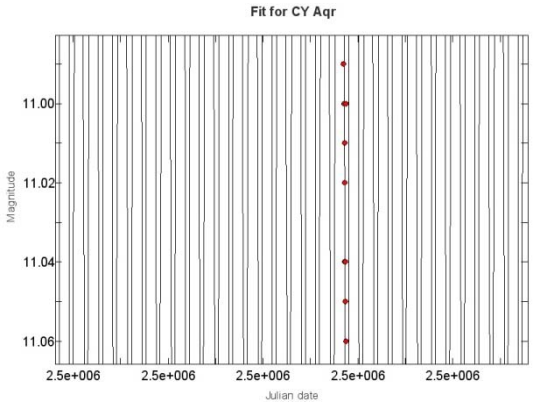

Figure 3

KZ Hya:

The light curve of this star obtained from data by the AAVSO database, contained 134 data points in 42 nights, in general the data were obtained by 8 people; Figure 4. The Nyquist frequency for this data set was 732.646 cycles per day and the primary frequency was obtained by the highest major maximum in the Fourier Transform graph; shown in Figure 5, to be: 16.0427 c/d with an amplitude and phase of 0.2498 and 0.7725 respectively. Doncel et al 2004 had previously done photometry analysis on this variable and

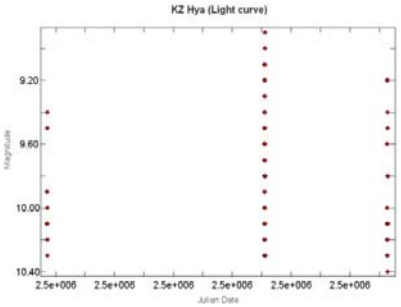

Figure 4

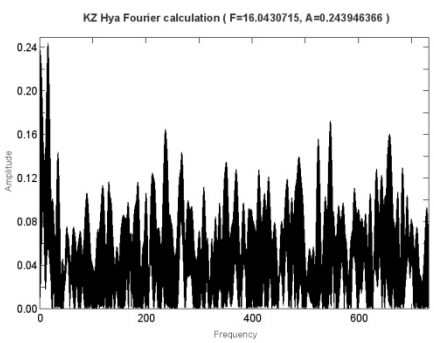

Figure 5

had obtained the frequency of 16.9175 c/d. We see the difference in the AAVSO data and that of Doncel et al. was about 0.8 c/d.

XX Cyg:

The light curve for this star contained 116 data points and was taken in 3 nights; the data had been registered by 2 people. The light curve of this star is shown in figure 6. The Nyquist Frequency for this data series was 277.553 cycles per day and the maximum frequency on the Fourier graph was 6.7422 cycles per day with amplitude of 0.3069 and phase of 0.6426. The Fourier Transform graph is shown in figure 7

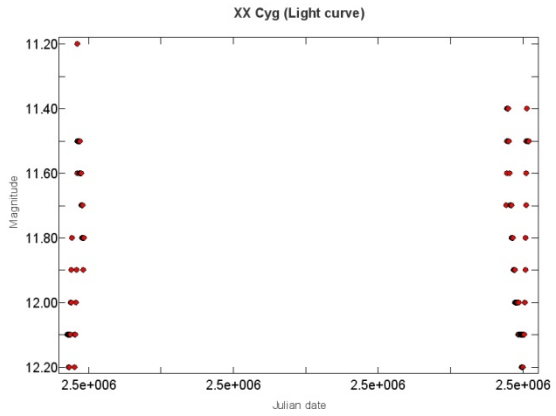

Figure 6

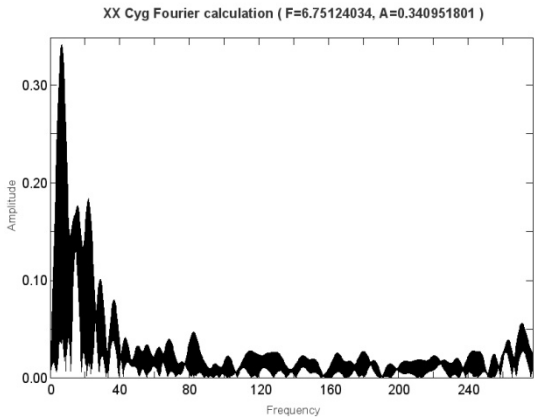

Figure 7

In the literature review, a paper titled, Amplitude and period changes in the SX Phoenicis star XX Cyg (2002) by Zhou et al, was studied in which the frequency of 7.4148 cycles per day had been found for this star, which showed a similarity to 0.67 cycles per day. Besides the primary frequency mode, four other harmonics were reported by Zhou et al; First harmonic: 14.82 c/p, Second harmonic: 22.24 c/p, Third harmonic: 29.65 c/p and the fourth harmonic was 37.07 c/p. These results which showed a very close similarity with the frequencies obtained from the AAVSO data and analyzed through the Period04 program: First harmonic: 14.85 c/p, Second harmonic: 22.89 c/p, Third Harmonic: 28.62 c/p, and fourth harmonic: 48.59 c/p. The graphs of the second to fifth mode frequencies as obtained using Period04 and the AAVSO data can be observed in figures 8 to 11.

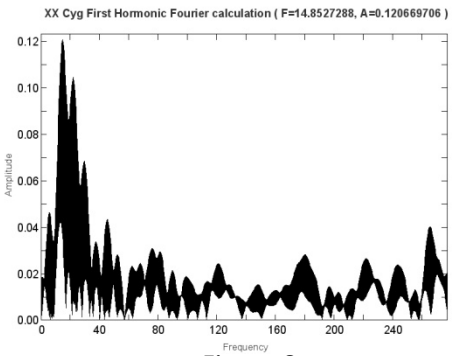

Figure 8

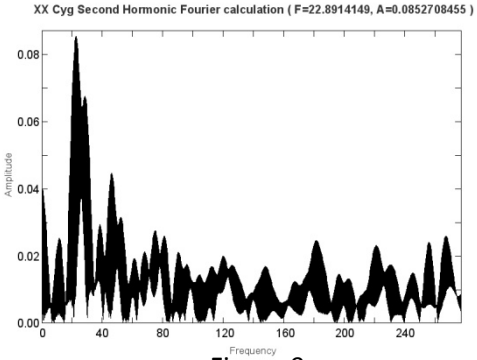

Figure 9

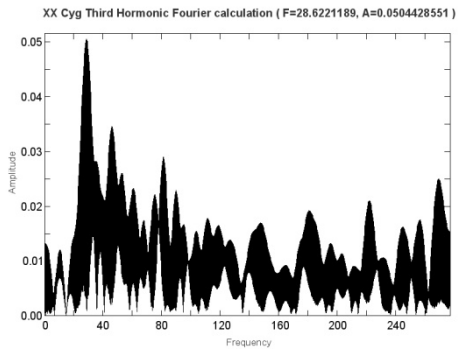

Figure 10

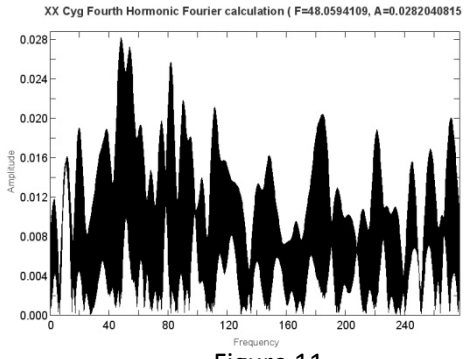

Figure 11

In the process of finding the harmonics, the Period04 program tries its best to disregard residual maximums; those maximums that enter the Fourier Transform due to gaps in the data mainly due to daytime and gaps between each two data points. If the gaps are symmetric, the residual frequencies appear symmetric about the maximum (supposing there is just one main frequency) but when more frequencies come in and the gaps aren't symmetric (like this case) and the data set contains a very limited number of data sets, like this case with only 116 data points, distinguishing the residual maximums from the actual maximums is a very difficult statistical process which Period04 finely does. We see that even with these limitations, the Period04 program and the AAVSO database have successfully acquired results very similar with Zhou et al (2002). The final graph based on all the mentioned harmonics, amplitude and phase, finely fit the light curve: Figure 12.

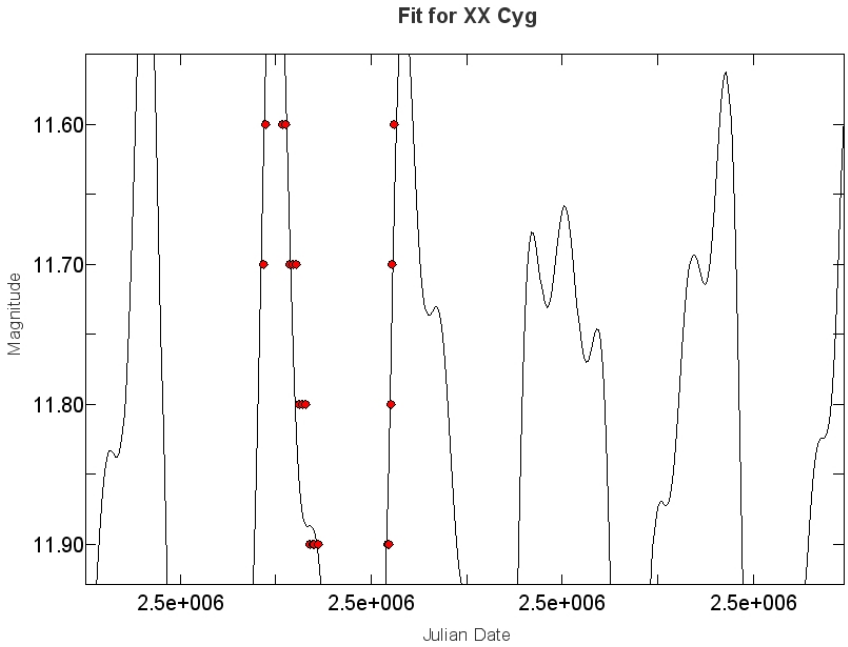

Figure 12

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