Recent Results from the High Speed Photometer

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Abstract

One of the first stellar photometry programs completed with the High Speed Photometer (HSP) on the Hubble Space Telescope (HST) was visual and ultraviolet observations of the Crab pulsar. We obtained continuous observations on four consecutive days using a visual filter (4000 - 7000 Å) and an additional observation, approximately two months later, using an ultraviolet filter (1600 - 3000 Å). Each observation has a time resolution of 10.7 μsec and spans approximately 30 minutes in duration. In addition to the observations made with the HSP, contemporaneous UBVR observations were also made at Jodrell Bank and McDonald Observatory. Some of the more prominent results include the following: 1) the main pulse arrival time is the same in the UV as it is in the optical and the radio regions of the spectrum, 2) there is essentially no difference in the shape of the optical pulse from one observation to the next, 3) the "flatness" of the peak of the main pulse suggests that the main pulse has been resolved in time, and 4) in accordance with the trend of observations from the radio to infrared wavelengths, the main pulse is slightly narrower in the UV than in the optical.

A second HSP science observing program was a long-term program to monitor the eclipsing dwarf nova, Z Chamaeleontis (P_{orb} = 107 minutes). We obtained a total of 42 observations of Z Cha in the UV (1120 - 1580 Å) each with a duration of approximately 45 minutes and separated by approximately three days. Although the majority of the observations cover the eclipse of the white dwarf and hot spot, a few observations were obtained outside-of-eclipse in order to obtain the complete light curve. During the course of this program, Z Cha underwent two "normal" outbursts in which the shape of the light curve changed dramatically. We will present a comparison of the light curve in quiescence with that during a "normal" outburst and quantify such geometrical and physical parameters as temperature and size of the white dwarf, hot spot, and accretion disk.

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Discussion

D. O'Donoghue: *Would you say that there is any difference between the UV data obtained by HST and the fast photometry obtained from the ground in the optical?*

D. Dravins: *How is it possible to determine a phase shift of 45μs between the ultraviolet and visual light curves of the Crab Pulsar given that the HST onboard clock has an accuracy of only 1 millisecond?*

Taylor: We have calculated the FWHM of the UV and the V main pulse profiles, I don't think this is a function of the accuracy of the onboard clock. You will notice that the trailing edges line up very well while the leading edges of the main pulse profiles are distinctly separated so, relatively speaking, I believe it is safe to say that the UV main pulse is narrower than the V.

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