Session 32: X Rays from Stars
1430-1550 (Room 309)

32.01 Soft X-rays From Cataclysmic Variables With Accretion Disks
J. Patterson (Columbia U.) and J. Raymond (CFA)

About half of the gravitational luminosity released by gas accreting onto a white dwarf through a disk should emerge from the star/disk boundary layer. For the high accretion rates (M(210^-9) M_s yr^-1) present in many cataclysmic variables, theory predicts that this luminosity should be in the form of an optically thick EUV/soft X-ray component, with T=2\times 10^7 K. We compare the theoretical predictions with available soft X-ray observations, and find satisfactory agreement. Previous doubts on this point were based on inappropriate choices for several critical parameters: white dwarf mass, interstellar column density, and the space density of classical novae. We also attempt to constrain the boundary layer radiation by comparing observed and predicted strengths of the He II 1640 and 4686 emission lines, assuming that these are produced by photoionization in the upper layers of the disk. The results support the optically thick model for high-M systems, but may require complicated X-ray spectra in low-M systems.

32.02 Identifications of New, X-ray Bright, Cataclysmic Variables with the HEAO-1 Scanning Modulation Collimator
D.A. Schwartz, W. Roberts (CFA), R. Remillard, H. Bradt (MIT), J. Patterson (Columbia), I. Tuohy, D. Buckley (MSSSO), F. Marshall (GSFC)

We identify the optical counterparts of three bright (~1 Jy at 3.5 keV) X-ray sources with cataclysmic variable type systems. These were all discovered as UV excess objects in or near precise, multiple lines of position obtained by the HEAO-1 Scanning Modulation Collimator, intersected with larger scale error boxes due to Uhuru, and the NRL and GSFC experiments on HEAO-1. We identify H0537-58 with an object of about 14th magnitude. The spectrum shows a weak Balmer decrement and is very similar to the AM Her type systems. The counterpart of H0459+75 is an object estimated to be 13-14 magnitude, and with a spectrum most resembling Z and RS Oph in having very strong Hα emission with the other lines extremely weak. The identification of 400540+60 is with a very UV object on a two color Schmidt plate. It shows optical flickering of 20% on 10s time scales, and up to 40x flares above a mean V = 14.6 on 10 minutes scales. It has a typical CV spectrum with very strong HeII 4686. The three objects lie at ~32°, ~34° and 15° galactic latitude, respectively. We therefore expect their distances to be between 100 and 1000 pc, and their 2-10 keV X-ray luminosities in the range 10^{34} to 10^{35} erg/s.

32.03 EXOSAT Observations of a Double X-ray Periodicity in EX Hydæ
F.A. Córdova (Los Alamos), K.O. Mason (MSSSO), S.M. Kahn (Columbia)

During a continuous 24 hour X-ray observation of the 98 minute binary EX Hydæ using the CMA detector on EXOSAT, a 67 minute modulation was detected with a pulse-fraction of about 50%. The phase of the modulation coincides with that of the 67 minute optical modulation which has a pulse-fraction of 1%. The X-ray and optical pulse shapes are virtually identical: the pulse is asymmetric with a sharp decline and a more gradual rise. A modulation with a period of 98 minutes is also apparent in the power spectral analysis of the EXOSAT data. This variation has an amplitude 50% that of the 67 minute X-ray modulation. The 98 minute phase-folded light curve is comprised of two features: a narrow, partial dip which corresponds to the duration and phase of a partial optical eclipse, and a broad, partial dip lasting about one-third of the 98 minute cycle and centered 75° earlier than the narrow feature. An analysis of extensive optical data reveals that in addition to the 67 minute variation, there are two optical modulations with pulsed fractions of 5%; one at half the orbital period, or 49.1 minutes, and one at 46.4 minutes.

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32.04 Einstein X-ray Observations of dMe Stars
K.A. Jensen * and J.H. Swank (NASA/GSFC)

Recent X-ray observations have indicated a correlation between rotation and X-ray luminosity for F5 - M stars. This correlation has been interpreted as due to coronal formation by a magnetic dynamo operating in the convection zones of rapidly rotating stars. Our Einstein IPC observations show that three dMe stars (Gliese 182, Gliese 867a, and Gliese 875.1) with rotation periods of 1 - 4 days are all bright, variable X-ray sources, with IPC count rates of 0.2 - 1.5 counts/s. This increases to six the number of dMe stars with known X-ray luminosities and rotation periods. Correlations between coronal activity and rotation for M stars can now be discussed and comparisons made with the correlations for earlier spectral types. Gliese 867 is variable on a time scale comparable to the rotation period of 4.08 days. The possibility that this variability is related to the BY Draconis syndrome will be discussed. We also have IPC data for a visual dMe binary associated with the bright HEAO-1 transient H0449-55. An X-ray flare was observed in this data. We will present quiescent and flaring X-ray spectra for our IPC observations of the four dMe systems and compare them with X-ray spectra of other dMe stars.

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32.05 X-ray Spectra of RS CVn Binaries
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We present preliminary results of a survey of the X-ray spectra of RS CVn stars. Using one and/or two temperature component Raymond-Smith spectra, we find in all cases evidence for the presence of hot (i.e., log T > 7.0) gas around these stars. Neither X-ray temperature, emission measure, nor X-ray luminosity (L_x) seems to correlate with orbital period. We explore other predictors for L_x and interpret the X-ray spectra in terms of models with a continuous distribution of emission measure vs. temperature.

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