44.06

Dependence of the Kilohertz QPO Frequency on the X-ray Variabilities at Lower Frequencies in Sco X-1

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We present here the results obtained from the analysis of the RXTE observations of Sco X-1. The correlation between the kilohertz QPO Frequency and the phase of the X-ray variability at lower frequencies (i.e. Normal Branch Oscillations (NBO) and Low-Frequency Noise (LFN)) have been studied. We have found that the results are consistent with the correlation between the kHz QPO frequency and the X-ray flux estabilished on longer time scales. These provide clues to the origin of the variability modes and kHz QPOs.

44.07

Discovery of Sidebands to kHz quasi-periodic oscillations

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We report the discovery of a third kilohertz quasi–periodic oscillation (kHz QPO) in the power spectra of three low–mass X–ray binaries, which is present simultaneously with the previously–known kHz QPO pair. The new kHz QPO is found at a frequency that is 52.8 ± 0.9 Hz, 64 ± 2 Hz, 58.4 ± 1.9 Hz higher than the frequency of the lower kHz QPO in 4U 1608–52, 4U 1728–34, and 4U 1636–53, respectively. The difference between the frequency of the new kHz QPO and the lower kHz QPO increased in 4U 1608–52 from 49.6 ± 1.4 Hz to 53.9 ± 0.5 Hz when the frequency of the lower kHz QPO increased from 672 Hz to 806 Hz. Simultaneously the difference between the frequency of the new kHz QPO and the upper kHz QPO increased by ~ 60 Hz, suggesting that the new kHz QPO is unrelated to the upper kHz QPO. In 4U 1636–53 a fourth, weaker, kHz QPO is simultaneously detected (3σ) at the same frequency separation below the lower kHz QPO, suggesting the new kHz QPOs are sidebands to the lower kHz QPO. We discuss the nature of this new kHz QPO and its implications on the models for the kHz QPOs.

44.08

Discovery of Nearly Coherent Oscillations with a Frequency of ~ 567 Hz during Type-I X-ray Bursts of the X-ray Transient and Eclipsing Binary X 1658–298

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We report the discovery of nearly coherent oscillations with a frequency of ~ 567 Hz during type-I X-ray bursts from the X-ray transient and eclipsing binary X 1658–298. If these oscillations are directly related to the neutron star rotation then the spin period of the neutron star in X 1658–298 is ~ 1.8 ms. The oscillations can be present during the rise or decay phase of the bursts. Oscillations during the decay phase of the bursts show an increase in the frequency of ~ 0.5 to 1 Hz, however, in one particular burst the oscillations reappear at the end of the decay phase at about 571.5 Hz. This represents an increase in oscillation frequency of about 5 Hz which is the largest frequency change seen so far in a burst oscillation. It is unclear if such a large change can be accommodated by present models used to explain the frequency evolution of the oscillations. Most bursts which happened during periods of X-ray dipping behavior showed weak or no oscillations, strongly suggesting that the X-ray dipping decreases the amplitude of the oscillations. This work was supported by NASA through the Chandra Postdoctoral Fellowship grant number PF9-10010 awarded by CXC, which is operated by the Smithsonian Astrophysical Observatory for NASA under contract NAS8-39073.

44.09

FUSE Observations of an X-ray Bright Region in the Vela Supernova Remnant

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We present the results of a *Far Ultraviolet Spectroscopic Explorer* observation of an X-ray selected knot in the Vela supernova remnant. Spectra were obtained through the $30^{s} \times 30^{s}$ low resolution aperture and the $4^{s} \times 20^{s}$ medium resolution aperture. O VI $\lambda\lambda$1032,1038 and C III λ977 are detected strongly in both spectra, and S VI $\lambda\lambda$933,944 is detected weakly only in the larger aperture spectrum. We also report the first detection of C II λ1037 emission in a supernova remnant. The spectra show the presence of two kinematic components along the line of sight—one with both low and high excitation emission centered at a velocity of -50 km s^{-1} and another with only low excitation emission centered at a velocity of + 100 km s^{-1}. We associate the -50 km s^{-1} component with the observed X-ray knot, and find a dynamical pressure of 3.7×10^{-10} dyne cm^{-2} driving the shock. We compare our results with data obtained using the *Hopkins Ultraviolet Telescope* at nearby locations and find that differences in the spectra imply the existence of two emitting components in the X-ray knot. Based on the X-ray morphology seen in a ROSAT HRI image, we identify two distinct regions which can be associated with these two components whose ultraviolet emission differs dramatically. These observations demonstrate the importance of high spectral resolution in understanding the proper physical relationships between the various emitting components in supernova remnants.

44.10

BeppoSAX observation of the SNR MSH 15-52

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BeppoSAX observed MSH 15-52 and PSR 1509-58 in February 1998. The instrumentation on board of this satellite provide a detailed spectroscopic analysis in a very wide X-ray band (0.1 - 200 keV), with a spatial resolution of $\sim 1.5'$, up to energies of 10 keV, that allows the analysis of different regions of the remnant.

44.11

A Chandra Observation of the SNR G11.2-0.3 and its Young Pulsar

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G11.2-0.3 is an apparently young supernova remnant which is the proposed counterpart of the historical supernova of A.D. 386, one of only eight historical supernovae recorded in the past 2000 years. It is unusual in that it contains a fast (65-ms), spin-powered, radio-quiet, X-ray pulsar powering a plerion near its center. However, the characteristic age of the pulsar, inferred from its spin-down, is 24,000 years, suggesting the two sources could be unrelated. We report on a Chandra ACIS imaging observation which, for the first time, spatially separates the X-ray emission from the pulsar, plerion, and shell. We present preliminary spatial and spectral studies of all three components, and discuss their implications for the association of the pulsar with the SNR and SN A.D. 386.

44.12

An Upper Limit on the Power-Law Index of the Radio Spectrum of Geminga

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Among the ~ 20 isolated neutron stars that emit in more than one energy band only *Geminga* was supposed to be radio-quiet. Very recently three groups at the Puschchino Radio Astronomy Observatory reported independently the detection of a weak pulsed radio emission from this source at 100