Is There a Pulsar at the Center of Cas-A?

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[Contributed talk, 15min.]

Abstract

A 50 ksec observation of the Supernova Remnant Cas-A was taken using the Chandra X-Ray Observatory High Resolution Camera (HRC) to search for periodic signals from the compact source located near the center. Using the HRC-S in imaging mode, problems with correctly assigning times to events were overcome, allowing the period search to be extended to higher frequencies than possible with previous observations (Murray (2000)). An extensive analysis of the HRC data is inconclusive in demonstrating the existence of a pulsar near the center of the Cas-A supernova remnant. Several possible candidate signals were found using various algorithms, including advanced techniques developed by Ransom (PhD Thesis Harvard university 2001) to search for low significance periodic signals. None of these candidates are at a high enough confidence level to be particularly favored over the rest, and none are strong enough to be considered real without a follow up confirming observation, which is planned in the Chandra Cycle 2 observing program for the fall of 2001. However, when combined with other information about the central region of Cas-A (e.g., spectra, total energetics, and the historical age of the SNR), one particular period candidate (around 12 msec) seems to be more physically realistic than the rest and although not necessarily real, is used for illustrative purposes in discussing the possible properties of a putative neutron star in the remnant.

A 50 ksec Advanced CCD Imaging Spectrometer (ACIS) observation was also taken. An analysis of these data for the central object shows that the spectrum is consistent with several forms, and that the emitted X-ray luminosity in the 0.5 -10 keV band is $10^{33} - 10^{35} erg\, cm^{-2} sec^{-1}$ depending on the spectral model and the interstellar absorption along the line of sight to the source. The spectrum is consistent with the model of hot polar caps suggested by Pavalov et al. 2000 and Chakrabarty et al. 2001.

CATEGORY: SUPERNOVAE, SUPERNOVA REMNANTS AND ISOLATED NEUTRON STARS