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Title:	*The Nature of the Unidentified EUV Sources: Accreting Isolated Neutron Stars?*
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The aims of this project were: (1) to investigate the nature of the EUVE 'NOID' sources, objects detected in the EUV bandpass but with no previous identification at optical or other energies; (2) to study the possible association of NOID sources with nearby, isolated neutron stars among the 1e9 predicted to exist in the Galaxy. These dead radio pulsars have not been detected so far in large numbers, but accretion from the interstellar medium can make them bright at EUV wavelengths; and (3) to use the EUVE data to set constraints on neutron star evolution, accretion physics and population properties. The original objectives of our program remain relevant. Indeed, the level of research in this area has increased substantially since our proposal was submitted as a result of new data from the ROSAT satellite. Below is a list of some of the results obtained.

EVIDENCE FOR A NEW CLASS OF EXTREME ULTRAVIOLET SOURCES.

Most of the sources detected in the extreme ultraviolet (EUV; 100A to 600A) by the ROSAT/WFC and EUVE all-sky surveys have been identified with active late-type stars and hot white dwarfs that are near enough to escape absorption by interstellar gas. However, about 15% of EUV sources are as of yet unidentified with any optical counterparts. We have examined whether the unidentified EUV sources may consist of the same population of late-type stars and white dwarfs. We presented B and R-band photometry of stars in the fields of seven of the unidentified EUV sources. We detected in the optical the entire main-sequence and white-dwarf population out to the greatest distances where they could still avoid absorption. We used colour-magnitude diagrams to demonstrate that, in most of the fields, none of the observed stars have the colours and magnitudes of late-type dwarfs at distances less than 100 pc. Similarly, none are white dwarfs within 500 pc that are hot enough to be EUV-emitters. The unidentified EUV sources we studied are not detected in X-rays, while cataclysmic variables, X-ray binaries, and active galactic nuclei generally are. We concluded that some of the EUV sources may be a new class of nearby objects, that are either very faint at optical bands or which mimic the colours and magnitudes of distant late-type stars or cool

white dwarfs. One candidate for optically faint objects is isolated old neutron stars, slowly accreting interstellar matter. Such neutron stars are expected to be abundant in the Galaxy, and have not been unambiguously detected.

ARE UNIDENTIFIED EXTREME-ULTRAVIOLET SOURCES THE CLOSEST NEUTRON STARS?

Unidentified extreme-ultraviolet sources, detected in the EUVE and ROSAT WFC all-sky surveys, could be isolated old neutron stars accreting material from the interstellar medium (ISM). The closest neutron stars, which are located in the local ISM bubble of unusually low density, are faint and cool (L~1e27 erg/s and T<6 eV). The extreme-UV spectrum of these sources is very sensitive to the HI column density, since a large fraction of the energy is emitted just below the hydrogen Lyman edge. The EUVE sources with large count rates in the long-wavelength bandpass (600A) seem to be the most promising candidates. These sources hould have low HI column density (N_HI<1e18 cm-2), constraining their distances to a few tens of parsecs. Otherwise, their spectra would be significantly modified by ISM absorption, and inevitably they would appear stronger in the short-wavelength (100A, 200A) EUVE band passes. If these unidentified objects are familiar EUV sources rather than neutron stars, i.e. white dwarfs, late-type stars, or cataclysmic variables, they are expected to be identifiable, and generally brighter than V~14.

ACCRETING ISOLATED NEUTRON STARS, PREHEATING OF INFALLING GAS AND COMETARY HII REGIONS.

Nearby, isolated old neutron stars (IONSs) accreting interstellar material may be detectable as sources of UV and soft X-ray radiation. We have investigated the interaction between this radiation field and the surrounding medium, assumed to consist of purely hydrogen and helium. This interaction results in a cometary HII region around the star which we modeled in detail by including all the relevant time-dependent ionization, recombination, heating, and cooling processes. We found that preheating of the ambient gas to temperatures higher than 1e4 K could significantly quench the accretion rate onto these neutron stars, thereby reducing the IONS number counts in the EUV and soft X-ray bands predicted by previous investigations. However, the reprocessing of hard radiation by the surrounding HII regions may enhance the delectability of IONSs at optical wavelengths. Searches for nearby accretion IONSs are currently under way.

OPTICAL IDENTIFICATION OF QUASAR 0917+7122 IN THE DIRECTION OF AN EXTREME-ULTRAVIOLET SOURCE

We have reported the identification of an R=18.3 mag, z=2.43 quasar at the position of a 6cm radio source and a faint ROSAT/PSPC X-ray source. The quasar lies within the error circles of unidentified EUV detections by the EUVE and ROSAT WFC all-sky surveys at 400A and 150A, respectively.

A 21-cm HI emission measurement in the direction of the quasar with a 21' diameter beam has yielded a total HI column density of 3e20 cm-2, two orders of magnitude higher than the maximum

allowed for transparency through the Galaxy in the EUV. The source of the EUV flux is therefore probably nearby (<100 pc), and unrelated to the quasar.

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