National Aeronautics and Space Administration

FINAL TECHNICAL REPORT FOR NAG 5-4633

Submitted to: Dr. Jean Swank, Code 662.0
NASA/Goddard Space Flight Center
Greenbelt, MD 20771

Submitted by: The Trustees of Columbia University
in the City of New York
351 Eng. Terrace
New York, New York 10027

Prepared by: Columbia Astrophysics Laboratory
Departments of Astronomy and Physics
Columbia University
550 West 120th Street, MC-5247
New York, New York 10027

Administrative P.I.: Jules P. Halpern
Science P.I.: Philip Kaaret

Title of Research: Hard X-Ray Emission from X-Ray Bursters


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The scientific goal of this project was to study the hard x-ray emission from x-ray bursters. One target of opportunity observation was made for this investigation during 1997. We obtained 38ks of data on the source 4U1705-44. The project was closely related to “Monitoring x-ray emission from x-ray bursters”, NASA project NAG5-3595, and “Long-Term Hard X-Ray Monitoring of X-Ray Bursters”, NASA project NAG5-3891, and shares publications in common with both of these.

Analysis of the x-ray timing information of that data was completed and appeared in the Astrophysical Journal in the paper “Discovery of Kilohertz Quasi-Periodic Oscillations in the Atoll X-Ray Binary 4U1705-44”, by E.C. Ford, M. van der Klis, and P. Kaaret, Astrophys. J. Letters 498, L41 (1998). This paper is mainly from the investigation “XTE Kilohertz quasiperiodic oscillations in atoll sources”, NASA grant NAGS-4416, but contains some data taken from this investigation.

To investigate the origin of the hard x-ray emission, we measured the hard lag spectrum of 4U1705-44. This is the time delay between variability in the soft x-ray band (2-9 keV in our case) versus the hard x-ray band (9-33 keV). Our results represent the first detection of hard lags from an accreting neutron star. These results appeared in the paper “Measurement of Hard Lags and Coherences in the X-Ray Flux of Accreting Neutron Stars and Comparison with Accreting Black Holes”, E.C. Ford, M. van der Klis, M. Mendez, J. van Paradijs, and P. Kaaret, Astrophys. J. Letters 512, L31 (1999). The results rule out the simplest Comptonization models for the production of hard x-rays and place strong constraints on more complex Comptonization models.