Observations of Black Hole Binaries with NICER

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Abstract

The Neutron Star Interior Composition Explorer (NICER; to be launched 2017 June) will observe both persistent Black Hole (BH) Binaries and BH-type transients during its 18-month Prime Mission. Substantial advances are expected from investigations of BH physical properties and accretion physics in strong gravity, continuing the science legacy of RXTE. One of the primary differences between NICER/XTI and RXTE/PCA Instruments is the energy response (0.2-12 keV vs 3-45 keV). NICER provides a direct spectral view of the inner accretion disk, where the maximum effective temperatures vary in the range 0.2-2 keV. In addition, NICER provides superior spectral resolution (140 eV at Fe K-alpha), superior time resolution (100 ns absolute accuracy), lower background (by a factor of 100), and full flexibility for data analyses (with complete information for every photon event). Finally the source count rate from NICER's 56 cameras will exceed the rate from RXTE (3 PCUs), except for sources obscured by very high levels of ISM column density (log Nh $>$ 22). The anticipated BH science themes include sensitive measures of the effective radius and temperature of the inner disk during BH hard states and transitions, full use the disk spectrum (as seed photons) for Comptonization models for the corona, and powerful opportunities to interpret timing properties including QPOs. Such capabilities will support a new initiative on the "disk:corona" connection, which is a fundamental component of the "disk:jet" connection and our understanding of the different accretion states. Early results from NICER will be reported, to the extent possible.

Keywords: NICER, accretion disk, accretion corona, Black hole binaries

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