

4.4 Quiescent State

The **quiescent state** corresponds to luminosities that are three or more orders of magnitude below the levels of the active states described above. The typical BHB with transient outbursts spends most of its time in a quiescent state that is characterized by an extraordinarily faint luminosity ($L_x = 10^{30.5} - 10^{33.5} \text{ erg s}^{-1}$) and a spectrum that is distinctly nonthermal and hard ($\Gamma = 1.5 - 2.1$). The quiescent state is particularly important in two ways: (a) It enables firm dynamical measurements to be made because the optical spectrum of the secondary star becomes prominent and is negligibly affected by X-ray heating (van Paradijs & McClintock 1995); and (b) its inefficient radiation mechanism underpins a strong argument for the event horizon (§8.1).

For a thorough review of the X-ray properties of this state and discussions of physical models, see McClintock & Remillard (2006). As commonly remarked, it is possible that the hard and quiescent states represent a single mechanism that operates over several orders of magnitude in X-ray luminosity. However, this question remains controversial. Corbel, Tomsick & Kaaret (2006) have recently derived precise spectral parameters for XTE J1550-564. They conclude that the quiescent spectrum of this source (and a few others) is softer than the spectrum in the much more luminous hard state.

5 X-ray Overview of State Evolution and Energetics

5.1 Overview Plots for Six Individual Sources

In §4, we described two ways of defining X-ray states: a quantitative method based on generic X-ray spectral modeling and PDS analysis (McClintock & Remillard 2006), and another based on radio properties, X-ray PDSs, and HIDs. Here we synthesize the two approaches to provide the reader with a comprehensive picture of the behavior of an accreting BH.

In Figures 4–9 respectively, we show detailed overviews of the behavior of six X-ray novae: five BHBs and one BHC (H 1743–322). Each figure contains seven panels that review the data for a single source. The overview plots can be used in two ways. One can focus on the figure (7 panels) for a particular BHB and examine for each color-coded state many aspects of the behavior of the source. The key science questions addressed by each panel are: (a, b) How do states and luminosity vary with time?; (c) How does the radiation energy divide between thermal and nonthermal components (2–20 keV)?; (d) How do the states of McClintock and Remillard (2006) relate to the states of Fender, Belloni, and Gallo (2004) which are presented in a HID?; and (e, f, g) How do three key X-ray properties – PL index, disk fraction, and rms power – vary as a function of either the hardness ratio or the X-ray state? On the other hand, one can choose a particular panel and compare the behavior of the six sources to draw general conclusions about common behavior patterns in BHBs as well as their differences. Such conclusions are discussed at the end of this Section and in §5.2.

The following comments pertain to all six figures. As an inspection of the various ASM light curves (*panel a*) shows, the data cover outbursts observed with RXTE during the time interval 1996–2004. The remaining panels (*b – g*) show results derived from RXTE pointed observations. These latter panels display several different kinds of data, but in every panel there is a common use of