J47a Peculiar Behavior of GRS 1915+105 on Its Near-Eddington Limit

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We study the X-ray spectra of GRS 1915+105 during its super-critical accretion episodes, by choosing the data with little variability from 1999 - 2000 RXTE data archive. We fitted the data with two pairs of models: firstly, the conventional disk blackbody (MCD)+thermal Comptonization model and secondly, the extended disk blackbody (extended DBB, also known as the p-free)+thermal Comptonization model. When we use the extended DBB model, we consider an appropriate temperature profile for the seed photon of the thermal Comptonization model, i.e. $T_{\rm eff} \propto r^{-p}$, where r is the disk radius and p is a fitting parameter ranging from 0.5 – 0.75. In both cases, precise interstellar absorption, reflection component (Iron-K line), and absorption features are (self-consistently) considered. From fitting with the extended DBB+thermal Comptonization, we obtained p -values that mostly deviate from 0.75 (9 out of 12 data prefer $p < 0.7$). In addition, the inner disk temperatures are higher compared to those of MCD+ thermal Comptonization fitting result. Our data produce two $L \propto T_{\rm eff}^4$-tracks in the X-ray HR diagram, despite the wide range of luminosity, L, from about 20% of the Eddington limit to slightly above it, regardless of whether we use MCD or extended DBB model for the disk component. The fact that the $L \propto T_{\rm eff}^4$-characteristic remains when the luminosity approaches and even exceeds the Eddington limit challenges the theoretical predictions of slim disk theory of super-critical accretion system. The possibility that GRS 1915+105 is a rotating black hole remains.