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Her X-1: the positive cyclotron line energy / luminosity correlation

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Studies of some bright, super-Eddington transient pulsars show a negative correlation between the energy of the cyclotron resonance scattering feature (CRSF) and the bolometric luminosity. For Her X-1, using repeated RXTE observations during 1996-2005, the inverse dependence was found: the energy of the cyclotron line increases as the luminosity increases. The X-ray flux measured by the RXTE/ASM (2-10 keV) has been assumed to represent the luminosity - more precisely: the maximum X-ray flux reached during the respective 35 d Main-On. Here, we question whether the ASM flux is really an accurate measure of the bolometric luminosity of the source. We redetermined the energy of the cyclotron line and performed spectral fits using the combined data from the PCA (3.5-60 keV) and HEXTE (20-75 keV) instruments on RXTE of the same 35 d cycles as used in the original work to determine the bolometric flux from those spectra. We confirm the result of the original analysis that the cyclotron line energy changes by ~7% for a change in flux by a factor of two.

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