

AN EMISSION LINE IN THE HARD X-RAY SPECTRUM OF HERCULES X-1:
QUANTIZED CYCLOTRON EMISSION FROM THE NEUTRON STAR

By

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A four hour balloon observation of HERC X-1 during the 'On-state' in the 35 day cycle was performed on May 3rd, 1976. The 1.24 second pulsations show a pulsed fraction of $58 \pm 8\%$ in the 18-31 KeV interval. A pulsed flux (1.24 sec) was discovered in the 31-88 KeV interval with a pulsed fraction of $51 \pm 14\%$. The spectrum of the pulsed flux can be represented up to 50 KeV by an exponential distribution with KT approximately 8 KeV. At approximately 58 KeV a strong and narrow line feature occurs which we interpret as electron cyclotron emission ($\Delta N = 1$ Landau transition) from the polar cap plasma of the rotating neutron star. The corresponding magnetic field strength is approximately 5×10^{12} Gauss, neglecting gravitational red shift. There is evidence for a second harmonic at approximately 110 KeV ($\Delta N = 2$).

The astrophysical application of this discovery will be discussed in some detail.