

"High Accuracy Atomic Physics in Astronomy", IP/ITAMP workshop, August 7-9, 2006, The Harvard-Smithsonian Center for Astrophysics, Cambridge, MA, in honor of Prof. Micheal J. Seaton

ACCURATE ATOMIC RATES AND THE WINDS FROM BLACK HOLE ACCRETION DISKS

John Raymond

The Harvard Smithsonian Center for Astrophysics, 60 Garden Street, Cambridge, MA 02138, USA

Email: jraymond@cfa.harvard.edu

Recent X-ray observations of a Black Hole Binary system in outburst revealed 90 absorption lines and measured their Equivalent Widths with unusual accuracy. Photoionization models made it possible to constrain the density, location, temperature and elemental abundances in the absorbing gas and, by eliminating the other possibilities, to show that it is a magnetically driven wind. The models depend mainly on photoionization cross sections, radiative recombination rates and low temperature dielectronic recombination rates. Collisional excitation of an Fe XXII fine structure line also provides a crucial density diagnostic. The observed absorption lines include H-like ions of elements not usually seen in X-rays, Na, Al, P, Cl, K, Ti, Cr, Mn, and Co. We discuss the sensitivity of the models to various atomic rates.