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Simulating Observations Of HMXBs With Athena's X-IFU To Test New Method Of Constraining Black Hole Mass Using High Resolution X-ray Reverberation Mapping

Classification of the compact object in bright X-ray binaries in our Galaxy is primarily established by means of mass measurement. In X-ray binaries, the mass function f(M) is the only directly measurable quantity, offering a lower limit for the mass of the compact object. In the case of many HMXBs, f(M) has proven too low to distinguish between a NS or BH primary. In these systems, a fraction of the compact object X-ray luminosity is intercepted by the surface of the secondary star and is 'reflected' by line fluorescence and Compton reflection. This emission reaches the observer with a time delay ~ a/c, where a is the separation between the compact object and the secondary star. A new method for estimating the orbital radius by measuring this time delay using temporally resolved high resolution spectroscopy was proposed by Vikhlinin, 1999. We use SIXTE to simulate observations of Cygnus X-1 performed with Athena's X-ray Integral Field Unit (X-IFU) instrument to explore the feasibility of extracting the time delay between the direct and the reflected emission from similar systems using X-IFU's capabilities.