XII SERBIAN CONFERENCE ON SPECTRAL LINE SHAPES IN ASTROPHYSICS
June 3-7, 2019, Vrdnik, Serbia
Book of Abstracts, Eds. D. Ilić, E. Stambulchik, A. Kovačević and L. Č. Popović
Faculty of Mathematics, University of Belgrade, 2019

Invited Lecture

POSSIBLE OBSERVATIONAL SIGNATURES OF SUPERMASSIVE BLACK HOLE BINARIES IN THEIR Fe Kα LINE PROFILES

P. Jovanović[1], V. Borka Jovanović[2], D. Borka[2] and L. Č. Popović[1]

[1] *Astronomical Observatory, Volgina 7, P.O. Box 74, 11060 Belgrade, Serbia*
[2] *Atomic Physics Laboratory (040), Vinča Institute of Nuclear Sciences, University of Belgrade, P.O. Box 522, 11001 Belgrade, Serbia*

E-mail: pjovanovic@aob.rs, vborka@vinca.rs, dusborka@vinca.rs, lpopovic@aob.rs

In order to study the potential observational signatures of supermassive black hole binaries (SMBHBs) in the Fe Kα line profiles emitted from the relativistic accretion disks around their components, here we simulated such profiles and compared them with those emitted from the accretion disks around single supermassive black holes (SMBHs). We considered two cases of the SMBHBs: a case when the secondary SMBH is embedded in the accretion disk around the primary, causing an empty gap in the disk, and a case with clearly separated components, where the accretion disks around both primary and secondary give a significant contribution to the composite Fe Kα line emission of a such SMBHB. For this purpose, we simulated these Fe Kα line profiles using ray tracing method in Kerr metric. The obtained results showed that both cases of SMBHBs can leave imprints in the form of ripples in the cores of the emitted Fe Kα line profiles. However, in the case of the composite line profiles emitted from two accretion disks, these ripples could have much higher amplitudes and strongly depend on orbital phase of the system, while in the case with empty gap in the disk around primary, the corresponding ripples mostly have lower amplitudes and do not vary significantly with orbital phase. The spectral resolution of the nowadays X-ray detectors, such as those onboard XMM-Newton, Chandra and Suzaku satellites is still not sufficient to detect and study in details these ripple effects in the observed Fe Kα line profiles from the SMBHBs. However, taking into account that the next generation of X-ray observatories (like Advanced Telescope for High Energy Astrophysics - ATHENA) will provide around 100 times higher spectral resolution, it will be possible to detect such signatures in the line profiles from the observed SMBHBs, and to use them as a tool for studying the properties of these objects.