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COMPOSITE PROFILE OF THE Fe Kα SPECTRAL LINE EMITTED FROM A BINARY SYSTEM OF SUPERMASSIVE BLACK HOLES

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Binary systems of supermassive black holes (SMBHs) originate in galactic mergers and it is believed that their coalescences represent the most powerful sources of gravitational waves. Electromagnetic radiation in different spectral bands emitted during such coalescences represents the most direct evidence for the formation of such binary systems, as well as their essential observational signatures. At some stage during galactic merger, two SMBHs initially carried within the bulges of their host galaxies, will become gravitationally bound and will start to orbit around their center of mass with velocities of a few thousand km s^{-1}. In such cases, accretion of the surrounding matter on both SMBHs could be expected, and as a result, a strong X-ray emission in the broad Fe Kα line at 6.4 keV might be observed. We developed a model of a relativistic accretion disk around a SMBH, based on ray-tracing method in the Kerr metric, and used this model to study the variations of the composite Fe Kα line emitted from two accretion disks around SMBHs in a binary system. We assumed that in this first stage the orbit of such a binary system is approximately Keplerian and simulated the composite line shapes during different orbital phases and for different mass ratios of the SMBHs. The obtained results show that, if observed, such composite Fe Kα line profiles could be used for constraining several orbital elements of the binary system and some parameters of its components.