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OPTICAL AND X-RAY COUNTERPART OF SUBPARSEC SUPERMASSIVE BINARY BLACK HOLES

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In order to study the optical and X-ray counterparts of subparsec supermassive black hole binaries (SMBHBs) in the profiles of optical spectral lines emitted from the broad line region (BLR), as well as from the X-ray spectral lines emitted from the relativistic accretion disks around both components, here we simulated such profiles and compared them with each other. For that purpose, we assumed a realistic set of orbital elements and mass ratios for such a SMBHB and used them to simulate the corresponding composite Hβ spectral line in the optical band and the Fe Kα line in the X-ray band. The Hβ line is assumed to come from two BLRs that follow the dynamics of component motions and an additional circumbinary BLR that surrounds the SMBHB system (see Popović et al. 2021). Regarding the X-ray band, we studied the composite Fe Kα line using the ray tracing method in Kerr metric, assuming that both accretion disks around primary and secondary give a significant contribution to the total Fe Kα line emission of such a SMBHB (see Jovanović et al. 2020 and references therein). The obtained results showed that SMBHBs could cause a specific, but different variability of the both Hβ and Fe Kα lines, leaving potentially detectable

imprints in their profiles. Since these imprints depend on the orbital phase of the system, they could be used for reconstructing the Keplerian orbits of the components in the observed SMBHBs. Moreover, such signatures in the optical and X-ray line profiles from the observed SMBHBs could be used as a tool for detection of these objects, as well as for studying their properties.

References

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