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The fate of Super Massive Black Holes in galaxy mergers

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We study numerically the fate of SMBHs in galaxy mergers. If the galaxies involved in these mergers have a gas fraction of at least %1 is expected that a massive gaseous disk with a mass of ten to hundred times the mass of the SMBHs will be formed in the central kilo parsec of the merger remnant. The SMBHs in these nuclear region will form a SMBH binary which separation will shrink mainly due to the gravitational torque produced by the gaseous disk. We focus our study in the transport of angular momentum from the binary to the disk and how this transport can result on the formation of a gap in the gaseous disk. If the formation of such gap occurs the shrinking of the SMBH binary will be dramatically delayed, instead if the binary doesn't excavate a gap on the disk the shrinking of the binary will continue until the extraction of angular momentum due to the emission of gravitational waves becomes efficient enough to drive the final coalescence of the binary.
We find in all our simulations of galaxy mergers that the formation of such a gap is unlikely and will be possible only if the SMBH binary mass is comparable or much greater than the mass of the gaseous disk. Our simulations imply that the mass of the SMBHs must be at least of the order of 10^{10} $M_{\odot}$, which is larger than the mass of the most massive SMBHs harbour by giant elliptical galaxies or cD galaxies. Our results have important implication on the number of SMBHs that will experience a fast migration and will enter in the gravitational wave emission regime, estimation that it is crucial to determine the amount of gravitational waves that we expect to observe with the future mission eLISA.

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