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Triple Supermassive Black Hole evolution in NGC 6240

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One of the main possible ways to create the supermassive black hole (SMBH) is a so-called hierarchical merging scenario. At the final phase of interacting and colliding host galaxies, the central SMBHs are observed as SMBH binary (SMBHB) candidates at different separations from hundreds of pc to mpc. But only several triple SMBHs systems have been detected so far.
One of them is a well studied ULIRG galaxy NGC 6240 which was first spatially and spectroscopically resolved in X-rays by Chandra as SMBHB system. Later high-resolution data from MUSE instrument at the ESO VLT may resolve the third active galactic nuclei (AGN). Dynamical calculation of the central SMBH triple merging in a dense stellar environment allows us to retrace their evolution from kpc to mpc scales.
We present the set of direct N-body simulations with different particle numbers (N=67.5k, 135k, 240k, 540k) and five different randomizations of initial positions and velocities of particles.
We found the formation of hierarchical triple systems in approximately 80 per cent of systems, while other 20 per cent of systems fly apart. In large part of the formed hierarchical triple systems, we observe the oscillation of eccentricities and inclination between inner and outer orbits, which is the demonstration of Lidov-Kozai mechanism. This process can be one more mechanism to solve the merging BHs "last final parsec" problem.
Further detailed research of rare dual/multiple BHs in a dense stellar environment (based on observations data) can clarify the dynamical co-evolution of central BHs and their host-galaxies.

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