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Extreme Resonant Eccentricity Excitation of Stars around Merging Black-Hole Binary

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We study the dynamics of a star orbiting a merging black-hole binary (BHB) in a coplanar triple configuration. During the BHB ' s orbital decay, the system can be driven across the apsidal precession resonance, where the apsidal precession rate of the stellar orbit matches that of the inner BHB. As a result, the system gets captured into a state of resonance advection until the merger of the BHB, leading to extreme eccentricity growth of the stellar orbit. This resonance advection occurs when the inner binary has a nonzero eccentricity and unequal masses. The resonant driving of the stellar eccentricity can significantly alter the hardening rate of the inner BHB and produce observational signatures to uncover the presence of nearby merging or merged BHBs.

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