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Resonance-induced eccentricity in spherical extreme-mass-ratio inspirals

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It has been shown that spherical orbits around Kerr black holes remain spherical (zero eccentricity) under the influence of gravitational radiation reaction in the adiabatic limit. I will show that spherical orbits in non-Kerr black holes that still preserve most of the good qualities and symmetries of Kerr spacetime can access certain resonances in such a way that an initially spherical inspiral acquires nonzero eccentricity and becomes nonspherical. The strength of resonant excitation of eccentricity depends on the initial position and inclination of the integrable EMRI system. The harmonics of gravitational waves emitted from these inspirals undergo a frequency modulation as the orbit "metamorphoses"from spherical to nonspherical, due to the effect of resonant eccentricity excitation. The gain that low-amplitude harmonics experience in these oligochromatic EMRIs, due to resonances, may be detectable with future spaceborne detectors and serves as an indicator of non-Kerrness of the background spacetime.

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