Abstract Submitted
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Secular evolution of very eccentric, inclined orbits around a supermassive rotating black hole[1] CLIFFORD WILL, Univ of Florida - Gainesville, MATTHEW MAITRA, Cambridge University, Cambridge — We analyze the secular evolution of the highly eccentric, inclined orbit of a star or black hole in the field of a rotating massive Kerr black hole. Such orbits, with $1 - e$ ranging from 10^{-2} to 10^{-6} may be the end result of a process of stellar interactions in a dense nuclear star cluster surrounding the black hole, leading to extreme-mass ratio inspirals (EMRIs). The calculations are done in post-Newtonian (PN) theory, through 3PN order in the conservative sector, including spin-orbit, quadrupolar and $(\text{spin})^2$ terms from the Kerr geometry, and through 4.5PN order, including 4PN spin-orbit contributions, in the radiation reaction sector. We also incorporate an accurate criterion for capture of the body by the rotating black hole for arbitrary inclinations. For a range of initial values of the bodys semi-major axis, eccentricity and inclination, we determine the time and number of orbits until plunge and the final orbital eccentricity. We also estimate the gravitational-wave frequency and energy flux at the final plunge, as a function of the orbital inclination.

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