

EM counterparts to extreme mass ratio inspirals: quasi-periodic eruptions

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Quasi-periodic eruptions (QPEs) are intense repeating soft X-ray bursts with recurrence times about a few hours to a few weeks from galactic nuclei. Though the debates on the origin of QPEs have not completely settled down, more and more analyses favor the interpretation that QPEs are the result of collisions between a stellar mass object (a stellar mass black hole or a main sequence star) and an accretion disk around a supermassive black hole (SMBH) in galactic nuclei. If this interpretation is correct, QPEs will be invaluable in probing the orbits of stellar mass objects in the vicinity of SMBHs, and further inferring the formation of extreme mass ratio inspirals (EMRIs), one of the major targets of spaceborne gravitational wave missions. In this work, we extended the EMRI orbital analysis in Paper I arXiv:2401.11190 to all the known QPE sources with more than flares observed. Among all the analyzed 5 QPE sources, two distinct EMRI populations are identified: 4 EMRIs are of low orbital eccentricity (consistent with 0) which should be born in the wet EMRI formation channel, and 1 mildly eccentric EMRI is consistent with the predictions of both the dry loss-cone formation channel and the Hills mechanism.

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