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Evolution of binary systems accompanying axion clouds in extreme mass ratio inspirals

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Axions can form a cloud around a rotating black hole (BH) by the superradiant instability. We expect to be able to explore axions from gravitational waves (GWs) from binary BHs. In particular, when the BH with a cloud belongs to a binary system, the resonant phenomenon occurs during the inspiral phase. We study the evolution of binary systems accompanying the axion cloud around the resonance frequency, focusing on small mass ratio cases. We also discuss the implication to the observational signatures and show that the modification of the GW frequency evolution can be a signature of the presence of axions.

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