

Whispers from the Dark Universe - Particles & Fields in the Gravitational Wave Era

CLUSTER OF EXCELLENCE
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WHISPERS FROM THE DARK UNIVERSE – PARTICLES & FIELDS IN THE GRAVITATIONAL WAVE ERA

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Signatures of ultralight bosons in the orbital eccentricity of binary black holes

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It is well known that clouds of ultralight particles surrounding black holes produced by the superradiant instability can experience Landau-Zehner transitions if the black hole is part of a binary system.

We study the effect of orbital eccentricity, backreaction of the cloud onto it and observational possibilities with future gravitational-wave detectors like the Laser Interferometer Space Antenna, as well as the planned deciHertz gravitational-wave observatories. For black hole binaries with chirp masses below $10 M_{\odot}$, such effects would provide strong evidence for the existence of a new particle of mass between 10^{-13} to 10^{-11} eV.

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