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Self-force on a scalar particle in a class of wormhole spacetimes

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Abstract

We consider the self-energy and the self-force for scalar massive and massless particles at rest in a class of wormhole spacetimes. We develop a general approach to obtain the self-force and apply it to the two specific profiles of the wormhole throat, namely, with singular and with smooth curvature. We found that the self-force changes its sign at the point where nonminimal coupling ξ=1/8 (for the massless case) and it tends to infinity for specific values of ξ. It may be attractive as well as repulsive depending on the profile of the throat. For the massless particle and minimal coupling case, the electromagnetic results are recovered. © 2009 The American Physical Society.

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