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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 $\xi=1/8$ (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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