

Abstract Submitted  
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**Breakdown of the Equivalence Principle for a Quantum Body.**

ANDREI LEBED, University of Arizona — We calculate passive gravitational mass of a quantum body with inner degrees of freedom and investigate the possible application of the Equivalence Principle (EP) to it. We show that, in the most practical cases, the EP is applicable, as expected. Nevertheless, in one important case, where we have a coherent macroscopic ensembles of the superpositions of the stationary quantum states (which we call Gravitational demons), the EP is shown by us to be broken [1,2]. We demonstrate that the calculated weight of such ensemble (i.e., its passive gravitational mass) is not related to energy by the Einstein's equation  $E=mc^2$  anymore and that the corresponding difference can be of order of unity. We also discuss possibilities for experimental observations of this unique phenomena. [1] A.G. Lebed, Int. J. Mod. Phys. D, v. 28, 1930020 (2019). [2] A.G. Lebed, Mod. Phys. Lett. A, v. 35, 2030010 (2020).

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