

Abstract Submitted
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Dirac Equation as a Bridge to the Equivalence Principle for Antimatter¹ ULRICH JENTSCHURA, Missouri Univ of Sci Tech — The Dirac equation is interpreted as a bridge toward the description of the gravitational interaction of antimatter. It has long been known to atomic physicists that the Dirac equation allows for antiparticle solutions (of negative energy) which are described by the same equation that also has particle solutions (of positive energy). Hence, the Dirac equation, when properly coupled to a gravitational field, allows us to compare the quantum dynamics of a matter wave (of a quantum state describing matter) with that of an antimatter wave (of a quantum state describing antimatter). This comparison leads to an identification of the inertial mass of the particle solutions with the particle's gravitational mass, and, at the same time, to a relation of the inertial mass of the antiparticle solutions with the antiparticle's gravitational mass. A recent study published in [Int.J.Mod.Phys.A vol. 34, 1950180 (2019)] has revealed that the identification of the inertial and gravitational masses for antiparticles (antimatter) is just the same as for particles, and constitutes a straightforward and intrinsic prediction of the gravitationally coupled Dirac equation. This conclusion holds for arbitrary dynamic curved space-time backgrounds.

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