

Negative Mass in the Universe is Relative, Repulsive and Real

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The Schwarzschild solution admits one parameter, the mass, which can be positive or negative. What is the meaning of the negative mass solution? Negative mass is an intriguing idea. Negative mass, to be physical, must satisfy the dominant energy condition. Indeed stable configurations can be found that correspond to bubbles of negative mass, however crucially, in a background energy density. It seems that positive mass attracts while negative mass repels when acting on all masses, positive or negative, due to the equivalence principle. However a simple analysis of one graviton exchange implies that the potential between like mass particles should be negative, be they of positive or negative mass, implying naively attraction. We explain how this conclusion is eschewed, and gives repulsion for negative mass particles.

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