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Superluminal particles: signatures, experiments and bounds

L. Gonzale-Mestres

CNRS-IN2P3, B.P. 110, 74941 Annecy-le-Vieux Cedex, France.

Abstract. Lorentz symmetry violation (LSV) can naturally occur at Planck scale or at some other fundamental length scale, and be related to completely new physics. Present low-energy bounds on LSV do not allow to exclude the possible exis-tence of superluminal particles (*superbradyons*) with critical speed in vacuum $c_{i \gg c}$ (c = speed of light) and kinematical properties close to those of ordinary particles apart from the difference in critical speed. If they exist, superbradyons may be the basic building blocks of matter, provide most of the matter in the Universe and be natural dark matter candidates. We present an updated discussion of possible signatures and experiments, as well as of the experimentals bounds on superbradyon models that can be derived from high-energy cosmic-ray data.

Correspondence to: L. Gonzale-Mestres (gonzalez@lapp.in2p3.fr)