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Relativistic Generalized Uncertainty Principle and minimum length

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Theories of Quantum Gravity predict a minimum measurable length and acorresponding modification of the Heisenberg Uncertainty Principle to theso-called Generalized Uncertainty Principle (GUP). However, this modification isnon-relativistic, making it unclear whether the minimum length is Lorentzinvariant. We formulate aRelativisticGeneralized Uncertainty Principle, resultingin aLorentz invariantminimum measurable length. We show that this implies thatspacetime coordinates are non-commutative and that spacetime itself is fuzzy atthe Planck scale. We examine potential experimental signatures of our result andnote that this is the first step in formulating quantum field theories with aminimum length.

Reference :Relativistic Generalized Uncertainty Principle,V. Todorinov, P. Bosso, S. Das, Ann. Phys.405, 92-100 (2019)[arXiv :1810.11761].

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