University of Lethbridge

Department of Physics and Astronomy
Presents

Quantum Gravity Phenomenology from the Generalized Uncertainty Principle

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Comprehensive Exam Presentation

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Abstract:

One of the cornerstones of Quantum Mechanics (QM), the Heisenberg's Uncertainty Principle (HUP), establishes that it is not possible to simultaneously measure with arbitrary precision both the position and the momentum of a system. This principle, however, does not prevent one from measuring with infinite precision the particle's position, losing all information about its momentum and vice versa. Theories of Quantum Gravity, aiming to bridge between General Relativity and QM, seem to show the existence of a minimal observable length - a minimal uncertainty on the position generally of the order of the Planck length `Pl ~ 10−35 m. The presence of a minimal measurable length, therefore, contradicts the HUP requiring a modification of the principle. This need gave rise to the Generalized Uncertainty Principle (GUP). In this presentation, after introducing the basics of the Uncertainty Principle, I will show how the GUP can change known aspects of standard Quantum Mechanics, for example the angular momentum theory, the model of Hydrogen atom and the interaction between quantum systems and magnetic field, leading to ways to test Quantum Gravity.

EVERYONE IS WELCOME