# Decoherence limit of quantum systems obeying generalized uncertainty principle: new paradigm for Tsallis thermostatistics

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The generalized uncertainty principle (GUP) is a phenomenological model whose purpose is to account for a minimal length scale (e.g., Planck scale or characteristic inverse-mass scale in effective quantum description) in quantum systems. In my talk I will discuss possible observational effects of GUP systems in their decoherence domain. I first derive coherent states associated to GUP and unveil that in the momentum representation they coincide with Tsallis' probability amplitudes, whose non-extensivity parameter q monotonically increases with the GUP deformation parameter β. Secondly, for β<0 (i.e., q<1), I show that, due to Bekner-Babenko inequality, the GUP is fully equivalent to information-theoretic uncertainty relations based on Tsallis-entropy-power. Finally, I invoke the Maximal Entropy principle known from estimation theory to reveal connection between the quasi-classical (decoherence) limit of GUP-related quantum theory and non-extensive thermostatistics of Tsallis. This might provide an exciting paradigm in a range of fields from quantum theory to analog gravity. For instance, in some quantum gravity theories, such as conformal gravity, aforementioned quasi-classical regime has relevant observational consequences. I will discuss some of the implications.

References

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