

SEMINAR

Path integral in position deformed Heisenberg algebra

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ABSTRACT

The deformed Heisenberg algebra is one of the promising candidate approaches to probe quantum gravity at the Planck scale. It consists of deforming the ordinary Heisenberg algebra in momentum or in position operators. Recently, we proposed in [1], a position deformed Heisenberg algebra in 2D with simultaneously existence of minimal and maximal length uncertainties. Its applications run from quantum well [2], quantum optics [3], quantum statistics [4] to quantum non-Hermitian operators [5].

More recently in [6], we have studied the effects of this deformation on the trajectories of a system moving from one point to another. As result, we have shown that this system can travel very faster in this deformed space with very low energies. As interpretation, this result can be understood as if deformation effects shorten the paths of the system, allowing it to move in this space in a short time using minimal kinetic energy.

[1] L. Lawson, Minimal and maximal lengths from position-dependent noncommutativity, J. Phys. A: Math. Theor. 53, 115303 (2020)

[2] L. Lawson, Position-dependent mass in strong quantum gravitational background fields, J. Phys. A: Math. Theor. 55, 105303 (2022)

[3] L. Lawson and P. Osei, Gazeau-Klauder coherent states in position-deformed Heisenberg algebra, J. Phys. Commun. 6, 085016 (2022)

[4] L. Lawson, Statistical description of ideal gas at Planck scale with strong quantum gravity measurement, Heliyon 8, e10564 (2022)

[5] L. Lawson, Minimal and maximal lengths of quantum gravity from non-Hermitian position-dependent noncommutativity, Scientific Reports 12, 20650 (2022)

[6] L. Lawson and P. Osei, K. Sodoga, F. Soglohu, Path integral in position deformed Heisenberg algebra with maximal length uncertainty, Annal of Phys doi:10.1016/j.aop.2023.169389 (2023)

BIOGRAPHY



I am Togolese in nationality, residing in Ghana. I attended the University of Lomé, Togo (2006-2010) where I studied Physics and Chemistry. After three years of teaching Physics in secondary schools, I moved to IMSP (Institut de Mathématiques et de Sciences Physiques) in Benin, from 2013 to 2018, where I obtained an MSc and PhD in Mathematical Physics. I then returned to the University of Lomé and lectured as a teaching assistant in the Physics department for two years. In October 2020, I began my Postdoctoral research and served as a tutor at AIMS in Ghana. My research interests are in noncommutative quantum mechanics, quantum groups, representation theory of differential operators and machine learning.

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