Brownsville Seminar

UTRGV
School of Mathematical & Statistical Sciences

The p-Adic Schrödinger Equation and the Two-slit Experiment in Quantum Mechanics.

Speaker: Wilson A. Zúñiga-Galindo

Abstract

p-Adic quantum mechanics is constructed from the Dirac-von Neumann axioms identifying quantum states with square-integrable functions on the N-dimensional p-adic space, Q_p^N. The time is assumed to be a real variable. The time evolution is controlled by a nonlocal Schrödinger equation obtained from a p-adic heat equation by a temporal Wick rotation. This p-adic heat equation describes a particle performing a random motion in Q_p^N. The Hamiltonian is a nonlocal operator; thus, the Schrödinger equation describes the evolution of a quantum state under nonlocal interactions. In this framework, the Schrödinger equation admits plane wave solutions, but the de Broglie wave-particle duality is ruled out since the time is real and the position is p-adic. Consequently, our model has no quantum waves. Using a suitable Cauchy problem for the p-adic Schrödinger equation, we construct a mathematical model for the two-slit and one-slit experiments. At time zero, at each slit, there is a localized particle; these particles interact with each other in a nonlocal way to produce an interference pattern. The pattern created by two slits looks like the pattern produced by one slit if the distance to the slits is sufficiently large. Finally, we propose that the classical de Broglie wave-particle duality is just a manifestation of the discreteness of space-time. The preprint is available at arXiv:2308.01283.

Date: October 20th, 2023

Talk time: 1:30-2:30 pm

Coffee and Cookies provided !!!

Talk location: BLHSB 1.316

Zoom: https://utrgv.zoom.us/j/83585846705

For further information or for special accommodations, please contact Dr. Alexey Glazyrin via email alexey.glazyrin@utrgv.edu. More information about the seminar talks is available at the website https://www.utrgv.edu/math/news-events/seminars/brownsville/index.htm.