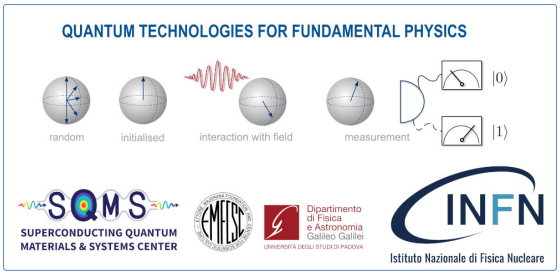

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Test of Causal Non-Linear Quantum Mechanics by Ramsey Interferometry on the Vibrational Mode of a Trapped Ion

Tuesday, 5 September 2023 09:00 (25 minutes)

Kaplan and Rajendran have recently demonstrated that non-linear and state-dependent terms can be consistently added to quantum field theory to yield causal non-linear time evolution in quantum mechanics. Causal non-linear theories have the unavoidable feature that their quantum effects are dramatically sensitive to the full physical spread of the quantum state of the system. As a result, such theories are not well tested by conventional atomic and nuclear spectroscopy. By using a well-controlled superposition of vibrational modes of a 40Ca+ ion trapped in a harmonic potential, we set a stringent limit of 5.4×10−12 on the magnitude of the unitless scaling factor ϵ̃γ for the predicted causal, non-linear perturbation.

Presenter: RAJENDRAN, Surjeet (The Johns Hopkins University)

Session Classification: Tests of Quantum Mechanics