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2024 Spring Meeting of the APS Eastern Great Lakes Section Friday–Saturday, April 12–13, 2024; Kettering University, Flint, Michigan

Session E01: Poster Session (4:30 pm - 6:30 pm ET)

4:30 PM, Friday, April 12, 2024

Kettering University Room: Asahi Kasei Traverse

Abstract: E01.00007 : Exploration of the Quantum Coherent States Through Hertz-Type Classical Nonlinearity*

← Abstract →

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In quantum computing and information technology, the coherent superposition of states is an essential topic for realizing the physical state of data processing and storage. The fundamentals of current technology, a quantum bit, have limitations due to the collapse and decoherence of wave function, which hinders the superposition of states. We eliminate the limitations by introducing the elastic bit generated through the Hertz-type nonlinearity of granular beads. This study shows the experimental formation of the elastic bit in a coupled granular network manipulated by external harmonic excitation. The excitation generates a phase-dependent dynamic movement, and mapping onto the energy states of the linear vibration modes forms the coherent superposition of states. This state vector component comes from the amplitude of the coherent states, which is projected into the Hilbert space through time dependency. The coherent states represent an actual amplitude, which makes the elastic bit susceptible to decoherence. The elastic bit also demonstrates quantum operation, showcasing the Hadamard gate, which maps one superposed state to another. These characteristics of the elastic bit pave the way for sustainable quantum computation and data storage.

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