Canadian Association of Physicists
Association canadienne des physiciens et physiciennes

Contribution ID: **4518** Type: **Oral not-in-competition (Graduate Student) / Orale non-compétitive (Étudiant(e) du 2e ou 3e cycle)**

(G) Quantum error correction for unresolvable spin ensemble

Monday 27 May 2024 17:00 (15 minutes)

Atomic and solid-state spin ensembles are promising platforms for implementing quantum technologies, but the unavoidable presence of noise imposes the needs for error correction. Typical quantum error correction requires addressing specific qubits, but this requirement is practically challenging in most ensemble platforms. In this work, we propose a quantum error correction scheme for error correction without individual spin resolution. Our scheme encodes quantum information in superposition of excitation states, even though they are fundamentally mixed. We show that our code can protect against both individual and collective errors of dephasing, decaying, and thermalization. Furthermore, we illustrate how our scheme can be implemented with realistic interaction and control. We also exemplify the application of our formalism in robust quantum memory and loss-tolerant sensing.

Keyword-1

Identical Spin Ensembles

Keyword-2

Quantum Error Correction

Keyword-3

Author: SHARMA, Harsh (Indian Institute of Technology Bombay)

Co-authors: SHEKHAR DHAR, Himadri (Indian Institute of Technology Bombay); LAU, Hoi-Kwan (Simon Fraser University)

Presenter: SHARMA, Harsh (Indian Institute of Technology Bombay)

Session Classification: (DQI) M3-9 Quantum Error Correction | Correction des erreurs quantiques (DIQ)

Track Classification: Technical Sessions / Sessions techniques: Division for Quantum Information / Division de l'information quantique (DQI / DIQ)