



Canadian Association  
of Physicists

Association canadienne  
des physiciens et physiciennes

Contribution ID: 148

Type: **Invited Speaker / Conférencier(ère) invité(e)**

## A Quantum Structural Phase Transition in Trapped Ion Crystals

*Tuesday 10 June 2025 14:15 (30 minutes)*

Arrays of trapped ions offer precise control over both internal quantum states and collective vibrational motion. Here, we demonstrate the manipulation of vibrational modes in ion arrays to drive the 1D linear–2D zigzag quantum structural phase transition. This system provides an intrinsic source of novel entangled states of ion crystal structures, which can be manipulated through trapped ion double-well interferometry. I will discuss how we experimentally control and characterize this transition in a linear Paul trap, using Raman sideband spectroscopy to probe energy levels and motional distributions near the critical point. Finally, I will explore coherence assessment and potential applications in in-situ electric field noise sensing.

### Keyword-1

Quantum state manipulation

### Keyword-2

Laser cooled trapped ions

### Keyword-3

**Author:** HALJAN, Paul C (Department of Physics, Simon Fraser University)

**Presenter:** HALJAN, Paul C (Department of Physics, Simon Fraser University)

**Session Classification:** (DAMOPC) T2-3 Stored Ions and Quantum Control | Ions stockés et contrôle quantique (DPAMPC)

**Track Classification:** Technical Sessions / Sessions techniques: Atomic, Molecular and Optical Physics, Canada / Physique atomique, moléculaire et photonique, Canada (DAMOPC-DPAMPC)