

NOTES ON NACTI 2019 AT UMD

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I. QUANTUM SIMULATIONS WITH TRAPPED IONS—UMD, CHRIS MONROE

1. 80 ions in HOA2
2. Highly engineered laser exist for Ytterbium ions
3. dipole-dipole coupling, XX gate, $T = 10 \sim 100\mu s$, $F \approx 98\% \sim 99.9\%$
4. Long-range Ising Hamiltonian to generate global entanglement

5. Quantum scrambling, complete diffusion of entanglement within a system, relevant to information in black holes
 6. Simulations of molecular applications
 7. Global interaction simulations
 - Pre-thermalization, the center of the ion chains move with $Jt = 36$
 - Dynamical phase transition with 50+ qubits
 - (a) prepare spins along x
 - (b) Quench spins to H
 - (c) Measure along x
- Global control AQOA

II. QUANTUM SENSING AND SIMULATIONS WITH LARGE TRAPPED ION CRYSTALS—NIST, M. AFFOLTER

1. Penning Trap, multi-dimensional ion crystal, spin squeezing, weak E-Field sensing and the like

III. IMPROVED TEST OF LOCAL LORENTZ INVARIANCE FROM A DETERMINISTIC PREPARATION OF ENTANGLED STATES— UC BERKELEY, E. MEGIDISH

1. Use the Zeeman splitting of $D_{5/2}$ state of $^{40}\text{Ca}^+$
2. Entangled states
3. Ar^+ milling decreases the motional heating of ion trap

IV. QUANTUM SIMULATION OF SPIN MODELS IN ARBITRARY SPATIAL DIMENSIONS USING A LINEAR CHAIN OF IONS—PI, R. ISLAM

1. Analog-digital

V. QUANTUM OPTOMECHANICS WITH TRAPPED IONS AND NANOSPHERES—UNIV OF INNSBRUCK, T. E. NORTHUP

1. ion trap potential: deep, harmonic with a large volume regime
2. cavity qed in the strong coupling regime, shift more than linewidth

3. ions are light, 200nm motional regime
4. non-gaussian states can be obtained by ions' internal degrees of freedom
5. Mechanical motion shifts the cavity resonance
6. strong field strength leads to linearized interaction, which maps Gaussian states into Gaussian states
7. Nonlinear interaction is required
8. electrical feedback cooling
9. optical feedback cooling
10. wheel-type trap

VI. HYBRID TRAPPED ION AND NEUTRAL ATOM BASED QUANTUM NETWORKING—ARL, Q. S. QURAISHI

1. better wire access in blade trap
2. PPLN, Difference frequency generation, $493 + 1343 \rightarrow 780$

VII. QUANTUM NETWORKING WITH TRAPPED ION QUBITS AT AFRL—AFRL, K.-A BRICKMAN SODERBERG

1. $^{133}\text{Ba}^{+2}D_{5/2}$ lifetime 30s, $I = 1/2$

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OF BASEL, Z. MEIR**

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AN ION-ATOM HYBRID TRAP**

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XXIII. HONEYWELL'S TRAPPED ION QUANTUM COMPUTER—HONEYWELL, B. NEYENHUIS

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XXIV. SCALING TRAPPED ION QUANTUM COMPUTING—IONQ, J. MIZRAHI

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XXIX. QUANTUM-CLASSICAL HYBRID CIRCUITS WITH TRAPPED IONS—UMD, N. M. LINKE

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XXX. HOT TOPICS

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XXXII. POSTER SESSION II