Abstract Submitted
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Transport and heating in an X-junction ion trap array[1] R.B. BLAKESTAD, A.P. VANDEVENDER, C. OSPELKAUS, NIST, J.M. AMINI, J. BRITTON, D. LEIBFRIED, D.J. WINELAND, NIST — Key requirements for efficient large-scale quantum information processing (QIP) include reliable transport of information throughout the processor and the ability to perform gates between arbitrarily selected qubits. Trapped ions are a useful system for studying the elements of QIP and can potentially satisfy these requirements. For example, ions could be distributed over separate zones in an array, where information would be shared between zones by moving the ions [1]. Multidimensional arrays incorporating junctions would enable ions selected from arbitrary locations to be grouped together for multi-qubit gates. However, kinetic energy gained during transport would reduce computational fidelity and increase the duration required for ion re-cooling. Here, we report reliable transport of Be+ ions through a 2-D trap array that incorporates an "X-junction", with low energy gain (< 10 quanta). We also examine two sources of energy gain during transport: a particular radio-frequency noise heating mechanism and digital sampling noise. [1] D. Kielpinski, C. Monroe and D.J. Wineland. Nature **417**, 709 (2002)

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Brad Blakestad
NIST

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