

DAMOP15-2015-020120

Abstract for an Invited Paper
for the DAMOP15 Meeting of
the American Physical Society

Implementation of microwave quantum logic towards developing a large scale ion trap quantum computer

WINFRIED HENSINGER, University of Sussex

To this point, entanglement operations on ion qubits have predominantly been performed using lasers. When scaling to larger qubit numbers however this becomes problematic due to the challenging engineering that might be required. The use of microwaves combined with a static magnetic field gradient overcomes this problem. I will present our work towards implementing high-fidelity entanglement gates using microwave radiation including the experimental demonstration of spin-motion entanglement, the demonstration of ground-state cooling using long-wavelength radiation and the first realization of driving motional sideband transitions with microwave dressed states. I will present a vision to scale this scheme to build a large scale quantum computer and present results concerning the development of ion microchips that can be used for this purpose.