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**Quantum absorption refrigerator with trapped ions**[1] JAREN GAN, GLEB MASLENNIKOV, ROLAND HABLTZEL MARRERO, SHIQIAN DING, STEFAN NIMMRICHTER, ALEXANDRE ROULET, JIBO DAI, Centre for Quantum Technologies, National University of Singapore, VALERIO SCARANI, DZMITRY MATSUKEVICH, Centre for Quantum Technologies, National University of Singapore; Department of Physics, National University of Singapore — We report on an experimental realization of a quantum absorption refrigerator in a system of the three trapped $^{171}Yb^{+}$ ions. The normal modes of motion are coupled by a trilinear Hamiltonian $a^{\dagger}bc + h.c.$ and represent "hot", "work" and "cold" bodies of the refrigerator. We investigate the equilibrium properties of the refrigerator, and demonstrate the absorption refrigeration effect with the modes being prepared in thermal states. We also investigate the coherent dynamics and steady state properties of such a system away from equilibrium operation. We compare the cooling capabilities of thermal versus squeezed thermal states prepared in the work mode as a quantum resource for cooling. Finally, we exploit the coherent dynamics of the system and demonstrate single-shot cooling in the refrigerator. By stopping the evolution in the right moment, we show a significant advantage in cooling as compared to both the steady state and equilibrium performance.

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Dzmitry Matsukevich
National University of Singapore

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