

Abstract Submitted  
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**Cooling of a resonant circuit via laser cooled ions** NIKOS DANIILIDIS, SOENKE MOELLER, University of California - Berkeley, BOYAN TABAKOV, University of new Mexico, AARON BRADLEY, HARTMUT HAEFFNER, University of California - Berkeley — We discuss our experimental progress towards coupling strings of trapped ions to an LC-resonator. The goal of our experiments is to cool the resonant mode of a superconducting high-quality resonant circuit to ultra-low temperatures. By continuously laser cooling a crystal of ions coupled to the circuit, energy is removed from the resonator. For quality factors on the order of  $10^5$ , the time-scale of the environment-to-mode coupling, i.e. the time for the resonant mode of the LC-resonator to thermally equilibrate, can be on the order of a second. Thus, engineering an ion-resonator coupling of 10 kHz results in a reduction of the resonant mode temperature by four orders of magnitude as compared to the ambient temperature of the resonator. The expected temperatures, below 1 mK, approach the vibrational ground state of the oscillator mode.

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