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Towards laser cooling of a LC-resonator via trapped ions SOENKE MOELLER, NIKOS DANIILIDIS, UC Berkeley, BOYAN TABAKOV, University of New Mexico, AARON BRADLEY, HARTMUT HAEFFNER, UC Berkeley — We will 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$\sim$kHz results in a reduction of the electronic temperature by four orders of magnitude as compared to the ambient temperature of the resonator. The expected temperatures below 1mK are extremely low approaching even the vibrational ground state of the oscillator mode, enabling novel quantum electronics applications in the solid state.

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