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Steps Towards Cavity QED experiments with cold ion Coulomb Crystals J.P. MARLER, P. HERSKIND, A. DANTAN, M. ALBERT, M. DREWSEN, University of Aarhus, Denmark — Clouds of ions present an interesting alternative to traditional single neutral atom based experiments to study CQED. Ions can be easily trapped and cooled for long times and in sufficient number to potentially access the strong coupling regime even with a physically realizable finesse (mode volume) of the cavity. In the present experiment thousands of $^{40}Ca^{+}$ ions are trapped in a linear Paul trap incorporating a high finesse (F$\sim$3200) optical cavity. We will show results which indicate that the number of ions inside the cavity mode is in principle high enough to achieve strong collective coupling. Near term plans include fundamental studies of cavity QED, and exploring the possibility of using cavity interactions to aid in cooling of neutral molecular species. Briefly discussed will be a planned experiment which will employ an optical field to further investigate and control the nature of the ion Coulomb crystal structures formed.

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