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Coherent dynamics of trapped ions outside the Lamb-Dicke regime
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We demonstrate the ground state cooling of atomic ions outside the Lamb-Dicke (L-D) regime. Coherent studies both within and outside the L-D regime already have been carried out for a single ion qubit, which is realised by trapping a calcium ion in a Penning trap. It is important to carry out the coherent studies of a multi Ion Coulomb Crystal (ICC) to demonstrate a scalable trapped ion quantum computer/simulator. In this seminar I will be talking about the recent results of ground state cooling of a small ICC. Currently, the coherent studies have been extended up to three ions and our plan is to extend the studies to larger crystals. On the other hand, we have characterised the heating rates of our trap and found them to be lowest in any ion trap so far. The motional coherence time of a ground state cooled ion has been measured to be of the order of a second, which suggests that the trap is a suitable candidate to study the interactions that need a long interrogation times.

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