Abstract Submitted
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Towards the realization of Ba+ and Li quantum mixture ELIA PEREGO, INRiM, AMELIA DETTI, Unifi, LUCIA DUCA, INRiM, MASSIMO INGUSCIO, CNR, CARLO SIAS, INRiM; LENS — Ultracold atoms and trapped ions are among the most studied physical systems in experimental quantum physics. On the one hand, ultracold neutral atoms form coherent ensembles of particles whose interactions, dimensionality and motion can be precisely controlled. On the other hand, trapped ions form cold crystals in which the Coulomb repulsion ensures a relatively large inter-particle separation, making it possible to address each single ion in a crystal. Quantum mixtures of ultracold atoms and trapped ions combine the advantages of the two techniques in a single experimental apparatus, and offer the possibility of using atom-ion interactions, which are approximately two orders of magnitude longer-ranged than atom-atom interactions, for the realization of new experiments in quantum simulation, quantum computation and controlled chemistry. We are currently setting up a novel apparatus for the realization of a quantum mixture of ultracold Lithium atoms and Barium ions. This setup, which aims at the realization of a coherent atom-ion mixture, is formed by a hybrid trap made of an ion trap within which ultracold atoms can be trapped either optically or magnetically. We will show the technological improvements and progress made so far in our experimental setup, which represent the first ion trapping experiment in Italy. Finally, we will give an overview of the experiments we will pursue with this setup.

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