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Trapped ions for hybrid quantum systems

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Ultracold atoms and trapped ions have proven to be valuable resources for getting new insights on fundamental physical phenomena. Trapped ions can be individually addressed and coherently manipulated. Ultracold gases, instead, provide large atomic samples where trapping potentials and interactions are controlled externally, making them well suited for systematic studies of many-body quantum phenomena. An atom-ion hybrid system brings together the advantages of each physical system and provides an ideal platform to investigate fundamental quantum mechanics, like localized impurities in a Fermi gas. Here we present the first step towards the realization of such hybrid system: the trapping of Ba ions, together with the current state of advancement of the apparatus that will allow us to reach coherent atom-ion coupling.

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