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The rise of long-distance entanglement within a linear chain of ions THOMAS FOGARTY, Physics Department, University College Cork, Cork, Ireland, ENDRE KAJARI, BRUNO G. TAKETANI, Theoretische Physik, Universitat des Saarlandes, D-66123 Saarbrucken, Germany, ALEXANDER WOLF, Institute of Quantum Physics, Ulm University, D-89069 Ulm, Germany, THOMAS BUSCH, Physics Department, University College Cork, Cork, Ireland, GIOVANNA MORIGI, Theoretische Physik, Universitat des Saarlandes, D-66123 Saarbrucken, Germany — One stumbling block which limits our observation of quantum effects in the macroscopic world is decoherence. For this reason the study of decoherence and dissipation in open quantum systems has attracted a lot of attention. It has been shown that the generation of long distance entanglement is possible between oscillators via a harmonic crystal (Wolf et al, EPL, 95(2011) 60008). The aim of this current work is to propose an experimentally feasible setup to test the possibility of the creation of long distance entanglement. For this purpose we consider an ion chain in a linear Paul trap with two embedded impurities, whose transverse modes resemble the two degrees of freedom that we aim to entangle via the rest of the chain. With the aid of appropriately designed laser fields, the dynamics described in (Wolf et al, EPL, 95(2011) 60008) is reproduced. The resulting entanglement between the transverse modes of the impurities is analysed by means of the logarithmic negativity.

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