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**Robust preparation of Dicke-states by multi-ion STIRAP** IAN LININGTON, NIKOLAY VITANOV, University of Sofia — We present a simple technique for the generation of arbitrary-sized Dicke states in a chain of trapped ions. The method uses global addressing of the entire chain by two pairs of laser pulses in order to engineer collective adiabatic passage along a multi-ion dark state – a unique eigenstate of the Hamiltonian in which decaying energy levels are not populated in any ion. In the adiabatic limit, the system resides in the dark state at all times and hence spontaneous emission is completely avoided. Dicke state preparation is achieved in only two stages of collective adiabatic passage, in between which the system resides in a vibrational Fock state. As well as an extremely simple experimental implementation, our technique also possesses the following advantages: (i) dynamical and geometric phases acquired during the entire preparation procedure are both identically zero; (ii) the proposed technique is adiabatic in nature and hence it is robust against fluctuations in the intensity and timing of the laser pulses; (iii) there is no decoherence arising from spontaneous emission in the adiabatic limit, regardless of the decay rate from the upper level – this allows the use of resonant laser pulses which in turn allows shorter pulse durations; (iv) because only two, very rapid, interaction steps are required, the effects of heating are almost negligible under realistic experimental conditions. For a Dicke state of ten ions sharing two excitations, we predict a fidelity approaching 99%.

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