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Adiabatic Passage of Collective Excitations in Atomic Ensembles

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Abstract: We describe a theoretical scheme that allows for transfer of quantum states of atomic collective excitation between two macroscopic atomic ensembles localized in two spatially-separated domains. The conception is based on the occurrence of double-exciton dark states due to the collective destructive quantum interference of the emissions from the two atomic ensembles. With an adiabatically coherence manipulation for the atom-field couplings by stimulated Ramann scattering, the dark states will extrapolate from an exciton state of an ensemble to that of another. This realizes the transport of quantum information among atomic ensembles.

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Key words: quantum information, atomic ensemble, double-exciton dark state

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