

## Storage of Entangled States with Multiple Trapped Ions in Thermal Motion

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**Abstract:** This paper presents an alternative scheme to realize the storage of entangled states for multiple trapped ions including W state, Bell states, and GHZ states even with ions which exchange vibrational energy with a heating surrounding. Our scheme requires that the ions be simultaneously excited by two laser beams with different frequencies. In this scheme the vibrational degrees of freedom are only regarded as intermediate states and the ions exchange energy via the mediation of the vibration of the vibrational mode in coupling processes. The scheme is insensitive to both the initial vibrational state and heating if the system remains in the Lamb-Dicke regime. Since the effective Rabi frequency has a small dependence on the vibrational quantum number the heating will have no direct effect on the internal state evolution.

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