Abstract Submitted
for the DAMOP05 Meeting of
The American Physical Society

Observation of very long-lived entanglement TIMO KOERBER, CHRISTIAN ROOS, WOLFGANG HAENSEL, UMAKANT RAPOL, MICHAEL CHWALLA, JAN BENHELM, DANY CHEK-AL-KAR, MARK RIEBE, HARTMUT HAEFFNER, FERDINAND SCHMIDT-KALER, RAINER BLATT, University of Innsbruck — Arbitrary atomic Bell states with two trapped ions are generated in a deterministic and preprogrammed way. The resulting entanglement is quantitatively analyzed using various measures of entanglement. For this, we reconstruct the density matrix using single qubit rotations and subsequent measurements with near-unity detection efficiency. This procedure represents the basic building block for process tomography of quantum computations. As a first application, the temporal decay of entanglement is investigated in detail.We observe ultralong lifetimes for Bell states, close to the fundamental limit set by the spontaneous emission. Furthermore, if we encode the Bell states in ground state sublevels, this limit can be evaded and entanglement can be maintained for over 10 seconds.

Timo Koerber
University of Innsbruck

Date submitted: 11 Mar 2005 Electronic form version 1.4