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Bell inequality violation with two remote atomic qubits[1]
DZMITRY MATSUKEVICH, PETER MAUNZ, DAVID MOEHRING, STEVEN OLMSCHENK, CHRIS MONROE, JQI and Department of Physics, University of Maryland — We report the violation of a Bell inequality between the quantum states of two remote Yb ions separated by about one meter. First, we prepare the two spatially separated ions, each entangled with the polarization state of a photon it has emitted. Next, the heralded entanglement of two ions is established via interference and joint detection of these photons. The near unit detection efficiency of the quantum state of the remote trapped ions allows us to close the detection loophole in a Bell inequality measurement. This experiment also offers an approach to a loophole-free test of a Bell inequality.

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