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Decoherence-Free Control of Large Spin-Atomic Systems with Coherent Electromagnetic Fields[1] SETH MERKEL, University of New Mexico, SOUMA CHAUDHURY, POUL JESSEN, University of Arizona, IVAN DEUTSCH, University of New Mexico — Cold atomic systems provide a excellent testing ground for quantum control protocols due to their isolation from their environment and the availability of high precision fields from the "quantum optics toolbox". We consider controlling the 16-dimensional ground state hyperfine manifold of 133Cs through microwaves and rf-magnetic fields. These fields allow for essentially decoherence-free control of a system with non-trivial dynamics. We analyze the controllability of the system and numerically study the performance of a protocol for performing state preparation, mapping a fiducial state to an arbitrary target state.

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