Abstract Submitted for the DAMOP05 Meeting of The American Physical Society

Trapping and interactions of an ultracold gas of Cs₂ molecules T. KRAEMER, M. MARK, P. WALDBURGER, J. HERBIG, C. CHIN, H.C. NAEGERL, R. GRIMM, Institut für Experimentalphysik, Universität Innsbruck, Technikerstraße 25, 6020 Innsbruck, Austria — We investigate dynamics and interactions of Cs_2 dimens in a CO_2 -laser dipole trap. Starting with a Bose-Einstein condensate (BEC) of $2.2*10^5$ Cs atoms, we create ultracold molecules in a single, weakly bound quantum state by sweeping the magnetic field across a narrow Feshbach resonance. When the molecules are created in free space, the conversion efficiency exceeds 30%, yielding up to 40000 molecules. In our trapping experiments, about 6000 ultracold C_{s_2} dimensionary prepared in the optical trap at a temperature of 200 nK. We transfer the trapped molecules from the initial molecular state to other molecular states by following avoided crossings. We find two magnetically tunable resonances in collisions between the molecules for one of the molecular states. We interpret these Feshbach-like resonances as being induced by Cs_4 bound states near the molecular scattering continuum. Further, we have discovered a new molecular state with very large orbital angular momentum of l=8. This state is very weakly coupled to one of the initial molecular states. We use the corresponding avoided crossing as a beam splitter to realize a molecular interferometer. We acknowledge support by the Austrian Science Fund (FWF) within SFB 15 and by the European Union in the frame of the Cold Molecules TMR network under Contract No. HPRN-CT-2002-00290.

> Cheng Chin Institut für Experimentalphysik, Universität Innsbruck Technikerstra25, A-6020 Innsbruck

Date submitted: 11 Mar 2005

Electronic form version 1.4