Abstract Submitted for the DAMOP05 Meeting of The American Physical Society

Collisions in a gas of metastable helium near quantum degeneracy SIGNE SEIDELIN, NIST, JOSE GOMES, RODOLPHE HOPPELER, OLIVIER SIRJEAN, DENIS BOIRON, CHRIS WESTBROOK, ALAIN ASPECT, Institut d'Optique, Orsay — Experiments with an atomic cloud of metastable helium (He^{*}) in the vicinity of Bose-Einstein condensation will be presented. The metastability of the atoms has opened the door for using new and original detection methods: due to their internal energy, the atoms can be detected electronically by means of a micro-channel plate. The use of He^{*} is also interesting due to the presence of ionizing collisions in the sample. The He⁺ ions produced in collisions between the metastable atoms can be detected in real- time, and the ion signal constitutes an alternative and useful diagnostic. In particular, this signal allows one to identify very precisely the Bose-Einstein condensation threshold. One of the advantages of using this signal to probe the cloud is its "non-invasive" nature: observing the ions does not at all alter the natural evolution of the cloud, in contrast to the ordinary detection technique which consists of releasing the atoms from the trap and then imaging the cloud. In the experiments to be discussed, by using this new diagnostics based on the ion signal, we have measured some important parameters governing both elastic and inelastic collisions: the ionizing rate constants and the scattering length for metastable helium.

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Date submitted: 11 Mar 2005

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