Experiments with a molecular matter wave interferometer for studying cold collisions between atoms and molecules

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For experiments with cold atomic ensembles the collisions in traps are of great interest. We are looking for the influence of collisions between K atoms and K$_2$ molecules at low relative velocities in a Ramsey-Bordé matter wave interferometer [1]. We expect that under our experimental conditions a small phase shift of the interference pattern due to collisions in the interferometer can be an access to the long range interaction between atoms and molecules. The setup is expected to be very sensitive for weak interactions and the collisional partners are in well defined quantum states.

We prepare the atoms in excited electronic states to increase the polarizability and thus the cross section. By switching from excited atoms to ground state atoms in the interferometer we modulate the collisional conditions. This may be assisted by deflecting a significant fraction of the atoms out of the molecular beam before entering the interferometer.

We present the experimental status, the analysis of first measurements and we will briefly describe our ideas to establish an interferometer for molecules in the electronic ground state.

[1] Ch. Lisdat, M. Frank, H. Knöckel, M.-L. Almazor, E. Tiemann,