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JOHANNES GUTENBERG UNIVERSITÄT MAINZ

Seminar über Quanten-, Atom- und Neutronenphysik (QUANTUM)

Nov. 29, 2018 at 2 p.m. c.t.
MITP-Seminarraum, 02-430, Staudingerweg 9 (Nachbargebäude)

Note: Achtung Raumänderung, da gemeinsames Kolloquium mit NPCCM Meeting

Dr. Hendrick L. Bethlem
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Toying with molecules; ammonia molecules in a fountain and synchrotron

We use electric fields to cool and manipulate polar molecules and use these cold molecules to perform precision tests of fundamental physics theories and collisions studies. I will present two experiments; in the first experiment we let beams of argon atoms collide with ammonia molecules that are stored in a synchrotron. Using a synchrotron has the advantage that the collision partners move in the same direction, resulting in a low collision energy. Furthermore, by storing molecules many roundtrips the sensitivity to collisions is greatly enhanced [1]. In the second experiment beams of ammonia molecules are decelerated, trapped, cooled and subsequently launched upwards with a velocity between 1.4 and 1.9 m/s. Molecules with this speed will fly up 60-180 mm before falling back under gravity. We have demonstrated field-free interaction times up to 266 millisecond, two orders of magnitude longer than has been achieved with molecular beams [2]. Finally, I will discuss a new project, conducted in collaboration with the University of Groningen, to cool barium-fluoride molecules and use these to search for the electric dipole moment of the electron which is a sensitive probe for physics beyond the standard model [3].

References

[1] Cold Collisions in a Molecular Synchrotron, A.P.P. van der Poel, P.C. Zieger, S.Y.T. van de Meerakker, J. Loreau, A. van der Avoird, and H.L. Bethlem, Phys.

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[2] Molecular Fountain, C. Cheng, A.P.P. van der Poel, P. Jansen, M. Quintero-Prez, T.E. Wall, W. Ubachs, and H.L. Bethlem, Phys. Rev. Lett. 117, 253201 (2016).
[3] Measuring the electric dipole moment of the electron in BaF, NL-eEDM collaboration, Eur. Phys. J. D. 72, 197 (2018).

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