CFEL SCIENCE

SEMINAR

1st February 2018 - 10:00 h

CFEL – Building 99, seminar room I+II (ground floor)

Christian Brand

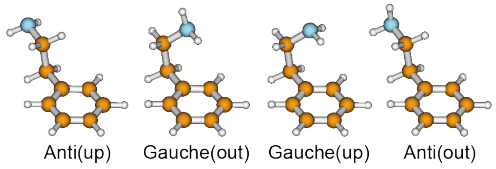
Fakultät für Physik, Universität Wien

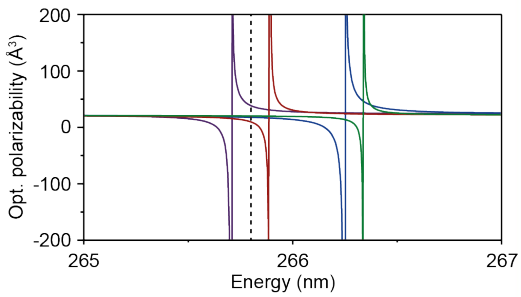
Molecular matter-wave diffraction at a single grating

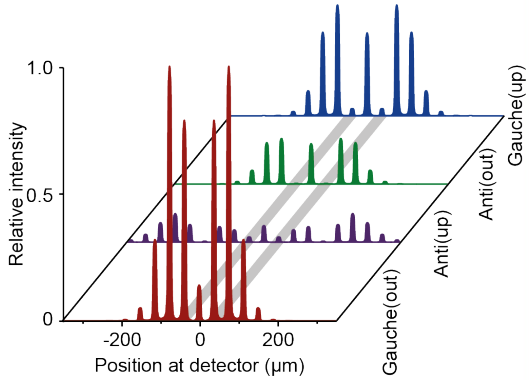
Since the first demonstration in 1999, matter-wave interference of massive molecules has been used to study fundamental processes in physics and extract molecular parameters such as dynamic polarizabilities and absolute absorption cross sections from delocalized molecules [1]. These experiments are often conducted in closed interferometers made out of three gratings and until now these interferometers have been used to study molecules with a mass up to 10 000 amu.

Molecular diffraction at a single grating offers the advantage of high versatility regarding the diffraction element and allows to study the interaction between the grating and the molecular wave in great detail. This led to the recent demonstration of a molecular beam splitter made from single layer graphene [2] and the first explicit test of Born's rule using matter-waves [3].

Gratings made from a tunable standing light wave promise to be an elegant way to manipulate delocalized molecules during the diffraction process. This can be used to spatially separate individual conformers of complex molecules from a molecular beam [4]. The proposed method exploits the strong wavelength-dependency of the polarizability close to an electronic transition and is independent of the molecular dipole moment. I will discuss how this might lead to conformer-selected reaction studies of highly complex molecular systems and molecular clusters.







[1] K. Hornberger, S. Gerlich, P. Haslinger, S. Nimmrichter, and M. Arndt, Rev. Mod. Phys. 84 157 (2012)

[2] C. Brand et al., Nat. Nanotechnol. 10 845 (2015)

[3] J. P. Cotter, C. Brand, C. Knobloch, Y. Lilach, O. Cheshnovsky, and M. Arndt, Sci. Adv. 3 e1602478 (2017)

[4] C. Brand, B. A. Stickler, C. Knobloch, A. Shayeghi, K. Hornberger, and M. Arndt, ArXiv 1710.01035 (2017)

Host: Terry Mullins / CFEL Molecular Physics Seminar