Matter wave interferometry as a tool for molecule metrology

STEFAN GERLICH, MICHAEL GRING, HENDRIK ULBRICHT, University of Vienna, KLAUS HORNBERGER, Ludwig-Maximilians-University Munich, JENS TUEXEN, MARCEL MAYOR, University of Basel, MARKUS ARNDT, University of Vienna — Kapitza-Dirac-Talbot-Lau interferometry (KDTLI) has recently been established as an ideal method to perform quantum matter wave experiments with large, highly polarizable molecules in an unprecedented mass range of beyond 1000 atomic mass units [1]. Since the interference visibility reveals important information on the properties of the examined particles, such as their mass and polarizability, we identified KDTLI as a valuable tool for precision metrology. We demonstrate that quantum interferometry can therefore also serve as a powerful complement to mass spectrometry [2], in particular in cases where fragmentation may occur in the detector. Our new method is applicable to a wide range of molecules and is particularly valuable for characterizing neutral molecular beams.


Stefan Gerlich
University of Vienna

Date submitted: 21 Nov 2008

Electronic form version 1.4