Abstract Submitted
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A Kapitza-Dirac Talbot-Lau interferometer for molecules STEFAN GERLICH, LUCIA HACKERMUELLER, FABIENNE GOLDFARB, KLAUS HORNBERGER, TIM SAVAS[1], ALEXANDER STIBOR, HENDRIK ULBRICHT, MARKUS ARNDT, University of Vienna — We present a novel matter-wave interferometer setup which is designed for particles with wavelengths down to 0.5 pm. Such a short wavelength corresponds for instance to a mass of 7000 atomic mass units (amu) at a velocity of 100m/s. Such an advance in mass and complexity can only be accomplished by introducing a standing light wave [1,2,3] to replace the central material grating used in a standard Talbot-Lau interferometer [4]. Light gratings combine high transmission with the absence of the perturbing van der Waals forces otherwise encountered at material gratings. This is particularly desirable for the investigation of the wave-particle duality of large molecules with high polarizabilities. We show the first successful application of this interferometer with C_{70}-Fullerenes. Preliminary studies with sources and detection schemes for molecules of up to 7000 amu are very promising for interference experiments with such large and heavy objects in the immediate future. [1] P. Gould et al., Phys. Rev. Lett. 56, 827 (1986) [2] D. Freimund et al., Nature 413, 142 (2001) [3] O. Nairz et al., Phys. Rev. Lett. 87, 160401 (2001) [4] B. Brezger et al., J. Opt. B 5, 82 (2003)

[1]NanoStructures Laboratory, MIT

Stefan Gerlich
University of Vienna

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