Abstract Submitted
for the DAMOP13 Meeting of
The American Physical Society

Quantum superposition of massive molecules and molecular clusters in the time-domain PHILIPP HASLINGER, NADINE DOERRE, JONAS RODEWALD, PHILIPP GEYER, STEFAN NIMMRICHTER, University of Vienna VCQ, Austria, KLAUS HORNBERGER, University of Duisburg-Essen, Germany, MARKUS ARNDT, University of Vienna VCQ, Austria — Recent experimental advances have allowed us to devise new molecular sources, interferometer arrangements and detection methods that open the path to testing and exploiting the quantum superposition principle, both using a range of different massive particles and with high sensitivity. Our most recent interferometer uses pulsed optical gratings [1]. This allows us to conduct experiments in the time-domain which eliminates most of all causes of velocity-dependent dephasing [2]. The gratings are realized by standing light waves of three nanosecond laser beams at $\lambda = 157$ nm. This wavelength is short enough to achieve efficient single-photon ionization of a broad range of atoms, molecules and nanoparticles. In combination with an external electric field these pulses act dominantly as absorptive gratings in the time-domain. On the applied side the *O*ptical *TI*me-domain *MA*tter (OTIMA) interferometer can be used as a nanoruler for high-precision measurements of external forces or internal particle properties [3], too.

[1] Haslinger P., et al., *Nature Physics*, accepted (2013), Reiger E., Opt. Comm. 264 326-32 (2006)
[2] Nimmrichter S., et al., *Phys. Rev. A* 78, 063607 (2008)
[3] Berninger M., et al., *Phys. Rev. A*, **76**, 013607 (2007)

Philipp Haslinger
University of Vienna VCQ, Austria

Date submitted: 22 Jan 2013 Electronic form version 1.4