Abstract Submitted
for the DAMOP16 Meeting of
The American Physical Society

Peptides and proteins in matter wave interferometry: Challenges and prospects. UGUR SEZER, PHILIPP GEYER, LUKAS MAIRHOFER, CHRISTIAN BRAND, NADINE DOERRE, JONAS RODEWALD, Univ of Vienna, JONAS SCHAETTI, VALENTIN KOEHLER, Univ of Basel, MARCEL MAYOR, Univ of Basel, Karlsruhe Institute of Technology, MARKUS ARNDT, Univ of Vienna — Recent developments in matter wave physics suggest that quantum interferometry with biologically relevant nanomaterials is becoming feasible for amino acids, peptides, proteins and RNA/DNA strands. Quantum interference of biomolecules is interesting as it can mimic Schrödingers cat states with molecules of high mass, elevated temperature and biological functionality. Additionally, the high internal complexity can give rise to a rich variety of couplings to the environment and new handles for quantitative tests of quantum decoherence. Finally, matter wave interferometers are highly sensitive force sensors and pave the way for quantum-assisted measurements of biomolecular properties in interaction with tailored or biomimetic environments. Recent interferometer concepts such as the Kapitza-Dirac-Talbot-Lau interferometer (KDTLI) or the Optical Time-domain Matter Wave interferometer (OTIMA) have already proven their potential for quantum optics in the mass range beyond 10000 amu and for metrology. Here we show our advances in quantum interferometry with vitamins and peptides and discuss methods of realizing cold, intense and sufficiently slow beams of synthetically tailored or hydrated polypeptides with promising properties for a new generation of quantum optics.

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Date submitted: 29 Jan 2016 Electronic form version 1.4