

Abstract Submitted
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Grating chips for quantum technologies JAMES PATRICK MCGILLIGAN, STUART INGLEBY, PAUL FRANCIS GRIFFIN, ERLING RIIS, AIDAN ARNOLD, University of Strathclyde — Laser cooled atomic samples have resulted in profound advances in frequency metrology, however the technology is typically complex and bulky. In the cover story of the May 2013 issue of Nature Nanotechnology [1] we describe a micro-fabricated optical element that greatly facilitates miniaturisation of ultra-cold atom technology. Portable devices should be feasible with accuracy vastly exceeding that of equivalent room-temperature technology, with a minimal footprint. Laser cooled samples will be ideal for measurement devices e.g. portable atomic clocks and magnetometers and, moreover, they hold great potential for longer-term breakthroughs exploiting e.g. optical lattices for all-optical clocks and Bose-Einstein condensates for atom interferometry. Here we will discuss next generation diffractive optical elements (DOE) and demonstrate quantum based measurements on samples of ultra-cold atoms created using our miniaturised optical setup.

[1] C. C. Nshii et al., *A surface-patterned chip as a strong source of ultra-cold atoms for quantum technologies*, Nature Nanotech. **8**, 321 (2013).

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