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Enhanced Optical Geometries for Atoms

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There has been recent dramatic global investment in quantum technologies, which now often harness laser-cooled atom traps. Such traps yield orders of magnitude longer measurement times and concomitant accuracy enhancements promised within the small physical footprint already demonstrated in warm atomic systems. Six-beam magneto-optical traps (MOTs) are ubiquitous in cold atomic physics experiments, delivering dense and cold atomic vapours. Grating MOTs (GMOTs), used either in- or ex-vacuo, enable simple and robust MOT generation with a single input laser beam. We present recent Strathclyde GMOT-based experimental results including a truly compact vacuum cell, a clock etc [1], and highlight GMOT developments in other groups. Prospects for utilising reflective and transmissive micro-fabricated planar optics for single-input-beam high-stability optical lattices [1] and Fresnel optical waveguides will also be discussed [2].
[1] https://eqop.phys.strath.ac.uk/atom-optics/grating-mots/
[2] https://eqop.phys.strath.ac.uk/atom-optics/qt-atom-interferometers/

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