

Grating chips for quantum technologies.

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Laser cooled atomic samples have resulted in profound advances in frequency metrology, however the technology is typically complex and bulky. Micro-fabricated diffractive optical elements (DOEs) [1] can greatly facilitate the miniaturisation of magneto-optical traps (MOTs) for use in ultra-cold atom technology (Fig. 1). Here we present our latest results: precise optical characterisation of several new gratings, an investigation of phase-space properties in the MOT, and a magnetic trap loaded from the grating-based optical molasses.

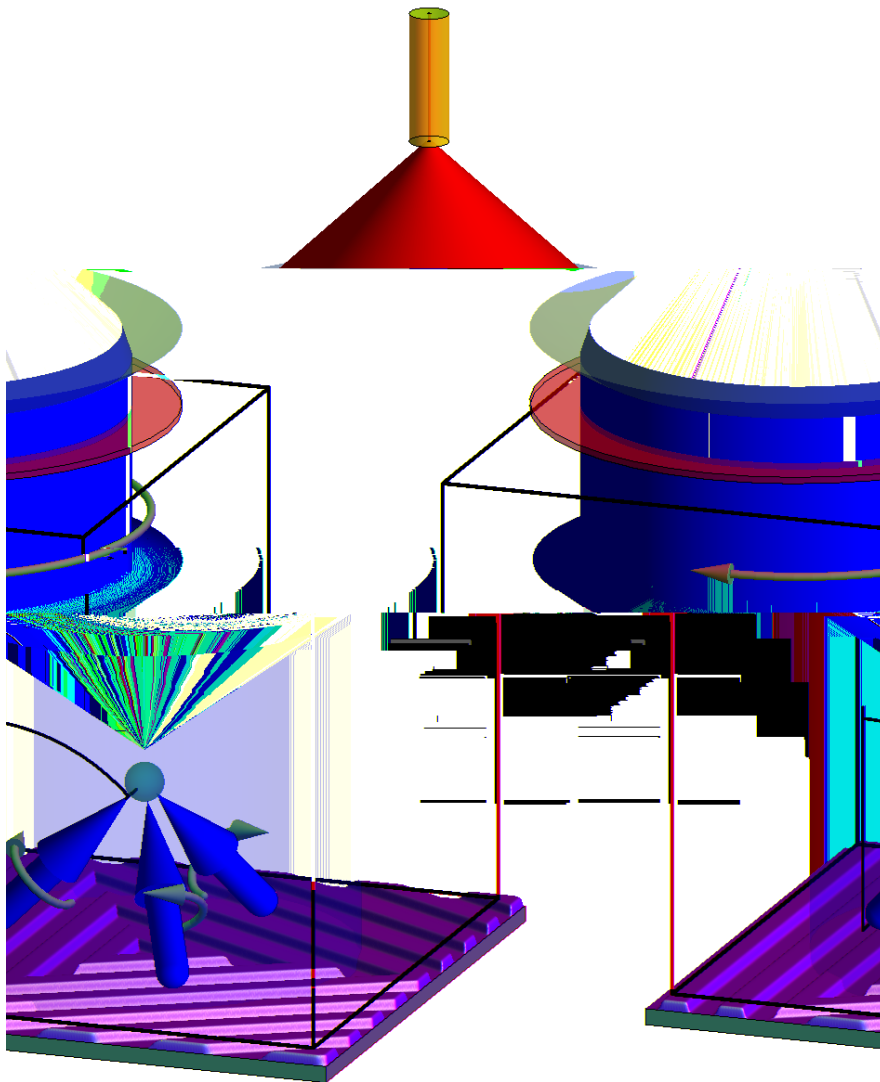


Figure 1: A diffractive optical elements (DOE) can transform a single circularly-polarised input beam into all required beams for an intensity-balanced magneto-optical trap [1]. This kind of chip was used to sub-Doppler cool atomic gases and subsequently load them into a magnetic trap.

References

[1] C. C. Nshii et al, A surface-patterned chip as a strong source of ultra-cold atoms for quantum technologies, nature nanotechnology Lett. 47 (2013)