



Tara Cubel Liebisch

(NIST Time and Frequency, Boulder, USA)

Laser Cooling for Compact Atomic Devices

Using stimulated cooling forces, namely the bichromatic force [1], a large flux of atoms can be cooled and loaded into an atomic trap, all within a small volume. The ability to create large atom samples in small volumes would enable the realization of portable, high-performance, low-energy atomic devices such as clocks, accelerometers, gyroscopes, and magnetometers. Using the bichromatic force to slow an atomic beam over distances less than 15mm, we are able increase the flux of cold atoms loaded into a magneto-optical trap by 15X and increase the atom number by 10X.

[1] Soeding et. al. PRL 78 1420 (1997) (First experimental demonstration of the bichromatic force.)

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**Universität Stuttgart, NWZII, Raum 3.123
Pfaffenwaldring 57, 70569 Stuttgart**

