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Adiabatic cooling of atoms trapped in a transformable optical trap SEUNG KOO LEE, HUI DONG KIM, SIN HYUK YIM, D. CHO, Korea University — We demonstrate adiabatic cooling of rubidium atoms in an optical trap by gradually transforming the trap from a corrugated form of a standing wave to a flattened form of a traveling wave. We trap atoms in an optical trap formed by a Fabry-Perot interferometer, which is used as a power build up cavity (PBC). We phase modulate the trapping beam using an electro-optic modulator (EOM). When the modulation frequency is the same as a free spectral range of the PBC, both carrier and sidebands can couple to the cavity simultaneously. When the modulation index is 1.2, the carrier and the sidebands have the same power and the potential well near the center of the PBC becomes flat. By controlling the modulation index we can change time-averaged intensity distribution of the intra cavity trap beam from a standing wave to a flattened form of a traveling wave. Accompanying reduction in the oscillation frequency of the trapped atoms leads to adiabatic cooling for the longitudinal degree of freedom.

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