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Cooling a degenerate Fermi gas in an optical trap by parametric excitation with anharmonic trapping frequency JIAMING LI, JI LIU, LEONARDO DE MELO, LE LUO, Indiana UniversityPurdue University Indianapolis, LE LUO TEAM — We demonstrate a technique for parametric cooling a degenerate Fermi gas in a crossed-beam optical trap, where high-energy atoms near the trap edge can be selectively removed by modulating the stiffness of the potential with anharmonic trapping frequencies [1]. A noninteracting degenerate Fermi gas is used for a proof of principle study, in which other cooling mechanisms are minimized and the excited high-energy atoms can leave the trap quickly without colliding with the low-energy atoms. We apply the parametric excitation by modulating the optical intensity of the trapping beams and measure the dependence of the cloud energy on the frequency and amplitude of the modulation. It is found that large anharmonicity along the axial trapping potential allows to generate anisotropic energy distribution, in which the axial cloud energy can be reduced to the ground state value when the modulation frequency is tuned to resonance with anharmonic trapping frequency. After cross-dimensional thermalization, the equipartition energy distribution is retrieved and the energy per particle E/E_F decreases about 20%. [1] Jiaming Li, Ji Liu, Wen Xu, Leonardo de Melo, Le Luo, arXiv:1512.01277 (2015).

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