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ULTRACOLD ATOMS FOR MATTER-WAVE INTERFEROMETRY IN MICROGRAVITY

Abstract

Light-pulse atom interferometry has various applications ranging from inertial sensing through gravimetry or gradiometry to fundamental tests of physics like the equivalence principle. Any precision measurement using atom interferometry has demanding requirements, for example, regarding the velocity spread of the atomic ensemble. We combined a collective excitation of an ^{87}Rb Bose-Einstein condensate with a magnetic lens in order to achieve 3D collimation equivalent to a kinetic temperature of 70 pK. The ultrasmall expansion rates are critical in order to exploit the full potential of the extended free fall and pave the way to space-based precision tests of the equivalence principle and beyond.