

Abstract Submitted
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Radiation pressure excitation of Low Temperature Atomic Force & Magnetic Force Microscope (LT-AFM/MFM) for Imaging OZGUR KARCI, UMIT CELIK, NanoMagnetics Instruments Ltd., AHMET ORAL, Middle East Tech Univ, NANOMAGNETICS INSTRUMENTS LTD. TEAM, MIDDLE EAST TECH UNIV TEAM — We describe a novel method for excitation of Atomic Force Microscope (AFM) cantilevers by means of radiation pressure for imaging in an AFM for the first time. Piezo excitation is the most common method for cantilever excitation, but it may cause spurious resonance peaks. A fiber optic interferometer with 1310 nm laser was used both to measure the deflection of cantilever and apply a force to the cantilever in a LT-AFM/MFM from NanoMagnetics Instruments. The laser power was modulated at the cantilever's resonance frequency by a digital Phase Lock Loop (PLL). The force exerted by the radiation pressure on a perfectly reflecting surface by a laser beam of power P is $F = 2P/c$. We typically modulate the laser beam by $\sim 800 \mu\text{W}$ and obtain 10nm oscillation amplitude with $Q \sim 8,000$ at 2.5×10^{-4} mbar. The cantilever's stiffness can be accurately calibrated by using the radiation pressure. We have demonstrated performance of the radiation pressure excitation in AFM/MFM by imaging a hard disk sample between 4-300K and Abrikosov vortex lattice in BSCCO single crystal at 4K to for the first time.

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