Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Design of a Self-Aligned, High Sensitivity Fiber Fabry-Perot Interferometer for Low Temperature Atomic Force Microscope/Magnetic Force Microscope OZGUR KARCI, Hacettepe University, MUNIR DEDE, Nano-Magnetics Instruments Ltd., AHMET ORAL, Sabanci University — We describe the design of a high sensitivity fiber Fabry-Perot interferometer for low temperature atomic force microscope/magnetic force microscope. This is a self-aligned system utilizing an alignment chip and eliminating all tedious alignment procedures. Our interferometer cavity is composed of a cleaved fiber, which is coated using dielectric to increase the reflectivity of laser from fiber-air interface, and a cantilever. 50 percent of the incident laser beam is reflected at the end of the fiber. The transmitted light propagates from the fiber end and hits the cantilever. Multiple reflections occur between cantilever and the fiber then the beams go into the fiber again. These two beams interfere and generate a photocurrent at the PD which is used for deflection measurement. We designed a special stick-slip coarse approach mechanism using piezoelectric tube scanner of the microscope. We have measured 8fm per square root Hz noise level at 300K, while the shot noise limit was 2fm per square root Hz. Our previous Michelson interferometer design had 20 fm per square root Hz noise level and gave better than 10nm MFM resolution on hard disk. Our goal is to further enhance the noise levels and achieve 6 nm resolution for LT-MFM with this new interferometer.

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Date submitted: 28 Nov 2011 Electronic form version 1.4