

Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Ultra-sensitive magnetic microscopy with an atomic magnetometer and flux guides YOUNG JIN KIM, IGOR SAVUKOV, Los Alamos National Laboratory — Many applications in neuroscience, biomedical research, and material science require high-sensitivity, high-resolution magnetometry. In order to meet this need we recently combined a cm-size spin-exchange relaxation-free Atomic Magnetometer (AM) with a flux guide (FG) to produce ultra-sensitive FG-AM magnetic microscopy. The FG serves to transmit the target magnetic flux to the AM thus enhancing both the sensitivity and resolution to tiny magnetic objects. In this talk, we will describe existing and next generation FG-AM devices and present experimental and numerical tests of its sensitivity and resolution. We demonstrate that an optimized FG-AM has sufficient resolution and sensitivity for the detection of a small number of neurons, which would be an important milestone in neuroscience. In addition, as a demonstration of one possible application of the FG-AM device, we conducted high-resolution magnetic imaging of micron-size magnetic particles. We will show that the device can produce clear microscopic magnetic image of 10 μm -size magnetic particles.

Young Jin Kim
Los Alamos National Laboratory

Date submitted: 03 Jan 2017

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