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Monolithic diamond probes for nanoscale magnetic imaging using single spins in diamond PATRICK MALETINSKY, SUNGKUN HONG, MICHAEL GRINOLDS, BIRGIT HAUSMANN, RON WALSWORTH, MIKHAIL LUKIN, MARKO LONCAR, AMIR YACOBY, Harvard University — Sensitive detection of magnetic fields at the nanoscale is a challenging problem in biological and physical sciences with great relevance to technological applications. Recent experimental demonstrations have shown the outstanding performance of diamond nitrogen-vacancy (NV) centers in magnetic field sensing [1, 2]. Here, we present a robust experimental realization of a scanning NV-magnetometer that exploits the full coherence properties of the NV-center for magnetic imaging. Our apparatus consists of a combined atomic force (AFM) and optical microscope, where the AFM tip is formed by a high purity diamond nanopillar containing a single NV center at its end. This geometry ensures high spatial resolution, long NV coherence times and waveguiding of NV fluorescence through the pillar, which combine to give maximal magnetic field sensitivity. We demonstrate the performance of our nanoscale magnetometer by imaging various magnetic field sources, including few tens of nm wide domains of a magnetic memory.

[1] Nature 455, 648 (2008)
[2] Nature 455, 644 (2008)

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