Abstract Submitted
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Optical magnetic imaging of living cells using NV centers in diamond[1] DAVID LE SAGE, Harvard-Smithsonian Center for Astrophysics, KEIGO ARAI, Massachusetts Institute of Technology, DAVID GLENN, Harvard-Smithsonian Center for Astrophysics, STEPHEN DEVIENCE, LINH PHAM, Harvard University, RONALD WALSWORTH, Harvard-Smithsonian Center for Astrophysics — Nitrogen-vacancy (NV) color centers in diamond can function as sensitive atomic-scale magnetometers with optical initialization and read-out. By imaging the fluorescence from a dense surface layer of NV centers ($\sim$10 nm deep) onto a sCMOS camera, we demonstrated rapid 2D vector magnetic field imaging over a wide field of view and with diffraction-limited spatial resolution. Here we apply this technology to image the magnetic field patterns produced by living magnetotactic bacteria placed on the diamond surface. We reconstruct images of the vector magnetic field projections along all three coordinates with sub-micron resolution, and spatially correlate these magnetic field patterns with optical images of the bacteria concurrently recorded. The measured magnetic field patterns agree well with models of the expected fields from the bacteria. We expect that this NV optical magnetic imaging will enable the first time-resolved measurements of dynamic magnetic field patterns produced throughout the life cycle of a single magnetotactic bacterium, and may open up a wide variety of other biologically-relevant measurement capabilities as well.

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