NANOSCOPY FOR MAGNETIC IMAGING OF CELLS WITH NANODIAMONDS

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Negatively charged nitrogen-vacancy (NV^-) centres in nanodiamonds (ND) have laid a new ground for superresolution imaging and magnetic sensing [1,2]. Here, we demonstrate superresolution magnetic imaging of magnetically-labelled MCF10A cells tagged with blinking NDs. For the first time, the blinking phenomenon is induced by a non-thermal process [3]. NDs are imaged under an external magnetic source of 7 mT and 532 nm wavelength to acquire the blinking fluorescence for nanoscale reconstruction of cells. We demonstrate a resolution down to 19 nm. The magnetic nanoparticles labelling the cells are then magnetised by an external magnetic source of 1 mT. The source is then removed. The magnetic field pattern is reconstructed under 561 nm wavelength and microwave stimulation via optically detected magnetic resonance (ODMR) of NV^- centres in the ND- labeled cells. We demonstrate a magnetic sensitivity down to 1 nT/$\sqrt{\text{Hz}}$. The presented work provides a method for nanoscale magnetic imaging in life science with NDs.

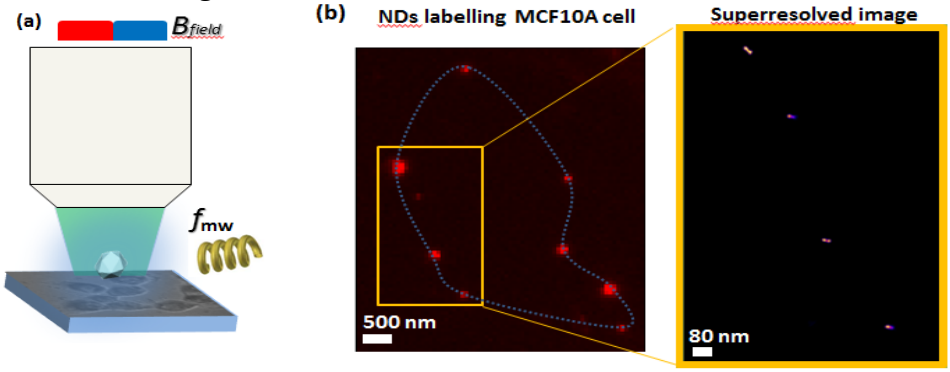

Figure 1: a) Schematic of the setup implemented to image magnetically-labelled MCF10A cells tagged with NDs. b) (Left) Wide field image of magnetically-labelled MCF10A cells tagged with NDs. (Right) Superresolved image of blinking NDs.

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[3] M. Gu *et al.* "Super-resolving single nitrogen vacancy centres within single nanodiamonds using a localization microscope," *Optics Express* ,**21** 17639–17646 (2013).