HIGH SENSITIVITY MAGNETIC FIELD MEASUREMENT IN MCF10A CELLS WITH SUPERRESOLVED BLINKING NITROGEN VACANCY CENTRES IN NANODIAMONDS

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Negatively charged nitrogen-vacancy (NV^-) centres in nanodiamonds (NDs) have been identified as an indispensable fluorescent tool for imaging and sensing [1,2]. Here, we report on high sensitivity magnetic fields from fixed MCF10A cells with superresolved blinking nanodiamonds in the order of μT. The MCF10A cells are labelled with iron oxide magnetic nanoparticles. First, the iron oxide nanoparticles are magnetized when an external magnetic field of 10 Gauss is applied. Then the external magnetic field is removed. Under 532 nm laser and microwave stimulation, the optically detected magnetic resonant (ODMR) signal shows two dips with a small frequency gap due to the magnetic contribution from the nanoparticles. Furthermore, by acquiring the blinking signals of the NV^- centres we combine the high sensitivity magnetic field measurement with parallel imaging for accurate reconstruction of the magnetic field beyond the diffraction limit. The sensitivity achieved is η= 16μT/$\sqrt{Hz}$ with 25 nm NV^- centres. The presented method provides a new platform for studying and imaging magnetic fields at the nanoscale with superresolution techniques.

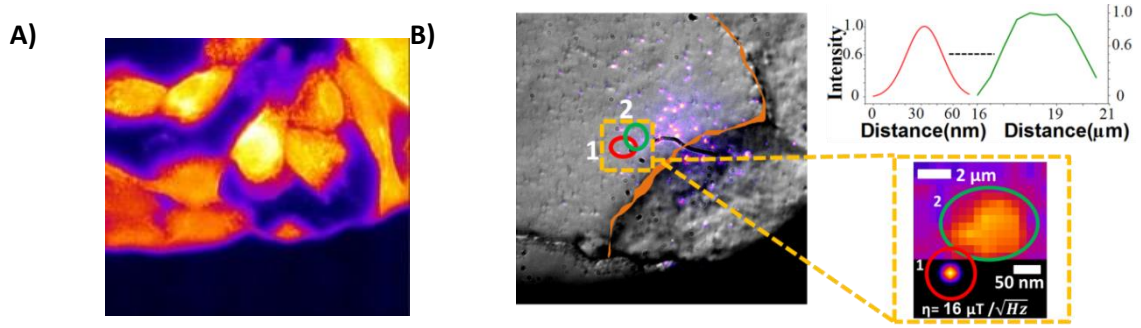

Figure 1: **A)** MCF10A cells labelled with magnetic nanoparticles. **B)** (left) Comparison of magnetic sensing enabled with and without superresolution (respectively point 1 and point 2). (right) cross section of the nanodiamonds and zoomed-in view showing the diffracted limited ND (scale bar 2μm) and the resolved high magnetic sensitive NV^- centre (scale bar 50 nm).

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