

FIBER-OPTICAL MAGNETIC MICROSCOPY PROBE

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Fiber-optical microscopy probes have enabled *in-vivo* fluorescent imaging with sub-micrometer resolution for research and clinical applications [1]. However, conventional fiber-optical microscopy probe is not applicable for magnetic imaging that provides essential information for probing living biological systems. Here, we report on the development of a miniaturized fiber-optical magnetic microscopy probe (FOMMP) which can potentially facilitate *in-vivo* magnetic imaging enabled by optically detected magnetic resonance (ODMR) measurement of nitrogen-vacancy (NV) centres in nanodiamonds. The FOMMP is mainly constituted with a micro-optic system and a microwave wire. The micro-optic system including an optical fiber and a microlens system is encapsulated in a tube for fluorescent imaging. A microwave wire is integrated in the FOMMP and the microwave field is applied by the wire placed on the external surface of the optical window. Magnetic microscopy imaging is obtained from the ODMR signal of the NV centres by detecting the fluorescence excited by a 532 nm laser beam and a microwave. An ultra-compact aberration-free microlens system with high numerical aperture [2] can be manufactured by two-photon direct laser writing on the fiber tip. The presented FOMMP provides a novel miniaturized and flexible tool to achieve *in-vivo* magnetic imaging.

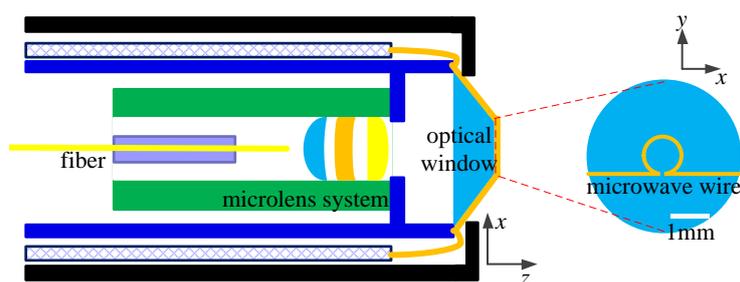


Figure 1: Schematic of a fiber-optical magnetic microscopy probe

[1] Flusberg, Benjamin A., Eric D. Cocker, Wibool Piyawattanametha, Juergen C. Jung, Eunice LM Cheung, and Mark J. Schnitzer. "Fiber-optic fluorescence imaging," *Nature methods*, **2**, 941-950 (2005).

[2] Gissibl, Timo, Simon Thiele, Alois Herkommer, and Harald Giessen. "Two-photon direct laser writing of ultracompact multi-lens objectives," *Nature Photonics*, **10**, 554-560 (2016).