Title: Subnanotesla Magnetometry with a fiber-coupled diamond sensor

The negatively charged nitrogen-vacancy (NV) centre in diamond is among the most studied solid-state defects due to the property of optically detected magnetic resonance which allows the spin state to be initialised and read out through optical means [1]. For this reason, the NV centre has seen application in a range of diverse fields with a key application being the detection of external magnetic fields [2]. An ensemble of NV centre defects in diamond have been used in applications ranging from single neuron action potential detection [3] to eddy current detection of conductive materials [4]. Many of these set-ups are confined to optical tables and thus their applications are limited. Here we present the most sensitive fibre-coupled diamond magnetometer, reaching a sensitivity of 310 ± 20 pT/Hz1/2 in the frequency range of 10-150 Hz [5]. The targeted application is in the detection of cardiac magnetic fields for magnetocardiography (MCG). Heart-related illnesses are among the leading causes of death globally and MCG has proved to be superior to electrocardiography, the current method used in hospitals. However, current magnetic field sensor technologies, such as the superconducting conducting quantum interference device are too expensive to allow widespread usage [6]. A sensor based on an ensemble of NV centres could be more economically feasible for use in medical applications.

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