

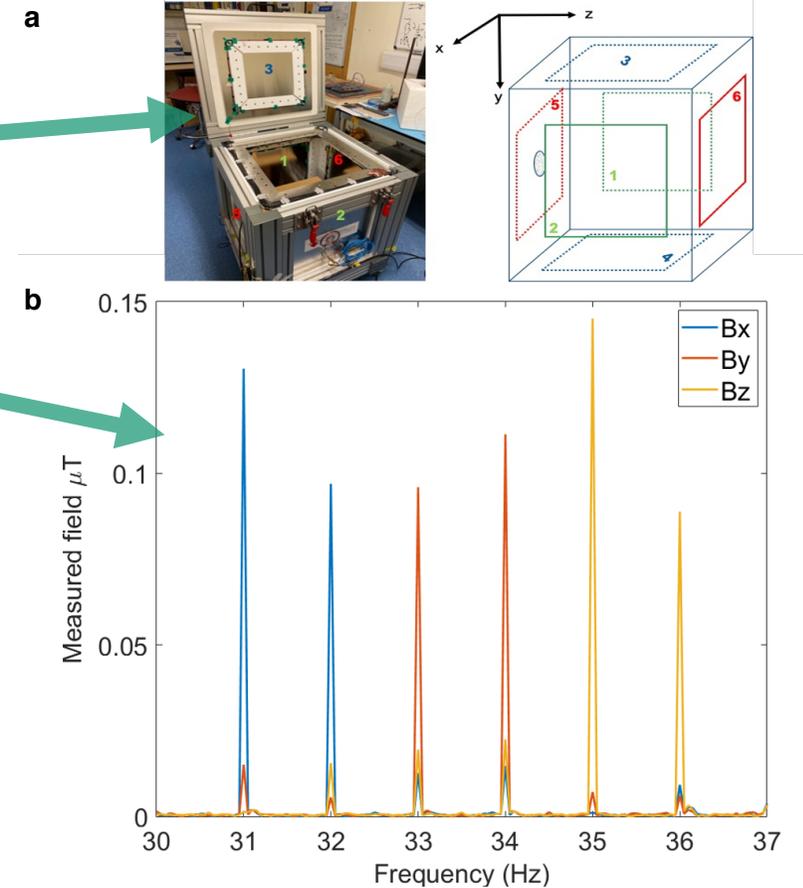
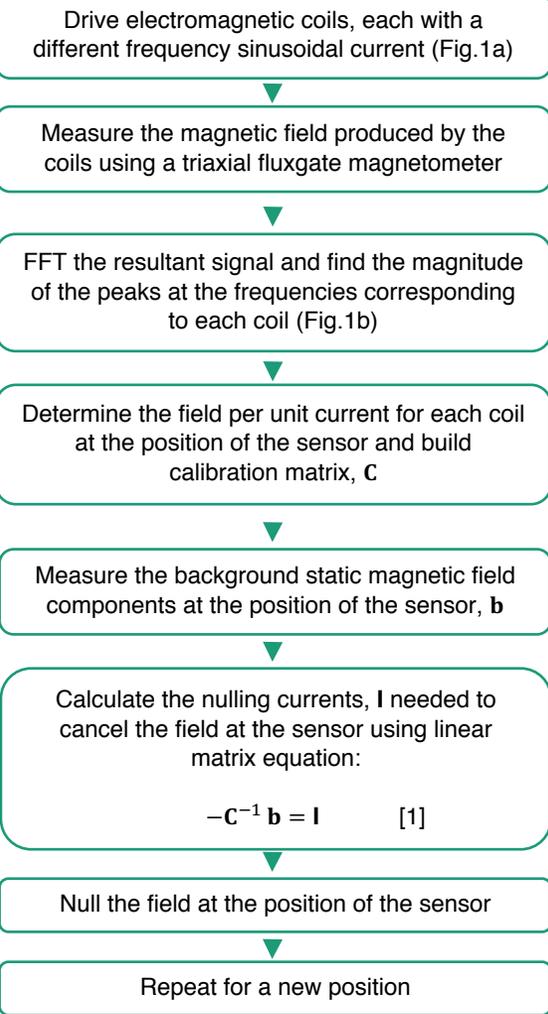


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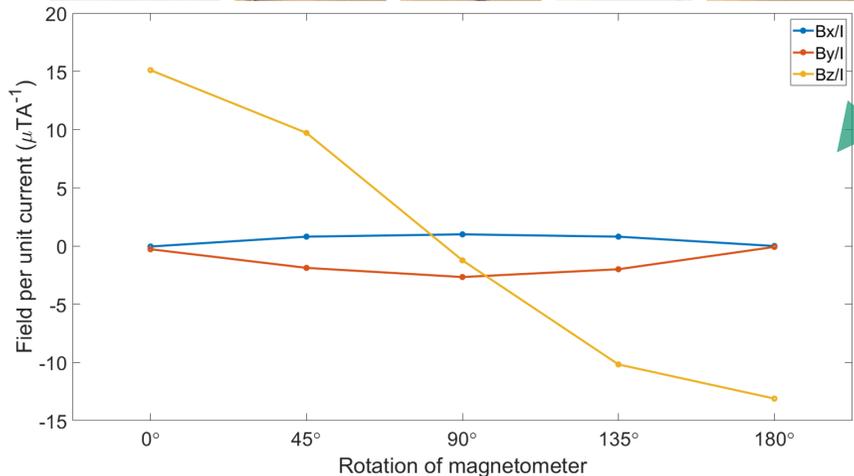
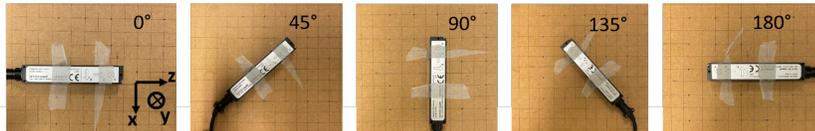
## 1. Background

- Head-mounted **OPMs** allow movement during **MEG** recordings but movement through non-zero background magnetic fields induces artefacts which can mask brain activity and send OPMs outside of their dynamic range.
- Active magnetic shielding, using **electromagnetic coils**, is used to cancel the remnant magnetic field inside a magnetically shielded room over a fixed volume.
- Knowledge of the field experienced by the OPMs is needed, and the coil to sensor field transfer function needs to be **calibrated**.
- To allow for movement outside the initial shielded volume, the transfer function needs to be recalibrated: this process needs to be fast and continuous.
- Here, we introduce a new approach that allows **continuous monitoring** of the field per current generated at a **sensor array** by a **set of coils**.
- Our initial demonstration of this approach uses a 3-axis fluxgate magnetometer and a set of six coils mounted on the faces of a small mu-metal box. Future work will include extension to field compensation and use of an array of OPMs.

## 2. Method and Results



**Figure 1:** (a) A schematic diagram showing the positions of 6, 20x20cm<sup>2</sup> square electromagnetic coils each with 10 turns mounted on the internal faces of a 55x55x55 cm<sup>3</sup> mu-metal box. Each coil, labelled 1 to 6, was driven with a different sinusoidal current-31,32,33,34,35,36 Hz respectively. (b) A Fourier transform of the field components, B<sub>x</sub>, B<sub>y</sub>, B<sub>z</sub>, measured by a triaxial fluxgate magnetometer positioned at ~ the centre of the mu-metal box (see fluxgate position- Fig.2 at 0°).



**Figure 2:** The B<sub>x</sub>, B<sub>y</sub> and B<sub>z</sub> components (shown in blue, red and yellow respectively), generated by coil 5 (Fig. 1), positioned on the inside x-y face of a 55x55x55cm<sup>3</sup> mu-metal box, were measured using a triaxial fluxgate magnetometer. The field per unit current at the position of the sensor was calculated after each rotation, between 0 and 180°.