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Synthesized high-density magnetomyography in vivo

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Magnetomyography (MMG), the measurement of magnetic fields produced by muscle activity, remains a scarcely explored topic in biomagnetism. The commercialization of miniaturized zero-field optically pumped magnetometers (OPMs) in the past decade has sparked new interest in in vivo MMG investigations, as sensor grid geometries can now be flexibly adapted to the anatomical shapes of individual muscles. Still, high-density experimental mapping of the spatio-temporal evolution of the magnetic field from in vivo muscles is lacking, greatly complicating both the physiological interpretation of obtained data and the general specification of MMG sensor requirements. In this study, we expand on the method in [1] by employing triaxial zero-field OPMs (QuSpin QZFM, Gen. 3) in a translational grid and performing sequential measurements of the magnetic field from the electrically stimulated abductor digiti minimi (ADM) muscle of the hand. A synthesized 1-mm-pitch magnetic field map is obtained and is set in geometrical relation to the ADM's anatomy through magnetic resonance imaging and 3D scans. The results show both major differences and similarities to simultaneous high-density electromyography recordings and in silico modeling.

References

[1] Kruse M. et al. *Biomed. Phys. Eng. Express* **11**, 025028. <https://dx.doi.org/10.1088/2057-1976/adaec5> (2025).

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