

Evolution of MEG: a first MEG-feasible fluxgate magnetometer

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Manuscript Source: <https://www.biorxiv.org/content/10.1101/2021.03.22.435762v1>

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Comments and Caveats:

- The sentence parsing is achieved using a prototype natural language processing pipeline written in Python and may include occasional errors in sentence segmentation.
- Depending on the source of the input text, the Sentence Audit may contain occasional html artefacts that are parsed as sentences (E.g. "Download figure. Open in new tab").
- Always consult the original research paper as the true reference source for the text.

Contact Information:

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All queries, feedback or suggestions are also very welcome.

Research Paper Sections:

The sections of the research paper input text parsed in this audit.

[illegible]

Title **Evolution of MEG: a first MEG-feasible fluxgate magnetometer**

S1 [001] Abstract

S1 [002] In the current article we present a first solid-state sensor feasible for magnetoencephalography (MEG), and working at room temperature.

In the current article we present a first solid-state sensor feasible ...
... for magnetoencephalography ...
... (MEG), ...
... and working ...
... at room temperature.

S1 [003] The sensor is a fluxgate magnetometer based on yttrium-iron garnet films (YIGM).

The sensor is a fluxgate magnetometer based ...
... on yttrium-iron garnet films ...
... (YIGM).

S1 [004] In this feasibility study we prove the concept of usage the YIGM in terms of MEG by registering a simple brain induced field: the human alpha rhythm 1.

In this feasibility study we prove the concept ...
... of usage the YIGM ...
... in terms ...
... of MEG ...
... by registering a simple brain induced field: ...
... the human alpha rhythm 1.

S1 [005] All the experiments and results are validated with usage of another kind of high-sensitive magnetometers - optically pumped magnetometer (OPM), which currently appears to be well-established in terms of MEG.

All the experiments ...
... and results are validated ...
... with usage ...
... of another kind ...
... of high-sensitive magnetometers - optically pumped magnetometer ...
... (OPM), ...
... which currently appears ...
... to be well-established ...
... in terms ...
... of MEG.

S1 [006] Magnetoencephalographyfluxgate magnetometersoptically-pumped magnetometersyttrium-iron garnet magnetometersalpha rhythm

S2 [007] 1 Introduction

S2 [008] Magnetoencephalography (MEG) is an attractive neuroimaging modality that combines non-invasiveness with high spatial and temporal resolution.

Magnetoencephalography ...
... (MEG) ...
... is an attractive neuroimaging modality ...
... that combines non-invasiveness ...
... with high spatial ...
... and temporal resolution.

S2 [009] These properties place MEG among the most informative neuroimaging tools capable of localizing neuronal activity with distinct temporal structure and suitable for studying complex functional integration processes.

These properties place MEG ...
... among the most informative neuroimaging tools capable ...
... of localizing neuronal activity ...
... with distinct temporal structure ...
... and suitable ...
... for studying complex functional integration processes.

S2 [010] The first demonstration of MEG in humans dates back to 1972 when D.Cohen [1] used Superconducting Quantum Interference Devices (SQUIDs) to register human alpha activity.

The first demonstration ...
... of MEG ...
... in humans dates back ...
... to 1972 ...
... when D.Cohen ...
... [1] ...
... used Superconducting Quantum Interference Devices ...
... (SQUIDs) ...
... to register human alpha activity.

S2 [011] Since then MEG found numerous applications in both medicine [2–4] and neuroscience [5–8].

Since then MEG found numerous applications ...
... in both medicine ...
... [2–4] ...
... and neuroscience ...
... [5–8].

S2 [012] Currently, SQUID based MEG device (SQUID-MEG) implemented in the form of a fixed-size helmet-dewar remain the most widely used MEG instrument.

Currently, ...
... SQUID based MEG device ...
... (SQUID-MEG) ...
... implemented ...
... in the form ...
... of a fixed-size helmet-dewar remain the most widely used MEG instrument.

S2 [013] While SQUID-MEG has been successfully utilized in experimental and clinical neurology the technology behind SQUID-based MEG systems limits the range of exciting applications.

While SQUID-MEG has been successfully utilized ...
... in experimental ...
... and clinical neurology the technology behind SQUID-based MEG systems limits the range ...
... of exciting applications.

S2 [014] The system is costly to purchase and maintain due to the constant need for cooling the sensors in the liquid helium.

The system is costly ...
... to purchase ...
... and maintain ...
... due to the constant need ...
... for cooling the sensors ...
... in the liquid helium.

S2 [015] In addition, the application of such a system is difficult for subjects with small heads (babies, children).

In addition, ...
... the application ...
... of such a system is difficult ...
... for subjects ...
... with small heads ...
... (babies, ...
... children).

S2 [016] For adult subjects, the distance between the sensors and the human head is about 2-3 cm (the thickness of the dewar walls) and noticeably increases for children, severely limiting the sensitivity of the device due to the attenuation of the magnetic field in inverse proportion to the square of the distance between the current source and the sensor [9].

For adult subjects, ...
... the distance ...
... between the sensors ...
... and the human head is ...
... about 2-3 cm ...
... (the thickness ...
... of the dewar walls) ...
... and noticeably increases ...
... for children, ...
... severely limiting the sensitivity ...
... of the device ...
... due to the attenuation ...
... of the magnetic field ...

... in inverse proportion ...
... to the square ...
... of the distance ...
... between the current source ...
... and the sensor ...
... [9].

S2 [017] Despite all the advantages and uniqueness of the spatial and temporal resolving properties the listed technological shortcomings precluded a wide spread of MEG neuroimaging modality currently available only at several hundred locations worldwide.

Despite all the advantages ...
... and uniqueness ...
... of the spatial ...
... and temporal resolving properties the listed technological shortcomings precluded a wide spread ...
... of MEG neuroimaging modality currently available ...
... only ...
... at several hundred locations worldwide.

S2 [018] Recent technological developments in the field of atomic magnetometry hold promise of lifting several limitations inherent to the current MEG systems.

Recent technological developments ...
... in the field ...
... of atomic magnetometry hold promise ...
... of lifting several limitations inherent ...
... to the current MEG systems.

S2 [019] The first demonstration of a non-cryogenic sensor with a SQUID-system level sensitivity [EMBEDDED IMAGE] was described by Schwindt et al. at 2010 [9] who used optically pumped magnetometers (OPM) to register brain activity.

The first demonstration ...
... of a non-cryogenic sensor ...
... with a SQUID-system level sensitivity [EMBEDDED IMAGE] was described ...
... by Schwindt et al. ...
... at 2010 ...
... [9] ...
... who used optically pumped magnetometers ...
... (OPM) ...
... to register brain activity.

S2 [020] Optically pumped magnetometers (OPM) operate in the so-called spin-exchange relaxation free (SERF) mode [10].

Optically pumped magnetometers ...
... (OPM) ...
... operate ...
... in the so-called spin-exchange relaxation free ...
... (SERF) ...
... mode ...
... [10].

End of Sample Audit

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