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Development of a portable double-resonance OPM for use in space weather observation

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Optically Pumped magnetometers (OPMs) have seen recent advances due to the emergence of new interrogation schemes, operational modalities, and availability of improved components forming the sensors. The use of microfabrication techniques for manufacturing alkali vapour cells [1,2], miniature optics and the integration of chip-scale lasers, allows for mass-production of compact, high sensitivity sensors.
These advances transformed laboratory-based OPM experiments into portable devices that can be fielded as practical sensors and used for a myriad of applications, ranging from biomedical, such as magnetocardiography (MCG) and magnetoencephalography [3,4], as well as industrial applications such as navigation [5] or non-destructive testing [6].

We will present a portable double-resonance OPM developed at Strathclyde, offering accurate and precise geomagnetic measurements in a compact package. We will show a practical application of this sensor in a new national network of magnetic observation [7], which can be used to monitor the effects of space weather, including observation of geomagnetic storms [8]. These high-performance practical measurements have been underpinned by in-depth optimisation of MEMS cell design, fabrication, filling, and validation [1,2]. These techniques will also be discussed.

References
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