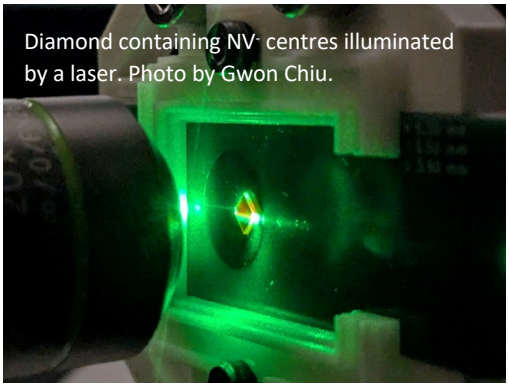
Diamond magnetometry: towards Lunar Navigation

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Diamond containing NV^- centres illuminated by a laser. Photo by Gwon Chiu.

Background: Nitrogen-vacancy (NV^-) centres in diamond have isolated electron spins which can store quantum information at room temperature for over one millisecond. These qubits can be sensitively read out optically allowing diamond magnetometers to be built. These are robust, solid state devices that work in a broad range of environments with high sensitivity. The sensing of weak magnetic fields has applications in space missions, medical use, fusion power diagnostics, non-destructive testing [1, 2] and navigation [3]. We have recently built the world's most sensitive fibre-coupled diamond magnetometer [4]. This is based on the optically detected magnetic resonance of NV^- centres in diamond.

The project: Diamond is radiation hard and can perform very sensitive vector sensing of magnetic fields, enabling it to be used in environments such as space and fusion power plants. As part of this project, we will develop the underlying sensing techniques and subsequent sensor design of space-capable magnetometers, working in partnership with the European Space Agency to develop the sensor technology to utilise magnetic crustal anomalies on the moon as a Lunar Navigation reference.

The successful applicant will work as part of a vibrant team and will learn to build cutting-edge devices combining lasers, optical fibres, microwaves, RF, electronics, magnets, software and diamonds. Our lab in Warwick also benefits from several other NV^- experiments for quantum science and quantum technologies. The successful applicant will join a community of more than ten academics and over twenty PhD students in the departments of Physics, Chemistry, Engineering and the Warwick Manufacturing Group all researching different aspects of diamond science and technology. Warwick has excellent facilities for characterisation and processing of diamond and a strong record of successful collaboration with industry.

The project is experimental and includes collaboration with academic and industrial partners. You should have obtained, or be about to obtain a First or Upper Second Class UK Honours degree in Physics, Engineering or a related subject. Applicants with equivalent qualifications gained outside the UK will also be considered. Funding may be available, but only for UK students. For further information please contact Ben Green (b.green@warwick.ac.uk) or Ravi Desai (Ravindra.Desai@warwick.ac.uk).

[1] A. J. Newman *et al.*, Physical Review Applied **21**, 014003 (2024).
[2] L. Q. Zhou *et al.*, Physical Review Applied **15**, 024015 (2021).
[3] S. M. Graham *et al.*, Diamond and Related Materials **152**, 111945 (2025).
[4] S. M. Graham *et al.*, Physical Review Applied **19**, 044042 (2023).