

## Measuring the defect structure orientation of a single NV- centre in diamond

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The negatively charged nitrogen-vacancy (NV-) centre in diamond has many exciting applications in quantum nano-metrology, including magnetometry, electrometry, thermometry and piezometry. Indeed, it is possible for a single NV- centre to measure the complete three-dimensional vector of the local electric field or the position of a single fundamental charge in ambient conditions. However, in order to achieve such vector measurements, near complete knowledge of the orientation of the centre's defect structure is required. Here, we demonstrate an optically detected magnetic resonance (ODMR) technique employing rotations of static electric and magnetic fields that precisely determines the orientation of the centre's major and minor trigonal symmetry axes. Thus, our technique is an enabler of the centre's existing vector sensing applications and also motivates new applications in multi-axis rotation sensing, NV growth characterization and diamond crystallography.

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