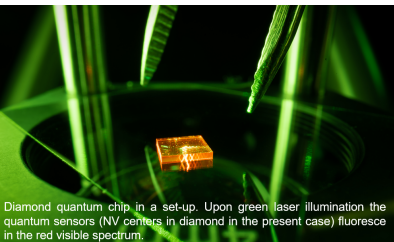


Boosting sensitivity and speed for quantum sensing

As individual defects in diamond, nitrogen vacancy (NV) centers present extraordinary opportunities for quantum sensing. We are pleased to present an innovative solution that represents a significant advancement in the field of NV-NMR measurements. The approach revolves around achieving homogeneous control over a broad area spin ensemble, allowing enhanced sensitivity and resolution.

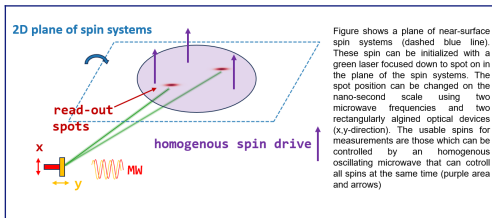


Diamond quantum chip in a set-up. Upon green laser illumination the quantum sensors (NV centers in diamond in the present case) fluoresce in the red visible spectrum.

Simultaneous local spin manipulation

By introducing microwave radiation, the novel approach manipulates the spin ensemble, and readout occurs through laser illumination with temporal-spatial encoding of luminescence. High-precision analyses within the boundary of the solid-state matrix offering unmatched control and accuracy.

- 01 sensitivity increase of 300-500% compared to existing methods
- 02 lower-power pulse laser, allowing more efficient energy utilization
- 03 minimal disruption to often heat sensitive biological or chemical samples
- 04 10 times faster readout speed



IP RIGHTS

Filed in EP and US

2024

CHALLENGE

The utilization of spin ensembles within solid-state matrices presents a formidable challenge due to several intricate factors. Distinguishing between spin states and the inadvertent interactions with other particles in the matrix pose significant difficulties. Furthermore, achieving accurate measurements necessitates the use of averaging to attain an adequate signal-to-noise ratio, a process that inherently limits sensitivity.

INNOVATION

The presented invention outlines an approach aimed at achieving homogeneous control over a large surface-area spin ensemble. To facilitate rapid transition between illuminated points an optical modulator is integrated into the laser pathway. Additionally, the use of a deflected and focused laser beam enables the attainment of high light power densities within the illuminated area, while maintaining laser power uniformity. The core advantage of this innovative concept lies in its ability to uniformly control the spin ensemble across a vast surface area. This, in turn, promises precision in measurement and higher levels of resolution.

01 Basic principles observed · 02 Technology concept formulated · 03 Experimental proof of concept · 04 Technology validated in lab · 05 Technology validated in relevant environment · 06 Technology demonstrated in relevant environment · 07 System prototype demonstrated in operational environment · 08 System complete and qualified

TRL 08

TRL 07

TRL 06

TRL 05

TRL 04

TRL 03

TRL 02

TRL 01

Technology Readiness Level (TRL)



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