

Products Information



Quantum Diamond Atomic Force Microscope

AFV

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"To Make a Better Life by Applied Science"

پیشگام در راهکارهای نانو تکنولوژی

Introduction

Quantum Diamond Atomic Force Microscope (QDAFM)

Quantum Diamond Atomic Force Microscope (QDAFM) is a magnetic imaging instrument based on both NV center in diamond and AFM scanning imaging technology. By quantum control and readout of the spin state in the diamond probe, the magnetic property of samples is acquired quantitatively and non-invasively. With nanoscale spatial resolution and ultra-high detection sensitivity, QDAFM is an innovative technology to develop and study magnetic textures, high-density magnetic storage, and spintronics.

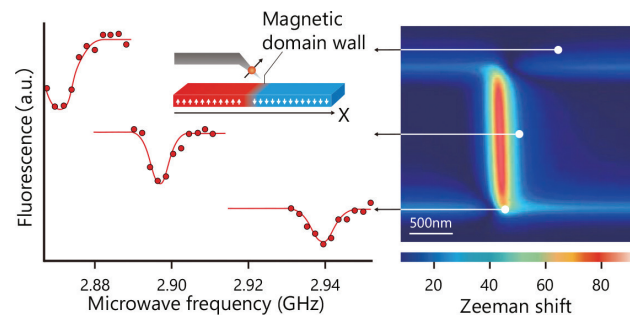
Features



Introduction

QDAFM has extensive applications in material science, biology, physics and so on.

Nanoscale magnetic imaging



Magnetic imaging of Bloch domain wall

In condensed matter physics, it is significant to determine the static spin distribution of magnetic materials, which is also the key to study new magnetic devices.

QDAFM enables high-quality imaging of domain walls with ultra-high sensitivity at the nanoscale.

Reference:

Tetienne, J. P. et al. The Nature of domain walls in ultrathin ferromagnets revealed by scanning nanomagnetometry. *Nature Communications* 6, 6733(2015).

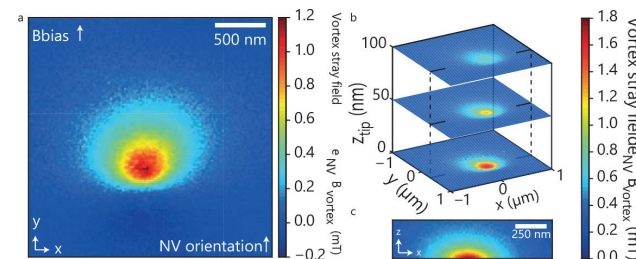
Superconductor vortex imaging

Microscopic studies of superconductors and their vortices play a vital role in understanding the mechanisms underlying superconductivity.

QDAFM working at cryogenic conditions demonstrated its quantitative measuring and imaging ability for superconductor vortices, and this technique can be easily applied to other cryogenic condensed matter systems.

Reference:

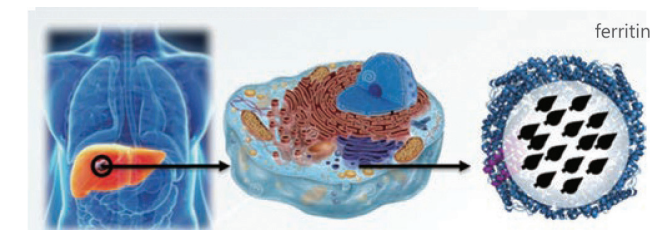
Thiel, L. et al. Quantitative nanoscale vortex imaging using a cryogenic quantum magnetometer. *Nature Nanotech* 11,677-681 (2016).



Quantitative mapping of single-vortex stray magnetic fields

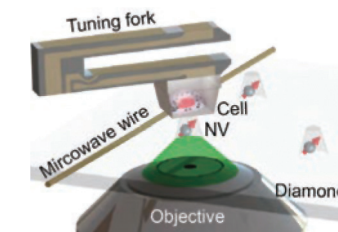
Single cell magnetic imaging

The in situ measurement of biomolecules inside a single cell is an important goal in life science. Among various imaging techniques, the magnetic resonance imaging (MRI) technique can quickly and non-destructively acquire spin distribution images in vivo.



In situ nanoscale magnetic imaging of ferritins in a single cell

As MRI has almost no damage to organisms, it plays an important role in pathological research, di-



Schematic view of the experimental setup for nanoscale magnetic imaging

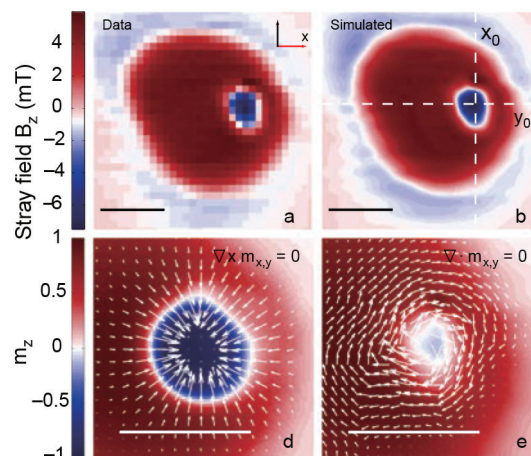
Introduction

agnosis, and treatment of diseases. However, the spatial resolution limit of traditional MRI is above micrometers, thus it is impossible to perform molecular-scale MRI in a cell. The researchers break the limit with QDAFM, which enables a 10 nm spatial resolution magnetic imaging of ferritins in a single cell. Reference.

Topological magnetic structure characterization 6 y Wang, P. et al. Nanoscale magnetic imaging of ferritins in a single cell. Science advances 5, 8038 (2019).

Topological magnetic structure characterization

Magnetic skyrmions are small swirling topological defects in the magnetization texture. It exhibits rich novel physical properties and provides a new platform for studying topological spintronics. The potential applications include high-density, low-power cost and nonvolatile storage devices. However, the detection of a single skyrmion at room temperature is still challenging. Owing to the high sensitivity and high spatial resolution features, QDAFM demonstrated its ability to solve this long-standing problem by reconstructing the full set of spin textures from a measured stray field.

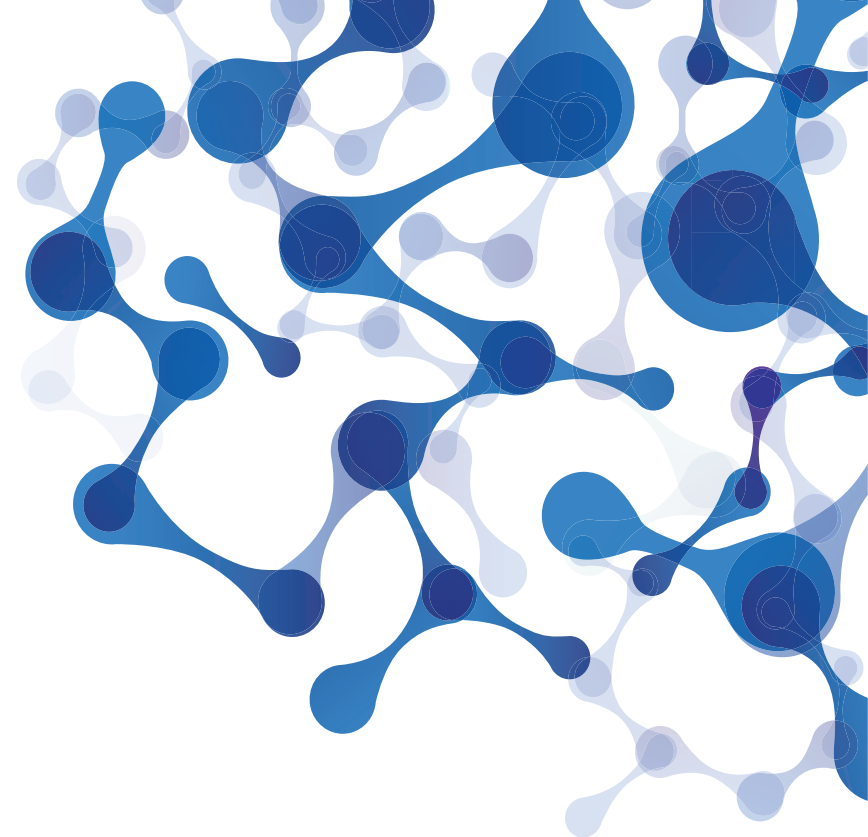


Reference:

Dovzhenko, Y. et al. Magnetostatic twists in room-temperature skyrmions explored by nitrogen-vacancy center spin texture reconstruction. Nature Communications 9, 2712 (2018).

Specifications

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|--|------------------------------|
| Scanning probe frequency | 32 kHz |
| Compatible probe type | Akiyama probe, diamond probe |
| AFM scan range | 80×80 μm ² |
| Confocal scan range | 80×80 μm ² |
| Lens numerical aperture | 0.7 |
| Spatial resolution of magnetic imaging | 10 nm |
| Magnetic detection sensitivity | 1 μT/ Hz |
| Microwave frequency | 0.7 - 4.0 GHz |
| Time accuracy of pulse control | 50 ps |
| Magnetic field | 10 - 500 Gauss |



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PLASMA

ARIA FAN VARZAN is a part of FANDA Group