

ProteusQ

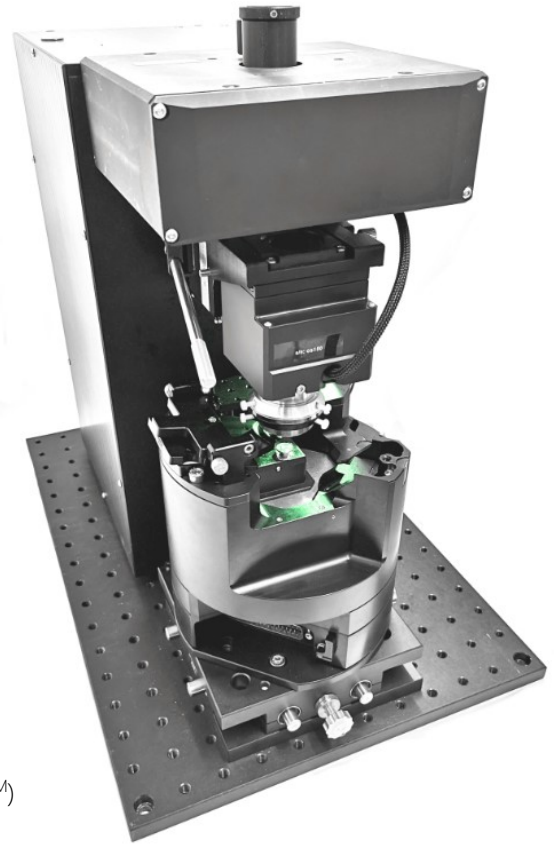
Unleash the future of material science

Product leaflet | Release version: December 2019

Quantitative and non-perturbative
analysis of surface magnetic fields

powered by

HORIBA

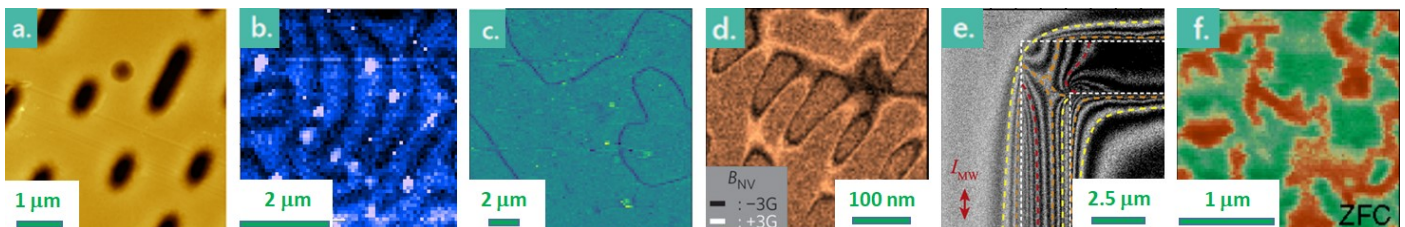


Key Features

- ✓ Tuning fork based scanning NV magnetometer
- ✓ Quantitative magnetometer with a **single-spin** probe (→ QuantileverMX™)
- ✓ Non-perturbative magnetic field sensing (**sensitivity: 1 $\mu\text{T}/\text{Hz}^{1/2}$**)
- ✓ AFM & NV measurement modes at ambient condition
- ✓ Automated sample approach & NV readout
- ✓ Robust confocal microscope (**NA = 0.7**) design **without** optical realignment
- ✓ **Safe & Fast** (< 2 min) sample/probe exchange mechanism
- ✓ Programmable control & measurement software LabQ™



Applications examples



- a. CD-ROM topography (AFM mode by ProteusQ)
- b. Ultrathin Co/Pt (NV quenching mode by ProteusQ)
- c. Bi(111)/YIG Surface (NV quenching mode by ProteusQ)
- d. Recording media (NV mode, quantitative)¹
- e. Microwave imaging (NV mode, quantitative)²
- f. Antiferromagnetic RAM (NV mode, quantitative)³

1. Adapted from *Nat. Nanotech.* 7, 320 (2012) • 2. Adapted from *New J. Phys.* 17, 112001 (2015) • 3. Adapted from *Nat. Commun.* 8, 13985 (2017).



Specifications

SPM Scanner & Positioning Module

| | |
|-------------------------------------|--|
| Sample scanner | • xy scanner range: 100 μm \times 100 μm z scanner range: 15 μm |
| | • Noise: 0.1 nm/0.02 nm (closed/open-loop) in xy (BW: 100 Hz); <0.04 nm (typical, closed-loop) in z (BW: 1 kHz) |
| Close-loop X/Y/Z coarse positioning | • 5 mm / 5 mm / 15 mm positioning ranges along x/y/z axes (<1 μm resolution) |
| SPM modes | • Tuning fork based AFM mode, NV mode |
| Sample size | • < 40 mm in diameter and < 15 mm in thickness |
| Probe-sample drift rate (300 K) | • < 2 nm/h over 24h |

Confocal Microscope Module

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|-------------------------|--|
| Objective lens | • \times 100 magnification, NA=0.7 |
| Close-loop lens scanner | • 30 μm \times 30 μm \times 15 μm (< 1 nm resolution) |

Quantum control Module

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|--------------------------------------|---|
| MicrowaveQ™ (19" chassis, 2U height) | • Full digital microwave controller with integrated APD detector |
| Microwave delivery module | • Mini-linear X/Y/Z stages (+ /- 2 mm, μm -resolution) |
| Integrated miniaturized RF-probe | • Connector type: SMA |

Software

| | |
|-------|---|
| LabQ™ | • GUI for AFM & NV modes (qualitative & quantitative modes) |
| | • Programming user interface (Python, Qudi framework) |

Additional Options

| | |
|---------------------|--------------------------------|
| Environment control | • Vibration/acoustic isolation |
|---------------------|--------------------------------|

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