Qnami ProteusQ

Capture surface magnetic fields at the atomic scale

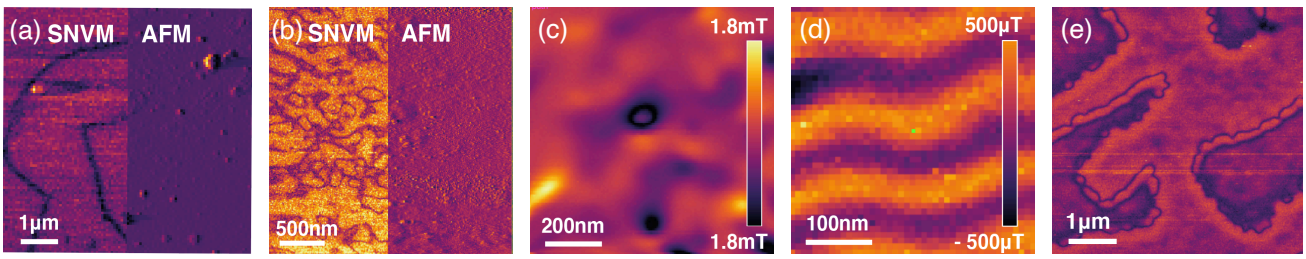
Specification sheet I Release version: May 2020

Key Features

- ☑ Tuning-fork based scanning NV magnetometer (SNVM)
- ☑ **Quantitative** magnetometer with a **single-spin** probe (→ Quantilever**MX**™)
- ☑ **Non-perturbative** magnetic field sensing (**sensitivity: 1 μT/Hz$^{1/2}$**)
- ☑ **AFM & SNVM** measurement modes at ambient condition
- ☑ **Automated** sample approach & NV readout
- ☑ **Robust** confocal microscope design without optical realignment
- ☑ **Safe & Fast** (< 2 min) sample/probe exchange mechanism
- ☑ **Programmable** control & measurement software Lab**Q**™

powered by HORIBA

Application examples



(a) Ferromagnet Bi:YIG **(b) & (c)** Antiperosvkite Mn_3GaN **(d)** Multiferroic $BiFeO_3$ **(e)** Synthetic Antiferromagnet Co/Ru/Pt/Co

Samples courtesy of UMR CNRS/Thales and University of Wisconsin Madison

Specifications

AFM
5x5x15 mm³ motorized approach system for XYZ sample positioning with positioning resolution < 1 um
100x100x15 (+/-10%) um³ XYZ piezo closed-loop sample scanner with XY non-linearity of 0.05%, and Z non-linearity of 0.05%
Noise level: 0.1nm RMS in XY dimension in 200Hz bandwidth with capacitance sensors 'on' 0.02nm RMS in XY dimension @ 100Hz bandwidth with capacitance sensors 'off' < 0.04nm RMS Z capacitance sensor @ 1000Hz bandwidth
Maximum sample size: 40x50mm², 15mm thickness.
Quantilever tuning-fork probe holder
Integrated miniaturized microwave near-field antenna
4x4x4 mm³ xyz manual stage for near-field antenna positioning with resolution < 1 um
NV bias magnet mounted on objective (vertical direction: -2.5 to +2.5 mT, manually adjustable)
Optics
100x Plan Apo infinity corrected objective, NA=0.7, working distance: 6mm
30x30x15 µm³ XYZ closed loop piezo objective scanner
Video microscope top channel, including LED illuminator and a USB Industry CMOS camera (DFK 22AUC03), 744x480 pxl (0.4Mpxl), 4.46x2.88mm² sensor size
Confocal optical unit with up-straight photon collection and 50um multimode fiber output coupler
Optical diode laser (λ = 515±5 nm), tunable output power 0.01 - 20.0 mW at focal point
Single photon counting module
Microwave generator
Operating frequency bandwidth 2.5-3.5 GHz, 10Hz resolution
Maximum power > 30dBm, with 0.1dB power resolution
Gain compensated for flat power distribution across the whole frequency bandwidth
4 General purpose Input-Output (GPIO) channels with TTL level specification
1Gigabit Ethernet connection port for data transmission
Software
Windows software for control of Smartscan SPM modes
LabQ software for SNVM (NV fluorescence mode, optically detected magnetic resonance spectroscopy)
Fluorescence auto-track routine
Measurement scripting abilities via Jupyter Notebook

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