Qnami

the quantum wave

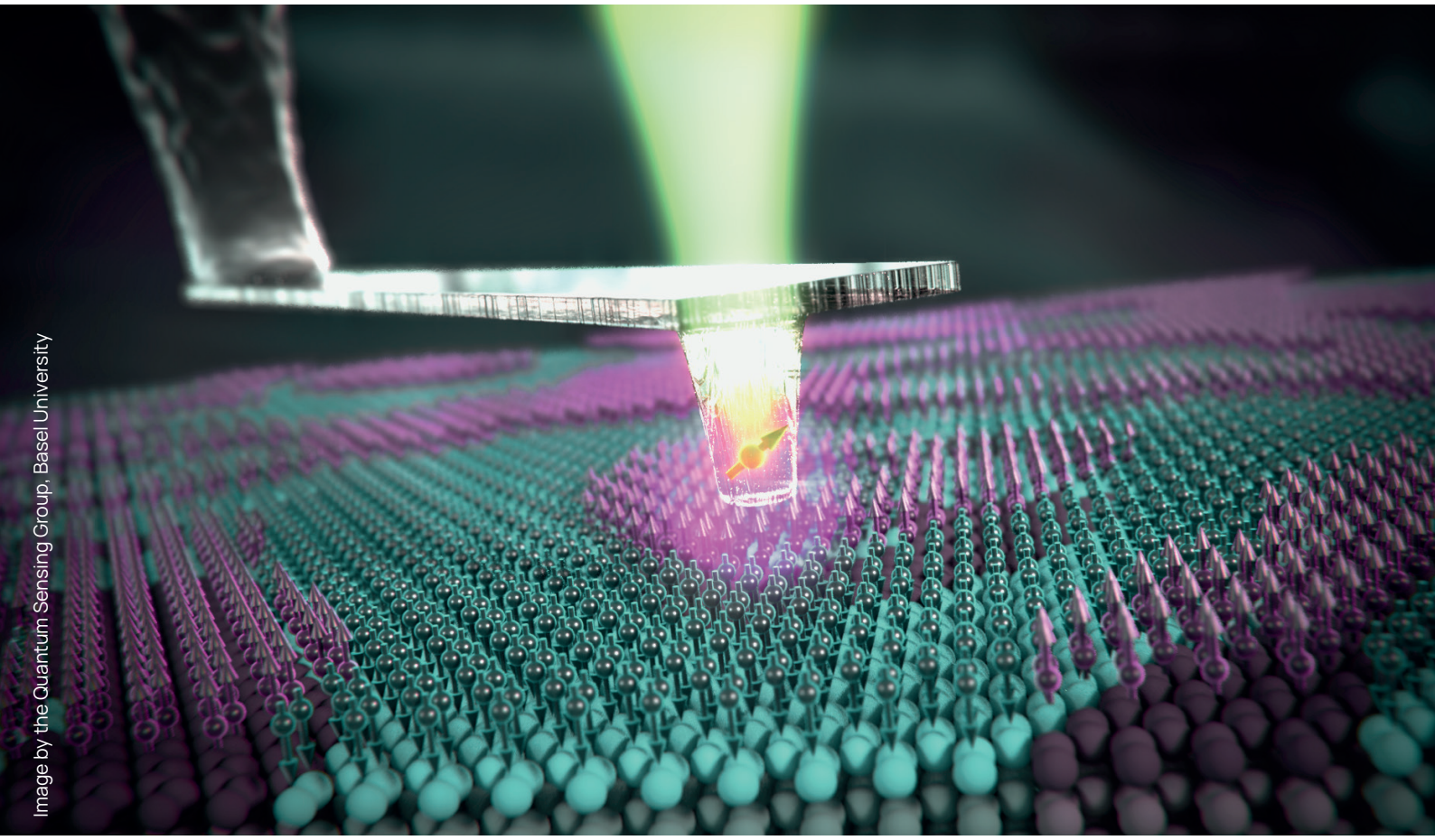


Image by the Quantum Sensing Group, Basel University

Qnami ProteusQ™

Capture surface magnetic fields at the atomic scale

ProteusQ

February 2022

Powered by HORIBA

Next level in precision

Qnami ProteusQ is a complete quantum microscope system. It is the first scanning NV (nitrogen-vacancy) microscope for the analysis of magnetic materials at the atomic scale.

The Qnami ProteusQ system comes with state-of-the-art electronics and software. Its flexible design allows for future adjustments and scaling, expansion and capability upgrades.

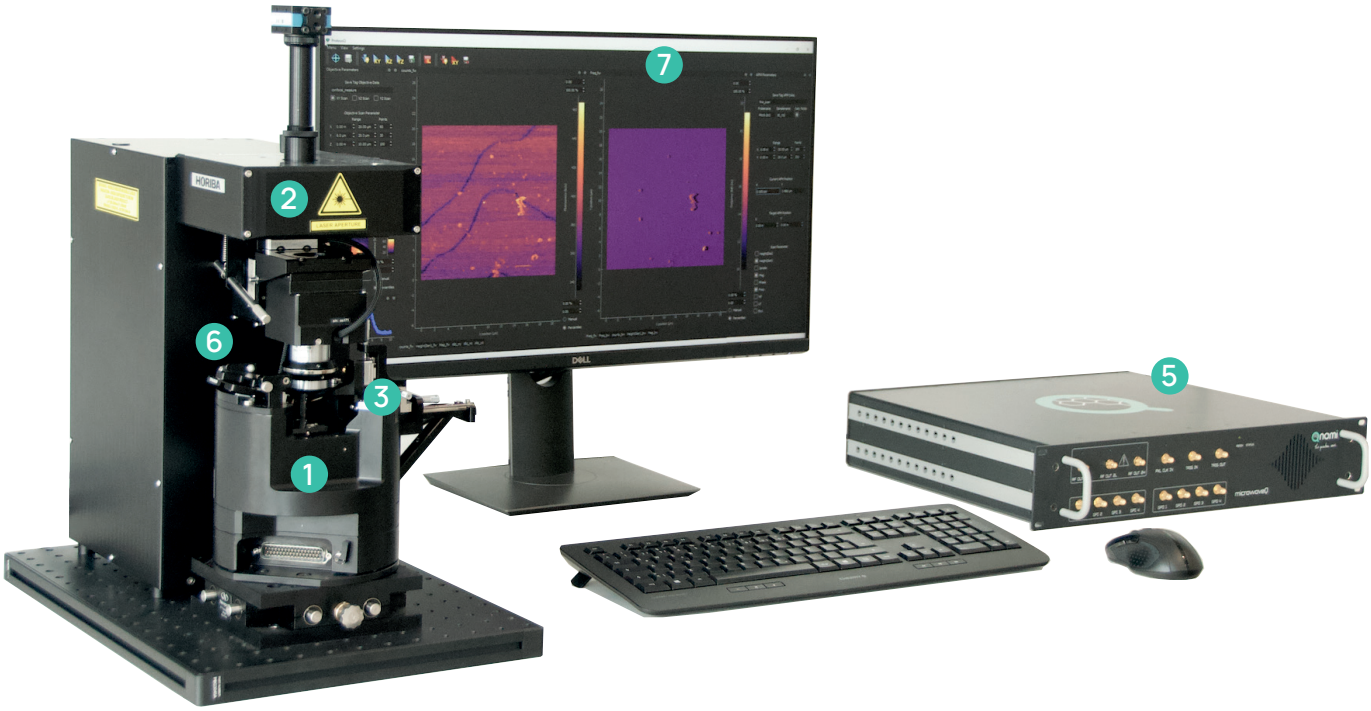
The proprietary Qnami ProteusQ quantum technology provides high precision images for you to see directly the most subtle properties of your samples and the effect of microscopic changes in your design or fabrication process.

The Qnami ProteusQ opens a new window on your research and gives you a new level of control to drive innovation in the the design, creation and delivery of smart and energy-efficient electronics.

Qnami ProteusQ™

Key features

- **Quantum performance**
  New level of mapping a wide range of magnetic signals for materials science and more
- **Ease of use**
  Automated operations, tip and sample exchange in just a few minutes
- **Robust and stable**
  Proven SPM platform. Tips with unbeatable lifetime
- **Atomic precision**
  Sensitivity down to the single atomic layer combined with nanoscale resolution
- **Intuitive**
  No quantum expertise required
- **Customizable**
  Synchronize your measurements and run your own protocols using Jupyter Notebook (Python)
- **Unlimited potential**
  Extend to standard SPM modules (AFM, LFM, EFM, MFM, KPFM, PFM, Force curves, etc...) and more quantum imaging modes
- **Powered by HORIBA**
  World leader in AFM and optics



Scanning NV microscope

1 Sample scanner
- closed-loop scanner and coarse positioner
- ultra-low drift

2 Confocal microscope
- high numerical aperture
- objective scanner
- stable design
- fiber-output

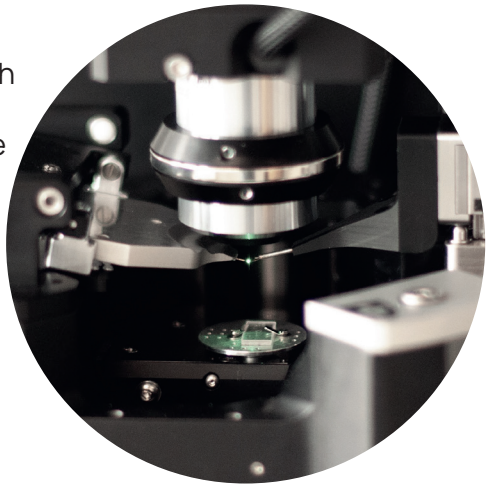
3 NV SPM head
- fast and safe tip exchange
- easy near-field antenna approach

4 Microwave signal generator
- GHz electronics for NV spin detection
- optional high-frequency pulsing capabilities

5 Photon counting module
- single photon counting
- high quantum efficiency

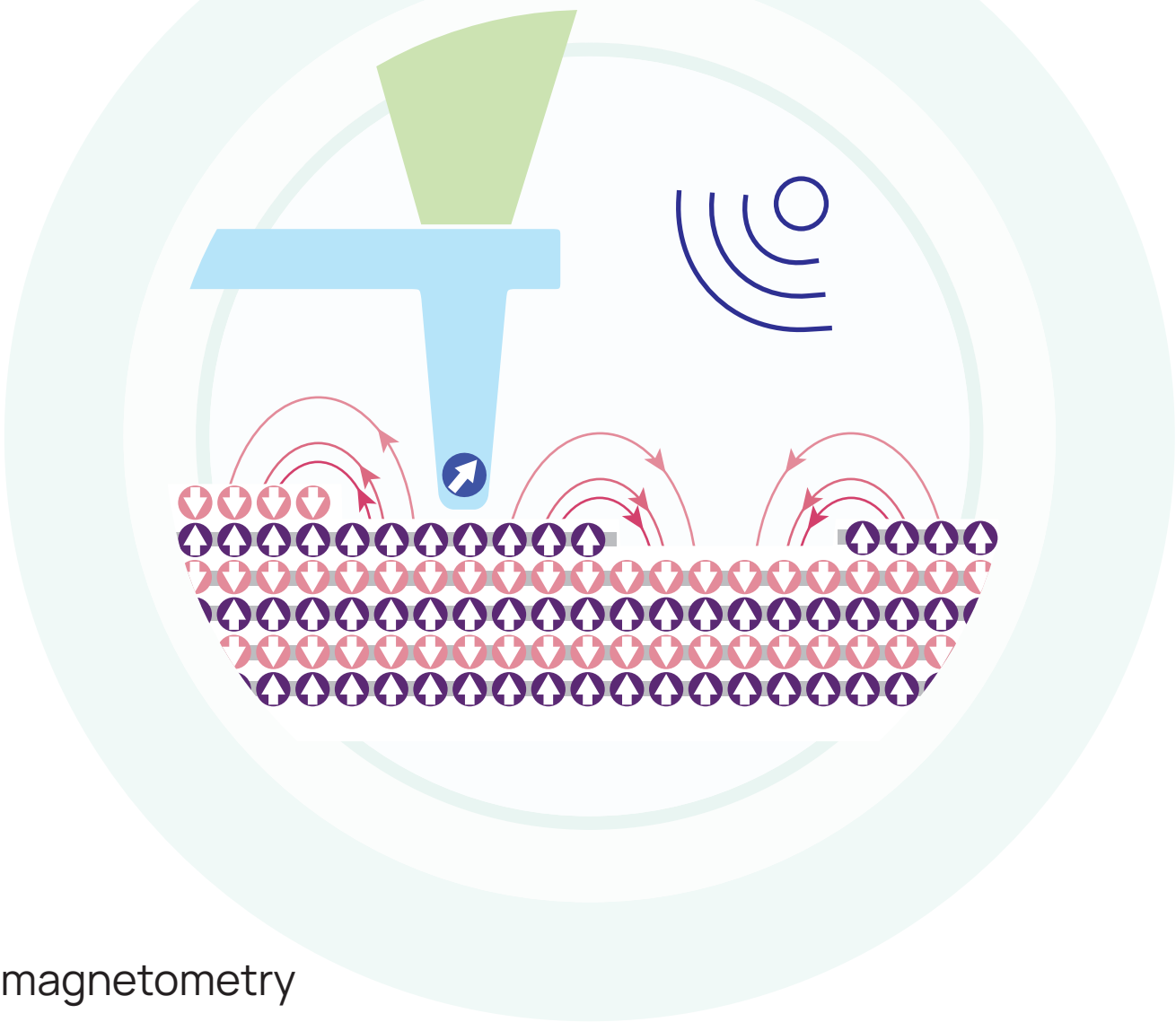
6 QuantileverTM
- single spin quantum sensor
- optimized architecture for high fluorescence throughput
- tuning-fork force-sensor

7 Software
- automized approach and landing procedures, fluorescence auto-track mode
- simultaneous recording of topography and magnetic stray fields



Probe and near-field antenna, with sample retracted

How it works



NV magnetometry

A laser is focused on the diamond tip and excites the embedded single NV, which emits red light in return. A microwave signal is sent by the close-by near-field antenna to probe the NV spin resonance. The frequency of this resonance is identified by monitoring the NV fluorescence, a technique known as optically detected magnetic resonance (ODMR). The measured frequency directly translates into an exact value of the magnetic field, with no further calibration.

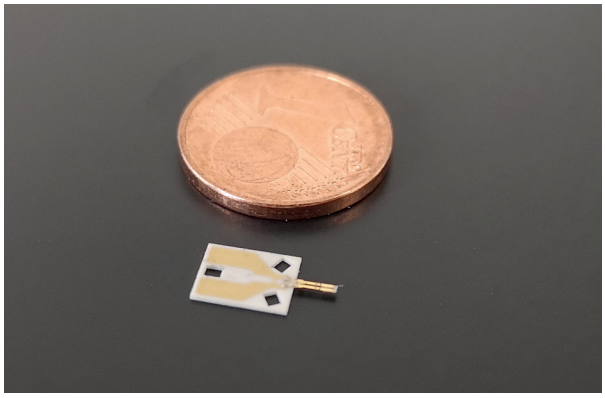
Scanning NV Microscopy

NV Magnetometry and Scanning Probe Microscopy techniques are combined onto a single platform, allowing the simultaneous acquisition of the sample's topography and surface magnetic fields. While the tip's radius of curvature determines the lateral resolution for the topography image, it is the distance between the NV center and the sample surface which determines the lateral resolution for the magnetic image.

Quantilever™

An atomic defect in perfect diamond

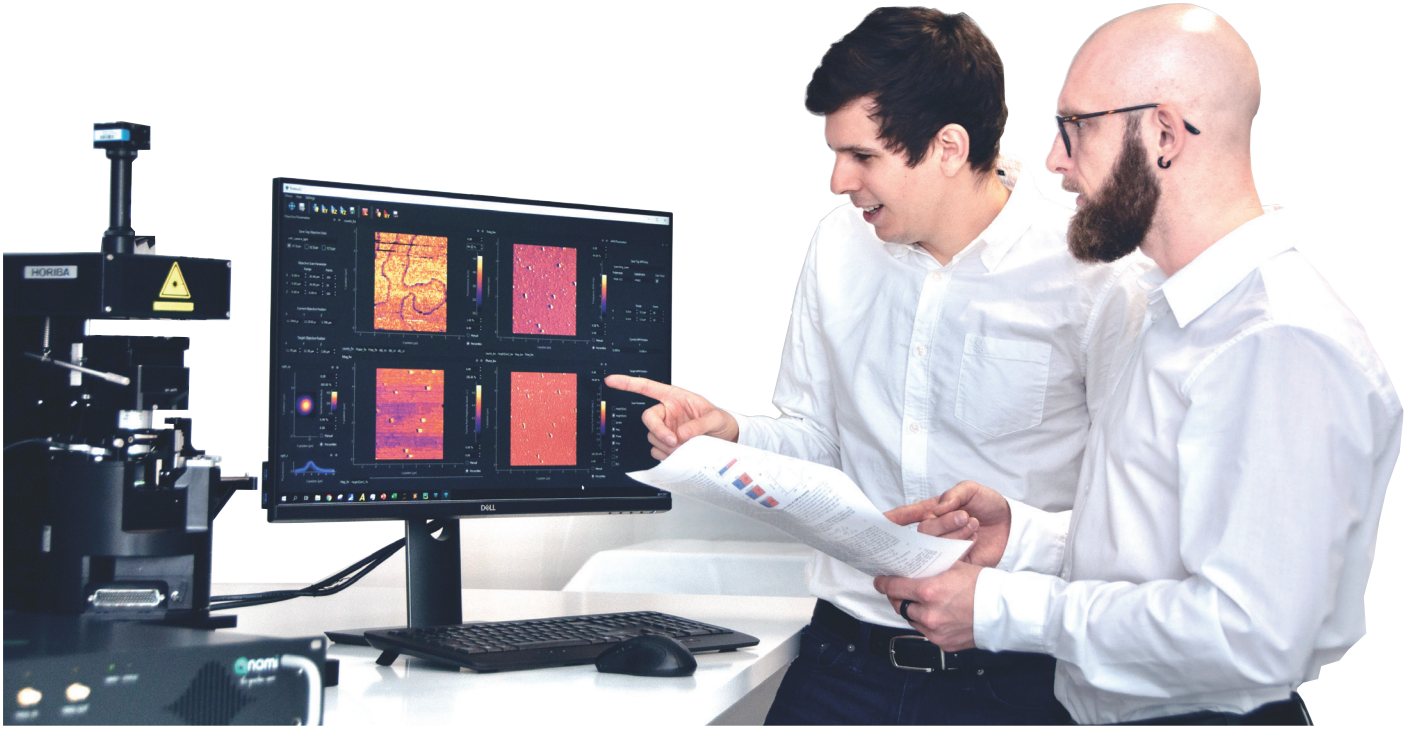
The Quantilever MX series, designed for magnetic imaging, is based on the patented technology developed by Qnami. Each Quantilever MX behaves like a true single-spin, allowing non-perturbative analysis of a large variety of magnetic materials. Combined with the Qnami ProteusQ, the Quantilever MX provides a direct quantitative measurement of the magnetic field without the need for calibration.



LabQ

Community-built software

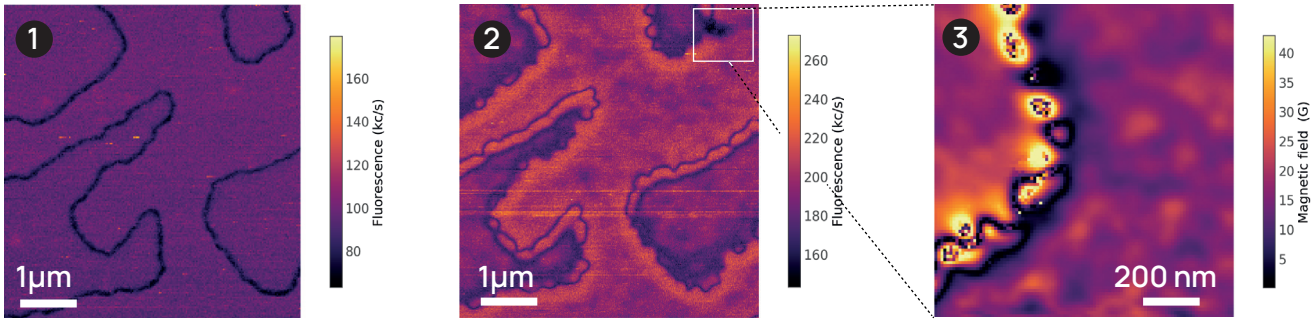
While the Qnami ProteusQ will give you new insight to the nanoworld, we did not want the quantum machinery behind it to get in your way. Built upon the open-source Qudi framework, the LabQ software intuitively guides you through the different measurement modes so that you get the answers you need as quickly as possible. For the experts, the Jupyter Notebook will allow you to write your own scripts and run custom-made protocols.



Designed to improve your workflow ...

From the software interface to the handling of every component, the Qnami ProteusQ is designed so that you can focus on your work. Whether you work in an academic or industrial environment, Qnami ProteusQ will extend your range of available analytical techniques and support your research

From fast sample preview ... **... to detailed analysis**

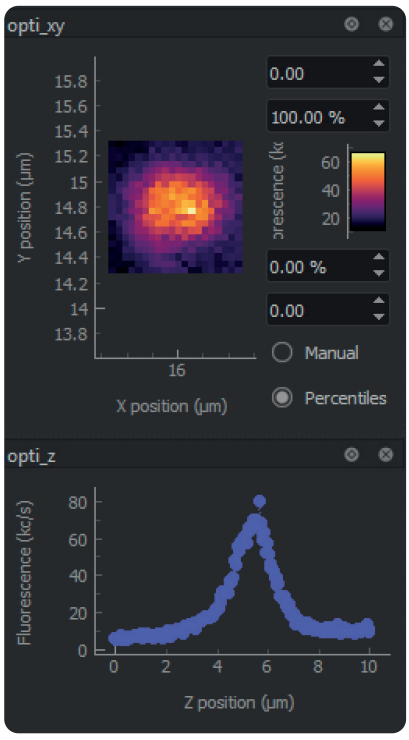


NV-fluorescence quenching mode

iso-B mode

full-B mode

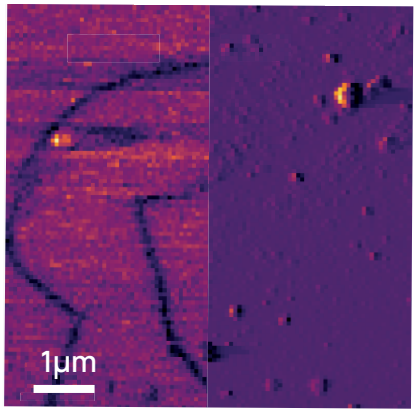
Stay focused **Minimize turn-around time**



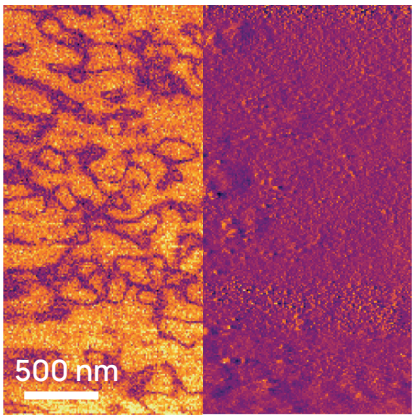
Fluorescence auto-track mode

Quantilever exchange system (optional)

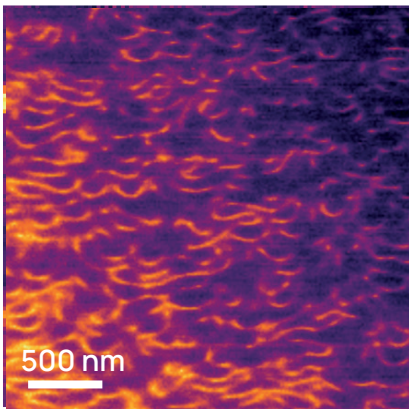
Simultaneous mapping of magnetic fields and topography



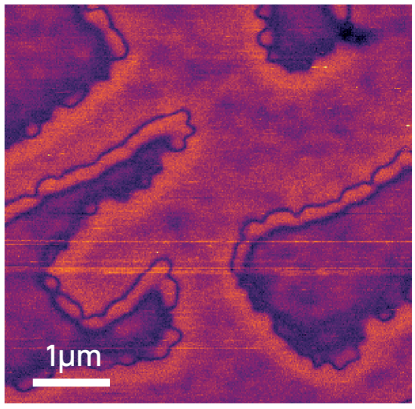
Bi: YIG



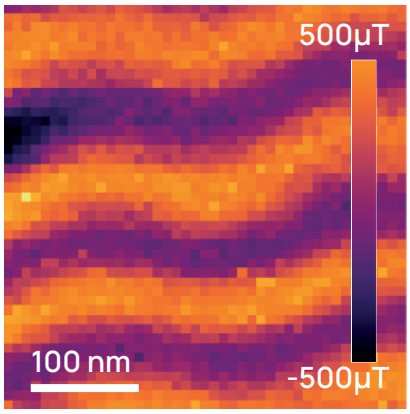
Mn_3GaN



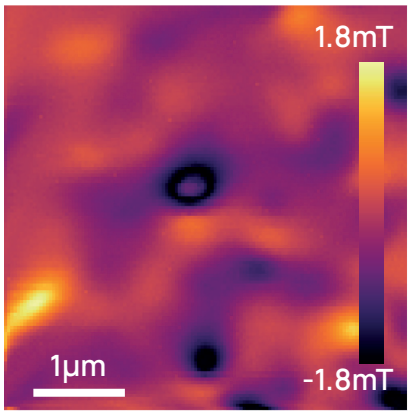
$(Co/Pt)_{25}$ (quenching)



Co/Ru/Pt/Co (iso-B)



BiFeO3 (full-B)



Mn_3GaN (full-B)

T

mT

µT

nT

... and your understanding of the nanoworld

Make sense of the very small

At Qnami we develop fundamental new technology using quantum mechanics. The control and measurement of the state of a single electron enables us to measure what could never be measured before. We call this quantum sensing and are enthusiastically developing this technique to improve people's lives and the world.

Our highly sensitive quantum sensors allow the fastest and most accurate measurement of magnetic fields on an atomic scale. We are proud to be part of the global quantum revolution that drives quantum physics from the lab to every day life. As pioneers in the field, we make important contributions to the on-going development of quantum sensing.

We partner with experts around the world, reviewing obstacles and exchanging knowledge to help address scientific and practical challenges. Our partnership with HORIBA aims to deliver unique performance in scientific instrumentation and ensure the highest quality service around the world.

We hope you will have as much fun using the Qnami ProteusQ as we had making it.

The Qnami Team

Qnami
the quantum wave

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