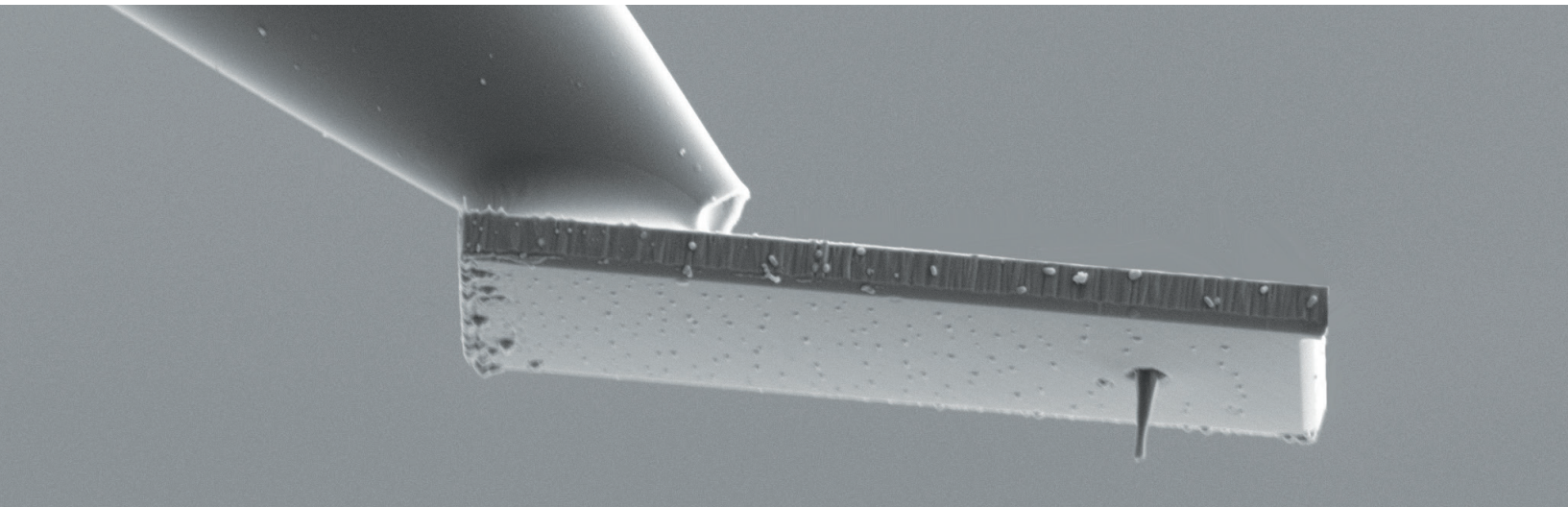




# Quantilever™ MX

A single atomic defect in an all-diamond probe



November 2021



# Quantilever™ MX

## Product Overview

Quantilever MX are all-diamond probes for scanning NV microscopy applications. With a single NV at the apex of the tip, Quantilever MX probes scan surfaces with extreme precision and allow non-perturbative analysis of a large variety of magnetic materials.

Qnami Quantilevers can operate under different measurement environments (ambient conditions, low temperature). Their ultimate performances are extracted when used with the Qnami ProteusQ microscopes.

**Innovative** Quantilever MX is based on a patented technology developed and owned by Qnami. **Patent Family:** WO2014051886A1, **Patent Family:** WO2021151796A1

**Precise** Each Quantilever MX behaves like a **true single-spin** momentum, allowing **non-perturbative** analysis of different materials with **atomic precision**.

**Versatile** Quantilever MX is available in different configurations to meet **application-specific requirements**.

## Key Specifications

The following features make the Quantilever MX the go-to quantum sensor to perform quantitative measurements of magnetic fields at the nanoscale with high reproducibility and state-of-the-art AFM performance.

### ○ Diamond sensor

- Diamond tip apex radius: 100 nm (typical)
- Available with two implantation depths: 10nm, 18nm (nominal)
- NV lifetime: up to 6 months
- Bulk-like spin properties

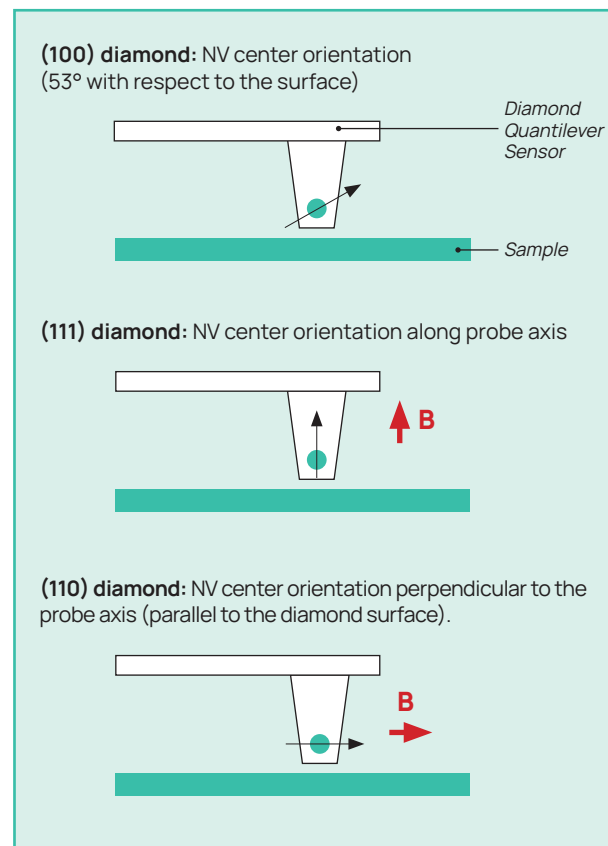
### ○ Diamond orientations

Available in three orientations for optimal application choice (graphical representation on the right)

- (100) standard
- (111) high out of plane magnetic fields and easy data interpretation
- (110) in plane magnetic fields and current sensing

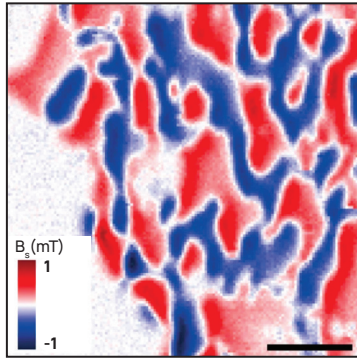
### ○ Probe properties

- Ceramic PCB (6.5mm x 5.1 mm x 0.4mm) with 2 gold plated contacts
- Q-factor: >1000 (guaranteed)  
~2000 (expected using ProteusQ)
- Resonance frequency: 32 kHz (typical)



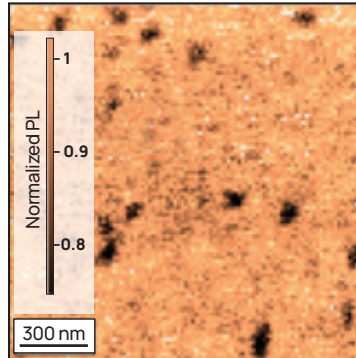
# Applications

Quantilver MX is designed for magnetic imaging with nanoscale resolution. It allows to fully characterize materials and devices such as Antiferromagnets, Multiferroics, 2D magnets, non-volatile memories, Spintronics devices, Quantum devices and much more.



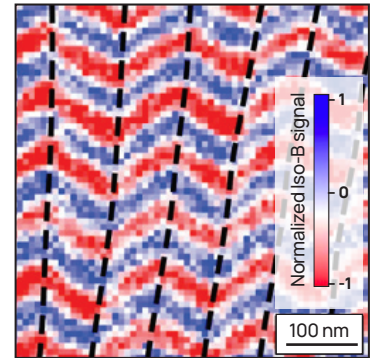
## 2D van der Waals magnets

**Sample:** CrBr<sub>3</sub>  
 Nat Commun 12, 1989 (2021)\*  
**PI:** J. Wrachtrup, Stuttgart University



## Skyrmions

**Sample:** Pt/Co/Ni<sub>80</sub>Fe<sub>20</sub>Ir<sub>20</sub>Mn<sub>80</sub>  
 Phys. Rev. Applied 13, 044079 (2020)\*\*  
**PI:** O. Boulle, CNRS, CEA, Spintec



## Antiferromagnetic Spintronics

**Sample:** BiFeO<sub>3</sub>  
 Nat Commun 11, 1704 (2020)\*  
**PI:** V. Garcia, Unité Mixte de Physique, CNRS, Thales

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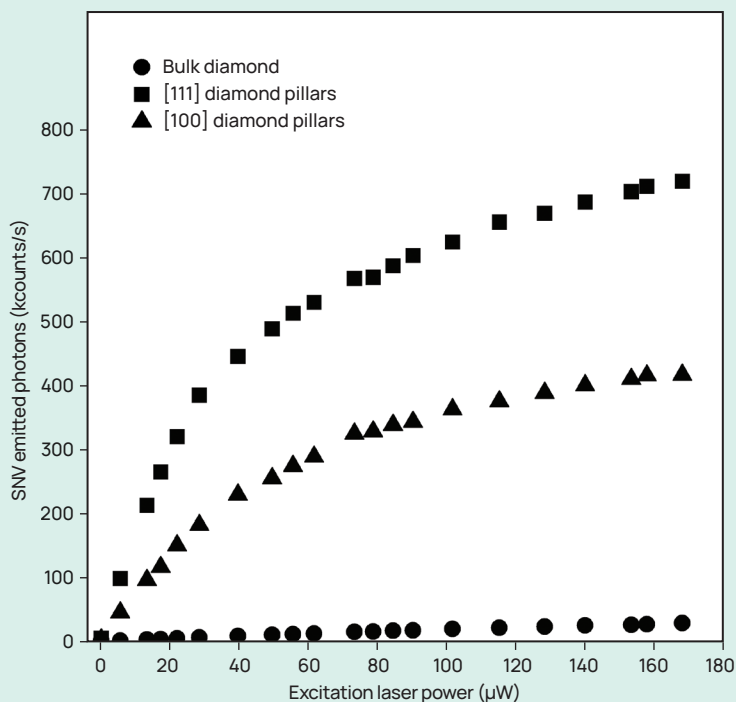
\*\* Reprinted figure with permission from Jacques V. et al., Physical Review Applied 13, 044079, 2020. © 2021 by the American Physical Society

# Quality Control

Each Quantilver MX is prepared and carefully characterized using an industry standard to ensure the highest quality. Each device is delivered with its own individual quality certificate.

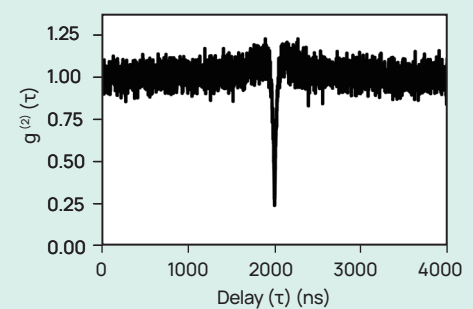
## Fluorescence count-rate

The Quantilver MX is a bright probe with a shape that allows the optimum collection of NV photons



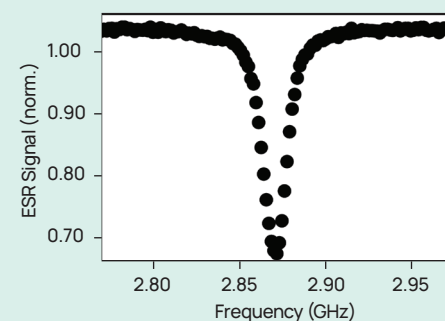
## Single photon emission

A single NV embedded in each probe



## Electron Spin Resonance

Self-calibrated measurement of magnetic fields using Zeeman effect



# Next level in precision



## Qnami ProteusQ™

Combine the Quantilever MX probes with Qnami ProteusQ scanning NV microscope for direct quantitative measurement of the magnetic field with minimal calibration requirements.

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.