



# Quantum Sensing & Imaging

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It's About Tech #10 – December 2024

# Introduction

**Computing, communications, sensing:  
3 pillars of our digital economy**

**Quantum Sensing: leveraging a quantum weakness?**



# \$170B+ sensor market with \$25B+ in high resolution, high sensitivity use cases suited for quantum sensing

**\$170-200B**  
**TAM**

*Global sensor market*

**\$25-40B**  
**SAM**

*Expected quantum advantaged sensor market*

**\$3-5B**  
**SOM**

*Quantum Sensor market*

**Market by 2030**

Source: Boston Consulting Group 2023



**\$ 13bn**

**Scientific Instrumentation**



**\$ 10bn**

**Bioimaging**



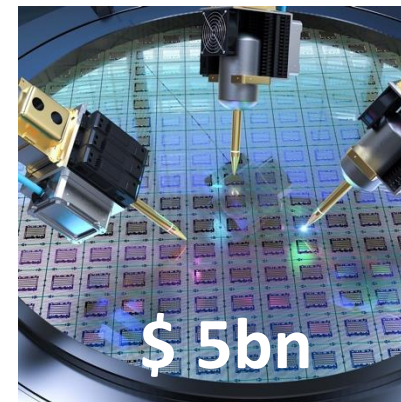
**\$ 40bn**

**Diagnostics**



**\$ 3bn**

**Navigation**



**\$ 5bn**


**Semiconductor**



**\$ 8bn**

**Defense**

# Technologies and measured properties

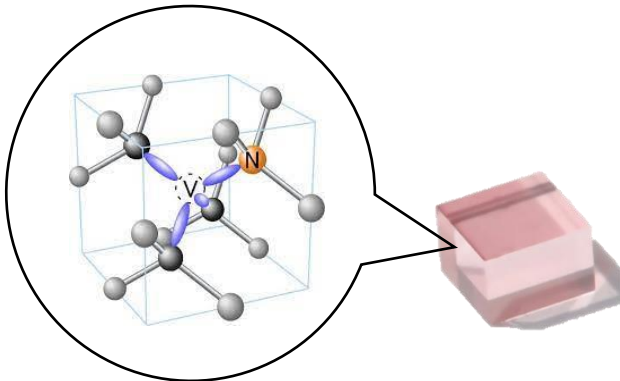
		Technology				
						
Physical property		Nitrogen vacancy centers	Cold atomic clouds	Atomic vapors	Photonics	Superconducting circuits
	Magnetic field	✓	✓	✓	✓	✓
	Electric field	✓	—	✓	✓	—
	Time and frequency	—	—	✓	—	—
	Temperature/Pressure	✓	—	—	—	—
	Acceleration	—	✓	—	—	—
	Rotation	✓	✓	✓	—	—

# Quantum Sensing With Diamonds

## Unique material

Ultra-pure diamond substrates are doped with Nitrogen atoms to form Nitrogen-Vacancy (NV) centers (quantum system).

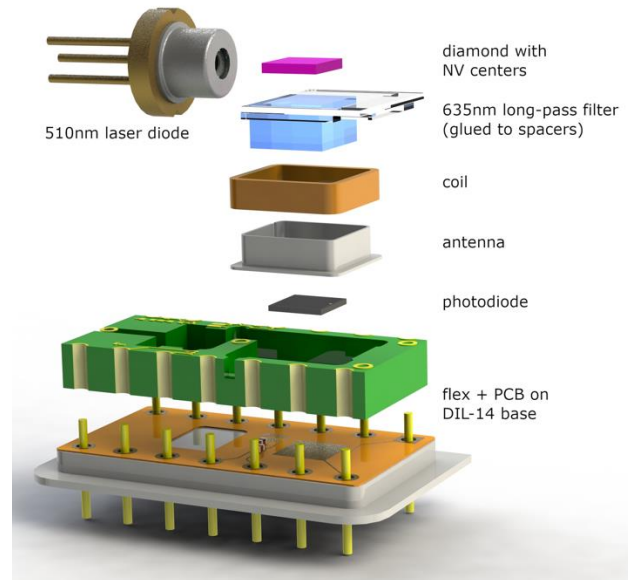
- Quantum sensitivity
- Industrial production
- Scalable manufacturing



## Integrated technology

Complete sensor combines photonics, and RF technologies

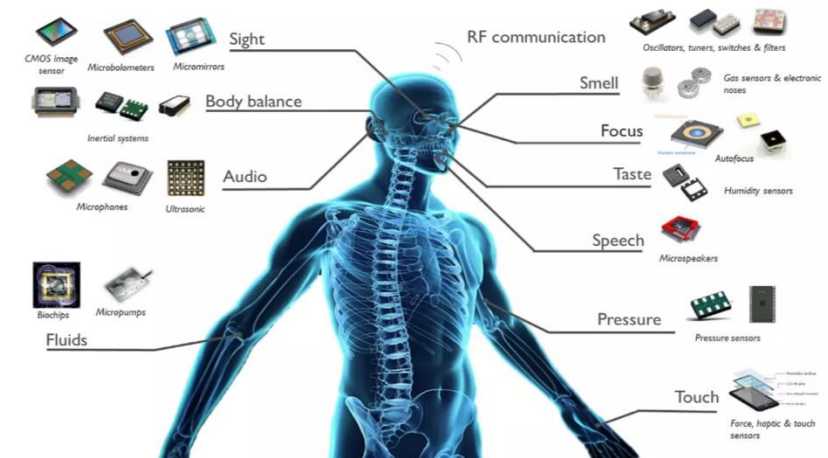
- Established micro-fabrication processes
- Miniaturizable



## Platform

Extended range of measurement capabilities for diverse set of applications

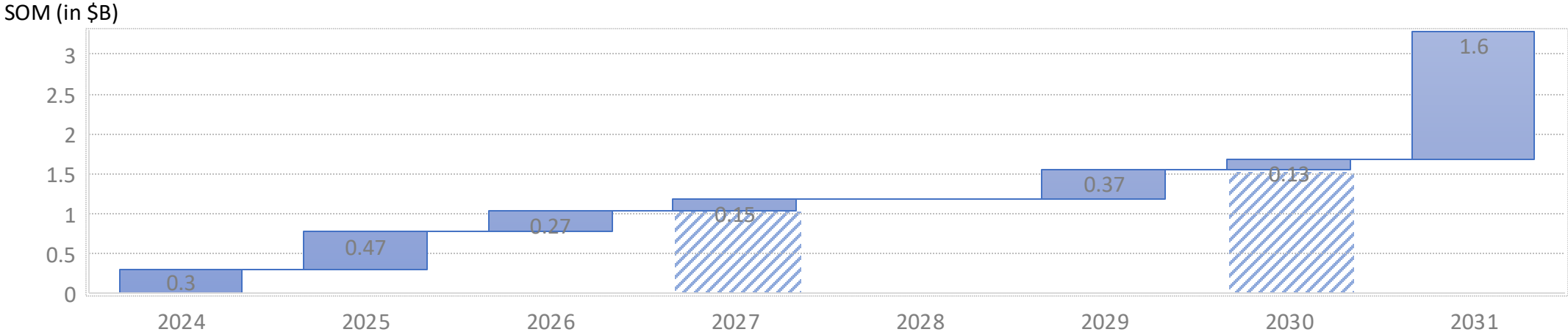
- Magnetic field sensor
- Metal detection
- Ampermeter
- High frequency spectrometer
- Gyrometers
- ...



MEMS sensors (srce. Yole development)

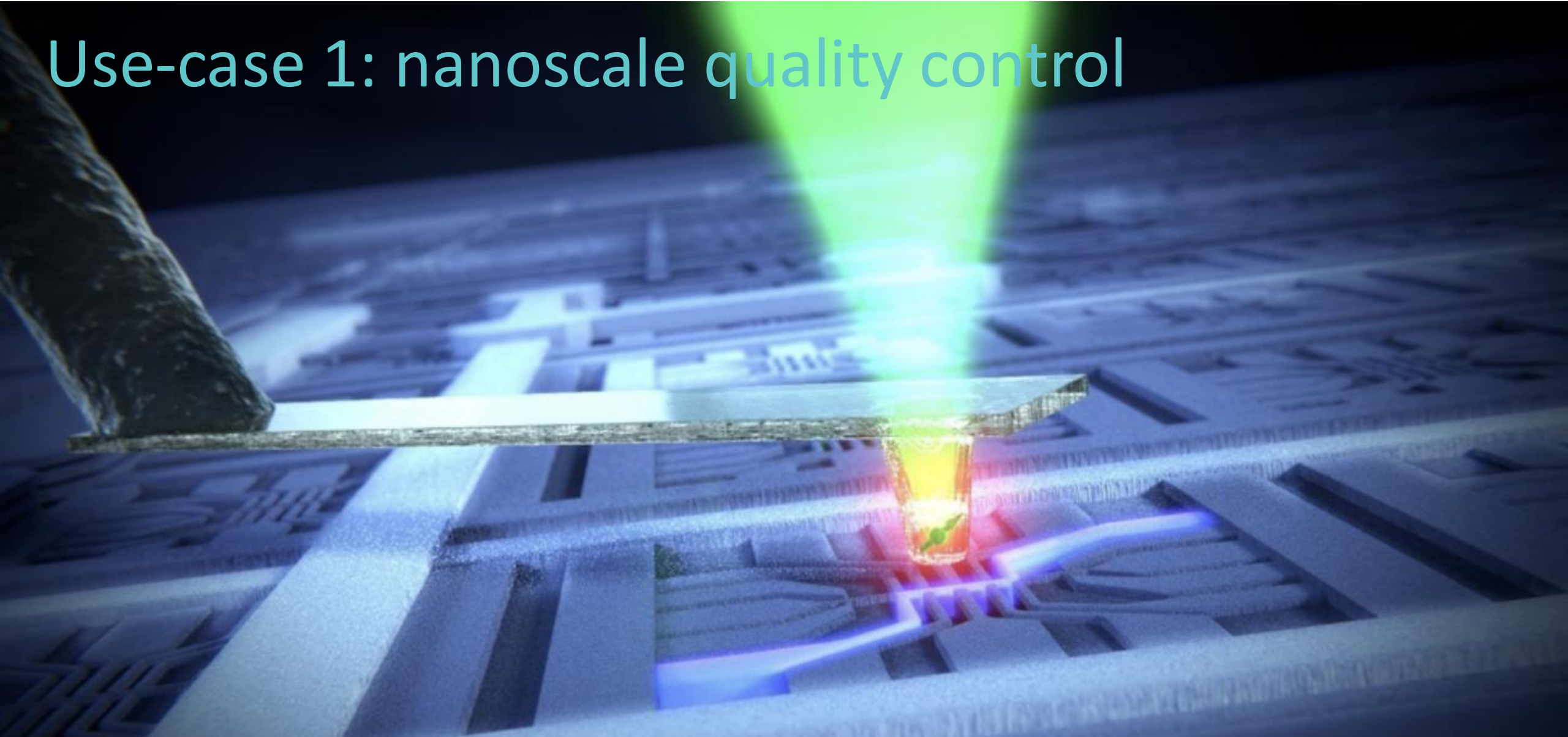
# Quantum Sensing With Diamonds

Path to \$ Bn SOM defined by technical milestones in magnetic sensing and expansion to new sensing modalities



	Stage 1	Stage 2 (Series B)			Stage 3		Stage 4 ...
Resolution*	1uT	100 pT	<10 pT		<1 pT	< 0.1 pT	Expansion into other modalities
Form factor*	Cubic meter	Shoebox			Sugar cube		
Example use cases	Defect inspection Semiconductor	Mineral Exploration	Warfare	Heart Monitoring	Navigation	Brain Monitoring	

# Use-case 1: nanoscale quality control



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## Need:

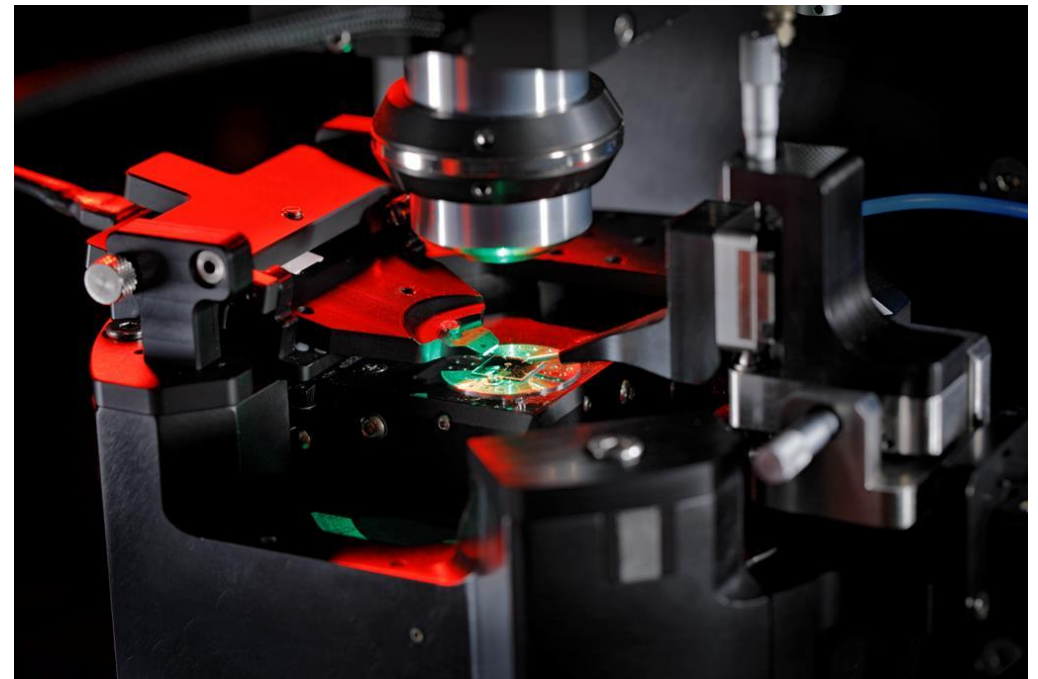
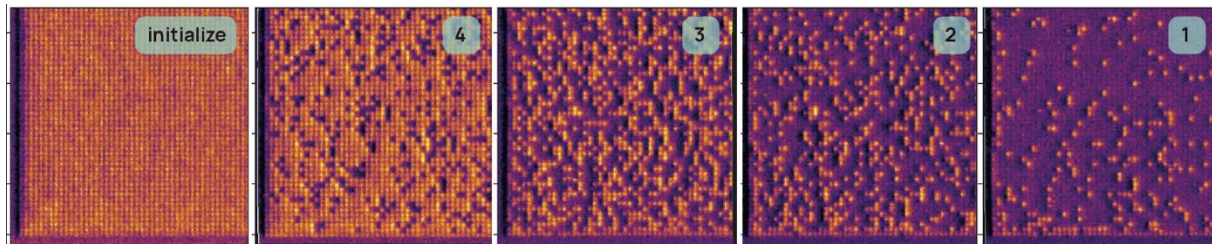
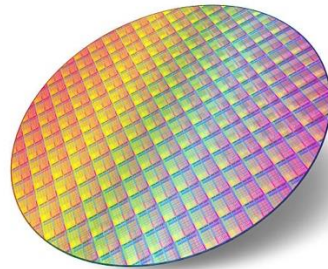
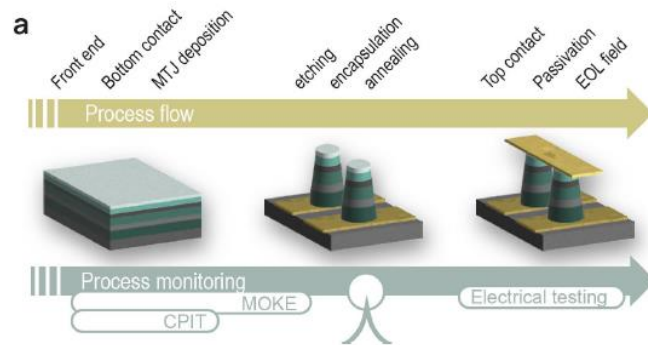
Metrology solution for bleeding edge chip design validation

## Customer:

Semiconductor industry, battery manufacturers

## Solution:

Qnami ProteusQ: complete quantum imaging system





# Use-case 2: mineral exploration

## Need:

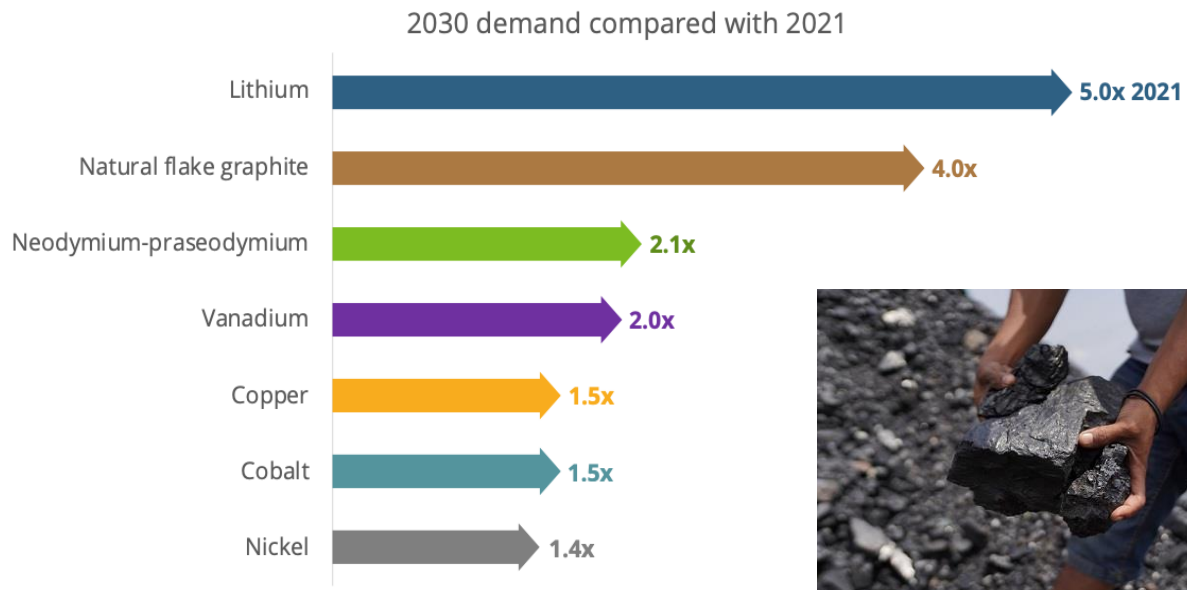
Fast, cost-effective identification of critical mineral ore deposits

## Customer:

Mining majors and juniors

## Solution:

Compact, robust, drone compatible sensor



# Use-case 3: neurotechnology

**Need:**

Non-invasive detection of neural activity

**Customer:**

Hospitals, Consumers

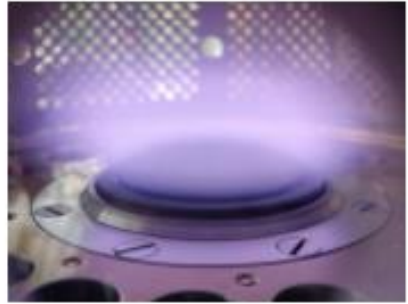
**Solution:**

Non invasive, high sensitivity sensors



# Shaping the industry

Diamond wafer



Quantum wafer



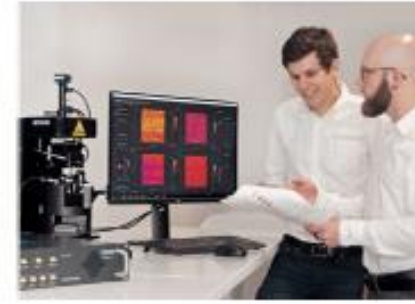
Nanofab



Device/Sensor



System



Application



## Challenges

- Case for change
- Product design, standards
- Volume production, miniaturization, costs
- Regulatory compliance, safety
- Data corruption

## Business models

- Foundry
- Sensor manufacture
- Data provider
- And everything in-between

# Qnami AG

Incorporation: 2017

Headquarter: Basel (CH)

Quantum Foundry: Villingen (CH)

Qnami Germany GmbH (DE)

Team: 15+

Patents: 10

Academic and industrial partners:



ETH zürich



imec

elementsix™  
DE BEERS GROUP



Backed by tier-1 quantum investors:

VERVE  
VENTURES

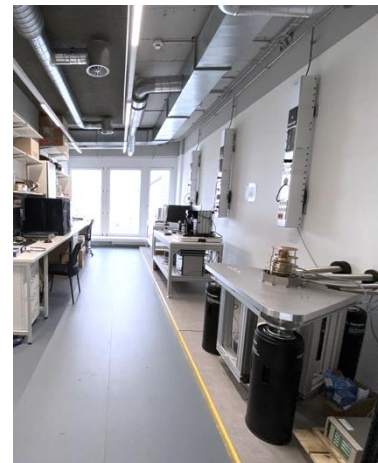
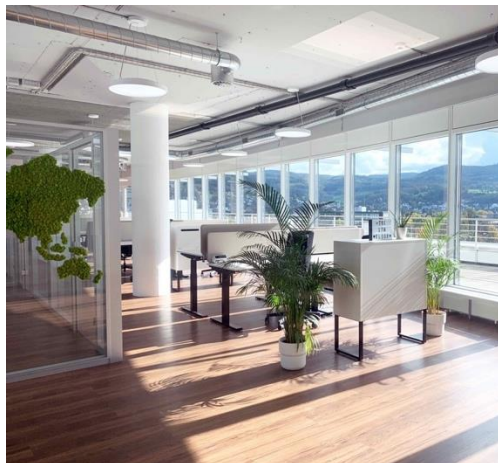


Runa  
Capital

High-Tech Gründerfonds

QUANTO  
NATION

CONSTRUCTOR



SWISS  
STARTUP  
AWARD  
2022

venture leaders

Forbes



# Quantum & Switzerland

- New technology with enormous potential economical impact and critical importance with regard to safety and sovereignty
- Historical strength in CH through decades of investments in fundamental research
- Industry leaders in all pillars
- A complex technology requiring large investment and pan-national collaborations
- Switzerland in Europe: a role to be defined





*Investment opportunity open now*

[www.qnami.com](http://www.qnami.com)