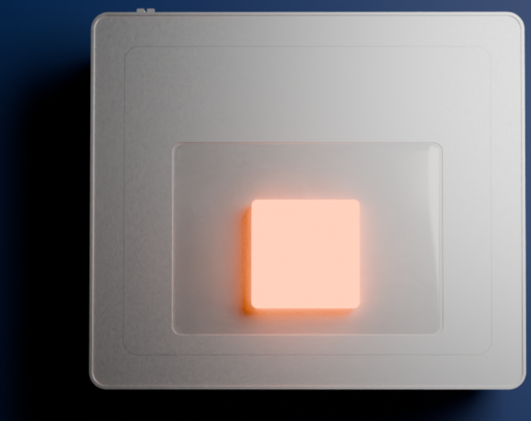
Advanced Quantum

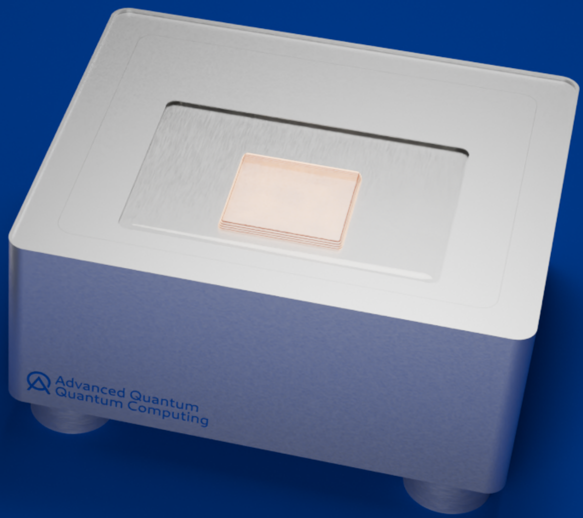


compact quantum computers
and sensors.

Bringing Quantum Within Reach.

The Quantum Computing Kit
for education and training

Step into the world of quantum computing with our cutting-edge educational quantum system. Designed for universities, research labs, and advanced learners, this system provides a hands-on experience with real single-spin qubits in diamond—no cryogenics required.



Diamond quantum chip
with 2 qubits inside.

Your Advantage

- Small form-factor single defect spin-physics experiments
- Two Qubit-System (one electron and one nuclear spin)
- Low-cost and low-maintenance room-temperature operation
- Browser based experimental control on integrated control computer
- Suitable for lab-courses or live-demonstrations in lectures, workshops and seminars
- Sophisticated interactive teaching concept integrated in the graphical user interface
- Quick setup times, transportable by single person
- No lab required!
- Contact us today to learn more!

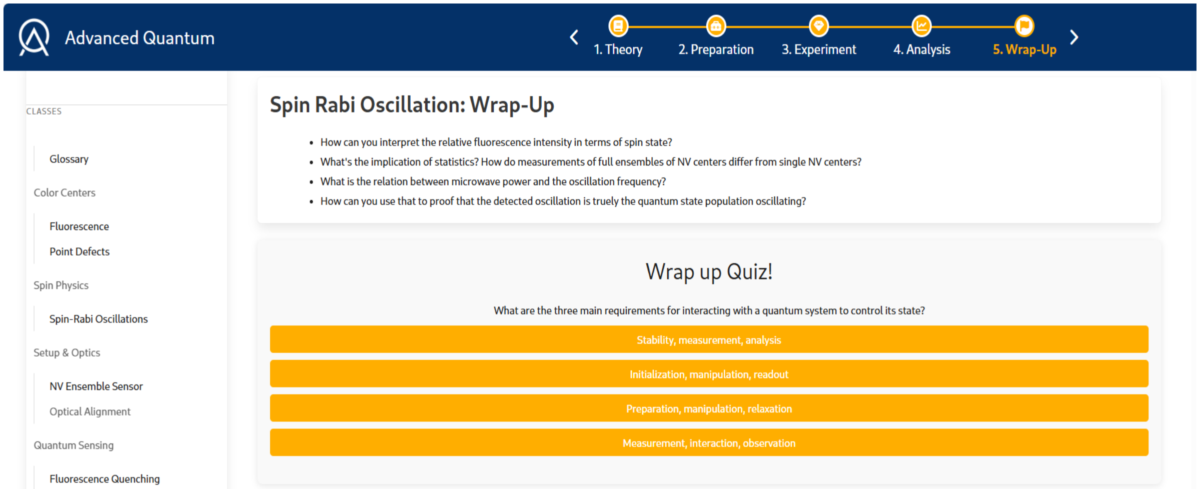
Empower Your Teaching
with Hands-On Quantum Computing

This kit is designed to bring quantum mechanics to life in the classroom. It provides a structured and intuitive path from foundational experiments – like Optically Detected Magnetic Resonance (ODMR) and Rabi oscillations – all the way to the practical implementation of quantum logic gates.

Your students will not only observe quantum phenomena, but actively engage in building and calibrating real quantum gates – developing a deep understanding of how quantum computers operate.

To illustrate the potential of quantum algorithms, the kit includes the Deutsch-Jozsa algorithm-a powerful teaching example that clearly demonstrates where and how quantum computers can outperform classical ones.

With built-in didactic support, browser-based control, and content tailored to different learning levels, this system is perfect for lab courses, workshops, or interactive lectures.

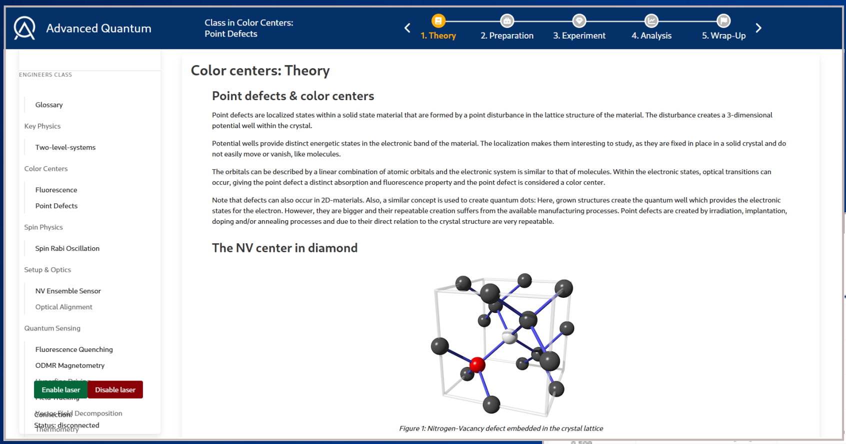


Interactive modules and quizzes make self-paced learning easy and enjoyable, boosting motivation and helping learners dive deeper into quantum concepts.

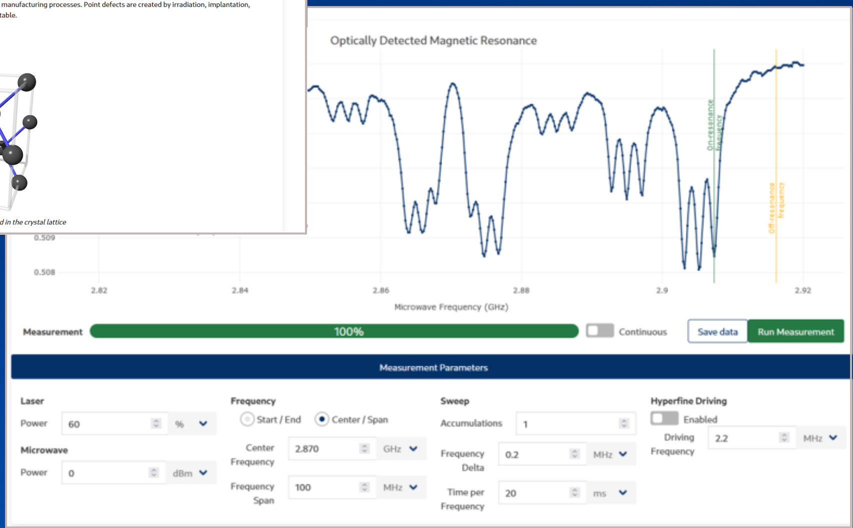
Smart Didactics – Included by Design
In Every Didactic Module

- ✔ User-friendly browser interface
- ✔ Built-in didactic concept – Structured learning paths integrated in the interface
- ✔ Real-time ODMR measurement – Visualize quantum resonance effects live on screen
- ✔ Designed for beginners, intermediate, and university-level teaching
- ✔ Full control over experimental parameters - Tune laser & microwave power
- ✔ Data export functionality - Save and share measurement data with one click
- ✔ Supports advanced quantum protocols - Rabi oscillations, Hahn echo, and more

From theory to experiment in one interface
In your favourite browser



✔ Connect textbook knowledge with hands-on practice-ideal for building intuition and deep understanding of quantum concepts.



✔ Students gain confidence by seeing the direct impact of their actions on quantum systems-perfect for interactive lab work and demonstrations.

NV Centers in Diamond
The Building Block of Practical Quantum Technology

The nitrogen-vacancy (NV) center in diamond is one of the most promising platforms for turning quantum science into real-world applications. Why? Because it uniquely combines quantum sensitivity, robustness, and scalability—all at room temperature.

🔍 Precision in Sensing:

NV centers can detect magnetic fields, temperature changes, and even strain with nanoscale resolution and exceptional stability. They are ideal for:

- ✔ Biomedical imaging & Material analysis
- ✔ Navigation without GPS
- ✔ Non-invasive diagnostics and more

NV-based sensors can be miniaturized and integrated into portable devices—bringing high-end quantum sensing to handheld formats.

💻 A Gateway to Quantum Computing

As a solid-state spin qubit, the NV center enables quantum logic operations, entanglement, and quantum memory when coupled to nearby nuclear spins. Its long coherence times at room temperature make it a key candidate for:

- ✔ Hybrid quantum processors
- ✔ Quantum repeaters for secure communication
- ✔ Scalable, chip-integrated quantum systems

Combined with its mature control methods and optical readout, the NV center is helping bridge the gap between lab-scale research and deployable quantum hardware.

The Quantum Sensing Kit
for education and training

Using special properties of diamond, it can detect magnetic fields in a unique way, making invisible forces visible. At its core are nitrogen-vacancy (NV) centers, tiny defects in diamond that respond to their surroundings at a quantum level. These allow us to explore magnetism with incredible sensitivity, whether for scientific experiments, engineering applications, or education.

Your Advantage

- Small form-factor spin-physics experiments
- Suitable for lab-courses or live-demonstrations in lectures, workshops and seminars
- Includes all needed optical elements and required electronics
- Low-cost and low-maintenance room-temperature operation
- Browser based experimental control on integrated control computer
- Sophisticated interactive teaching concept integrated in the graphical user interface
- Quick setup times, transportable by single person
- and you guessed it ... no lab required!

Contact us today to learn more!

Basic Kit

The Basic Kit is your gateway to hands-on quantum education - a ready-to-use, entry-level system designed to bring the fascinating world of quantum sensing into your classroom or lab.

Included in the kit:

- ✔ A diamond sensor head with embedded NV centers
- ✔ Optical and electronic components – pre-configured for seamless setup
- ✔ An all-in-one control unit – manages laser, RF generation, and data acquisition with ease

With the Basic Kit, your students can: Perform Optically Detected Magnetic Resonance (ODMR), observe fluorescence quenching, gain hands-on experience with real quantum sensors.

Advanced Kit

Ready to go beyond the basics? The Advanced Kit builds on the foundation of the Basic Kit and unlocks the full potential of quantum control and coherence.

Activate advanced experiments like:

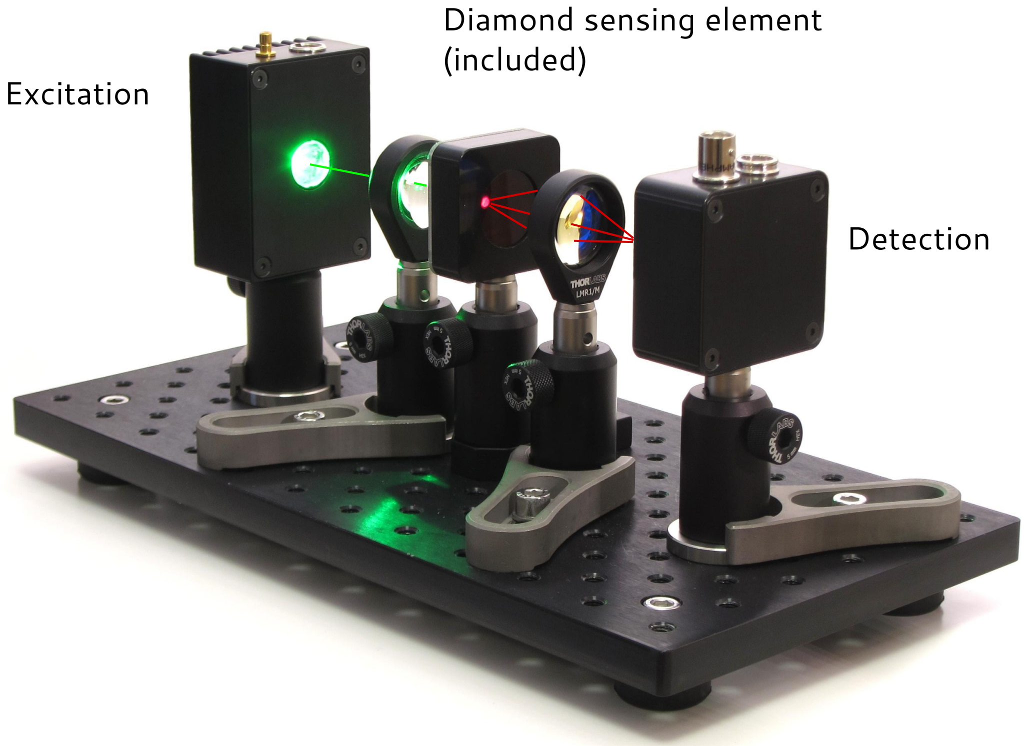
- ✔ Pulsed ODMR – isolate dynamic quantum behavior
- ✔ Rabi Oscillations – visualize coherent spin control
- ✔ Hahn Echo – teach decoherence (T2) and noise suppression
- ✔ Ramsey Sequences – demonstrate precision measurement techniques

These experiments give learners firsthand experience with the techniques used in cutting-edge research, while fostering a deeper understanding of quantum coherence, manipulation, and measurement precision.

Quantum Sensing Addons

Classroom ready optical breadboard

Learning to plan, assemble and align optics is one of the most crucial skills needed in any optics lab. With this addon you can build a quantum sensor with your students.

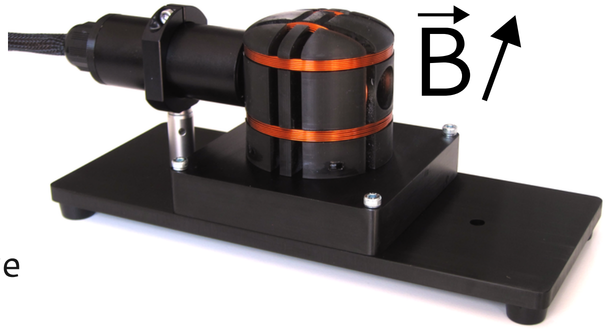


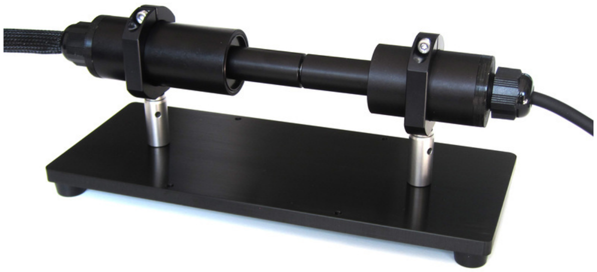
Your Advantage

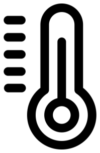
- Build-it-yourself NV setup – Breadboard-based fluorescence detection with diamond
- Hands-on optics training – Align, optimize, and measure your own setup performance
- Ideal for lab courses – Practical, engaging, and classroom-ready

Vector Magnetometry

Explore the full 3D vector field using a specially designed Helmholtz coil setup. Learn how NV centers in diamond enable vector measurements despite the projective nature of quantum measurements.





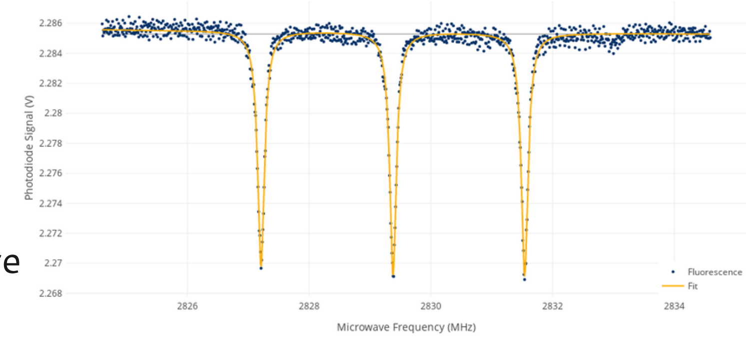


Temperature Sensing

Investigate how changes in crystal temperature influence spin states. This add-on demonstrates how thermal effects on the diamond lattice shift the NV center energy levels, allowing precise temperature readout.

Hyperfine Driving

Uncover the quantum interaction between electron and nuclear spins. This module demonstrates hyperfine splitting using real-time RF control and ODMR readout. Students explore how nuclear spins enhance sensing.



Each dip corresponds to a transition conditioned on the nuclear spin projection.

Your Partner in Quantum Innovation

Advanced Quantum is your expert partner in spin-defect-based quantum technologies – bridging the gap between cutting-edge research and real-world applications.With roots at the prestigious 3rd Institute of Physics at the University of Stuttgart, our team pioneers work on nitrogen-vacancy (NV) centers in diamond and silicon carbide (SiC). These quantum defects open the door to entirely new ways of sensing, computing, and understanding materials.

Our mission: Make quantum technologies accessible and impactful for education, industry, science, and society.

Key Advancements:

- ✔ First commercial NV-center-based vector magnetometer.
- ✔ DLR QCI contract to build a SiC-based quantum computer and a spin qubit characterization system for various defects.

Services:

- ✔ Hands on educational quantum technology
- ✔ Customized quantum instrumentation, quantum-sensing and quantum-computing devices
- ✔ Low-temperature and room temperature confocal microscopes
- ✔ Spin-defect characterization setups
- ✔ Custom RF and qubit control systems
- ✔ Consulting

Industries and Applications:

- ✔ Non-desctructive material testing
- ✔ Structural health monitoring
- ✔ Archaelogy and geology
- ✔ Aerial magnetic surveys
- ? Your application and industry

Airborne quantum sensors for aerial survey.

Our Partners

- Federal Ministry of Education and Research (BMBF)
- Federal Ministry for Economic Affairs (BMWK)
- DLR Quantum Computing Initiative (QCI)
- QuantumBW, PhotonicsBW
- Fraunhofer IAF, University of Stuttgart

  and many more.

Our Team

We are a diverse, interdisciplinary, and international team of scientists, physicists, engineers, educators, and entrepreneurs – each brilliant in their unique field. By combining our wide-ranging expertise and creativity, we confidently master even the most complex challenges, driving innovation and excellence together.

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info@advanced-quantum.de
www.advanced-quantum.de
+49 7191 2299 712

Advanced Quantum GmbH · Christophstr. 4 · 70178 Stuttgart · Germany

Advanced Quantum

info@advanced-quantum.de
www.advanced-quantum.de
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