# WED-ID 4: Quantum Sensing & Metrology

Time: Wednesday 14:45–16:45 Location: ZHG007

**Invited Talk** WED-ID 4.1 Wed 14:45 ZHG007
**Quantum magnetometers and the aspect of industrialisation** — •Thomas Strohm — Robert Bosch GmbH, Robert-Bosch-Campus 1, 71272 Renningen

One of the more prominent quantum sensors is the quantum magnetometer based on color centers (NV) in diamond. We present the basic principles of the technology, possible applications and technological as well as industrialisation challenges.

**5 min. break**

**Invited Talk** WED-ID 4.2 Wed 15:10 ZHG007
**From Lab to Industry: Fiber Microcavities for Quantum Tech** — •Michael Förg, Jonathan Noé, Manuel Nutz, and Thomas Hümmer — Qlibri GmbH, Karlsplatz 3, 80335 Munich, Germany

One hundred years after the birth of quantum physics, we are witnessing a new era where quantum technologies are moving from the lab into the real world. At Qlibri, we develop miniature optical devices called fiber-based microcavities that can trap and control light with extreme precision. These tiny structures make it possible to study materials at the nanoscale, detect subtle signals, and even interface with single atoms. Originally used only in fundamental research, our goal is to bring this powerful technology into practical applications - from next-generation sensors to building blocks for quantum devices.

**5 min. break**

**Invited Talk** WED-ID 4.3 Wed 15:35 ZHG007
**Advance semiconductor chip analysis with quantum diamond magnetoemters** — •Nimba Oshnik — QuantumDiamonds GmbH Friedenstraße 18 81671 Munich, Germany

The innovative application of nitrogen-vacancy (NV) centers in diamond-based sensing technology for the analysis of semiconductor chips is explored, focusing on their potential to enhance advanced packaging techniques. NV centers, known for their exceptional sensitivity to magnetic and electric fields, enable precise detection of defects and characterization of materials at wide-field scale. We demonstrate the effectiveness of quantum diamond magnetometers in semiconductor analysis, and highlight the implications for improving packaging processes and failure analysis. This approach promises to lead to more reliable and efficient electronic devices, paving the way for advancements in the semiconductor industry.

**5 min. break**

**Invited Talk** WED-ID 4.4 Wed 16:00 ZHG007
**A commercial optical frequency standard based on a single $^{171}Yb^{+}$ ion** — •Stephan Ritter — TOPTICA Photonics AG, Lochhamer Schlag 19, 82166 Graefelfing / Munich, Germany

Decades of persistent research on frequency standards with optical transitions is paying off. These optical frequency standards (OFS) now surpass current cesium primary frequency standards by two orders of magnitude. Consequently, plans for a redefinition of the second are being pursued. The spectacularly low uncertainties are, however, often achieved at the expense of reliability of these research-type setups, as is manifest in limited uptime and availability. Suitable OFS with laser-cooled reference atoms have until recently also not been available commercially. Here, we report on tackling both issues with a commercial single-ion optical frequency standard housed in two standard 19-inch racks that are transportable. It features a single $^{171}Yb^{+}$ ion trapped in ultra-high vacuum. Five diode lasers are employed for loading of the ion, laser cooling, state preparation and readout, and interrogation of the clock transition. The system builds on the results of a funded project coordinated by TOPTICA and the National Metrology Institute PTB, in which ten German partners, experts in very different domains, joined forces. The presentation will illustrate how this continued collaboration between a privately held, commercial entity and a federal institute was subsequently turned into a commercial solution, will give an overview over the system design of the OFS, and report on the status of the characterization of its metrological performance.

**5 min. break**

**Invited Talk** WED-ID 4.5 Wed 16:25 ZHG007
**Accelerating semiconductor developments with Quantum Metrology** — •Mathieu Munsch — Qnami, Basel, Switzerland

The rapid advancement of generative AI is driving unprecedented demand for high-performance, energy-efficient semiconductor devices. This shift places enormous pressure on both memory and compute technologies, exacerbating challenges such as the memory wall and pushing the limits of conventional architectures. Emerging solutions including 2D materials, neuromorphic processing units, and quantum processing units are now being explored alongside traditional CPUs and GPUs to meet these requirements.

In this evolving landscape, the need for precise, high-resolution data to guide and accelerate development is more critical than ever. Conventional test tools are reaching their limits in sensitivity and spatial resolution, especially in heterogeneous and quantum-class devices. To address this, we introduce a new class of test solutions based on quantum sensors. These tools offer unprecedented precision and are compatible with a wide range of operating environments, from cryogenic conditions to ambient settings.

Our presentation will demonstrate how quantum metrology enables deeper insights into device behavior at the nanoscale, delivering actionable information that helps our customers explore the cutting edge of science and accelerate R&D cycles. We will highlight case studies where quantum sensing provided a unique advantage, paving the way for the next era of semiconductor innovation