



# PRESS RELEASE

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## Quantum Leap in NMR Spectroscopy: EU's QUENCH Project Advances Chemical Analysis with Diamond-Based Quantum Sensors

The QUENCH, a Horizon Europe Research and Innovation Action (RIA) project, is set to transform the landscape of Nuclear Magnetic Resonance (NMR) spectroscopy. Launched in January 2024, this initiative brings together seven leading partners across four countries, with a shared vision to redefine benchtop NMR spectrometers using quantum sensing technologies, specifically nitrogen-vacancy (NV) centers in diamond. Benchtop NMR devices are valued for their compact design and accessibility, but they often face sensitivity limitations. QUENCH aims to break through this barrier by integrating advanced quantum techniques, ushering in a new era of ultra-sensitive molecular analysis. The technology promises widespread applications- from analytical chemistry and quality control to medical diagnostics and materials science.

***"Our goal is to unlock the full potential of benchtop NMR spectroscopy by embedding robust, quantum-enhanced components directly into compact, commercially viable instruments."** said Prof. Dominik Bucher, scientific lead on the quantum sensor development in Technical University of Munich (TUM) and coordinator of Quench project.*

A recent milestone achieved by the QUENCH consortium demonstrates a tenfold increase in detectable frequencies for quantum sensors—from just a few megahertz to as high as 85 MHz. Led by Dominik Bucher, Aharon Blank, and their collaborators, the team introduced a novel continuous dynamical decoupling (CDD) technique that significantly outperforms traditional pulsed protocols. This method will deliver higher spectral resolution and enables the detection of high-frequency signals critical to advanced NMR applications. As a result, this breakthrough opens new possibilities in high-resolution chemical analysis, magnetic resonance at higher magnetic fields, and radio-frequency field detection for communication and sensing technologies.




### A European Value Chain Driving Innovation

The project's innovation pathway follows a comprehensive European value chain—from quantum sensing expertise in universities and research institutes to industry-driven engineering and integration.

### Media Contact

 Quench project

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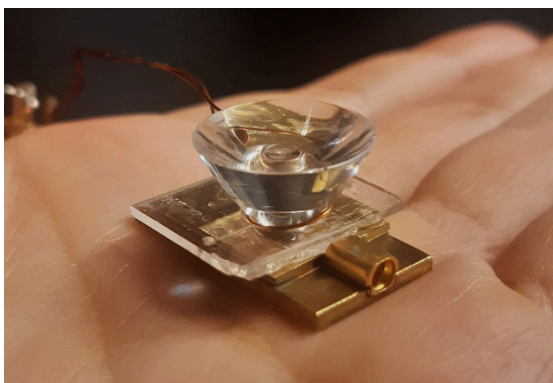
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## Key technological pillars include:

- High-quality synthetic diamonds developed by Fraunhofer IAF, optimized for NV center performance.
- Quantum logic-enhanced readout methods led by Technical University of Munich (TUM), enabling ultra-sensitive data extraction from quantum sensors.
- Advanced pulse sequences from UNIVERSIDAD DEL PAIS VASCO/ EUSKAL HERRIKO UNIBERTSITATEA (UPV/EHU), critical for the coherent manipulation of quantum spins.
- High-homogeneity magnets provided by Magritek, tailored for compact NMR systems.
- Microwave resonator development led by TECHNION – ISRAEL INSTITUTE OF TECHNOLOGY (TECHNION), delivering precise microwave control essential for NV center operations.
- AMIRES, a Czech-based consulting firm, is supporting the coordination of the project lifecycle and dissemination of outcomes.

The success of the QUENCH project is expected to bring far-reaching benefits across the continent. It will accelerate the development of quantum technologies throughout Europe, foster new commercial opportunities in the sensor and instrumentation industries, and reinforce Europe's position as a leader in applied quantum sensing.




## About Quench

QUENCH (Quantum-Enhanced Benchtop NMR Spectroscopy) is a Horizon Europe-funded project advancing compact NMR spectroscopy through quantum sensors based on NV centers in diamonds. **The project has received funding from the European Union's Horizon Europe – The EU Research and Innovation Programme under grant agreement No. 101135742**

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