

# Quantum Sensing & Computing with Color Centers. Controlled.

Zurich Instruments' expertise combines integrated qubit control solutions, experiment control software, lock-in amplifiers, and application know-how in a wide range of technologies and measurement methods. For experiments with single color centers or ensembles, this means less engineer-

ing and programming effort and a shorter time to result. Our solutions enable high-sensitivity measurements to be achieved quickly in topics ranging from scanning gradiometry to heralded entanglement.

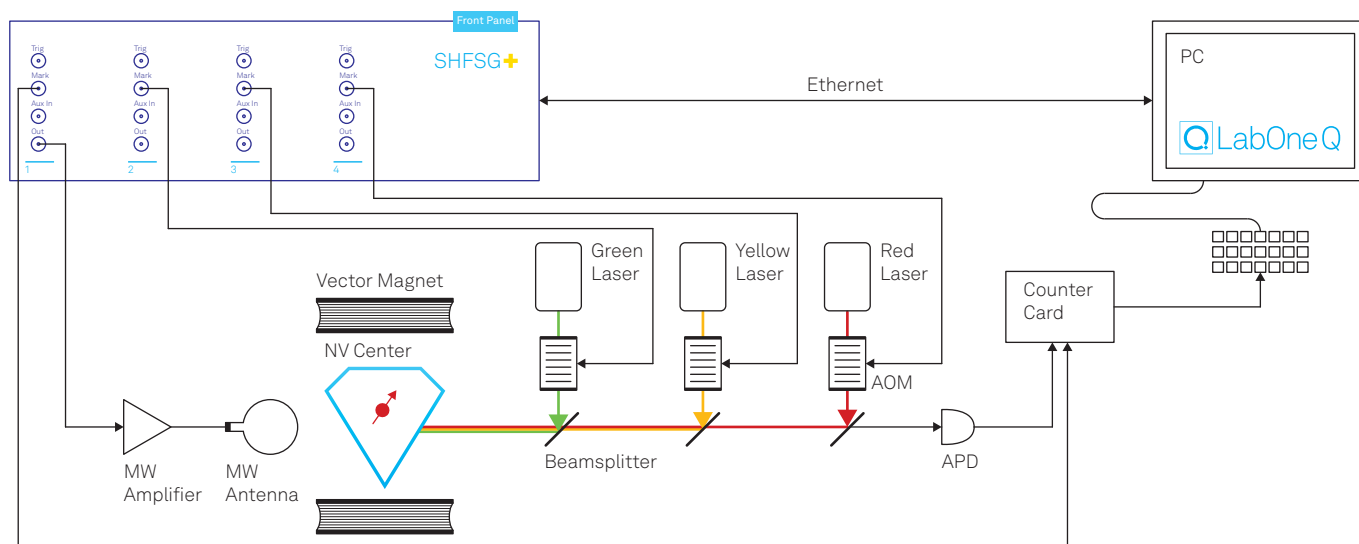


Figure 1. A typical setup using an SHFSG Signal Generator for quantum sensing with a single NV center.

## Your Benefits

- Everything for controlling multiple electronic and nuclear spins in one instrument: multiple outputs, DC–8.5 GHz frequency and beyond, frequency multiplexing, marker outputs
- Maximum spin coherence during long measurements thanks to low output noise
- Realize charge state reset and other conditional logic easily with a built-in pulse counter on the HDAWG Arbitrary Waveform Generator
- Fast lock-in measurement with ensembles thanks to market-leading input noise

## Your Application Resources

- Code examples: standard characterization including Rabi and ODMR measurements
- Blog posts: adaptive sensing, sample-precise timing control of pulses, and more
- Reference publications: metropolitan-scale entanglement, spectral multiplexing, quantum

## CPMG Made Easy

- Full arbitrary waveform generator capability to realize any pulse shape
- Fast sequence upload and real-time phase control thanks to digital modulation
- Sample-precise playback
- Software support for integrating time taggers and other 3rd party instruments
- Advanced pulse visualization covering all experimental signals

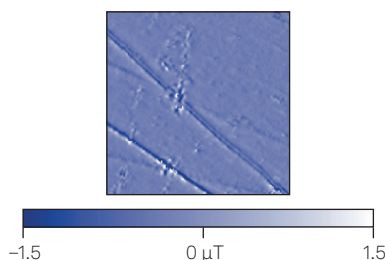


Figure 2. Gradiometry map of topographic defects on a polished, single-crystal antiferromagnetic material,  $\text{Cr}_2\text{O}_3$ . Nano-tesla magnetic fields could be detected by using CPMG on a single NV center in the tip of an AFM probe. Measurements done with an HDAWG Arbitrary Waveform Generator!

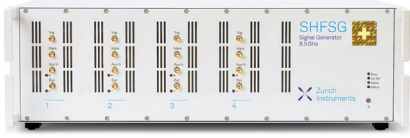
Discover more online



## References

- W.S. Huxter et al., Nat. Comm. 13, 3761 (2022). Data courtesy of the Degen group at ETH Zurich.

## Product Highlights



### SHFSG+ Signal Generator

One-box solution for generating microwave signals, including frequency multiplexing, from DC–8.5 GHz with AWG functionality for any sensing sequence from ODMR to XY8 and beyond.



### HDAWG Arbitrary Waveform Generator

AWG functionality from DC–750 MHz with the ability to perform conditional logic based on built-in photon counter rates and to generate pulses with multiple modulation frequencies.



### MFLI Lock-In Amplifier

Reads out ensembles of color centers and comes with a whole suite of measurement tools including scope, sweeper, and spectrum analyzer.



All instruments are controlled by [LabOne Q](#), an open-source Python-based software framework offering both high- and low-level access. Achieve results quickly with extensive code examples, documentation, and support.

## Meet Our Quantum Technology Experts

Every member of our Quantum Technology team has a background in advanced scientific research, including quantum error correction, quantum sensing, quantum computing, and theory of quantum algorithms.



## Our Customers' Accomplishments

- Photonic Inc.: building a scalable, fault-tolerant quantum computer based on the T-center qubit in silicon
- Hanson lab (TU Delft): Metropolitan-distance entanglement of NV centers, [arXiv:2404.03723 \(2024\)](#)
- Reiserer group (Technical Univ. of Munich): spectral multiplexing of rare-earth emitters for distributed quantum information processing, [Adv. Opt. Mat., 202302897 \(2024\)](#)
- Bonato group (Heriot-Watt Univ.): real-time adaptive estimation of decoherence timescales for a single NV center, [Phys. Rev. Appl. 21, 024026 \(2024\)](#)
- Walsworth group (Univ. of Maryland): quantum diamond microscope, [Phys. Rev. Appl. 22, 054050 \(2024\)](#)
- Lukin group (Harvard Univ.): using single SiV centers as an efficient source of shaped single photons, [Phys. Rev. Lett. 129, 053603 \(2022\)](#)