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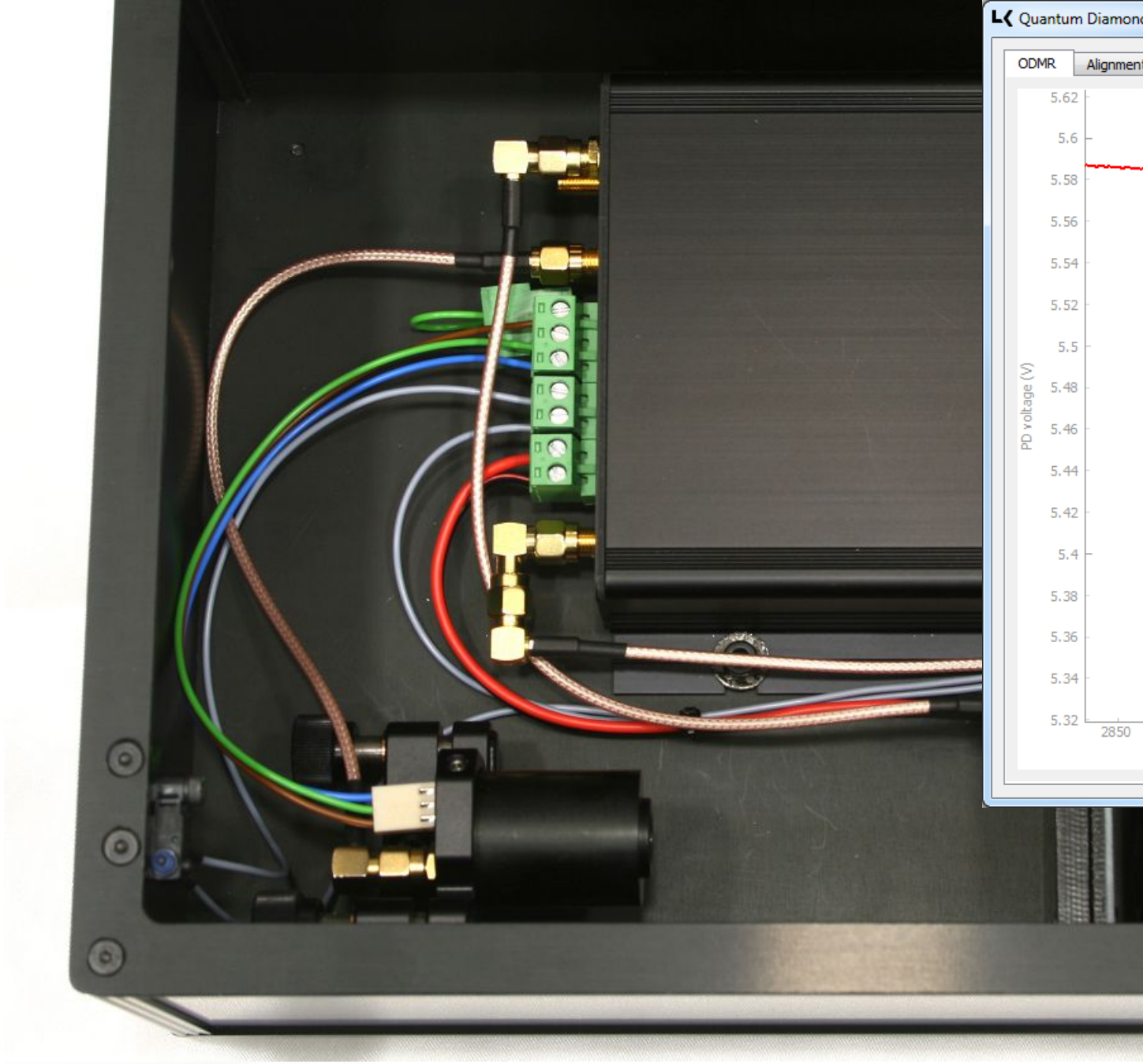
Quantum Diamond Magnetometer

Education experiment for student labs.


Quantum Diamond
ODMR
Alignment
5.62
5.6
5.58
5.56
5.54
5.52
5.5
5.48
5.46
5.44
5.42
5.4
5.38
5.36
5.34
5.32
PD voltage (V)
2850

1

2

In one of it's allotropes, carbon forms a cubic lattice, called diamond. Within the diamond lattice numerous types of defects can exist. One of these defects is the nitrogen-vacancy (NV) center. It is formed by a substitutional nitrogen atom associated with a neighboring vacancy.
When in the negative charge state, six electrons are associated to the NV center and form a molecular system. These electrons can be exited using a green (520 nm) laser and can emit red fluorescence when returning to the ground state. Since the fluorescence depends on the spin state of the electrons, optically detected magnetic resonance (ODMR) experiments are possible.
The electron spins of the NV center can be manipulated at room temperature with microwave radiation or by applying magnetic or electric fields. Therefore the NV center is suitable for quantum sensing applications.

This education experiment will introduce students to the concepts of quantum sensing. The experiment is easy and intuitive to operate and require low maintenance. It utilizes our Laser Diode Driver and Photodiode together with a purpose-built RF sweep generator and a microcontroller interface to combine the whole setup into one compact enclosure. So the only thing needed is a computer running our cross-platform python measurement software.

Features

- HPHT diamond
- 4 GHz RF sweep generator

- 520 nm diode laser
- PC interface via USB (VCP) or Ethernet (Telnet)

Measurements

- NV fluorescence
- ODMR
- Spin relaxation time
- Magnetic field