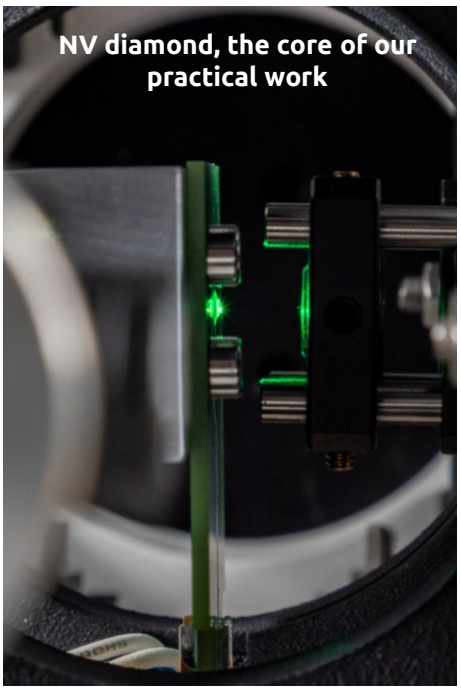
WAINTEACH *Practical work in quantum engineering*

wainvam


NV diamond, the core of our practical work

WAINTEACH is a kit for practical courses in **quantum physics**, for **Masters 1 and 2,** and **BTEC Higher National Diploma** students … to contribute to their training in **quantum information.**

With this kit, they will approach the concepts of quantum bit manipulation by studying the **NV** *(Nitrogen Vacancy)* diamond **centres**.

The simple experimental implementation (no vacuum, no cryogenics ...) allows great flexibility, for example on optical alignments. This **practical approach** will complete the theoretical knowledge given in the course.

1 basic module, 1 extension …

a wide range of experiments !

Basic module

Optical detection of magnetic resomance

Zeeman Effect

Hyperfine levels

Extension

Longitudinal relaxation time T1

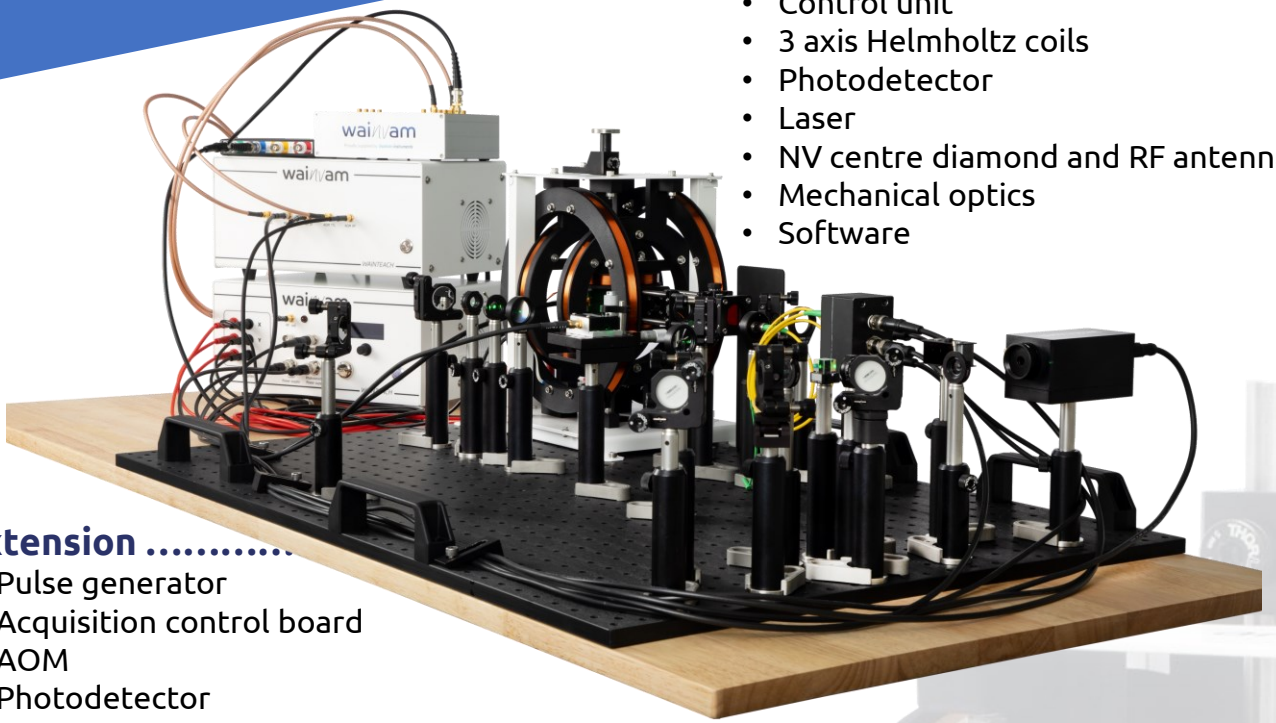
Transverse coherence time T2*

Coherence time $T2^{echo}$

Rabi oscillations

Saturation of a two-level system

Composition of the kit



Basic module .....

- Control unit
- 3 axis Helmholtz coils
- Photodetector
- Laser
- NV centre diamond and RF antenna.
- Mechanical optics
- Software

Extension .....

- Pulse generator
- Acquisition control board
- AOM
- Photodetector
- RF switch

Measurement examples .....

With the basic module

Hyperfine levels

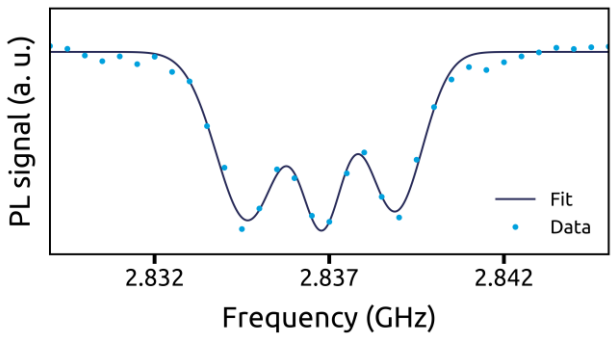
Optically detected **electron spin magnetic resonance observation**. This measurement highlights the hyperfine coupling between the electron spin and the nuclear spin of the NV's nitrogen atom (^{14}N).

With the extension

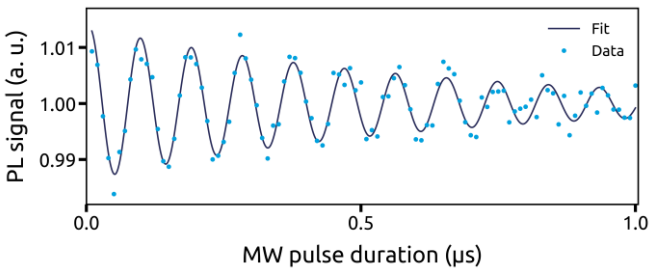
Rabi oscillations
between two fine levels.

Observation of Rabi oscillations induced by a resonant microwave between two electron spin levels. The acquisition of such a curve is the basic experiment to approach the notions of quantum gates.

Optically detected magnetic resonance



Rabi oscillations



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