

# Dipolar interactions in dense ensembles of Nitrogen-Vacancy centers

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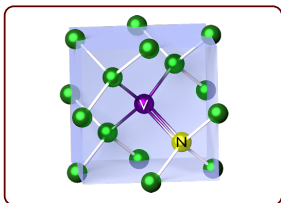
QUANTERA



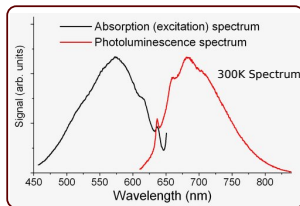
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de France

# Preamble : the NV center

## Crystalline structure

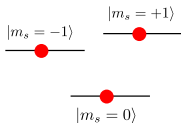


## Optical properties



## Spin properties

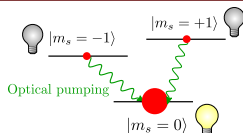
$S = 1$  in the electronic ground state



Unpolarized at 300 K :  
 $\rho_{00} \approx 1/3 \approx \rho_{+1+1} \approx \rho_{-1-1}$

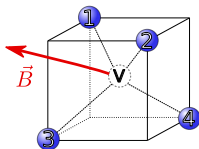


## Interplay between spin and light

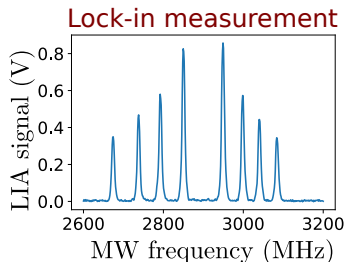
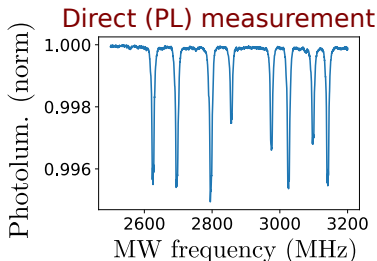
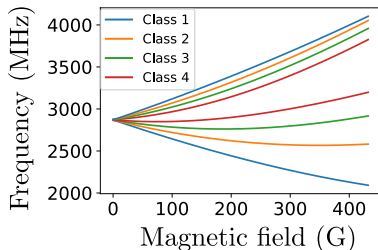


- Optical pumping in the  $|m_s = 0\rangle$  state
- $|m_s = 0\rangle$  state brighter than  $|m_s = \pm 1\rangle$

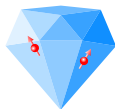
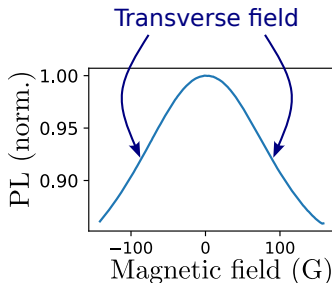
# Preamble : the 4 classes of NV centers



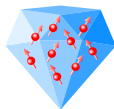
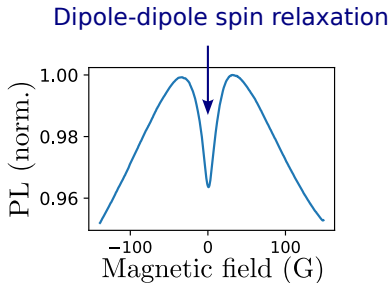
4 different projections of  $\vec{B}$   
over the 4 possible NV axes  
→ 4 classes of resonances



# Depolarization of dense NV ensemble at low magnetic field



Low NV density  
[NV]  $\leq$  100 ppb



High NV density  
[NV]  $\geq$  1 ppm

- Better understand the dipole-dipole coupling in dense NV ensembles
- Exploit the PL feature for magnetometry