

MSE-494

Quantum materials: fundamentals and applications

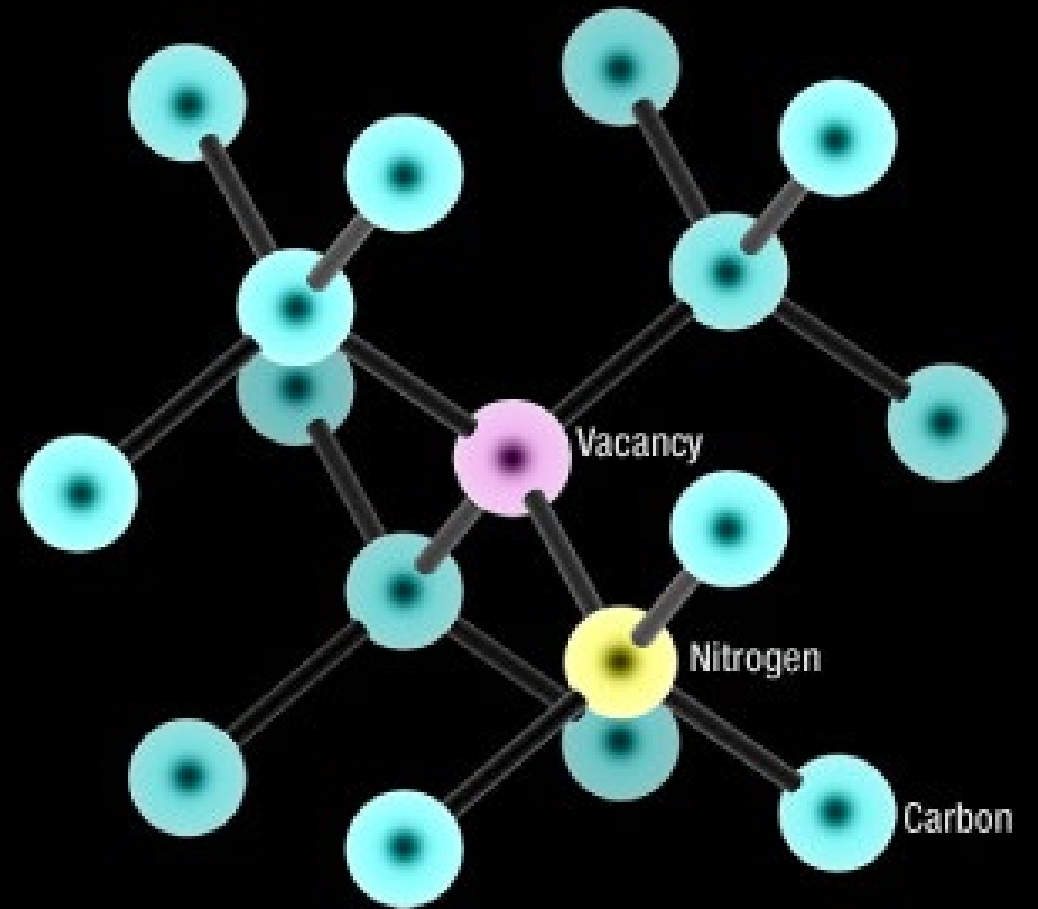
Week 2, Spring 2025

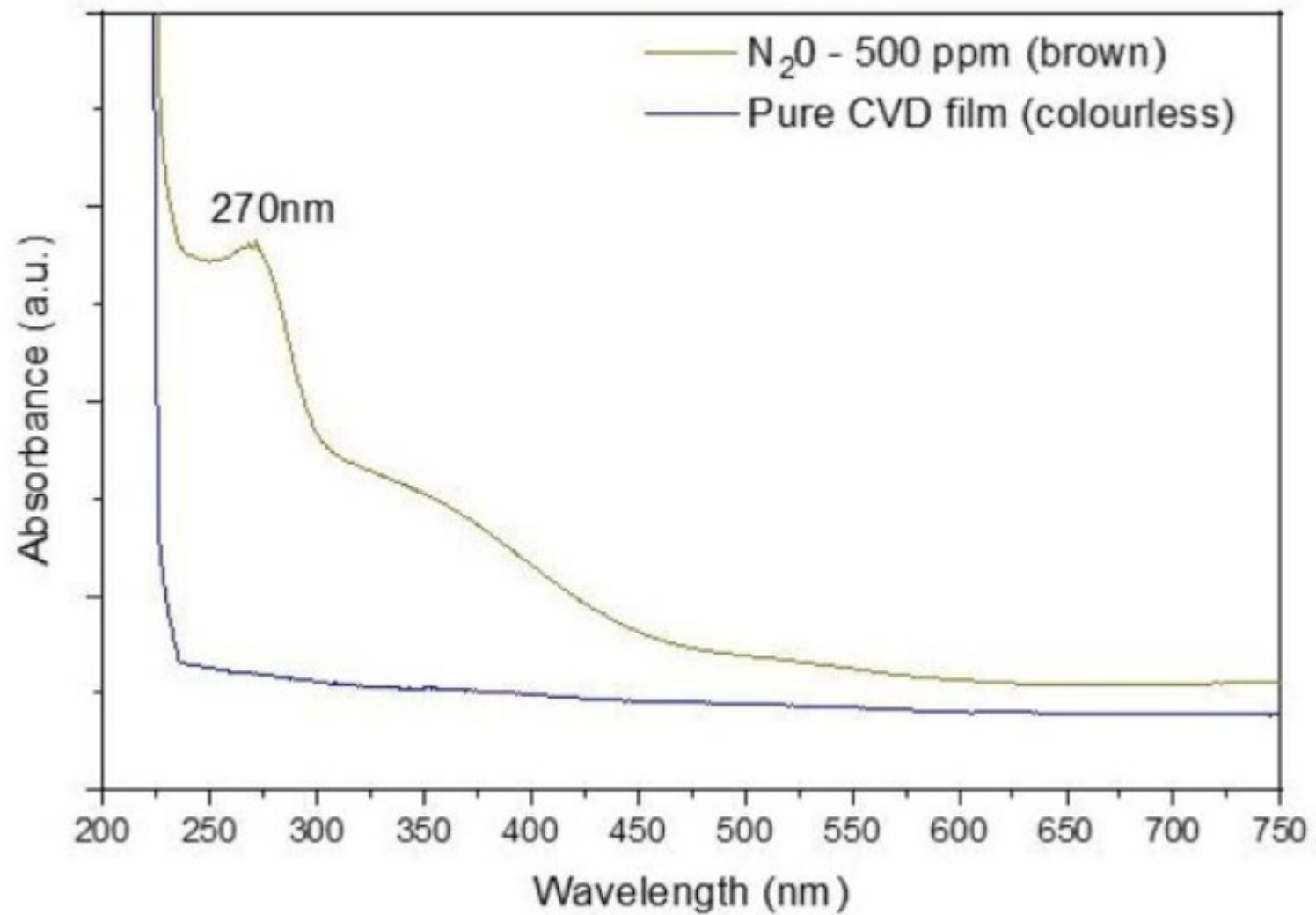
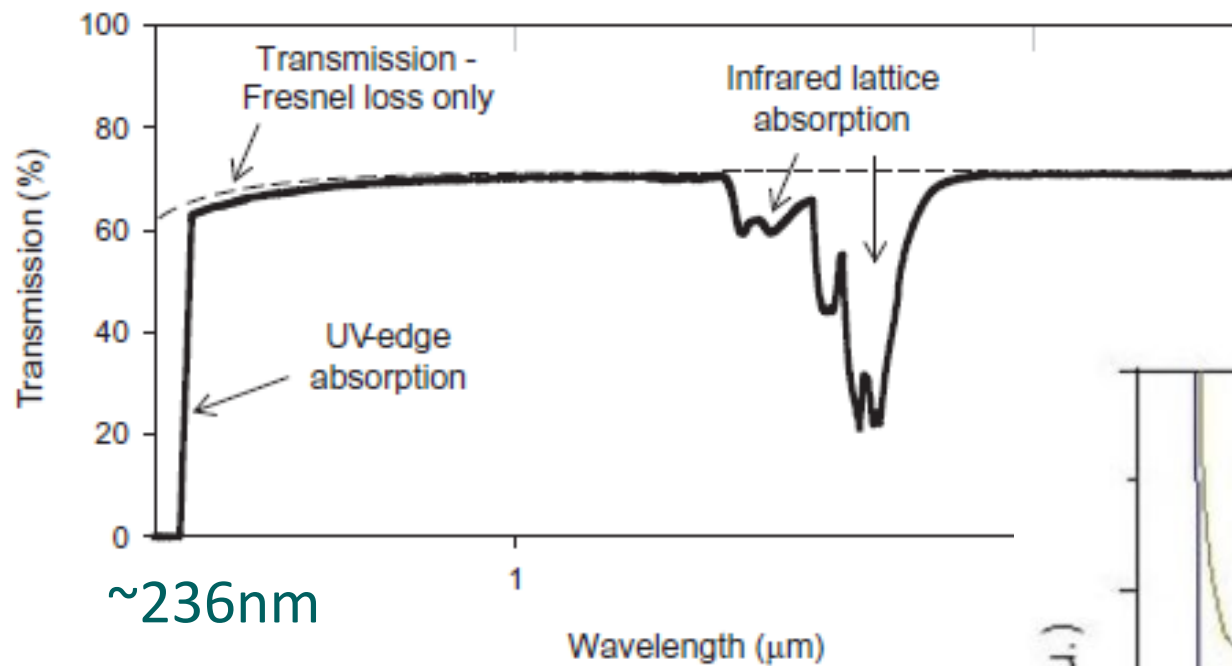
Gregor Jotzu

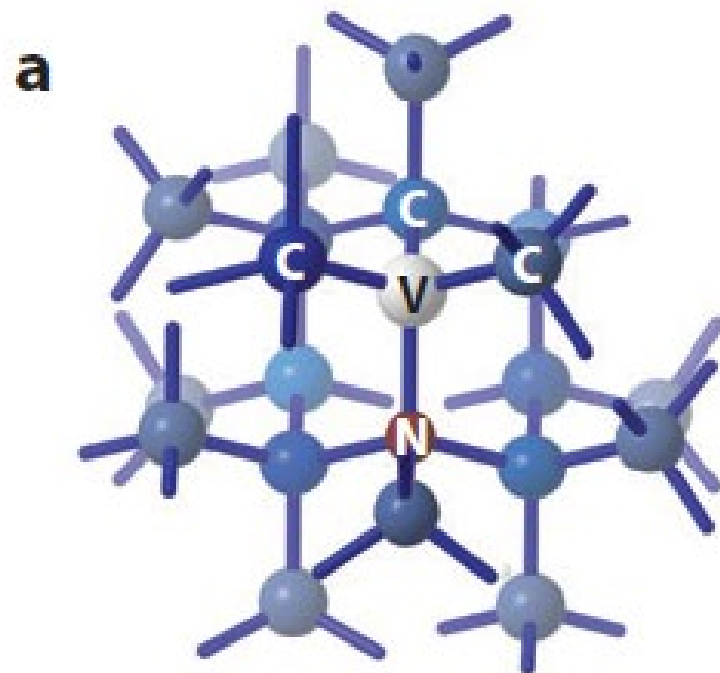
Dynamic Quantum Materials Laboratory

PART 1: Zero dimensions.

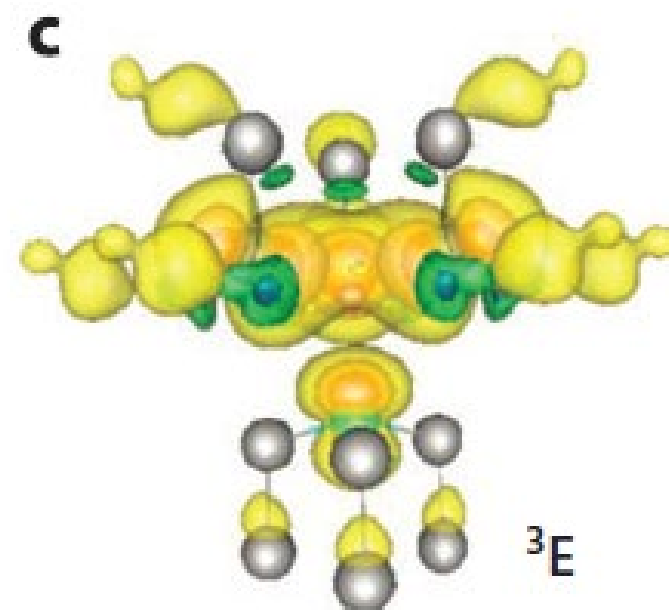
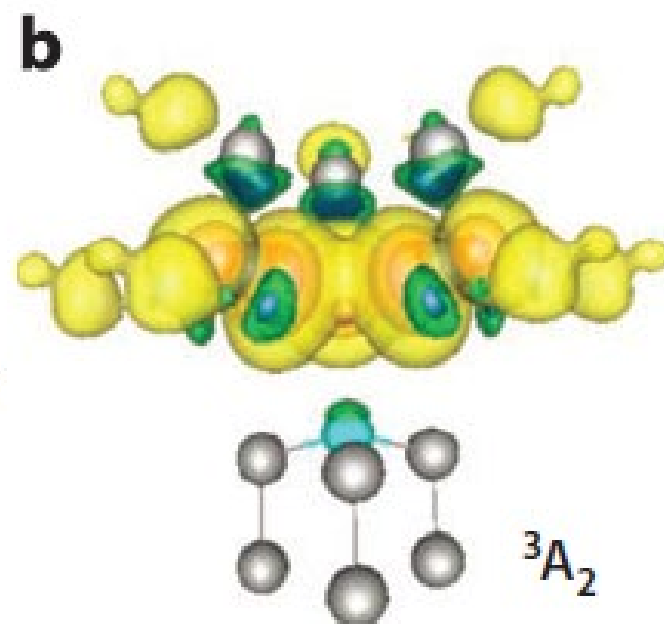
Diamond Nitrogen-Vacancy centers



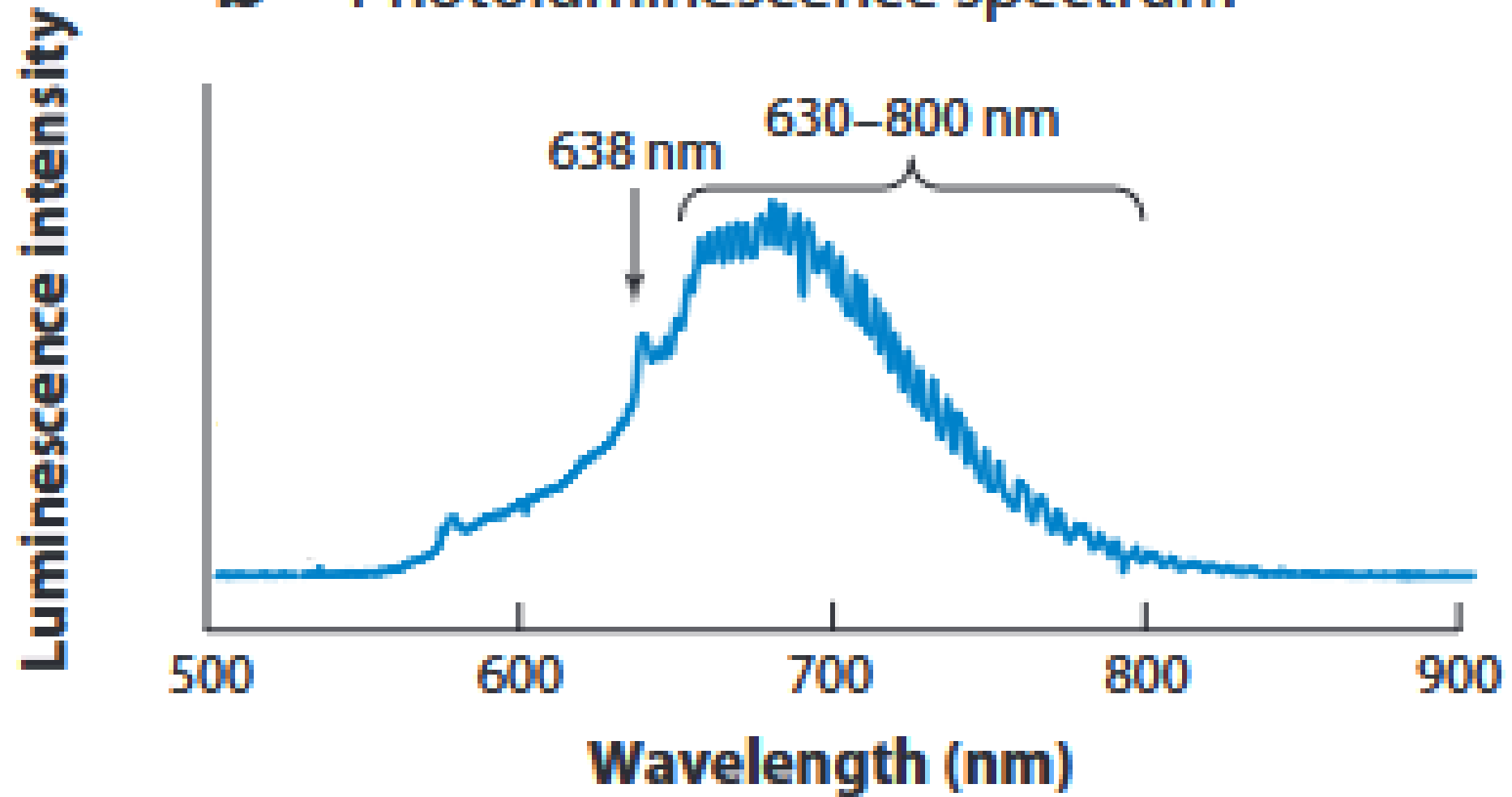




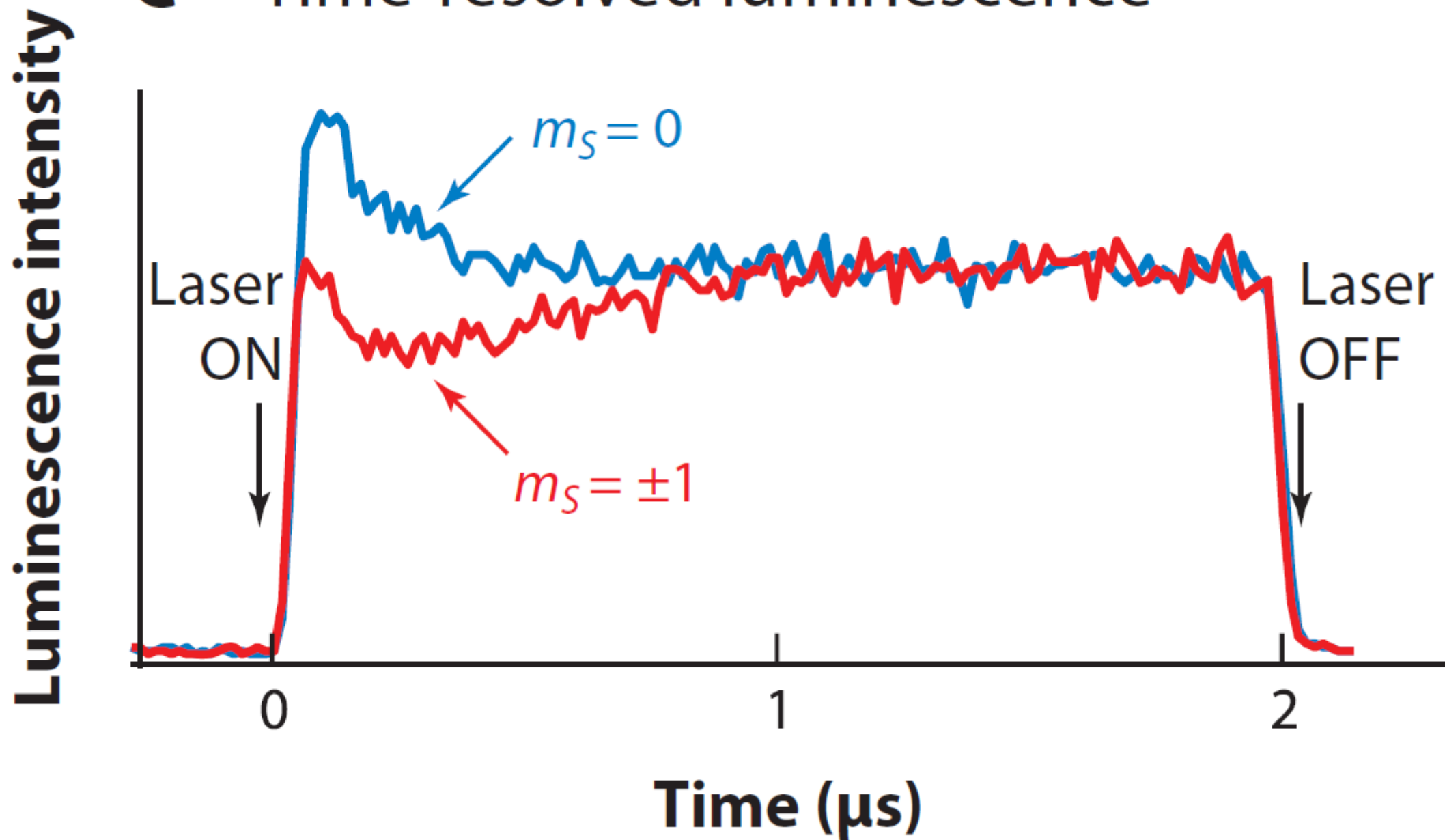
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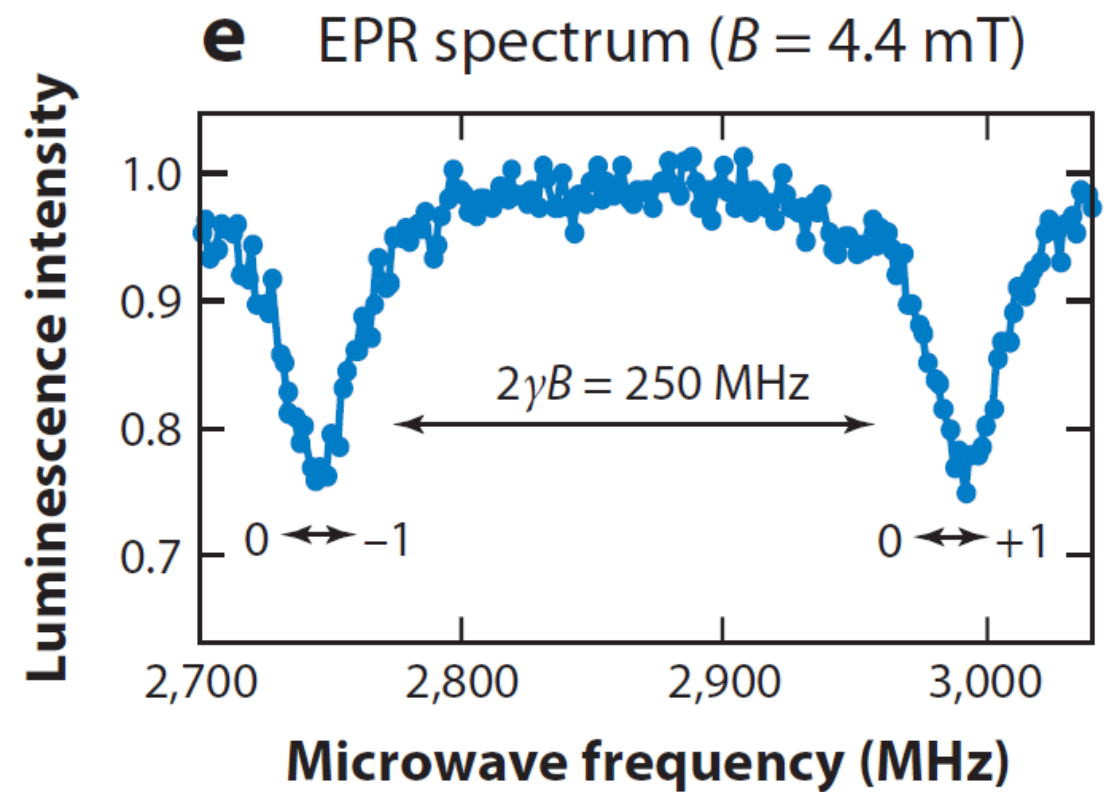
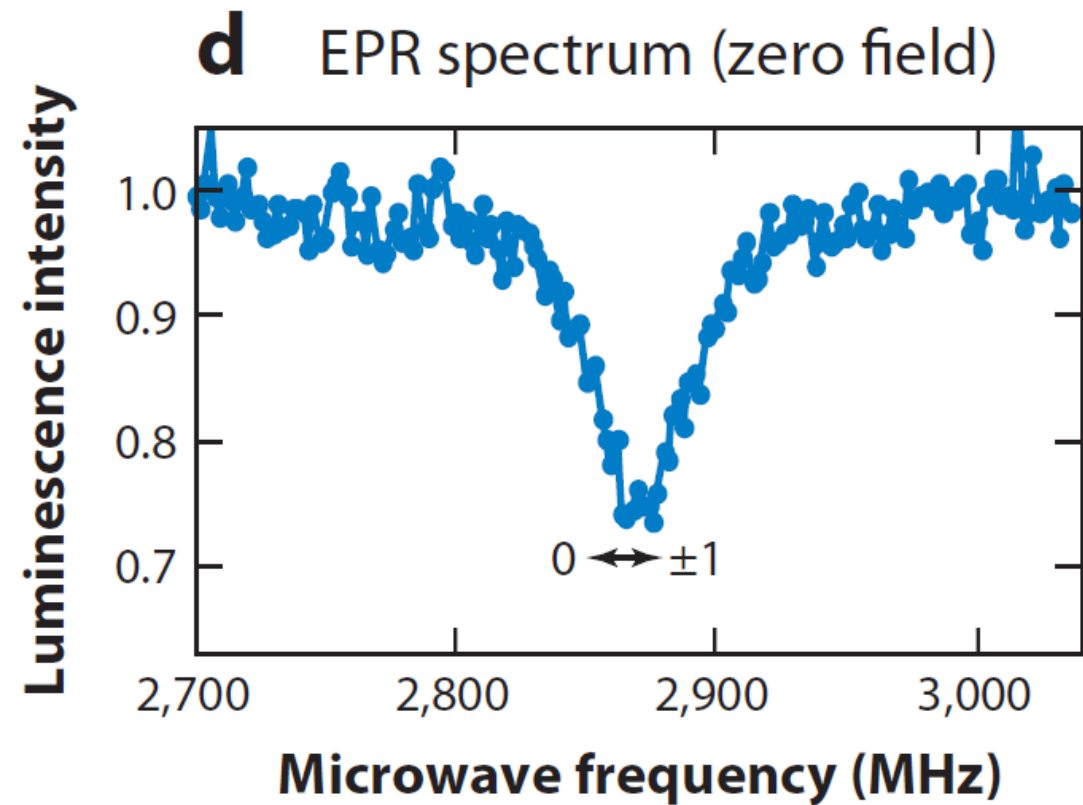


b Photoluminescence spectrum



C Time-resolved luminescence





a

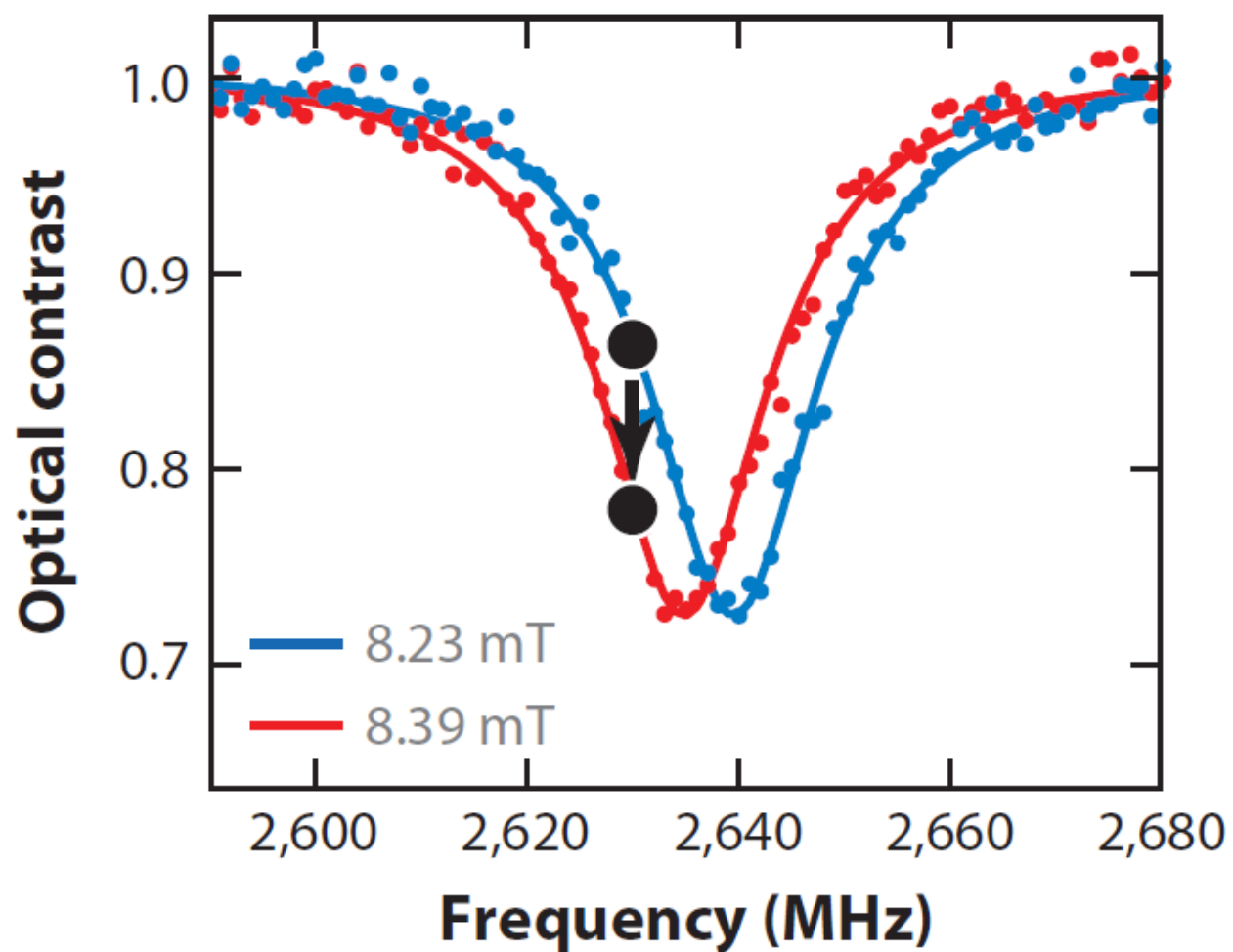
Laser

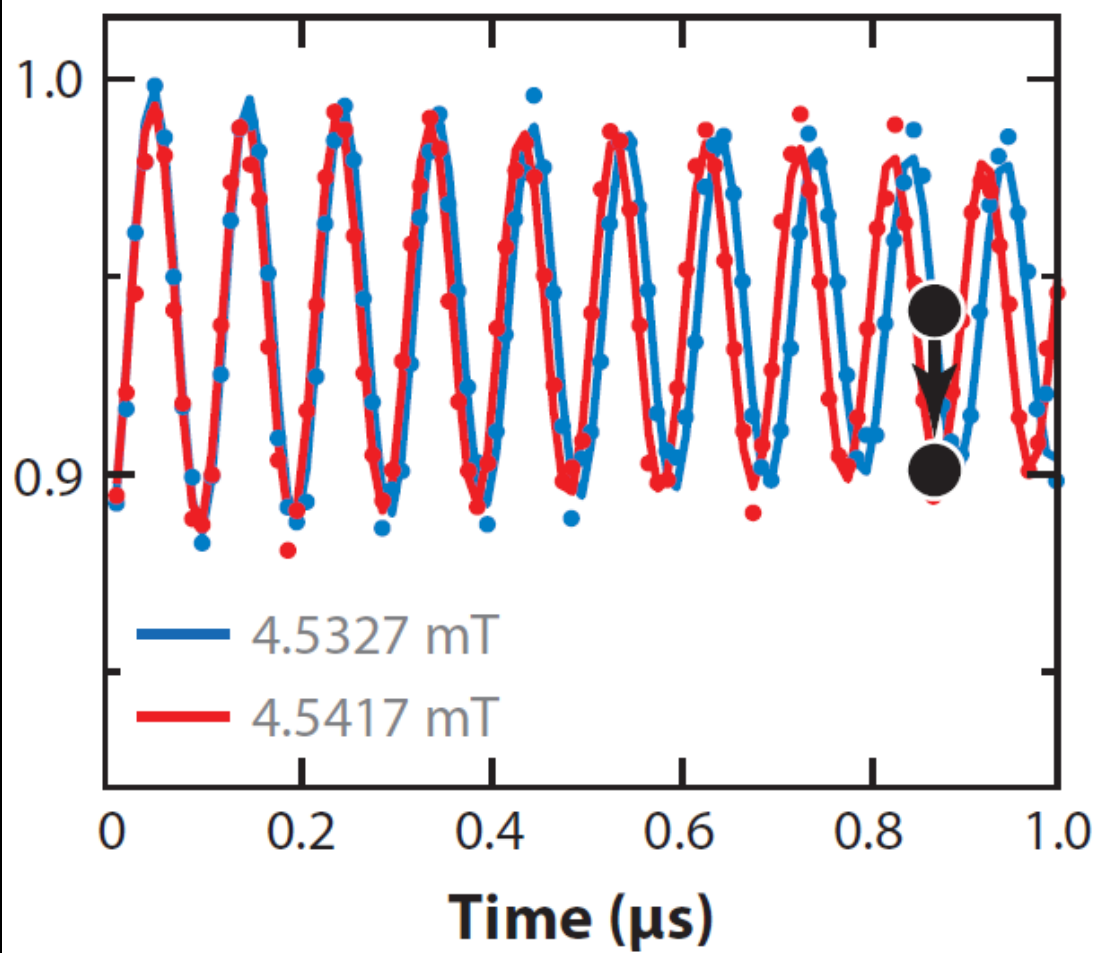
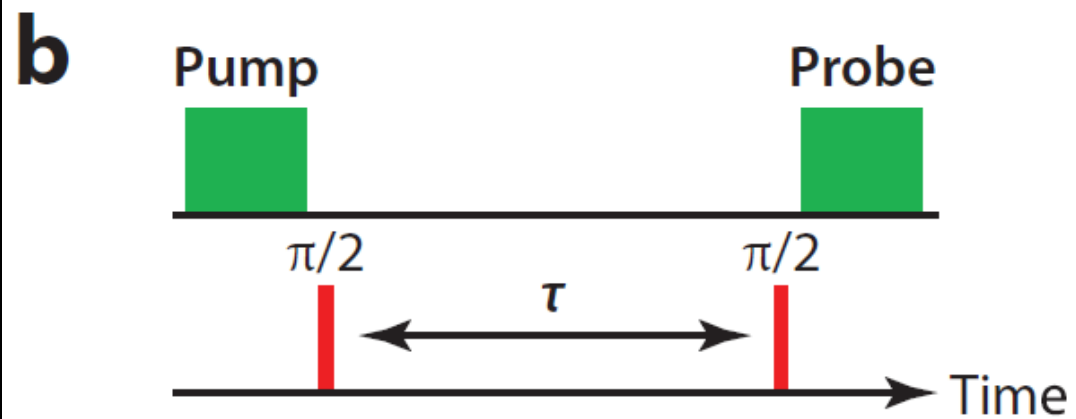
Continuous illumination

Microwaves

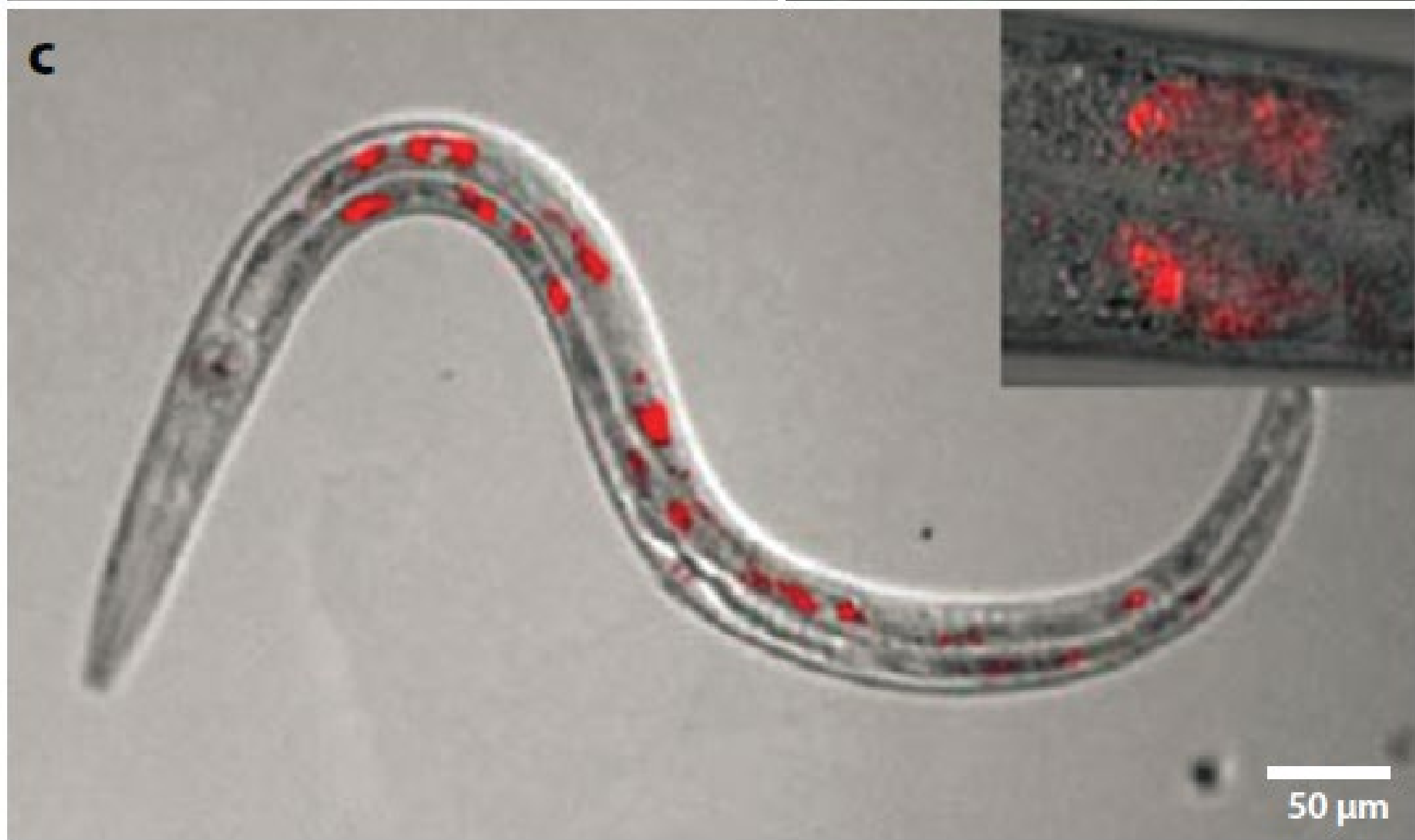
Continuous microwaves

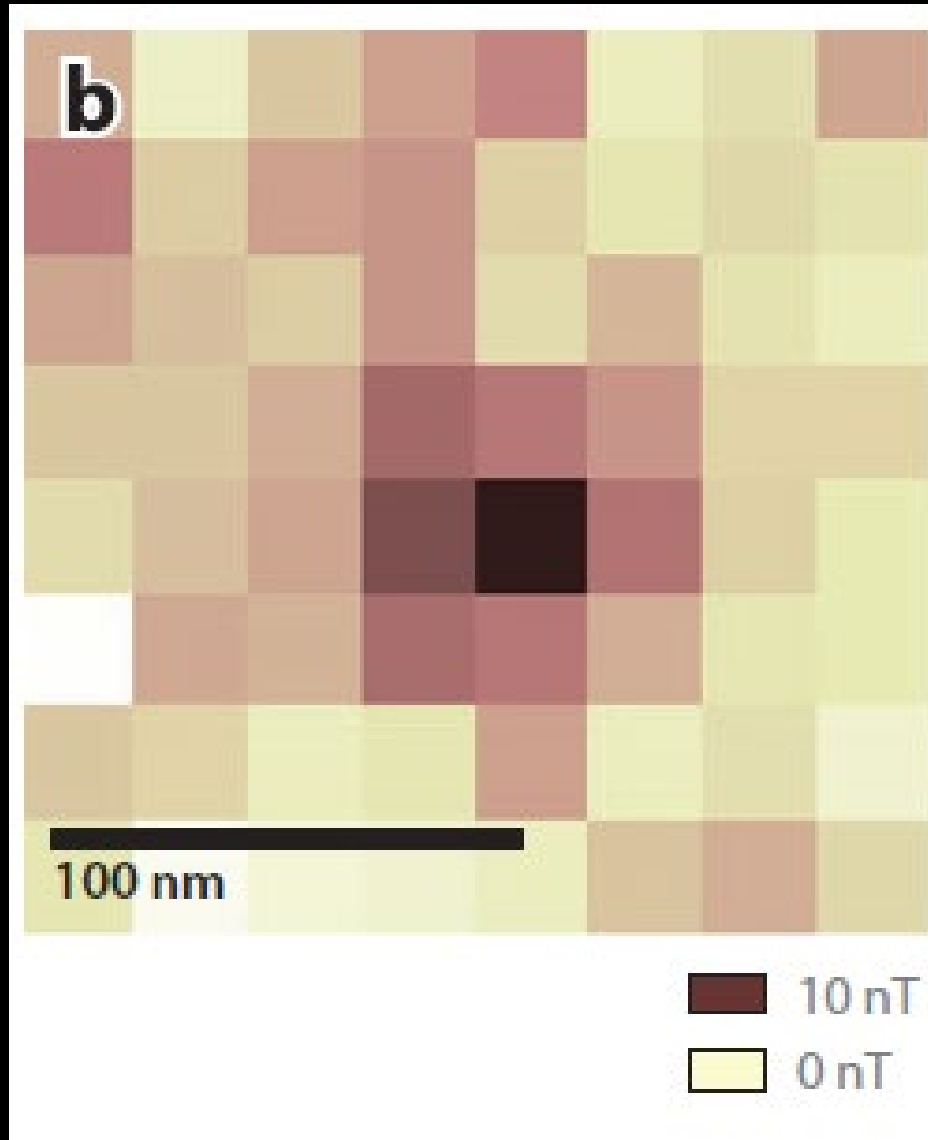
Time →



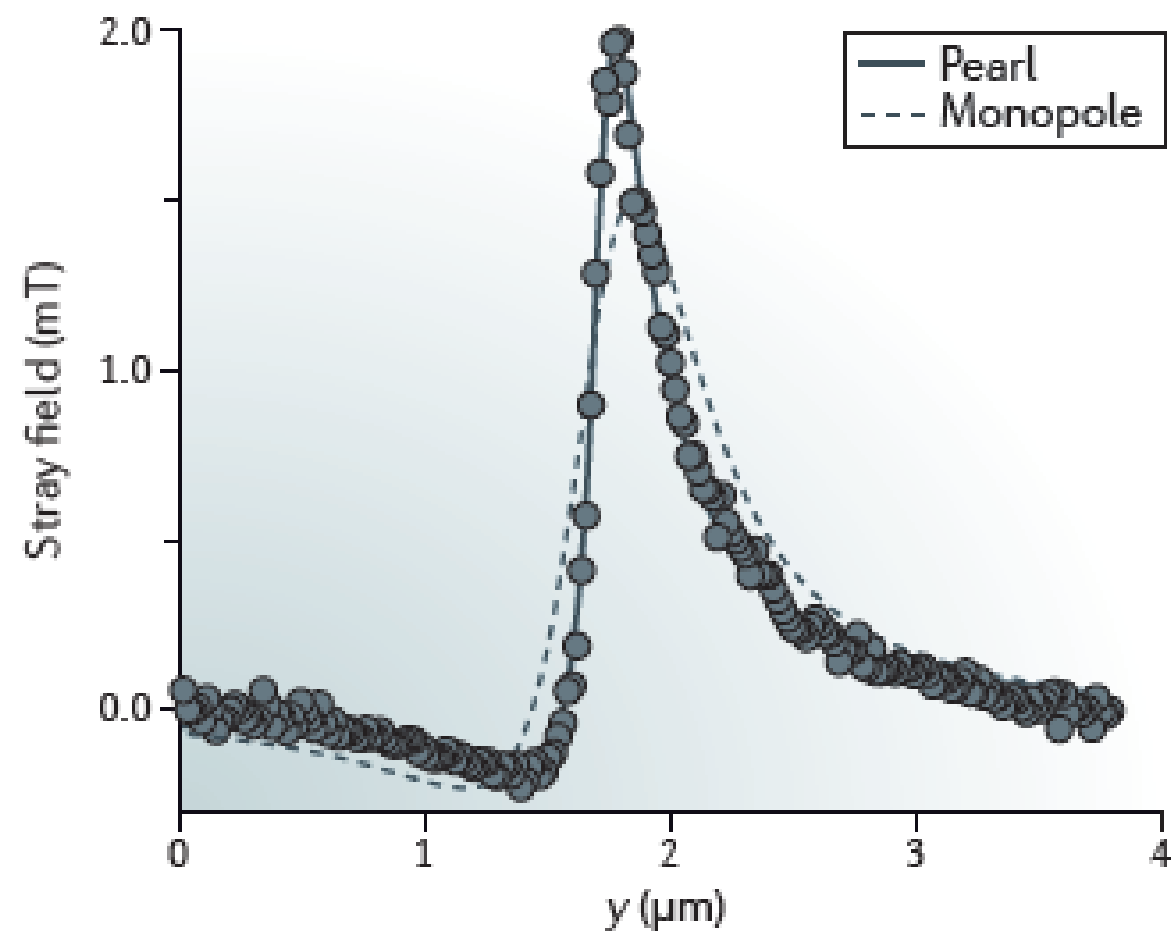
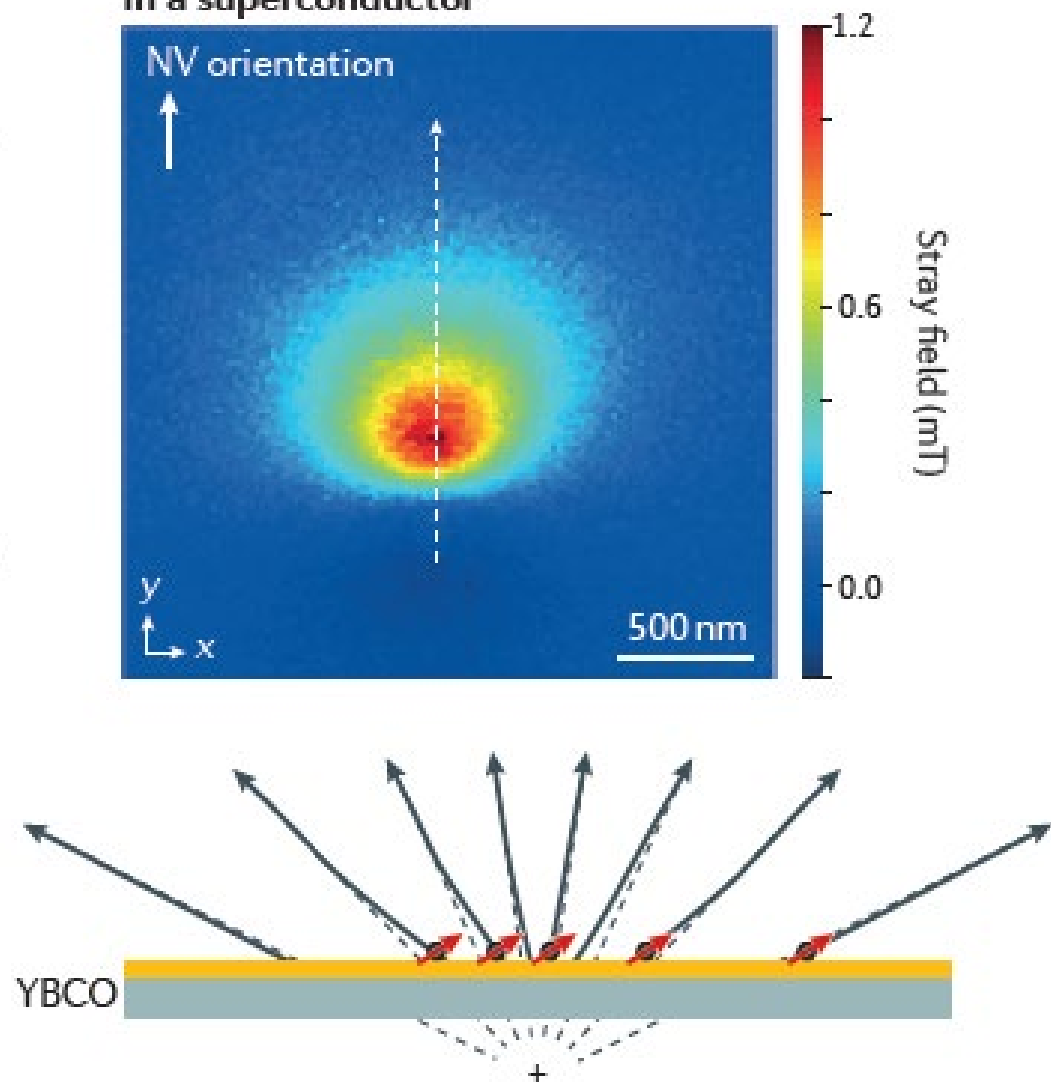


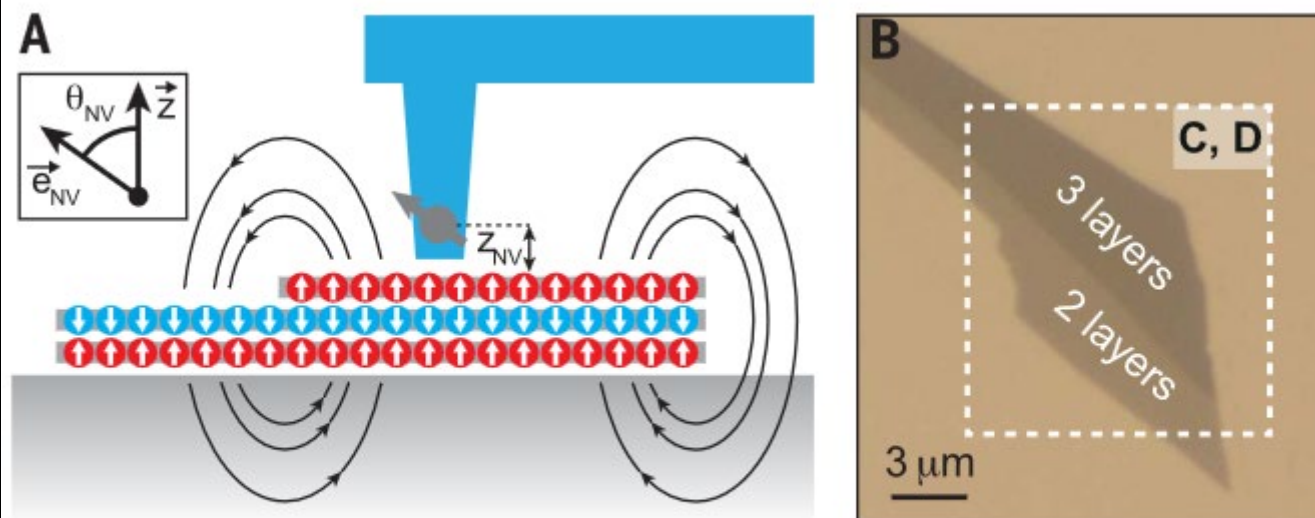
C



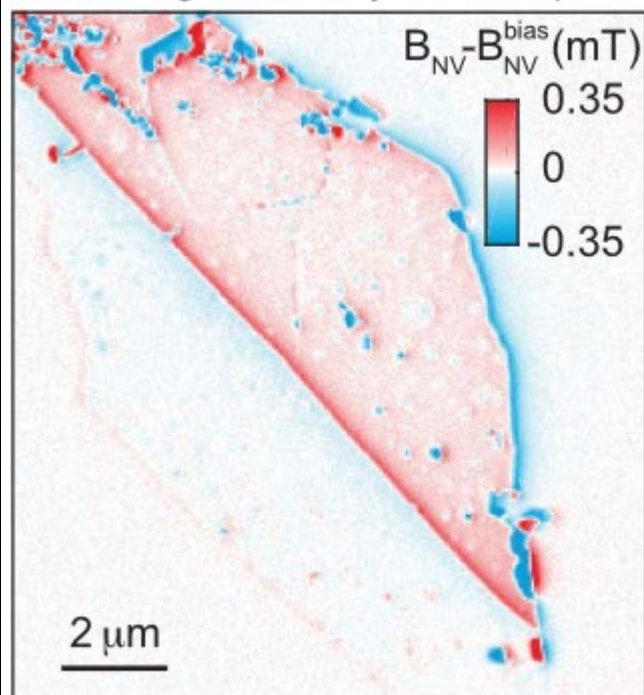


b Measuring the magnetic field generated by a vortex in a superconductor

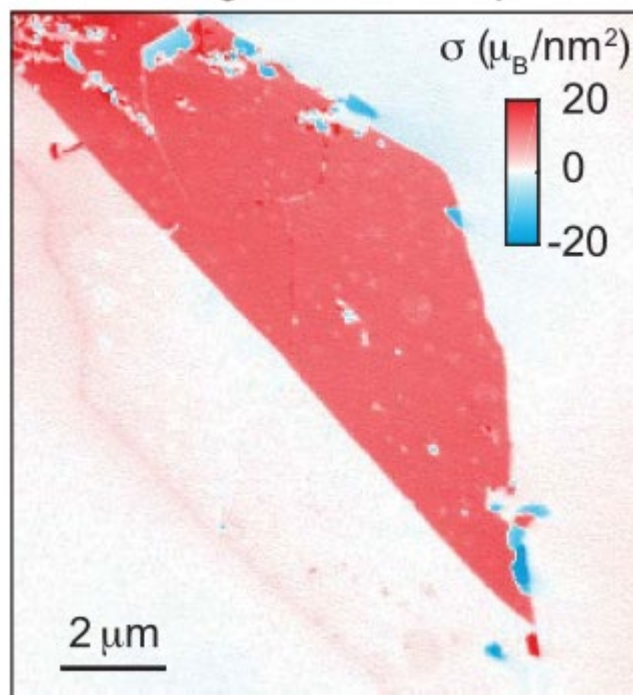




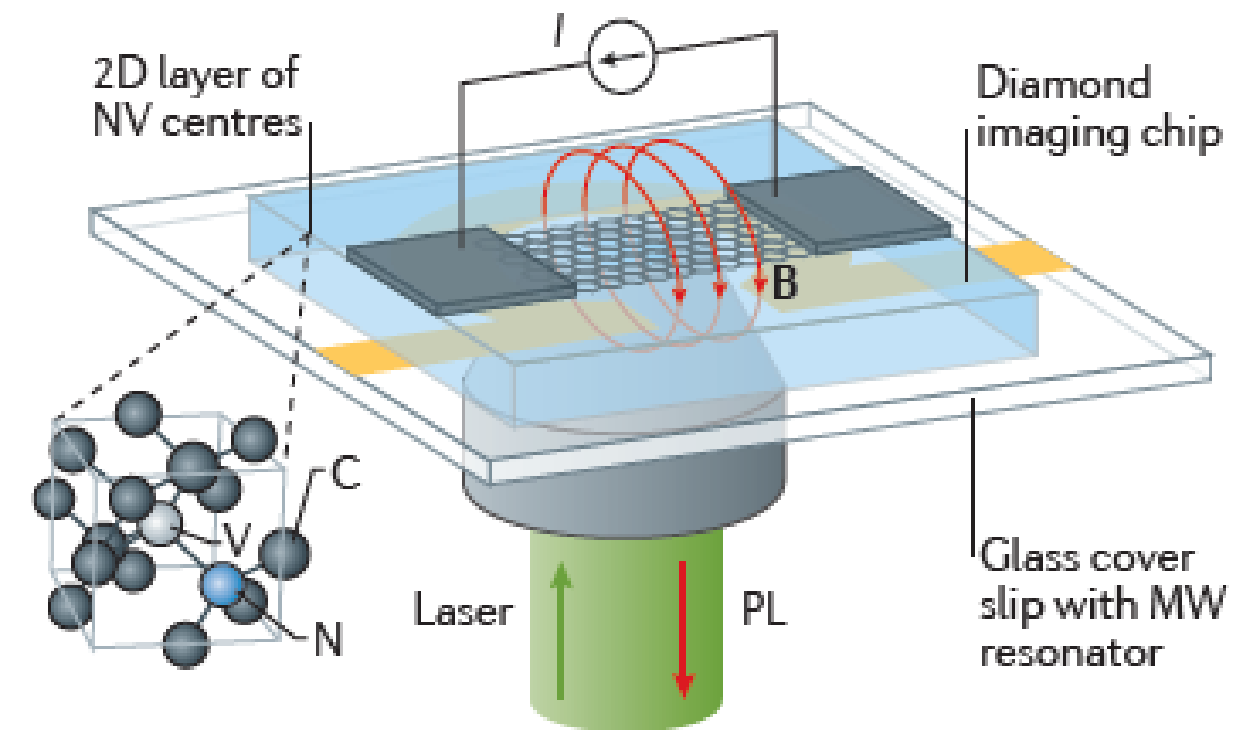
C Magnetic stray-field map



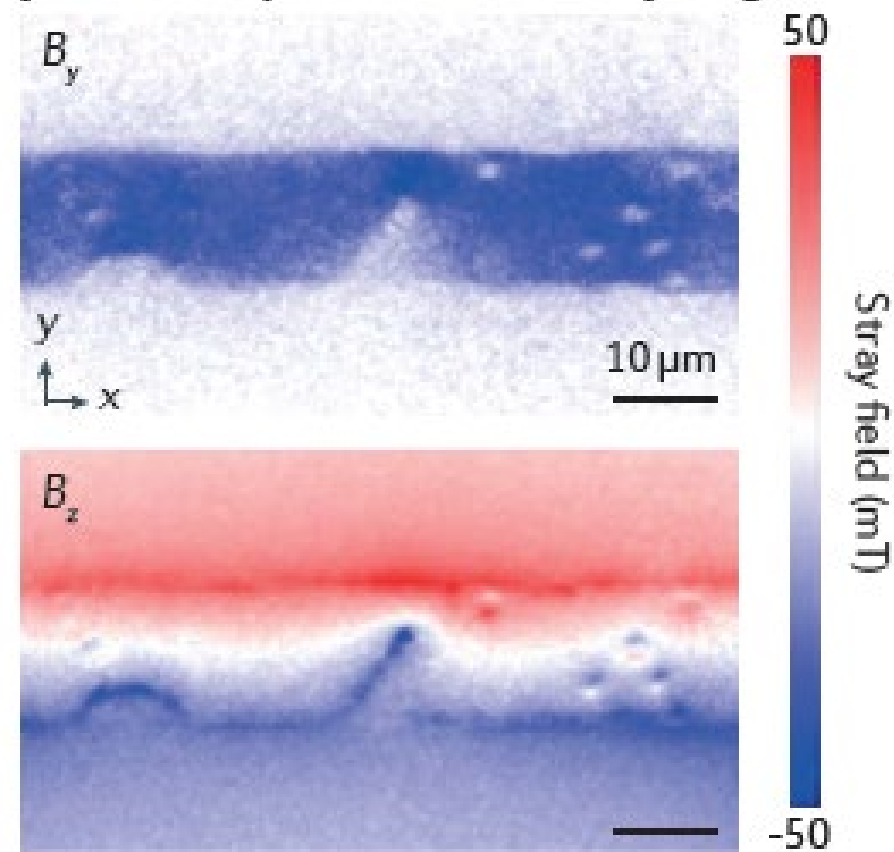
D Magnetization map



a Measuring current in a graphene flake
Measurement setup



y and z components of the stray magnetic field



Reconstructed current density

