

Plastic Electronics and Quantum Mechanics

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How did I end up here.....



WALTER SCHOTTKY INSTITUT
Center for Nanotechnology and Nanomaterials



UNSW
THE UNIVERSITY OF NEW SOUTH WALES
SYDNEY • AUSTRALIA

CENTRE FOR
QUANTUM COMPUTER
TECHNOLOGY
AUSTRALIAN RESEARCH COUNCIL CENTRE OF EXCELLENCE

BSc: UNSW
PhD: Centre for Quantum Computer Technology
Postdoc: University of Utah
ARC Postdoctoral Fellow: Sydney

Organic Electronics - Applications

Organic semiconductors are a promising material for low cost optoelectronic applications

Low Power



Photo: HTC

Flexible



Photo: Sony

Bright



Photo: Epson

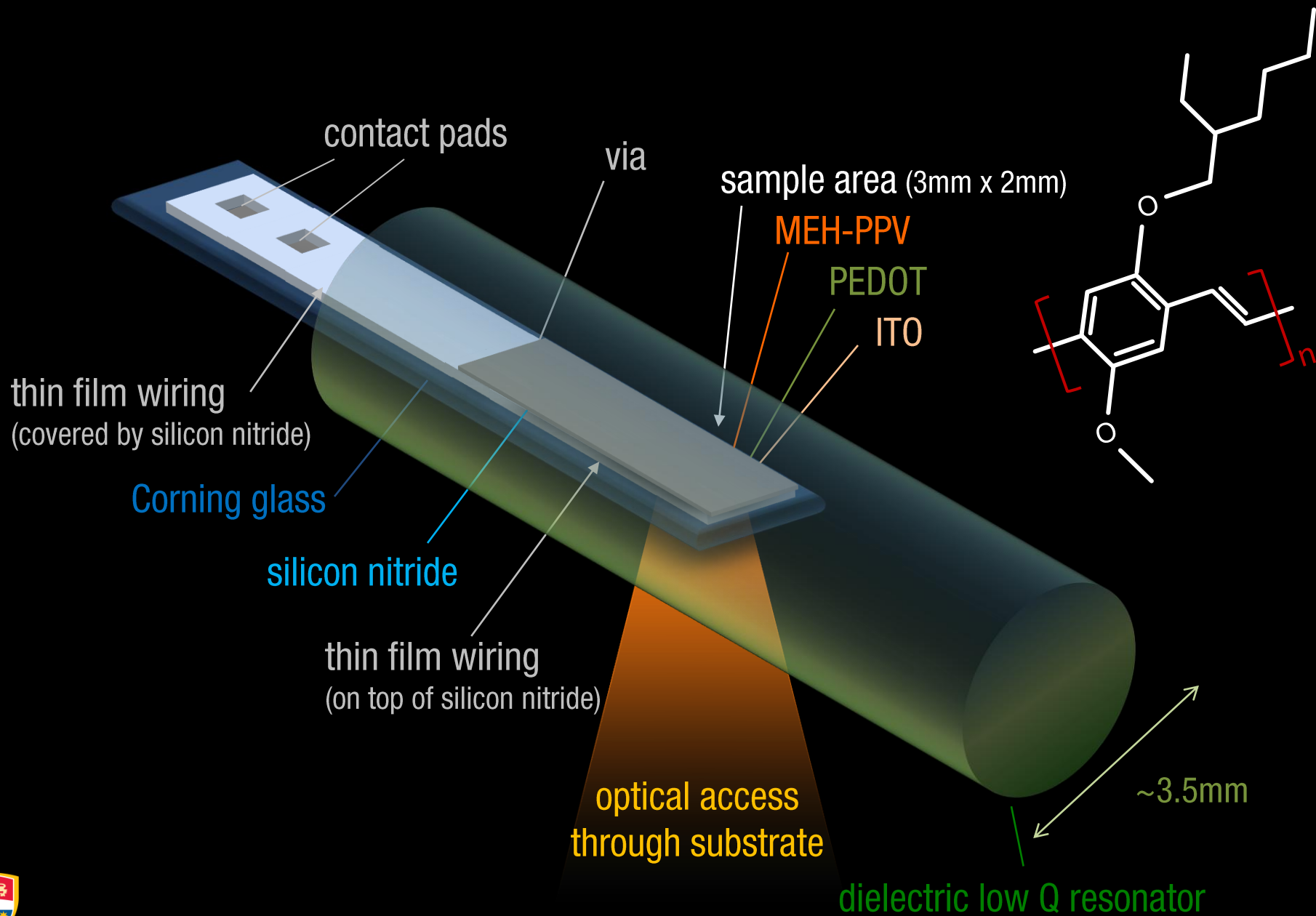
Light



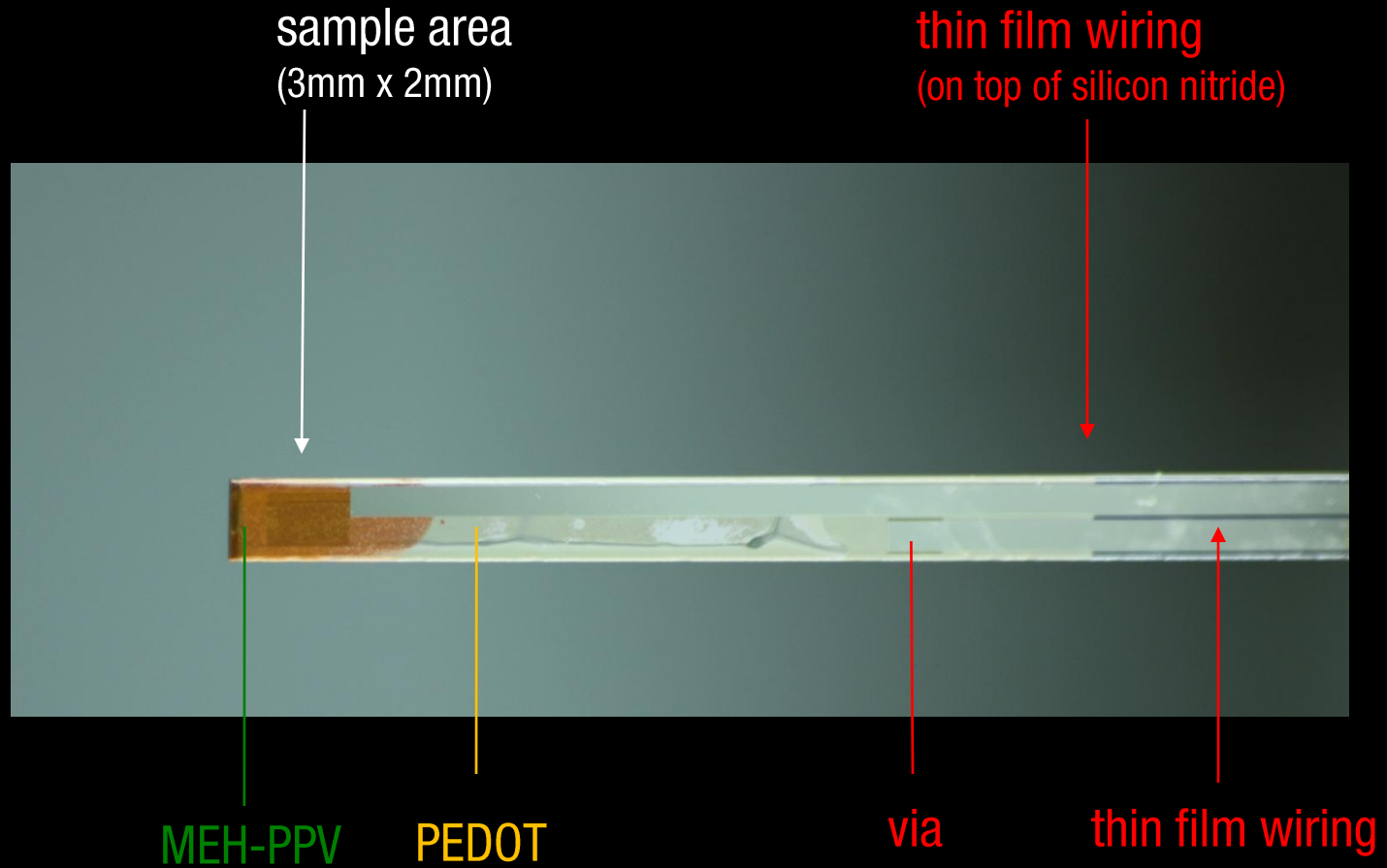
Photo: Neuber/Konarka



How do we make on Organic Device?



An Organic Light Emitting Diode

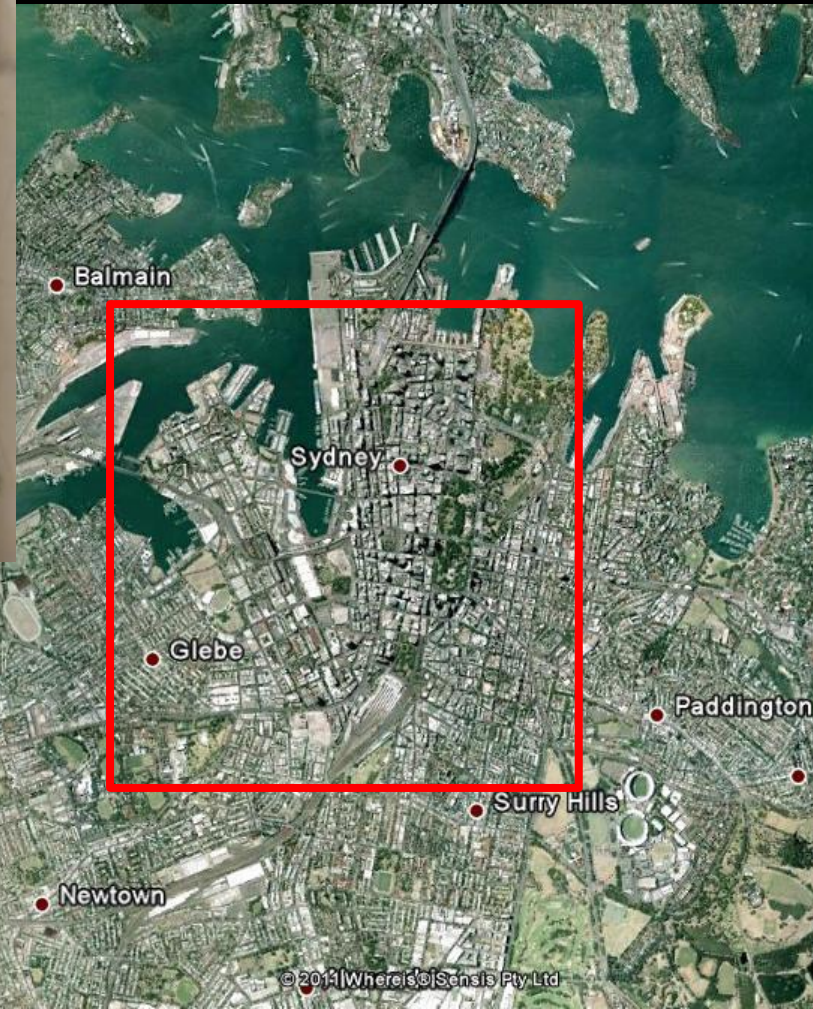


How does industry make a device?

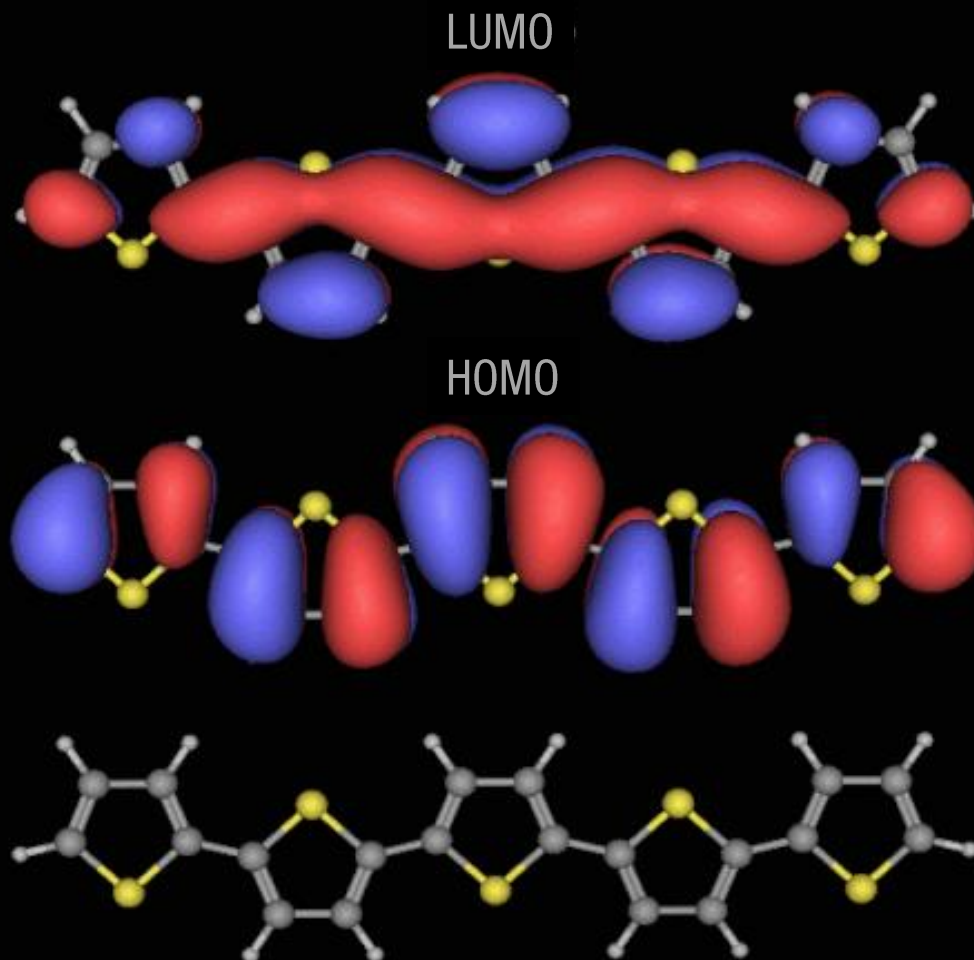
Reel-to-reel printing (like newspapers)



Konarka Technologies estimates that one of their facilities can produce > 10 million m² /year of solar cells



Organic Semiconductors

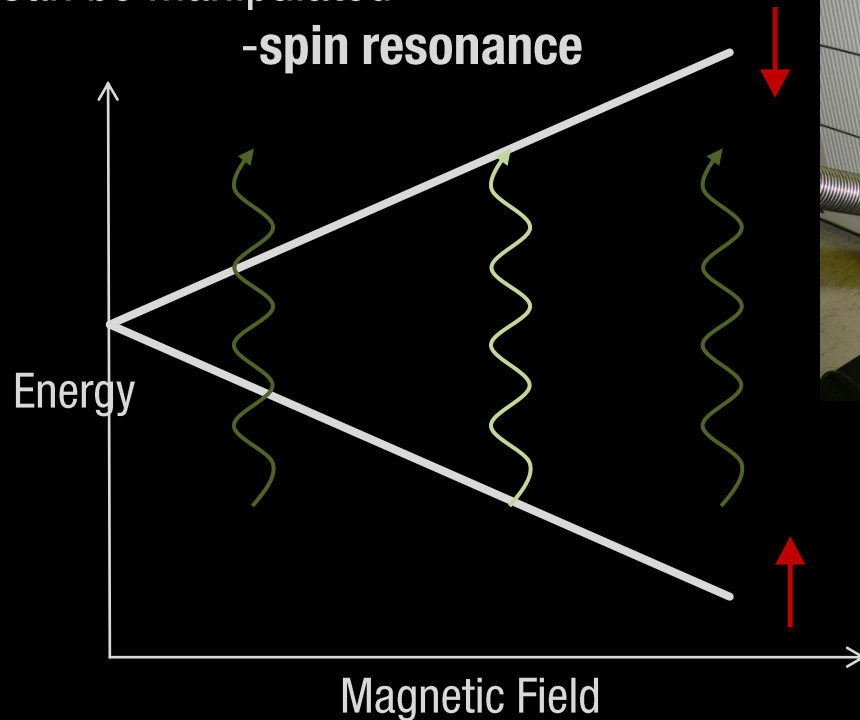


LUMO /HOMO can be thought of like Conduction/Valence band in conventional semiconductors



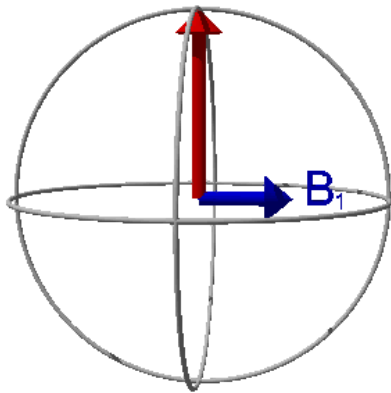
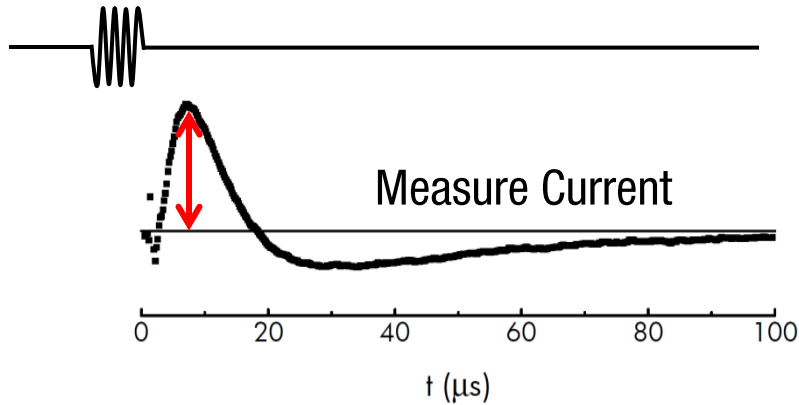
spin

- Is a property of electrons which can be thought of *like* a small bar magnet
- Behaves in a quantum mechanical way
 - probabilistic
 - superposition
 - entanglement
- Can be manipulated
 - spin resonance**

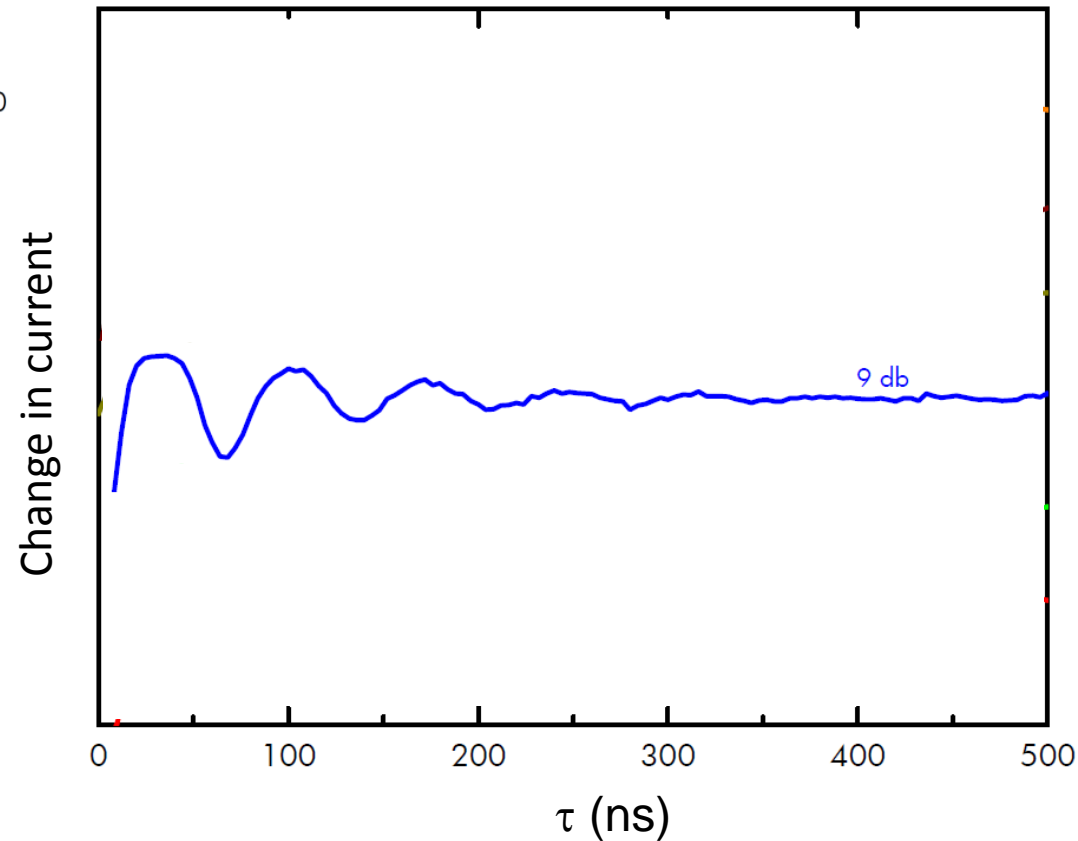


Coherent Manipulation of Spin

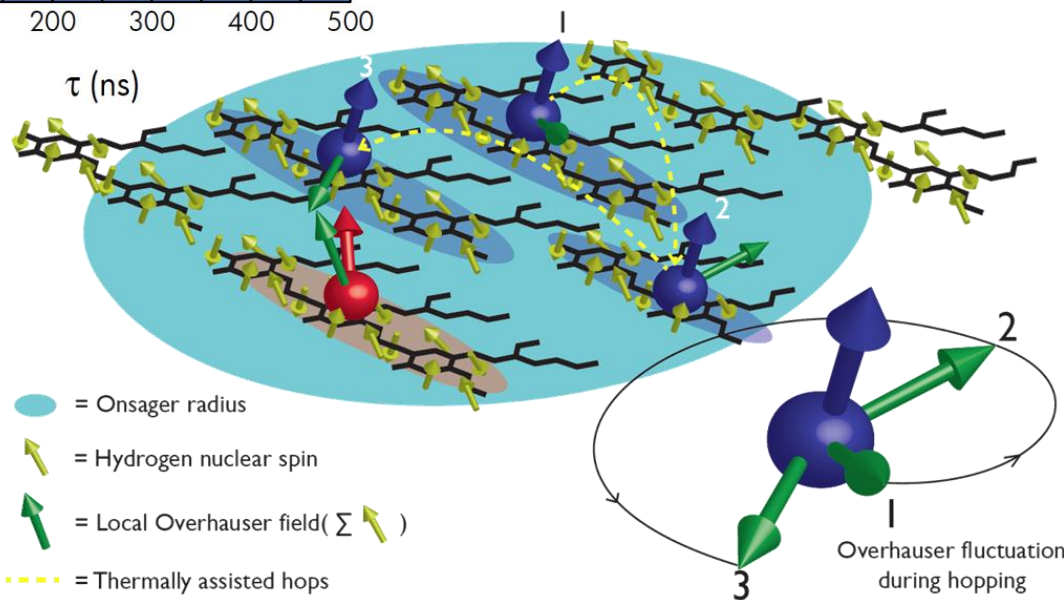
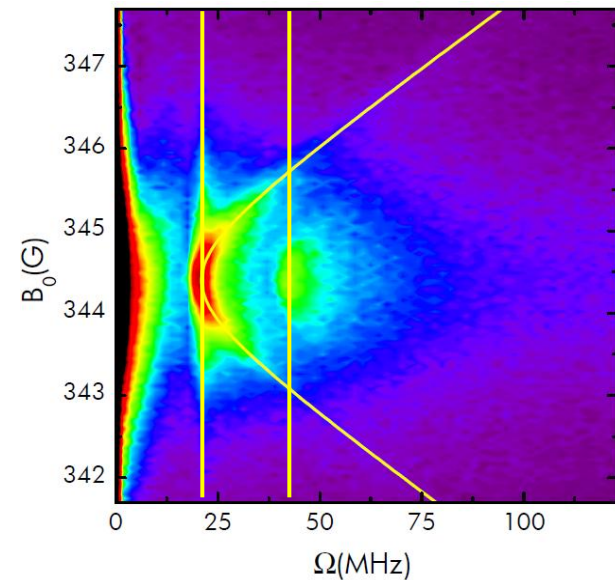
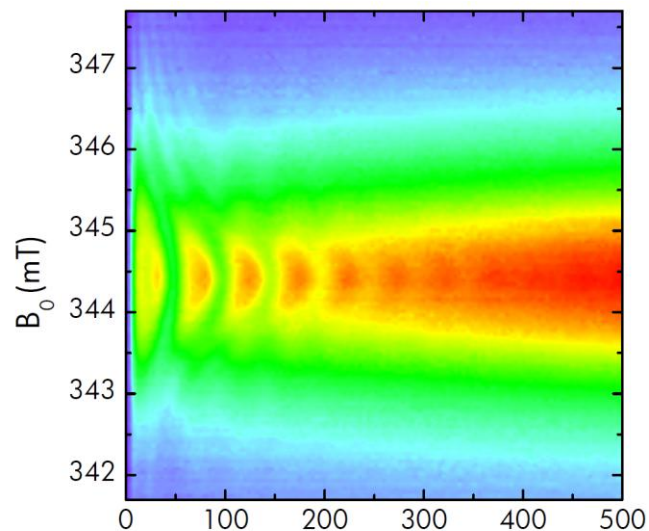
Manipulate spins



The spin of the charge carriers (polarons) influences the resistance of the device.



Investigating the coherent dynamics



Allows us to determine how polarons move through the complex polymer network



Questions?

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