

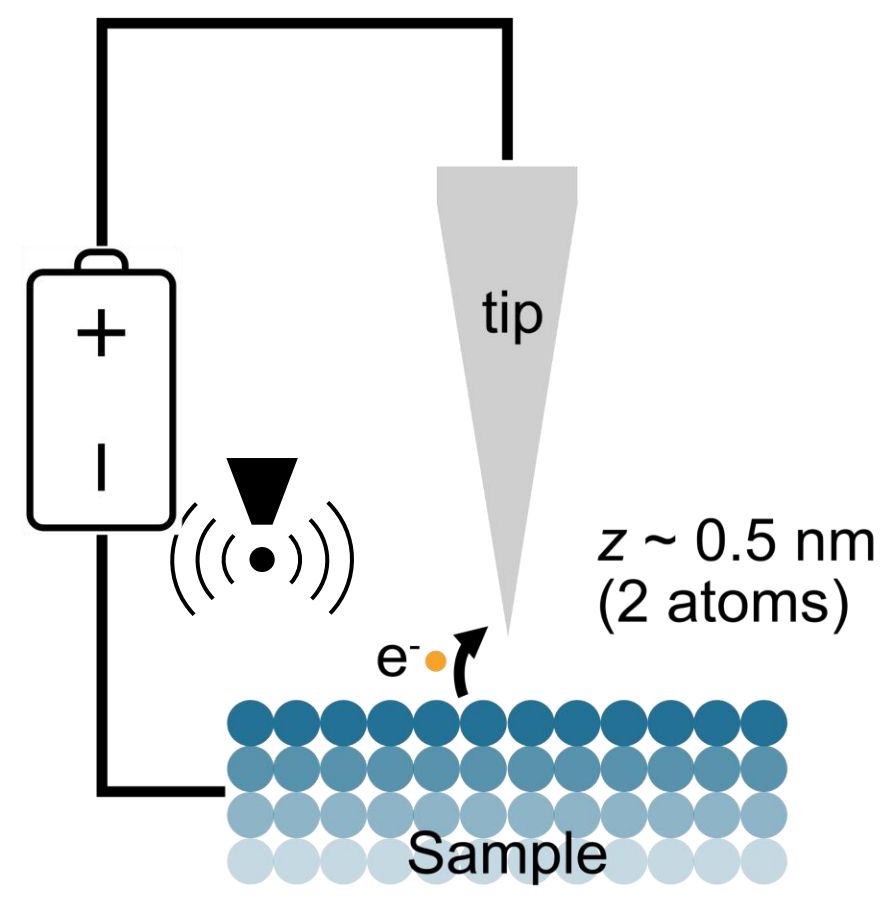
Quantum Materials and Sensing

Exploring the atomic world

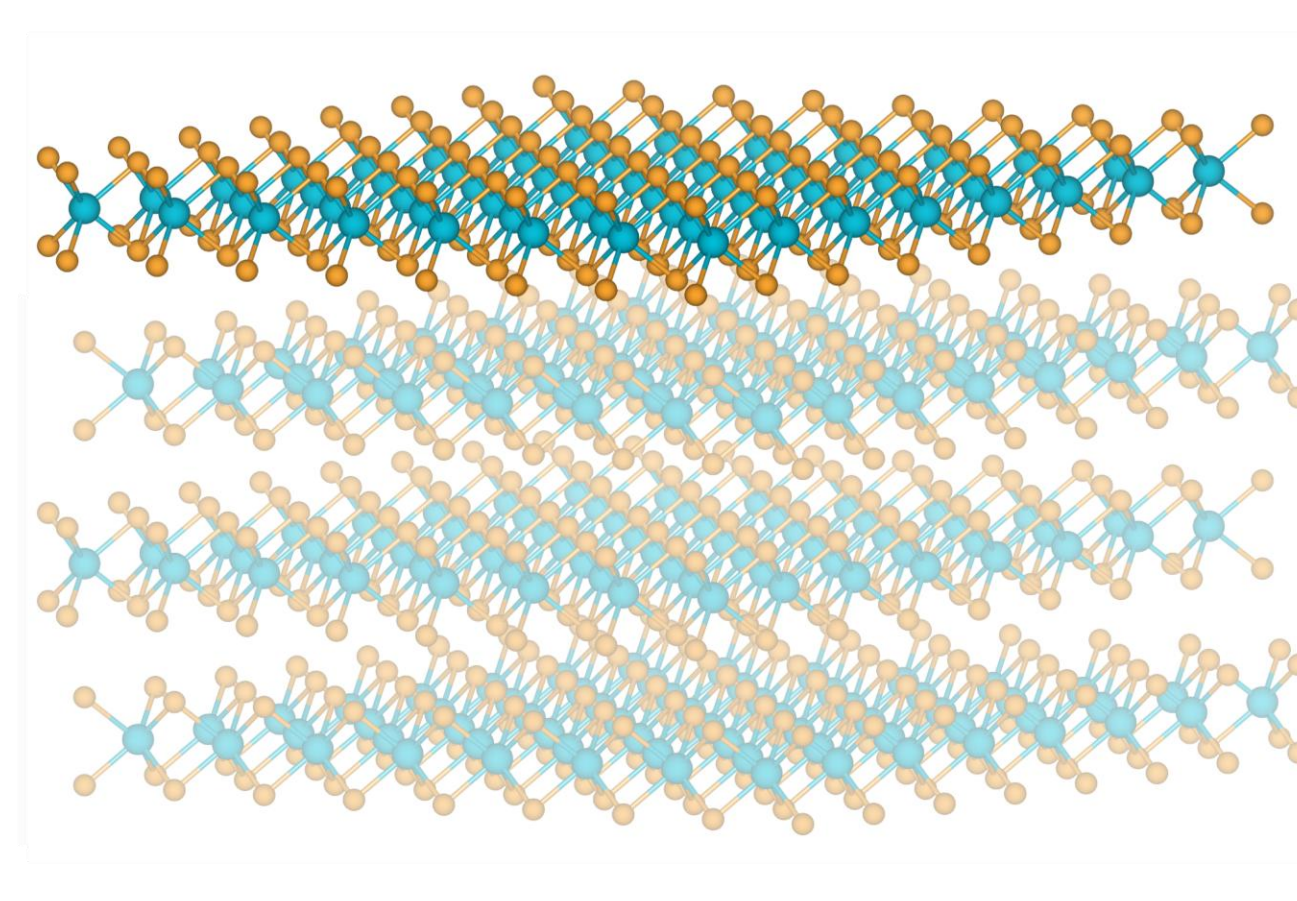
Fabian D. Natterer Group

Gleb Neplyakh, Ajla Karić, Lebin Yu, Saketh Ravuri,
Dr. Rian Lighthart, Dr. Alexander LaFleur, Dr. Kevin Hauser

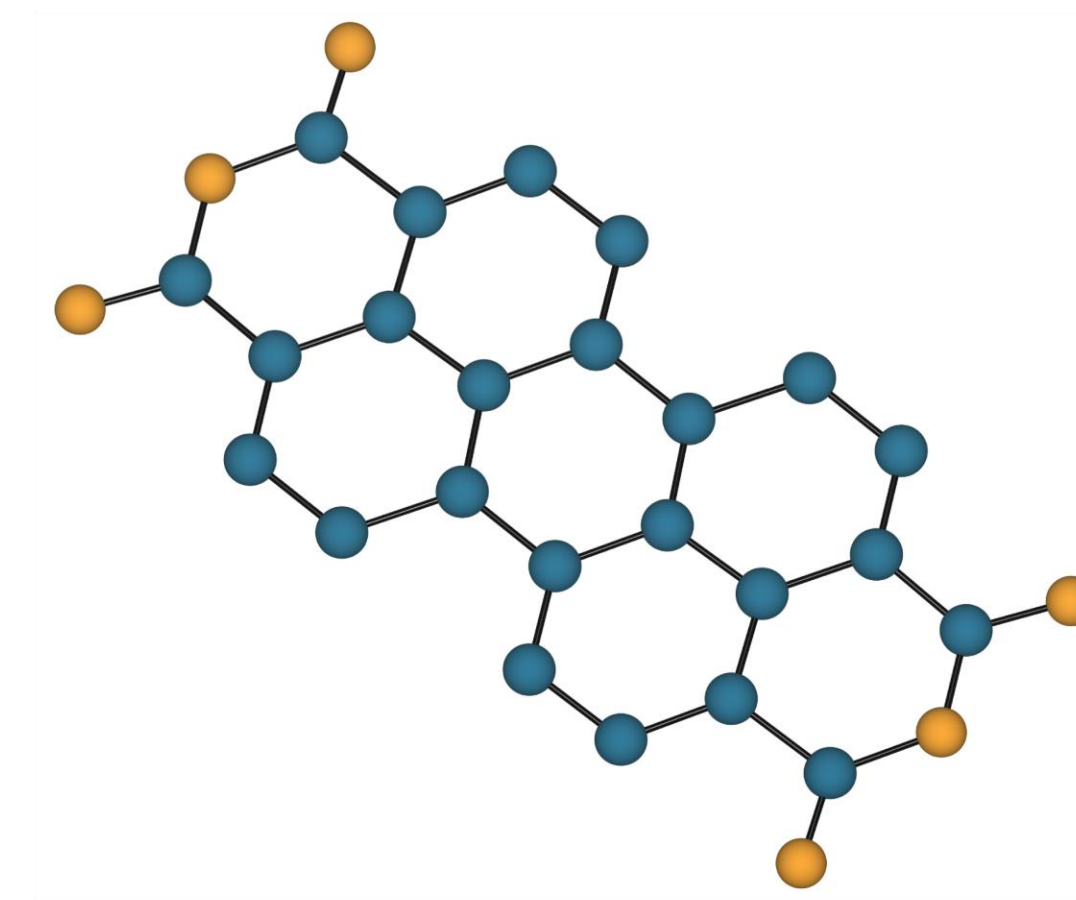
Scanning probe microscopy:



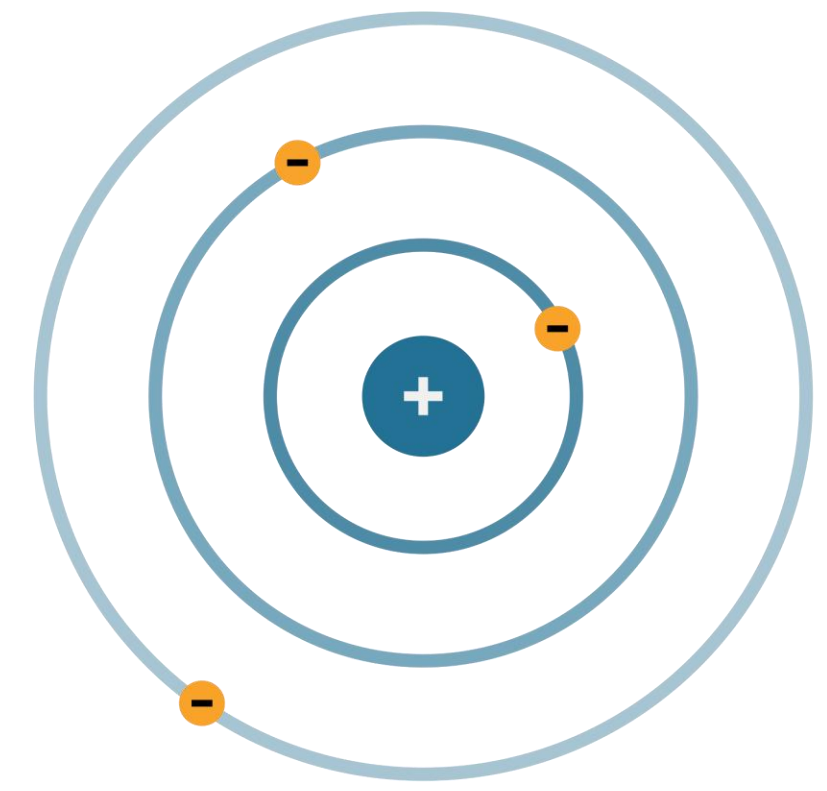
From surfaces...



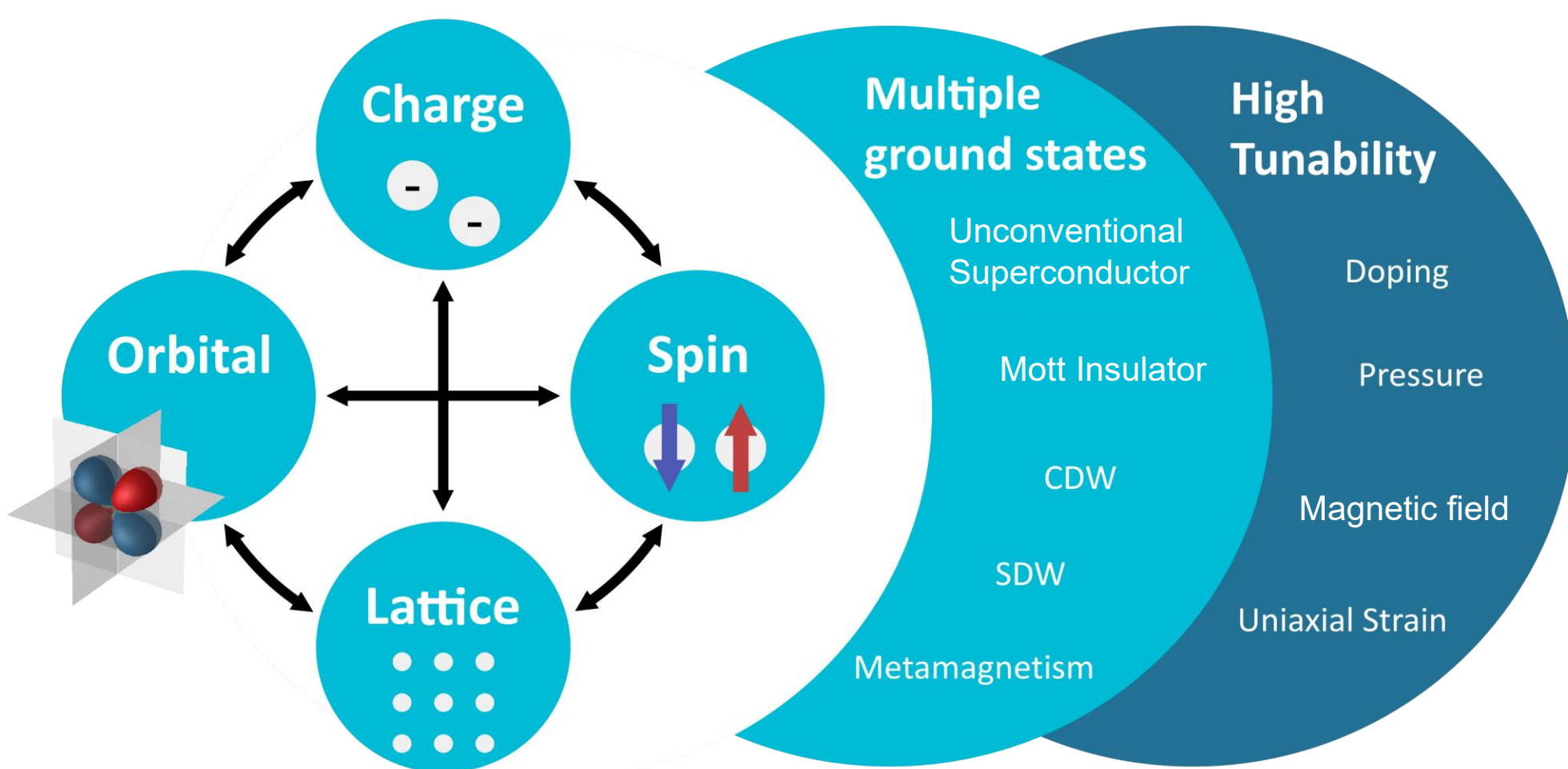
to molecules...



to atoms!

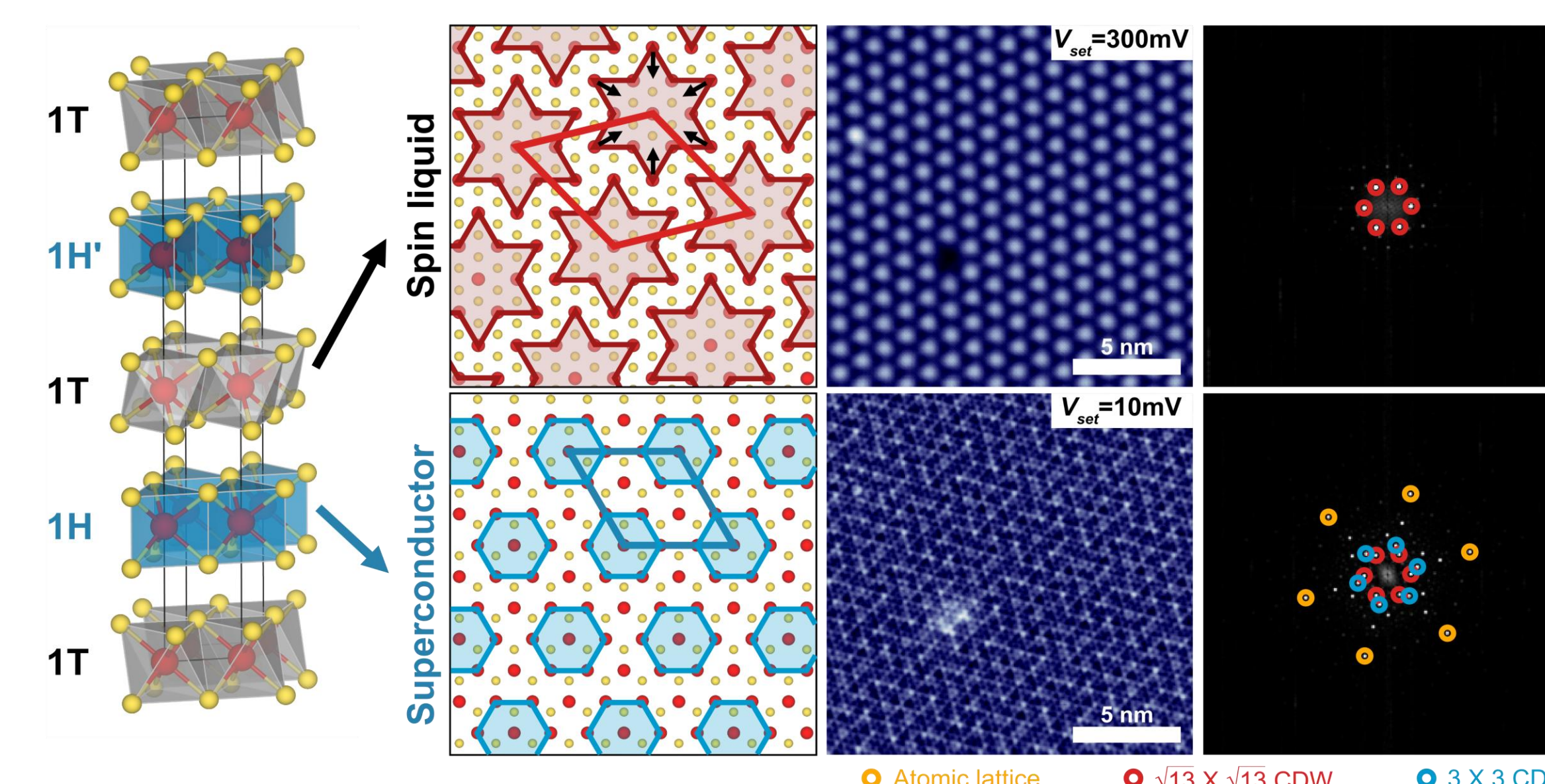


Quantum materials

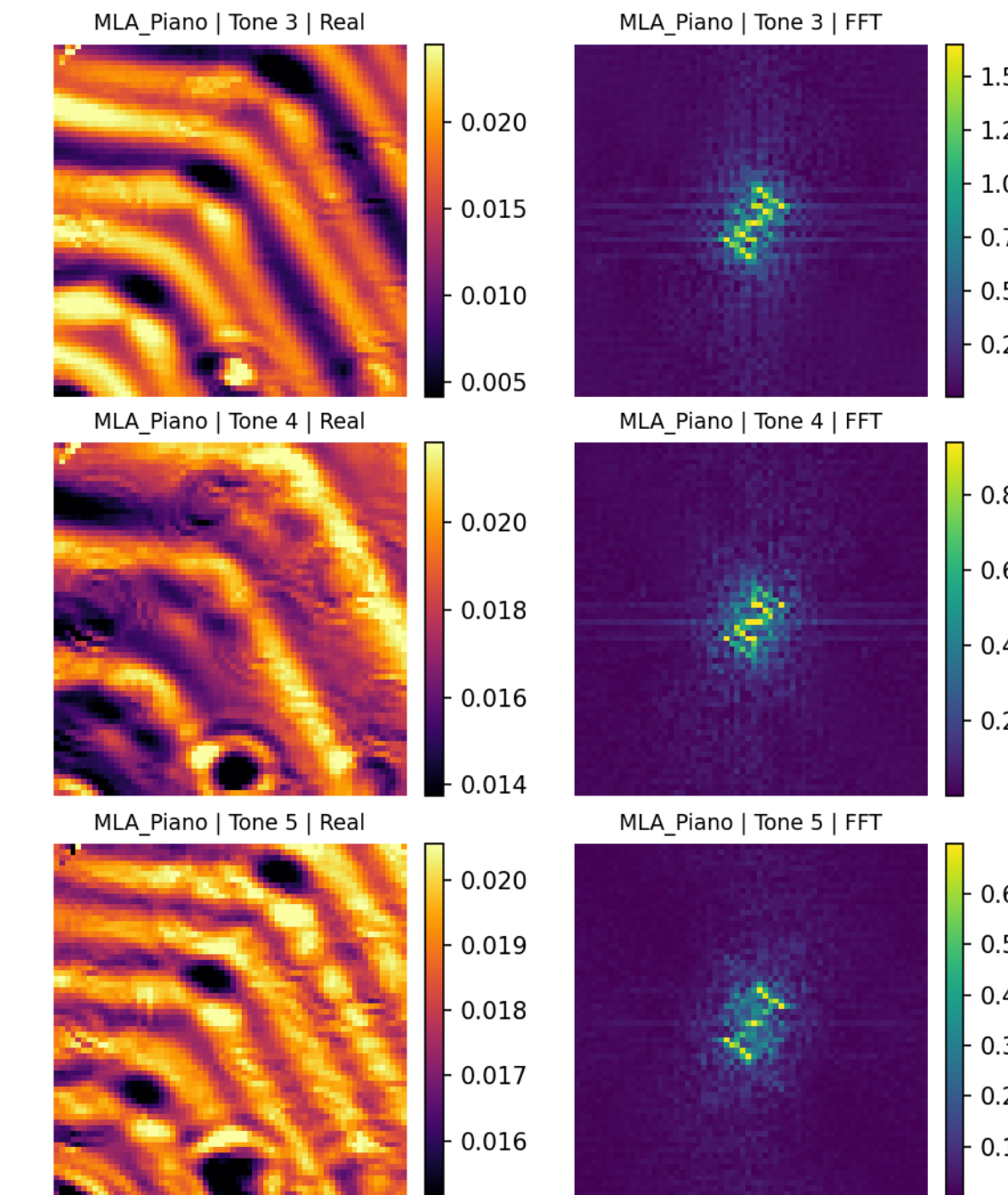


Van der Waals materials: C. A. Marques *et al.* in preparation

The case of the unconventional superconductor 4Hb-TaS₂

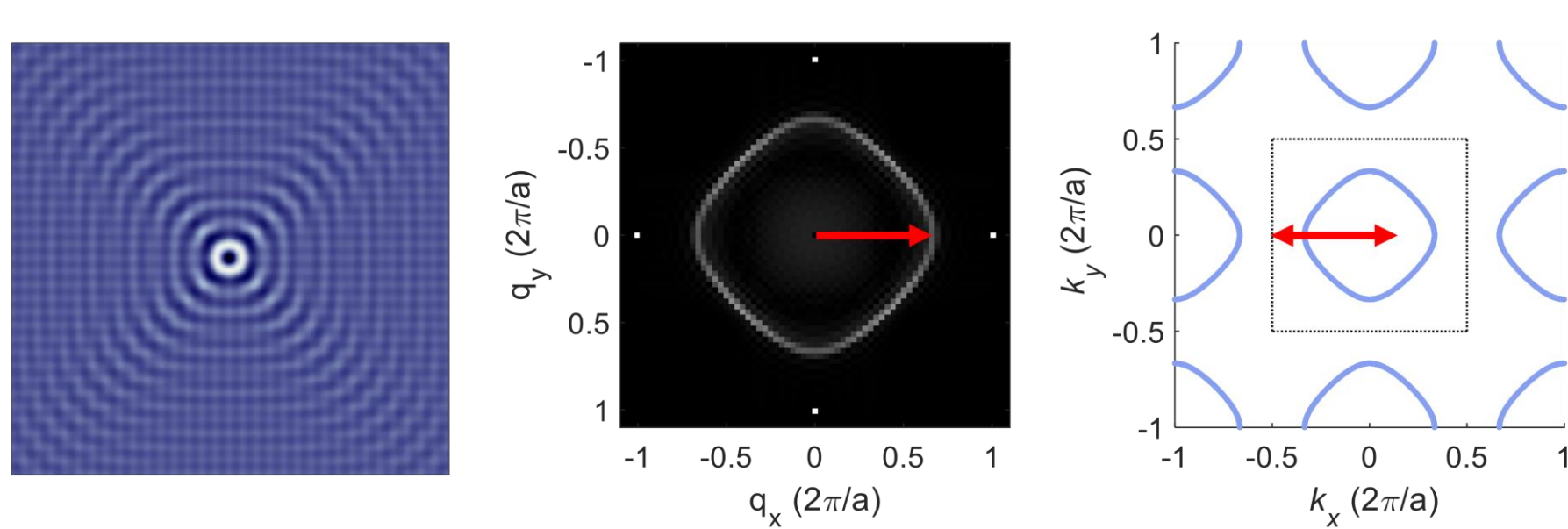


Au (111)

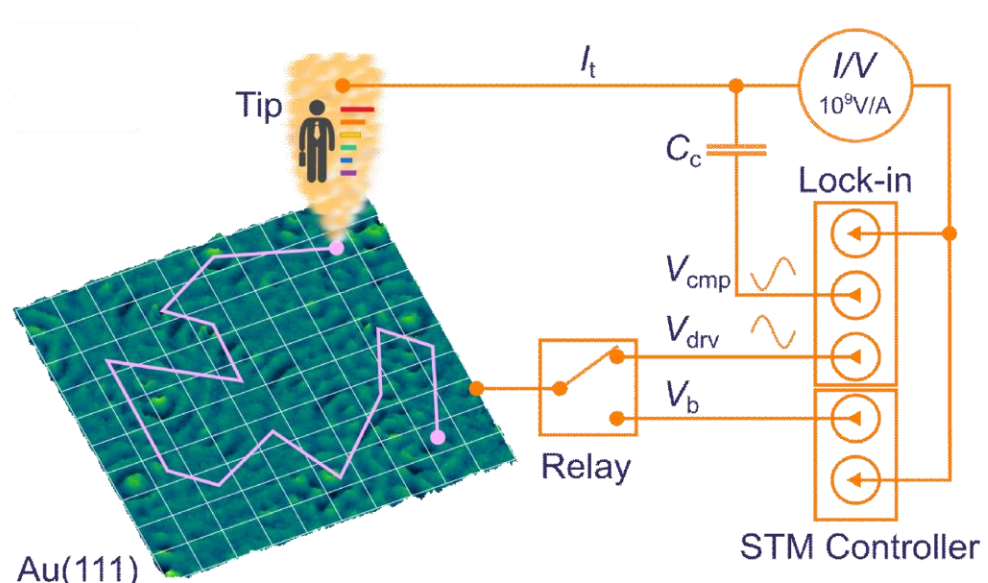


Quasiparticle interference (QPI):

A means to probe the electronic structure



Methodology to speed-up



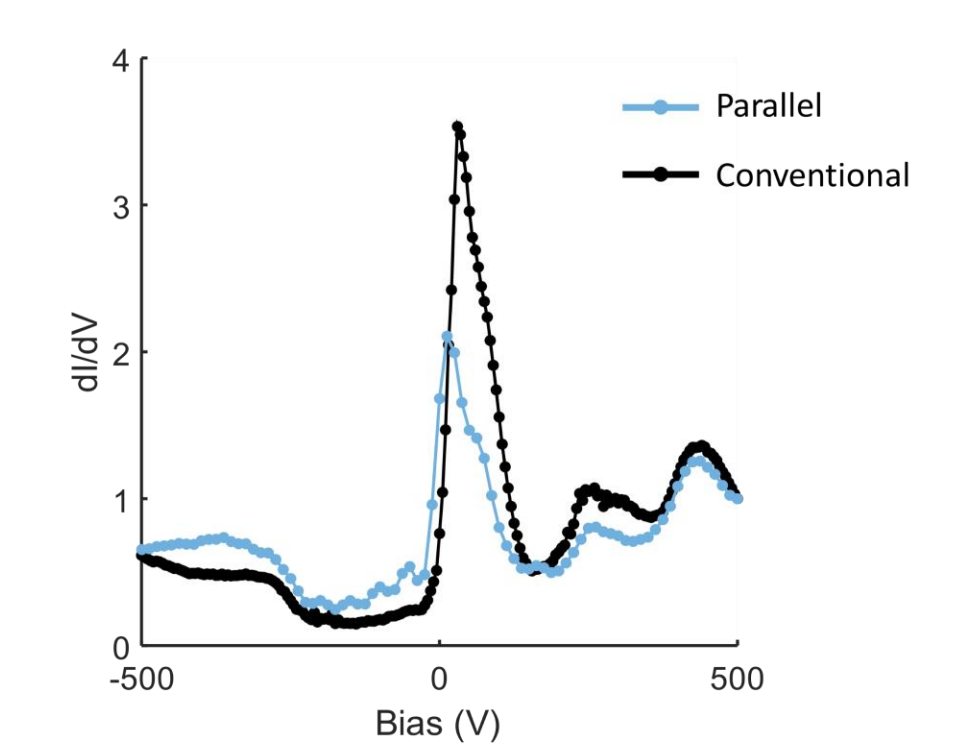
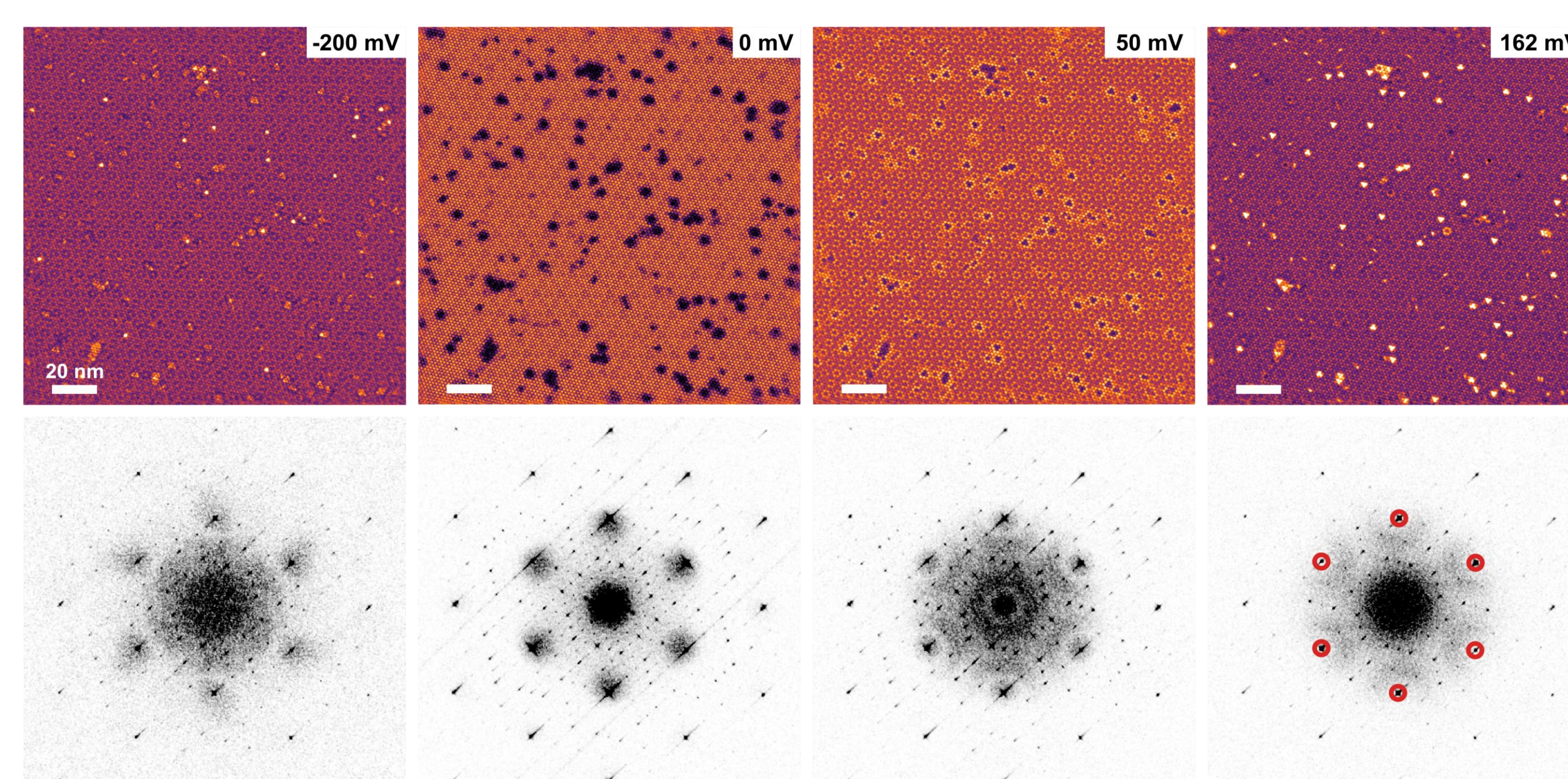
Sparse sampling:

- Measuring less points

Parallel spectroscopy:

- Measuring spectra faster

Fast-QPI on 1T-surface



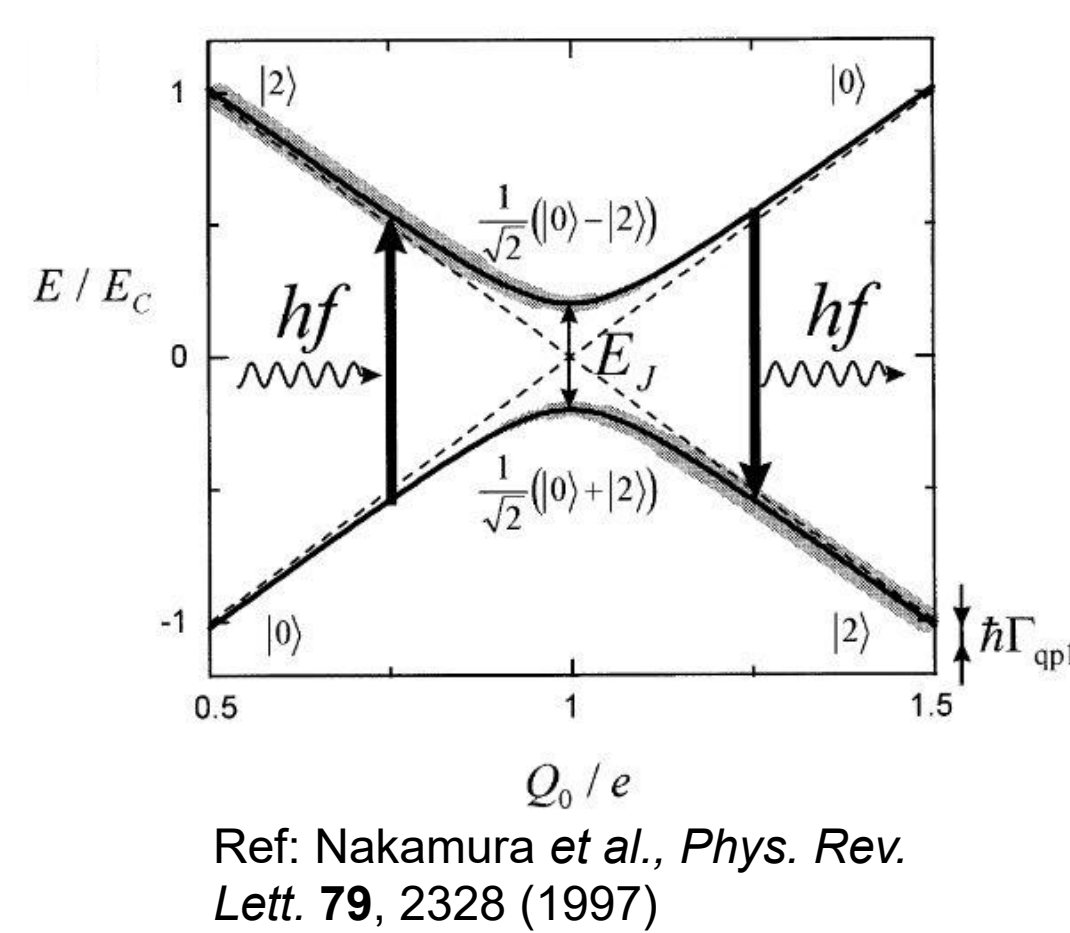
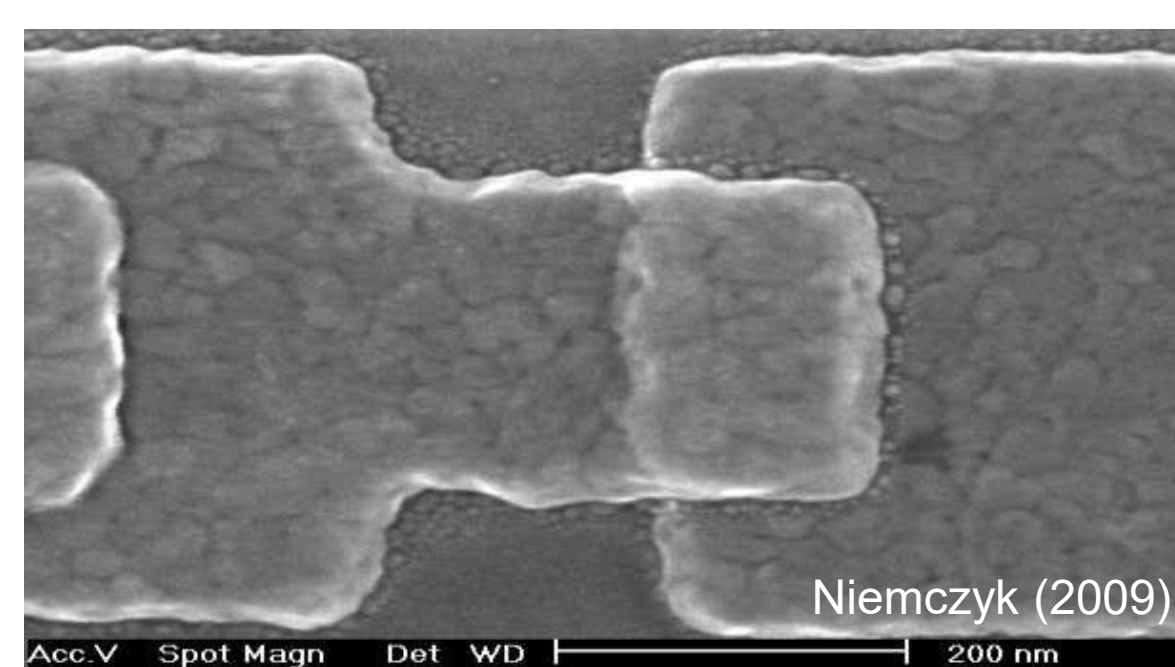
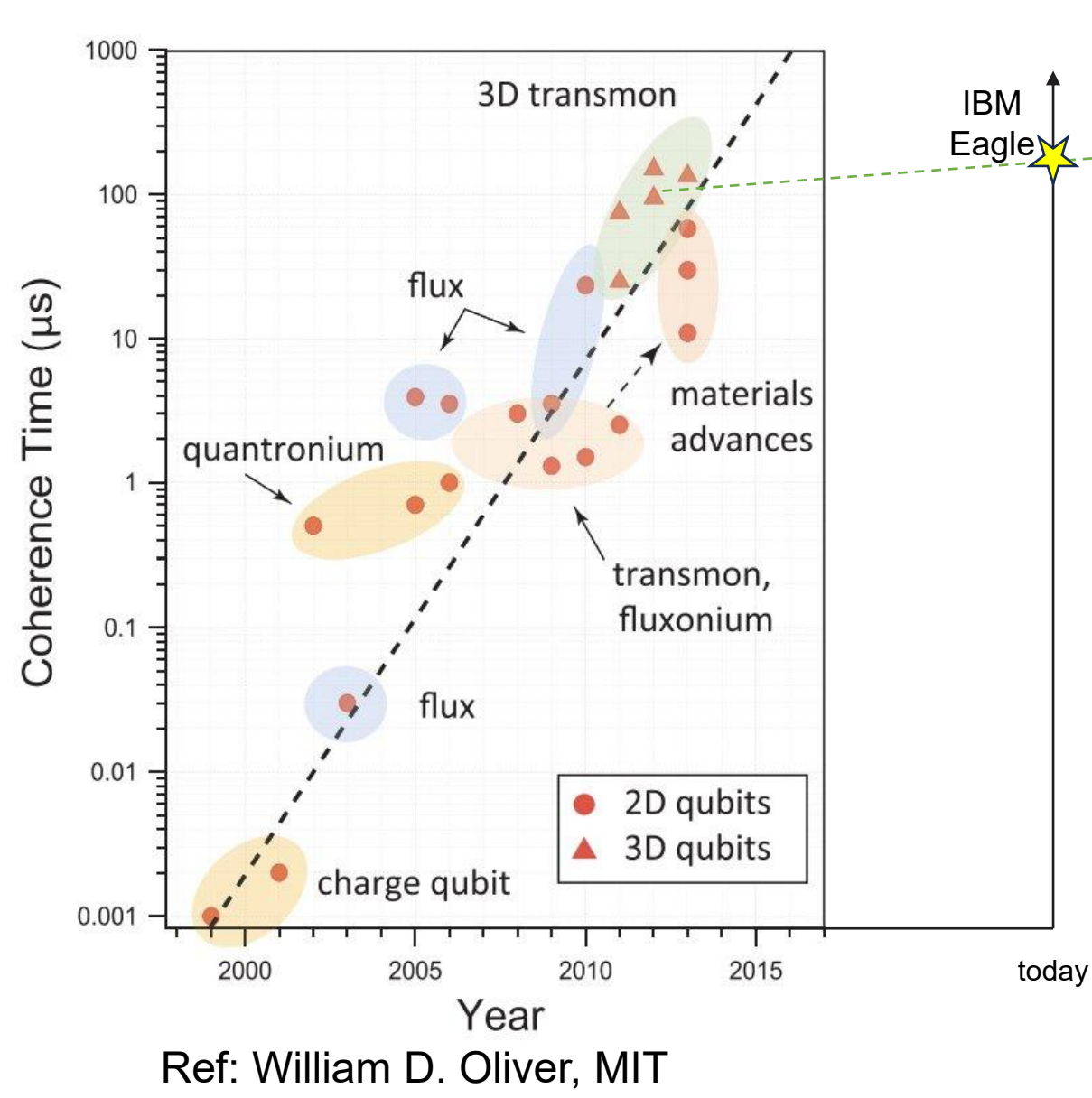
Conventionally:
Total map time 27 days

Fast-approach:
Total map time 2 days

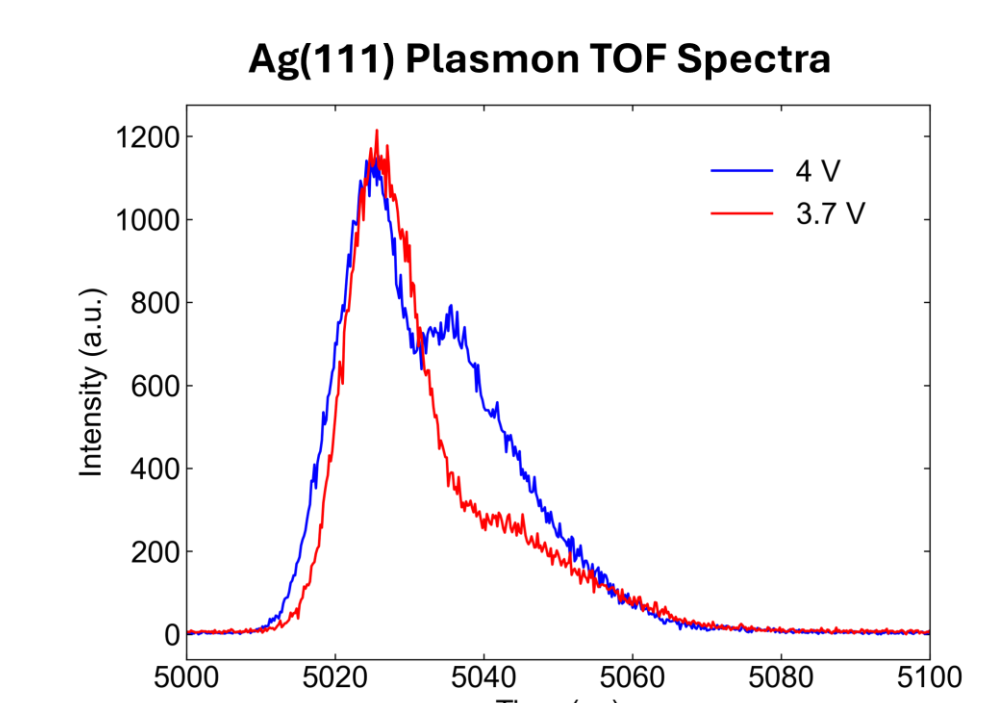
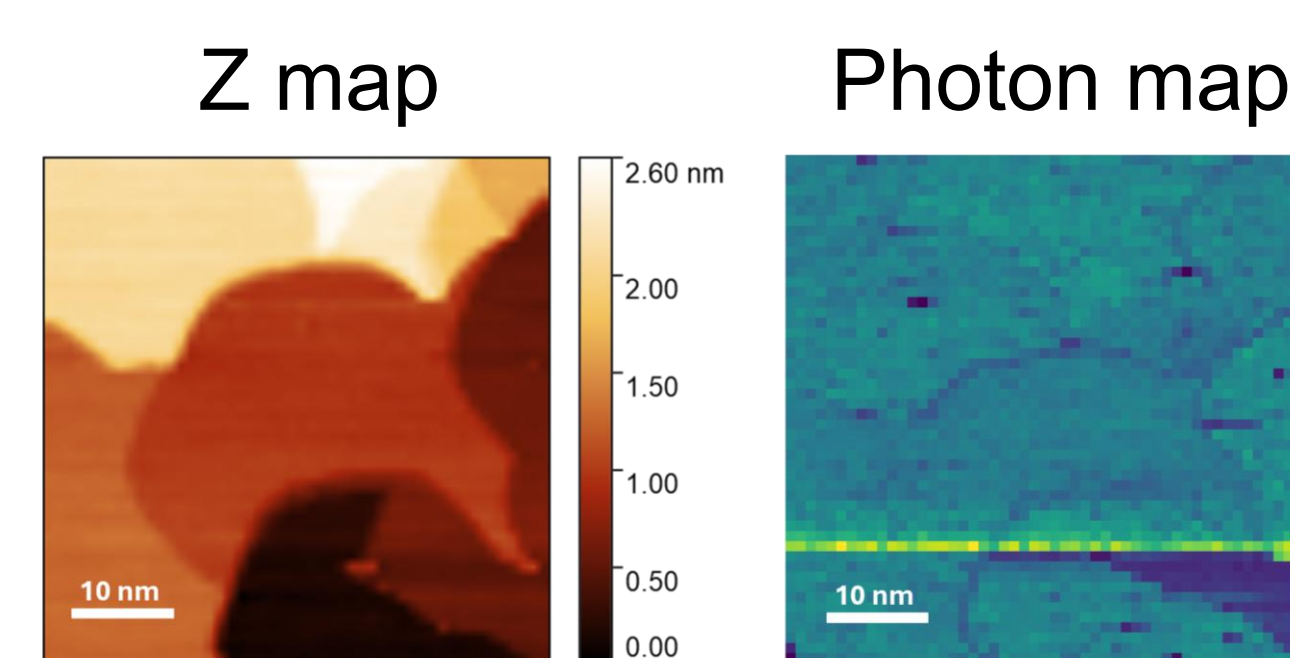
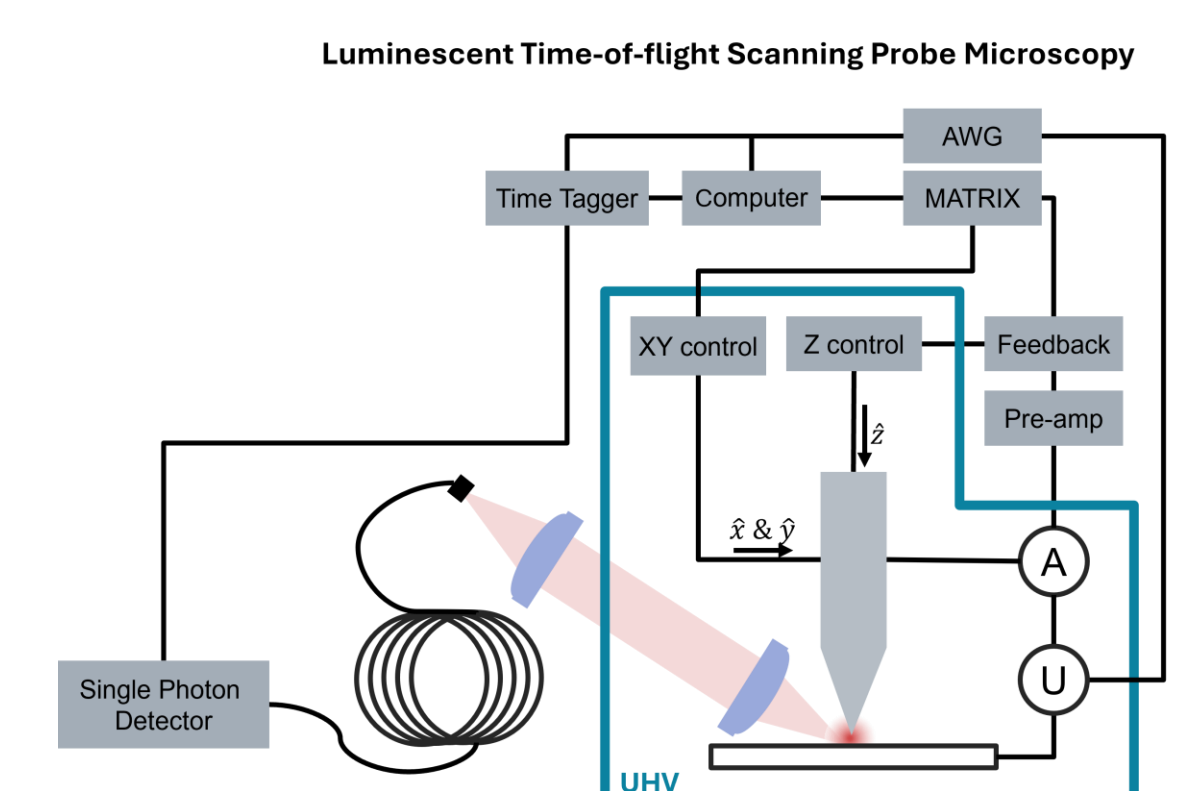
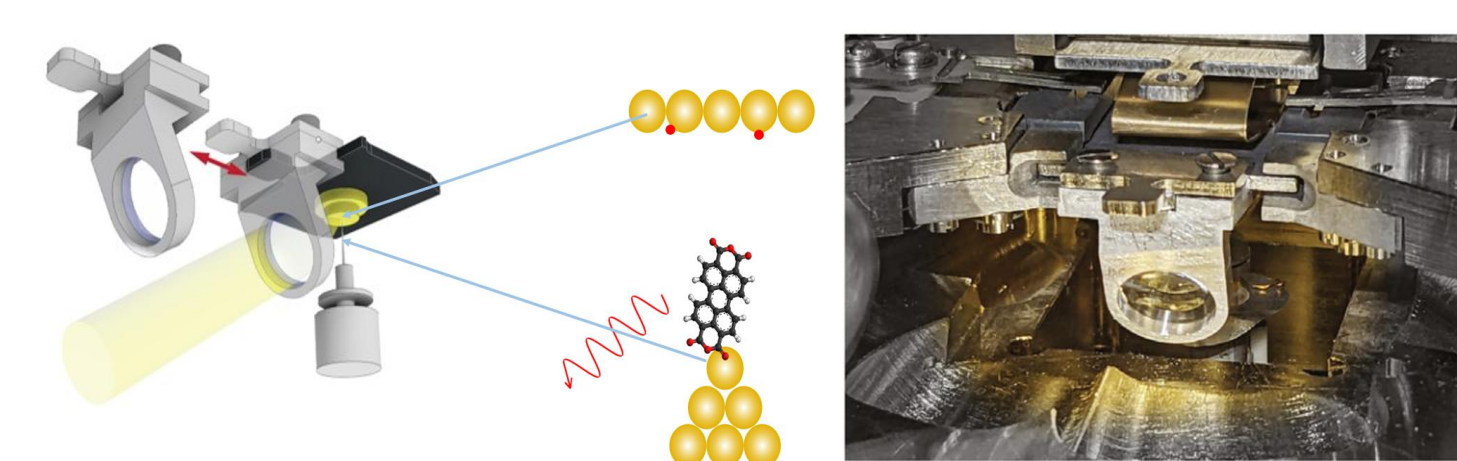
* Fast spectroscopic mapping of two-dimensional quantum materials (2021), Berk Zengin, Jens Oppliger *et al.*, Physical Review Research, <https://doi.org/10.1103/PhysRevResearch.3.L042025>

Quantum sensing

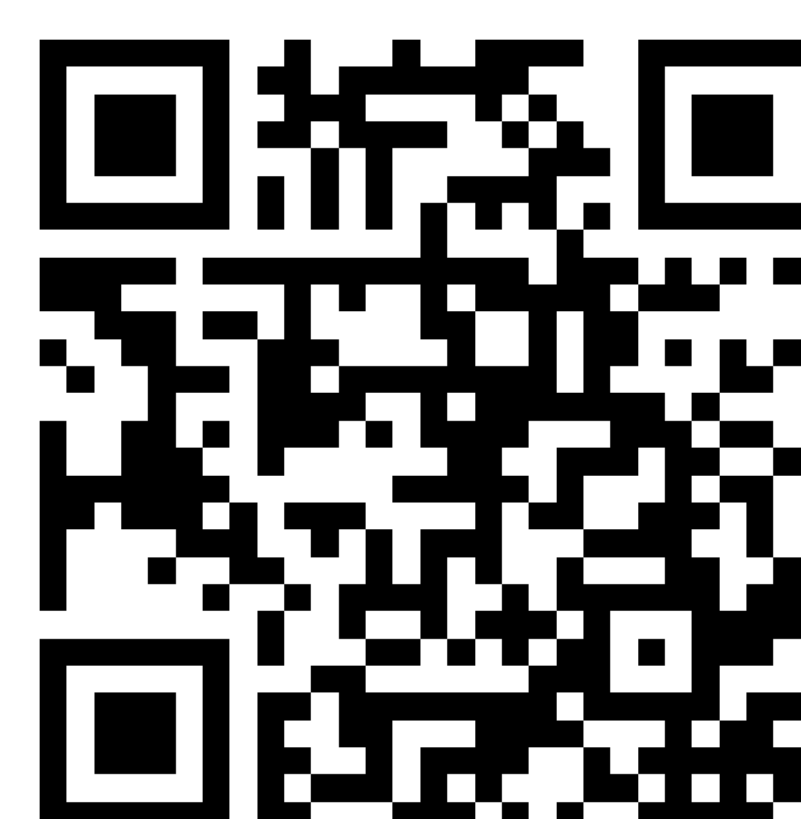
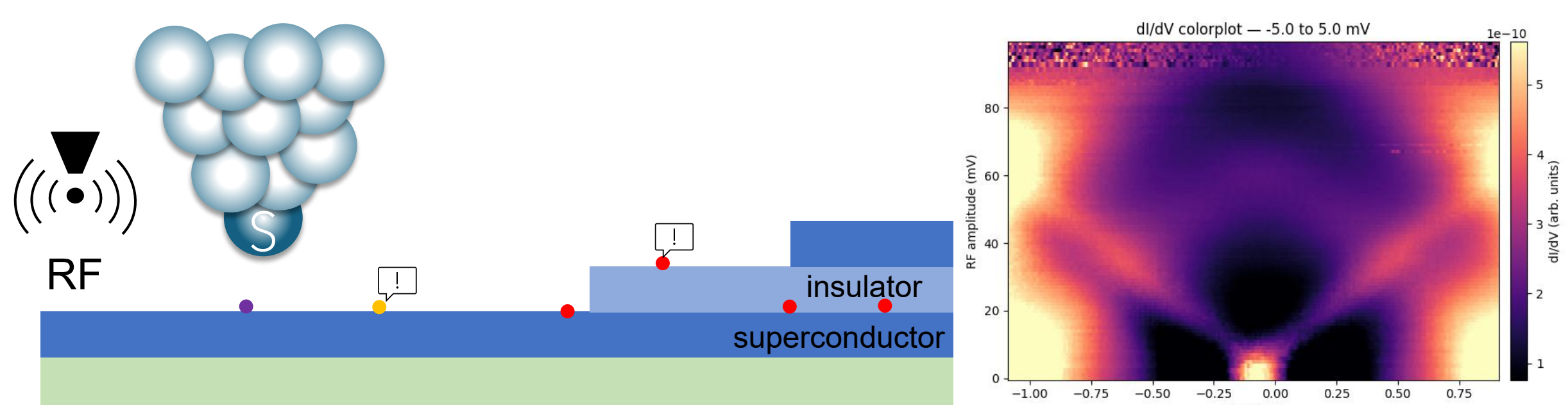
Poor coherence in superconducting qubits



Plasmonic junctions illuminate the atomic world



What's lurking inside a Josephson Junction?



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MSc Projects?
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