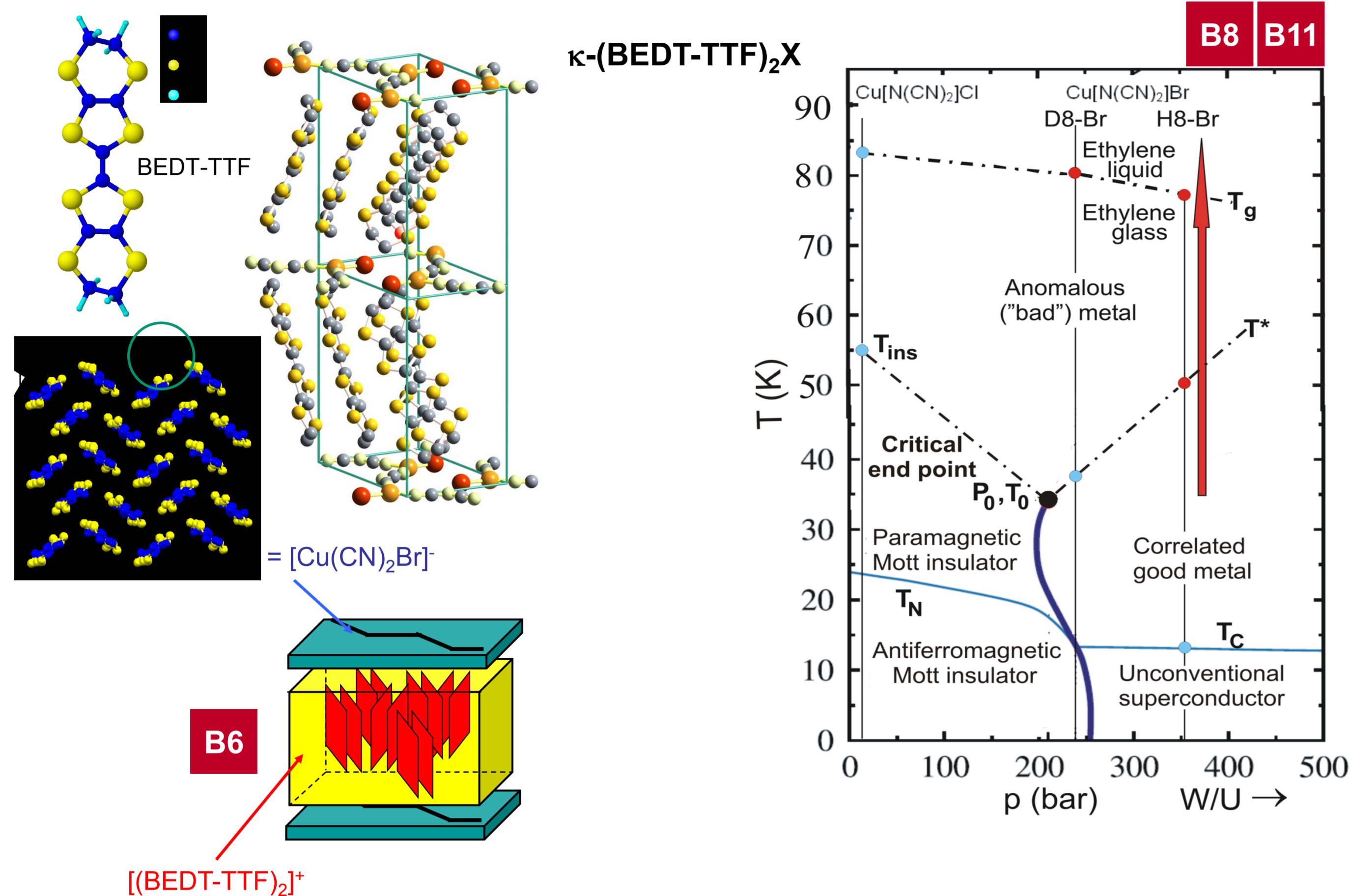


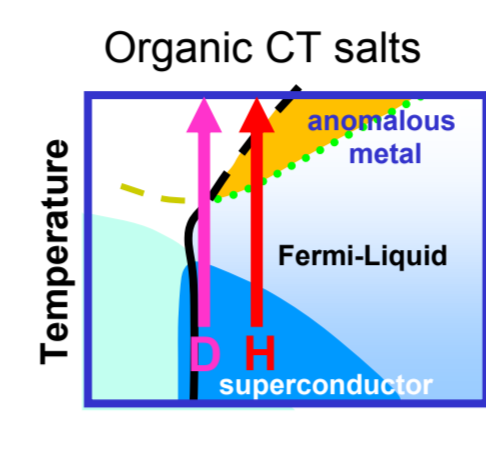
### Introduction

Organic charge transfer (CT) salt: quasi-2D bandstructure, correlated  $\pi$ -electron system,  $T_c = 11$  K, unconventional superconductivity



- [P5] K. Medjanik, M. de Souza, D. Kutnyakhov, A. Gloskovskii, J. Müller, M. Lang, J.-P. Pouget, P. Foury-Leylekan, A. Moradpour, H. J. Elmers, and G. Schönhense, *Eur. Phys. J. B* 87, 256 (2014).
- [P6] S. Diehl, T. Methfessel, J. Müller, M. Lang, M. Huth, M. Jourdan, and H. J. Elmers, arXiv:1410.5245
- [P7] S. Diehl, T. Methfessel, J. Müller, M. Lang, M. Huth, M. Jourdan, and H. J. Elmers, arXiv:1411.2813
- [P8] A. Chernenkaya, A. Kotov, K. Medjanik, R. Morgunov, E. Yagubskii, H. J. Elmers, and G. Schönhense, arXiv:1411.2813

### Project goals and work program



Measure temperature-dependent spectra from well defined in-situ prepared surfaces of two-dimensional strongly correlated many-body systems occurring in real material environment.

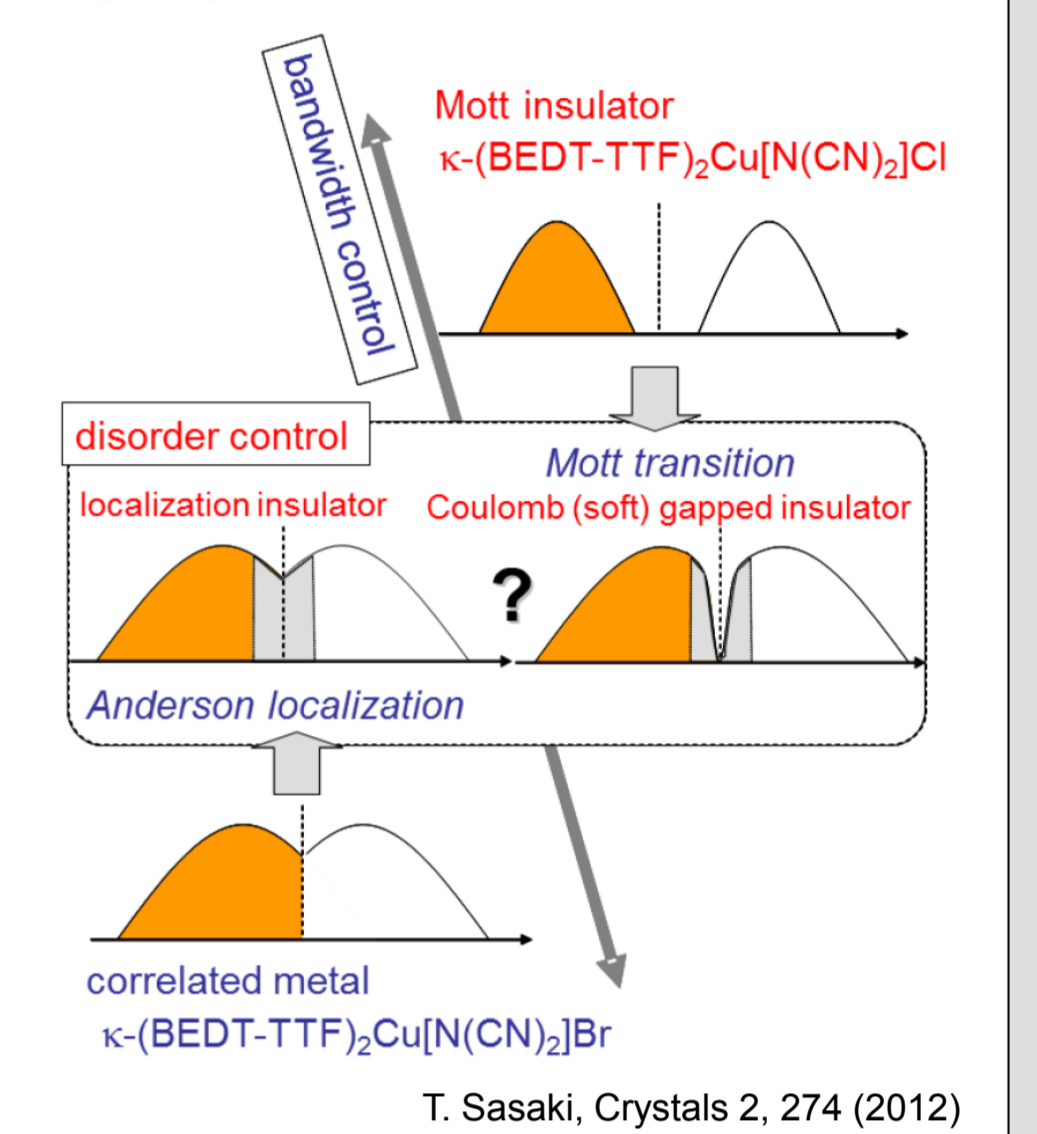
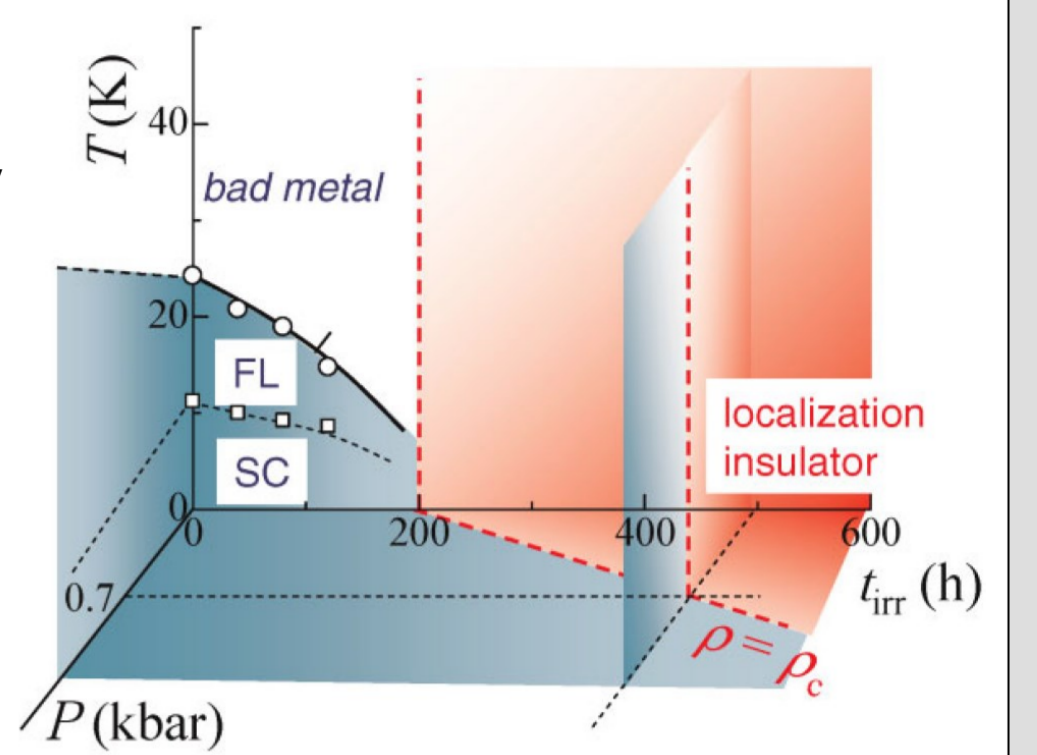
Focus on metal-superconductor transition in the organic charge transfer salts  $\kappa$ -(BEDT-TTF) $_2$ X (X=Cu(NCS) $_2$ , Cu[N(CN) $_2$ ]Br, Hg(SCN) $_2$ Cl) close to the metal-insulator transition

Investigation of the relation between disorder and superconductivity by variation of intrinsic disorder (deuteration, cooling rate, irradiation)

Study of the action of uniaxial pressure on electron correlation effects following hints from transport measurements

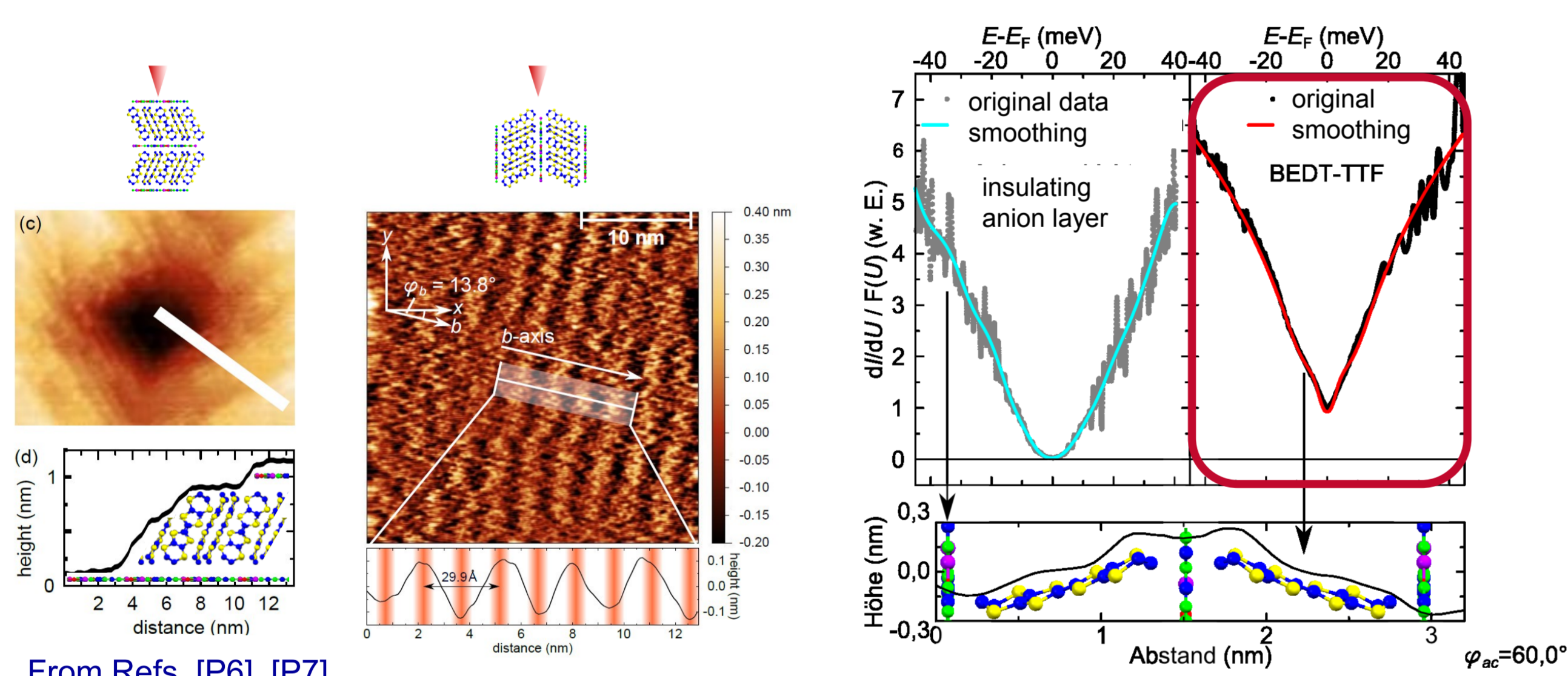
Temperature dependent measurements of differential conductivity of (DOEO) $_4$ HgBr $_4$

B2 B6 B8 B9 B11



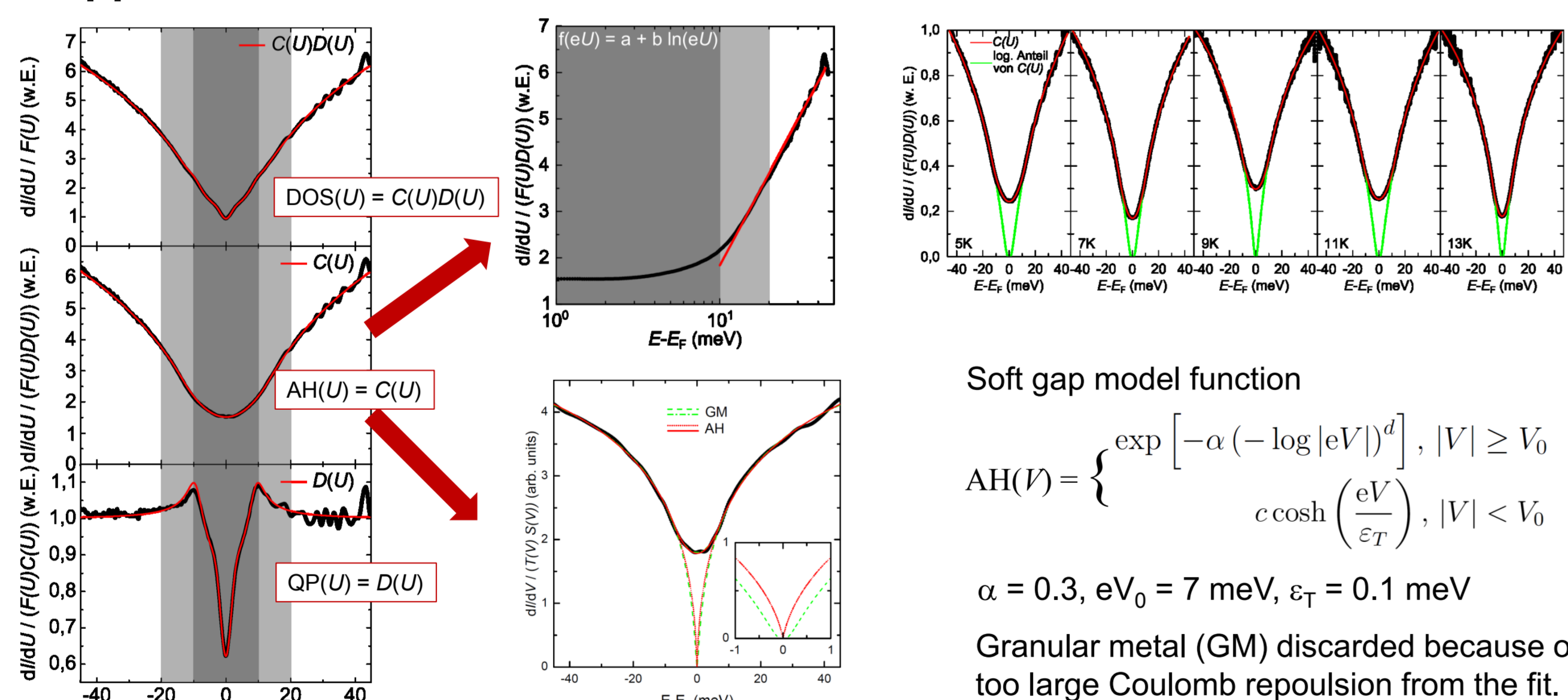
### Experimental Results

#### Tunneling parallel and perpendicular to the conducting layers



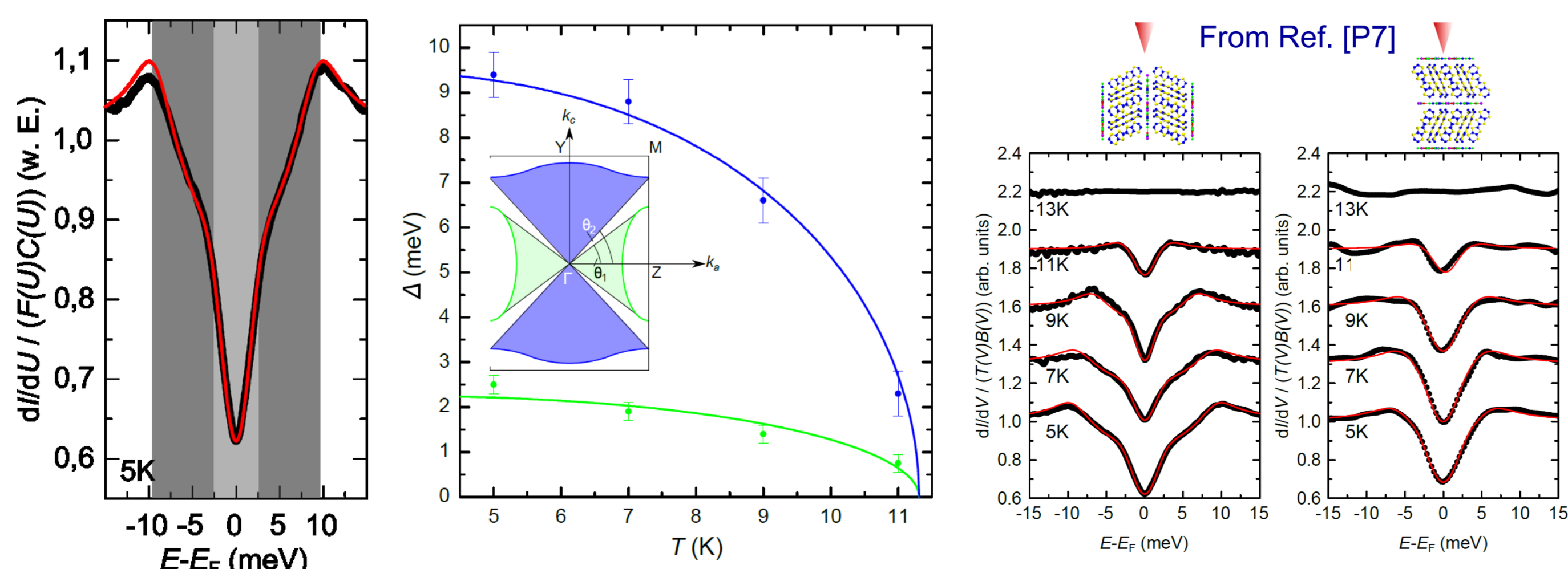
From Refs. [P6], [P7]

#### Suppression of the DOS near Fermi level - Anderson-Hubbard model



From Ref. [P6]

#### Quasiparticle DOS in the superconducting state - two gaps

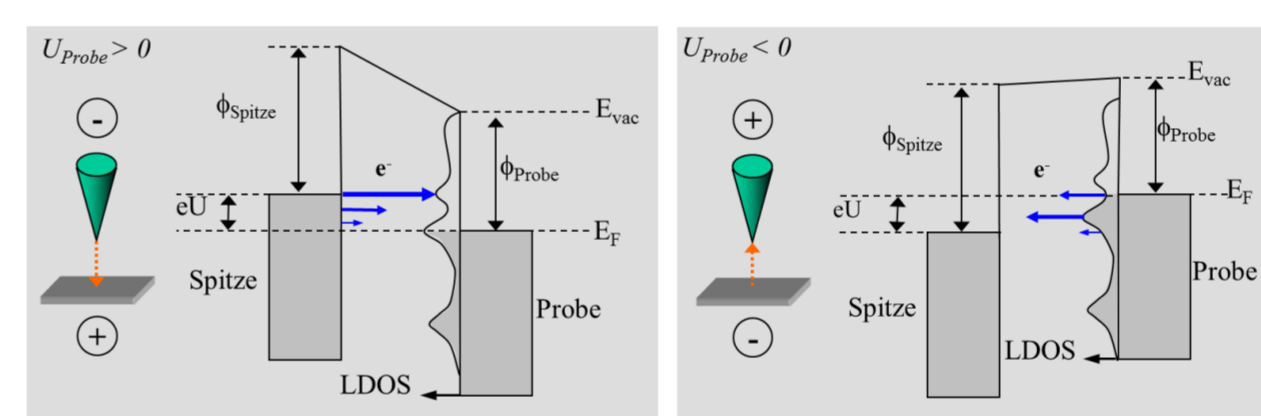


From Ref. [P7]

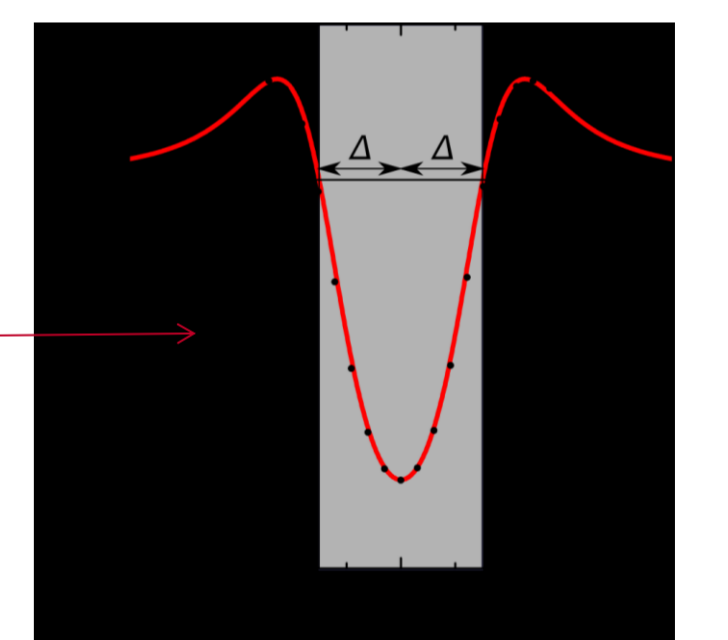
### Techniques

#### Low-temperature STM (Omicron LT-STM)

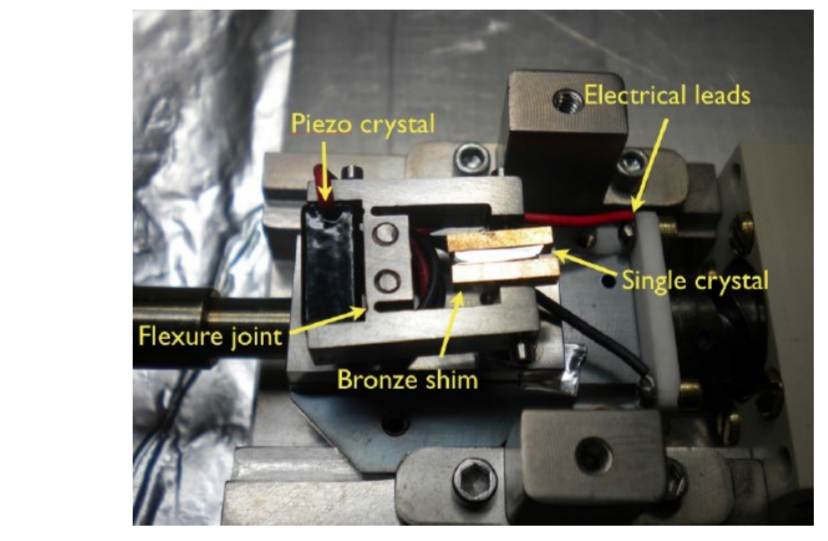
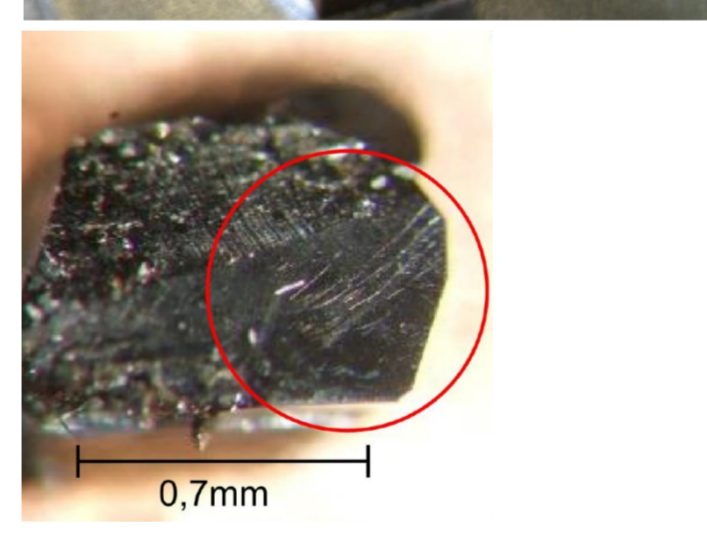
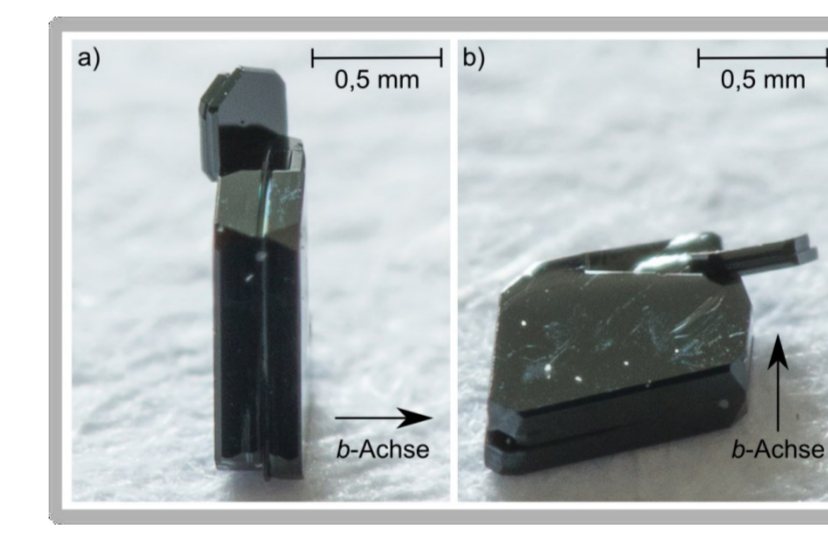
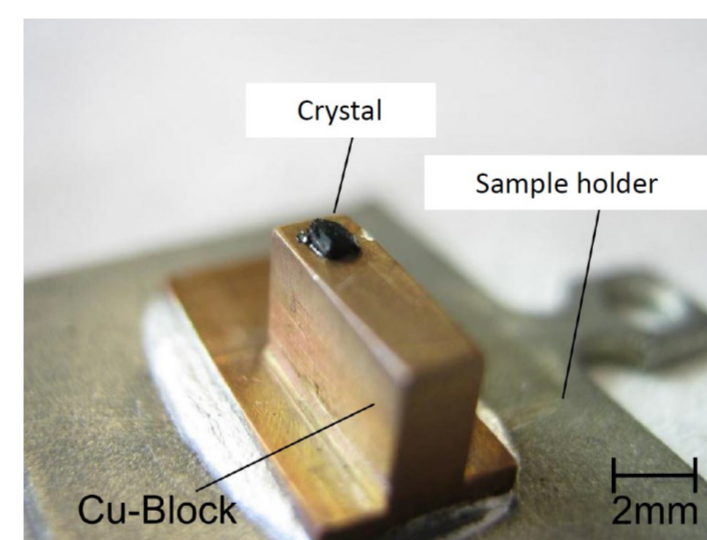
Obtaining spectral information



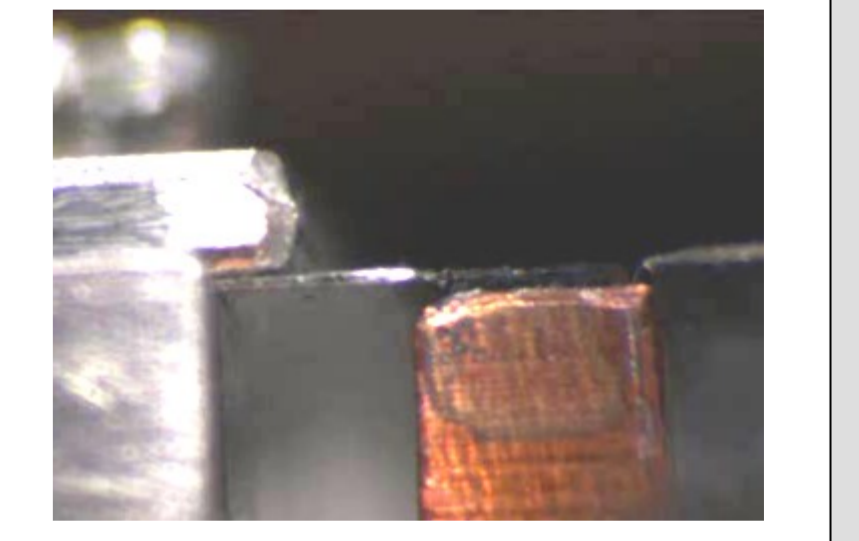
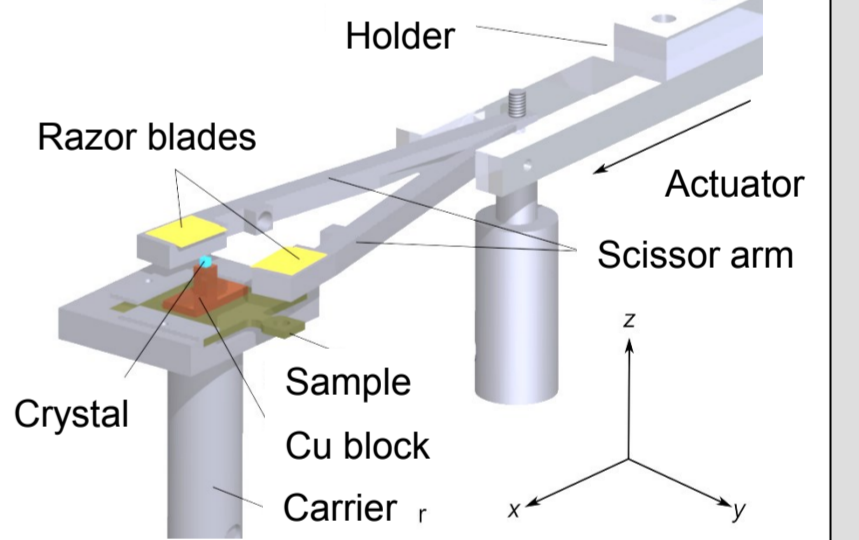
Test measurement with BCS-SCC Nb



Crystal mounting



Crystal cleavage



### Role within the SFB/TR 49

Thermodynamic and transport properties of  $\kappa$ -(BEDT-TTF) $_2$ X (X=Cu[N(CN) $_2$ ]Br) are investigated in projects B6 (Lang) and B11 (Müller) on single crystals.

B6 B11

Samples are provided from projects B6 (Lang) and B11 (Müller).

B6 B11

Definition of cooling rate induced disorder Deduced from noise spectroscopy Performed in project B11 (Müller).

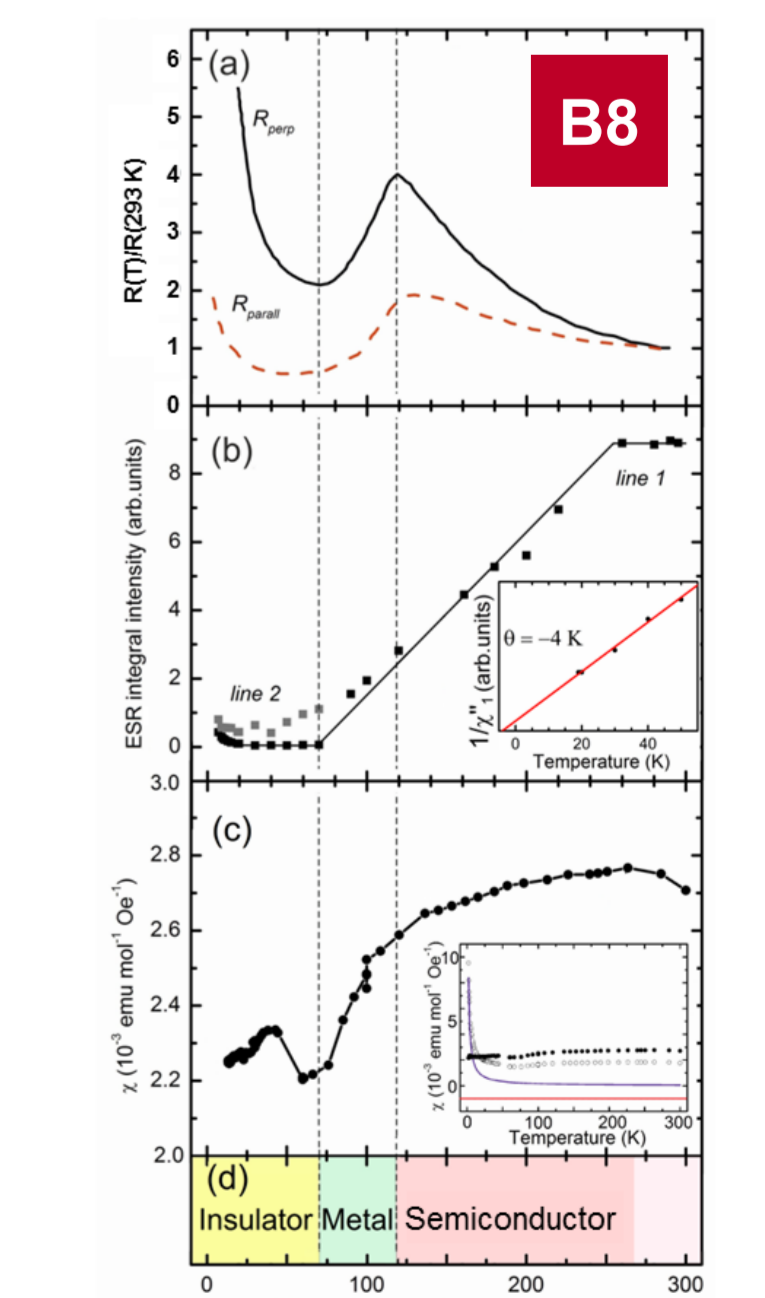
B11

Continuation of intense cooperation with project B2 (Valenti) for microscopic understanding of superconducting order parameter and B9 (Huth) for analysis of results.

B2 B9

Photoemission spectroscopy performed in project B8 (Schönhense) supplies complementary information.

B8



Cooperation on DOEO with project B8 (Schönhense) From Ref. [P8]