

Nb-Based Nanoscale Superconducting Quantum Interference Devices Tuned by Electroannealing

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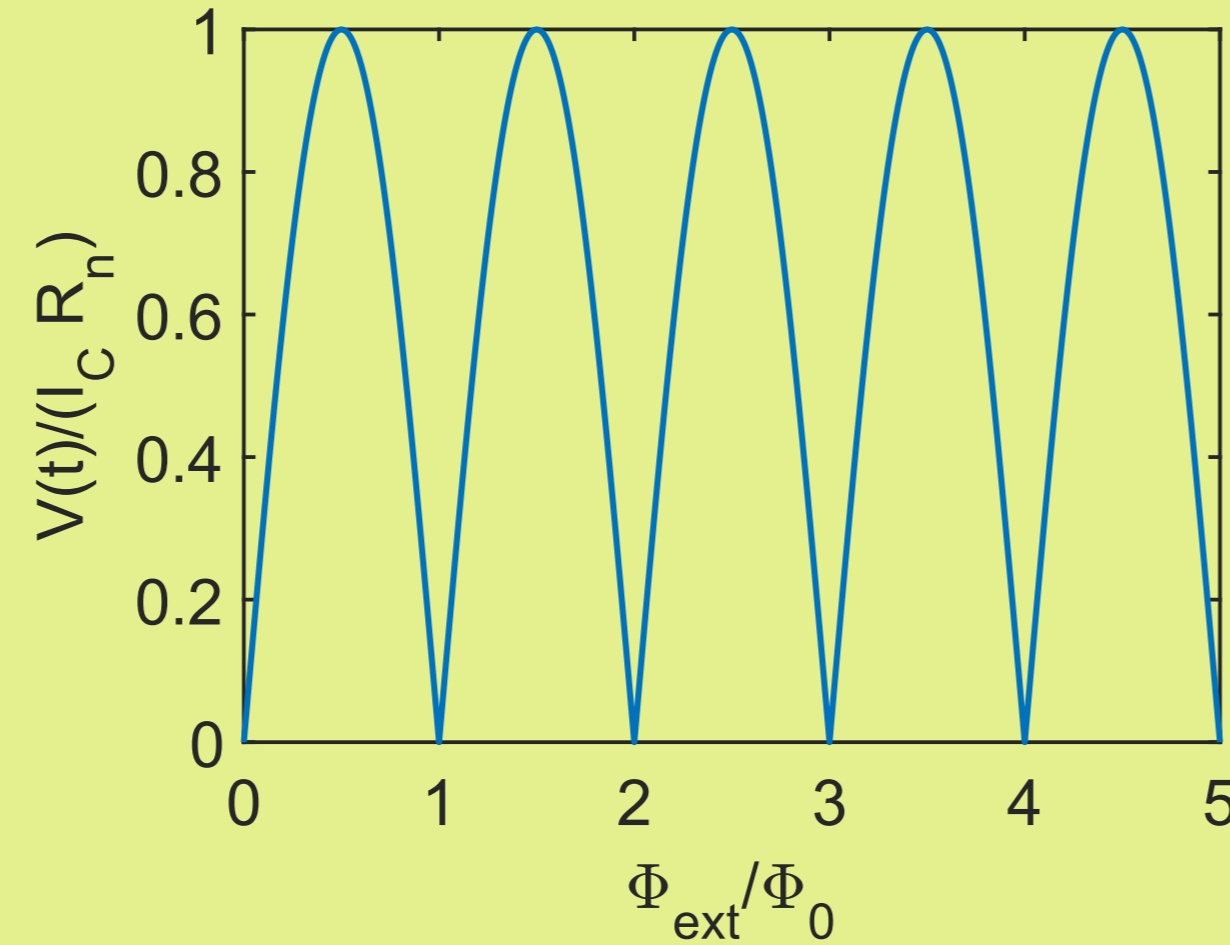
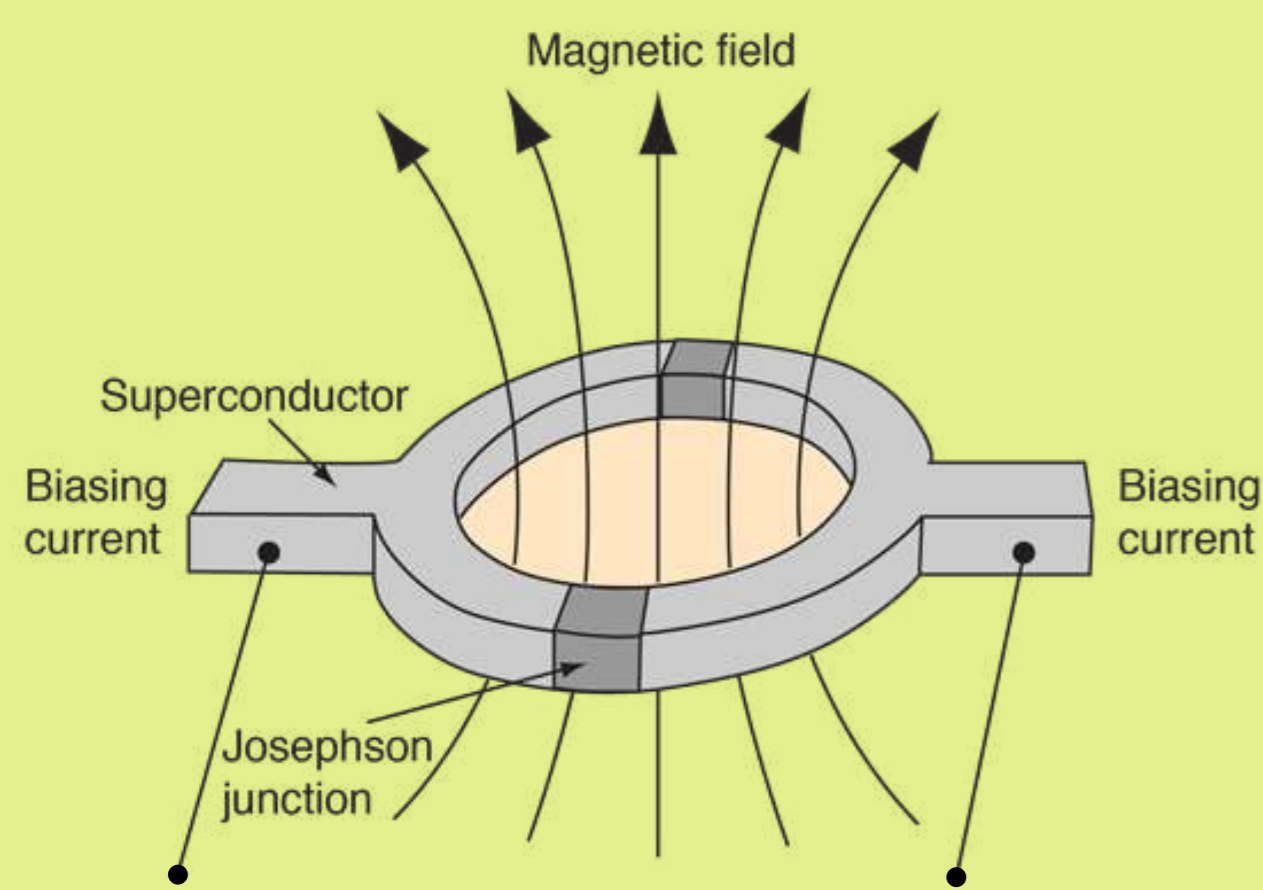
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SQUID : Superconducting QUantum Interference Device

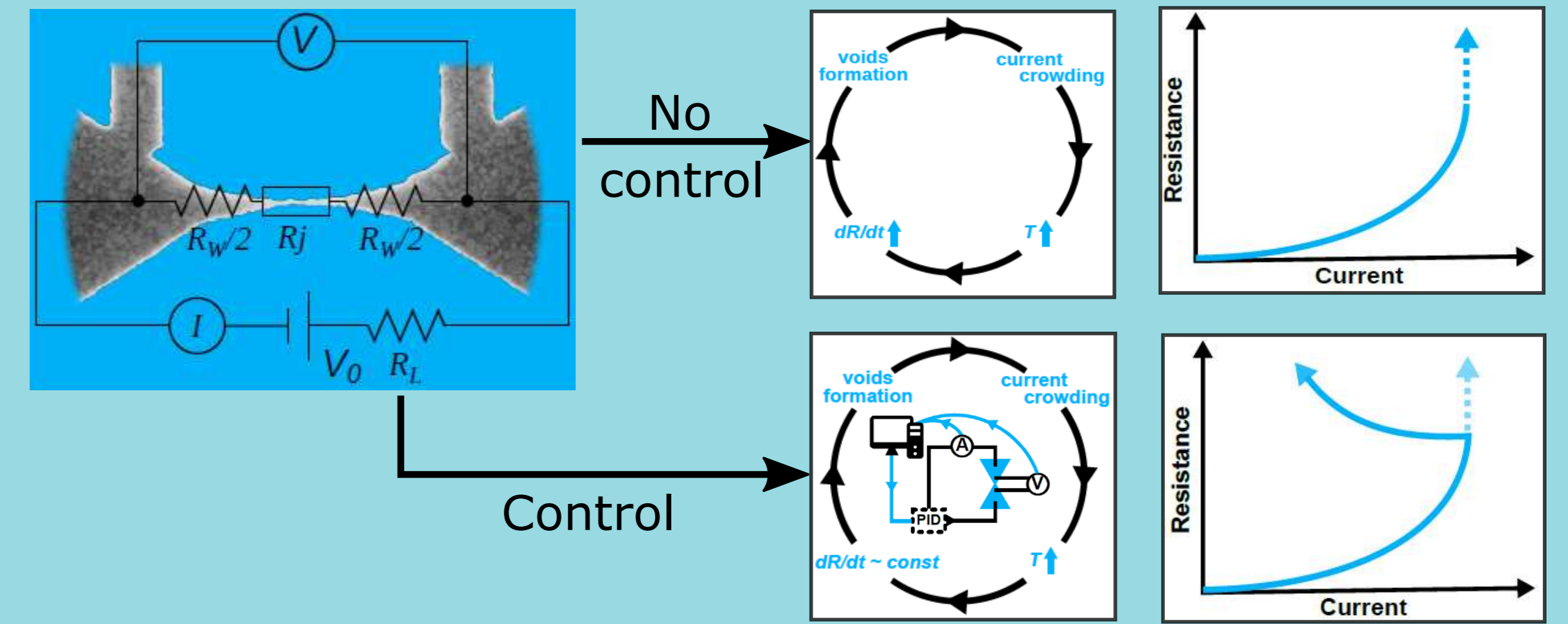


- DC SQUIDS are composed of two Josephson junctions in parallel forming a loop.
- Josephson junction (JJ) is formed by a weak link between two superconducting materials.
- Examples of weak link: an insulator, a metal, a superconductor of smaller T_C , a **Dayem bridge**.
- The weak link determines the properties of the JJ, and consequently, of the SQUID.

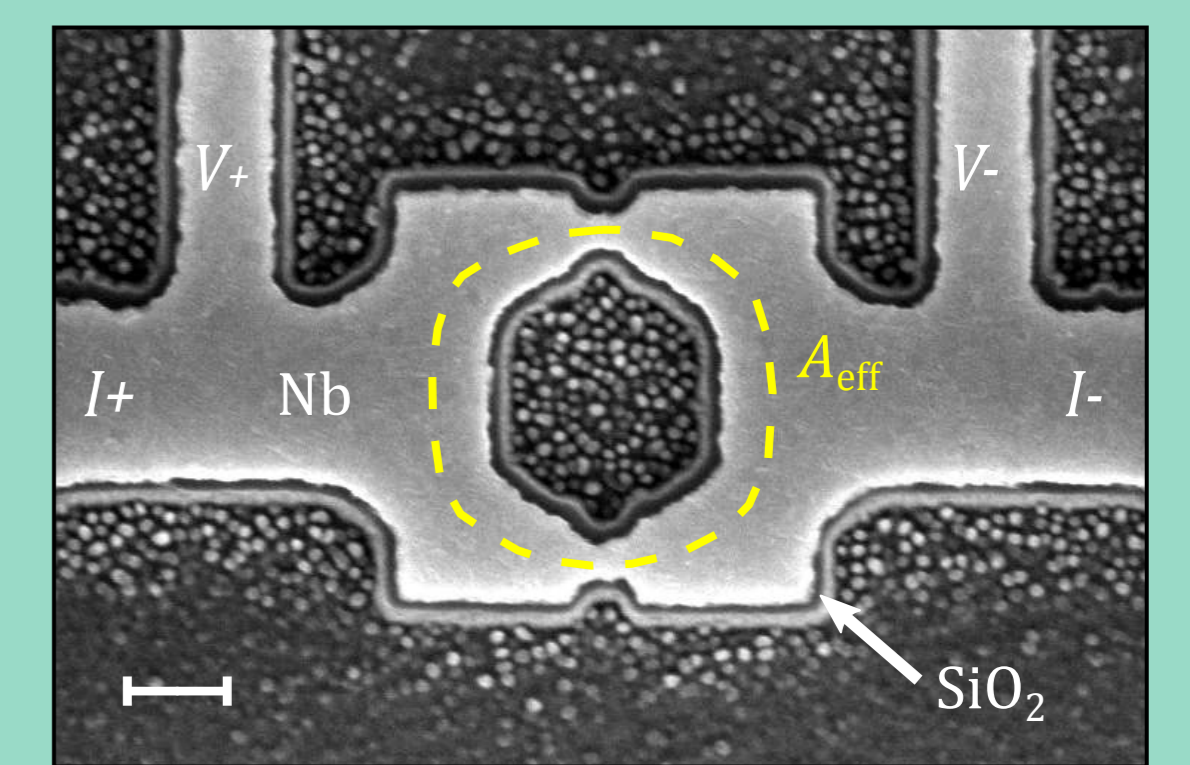
$$\Phi_0 = \text{flux quantum} = h/2e = 2.068 \cdot 10^{-15} \text{ Tm}^2$$

- Investigate the possibilities of EM/EA as
- Determine how EM/EA is able to tune the characteristics of a SQUIDS (oscillations, critical current, etc).

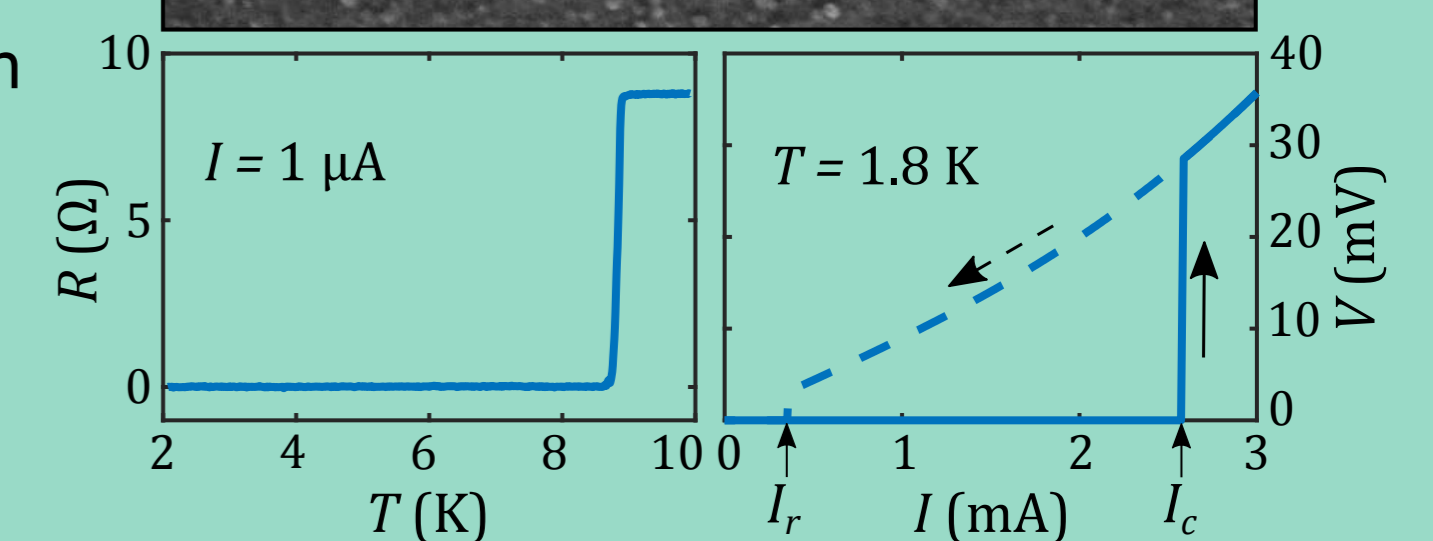
What is electromigration/electro-annealing?



Virgin state : layout and V(I)

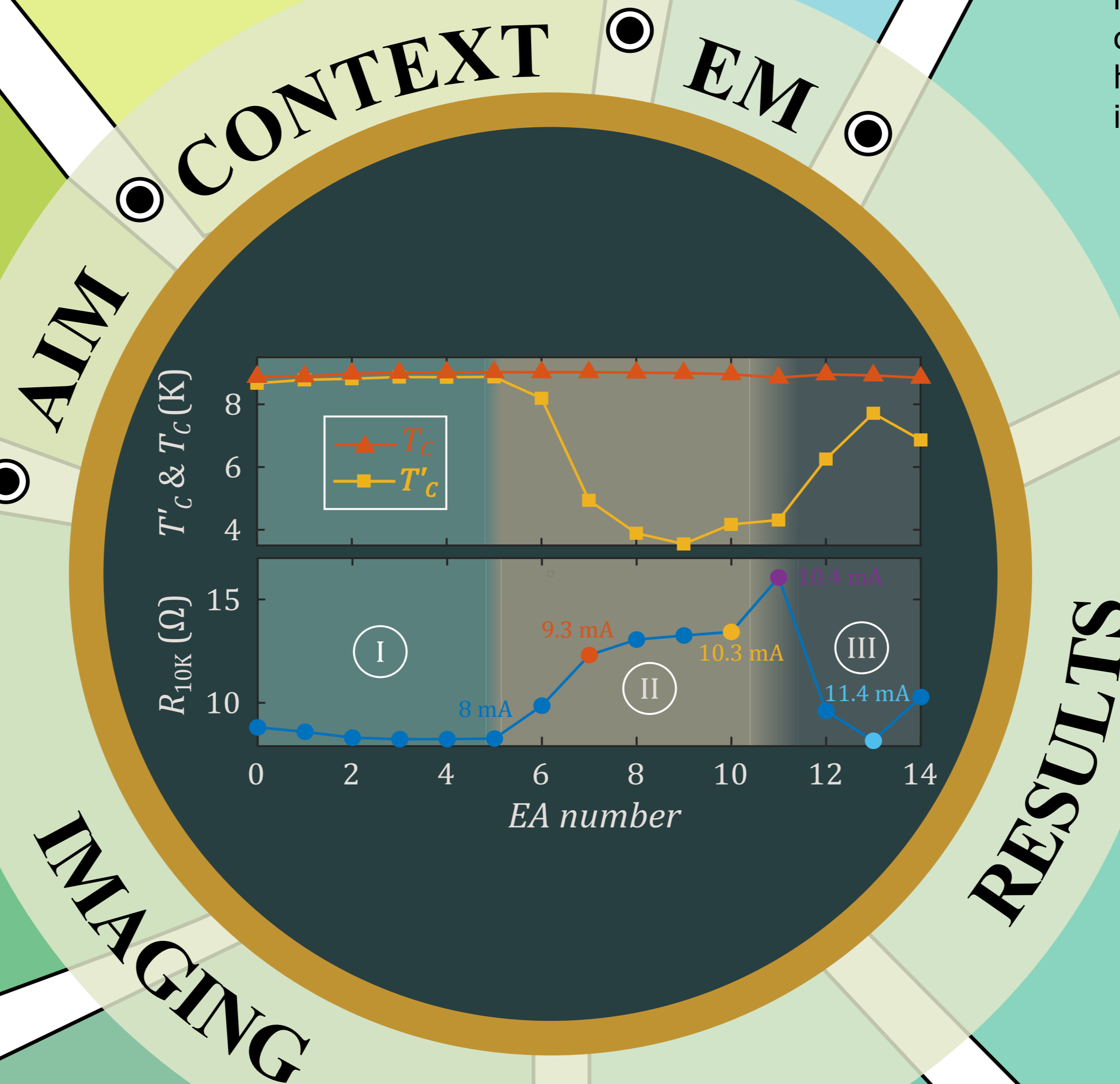
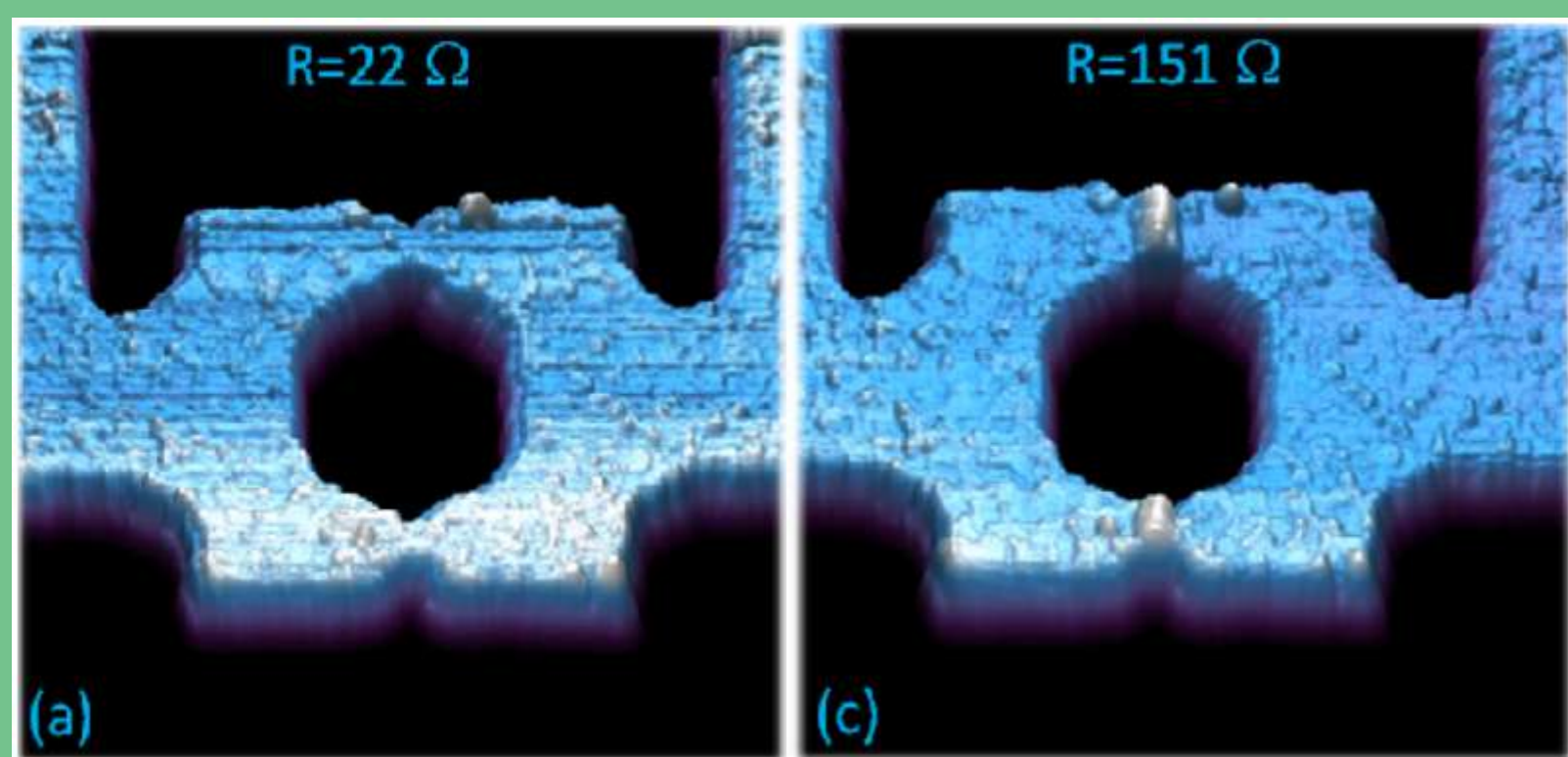


- The junction's size allows large critical current, however with irreversible

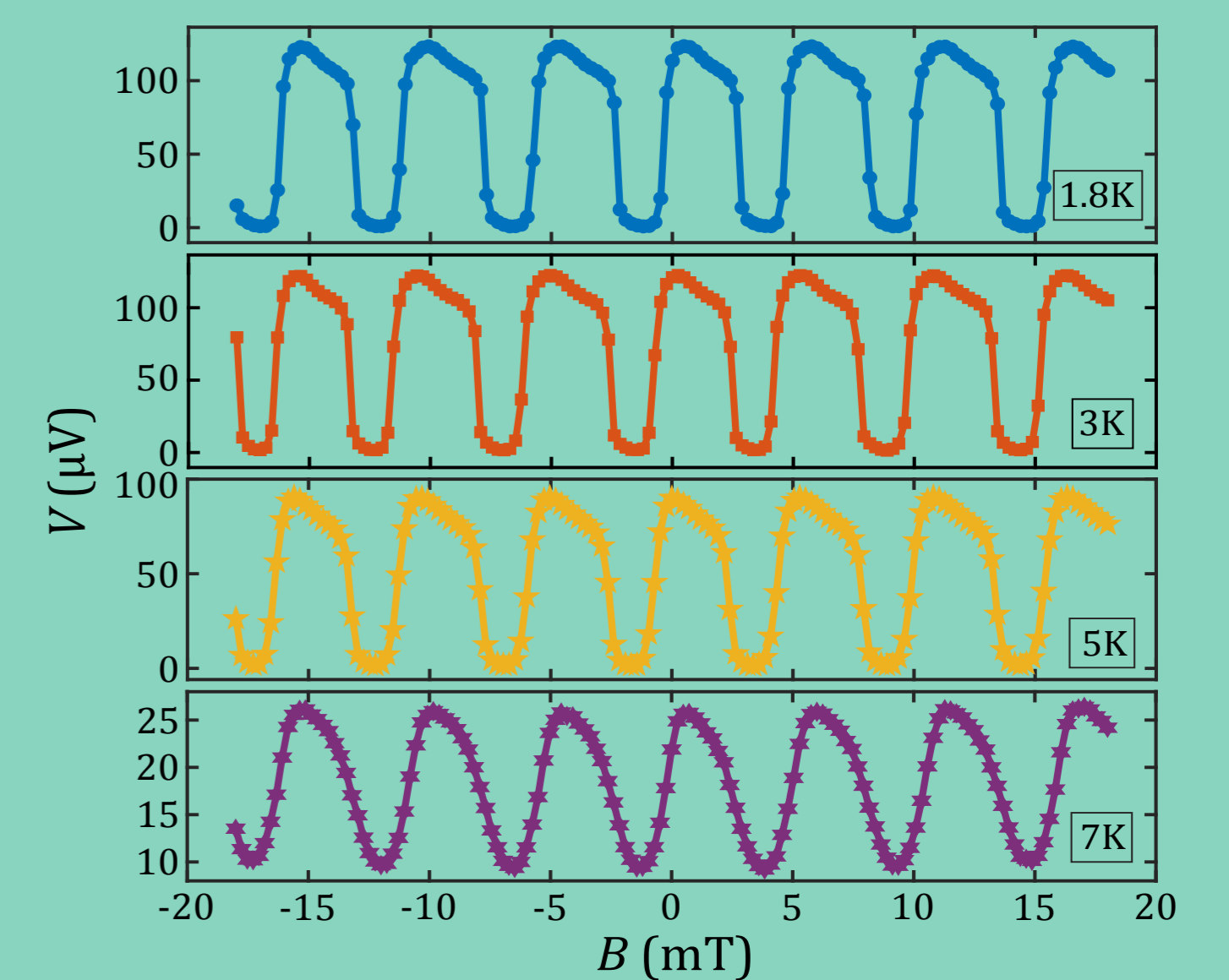


AFM imaging

- Ambient temperature and pressure.
- EM create important atomic movements, creating

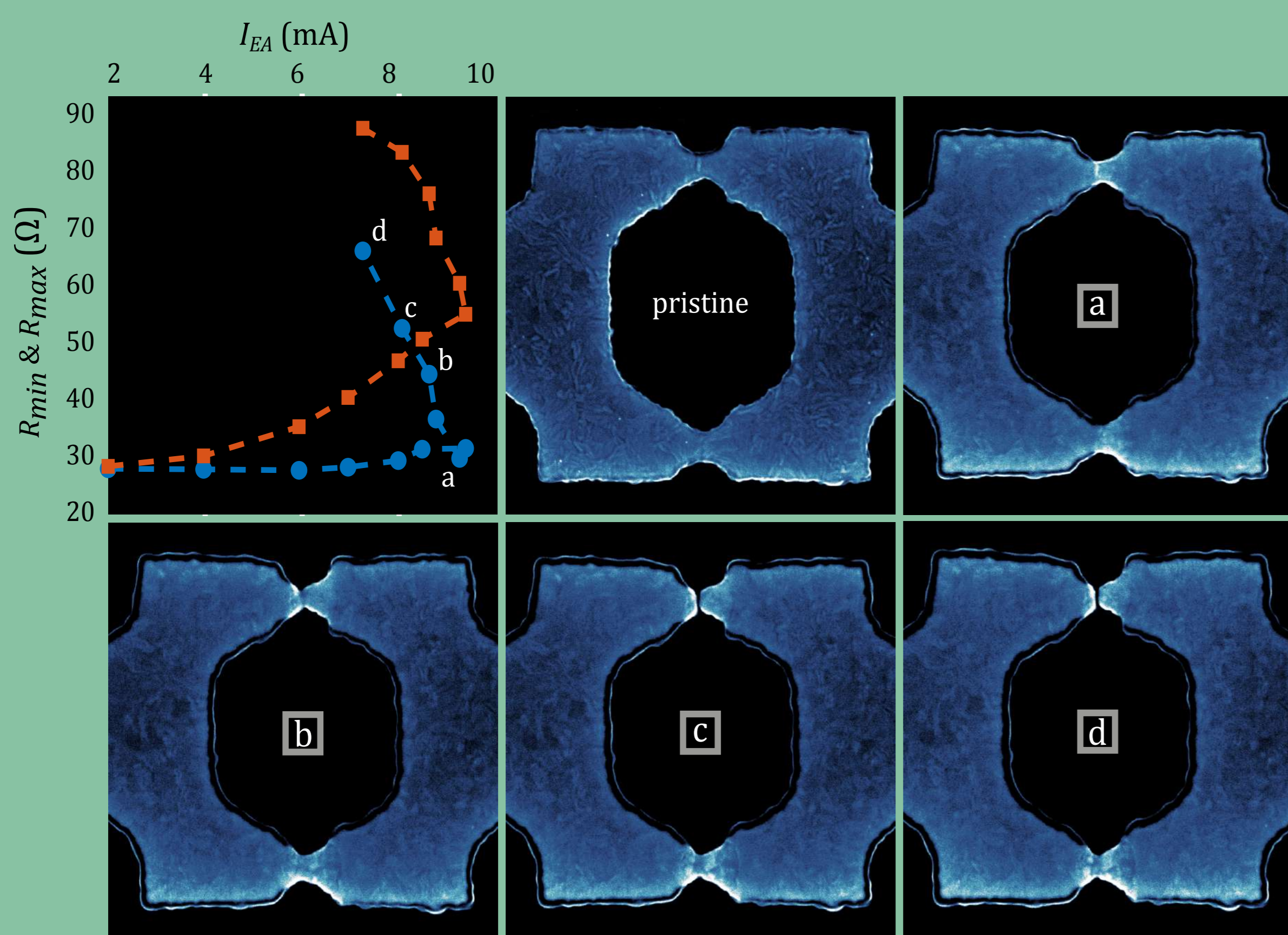


Voltage oscillations

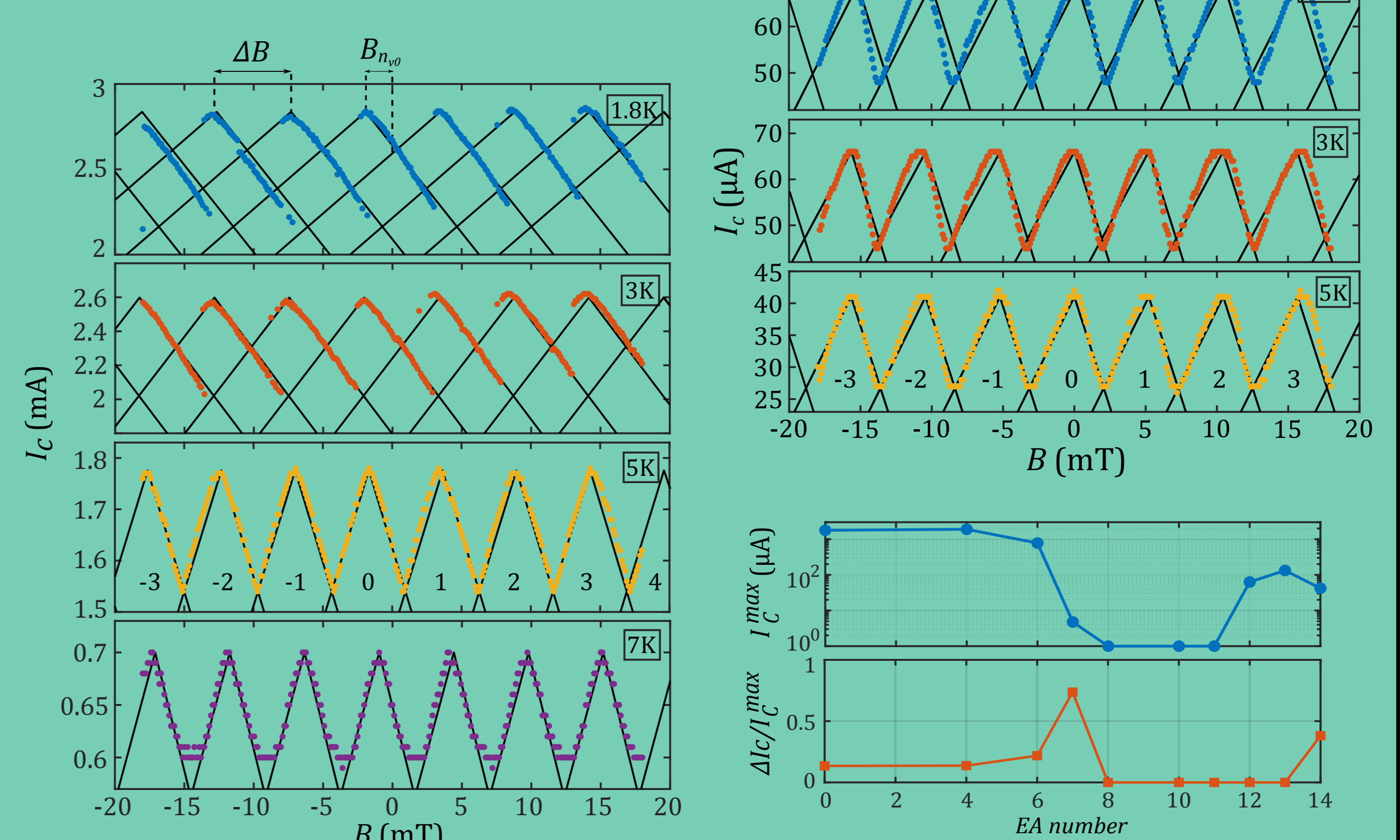


SEM imaging

- Ambient temperature, $P \sim 10^{-6}$ mbar.
- Current crowding induces modification of the two



Critical current oscillations



KU LEUVEN



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