

# QPlus Upgrade for LT STM - AFM performance at the limit of technological feasibility

## QPlus Upgrade for LT STM at a glance:

- New scanner and shielding design allows signal amplification/detection at atmospheric side
- Atomic resolution on isolating surfaces as well as on conducting materials competitive to STM imaging (typ. 10pm corrugation)
- Ultimate performance together with new generation QPlus sensors (included in this upgrade package)
- Fundamental AFM performance proof on isolators
- AFM measurements in genuine df feedback



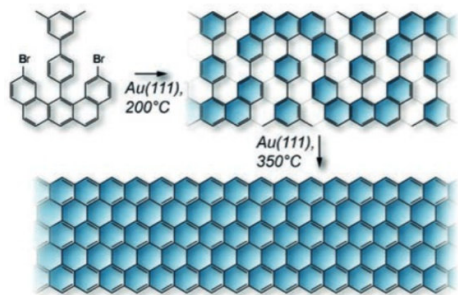
Scanner sensor reception



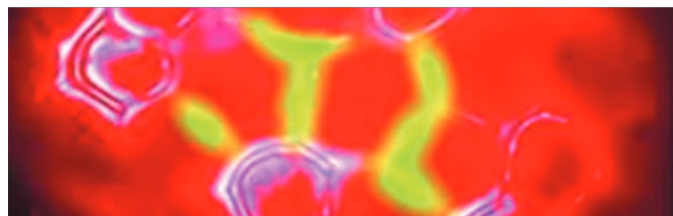
QPlus sensor new design



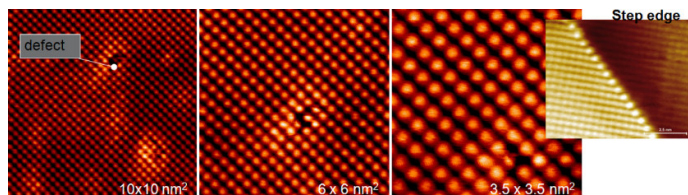
QPlus Preamplifier



Structure of precursor monomer and surface-assisted reaction step for the synthesis of 6-ZGNRs (top). Constant height nc-AFM frequency shift image taken with a CO-functionalized tip. The intraribbon resolution shows the formation of a 6-ZGNR with atomically precise CH edges. Oscillation amplitude  $A_{osc} = 0.7 \text{ \AA}$ ,  $V = 5 \text{ mV}$ .  
Publication: Pascal Ruffieux et al., Nature 531, 489-492, 2016



Real-Space Identification of Intermolecular Bonding with Atomic Force Microscopy.  
Publication: Xiaohui Qiu et al., DOI: 10.1126/science.1242603



LT-STM QPlus atomic resolution on NaCl(100) single crystal at T=5K

## Summary

### Parts needed:

- QPlus Scanner for LT/STM
- Preamplifier Q9
- PIC 8 cable
- BNC Feedthrough
- internal wiring (Coax cable for QPlus signal), connector plate

### Requirements:

- SPM controller with AFM QPlus functionality

### Limitations:

- Some very old variants of LT-STM might require machining of the LHe cryostat which can be processed at HQ only

### Options:

- Combine Package with MATRIX AFM upgrade