

Master Thesis: Using low-temperature atomic force microscopy for imaging and atomic manipulation

Our current work focuses on imaging and manipulating surfaces at the atomic level. We have several low-temperature (liquid He) systems that are outfitted with state-of-the-art non-contact atomic force microscopes. We have used them to investigate various systems including topological insulators and atomic-scale magnetic systems. On top of using the microscope as an imaging tool, we try to understand the physics behind the systems we are studying, e.g. the influence of the tip on the experiment. To do this, we sharpen and characterize our tips at the atomic scale.

Your work would include learning how to work with an ultra-high vacuum system, a liquid-He cryostat and frequency-modulation atomic force microscopy. You would build new AFM sensors, learn sample preparation, and collect and analyze high-resolution data. Possible projects include imaging topological insulators, atomic manipulation and spectroscopy of superconductors.

The master thesis project can be started at any time. Interested people should contact either Alexander Liebig (alexander.liebig@ur.de) or Julian Berwanger (julian.berwanger@ur.de). We can arrange a meeting to have a more detailed discussion about the possible topic and present the described labs.

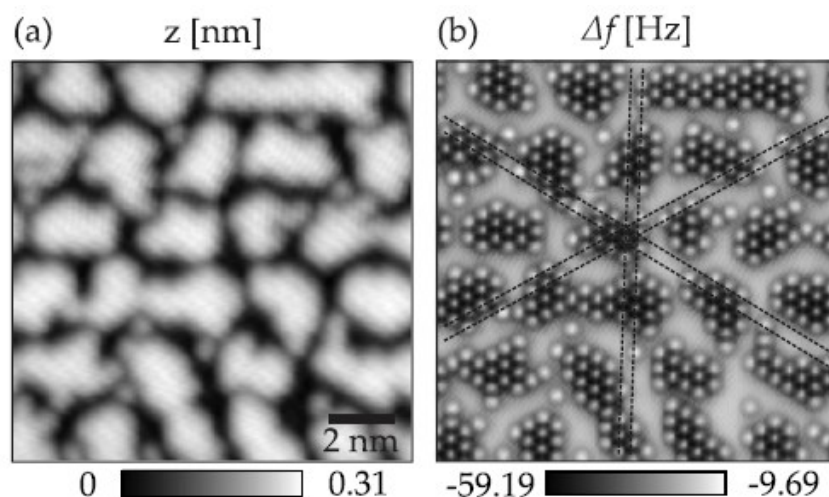


Figure: (a) STM image of the topological insulator TlBiSe₂ and (b) AFM image of the same area, showing atomic resolution.

From our publication F. Pielmeier et al., *New J. Phys.*, 17, 023067 (2015).