# Steps Towards Implementation of a Quantum Twisting Microscope

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Scanning probe microscopy (SPM) instrumentation typically uses a probe that is rastered across a surface, collecting information based on the interaction between the probe and the sample, to provide spatially resolved characterization of material properties. For example, the scanning tunneling microscope (STM), with its atomically sharp tip, collects tunneling current between tip and sample to obtain topographic maps with resolution down to single atoms. Additionally, through scanning tunneling spectroscopy (STS), one obtains the local density of states with energy resolution limited primarily by temperature. It is, however, much more difficult to access the momentum space of the electronic states measured. Enter the quantum twisting microscope (QTM), a novel measurement technique based on creating vertical tunneling junctions in 2D heterostructures, that can be modified in-situ by twisting the stacked layers [1].

Here, we discuss our progress towards realizing this measurement technique. The design is implemented on the platform of a scanning probe microscope. The top layer of the vertical tunneling junction is placed on a custom-designed atomic force microscope (AFM) cantilever and the bottom layer is embedded in a custom-made sample stage. We present progress in the nanofabrication steps towards implementing the tip and the sample as well as discussion about the measurement mode.

References

[1] Inbar, A., Birkbeck, J., Xiao, J. *et al.* The quantum twisting microscope. *Nature* **614**, 682–687 (2023).