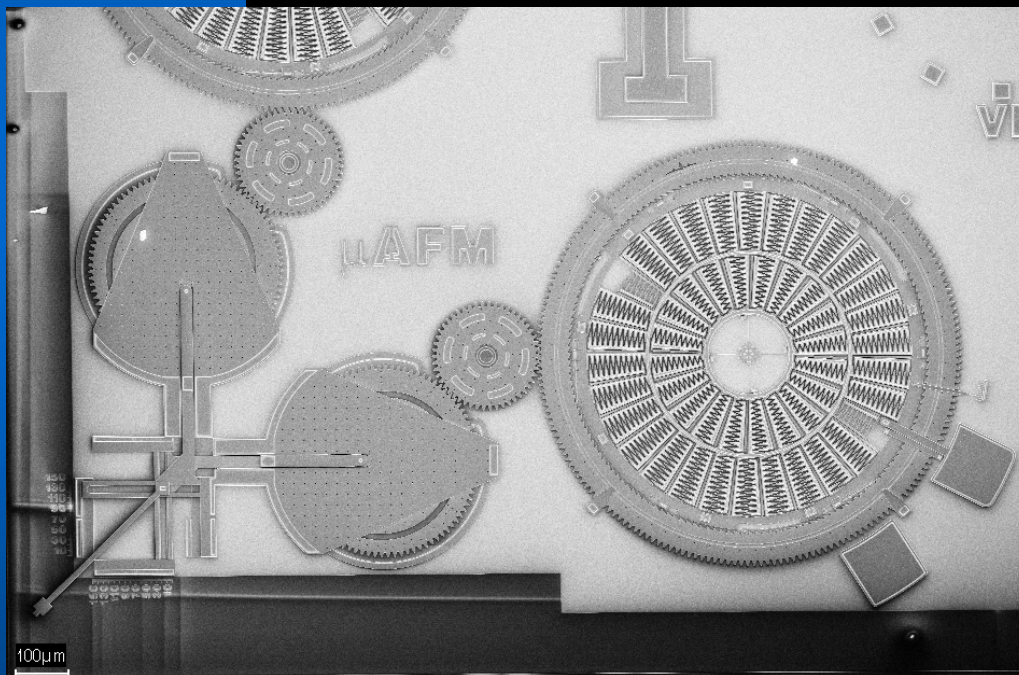
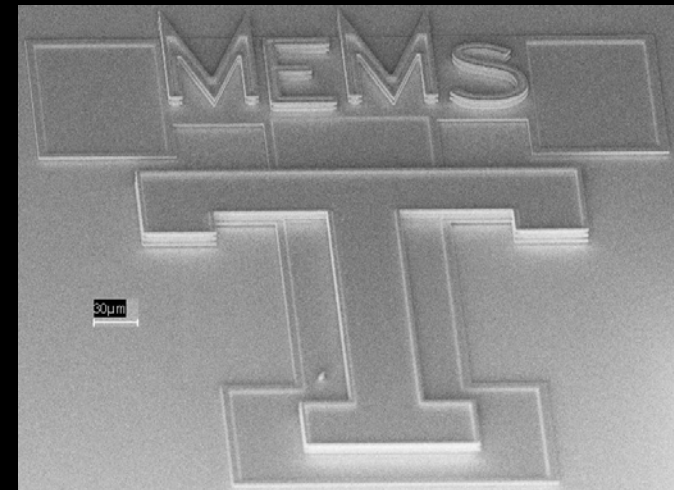




SUMMIT V design of a Micro X-Y Scanner with pseudo-AFM tip

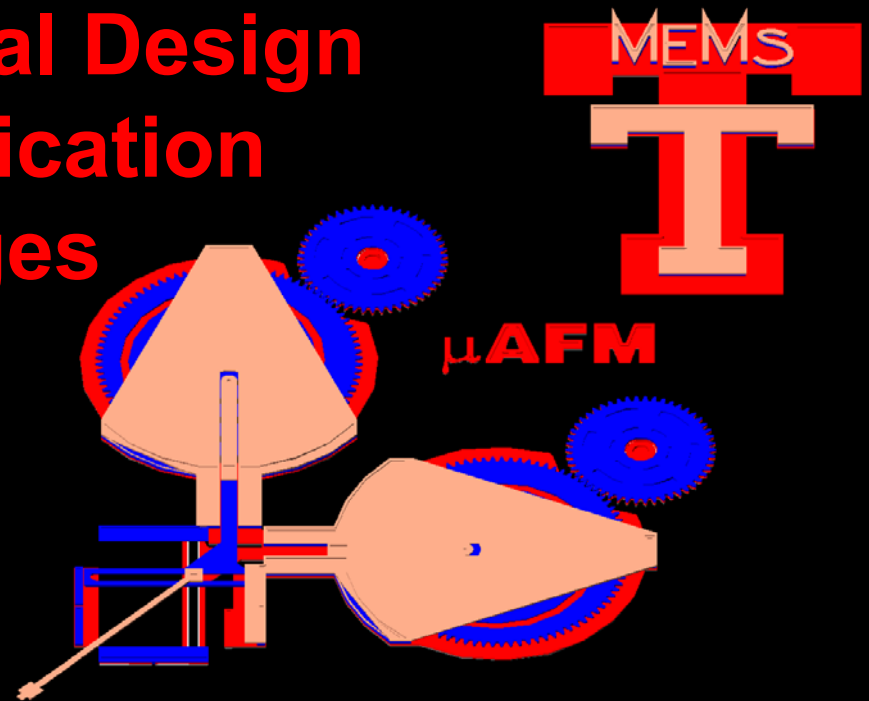


Phillip Beverly
TTU BS-EE – SwRI
Tim Dallas, PhD
Texas Tech University

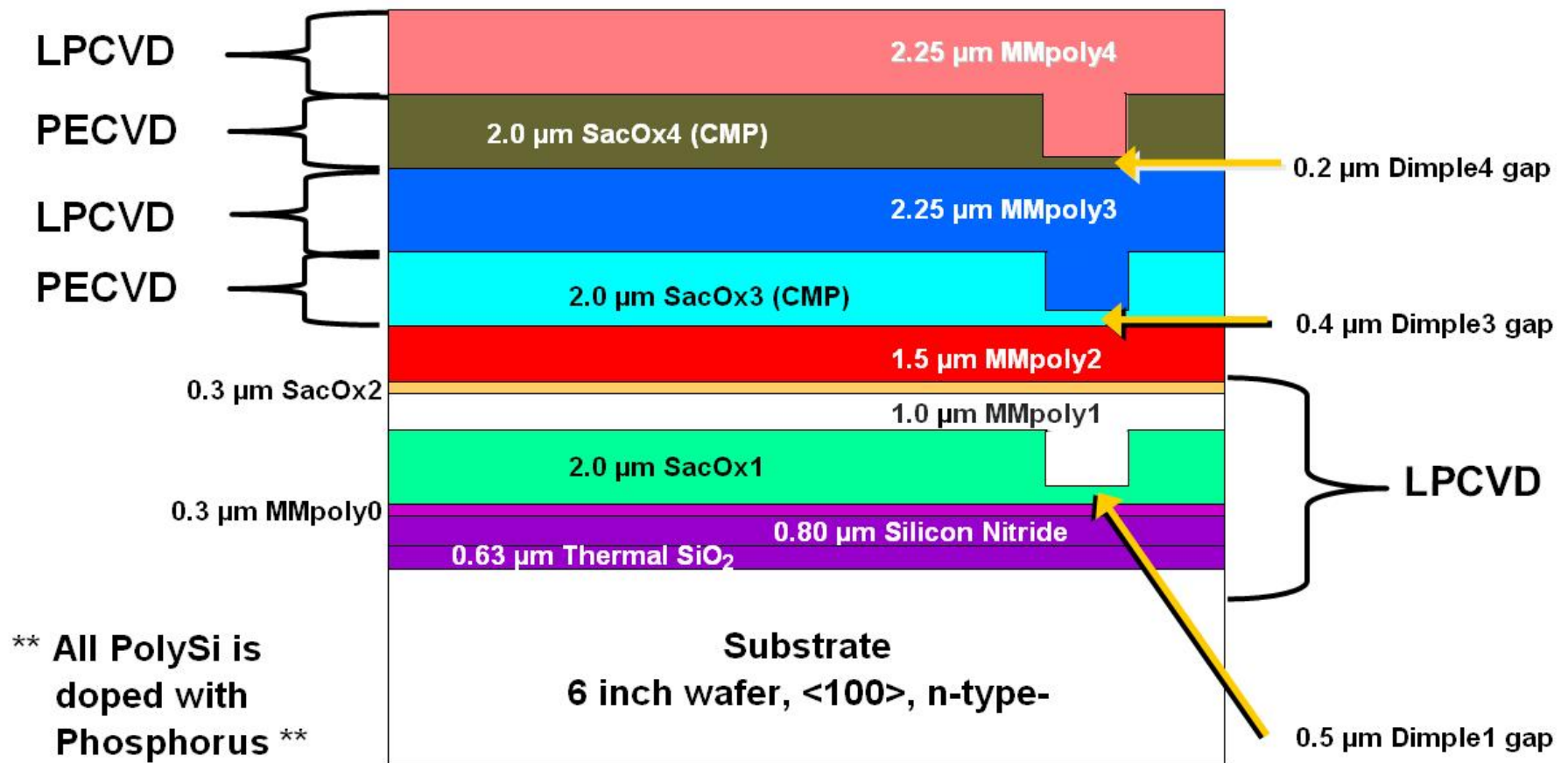


Outline

- Summit V Process
- TTU Module Layout
 - μ AFM
 - Mechanical Design
 - Post Fabrication
 - SEM Images

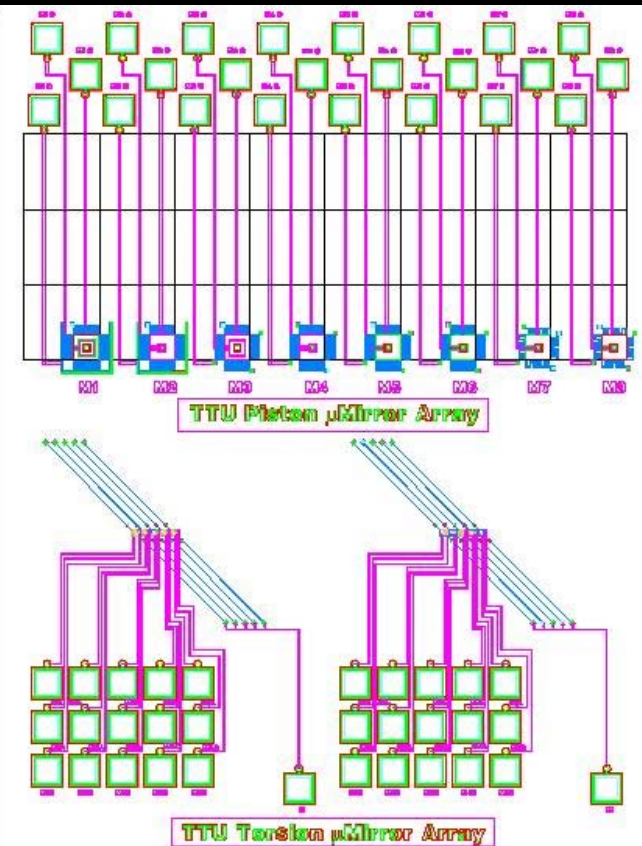
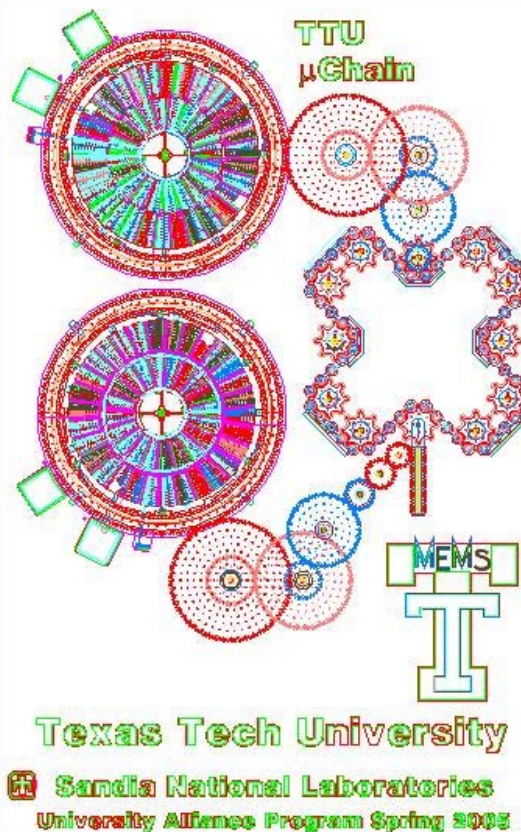
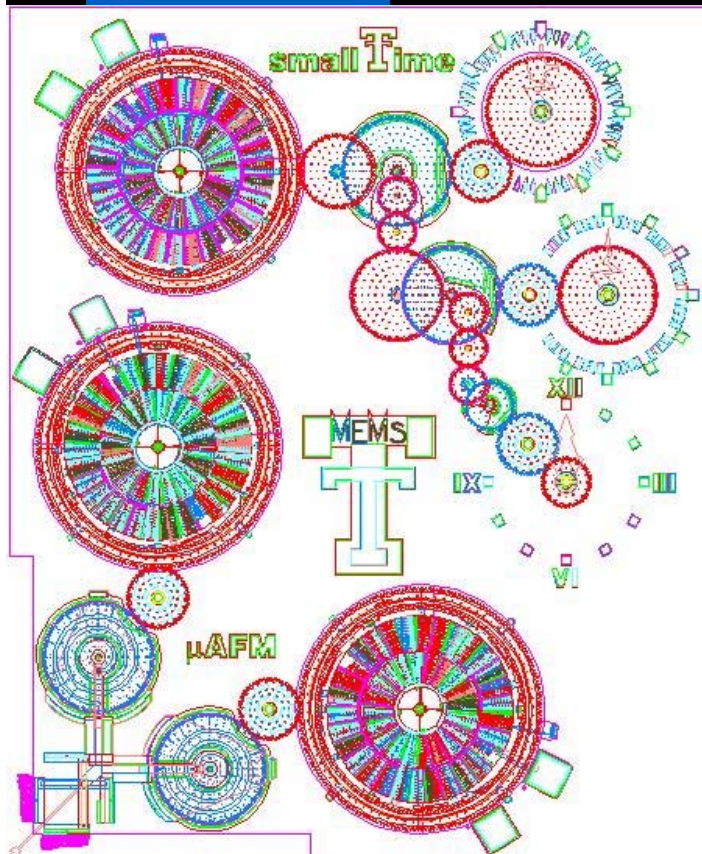


SUMMiT V Process

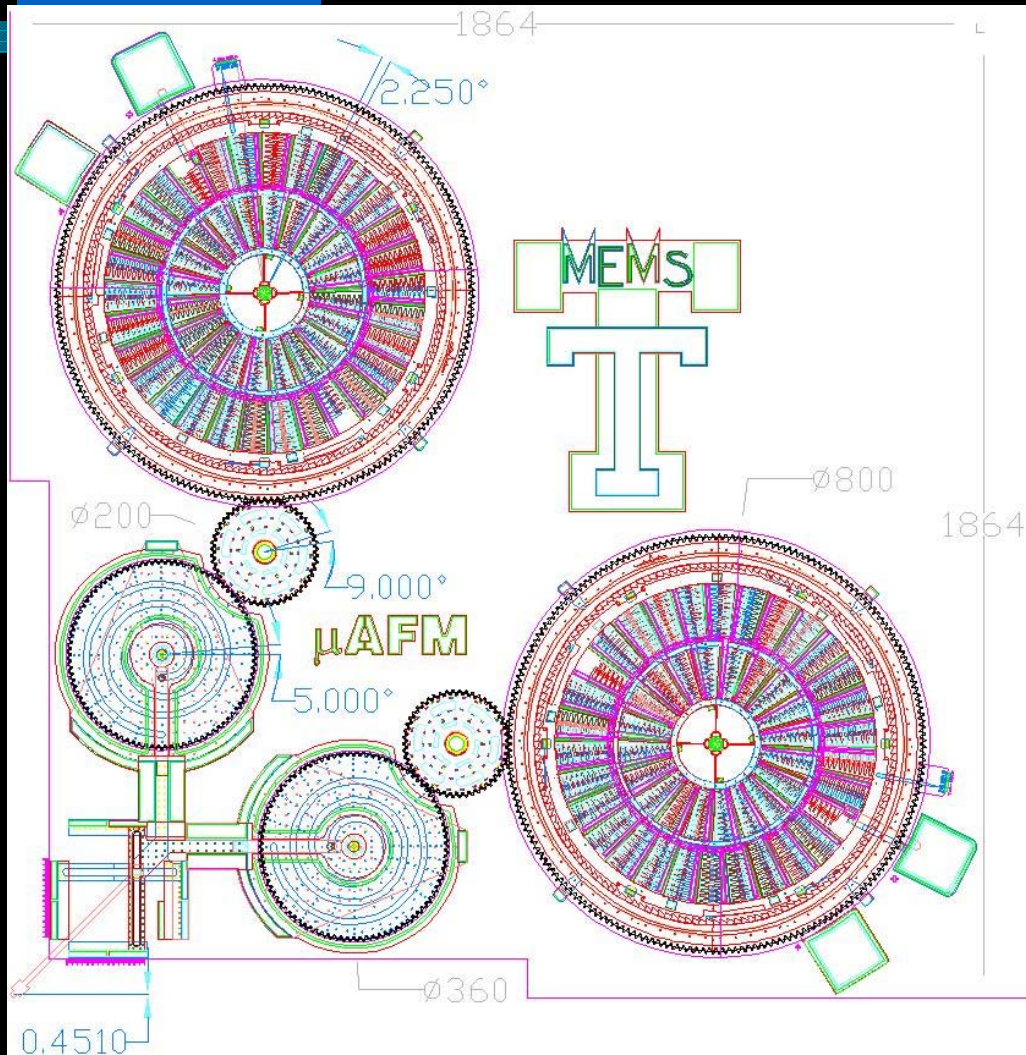




TTU 2005 Module

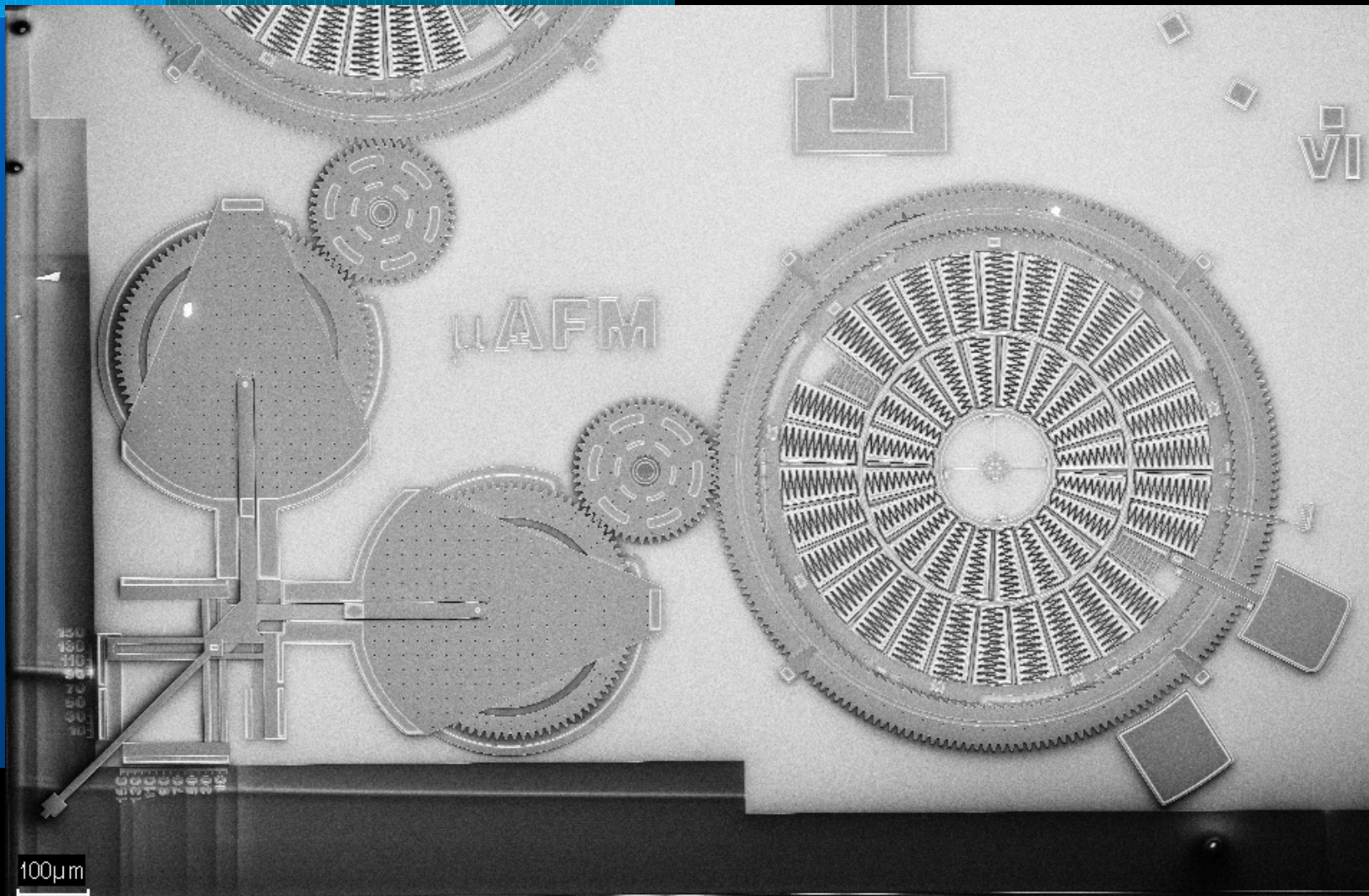


μ AFM



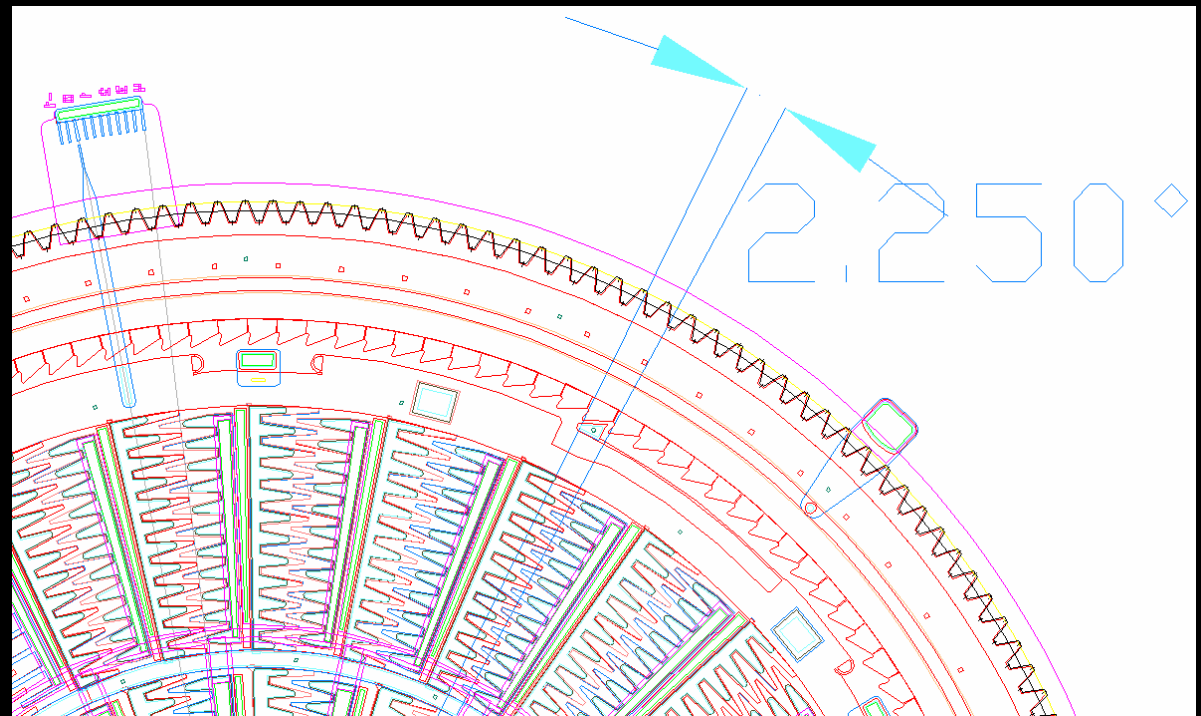
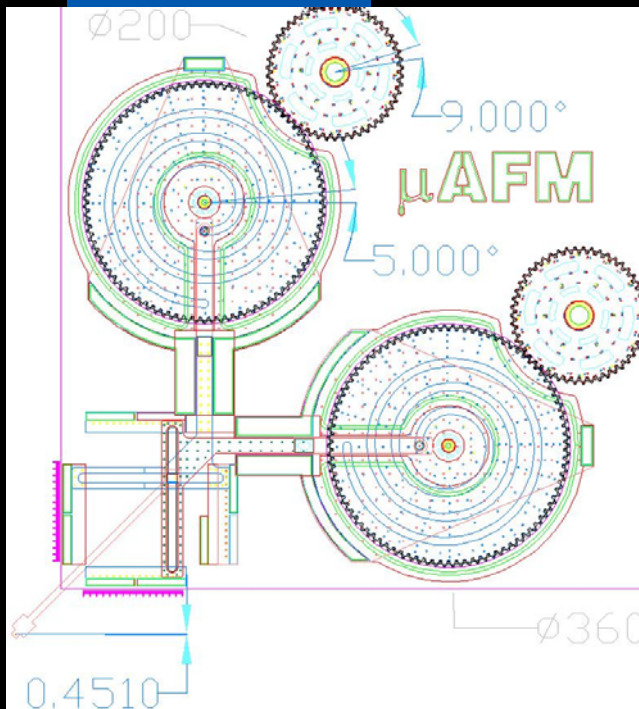
- Occupies 3.47 mm^2
- 19.4% of the module
- Designed to extend $110 \text{ }\mu\text{m}$ in both X-Y directions with off chip access
- Cam and linkage translating 1080° of rotation to $110 \text{ }\mu\text{m}$ linear motion
- Complete surface coverage up to 0.0121 mm^2
- $340 \text{ }\mu\text{m}$ Tip Arm

SEM of entire μ AFM

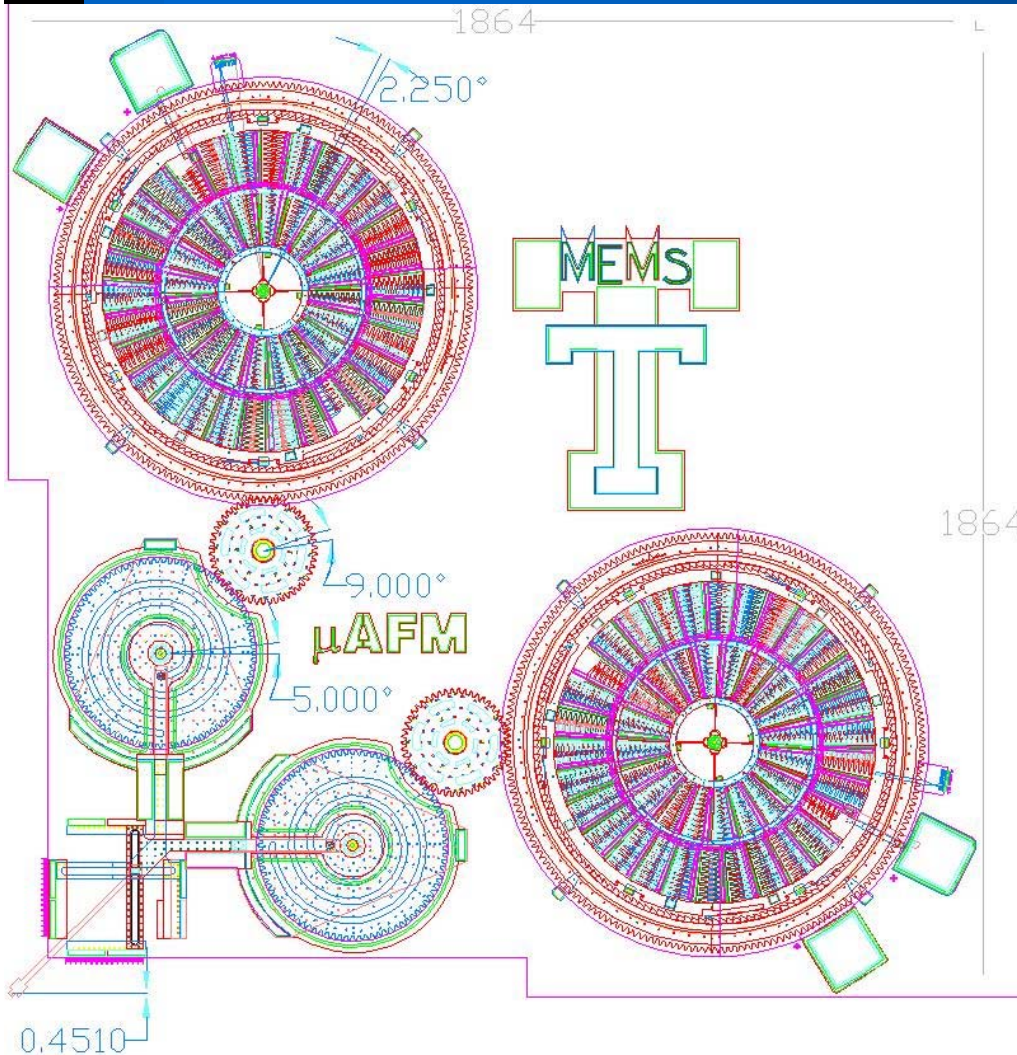


Resolution Step Size

- Estimated 2.25° to 4.00° rotation per cycle
- Estimated Step resolution of 451 nm to 802



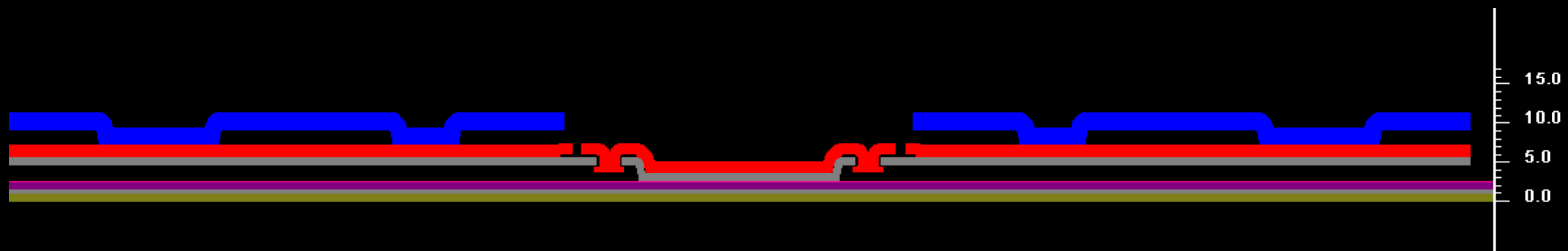
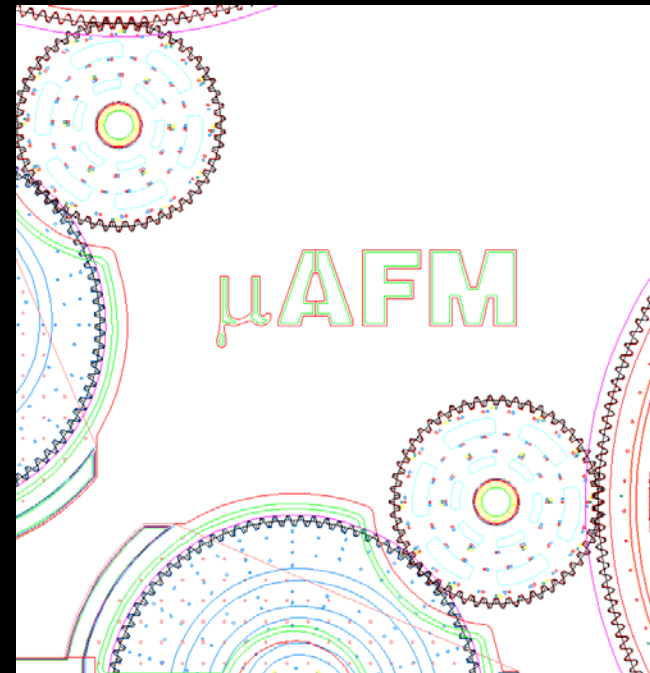
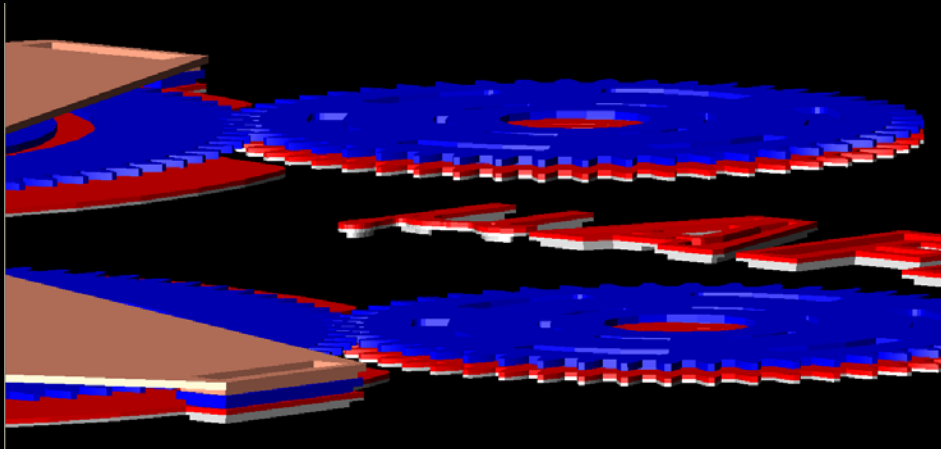
μ AFM



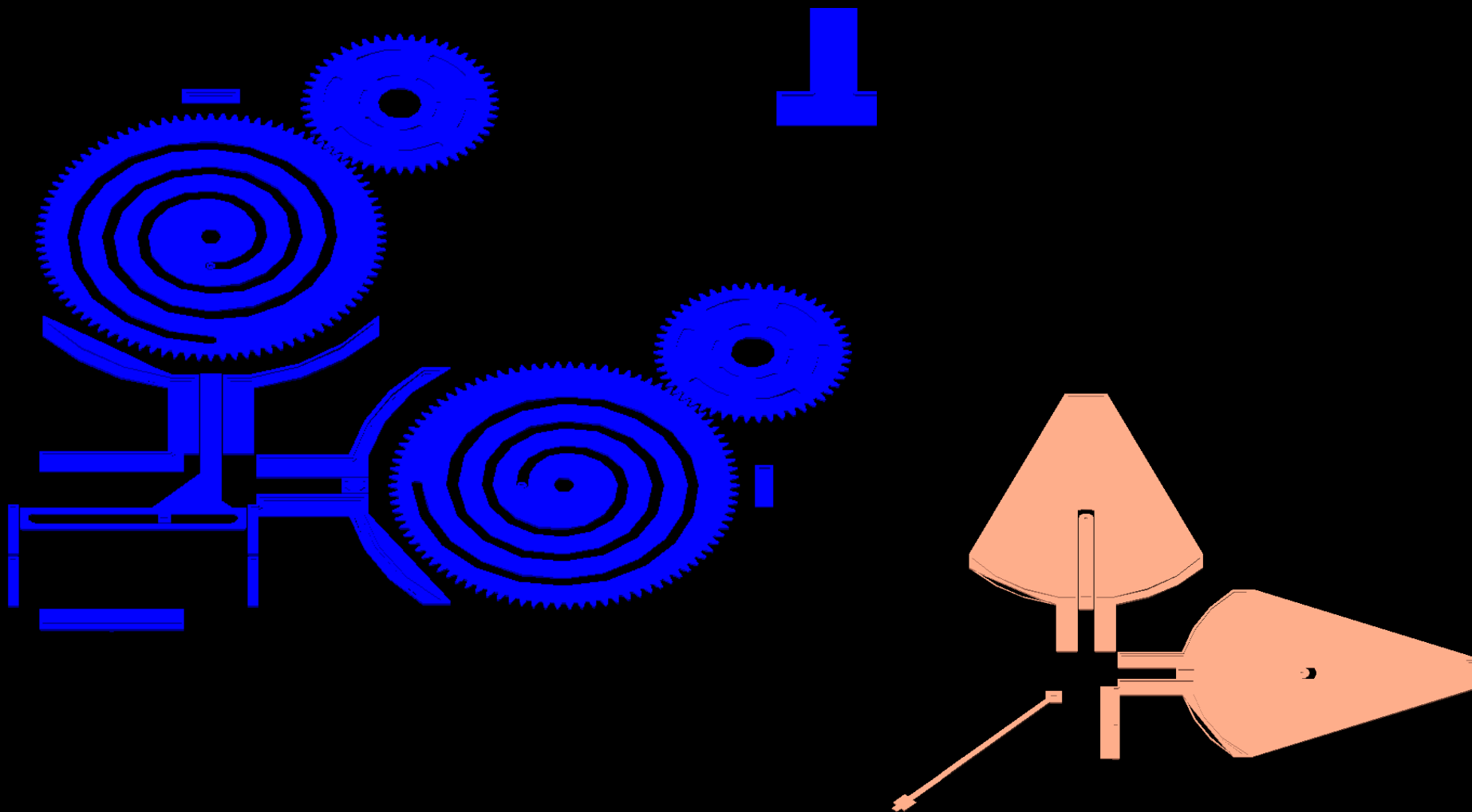
● Components

- Dual Unidirectional Tensional Ratcheting actuators (TRA)
- X-Y Spiral CAM Gear and Follower
- X-Y Controller Arms
- AFM Tip and Arm

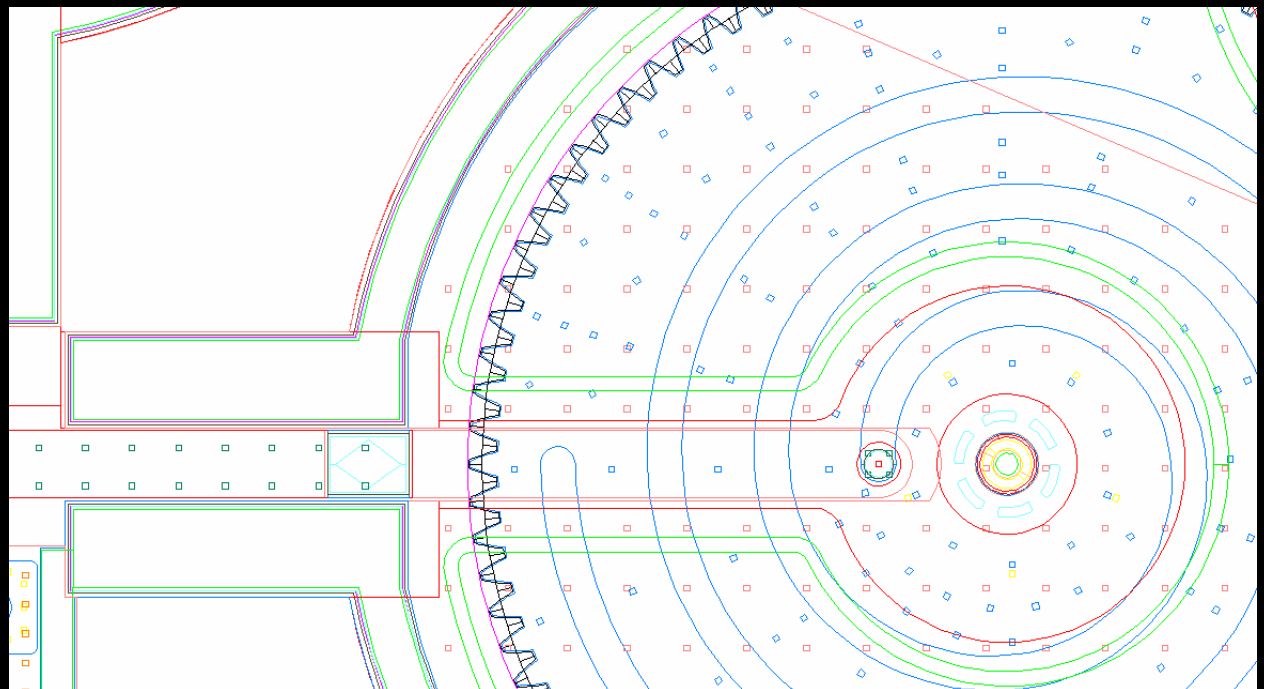
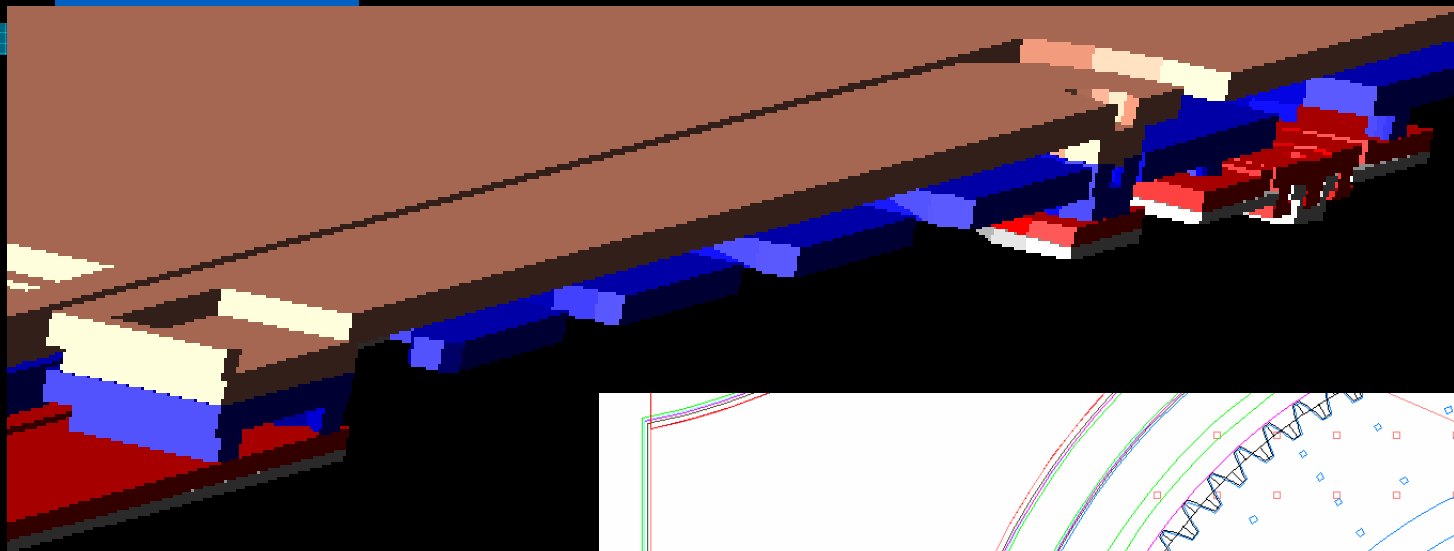
μ AFM-TRA Interface Gears



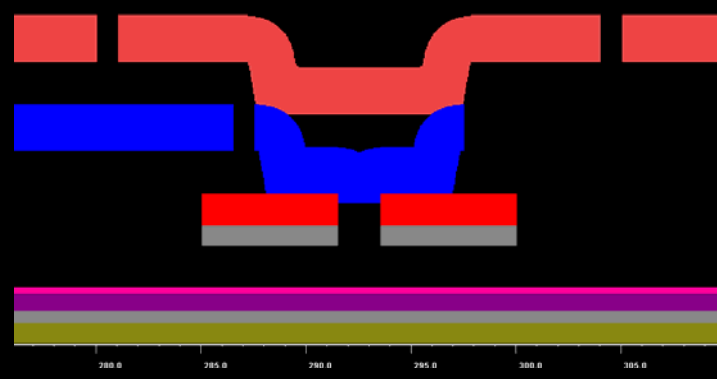
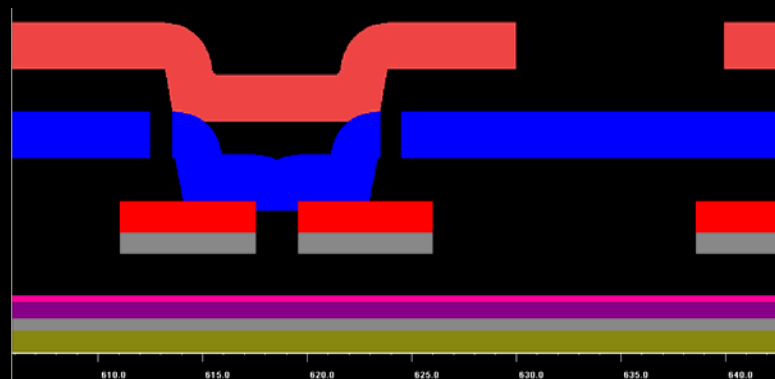
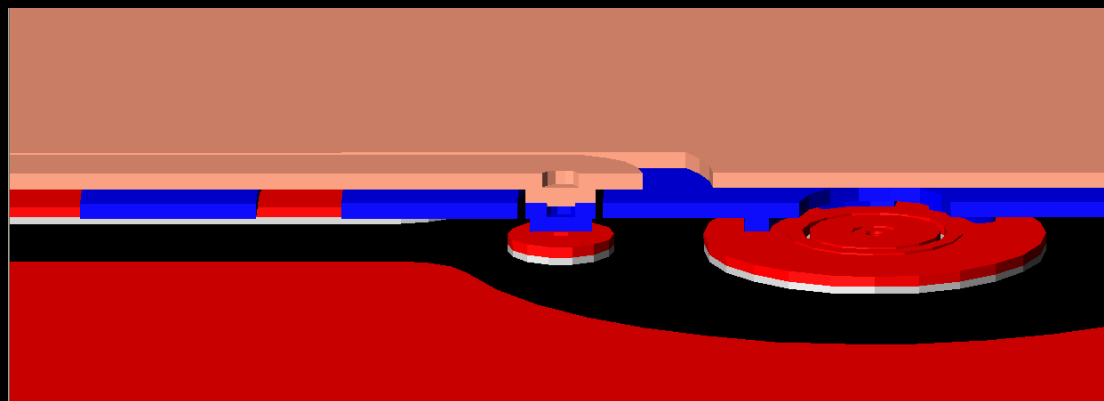
μ AFM-Cam System



μ AFM-Arm/Cam Follower Interface

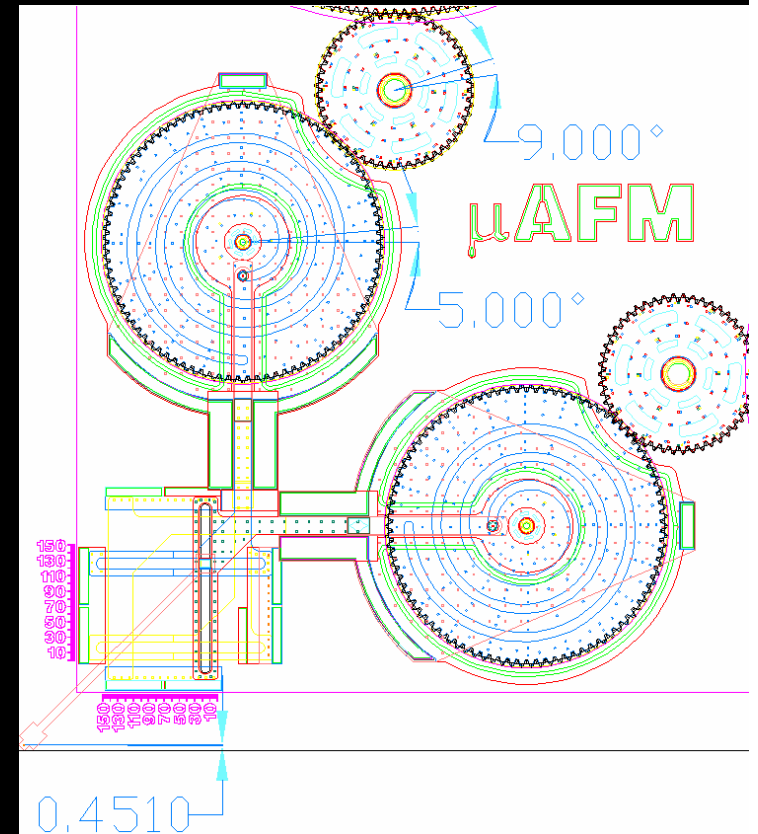
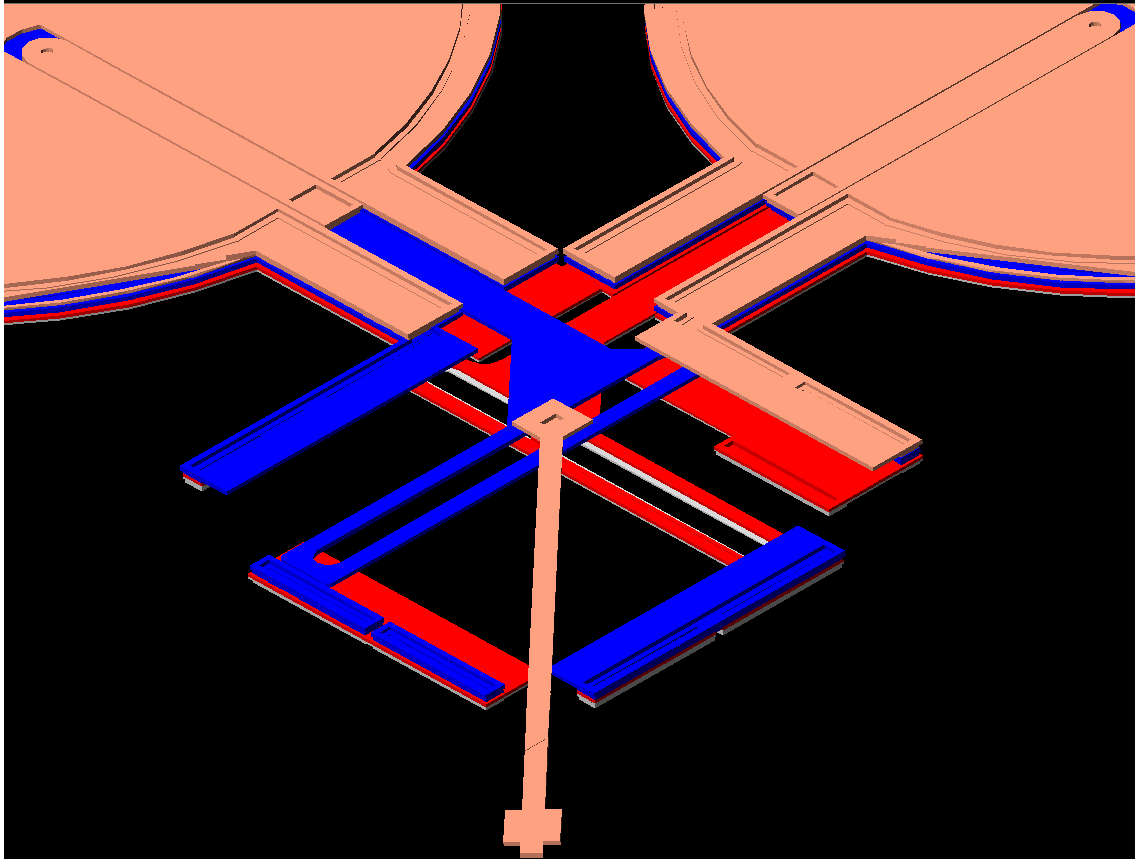


μ AFM-Cam Follower Interface

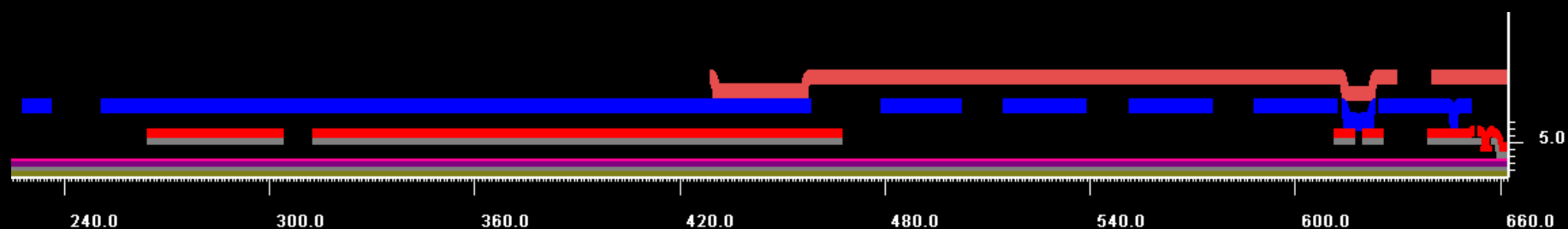
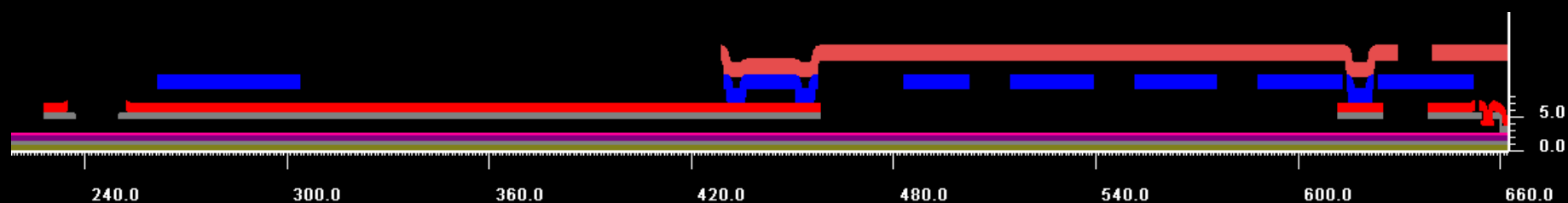




μ AFM-Cam Follower Linkage

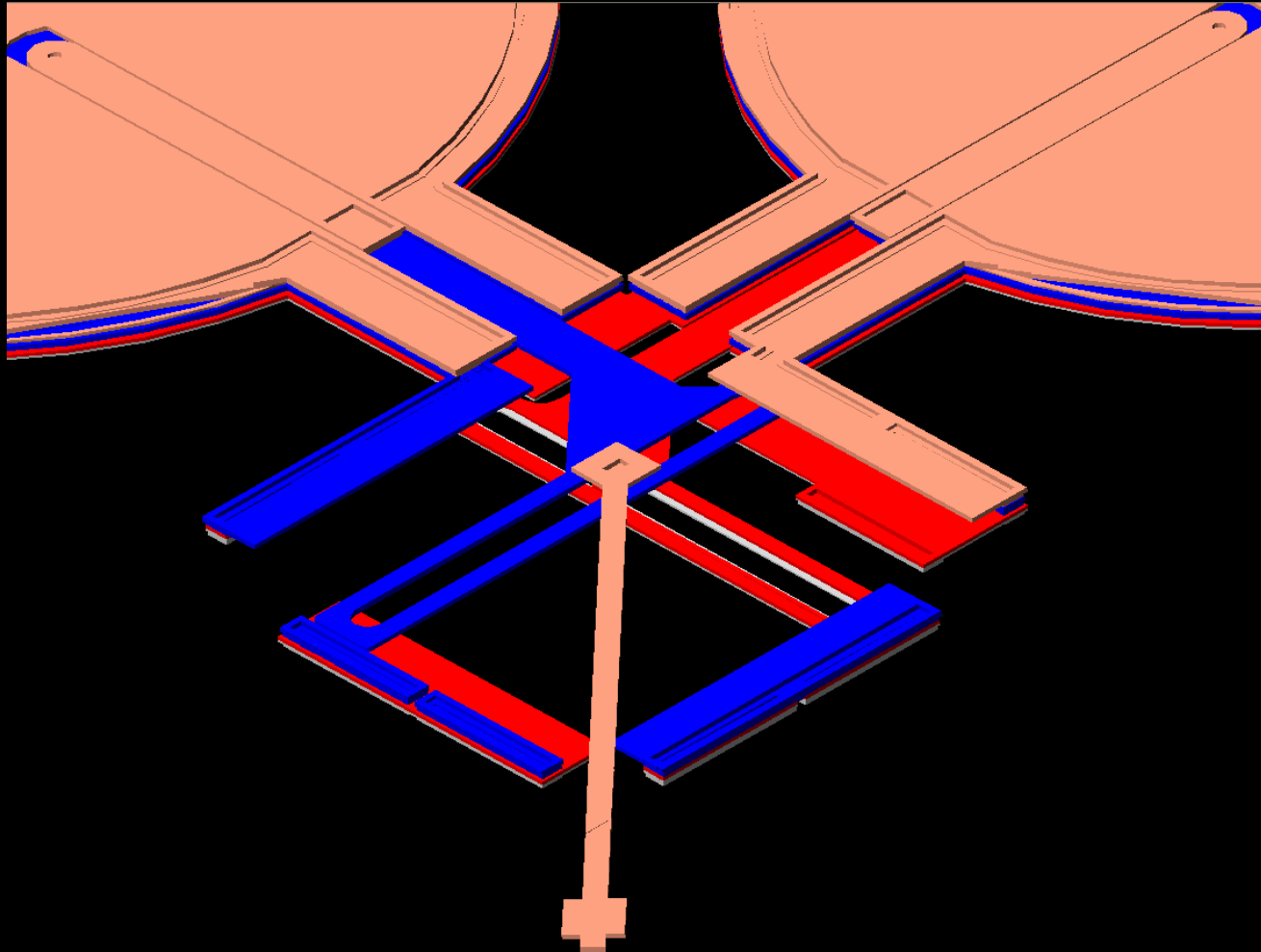


μ AFM-Cam Follower Linkage



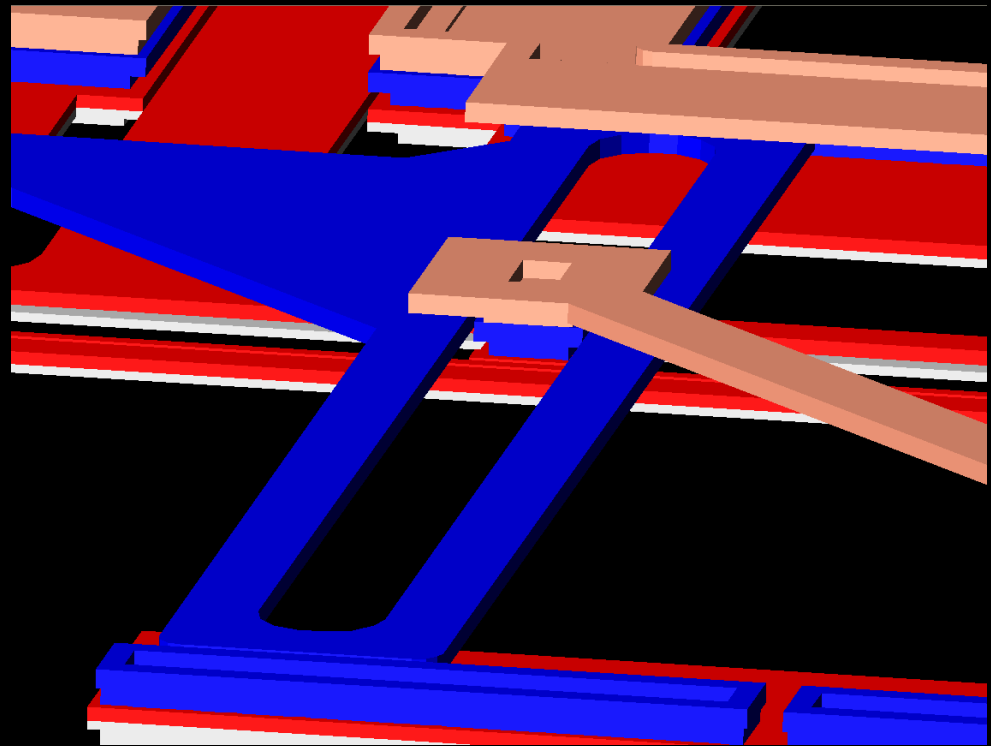
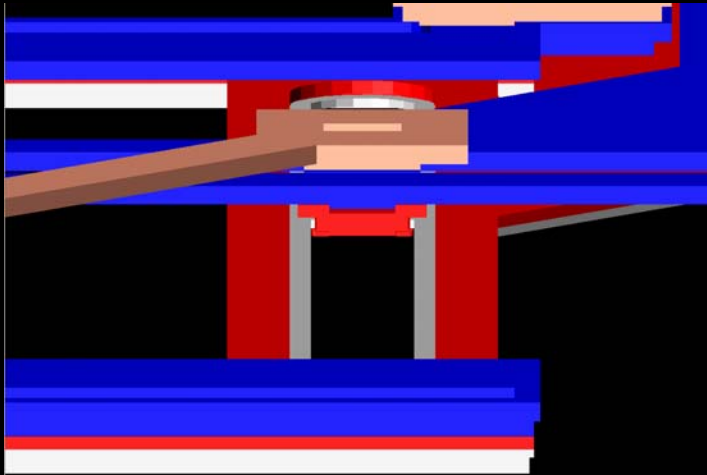


μ AFM-Tip Assembly



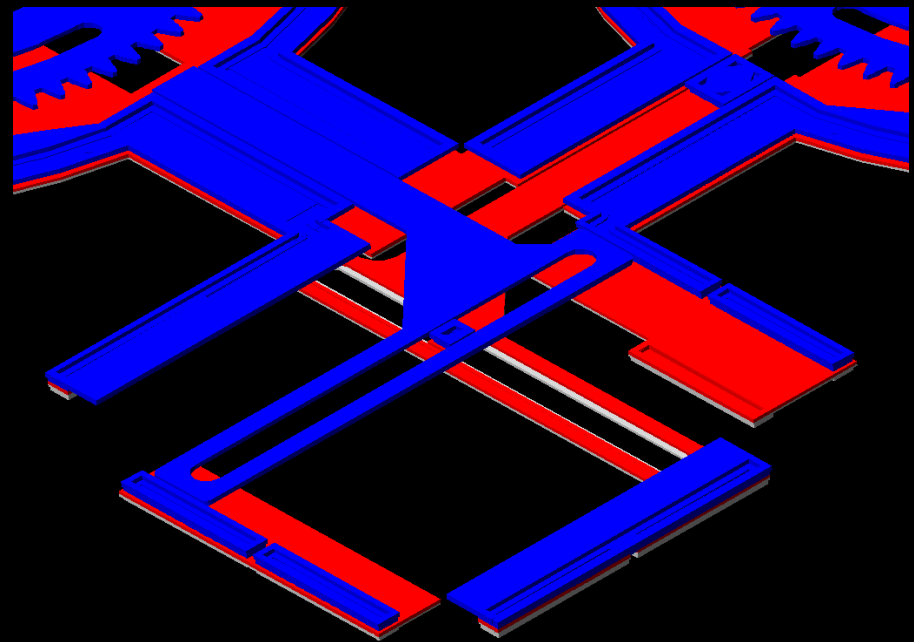
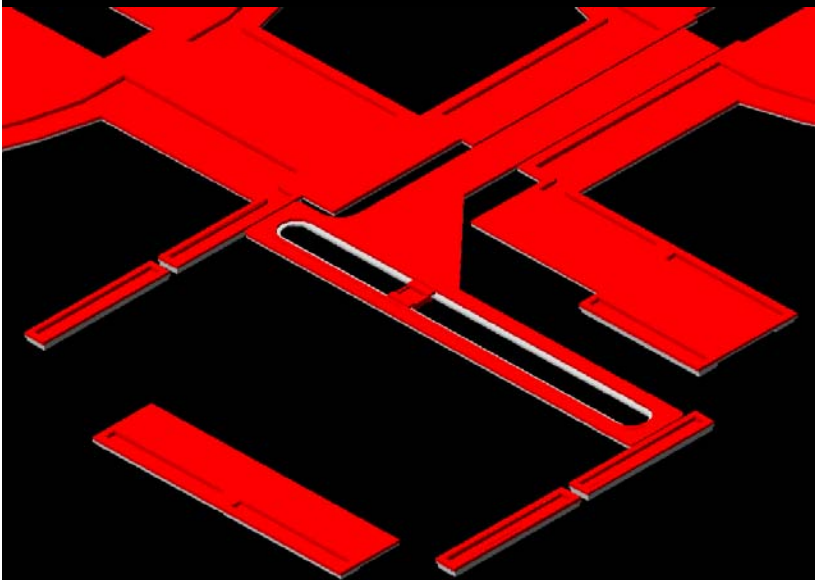


μ AFM-Tip Assembly



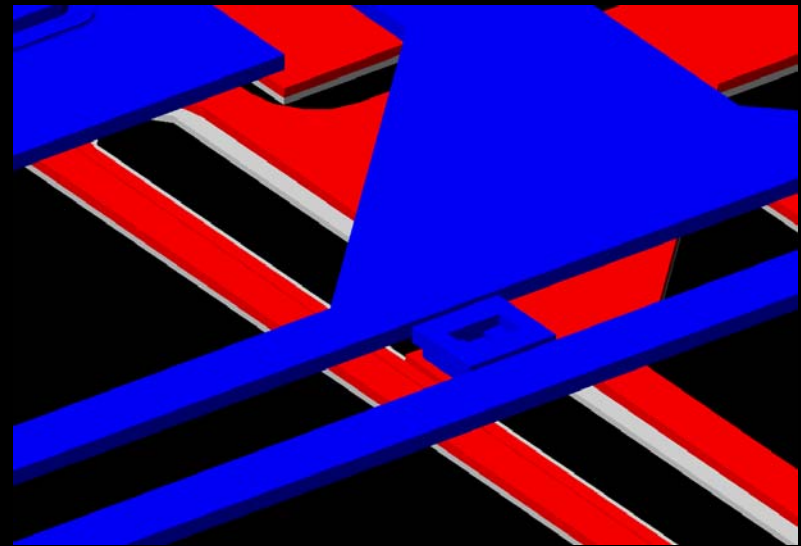


μ AFM-Tip Assembly

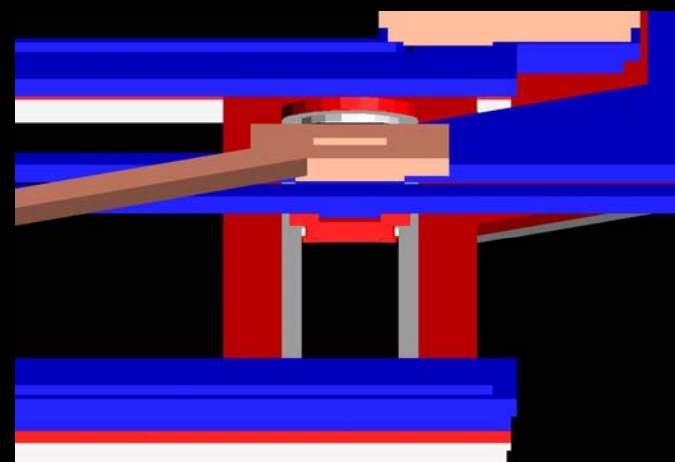
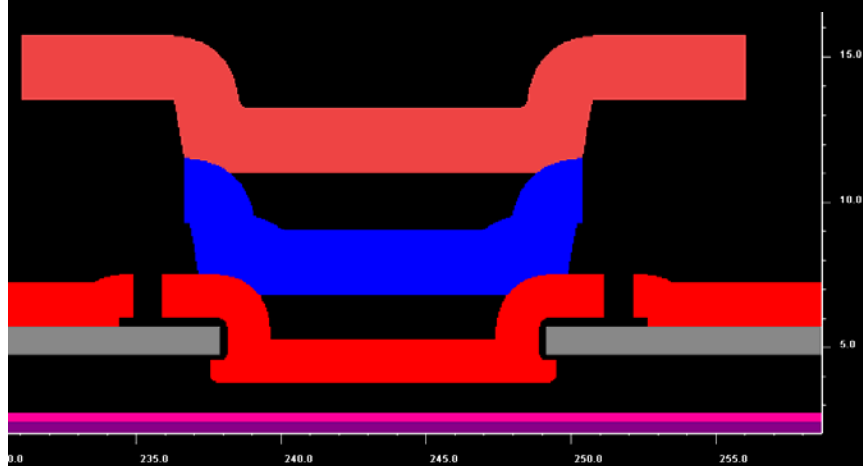
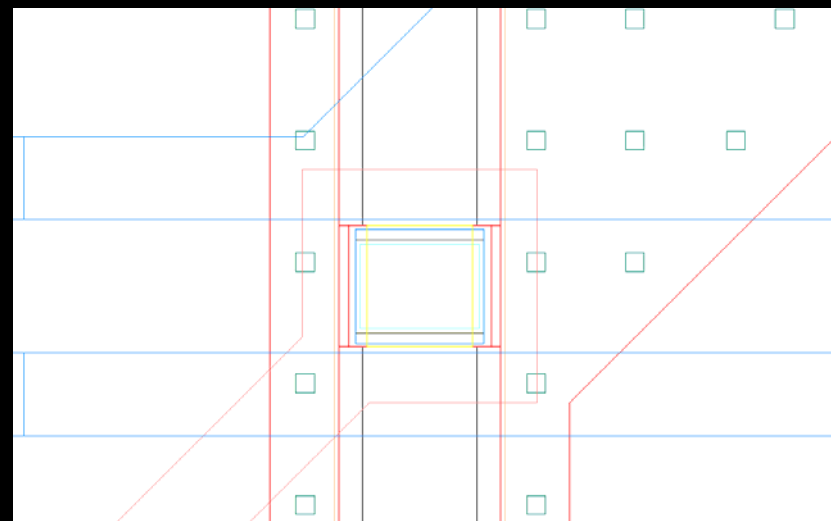
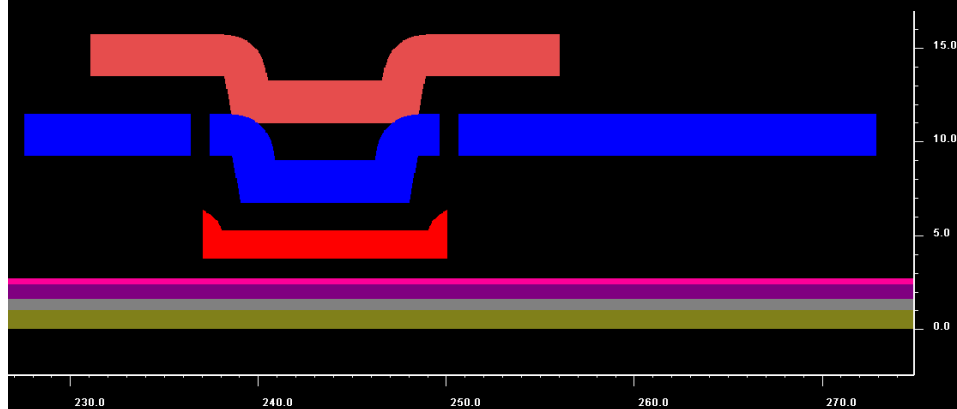




μ AFM-Tip Assembly

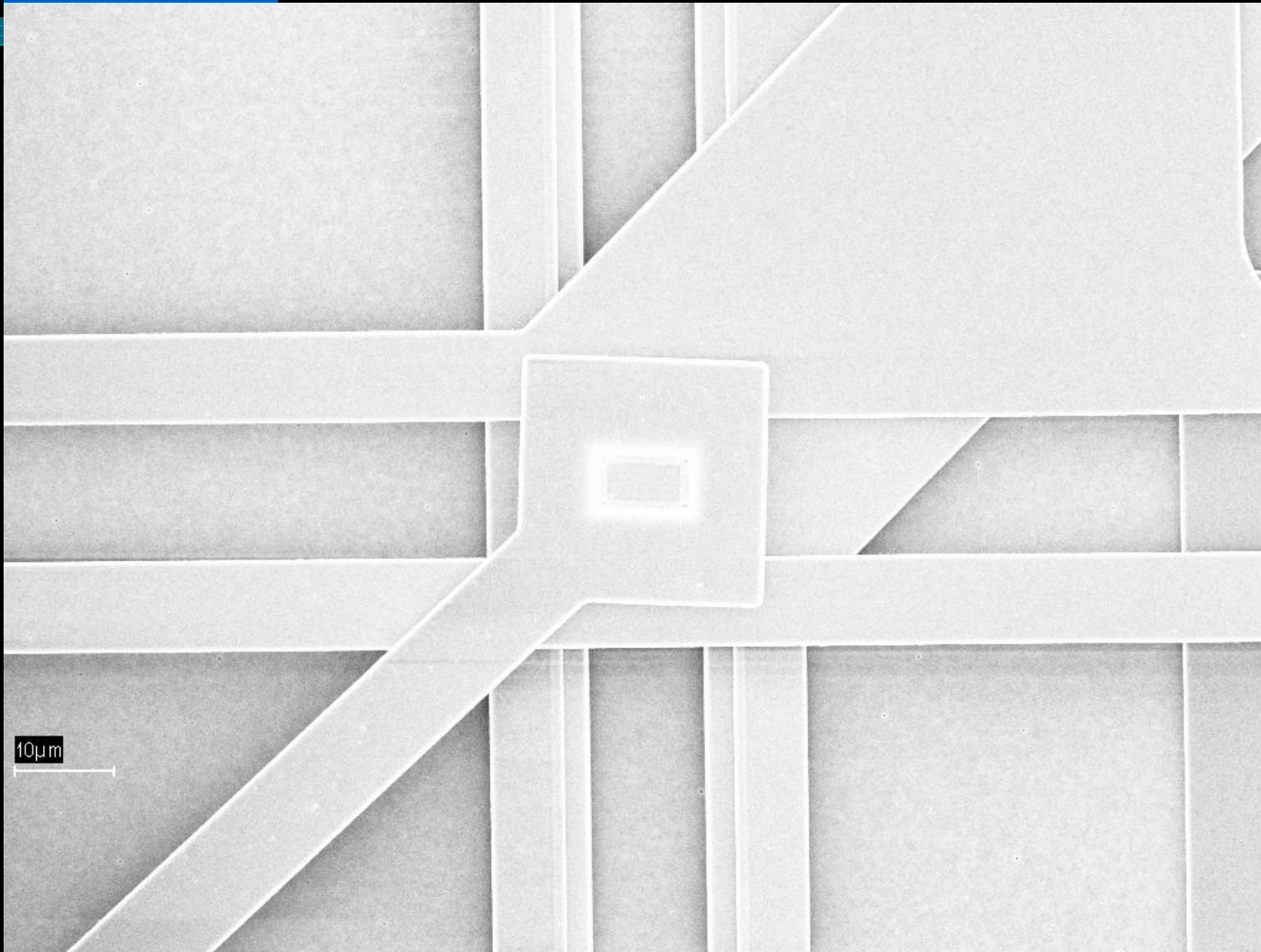


μ AFM-Linkage



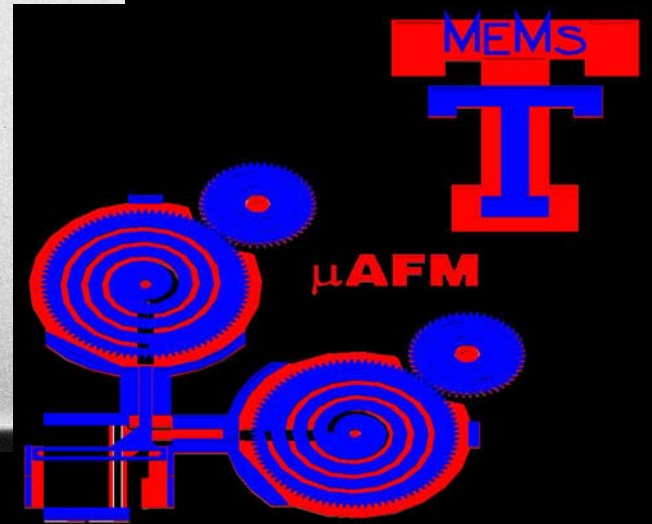
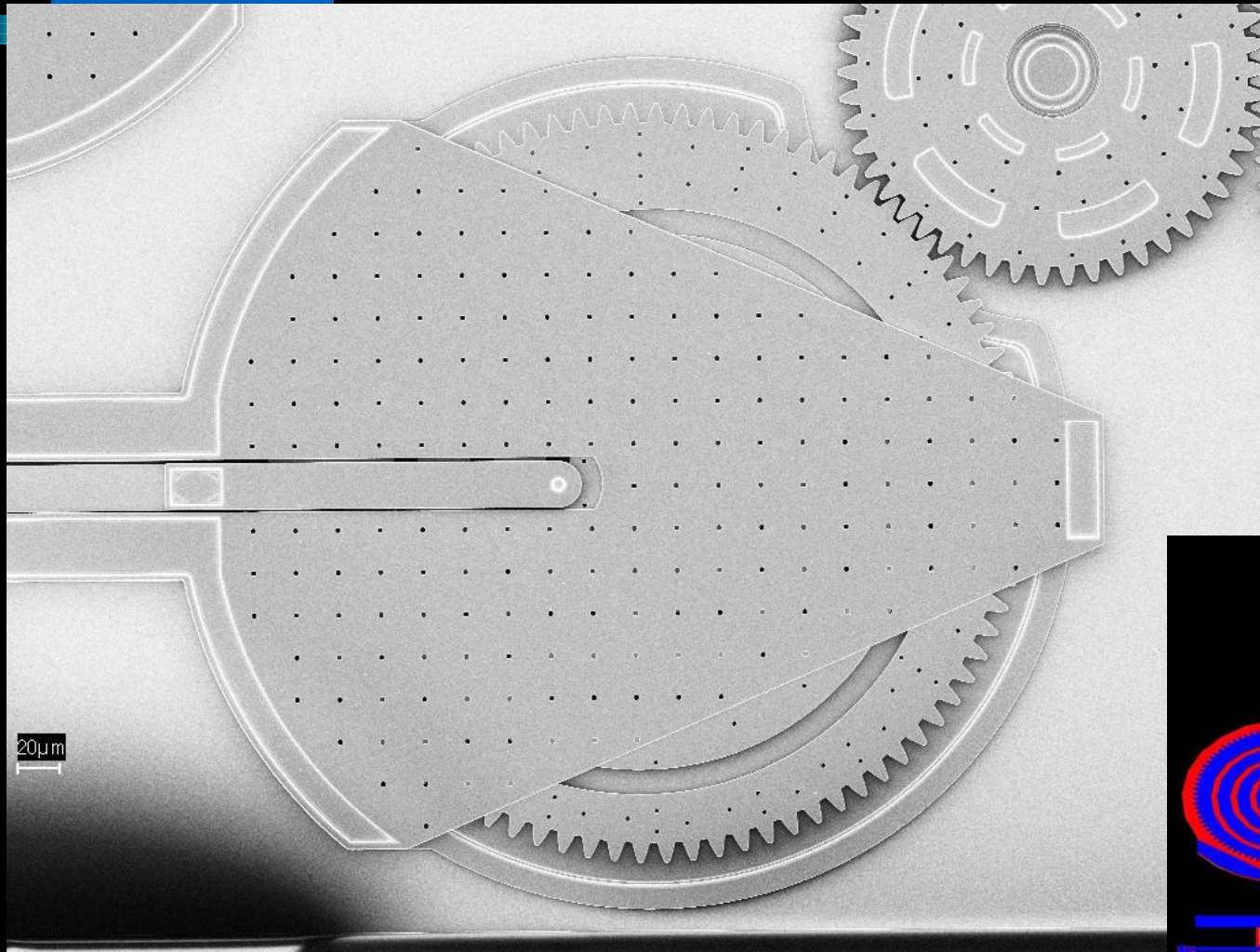


μ AFM-Linkage

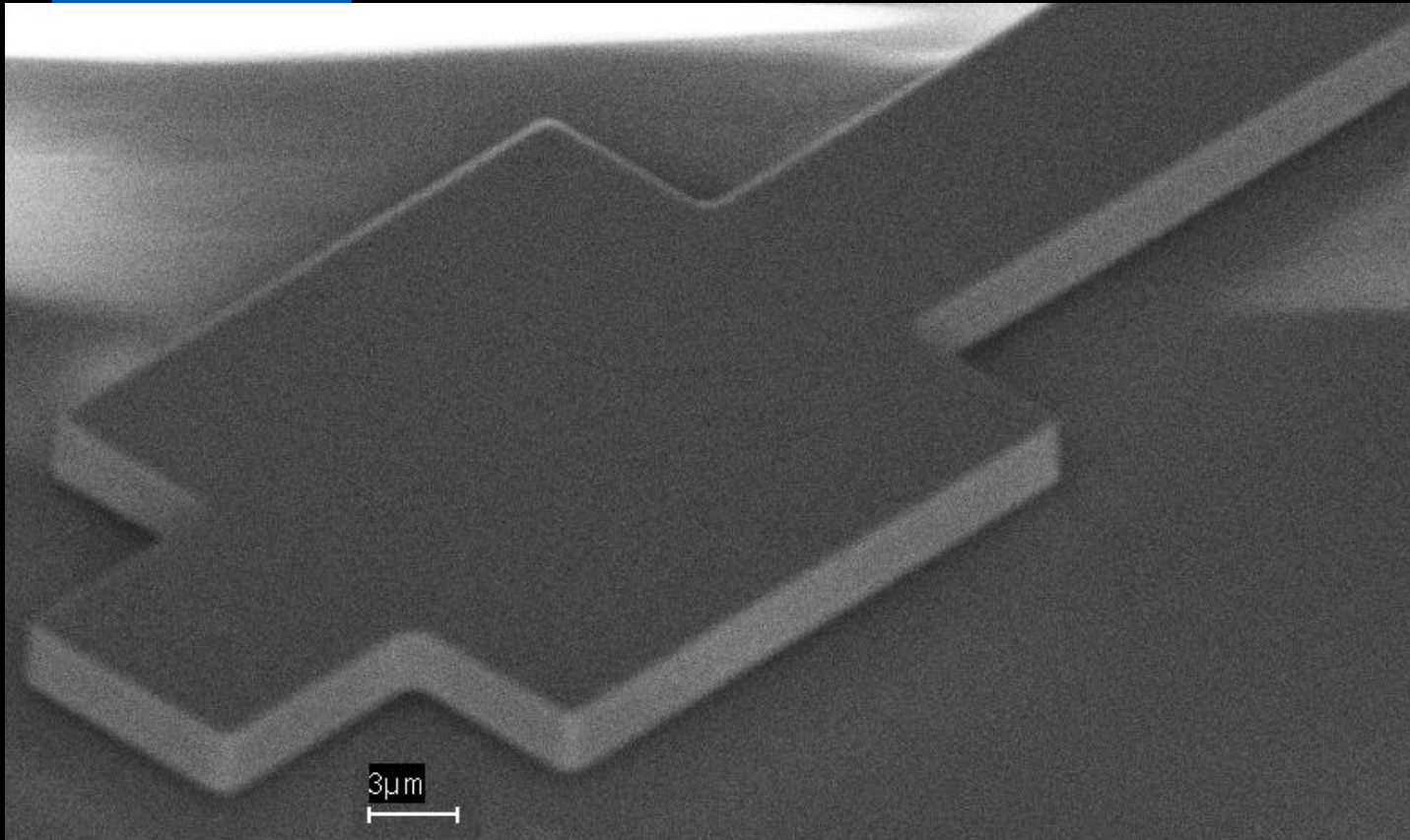
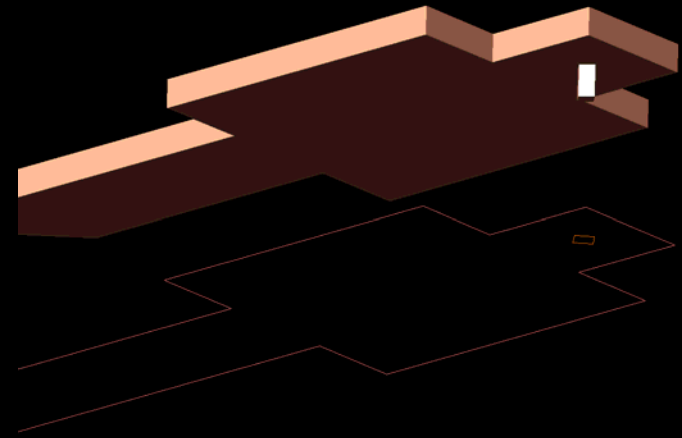


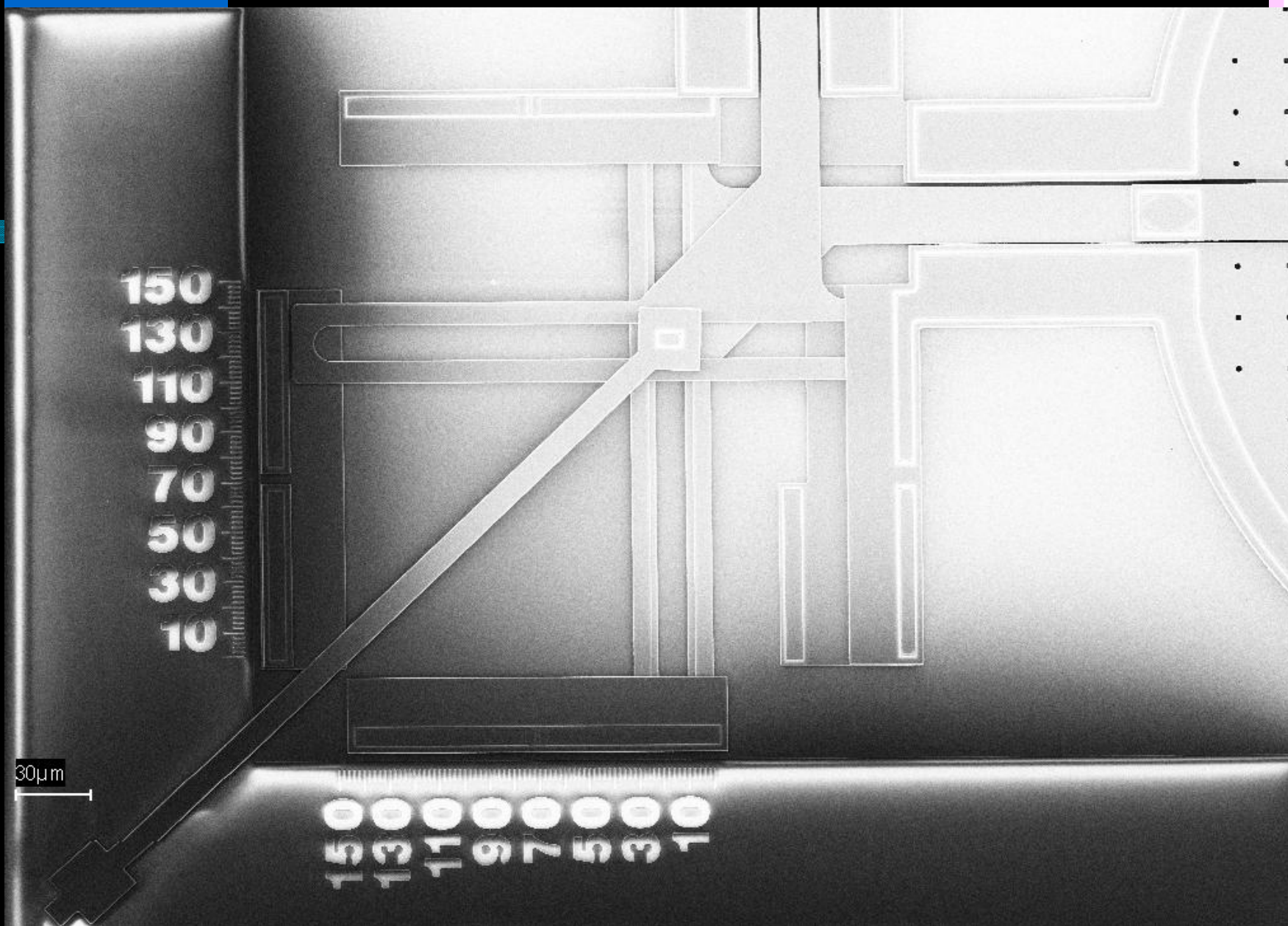


Horizontal Cam and Link

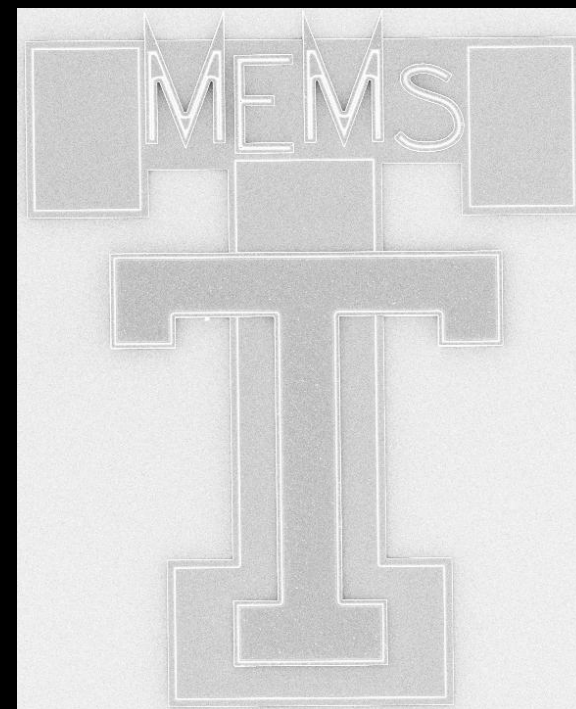
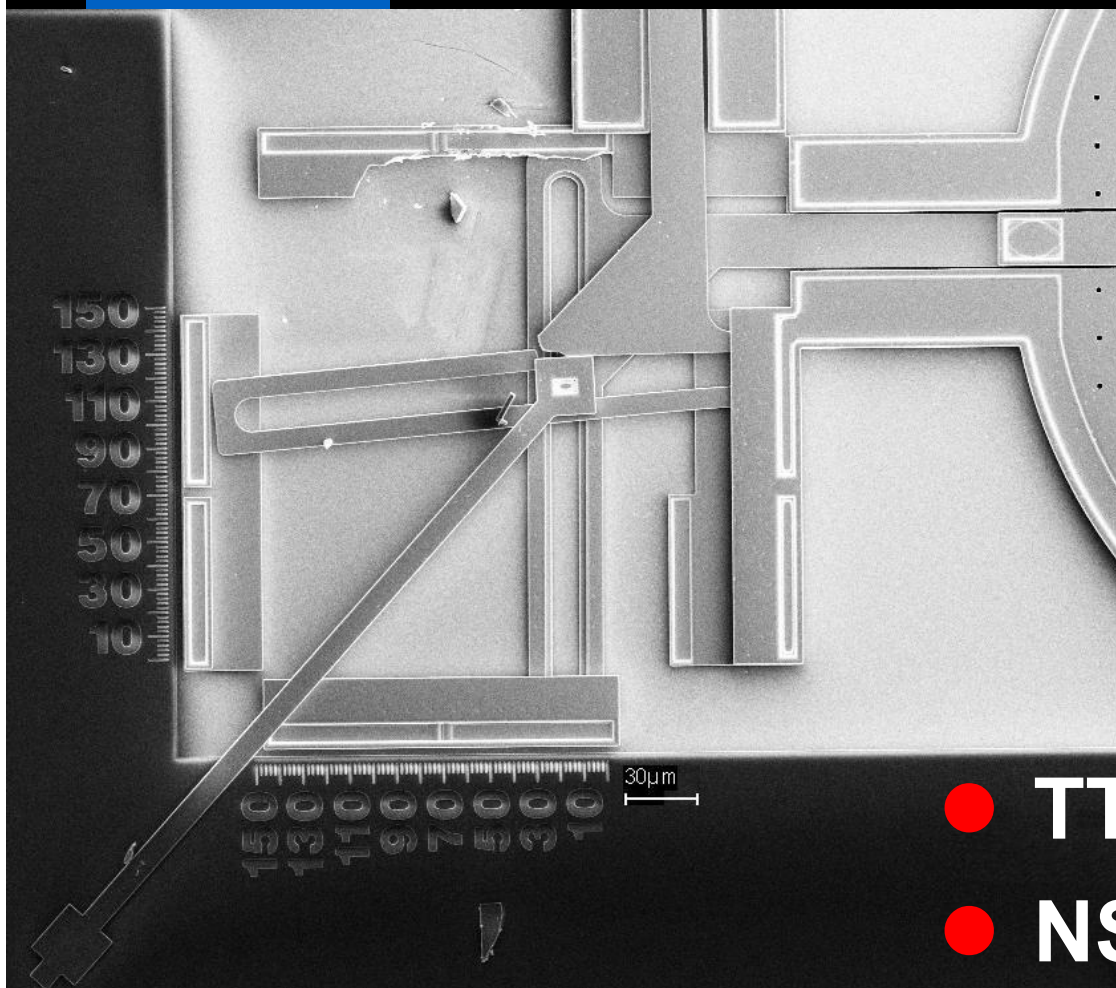


μ AFM-Tip





Acknowledgements



- **TTU TLTC Grant**
- **NSF ECS #0326218**
- **Sandia MESA Group**