

## Special Note on High Aspect AFM Imaging

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### Purpose

This document supplements the UTD Cleanroom Veeco Dimension 3100 Atomic Force Microscope instructions on tapping mode imaging [for the special case of high aspect imaging] with probe tips having ion milled ultra sharp points. The special tips are intended to reach into very small trenches and conform closely to the trench wall slopes. However these sharp tips are expensive, very delicate, and can be immediately broken if engaged with the same forces used with standard OTESP probes. This document describes the parameter adjustments required to land the tip with a very light force to protect it from landing damage.

### Parameter Adjustments

It is suggested that for future use, you save your standard tapping mode workspace with a new name like "HighAspectTapping" or something that reminds you what it's for and then make the following parameter changes. The approach taken by these parameter adjustments is to land the tip with a very light force and make slight contact force adjustments after landing to insure that the tip is in fact correctly following the profile of the surface.

### Instructions:

1. Click on TOOLS
  - a. Click on ENGAGE PARAMS
    - i. Click on TAPPING ENGAGE
    - ii. Change the following parameters to the corresponding values
      1. DELTA SETPOINT → -0.01 (neg.)
      2. FINAL DELTA SETPOINT → 0.02
      3. SEW TIP → Yes
2. Click on ACQUIRE
  - a. Click on SCAN PARAMETER LIST in the ACQUIRE menu
    - i. Under OTHER menu, change the following parameter
      1. ENGAGE SETPOINT → 1.00
3. Engage the tip as normal, but slow the tip scan speed to less than 15 microns per second. Increase the INTEGRAL GAIN until you see amplifier oscillations in the profile scope trace. Reduce the gain until the oscillations just disappear. If the profile shows that you are not yet on the surface (trace and retrace overlap not matching), highlight the AMPLITUDE SETPOINT value and reduce it one (left arrow) click at a time until the surface profile shows up in the scope graph.

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These instructions allow the system to land with a very light force, thus avoiding breaking the tip immediately upon a normal “hard” landing. The image quality will require the same type of adjustments as in normal tapping mode operation, but the application of those changes must be very light (one step at a time until the quality improves).

## Conclusion

This brief document is a reference note to supplement instructions for performing delicate high aspect ratio imaging at high magnification. This should be treated as a reminder after having received individual training on how to do this.