

AFM Safety Exam

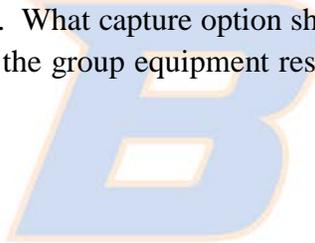
- 1) The piezoelectric crystals (piezos) are the most delicate component found in each AFM. They are relatively easy to break, and are expensive to replace. Where are the piezos physically located?

- 2) Which of the following could potentially break or damage the piezos?
 - a. Z motor pressing a sample against the probe holder
 - b. Electrical shock from a static electricity discharge
 - c. Dropping the probe holder
 - d. Applying a voltage across the piezos
 - e. Placing a strong magnet next to the probe holder
 - f. Cleaning the probe holder with organic solvents (e.g., acetone) or water

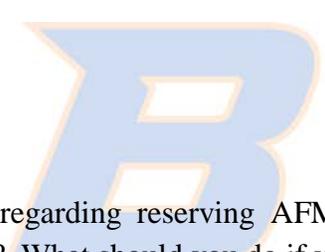
- 3) A user aligns the laser and achieves a decent sum during setup. After centering the laser on the detector and bringing the sample surface (or tip reflection, as appropriate) into focus, the user positions the tip above the surface. The user then engages and watches the video feed. The tip approaches the surface, flexes as it hits the surface, and eventually shatters.
 - a. Describe two different scenarios that could have led to this, one for the MM8 and one for the Dimension series AFMs.

 - b. What should the user do as soon as the tip breaks?

 - c. What would happen if the user did nothing and allowed the system to continue engaging after the tip broke?

- 4) Why is it customary/good practice to set the initial scan size to zero before engaging the surface?
- 5) You decide the PC running the Nanoscope control software needs to be rebooted. Is it best to turn the AFM controller off, or leave it on for the reboot? Explain your reasoning.
- 6) You just started a scan that will take an hour to complete. However, you need to leave and might not return for three hours. What capture option should you use in this situation? What should be done with regards to the group equipment reservation calendar, login spreadsheet, and AFM setup?
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- 7) You are running a scan and suddenly remember the lab manager telling you, “Don’t leave the piezos significantly extended or retracted for long periods of time.”
- How can you check to make sure the piezos are not extended in the x or y directions?
 - How can you check the piezo extension in the z direction?

- 8) What is the approximate (order of magnitude) purchase price of one of our AFM systems and the cost to replace/repair the AFM scanner head if it is damaged, respectively?
- \$25,000-\$50,000; \$500-\$2,500
 - \$100,000-\$200,000; \$2,500-\$5,000
 - \$250,000-\$500,000; \$5,000-\$25,000
 - \$500,000-\$1,000,000; >\$25,000
- 9) What two things should you always do to minimize scheduling conflicts and running out of probes, as well as ensure that AFM time and probe usage is properly accounted for? What should you do if you ever encounter a problem/issue with the AFM?



10) What are the rules/guidelines regarding reserving AFM time (i.e., maximum number of hours, how far in advance, etc.)? What should you do if you need more AFM time?

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- What if you're running late or can't make your AFM time? At what point do you forfeit your reservation?
- What is the penalty for consistently violating SSL policies? Why do we have these policies?