

**UNIVERSITY OF CALIFORNIA, MERCED**

**SCIF CLEANROOM FACILITY**

**STANDARD OPERATING PROCEDURE (SOP)**

**Profilometer Operation (Stylus Profilometer – DektakXT or Equivalent)**

**Location: SE1: 153**

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## **1. PURPOSE**

To provide a standardized and safe procedure for measuring thin film thickness, step height, and surface roughness using a stylus profilometer while maintaining cleanroom standards.

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## **2. SCOPE**

Applicable to all trained users performing surface profiling measurements on wafers, thin films, and microfabricated structures.

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## **3. RESPONSIBILITIES**

- **Users:** Follow SOP and ensure correct measurement parameters
  - **Core Staff:** Maintain system and provide training
  - **Facility:** Ensure system functionality and compliance
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## **4. SYSTEM OVERVIEW**

The stylus profilometer (e.g., DektakXT) measures surface topography by mechanically scanning a diamond stylus across a sample surface.

Capabilities:

- Step height measurement (nm to  $\mu\text{m}$  range)
  - Thin film thickness measurement
  - Surface roughness analysis
  - 2D profile scanning
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## **5. REQUIRED SYSTEM CONDITIONS**

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## 5.1 Utilities

- AC Power (system + computer)
- Profilometer control software operational
- Vibration-free environment

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## 5.2 System Conditions

- Stylus tip intact and clean
- Stage clean and free of debris
- System calibrated (if required)
- No sample contamination

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## 6. SAFETY REQUIREMENTS

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### 6.1 Hazards

- Stylus tip damage (very delicate)
- Sample damage due to excessive force
- Mechanical stage movement

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### 6.2 PPE

- Cleanroom gloves
- Safety glasses
- Lab coat

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### 6.3 Critical Safety Rules

- Never touch stylus tip
  - Avoid excessive force on samples
  - Do not scan soft or contaminated surfaces without approval
  - Ensure proper sample mounting
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## **7. CLEANROOM PROTOCOL**

- Handle samples with tweezers only
  - Ensure samples are clean and particle-free
  - Do not place contaminated samples on stage
  - Use cleanroom wipes if needed
  - Avoid particle generation near system
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## **8. DETAILED OPERATION PROCEDURE**

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### **STEP 1: SYSTEM PRE-CHECK**

- Verify:
    - o System powered ON
    - o Software running
    - o Stylus condition OK
    - o Stage clean
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### **STEP 2: LOAD SAMPLE**

- Place sample on stage
  - Ensure flat and stable positioning
  - Secure sample if necessary
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### **STEP 3: SETUP MEASUREMENT**

- Select scan length
  - Set stylus force (typically 1–5 mg)
  - Set scan speed
  - Define measurement range
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### **STEP 4: ALIGN STYLUS**

- Use camera (if available)
- Position stylus above region of interest
- Lower stylus carefully

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### **STEP 5: RUN SCAN**

- Start scan
- Monitor stylus movement
- Ensure smooth scan without jumps

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### **STEP 6: DATA ACQUISITION**

- Observe profile data
- Identify step height or features
- Apply leveling or baseline correction if needed

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### **STEP 7: SAVE DATA**

- Save measurement file
- Export data (CSV/image) if required
- Record in logbook

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### **STEP 8: REMOVE SAMPLE**

- Raise stylus
- Remove sample carefully
- Clean stage if needed

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### **STEP 9: SHUTDOWN**

- Close software
- Leave system in standby mode

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## **9. TROUBLESHOOTING GUIDE**

<b>Issue</b>	<b>Cause</b>	<b>Action</b>
No signal	Stylus not contacting surface	Adjust height

<b>Issue</b>	<b>Cause</b>	<b>Action</b>
Noisy data	Vibration or contamination	Clean sample
Stylus jump	Surface too rough	Reduce speed
Incorrect height	Calibration issue	Recalibrate
Scratched sample	Excess force	Reduce force

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## **10. CRITICAL DOs & DON'Ts**

### **DO**

- Use appropriate stylus force
- Ensure clean samples
- Calibrate when needed
- Monitor scan in real time

### **DON'T**

- Touch stylus tip
  - Scan soft materials at high force
  - Use contaminated samples
  - Leave stylus in contact unattended
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## **11. CONTAMINATION CONTROL**

- Keep stage clean
  - Avoid particles and residues
  - Clean samples before measurement
  - Use lint-free wipes only
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## **12. WASTE HANDLING**

- Dispose wipes per cleanroom protocol
  - Follow SCIF waste procedures
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### **13. EMERGENCY PROCEDURES**

- Stylus crash → Stop immediately
  - System error → Abort scan
  - Mechanical issue → Notify staff
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### **14. TRAINING COVERAGE**

Users are trained on:

- Stylus profilometry principles
  - Measurement setup
  - Data interpretation
  - Equipment safety
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### **15. ACKNOWLEDGMENT & APPROVAL**

Director Name: \_\_\_\_\_

Director Signature: \_\_\_\_\_

Date: \_\_\_\_\_

User Name: \_\_\_\_\_

User Signature: \_\_\_\_\_

Date: \_\_\_\_\_