

**UNIVERSITY OF CALIFORNIA, MERCED**  
**SCIF CLEANROOM FACILITY**  
**STANDARD OPERATING PROCEDURE (SOP)**  
**Profilometer Operation (DektakPro Stylus Profilometer)**  
**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 the DektakPro stylus profilometer, ensuring accurate and reproducible results.

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## **2. SCOPE**

Applicable to all trained users performing surface profilometry measurements on wafers, thin films, and microfabricated samples using the DektakPro system.

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## **3. RESPONSIBILITIES**

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

The DektakPro stylus profilometer uses a diamond-tipped stylus to scan across a sample surface and measure vertical displacement.

Capabilities:

- Step height measurement (nm– $\mu\text{m}$  range)
  - Thin film thickness measurement
  - Surface roughness (Ra, RMS)
  - Profile analysis of patterned structures
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## **5. REQUIRED SYSTEM CONDITIONS**

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## **5.1 Utilities**

- AC power (instrument and computer)
- Profilometer software operational
- Stable, vibration-free setup

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## **5.2 System Conditions**

- Stylus tip intact (no damage or wear)
- Stage clean and debris-free
- System calibrated (when required)
- Sample clean and dry

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## **6. SAFETY REQUIREMENTS**

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### **6.1 Hazards**

- Fragile stylus tip (risk of damage)
- Sample scratching due to excessive force
- Moving mechanical stage

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### **6.2 PPE**

- Cleanroom gloves
- Safety glasses
- Lab coat

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### **6.3 Critical Safety Rules**

- Never touch or manually move stylus
  - Do not exceed recommended stylus force
  - Avoid scanning soft or sticky materials
  - Ensure sample is flat and secure
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## **7. CLEANROOM PROTOCOL**

- Handle samples using tweezers only
  - Ensure samples are particle-free
  - Avoid tape residue or contaminants
  - Keep stage clean at all times
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## **8. DETAILED OPERATION PROCEDURE**

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

- Verify:
    - o System powered ON
    - o Software launched
    - o Stylus in safe (raised) position
    - o Stage clean
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### **STEP 2: LOAD SAMPLE**

- Place sample on stage
  - Ensure flat, stable positioning
  - Align region of interest
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### **STEP 3: SELECT MEASUREMENT METHOD**

- Open measurement software
  - Choose scan type (step height / roughness)
  - Load or create method
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### **STEP 4: SET PARAMETERS**

- Stylus force: ~1–5 mg
- Scan length: based on feature size
- Scan speed: low for high resolution
- Vertical range: appropriate for expected height

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### **STEP 5: ALIGN STYLUS**

- Use camera/optics
- Position stylus over scan start point
- Lower stylus gently

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### **STEP 6: RUN SCAN**

- Start scan
- Monitor movement and signal
- Ensure no sudden jumps or crashes

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### **STEP 7: DATA ANALYSIS**

- Apply leveling/tilt correction
- Measure step height
- Calculate roughness (Ra, RMS)

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### **STEP 8: SAVE DATA**

- Save raw data file
- Export graph or CSV if needed
- Record measurement in logbook

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### **STEP 9: REMOVE SAMPLE**

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

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### **STEP 10: SHUTDOWN**

- Return stylus to safe position
- Close software
- Leave system in standby

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## 9. TROUBLESHOOTING GUIDE

<b>Issue</b>	<b>Cause</b>	<b>Action</b>
No signal	Stylus not contacting	Adjust height
Noisy profile	Vibration / dirty sample	Clean sample
Stylus jump	Rough feature	Reduce speed
Incorrect height	Calibration issue	Recalibrate
Sample damage	Excess force	Reduce force

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## 10. CRITICAL DOs & DON'Ts

### DO

- Use low stylus force
- Ensure clean sample
- Monitor scan during operation
- Calibrate regularly

### DON'T

- Touch stylus tip
  - Scan soft polymers at high force
  - Use dirty or taped samples
  - Leave stylus on surface unattended
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## 11. CONTAMINATION CONTROL

- Maintain clean stage surface
  - 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
  - Software/system error → Abort scan
  - Mechanical failure → Notify staff
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### **14. TRAINING COVERAGE**

Users are trained on:

- Profilometry principles
  - Method setup and parameter selection
  - Data interpretation
  - Equipment safety
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### **15. ACKNOWLEDGMENT & APPROVAL**

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

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

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

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

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

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