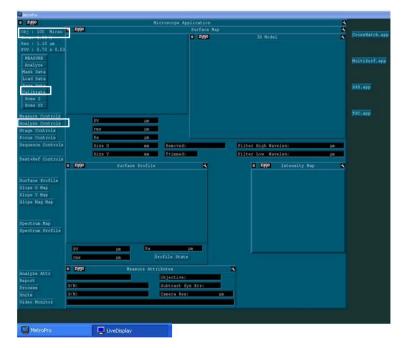
# ZYGO OPTICAL INTERFEROMETER SOP



Revised April 2020

#### START UP

- 1. Login to the tool from your FOM account.
- 2. Open MetroPro software.
- **3.** Click on Mirco7k.app to open measurement application.
- 4. Click on Live display window in the task bar.
- 5. Make sure the objective head is all the way up and place your sample on the stage.
- 6. Choose the right objective by clicking on OBJ located on the left top corner of the Micro7k application window. Be sure to raise the height of the objectives before switching magnification, otherwise you may break an objective!
- 7. Setting Z-stop: If Z-stop is not red and blinking, press on Z-stop once. Z-stop will start flashing. Move the objective down towards the sample (Z speed Fast, Medium, and Slow) and when you see the sample in the live display click on Z-stop. Z-stop will turn solid Red from flashing Red.



8. Look at the live display and approach the sample using the "Z rotation" on the joystick and alternatively press F5 to adjust the light intensity when the live display turns red (saturation). Repeat this process until the sample comes into Focus. Once the sample comes into focus, fringes (alternatively bright and dark) will usually be seen on the live display.

#### FRINGES ADJUSTMENT

- 2 to 3 fringes on the screen should give the best results. For adjusting the number of fringes and the alignment of the fringes, press **"P-R"** (Pitch and Roll) on the joy stick.
- In P-R setting, X and Y movement can be used to move the fringes to vertical or horizontal position on the display.
- Moving the fringes in either P (X) or R(Y) will change the spacing of the fringes. Continue moving the joystick in this direction until you see 2 or 3 fringes on the screen. Also, Z rotation will help in moving the fringes to the center of the field of view if needed.
- Make sure to eliminate saturation in all the fringes, even those outside the field of view by pressing F5 to auto-adjust the intensity.
- **9.** Now press **F4** for light level and intensity adjustments. A new window opens with the following settings: Light level, peak intensity and saturation. Maintain the peak intensity between 95-96% and saturation to green. Following are the shortcut buttons for intensity and saturation adjustments.
  - \* increase peak intensity in large steps
  - + increase peak intensity in small steps
  - / decrease peak intensity in large steps
  - decrease peak intensity in small steps
- **10.** Go to **Measure controls** on the main window. Set the desired scan length and image zoom in scan controls.

B Zygo Measurement Cont	rols 🚽
Comment:	
Part Number:	Min Mod (%): 15
Serial Number:	Min Area Size: 7
Instrument: NewView7000 Id 0 SN 073180	
Acquisition Mode: Scan	
Scan Type: Bipolar	Image Zoom: 1X
Camera Mode: 640x480 210 Hz	Remove Fringes: On
Subtract Sys Err: Off	Number of Averages: 0
Sys Err File: SysErr.dat	FDA Noise Threshold: 10
Phase Controls Scan Con	trols
AGC: Off Scan Ler	ngth: 5 um bipolar (1 sec)
Phase Res: High Extended	l Scan Length: 1000 µm
Connection Order: Location FDA Res:	High 2G
Discon Action: Filter	

- **11.** Hit **F1** to make a measurement.
- **12.** Filled plot, surface profile, intensity map, and 3D model of the sample are seen on the window.

MetroPro						
8 2990			Microscope Ap			4
Obj : 10X Mirau	8 ZY90			Surface Map		4
Zoom: 1.00 X Res : 1.10 µm FOV : 0.70 x 0.55			+7.89768	a 2990	3D Model	\$
MRABURE Analyze Mask Data Load Data Save Data Calibrate Home 2 Home XY	<u>~</u>	0-	μm -2.24239		•	
Measure Controls	Distance in the second					
Analyze Controls	PV	10.140 µm	-			
Stage Controls	INS	1.847 µm	-			
Focus Controls	Ra	1.133 µm				
Sequence Controls			Removed:	Plane	Filter High Wavelen:	µя
Test+Ref Controls	Bize	Y 0.53 nm	Trinmed:	0	Filter Low Wavelen:	un
	0 2990			4	a 2990 Intensity Map	4
Eurface Profile Elope X Map Elope Y Map Elope Mag Map	+8.00000 +5.50000 () 3.00000 10 10 2-0.50000		X Y Copy to	opizeller Obits Cispbard * Control +		
Spectrum Map Spectrum Profile	-2.00000	0.100 0.200 Distance (mm)				
	8V 8.65 ms 3.39		3.134 Profile State	in and a second		
Analyze Attr	a zygo				4	
Report	Wed Feb 17 15:	48:07 2010	Objective:	10X Mirau		
Process	P/N:		Subtract S	ys Err: Off		
Units	B/N:		Camera Res	: 1.096 µa		
Mideo Monitor				and the second		

- **13.** On the filled plot, place the cursors where desired to measure the heights. This gives the average **PV**, **rms** and **Ra** value of the filled plot.
- **14.** Surface profile: Right click on surface profile and go to **show controller** which opens profile plot window. Click on the **Inspector** icon in **profile plot** twice to see both the cursors. The surface profile allows leveling and gives the PV, rms and Ra at a particular location on the filled plot.

					🛚 Pro	fil	e Plot	:
⊠ Zygo	Surface	Profile			yMax:			μm
+8.00000 -					yMin:			μm
					xMax:			mm
+5.50000					xMin:			mm
 					yDst: -	0.1	27366	μm
5. 50000					xDst: 0.3377			mm
= +0.50000					angle: -	0.0	2161	degs
-2.00000	*				Update	;	Inspe	ctor 2
	****	••••••		<del></del>	Reset		Pro	f PV
0.000 0.100 0.200 0.300 Distance (mm)				Set		Trace		
PV 8.652	2 µm	Ra	3.134	μm			Spli	ne BG
rms 3.390	) µm	Pr	ofile Stat	:8	Level		Axes0	tloff

#### SAVING DATA

• Click on **Save data** to save all the data. By saving the data as a **.dat** file you can use MetroPro software to modify your data at a later point of time.

**NOTE:** MetroPro 8.3.2 can be downloaded from http://www.zygo.com/?sup=/resource/software.cgi

• For saving individual plots, right click on Zygo icon located at the left-top corner of each window and save as **.tiff** or **.bmp** file.

#### SHUTTING DOWN

- **15.** Move the head all the way UP. Unload your samples and close MetroPro.
- **16.** Log out from the tool I your FOM account.

## ADDITIONAL NOTES

## a. Z-Stop

- Red and flashing, Z-stop is not set and objective might crash onto the sample.
- Solid Red, Z-stop is set.
- Green and you hear a beep sound when the objective is approaching the sample; you reached your set working distance. If the sample is still not visible either move the objective in the upward direction or set a new Z-stop.
- **b.** When the objective is approaching the sample, it is always advisable to change the Z-speed to medium or slow.
- c. Hit F5 for auto light adjustment when the display turns red (saturation) during any step.
- **d.** Make sure to eliminate saturation in all the fringes, even those outside the field of view. For this move the stage in X-Y direction.
- e. Measurement controls:
  - After making a measurement, if you notice a lot of data dropout in the filled plot, go to measurement controls and lower the **min mod %** (do not go below 5%) and click analyze on the main window.
  - Add comments in measurement control window if desired.
  - Click on image zoom to change the magnification if desired (multipliers available 0.5X, 1X, 2X).
- f. Analyze controls (see figure below):
  - If you are trying to determine the roughness of a sample and you see large peaks which are modifying your data, go to analyze controls and use a filter as desired or turn ON Remove spikes and specify the height of the spikes, then click analyze on the main window.
  - **Data fill option** can be turned **ON** if you have a data drop out which cannot be fixed using Min Mod%. But, be sure you are not changing your real data or getting false data.

8 Zygo	Surface	e Map Controls	4
Remove: Plane		Min Area Size: 0	
Sphere Radius: 0 µ	m		
		Remove Spikes: Off	
Trim: 0		Spike Height(xRMS): 2.50	
Trim Mode: All			
Data Fill: Off			
Data Fill Max: 25			
Filter: Off			
Filter Type: Average			
Filter Window Size: 3			
Filter Trim: Off			
		Filter Low Wavelen:	
Filter Low Wavelen:	μm		μm
Filter High Wavelen:	μm	Filter High Wavelen:	μm
Filter Low Freg:	1/mm (	Filter Low Freq:	1/mm
· ·			
Filter High Freq:	1/mm	Filter High Freq:	1/mm

# Click on Films7k.app to open measurement application if you have multiple transparent layers on your sample

- 1. Go to measure control and generate Sys Char File
  - Choose a surface without multi-layer films for this measurement. (e.g. Plain silicon wafer)
  - Desired file name can be typed in at Sys Char file : @
  - Then click on Generate Sys Char File with 5-6 fringes on the live display.
  - Once the system char. file is saved, you can click on select **Sys Char** file and select your file the next time you want to make a measurement.
- 2. Go to the area of interest and repeat the process explained in Micro7k.app
- 3. Also, thickness of the films can be measured using film controls on measure control window

a 2980	Nicroscope Films					
10X Mirau	a 2990	-				
		•	CrossHatch.app			
MEASURE	s Z990 Measurement	Controls				
Analyze Mask Data	Connent:					
Load Data	Part Number:	Min Mod (%): 15.00				
Save Data	Serial Number:	Min Area Size: 7				
Load SWLI	BULLAL MURCULI					
Save SWLI	Instrument: NewView7000 Id 0 SN 073180	Image Zoom: 1X		\$PS.app	StepHt.app	
Calibrate	Acquisition Mode: Scan	Remove Fringes: Off				
Home 2	Camera Mode: 640x480 210 Hz	Number of Averages: 0				
Home XY		Number of Averages: 0			TrimPTR.app	
	Scan Direction: Downward				TrimPTR.app	Dynamic.app
Analyze Controls	Scan Length: 5 um bipolar (1 sec)					
Stage Controls						
Focus Controls	Phase Controls					
Sequence Controls	AGC: Off	FDA Res: Films				
sequence concrors	Phase Res: High	Discr Mode: RAM				
Surface Profile	Connection Order: Location					
	Discon Action: Filter					
Thickness Profile	Films Controls					
Thickness Control	Films Mode: Top Surface F:	llm Min Mod (%): 5.000000				
	Film Min Thickness: 0 µm B	otton/Top Reflectivity Ratio Filter: Off				
Sec Surf Profile	Film Max Thickness: 0 µm N	in Reflectivity Ratio: 0				
Sec Surf Profile Sec Surf Controls		ax Reflectivity Ratio: 1.000				
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Test+Ref Controls	System Characterization					
Point Trace	Sys Cher File: 0					
Films Intensity	by the first of					
Measure Attr	Generate Sys Char File Select Sys	Char File Select Default Sys Char File				
Analyze Attr	Display Fixel trace Analyze Films					
Report Process						
Units						
Video Monitor						