

FSM 8800 Film Stress Measurement Machine

Standard Operating Procedure

4D LABS Confidential

Revision: 1.0 — Last Updated: Dec. 18/2009, Revised by Nathanael Sieb

Overview

This document will provide a detailed operation procedure of the FSM Thin Film Stress Meter. Formal Training is required for all users prior to using the system.

Revision History

#	Revised by:	Date	Modification
1	Nathanael Sieb	December 18, 2009	Initial release
2			
3			
4			
5			

Document No. 4DSOP000X

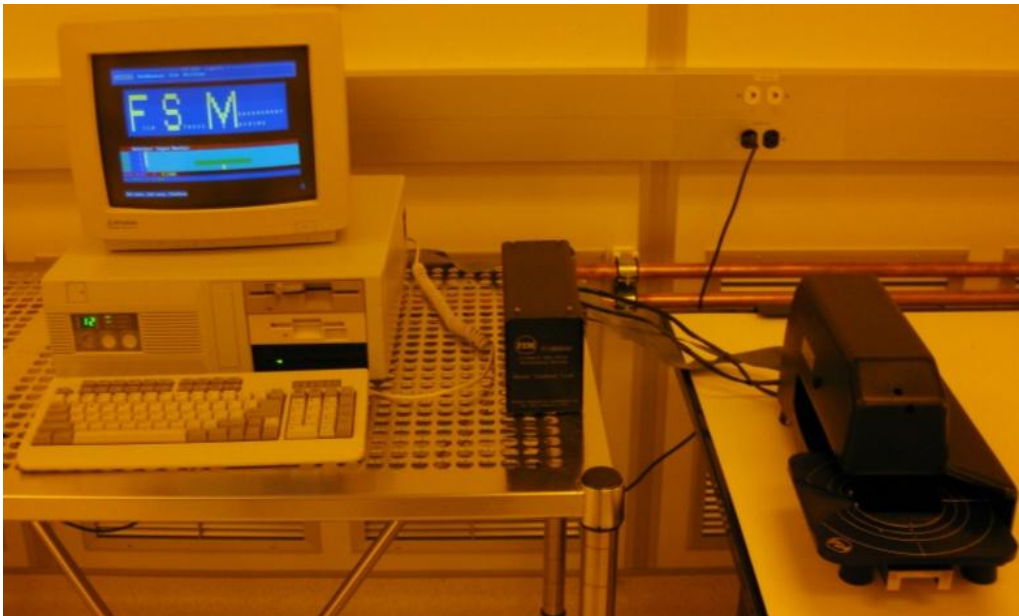


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General Information

The FSM 8800 Film Stress Measurement Machine is used to measure the stress in thin films. It does so by using a laser and a scanning stage to measure the surface profile of a wafer along a line before and after the film is deposited. The software will calculate the curvature of the surface before and after deposition and subsequently the stress in the film, using the Stoney equation (see Section 1.1 of the FSM 8800 manual). The software assumes that the substrate is a silicon wafer. Other substrates may be used but the stress value given by the software must then be multiplied by the ratio of Young's modulus of the substrate to that of silicon.



Operation

1. Measuring a blank wafer

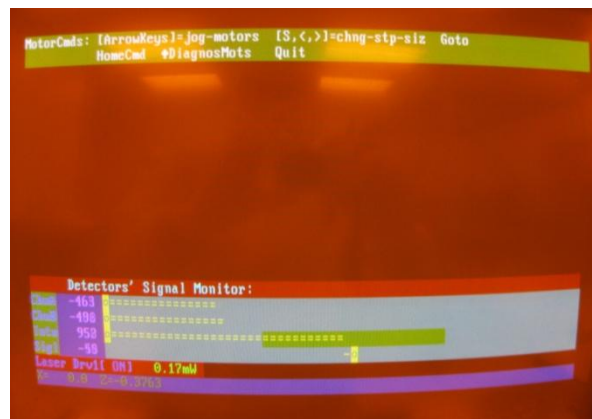
1. Turn on the system by turning on the power bar located to the left of the computer.
2. Press [n] when asked "Starting FSM, do you want to skip DIAGNOSTICS and skip HOMING?".
3. Exit to DOS by going to Utilities → DOS.



4. Change to your personal directory. (e.g., "cd 4dlabs")
5. Type "exit" to return to the FSM program.
6. Load blank wafer, with the primary flat to the left, against all three alignment pins. Be sure to use the alignment pin locations for the proper wafer size. Alignment pin holes are only available for standard wafers 3" and larger. For smaller wafers, centre the wafer as well as you can. **Note the wafer position and orientation because you will need to use the same position and orientation for the second scan after the film has been deposited.**

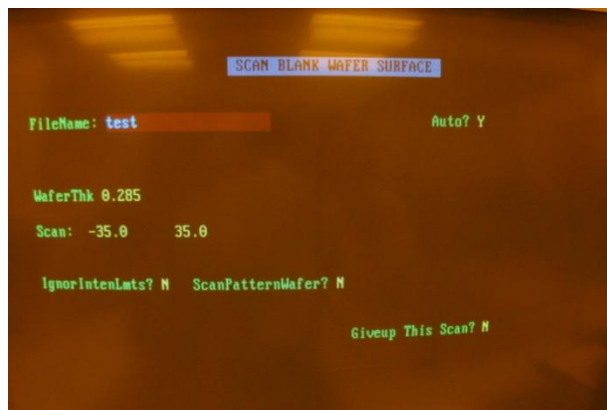


7. Go to Utilities → Motor.
8. In the motor screen, press 'g' → '0' → [Enter]. This step will move the stage under the laser. Press 'q' to quit this screen.



9. Check the detector signal monitors on the screen. The "Intr" should be in the green region and the "Sigl" should be close to 0. If "Intr" is not in the green region, try adjusting the laser intensity knob on the left of the instrument. If "Sigl" is not close to zero, i.e., if many "+" or "-" signs are displayed, adjust the detector mirror using the **lower** set screw until the "+" and "-" signs disappear. Only a slight adjustment should be required so proceed cautiously. *There is also **upper** set screw, which is covered by a piece of red tape – do not adjust this screw.* If this step still does not work, consult a technician.

- Press the [F1] key for the 1st Scan. Enter the FileName (max 8 characters), WaferThk (in mm), and Scan coordinates (in mm) *e.g.*, -35 to 35 for 4-inch wafers. WaferThk is required for the stress calculation. Additional options are described in the FSM 8800 manual.



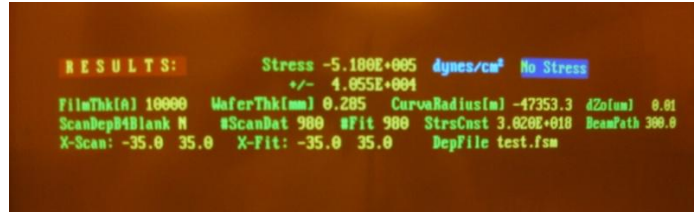
- Press the [Esc] key and the scan will begin.
- After your measurements are done, remove your wafer and shut down the system by turning off the power bar to the left of the computer.

2. Measuring a wafer after deposition

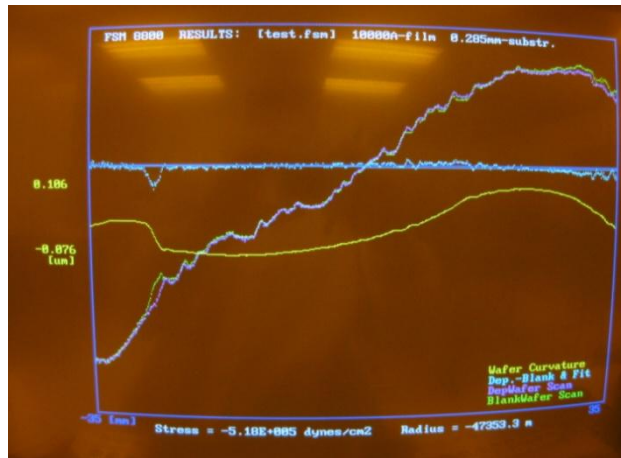
- Deposit the film on the surface.
- Determine the thickness of the film. You will need this for the stress calculation.
- Repeat steps 1-9, using the wafer with the film deposited instead of a blank wafer. **The wafer must be in the same position and orientation as the blank wafer.**
- Press [F5] for the 2nd Scan. Enter the FileName (must be same as blank wafer), FilmThk (in Angstroms), and WaferThk (in mm).



17. Press the [Esc] key and the scan will begin.
18. At the end of the scan the Results are displayed.



19. Press any key to exit this screen.
20. From the main screen, press [F8] to redisplay the results or press [F6] to display the plotted data.



21. Press any key to exit from this screen.

3. Data analysis

22. All data files can be opened in a text editor or in Excel. Data must be transferred from the computer using the 3.5" floppy disks.
23. Exit to DOS by going to Utilities → DOS. You should be in your own directory.
24. Copy your data files to a floppy disk with the command: copy *filename.ext* a:
25. After your measurements are done, remove your wafer and shut down the system by turning off the power bar to the left of the computer.



References and Files

FSM 8800 Manual and training notes.

Contact Information

Questions or comments in regard to this document should be directed towards Nathanael Sieb (sieb@4dlabs.ca) in 4D LABS at Simon Fraser University, Burnaby, BC, Canada.