

## FR-Scanner: Automated, Ultra-fast & Accurate mapping of thickness and optical properties of films and coatings

### Introduction

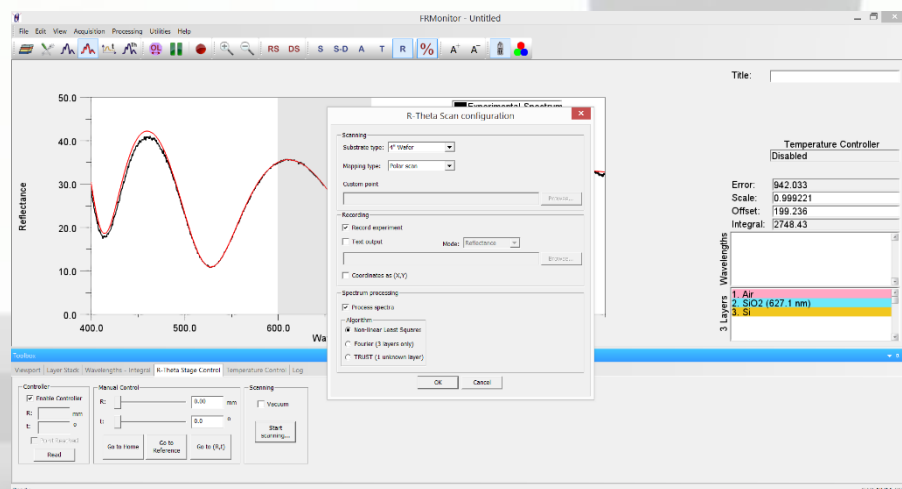
FR-Scanner is a compact bench-top tool suitable for the automatic characterization through reflectance measurements of films and coatings on large substrates.

FR-Scanner is the ideal tool for the fast and accurate mapping of films in terms of thickness, refractive index, uniformity, color etc. Wafers of any diameter or of any shape can be accommodated on the vacuum chuck.

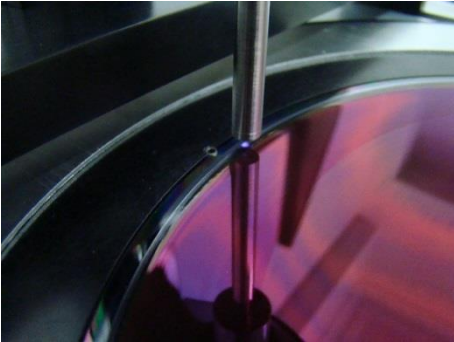
Typical scanning of an 8" Si wafer at 625 points take no more than 3min in FR-Scanner-E configuration and less than 60 sec in FR-Scanner-F configuration.

The optical head of the scanner follows a unique design and accommodate the spectrometer, a hybrid light source and all other optical parts. In this design there are not any bending or moving fibers and therefore excellent performance in terms of accuracy, reproducibility and long term stability is guaranteed. Furthermore the special design of the light source offer extreme long life, 10000h.

Thanks to its robust & unique optical and mechanical design, FR-Scanner scan the samples under test in very high speed by rotating the stage and by moving linearly the optical head on top (polar scanning). Simulated X-Y scanning is also available as standard. This way accurate reflectance data with high repeatability are recorded in a very short time making FR-Scanner the ideal tool for the at-line and on-line characterization of wafers or other substrates (e.g. PV panels) at processing facilities.

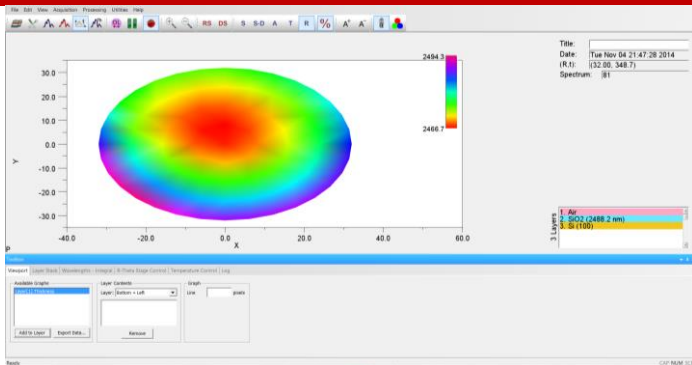


FR-Monitor software, control the FR-Scanner, performs data acquisition, and film thickness-optical constants calculations. A database with >300 widely used materials is included and can easily be expanded by the user. The system is shipped ready for measurements and it can be easily used by anyone with basic computer skills without deep knowledge of optics. The only additional part needed is a PC running Windows XP/Vista/7/8/10.

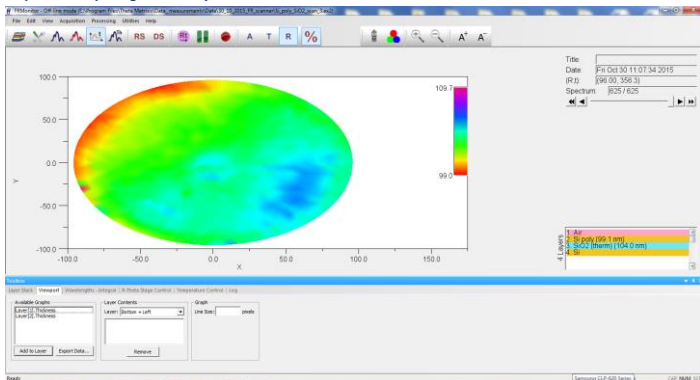


FR-Monitor includes the **White Light Reflectance Spectroscopy (WLRs)** algorithm (ThetaMetrisis™) for accurate calculation of film thickness and optical constants (n & k) of free-standing and supported (on transparent or partially/fully reflective substrates) stack of (<6) films. Furthermore FR-Monitor include several very useful features like experiment recording with the ability for later data analysis – re-processing, and Video recording of experiments.

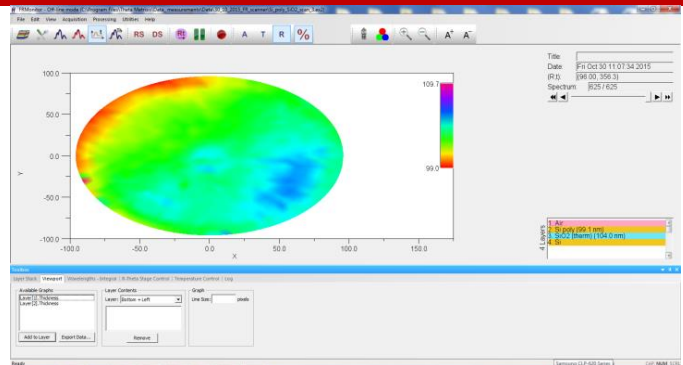
## Results



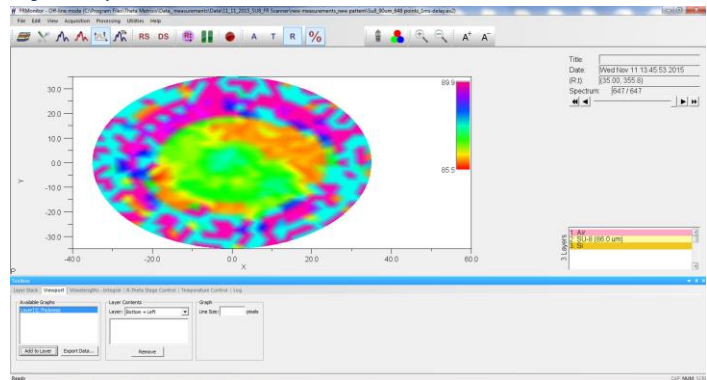
Film thickness mapping of a thick annealed silicon dioxide (TEOS) layer deposited on a 4inch Si wafer



Film thickness mapping of a polycrystalline silicon layer deposited on a 8 inch Si wafer



Film thickness mapping of a polycrystalline silicon layer deposited on a 8 inch Si wafer



SU-8 film thickness mapping on a 3inch Si wafer

## Applications

Characterization of any smooth transparent or semi-transparent layer or stack of layers (thin metallic layers are included). The materials database include more than 300 materials

Semiconductor Manufacturing (photoresists, dielectrics, poly-Si, a-Si, DLC, photonic multilayer structures, ...)	MEMS and MOEMS
PV Industry ( )	Membranes
Liquid Crystal Displays	Optical Coatings
Optical coating	
Polymers	
Hardcoat, Anodization, Metal parts process	

## Specifications

	FR-Scanner-E VIS/NIR	FR-Scanner-F VIS/NIR	FR-Scanner-F VIS
Sample size	Wafers: 2in-3in-4in-6in-8in. Samples of irregular shape <sup>1</sup>		
Resolution in R	10μm	5μm	5μm
Resolution in Angle	0.2°	0.1°	0.1°
Spot Size	500μm (diameter): area from which the reflectance is acquired		
Minimum Thickness for simultaneous measurement of thickness & refractive index <sup>2</sup>	100nm		
Spectral Range <sup>3</sup>	350nm - 1100nm	350nm - 1100nm	550nm - 900nm
Spectrometer specs	3648 pixels		
Light Source MTBF	10000h		
Thickness Range <sup>4</sup>	20nm-90μm	20nm-90μm	100nm-190μm
Measurement precision <sup>5</sup>	<0.1nm	0.06nm	0.06nm
Measurement stability <sup>6</sup>	<0.1nm	0.06nm	0.06nm
Measurement accuracy <sup>7</sup>	1nm	1nm	1nm
Scanning Speed <sup>8</sup>	200meas/min 5points: 6sec 25points: 15sec	625meas/min 5points: 4sec 25points: 9 sec	625meas/min 5points: 4sec 25points: 9 sec
Computer Interface	USB 2.0 / USB 3.0. Any PC running Windows 7/8/10 64bit		
Dimensions <sup>9</sup>	485W x 457L x 500H mm		
Power Requirements	110V/230V, 50-60Hz, 300Watts		
Weight	23Kg	40Kg	40Kg
After Sales Support	24/7		

## Accessories

	FR-Scanner-E VIS/NIR	FR-Scanner-F VIS/NIR	FR-Scanner-F VIS
Computer	Touch Panel PC with 19inch screen		
Focusing module	Optical module attached on the reflection probe for 250μm diameter spot size		
Pump	Dry vacuum pump for wafer holding		

Specifications are subject to change without any further notice

<sup>1</sup> The chuck can accommodate samples of arbitrary shape. Stage supporting 300mm and 450mm wafers is also available on request. True X-Y scanning is also possible through custom-made configuration.

<sup>2</sup> Material dependent

<sup>3</sup> Other configurations are possible upon request

<sup>4</sup> The thickness values based on single layer SiO<sub>2</sub> film over Si substrate. For other films/substrates these values may be slightly different.

<sup>5</sup> Average of standard deviation of mean value over 15 days. Sample: 1micron SiO<sub>2</sub> on Si wafer

<sup>6</sup> 2\*Standard-Deviation of daily average over 15 days. Sample: 1micron SiO<sub>2</sub> on Si wafer

<sup>7</sup> Measurements compared with a calibrated spectroscopic ellipsometer

<sup>8</sup> The measurements based on 8" wafer. Higher scanning speed over 1000measurements/min is possible on special request

<sup>9</sup> In FR-Scanner-F the housing based on electrostatically powder painting Steel and 304 Stainless Steel exterior panels