TEA Systems Corporation

Weir PSFM

Wavefront Engineering Tools

Automated Wavefront Engineering Software Suite for Focus Control in the process

Sources of Input

- PSFM and PGM Focus Monitor data.
- ASML FOCAL Data
- CD-sem metrology, Optical Scatterometry, Ellipsometry
- User custom focus-reticle data
- Registration data from focus metrology patterns

Data and Analysis Storage

- Microsoft Excel™ sSpreadsheets and work-books
- Full user access is provided for all raw, calculated and modeled data.

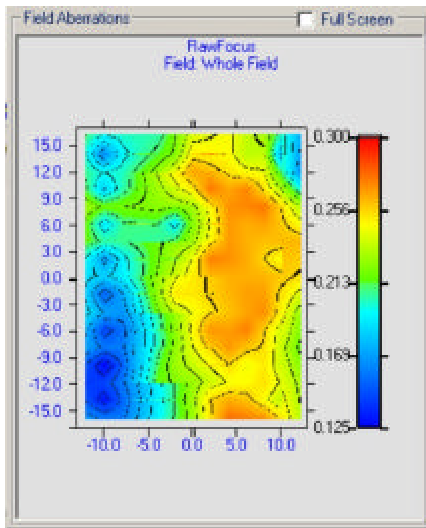
Weir PSFM is a focus calibration, modeling and control software suite for use in semiconductor development as well as process and exposure tool fabrication control. Weir PSFM provides all the tools needed for characterization and control tasks associated with focus analysis in advanced semiconductor fabrication. Use the Weir software suite to measure and monitor:

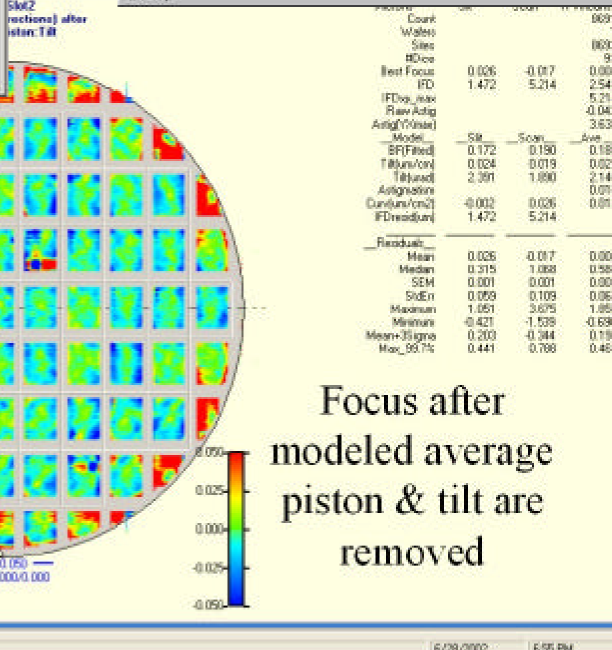
- **Lens and scanner wavefront behavior**
- **Wavefront and lens aberration characterization**
- **Full-field and/or scanner-slit process window characterization.**
- **Wafer and photoresist uniformity**
- **Separate wafer and reticle stage tilt**
- **Reticle-scan stage travel stability**
- **Astigmatism mapping and**
- **Reticle-enhancement element qualification**

Microsoft Excel - focus_monitor193_allfields_Day2.XLS

	A	B	C	D	E	F	G	H	I	J	K
1	Modeled Values: Data Removal,None:RawData: Mean										
2											
3	RowModel:	Wafer	Field	Row (mm)	Focus (um)	FocusSE (um)	Tilt(urad)	TiltSE(urad)	Curv(um/cm2)	CurvSE(um/cm2	IFDresidualsSE(
4	MEAN:	1.0000	15.9568	0.0576	0.1037	0.0404	-1.2683	2.4737	0.0077	0.0211	0.0
5	MAX:	1.0000	31.0000	16.0000	0.1891	0.2452	12.0725	30.8517	0.0982	0.1178	0.2
6	MIN:	1.0000	1.0000	-16.0000	0.0012	0.0004	-12.8700	0.0545	-0.0475	0.0003	0.0
7	RANGE:	0.0000	30.0000	32.0000	0.1879	0.2448	24.9425	30.7972	0.1458	0.1175	0.2
8											
9	RowModel:	Wafer	Field	Row (mm)	Focus (um)	FocusSE (um)	Tilt(urad)	TiltSE(urad)	Curv(um/cm2)	CurvSE(um/cm2	IFDresidualsSE(
10		1.0000	1.0000	-16.0000	0.1178	0.0437	-2.8926	2.3530	0.0236	0.0242	0.0
11		1.0000	1.0000	-12.0000	0.1077	0.0446	-2.8207	2.4011	0.0264	0.0247	0.0
12		1.0000	1.0000	-8.0000	0.1012	0.0153	-0.5637	0.8227	-0.0141	0.0085	0.0
13		1.0000	1.0000	-4.0000	0.0736	0.0272	1.7030	1.4647	0.0006	0.0151	0.0
14		1.0000	1.0000	0.0000	0.1146	0.0184	-0.4120	[illegible]	-0.0017	[illegible]	0.0

Sites / Excluded / Layout / Raw Focus / Aberrations / InterpolateArray





Above:
Weir data and analysis results are stored in open-format spreadsheets.

Left:
Full-Wafer Focus Contour, fixed-focus analysis.
Weir software removed the modeled exposure tool piston and reticle tilt from wafer data to view the wafer aberrations and stage leveling errors.

Upper Left:
Scanner average field with focus showing bearing-pop during exposure.

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PSFM is a trademark of Benchmark Technologies, Inc. FOCAL is a trademark of ASML
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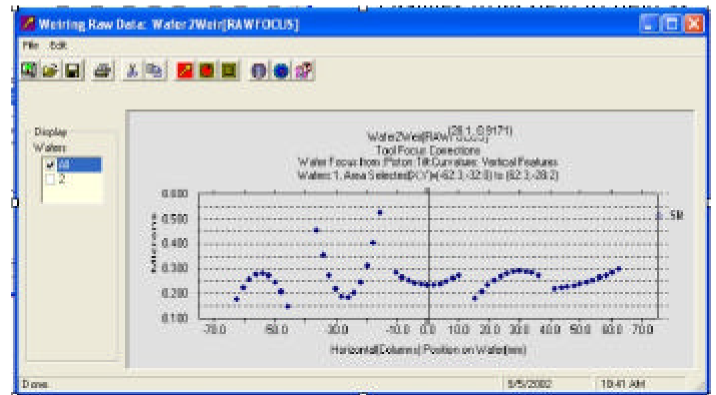
Weir PSFM automatically imports and sorts feature measurements from SEM's, Scatterometry, Electrical Linewidth Metrology (ELM), Optical and X-ray tools. Automated and manual-interactive data culling methods are fully employed. Output can be on paper or binary format with control surface element-outputs to exposure tools and track.

The Interface

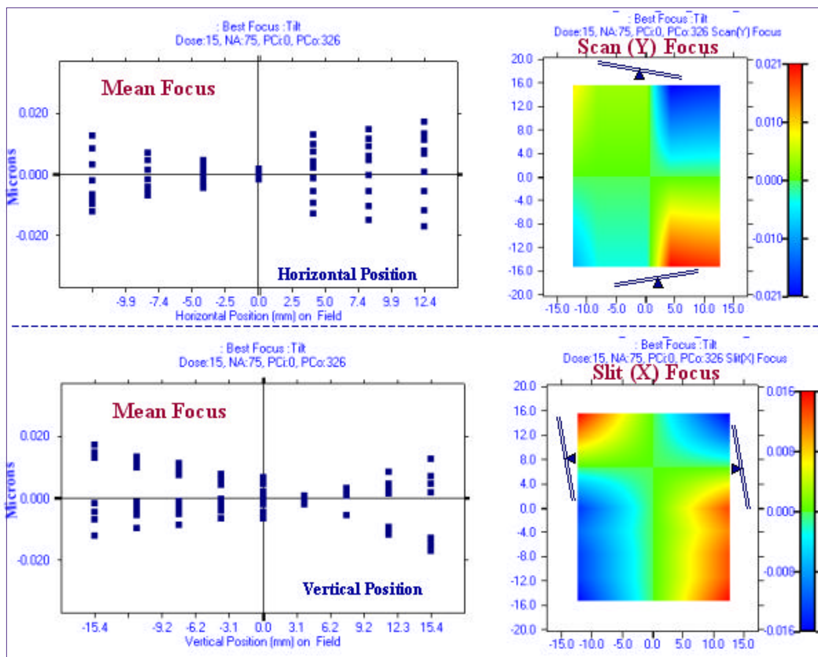
A "Weir" is defined as an "obstruction placed in a stream, diverting the wavefront through a prepared aperture". The Weir PSFM analysis provides tools to optimize and characterize the wavefront and it's aberrations and to optimize wavefront performance.

Data import from any data source is supported using simple windows controls. The system is an "open" tool with data stored and easily accessed for user extended analyses using Microsoft Excel Spreadsheets. Worksheet macros are not used for the analysis but the user can add their own if desired.

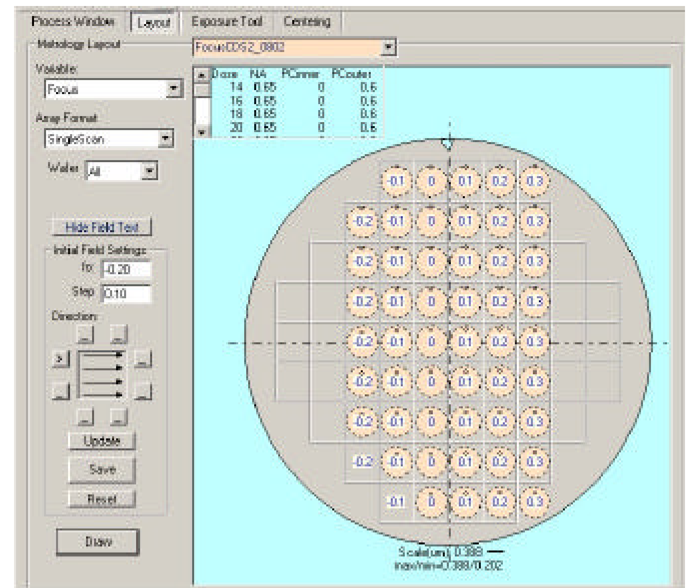
The analysis will automatically determine lens and system aberrations for the stepper and scanner.



Mouse-selected, modeled Intra-Field Deviation of Piston, Tilt (columnar) & Curvature as a function of location in the slit.



Modeled scanner reticle platen tilt for slit & scan.



Weir graphic interface for interactive specification and modification of exposure variables Focus, Dose, Partial Coherence and Scan/Stage direction.

Weir PSFM is a compiled application with a full object oriented, mouse-interactive interface. The software is functional on Windows NT and Windows 2000, XP etc.. Microsoft Excel is required.

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