

Product Overview

Weir PW

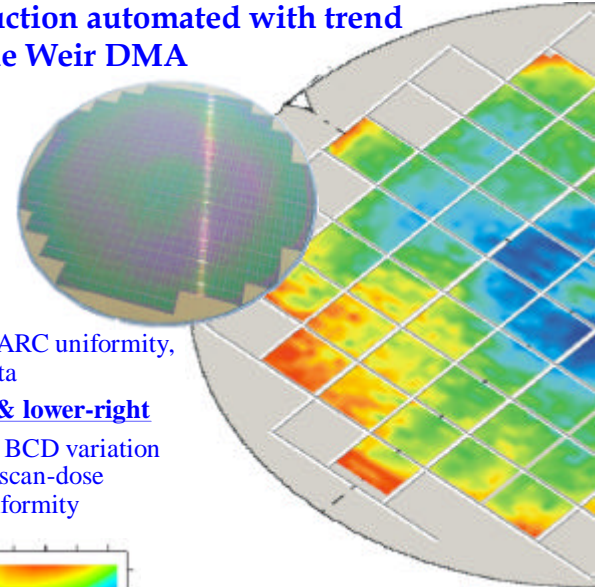
Wavefront Engineering Tools for Semiconductor Lithography

An engineering process modeling workbench for setup, tuning, characterization and control.

Weir PW analyses can be encapsulated into macros and production automated with trend charts using the interactive Weir DM or callable Weir DMA

Applications

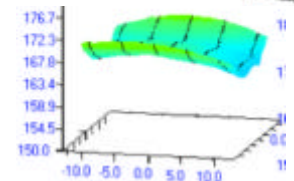
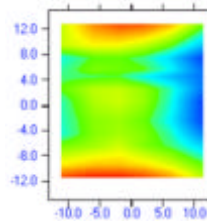
- ▶ **Reticle & Photomask**
 - ▶ Process Control
 - ▶ Data encapsulation for signature transmission
 - ▶ Signature encapsulation
 - ▶ New design qualification
 - ▶ In-process reticle validation
 - ▶ Feature derivation from semiconductor imaging
 - ▶ Signature removal for semiconductor process setup.
 - ▶ Reticle library entry
- ▶ **Simulation Support**
 - ▶ Results feedback and verification
 - ▶ Profile validation and optimization
 - ▶ Process tolerance derivation for Design for Manufacture
 - ▶ MEF (Mask Error Factor); Full-field, feature specific derivation
 - ▶ Lot, wafer, reticle, field, lens and scan signature derivation
 - ▶ Process window extrapolation
 - ▶ Feature response confirmation
 - ▶ Constants derivation
 - ▶ OPC, etch and dose bias signatures
- ▶ **Characterization & Optimization**
 - ▶ Focus and dose signature mapping
 - ▶ Reticle stage direction sensitivity mapping
 - ▶ Reticle bow mapping
 - ▶ Reticle Enhancement Technique (RET) results
 - ▶ Reticle feature derivation from wafer images
 - ▶ Optical Proximity Correction (OPC) tuning
 - ▶ Hot-plate setup
 - ▶ IsoFocal response plots



Right: TARC uniformity, raw data

Bottom & lower-right

Modeled BCD variation due to scan-dose nonuniformity



▶ Setup

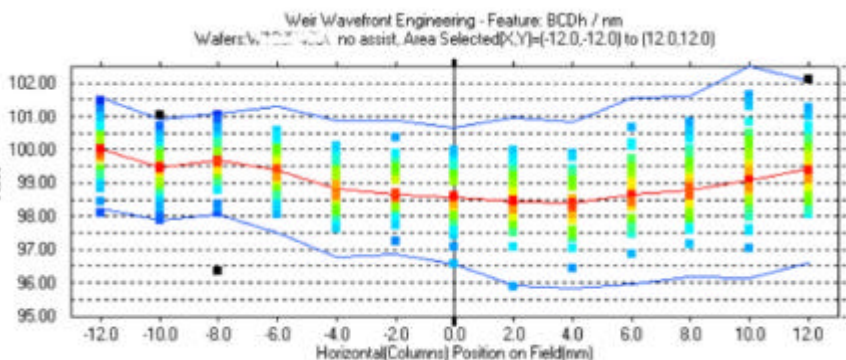
- ▶ Exposure tool stage, wafer-leveling, scan direction, lens slit performance on profiles,
- ▶ Process setup; multi-feature & film
- ▶ Exposure tool specific, full-field process windows
- ▶ Reticle and wafer signature removal
- ▶ MEF uniformity and stability
- ▶ Hot plate setup and thermal correlation.

▶ Control

- ▶ Focus Uniformity
- ▶ Best Focus derivation
- ▶ Depth-of-Focus uniformity
- ▶ Signature perturbations
- ▶ Lens perturbations
- ▶ Wafer, stage and film uniformity

Yield Analysis

- ▶ Reticle performance evaluation
- ▶ Reticle Enhancement Technique (RET) optimization
- ▶ Feature and film profile mapping
- ▶ Deposition, etch and film uniformity modeling
- ▶ Exposure; source and uniformity mapping
- ▶ Film uniformity mapping
- ▶ Performance and process daily monitor



Population Density Plot, similar to a Box-Plot, showing BCD lens-slit contributed error.

TEA Systems

65 Schlossburg St.
Alburtis, PA 18011

TEL: (01) 610 - 682 - 4146

Email: Info@TEAsystems.com

Data Input & Storage

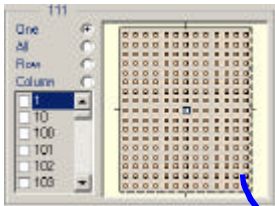
- ▶ Any film or feature metrology or response data
- ▶ Drag & Drop file loading
- ▶ Focus Exposure Matrix (FEM) spreadsheets
- ▶ CD-sem, overlay, scatterometry, simulation output etc
- ▶ Custom reticle data from any source or simulation

Storage using

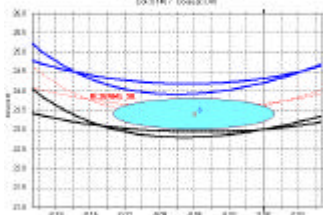
- ▶ Microsoft Excel[™] Spreadsheets and workbooks are used for data and report storage. Results can be easily incorporated into other applications or into the user's own suite of Excel programs.
- ▶ Open system; access to all raw, calculated and modeled data.

Weir PW is an engineering tool for process and equipment engineers. Part of the Weir Engineering Software Suite, Weir PSFM and Weir PW provide complete and comprehensive tools for control of the lithographic tool and process environment.

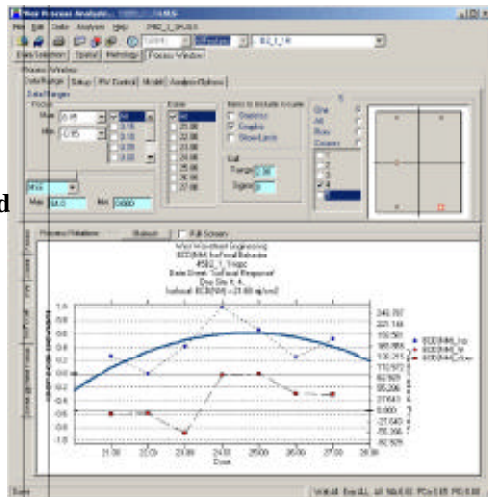
Graphics



Multi-site/feature process window analyses



- ▶ 1D & 2D vector plots
- ▶ Contour
- ▶ 3D Surface
- ▶ Modeled spatial variables
- ▶ Residuals, fitted and "what-if"?
- ▶ Multiple wafer and field models
- ▶ Precision
- ▶ Isofocal
- ▶ Best-Focus
- ▶ Dose at Best-Focus
- ▶ Feature vs Focus
- ▶ Feature vs Dose
- ▶ Process Windows
- ▶ Depth-of-Focus vs EL%
- ▶ Full-field depth-of-focus
- ▶ XY plots
- ▶ Addition of fitted curves
- ▶ Histograms
- ▶ Box-Plots



IsoFocal & Aberration Analysis

- ▶ Population-density plots
- ▶ Covariance plots
- ▶ Film uniformity
- ▶ Bake-plate correlation

Right: Weir PW experiment layout screen

Bottom: Ellipsometer metrology precision calculation of error budget.

Features

Data import is set up using a simple windows-graphic control. The system is an "open" tool with data stored and easily accessed at any point of the analysis using Microsoft Excel Spreadsheets. Worksheet macros are not used but can be added by the user if desired.

Features

- ▶ Automatically converts any data into Excel Spreadsheets.
- ▶ Model process, bake, lot, wafer, field lens-slit and reticle scan induced aberrations.
- ▶ Remove modeled wafer and field errors prior to calculation.
- ▶ Estimate reticle contributions or remove reticle signatures from the analysis.
- ▶ Automated exposure layout and tool configuration with the Weir layout interface.
- ▶ Adaptive model, raw data and residual spatial analysis interface
- ▶ Object-oriented structure with point-and-click data editing, graphics and culling.
- ▶ Advanced graphics including histograms, 1D & 2D vector, range, XY plots, contour, and 3D plotting.
- ▶ Easily modify any graph to add titles, fitted-trends, boxplots, population density and histograms.
- ▶ Easy mouse-driven sub-set data selection; automated and manual
- ▶ Data culling ... automated by wafer, field, site, range, NA, PC (Sigma) and manual mouse-selection.
- ▶ Automated precision and error budget calculation.
- ▶ Full wafer and field models with coefficient removal and simulator for "What If?" scenario investigations.
- ▶ Feature and process correlations with variable covariance matrices.
- ▶ Layout template library for easy exposure-layout definition
- ▶ Tools for user-generated variable entry such as "standing features" and "resolved nested sets".
- ▶ HTML Reports: Reports for every analysis are stored in the data workbook. Reports and graphics can then be saved and uploaded using the Excel HTML formatting.

System Requirements

- ▶ Weir PW is functional using single-node and multi-node licenses on Windows 2000 and XP.
- ▶ Microsoft Excel is required for data storage.
- ▶ Pentium IV CPU, 1.2 GHz, 256 Meg of RAM, 1024x768 Graphic Monitor and 2.0 G bytes free space on disk for programs. Data storage may require up to 8.0 Gigabytes additional.

▶ Copyright © 2004-2006 TEA Systems Corp.

<http://www.TEAsystems.com> - Contact TEA Systems Corp. (+1) 610-682 4146 or WeirEngr@TEAsystems.com