TRACER

Advancing the Standard

Electron Scattering and Process Effects Quantified

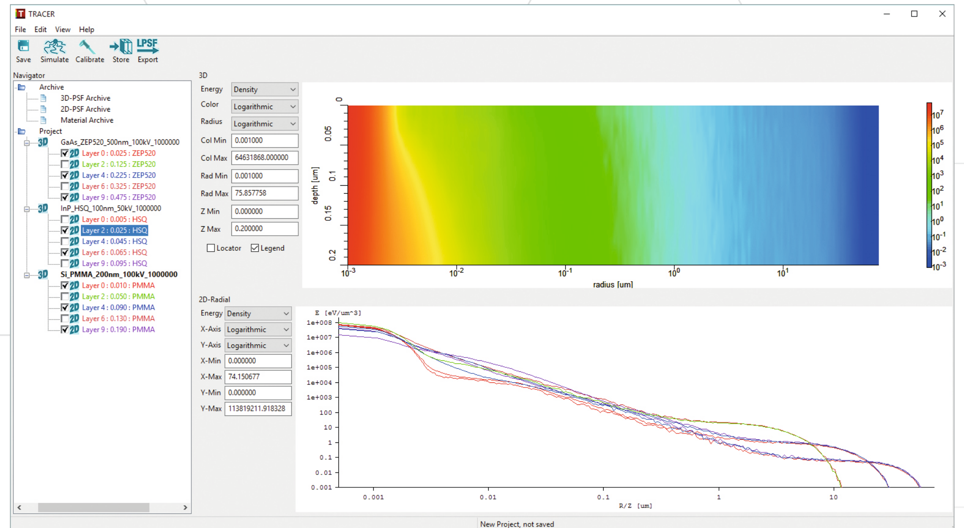
TRACER is a Monte Carlo simulator that computes the electron-solid interaction of any arbitrary material stack and performs advanced process calibration for electron beam proximity effect correction.

GenISys

www.genisys-gmbh.com

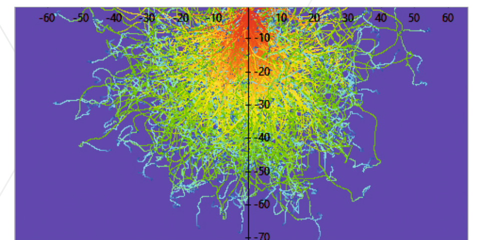
Fast, Easy and Accurate PSF Simulation and Visualization

Manage, Maintain and Archive all PSFs with an Interface to BEAMER & LAB



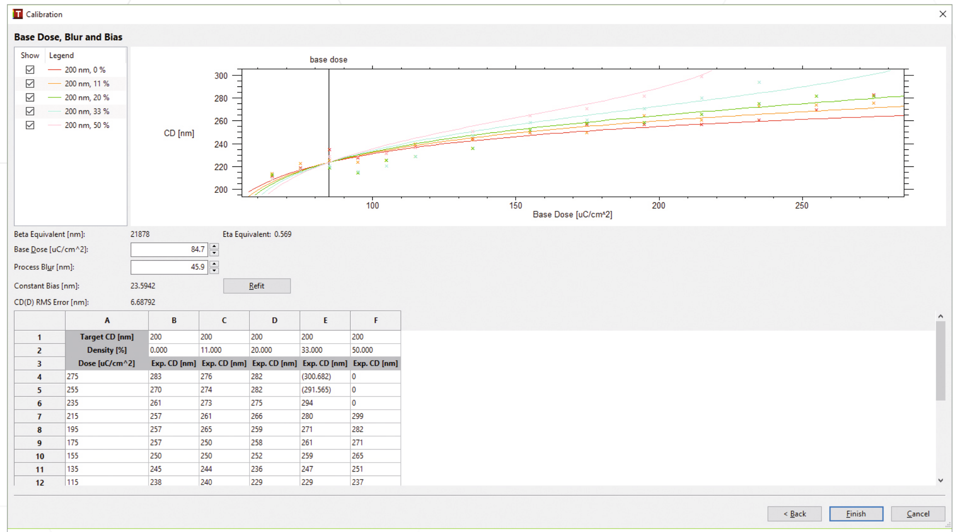
A Point Spread Function (PSF) is the essential input for any type of Proximity/Process Effect Correction (PEC) or e-beam simulation. A PSF describes the deposited energy as a function of the distance from the incident beam. In other words, a PSF can be described as the convolution of the electron scattering beam size (or beam blur) and process effects, which can include collateral effects from resist development and pattern transfer. The quality of a process effect correction depends entirely on the knowledge of the PSF and process correction parameters such as base dose and process bias. As such, a necessary starting point is a high-quality Monte Carlo (MC) simulation of not only electrons backscattered from the substrate, but also fast secondary electrons from both the primary exposure and backscattering events.

TRACER offers an easy-to-use interface for defining the required parameters (material data, stack parameters, acceleration voltage), running the MC simulation, visualizing the 2D r-z simulation results (energy spread at different resist thicknesses), and extracting the 1D PSF which can then be used for PEC.



The comprehensive material database includes all standard materials and can easily be expanded with custom materials by defining the new material's stoichiometry and mass density. Functionalities such as fitting to Gaussian functions, averaging, convolution of PSFs, determination of base-dose factors between PSFs and powerful visualization enable the user to analyze, compare and optimize PSFs.

In addition tool and process effects such as spot size, lateral development, resist diffusion and loading effects need to be quantified and corrected. **TRACER** has an easy-to-use Calibration feature which determines and corrects these effects using measured CD data (typically CD as a function of dose and layout density) obtained after processing of a calibration pattern. Process parameters such as base dose, process blur and process bias are rapidly computed and the display of calibration versus measured data allows the user to immediately verify the fit quality.



TRACER Major Features

Monte Carlo Simulation

- Easily-defined stack
- User-defined number of electrons
- Automatic or custom grid spacing
- Live updating during simulation
- Store a PSF directly into the library shared with **BEAMER**

Analysis & Computation

- Model fitting with 2–4 Gaussians
- Averaging of PSFs
- Convolution of PSFs
- Calculation of relative base dose between PSFs

Visualization

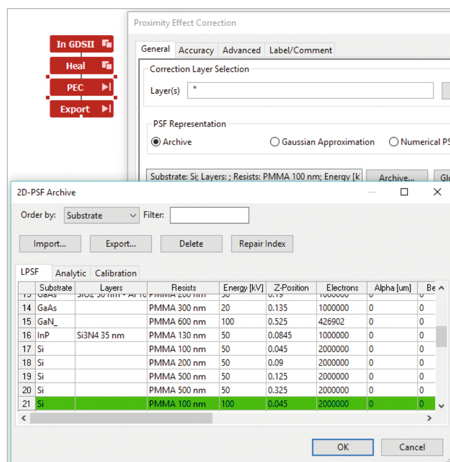
- 2-D and 1-D plotting of energy distribution
- Electron trajectory plots
- Highly-customizable plots

Material Library

- Library of common materials
- Metals, semiconductors, insulators, resists
- Easy for users to add additional materials

Process Calibration

- Based on exposure and measurement of critical CD through dose and density
- Determines base dose, process blur, process/metrology bias, lateral development
- Usable by **BEAMER** to correct for full process effects
- 2-Stage fitting for more accurate results



GenISys products share highly dedicated support, have flexible licensing and are available on various platforms/operating systems.

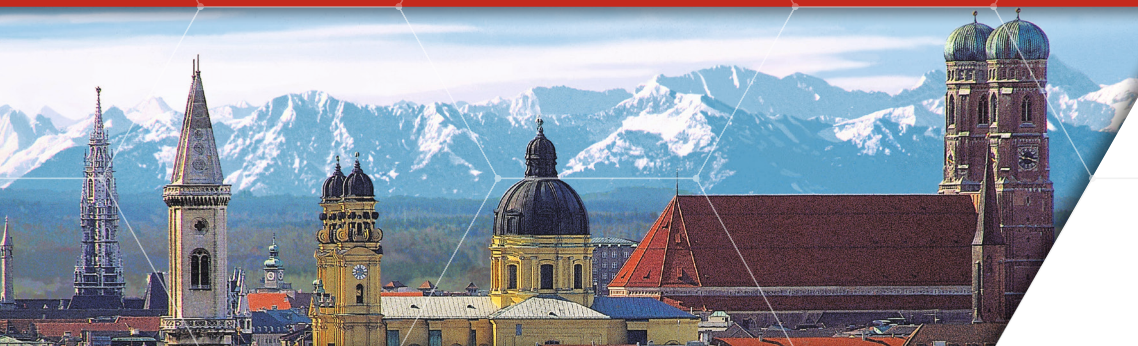
Flexible licensing and platform support

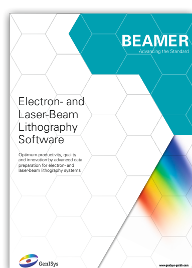
- USB license key for dongle and network
- Flexible on off-the-shelf PCs (> 4 GB RAM recommended)
- Windows 7/8/10 64bit, Linux64 Red Hat 5.4+, Ubuntu 14.04+
- Multithreading

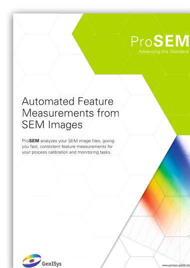
Maintenance and Support

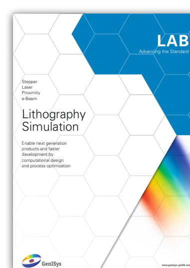
- Technical Support Hotline (e-mail, Skype, phone)
- Frequent updates with enhancements, new functions, performance tuning and bug fixes
- Regional trainings, technical workshops, user meetings
- 12 month maintenance service included in license price
- User feature requests are high-priority for implementation in future updates

TRACER









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Based in Munich, Germany, with offices in Tokyo, Japan and California, USA, **GenISys** develops, markets and supports flexible, high-performance software solutions for the optimization of micro- and nano-fabrication processes. Addressing the market for lithography and inspection, **GenISys** combines deep technical expertise in layout data processing, process modeling, correction and optimization with high caliber software engineering coupled with a focus on ease of use.

The **GenISys** software suite provides researchers, manufacturers and system suppliers with unparalleled, efficient, ease-of-use solutions to advance the research, development and production of next generation nano-patterning technologies.

As a company focused on customer service, **GenISys** provides fast, highly dedicated support for the application and development of the functionality needed to meet demanding customer requirements.