Sentaurus Calibration Workbench (SCW)

AI/ML-Assisted TCAD Calibration and Process Optimization

Product Overview

Sentaurus Calibration Workbench (SCW) is an advanced, user-friendly platform that integrates Artificial Intelligence (AI) and Machine Learning (ML) technologies into Technology Computer-Aided Design (TCAD). SCW accelerates process and device development by automating calibration workflows, that enable highly reductive modeling, and optimization of semiconductor technologies with unprecedented efficiency.

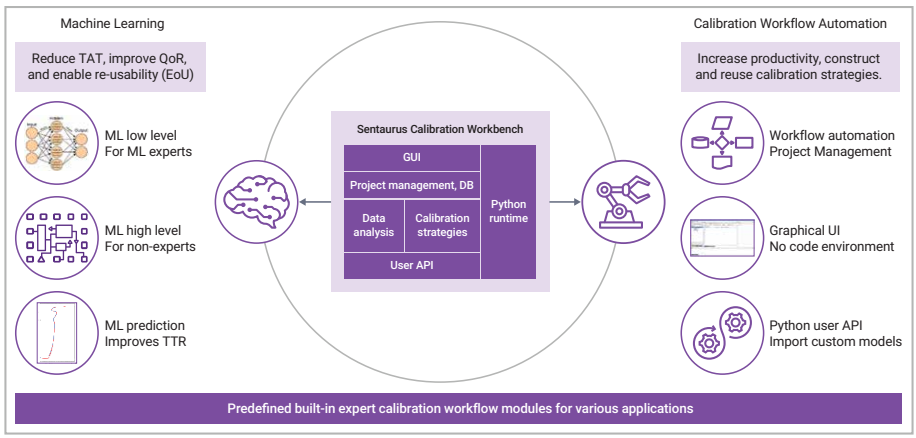

Figure 1: Overview of Sentaurus Calibration Workbench.

Key Features

- End-to-End Workflow Automation: Streamlines TCAD calibration from project setup to results, reducing manual intervention.

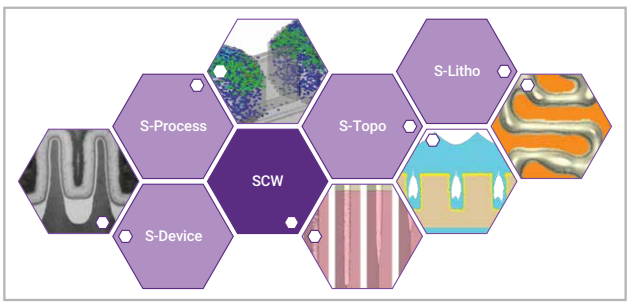

Figure 2: SCW works seamlessly with all core Sentaurus tools including, but not limited to: S-Process, S-Device, S-Topo, and S-Litho.

- Machine Learning Integration: Employs ML-based calibration for rapid, accurate parameter exploration and calibration with >10x faster turnaround time than manual calibration.

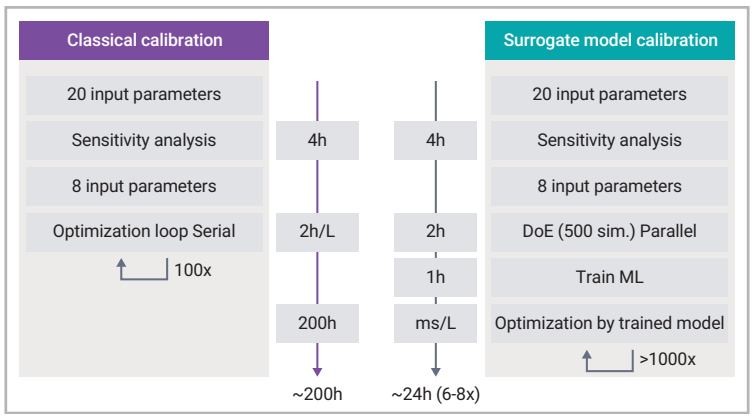

Figure 3: Machine Learning speeds up calibration by an order of magnitude

- Intuitive Graphical User Interface: Offers a modern GUI with Python scripting support, allowing seamless project management and data visualization.
- Modular Workflow Design: Supports calibration for both CMOS and High Aspect Ratio Etch (HARE) technologies through reusable modules (CV, LC, SC, On-State, GIDL, PMCCal).
- Surrogate Modeling Engine: Accelerates simulations and enables reverse design with ML-trained models, reducing simulation loads and time-to-results.
- Comprehensive Data Analysis Tools: Integrated visualization, sensitivity analysis, and reporting functions.

Applications

- Semiconductor process and device development (pre- and post-silicon)
- Workflow-based calibration for TCAD tools to hardware data
- Parameter sensitivity and design space analysis
- Process optimization and technology down-selection
- Predictive modeling and digital twin validation

Workflow Highlights

- CMOS Calibration: Modular steps (CV, LC, SC, On-State, GIDL) with ML-guided parameter tuning and iterative refinement.
- HARE Calibration: Stepwise calibration from initial evaluation to refinement, including custom surrogate model creation for specialized etch profiles.
- Surrogate Modeling: Rapid prediction, reverse parameter search, and validation with final TCAD simulation runs.

Technical Specifications

Component	Description
GUI Environment	Modern graphical interface, Python runtime integrated
Supported Workflows	CMOS, 1D SIMS, HARE, Custom topography calibration
Calibration Methods	Gradient-based, ML-based
Integration	Compatible with Sentaurus TCAD projects
Data Analysis	Built-in visualization and reporting tools
Open Source	Supports open-source models built in Pytorch and TensorFlow, Access to Synopsys-validated and enhanced models

Benefits

- Improved Quality of Results (QoR): Achieve high calibration accuracy and robust predictive modeling.
- Ease of Use (EoU): Non-specialists can manage complex calibration with minimal training.
- Time to Results (TTR): Accelerated workflows dramatically shorten calibration cycles compared to manual workflows.
- Cost Reduction: Fewer experimental wafer runs and more efficient resource allocation.
- Knowledge Transfer: Reusable modular workflows support organizational learning.

Use Cases

- CMOS Calibration: Demonstrated iterative ML-guided calibration, resulting in superior device matching and reduced time-to-results.
- HARE Process Calibration: ML-based parameter exploration enabled rapid calibration versus classical methods.

Implementation and Support

- SCW ships with detailed user documentation, training modules, and workflow templates for immediate productivity.
- Professional support and consulting services available for custom workflow development and on-site training.

Ordering Information

- For licensing options, deployment requirements, or to schedule a demonstration, please contact your sales representative.

Sentaurus Calibration Workbench leverages cutting-edge AI and ML technologies to transform TCAD calibration and maximize the value of TCAD by allowing highly accurate and predictive simulations. Streamline your innovation—automate, accelerate, and achieve the best results with SCW.