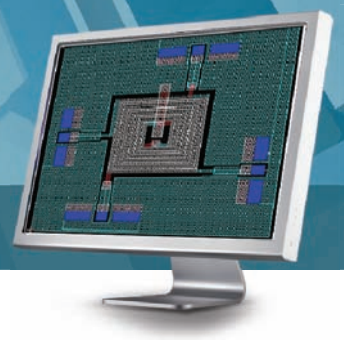
Quest

3D RF Passive Device Modeling



Quest calculates 3D frequency dependent inductance, resistance, capacitance, and capacitive loss for any multi-port network for RF SPICE analysis. Quest creates frequency dependent and independent SPICE models for W-element transmission lines, inductors, and MIM capacitors from GDSII layouts.

- **Calculates frequency dependent or independent spiral inductor standard SPICE models directly from GDSII layout and technology files**
- **Calculates frequency dependent W-element transmission line SPICE models directly from GDSII layout and technology files**
- **Calculates frequency dependent multi-port S-parameter models directly from GDSII layout and technology files for use in RF SPICE for any arbitrary layout and structure**
- **Calculates L, C, or R coupling effects between conductors**
- **Includes complex permittivity and frequency dependent material permittivity to account for lossy dielectrics**
- **Integrated into Virtual Wafer Fab (VWF) to allow Design Of Experiments (DOE) and optimization features**
- **Silvaco's strong encryption is available to protect valuable customer and third party intellectual property**

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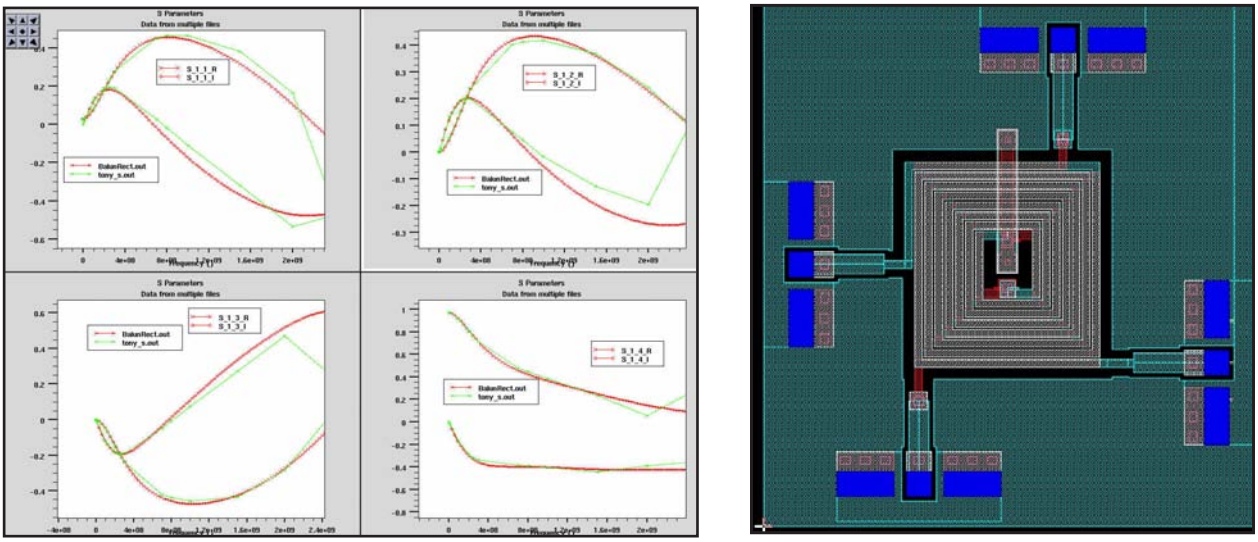
Advanced Physics

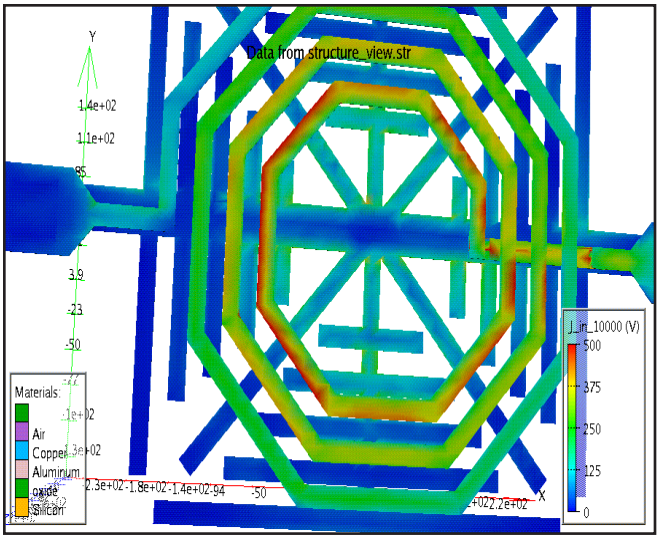
- Fictitious domain method to solve quasi-static Maxwell equation
- No 3D tetrahedral meshing
- Dual meshing algorithm increases simulation speed, reduces memory need, and allows analysis of larger structures
- Calculates effects of substrate resistivity and skin depth
- True physics-based simulator allows any arbitrary structure to be correctly characterized
- Simulation speed allows full frequency analysis and realistic DOE simulation times
- Multiple metals on the same level
- 4 ports to 2 ports transformation
- Trapezoidal metal shape
- Complex permittivity and frequency dependent material permittivity
- RF SPICE frequency domain analysis of arbitrary multi-port layout defined structures

Automated Multi-Port S-Y-Z Parameter Generation

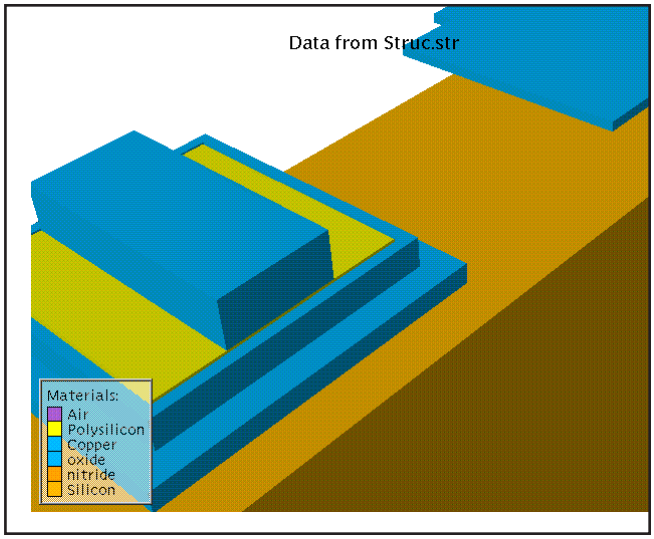


S-Parameter output example for a balanced inductor.

We acknowledge STM Tours to have provided measurements and support to accomplish this work.



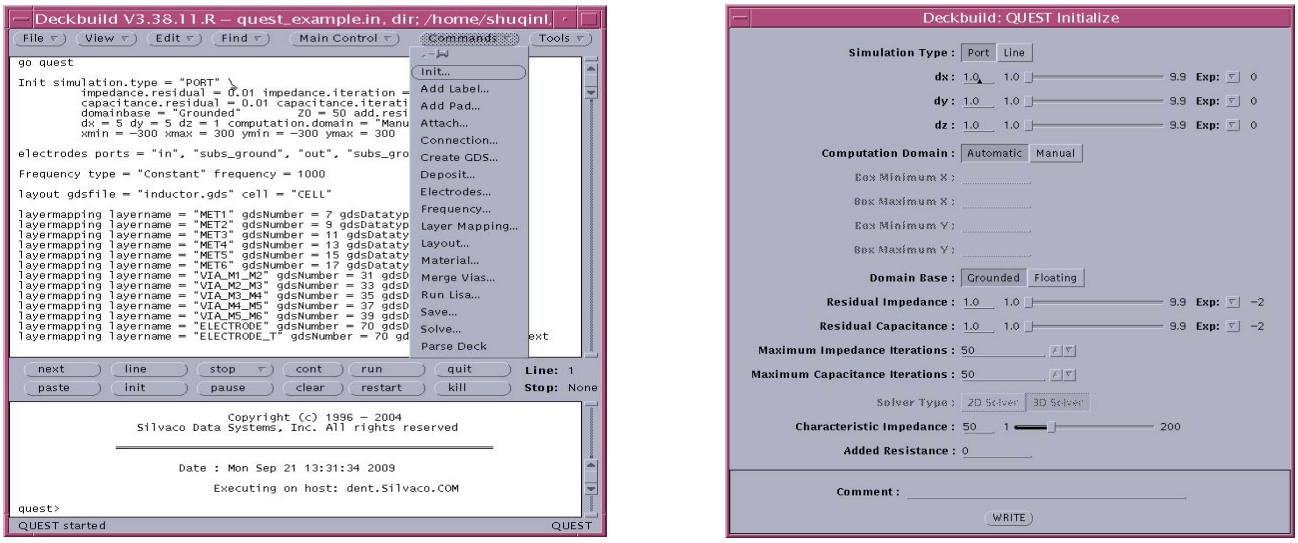
Calculated current coupling in patterned ground shield of 10Ghz.



Using Quest for RF MIM capacitance analysis.

Productivity and Versatility

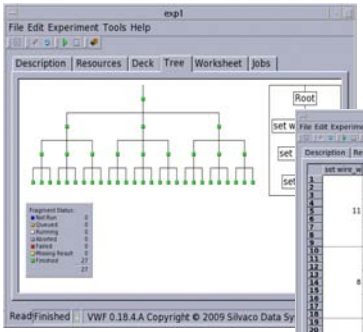
- The DOE feature within VWF allows a large number of experiments to be run on multiple CPUs for design optimization
- Optimization capability within VWF and DeckBuild using multi-threaded GA and LM optimizer
- Existing inductor/transmission design libraries can be re-characterized to analyze behavior for next version up process technology or for second source fabrication facilities
- Javascript interface including complex number calculation for processing measurement data
- Inductor creation from pre-defined or user-defined P-cells allows layout-based DOE



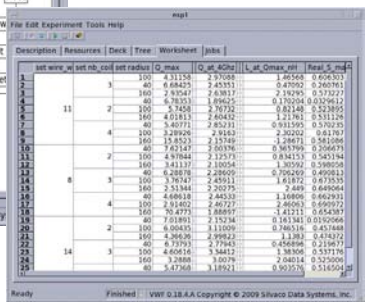
DeckBuild built-in Commands pop-up interface makes generating command input files simple.

Ease of Use

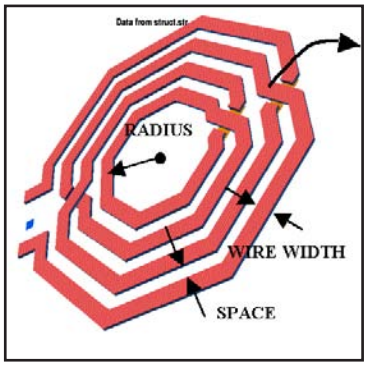
- All program operations and functions are accessed via DeckBuild GUI interface
- Capability of adding labels and pads to GDSII files for automatic electrodes generation
- Fully integrated with Silvaco's layout editor Expert, Utmost IV, as well as Silvaco's Interactive Tools, TonyPlot, and TonyPlot 3D
- Conversion from measured S parameter file in .citi and .csv format to Quest S, Y, and Z parameter outputs for direct comparison between measurement and Quest simulated results



Tree view graphic of Quest simulation in VWF.

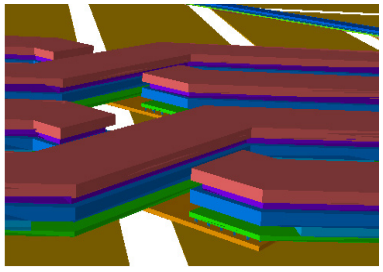


VWF worksheet with layout variables and output results.

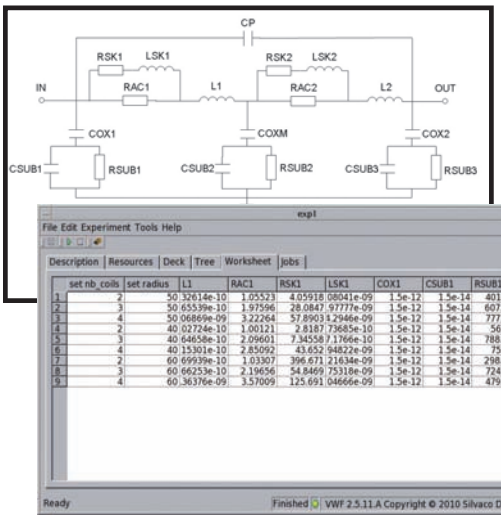


Automated layout and structure creation.

Close-up of a created example inductor at the cross-over location.

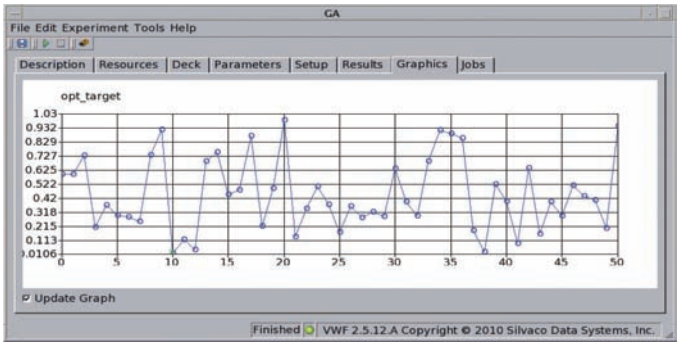


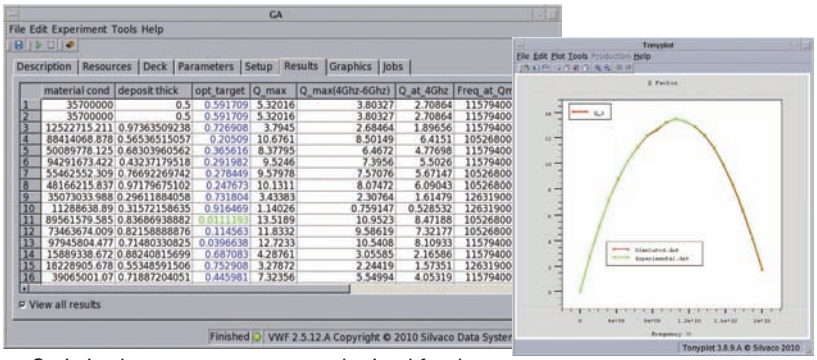
Layout-based DOE on pre-defined or user defined P-cells allows inductor performance analysis as well as PDK generation.



Utmost IV extraction results directly available in the worksheet to be loaded in Spayn for PDK generation.

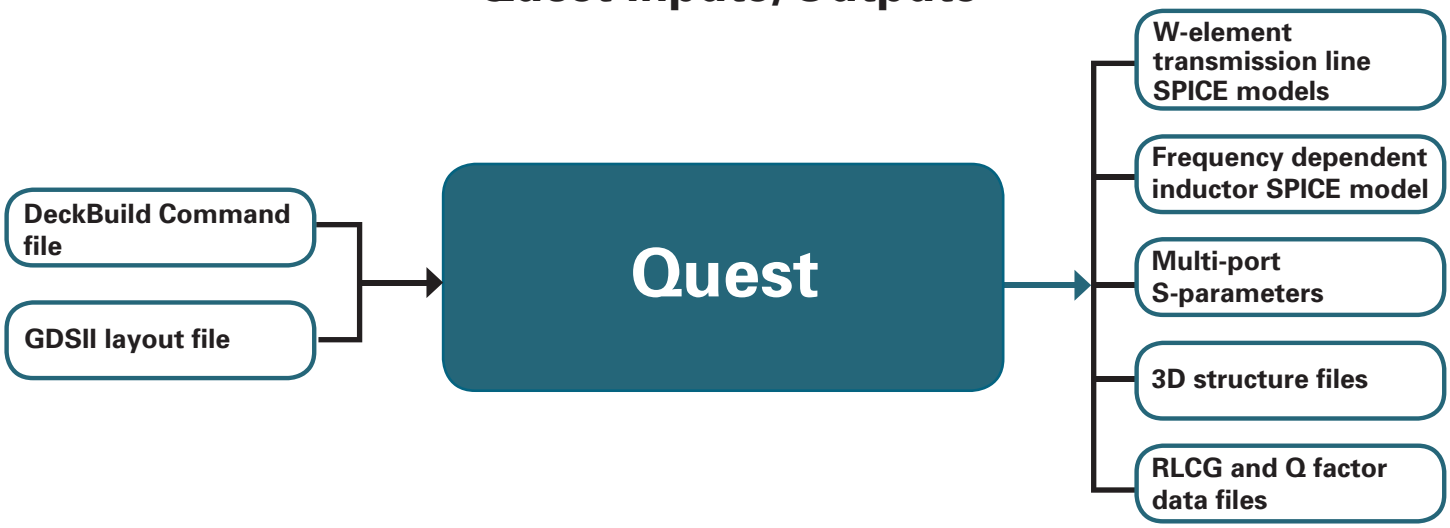
Graphical view of an optimization experiment. In Green the best result that minimize the target.





Optimized process parameters obtained for the targeted experimental Q factor curve.

Quest Inputs/Outputs



SILVACO

HEADQUARTERS
4701 Patrick Henry Drive, Bldg. 2
Santa Clara, CA 95054 USA
Phone: 408-567-1000
Fax: 408-496-6080

CALIFORNIA sales@silvaco.com 408-567-1000
MASSACHUSETTS masales@silvaco.com 978-323-7901
TEXAS txsales@silvaco.com 512-418-2929

JAPAN jpsales@silvaco.com
EUROPE eusales@silvaco.com
KOREA krsales@silvaco.com
TAIWAN twsales@silvaco.com
SINGAPORE sgsales@silvaco.com

WWW.SILVACO.COM

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