

VIRTUOSO SPECTRE RF SIMULATION OPTION

Virtuoso® Spectre RF Simulation Option for Virtuoso Spectre Circuit Simulator

provides fast, accurate simulations for RF and high-frequency integrated circuits.

Virtuoso Spectre® RF works with the Virtuoso Analog Design Environment to provide detailed, high-capacity analyses of RF and high-frequency designs.

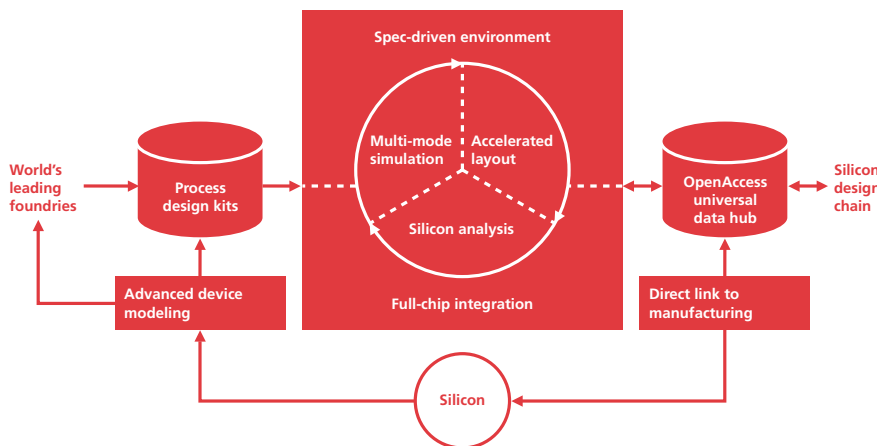


Figure 1: Virtuoso custom design platform

VIRTUOSO CUSTOM DESIGN PLATFORM

The Virtuoso custom design platform is a comprehensive system for fast, silicon-accurate design and is optimized to support “meet-in-the-middle” design methodologies such as advanced custom design. Virtuoso includes the industry’s only specification-driven environment, multi-mode simulation with common models and equations, vastly accelerated layout, advanced silicon analysis for 0.13 microns and below, and a full-chip, mixed-signal integration environment. The Virtuoso platform is available on the Cadence® CDBA database and the industry-standard OpenAccess database. With the Virtuoso platform, design teams can quickly design silicon that is right and on time at process geometries from one micron to 90 nanometers and beyond.

VIRTUOSO SPECTRE RF

Virtuoso Spectre RF provides fast, accurate SPICE-level simulations of wireless communication designs in the frequency domain. Virtuoso Spectre RF frames the simulation problem in the RF designer's natural design domain and delivers the performance and capacity required for these tough circuits. Tightly integrated into the Virtuoso custom design platform, the superior architecture of Virtuoso Spectre RF allows for low memory consumption and high-capacity analysis (See Figure 2).

BENEFITS

- High-performance simulation of thousands of RF transistors
- Maximum design productivity with advanced algorithms and RF-oriented analysis that converges quickly on highly non-linear circuits
- Minimal design translation due to shared syntax across all Virtuoso Multi-mode Simulation platform simulators
- Consistent silicon accuracy maintained within the Virtuoso Multi-mode Simulation with shared device models among all the simulators

FEATURES

ADVANCED SIMULATION TECHNIQUES

Advanced architecture and algorithms simulate critical RF performance characteristics of large, non-linear circuits containing more than 5,000 transistors. Virtuoso Spectre RF uses patented methods to solve the circuit's periodic steady state (PSS) and provide high-capacity and non-linear circuit support. Virtuoso Spectre RF provides RF-oriented analyses such as conversion gain, IP3, 1-dB compression, noise figure, spurious response, and large signal S-parameter measurements. It utilizes robust, adaptive Virtuoso Spectre time step transient analysis and provides low numerical noise floor using Fourier integral DFT (see Figure 3). In addition, Virtuoso Spectre RF is fully

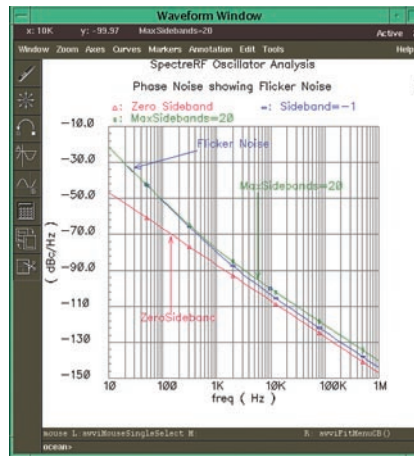


Figure 2: Phase noise plot generated from Virtuoso Spectre RF results using Virtuoso Analog Design Environment

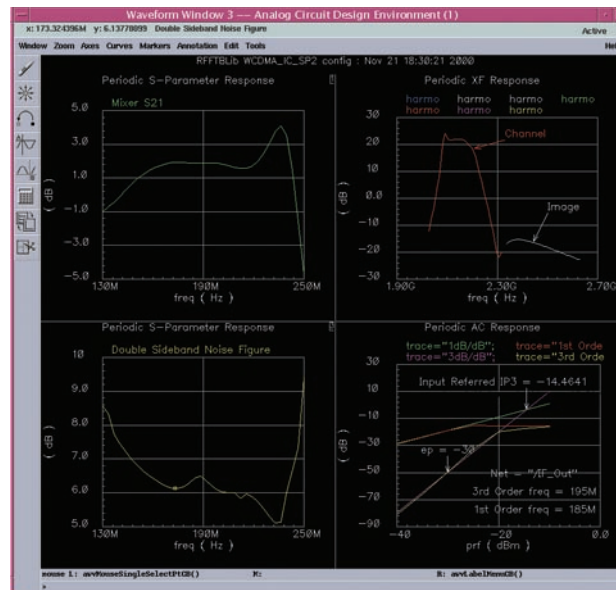


Figure 3: Receiver simulation results—gain, image rejection, noise figure, and IP3

compliant with the Verilog-A 2.0 analog hardware description language capability for advanced behavioral modeling. It combines top-down and bottom-up RF modeling capability in a single simulation.

PHYSICAL COMPONENT MODELING

Comprehensive on-chip passive component modeling creates models for spiral inductors, planar transformers,

transmission lines, and bonding pads using 3-D electromagnetic solvers. The extracted RLCG models can then be included in the schematic or netlist with the rest of the circuit for simulation. Operating from geometric and material property parameters, Virtuoso Spectre RF extracts multi-PI equivalent circuits, including the effects of lossy substrates, lossy conductors, and skin effect in both narrow and wide bandwidth components.

RF PACKAGE MODELING

The integral RF IC package modeler extracts RLC and mutual inductance parasitics efficiently for DIP, SOIC, and QFP packages. The package modeler provides an easy-to-use graphical interface that allows the user to enter in the package geometry, including bonding information, and creates a 3-D model for simulation. The package modeler uses fast field solver simulations to extract parasitics (including skin effects) coming from the IC package. This feature is accurate up to design frequencies of 10GHz. The model can export subcircuit netlists in Virtuoso Spectre- or HSPICE-compatible formats and provides a quick and easy method to include package parasitics in their design flow.

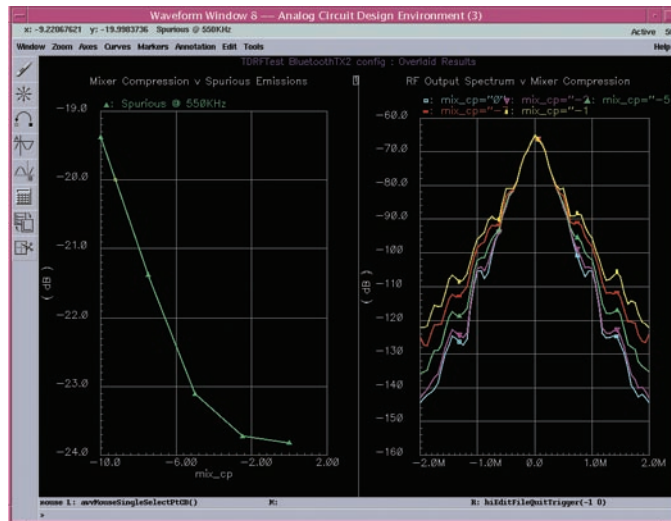


Figure 4: Sweep of transmit modulator compression point showing the effect on spurious emissions at +550KHz offset and power spectral density curves. Simulation time under 1 minute

SPECIFICATIONS

COMPREHENSIVE DEVICE MODEL SUPPORT

- MOSFET models, including BSIM1, 2, and 3, with approved versions of BSIM3v3 (3.2.1 and 3.2.2) and BSIM4 from the Compact Modeling Council; high-voltage MOS (HVMOS), MOS9, and EKV; mature models for MOS1, 2, and 3; and specialized switch-level MOS0
- Bipolar junction transistor (BJT) models, including VBIC, HICUM, HBT (for SiGe), Gummel-Poon, and Ebers-Moll models
- Diode models used for either junction or Schottky Barrier diodes with reverse breakdown
- GaAs metal semiconductor field-effect transistor (MESFET), a completely symmetrical model (developed by Statz, Newmann, Smith, Pucel, and Haus)
- Silicon on insulation (SOI), including the Berkeley Technology Associates (BTA) SOI model and the University of California, Berkeley partially-depleted BSIM3SOI model
- Rensselaer Polytechnic Institute's Poly and Amorphous Silicon Thin-Film models

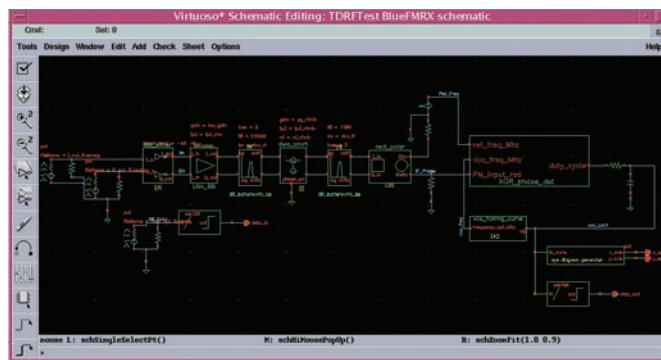


Figure 5: Bluetooth receiver model including phase-domain PLL for FM demodulation

COMPREHENSIVE CIRCUIT ANALYSES

- Supports all Virtuoso Spectre circuit analyses and adds new RF analyses
- Periodic and Quasi Periodic Steady State analyses (PSS, QPSS)
- Conversion gain and intermodulation products calculations
- Spurious response, image rejection, and Power Supply Rejection (PSR) (see Figure 4)
- IEEE noise figure and double sideband noise figure calculations
- Instantaneous noise, jitter calculations for ADCs, PLLs (see Figure 5)
- Digital modulation and ACPR measurements

DESIGN INPUTS/OUTPUTS

- Virtuoso Spectre
- HSPICE
- SPICE 2/3
- S-parameter data files
- PSF Waveform format

PLATFORM/OS

- Sun/Solaris
- HP-UX
- IBM
- Linux

CADENCE SERVICES AND SUPPORT

- Customer-focused solutions that increase ROI, reduce risk, and achieve your design goals faster
 - Collaborative approach and design infrastructure—virtual teaming
 - Proven methodology and flow tuned to your design environment
 - Design and EDA implementation expertise
- Product and flow training to fit your needs and preferred learning style
 - Over 80 instructor-led courses—certified instructors, real world experience
 - More than 25 Internet Learning Series (iLS) online courses
- Cadence customer support that keeps your design team productive
 - Cadence applications engineers provide technical assistance
 - SourceLink® online support gives you access to software updates, technical documentation, and more—24 hours a day, seven days a week

FOR MORE INFORMATION

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