Agilent EEsof EDA

Premier Communications Design Software

Product Overview

Better *Communications*

Products *Faster*

Agilent Technologies

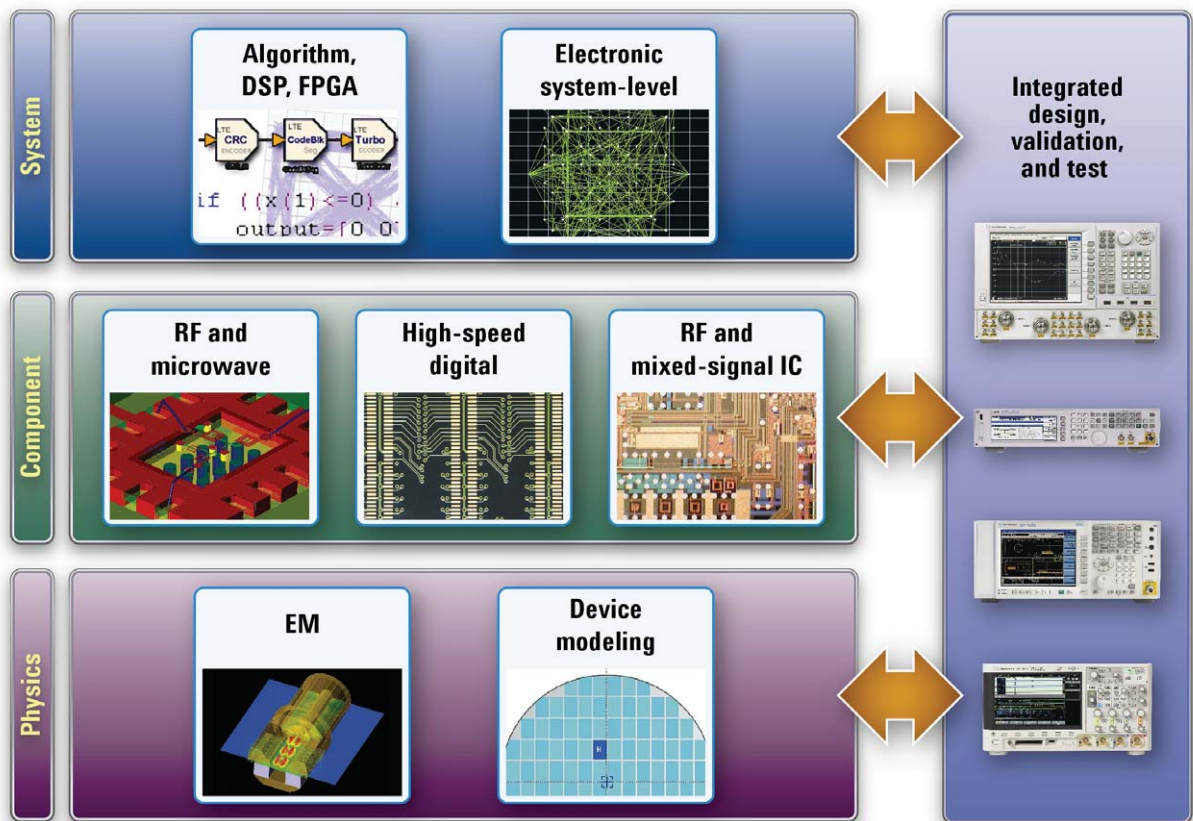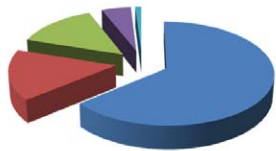# Offering Design Software for Complete Flow Solutions

Figure 1. Agilent EEsof EDA is the leading supplier of Electronic Design Automation (EDA) software for communications designs.

Figure 2. Agilent EEsof is the leading provider of RF Design and Simulation tools.*

* Gary Smith EDA's December 2010 market share report.

Agilent EEsof EDA is the leading supplier of Electronic Design Automation (EDA) software for communications product design. High-frequency, high-speed, device modeling, signal-processing and RF circuit design engineers create better products faster using design flows built on our system, component, and physics-level design tools. We offer complete design integration for products such as cellular phones, wireless networks, radar, satellite communications systems and high-speed digital wireline designs. Applications include electronic system level (ESL), high-speed digital, RF-Mixed signal, device modeling, RF and Microwave design for commercial wireless, aerospace, and defense markets. Our software is compatible with and is used to design Agilent's own test and measurement equipment.

All of our EDA software bundles are scalable to offer you the widest variety and most flexible plans available to work within your design flow and your budget. As your design needs grow, you can add simulators, models and libraries as you require them. We are dedicated to providing the right software and support to increase your design productivity and advance your long-term success.

# World-Class Products Enabling the Entire Communications Design Flow

Advanced Design System (ADS) is the leading electronic design automation software for RF, microwave, and high speed digital applications. ADS pioneers the most innovative and commercially successful technologies, such as X-parameters * and 3D EM simulators, used by leading companies in the wireless communication & networking and aerospace & defense industries.
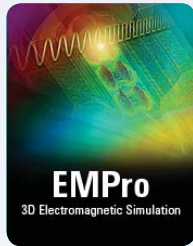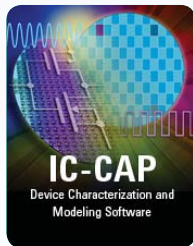
Electromagnetic Professional (EMPro) is a 3D modeling and simulation environment for analyzing the 3D electromagnetic (EM) effects of high-speed and RF/microwave components. EMPro features a modern design, simulation and analysis environment, high capacity time-and frequency-domain simulation technologies and integration with ADS, the industry's leading high-frequency and high-speed design environment.
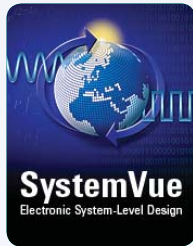
SystemVue is a focused EDA environment for electronic system-level (ESL) design that enables system architects and algorithm developers to innovate the physical layer (PHY) of next-generation wireless and aerospace/defense systems. As a dedicated platform for ESL design and signal processing realization, SystemVue replaces general-purpose digital, analog, and math environments and provides unique value to RF, DSP, and FPGA/ASIC implementers.
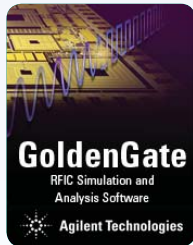
GoldenGate provides the framework for RF-Mixed Signal (RF-MS) designers to rapidly simulate circuits, verify specs and validate potential yield of complex highly integrated RFICs. Designers can confidently simulate blocks, combinations of blocks and full receive/transmit chains to understand the influences introduced by noise, distortion, parasitics and numerous other effects confronted in modern RF-MS IC design.

Integrated Circuit Characterization and Analysis Program (IC-CAP) is the industry standard for DC and RF semiconductor device modeling. IC-CAP extracts accurate compact models used in high speed/digital, analog and power RF applications. IC-CAP is the most advanced, customizable modeling software and includes measurement, simulation, optimization and statistical analysis tools.
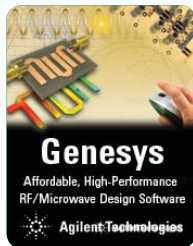
Genesys is an affordable, high-performance design tool specifically created for the RF and microwave circuit board and subsystem designer. Providing the optimal balance of design capabilities and ease-of-use, designers can quickly attain the skill set necessary to operate the tool while realizing unbeatable engineering productivity in the shortest time possible. As a proven safe investment with an installed base of 5,000 satisfied designers, Genesys literally pays for itself through cost savings within its first year of deployment.

"X-parameters" is a trademark of Agilent Technologies, Inc. The X-parameter format and underlying equations are open and documented.

Advanced Design System (ADS) — Premier High-Frequency and High-Speed Design Platform

Advanced Design System is the leading electronic design automation software for RF, microwave, and high-speed digital applications, providing the design simulation software environment that enables the co-design of IC, package, and board in high-frequency and high-speed applications. ADS has pioneered the most innovative and commercially successful technologies, including the industry's most advanced suite of system, circuit, and EM simulation products, plus X-parameters, a breakthrough in nonlinear modeling. ADS offers the industry's only true multi-technology design environment which allows multiple IC's combined with laminate and packaging PCB to all be designed together. ADS seamlessly integrates these powerful tools in a complete front-to-back design platform, taking you every step from concept to manufacturing, making it the choice of leading companies in the wireless communication & networking and aerospace & defense industries.

The Industry's Leading Technology, and Much More

ADS puts an unparalleled suite of simulation technology at your fingertips including: S-parameter, AC analysis, harmonic balance, high-frequency SPICE, convolution, circuit envelope, high-speed channel, Agilent Ptolemy system dataflow, Momentum 3D planar EM, and full 3D EM finite element method, but that is only the beginning.

To shorten your design cycles, ADS provides a huge amount of application-specific data. Over 300 examples cover everything from specific application circuits to tutorials on how to get the most out of ADS. Through DesignGuides, we have integrated the experience and best practices of leading designers. They provide wizards, pre-configured set-ups and displays, and step-by-step instructions for design applications such as amplifiers, filters, mixers, RF systems, etc., giving you easy access to the power of ADS from day one.

Agilent also works with top GaAs, GaN, InP, SiGe and Silicon foundries around the world to develop and support process design kits for RFIC and MMIC design in ADS. Finally, all the major surface mount component vendors provide up-to-date component libraries, representing thousands of models, specifically for ADS RF PCB design.
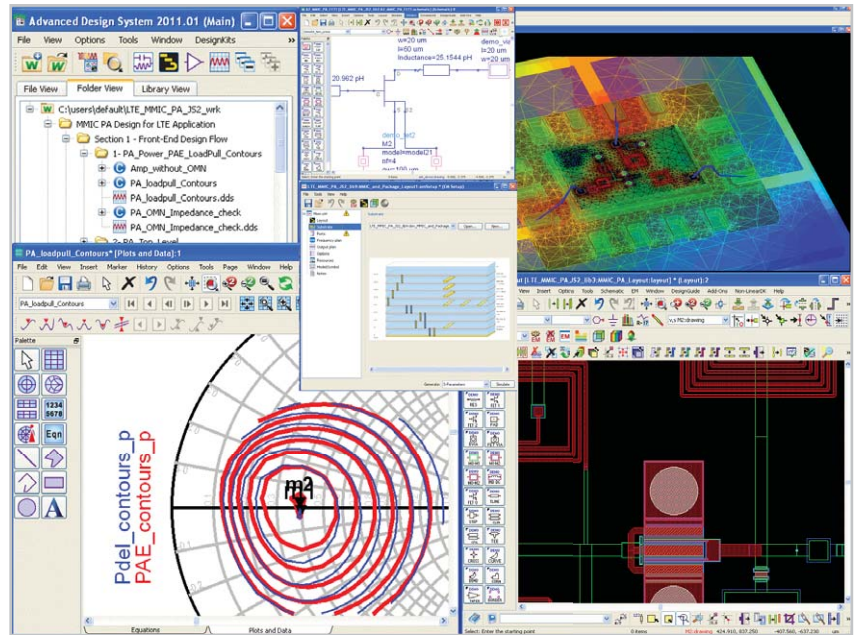

Figure 3. ADS is the industry's leading electronic design automation software for wireless communications & networking, aerospace & defense, and signal integrity applications.

ADS Key Features

- Complete schematic capture and layout environment
- Innovative and industry leading circuit and system simulators
- Direct, native access to 3D planar and full 3D EM field solvers
- Largest number of process design kits (PDKs) developed and maintained by leading foundry and industry partners
- EDA and Design Flow Integration with companies such as Cadence, Mentor, and Zuken
- Optimization Cockpit for real-time feedback and control when using any of 12 powerful optimizers
- X-parameters model generation from circuit schematic and Agilent's NVNA for nonlinear high-frequency design
- Up-to-date Wireless Libraries enable design and verification of the latest emerging wireless standards
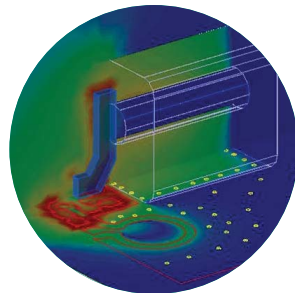

Figure 4. Enhanced Integrated 3D EM Analysis — including Finite Element EM sweeps, optimization and co-simulation with circuit analysis.

ADS Speeds Your Optimized Design from Concept to Implementation

Boost Productivity with an Integrated Design Environment

ADS integrates all this proven RF, signal integrity, mixed-signal and electromagnetic technology into a single, flexible environment. Additionally, ADS works with other EDA frameworks to fit well with your specific design flow and, with the ADS instrument connectivity, it provides a truly unique integration of design and measurement.

This proven software environment is easily customized to meet your unique design or application needs. ADS runs on Windows® and LINUX, with complete file compatibility between platforms and across networks.
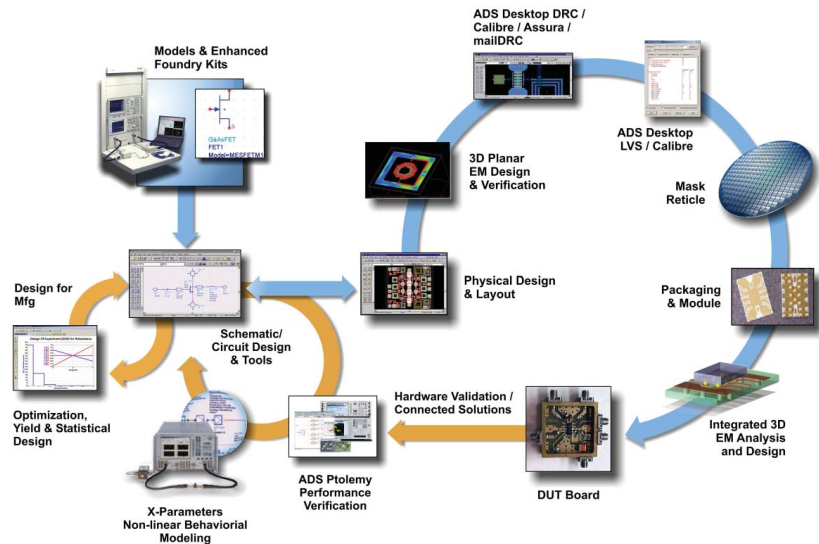

Figure 5. Complete ADS Desktop flow concept, physical design to manufacturing.

High Speed Digital Design

Signal integrity engineers who are hurdling the multigigabit/s barrier look to ADS for the correct treatment of high-speed effects like distortion, mismatch, and crosstalk. Uniquely, ADS integrates accurate system, circuit, and EM simulators, so you can not only get the right answers but also get them faster by avoiding error-prone and time-consuming data transfer between a collection of point tools.
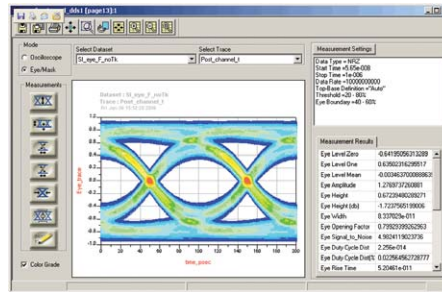

Figure 6. The eye diagram front panel in ADS allows you to calculate eye diagram parameters using an interface that is similar to that of Agilent instruments.

X-parameters Generator

X-parameters models are fast, cascadable, nonlinear behavioral models that accurately account for frequency mixing and impedance mismatch. X-parameters fulfill a long standing need from the high-frequency design community for nonlinear behavioral models that can be created from measurement or simulation with the same speed and convenience as the well known linear S-parameters. The X-parameters Generator enables MMIC, RF-SIP and RF module design houses to provide their customers with an accurate, pre-prototype model of their nonlinear devices (e.g. power amplifiers, front-end modules and transceivers) to further enable concurrent design and secure early design wins.

Figure 7. Agilent's X-parameters represent a new category of nonlinear network parameters for high frequency design. They are applicable to both large-signal and small-signal conditions, and for linear and nonlinear components.

EMPro — 3D Electromagnetic Modeling and Simulation Environment Integrated With Your ADS Design Flow

Electromagnetic Professional (EMPro) is a 3D modeling and simulation environment for analyzing the 3D electromagnetic (EM) effects of high-speed and RF/microwave components. EMPro features a modern design, simulation and analysis environment, high capacity time-and frequency-domain simulation technologies and integration with the industry's leading high-frequency and high-speed design environment. EMPro allows you to create 3D components that can be simulated together with 2D circuit layouts and schematics within Advanced Design System (ADS), using EM-circuit cosimulation. Designers can quickly create arbitrary 3D structures with a modern, simple GUI that saves time and our EMPro EM simulation software provides advanced scripting features.

Features

Modern, efficient 3D solid modeling environment

EMPro provides the flexibility of drawing arbitrary 3D structures and the convenience of importing existing CAD files. You can create 3D shapes, add material properties, set up simulations, and view results—all within the EMPro environment.

Time and frequency-domain simulation technology

3D structures can be analyzed in EMPro using the same FEM simulator available in ADS. FEM is a frequency-domain technology widely used for RF/microwave applications. For electrically large problems, such as antennas and EMI, the finite difference time domain (FDTD) simulator can be used.

Parameterized 3D EM component generation

Parameterized 3D components can be created in EMPro and placed on a layout design in ADS. The FEM simulator can then be used to simulate the combination of the 2D layout and the 3D EM component.

IC Packaging · High-Speed Connectors · RF SiP / Modules · Handset Antennas · RF Connectors · Radar / RCS
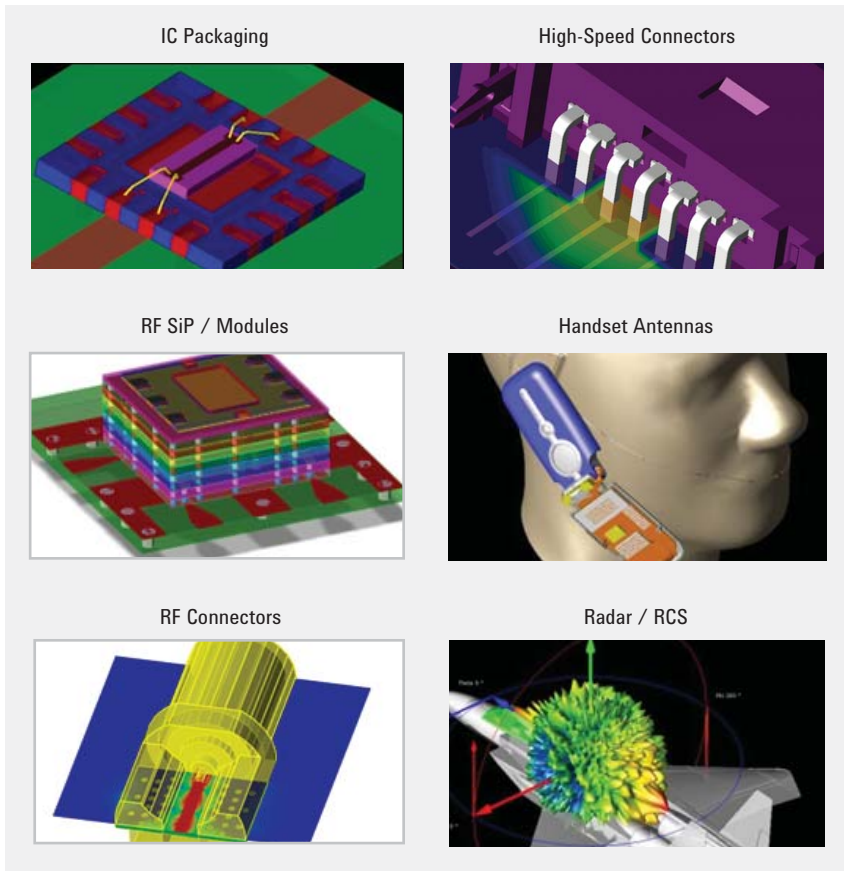
Figure 8. EMPro is used in a wide variety 3D electromagnetic modeling and simulation applications.
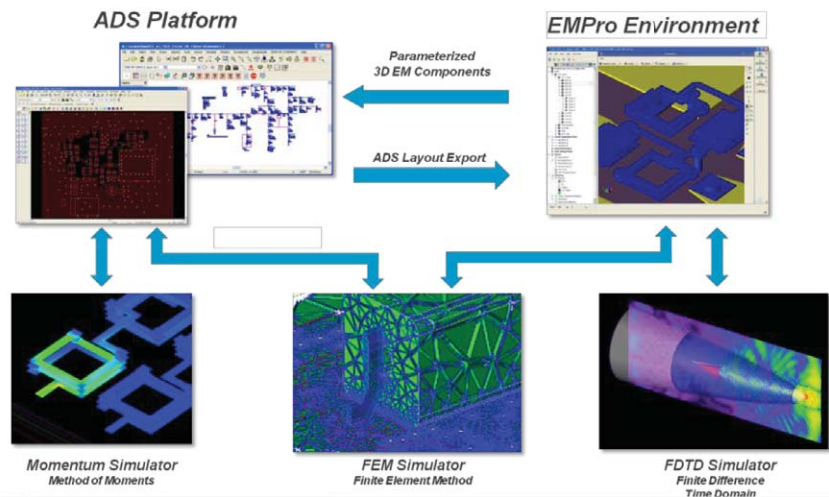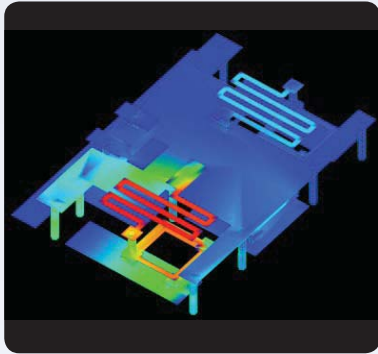

Figure 9. Agilent provides multiple EM simulation technologies integrated with the ADS design flow. EMPro adds a 3D solid modeling environment to this flow.

Agilent Offers the Broadest Selection of EM Simulation Technologies

Momentum Simulator

The Agilent Momentum Simulator is the leading 3D planar electromagnetic (EM) simulator used for passive circuit modeling and analysis. It uses frequency-domain Method of Moments (MoM) technology to accurately simulate coupling and parasitic effects of complex multi-layer designs. Accurate EM simulation enables RF/MMIC designers, RF/High-Speed Board Designers, RF Module/SiP Designers and Antenna Designers to improve design performance and increase confidence that the manufactured product will meet spec.

Momentum is integrated with ADS, Genesys, and GoldenGate, along with third-party tools from Cadence, Mentor and Zuken.

Features:

- Frequency-domain solver based on Method of Moments technology
- Most efficient EM simulation technology for planar structures
- Handles multi-layer IC/Board/Module designs, including vias
- Supports CPU multi-threading
- Generates multi-port S-parameter models from a single simulation
- Very efficient for high-Q applications
- "Microwave Mode" provides high accuracy full-wave solvers
- "RF Mode" provides high-speed quasi-static solvers

## Finite Element Method (FEM) Simulator
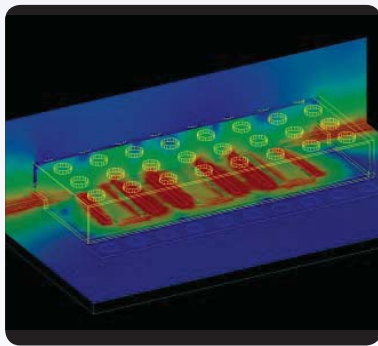
The Agilent FEM Simulator is based on the industry-proven Finite Element Method. Unlike 3D planar simulators, this technology can handle arbitrarily shaped 3D structures such as bondwires, conical shaped vias and solder balls/bumps where z-dimensional changes appear in the structure. FEM solvers can also simulate dielectric bricks or finite-size substrates.

Agilent FEM is integrated with ADS so layout designs do not need to be exported to third-party EM simulators. Agilent FEM is also available in EMPro for simulating 3D models imported from other CAD tools or created natively.

Features:

- Frequency-domain solver based on Finite Element Method technology
- Most accurate EM simulation technology for 3D structures such as packaging, bond-wires, connectors and other components
- Supports CPU multi-threading
- Generates multi-port S-parameter models from a single simulation
- Very efficient for high-Q applications
- Adaptive mesh refinement automates the setup process
- Adaptive frequency sweeps ensures accurate results at resonant frequencies

Finite Difference Time Domain (FDTD) Simulator
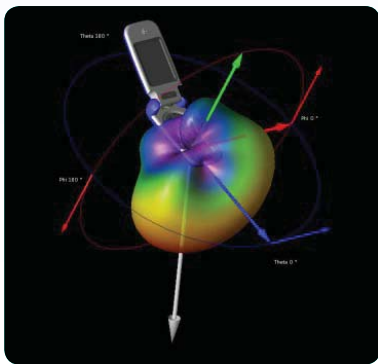
The Agilent FDTD Simulator is based on Finite Difference Time Domain technology. Like FEM, FDTD can handle arbitrarily shaped 3D structures. Whereas FEM produces a large matrix during the solution process, FDTD uses an iterative process to update field values at each time step. FDTD is an inherently parallel method and therefore lends itself very well to the processing capabilities of the most recent advances in CPU (general-purpose processors) and GPU (graphics processors) hardware.

The Agilent FDTD simulator is available in EMPro for simulating 3D models imported from other CAD tools or created natively.

Features:

- Time-domain solver based on Finite Difference technology
- Highest capacity EM simulation technology for electrically large 3D structures
- Most efficient solution for antenna, EMI/EMC, radar cross section and biomedical applications
- Supports both CPU multi-threading and GPU acceleration
- Very efficient for broadband applications
- Best for time-domain analyses such as TDR

SystemVue — Electronic System-Level (ESL) Design Software

SystemVue – System Design

SystemVue is a focused EDA environment for electronic system-level (ESL) design that enables system architects and algorithm developers to innovate the physical layer (PHY) of next-generation wireless and aerospace/defense systems. It provides unique value to RF, DSP and FPGA/ASIC implementers who rely on both RF and baseband DSP to architect and implement the full value of their hardware platforms, cutting both design and verification time compared to general-purpose alternatives.

SystemVue brings core Agilent competencies in RF modeling, IP reference libraries, and measurement science to bear on algorithm and system design challenges, flowing from architecture into realization and verification. SystemVue connects to both RF platforms and measurement equipment, leveraging your expertise and uniting your workgroups.
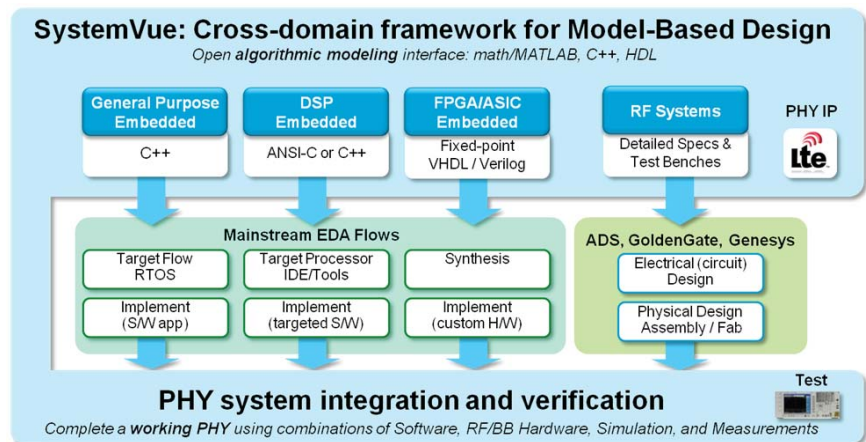

Figure 11. SystemVue unites a top-down system-level design approach that crosses the RF/ Baseband gap and connects to major digital and RF design flows. A platform that sits above the "A-to-D converter divide" is able to create superior architectures.
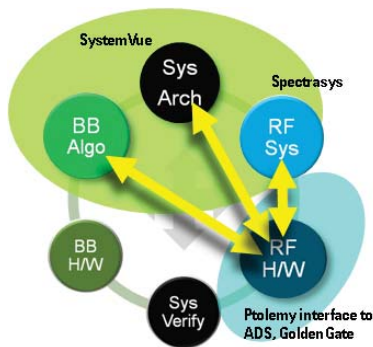
Figure 10. SystemVue unites a top-down system-level design approach to Baseband and RF, and connects to major Agilent RF design flows, such as ADS and GoldenGate.

Spectrasys – RF Architecture

Agilent Spectrasys provides RF subsystem design, analysis, and debug tools for RF System Architects that are unmatched by any other technology. Unlike spreadsheet-based tools, Spectrasys is graphical and accounts for a much greater level of physical detail and analog performance issues such as mismatch effects, intermodulation terms, reverse propagation, SSB noise, phase noise, nonlinear effects, and X-parameters.

Figure 12. SystemVue also connects system architects to the latest communications equipment, for accelerated functional

GoldenGate — Advanced Simulation and Analysis Solutions for RF-Mixed Signal IC Design
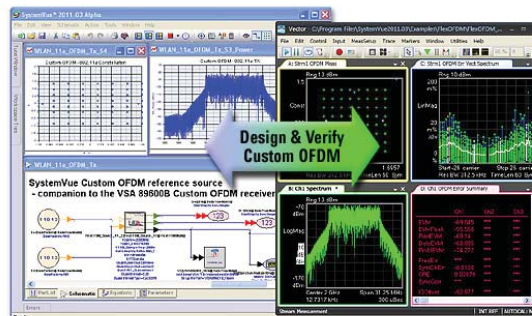
Features

- GoldenGate is fully compatible with Cadence® IC5 and IC6 platforms.

- Speed and capacity enables full characterization of complete RF transceivers, including parasitics, prior to tape-out.

- Performs both small and large signal analysis including DC, Transient, AC, Harmonic Balance, Envelope, Convolution, Noise, Yield, fast Mismatch and Verilog-AMS co-simulation.

- Includes a suite of automation tools to quickly analyze circuit performances and diagnose problematic issues with mixed-signal RFICs earlier in the design cycle.

- Part of Agilent's unique RF-MS IC flow that links the RF system, subsystem and component-level design and analysis as part of a comprehensive design flow.

GoldenGate provides the framework for RF-Mixed Signal (RF-MS) designers to rapidly simulate circuits, verify specs and validate potential yield of complex highly integrated RFICs. Designers can confidently simulate blocks, combinations of blocks and full receive/transmit chains to understand the influences introduced by noise, distortion, parasitics and numerous other effects confronted in modern RF-MS IC design. Additionally, designers can analyze the manufacturability of circuits using industry standard techniques such as Process and Mismatch Monte Carlo as well as unique Agilent statistical mismatch and process analyses.

These tools provide a comprehensive circuit simulation, verification and analysis methodology that has been seamlessly integrated into the Cadence Analog Design Environment. Designers can move smoothly through schematic capture, test bench setup, simulation and analysis to achieve insight into design performance and manufacturability prior to tape out, avoiding costly mistakes and design re-spins.
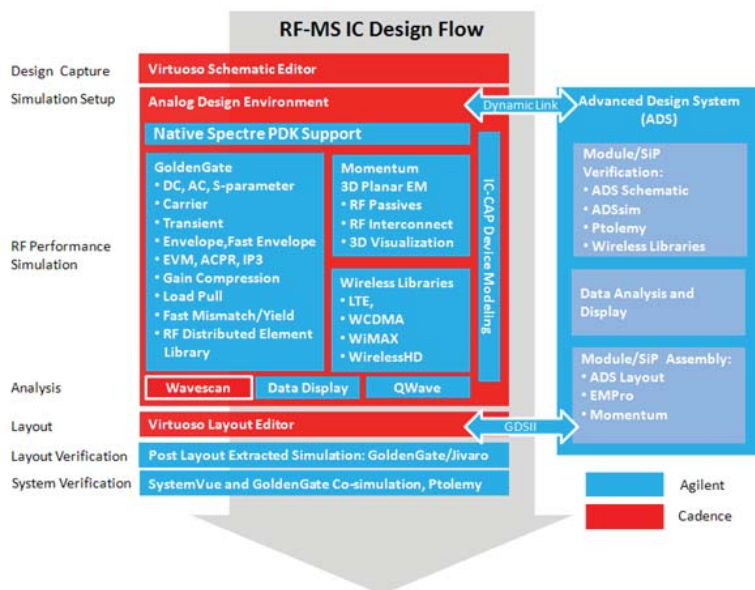

Figure 13. RFIC designers working in the Cadence environment may directly access Agilent's GoldenGate RFIC Simulation Software, Momentum for EM analysis as well as execute wireless test benches from either Ptolemy or SystemVue. Circuit netlists from the Cadence environment can also be brought into ADS for package and module level analysis using Dynamic Link.
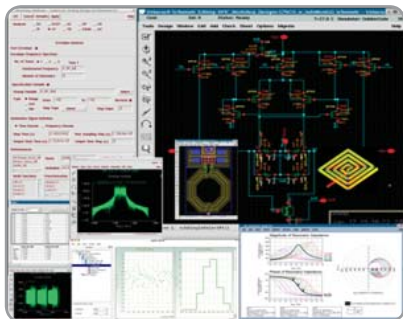
Complete RF-Mixed Signal IC Design Flow

GoldenGate is part of a comprehensive RF-MS IC design flow which originates at design capture and flows seamlessly to prototype test. Designs initially are created in Cadence Virtuoso Schematic Capture. Circuits are then simulated in GoldenGate directly from the schematic, enabling a smooth capture to simulation. Advanced simulation analyses including Carrier, Envelope, Fast Envelope, Noise and Transient can be used in combination with specific tasks such as Load Pull, optimization, parameter sweeping, Monte Carlo/Corners, including Fast Mismatch, provide "real world" view of performance and yield. Simulation results can be viewed using either Cadence results viewer or Agilent's rich set of RF-oriented Data Display capabilities.

After the IC layout is complete, extracted parasitics can be simulated and performances analyzed with GoldenGate. Additional EM based parasitic and RF passive component modeling is performed using Momentum and EMPro simulators. Co-simulation with the Agilent SystemVue system simulator is used to verify that overall system behavior matches the relevant wireless specification. Final prototype measurements, and additional circuit and device modeling are performed with Agilent test equipment and IC-CAP software.

IC-CAP Device Modeling Software -- Measurement Control and Parameter Extraction

Figure 14. IC-CAP WaferPro provides a multi-site, multi-wafer, automated DC and RF measurement solution for semiconductor device modeling applications.

Integrated Circuit Characterization and Analysis Program (IC-CAP) is the industry standard for DC and RF semiconductor device modeling. IC-CAP extracts accurate compact models used in high-speed digital, analog and power RF applications. Today's most advanced semiconductor foundries and IDMs rely on IC-CAP for modeling silicon CMOS, Bipolar, compound gallium arsenide (GaAs), gallium nitride (GaN) and many other device technologies.

IC-CAP offers device engineers and circuit designers state-of-the-art modeling software that performs numerous modeling functions including instrument control, data acquisition, graphical analysis, simulation, optimization, and statistical analysis. All of these processes are combined for efficient and accurate extraction of active device and circuit model parameters. IC-CAP runs on both Windows and Linux platforms while providing a flexible and intuitive Windows-style environment. It also provides the power to build model libraries for Agilent EEsof's ADS and other simulators.

A Complete Device Modeling Solution

Successful device modeling requires a thorough understanding of the complex integration between measurement hardware and modeling software. IC-CAP provides a complete set of tools for a fully integrated solution for device modeling engineers.

Measurement

IC-CAP software provides powerful modeling measurement capabilities including DC, LCRZ, CV, RF and 1/f noise measurements. IC-CAP Wafer Professional (WaferPro) provides a dedicated wafer map environment to enable test engineers to efficiently create and execute automated test plans across temperature. WaferPro supports a variety of instruments (including Agilent Parametric Testers), probers and thermal chucks.

Extraction Modules

The device modeling world comprises a wide variety of technologies, each having its own particular application focus. IC-CAP provides complete model extraction solutions along with convenient user interfaces and extraction methodologies.

IC-CAP actively supports the following modeling technologies:
- CMOS
- HBT
- BJT
- FET
- HEMT
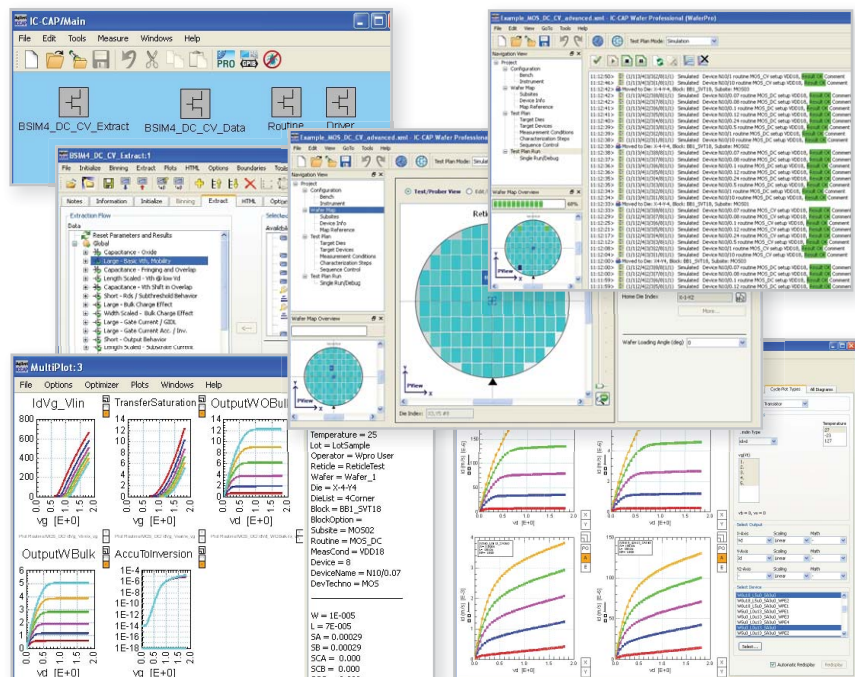- Custom model developments
- Diode
- 1/f Noise

Figure 15. IC-CAP's open software architecture enables maximum accuracy and provides ultimate flexibility to create and automate measurement, extraction and verification procedures.

Most Efficient Modeling Solution on a Single Platform

An efficient device modeling flow is the critical path to any foundry's success. Time, money, and market share can be compromised if there are problems in this process.

IC-CAP is the first modeling tool to provide a comprehensive family of extraction solutions for all Compact Modeling Council (CMC) industry standard CMOS models, BSIM3,BSIM4, PSP, HiSIM2 and HiSIM_HV. IC-CAP's unified measurement approach enables data from one technology to be used for extraction in the next without having to take new measurements, assuming there are no additional measurements required. This single platform approach to CMOS modeling facilitates risk-free transitions from one model technology to the next.

In addition to the advantage of a single platform, IC-CAP users save time and effort with an efficient, intelligent, direct extraction methodology. Dramatic reductions in extraction time can be experienced with the IC-CAP CMOS model extraction packages. For example, the BSIM4 extraction package has demonstrated a 2-day model extraction that is accurate and physically based.

Genesys — Affordable, High-Performance RF/Microwave Design Software

Key Strengths

- Industry's widest coverage of RF/microwave circuit synthesis capabilities to reduce hours of manual design into minutes.
- RF system architecture and frequency planning simulators with root-cause analysis to catch errors and prevent costly rework downstream.
- Accurate circuit simulators to tune and optimize designs for performance and yield to minimize bench top hardware iterations.
- Fast, high capacity Momentum planar electromagnetic simulator to account for RF board layout effects before RF PCB hardware fabrication.
- Support for X-parameters nonlinear simulation in circuit and system simulation with breakthrough accuracy and convenience.

Lowest Cost of Ownership

- A node-locked license of Genesys including the first year of support and upgrades costs typically 1/3 less than any competing equivalent capabilities in the industry.
- The cost of a perpetual Genesys license is even less than a 1 year rental of many other RF/microwave design tools of lesser capabilities.
- For projects with tight budgets or where cash flow conservation is critical, Genesys is also available as time-based licenses to lower ownership costs further.

Industry's Broadest Coverage RF Circuit Synthesis

Genesys provides the industry's widest coverage of passive and active circuit synthesis capabilities. The following 11 synthesis modules are included in the Genesys Synthesis building block:
- Lumped filters
- Distributed microwave filters
- Narrow/broadband lumped/distribute matching networks
- Transmission lines
- Customized shaped-response filters
- Active filters
- Group-delay equalization networks
- Oscillators
- Phase locked loops
- Signal control couplers, baluns & attenuators
- Mixers

Agilent Genesys is an affordable, high-performance RF and microwave tool specifically created for the RF and microwave circuit board and subsystem designer. Providing the optimal balance of design capabilities and ease-of-use, designers can quickly attain the skill set necessary to operate the tool while realizing unbeatable engineering productivity in the shortest time possible. Genesys is available in six different languages (English, Japanese, Russian, Korean, Chinese simplified, and Chinese traditional), further adding to its ease of learning and enabling global collaboration by engineers and technicians alike.

Genesys is endorsed by an installed base of over 5,000 satisfied RF and microwave designers worldwide, many of whom have been loyal repeat customers over the past 20 years. Genesys is also backed by Agilent's extensive industry wide expertise in RF/microwave design, development and support. As a proven safe investment, it literally pays for itself through cost savings within its first year of deployment. Further protecting the user's investment, as the designer's needs grow beyond RF board applications, Agilent provides a full trade-in credit that can be applied towards the purchase of ADS for designing MMIC and multi-technology RF system-in-package (SIP) modules.
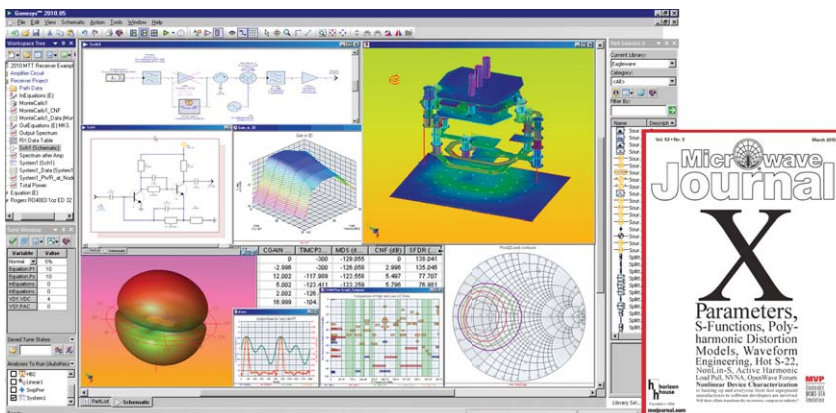

Figure 16. Easy-to-use and easy-to-learn, Genesys is the low-cost, high-performance integrated electronic design automation software for RF/microwave circuit board and subsystem designers.
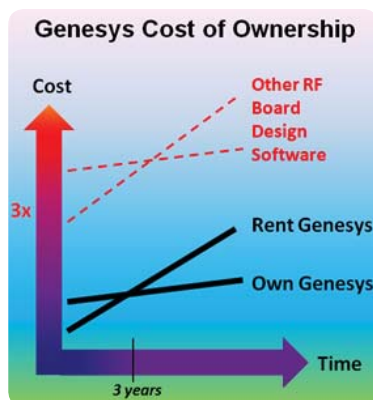

Figure 17. As a proven safe investment with an installed base of 5,000 satisfied designers, Genesys literally pays for itself through cost savings within its first year of deployment.

Training, Support, and Service — When and Where You Need It

Agilent's EEsof EDA products are backed by a world-class team of experienced application and technical support engineers who are dedicated to providing the right software, support, and consulting solutions to increase engineering productivity and long-term success. We offer worldwide, local-language, technical support via the worldwide web, e-mail, telephone and fax.

In addition, our web-based Agilent EEsof EDA Knowledge Center is an around-the-clock resource for comprehensive support information and downloadable examples for all our products. It hosts software updates and has a tracking feature that makes it easy for you to submit and manage support cases and related enhancement requests. The search feature makes it easy to find and sort through available solutions by date, popularity, or user ratings. The Knowledge Center also contains product discussion forums that put you in touch with other users, support engineers, and product developers.

Our Customer Education group offers a comprehensive set of instructor-led and e-Learning courses designed to quickly enable engineers to apply Agilent EEsof EDA tools to their design challenges. Our instructor-led courses are hands-on for maximum learning, and they are available at Agilent sites around the world or they can be delivered at your site.

Every teams's design flow has aspects that are unique. To save time and get individual attention for your application, take advantage of our consulting in MMIC, high-speed digital, RF-Mixed signal, device modeling, board/module or system-level design.

Agilent Email Updates

www.agilent.com/find/emailupdates
Get the latest information on the products and applications you select.

For more information on Agilent Technologies' products, applications or services, please contact your local Agilent office. The complete list is available at:

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Mexico	01800 5064 800
United States	(800) 829 4444

Asia Pacific

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China	800 810 0189
Hong Kong	800 938 693
India	1 800 112 929
Japan	0120 (421) 345
Korea	080 769 0800
Malaysia	1 800 888 848
Singapore	1 800 375 8100
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Europe & Middle East

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Ireland	1890 924 204
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Netherlands	31 (0) 20 547 2111
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Revised: June 8, 2011