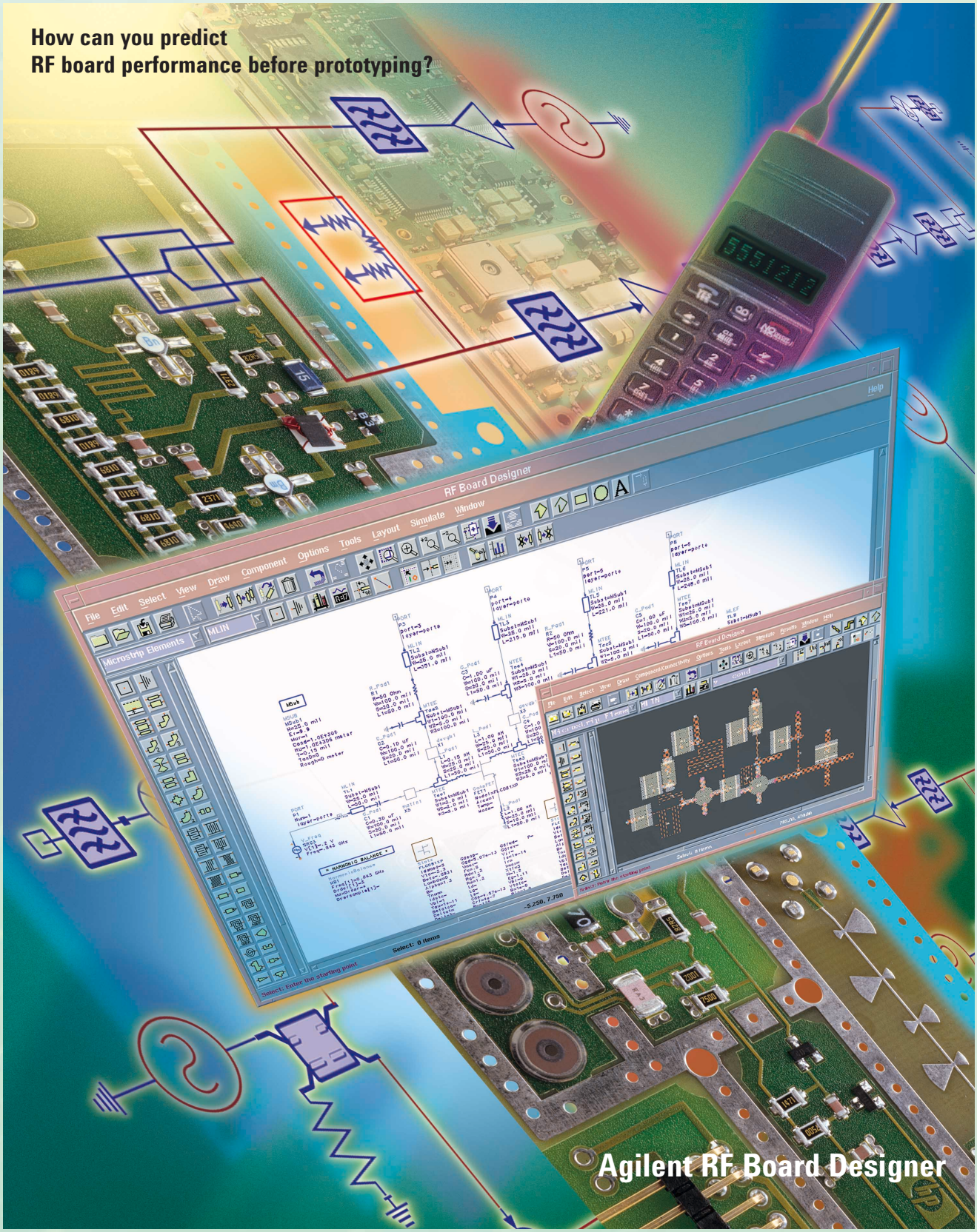
Agilent EEsof EDA Design Technology



Agilent Technologies
Innovating the HP Way

Reducing Product Development Cycles

When creating RF designs on printed circuit boards, designers face the challenge of taking their specifications from concept to physical reality. This challenge is further compounded by the market demand for products with high performance, small size, and low cost. The pressure is on to release projects to manufacturing.

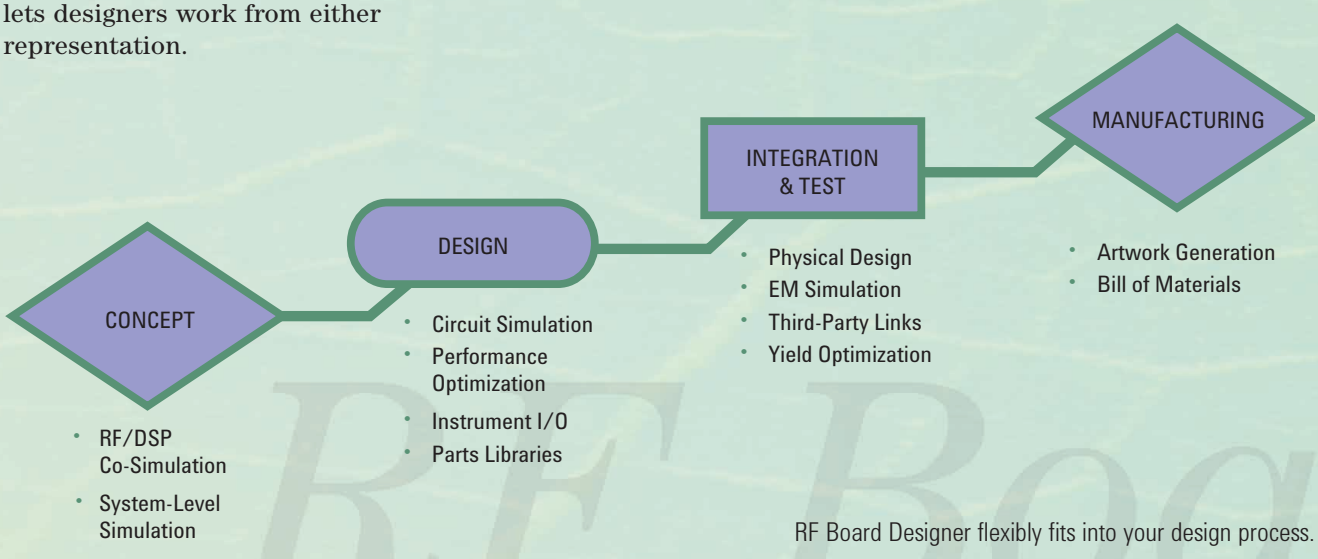
To meet this challenge, RF designers need powerful, accurate solutions to quickly evaluate and refine designs before committing them to expensive hardware. Using a single user interface, RF Board Designer combines circuit and system simulators, schematic capture and layout, and powerful optimizers to help maximize performance and manufacturing yield. Unlike other EDA tools, RF Board Designer synchronizes the layout with the schematic and lets designers work from either representation.

Taking Projects Through the Design Process

From concept to manufacturing, RF Board Designer fits into each step of your design process, from analyzing RF system block diagrams and developing individual circuits, to selecting optimal parts and implementing board layout. The process is geared to find errors earlier and expedite release to manufacturing.

In the conceptual stage, system models co-exist with circuit blocks allowing performance trade-offs using convenient budget analysis. At the design stage, circuit simulation incorporates a variety of device models, multiple optimizers for performance and manufacturing yield, and many vendor component libraries.

During physical design, the layout helps identify areas of the design that may exhibit parasitic and coupling effects. Electromagnetic simulation reveals where the design should be modified. And finally, release to manufacturing is supported with outputs to industry standard data files and links to third-party EDA frameworks, such as Mentor Graphics and Cadence.



RF Board Designer flexibly fits into your design process.

Building Complex Designs Efficiently

Managing Designs Easily and Effectively

The collective work of an RF design team can be managed in a single project directory. Or, team members can use separate project directories so that multiple designs (schematic and layout) can proceed in parallel and then be merged together in a single higher-level design. Finally, designers working in any project directory can share a common set of custom libraries and subcircuits.

Combining System and Circuit Analyses

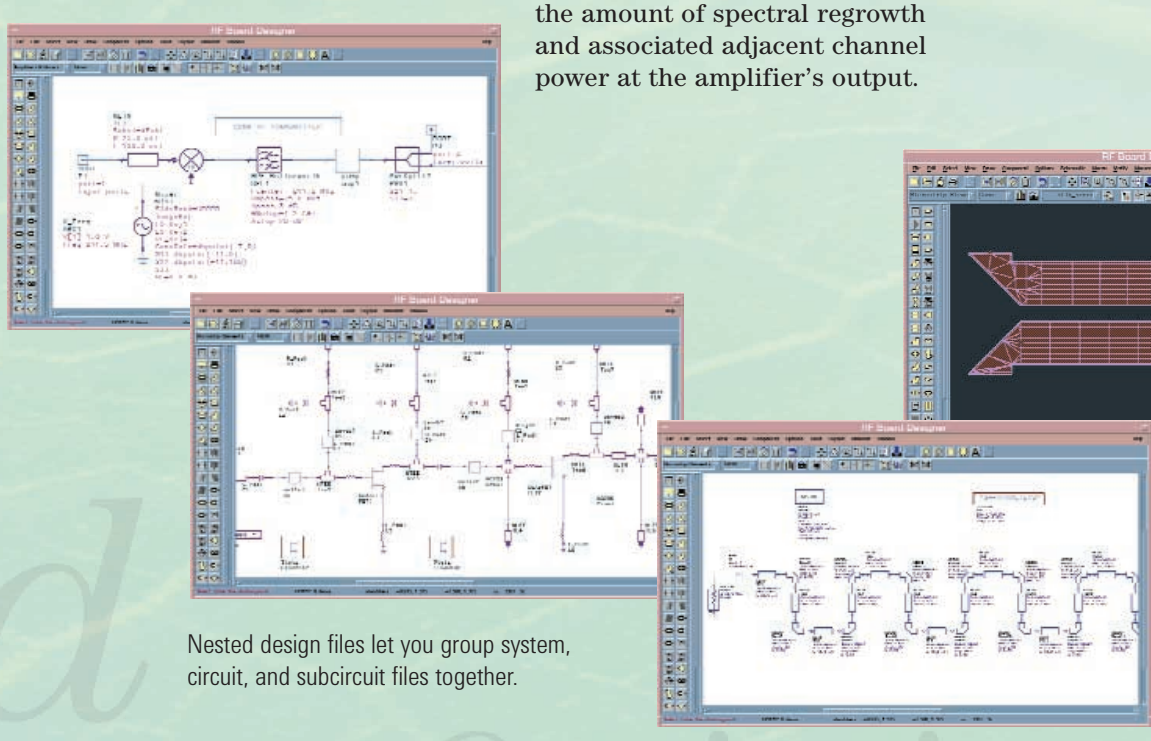
One of RF Board Designer's most powerful features is the ability to directly embed linear and nonlinear circuits in higher-level RF system designs. With a full range of complex modulated signal sources available, engineers can test these circuits under real-world conditions.

For example, the nonlinear circuit simulator first optimizes an amplifier's performance for maximum output power and minimum input return loss. Then, with the amplifier embedded in a higher-level system, performance is re-evaluated. Using a complex modulated signal, designers can accurately predict the amount of spectral regrowth and associated adjacent channel power at the amplifier's output.

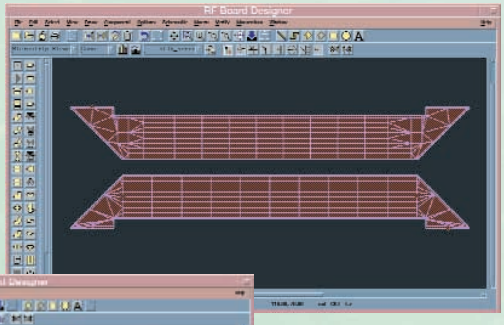
Including Physical Design Considerations

RF Board Designer's high-frequency layout capabilities let you tie the physical design to the schematic and simulation. The effects of routing, packaging and material properties are included in the circuit design phase. Measured data can be easily accounted for in designs with links to test equipment and device modeling tools.

Detailed 2-D and 3-D electromagnetic analysis of critical board structures using the Momentum planar EM simulator and the Agilent High-Frequency Structure Simulator can be included in the schematic.



Nested design files let you group system, circuit, and subcircuit files together.



From the RF Board Designer layout window (above), you can launch the optional Agilent Momentum EM simulator to precisely analyze complex structures.

Using the Best Tools for the Task at Hand

Leveraging Multiple Simulation Technologies

RF Board Designer provides a spectrum of simulation technologies, including linear, nonlinear, time- and frequency-domain—all available directly from the same schematic. Together, these technologies let designers fully characterize and optimize designs under multiple conditions.

With yield analysis and discrete value optimization, designers can test the sensitivity of a design to part tolerances. Physical design tools generate the layout and artwork for bringing designs to prototype, final artwork, or merging with analog/digital circuitry on a single board.

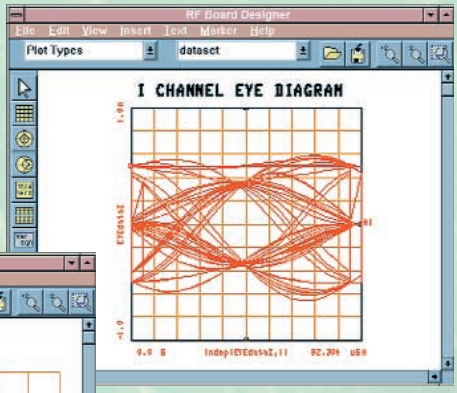
Links to measurement instruments such as network analyzers, spectrum analyzers, and oscilloscopes make data collection quicker and simpler than ever. Since real world signals and measurements are available, it is easy to compare measured versus simulated data.

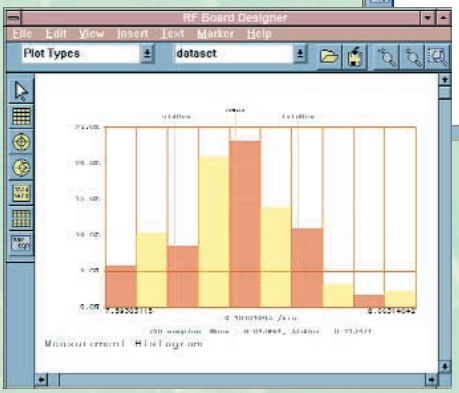
Linear and Nonlinear Steady-State Analysis

Linear simulation is the most frequently required analysis for the design of LNAs, filters, and passive microstrip structures, such as matching networks. Gain and noise figure circles help predict amplifier performance, while S-, Z-, Y-, and H-parameters provide accurate subcircuit characterization.

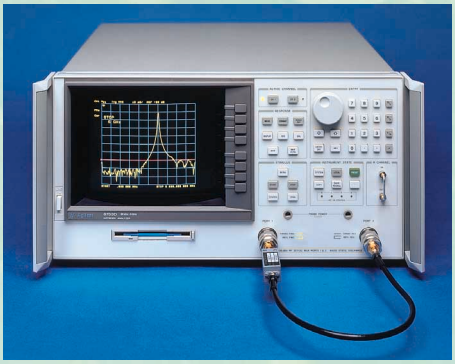
Use RF Board Designer's extensive library of RF system, circuit and layout elements to define the prototype from the bottom up. System-level behavioral elements include mixers, filters, amplifiers, and switches. Multilayer interconnect elements model physical traces, including curves and bends. Even the effects of board construction, such as layer thickness, dielectric constant, and loss tangent can be included in the simulation.

Nonlinear simulation using the harmonic balance technique extends the capabilities of linear simulation by analyzing DC bias points, compression effects in amplifiers, mixer noise, and nonlinear amplifier noise.





Quickly analyze data with specialized outputs, such as eye diagrams and measurement histograms.



Data extraction is simplified with direct links to measurement instrumentation including spectrum analyzers, oscilloscopes, and network analyzers, such as the Agilent 8753.

Transient Analysis

The high-frequency SPICE transient simulator is optimized for RF design. It is ideal for analyzing the start-up effects of oscillators, stepped RF responses in amplifiers and other active circuits, and coupling of high-speed interconnects. For greater accuracy, use the convolution simulator to extend the capabilities of high-frequency SPICE. Convolution analysis is ideal for time-domain simulation of circuits that contain frequency dependent data such as S-parameter files or dispersive losses.

Complex Modulated Signal Analysis

A hybrid time-frequency-domain simulator, Circuit Envelope, is ideal for analyzing complex, digitally-modulated RF signals in circuits and subsystems. This type of simulation was previously impractical or impossible with other simulation techniques. Circuit Envelope helps predict specifications such as transmitter amplifier adjacent channel power, error vector magnitude, mixer intermodulation, and PLL lock times. Performance measures can be directly verified against international wireless standards, such as NADC, GSM, and PDC.

Performance and Yield Optimization

To produce linear and nonlinear circuits with peak performance in gain, noise figure, input/output matching, and power-added efficiency, engineers can select from several powerful optimizers. Optimization goals can be set for virtually any measurable parameter, across frequency or even across swept element values. Use discrete value optimization to account for gaps in part values available in manufacturing. Then, yield optimization helps designers maximize the percentage of manufactured circuits that pass specification based on actual part tolerances.

See enhanced performance of your linear designs with tools for impedance matching, including gain and noise figure circles.

Verify nonlinear output measurements using phase noise and time-domain analysis.

Implementing the Physical Design

High-Frequency Based Layout Editor

Because reliable prediction of hardware performance depends upon accurate implementation of the physical design, RF Board Designer features a layout tool optimized for RF board design. In addition to part placement and trace routing capabilities, it allows details of the physical board to be simulated directly from the layout.

Smart trace functions help with routing, such as automatic connection after layer changes. Dead zones can be created to identify restricted areas of the board where no traces may be placed.

Models and Libraries for Real-World Results

SMT libraries from Agilent EEsof EDA contain over 80,000 parts including resistors, capacitors, inductors, mixers, amplifiers, and filters. Hundreds of vendor parts are cataloged in their SMT package configuration for easy placement. Form factors and special restrictions to layouts can easily be accounted for. Custom artwork can be created for non-standard parts and footprints that insure layouts that are true to life.

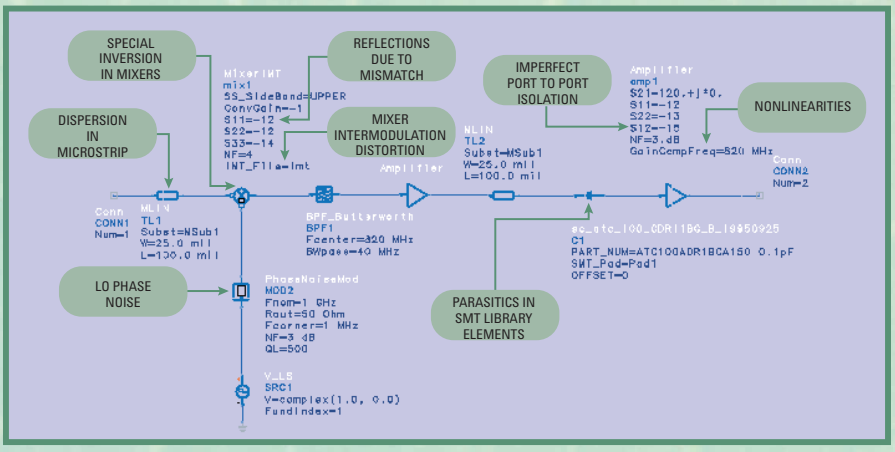
Accurate models are available for dozens of microstrip, stripline and printed circuit board lines, tees, crosses, bends, and curves. These models let you quickly and easily include details of the board layout at both the circuit and RF subsystem levels. Additionally, designers can also access corporate parts libraries that may have been developed with third-party tools.

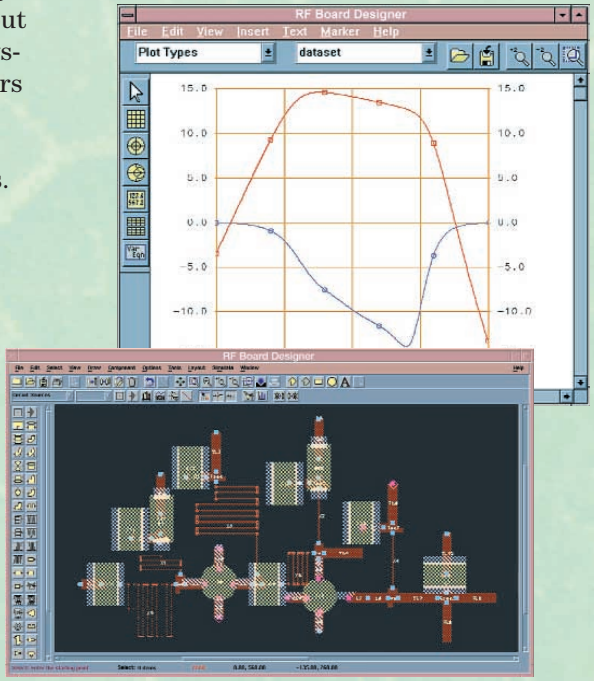
Layout Linked to Schematic

Using design synchronization, the layout has a one-to-one correlation with the schematic so that each design feature is accounted for in the simulation.

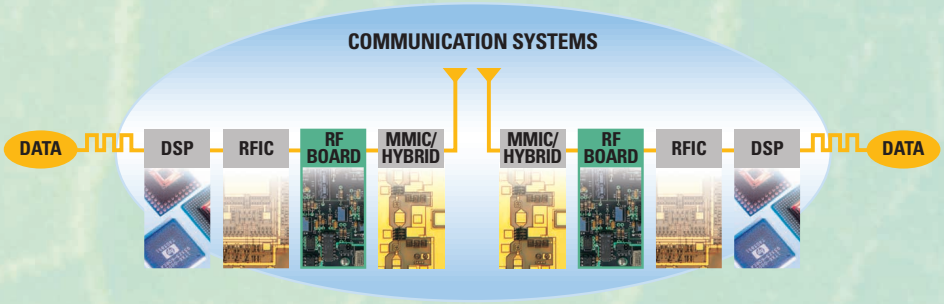
Circuit simulations are hierarchically tied to both the RF schematic and the physical layout to provide fast, accurate, and proven analysis at all phases of the design process. Board traces can be characterized as transmission lines so that the effects of bends, corners, and pads are transferred to the simulator. Vias and multiple coupled lines are just some of the models available.

RF Board Designer can model most of the RF hardware impairments found in typical communications systems.





Accurate simulations include the effects of packaged library parts.



RF Board Designer is part of Agilent Advanced Design System, which lets you simulate the entire communications signal path from input bits to output bits—with powerful tools for RF board, DSP, RFIC, MMIC/hybrid, communications systems, and planar EM—all in a single design environment.

Accounting for Coupled Structure Performance

The Agilent Momentum planar electromagnetic simulator is available to evaluate tightly packed designs where coupling and crosstalk impact performance. Using this 2-D EM simulation, designers can accurately analyze arbitrarily shaped, multilayer, planar circuits in stripline, microstrip, suspended substrate, slotline, and other layered dielectric media.

Library Translator Tool

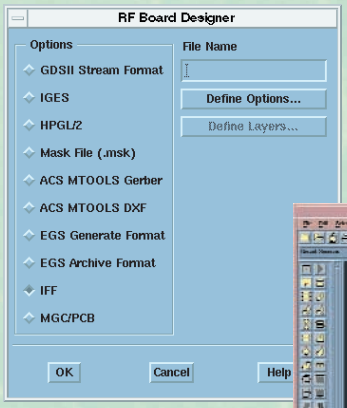
Corporate parts libraries can be translated into RF Board Designer for use in RF schematics and layouts. The parts will exactly match the configuration maintained in your corporate library; when the layout is transferred to third-party EDA tools, such as Mentor Graphics or Cadence, the parts are immediately recognized.

Links to Third-Party Design Tools

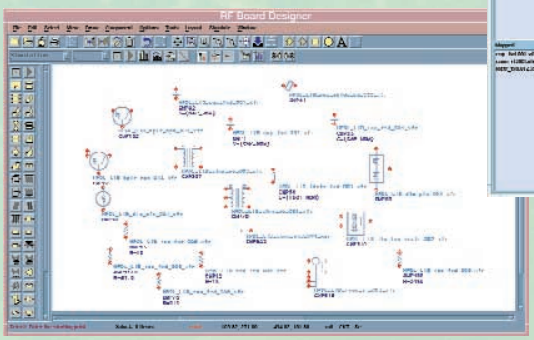
Now, designers no longer need to spend time recreating RF schematics and layouts for third-party EDA tools. Designs can be directly transferred using the Agilent EEsof EDA intermediate file format (IFF). Using these IFF integration tools along with other vendors' IFF companion software, RF designs are easily integrated with digital and low-frequency analog elements on a common board. Bi-directional transfer lets engineers re-define the RF layout region and pass the RF portion back to Agilent EEsof EDA tools for re-layout and simulation.

Industry-Standard Outputs

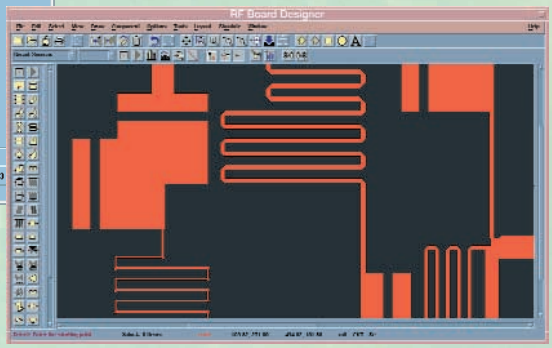
Designs are quickly and efficiently transferred to manufacturing with a number of industry-standard database outputs, such as Gerber, DXF, and IGES files. A bill of materials list can be generated to aid the manufacturing process.



Physical design data can be easily output to a variety of convenient file formats.



Corporate library parts from Cadence and Mentor files can be imported into your RF Board Designer simulations.



Product Design Suites

RF Board Designer combines leading edge high-frequency simulation and optimization technologies with accurate models and physical design tools tailored for RF Board designers. These cost-effective solutions are available in both node-locked and network-licensed configurations on PC and UNIX systems, except where noted.

	Model Numbers
RF Designer (PC Only)*	E8940A
Design Environment	E8900A
Data Display	E8901A
Linear Simulator	E8881A
Layout Basic (optional)**	E8944A
RF Board Designer Pro	E8942A/AN
Design Environment	E8900A/AN
Data Display	E8901A/AN
Linear Simulator	E8881A/AN
Harmonic Balance Simulator	E8882A/AN
RF Passive Circuit Models	E8950A/AN
Statistical Design	E8824A/AN
RF Transistor Library	E8953A/AN
RF Passive SMT Library	E8956A/AN
RF Board Designer Premier	E8943A/AN
Includes RF Board Designer Pro modules plus:	E8900A/AN
Circuit Envelope Simulator	E8883A/AN
Multilayer Interconnect Models	E8951A/AN
RF System Models	E8854A/AN
Layout	E8902A/AN
Optional Modules	
High-Frequency SPICE	E8884A/AN
Convolution Simulator	E8885A/AN
Momentum Planar EM Simulator	E8921A/AN
High Frequency Diode Library	E8954A/AN
Murata SMT Capacitor Library	E8957A/AN
Mentor IFF Schematic Translator	E8965A/AN
Mentor IFF Layout Translator	E8966A/AN
IFF Schematic Translator	E8967A/AN
IFF Layout Translator	E8968A/AN
Library Translator	E8969A/AN

* Certain functionality restrictions apply.
** This is the single expansion option.

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Printed in U.S.A. 11/00
5966-2872E

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