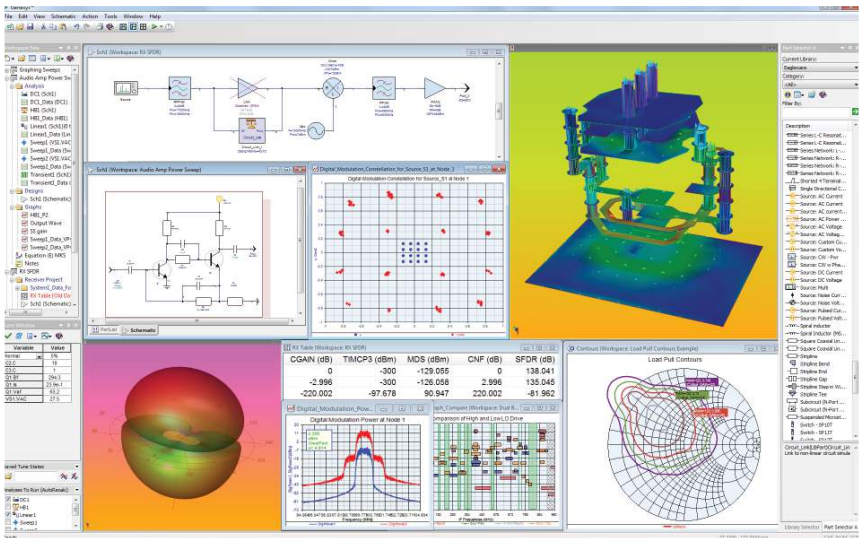
Keysight Technologies
Genesys

An integrated simulation and synthesis design tool for RF/microwave circuit board and subsystem designers



KEYSIGHT TECHNOLOGIES

Keysight Technologies, Inc. Genesys is an affordable, accurate, easy-to-use RF and microwave simulation tool created for the circuit board and subsystem designer. Providing the optimal balance of capabilities with ease-of-use, designers can quickly attain the skills necessary to operate the tool while realizing unbeatable engineering productivity through powerful automatic circuit synthesis technology. Genesys is available in 6 different languages (English, Japanese, Korean, Chinese simplified, Chinese traditional and Russian), further adding to its ease of global deployment and collaboration by engineers and technicians.

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 30 years. Genesys incorporates breakthrough nonlinear X-parameter simulation and is backed by Keysight's extensive industry-wide expertise in RF/microwave design, instrumentation and support. As a proven safe investment, Genesys literally pays for itself through cost savings within its first year of deployment as a design productivity tool. As your requirements expand to include enterprise level design of RF/high speed boards, MMICs or multi-technology RF system-in-package (SIP) modules, Keysight protects your Genesys investment by providing full trade-up credit towards the even more capable Advanced Design System (ADS).

The core capabilities of Genesys can be extended with additional simulation building blocks into powerful and affordable bundles.

Genesys Configuration Overview

Genesys offers the highest design productivity by providing:

- Industry's widest coverage of RF and microwave automatic circuit synthesis
- Fastest RF system architecture and frequency planning tools
- Modulated RF analysis of circuits and systems for EVM, BER and ACPR with WLAN 802.11ac and LTE-3GPP verification
- Time- and frequency-domain circuit simulation with optimization
- Fast, memory-efficient 3D-planar electromagnetic (EM) simulation
- Accurate and convenient X-parameter nonlinear circuit and system simulation

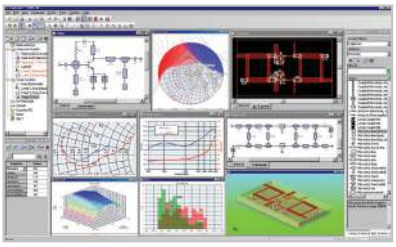
Genesys Core Environment

All Genesys configurations start with the prerequisite Genesys core environment, which is itself a full-featured design bundle. Extended capabilities are added to other affordable bundles to include:

- Filter and circuit synthesis
- RF system architecture
- Modulated RF analysis
- Nonlinear circuit simulation (DC, time- and frequency-domains)
- 3D-planar EM simulation

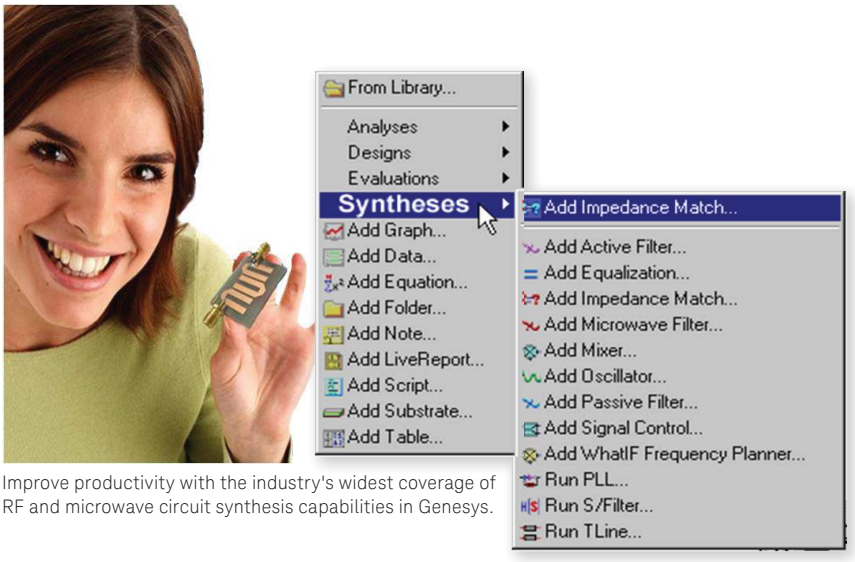
Key building blocks
Genesys bundles are comprised of one or more of these building blocks.
Core – Schematic, Layout, Plot, Linear Analysis, Optimization, Instrument Links
Filter and match – Filter & Matching Circuit synthesis
Synthesis – Custom Filter, Mixer, Oscillator, Signal Control , Equalizer synthesis
System – System simulation, Budget analysis & Frequency Planning synthesis
Modulated RF – Modulated RF analysis of EVM, BER and ACPR with WLAN & LTE verification
Circuit – Harmonic Balance & SPICE circuit simulation
EM – 3D Planar Electromagnetic simulation of printed circuits & antennas

Core Building Block

Capability module	Description
W1320BP/BT Genesys core  www.keysight.com/find/eesof-genesys-core	Design environment – Integrated, easy-to-use Windows-based graphical user environment for hierarchical design creation and management; available in six major languages worldwide – Scripting from Visual Basic, C++, VBScript or JScript for automation of Genesys to perform custom or repetitive tasks – LiveReport for creating auto-updating and interactive design documentation – Export Genesys designs for use in Keysight ADS in design collaboration Fast linear simulation and powerful optimization – Interactive tuning for quick insights – Fast and robust design optimizer – Linearizes nonlinear components at their DC bias before linear simulation. NOTE: Full DC analysis requires Harbec/Cayenne
	Statistical simulation – Monte Carlo yield analysis – Graphical and spreadsheet report Data manipulation and display – Data sets for persistent storage of simulation and measurement data for post-processing and display to eliminate wasteful re-simulation – Matlab script with 100% compatibility with Matlab for custom equations, functions and data processing – Flexible data display and analysis with rectangular, polar, Y/Z Smith, histogram, 3D-parametric plots, and instrument-style marker readouts – Interactive 3D viewer for EM surface currents and antenna far-field patterns RF/microwave layout and artwork translators – Create layout from schematic, imported artwork, or direct drawing for EM simulation and board fabrication – 3D viewer for layout with interactive rotation, zoom, vertical stretching, and cut planes to verify correct geometry before fabrication – Full library of pad/package layout footprints – Import /export masks and drill files in popular printed circuit board (PCB) formats (e.g., Gerber, DXF/DWG, and GDSII) for PCB board realization on fast prototyping machines or chemical etching Libraries of simulation models and parts – Full libraries of accurate high-frequency physical models with automatic discontinuities – Over 30,000 linear, nonlinear and system parts libraries Testlink – Captures measured data directly into Genesys for simulation and display on network analyzers, impedance analyzers, oscilloscopes, vector/spectrum analyzers, semi-conductor analyzers, and power meters – Supports over 140 instruments from more than 14 equipment manufacturers www.keysight.com/find/eesof-genesys-testlink

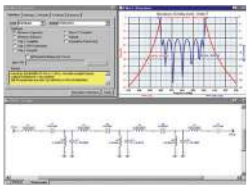
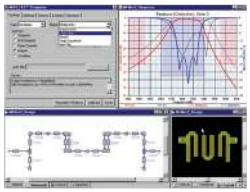
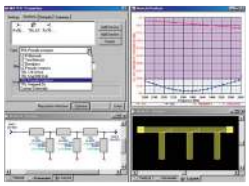
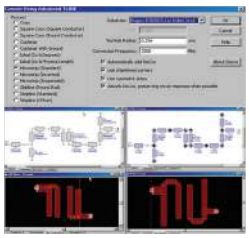
Genesys Synthesis

Genesys provides the industry's widest coverage of passive and active circuit synthesis capabilities. The synthesis modules create high-performance circuits, accelerate routine design tasks from hours to minutes, and enable fast make-or-buy decisions on RF components. All 11 synthesis modules are included in the Genesys Synthesis building block. An economical subset containing the 4 most popular synthesis modules is the "filter and match" building block.

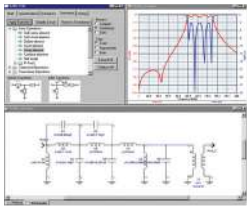
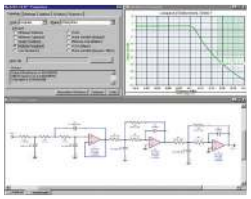
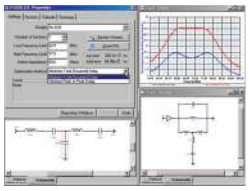
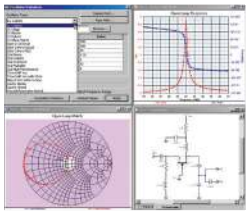
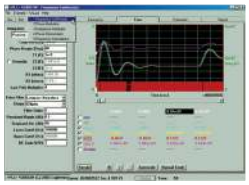
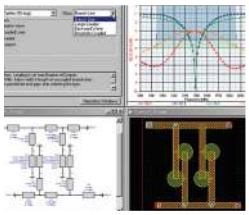
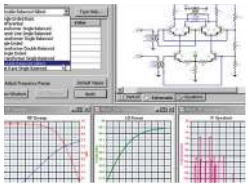


Improve productivity with the industry's widest coverage of RF and microwave circuit synthesis capabilities in Genesys.

Filter and Match Building Block

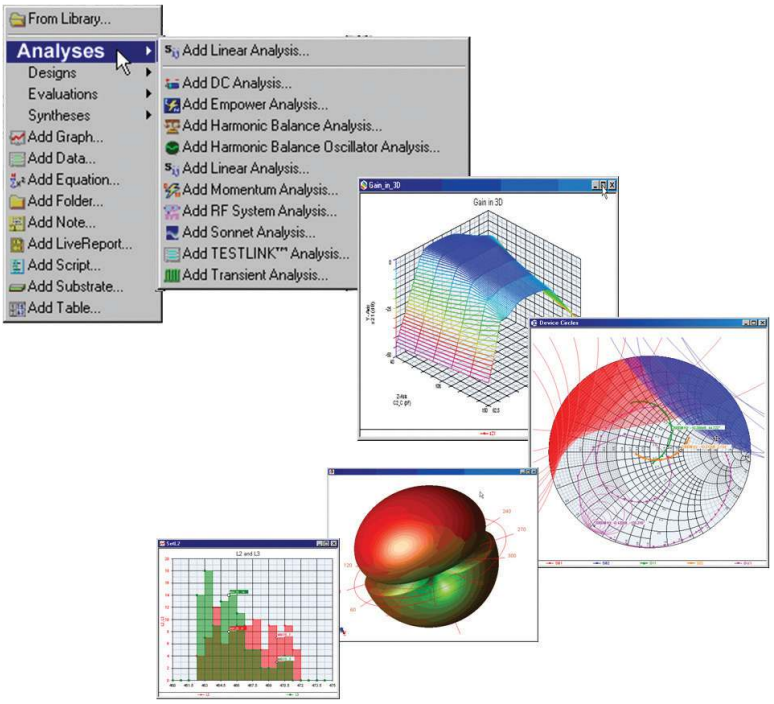
Capability module	Description
	Filter synthesis Classical lumped filter synthesis for RF applications. This module is the single highest-selling synthesis module from our Genesys product line. www.keysight.com/find/eesof-genesys-filter
	M/filter synthesis Distributed filter synthesis for microwave applications with over 60 topologies, including automatic layout for subsequent EM analysis. Synthesizes high-performance microwave filters and assists make-versus-buy decisions. www.keysight.com/find/eesof-genesys-m-filter
	Match synthesis Synthesizes impedance-matching networks over narrow/broad frequency bands with lumped/distributed components and complex frequency-dependent loads. www.keysight.com/find/eesof-genesys-match
	Advanced transmission line synthesis Synthesizes 13 types of transmission lines with lump-distributed circuit conversion and automatic discontinuity insertion. Converts ideal electrical designs to physical implementation such as microstrips and striplines on your choice of substrate. www.keysight.com/find/eesof-genesys-advanced-t-line

Synthesis – Includes Filter and Match

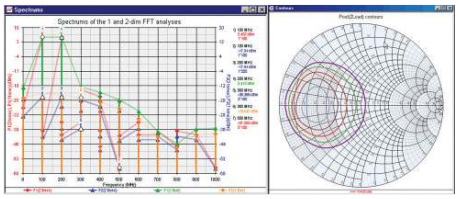
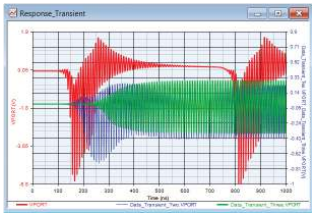
Capability module	Description
	S/filter synthesis Direct synthesis technology enables precise shaping of filter response with transmission zeros to automatically create custom lumped and distributed filter topologies. Comes with over 200 interactive lumped and distributed topological transforms for high-performance custom filter realization. www.keysight.com/find/eesof-genesys-s-filter
	A/filter synthesis Active op-amp filter synthesis with over 30 active topologies. Use for IF, video, baseband frequencies, and control applications such as power control and AGC circuits. www.keysight.com/find/eesof-genesys-a-filter
	Equalize synthesis Synthesizes equalization networks to compensate for linear phase distortions in the circuit or system that impacts modulation fidelity such as error vector magnitude (EVM), video, and audio fidelity. www.keysight.com/find/eesof-genesys-equalize
	Oscillator synthesis Explore 19 RF oscillator topologies from classical L-C, transmission line, SAW, crystal, cavity, and coaxial hybrid. Recommended companion to the Harbec or Cayenne circuit simulators. www.keysight.com/find/eesof-genesys-oscillator
	PLL synthesis Phase-locked loop (PLL) synthesis of analog loop filters and 5 setup wizards to design frequency synthesizers and phase/frequency modulators/demodulators. www.keysight.com/find/eesof-genesys-pll
	Signal control synthesis Synthesizes a variety of lumped and distributed couplers (10 types), splitters (10 types), Baluns (5 types), and attenuator (2 types) circuits that control RF signal flow. www.keysight.com/find/eesof-genesys-signal-control
	Mixer synthesis Explore a range of performance trade-offs between 11 RF mixer topologies based on BJTs, FETs and diodes from diode rings to Gilbert cells. Design companion to the Harbec circuit simulator. www.keysight.com/find/eesof-genesys-mixer

Genesys Simulation

Genesys offers comprehensive circuit, system and electromagnetic simulation capabilities that are provided in the following 4 building blocks which are used to construct powerful and economical Genesys RF and microwave board design bundles.

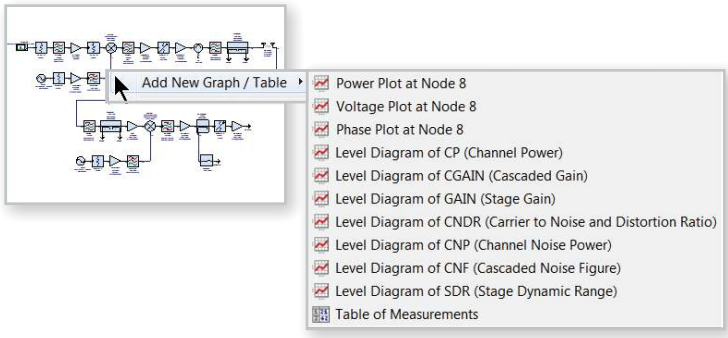


Circuit Building Block

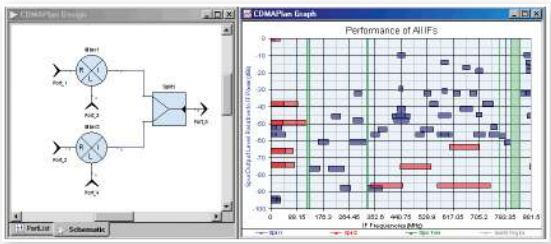
Capability module	Description
	Harbec Harmonic balance, nonlinear frequency-domain circuit simulation and optimization that calculates harmonic spectrum at any circuit node, IP3, compression, efficiency, conversion gain, phase noise, load pull contour, large-signal oscillator, amplifier, or mixer. Indispensable tool for RF/microwave and DC bias designs with active transistors, diodes, and components. Harbec now incorporates Keysight's breakthrough nonlinear X-parameters simulation technology for convenient and accurate nonlinear circuit designs with X-parameter models of transistors and RFICs. www.keysight.com/find/eesof-genesys-harbec
	Cayenne Spice simulation for RF circuits that works from the same schematic and RF physical models as Harbec. Includes convolution algorithm to use S-parameters and frequency-domain transmission-line models in accurate time-domain transient simulations of high-speed signal paths. Includes full DC analysis and optimization of DC voltages and currents www.keysight.com/find/eesof-genesys-cayenne
	Advanced modeling kit Verilog-A modeling allows you to add robust, custom nonlinear models to Genesys Harbec and Cayenne using the industry's most popular analog behavioral-modeling language. Custom nonlinear models are fast transportable and extend Genesys for new applications such as MEMS and electro-optics. www.keysight.com/find/eesof-genesys-amk

Genesys System Architecture

The Genesys system building block includes Spectrasys, a powerful RF system architecture and diagnostic simulator, and WhatIF, an innovative frequency planning simulator that instantly identifies spurious-free bands when designing frequency conversion systems.

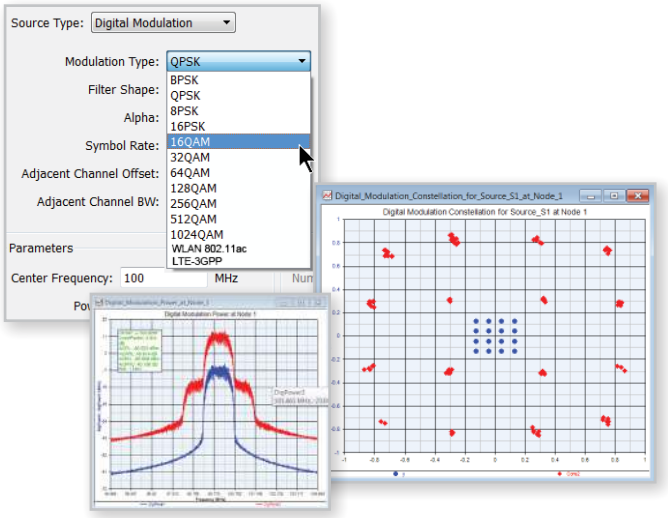


System Building Block

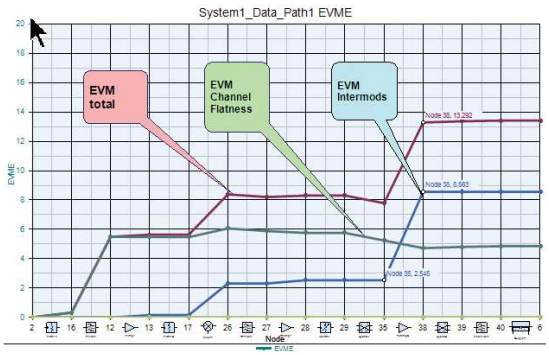
Capability module	Description
	Spectrasys Interactive RF system architecture tool that diagnoses the source of analog impairments such as spurious frequency mixing and mismatch ignored by spreadsheets, with superior ease-of-use. Integrates with circuit synthesis, circuit simulation, optimization, statistics, and EM simulation. Spectrasys now comes with sweep plots to quickly identify and track spurious signals in swept analysis of multi-conversion systems. It also incorporates break-through nonlinear X-parameters simulation technology for convenient and accurate system design with nonlinear X-parameter models of system blocks such as amplifiers, mixers or transceiver RFICs. www.keysight.com/find/eesof-genesys-spectrasys
	WhatIF Unique, graphical frequency-planning tool that quickly identifies spurious-free bands across a wide bandwidth involving multiband conversions to a common IF, using realistic mixers. Useful for designing multiband down-converters with high- and low-side LO's. A natural companion to Spectrasys. www.keysight.com/find/eesof-genesys-whatif

Genesys Modulated RF

The Genesys Modulated RF capability extends the prerequisite System building block by adding the SystemVue dataflow simulator. It enables RF designers to easily specify digitally modulated RF signals to analyze circuits and systems for digital modulation metrics such as EVM, BER and ACPR. Included WLAN and LTE verification libraries assure design compliance with the latest wireless standards.



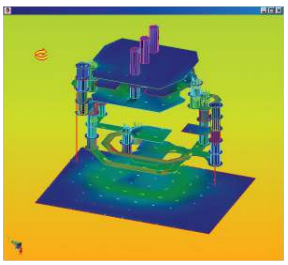
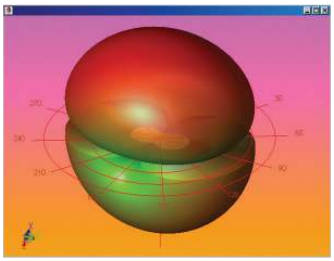
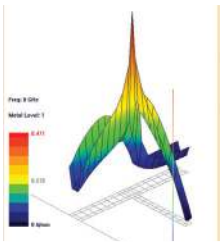
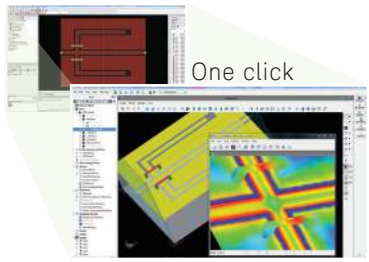
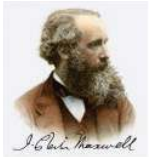
Modulated RF Building Block

Capability module	Description
	SystemVue Dataflow Simulator The SystemVue dataflow simulator enables digitally modulated RF signals to be used for simulating circuits and systems to calculate digital RF figure of merits such as EVM and ACPR. It comes with 11 basic PSK and QAM digital modulation schemes, selectable through a pull down menu on the signal source. Once the digital modulation source is selected, all dataflow parameters, including data sinks are automatically set up correctly for the analysis; thus relieving the RF engineer from having to deal with unfamiliar digital signal processing (DSP) dataflow parameters before starting the simulation. www.keysight.com/find/eesof-systemvue-engine
	Modulated RF Budget Analysis The modulated RF budget analysis of EVM, BER and ACPR on the level diagram is a breakthrough capability in the industry that enables the RF system designer to pinpoint which components in the system architecture are contributing to EVM, BER or ACPR failures. Unlike a single pass/fail simulation, the level diagram indicates stage-by-stage the relative contribution of each component in the system chain to the overall system performance. Based on patented fast estimation algorithms, modulated RF budget analysis also allows interactive tuning of individual component specs to see their relative impact on EVM, BER or ACPR during design. www.keysight.com/find/eesof-genesys-modulated-rf
	Verification library LTE-3GPP and WLAN 802.11ac Instead of going through volumes of LTE-3GPP or WLAN802.11ac test and compliance specifications in trying to set up complicated simulations for verifying your circuit or system design, Genesys has already done that for you. The included LTE-3GPP and WLAN 802.11ac verification libraries comes ready set up with correct default dataflow parameters for the RF engineers to begin the verification simulations with zero learning curve. This follows the tradition of ease-of-use and instant productivity that Genesys is always sought after for. www.keysight.com/find/eesof-systemvue-lte-baseband-verification-library www.keysight.com/find/eesof-systemvue-wlan-library

Genesys EM Simulation

The Genesys EM block includes Momentum GXF, the most advanced 3D-planar electromagnetic simulator in the industry, along with Momentum GX, EMpower and links to Keysight EMpro full 3D-EM simulator and Sonnet.

EM Building Block

Capability module	Description
	Momentum GXF Highest-performance, integrated 3D-planar EM simulator with superset capabilities of Momentum GX, including fast multi-threaded simulation on multicore processors, quadrangle mesher and highly memory-efficient NlogN solvers. Offers the highest speed and capacity for 3D-planar EM simulation to analyze complex multilayer layouts or large planar-antenna arrays. It is typically 20x faster than EMpower. www.keysight.com/find/eesof-genesys-momentum-gxf
	Momentum GX High-performance, integrated 3D-planar EM simulator based on method-of-moments with efficient polygonal meshing of curved and straight geometries. Momentum GX solves a much wider variety of larger problems, faster, using far less memory than traditional rectangular-grid EM solvers. It is typically 5x faster than EMpower. Interactive 3D viewer for surface currents and antenna far-field opens up design insights and is indispensable for troubleshooting. www.keysight.com/find/eesof-genesys-momentum-gx
	EMpower An integrated 3D-planar EM simulator based on method-of-lines for analyzing smaller planar layouts that fit on a rectangular grid mesh. Lower performance, capacity, and versatility than Momentum GX. www.keysight.com/find/eesof-genesys-empower
	Keysight EMPro link Keysight EMPro analyzes non-planar 3-D electromagnetic effects such as packaging, shielding and integration of circuit with waveguides. In a single click, Genesys exports its planar RF/microwave layout, along with ports and substrate material properties to EMPro for immediate simulation. Eliminates tedious manual re-entering of 3D structures, EM port locations and material properties. www.keysight.com/find/eesof-empro
	Sonnet link Enables users of Sonnet planar EM simulator to take advantage of Genesys circuit/system synthesis and simulation by performing circuit-EM co-simulation. www.keysight.com/find/eesof-genesys-sonnet

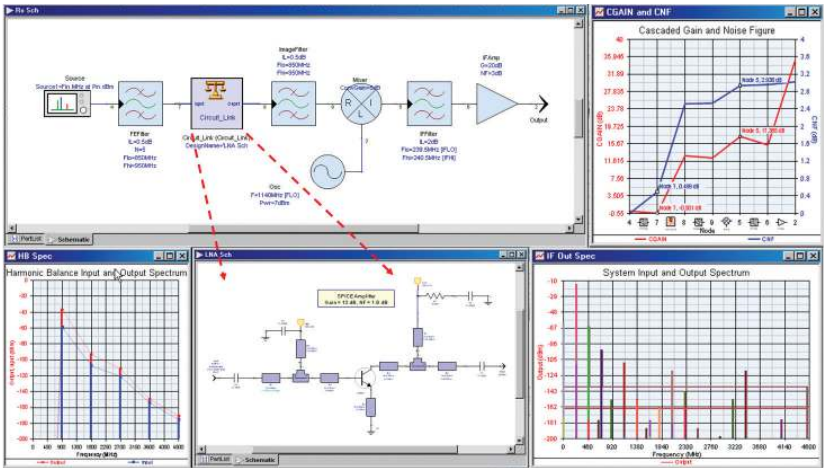
Genesys Co-Simulation

The already powerful system, circuit and electro-magnetic simulators can also be used together to analyze, tune and optimize your designs in a single pass. This eliminates tedious and error-prone manual translation of data between simulators.

Circuit-System Co-Simulation

Circuit | System

Enables nonlinear circuit parameters to be tuned and optimized to system specs in one pass. It eliminates tedious, non-interactive and error-prone creation of inaccurate system behavioral models from circuits to perform circuit-system verification.



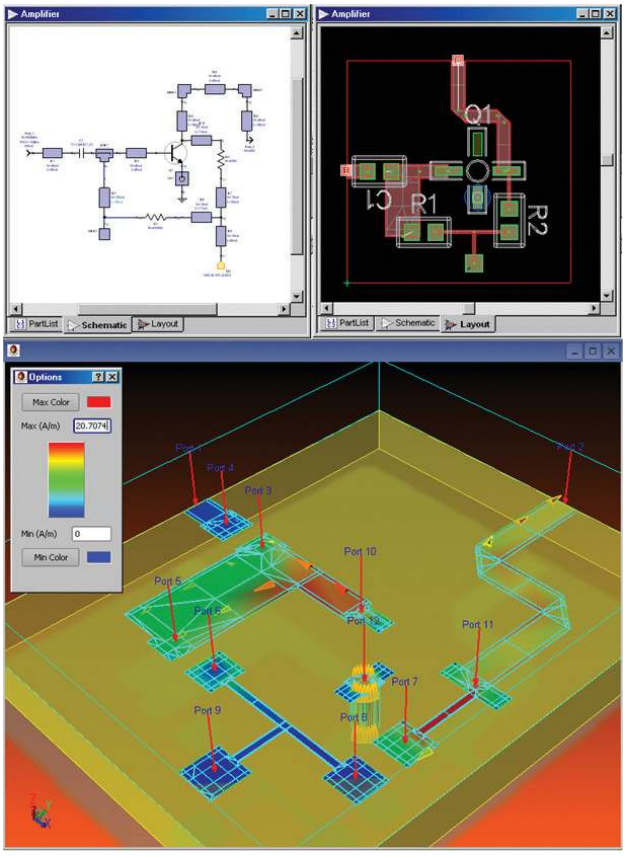
Circuit-EM Co-Simulation

Circuit | EM

Automatically includes the physical effects of board layout in both linear and nonlinear circuit simulations.

It enables you to identify and fix circuit performance degradation caused by undesired proximity coupling, resonance and reflection from your RF board layout.

3D interactive viewing of animated surface current flows help you pinpoint the location of these problems without guesswork.



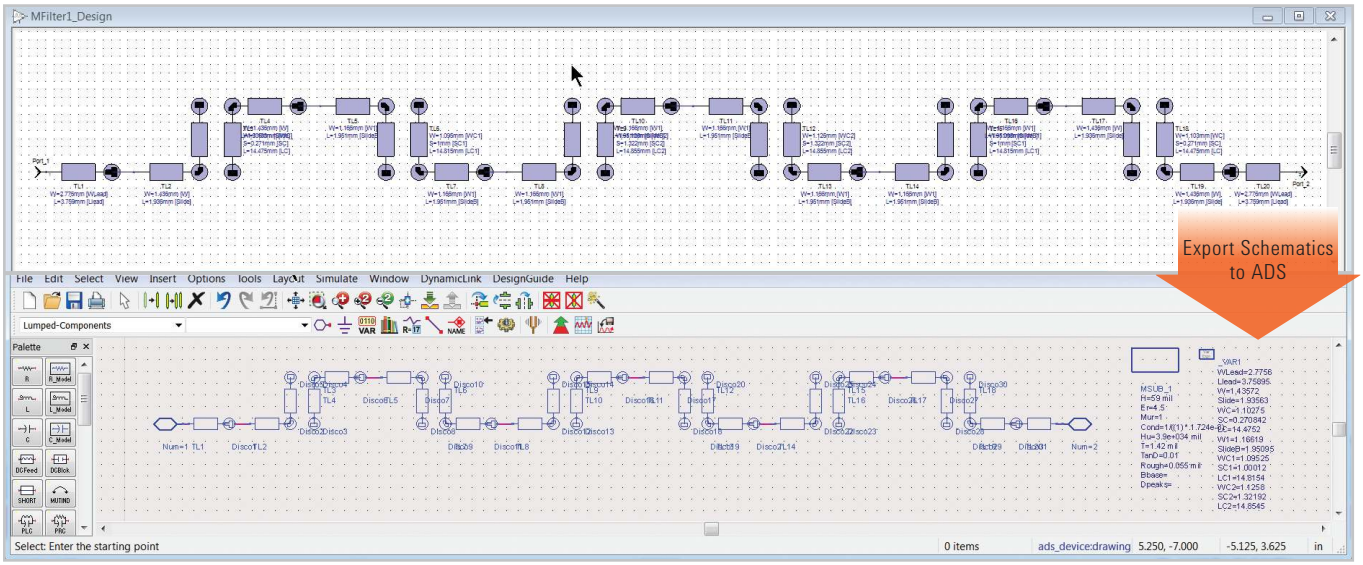
Genesys for ADS users

The automatic circuit synthesis and RF system architecture capabilities in Genesys are perfect complement to ADS users for enhancing personal design productivity at minimum cost.

Genesys Synthesis to ADS Schematic transfer

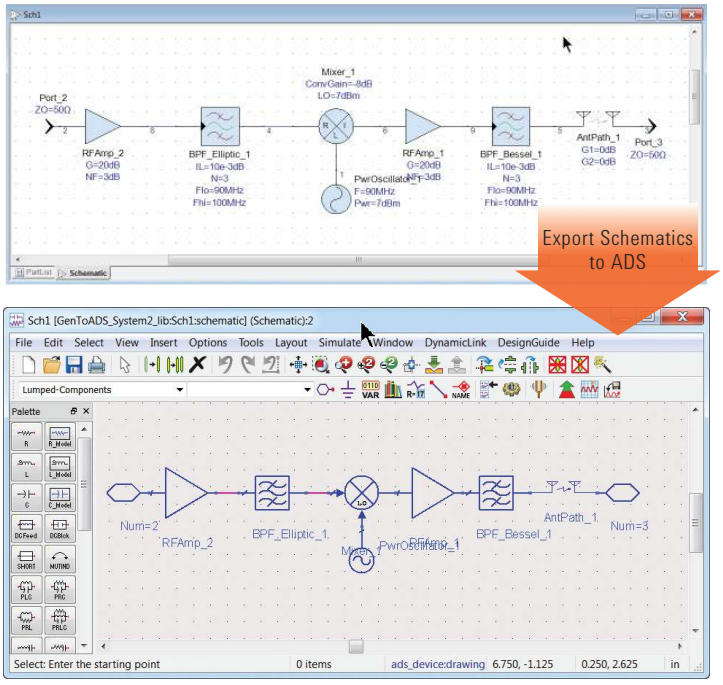
Using Genesys synthesis for broadband impedance matching network design reduces hours of tedious work into a few minutes of mouse clicks as you watch your matching network being synthesized and optimized automatically.

Designing demanding custom notched filters or difficult multiplexers are efficiently tackled with automatic filter synthesis and network transforms to produce novel realizable topologies within minutes instead of days of looking up references. The Genesys synthesized circuit schematic can be transferred to ADS with one click for inclusion into a bigger design.



Genesys System Architecture to ADS schematic transfer

Quickly putting together a system block diagram and simulating it to pinpoint the components causing system impairments is one of the most valued capabilities in Genesys by all RF system designers. All of the above are now available to ADS users as the RF Architect and Synthesis elements W2362EP and W2372EP. They can also run as standalone Genesys bundles when available ADS licenses are depleted.



Getting the Most Value From your Keysight Genesys Software

Keysight has a worldwide network of trained professionals to help you be effective in using and deploying Genesys sooner. An annual software maintenance subscription is an affordable assurance that you will always be up-to-date with the latest software capabilities and bug fixes. It comes with highly-competent Keysight phone and email support, as well as unlimited 24/7 access to the Keysight Knowledge Center for solutions to thousands of engineering questions.

Training is recommended to bring all designers up to a similar skill level and to get the most out of Genesys for productive teamwork and organizational effectiveness.

If you have an old outdated Genesys, you can always upgrade it to the latest version to protect and enhance your original investment at minimum cost.

Support, Training and Upgrade

Capability module		Description
Genesys software support option		Software maintenance subscription and technical support – Annual software maintenance subscription keeps your software fresh with the latest enhancements, applications, defect fixes, operating system, and hardware support. – Provides access to the Keysight technical support network worldwide through email, telephone, and the 24/7 Keysight Knowledge Center. – Software on current maintenance can be enhanced, upgraded to a floating license, re-hosted, or transitioned to Keysight ADS. – Typically, there are about two software releases of Genesys per year. www.keysight.com/find/eesof-support
N3244A		Genesys concepts - training class Three-day, hands-on Genesys training class, updated for the current release. Can be delivered at Keysight training site (N3244A), or at your site (N3244B). www.keysight.com/find/eesof-genesys-class
W1401R		Genesys software upgrade If your Genesys is outdated, you can upgrade to the latest version at very low cost to preserve your investment in this valuable tool.

Genesys Bundles

Genesys bundles are affordable combinations of useful capabilities that work seamlessly together at a fraction of the cost of any competing design tools. For ADS users, two elements containing Genesys automatic synthesis and system capabilities are specially created for boosting personal design productivity with one click schematic transfer. They can also run as standalone Genesys bundles.

Genesys Bundle Name:	Genesys core	FILTER MATCH Genesys core, filter, match	Synthesis Genesys core, synthesis	System Genesys core, system	System Synthesis ADS RF architect and synthesis element	Circuit Synthesis Genesys core, synthesis, circuit	EM Synthesis Genesys core, synthesis, EM	System Circuit Genesys core, synthesis, circuit, system	EM Circuit Synthesis Genesys core, synthesis, circuit, EM	EM System Circuit Synthesis Genesys core, synthesis, circuit, system, EM	Modulated RF System Genesys core, system, modulated-RF	Modulated RF System Synthesis ADS RF architect, synthesis, modulated-RF element	Modulated RF System Circuit Synthesis Genesys core, synthesis, circuit, system, modulated-RF	Modulated RF System Circuit Synthesis Genesys core, synthesis, circuit, system, modulated-RF, EM
	Core W1320BP	Core W1321BP	Core W1322BP	Core W1323BP	Core W2362EP	Core W1324BP	Core W1325BP	Core W1326BP	Core W1327BP	Core W1328BP	Core W1333BP	Core W2372EP	Core W1336BP	Core W1338BP
Genesys core Environment	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Testlink	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Filter		Y	Y		Y	Y	Y	Y	Y	Y		Y	Y	Y
M/filter		Y	Y		Y	Y	Y	Y	Y	Y		Y	Y	Y
Match		Y	Y		Y	Y	Y	Y	Y	Y		Y	Y	Y
Advanced Tline		Y	Y		Y	Y	Y	Y	Y	Y		Y	Y	Y
S/filter			Y		Y	Y	Y	Y	Y	Y		Y	Y	Y
A/filter			Y		Y	Y	Y	Y	Y	Y		Y	Y	Y
Equalize			Y		Y	Y	Y	Y	Y	Y		Y	Y	Y
Oscillator			Y		Y	Y	Y	Y	Y	Y		Y	Y	Y
PLL			Y		Y	Y	Y	Y	Y	Y		Y	Y	Y
Signal control			Y		Y	Y	Y	Y	Y	Y		Y	Y	Y
Mixer			Y		Y	Y	Y	Y	Y	Y		Y	Y	Y
Harbec						Y		Y	Y	Y			Y	Y
Cayenne						Y		Y	Y	Y			Y	Y
Advanced modeling kit						Y		Y	Y	Y			Y	Y
Spectrasys				Y	Y			Y		Y	Y	Y	Y	Y
WhatIF				Y	Y			Y		Y	Y	Y	Y	Y
Dataflow Simulator											Y	Y	Y	Y
Budget Analysis											Y	Y	Y	Y
LTE, WLAN Verification											Y	Y	Y	Y
Momentum GXF							Y		Y	Y				Y
Momentum GX							Y		Y	Y				Y
EMpower							Y		Y	Y				Y
Sonnet Link							Y		Y	Y				Y

Genesys Licensing Options

License type	Node-locked	Networked
Perpetual license	– A node-locked perpetual license is locked to a USB key or PC LAN physical address – You own the license and this is the most cost-effective option for the long term – The node-locked perpetual license is the most popular option	– The networked perpetual license enables convenient sharing by users across a network – Costs about 30% more than node-locked perpetual license – Suitable for larger companies and requires network license server administration
Subscription (time-based) license	– The node-locked time-based license is locked to a USB key or PC LAN physical address – Usage expires after the 12-months time-based license period – Costs about 1/3 of a perpetual license including support; suitable for projects with tight cash flows	– The networked time-based license enables convenient sharing by users across a network – Costs about 30% more than a node-locked time-based license – Suitable for larger companies who need to optimize cash flows – Requires network license server administration
www.keysight.com/find/eesof-genesys-license-options		

Securing Your Genesys License

Genesys licenses can be secured to your personal computer's (PC) local area network (LAN) physical address or a universal serial bus (USB) hardware key serial number.

LAN Physical Address - When secured to your computer LAN physical address, the danger of losing the small USB hardware key is eliminated and your license enables you to start using Genesys just like any other software on your PC.

USB Hardware Key - When secured to a USB hardware key, you have the convenience of license portability to run Genesys on different computers. However, you may risk losing the USB key which then prevents you from using Genesys.

www.keysight.com/find/eesof-usb-key 

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A personalized view into the information most relevant to you.

www.keysight.com/find/eesof-genesys-latest-downloads

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