**cādence**®

AWR Software

Product portfolio

The Cadence® AWR Design Environment® platform electronic design automation (EDA) software suite provides RF/microwave engineers with access to innovative high-frequency circuit, system, and electromagnetic (EM) analysis technologies. Today's microwave and RF engineers use this powerful, open platform to design wireless products ranging from base stations to cellphones to satellite communications. The AWR Design Environment software advantages are straightforward: an intuitive use model that delivers an exceptional user experience (UX), robust simulation technologies that deliver both speed and accuracy, and an open design flow supporting data to/from third-party tools.

AWR Software Platform

The powerful, innovative AWR® UX provides an intuitive yet powerful environment that unleashes engineering productivity, enabling engineers to address the design challenges of communication and radar systems.

Robust, advanced simulation technologies support detailed device modeling and the same performance measurements used to specify device requirements. These technologies provide fast, accurate results with fully integrated system, circuit, and EM analyses that accurately predict/optimize component performance before prototype manufacturing and test.

Design-flow automation connects simulation models, third-party tools, and layout geometries to manufacturing processes to aid designers as they move from concept through engineering signoff. Flows for PCB, microwave monolithic integrated circuit (MMIC), RFIC, and multi-chip module (MCM) fabrication provide support through process design kits (PDKs), wizards/scripting, and third-party solutions.
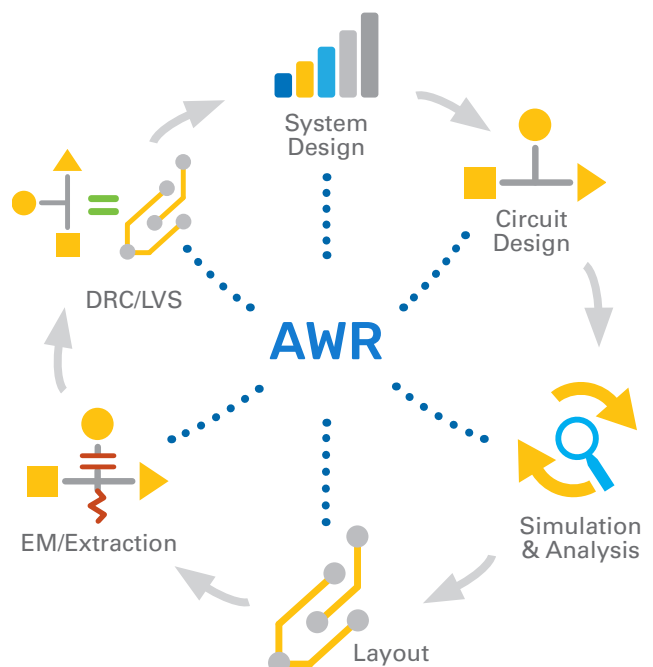
AWR Design Environment

Product Strengths

Unified Design Capture

Provides a front-to-back physical design flow for MMIC, RFIC, PCB, and module process technologies with dynamically linked electrical and layout design entry. Components placed in an electrical schematic automatically generate a synchronized physical layout based on libraries of standard and/or customized components, enabling designs to progress from early concept through final layout in a logical and straightforward manner.

Simulation and Analysis

Integrates circuit, system, and EM simulation technologies, enabling RF/microwave circuit designers to develop component specifications from system link budgets and analyze device performance with system testbenches for communication standards. Linear and nonlinear (time and frequency domain) network behavior can be studied and in-situ EM extraction of interconnects can be performed from within a single environment.

Design Management/Flow

Supports complex hierarchical projects with parameterized subcircuits for easy optimization and state-of-the-art tuning. Circuit, system, or EM-based subcircuits can be quickly generated and reused to create the complex networks common in today's RF front-end circuitry. Additionally, the flow accounts for the parasitic effects of transmission line losses, EM coupling between structures, and impedance mismatches. The layout and physical design work directly with AWR AXIEM® 3D planar and AWR Analyst™ 3D finite element method (FEM) EM solvers to characterize the electrical performance of passive on- and off-chip components and interconnects.

Interoperability and Manufacturing

Supports third-party interoperability with industry-standard tools, allowing the exchange of design data for schematic/netlist import, bi-directional EM co-simulation, electric rule check/design rule check/layout vs. schematic (ERC/DRC/LVS), and production-ready GDSII export. Powerful yield analysis and optimization supports robust design.

Scripting, Customization, and More

The powerful application programming interface (API) extends the capabilities of the software using popular programming languages, enabling users to create scripts for automating common or complex tasks. The platform also offers PDKs, a custom library of models, layout cells, and symbols, as well as other information that configures the environment for a specific foundry process.

Products

▸ AWR Microwave Office® – RF/microwave circuit design software that includes comprehensive component libraries and an integrated AWR APLAC® harmonic balance engine for nonlinear, frequency and time-domain analysis, as well as circuit envelope for digitally modulated devices

▸ AWR Visual System Simulator™ (VSS) – Communication and radar system design software that provides behavioral models and analysis for end-to-end simulations of baseband through the RF front-end / propagation channel for the development of system architectures, transceivers, and antenna arrays.

▸ AWR AXIEM – 3D planar EM analysis software that offers fast solver technology to readily characterize and optimize antennas, passive structures, transmission lines, and large planar devices on RF PCBs, modules, LTCCs, MMICs, and RFICs.

▸ AWR Analyst – Arbitrary 3D FEM EM simulation software provides fast and accurate analysis of non-planar structures such as horn and wire-based antennas, waveguide structures, resonant cavities, and component housings, as well as common or complex interconnect technologies such as wire bonds, ball grid arrays, and vias.

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> *The AWR Design Environment platform is highly integrated and brings together most aspects needed for RF design. The software has a user-friendly interface that enables designers to have full control of the tool.*
>
> Bumjin Kim, Qorvo

Applications and Technologies

Microwave Components

Innovative technologies such as linear and nonlinear stability analysis, impedance-matching, and filter synthesis combine with enhanced circuit envelope and robust transient and harmonic-balance simulation, load-pull data management, and powerful measurement plotting/visualization to accelerate front-end component design and optimization. Design automation, an intuitive interface, and scripting/customization support all phases of product development. Co-simulation with system and EM simulators provides in-situ parasitic extraction, design verification, and standards-compliant communication testbenches.

MMICs/RFICs, Modules, and Boards

Enhancements in simulation technology, automation, and design flow support the physical design of high-frequency electronics with improvements in speed, accuracy, and design management for complex process technologies, including mixed-technology design for multi-chip module integration. Accurate modeling of PCB transmission media from the RF signal path to digital control and DC bias lines, as well as circuit/system and EM co-simulation, enables first-pass success with complete PCB analysis of surface-mount components, interconnecting transmission lines, embedded/distributed passive elements, and EM verification.

Radar and Antennas

EM technologies simulate antenna metrics of gain, return loss, radiation efficiency, and currents. Phased array models enable antenna-array planners to construct custom configurations based on measured or simulated radiating-element data to study beam steering, shape the main beam and side lobes, and understand the impact of beam steering on driver input impedance. Design automation and simulation/model technology accurately represents signal generation, transmission, phased arrays, T/R switching, clutter, noise, jamming, and signal processing, enabling users to tackle the design challenges for modern radar systems.

Wireless Communications

Simulation models and waveform structures support the most popular wireless standards, including DVB-H/DVB-T, WiMAX/802.16d-2004/802.16e-2005 (mobile and fixed), CDMA2000, GSM/EDGE, WLAN/802.11a/b/g and 802.11ac, 3G WCDMA FDD, IS95, and more. Carrier aggregation with intra/interband component carriers, throughput measurements of combined component carriers, and 5G candidate modulation waveforms are supported with added functionality that includes signal generation and demodulation for full-system simulation, such as adjacent channel power ratio (ACPR), error vector magnitude (EVM), and bit-error rate (BER) measurements.
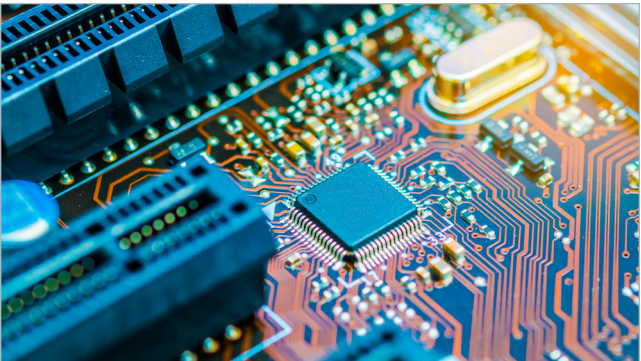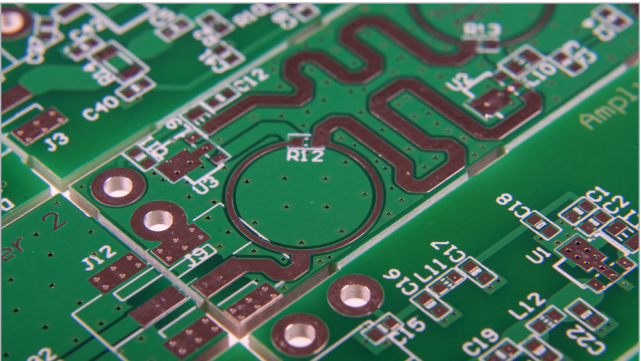
AWR Microwave Office

RF and Microwave Circuit Design Software

Cadence AWR Microwave Office is used by leading manufacturers to accelerate product development of high-frequency electronics. The intuitive interface, combined with innovative design automation and powerful harmonic-balance circuit simulation, ensures greater engineering productivity and accelerated design cycles. AWR Microwave Office seamlessly interoperates with Cadence AWR VSS system design and Cadence AWR AXIEM and Cadence AWR Analyst EM simulation software tools within the Cadence AWR Design Environment platform to deliver a complete RF and microwave circuit, system, and EM co-simulation environment.

AWR Software Platform

The AWR proprietary unified database directly links RF-aware schematic capture and design layout to accelerate simultaneous physical design with electrical simulation. Powerful design automation and assistance tools such as filter, mixer, passive component, transmission line, and matching network synthesis, along with industry-leading load-pull analysis for power amplifier design, provide critical support for all phases of product development.

Fast and accurate simulation technology offers robust circuit analysis and design insight, providing the linear/nonlinear time- and frequency-domain measurements required to properly characterize and optimize high-frequency electronics.

Comprehensive libraries of high-frequency distributed transmission models, surface-mount vendor components, and process design kits from leading MMIC/RFIC foundries enable accurate simulation of designs prior to manufacture, resulting in fewer and faster design iterations.

Product Strengths

Design Entry

The intuitive user interface is tailored to provide project management and design entry for high-frequency circuits, enabling designers to quickly build networks from a comprehensive library of RF-aware components. The library supports parameterization for tuning/optimization and hierarchical design with circuit, system, and EM co-simulation, simulation controls, and result graphs for standard and user-customized RF/microwave measurements.

Automation

Powerful automation features expedite design tasks and manage network and measurement data, including laborsaving wizards to import PCB layout and/or OpenAccess schematic information from third-party tools, as well as an easy-to-use API and scripting functionality to support customization and user-defined automation.

Load-Pull Analysis

Amplifier input/output matching circuits can be readily developed using complex swept load-pull data sets based on either measured or simulated data. Performance contours include available output power, gain, power-added efficiency (PAE), two-tone intermodulation distortion, and other key amplifier performance metrics.

Simulation Technology

The robust AWR APLAC harmonic-balance (HB) simulator provides linear and nonlinear circuit analysis with powerful multi-rate HB, transient-assisted HB, and time variant (circuit envelope) analysis, supporting large-scale and highly nonlinear RF/microwave circuits.

The AWR AXIEM EM simulator provides the speed and accuracy to characterize and optimize passive structures, transmission lines, planar antennas, and large (more than 100K unknowns) patch arrays.

The AWR Analyst simulator helps accelerate high-frequency product development from early physical design characterization through to full 3DEM verification. Its 3D finite element solver provides fast and accurate EM analysis of interconnects such as bondwires, vias/via fencing, and ball grids.

Synthesis and Design Assistance

Powerful synthesis modules and design assist wizards accelerate design starts that generate impedance-matching networks from vendor libraries and foundry-authorized PDKs for PCB and MMIC designs based on user-specified RF/microwave performance criteria. Synthesized filters, impedance matching, mixer, and passive component networks are available for further refinement, optimization, EM verification, and physical design in AWR Microwave Office software.

Features

- ‣ Schematic/Layout – Synchronous schematic/layout design entry with industry-leading tuning
- ‣ APLAC – Linear and nonlinear harmonic-balance circuit simulation
- ‣ EM Analysis – Fully integrated EM with AWR AXIEM and AWR Analyst tools
- ‣ Load-Pull – State-of-the-art load-pull analysis with harmonic and video-band tuning
- ‣ Stability – New fast, rigorous loop circuit envelope analysis for multi-stage and balanced amplifier stability
- ‣ DRC/LVS – Design rule checking/layout vs. schematic

## Applications and Technologies

MMIC

The front-to-back MMIC design flow with an innovative user interface and complete integration of design entry, simulation, and physical design tools enhances engineering productivity and ensures first-pass success with PDKs from a wide range of gallium arsenide (GaAs), gallium nitride (GaN), silicon germanium (SiGe), and CMOS foundry partners. The hierarchical framework supports simulation of diverse MMIC, RFIC, and PCB processes, multi-layer interconnects, embedded passives, and surface-mounted mini-devices found within multi-chip RF modules.

PCB

Accurate modeling of transmission media from the RF signal path to digital control and DC bias lines supports increasing functionality of PCBs. Circuit/system and EM co-simulation provide complete analysis of surface-mount components, interconnecting transmission lines, and embedded and distributed passive elements, as well as EM verification. The integrated platform supports concurrent electrical/physical design and circuit/system/EM co-simulation to minimize reliance on disparate point tools. RF-aware PCB design with EM co-simulation provides enhanced accuracy and greater fast-pass success.

Module

Multi-technology integration models the behavior of many different technologies and the hierarchical framework supports simulation of diverse MMIC, RFIC, and PCB processes, multi-layer interconnects, embedded passives, and surface-mounted mini-devices found within multi-chip RF modules. Design automation accelerates product development with smart workflows for module realization. EM-enabled parasitic extraction and design verification provide enhanced accuracy and greater fast-pass success. The integrated platform supports concurrent electrical and physical design, as well as circuit, system, and EM co-simulation to minimize reliance on multiple point tools.
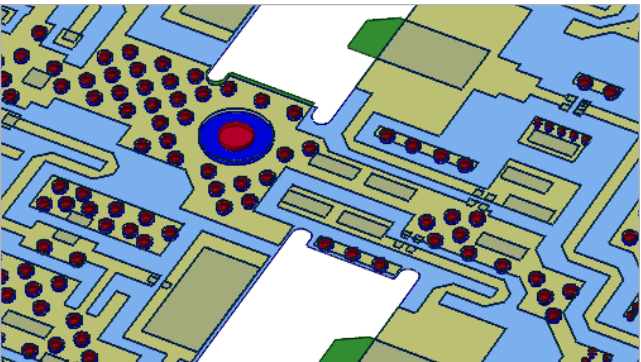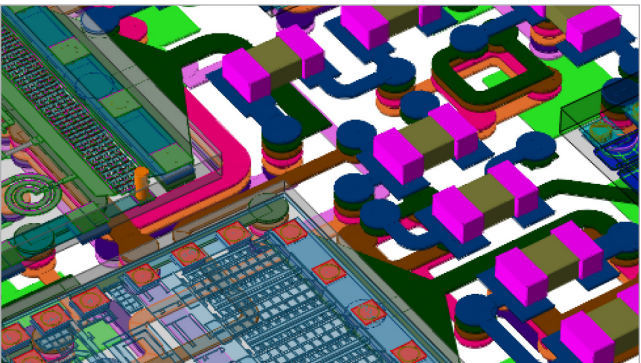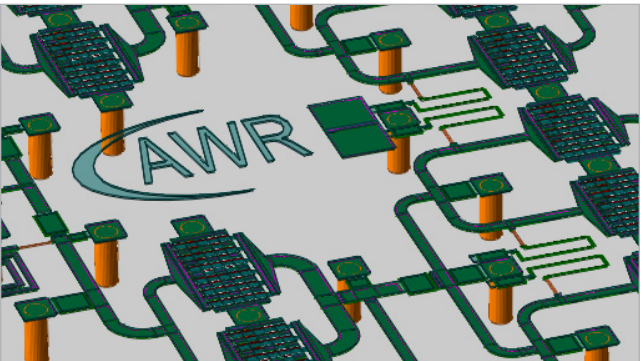
> *Every designer faces a choice during the design cycle: do I believe the simulation results displayed by the software, or not? I trusted the predictions and, thanks to AWR Microwave Office, the new design worked perfectly. The performance we achieved is unlike any other MMIC ever produced.*
>
> Christopher Marki, Marki Microwave

AWR Visual System Simulator

Communications/Radar systems design software

Cadence AWR VSS communications and radar systems design software within the Cadence AWR Design Environment platform supports realistic measurements of mixed-signal (RF/digital) networks and cascaded RF blocks. It helps identify the source of spurious products and system metrics such as BER, all from a single system diagram. Designers of commercial and military transmitters and receivers can then create subsystem architectures, specify component requirements, and optimize for best overall performance.

AWR Software Platform

Conceptualize and rapidly implement virtual 5G New Radio (NR) and internet of things (IoT) communication and radar/ electronic warfare (EW) systems using RF/microwave and signal processing blocks based on measured, simulated, or projected behavior to investigate new architectures and study overall system performance.

Design RF-aware systems and perform rigorous link budget design with RF/microwave behavioral models that incorporate linear and nonlinear performance metrics as well as terminal impedances that lead to power loss due to component-to-component impedance mismatch.

Validate RF circuit specifications by co-simulating with Cadence AWR Microwave Office circuit design software for RF/microwave design, as well as the AWR Design Environment platform's Cadence AWR AXIEM planar and Cadence AWR Analyst arbitrary 3D EM solvers, to support communication measurements for individual components and validate component specifications to meet system requirements.

Product Strengths

Digitally Modulated Systems

Design and simulate system architectures and components with IP libraries for wireless communication standards, including LTE-A, 5G, narrowband IoT, and more. Preconfigured testbenches support transmitter conformance testing and receiver sensitivity analysis, as well as circuit co-simulation, for linearity measurements such as ACPR and BER of power amplifiers (PAs) operating under high peak-to-average power ratio (PAPR).

Link Budgets and Spur Analysis

Perform RF-cascaded measurements such as gain, noise figure (NF), and third-order intercept (IP3) while accounting for impedance mismatch throughout the signal path. The AWR VSS RF Inspector (RFI) frequency-domain simulation tool that helps designers identify frequency content (harmonic and intermodulation tones arising from device nonlinearity) anywhere along an RF link.

Phased Array Systems

Simulate critical antenna performance in phased arrays with a reconfigurable model supporting thousands of radiating elements based on measured or simulated antenna data for the development of beamforming algorithms, evaluation of hardware impairments, and RF link analysis.

Hardware in the Loop

Plug-and-play support for co-simulation with LabVIEW, MATLAB, and C++ expands modeling capabilities with custom models, automation scripts, and user-defined signal processing algorithms.

Testbenches

Testbenches are pre-configured for common measurements such as ACPR, EVM, spectral, and many other types of measurements. For instance, preconfigured testbenches with 5G NR signals and measurements support performance verification of components or subsystems with 5G NR standard test model signals.

5G/Radar Library (Option)

The 5G/Radar library offers easy-to-configure signal sources and receivers that can be used for evaluation of RF components and/or RF links used in radar and 5G system-level measurements.

Preconfigured measurements for 5G NR transmitter components include complementary cumulative distribution function (CCDF), AM to AM/PM, spectrum, EVM, ACPR, IQ constellation, and more. 5G NR receiver simulation sensitivity measurements include BER, block error rate (BLER), and throughput.

For radar applications, the library offers radar signal generation, radar-specific target and propagation modeling, and radar signal processing capabilities, including moving target indicator (MTI), moving target detector (MTD), and constant false-alarm rate calculator (CFAR).

Features

▸ RF chain impairment analysis

▸ RFA RF system-level architectural planning tool

▸ Phased array (MIMO/beam-steering) generator tool

▸ Co-simulation with AWR Microwave Office software

▸ EVM, ACPR, and Phase-Noise Measurements

▸ Wireless Communication Standards Testbenches Including 5G NR and narrowband (NB)-IoT

Applications and Technologies

RF System Models

RF system models include RF behavioral, file, and circuit-based models that quickly perform frequency-based cascaded measurements such as cascaded NF or operating gain or identify the makeup of frequency content at any point in an RF link using the RFI tool. RF modeling applies to the portions of a system design that represent analog voltage signals, usually at RF frequencies but not always. These are the portions of the design that include behavioral amplifiers, mixers, and circuit-based filters, as well as blocks for incorporating AWR Microwave Office circuit designs within a system simulation.

Communication PAs

Preconfigured testbenches supporting the latest 5G signals and frameworks proposed by various industry groups allow designers to simulate and optimize the performance of RF front-end components such as PAs based on PAPR, adjacent channel leakage ratio (ACLR), EVM, or any number of critical amplifier performance metrics, as well as identify the source of spurious products and other system impairments. System-level load-pull analysis generates contours for communication performance metrics such as ACPR and EVM, allowing designers to optimize impedance-matching networks for linear PAs used in wireless communication systems.

Phased Array Generator

The phased array generator wizard within AWR VSS software enables designers to interactively design a phased array antenna and then generate schematics or system diagrams that represent the design. Quickly configure planar phased array or multiple-in-multiple-out (MIMO) array systems, interactively modify designs to achieve the desired behavior, and generate system diagrams and/or circuit schematics and EM structures for further, more rigorous analysis. The wizard supports interactive specification of the layout, feed network settings, element antenna and RF link settings, gain tapers, and element failures.
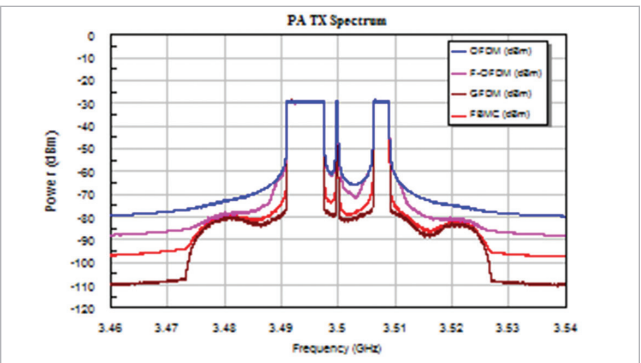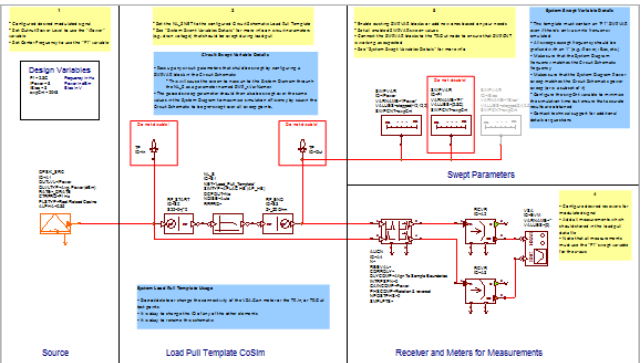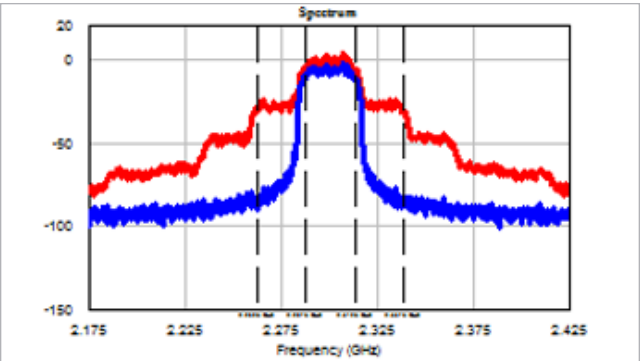
> *The unique, open, and integrated environment of VSS enabled us to study the effects of the nonlinear distortion on our communications link margin using real digital modulated analog waveforms.*
>
> Stephan VanFleteren, General Dynamics

AWR AXIEM

3D Planar EM Analysis Software

The Cadence AWR AXIEM 3D planar EM analysis software in the Cadence AWR Design Environment platform provides fast solver technology that readily addresses passive structure, transmission line, large planar antenna, and patch array designs. Whether characterizing and optimizing passive components on RF PCBs, modules, low-temperature co-fired ceramics (LTCCs), microwave monolithic integrated circuits (MMICs), RFICs, or antennas, AWR AXIEM software has the accuracy, capacity, and speed needed to ensure a right-the-first-time design.

AWR Software Platform

Fast and accurate adaptive hybrid-meshing technology supports thick-metal planar structures and vias to automatically break down structures into triangular and rectangular elements for maximum accuracy and robust broadband results, from DC to daylight.

Seamless integration with circuit and system designs supports direct EM co-simulation of planar structures such as passive components and interconnects. The proprietary AWR unified data model enables EM extraction and design verification, directly incorporating the results into circuit and/or system simulations without having to perform explicit layout definition, EM simulation set-up steps, or data importing.

Versatile, extensive sources/ports, including auto-calibrated internal ports and de-embedding options, provide greater flexibility while maintaining accuracy for structures with embedded circuit-based, lumped-element components and active devices such as transistors.

Product Strengths

Design Flow

Supports database imports from enterprise layout tools such as Cadence, Mentor Graphics, Zuken, and more, as well as many design automation features such as automatic addition of ports to EM subcircuits that greatly simplify the use of EM simulation throughout the design process.

Passive Modeling

Provides 3D planar EM simulation of transmission lines and arbitrary structures on single- and multi-layer circuits using method-of-moments (MoM) technology with advanced meshing to accurately compute S-, Y-, and Z-parameters, as well as current densities of multilayer RFICs, MMICs, PCBs, hybrids, and multi-chip modules (MCMs).

Optimization and Yield

Enables accurate design diagnostics such as yield analysis and optimization for passive components and complex interconnects, capturing true coupling and parasitic effects of circuit topologies that are specified parametrically and/or defined through rules-based shape modifiers/de-featuring.

Visualization

Allows the plotting of color-coded currents and electric field strength directly on an analyzed structures to gain insight into component behavior and the source of potential design failures.

Simulation Technologies

Meshing

AWR AXIEM software is optimized to maximize accuracy with minimal unknowns using advanced hybrid meshing technology that automatically fractures structures with triangular and rectangular elements. This heuristic approach extends the tool's capacity reach above and beyond traditional homogeneous mesh types.

Method of Moments

The software employs a unique and proprietary technique similar to the fast multi-pole method, yet adapted for full-wave analysis. As such, the AWR AXIEM solver algorithm scales on the order of N*log(N) as opposed to the N3 used by most existing MoM products.

Antenna Analysis

The software allows you to perform analysis and post-processing of planar antennas and planar arrays. The fast N*Log(N) solver technology addresses large, complex arrays that were previously impractical to simulate in their entirety. New peak antenna measurements support performance metrics such as total radiated power, or power in a particular polarization across the "cut" of a radiation pattern as a function of swept frequency or other user-defined swept parameters.

Features

- Layout/Drawing Editor – 2D and 3D views
- Proprietary method-of-moments (MoM) technology
- Hybrid Meshing Technology – Automatic adaptive meshing (hybrid rectangular/triangular mesh)
- Numerous sources and excitations
- Visualization and results post-processing
- Parametric Studies – Optimization, tuning, and yield analysis
- HPC – Multi-core configurations and asynchronous simulation

Applications and Technologies

On-Chip

AWR AXIEM software readily analyzes on-chip passive structures, transmission lines, interconnects, vias, and MMIC packaging. Thick metal is supported by creating 3D meshes of extruded planar geometries, accurately accounting for all x, y, and z directed currents on all surfaces—a prerequisite for III-V and silicon MMIC/RFIC designs, which rely on circuit/EM co-simulation to provide embedded parasitic extraction and design verification. With hierarchical EM/circuit co-simulation, designers can perform in-situ EM analysis to capture and correct harmful parasitic couplings and resonances before tapeout.

Package and Board

The layout-driven PCB design flow in AWR AXIEM software supports accurate simulation of the entire RF signal path. Circuit/system and EM co-simulation provide first-pass design success with complete PCB analysis of surface-mount components, interconnecting transmission lines, and embedded and distributed passive elements, as well as EM verification. EM verification is enabled by importing an IPC-2581 (Gerber or ODB++) file from PCB layout tools such as Cadence Allegro® technology into AWR software through the PCB import wizard. Powerful editing features prepare the structure for fast, accurate, and efficient EM analysis.

Antennas

RF designers of today's 5G and IoT smart devices need specialized simulation and optimization technology to develop small-size, embedded antennas with high gain and single- or multi-band, as well as wideband, frequency range. AWR AXIEM software helps engineers design, optimize, and integrate antennas/arrays, providing powerful EM technologies to simulate antenna metrics such as gain, return loss, radiation efficiency, and currents, and to visualize 2D/3D far-field antenna patterns.
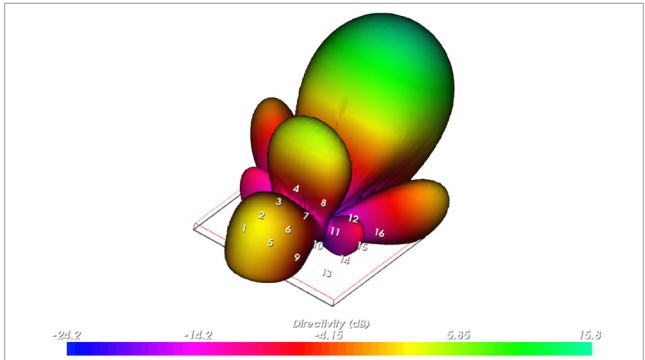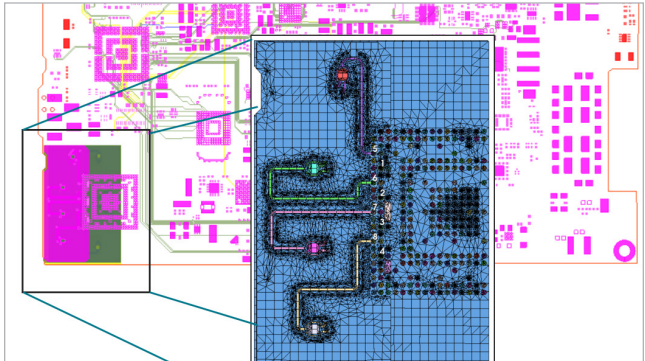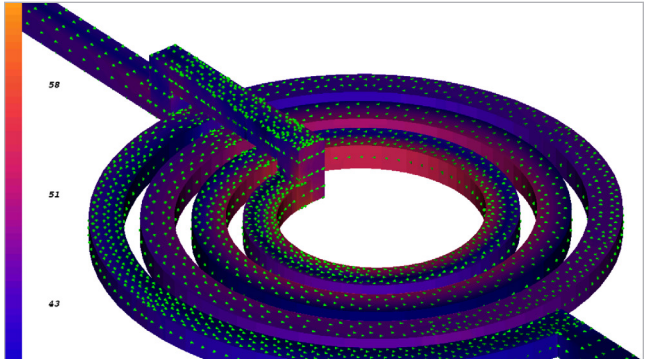
> **"** AWR Microwave Office, AXIEM, and Analyst were pivotal in the analysis of circuit parasitics, tuning towards optimization, and analysis of the effects of environmental disturbance, enabling us to produce an overall more robust product.
>
> Nicolas Henriet, Sensata Technologies

AWR Analyst

Full 3D FEM EM Analysis Software

Cadence AWR Analyst arbitrary 3D FEM EM simulation and analysis software within the Cadence AWR Design Environment platform accelerates high-frequency product development from early physical design characterization through to full 3D EM verification. The 3D FEM solver provides fast and accurate EM analysis so engineers can achieve higher performance in less development time for greater first-pass success.

AWR Software Platform

With the AWR Analyst software, you can detect and diagnose design problems that can cause products to fail performance requirements. A 3DEM simulation fully integrated and readily available within an RF/microwave component design flow enables designers to identify and eliminate potential failures.

Access and create libraries of parameterized EM cells (PCells) for common and custom 3D interconnects and passive PCB and IC components that enable reuse. Incorporation of complex structures with a simple drag and place captures true electrical responses throughout the design process.

In addition, you can accurately and rapidly characterize interconnect structures, dense circuitry, and antenna structures of all sizes with full 3D FEM solver technology with adaptive volumetric tetrahedral meshing, direct and iterative solvers, and discrete and fast-frequency sweeps.

Product Strengths

Design Exploration

Automatically improve performance and mitigate design problems from unforeseen resonances and coupling between structures with 3D EM parametric studies that support optimization, tuning, and yield analysis. Combine spectral decomposition with remote computing to expedite simulation run times and provide answers faster.

3D Modeling

Readily characterize passive 3D components, distributed planar structures, interconnects such as vias and bondwires, complex electronic packaging, and waveguide structures directly within a circuit network. Support for 3D CAD file formats like IGES, STEP, and STL allows designers to perform EM analysis on structures from alternative CAD tools.

Optimization and Yield

Perform accurate design diagnostics such as yield analysis and optimization for passive components and complex

interconnects, capturing true coupling and parasitic effects of circuit topologies that are specified parametrically and/or defined through rules-based shape modifiers/de-featuring.

Visualization

Plot color-coded currents and electric field strength directly on an analyzed structure to gain insight into component behavior and the source of potential design failure.

Simulation Technologies

Adaptive Meshing

3D adaptive meshing algorithms use a highly robust volumetric tetrahedron meshing technique to automatically provide accurate results with minimal set-up effort or manual intervention. If necessary, user control of the mesh can be enabled for individual shapes using the 3D editor.

Finite Element Analysis

The proprietary and state-of-the-art full-wave FEM EM analysis technology within Analyst software supports direct and iterative solvers, as well as discrete and fast-frequency sweeps. Developed over many decades, the technology has been optimized for scalability and accuracy.

Antenna Analysis

Analyze 3D and 2D antennas, including patch antennas and antenna arrays on finite dielectrics, plot near- and far-field radiation patterns and simulate key antenna metrics such as gain, directivity, efficiency, side lobes, return loss, surface currents, and more.

Features

- Layout/Drawing Editor – 2D/3D construction and views
- Proprietary FEM Full-Wave technology
- Meshing Technology – Automatic and adaptive meshing
- Numerous sources and excitations for ports
- Visualization and results post - processing
- Parametric Studies – Optimization, tuning, and yield analysis
- HPC – Multi-core configurations and asynchronous simulation

## Applications and Technologies

On-Chip Passive

Successful passive component design focuses on reducing the footprint, costs, and associated insertion losses, while providing increased power-handling capabilities. Capture the broadband performance of IC layout and on-chip passives by accurately simulating the electrical behavior resulting from die-level vias, tapered lines, spiral inductors, and other passive semiconductor structures. Define Analyst EM structures from extruded 2D shapes and vias as conductors or dielectrics. Passive component performance such as frequency-dependent impedance/reactance or quality factor (Q factor) can be determined.
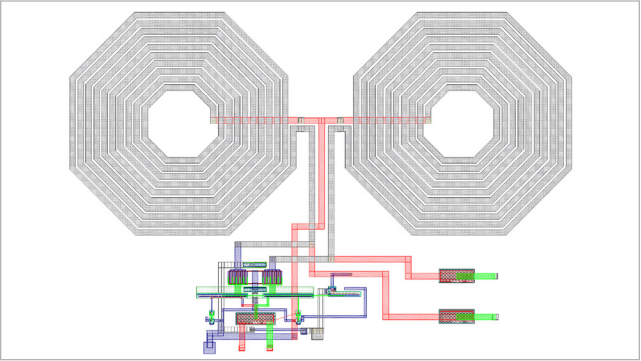
IC, PCB, and Packaging

The advanced solver technology provides fast and accurate analysis of the 3D structures/interconnects within today's complex high-frequency electronics. Simulate advanced package and board interconnects, including air bridges, bondwires, bumps, and solder balls between the die and its package or the package and its board with 3DEM accuracy, improving end-product performance. Analyst software can simulate the response of finite (area) dielectric structures and should be used over a planar EM solver when the RF behavior of metal interconnects and distributed components may be impacted by proximity to the edge of a substrate.
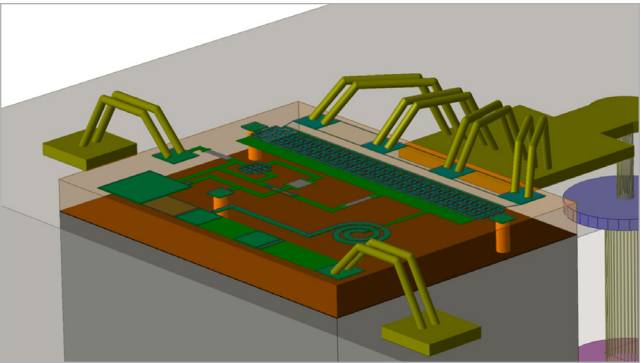
Antennas and Connectors

Arbitrary 3D structures such as horn and helix antennas can be modeled to extract S-parameters for voltage standing-wave ratio (VSWR), return loss, and radiation patterns. A variety of pre-designed common RF/microwave parts such as connectors and antennas are included and, in addition, users can create custom PCells as needed with the Analyst 3D editor. Simulation and modeling capabilities support additional custom 3D constructs, such as bondwires, ball grid arrays, tapered vias, and more. New peak antenna measurements support performance metrics such as total radiated power, or power in a particular polarization across the "cut" of a radiation pattern as a function of swept frequency or other user-defined swept parameters.
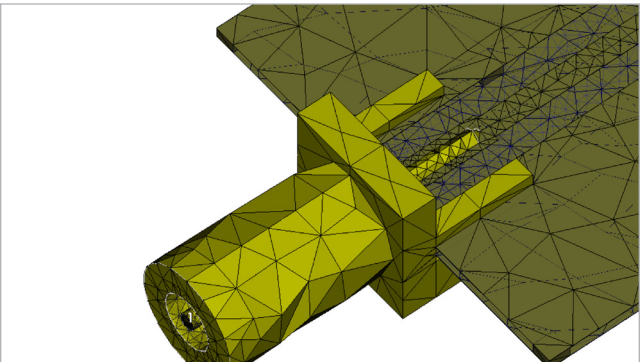
We chose AWR software because of the proven success of AntSyn and Analyst. The resulting designs worked from the very start and removed the iteration and experimentation usually required in antenna design efforts.

Mark Ross, Striiv

Services and Support

▸ Get started faster or work through tough issues by contacting AWR software support engineers who are ready to help via phone and email during normal business hours.

▸ Access volumes of self-help information in the AWR KnowledgeBase at kb.awr.com, including application tips, example projects, user forum, and more.

▸ Get a jump-start with self-paced modular training videos on awr.com/elearning that educate new users on AWR software.

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