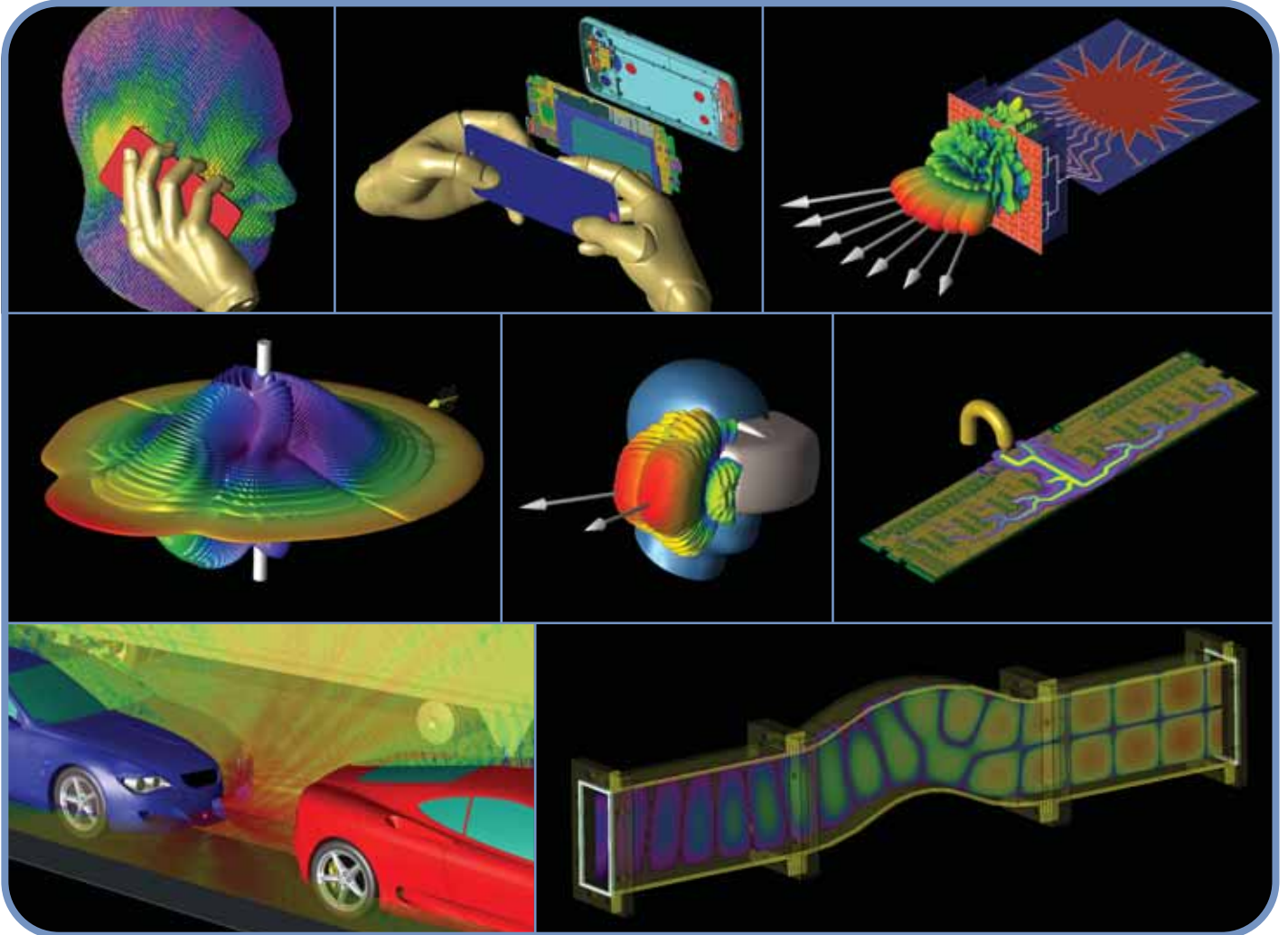


XFDTD® Electromagnetic Simulation Software



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Electromagnetic Simulation Solutions for Design Engineers and EM Professionals

Remcom provides electromagnetic simulation and site-specific radio propagation software for analyzing complex EM problems and antenna propagation. We empower design engineers with unique solutions for navigating today’s rapidly changing technologies.

Our complementary products work together to provide complete end-to-end design and analysis of complex devices in real world scenarios, simplifying EM analysis for a wide variety of applications including:

- Mobile Device Design
- 5G and MIMO Applications
- Automotive Radar
- Radar and Scattering
- Microwave Devices and Waveguides
- Biomedical and SAR Validation
- Outdoor and Indoor mmWave Planning and Analysis
- WiFi Device Performance





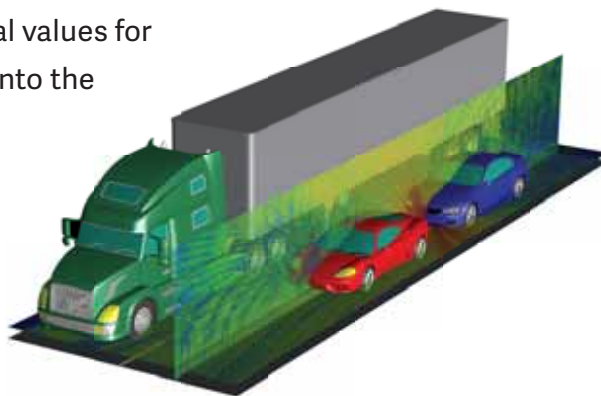
XFtdt®: Fast and Accurate Has Never Been So Easy

Save Time and Streamline Your Work

A full-featured EM simulation solver, XF outpaces other methods in efficiency as the number of unknowns increases. XF includes full-wave, static, bio-thermal, optimization, and circuit solvers to tackle a wide variety of applications.

Key benefits of XFtdt 3D EM Simulation Software include:

- Superposition Simulations and Array Optimization facilitate the use of beam steering, spatial diversity, and other techniques to maximize 5G device performance.
- Circuit Co-Simulation facilitates a realistic analysis of device performance by including imported manufacturers' circuit components within the simulation.
- Circuit Element Optimizer determines optimal values for lumped circuit elements connected directly into the EM simulation mesh.
- ESD Testing predicts locations and components at risk of suffering dielectric breakdown in a device design prior to hardware testing.
- Optenni Lab Integration makes it easy to generate a matching network topology and initial component values for your device.
- ProGrid Project Optimized Gridding® simplifies grid creation by considering multiple aspects of a project to optimize the grid for both accuracy and runtime.
- XStream® GPU Acceleration for CPUs and GPU clusters enables calculations to finish in minutes as compared to hours.
- XACT Accurate Cell Technology® resolves the most intricate designs with fewer computational resources.
- Intelligent, ultra-fast meshing expedites previewing of finished meshes prior to simulation.



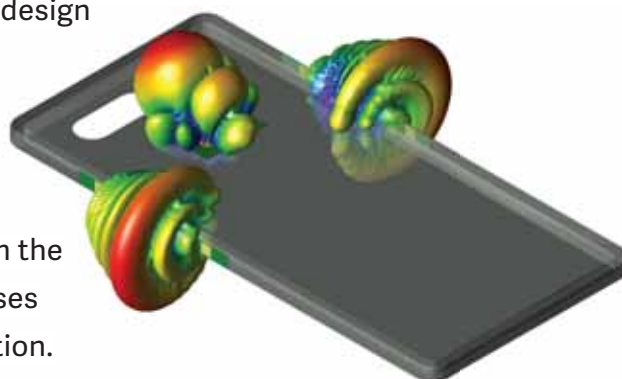
5G Array Analysis

In-depth analysis of 5G-capable devices.

Antenna engineers are developing advanced antenna systems capable of beam steering and multiple data stream transmission in order to meet throughput requirements for 5G. XF enables in-depth analysis of a device's stand-alone performance, with 5G device design features that support high-frequency array antennas and complex devices operating at millimeter wave frequencies.

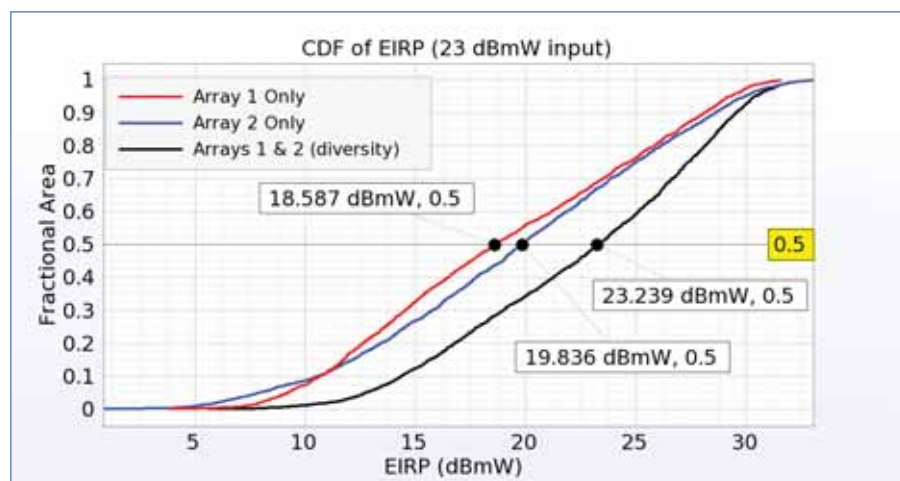
Superposition and Array Optimization

Determining the numerous beam states for a new design can be tedious due to the hundreds or thousands of port phase combinations. XF leverages the electromagnetic principle of superposition to quickly analyze these combinations with a single simulation. By combining steady-state results from the simulation, XF efficiently determines the port phases that maximize the far zone coverage in each direction.



CDF of EIRP

XF's full wave solver computes S-Parameters, efficiencies and far field for each of the elements in a device. The Array Analysis tool then optimizes the phases of the feeds for each element



over a set of desired beam angles. A cumulative distribution function of effective isotropic radiated power (CDF of EIRP) plot is then generated for one or more arrays to provide a total metric of the performance of the device.



Powerful Flexible Modeling

Spending less time modeling and more time getting results.

Whether you're importing CAD databases or building your own models, the sophisticated modeling tools in XF will make your job easier. The modeling engine in XF allows you to build complicated models from the ground up or modify imported CAD files. This reduces the amount of time you spend modeling, leaving more time to focus on your results.

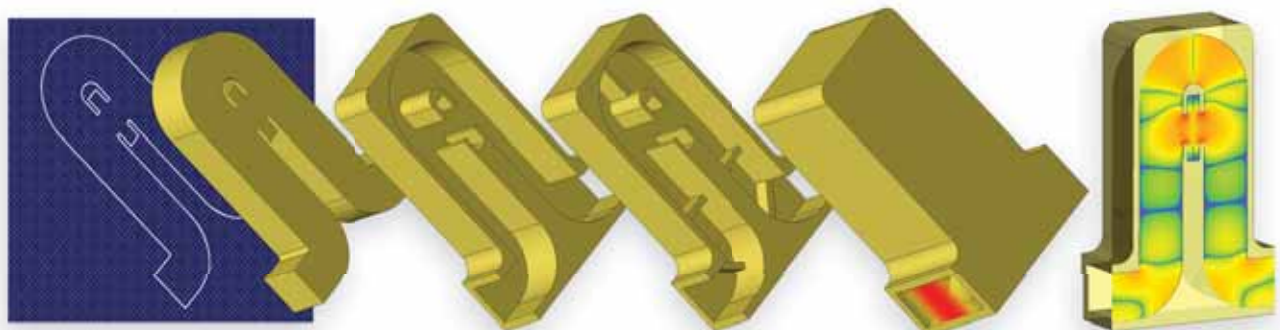


Key Features

- 2D Sketcher with constraints: Intuitive grid/object snapping and a constraint system allow for quick creation of complex shapes.
- Feature history for objects: Modeling operations are chained together on each object, creating an editable history for each model in your project.

Importable CAD Formats

- ODB++
- VDA-FS
- Pro/E
- Inventor
- SAT/SAB
- STEP
- CATIAv4
- STL
- DXF
- IGES
- CATIAv5



Simplified Workflow

XF streamlines your workflow by eliminating time-consuming, redundant tasks.

XF multiplies your productivity by allowing you to reuse almost anything you create. Any project can be turned into a template, the parts of your project can be stored in a shared library, and your simulations are saved and the results easily accessed for comparison purposes.

Key Features

- Custom project templates
- Simulation history with all results
- Shared libraries
- Shared component, sensor, and waveform definitions
- PCB Merge for importing layered PCBs in ODB++
- CAD Merge

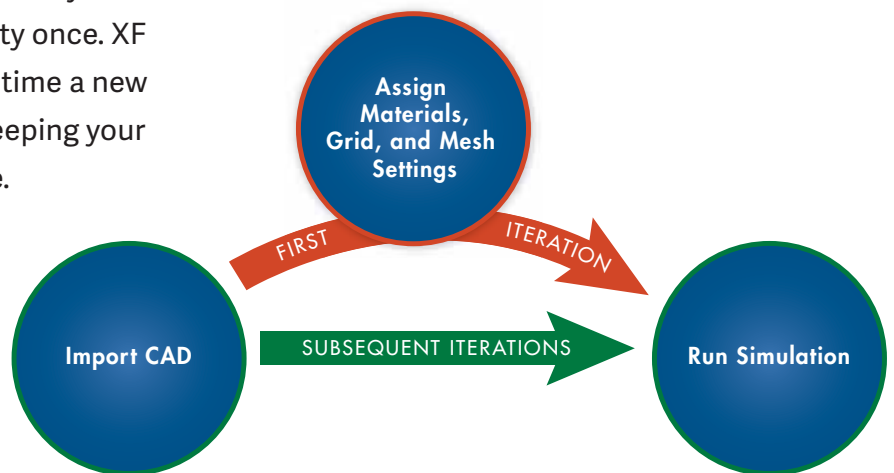


XF's Assistant is a step-by-step guide that speeds the learning curve for new users.

Seamless Revisions with CAD Merge

If you work with frequently updated CAD files, you'll only have to set up the hierarchy, material assignments and meshing priority once. XF preserves this information each time a new version of the file is imported, keeping your workflow as efficient as possible.

CAD Merge compares the new geometry with the original and automatically refreshes the project tree with the changes.





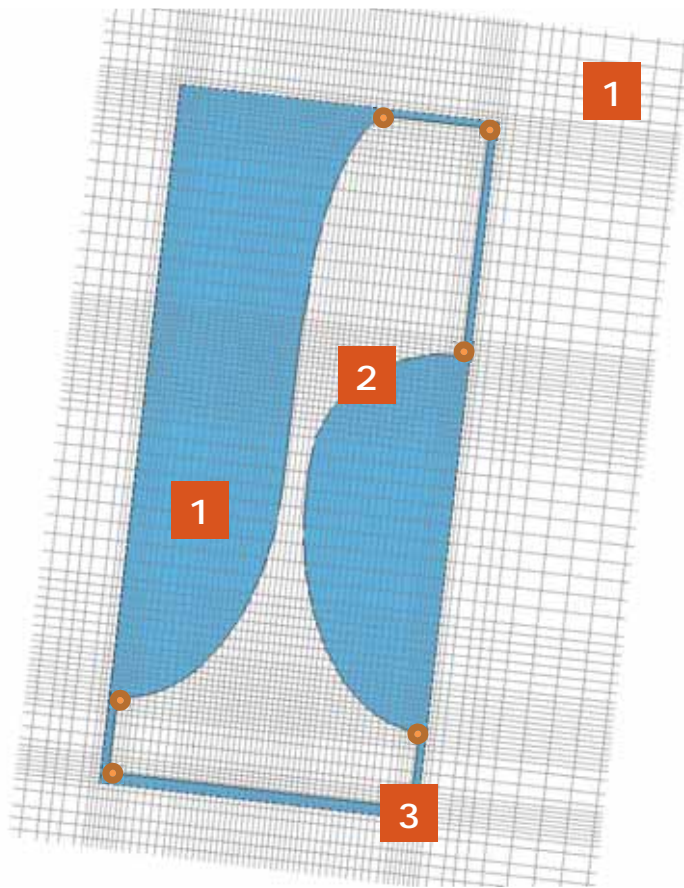
■ Fast, Intelligent Meshing

XF makes it easier to generate more accurate and efficient meshes with less work.

XF allows you to see the finished mesh with materials before the simulation ever starts. This provides the confidence that the simulation will not fail due to a meshing error. XF's intelligent and ultra-fast mesh updating capabilities make this process even more seamless than before.

PrOGrid Project Optimized Gridding®

Additionally, XF's Project Optimized Gridding algorithm, PrOGrid, streamlines the process of generating an efficient grid. By considering a combination of geometry features, operating frequency, and material parameters, PrOGrid intelligently creates a grid that is optimized for high accuracy and short run times.



PrOGrid Logic

1. Guarantee cells per wavelength in free space and in dielectrics where the wavelength is shorter.
2. Reduce cell size around curved geometry.
3. Apply boundary refinement at the edges of conductors where electric fields are strongest.

Identify geometric features like vertices [●] and snap grid lines to them.

■ XACT Accurate Cell Technology®

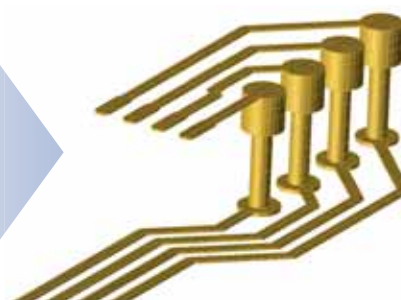
Accurate meshing of curved geometry.

With XF, there is no need to choose performance over accuracy. XACT mesh reduces simulation time while improving the accuracy of even the most intricate designs. Using an advanced sub-cellular conformal method, XF reduces computing resources while maintaining the accuracy of a full wave solver. Faster, more accurate simulations improve the throughput of your designs from start to finish.

Traditional FDTD Mesh



XACT Mesh

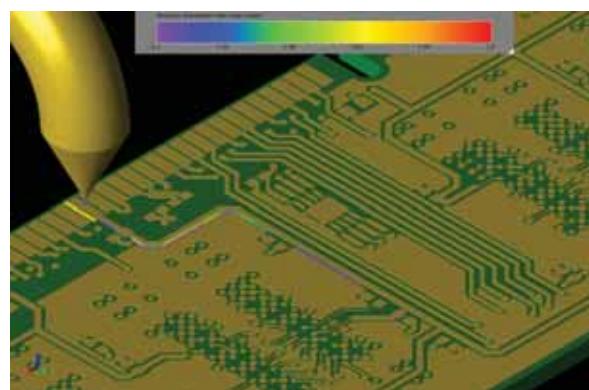


Comparisons show the dramatic improvement with XACT.

■ ESD Testing Simulation

Predict locations at risk of dielectric breakdown.

XF simulates electrostatic discharge (ESD) testing, enabling engineers to identify potential locations of dielectric breakdown and components at risk of damage in their device designs. For less obvious damage this pre-prototype insight is especially valuable, as it minimizes the chance of undetected weaknesses and reveals areas of concern prior to hardware testing.



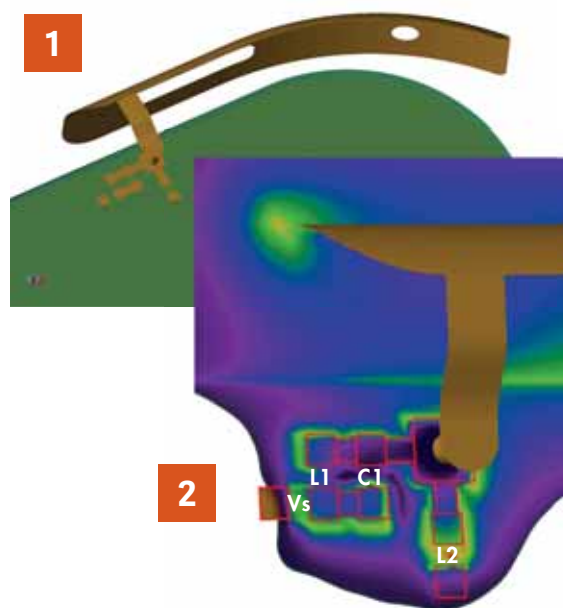
Cell edges which exceeded their dielectric strength during a simulation can be examined with the Dielectric Breakdown Sensor and Dielectric Breakdown Ratio result type.



■ Circuit Element Optimizer (CEO)

Determine component values for Full-Wave Matching Circuit Optimization (FW-MCO).

Circuit Element Optimization is a technology unique to XF, and is able to consider electromagnetic field interactions between the components and the surrounding environment. This makes it easier than ever to find the optimal set of components and achieve the desired performance with a matching network or filter.

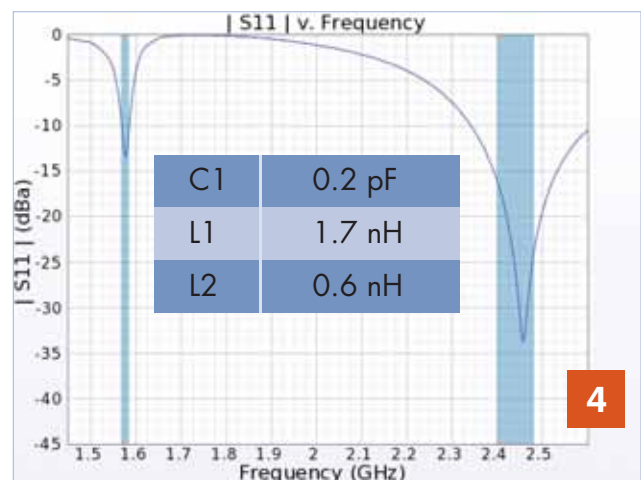


Design Flow with CEO

1. Set up the XF project including copper traces, component locations, materials, grid, etc.
2. Create a Response Matrix which uses FDTD simulations to characterize field interactions affecting the components.
3. Perform a Circuit Optimization that uses S-Parameter and/or efficiency goals to select the optimal set of component values.
4. Verify that the matching network or filter performs as desired with the selected component values.

S11 Threshold	
GPS:	-6 dB
Bluetooth:	-15 dB

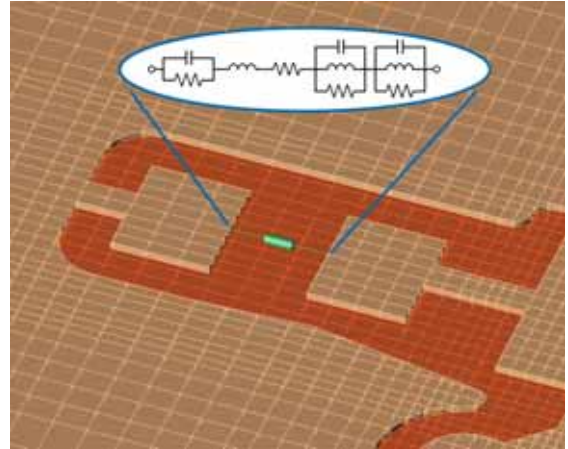
Component Values	
L:	1 nH to 10 nH
C:	1 pF to 10 pF



■ Circuit Co-Simulation

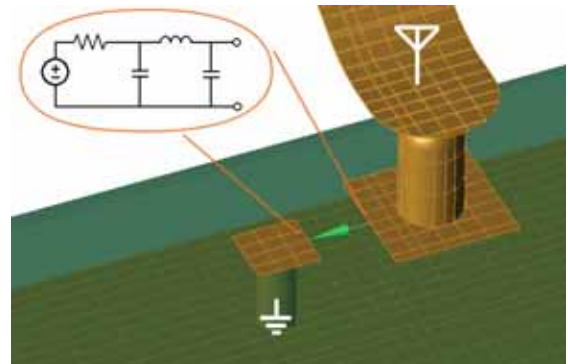
XF facilitates a realistic analysis of device performance by including imported circuit components within the simulation.

XF improves chip component and matching network analysis using a combined time-domain circuit solver and full wave electromagnetic solver. Import the schematic for a desired component via a netlist file, including SPICE elements such as resistors, capacitors, inductors, coupled inductors, and subcircuits. Netlist components can also be assigned as a matching circuit embedded within a feed, further simplifying matching network design.



Key Features

- Simulate realistic chip performance using measured data from manufacturers such as Murata, Coilcraft, and Taiyo Yuden
- Define a matching network as a SPICE model and include in a voltage source





■ Versions

	Standard	Pro	MIMO		Standard	Pro	MIMO
HPC Tokens (Workstation)	1	2	4	Power Density		•	•
3D CAD Modeling	•	•	•	Biological Thermal Sensor		•	•
Parameterization & Scripting	•	•	•	VariPose® Mesh Repositioning		•	•
CAD and PCB Import	•	•	•	Birdcage Tool		•	•
XACT Accurate Cell Technology®	•	•	•	Superposition			•
Electrostatic Solver (ESS)	•	•	•	Array Optimization			•
Rotman Lens Designer®	•	•	•	Circuit Element Optimization			•
Specific Absorption Rate (SAR)		•	•				

High performance computing packages are also available, including Cluster and Enterprise bundles for very large GPU, MPI, and MPM distributed memory installations. Please contact Remcom for pricing.

■ Results & Output

XF keeps track of every simulation for each project. Results from other projects or past simulations can be added to graphs, viewed in 3D, post-processed, or exported to text files. In addition, the fully customizable Results Browser makes it easy to filter and search.

Visual Output

- Planes, surfaces and volumes of output shown with input geometry
- E/H/B, conduction current, rotating B near fields, dissipated power density
- 3D far field patterns of E, gain, realized gain, axial ratio, radar cross section, EIRP
- Hearing aid compatibility, SAR, MR transmit efficiency, and approximate MR image outputs
- Biological temperature rise
- Dielectric Breakdown Prediction

Graphical Output

- Near zone fields/currents vs. time
- Impedance, S-Parameters vs. frequency, VSWR, active VSWR
- Polar plot antenna patterns
- Smith chart impedance plots
- FFT of transient results
- Group Delay output type
- Time Domain Reflectometry (TDR) and Time Domain Transmission (TDT)
- Dissipated Power Density
- Cumulative Distribution Function



Remcom has been leading the EM market with innovative simulation and wireless propagation tools for 25 years.

Our Family of Products

Remcom Simulation Platform

Remcom's Simulation Platform unites WaveFarer® and XFtdt® for seamless analysis of radar returns and full-wave simulation in a common user interface.

XFtdt®

General purpose 3D EM simulation solver that simplifies analysis of a wide variety of applications.



WaveFarer®

High-fidelity radar simulator for drive scenario modeling at frequencies up to and beyond 100 GHz.



Wireless InSite®

Suite of ray-tracing models and high-fidelity EM solvers for analyzing site-specific radio wave propagation and wireless communication systems.



XGtd®

High frequency GTD/UTD software for analyzing antenna systems on complex objects such as vehicles and aircraft.



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