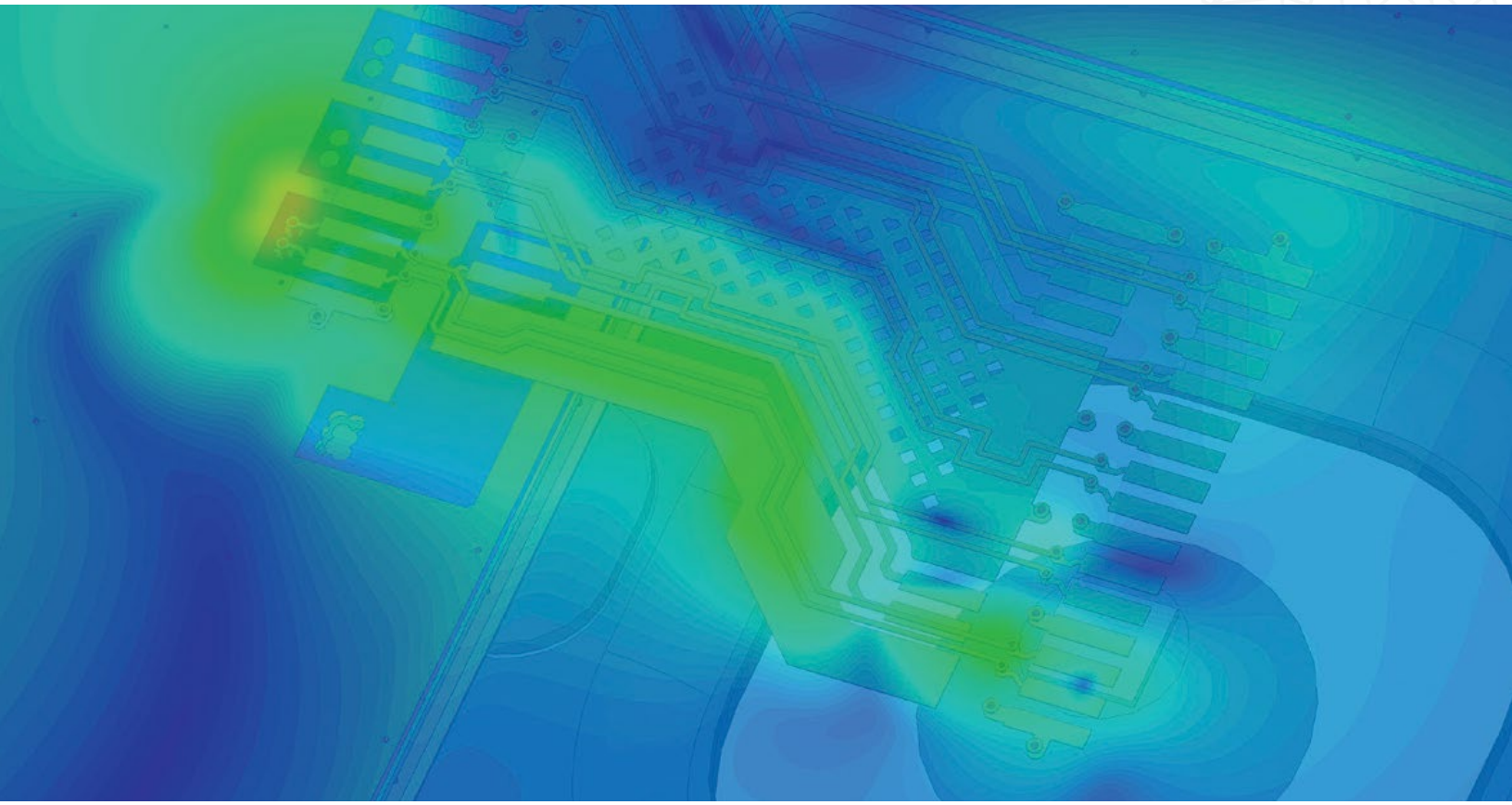
goengineer



A GOENGINEER SOFTWARE BUYING GUIDE

CST STUDIO SUITE 2025

WHAT YOU NEED TO KNOW BEFORE YOU BUY

CST Studio Suite is high-performance design & simulation software for electromagnetics. What are its key strengths, features, packages, and hardware requirements?

This guide provides answers.

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WHY SIMULATE?

Electromagnetic (EM) components are crucial to the success of an ever-increasing range of products. Not only are long established industries such as automotive and communications being disrupted by new electrical and electronic devices, advances in technology are opening entirely new markets in fields such as medical equipment, renewable energy and metamaterials. Keeping up with these advances requires both visionary designs and rapid, flexible development cycles.

Simulation allows engineers to experiment with virtual prototypes even at the earliest stages of the design process, to compare the performance of different configurations, and to optimize their products. Simulation can reduce the number of physical prototypes required and shorten the development process, cutting both costs and time-to-market. Products can be simulated as part of a realistic system to analyze their installed performance and verify they meet legal electromagnetic compatibility (EMC) and exposure limits, potentially avoiding time-consuming redesigns or costly and embarrassing recalls.

Electromagnetics is just one field of physics, but one that overlaps with many others. Motors for instance use magnets and electrical coils to produce motion, while a microwave oven uses high-frequency EM fields to heat up food. EM simulation is one tool in a set of simulation technologies that can be used together for a fuller multiphysics simulation workflow.

Electromagnetic Simulation

- *From statics to high frequency*
- *Specialized solvers for applications such as motors, circuit boards, cable harnesses and filters*
- *Coupled simulation: System-level, hybrid, multiphysics, EM/circuit co-simulation*

Modeling

- *All-in-one fully parametric design environment*
- *Import/export wide variety of CAD and EDA files*
- *Wide range of complex material models*

Analysis

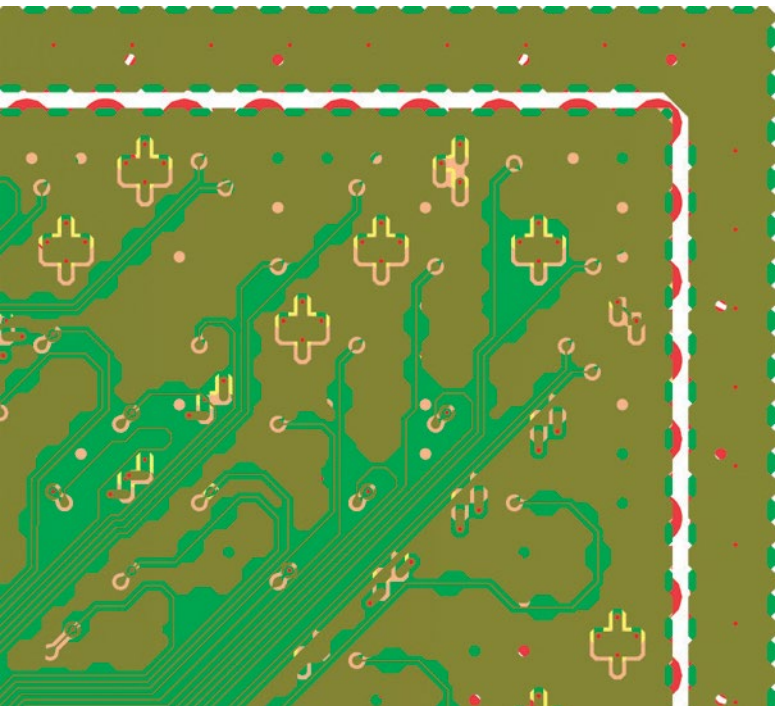
- *Powerful post-processing and visualization tools*
- *Built-in optimizers*

High-Performance Computing

- *Workstation: Multithreading, GPU and hardware acceleration*
- *Cluster: Distributed computing and MPI*
- *Cloud compute: All-in-one scalable solution for accelerating simulation performance for constant and burst computing*

CST + 3DEXPERIENCE

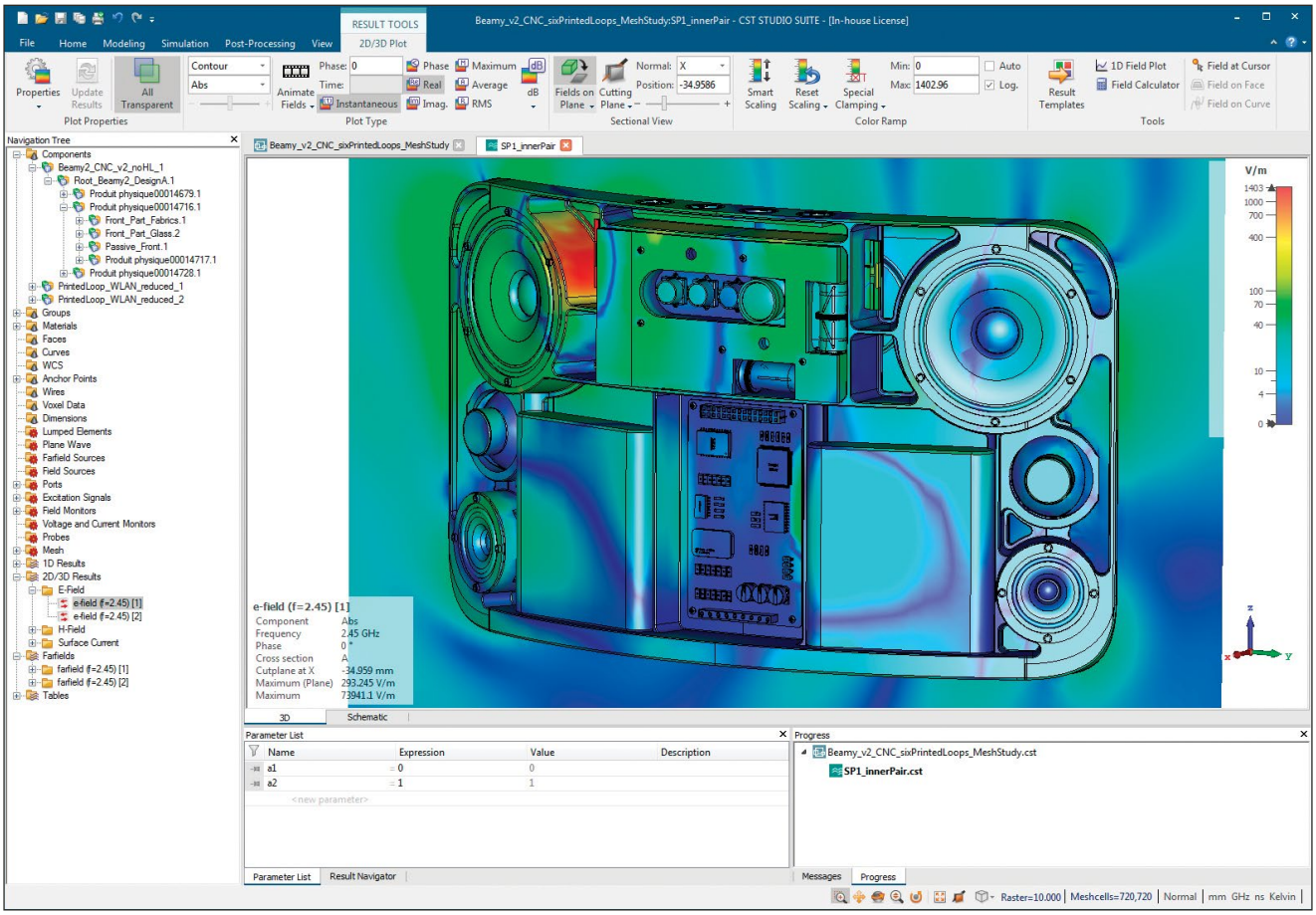
- *Multiple ways to connect CST Studio Suite to the **3D**EXPERIENCE Platform*
- *Company-wide synchronization on version-controlled, CAD-integrated EM simulation*
- *Lightweight visualization of model, mesh, scenario and results; help decision makers experience results and reduce time generating reports*
- *Direct access to geometry*
- *Web-based portal to submit and monitor cloud-compute jobs from anywhere*



High-Tech: *Imported simulation model of an integrated chip package.*

CST STUDIO SUITE

CST Studio Suite is a best-in-class software package for EM and multiphysics simulation used in leading technology and engineering companies around the world. With solvers that span the frequency spectrum, CST Studio Suite offers a wide range of tools for designing, analyzing and optimizing products; and it can now be integrated with the **3D**EXPERIENCE Platform for collaborative workflows.



DESIGN ENVIRONMENT

MODELING

CST Studio Suite offers a powerful and fully parametric CAD interface for constructing and editing simulation models. Import and export tools mean that models can imported from a wide range of CAD and electronic design automation (EDA) software. The fully parametric two-way link to SOLIDWORKS means that design changes made in CST Studio Suite can be imported directly back into the SOLIDWORKS EMC project, and vice versa.associated with a conventional staircase mesh, even for models with billions of mesh cells, but allows curved structures and complex CAD data to be modeled accurately.

MATERIALS

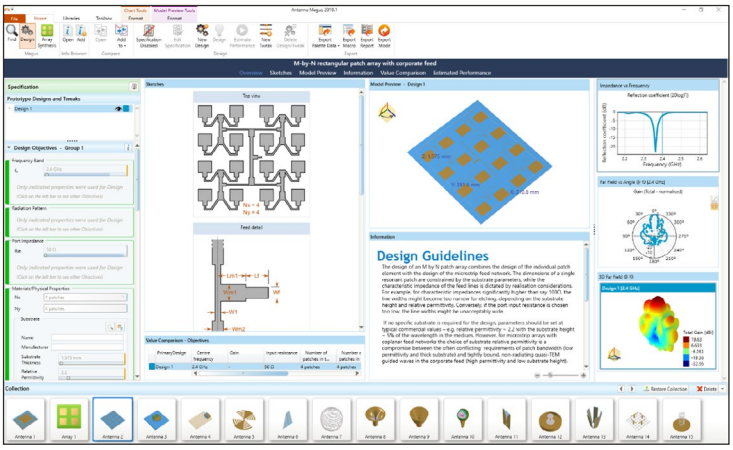
There are many application areas, such as magnetics, photonics and biological physics, where the characteristic electromagnetic effects come about as a result of complex non-linear material properties. CST Studio Suite includes numerous material models to allow a vast array of phenomena to be simulated, including plasmonic and photonic effects, ferromagnetism, secondary electron emission and biological heating.

BODY MODELS

The interaction of EM fields in the human body is a crucial design consideration for many devices, and informs both product performance and safety – especially in healthcare and life sciences. CST Studio Suite includes both voxel-based and CAD-based body models with detailed internal structure and realistic EM and thermal properties, allowing the human body to be taken into consideration.

MESHING

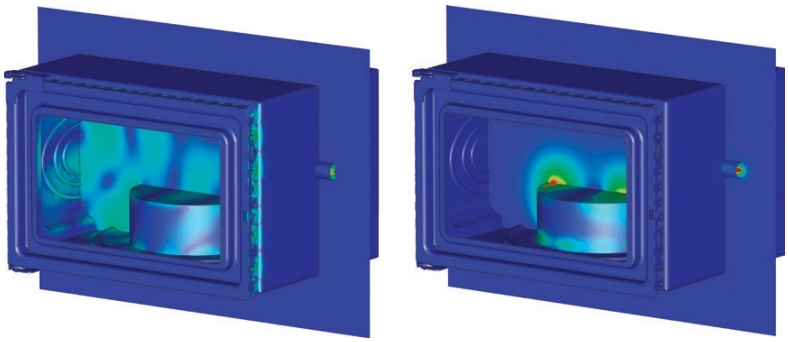
Accurate meshing is an essential part of the simulation process. CST Studio Suite provides fast, automatic meshing, with mesh refinement and automatic adaptation to increase the quality of the mesh in critical parts of the model. The proprietary Perfect Boundary Approximation (PBA) used by CST Studio Suite retains the speed advantages associated with a conventional staircase mesh, even for models with billions of mesh cells, but allows curved structures and complex CAD data to be modeled accurately.



Antenna Magus: *An invaluable aid to antenna design engineers.*

SYNTHESIS

CST Studio Suite offers a range of synthesis tools for automatically building models of potential designs. These include Filter Designer 3D for cross-coupled cavity and planar filters and the Array Task for antenna array modelling and simulation. Antenna Magus for antenna design and FEST3D for waveguide design complement the bouquet of synthesis tools available for CST Studio Suite users.



Industrial Equipment: *EM (left) and thermal (right) simulation of a microwave oven in use.*

SIMULATION

SOLVERS

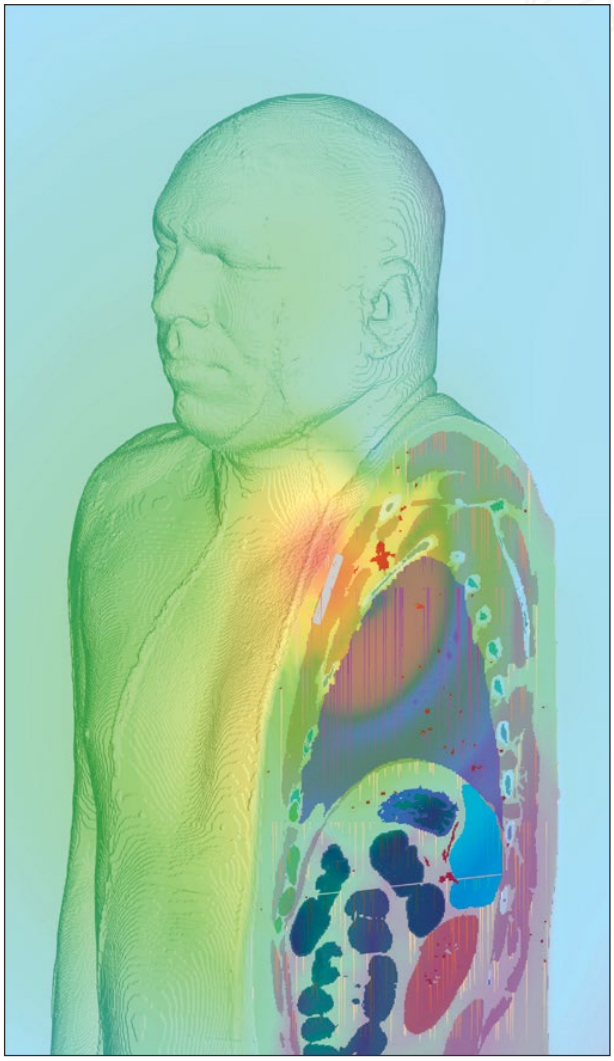
The solvers are the foundation of CST Studio Suite. From the general purpose solvers like the Time Domain and Frequency Domain Solvers, suitable for a wide range of scenarios, to more specialized ones for applications such as electronics, electron devices, motors and cables, CST STUDIO SUITE offers best-in-class solvers for EM simulation. Multiphysics effects can also be simulated using the thermal and structural mechanics solvers, which can be coupled with the EM solvers for an integrated workflow.

OPTIMIZERS

One key benefit of simulation is that devices can be optimized in order to improve their performance, tune them to stringent specifications, or reduce production cost. CST STUDIO SUITE includes built-in local and global optimizers, which can be used with all solvers to optimize any design parameters of the model.

POST-PROCESSING

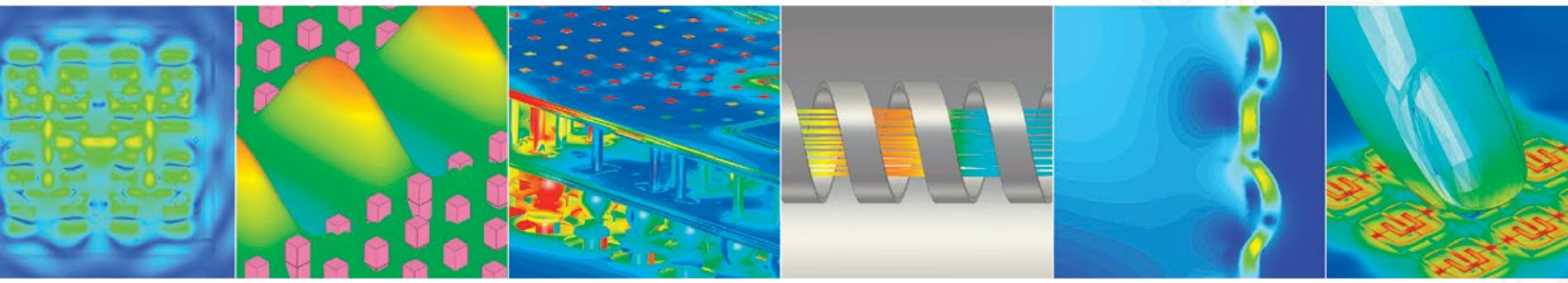
Post-processing allows simulation results to be used in a wide range of analyses to replicate common measurements and figures of merit. The post-processing templates in CST Studio Suite offer solutions for common workflows such as eye diagrams for electronics, efficiency mapping for motors and field analysis for MRI, as well as versatile general purpose templates for creating custom workflows.



Life Sciences: *Electric field from a pacemaker antenna inside the human body.*

HYBRID AND SYSTEM SIMULATION

Different aspects of simulation are often well suited to different solvers. For example, antennas are often best simulated by the Time Domain Solver, but large platforms such as vehicles are better suited to the efficient Integral Equation Solver – an analysis of the installed performance of a vehicle-to-vehicle (V2V) antenna on a car includes both. System Assembly and Modeling (SAM) in CST Studio Suite allows simulations to be combined into a single 3D model or a linked automatic workflow, and the Hybrid Solver Task allows multiple solvers to be combined in a single simulation task.



INDUSTRY APPLICATIONS

Aerospace and Defense
- *Installed antenna performance*
- *Lightning strike and environmental electromagnetic effects (E3)*
- *Radar*
- *Co-site interference*

Construction, Cities and Territories
- *Building shielding*
- *Cabling*
- *Lightning protection*
- *Indoor communication*

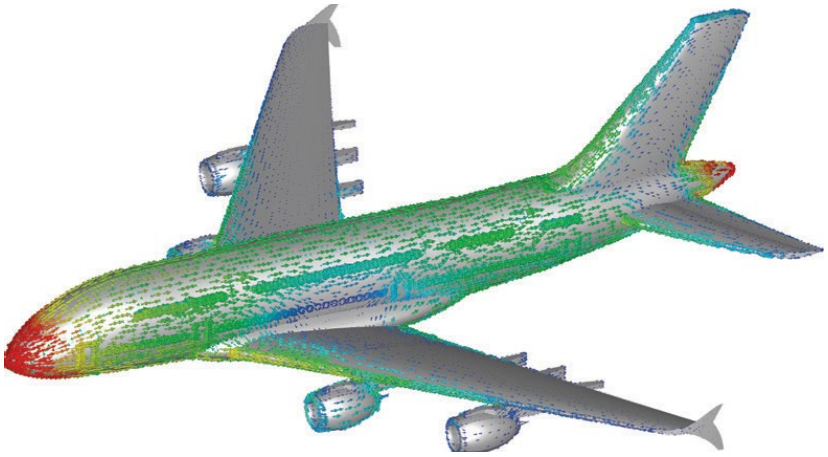
Energy and Materials
- *High-voltage components*
- *Generators and motors*
- *Solar panel optimization*
- *Transformers*

Industrial Equipment
- *RFID*
- *Non-destructive testing (NDT)*
- *Motors and actuators*
- *Welding and lithography*
- *Specific absorption rate (SAR)*

Life Sciences
- *MRI*
- *Specific absorption rate (SAR)*
- *Implant safety*
- *Wearable devices*
- *RF diathermy*
- *X-ray tubes*

High Tech
- *Antenna performance*
- *Microwave and RF components*
- *Electromagnetic compatibility (EMC)*
- *Signal and power integrity (SI/PI)*
- *Touchscreens*
- *Cables and connectors*
- *Specific absorption rate (SAR) exposure*

Transportation and Mobility
- *Antenna installed performance*
- *Electromagnetic compatibility (EMC) including harnesses*
- *Automotive radar*
- *Electric motors*
- *Wireless charging*
- *Onboard electronics*
- *Sensors*



Aerospace & Defense: *Surface currents on an aircraft during a lightning strike.*

INTEGRATED DESIGN & SIMULATION TOOLS

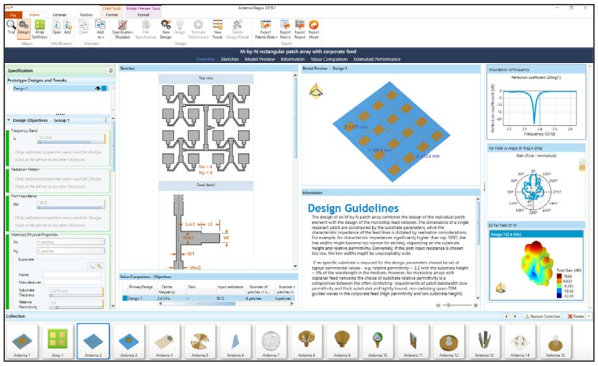
Tight integration between design and simulation is essential for quick and effective design iteration. For this purpose, the CST Studio Suite team has developed powerful tools that are either included with or attachable to any CST Studio Suite package.

ANTENNA MAGUS: ANTENNA DESIGN TOOL

Antenna Magus is a software tool for the acceleration of the antenna design and modeling process. It has proven to be an invaluable aid to antenna design engineers and to anyone who requires antenna models for antenna placement and/or electromagnetic interference studies. An engineer can make a more informed choice of antenna element, providing a good starting design and thus increasing efficiency.

Highlights

- *Accelerate antenna design and modeling process.*
- *Access topology database of over 350 antennas.*
- *Design for a range of objectives: operating frequencies, gain, input impedance, substrate type.*
- *Synthesize array layouts and excitation distributions.*
- *Easily export "ready-to-run" parametric models for simulation with CST Studio Suite.*
- *Leverage a library of useful tools like the FRIIS calculator and the standard connector library.*

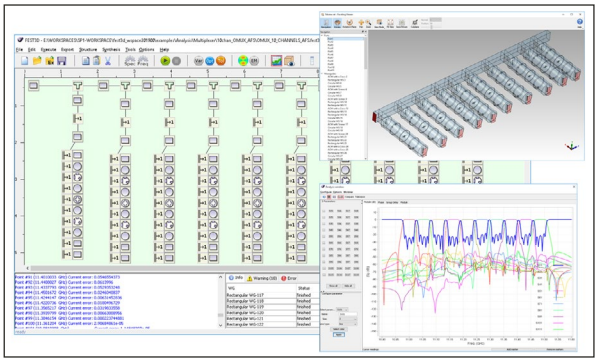


FEST3D: MICROWAVE FILTER DESIGN TOOL

FEST3D employs a mathematical combination of Method of Moments (MoM) and Boundary Integral-Resonant Mode Expansion (BI-RME) methods for extracting the modal chart of complex waveguides with arbitrary cross-section, with high accuracy at low computational cost.

Highlights

- *Analyze complex passive microwave components based on waveguide and coaxial cavity technology.*
- *Benefit from higher accuracy compared to mode-matching methods.*
- *Design passive components with optimization and tolerance analysis.*
- *Utilize synthesis tools for bandpass, dual-mode and lowpass filters from user specifications.*

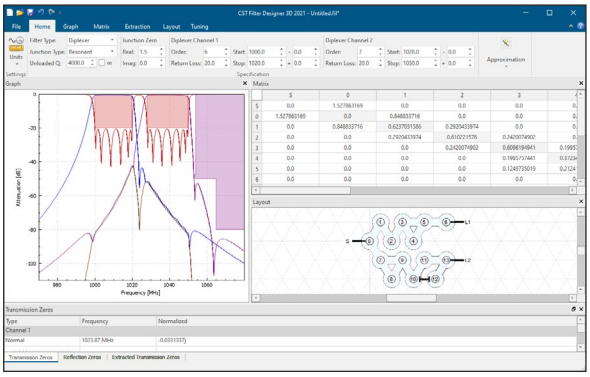


FILTER DESIGNER 3D: FILTER SYNTHESIS TOOL

A synthesis tool for designing bandpass and diplexer filters, where a range of coupling matrix topologies are produced for the application in arbitrary coupled-resonator based technology. It also offers a choice in building blocks to realize the 3D filter by making use of the Assembly Modelling.

Highlights

- *Choose between combline/interdigital coaxial cavities and rectangular waveguides or define customized building blocks (e.g. SIW or dielectric pucks).*
- *Cross-coupled filters for different electromagnetic technologies (e.g. cavities, microstrip, dielectrics)*
- *Includes the coupling matrix extraction that can directly be used as a goal for optimization of a simulation model.*
- *Tune complex hardware via real-time measurements using a network analyzer.*

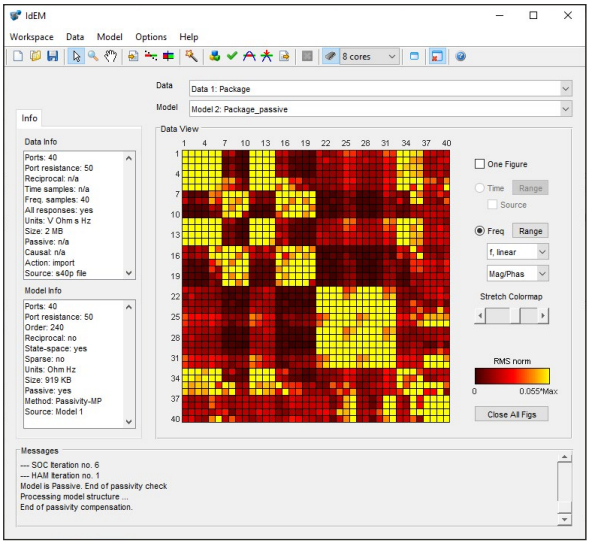


IDEM: ELECTRONIC DEVICE CHARACTERIZATION

IdEM is a user-friendly tool for the generation of macromodels of linear lumped multi-port structures (via fields, connectors, packages, discontinuities, etc.), known from their input-output port responses. The raw characterization of the structure can come from measurement or simulation. A suite of advanced and well-conditioned rational fitting modules grants applicability to virtually any kind of characterization. The resulting models are cast in common SPICE formats for the system-level simulations required in your design flow. Thus, IdEM enables SPICE model extraction and processing for any kind of linear structure, component, interconnect, package, whatever your native characterization and application area.

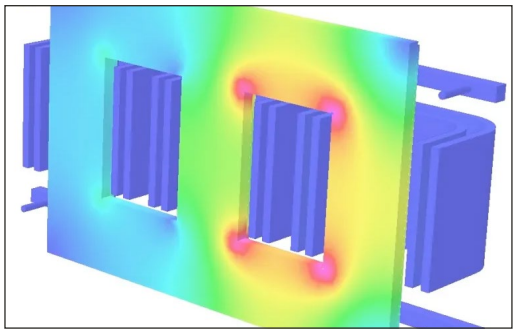
Highlights

- *A proprietary causality check module enables the detection of possible measurement/simulation errors that compromise the physical consistency of the raw data.*
- *Top-class algorithms are available for model passivity enforcement, ensuring safe use of models in system-level EMC/SI/PI simulations.*
- *An advanced module enables multi-thread capabilities, with an extraordinary speed-up in simulation time and guaranteeing an efficient macromodeling of ever-larger structures.*



OPERA

Once a standalone product purchased separately from CST Studio Suite, Opera is an FEA software suite that performs simulations of electromagnetic (EM) and electromechanical systems in two and three dimensions. Opera complements CST Studio Suite with its strength in low-frequency simulation, which is useful for the design of systems such as magnets, electric motors and other electrical machines. Simulation can be used from the earliest stages of development to help bring products to market faster.



Opera includes dedicated 2D and 3D pre- and post-processing environments for problem definition and results analysis. The Graphical User Interface (GUI) gives access to features that simplify electromagnetics and multi-physics design processes. Engineers can accelerate the design process by regularly performing actions into parameterized macro-files.

Highlights

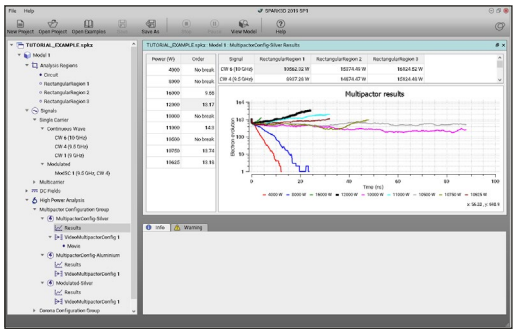
- *Finite-element solver for electromagnetic and electromechanical systems (2D/3D); strength in low-frequency device design (magnets, motors, etc.).*
- *Modular architecture: static, dynamic EM, motion, quench, thermal/mechanical, and charged-particle modules for tailored physics solutions.*
- *Graphical user interface with parameterized modeling: import CAD or use built-in 2D sketcher/3D modeler; each model file stores the full command history for replay and variant exploration.*
- *Integrated pre-/post-processing: CAD import, geometry creation (Boolean ops, sweeps, lofts, etc.), parameterization, meshing, and circuit definition; plus post-analysis tools for visualizing fields, forces, losses, energy, and particle trajectories.*
- *Advanced material modeling: supports linear/nonlinear (with hysteresis) magnetic materials, isotropic/anisotropic/laminated properties, and permanent-magnet modeling.*
- *Multiphysics capabilities: electromagnetic analyses can feed into thermal and structural solvers (e.g. passing EM losses to a thermal solver for temperature-dependent studies).*
- *Built-in Opera Optimizer: combined deterministic and stochastic algorithms for single- and multi-objective design optimization.*

SPARK3D: MULTIPACTOR & CORONA ANALYSIS TOOL

Typical approximate approaches to determine the RF breakdown power level of any component are intentionally extremely conservative. Spark3D is based on advanced methods which analyze the breakdown phenomena numerically, predicting more realistic breakdown power levels, and thus improving the design margins.

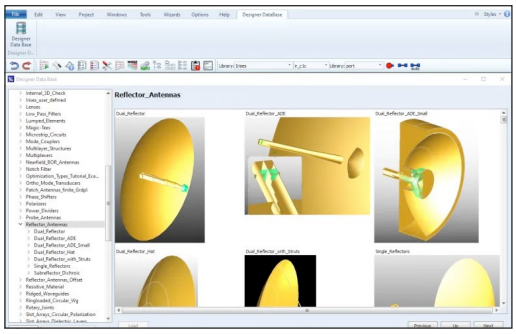
Highlights

- *Determine RF breakdown power level in a wide variety of passive devices, including cavities, waveguides, microstrip and antennas.*
- *Imported CST Studio Suite field results to analyze vacuum breakdown (multipactor) and gas discharge.*
- *Calculate the maximum power that the device can handle without causing discharge effects.*



WASP-NET

WASP-NET (Waveguide and Antenna Synthesis Program for Networks) is a hybrid EM design and optimization tool for microwave, antenna, and RF applications. Engineers can use WASP-NET to complete microwave and RF design tasks quickly through direct, fast and accurate full-wave overall EM optimization. The simulation speed of WASP-NET enables full design space exploration through a high number of optimization iterations in a short time.



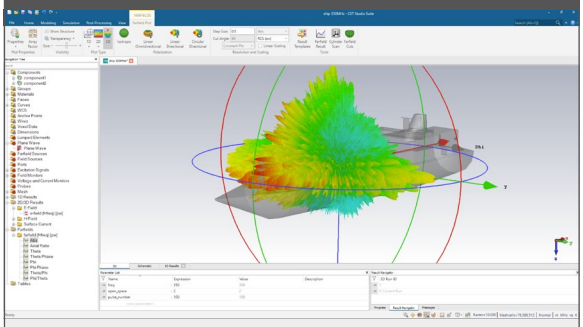
Highlights

- *Hybrid multi-solver engine: Combines analytic (mode-matching) and numerical (FE/MoM) solvers with advanced accelerations (domain decomposition, fast multipole, adaptive methods, etc.) for faster analysis.*
- *Fast full-wave optimization: Enables many EM design iterations in short time through direct, high-speed full-wave simulation.*
- *Rigorous accuracy: Supports complete 3D model flexibility with full-wave accuracy for passive microwave/RF components, antennas, antenna arrays and feed networks.*
- *Efficiency and speed: High simulation and optimization efficiency reduces development time and time-to-market for complex microwave/RF designs.*
- *Specialized design tools: Includes dedicated modules (and wizards) for waveguide components, antenna feed-networks, and arrays, backed by a parametric database of common RF structures.*

TRADITIONAL VS. CLOUD

Just like the rest of the world, the manufacturing industry is transitioning to cloud solutions, bit by bit. For Dassault Systèmes, that cloud solution is based on the all-encompassing **3D**EXPERIENCE product development platform, which provides CAD, CAE, CAM, and PLM applications, and natively connects them all to a single source of product data. CST Studio Suite is available both on and off the **3D**EXPERIENCE Platform, and each version has its strengths:

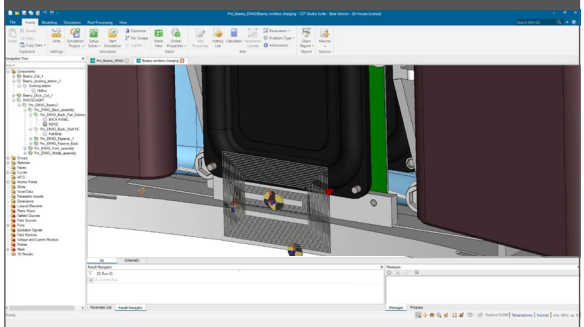
TRADITIONAL



CST Studio Suite

- *CST application is locally installed*
- *Contains all core simulation capabilities*
- *Focus on integrated design tools*
- *Focus on full customization*
- *Unified compute licensing with other traditional physics solvers (like Abaqus)*

CLOUD



3DEXPERIENCE ELECTROMAGNETICS

- *CST application can be locally installed OR run in-browser*
- *Contains all core simulation capabilities*
- *Focus on PCB design integration*
- *Focus on cloud compute & results viewer*

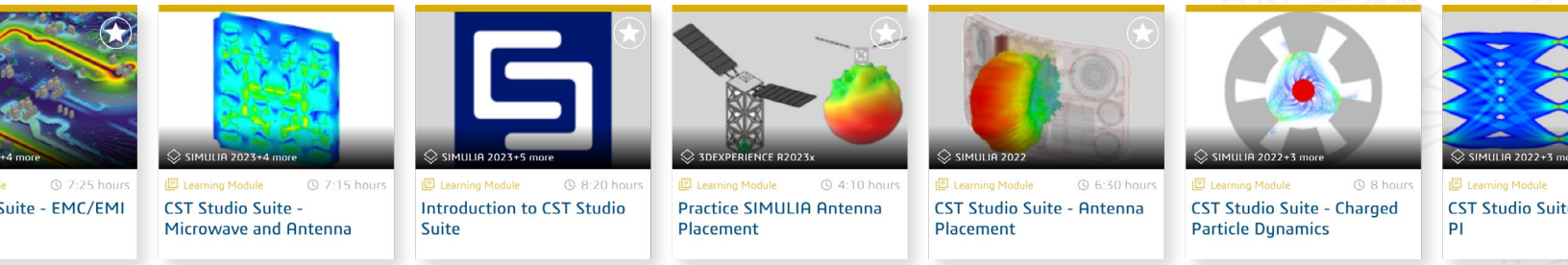
CST STUDIO SUITE 2025
FEATURE MATRIX

	TRADITIONAL CST STUDIO SUITE	3DEXPERIENCE ELECTROMAGNETICS
HIGH-FREQUENCY SOLVERS		
Time Domain The transient solver's finite integration technique (FIT) calculates broadband S-parameters from one single calculation by applying DFTs to time signals. The transmission line method (TLM) is also available.	✓	✓
Frequency Domain A classical approach to solving Maxwell's equations with time-harmonic dependence using the finite element method (FEM) and adaptive tetrahedral meshing with multiple broadband sweep solutions.	✓	✓
Eigenmode Calculate the frequencies and corresponding electromagnetic field patterns when no excitation is applied.	✓	✓
Integral Equation Discretize the object boundary using the multilevel fast multipole method (MLFMM) for electrically large models.	✓	✓
Asymptotic Frequency domain analysis based on a raytracing technique, typically used for scattering or antenna placement for electrically very large domains.	✓	✓
Multilayer Simulate multilayer geometries accurately and efficiently using the method of moments (MoM).	✓	✓
LOW-FREQUENCY SOLVERS		
Time Domain Simulate the time-harmonic behavior in low-frequency systems, useful for coils, wireless power transfer, and electric motor design.	✓	✓
Frequency Domain Evaluate transient behavior, including eddy currents, non-linear effects, motion, and resistive-capacitive effects, useful for electric motor design.	✓	✓
Partial RLC Calculate equivalent circuit parameters in the frequency domain, including partial inductances, partial resistances, and partial capacitances.	✓	✓

	TRADITIONAL CST STUDIO SUITE	3DEXPERIENCE ELECTROMAGNETICS
STATIC SOLVERS		
Electrostatic Simulate static electric fields.	✓	✓
Magnetostatic Simulate static magnetic fields.	✓	✓
Stationary Current Simulate the flow of DC currents through a device, especially with lossy components.	✓	✓
MULTIPHYSICS SOLVERS		
Steady State Thermal Calculate the stationary temperature distribution of a system, supporting many heat sources, including human bio-heat and particle collisions.	✓	✓
Transient Thermal Calculate how a system heats over time, including human bio-heat and particle collisions.	✓	✓
Conjugate Heat Transfer Calculate the heating of a device with thermal and fluid dynamics simulation methods.	✓	✓
Mechanical Calculate the displacement and deformation of structures using linear or nonlinear methods.	✓	✓
PARTICLE DYNAMICS SOLVERS		
Particle-in-Cell Calculate both particle trajectory and electromagnetic fields in the time domain, taking into account the space charge effects and mutual coupling between the two.	✓	✓
Particle Tracking Simulate particle trajectories through electromagnetic fields.	✓	✓
Particle-in-Cell Calculate both particle trajectory and electromagnetic fields in the time domain, taking into account the space charge effects and mutual coupling between the two.	✓	✓
PCB SOLVERS		
PCBs & Packages Calculate signal integrity (SI), power integrity (PI), and electromagnetic compatibility (EMC) analysis on printed circuit boards (PCB).	✓	✓
CABLE SOLVERS		
Cable Suite Calculate, in 3D, signal integrity (SI), conducted emission (CE), radiated emission (RE), and electromagnetic susceptibility (EMS) of complex cable structures in electrically large systems.	✓	✓

	TRADITIONAL CST STUDIO SUITE	3DEXPERIENCE ELECTROMAGNETICS
CIRCUITS & SYSTEMS		
Schematic Design systems and circuits with this powerful and easy-to-use schematic design tool.	✓	✓
Assembly Integrate complex structures for synthesis and optimization with this layout tool.	✓	✓
DESIGN & MODELING TOOLS		
Design Study & Optimization Do parametric design and optimization studies with fully-integrated optimization tools built into every design module.	✓	✓
IdEM A user-friendly tool for the generation of macromodels of linear lumped multi-port structures (via fields, connectors, packages, discontinuities, etc.), known from their input-output port responses.	✓	
Antenna Magus An invaluable aid to antenna design engineers and to anyone who requires antenna models for antenna placement and/or electromagnetic interference studies.	✓	
Filter Designer 3D A synthesis tool for designing bandpass and diplexer filters, where a range of coupling matrix topologies are produced for the application in arbitrary coupled-resonator based technology.	✓	Add-on
FEST3D Microwave filter design tool that extracts the modal chart of complex waveguides with arbitrary cross-section, with high accuracy at low computational cost.	✓	
SPARK3D Multipactor and corona analysis tool that analyzes breakdown phenomena numerically, predicting more realistic breakdown power levels, and thus improving the design margins.	✓	
CLOUD TOOLS		
Cloud Preprocessor Launch CST Studio Suite in a web-browser and build your model from product data saved on the 3DEXPERIENCE Platform.		✓
Cloud Compute Send models to the official Dassault Systèmes to compute on up to 288 cores or 48 cores + 8 GPUs.	Add-on	16-core access included (Add-on for more)
Web-Based Results Viewer & Reporting See geometry, 1D results, farfield plots, and 3D field plots from a web browser.	Add-on	✓

	TRADITIONAL CST STUDIO SUITE	3DEXPERIENCE ELECTROMAGNETICS
NATIVE TWO-WAY CAD INTEGRATION		
SOLIDWORKS	✓	✓
PTC Creo	✓	✓
Altium Designer		Add-on
Cadence Allegro		Add-on
STATIC IMPORT: 3D CAD		
ACIS SAT/SAB	✓	✓
CATIA V4 / V5 / V6	✓	✓
SOLIDWORKS	✓	✓
Solid Edge	✓	✓
Parasolid	✓	✓
Autodesk Inventor	✓	✓
Siemens NX	✓	✓
PTC Creo	✓	✓
Mecadtron	✓	✓
Conventor	✓	✓
ADS/HFSS/Sonnet	✓	✓
NASTRAN	✓	✓
STEP / IGES / STL / OBJ / VDA-FS	✓	✓
EDA IMPORT: 2D CAD		
DXF	✓	✓
GDSII	✓	✓
Gerber Single-Layer	✓	✓
EDA IMPORT: EDA		
GDSII	✓	✓
Cadence Allegro PCB / APD / SiP	✓	✓
Mentor Graphics Expedition / HyperLynx / PowerPCB (PADS)	✓	✓
Simlab PCBMode	✓	✓
Zuken CR-5000 / CR-8000	✓	✓
ODB++	✓	✓
IPC-2581	✓	✓
Gerber Multi-Layer	✓	✓
Chip Interface A tool to accelerate the generation of complex 3D chip models, starting from the 2D chip layouts imported from OpenAccess databases (lib.defs, cds.lib) and GDSII files. The Process Queue allows the user to mimic an actual fabrication process which results in the generation of a 3D model.	Add-on	



ONLINE SELF-PACED TRAINING BUNDLE

GoEngineer offers a complete online training bundle from the **3D**EXPERIENCE Edu Space: seven classes, 6-8 hours each, including workshops and tutorials. Do the courses you want, when you want, and get up and running with CST Studio Suite at your own pace.

INTRODUCTION TO CST STUDIO SUITE

You will become familiar with basic usage of CST Studio Suite's modeling and simulation capabilities, including general setup, submission, and result analysis procedures for high-frequency 3D emag simulations.

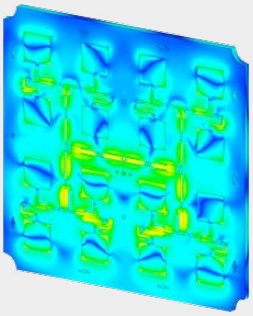
This class will also introduce the various high-frequency solvers available in CST Microwave Studio and provide a behind-the-scenes look at the FIT and FEM algorithms used by the general-purpose time- and frequency-domain solvers.

>> *See Course Contents*

MICROWAVE AND ANTENNA

You will become familiar with the high-frequency solvers used to simulate different type of antennas.

This course will also discuss more specific topics like antenna matching network and SAR calculations in the human body.



>> *See Course Contents*

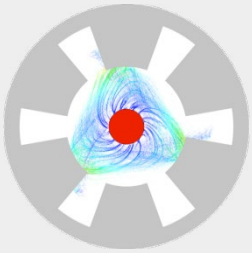
ELECTROMAGNETIC COMPATIBILITY

Learn how to apply CST Studio Suite's EMC module toward EMC design and analysis for emissions and immunity, conducted and radiated.

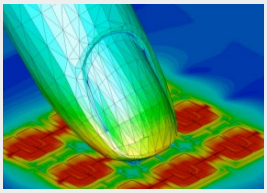
>> *See Course Contents*

CHARGED PARTICLE APPLICATIONS

Learn to use the different solvers available within the CST Charged Particle module. This course is well-suited for the design of vacuum electronic devices, accelerators, and any applications taking into account the propagation of a charged particle beam under vacuum or a dispersive media like a plasma. Also covers multipactor analysis.



>> *See Course Contents*



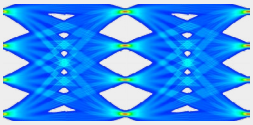
LOW FREQUENCY

After a short overview of the basic usage of CST Studio Suite, this course focuses on low-frequency and static applications.

>> *See Course Contents*

EDA & SIGNAL/POWER INTEGRITY

This course will cover the fundamentals of setting up and running an analysis for signal integrity/high-speed technology. It will detail the features and tools that are most helpful for electronics applications.



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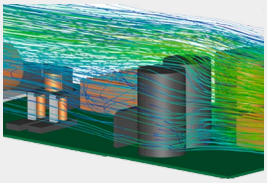
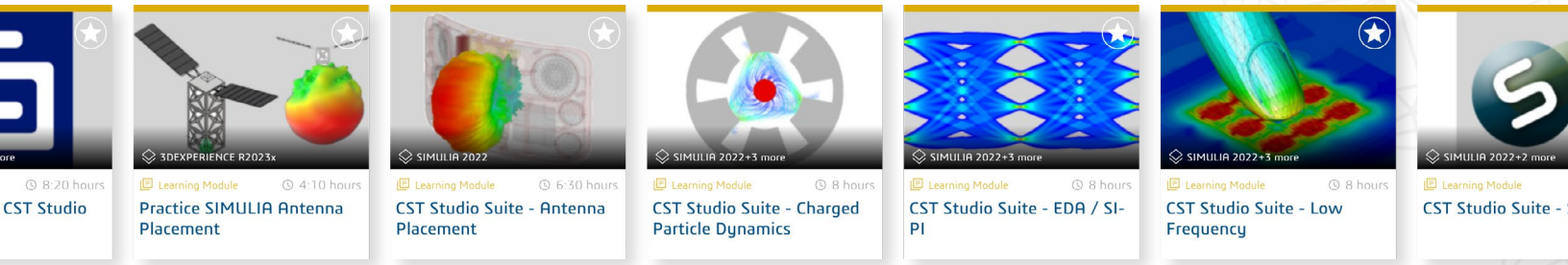


MULTIPHYSICS

The course reviews the basic concepts of heat transfer and mechanical behaviors of materials, then explains the sources, boundary conditions, meshing, solvers, and workflows needed for an EM-thermal-mechanical coupled simulation.

>> *See Course Contents*



INSTRUCTOR-LED TRAINING

GoEngineer also offers live instructor-led training that can be done in-person or online in one to four days.

INTRODUCTION TO CST STUDIO SUITE

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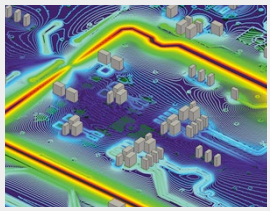
>> *See Course Contents*

EMC/EMI SIMULATION AND ANALYSIS

Learn how to apply CST Studio Suite's EMC/EMI module toward design and analysis for emissions, immunity, and conducted and radiated phenomena.



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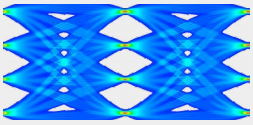

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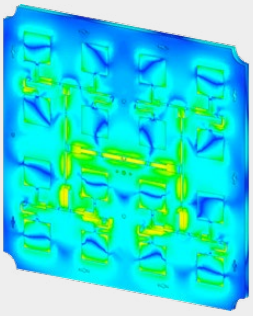
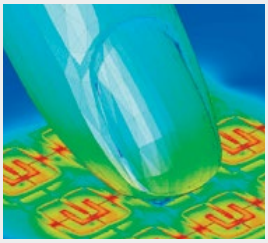
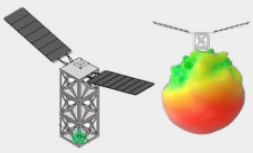


LOW FREQUENCY

This course focuses on the different sources, modeling, solvers, and post-processing available for low-frequency and static electromagnetic simulation.

>> *See Course Contents*





ANTENNA PLACEMENT

Learn about positioning of antennas, interaction between them, antenna matching networks, and radiation hazards. Special emphasis on the creation and application of near/far-field sources within the framework of the Hybrid Solver Task.

>> *See Course Contents*

HARDWARE REQUIREMENTS & RECOMMENDATIONS

EM simulations can be classified as high-performance computing tasks. This means that computers used for CST applications must meet high requirements in terms of CPU, RAM, and GPU specifications in order to achieve optimal performance. Sufficient power supply and cooling must also be ensured for the workstation or server.

GoEngineer note: **This information is primarily for traditional CST Studio Suite with on-premise compute.** It comes courtesy of Dassault Systèmes mid-2024, and is subject to change as new hardware is released. Contact your GoEngineer simulation rep for the most up-to-date and personalized hardware advice.

	Minimum Requirement	High-End Server/Workstation Recommendation	Notes for Recommended Hardware
PROCESSOR	x86-64 processor (Intel or AMD)	Dual 5th Generation Intel Xeon Scalable Processors (also known as "Emerald Rapids") or Dual 5th Gen AMD EPYC™ Processors (also known as "Turin")	We recommend high processor base clock frequency (>3 GHz) and 16-24 cores per CPU are recommended for general-purpose simulation workstation
MEMORY (RAM)	32 GB	64-128 GB per CPU	We recommend fastest RAM memory modules available, currently DDR4 or DDR5 memory type.
DISPLAY GPU	100% OpenGL compatible graphics card	NVIDIA or AMD card dedicated to CAD/CAE applications	
STORAGE	50 GB of free disk space	At least 500GB-capacity drive	We recommend SSDs for better performance.
COMPUTE GPU (OPTIONAL)	Supported GPU card	High-end NVIDIA Quadro, RTX, or NVIDIA Tesla card	Please refer to the **GPU computing guide**.
MPI COMPUTING (OPTIONAL)	Dedicated compute cluster hardware		Fast network interconnects with low latency is strongly recommended. e.g. InfiniBand. Please refer to the **MPI computing guide**.
DISTRIBUTED COMPUTING (OPTIONAL)	For optimal simulation performance, the solver servers should run on separate computers from the frontend and the main controller. A fast network connection between the solvers servers, the main controller, and the frontend is recommended as simulations may generate a lot of data that needs to be transferred.		

PROCESSOR

Minimum requirement: x86-64 CPU from Intel or AMD

For Intel processors, we recommend the latest Intel Xeon processors in a dual socket configuration for a high-end workstation or server configuration; currently these are the 5th Generation Intel Xeon Scalable Processors, also known as "Emerald Rapids".

For AMD processors, we recommend AMD EPYC 7005 Series processors in a dual socket configuration for a high-end workstation or server configuration; currently these are the 5th Gen AMD EPYC Processors also known as "Turin".

Please note that the CST solvers uses only the performance cores and not the efficient cores for the simulation. Also processor's turbo frequency cannot usually be used for long periods due to electrical and thermal limits, so for general performance and for long simulation times the base frequency gives a more realistic performance expectation.

We also recommend 8-16 cores per CPU for a general-purpose simulation workstation. It is in general advisable to have a high processor base frequency rather than a large amount of cores. The performance scaling as a function of number of cores depends on the used solver technology, the simulation model, and other factors.

For some applications and solver technologies, a high amount of processor cores and more than two processors may be a good option to obtain better performance. If you are planning a large hardware investment in high-end HPC hardware like a cluster system or a system with more than two CPU sockets, we recommend that you contact our technical support team directly so that we can help you during the configuration process.

A single processor system with a high base clock frequency may also deliver sufficient simulation performance for many applications. For that purpose, we recommend the Intel Xeon or AMD Ryzen Threadripper processor. The above advice is also valid for such configurations.

MEMORY (RAM)

Minimum requirement: At least 32 GB for a typical simulation workstation

Simulation memory requirement is highly application and solver technology dependent. For a high-end workstation or server system, we recommend at least 64-128 GB RAM per CPU depending on the complexity of your application and the used solver technology. We recommend the fastest RAM memory module available, currently DDR4 or DDR5 memory.

To make use of the total available memory bandwidth in the system, the memory modules should be arranged in such a way that it occupies all the memory channels provided for the system memory per processor. For the recommended Intel and AMD processors above, it should be 8 or 12 memory modules per processor. A high memory channel bandwidth is essential to obtain the best possible performance for many of the CST solvers. The maximum memory channel bandwidth depends on the number of RAM modules as well as the type of the modules. Please ask your hardware vendor to provide you with a configuration that achieves the best possible memory channel bandwidth.

DISPLAY GPU (GRAPHICS CARD)

Minimum requirement: 100% OpenGL compatible graphics card

For the best performance of the 3D modeling and post-processing interface, we recommend a fast 3D graphics card. Both NVIDIA and AMD cards are well tested with CST Studio Suite & Opera and so we recommend using a card of this series that is dedicated to CAD/CAE applications.

STORAGE

Minimum requirement: 50GB of free disk space for the installation of CST Studio Suite.

The base installation of CST Studio Suite requires approximately 7GB of disk space while additional space is required for the installation of the service packs and other CST Studio Suite programs and tools.

Simulations may generate a lot of data, so sufficient storage space should be ensured. We recommend at least a 500 GB hard disk drive for a typical simulation workstation. You may use SSDs for storage, but they are not necessary for good simulation performance.

COMPUTE GPU

Minimum requirement: A supported GPU card, please see the GPU Computing Guide.

The high memory bandwidth and parallel processing abilities of GPU cards provide a significant simulation speed-up compared to CPU computing alone. Options are available for server-class and workstation configurations. Please see the **GPU computing guide** for a list of supported GPU devices as well as information about the requirements that the host system must fulfill.

MPI COMPUTING

Some CST Studio Suite solvers support MPI computing. It typically requires dedicated compute cluster hardware (e.g. InfiniBand network interconnects). Please refer to the **MPI computing guide** for more information about the requirements and general setup information.

If you are planning a large hardware investment in high-end HPC hardware like a cluster system, we strongly recommend that you contact us directly so that we can help you during the configuration process.

DISTRIBUTED COMPUTING

Distributed computing divides the simulation workload across three different components: frontend, main controller, and one or more solver servers. For optimal simulation performance, the solver servers should run on separate computers from the frontend and the main controller. A fast network connection between the solvers servers, the main controller, and the frontend is recommended as simulations may generate a lot of data that needs to be transferred.

For solver server computers the above advice for hardware configuration is valid, as they run the most resource intensive part of the simulation. The frontend is used mainly for post-processing and graphical analysis of the results, so it does not require powerful hardware. The main controller maintains a simple job queue and transfers simulation data from the solver servers to the frontend, so it also does not require powerful hardware.

OPERATING SYSTEM

Minimum requirement: A supported 64-bit operating system, please see the supported OS guide.

We support the 64-bit Microsoft Windows operating systems as well the 64-bit Red Hat Enterprise Linux and Suse Linux Enterprise versions. For more information on supported versions, please refer to the **supported OS guide**.

EXAMPLE CONFIGURATIONS FOR TRADITIONAL CST STUDIO SUITE

The following system configurations provide examples of low-end and high-end workstations that are suited to EM simulations using CST Studio Suite and Opera.

Low-End Configuration (Laptop):

- *Windows 11*
- *Intel Core i7-14700K 14th Generation*
- *100% OpenGL compatible graphics hardware, e.g. NVIDIA T600*
- *32 GB (2 x 16 GB DIMMs) DDR5 5600 MT/s RAM*
- *1TB SSD*

Note that this configuration is not expected to deliver ideal performance for most practical use-cases. This configuration is appropriate for simple simulations, post-processing calculations and graphical rendering purposes.

High-End Configuration (Workstation):

- *Windows 11 Pro*
- *Dual Intel® Xeon® Gold 6526Y Processor, 16 cores per processor, 2.8 GHz base clock*
- *(Or) Dual AMD EPYC™ 9135 Processor, 16 cores per processor, 3.65 GHz base clock*
- *GPU acceleration/graphics: NVIDIA RTX 6000 Ada*
- *256 GB (16 x 16 GB DIMMs) DDR5 up to 5200 MT/s RAM in case of 5th Generation Intel® Xeon® Scalable Processor*
- *(Or) 384 GB (24 x 16 GB DIMMs) DDR5 up to 6000 MT/s RAM in case of 5th Generation AMD EPYC™ Processor*
- *4TB SSD for storage*

High-End Configuration (Server):

- *RHEL 9 (or) Windows Server 2022*
- *Dual AMD EPYC™ 9275F Processor, 24 cores per processor, 4.1 GHz base clock*
- *(Or) Dual Intel® Xeon® Gold 6544Y Processor, 16 cores per processor, 3.60 GHz base clock*
- *GPU acceleration/graphics: NVIDIA L40 GPU*
- *384 GB (24 x 16 GB DIMMs) DDR5 up to 6000 MT/s RAM in case of 5th Generation AMD EPYC™ Processor*
- *(Or) 256 GB (16 x 16 GB DIMMs) DDR5 up to 5200 MT/s RAM in case of 5th Generation Intel® Xeon® Scalable Processor*
- *4TB SSD for storage*

If a system is used only for results post-processing and analysis, e.g. for distributed computing frontend, then it does not need powerful hardware. A powerful graphics card and enough disk space for storing the results are usually sufficient.

*This feature is available for selected solvers in CST Studio Suite only and not available in Opera. Please refer to the relevant guide or online help for more information.

** This GPU has poor double precision and so not recommended for all solvers. Please refer section 2.1 in the GPU computing Guide.

NOTE: GoEngineer strongly advises personal consultation before any hardware purchase and assumes no liability for any problems caused by these hardware recommendations.

HARDWARE FOR CLOUD & 3DEXPERIENCE

Traditional CST Studio Suite and **3D**EXPERIENCE ELECTROMAGNETICS can both leverage the **3D**EXPERIENCE cloud for running analyses. By doing so, the user can greatly reduce their CPU and GPU requirements, since no heavy computation will take place locally. GoEngineer will help craft affordable software licensing and hardware purchasing plans that take advantage of cloud compute.

WHY GOENGINEER?

GoEngineer is not just the nation's largest SOLIDWORKS partner.
We have large teams of dedicated specialists in CAD, CAE, CAM, PLM, and additive manufacturing doing support and consulting work on a daily basis using the industry's most advanced tools. Our customers benefit from the considerable resources we can put toward a superior customer experience and end-to-end manufacturing solutions:

- **Advanced simulation consulting** with top-end SIMULIA software & computing resources
- SIMULIA training, certification, methodology development, and mentorship
- Affordable **Abaqus**, **CST Studio Suite**, and more from the SIMULIA portfolio
- The **3D**EXPERIENCE **CAD**, **CAE**, **CAM**, and **PLM** portfolios
- Your own customer success manager
- **3D printing** from Stratasys, Xact Metal, and others
- **3D scanning** from Creaform, Artec3D, and others
- **60+ GoEngineer offices** for a local VAR experience
- **Self-service customer portal**
- **GoEngineer User Community**

Whether it's CST Studio Suite or anything else, please don't hesitate to reach out. We share your excitement and passion for the manufacturing industry, and we'd love to discuss how we can help your business grow and thrive.