



3DEXPERIENCE®

# CST STUDIO SUITE ELECTROMAGNETIC FIELD SIMULATION SOFTWARE

# 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.

## 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. The All Physics Analyst role allows CST Studio Suite to be integrated into collaborative workflows on the **3DEXPERIENCE**® platform.

### 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

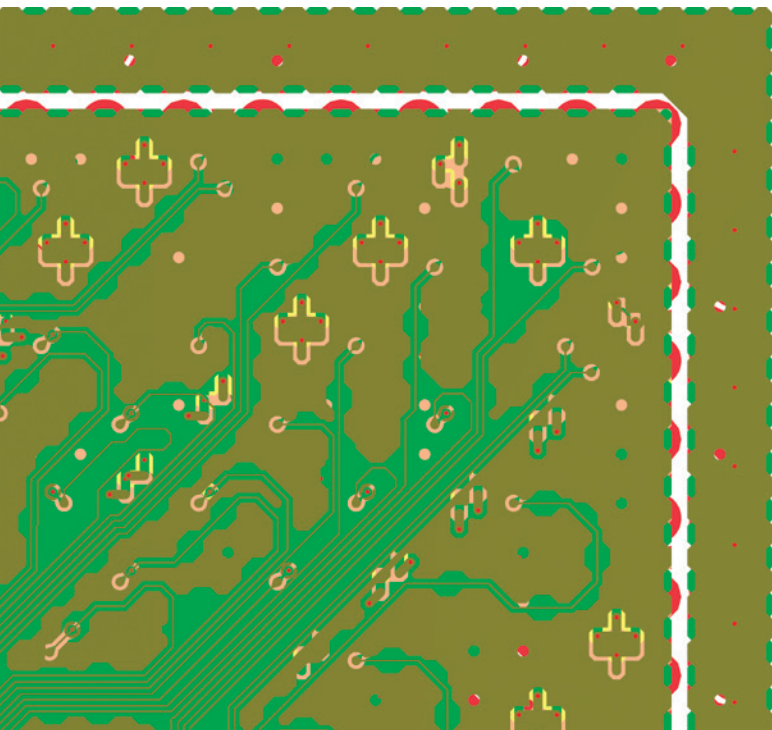
- Powerful post-processing and visualization tools
- Built-in optimizers

### 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 Studio Suite in the All Physics Analyst role on 3DEXPERIENCE

- Setup a collaborative space, add people and everyone works on the same set of data; it's synchronized and version controlled as you work
- 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 CST Studio Suite jobs from anywhere
- Run CST Studio Suite in a "connected" mode, leveraging 3DEXPERIENCE
- Capabilities for collaboration, visualization, version control and knowledge capture
- Supports all CST Studio Suite capabilities including continued openness to run any custom plug-ins or scripts.
- Configure, submit and monitor CST Studio Suite Solvers from 3DEXPERIENCE.



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



# 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

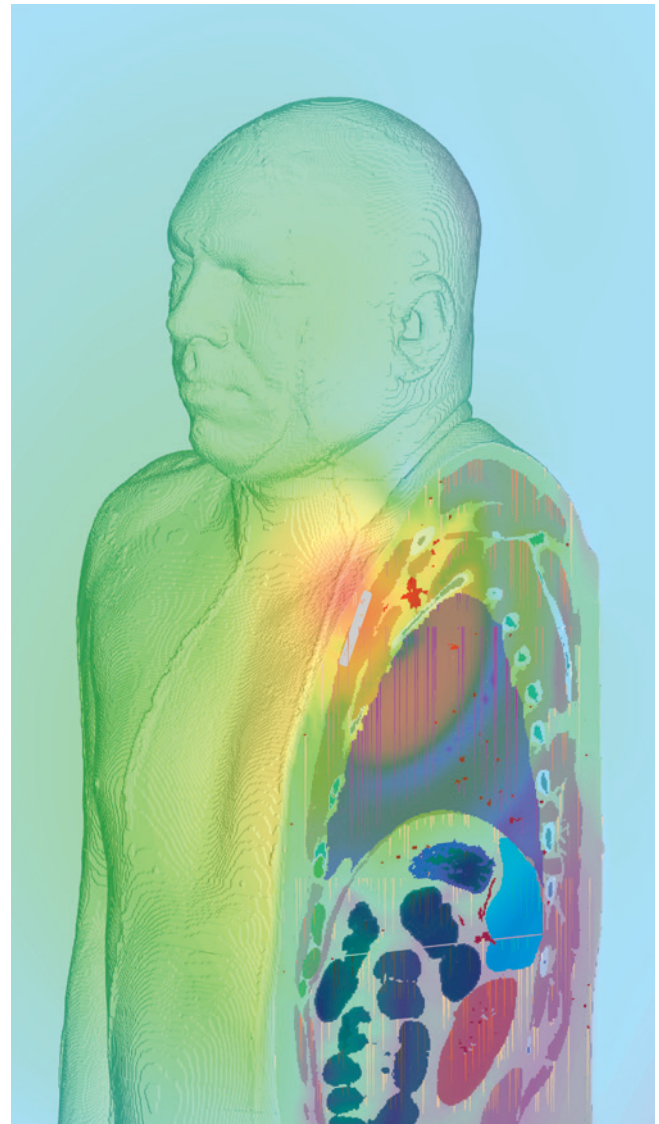
One key benefit of simulation is that devices can be optimized in order to improve their performance, tune them to stringent specifications, or reduce production cost. CST STUDIO SUITE includes built-in local and global optimizers, which can be used with all solvers to optimize any design parameters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

## Post-Processing

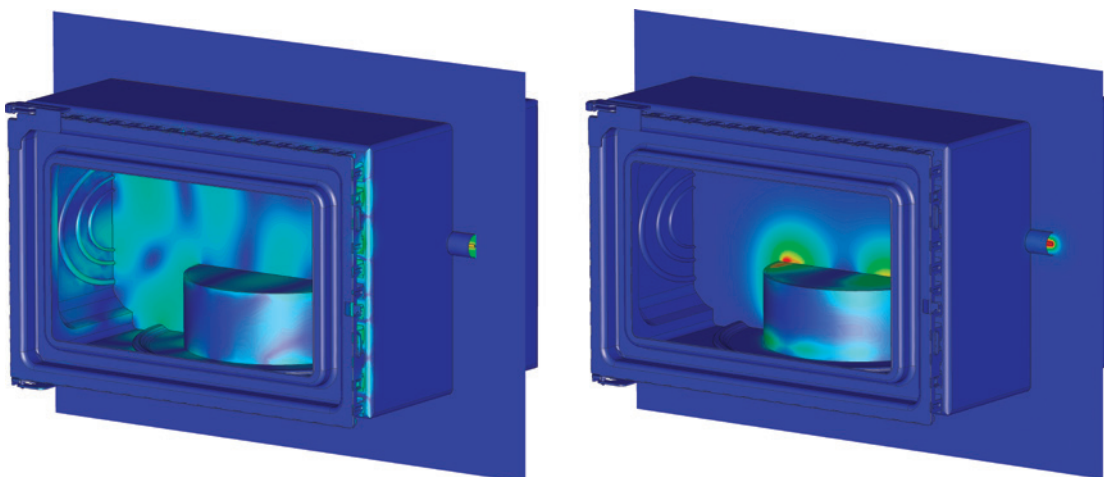
Post-processing allows simulation results to be used in a wide range of analyses to replicate common measurements and figures of merit. The post-processing templates in CST Studio Suite offer solutions for common workflows such as eye diagrams for electronics, efficiency mapping for motors and field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

## Hybrid and System Simulation

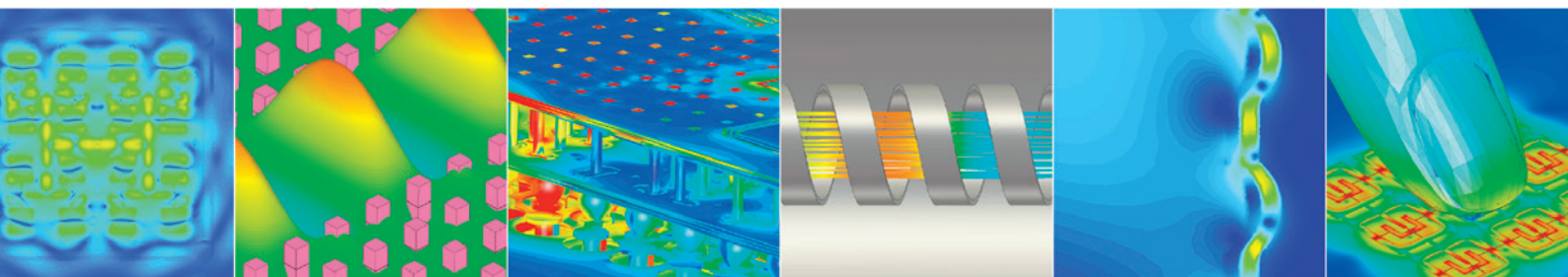
Different aspects of simulation are often well suited to different solvers. For example, antennas are often best simulated by the Time Domain Solver, but large platforms such as vehicles are better suited to the efficient Integral Equation Solver – an analysis of the installed performance of a vehicle-to-vehicle (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.



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



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



## INDUSTRY APPLICATIONS

### Aerospace and Defence

- 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

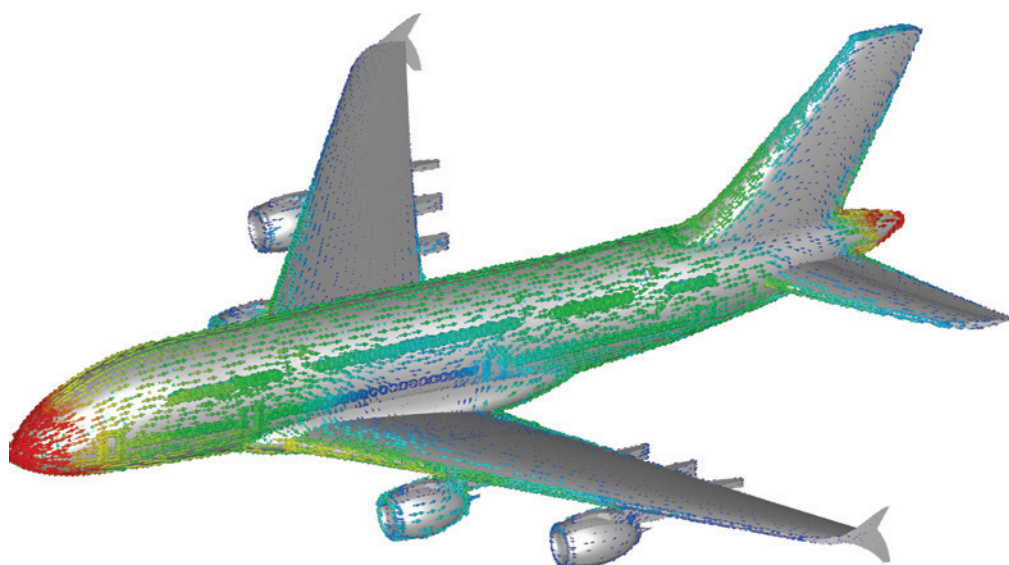
- MRI
- Specific absorption rate (SAR)
- Implant safety
- Wearable devices
- RF diathermy
- X-ray tubes

### High Tech

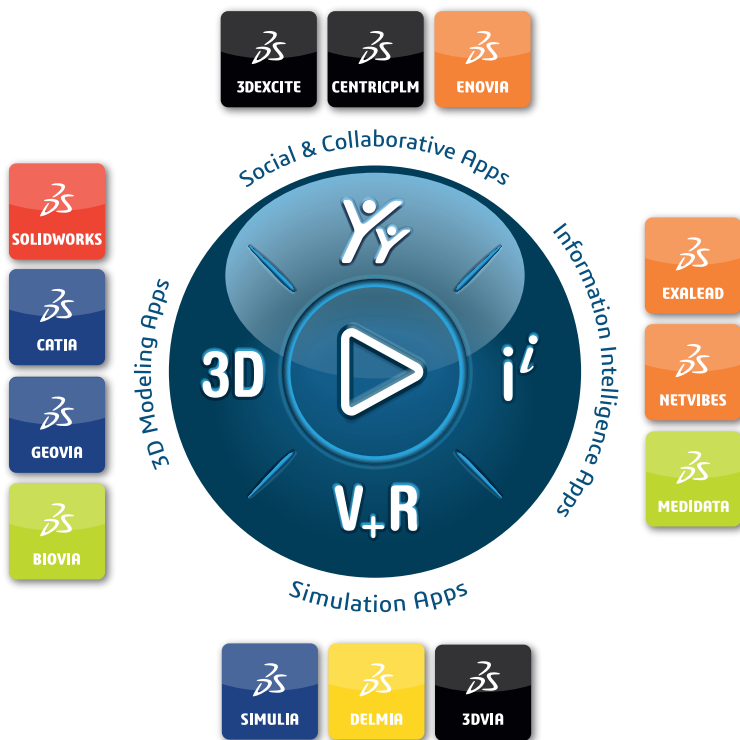
- Antenna performance
- Microwave and RF components
- Electromagnetic compatibility (EMC)
- Signal and power integrity (SI/PI)
- Touchscreens
- Cables and connectors
- Specific absorption rate (SAR) exposure

### Transportation and Mobility

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



**Aerospace and Defence:** Surface currents on an aircraft during a lightning strike.



**Our 3DEXPERIENCE® platform powers our brand applications, serving 11 industries, and provides a rich portfolio of industry solution experiences.**

Dassault Systèmes, the 3DEXPERIENCE Company, is a catalyst for human progress. We provide business and people with collaborative virtual environments to imagine sustainable innovations. By creating ‘virtual experience twins’ of the real world with our 3DEXPERIENCE platform and applications, our customers push the boundaries of innovation, learning and production.

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