CST STUDIO SUITE™ 2008

OVERVIEW

CST DESIGN ENVIRONMENT™

CST MICROWAVE STUDIO® | CST EM STUDIO™ | CST PARTICLE STUDIO™

CST DESIGN STUDIO™

CST – COMPUTER SIMULATION TECHNOLOGY

Founded in 1992, CST offers the market's widest range of 3D electromagnetic field simulation tools.
CST's ground breaking »complete technology« complements its market and technology leading time domain solver, thus offering unparalleled accuracy and versatility for all applications.

Customers operate in industries as diverse as Telecommunications, Defense, Automotive, Electronics, and Medical Equipment, and include market leaders such as IBM, Intel, Mitsubishi, Samsung, and Siemens.

CST provides timely local support through its direct sales and technical support forces. Together with its highly qualified distributors and representatives, CST supports its EM products in over 30 countries.

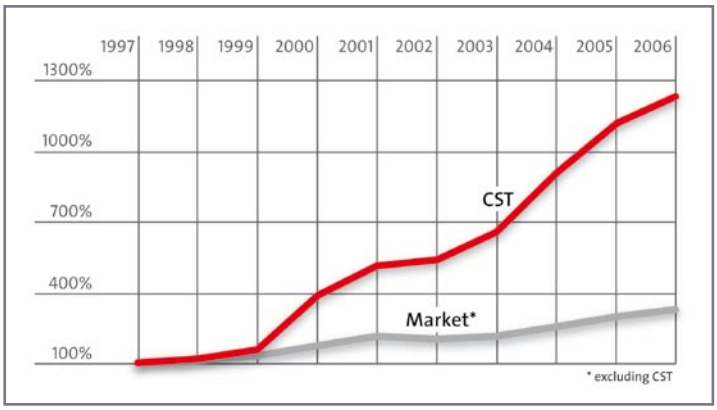
FOUNDATIONS OF CST'S SUCCESS

CST's success is based on the implementation of leading edge technology in a user-friendly interface.

With the introduction of the proprietary PERFECT BOUNDARY APPROXIMATION [PBA]® in 1998 with the first version of CST MICROWAVE STUDIO® [CST MWS], CST established a profound technical advantage. Moreover the significance of this method's merits can be seen in the economic development of the company.

CST has built on this success, encouraging innovation and investing in product development. The resulting expansion in solver technology has created CST's »complete technology« approach to simulation. This enables users to select the most appropriate method for their application and can offer additional security through cross verification.

Today CST employs more than 100 sales, development, and support personnel, and enjoys a market share of over 30% in high frequency 3D EM simulation.



Revenue growth: 3D EM tools

CST STUDIO SUITE

CST STUDIO SUITE™ 2008 is the culmination of many years of research and development into the most accurate and efficient computational solutions to electromagnetic designs.
It comprises CST's tools for the 3D EM design and optimization of static to optical frequency applications, as well as synthesis and circuit simulation.

All programs are accessible through a common interface which facilitates multi-physics and co-simulation.

CST DESIGN ENVIRONMENT™: the access point to and framework for all CST STUDIO SUITE™ modules.

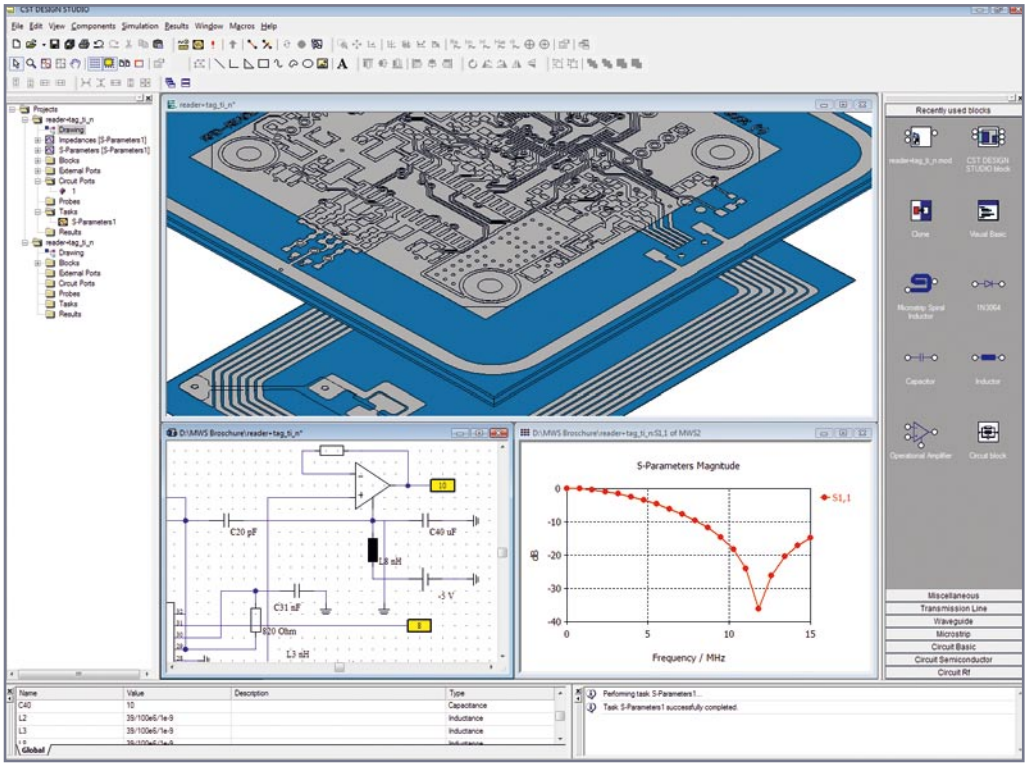
CST MICROWAVE STUDIO®: the leading edge tool for the fast and accurate simulation of high frequency devices. Markets include Microwaves & RF, EDA/Electronics, and EMC/EMI.

CST EM STUDIO™: for the simulation of static and low frequency EM, and thermal applications, such as sensors, actuators, transformers, and shielding effects.

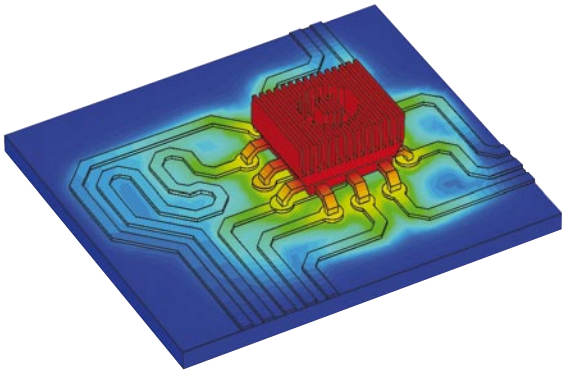
CST PARTICLE STUDIO™: a highly specialized product for the fully consistent simulation of free moving charged particles. Applications include electron guns, cathode ray tubes, magnetrons and wake fields.

CST DESIGN STUDIO™: a versatile tool that facilitates the breaking down of large simulations into small parts, as well as 3D EM/circuit co-simulation.

CST DESIGN ENVIRONMENT



CST STUDIO SUITE™'s graphical user interface: the S-parameters of a passive 3D EM structure are obtained using CST MWS for a co-simulation with an active element circuit in CST DESIGN STUDIO™



Coupled simulation: temperature distribution due to electric losses in an IC

CST EM STUDIO™ [CST EMS] can be used for stationary temperature calculations. Possible heat sources are the electric losses obtained using CST STUDIO SUITE's high or low frequency solvers.
The electric loss data can be exchanged easily inside the CST DESIGN ENVIRONMENT™ [CST DE].

CST DESIGN ENVIRONMENT™ [CST DE] is the access point to CST's entire range of solver technology and was developed in response to the growing demand for coupled problems and co-simulation:

- circuit /EM co-simulation
- thermal analysis using all 3D electric loss results
- magnetostatic analysis of current flow fields
- charged particle simulation with 3D static and eigenmode fields
- ...

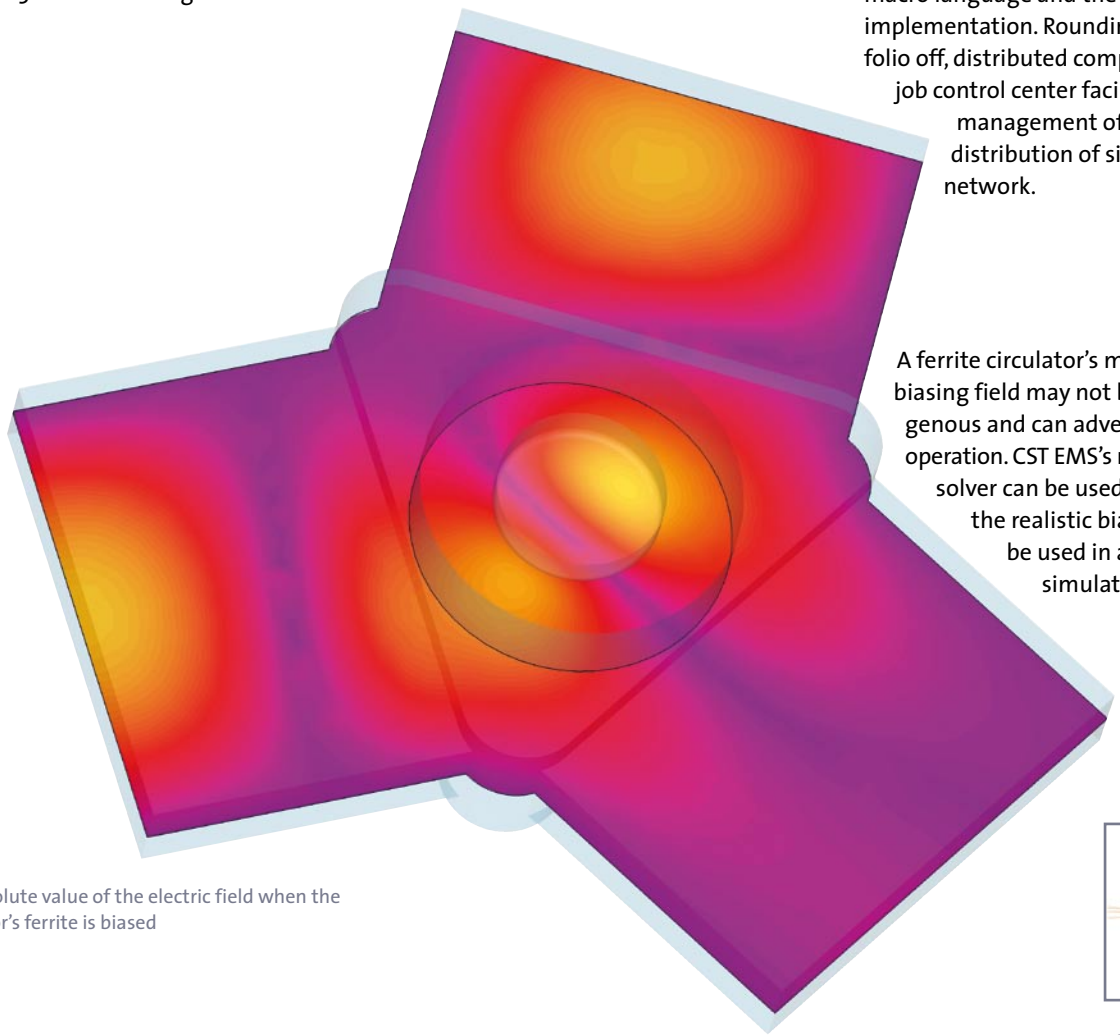
The intuitive and easy-to-use graphical user interface is common to all of CST's 3D simulators. Several projects can be opened simultaneously in a single front-end using the multiple document interface.
For each CST MWS model an associated CST DESIGN STUDIO™ [CST DS] schematic is automatically created.

CST MWS model can be easily embedded in an RF/microwave circuit system for which various circuit analysis types are available.

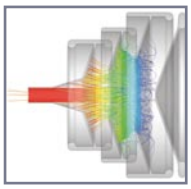
Several CST MWS model blocks, as well as third-party blocks, for example via Touchstone®, can be co-simulated in CST DS. Furthermore, a divide and conquer approach can be used in CST DS for the decomposition of large microwave components into smaller sub-components that can be handled much more easily and rapidly.

The integrated optimizer operates within and between the solver modules. Projects can be controlled using the VBA macro language and the COM/DCOM implementation. Rounding the portfolio off, distributed computing and the job control center facilitate the management of projects and distribution of simulations on a network.

A ferrite circulator's magnetic biasing field may not be homogenous and can adversely affect its operation. CST EMS's magnetostatic solver can be used to calculate the realistic biasing field to be used in a CST MWS simulation.



The absolute value of the electric field when the circulator's ferrite is biased



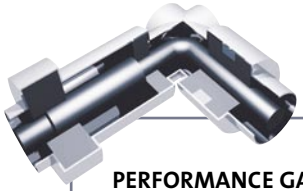
Depressed collector:
electrons are decelerated by electrostatic fields

ACCURACY AND PERFORMANCE

PERFECT BOUNDARY APPROXIMATION

CST gained a major competitive advantage with the introduction of PERFECT BOUNDARY APPROXIMATION [PBA]®. Whereas the staircase grid is pretty efficient for a large number of mesh cells, it does have a major drawback when it comes to the geometrical approximation of arbitrarily shaped structures.
Tetrahedral meshing has more or less the opposite strengths and weaknesses. PBA combines the advantages of both standard approaches, accuracy and performance, and offers a superior solution for most applications.

Various meshing strategies for a simple sphere: staircase, tetrahedral, and CST's unique technology PBA



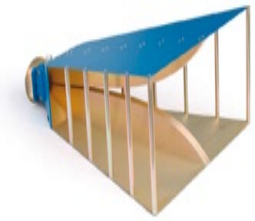
90° coaxial connector efficiently solved using PBA technology

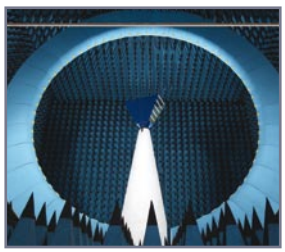
PERFORMANCE GAIN

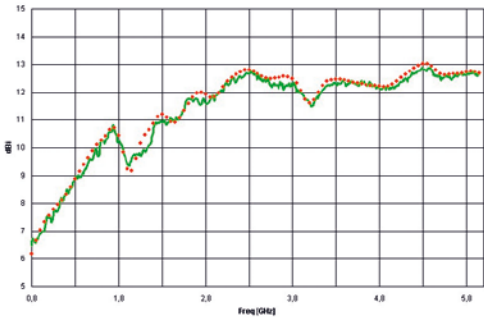
When designing a coaxial connector you may try using standard FDTD to take advantage of the fast creation of broadband results. Having finished your design, a convergence study to verify your results seems to be the logical next step. But having run one calculation pass after the other, no convergence is met.
Repeating the design process with CST MWS offers you an entirely different experience. The geometrical accuracy, achieved thanks to PBA, enables smooth broadband convergence with a minimum number of passes. Using the same hardware you have realized a performance gain in excess of a factor 50.

BROADBAND SIMULATION

For the performance evaluation of antennas, a time domain simulation not only delivers the broadband S-parameter results, but also all far-field data over the entire relevant spectrum in just one simulation run.



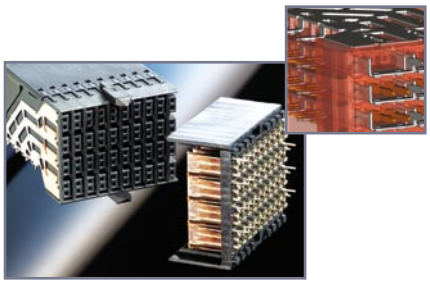




Excellent agreement between measured and simulated broadband gain of a Satimo dual-ridge horn antenna

»The ERNI Ermet zeroXT connector is able to transmit differential signals up to a data rate of 10 Gbit/s [of a non-return zero code]. The complete design support, including the electromagnetic field analysis, the impedance calculation and the crosstalk analysis, was done using CST MICROWAVE STUDIO®. Due to the accurate results, the connector could be manufactured, without a major re-design, in one pass.«

Dr. Thomas Gneiting, AdMOS

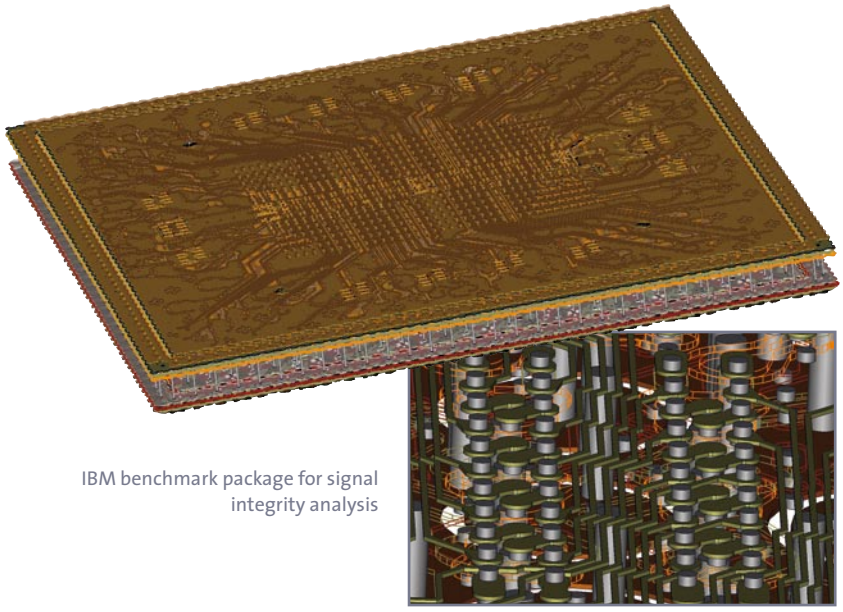


ERNI ermet zeroXT connector

STEP AHEAD OF YOUR COMPETITION

CST's leading-edge position was convincingly demonstrated at the 15th Conference on Electrical Performance of Electronic Packaging [www.epep.org].

IBM created a benchmark with a complete IC package, with 8 metallization layers and a total of 40,000 geometrical entities. CST was the only vendor whose software was capable of solving the original benchmark.



IBM benchmark package for signal integrity analysis

CODE OPTIMIZATION AND HARDWARE ACCELERATION

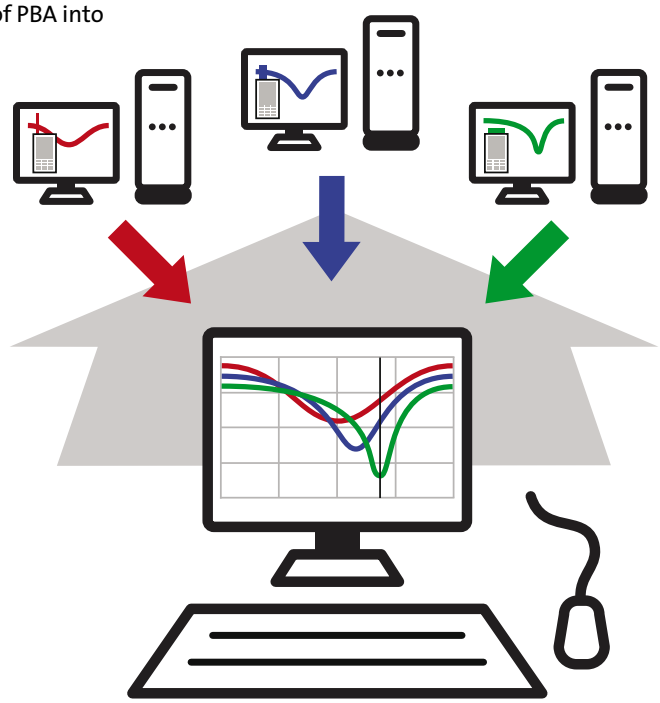
CST and Intel are working together to provide optimized CST MWS performance on Intel's latest multicore hardware platforms. This fruitful collaboration can currently provide you with a performance increase of up to 400 %.

While mainstream development depends on the progress of CPU manufacturers, GPUs provide the competitive edge in low cost, high performance computing. CST partners with Acceleware to bring the advantages of PBA into this promising field.

DISTRIBUTED COMPUTING

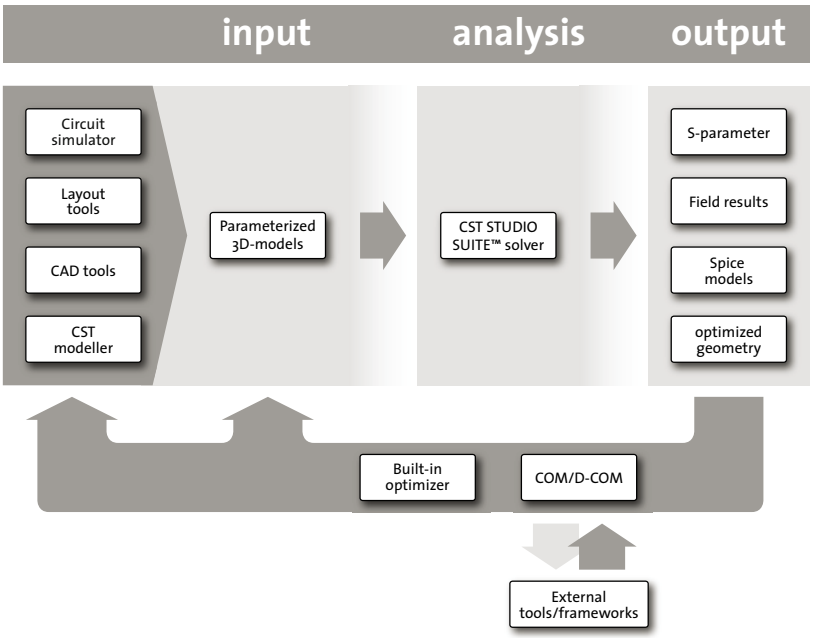
In order to get your designs right quickly, you need automatic optimization and parameter studies. Wouldn't it be nice to go onto your next task, while the simulation is performed in the back ground on another, dedicated machine?

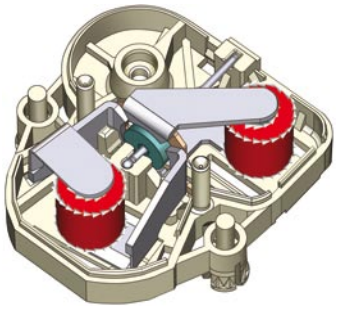
Or even better, run this job in parallel and cut down optimization time. CST's distributed computing offers you a cost effective means of doing just this.



Increased performance through distributed computing

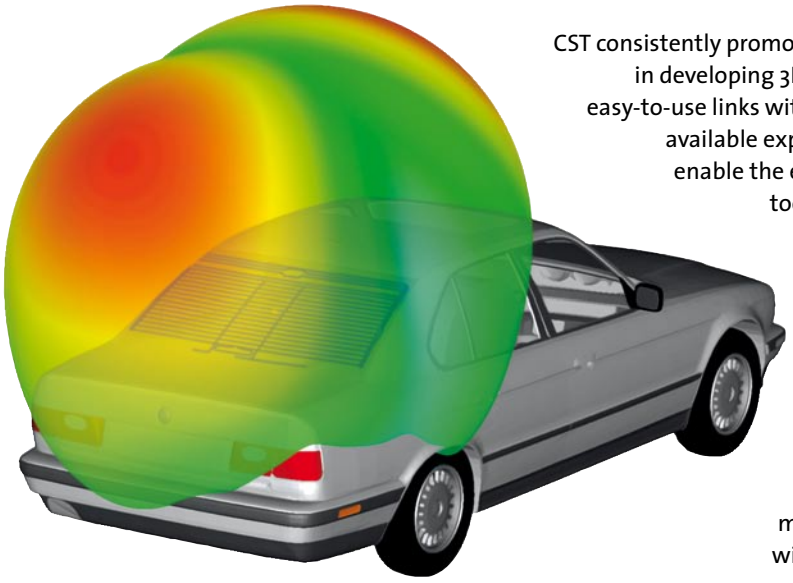
WORKFLOW INTEGRATION





Gauge for a speedometer
driven by a stepping motor imported through IGES interface

USING THE BEST-IN-CLASS

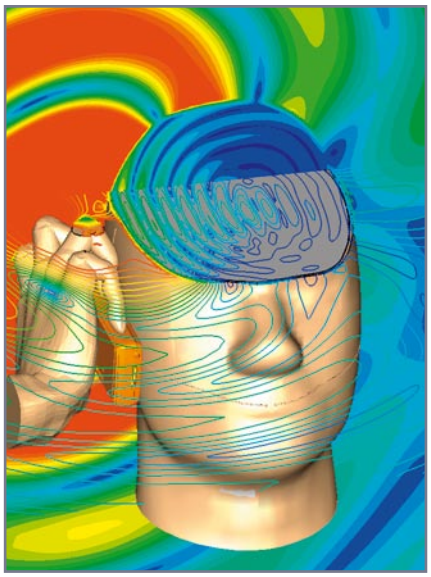


CST consistently promotes the best-in-class approach. We specialize in developing 3D EM software and provide straight-forward, easy-to-use links with other best-in-class vendors, connecting all available expertise. A wide range of import/export filters enable the easy exchange of geometrical data with CAD tools. Furthermore, imported structures can be modified and parameterized, and used for optimization and design studies.

Special interfaces to various EDA tools for signal integrity analysis, and to RF circuit/system simulators for EM/circuit co-simulation, enhance and unite the capabilities of different worlds. Moreover the powerful VBA based and OLE-compatible macro language allows direct communication with programs like e.g. MATLAB® or MS Excel®.

Farfield pattern of a rear screen antenna at 100 MHz

The import and export of structural information is fundamental to embedding a simulator in a design flow. CST STUDIO SUITE™ filter options include: SAT, STL, IGES, STEP, Nastran, VDA-FS, Autodesk Inventor®, Pro/ENGINEER®, CATIA® v4 and v5, DXF™, GDSII, Multi-layer Gerber, Cadence® Allegro®, Mentor Graphics® Expedition™, Agilent ADS layouts, AWR Microwave Office® layouts, Sonnet® models, biological voxel data, ...



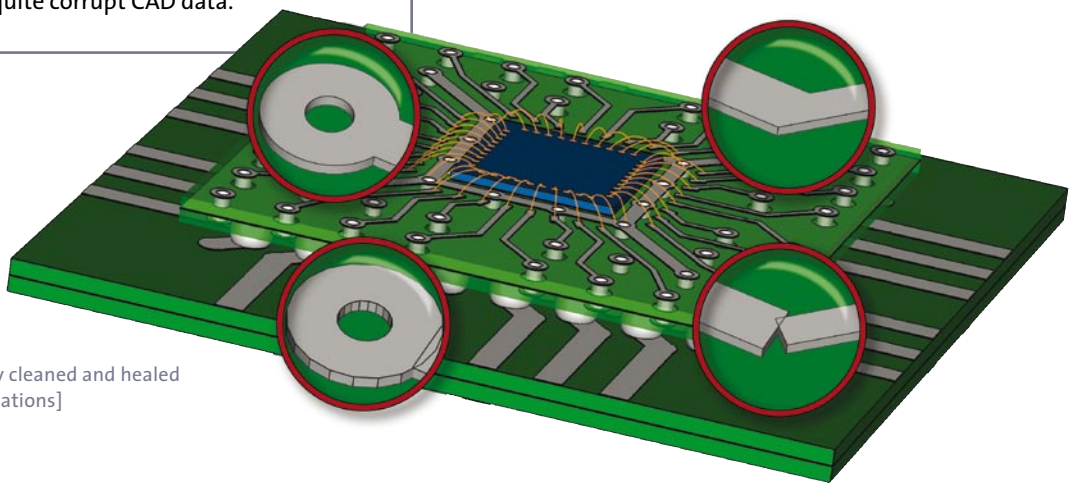
SAR analysis and EM field distribution of a Sony Ericsson mobile phone at 1.8 GHz: the mobile phone's CAD data was imported using the STEP interface and combined with a hand and SAM model

ARE ALL IMPORTS EQUALLY EFFECTIVE?

Import options are available in the majority of simulation tools nowadays, but their effectiveness is often impaired by seemingly insignificant details.

There is nothing more frustrating than successfully importing 98% of a structure, as the missing 2% may make it impossible to continue and it could cost days to fix the problem.

Moreover, imports from EDA tools are particularly prone to small gaps and edges which unnecessarily complicate the simulation model. CST MWS contains a sophisticated cleaning procedure as well as automatic healing; these features, combined with the robust mesher, enable effective simulation, even for quite corrupt CAD data.

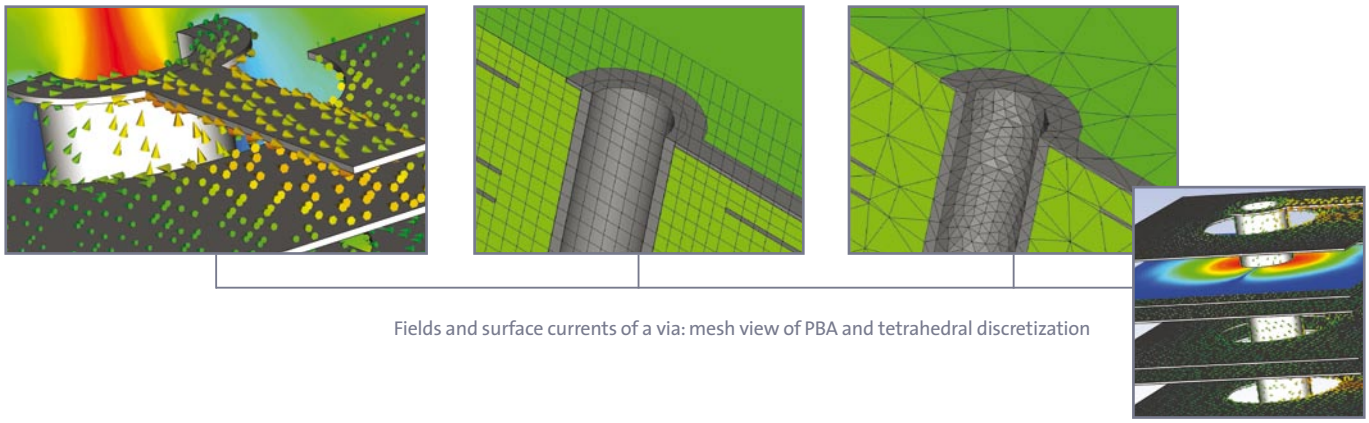


An imported package highlighting the automatically cleaned and healed CST MWS model [top magnifications]

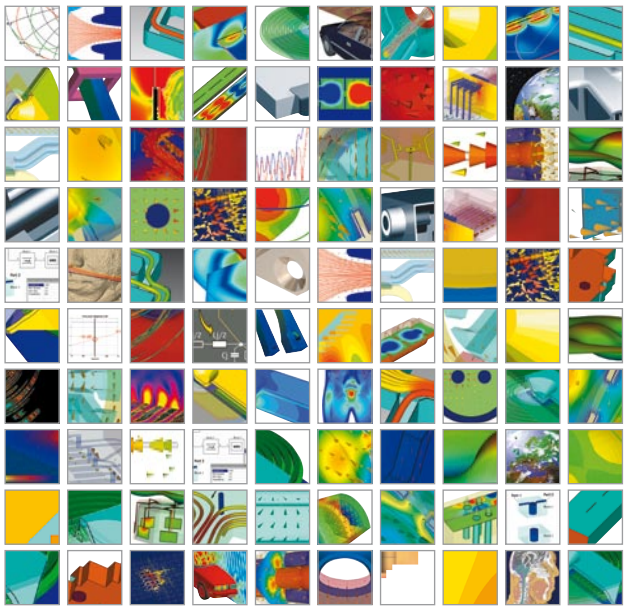
»CST specializes in passive 3D EM field simulation, and through partnerships with best-in-class active simulation tools, has made true co-simulation and co-optimization an everyday task. CST MICROWAVE STUDIO® contains a powerful and easy to use solid modeler, and its powerful import filters enable the successful import and parameterization of complex geometrical data.« 3D EM Application Team, Infineon Technologies AG

WHAT MAKES CST THE MOST COMPLETE SOLUTION?

Just a decade ago, experts argued which technology would dominate the 3D EM simulation market: time or frequency domain? Time domain was known for its ability to solve problems with a large number of mesh cells, whereas frequency domain – using tetrahedral instead of rectangular gridding – often offered better geometry approximation. Both methods have evolved a great deal since then; CST's achievement in overcoming the disadvantages associated with the time domain's staircase approximation has proved especially important. Still it's true that no one method is perfect for every application. With this in mind, CST has developed frequency domain technology which complements the time domain as a general purpose solver. Moreover, CST has also added an Integral Equation solver [including MLFMM], which uses surface discretization, thus further enhancing the range of choices for its users.



Fields and surface currents of a via: mesh view of PBA and tetrahedral discretization



Diversity of problem types illustrate wide application range of CST STUDIO SUITE™'s solver modules

WHAT DO AN RFID, A PARTICLE GUN, AND A CAR ANTENNA HAVE IN COMMON?

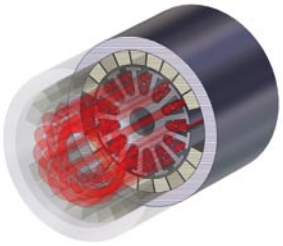
You can design all of these applications using CST STUDIO SUITE™. It offers an extensive range of features and solvers suited to all kinds of EM problems. While you can customize the package for specific applications, you can also easily switch to other design projects, exploiting your experience with the interface, workflow, and methodology. The solver range includes: Time Domain, Frequency Domain, Integral Equation, Fast Resonant, Eigenmode, static and stationary fields, charged particles, temperature, circuit simulation and more.

WHY IS IT IMPORTANT TO HAVE A COMPLETE SOLUTION?

Imagine you have been happy with your software, but one day you get an application whose simulation time threatens to be in the order of days rather than hours. You know you won't meet the deadline unless you find a way of accelerating the simulation time significantly.

CST software allows you to switch easily from one solver to another, without changing the model and parametric settings. So you can choose the most appropriate method for each problem, thus minimizing your simulation run time. You only need a test password and you can try out any feature or solver. A nice side effect of this, is that adding an additional solver is far more economical than buying a whole new package.

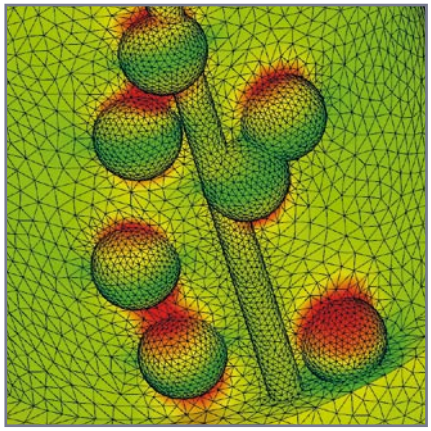
3D RCS plot of a helicopter



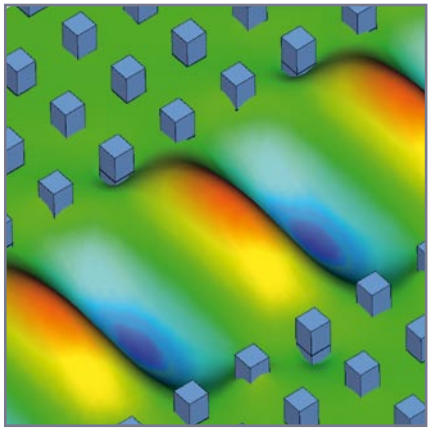
Permanent
magnet DC machine simulation

CONFIDENCE THROUGH CROSS VERIFICATION

Sometimes simulation and measurements just don't agree, but why? If the measurement was made by another working group they may quickly come to the conclusion that the simulation must be wrong.
By running a simulation with both time and frequency domain solvers you can greatly increase confidence in your results. Reaching agreement with two different numerical methods proves that the deviation must have been caused by another factor, such as wrong material values, measurement failure etc.



Electroquasistatic simulation of a high voltage insulator contaminated by water drops



Line defect waveguide in a photonic crystal

»CST MICROWAVE STUDIO has turned out to be the most versatile and powerful 3D EM simulation tool we have ever used. Furthermore, an extremely helpful and knowledgeable staff backs up this package.« Frederic Lecuyer, RF Design Engineer [former RFS]