CST DESIGN STUDIO(tm)
Technical Specification

Welcome

Welcome to CST Studio Suite®, the powerful and easy-to-use schematic design tool built for fast synthesis and optimization of complex systems. The tight integration with our electromagnetic field simulators allows considering systems at different levels of detail and takes into account various effects.

Please refer to the CST Studio Suite *Getting Started* manual first. The following explanations assume that you already installed the software and familiarized yourself with the basic concepts of the user interface.

Within CST Studio Suite, CST Design Studio appears in two different configurations:

☐ As a stand-alone tool. It runs independently, without any connections to a specific field simulator project.

☐ As an associated view to a 3D project. It represents the schematic view that shows the system level description of the current field simulator project.

All steps necessary to set up a simulation in CST Design Studio are identical for both flavors described above.

How to Get Started Quickly

We recommend that you proceed as follows:

1. Read the CST Studio Suite - Getting Started manual.
2. Work through this document carefully. It provides all the basic information necessary to understand the advanced documentation.
3. Look at the examples provided in the Component Library (File: Component Library ⇨ Examples). Especially the examples which are tagged as Tutorial provide detailed information of a specific simulation workflow. Press the Help ❓ button of the individual component to get to the help page of this component. Please note that all these examples are designed to give you a basic insight into a particular application domain. Real-world applications are typically much more complex and harder to understand if you are not familiar with the basic concepts.
4. Start with your own first example. Choose a reasonably simple example which will allow you to quickly become familiar with the software.
5. After you have worked through your first example, contact technical support for hints on possible improvements to achieve even more efficient usage of the software.

What is CST Design Studio?

CST Design Studio is a schematic design tool for system level simulation. Several component libraries are available based on analytical and semi-analytical models. Library models can be expanded by means of field simulators of CST Studio Suite. Measured data are taken into account as TOUCHSTONE or SPICE blocks and the support of the IBIS standard allows an easy I/O device description. A vendor library of linear and non-linear components helps to easily set up a design.

CST Design Studio is tightly integrated to various electromagnetic (EM) and multiphysics field simulation tools of CST Studio Suite. A hierarchical task concept and a powerful 3D assembly view make CST Design Studio a unique product for System Assembly and Modeling (SAM). SAM technology is able to extract a complex 3D system by connecting its individual components on a schematic level.

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Main Applications for CST Design Studio

CST Design Studio users will take advantage of its versatility and the seamless workflow between a circuit simulator and electromagnetic (or multiphysics) field simulators. Main applications are the following:

- ☐ Antenna module design with system performance optimization including matching/driver networks
- ☐ Microwave/RF device and system design, applicable for filters, diplexers, phase shifters, high performance RF amplifiers etc.
- ☐ Signal Integrity (SI) simulation of packages, 3D connectors and cables, system channels including high speed and control PBCs
- ☐ EMC/EMI analysis of complex systems, considering radiation phenomena from and into connected cable harnesses
- ☐ Multiphysics simulations like resonator optimizations to compensate the resonance frequency shift due to temperature depending deformation of the resonator geometry, induced by EM material losses

CST Design Studio Key Features

The following list provides an overview of CST Design Studio main features. Please note that not all options may be available to you due to license restrictions. Please contact your local sales office for details.

User Interface

- ☐ Intuitive and easy-to-use schematic view, allowing to quickly setup and define a circuit

Components / Circuit Models

- ☐ Several analytical components
- ☐ Comprehensive analytical and 2D EM based microstrip and stripline component libraries
- ☐ Active, passive, linear and non-linear circuit elements
- ☐ Support of hierarchical modeling, i.e. separation of a system into logical parts
- ☐ Tight integration with 3D EM field simulation of CST Studio Suite
- ☐ Import of net lists and semiconductor device models in Berkeley SPICE, Cadence® PSpice® or Synopsis® HSPICE®[1] format
- ☐ Support of the IBIS data file format
- ☐ Import of measured or simulated data in the TOUCHSTONE file format
- ☐ Control and use of extensible element library

SAM (System Assembly and Modeling)

- ☐ 3D representations for individual components
- ☐ Automatic project creation by assembling the schematic's elements into a full 3D representation
- ☐ Fast parametric modeling front end for easy component transformation and alignment
- ☐ Manage project variations derived from one common 3D geometry setup
- ☐ Coupled multiphysics simulations by using different combinations of coupled Circuit/EM/Thermal/Stress projects
- ☐ Hybrid Solver Task (uni- or bi-directional coupling of 3D high frequency solvers)
- ☐ Antenna Array Task
- ☐ Electrical Machine Task that performs and analyses various drive scenarios

Analysis

- ☐ Global parameterization
- ☐ Flexible and powerful hierarchical task concept offering nested sequence/parameter sweep/optimizer setups
- ☐ Parameter sweep task with an arbitrary number of parameters
- ☐ Optimization task for an arbitrary number of parameters and a combination of weighted goals

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[1] Only available if the HSPICE simulation kernel is used

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- ☐ Template-based post-processing for user defined result processing
- ☐ Tuning parameters by moving sliders and immediately updating the results
- ☐ Powerful circuit simulator, offering DC, AC, S-Parameter, Transient and Harmonic Balance simulations
- ☐ Interference Task to estimate possible interference violations on platforms carrying multiple sender and receiver modules.
- ☐ Robust and accurate handling of frequency domain data (e.g. S-Parameters) in time domain
- ☐ Mixer and amplifier simulations
- ☐ Net list file export in HSPICE format
- ☐ Result cache for S-Parameters from high frequency simulation projects
- ☐ Recombination of fields in CST Studio Suite for stimulations calculated in CST Design Studio
- ☐ Fast time domain simulation of coupled problems by transient EM/circuit co-simulation
- ☐ Automatic solver choice that automatically selects either an analytic or numerical evaluation of microstrip and stripline components depending on the validity of the analytic models
- ☐ Consideration of higher order modes
- ☐ SPICE model extraction

Synthesis

- ☐ Filter Designer 2D automatically designs and creates lumped or 2D filter structures. All 2D structures can be accompanied by an automatically created 3D model, ready for verification with full 3D EM field simulation.
- ☐ Filter Designer 3D synthesizes / optimizes band pass filter structures of arbitrary topology. SAM technology is used to automatically assemble the final 3D filter design by using predefined resonator / coupler elements from the component library.

Visualization

- ☐ Multiple 1D result view support
- ☐ Automatic parametric 1D result storage
- ☐ Displays S-Parameters in xy-plots (linear or logarithmic scale)
- ☐ Displays S-Parameters in Smith charts and polar charts
- ☐ Fast access to parametric data via interactive tuning sliders
- ☐ Measurement functionality inside the views (axis markers, curve markers)
- ☐ Possibility of keeping and comparing results in user-defined result folders
- ☐ Full 3D assembly viewer

Result Export

- ☐ Export of S-Parameter data as TOUCHSTONE files
- ☐ Export of result data, e.g. 1D plots, as ASCII files

Documentation

- ☐ Creation and insertion of text boxes and images inside the drawing for documentation purposes
- ☐ Annotations inside the data views

Automation

- ☐ Powerful VBA (Visual Basic for Applications) compatible macro language including editor and macro debugger
- ☐ OLE automation for seamless integration into the Windows environment (Microsoft Office®, MATLAB®, AutoCAD®, MathCAD®, Windows Scripting Host, etc.)

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