EMC Studio

EMC Simulation Has Never Been So Easy

EMC Studio is a powerful program package for the sophisticated computer analysis of EMC-problems. **EMC Studio** was specially created to address engineers working with EMC-problems appearing in large systems like automobiles, aircrafts, ships or computer systems.

Immunity-, EMI- and Cross-Talk- problems of electronic systems linked with complex cable harnesses can be conveniently calculated with a maximum of reliability. The calculation cores are based on the most efficient computational techniques like Method of Moments (MoM), Method of Auxiliary Sources (MAS), Transmission Line Methods (MTL) and Network Analysis (SPICE, PSPICE, HSPICE and DOLPHIN - SMASH VHDL - AMS). The computational techniques are applied either directly or the most suitable methods are mixed, according to the demands defined by the problem. This ensures the most accurate and fastest solution of EMC problems.

EMC Studio supports the full EMC process chain. It can help with early concept decisions, simulate the bench level testing of subsystems and calculates the behaviour of the complete system in later development stages.

For EMI-analysis sophisticated antenna calculation features are implemented. This makes **EMC Studio** a powerful antenna calculation program. Antennas can be created, analyzed, using the multiple post processing features and optimized for best performance.

Ease of use is one of the most important features of **EMC Studio**. The program allows in a convenient and fast way to model a complicated EMC problem, solve it accurately and present directly the results. Its intuitively useable graphical interface and the powerful calculation capabilities make **EMC Studio** indispensable.

EMCoS has long recognized the need for special EMC Software that allows engineer to solve EMC problems easily and with high accuracy.

The most appropriate numerical methods for EMC problems were combined with user-friendly interface to make pre-compliance EMC analysis as accurate and fast as possible.
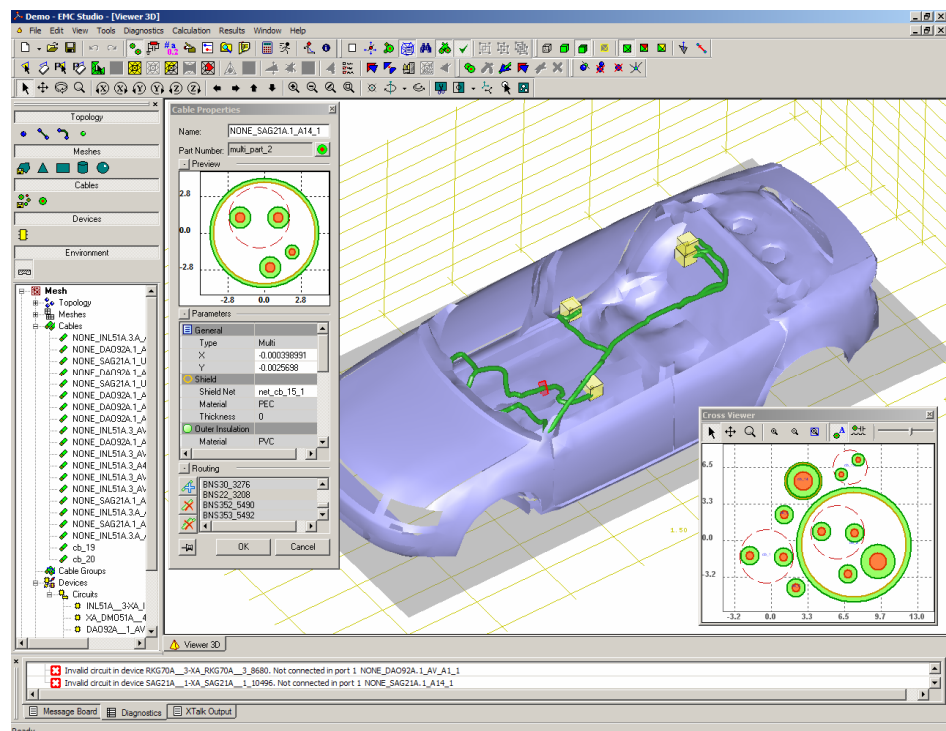
The EMC Studio user interface with car model and cable harness

EMCoS Overview

The work of EMCoS Ltd. focuses on the generation of special simulation software for electromagnetic field calculation and data visualization as well as on consultation on EM problems.

We help our customers with simulations of complex EMC problems by offering appropriate tools, or we support them with processing of, in most cases, complex data.

We do not claim to produce software to model everything, but we focus on specific directions:

- EMC in large systems
- Antenna calculations
- EMC/EMI of PCB in complex environment
- PCB data pre-processing
- Mesh and cable harness pre processing

We see our mission in the generation of special methods and programs that are on the cutting edge of science and provide the most appropriate solution for each specific problem.

Company Background

EMCoS Ltd. was founded as a spin-off of scientists of the Laboratory of Applied Electrodynamics of the Tbilisi State University of Georgia. The Laboratory of Applied Electrodynamics has more than 20 years of experience in the field of data visualization and simulation of electromagnetic problems.

The fields of interest cover a wide range. Starting from the simulation of the non-linear arc resistance as generated by ESD or electrical switches to the calculation of field coupling, or radiation of complex cable harness systems in automobiles.

Basic Idea

EMC in large systems like automobiles, aircrafts and ships is in most cases mainly determined by:

- the large metallic structures
- the cable harness
- the ECU's and other electrical components
- the antennas

By modelling the above listed items accurately and applying suitable calculation methods a good prediction of the EMC-behaviour is possible.

With a pure field calculation program it is not possible to handle the complexity of large systems. The generation of an appropriate calculation model is in many cases an unsolvable problem.

EMC Studio closes the gaps. It helps with the generation of complicated calculation models of large systems. For the calculation of the EMC behaviour EMC Studio offers sophisticated hybrid methods.

Pre Processing

Pre-processing has never before been so easy. EMC Studio allows the modelling of nearly arbitrary structures. Complicated cable harnesses, rod structures or antennas can be constructed inside 3D-structures and modified in a very convenient way.
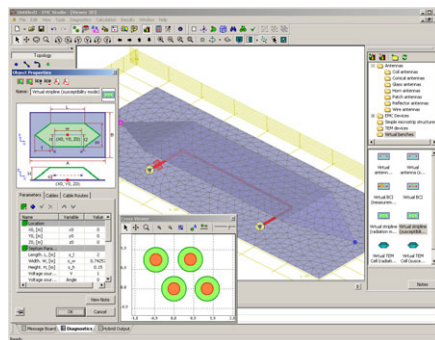

Virtual Stripline Model

EMC Studio can import and process complex models from standard CAD formats (ACIS SAT, IGES, CATIA V4 and V5). Triangulated geometry data can be imported from NASTRAN or STL file formats.

Harness data can be imported either using EMCoS Harness Studio as STEP AP 212

file or by a customized import filter. The preparation of the simulation tasks is done in an intuitive way. EMC Studio gives the possibility to refine and adjust the mesh in critical regions either automatically or with just some mouse clicks.
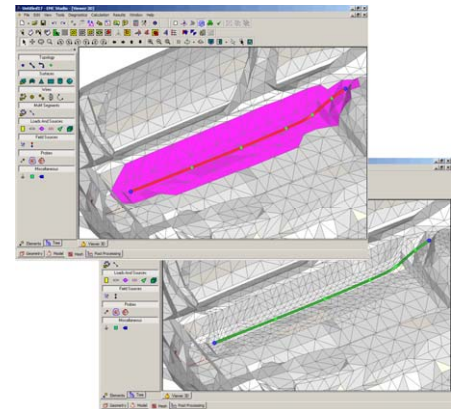
Mesh under a wire structure before and after automatic refinement

The graphical user interface supports different modes for data input and data adjustment.

- Geometry Mode – used for initial geometry primitives construction. Here geometry data can be constructed with comfortable CAD features.

- Model Mode – used for assignment of physical properties to geometry objects. Electrical parameters can be given to geometry. Complex circuits can be constructed to represent lumped devices.

- Mesh Mode – model objects are converted automatically to discrete elements ready for calculations. In this mode all calculation elements are accessible and advanced user can further process or tuned the discrete calculation model, if required. Model size is automatically adjusted to highest frequency. Methods for error estimation are available.
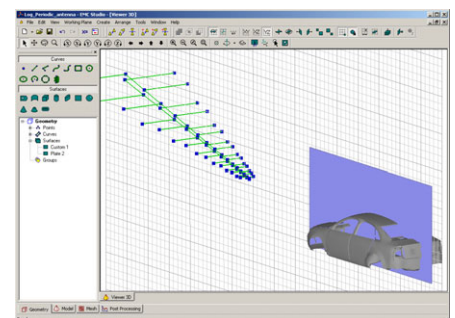
Geometry Mode

Product Feature Summary

- Specialized for EMC-problems of large systems
- Powerful antenna calculation and optimization functions
- Accurate and very efficient methods for EMC computation of large systems
- Cross-talk analysis of extended complicated wire structures
- Hybrid algorithm for EMI analysis of complex cable harnesses with arbitrary terminations
- Hybrid algorithm for Interference analysis of complex cable harnesses with arbitrary terminations
- Virtual bench testing models (Stripline, BCI, Virtual Antenna, TEM Cell)
- Very convenient model generation and modification
- Ease of use for modeling of cables and terminations
- Analysis of single cables, cable bundles, twisted pairs, ribbon and shielded cables (coaxial, ribbon and complex multi-layered)
- Schematic editor for circuit construction
- Integrated and editable library of circuit elements
- Import of complex cable harnesses and meshes
- Standard CAD formats processing (ACIS SAT, IGES, STEP, CATIA V4/V5)
- PCB data processing
- Sophisticated mesh checking routines
- Automatic mesh refinement and adjustment features
- Frequency and time domain analysis
- Signal Integrity functions

Calculation Cores

EMC Studio offers highly sophisticated methods to calculate the EMC- and antenna behaviour.

Depending on the demands, the solution will be found with combination of several solver modules.

3D-field solver (TriD)

EMC Studio supports the EMCoS solver module TriD. This Method of Moment (MoM) based module offers accurate results with an extremely fast out of core solver for the resulting equation system. A parallel option for Linux or Windows cluster systems can increase further the performance to calculate extremely large models.

2D-static solver (Static2D)

To calculate transmission line coefficients of complex cable-systems for cross talk or hybrid computations EMC Studio offers a very accurate and fast 2D field solver module based on the Method of Auxiliary Sources (MAS).

3D-static solver (Static3D)

The static 3D solver calculates the coupling coefficients between metallic structures and gives the base for the circuit analysis.

Hybrid solvers (Field2TL and TL2Field)

The hybrid core combines the MoM with transmission line analysis or equivalent sources. Common mode current calculation with impressed current substitution in MoM and field-to-MTL coupling approaches are implemented.

Circuit simulation solvers

EMC Studio allows the mixed electromagnetic and circuit analysis. The program is able to generate equivalent circuits of your cable harness. These networks can be calculated either by an included SPICE3f5 module or any other SPICE3F5 compatible network analysis program. The SPICE link allows the usage of nearly arbitrary terminations for DC, AC or transient analysis. DOLPHIN - SMASH VHDL - AMS circuit simulation interface is also supported.

Analysis Modes

EMC Studio supports several modes for the analysis of common EMC problems.

Cross-talk

The calculation of cross talk is done by MTL methods that are implemented in the calculation modules. Frequency- and Time-Domain analysis of non uniform arbitrary cable structures with non linear terminations can be done. Models for twisted pair and shielded cables are available.

Radiation

Radiation problems can be solved by direct MoM or by using the hybrid core that generates equivalent radiation sources. This can reduce the calculation time dramatically and allows the usage of arbitrary non-linear terminations.

Susceptibility

Susceptibility with non-linear terminations can be calculated with direct MoM or a hybrid field-to-TL coupling method. Also here computation time is reduced.

Static3D

Problems in the low frequency range (depending on structure size: DC – 30 MHz) can efficiently be solved with calculation of the coupling coefficients, the generation of equivalent circuits, and network analysis.

Virtual Bench

Virtual component testing can be done very comfortable with parametrical models for Stripline, BCI, Virtual Antenna and TEM-Cell. Underlying special calculation algorithms allow the accurate and fast solution.

Post Processing

Comfortable post-processing features help user to visualize and analyze the results. 2D results can be shown as XY-graphs, polar plots or Smith chart. Linear or logarithmic scaling with automatic dB labelling is possible. Multiple 3D options permit static results evaluation or production of movies showing dynamic properties of results.

- Full wave 3D MoM module for LF and HF analysis
- Matrix-Partitioning functions for fast optimization calculations
- PO (Physical Optics) calculation core for very high frequencies
- LF Electric Field Solver
- LF Magnetic Field Solver
- Static2D solver module for MTL parameter calculation
- SPICE 3F5 circuit calculation module
- OrCad PSpice, Synopsys HSpice circuit simulation interfaces
- DOLPHIN - SMASH VHDL - AMS circuit simulation interface
- Fast and accurate out of core equations system solvers
- Parallel solvers for Linux and Windows
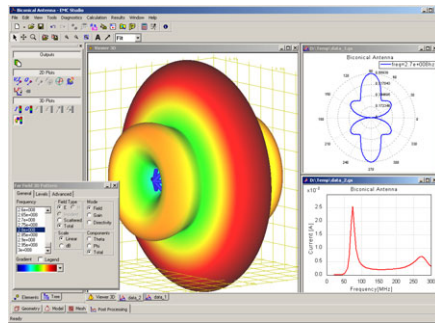
Mixed 2D and 3D Post-Processing
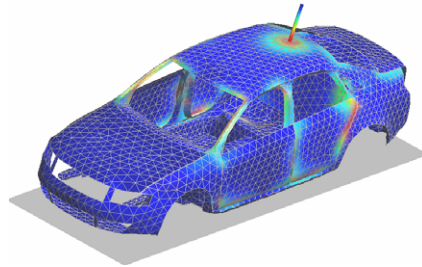
Current and Charge Distribution
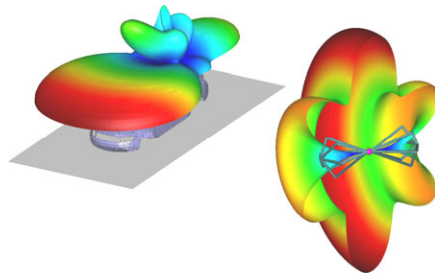
Far Field 3D Pattern

Application Examples

- EMC Studio covers the calculation of many EMC-problems arising with large systems
- EMC problems of complex wire systems with non-linear terminations
- Immunity problems related to cable coupling like in automotive industry, shipbuilding, aircraft construction or military areas can be solved
- Radiation from complicated wire systems like in transportation vehicles, aircrafts, computers
- Cross-talk analysis of extended complicated wire structures
- Antenna design, analysis and optimization

- PCB modeling in complex environment
- Bench level testing features (BCI, Virtual Antenna, Stripline and TEM Cell) for EMI and Immunity

Other Features

- Powerful model editor
- Analysis of single cables, cable bundles, twisted pairs, ribbon and shielded cables (coaxial, ribbon and complex shielded)
- Schematic editor for circuit creation
- SPICE 3F5, PSPICE, HSPICE circuit calculation module
- DOLPHIN - SMASH VHDL-AMS circuit simulation interface
- Standard CAD formats processing (ACIS SAT, IGES, STEP CATIA V4/V5)
- PCB data processing
- Advanced CAD and meshing functions
- Point-and-click drawing and editing
- Frequency domain analysis from DC up to several GHz
- Time domain analysis with powerful FFT functions
- Comfortable pulse construction and pulse shape influence analysis features
- Arbitrary complex linear circuits in MoM analysis
- Dielectric material support
- PO (Physical Optics) calculation core for very high frequencies
- Matrix-Partitioning for extremely fast and accurate optimization calculations
- 3D and 2D post processing tools to present comfortable models and results
- Parallel solvers for Linux and Windows
- ReMesh link
- MATLAB® link
- SMASH® link