What is New in EMC Studio v.6.0

compared to version 5.1

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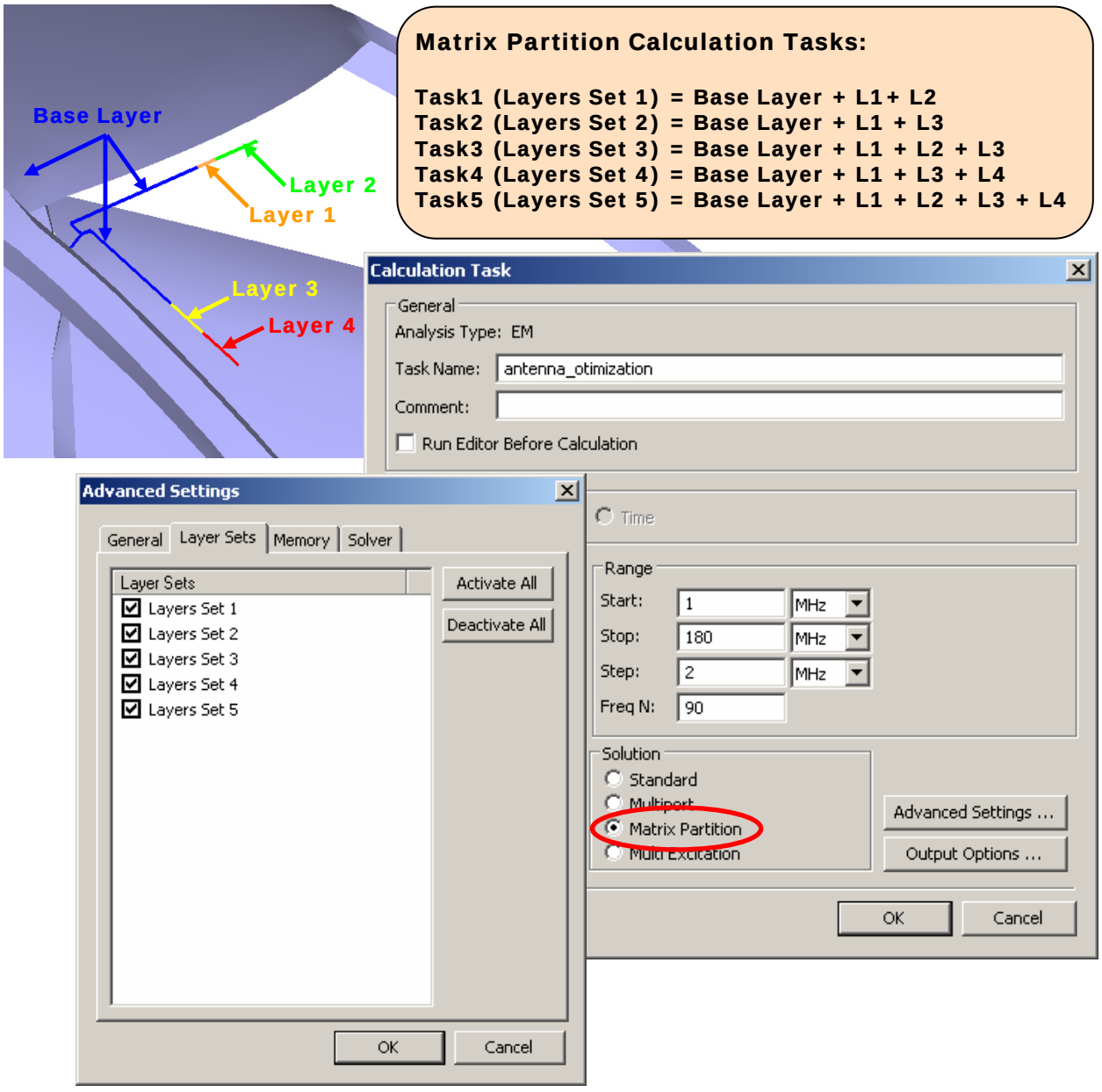
Contents

1 New Features v6.0

1.1 New Features and Improvements in Matrix Partition Solution

EMC Studio v6.0 provides improved **Matrix Partitioning** calculation scheme. This includes:

- *Improvement of calculation scheme: less HD space required, easier parallel cluster calculations*
- *Optimized task processing: one input file definition for set of problems, one execution of computational solver*
- *Improvements in Layers organization for geometry objects*
- *Layer Sets for convenient definition of calculation task and separate view of each model variation*



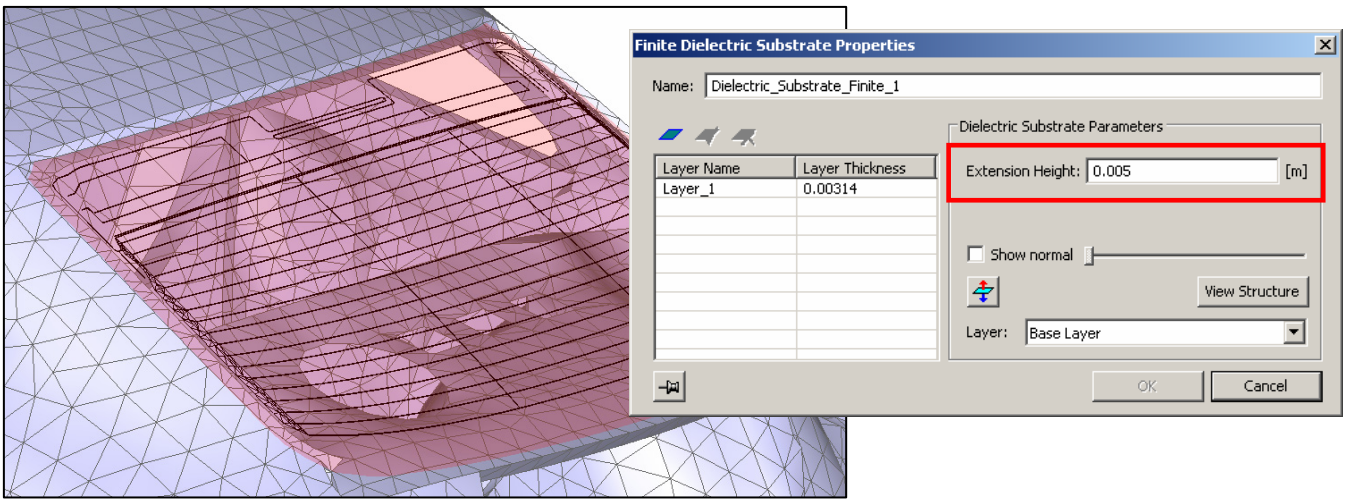
1.1.1 Detection of Geometry Elements Related to Dielectric Substrate

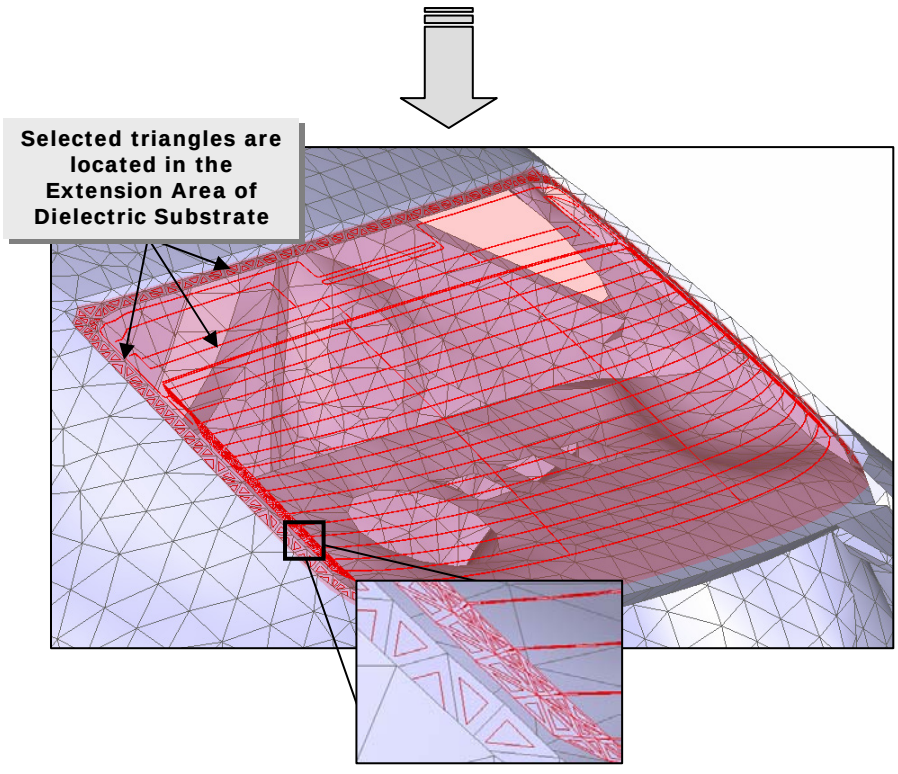
For correct simulations of glass antenna optimization problems using **Matrix Partitioning** scheme all metallic elements affected by dielectric substrate must be placed to the same *Base Layer* or *Additional Layers Set* as dielectric. New geometry selection tool provides fast and convenient access to triangles and wire segments related to particular dielectric substrate.

In order to select wires or triangles near selected dielectric substrate(s):

1. Select dielectric substrate(s) to select corresponding geometry elements (wires or triangles)
2. Click **Select**  button on **Mesh Editor** toolbar and in button popup menu select **Triangles > Near Selected Dielectric Substrates** or **Wires > Near Selected Dielectric Substrates** item

All wires and triangles related to the selected dielectric substrate(s) will be selected:

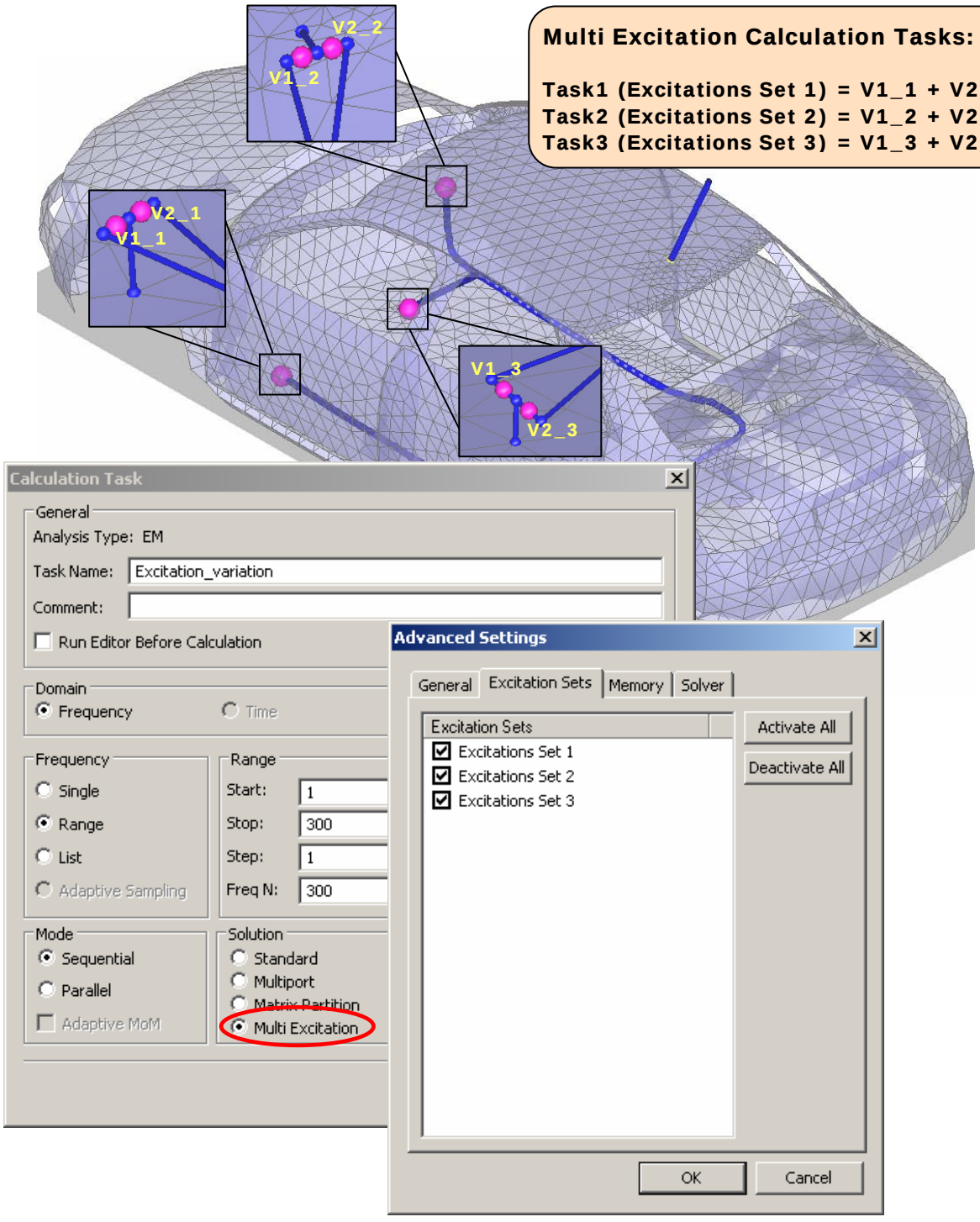




1.2 New Features and Improvements in Multi Excitation Solution

EMC Studio v6.0 provides improved **Multi Excitation** calculation scheme. This includes:

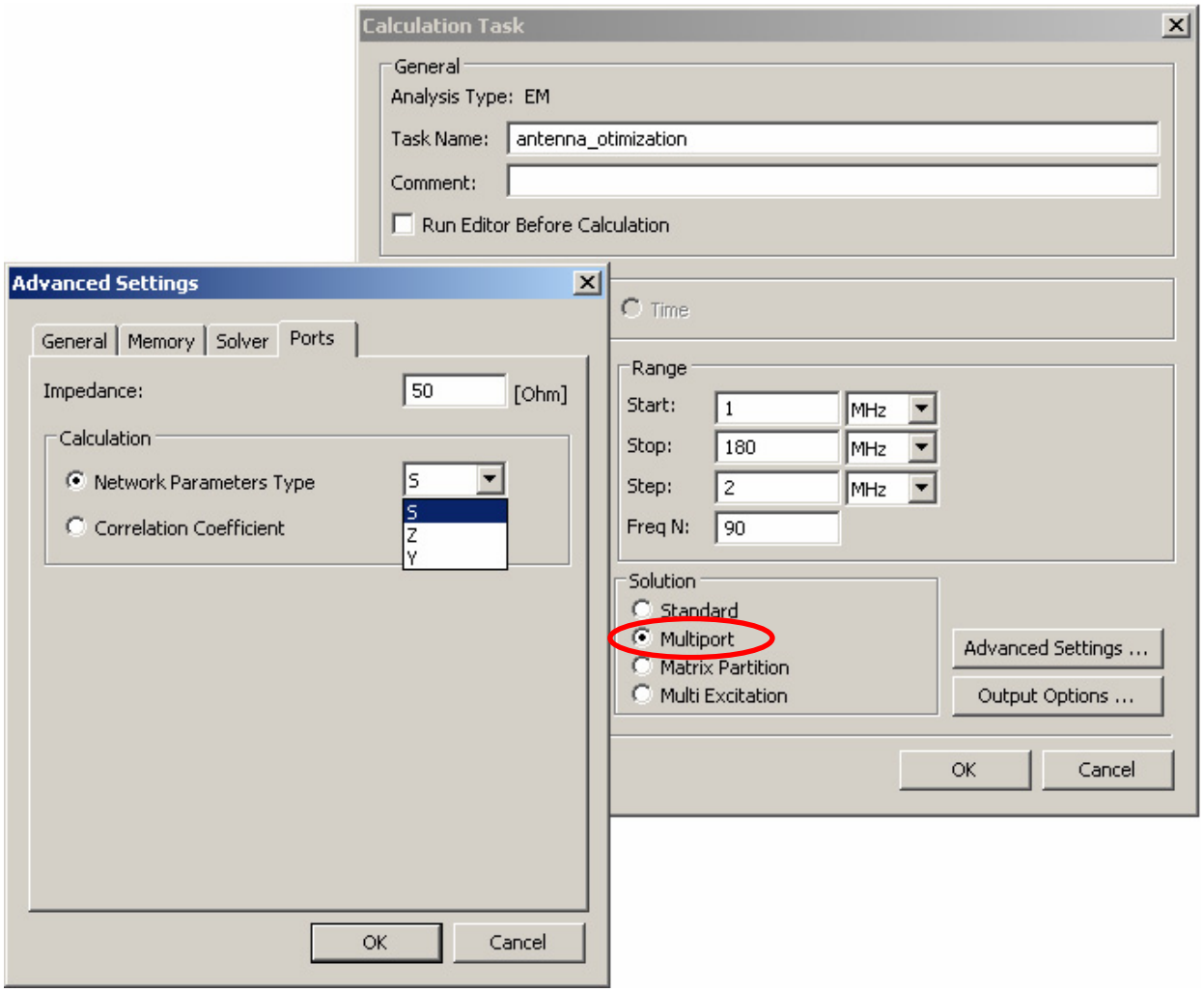
- *Improvement of calculation scheme: less HD space required, easier parallel cluster calculations*
- *Optimized task processing: one input file definition for set of problems, one execution of computational solver*
- *Excitation Sets allows to group several excitation sources for convenient definition of calculation task*



1.3 New Ideology of S, Y, Z Solution – Multiport Solution

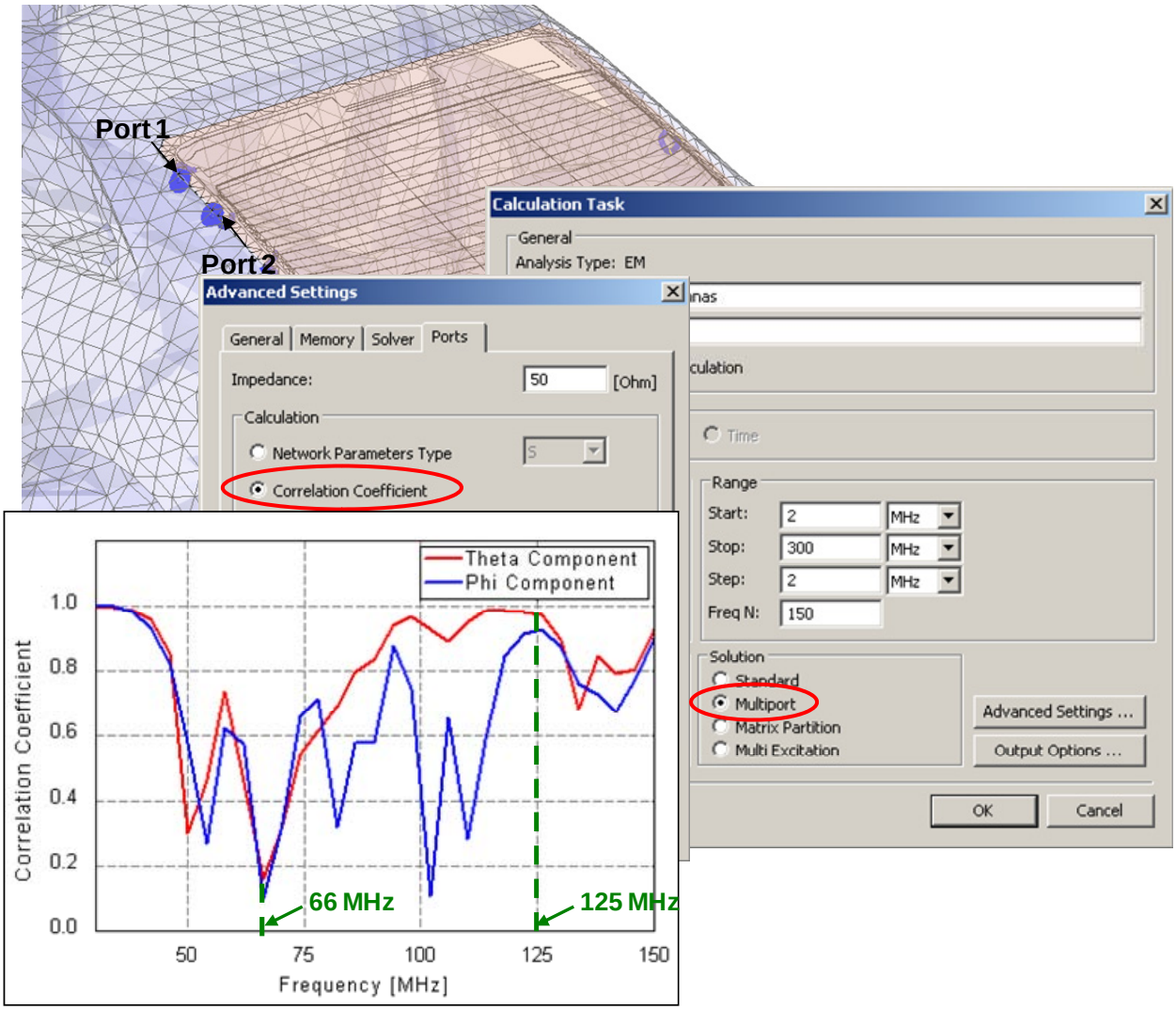
EMC Studio v6.0 provides new ideology of **Multiport** solution. This includes:

- *Easier calculation approach for analysis of multiport systems*
- *User-defined reference impedance*
- *User-defined type of output network parameters (S, Z or Y)*
- *New Port objects are introduced in TriD solver*
- *Antenna diversity analysis by means of Correlation Coefficient*
- *New 2D Post Processing Tool for Correlation Coefficient observation*

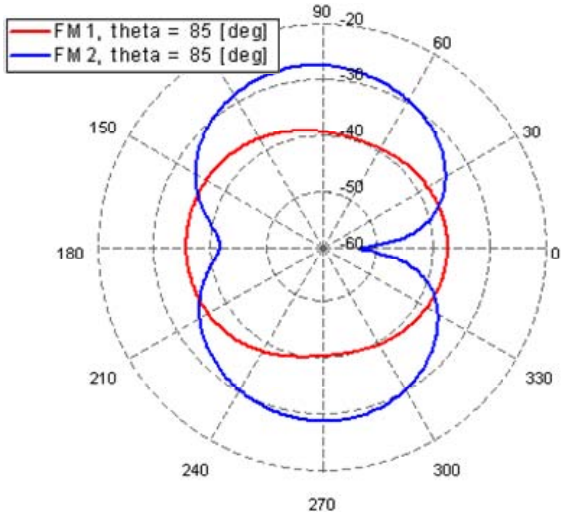


1.3.1 Antenna Diversity Analysis by means of Correlation Coefficient

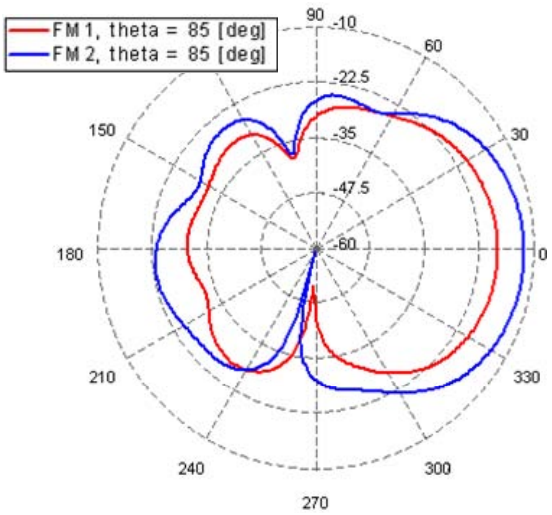
EMC Studio v6.0 provides new method for antenna diversity analysis by means of **Correlation Coefficient**:



Total Electric Field (Theta, Magn) [dBV] vs. Phi [deg]



Frequency 66 MHz



Frequency 125 MHz

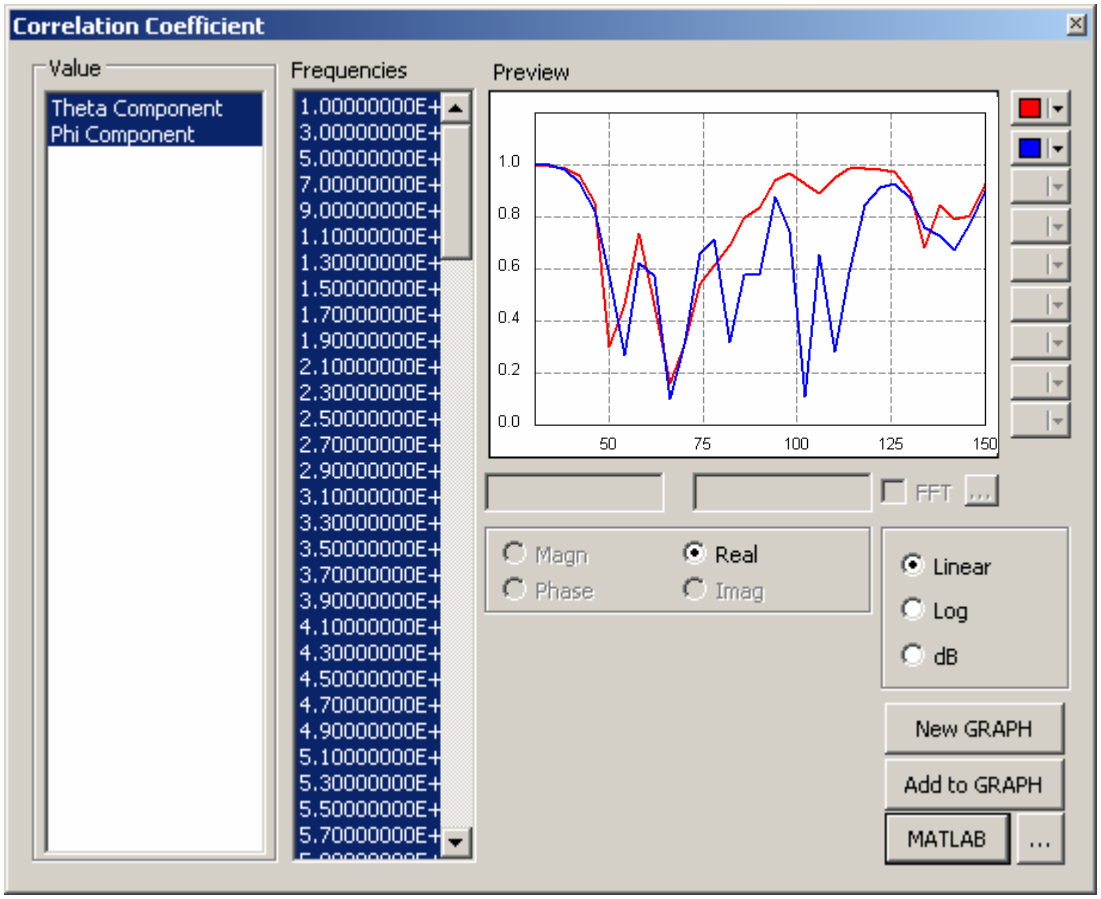
For convenient antenna Correlation Coefficient observation new 2D Post Processing Tool are available.

1.3.2 New 2D Post Processing Tool for Correlation Coefficient Observation

EMC Studio v6.0 provides new 2D post processing tool for antenna correlation coefficient observation and analysis.

To activate **Correlation Coefficient** dialog:

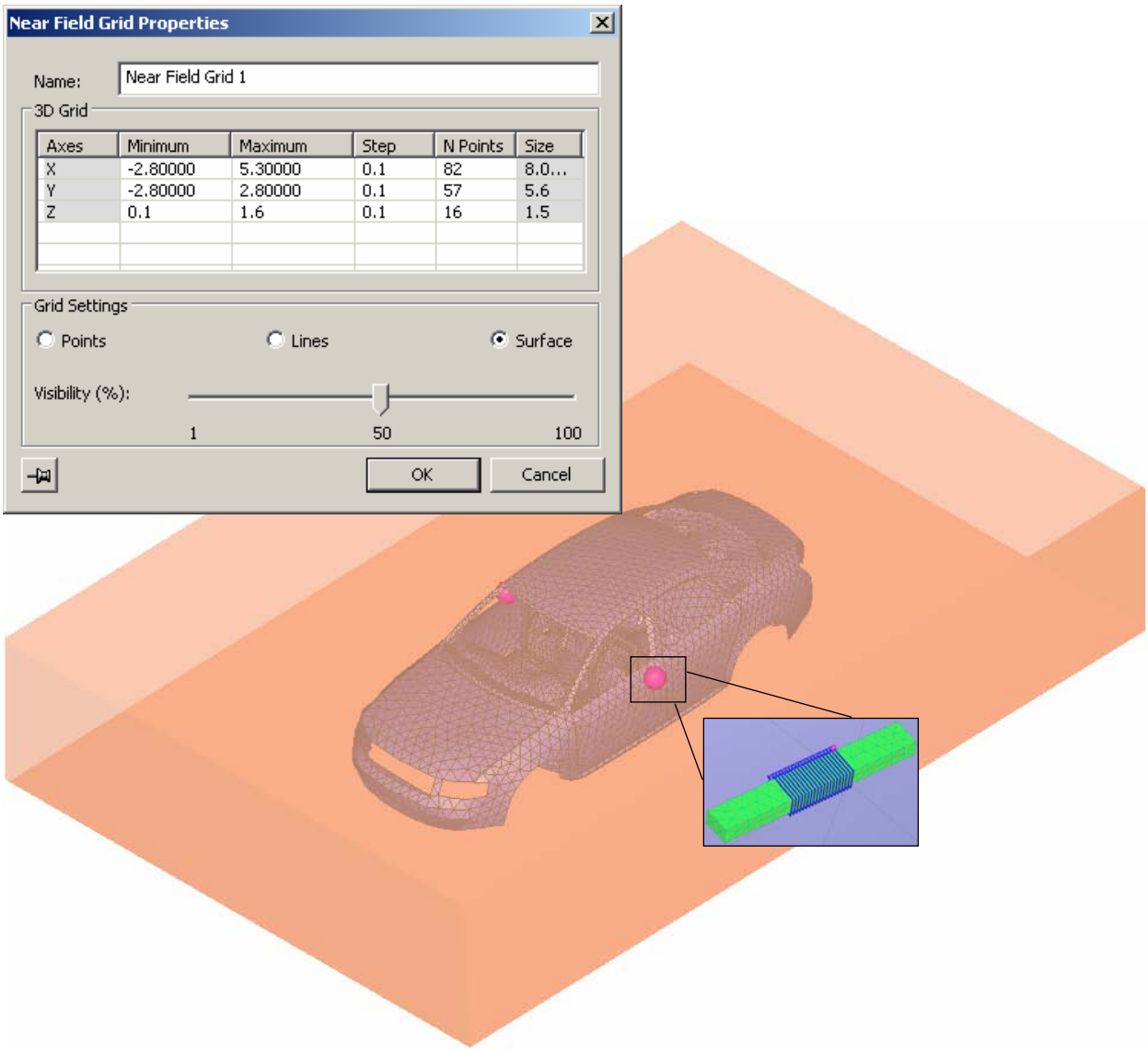
- Click **Correlation Coefficient** button on **Post Processing** bar
- Select **Results>Correlation Coefficient** from **Main Menu**



1.4 Special Solution for Smart Entry Antenna System

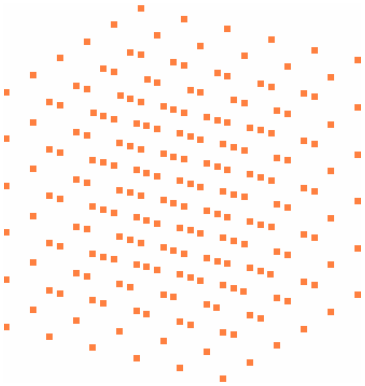
1.4.1 Near Field Calculation in Volume – Near Field Grid

EMC Studio v6.0 provides new observation quantity, **Near Field Grid** required for near field calculation and observation in volume. In this case field values are calculated in vertices of the defined near field grid.

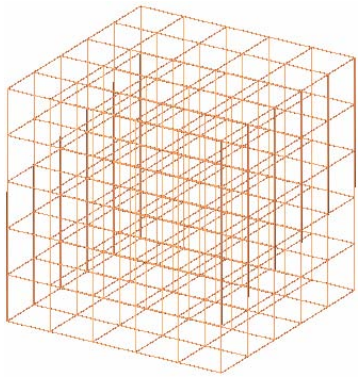


To define near field grid observation region:

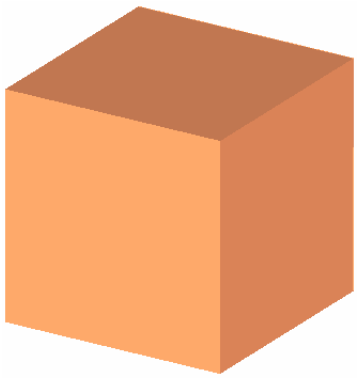
1. Click **Near Field Grid** button on **Elements Panel**
2. In **Create Near Field Grid** dialog specify near field grid name (or use default)
3. Define *Minimum*, *Maximum* and *Step* values for each axis (*N Points* and *Size* values are recalculated automatically)
4. Define grid visualization settings in **Grid Settings** group. Three visualization modes are available (*points*, *lines* and *surface*)



Points View



Lines View



Surface View

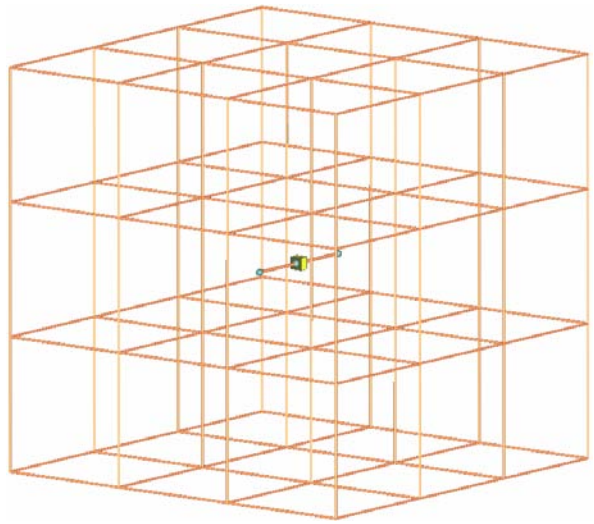
5. Define points or lines visualization density by moving **Density** slider. For surface view move slider to set required transparency level
6. Click **Create** button

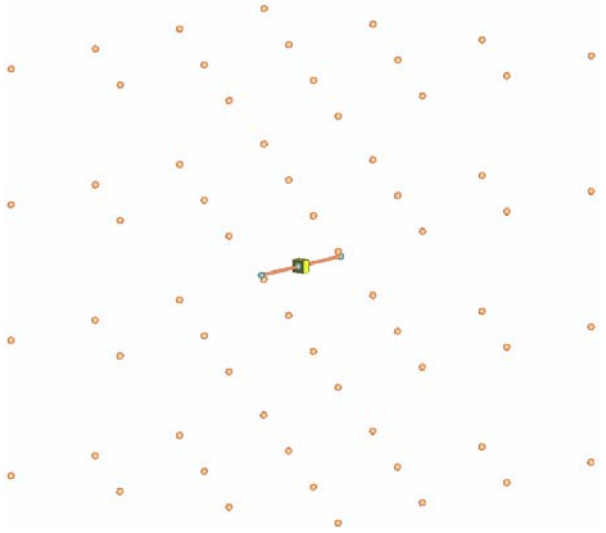
Convert Near Field Grid to Field Probes:

To convert near field grid to field probes:

1. Select near field grid in **Viewer 3D** or **Tree View**
2. Activate near field grid popup menu with right mouse click and select **Convert to Field Probes** item

Near field grid will be converted to field probes located in the grid vertices:





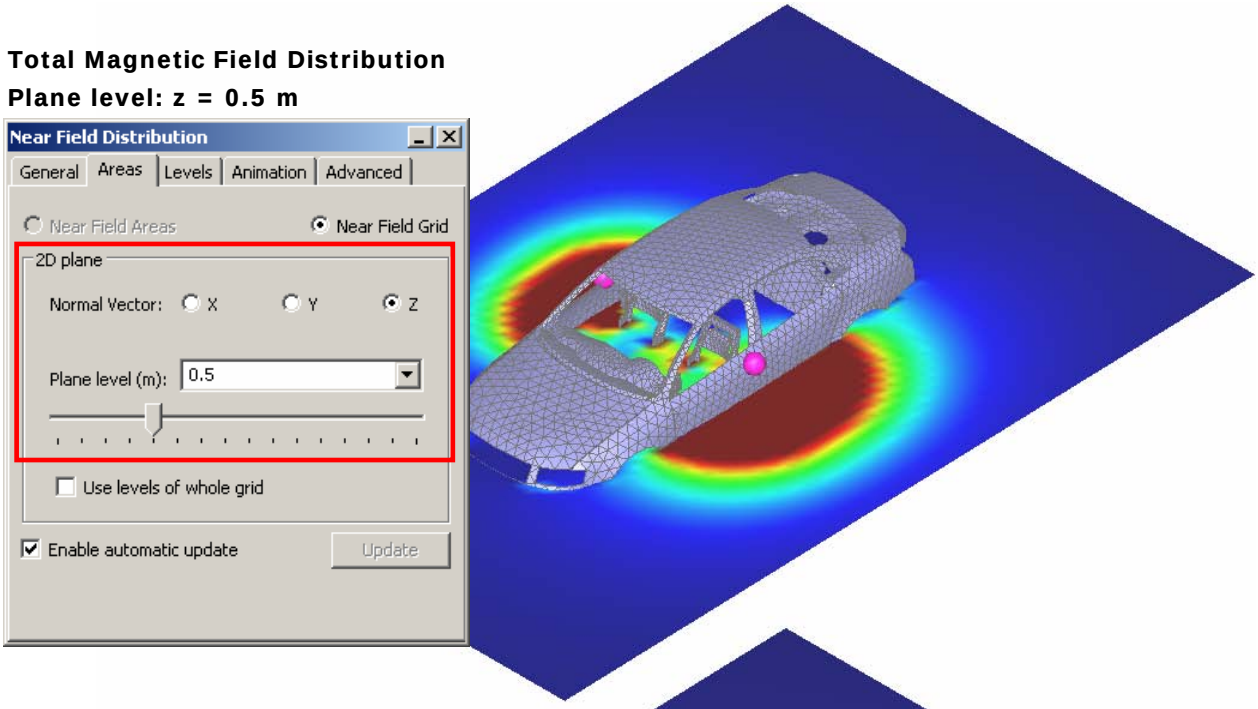
1.4.2 Near Field Distribution in Near Field Grid

In order to allow observation of near fields in near field grid **EMC Studio v6.0** provides updated **Near Field** 3D post processing tool. To view near field distribution in 3D grid:

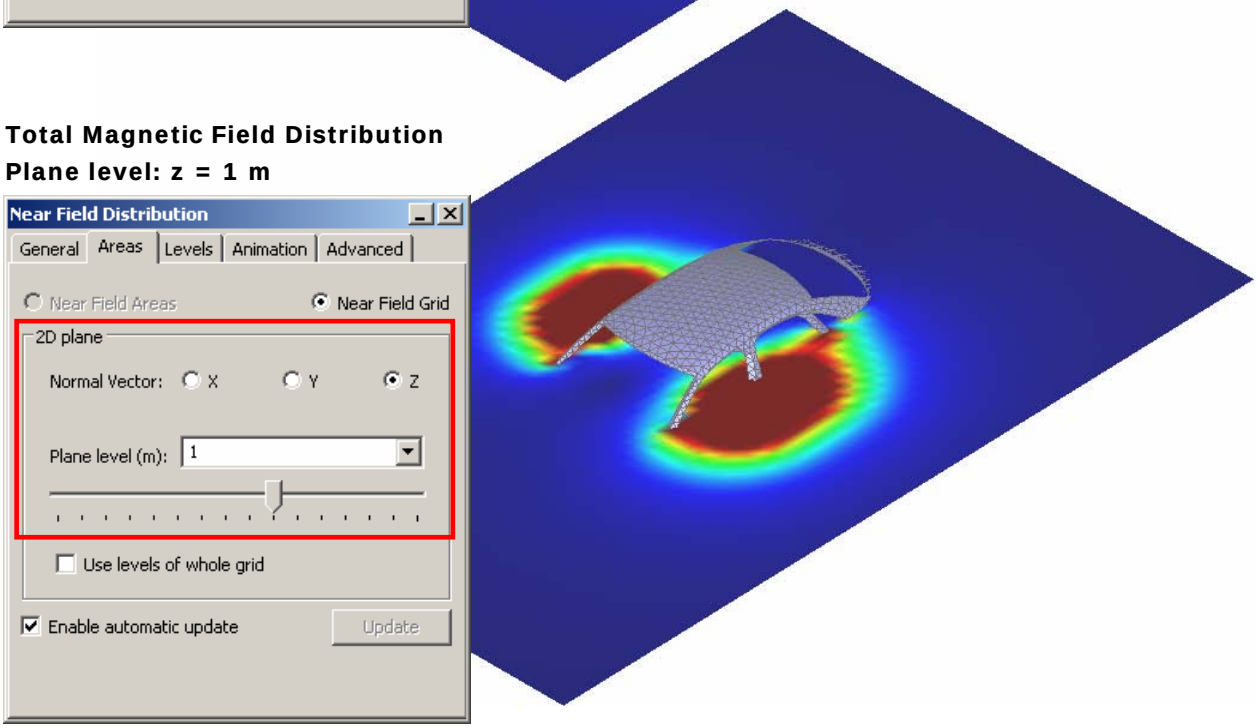
1. Activate **Near Field Distribution** dialog
2. On **General** tab specify general observation parameters
3. Switch to **Areas** tab and choose **Near Field Grid** radio button
4. In **2D Plane** group define normal vector (**X**, **Y** or **Z**) and plane level from **Plane Level** combo box or by moving corresponding slider

   If **Use levels of whole grid** is selected then field values for chosen plane level are recalculated related to min. and max. values of whole grid.

Total Magnetic Field Distribution
Plane level: z = 0.5 m



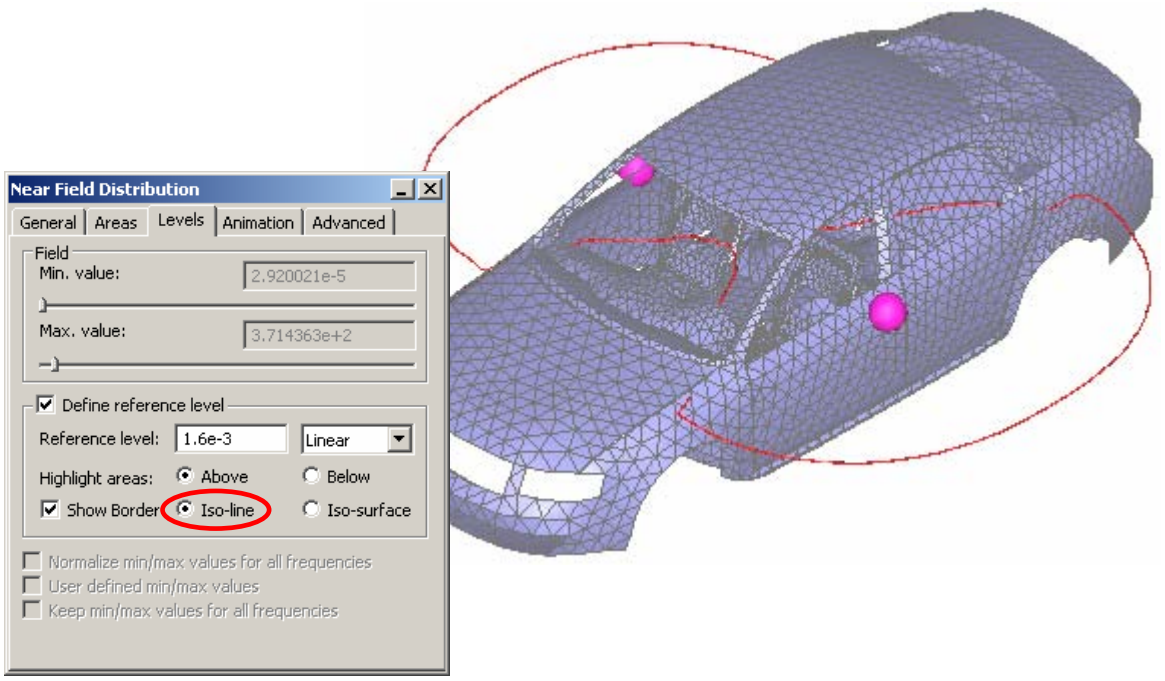
Total Magnetic Field Distribution
Plane level: z = 1 m



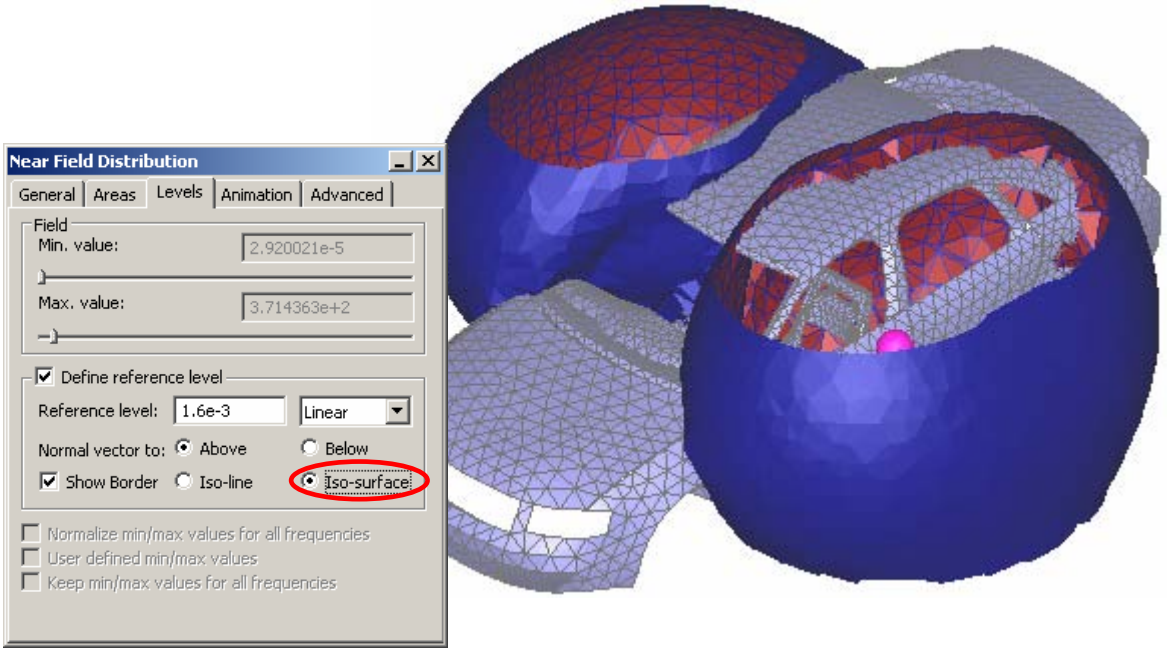
If **Enable automatic update** check box is switched on then near field visualization in **Viewer 3D** will be dynamically updated.

1.4.3 Field Reference Level – Iso-line and Iso-surface Definition

EMC Studio v6.0 provides new field reference levels visualization options for convenient analysis of smart entry antenna systems – **Iso-line** and **Iso-surface** modes.



Total Magnetic Field Reference Level – Iso-line View



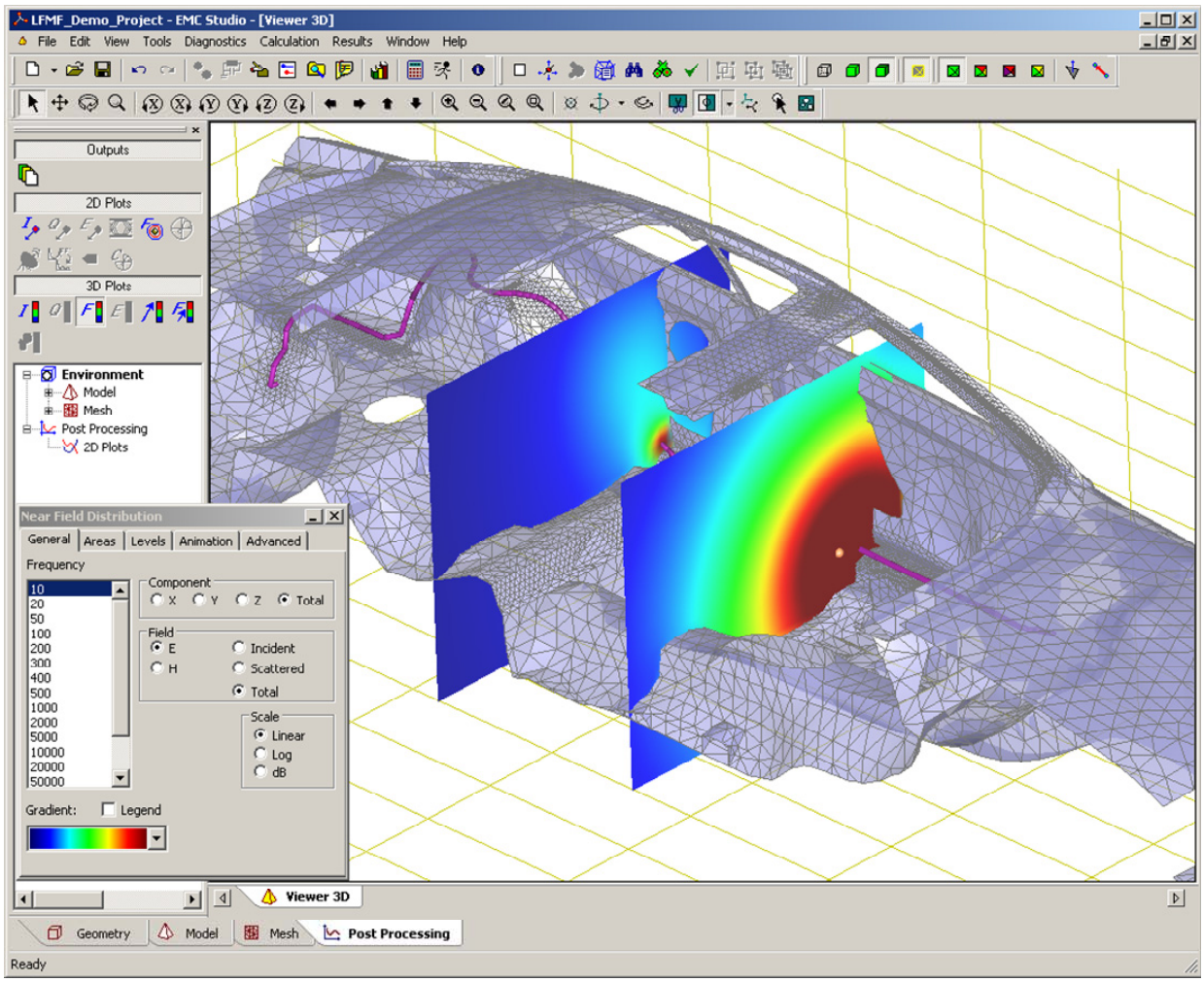
Total Magnetic Field Reference Level – Iso-surface View

Note: Iso-surface option is available only for fields calculated in near field grid.

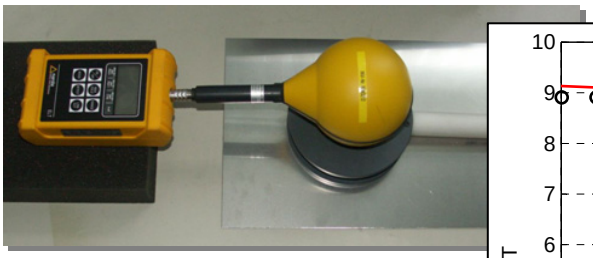
1.5 LF Magnetic Field Analysis Type for Low Frequency Problems

New **LF Magnetic Field Analysis Type** in **EMC Studio v6.0** provides environment for modeling of low frequency magnetic field interaction with thin 3D sheets characterized by combined resistive and magnetic properties.

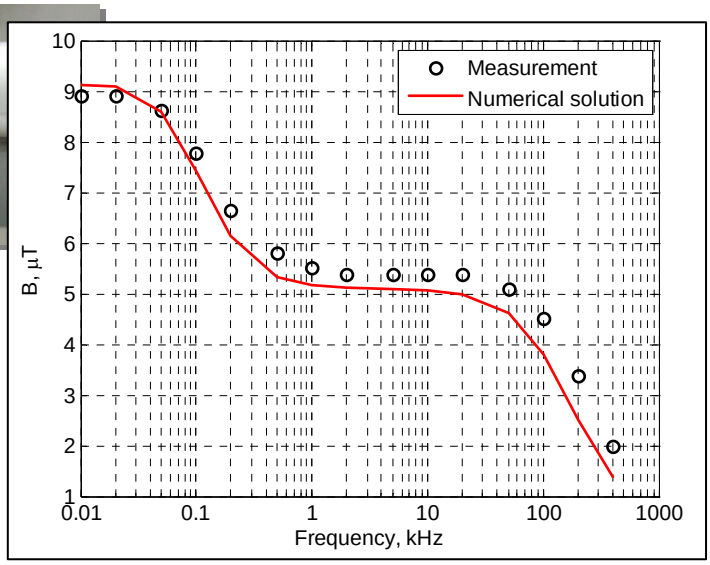
Automotive and industrial magnetic shielding problems can be effectively solved in frequency range from DC up to several MHz.



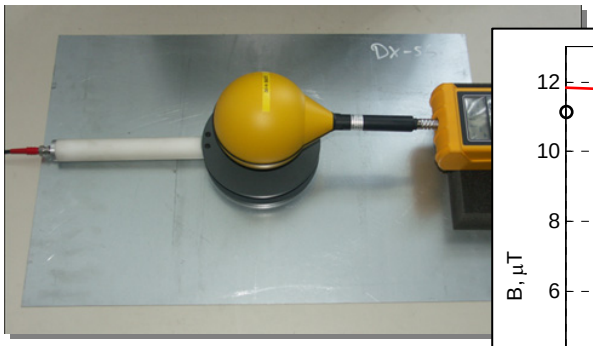
Magnetic Field above the Aluminium Plate:



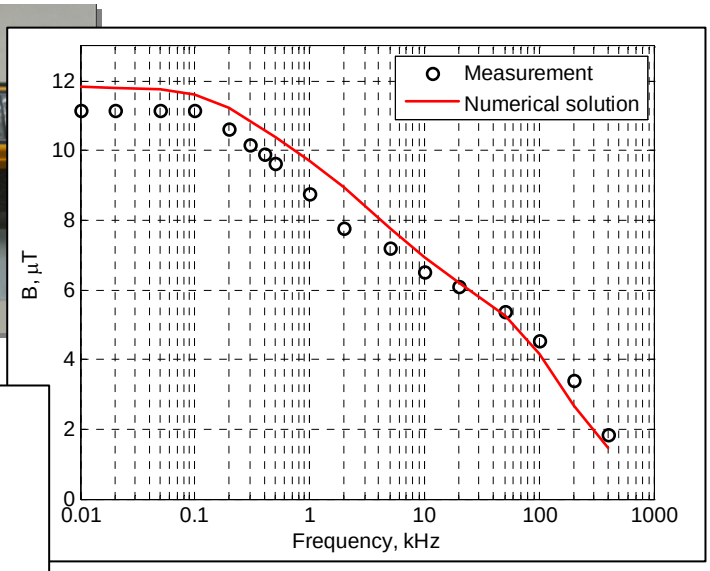
Measurement Setup: Aluminium Shield

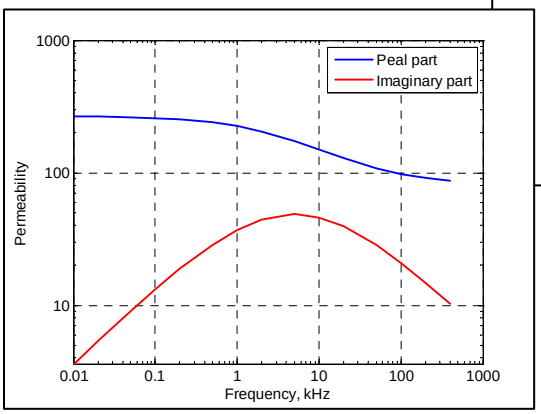


Magnetic Field above the Steel Plate:



Measurement Setup: Steel Shield

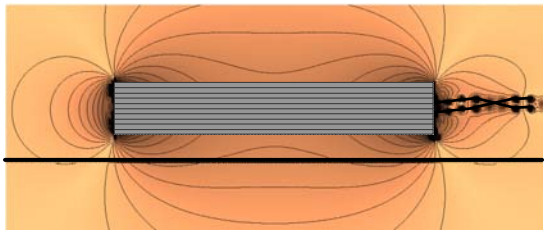




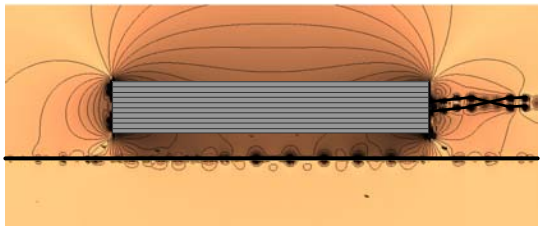
Measurements are performed in AUDI AG, Germany

Magnetic Field Distribution

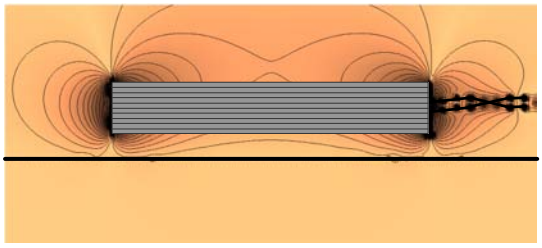
Aluminum plate; *f* = 10 Hz



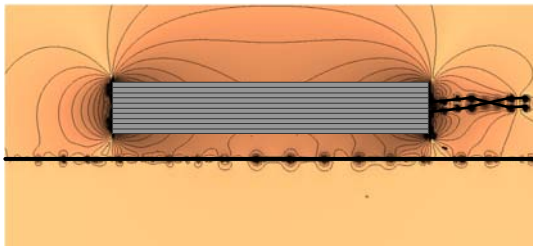
Steel plate; *f* = 10 Hz



Aluminum plate; *f* = 5 kHz



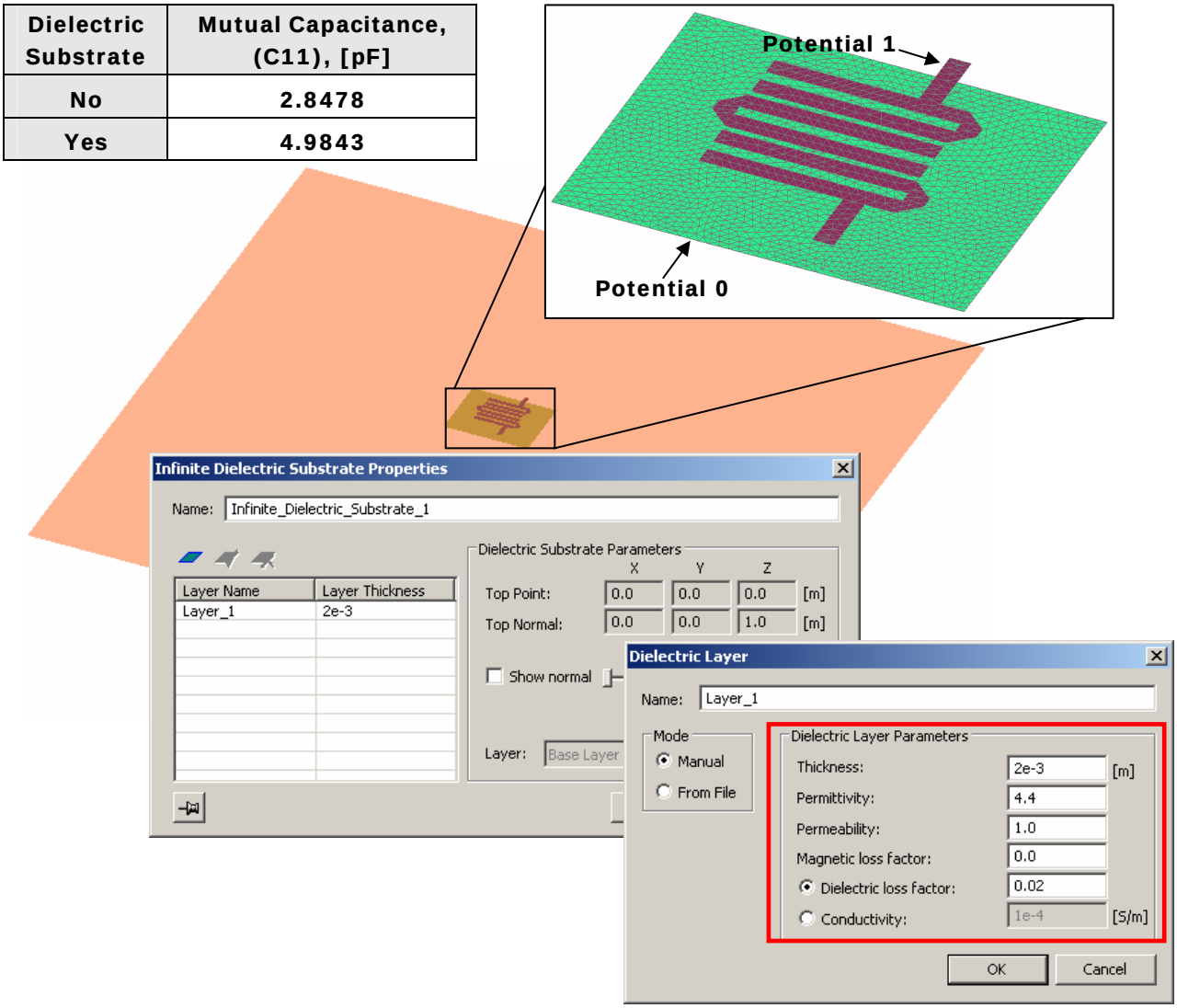
Steel plate; *f* = 5 kHz



1.6 Dielectric Substrates Support in LF Electric Field Analysis Type

Infinite dielectric substrate is supported for **LF Electric Field Analysis Type** calculations:

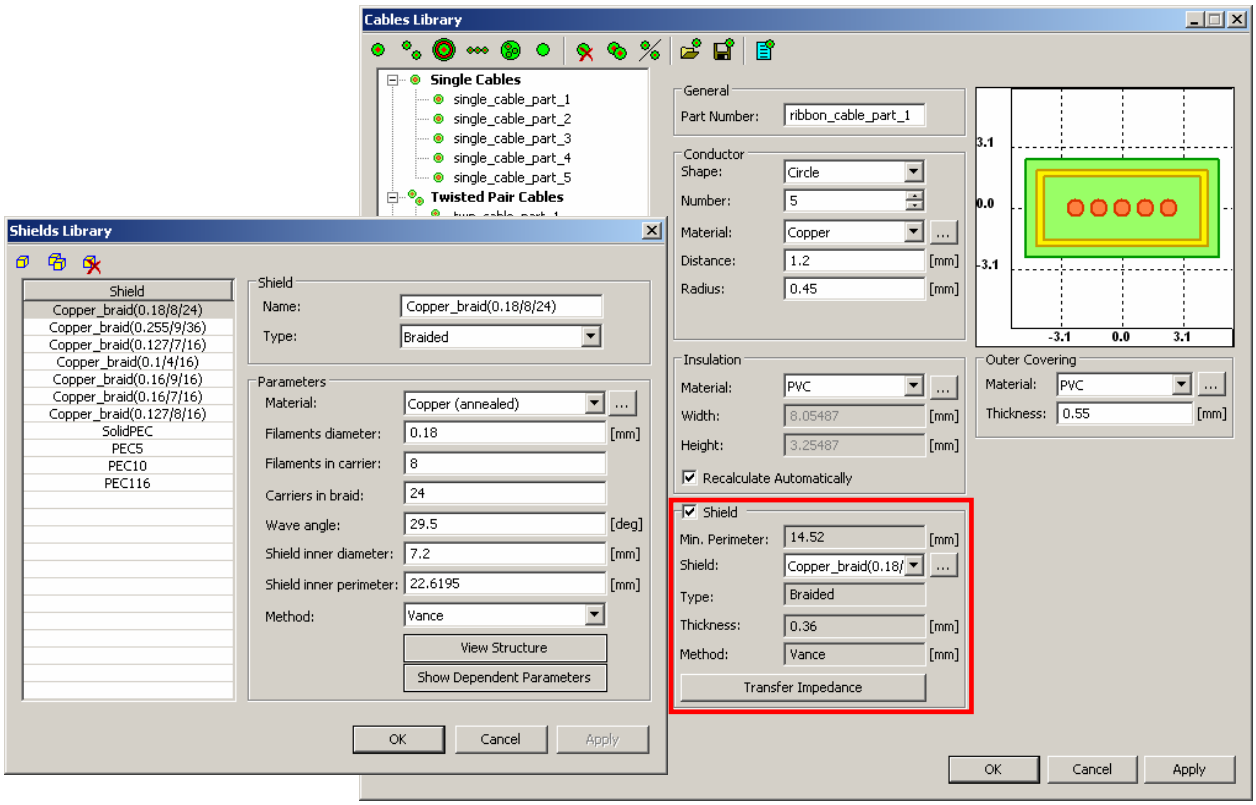
Dielectric Substrate	Mutual Capacitance, (C11), [pF]
No	2.8478
Yes	4.9843



1.7 Extension of Shield Shapes

1.7.1 Shielded Ribbon Cables Support

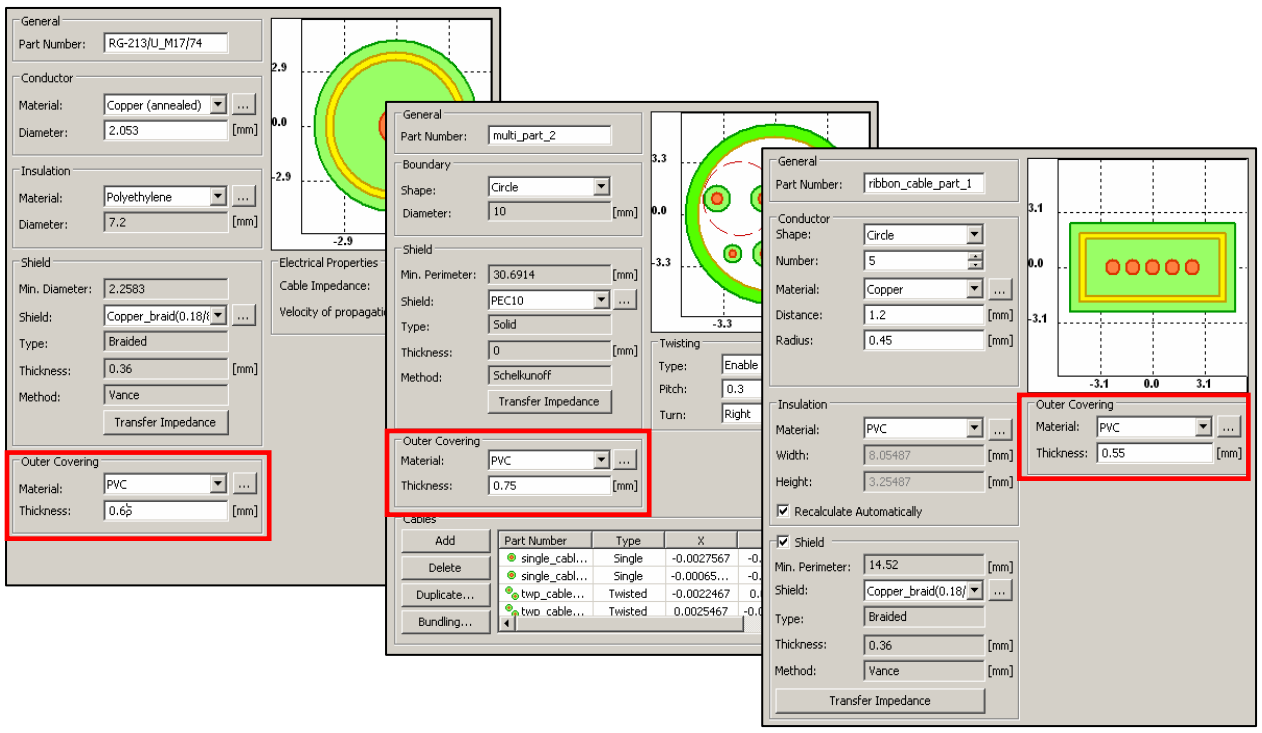
EMC Studio v6.0 supports shielded ribbon cables in **Hybrid Analysis Types**:



In order to define shield parameters for ribbon cables switch on **Shield** check box in **Parameters Panel**.

1.7.2 Outer Covering Support for Coaxial, Ribbon and Multi Cables

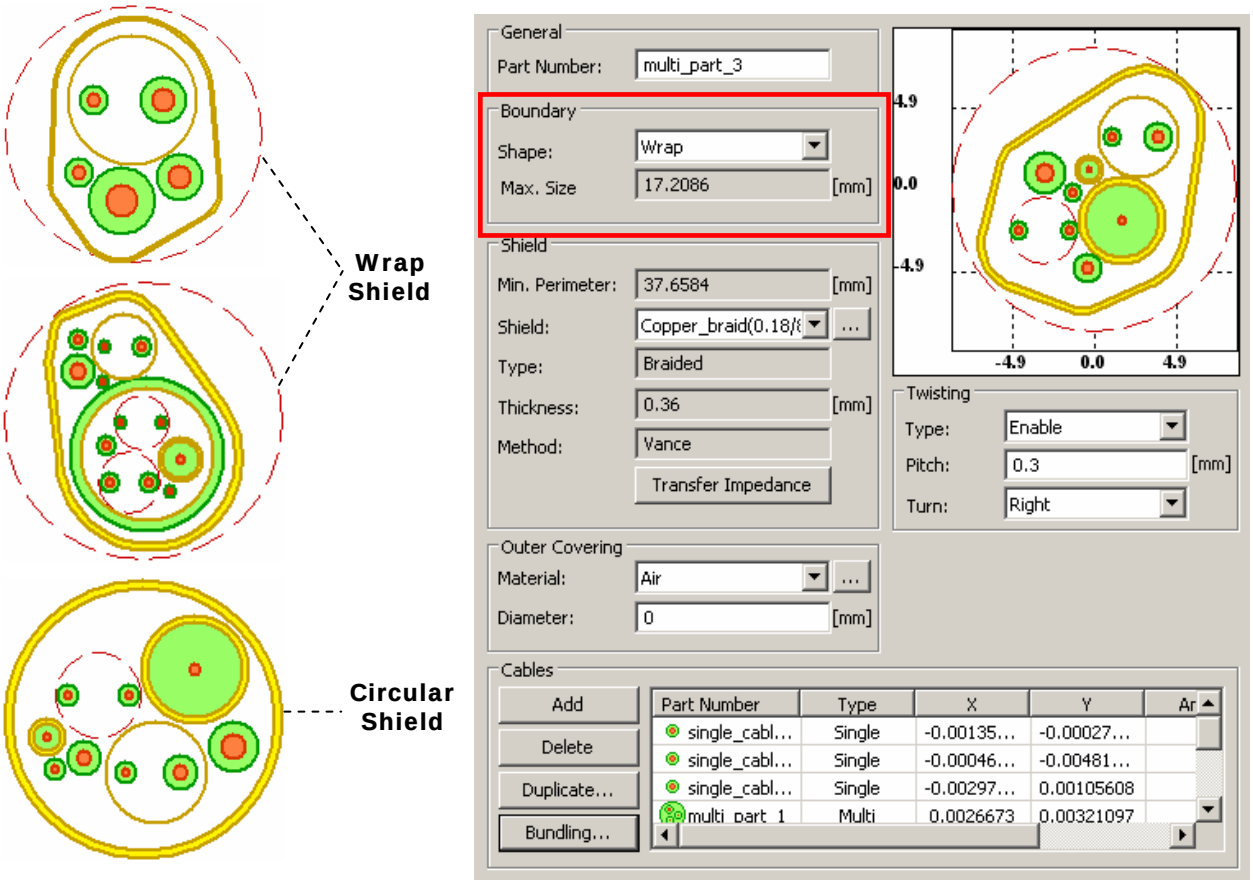
EMC Studio v6.0 provides definition of outer covering for coaxial, ribbon and multi cables:



Outer covering parameters (*Material* and *Thickness*) are defined in **Outer Covering** group in **Parameters Panel** of **Cables Library** dialog.

1.7.3 Wrap Shaped Shields Support

EMC Studio v6.0 extends shield shapes and provides wrap shaped shields support for multi cables:

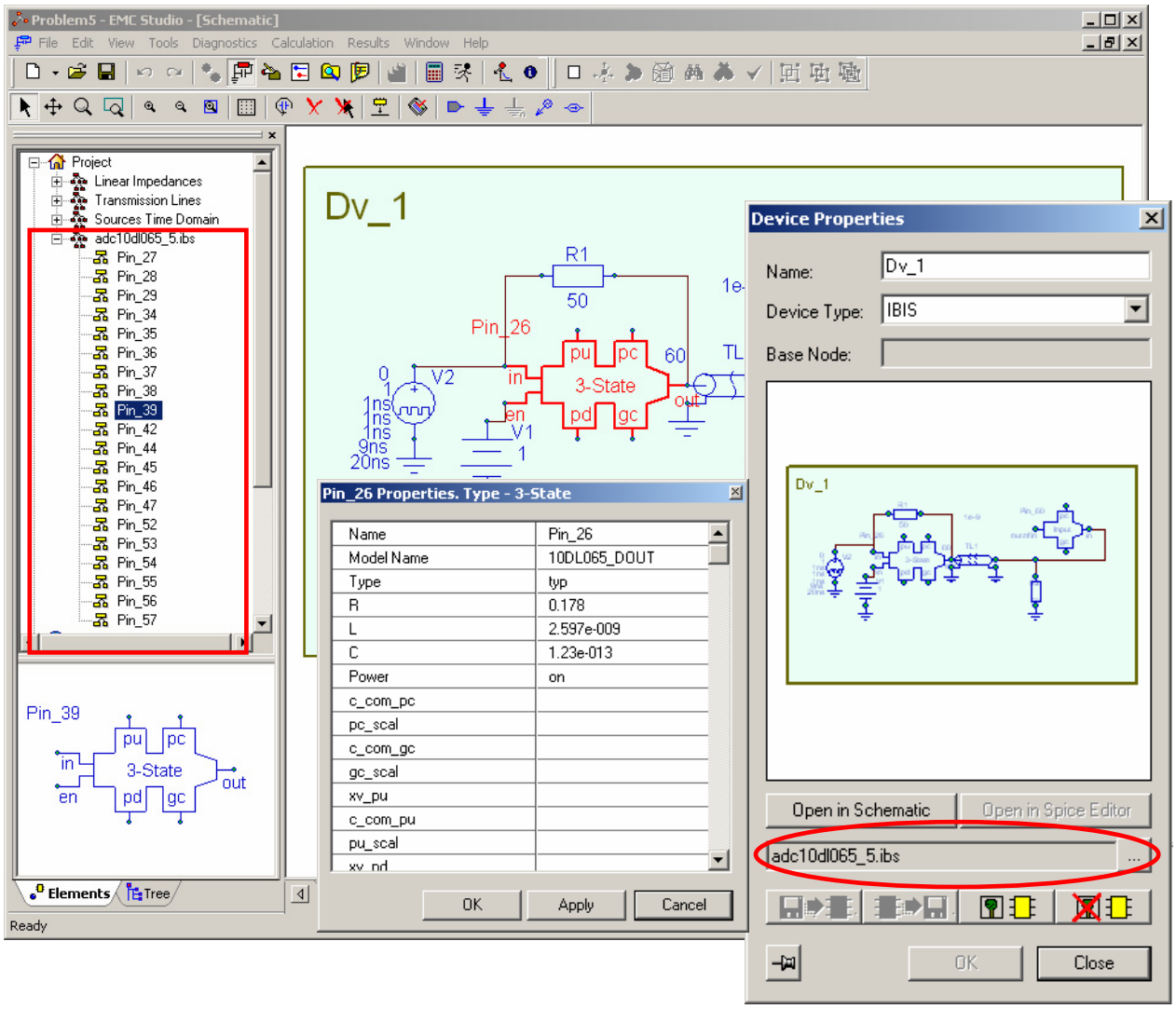


1.8 Extended Functionality in System Simulation and Schematic

1.8.1 IBIS Devices Support

IBIS is the **Input/Output Buffer Information Specification** from the **Electronics Industry Alliance**. IBIS is a behavioral model that describes the electrical characteristics of the digital inputs and outputs of a ECU through V/I and V/T data without providing the actual circuit information. An IBIS model consists of tabular data made up of current and voltage values in the output and input pins, as well as the voltage and time relationship at the output pins under rising or falling switching conditions. This tabulated data represents the behavior of the ECU.

In order to introduce ECU behavioral characteristics to system simulation model **EMC Studio v6.0** provides new type of device – **IBIS Device**.



To define device data from IBIS file:

1. Activate **Device Properties** dialog
2. Choose **IBIS** device type from **Device Type** combo box
3. In **Device Properties** dialog click **Load Device from file** ... button and select required *.ibs file from standard **Open** dialog and click **OK**

Note: Devices defined from IBIS data file are visualized in light cyan color in **System Diagram** window.

After IBIS device creation all pins loaded from IBIS file are imported into **Schematic** environment as elements for circuit model construction. In **Schematic Elements Tree** all IBIS pins are located under the elements group having the same name as loaded IBIS file.

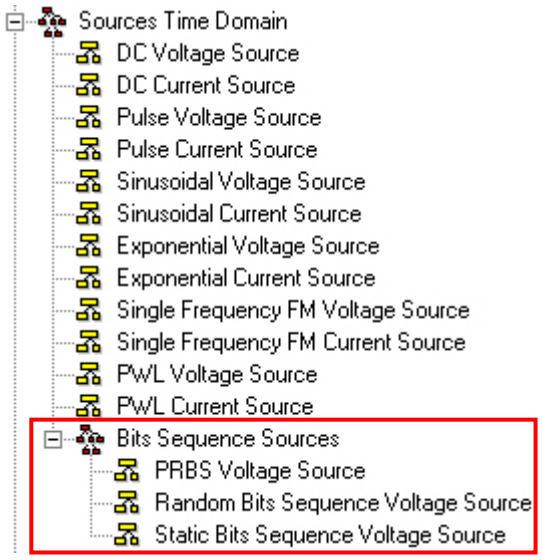
Pin parameters loaded from IBIS file can be viewed and edited from **Elements Properties** dialog. For this purpose select pin in **Schematic** window, activate elements popup menu with right mouse click and select **Elements Properties** item.

Note: HSpice model is used for IBIS devices.

1.8.2 Bits Sequence Sources Support

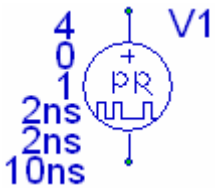
EMC Studio v6.0 supports special type of sources in **Schematic Elements Library**, intended for bit signal generation in time domain tasks **- Bits Sequence Sources**. This includes:

- *Pseudo Random Bits Sequence*
- *Random Bits Sequence*
- *Static Bits Sequence*



Note: In order to support **Bits Sequence Sources** in Spice calculations **EMC Studio** generates bit signal and converts the signal to PWL source.

PRBS Voltage Source:

Symbol	Parameters	Default Values
	Name	V1
	N (number of bits will be calculated by formula NBits = 2^N - 1)	4
	VLow (voltage at low state)	0
	VHigh (voltage at high state)	1
	Rise Time (time required for a signal to change from VLow value to VHigh value), [s]	2 ns
	Fall Delay (time required for a signal to change from VHigh value to VLow value), [s]	2 ns
	Bits Length (pulse width), [s]	10 ns

Spice Syntax:

```
V#name #node1 #node2 PRBS(#param1)
```

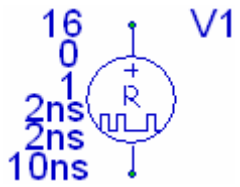
PSpice Syntax:

```
V#name #node1 #node2 PRBS(#param1)
```

HSpice Syntax:

```
V#name #node1 #node2 PRBS(#param1)
```

Random Bits Sequence Voltage Source:

Symbol	Parameters	Default Values
	Name	V1
	NBit (number of bits will be calculated by formula NBits = 2^N - 1)	16
	VLow (voltage at low state)	0
	VHigh (voltage at high state)	1
	Rise Time (time required for a signal to change from VLow value to VHigh value), [s]	2 ns
	Fall Delay (time required for a signal to change from VHigh value to VLow value), [s]	2 ns
	Bits Length (pulse width), [s]	10 ns

Spice Syntax:

```
V#name #node1 #node2 RBS(#param1)
```

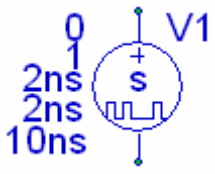
PSpice Syntax:

```
V#name #node1 #node2 RBS(#param1)
```

HSpice Syntax:

```
V#name #node1 #node2 RBS(#param1)
```

Static Bits Sequence Voltage Source:

Symbol	Parameters	Default Values
	Name	V1
	Bits Sequence (user defined sequence of bits)	101101110010
	VLow (voltage at low state)	0
	VHigh (voltage at high state)	1
	Rise Time (time required for a signal to change from VLow value to VHigh value), [s]	2 ns
	Fall Delay (time required for a signal to change from VHigh value to VLow value), [s]	2 ns
	Bits Length (pulse width), [s]	10 ns

Spice Syntax:

```
V#name #node1 #node2 SBS(#param1)
```

PSpice Syntax:

```
V#name #node1 #node2 SBS(#param1)
```

HSpice Syntax:

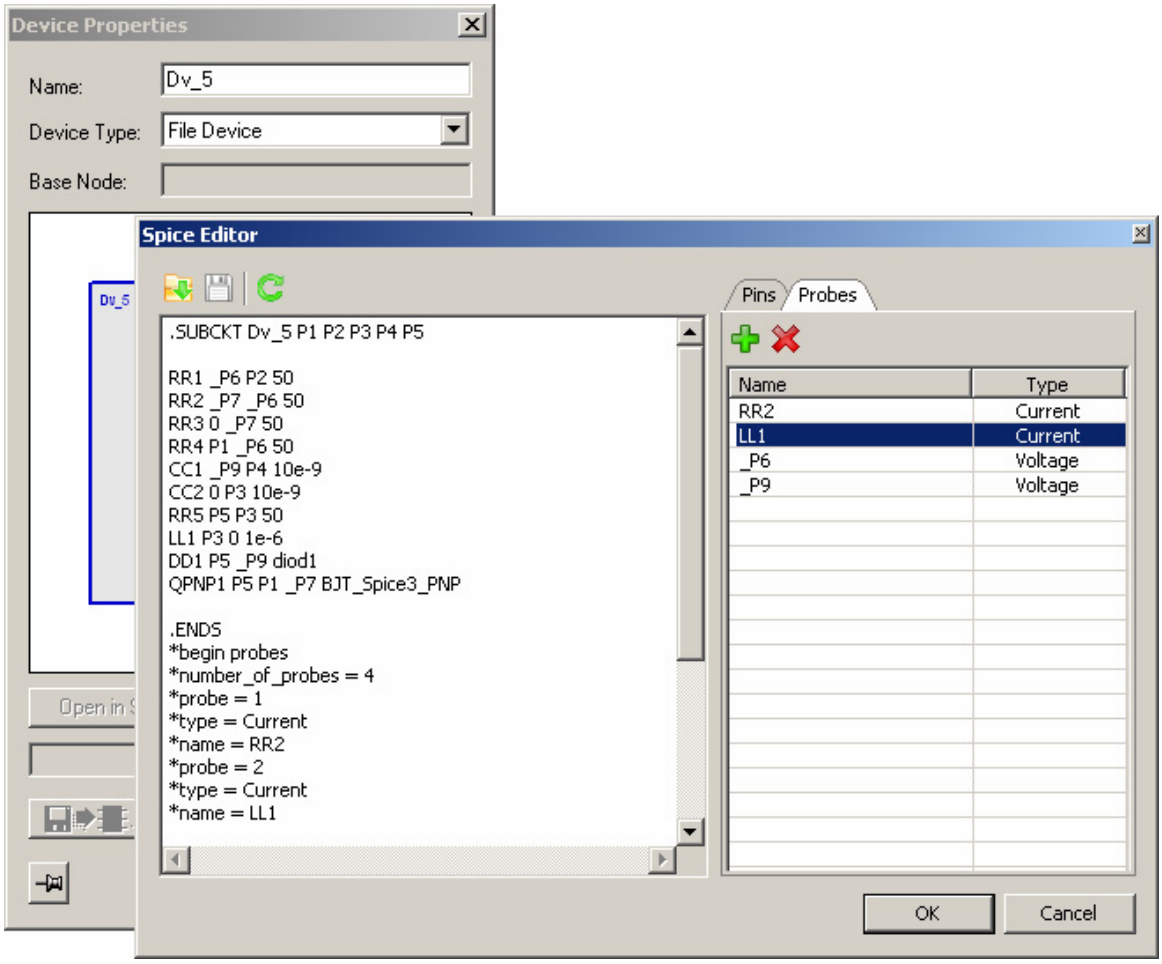
```
V#name #node1 #node2 SBS(#param1)
```

1.8.3 User - Defined Probes for Circuit File Devices

During calculation of devices defined from *.cir file only voltages on pins are printed to output file and results for inner circuit elements are omitted. **EMC Studio v6.0** provides possibility to get output results for particular elements of file devices. For this purpose user-defined probes can be added to spice syntax directly in **Spice Editor**.

To create user-defined probes for circuit elements of the file device:

1. In **Device Properties** dialog click **Open in Spice Editor** button
2. In **Spice Editor** switch to **Probes** tab
3. Click **Add Probe**  button to create new probe
4. New probe entry (with default type *"Voltage"*) will be added to **Probes Table**
5. Choose required probe type *"Voltage"* or *"Current"* from **Type** column



6. Double click on probe entry in **Name** column and define probe name. Probe name definition depends on chosen probe type:
   - *"Voltage"* - probe name should correspond to name of elements connection node defined in editor
   - *"Current"* - probe name should correspond to elements full name defined in editor
7. Click **OK**

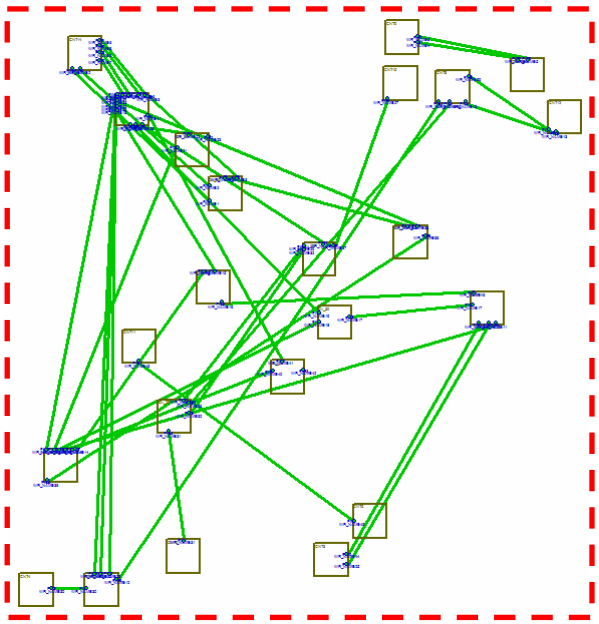
To remove existing probes, select them in **Probes Table** and click **Remove Probe**  button.

Defined probes will be appended to the loaded spice file as a comment with the following format:

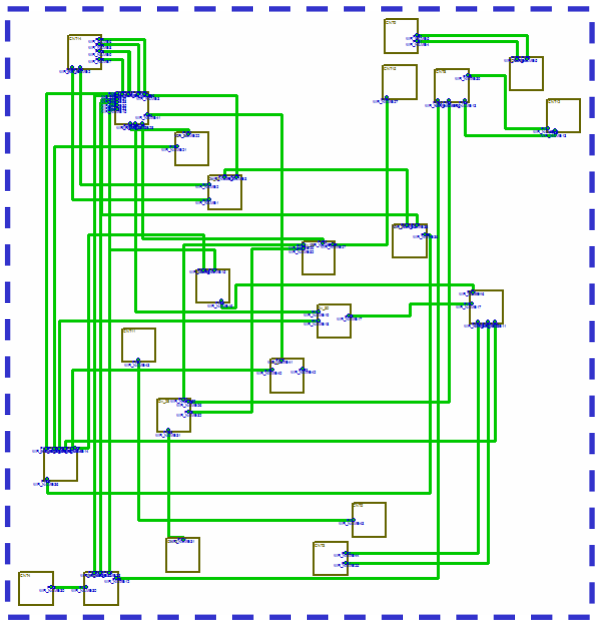
```
begin probes
number_of_probes = N (number of defined probes)
probe = m (probe index [from 1 to N])
type = Voltage or Current (type of probe)
name = Probe name
end probes
```

1.8.4 Improved Wires Routing in System Diagram

Improved **System Diagram** in **EMC Studio v6.0** provides smart rule for automatic routing of connector wires between devices:



Old Wire Routing Rule in System Diagram



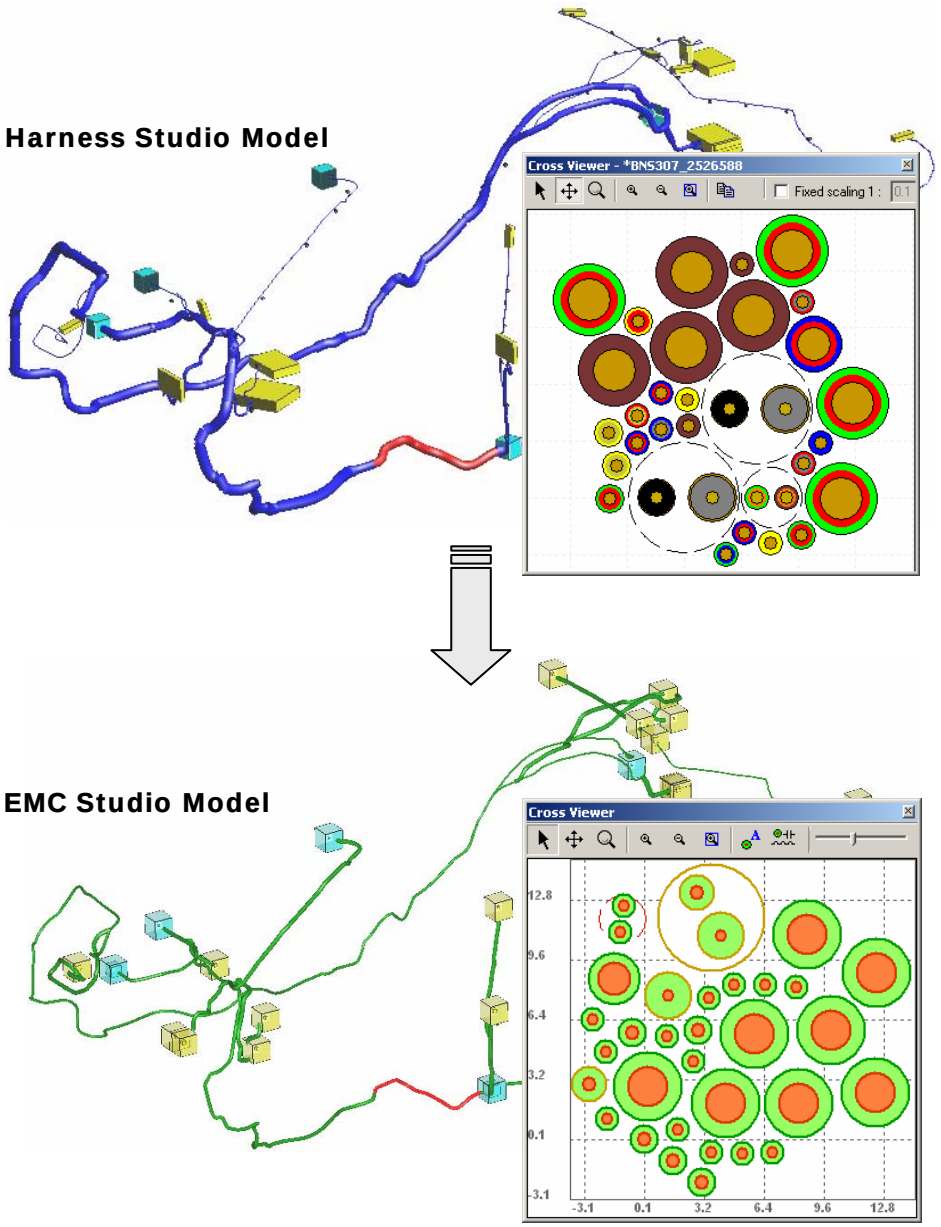
New Wire Routing Rule in System Diagram

1.9 ASC File Extension

ASC file format is extended with additional information in **EMCoS** software products (**EMC Studio**, **EMC Expert** and **Harness Studio Family**). This includes:

- *Cable Material Parameters (Insulation and Conductor Materials Parameters)*
- *Shield Parameters (Solid, Braided and Layered)*
- *Information about Cable Parts and Parameters (Single, TWP, Coaxial, Multi and Fiber)*
- *Devices and Splices Parameters*
- *Unit Definition for Exported and Imported ASC File*
- *Optimization of harness route definition and improved re-segmentation of imported harness*

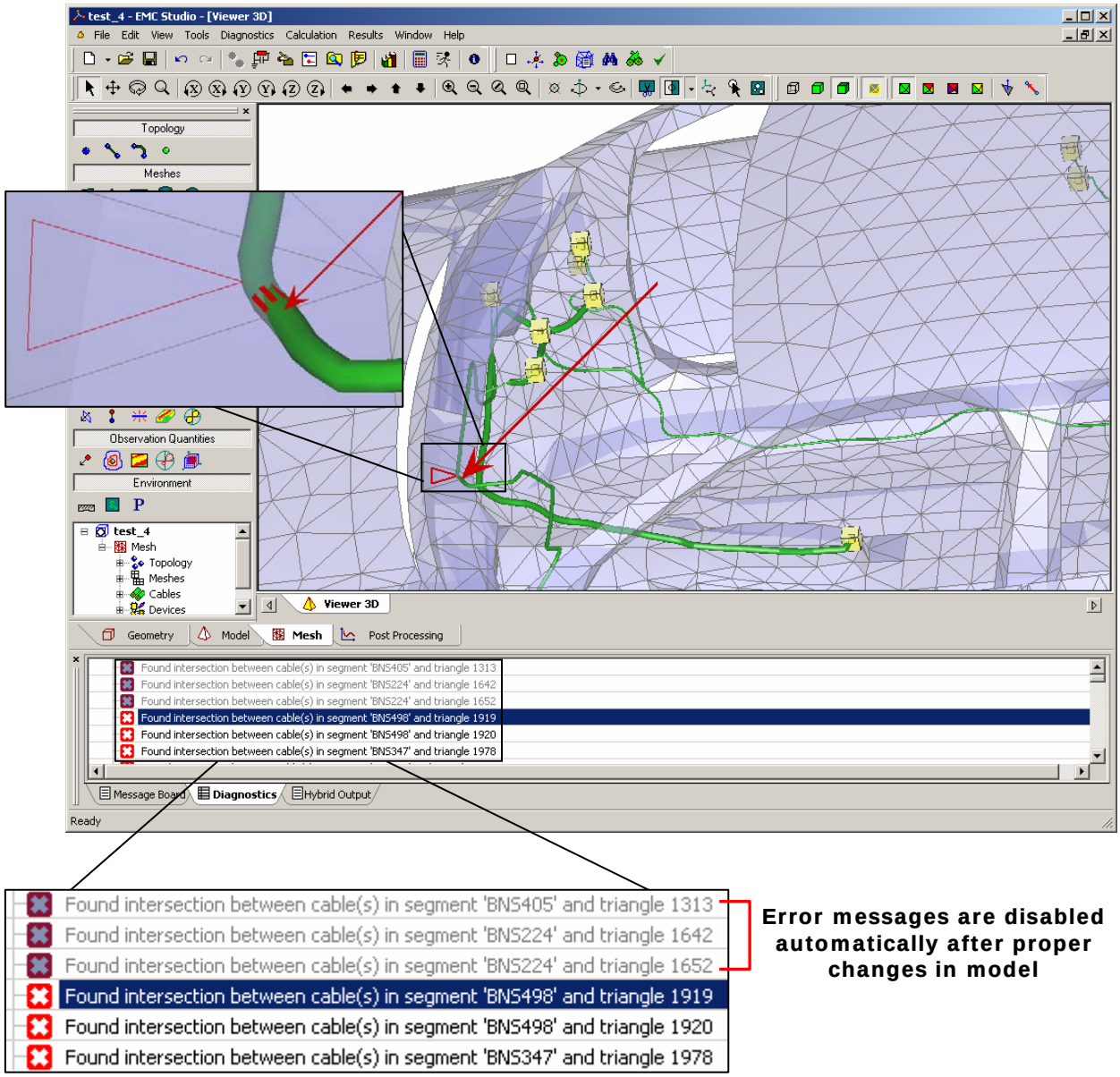
ASC file format extension provides better data exchange capabilities between **EMC Studio** and other **EMCoS** products:



1.10 Improved Intersection Detection between Cables and Triangles

Improved intersection detection between cables and triangles provides more convenient errors fixing procedure. Problematic cables and triangles are highlighted in **Viewer 3D** when corresponding errors are selected in **Diagnostic Board**. This provides fast and easy access to problematic regions.

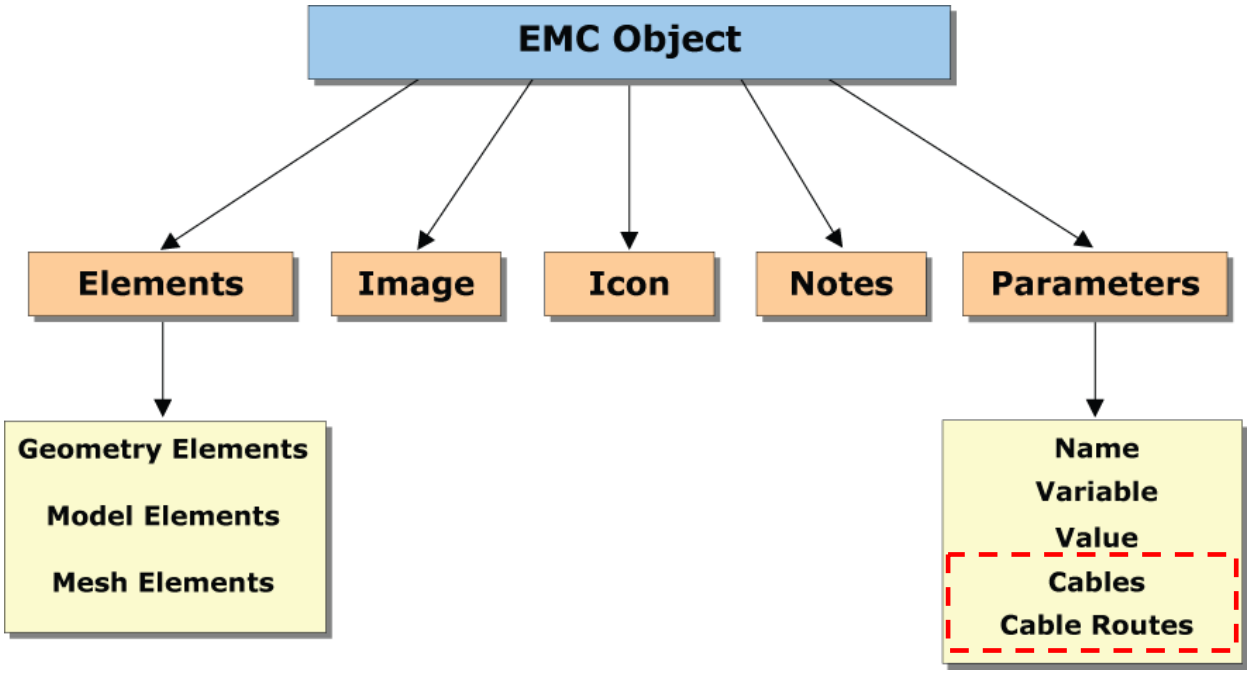
After manual correction of problematic areas corresponding error messages are disabled automatically without reapplying checking functions. This significantly optimizes model pre processing routines and saves time.



Error messages are disabled automatically after proper changes in model

1.11 Extension of Object/Model Ideology to Hybrid Analysis Types

EMC Studio v6.0 extends Object/Model ideology to **Hybrid Analysis Types**. In new version object parameters of **Hybrid Analysis Type** are extended with user-defined Cable Routes (special group of the segments used for cables construction). Hybrid cables created based on Cable Routes are also considered as Object/Model parameters.



Cables and cable routes have the following attributes:

Cable attributes:

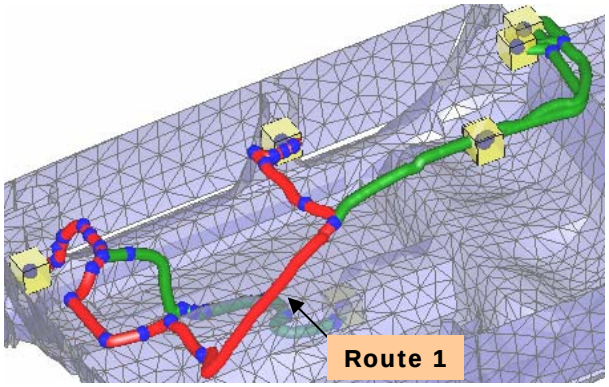
- *Cable Name* - unique name of the hybrid cable defined based on route
- *Part Number* - reference to a library cable
- *Position* – 2D position in bundle cross section
- *Route* - reference to route on which cable is created

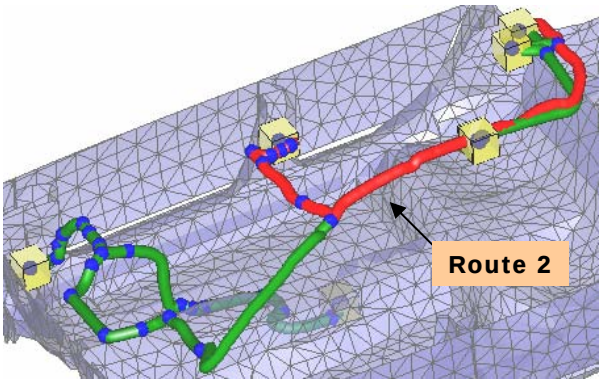
Route attributes:

- *Route Name* - unique name of the route
- *Segments* - unique name of the segments included in cable route

1.11.1 New Segments Grouping Functionality - Cable Routes

Segments intended for hybrid cables creation can be combined into special groups called **Cable Routes**. These groups can be used as pre defined routes during cables creation procedure.





Note: Cable routes and cables defined based on them are stored as a part of **EMC Studio** object which can be exported to the external *.emm (EMC Model) files or added to **Models Library**.

In order to create new cable route based on selected segments activate segments popup menu and choose **Create Cable Route on Segment(s)** item.

Note: One segment can belong to several routes.

Cable routes can be added, edited or deleted directly from **Object Properties** dialog.

To view and modify cable routes properties:

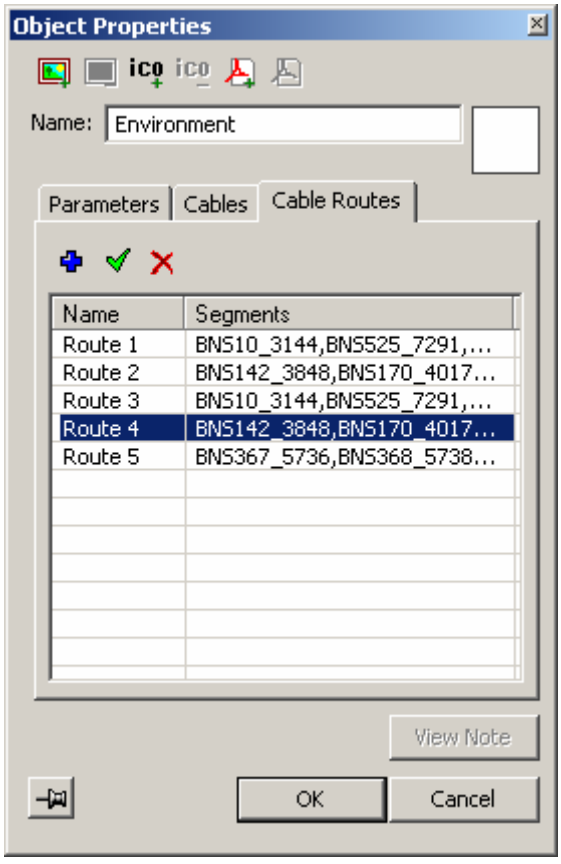
1. Select object in **Elements Tree View**
2. Activate objects popup menu with right mouse click and select **Properties...** item
3. In **Object Properties** dialog switch to **Cable Routes** tab

   Cable Routes section displays all cable routes created in current object and provides editing functionality:

   Add Route - creates new cable route

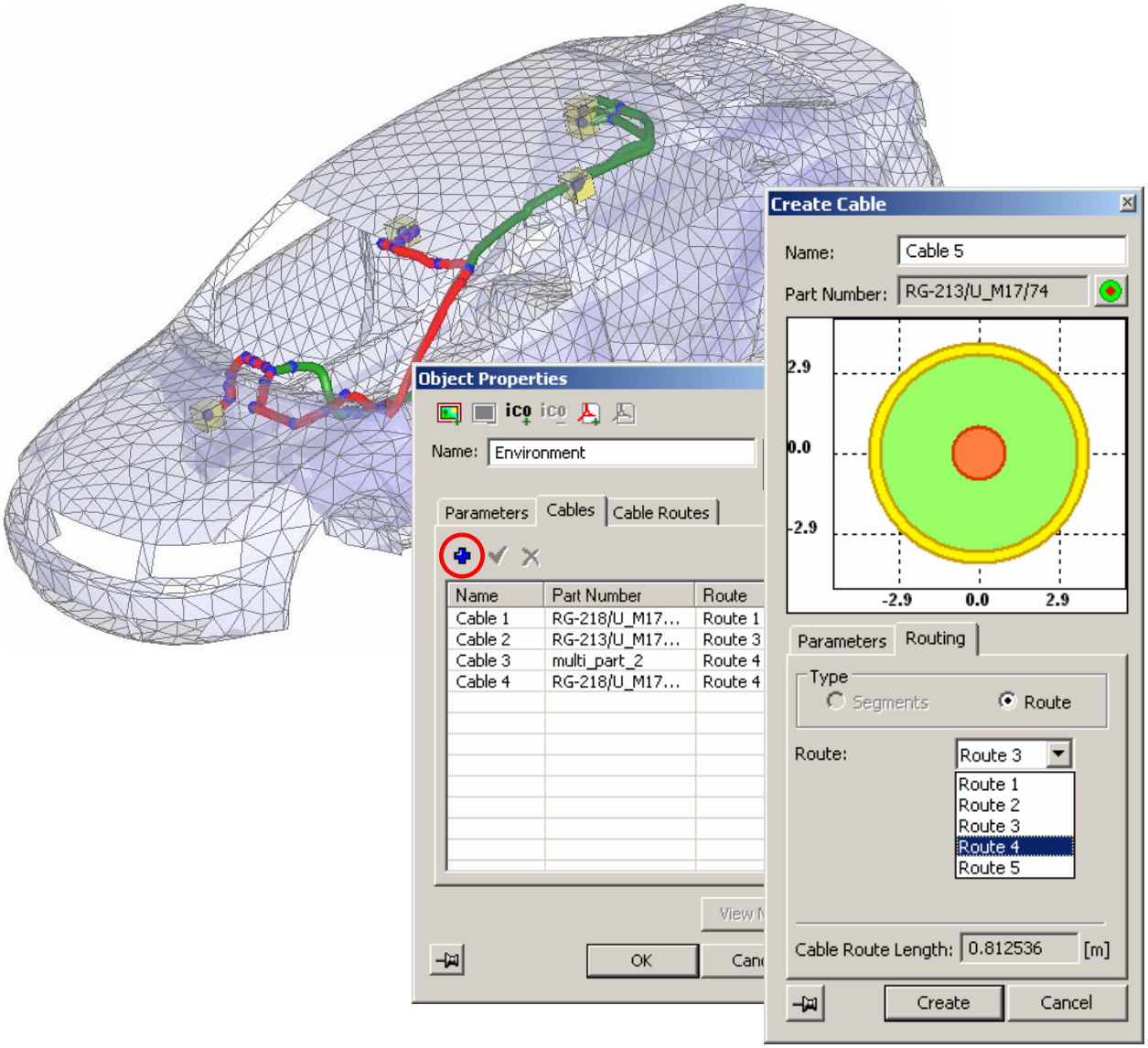
   Edit Route - edits cable route content (allows to add or remove segments)

   Delete Route - deletes selected cable routes



1.11.2 New Method for Hybrid Cables Creation - Based on Pre-defined Route

When cables are created based on pre-defined routes in **Hybrid Analysis Types** they are automatically added to the active objects parameters and can be accessed or edited directly from **Objects Parameters** dialog.



To view and modify cables properties:

1. Select object in **Elements Tree View**
2. Activate objects popup menu with right mouse click and select **Properties...** item
3. In **Object Properties** dialog switch to **Cables** tab

   Cables section displays all cables created in current object and provides editing functionality:

   Add Cable - creates new cable

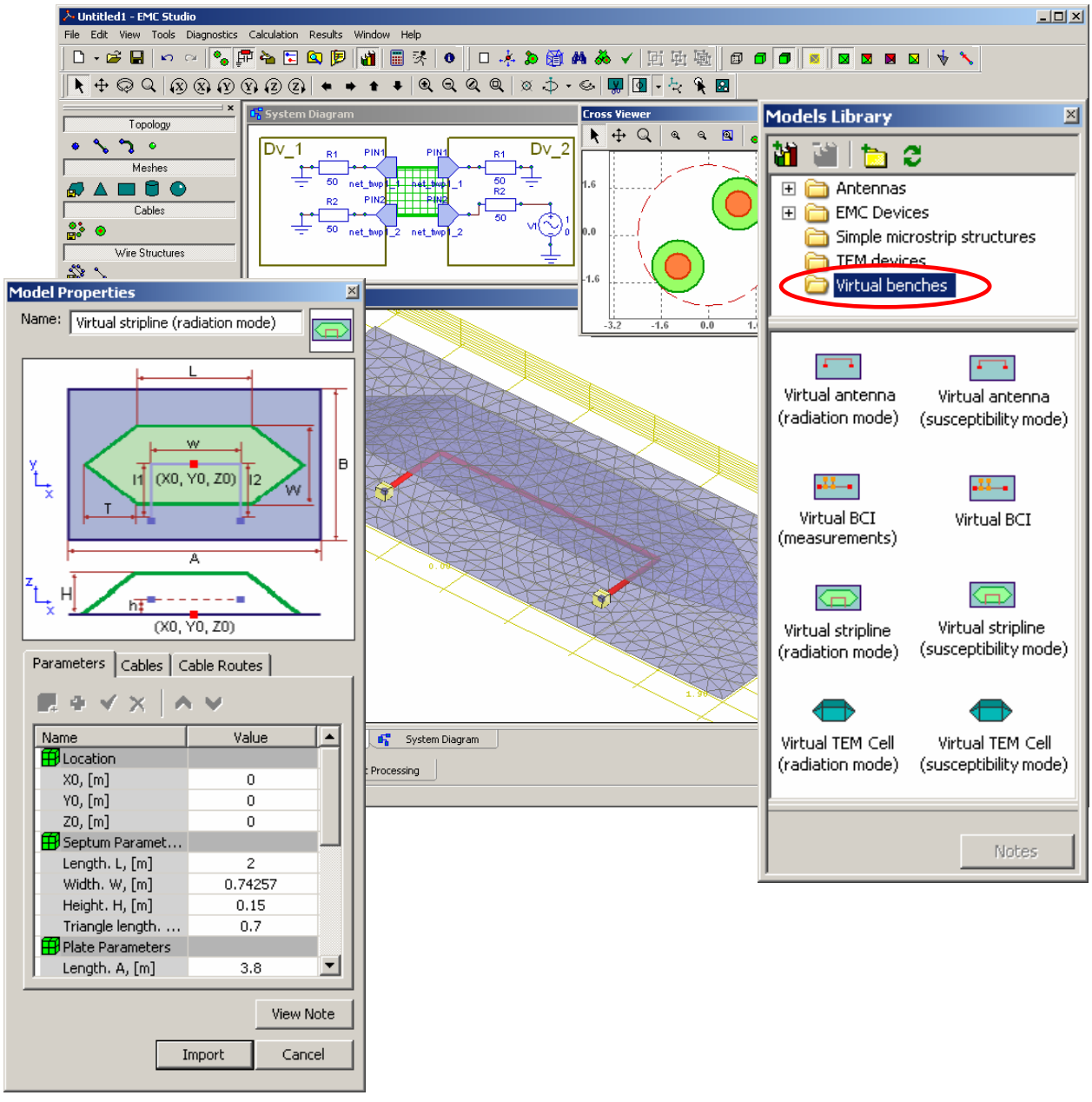
   Edit Cable - edits cable parameters

   Delete Cable - deletes selected cables

1.12 Extension of Models Library with Virtual Bench Models

Virtual benches in **EMC Studio v6.0** are introduced as parametric models in **Models Library**. Up to date cable models and device types for hybrid analysis are supported.

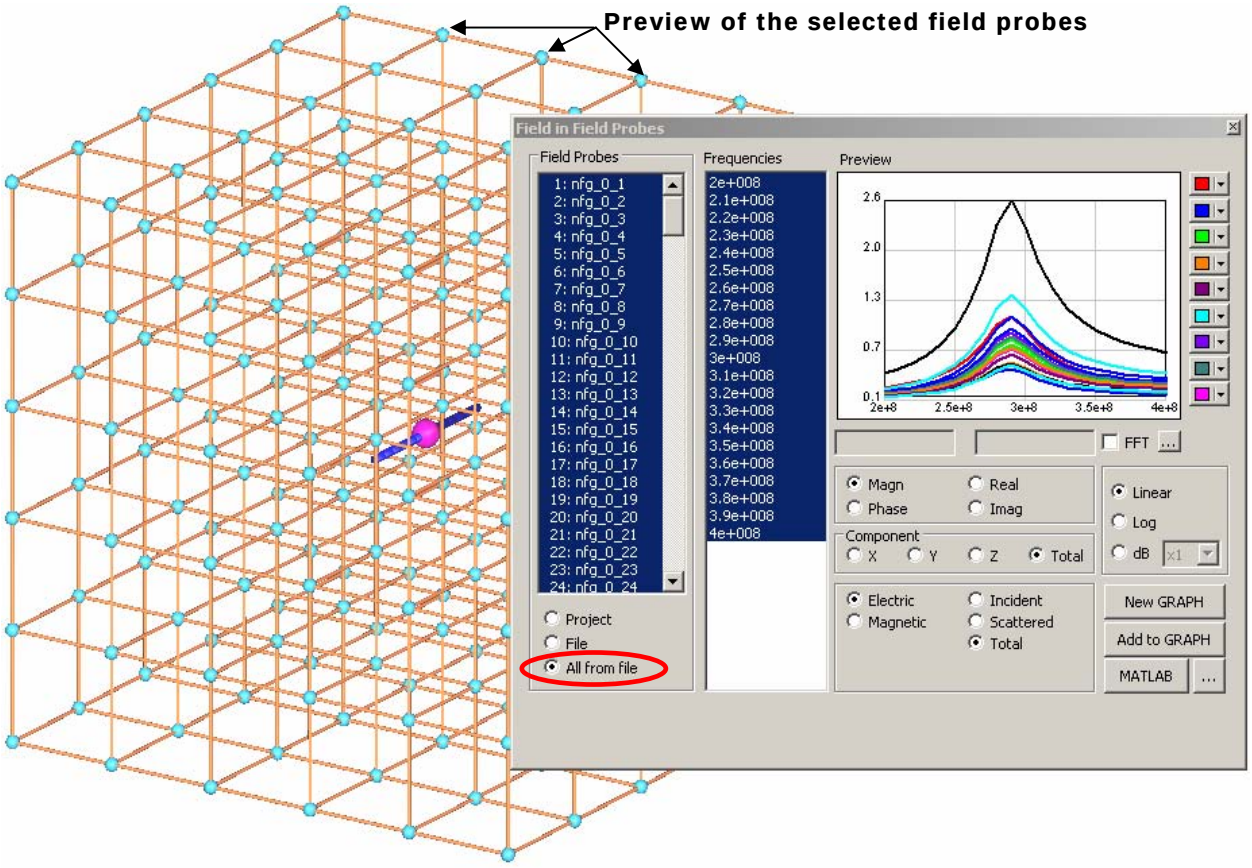
Virtual bench models (**Virtual Antenna**, **Virtual Stripline**, **Virtual BCI** and **Virtual TEM Cell**) integrated in **Models Library** are variables based and contain pre defined cable routes. Based on these routes user can define required cables configuration and simulate testing model.



1.13 Improved 2D Post Processing for Near Field Observations

Preview of field probes selected in 2D post processing is available in centers of triangles for Near Field Areas and in grid vertices of Near Field Grid.

To display preview of field probes for near field areas or near field grid activate **Field in Field Probes** dialog and select **All from file** option. List of **Field Probes** will be automatically filled with field probes corresponding to near field areas or near field grid.



Names of the obtained field probes have the following format:

- *"nfa" + Near Field Area ID + internal ID of point from Near Field Area*
- *"nfg" + Near Field Grid ID + internal ID of point from Near Field Grid*

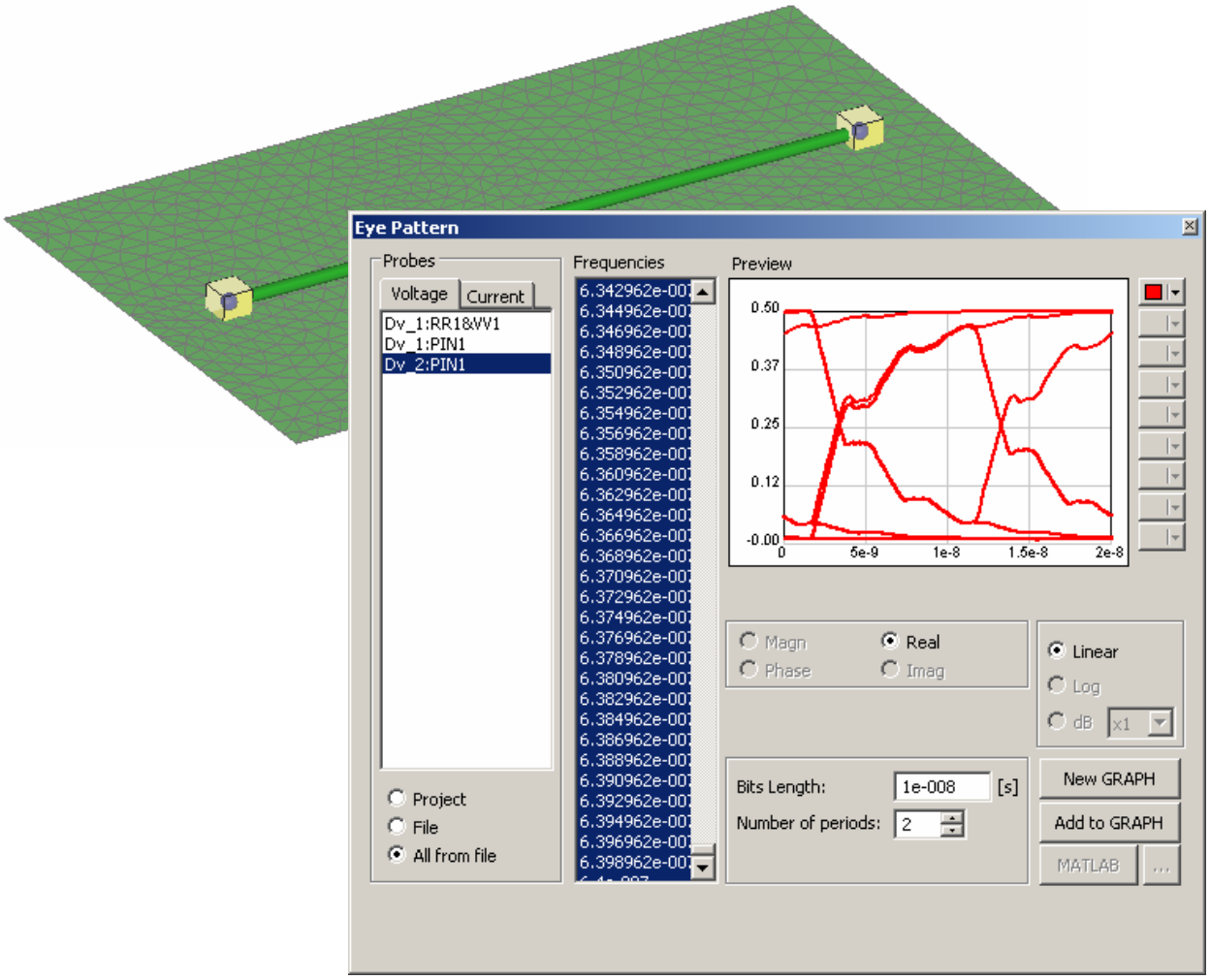
1.14 New 2D Post Processing Tool for Hybrid Analysis Type - Eye Pattern

EMC Studio v6.0 provides new 2D post processing tool **Eye Pattern**.

Eye Pattern post processing tool allows to analyze signal integrity results obtained for System Simulation, Hybrid Cross Talk and Susceptibility analysis in Time Domain calculations.

To activate **Eye Pattern** dialog:

- Click **Eye Pattern**  button on **Post Processing** bar
- Select **Results>Eye Pattern** from **Main Menu**



1.15 Full Support of Windows 7

EMC Studio v6.0 provides full support of Windows 7 operating system.

2 Improvements v6.0

- ***Improvements in Computational Cores***
  - Faster LC calculation with LF Electric Field solver
  - Improved construction of cable bundle cross-section
  - Binary format for TriD output file is supported
  - Improved output file for time domain TriD calculations
  - Definition of multiple calculations for stochastic cables analysis is available in XTalk and Radiation Hybrid solvers
  - Slight improvements in S2Cir converter
  - User's Manual for Hybrid Cores is available
- ***Support of Multiple Near Field Sources and Impressed Currents***
- ***Improvement of Cables Auto-bundling for Random Type***
- ***Improved Processing of Imported Touchstone and *.cir Devices in Schematic and Cores***
- ***Improvements in System Diagram and Schematic***
  - Improved automatic placement of devices
  - View of indexes of circuit element pins in Schematic
- ***Improvements in Cables Library***
  - Units for all cable types are changed from meters to millimeters
  - Improved definition of shield parameters
  - Additional parameter Angle for internal wires of multi cables
  - Cables description generation for all cable types
- ***Convenient Selection of Splices***
- ***Improved Union Segments Functionality***
- ***Possibility to Edit Input File for Hybrid Analysis Type for Advanced Users***
- ***Improvements in Post Processing Mode***
  - Improved field probes processing
  - Convenient Handling of Near Field Areas in 3D Post Processing
- ***Improvement of Static2D Viewer***
- ***GUI Improvements***