Agilent Technologies

EMPro 2011.01
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EMPro Quick Start

Acknowledgments

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Errata The ADS product may contain references to "HP" or "HPEESOF" such as in file names and directory names. The business entity formerly known as "HP EEsof" is now part of Agilent Technologies and is known as "Agilent EEsof". To avoid broken functionality and to maintain backward compatibility for our customers, we did not change all the names and labels that contain "HP" or "HPEESOF" references.

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EMPro Quick Installation

Download the EMPro installation files from the EMPro download page .

EMPro can be installed on a PC running Windows and Linux operating systems.

The following flowchart illustrates quick installation steps that will help you to install EMPro quickly and create a complete license setup.

Click on the respective box in the flowchart below for further details on the selected topic.

EMPro Installation Flowchart

FAQ

Obtaining EMPro License

You can place EMPro license request for any of the following requirements:

- New Sale License Request
- New Release License Request
- Renew Expired License Early Access
- License Request Change / Transfer
- Evaluation License / Token Redemption / Renewal Request

Click here to place your EMPro License request.

Back to Installation Flowchart

Supported Platforms

EMPro supports the following Windows and Linux platforms:

Operating System	32-bit	64-bit
Windows/VISTA/Windows 7	Microsoft Windows XP Professional SP3 Microsoft Windows Vista Enterprise SP1	Microsoft Windows XP Professional x64 Microsoft Windows Vista Enterprise SP1 64-bit edition
LINUX	Redhat RHEL WS 4.x Novell SUSE SLES 10	Redhat RHEL WS 4.0 Novell SUSE SLES 10 (64-bit AMD Opteron and Intel EM64T processors)

Back to Installation Flowchart Troubleshoot - Supported Platforms

System Requirements

The system requirements for EMPro are as follows:

- 1 GB RAM (minimum), 2 GB or more (recommended)
- 1280 x 800 display resolution
- ATI Radeon 7500 or NVidia GeForce 4 or a newer video card
- 3 GB or more hard disk space for complete installation of software and all the example files

Back to Installation Flowchart

Download EMPro Software

Click here to download EMPro installation file of Windows/Vista and Linux.

You can also use Agilent Download Manager to download EMPro installation file.

Make sure your download is successful by comparing the downloaded file size with the one on the Download page. In case there is any size difference, you need to download the file again.

Back to Installation Flowchart Troubleshoot - EMPro Download

Installation

Windows Quick Installation

Note
Use this condensed installation procedure if you are experienced in the installation of Agilent EEsof products. If you have installed an *Early Access* version of EMPro, you should uninstall it before installing this version.

To install EMPro on a Windows PC:

1. After downloading the EMPro windows installation image from the EMPro download page , unzip the file contents to the local hard disk.
2. Navigate to the directory where you saved the downloaded image file and unzip it.
3. Exit all Windows programs and run setup.exe from the extracted files.
4. When the installation wizard appears, follow the on screen instructions to start the installation. When the installation is complete, click **Finish**.
   - Install your Licenses. For instructions on installing the Licenses, refer to *Installing Your Licenses* (license).
   - Install the *Acresso FLEXid* software-security hardware key to your PC's parallel port, or use your PC LAN card's Ethernet ID. For instructions and more information, refer to *Installing Your Licenses* (license).
5. Launch EMPro. Do this by selecting **EMPro** > **EMPro 2011.01** > **EMPro 2011.01 (32-bit GUI)** (for 32-bit systems, replace 32 by 64 on 64-bit systems) from the_Start_ menu. If you are using license bundles, select a bundle using the *Agilent License Preference Tool* prior to running EMPro. This tool is described in *Licensing EMPro* (license) in the EMPro documentation. The licensing tool is available from the start menu by selecting **EMPro** > **EMPro 2011.01** > **EMPro Tools** > **License Preference Tool**.

Note
Before launching EMPro, click here for *EMPro License Setup* (license).

Back to Installation Flowchart Troubleshoot - Installation

Linux Quick Installation

Note
Use this quick installation procedure if you are experienced in installing Agilent EEsof products. If you have installed an *Early Access* version of EMPro, you should uninstall it before installing this version.

To install EMPro on a Linux PC:

1. Log on to the system where you want to install EMPro.
2. Download and untar the EMPro installation image from the EMPro download page .
3. Change directories to the directory where the extracted tar files are located.
4. To start the *Setup* program use the following command:
   `./SETUP.SH`
5. When the EMPro Installation window appears, you can begin the installation. Details about each window are available in *Detailed Installation* (install). When the installation is complete, note the *License ID* (hostid) then click **Done** to exit the program.
6. Use the *FLEXnet* security licenses supplied by Agilent EEsof to set up a *license.lic* file. For more information, refer to *Installing Your Licenses* (license).

7. Place the *license.lic* file in the *licenses* sub-directory of your EMPro installation directory and start FLEXnet. For more information, refer to *Licensing EMPro* (license).
8. If you are using license bundles, select a bundle using the *Agilent License Preference Tool* prior to running EMPro . This tool is described in *Using the Agilent License Preference Tool* (license).
9. Launch EMPro. To do this, navigate to the directory in which EMPro is installed and select ***bin/Linux-i686RHEL4*** (for 32-bit systems) or ***bin/Linux-x86_64*** (for 64-bit systems) and use the command:

   `./startempro` --driver=x11

Windows License setup

To setup the licenses for Windows Installation, visit *Windows License Setup* (license).

Back to Installation Flowchart

Linux License setup

To setup the licenses for Linux Installation, see *Linux License Setup* (license).

Back to Installation Flowchart

Setting the Display

If you want to run EMPro from a remote computer and you want the display to appear on your local machine, you will need to set the `DISPLAY` environment variable:

```
setenv DISPLAY : 0.0 (C-Shell)
DISPLAY = : 0.0 (Korn Shell, Bourne Shell)
export DISPLAY
```

For a Sun Ray file server and diskless terminals using Solaris 8, you will need to set the *DISPLAY* environment variable:

```
setenv DISPLAY $Display (C-Shell)
set DISPLAY = $Display (Korn Shell, Bourne Shell)
export DISPLAY
```

For details on using the Sun Ray appliance, refer to the Sun Microsystem website at: http://wwws.sun.com/sunray/index.html

Back to Installation Flowchart Troubleshoot - Installation

Launch EMPro

Launching EMPro in Windows

Your FLEXnet license file must be properly configured and installed before you can run EMPro. To set up your license file, follow the instructions in *Windows License Setup* (license).

To run EMPro from the Start menu, select **Programs** > **EMPro** > **EMPro 2011.01** > **EMPro 2011.01 (32/64 bit GUI)**.

The choices available are:

- **EMPro Documentation:** Brings up your Web browser and the starting point for accessing EMPro documentation. The documentation files are accessed from the location in which they are installed (if you chose to install documentation).
- **Launch EMPro in Windows:** Launches the EMPro Main window, enables the 32-bit simulators, and the use of the various EMPro Suites, features and modules you have licensed. (If EMPro is installed on a 64-bit operating system and you want to use the 64-bit simulator, choose EMPro (64-bit GUI).
  If you are not familiar with EMPro, choose *Help* > *Topics and Index* > *Quick Start* for help on getting started with EMPro.
- **Uninstall EMPro 2011.01:** Launches the Uninstall Program.

Launching EMPro in Linux

Environment variables must be set before you can run EMPro.Your FLEXnet license file must be properly configured and installed before you can run EMPro. To set up your license file, follow the instructions in *Linux License Setup* (license).

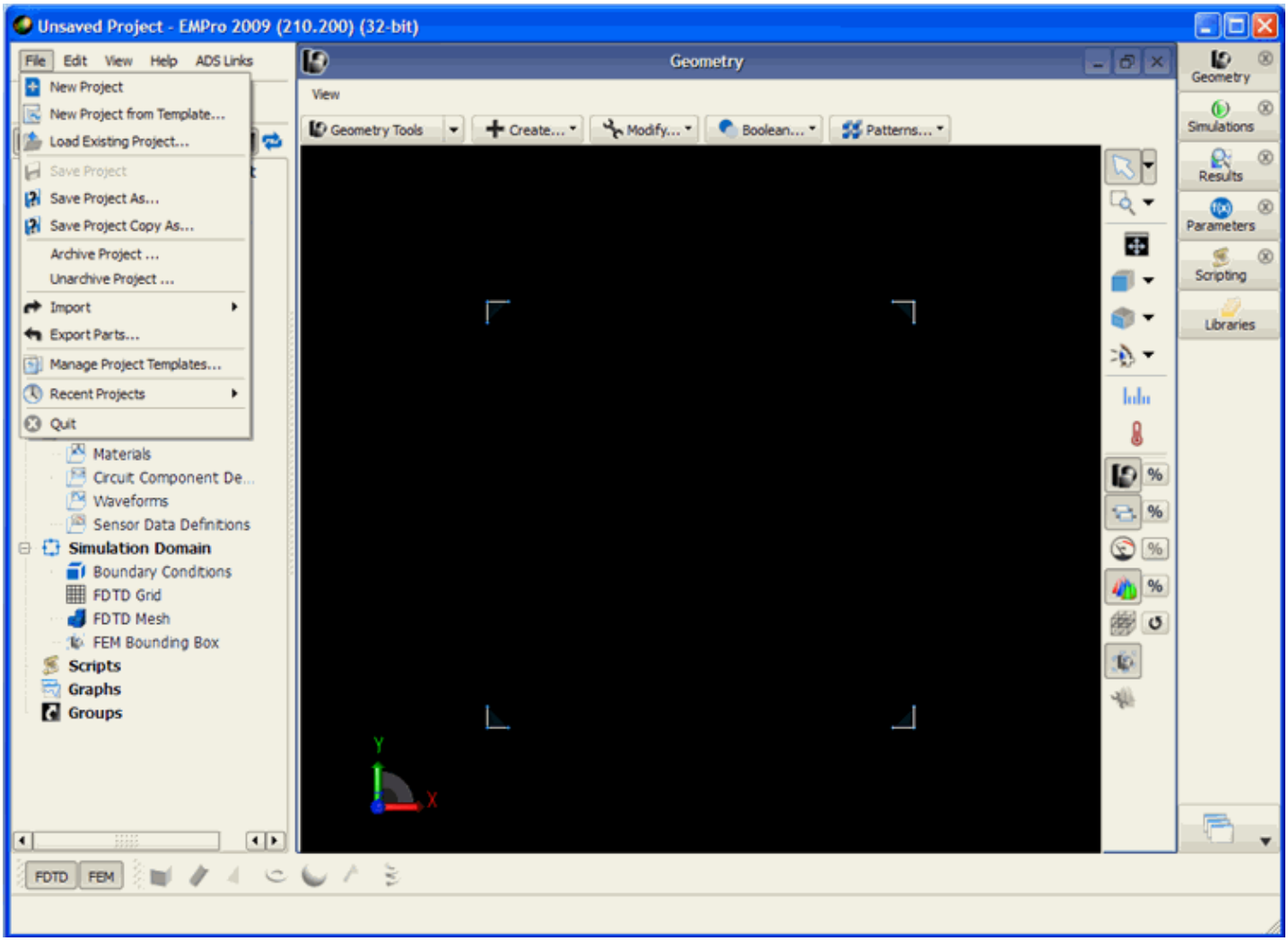
Choose **Help** > **Topics and Index** > **Quick Start** for help on getting started with EMPro.

Managing EMPro Projects

EMPro uses projects to organize and store the data generated when you create, simulate, and analyze designs to accomplish your design goals.

A project includes circuit, layout, simulation, analysis, and output information on the designs that you create, along with any links you add to other designs and projects.

Use the **File** menu in the EMPro Main window to create and open projects.



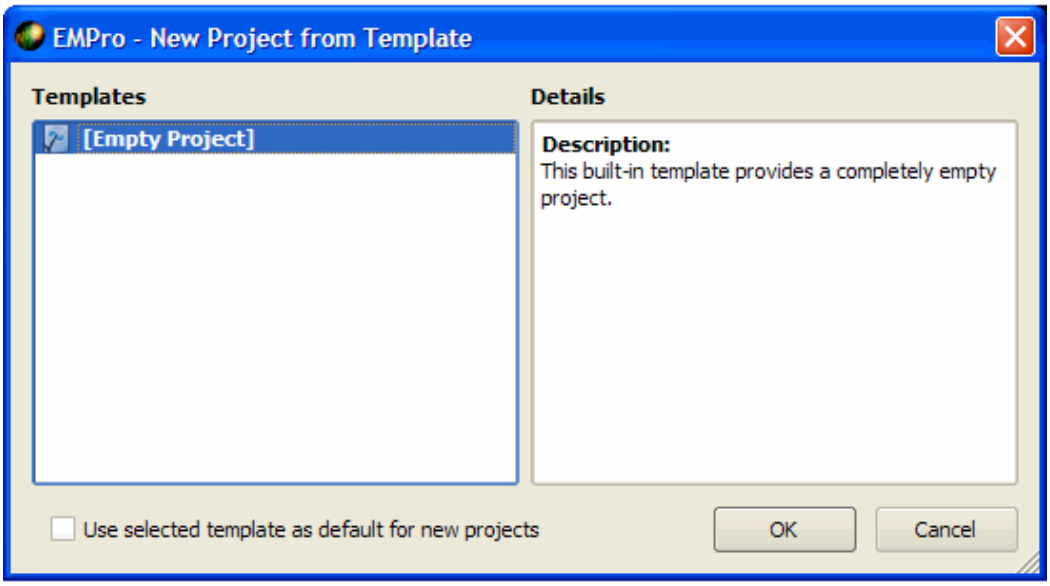
Creating Projects

Use the *Main* window to create a project and organize your designs.

Choose **File > New Project** to create a new project in EMPro.

Creating Projects from a Template

1. Choose **File > New Project From Template** to open the following dialog box:



2. Click **OK** to open the project.

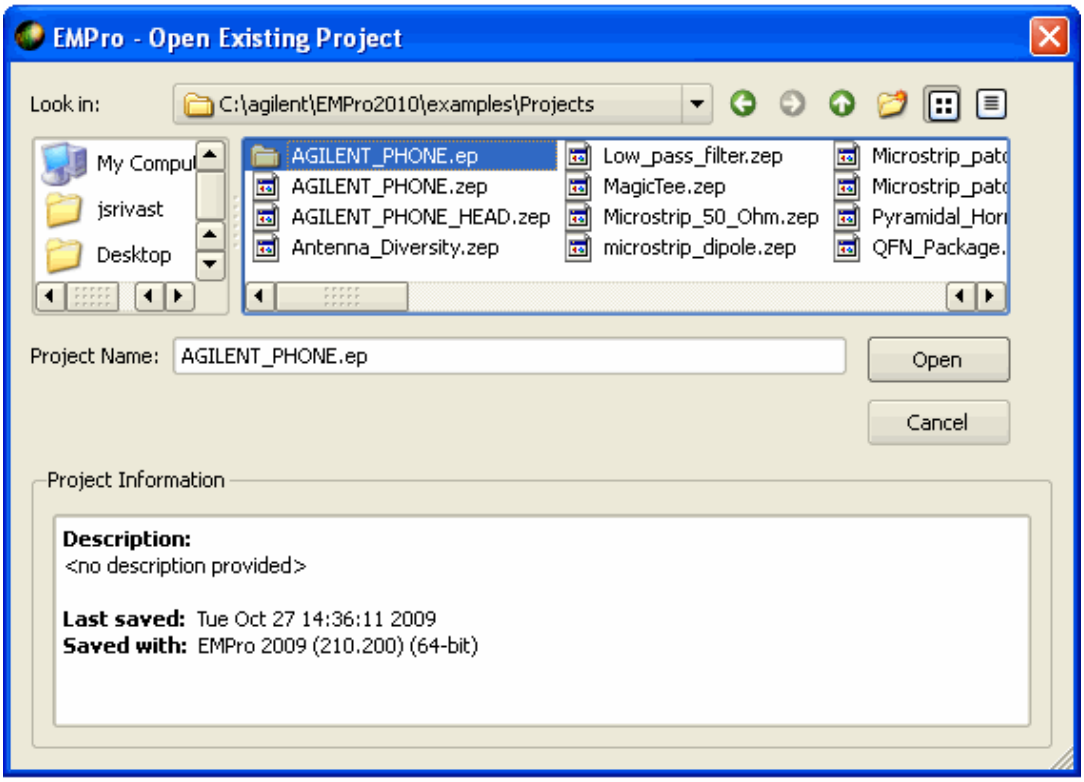
Opening Existing Projects

Use the *Main* window to reuse and load the existing projects without the requirement to include all the individual parts manually to make a project.

Note
You can open only one project at a time.

When you begin to open a project, you are prompted to save any changes you have made in the currently open project before it is closed automatically.

1. Choose **File** > **Open Existing Projects** to open the following dialog box:

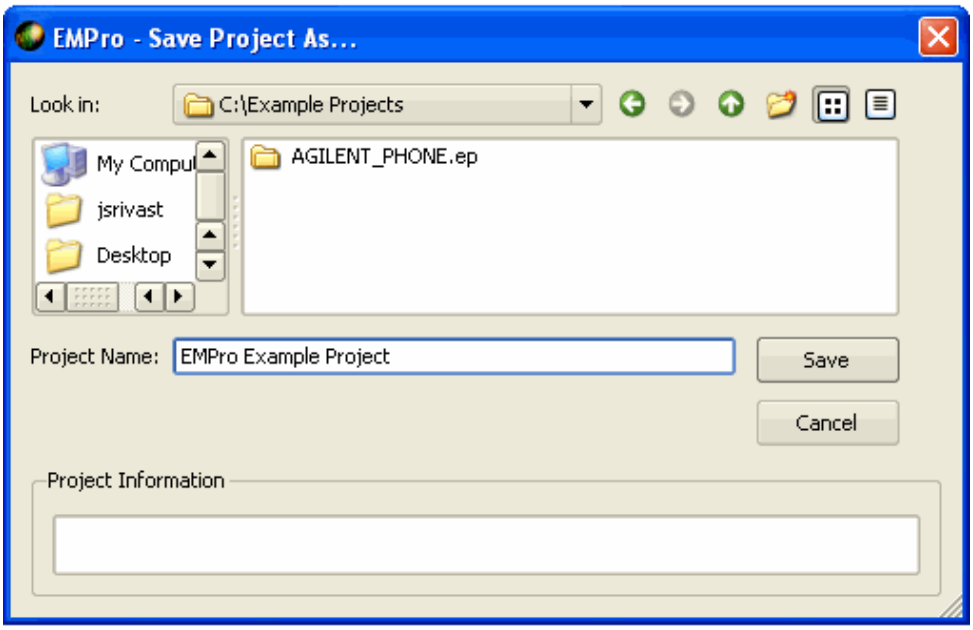


2. Select the project you wish to open and click **Open** to open the project.

Saving a Project

To save a new project to a specified directory:

1. Choose **File** > **Save Project As** to save the project. The following dialog box is displayed:

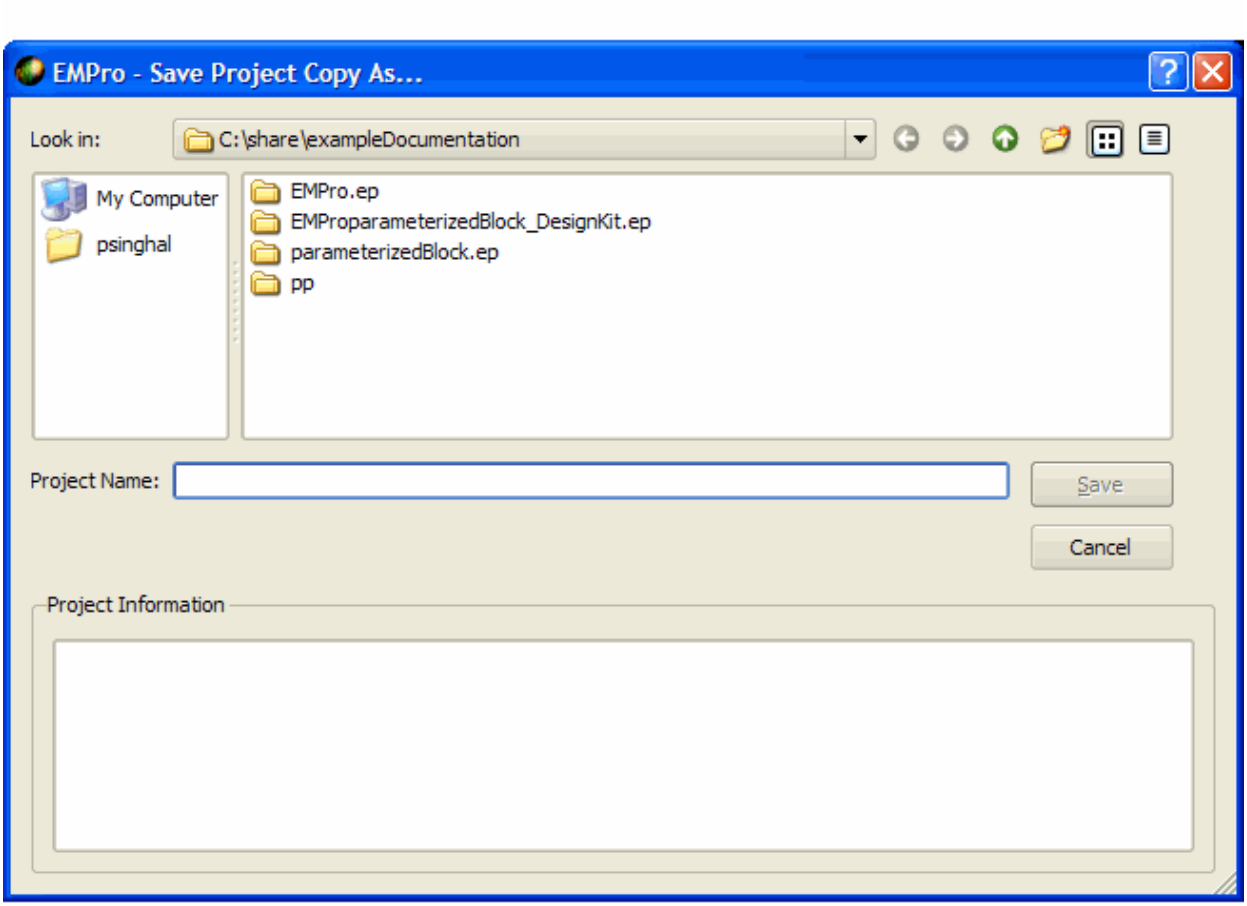


2. Type the name of the project and click **Save** to save the project.

Saving a Copy of the Project

Copying a project directory and its contents to a new project directory allows you to save time and effort by using an existing project as a template.

1. Choose **File** > **Save Project Copy As** to save the project. The following dialog box is displayed:

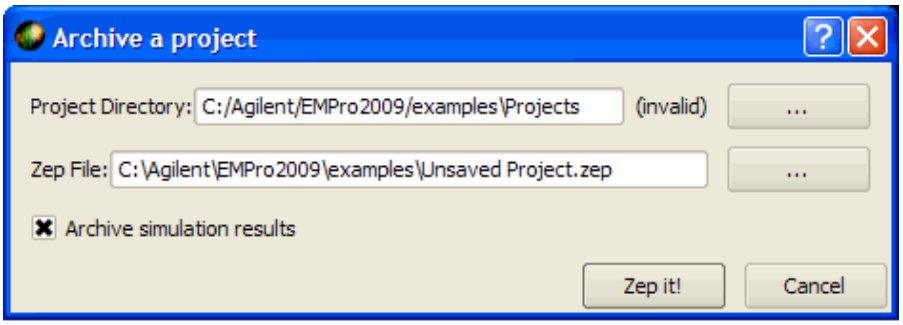


2. Type the name of the project and click **Save** to save the project.

Archiving Projects

Archive/Unarchive projects to transfer a compact project archive. Creating a single file for a project simplifies transferring projects to another file system or to another location on the same file system.

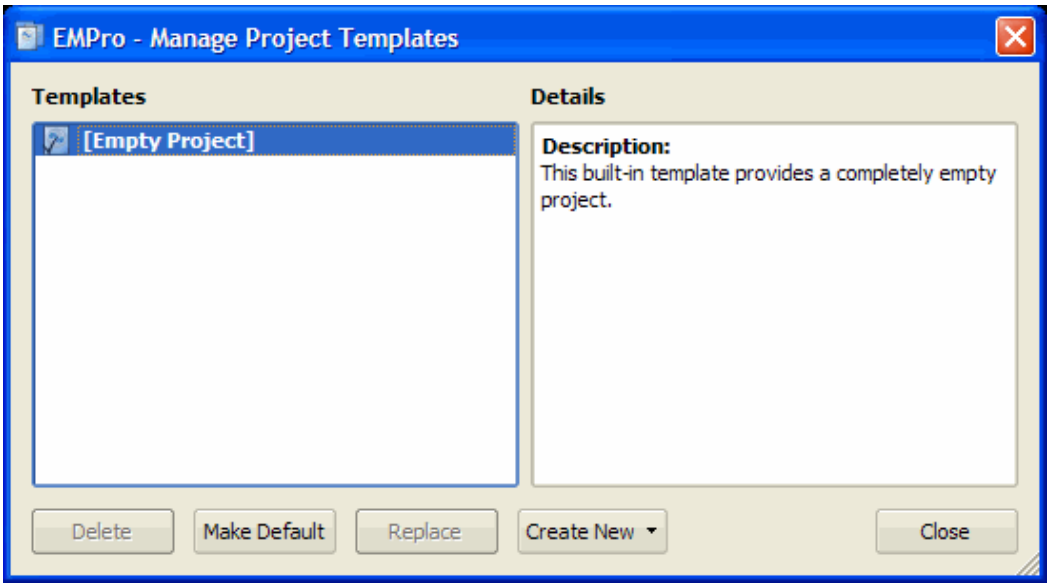
Choose **File > Archive Project** and use the *Archive a project* dialog box to locate and archive the project.



Managing Project Templates

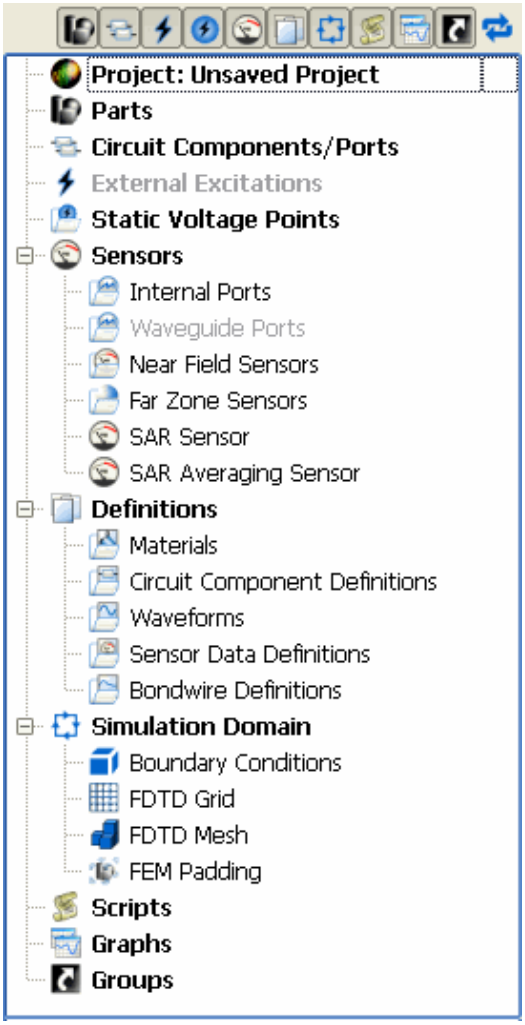
EMPro allows you to create a new template or to assign a default template to be loaded whenever a new project is opened. You can delete, replace, and modify projects, as well as create a new template from the current project.

Choose **File > Manage Project Templates** and use the following dialog box to manage a project.



Using the Project Tree

The EMPro Project Tree provides a tree-structured representation of the active project, as shown in the following figure:



It is organized into the following branches:

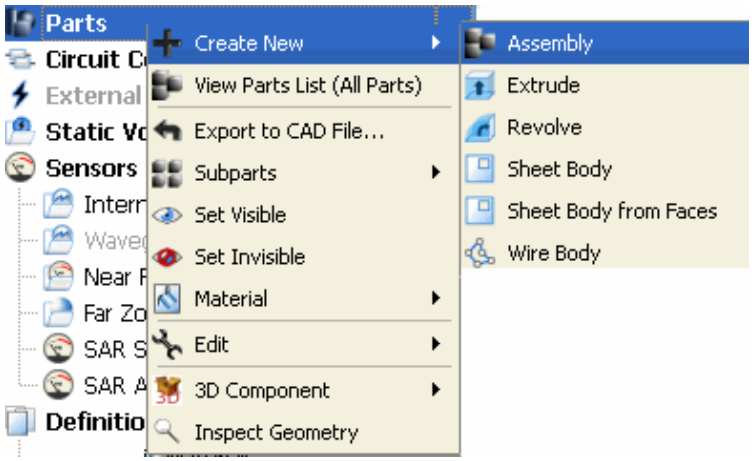
- Parts
- Circuit Components/Ports
- External Excitations
- Static Voltage Points
- Sensors
- Definitions
- Simulation Domain
- Scripts
- Graphs
- Groups

The EMPro Project Tree is easy to manipulate by means of branch and object toggle buttons.

Branches of the Project Tree

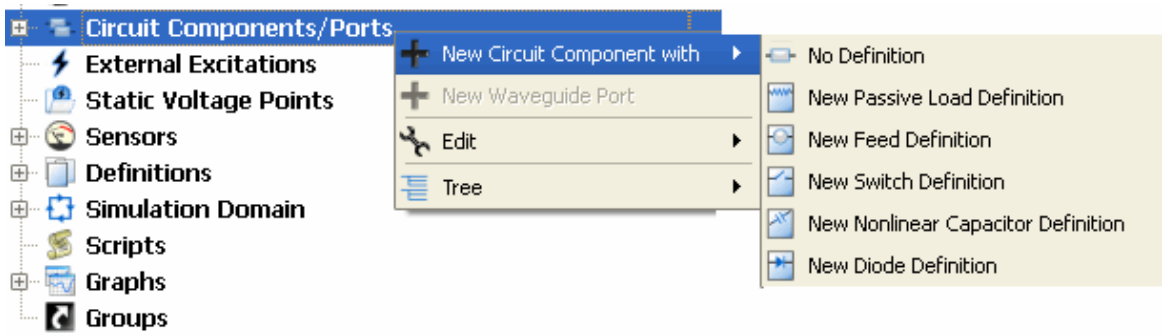
Parts

The *Parts* branch organizes the physical parts of a project. It also lists material definitions and modeling operations applied to any parts object in the tree.
It is possible to organize similar parts objects in groups with an Assembly by right-clicking and selecting **Create New: Assembly**, as shown in the below illustration.



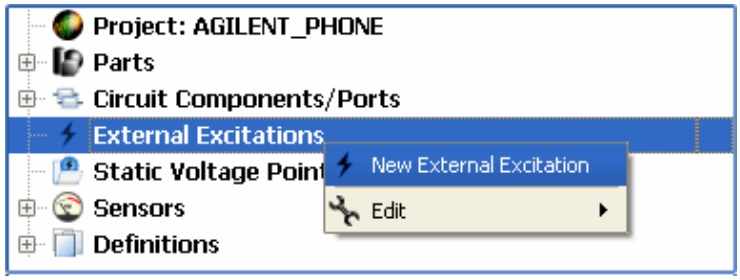
Circuit Components/Ports

The *Circuit Components/Ports* branch organizes discrete circuit components in a project.



External Excitations

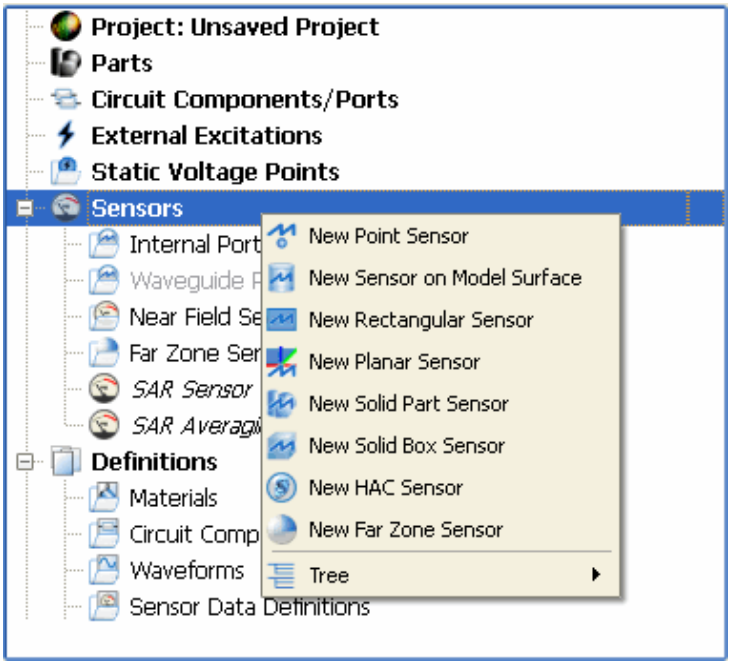
The *External Excitations* branch organizes the external excitations applied to a project.



Sensors

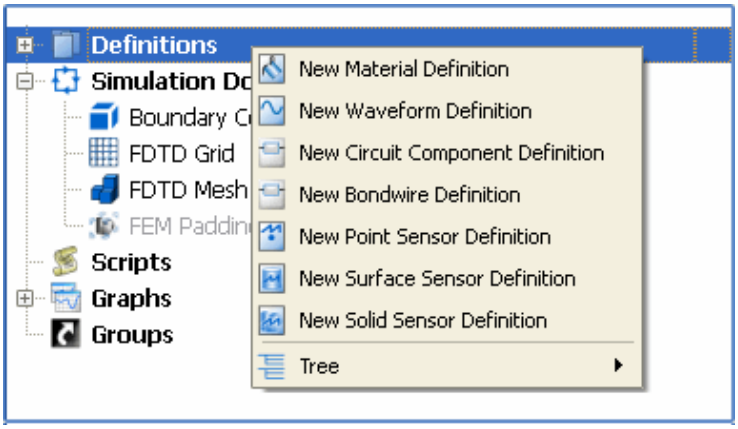
The *Sensors* branch organizes the sensors defined in a project. Sensors are responsible for

saving the data collected during a calculation.
They are added by right-clicking on Sensors branch of the Project Tree and choosing the required sensor.



Definitions

The *Definitions* branch stores definitions that can be applied to or shared with other objects within the project.
To add a new definition object, right-click on the Definitions branch and select the desired definition.



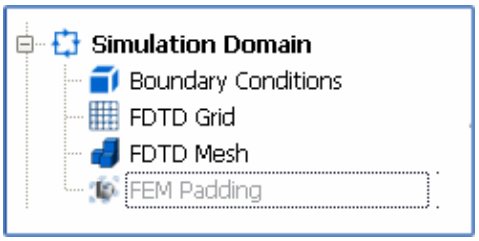
Simulation Domain

The *Simulation Domain* branch stores definitions associated with the outer boundaries of the project, as well as the grid and mesh. It also includes information about the FEM Padding Editor.

- Double-clicking the **Boundary Conditions** icon will bring up the Boundary Conditions Editor.
- Double-clicking the **FDTD Grid** icon will bring up the FDTD Grid Tools dialog box,

used to specify the characteristics of the grid.

- Double-clicking the **FDTD Mesh** icon will enable Mesh View.
- Double-clicking the **FEM Padding** icon will bring up the FEM Padding Editor.

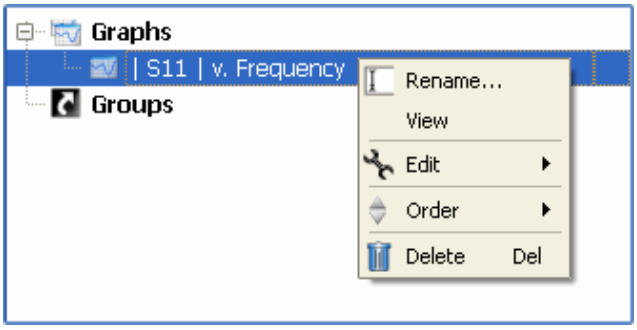


Scripts

The *Scripts* branch stores user-defined scripts.
Right-click this branch to add a new script or to import an existing macro or function script to the project.
You can execute or edit the script in the Scripting workspace window.

Graphs

The *Graphs* branch organizes the graphical output associated with data collected during a calculation



Groups

The *Groups* branch allows you to create fully customizable short-cut groups that may include any grouping of objects (for example, Parts objects, Sensor objects, Definition objects, etc.).

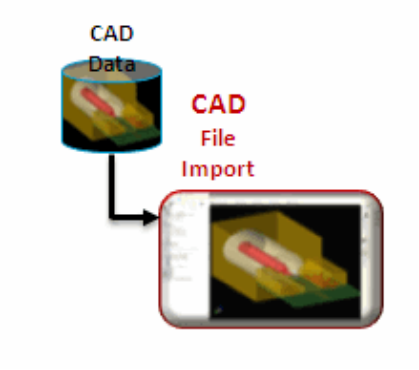

Groups
New Shortcut Group
Select Shortcut Targets
Edit

Importing Files

In order to enhance the geometric modeling process, EMPro has the ability to load both CAD drawings, voxel objects and mesh objects.

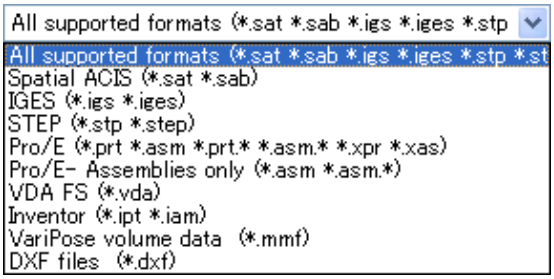
CAD Files

EMPro allows you to import various industry standard CAD formats. This includes existing design geometries in the EMPro simulation space.



CAD Files can be imported and exported in various file formats in EMPro, as shown in the following figure:

Figure: Supported CAD Formats



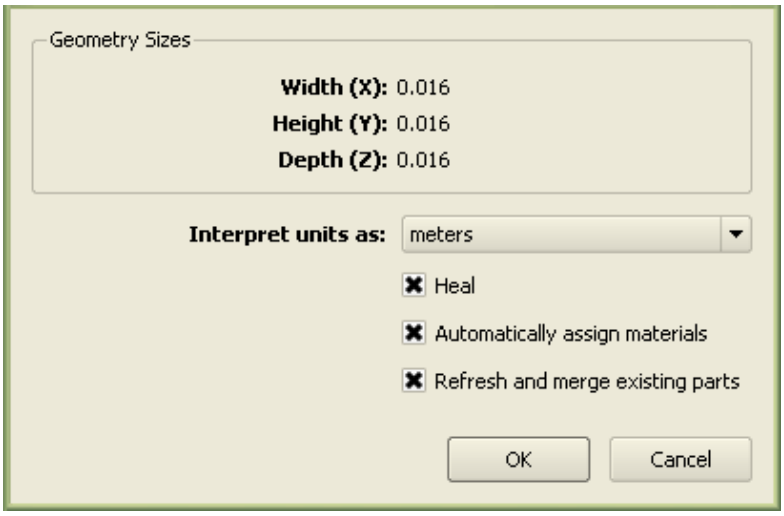
Note
EMPro 2011.01 does not support SolidWorks files.

CAD Import Options

The CAD Importer is used to import CAD files from many popular modeling packages into EMPro for use in simulations. To import a CAD file, select **File** > **Import** > **CAD File(s)** and load the desired file.

After the you select the CAD file to load, a dialog box will pop-up with several important options. This is shown in the following figure.

CAD import options

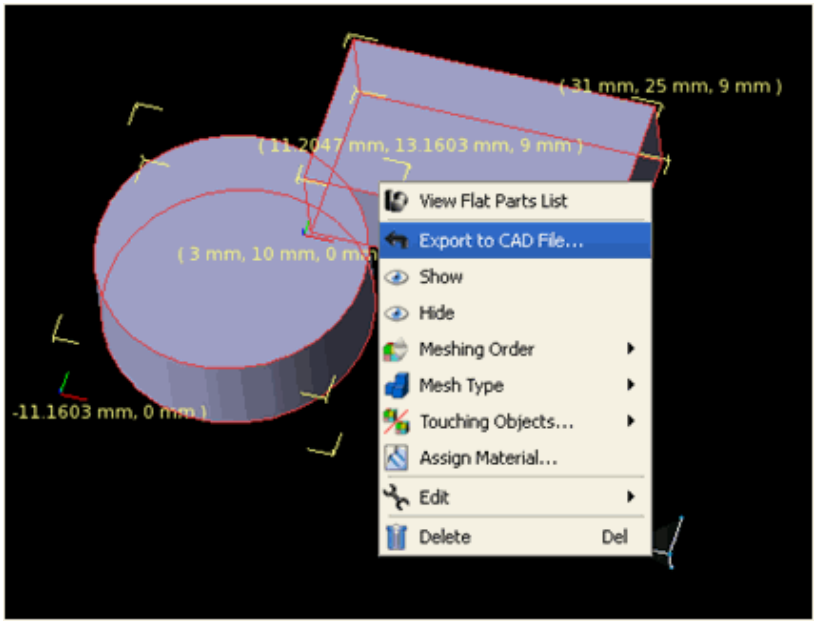


- The *Interpret Units As* drop-down list assigns the units to the CAD file after it is imported.
- The *Heal* check-box will check imported files for errors and correct them as needed. In particular, objects imported from *IGES* files and *STEP* files may have errors. For more complex objects, this can be a time consuming process and pop-up window will display the progress of the operation.
- The *Automatically Assign Materials* check-box appears after the external CAD files have been read. When this option is selected, color information will be extracted from the imported parts if it is available. If a material exists in the project that has the color of the imported part, that material is assigned to the part. If no material is found, and a color is available, a new material is created and assigned.
- The *Refresh And Merge Existing Parts* check-box should be checked when the user has already loaded a CAD file into an EMPro project and desires to update it with a newer (external) version of the source file. When this option is selected,
  - parts that are *used* within your EMPro project will be updated with any geometrical changes present in the newly imported CAD file.
  - parts that are *new* to the imported CAD file are added to the project.
  - parts that have been *deleted* in the imported CAD file, but are still present in the EMPro project, will remain in the project without change.
  - parts that have been *deleted* in the EMPro project, but are still present in the CAD file, will be added to the EMPro project with *Meshing Disabled* and its *Visible* property unchecked.

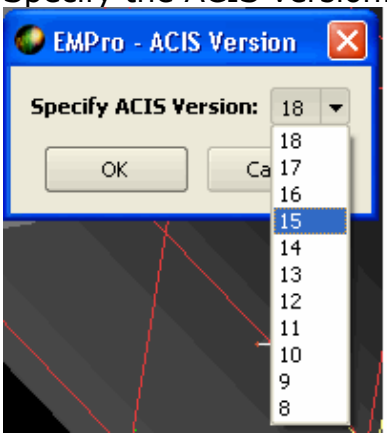
Note
In each of the above four cases, all changes from the original files will be documented in a shortcut group in the *Groups* branch of the *Project Tree*.

Exporting a CAD File

1. Create a 2D or 3D geometry in EMPro.
2. Right-click the object and select **Export to CAD File**. This opens the *Export to CAD File* dialog box.
3. Specify a file name and save it as a SAT File. You can also export as an IGES or STEP file.

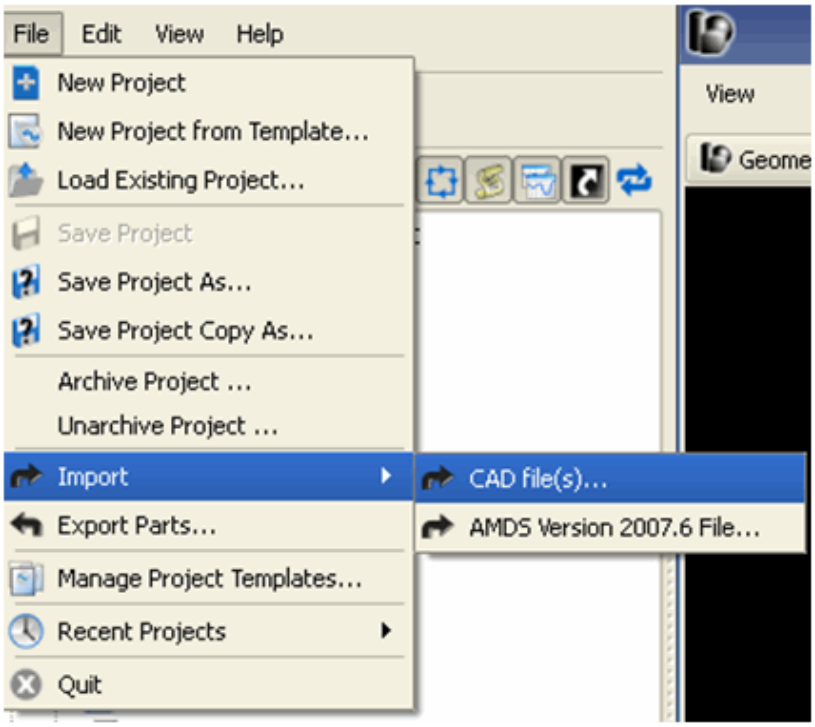


4. Click **Save**.
5. Specify the ACIS version.

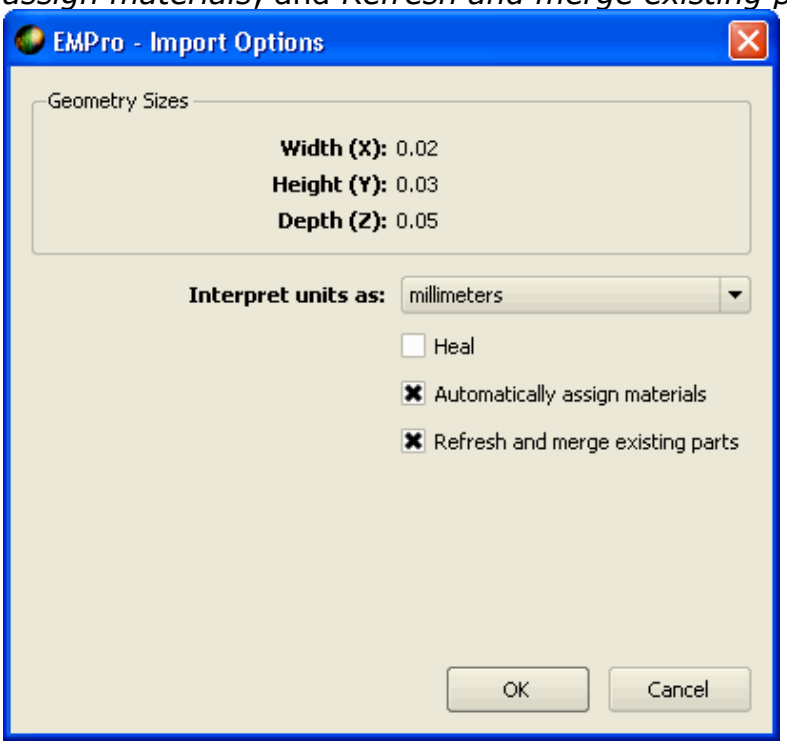


Importing CAD Files

1. Select **File > Import > CAD File(s)**.



2. Point to the directory where the required files are located and select the required files.
3. Click **Open**. This opens the *Import Options* dialog box.
4. Set the **Interpret units** as **millimeters**. Do not select the *Heal*, *Automatically assign materials*, and *Refresh and merge existing parts* options.



5. Click **OK**.

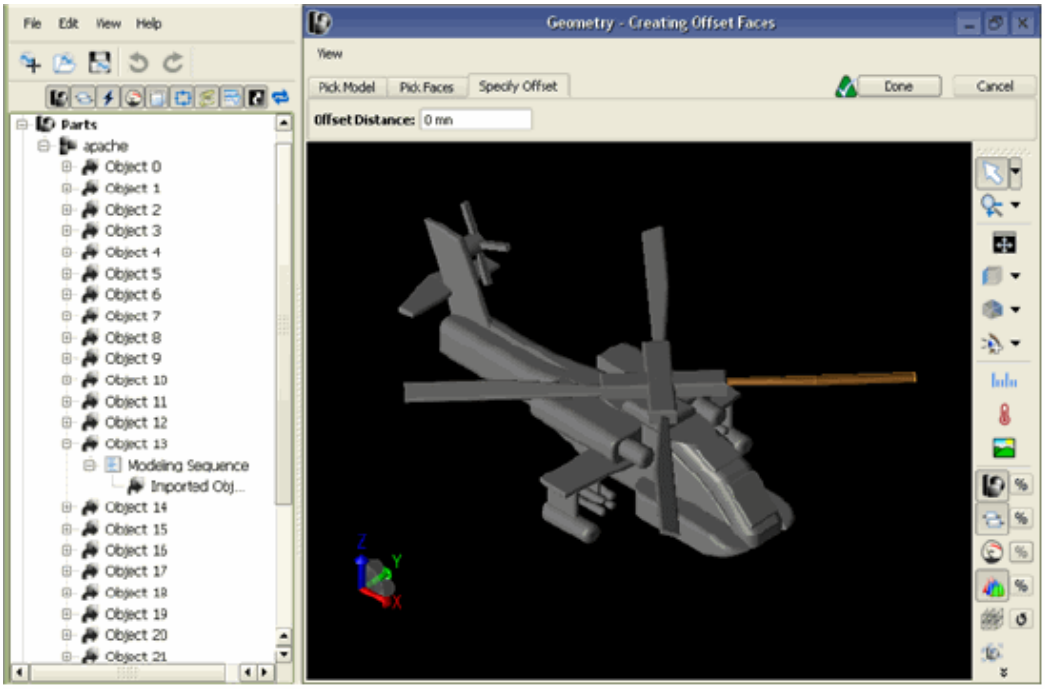
Note
Imported objects are assembled to an assembly part with a name *Multi-file import* and do not have materials assigned to them. You need to rename the imported objects for a better readability of object names and assign them to certain materials.

Modifying a CAD File

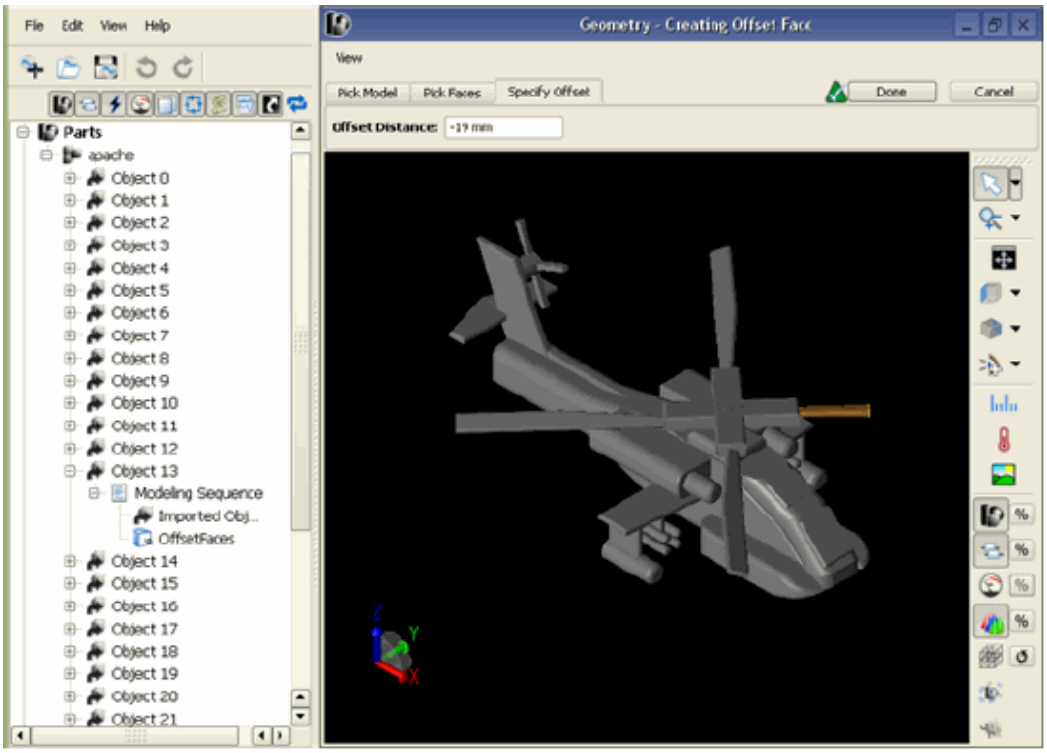
Once imported, an assembly containing all of the parts of the CAD file is added to *Parts* branch of the *Project Tree*. Since every part of the CAD file is treated as its own separate object, all available modeling operations can be applied to any individual object imported from the file. Selecting an operation in the *Modify* drop-down box within *Geometry Tools* will enable you to select any part to modify.

Below, the first figure shows an imported CAD object before a modification operation is applied. the second figure shows the CAD object after an *Offset Faces* operation is applied to one of its parts, and the resulting *Modeling Sequence* object that is added to the tree.

CAD file before modification



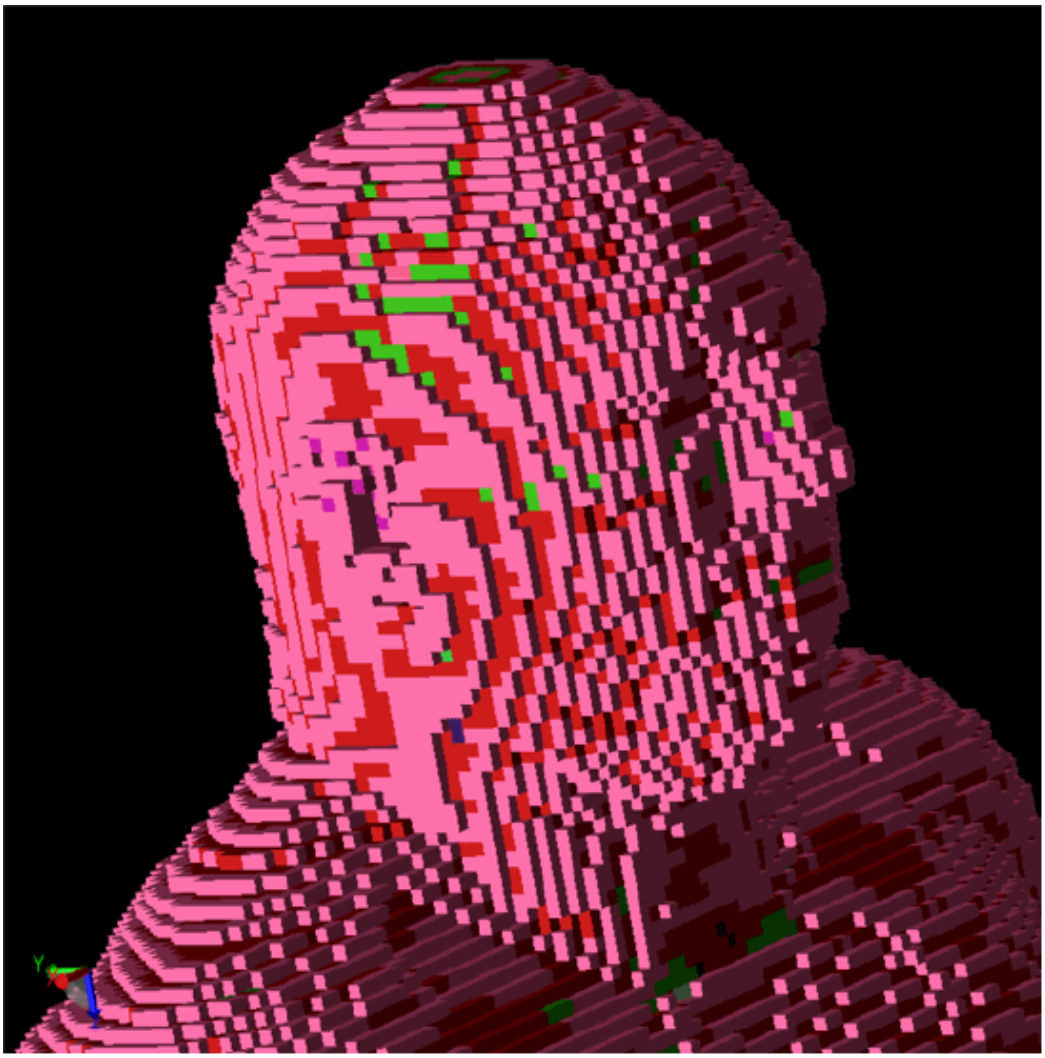
CAD file after modification



Voxels

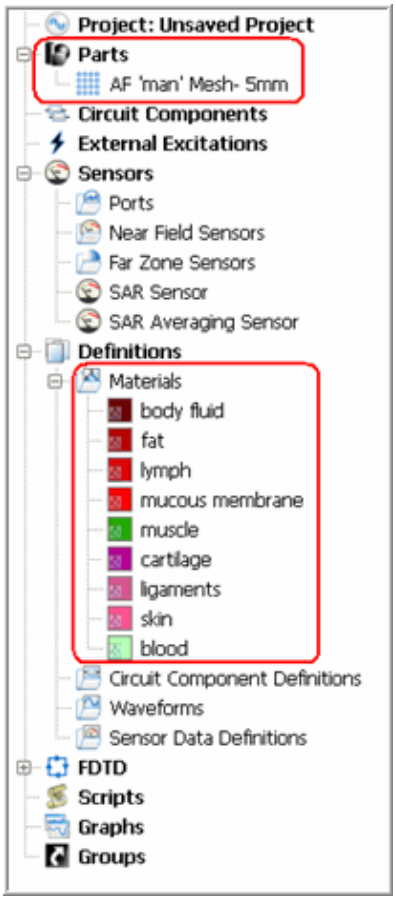
Voxel objects are volumetric pixel points in space with specific volume characteristics. Voxels are a similar to CAD objects in that they are linked to an external voxel data file, and are loaded through selecting the select **File** > **Import** > **CAD File(s)** option. The external voxel data file follows the format specified from the *VariPose .mmf* file. The illustration below displays an imported **.mmf* file.

The head of an imported human body mesh comprised of 5-mm voxel objects



The following illustration shows the *Project Tree* after the the **.mmf* file seen above was imported. Note that an object has been added to the *Parts* branch that contains the voxel object and a list of all the materials contained in the object have been added to the *Definitions: Materials* branch.

The Project Tree with imported voxel object



Meshing a Voxel object

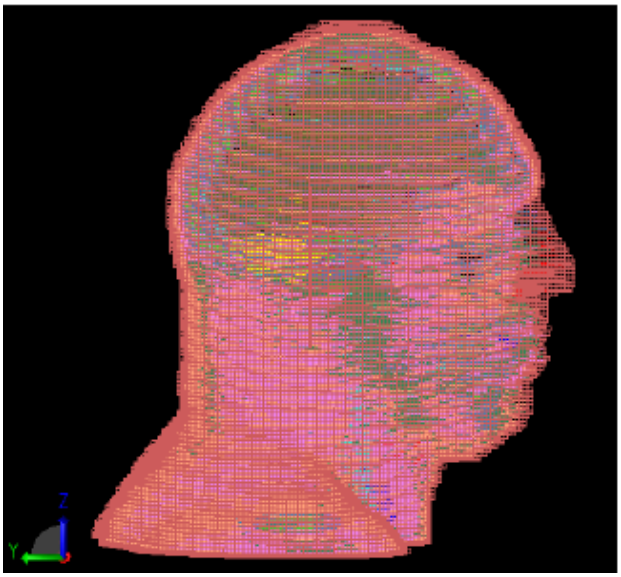
To set the meshing parameters for the voxel object, right-click the object in the *Project Tree* and select *Meshing Properties* to open the *Meshing Parameters Editor*.

Note
For more on configuring the settings of the *Meshing Parameters Editor*, refer to *Volume Meshing Options* (using) located in "Defining the Grid and Creating a Mesh".

Mesh Objects

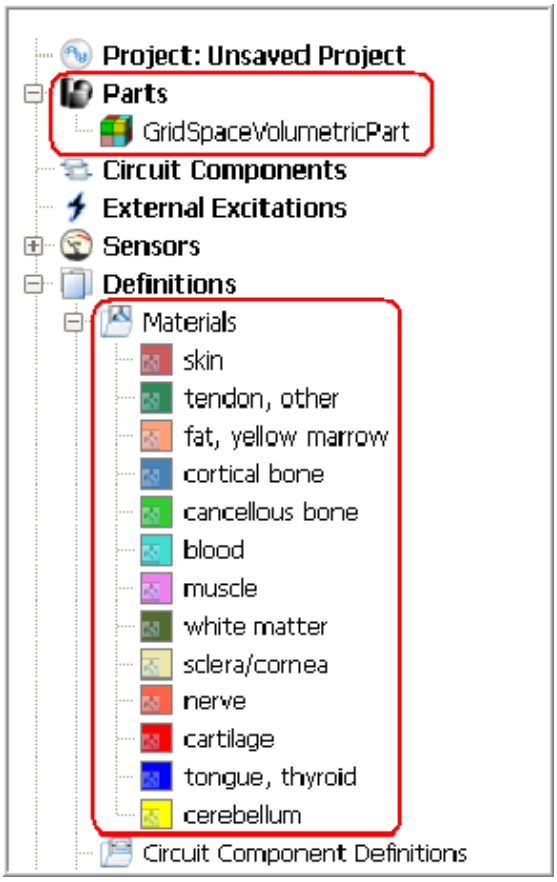
A mesh object is essentially a collection of edges (of various sizes) with applied materials. It is a subsection of the EMPro grid from a previous version. Mesh objects, like voxel objects, are linked to an external mesh object data file, and are loaded through the *File > Import > AMDS Version 2007.6 File...* option. The following figure displays an imported *.mesh file.

The head of an imported human body mesh object



The next figure shows the *Project Tree* after the the **.mesh* file seen above was imported. Note that an object has been added to the Parts branch that contains the mesh object and a list of all the materials contained in the object have been added to the *Definitions: Materials* branch.

The Project Tree with imported mesh object



Like a voxel object, to set the meshing parameters for a mesh object, right-click the object in the *Project Tree* and select *Meshing Properties* to open the *Meshing Parameters Editor*.

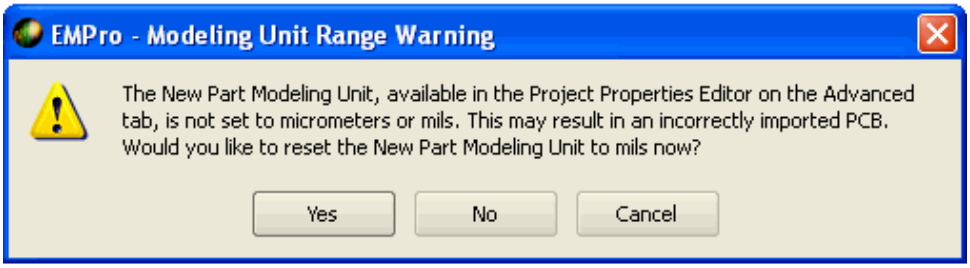
Note
For more information on configuring the settings of the Meshing Parameters Editor, refer to *Volume Meshing Method* (using).

Importing ODB++ Files

The FDTD simulation method can be used to simulate the way energy propagates through and around Printed Circuit Boards (PCBs). To create complex PCB designs, geometry can be imported from another application.
The ODB++ format is used to import complex geometry as it is a standardized format which facilitates data exchange between many applications in the PCB industry.
EMPro reads the ODB++ database and constructs a three dimensional representation of the data.

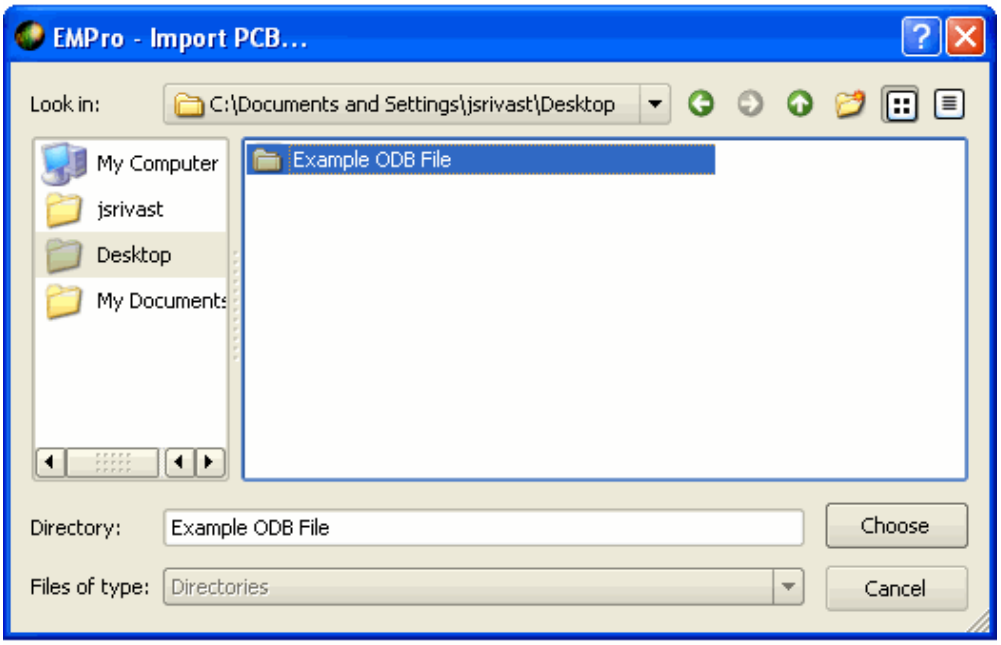
To import ODB++ files:

1. Choose **File** > **Import** > **PCB**. The *Modeling Unit Range Warning* dialog box may appear.

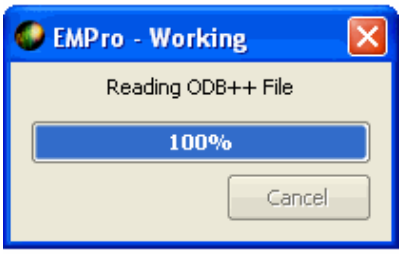


Note
To successfully construct the solid model, the New Part Modeling Units must be in mils or micrometers. If the Project Properties Editor is not set to one of these two units, EMPro will prompt to change the unit.

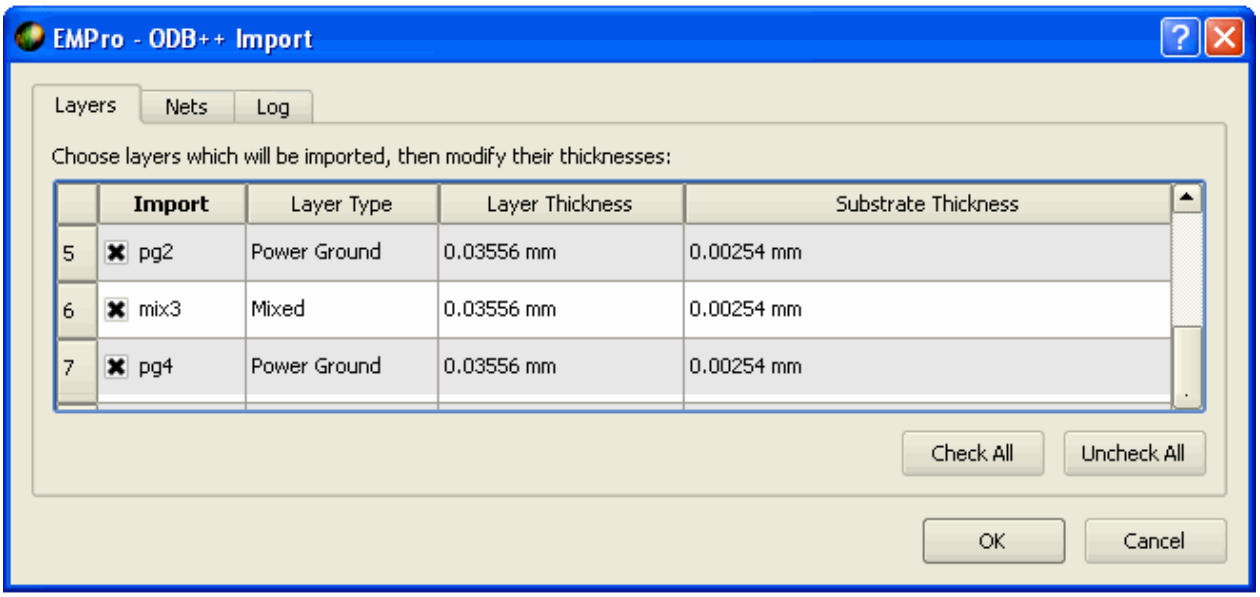
2. Click **Yes** to convert New Part Modeling Units to mils or micrometers else Click **No**. After the unit conversion is complete, the *Import PCB* dialog box appears.



3. Select the ODB++ file to be imported and click **Choose**. A Status window will display the reading status information of the ODB++ file.



Once the ODB++ file is completely read, the *EMPro-ODB++ Import* dialog box is displayed.



In the *EMPro-ODB++ Import* dialog box,

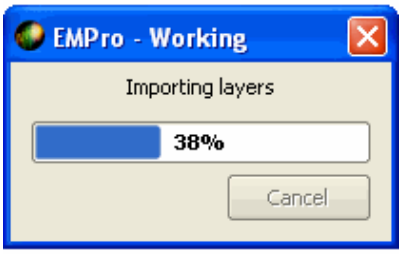
The **Layers** tab displays a list of all the layers in ODB++ file. By default, all the layers are imported. Layers of the types signal, power ground, drill and mixed are checked by default, but each layer can be changed by clicking the check box next to the layer name. To import selective layers, un-check the layers from Import column under Layers tab. The Layer Type is a non-editable field and is displayed only for information purpose. You can modify the Layer Thickness and Substrate Thickness fields. Each thickness can be modified by clicking on the value in the table and entering a different value.

Note
You can check or un-check all the layers using Check All and Uncheck All buttons, respectively.

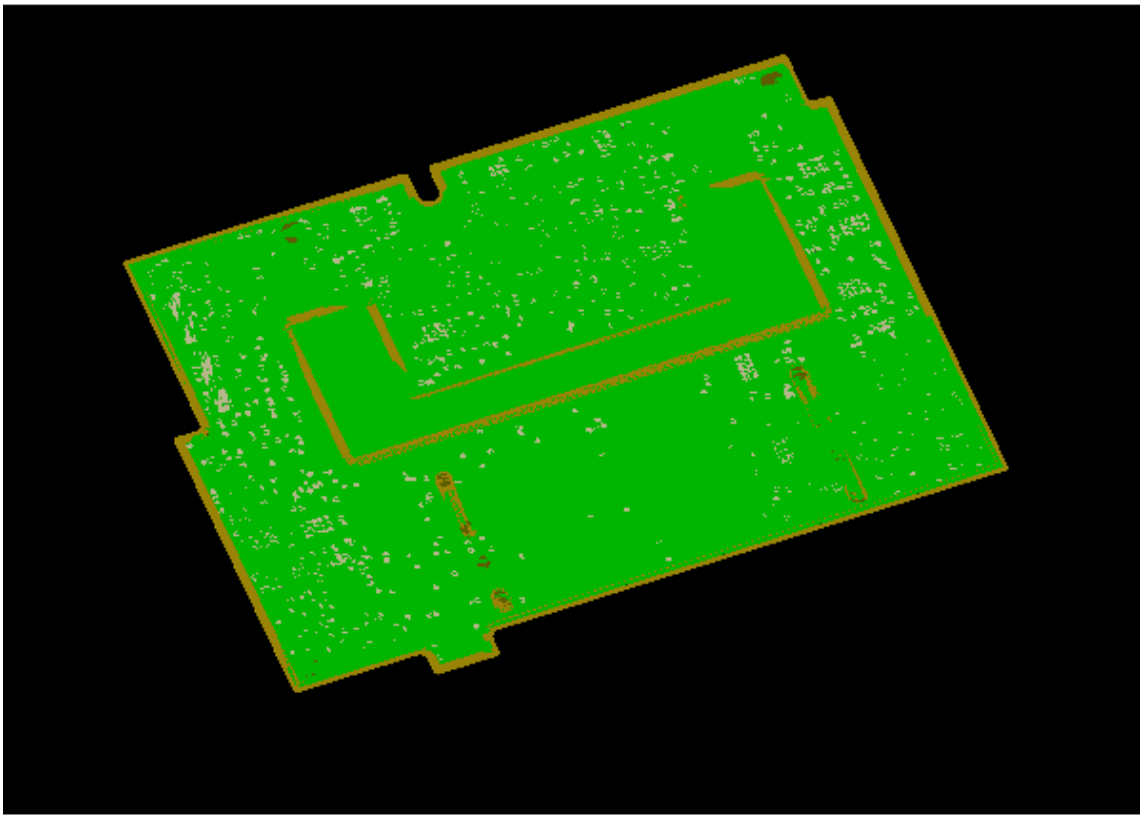
The **Nets** tab is available if the ODB++ database contains EDA data. If there is no EDA data or no nets are chosen, the geometry for each layer is separated into pads, traces, surfaces and polarity. If nets are chosen, the geometry for each net is separated in its own part, and then the remaining geometry is separated into layers.

The **Logs** tab provides the feedback generated when the data is read from the ODB++ database. The contents of this log indicates any errors encountered. The messages provided in the log do not include the status of converting the data to the solid models. After you chooses OK, the data is converted into parts. In the event of an error during this conversion, a window will appear after conversion has finished indicating the problems encountered.

4. Once you are done with layer selection, click **OK** to import ODB++ file into EMPro else click **Cancel**.
   A Status window opens displaying the import information.



5. Once the file import is complete, the output data is displayed in the *Geometry* workspace window.



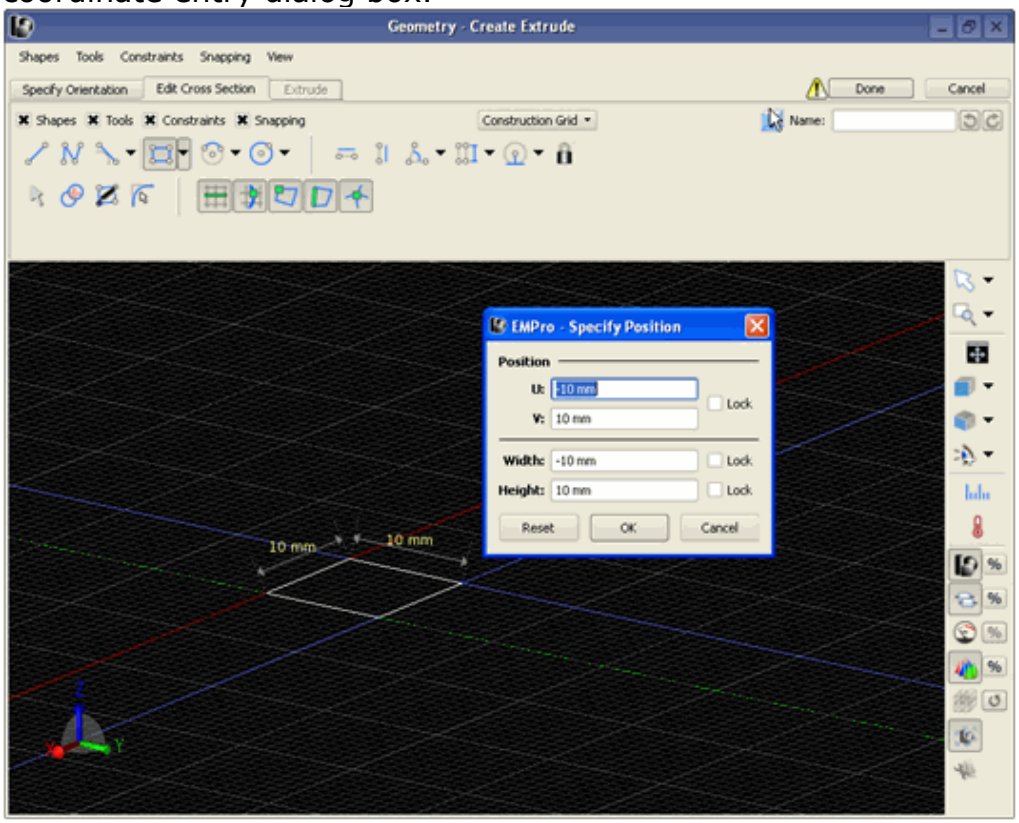
Modifying Existing 2D and 3D Objects

The modeling operations applied to the object are stored in EMPro. This enables you to change the operations according to your requirements. You can modify existing geometries which include imported objects, for example, move, copy, rotate, and Boolean operations. This section describes how to modify 2D and 3D objects.

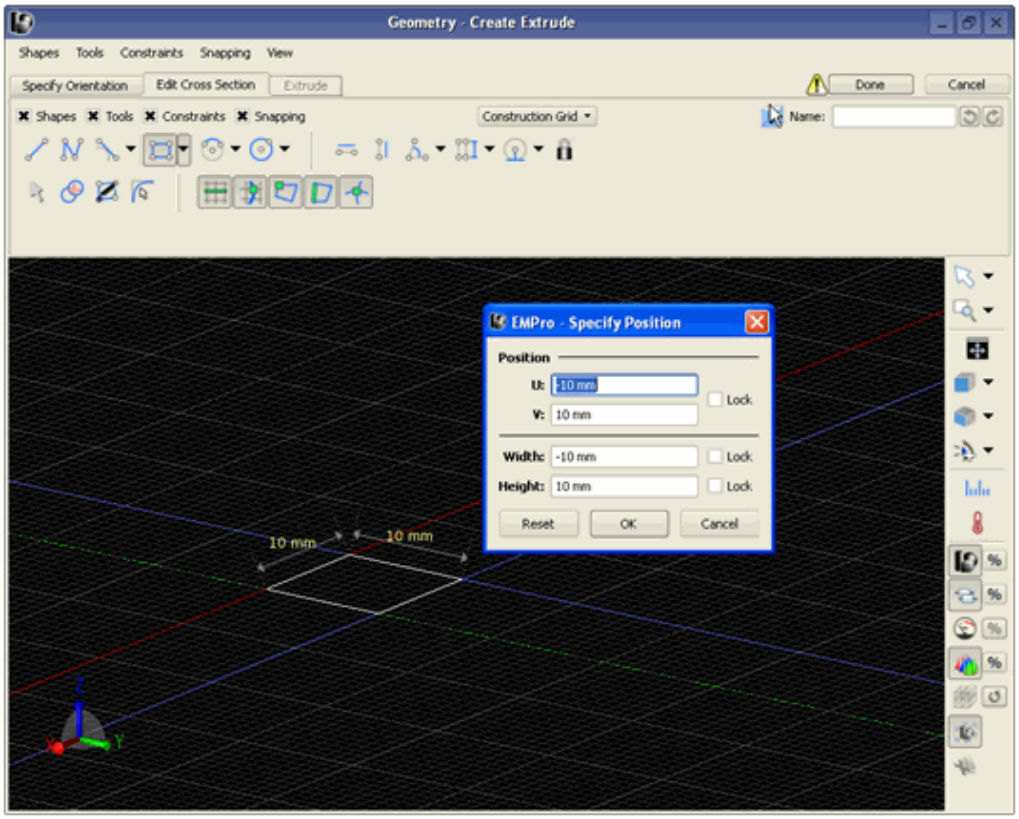
Creating 3D Objects from 2D Objects

Perform the following steps for creating 3D objects from 2D objects:

1. Select **Create** > **Extrude**.
2. Specify the **Name** of the object.
3. Set the orientation of the drawing plane. By default, XY plane is the drawing plane orientation.
4. Draw 2D objects such as circle, rectangle, or polygons.
5. Select (0,0) from the lower-left corner of the object or press **Tab** to activate the coordinate entry dialog box.

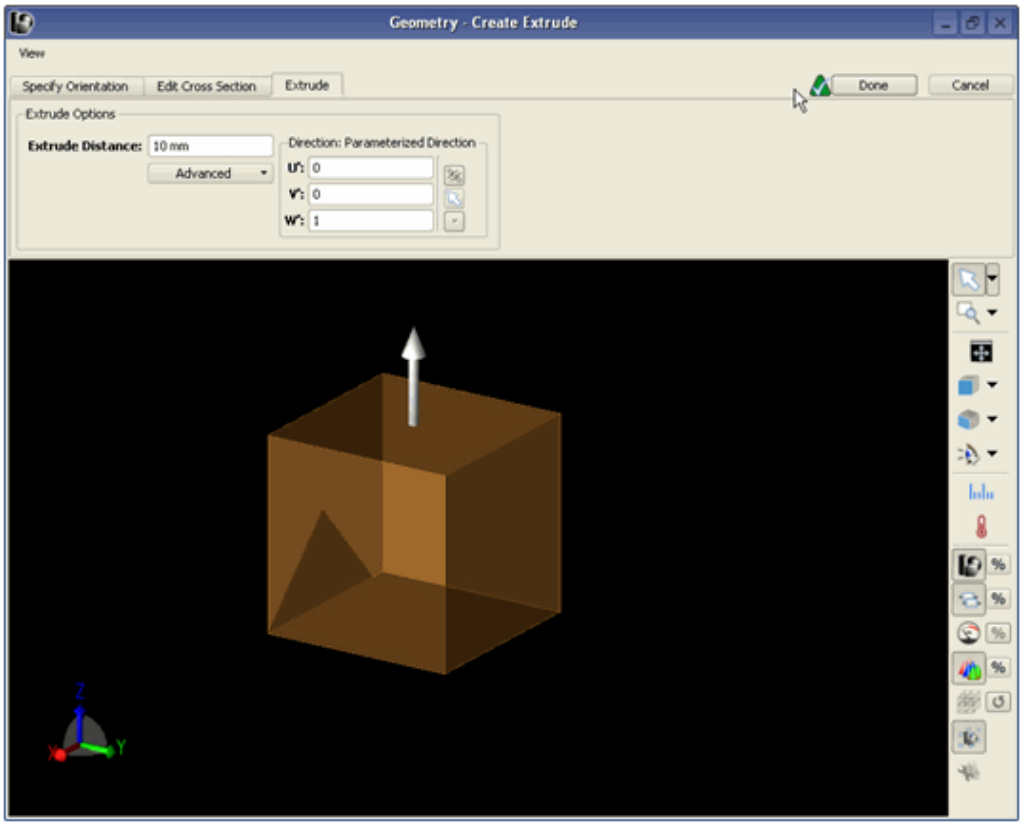


6. Extrude it to create a 3D object. Select the required coordinates or press **Tab** to open the **Specify Position** dialog box.



Note
When you move the the mouse over the drawing plane, the dX and dY (or U and V) values are displayed.

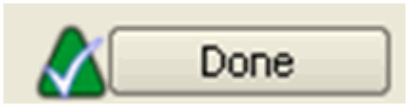
7. Click **Ok**.
8. Select the **Extrude** tab.



9. Enter a value in the in the **Extrude Distance** text box. You can also move the arrow

in the geometry space to change the distance.

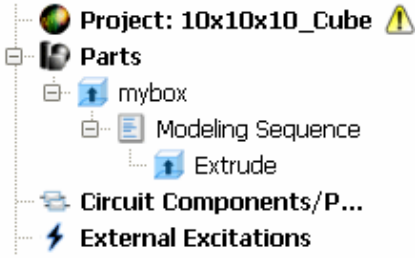
10. Click **Done**. The green check mark means that there is no problem with this object creation, as shown below:



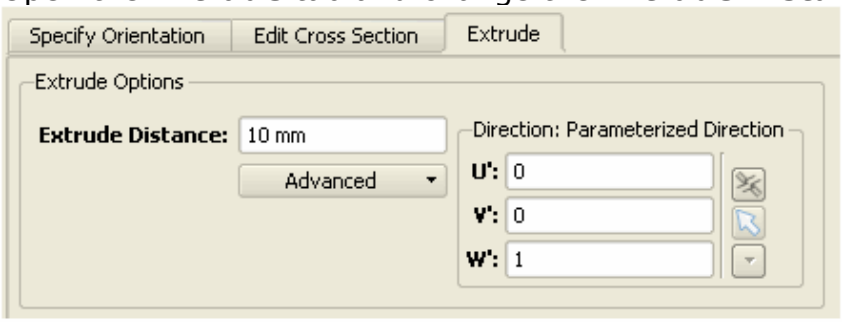
Resizing Existing 3D Objects

Perform the following steps for resizing the height of an object:

1. Open a EMPro project.
2. Expand the **Parts** menu and double-click **Extrude**.



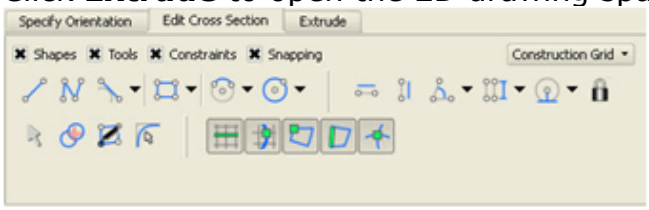
3. Open the **Extrude** tab and change the **Extrude Distance**.



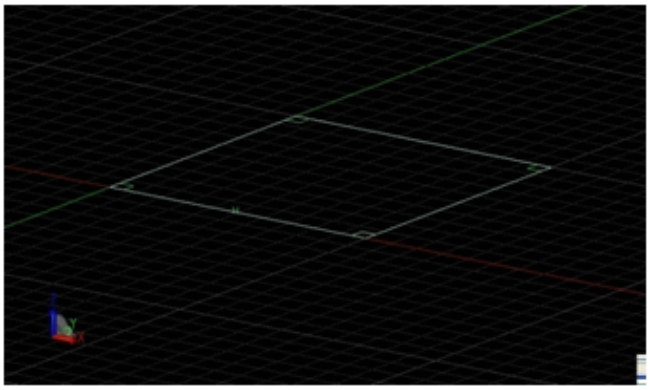
4. Click **Done**.

Editing Existing Extruded 2D Object

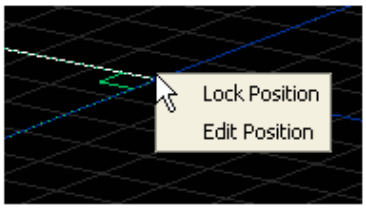
1. Click **Extrude** to open the 2D drawing space.



2. Click **Select/Manipulate** from **Tools** menu . Place the mouse over the edges or corners of rectangle, and right-click to open the **Edit/Delete** menu:

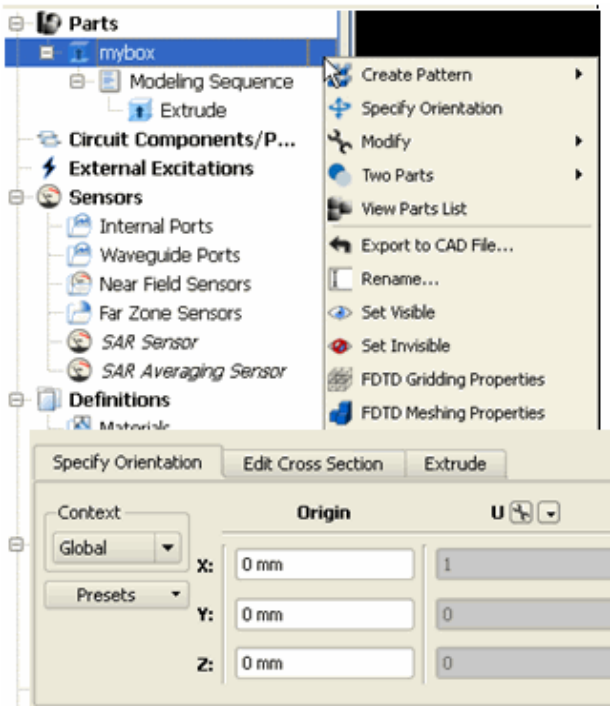


3. Delete the edges or select the vertices to edit or lock the positions.

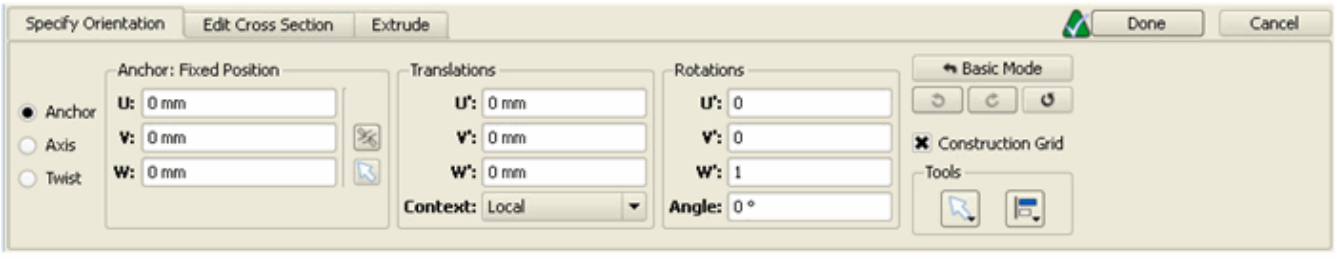


Moving (Translating)/Rotating Objects

Use "Specify Orientation" menu or tab from either the Geometry modeling menu or object created



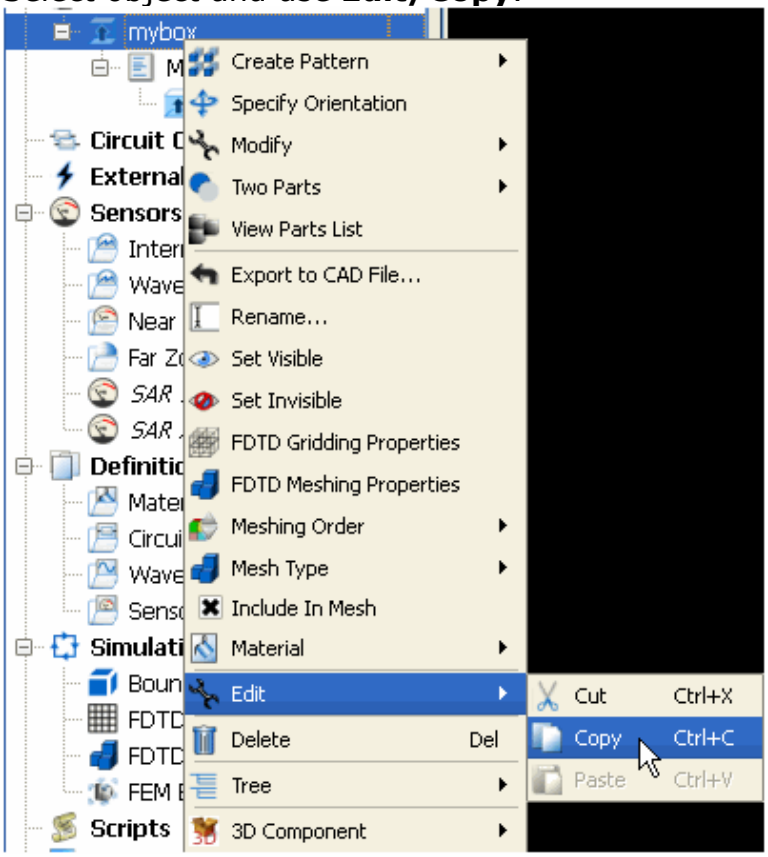
Moving objects is also referred as Translating objects in EMPro. Translation/rotation works in the local coordinate system but it can be changed to other coordinate system in the Context menu.



Copying/Deleting 2D/3D Objects

Perform the following steps for copying objects:

1. Select object and use **Edit/Copy**.



2. Select **Edit/Paste** in the **Parts** menu.

> **Note**
> Since the copy command copies onto the same position as the one being copied, you may need to translate it to other position.

Follow the same procedure for deleting an object, or you can use Delete key.

Boolean Operations

The following boolean operations are available in EMPro:

- Two Parts
- Extrude
- Revolve

The *Two Parts* tool provides several boolean operations to subtract, intersect, or unite two objects. For these operations, one object must be selected to be the *Blank*, and the other the *Tool* which acts on the blank.

Holes may also be extruded or revolved through any part with its respective tool in this menu. An object is selected in the *Pick Blank* tab and the cross section of the hole is sketched and oriented in the *Edit Profile* and *Feature Orientation* tabs, as described in the *Edit Cross Section Tab* (using) and *Specify Orientation Tab* (using), sections respectively.

Then the shape of the removed section is specified in the *Extrude Boolean* tab, or *Revolve* tab depending on which operation is selected. The *Preview* tab shows a preview of the object before the changes are formally applied to the project. For more information on defining extrusions or revolutions, refer to *3-D Solid Modeling Options* (using) in the Appendix of Geometric Modeling. An image of each boolean operation is available in *Boolean Operations* (using) in the "Appendix of Geometric Modeling".

Patterns

Patterns are created in EMPro by replicating a single selected object multiple times in one of the organized arrangements listed below.

- Linear/Rectangular
- Circular/Elliptical
  Linear/Rectangular or Circular/Elliptical patterns

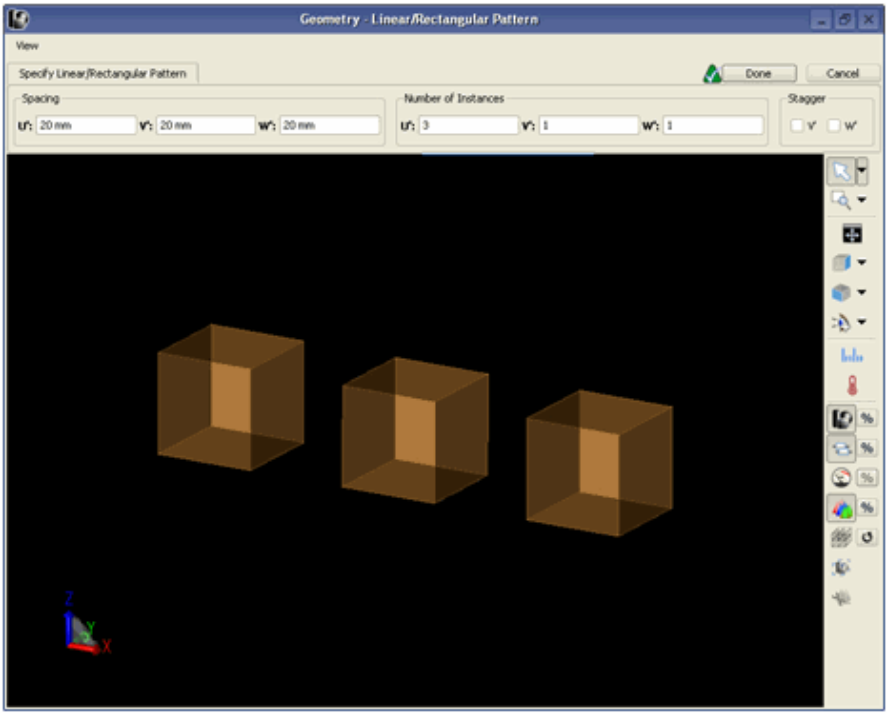


Figure: Elliptical Pattern

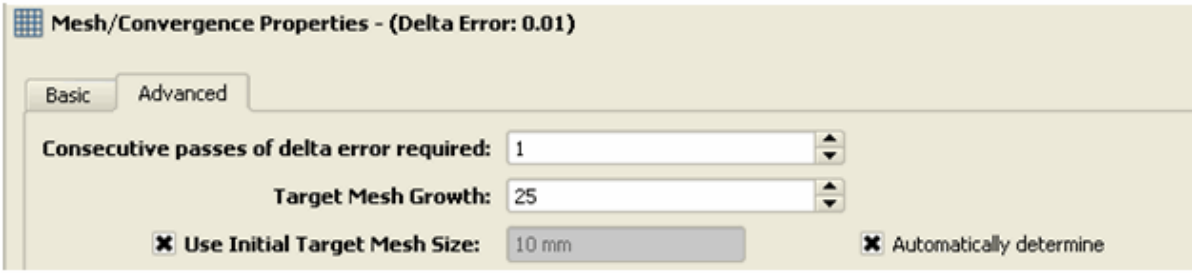
Advanced User Controlled Mesh Options

In EMPro 2010, following two advanced mesh control options are provided that allow the finer control of the initial mesh used in the adaptive refinement process:

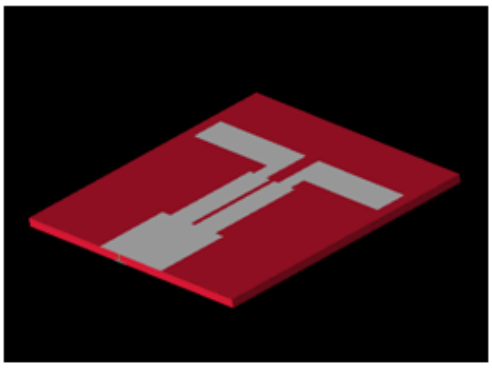
1. Initial target mesh size
2. Initial minimum mesh size

Initial Target Mesh Size

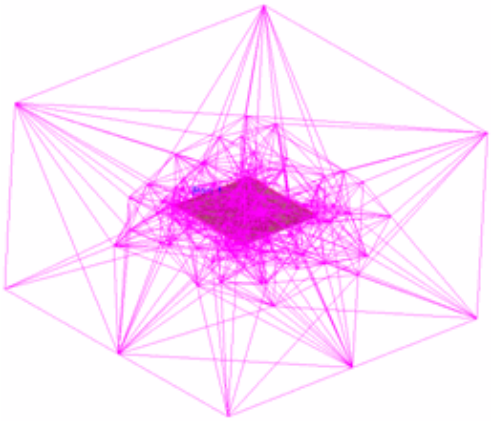
For electrically large structures it is beneficial to seed the free space with a larger number of tetrahedra than based on geometric features alone. To accomplish this, the maximum size of the edges in the initial mesh can be set to an appropriate value. Using the **Advanced** tab of the *Mesh/Convergence Properties* window (which is a part of the *Create FEM Simulation* dialog box) a length can be given (as shown in Figure below). When **automatically determine** is switched ON, EMPro provides a suggestion based on the given Frequency Plan. The automatically determined value is the wavelength in free space divided by 3.



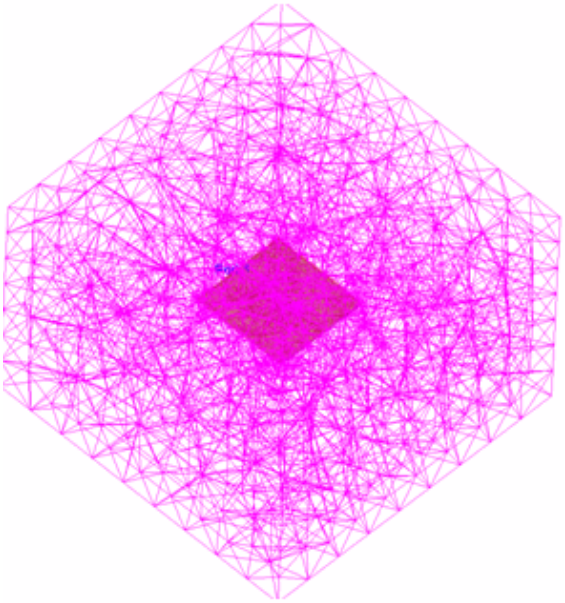
To understand this better let us take a look at the Microstrip Dipole Antenna(from **Help > Examples**):



Below is the mesh generated over freespace when **Initial Target Mesh Size** is not used:



When the same volume is meshed using the **Initial Target Mesh Size**, the mesh looks like:



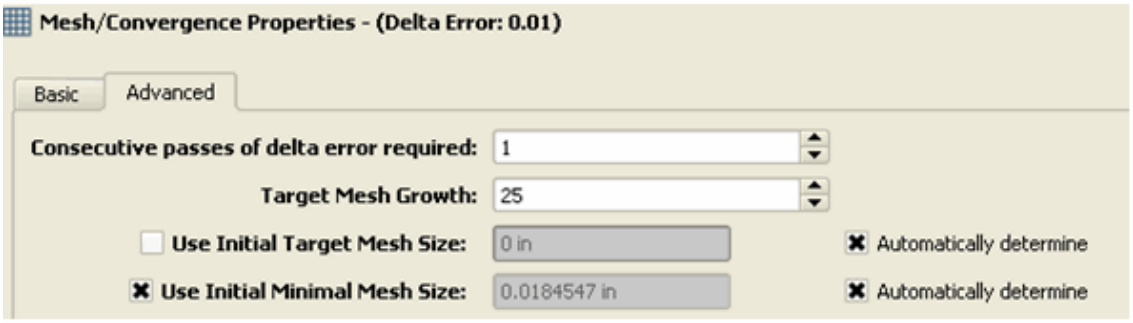
This leads to a faster convergence of iterative solver and in less number of passes in the Adaptive Frequency Sweep.

Initial Minimum Mesh Size

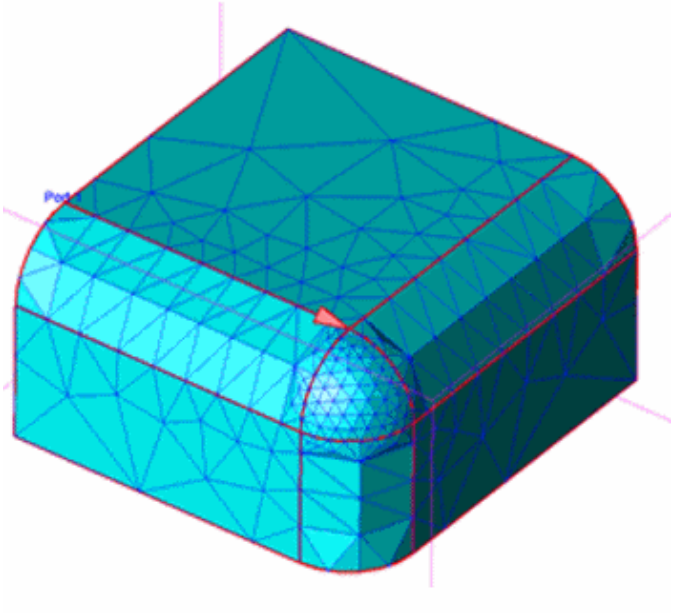
Initial Minimum Mesh Size controls the smallest length present in the initial mesh. It can be applied when there are geometric features present that are of less importance for the EM simulation. The result is a lower number of tetrahedra necessary to converge to the final solution. A typical use scenario for this feature is when a complex CAD model is imported or drawn where the geometric detail exceeds the detail required for the EM solution. The mesher is most effective in applying this constraint on curved surfaces.

Using the **Advanced** tab of the **Mesh/Convergence Properties** widget (which is a part of the *Create FEM Simulation* dialog box) a length can be given (as shown in Figure below).When the option **Automatically determine** is checked the EMPro GUI will provide

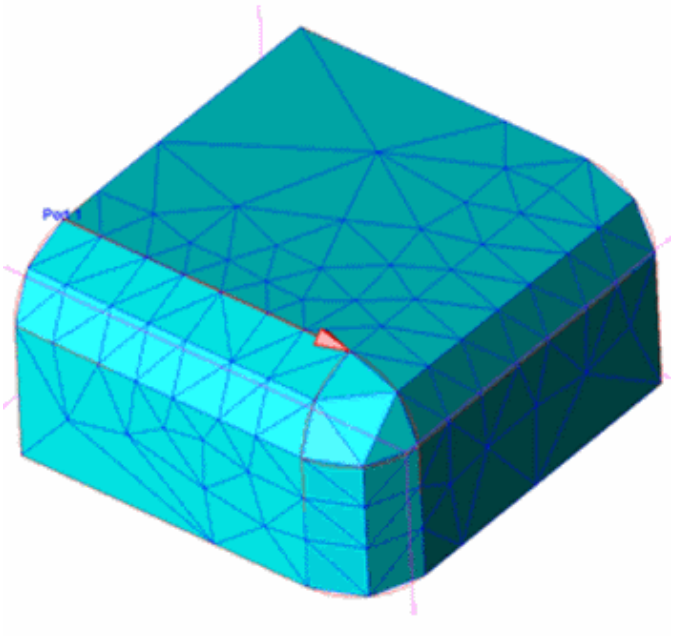
a suggestion. The suggestion is based on the size of the geometry and the value of the **Initial Target Mesh Size**. The ratio between the **Initial Target Mesh Size** and the **Initial Minimum Mesh Size** cannot be lower than 10 to provide the mesher with enough freedom to fill the solution space with tetrahedra.



The figures below illustrate the effect on a simple example when the setting minimum size is not set.



The figures below illustrate the effect on a simple example when the setting minimum size is set to 3 mm.


Port1