WIPL-D Pro CAD: What is New in 2025 Release?

The 2025 release of WIPL-D Pro CAD introduces major enhancements, powerful new features, and a wide range of improvements designed to boost performance and provide greater flexibility to users.

1. **Significant program environment upgrades:**
    a. **The new version of the program is a 64-bit application**
    b. **Working with multiple monitors is improved**
    c. **Flickering has been removed**
2. **Significant improvements to the program's operation:**
    a. **Domain Decomposition Solver can now be invoked directly from CAD**
    b. **Current Generators excitation is introduced in CAD**
    c. **Improved current calculations**
    d. **Access to new Type of Basis Functions, Physical Optics (PO), from CAD**
    e. **PEC, PMC, and Half-Space Green Functions are introduced in CAD**
    f. **Working with STL files has been improved**
    g. **Scattered field calculation is introduced when specifying Near Field results**
    h. **Pro Checker is introduced to check the correctness of IWP files**
    i. **Fast Calculation of the radiation pattern**
    j. **New ways to define custom excitation waves and far field directions of interest**
    k. **Run as Avoided with Extrapolation**
    l. **Other program's operation enhancements**
3. **Cosite (antenna systems coupling) analysis has been implemented:**
    a. **Automatically created Ellipsoids surround the area of interest around antenna systems and loadings, for the reduction of the number of unknowns**
    b. **Options to perform “Exact solution” and “Friis model solution”**
    c. **Different excitation types: Generator/Port, Field Generator, and Current Generator**
4. **Geometry modeling improvements:**
    a. **Segmented helix has been introduced**
    b. **New Split Face option**
    c. **Other geometry modeling improvements**
5. **Meshing of the structure is revised for simulation smoothness and user comfort:**
    a. **The mesh process has been accelerated significantly**
    b. **Coaxial port and waveguide port mesh and mesh for Periodic Boundaries have been improved**
    c. **Mesh quality is greatly improved for highly curved, small surfaces**
    d. **Mesh is optimized to prevent unnecessary re-meshing by monitoring changes in model settings**
6. **New possibilities when working with Symbol list:**
    a. **Supporting symbols definition expression up to 4096 characters**
    b. **Hints for the symbols table**
    c. **New mathematical functions**
    d. **Find & Replace mechanism**
7. **More flexibility for materials definitions and handling:**
    a. **Distributed loadings now apply to all metal bodies and appear in the Domain table**
    b. **Domain assignment via εr_imag, μr_imag, or via Loss Tangent (e_tan(δ), m_tan(δ))**
    c. **Metallic Pattern attribute**
    d. **After Boolean operations, new regions are now filled with vacuum instead of PEC**
8. **Additional improvements, enhancements, and bug fixes**

Enhanced Post-Processing for Smarter Insights!

The upgraded WIPL-G post-processing application offers advanced analysis and visualization of simulation results. Check out the full release notes.

1. Significant Program Environment Upgrades

This release brings a more stable software suite as we put in great effort to prevent bottlenecks and implement improvements suggested by our customers.

a) The New Version of The Program Is a 64-Bit Application

The new version of the program is a 64-bit application, which brings speed and reliable memory management compared to the previous 32-bit version. Extremely large models are smoothly previewed, saved, and meshed.

b) Working with Multiple Monitors is Improved

Advanced users will benefit when using multiple monitors, as in the new version, working in such an environment has been improved for increased user comfort.

c) Flickering has been Removed

Flickering of the Project Tree, Subtree, Symbol table, and Preview flickering during rendering, model rotations, and other preview operations have been removed.

2. Significant Improvements to the Program's Operation

There are numerous operation enhancements that have been introduced to simplify the interoperability of the programs comprising WIPL-D suite, minimize the chance of error, improve stability and robustness, and open new possibilities to boost productivity.

a) Domain Decomposition Solver can now be Invoked Directly from CAD

The new version supports a direct link to the Domain Decomposition Solver (DDS). The program is invoked by clicking on an icon located in the Simulation/Run group on the ribbon.

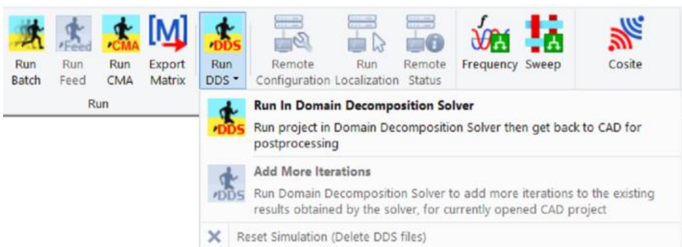


Fig. 1. How to start DDS from CAD.

Users can set the solver parameters for the initial run or subsequently add more iterations, as illustrated in the previous figure.

b) Current Generators Excitation is introduced in CAD

Current sources, i.e., generators, have now been introduced in CAD. They are set up similarly, as in WIPL-D Pro.

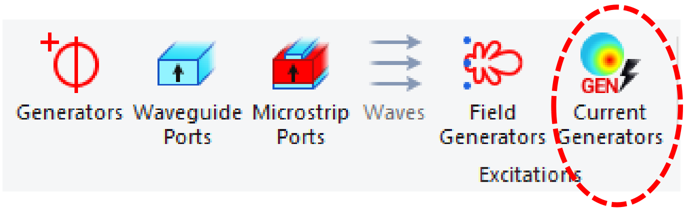


Fig. 2. Current generators in CAD.

The users fill in the necessary data in the menu, which opens by clicking on an icon located in Source/Load Tab Excitation group on the ribbon, as illustrated in the previous figure.

Then, the users should select Add to add the current generator settings or select an existing table row to edit or remove it. The table is presented in the next figure.

For Regular simulation, only one excitation, which corresponds to the first list entry, is considered. More than one excitation can only be used for Cosite simulation Friis model. Likewise, current generators cannot be mixed with other excitation types; it is only allowed for Cosite simulation Friis model (see Section 3).

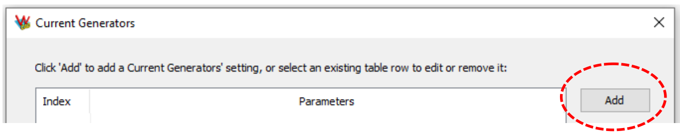


Fig. 3. Adding a current generator to the table.

Users should enter the path to the file where the current data has been defined. The source location within the model and its orientation can be adjusted – the current source can be translated and/or rotated according to the users' preferences by entering required data in the Current Generators table, as shown in the next figure.

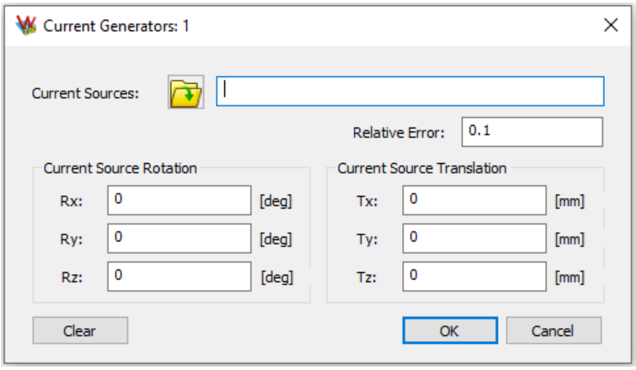


Fig. 4. Adjusting location and orientation for the imported current generator.

Where symmetry planes are defined, images of imported CSs can be included when calculating the radiation pattern, see the next figure for setting up current calculation (Home > Output Results > Currents).

c) Improved Current Calculations

Adaptive setting of the number of points as in WIPL-D Pro for Low/Medium/High current density.

An equivalent current source can be created from this menu by checking Create current sources field.

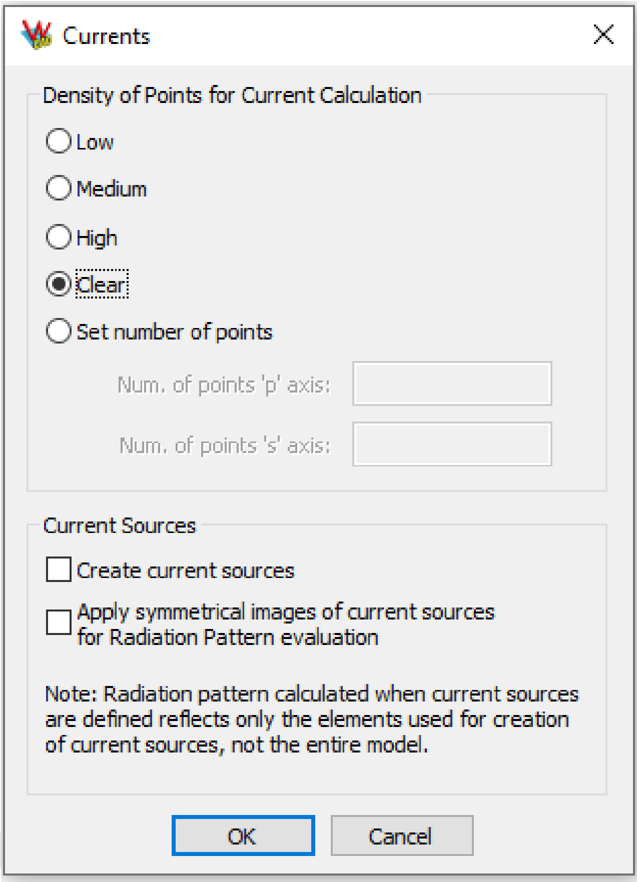


Fig. 5. Specifying density of points for current calculation.

d) Access to new Type of Basis Functions, Physical Optics (PO), from CAD

A novel type of Basis Functions has been introduced, Physical Optics (PO). This type can be selected for metallic structures only when one of the Scattering operation modes is active. They are most suitable for large scattering problems where approximate yet very accurate solution is required.

e) PEC, PMC and Half-Space Green Functions are Introduced in CAD

Another enhancement introduced with the analogy with Pro are the three new Green’s functions: PEC, PMC and Half-Space. They can be specified by clicking on Symmetry icon from Home/Define group.

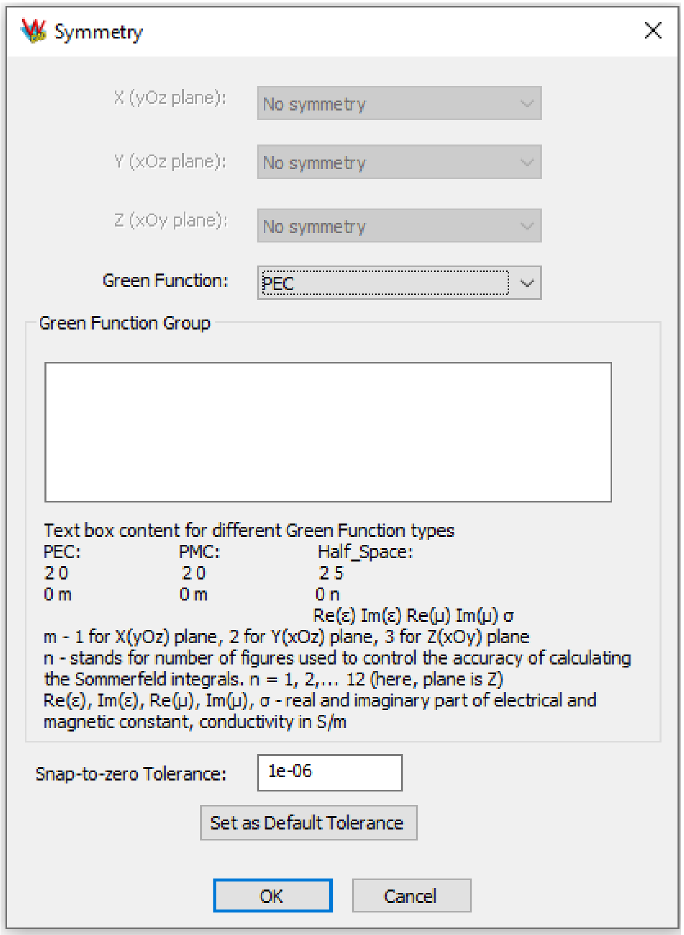


Fig. 6. Specifying Green’s function calculation.

For user comfort, the hints on how to fill in the field to use a particular Green’s function are included in the body of the Symmetry menu, as shown in the previous figure.

f) Working with STL Files has been Improved

Decimation and Meshing capabilities from WIPL-D Pro STL Editor have been adopted. The program automatically recognizes that STL file has been opened. Then the Mesh Settings window looks like shown in the next figure. Three meshing methods, each with its specific Decimation style, are available for selection.

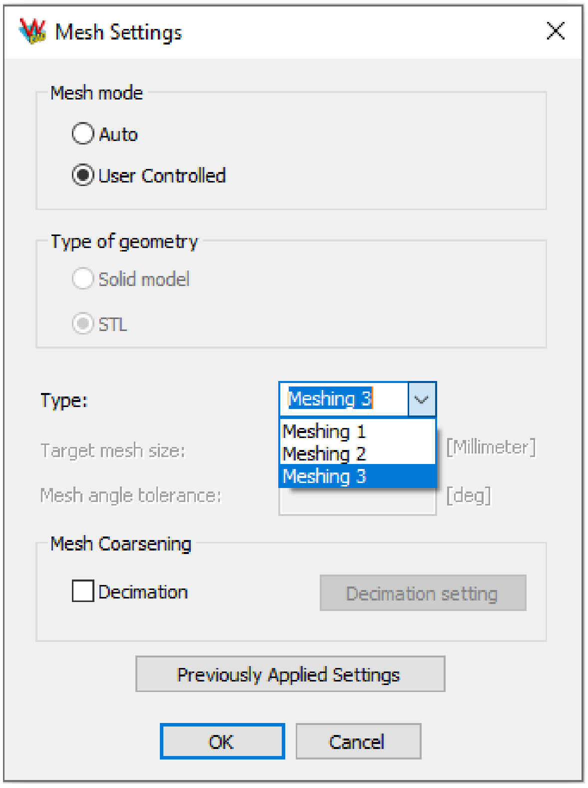


Fig. 7. Mesh settings for STL files – predefined settings.

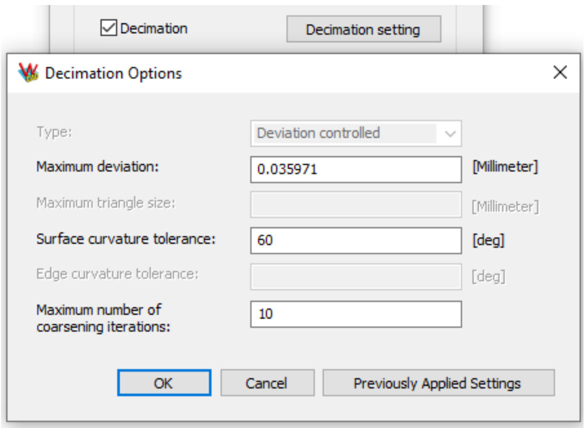


Fig. 8. Mesh settings for STL files – user defined settings.

Users can override the default decimation settings for each of the three methods by checking the Decimation field and opening the Decimation setting menu that becomes active.

More details on meshing methods and decimation settings can be found in WIPL-D STL Editor Manual.

g) Scattered Field Calculation is Introduced when Specifying Near Field Results

When specifying the output results, in Near Field table for both Scattering modes (Monostatic and Bistatic) users can now select to output the scattered field. This means that after the simulation finishes, the data for the near scattered field only (not the superposition of direct and scattered field) is available for display. This option is selected by choosing the *Scattered field only* option from the Near Field settings, as illustrated in the following figure.

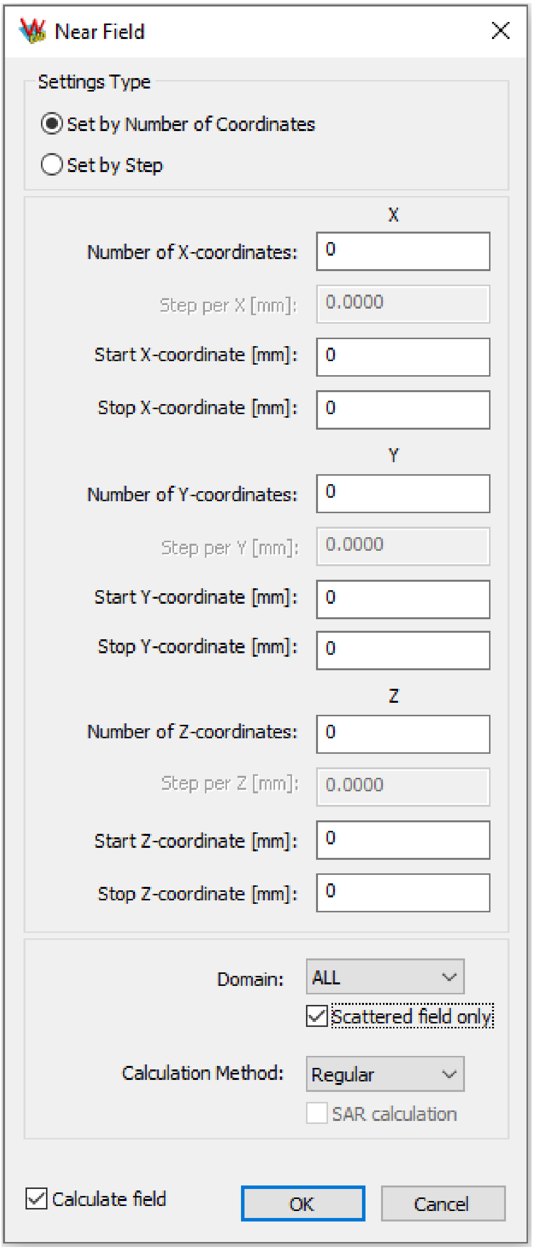


Fig. 9. Choosing Scattered Near Field calculation.

h) Pro Checker is Introduced to Check the Correctness of IWP Files

Pro Checker is introduced in CAD in order to check the correctness of IWP (mesh, i.e. simulation ready) file. The checking is executed by clicking Check Sim Ready File on Simulation/Mesh group as presented in the next figure.

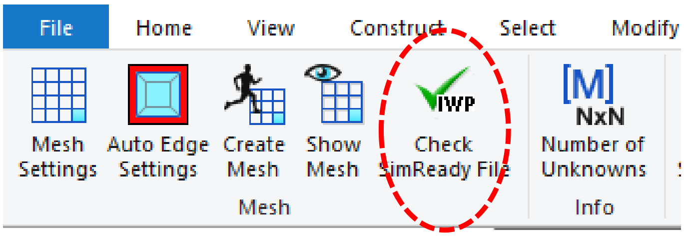


Fig. 10. Starting Check IWP file command.

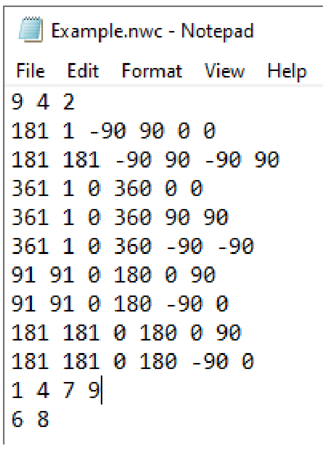
i) Fast Calculation of Radiation Pattern

A novel method of radiation pattern calculation has been developed. The method can be selected by checking Configure/Advanced Modeling/Fast Radiation Pattern evaluation option.

Users are encouraged to use it regularly, and perhaps for mission-critical projects, verify the results by comparison with the results obtained with classic method.

j) New Ways to Define Custom Excitation Waves and Far Field Directions of Interest

A new type of file format, .nwc, has been introduced which could be used with Big (Farfield) Data Calculation, where a large number of calculation directions and excitation waves are defined using direction grids. An example is provided in the next figure.


Example.nwc - Notepad

File Edit Format View Help

```
9 4 2
181 1 -90 90 0 0
181 181 -90 90 -90 90
361 1 0 360 0 0
361 1 0 360 90 90
361 1 0 360 -90 -90
91 91 0 180 0 90
91 91 0 180 -90 0
181 181 0 180 0 90
181 181 0 180 -90 0
1 4 7 9
6 8
```

Fig. 11. The .nwc file.

The interpretation of the data listed in the file are as follows:

In the first line, a total number of 9 direction grids is specified, where only 6 provide data for the simulation, 4 for excitation, and 2 for far field calculations. Nine direction grid line containing grid specification follow, the format is as described for .nwa files. Finally, line 11 presents that 1st, 4th, 7th, and 9th direction grid lines will be used to define the excitation grid, while line 12 specifies that lines 6 and 8 describe grids that will be used for far field calculations. More details on the specifications of .nwc file can be found in the User's Manual.

k) Run as Avoided with Extrapolation

Sometimes it is beneficial to have a rough estimate about the values of an important parameter as precise determination of the parameter would require significant computer resources. One illustrative example could be the RCS calculation of a target at a high frequency where the number of unknowns is prohibitive, as it would take a larger amount of memory than available.

To provide user with a reasonably accurate approximate result in such cases, a new computing option called Run as Avoided with Extrapolation has been introduced. Basic idea behind the new option is to extrapolate current distribution calculated on operating frequency to higher frequency and calculate RCS based on the extrapolated distribution without performing usual MoM calculation at higher frequency. The extrapolated current densities can be combined with Physical Optics (PO) calculation and weighted so that PO weight increases as the desired frequency departs from the frequency where exact solution has been calculated.

The calculations are invoked from Simulation > Run > As Avoided With > Run as Avoided with Extrapolation menu where averaging can be switched on/off by checking/unchecking the corresponding box. The frequency at which the extrapolated solution is required should be entered in the field Frequency and by clicking OK extrapolated solution calculation starts.

The avoided regime for calculations is set up automatically. Previously described method of fast Radiation Pattern calculation is also automatically invoked when using Run as Avoided with Extrapolation. At this point, the extrapolated calculation works with scattering modes, monostatic and bistatic only, and (A)symmetry, PEC/PMC and Rotation (PEC) setting cannot be used.

l) Other Program's Operation Enhancements

Numerous additional improvements have been implemented in the latest release, such as:

a. Improved robustness for Avoided Run which now supports projects with Field Generators. Also, Frequency Parallel and Frequency Dependent simulations are supported in Avoided mode.

b. Local settings parameters are more robust now.

c. Validation is significantly accelerated and a warning is introduced for Validation of projects with symmetry planes. For the Frequency Selective Surface (FSS) in the picture below, where Booleans were conducted through Validate, current model read-in time is 0.5 min while previously it was 10 min.

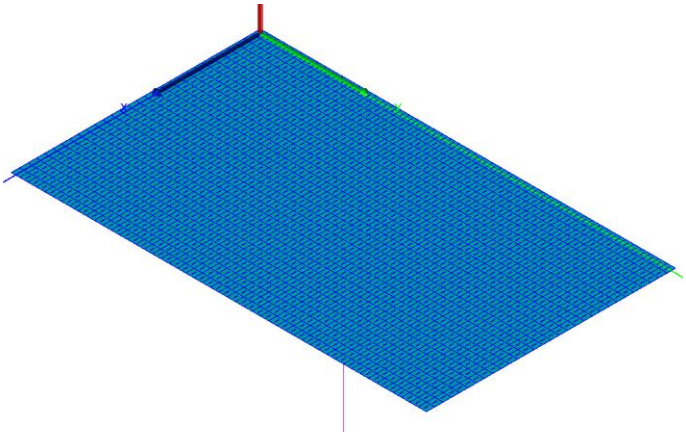


Fig. 12. Frequency Selective Surface (FSS) where validation has been accelerated around twenty times.

d. Assembly structure export is enabled.

e. Optimization of projects with waveguide load is more robust.

f. De-embedding changes made from graph viewer, WIPLG, are adopted for subsequent model simulation (useful for optimization e.g. scanned antenna arrays).

3. Cosite (Antenna Systems Coupling) Analysis has been Implemented

This novel program feature brings the possibility to explore the potential of interference between various systems located on large platforms by calculating the mutual coupling between the antennas/antenna systems, in the wide frequency range. Each antenna system may, of course, comprise a number of antennas i.e. an array. A typical example includes several antennas on a drone, as illustrated in the following figures where three of the antennas are presented. Electrically large scenario should be judiciously simplified to be simulated in real time and with available computing resources without sacrificing accuracy.

The RF Cosite Simulation Settings becomes active when pressing the Cosite icon on the Simulation tab.

Fig. 13. Cosite simulation icon is located at Simulation tab.

The following menu appears, allowing the user to control the approximation process.

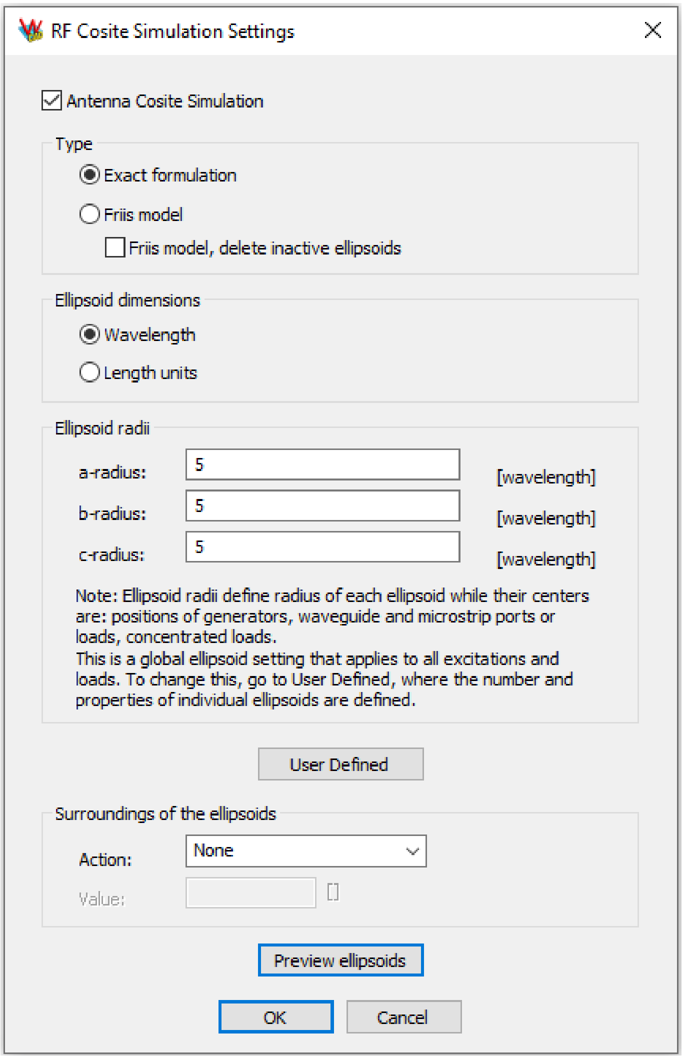


Fig. 14. Cosite simulation settings.

a) Automatically Created Ellipsoids Surround the Area of Interest around Antenna Systems and Loadings, for Reduction of Number of Unknowns

The first step in simplification of an electrically large structure is to define a volume centered around each antenna system (or loadings for passive antennas). The volumes around the antenna/loading are regarded as significant for subsequent EM simulation and are defined through specification of the ellipsoids that encompass the antenna.

A platform with three antennas and the corresponding ellipsoids is presented in the next picture.

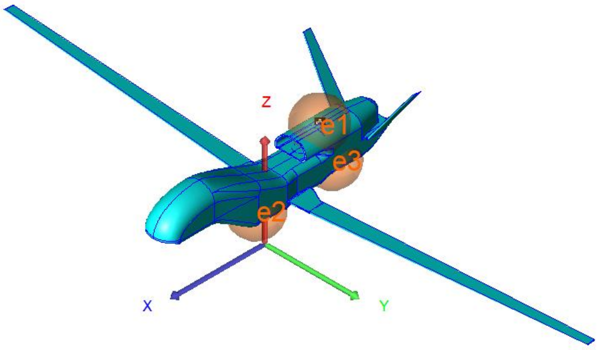
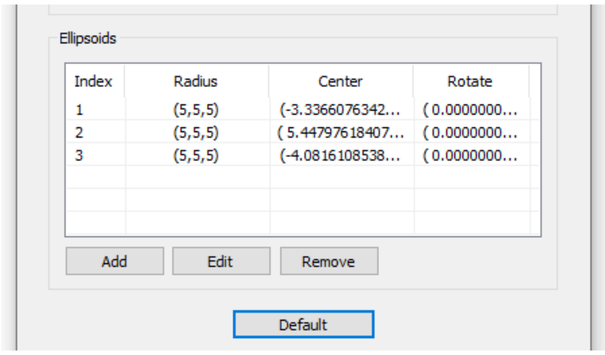


Fig. 15. Example of ellipsoids created around antennas.

Ellipsoid radius can be expressed in electrical (wavelengths) or geometrical (length) units. Dimensions of the ellipsoids are set up through a, b and c radius which can be made equal for all the ellipsoids in the structure. Alternatively, each ellipsoid might have a particular set of parameters which are set up in a table Ellipsoids that pops up after pressing User Defined button. The appearance of the table is presented Fig. 15.



Index	Radius	Center	Rotate
1	(5,5,5)	(-3.3366076342...	(0.0000000...
2	(5,5,5)	(5.44797618407...	(0.0000000...
3	(5,5,5)	(-4.0816108538...	(0.0000000...

Fig. 16. Settings for ellipsoids radii can vary from one ellipsoid to another.

Starting from specified ellipsoids, the user can opt for one of the ways to reduce the number of unknowns. The options are available from the Action submenu.

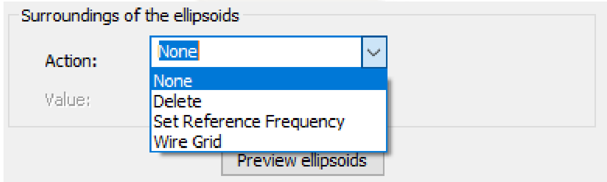


Fig. 17. Three options to set Cosite simulations.

The option *Delete* will delete the parts of the scenario not included in the ellipsoids.

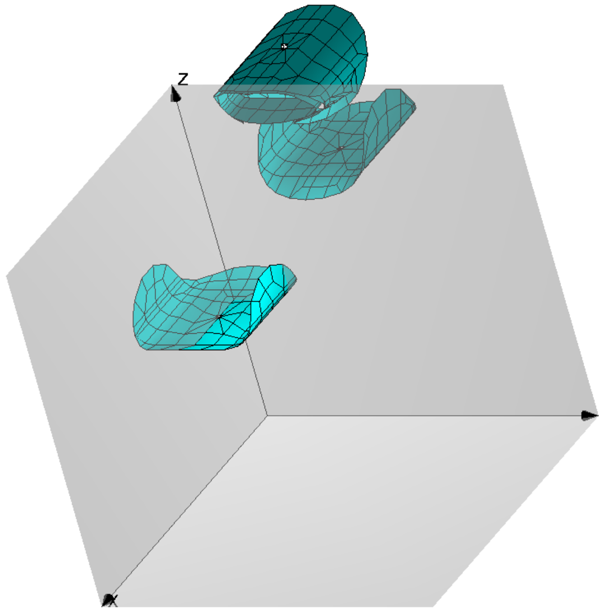


Fig. 18. Option Delete leaves only parts of the structure encircled by ellipsoids.

The *Set Reference frequency* is used to reduce the reference frequency on the parts outside the ellipsoids.

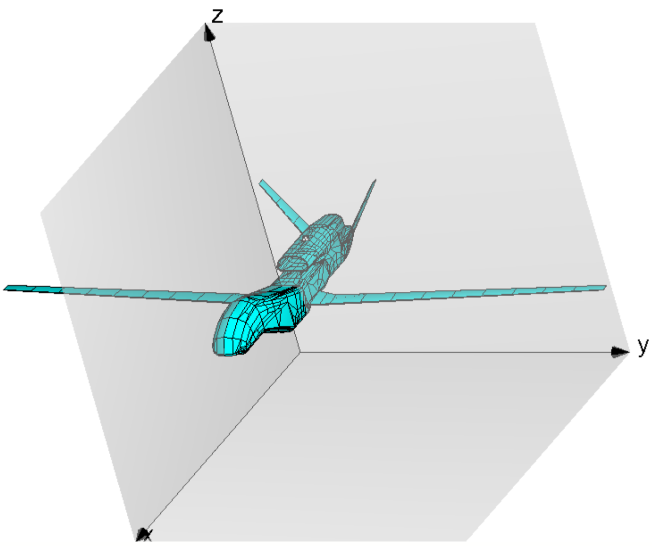


Fig. 19. Option Set Reference Frequency analyzes the whole structure, but the area not encircled by ellipsoids is meshed for lower reference frequency.

Wire Grid option creates wires in the areas outside of the ellipsoids, that provide current flow instead of bilinear plates. This option, as previous one, provides significant acceleration hance the size of the MoM model is reduced a number of times but should be used with caution to maintain model accuracy.

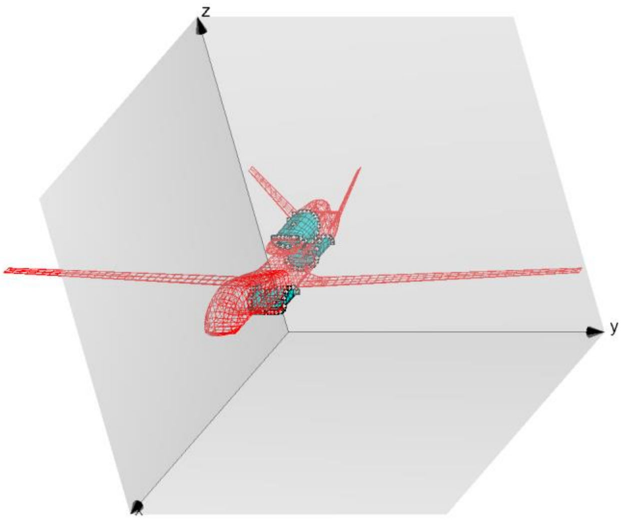


Fig. 20. Option Wire Grid creates wires instead of bilinear plates outside of the ellipsoids that surrounds antenna systems.

Finally, by choosing *None*, the user will choose to keep the scenario as it is which practically means to replicate the exact solution (no reduction in the number of unknowns).

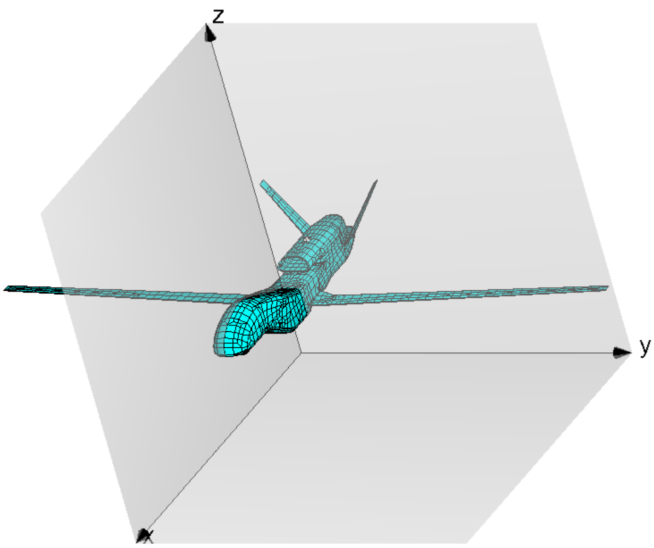


Fig. 21. Option None analyzes the whole structure without any approximation – Exact solution.

b) Options to Perform "Exact solution" and "Friis Model Solution"

When selecting the Exact formulation, the user calculates the coupling between the antennas directly from EM simulation.

Alternatively, the approximative method can be used based on the utilization of the Friis formula. In this method, the program uses full 3D simulation to calculate the antenna gains along the direct paths between each antenna pair and uses these values to replace corresponding values in the Friis formula. This approach is particularly useful when one should combine the EM simulation results obtained for the antenna which has the 3D model available with antenna having only measured data or data from data sheets available. The latter antennas can be represented with corresponding Field or Current generators.

Friis formulation allows deletion of so-called inactive ellipsoids, i.e. while calculation radiation from one antenna system to another the feature deletes geometry inside all other ellipsoids besides currently active one with currently active antenna system. This feature, used with caution, also reduces the size of MoM problem and speeds up simulation.

c) Different Excitation Types: Generator/Port, Field Generator and Current Generator

The antenna connection, mentioned previously, can take several forms such as Generator/Port, Field Generator and Current Generator. Generators and ports are required to define any type of antenna modeled in WIPL-D suite, while field and current generators allow for the use of measured or simulated data. These different types of antenna connections can be combined as needed, and multiple instances can be used within a single project.

4. Geometry Modeling Improvements

a) Segmented Helix has been Introduced

Segmented helix (a helix which is broken into segments) has been introduced to make the Sweep mechanism pass more easily and consequently to obtain higher quality mesh. Specifications of the helix is invoked by pressing the Helix button on Construct Reflector/Helix group.

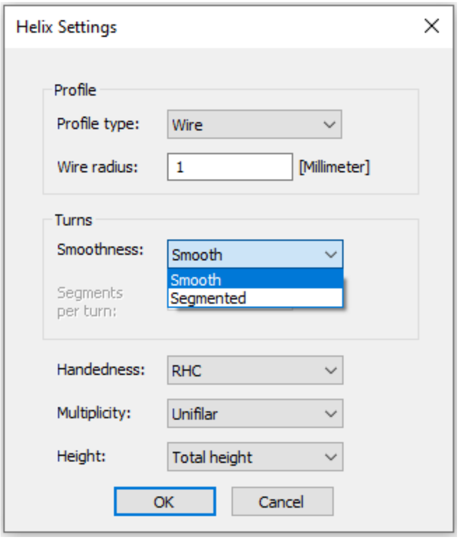


Fig. 22. Helix settings in new version – Segmented helix has been added.

The Helix Settings window opens where users can choose between Smooth and Segmented helix design. For Segmented designs, users can specify the number of segments per turn. The example of the smooth and segmented 5-turn helix is shown in the next figure.

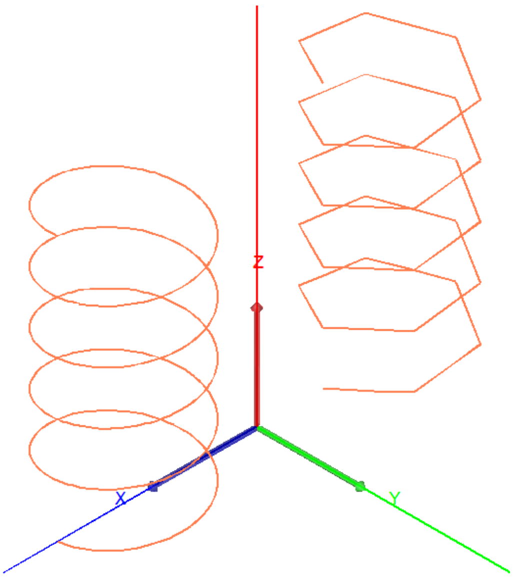


Fig. 23. Differences between Smooth and Segmented helix.

b) New Split Face option

This option introduced in the latest software release forces division of a face along parametric lines of the geometric surface. This is a powerful method to force finer meshing for particular faces.

The option is invoked by selecting a face of interest, clicking the right mouse button and then choosing Split by Parameter, or from menu Modify > Alter > Split Face.

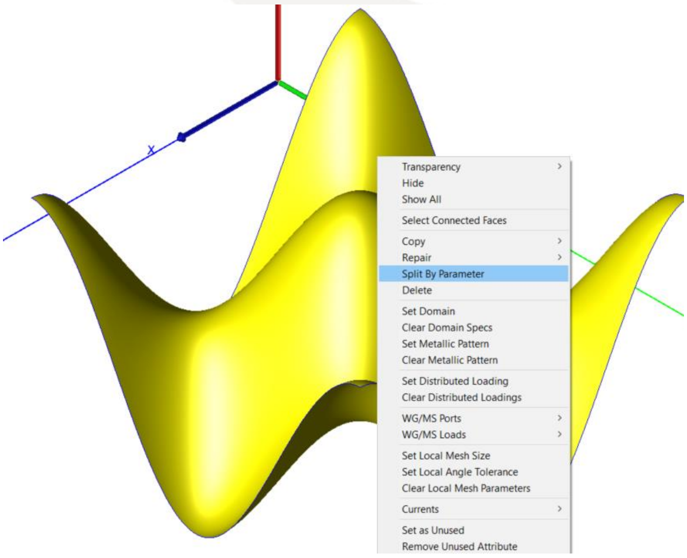


Fig. 24. Complex surface before Split Face command.

The following menu appears which should be filled in with numbers of division lines along u and v parameters.

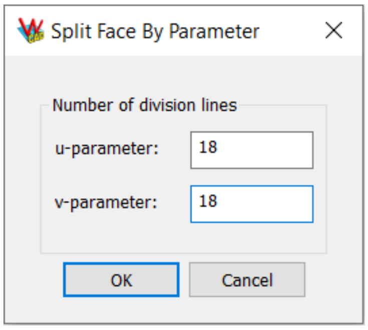


Fig. 25. Specifying division along each parameter.

After the desired division has been set and the menu released by clicking OK, the selected face is split into smaller pieces, as shown in the next picture.

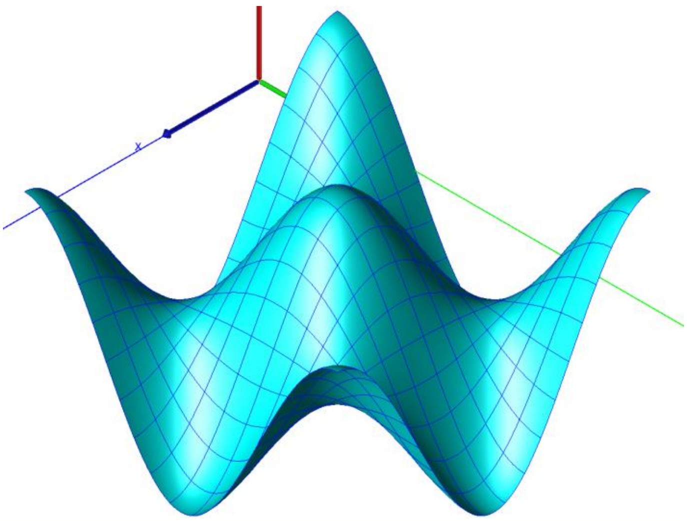


Fig. 26. Complex surface after Split Face command.

c) Other Geometry Modeling Improvements

The other geometry modeling improvements include:

a. Improved user experience when performing the Wrap operation.

b. Copy Layer for imported models from WIPL-D Pro (IWP files) works much smoother in a new version. Sometimes, Parasolid fails to perform Copy Layer for such bodies, so more robust operation is invoked in this particular case which includes procedure from WIPL-D Pro where IWP is native format.

c. Copy layer is now maximally robust for all body topologies. The algorithm preprocesses surfaces in several ways making it possible for the operation to execute.

d. Boolean operations were accelerated with performing more efficient check for possible geometry faults.

5. Meshing of the Structure is Revised for Simulation Smoothness and User Comfort

Meshing is considered a crucial step in using the program, and constant emphasis is placed on improvements.

a) The Mesh Process has been Accelerated Significantly

Meshing phase is accelerated many times for some models.

For example, for the model of absorber shown in the next picture the whole procedure now takes ~40 sec compared with ~7.5 min before.

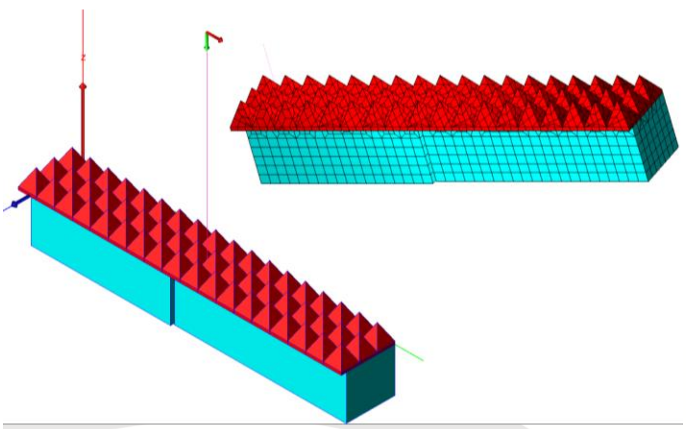


Fig. 27. Meshing a piece of absorber has been accelerated more than 10 times.

One of the models showed a huge acceleration, it used to take few hours, now it takes around ten minutes, etc.

b) Coaxial Port and Waveguide Port Mesh and Mesh for Periodic Boundaries have been Improved

The mesh quality and correctness are higher as several bugs were fixed for certain situations related to ports, and PBC structures.

c) Mesh Quality is Greatly Improved for Highly Curved Small Surfaces

In the next figures an airplane model is shown. The plane model has parts with very small radius of curvature.

The airplane model is therefore not ideally suited for CAD modeling and EM simulation. In such cases, original mesh algorithm tends to produce inadequate and uneven mesh which might cause numerical errors or slow convergence.

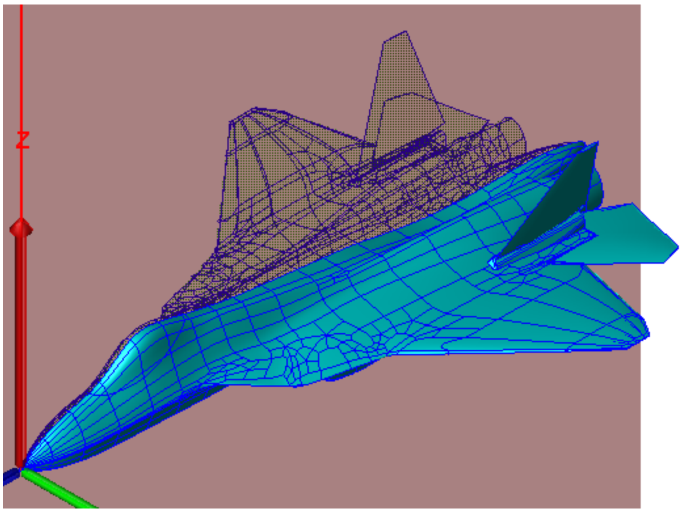


Fig. 28. Meshing of an airplane with parts having very small radius of curvature.

The following figure shows significant mesh quality improvement with a new algorithm implemented for some surface elements. The left side shows mesh produced with improved algorithm, while the right side shows the same area meshed with original algorithm. As can be seen, the original mesh struggles to maintain high quality factor on some surfaces, giving many narrow and dense faces.

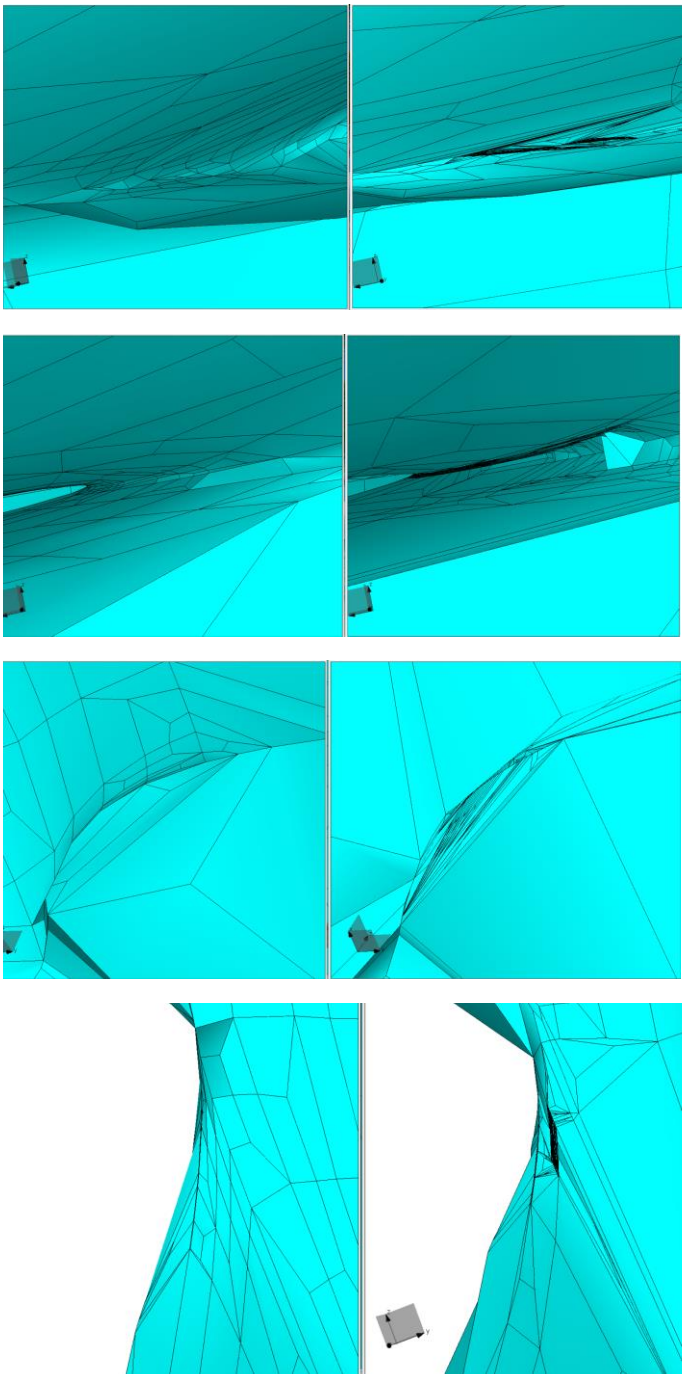


Fig. 29. The mesh resulting from Improved (left) vs. old (right) meshing algorithm.

d) Mesh is Optimized to Prevent Unnecessary Re-meshing by Monitoring Changes in Model Settings

Model changes that are not supposed to trigger mesh are monitored to avoid remeshing. These include changing output results settings, automatic edging, and much more.

6. New Possibilities when Working with Symbol List

Many actions have been put in place to make working with the Symbol list more comfortable and flexible.

a) Supporting Symbols Definition Expression up to 4096 Characters

To offer users greater flexibility, the Symbol list now supports symbols definition expression with up to 4096 characters.

b) Hints for Symbols Table

In the new version, several hints on how to use some features are provided while hovering over the list heading. The information provided is displayed in the next picture.

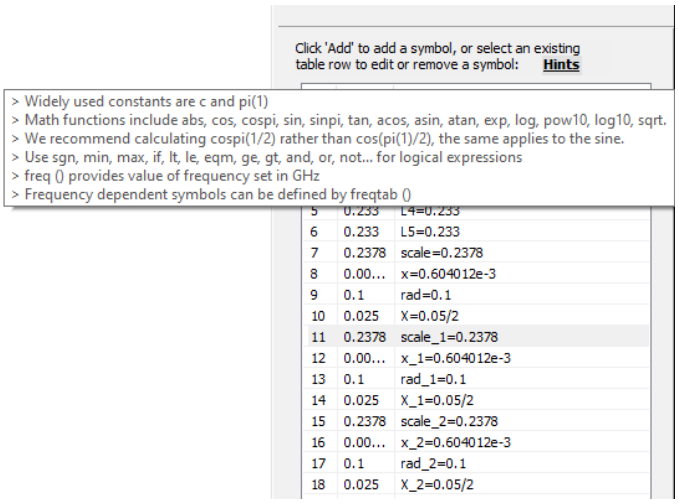


Fig. 30. Hovering above the Symbol list brings Hints about Symbol list essentials.

c) New Mathematical Functions

New mathematical functions sinpi(), cospi(), and sqrt(), have been introduced.

N..	Value	Symbol Expression
1	0	x1=sinpi(0)
2	1	x2=sinpi(0.5)
3	0	x3=sinpi(1)
4	0.707...	x4=sinpi(0.25)
5	1	y1=cospi(0)
6	0	y2=cospi(0.5)
7	-1	y3=cospi(1)
8	0.707...	y4=cospi(0.25)
9	10	z1=sqrt(100)
10	1.414...	z2=sqrt(2)
11	4	z3=sqrt(16)

Fig. 31. New mathematical functions sinpi(), cospi(), and sqrt().

sinpi(), cospi(), are common trigonometric functions with arguments in brackets automatically multiplied by π, as illustrated in the previous figure. Sqrt() is a common square root function that was previously entered through power function (as ()^0.5).

d) Find & Replace Mechanism

When the Symbols List is viewed in text box mode, Ctrl+F launches the Find & Replace dialog (the same holds for History List).

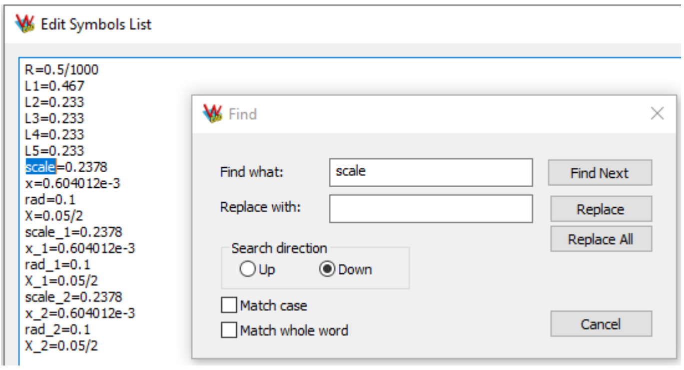


Fig. 32. Find/Replace can be used if the text editor is invoked for the Symbol (and History) list.

7. More Flexibility for Materials Definitions and Handling

Several additions have been made related to material definitions and handling complex situations where material assignments should be resolved.

a) Distributed Loadings now Apply to All Metal Bodies and Appear in the Domain Table

When defining distributed loadings, it can be automatically applicable to all metallic surfaces, PEC domain, without the necessity to apply it on each surface separately.

All distributed loadings are also listed in a table for domains i.e., materials, so all data about material properties, losses, etc., is available in one place.

b) Domain Assignment via εr_imag, μr_imag, or via Loss Tangent (e_tan(δ), m_tan(δ))

In addition to defining the real and imaginary parts of the dielectric permittivity or permeability, in general, the material can now be defined by choosing the appropriate Loss Tangent. The option is set from menu Configure > Dialog Options > Domains.

c) Metallic Pattern Attribute

This attribute can be defined on selected entities after right mouse click and selected Set Metallic Pattern or from menu Modify/Set Properties/Material Properties.

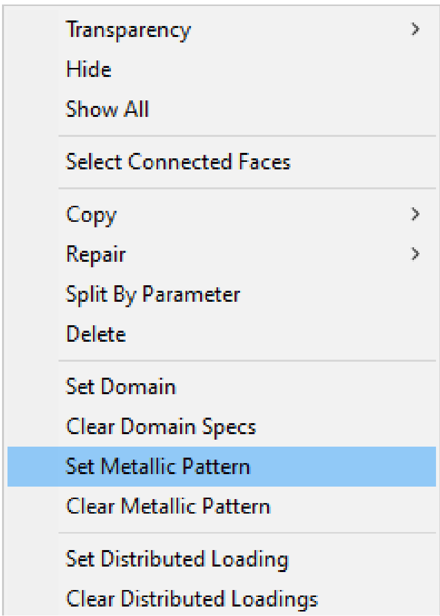


Fig. 33. Setting up the Metallic Pattern attribute

This setting keeps selected surfaces metallic after Boolean and any geometry operations, which is very useful for printed structures. Users don't have to worry if metallic parts will change their material properties while creating the model.

d) After Boolean operations, New Regions are now Filled with Vacuum instead of PEC

In the latest software version, after Boolean operations are performed, newly created regions are filled with vacuum, not with PEC as before. This is more natural and avoids errors in region domains during Booleans, Validation etc.

8. Additional Improvements, Enhancements, and Bug Fixes

a. Average Mesh Q factor is calculated and displayed after the meshing process is finished. Once the simulation is done, the mesh quality factor value is written in the OWP file.

b. Coinciding plates are now automatically recognized during the meshing procedure and are consolidated.

c. The import of WIPL-D Pro CAD models and the import of WIPL-D Pro models have been improved.

d. Multiple occurrences of geometry instances have been resolved and import accelerated for standard formats (STEP, IGS, etc.)

e. Improved consistency of numbering of generators/ports in Preview for (A)Symmetry projects.

f. Consistency of numbering of generators/ports during the Multiple Copy operation has been made more user-friendly.

g. Resetting the cutting planes (Y, Y and Z) to its original position is available

h. New modes of running from the command line:

   - ***sr*** - silent run, does not open CAD GUI, preview, project tree…
   - ***sm*** - silent mesh, does not open CAD GUI, preview, project tree…
   - ***fsr*** - full silent run, does not open CAD GUI, preview, project tree... Does not show solver window (wipler.exe)

i. Undo/Redo novelties:

   - Undo/Redo All has been introduced, enabling improved navigation through list of commands.
   - Switching quickly between Undo/Redo is no longer causing crash.

j. Multiple bug fixes are introduced.