

QUICKWAVE 2017

SOFTWARE FOR ELECTROMAGNETIC DESIGN AND SIMULATIONS

QUICKWAVE-3D QUICKWAVE-V2D

QW-MODELLER

QW-ADDIN FOR AUTODESK® INVENTOR® SOFTWARE

QW-BHM QW-GPUSIM QW-MULTIGPUSIM QW-OPTIMISERPLUS QPRONY



QWED has continued efforts on extending availability and functionality of the *QuickWave* software for electromagnetic design as well as the scope of its applications.

The most visible change in *QuickWave 2017* is the Ribbon GUI that appears in the *QuickWave Editor* and in *QuickWave Simulator*. All commands in the Ribbon are organised in a series of tabs divided in sections with grouped commands and contain various types of buttons and controls. *QuickWave Editor* is equipped in the main Ribbon containing all commands needed for creating complete project for FDTD electromagnetic simulation with *QuickWave Simulator*. *QuickWave Simulator* is equipped with the main Ribbon and window dedicated Ribbons containing all commands needed for running electromagnetic simulation, checking the FDTD mesh, observing the electromagnetic fields and components and getting the simulation results. For the convenience of the users, we kept the possibility of using the previous Toolbars style. The choice can be made during the first run of *QuickWave Editor* and *QuickWave Simulator* or later with the use of readily accessible commands from the menu.

All main menus and windows' menus in *QuickWave Editor* and in *QuickWave Simulator* were organised thematically, what provide easy access to options and commands.

The new *QuickWave Help* system provides easier and faster access to the specific topics. The *QuickWave Help* system is divided into subcategories and is available from every window and dialog of *QuickWave Editor* and *QuickWave Simulator*.

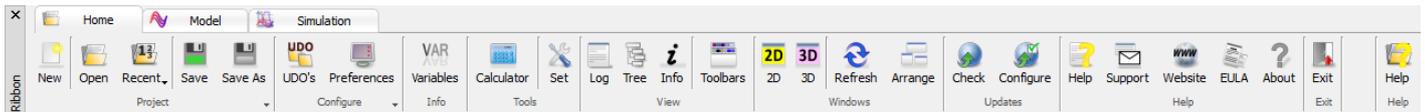
The *Basic Heating Module* is now enhanced with a wide variety of options, allowing defining complete BHM process directly from *QuickWave Editor* interface, which include intuitive configuration of Rotation Axes, Movement Trajectories, declaring variable heating steps etc.

The effective and practically useful solution for simulation convergence monitoring has been introduced. It utilises monitoring of the electromagnetic (EM) energy in the calculation model and stopping the simulation when it decays to a certain level. This allows reducing the number of performed FDTD iterations and as a result the computing time, without reducing a computational accuracy. This solution is now available in *QuickWave* as *Energy Stop Criterion* feature.

RIBBON GUI IN QUICKWAVE EDITOR

The Ribbon of *QuickWave Editor* groups all necessary menus and commands that guide the user during project preparation, setting of the simulation parameters, and simulation starting process.

The Ribbon Home tab is arranged in ten sections enabling basic file operations like loading and saving projects, adjusting the project content view to user's preferences, setting access to external applications or format converters, managing windows and refreshing the project after introducing modifications, staying up to date with *QuickWave* updates, accessing main help, support, QWED's website, *QuickWave End User Licence Agreement*, exiting the *QuickWave Editor* and accessing help for Home commands.



The Ribbon Model tab is arranged in thirteen sections enabling basic file operations like loading and saving projects, defining basic project settings, drawing geometry from UDO scripts, setting excitation type and its parameters, boundary conditions, meshing, and accessing help for Model commands.



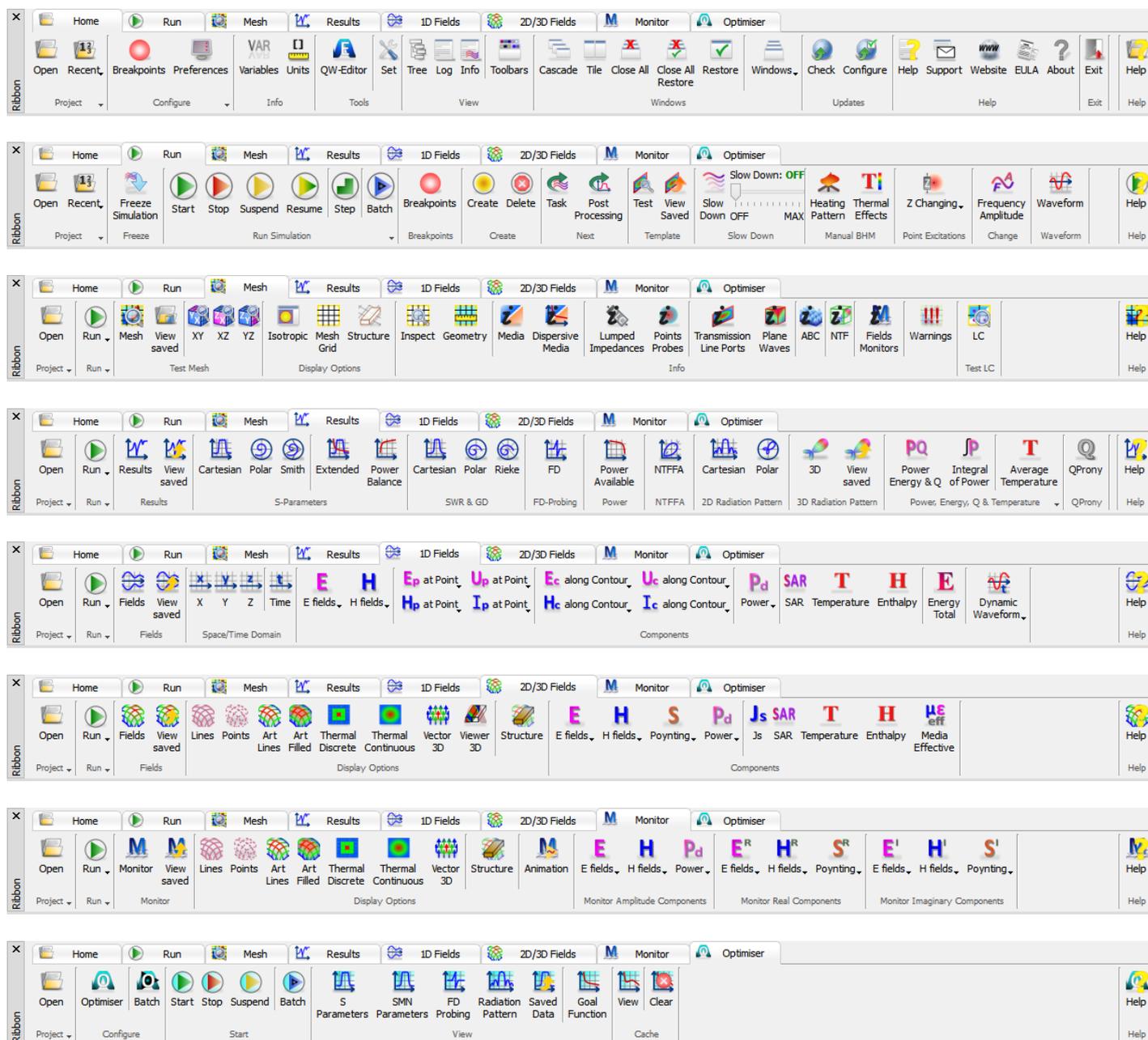
The Ribbon Simulation tab is arranged in five sections enabling basic file operations like loading and saving projects, defining post-processings, choosing *QuickWave Simulator* type, exporting the current project to *QuickWave Simulator* and starting simulation, and for user's convenience accessing help for Simulation commands.



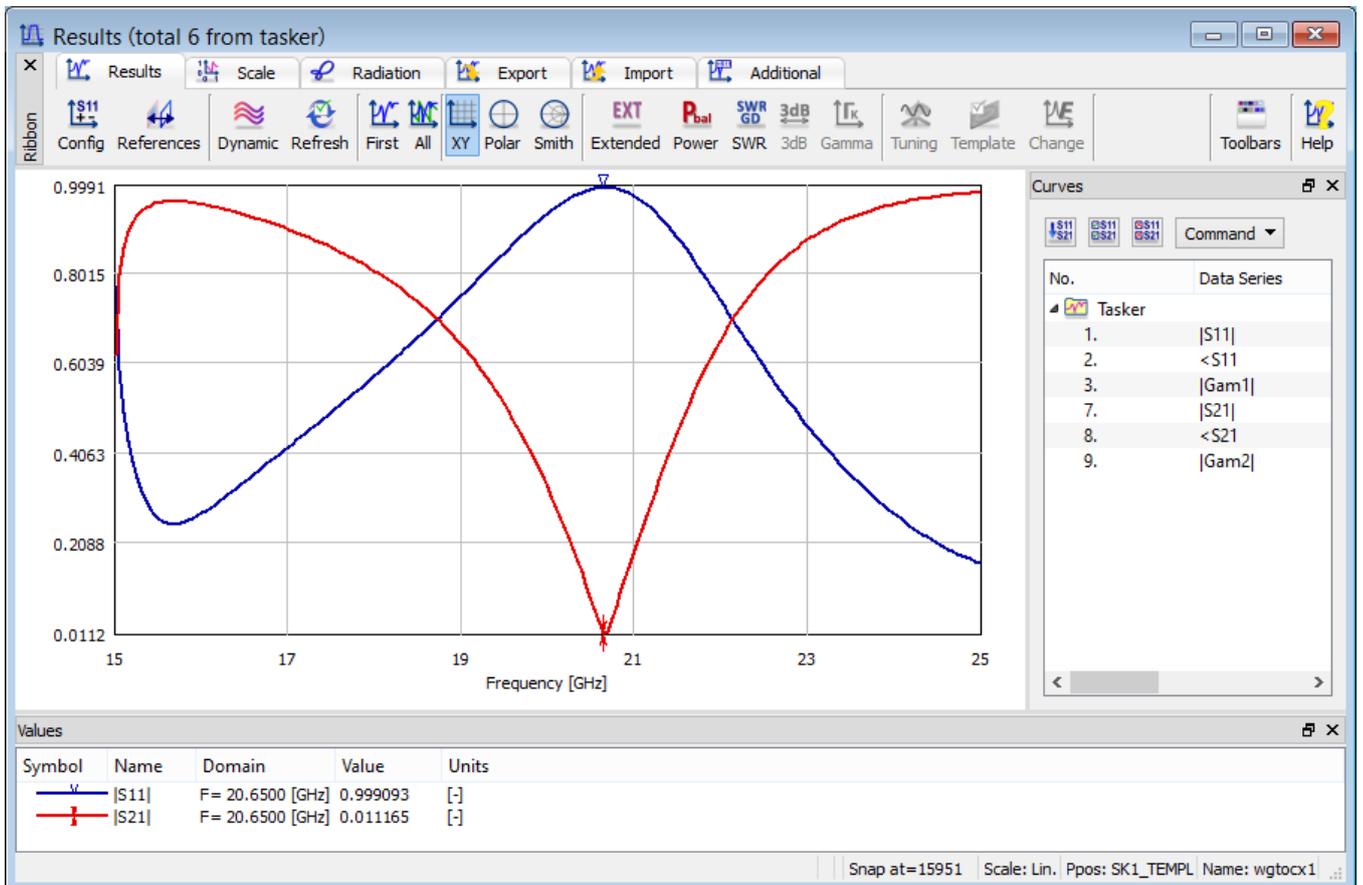
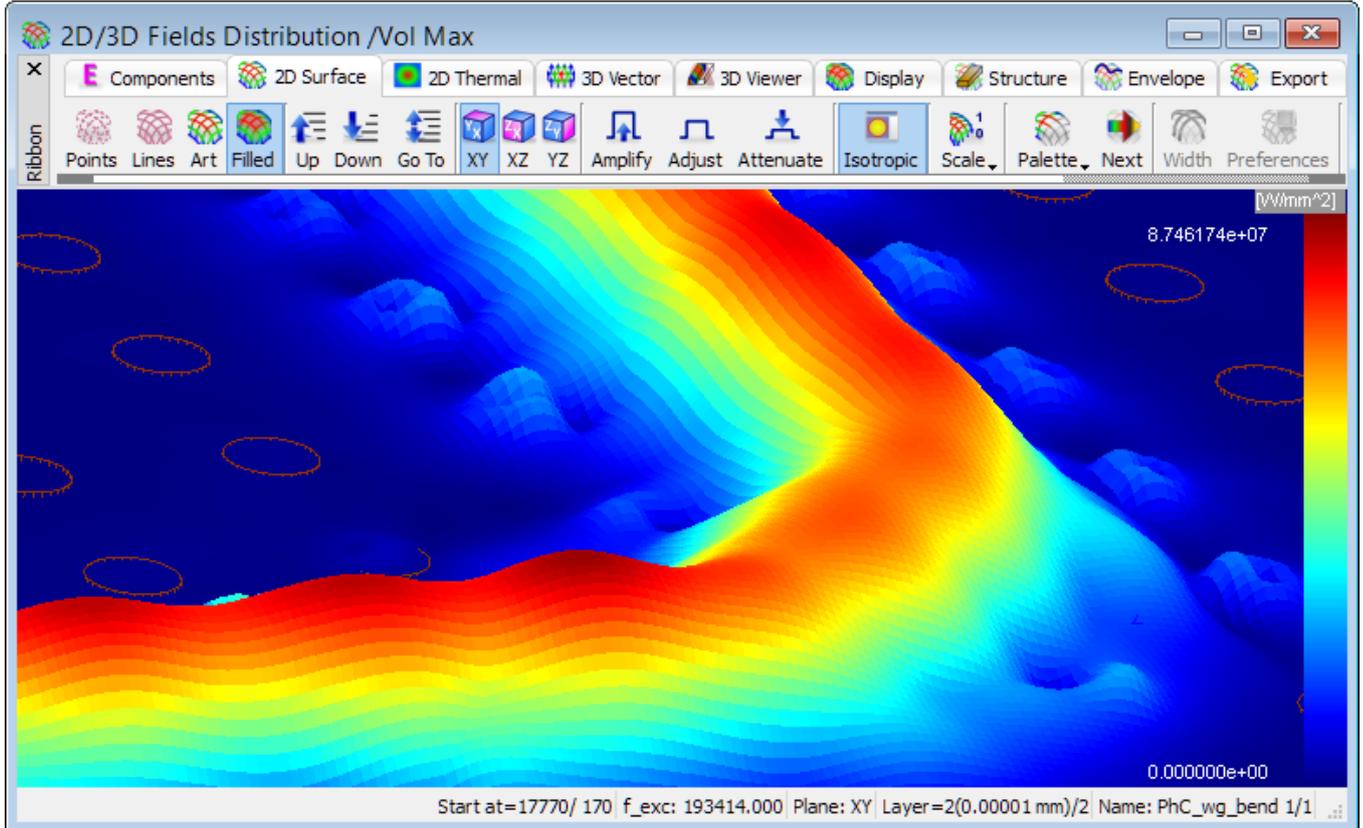
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RIBBON GUI IN QUICKWAVE SIMULATOR

QuickWave Simulator is equipped with the main Ribbon and window dedicated Ribbons containing all menus and commands necessary for running electromagnetic simulation, checking the FDTD mesh and using mesh testing tools, viewing a wide variety of simulation results including electromagnetic fields, exporting the simulation results and loading the previously saved results.

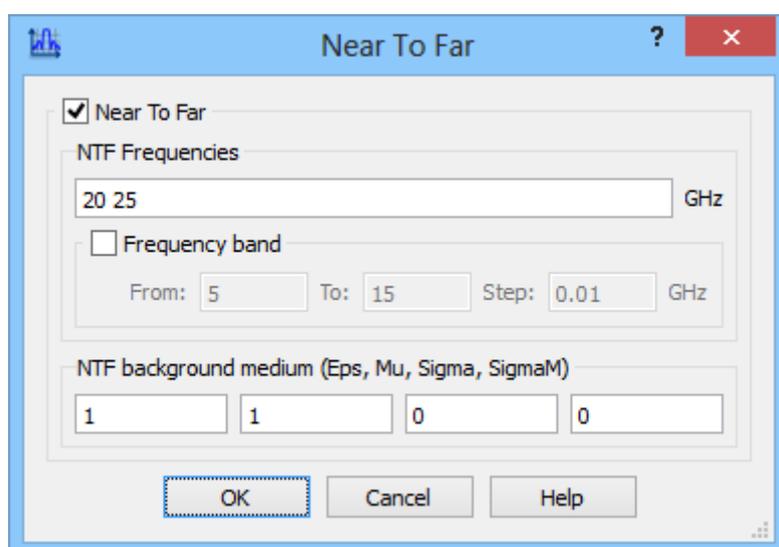
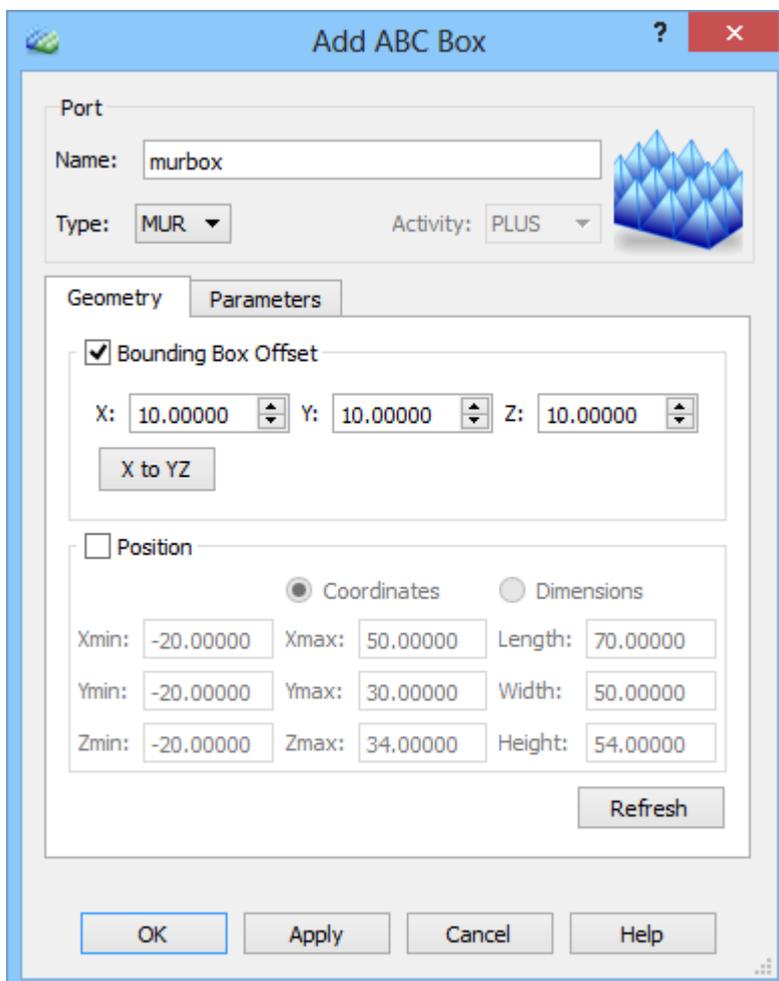


For the convenience of the users, we kept the possibility of using the previous Toolbars style. The choice can be made during the first run of *QuickWave Simulator* or later with the use of readily accessible commands from the menu.



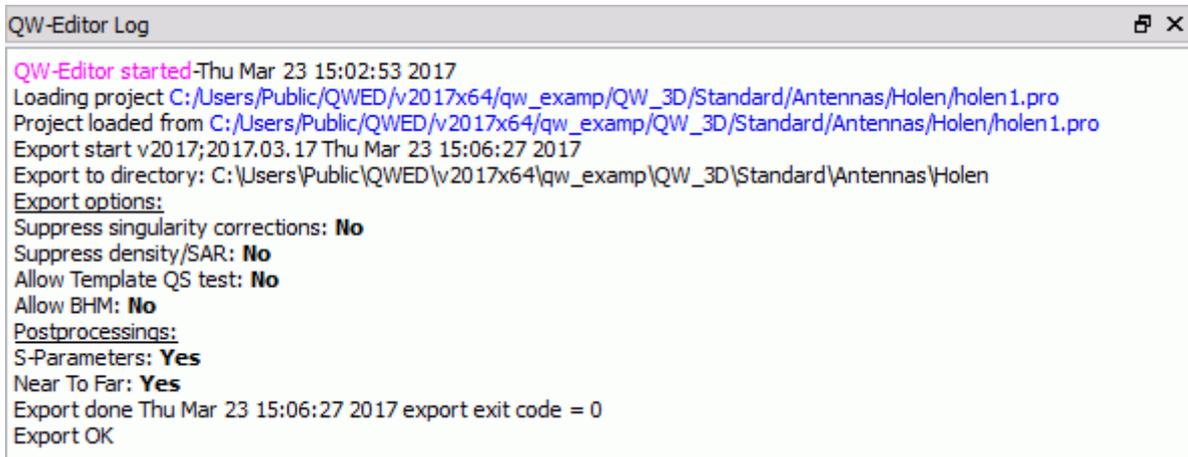
MORE CONVENIENT DIALOGUES IN QUICKWAVE EDITOR

The *QuickWave Editor* user interface has been enhanced with a set of new intuitive dialogues, for introducing and editing parameters of the ports, probes, Absorbing Boundary Conditions, field monitors, etc., for introducing mesh snapping planes or configuring the post-processings. The new dialogues allow the user to introduce project parameters modification in an easy and convenient way.



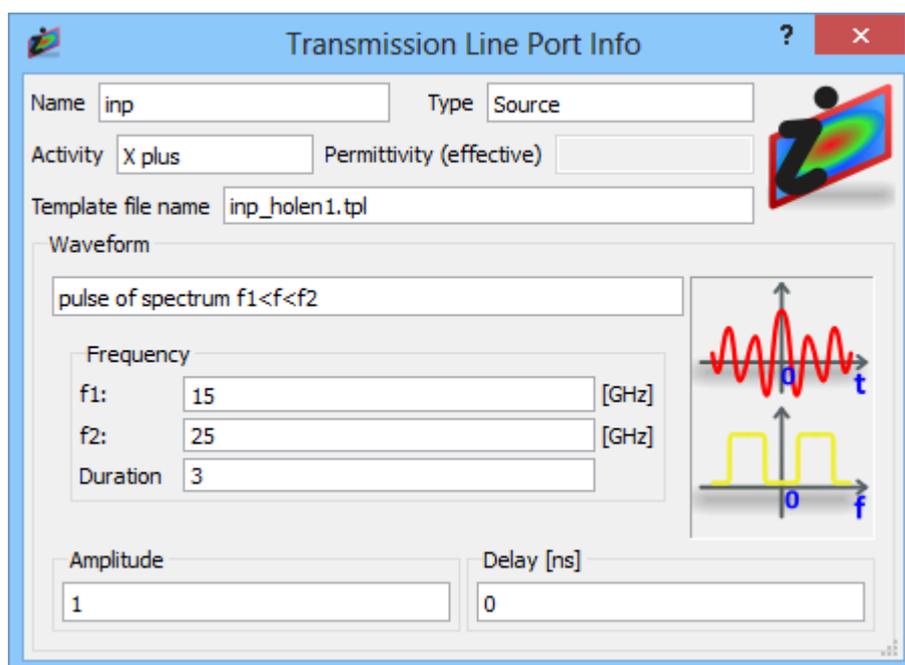
QW-EDITOR LOG

The *QuickWave Editor* user interface has been supplemented with the new *QW-Editor Log* window, which delivers a wide variety of information concerning the project that the user is working with. The displayed information include the warning/error messages issued by Parser – UDO scripts interpreter, the activated Export Options notice, information regarding post-processings that has been activated for the project, etc. and also warning/error information issued by Export procedures.



FDTD MESH TESTING TOOLS

New set of testing tools is available for effective FDTD mesh grid. The testing tools allow inspecting the information regarding the effective FDTD mesh grid, including the position of the consecutive mesh lines along all three axis, the size of the following mesh cells, and additional information indicating if the cell is of minimum or maximum size generated for the project. Additional mechanism allowing finding the step in cell size between neighbouring FDTD cells, with user defined cell size ratio has been enabled. Moreover, the testing tools allow checking the position and dimensions of different simulation objects like, e.g. transmission line ports, MUR wall/box, NTF box, etc.



Mesh Inspect

Subcircuit: holen1 (1/1)

X Y Z

Nb	Position	Size	Info
-	-21.63062	0.94204	
1	-20.68858	0.94204	
2	-19.74654	0.94204	min
3	-18.80450	0.94204	
4	-17.86246	0.94204	
5	-16.92041	0.94205	
6	-15.97837	0.94204	
7	-15.03633	0.94204	
8	-14.09429	0.94204	
9	-13.15225	0.94204	
10	-12.21021	0.94204	
11	-11.26817	0.94204	
12	-10.32612	0.94205	
13	-9.38408	0.94204	
14	-8.44204	0.94204	
15	-7.50000	0.94204	
16	-6.50000	1.00000	max
17	-5.50000	1.00000	

Min/Max cells size

X: 1.00000/1.00000
Y: 0.94204/1.00000
Z: 0.68858/1.00000

Number of cells

X: 48
Y: 43
Z: 43
Geometry: 88752
With boundaries: 107536
RAM: ~ 10 MB

Cell Size Step

X to YZ

X: 10.00
 Y: 10.00
 Z: 10.00

Next Subcircuit Geometry... Refresh Close Help

Absorbing Boundary Conditions Info

Name	Activity	Type
abs_bot	Z plus	MUR
abs_top	Z minus	MUR
abs_left	X plus	MUR
abs_right	X minus	MUR
abs_down	Y plus	MUR
abs_up	Y minus	MUR

View

Plane

XY XZ YZ

Show

Info

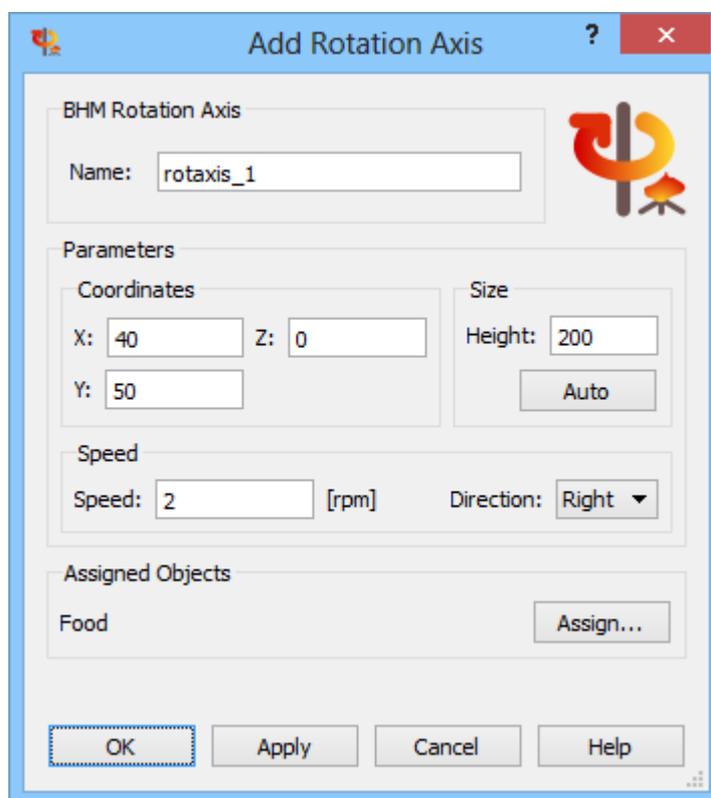
Info...
Dynamic...

Close Help



BHM IMPROVEMENTS

The Basic Heating Module is now enhanced with a wide variety of options, allowing defining complete BHM process directly from *QuickWave Editor* user interface, which include intuitive configuration of Rotation Axes, Movement Trajectories, declaring variable heating steps etc.



Add Rotation Axis

BHM Rotation Axis

Name:

Parameters

Coordinates

X: Z:

Y:

Size

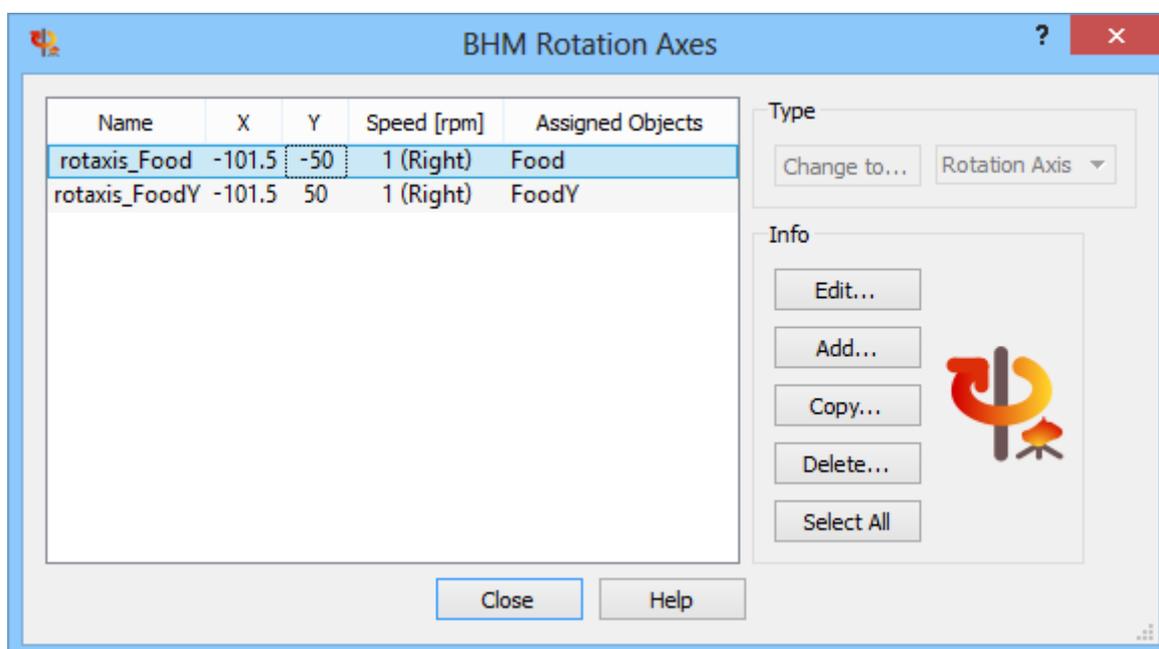
Height:

Speed

Speed: [rpm] Direction:

Assigned Objects

Food



BHM Rotation Axes

Name	X	Y	Speed [rpm]	Assigned Objects
rotaxis_Food	-101.5	-50	1 (Right)	Food
rotaxis_FoodY	-101.5	50	1 (Right)	FoodY

Type

Change to...

Info

Add Movement Trajectory

BHM Movement Trajectory

Name:

Parameters

Movement Type

XY Z

	dx	dy	dZ
1	27	52	0
2	54	52	0
3	81	0	0
4	54	-52	0
5	27	-52	10
6	0	0	10

Buttons: Add, Delete, Up, Down, Import..., Export...

Assigned Objects

Food

Buttons: OK, Apply, Cancel, Help

BHM Movement Trajectories

Name	Type	Assigned Objects
movetraj_Food1	Movement XY	Food1
movetraj_Food2	Movement XY	Food2

Type

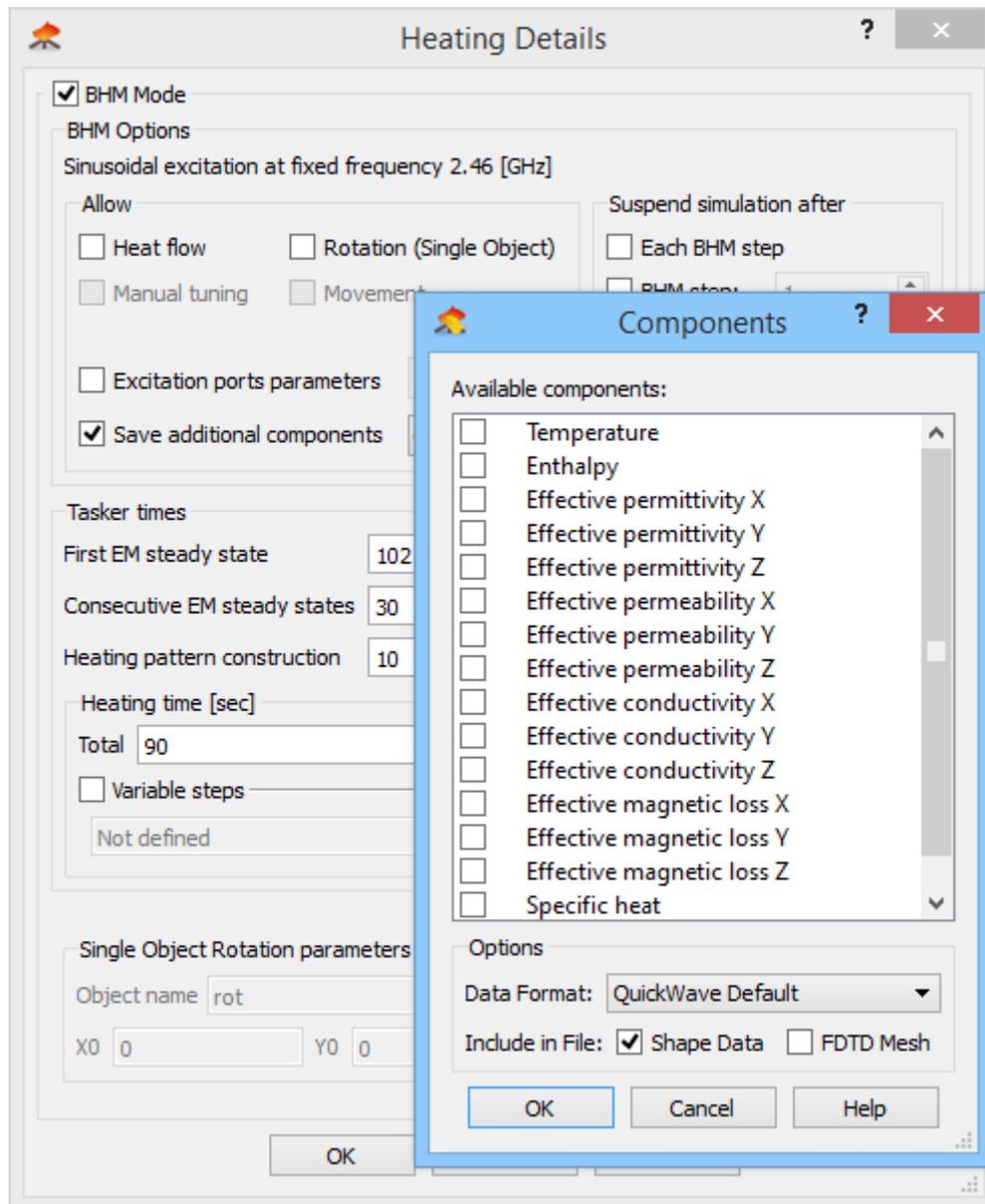
Change to...

Info

Buttons: Edit..., Add..., Copy..., Delete..., Select All

Buttons: Close, Help

In this version, the user is also allowed to enable saving in each BHM step, parameters other than temperature, e.g. enthalpy, effective media parameters, etc.

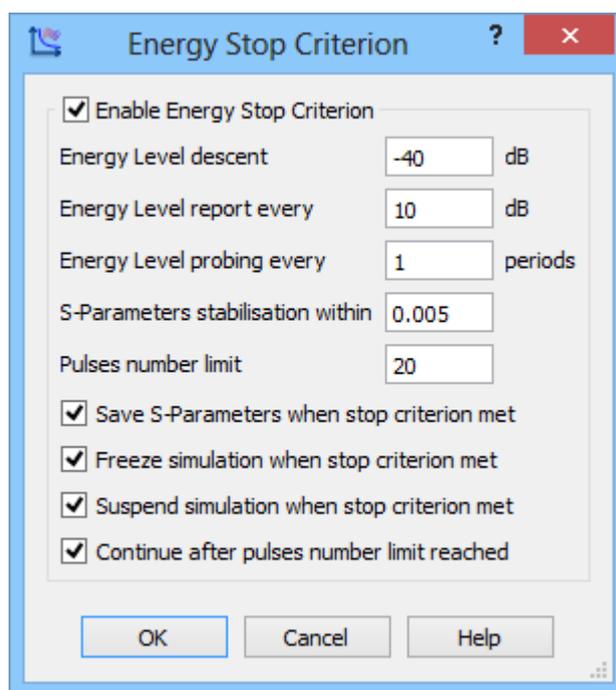


AVERAGE TEMPERATURE

For *QW-BHM* simulation, calculation of average temperature in the heated has been enabled. Two values of average temperature are available: *arithmetic average temperature* and *volume average temperature*. The *average temperature* is calculated separately for media with non-zero density (both lossy and lossless) and those with zero density (both lossy and lossless).

ENERGY STOP CRITERION

The effective and practically useful solution for simulation convergence monitoring has been introduced. It is enabled for pulse excitation with a finite duration time and utilises monitoring of the electromagnetic (EM) energy in the calculation model and stopping the simulation automatically when it decays to a certain level. This allows reducing the number of performed FDTD iterations and as a result the computing time, without reducing computational accuracy. This solution is now available in *QuickWave* as Energy Stop Criterion feature, which is supplemented with several options additionally restricting the stop criterion, e.g. coupling the energy level with S-Parameters results fluctuations.



S-PARAMETERS CORRECTION AROUND 0 GHz

The differential method of *S-parameters* extraction used in *QuickWave* converges slowly close to DC. This note is important for *TEM transmission lines*, where we may be interested in results close to DC. In the *QuickWave 2017* the algorithm for S-parameters extraction has been extended to assure higher accuracy results near DC range.

COLD PLASMA MATERIAL

The new Cold Plasma material has been introduced. Its complex relative permittivity (including series losses) is given by single-pole *Drude* dispersion model with user-specified parameters.

TOTAL ENERGY

The total energy accumulated in the circuit and its variation with the simulation time is now available for viewing at any simulation stage.

WAVEFORM

The excitation waveform of all sources included in the project is now available for viewing at any simulation stage. As previously, the excitation waveform may be observed as it is generated and injected into the circuit and additionally, the entire excitation waveform may be viewed at any simulation stage from file, which is saved automatically by the software.

FREEZE WITH SUBTASKS

Simulation freeze operation has been significantly extended and it is now available also while the certain subtasks e.g. *Save_Full_Volume_Envelope* are in progress. After unfreezing the simulation, the subtasks that were previously in progress will continue their calculations.

NTF FREQUENCY BAND

The radiation pattern and scattering pattern will be calculated at all frequencies specified by giving directly their values (as previously available) or by declaring the frequency range and frequency step between consecutive values.

NEW HELP SYSTEM

The new *QuickWave Help* system provides easier and faster access to the specific topics. The *QuickWave Help* system is divided into subcategories and is available from every window and dialogue of *QuickWave Editor* and *QuickWave Simulator*.

OTHER

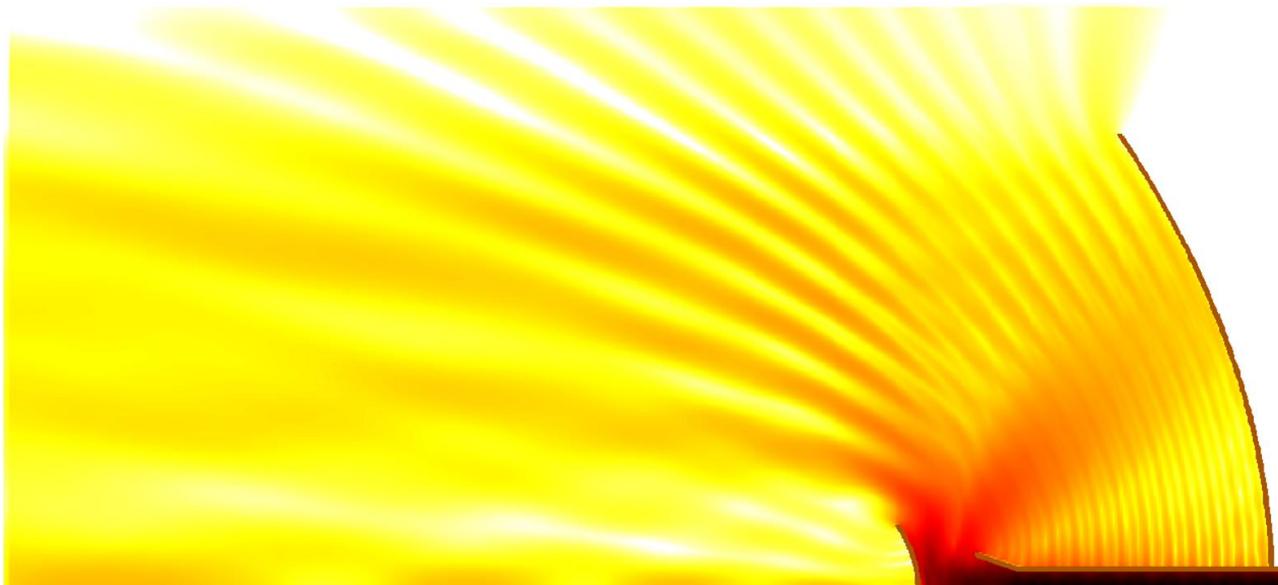
1. *QW-BHM* module allows for rotating metal objects, what is a significant extension of *QW-BHM* functionalities.
2. *QW-BHM* module allows for suspending and/or freezing the simulation after each or user defined number of BHM step.
3. *QW-BHM* allows for setting variable duration of consecutive heating steps.
4. The preview of Rotation and Movement process for *QW-BHM* projects has been enabled.
5. The diagnostic run for TEM template ports has been introduced.
6. Stability Factor Multiplier has been enabled for modifications in *QuickWave Editor*
7. *QuickWave Editor* has been adjusted to operation with several monitors.
8. The parameters list of *Save_Volume_Instantaneous* and *Save_Full_Volume_Instantaneous* subtasks has been extended with media effective parameters, e.g. EpsX, MuX, SigmaX, SigmaMX, Specific heat, etc.
9. Viewing previously saved Shape file (*.sh3) has been enabled.
10. New results file for NTF post-processing, containing radiation efficiency, radiation resistance, power radiated, power injected, and current injected by the source, saved automatically upon NTF results export/save command.

SHORT-TERM LICENCES

Short-term licences involve time periods from 1 month to 6 months and are available for *QuickWave Professional* package, *QuickWave Standard* package, and all *QuickWave* optional modules.

The new licences are protected with a software licencing procedure.

qwStore gives the possibility of getting quotation and purchasing short-term licence of your choice for *QuickWave* software.



Design is as simple as it can be.

Simulation is as fast as you want it to be.

Results are as accurate as they should be.

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