

QUICKWAVE 2019

SOFTWARE FOR ELECTROMAGNETIC/MULTIPHYSICS DESIGN AND SIMULATIONS

3D MODULE V2D BOR MODULE
MULTIPHYSICS/MICROWAVE HEATING MODULE
OPTIMISATION MODULE HIGH-Q MODULE
GPU/MULTI-GPU MODULES
CAD DESIGN MODULES



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

Our longstanding experience in EM modelling shows that the simulation speed is an important issue. Radiation pattern calculations for very complicated or very big problems can constitute a significant part of the total computation time. In this release we focused on enhancing the speed of calculations algorithms for radiation pattern extraction. The calculating procedures were optimised to achieve a maximum speed of calculations – the sequential procedures are over 20% faster compared to previous version 2018 and over 35% compared to the earlier versions of *QuickWave*. Radiation pattern calculations have been fully parallelised for multiple NTF frequencies analysis.

A new calculation regime for multiphysics simulations with *QuickWave* has been introduced: *CFD Fluid Flow Module* allows for simulation of fluid flow coupled with microwave heating and heat transfer.

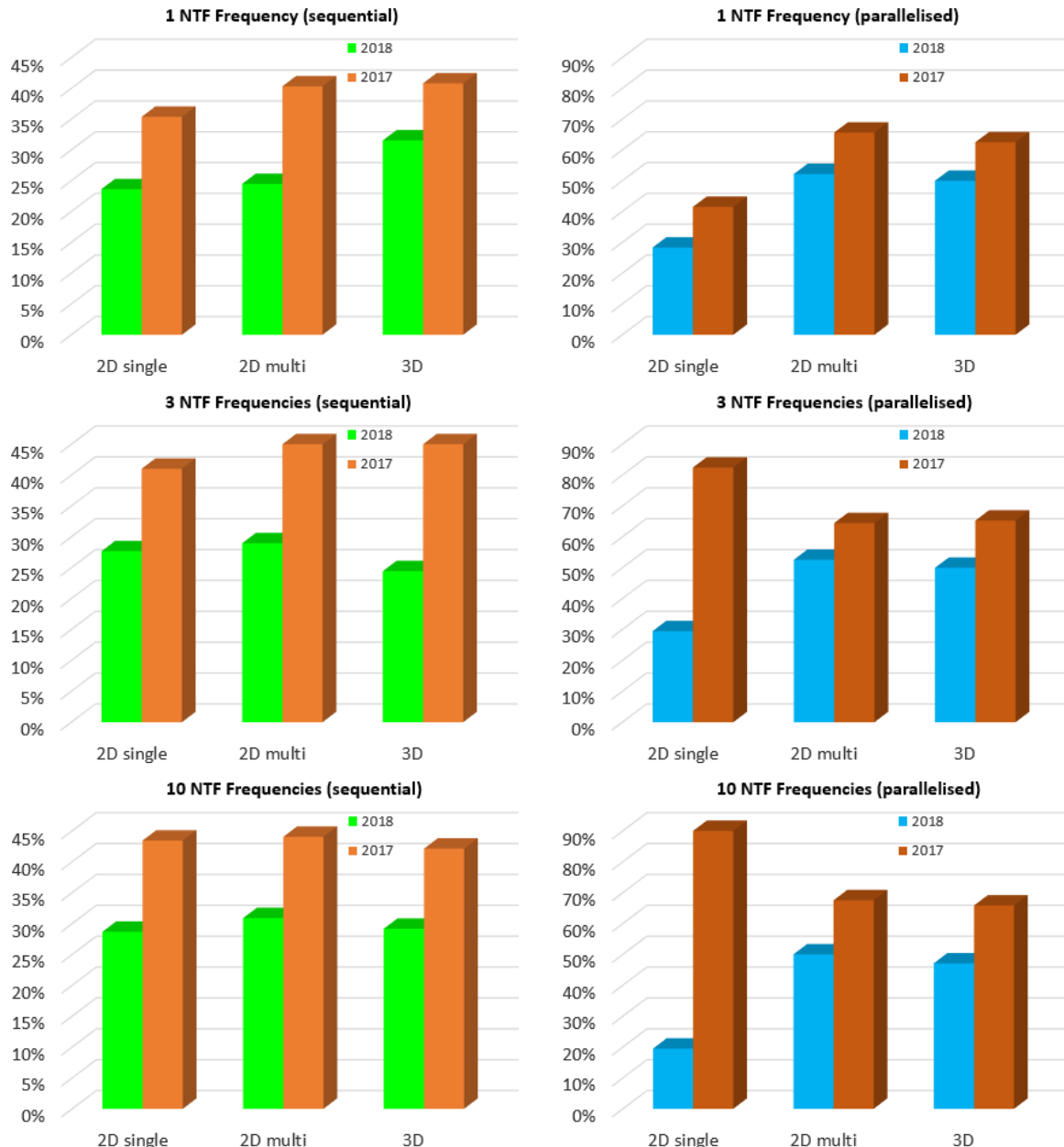
Visualisation regimes of 3D Radiation Pattern were extended with display functions useful in beam-forming, beam-steering, and tracking applications.

Various simulation results in a form of pictures can be now easily collected with new *Collect Data for Grid Search* objective. Images with results are saved in an automatic way in each step of Grid Search routine.

New Dispersive Curves Fitting operation regime that was introduced in version 2019 allows for introducing dispersive materials characteristics in a form of measured curves and fitting them to dispersive material models used in the simulation.

RADIATION PATTERNS CALCULATIONS

The calculation algorithms for radiation patterns have been enhanced in terms of computation speed. The acceleration has been introduced in both, sequential and parallelised approaches. For sequential QW-Simulator, calculation procedures are 20% faster. The radiation patterns calculation with the use of QW-Simulator GPU and MultiGPU has also been significantly accelerated. Calculation procedures in the analysis considering multiple NTF frequencies have been parallelised taking advantage of NTF frequencies.

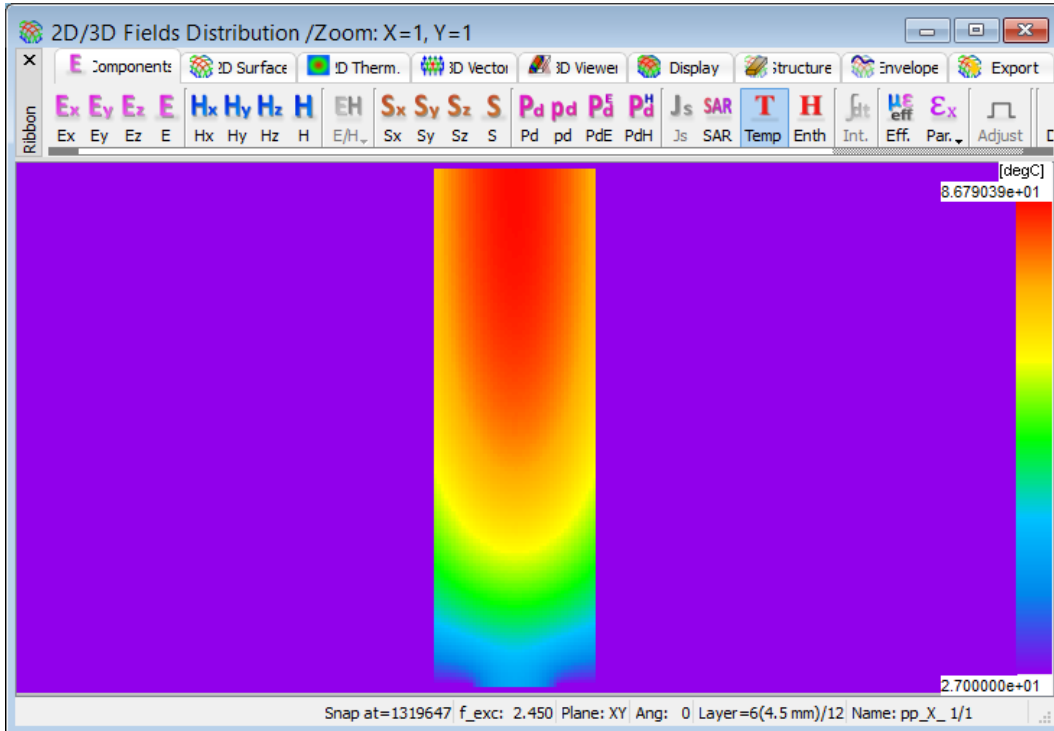


Speed-ups obtained for the radiation pattern calculations compared to QuickWave 2017 and QuickWave 2018.

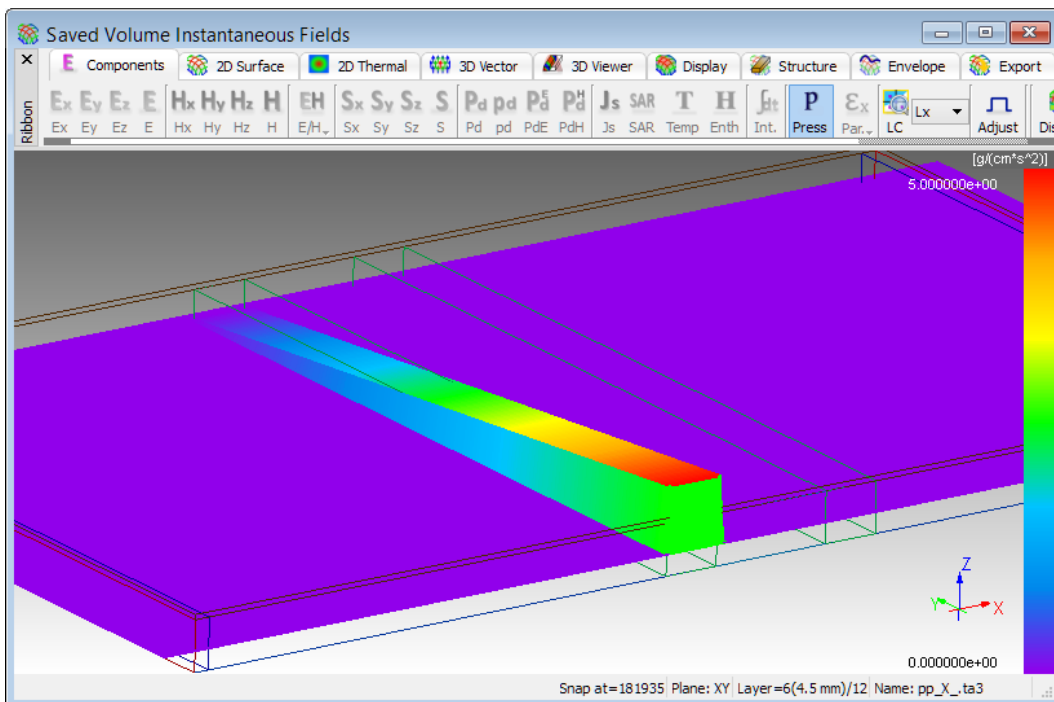
Note: In the above charts, *2D single* stands for a single 2D radiation pattern (for a given plane described with θ or φ angle) and *2D multi* describes a set of 2D radiation characteristics (for a given plane described with θ or φ angle and a grid of the other, φ/θ , angle values). *3D* stands for 3D radiation pattern results in a spherical coordinates.

CFD FLUID FLOW MODULE

A new calculation regime for multiphysics simulations with *QuickWave* has been introduced: *CFD Fluid Flow Module* allows for simulation of fluid flow coupled with microwave heating and heat transfer. *Fluid Flow Module* in *QuickWave* solves equations for incompressible flow in Cartesian coordinate system and is based on the conservation laws for mass, momentum, and energy.



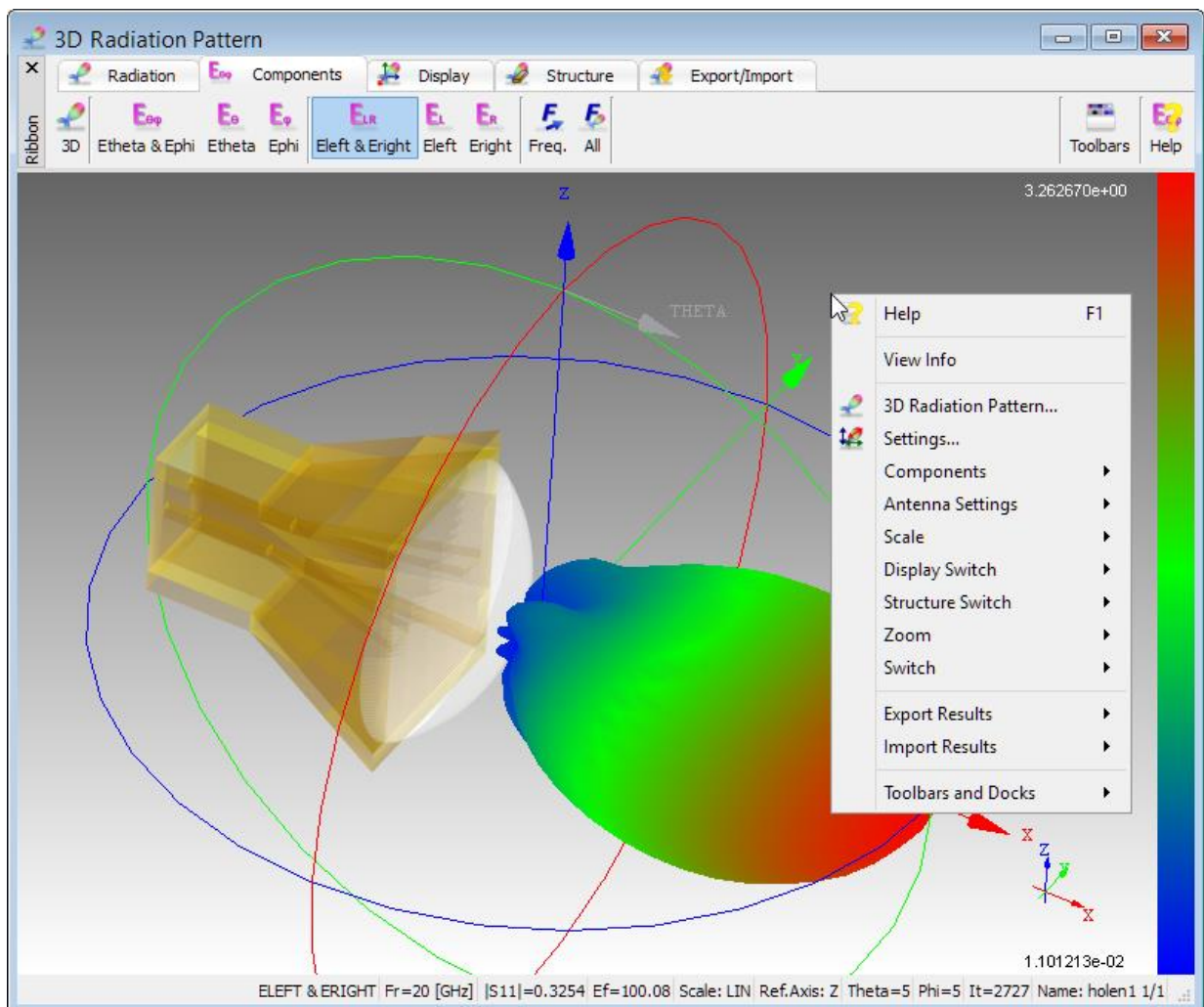
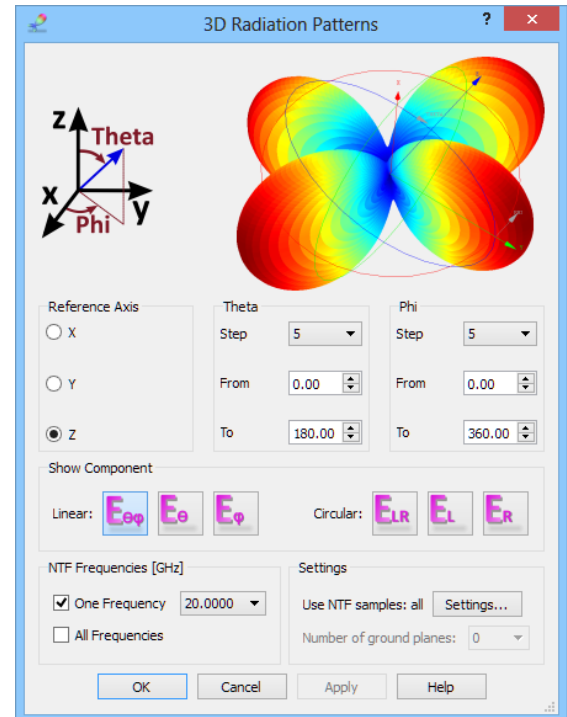
Temperature distribution in fluid medium.



Pressure distribution in fluid medium.

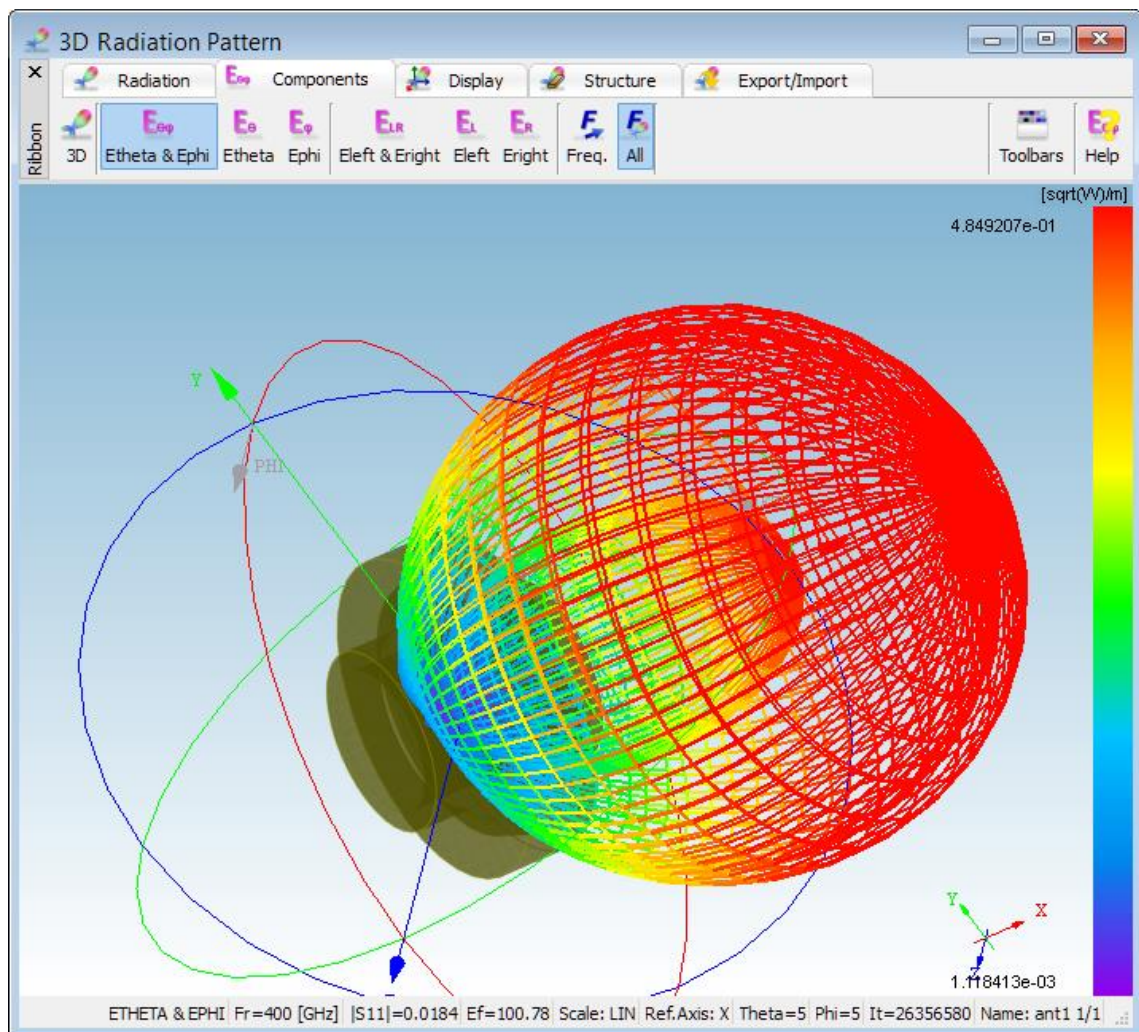
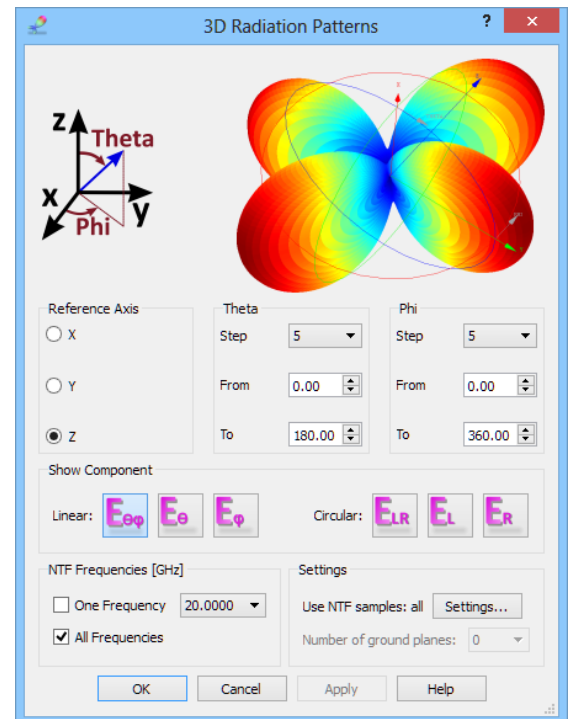
3D RADIATION PATTERN – COMPONENTS

3D radiation pattern field components are now available in 3D Radiation Pattern window. Each field component, of linear and circular polarisation, can now be shown without every-time recalculation of 3D radiation characteristic. Additional Components tab was added to Ribbon in 3D Radiation Pattern window.



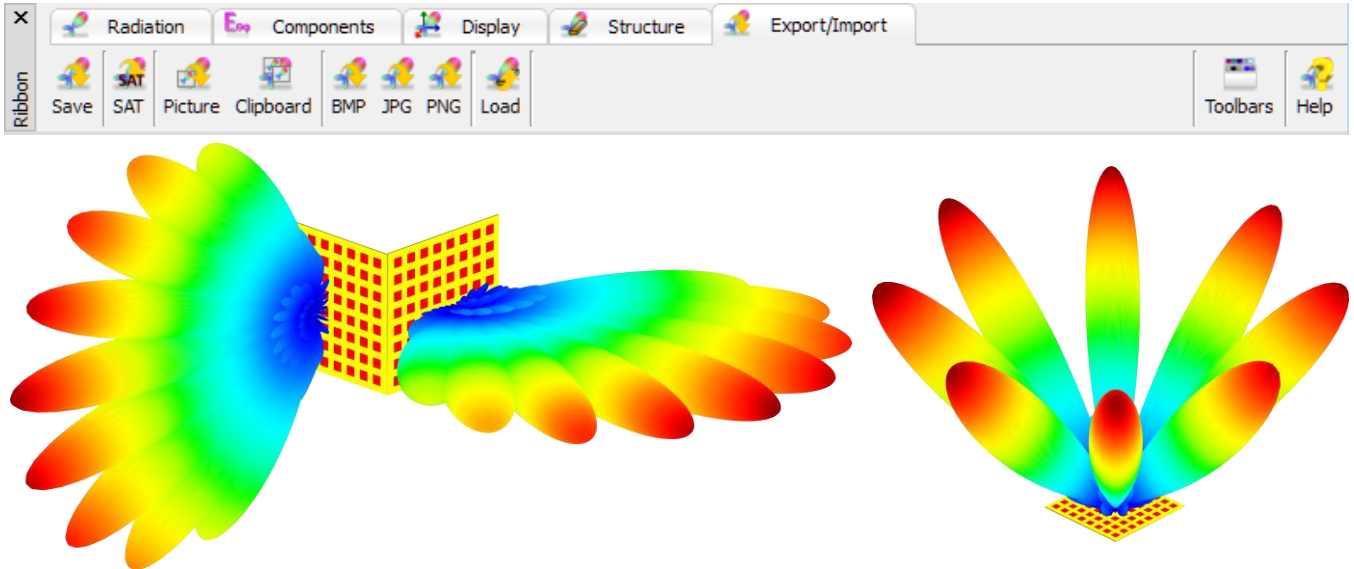
3D RADIATION PATTERN – ALL FREQUENCIES

3D radiation patterns for all NTF frequencies considered in the analysis can be calculated and simultaneously displayed in 3D Radiation Pattern window.



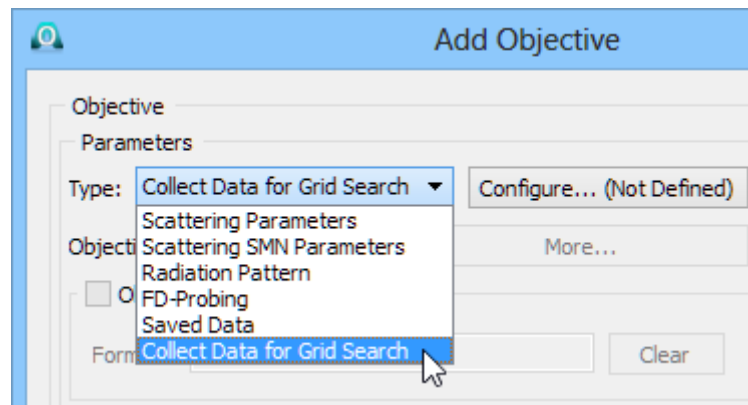
3D RADIATION PATTERN – LOAD PATTERN

3D radiation patterns saved to file can now be loaded as a reference in 3D Radiation Pattern window. It is considered as a useful display option for beam-forming, beam-steering, and tracking applications for the purpose of observation of pattern shape and radiation direction changes.



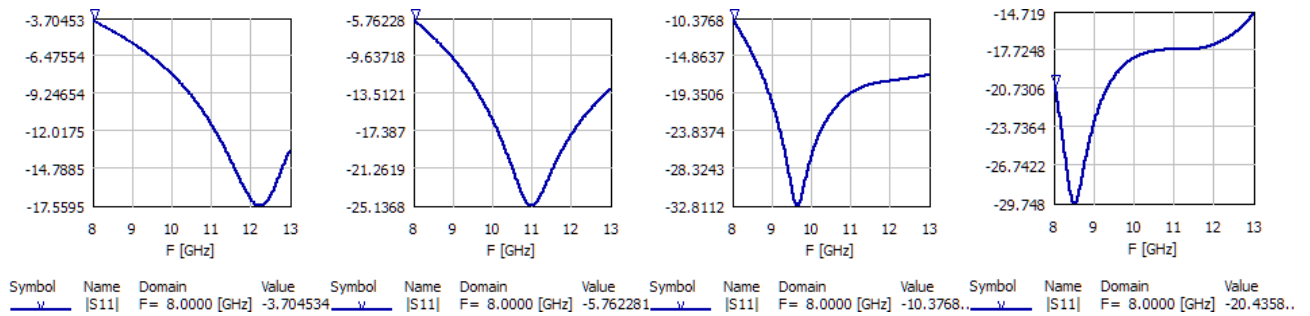
COLLECT DATA FOR GRID SEARCH OBJECTIVE

New *Collect Data for Grid Search* objective allows saving a set of images with various simulation results. Results images are saved in an automatic way in each step of Grid Search.

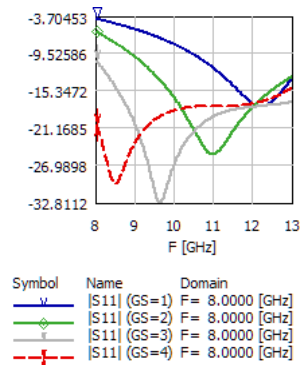


Collect Data for Grid Search objective allows for saving results displayed in the following windows:

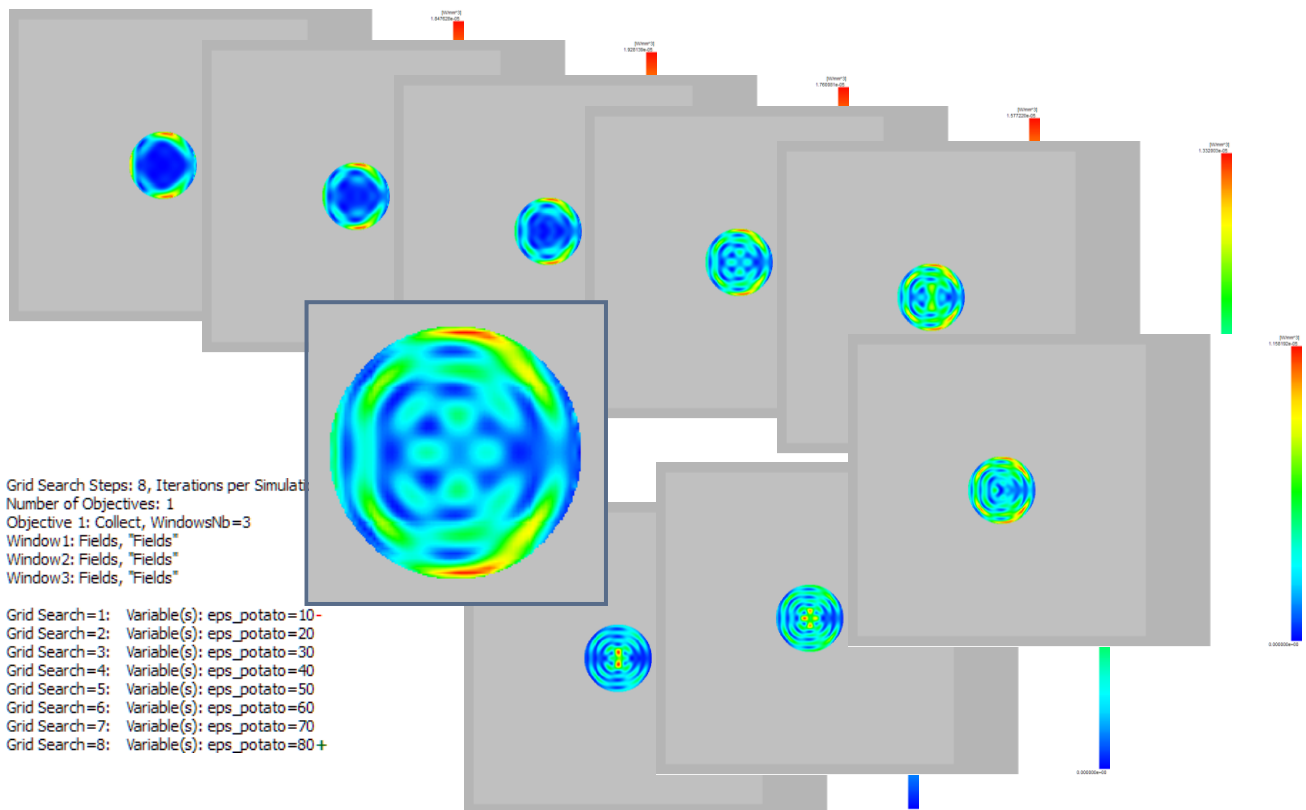
- S-Parameters Results
- S-Parameters Cumulative Results
- 2D Radiation Pattern Results
- 3D Radiation Pattern Results
- Fields (fields time-domain distribution)
- Fields Monitor (fields frequency-domain monitor)



Collection of |S11| results in consecutive Grid Search steps



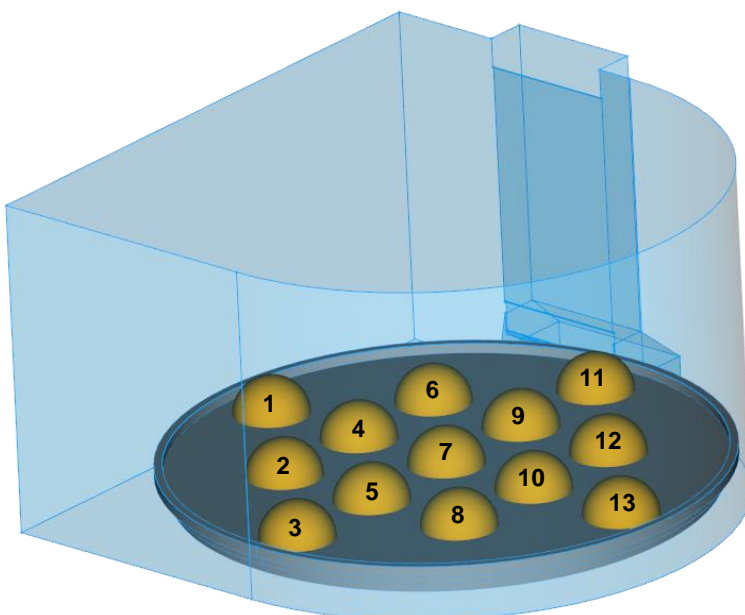
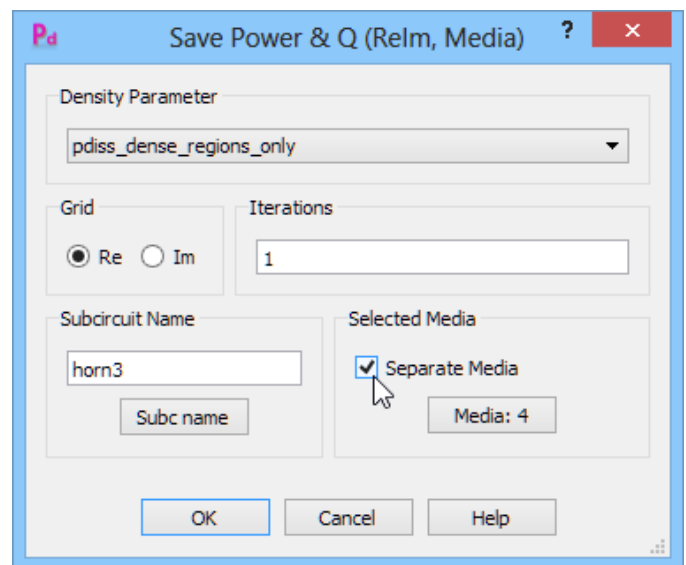
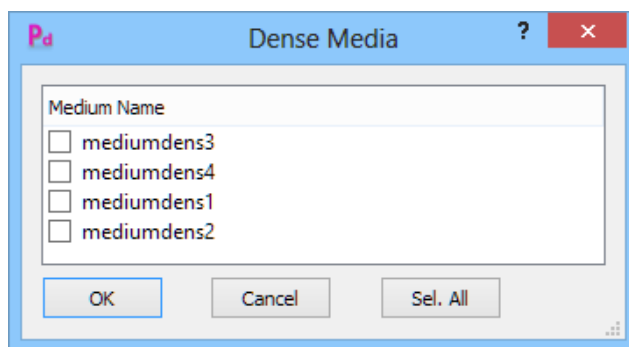
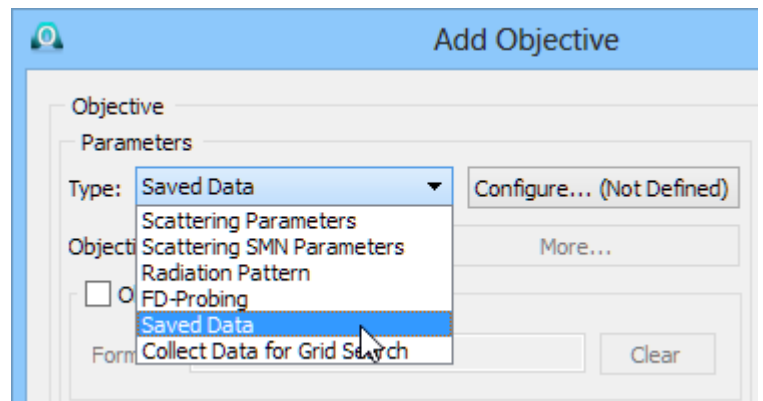
Cumulative |S11| results after all Grid Search steps.



Collection of SAR distribution in consecutive Grid Search steps.

SAVING POWER AND ENERGY RESULTS SEPARATELY

New function for saving power and energy results, separately in each dense medium, is available in Saved Data objective regime. A set of results is saved in an automatic way in each step of Grid Search.



Power and energy results will be saved separately in each dense medium (from 1 to 13).

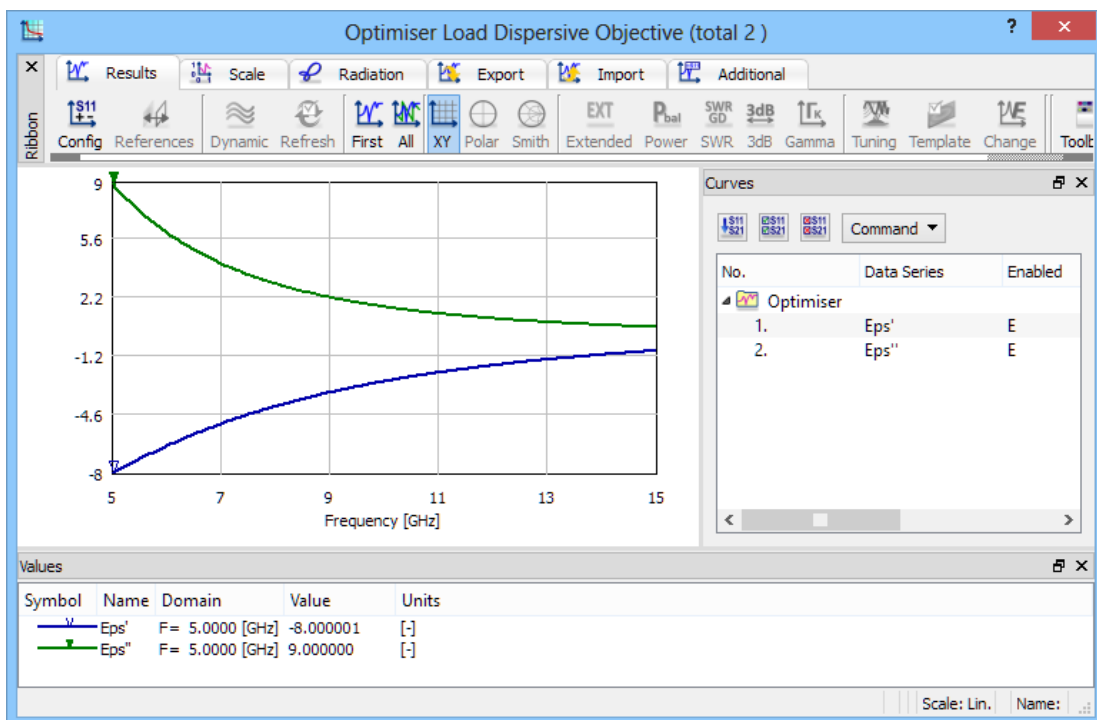
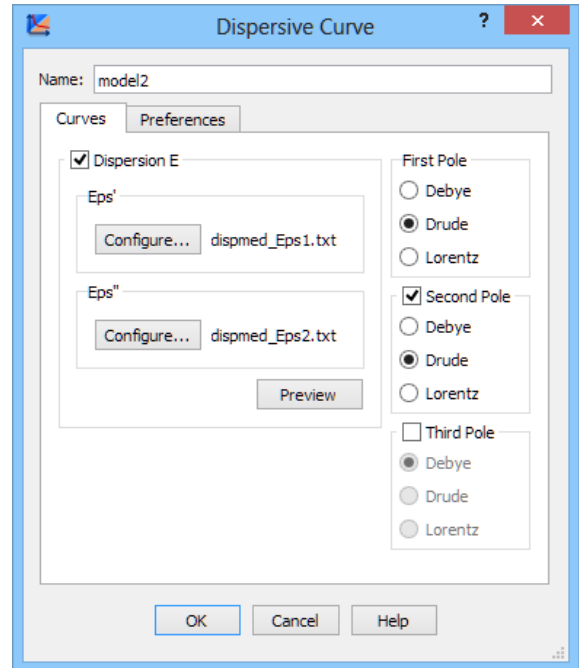
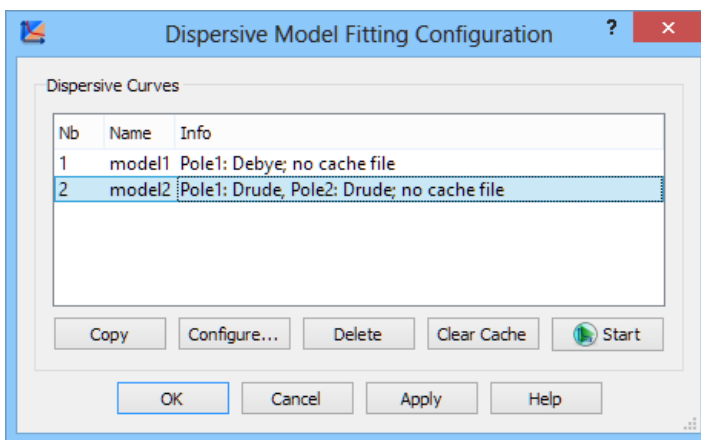
DISPERSIVE CURVES FITTING

Dispersive Curves Fitting uses *QW-OptimiserPlus* for finding dispersive model parameters (*Debye*, *Drude*, *Lorentz*, or combination of those), used in QuickWave simulation, to best fit the user-defined media parameters (ϵ' and ϵ'') dispersive curves.

During dispersive curves fitting process, the basic information about its progress is displayed in the *Optimiser Info* tab of the *Simulator Log* window.

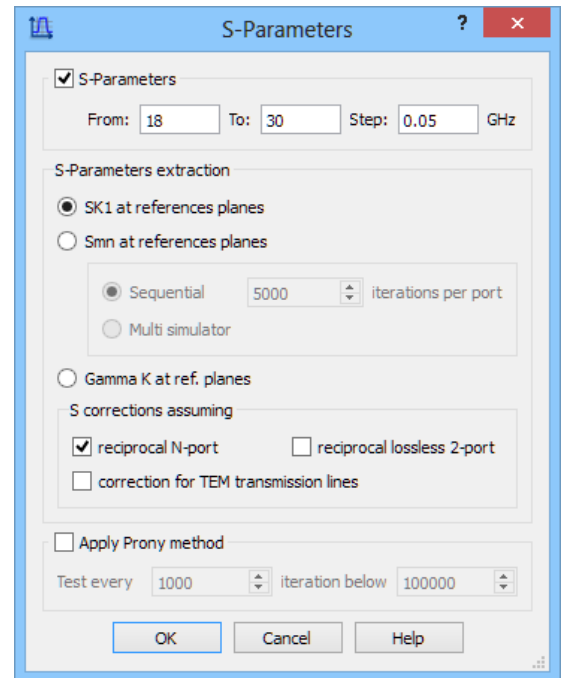
The *cache* accumulates the results of optimisation for consecutive values of the considered dispersive model parameters.

Single-, dual-, and triple-pole dispersive medium model, being a composition of *Debye*, *Drude* or *Lorentz* dispersion models, can be chosen as a target for fitting procedure.



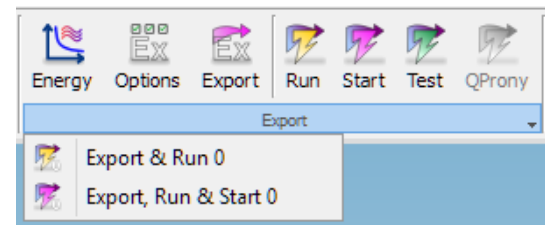
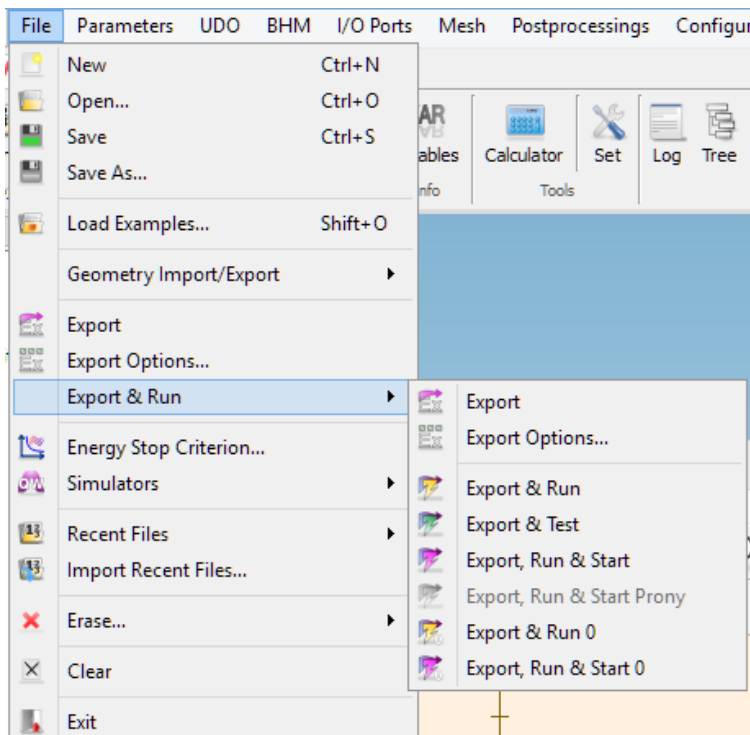
S-PARAMETERS: CORRECTION FOR TEM TRANSMISSION LINES

New option for choosing calculation regime for impedance computation for TEM transmission lines.



START QW-SIMULATOR WITHOUT FIELD TEMPLATE MODE GENERATION

New options for start QW-Simulator or start QW-Simulator and simulation without field template mode generation. This option is useful when changes in the project doesn't influence in the field template mode and the field template mode generated previously can be used.



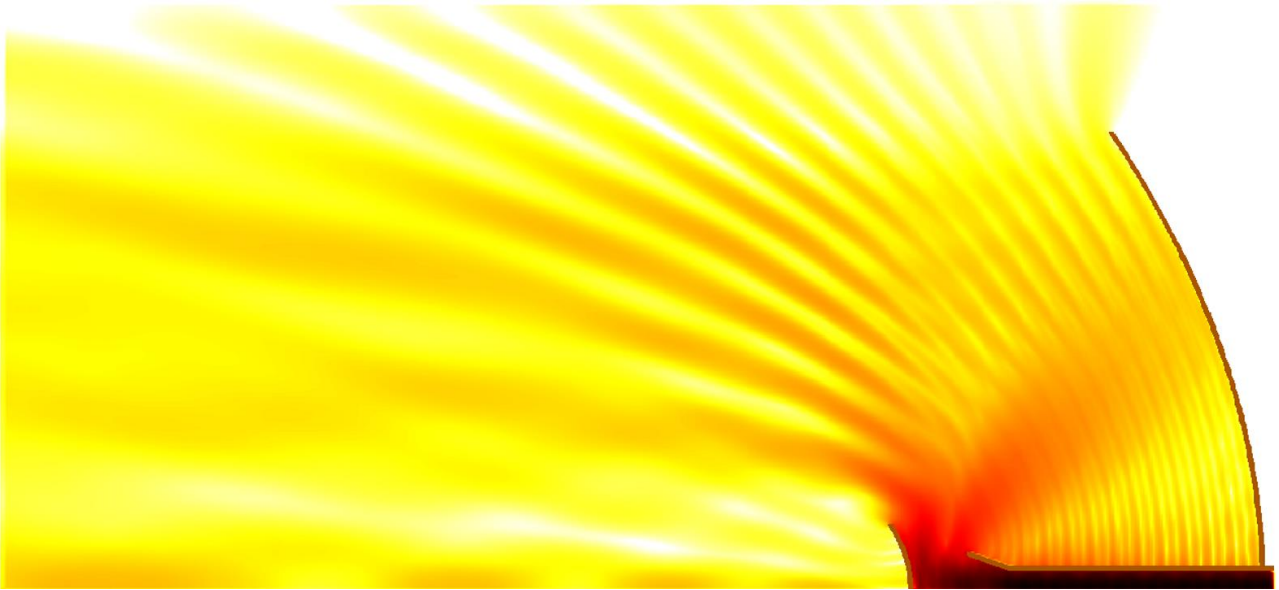
OTHER

1. Improvement in calculation algorithms for analytical generation of field template mode for ports in YZ plane.
2. Option for suppressing calculation models for conformal lossy cells for Heat Flow Module. Conformal lossy cells will be replaced with cells uniformly filled with medium having higher losses.
3. Heat Flow Module takes into account lossless media.
4. Complete data for radiation pattern results for circular polarisation for BOR (V2D) projects are now saved in DA3 file.
5. Complete data for multiple radiation pattern results for linear polarisation for BOR (V2D) projects are now saved in DA3 file.
6. Complete data for radiation pattern results are saved in TXT and CSV files.
7. Improvement in Group Delay results calculation for virtual shift of the reference plane position.

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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