QUICKWAVE 2012

NEW FEATURES

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Contents

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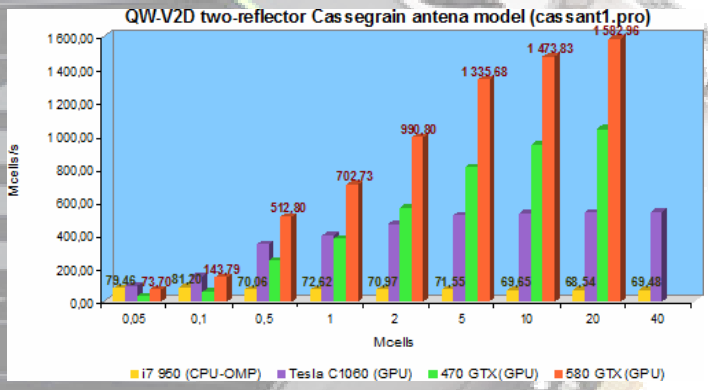
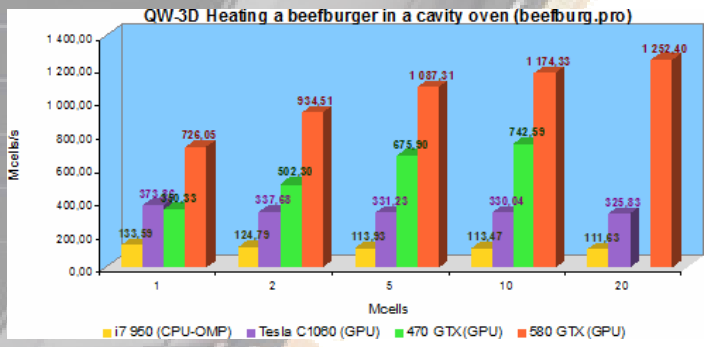
GPU version of *QW-Simulator*

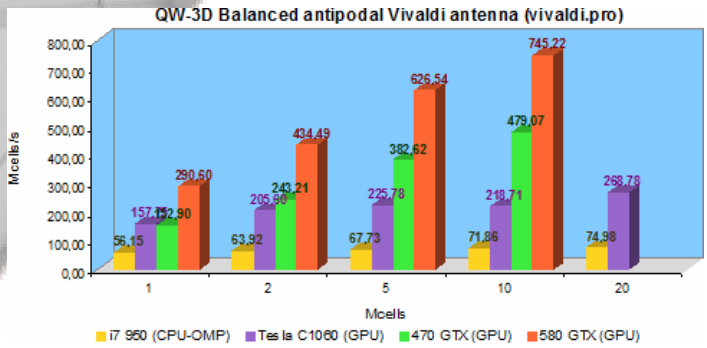
QW-GPUSim is a version of *QW-Simulator* designated for massive parallel computing hardware. It incorporates parts of *QW-Simulator* code re-written by QWED in OpenCL . This strategy stabilises *QW-GPUSim* on the very dynamic GPU/CPU hardware market.



QW-GPUSim is currently optimised for application on modern PC graphic cards of a massively parallel architecture. For the above reasons, only the parts of the code judged crucial to the speed of processing have been ported to OpenCL. Thus the gain in speed with respect to a regular CPU version depends on the actually simulated scenario and the required postprocessings.



As shown by the charts, for the *QW-V2D* Cassegrain antenna model, one obtains the FDTD speed of about **1600** [Mcells/s] and a speed-up of **20** when comparing GPU GTX 580 against CPU OMP I7 950. For the 3D beefburger model, one obtains the speed of about **1300** [Mcells/s] and a speed-up about **11.** For the 3D antenna models with absorbing boundary conditions and NTF processing, the FDTD speed is about **750** [Mcells/s] and speed-up is equal to **10**.



QW-GPUSim is available only for 64-bit version

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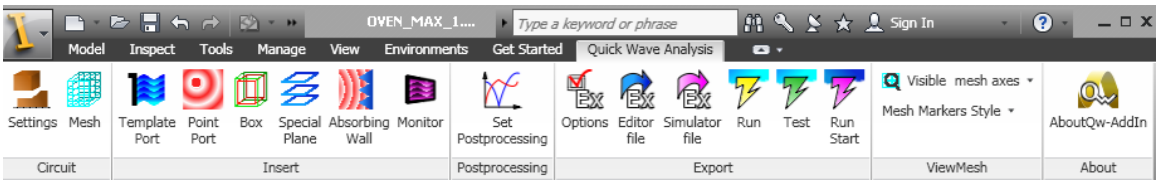
QW-AddIn for Autodesk® Inventor® Software

An AddIn for Autodesk® Inventor® Software allows preparing a complete project for the *QuickWave Simulator*.

- user-friendly CAD environment for complex geometry definition
- easy-to-learn set of tools
- automatic QuickWave-3D simulation models generation
- QuickWave-3D user interface
- EM sources, field monitors, boundary conditions
- postprocessing tasks: S-parameters, antenna pattern, power available
- material parameters
- automatic mesh generation



QuickWave Analysis AddIn.

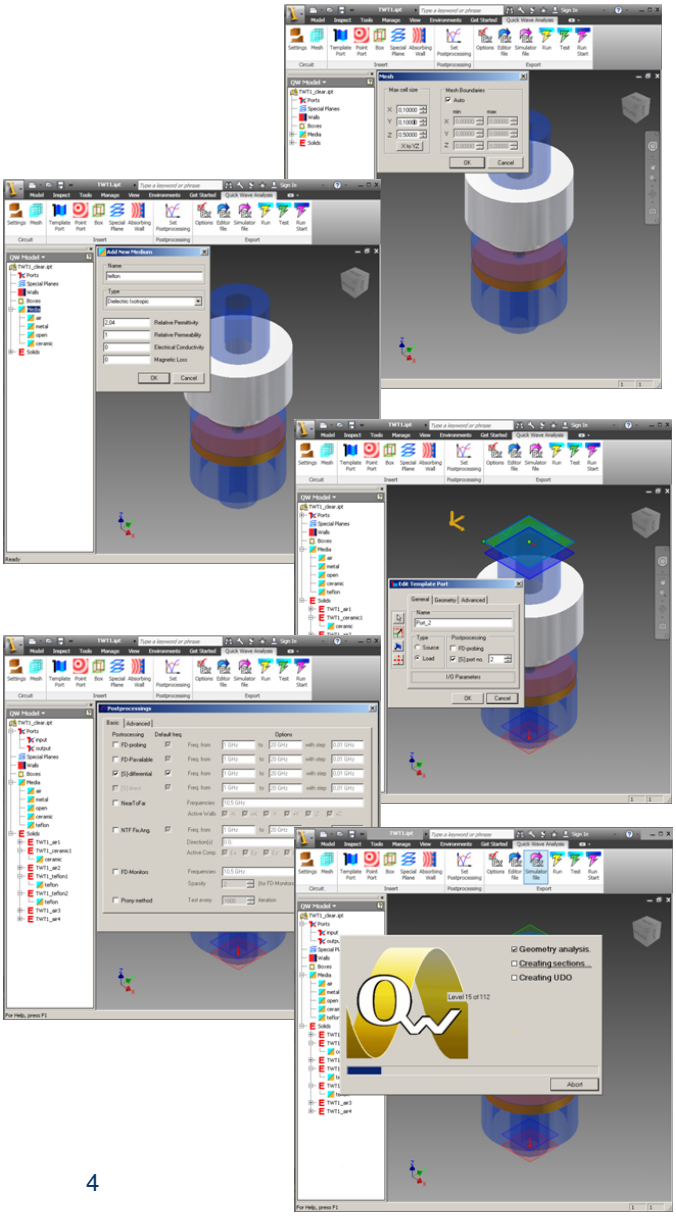
QuickWave Analysis AddIn - Mesh settings dialogue.

QuickWave Analysis AddIn - Add New Medium dialogue.

QuickWave Analysis AddIn - Port settings dialogue.

QuickWave Analysis AddIn - Postprocessings dialogue.

QuickWave Analysis AddIn - export progress.



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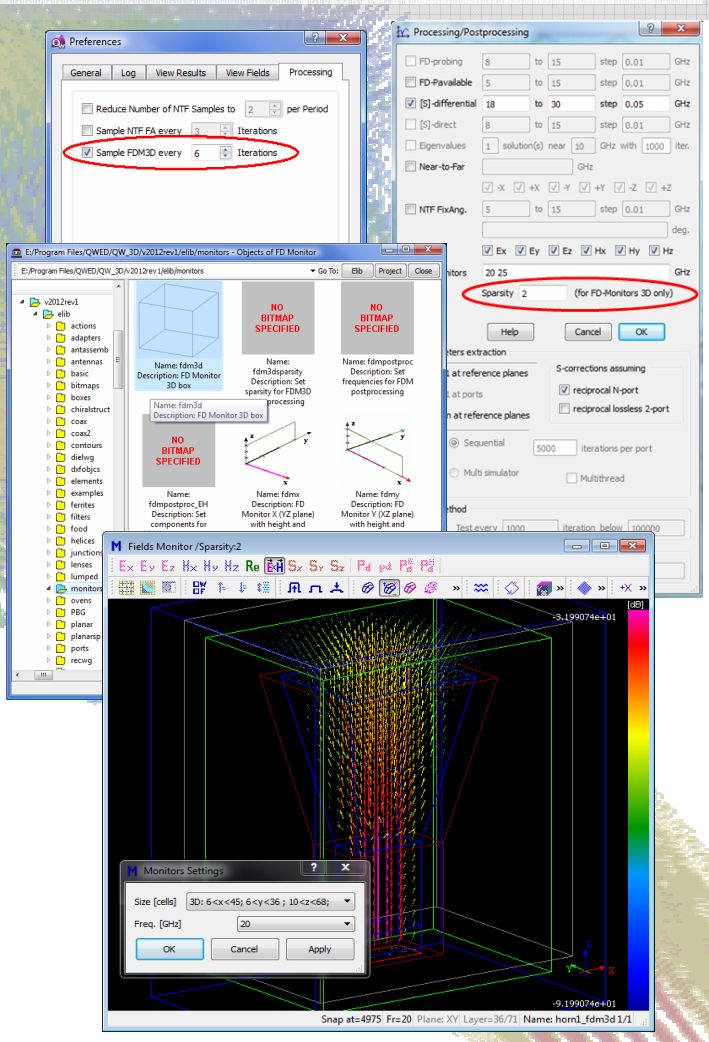
FD-Monitor 3D

A 3D option of Frequency Domain Monitors allows specifying a volume, where the fields will be monitored at a given frequency.

Time sparsity of an *FD-Monitor* 3D calculation can be set in *QW-Simulator* in the *Preferences* dialogue.

Spatial sparsity of an *FD-Monitor* 3D calculation can be set in a pre-processing stage in *QW-Editor* in the *Processing/Postprocessing* dialogue.

New UDOs with an *FD-Monitor* 3D box and settings are available in a standard QW library.



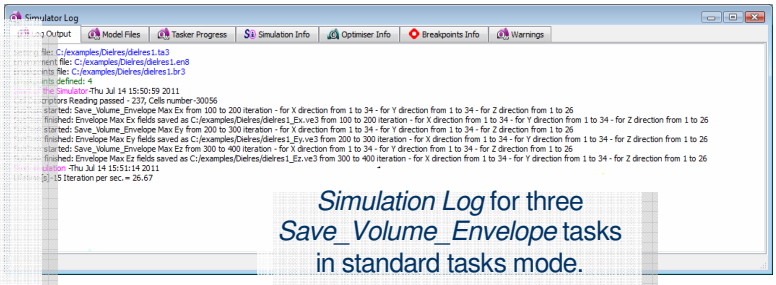
Real part of the complex Poynting vector at $f = 20$ GHz for the horn antenna.

The *Monitors Settings* dialogue allows choosing frequency and monitors.

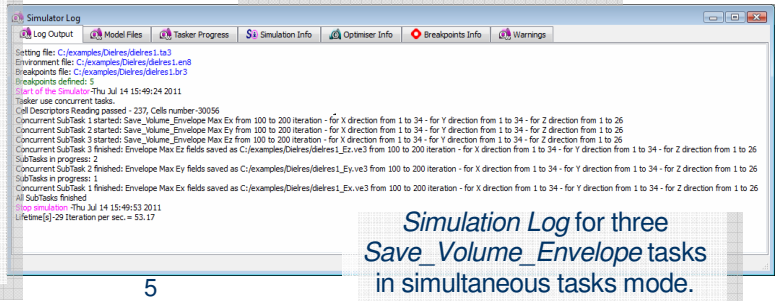
Subtasks can work simultaneously

Subtasks like:
Save_Plane_Envelope
Save_Line_Envelope
Save_Fields_Along_Contour
Save_Time_Probes
Save_Volume_Envelope
Save_Pdiss_Energy_QF
Calculate_With_Prony

can work simultaneously, and now it is possible to i.e. save envelope for different components at the same time. This mode can be switched on by placing **Use_Concurrent_Tasks** command in Breakpoints or in the tasker file.



Simulation Log for three *Save_Volume_Envelope* tasks in standard tasks mode.



Simulation Log for three *Save_Volume_Envelope* tasks in simultaneous tasks mode.

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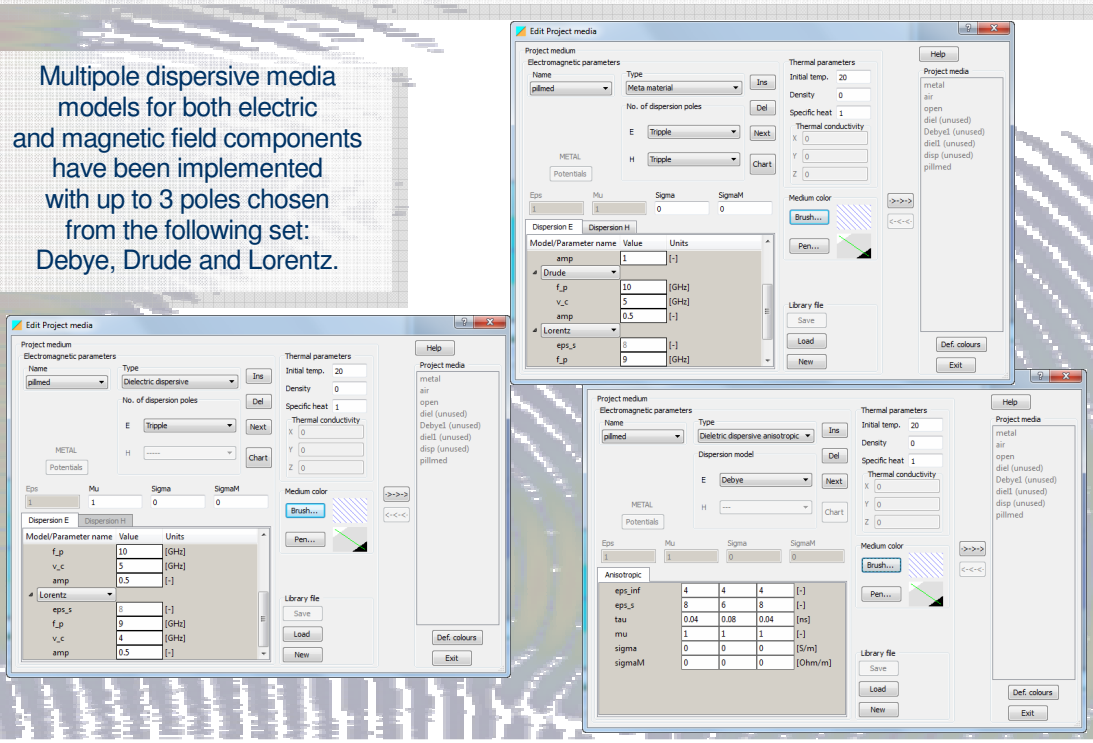
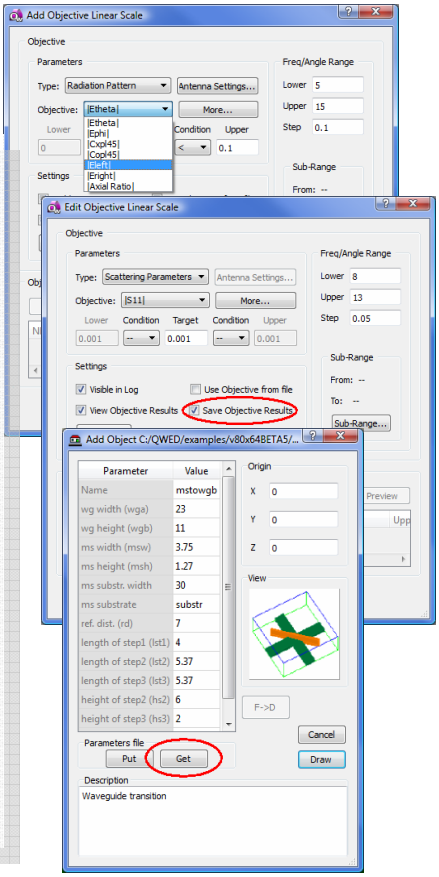
Multipole dispersive media

Multipole dispersive media models for both electric and magnetic field components have been implemented with up to 3 poles chosen from the following set: Debye, Drude and Lorentz.



QW-OptimiserPlus improvements

New Objective for optimisation and grid search: radiation pattern for circular polarisation.



Objective Results in Optimiser/GridSearch

After each optimisation or grid search iteration the results of the current simulation will be saved in the file with the name:

<PROJECTNAME>_<OPTGS>_<OBJNB>_<OPTIT>.da3

where:

<PROJECTNAME> - name of the project
<OPTGS> - string ”opt” for optimisation, ”gs” for grid search
<OBJNB> - number of objective
<OPTIT> - number of current iteration of optimisation or grid search

Additionally the files with the name:

<PROJECTNAME>_<OPTGS>_<OBJNB>_<OPTIT>.udp

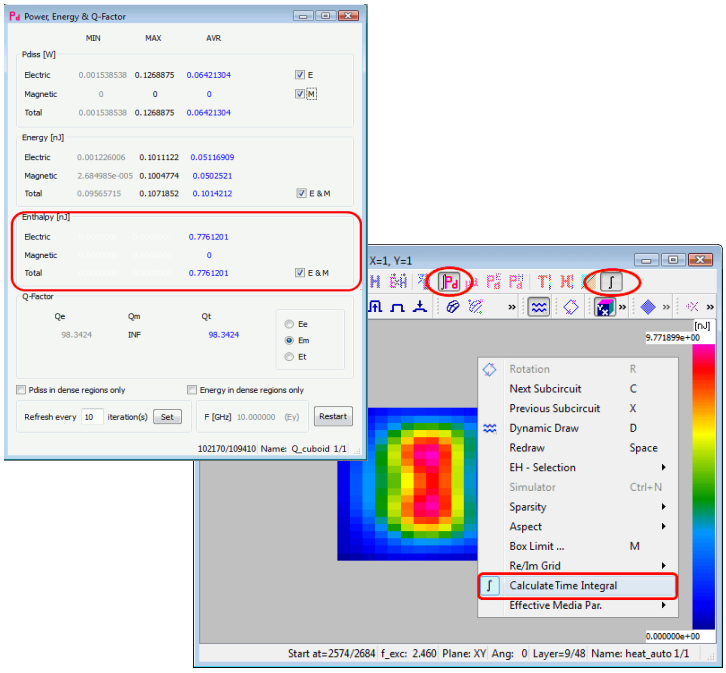
will be saved. These files contain current values for variables that are selected for optimisation or grid search.

File *.udp can be easily imported to *QW-Editor* in the *Add Object* window by pressing *Get* button.

Integration of dissipated power over time

Enthalpy is integrated when its checkbox (E&M) indicates “v”. Note that the area of integration can be performed in all media or in the chosen media depending on the state of the checkbox “Pdiss in dense regions only”.

Calculate Time Integral is used to calculate the enthalpy by integration of the dissipated power over time.
It can be turned on when one of the components: Pdiss/Pdens/PdissE/PdissM is chosen. This option is useful when we want to calculate the energy dissipated over the entire duration of a pulse of limited duration regardless of its spectral content.



Big project scalability

Big (larger than 4GB) files supported e.g. save volume fields, save volume envelope, freeze, dump fields etc. files.

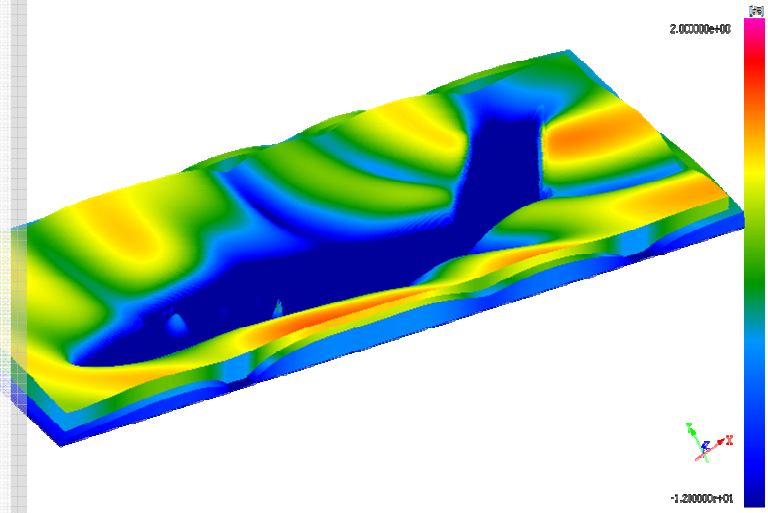
Progress Bar for Load/Save Project, Load UDO, Export operations in *QW-Editor*.

Significantly faster elements/objects deleting in *QW-Editor*.

New implementation of *Select Element* dialog (faster opening, sort and filter feature added) in *QW-Editor*.

Parallel preprocessing (LC) – semi linear speedup, Plane Wave, NTF (FAR), FD-Monitor for OMP version of *QW-Simulator*.

QViewer improvements – progress for drawing, dB scale, 64-bit version.



New functions in View Results window

New Curves Pane contains grouped complete list of the available curves.

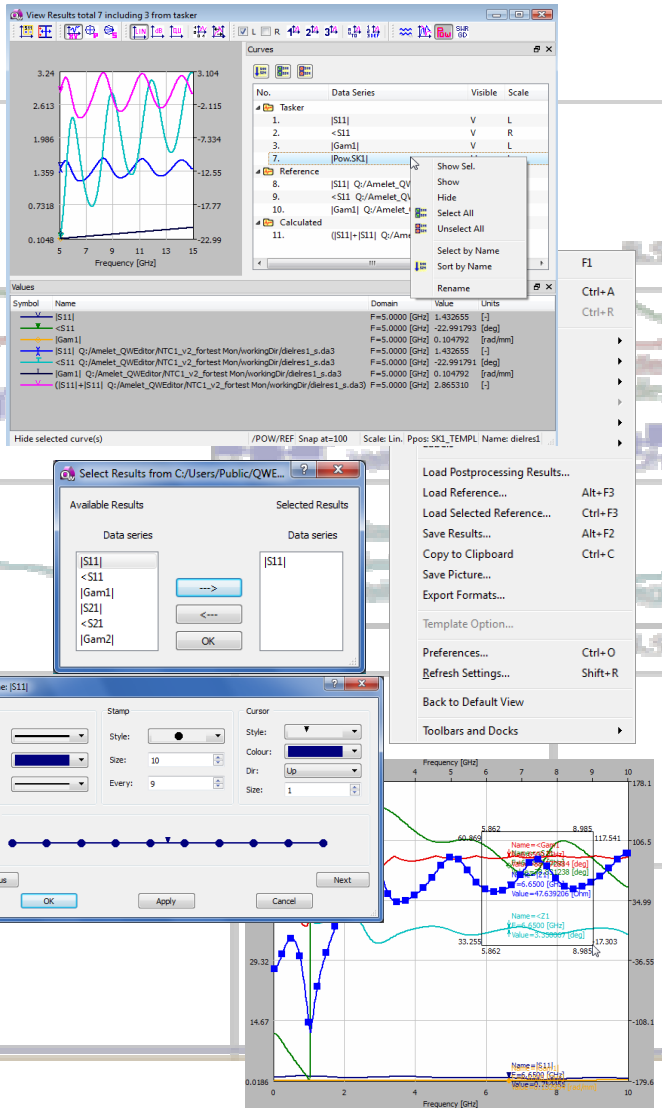
New menu commands:
Load Postprocessing Results allows loading of results from other *FD-Probing* postprocessings.

Load Selected Reference allows viewing the currently calculated results against a selected reference curve. It invokes a standard Open File dialogue and then opens *Select Results* dialogue where the user can choose the results which are supposed to be loaded.

New functions of the *Edit Line* dialogue.

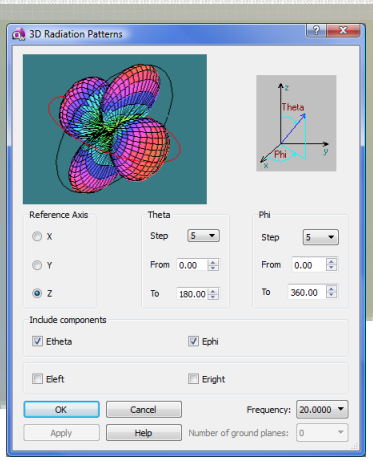
Ep (E-field at point) and Hp (H-field at point) results available in the *View Results* window for *FD-Probing* postprocessing.

Zoom by drawing a rectangle with CTRL + left mouse button. The rectangle should be drawing from top-left to bottom-right corner. Return to the previous view with CTRL+Z.



Additional parameters for 3D Radiation Patterns

Additional parameters for display of 3D Radiation Patterns:
- limits for Theta & Phi
- number of ground planes.



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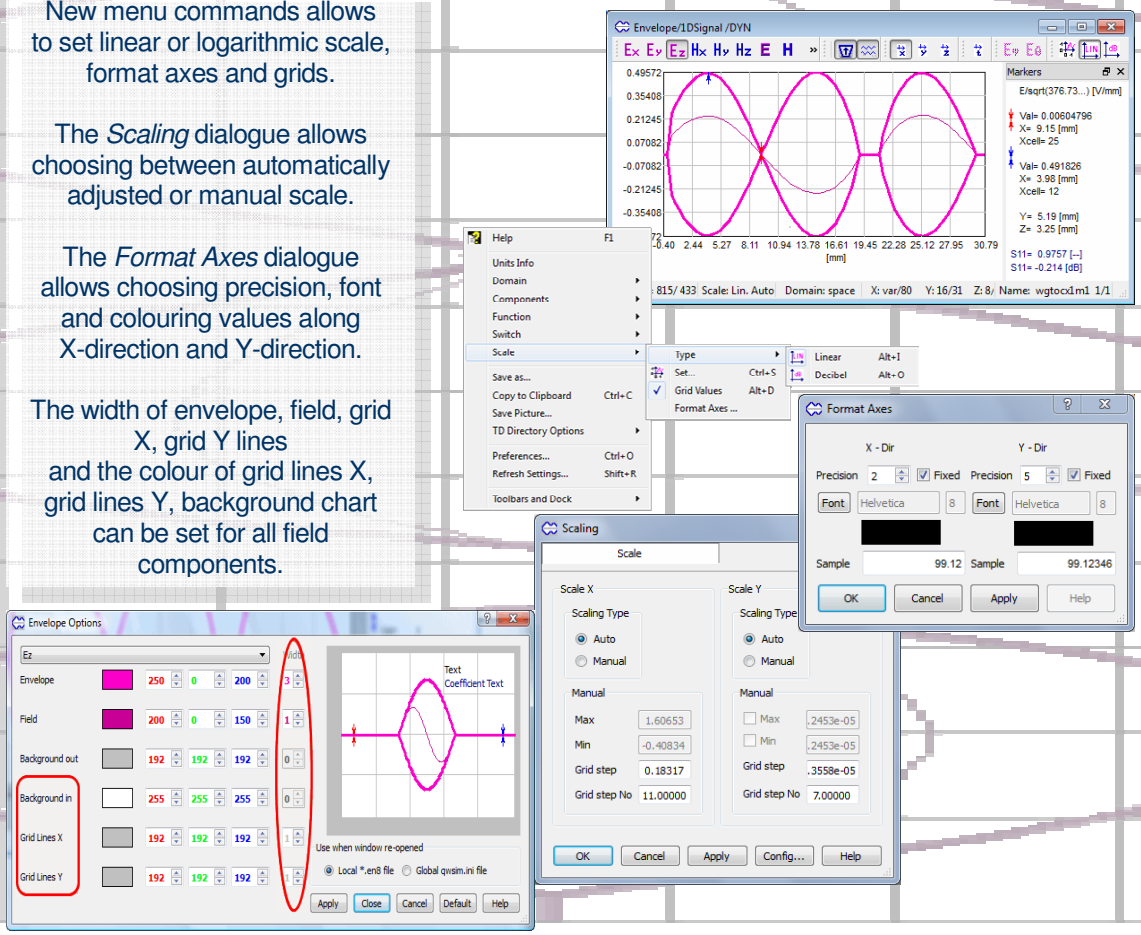
New users friendly functions in View Envelope

New menu commands allows to set linear or logarithmic scale, format axes and grids.

The *Scaling* dialogue allows choosing between automatically adjusted or manual scale.

The *Format Axes* dialogue allows choosing precision, font and colouring values along X-direction and Y-direction.

The width of envelope, field, grid X, grid Y lines and the colour of grid lines X, grid lines Y, background chart can be set for all field components.

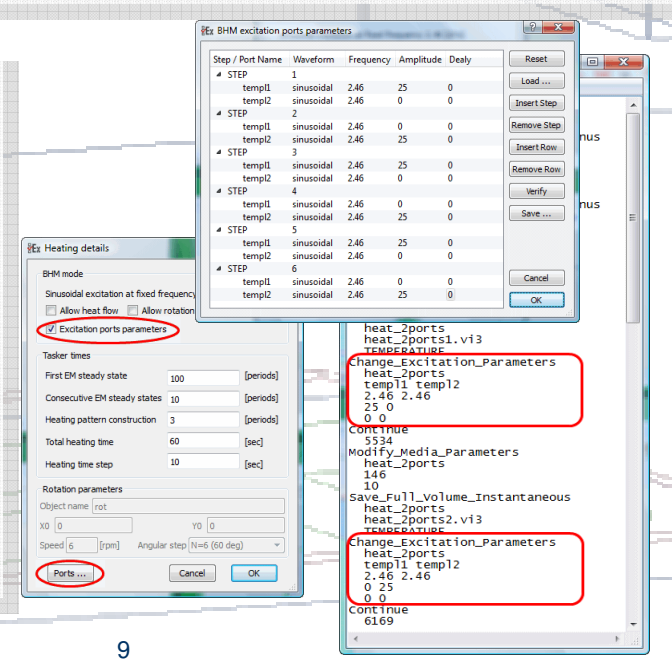


QW-BHM regime with changing excitation

This regime is dedicated for BHM examples with N (N>=1) sinusoidal excitations.

The new settings of frequency, amplitudes, and phases are pre-defined by the user in *QW-Editor*, before the whole simulation is launched.

QW-Simulators reads files *.ta3 with new command **Change_Excitation_Parameters**.



New Tasks

Save_Time_Probes_Extended_Dir
S_NAME
F_NAME
Ex / Ey / Ez / Hx / Hy / Hz / E / H / UPoint / IPoint / SAR / Pdiss / PdissE / PdissH / Pdens / TEMPERATURE / ENTHALPY / Waveform / Ephi / Etheta / EPoint / HPoint
<Xcell>
<Ycell>
<Zcell>
<Nb_of_It>
<Nb_of_files>
Probe_NAME
SUBDIR

This task is the same as *Save_Time_Probes* but time probes will be saved in *SUBDIR* sub-directory.

View_Fields_Monitor_3D
Dummy

Equivalent to *View-Fields Monitor* for 3D Monitor from menu of *QW-Simulator*.

Save_Fields_Monitor_3D
S_NAME
F_NAME
Ex / Ey / Ez / Hx / Hy / Hz / Sx / Sy / Sz
Re / Im
<fdm_box_number>
<fdm_frequency>

The 3D fields monitor data of the chosen field component, in subcircuit *S_NAME*, for the *<fdm_box_number>* monitor box and *<fdm_frequency>* monitor frequency. Please note that *Re / Im* parameter is ignored for others components that *Sx, Sy, Sz*.

Save_Circular_Antenna_Results_Extended_Walls
R_NAME
QW_3D / QW_Antenna_Pure / SAC / GRASP
X / Y / Z [<EulerAlfa> <EulerBeta> <EulerGamma>]
phi / theta [<ground_planes_nb>]
<const_angle_value>
<variable_angle_step>
<variable_angle_from>
<variable_angle_to>
<X_POS>
<Y_POS>
<Z_POS>
onlynear / nearfar [Directive / Power / Absolute / Relative / Fields_at_1m]
<-X +X -Y +Y -Z +Z>

This task is the same as *Save_Antenna_Results_Extended_Walls* but for circular polarization of antenna characteristics.

Change_Excitation_Parameters
S_NAME
<Port_Name1><Port_Name2>...
<Port_Freq1><Port_Freq2>...
<Port_Amp1><Port_Amp2>...
<Port_Delay1><Port_Delay2>...

Sets frequency (*Port_Freq1*), amplitude (*Port_Amp1*) and delay (*Port_Delay1*) in port of name *Port_Name1* and consecutively in the next ports (if parameters are present) in subcircuit *S_NAME*.

Save_Pdiss_Energy_QF_ReIm
S_NAME
F_NAME
pdiss_dense_regions_only/energy_dense_regions_only/pdiss_energy_dense_regions_only/ All_Region
Re / Im
No_of_It

This task should be preceded by the *RunIter* task with parameter *No_of_It1*. The simulation will be continued until *No_of_It*, and between *No_of_It1* and *No_of_It* power, energy and Q-Factor in subcircuit *S_NAME* will be calculated and at iteration *No_of_It* saved to file *F_NAME*. The third line of parameters allows controlling regions of integration: *All_Region* entails that power and energy are integrated over the whole circuit; *pdiss_dense_regions_only* / *energy_dense_regions_only* / *pdiss_energy_dense_regions_only* reduce the regions of integration of only power / only energy/ both power and energy to regions of non-zero material density. Parameter Re/Im makes a selection of real/imaginary grid.

Save_Enthalpy_ReIm
S_NAME
F_NAME
dense_regions / All_Region
Re / Im
No_of_It

This task should be preceded by the *RunIter* task with parameter *No_of_It1*. The simulation will be continued until *No_of_It*, and between *No_of_It1* and *No_of_It* enthalpy in subcircuit *S_NAME* will be calculated and at iteration *No_of_It* saved to file *F_NAME*. The third line of parameters allows controlling regions of integration: *All_Region* enthalpy is integrated over the whole circuit; *dense_regions* reduce the regions of integration to regions of non-zero material density. Parameter *Re/Im* make selection of real/imaginary grid.

Save_Volume_Integrated
S_NAME
F_NAME
Pdiss / PdissE / PdissH / Pdens
<MinX>
<MaxX>
<MinY>
<MaxY>
<MinZ>
<MaxZ>
No_of_It

The integrated field of the chosen field component, in subcircuit *S_NAME*, in chosen sub-volume will be saved to the file *F_NAME*.

Save_Full_Volume_Integrated
S_NAME
F_NAME
Pdiss / PdissE / PdissH / Pdens
No_of_It

The integrated field of the chosen field component, in subcircuit *S_NAME*, in the whole volume will be saved to file *F_NAME*.

New Breakpoints

Configuration dialogue for *Save FD Probing Results Extended* Breakpoint.

Configuration dialogue for *Save Circular Antenna Results Extended Walls* Breakpoint.

Configuration dialogue for *Save Time Probes Extended Dir* Breakpoint.

Configuration dialogues for *Save Volume Integrated* Breakpoint.

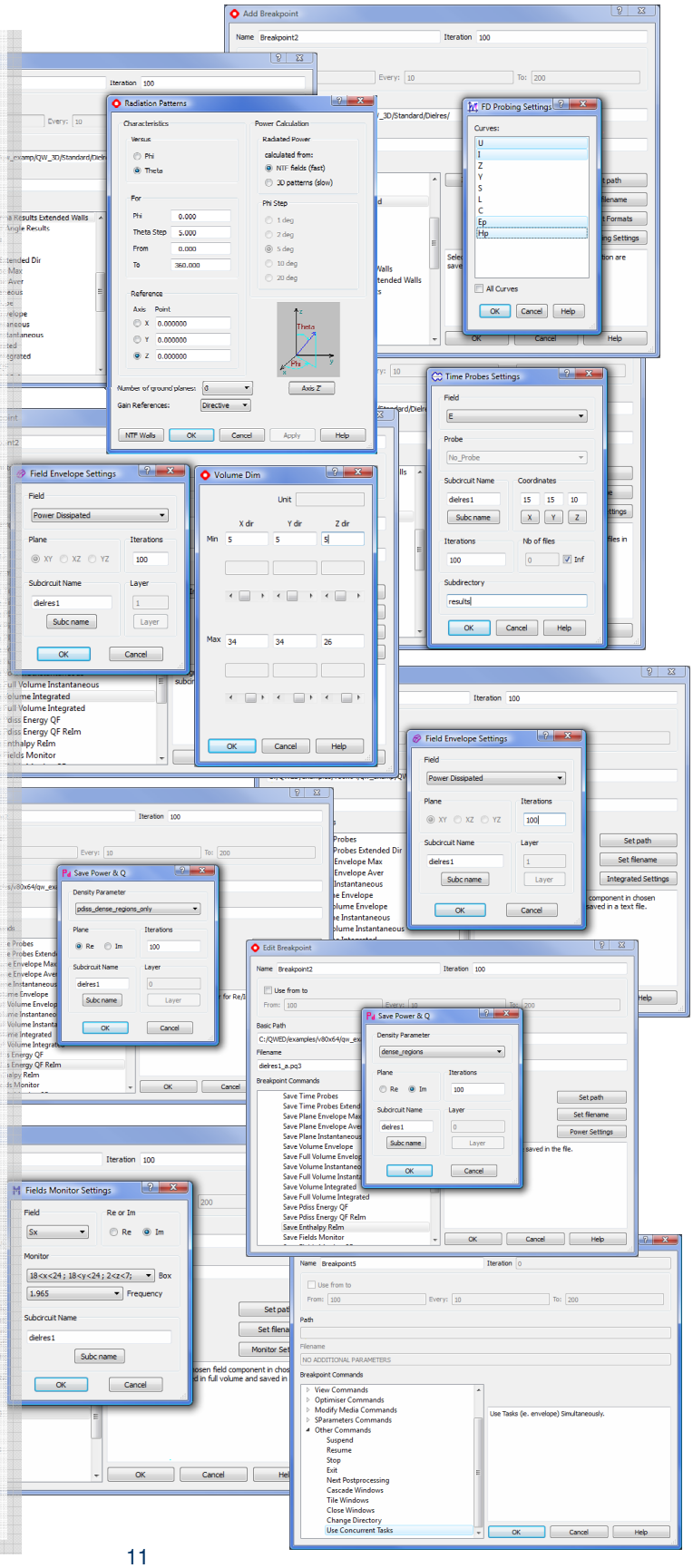
Configuration dialogue for *Save Full Volume Integrated* Breakpoint.

Configuration dialogue for *Save Pdiss Energy QF Relm* Breakpoint.

Configuration dialogue for *Save Enthalpy Relm* Breakpoint.

Configuration dialogue for *Save Fields Monitor 3D* Breakpoint.

Settings for *Use Concurrent Tasks* Breakpoint.



New UDO commands

FDM3DSPARS *(<sparsity>);*

Set spatial sparsity for FD-Monitor 3D.

DISPERSION2 *(<mediumname>, <model_name>, <par_1>, <par_2>, <par_3>, <par_4>, <par_5>, <par_6>, <par_7>, <par_8>, <par_9>, <par_10>, <par_11>);*

Sets multipole dispersive dielectric parameters.
The *model_name* options are: DRUDE2, DEBYE2, LORENTZ2, DEBYE_DRUDE, DEBYE_LORENTZ, DRUDE_LORENTZ, DRUDE3, DEBYE3, LORENTZ3, DEBYE2_DRUDE, DEBYE2_LORENTZ, DEBYE_DRUDE2, LORENTZ_DRUDE2, DEBYE_LORENTZ2, LORENTZ2_DRUDE, DEBYE_DRUDE_LORENTZ, DEBYE_ANIS.

- DRUDE2: (*<par_1>*,…,*<par_11>*) – (eps_inf,v_c, f_p, Amp1,v_c2,f_p2,Amp2,0,0,0,0)
- DEBYE2: (*<par_1>*,…,*<par_11>*) – (eps_inf,eps_s,tau,Amp1,tau2,Amp2,0,0,0,0,0)
- LORENTZ2: (*<par_1>*,…,*<par_11>*) – (eps_inf,eps_s,v_c,f_p,Amp1,v_c2,f_p2,Amp2,0,0,0)
- DEBYE_DRUDE: (*<par_1>*,…,*<par_11>*) – (eps_inf,eps_s,tau,Amp1,v_c2,f_p2,Amp2,0,0,0,0)
- DEBYE_LORENTZ: (*<par_1>*,…,*<par_11>*) – (eps_inf,eps_s,tau,Amp1,v_c2,f_p2,Amp2,0,0,0,0)
- DRUDE_LORENTZ: (*<par_1>*,…,*<par_11>*) – (eps_inf,eps_s,v_c,f_p,Amp1,v_c2,f_p2,Amp2,0,0,0)
- DRUDE3: (<par_1>,…,<par_11>) – (eps_inf,v_c,f_p,Amp1,v_c2,f_p2,Amp2,v_c3,f_p3,Amp3,0)
- DEBYE3: (*<par_1>*,…,*<par_11>*) – (eps_inf,eps_s,tau,Amp1,tau2,Amp2,tau3,Amp3,0,0,0)
- LORENTZ3: (*<par_1>*,…,*<par_11>*) – (eps_inf,eps_s,v_c,f_p,Amp1,v_c2,f_p2,Amp2,v_c3,f_p3,Amp3)
- DEBYE2_DRUDE: (*<par_1>*,…,*<par_11>*) – (eps_inf,eps_s,tau,Amp1,tau2,Amp2,v_c3,f_p3,Amp3,0,0)
- DEBYE2_LORENTZ: (*<par_1>*,…,*<par_11>*) – (eps_inf,eps_s,tau,Amp1,tau2,Amp2,v_c3,f_p3,Amp3,0,0)
- DEBYE_DRUDE2: (*<par_1>*,…,*<par_11>*) – (eps_inf,eps_s,tau,Amp1,v_c2,f_p2,Amp2,v_c3,f_p3,Amp3,0)
- DEBYE_DRUDE_LORENTZ: (*<par_1>*,…,*<par_11>*) – (eps_inf,eps_s,tau,Amp1,v_c2,f_p2,Amp2,v_c3,f_p3,Amp3,0)
- LORENTZ_DRUDE2: (*<par_1>*,…,*<par_11>*) – (eps_inf,eps_s,v_c,f_p,Amp1,v_c2,f_p2,Amp2,v_c3,f_p3,Amp3)
- LORENTZ2_DRUDE: (*<par_1>*,…,*<par_11>*) – (eps_inf,eps_s,v_c,f_p,Amp1,v_c2,f_p2,Amp2,v_c3,f_p3,Amp3)
- DEBYE_LORENTZ2: (*<par_1>*,…,*<par_11>*) – (eps_inf,eps_s,tau,Amp1,v_c2,f_p2,Amp2,v_c3,f_p3,Amp3,0)
- DEBYE_ANIS: (*<par_1>*,…,*<par_11>*) – (eps_inf_x,eps_s_x,tau_x,eps_inf_y,eps_s_y,tau_y,eps_inf_z,eps_s_z,tau_z,0)

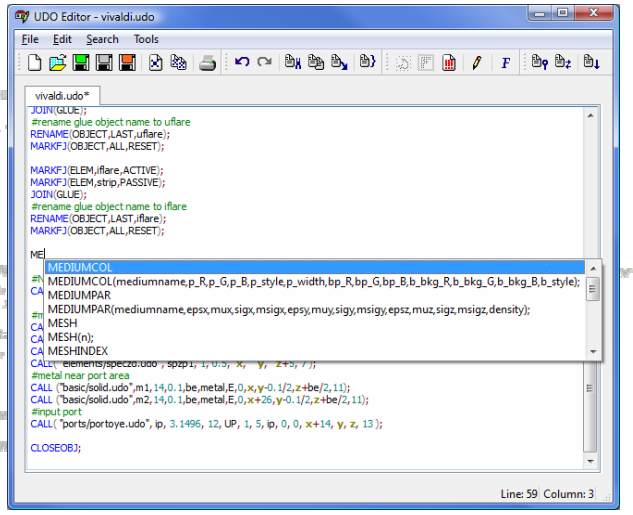
DISPERSIONH2 *(<mediumname>, <model_name>, <par_1>, <par_2>, <par_3>, <par_4>, <par_5>, <par_6>, <par_7>, <par_8>, <par_9>, <par_10>, <par_11>);*

Sets multipole dispersive dielectric parameters.
The *model_name* options are: DRUDEH2, DEBYEH2, LORENTZH2, DEBYEH_DRUDEH, DEBYEH_LORENTZH, DRUDEH_LORENTZH, DRUDEH3, DEBYEH3, LORENTZH3, DEBYEH2_DRUDEH, DEBYEH2_LORENTZH, DEBYEH_DRUDEH2, LORENTZH_DRUDEH2, DEBYEH_LORENTZH2, LORENTZH2_DRUDEH, DEBYEH_DRUDEH_LORENTZH.

- DRUDEH2: (*<par_1>*,…,*<par_11>*) – (mu_inf,v_cH,f_pH,Amp1H,v_c2H,f_p2H,Amp2H,0,0,0,0)
- DEBYEH2: (*<par_1>*,…,*<par_11>*) – (mu_inf,mu_s,tauH,Amp1H,tau2H,Amp2H,0,0,0,0,0)
- LORENTZH2: (<par_1>,…,<par_11>) – (mu_inf,mu_s,v_cH,f_pH,Amp1H,v_c2H,f_p2H,Amp2H,0,0,0)
- DEBYEH_DRUDEH: (*<par_1>*,…,*<par_11>*) – (mu_inf,mu_s,tauH,Amp1H,v_c2H,f_p2H,Amp2H,0,0,0,0)
- DEBYEH_LORENTZH: (*<par_1>*,…,*<par_11>*) – (mu_inf,mu_s,tauH,Amp1H,v_c2H,f_p2H,Amp2H,0,0,0,0)
- DRUDEH_LORENTZH: (<par_1>,…,<par_11>) – (mu_inf,mu_s,v_cH,f_pH,Amp1H,v_c2H,f_p2H,Amp2H,0,0,0)
- DRUDEH3: (<par_1>,…,<par_11>) – (mu_inf,v_cH,f_pH,Amp1H,v_c2H,f_p2H,Amp2H,v_c3H,f_p3H,Amp3H,0)
- DEBYEH3: (<par_1>,…,<par_11>) – (mu_inf,mu_s,tauH,Amp1H,tau2H,Amp2H,tau3H,Amp3H,0,0,0)
- LORENTZH3: (<par_1>,…,<par_11>) – (mu_inf,mu_s,v_cH,f_pH,Amp1H,v_c2H,f_p2H,Amp2H,v_c3H,f_p3H,Amp3H)
- DEBYEH2_DRUDEH: (<par_1>,…,<par_11>) – (mu_inf,mu_s,tauH,Amp1H,tau2H,Amp2H,v_c3H,f_p3H,Amp3H,0,0)
- DEBYEH2_LORENTZH: (<par_1>,…,<par_11>) – (mu_inf,mu_s,tauH,Amp1H,tau2H,Amp2H,v_c3H,f_p3H,Amp3H,0,0)
- DEBYEH_DRUDEH2: (<par_1>,…,<par_11>) –
  (mu_inf,mu_s,tauH,Amp1H,v_c2H,f_p2H,Amp2H,v_c3H,f_p3H,Amp3H,0)
- DEBYEH_DRUDEH_LORENTZH: (<par_1>,…,<par_11>) –
  (mu_inf,mu_s,tauH,Amp1H,v_c2H,f_p2H,Amp2H,v_c3H,f_p3H,Amp3H,0)
- LORENTZH_DRUDEH2: (<par_1>,…,<par_11>) –
  (mu_inf,mu_s,v_cH,f_pH,Amp1H,v_c2H,f_p2H,Amp2H,v_c3H,f_p3H,Amp3H)
- LORENTZH2_DRUDEH: (<par_1>,…,<par_11>) –
  (mu_inf,mu_s,v_cH,f_pH,Amp1H,v_c2H,f_p2H,Amp2H,v_c3H,f_p3H,Amp3H)
- DEBYEH_LORENTZH2: (<par_1>,…,<par_11>) –
  (mu_inf,mu_s,tauH,Amp1H,v_c2H,f_p2H,Amp2H,v_c3H,f_p3H,Amp3H,0)

New functions in UDO Editor

- hint for complete syntax of UDO command
- detection of the outside modification of the file
- 64-bit version



Other improvements

QW-SAT Filter improvements – also 64-bit version.

Info for network license in *QW-Simulator* Help-About window.

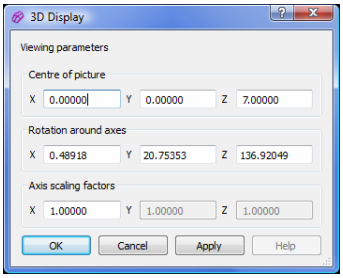
Progress Bar for preprocessing (LC) for V2D projects in *QW-Simulator*.

Tree view for browsing/editing project items in *QW-Editor*.

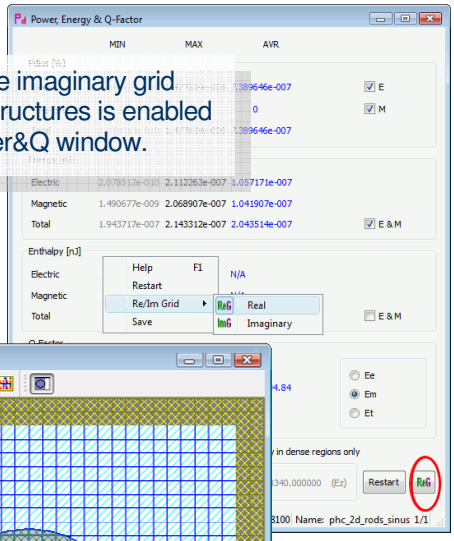
Improved algorithm of searching library UDO files in *QW-Editor*.

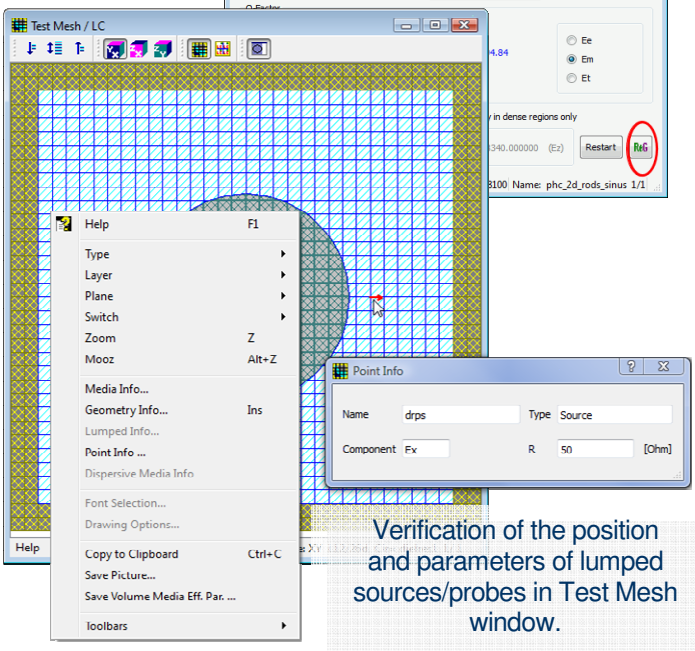
Improved behaviour for system large fonts.

Viewing options in display 3D in View Fields window.

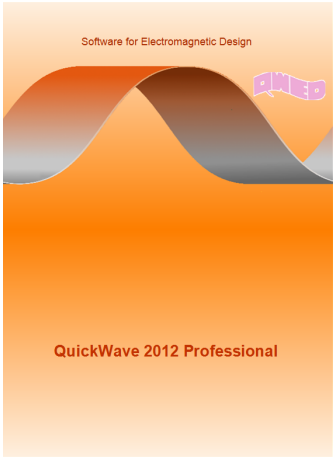


Real or the imaginary grid for periodic structures is enabled in Power&Q window.





Verification of the position and parameters of lumped sources/probes in Test Mesh window.



QuickWave 2012 Professional

- 3D or V2D or 3D & V2D license
- 64-bit and 32-bit version
- sequential and multi-core/multi-processor QW-Simulator

QuickWave 2012 Standard

- 3D or V2D or 3D & V2D license
- 32-bit version
- sequential version QW-Simulator

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