WIPL-D Pro

- Features and Improvements in Previous Versions -

20.0

New features/improvements introduced in v20 are:

- WIPL-D scripting in Python:
    - Open and run WIPL-D suites
    - Access and modify symbol lists
    - Obtain simulation results
- Voxel Editor includes:
    - Support for New voxel file formats
    - Refined decimation for models of complex shapes
- New object BoCS enables:
    - Creation of objects by sweep of generatrix along composite 3D path
- Medical Microwave Imaging (MMWI) Toolkit:
    - Design of Helmet antenna system for tumor and stroke detection/monitoring
- Current Generators grant:
    - Rotations and translation of sources
    - Usage of current sources in combination with symmetry planes (PEC, PMC, Half-Space)
    - Max. number of current source elements exceeding 1 million
    - Creating current generator files from IWP project
- Domain Decomposition Solver:
    - Quick evaluation of monostatic RCS
      (Example: For additional 360 directions, CPU time equals that for bistatic RCS)
- STL Editor provides:
    - Refined meshing of extreme shapes
      (Example: Elongated branches of treetop)
    - 10 times faster decimation and meshing
- Improvements in WIPL-D Graph Viewer:
    - Fast presentation of current distribution
    - Extended limits for presentation of structures in conjunction with 3D graphs
- Preview:
    - Improvements in plate selection
    - Improvements regarding Hide/Alt+L features
    - Current Sources Threshold
    - Improvements in displaying Waves
- Improved multiprocessing for lower-order basis functions
- Other Features/Improvements:
    - Improvements in IWP file import
    - Improvements in handling projects with an extremely large number of plates
    - Working with Tables
    - RAM Memory Limit

More on improvements and new features introduced in v20 you can find in the document **WIPL-D v20 - What is New.pdf**.

19.0

New features/improvements introduced in v19 are:

- Full exploitation of Matrix Symmetry:
    - Reduced matrix fill time
    - Reduced matrix solution time
- Improved GPU out-of-core solution:
    - Matrix fill in parallel on multiple hard disks
- Accelerated GPU matrix fill: up to 40%
- New functionalities in massive RCS calculation ("Run As Avoided with Interpolation")
    - Support for 3D angular interpolation
    - Refined interpolation by Spline function
    - New interpolation function: Rational function
    - Error estimation
- Refined accuracy of Periodic Boundary Condition
- Sweep parallel run
    - Concurrent simulation of multiple sub-projects
- Fast calculation of excitation matrix for Field Generators' arrays
- STL editor
    - Import of STL files
    - Variety of edit options
    - Decimation
    - Quadrilateral meshing
    - Export to STL files
- Accelerated Topological Analysis
- Easier handling of (very) complex structures
    - Hide Selected Plates
    - Select Layer
    - Extended limits for "Manipulations"
    - Fast Open/Save/Save As
- Scenario Project:
    - Assembly of WIPL-D projects (components), merged into a single WIPL-D project (scenario), by using a set of Manipulations commands
    - Components and their copies can be turned on/off with one click
    - Components can be easily deleted or replaced with another WIPL-D project
    - A component can be modified separately, and changes can be included in the scenario with one click
- Voxel Editor
    - Enables usage of various Voxel formats (Zubal, Mtype-Pvalue, NIFTI-1)
    - Creates human phantoms (breast, head, torso) in native WIPL-D formats
    - Two ways of creation and simplification of phantom: homogenization and decimation
- General Integral Equation Solver

- Ability to handle arbitrary Green function through Green Function Calculator (GFC)
    - Half-Space GFC – 3D EM modeling of antennas above real ground
    - PEC/PMC GFC – Alternative way of taking basic symmetry planes into account
- Medical Microwave Imaging (MMWI) Algorithms
    - Enable detection of tumor/stroke position, shape, and size in a simulated MMWI scenario
    - Two different methods: TSVD and LSM
- Periodic Boundary Condition:
    - Now includes antenna operation mode
    - Junctions are supported in PBC
    - Refined accuracy for cells up to 10λx10λx10λ
    - Simulation accelerated up to 10 times
- Domain Decomposition Solver:
    - Limits: extended to 12 million unknowns
    - Accuracy: increased up to 10 times
    - Simulation time: reduced up to 3 times
- Units:
    - Model dimensions preserved after changing units for structures defined by symbols
    - Enabled import of projects using a different set of units
- New features and improvements in WIPL-D Graph Viewer:
    - Plotting the results of a mathematical expression
    - Automatic calculation of radiation characteristics such as 3dB beamwidth, 1st side lobe level, F/B ratio, etc.
    - Plotting a predefined mask to visualize the limits of the targeted response
    - Plotting the YZS parameters as a function of port
    - Advanced grid settings, including minor grids and adjustable color, style, and width of the grid lines
    - Other options: show/hide layers, fitting with normalization, phase unwrapping
- Preview
    - Show all (hidden entities)
    - Cascade view (multiple open projects)
    - Selection of plates is accelerated by an order of magnitude
    - Multiple selection of virtual plates is enabled together with real plates
- Modeling of large and complex structures:
    - Deleting nodes is accelerated by an order of magnitude
    - Increased maximum number of domains: 4096 different materials applicable in a single project
    - Creating/deleting entities in Local Settings, Distributed Loadings, and Manipulations is accelerated by an order of magnitude
- Other Features/Improvements:
    - Increased maximum number of Junction nodes (expandable junction table)
    - Increased maximum number of characters in symbol names
    - Group of objects: enabled usage of symbols
    - Enabled usage of tab key in Node/Plate tables

More on improvements and new features introduced in v19 you can find in the document **WIPL-D v19 - What is New.pdf**.

18.0

New features/improvements introduced in v18 are:

- New options in the STL Editor:
    - Automatic validation
    - Automatic healing (simplification and unite)
    - Fully controlled decimation and quad meshing
    - Export of selected model parts
    - Model settings
    - Manipulations
- NEVA-based human phantoms for EM modeling
- Library of antennas for medical microwave imaging
- Material library with over 80 predefined materials, and three new ways to define
- Frequency-dependent material properties:
    - Frequency table
    - Cole-Cole approximation
    - Djordjevic-Sarkar approximation
- Operations applicable to a selection of domains:
    - Near-field calculation
    - Averaging of material properties
- Enhanced capabilities when importing models/projects
- New application for plotting the output results (WIPL-D graph viewer):
    - Completely new algorithm for reading and processing data
    - An intuitive and user-friendly setting of graph parameters
    - Introduction of new variables for plotting
    - Plotting different data formats on the same graph
    - Save and reuse graph settings
    - Other improvements: rounding numbers, faster 3D rendering using OpenGL display lists, spline fitting, export to ASCII for overlaid results
- Extended limits of the periodic boundary condition solver
- GPU solver: accelerated GPU matrix solve for a large number of excitations
- Export and re-use of the MoM matrix
- Fast preview of large and complex structures
- Other features/improvements:
    - Repair projects at open
    - Reverse simulation order in frequency and sweep parallel runs
    - Import of MAP files
    - Enhanced limits for handling large and complex structures
    - Enhanced limits for handling of structures with a large number of generators/ports
    - Custom-defined merge tolerance

More on improvements and new features introduced in v18 you can find in the document WIPL-D v18 - What is New.pdf.

17.0

New features/improvements introduced in v17 are:
- Full exploitation of Matrix Symmetry:
  - Reduced matrix fill time
  - Reduced matrix solution time
- Improved GPU out-of-core solution:
  - Matrix fill in parallel on multiple hard disks
- Accelerated GPU matrix fill: up to 40%
- New functionalities in massive RCS calculation ("Run As Avoided with Interpolation")
  - Support for 3D angular interpolation
  - Refined interpolation by Spline function
  - New interpolation function: Rational function
  - Error estimation
- Refined accuracy of Periodic Boundary Condition
- Sweep parallel run
  - Concurrent simulation of multiple sub projects
- Fast calculation of excitation matrix for Field Generators' arrays
- STL editor
  - Import of STL files
  - Variety of edit options
  - Decimation
  - Quadrilateral meshing
  - Export to STL files
- Accelerated Topological Analysis
- Easier handling of (very) complex structures
  - Hide Selected Plates
  - Select Layer
  - Extended limits for "Manipulations"
  - Fast Open/Save/Save As

More on improvements and new features introduced in v17 you can find in the document **WIPL-D v17 - What is New.pdf**.

16.0

New features/improvements introduced in v16 are:
- **Periodic Boundary Condition (PBC):**
  - 2D periodic structure
  - Plane wave illumination
  - 3D cell in a form of arbitrary composite material structure
  - Complex connections at boundaries of neighboring cells
  - FSS, Meta & Nano materials, Diffraction grating, Absorber & Reflect arrays
- **ULTRA higher order bases**

- o Maximum expansion order increased from 8 to 32
- o Maximum patch size enlarged from 2 λ to 10 λ
- o Increased efficiency and accuracy for complex and large structures
- o Advanced convergence tests based on p-refinement
- **New Edging technique - "Refined" edging**
  - o Efficiency of "Classic", but robustness of "Advanced" edging
- **GPU Cluster Solver:**
  - o Support for arbitrary number of GPUs per node with improved efficiency
- **Other options/improvements:**
  - o Determining required number of unknowns
  - o Avoided with Interpolation available now in Remote Run mode
  - o Custom defined excitation waves and radiation directions for RCS

More on improvements and new features introduced in v16 you can find in the document **WIPL-D v16 - What is New.pdf**.

15.0

New features/improvements introduced in v15 are:

- **NEW generation of GPU Solver** - **100,000 unknowns solved in less than 5 minutes!**
  - o improved efficiency of a multiple GPU setup
  - o support for arbitrary number of GPUs
  - o ultra-fast in-core solution for multiple excitations
- **RCS calculation using real life antenna excitation** - emulation of RCS measurements
  - o target illuminated by a real antenna radiation pattern (spherical wave)
  - o RCS at finite and infinite distance
  - o calculation of bistatic and monostatic RCS
- **Advanced GUI options**
  - o exporting videos from the field and the currents animation
  - o graphic representation of currents for selected domains
  - o advanced phase center calculation
  - o real-time graphic representation of the cost function in Optimizer
  - o saving the specification of used hardware in the OWP file…
- **Enhancements in DDS** (Domain Decomposition Solver)
  - o memory requirements reduced by an order of magnitude
  - o efficient handling of multiple excitations
  - o fast convergence for structures with cavities
  - o GPU acceleration for sub-domain solutions
  - o comparison of results after each iteration
- **Fast in-core solution for multiple excitations where CPU is used for matrix inversion**
  - o block forward/backward substitution
  - o applicable to monostatic RCS and antenna arrays
- **Memory/Solution management**
  - o The user can choose the classes of problems where the solution for current coefficients should be stored for future reuse. The data format can also be chosen.

- **Improved CMA Solver**
  - increased accuracy for eigenvalues and eigenvector calculation
  - improved mode tracking
- **GPU Cluster Solver**
  - advanced resource management
  - more flexible licensing …

More on improvements and new features introduced in v15 you can find in the document **WIPL-D v15 - What is New.pdf**.

14.0

Improvements and new features introduced in version 14.0 are:
- New De-embedding Technique enables:
  - **Multi-mode ports/feeders**
  - **Circularly polarized modes**
  - **Any combination of ports and generators**
  - **Multiple use of single feeder at arbitrary number of ports**
  - **Recalculation of output results for arbitrary set of powers/phases of modes/generators, without rerun, by post-processing only**
  - **Usage of current generators instead of voltage generators in post-processing**
  - **Using results in mode "one generator at time" to obtain results for "all generators", without re-run, by post-processing only**
  - **Setting of matched ports**
- **Fast MoM Matrix Evaluation as Support for DDS** (Domain Decomposition Solver) – Increases simulation speed up to ~5 times in full wave solution of electrically large structures, thus reducing the simulation time of a 1000 λ antenna placement problem to 5 hours.
- Advanced Interpolation of RCS Results
  - **Interpolation in Frequency domain:** Using results calculated over a coarse sampled frequency range, the results over arbitrarily dense sampled range are efficiently reconstructed
  - **Improved algorithm in Space domain:** The existing algorithm is accelerated 10 times. (The monostatic RCS in many directions is efficiently reconstructed from a few samples.)
- **Improved power balance characterization:**
  - Adaptive integration of far field in calculation of irradiated power, enabling precise calculation in case of huge antenna arrays and electrically large scatterers
  - Determination of power dissipated to generators, concentrated and distributed loadings in each of domains
  - Dissipation of power in all lossy domains, including the domains where generators are placed at the boundary surface
- **Easy creation of corrugated waveguides/horns** - Object BoCG (Body of Connected Generatrixes) is expanded to include various types of corrugations (radial, axial, orthogonal) which can be implemented to arbitrary cylindrical/conical surfaces.
- **Improved Mode Tracking Algorithm in CMA solver** (Characteristic Modes Analysis Solver)
- **Remote Run for all simulation modes** including Radome Reduction.
- **Improved FG kernel** (Field Generator kernel) - Handling of extremely large FG arrays is enabled
- **Advanced Setting and Graphical Representation of Output Results:**
  - Graphical presentation of a variety of results related to power balance calculation is enabled (efficiency, power delivered by generators, radiated power, power dissipated in lossy domains and loadings, physical and numerical error, etc.)
  - A particular set of output results can be assigned to each plane wave excitation
  - 2D graphs of the current distribution can be shown along selected set of wires.
  - A number of new toolbars is introduced (e.g. to show Ellipticity in dB).

- **GPU Cluster Solver** - employs simultaneously the multi-node parallelism of the cluster architecture and the multi-processor parallelism of GPUs, allowing solving of electrically very large problems. Two operation modes have been developed:
  - o Single-node operation mode – each node simulates independent set of single frequency projects. Intended for faster simulation of the multi frequency problems.
  - o Multi-node operation mode - nodes are employed together in solving the same problem. Intended for fast solving of electrically very large problems.

More on improvements and new features introduced in v14 you can find in the document **WIPL-D v14 - What is New.pdf**.

13.0

Improvements and new features introduced in version 13.0 are:

- **Support of Domain Decomposition Solver (DDS)** - Enables much faster full wave solution of electrically large structures and simulation of large structures up to 1000 λ.
- **Characteristic Modes Analysis Solver** - Gives deep insight into the EM behavior of the analyzed structure.
- **Concurrent simulation of multiple frequency points, in both CPU and GPU mode** - Increases the efficiency of simulation of small and medium size multi-frequency projects.
- **New features in Field Generators kernel**
  - o Support for arbitrary number of positions of field generators
  - o Calculation of different outputs for different excitations
  - o Placing field generator in arbitrary domain
  - o Support for infinite real ground
  - o Support for Field Generators excitation in Time Domain Solver
- **Synthetic Aperture Radar (SAR) simulations** - High efficiency is achieved combining a variety of old and new features.
- **Save and re-use of LU decomposed matrix** - In case of "out-of-core" and "out-of-core" reduced matrix inversion the LU decomposed system matrix can be saved and reused for new excitations.
- **Automatic determination of shadow region in RCS calculations** - In case of the Scattering operation modes enables speed up of simulation up to an order of magnitude.
- **Interpolation of results for Monostatic RCS** - Using results calculated for a few directions, the results in many other directions are efficiently reconstructed.
- **GUI** - A number of changes is made to enable new options and make GUI more user friendly, e.g.
  - o Graphical presentation of results for a number of new quantities (eigenvalue, modal significance, and characteristic angle)
  - o A number of new toolbars is introduced

More on improvements and new features introduced in v13 you can find in the document **WIPL-D v13 - What is New.pdf**.

12.0

Improvements and new features introduced in version 12.0 are:

- Excitation of the structure by user defined sets of current sources (obtained in another software or by using analytical expressions or by measurements), where each set of current sources is written in a separate input file; export of current sources into file for selected wires and plates is also enabled
- Calculation of near field and/or radiation pattern based on the imported current distribution of selected wires and plates
- Extended limits for low frequency analysis and the analysis of small details in complex structures – parts ~ 1/1,000,000 wavelength are properly handled
- Improved multi-core CPU parallelization of matrix fill - efficiency is enhanced to 90% for 32 cores

- Parallelization of the excitation and near/far field calculations by field generators which enables usage of up to 100,000 sources
- Highly efficient simulation of transparent multilayered radomes excited by directed arrays of field generators - reduction of the number of unknowns for an order of the magnitude
- Local patch size settings for selected wires, plates, and objects
- Improved specification of distributed loading: assignment to the objects (in addition to wires and plates) and ability to copy and re-numerate defined loadings
- Gradual reduction of number of unknowns for selected set of plates
- Possibility to simulate only selected part of the structure defined in project without need to delete the remaining part
- Usage of user defined input data files for frequency dependent symbolic mechanism (e.g. frequency dependent materials)
- "Set as read-only" option for project
- The ability to simply disable/enable near filed and radiation pattern calculations via button
- New features in graphical representation of output results (diagrams with grids. currents in dBs, etc.)
- Calculation of specific absorption (SA) through integration with WIPL-D Time Domain Solver
- Improvements of the optimization mechanism (absolute gain optimization, VSWR optimization, etc.)

More on improvements and new features introduced in v12 you can find in the document **WIPL-D v12 - What is New.pdf**.

11.0

New Features
- Power balance calculation for lossy materials (antenna efficiency, losses in different regions, corrections of gain and admittance, estimations of errors)
- Frequency dependent symbols enable analysis of frequency dependent materials, loadings, geometry...
- Increased resolution in handling distant objects and objects with small details is enabled by optional usage of double precision for input data
- Advanced calculations of near field (accurate characterization in the vicinity of wires, high resolution at boundary of weak field region and strong field region, specific absorption rate (SAR) calculation...)
- Calculation of radiation pattern over the sphere of finite user-defined radius and presentation with/without standard radiation pattern (at infinite distance)
- Simultaneous analysis of a structure excited by various sets of Field Generators based on single LU decomposition of MoM matrix
- Vector representation of near field, far field, and currents
- Automatic recognition of wire-to-plate junctions can be optionally combined with manually defined junctions

Improvements of Existing Features
- Advanced mesh of paraboloidal dish with circular hole
- Custom defined steering angles for Field Generators
- Additional selection modes of various entities in 3D view (by single click and by window)
- Selection of Distributed loadings
- Optimization, sweep and time-domain solution in Batch
- WIPL-D Remote Run (Client - Server)
- Automatic checking of structure topology before running simulation
- Checking of irregular plates (plates having nodes along a line)
- Export of 2D cut of 3D structure into 2D solver projects
- Plotting results:
  o Saving global graph parameters and using graph templates
  o Customized 3D graph plotting (naming and labeling of axes, compact view...)

- Plotting of radiation pattern graphs on the position of antenna element
- Export of fitted results in Touchstone format
- Automatic overlay of Sweep results and shortcuts for changing sweep parameters
- Zoom of Smith chart
- Export of images plotted during the animation

10.0

New Features
- Single-click creation of all WIPL-D entities (Domains, Nodes, Wires, Plates, Junctions, Objects, Manipulations, Loadings, Excitations and Symbols)
- Ability to edit and delete arbitrary number of selected entities
- Various operations (Group, Move, Rotate and Copy) on selected entities
- Easily accessible shortcuts for all EM (Operation Mode, Frequency) and Simulation (Symmetry, Options, Output Results) settings
- Easy navigation through the whole model, providing information about project parts and their mutual relations

Improvements of Existing Features
- Field Generators are improved with the option Custom Defined Main Beam Directions, which allows user to define any values for main beam directions rather than a uniform grid
- The new and redesigned interface offers a lot of new and customizable toolbars and shortcuts within them, enabling user to organize working layout in such a manner to maximize Preview window while maintaining easy access to the tools user needs most
- Pre-Run option enables user to perform automatic checking of the model before running EM simulation. If the model is already simulated, it will warn the user about the deletion of previously calculated results

9.0

New Features
- Excitation by **Field Generators** option
- Ability to employ advanced **GPU** technology to decrease simulation time
- **Asymmetric excitation** of symmetric structures
- New **output results** available
- **Automatic creation** of multilayered structures with equidistant surface points

Improvements of Existing Features
- More interactive Preview window: zoom, selection, creation, deletion, ...
- Direct creation and editing of models from the improved Structure Tree
- Improved algorithms for meshing of large plates and edging, which result in shorter simulation time and memory requirements
- Improved tables that enable the fastest numerical editing of structures so far
- Naming of domains and objects for better orientation while modeling
- Efficient interpolation of radiation pattern
- More possibilities for manipulation of results: improved markers and graphs, group operations, customization of up to 2000 ports, ...

8.0

New Features

- Parallelization of all simulation phases on multi-core computers (speed-ups on a quad-core computer are: 2 times for large examples running on out-of-core solver and up to 4 times for all others)
- Structure Tree tool for facilitating modeling operations (easy navigation through the model, easy selection of model parts, creation of all model parts from a single place)
- Optimized out-of-core matrix solver (various improvements which combined with the parallelization provide up to 2 times faster out-of-core solver compared to previous version)
- New tools to control accuracy / convergence (user-defined reference frequency, user-defined maximum patch size, three types of basis functions used - selection automatic or manual)

Improvements of Existing Features

- Automatic switch from in-core to out-of-core solver with automatic choice of optimum data block size
- Check of memory resources availability for all types of matrix solution
- Increased resolution of near-field results (precise calculation of very low fields inside cavities)
- Improved handling of objects, manipulations and/or RV-entities in complex scenarios
- Improved far-field approximation in MLFMM (improving accuracy of results for the same distance threshold)
- Automatic removal and replacement of a domain with another, selected domain
- Saving all units on project level (previously saved on application level, except for length units)

7.0

New Features

- Multilevel fast multipole method (MLFM) greatly extends the maximum solvable electrical size
- Parametric sweep analysis - all simulation results can be analyzed with regard to a project symbol
- Fast graphics in Preview window easily handles complex 3D models containing large numbers of plates
- Fast open and save operation for projects containing large numbers of plates
- Fast visualization of all results containing a large amount of data (e.g., electric and magnetic currents over a 3D model)
- Support for optimization of models created in AW Modeler
- Custom shaped reflector using generatrix specified within the user defined data file
- Zoom Area option in 2D and 3D graphs
- Optional saving of settings in Graph window (. e.g., preserving range settings when displaying radiation pattern for different frequencies)
- "Save as With Results" option
- Permanent and time-limited network license supported
- Index is added to User's Manual

Improvements of Existing Features

- Out-of-core now supports the distributed loadings option
- Visualization of currents over wires is completed (e.g., presentation of currents over helix object and virtual wire objects is enabled)
- Export to Touchstone format enabled for formats AD2 (de-embedded s-parameters) and AD3 (s-parameters for reference impedance other than 50 ohms) in addition to format AD1
- Symbols are now accepted in multi-band part of the Frequency dialog box and in the Waves table
- The Show window displays node coordinates in active project units, instead in meters
- After selecting domains (Alt+D) / layers (Alt+L) for display the model preview is preserved after creation of a new entity
- Deletion of wires causes deletion of all corresponding generators / junctions
- Placement of generator at arbitrary elements of an array obtained by Copy manipulation

6.4

New Features

- Three to four times faster in-core/out-core matrix inversion on single core CPUs
- Multithreading: Matrix inversion speed-up on multicore CPU computers
- Simulation of EM fields coupled through apertures in infinite PEC/PMC planes
- Adaptive domain - wavelength related meshing lowers number of unknowns for multi-domain problems
- Multiple frequency band simulation and optimization
- Enhanced results visualization: Graph markers with search function
- Link to AW Modeler and Time Domain Solver

6.1

New Features

- Fast iterative solution of large scatterers and antenna placement structures - The new set of basis functions enables very fast, accurate, iterative solution of large linear systems in case of electrically large scatterers and most antenna placement structures
- Fast and memory efficient simulation of antennas on large platforms - Smart reduction of expansion order enables solution of antenna placement structures with up to 10 times less memory with preserved good accuracy
- Improved accuracy of integration - Accuracy automatically provided by the software is enhanced, thus requiring less intervention by the user

6.0

New Features

- Outcore solver - Structures requiring more than 15,000 unknowns can be simulated using the hard drive as storage space during the computations. Thanks to efficient communication with the hard drive, this is done in a reasonable amount of time, even for very large number of unknowns
- High efficiency and accuracy in modeling large reflector antennas (advanced meshing of Reflector object halves the number of unknowns)
- New tabular listing of output results (adjustable number of significant digits, listing of arbitrarily large files, halved hard drive space consumption, easy copying to Excel tables)
- Project names longer than 8 characters supported
- Optimization of circuit parameters obtained by de-embedding
- Optimized automatic edging
- Open and Save As dialog boxes fully compatible with newest Windows OS
- Alternative de-embedding procedure offering better accuracy in most cases
- Easy zoom in, zoom out and move of the model preview by using mouse wheel
- Automatic Intersection of overlapping Pattern entities, used for creation of multilayered structures
- Presentation of single data point in Smith Chart
- Customized Legend - position, transparency, and framing can be specified
- Easy creation and usage of Notes, Header, and Footer
- Logarithmic scale for frequency axis in 2D graphs
- New toolbars for quick plotting of results
- Copying of Grids

5.1

New Features

- Extremely fast matrix inversion algorithm (up to 20 times faster)
- Automatic edging
- Low frequency analysis
- User defined single/double precision analysis
- Easy grouping