Altair

HyperWorks

Altair Feko + WinProp 2019.1

Release Notes

Intellectual Property Rights Notice

Copyrights, Trademarks, Trade Secrets, Patents & Third Party Software Licenses

Altair Feko 2019.1 Copyright 1999-2019

The Platform for Innovation™

> **Note:** Pre-release versions of Altair software are provided 'as is', without warranty of any kind. Usage of pre-release versions is strictly limited to non-production purposes.

Altair HyperWorks™ - The Platform for Innovation™

Altair AcuConsole™ ©2006-2019

Altair AcuSolve™ ©1997-2019

Altair ElectroFlo™ ©1992-2019

Altair ESAComp™ ©1992-2019

Altair Feko™ ©1999-2014 Altair Development S.A. (Pty) Ltd.; ©2014-2019 Altair Engineering Inc.

Altair Flux™ ©1983-2019

Altair FluxMotor™ ©2017-2019

Altair HyperCrash™ ©2001-2019

Altair HyperGraph™ ©1995-2019

Altair HyperLife™ ©1990-2019

Altair HyperMesh™ ©1990-2019

Altair HyperStudy™ ©1999-2019

Altair HyperView™ ©1999-2019

Altair Virtual Wind Tunnel™ ©2012-2019

Altair HyperXtrude™ ©1999-2019

Altair MotionSolve™ ©2002-2019

Altair MotionView™ ©1993-2019

Altair Multiscale Designer™ ©2011-2019

Altair OptiStruct™ ©1996-2019

Altair Radioss™ ©1986-2019

Altair SimLab™ ©2004-2019

Altair SimSolid™ ©2015-2019

Altair nanoFluidX™ ©2013-2018 Fluidyna GmbH, © 2018-2019 Altair Engineering Inc.

Altair ultraFluidX™ ©2010-2018 Fluidyna GmbH, © 2018-2019 Altair Engineering Inc.

Altair WinProp™ ©2000-2019;

Altair ConnectMe™ ©2014-2019;

Plus other products from the Altair solidThinking Platform.

Altair Packaged Solution Offerings (PSOs)

Altair Automated Reporting Director™ ©2008-2019

Altair GeoMechanics Director™ ©2011-2019

Altair Impact Simulation Director™ ©2010-2019

Altair Model Mesher Director™ ©2010-2019

Altair NVH Director™ ©2010-2019

Altair Squeak and Rattle Director™ ©2012-2019

Altair Virtual Gauge Director™ ©2012-2019

Altair Weight Analytics™ ©2013-2019

Altair Weld Certification Director™ ©2014-2019

Altair Multi-Disciplinary Optimization Director™ ©2012-2019

Altair solidThinking - Where Innovation Begins™

Altair Inspire™ ©2009-2019 including Altair Inspire Motion and Altair Inspire Structures

Altair Inspire™ Extrude-Metal ©1996-2019 (formerly Click2Extrude®-Metal)

Altair Inspire™ Extrude-Polymer ©1996-2019 (formerly Click2Extrude®-Polymer)

Altair Inspire™ Cast ©2011-2019 (formerly Click2Cast®)

Altair Inspire™ Form ©1998-2019 (formerly Click2Form®)

Altair Inspire™ Mold ©2009-2019 (initial release-Q2 2019)

Altair Inspire™ Studio ©1993-2019 (formerly 'Evolve')

Altair Compose™ ©2007-2019 (formerly solidThinking Compose®)

Altair Activate™ ©1989-2019 (formerly solidThinking Activate®)

Altair Embed™ ©1989-2019 (formerly solidThinking Embed®)

- **Altair Embed SE™** ©1989-2019 (formerly solidThinking Embed® SE)
- **Altair Embed/Digital Power Designer** ©2012-2019

Altair SimLab™ ©2004-2019

Altair 365™ ©1994-2019

Altair PBSWorks™ - Accelerating Innovation in the Cloud™

Altair PBS Professional™ ©1994-2019

Altair Control™ ©2008-2019; (formerly **PBS Control**)

Altair Access™ ©2008-2019; (formerly **PBS Access**)

Altair Accelerator™ ©1995-2019; (formerly **NetworkComputer**)

Altair Accelerator Plus™©1995-2019; (formerly WorkloadXelerator)

Altair FlowTracer™ ©1995-2019; (formerly **FlowTracer**)

Altair Allocator™ ©1995-2019; (formerly **LicenseAllocator**)

Altair Monitor™ ©1995-2019; (formerly **LicenseMonitor**)

Altair Hero™ ©1995-2019; (formerly **HERO**)

Altair Software Asset Optimization™ (SAO) ©2007-2019

Note:

Compute Manager™ ©2012-2017 is now part of **Altair Access**

Display Manager™ ©2013-2017 is now part of **Altair Access**

PBS Application Services™ ©2008-2017 is now part of **Altair Access**

PBS Analytics™ ©2008-2017 is now part of **Altair Control**

PBS Desktop™ ©2008-2012 is now part of **Altair Access**, specifically **Altair Access desktop**, which also has **Altair Access web** and **Altair Access mobile**

e-Compute™ ©2000-2010 was replaced by **"Compute Manager"** which is now **Altair Access**

Altair SmartWorks™ - Innovation Intelligence®

Altair SmartCore™ ©2011-2019

Altair SmartEdge™ ©2010-2019

Altair SmartSight™ ©2014-2019

Third party software licenses

AcuConsole contains material licensed from Intelligent Light (www.ilight.com) and used by permission.

Software Security Measures:

Altair Engineering Inc. and its subsidiaries and affiliates reserve the right to embed software security mechanisms in the Software for the purpose of detecting the installation and/or use of illegal copies of the Software. The Software may collect and transmit non-proprietary data about those illegal copies. Data collected will not include any customer data created by or used in connection with the Software

and will not be provided to any third party, except as may be required by law or legal process or to enforce our rights with respect to the use of any illegal copies of the Software. By using the Software, each user consents to such detection and collection of data, as well as its transmission and use if an illegal copy of the Software is detected. No steps may be taken to avoid or detect the purpose of any such security mechanisms.

Technical Support

Altair provides comprehensive software support via web FAQs, tutorials, training classes, telephone and e-mail.

Altair Support on the World Wide Web

The Altair web site is a valuable online companion to Altair software. Visit www.altairhyperworks.com for tips and tricks, training course schedules, training/tutorial videos, and other useful information.

Altair Training Classes

Altair training courses provide a hands-on introduction to our products, focusing on overall functionality. Courses are conducted at our main and regional offices or at your facility. If you are interested in training at your facility, please contact your account manager for more details. If you do not know who your account manager is, please send an e-mail to training@altair.com and your account manager will contact you.

Telephone and E-mail

When contacting Altair support, please specify the product and version number you are using along with a detailed description of the problem. Many times, it is very beneficial for the support engineer to know what type of workstation, operating system, RAM, and graphics board you have, so please have that information ready. If you send an e-mail, please specify the workstation type, operating system, RAM, and graphics board information in the e-mail.

To contact an Altair support representative, reference the following table or the information available on the HyperWorks website: www.altairhyperworks.com/ClientCenterHWSupportProduct.aspx.

Location	Telephone	E-mail
Australia	64.9.413.7981	anzsupport@altair.com
Brazil	55.11.3884.0414	br_support@altair.com
Canada	416.447.6463	support@altairengineering.ca
China	86.400.619.6186	support@altair.com.cn
France	33.1.4133.0992	francesupport@altair.com
Germany	49.7031.6208.22	hwsupport@altair.de
India	91.80.6629.4500 1.800.425.0234 (toll free)	support@india.altair.com
Israel		israelsupport@altair.com
Italy	39.800.905.595	support@altairengineering.it

Location	Telephone	E-mail
Japan	81.3.6225.5830	support@altairjp.co.jp
Malaysia		aseansupport@altair.com
Mexico	55.56.58.68.08	mx-support@altair.com
South Africa	27 21 8311500	support@altair.co.za
South Korea	82.70.4050.9200	support@altair.co.kr
Spain	34 910 810 080	support-spain@altair.com
Sweden	46.46.460.2828	support@altair.se
United Kingdom	01926.468.600	support@uk.altair.com
United States	248.614.2425	hwsupport@altair.com

For questions or comments about this help system, send an email to connect@altair.com.

In addition, the following countries have resellers for Altair Engineering: Colombia, Czech Republic, Ecuador, Israel, Russia, Netherlands, Turkey, Poland, Singapore, Vietnam, Indonesia

Official offices with resellers: Canada, China, France, Germany, India, Malaysia, Italy, Japan, Korea, Spain, Taiwan, United Kingdom, USA

See www.altair.com for complete contact information.

Release Notes: Feko + WinProp 2019.1

1

Feko + WinProp 2019.1 is available with new features, corrections and improvements. It can be applied as an upgrade to an existing 2019 installation, or it can be installed without first installing Feko + WinProp 2019.

This chapter covers the following:

- Feko 2019.1 Release Notes (p. 9)
- WinProp 2019.1 Release Notes (p. 11)
- Component Version Numbers (p. 13)

Feko is a powerful and comprehensive 3D simulation package intended for the analysis of a wide range of electromagnetic radiation and scattering problems. Applications include antenna design, antenna placement, microstrip antennas and circuits, dielectric media, scattering analysis, electromagnetic compatibility studies including cable harness modelling and many more.

WinProp is the most complete suite of tools in the domain of wireless propagation and radio network planning. With applications ranging from satellite to terrestrial, from rural via urban to indoor radio links, WinProp’s innovative wave propagation models combine accuracy with short computation times.

Feko 2019.1 Release Notes

The most notable extensions and improvements to Feko are listed by component.

CADFEKO

Resolved Issues

- Corrected the workplane handling of far field requests calculated in the plane wave incident direction to use the workplane settings of the plane wave source.
- Fixed a display issue with plane wave sources. A plane wave source defined to be looped over multiple directions, but defined with a single angle, was not displayed in the 3D view. Such a source is now rendered like its **Single incident wave** equivalent.
- Improved the robustness of the **Repair edges** tool.
- Updated the geometry exporter to Gerber format to use commands from the current Extended Gerber (RS-274X) specification. Deprecated commands are discontinued.
- Resolved an issue with PCB imports (Gerber and ODB++ files) that caused the imported geometry to be scaled by the model extents setting.
- Updated the parameter sweep script to support UNC paths for model files located on a network drive.

POSTFEKO

Feature

- Extended the POSTFEKO API with the **`GetDataSet`** method for **`FarFieldPowerIntegrals`** and **`FarFieldPowerIntegralStoredData`** objects.

Resolved Issues

- Fixed a regression introduced in POSTFEKO 2019.0.1 that could cause the result palette to remain active after creating a new project. Interacting with the trace (from the previous project) could cause the application to crash.
- Fixed an issue where legend scaling was not applied correctly when the legends were set to use **Scale only to selected frequency**. The legend range sometimes changed instead of remaining constant over frequency.
- Added validation to prevent calculating the inverse of a matrix containing invalid (NaN) values, which caused the application to close with a critical error. Running a script that calls the `Inverse` function on an invalid `Matrix` object will end in the error "Matrix inverse calculation failed."

Solver

Feature

- Power loss in lossy segments, triangles, FEM and VEP tetrahedra, as well as metallic triangles on or in a FEM region are now exported to a `.epl` file, along with the Cartesian coordinates of the centre of each element, its size and label.

Resolved Issues

- Improved the robustness of the ACA solution by improving the detection of linearly independent rows. This results in accuracy improvements without affecting performance.
- Fixed a numerical tolerance bug that led to incorrect S-parameter results for some models with a specific frequency sampling rate in a narrow band.
- Fixed a bug in the initialisation of the iterative solution of a decoupled FEM/MLFMM model. The fix enhances the accuracy of the iterative solution to match results given by a direct decoupled FEM/MoM solution.
- Improved the accuracy of the calculated per-unit length inductance/capacitance of cables, by refining the local mesh settings of a cable cross section.
- Parallel ordering is no longer activated by default, based on problem size, for MLFMM problems solved with a sparse LU preconditioner.
- Fixed a bug when calculating the percentage progress during the "Precomputation of far field coefficients" phase of the solution of a model with impressed sources. A percentage progress larger than 100% was previously displayed during this phase.
- Fixed a bug that prevented the use of radiating cable sources (CableMod/CRIPTE excitation) in a model solved with RL-GO.

Shared Interface Changes

Feature

- Added an option to the **Rendering options** dialog in CADFEKO and POSTFEKO to change the graphics driver. This option may provide a solution or workaround when experiencing graphics card problems.

Resolved Issues

- Resolved an issue with the keytips not being populated properly on the ribbon for the various GUI applications.
- Improved form dialog destruct behaviour. Hovering over the script editor in the Windows 10 taskbar (when the Windows system performance setting "Enable peek" is active) now only shows the dialogs from the script that was last executed. Before, the form dialogs from multiple scripts would be stacked in the preview.

WinProp 2019.1 Release Notes

The most notable extensions and improvements to WinProp are listed by component.

ProMan

Features

- For automotive radar applications, when radar cross section (RCS) information from Feko is used, this information is dynamically adjusted to account for the actual finite distance to the object.
- Added support for converting multiple topography tiles, given in the ASCII grid format, in one run. This is available through the **ASCII grid format index file (*.txt)** option in the topography conversion dialog box.
- The offset of receiver antenna elements is now considered in the delay calculations of subchannel and stream results.

Resolved Issues

- Attenuation due to atmospheric conditions was incorrectly considered for indoor and urban scenarios, and it was ignored for various propagation models in the rural scenario. This is fixed.
- Fixed a bug that resulted in wrong entries of the transmission matrix and the ex_v, ey_v, ez_v and ex_h, ey_h, ez_h values in case of non full polarimetric projects. In case of vertical polarisation at the transmitter the horizontal components of the transmission matrix were equal to zero. Non-zero entries are now computed for all polarisations.
- The received power could be incorrect for a receiving antenna that was tilted close to 90 degrees up or down. This is fixed.
- Fixed a bug that resulted in the sub-channel power results written to ASCII files, during post-processing, being identical for multiple antenna elements at the receiver.
- Fixed a bug that incorrectly resulted in a region of a rural database not being computed when an antenna pattern with a 0.25 degree resolution is used.
- Added support for patterns with sub one degree resolution at the mobile station.
- Fixed a bug that resulted in some of the network planning results along trajectory not being computed.
- Adjusted allowed tolerances to allow for network planning to be carried out with very fine resolutions.

WallMan

Resolved Issues

- Fixed a bug that resulted in visibility information from diffraction wedges not being included in an indoor database that is preprocessed for IRT.

- A check for a defined polygon has been added prior to preprocessing a database when the area of preprocessing is chosen to be based on a user defined polygon. An explicit error message is now issued prior to preprocessing in case there is no predefined polygon.
- Significantly reduced the time taken for database preprocessing for Urban IRT. A speed-up factor of ~2x can be obtained.

Component Version Numbers

The version numbers of the components in this release are provided as a reference.

Released component versions and dates.

Table 1: Released component versions and dates.

Component	Version	Date
ADAPTFEKO	2019.1-10	2019-02-13
Altair Feko Updater	2019.1-353059	2019-06-20
Altair Feko Updater GUI	2019.1-353059	2019-06-20
CAD CONVERTER	2019.1-353059	2019-06-20
CADFEKO	2019.1-353059	2019-06-20
CADFEKO_BATCH	2019.1-353059	2019-06-20
EDITFEKO	2019.1-353059	2019-06-20
ENVFEKO	2019.1-1	2018-08-31
FEKO_MKL	2019.1-338	2019-06-07
Launcher	2019.1-353284	2019-06-20
MAT2ASCII	2019.1-1	2018-10-12
OPTFEKO	2019.1-5	2019-06-11
POSTFEKO	2019.1-353059	2019-06-20
PREFEKO	2019.1-48	2019-03-29
QUEUEFEKO GUI	2019.1-353059	2019-06-20
RUNFEKO	2019.1-7	2019-02-07
STR2ASCII	2019.1-1	2018-10-12
AMan	2019.1-35728	2019-06-19
CoMan	2019.1-35728	2019-06-19
CompoMan	2019.1-35728	2019-06-19
OptMan	2019.1-35728	2019-06-19

Component	Version	Date
ProMan	2019.1-35728	2019-06-19
TuMan	2019.1-35728	2019-06-19
WallMan	2019.1-35728	2019-06-19

Release Notes: Feko + WinProp 2019.0.1

2

Feko + WinProp 2019.0.1 is available with new features, corrections and improvements. This version (2019.0.1) is a patch release that should be applied to an existing 2019 installation.

This chapter covers the following:

- Feko 2019.0.1 Release Notes (p. 16)
- WinProp 2019.0.1 Release Notes (p. 19)
- Component Version Numbers (p. 21)

Feko is a powerful and comprehensive 3D simulation package intended for the analysis of a wide range of electromagnetic radiation and scattering problems. Applications include antenna design, antenna placement, microstrip antennas and circuits, dielectric media, scattering analysis, electromagnetic compatibility studies including cable harness modelling and many more.

WinProp is the most complete suite of tools in the domain of wireless propagation and radio network planning. With applications ranging from satellite to terrestrial, from rural via urban to indoor radio links, WinProp’s innovative wave propagation models combine accuracy with short computation times.

Feko 2019.0.1 Release Notes

The most notable extensions and improvements to Feko are listed by component.

CADFEKO

Feature

- Allow the use of metallic media for the ground plane option **Homogeneous half space in region Z<0 (reflection coefficient approximation)**. Validation prevents setting a metal as the ground medium when using the Sommerfeld formulation.

Resolved Issues

- The **Import geometry** dialog detects ODB++ files with the extension `.tar.gz`. In older versions it was required to change the drop-down list selection from **Unknown** to **ODB++** before files with this extension could be imported.
- Upgraded the ODB++ library to support layer thickness when importing geometry.
- Resolved an issue where Parasolid error P555 was encountered when importing a `.igs` file into an existing CADFEKO model.
- Added validation to the **Face properties** dialog to prevent the specification of incorrect material for a windscreen reference face. CEM validate detects windscreen reference faces in existing models where the face medium is set to a setting other than **Default** or **PEC**.
- Resolved an assertion that failed with message ending in `expressionValid`. The assertion failed when meshing and saving a model after using the API to first add an S-parameter request with a single waveguide port and then modifying the request using `SetProperties` to include more ports.
- Resolved an issue on the **Import mesh** dialog that caused the wrong type of files to be listed when browsing for files after selecting **CADFEKO mesh** or **Voxel mesh** as the file format. Selecting **CADFEKO mesh** format now correctly results in `.cfm` files being listed, and selecting **Voxel mesh** format shows `.raw` files.

POSTFEKO

Resolved Issues

- Resolved the issue that unit scaling was not applied to imported electric and magnetic field data.
- FFE file imports now support header fields in any order of appearance and white space delimiters consisting of spaces, tabs or a combination of both.
- Resolved an issue where an insufficient overlap warning was shown incorrectly for certain time analysis simulation frequency ranges.
- Resolved an issue where the application could not be closed after running a script that terminated with an error.

Solver

Features

- Added support for diffraction effects from edges and wedges of RL-GO PEC faces meshed with curvilinear triangles.
- Significantly improved the time efficiency of the geometry processing stage of the solution for FEM/MoM models.
- The definition of metallic materials is now allowed for the ground plane option **Homogeneous half space in region Z<0 (reflection coefficient approximation)**.
- Improved the time efficiency of the solution by allowing the re-use of previously computed currents in a `.str` file for different power scaling applied to a model. Recalculation of the surface currents is avoided if a different source power scaling is applied to the model.

Resolved Issues

- Fixed a bug that resulted in the visibility of some wedges or edges to be incorrectly identified when the model is illuminated by a point source or a plane wave. This led to inaccurate results when computing diffraction contributions from from the misidentified wedges with RL-GO.
- Fixed a bug that resulted in some rays, interacting with some RL-GO surfaces meshed with curvilinear triangles, being incorrectly traced.
- Refined the information about ray interactions with geometry written in the "RL-GO Engine Statistics" section of the `.out` file.
- Corrected the information in the header of exported `.ray` files to reflect that the exported field quantities are based on the magnetic field.
- Fixed a bug that resulted in the inability to visualise computed fields and received power of a model with receiving near field apertures in POSTFEKO.
- Fixed a bug that resulted in an internal error for a single wire model with one-dimensional periodic boundary conditions (PBC) where the wire is perpendicular to the vector defining the orientation of the PBC.
- Fixed a bug where a warning regarding singular fields was wrongly issued during far field calculations of a model involving a homogeneous ground space modelled with exact Sommerfeld integrals. This warning is no longer produced.
- Fixed a bug that resulted in incorrect computation of diffraction coefficients when a PEC RL-GO surface is embedded in a dielectric background medium.
- Monostatic RCS is now calculated using the phase offset of the incident plane wave rather than the offset specified at the coordinate axis of the far field request.
- Updated the warning message concerning the thickness of a coating layer applied to a segment to include cable specific details if the coating is indeed applied to the shield of a cable.
- Fixed a bug that resulted in a time increase of the phase of the solution during which the right hand side vector is calculated for some models with many impressed sources.

Shared Interface Changes

Feature

- Added a command line option (`--file-info`) that queries the application versions that were used to modify CADFEKO models and POSTFEKO session files.

Support Components

Resolved Issue

- Resolved an issue with the keytips of the Feko Launcher where the launch commands for other components took precedence over the keytip actions.

WinProp 2019.0.1 Release Notes

The most notable extensions and improvements to WinProp are listed by component.

ProMan

Features

- The currently displayed 3D view in ProMan can now be saved to a bitmap.
- The prediction area is now automatically adjusted to be equal to the smallest rectangle that includes transmitters and defined trajectories in case the dominant path model is used for prediction in indoor, urban or rural scenarios. Previously, this rectangle only covered the defined trajectory and results were not computed in case the transmitter was located outside the rectangle.
- Results along trajectories are now exported to an ASCII file in a tab separated format for each computed quantity during propagation modelling, mobile station post-processing or network planning. A unique trajectory identifier associates computed results to each trajectory defined in the project.

Resolved Issues

- The ProMan GUI now has added support for checks on the range of acceptable values that can be entered for path loss exponents of the dominant path model.
- Fixed a bug when computing the stream power results at a mobile station with more than one receiver. The best value from sub-channels associated with each receiving antenna is now correctly considered in the aggregated stream power results of the mobile station.
- An explicit error message is now issued for results in point mode with multiple prediction heights in a time-variant database.
- The specific transmit antenna used and its orientation (azimuth, tilt) are now written out in the result file, with channel matrices per point, that is obtained after post-processing with RunMS.
- Fixed a bug when computing propagation results of a rural project that uses a satellite transmitter in a database defined in geodetic coordinates.
- Changed the default angular orientation of the imported RCS data from **North (0) to East (90)** to **East (0) to North (90)**. The new orientation is in line with the conventional spherical coordinate system used in Feko.
- Fixed a bug that resulted in trajectory or point mode predictions not being automatically disabled when the area of planning is set to “Individual for each transmitter”. For this setting, area wide mode is now automatically activated.
- Fixed a bug that resulted in propagation results associated with a carrier being displayed even after invalidating a computation by changing prediction parameters.
- Fixed a bug that resulted in an extra line, with the input coordinates, being written to the output file when converting from the longitude-latitude system to the UTM coordinate system.
- Fixed a bug that resulted in a failure to open the user guide from within WinProp applications in a server installation.

- Fixed a bug when defining the prediction area around cells. The default prediction area is now automatically selected when the simulation area is set to **Individual for each transmitter**. This allows for the definition of a single prediction area that applies to all cells.

Application Programming Interface

Resolved Issue

- Databases saved using AutoCAD file formats (`.dxf` and `.dwg` files) can now be converted into WinProp's database formats through the WinProp API on Linux.

Component Version Numbers

The version numbers of the components in this release are provided as a reference.

Released component versions and dates.

Table 2: Released component versions and dates.

Component	Version	Date
ADAPTFEKO	2019.0.1-10	2019-02-13
CADFEKO	2019.0.1-349439	2019-04-05
CADFEKO_BATCH	2019.0.1-349439	2019-04-05
ENVFEKO	2019.0.1-1	2018-08-31
FEKO_MKL	2019.0.1-323	2019-04-03
Launcher	2019.0.1-350246	2019-04-30
MAT2ASCII	2019.0.1-1	2018-10-12
OPTFEKO	2019.0.1-3	2019-01-21
POSTFEKO	2019.0.1-349439	2019-04-05
PREFEKO	2019.0.1-47	2019-03-25
RUNFEKO	2019.0.1-7	2019-02-07
STR2ASCII	2019.0.1-1	2018-10-12
AMan	2019.0.1-35281	2019-04-15
CoMan	2019.0.1-35281	2019-04-15
CompoMan	2019.0.1-35281	2019-04-15
OptMan	2019.0.1-35281	2019-04-15
ProMan	2019.0.1-35281	2019-04-15
TuMan	2019.0.1-35281	2019-04-15
WallMan	2019.0.1-35281	2019-04-15

Release Notes: Feko + WinProp 2019

3

Feko + WinProp 2019 is available with a long list of new features, corrections and improvements. Feko + WinProp 2019 is a major release. It can be installed alongside other instances of Feko.

This chapter covers the following:

- Highlights of the 2019 Release (p. 23)
- Feko 2019 Release Notes (p. 25)
- WinProp 2019 Release Notes (p. 30)
- Component Version Numbers (p. 33)

Feko is a powerful and comprehensive 3D simulation package intended for the analysis of a wide range of electromagnetic radiation and scattering problems. Applications include antenna design, antenna placement, microstrip antennas and circuits, dielectric media, scattering analysis, electromagnetic compatibility studies including cable harness modelling and many more.

WinProp is the most complete suite of tools in the domain of wireless propagation and radio network planning. With applications ranging from satellite to terrestrial, from rural via urban to indoor radio links, WinProp’s innovative wave propagation models combine accuracy with short computation times.

Highlights of the 2019 Release

The most notable extensions to Feko and WinProp in the 2019 release.

> **Note:** Legacy licensing support ends with the release of Feko and WinProp 2019. Contact Support for queries regarding the HyperWorks Units (HWU) licensing system.

Salient Features

- Support for diffraction effects from PEC edges or wedges in an RL-GO simulation.
- Extended GPU support for RL-GO including computations with dielectric materials, including dielectric sheets and coatings.

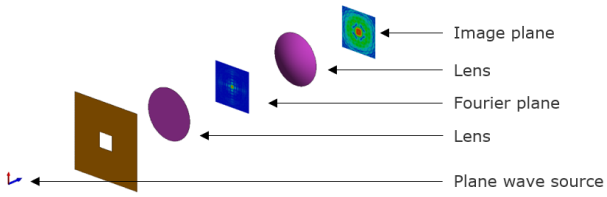

Figure 1: The optical 4F correlator (dielectric lenses) in the image simulates 16 times faster in Feko 2019 than in Feko 2018.2.1 on a laptop with Nvidia Quadro M1000M GPU.

- Significant reduction in run-time for power calculations for models involving many impressed near field sources.

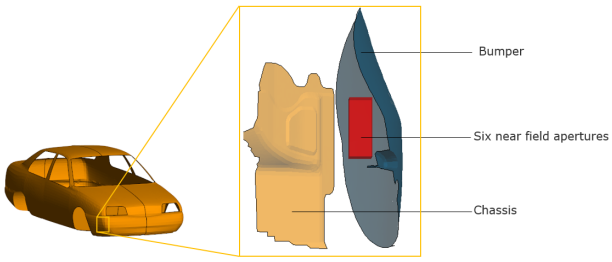

Figure 2: Side view of a radar antenna placement using 6 near field apertures, located in between the bumper and chassis.

- Memory estimation without performing the solution for models solved with PO, MoM and MLFMM with the command line option `--estimate-resource-requirements-only`.
- Improvement to loads with support for SPICE circuit loads and Touchstone (`.s1p`) loads. FEM line ports are extended to allow connections to non-radiating networks (that may be connected to sources or loads, but not to other geometry or mesh ports) via the schematic view.
- Improved display of GUI components on high resolution (4K) monitors. The applications get scaled with the operating system DPI setting for changing the size of items.

- Improved interaction between HyperMesh and Feko. A new Feko user profile in HyperMesh 2019 supports efficient mesh generation and material assignments for Feko in HyperMesh. Full bidirectional transfer of mesh and material data between Feko and HyperMesh is supported.

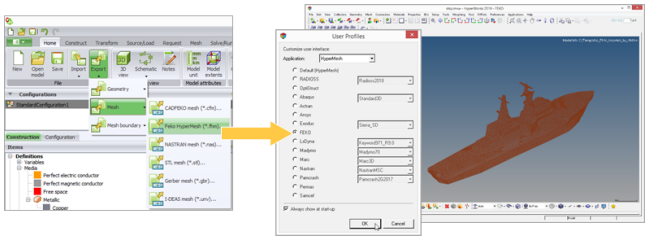

Figure 3: The Feko User Profile in HyperMesh ensures the generation of a valid mesh for Feko.

- WinProp extensions include:
  - Support for the use of radar cross section (RCS) information from Feko to represent objects in a database.

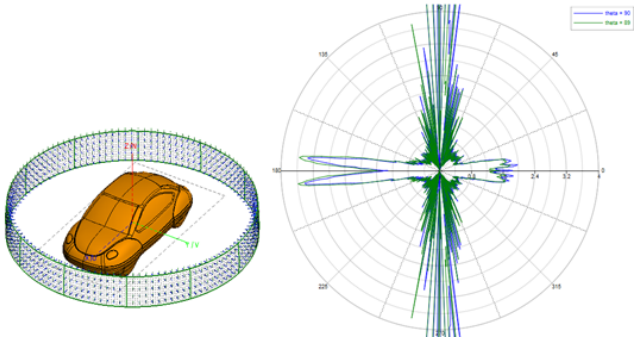

Figure 4: Feko-calculated RCS information can be included in a WinProp simulation through `.ffe` file import.

  - Improved signal level plans with more complete display of component information and power levels.
  - Various performance improvements in computations using the dominant path model.
  - Support for Monte Carlo simulations and associated network planning to the WinProp API.
  - Integration of the WinProp documentation into the HyperWorks documentation.

Feko 2019 Release Notes

The most notable extensions and improvements to Feko are listed by component.

CADFEKO

Features

- Added support to import and export Feko HyperMesh (`.fhm`) files.
- Extended FEM line ports to allow connections to SPICE or Touchstone networks via the schematic view.
- Added the ability to use 1-port SPICE circuit files as a load definition.
- Added the ability to use a 1-port Touchstone file as a load definition.
- Added a default interpolation method to the **Cable shield** dialog for the transfer impedance, surface impedance and transfer admittance definitions for a frequency dependent shield.
- Added validation for cable shield stretching ranges during CEM validate.
- Added support to specify the combined field integral equation (CFIE) factor on the **Solver settings** dialog. The magnetic field integral equation (MFIE) can now also be specified on the **Face properties** dialog.
- Added the option to the **High frequency** tab on the **Solver settings** dialog to enable or disable edge and wedge diffraction contribution for RL-GO.
- Modified the parameter sweep plugin to generate models in non-interactive mode.

Resolved Issues

- Improved the cleanup algorithm that removes activity logs. The presence of many log files resulted in slow application start time.
- Resolved an assertion failure with message ending in `m_portAnnotationMap.contains(pPortGroup)`. This assertion could be encountered when deleting a union which contains two or more wire ports, or undoing the deletion of geometry with multiple ports.
- Resolved an issue for imported meshes where the PEC setting was not correctly applied to faces associated with a FEM PEC region. This problem caused the solver to terminate with `Error 4564: Wrong specification of the medium for a metallic triangle`.
- Resolved a problem on the **Import mesh** dialog where the **Scale factor to metres** field was not applied when importing meshes in STL file format.
- Resolved a problem with the mesh export dialog introduced in CADFEKO 2018.2 for CADFEKO mesh (`.cfm`) format. The selection did not apply to the mesh exported to file.
- Corrected the `.pre` writing of the CR card for models containing a custom anisotropic reference workplane. This regression was present in CADFEKO 2017 (when using the optional mesh engine introduced in that version) and in CADFEKO 2018.
- Resolved an issue that prevented printing the notes view.

- Improved the **Create load** dialog. Images are displayed for all load types and the order of the editboxes (for the series and parallel circuit options) match the order of the checkboxes: Resistor, Inductor, Capacitor.
- Resolved the display issue on Windows 8 and 10 where disabled editboxes would turn white on mouse-over before returning to grey. This happened when the Windows appearance and performance setting "Animate controls and elements inside windows" was active.

EDITFEKO

Features

- Added support for Feko HyperMesh files (`.fhm`) files to the IN card.
- Added the ability to use a 1-port Touchstone file as a load definition to the L2, LC, LE, LF, LN and LZ cards.
- Extended FEM line ports to allow connections to SPICE or Touchstone networks via the NW and TL cards.
- Added a default interpolation method to the SD card for the transfer impedance, surface impedance and transfer admittance definitions for a frequency dependent shield.
- Added the option to enable or disable edge and wedge diffraction contribution for RL-GO on the UT card.

Resolved Issues

- Resolved a problem with the IN card where the **Scale factor** field was not applied when importing meshes in STL file format.
- Resolved an issue on the RA (receiving antenna) card where the "Use data block number" field appeared twice.
- Improved the responsiveness of the AR and RA cards. The opening and editing of these card panels slowed down with an increase in the number of theta and phi points, up to the point where the application seemed to hang.

POSTFEKO

Features

- Added support for font sizes larger than 20 and smaller than 6 points.
- Improved the handling of infinite values in continuous frequency results. Cartesian graphs no longer go blank if trace results contain infinite values. The infinite values are considered invalid and are not included on the graph.
- Updated the quick report templates with the latest Altair branding.

Resolved Issues

- Resolved an assertion failure that triggered when pressing Ctrl+A while an annotation was selected on a Cartesian graph. "Select all" functionality is not supported for annotations.

- Prevent the application from crashing when using the API to construct a matrix with a negative number of rows.
- The file browser filter, when exporting Touchstone data, is refined to use the specific file extension (corresponding to the number of ports being exported) instead of listing all Touchstone files.
- Resolved an issue where Lua script dialogs lost focus behind the POSTFEKO application when focus was placed on a graph or 3D view.
- Updated the parameter sweep plugin to store characteristic mode data as characteristic mode results instead of as custom results.
- Fixed the parameter sweep plugin to store receiving antenna data as custom results. These results were incorrectly stored as power results.

Solver

Features

- Added support to load a FEM line port with a non-radiating network. S-matrix, Z-matrix, Y-matrix and SPICE circuits are supported. FEM line ports cannot currently be connected via a non-radiating network combination.
- Added support for RL-GO simulations of dielectric models on the GPU.
- The IDs of the triangles, polygons or cylinder hit by a ray are now exported to the `.ray` file for geometries solved with RL-GO or UTD.
- Added support for diffraction effects from PEC edges or wedges in an RL-GO simulation.
- Added support for continuous far field request for models solved with RL-GO only, as well as those involving a hybrid MoM and RL-GO solution. For the latter case, continuous far field requests are only possible if there is a pre-existing `.str` file.
- Significantly reduced the run-time of power calculations for models involving many impressed near field sources.
- Introduced a mechanism to estimate memory requirements, for models solved with PO, MoM and MLFMM, without ever performing the solution. An estimate of the memory requirements is available in `--estimate-resource-requirements-only` mode.
- Added support for the description of frequency domain loads (segment - LZ, vertex - L2, edge - LE, cables - LC, networks - LN, FEM line port - LF) using a 1-port Touchstone file.
- Disabled parallel simulations through OpenMP threading. MPI parallelisation is used instead and is supported for more phases and solution methods. In some cases MPI performs better than OpenMP, even on shared memory systems.
- Updated Intel MPI to version 2018.0.4.
- Updated Intel MKL to version 2018.0.4.
- Feko's cluster computing based on MPI now also supports HPE-HMPT. Note that this is not shipped with Feko and must be installed separately.

Resolved Issues

- When using periodic boundary conditions in connection with incident plane waves, inaccuracies in the solution can occur when the incident angle of the plane wave coincide with the PBC direction of

periodicity. Such cases are now detected inside the Feko solver and warnings or errors are issued to alert the user.

- Adjusted the internal threshold for RL-GO when far field calculations switch to a faster but more memory demanding algorithm. This results in improvements in solution time for large models, at the expense of increased memory usage.
- Improved the mechanism behind exporting rays to the `.ray` file by not repeating identical ray path sections, leading to a significant reduction in the size of the exported file. Moreover, a decrease in the memory requirements of an RL-GO solution is achieved when the option to export rays is selected.
- Fixed a bug that led to an internal error state when running Feko in `--mtl-circuit-export` mode for shielded cables.
- Fixed a bug that resulted in a floating point exception when solving models with periodic boundary conditions.
- Fixed a bug when computing the contribution of multiple non-radiating network ports connected to a common segment.
- Fixed a bug that led to an error state when the Domain Green's function is applied to a finite array model containing dielectrics solved with the surface equivalent principle (SEP).
- In some cases, the Feko solver allocated a large amount of memory during the geometry setup and checking phases when modelling dielectric bodies with SEP. This could happen when dielectric bodies with many mesh elements were spread over a large geometrical extent, for example, for multiple widely-separated bodies. A new refined algorithm reduces this memory requirement significantly.
- Fixed a floating point exception that occurs on specific Windows and CPU systems during the ACA matrix compression phase.
- Fixed a bug when determining convergence of an FDTD solution based on a user-defined convergence threshold. The time-domain solution now stops after ensuring convergence based on the user-defined threshold.
- Fixed a bug that led to the inner residuum, rather than the outer residuum being written out to the `.cgm` file of a stabilised MLFMM solution.

Shared Interface Changes

Features

- Added support for the bidirectional transfer of mesh and material data between Feko and HyperMesh through the new Feko HyperMesh file (`.fhm`) format. Through the new Feko user profile in HyperMesh, these files can be imported and exported by HyperMesh while Feko is able to import and export these files using the standard mesh import and export options.
- Upgraded the graphical user interface to use Qt 5.9.6.
- Upgraded OpenSSL to version 1.0.2p.
- Removed the option to **Use shared memory / OpenMP threading for multiple CPU nodes / multicore CPUs** from the **Component launch options** dialog due to this option being deprecated.

- Removed the PREFEKO "Debug options" group from the **Component launch options** dialog.

Resolved Issues

- Fixed a bug that resulted in the incorrect version of the Windows operating system being written to the `.out` file. This affected computers running a version of Windows newer than Windows 8.1.
- Single quotes are no longer stripped from command line arguments on Windows platforms. A string should be surrounded by double quotation to be interpreted as a single argument.
- Resolved a display issue that caused tiny icons and fonts on high DPI monitors.
- Renamed the parameter sweep script in the application macro library. The CADFEKO script is called "Parameter sweep: Create models" and the POSTFEKO script "Parameter sweep: Combine results".
- Fixed a bug when determining the external input files required for a Feko solution. Optional files, such as `.str` files, are now only listed if they exist.

Support Components

Features

- Ended support for legacy licensing. Feko and WinProp make use of the HyperWorks Units licensing system and the Altair License Utility for licence management. The SECFEKO Legacy Licence Manager utility is discontinued.
- Dropped support for encryption in QUEUEFEKO.
- Included modal information from FEM modal ports in a solution with a continuous interpolated frequency range (ADAPTFEKO).
- Added support for Feko HyperMesh files (`.fhm`) files in PREFEKO.
- Validation is performed when updating from local directories. The updater will issue an error if subdirectories are selected and, if possible, suggest the correct path.
- Added a WinProp section to the **Documentation** tab of the Launcher utility. This section provides quick access to the WinProp HTML help and User Guide.
- Added a new "Scripting and API Reference Guide" PDF document with information on the CADFEKO and POSTFEKO Application Programming Interface (API). This content is split off from the Altair Feko User Guide (PDF). The information can be found in the HTML help in the same location as before.

Resolved Issues

- Improved application positioning behaviour when moving between different monitor combinations. All applications, including the Launcher, should now be displayed on the active screen when a monitor that was previously used to display the applications are unavailable.
- Fixed a bug in PREFEKO that resulted in the error `Data block map could not be determined for file - ABORTING FILE OPERATION` when importing a near field in the Cartesian boundary coordinate system format as near field source.

WinProp 2019 Release Notes

The most notable extensions and improvements to WinProp are listed by component.

General

Features

- Ended support for legacy licensing. Feko and WinProp make use of the HyperWorks Units licensing system and the Altair License Utility for licence management.
- Added links to launch the HTML documentation from within the various WinProp applications. The links can be accessed from the help (**?**) menu.
- An updated and unified user manual is now accessible from the help menu of all WinProp applications.
- All the WinProp examples have been reviewed and improved. Each example also has an accompanying document describing the example.
- Added information to the installation guide regarding the limitations imposed by the student editions of Feko and WinProp.
- Updated the documentation to reflect the implications of using adaptive resolution management with the urban dominant path model.

Resolved Issues

- Significantly improved simulation times of predictions done with the dominant path model. Improvements by an order of magnitude can be achieved for models with a fine resolution.
- Improved the performance of indoor scenario simulations when there is no furniture in a preprocessed database.
- Updated documentation to reflect the supported command line directive for filtering computed results.

ProMan

Features

- Default values for the dominant path propagation model are now identical between the WinProp GUI and API.
- Clutter losses are now supported in urban scenario simulations with the dominant path model.
- Updated the default values of the path loss exponents used in the dominant path model for rural scenarios to improve prediction accuracy.
- Added support for exporting the signal level plan, with the associated power budget information, to a `.dxf` file when components are used.

- Significantly improved the performance of radar simulations with ray-tracing models by adding support for the use of radar cross section (RCS) information, obtained from Feko, to represent objects in a database.
- Improved the accuracy of scattering loss computations for ray-tracing-based propagation models.
- The option to cancel the determination of further rays if free space loss is reached, is no longer activated by default for newly created urban IRT projects.
- The version number of WinProp is now printed in the header of ASCII result files.
- Added support for clutter databases in the project export tool in ProMan.

Resolved Issues

- Significantly improved simulation times of predictions done with the dominant path model. Improvements by an order of magnitude can be achieved for models with a fine resolution.
- Fixed a bug that led to instabilities in the user interface when setting parameters for a Monte Carlo network planning simulation.
- Fixed a bug that led to the association of computed results with the wrong time steps in a project with mixed static and time-varying receiver points.
- Fixed a bug that prevented the modification or editing of components defined on different floors in a multi-floor building.
- Fixed a bug that resulted in an infinite loop while generating PropSim output files.
- Improved the efficiency of simulations with the rural dominant path model in a project that does not consider building pixel databases.
- Fixed a bug that resulted in wrong delay data being written to the `.str` file for all time steps, except the first, during mobile station post-processing of a time-variant database.
- Fixed a bug that led to the antenna pattern at the base station not being considered during the computation of channel capacity.
- Fixed a bug which resulted in diffractions at a prediction plane erroneously being taken into account for the particular case where a prediction plane is aligned with other walls in a database.
- Fixed a bug that led to arbitrary values, for electrical properties (dielectricity and conductivity) of the ground, not being considered in the ITM propagation model. The definition of such values is now correctly handled.
- Fixed a bug that led to received power not being computed, during post-processing with RunMS, when the receive antenna is titled at 90 degrees.
- Fixed a bug that resulted in failures when reading patterns of antennas loaded from the components database.
- Fixed a bug that caused a crash when exporting the coverage report for a project containing components.
- Opening a WinProp project from the command line without passing any additional directives no longer launches a propagation simulation. Explicitly define the appropriate command line directive to launch a simulation.
- Fixed a bug that led to results not being computed in the special case where the transmitter is located at the centre of a pixel in the prediction grid.
- Fixed a bug that led to a crash in the ProMan GUI when moving a component (antenna, amplifier and so forth) to a different location in a building.

- Fixed a bug that led to an error when creating a new topographical database.
- Fixed a bug causing incorrect results when using the rural dominant path model in a database where the effects of the curvature of the earth are considered.

Application Programming Interface

Features

- Default values for the dominant path propagation model are now identical between the WinProp GUI and API.
- Added support for Monte Carlo simulations and associated network planning in the WinProp API.
- Added support for multi-threading during network planning via the WinProp API on Linux.
- Resolved differences observed in results when some projects are computed using the WinProp API and the ProMan GUI. The API now correctly uses the option "Fresnel coefficients for transmission/reflection and GTD/UTD for diffraction" when required. The API parameter **`InteractionModel`** moved from the **`Model_RAYTRACING`** struct to the **`WinProp_Additional`** struct.

Resolved Issues

- Significantly improved simulation times of predictions done with the dominant path model. Improvements by an order of magnitude can be achieved for models with a fine resolution.
- Fixed a bug that led to courtyards not being properly accounted for when computing propagation results using the WinProp API with the urban database defined in memory (not as a `.odb` file).

Component Version Numbers

The version numbers of the components in this release are provided as a reference.

Released component versions and dates.

Table 3: Released component versions and dates.

Component	Version	Date
ADAPTFEKO	2019-9	2019-02-13
Altair Feko Updater	2019-347919	2019-03-01
Altair Feko Updater GUI	2019-347919	2019-03-01
CAD CONVERTER	2019-347919	2019-03-01
CADFEKO	2019-347919	2019-03-01
CADFEKO_BATCH	2019-347919	2019-03-01
EDITFEKO	2019-347919	2019-03-01
ENVFEKO	2019-1	2018-08-31
FEKO_MKL	2019-306	2019-02-21
Launcher	2019-347619	2019-02-26
MAT2ASCII	2019-1	2018-10-12
OPTFEKO	2019-3	2019-01-21
POSTFEKO	2019-347919	2019-03-01
PREFEKO	2019-45	2019-02-08
QUEUEFEKO GUI	2019-347919	2019-03-01
RUNFEKO	2019-7	2019-02-07
STR2ASCII	2019-1	2018-10-12
AMan	2019-35015	2019-03-22
CoMan	2019-35015	2019-03-22
CompoMan	2019-35015	2019-03-22
OptMan	2019-35015	2019-03-22

Component	Version	Date
ProMan	2019-35015	2019-03-22
TuMan	2019-35015	2019-03-22
WallMan	2019-35015	2019-03-22

Release Notes: Feko + WinProp 2018.2.1

4

Feko + WinProp 2018.2.1 is available with new features, corrections and improvements. This version (2018.2.1) is a patch release and it should be applied to an existing 2018 installation.

This chapter covers the following:

- Feko 2018.2.1 Release Notes (p. 36)
- WinProp 2018.2.1 Release Notes (p. 38)
- Component Version Numbers (p. 40)

Feko 2018.2.1 Release Notes

The most notable extensions and improvements to Feko are listed by component.

POSTFEKO

Resolved Issues

- Resolved a performance issue when exporting or importing Y or Z parameters. The performance degraded with an increase in the number of ports, up to the point where the application appeared to hang.
- Fixed an assertion failure with the critical error message `Assertion failed: getAxisSet().isSubset(markedAxisSet.extractMarkedAxisSet() )`. Following the POSTFEKO API name change of the "Arbitrary" axis to "S-parameter" in Feko 2018.2, this assertion would fail when plotting stored S-parameter data obtained from an S-parameter dataset using "Arbitrary" as axis name.
- Improved the performance of importing ASCII custom data files.

Solver

Features

- Improved matrix fill time of models with periodic boundary conditions.
- Updated NOTE 35127, which is printed for sequential simulations, to better reflect the general parallel simulation possibilities afforded by the HWU licensing scheme.

Resolved Issues

- Added error checking mechanisms related to the treatment of FEM models that touch the boundary of a periodic unit cell. FEM regions are required to touch both sides of a PBC unit cell, and material indices appearing on one side of a unit cell should match those on the opposite side.
- Resolved a bug that led to an error state during the ray-launching phase of an RL-GO solution.
- Fixed a bug that caused parallel cable examples to hang where multiple configurations with a load utilising the SPICE circuit definition is defined as a global (over all configurations) option.
- Fixed a bug affecting MoM/RL-GO problems where the results of the second configuration were incorrect when solving two identical configurations consecutively.
- Fixed a bug that resulted in inconsistent configuration specific port information between processes in a parallel simulation.
- Fixed a bug in the evaluation of high order basis function models with periodic boundary conditions.
- Fixed a bug in the error checking phase of the solution of a model with periodic boundary conditions.
- Improved the consistency of mesh representations in the solver when a model is meshed with planar as well as curvilinear triangles.

- Fixed a bug related to memory access on a GPU during the computation of far fields with the FDTD method for a large number of frequency points.
- An explicit error message is now issued when out-of-core files are deleted during an MLFMM iterative solution with sparse LU preconditioning.
- The used CFIE factor, as specified on the CF card, is now written to the `.out` file.
- Resolved an error state caused by numerical tolerances in models solved with the multi-layer Green's function.

WinProp 2018.2.1 Release Notes

The most notable extensions and improvements to WinProp are listed by component.

ProMan

Features

- Added knife edge diffraction to the deterministic two-ray propagation model.
- Added support for the deterministic two-ray propagation model for rural scenarios in the ProMan GUI as well as the WinProp API.
- Post-processing of propagation results in point mode, with RunMS, is now possible for indoor and rural scenarios.

Resolved Issues

- Improved the performance of urban propagation simulations with the dominant path model involving topographical details.
- For a receiver with multiple antenna elements, per-stream results are now available for viewing in the results tree browser.
- Fixed a bug that led to an error message being displayed when connecting components with a cable.
- Fixed a problem with Legacy Licensing (non-HyperWorks Units licensing) involving a dongle, where a valid license ID was not recognized.
- Fixed a bug that led to the offset location of individual receiver antenna elements being reset in the ProMan GUI.
- Fixed a crash that could occur during the import of transmitters from a `.csv` file when there was a mismatch between the delimiters specified on the import dialog and those in the file.
- Fixed a bug in Line-of-Sight results that could occur in an urban scenario with topography.
- In version 2018.2, the path delay after RunMS could be different from that of RunPro. This incorrect behaviour is fixed.
- The project export functionality now maintains the folder structure of the results.
- Fixed a bug when displaying network planning results for receiving points defined at different heights.
- Corrected the logic during the selection of vector databases when creating a project, to prevent an inappropriate selection that resulted in a crash.
- Updated the user interface, when specifying the receiver antenna, to only show the relevant settings for each type of receiver antenna.

WallMan

Features

- The definition of the UTM zone is now allowed during conversion of UTM data.

Resolved Issues

- Fixed a bug that led to an error state in the graphics component of WallMan.
- Fixed a bug during UTM zone determination when converting an urban database.
- Fixed a bug that resulted in an offset in building heights, relative to ground, during conversion of an Open Street Map database.
- Fixed a bug that could cause a crash during pre-processing of a CNP database for intelligent ray tracing.
- Information about removed walls is now printed to the progress window when converting a `.dxf` file with non-planar structures.

AMan

Resolved Issues

- Fixed a bug in the generation of `.ffe` (far field) files by AMan. In some cases the `.ffe` file could not be imported by Feko.

Application Programming Interface

Features

- Updated the licensing mechanism to consider parallel computations in the API. The license draw is now consistent with that of the ProMan GUI in its dependence on the number of parallel threads.

Resolved Issues

- Added support for building and material type definitions in the urban API.

Component Version Numbers

The version numbers of the components in this release are provided as a reference.

Released component versions and dates.

Table 4: Released component versions and dates.

Component	Version	Date
ADAPTFEKO	2018.2.1-15	2018-10-12
Altair Feko Updater	2018.2-340009	2018-11-05
Altair Feko Updater GUI	2018.2-340009	2018-11-05
CAD CONVERTER	2018.2-340009	2018-11-05
CADFEKO	2018.2.1-343574	2018-12-19
CADFEKO_BATCH	2018.2.1-343574	2018-12-19
EDITFEKO	2018.2-340009	2018-11-05
ENVFEKO	2018.2.1-6	2018-08-31
FEKO_MKL	2018.2.1-566	2018-12-13
Launcher	2018.2-338937	2018-10-25
MAT2ASCII	2018.2.1-4	2018-10-12
OPTFEKO	2018.2.1-12	2018-10-23
POSTFEKO	2018.2.1-343574	2018-12-19
PREFEKO	2018.2.1-63	2018-12-07
QUEUEFEKO GUI	2018.2-340009	2018-11-05
RUNFEKO	2018.2.1-12	2018-10-19
STR2ASCII	2018.2.1-3	2018-10-12
AMan	2018.2.1-34360	2018-12-19
CoMan	2018.2.1-34360	2018-12-19
CompoMan	2018.2.1-34360	2018-12-19
OptMan	2018.2.1-34360	2018-12-19

Component	Version	Date
ProMan	2018.2.1-34360	2018-12-19
TuMan	2018.2.1-34360	2018-12-19
WallMan	2018.2.1-34360	2018-12-19

Release Notes: Feko + WinProp 2018.2

5

Feko + WinProp 2018.2 is available with new features, corrections and improvements. It can be applied as an upgrade to an existing 2018 installation, or it can be installed without first installing Feko + WinProp 2018.

This chapter covers the following:

- Highlights of the 2018.2 Release (p. 43)
- Feko 2018.2 Release Notes (p. 45)
- WinProp 2018.2 Release Notes (p. 51)
- Component Version Numbers (p. 54)

Highlights of the 2018.2 Release

The most notable extensions and improvements to Feko and WinProp in the 2018.2 release.

Salient Features

- Periodic boundary conditions (PBC) supported with FEM and significant performance improvements to PBC simulations.

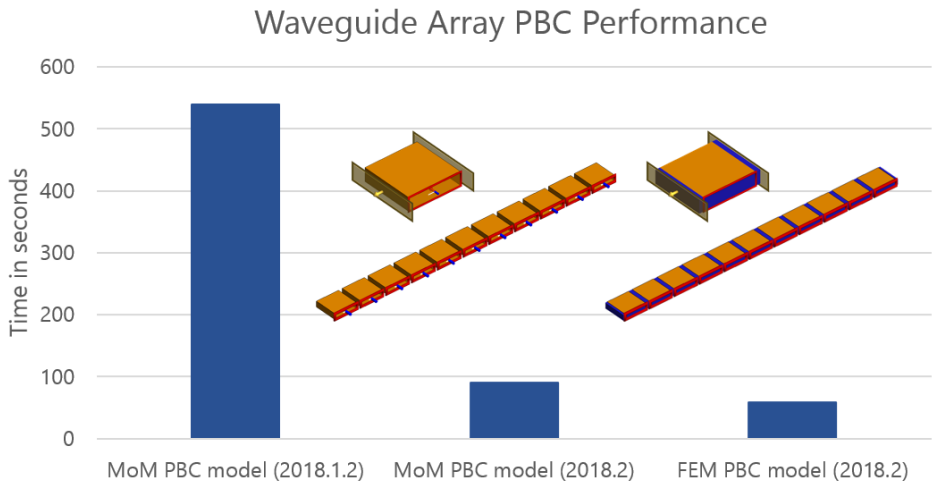

Figure 5: An 11x1 waveguide array solved at 1.645 GHz. The image shows the performance of the MoM PBC array solved with Altair Feko 2018.1.2 compared to the MoM PBC array solved with Altair Feko 2018.2 and the FEM PBC array solved with Altair Feko 2018.2. The PBC unit cells for the MoM and FEM models are shown as inserts with the 3D views of the models. The simulations were completed on a standard desktop computer (Intel® Core™ i5-4690 CPU @ 3.50GHz).

- Improved RL-GO curvilinear ray tracing speed.
- Improved POSTFEKO performance with faster loading times for large result and session files and faster time analysis of continuous frequency results.
- Support for double cable shields and braid formulations in CADFEKO.

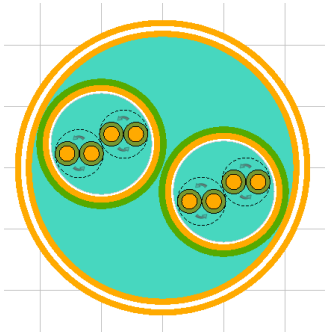

Figure 6: CADFEKO cross-sectional view of a cable bundle with double shields.

- Improved loading options to be more consistent for various solution methods.

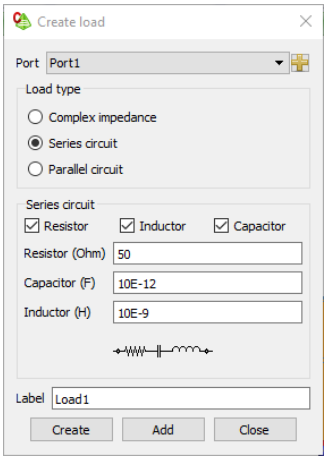

*Figure 7: The **Create load** dialog now shows an image of the resulting circuit.*

- Option to use new or keep existing ports and sources when unlinking a mesh.

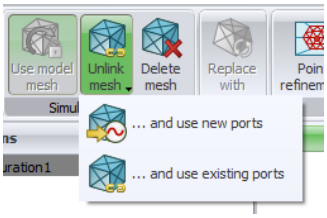

Figure 8: New unlink mesh options.

- Ability to simulate automotive radar in WinProp.

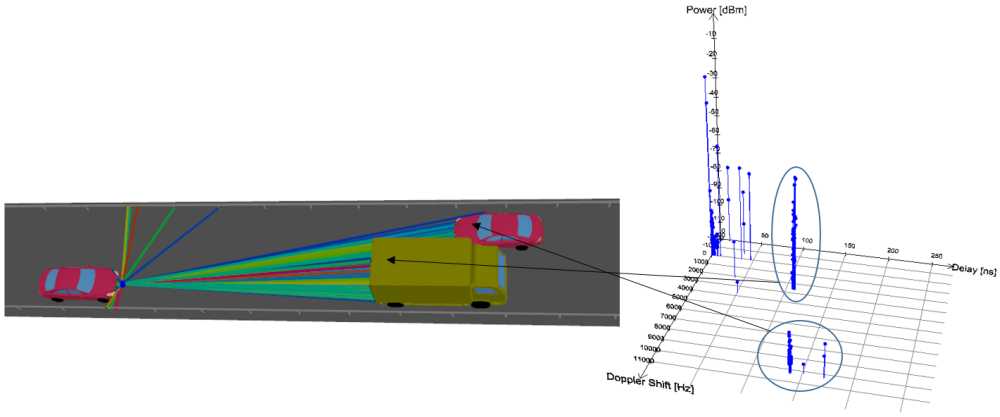

Figure 9: An automotive radar simulation in Altair WinProp.

- WinProp application programming interface (API) under Linux.

Feko 2018.2 Release Notes

The most notable extensions and improvements to Feko are listed by component.

CADFEKO

Features

- The shield insulation coating is moved to the coaxial cable and bundle dialogs. Validation for the stretching range of a braided shield is added when applying a braided shield to a coaxial cable or bundle.
- It is now possible to specify the transfer capacitance to approximate the admittance part of a cable shield definition.
- Added support for the Tyni and Demoulin braid formulations in addition to the Kley and Vance methods for a braided shield. Furthermore, the optical coverage definition is added to specify the size of the apertures for a braided shield. The weave angle definition was extended to include a weave angle deviation to take into account possible variations in the weave angle when the shield is stretched. A maximise optical coverage optimisation method is added to maximise the shielding when applying the shield on a coaxial cable or cable bundle. The weave angle and shield radius can also be specified manually if the weave angle is different from the optimal value determined from the maximise optical coverage optimisation method.
- Added direct support on the cable shield dialog to define double-layered shields.
- Added support for the surface impedance definition for a frequency dependent shield to take on a low-frequency braid-approximation (Zs=Zt), manually specify the data or load the properties from a file. Interpolation methods (Constant, Linear, Cubic spline and Rational) are added to the transfer impedance, surface impedance and transfer admittance definitions for a frequency dependent shield.
- Improved the unlinking of meshes by introducing an option to transfer sources, loads and other solution entities to the ports on the unlinked mesh. The old behaviour to keep using existing ports is retained as an alternative option.
- Improved the **Create load** dialog to clarify that the impedance calculation does not include zero-value elements. A resistor, capacitor and inductor can now be added or removed from the load circuit by toggling checkboxes on the dialog. A newly introduced image on the dialog updates to show the resulting schematic circuit.
- Extended far field requests to support the Cartesian coordinate system to define points on a regular Cartesian grid. This is in contrast to the default regular theta/phi grid requested when using spherical coordinates.
- Added an option to choose whether the port reference is absolute or relative when defining a non-radiating general network with a SPICE circuit.
- Series and parallel circuits are supported for loads on vertex, microstrip and network ports (in addition to complex impedances).

Resolved Issues

- Corrected CEM validation to allow current sources with the incident power scaling (transmission line model) power scaling option.
- Improved periodic boundary condition tests for finding matching faces on corresponding boundaries by increasing the tolerance.
- Fixed a regression introduced in FEKO 2018. Curved UTD faces are once more discretised into triangles when symmetry is applied.
- The cable path identical distance is reduced from 1e-4 to 1e-6. This allows cable end points to be located 100 times closer to each other than in previous versions.
- Resolved an issue with configuring Braided (Kley) cable shield method when setting different inside and outside dielectric braid-fixing material.
- Corrected a CEM validation check that failed with the warning `No sources have been defined in the model` when the voltage source magnitude was set to a value smaller than 0.5 V.
- Corrected the CEM validate check to allow free space MoM regions with VEP dielectric regions.
- Corrected an issue with CADFEKO model import. After importing a `.cfx` file, automatic meshing was unable to complete until a change was made to the model frequency.
- Resolved a meshing issue where a non-uniform surface mesh was generated close to a symmetric wire with ports located normal to the plane of symmetry.
- Excluded windscreen reference triangles from mesh intersection checks. These elements only define a reference position and do not form part of the solution. It does not result in a simulation error when these elements intersect with other elements.
- Prevented warnings from being issued when saving a model containing valid finite conductivity faces defined on a FEM PEC region.

EDITFEKO

Features

- Extended the FF card to allow using the Cartesian coordinate system when requesting far fields.
- The SPICE Circuit (SC) card is added to EDITFEKO. This card defines a 1-port SPICE circuit for subsequent use in load cards (L2, LC, LE, LF, LN and LZ).
- Additional load options (specifying a SPICE, series or parallel circuit) are available on the L2 and LN cards.

Resolved Issues

- The “Include tetrahedral elements” flag is now on by default when adding an IN card in EDITFEKO.

POSTFEKO

Features

- Extended POSTFEKO to support far fields specified in Cartesian coordinates.

- Added support for loads specified using 1-port SPICE circuits (SC card).
- Improved the handling of HTML styling applied to graph captions and text via the API.
- Added support for characteristic modes requests with looped plane wave sources.

Resolved Issues

- Improved the time analysis calculation speed for continuous frequency results. Some examples show speed improvements of up to 20 times.
- Resolved a performance issue when loading large POSTFEKO session files. The loading times of large `.pfs` files are significantly reduced.
- Windscreen layers and wire coatings are now displayed correctly in POSTFEKO regardless of the model unit.
- Corrected FEM load handling to consider two loads with different orientations to be the same load instead of two different loads. The second load would replace the definition of the first load.
- Resolved a crash when attempting to export S-parameters or arbitrary near field points to a `.mat` file.
- Resolved an assertion that failed with `index < pBlock->nports` when attempting to view the data for the second port of a non-radiating network.
- Added additional error checks to the `.ini` file reading process to give an error and reset the `.ini` file instead of failing to start the application.
- Fixed axis support is added for the transmission/reflection coefficient collection in the API.
- The axis for S-parameter DataSets can now be referenced as **`S-parameter`** in the API. Similarly, the alias **`MediumNames`** is added on the metadata of Near Field DataSets and **`PortNumber`** for the axis listing the port number on a Network DataSet. These axes were previously accessed as "Arbitrary" axes. Backwards compatibility is maintained, allowing the use of either **`Arbitrary`** or the new names when accessing the data.
- The **`ModalExcitationCoefficientIsCalculated`** flag is moved to the metadata of characteristic mode datasets in the API. The **`ModalExcitationCoefficient`** quantity is now only added to the dataset when it is requested. In the past, the value of $0+i0$ was added to the **`ModalExcitationCoefficient`** quantity when it was not requested in the simulation.

Solver

Features

- Updated the minimum number of unknowns for which a model can be solved efficiently with ACA to 10000.
- Support periodic boundary conditions for dielectric bodies with FEM.
- The quality of the MLFMM load balancing between the different processes in a parallel run is now written to the `.out` file. This feature can be used with the **`--check-only`** option (thus not solving the model).
- Significantly improved the performance of all simulations involving periodic boundary conditions (PBC). The performance is improved by one to two orders of magnitude while maintaining accuracy.

- Improved intersection checks between rays and geometry meshed with curvilinear triangles, leading to a significant speed-up of the ray launching/tracing phase of RL-GO. Further improved robustness of tracing rays close to grazing incidence.
- Improved the accuracy of RL-GO with adaptive ray launching settings.
- Improvement of the accuracy for the asymptotic RL-GO solver when impressed sources (including aperture sources) or MoM regions are very close to RL-GO region, as well as run-time reduction for the MoM / RL-GO hybrid method. As a result of this improvement, ray amplitudes exported to the `.bof` and `.ray` files now reflect the magnetic field strength along the ray path, no longer the electric field strength.
- Added support for the calculation of modal excitation coefficients for all angles of a plane wave with multiple angles of incidence during characteristic mode analysis.
- Improved the efficiency of computations involving loads defined on an edge, a vertex or a FEM load, defined in multiple configurations. Data calculated from a previous configuration get re-used if the loads do not change.
- Support far field computations in a Cartesian UV grid.
- Support the use of a general non-radiating one-port SPICE circuit as a complex load applied to a port (segment, vertex, edge, cable, network or FEM line port) in frequency domain solvers.
- Support SPICE circuits with pairwise relative port references connected to a non-radiating general network.
- Support series and parallel RLC loads applied to a wire port that is defined on a vertex.
- Support series and parallel RLC circuit loads applied to a non-radiating network port.
- Parallel processing of geometry intersection checks is supported and the progress output is updated during this phase.
- Memory usage is now consistently reported at the same location in standard output and the `.out` file when iterative solvers, such as FEM or MLFMM, are used.

Resolved Issues

- Fixed a bug that led to an error state during a solution with adaptive cross-approximation.
- Single or double precision data storage information is now written to the `.out` file for ACA.
- Corrected the logic when configuring solution settings involving general network ports.
- Improved the performance of the interpolation phase of a PBC solution by two orders of magnitude on average.
- An error message is now issued for a PBC model containing curvilinear segments.
- Removed a note that was issued if all triangles in the mesh of an RL-GO model are found to be planar despite curvilinear meshing being enabled.
- Added geometry intersection tests between cable paths and a PEC ground plane.
- Added a check for the consistent definition of microstrip edge ports with associated load or excitation across all configurations.
- Resolved a bug that led to an internal error state when computing SAR by improving tolerances used in identifying the medium of an observation point.
- Fixed a bug that led to a parallel deadlock during the geometry checking phase of the solution of a closed surface modelled with CFIE.

- Resolved a circular dependency in the memory initialisation of RL-GO
- Restricted the check for a metallic surface in a mixed FEM/MoM model with connected FEM and MoM regions to the FEM/MoM boundary.
- Refined the grazing angle threshold to improve the accuracy of RL-GO with adaptive ray-launching settings for models with spherical mode sources near RL-GO surfaces.
- Do not print a warning when there is a CUDA driver mismatch if GPU usage is not requested.
- Fixed a bug that led to a memory error state on Windows for a cable model with capacitor connections to ground.
- Fixed a bug in the calculation of modal input power during a characteristic mode analysis solution.
- Fixed a bug in the calculation of network losses in models with more than one configuration.
- Fixed a bug that led to an error state when parallel computations are executed on Windows on some CPUs.
- Fixed a bug that led to an error state when estimating the condition number in parallel in Windows.
- Fixed inconsistencies in recovering a corrupt or incomplete `.str` file between master and server processes, in a parallel simulation. Current file recovery is now exclusively handled by the master process.
- Improved the handling of non-radiating networks, through abstract representations, and increased the efficiency of the solution. As a by-product, a series load at a port, where a non-radiating network is also attached, is now allowed when S-parameters are requested.
- Improved the handling of Touchstone data embedded in a SPICE circuit that is included in a non-radiating general network, resulting in a significant reduction in simulation time.
- Corrected an error in the logic to use the fast far field method for RCS calculations with RL-GO.
- Corrected text related to the number of MoM basis functions reported in the `.out` file for an RL-GO only model.
- Improved MLFMM memory management and the accuracy of the reported memory usage of the near field matrix when the SPAI pre-conditioner is used.
- Changed the MoM treatment of an RLC circuit load with all three components equal to zero to evaluate to an open circuit. The usage of such loads in a model now results in an error.
- Improve message reported in the `.out` file when intersections are detected to indicate possible causes.
- Fixed a bug that resulted in an error state when updating the percentage progress output of a time domain solution.

Shared Interface Changes

Features

- Altair products are branded more consistently. FEKO is renamed to Altair Feko across the interface.

Resolved Issues

- Renamed “port impedance” for sources to “reference impedance” to avoid confusion. These reference impedances do not terminate the ports in actual impedances but serve as reference values for calculating the reflection coefficient.
- Resolved the slow response rate of the search bar. This regression introduced in FEKO 2018.0.2 could result in incorrect search bar input when characters were missed during typing.

Support Components

Resolved Issues

- Replaced the PREFEKO triangle-based meshing by a polygon-based meshing solution.
- Extended the User Guide and Installation Guide on where to download the feature updates/ hotfixes and how to correctly set up a local repository to prevent receiving the error that the `manifest.xml.gz` file could not be found.
- A new section on “How-Tos” is added as an appendix to the Feko User Manual. In this section, steps are provided to address specific, often more advanced, problems.
- Added information on how to create a response file for silent mode installations. This information was missing in the 2018.1 Installation Guide.

WinProp 2018.2 Release Notes

The most notable extensions and improvements to WinProp are listed by component.

General

Resolved Issues

- Fixed a bug that prevented the automated use of OptMan.

ProMan

Features

- Support for pre-processing of databases for IRT has been extended to time-variant scenarios in WallMan. IRT simulations in ProMan now also support time-variant scenarios.
- Extended post-processing of mobile station propagation results to time-variant scenarios in area-wide and point modes.
- Significantly improved the workflow of MIMO network planning by having all results provided in one simulation.
- WinProp radio channel data can be exported to the ASCII format supported by Keysight Propsim.
- Doppler shift calculation is available for time-variant scenarios. The Doppler shift data is included in the `.str` file and can be displayed on 2D and 3D plots.
- Adaptive orientation of a transmit antenna (azimuth, down-tilt), attached to a moving part of a time-varying database according to the trajectory of the moving object, has been added.
- Added support for prediction points and prediction planes at multiple prediction heights during post-processing of mobile stations.
- Antenna pattern resolutions smaller than one degree are now supported.
- Support for radar channel results for multiple frequency bins is now added to the post-processing utility, RunMS. Multiple frequency results, at the receiver, are now obtained in one simulation run.
- Added support for post-processing results in horizontal planes at multiple prediction heights in indoor scenarios.
- Included effects of the gain of the mobile station antenna in the ray data written during mobile station post-processing.
- Improved accuracy and usability for mobile station post-processing by disabling adaptive resolution management, by default, for all scenarios.

Resolved Issues

- Corrected the behaviour of ProMan to issue an explicit error message in case a failure occurs when checking a license.
- Fixed a regression that led to incorrect coherently superposed power results when using the Standard Ray Tracing method.

- Fixed a bug that led to a crash when viewing the channel impulse response of a time-variant project.
- Fixed a bug that led to a crash when displaying channel impulse response over a topological vector database.
- Fixed a regression that led to a crash during network planning simulation with a rural database.
- An additional mean-value result was added, for which logarithmic results are first converted to linear before the mean is taken. The mean is then converted back to dB.
- Fixed a bug in the consideration of the azimuthal orientation of a single receiving antenna.
- Corrected a bug in the consideration of the gain of the antenna at the mobile station during received power calculations.
- Fixed a bug in which the angle of a linear array in RunMS could be considered twice and thus unintentionally doubled.
- Fixed a bug that caused the orientation of the antenna to be displayed with a 90 degree rotation for time-variant simulations.
- Fixed a bug during the computation of angles of departure for a transmitter attached to a time-variant part of a database. The computation now takes into account the position of the transmitter in time.
- Fixed a bug that led to ray interaction points to be displayed below the topography of the terrain, when the pixel data of the topography is converted to vector data with the option of dividing each pixel into two triangles.
- Fixed a bug that led to a crash if a prediction area, trajectory or point is not defined in the project. An explicit error message is now issued for this case.
- Fixed a bug that led to crash for an urban database simulated with an empirical knife-edge model.
- Fixed a bug when post-processing mobile station results for a specific combination of the defined polarisations at the transmitter and receiver.
- Angular mean, delay spread and angular spread calculations are now restricted only to ray-optical propagation models where it is possible to compute these metrics as more rays are available.
- Corrected the computation of angles of departure, for trajectories in the line of sight of a transmitter, during post-processing.

WallMan

Features

- Support for pre-processing of databases for IRT has been extended to time-variant scenarios in WallMan. IRT simulations in ProMan now also support time-variant scenarios.
- Support for pre-processing databases for IRT, with a pre-specified prediction point, has been added.

Resolved Issues

- Fixed a bug in the conversion of HGT (1arc) files to topo databases.

Application Programming Interface

Features

- The ray matrix is now accessible through the API for outdoor predictions.
- Fixed several bugs in the API, and added a few missing parameters in the API. As a consequence, discrepancies in results between projects in the API and the GUI have been eliminated.
- The WinProp API has been ported to Linux. A C++ example that can be used with the Linux API is located in `../feko/api/winprop/source/apismall.cpp/` and is described in `../feko/api/winprop/ReadMe.txt`.

Resolved Issues

- Resolved a bug in urban scenarios in the API that led to only path loss being computed regardless of the requested output.
- Corrected `.str` file handling through the API for urban projects.
- Reconciled the definition of the DPM prediction area in the API with that of the GUI to avoid the possibility of small discrepancies.

Component Version Numbers

The version numbers of the components in this release are provided as a reference.

Released component versions and dates.

Table 5: Released component versions and dates.

Component	Version	Date
ADAPTFEKO	2018.2-15	2018-10-12
Altair Feko Updater	2018.2-340009	2018-11-05
Altair Feko Updater GUI	2018.2-340009	2018-11-05
CAD CONVERTER	2018.2-340009	2018-11-05
CADFEKO	2018.2-340009	2018-11-05
CADFEKO_BATCH	2018.2-340009	2018-11-05
EDITFEKO	2018.2-340009	2018-11-05
ENVFEKO	2018.2-6	2018-08-31
FEKO_MKL	2018.2-544	2018-11-02
Launcher	2018.2-338937	2018-10-25
MAT2ASCII	2018.2-4	2018-10-12
OPTFEKO	2018.2-12	2018-10-23
POSTFEKO	2018.2-340009	2018-11-05
PREFEKO	2018.2-62	2018-10-12
QUEUEFEKO GUI	2018.2-340009	2018-11-05
RUNFEKO	2018.2-12	2018-10-19
STR2ASCII	2018.2-3	2018-10-12
AMan	2018.2-34066	2018-10-23
CoMan	2018.2-34066	2018-10-23
CompoMan	2018.2-34066	2018-10-23
OptMan	2018.2-34066	2018-10-23

Component	Version	Date
ProMan	2018.2-34066	2018-10-23
TuMan	2018.2-34066	2018-10-23
WallMan	2018.2-34066	2018-10-23

Release Notes: Feko + WinProp 2018.1.2

6

Feko + WinProp 2018.1.2 is available with new features, corrections and improvements. This version (2018.1.2) is a patch release and it should be applied to an existing 2018 installation.

This chapter covers the following:

- Feko 2018.1.2 Release Notes (p. 57)
- WinProp 2018.1.2 Release Notes (p. 58)
- Component Version Numbers (p. 59)

Feko 2018.1.2 Release Notes

The most notable extensions and improvements to Feko are listed by component.

Solver

Resolved Issues

- Fixed a bug that led to an internal error when extracting parts of the CMA matrix.
- Fixed a bug that caused the reflection and transmission coefficients to be larger than one for PBC models with a dielectric coating.
- For cable harness modelling, the solver will report all cable signal information when no installation (reference ground represented by triangles or a ground plane) is defined below the cable. Previous versions would not provide information of the return signal in POSTFEKO or in the `.out` file.
- Increased the size of the messaging buffer to prevent an error state during an MPI parallel solution.
- Fixed a bug that caused TR results to be written out incorrectly when multiple TR requests written to `.tr` files are present inside plane wave loops and results at multiple frequency points are requested.
- Fixed a bug that resulted in the wrong current being displayed for PBC models, solved using HOBF, that touch the unit cell walls.

Support Components

Resolved Issues

- Issue a warning instead of an error when importing a binary `.stl` file when the expected number of elements are not present.
- Improve error message when reporting XSD file creation during CST NFS import.

WinProp 2018.1.2 Release Notes

The most notable extensions and improvements to WinProp are listed by component.

ProMan

Resolved Issues

- RunMS (not RunPro) gave incorrect results for received power in versions 2018.1 and 2018.1.1 due to an incorrect internal conversion from power to field strength. This is fixed.
- Fixed a bug that resulted in incorrect angles of departure when the height of the transmitter is set relative to the ground's topology.
- For a MIMO antenna array at the mobile station, if receiving antennas were isotropic without an actual imported antenna pattern, the received power was incorrectly calculated as if there had been only a single isotropic receiving antenna. This has been fixed.
- Fixed a bug that resulted in the absolute height of a transmitter not being correctly set for urban empirical models.
- Fixed a bug that resulted in slightly incorrect coherently superposed received power results along a trajectory.

Component Version Numbers

The version numbers of the components in this release are provided as a reference.

Released component versions and dates.

Table 6: Released component versions and dates.

Component	Version	Date
ADAPTFEKO	2018.1.2-12	2018-07-20
CAD CONVERTER	2018.1-327316	2018-06-15
CADFEKO	2018.1.1-332255	2018-08-20
CADFEKO_BATCH	2018.1.1-332255	2018-08-20
EDITFEKO	2018.1-327316	2018-06-15
ENVFEKO	2018.1.2-6	2018-08-31
Launcher	2018.1.1-332395	2018-08-20
Feko Updater	2018.1-327316	2018-06-15
Feko Updater GUI	2018.1-327316	2018-06-15
FEKO_MKL	2018.1.2-468	2018-09-12
MAT2ASCII	2018.1.2-3	2017-12-11
OPTFEKO	2018.1.2-10	2018-02-06
POSTFEKO	2018.1.1-332255	2018-08-20
PREFEKO	2018.1.2-47	2018-09-19
QUEUEFEKO GUI	2018.1-327316	2018-06-15
RUNFEKO	2018.1.2-10	2018-09-10
STR2ASCII	2018.1.2-2	2017-12-11
AMan	2018.1.2-33836	2018-09-18
CoMan	2018.1.2-33836	2018-09-18
CompoMan	2018.1.2-33836	2018-09-18
OptMan	2018.1.2-33836	2018-09-18

Component	Version	Date
ProMan	2018.1.2-33836	2018-09-18
TuMan	2018.1.2-33836	2018-09-18
WallMan	2018.1.2-33836	2018-09-18

Release Notes: Feko + WinProp 2018.1.1

7

Feko + WinProp 2018.1.1 is available with new features, corrections and improvements. This version (2018.1.1) is a patch release and it should be applied to an existing 2018 installation.

This chapter covers the following:

- Feko 2018.1.1 Release Notes (p. 62)
- WinProp 2018.1.1 Release Notes (p. 64)
- Component Version Numbers (p. 66)

Feko 2018.1.1 Release Notes

The most notable extensions and improvements to Feko are listed by component.

CADFEKO

Resolved Issues

- Upgrading the meshing library to the latest version brings the following improvements:
  - Resolved a crash that occurred when attempting to mesh a parabolic surface with complex cut-outs.
  - Improved meshing of complex periodic surfaces.
  - Meshing is less sensitive to model extents settings and less likely to yield intersecting triangles.
  - Meshing is less likely to yield multiple sliver triangles around curvature.

POSTFEKO

Resolved Issues

- Corrected the parameter sweep plugin handling of continuous axis data sampling (frequency and far field). The specified number of samples are now taken into account.
- Corrected a problem with the visualisation of wire currents in the 3D view. The bug could have resulted in wire currents not being displayed on the wires when zooming out the display.

Solver

Features

- Support power scaling for FEM line current sources.
- Achieved further memory savings by expanding shared memory usage to other phases. By using shared memory for the Legendre polynomial, memory savings are seen for models with large far field requests that are solved with MLFMM using many cores.
- Improved text output given when rays are discarded during RL-GO calculation.
- Improved the percentage progress output during the geometrical processing phase.

Resolved Issues

- Improved efficient calculation of triangle integrals for FEM/MoM interfaces.
- Improved the passivity checks for anisotropic 3D material by making it more tolerant to numerical uncertainty and inaccuracies.
- Corrected a problem where rays were not exported for RL-GO simulations that utilise the GPU.

- Fixed a bug that caused an error state when there is not enough space available on temporary storage devices during MLFMM runs.
- Fixed a bug that caused and internal error condition when running MoM PBC examples that contain SEP regions together with waveguide ports.
- Fixed a bug that caused an internal error for PBC problems where dielectrics are entirely enclosed in metal.
- Support MPI-3 shared memory on HPE-MPT (formally SGI-MPT) systems.
- Fixed a bug that caused an internal error state after Feko is done with a simulation.
- Significantly improved MoM matrix element calculation when the volume equivalence principle is used.
- Corrected an error in the logic to read and write the `.lud` file for models with multiple configurations.
- Issue an explicit error when PO is used with curvilinear triangles.
- Improved the cleanup process of temporary files for simulations running on multiple hosts by cleaning up on all hosts and not just the master.
- Relaxed the tolerance used to determine if a curvilinear triangle is lying vertically (normal to the XY plane).
- Improved the output message when intersecting elements are found.
- Refined tolerances used for various geometry checks.
- Improved the text for note 33644. The note now reads: "Single frequency inside a loop over angles of plane wave incidence will terminate the loop over angles due to backwards compatibility reasons and processing continues".

Support Components

Features

- Nastran mesh files with missing coordinate information resulted in an error, but will now rather produce a warning and continue with the import assuming the default coordinate system.

Resolved Issues

- Improved handling of MS-MPI command line options.
- The output file of a continuous frequency simulation interrupted by the user only contained converged data. The discrete data are now written irrespective of the convergence status so that users have access to the simulation results that have completed.
- Corrected a problem that could have resulted in the Feko Terminal window not displaying the correct version in the window title.
- Improved ADAPTFEKO argument handling to make it more robust with respect to the order of arguments.
- Corrected a problem with generating `.fek` file format 161 files with a PREFEKO that generates format 162 by default.

WinProp 2018.1.1 Release Notes

The most notable extensions and improvements to WinProp are listed by component.

General

Resolved Issues

- Fixed a license problem encountered with OptMan.

ProMan

Features

- Enhanced the command line options.
  - The `-a` option runs all computations that have been defined (RunPro, RunMS and RunNet):

    ```
    ProMan.exe "C:\SampleProject.net" -a
    ```
  - Added a new `-m` option that launches RunMS:

    ```
    ProMan.exe "C:\SampleProject.net" -m
    ```
- Added a new solution method for rural scenarios, namely the Rural Ray Tracing (RRT) method. Usually, in rural scenarios, the topography is described by pixels, and solution methods are limited to empirical methods and the dominant path method (DPM). In WallMan, pixel-based topography data can be converted to a geometry described by triangles. A building database can be added during this conversion. Then, in ProMan, deterministic ray tracing is possible. Two methods are available for rural topographies described by triangles: RRT, which operates in the vertical plane, and 3D ray tracing. RRT has the advantage of speed over 3D ray tracing.
- The maximum number of parallel threads within one machine is increased to 256.

Resolved Issues

- Fixed a bug that caused wrong results for the dominant path model (DPM) in combined network planning (CNP) mode (hybrid urban/indoor) with automatic floor management. Transmission losses through floors were not always taken into account correctly.
- Fixed a licence problem with UWB network planning projects.
- Fixed a regression that prevented the display of indoor results in hybrid urban-indoor (CNP) scenarios.
- Fixed a crash that occurred in ProMan when viewing a particular result (number of streams in Network Planning) in one of the example projects.
- For ray tracing over topo triangles, the GUI has been made more user friendly. Absolute height can now be defined for Tx in addition to height above local ground; the maximum size for scatter tiles has been increased (important in large scenarios), and several display inconveniences have been taken care of.
- Fixed a regression in which newly-created polygons with the Paint tool could not be closed.

- Reduced the memory requirements of simulations that combine a large pre-processed geometry database with a measurement-based calibration file.
- Re-enabled the option to display rays inside the indoor part of a combined network planning (CNP) (hybrid urban/indoor) project.
- Fixed a bug in reading the header of the ray file in a solved model with components.
- Fixed a problem that could cause rays in rural scenarios with the dominant path model (DPM) to appear as if they cross through the topology. This behaviour was caused by adaptive resolution management and subsequent interpolation. Propagation results for received power were still correct.
- Fixed a post-processing setting (to fill in pixels that were not computed by IRT) for urban IRT simulations. Slight differences could be observed in results for filled in pixels, depending on whether indoor penetration was active.
- Fixed a bug in which the ZIP archive for a project would not include the `.emc` file (in the relatively rare case that there was one).
- In one of the example models (CampusCNP_IRT), ProMan would hang when the user selected the received power to be displayed. This is fixed.
- Fixed a crash that could occur when combining an urban intelligent ray tracing (IRT) model with a calibration file.
- Fixed a crash that occurred in results display in one of the example models (Car2Car Sample).
- Fixed a crash that could occur during an urban intelligent ray tracing (IRT) simulation if the user cancelled a simulation in progress.

WallMan

Resolved Issues

- Fixed a regression in the topo converter for MSI Planet.

AMan

Resolved Issues

- Fixed one bug that prevented `.ffe` files (far field patterns) produced by AMan to be used in Feko. Those files would already work correctly in ProMan.

Application Programming Interface

Resolved Issues

- Added a missing license check-in during execution of the API. The missing check-in could result in two licenses being checked out.

Component Version Numbers

The version numbers of the components in this release are provided as a reference.

Released component versions and dates.

Table 7: Released component versions and dates.

Component	Version	Date
ADAPTFEKO	2018.1.1-12	2018-07-20
CAD CONVERTER	2018.1-327316	2018-06-15
CADFEKO	2018.1.1-332255	2018-08-20
CADFEKO_BATCH	2018.1.1-332255	2018-08-20
EDITFEKO	2018.1-327316	2018-06-15
ENVFEKO	2018.1.1-5	2017-12-11
Launcher	2018.1.1-332395	2018-08-20
Feko Updater	2018.1-327316	2018-06-15
Feko Updater GUI	2018.1-327316	2018-06-15
FEKO_MKL	2018.1.1-455	2018-08-22
MAT2ASCII	2018.1.1-3	2017-12-11
OPTFEKO	2018.1.1-10	2018-02-06
POSTFEKO	2018.1.1-332255	2018-08-20
PREFEKO	2018.1.1-42	2018-07-30
QUEUEFEKO GUI	2018.1-327316	2018-06-15
RUNFEKO	2018.1.1-9	2018-07-16
STR2ASCII	2018.1.1-2	2017-12-11
AMan	2018.1.1-33614	2018-08-22
CoMan	2018.1.1-33614	2018-08-22
CompoMan	2018.1.1-33614	2018-08-22
OptMan	2018.1.1-33614	2018-08-22

Component	Version	Date
ProMan	2018.1.1-33614	2018-08-22
TuMan	2018.1.1-33614	2018-08-22
WallMan	2018.1.1-33614	2018-08-22

Release Notes: Feko + WinProp 2018.1

8

Feko + WinProp 2018.1 is available with new features, corrections and improvements. It can be applied as an upgrade to an existing 2018 installation, or it can be installed without first installing Feko + WinProp 2018.

This chapter covers the following:

- Highlights of the 2018.1 release (p. 69)
- Feko 2018.1 Release Notes (p. 71)
- WinProp 2018.1 Release Notes (p. 75)
- Component Version Numbers (p. 76)

Highlights of the 2018.1 release

The most notable extensions and improvements to Feko and WinProp in the 2018.1 release.

Salient Features

- The restrictions for cable height above ground are lifted for differentially driven cable problems. The user needs to define the orientation of any cable that does not have nearby geometry by specifying the cable's reference direction.

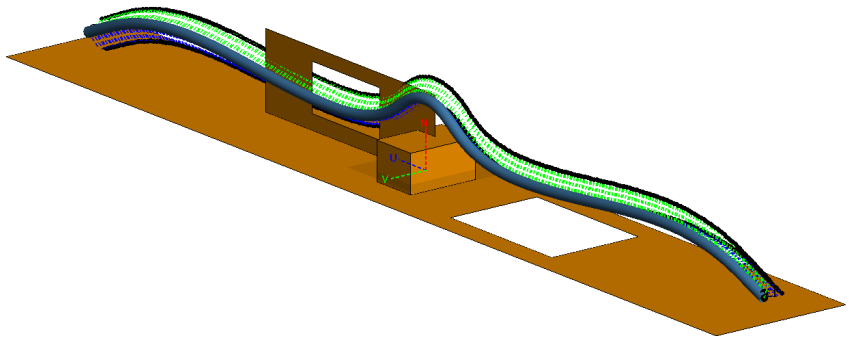

Figure 10: A preview of the cable cross-section orientation of a cable running above an arbitrary ground installation.

- GPU acceleration of flat PEC RL-GO models with manual ray-launching increment settings. Acceleration of up to 40 times faster can be achieved.
- Further memory savings using shared memory technology. The savings are model and solution method dependent with the most prominent savings observed for PO. The PO solution of currents due to a dipole source on a generic aircraft discretised into 1.95 million triangles showed a memory reduction of more than 30% when using 20 cores on a single CPU.
- A new direct ACA solver that is the default for ACA. Memory savings are model dependent with some examples showing up to a 90% reduction in the memory requirement.
- FEM is supported together with MoM/MLFMM windscreen solutions and planar multilayer substrates. Utilising FEM in parts of a model where it is more applicable than the MoM may provide substantial memory and runtime improvements. A representative example of an antenna module in a car with windscreen showed a reduction in memory and runtime of 80%.

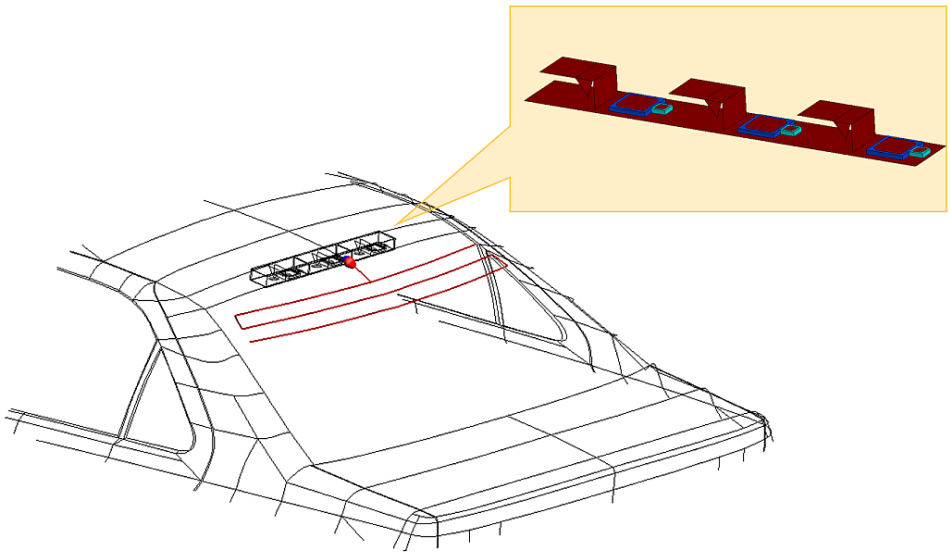

Figure 11: Partial view of a car with a windscreen antenna solved with the MoM/MLFMM and an antenna module mounted in the car's roof (shown enlarged in the insert) solved with the FEM.

- General improvements to the interface when working with Gerber files and to Gerber file export. Arbitrary file extensions are supported for Gerber import. Gerber exports are improved to handle more complex meshed planar geometry.

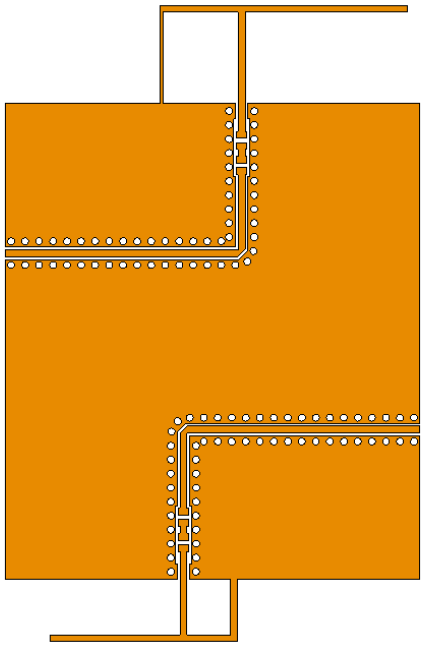

Figure 12: View of an exported Gerber file of a planar antenna with via holes.

Feko 2018.1 Release Notes

The most notable extensions and improvements to Feko, listed by component.

CADFEKO

Features

- All files (*.*) are now displayed in the file browser when importing geometry and selecting to import a Gerber file. The standard Gerber file extension is `.gbr`, but in practice, various other extensions are in use. The extensions that were supported in the previous version of CADFEKO (`.art`, `.gbr`, `.bml`, `.bot`, `.bps`, `.bsk`, `.gnd`, `.tmk`, `.top`, `.tps` and `.tsk`) are still shown in the file browser with other known CAD model files. Files with extensions like `.cmp`, `.ger`, `.gbl`, `.gtl`, `.sol`, and other custom extensions, can be imported by selecting "Gerber" as the file format. These files no longer have to be renamed to a known extension before import. The requirement holds that the files need to be in extended Gerber (RS274X) format.
- The CEM validate check for valid FDTD requests is updated to support a looped plane wave source together with FDTD.

Resolved Issues

- Gerber export now works for meshes of geometry faces that include cut-outs. Exporting to Gerber file did not recognise the cut-outs and for successful export, geometry had to be modified so that there was no hole in any single face.
- Files created in the Feko temporary directory during Gerber and ODB++ import could cause the import to fail if files with the intended temporary file names already existed. The import process now uses temporary folders with unique file names inside the Feko temporary directory. CADFEKO deletes these folders once the import completes or if the user cancels the import.
- Resolved a crash that could occur when applying changes to a huge model.
- Corrected the macro recording of actions performed on a primitive part inside a union to reference the parent union.
- Resolved an assertion failure with message ending in "m_dataOperatorMap.contains(pData.get())". This assertion could fail in CADFEKO 2018.0.2 when modifying a port in a model where meshes containing ports were previously merged and undo/redo operations were applied.
- Improved the meshing of some spiral structures to mesh more accurately around the centre of the spiral.
- Corrected the optimisation goal dialogs to list only valid operations when modifying optimisation goals. For example, the **Modify impedance goal** dialog incorrectly included the option to use "dB".
- Changed the behaviour when importing points from a text file to skip empty lines instead of only reading up to the first blank line. An assertion failed in "ImportCsvDriver.cpp" when trying to import points from a text file starting with an empty line.
- Fixed an assertion failure in "common_SchematicNet.cpp" that could occur when importing a `.cfx` file containing connected schematic elements. This assertion failure could also occur when deleting

a connection between rotated schematic elements, saving the model and selecting to undo past the point of saving.

- Opening the properties of a single mesh label and applying without changes resulted in the removal of the simulation mesh, the display of the message `Setting mesh label properties` in the message window and a comment recorded during macro recording. Applying no modification to a single mesh entity no longer removes the mesh or prints out these messages. Simultaneously applying no changes to the properties of more than one mesh entity with clashing settings still deletes the mesh and reapplies the settings.

EDITFEKO

Features

- Added the SD card for defining cable shield layers. The SD card definitions are used in an SH card when creating a single or double shield. The existing Solid (Schelkunoff), Braided (Kley) and Braided (Vance) definitions are available on the SD card. New Tyni and Demoulin formulations are available, or the shield transfer capacitance can be specified.
- Changed the SH card to support single and double cable shields using SD card shield definitions.
- Extended the method to define cable shield properties on the SD card (previously found on the SH card) to specify interpolation methods and extended the surface impedance options to define data points manually or to use a low-frequency braid approximation.

POSTFEKO

Resolved Issues

- Fixed a crash that could occur when exporting tables containing datasets to `.mat` file and improved validation to prevent the export of invalid or unsupported data types.
- Improved the adaptive frequency sampling for POSTFEKO frequency to time domain conversion.
- Corrected the normalisation and improved validation for Touchstone exports. Y-parameters and Z-parameters are normalised correctly. Newly introduced validation prevents the export of Y-parameters and Z-parameters when the reference impedance is unknown, or if ports have incompatible reference impedances. Results are not normalised when exporting S-parameters for ports without reference impedances, such as FEM modal ports.
- Changed the way the 3D view legend handles individual ranges and rounding to prevent the misinterpretation of results. When a dynamic range is specified, and legend rounding is switched on, going forward, the legend may use a range exceeding the specified range. The display now remains unchanged when changing from the “Specify dynamic range” setting to a “Fixed range” and entering the legend settings displayed in the 3D view for the “Specify dynamic range” option.
- Fixed cursor table column spacing and improved the accuracy of displayed values.

Solver

Features

- Support GPU acceleration for flat PEC RL-GO models with manual ray-launching increment settings.
- Reduced memory usage for MoM, MLFMM, PO and LE-PO problems run in parallel where some processes share a node (shared memory).
- Support waveguide ports on MoM regions for the uncoupled MoM/RL-GO hybrid method.
- Support elliptically polarised plane wave source for the RL-GO solution method.
- Cable height above ground restrictions are lifted for differentially driven cable problems.
- Support surface impedance and different frequency ranges for transfer impedance, surface impedance and transfer admittance in cable shield definitions imported from `.xml` file.
- Support cable shields defined by transfer capacitance.
- Support different interpolation methods for cable shield impedance and admittance data.
- Support manually specified cable shield surface impedance.
- Support a low-frequency braid approximation for cable shield surface impedance.
- Support modelling double shielded cables directly.
- Support Tyni and Demoulin formulations for transfer and surface impedance and transfer admittance in cable shield modelling.
- Support the sequential direct LU decomposition solution technique for ACA.
- Select the direct solver for ACA problems by default. Previously the iterative solver was used.
- Support monostatic RCS calculation in a loop for the FDTD.
- Support FEM together with MoM/MLFMM windscreen solutions and planar multilayer substrates.

Resolved Issues

- Bypassed a bug in a maths library used on AVX-512 systems that caused a floating point exception during the iterative solution phase of the MLFMM.
- Significant performance improvement for MoM PBC matrix fill.
- Improved the robustness of the solution of MoM PBC problems when the direction of incidence is at theta=90.
- Improved the robustness for RL-GO curvilinear triangle ray intersection tests.
- Improved RL-GO low accuracy results for incident waves close to grazing incidence.
- Improved automatic convergence for adaptive ray-launching for RL-GO.
- Fixed a cable meshing bug that caused small features to be distorted.
- Avoid internal error 38719 by improving the calculation of surface impedance for braided cable shields.
- Fixed a bug that caused sporadic Intel MPI Hydra errors on parallel Windows systems.
- Fixed an internal error state when calculating the far fields with UTD due to a spherical mode source defined with a very large number of modes.
- Fixed a bug that caused in internal error state when printing out RL-GO ray statistics when there are zero rays generated.

- Improved error checking for problems where TR coefficients are extracted with an RL-GO surface together with the multilayer substrate formulation.
- Improved the Touchstone file import correctness check for reference impedance values set to zero.
- Improved error messages that occur during cable shield braid setup.
- Added geometry intersection tests for cable paths and wire segments with planar triangles.
- Fixed a bug that caused the electric charge distribution to be unsymmetrical for FEM problems where an electrical plane of symmetry is used.

Support Components

Features

- Improved error messages when importing external Feko data files such as `.tr`, `.ffe`, `.efe` and `.hfe` (PREFEKO).

Resolved Issues

- Fixed a bug that reported the runtime incorrectly for continuous frequency solutions (ADAPTFEKO).
- Added firewall exceptions for the MPI Hydra service to the installation process when running it as an administrator.
- Changed the console mode installation to have automatic updates turned on by default.
- Added an example to the Feko Examples Guide that demonstrates the use of the characterised surfaces feature with RL-GO for efficiently solving a frequency selective surface.

WinProp 2018.1 Release Notes

The most notable extensions and improvements to WinProp, listed by component.

ProMan

Features

- Added the ability to compute and present a new class of results, elevation angles and spreads, in addition to the already existing azimuth angles and spreads.
- When viewing field or power results, ProMan will, from now on, ask only once per session whether to load available ray paths.

Resolved Issues

- Fixed a bug that could lead to different results for received power in RunMS depending on whether a channel matrix entry is selected as output or not.
- Fixed a bug in the superpositions of ray contributions in the received-power calculation (RunMS).
- Fixed a bug where, in "PostProcessing incl. Tx and Rx", the transmitter antenna pattern was not considered.
- Fixed a bug in the power superposition for rays in Standard Ray Tracing with Fresnel/UTD coefficients.
- Fixed a bug that prevented the channel condition number from being computed in the previous update, 2018.0.2.
- Fixed a bug that, on some systems, caused the **3D** button that toggles the 3D display to be greyed out in rural scenarios.

Application Programming Interface

Resolved Issues

- Added capabilities to the WinProp API for handling vegetation and clutter in outdoor scenarios. In doing so, backward capability for outdoor clutter in the API could not always be maintained.

Component Version Numbers

The version numbers of the components in this release are provided as a reference.

Released component versions and dates.

Table 8: Released component versions and dates.

Component	Version	Date
ADAPTFEKO	2018.1-10	2018-06-13
CAD CONVERTER	2018.1-327316	2018-06-15
CADFEKO	2018.1-327316	2018-06-15
CADFEKO_BATCH	2018.1-327316	2018-06-15
EDITFEKO	2018.1-327316	2018-06-15
ENVFEKO	2018.1-5	2017-12-11
FEKO_MKL	2018.1-424	2018-07-20
Feko Updater	2018.1-327316	2018-06-15
Feko Updater GUI	2018.1-327316	2018-06-15
Launcher	2018.1-327009	2018-06-18
MAT2ASCII	2018.1-3	2017-12-11
OPTFEKO	2018.1-10	2018-02-06
POSTFEKO	2018.1-327316	2018-06-15
PREFEKO	2018.1-37	2018-06-19
QUEUEFEKO GUI	2018.1-327316	2018-06-15
RUNFEKO	2018.1-7	2018-06-08
STR2ASCII	2018.1-2	2017-12-11
AMan	2018.1-33171	2018-06-22
CoMan	2018.1-33171	2018-06-22
CompoMan	2018.1-33171	2018-06-22
OptMan	2018.1-33171	2018-06-22

Component	Version	Date
ProMan	2018.1-33171	2018-06-22
TuMan	2018.1-33171	2018-06-22
WallMan	2018.1-33171	2018-06-22

Release Notes: Feko + WinProp 2018.0.2

9

Feko + WinProp 2018.0.2 is available with new features, corrections and improvements. This version (2018.0.2) is a patch release and it should be applied to an existing 2018 installation.

This chapter covers the following:

- Feko 2018.0.2 Release Notes (p. 79)
- WinProp 2018.0.2 Release Notes (p. 82)
- Component Version Numbers (p. 84)

Feko 2018.0.2 Release Notes

The most notable extensions and improvements to Feko are listed by component.

CADFEKO

Resolved Issues

- The thickness of metal faces gets imported from `.fek` files.
- Ports are no longer removed when merging meshes.
- Some problematic CAD faces could have resulted in an assertion failure with the message "! errorInfo.needsRollback()" when snapping in the 3D view or querying the centre of gravity of such a face through the API. The 3D view is now functional even when such faces are present, and an error gets issued in the scripting environment when it is not possible to calculate the centre of gravity.
- Resolved an issue that prevented changing the face solution properties of a face labelled "Face0". The problem presented when creating a cone or flare primitive with the top dimension set to zero and then modifying this dimension to be non-zero.
- A problem is fixed that caused an assertion to fail with "Current active state widget SpecifyPointsImportPointsButton doesn't have focus and should be visible" when pressing Tab or Shift+Tab repeatedly on certain dialogs, such as the **Create dielectric medium** dialog.
- Inactive waveguide ports were handled incorrectly for S-parameter configurations, causing `Warning 33046: Possibly wrong use of the specification "additional" for a source, please verify active sources` during simulation. This is corrected.
- Meshing a model directly after excluding or including a configuration takes all included configurations into account with immediate effect. Before, it was required to mesh a second time or to make other changes to the model before the settings took effect.
- Prevented an assertion failure with the message "simulationMeshCollector.getGraphNodes().size() == 1". Upon opening a model that issues `Warning 16889: GeometryPart has more than one linked mesh. This can cause problems and/or the application to close unexpectedly.`, all but one of the linked meshes are now deleted to prevent further problems.
- Resolved a crash and assertion failure with message "m_modelBoxDiagonal > 0.0" that could occur when meshing some models.
- A model saved with no 3D view would open with the default 3D view of the model. It now re-opens as it was saved, without a 3D view open. Closing the 3D view provides an alternative to hiding elements from the view for improved performance when working with complex models.
- Improved the intersecting triangle algorithm.
- Selecting an individual segment highlighted the whole wire in the 3D view. Highlighting is corrected for the selection of individual segments when using wire display with surface display disabled.
- The region, face or edge properties of a geometry part opened and applied without changes resulted in the removal of the mesh and printed the message `Changed settings for geometry entities` to the message window. Macro recording recorded this action as a comment. Applying no changes no longer removes the mesh or prints out these messages.

- Suppressed a Parasolid error that caused a geometry modeller problem during meshing or an assertion failure when meshing with the FDTD solver active.

EDITFEKO

Resolved Issues

- Resolved a crash that could occur when entering text in the search bar and pressing a modifier key like Ctrl.

POSTFEKO

Resolved Issues

- Improved the placement of cursor text boxes on 2D graphs to avoid overlap and to remain visible inside the graph area.
- Resolved an assertion failure in "DataSetExporter" that were triggered when reading fields through scripting if a plane wave source was set to calculate the orthogonal polarisations.
- The result for the orthogonal polarisation of a single incident plane wave is now available. This result was unavailable for a far field result calculated in the plane wave incident direction when the plane wave set to **Calculate orthogonal polarisations** was defined in a single direction only.
- Fixed an assertion failure that terminated the application with "Assertion failed: Manager was never set, i.e. nothing was assigned to: Position" when storing combined receiving antenna data.
- A problem is fixed that caused an assertion to fail with "Current active state widget SpecifyPointsImportPointsButton doesn't have focus and should be visible" when pressing Tab or Shift+Tab repeatedly on certain dialogs, such as the **Create time signal** dialog.

Solver

Resolved Issues

- Improved insufficient memory allocation errors reported by external libraries.
- Introduced an error to prevent the simulation of any cable path terminated by a load, source or interconnect connection onto itself.
- Fixed a bug that caused certain cable problems solved in parallel using the combined MoM/MTL method to end in the error state 52695.
- Fixed a bug that caused incorrect receive power to be reported when a highly directional receive antenna is modelled using spherical modes and rotated within the model.
- Improved the stability of triangle intersection checks for triangles that touch at a single point.
- Fixed a bug that caused an internal error state to be issued during geometry checking for CFIE models where the surface touches itself on an edge.
- Fixed a bug that caused very large symmetrical MoM problems to appear to hang when solved in parallel.

- Fixed a bug that caused a parallel deadlock for models that contain cable problems and connection points with current sources on MoM problems.
- Fixed a sporadic floating point error when calculating the ACA H-matrix.
- Fixed a bug that caused closed CFIE geometries with internal surfaces touching on edges only to report an error.

Support Components

Resolved Issues

- The model for example D02 (Calculating Field Coupling into a Shielded Cable) is corrected to use local ground connections on the cable schematic to terminate the cable start and end connectors. Simulation of the model issued `Warning 38926: A SPICE interconnect circuit applied to a cable harness has connectors separated by more than 5% of the total harness length`. The simulation results were correct in this case, but it is not generally advised to set up a model in this way. `Error 52712: A cable path should not be terminated by a load/source/interconnect connection onto itself` is now issued when cable connectors are connected through the global ground.

WinProp 2018.0.2 Release Notes

The most notable extensions and improvements to WinProp are listed by component.

ProMan

Features

- The polarimetric analysis capability has been completed. This new capability, which one selects at the beginning of a new project, is available for indoor and urban scenarios. It requires an antenna pattern from Feko in `.ffe` format, since this format contains all field components for every individual direction. For simulation, standard ray tracing or intelligent ray tracing, with the use of Fresnel/UTD coefficients, is recommended. The standard (non-polarimetric) capability can be selected for any scenario and any simulation method at the beginning of a project. It should be mentioned that one can always use Feko antenna patterns in `.ffe` format. However, in the standard work flow, no attempt is made to extract polarization-specific information from the antenna pattern, as for many permitted formats this is simply not part of the file. In the standard work flow, one can still specify the predominant antenna polarization and the cross-polarization level, both for transmitting and receiving antennas. The difference is that such polarization information in the standard analysis applies to all directions in the antenna pattern.

Resolved Issues

- Fixed a bug that resulted, for selected indoor scenarios, in longer simulation times in version 2018.0.1.
- Fixed a bug where ProMan was using incorrect information from an antenna pattern in Feko `.ffe` format when it was used in a non-polarimetric (standard) analysis. ProMan was using the vertically polarized fields instead of the total fields in that particular case.
- Fixed a crash that could occur in MIMO post processing due to a bug in the computation of the condition number.
- Fixed a crash that could be triggered by an unusual sequence of user actions.
- Fixed a crash that could occur when using the "Additional Data" menu with a topological database loaded.

WallMan

Resolved Issues

- Fixed a crash that could occur when pre-processing of a database was cancelled.
- Fixed a bug related to DWG/DXF import of 2D CAD data. A window that enables the user to define wall height (used by WallMan to extrude the 2D data) did not appear.
- Fixed a crash that occurred during pre-processing of a particular database.
- Modified a default setting. During pre-processing, by default adaptive resolution management used to be activated. As a consequence, in ProMan during RunMS, for some pixels no results might be

computed, which would raise concerns. With the new default setting, one always obtains results for all pixels.

- Fixed a crash that could occur during pre-processing of an urban database.
- Fixed a bug that could cause a “read access violation” when the user pressed the Cancel button during pre-processing.
- Fixed a bug that limited WallMan's pre-processing to one database. To handle a second database, one needed to start a new instance of WallMan.

Application Programming Interface

Resolved Issues

- Fixed an “access violation” in the WinProp API.

Component Version Numbers

The version numbers of the components in this release are provided as a reference.

Released component versions and dates.

Table 9: Released component versions and dates.

Component	Version	Date
ADAPTFEKO	2018.0.2-9	2017-12-18
CADFEKO	2018.0.2-326038	2018-05-23
CADFEKO_BATCH	2018.0.2-326038	2018-05-23
EDITFEKO	2018.0.2-326038	2018-05-23
ENVFEKO	2018.0.2-5	2017-12-11
FEKO_MKL	2018.0.2-352	2018-05-18
Feko Updater	2018.0.1-324816	2018-04-20
Feko Updater GUI	2018.0.1-324816	2018-04-20
Launcher	2018.0.1-324912	2018-04-20
MAT2ASCII	2018.0.2-3	2017-12-11
OPTFEKO	2018.0.2-10	2018-02-06
POSTFEKO	2018.0.2-326038	2018-05-23
PREFEKO	2018.0.2-31	2018-03-28
QUEUEFEKO GUI	2018.0.1-324816	2018-04-20
RUNFEKO	2018.0.2-6	2017-12-11
STR2ASCII	2018.0.2-2	2017-12-11
AMan	2018.0.2-32969	2018-05-24
CoMan	2018.0.2-32969	2018-05-24
CompoMan	2018.0.2-32969	2018-05-24
OptMan	2018.0.2-32969	2018-05-24
ProMan	2018.0.2-32969	2018-05-24

Component	Version	Date
TuMan	2018.0.2-32969	2018-05-24
WallMan	2018.0.2-32969	2018-05-24

Release Notes: Feko + WinProp 2018.0.1

10

Feko + WinProp 2018.0.1 is available with new features, corrections and improvements. This version (2018.0.1) is a patch release and it should be applied to an existing 2018 installation.

This chapter covers the following:

- Feko 2018.0.1 Release Notes (p. 87)
- WinProp 2018.0.1 Release Notes (p. 89)
- Component Version Numbers (p. 91)

Feko 2018.0.1 Release Notes

The most notable extensions and improvements to Feko are listed by component.

POSTFEKO

Resolved Issues

- The DerivedResults module is corrected to support phi axis ranges. Using the module to calculate results from data with phi values could have resulted in an error. This is now also fixed for Ludwig III (Co) and Ludwig III (Cross) components.
- Improved the adaptive algorithm used to interpolate and extrapolate frequency responses during the frequency to time domain transformation in POSTFEKO.

Solver

Features

- Improved solution time when calculating per-unit-length cable parameters for cable solutions.
- Optimised memory usage for the fast far field calculation for discrete frequency models.

Resolved Issues

- Fixed a bug that caused the solver to hang in exceptional cases when parallel processes write CMA data to CMA files.
- Improved the accuracy of the phase when using physical optics for models with thin dielectric sheets or coatings when the sheets/coatings become thick.
- Fixed a bug that caused near field to spherical mode transformation to fail if the field complexity requires a high level of recursion.
- Fixed a bug that caused an incorrect error stating that the normal vector orientation is not correct for certain windscreen antenna problems.
- Fixed a bug that caused cable results to differ depending on the order of signal number specification.
- Fixed a bug that caused intersecting triangle errors for certain models meshed using lower precision.
- Improved general memory usage.
- Allow transmission and reflection coefficients to be calculated for incident waves that are parallel to the surface of PBC structures and Green's function planes.
- Fixed a bug that caused an internal error state when circular/coaxial waveguide ports were used together with rectangular waveguide ports.
- Improved flushing cache files (STR/PUL) in between frequency points.
- Fixed a bug that reported negative percentage output when using the MLFMM to calculate certain problems.

- Improved the power loss calculation per medium for cable calculations - total losses stays unchanged.
- Relax geometry intersection check tolerances to allow certain valid geometry.
- Fixed a bug that could influence the performance of some SPAI preconditioned parallel iterative solution.
- Improved error reporting for models that contain faulty triangles.
- Improved memory usage and reporting for parallel MLFMM and MoM problems.
- Improved time usage reporting for tracked CMA problems.
- Fixed a bug that caused an error state for PBC examples that had edges defined on the corners of the PBC cell.
- Improved accuracy of memory usage reporting.
- Fixed a bug that caused an incorrect error stating that a curvilinear triangle is malformed.
- Fixed a bug that caused Feko initialisation to abort if environment variables contain illegal characters.

Support Components

Resolved Issues

- Support multiple frequency blocks when importing near fields (`.efe`/`.hfe`).
- Multiple instances of the Feko + WinProp Launcher utility can be open at the same time to launch components from different installations.
- Minor corrections to the User Guide include the correction of the file formats in the section "Defining Near Field Data from File".

WinProp 2018.0.1 Release Notes

The most notable extensions and improvements to WinProp are listed by component.

General

Resolved Issues

- Added support for floating licenses to the 2018 WinProp Student Version to bring it in line with the 2018 Feko Student Version.
- Fixed a bug that sometimes prevented TuMan files created under Windows 10 to open under Windows 7. There was an initialisation that is done automatically on newer operating systems and not automatically on Windows 7.
- Fixed a bug in AMan where binary files were produced that couldn't be read later.
- Enhanced the flexibility of AMan to read antenna patterns with angles beyond 180 degrees.
- Fixed a crash in the API that occurred when results for multiple heights were requested.

ProMan

Features

- For simulations with empirical methods, in addition to defining a polarization for the transmitter, the user can define a cross-polarization level.

Resolved Issues

- In a network planning run that was performed after including the pattern of the mobile station via RunMS, sometimes the wrong receiver power values were used, leading to incorrect data rates. This has been fixed.
- Fixed a bug where the option of multi-threading for standard ray tracing was not respected.
- Prevented a race condition from occurring when multiple threads read the same antenna-pattern file.
- Fixed a crash that could occur when an invalid file is selected to define a satellite transmitter. Now an appropriate error message is displayed.
- Fixed an error given in certain simulations involving the Dominant Path Model with Fresnel coefficients.
- Fixed a problem with computational efficiency for the Dominant Path Model (DPM). This problem had caused simulations with DPM to be slower than expected.
- Fixed a case in which the computation dialog couldn't be closed after cancelling a simulation.
- In cases where the user had defined a directory name other than the default for RunMS results, problems could occur later during network planning, as the new name was not always passed on. This has been fixed.
- Fixed a bug that could lead to the wrong display of transmitter orientation.

- Fixed a bug that had disabled one route of importing measurement files.
- Added the option to display ray interaction points in 3D with smaller dots than the default. They could sometimes be a bit large.
- Fixed a crash that could occur in ProMan when invalid data were loaded in addition to topographical data.
- Fixed a bug that could cause a crash when displaying all propagation paths.
- Fixed a crash in viewing impulse response results on Windows 7.

WallMan

Resolved Issues

- A bug has been fixed that prevented the conversion of certain topographical maps that crossed the equator.
- In WallMan, a rare endless loop that could occur during pre-processing for IRT has been fixed.
- Fixed a few issues related to HyperWorks licensing, such as a license being checked back in prematurely after preprocessing in WallMan.
- Fixed a problem with a missing DLL that caused WallMan to crash on Windows 7. This didn't happen for every Windows 7 installation since often other installed software tools already provided the DLL.

WinProp CompoMan

Resolved Issues

- Fixed a crash in CompoMan.

Component Version Numbers

The version numbers of the components in this release are provided as a reference.

Released component versions and dates.

Table 10: Released component versions and dates.

Component	Version	Date
ADAPTFEKO	2018.0.1-9	2017-12-18
CADFEKO	2018.0.1-324816	2018-04-20
CADFEKO_BATCH	2018.0.1-324816	2018-04-20
EDITFEKO	2018.0.1-324816	2018-04-20
ENVFEKO	2018.0.1-5	2017-12-11
FEKO_MKL	2018.0.1-341	2018-04-11
Feko Updater	2018.0.1-324816	2018-04-20
Feko Updater GUI	2018.0.1-324816	2018-04-20
Launcher	2018.0.1-324912	2018-04-20
MAT2ASCII	2018.0.1-3	2017-12-11
OPTFEKO	2018.0.1-10	2018-02-06
POSTFEKO	2018.0.1-324816	2018-04-20
PREFEKO	2018.0.1-31	2018-03-28
QUEUEFEKO GUI	2018.0.1-324816	2018-04-20
RUNFEKO	2018.0.1-6	2017-12-11
STR2ASCII	2018.0.1-2	2017-12-11
AMan	2018.0.1-32806	2018-04-20
CoMan	2018.0.1-32806	2018-04-20
CompoMan	2018.0.1-32806	2018-04-20
OptMan	2018.0.1-32806	2018-04-20
ProMan	2018.0.1-32806	2018-04-20

Component	Version	Date
TuMan	2018.0.1-32806	2018-04-20
WallMan	2018.0.1-32806	2018-04-20

Release Notes: Feko + WinProp 2018

11

Feko + WinProp 2018 is available with a long list of new features, corrections and improvements. Feko + WinProp 2018 is a major release. It can be installed alongside other instances of Feko.

This chapter covers the following:

- Highlights of the 2018 release (p. 94)
- Feko 2018 Release Notes (p. 99)
- WinProp 2018 Release Notes (p. 108)
- Component Version Numbers (p. 111)

Altair® Feko® is a comprehensive computational electromagnetics (CEM) software used widely in the telecommunications, automobile, aerospace and defence industries.

Feko offers several frequency and time domain electromagnetic (EM) solvers under a single license. Hybridisation of these methods enables the efficient solution of a broad spectrum of EM problems including analyses of antennas, microstrip circuits, RF components and biomedical systems, placement of antennas on electrically large structures, calculating scattering effects and performing electromagnetic compatibility (EMC) studies.

WinProp is the most complete suite of tools in the domain of wireless propagation and radio network planning. With applications ranging from satellite to terrestrial, from rural via urban to indoor radio links, WinProp’s innovative wave propagation models combine accuracy with short computation time.

Highlights of the 2018 release

The most notable extensions to Feko and WinProp in the 2018 release.

Features

- WinProp is included as part of the Feko HyperWorks installation. WinProp is a leading software for wireless propagation modelling and radio network planning. It interfaces with Feko through the import of Feko `.ffe` far field patterns. The legacy licensed Feko installation does not include WinProp and a legacy licensed WinProp installation is available.
- A new **Feko + WinProp** Launcher utility reduces the number of icons added to the Windows start menu. This utility contains options to launch the various Feko and WinProp components. It also provides easy access to the Feko documentation and the Altair licence utility.

Figure 13: The Feko + WinProp Launcher utility

- Characterised surfaces for the ray launching geometrical optics (RL-GO) solver greatly speeds up RL-GO analysis of complex multilayer structures.

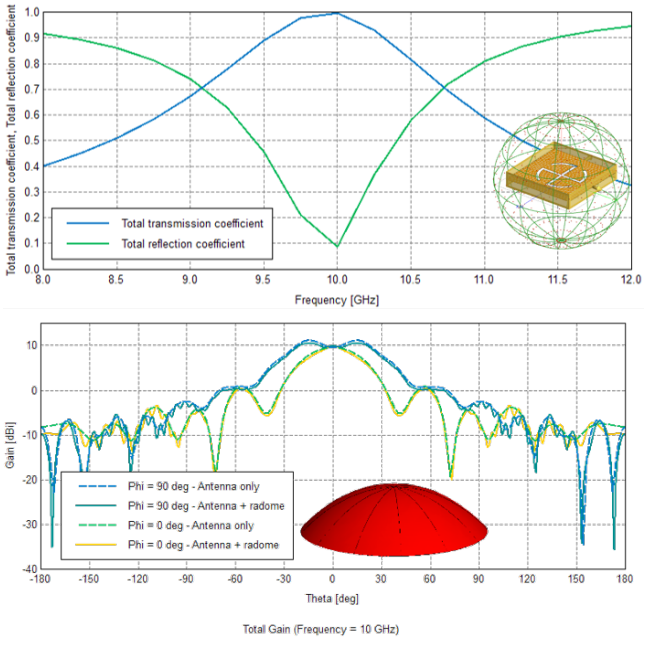

Figure 14: Antenna operating at 10 GHz with FSS radome modelled with a characterised surface. The radome simulation completes within a few minutes.

- The hybrid FEM/MoM supports dielectric objects solved with the surface equivalence principle (SEP) in combination with dielectric objects treated with the finite element method (FEM), provided the regions do not touch. This can reduce the simulation requirements significantly for some applications. The ferrite circulator example below completed in half the runtime, using seven times less RAM than the FEM-only solution.

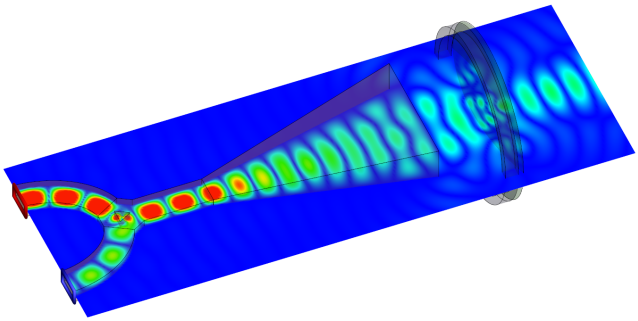

Figure 15: Ferrite circulator (FEM) with horn antenna and dielectric lens (SEP).

- Various cable modelling extensions, including:
  - A reference direction can be defined for a cable path. This provides precise control over cable orientations, instead of letting the solver search for the closest ground to the cable path.

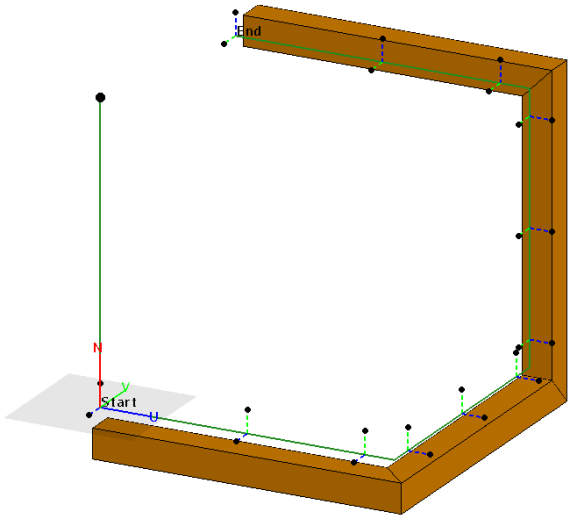

Figure 16: A reference direction can be defined to specify the orientation of a cable.

  - Error handling is improved for cables requiring a ground plane.
  - A newly developed cable cross section mesh library results in improved cable meshes, especially for cables close to geometry and for closely spaced cable conductors.

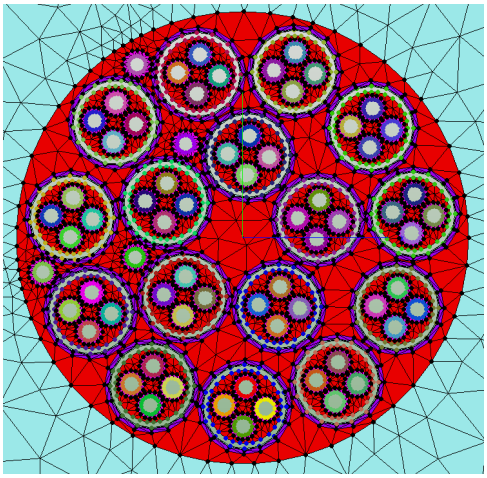

Figure 17: An example of a cable cross section mesh used by the solver.

  - N-port Touchstone files can be used as interconnections or terminations of cables.
  - HyperSpice is supported as a SPICE solution method for cable and network simulations. This SPICE solver provides a great speedup compared to the NGSPICE solver that is also available in Feko.
- Numerous meshing improvements, including:
  - Automatic meshing (Standard, Fine and Coarse) now yield different meshes for models where the mesh size is governed by the geometry curvature rather than the electromagnetic properties like frequency.
  - Automatic meshing rules for metal faces between dielectric regions are relaxed to be more in line with practical requirements.
  - Many performance enhancements and improvements to the meshes generated by the mesh engine introduced in Feko 2017.
  - A comprehensive check is added to detect overlapping or intersecting triangles when the solver is run.
- Improved DC estimation for time analysis.
- Graphs and displays are updated as adaptive frequency sampling results (results calculated over a continuous frequency range) become available.

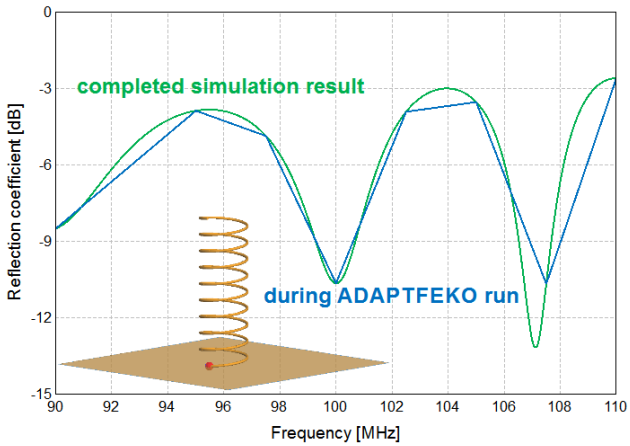

Figure 18: A Cartesian graph with the reflection coefficient of a helix antenna shows the completed continuous frequency result and the discrete result as it gets displayed during simulation.

- Untracked characteristic modes can be displayed in POSTFEKO.

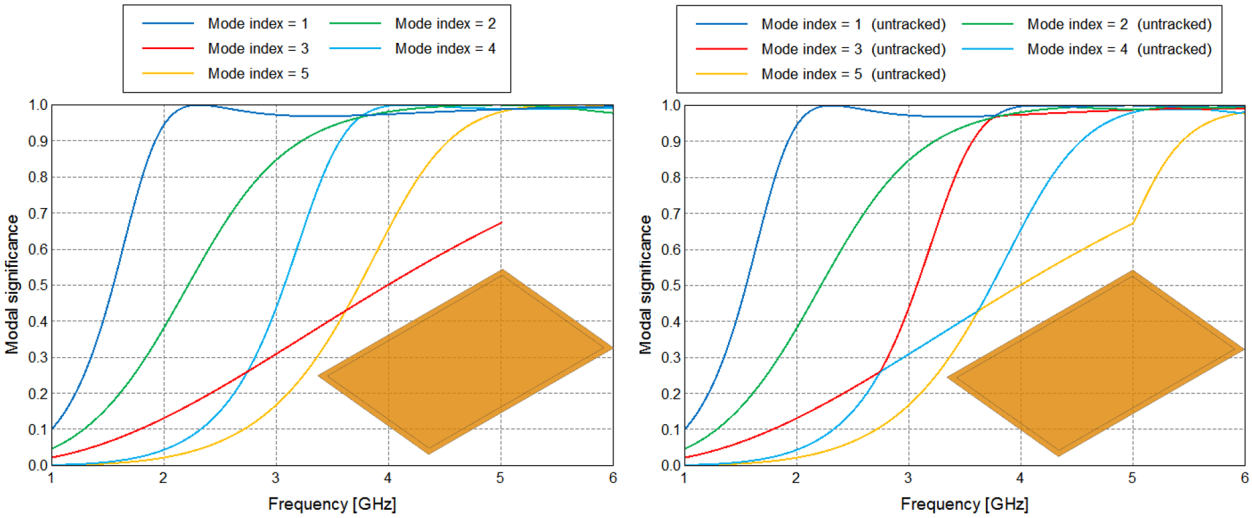

Figure 19: Modal significance plots from a characteristic mode analysis performed on a PEC plate showing tracked modes on the left and untracked results on the right.

- A phase reference point can be set for a plane wave source (before the reference was assumed to be the global origin).
- WinProp extensions include:
  - Full polarimetric analysis through the import of Tx and Rx antenna patterns from Feko. Polarisation can be taken into account in WinProp.
  - Support for the import of OpenStreetMap data (`.osm` XML files).
  - In Virtual Drive Test, a velocity profile can be defined along the trajectories. The results will include the Doppler shift.
  - WinProp radio channel data can be exported to the ASCII format supported by Keysight Propsim.

  - Increased user-friendliness through the use of relative paths when archiving antenna patterns and databases. Properties of antenna, sites, transmitters and cells can also be imported from existing WinProp projects, simplifying the setup of similar projects.
- The documentation is reworked with many improvements and changes, including the following:
  - The Feko manuals are incorporated into the HyperWorks help format.
  - The Feko documentation is improved to be more task driven.
  - The Feko User Manual includes more information, for example, a new section lists common errors and warnings that may be encountered.
  - Improved syntax highlighting of code snippets.
  - The location of the help folder is updated to: `c:\Program Files\Altair\2018\help`.

Feko 2018 Release Notes

The most notable extensions and improvements to Feko are listed by component.

CADFEKO

Features

- The CEM validate check for dielectrics in the same model is updated to support FEM together with SEP, provided that the regions do not touch. (2018)
- The plane wave source is extended to support calculating two orthogonal plane wave source polarisations without the requirement to create multiple configurations. (2018)
- Characterised surfaces can be defined and applied to RL-GO faces. (2018)
- Support is added to export transmission / reflection coefficients to `.tr` file. The request is activated on the transmission / reflection request dialog. (2018)
- The option to specify the return path for ribbon cables is removed. The setting is no longer used and the return path is calculated automatically (either via the ground or via the cable conductors). (2018)
- The orientation of cables can be defined. This provides precise control over the cable orientation instead of letting the solver search for the closest ground to the cable path. (2018)
- Mesh imports are extended to recreate, when possible, the parts and associated faces during the import process. Faces are grouped into parts as they were at the time of export. Imported meshes without labels will be grouped into an "UnknownMeshParts" part. The feature can be disabled to obtain the previous import behaviour yielding parts labelled "MeshImport". (2018)
- Automatic meshing (fine, standard and coarse) now influence the advanced mesh settings for curved geometry approximation (refinement factor and minimum element size). This ensures that the three automatic mesh size options yield different meshes for models where the mesh size is governed by the geometry rather than the electromagnetic properties (like frequency). (2018)
- The meshing library is upgraded to the latest version. (2018)
- The automatic meshing rules for metal faces between two dielectric regions are relaxed. The theoretical meshing requirements are too stringent for most practical simulations. A compromise between the theoretical required meshing and required resources that still provides good simulation accuracy is implemented. (2018)
- The CADFEKO API is extended to return a list of parts that are imported. This change breaks backwards compatibility and may require users to update their scripts that use the return value. (2018)
- The CAD import library is upgraded to provide access to the latest CAD formats and to benefit from the latest bug fixes and performance improvements. (2018)

Resolved Issues

- The calculation of the size of the FDTD boundary box is corrected for the option to specify the size of the free space buffer in the X-direction (+X or -X). (2018)

- A problem with periodic boundary condition meshing is resolved, where for some models, the geometry modeller encountered a problem and the mesher aborted abnormally. (2018)
- The order of some cards in the `.pre` file was not written out consistently. This could lead to the solver detecting changes in the model, preventing the `.str` file to be used for subsequent calculations. This is corrected. (2018)
- The dialog for exporting a model to Parasolid format is updated to allow exporting to the latest versions. (2018)
- An assertion that failed with "Assertion failed: ((*it)->addToHistory())" is resolved. An error, "Scaled model contains faults" will now be triggered when a `.cfx` file is imported and the operation cannot complete due to problems with the required scaling during import. (2018)
- An assertion that failed with "src\cf_ProjectAutomation.cpp (117): Assertion failed: 0" is fixed. This assertion failure could be encountered when importing `.cfx` models created by the Antenna Magus software. (2018)
- Gerber imports could have resulted in imports where some parts were missing. These problems are corrected. (2018)
- Improvements to the Gerber import process prevent some elements from being clipped (trimmed) during the import process. (2018)
- Gerber and ODB++ import offers improved support for folders and files that use unicode characters. (2018)
- The region settings on faces imported from Gerber files could have been set incorrectly during the import process. These region settings are now applied correctly. (2018)
- A mismatch between the model extents and the extents of Gerber or ODB++ files could have resulted in an assert failing during the import process. (2018)
- A correction to the Gerber unit directive resolves a problem that resulted in some entities not being imported into CADFEKO. (2018)
- The Gerber and ODB++ library is upgraded with many improvements implemented with the upgrade. The upgrade includes various bug fixes and enhancements. (2018)
- The problem that required some users to install Microsoft Visual C++ 2008 redistributables before they could import Gerber and ODB++ files is resolved. (2018)
- Script recording is extended to support the import of Gerber, 3Di and ODB++ files. (2018)
- The recorded script when importing a `.fek` file used an undefined "properties" table that resulted in an error when running the script. This is fixed. (2018)
- Script recording is extended to support `.dxf` file import. (2018)
- The algorithm for detecting intersecting triangles is improved. The problem that a different number of intersecting elements gets reported for a model mesh and the same mesh used as simulation mesh is resolved. (2018)
- An error with mesh variable evaluation could have resulted in meshes using the previous mesh setting under very special circumstances. The evaluation bug is fixed. (2018)
- Re-meshing of volume meshes (finite element method) did not correctly take into account embedded metal structures and resulted in non-matching triangle-tetrahedron boundaries. Meshes of model meshes now include the discretisations for internal metallic faces. (2018)

- The meshing quality and the meshing performance for FEM models (volume meshing) are considerably improved. These performance improvements are easily seen when meshing large array structures. (2018)
- Meshing of fine helical structures with curvilinear segments is improved. (2018)
- Automatic meshing is revised to correctly mesh second order elements on FEM-FEM boundaries. First order elements are still created on FEM-MoM boundaries. Faces bounding FEM regions are corrected to use the meshing rules of the FEM region and not the MoM meshing rules. (2018)
- The meshing performance for UTD plates is improved. For large models the resource requirements could have resulted in the meshing process failing. (2018)
- Periodic boundary condition meshing is improved to take into account the effect of wires touching faces on the periodic boundaries. (2018)
- A meshing issue with some problematic faces that could not be meshed is resolved. Warning messages, including the warning "A correct definition could not be recovered", were triggered during meshing. These faces are now meshed correctly. (2018)
- Large volume meshes with fine detail could have resulted in large tetrahedra. The problem is corrected and the tetrahedral element sizes are now consistent. (2018)
- The meshing of spherical geometries is improved. In the past it could happen that some faces of spherical structures were not meshed. This problem is resolved. (2018)
- A wire with a segment and a vertex port in close proximity could have resulted in an assert failing. This case is now correctly taken into account, resulting in an error message or a successful mesh (when meshing is possible). (2018)
- Corrections made to wire re-meshing ensure that the wire mesh settings are taken into account correctly. Some re-meshed wires could have resulted in much fewer segments in previous versions. (2018)
- Small geometry feature suppression during meshing is corrected for models containing wire ports and symmetry planes. Small geometry features are now ignored for the specified percentage of the mesh size. (2018)
- The mesher aborted abnormally when attempting to mesh some analytical curve geometry using curvilinear segments. The geometry now meshes successfully. (2018)
- The meshing of sharply curved hyperbolic arcs are improved. (2018)
- Sinusoidal curve geometries are approximated more accurately when meshing with straight elements. (2018)
- The API is extended to allow the use of interpolation features in result scripts. (2018)
- An assertion that failed with "src/operatorframework/mesh/modifiers/gaia_NonRestorableMeshModifier.cpp (6): Assertion failed: 0" is resolved. This problem could be encountered when attempting to delete parts of a locked model mesh. (2018)
- A crash is resolved that could present when translating a mesh part imported from a `.cfx` file. This was due to the "Use model mesh" setting incorrectly being in an inconsistent state. (2018)
- Many unions that failed in the past now union correctly due to improvements to the union operator. (2018)
- Meshing of wire ports located at the centre of the wire has been corrected to create the wire segment port at the centre of the wire. In some cases the meshing could have resulted in the port being slightly offset. (2018)

EDITFEKO

Features

- The A0 card (plane wave source) is extended to allow users to specify whether the orthogonal plane wave definition should be included in the simulations. (2018)
- The DA card (data output) is extended to allow exporting `.tr` files (transmission / reflection data from infinite surface structures). (2018)
- The DI card (dielectric and magnetic material definition) is extended to support characterised surface materials. (2018)
- The SK card (skin effect and other surface properties) is extended to allow users to apply characterised surface properties on RL-GO faces. (2018)
- The CS card (cable section) is extended to support cable orientations. The cable orientations are required when no ground plane is available to define the orientation or when the ground plane is electrically far from the cable path. (2018)
- The CD card (cable cross section definition) option to specify the return path number for ribbon cables is removed. This setting is no longer used and the return path is determined automatically (either via the model ground or cable conductors). (2018)
- The CI card (cable interconnect) is extended to support N-port Touchstone interconnections and terminations on cables. (2018)
- Edge loads now take port polarity into account at the LE card. (2018)

Resolved Issues

- Support for the old A4 and L4 cards has been discontinued. These cards have been removed from the interface. (2018)

POSTFEKO

Features

- The adaptive frequency sampling algorithm is used to interpolate and extrapolate frequency responses for time analysis in POSTFEKO. The new algorithm greatly improves the direct current (DC) estimate and this results in better time domain results. The setting can be disabled on the **Time domain** tab in POSTFEKO. (2018)
- Support is added in POSTFEKO to allow loading and displaying models where both orthogonal plane wave polarisations are requested. (2018)
- Support for ray launching geometrical optics (RL-GO) characterised surfaces was added. The characterised surface can be defined and then applied to RL-GO faces. (2018)
- Support is added for N-port Touchstone files to be used as terminations or interconnections for cables. (2018)
- The display of untracked modes from characteristic mode analysis (CMA) simulations is supported. The mode number (for tracked data) or the mode number with "untracked" in parentheses (for untracked data) can be selected on views and plots showing CMA results. (2018)

- Support for surface graph point annotations is added. Quickly add an annotation to a Cartesian surface graph by holding Ctrl+Shift and left mouse clicking on a plot, or specify the horizontal and vertical axes values at the point of interest. (2018)
- The surface graph supports exporting results to a text file for further processing. The results can be exported to the clipboard using the Ctrl+X keyboard shortcut. (2018)
- POSTFEKO monitors simulation results and updates the display and graphs as the results become available for discrete frequency results. This feature is now also available for adaptive frequency sampling results (continuous frequency). POSTFEKO will display the discrete results during the simulation and interpolate the results once the simulation has completed. (2018)
- The `OpenFile` method in the API is changed to open models (`.fek` files) with many mesh elements by default (instead of not loading the mesh). (2018)
- Phase unwrapping support is implemented for receiving antennas. (2018)
- Support is added for changing the unit (V/m versus kV/mm) when displaying results in decibels. (2018)
- The `.fek` file version is increased to 159 to accommodate new cable extensions. (2018)
- The Feko far field file formats are extended to provide the polarisation angle in the block header. (2018)
- Edge loads now take port polarity into account and this is correctly indicated in the 3D view and details tree. (2018)

Resolved Issues

- Improved support was added for importing large data files (larger than 1 GByte). (2018)
- Touchstone impedance and admittance files were incorrectly imported (incorrect normalisation was used) and has been fixed. (2018)
- A display bug is fixed that could have resulted in a crash when setting the segment display radius to zero. (2018)
- Scaling of text on images exported from 3D views are improved. The text size was much smaller on exported images than on the 3D view. The font sizes on images exported with the "Same as source" size setting are now the same as on the 3D view. (2018)
- The display of far field lobes with transparency is corrected. In previous versions, the colours could have changed when using hardware rendering. Software rendering remains correct. (2018)
- Support for an invalid (collapsed) axis definition is improved. Invalid axis definitions could have resulted in an assert failing, but they are now handled correctly in POSTFEKO. (2018)
- The Cartesian surface graph display is extended to support invalid and infinite numbers. The invalid values are ignored, but previously could have resulted in an assert failing. (2018)
- Cartesian surface graphs now support polarisation angle, plane wave theta and plane wave phi as possible independent axes when these are available. An empty combobox was displayed for near field results containing these values and polarisation angle could not be selected as independent axis for far field results. (2018)
- The Cartesian surface graph right click context menu is corrected to be available from anywhere on the plot area. (2018)
- All polar plot annotations with a horizontal position of greater than 180 degrees was shown at 180 degrees. This regression was introduced by changes in POSTFEKO 2017.2.5. It is corrected. (2018)

- The option to change the time signal for a Cartesian graph time analysis trace is now available for S-parameter results, waveguide source data and modal source data. (2018)
- Measurement cursors update correctly for negative horizontal axis values. The problem that was introduced in POSTFEKO 2017.2.5 is resolved. (2018)
- The width of combo box widgets on the ribbon is increased to improve readability of items with longer text. (2018)
- Validation on the API for exporting results was corrected to require a minimum of two points. It was incorrectly possible to export using a single point. (2018)
- The `DerivedResults` module is corrected to support phi axis ranges. Using the module to calculate results from data with phi values could have resulted in an error. (2018)

Solver

Features

- Improve the scaling and robustness of the MoM phase of the coupled FEM/MoM solution method. (2018)
- FEM/MoM problems are supported with SEP dielectric regions, provided that the SEP dielectrics do not touch the FEM/MoM interface. (2018)
- CUDA is upgraded to version 8.0, providing access to the latest enhancements in GPU computing. (2018)
- Higher order waveguide triangle basis functions are pre-calculated, resulting in large performance improvements for waveguide models utilising higher order basis functions. Pre-calculation was already supported for the RWG basis functions. (2018)
- Shared memory is expanded to further phases, resulting in more memory savings for the MLFMM. (2018)
- The number formatting for MLFMM memory usage reports is improved. (2018)
- Exporting near and far field data for orthogonal plane wave sources is supported. (2018)
- Characterised surface definitions can be exported to `.tr` files. (2018)
- Characterised surfaces can be used to speed up RL-GO calculations for surfaces where transmission and reflection coefficients are a function of frequency and direction of source incidence. (2018)
- Support is added to set the plane wave source reference point. The phase reference was always assumed to be the global origin, but now it can be set by the user. (2018)
- Support is added for the phase reference for plane wave sources in the FDTD. (2018)
- N-port Touchstone files can be used as interconnections or terminations of cables. (2018, 2018)
- The error handling for cables requiring a ground plane is improved. The cable height above the ground is tested at the highest frequency. An error is given if the cable is too high above the ground. This error was present in the past, but would often be triggered only after many frequencies have been simulated. (2018)
- A newly developed cable cross section meshing library results in improved cable meshes, especially for cables close to geometry and for closely spaced cable conductors. (2018)

- An environment variable, FEKO_WHICH_CABLE_MESHER, is added to enable the selection of the mesher to be used for cable solutions. (2018)
- HyperSpice is supported as a SPICE solution method for cable and network simulations. Low-frequency cable performance is improved with the addition of this SPICE solver. (2018)
- Edge loads are supported for finite antenna array analysis. (2018)
- The Intel Math Kernel Library (MKL) is upgraded to version 2018.1. The new version shows performance improvements on newer hardware (being able to utilise the latest hardware advancements). (2018)
- Feko is compiled using the latest Intel compilers, allowing it to optimally utilise the latest hardware for the best possible performance. (2018)
- The Windows compilers are upgraded to Microsoft Visual Studio 2015 (service pack 3). (2018)
- The Linux GNU Compiler Collection (GCC) is upgraded to version 4.9.4, requiring libstdc++ version 6.0.20 or later. (2018)
- The latest Intel Message Passing Interface (MPI), version 2018 update 1, is used for process communication. The upgrade includes the removal of SMPD / MPD and the I_MPI_PROCESS_MANAGER environment variable since these are deprecated in the latest version. (2018)
- Edge loads now take port polarity into account. (2018, 2018)
- A new option is added to wait for available HyperWorks Units (HWUs) if there are not enough units available to start a solver job. Set the environment variable ALM_QUEUE_TIMEOUT to the desired waiting time (in seconds). (2018)
- The str2ascii tool is extended to support the latest .str file format (12). (2018)
- A check for overlapping triangles in simulation meshes is added. (2018)
- The MoM meshing requirements for metal faces on dielectric boundaries are relaxed. (2018)

Resolved Issues

- An internal error that could have resulted for FDTD models where the resistance, capacitance and inductance are set to zero is corrected. (2018)
- The FDTD minimum time interval was ignored if the automatically calculated maximum time interval was shorter than the specified minimum time interval. This is fixed. (2018)
- Incorrect results were calculated for PBC problems that are long relative to the periodic cell surface area. This is fixed. (2018)
- The robustness and speed of intersection tests for RL-GO models are improved. (2018)
- The automatic parameters for small RL-GO models (where RL-GO is not really applicable) are improved to produce more accurate results. (2018)
- A bug is fixed that prevented the proper detection of degenerate triangles in the mesh RL-GO and windscreen elements. (2018)
- The RL-GO warnings are improved to provide a summary of the number of rays with angular increments that are too coarse. The number of rays being affected are listed instead of issuing a warning for each ray. (2018)
- RL-GO is extended to provide more details regarding rays that are discarded during the simulation. The ray origin, direction and decay are included in the .out file. (2018)

- The performance of RL-GO is improved by not computing the magnetic dipole moment when a ray hits a PEC surface. (2018)
- A bug is fixed that caused an error while writing rays to the `.ray` file for UTD cylindrical geometry. (2018)
- SPICE models that contain special characters, such as a circumflex, in the file name no longer result in an error when using the SPICE solver. (2018)
- MoM matrix fill times are improved. (2018)
- Unused quantities are removed from the geometry and basis function sections of the OUT-file. (2018)
- The calculation of transmission/reflection coefficients for electrically small unit cells with high aspect ratios is corrected. (2018)
- A bug that caused an internal error for triangles with features smaller than the model tolerances is fixed. (2018)
- Add the environment variable FEKO_MPI_ROOT_FORCE to force the MPI implementation used. (2018)
- LD_BIND_NOW is not enabled for Feko runs on Linux systems. This is no longer required to avoid floating point exceptions. (2018)
- A correction is made to the test for the application of losses to conducting surfaces. Warning 32412 may not have been triggered when it should have for some low conductivity or high permeability examples. (2018)
- Support for the microstrip coaxial feed approximation is removed as more modern alternatives are available. (2018)

Shared Interface Changes

Features

- The API `Launcher` object is extended to allow users to access the command used to launch other Feko components. Each function returns a command string that takes the current settings into account. This extension makes it easier to integrate third party applications into the interface. (2018)
- Collections in the API are extended with a `UniqueName` method that will use the contents of the collection to find a unique name (with no duplicate) for a given base name. This removes the burden of defining a unique name from the user. (2018)
- The 3D CAD modeller used in CADFEKO is upgraded to version 30, providing access to the Parasolid formats, bug fixes and performance enhancements. (2018)
- The rendering engine is upgraded to the latest version to access the latest bug fixes and performance enhancements. (2018)

Resolved Issue

- The options --remove-use-mpi and --remote-host could have been included when remote execution was not activated. A machines file could also have been generated and used for local runs. These errors are corrected. (2018)

Support Components

Features

- The Feko updater is greatly improved in terms of speed and its ability to efficiently handle a large number of small files in an update. (2018)
- The optimisation engine is improved to make it less sensitive to extremely large or extremely small values. (2018)
- A Feko + WinProp Launcher utility allows quick and easy access to all the Feko and WinProp components, documentation and licensing utilities. The launcher eliminates clutter by greatly reducing the number of icons added to the Windows start menu. (2018)
- The installers are upgraded to use the latest version of the installation software. This version has improved support for ultra high definition (UHD) screens. (2018)
- The WinProp example models are included in the installation. In previous releases, these examples had to be downloaded from the website. (2018)
- The mat2ascii and str2ascii utilities are included in the Feko installation. In the past, these utilities had to be downloaded from the Feko website. (2018)
- The scripting examples and related PDF document are removed from the Feko installation. Any users requiring the old models and document should contact the Feko Support team. (2018)
- Third party resources, such as the NGSPICE manual, are now located in the shared/pdf folder in the Feko installation directory. (2018)
- The documentation (all Feko content) has been re-created making it easier to find content, follow steps to complete tasks. The HTML version of the documentation uses the system web browser. (2018)
- The Linux build environment is upgraded to support the new compilers and the latest library upgrades. The build environment is CentOS 6.9 with Development Toolkit 3.1. Linux systems require a GLIBC version of 2.12 or later in order to run Feko. (2018)

Resolved Issues

- Empty lines before the Touchstone specification line are supported. (2018)
- The Feko updater no longer requires a valid licence file in order for system administrators to update Feko to the latest version before installing a valid licence. (2018)
- A bug that prevented the import of materials from XML databases on Linux systems is fixed. (2018)
- The OPTFEKO help text for parallel farming runs is clarified. (2018)

WinProp 2018 Release Notes

The most notable extensions and improvements to WinProp are listed by component.

General

Features

- Feko far field results (antenna patterns) can be imported in `.ffe` format. These files contain full polarimetric information, such as antenna patterns for theta polarization and for phi polarization, to increase the breadth of suitable WinProp applications. (2018)
- WinProp (using HyperWorks units) is included in the Feko installation and gets installed to the same location. The Feko bin directory and other folder structures are shared. The legacy licensed WinProp still requires a separate installation. (2018)
- Multiple concurrent WinProp installations are now possible. (2018)
- As part of the merger of WinProp and Feko installers (for installations with HyperWorks licensing), administrative privileges are no longer required. (2018)
- Similar to other Altair HyperWorks tools, WinProp now also supports a Student Edition. (2018)

Resolved Issue

- Fixed a bug in which modified RunMS settings were sometimes not respected by the solver. (2018)

ProMan

Features

- For rigorous analysis, the full angle-dependent polarization of both the transmitting and the receiving antennas are now taken into account in indoor and urban scenarios with ray-tracing methods SRT and IRT (provided also the option Fresnel/UTD is selected). (2018)
- Transmit power is limited to 120 dBm (1 GW) to avoid unintended consequences if an unrealistic value is entered by mistake. (2018)
- Projects can be exported along with antenna patterns and geometry databases into an archive without absolute path information. This facilitates the exchange of complete projects between different machines and users. (2018)
- For simulations with empirical methods, in addition to defining a polarization for the transmitter, the user can define a cross-polarization level. (2018)
- In addition to indoor scenarios, polarization of transmitters can now also be defined in urban and rural scenarios. (2018)
- A translator is added to convert data exported from OpenStreetMap (as `.osm` XML) into WinProp readable format. (2018)
- WinProp radio channel data can be exported to the ASCII format supported by Keysight Propsim. (2018)

- It is now possible to export and import the properties of sites, antennas and cells. These properties can be read directly from a saved project file into another project. This saves time when setting up new projects that are similar to existing ones, and reduces the chance of errors. (2018)
- For RunMS postprocessing, multiple trajectories can now be handled. (2018)
- A velocity profile can now be included along receiver trajectories in the Virtual Drive Test (RunMS), so Doppler shift is added to the results. (2018)

Resolved Issues

- Fixed a problem that caused, in some cases, the range of the legend to be missing for a result plot. (2018)
- Fixed a problem that caused ProMan to crash while computing the propagation results for modified antennas. (2018)
- Fixed a situation where ProMan was looking for RunMS results in a folder with the default name while the user had specified a custom name. (2018)
- Fixed a situation in ProMan where the button for displaying results for selected rays was not available. (2018)
- Fixed a rare crash in an urban scenario with vegetation. (2018)
- Fixed a crash in ProMan that occurred when a user attempted to combine topographical databases with different resolutions. (2018)
- Fixed a bug that prevented the completion of a RunMS simulation for models with multiple trajectories. (2018)
- Fixed a bug that impeded receiver antenna postprocessing in area mode. (2018)
- Fixed a problem that prevented the computation of Channel Capacity in the RunMS feature. (2018)
- Fixed a situation in which an imported bitmap could no longer be displayed. (2018)
- Fixed an incorrect legend display for results in which all pixels had the same value. (2018)
- Fixed a case in ProMan where an omnidirectional antenna would continue to be displayed as a sector antenna. (2018)
- Fixed a situation in ProMan where, with certain settings, the transmitting antenna could not be moved anymore. (2018)

WallMan

Feature

- WallMan offers new shortcuts for the conversion of vector databases. (2018)

Resolved Issues

- Fixed a crash in WallMan that occurred when a furniture object overlapped with certain existing wall objects. (2018)
- Fixed a WallMan problem where changing the resolution in a database conversion could lead to an incorrect database. (2018)

AMan

Features

- Two antenna patterns, one for theta polarization and one for phi polarization, can be converted into one pattern in `.ffe` format with full polarization information. The original antenna patterns can be in several formats, such as `.msi`, `.apb` and `.apa`. (2018)
- A superposition of antenna patterns at one site can be created into one antenna pattern at that site. This avoids having to run a simulation more than once. (2018)

Application Programming Interface

Features

- A sample project developed in Visual C# shows how the WinProp API can be called or implemented in C#. (2018)
- The WinProp API can now be used under HyperWorks Units (HWU) licensing. (2018)

Component Version Numbers

The version numbers of the components in this release are provided as a reference.

Released component versions and dates.

Table 11: Released component versions and dates.

Component	Version	Date
ADAPTFEKO	2018-9	2017-12-18
CADFEKO	2018-319328	2018-02-15
CADFEKO_BATCH	2018-319328	2018-02-15
EDITFEKO	2018-319328	2018-02-15
ENVFEKO	2018-5	2017-12-11
FEKO_MKL	2018-309	2018-02-15
Feko Updater	2018-319328	2018-02-15
Feko Updater GUI	2018-319328	2018-02-15
Launcher	2018-320300	2018-02-22
MAT2ASCII	2018-3	2017-12-11
OPTFEKO	2018-10	2018-02-06
POSTFEKO	2018-319328	2018-02-15
PREFEKO	2018-29	2018-02-06
QUEUEFEKO GUI	2018-319328	2018-02-15
RUNFEKO	2018-6	2017-12-11
STR2ASCII	2018-2	2017-12-11
AMan	2018-32519	2018-02-20
CoMan	2018-32519	2018-02-20
CompoMan	2018-32519	2018-02-20
OptMan	2018-32519	2018-02-20
ProMan	2018-32519	2018-02-20

Component	Version	Date
TuMan	2018-32519	2018-02-20
WallMan	2018-32519	2018-02-20

Feko 2017.2.5 Release Notes

12

Feko 2017.2.5 is a bug-fix update that includes the enhancements and bug fixes documented below.

This chapter covers the following:

- CADFEKO (p. 114)
- EDITFEKO (p. 115)
- POSTFEKO (p. 116)
- Support Components (p. 117)
- Component Version Numbers (p. 118)

Note: Feko 2017.2.5 is a cumulative update that contains changes from previous updates. It should be applied to an existing installation of Feko 2017 (that may or may not have been updated previously).

CADFEKO

Resolved Issues

- The part labels for sheet bodies imported from STP file now use the face names instead of "NONE". (2017.2.5)
- The setting to calculate far fields for an array of elements did not persist for monostatic RCS calculations. The setting would be reverted each time the far field request dialog was opened. This problem is now resolved. (2017.2.5)
- CADFEKO issues an error when running OPTFEKO if any of the request labels used in an optimisation goal starts with a number. The `.opt` file is no longer created if the labels are problematic. Labels starting with a number would cause the simulation to terminate with "ERROR 21027: Error in expression" during optimisation goal calculation. (2017.2.5)

EDITFEKO

Feature

- The FM card (fast method settings) layout is simplified for the near field and far field calculation method settings. Two check boxes replace the old radio button options. The fast near field and fast far field calculation methods are simply enabled or disabled using the check boxes. (2017.2.5)

POSTFEKO

Resolved Issues

- The memory consumption for opening and closing huge sessions containing many graphs, views and results is reduced significantly. This avoids a crash of the application due to insufficient memory. (2017.2.5)
- A crash is resolved that could happen when exporting a stored S-parameter DataSet from POSTFEKO. (2017.2.5)
- Improvements to the way annotations are added to 2D graphs make it easier for annotations to be snapped to a trace. (2017.2.5)

Support Components

Feature

- A problem with HyperWorks licensing is resolved that could have resulted in a crash when insufficient licences were available to complete the licence checkout when using the solver node licensing scheme. (2017.2.5)

Component Version Numbers

The version numbers of the components in this release are provided as a reference.

List of Components and Versions

Table 12: Released component versions and dates.

Component	Version	Date
CADFEKO	2017.2.5-317065	2018-01-11
CADFEKO_BATCH	2017.2.5-317065	2018-01-11
EDITFEKO	2017.2.5-317065	2018-01-11
POSTFEKO	2017.2.5-317065	2018-01-11

Feko 2017.2.4 Release Notes

13

Feko 2017.2.4 is a bug-fix update that includes the enhancements and bug fixes documented below.

This chapter covers the following:

- CADFEKO (p. 120)
- POSTFEKO (p. 121)
- Solver (p. 122)
- Support Components (p. 123)
- Component Version Numbers (p. 124)

Note: Feko 2017.2.4 is a cumulative update that contains changes from previous updates. It should be applied to an existing installation of Feko 2017 (that may or may not have been updated previously).

CADFEKO

Features

- The Optenni Lab plugin is extended to support the Altair Partner Alliance (APA) version. The APA version of Optenni Lab uses different registry entries compared to the stand-alone version. The plugin now also supports a FEKO_OPTENNI_PATH environment variable allowing users to set the path to the Optenni Lab installation that should be used when multiple versions are installed. (2017.2.4)

Resolved Issues

- An issue with the new mesh engine is resolved that could cause large tetrahedra to be created in a region cut by a symmetry plane. (2017.2.4)
- Extremely small edges (smaller than 0.1% of the model size) are now ignored during meshing. These edges caused tiny elements to be created in CADFEKO 2017.2.2 and 2017.2.3. This was due to the change made to CADFEKO 2017.2.2 to improve the meshes generated for models containing small edges with an applied mesh size much larger than the dimension of the edge. (2017.2.4)
- A crash is resolved that could be encountered on AMD machines during voxel meshing. (2017.2.4)

POSTFEKO

Resolved Issues

- An issue is resolved that could lead to an assertion failing with "converterMap.contains(A)" when entering a unit value on the result palette that is not listed as an option for the vertical unit setting of the trace from on the ribbon (Trace tab). This assertion failure could also be encountered when setting the unit through the API. (2017.2.4)
- To avoid ambiguous quantity units, temperature units are modified to "degC", "degK" and "degF" instead of "C", "K" and "F". References to Kelvin may cease to work and replacing the unit "K" with "degK" on the result palette or in the script should resolve any problems. (2017.2.4)
- The scaling for tonne (metric ton) is corrected to 1e6 grams. (2017.2.4)
- The "Select all" (Ctrl+A) behaviour for graph traces is corrected. (2017.2.4)

Solver

Features

- The convergence speed of stabilised CFIE MLFMM examples is improved by disabling stabilisation. (2017.2.4)
- The iteratively coupled hybrid MoM/MLFMM-PO/LE-PO solutions are now also supported for cases where the MoM/MLFMM region are solved using the CFIE. (2017.2.4)

Resolved Issues

- CMA solution robustness and parallel scaling efficiency is improved. (2017.2.4)
- A segmentation violation for characteristic mode analysis problems with more than 40 000 unknowns is fixed. (2017.2.4)
- A bug is fixed that could lead to "ERROR 46104: Error while reading the matrix from a file" for CMA examples. (2017.2.4)
- The reflection coefficient for circularly polarised excitation of a circular waveguide is corrected. (2017.2.4)
- A hang is fixed for parallel runs with waveguide ports when the mode expansion settings are changed between configurations. (2017.2.4)
- The condition number of matrices is not calculated on parallel Linux systems due to a bug in Intel MKL. (2017.2.4)

Support Components

Resolved Issues

- The Feko Example Guide graphs for "Example D-1: Shielding factor of a sphere with finite conductivity" are corrected. The result on the "Shielding factor (E-field)" graph was incorrectly scaled and the unit is corrected in the "Shielding factor (H-field)" graph. (2017.2.4)
- Continuous frequency results varied for some geometries when rotated. This is fixed. (2017.2.4)
- The processing of CST near field scan data is corrected for cases where the model unit differs from the dimension unit used in the imported near field scan. (2017.2.4)
- Local parallel RSH Feko runs on Linux systems are no longer prevented when the hostname returns the fully qualified domain name by default. (2017.2.4)
- An extra console window is no longer shown by the updater when it is launched from a medium integrity process to update an application installed in a location that requires high process integrity. (2017.2.4)
- An improved error message is displayed when using the command line updater to update from a local repository without specifying the version to upgrade to for the --upgrade-from command. (2017.2.4)
- An error message is displayed when the updater is unable to write settings to the `.ini` file and the updater settings cannot be stored. (2017.2.4)

Component Version Numbers

The version numbers of the components in this release are provided as a reference.

List of Components and Versions

Table 13: Released component versions and dates.

Component	Version	Date
ADAPTFEKO	2017.2.4-7	2017-10-23
CADFEKO	2017.2.4-315226	2017-11-24
CADFEKO_BATCH	2017.2.4-315226	2017-11-24
FEKO_MKL	2017.2.4-545	2017-11-20
Feko Updater	2017.2.4-315226	2017-11-24
POSTFEKO	2017.2.4-315226	2017-11-24
PREFEKO	2017.2.4-40	2017-11-20
RUNFEKO	2017.2.4-16	2017-10-23

Feko 2017.2.3 Release Notes

14

Feko 2017.2.3 is a bug-fix update that includes the enhancements and bug fixes documented below.

This chapter covers the following:

- CADFEKO (p. 126)
- Solver (p. 127)
- Component Version Numbers (p. 128)

Note: Feko 2017.2.3 is a cumulative update that contains changes from previous updates. It should be applied to an existing installation of Feko 2017 (that may or may not have been updated previously).

CADFEKO

Resolved Issue

- An assertion failed with "getMeshElementDescriptors().count() == 1" when saving a model containing a suspect port connected to a general network or transmission line. The `.pre` file will now contain the error message "The mesh instance of port '[port label]' is suspect". (2017.2.3)

Solver

Resolved Issues

- The linear system solution numerical libraries are reverted back to the previous version due to floating point exceptions encountered on some hardware platforms. (2017.2.3)
- The first frequency impedance was incorrectly calculated for a multi-configuration problem run in parallel. (2017.2.3)
- S-parameters were calculated incorrectly when adding reference impedances to existing loads at microstrip ports. (2017.2.3)
- A division by zero error is avoided when requesting the scattered far field only for models that consist of sources only. (2017.2.3)
- The performance of the initialisation phase for the windscreen solution method is improved. (2017.2.3)
- Floating point exceptions that could have been raised on Linux systems using newer versions of glibc are resolved. (2017.2.3)

Component Version Numbers

The version numbers of the components in this release are provided as a reference.

List of Components and Versions

Table 14: Released component versions and dates.

Component	Version	Date
CADFEKO	2017.2.3-312190	2017-10-25
CADFEKO_BATCH	2017.2.3-312190	2017-10-25
FEKO_MKL	2017.2.3-538	2017-10-27
RUNFEKO	2017.2.3-16	2017-10-23

Feko 2017.2.2 Release Notes

15

Feko 2017.2.2 is a bug-fix update that includes the enhancements and bug fixes documented below.

This chapter covers the following:

- CADFEKO (p. 130)
- POSTFEKO (p. 132)
- Solver (p. 133)
- Support Components (p. 134)
- Component Version Numbers (p. 135)

Note: Feko 2017.2.2 is a cumulative update that contains changes from previous updates. It should be applied to an existing installation of Feko 2017 (that may or may not have been updated previously).

CADFEKO

Resolved Issues

- An update to the latest version of the meshing library provides the following improvements (2017.2.2):
  - The performance of meshing large, curved surfaces such as spheres, paraboloids and reflector antennas is improved.
  - The meshing of sharp, pointed geometry, like the tips of cones is improved.
  - Some problematic faces that could not be meshed before can now be meshed.
  - A crash is resolved for meshing long, intertwined helices with the refinement factor advanced mesh setting set to a value much finer than the default.
- Improved meshes are generated for models that have small edges with a large mesh size (larger than the dimension of the edge) applied on them. (2017.2.2)
- The meshes generated for low frequency models using automatic meshing (setting the mesh size to **Fine**, **Standard** or **Coarse**) are improved. (2017.2.2)
- The meshing quality of triangles and tetrahedra that bound small curved surfaces is improved. (2017.2.2)
- Improved warnings are written to the message window when problems are encountered during meshing. (2017.2.2)
- The performance of re-meshing surface meshes is improved. (2017.2.2)
- The meshes generated for models with large model extents are improved:
  - The meshing of small wires in models with large model extents is improved. Error 17601, advising the user to adjust the mesh settings, could be given when meshing with curvilinear segments enabled and linear segments did not always accurately represent the geometry. (2017.2.2)
  - A meshing issue for large model extents where faces were sometimes ignored during meshing is resolved. If a similar problem is encountered, a warning will now be issued. (2017.2.2)
  - Poor meshes were generated in some instances for models with large model extents, causing the KERNEL to terminate with "ERROR 832: Segmentation rules have been violated (two triangles touch without a common edge)". This issue is resolved. (2017.2.2)
  - An assertion could fail with "!composingEntities.isEmpty()" when meshing a model with large model extents. (2017.2.2)
- A meshing issue is resolved where wire segments much shorter than the wire or the requested wire segment length were sometimes created. This could happen on a curved wire containing a segment port when the requested wire segment length was defined to be more than 80% of the wire length. These short segments caused the solver to terminate with "ERROR 116: The ratio of the segment radius to length is too large" or "ERROR 241: A segment is too short or EPSENT is too large" when running the simulation. (2017.2.2)
- A meshing issue for UTD models is resolved. Slight intolerances in a union of UTD polygons could lead to faces being meshed into triangles instead of unmeshed plates. "Warning 18172: The UTD plate has non-straight edges and will be approximated by triangular elements" is no longer triggered during meshing if points on the geometry are within a tolerance of 1e-6. (2017.2.2)

- The "Faulty parts" dialog is given once, instead of once per faulty part, when changing the model extents to a setting that would result in the scaled model containing faults. (2017.2.2)
- An issue is resolved where an assertion could fail with "GET_SERVICE(common_ParaModellerSession)->getUndoStackDepth() == m_pOriginalAction->m_undoStackDepth" when pressing undo after a failed import. (2017.2.2)
- Coincidental edges in polylines are no longer prevented. Error 17944 that was introduced in Feko 14.0 is replaced by Warning 17944. It is not advised to use coincidental edges in the definition of a polyline, since this could lead to a geometry modeller error in some cases. (2017.2.2)
- An assertion failed with "supportsLabelScoping()" when copying a configuration specific source, load or request other than near fields, far fields, currents or error estimates to another configuration. (2017.2.2)
- The speed of FDTD grid calculation is improved for models containing many vertices. The "Create mesh" dialog will now open faster, moving past the "Generating grid..." dialog more quickly for geometry with many vertices. The dialog is also more responsive for updating the mesh settings. (2017.2.2)
- FDTD boundary conditions were being displayed when the FDTD solver was not enabled. (2017.2.2)
- CEM validate incorrectly reported "Error 19956: Dielectric faces may not be located on the interface of the planar Green's function." for models containing a multilayer substrate defined with a positive Z value at the top of layer 1 and faces at the corresponding negative Z value. (2017.2.2)
- CEM validate no longer reports an error when a cable harness is defined to use the MTL method to consider irradiating effects while the FDTD solver is enabled. MTL with FDTD (irradiation solution) is supported since Feko 2017.2. (2017.2.2)
- The general solver setting "Read *.pul file if it exists, else create it" introduced in Feko 2017.1 was not applied unless another output file setting was set to something other than **Normal execution**. (2017.2.2)
- The opening speed is improved for models containing frequency settings specifying an extremely large number of frequency points. (2017.2.2)
- An API issue that caused an increase in run-time and memory usage when successively returning specific face objects from a collection of faces is fixed. The problem was encountered when using the face labels to identify the faces. (2017.2.2)

POSTFEKO

Resolved Issue

- POSTFEKO failed to open some sessions saved in POSTFEKO 2017.2. The error message "Error 16314: The file contains an unsupported *.pfs file version." was encountered when attempting to open `.pfs` files containing near field time analysis graphs with traces displaying magnetic field, electric field or Poynting vector quantities. These saved POSTFEKO sessions can now be opened. (2017.2.2)

Solver

Feature

- The linear system solution numerical libraries are updated. (2017.2.2)

Resolved Issues

- A bug is fixed that could have caused incorrect results for MoM/MLFMM examples run in parallel with MPI-3 shared memory activated. (2017.2.2)
- A near field aperture was prevented from calculating the received power from the scattered field only. (2017.2.2)
- A bug is fixed that might have caused incorrectly calculated losses for MoM HOBF 1.5 and 3.5 triangular elements. (2017.2.2)
- Non-radiating networks are not allowed on edge ports connected at SEP dielectric boundaries. This is prevented by the explicit error 52602. (2017.2.2)
- PEC geometry is allowed to pass through FEM modal ports. (2017.2.2)
- The robustness of curvilinear search algorithms is improved. (2017.2.2)
- Material search functions are improved so that correct material checking is done if windscreen material specification is not set correctly. (2017.2.2)

Support Components

Resolved Issues

- ADAPTFEKO ended in an error state if a continuous frequency range follows a discrete list of frequencies. (2017.2.2)
- Resolved a problem with the interpretation of units when importing a custom array from file in the FA card. (2017.2.2)

Component Version Numbers

The version numbers of the components in this release are provided as a reference.

List of Components and Versions

Table 15: Released component versions and dates.

Component	Version	Date
ADAPTFEKO	2017.2.2-6	2017-08-22
CADFEKO	2017.2.2-311522	2017-09-20
CADFEKO_BATCH	2017.2.2-311522	2017-09-20
FEKO_MKL	2017.2.2-514	2017-09-14
POSTFEKO	2017.2.2-311522	2017-09-20
PREFEKO	2017.2.2-39	2017-08-21

Feko 2017.2.1 Release Notes

16

Feko 2017.2.1 is a bug-fix update that includes the enhancements and bug fixes documented below.

This chapter covers the following:

- Solver (p. 137)
- Component Version Numbers (p. 138)

> **Note:** Feko 2017.2.1 is a cumulative update that contains changes from previous updates. It should be applied to an existing installation of Feko 2017 (that may or may not have been updated previously).

Solver

Features

- Memory usage is reduced for shared memory runs when Intel MPI is used. (2017.2.1)
- Improved algorithms are used for geometry processing prior to calculation. (2017.2.1)
- Memory consumption of the model geometry check process for CFIE problems is reduced and runtime is improved. (2017.2.1)

Resolved Issues

- Error 34357 was incorrectly issued for PBC examples that have metallic triangles the background medium connected to dielectric triangles. (2017.2.1)
- A bug is fixed that caused a floating point internal error while calculating far fields on certain Intel platforms. (2017.2.1)
- Several memory leaks for FDTD problems are fixed. (2017.2.1)
- Impedance calculations were incorrect for FDTD ports that consist of multiple sections with some sections consisting of only one voxel. (2017.2.1)
- An internal floating point error that occur during the fast far field calculation is fixed. (2017.2.1)
- An error regarding an incorrectly meshed curvilinear triangle was not issued on Linux systems. (2017.2.1)
- An incorrect S-parameter transmission coefficient was calculated for higher order waveguide ports if the higher order mode excitation was defined as a receive port only. (2017.2.1)
- Runtime reporting is improved when exporting rays in parallel for RL-GO. (2017.2.1)
- An internal error state occurred for large element physical optics problems if the solution was read from `.str` file. (2017.2.1)

Component Version Numbers

The version numbers of the components in this release are provided as a reference.

List of Components and Versions

Table 16: Released component versions and dates.

Component	Version	Date
FEKO_MKL	2017.2.1-495	2017-08-10

Feko 2017.2 Release Notes

The Feko 2017.2 update includes the features, enhancements and bug fixes documented below.

This chapter covers the following:

- CADFEKO (p. 140)
- EDITFEKO (p. 141)
- POSTFEKO (p. 142)
- Solver (p. 143)
- Support Components (p. 144)
- Component Version Numbers (p. 145)

Prominent features

- Custom user specification of the convergence criteria for the finite difference time domain (FDTD) solver.
- Improved support for PEC regions embedded in dielectric regions for the finite element method (FEM).

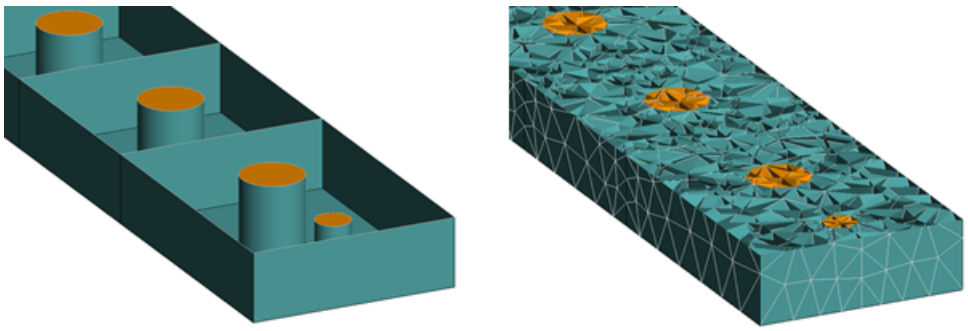

Figure 20: Partial view of a coaxial diplexer model (left) and mesh (right) with the perfect electric conductor pins meshed into tetrahedra with the dielectrics and solved as part of the FEM solution.

Note: Feko 2017.2 is a cumulative update that contains changes from all previous releases. It can be applied as an update to an existing installation of Feko 2017 or it can be installed without first installing Feko 2017.

CADFEKO

Features

- Support for setting FEM regions to the **Perfect electric conductor** medium. FEM PEC regions are meshed into tetrahedra, but do not add to the number of unknowns in the FEM solution. (2017.2)
- The advanced solution frequency settings are extended with options to specify the minimum time interval, the maximum time interval and the convergence threshold for FDTD simulations. (2017.2)
- The near field optimisation goal is extended to support optimisation of (normalised) electric and magnetic flux density. (2017.2)
- The far field optimisation goal is extended to support the optimisation of realised gain. (2017.2)
- The API is extended to provide rational interpolation functionality to the scripting environment.
- The meshing library is upgraded to the latest version. (2017.2)

Resolved Issues

- A problem with the file browser file extension filter for mesh imports is resolved. The filters for CADFEKO mesh (`.cfm`) and (`.fek`) files did not show files of these types in the file browser when opening files to import. (2017.2)
- An issue is resolved with configuration specific cable sources that could trigger "ERROR 38353: Multiple cable sources defined at the same connector pin combination are not allowed" during the simulation. (2017.2)
- An issue is resolved that prevented changes from being made to the medium properties of a face. The problem was encountered when creating a cone or flare primitive with the top dimension set to zero and then modifying this dimension to be non-zero. The face created during this modification would have "Perfect electric conductor" medium properties and changes to the face medium would not be applied. (2017.2)

EDITFEKO

Features

- The ME card (dielectric region) is extended to allow defining perfect electric conductor FEM tetrahedra. (2017.2)
- The FD card (FDTD settings) is extended with the options to specify the minimum time interval, the maximum time interval and the convergence threshold for FDTD simulations. (2017.2)

POSTFEKO

Features

- Support the display of electric and magnetic flux densities for near field graphs and views. (2017.2)
- The file size is reduced for POSTFEKO `.pfs` files sessions that contain imported data. (2017.2)
- The API is extended to provide rational interpolation functionality to the scripting environment.
- The `.fek` file version is increased to 158 to accommodate new features. (2017.2)

Resolved Issues

- The visualisation of stored data for near field requests using local workplanes is corrected. (2017.2)
- An issue with cable probes used across multiple configurations is resolved. If cable paths were swapped between configurations, probe results could be incorrectly labelled, associated with the wrong configuration or not be available for plotting. (2017.2)

Solver

Features

- Improved handling of PEC regions embedded in FEM solution domains. (2017.2)
- Custom user specification of the FDTD convergence criteria is supported. (2017.2)
- Support is added to the FDTD solver for left/right handed polarisation and ellipticity of a plane wave source. (2017.2)
- Irradiation MTL cable analysis for frequency domain FDTD is supported. (2017.2)
- The stabilised MLFMM now supports specifying the residuum for the stopping criteria. (2017.2)
- The MUMPS sparse LU preconditioner is used for extremely large MLFMM problems (more than 2^31-1 matrix entries) instead of the fall-back SPAI preconditioner. (2017.2)
- Various computational libraries are upgraded to improve support for large models run with the FEM and MLFMM. (2017.2)

Resolved Issues

- An issue causing incorrect reflection coefficient phase values for the planar Green's function when the phase reference is not set to z=0 is resolved. (2017.2)
- A bug is fixed that caused incorrect results (small differences) for physical optics problems connected to a ground plane. (2017.2)
- An issue is resolved that caused an internal error state when solving certain MLFMM models containing dielectric media in parallel. (2017.2)
- Incorrect transmission coefficients reported for a negative incident theta angle are resolved. (2017.2)
- An internal error condition that occurred when setting all ports active for S-parameter requests with four or more ports is fixed. (2017.2)
- Memory usage of the out-of-core pre-conditioner used for large MLFMM problems is improved. (2017.2)
- Parallel memory reporting is improved at various stages for distributed MPI parallel examples. (2017.2)
- A memory location fault encountered for certain MLFMM problems that use the MUMPS preconditioner is prevented. (2017.2)
- Rays were missing from `.ray` and `.bof` files when using distributed parallel MPI Feko runs. (2017.2)
- An issue is resolved that caused parallel Feko runs to terminate because a host list file could not be written. (2017.2)
- An error regarding the size of the mesh in relation to the number of processes used was issued incorrectly for certain small FDTD examples. (2017.2)

Support Components

Feature

- A shared Lua module gives the user access to common actions. The module provides the ability to read values from an ASCII file. (2017.2)

Component Version Numbers

The version numbers of the components in this release are provided as a reference.

List of Components and Versions

Table 17: Released component versions and dates.

Component	Version	Date
CADFEKO	2017.2-305925	2017-06-21
CADFEKO_BATCH	2017.2-305925	2017-06-21
EDITFEKO	2017.2-305925	2017-06-21
FEKO_MKL	2017.2-473	2017-06-12
POSTFEKO	2017.2-305925	2017-06-21

Feko 2017.1.2 Release Notes

18

Feko 2017.1.2 is a bug-fix update containing the fix described below.

This chapter covers the following:

- CADFEKO (p. 147)
- Component Version Numbers (p. 148)

> **Note:** Feko 2017.1.2 is a cumulative update that contains changes from previous updates. It should be applied to an existing installation of Feko 2017 (that may or may not have been updated previously).

CADFEKO

Resolved Issues

- A regression that was introduced in the 2017.1.1 update is resolved. Volume meshing created overlapping tetrahedra when using the default mesh engine to mesh regions entirely enclosed in another region. (2017.1.2)

Component Version Numbers

The version numbers of the components in this release are provided as a reference.

List of Components and Versions

Table 18: Released component versions and dates.

Component	Version	Date
CADFEKO	2017.1.2-304978	2017-06-06
CADFEKO_BATCH	2017.1.2-304978	2017-06-06

Feko 2017.1.1 Release Notes

19

Feko 2017.1.1 is a bug-fix update that includes the enhancements and bug fixes documented below.

This chapter covers the following:

- CADFEKO (p. 150)
- POSTFEKO (p. 152)
- Solver (p. 153)
- Support Components (p. 154)
- Component Version Numbers (p. 155)

Note: Feko 2017.1.1 is a cumulative update that contains changes from previous updates. It should be applied to an existing installation of Feko 2017 (that may or may not have been updated previously).

CADFEKO

Resolved Issues

- A regression in Feko 2017 that meshes of locked parts are removed when the solution frequency changes is resolved. (2017.1.1)
- An issue with models containing **Feko Solver field on Cartesian boundary** near field data (introduced in Feko 14.0.421) is resolved. The models could not be opened in the same version of the application that was used to save them. (2017.1.1)
- The constrained surface tool conditions are relaxed for issuing Error 16898 when conflicting U' or V' parameter values or axis directions are identified. The error was not encountered when first adding all points of a constrained surface and then defining the surface parameters according to the U'V' axes preview, but was easily triggered when adding points to a constrained surface with specified surface parameters. The U' and V' axes are now updated to comply with the specified surface parameter values, allowing the user to add points to previously defined constrained surfaces. (2017.1.1)
- Curvilinear segment meshing is supported with windscreens. Curvilinear mesh segments were introduced in Feko 14.0, but were initially not supported for windscreen antennas. Support in the Solver for curvilinear wires as part of windscreen antennas was added in Feko 14.0.420, but CADFEKO was not extended to create curvilinear segments during meshing when windscreens were present. (2017.1.1)
- Any meshed PEC region containing a wire and somehow depending on a variable would give "Error 17901: Surrounding medium has an invalid value" when attempting to modify the variable. This is fixed and the variables can be modified. (2017.1.1)
- The Feko 2017 setting to use the legacy mesher was not saved if this was the only change to a model. (2017.1.1)
- For some models, meshing with curvilinear segment meshing enabled could terminate CADFEKO with "Assertion failed: edgeType == MESH_ELEMENT_TYPE_EDGE3". This assertion is changed to Error 17601, with a message that indicates the problematic wire. (2017.1.1)
- An issue with the default mesher that could yield collapsed triangles is resolved. The collapsed triangles would lead to the solver terminating with "ERROR 240: A triangle is too small or EPSENT is too large". (2017.1.1)
- The likelihood of encountering "Error 18176: Volume meshing failed" when meshing a FEM model with the new mesh engine is reduced. (2017.1.1)
- Meshing of parts, such as open periodic cylinders, that terminate in continuous, closed edges on periodic boundaries are now handled correctly by the default mesher. In the initial Feko 2017 release, mesh entities forming a closed loop on a periodic boundary did not always line up and the simulation would terminate with "ERROR 832: Segmentation rules have been violated (two triangles touch without a common edge)". (2017.1.1)
- An assertion is fixed that failed with "found == true" when using the default mesh engine to mesh some models using periodic boundary conditions. This affected models where the unit cell contains parts that terminate on the periodic boundary and have the same dimensions, but different material parameters. (2017.1.1)

- A problem with the interpretation of units when importing a custom array from file is resolved. (2017.1.1)
- Gerber files lacking a unit directive could not be imported. Millimetre will now be assumed if the unit is not specified in the file. A warning message is displayed on the import dialog to indicate to the user when the unit is undefined and millimetre is assumed. If the geometry in the Gerber file is defined in inches, the user can scale the geometry after import, or, to import in inches, ensure that the unit is specified in the Gerber file. (2017.1.1)

POSTFEKO

Resolved Issues

- A new option allows enabling OpenGL rendering for accelerated performance when working with 2D graphs containing thousands of sample points. (2017.1.1)
- Forms in the API are extended. The **`FormDataSelector`** shows only available data by default. The boolean **`IncludeMissingData`** property is introduced to control the inclusion of results that are not valid or available at the time that the form data selector is populated. The new **`Refresh`** method re-populates the data selector with relevant items. (2017.1.1)
- Polar graph chart images are fixed. Attempting to add chart images in model reference to data cut orientation for near field results defined using cylindrical or conical coordinates terminated POSTFEKO with "src\common_AxisSet.cpp (225): Assertion failed: index != -1". (2017.1.1)
- Corrected the 3D view display of single point near field requests. Single near field points specified in conical coordinates were displayed as black dots, instead of matching the legend colour. In Feko 14.0.401 and later, when a single point near field result (specified in coordinates other than conical) was added to a 3D view, nothing was displayed. This is fixed. (2017.1.1)
- Custom **`DataSets`** containing custom axes can be plotted on Cartesian surface graphs. Before the fix, custom data could only be plotted on a Cartesian surface graph if the axes were standard axes like Frequency, X, Y or Z. (2017.1.1)
- A problem with the export of large datasets (results containing many points) that could cause POSTFEKO to crash, giving a critical error "Assertion failed: 0", is resolved. Large sets of near field and far field data can now be exported successfully, storing GBytes of data to file. (2017.1.1)
- An assertion that could fail with "!m_pSelectedResultEntities.isEmpty()" when adding result entities from the **Add result entity** dialog. This dialog can be accessed to browse through the available results when multiple results of the same type are present. It could happen before that no result was selected at the time of adding, which led to the assertion failing. The **Add** button is now only enabled when a valid result is selected. (2017.1.1)

Solver

Resolved Issues

- An integer overflow for RL-GO examples run in parallel with more than 2^31-1 launched rays caused incorrect results. (2017.1.1)
- A bug is fixed that caused incorrect results when MoM were used with VEP tetrahedra in parallel and low frequency stabilisation was active. (2017.1.1)
- Incorrect values were calculated for surface losses on metallic triangles (due to coatings) when run in parallel. (2017.1.1)
- An internal error condition issued during the Kley shield capacitance calculation phase for certain complicated cable modelling examples is avoided. (2017.1.1)
- A floating point error issued for extremely large examples in terms of wavelength solved using the MLFMM is avoided. (2017.1.1)
- A sporadic segmentation violation that occur on the Intel(R) Core(TM) i7-3770K CPU is fixed. (2017.1.1)
- The robustness of the UTD corner diffraction contribution calculation algorithm is improved. (2017.1.1)
- The robustness of source placement checks for multiple configuration problems is improved. (2017.1.1)
- Geometry error checking for waveguide port problems is improved. (2017.1.1)
- Memory reporting for fast far field calculation is improved. (2017.1.1)
- Error report handling in memory constrained environments is improved. (2017.1.1)
- `.isd` file export is improved when a list type frequency selection is used. (2017.1.1)
- An error is now issued when the PO approximation is not valid because the requested frequency is too low. (2017.1.1)

Support Components

Resolved Issue

- Using the `runfeko` command with `--execute-cadfeko_batch` will no longer execute CADFEKO_BATCH between adaptive frequency (ADAPTFEKO) runs. (2017.1.1)

Component Version Numbers

The version numbers of the components in this release are provided as a reference.

List of Components and Versions

Table 19: Released component versions and dates.

Component	Version	Date
CADFEKO	2017.1.1-303889	2017-05-17
CADFEKO_BATCH	2017.1.1-303889	2017-05-17
FEKO_MKL	2017.1.1-427	2017-05-04
POSTFEKO	2017.1.1-303889	2017-05-17
RUNFEKO	2017.1.1-15	2017-03-28

Feko 2017.1 Release Notes

20

Feko 2017.1 is a feature and bug-fix update that includes the features, enhancements and bug fixes documented below.

This chapter covers the following:

- CADFEKO (p. 157)
- EDITFEKO (p. 159)
- POSTFEKO (p. 160)
- Solver (p. 161)
- Shared Interface Changes (p. 163)
- Support Components (p. 164)
- Component Version Numbers (p. 165)

Note: Feko 2017.1 is a cumulative update that contains changes from all previous releases. It can be applied as an update to an existing installation of Feko 2017 or it can be installed without first installing Feko 2017.

CADFEKO

Features

- A new output file option on the "Solver settings" dialog allows cable per-unit-length parameters to be read from or saved to a `.pul` file. (2017.1)
- The meshing library is upgraded to the latest version. (2017.1)
- The parameter sweep plugin is updated to benefit from the relaxed limit on the number of "DataSet" object axes, allowing more variables to be swept. "DataSet" objects were extended in Feko 2017 to allow up to a maximum of 12 axes. The plugin can now be used for certain problem types that were not supported in the past due to this restriction. (2017.1)

Resolved Issues

- The performance of dialogs accepting NASTRAN point import is improved. A noticeable speed up will be experienced when working with large numbers of points to define polylines, polygons, fitted splines, imprinted points, cable paths or polyline refinement meshing rules. An import that could have taken several minutes to process will now finish in seconds. (2017.1)
- A problem with STEP import is resolved. An error will be given if the imported geometry falls outside of the model extents. Scaling is applied correctly to take the model unit into account. (2017.1)
- The 3D mouse sensitivity setting is fixed to be applied correctly. (2017.1)
- Geometry vertices were sometimes incorrectly removed during a union operation. (2017.1)
- Mesh wire segments crossing multilayer substrate layers were sometimes created during meshing. It was necessary to imprint points on the wires where they crossed the boundaries of the different layers to obtain a valid mesh. The mesh engine now takes care of this automatically. (2017.1)
- The error feedback for KBL cable harness import is improved. If some elements fail during KBL import, instead of giving an error that the import failed, warnings will be given for the failed elements. (2017.1)
- The following issues relating to the "Replace mesh" feature released in Feko 2017 are resolved:
  - An assertion that could fail with "m_pMeshModel != NULL" during meshing when a valid location for a mesh segment port could not be found on the replacement mesh is resolved. (2017.1)
  - An assertion that failed with "cf_MeshSegmentPort.cpp (1075): Assertion failed: found" is resolved. This could happen when incorrectly attempting to replace a mesh with wire ports applied to it with a mesh that does not contain wire segments. An error will now be given that a valid port segment must be specified. (2017.1)
  - An assertion failed with "cf_Application.cpp (729): Assertion failed: 0" when replacing a mesh containing straight wire segments with a mesh containing curvilinear wire segments or vice versa. (2017.1)
  - A rollback error is resolved that caused an assertion to fail with a message referring to "gaia_DefaultModelUndoAction.cpp (34)". This could occur during mesh replacement when a valid location for a mesh segment port could not be found on the replacement mesh. (2017.1)

- The "Use model mesh" state (that determines whether a model mesh can be re-meshed, or if the model mesh is used as simulation mesh) from the original mesh is now used, instead of that of the replacement mesh. (2017.1)

EDITFEKO

Features

- The PS card (data structure output control) is extended to allow cable per-unit-length parameters to be read from or saved to a `.pul` file. (2017.1)

POSTFEKO

Features

- Extensions to the API: New methods are added for exporting `.mat` files. Matrices, complex matrices, datasets and tables (that may contain numbers or strings) can be exported to `.mat` file. (2017.1)
- Extensions to the API: The name of a dataset axis can now be modified in addition to its unit and values. (2017.1)

Resolved Issues

- Cut planes are corrected to cut through RL-GO PEC and metal surfaces. (2017.1)
- The speed of working with time signals that are specified by a large number of points is improved by not always showing the table of points. The user can select to show the values for viewing and modification. The import dialog for manually specifying time signals is extended to filter based on `.csv` files when browsing for a file to import. (2017.1)
- Cut planes is corrected to cut through windscreen layers (for the layer visualisation introduced in Feko 2017). (2017.1)
- The preferences "Round off legend range and step size" setting was not correctly applied to new 3D views, resulting in the rounding of all 3D view legend entries. The setting would apply when any change was made to the settings affecting the 3D view legend range. The setting can now successfully be disabled as a default preference. (2017.1)
- The sampling for calculating the power in the spectrum of time signals now uses the sampling value specified by the user instead of automatically determining the number of samples to use. It is less likely that users will encounter "Warning 17782: The defined time signal has rapid value changes. Limiting upper frequency domain content to 100GHz." and "Error 17173: The defined signal requires too many samples for an accurate representation." (2017.1)
- Extensions to the API: Improved options are available to read data from `.mat` file and to manipulate the imported data. (2017.1)
- An assertion failed with "common_RangeOf.hxx (70): Assertion failed: min < m_maxValue" when opening a POSTFEKO session containing a 3D view with wire currents plotted in dB is resolved. (2017.1)
- An assertion failed with "common_AxisSet.h (232): Assertion failed: 0" when storing a near field dataset containing non-numeric values in one of its first three axes. (2017.1)
- Validation is added to prevent the entries of a DataSet axis that has a unit to be populated with string values. If an axis has a unit, only numeric values are accepted. Attempting to plot a DataSet with string axis entries on a Cartesian surface graph or 3D view could have led to an empty graph or an assertion failing. (2017.1)
- POSTFEKO froze when time analysis near field potential results were loaded. (2017.1)
- Error messages that displayed hashes (#####) are corrected to display the applicable error number. (2017.1)

Solver

Features

- A new cache file for cable per unit length parameters is added to speed up continuous (ADAPTFEKO) calculations by preventing the recalculation of the parameters for each frequency. (2017.1)
- Aperture source optimisation is allowed for PO/LE-PO except for the iterative hybrid MLFMM-PO/LE-PO method. (2017.1)
- Network voltage sources are supported with the RL-GO. (2017.1)
- Each request for currents and charges is stored to a separate `.os` and `.ol` file.
  The file naming convention is the same as for other requests stored per request basis:<FEKO_base_filename>_<requestname>(k).<extension>. (2017.1)

Resolved Issues

- Memory usage is improved for large MoM and MLFMM models. (2017.1)
- Memory usage is improved for large MLFMM problems solved in parallel. (2017.1)
- Memory consumption and allocation reporting are improved for fast far field calculations for the MLFMM. (2017.1)
- The robustness for FEM modal port eigenmode calculations is improved. (2017.1)
- The robustness of cable handling when detecting nearby geometry is improved.
- The criteria used for geometry requirements at cable terminations are slightly relaxed. (2017.1)
- Geometry checking failed when a model contained a wire consisting of a single segment connecting to a face. (2017.1)
- An internal error given when multiple configurations used sources with the same field data (such as point sources with defined radiation patterns) is resolved. (2017.1)
- A segmentation violation was triggered for models with multiple configurations where sources are moved between configurations. (2017.1)
- A bug is fixed that caused an error state when anisotropic material is used for the FEM region in some FEM/MoM hybrid models. (2017.1)
- Incorrect results were obtained when using the FDTD to solve an anisotropic material defined using the complex tensor definition type. (2017.1)
- An internal error given for parallel FDTD examples where a perpendicular PEC boundary condition is used with a far field request is resolved. (2017.1)
- The megacells per second (MCPS) calculation for FDTD results computed on a GPU is corrected. (2017.1)
- A bug that resulted in small errors for multilayer isotropic thin dielectric sheets is fixed. (2017.1)
- An issue is resolved that caused incorrect near fields to be calculated when 2D anisotropic thin dielectric sheets (TDS) are used with the RL-GO. (2017.1)
- A bug is fixed that resulted in an internal error state for certain RL-GO examples. (2017.1)
- An issue causing slight inaccuracies for curvilinear RL-GO is resolved. (2017.1)

- Suppressed warnings about the spherical cut-off region that were incorrectly generated for internal spherical mode transformations. (2017.1)
- An internal error is resolved that occurred when solving certain low frequency ACA problems. (2017.1)
- A bug is resolved that could have been triggered on the second solution frequency causing the ACA to fail. (2017.1)
- An issue is resolved for some Linux systems such as Ubuntu where parallel runs would hang. (2017.1)
- A bug is fixed that caused problems when writing binary `.lud` or `.mat` files in parallel when the number of unknowns are small compared to the number of processes used. (2017.1)
- I/O errors that were triggered sporadically when running problems in parallel are resolved. (2017.1)
- Incorrect transmission and reflection coefficients were calculated for periodic boundary examples rotated and shifted using a coordinate transformation. (2017.1)

Shared Interface Changes

Resolved Issue

- An issue with the termination of sequential iterative solutions is resolved. Pressing the "Stop" button in the GUI or Ctrl+C in the console when a iterative run has passed the threshold (the square root of the target residuum) will cause Feko to use the current solution and continue with the rest of the simulation. (2017.1)

Support Components

Features

- The CADFEKO Student Edition now allows the importing of Parasolid CAD geometry. (2017.1)
- HyperWorks licensing is updated to use the Altair License Management System 13.1. Components using ALM 13.1 are compatible with servers running Altair License Server 13.0. (2017.1)

Component Version Numbers

The version numbers of the components in this release are provided as a reference.

List of Components and Versions

Table 20: Released component versions and dates.

Component	Version	Date
CADFEKO	2017.1-300391	2017-03-15
CADFEKO_BATCH	2017.1-300391	2017-03-15
EDITFEKO	2017.1-300391	2017-03-15
FEKO_MKL	2017.1-403	2017-03-14
POSTFEKO	2017.1-300391	2017-03-15
SECFEKO	2017.1-24	2017-03-08