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Altair Feko 2025.1

Release Notes

Updated: 05/22/2025

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Altair Feko Release Notes

This guide covers changes to recent versions of Altair Feko.

View Altair Feko Comprehensive Release Notes online for release notes from previous versions.

Release Notes: Altair Feko 2025.1

1

Altair Feko 2025.1 is available with new features, corrections and improvements. Altair Feko 2025.1 is a major release. It can be installed alongside other instances of Altair Feko.

This chapter covers the following:

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.

WRAP is a comprehensive tool for electromagnetic propagation, antenna collocation and spectrum management. WRAP combines propagation analysis, often over large areas with many transmitters and receivers, with system analysis to include complex non-linear equipment properties.

Highlights of the 2025.1 Release

The most notable extensions and improvements to Feko, WinProp and WRAP in the 2025.1 release.

Salient Features in Feko

- A sinuous spiral antenna was added to the Component library in CADFEKO. The antenna model is parametrised with six design variables.

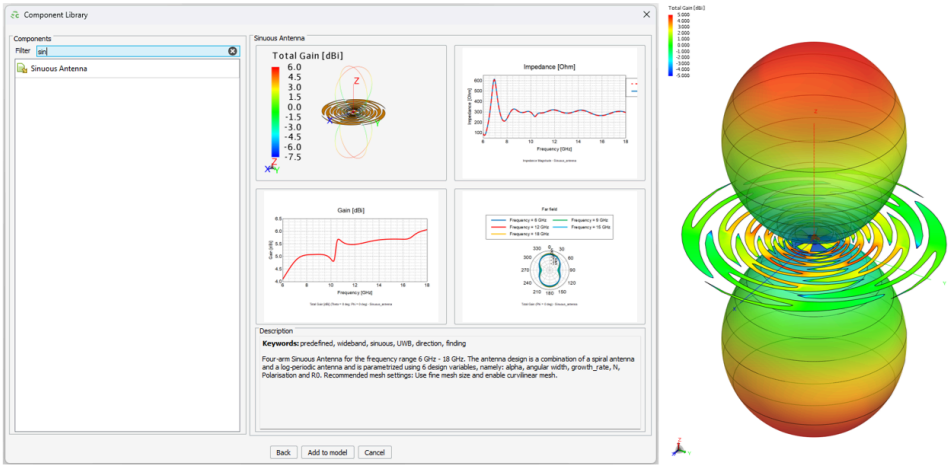
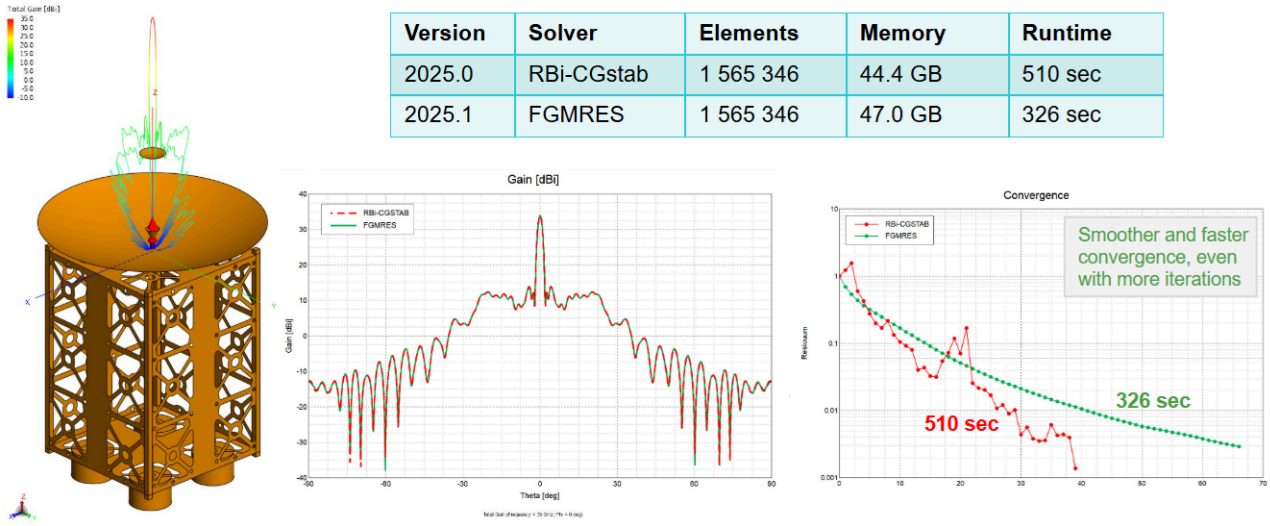


Figure 1: The Sinuous Antenna that is now available in the Component Library.

- A new iterative solver (FGMRES[1]) was added for the MLFMM, hybrid FEM/MoM, hybrid FEM/MLFMM and FEM simulations. This iterative solver provides an improved rate of convergence and monotonically decreasing residuum.



Version	Solver	Elements	Memory	Runtime
2025.0	RBi-CGstab	1 565 346	44.4 GB	510 sec
2025.1	FGMRES	1 565 346	47.0 GB	326 sec

Figure 2: A comparison of FGMRES) and RBi-CGstab for a Cassegrain reflector (35 GHz) at 12U CubeSat.

1. Flexible Generalized Minimal Residual method

- A new Domain-Level Preconditioner (DLP) was added for the MLFMM that has repeatable memory requirements and is more efficient for massive parallel scaling.
- The speed and accuracy for RL-GO was improved. Significant run-time reductions (dependent on the example, several orders of magnitude) and accuracy improvements when incident plane waves are used as excitation.

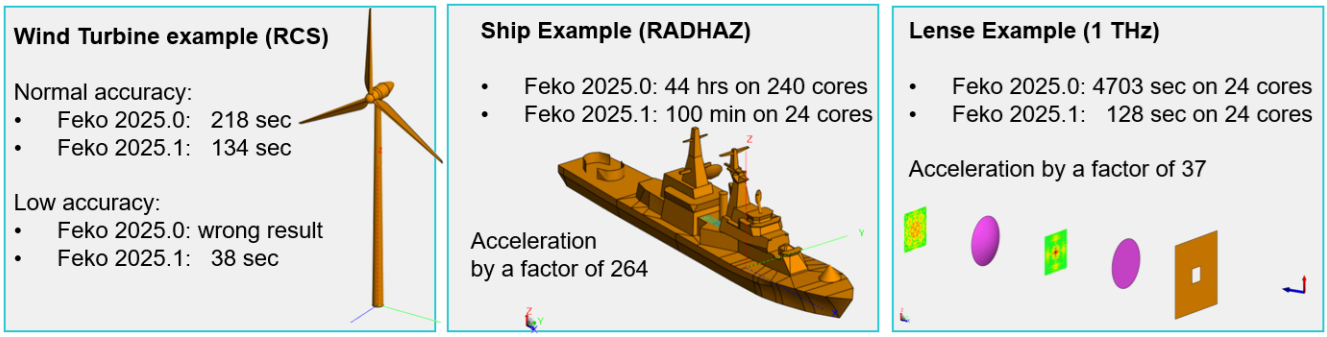


Figure 3: Examples showing the run-time reductions and accuracy improvements when incident plane waves are used as excitation.

- Support was added for a FEM distributed line port that defines a Norton equivalent circuit port in a FEM region. The two terminals of the port are formed by two N-point polylines, defining the start and end points, respectively, of N discrete lines.
  - The distributed FEM line port can be used as a replacement for the FEM line port, where a distributed excitation current or lumped-element loading along two selected edges (a positive edge and a negative edge) in the FEM model is preferable to a single point excitation/load.
  - The distributed FEM line port may also be used as a replacement for waveguide/modal or microstrip-port excitations/loads on structures such as coaxial lines and microstrips where a uniformly distributed current or load is preferred.

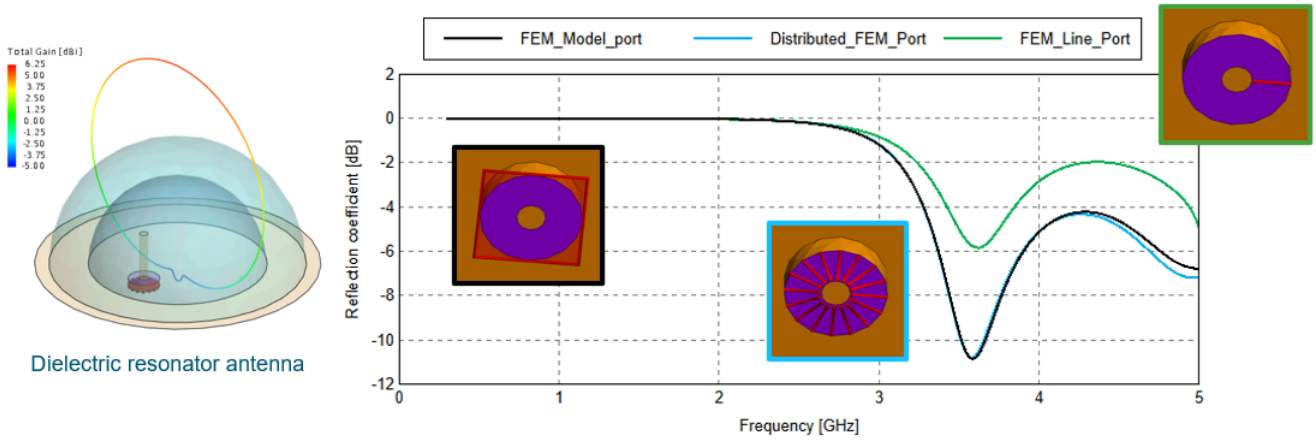


Figure 4: A dielectric resonator antenna excited using a FEM modal port, a distributed FEM line port and a FEM line port respectively. S-parameters computed using the distributed FEM line port impedance agree far better with the FEM modal excitation, but the port may be used to apply a lumped excitation or load rather than a mode-based excitation/termination.

- A MoM surface or region can now be set to perfect magnetic conductor (PMC), in a similar way to PEC. Support was also added to treat dielectric boundary faces on the outside of FEM regions as perfect magnetic conductors (PMC's) rather than absorbing boundaries when decoupled from the MoM.

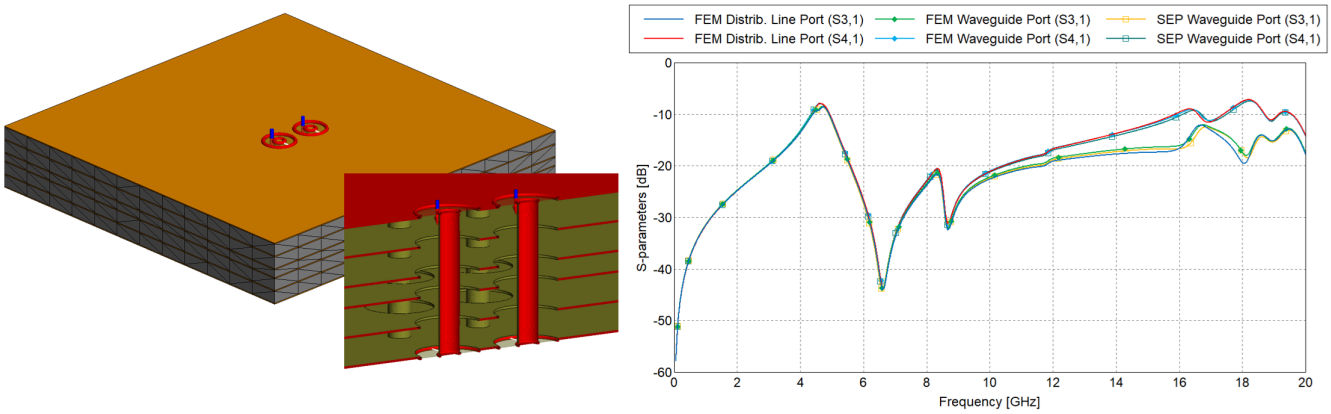


Figure 5: An example of where the boundaries of PCB cutout are modeled as perfect magnetic conductor. The S-parameter comparison in frequency range 50 MHz – 20 GHz. FEM using distributed line ports (decoupled from MoM, PMC BC), FEM using waveguide ports (decoupled from MoM, PMC BC) and SEP using waveguide ports (bounded by MoM PMC triangles) are compared.

- The robustness of the hybrid Characteristic Mode Analysis (CMA) tracker was enhanced using the linear sum assignment optimization algorithm and the resonant frequency estimates are now written to the `.out` file.

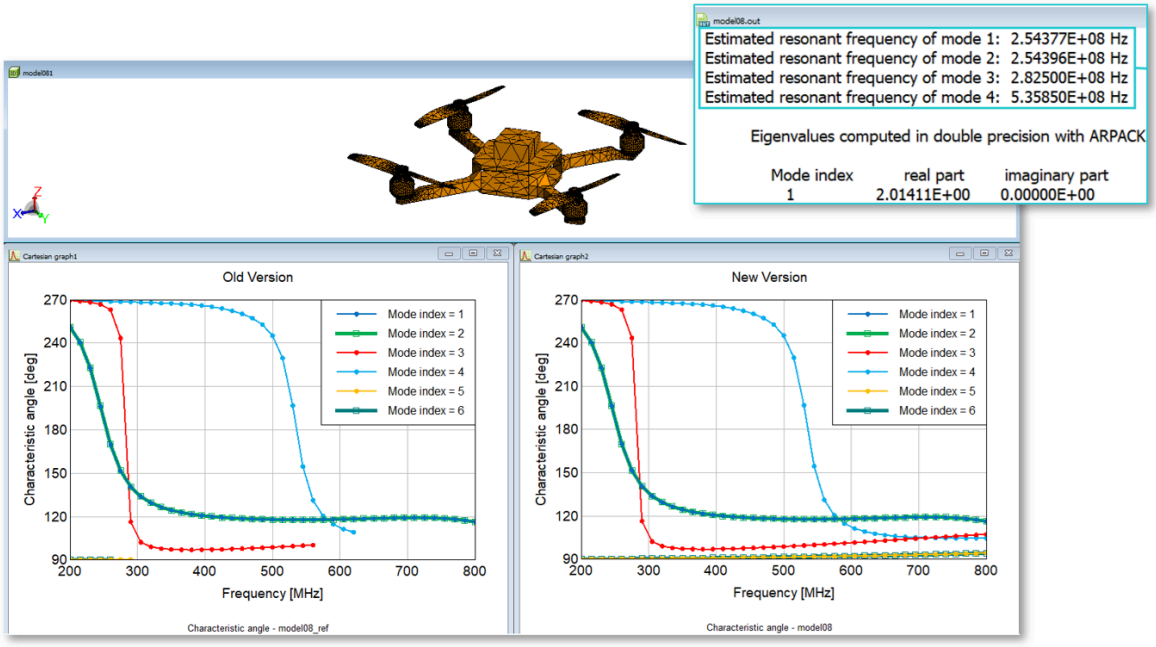


Figure 6: An example of a CMA analysis for a conservation Unmanned Aerial Vehicle (UAV).

- The Feko GUI components now support remote execution using PowerShell-Invoke. The setting is available on the **Launch Options** dialog.
- The following extensions were made to the meshing workflow in CADFEKO:
  - Simulation mesh from unlocked and locked parts are now loaded from legacy `.cfx` files. No re-meshing is done after loading the model until changes are made. This behaviour is the same as in legacy CADFEKO.
  - Added the **Create Mesh** button where the meshing scope can be specified on the **Create Mesh** dialog. Specifying the scope allows you only to mesh a selected entity or multiple selected entities. All parts in a mesh group are meshed.

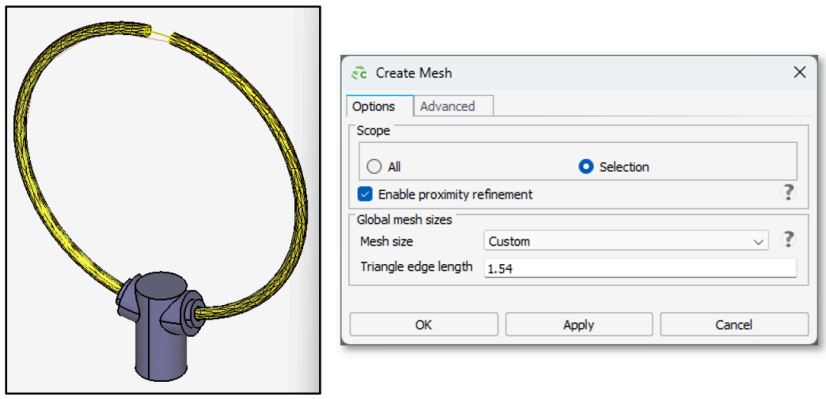


Figure 7: An example showing that only the selected part is meshed.

  - Added the option to activate and deactivate smart refinement to account for the proximity of objects when meshing a model or a specific primitive part. In previous CADFEKO versions, the impact of proximity of parts was always considered.

    Objects for which proximity meshing is disabled are meshed in isolation, and the mesh and characteristics of nearby parts will have no effect on the meshing. You can control the application of proximity meshing during meshing (global) for a specific part and can also define the default behaviour to be used for new models.

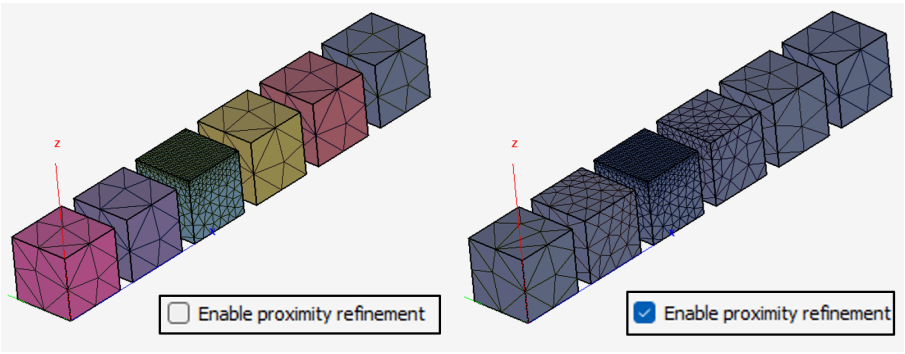


Figure 8: An example showing the effect of proximity refinement.

  - You can now choose to terminate an ongoing meshing process. For larger meshes it may take time for mesher to be stop. A progress bar is shown to indicate that the termination process is ongoing.

Salient Features in WinProp

- Beam steering was improved for Non-Line-of-Sight (NLOS) scenarios to determine the optimum direction that maximises the received power. The API now also supports beam steering in 5G networks based on phased array antennas, where the antenna array forms a focused beam in the desired direction and can track the movement of users.

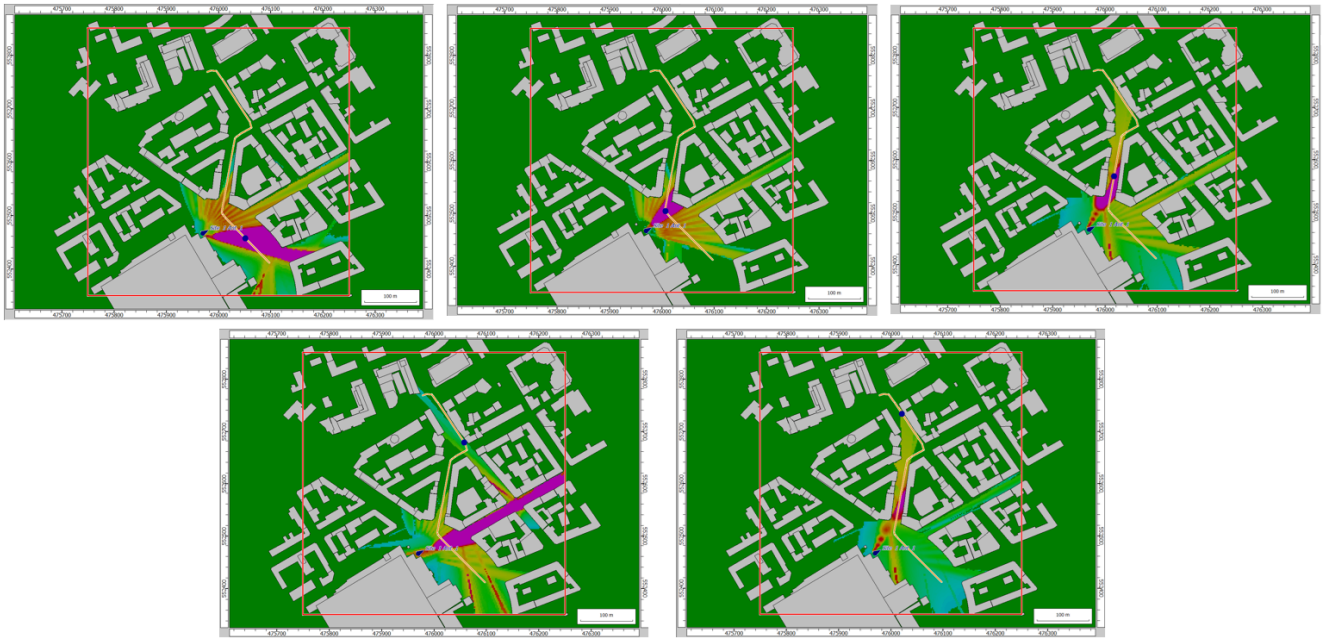


Figure 9: An example showing the beam steering for a user along a trajectory. The bottom images show the beam steering in NLOS scenarios.

- The Standard Ray Tracing (SRT) in ProMan was extended for computing reflections at pixel topography. You can now define tiles on which a reflection is being searched for. For each tile at maximum one reflection can be searched for. There can be multiple reflections between transmitter and receiver at multiple tiles.

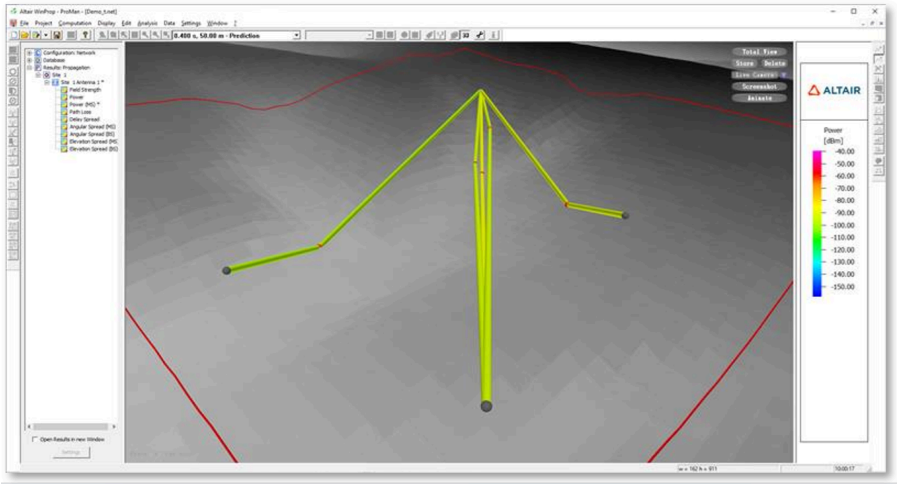


Figure 10: An example where reflections are computed on pixel topography for SRT.

- The FMCW radar post-processing algorithms were extended to include:

  Constant False Alarm Rate (CFAR)

  CFAR is a widely used algorithm in radar systems for target identification while minimizing false positives. It adaptively sets the detection thresholds based on the surrounding noise to maintain a constant false alarm rate.

  MUSIC (Multiple Signal Classification)

  MUSIC is a high-resolution subspace-based algorithm used for angle-of-arrival (AOA) estimation. It can estimate the angular directions (azimuth or elevation) of targets with high accuracy. However, it is not always necessary for 4D radar due to its computational complexity, which makes it less practical for real-time systems compared to FFT-based AOA estimation.

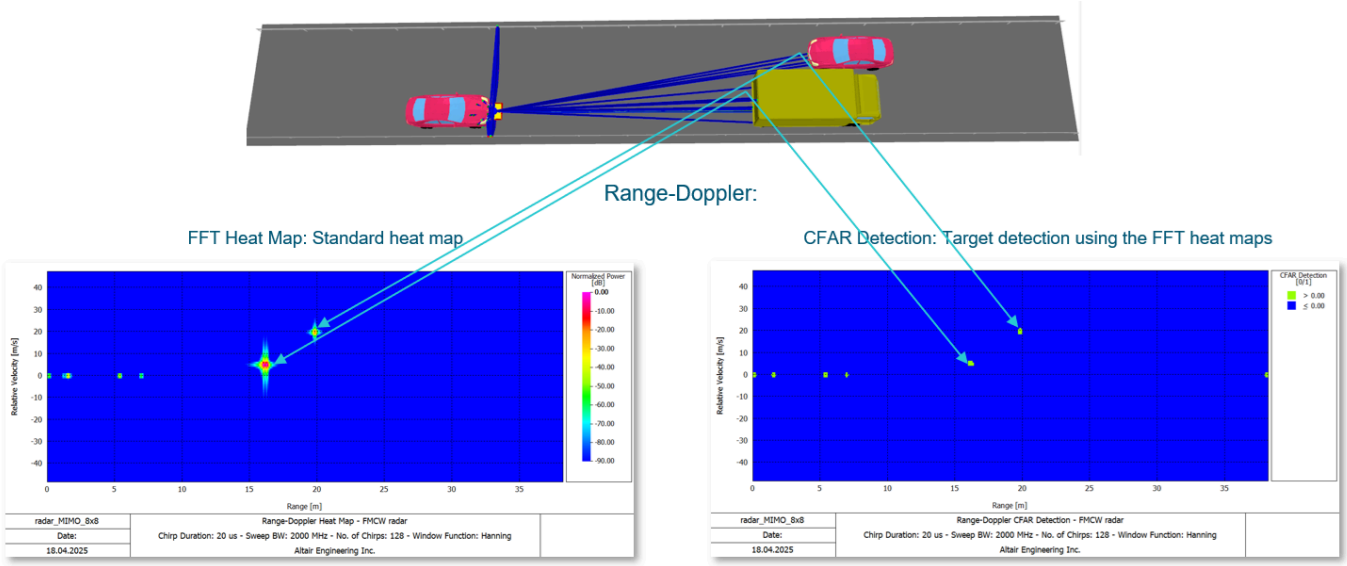


Figure 11: An example of an 8x8 MIMO radar with the following configuration for range angle.

- The handling of Reconfigurable Intelligent Surface (RIS) using bistatic RCS computed in Feko was improved for a single incidence direction. You can compute the RCS for the desired incidence angle in Feko and then set the azimuth adjustment correctly in ProMan.

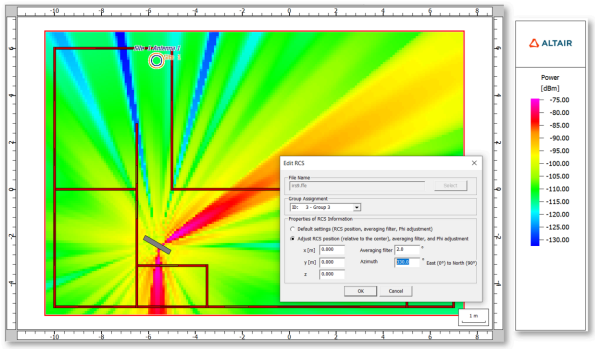


Figure 12: An example where the RCS was computed in Feko and then the azimuth was adjusted in ProMan.

Salient Features in WRAP

- Support was added for Microsoft SQL Server 2022 as a database engine.
- A license pool for API licenses has been added. A single license is checked out at the start of WRAP. At exit, WRAP will check in all of the checked-out licenses. Using the license pool will let the API calls execute immediately, without any lengthy license checkout, if a license is available.
- Units can now be converted between m and feet and between km and NM on the **Radio Calculator** dialog.
- When saving `.wpr`/`.wpe` project files, information is written to a log file (which includes error information).
- The British National Grid was added to the recognized coordinate systems. Area patches in Shapefile format may now use coordinate systems other than Lat-Long WGS84, if a standard project file (`.prj`) is supplied.

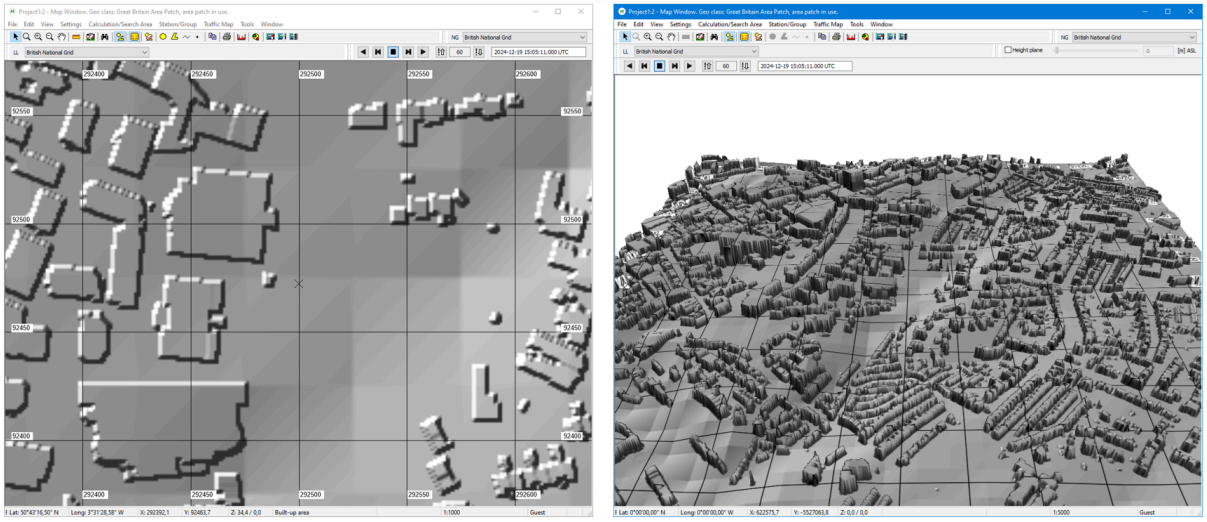


Figure 13: Samples from building height vector data based on GBNG, converted to the WRAP format.

- Added support for the import of Ofcom WTR Database.
- Review date has been added to the following:
  - Allotments: The review date is included in allotment searches both from GUI and API
  - Equipment: The review date is added for all types of Equipment and included in their associated search functions.
- Added the feature to allow the user to save allotments, stations and equipment to read-only databases using the API. Also, the `.wpc` file has been extended to handle preferred allotments and multiple modes on equipment.

Feko 2025.1 Release Notes

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

CADFEKO

Features

- Added the ability to only mesh selected parts.
- Introduced a new option for controlling proximity refinement when meshing multiple geometry parts. Proximity refinement can be globally enabled or disabled from the mesh settings dialog or can be enabled or disabled per part. By default, proximity refinement meshing is disabled for locked parts.
- Added a setting under **Preferences** to configure whether proximity refinement for meshing should be enabled by default.
- Re-meshing multiple touching model meshes will produce a valid mesh. Note that proximity refinement is not supported for model mesh parts.
- Locking a part with a simulation mesh will keep its simulation mesh while allowing the part to be transformed. Once locked, if the part's proximity refinement setting is set to **Auto**, the part will not be considered during meshing. The user can change this setting before locking the part if they want the part to affect the mesh of nearby parts, which, depending on the model, could increase the meshing time.
- Improved the performance of including and excluding parts while automatic mesh generation is enabled.
- Automatic meshing can be disabled for new models by deselecting it under the default preferences. If a model is opened that has automatic meshing enabled, when this preference is set, a dialog will allow the user to decide if it automatic meshing should be disabled (preventing meshing) when loading the model.
- The simulation mesh of a part can be deleted. When deleted, it forces a complete re-mesh of the part next time it is meshed.
- Added a check that all meshes are available. A notice will be printed in the model status window if a model includes a part that does not have an associated simulation mesh.
- Added a verification info message when cancelling background processes. This is most notable for automatic meshing.
- CADFEKO_BATCH will now remesh the model even if parts were already meshed. This gives the user more control to get an updated mesh using the latest version of CADFEKO.
- Loading a legacy CADFEKO model (`.cfx` file) will transfer the simulation mesh of a part when available.
- Loading a legacy CADFEKO model (`.cfx`) file will disable the global proximity refinement mesher setting.
- Implemented a new two-step process for converting legacy CADFEKO models that improves the handling of geometry parts that are difficult to convert.

- CADFEKO model (`.cfx` file) import will now first resave models older than 2025.1 in the latest version before importing it. The original model is not modified, since the model gets saved in a temporary location. This improves the robustness of CADFEKO model imports.
- Updated the surface mesher library to the latest version. Bug fixes include improved meshing growth rate of triangles around short edges on curved surfaces and addressing incorrect meshing of helixes at certain number of turns.
- Added the option to show tick marks on the global axes in the 3D view.
- Implemented windscreen layer rendering for model mesh parts.
- Windscreen layers are no longer shown for hidden parts.
- Added opacity to windscreen layer rendering.
- Added the ability to specify the compression level for CADFEKO model (`.cfx`) and CADFEKO mesh (`.cfm`) files. The default setting provides a good speed versus size tradeoff. Selecting **Best compression** results in smaller file sizes at the expense of longer file save times, whereas selecting **Best speed** results in larger files but decreased file save time. The default setting (applicable to new models) can be found at **File** > **Settings** > **Preferences** > **Default Settings** > **Model**. To adjust the level for the current model, open the setting at **File** > **Settings** > **Model Compression Level**.
- Added support for the FEM distributed line port.
- Added support for PMC regions and PMC faces for MoM and MLFMM with surface equivalence principle (SEP). PMC regions are allowed to intersect PMC ground planes.
- Added the Domain Level Preconditioner solver option.
- Schematic inductors and capacitors now support negative and zero values.
- Added verification warnings to protected models that have locked parts as this could lead to issues with mesh quality or connectivity.
- Upgraded the ECAD import library to the latest version provided by Altair PollEx. Improvements in this upgrade include improvements in the stackup formulation that could have resulted in some layers being missed or merged together.
- Added support for setting S-parameter Touchstone parameter format and parameter precision.
- Added a parametric four arm sinuous antenna to the component library.
- Improved the random colour generation algorithm to try to avoid using colours that are similar to colours that are already being used.
- Write out UT cards more compactly in the `.pre` file.

Resolved Issues

- Resolved a performance regression that got introduced in CADFEKO 2023.1 that caused a slowdown when meshing models containing many wires.
- Extended CADFEKO mesh (`.cfm`) file writing to detect wires inside PEC regions and not write them out to avoid an error regarding a singular field on the axis of a segment. These wires should rather be removed with the simplify tool, but due to backwards compatibility, the feature was implemented.
- Improved general tree performance when selecting and scrolling.
- Improved the rendering performance of models with large numbers of model mesh items.

- Improved the scrolling behavour of the run dialog.
- Improved the CADFEKO model (`.cfx`) import process to resolve application crashes happening when importing a model.
- Improved the robustness of importing older CADFEKO model (`.cfx`) files by first saving them in the latest version and then importing the model.
- CADFEKO model (`.cfx` file) importing will import work surface definitions.
- CADFEKO model (`.cfx` file) importing will import the local mesh settings.
- Resolved a crash when copying faces.
- Resolved a crash that could occur when switching focus to the FEM line port dialog.
- Resolved a crash when adding a source or a load to a wire port that was added to a wire before symmetry was defined that intersects the wire.
- Resolved an issue where applying a wire port to a wire that crosses a symmetry plane could result in an internal error or an assertion failure.
- Resolved an issue where an empty `.pre` file could be generated in some cases when saving a model.
- Resolved an issue where, in some cases, the FDTD mesh size was not correctly restored from a saved model.
- Avoid a crash when using stop/step after running a script with breakpoints in the script editor.
- Fixed a crash when trying to create a windscreen surface from a surface that is not suited to windscreens.
- Resolved a surface meshing issue where fixed points were not always respected.
- Resolved an issue where selecting a vertex on a copied and translated model mesh part would highlight multiple vertices in the 3D view.
- Avoid overlapping segments when wires are in the symmetry plane.
- Mesh refinement is now correct around a wire port if the port is on the symmetry plane.
- Resolved an issue where the regions of a mesh part were ignored when determining if an entity is the last entity in the part. This would have caused the part to be deleted when the last other entity (such as a face or a wire) was removed from the part even when it still had regions (tetrahedra).
- Corrected a problem with CADFEKO mesh (`.cfm`) file writing where the medium on the two sides of a triangle was incorrectly identified for model mesh faces that consist of one or more small triangles.
- Fixed a problem with the surface line primitive and other primitives created on a work surface that is very large or very small. The legacy converter could have failed to convert some legacy windscreen models due to this problem.
- Resolved an issue with KBL (`*.kbl`) file importing where curves of degree 1 were represented as straight lines instead of with their consecutive sequence of points.
- Corrected the file extension when exporting a mesh in Nastran format and specifying the filename with the `.bdf` extension.
- FEM modal mesh ports that are defined using vertices will render the faces transparent.
- Updated validation to not require sources for S-parameter configurations and characteristic mode configurations.
- Improved behaviour relating to workplanes of geometry groups as follows:

    - When creating a group, the Global XY plane is used and not the default workplane.
    - It is now possible to modify the workplane of a model mesh group, a mesh refinement rule group or a model mesh part from its properties modification dialog.
- Fixed the problem that the model was not indicated as modified after adding or removing model protection. This allows the user to save the model if the only change was the protection status of the model.
- The mesh histogram is now cleared on the mesh info dialog along with the mesh statistics when the mesh is removed from the part under consideration.
- Ensure that the details tree updates to show the selected part when selecting between model mesh topology belonging to different parts in the 3D view.
- Resolved an issue where a model verification error would be issued when using the MTL cable solution method and having defined the frequency as a list of discrete points. The error, that incorrectly indicated that the frequency needed to be set, would not be issued if the frequency was first defined using a different option and then changed to a discrete list.
- Relaxed edge delete validation to allow a redundant edge to be deleted if it is the last edge of the object.
- Disabled memory protection for CADFEKO_BATCH meshing. A warning is printed if there is a chance that the meshing cannot complete with the available memory.
- Voxel grid generation now uses the maximum identical distance for tolerance. For certain cases of small models at high frequency the voxel grid should now be calculable.
- Fixed the issue that the offset Cassegrain reflector antenna from the component library failed with the error `Invalid solver variant encountered` when selecting MLFMM/PO as the solver type.
- Improved the stability of the **Generate Antenna Array** application macro to avoid application crashes when creating large arrays with hundreds of elements.
- Added API functionality to set thickness enabled when thickness is directly set on a face (not via SetProperties).

EDITFEKO

Features

- Extended the CG card with the **Domain Level Preconditioner** solver option.
- Extended the CG card with the FGMRES solver option.
- Added support to the DA card to allow specifying Touchstone parameter format and Touchstone parameter precision.
- Extended the FP card to define FEM to use a PMC boundary condition.
- Extended the ME card to support PMC triangles.
- Extended the PS card super user options to support magnetic current coefficients.
- Extended the PT card to support FEM distributed line ports.
- Extended the TG card to support PMC triangles.

POSTFEKO

Features

- Added support for the reading in and display of perfect magnetic conductor mesh triangles, as well as the display of magnetic surface currents and error estimation results on perfect magnetic conductor triangles.
- Added support for the FEM distributed line port.

Resolved Issues

- Fixed the loading of results from the `.bof` file. The list of frequencies when setting the fixed axis on a graph could have been incomplete when the `.fek` file was not present and the solution frequency had been specified as a list of discrete points.
- When selecting distance in the slice widget, values very close to zero will be rounded to 0.0.
- Fixed an issue in the DRE import application macro with the auto result detection which did not pick up the far field result type correctly from `.dres` file.

Solver

Features

- Updated HDF5 to the latest available version bringing through security fixes.
- Improved CMA performance in case RHS vector(s) are used by dropping orthogonality checks and avoiding the solution of the standard MoM matrix equation
- Untracked characteristic mode indices have been removed, since the characteristic mode tracking has been improved to no longer require this.
- Improved CMA mode tracking algorithm based on a hybrid eigencurrent-eigenpattern correlation approach
- Algorithmic changes to the Ray-Launching Geometrical Optics (RL-GO) solver framework resulting in significant run-time reductions (dependent on the example several orders of magnitude) combined with accuracy improvements when incident plane waves are used as excitation. Similar improvements for point sources/antenna will follow in a later release.
- Improved speed and memory requirements for RL-GO when used in connection with ground planes.
- Issue an error if problems solved with asymptotic solvers are too small compared to the wavelength.
- Improvements in the management of mesh storage can dramatically improve runtime performance for models with extremely high numbers of mesh elements and models with non-uniform meshes or fine details. For extreme cases, a 4x speedup for geometry initialization is observed.
- Add the received mode phase information to the received mode expansion data at waveguide and modal ports in the .out file.
- We have updated OptiX to version v9.0. OptiX 9.0 requires the following: 1. Driver version: NVIDIA R570 or newer. 2. CUDA version: CUDA 11.8 or higher is recommended for optimal performance and compatibility. It's important to note that OptiX 9.0 supports NVIDIA GPUs from the Maxwell architecture and newer, including GeForce, RTX/Quadro, and Data Center/Tesla series.

- Computation of PBC interpolation tables is parallelised.
- The text in the out file was improved to indicate where surface integration is used as opposed to Huygens sources when solving using RL-GO.
- For FEM and FEM-MLFMM simulations, FGMRES is now the default iterative solver. If a different solver is required, users can manually select an alternative during simulation setup..
- The default iterative solver applied with MLFMM is now the FGMRES, which brings improved convergence and efficiency.
- Avoid incremental resizing when populating a secondary source list that consists of the port-based sources that should be checked for an overlap at a port definition.
- Compute the reflection and transmission for the main beam (ignoring grating lobes) for periodic boundary conditions
- Optimise spherical mode calculation times, also introducing the use of threaded parallelisation.
- Detect and give an informative error that the application of a metallic medium (exact expression of the skin effect) is not supported in an anisotropic FEM environment.
- Support PMC modelling with the MoM.
- Enable selection of FGMRES as iterative solver for the FEM, FEM/MoM and FEM/MLFMM.
- Optimise the calculation of complex spherical vector modes.
- Updated CUDA to version 12.8. The minimum driver version for CUDA 12.8 is 525.60.13 for Linux x86_64 and 527.41 for Windows. Regarding the minimum compute capability, CUDA 12.8 requires a GPU with compute capability 7.0 or higher.
- When exporting Touchstone S-parameter files, change the default format to RI (real/imaginary data pairs) and allow for the user to specify the precision with which data should be exported.

Resolved Issues

- Added UTD effects in addition to direct reflection where MoM elements are attached to UTD surfaces. This will improve accuracy for antenna coupling problems solved using MoM / UTD.
- Fixed a bug that caused incorrect results for some RL-GO examples where plane waves were used in conjunction with manual ray launching settings.
- Fixed a bug that caused a slight misalignment in some transmitted RL-GO rays with minor effects on accuracy.
- Fix bug for supporting Characterised Surfaces on top of dielectrics with RL-GO.
- Improved parallel scaling for periodic boundary conditions (PBC).
- Improve detection of the incorrect application of unsymmetrical loads/coatings/skin effect at symmetrical mesh elements.
- Fixed a problem with out-of-core file management on Windows when more than 1.1 TByte hard disk space is required for the sparse LU MLFMM preconditioner.
- Resolved an overflow error (internal error 3977) which could be caused during facetted UTD computations for some cases.
- Fixed a bug that caused segmentation violations when calculating creeping rays for the faceted UTD.
- Restore percentage progress output during LU decomposition of the MoM matrix when running the sequential version of Feko.

- Fix solution of a PEC shielded cable combined with the hybrid FEM/MoM in an S-parameter configuration program flow.
- Losses in infinite substrate layers are not included in the reported losses or efficiency calculations. Print a note to inform the user.
- Fixed a bug that caused incorrect values for theta/phi RL-GO using special external settings to be ignored.
- Fix a segmentation violation during the search for metallic triangles matching tetrahedral faces for some VEP models.
- Optimise the processing of source cards. This phase may have resulted in an execution slow down when the model consisted of a large numbers of dipoles.

Shared Interface Changes

Feature

- Remote execution through PowerShell is possible from the various GUI components through a new setting on the **Component Launch Options** dialog.

Support Components

Features

- Removed the **newFASANT** from the Feko Launcher utility.
- The newFASANT components have been removed from the standard Feko installer. For users who would like to use newFASANT, an additional archive is available which can be extracted into an existing Feko installation. This will add the newFASANT files to the existing Feko installation so that they can be launched from the Feko Launcher as before.
- New feature to use Windows Powershell for remote launching

Resolved Issue

- Fixed a bug in PREFEKO with the exporting of a multiline protected FR card to the `.fek` file.

WinProp 2025.1 Release Notes

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

General

Resolved Issues

- The consideration of the antenna phase as given in the `.ffe` pattern during RunMS for the E field vectors and the transmission matrix has been corrected.
- The correct phase is saved in the `.str` file including the antenna phase for full polarimetric projects, both for RunPRO and RunMS results.

ProMan

Features

- Extended the FMCW radar post-processing algorithms to include Constant False Alarm Rate (CFAR) and MUSIC (Multiple Signal Classification).
- Improved the handling of bistatic RCS in ProMan (for example, for simulating the impact of RIS).
- Added the ground reflection on pixel topography to the SRT propagation model.
- Corrected the legend text for displaying channel impulse response.
- Five decimals for point and trajectory mode are now saved to the `.str` file for the x and y coordinates.
- Added support to select a carrier across different frequency bands on the **Carrier Assignment** dialog. If carriers are unique among different frequency bands, all carriers will be added to the project (each under its frequency band). If carriers are not unique, the **Frequency Bands** dialog will be displayed to select one of the frequency bands as in previous versions.
- Added the number of launched rays to the **Parameter: Shooting and Bouncing Rays (SBR)** dialog. The value updates when the **Max ray tube width/height** or **Ray length to first split** is modified.
- Improved beam steering for NLOS scenarios to determine the optimum direction that maximises the received power.

Resolved Issues

- Resolved a crash that could have occurred when using the urban IRT with Knife Edge (KE) preprocessing should the KE ray have line of sight (LOS).
- Resolved a crash that occurred when requesting **Min. Number of Interactions** as computed prediction results.
- The SRT propagation model can also be used for moving satellites in a time-variant project.
- Resolved an issue where not all transmitters were computed in parallel for the rural DPM.

- Resolved an issue where an MS antenna configuration without a name could have resulted in the wrong fields being read from the `.mic` file, resulting in a crash.
- Resolved a crash that could have occurred during an SBR computation.
- Resolved an issue for the urban IRT where an overflow could have occurred when computing the angles between objects.
- Corrected a bug where the absolute antenna height was not showing the correct antenna height in the PE vertical result plane. The **Reset zoom window** button is now enabled for arbitrary prediction planes to reset the zoom to the prediction plane extents. Corrected the scaling of the x-axis with the **Line plot** tool when tracing the result in a non-horizontal direction.
- Added the phase for the knife edge diffracted ray in the vertical plane as post-processing for the urban IRT result.
- Resolved a crash that could have occurred during a CNP IRT computation.
- Resolved a crash that occurred when displaying RCS and cancelling the **Edit Project Parameter** dialog.
- Duplicated wall numbers are now avoided when creating topo vector `.tdv` files with additional walls from an `.idb` file.
- When loading `.ffe` antenna patterns, undefined values are no longer interpolated; instead, a default value of -100 dBi is used.
- The extension of the prediction area in case of moving transmitter is only done for the DPM, but no longer for the other urban propagation models.
- Resolved issues with the 3D view of prediction results, in case the topo information was missing for some pixels.
- Resolved a crash that could have occurred when using the SBR propagation model for very long distances.
- Corrected the 2D display of very long rays (for example, from the Earth to the moon) and improved the performance when viewing the rays in the 3D view.
- Corrected the progress bar for SRT scattering on topo tiles where the number of tiles can be millions.
- Resolved a crash that could have occurred if **MS Antenna Display Mode** > **Display antenna elements** with **Show only if mouse location** was activated.
- Resolved an issue where the displayed MS antenna orientation always showed the azimuth orientation of the default configuration.
- Resolved a crash that could have occurred in EMC analysis if there were many frequency bands and the project's path was long.
- Resolved an issue where incorrect breakpoints could have been considered when using the DPM for combined network planning (CNP).
- Resolved an issue with detecting duplicate rays for the IRT for rays containing reflection or scattering.
- Corrected a bug that could have occurred and accelerated the computation of diffraction angles for one-wall wedges using ray-tracing methods.
- Resolved an issue for the urban IRT where the diffraction angles computed during SRT post-processing were incorrect.

- Resolved an issue where the prediction area differs between the GUI and WinPropCLI when computing the prediction.

WallMan

Feature

- Added support to detect the model unit automatically when converting a `.dxf`/`.dwg` file should the **`INSUNITS`** variable be defined in the file.

Resolved Issues

- Resolved a crash that occurred when converting a CAD layer from `.dwg`/`.dxf` to `.idb`.
- Resolved problems when exporting a preprocessing project to a ZIP archive.
- Corrected an issue where exporting to NASTRAN format did not include the original triangular objects, only triangulated polygons.
- Some `.dxf` files exported from WallMan may not be compatible with Altair SimLab. If this happens, the objects should first be triangulated before exporting to a `.dxf` file.
- Corrected an issue where converting urban building vectors, the UTM zone is now correctly set (Northern or Southern hemisphere) if the option **UTM Zone automatically determined** is selected and the setting is kept when the option is changed to **UTM zone manually defined**.

Application Programming Interface

Feature

- Added support in the API for beam steering in 5G networks based on phased array antennas, where the antenna array forms a focused beam in the desired direction and can track the movement of users.

Resolved Issues

- Resolved an issue where, for a disabled trajectory, WinPropCLI might have ended with an error message while reading the result files.
- Resolved issues that could have occurred when using WinPropCLI, resulting in errors.
- Resolved an issue where converting `.tda` topography files using the API resulted in an error `Error (0): Values for columns in file are negative but only positive values are allowed! Error during conversion.`

WRAP 2025.1 Release Notes

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

General

Features

- Updated the **Propagation model advice** dialog to include ITU-R P.684.
- Support for import of Ofcom WTR Database added.
- A license pool for API licenses has been added. A single license is checked out at start of WRAP. At exit , WRAP will check in all of the licenses that have been checked out. Using the license pool will let the API calls execute immediately, without any lengthy license check out, if a license is available.
- Review date has been added to allotments. Option is available while creating and editing allotments. The review date is included in allotment searches both from GUI and API.
- Disconnection from License server is managed as follows: In case WRAP is not being used as an API server, when WRAP is disconnected from the license server, it will show a pop-up window for the user. In case WRAP is being used as an API server (at least one message is sent), if the license server is disconnected until timeout, no pop-up window is shown. Instead, WRAP will wait for the next message and will try checking out new license. If it fails again, it will return an error message and will close after returning the results of any running calculations.
- The ability to create, modify, delete, use, get, link stations in read-only databases via the API has been added. The ability to perform calculations using stations in read-only databases has also been added.
- The calculation speed, when using area patches with a lot of objects, has been improved.
- Filters and Circulators made searchable via API.
- Area patches in Shapefile format may now use coordinate systems other than Lat-Long WGS84, if a standard project file (*.prj) is supplied. The British National Grid has also been added to the recognized coordinate systems.
- 'Review Date' has been added for all types of Equipment and included in their associated search functions.
- Added unit conversion between m and feet and between km and NM to the **Radio Calculator** dialog.
- More stringent controls added on the antenna diagram to avoid problems when an antenna creation message is sent into the API.
- Ability to log information, especially error information, when saving wpr/wpe project files has been added.
- When a status request is sent to the standard port (1234 by default), an error message is sent back stating "Status Message on Standard Port".

Resolved Issues

- Resolved issues in Coverage calculations, when the mobile height type is above ground level and building or above surface.
- Min and Max values in the statistics of Coverage results are now in correct order.
- When loading geo data in unprojected format, the created internal terrain rasters had lower resolution than they should have had. For very large areas the terrain resolution sometimes was reported as 0 meters. These issues have been resolved.
- SFAF Message contents are now read from Item 005 onwards. In Item 363/463, S is interpreted as M-Mixed. All supplementary details under Item 520 are now concatenated.
- Administrative change 'A' SFAF messages will now try to create a new station instead of calling an unimplemented function.
- Resolved an assertion failure when saving equipment and allotments with an invalid review date. It is now possible to copy equipment from read-only to writeable database.
- Resolved an issue with selection of 'Time' Radio Button within Resolution setting in **Edit Trajectory Dialog**
- Resolved an issue for database column sort when the column data contained " - ".
- Resolved the issue in **Coverage** calculations, when the altitude type in trajectory is 'Above surface'.
- *TEmissionClasses* within API for Allotment has been extended with a choice of *TDesignationOfEmission* to complement the *TClassOfEmission*
- Option 'Volume Above Sea Level' has been disabled for Mobile Field Strength calculation in **Coverage** dialog. Also resolved issue related to mobile field strength calculation in **Coverage**.
- * can now be used as wildcard in the 'Area' field within **Allotment** search.
- Resolved an issue with the visibility of Comment field in **Allotment Search Dialog**.
- Resolved an issue when changing geo class might result in unexpected graphic effects.
- Fixed bugs in **Coverage**, **Interference**, and **Spectrum Viewer** when typical stations are involved in the calculation.
- The return message of TStationCable now follows the same pattern as the input.
- Empty API message no longer hangs WRAP.
- Resolved the issue of removing databases from LocalDB instances within ChangeDB.
- Added the feature to allow the user to save allotments, stations and equipment to read-only databases using the API.
- Error messages returned from API calls could have the incorrect spelling "Unkown" in them. That has been corrected to "Unknown".
- Fixed a problem that might lead to a crash when loading large area maps with very high resolution.
- Fixed a problem when sending an API message to create antenna with wrong DBGUID which might lead to a crash.
- Fixed a problem that caused X and Y to be reversed in the area parameters dialog of the Raster Conversion tab, when using geo classes with different projections.
- Corrected an error in the definition of type TStation in API schema.
- Added an error message when non-status messages are sent on the status port.

- Resolved an issue where WRAP might hang if the **Socket Communicator** is closed before the calculations are finished.
- Fixed an error when converting height values in vector files into raster files. The handling of empty attribute fields of a polygon has been improved.
- Number of decimals used has been increased to reduce the rounding error in conversion back and forth between foot and meter.
- Dates that are used in SQL queries have internally been changed to use a specified format and not the localized date format which might not be compatible with SQL Server.
- Resolved an issue with copying equipment from read-only to writable database.

Release Notes: Altair Feko 2025

2

Altair Feko 2025 is available with a long list of new features, corrections and improvements. Altair Feko 2025 is a major release. It can be installed alongside other instances of Altair Feko.

This chapter covers the following:

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.

WRAP is a comprehensive tool for electromagnetic propagation, antenna collocation and spectrum management. WRAP combines propagation analysis, often over large areas with many transmitters and receivers, with system analysis to include complex non-linear equipment properties.

Highlights of the 2025 Release

The most notable extensions and improvements to Feko, newFASANT, WinProp and WRAP in the 2025 release.

Salient Features in Feko

- Different ground configurations can now be evaluated in a single simulation by specifying result-specific ground planes. Result-specific ground planes can be specified for far fields, near fields, SAR, and receiving antenna requests when the ground plane for the model is set to **No ground**. The impact of the ground plane(s) on the results is only considered during post-processing. When using result-specific ground planes, the back coupling of ground reflection to current distribution on the structure is neglected. Note that result-specific ground planes are not supported with RL-GO for 2025.

  For PEC, PMC and homogenous half-space ground planes (including result-specific ground planes), any Z-value (height) can now be specified. An example would be a vehicle with an antenna above a metallic plane. In the past, the workflow would have been to translate the vehicle to the correct height; now the height of the ground plane can be modified instead.

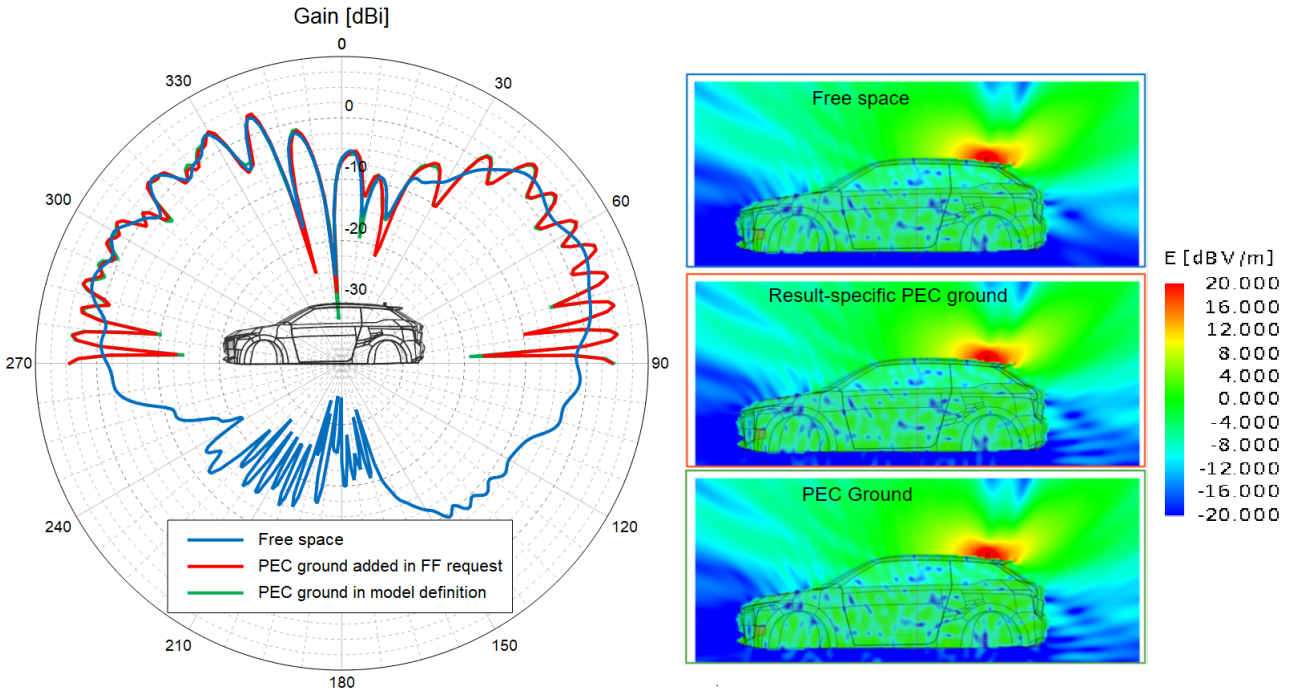
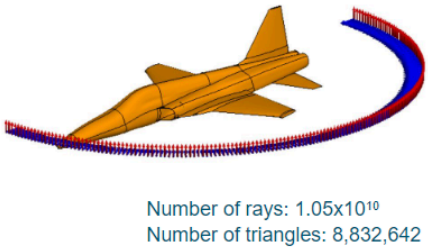


Figure 14: Evaluate the near field and far field for a cellular antenna on a vehicle for f = 960 MHz. Three configurations were examined: the vehicle in free space, the vehicle with a result-specific PEC ground plane, and the vehicle with a PEC ground plane in model definition.

- The meshing engine now supports multi-threaded meshing of volume regions in the same model.

  Support for controlling the aspect ratio of elongated mesh triangles was added. Adjusting the maximum allowable aspect ratio can often achieve a more efficient mesh (fewer elements while retaining good geometry representation).

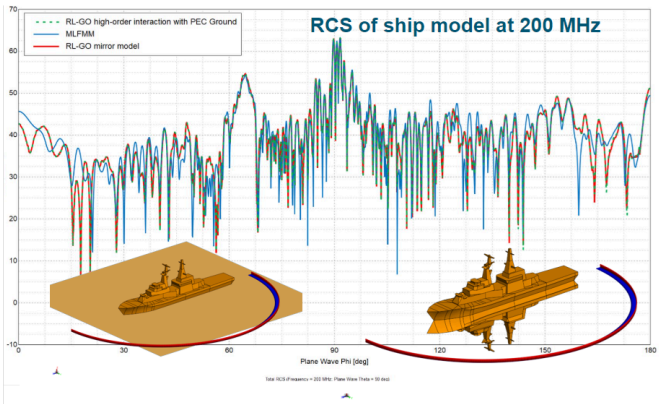
- RL-GO was extended and now supports:
  - Multiple GPU usage for parallel MPI RL-GO runs when using manual settings. This results in a huge speedup for RL-GO solutions with multiple diffractions interactions.



NP	Run time	Wall time	Speedup
1	12082	12119	1.0
2	6058	6073	2.0
3	4217	4229	2.9
4	3323	3331	3.6
5	2882	2892	4.2
6	2596	2604	4.7
7	2603	2612	4.6
8	2332	2344	5.2

Figure 15: An example showing the speedup when using multiple GPUs for RL-GO.

  - Higher-order interactions with PEC, PMC or homogeneous half-space (reflection coefficient approximation) infinite ground plane.



Approach	Parallelization	Runtime	Memory
RL-GO with Ground	8 on 1 CPU	0.17 h	5.7 MB
RL-GO mirror	8 on 1 CPU	0.31 h	11 MB
MLFMM	64 on 2 CPUs	9.8 h	39 GB

Figure 16: An example showing the speedup when using RL-GO with an infinite plane.

- PREFEKO can now use multiple threads when preparing a `.fek` file for simulation. This can significantly impact overall runtime when performing many simulations (optimization or parameter sweep) or for large `.pre` files. The efficiency beyond 8 processors is low.

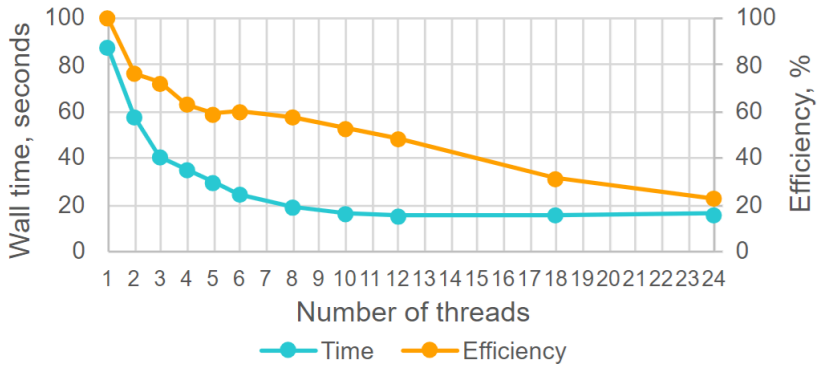


Figure 17: An example using 15.7 million triangles and 642 MB `.fek` file size.

Salient Features in WinProp

- Accelerated the Intelligent Ray Tracing (IRT) model for urban scenarios in point/trajectory mode.

Test cases each has 3 transmitters and a maximum of 3 interactions, simulated with 64 threads on a 128-core machine.
Results include received power and LOS results.

Test Case	Contains Topography	2024.1 Runtime in seconds	2025 Runtime in seconds	Speedup
Small test	Yes	18	9	2x
4000 objects	No	4182	472	8.86x
9000 objects	No	3743	742	5.04x
10000 objects (incl. vegetation)	No	3387	840	4.03x
19000 objects	No	31522	3711	8.49x

Test case has a single transmitter and a maximum of 3 interactions, simulated with 12 threads on a 6-core machine.

Test Case	Contains Topography	2024.1 Runtime in seconds	2025 Runtime in seconds	Speedup
9500 objects	Yes	5533	201	27.52x

Figure 18: Test cases comparing the runtime between 2024.1 and 2025.

- A MIMO antenna configuration can now be specified in the FMCW radar. With *N* transmitting and *M* receiving antenna elements, a virtual antenna array of *N***M* elements can be generated with proper antenna placement. The angle resolution is improved by the multiplicative increase in the number of (virtual) antenna elements.

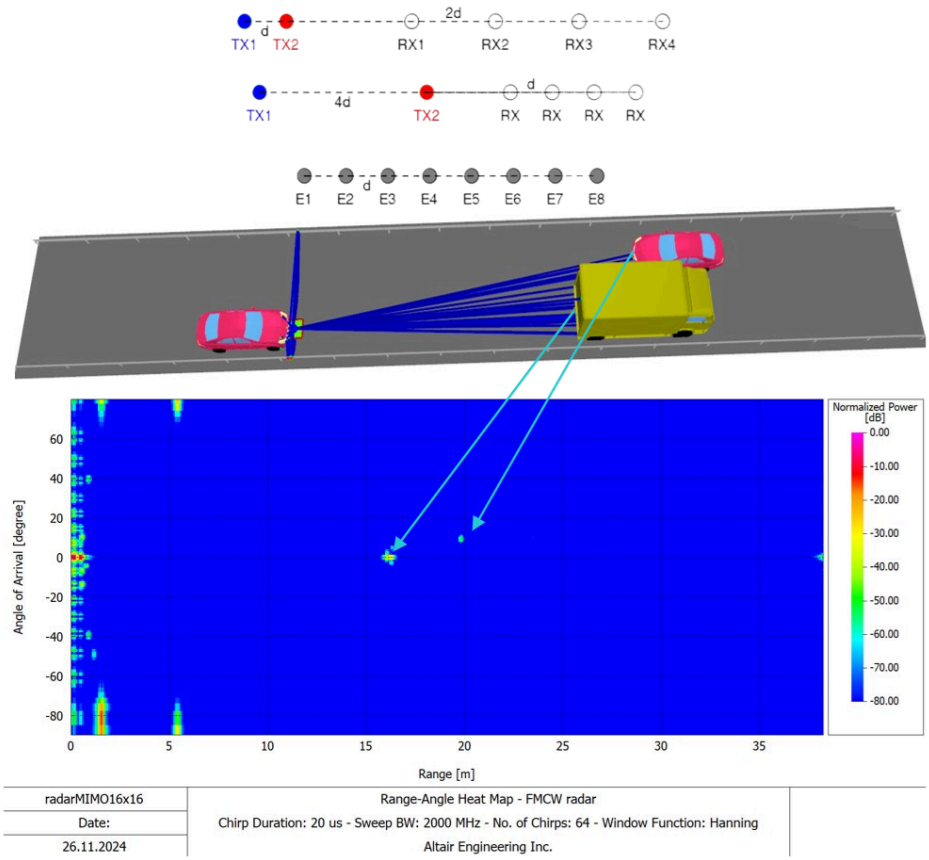


Figure 19: An example of a range-angle heat map showing the MIMO antenna configuration.

- The power delay profile can now be displayed where the triangle pulse width is specified in nanoseconds.

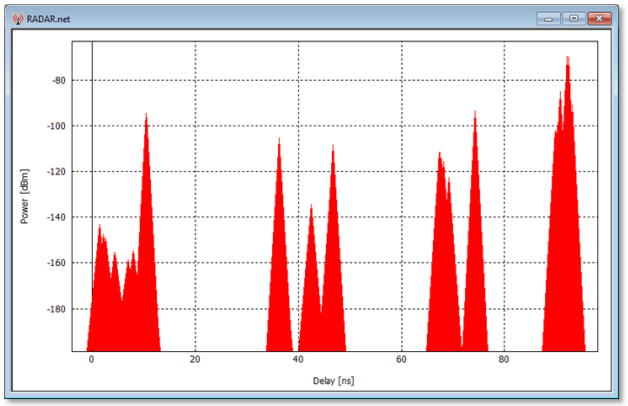


Figure 20: An example of a power delay profile plot.

- The handover process for the cell assignment can now be considered for trajectory mode. The handover to the new serving cell is only performed if the received signal level (or RSRP/RSRQ, depending on the selected cell assignment criteria) is the defined handover offset [dB] higher for a period longer than the defined TTT (time to trigger) interval [ms].

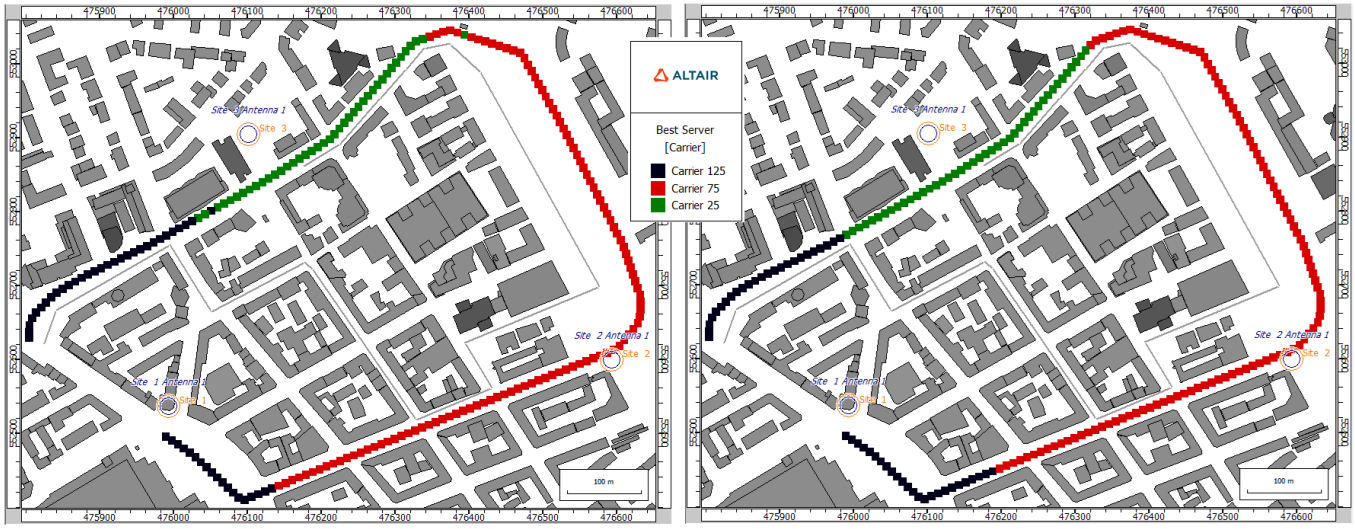


Figure 21: Left is an example of the best server without handover, and right is the best server with handover.

Salient Features in WRAP

- A new propagation model for prediction was added for frequencies below 150 kHz according to ITU-R P.684-8.
- The **Radar Coverage** tool now supports distance/height input in nautical miles/feet.

Feko 2025 Release Notes

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

CADFEKO

Features

- Added support for specifying result-specific ground planes to far field, near field, SAR and receiving antenna requests. Result-specific ground planes can only be specified if the ground plane for the model is set to **No ground**. When a request is selected in the tree, the result-specific ground plane will be shown in the 3D view. The z-value can now also be specified for PEC, PMC and homogeneous half space ground planes.
- Added support for multithreaded meshing of multiple volume regions in the same model.
- Added elongated mesh triangle aspect ratio control under advanced mesh settings. Note that elongated meshing is disabled by default in new models and for models loaded from earlier versions.
- Updated the surface mesher library to the latest version. This improves meshing performance and addresses various meshing issues noted in other release notes, including improved meshing of cases where meshes were being overrefined.
- Updated the 3D rendering library to the latest version.
- When specifying lossy metal materials on faces, the thickness of the lossy material may be left unspecified. If a thickness is specified, then the thickness will be considered in the solution, but if no thickness is specified, the solution will assume that the face is sufficiently thick for the high frequency skin effect approximation to be valid for the frequencies of interest.
- Added support for unioning and intersecting groups of geometry.
- Extended model protection to allow setting FEM or VEP as the solution method for regions inside protected models.
- Extended the **Solver settings** dialog with an option to activate enhancements for complex structures when using RL-GO.
- Added support for the new **Double edge and wedge diffraction** faceted UTD option under high frequency solver settings.
- Renamed the **Higher-order effects** high frequency advanced faceted UTD solution option to **Combination of different effects**.
- When identical field data is used in multiple spherical mode sources, the data will not be read multiple times when running the Feko simulation. This is achieved by using an extension of the AS card syntax in the pre file to allow re-use of previous field data definitions.
- Extended the near field optimisation goal to include support for the conical coordinate system.
- Extended schematic links with support for FEM line ports (geometry and mesh).
- Added validation to indicate which solvers are supported with planar multilayer substrates.
- Replaced the legacy cfx converter **`--verbose`** command with the **`--verbosity-level`** command to control the granularity of its output. The verbosity level can be set to a value between 0 and

3, where 0 is no logging and 3 outputs the most information. Verbosity level 1 outputs basic information such as errors and categories of transfer only, level 2 includes additional information such as warnings and the type of geometry or entity being transferred (without including any labels or coordinates) and level 3 outputs all information including coordinates, labels of parts and entities and the model bounding box information.

- The **Optenni Lab: Port Matching** application macro which enables easy interaction between Feko and Optenni Lab is now included with in the installed application macros.
- Added an application macro which allows export and import of variables. Variables may be exported to JSON or CSV format.

Resolved Issues

- Resolved an issue where the application would close abruptly when attempting to save a model containing many importing mesh parts with long part labels.
- Resolved a crash when opening the properties dialog of an entity with an invalid label.
- Resolved a problem that could have resulted in two actions being performed at the same time, which could cause the application to hang or crash.
- Corrected a check for regions in the solid modeller for the case where a body does not have valid regions. This avoids an assertion failure when making a selection in the model tree after a failure to move a part into another by dragging and dropping it in the tree.
- Corrected a point entry value problem that could cause the application to crash when using point entry to apply a change to multiple entities at once.
- Resolved an assertion failure that could occur when displaying connectivity vertices.
- Added missing validation to prevent the vertex being deleted to be used as the new resulting vertex. This avoids a crash that could be encountered when deleting a mesh vertex and selecting the same vertex to merge to.
- Fixed a problem where collapsed triangles could cause an assertion failure when calculating the triangle normal. This assertion failure could be encountered when snapping to a mesh containing collapsed triangles, for example, when using snapping to enter values on a tool such as Translate.
- The undo stack is cleared after executing an application macro to prevent crashes on undo.
- Prevent a hang when quitting the license error dialog.
- Corrected a problem where a crash could have resulted when deleting a part.
- Fixed a problem that could have triggered if a face is modified and the modification dialog remains open and then the neighbouring faces are deleted and the dialog is closed.
- Resolved an assertion failure that could have triggered on some systems noting a problem dereferencing a process execution handle while working on a dialog.
- Corrected a problem with FDTD meshing when many voxels are required for the model that could have caused the application to crash.
- Fixed an issue with the rendering of UTD plates that caused the application to crash when creating a UTD plate with a hole in it.
- Resolved an issue with the rendering of UTD mesh elements that could cause the application to crash when scaling the model or changing the model unit.
- Avoid a crash on save when referencing model mesh labels from scoped requests.

- Allow deleting parts that are referenced in scoped requests and update scoped requests accordingly.
- Added verification to trigger model status warnings when model decomposition requests are set to be scoped by topology labels but do not have any labels defined.
- Added verification for scope labels referencing excluded items in requests.
- Resolved an issue with the **Remove Small Features** tool that could not be used without the option to **Remove gashes**. Using the tool with this option unchecked would trigger an assertion failure.
- Resolved a crash when trying to repair edges.
- Corrected validation on named points to prevent a named point from having a circular dependency on itself.
- Fixed a crash when cancelling the form dialog from an example guide script.
- Improved label validation when importing a legacy CADFEKO model (`.cfx` file) into an existing model. This prevents the application from crashing when labels in the two models clash and the import cannot be completed.
- Improved the legacy CFX file conversion process for primitive parts.
- Corrected the legacy CADFEKO model conversion process for meshes that had the model extents set to a value other than the default (500) so that the meshes are correctly positioned after conversion.
- Fixed an issue with legacy model conversion of near field data definitions where the option that specifies which data blocks to use did not get transferred correctly.
- Improved various aspects of the legacy CADFEKO model conversion process.
- Extended the header of NASTRAN files exported from CADFEKO to include the application name and version that is used to export the file.
- Corrected the column width when exporting tetrahedra to NASTRAN format.
- Added support for NASTRAN files with `.bdf` extension when importing points from file (cable path, polyline and other point lists).
- Corrected the binary Parasolid export file extension.
- Corrected a framework bug where widget paint events were not being processed correctly. This resulted in a variety of problems such as the variable modification dialog not updating after applying changes, new schematic items would not be shown on the schematic until clicking on the schematic and values of schematic items, for example resistance of a resistor, would not update until interacting with the schematic.
- Fixed the problem that the model was not indicated as modified after running a script that made changes to the model.
- Fixed an issue where CADFEKO would write files in such a way that PREFEKO would always be executed even if the model was not changed.
- Resolved an issue where geometry with metal face media could not have their mesh unlinked.
- Resolved an issue where metallic media could not be applied to mesh faces.
- Corrected a bug where cut planes could have caused items to display at an incorrect position.
- Resolved an issue where partially visible parts were not being taken into account when zooming to extents.
- Fixed zoom to extents for protected models with transforms or different model units.

- Fixed a bug where the **Coatings** button (on the 3D view contextual **Display Options** ribbon tab, in the Style group) did not to work correctly and could result in faces being displayed with the incorrect colour in the 3D view.
- Corrected the rendering for windscreen layer display to take into account all dimensional aspects, including the size of all the specified layers as well as the model units.
- Corrected mesh connectivity display to take transforms and local workplanes into account.
- Improved snapping to mesh segment points close to mesh triangles.
- Resolved an issue where using mesh label selection could also select boundary edges.
- Fixed an issue where it was possible to select a mesh boundary edge behind a mesh triangle.
- Fixed the skewed rendering of cable paths with acute bends.
- The radius of a cable tube is scaled correctly before rendering. This resolves the issue where strange blue objects would sometimes be present in the 3D view of models containing cables.
- Resolved a rendering issue where periodic boundaries could be displayed incorrectly if the height of the unit cell was small relative to its other dimensions.
- Fixed a bug where mesh settings would sometimes not be correctly applied to model mesh faces during remeshing.
- Resolved an issue where volume meshing could fail for models containing FEM line ports. In many cases meshing succeeded, but there were some cases where meshing would fail and removing the FEM line port would allow meshing to succeed.
- Resolved an issue where, for some mesh file formats, the mesh file to be imported could get deleted if the import process failed.
- Reversing mesh face normals are now reflected correctly in the `.cfm` file. The problem could cause an error about face media settings being inconsistent when running the simulation.
- Corrected meshing for wire segment ports where the mesh vertices could have been created at incorrect positions.
- Corrected the `.pre` file writing for mesh wire vertex ports to prevent an assertion from failing when saving a model containing such ports.
- Valid meshes are now generated when remeshing discontinuous segment wires (which may be typical in some imported meshes).
- Fixed `.cfm` file writing for segment ports on a symmetry plane. The problem could cause an incorrect mesh representation and incorrect simulation results.
- Corrected an issue where meshing silently failed when mesh parts that should be remeshed and mesh parts that should not be remeshed were grouped together due to proximity.
- Addressed an issue where unnecessary mesh refinement was seen along symmetry planes.
- Resolved an issue where an unnecessarily fine mesh was seen along some edges passing over a region with mesh refinements/ports.
- Resolved a meshing issue that could result in intersecting elements at T-junctions.
- Fixed a meshing issue that improves some cases where edges were being overrefined.
- Fixed meshing problems related to elongated triangles where poor quality meshes could be generated.
- Fixed a meshing issue where an unexpectedly large number of triangles got created due to triangles not being elongated.

- Corrected a problem with the mesh size calculation for anisotropic media.
- Resolved an issue with the incorrect writing of anisotropic FEM regions to the `.cfm` file. The solver would issue the error `A triangular patch and a tetrahedral volume element overlap` when running the simulation, even though the model was correctly set up.
- Prevent deleting the default workplane and allow opening older models that do not have a default workplane defined.
- When creating a port using a dialog launched from the "Create new..." option on the port selection of a source creation dialog, the selection of an edge to define a microstrip port or a FEM line port now works as expected.
- Improved validation for FEM modal ports.
- Resolved a bug where a slight misalignment was seen between tetrahedra and triangles that would results in the solver error "Inconsistent specification of the media at a metallic triangle on the boundary of a tetrahedron mesh".
- Changed the calculation of the maximum identical distance (*EPSENT*) used in the `.pre` file to depend on the size of parts and be independent of location.
- Adapted spinbox ranges to allow entering values higher than 99 (up to 99999).
- Corrected a cable auto-bundling problem where values could differ between Windows and Linux, possibly also resulting in the solver reporting an error that cables touch or intersect.
- Improved the `.pre` file writing of SK and CO cards for parts without associated mesh elements. Previously, the solver would issue an error that no triangles/segments were found with the correct label to apply the skin effect approximation. SK and CO cards will now only be written out when the topology has mesh elements.
- Resolved an issue where face properties (SK and CO cards) did not get written out correctly for all cases in all symmetry regions.
- `Overlapping regions were detecting while meshing` verification warning should no longer incorrectly trigger for regions that intersect the symmetry planes.
- Resolved an issue where model mesh parts defined as static parts for the numerical green's function did not get written out to the `.pre` file and consequently were not being considered static during simulation.
- The tree icon for NGF will be shown next to primitive geometry parts and model mesh parts that are set to be static parts for the numerical green's function.
- Added context menu entries for NGF to model mesh parts that are set as static parts for the numerical green's function to more easily access the NGF settings.
- Corrected the `.pre` file writing for receiving antennas that use definitions other than a Feko far field file (`.ffe` file) to avoid an error regarding an incorrect file format when running the solver.
- Corrected a problem on the cable instance dialog that could have caused the list of pins and signal annotations to be empty. This prevented the user setting the source and destination pins when creating a cable instance and the cable instance had to be modified to complete its setup.
- Resolved an assertion failure when setting the reference direction on multiple cable paths simultaneously.
- Adding a new variable to a model that contains analytical curves will not result in geometry being re-evaluated or a new mesh being generated.

- Resolved an issue where a model status error could be triggered for loads on network ports, incorrectly stating that the loads were not symmetric around the defined symmetry planes. Loads on network ports are no longer being considered in symmetry checks.
- HTML character sequences do not appear in normal plain text !!print_error messages in the `.pre` file anymore.
- Improved the `.pre` file writing for domain connectivity to cater for the case where all connections are excluded. Previously, the solver would issue an error if domain connections were defined, but excluded from the model.
- Transforms applied to groups inside combined geometry such as unions will affect the resultant body.
- Fixed the details tree for geometry groups to show transforms applied to the group only and not all geometry inside the group.
- Converted the error message when CFIE/MFIE is specified on a face that does not bound a closed region to a warning message if the model contains periodic boundary conditions. The warning message offers a hint on how to correct the model if faces on the boundary have been removed. Generally, faces on a periodic boundary are correctly managed and need not be removed manually before launching the solver. As such, the closed regions which may be needed to apply region-based settings remain valid even when using periodic boundary conditions.
- Resolved an issue with the documentation not launching when selecting to open it from the script editor (Help menu or ribbon button).
- Provided scripting API access for **`MeshFrontMedium`** and **`MeshBackMedium`** on the **`MeshTriangleFace`** object. The boundary face and boundary edge collections are also now accessible on the **`Mesh`** object.
- Added missing documentation of schematic link creation processes.
- The parameter sweep application macro ignores the setting to write variables to `.out` file instead of failing when this PREFEKO component launch option is set.

EDITFEKO

Features

- Extended the AS card that defines an excitation by means of impressed spherical modes with the option to use the impressed mode data from the previous AS card.
- Extended the BO card with the options to apply the ground to solution requests and to specify a z-value.
- Extended the UT card with an option to enable enhancements for complex structures when using RL-GO.
- Added support for the new **Double edge and wedge diffraction** faceted UTD option on the UT card.
- Renamed the **Higher-order effects** option for faceted UTD on the UT card to **Combination of different effects**.

POSTFEKO

Features

- Support reading solution-specific BO cards from the `.fek` file. In this case BO cards are treated as general cards and the ground planes are applied to the far fields, near fields, SAR and receiving antenna requests. The details panel will show the more information on the ground plane which was applied to the specific request. The associated ground plane will be displayed along with the result when it is added to the 3D view.
- Upgraded FFmpeg to version n7.0.2.
- Added a new application macro which determines the locations/directions of the minimum and maximum points of near field or far field datasets. The results can be exported to a `.dat` file.
- Added support for grouped variables in the **Optimise model in HyperStudy** application macro.

Resolved Issues

- Resolved an issue where repeatedly loading a `.pfs` file could cause the application to crash.
- Remove axis labels from a surface graph when the `.bof` file is missing to avoid confusion. The plot could be in a transitional state, with axis values and labels not matching the axis settings, due to the plotting data not being available.
- Updated the datasource element with the new HyperStudy format for the hstp file in the **Optimise model in HyperStudy** application macro. Also added support for a period character used in the POSTFEKO session name.

Solver

Features

- Extended the reflection coefficient ground plane options, allowing the ground plane to be defined at an arbitrary z-plane value and for the ground plane to be defined as a post-processing-only option. When using this option the plane is not considered in the solution, but the impact is considered in post-processing calculations.
- When using the high frequency approximation of the skin effect a thickness does not need to be specified. If no thickness is specified, it is assumed that the user has applied the high frequency approximation sensibly and materials are thick enough at the frequencies of interest. The solver does not perform any warning checks on thickness compared to lateral triangle dimensions or wavelength.
- Support multiple GPU usage for parallel MPI runs for manual RL-GO problems.
- The processing of rays in the RL-GO solution which have not yet converged (or rays which would require a higher number of interactions to be considered in order to fully consider the impact of those rays on the solution) can be avoided by activating the Enhancements for Complex Structures option on the UT card. For complex geometries where a limited number of interactions is specified, using this option may result in more accurate and faster solutions.
- Extended the RL-GO method to support interaction with PEC, PMC or homogeneous half-space (reflection coefficient approximation) infinite ground plane. Reflections between the RL-GO geometry and ground plane is fully considered up to the specified number of interactions.

- Additional information is reported to the out file for RL-GO solutions indicating the proportion of rays in the RL-GO solution which have not converged and for which a higher number of interactions should be requested. This measure can be used as an indication of accuracy of the solution in some cases.
- A warning note is provided in the out file for an RL-GO solution which may differ from the PO solution with one interaction as a high proportion of the ray contributions are not converged and a higher number of interactions would be needed to reach the correct solution.
- Adjusted the method used in RL-GO to address ray interactions with curved PEC geometry. This will result in a more precise solution for curvilinear geometries.
- Enabled more flexible simulation control by allowing independent activation/deactivation of double wedge diffraction in faceted UTD.
- Extended the multiport processor tool to support frequency varying source and load definitions through a tabulated list of complex data.
- Extended the MoM basis function setup to support metal surfaces and wires passing through or terminating in a planar Green's function aperture surface.
- Add support for combined MoM/MTL cable harnesses to be solved in a planar Green's function environment.
- Improved the auto mesher to consider signal twist pitch length along combined MoM/MTL paths.
- Improved the auto meshing rules of the cable harness solution by considering the environment that the cable path runs through.
- Add support for combined MoM/MTL cable harnesses to pass through different material SEP regions.
- Reporting of voltage probe data to the `.out` file was extended for MTL harness signals in the outer subproblem.
- Extended the cable schematic link definition to support FEM line ports.
- Change the default for the eigensolution of lossless FEM modal ports to use double precision real instead of complex ARPACK. This has a performance and memory usage advantage.
- An informative error message is provided should a simulation terminate due to an integer overflow at assembly of the combined FEM/MoM system matrix when using the direct sparse solver.
- Extended MLFMM with characterised surfaces to use `.tr` files containing data for a single polarisation angle. Previously, it was mandatory for the files to contain data for two orthogonal polarisation angles. The extension allows faster creation of `.tr` files.
- A warning is issued when the internal near field aperture to spherical mode source transformation is skipped due to under sampling, or due to normals pointing inwards.
- The Feko solver binary has been renamed from “feko_mkl” to “feko”. This change should have no impact on all supported workflows, but users who may be calling the solver executables directly from custom scripts or scheduling systems should adjust the name of the binary accordingly.

Resolved Issues

- Prevent a segmentation violation for multiple configuration RL-GO coupled MoM problems when the fast far field method is automatically disabled.
- The runtime performance and parallel scaling of models with multiple interactions and wedge/edge diffraction effects activated for the RL-GO has been dramatically improved.

- Avoid a segmentation violation that may have been triggered during the sorting of NGF domain triangles.
- When using CBFM with MLFMM in problems including dielectric materials with high relative permittivity and high loss tangents, segmentation violations are avoided.
- Fixed a segmentation violation while computing the characteristic basis functions using the method of moments.
- Restore *--estimate-resource-requirements-only* execution mode computation of the memory estimate. The memory estimate was incorrectly accumulated for multiple solution configurations.
- Extended the spherical mode source definition to separate the amplitude scaling factor and phase offset from the mode definition to improve large array memory management.
- Fixed a segmentation violation which may have been triggered when solving consecutive configurations with S-parameters and combined MoM/MTL.
- Improved the S-parameter load definition to restore the loads to the state prior to executing the S-parameter configuration.
- Resolved an internal error that could have been encountered when using the combined MoM/MTL solution method with twisted pair cables.
- Extended the 2D Laplace static solver to support specifying of losses using sigma when computing cable per-unit-length parameters.
- Field data points of a Cartesian boundary near field request are now always exported to .efe/.hfe files with a positive increment over all local axes directions.
- Disbled messages relating to GPU availability on the simulation machine which may have caused confusion.

Shared Interface Changes

Features

- Deprecated the option to encrypt Windows credentials in the registry for MPI processing.
- Added support for `.fek` format 200 to accommodate new features.

Resolved Issues

- Fixed the launching of the Feko Terminal on Linux. POSTFEKO and EDITFEKO now uses the same algorithm that CADFEKO uses to find a suitable terminal application to launch. Previously only the value of the *TERM* environment variable was used.
- Resolved an issue where the application version strings could have shown “DIRTY”. There is no reason for concern when using a previously released version of the product that contained “DIRTY” in the version string, since this was a system issue that had no effect on the application itself.

Support Components

Features

- Removed the **Update Parallel Credentials** tool from the Launcher utility as registry-based authentication is no longer supported by Intel MPI on Windows.
- When preparing the input for the Solver using PREFEKO multiple threads may be used to accelerate the processing of the input. Please refer to the Feko User Guide for details on the settings and considerations when using this option.

Resolved Issues

- By caching of files imported using a DA card (version 2 and higher) processing performance of input data by PREFEKO has been improved.
- Various optimisations lead to faster PREFEKO processing.
- RUNFEKO will not overwrite/adjust environment variables that were set before RUNFEKO was called.
- Recent versions of Intel MPI, including the version shipped with Feko, use the Powershell Invoke-Command when launching on a remote host. Various changes have been made to support this approach.

WinProp 2025 Release Notes

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

General

Feature

- Upgraded FFmpeg to version n7.0.2.

ProMan

Features

- Accelerated the Intelligent Ray Tracing (IRT) model for urban scenarios in point/trajectory mode.
- Improved the Urban Knife Edge Diffraction model to create fewer diffraction points.
- Added support to display the power delay profile. The triangle pulse width can be specified in nanoseconds.
- The consideration of the handover process for the cell assignment was added for trajectory mode, which can be activated and configured under the **Air Interface** tab. The handover to the new serving cell is only performed if the received signal level (or RSRP/RSRQ, depending on the selected cell assignment criteria) is the defined handover offset [dB] higher for a period longer than the defined TTT (time to trigger) interval [ms].
- The maximum number of supported prediction points for point and trajectory modes was increased to 250,000. The new threshold for the maximum number of sampling points is 4 million. Error messages have been added when results with too many sampling points are loaded in ProMan or processed in RunMS.
- Added support for a Tx antenna array configuration in the RunMS workflow. The Tx configuration is used for all the transmitters. View the multiple Tx elements in the result tree.
- Added support to display the following in the 3D view: rectangular prediction area, trajectories, points (prediction, markers/reference, user), and database polygons.
- Added a display option to limit the dynamic range of TX and RX antenna patterns in the 3D view.
- Added support for MIMO antenna configuration in the FMCW radar. With *N* number of transmitting antenna elements and *M* number of receiving antenna elements, you can generate (with proper antenna placement) a virtual antenna array of N*M elements. The multiplicative increase in the number of (virtual) antenna elements corresponds to an improvement in the angle resolution.

Resolved Issues

- The position, azimuth and downtilt orientation of the MS antenna pattern is now correctly set also in case of time-variant projects.
- Resolved an issue where, for the Shooting and Bouncing Rays (SBR) model, the pixel topography cells were computed incorrectly, leading to missing rays.

- Resolved a crash that could have occurred when exporting a project with results.
- In the case of ground reflection for the urban IRT, the defined **Ground Material** on the **Parameter: Intelligent Ray Tracing (IRT)** dialog is now also applied when the **Default Materials** option is selected on the **Building Data** tab.

  The BRDF scattering loss values have been corrected in case of grazing incidence, which also affects the reflection loss in case of surfaces with roughness > 0.
- Resolved an issue where duplicate ray detection for urban IRT CNP projects was not working correctly.
- Resolved an issue where the offset was incorrect for Rx antenna elements in the 3D view for RunMS results if propagation paths were not computed.
- Resolved an issue where *LOWER_LEFT* and *UPPER_RIGHT* values in the ASCII network planning results were the same for trajectory mode.
- Resolved an issue where urban buildings cut by courtyards into multiple polygons could have resulted in rays intersecting the building incorrectly.
- Resolved an issue where the Dominant Path model did not compute the whole user-selected prediction area.
- Resolved an issue where, for MS calculations, transmission matrix entries could have been zero.
- Added support on the **Display Settings** dialog for disabling or adjusting the scaling factor when rendering the prediction area (rectangle, trajectories, or points) in the 3D view.
- Resolved an issue where the incorrect MS configuration was displayed for the 3D antenna pattern.
- Resolved an issue where the default antenna configuration was taken in the case of time-variant points when computing RunMS instead of the assigned antenna configuration.
- Resolved an issue where using the urban IRT combined with KE diffractions resulted in duplicate interactions.
- For the urban IRT, knife-edge diffracted rays interacting with the same building are discarded to prevent invalid rays.
- Resolved an issue where the total power was not computed if the **Superposed Received Power** option (**Propagation** tab) and the **Received Power in tabular Format** option (**Network** tab) were activated.
- Resolved an issue where the elevation relative to the TX did not include the curvature.
- Resolved an issue where the Doppler shift was calculated incorrectly for certain movement types.
- Resolved an issue where the topography database was not displayed for indoor scenarios with topography data.
- Resolved an issue where, for urban prediction surfaces, the result values could not be obtained using the mouse cursor.
- The LOS/NLOS results can now be computed using the Parabolic Equation method.
- When using a geodetic topo map given in longitude and latitude coordinates, the satellite positions (both geostationary and non-geostationary) are now correctly converted.

WallMan

Features

- Extended `.dwg`/`.dxf` file import to support 3DSolid, Body, PolygonMesh and SubMesh object types.
- Resolved an issue where time-variant objects were not included in the preprocessed database for static preprocessing. This resulted in rays being missed that would have interacted with the time-variant objects.

Resolved Issues

- Resolved an issue where the scaling factor was not applied to GDAL raster conversions.
- Resolved an issue for time-varying scenarios where the group dynamics dialog was slow to update when switching between groups.
- The error messages during the data conversion are now shown in the progress bar instead of message dialogs that require confirmation from the user.

Application Programming Interface

Features

- Added support for a generalised API function to allow reading of all result types (area, points, trajectories). As part of this change, most defines were converted to enums, and incorrect copying between API and internal structures was corrected.
- Added support for the `-L` command line argument for WinPropCLI. The argument writes a log file for each transmitter in RunPRO and RunMS and a general log for RunPRO and RunNET.
- The API parameter **`Model_RAYTRACING::GroundInteractions`** was split into two separate parameters for **`GroundReflections`** and **`GroundDiffractions`**.
- Added support to the API to compute the total power from all transmitters together.

Resolved Issues

- Resolved an issue that resulted in a RunMS error: “Error while superposing mobile antenna”.
- Resolved an issue that could have resulted in an error `Error starting prediction` when using WinPropCLI for network, capacity, and total power results.
- When using WinPropCLI, a check has now been added to determine whether one of the supported normalization methods (must be in the frequency domain) is selected for the computation of the channel capacity.

newFASANT 2025 Release Notes

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

General

Feature

- The newFASANT components have been removed from the standard Feko installer. For users who would like to use newFASANT, an additional archive is available which can be extracted into an existing Feko installation. This will add the newFASANT files to the existing Feko installation so that they can be launched from the Feko Launcher as before.

WRAP 2025 Release Notes

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

General

Features

- Extended the function in the **Frequency Assignment** tool to include typical stations in the calculation.
- Added support in the **Radar Coverage** tool for distance/height input in nautical miles/feet.
- Added support in the API to add, modify and delete modes on transmitters.
- Implemented a new propagation model ITU-R P.684 according to recommendation ITU-R P.684-8.
- The **Interference Analysis** dialog is now resizable. All controls on the dialog will adjust accordingly when the dialog is resized.

Resolved Issues

- Corrected bugs in the propagation calculations when the settings of **Station Antennas and Site Origins** in a geo class are set to **At Ground Height + Building Height.**.
- Corrected a bug that sometimes caused the wrong terrain code and object height to be used in both the profile viewer and the propagation models.
- Corrected a bug where the terrain profile used in diversity calculation of Radio Link Performance did not use the terrain data defined in the area patch.
- Resolved an issue where text was truncated on the **Edit Result** dialog for legend descriptions.
- Resolved an issue that caused links to disappear when zooming in while using unprojected map data. Also, fixed issues with coverage calculations and result display when the result covered the “dateline” (180 degrees east/180 degrees west).
- The menu "Use log file..." has been added for the Chinese and Korean versions.
- Resolved errors that occurred in Profile Viewer when using the geo class option **Ground + building height ASL [m]**.

Release Notes: Altair Feko 2024.1

3

Altair Feko 2024.1 is available with new features, corrections and improvements. It can be applied as an upgrade to an existing 2024 installation, or it can be installed without first installing Altair Feko 2024.

This chapter covers the following:

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.

newFASANT complements Altair's high frequency electromagnetic software tool (Altair Feko) for general 3D EM field calculations, including, among others, special design tools tailored for specific applications like complex radomes including FSS, automated design of reflectarrays and ultra-conformed reflector antennas, analysis of Doppler effects, ultrasound systems including automotive or complex RCS, and antenna placement problems. Advanced solver technologies like the MoM combined with the characteristic basis functions (CBFS), PO/GO/PTD, GTD/PO and MLFMM parallelised through MPI/OpenMP, being some of them especially efficient for the analysis of electrically very large problems.

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.

WRAP is a comprehensive tool for electromagnetic propagation, antenna collocation and spectrum management. WRAP combines propagation analysis, often over large areas with many transmitters and receivers, with system analysis to include complex non-linear equipment properties.

Highlights of the 2024.1 Release

The most notable extensions and improvements to Feko, newFASANT, WinProp and WRAP in the 2024.1 release.

Salient Features in Feko

- Model protection was extended to allow a custom 3D representation to be shown when a protected model is imported by a client. The 3D representation does not get meshed and does not form part of the simulation. The custom representation geometry is specified by the model creator and replaces the grey translucent box that is displayed for protected models without a custom representation geometry.

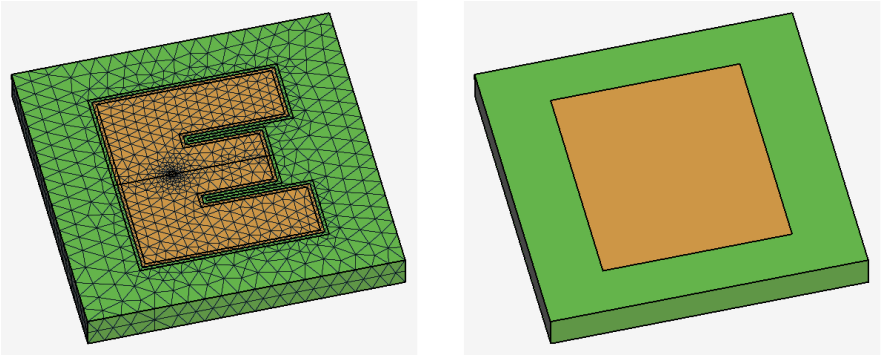


Figure 22: On the left, an example of a protected model which is only visible if the password is known. On the right is the representation geometry that will be visible to the client. Note that representation geometry is not meshed.

Protected models can now be imported and placed on other geometry and the meshing will take this into account.

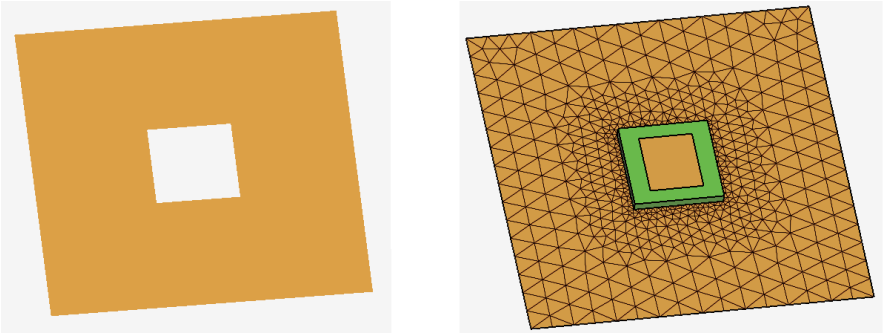


Figure 23: On the left, the model where the protected model will be imported. Note that overlapping areas need to be substracted. On the right, the protected model was imported into the model and was meshed.

Workplanes and ports in a protected model can be exposed allowing clients using the protected model access to the workplanes and ports. Sources and loads can now be added to these exposed ports in the protected model.

When using a protected model, S-parameter configurations and near field requests are now supported.

- The following components were added to the component library:
  - Predefined EMC test setup typical of standard GB/T 18387 EMC measurements using a loop EMC antenna.
  - Multi-band stacked patch antenna, such as typically used for global navigation satellite system (GNSS) applications.

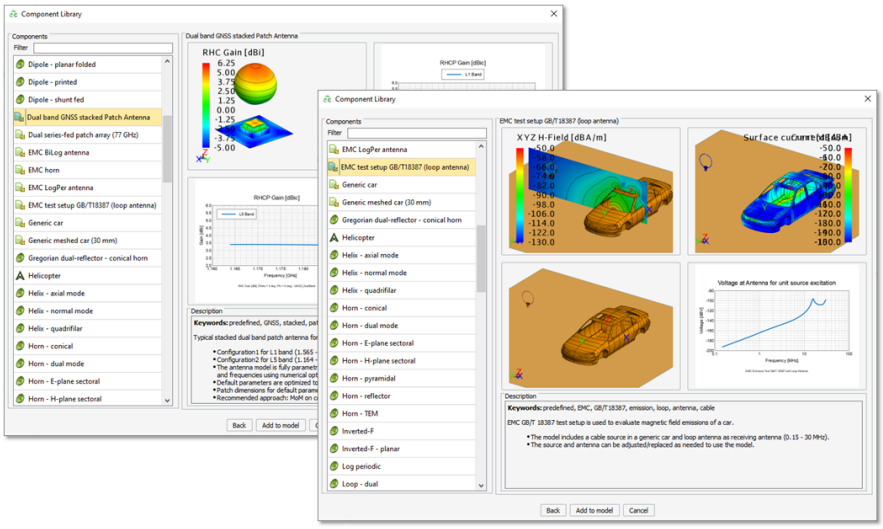


Figure 24: The dual band GNSS stacked patch antenna and EMC test setup GB/T 18387 EMC (loop antenna) available in the Feko 2024.1 component library.

- AMD AOCL libraries (optimised for AMD processors) can now be enabled when running the Feko Solver.

Salient Features in WinProp

- Beam steering in 5G networks is now supported in ProMan, where it dynamically directs radio signals towards specific users, improving signal strength and quality. Beam steering is based on phased array antennas, where the signal phases fed to the antenna elements are adjusted to form a focused beam in the desired direction and can track the movement of users.

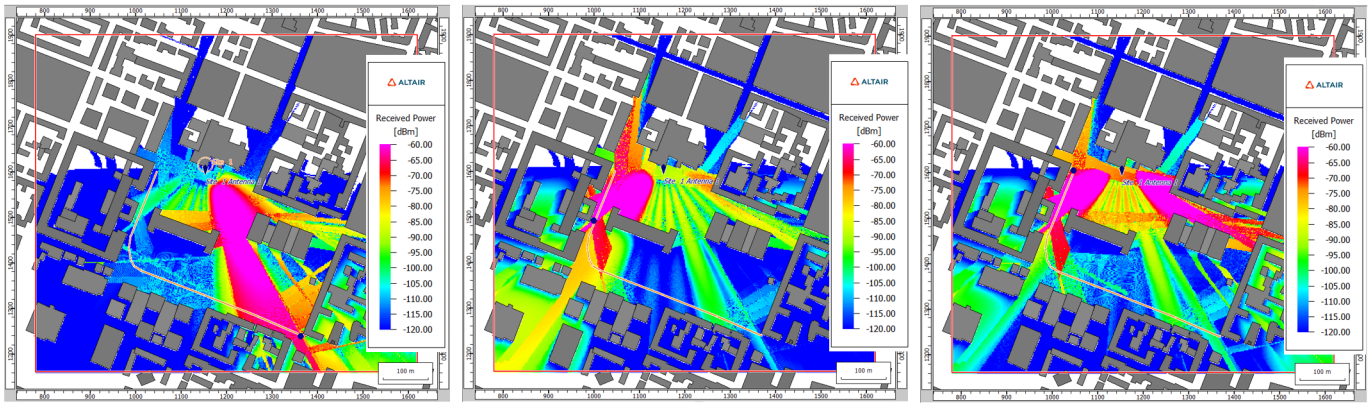


Figure 25: The data beam from the antenna array serving a user at different times.

- The automatic report generation were extended to include a project summary along with the exported results and 3D view.

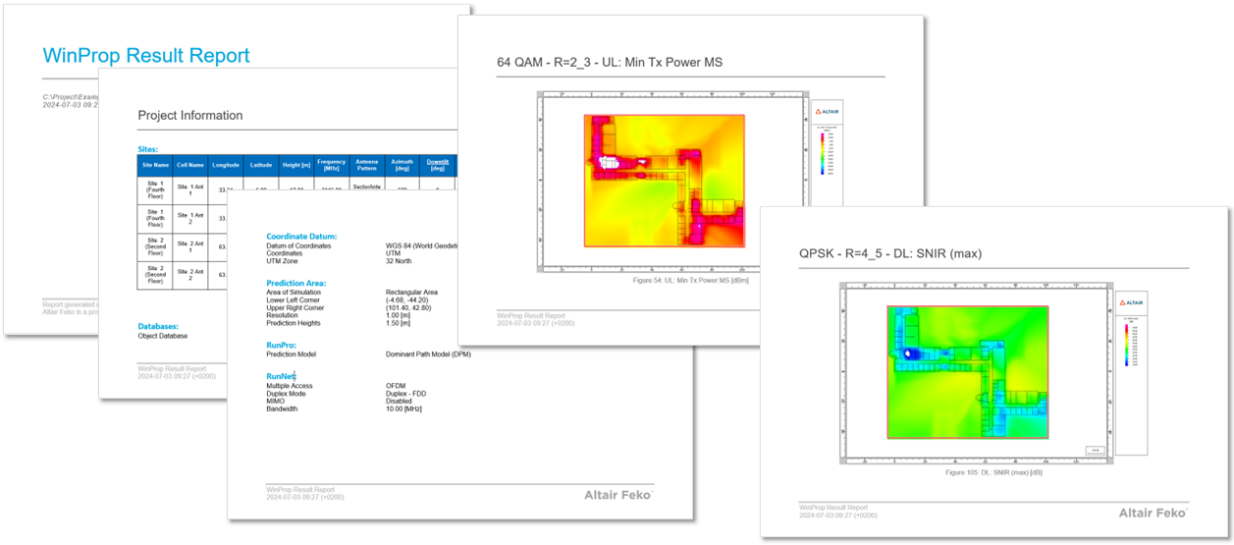


Figure 26: An example of an exported Microsoft Word report.

- Extended the balloon tip feature to create a reference point with each click. The balloon tip for the marker shows the result value and the coordinates at this point. A marker is indicated by a red "X" and can be deleted by clicking on the marker. When new results are loaded or if the marker is outside the simulation area, the marker info in the balloon tip is updated accordingly.

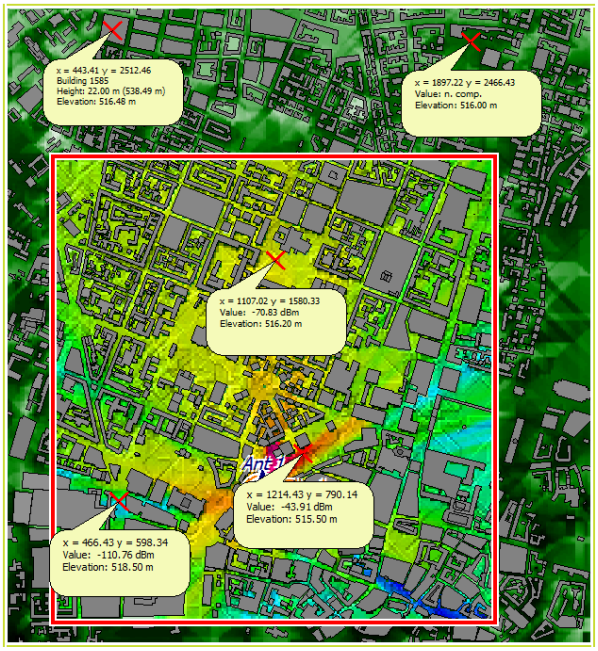


Figure 27: An example of multiple markers with balloon tips displaying the result value (where relevant) and coordinates.

- The computed prediction results that can be requested additionally, now include superposed received power where support was added for coherent superposition (phase considered). Up till version 2024, only incoherent superposition (power sum, phase ignored) was supported.

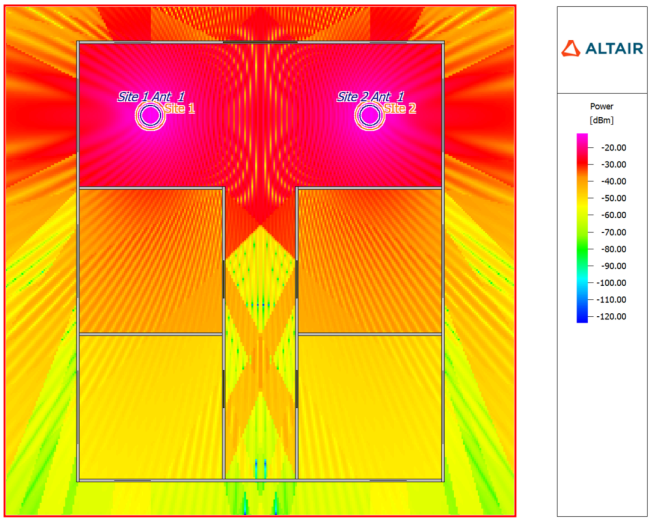


Figure 28: An example showing the superposed received power (coherent superposition) for an indoor propagation scenario.

- Multiple mobile-station antenna configurations are now supported in a project for point and trajectory mode.

Salient Features in WRAP

- The coverage result levels can now be inverted for many types of results. For example, it is now possible to visualise the required antenna height above and below a certain level. Some result types can now generate more information, both in the result information dialog and printout.

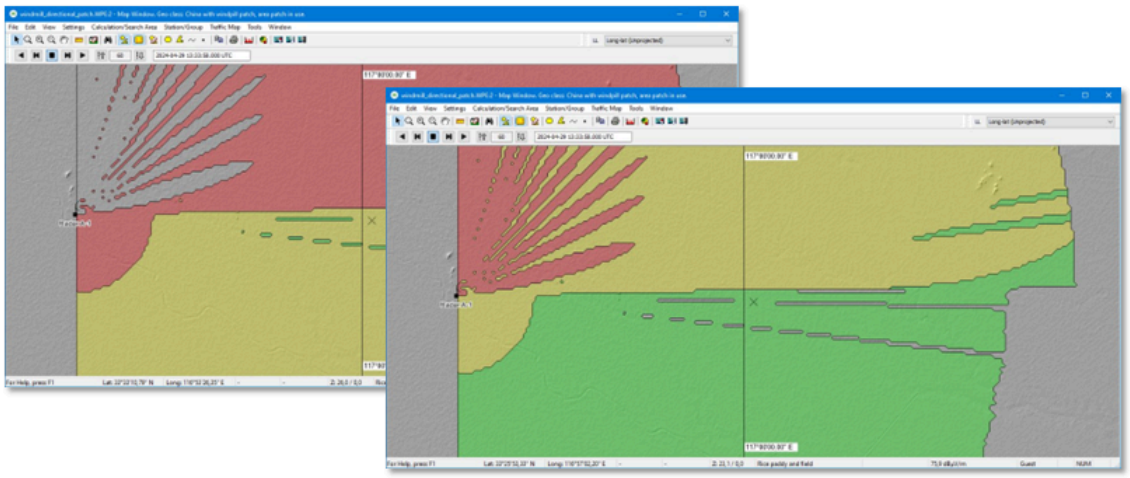


Figure 29: On the left, an example of the original coverage results. On the right, coverage results were inverted.

- The Interference tool was extended to include typical stations in the calculation. You can also now perform interference calculations for “typical” station types (they can be created without any particular geographical coordinates, may have predefined service area).

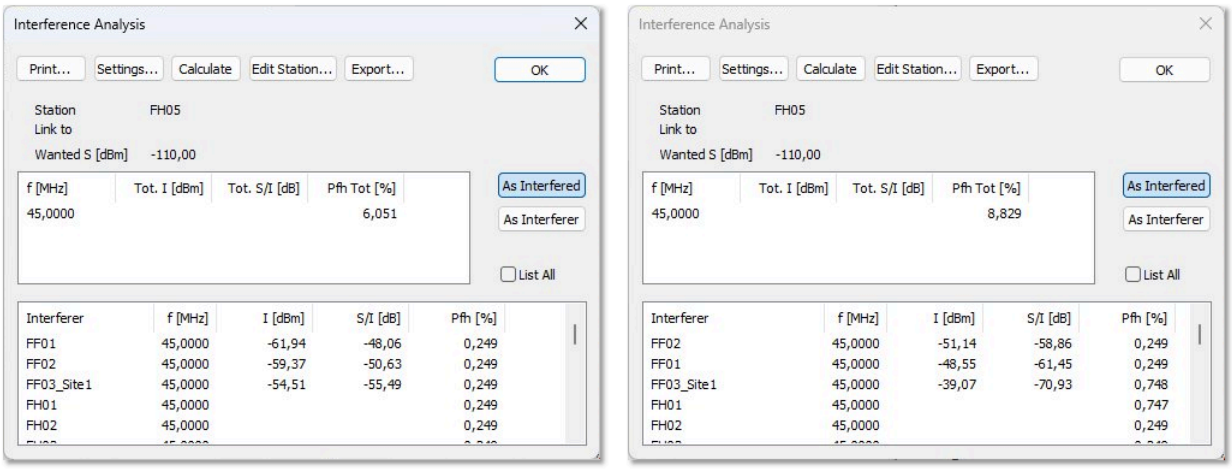


Figure 30: On the left, an example of a fixed station and on the right, an example of a typical station.

Feko 2024.1 Release Notes

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

CADFEKO

Features

- The new mesh engine that was introduced in CADFEKO 2023.1 is now the official mesh engine without fallback. The legacy mesh engine has been removed.
- The legacy cfx converter now supports a `--verbose` option. This will give additional information about each phase of the conversion and can be used when giving feedback to the Feko support team. For large files it is best to pipe this output to a text file.
- Extended model protection with the following:
  - Ports in a protected model can be exposed allowing client models to add sources or loads directly to the ports inside the protected model.
  - Workplanes in a protected model can be exposed allowing client models to use them. This replaces the single **Orientation Workplane** that could previously be defined for a protected model.
  - Representation geometry allows the creator of the protected model to design a custom 3D view representation of the confidential model. The representation geometry will be shown in the 3D view of the client model when the protected model is imported.
  - Added support for near field requests when using protected models.
  - Added support for S-parameter configurations in client models that include imported protected models.
  - Improved meshing of client models that include imported protected models to allow placement of a protected model directly onto a component in the client model.
- Cartesian boundary near fields computed without samples on the edges of the bounding box can now be used when defining an impressed near field source or receiving antenna.
- Changed the faceted UTD ray contribution settings to include corner diffraction and creeping rays by default.
- Added surface transmission to the ray contribution options for faceted UTD.
- Added additional checks for improved schematic link validation.
- Reworked drag and drop functionality. Dropping onto a item, "Move In" will move into that entity if valid and geometry groups can be dragged into combined geometry.
- CADFEKO_BATCH now supports changing variables in groups from the command line. The syntax of referencing a variable in a group is through a dot between the group name and the variable. Nested groups are also supported.
- Added a predefined EMC test setup typical of standard GB/T 18387 EMC measurements using a loop EMC antenna to the component library.
- Added a multiband stacked patch antenna, such as typically used for global navigation satellite system (GNSS) applications, to the component library.

- Added the **Create Coaxial Connector Feed** macro that creates a coaxial connector on a finite substrate. This application macro uses three defined named points in the model to define where the coaxial connector will be located. The coaxial connector is defined using an outer diameter, inner diameter, coaxial length and insulating dielectric.
- Upgraded the ECAD import library used by CADFEKO to the latest version provided by Altair PollEx.

Resolved Issues

- Fixed an issue with license checking that could cause a license error when opening CADFEKO with an existing project if managed licensing is used. This problem also caused the model creation phase of the parameter sweep application macro to fail for users using managed licensing.
- Fixed a crash that could be encountered when using the **Generate Antenna Array** macro.
- Resolved an assertion failure when dismissing the **Executing PREFEKO** window if it was left open from a mesh import into a previous project.
- Fixed incorrect `.pre` file writing for loads on cable ports under certain conditions. The circuit was not correctly passed to the solver, causing the solver to issue `Warning 38935: A SPICE circuit element has an unconnected floating terminal. Please verify circuit connections.`
- Fixed a crash when converting a legacy model that had geometry operations that could no longer be executed successfully.
- Resolved issues with rectangle selection of model mesh elements:
  - Fixed a crash when deleting mesh triangles that were selected using rectangle selection.
  - Resolved an issue where mesh normals would not be reversed for elements that were selected using rectangle selection.
- Resolved an issue with the edge loop selection tool that could cause the application to hang or crash.
- Fixed a memory performance issue with the project geometry operation that could result in a crash.
- Fixed a framework memory allocation assertion failure which is triggered when running a Lua script that loads many large models consecutively.
- Fixed crashes when creating geometry in the negative symmetric regions.
- Fixed an intermittent crash when closing dialogs that dynamically draw contents.
- Fixed an intermittent crash with dialogs containing tab widgets.
- Resolved an issue with the legacy cfx converter where errors would not be reported correctly. This could have resulted in a converted model containing no geometry without any errors being issued during the conversion process.
- Fixed an undo bug that could result in a crash when saving the model.
- Fixed undo bug that could cause meshing to stop working until the model is re-opened.
- Resolved an assertion failure when accessing the properties of a geometry group.
- Fixed a hang when dragging a geometry group into itself.
- Resolved an assertion failure when attempting to transform a group inside combined geometry such as a union.
- When separating a part, any groups that were inside will also be moved out of the part and no longer be deleted.

- Resolved an assertion failure when projecting geometry and clicking on a preview in the 3D view while the **Project** dialog is open.
- The target of projected geometry now gets indicated by a **T** icon in the model tree.
- The target of projected geometry can be updated by selecting **Update Target** on the right-click context menu of the intended target geometry entity inside the projected geometry part.
- Resolved an issue where changing the solution configuration global/local settings from the cogwheel icon on the model tree (Configuration tab) could result in a crash.
- Improved component library importing stability through the GUI to prevent a crash that could be encountered when adding a predefined component to a project.
- Avoid a crash when opening loft properties.
- Avoid a crash when dragging and dropping geometry elements in the model tree.
- Avoid a crash on Linux when changing number of parallel processes.
- Resolved an issue that prevented the user from specifying more than 99 parallel processes on the **Component Launch Options** dialog.
- Fixed an issue where a `.pre` file overwrite message appeared unexpectedly when saving a model while it was being meshed and then CADFEKO seemed to become unresponsive.
- Resolved an issue that no prompt to save would be given when loading a model from the recent file list and any changes to the current project would be lost.
- Fixed the file browser to open at the location of the most recent file that was used.
- Closing the application with multiple open tools will now close all of them.
- Added a mechanism that will undo a process that failed for an unexpected reason. An error message is given with an option to attempt to fix the model.
- Improved the robustness of `.cfm` file writing to avoid unexpected errors when running the solver. Previously, if new line characters were used in variable descriptions, errors such as `Error 30410: An unsupported card in the *.cfm include file` would be triggered by the solver.
- Improved mesh growth around edge and microstrip geometry ports for cases where the edge is very short relative to the wave length. This will generally result in improved accuracy when using edge ports.
- Resolved an issue with meshing where wire mesh sizes were not being affected by surrounding geometry.
- Added a verification warning when overlapping regions are detected during the meshing process.
- Fixed a problem where renaming a variable could cause the cable schematic to change.
- Added verification so that model status warnings get triggered for empty labels on far field, near field and current requests that are set to be scoped by topology labels.
- Models containing polygonal model mesh UTD plates with more than ten corners can now be loaded and visualised.
- Significantly improved the loading performance of models that utilise periodic boundary conditions.
- Fixed the loading performance and a possible crash when opening large models with auto-meshing disabled and no frequency set.
- Improved the performance of face/edge deletion for large models.
- Resolved an issue where an error message got issued when creating an S-parameter configuration and using a valid variable as port impedance. A known bug still affects the dialog when modifying

an S-parameter configuration that references variables. A workaround for this problem, for the variables to be resolved correctly, is to modify the S-parameters from the **Configuration** tab in the model tree.

- Improved the performance of the **Executing runfeko** dialog for models where many lines of output are generated. Before, it could have happened that all the lines did not get displayed correctly, with some text towards the end of the output appearing as blank space.
- Resolved an issue when scaling model meshes that any waveguide ports applied to it did not get scaled correctly when preparing the solver input. This caused the solver to issue `Error 4793: The surface area of the triangles of a waveguide port does not correspond with the waveguide port definition`. The correct dimensions are now used.
- Fixed the rendering of waveguide ports on parts with mirror transforms and mesh parts with scale transforms.
- Resolved an issue where the dielectric surface impedance approximation could not be applied to model mesh faces. The face medium of a model mesh face can be set to dielectric surface impedance when the front and back mediums are the same dielectric or dielectric and free space.
- Resolved a crash when importing a CADFEKO model (`.cfx` file) and choosing to merge identical media.
- Fixed a CADFEKO model (`.cfx` file) import failure when merging identical variables.
- Fixed the `.pre` file writing of media used in protected models.
- Added a verification message if an included protected model configuration does not have a frequency defined.
- Removed a verification warning about the "MaxIdenticalDistance" setting being out of sync between a model and a protected component.
- Resolved various issues that could be encountered when undoing or redoing enabling or removing model protection. These actions are no longer placed on the undo/redo stack.
- Fixed a bug that would cause POSTFEKO to stop checking for file changes if the file uses model protection.
- Corrected the preview of transforms applied on protected model geometry.
- Corrected validation for schematic link port references.
- Resolved an issue where redundant automatic schematic links were being written to the `.pre` file.
- Added verification of the separation distance for schematic links that define the connection between cables and geometry.
- Resolved a crash that could happen when using **Undo** after running a script.
- Fixed script recording and undo/redo when setting the target of the project and subtract operators.
- Fixed an issue with the API where running a macro recorded script that duplicates geometry would fail with the error `attempt to call method 'DuplicateTopology' (a nil value)`. The **`DuplicateTopology`** process is now available via automation.
- Fixed macro recording to record moving geometry using drag and drop.
- Avoid the double display of shortcut keys in the tooltips of the script editor.

EDITFEKO

Features

- Cartesian boundaries computed without samples on the edges of the bounding box can now be used when defining an impressed near field source.
- Changed the UT card faceted UTD ray contribution settings to include corner diffraction and creeping rays by default.
- Extended the UT card with the **Surface transmission** ray contribution option for faceted UTD.

POSTFEKO

Features

- Added the capability to plot near field results on 2D graphs when using protected models.
- Improved the 2D graph handling of near field results requested below a ground plane. Near field values for points that fall below the ground plane will no longer be plotted on 2D graphs.
- Added the **Export Graph Data to DAT File** macro. This application macro creates a `.dat` file in the specified output folder for each trace on every Cartesian and polar graph in the current project.

Resolved Issue

- Resolved an issue where surface graphs did not update correctly to show the updated plot range after changing the independent axes.

Solver

Features

- Added support to specify materials (including reflection and transmission effects with multilayer thin dielectric sheets and coated PEC, characterised surfaces and surface impedances) when using Faceted UTD.
- Faceted UTD enables corner and tip diffraction and creeping waves by default.
- Dramatically improved the speed of the processing phase for models including many wire segments.
- Near field requests may now be calculated in models which include protected parts. Any near field points on or close to protected parts will not be calculated.
- Model decomposition data may now be exported to a `.sol` file file during a simulation that includes protected models.
- Error estimate may now be requested for a simulation that includes protected models.
- Currents may be requested when simulating a model that includes protected components.
- Updated MPICH to version 4.2.1 on Linux.
- Upgraded the Intel MPI library to version 2021.12.1 for Windows and Linux.
- Upgraded to MUMPS v5.7.1c.

Resolved Issues

- Improved faceted UTD capabilities for complex models where the number of triangles and/or observers is large.
- Fixed a bug that caused internal errors for faceted UTD problems where more than one interaction is requested.
- Resolved an issue where wires connected to faceted UTD triangle edges were incorrectly reported as segmentation rule violations.
- Fixed a bug (memory out-of-bounds) for sequential stabilised MLFMM with multiple dielectrics.
- Improved the program flow and setup of the internal near field aperture to equivalent spherical mode sources transformation phase. This avoids the previous incorrect reporting of Warning 53699 (mismatch in frequency, spherical mode data) and Warning 40147 (near fields are in spherical mode cut-off region).
- Fixed various segmentation violations that could occur when using a GPU for RL-GO problems.
- Enforce CUDA compute version checks to agree with what is reported in the manual.
- Issue a note when there are no MoM segment/triangle basis functions associated with the specified labels for export to a `.sol` file.
- Resolved an error when using CFIE with periodic boundary conditions.
- Fixed a bug in the execution of consecutive far field requests where a change in label selection (OF card) did not trigger a proper re-evaluation of the solution parameters.
- Improved result consistency when using MoM with higher order basis functions and EFIE/CFIE.

Shared Interface Changes

Feature

- Upgraded the 3D CAD modelling library, providing access to the latest Parasolid formats, bug fixes and performance enhancements.

Support Components

Features

- Adjusted AMRFEKO reference levels to provide more accurate converged results when using the low threshold settings.
- Added support to enable AMD AOCL libraries when running a simulation. See the Feko User Guide for more details on setting the environment variable **`ALTAIR_EXT_MATH_API`**.
- The *Get to Know the New CADFEKO Interface* document was removed from the installation. For more information on migrating legacy CADFEKO scripts to the new CADFEKO API format, refer to the Altair Community article.

Resolved Issue

- Fixed an issue that may have resulted in a `Signal 22` error when importing `.fek` files that use 3D anisotropic media.

WinProp 2024.1 Release Notes

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

General

Features

- Extended the wireless standard definition files `.wst` in Example A07 (available in `/help/winprop/examples/ExampleGuide_models`) for 5G, LTE, 802.11be, 802.11ax and UWB.
- Upgraded the Intel MPI library to version 2021.12.1 for Windows and Linux.

ProMan

Features

- Added support for the MS azimuth orientation to be considered in case of full polarimetric projects to account for the polarisation impact on the electric field vector.
- The MS antenna pattern can now be displayed in the 3D view.
- Added support for beam steering in 5G networks based on phased array antennas, where the signal phases fed to the antenna elements are adjusted to form a focused beam in the desired direction and can track the movement of users.
- Resolved an issue where rays were not displayed for urban models with topography and calculating point mode.
- Extended the report generation to include project information.
- Added a button on the **Edit Project Parameter** dialog (**Simulation** tab) to restore the prediction area to the default size in the case of area mode.
- Added the option for coherent superposition of the transmitters to compute the total received power as additional output in a project.
- Extended the balloon tip feature to create a reference point with each click. The balloon tip for the marker shows the result value and the coordinates at this point. A marker is indicated by a red "X" and can be deleted by clicking on the marker. When new results are loaded, the marker info in the balloon tip will be updated accordingly.
- Added support for multiple mobile-station antenna configurations in a project for point and trajectory mode.
- Results, databases, antenna patterns and measurement files in ProMan are now added directly to the zip archive without first copying the files into a temporary location when exporting projects.

Resolved Issues

- The minimum distance for the dominant path model was reduced from 1 m to 1 cm.
- Resolved an issue where selecting a `.ffe` antenna pattern for a transmitter resulted in an error dialog being displayed.

- Resolved an issue where the degree symbol was not displayed correctly on certain dialogs, for example, the **Transmitter Type** dialog and **Cell** dialog.
- Resolved an issue that could have occurred where pixels without topography were not disabled for computations, resulting in computations not progressing after a certain percentage.
- If network planning based on traffic is selected but no applications are defined, an error message is now displayed. In the past, this would have resulted in a crash.
- Resolved an issue where text was cut off on the **Edit Project Parameter** dialog (**Computation** tab) and **Parameter: Ray Tracing** dialog.
- The rural ray tracing model (RRT) has now been enabled for satellite transmitters that are typically outside the given topographical map. Furthermore, a problem with the computation of the direct ray has been fixed, based on which the direct ray was partly missing in the computed results.
- Resolved a crash that could have occurred when opening a database and viewing it in the 3D view.
- Added satellite, gps_satellite and external Tx types to `.csv` export and import.
- The breakpoint distance is no longer checked for the Deterministic Two-Ray model, as it is not used in the computation.
- Satellite transmitters are now displayed in the 2D view. Depending on the position, you might need to zoom out to view the satellites projected onto the 2D view.
- If **Superposed Received Power** is requested, the progress bar remains open if there is an error during the propagation phase.

WallMan

Feature

- Upgraded the ASAM OpenDrive library in WallMan to support the import of traffic signs, which allows you to specify large and complex road networks.

Resolved Issues

- For the conversion of topography and clutter pixel maps in WallMan and ProMan the extract of a part directly at the conversion process is now possible.
- Resolved an issue where vegetation and furniture materials were exported incorrectly to `.ida` files.
- Resolved a crash that could have occurred when opening a database and viewing it in the 3D view.

Application Programming Interface

Feature

- Modified WinProp API structs to use static instead of dynamic memory for strings.

newFASANT 2024.1 Release Notes

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

Solver

Feature

- Upgraded the Intel MPI library to version 2021.12.1 for Windows and Linux.

WRAP 2024.1 Release Notes

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

General

Features

- Improved the default map window by setting **GrayScaleRelief** as the default raster background for a new empty map. The new default setting improves map visibility and reduces the effort to set the map raster background for every new map window. In previous releases, the default map window raster background was always empty even if default Geodata was installed. The raster background then had to be set for each new map window.
- The coverage result levels may now be inverted for many types of results. For example, it is now possible to visualize the required antenna height above and below a certain level. Some result types can now generate more information, both in the result information dialog and printout.
- Coverage results can now be shown as non-interpolated in the map viewer. This may result in a cleaner result image if the result areas are very narrow.
- Heights below -600 meters are now considered valid; the lowest valid height value is now -9998 meters to allow for calculations on planets other than the Earth.
- Extended the function in the Interference tool to include typical stations in the calculation.
- The varying frequency separation has been given the additional options **Round** and **Truncate** to closest allotment channel when calculating the frequency separation. The option **None** corresponds to the single **Varying** option available previously.
- Added a warning if the source directory contains files with different resolutions. Raster file types that are checked are ESRI Arc/Info GRIDASCII, GeoTIFF, and clutter files in TIFF with TFW format.
- Upgraded the Intel MPI library to version 2021.12.1 for Windows and Linux.
- Read the Feko Installation Guide Section 6.2.1 and Section 6.2.8 if you need to update Feko and WRAP and want to keep the same Databases and Geo maps settings as an older version of WRAP.

  These steps are only applicable if you have an existing installation of Altair Feko with WRAP installed and updating to a new major version. If you are updating the minor release or installing the patch, then WRAP will keep the same previous settings by default as long as the Feko version and installation are the same.

Resolved Issues

- Fixed a bug which, in some cases, could move the terrain rasters one pixel to the south.
- Resolved an issue where a large, nearby object in an area patch was not included in the terrain profile used for calculations. Also, the use of vegetation zones for area patches without explicit DEM values for WRAP FM was corrected.
- Resolved a crash when calculating Coverage, **No of Servers, Interference limited** for uplink.
- Resolved a crash that could occur when calculating on radio links longer than 100 km.

- Resolved an issue that may have caused a simulation to go into an endless loop in the case of calculating atmospheric attenuation for a slant propagation path and the smooth earth curvature blocking the LOS.
- Resolved an issue that prevented a custom ellipsoid from being entered.
- Added a warning when an invalid MGRS or GARS coordinate is entered in the position dialog or read during station and area import.
- Added support to pan and zoom while an area is drawn.
- Fixed a bug that prevented the profile from being shown if both the tx and rx positions were already set in a map.

Release Notes: Altair Feko 2024.0.1

4

Altair Feko 2024.0.1 is available with new features, corrections and improvements. This version (2024.0.1) is a patch release that should be applied to an existing 2024 installation.

This chapter covers the following:

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.

newFASANT complements Altair's high frequency electromagnetic software tool (Altair Feko) for general 3D EM field calculations, including, among others, special design tools tailored for specific applications like complex radomes including FSS, automated design of reflectarrays and ultra-conformed reflector antennas, analysis of Doppler effects, ultrasound systems including automotive or complex RCS, and antenna placement problems. Advanced solver technologies like the MoM combined with the characteristic basis functions (CBFS), PO/GO/PTD, GTD/PO and MLFMM parallelised through MPI/OpenMP, being some of them especially efficient for the analysis of electrically very large problems.

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.

WRAP is a comprehensive tool for electromagnetic propagation, antenna collocation and spectrum management. WRAP combines propagation analysis, often over large areas with many transmitters and receivers, with system analysis to include complex non-linear equipment properties.

Feko 2024.0.1 Release Notes

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

CADFEKO

Features

- Added the option to reverse the normal on a model mesh triangle element.
- Added a new **Regroup** feature to allow manipulating the labels of a mesh part. The **Regroup** action can be found on the **Mesh** tab in the **Repair** group. **Regroup** can be used to move a selection of triangle mesh elements into a new mesh label or it can be applied to a mesh part to automatically split up the mesh into separate labels based on its boundary edges.
- Improved visibility of sub-part modification. Added warnings to notify the user that settings might not propagate to the root-level part when applied to a sub-part, which would result in the settings not being used during simulation.
- Made the following improvements to cable path rendering:
  - Improved cable path styling. The increased line thickness and colour change should make cable paths easier to see in the 3D view.
  - Cable paths are now cut by cutplanes.
  - Cutplanes do not cut items that are rendered due to an open dialog.
- Upgraded the ECAD import library used by CADFEKO to the latest version provided by Altair PollEx.
- The CAM350 format is supported for PCB imports.

Resolved Issues

- Fixed a possible crash when executing the solver from CADFEKO.
- Fixed a bug where performing actions quickly through fast mouse clicking could result in a crash.
- Resolved an assertion failure that could occur when opening a `.cfx` file where modifications have been made to model meshes.
- Prevented a crash or assertion failure when creating new model mesh triangles.
- Prevented an assertion failure when deleting model mesh triangles.
- Fixed a crash when deleting filtered details tree entities which had errors.
- Resolved a crash when importing a model with invalid variable group labels containing spaces into Feko 2024, as well as an issue that the tree appeared incomplete when opening the model. Such models could be created in older versions before validation was made stricter in Feko 2024. The problem also affected the EMC log periodic antenna from the component library, causing a crash when trying to add it to a project.
- Fixed a possible crash when automatic meshing is disabled and undo operations are performed.
- Fixed a crash that could have been caused by undoing an action and saving in some cases.
- Fixed a crash that may have been triggered on save, when a wire port references a wire on a geometry part that was separated.

- Fixed a crash that could happen when generating a volume mesh when using the new mesher.
- Fixed a volume mesh bug that caused the creation of tetrahedra that were too small.
- Fixed a meshing bug where surface mesh gradation was not propagated to wires in close proximity.
- Resolved meshing problems related to periodic boundary conditions when using the new mesher:
  - Resolved an issue that caused overlapping triangles at periodic boundaries.
  - Resolved an issue where volume meshing sometimes failed for regions when bounded by periodic boundaries in two dimensions.
- Improved meshing of models with invalid geometry.
- Resolved an issue with the **Find Intersecting Mesh Elements** tool that did not take transforms on mesh parts into account.
- Models containing polygonal UTD plates with more than ten corners can now be loaded and visualised.
- Corrected a problem with the scaling of hyperbolic arcs.
- Fixed a mesh size problem with the offset Cassegrain reflector antenna component in the component library.
- Added context menus when dropping entities into and out of groups to improve usability.
- Resolved an issue where duplicating geometry in groups resulted in the duplicated geometry being placed in the geometry collection instead of inside the group.
- Fixed an issue where modifying non-root-level geometry inside of a subtract may have resulted in the subtract operation not being correctly applied in the geometry evaluation.
- Resolved an issue where modifying non-root-level geometry incorrectly resulted in a missing face at the root-level.
- Resolved an issue where verification failed for a coating setting previously applied to a face.
- Resolved an issue where an SL card was incorrectly written out to the `.pre` file when the cable harness was set to solve using MTL. Schematic links can be used to define connections between cable schematic elements and 3D geometry when the combined MoM/MTL solution method is used.
- Resolved an issue where redundant automatic schematic links were being written to the `.pre` file.
- Added verification of the separation distance for schematic links that define the connection between cables and geometry.
- Extended edge port creation validation to allow specifying a combination of root-level and child part faces in the positive and negative faces list. Schematic link validation now also allows specifying root-level faces in association with an edge port specified using child part faces (and vice versa).
- Added verification to shielded enclosures requiring connectors to be specified.
- Fixed an issue with the **Generate Antenna Array** application macro where the phase difference between array elements, when specified, did not get applied to the excitations.
- Fixed a label dependency in the **Create Inductive Charging Coil** application macro.
- Fixed an issue for the **Create Edge Port for Finite Substrate** application macro, where the voltage source is not added to the edge port when sources were set to per configuration in the model.

POSTFEKO

Feature

- Significantly improved the performance of loading a model with a large number of faces (greater then 10 000) with each of the faces specified to be solved with RL-GO.

Resolved Issues

- Resolved an issue where a POSTFEKO session file containing FEM line ports could not be re-opened if it was created in version 2024 or updated and saved in version 2024. An error message would report that it was an unsupported `.pfs` file version. The sessions that were previously saved can now be opened.
- Resolved a crash that could have been encountered when trying to open certain cable models. The problem affected models where a cable bundle definition was updated to reference a cable cross section that was created after the cable bundle.
- Resolved an assertion failure when changing the source of a near field surface power trace to another result which uses a different coordinate system.
- Resolved an issue with the calculation of second minimum annotations. The incorrect calculation was a regression that got introduced in POSTFEKO 2022.2.
- Fixed the utf8 conversion for the **Optimise model in HyperStudy** application macro. Special characters used in the description field of a variables in CADFEKO are now transferred correctly to the relevant variables in HyperStudy.
- Resolved an issue that caused the **Transmission Line Calculator** application macro to terminate with an error when launching it from POSTFEKO.

Solver

Features

- For faceted UTD, improved checks are used to test for connected surfaces (aligned mesh) and relevant error feedback is provided.
- Improved the memory usage when computing visibility matrices during a faceted UTD solution.
- Improved feedback regarding the convergence of the RBi-CGSTAB iterative process, when it is terminated due to reaching the maximum restart level number of iterations.

Resolved Issues

- Avoided an error when network transformations are required for many ports.
- The number of CPUs and cores is correctly detected for modern CPUs and for high core-count CPUs the processes can be used correctly on Windows. In some cases, the correct environment variables may need to be set to use all available processes.

Shared Interface Changes

Resolved Issue

- Fixed the validation for the conductivity and resistivity input fields for the **Calculate Skin Depth** application macro.

Support Components

Resolved Issue

- Prevent PREFEKO from triggering `ERROR 23480` indicating an inconsistent number of samples in a near field data source when the data is consistent.

WinProp 2024.0.1 Release Notes

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

General

Resolved Issues

- Fixed numerical problems that could have occurred during the geometry check in TuMan.
- Resolved an issue where the special characters were not displayed correctly on dialogs.
- Improved the display of Example-C18-LTE_Urban. This is one of the examples included in the installation package and available in the installation folder, for example, `C:\Program Files\Altair\2024\help\winprop\examples\ExampleGuide_models`.
- Resolved an issue in TuMan where the Track List ASCII import did not import `PORTAL`, `NODE`, and `SPLINE`, elements, resulting in the **Automatic generation of missing track elements** not working correctly.

ProMan

Features

- Added support for line plots and the export of data along polylines for arbitrary planes.
- Added support for satellite transmitters outside the topo map when using the ray-optical propagation models SRT/SBR to consider multipaths.
- Added support for defining a non-stationary satellite with the location in meter scale by adding the **Long/Lat in Deg (otherwise meter)** check box to the **Satellite Location** dialog. In the past, only the longitude and latitude definition was possible.
- For transmitters outside the prediction area (for example, satellites), the whole available topo and clutter map is now considered for the rural propagation models in the vertical plane. In previous releases, only the topo and clutter map of the prediction area were considered, which impacted the computation of the ground reflection for part of the area.
- Extended the report generation to include 3D views with results.
- Improved the 2D view display of vertical plane results computed by the Parabolic Equation solver to be automatically scaled in the Z-direction.
- Improved the parallel efficiency when computing multiple antennas defined in parallel, thus decreasing the average runtime per antenna.
- A warning dialog will be displayed if a result cannot be loaded from the result tree.

Resolved Issues

- Resolved an issue with the superposition of electric field components in RunMS in the case of full polarimetric projects.
- Corrected the LOS/NLOS map for the deterministic two-ray model.

- Resolved an issue where using the SRT/SBR in full polarimetric projects with empirical interaction losses caused the results not to be computed.
- Resolved an issue where the database name was incorrectly appended when opening the **Pixel Databases** or **Building Data** tabs.
- Corrected the consideration of MS polarisation for non full-polarimetric projects.
- Resolved an issue where parts of a large database were not displayed in the 3D view.
- Resolved an issue where the repeater coverage was not calculated due to incorrect assignment of gateways/repeaters.
- A warning will be issued when MIMO is disabled in a network planning project and the defined MIMO IDs are ignored.
- Added support to import measurements from a `.csv` file.
- Removed a memory leak that occurred for time-variant projects containing trajectories.
- Corrected the **Propagation Paths** dialog so that its size can be increased vertically to make more rays and their properties visible.
- The progress window is now automatically closed when a new computation is launched. If the progress window remains open, a warning dialog will inform the user that the progress window must be closed before a new computation can be started.

WallMan

Feature

- Improved the CAD import in WallMan to handle scaling factors with commas. For very small scaling factors, the scale will be set to 1.0.

AMan

Resolved Issue

- Resolved an issue that could have occurred for some cases where the tilt in `.msi` antenna patterns was assumed to be mechanical, leading to incorrect interpolation.

Application Programming Interface

Resolved Issue

- Updated the WinProp API to include all the supported propagation models. The list of propagation models was previously incomplete at some locations.

newFASANT 2024.0.1 Release Notes

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

General

Resolved Issue

- Resolved an issue with importing a `.nas` mesh file into newFASANT.

Release Notes: Altair Feko 2024

5

Altair Feko 2024 is available with a long list of new features, corrections and improvements. Altair Feko 2024 is a major release. It can be installed alongside other instances of Altair Feko.

This chapter covers the following:

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.

newFASANT complements Altair's high frequency electromagnetic software tool (Altair Feko) for general 3D EM field calculations, including, among others, special design tools tailored for specific applications like complex radomes including FSS, automated design of reflectarrays and ultra-conformed reflector antennas, analysis of Doppler effects, ultrasound systems including automotive or complex RCS, and antenna placement problems. Advanced solver technologies like the MoM combined with the characteristic basis functions (CBFS), PO/GO/PTD, GTD/PO and MLFMM parallelised through MPI/OpenMP, being some of them especially efficient for the analysis of electrically very large problems.

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.

WRAP is a comprehensive tool for electromagnetic propagation, antenna collocation and spectrum management. WRAP combines propagation analysis, often over large areas with many transmitters and receivers, with system analysis to include complex non-linear equipment properties.

Highlights of the 2024 Release

The most notable extensions and improvements to Feko, newFASANT, WinProp and WRAP in the 2024 release.

Salient Features in Feko

- Realistic connections of cable signals using the combined MoM/MTL to arbitrary 3D geometry using the MoM are now supported. This enables accurate solutions of radiation and conducted emissions, including effects such as imperfect shielding, pigtails and actual core conductor routing.

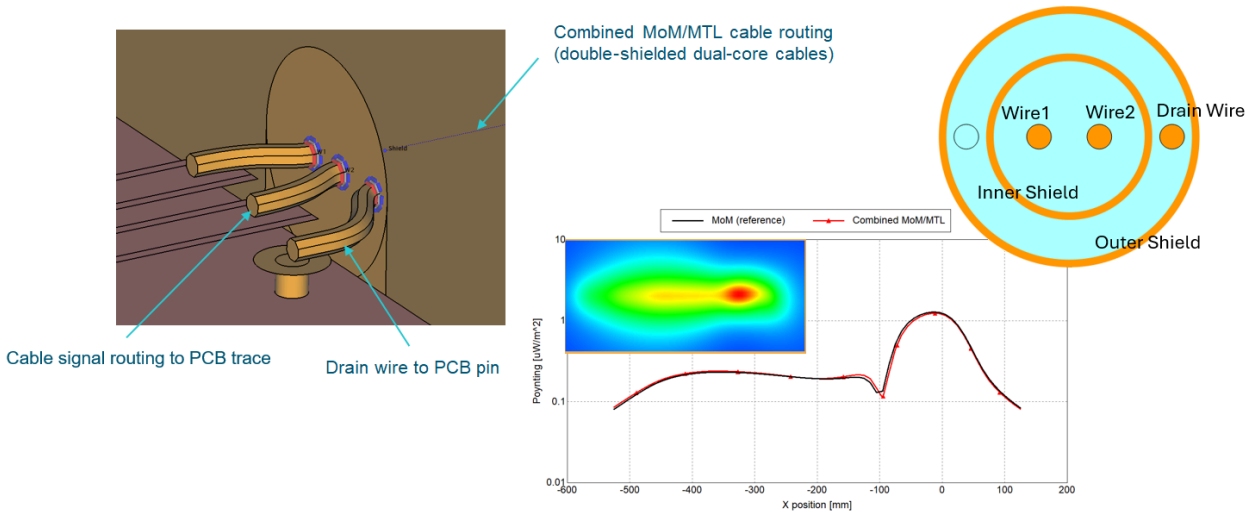


Figure 31: Modelling of a realistic connection between a double-shielded dual-core cable with drain wire and a circuit board using combined MoM/MTL.

- Added support for lossy dielectrics in the CBFM and MLFMM+CBFM.

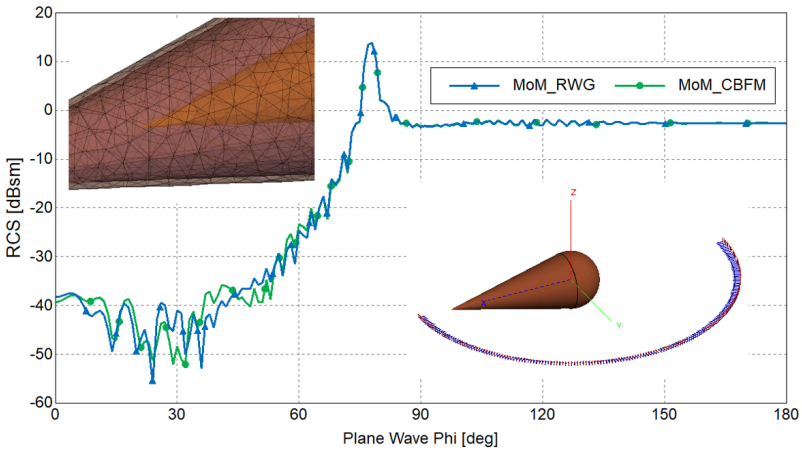


Figure 32: Computation of RCS using CBFM for a cone-sphere coated with a lossy dielectric material. Using this approach large reductions in memory and runtime requirements can be achieved (approximately 13 times less time and memory needed for the cone-sphere example when compared to MoM).

- The following standard RCS test components were added to the component library:
  - Almond
  - Ogive
  - Double-Ogive
  - Cone-Sphere (with gap)
  - Cone-Sphere (without gap)

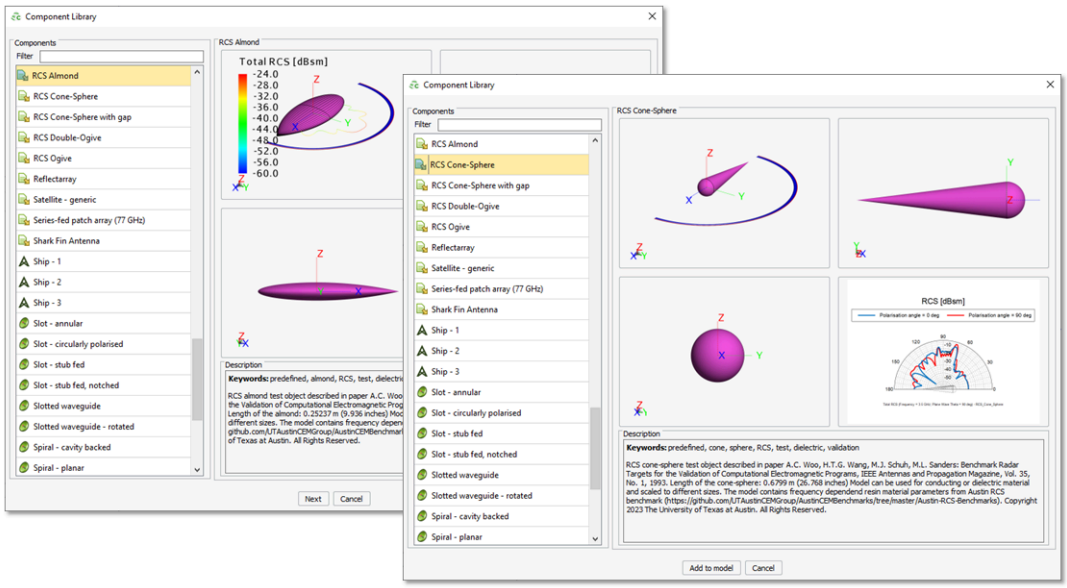


Figure 33: The RCS Almond and RCS Cone-Sphere components available in the Feko 2024 component library.

Salient Features in WinProp

- The Standard Ray Tracing (SRT) method in ProMan was extended to support parallelisation using the Message Passing Interface (MPI).

Number of Threads	Time (seconds)	Efficiency
1	14853	100%
16	956	96.9%
32	485	95.7%
48	330	93.8%
64	267	86.9%
96	190	81.4%
128	152	76.3%

Setting	Time (seconds)	Efficiency
1 node with 64 threads each	22275.0	100 %
2 nodes with 64 threads each	11216.0	99.3%
3 nodes with 64 threads each	7694.0	96.5%

Figure 34: The performance for an indoor model with 3 interactions.

- ProMan now supports the automatic generation of a Microsoft Word report that contains the project name, date and an exported image of each result with a title indicating the result type.

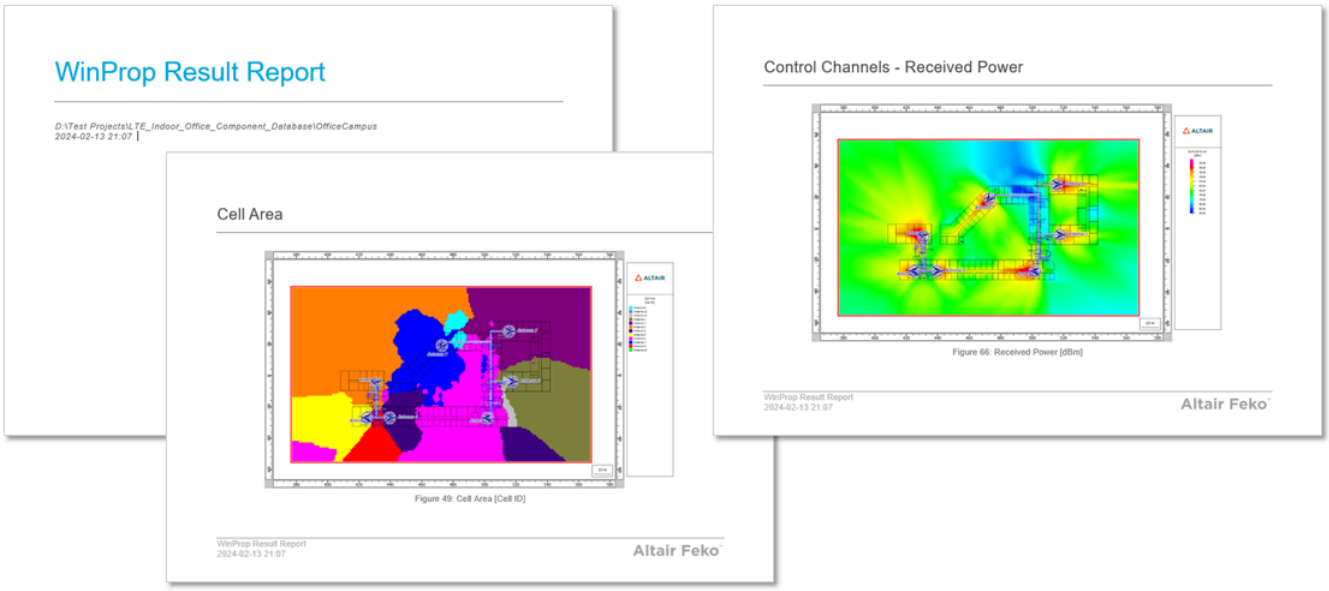


Figure 35: An exported Microsoft Word report showing the exported result images.

- Default vegetation properties were added for 16 frequency bands from 450 MHz to 300 GHz. These properties are also relevant to furniture when an urban database is converted to a full 3D scenario using the "indoor" format.

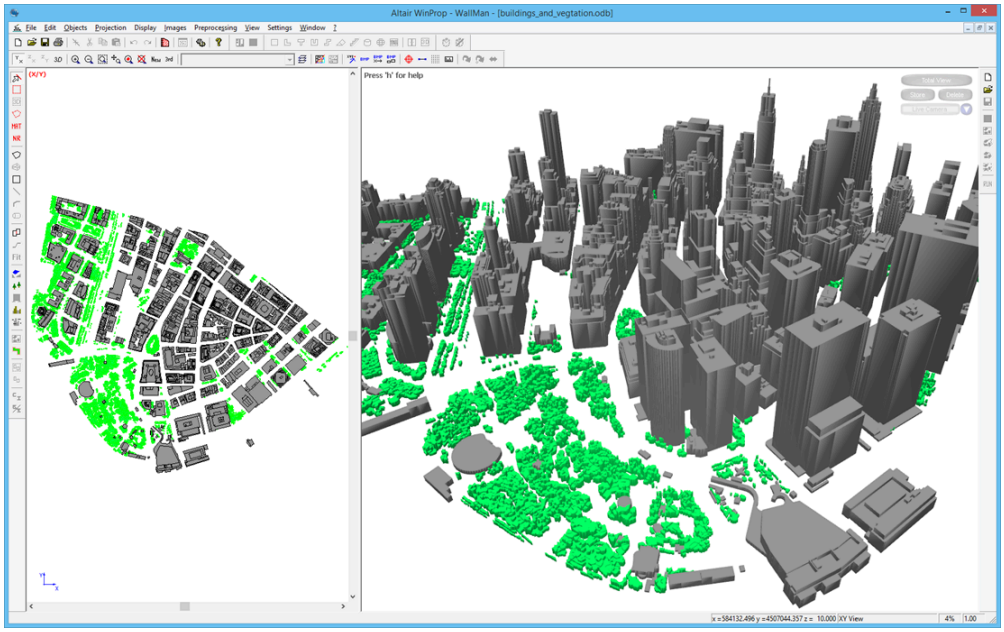


Figure 36: An example of an urban database (`.odb` file showing the vegetation in New York (Manhattan)). The vegetation losses can now be considered from 450 MHz to 300 GHz.

- Bistatic RCS (computed in Feko for a single incidence direction) can now be considered when computing the wave propagation in WinProp in addition to using monostatic RCS. For the incidence direction, a tolerance of 10° is applied. This feature is useful when, for example, a detailed geometry like a windmill is to be considered for a larger propagation scenario or for the consideration of Reconfigurable Intelligent Surfaces (RIS) towards 6G.

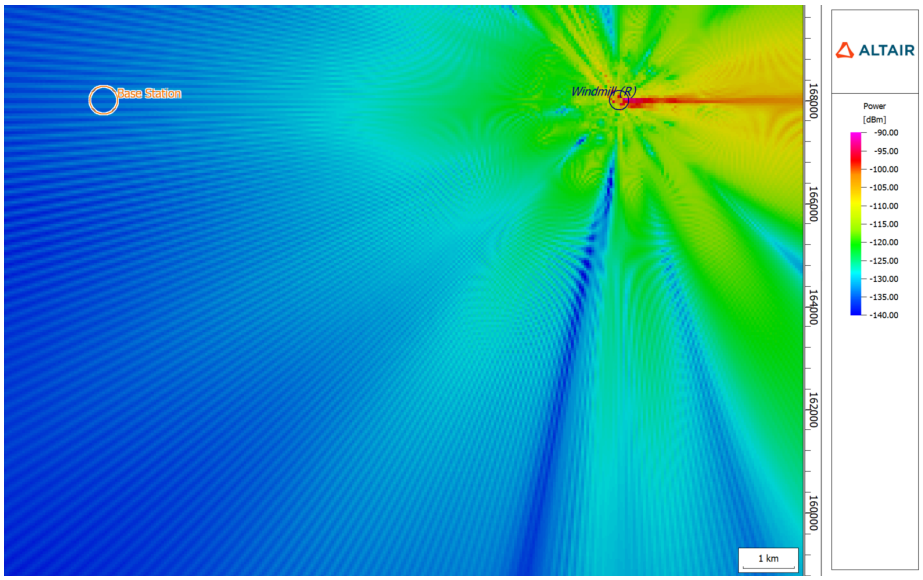


Figure 37: An example of where a windmill is considered in a larger propagation scenario.

- The 2D view was extended to overlay results with transparency on the topography bitmap.

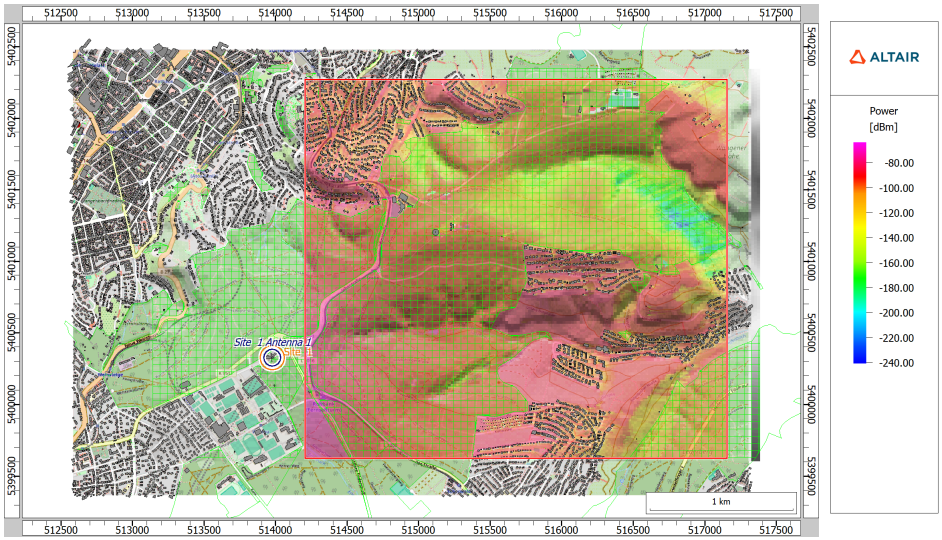


Figure 38: An example of transparent results over the topography bitmap.

Salient Features in WRAP

- GeoTIFF image files larger than 2 GB can now be converted, including GeoTIFF files using PACKBITS compression.

Figure 39: An example of a GeoTIFF image file with a size larger than 2 GB that was converted.

- The equipment type **Circulator** is now available WRAP. A circulator is set on the transmitter side of a station to reduce incoming signals that might generate Tx intermodulation that could be interfering with receivers.

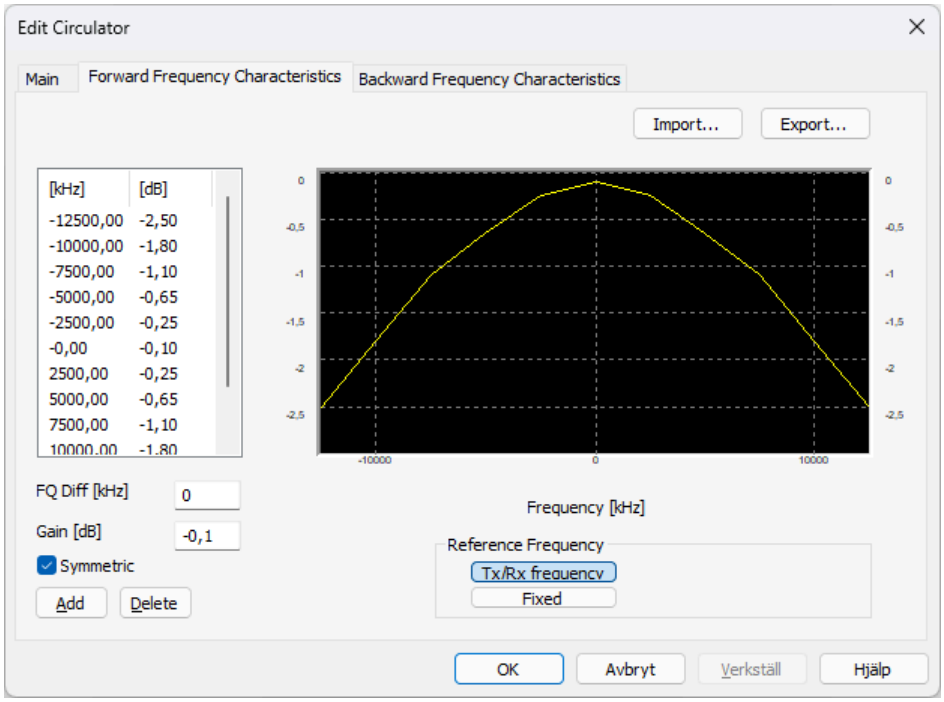


*Figure 40: The **Edit Circulator** dialog where the new equipment type can be edited.*

- The ITU-R P.530-17 propagation model was updated to ITU-R P.530-18.

- The function in the **Spectrum Viewer** tool was extended to include typical stations in the calculation.

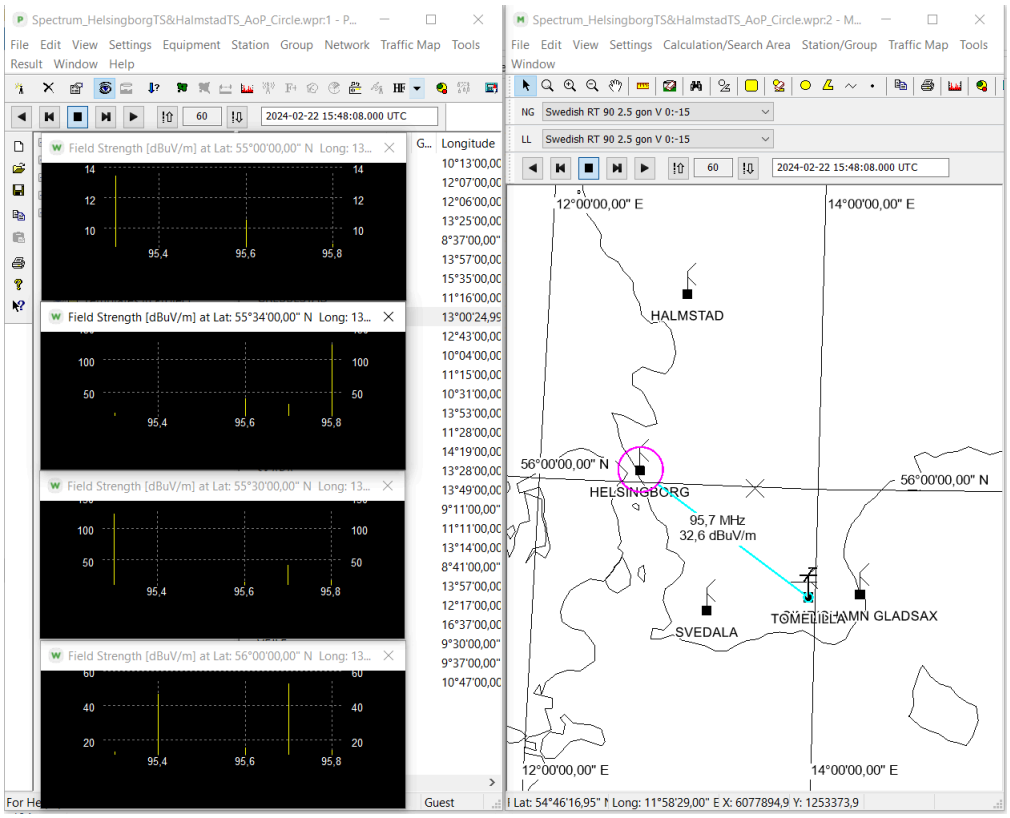


*Figure 41: An example project with two typical stations, Helsingborg and Halmstad. The frequency for the station is shown on the **Spectrum Viewer** dialog, and a line is drawn from the calculation point to a point in the station's operation area, which is the closest point between the calculation point and the area of operation.*

- A database can now be imported in WRAP ChangeDB by right-clicking on a selected database. The import feature replaces the existing selected database with the new one and deletes the existing log file. The existing database file is backed up, and the original database is restored in case of failure.

Feko 2024 Release Notes

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

CADFEKO

Features

- Added an option to disable sampling on edges for near field requests on a Cartesian boundary.
- Added an option to let the Solver automatically determine the approximation method for spherical modes receiving antennas.
- Upgraded the ECAD import library to the latest version provided by Altair PollEx.
- Implemented zoom to selection for schematic view components.
- Added the following to the component library:
  - A standard biconical EMC antenna.
  - A predefined EMC test setup typical of CISPR25 EMC measurements with a biconical EMC antenna.
  - Five models of standard RCS targets (almond, ogive, double ogive, cone-sphere with and without gap).
- Added the **Model Info** script to the **Utility** group of the Application Macro Library. The script prints out a basic text summary of the API objects present inside the model.

Resolved Issues

- Resolved a regression with `Forms` in the API that got introduced in Feko 2023.1.1. The problem caused a form dialog to close when clicking to select an option on the form, instead of the form remaining open until all the options have been configured and the user opts to proceed.
- Resolved a bug where exporting an image from a Lua script would give an error when running the script from the terminal in interactive mode. Image export is expected to fail in non-interactive mode, but should work when running the script from the terminal in interactive mode.
- Resolved an issue where the script editor did not get shown when launching it from the ribbon after it was minimized.
- Resolved an issue where the application could lose focus when opening or saving a project.
- The project is closed correctly when a model fails to open.
- Corrected CADFEKO initial configurations to use the settings provided during the installation process.
- Add environment variables specified on the **Component Launch Options** dialog to the command line of sequential runs. Previously, these were only added for parallel runs.
- Resolved a crash when undoing past the point of opening a model or creating a new project.
- Removed the **Undo View** and **Redo View** actions that were not working as expected and could cause the application to crash.
- Error messages are no longer suppressed when solving a model in a location without write access.

- Fixed a serialisation crash that could occur when saving a model after deleting geometry that had been modified, for example faces or edges had been removed from the part.
- Improved tracking for edge, face and vertex deletion as well as CAD fixing operations to correctly track regions and region settings before and after the changes.
- Operators that modify geometry will now create the resulting geometry where the original geometry resided in the model tree hierarchy. As an example, using Simplify on a part inside a group will create the simplified geometry in the group.
- Improved application performance for large models with many tree items.
- Improved user interaction performance during meshing.
- Improved meshing for low frequency models when using the new mesher.
- Improved meshing for models with small details but a large mesh size when using the new mesher.
- Resolved a bug where FEM ports were not transformed correctly for the volume mesh. Meshing could have failed in models containing FEM line ports.
- Fixed issues with the mesh not correctly being captured between undo and redo actions.
- Fixed the verification check that informs the user when a mesh still needs to be generated to ignore excluded entities.
- Fixed a case where creating a hyperbolic arc would crash the application.
- Resolved a crash when zooming to selection on Cartesian boundary or tetrahedral mesh near field requests.
- Fixed an assertion failure when clicking on apply after using point entry to edit the last widget in a coordinate list, for example, when modifying a cable path or polyline.
- Resolved an issue where anisotropic dielectric media were not imported during CADFEKO model import.
- Resolved an assertion failing when adding certain plastics from the Altair Material Data Center. An error message is now triggered if a material fails to load.
- Added validation to CADFEKO model import that prevents legacy models with same named entities from being imported.
- Resolved a crash when grouping many variables that had lots of dependencies within the model.
- Resolved an issue with variable creation where point entry of variables inside groups did not include the group name.
- Added validation to group labels to ensure that groups and entities inside of groups have unique labels. Existing models with incorrect labels will be corrected upon loading.
- Fixed an issue with the calculation of relative paths when the user selects a directory in the file browser, for example, when importing near field data.
- Updated validation to allow the radius of a twisted pair cable to be equal to two times the sum of the core radius and insulation thickness. Previously, incorrect validation prevented some legacy models from converting correctly.
- Added validation when using cable harnesses to make sure variable $c0$ is accessible. This variable that defines the speed of light in free space gets used in calculations to determine if the model setup is valid, for example, when determining if a cable runs within the required distance from a conducting surface or ground plane.

- Resolved an issue where schematic connections could be lost when adding or removing pins from a cable connector. Cable connector pins that are connected on the schematic can also no longer be removed when modifying a connector.
- Cable signals from cancelled modification no longer prevent deletion of cable connectors.
- Corrected the text for a tooltip indicating why the cable schematic **Installation** button is disabled.
- Improved the verification message for ports on overlapping segments. This verification check for mesh ports now take transforms into account.
- Updated the check box text on the **Create Waveguide Port** dialog from **Propagation direction opposite to normal** to **Port direction opposite to the face normal**. This check box allows the user to reverse the port direction. The arrow indicating the port orientation should always point into the waveguide section, irrespective of whether the port is used as a source or a sink.

EDITFEKO

Features

- Added the schematic link (SL) card for defining the interface between cable schematic elements and 3D geometry.
- Added the port (PT) card for defining ports referenced by subsequent cards that define sources, loads, networks as well as schematic links in cable harnesses.
- Extended the various source, load and network cards to support referencing a port defined with a PT card.
- Added a checkbox on the FE card panel to toggle sampling on edges for cartesian boundary near field requests.
- Extended the RA card with the spherical modes source type option to automatically determine the approximation method.

POSTFEKO

Resolved Issue

- Fixed a crash when changing axis indexes on a Cartesian surface graph.

Solver

Features

- Support physical optics integrals in the computation of monostatic RCS when using RL-GO with the normal accuracy setting for improved performance and accuracy.
- For the characteristic basis function method (CBFM) that is used by the MoM and MLFMM solvers, support lossy dielectrics in the surface equivalence principle (SEP).
- Support an arbitrary number of thick coatings for the CBFM.

- Introduced a cable schematic link definition to support realistic connections of cable signals using the combined MoM/MTL to arbitrary 3D geometry using MoM ports and a reference plane.
- For spherical mode receiving antennas added an option to automatically switch to the far field representation if the receiving antenna is in the far field of the geometry and transmitting antenna system.
- Added support for disabling the sampling on edges for Cartesian boundary near field requests.
- Extended transmission and reflection ray effects for faceted UTD (planar and curved geometries) for the following materials: isotropic multilayer dielectric coated PEC (only reflection), isotropic multilayer thin dielectric sheets, impedance sheets and characterised surfaces. Multiple reflections or transmissions are supported.
- For the LU decomposition phase of a MoM solution, new options (values of -2, -1 and 0) are now supported for the FEKO_BLOCKSIZE environment variable. This could be used in specific cases on specific systems.
- Adjusted the default block size settings used during hybrid FEM/MoM solutions using MPI to improve performance.

Shared Interface Changes

Features

- Added support for `.fek` file format 195 to accommodate new features.
- Updated the library used to create and extract zip archives to the latest version.

Support Components

Feature

- Added PREFEKO support for Cartesian boundary near field requests where the sampling on edges is disabled.

WinProp 2024 Release Notes

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

ProMan

Features

- Added support in the 2D view to display a background bitmap with transparent results.
- Added support for bistatic RCS (computed in Feko for a single incidence direction) for the wave propagation in WinProp in addition to using monostatic RCS. For the incidence direction, a tolerance of 10 degrees is applied up to which the bistatic RCS can be considered.
- Added optional SRT post-processing for urban and indoor IRT propagation models. By default, this additional post-processing is disabled, but it can be enabled in the `.nup` or `.nip` file by setting `IRT_POSTPROCESSING_WITH_SRT y`. Conversely, disable the additional post-processing by setting `IRT_POSTPROCESSING_WITH_SRT n`.
- Added support for parallelisation using the Message Passing Interface (MPI) for the SRT method.
- Added the UTM zone information to the header of the ASCII `.txt` and `.str` files.
- Added support for automatically generating a Microsoft Word report containing the project name, date and an exported image of each result with a title indicating the result type.
- Added support to display the cross-sectional view of the database along the plane axes for arbitrary prediction planes.
- Added default vegetation properties for 16 frequency bands from 450 MHz to 300 GHz.

Resolved Issues

- Resolved issues when exporting an image and scaling the bitmap, which include the legend not being scaled in accordance with the bitmap, missing buildings when upscaling the image, the legend font size not adjusted if the bitmap was scaled and a crash that occurred when downscaling the bitmap, to smaller than the border rules.

WallMan

Feature

- Added support for importing Planetary Data System (`.img` / `.lbl` / `.xml`) topography maps.

Application Programming Interface

Feature

- Added support in the API for 5G beam switching capability using a predefined set of beams.

WRAP 2024 Release Notes

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

General

Features

- Extended the function in the **Spectrum Viewer** tool to include typical stations in the calculation.
- Conversion of GeoTIFF image files larger than 2 GB is now possible. GeoTIFF files using PACKBITS compression can now also be converted.
- Added support to import a database in WRAP ChangeDB by right-clicking on a selected database. The import feature replaces the existing selected database with the new one and deletes the existing log file. The existing database file is backed up, and the original database is restored in case of failure.
- Improved area patch buildings on slopes. The rooftops are now horizontal for area patch buildings. Decimal values for all types of area patches are now handled correctly.
- When loading a geo class file, the default was changed not to replace current geo classes but to append to the current ones.
- Added support for converting MapInfo files with building data (exported from WinProp) to WRAP area patches in Shapefile format.
- Updated propagation model ITU-R P.530-17 to P.530-18.
- The equipment type **Circulator** was added to WRAP. A circulator is set on the transmitter side of a station to reduce incoming signals that might generate Tx intermodulation that could be interfering with receivers.
- Replaced the term “master” with “primary”.
- As part of changes to the Altair Educational program, the limitations of WRAP Student Edition applications have been removed.

Resolved Issues

- Fixed a bug in the **Link Performance Analysis** tool, which may result in wrong values for the recommended tilt angles for the antennas in diversity analysis.
- The log file is now cleared when the corresponding menu item is selected.

Release Notes: Altair Feko 2023.1.2

6

Altair Feko 2023.1.2 is available with various corrections and improvements. This version (2023.1.2) is a patch release that should be applied to an existing 2023 or 2023.1 installation.

This chapter covers the following:

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.

newFASANT complements Altair's high frequency electromagnetic software tool (Altair Feko) for general 3D EM field calculations, including, among others, special design tools tailored for specific applications like complex radomes including FSS, automated design of reflectarrays and ultra-conformed reflector antennas, analysis of Doppler effects, ultrasound systems including automotive or complex RCS, and antenna placement problems. Advanced solver technologies like the MoM combined with the characteristic basis functions (CBFS), PO/GO/PTD, GTD/PO and MLFMM parallelised through MPI/OpenMP, being some of them especially efficient for the analysis of electrically very large problems.

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.

WRAP is a comprehensive tool for electromagnetic propagation, antenna collocation and spectrum management. WRAP combines propagation analysis, often over large areas with many transmitters and receivers, with system analysis to include complex non-linear equipment properties.

Feko 2023.1.2 Release Notes

The most notable improvements to Feko are listed by component.

CADFEKO

Resolved Issues

- Resolved a regression that prevented CADFEKO_BATCH version 2023.1.1 from successfully updating models with parameter changes. The problem could be observed as warnings in optimisation output that the execution of CADFEKO_BATCH failed. This regression had severe impact on optimisation workflows, causing OPTFEKO to terminate due to errors.
- Fixed an intermittent hang triggered by running a Lua script from CADFEKO using a command line argument and running the script in non-interactive mode. This mechanism is used extensively when doing optimisations through HyperStudy, where this hang was prevalent.
- Resolved an issue where importing a `.fek` file with transformed parts did not transform all triangles.
- Resolved various meshing-related issues by updating the new meshing library to the latest version. This version resolves problems when meshing imported geometry, specifically with overlapping triangles created at the ends of slanted T-junctions and resilience against invalid meshes when vertices are very close together. There is improvements with the handling of thin metallic faces on dielectric boundaries to avoid collapsed triangles and small gaps, especially on symmetry boundaries. The remeshing of wire model meshes has also been improved.
- Corrected an error where CADFEKO Lua scripts referencing string names of entities may have interpreted the strings as integer numbers resulting in index errors or operations on the incorrect entity.
- When performing a series of of geometry operations, undo/redo operation and toggling automatic meshing, a potential crash is now avoided.
- Resolved a crash that could occur when rotating the 3D view with the selection type set to edge selection.

Solver

Resolved Issue

- A change made to the faceted UTD method in the Feko 2023.1.1 hotfix update caused poor performance and inaccurate results in some cases. This change has been reverted as part of this hotfix. The intended improvements will be reimplemented in a better way for a future release.

WinProp 2023.1.2 Release Notes

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

Application Programming Interface

Resolved Issue

- Resolved an issue where the path loss was incorrectly calculated using the WinProp API.

Release Notes: Altair Feko 2023.1.1

7

Altair Feko 2023.1.1 is available with various corrections and improvements. This version (2023.1.1) is a patch release that should be applied to an existing 2023 or 2023.1 installation.

This chapter covers the following:

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.

newFASANT complements Altair's high frequency electromagnetic software tool (Altair Feko) for general 3D EM field calculations, including, among others, special design tools tailored for specific applications like complex radomes including FSS, automated design of reflectarrays and ultra-conformed reflector antennas, analysis of Doppler effects, ultrasound systems including automotive or complex RCS, and antenna placement problems. Advanced solver technologies like the MoM combined with the characteristic basis functions (CBFS), PO/GO/PTD, GTD/PO and MLFMM parallelised through MPI/OpenMP, being some of them especially efficient for the analysis of electrically very large problems.

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.

WRAP is a comprehensive tool for electromagnetic propagation, antenna collocation and spectrum management. WRAP combines propagation analysis, often over large areas with many transmitters and receivers, with system analysis to include complex non-linear equipment properties.

Feko 2023.1.1 Release Notes

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

CADFEKO

Features

- Improved the new mesher behaviour, specifically related to wire meshing.
- Fixed a crash that could have triggered when closing some dialogs with the X in the title bar.
- Extended the Lua API with "run and continue" methods to be used in addition to the "run and wait until complete" methods. These methods apply to the Feko Solver, PREFEKO and OPTFEKO. Support is also added for running AMRFEKO from scripts.
- Added validation that would trigger an error message when a shielded enclosure references an excluded region.
- Improved the problem description and the validation for coatings and thin dielectric sheets.
- Added missing documentation for view manipulation API methods.

Resolved Issues

- Removed an error given incorrectly when defining an edge port on a VEP region.
- Improved verification of FEM line port validity.
- Removed a warning message that was incorrectly issued for S-parameter and characteristic mode analysis configurations when modelling cables with circuit crosstalk.
- Prevent a crash when importing geometry with corrupt bounding boxes.
- Added API documentation for auxiliary Lua methods that were previously undocumented.
- Fixed an issue with the new mesher not refining the mesh around feed points.
- Fixed an issue with the new mesher creating meshes with intersecting triangles.
- Fixed a problem with the new mesher that would cause volume meshing to fail.
- Resolved an issue where wires with the windscreen solution method did not have their labels written to the `.pre` file correctly in all cases. The solver would terminate with `ERROR 34480: Different windscreen antennas/reference planes not allowed to share the same label`, even though the model was correctly set up in CADFEKO.
- Resolved a crash when adding multiple polylines or cable paths in succession, without closing the creation dialog, and using point entry mode to add values to the dialog from the 3D view.
- Fixed a bug where symmetric meshing would take longer than regular meshing.
- Fixed a crash when trying to modify a locked part.
- Fixed a crash when clicking on a geometry preview in the 3D view.
- Fixed an issue with the **Reverse polarity** setting on wire and microstrip ports not being correctly written to the `.pre` file for transmission lines.
- Fixed an issue with the manually specified cable reference direction not taking the cable path workplane into account.

- Resolved an issue where the waveguide mode rotation angle specified in S-parameter requests was not written correctly to the .pre file.
- Fixed an issue where certain cable models would not generate `.pre` file cards correctly, causing an empty `.pre` file to be written out.
- Resolved an issue that caused a crash when attempting to add or modify a far field request in some models. This was a regression that got introduced in CADFEKO 2023.0.1.
- Fixed a bug where working with a large number of selected mesh elements could crash or hang the application.
- Resolved an issue where unlinking a wire with a surrounding medium did not result in a mesh wire with the same surrounding medium. This could have triggered the error `ERROR 3848: Wrong specification of the medium for a wire segment` when solving the model without manually setting the wire surrounding medium properties.
- Improved .pre file writing so that the ground planes are only written out once. This leads to faster solutions for models with multiple configurations.
- Corrected near field request .pre file writing when using the conical coordinate system.
- Expressions in Lua can now be assigned using variables and named points when using a properties table or individual property assignments. Previously, variables and named points could not be directly assigned and the Label property had to be used to assign variable and named point values.
- Improved edge and face selection so that edges behind faces are not selectable.
- Resolved issues for various geometry and request types, as well as the cutplane and workplane, where dimensions and coordinates defined by named points were not correctly interpreted. This could have resulted in incorrect positions and dimensions for non-default workplanes and applying rotations could unexpectedly change the dimensions of geometry.
- Fixed a bug with periodic boundary condition meshing precision. This could have resulted in the Feko Solver issuing `ERROR 32723: For periodic boundaries no geometry is allowed outside the unit cell.` for a model that should have been solved successfully.
- Fixed a crash when importing geometry with many parts.
- Improved the tolerance of the PCB simplification algorithm to avoid import failures when scaling is applied. Before this fix, polygons could have imported with gaps resulting in a failure to create the correct face.
- Resolved a crash when running a script that deletes an object twice. An error will now be issued when the object being deleted is invalid.
- Resolved a crash when using the details tree while a group was selected.
- Added previews to transformations of groups.
- Resolved unresponsive dialog behaviour when double clicking instead of clicking once to enter a value from the model tree while in point entry mode (holding Ctrl+Shift).
- Fixed a crash where the target geometry of a projection is deleted before the projection is applied.
- Fixed an issue with the Split process where variables were not preserved for the resultant geometries.
- Fixed a crash when opening the properties of geometry from the tree in some special cases.
- Fixed a bug where an error message was given incorrectly for a dielectric sheet with frequency-dependent magnetic properties.

- Resolved various problems that could ensue after replacing the target in an operator that has a target, for example, subtract or path sweep.
- Fixed a crash when unlinking a mesh containing a port that doesn't reference a face or wire.
- Fixed a bug where simplification of geometry would not remove all edges that were expected to be removed.
- Corrected the `.pre` file writing for cable device grounds connected directly to an installation.
- Fixed a bug where refinement regions with a size larger than the global mesh size caused incorrect meshing.
- Resolved an incorrect warning for FEM regions that were previously set to the SEP (default) solution method with local basis function control enabled.
- Resolved an issue where FEM element order and higher order basis function settings were not written to the .pre file for FEM and MoM regions.
- Fixed the legacy model conversion of some path sweeps that failed to convert correctly.
- Resolved an issue where the full path to a file was required when importing PCB files through the API.
- Resolved an issue with scripting where evaluating an expression with an invalid value would crash the application.
- Resolved an issue where a model kept showing unsaved changes (indicated by an asterisk next to the filename in the title bar) after it was saved from the prompt that gets triggered when running the Feko Solver.
- Resolved a crash when remeshing UTD model meshes using the legacy mesher.
- Resolved an issue with cable paths not always being visible in the 3D view when the view is zoomed out.
- Fixed a symmetry verification issue where excluded entities were causing errors.
- Avoid a crash when the machines file (used for parallel execution and farming) has invalid content, is empty or missing.
- Improved the run dialog to update more regularly from the output produced by the running component.
- Ensured CADFEKO_BATCH will show an error message if the memory check finds insufficient resources for meshing.
- Added API documentation for the **`CableRoute`** object.
- Fixed a bug where CADFEKO_BATCH did not maintain the automatic meshing setting of a model and would save the model with automatic meshing enabled. The setting is now restored once meshing is complete.
- Resolved an issue where the continuous snapping marker was too large.
- A model of a base station sector antenna was added to the component library.
- Always apply basic healing, including removal of duplicate points and making small tolerance adjustments, when importing PCB files to avoid unexpected import errors and tiny gaps in imported geometry.
- Fixed the meshing of edges with local mesh sizes set. These edges were getting over-refined in the resulting mesh.

- Resolved an issue with .pre file writing where FP cards for FEM regions did not contain element order or MoM decoupling information when global HOBF was disabled.
- Fixed the show/hide tree action on the ribbon (**Tree** button on the View tab).
- Removed the ability to transform edge mesh refinements. The refinement position is defined by the edge, thus transforms are not applicable.
- Fixed the message output in interactive mode for the **Adaptive Meshing** application macro.
- Revised API documentation to add missing links.
- Resolved a crash when manipulating variables using the **Modify Variables** dialog and then opening a model.
- A regression that got introduced in Feko 2023.1 prevented the exclamation icons that indicate warnings or errors to be shown for tree items that do not have a default icon. The icon now gets shown with the tooltip that displays the associated warning or error messages.
- Improved automatic mesh size choices for electrically small models or simulations at low frequency.
- Fixed a problem that could cause the volume mesher to crash on Linux.
- Fixed a crash that could occur when filling holes.
- Changed the background colour of images exported from CADFEKO from grey to white.
- Modified cutplanes to affect named points shown in the 3D view.

POSTFEKO

Resolved Issues

- Fixed a bug where POSTFEKO incorrectly used global coordinates when writing out coordinate values to `.efe` and `.hfe` files for near field requests that were specified with local coordinates.
- Fixed an assertion that failed when loading a .bof file without the .fek file present when the model contained finite antenna arrays (FA cards).
- Fixed a crash that occurred when opening a `.pfs` file containing a large model and selecting **Hide geometry**.
- Fixed a bug that prevented POSTFEKO displaying near field potential values when requested as specified points.
- Fixed an issue where zoom to extents was not working for surface graphs when called from a script.
- Fixed an issue where coordinates on annotations of Cartesian-based near field results were displayed as local coordinates. The annotations now correctly show global coordinates.

Solver

Features

- The double wedge diffraction is computed if the user selects **Include edge and wedge diffractions** and the maximum number of interactions is greater than 1.

- The summary of required times written to the out file now includes a separate row for the calculation of CBFs related to the characteristic basis function method.
- Upgrade to MUMPS 5.6.2.1altair.

Resolved Issues

- Some reflected rays which may have been missed are now correctly resolved when using the faceted UTD solution method,.
- Address an internal Feko error for the sparse LU FMM preconditioner due to a negative count at MPI_Pack (related to upgrade to MUMPS 5.6.2.1altair).
- Fixed a bug that caused invalid memory allocation errors for MLFMM problems with very high losses.
- Consistent results will be given for all reference vector directions when using characterised surfaces illuminated at normal incidence with RL-GO.
- Improve robustness with the conversion of MPI processes to OpenMP threads to conserve FEM or MLFMM-FEM sparse LU preconditioner memory for an irregular distribution of MPI processes over compute nodes.
- During solutions on Windows machines, the correct output will always be directed to stdout (this corrects a situation where some output may have incorrectly been directed to stderr for some situations).
- Various improvements to MoM/MTL solutions to reduce numerical noise, improve management of connection points and schematic link connections as well as error message text improvements.

Shared Interface Changes

Resolved Issues

- Corrected the rendering of plane waves with a local workplane in CADFEKO and the POSTFEKO rendering of plane waves with an origin (phase reference point) that does not coincide with the global origin.
- Fixed an issue where the version number shown in the Feko Terminal title was incomplete.

Support Components

Features

- Improved the text formatting of AMRFEKO output to be more consistent with other components.
- Variable limits defined in the CADFEKO model will be transferred to HyperStudy when using the Feko-HyperStudy interface.
- Added create line options for the **Transmission Line Calculator** application macro. This allows the user to create the line calculated in a CADFEKO model.

Resolved Issues

- Improved the handling of S-parameter configurations when using AMRFEKO.

- Disabled CADFEKO auto-meshing where relevant when using the HyperStudy Feko interface.

WinProp 2023.1.1 Release Notes

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

General

Feature

- Added the tunnel length per segment to the information dialog given by the tunnel check.

Resolved Issues

- Resolved an issue where surface roughness was not considered in TuMan.
- Walls with material ID -1 are no longer exported from TuMan.

ProMan

Features

- The 5G numerologies 4, 5, and 6 have been added for 100, 200, and 400 MHz bandwidth.
- The upper limit for the Tx power was increased to 150 dBm.
- Different colours for already used and unused frequency carriers are now also applied in the **Carrier Assignment** dialog.
- Support was added to export images of all the results to a specified folder. These images can be used to create a report.

Resolved Issues

- Avoided a crash with leaky feed cables where DPM was used for an indoor project.
- The RunMS option of randomly distributed phases has been corrected.
- Resolved an issue for rural projects, where using the deterministic two-ray model, the correct ground reflection point is now computed for the case where the transmitter is defined outside the topo map, for example, a satellite.
- Resolved an issue that prevented components from being connected across different floors.
- Resolved a crash that could have occurred when the SBR solver only found a ray with transmission.
- Fixed a crash which might have occurred when opening a result file individually without a project.
- Resolved an issue where rays with invalid ray geometry were not discarded for the SBR solver.
- Fixed a crash in ProMan when displaying the Doppler-Heat map a second time.
- Fixed a crash that could have occurred for the calibration of DPM using point mode, which is not supported.
- Resolved an issue for the SRT where reflections were not computed after scattering.
- For furniture objects, default properties can now be defined and considered in the simulation (for all the furniture objects in the scenario).

- Resolved a crash that occurred in `Propagator.dll` when computing the propagation.
- Included Doppler shift when interacting with vegetation and furniture.
- Fixed the progress bar output for the urban IRT preprocessing and prediction to avoid overflows in case of a huge number of pixels.
- Fixed the not predicted areas in LOS when using the KE post-processing for an urban IRT project with a sub-area preprocessed for IRT.
- Resolved an issue where the total power result was unavailable for point mode analysis.
- Resolved an issue with the display of topography where the wrong colour was used in the 2D view. After displaying a result and selecting a display layer, the topography was no longer displayed if clicking on **Database** > **Topography**.
- Fixed a crash that occurred when running RunMS if multiple trajectories were defined and one was disabled.
- Corrected the dialog text for post-processing results with multiple heights (for example, subtract).
- Fixed the legend display to use the correct scaling when importing measurements using **File** > **New Measurement File**.

WallMan

Features

- Resolved an issue where the topography map in `.tif` format could not be converted to `.tdb` format due to undefined values.
- Added an information dialog for the preprocessing in WallMan that asks if the existing preprocessed file should be overwritten should it already exists.

Resolved Issues

- Resolved an issue where group names were not stored in the `.idb` file with the result that it displayed incorrectly on dialogs.
- Resolved an issue with the export of a MapInfo file, where building heights were exported as an integer instead of a float in the `.mif` file.
- Improved the file handling in WallMan to suggest by default the same folder for **File** > **Save As** as used for **File** > **Open**.

Application Programming Interface

Feature

- Added support for urban API computations to load buildings and the topography from either a file or memory. In the past, building and topography could only be loaded from a file or memory, but not a combination of the two.

Resolved Issue

- Resolved an issue with the API where the `hwloc-15.dll` library was missing from the installation.

WRAP 2023.1.1 Release Notes

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

General

Feature

- Added several example files with measured coverage results using different formats.

Resolved Issues

- Resolved an issue with the **Pan and Zoom** check box in the ObsMan Link Check Tool.
- Resolved issues in propagation models ITU-R P.2001/P.368 and ITU-R P.526, which led to strange transmission loss values when the transmitter or receiver antenna was below/inside an object.
- Disabled mobile heights settings for trajectory type of calculation area on the **Coverage** dialog. Added new settings on the **Edit Trajectory** dialog to allow setting the same altitude for all trajectory points.
- Fixed a bug in the importing of measured coverage results from text files.
- Removed a warning message in ObsMan regarding the z value shown when irrelevant.
- Fixed a crash that occurred when using a MapInfo file lacking CRS information.
- Resolved an issue where the heights in the site and station dialogs were not updated correctly when a sub-site was moved relative to its parent.
- Resolved errors that occurred when using the geo class option **Ground + building height ASL [m]**.
- Sample projects paths have been updated in API messages.

Release Notes: Altair Feko 2023.1

8

Altair Feko 2023.1 is available with an assortment of new features, corrections and improvements. Altair Feko 2023.1 is a major release. It can be installed alongside other instances of Altair Feko.

This chapter covers the following:

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.

newFASANT complements Altair's high frequency electromagnetic software tool (Altair Feko) for general 3D EM field calculations, including, among others, special design tools tailored for specific applications like complex radomes including FSS, automated design of reflectarrays and ultra-conformed reflector antennas, analysis of Doppler effects, ultrasound systems including automotive or complex RCS, and antenna placement problems. Advanced solver technologies like the MoM combined with the characteristic basis functions (CBFS), PO/GO/PTD, GTD/PO and MLFMM parallelised through MPI/OpenMP, being some of them especially efficient for the analysis of electrically very large problems.

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.

WRAP is a comprehensive tool for electromagnetic propagation, antenna collocation and spectrum management. WRAP combines propagation analysis, often over large areas with many transmitters and receivers, with system analysis to include complex non-linear equipment properties.

Highlights of the 2023.1 Release

The most notable extensions and improvements to Feko, newFASANT, WinProp and WRAP in the 2023.1 release.

Salient Features in Feko

- Feko's combined MoM/MTL cable solution method is extended so that the outermost shield signals of different paths in the harness may be connected to each other through a closed shielded conducting enclosure of arbitrary shape defined in the 3D full wave model. Full coupling is considered between the cable harness, the shielded enclosure and the environment. Non-radiating electrical and circuit connections between different cable path signals can be defined in a schematic view - effectively modelling connections and circuitry within the shielded enclosure.

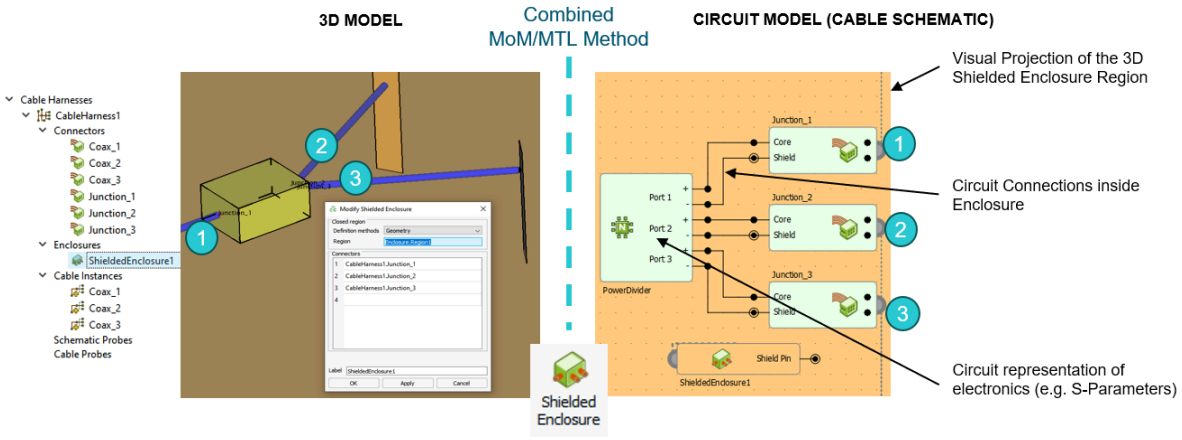


Figure 42: Illustration of the new shielded enclosure functionality in Feko.

- The following components were added to the component library:
  1. A generic car model
  2. A “shark fin” antenna system for cellular, GNSS, SDARS, V2X and WLAN, typical in automotive applications
  3. A generic windmill model

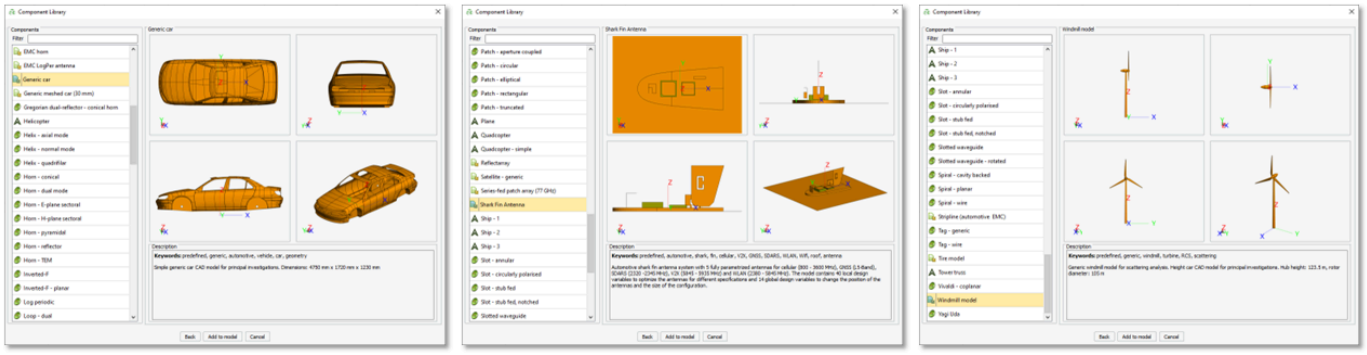


Figure 43: Three new components available in the Feko 2023.1 component library.

Salient Features in WinProp

- ProMan now supports 5G beam switching capability using a predefined set of beams. Users can now be served by a dedicated beam, with the possibility to transition to a different beam as they move.

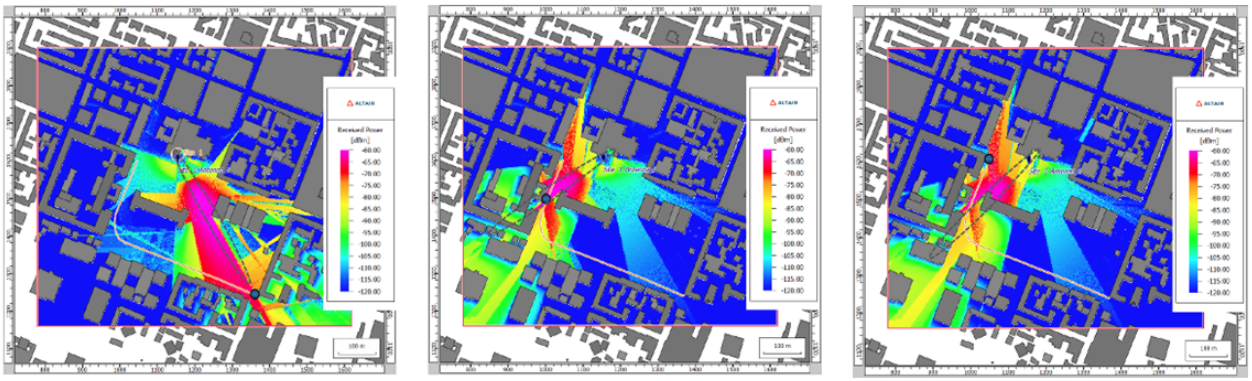


Figure 44: Left: Only the data beams that are serving a user are active (the best serving beam is selected. Centre: If the user moves, it switches to another predefined beam. Right: The serving beam is not necessarily oriented in the direct direction, it can for example, come from a reflection at the building.

- Added support in ProMan to display the total power from all transmitters in the tree under **Results: Propagation** if the **Superposed Received Power** check box was selected.

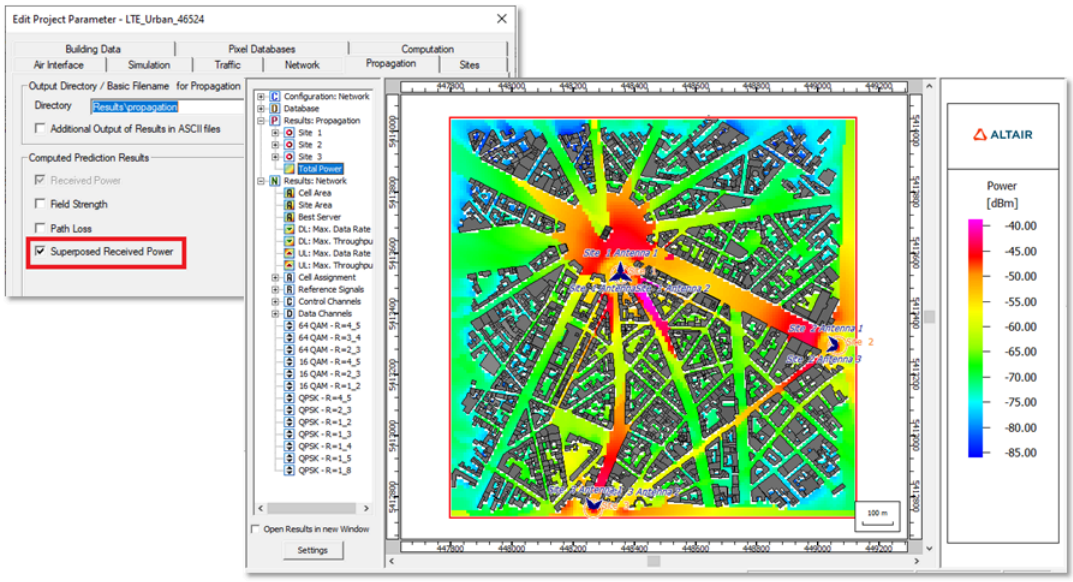


Figure 45: The total power is available in the tree if the option was enabled.

- ProMan was extended to define and display reference points on maps. These points are always visible on a map using an “X” sign (even if data is plotted). The names of points (prediction, user or reference points) can now be shown or hidden using the setting on the **Display Settings** dialog.

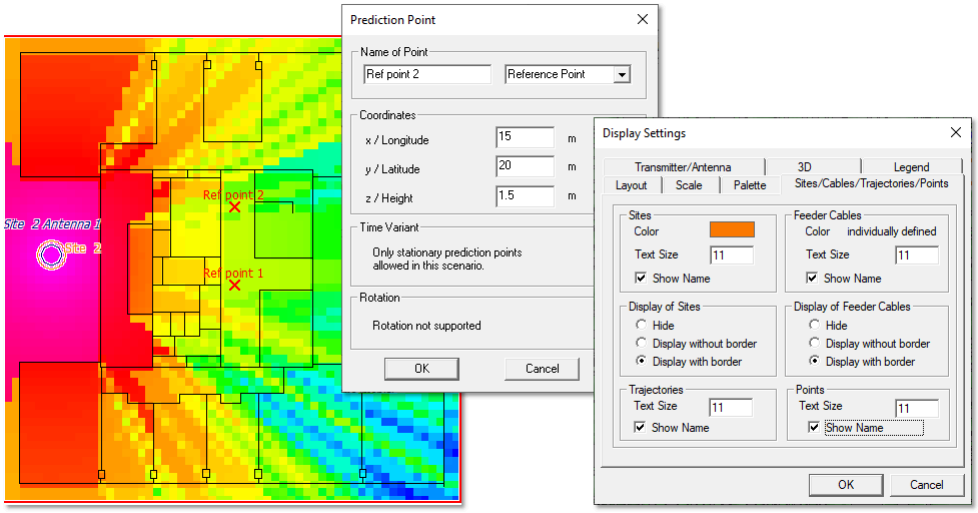


Figure 46: Reference points can be added to a map.

Salient Features in WRAP

- The ITU-R P.1812 propagation model was updated to recommendation ITU-R P.1812-6.
- The Clutter Loss Model was updated to recommendation ITU-R P.2108-1.
- Support was added to enter 5G parameters for calculations. The 5G parameters are used when calculating RSRP, RSSI, RSRQ, SINR, Data rate and Throughput.

Feko 2023.1 Release Notes

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

CADFEKO

Features

- Added functionality to reference grouped variables via their group name. Before it was required to give variables unique labels to ensure referencing the correct variable. It is now possible to distinguish between variables inside different groups and ungrouped variables, for example, *Var1*, *Group1.Var1* and *Group2.Var1*.
- Added the option to specify the transmit power to be used during the S-parameter calculation.
- Added the **Ensure continuous region representation** option to the Advanced tab of the **Voxel Mesh Settings** dialog. This setting controls whether a voxel mesh representation is created for a thin dielectric region which does not cut across multiple voxels.
- Extended cable schematics to support a distinction in concepts between local circuit device ground and global installation ground. This is achieved through the addition of new symbols for “Device ground” and “Installation ground”.
- The ECAD import library used by CADFEKO, has been upgraded to the latest version provided by Altair PollEx.
- Gerber files (274X or 274D format) can be imported.
- Meshes can be exported to the Gerber file format.
- Feko's combined MoM/MTL cable solution method was extended to allow for the outermost shield signal of different paths in the harness to be connected via a shielded conductive enclosure defined in the full wave model. Inner circuit connections between different cable path signals bounded by the enclosure are now supported. Full coupling is supported between the cable harness, enclosure and the environment.
- Added the **Show mesh configuration details** checkbox to the advanced tab of the **Modify Mesh Settings** dialog. This option, when enabled, reveals some of the calculated values used for meshing.
- Improved the display of selected items (geometry and mesh parts and entities) in the 3D view.
- Added new visibility options. **Show** and **Hide** are available in addition to the existing visibility options such as toggling the visibility. All visibility options are grouped together inside the **Visibility** sub-menu on the right-click context menu.
- Changes were made to colours used in the 3D view to aid model investigation. Edges and wires are now shown in a thicker blue instead of yellow from previous versions. Various styling improvements were made to make it easier to work with and find items in the 3D view.
- Improved the display of selected items to be opaque when using opacity. This highlights the selected item with the rest of the model being semi-transparent. The overlay is also automatically hidden when opacity is used, resulting in a cleaner and clearer display of the model.
- Added a generic windmill model to the component library.

- Added a generic car CAD model to the component library.
- Extended the model tree to indicate hidden items with grey text and a disabled first icon. If an item is not visible, but sub-items are visible, the icon is updated to indicate the partial visibility. For excluded items, all icons are disabled.
- Extended the PCB import dialog with a netlist filter that enables to the user to specify specific nets to be imported.
- Added checks to ensure that schematic circuit connections take preference over mesh connections in combined MoM/MTL cable harnesses.
- Added the option to **Preserve all entities** for global and local mesh settings. This option is used to retain an entity after meshing. Tiny edges in the model, that would otherwise be collapsed, can be retained by enabling this option.
- Updated the layout of the S-parameters dialog.
- Added an additional **Simplify** option to the **Spin** operator. With this option enabled, redundant vertices and edges are removed as a final step in the creation of the spun geometry. This simplification was performed by default when creating spun geometry in the original 2023 release, but had to be removed since it was not available in CADFEKO [LEGACY] and caused issues for the conversion of legacy models.
- Added a model of a parameterised automotive shark fin antenna system (Cellular, GNSS, SDARS, V2X, WLAN) to the component library.

Resolved Issues

- Fixed a crash when pressing the delete button twice in quick succession to delete geometry entities such as edges or faces.
- Improved usability by reviewing and updating visibility and visualisation features.
- Fixed a bug where replacing parts in sub-trees did not perform the correct mapping. The incorrect mapping could result in strange behaviour such as **Show All** having no effect on the items.
- Corrected an issue with the cable schematic view where the view resized and connectors were placed on top of each other when adding a cable connector.
- New CADFEKO now theoretically supports saving and loading model file sizes up to 9 Exabytes. Previous models were limited to a maximum of 2 Gigabytes or less, depending on model complexity.
- Resolved an issue that prevented importing a CADFEKO model containing references to variables inside groups and using a prefix during import. Depending on the version, either a `Variable not found` error was issued or an assertion failed when attempting to import a model with grouped variables.
- Resolved an assertion failure when the user interacts with the 3D view after switching off automeshing.
- Various improvements in meshing of models that failed to mesh.
- Resolved an issue with the schematic view not opening with the same view (zoom level and position) as at the time of saving the model.
- Resolved an issue with a sudden change in the schematic view after loading a model and panning or zooming the schematic view.

- Improved mapping of edges when using the sweep and the path sweep operator or any operation that derives entities from other entity types (a vertex being the source of an edge or an edge being the source of a face or a face being the source of a region). This change causes edges to have different labels, but is an improvement (correction).
- Fixed a problem where a rendering update box would always be displayed in the preview for a split operation.
- Resolved an issue where grouped variables did not show on the **Modify variables** dialog. Variables inside groups can now be modified on this dialog and variables can be moved between existing variable groups.
- Fixed a bug that caused some models to hang during legacy conversion.
- Improved meshing of tightly coiled helix structures when using the new default mesher in CADFEKO. Invalid meshes may still be encountered when switching to the legacy mesher or when using CADFEKO [LEGACY].
- Fixed the loading performance of models where a large number of model verification warning or error messages get issued.
- Resolved a crash that could be encountered when working with a model containing cable ports that are not associated with a cable harness. It was possible to create a model like this in older versions of CADFEKO where cable ports were not deleted when the cable harness that they referenced was deleted. Any cable ports that are not associated with a cable harness are now deleted from a model when it gets loaded.
- Improved internal CAD model structures to reduce memory usage and file size and to improve performance.
- Added verification that an edge mesh port cannot bound a FEM region.
- Resolved an issue with the Show/Hide functionality where showing a port on hidden geometry resulted in all other geometry being hidden in the 3D view.

EDITFEKO

Features

- Added the schematic link (SL) card for defining the interface between cable schematic elements and 3D geometry.
- Added an option to the SP card to specify the transmit power to be used during S-parameter calculation.
- Updated text on the AK, CI and LC cards to distinguish between device ground and installation ground pins.
- Added a new cable harness (CH) card to group harness specific parameters.
- Extended the CS card to allow for the definition of a connection to the device ground at the start or end of a cable path section in combined MoM/MTL cable harnesses.

POSTFEKO

Resolved Issue

- Corrected the positioning and sizing of graphs with PDF report generation.

Solver

Features

- Upgraded Qt and OpenSSL to the latest versions.
- Support S-parameter calculations at a user-defined transmit power level.
- Updated Intel MKL to version 2023.2.
- CMA support for generalised impedance boundary conditions (GIBC) applied on the boundaries of SEP regions.
- Improved accuracy of the characteristic mode analysis for impedance boundaries in the free space, port loads and networks.
- Added support for CMA simulations with the CFIE.
- Added support double edge and wedge diffraction with Faceted UTD. Ray paths between sources and observers can now concatenate two single diffractions at physical edges and wedges. Consideration of this effect requires "Edge and wedge diffraction" and "Higher-order effects" to be enabled and a maximum number of interactions larger than or equal to two.
- Significantly increased faceted UTD simulation speed over discrete frequency bands by reusing calculated rays.
- Support Physical Optics integration to compute the radiation from equivalent sources using RL-GO with high accuracy setting. It improves the accuracy of the solver by considering the phase variation of the equivalent current across the ray footprints on the geometry.
- Reduce the memory footprint for the parallel MPI direct sparse FEM solver of more than hundred thousand unknowns by using some MPI processes as threads during the sparse LU factorization and solve phases.
- The combined MoM/MTL method was extended to support additional configurations when connecting cable path end points and the MoM mesh. As an example, pigtail-type connections can now be accurately represented. Configuring these connections is not trivial, and this will be addressed in future updates.
- Upgraded MUMPS to version 5.6.2altair.
- The performance of hybrid FEM/MoM simulations involving multiple excitations (for example a solution with plane-wave incidence angles or a multiport S-Parameter calculation) is improved by avoiding re-computation of matrices where it is not neccessary.
- The MTL solution method was extended to support a distinction in concepts local circuit device ground and global installation ground. Circuit connections between harness signals and a nearby local device ground is considered non-radiating. The net current through elements connected between the device ground and the installation will be added as impressed currents to the radiating solution. For combined MoM/MTL harnesses the device ground indicates the transitioning point

from circuit to full wave solver. Connections beyond the device ground should be included in the full wave model.

- Accelerated loss calculations over segments, triangles, VEP cuboids and VEP tetrahedra by parallelizing the relevant routines.
- Improved the speed of computation of spherical modes for multi-processor simulations.
- Improved parallel process memory scaling when using the direct FEM sparse solver for a hybrid FEM/MoM solution.

Resolved Issues

- Implemented validation for model mesh labels to ensure compatibility with solvers.
- In combined MoM/MTL harnesses schematic circuit connections now take preference over mesh connections. This results in the setup of an improved full wave model.
- Resolved a bug in no results being computed in standard configurations defined after a CMA configuration.
- Improved the management of far-field interactions for MLFMM algorithm for models with very high losses to avoid errors during the iterative solution.
- Corrected excessive memory consumption and potential crash when running large ACA simulations over multiple nodes.
- Avoid internal error 32488 when using both CFIE and EFIE in a solution involving CBFM and MLFMM.
- Corrected errors with adaptive cross-approximation (ACA) solutions including multilayer planar dielectrics and using threads.

Shared Interface Changes

Features

- Renamed **Orbit/Satimo (*.mfxml) measurement file** to **MVG (*.mfxml) measurement file** in CADFEKO and EDITFEKO.
- Increased the `.fek` file version to 192 to accommodate new features.
- Updated the multiport combinations configuration file format to include information on the spatial positions of ports.
- Removed the limitations of the Student Edition of CADFEKO and POSTFEKO.

Support Components

Features

- The CADFEKO [LEGACY] graphical user interface component is in the process of being phased out and is no longer included in the main Feko installation. It is available as a separate installation for users who need to continue using the CADFEKO [LEGACY] graphical user interface while the new interface gets rounded off based on feedback received.

- Removed the functionality to launch CADFEKO [LEGACY] from the Launcher utility. The CADFEKO [LEGACY] interface can still be installed alongside the Feko installation and launched directly from the installed location.
- Added the **Create Edge Port for Finite Substrate** macro that creates an edge port on a finite substrate. The macro removes a small cuboidal section and creates a PEC " bow-tie" structure. An edge port is then added to the centre edge of the " bow-tie" structure. This macro simplifies the process of adding an edge port to a finite substrate since a port cannot be placed on the boundary of a finite dielectric substrate when using the method of moments (MoM).

WinProp 2023.1 Release Notes

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

General

Features

- Updated Intel MKL to version 2023.2.
- Removed the limits for the Student Edition of WinProp.

ProMan

Features

- Added support to specify and display reference points on maps. The points are defined on the **Prediction Point** dialog and are always visible on a map (even if data is plotted) using an "X" sign. Added support to show/hide the names of points (for example, prediction, user or reference points) on the **Display Settings** dialog.
- Improved the loading time of predictions in the vertical plane.
- Added support for 5G beam switching capability using a predefined set of beams. Users can now be served by a dedicated beam, with the possibility to transition to a different beam as they move.
- Extended urban empirical models to include ray intersections with vegetation.
- Changed the minimum reflection angle to 0.1 deg, before it was 1 deg.
- The total power from all transmitters together can now be displayed (optional) after a regular propagation simulation.

Resolved Issues

- Resolved an issue for the SBR/SRT where rays were incorrectly discarded while checking for line-of-sight.
- Resolved an issue for the SBR where rays were discarded due to incorrect path loss estimation.
- Fixed a problem where the transmission loss was computed incorrectly for empirical losses.

newFASANT 2023.1 Release Notes

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

GUI

Resolved Issues

- Various improvements have been made to the image rendering and the shading of the 3D view has been adjusted.

Solver

Feature

- Updated Intel MKL to version 2023.2.

WRAP 2023.1 Release Notes

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

General

Features

- Updated WRAP equipment databases to version 173.
- Moved the import and export to the same menu as other area formats.
- WRAP will not open API sockets by default. The user needs a valid API license and the license feature **SolverHPC** and **OpenAPISocket** element should be enabled in the WRAP settings file `WRAPSettings.ini`.
- Altair license feature "SolverHPC" is required to use Socket communication API functionality in WRAP.
- A new function was added in ObsMan to allow the exclusion of existing cases from calculations.
- The colour of the obstacles shown in the map are now different depending upon the obstacle origin and status.
- Added the option to limit the number of created wind turbines in an ObsMan wind turbine farm.
- Added ability to show obstacles from FIA and ObsMan simultaneously. Shown obstacles stays with their selection per ObsMan tab page.
- Made the following dialogs resizable in map viewer: **Open Area** dialog and **Delete Area** dialog. Made the following dialogs resizable in Obstruction Manager: main window, **Select case** dialog, **Method 2 settings** dialog, **Detailed Calculation Results** dialog, **Detailed link result** dialog, **Radar types** dialog and **Create obstacle farm** dialog.
- Propagation model ITU-R P.1812 has been updated according to ITU recommendation ITU-R P.1812-6.
- Updated the clutter loss model according to recommendation ITU-R P.2108-1.
- Added Example 2.6 to WRAP Example Guide. It shows how to perform LTE Specific Coverage Calculations, considering parameters like RSRP and Data Rate, effects of MIMO, and using recently introduced post-processing features.
- Updated Example 15.2 in WRAP Example Guide that guides the user on how to integrate population data in WRAP and use Cost and Coverage Optimizer for population-based coverage calculations.
- Added support to enter 5G parameters for calculations. RSRP, RSSI, RSRQ, SINR, Data rate and Throughput were extended to use the 5G parameters during the calculation.
- The FIA database can now be updated from a text file in addition to the DAIM format.

Resolved Issues

- Corrected the crop function in the WRAP MapDataManager for use with the new index file format.
- Corrected the WRAP MapDataManager GRIDASCII export function.

Release Notes: Altair Feko 2023.0.2

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Altair Feko 2023.0.2 is available with new features, corrections and improvements. This version (2023.0.2) is a patch release that should be applied to an existing 2023 installation.

This chapter covers the following:

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.

newFASANT complements Altair's high frequency electromagnetic software tool (Altair Feko) for general 3D EM field calculations, including, among others, special design tools tailored for specific applications like complex radomes including FSS, automated design of reflectarrays and ultra-conformed reflector antennas, analysis of Doppler effects, ultrasound systems including automotive or complex RCS, and antenna placement problems. Advanced solver technologies like the MoM combined with the characteristic basis functions (CBFS), PO/GO/PTD, GTD/PO and MLFMM parallelised through MPI/OpenMP, being some of them especially efficient for the analysis of electrically very large problems.

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.

WRAP is a comprehensive tool for electromagnetic propagation, antenna collocation and spectrum management. WRAP combines propagation analysis, often over large areas with many transmitters and receivers, with system analysis to include complex non-linear equipment properties.

Feko 2023.0.2 Release Notes

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

CADFEKO

Resolved Issues

- Model status verification will only indicate `Error 19956: Dielectric faces may not be located on the interface of the planar Green's function` when the error is relevant.
- Fixed voxel meshing failures for specific models, especially at higher frequencies.
- Resolved an issue where ports went missing when converting a part to primitive. Ports that were placed on geometry parts deeper than three levels inside the root geometry were erroneously being removed when converting the outer level part to primitive.
- Prevented an assertion failure when loading a legacy model containing faulty parts. The model can now be opened and an error message in the model status window indicates which parts are problematic.
- Fixed a crash when modifying the cross section of a cable instance to a new cross section with fewer signals.
- A failed deletion of cable connectors and schematic components will not result in duplicated 'ghost' symbols on the schematic.
- Resolved a crash during legacy conversion for a model with overlapping terminals and nets.
- Resolved an issue where the `.pre` file writing of SD cards omitted the transfer admittance definition of a cable shield. The solver could terminate with `ERROR 52750: Define shield properties: expecting an impedance and/or admittance specification` when running a model where the cable shield transfer admittance definition was set to reference an external XML file.
- When saving a model, the saved state indicator (*) was not correctly cleared after saving completed.
- Resolved a crash when undoing a sweep or spin operation on geometry.
- Improved handling of faulty parts for CAD models. This speeds up load time.
- Resolved an issue where the project filter was not correctly filtering faces with default medium set.
- Fixed an issue where the modification of a geometry part did not take effect if the part was previously deleted and reinstated using the undo operation.
- Added a minimise button to the **Executing runfeko** dialog.
- Improved the modify variables tool to allow editing of **Minimum** and **Maximum** values while **Limiting** is unchecked.
- Resolved an issue where the **Polyline** and **Polygon** dialogs could sometimes get into a strange state when clicking **Add**. This strange state resulted in crashes.
- Updated the verification message that gets issued when a cable harness solved with the multiconductor transmission line (MTL) solution method intersects with a conducting surface or a PEC ground plane. Previously, the same error message was issued as for the case where the distance from the conducting surface or ground plane is too large.

- Resolved an issue where there was no icon in the tree indicating if local mesh settings were applied to primitive geometry parts.
- Improved legacy CADFEKO model conversion for models where the normal direction of selected faces was reversed in earlier versions. Before this change, such models may have failed to convert to the latest CADFEKO format.
- Resolved a crash when invalid signal connections were applied on the **Create Cable Instance** dialog.
- The **Windows Security Alert** firewall exception dialog is no longer shown when opening the **Altair Material Data Center**.
- Resolved an issue where FEM ports could not be created for meshes if there were only FEM meshes in the model.
- Symmetric verification for face normals is no longer checked when the face medium is set to perfect electric conductor, dielectric boundary or default.
- Fixed a crash after loading overlapping frequency bands from the model in the **Create Frequency Ranges** application macro.

POSTFEKO

Resolved Issue

- Resolved an issue with near field exports where local coordinate axes would not be written out to `.efe` and `.hfe` file for near fields in the global coordinate system with only an offset specified.

Shared Interface Changes

Resolved Issues

- The complete simulation output is correctly shown in the execution dialog during AMRFEKO runs.
- The complete simulation output is correctly displayed on the console during an AMRFEKO run.

Support Components

Features

- During AMRFEKO runs, error estimates will not be written to the out file by default so that large out files are avoided.
- The temporary files created by AMRFEKO now include "_amr_" in the name for easy identification.

Resolved Issues

- During an AMRFEKO run, the number of completed and remaining solutions is correctly reflected in the standard output.
- The standard output of AMRFEKO does not include duplicate linefeeds/newlines.

- Transformed geometry (TG card) is correctly managed during the execution of an AMRFEKO run.
- Corrected the command line parsing so that --keep-files can be used with AMRFEKO and other utilities such as ADAPTFEKO.

WinProp 2023.0.2 Release Notes

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

General

Feature

- Resolved an error that occurred when converting a `.tub` database to `.ida` or `.idb` file format.

Resolved Issue

- A more coarse resolution from the **Elevation Profile** dialog when exporting a tunnel topo to `.idb` file is only suggested when the area covers more than 10 million pixels.

ProMan

Feature

- Relaxed the condition for the monostatic RCS consideration so that all pixels in the direction back to the transmitter are computed.

Resolved Issues

- Resolved an issue where a log file (`WinPropLogfile.txt`) was written out for urban computations when a warning was encountered.
- The conditions for the calibration of the wave propagation models (DPM, IRT, SRT) are now checked before the computation.
- Resolved an issue where projects containing area wide and prediction planes, the status bar showed “N.C.” for area result values.
- Fixed a bug for the urban IRT where the reflection point was at z=0 instead of the correct tile center location.
- Resolved an issue where only the first Rx height was computed and displayed for rural projects based on geodetic coordinates. This was corrected, and multiple Rx heights can now be computed and displayed.
- Resolved an issue where the computation of a project using SBR resulted in a long runtime due to freeing memory.
- Fixed a bug where, for very small resolution, no prediction plane was created for the repeater, which resulted in the repeater contribution being missing in the network planning result.
- Resolved an error for network planning if the MS results were saved in individual sub-folders that can be configured under **Settings** > **Global Settings (Directories, Display)**.
- The palette for the display of computed results is now correctly loaded and saved in the `.wpi` file.
- Resolved an issue where higher computation time was observed when compared with previous releases.

- Resolved an issue with the Urban Knife Edge model where the wrong coordinates were used during propagation for point prediction at absolute height.

WRAP 2023.0.2 Release Notes

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

General

Feature

- Statistical results in coverage that decreases with distance, for example, Field strength and Received Power, are sorted in reverse order to align with the coverage information page on the **Edit result** dialog.

Resolved Issues

- Resolved an issue where the full power from the base station is now used in the SINR calculation instead of the reduced power when the cell load is less than 100%.
- On the **Separation Distance** dialog, enable the **Calculate Distance** button with default settings by changing the default calculation mode to area mode for the default propagation model (Longley-Rice).

Release Notes: Altair Feko 2023.0.1

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Altair Feko 2023.0.1 is available with new features, corrections and improvements. This version (2023.0.1) is a patch release that should be applied to an existing 2023 installation.

This chapter covers the following:

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.

newFASANT complements Altair's high frequency electromagnetic software tool (Altair Feko) for general 3D EM field calculations, including, among others, special design tools tailored for specific applications like complex radomes including FSS, automated design of reflectarrays and ultra-conformed reflector antennas, analysis of Doppler effects, ultrasound systems including automotive or complex RCS, and antenna placement problems. Advanced solver technologies like the MoM combined with the characteristic basis functions (CBFS), PO/GO/PTD, GTD/PO and MLFMM parallelised through MPI/OpenMP, being some of them especially efficient for the analysis of electrically very large problems.

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.

WRAP is a comprehensive tool for electromagnetic propagation, antenna collocation and spectrum management. WRAP combines propagation analysis, often over large areas with many transmitters and receivers, with system analysis to include complex non-linear equipment properties.

Feko 2023.0.1 Release Notes

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

CADFEKO

Features

- Added quick entry of variables to fields on dialogs that support parametric expressions by snapping to variables in the model tree.
- Extended KBL cable harness importing to parse **`Special_terminal_occurrence`**, **`Component_box_occurrence`** and **`Referenced_components`** objects and made general improvements to KBL importing.
- Increased the size of the **Modify Variables** dialog. The dialog can now also be vertically resized.

Resolved Issues

- Fixed an issue with legacy model conversion that could result in cable connectors drawn with a different width than expected on the cable schematic view, causing incorrect or missing connections.
- Resolved an issue during legacy model conversion where the reference direction on a cable path could be reset if it was defined using expressions.
- Schematic items are now created as close as possible to the centre of the schematic view.
- Resolved an issue for schematic views where pressing Ctrl and holding down the left mouse button while hovering over a node entered wire creation mode instead of panning the view.
- Moved the **Rendering** group from the **View** tab to the **Display Options** 3D view contextual tab.
- Fixed a problem for schematic views where moving components connected to nets would create a spike in the net.
- Removed a verification error preventing regions using VEP and DSIA solution methods being solved when using CMA.
- Resolved an issue where face media properties were not considered for FDTD meshing.
- Fixed an issue with the conversion of adaptive frequency sampling settings in legacy CADFEKO models. The **Transmission / reflection coefficients** and **Non-radiating networks and loads** quantities were incorrectly transferred to new CADFEKO.
- Resolved a hang that could occur when automatically meshing geometry from large Parasolid imports.
- Fixed an assertion failure when unlinking the mesh of symmetric wires with ports on the symmetry plane.
- Resolved a crash when undoing a change that required the model to be re-meshed due to other parts being in close proximity to the part that was changed.
- Resolved a rare crash when rendering a model with a very large mesh.
- Remove a cable port when its associated cable harness is deleted to avoid a crash.
- Fixed a problem where an empty `.pre` file was written out after loading a legacy `.cfx` file.

- Resolved an issue with the `.cfm` file writing of symmetric wires that could result in `Error 16: Undefined wire port segment` when running the solver.
- Added a warning that will be issued when the file size of the model approaches the upper limit which can be saved.
- Fixed a crash when selecting edges while creating a microstrip port.
- Resolved an issue with SK card writing to `.pre` file where SK cards were not always written out for wires with ports on them. If a wire has a port, it will now always write an SK card for the port. An SK card for the wire will only be written in addition to the SK card for the port if there is more than one segment in the mesh for the wire.
- Fixed an issue where CI cards were not written out correctly to `.pre` file for shielded cable instances with direct connections between cable connectors on the schematic view.
- Added a check for a valid FEKO_TMPDIR to use for temporary files. The application will attempt to create a folder if it does not exist. If a process like geometry import fails due to the temporary folder being inaccessible, an appropriate error is issued.
- Added show/hide functionality to cable harnesses.
- Fixed a bug that hiding a cable connector would shift items on the cable schematic.
- Resolved a crash upon opening the mesh info dialog in version 2023 when there is no simulation mesh to report on.
- Loading large legacy models should no longer result in an assertion failing with `xtgraphics` error messages. This is a regression that got introduced in Feko 2022.2.2. The assertion failure was triggered in the last step of the conversion when the view was being zoomed to extents. A workaround for this bug is to convert the model first using the legacy CFX converter application before loading it into CADFEKO.
- Performance is now significantly improved for models that have many requests, source loads or parametric geometry that use variables. Model loading speed and 3D view interactions have seen up to a factor of three times improvement when variables are used extensively. Furthermore, rendering of near field requests is now faster.
- Improved entity auto-labelling to be more consistent with CADFEKO [LEGACY] . Some macro recorded scripts may need adjustments since the labels may have changed.
- Resolved an intermittent assertion failure when using the **Parameter Sweep: Create Models** application macro.
- Fixed an issue where a schematic net would change shape when moved within a larger selection.
- Improved the schematic view interaction performance.
- Fixed a crash when moving items on the schematic view if the current selection of items also contains items that are not on the schematic view.
- Prevent creating duplicate triangles in the simulation mesh when symmetry is enabled.
- Fixed a possible crash when modifying ports containing lists of geometry references.
- Resolved an issue where the mesh would be hidden when the mesh info dialog was open.
- Resolved an issue where closing the application while the model was being validated could result in a crash.
- Resolved an issue where the `.pre` file writing of SD cards did not reflect that the transfer impedance of a cable shield was to be loaded from a file. The solver terminated with `ERROR 52750:`

`Define shield properties: expecting an impedance and/or admittance specification` when running a model where the cable shield transfer impedance definition referenced an XML file.

- Greatly improved rectangle selection performance when multiple items are selected.
- Corrected legacy model conversion of FEM line ports when a custom default workplane was set. The line port would use the default workplane instead of the correct **Global XY** workplane.
- Corrected waveguide port validation on model mesh faces. The model status window could have incorrectly indicated that the port reference vector does not align with one of the rectangular waveguide edges.
- Resolved an assertion failure when opening the mesh info dialog if the model contains only wire segments.
- Prevent deleting boundary triangles, for example the boundary triangles of a tetrahedral region.
- Resolved a crash when deleting triangles from transformed model meshes.
- Fixed a problem where waveguide ports and sources would cause `.pre` file writing to fail.
- Improved meshing for models that contain extremely small edges that should rather be ignored. Previously it would over-refine in these areas.
- Improved the calculation for the start and end points of microstrip ports.
- Improved the handling of symmetrical elements crossing the symmetry plane by ensuring that they are written out perfectly symmetrical to avoid an error in the solver.
- Resolved an issue with model status errors not being issued for grouped geometry or meshes that are not symmetric around the symmetry planes.
- Improved the conversion of legacy CADFEKO models where different types of schematic components have identical labels.
- Added validation to the prefix field when importing a CADFEKO model. Previously an assertion failed upon import if the prefix label contained invalid characters.
- Improved tolerance handling with respect to `.pre` file writing for models employing symmetry.
- Corrected the criteria for the verification of dielectric sheet layer magnetic properties. The check is ignored when the face bounds SEP regions, is compared against free space when the face bounds VEP regions and compares against front and back medium when bounding FEM regions.
- Avoid creating metallic triangles on the symmetry plane when symmetry is enabled.
- Fixed symmetry verification messages to only show root level geometry and not nested geometry as well.
- Symmetrical mesh entities using a scale transform will be correctly identified as symmetric.
- Fixed macro recording for transforms.
- Removed memory leaks during an optimisation run by greatly improving the memory usage of the launcher dialog and external process executor.
- Fixed an assertion failure when trying to add a solution coefficient source to a model containing locally defined sources and multiple configurations.
- Models that require an internal mesh element size larger than 100 could have over-refined and possibly caused the mesher to run out of memory. This was seen mostly with model mesh parts that were scaled and even though the mesh size was smaller than 100, the scaled mesh size was larger than 100 and caused the problem.
- Fixed an issue causing additional refinement in the mesh when symmetry is enabled.

- Fixed an assertion failure when closing a model with variables referenced in the mesh settings.
- Resolved an issue where SK cards were incorrectly written out to `.pre` file and the solver failed with the error `No triangles/segments found with the correct label to apply the skin effect approximation` for valid models.
- Fixed script recording that sometimes missed setting values when adding entities.
- Fixed an issue with view anchoring selecting model mesh behind a geometry part.
- Improved mapping of edges when using the sweep and the path sweep operator. This change causes edges to have different labels, but is an improvement (correction).
- Updated CADFEKO `.pre` file writing to write to the EG card a maximum identical distance that depends on the size of the model. In the past it would always use 1e-6 as the default. This solves problems for small and large models where the elements became too small or too large relative to the maximum identical distance.
- Changed the spin operator in the new CADFEKO to work like it did in CADFEKO [LEGACY] by no longer automatically removing redundant edges. This solves problems with loading legacy models.
- Improved curved edge symmetry calculation.
- Fixed the progress indicator not completing when other Feko components like PREFEKO and RUNFEKO have finished running.
- Made general and simulation mesh related memory improvements.
- Resolved an assertion failure with drag and drop for combined geometry containing nested groups.
- Resolved an issue where the script editor would not maintain the location of previously saved or opened scripts.
- Resolved an error being issued after a successful geometry import if there is no 3D view.
- CADFEKO model (`.cfx` file) importing will now zoom to extents after a valid import to show the entire model in the 3D view.
- Made improvements to the legacy model converter for labelling and grouping of elements that fail to convert or struggle to match with an element in a legacy model.
- A number of corrections were made to the simplify operator. In some cases, edges, faces and redundant points were not removed when they were supposed to be removed.
- Fixed missing reference vector fields when setting the medium to characterised surface on the mesh properties dialog.
- Named points and variables can now be used to modify a mesh vertex. The vertex will not keep a reference to the symbol once modified.
- Fixed a circular reference exception when a named point attempts to reference itself. An error message indicates when a named point definition contains a circular reference.
- Fixed a crash when using nil or empty expressions in Lua scripts when calling a method.
- Improved 3D view anchoring to rotate around topology under the cursor when the rectangle selection method is in use. If nothing is under the cursor, rotation will still be around the centre of the view.
- New options and improvements to the project tree filter can greatly improve the filtering performance. The label filter also now supports exact, in addition to partial, filtering.
- Prevented the operators on excluded topology as it would result in scenarios where the topology could not be included again.

- Corrected the `.pre` file writing for error estimates that use label scopes, in other words, error estimates that are set up to calculate on elements with a set of labels.
- Fixed an issue where mesh ports were not being rendered in the correct position when transforms were applied.
- Measurement tools can now reference variables and named points.
- Resolved an assertion failure when grouping combinations of groups and other topology.
- Improved 3D view anchoring for rotations around ports. Now the centre of rotation will anchor to ports when under the cursor instead of using the centre of the view.
- Resolved a model status error that was incorrectly issued for correctly defined 3D anisotropic media by adding a machine precision tolerance.
- Fixed the display of mirrored model mesh face normals.
- Resolved an issue with the keyboard shortcut (R) not working to rotate elements on the schematic view.
- Fixed a legacy conversion issue that the schematic projection and connector spacing values were not transferred to the new model.
- Fixed visibility for FEM line ports defined using points.
- Changed the default scale value for an optimisation goal from zero to one.
- Fixed a case where a model with locked parts could not be loaded.
- Fixed a model tree visualisation bug where the simulation mesh icon was displayed for geometry children of unmeshed combined geometry inside of a group. Combined geometry refers to geometry created with Boolean operators such as subtract.
- Operators that combine geometry will now create the resulting geometry where the geometry being combined reside. As an example, a union of two parts in a group will create the union in the group.
- Removed a verification warning for looped plane waves with CMA.
- Local sources and loads on ports are only displayed in the 3D view for the active configuration.
- Relaxed the tolerance and increased the number of entities considered as potential symmetric entities to improve the accuracy of finding a valid symmetric partner.
- Resolved an incorrect error when using the fill hole tool.
- Prevent setting locked or included status on child geometry via scripting.
- Added the lock action to the **Transform** tab on the ribbon.
- Converting a combined geometry with nested groups into a group will move the nested groups into the newly created group.
- 3D view anchoring for rotation now ignores rendering of requests so that rotation will centre around topology under the cursor instead of the centre of the view.
- Fixed certain instances where the initial mesh for a locked geometry part was not generated.
- Resolved an issue where the application appeared to hang when opening the mesh info dialog during meshing. If a mesh is not available, the line edits will indicate zero and if meshing is happening in the background, the fields will indicate **Updating...**.
- Resolved an issue where a UTD plate with defined symmetry resulted in a solver error.
- Added validation when trying to modify locked entities. Actions that cannot be performed on locked entities are disabled.

- Ensured legacy CADFEKO model conversion transfers the locked status of entities correctly.
- Added a progress bar when creating the models in non-interactive mode for the **Parameter Sweep:Create Models** application macro.
- Improved the bounding box calculation for segment voltage sources on ports at the start and end of a wire. Before this correction FDTD validation could incorrectly fail for a valid model.

EDITFEKO

Resolved Issues

- Resolved an issue when opening an AW card from an older model, it did not have the **Use legacy magnitude convention** option checked.
- Resolved an incorrect error that was issued when editing the CD card if the radius of a twisted pair cable was larger than 1.
- Fixed the RA card file browser to filter on the correct file extensions for Orbit/Satimo format.

POSTFEKO

Features

- Extended the **Optimise Model in HyperStudy** application macro to support HyperStudy on Linux.
- Extended the **Calculate Mixed Mode S-Parameters** application macro to export the mixed mode S-parameters results to Touchstone version 1 files.

Resolved Issues

- Resolved assertion failures that could have occurred when using the POSTFEKO **Calculate Mixed Mode S-Parameters** application macro.
- Resolved a regression that got introduced in version 2022.3 where manual grid range settings were not being respected on Cartesian graphs when zooming to extents.
- Corrected the display of mesh faces set to be coloured by element normal.
- Fixed an assertion failure that was triggered when loading far field receiving antenna results from a `.bof` file only (no `.fek` file available) and selecting the result in the tree.

Solver

Features

- Improved the CMA treatment for lossless and lossy SEP cases so that performance for lossless calculations is comparable to earlier versions of Feko .
- Improvements were made to the faceted UTD, improving the identification of diffracted and reflected ray paths.

- The correct value for the CBFM threshold is written to the out file and the default MLFMM + CBFM block size is adjusted to appropriate values for CFIE and EFIE based solutions in order to improve general accuracy and maintain generally good convergence of the iterative solution across a number of problems.
- The accuracy of the CBFM for problems where there are sources close to the geometry has been improved.

Resolved Issues

- Improved spacing in the header line of the ray file.
- Improved ray tracing for faceted UTD to identify ray contributions that may have been missed for some cases.
- Avoided an error when tetrahedral near field requested without any tetrahedra in the model. A warning will now be issued for this case.
- Improved faceted UTD runtime for results that require multiple interactions.
- Fixed a segmentation violation when running CBFM with MLFMM.
- Corrected the interpretation of phase information included in equivalent near field aperture source and/or receiving antenna definitions for coupling simulations, thereby improving accuracy for Cartesian boundary formats.
- Fixed a bug in the calculation of the normal vectors to the aperture faces of a Cartesian boundary near field receiving antenna. A consistent outward normal should be used.
- Improved error reporting when too many parallel processes are used for the distributed FEM preconditioner or direct sparse solver.

Shared Interface Changes

Resolved Issue

- Improved failure avoidance during startup due to application macros. A warning is displayed to the user if the application macro library extraction fails. Before, if the archive containing the shipped application macros could not be found and successfully extracted, application startup would fail silently.

Support Components

Feature

- Added an FAQ topic in the Feko User Guide that lists the solution methods that support GPU acceleration.

Resolved Issue

- AMRFEKO will now correctly stop when it is stopped from the run dialog in the GUI applications.

WinProp 2023.0.1 Release Notes

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

General

Resolved Issues

- Corrected a problem where certain dialogs could not be resized in AMan (**Convert File** dialog) and WallMan (**AutoCAD Export** dialog, **Database Save As** dialog, **Import Database** dialog and **Material Import** dialog).
- Fixed a problem for the urban IRT preprocessing, to limit the prediction to the preprocessed area.

ProMan

Features

- Added an angular tolerance for the ground reflection of the rural ray tracing (RRT) to get a ground-reflected contribution in case of no specular reflection.
- Updated the text on the **Parameter: Standard Ray Tracing (SRT)** dialog to indicate that scattering is also included in the specified limit **Max reflections and diffractions**.
- The **Propagation phenomena** group is now greyed out in ProMan for urban projects on the **Material Properties** dialog. In case of 0 roughness, scattered rays are no longer computed for the urban IRT, which happened in previous versions by mistake.
- Dynamic range for difference plots has been adapted to show more details.
- Propagation results can now be converted to dBW/m2 and the x-axis of 1D line plots can be converted from metres to nautical miles.
- Enhanced the coordinate transformation capabilities by adding the UTM to Geodetic conversion option and by allowing to copy the converted coordinates.

Resolved Issues

- Improved the accuracy of the parabolic equation solver in regions of the topography where the slope is too steep.
- Resolved a bug in the computation of transmission matrix element computations for predictions where only the direct ray is considered.
- Corrected a problem where the leaky feeder cable was not displayed in the 2D or 3D view.
- Several improvements for transparent repeaters were made, including higher default amplifier gain, setting the signal group ID of the gateway to avoid interference, consideration of repeater results in RunMS.
- Resolved an issue for the rural ray tracing (RRT) propagation model where the number of standard ray tracing (SRT) interactions on 3D objects was not correct.

- Resolved an issue where the ground reflection for a transmitter outside the preprocessed map was not computed.
- Resolved an issue with the superposition of electric field components in RunMS to use complex Ex, Ey and Ez values.
- Resolved a crash that could have occurred when pressing Ctrl+Shift+F11 to enable column/line mode view in the status bar.
- Resolved an issue where RCS was computed, but no valid receiving point was defined. A warning message will now be issued if no valid receiving point defined.
- Fixed a bug for the auto-calibration in ProMan using the urban IRT propagation model that could have resulted in a crash.
- Propagation rays can now be displayed in the 3D view of projects with multiple prediction heights.
- Resolved an issue where plotting multiple 1D values along a line, the legend showed the result type of the last loaded result. The same behaviour occurred when viewing the info of a plot.

WallMan

Resolved Issues

- Resolved an issue with the layout of the **Simplify Indoor Database** dialog.
- Resolved an issue with buildings being converted multiple times when converting a CityGML database to a WinProp urban database.

Application Programming Interface

Feature

- Improved the progress output in the case of HPCs when writing output to a file, where control characters are now omitted when not recognised.

WRAP 2023.0.1 Release Notes

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

General

Features

- Added column sorting for the **Obstacles** tab and improved the column sorting for the Method 1 **Calculation and Result** tab in ObsMan.
- Added an option in ObsMan to run method 1 and method 2 calculations without impact from weather radars.
- Added the option to activate a log file for calculations running through the API.
- A new status port has been added in the WRAP API interface. The new status port can be used to check the status of WRAP Main program, which is running through the standard API port. The new status port should be specified in the API settings file named, `APIConfigFile.txt`, that is installed by the installation program under Feko installation folder "`feko\shared\wrap`". More information is available in Reference Binder C16 (wrap1974D).

Resolved Issues

- Resolved a crash that could have occurred when setting the map center position at or very near one of the poles.
- Corrected a bug where values for a station already deleted from **Stations** tab are still shown on the **Coupling Loss Matrix** tab in **Edit Group** dialog.
- Corrected a bug where user-defined or imported coupling loss matrix values in a site could be reset to internally computed values after editing station information through **Stations** tab in **Edit Group** dialog.
- Any tool settings file saved with version 2023.0 is corrupt and should be replaced by a new one saved with 2023.0.1 or later.
- Corrected a bug where WRAP would go into an infinite loop when showing maps containing area patches.
- Corrected a bug where it was not possible to enter the raster database resolution for raster databases created with earlier versions of WRAP.
- ESRI GRIDASCII files are now converted correctly with respect to x/yllcenter and x/yllcorner.
- Resolved a crash that occurred when printing to A3 pdf in WRAP FM.
- Resolved an issue in ObsMan where if an obstacle was located at lat-long (0, 0) and the station database contained any station at (0, 0), the SQL circle search statement could have caused a divide by zero exception in the ADO driver.
- Added threadlock to avoid removal of valid placement cells.
- Improved the implementation of Field Strength Calculation to optimize the computation time.
- Opening a project with maps using the API now closes any open projects with maps.

Release Notes: Altair Feko 2023

11

Altair Feko 2023 is available with new features, corrections and improvements. Altair Feko 2023 is a major release. It can be installed alongside other instances of Altair Feko.

This chapter covers the following:

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.

newFASANT complements Altair's high frequency electromagnetic software tool (Altair Feko) for general 3D EM field calculations, including, among others, special design tools tailored for specific applications like complex radomes including FSS, automated design of reflectarrays and ultra-conformed reflector antennas, analysis of Doppler effects, ultrasound systems including automotive or complex RCS, and antenna placement problems. Advanced solver technologies like the MoM combined with the characteristic basis functions (CBFS), PO/GO/PTD, GTD/PO and MLFMM parallelised through MPI/OpenMP, being some of them especially efficient for the analysis of electrically very large problems.

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.

WRAP is a comprehensive tool for electromagnetic propagation, antenna collocation and spectrum management. WRAP combines propagation analysis, often over large areas with many transmitters and receivers, with system analysis to include complex non-linear equipment properties.

Highlights of the 2023 Release

The most notable extensions and improvements to Feko, newFASANT, WinProp and WRAP in the 2023 release.

Salient Features in Feko

- A selection of new components was added to the CADFEKO component library. Ten new antenna models (including antennas for EMC testing) and four new platform models were added.

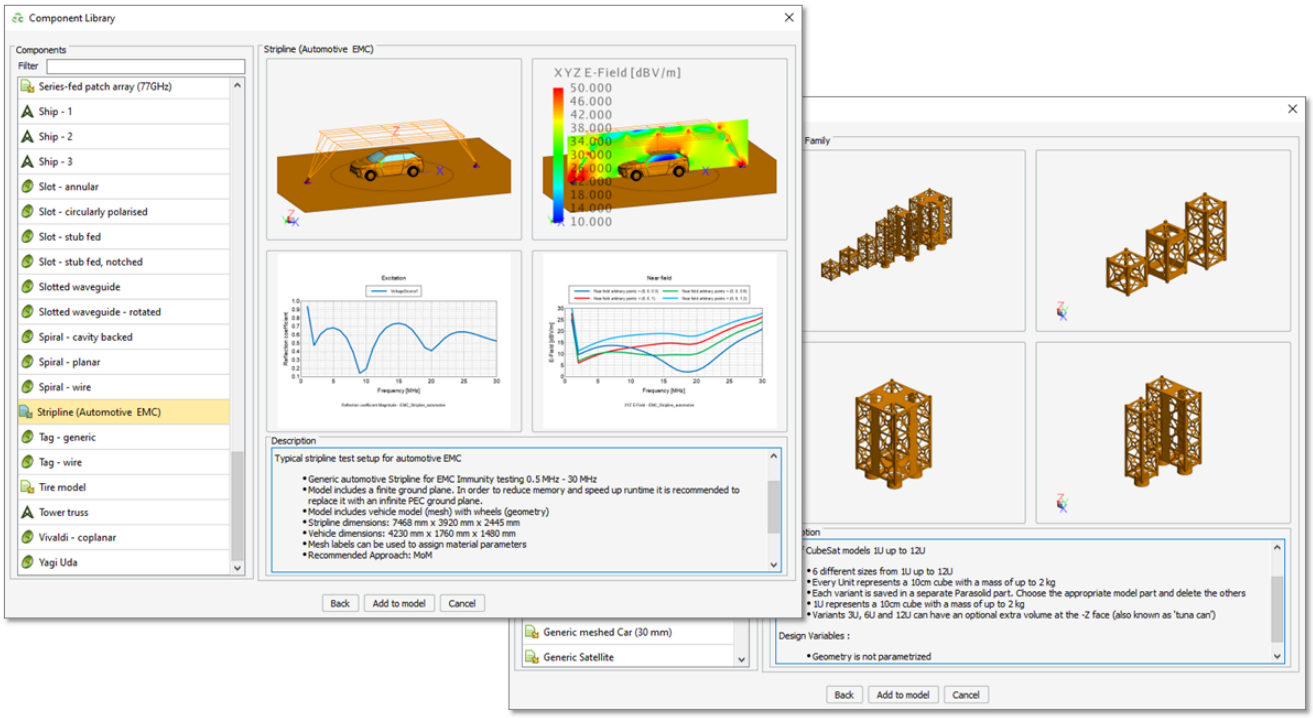

Figure 47: A selection of the new components available in the component library.

- The Altair Material Data Centre is now populated with media from CADFEKO. Import the media and use in Feko simulations.
- Reduced solution method limitations:
  - SEP regions (dielectrics) can be used in the MoM part of the solution for coupled and uncoupled scenarios with RL-GO.
  - Lossy dielectrics can be included in characteristic mode analysis calculations.
  - Loading restrictions have been relaxed to model direct/strong coupling between the inner and outer regions at the cable terminations in combined MoM/MTL simulations.
- A new tool (AMRFEKO) is now available, which enables automatic adaptive mesh refinement based on error estimates for FEM and MoM/FEM solutions. The fully-automatic tool can be launched from a command prompt or any of the Feko GUIs and can also be used on HPC resources in a similar fashion to RUNFEKO.

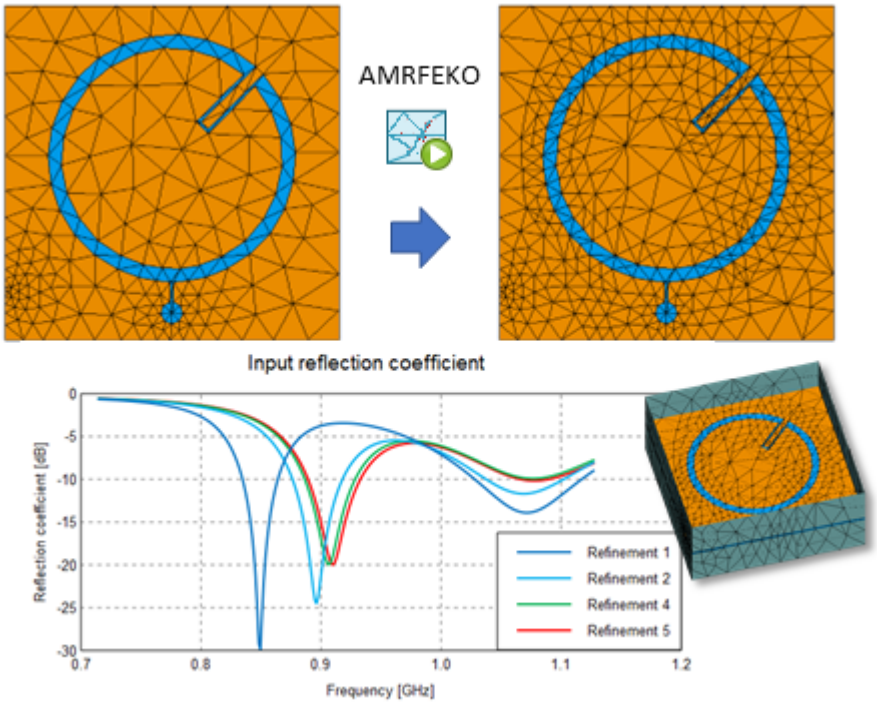

Figure 48: An example of a model refined using AMRFEKO; Left: unrefined, Right: final refinement.

- A new domain connectivity approach allows meshes of specific parts to be treated as if "connected" during MoM and MoM/MLFMM solutions in places where the borders of the meshes are close together, even if the mesh vertices on those borders are not coincident. Domain connectivity can now be configured in CADFEKO (new in 2023) or EDITFEKO (since 2022.3) and visualized in POSTFEKO (new in 2023).

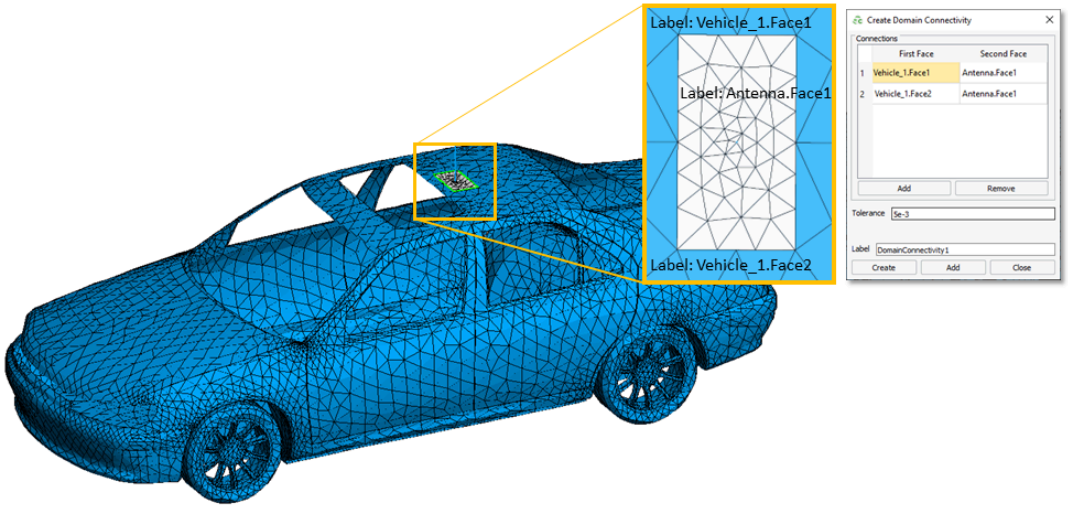

Figure 49: A static imported car mesh and a parameterised antenna geometry viewed in POSTFEKO where the ***Domain Connectivity*** *display tool highlights edges in green that are connected using domain connectivity.*

- CBFM is a modification of the conventional method of moments (MoM) that reduces the number of unknowns using macro basis functions. This approach could be used with MoM from Feko 2022.3 but is now available for use with MoM/MLFMM – helping achieve a substantial performance improvement over MLFMM in some applications such as monostatic RCS calculations of large objects with similar solution accuracy compared to the default solution.

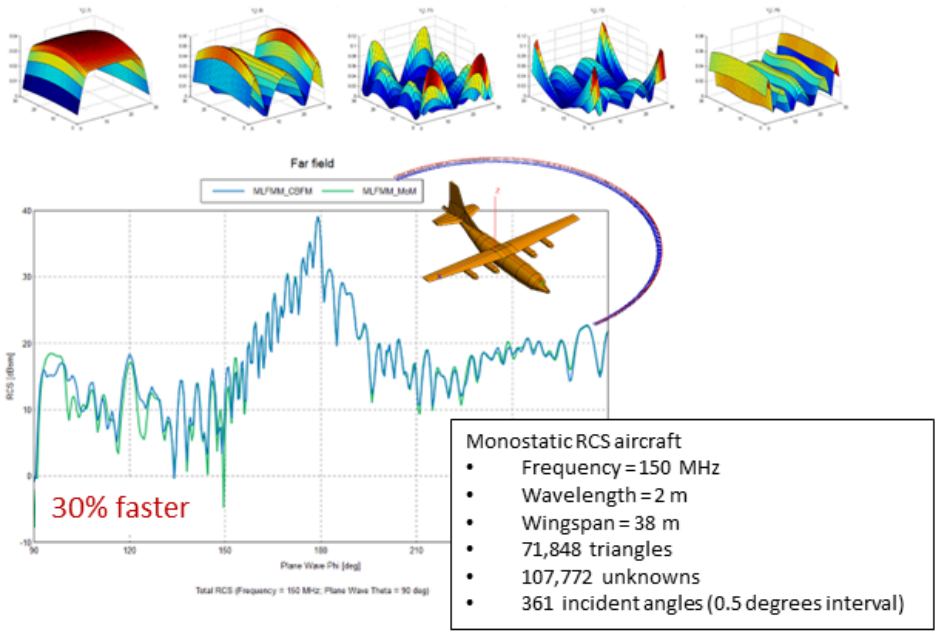

Figure 50: An example of a monostatic RCS calculation of an aircraft solved with MLFMM and MoM/MLFMM.

Salient Features in WinProp

- Modified the beam assignment algorithm to use the rays of the receiving pixel leading to more accurate results.

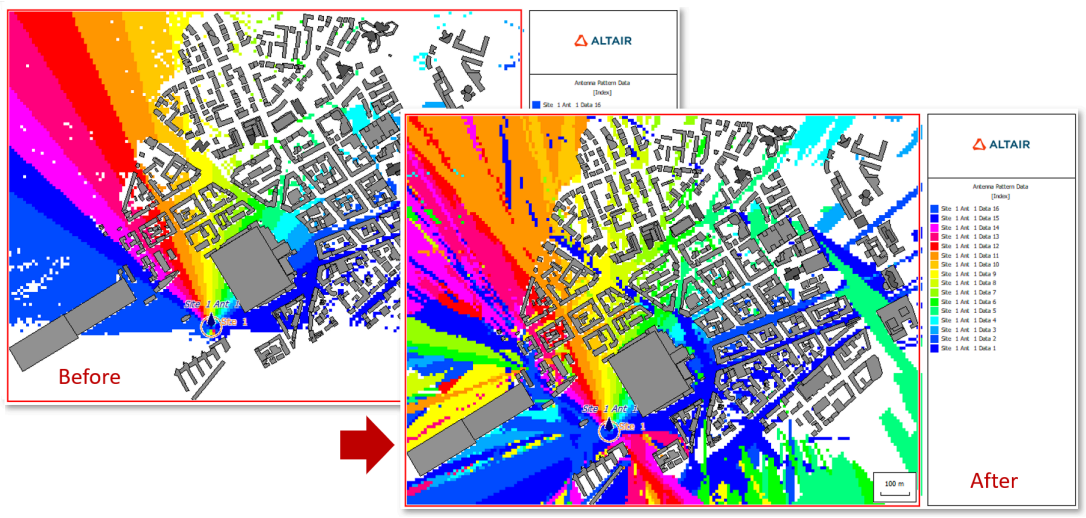

Figure 51: A before (left) and after (right) example of improved beam assignment algorithm.

- Arbitrary prediction planes can now be viewed in the 2D view by selecting the plane from the prediction plane drop-down list. In the past, arbitrary prediction planes could only be viewed in the 3D view. This option is useful when viewing vertical planes of the Parabolic Equation (PE) model.

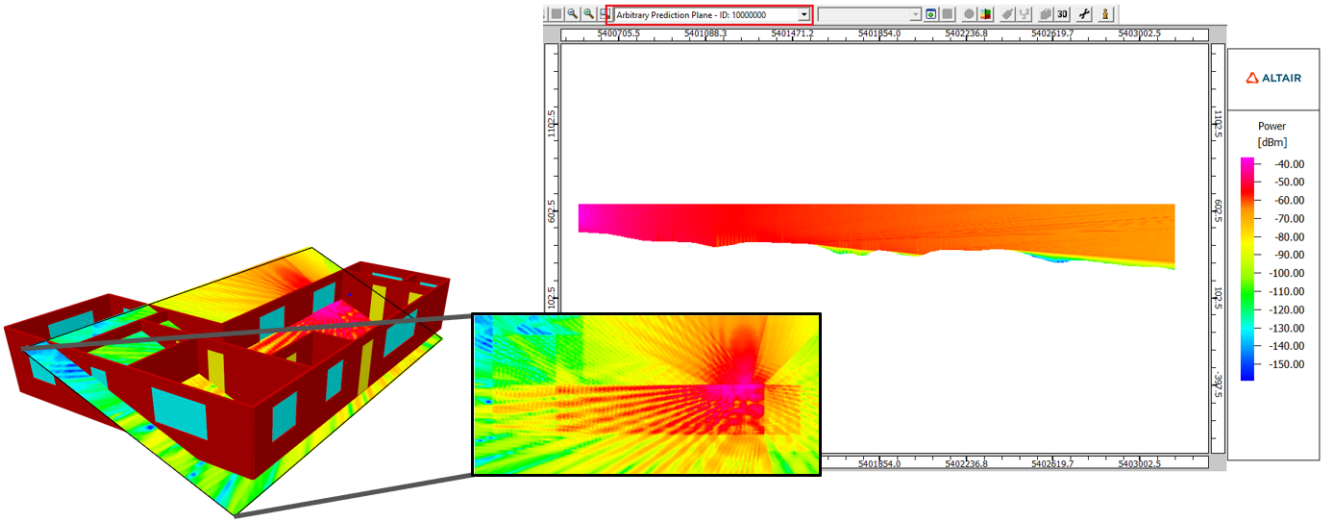

Figure 52: Examples of arbitrary prediction planes that are now available in the prediction plane drop-down list. Left: Arbitrary plane in an indoor scenario in the 3D view and new 2D view; Right: A vertical prediction plane used in the PE model.

- The pixel center and pixel grid can be enabled on the **Default Settings** dialog.

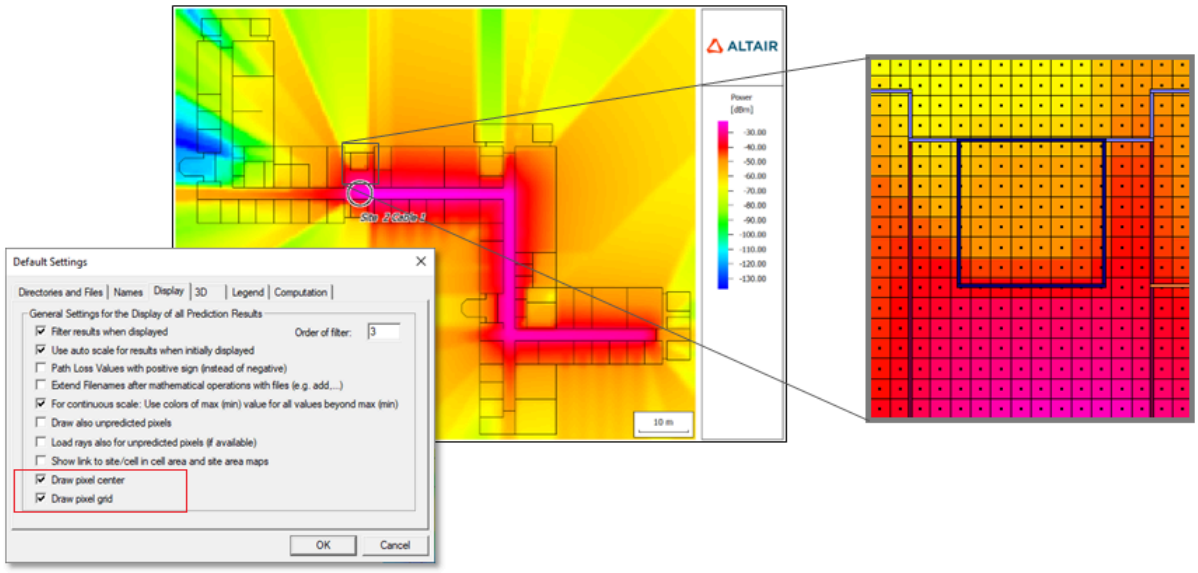

*Figure 53: An example of an indoor database where the pixel center and pixel grid were enabled on the **Default Settings** dialog. For a large database, zoom-in to view the pixel center and pixel grid.*

- Added the new wireless standard definition files (`.wst`[2]) for WiFi 7 (802.11be) and updated WiFi 6 (802.11ax). ProMan was extended to support the new 4096-QAM transmission modes for WiFi 7 (802.11be).

Salient Features in WRAP

- Added a new and improved format for height and landcover maps to WRAP and MapDataManager that have non-integer resolutions and are backwards compatible with the old format. To support coordinates and resolutions with non-integer arc second values, modifications were made to MapData Manager and height/clutter data reader functions. For this new format, WRAP supports horizontal resolution in micrometers, and vertical resolution in mm. This will assist detailed prediction and planning, involving maps with finer vertical and horizontal details of height and clutter (land use) data.
- The ITU-R P. 1409 propagation model was added to WRAP, which provides propagation predictions for radio communication systems or networks using high-altitude platform stations (HAPS) or other elevated stations in the stratosphere. The model is valid from 1 GHz and above.

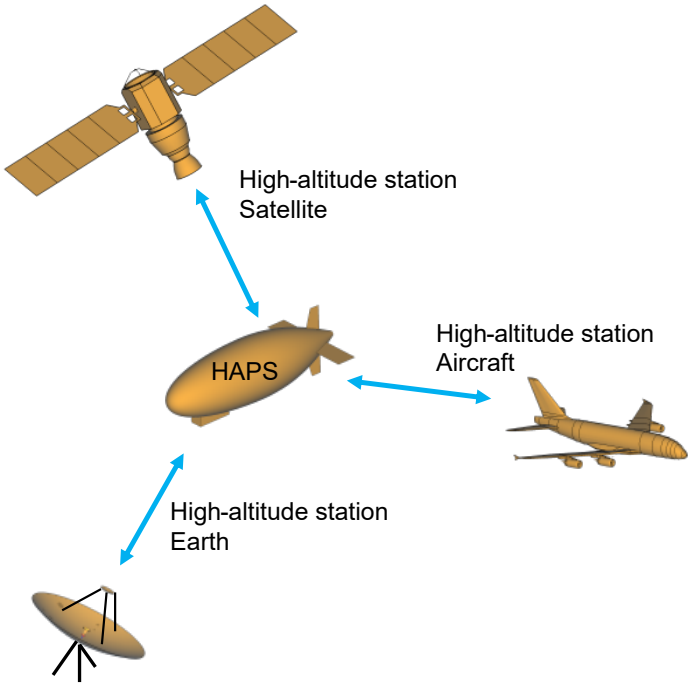

Figure 54: Propagation paths for high-altitude station.

- Added support to calculate the LTE sub-carrier interference between neighbouring co-channel LTE base stations. The user has the option to select the strongest co-channel interference only, or all interference, in addition to defining the cell load. The option is used when LTE transmitters exist in coverage calculations that make use of interference, for example, RSSI, RSRQ, Data rate, Throughput, SINR.

2. Available in the `\help\winprop\examples\ExampleGuide_models\Example-A07-Air_Interfaces_aka_Wireless_Standards.zip` folder.

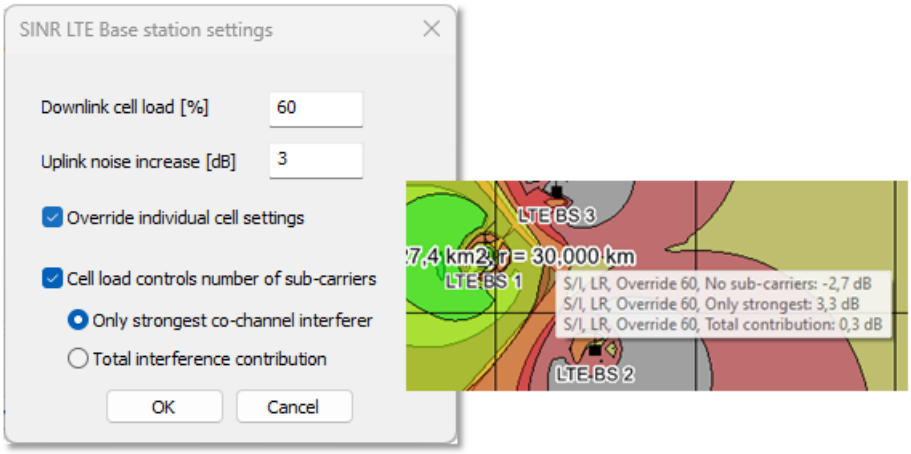

*Figure 55: The **SINR LTE Base station settings** dialog where you can select the strongest co-channel interference only, or all interference, in addition to defining the cell load.*

Feko 2023 Release Notes

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

CADFEKO

Features

- Added the **Find Cable** tool.
- Antenna arrays are now supported when importing a `.cfx` file.
- Extended the waveguide mesh port to support curvilinear faces.
- Added auto-delete of the waveguide mesh port when the referenced mesh topology is deleted with vertex definition (for both normal and curvilinear faces).
- Implemented unlinking of waveguide mesh ports (for both normal and curvilinear faces).
- The **Adaptive Refinement** mesh refinement rule option was renamed to **Error Estimate Refinement**. The old API (**`MeshRefinementRules:AddAdaptiveRefinement`**) is still supported.
- Model mesh boundary edges and boundary faces are exposed on the details tree. This change allows visualisation of these model mesh boundary faces and boundary edges in the 3D view.
- Added support to group mesh refinement rules.
- Added support for adding edge mesh refinements. This allows mesh refinement of geometry or model mesh edges.
- Improved application startup behaviour by showing the splash screen earlier during startup. This provides more immediate feedback to the user that the application had been launched.
- Enable the combination of CBFM and MLFMM.
- Added support to configure domain connectivity.
- Added missing Matrix Lua bindings.
- Added the ability to export the mesh outline to a `.dxf` file as two-dimensional data by projecting it onto the XY plane.
- Added a histogram to the **Mesh Info** dialog for a visual representation of the distribution of simulation mesh edge lengths.
- Extended FEM line ports to cause mesh refinement around the port.
- New instances of CADFEKO will have default tree branches expanded by default. An application session will remember the tree expansion setting as new models are created or loaded. Details trees will remember collapsed states of the collection when swapping between entities.
- Added support to hide individual cable paths by clicking on the related icon in the model tree.
- Improved the **Mesh Info** dialog to indicate whether a specific part or all parts are considered in the calculation of the displayed mesh information.
- Added the same limits of student licences in legacy CADFEKO to new CADFEKO.
- Added support to hide individual named points by clicking on the icon for that named point in the model tree.

- Various models have been added to the component library. When using these components, design or configuration options that are available with other component library models are not shown, but rather a preconfigured model is imported into the open project. The user may then adjust variables and settings as needed.
- A model of a biconical/log hybrid (bilog) antenna for EMC immunity testing was added to the component library.
- A model of a horn antenna for EMC immunity testing was added to the component library.
- A model of a log periodic antenna for EMC immunity testing was added to the component library.
- A model of a stripline antenna for EMC immunity testing was added to the component library.
- A model of a reflectarray was added to the component library.
- A model of a generic satellite was added to the component library.
- A model of an open boundary quad-ridged horn antenna was added to the component library.
- A model of a two-by-two corporate feed patch antenna array at 5.7 GHz was added to the component library.
- A model of a square-shaped miniature satellite (CubeSat) was added to the component library.
- A model of a base station sector antenna was added to the component library.
- A model of a series-fed patch array for 77 GHz advanced driver assistance systems (ADAS) radar was added to the component library.
- Models of a generic car and tyres were added to the component library.

Resolved Issues

- Resolved an issue where face media properties were not considered for FDTD meshing.
- Resolved an assertion that failed with the message `Assertion failed: Geometry could not be transformed correctly for combining` when creating a union of geometry parts. This assert prevented the import of certain legacy CADFEKO models.
- Resolved an assertion failure that could be triggered when saving a model with defined coatings.
- Resolved a crash when opening repair and sew faces operator properties.
- Resolved an issue where the mesh size setting was scaled with mesh parts resulting in meshes that were not the correct size. The correct mesh size is now applied when re-meshing scaled mesh parts.
- Reversing normals now works correctly on all mesh face types.
- Component launch options, which could have been modified in another Feko component, for example, in POSTFEKO, are loaded when opening the component launch options tool. The options are also stored when applying changes, making it available to other Feko components while the current instance of CADFEKO is still running.
- Improved geometric region symmetry calculations by introducing a tolerance.
- Fixed a symmetric meshing problem that resulted in a verification error containing `SimulationMeshRegionEntity.cpp (614): Assertion failed: It should have 1 region.`
- Resolved an issue where reversing the model mesh element normals had no effect in the 3D view.
- Resolved an issue when exporting mesh to I-DEAS mesh (`.unv`) file format that resulted in reversed element normals.
- Added support to allow vertical resizing of dialogs containing tables.

- Show a warning instead of an error when face normals point in the wrong direction for the faces to be considered symmetric around a plane of symmetry.
- Symmetrical geometric entities which have a scale transform applied to them will now be correctly assessed according to the symmetry setting specified.
- Improved erratic tree behaviour. The scroll bar position no longer jumps to the previously selected item.
- Improved legacy script error feedback in the script editor so that the line at which the error occurred is reported.
- Cable dialogs now all have correct Escape and Enter key behaviour to close the dialog or accept changes without first having to change focus away from the image to another field by pressing Tab or through clicking.
- Resolved an issue where excluding a group did not exclude the entities inside of the group.
- Improved the **Save As** dialog to use the current project name (instead of the name of a previously imported file) as the suggested file name.
- Validation hierarchy notifications no longer appear as message dialogs but are shown as verification messages in the model status panel.
- Resolved an issue where the **Show Only** tool was not working as intended.
- Improved selection behaviour using the **Rectangle Select** tool.
- Point entry widgets refresh their styling when focusing into the widget.
- Fixed missing API documentation on some objects for **LocalWorkplane**.

CADFEKO [LEGACY]

Features

- When importing Cartesian boundary near field data from files, the option to ignore a face of the near field boundary is now available in both CADFEKO and legacy CADFEKO. This option should be used to achieve accurate simulation results for Cartesian boundary near field data that was computed with one face of the Cartesian boundary coincident with a conductive plane.

EDITFEKO

Features

- Enable the selection of CBFM with MLFMM at the FM card.

POSTFEKO

Features

- Added the functionality to POSTFEKO to plot complex eigenvalues.
- Added rendering support for domain connectivity.

Resolved Issues

- Resolved an assertion failure in POSTFEKO that occurred when importing a large `.fek` file.
- Implemented a correction to prevent a crash during `.fek` file updating.
- Added support to display error estimates on curved triangles (order 0.5 only) and segments.

Solver

Features

- Extended the combined MoM/MTL method to relax the loading restrictions at terminations, allowing for direct/strong coupling between the inner MTL and outer MoM regions.
- Added support for CFIE in the characteristic basis function method (CBFM).
- The characteristic basis function method (CBFM) can now be used with MoM in the Feko Solver. This implementation will be extended to support MoM/MLFMM in future releases to improve impact for a wider range of practical problems for applications such as scattering analysis.
- Added a utility for de-embedding S-parameters.
- Add support for MoM-SEP (dielectric materials) hybridized with RL-GO for both coupled and uncoupled cases.
- The calculation of FEM error indicators at metallic surfaces (infinitely thin sheets) within a FEM region has been improved. The error indicator levels are now comparable to the indicator levels in other regions of the model, impacting positively on all workflows relying on these error indicator values. The error indicator calculation phase has also been parallelized.

Shared Interface Changes

Features

- Increased the `.fek` file version to 191 to accommodate new features.
- Automatic adaptive mesh refinement can be achieved by launching AMRFEKO from the Run/Launch ribbon group. AMRFEKO options are available on the dialog launcher on the Run/Launch ribbon group. The option to launch AMRFEKO is available from CADFEKO, EDITFEKO and POSTFEKO.

Support Components

Features

- Removed the CoMan and OptMan examples from the installation and documentation. Users are encouraged to use HyperStudy for optimisation studies.
- Added a table of supported media types for each solution method to the Feko User Guide.
- Extended the Feko User Guide to include a list of solution methods supported with a multilayer substrate.

- After running a set of simulations prepared using the **Create Frequency Ranges** macro in CADFEKO, the **Combine Results** macro will automatically be launched in POSTFEKO to process and display the combined results.
- Converted the **Create Impedance Sheet for Layered Metals** application macro from the CADFEKO [LEGACY] API to the new CADFEKO API.

WinProp 2023 Release Notes

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

General

Features

- Added new wireless standard definition files for WiFi 7 (802.11be) and updated ones for WiFi 6 (802.11ax).
- OptMan is deprecated and removed from the installation.
- CoMan is deprecated and removed from the installation.
- Upgraded the CityGML converter and corrected an issue where buildings were added multiple times.

ProMan

Features

- Added support to view arbitrary prediction planes in the 2D view. The display of the pixel center and pixel grid can be enabled on the **Default Settings** dialog (**Display** tab).
- Modified the beam assignment algorithm to use the rays of the receiving pixel leading to more accurate results.

WallMan

Features

- Added an error message that urban preprocessing with negative coordinates is not possible.

Resolved Issues

- Resolved an issue when saving an indoor database (`.idb`) as an outdoor database (`.odb`).

WRAP 2023 Release Notes

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

General

Features

- Add three options (best-case, worst-case, and mean) for methods to combine multiple coverage results in the composite function.
- Added support to define a threshold in the coverage comparison tool.
- The demo database shipped with WRAP now contains LTE Base Station Template, Mobile Station, Transmitter and Receiver (for LTE Band1) for LTE Coverage Calculations.
- The size of the icons in WRAP Toolbar has been modified to adapt to the display resolution.
- Added support for calculating LTE sub-carrier interference between neighbouring co-channel LTE base stations in the Coverage tool.
- Implemented the ITU-R P. 1409 propagation model, which provides propagation predictions for systems using high-altitude platform stations or other elevated stations in the stratosphere.
- Added support for the ITU-R P.617 model in the API with the Link Performance Tool.

Resolved Issues

- Fixed error with ObsMan Method 2 considering out of range radars, when search sector was not specified.
- Corrected some of the warnings about valid ranges in the Radio Link Performance tool.

WRAP MapDataManager

Features

- Added support for map data with non-integer and sub-integer resolutions to support high resolution maps with resolutions below 1 arcsec or below 1 m.