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Antenna Pattern Editor 2.0

User Manual

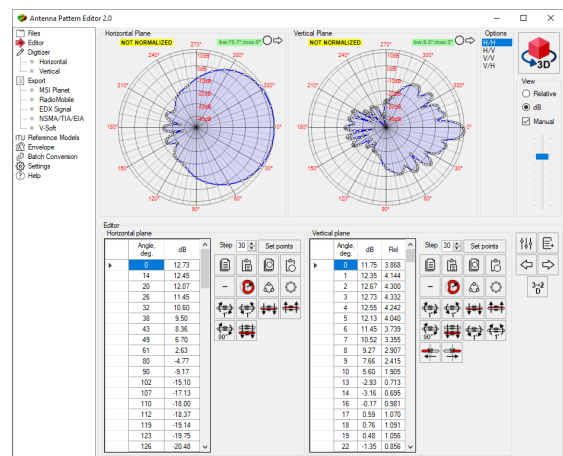
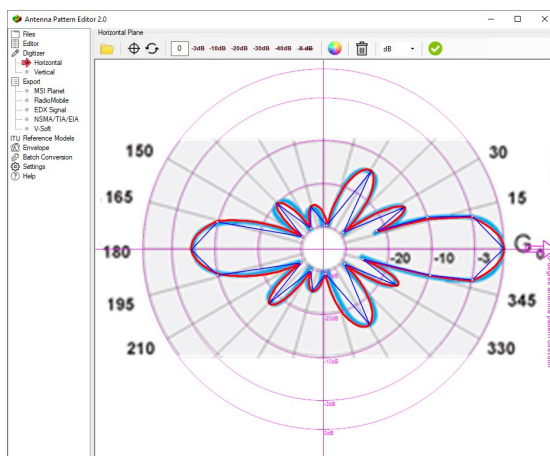
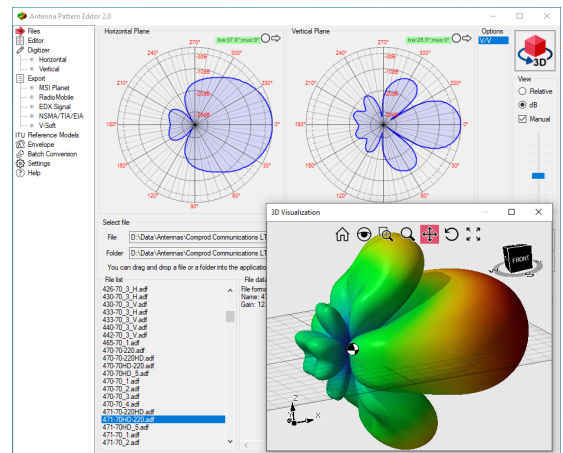
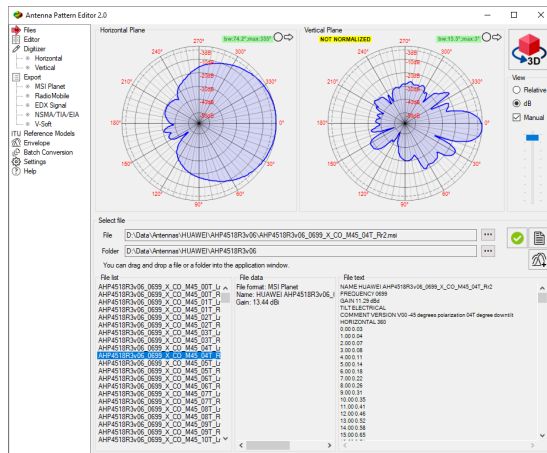


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From the Developers

We made every effort to create a user-friendly and intuitive application. However, we recommend you spend some time reading this User Manual to get the most out of the Antenna Pattern Editor application.

Features

Antenna Pattern Editor is a versatile tool with which you can view, create, edit, and convert antenna pattern files. The main idea embedded in the program is to provide the user with the opportunity to quickly create an antenna pattern file using various methods.

Antenna pattern file is a simple text or XML file that describes the main characteristics of the antennas - radiation patterns, gain, frequency range, name, manufacturer and other data. These files are used in various radio planning tools including our RadioPlanner, Indoor RadioPlanner and MLinkPlanner (see <https://www.wireless-planning.com/>)

Due to the large number of antenna pattern file formats, it often happens that an antenna pattern file in the exact format you need is not available. In this case, using the Antenna Pattern Editor, you can easily convert the file to the format you need.

Sometimes the antenna information is just a picture of the antenna pattern. In such cases, using the Antenna Pattern Editor, you can prepare the necessary file in just a few minutes. Thanks to the simple graphical interface, as well as the applied cubic spline interpolation algorithm, you can get the desired file by pointing only a few characteristic points on the downloaded image. You can use images of any raster format - png, jpg, bmp, tiff.

Using the Antenna Pattern Editor, you can view, edit, transform, normalize the antenna pattern, as well as a number of other functions described below.

Features:

- View 2D/3D antenna patterns in linear and logarithmic scales
- View text information from antenna pattern file
- Create/edit the antenna pattern in the table form with advanced copy and paste capabilities
- Create an antenna pattern from the picture (digitizing)
- Perform various transformations of antenna pattern (rotation, mirroring, normalize, etc.)
- Create of antenna patterns on various ITU-R reference models
- Antenna pattern report in Word, Excel, and PDF
- Export antenna patterns to various formats
- Calculation of the width of the main lobe in the horizontal and vertical plane, as well as the electrical antenna tilt
- Create an antenna pattern envelope file from a set of antenna patterns
- Batch convert antenna pattern files between formats

Antenna Pattern Editor allows you to work with most antenna pattern file formats. Both simple formats with two patterns in the azimuth and elevation planes are supported (for example, MSI Planet, Radio Mobile V3, etc.), as well as more complex formats with antenna patterns in different polarization and the so-called "slice" formats (NSMA, TIA / EIA -804-B, EDX, etc.). Full 3D formats ETS-Lindgren and Satimo are also supported.

Supported antenna pattern file formats:

- MSI Planet (*.msi, *.pla, *.pln, *.ptn, *.txt, *.ant)
- Radio Mobile V3 (*.ant)
- NSMA WG16.99.050 (*.adf *.dat *.nsma *.nsm *.txt)
- TIA/EIA-804-B (*.adf)
- EDX (*.pat)
- AntPat (*.ana)
- CelPlan (*.txt)
- RadioSoft ComStudy (*.pt2)
- V-Soft (*.pat, *.vep)
- 3D formats: ETS-Lindgren, Satimo (*.csv)

Installation and Activation

Antenna Pattern Editor runs on Windows 7, 8, 8.1, 10,11.

The minimum computer configuration is Core i3 CPU, 4 GB RAM, 200 GB HDD, video card, and monitor with support for 1366x768.

Run the Setup_ AntennaPatternEditor.exe file. Select your language and press the **Install** to launch the installation process. Click Next. To continue the installation process, read and accept the License Agreement. Activate the checkbox "I accept the terms in the License Agreement" and press Next.

After installing Antenna Pattern Editor, you will see a new line in the Start menu and a shortcut on the desktop.

During the 7-day trial period, you can try all the program's features without activation.

After the trial period has expired, you must purchase a license and activate the software to use all the features.

After the trial period, most of the program's features - viewing, transforming and antenna datasheet generation will continue to work, but Antenna Pattern Editor will retain the ability to export antenna patterns only to Radio Mobile V3 (*.ant) format.

To buy Antenna Pattern Editor, click on Help - Purchase, after which the purchase page will open in the browser. After making a purchase, you will immediately receive an activation ID code to your email. Then click Help - Enter your Activation ID code, enter your code and click on ACTIVATE.

Software Update

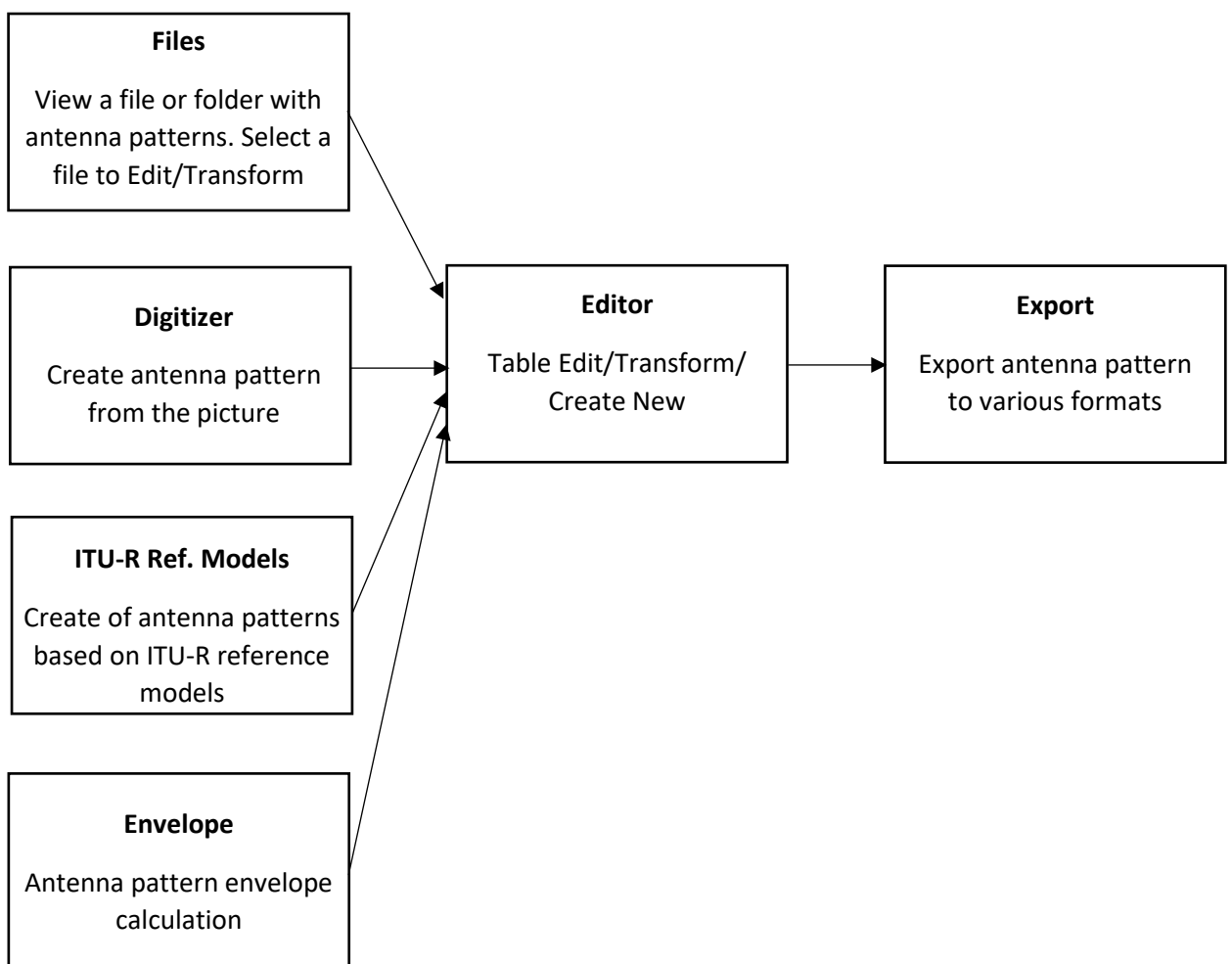
Periodically, we release free, ongoing updates that improve the functionality and stability of the software.

Antenna Pattern Editor supports both manual and automatic update checks. The program will check for available updates each time it starts. To check for updates manually, click Help - Check for Updates. If there is an available update, a window will open with current and available versions. Download the update from the link and install it manually (close Antenna Pattern Editor before installing the update).

Settings

Language	Selecting the interface language: - English
Units	Values Units in the Editor: - dB - Relative (E/E _{max}) - dB + Relative (E/E _{max})

How to Work with the Antenna Pattern Editor



The general principle of the Antenna Pattern Editor operation can be understood from the above block diagram.

In the "Files" block, you can view the antenna patterns, prepare an antenna data sheet in Word, Excel, and PDF. Here, you can also select an antenna pattern for further editing.

In the "Digitizer" block, you can digitize the antenna pattern presented as an image. The antenna pattern vector data obtained as a result of digitization in the azimuth and elevation planes are then transferred to the Editor for further processing.

In the "ITU-R reference models" block, you can create an antenna pattern based on ITU-R reference models. The resulting antenna pattern is transferred to the Editor for further processing.

In the "Envelope" block, the antenna pattern envelope is calculated from a set of individual antenna patterns. This is frequently required to determine the worst-case radiation situation in terms of the harmful effects of radio waves.

In the "Editor" block, a new antenna pattern is created/edited in a tabular form, transformation, normalization and other processing of the antenna pattern.

In the "Export" block, the antenna pattern is exported to various formats. Export is performed for the antenna pattern placed in the Editor.

User Interface

As the main user menu, the software uses a Tree View interface (multi-level tree), the controls of which are in the left part of the main panel. When you select a menu item, the corresponding panel opens on the right.

[View and Select Antenna Pattern File](#)

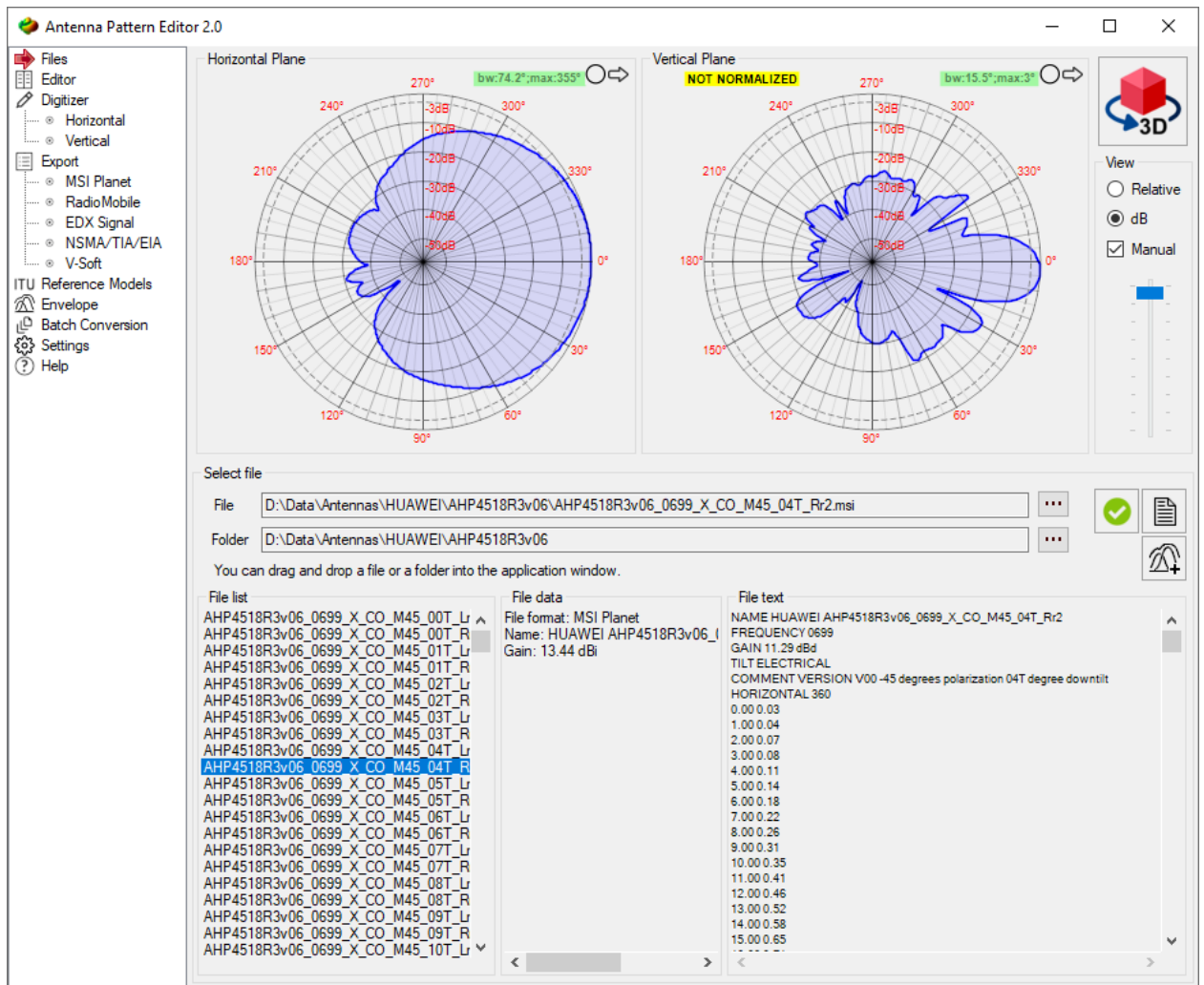
Viewing of the antenna pattern, as well as selecting files for further editing, is performed in the Files menu. Here you can also get a report in the form of a specification for a specific antenna in Word, Excel or PDF format.

You can upload either a single file or a folder with a set of files.

Antenna Pattern Editor allows you to view the antenna pattern, as well as other information from the antenna pattern files. You can open the file or folder in the standard way, or simply by dragging and dropping the desired file or folder into the Antenna Pattern Editor window.

If a folder with a set of antenna files has been opened, a list will appear on the left side. You can select the desired antenna from that list. Files from folders enclosed in the current folder will not be displayed.


After selecting the file, the image of the antenna pattern in the horizontal and vertical planes appears on the top panel. Information about the antenna pattern file format, antenna name and gain will appear on the right. The full text of the antenna pattern file will be shown in a separate block.

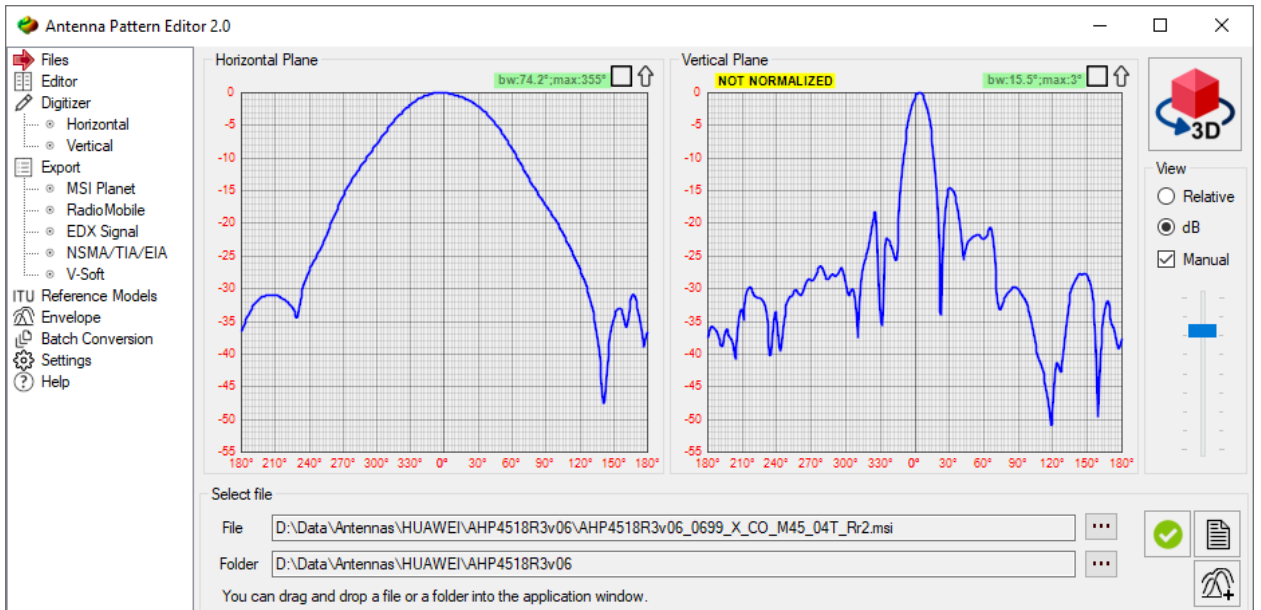


View Antenna Pattern Files

Using the tools located to the right of the antenna pattern, you can change the display of the antenna pattern - in relative units (E/E_{max}) or dB. The scale is set automatically, but for dB, you can also set the scale manually (click on Manual and move the slider).

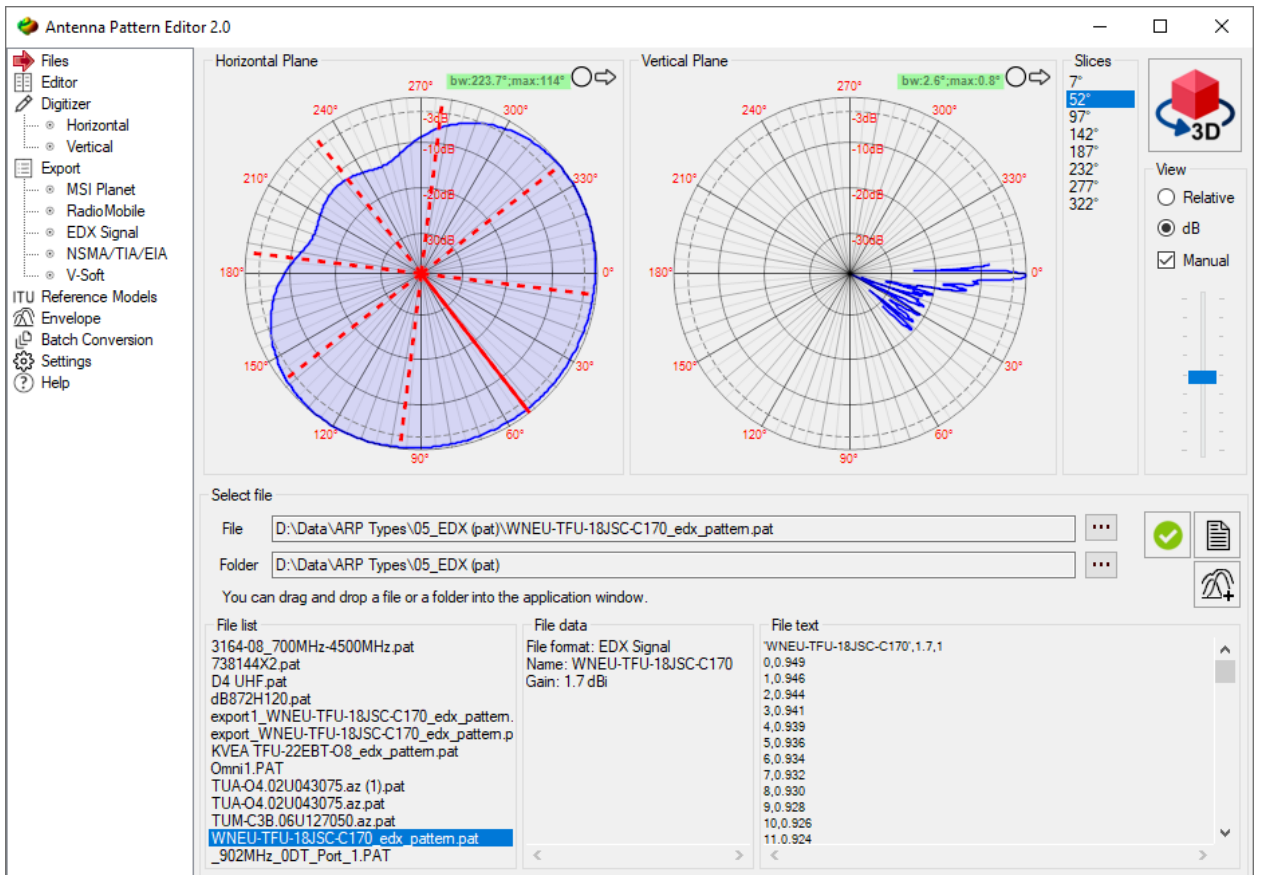
If the antenna pattern is not normalized, then a corresponding mark will appear above it.

Using the controls  above the antenna pattern, you can select its representation (in polar or Cartesian coordinate system), as well as the antenna pattern orientation (up or right).



Antenna Pattern in Cartesian Coordinate System

If the antenna pattern file contains patterns for several polarizations or slices (some file formats allow this), then an additional field for selecting options will appear. To view the corresponding antenna pattern, click on the appropriate option (polarization type or slice azimuth).



Sample antenna with multiple slices in EDX format

The width of the main lobe is displayed at a level of 3 dB ($E/E_{max}=0.7$) on both the horizontal and vertical antenna patterns. The main lobe azimuth and vertical tilt are also displayed. These values are calculated from the information in the antenna pattern file.

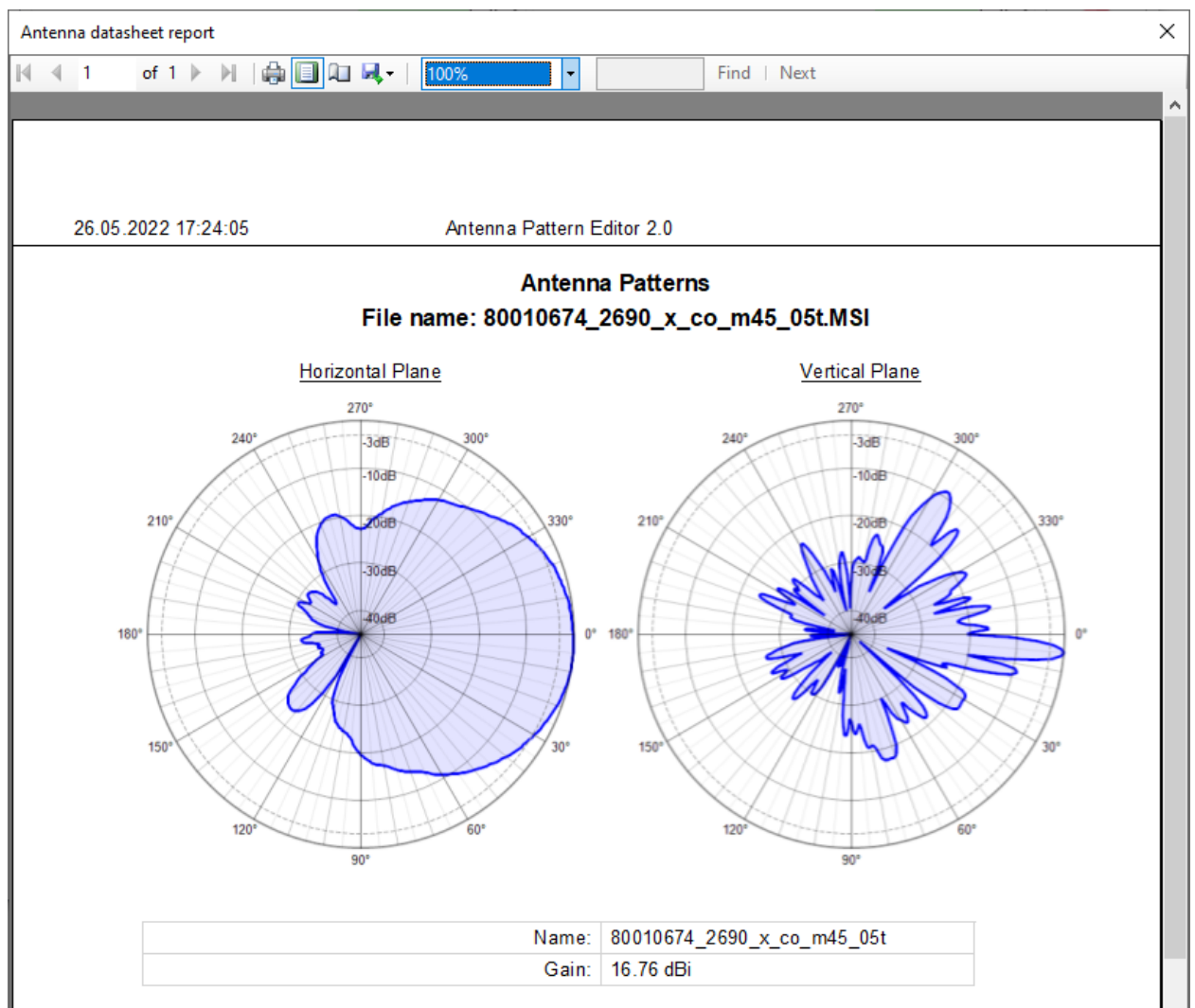
If you want to use the current antenna pattern for further editing, then click on the "Select this antenna for editing" button, after which the editor will open and a copy of the antenna pattern will be transferred to it.

Antenna Data Sheet

Antenna Pattern Editor provides a report of the main characteristics of the antenna, which can then be saved in Word, Excel or PDF format.

To view the report, click on the Antenna data sheet button. The report is generated based on the pattern of the current antenna and the header data of the description file.

To save the report in Word, Excel or PDF formats, use the appropriate tool from the top panel.



Antenna Datasheet Report

3D Antenna Pattern Visualization

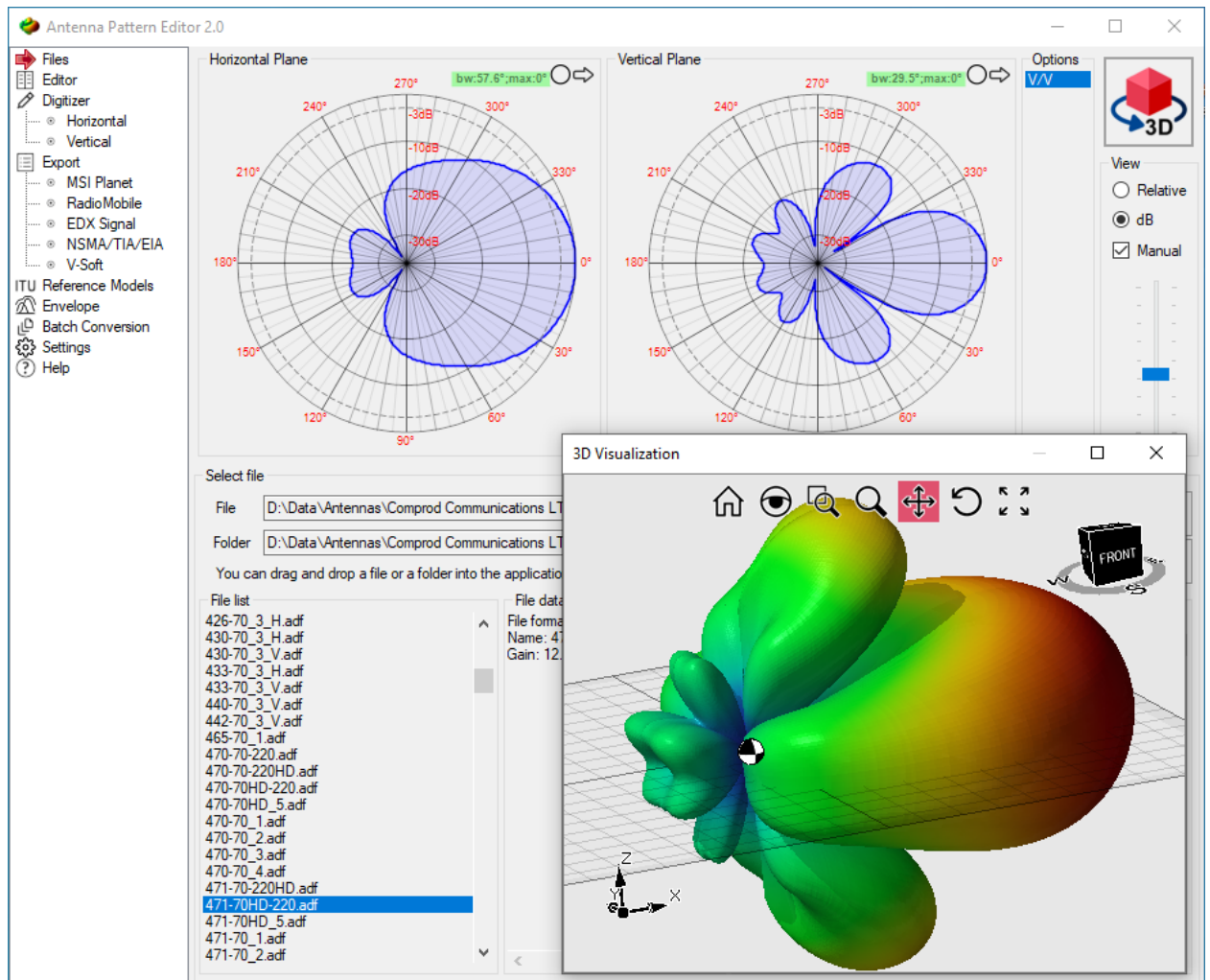
Antenna Pattern Editor performs 3D visualization of antenna patterns.

The conversion of 2D antenna pattern into 3D is performed using the CrossWeighted conversion algorithm.

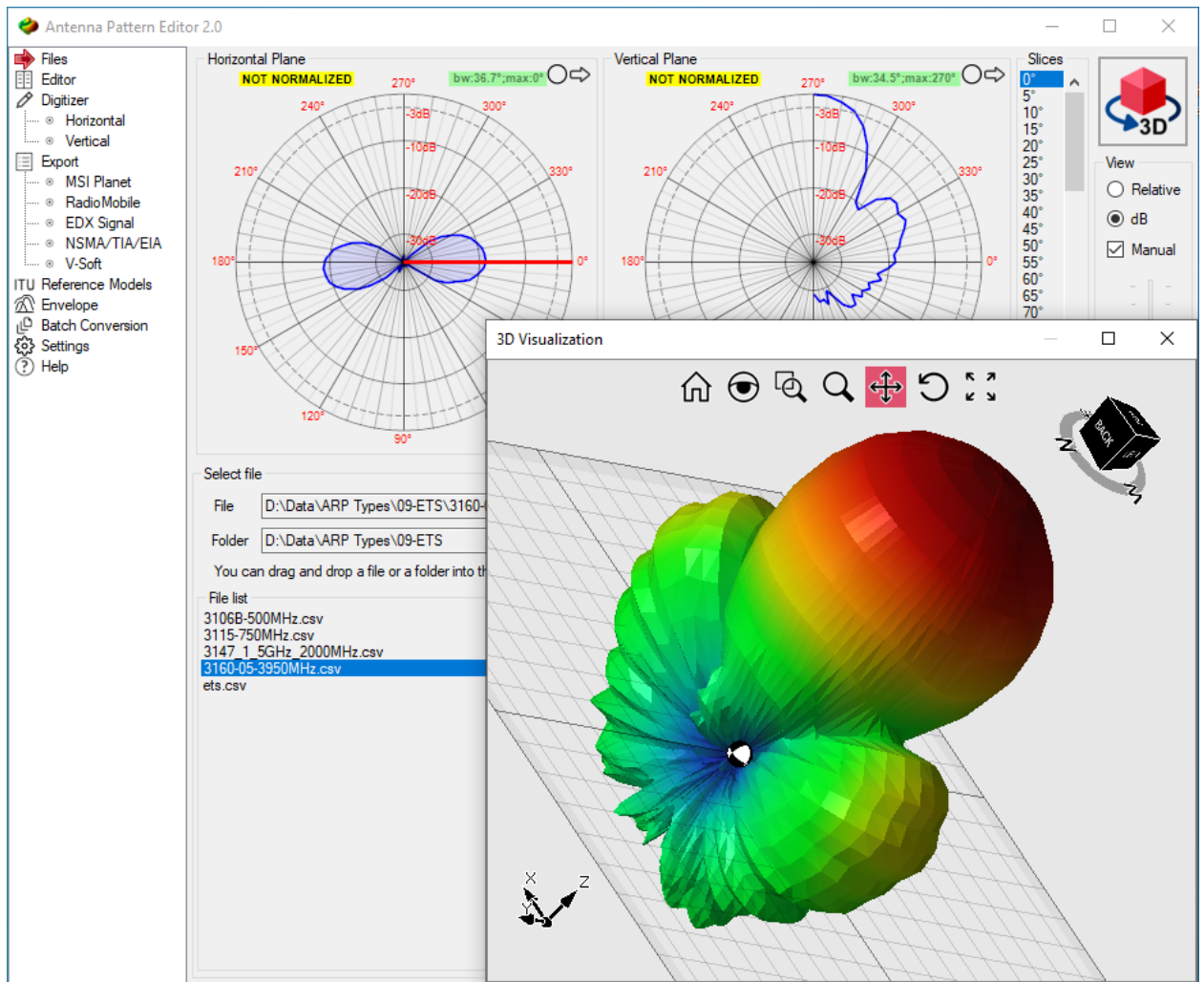
For full 3D formats (ETS-Lindgren, Satimo) direct display is performed in the spherical coordinate system.

To view the antenna pattern in 3D, click on the 3D button, which is located in the upper right corner. The 3D model of the selected antenna will open in a separate window.

The 3D visualization controls are at the top. Rotation of a 3D visualization is most conveniently performed using the ViewCube in the upper right corner. The ViewCube is a cube-shaped widget placed in an up right corner of the window. When used as an orientation controller, the ViewCube can be dragged, or the faces, edges, or corners can be clicked on, to easily orient the scene to the corresponding view. When acting as an orientation indicator, the ViewCube turns to reflect the current view direction as the user re-orientes the scene using other tools.



3D visualization of 2D antenna pattern



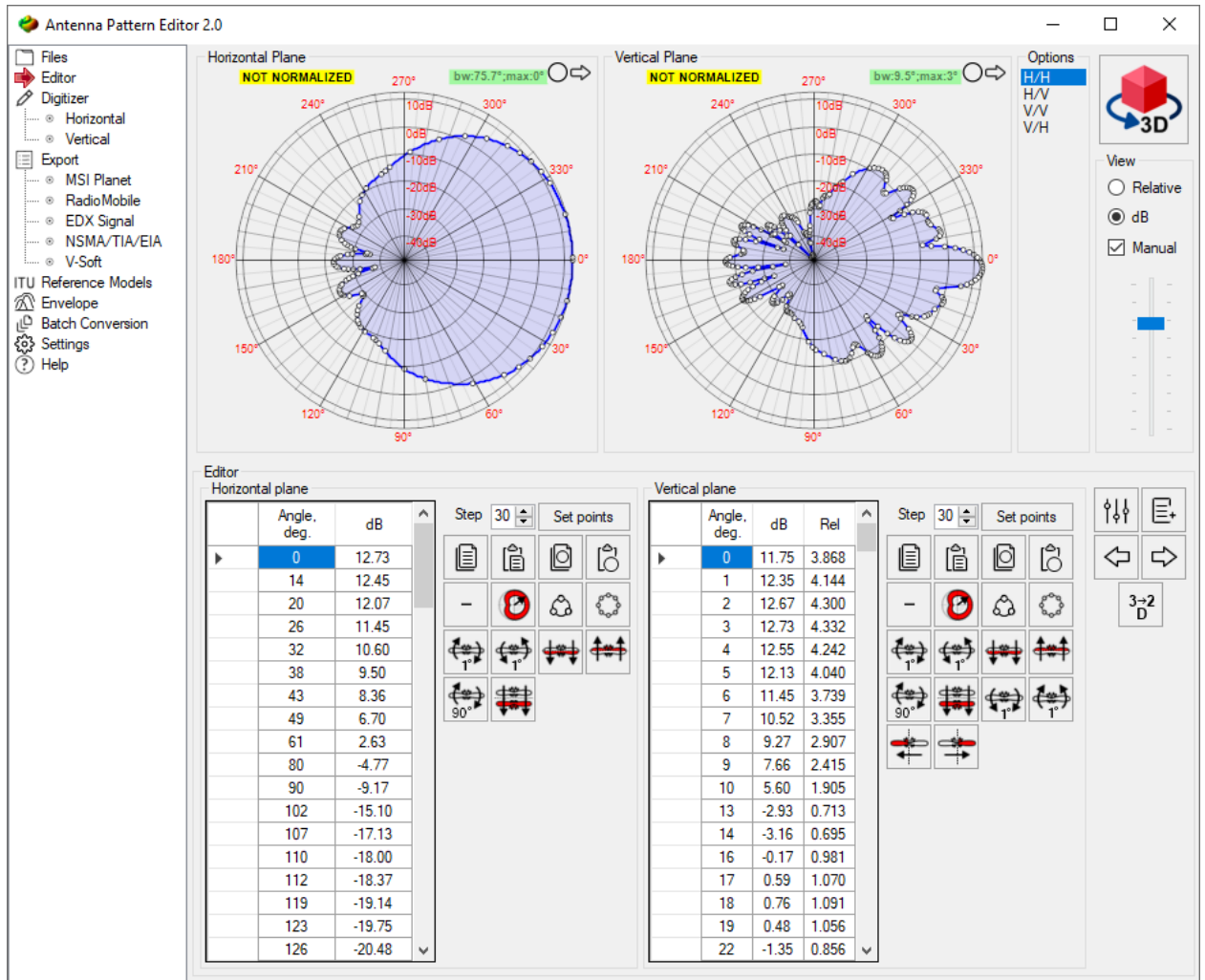
3D Antenna Pattern Visualization

Edit/Transform/Create

In the "Editor" block, a new antenna pattern is created/edited in a tabular form, transformation, normalization and other processing of the antenna pattern.

Note that when an antenna pattern is placed in the editor, regardless of the previous format, the antenna pattern values are converted to a universal form in which dB values can be either positive or negative.

The table can be filled in and edited manually. There are also advanced options for copy-pasting table cells via the clipboard from spreadsheets, text files, and also antenna patterns from FM and TV queries from the FCC website www.fcc.gov



Editor

Manual Entry and Editing Antenna Pattern

When manually entering and editing, you simply enter the angle values and the corresponding antenna pattern values in logarithmic or relative units. You just need to enter one of the values, the second is calculated automatically.

To delete rows in the table, you need to select these rows in the left empty field and press Delete on the keyboard.



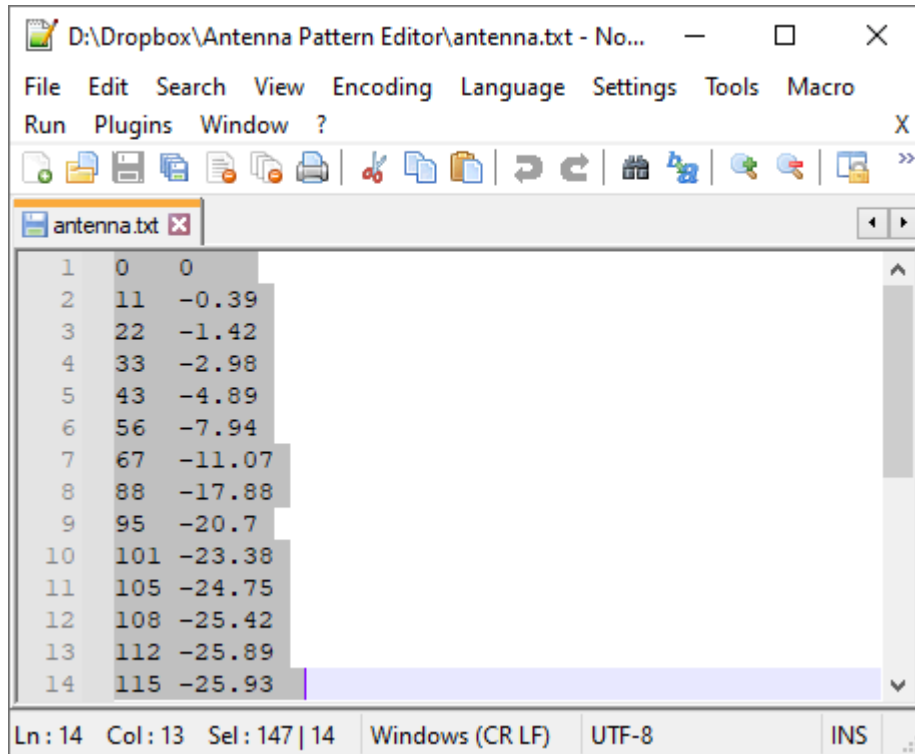
Any action in the editor can be undone or redone using the tools

Copy Antenna Pattern Data from Spreadsheets and Text Files

The Editor allows you to insert into the table the angles and the corresponding values of the antenna pattern from spreadsheets and text files.

To copy data from a spreadsheet, copy two columns (a column with corners and a corresponding column with values), then click the Paste data from clipboard button. In the prompt that appears, specify the type of units to be inserted - dB or Relative, then click on OK and the data you copied will appear in the table sorted in ascending angles. If there were already antenna pattern values with the same angles in the table before, they will be replaced with new ones.

The editor allows you to copy antenna pattern values from text files. In this case, in the text file, the angles values and antenna pattern values must be separated by spaces or tabs. Copy the lines you need in the text file and paste into the table. In the prompt that appears, specify the type of units to be inserted - dB or Relative, then click on OK and the data you copied will appear in the table. If there were already antenna pattern values with the same angles in the table before, they will be replaced with new ones.



Copy antenna pattern from a text file

You can run two instances of the software on a computer and copy-paste the antenna pattern values between different windows. This method is convenient to use when you need to replace the antenna pattern in one plane - horizontal or vertical.

Copy Antenna Pattern from FCC Website

You can copy antenna patterns from standard FM query and TV query results directly from the FCC website. By these requests, you can find the antenna parameters of FM and TV broadcasting stations in the FM, VHF and UHF bands.

Requests are made from addresses <https://www.fcc.gov/media/television/tv-query> and <https://www.fcc.gov/media/radio/fm-query>

Requests can be made by various parameters: call sign, states, cities, etc.

If the FM or TV station has a directional antenna, this antenna pattern in the azimuthal plane can be copied and pasted into the Editor.

Technical Data Links & Maps

42° 18' 10.70" N Latitude 42.302972 WFX's first license was granted 04-14-1978.
 71° 13' 04.90" W Longitude (NAD 83) -71.218028

Site is in the in Canadian Border Zone -- Nearest border point is 292.5 km at 75.9°

Polarization: Elliptical (H > V)

Effective Radiated Power (ERP): 1000. kw ERP
 Antenna radiation center Height Above Average Terrain: 350. meters HAAT - Calculate HAAT
 Antenna radiation center Height Above Mean Sea Level: 393. meters AMSL
 Antenna radiation center Height Above Ground Level: 347.0 meters AGL

TV Zone: 1

Antenna ID No.: 25076f916c250944016c2a77639e0e9c
 Antenna Make: DIE Antenna Model: TUM-AP-04-14/56H-2-B

Directional

Relative Field values for directional antenna

0°	0.936	60°	0.685	120°	0.775	180°	0.937	240°	0.647	300°	0.742
10°	0.872	70°	0.754	130°	0.980	190°	0.877	250°	0.703	310°	0.955
20°	0.697	80°	0.913	140°	0.923	200°	0.706	260°	0.855	320°	0.908
30°	0.773	90°	0.941	150°	0.683	210°	0.768	270°	0.881	330°	0.686
40°	0.979	100°	0.877	160°	0.750	220°	0.959	280°	0.822	340°	0.757
50°	0.924	110°	0.701	170°	0.908	230°	0.896	290°	0.654	350°	0.910

Additional azimuths:
 23° 0.678 243° 0.616
 133° 1.000 293° 0.639
 203° 0.686

Additional Individual Tower Information from the Antenna Structure Registration database.
 (Use the Registration Number link for detailed information.)

ASRN	Site Elevation (meters)	Overall Height Above Ground (meters)	Overall Height Above Mean Sea (meters)	NAD 83 Tower Coordinates	Convert to NAD 27	FAA Study No.
1004233	46.0	366.0	412.0	N 42° 18' 10.7" W 71° 13' 4.9"	To NAD27	2014-ANE-121-OE

FAA links: Open [Obstruction / Airport Airspace searches](#) then try FAA Study No. [2014-ANE-121-OE](#)

Copy antenna pattern from FCC website






















Transformation of Antenna Pattern

Using the tools in the **Transformation** menu, you can perform various transformations of the antenna pattern in the horizontal and vertical planes.

Step Set points Fill the table with azimuths/elevations at a given interval

Copy selected cells to the clipboard

Paste data from clipboard

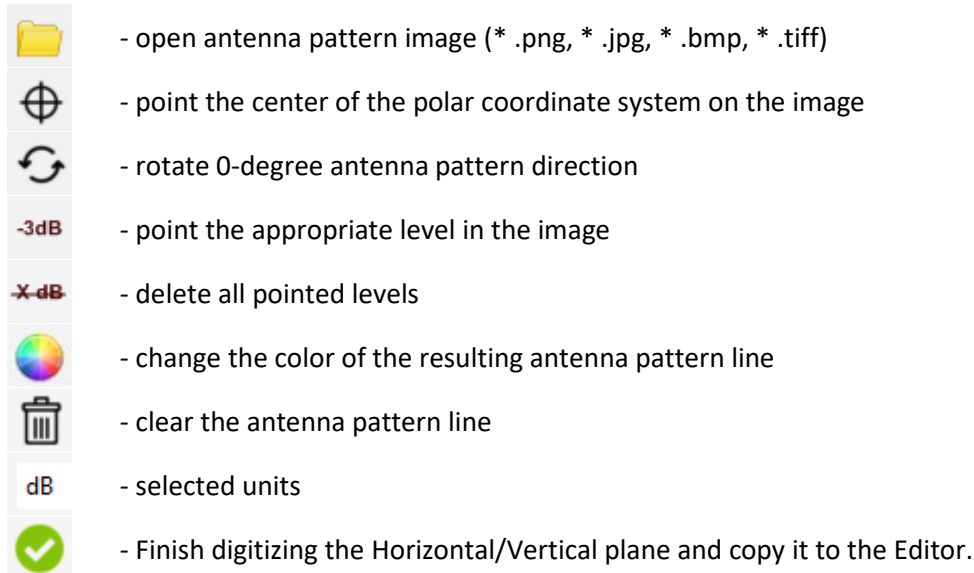
	Copy all cells to the clipboard
	Replace all cells with data from the clipboard
	Make all dB values negative. This conversion is required when copy-pasting into a table of values from a text file of antenna patterns in MSI format
	Normalize the antenna pattern
	Simplify antenna pattern by using Douglas-Peucker algorithm
	Interpolate in 1 degree step
	Rotate the antenna pattern clockwise 1 degree
	Rotate the antenna pattern counterclockwise 1 degree
	Copy the antenna pattern from top to bottom
	Copy the antenna pattern from bottom to top
	Rotate the antenna pattern clockwise 90 degree
	Vertical mirroring of the antenna pattern
	Tilt both sides of the antenna pattern 1 degree down
	Rotate both sides of the antenna pattern 1 degree up
	Copy the right side of the antenna pattern to the left
	Copy the left side of the antenna pattern to the right
	Edit antenna pattern parameters
	Create a new antenna pattern
	Undo
	Redo
	Transform 3D antenna pattern to 2D

Digitizing of the Antenna Pattern Picture

In cases where the antenna pattern is presented as an image, the antenna pattern file can be prepared by digitizing this image.


In this case, the following actions are performed - you upload a file with a picture of a horizontal antenna pattern, mark several characteristic points on it, mark the center of the polar coordinate system and one or more levels in dB of the antenna pattern. Then the same operations must be done with the vertical antenna pattern, then fill in several fields with the antenna parameters and save the antenna pattern in the desired format.


Toolbar:



Detailed step-by-step procedure for digitizing antenna pattern picture:

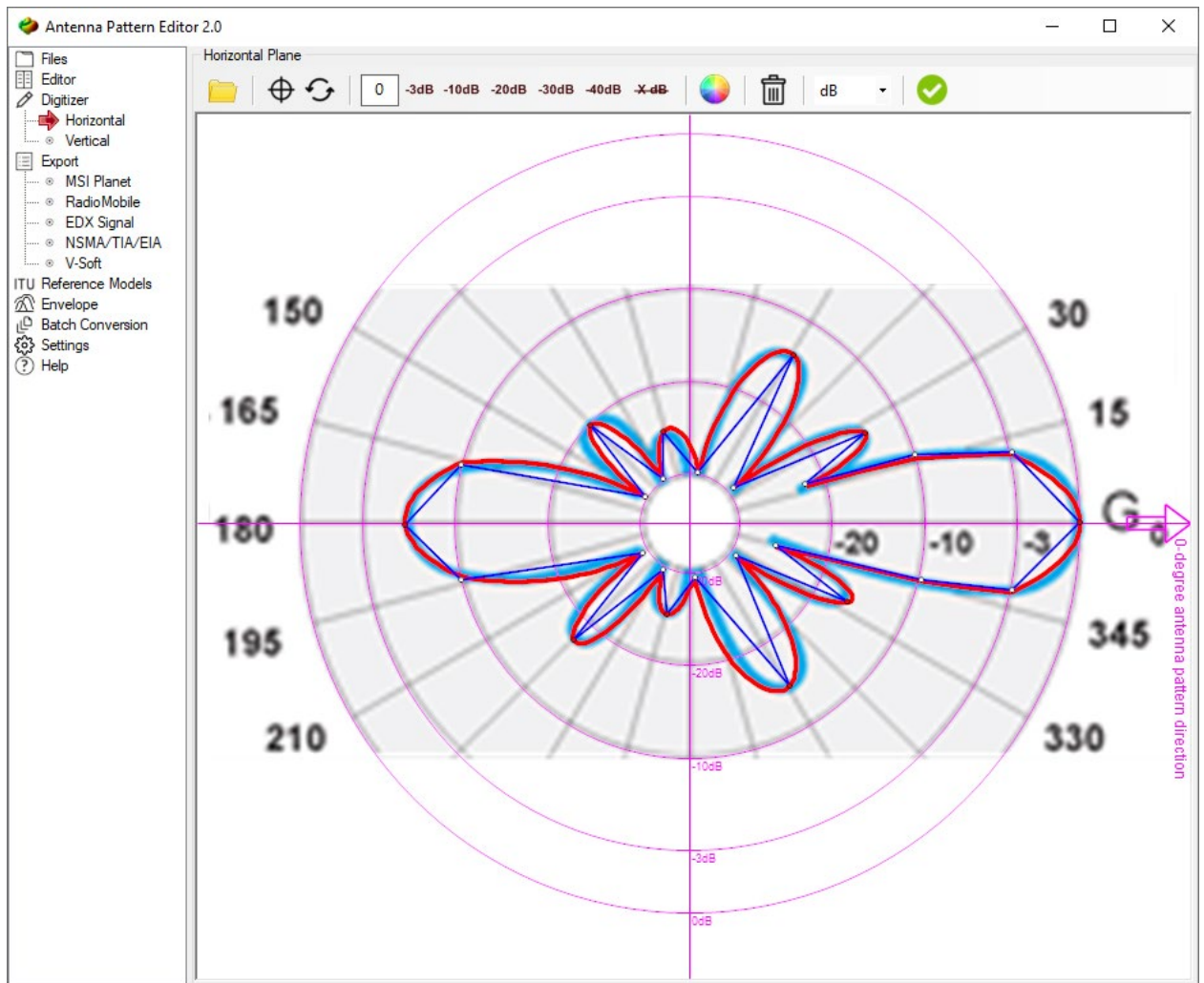
Step 1. Go to the Digitization – **Horizontal Plane**. Download the image file of the antenna pattern in the horizontal plane, or paste the image from clipboard. Moving the downloaded image is carried out by the mouse with the wheel pressed, scaling - by rotating the mouse wheel.

Step 2. Set the center of the polar coordinate system to the center of the antenna pattern. Click on the tool , and then click on the center of the downloaded image antenna pattern.


Step 3. Using the tool , specify the direction of the antenna pattern by 0 degrees (antenna manufacturers provide the antenna pattern, in which the direction of the antenna pattern at 0 degrees is sometimes indicated up, sometimes to the right).

Step 4. Using the dB - E/E_{max} tool, specify the units in which the antenna pattern in the image is shown - in decibels or relative units.


Step 5. Set the nodes of the polyline (it is marked in blue) on the characteristic points of the image of the antenna pattern (usually these are the maxima and minima of the antenna pattern, as well as the characteristic bends of the antenna pattern). Moving a polyline node is performed by clicking the left mouse button, deleting a node by clicking the right mouse button on the node, creating an additional node by clicking the right mouse button on the polyline.



Digitization of H-plane antenna pattern

Step 6. Evaluate the coincidence of the resulting antenna pattern, which is shown in red (the color can be changed using the tool ) with the original image of the antenna pattern. To make the resulting radiation pattern smooth in any of the nodes, you should enable spline interpolation in it by double-clicking the left mouse button, and the node will be highlighted in red. If necessary, add additional nodes (do not forget - nodes are added on the blue polyline with the right mouse button) until a satisfactory match with the picture is obtained.

Step 7. If the antenna image is given in decibels in the original image, then you need to specify the levels from the range -3, -10, -20, -30 or -40 dB, which are marked on the loaded image of the antenna pattern (several are better, since the scale on image antenna pattern may be non-linear). To do this, click on the desired button, and then click on the appropriate level in the image antenna pattern. If the antenna image is shown in relative units on the image, then the -3, -10, -20, -30, and -40dB levels are not required, except for the following case. Very rarely, but it happens that some manufacturers draw the antenna pattern in relative units, in which 0 is not in the center, but at a certain radius from the center. In this case, at a radius corresponding to 0, you need to specify the level of -40dB. This level will be taken as 0.

Step 8. Click on  button to digitize the horizontal-plane antenna pattern. Then it will appear in the **Editor** menu.

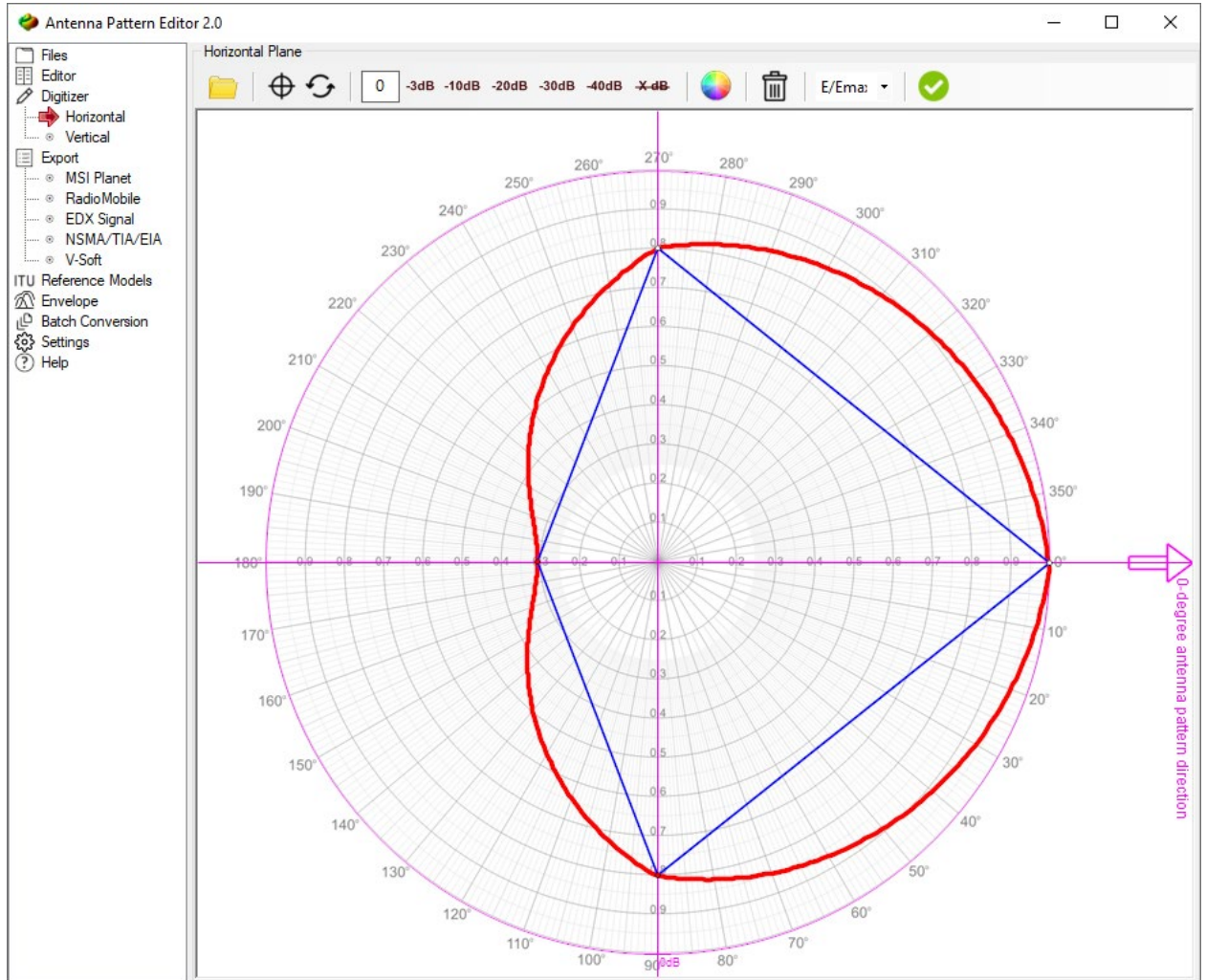
Step 9. On the **Vertical Plane** tab, repeat steps 1-8 for the Vertical plane antenna pattern.

Creating an Antenna Pattern Using a Graphical Editor

Using the digitizer, you can quickly draw an antenna pattern from a blank antenna pattern in a logarithmic or linear scale. Blank templates can be opened for the horizontal and vertical antenna pattern with a tool



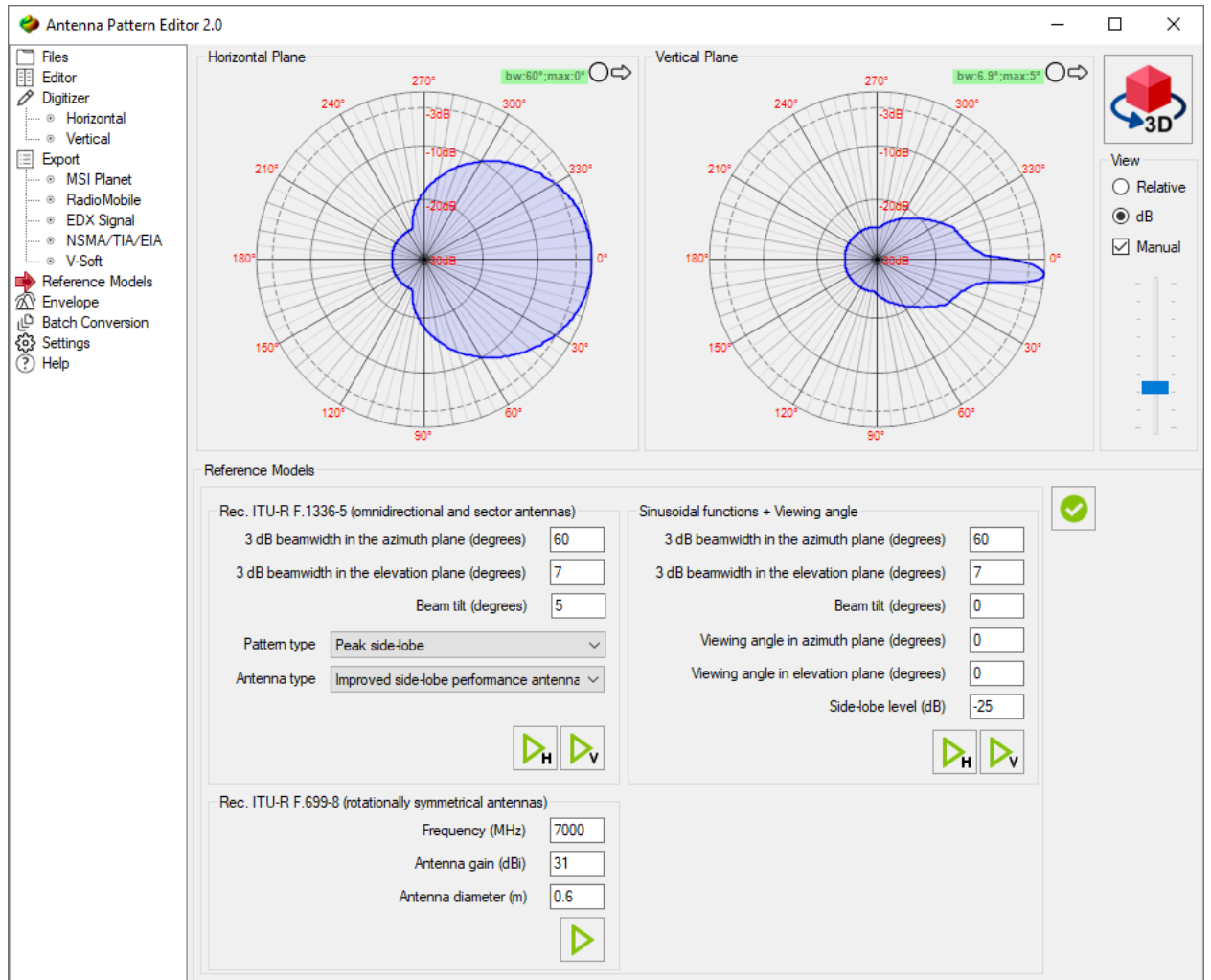
. Next, you must specify the values of the antenna pattern on the blank template in accordance with the step-by-step instructions outlined in the section Digitizing the antenna image.



Drawing an Antenna Pattern Using a Blank Template

Antenna Pattern Synthesis Based on ITU-R Reference Models





Antenna Pattern Editor allows you to synthesize an antenna pattern in accordance with reference models based on information about the main characteristics of the antennas - main lobe width, side-lobe level, frequency range, tilt, etc.



Antenna Pattern Synthesis by Reference Models

For sector and omnidirectional antennas, the synthesis of radiation patterns is carried out in accordance with Rec. ITU-R F.1336-5 “Reference radiation patterns of omnidirectional, sectoral and other antennas for the fixed and mobile service for use in sharing studies in the frequency range from 400 MHz to about 70 GHz”.

3 dB beamwidth in the azimuth plane (degree)	3 dB beamwidth in the azimuth plane (degree)
3 dB beamwidth in the elevation plane (degree)	3 dB beamwidth in the elevation plane (degree)
Beam tilt (degree)	Beam tilt (degree)
Pattern Type: - Peak side-lobe - Average side-lobe	Type of antenna pattern approximation: - on the peaks (maximums) of the side lobes - the average level of the side lobes
Antenna Type - Typical antenna - Improved side-lobe performance antenna	Antenna Type - Typical antenna - Improved side-lobe performance antenna

-  - Create a H-plane pattern
-  - Create a V-plane pattern
-  - Create an antenna pattern
-  - Copy antenna pattern to the Editor

For rotationally symmetrical antennas (microwave antennas and satellite earth stations antennas) the synthesis of the antenna pattern is carried out in accordance with Rec. ITU-R F.699-8 “Reference radiation patterns for fixed wireless system antennas for use in coordination studies and interference assessment in the frequency range from 100 MHz to 86 GHz”.

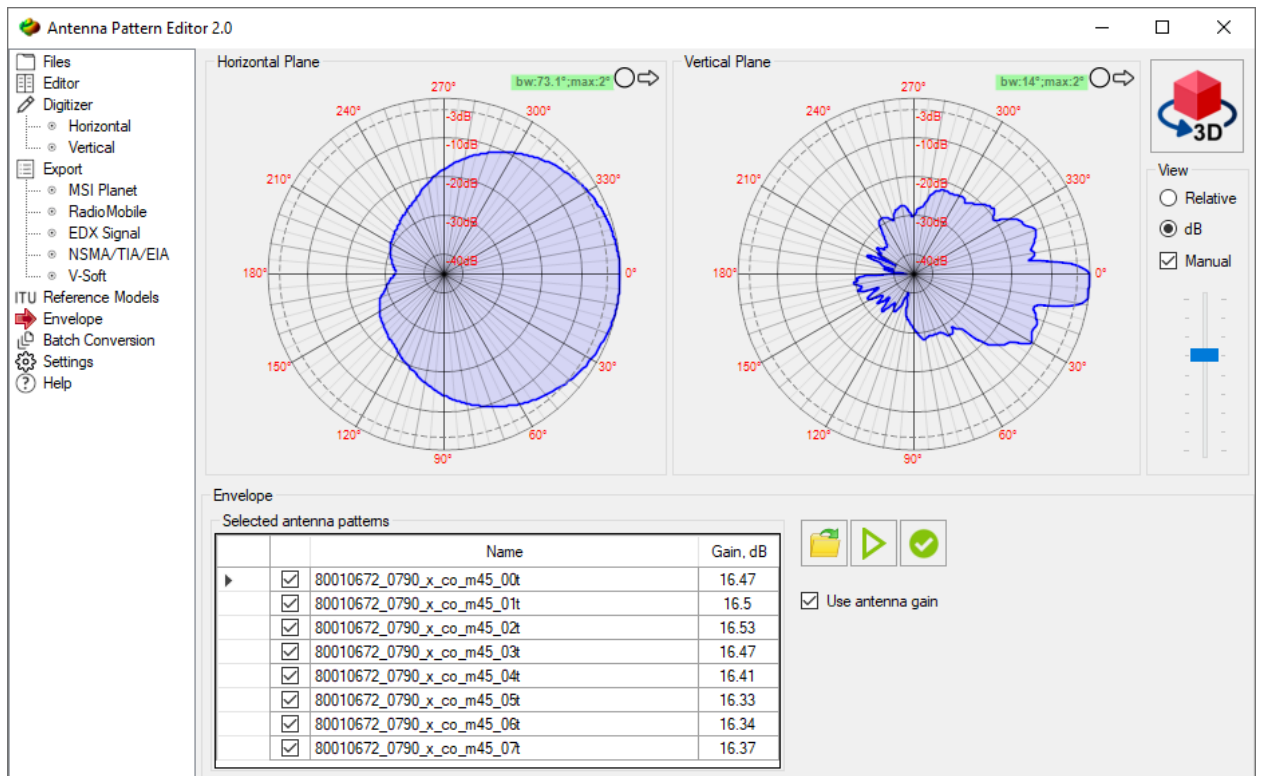
Frequency (MHz)	Frequency, MHz
Antenna gain (dBi)	Antenna gain, dBi
Antenna diameter (m)	Antenna diameter, m

Another common antenna synthesis method that can be used in a program is synthesis using a sinusoidal function and viewing angle.

3 dB beamwidth in the azimuth plane (degree)	3 dB beamwidth in the azimuth plane, degree
3 dB beamwidth in the elevation plane (degree)	3 dB beamwidth in the elevation plane, degree
Beam tilt (degree)	Beam tilt (degree)
Viewing angle in the elevation plane (degree)	Viewing angle in the elevation plane, degree
Side-lobe level (dB)	Side to main lobe level, dB

Envelope


In this menu, you can prepare an antenna pattern envelope from a set of individual antenna patterns. This is frequently required to determine the worst-case radiation situation in terms of the harmful effects of radio waves.



Create an antenna pattern envelope



- Select a folder with antenna pattern files
- Create an envelope pattern
- Copy envelope pattern to the Editor

Antenna patterns in the set can be selected individually in the "Files" menu using the "Add this antenna pattern to envelope"  button. You can also add to the set all antennas from a specific folder in the "Envelope" menu.

All selected files will appear in the "Selected antenna patterns" list. Only antenna patterns marked with a tick in the list are included in the calculation.

You can take into account each of the antenna gain of the set; the gain values will be loaded from files, but it can then be edited manually directly in the table.

Export Antenna Pattern to Files of Various Formats

Antenna Pattern Editor allows you to save the antenna pattern file in any of the following formats:

- MSI Planet
- Radio Mobile V3

- EDX Signal
- NSMA TIA/EIA-804-B
- V-Soft

Export is performed for the antenna pattern placed in the Editor.

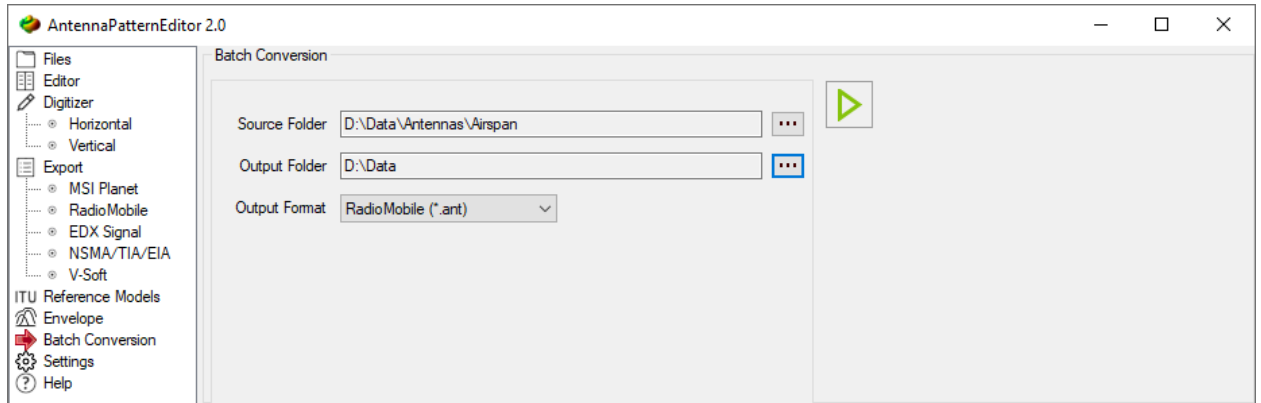
Export Antenna Pattern to MSI file

To save the file, select the desired format in the **Export** menu, then fill in the header fields corresponding to this format. Information for each field appears when you hover over the icon next to the corresponding field. The user usually determines the completeness of the header by himself. In radio planning tools often used only the antenna pattern from the file. The heading is rarely used. To save the file, click the **Save** button.

Please note, if the software is not activated after trial period, you can export antenna patterns to the Radio Mobile V3 (.ant) format only.*

Batch Conversion of Antenna Pattern Files Between Different Formats

In the **Batch Conversion** menu, a set of files is converted between different formats. To perform the conversion, select the source and the output folders, as well as the format in which you want to convert. To convert, click the **Convert all files in the folder** button.



Batch Conversion

Appendix 1. Antenna pattern formats

MSI Planet Antenna Pattern File Format

Planet is a RF propagation simulation tool initially developed by MSI. Planet was a 2G radio planning tool which has set a standard in the early days of computer aided radio network design. The antenna pattern file and the format which is currently known as ".msi" format or .msi-file has become a standard.

The antenna pattern file is an ASCII Text file and the general information; horizontal data points and vertical data points are stored in one file. The left column label and the data is separated by at least one space. The horizontal data and vertical data can be separated by at least one space or a Tab character.

There must be 360 data points (0 through 359) for the Horizontal data and 360 data points (0 through 359) for the Vertical data. Zero degrees represents North for the Horizontal pattern, and Zero degrees represents the horizon for the Vertical pattern. The antenna gain unit is dBd. If the Gain is in dBi, it must be indicated after the Gain value (separated with at least one space). All gain data points are relative to maximum gain being zero. Any value below zero is assumed to be negative. Do not include the minus sign for these values.

The name of the antenna should be the first line of the file.

antenna.msi	
NAME	<name>
MAKE	<make>
FREQUENCY	<frequency>
H_WIDTH	<h_width>
V_WIDTH	<v_width>
FRONT_TO_BACK	<front_to_back>
GAIN	<gain>
TILT	<tilt>
POLARIZATION	<polarisation>
COMMENT	<comment>
HORIZONTAL	360
0	<0H>
.	
.	
359	<359H>
VERTICAL	360
0	<0V>
.	
.	
359	<359V>

Variables:

Variable	Comment
NAME	Name of the antenna

MAKE	Name of the manufacturer
FREQUENCY	Frequency in MHz
H_WIDTH	Opening angle in the horizontal plane between the -3 dB points
V_WIDTH	Opening angle in the vertical plane between the -3 dB points
FRONT_TO_BACK	Front to back ratio in dB
GAIN	Antenna gain in dBd when in dBi this must be specified
TILT	Electrical tilt of the main beam in degrees
POLARIZATION	Horizontal, vertical, +45 or -45
COMMENT	Comment
OH..359H	Horizontal gain datapoints per horizontal angle relative to maximum gain being zero. Any value below zero is assumed to be negative. <i>Minus sign is not used with these values</i>
OV..359V	Vertical gain datapoints per vertical angle relative to maximum gain being zero. Any value below zero is assumed to be negative. <i>Minus sign is not used with these values</i>

Restrictions when exporting to the MSI file format:

If the antenna pattern in the editor contains sets of patterns for different polarization or slices, then only the set that is currently displayed will be exported.

If the antenna pattern in the editor contains a number of points other than 360, then these patterns will be converted to the format 0-360.

If the antenna pattern in the editor does not contain a full 360-degree circle, then the antenna pattern values in the missing sector will be linearly interpolated.

Radio Mobile V3 Antenna Pattern File Format

This antenna pattern file format is used in the popular free radio planning application Radio Mobile.

This format stores the antenna pattern in the horizontal plane and the pattern in the vertical plane in one file.

More information about the format can be found at the link:

http://radiomobile.pe1mew.nl/?The_program:File_formats:Antenna_ant_format_%28V3%29

It is possible to export the antenna pattern to the Radio Mobile V3 (*.ant) format in an inactivated Antenna Pattern Editor. This feature, as well as the feature of viewing antenna patterns, will work even after the 14-day trial period has expired.

Restrictions when exporting to the Radio Mobile file format:

If the antenna pattern in the editor contains sets of patterns for different polarization or slices, then only the set that is currently displayed will be exported.

If the antenna pattern in the editor contains a number of points other than 360, then these patterns will be converted to the format 0-360.

If the antenna pattern in the editor does not contain a full 360-degree circle, then the antenna pattern values in the missing sector will be linearly interpolated.

EDX Signal Antenna Pattern File Format

This antenna pattern file format is used in EDX Signal/Signal Pro planning tools.

This format stores the antenna pattern in the horizontal plane and a set of slices in the vertical plane at given azimuths in one file.

More information about the EDX Signal format can be found at the link:

<https://help.edx.com/help/directional-antenna-pattern-file>

Restrictions when exporting to the EDX file format:

The antenna pattern in the horizontal plane can contain any number of points.

All slices must contain the same number of points in the range of -90 to +90 degrees.

If the antenna in the editor contains several sets of antenna patterns in different polarization, then the set that is currently displayed will be saved.

If the current format does not support slices (for example, the MSI format), then two slices will be created during saving at azimuths of 0 and 180 degrees.

NSMA and TIA/EIA-804-B Antenna Pattern File Format

In NSMA antenna pattern file format, one or more pairs of horizontal and vertical patterns for different polarization is stored in one file.

Full information in NSMA (National Spectrum Management Association) recommendation WG16.99.050 "Antenna Systems – Standard Format for Digitized Antenna Patterns" at the link:

https://nsma.org/wp-content/uploads/2016/05/wg16_99_050.pdf

Antenna pattern file format according to the TIA/EIA-804-B standard almost completely coincides with the NSMA format.

Restrictions when exporting to the NSMA/TIA/EIA-804-B file format:

Each antenna pattern can contain any number of points in the range of 0-360 degrees.

If the antenna pattern does not contain a full 360-degree circle, then the missing sector will be linearly interpolated.

If the antenna pattern contains multiple vertical plane pattern slices, only the one currently displayed will be saved.

V-Soft Antenna Pattern File Format

This format is used in V-soft software v-soft.com

In this format, the antenna pattern is divided into two files:

The vertical plane antenna pattern is saved to a file with the *.vep extension. It contains 181 points in the range -90...+90 degrees.

The horizontal plane antenna pattern is saved to a file with the *.pat extension. It contains 360 points (a full circle of 360 degrees, 0...359).

Restrictions when exporting to the V-Soft file format:

If the antenna pattern in the editor contains several sets of antenna pattern for different polarization, then the currently displayed one will be saved when exporting to a file.

If the antenna pattern in the editor contains points with an interval other than 1 degree, then this antenna pattern will be interpolated with an interval of 1 degree.

When exporting, all points on the vertical plane antenna pattern that are outside the range of -90 to +90 degrees will be deleted.

3D Antenna Pattern File Format

The software supports a simple 3D file format as a CSV text file with antenna pattern values and semicolon delimiters:

```

D:\Data\ARP Types\09-ETS\3106B-500MHz.csv - Notepad++
File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ? X
3106B-500MHz.csv
1 3D;0;5;10;15;20;25;30;35;40;45;50;55;60;65;70;75;80;85;90;95;100;105;110;115
2 0;-0.76;-0.75;-0.71;-0.66;-0.61;-0.54;-0.48;-0.41;-0.34;-0.29;-0.24;-0.19;-0
3 5;-0.96;-0.94;-0.90;-0.85;-0.80;-0.75;-0.69;-0.64;-0.59;-0.54;-0.50;-0.46;-0
4 10;-1.11;-1.10;-1.07;-1.04;-1.00;-0.97;-0.94;-0.90;-0.88;-0.86;-0.85;-0.83;-
5 15;-1.56;-1.54;-1.51;-1.49;-1.47;-1.46;-1.46;-1.48;-1.50;-1.53;-1.56;-1.59;-
6 20;-2.15;-2.14;-2.12;-2.12;-2.13;-2.15;-2.19;-2.25;-2.33;-2.43;-2.53;-2.64;-
7 25;-2.90;-2.89;-2.88;-2.90;-2.94;-3.02;-3.11;-3.24;-3.40;-3.58;-3.77;-3.96;-
8 30;-3.82;-3.81;-3.82;-3.86;-3.92;-4.01;-4.15;-4.34;-4.56;-4.83;-5.12;-5.42;-
9 35;-4.97;-4.97;-4.99;-5.03;-5.12;-5.26;-5.43;-5.67;-5.98;-6.34;-6.70;-7.09;-
10 40;-6.39;-6.38;-6.38;-6.40;-6.46;-6.59;-6.76;-7.02;-7.34;-7.74;-8.18;-8.64;-
11 45;-8.12;-8.08;-8.03;-8.02;-8.06;-8.16;-8.32;-8.59;-8.96;-9.40;-9.86;-10.37;
12 50;-10.11;-10.08;-9.97;-9.87;-9.78;-9.77;-9.84;-10.02;-10.31;-10.71;-11.18;-
13 55;-12.26;-12.08;-11.84;-11.60;-11.39;-11.27;-11.29;-11.45;-11.72;-12.10;-12
14 60;-14.23;-14.13;-13.83;-13.43;-13.05;-12.77;-12.64;-12.64;-12.84;-13.18;-13
15 65;-15.49;-15.21;-14.86;-14.42;-14.05;-13.77;-13.71;-13.79;-13.97;-14.29;-14
16 70;-15.91;-15.86;-15.65;-15.38;-15.07;-14.82;-14.68;-14.66;-14.92;-15.17;-15
17 75;-16.01;-15.99;-15.95;-15.83;-15.71;-15.62;-15.69;-15.77;-15.89;-16.16;-16
18 80;-16.13;-16.18;-16.25;-16.34;-16.38;-16.41;-16.45;-16.55;-16.72;-16.98;-17
19 85;-16.49;-16.57;-16.74;-16.91;-17.06;-17.21;-17.49;-17.63;-17.84;-18.18;-18
20 90;-16.91;-16.96;-17.11;-17.35;-17.59;-17.87;-18.20;-18.58;-19.03;-19.40;-19
21 95;-17.69;-17.71;-17.90;-18.13;-18.44;-18.85;-19.34;-19.84;-20.37;-20.92;-21
22 100;-18.71;-18.65;-18.69;-18.84;-19.09;-19.40;-19.85;-20.40;-21.01;-21.44;-2
23 105;-20.23;-20.03;-19.89;-19.90;-20.01;-20.16;-20.55;-20.81;-20.92;-20.91;-2
24 110;-22.13;-21.91;-21.49;-21.27;-21.05;-20.90;-20.69;-20.45;-20.38;-20.03;-1
25 115;-24.29;-23.85;-23.58;-23.27;-22.88;-22.34;-21.94;-21.15;-20.34;-19.57;-1
26 120;-24.56;-24.69;-25.20;-25.90;-26.33;-26.15;-25.03;-23.46;-22.27;-20.89;-1
length: 18 644 lines: 39 Ln: 1 Col: 76 Pos: 76 Windows (CR LF) UTF-8 INS

```

File sample in 3D format

Where:

3D is a sign of a 3D file

first line - theta angles from 0 to 359 degrees

first column - phi angles from 0 to 180 degrees

Such a file can be easily obtained from 3D ETS-Lindgren or Satimo file using any spreadsheet editor.