KROKS

SCIENTIFIC AND PRODUCTION COMPANY

SOFTWARE MANUAL

ARINST VNA

CONTENT

1. DEVICE REQUIREMENTS

1.1. Supported devices

- ARINST VR 1-6200
- ARINST VR 23-6200 (VR 23-1600, VR 23-2600, VR 23-3000)[1]

1.2. PC requirements:

- Windows 7 or higher operating system (32-bit or 64-bit)
- Processor: 1 GHz (recommended frequency from 2 GHz and higher)
- RAM: 1 GB (32-bit), 2 GB (64-bit). Recommended size from 4 GB or higher
- At least 200 MB of free hard disk space

[1] The application displays the results of measurements within the operating range of the device.

2. INSTALLATION

2.1. Go to the official website of ARINST by entering the address in the address bar of your browser www.arinst.net. Go to the DOWNLOAD section and click on the application installation file for managing ARINST vector reflectometers *ArinstVNA* (Figure 2.1).

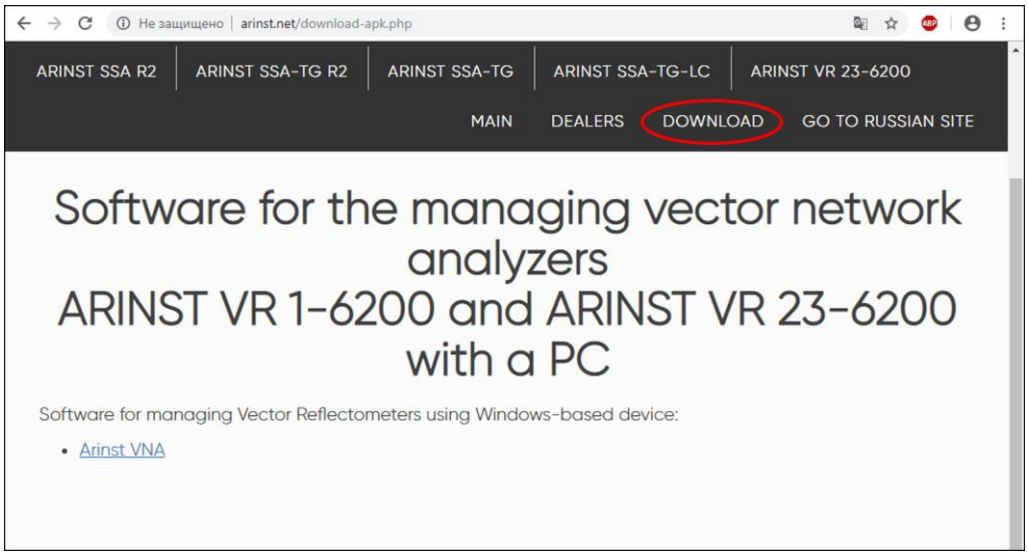

Figure 2.1-Loading the application installer

2.2. Specify the path to download the installer archive file and click **Save** (figure 2.2). *In our example in figure 2.2 the archived file ArinstVNA is saved to the Download folder.*

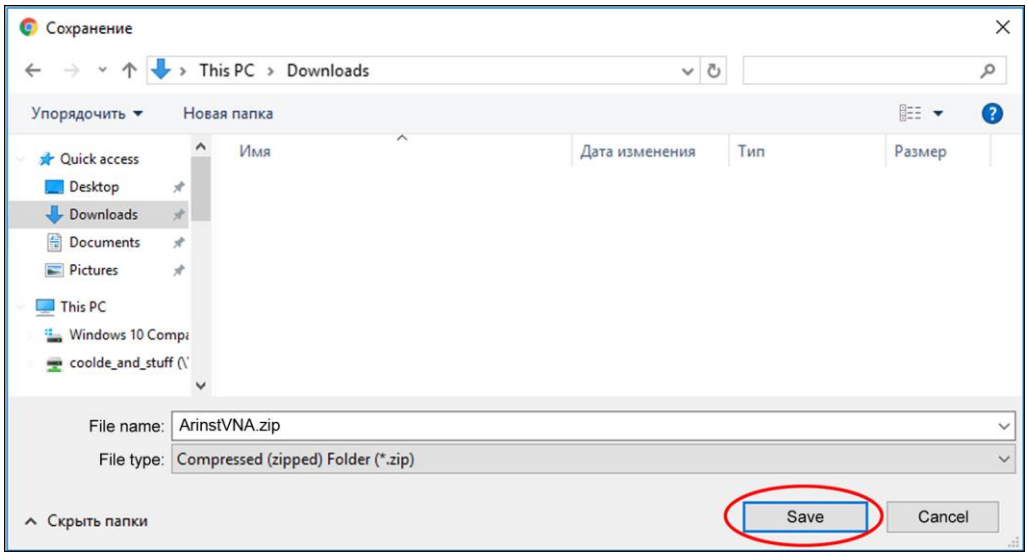

Figure 2.2 - Saving the downloaded file

2.3. Enter the directory where the archive file was downloaded and unzip it using archiver programs (Figure 2.3).

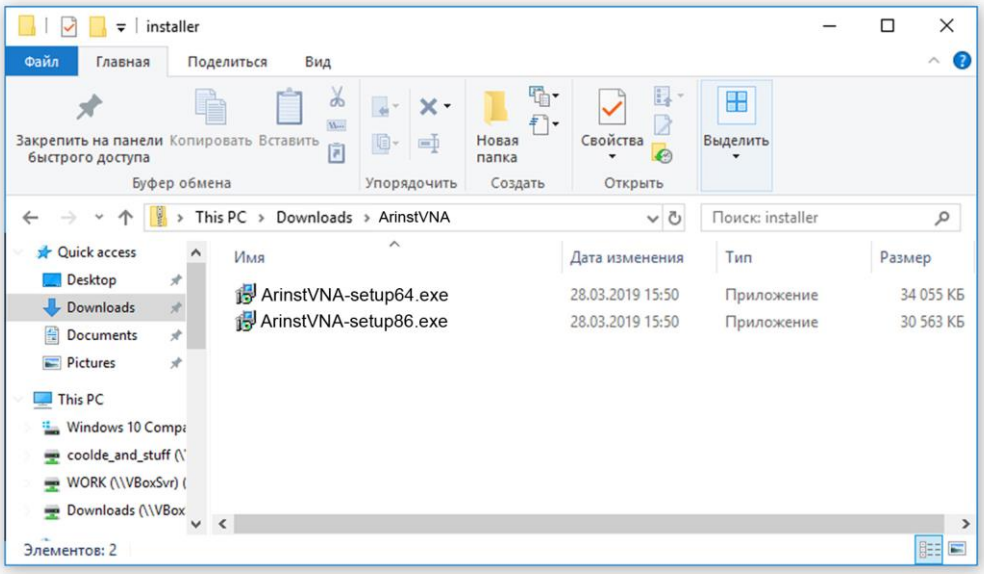

Figure 2.3 - Unzipped downloaded file

2.4. Install the application on your PC. To do this, double-click on the application installation file, depending on the bit depth of your Windows operating system.

The unzipped file contains 2 objects:

- Update bootloader installation file *ArinstVNA-setup64.exe* for 64-bit Windows operating systems.
- Update bootloader installation file *ArinstVNA-setup86.exe* for 32-bit Windows operating systems.

Attention! The installer set contains all the necessary components for the correct operation of the application and the connected equipment. If the installation of any components was interrupted by the user, these components must be installed independently or restart the installer set.

Note. To determine which Windows operating system (32-bit or 64-bit) is installed on your PC:

For Windows 7:

- Click the **Start** button, right-click **Computer**, and then select **Properties**.
- In the **System** section, see what type of system is specified.

For Windows 8.1 and Windows 10:

- Press the **Start** button and select: **Settings** → **System** → **About System**.
- In the device **Specifications section**, see which system type is specified.

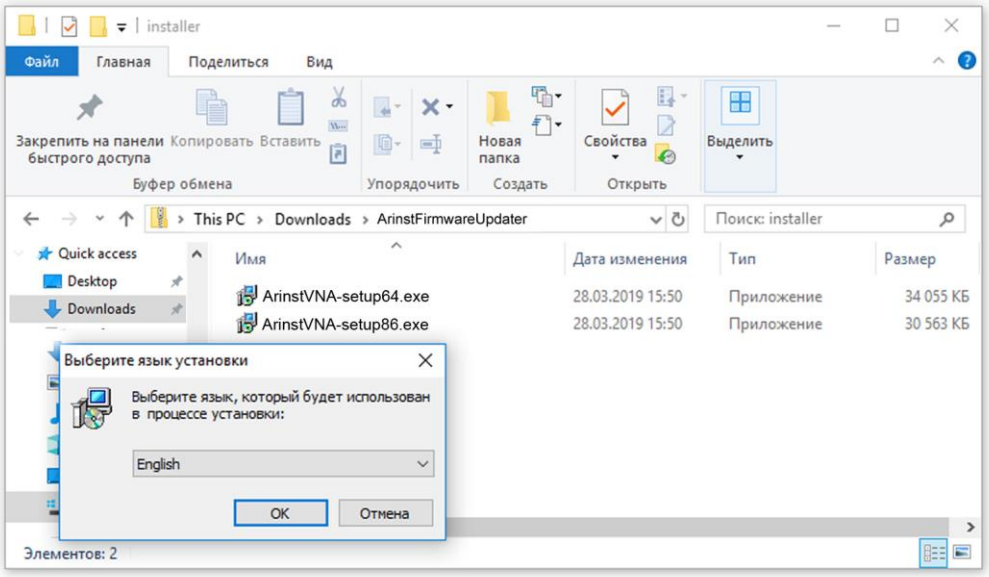

Figure 2.4 - Selecting the language that will be used during the installation of the application

From the drop-down list, select the language (Russian or English) in which the messages will be displayed during the installation of the application and click **OK** (Figure 2.4).

2.5. Read the terms of the license agreement carefully. To further install the application, accept the terms of the license agreement and click **Next** (Figure 2.5).

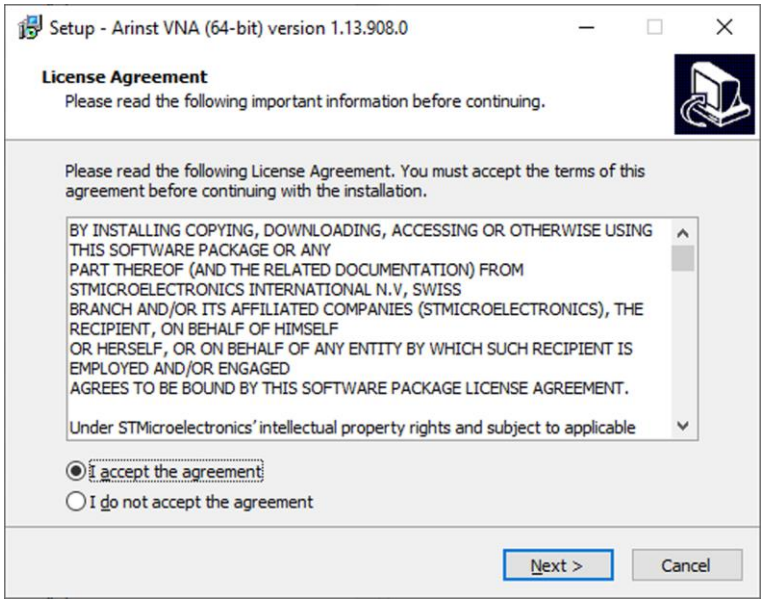

Figure 2.5 - License agreement

2.6. In the installation dialog box, specify the path to the directory where the application should be installed by clicking the **Review** button. After selecting the application installation location, click **Next** (figure 2.6).

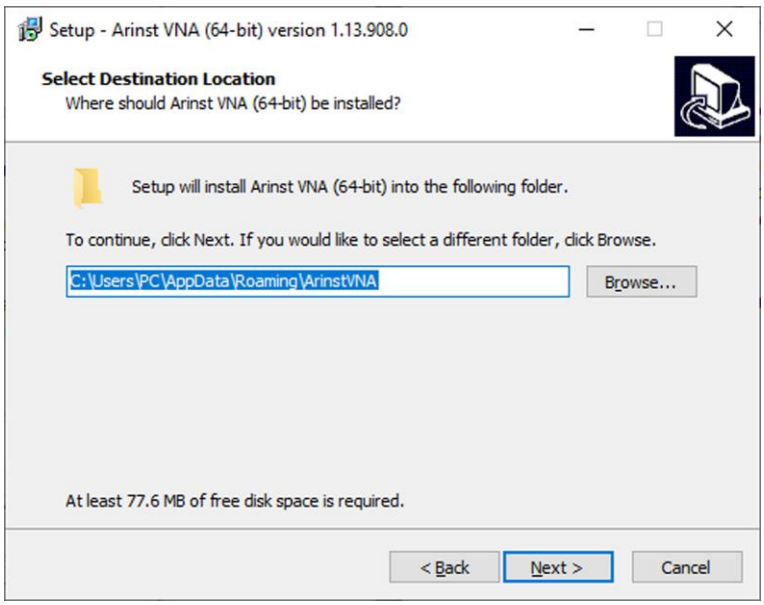

Figure 2.6-Selecting the application installation directory

2.7. If you want the application shortcut to be placed on the desktop of your PC, select the «check mark» next to this option and click **Next**.

Check the application installation options and click **Install** (figure 2.7).

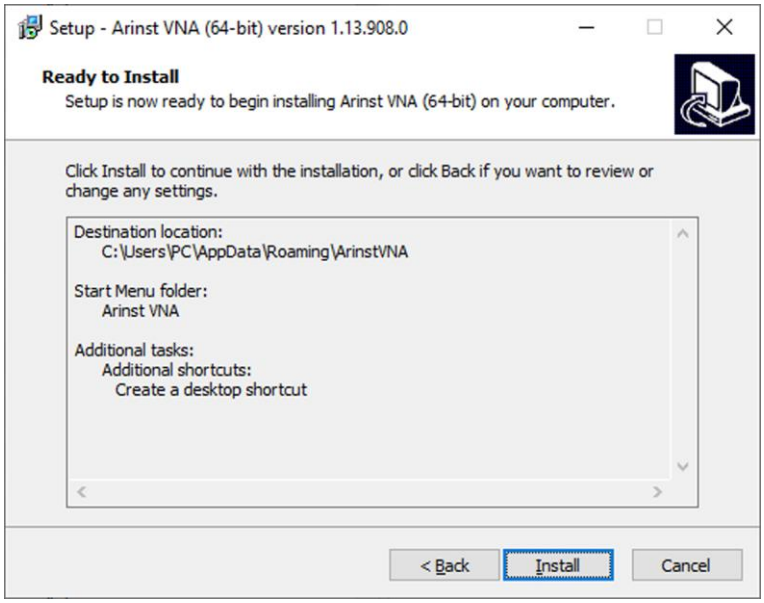

Figure 2.7- Application installation options

2.8. The virtual port installation process will begin, which may take some time. In the installation wizard window that appears (figure 2.8); specify what you want to do:

- Modify – add new or remove already installed program components
- Repair - reinstall all program components that were previously installed
- Remove — removes all installed program components.

Then click **Next**.

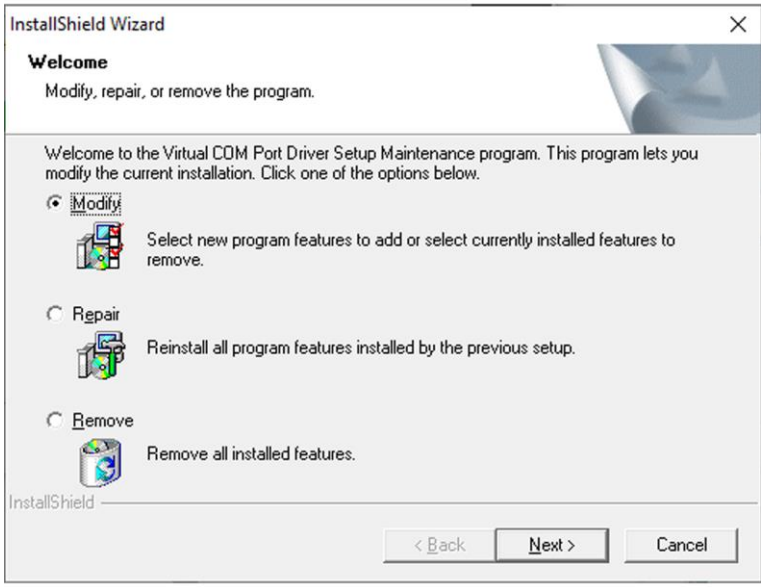

Figure 2.8 - Application installation wizard

2.9. After completing the installation of the virtual port *STMicroelectronics (usbser) Ports* the installation wizard will inform the user that the virtual COM port is installed and ready for use. Click **Finish** to exit the device driver installation wizard (figure 2.9).

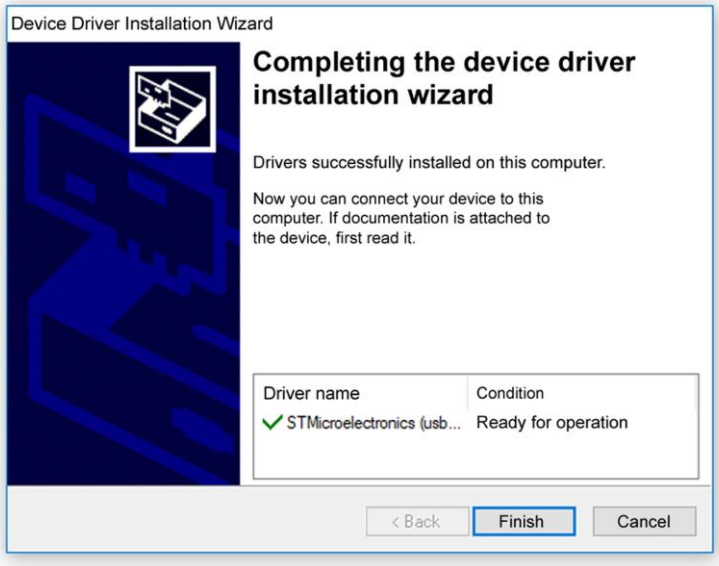

Figure 2.9 - Driver installation wizard message

2.10. After completing the installation of the Arinst VNA application, the application installation wizard will inform the user that the application is installed. To start the application immediately after exiting the installation wizard, check the box next to the corresponding option. Click **Finish** to exit the installation wizard (figure 2.10).

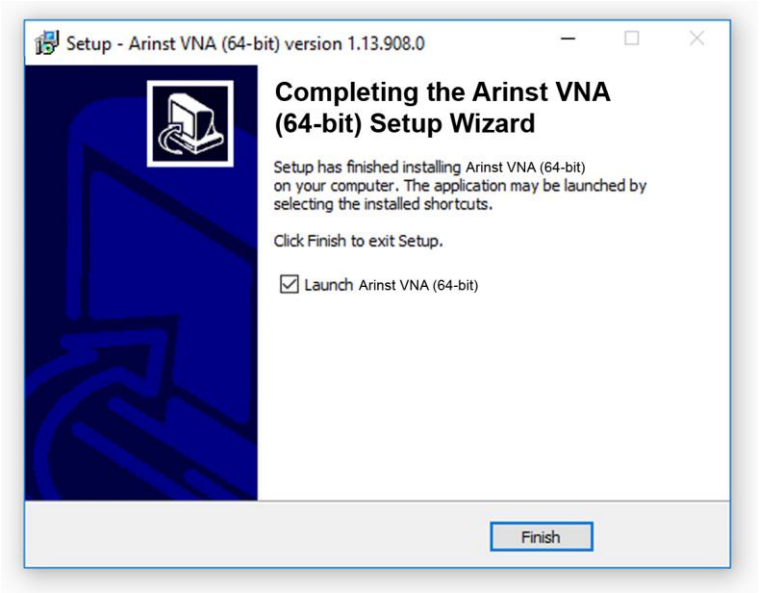

Figure 2.10-Completing the application installation

3. CONNECTING THE DEVICE TO PC

3.1. Turn on your PC.

3.2. Connect the vector reflectometer to the USB port of your PC using a USB 2.0 – mini-USB or USB 2.0 – USB 2.0 type B cable. Turn on the device by pressing the button «**MENU**».

Attention! Simultaneous use of two USB ports of the device is strictly prohibited! Failure to do so may cause the device to fail.

3.3. Launch the «Arinst VNA» application by double-clicking on the application shortcut on the desktop of your PC.

3.4. Click on the button [2] connecting the device to your PC (Figure 3.1).

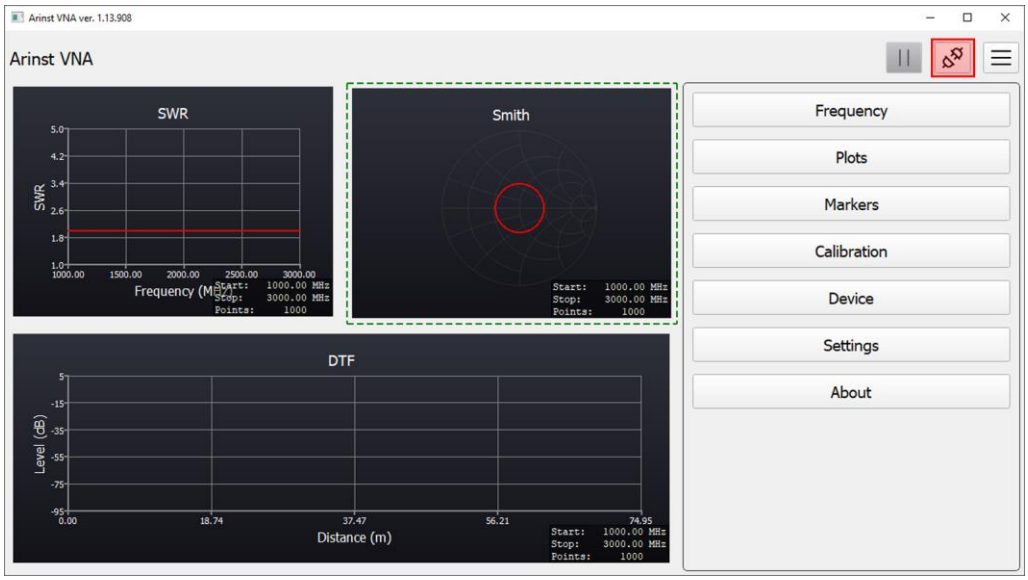

Figure 3.1 - Connecting the device to a PC

3.5. In the window that opens, select the virtual COM port for connecting the device from the drop-down list (Figure 3.2).

3.6. If there is no required port in the list of virtual ports, click the **Update button**, as shown in Figure 3.3.

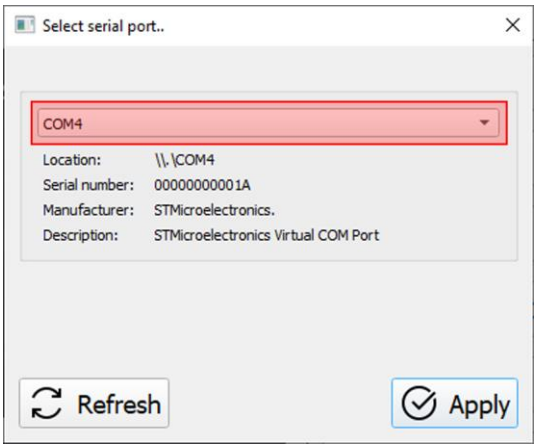

Figure 3.2 - Choosing a virtual COM port

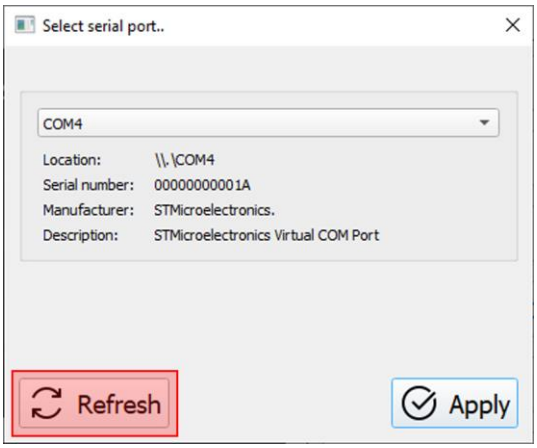

Figure 3.3 - Updating the list of PC ports

[2] The buttons for the bootloader interface commands in this document are highlighted in red solely for readability.

3.7. After selecting the port, connect the device to the PC by clicking the **Connect button** (figure 3.4).

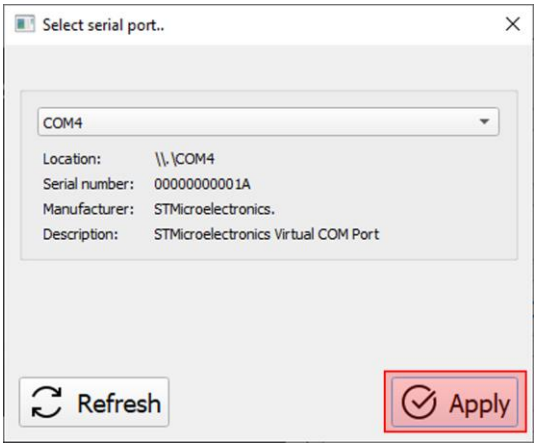

Figure 3.4 - Connecting the application to the device

3.8. After connecting the device to a PC, the graphs of the measured signal will appear on the screen as in Figure 3.5.

A message about USB connection will appear on the vector reflectometer screen.

Figure 3.5 - the device is connected to a PC

4. INTERFACE CONTROL BUTTONS

4.1. Status and purpose of the program interface control buttons **«Arinst VNA»** shown in table 1.

Table 1

Name	Status	Value
Status		The device is not connected to a PC.
		The device is connected to a PC.
		The device is connected to a PC.
Pause		The device is not connected to a PC and the «pause» function is not available.
		The device is connected to a PC, pressing the button will turn on the «pause» mode.
		The «pause» mode is enabled.
		The application is in the «forced pause» mode. The device is calibrated.
Menu		Clicking on the button hides or shows the application menu.
Back		Return to the main application menu.

5. APPLICATION MENU

5.1. Main menu

5.1.1. The main menu is located on the right side of the application interface (Figure 5.1).

Note. If the main menu is hidden, open it by pressing the **Menu** button  .

5.1.2. Each section of the main menu has its own purpose.

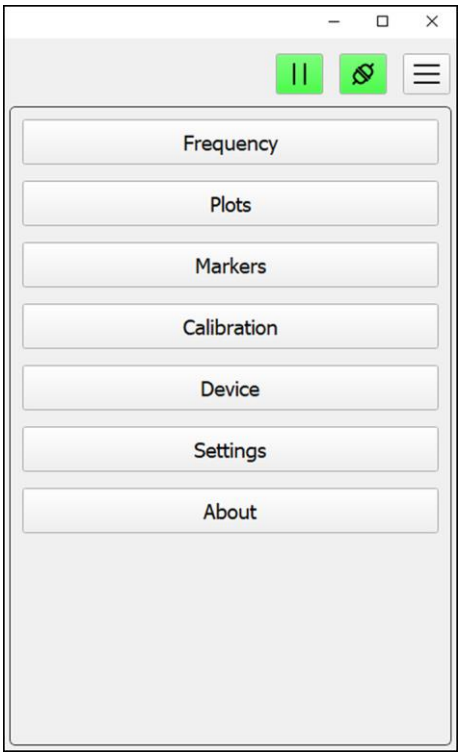

Figure 5.1 - The main menu

Frequency - the menu section in which the user sets the frequency reference, according to which the device or load is tested.

Plots - section of the main menu where you can select the layout options and configure the parameters of the displayed charts and graphs. In this section of the menu, additional settings are made for displaying graphs and charts.

Markers - the section where visual markers are set and their display parameters are configured when making measurements.

Calibration - menu section for calibrating the instrument.

Device - this section sets the compensation for the electrical length of the cable, specifies the serial number of the connected device and the version of its SOFTWARE. In this section, the device SOFTWARE update wizard starts.

Settings - language and user settings section.

About – section of the menu with information about the version of the application and its platform.

5.2. Frequency setting menu

The frequency reference consists of parameters by which the synthesizer is sweeped and the measurement mode is set (frequency range, number of measurement points and the bandwidth of the digital IF filter).

5.2.1. To set the frequency reference, enter the **«Frequency»** section of the main menu (Figure 5.2)

5.2.2. In the **«Frequency»** menu, you can set:

Start – the initial frequency of the scanned frequency range.

Stop – the final frequency of the scanned frequency range.

Center - central frequency of the scan range.

Span – scan band (frequency range).

Points – select the number of scan points.

BW – bandwidth of the digital intermediate frequency filter (IF).

5.2.3. Frequency parameters are set by entering a numerical value in the field corresponding to the parameter. To delete erroneous or previously entered values, click the **×** symbol in the field with this value.

Note. Changing the values of frequency parameters in 5 MHz increments can be performed using the «up» and «down» arrows on the keyboard. Place the cursor in the input field for one of the frequency parameters and use the «up» or «down» arrows to change the numeric value and press **Enter**.

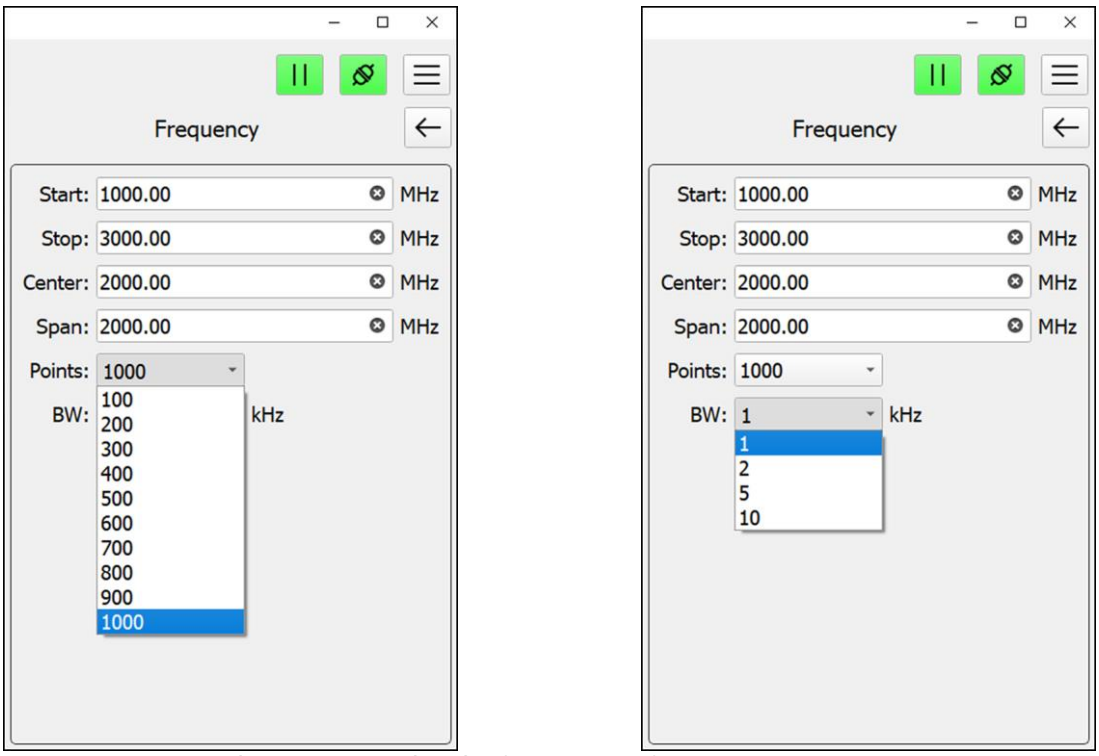

Figure 5.2 - Setting the frequency reference parameters

5.2.4. The frequency parameters can be set in three ways:

- By entering the initial **Start** and final **Stop** frequencies, while the center frequency **Center** is automatically assumed equal to their half-sum. The range of scanned frequencies **Span** is automatically taken equal to the difference between the final and initial frequencies.
- Setting the **Center** frequency and **Span** scan frequency range. In this case, the **Start** and **Stop** frequencies will be set automatically as **Center ± Span / 2**.
- Loading custom **«Preset»** settings from the **«Settings»** menu.

5.2.5. In the **«Points»** drop-down list, the user selects and sets the quantity of scan points. The frequency step and scan time depend on the specified quantity of points. Selecting the correct quantity of points and scanning range improves resolution of measurements, such as in the **DTF** and **Loss** graphs**.**

5.2.6. In the **BW** drop-down list, select the bandwidth of the digital IF filter. The narrower the passband of the digital filter, the higher the measurement accuracy and signal-to-noise ratio. This increases the scan time.

Note. Reducing (narrowing) the bandwidth by a factor of 10 will increase the signal-to-noise ratio by a factor of 3 (or 10 dB) while increasing the scan time by a factor of 10.

5.2.7. To exit the **«Frequency»** menu to the main menu, click the **Back** button  .

5.3. Settings menu for graphs displayed on the screen

The application interface allows you to display up to four graphs (charts) on the screen at the same time.

5.3.1. Enter the **«Plots»** section of the main menu (figure 5.3).

5.3.2. In the Configuration drop-down list, select the desired layout of graphs (diagrams) on the screen.

5.3.3. After selecting the desired chart layout, select one of the charts by clicking on it. The selected graph will be framed in a dotted frame. From the drop-down list **Type**, select the type of graph that will be displayed in the selected field.

5.3.4. In the additional fields for each of the selected graphs, enter additional options that correspond to the type of graph and the selected dimension.

- For the **Smith chart, polar chart and SWR graph**, it is possible to set the value and display the SWR limit line.
- For **graphs of linear magnitude and logarithmic magnitude** of reflection coefficient, the grid step value on the screen is set.
- In the additional fields of the **DTF graph**, the user sets the units of measurement along the horizontal axis (time or distance), specifies the value of the speed factor, and enters the measurement range.
- In the fields of the **Loss** grap, the user sets the value and units of measurement of the vertical axis.

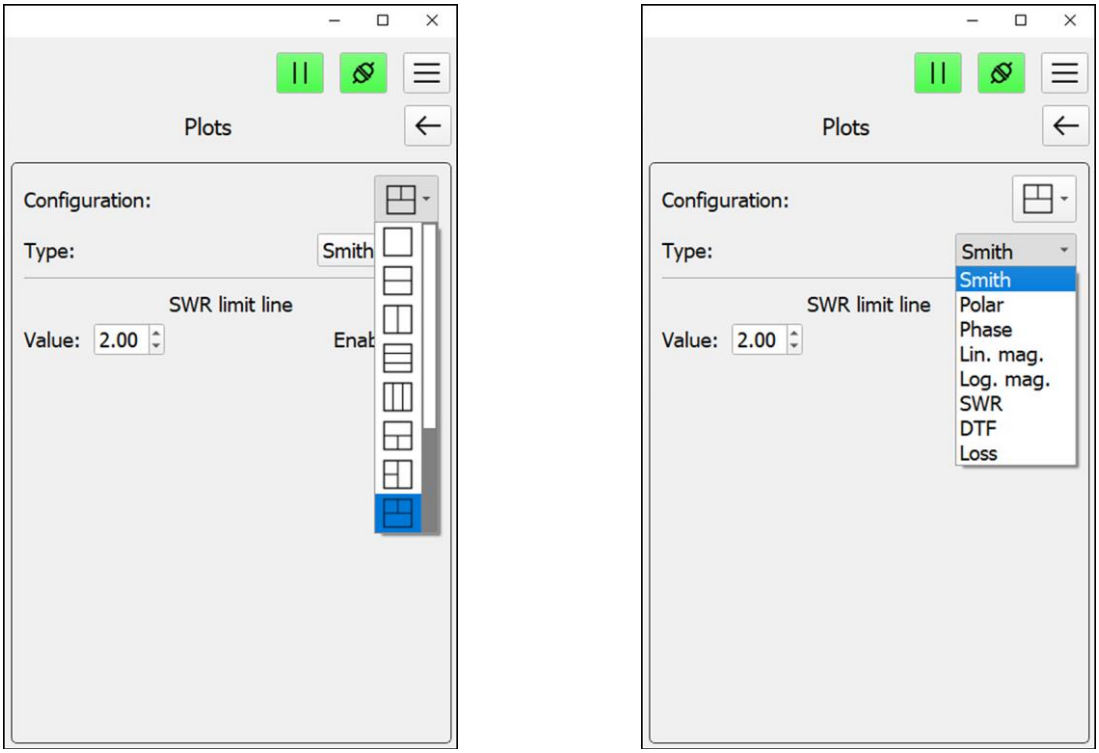

Figure 5.3 - configuring the graphs displayed on the screen

Note. You can change the values of additional options using the «up» and «down» arrows on the keyboard. Place the cursor in the input field for optional values for the selected graph and use the «up» or «down» arrows to change the numeric value and press Enter.

In our example in figure 5.4, the configuration for displaying three graphs on the screen is selected. At the same time, SWR graph, Smith diagram, and the DTF graph. The currently selected graph is assigned a display type – Smith chart. The option to display the SWR limit line with a value of 2 is enabled.

Figure 5.4 - Configuring the graphs displayed on the screen

5.3.5. To exit the **«Plots»** menu to the main menu, click the **Back** button  .

5.4. Markers menu

Up to six numbered markers can be displayed on all graphs and charts displayed on the screen to display numerical measurement results. Markers are independent of each other and can be adjusted by frequency and type of displayed values.

5.4.1. Enter the **«Markers»** section of the main menu (figure 5.5).

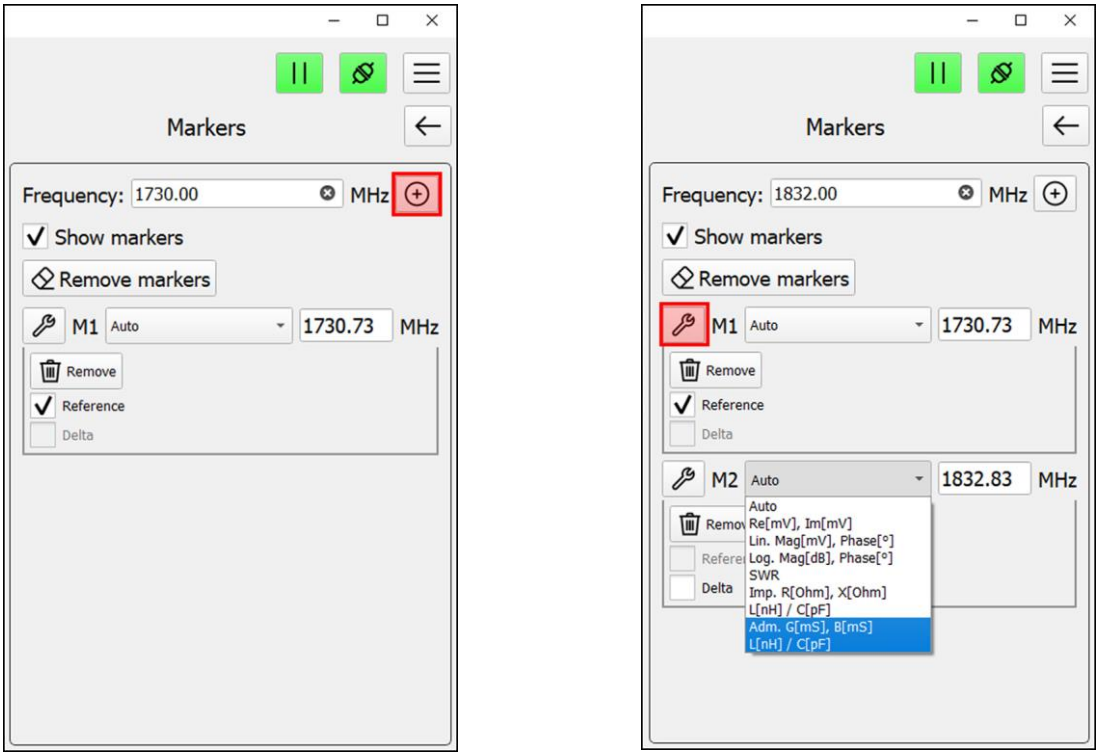

Figure 5.5 - Setting marker measurement parameters

5.4.2. Select the graph in which marker measurements will be taken. The selected graph will be framed by a dotted border.

5.4.3. There are three ways to set a marker:

- entering a value in the **«Frequency»** field;
- double-click the left mouse button, placing the cursor in the place of the chart;
- loading custom **«Presets»** from the **«Settings»** menu.

5.4.4. Enter the value of the frequency at which the marker should be set in the **Frequency** field and click the «+» button. The marker will be set at the specified frequency. This way, you can set up to six independent markers.

Note. You can move markers around the graph using the mouse or keyboard arrows.

- Press and hold the left mouse button to move the selected marker to the desired point on the chart.
- After placing the cursor in the frequency input field of one of the markers, move the keyboard arrows «up» and «down» markers on the graph in 5 MHz increments.
- Click the left mouse button on the selected marker on the graph. The marker will become active and its color will change to red. Use the left and right arrows to move the marker along the graph.

5.4.5. By clicking on the wrench icon (marker properties), set the type of marker.

Reference – marker, which is the starting point of reference and comparison with subsequent markers.

Delta – incrementing marker and moving relative to the reference marker.

5.4.6. From the drop-down list, select the type of value displayed by the marker for each marker. The types of values displayed by markers are shown in Table 2.

Table 2 - Types of values displayed by markers

Auto	The values of the complex reflection coefficient are displayed in the interpretation corresponding to the displayed graph. Switching the graph automatically changes the interpretation view.
Re[mV], Im[mV]	Displays the amplitude of the real and imaginary parts of the complex reflection coefficient in millivolts (mV). The total reflection corresponds to 1000 mV.
Lin. Mag[mV], Phase[°]	Display of magnitude in linear scale and phase in degrees
Log. Mag[dB], Phase[°]	Displaying the magnitude in logarithmic scale and the phase in degrees
SWR	The standing wave ratio (VSWR).
Imp. R[Ohm], X[Ohm], L[nH] / C[pF]	Displays the active and reactive parts of the impedance in Ohms. Type of reactivity-capacitance or inductance.
Adm. G[mS], B[mS], L[nH] / C[pF]	Displays of the active and reactive parts of the admittance in millisiemens (mS). Type of reactivity - capacitance or inductance.

5.4.7. Highlighting each of the graphs in turn, set the parameters of marker measurements for each graph displayed on the screen.

In our example, in figure 5.6, markers are placed on the Smith diagram. The first marker, which is the reference, is set at a frequency of 1730,73[3] MHz and displays the active and reactive parts of the impedance in automatic mode. The second marker is set at a frequency o1832,83[3] MHz and displays the active and reactive parts of the admittance.

[3] The entered value of the marker frequency is automatically rounded to the closest frequency value from the frequency grid specified by the frequency reference.

Figure 5.6 - Displaying markers on the chart

5.4.8. The interpretation of the parameters of marker measurements displayed on the free field of the graph is set forth in table 3.

Table 3 - Interpretation of marker measurement parameters.

Re: Im:	**Amplitude of the complex reflection coefficient**	R: X: C/L:	**Impedance**
Mg: Ph:	**Magnitude and Phase**	G: B: C/L:	**Admittance**
LMg: Ph:	**Logarithmic Magnitude and Phase**		
KCB:	**VSWR**		

5.4.9. To exit the **«Markers»** menu to the main menu, press the **Back** button  .

5.5. Device calibration menu

The device is initially factory-calibrated and stored in non-volatile memory. The corresponding information is displayed in the lower information line of the device screen. The calibration plane corresponds to the device port that is intended for connecting the tested devices and the load **(TEST PORT)**. To increase the accuracy of measurements when using additional adapters and cables, complete single-port calibration must be performed using a set of calibration measures.

5.5.1. Enter the **«Calibration»** section of the main menu (figure 5.7).

5.5.2. The user can load one of the calibrations in the instrument memory or save the new calibration in the instrument memory (Figure 5.7).

- To download the calibration from the device memory, select the number of the preset calibration from the drop-down menu and click the **Get calibration data** button.
- To save the calibration to the device memory, select the number of the preset calibration from the drop-down list and click the **Send calibration data** button.

Note. Quantity of preset calibrations available for storing in the memory of the device is limited by the memory size of your device.

5.5.3. The user can download one of the previously saved calibrations or save the current one to the PC. To do this, use the **Save calib to file** and **Load calib from file** buttons.

5.5.4. To reduce the influence of connecting wires and connectors on the measurement results, it is necessary to calibrate.

Note. Calibration is performed after warming up the instrument for at least five minutes. The change in ambient temperature from the moment of calibration to the measurement should not exceed ± 3°C. Before performing critical measurements, always calibrate the instrument to eliminate the effects of ambient temperature.

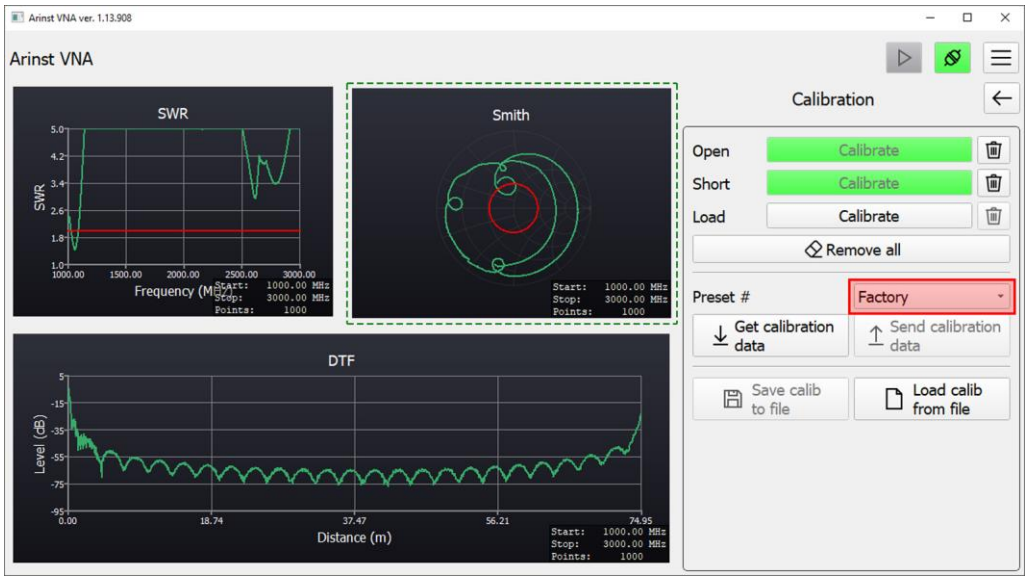

Figure 5.7 - The calibration process of the device

5.5.5. Before calibration, connect to the port **(TEST PORT)** the connectors, adapters and cables through which the device will be connected to the device under test.

5.5.6. When conducting a new calibration, connect the loads from the standard set of calibration measures to the required cable or connector:

- **Open** standard and press the **Calibrate** button;
- **Short** standard, and press the **Calibrate** button;
- **Load** standard, and click the **Calibrate** button.

After calibration, the background of the commands on the screen will turn green.

Note. To cancel (erase) one or another calibration, click on the trash can icon, and reconnecting the appropriate calibration measure, calibrate the device again.

5.5.7. During instrument calibration, the application will be in the «forced pause» mode, the «pause» button in the application interface will be displayed with a gray background  .
When you exit the **«Calibration»** menu until the calibration process is completed, the application will be in the «forced pause» mode. You must return to the «Calibration» menu and complete or cancel the calibration process.

5.5.8. To exit the **«Calibration»** menu to the main menu, click the **Back** button  .

5.6. Information about the device

5.6.1. Enter the **«Device»** section of the main menu (figure 5.8). Information about the device will be displayed on the screen:

- unique identifier (ID) of your device currently working with a PC.
- current software version (firmware) of your device.

5.6.2. In addition to information about the device connected to the PC, this section of the menu contains an **Electrical delay** option.

The **Electrical delay** option is used to transfer the calibration plane of the device.

In the process of measurements, when forced to use an additional adapter cable with a small total attenuation of the signal (not more than 1 dB), a shift of the calibration plane occurs. To compensate for the phase shift when additional cables are connected to the instrument, it is necessary to transfer the measurement plane to the calibration plane.

Enable this option by checking the box and entering the numerical value of the compensation time in picoseconds.

Note. You can change the compensation time value using the «up» and «down» arrows on the keyboard. Place the cursor in the value input field, use the «up» or «down» arrows to change the numeric value, and press Enter.

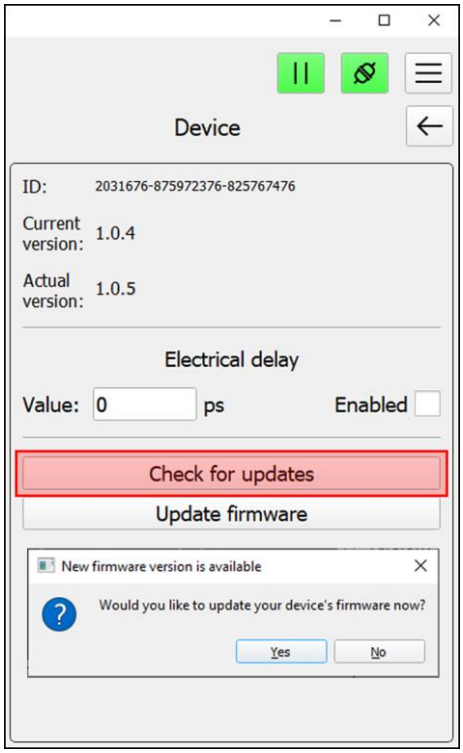

Figure 5.8-information about the device

5.6.3. Click the **Check for updates** button and if the current firmware version of the device is lower than the actual one, the application will offer to update the firmware.

5.6.4. If you want to update the firmware of the device in automatic mode, click **Yes** in the dialog box. If you plan to update the firmware later, click **No**. To manually update the firmware of the device, click the **Update firmware** button and update the firmware following the instructions of the application,

5.6.5. To exit the **«Device»** menu to the main menu, press the **Back** button  .

5.7. Custom settings menu

5.7.1. Enter the **«Settings»** section of the main menu (Figure 5.9).

5.7.2. In the **«Settings»** menu, you can select the language (Russian or English) of the application interface and save user settings.

5.7.3. To save user settings (frequency reference, calibrations, types of output graphs of marker settings), click the **Save to file** button. Assign a name to your user preference and click the **«Save»** button in the dialog box.

5.7.4. To load the saved settings, click on the **Load from file** button and, by selecting the desired settings file in the dialog box, click **«Open».**

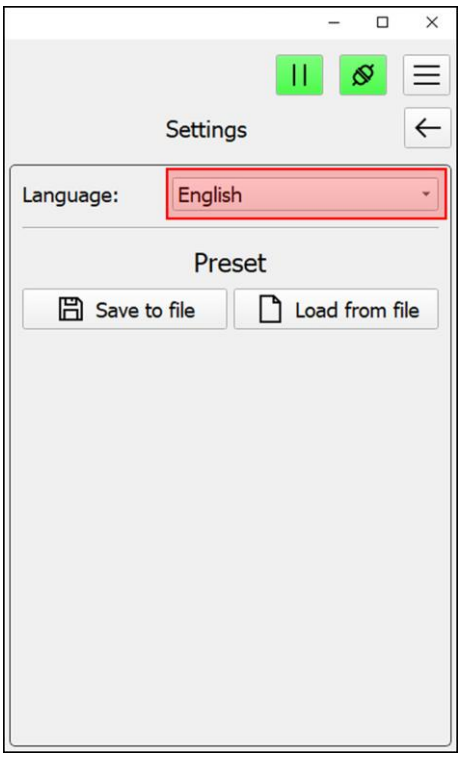

Figure 5.9 - Settings menu

5.7.5. To exit the **«Settings»** menu to the main menu, press the **Back** button  .

5.8. Application info

5.8.1. For information about the current version of the application and its platform, enter the **«About»** section of the main menu (Figure 5.10).

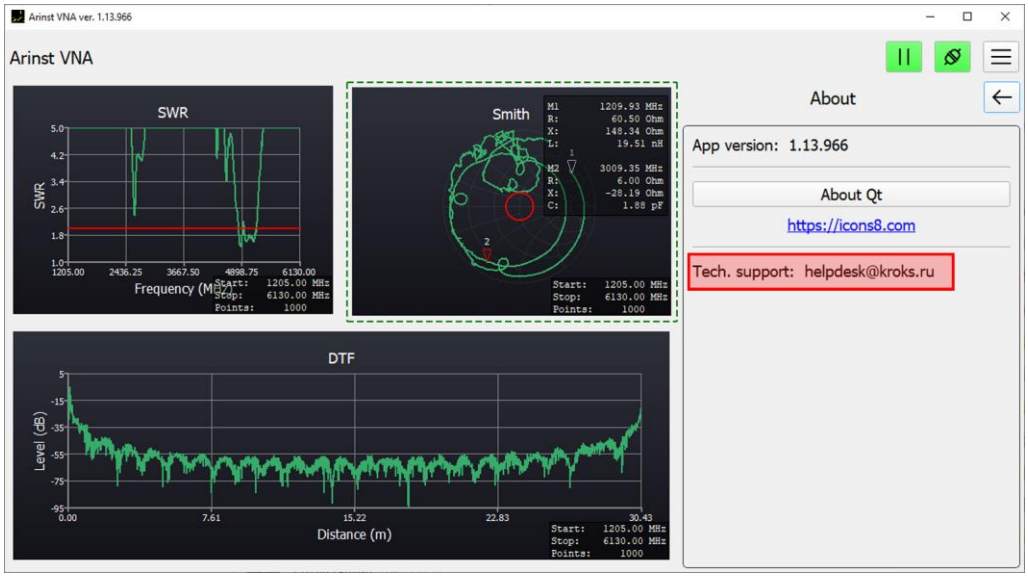

Figure 5.10 - Application Information

Please send your questions and suggestions for improving the "Arinst VNA" application to the following email address helpdesk@kroks.ru