

PERSEUS22

4 CHANNELS DIRECT SAMPLING RECEIVER



USER MANUAL

- Revision EN 1.4 - November 2025 -

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Revision History

Revision	Date	Description
Rev 1.2	04/2024	<ul style="list-style-type: none"> Added the revision history. Updated section 3 - System requirements.
Rev 1.3	06/2024	<ul style="list-style-type: none"> Updated section Technical Specifications.
Rev 1.4	11/2025	<ul style="list-style-type: none"> Updated section 6 - Operating the Perseus22 software.

1 Receiver description

1.1 Overview

Perseus22 was born from **Elad and Microtelecom** fusion, this allows sharing of technologies, experiences and production capabilities. Microtelecom and Elad has been operating since 1990 and are involved in civil and strategic communication fields, Software Defined Radios, RF instrumentation, Data Acquisition Systems and Electromagnetic Compatibility Instrumentation and assessment tests.

Perseus22 is a **4 channels**, direct sampling receiver with a continuous frequency coverage **from 10 kHz to 225 MHz** (usable up to 240 MHz, for DAB) and a typical image rejection larger than 70 dB.

All channels are synchronously sampled by a **high SNR, 14 bits A/D converter** and processed by a software defined digital down converter, implemented on an FPGA, which outputs are routed to the host computer by an USB 3.0 controller, allowing wide bandwidth IF applications.

The frequency coverage is split-up into 2 groups of channels:

- the first group with 2 channels for VLF-HF frequency range (10 kHz to 70 MHz),
- the second group with 2 channels for VHF frequency range (70 MHz to 225 MHz).

Each group is capable of **diversity** which can reduce noise on the order of tens of dB. All channels include an analog RF frontend equipped with attenuators, preselection filters and amplifiers.

The receiver enclosure is machined from solid aluminum and finished with a fine, non-reflective, black surface treatment.

The new multichannel software which allows Perseus22 management was born from the new team formed by Elad and Microtelecom developers. It takes advantage on an agile GUI interface platform, integrating most of DSP past experiences and ready for adding new modules for demodulators and decoders.

The **available demodulations** are AM, SAM, QSAM, CW, CW_r, RTTY, RTTY_r, LSB, USB, IQ, FM, WFM and DAB+ with sampling frequencies of 250, 500, 1000 and 2000 kSps (maximum displayed span of 1600kHz).

WARNING!

Read carefully the section **4 - Operating the receiver safely**, prior to use your receiver. Failing to observe the indications herein listed could seriously damage the receiver and voids the warranty.

1.2 Front panel description



⏻ & Fn: power button and function led.

Press the **power button for at least one second** to turn the Perseus22 on/off, the Fn led will turn on/off.

Notes about the power management.

1. The Perseus22 **detects the connection to the computer.**
When the computer is turned off or if the Perseus22 is not connected to a USB port, an internal circuit disables the Perseus22 and put it in **stand-by state**. When in stand-by state the Fn led blinks every 3 seconds.
2. The Perseus22 **detects the lack of power supply** or a too low voltage value.
When the USB port is connected and powered, if the power supply is not present or too low, the Perseus22 goes into stand-by and indicates this situation **by blinking the Fn led quickly 4 times** every 3 seconds.
3. The default behavior of the power button (on/off) can be bypassed to have the Perseus22 **automatically turn on** when powered up.
To enable (and disable) this feature **called remote mode, keep pressed the power button** for about 8 seconds until the Fn led begins to blink quickly continually, then release the power button.

HF1/HF2 - En: channel status.

This led is turned on when the corresponding HF **channel is activated**.

HF1/HF2 - Wb: wideband mode.

This led indicates that the HF channel is operating in **wideband mode**, i.e. no RF preselection filters inserted in the signal path.

NB: each channel has its own preselection filters.

HF1/HF2 - Att: attenuator status.

This led indicates that one of the HF channel **attenuator is inserted**. The HF channels have four levels of attenuation: 0, 10, 20 and 30 dB.

NB: each channel has its own attenuators.



VHF1/VHF2 - 70 ± 112: VHF band selection.

This led indicates that the VHF channel is operating in the **70 - 112 MHz frequency range**.

VHF1/VHF2 - 112 ± 137: VHF band selection.

This led indicates that the VHF channel is operating in the **112 - 137 MHz frequency range**.

VHF1/VHF2 - 137 ± 174: VHF band selection.

This led indicates that the VHF channel is operating in the **137 - 174 MHz frequency range**.

VHF1/VHF2 - WBIF: VHF band selection.

This led indicates that the VHF channel is operating in the **174 - 225 MHz frequency range**.

NB: this band is optimized for wideband IF use.

VHF1/VHF2 - Att: attenuator status.

This led indicates that one of the VHF channel **attenuator is inserted**. The VHF channels have four levels of attenuation: 0, 6, 12 and 18 dB.

NB: each channel has its own attenuators.

1.3 Rear panel description



VHF1: antenna connector.

VHF 1, SMA type, 50 Ω input connector for 70 MHz to 225 MHz frequency range. For best performance connect the Perseus22 to a suitable 50 Ohm antenna system.

VHF2: antenna connector.

VHF 2, SMA type, 50 Ω input connector for 70 MHz to 225 MHz frequency range. For best performance connect the Perseus22 to a suitable 50 Ohm antenna system.

REF-IN: reference input.

SMA type reference-input connector. Accepts a 100 MHz, 0 dBm typical, reference signal (min. -3 dBm, max. +6dBm).

SYNC: synchronization connectors.

Synchronization input/output connectors for future use, LVDS compatible.

USB 3.0: USB connection.

Type-B USB 3.0 connector. Connect the Perseus22 to a computer USB 3.0 port with the cable provided.

POWER: power connection.

Connector for regulated power supply. Use the Perseus22 only with the wall adapter provided with it. Improper voltage power supplies may seriously damage the Perseus22.

HF1: antenna connector.

HF 1, SMA type, 50 Ω input connector for 10 kHz to 70 MHz frequency range. For best performance connect the Perseus22 to a suitable 50 Ohm antenna system.

HF2: antenna connector.

HF 2, SMA type, 50 Ω input connector for 10 kHz to 70 MHz frequency range. For best performance connect the Perseus22 to a suitable 50 Ohm antenna system.

2 USB driver installation

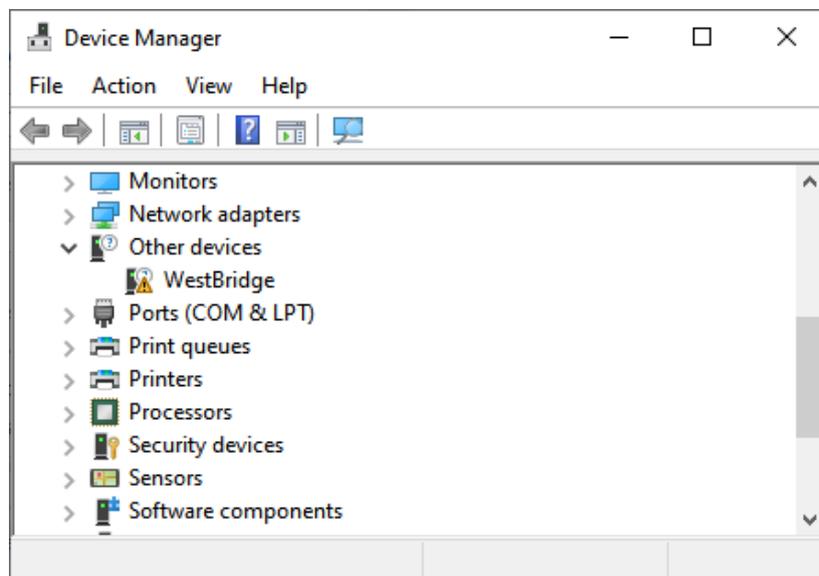
2.1 Preparation

Download the Perseus22 software from this address: <https://www.microtelecom.it/en>, it also includes the driver. Unzip the folder and place it in the location of your choice on your computer.

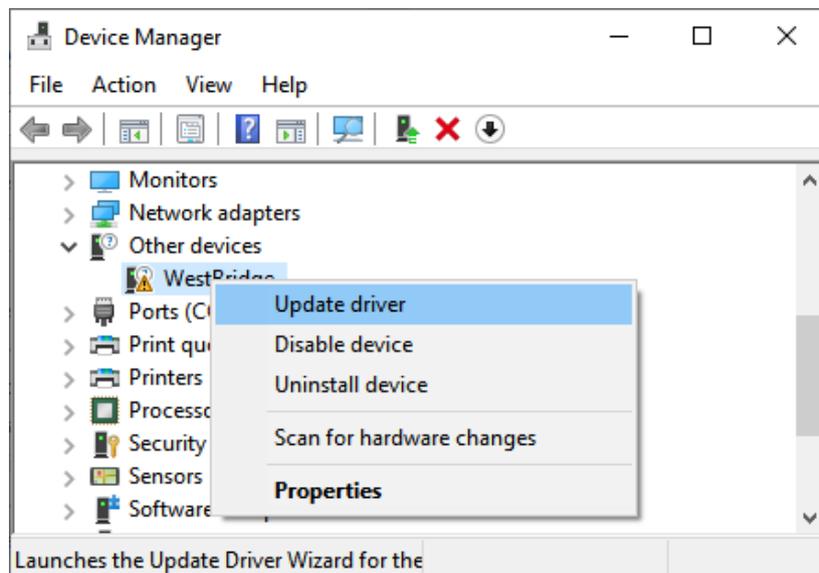
Now connect the Perseus22 to the wall adapter which must be powered, then connect the provided USB3.0 cable between the Perseus22 and your computer.

2.2 Installation

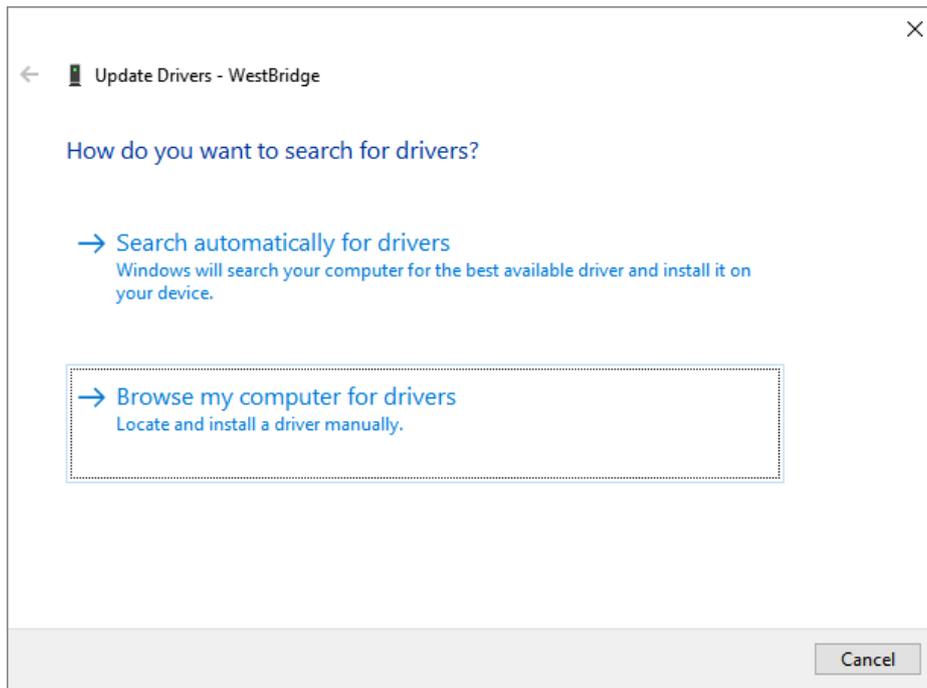
Once the first preparation step is done, open the Windows Device Manager and locate the **WestBridge** entry inside the **Other devices** section.



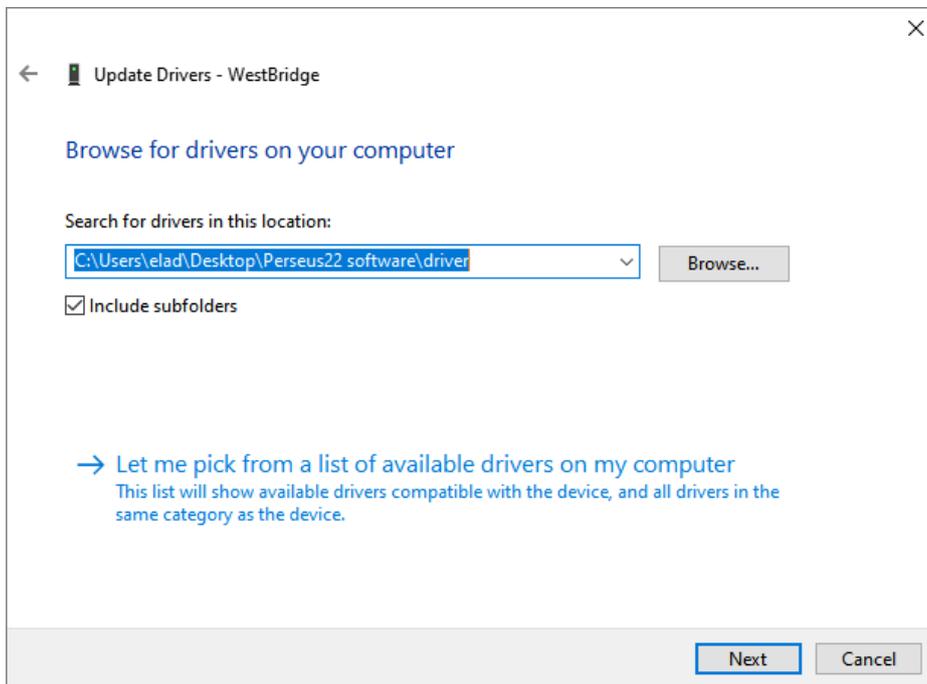
Select the **WestBridge** entry, right click on it and choose **Update driver**.



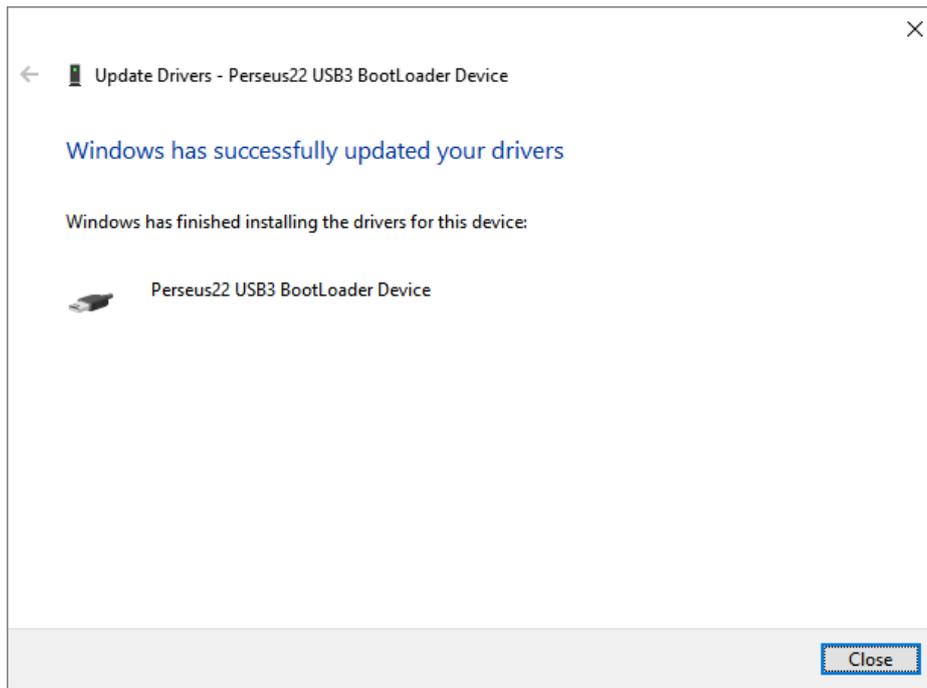
Choose to **browse** for your computer.



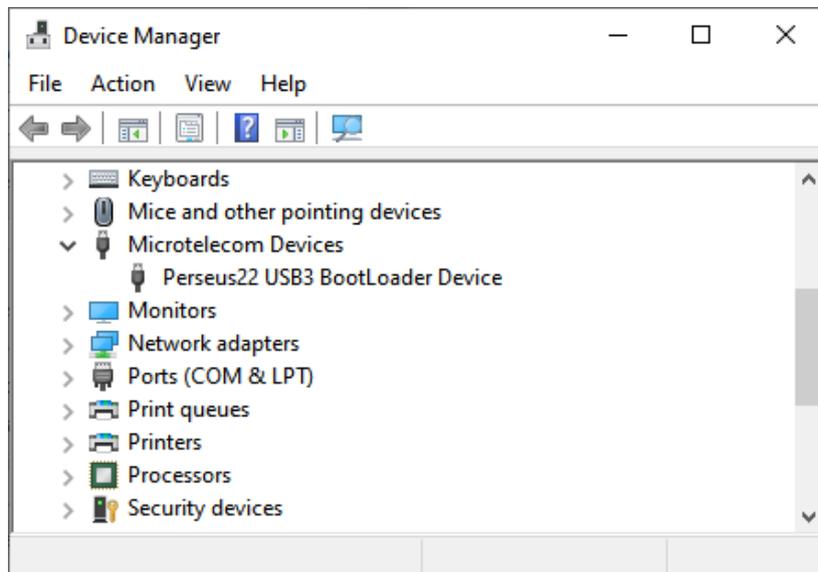
Click on the **Browse** button and choose the path of the **driver folder** which is inside the Perseus22 software folder you downloaded before. Then click **Next**.



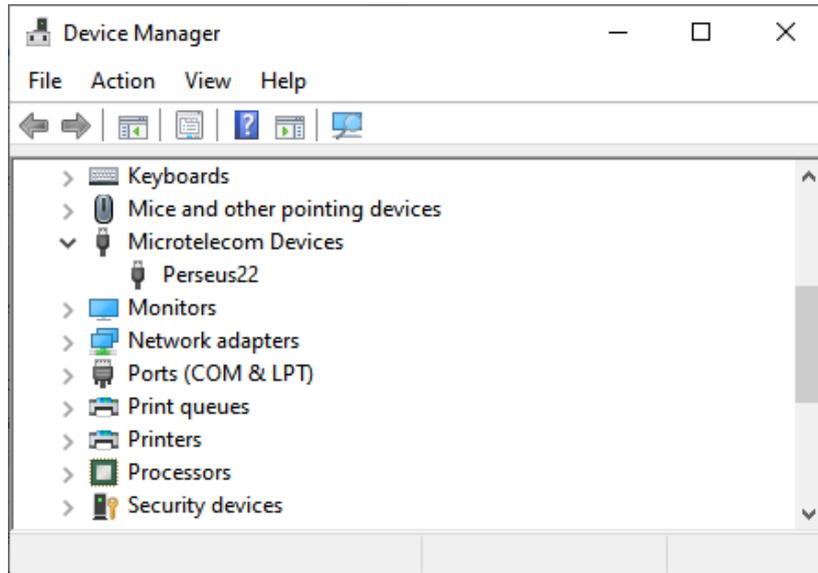
The **outcome window** must be the one below.



Now the Device Manager will have the **Perseus22 USB3 BootLoader Device** entry under the **Microtelecom Devices** section.



Once the Perseus22 software is launched, the **Perseus22 USB3 BootLoader Device** entry becomes **Perseus22**.



3 System requirements

Perseus22 software is a **64-bit** program that uses **OpenGL** libraries.

Supported operating systems are **Windows 10 and 11**, x64 only, ARM architecture is not supported.

A computer with a **USB 3** port (Type-A or Type-C connector) is required to operate the Perseus22. Note that the Perseus22 is shipped with a USB 3 cable with a Type-A connector, but a USB 3 C-A adapter can be used to connect the Perseus22 to a USB 3 port with a Type-C connector.

Recommended configuration: 9th generation Intel Core i5 processor or higher (or equivalent, for example: AMD Ryzen 5), 16GB of RAM. **Minimum configuration:** 7th generation Intel Core i3 processor (or equivalent, for example: AMD Ryzen 3), 8GB of RAM.

The choice of the **graphics card** used should not be underestimated (whether it is integrated or dedicated), in fact the Perseus22 software uses graphics libraries that exploit the graphics card (GPU), relieving the processor (CPU) of part of the work.

A **configuration lower than the minimum one** can be used but considering (1) the use of other programs in conjunction with the Perseus22 software and (2) the ever-increasing demand for resources by operating systems, the choice is not recommended.

Finally, the **processor** used must support **AVX2 Instruction Set Extensions**.

4 Operating the receiver safely

WARNING!

Failure to observe the following instructions could seriously damage the receiver:

- USE ONLY THE POWER SUPPLY PROVIDED WITH THE RECEIVER,
- DO NOT CONNECT THE ANTENNA CONNECTOR OF THE RECEIVER TO THE ANTENNA CONNECTOR OF A TRANSCEIVER/TRANSMITTER,
- DO NOT CONNECT THE RECEIVER TO AN ANTENNA WHICH IS NEAR AN ANTENNA SYSTEM CONNECTED TO A HIGH POWER HF TRANSCEIVER/TRANSMITTER, I.E. A HIGH RF FIELD.

5 Latest software release

The latest software release is available for download on the internet at the address:

<https://www.microtelecom.it/en>

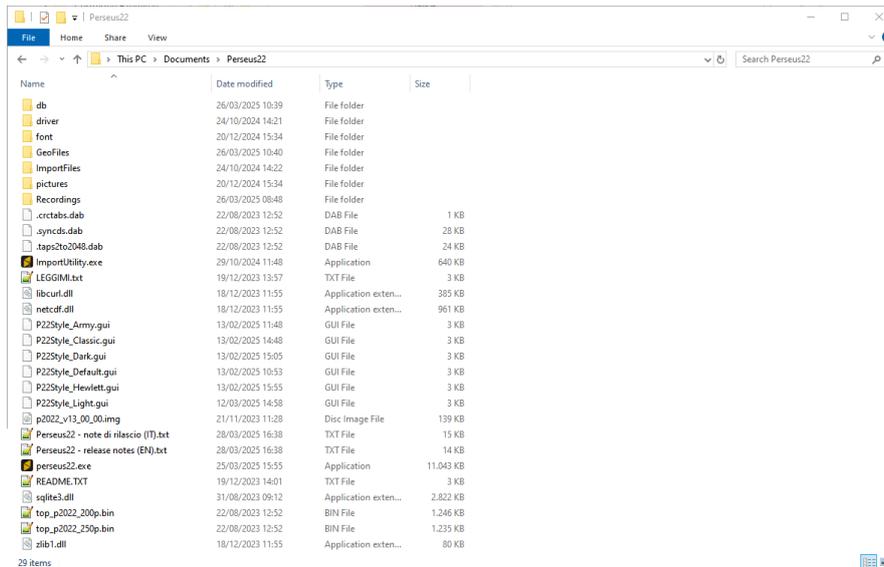
Release notes are provided at the same address or in the distributed software.

6 Operating the Perseus22 software

This section of the user manual refers to **version 1.4** of the Perseus22 software.

6.1 Installation, launch and update

To use the software, simply copy the "Perseus22" folder present in the archive (".zip" file) of the latest downloaded version onto your computer disk. Any location is acceptable, such as in the "Documents" folder or on a disk/partition other than the main one.

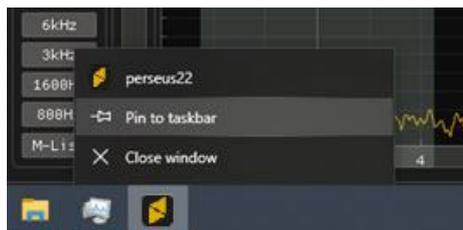


The Perseus22 software is able to work independently and does not install any files on the computer, except for the drivers which must be installed manually. To activate the Perseus22 receiver, run the "perseus22.exe" file (double click on the file, or right-click and "Open").

To **create a shortcut** to the software on the Desktop, simply right-click (assuming mouse left button is the primary one) on the "perseus22.exe" file, select the "Send to" item and then click on "Desktop (create shortcut)". The Perseus22 software icon will be added to the desktop.

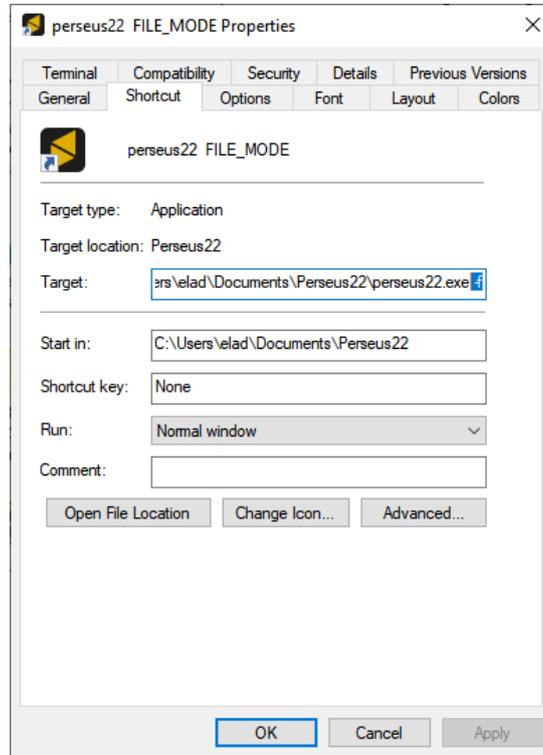


Once the software has started you can also **add it to the taskbar**. To do this, right-click on the software icon in the taskbar and choose "Pin to taskbar".



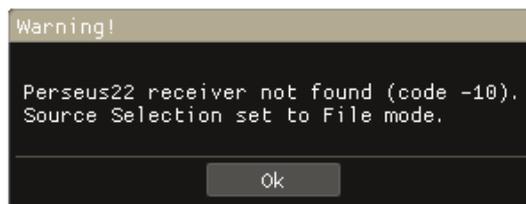
The Perseus22 software also accepts a **command line option** to run in **File mode** only, which allows you to play previously recorded files. This option is useful for running two instances of the Perseus22 software: one running normally and connected to the Perseus22, and the other running in File mode to play recorded files.

To set the use of this mode, simply create another shortcut, for example with the name “perseus22 FILE_MODE” and modify the shortcut options by adding the “-f” option.



You may encounter an error message similar to the one below when launching the software. There are two main reasons:

1. the Perseus22 receiver is not connected to the computer and/or is not powered;
2. the software folder has been corrupted, one or more software files are missing.



To overcome the first problem, simply turn on the Perseus22 and connect it to the computer.

To resolve the second problem, a corrupted software folder, proceed as if you were updating the software to a new version, as described on the next page.

In case of **updating the software** to a more recent version, simply copy the files of the most recent software version into the "*Perseus22*" folder already present on your computer. User settings files are never overwritten during copying.

If it is necessary to carry out manual actions on the **settings files**, here is a brief description of their function:

- "*imgui.ini*" file: graphics settings saving file,
- "*.gui*" files: theme (style) saving files,
- "*.gst*" files: files for saving software application settings,
- "*dbperseus22.db*" file: file of stored frequencies/stations and recordings.

The indicated settings files can be deleted if you do not wish to retain previous graphics/application settings. However, we recommend that you never delete your "*dbperseus22.db*" memory file because otherwise the frequencies of all previously stored radio stations will be lost.

6.2 User interface

The user interface is mainly composed of two parts:

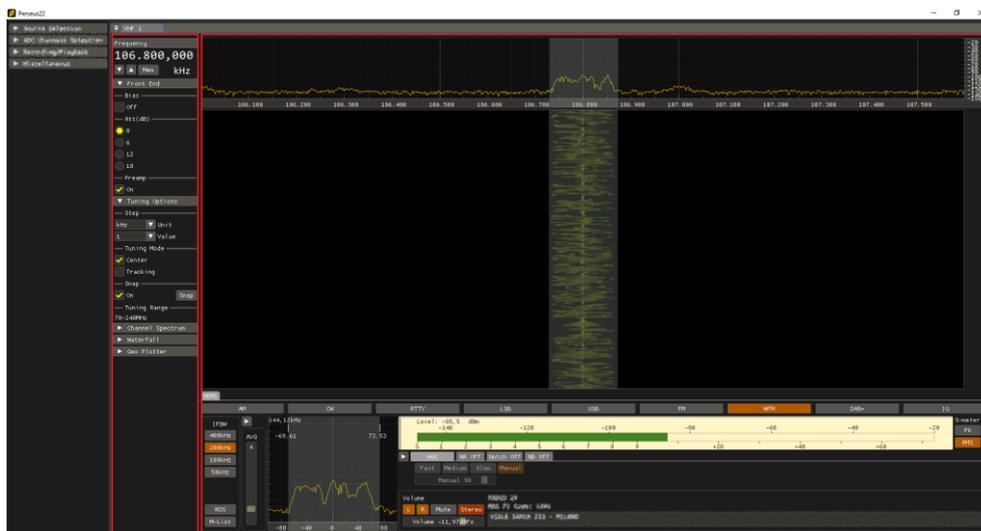
- **on the left**, a fixed vertical panel containing the **general settings** such as the data “Source Selection” and the “ADC Channels Selection”;
- **in the remaining section**, a large area for displaying **various windows**, the most important of which are the **channel windows** which allow you control of the receiver.



View of all 4 channel windows (HF 1, HF 2, VHF 1 and VHF 2).

The **channel windows** themselves are composed of two parts:

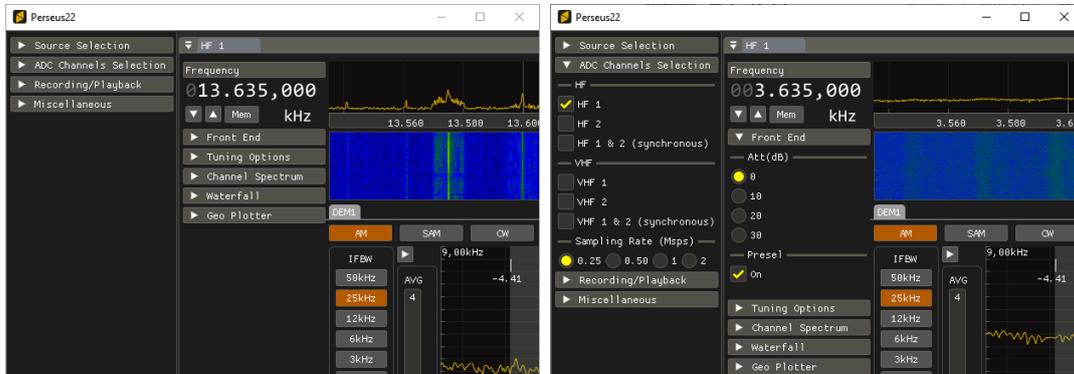
- **on the left**, a fixed vertical panel that groups together various **channel settings** such as the frequency management (“Frequency”) and the front end management (“Front End”);
- **in the remaining section**, a large horizontally divided area allows you to view the RF **spectrum** and its **waterfall**, the IF spectrum, the **S-meter** and other various information and controls.



View of a single channel window (VHF 1).

Perseus22 User Manual

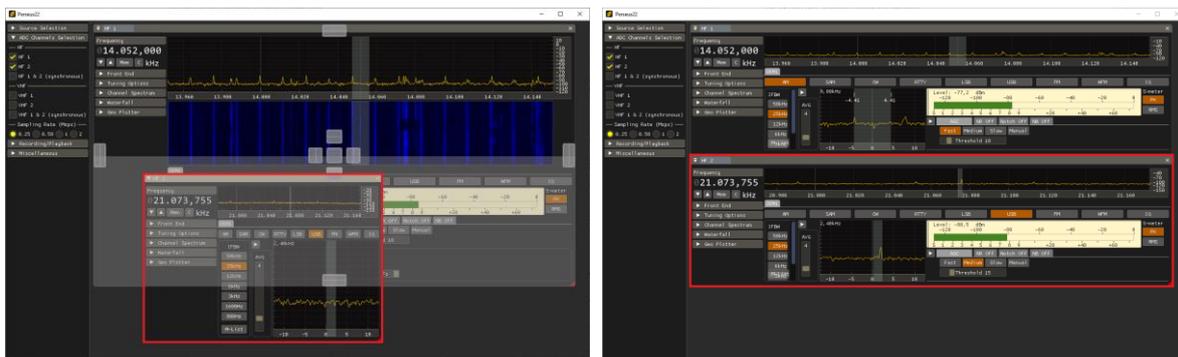
In the vertical panels for general settings and channel settings, you will find **drop-down menus** that group the various settings by type and/or functionality. Clicking on the menu name expands (displays) or collapses (hides) the menu, allowing you to optimize the software user interface by displaying the settings you need at the moment and hiding other settings that do not require constant adjustment.



“ADC Channels Selection” and “Front End” menus closed (left) and open (right).

The **arrow next to the menu name** indicates whether the menu is hidden (horizontal arrow) or displayed (down arrow). Within menus, horizontal separators group the various settings, always by type and/or functionality, also providing a title for the group of settings. For example, the “ADC Channels Selection” menu has three sections, each with a separator title: “HF”, “VHF” and “Sampling Rate”. Note that the “Frequency” menu in the channel windows cannot be closed.

The various **channel windows can be docked** (grouped) together by choosing from various docking methods: left, right, up, down, or tabbed (all in the same window). To do this, click and hold on the title of a window and drag it over another window. The docking points for the window will then appear. Then drag the cursor over the desired docking type and release the mouse button to confirm your choice.



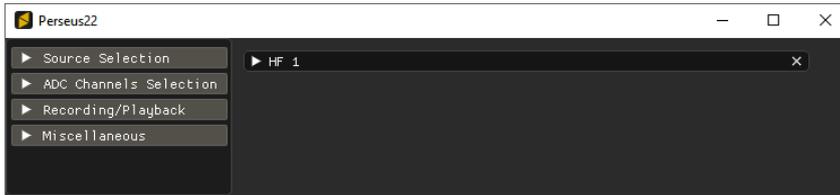
Before (left) and after (right) docking a channel window (in red).

To return to the not-docked view, simply click and hold on the window title (highlighted in the picture apart) and drag the mouse slightly.

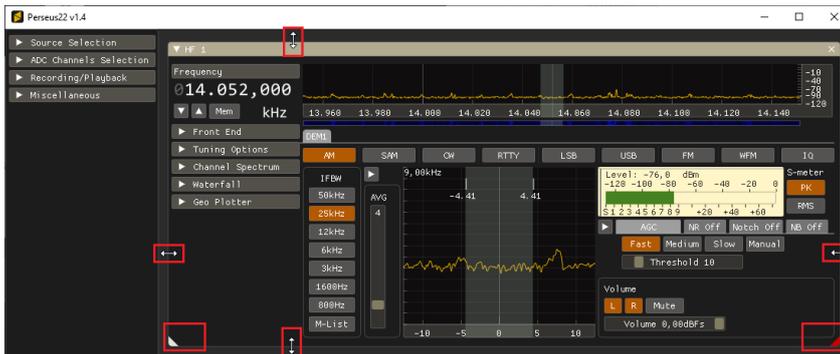


Here are some important aspects for using the user interface:

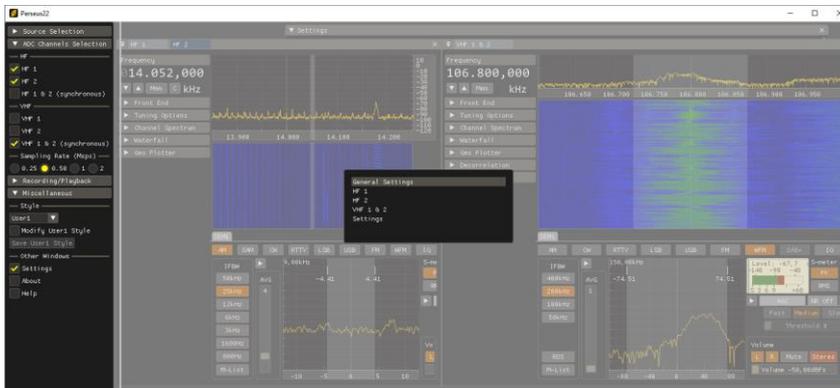
- **double-clicking on the title bar of a window** (if it is not docked) will collapse the window, another double-click will expand the window;



- **click and drag the triangle at the bottom corners** of a window to resize it, the triangle changes color depending on its state: unclicked, clicked and dragged; you can also **resize the window by dragging its edges**, a double-arrow cursor appears;



- use the **“CTRL+TAB”** key combination to view the various open windows, holding down **“CTRL”** and pressing the **“TAB”** key allows you to switch from one window to another, release both keys to view the selected window;

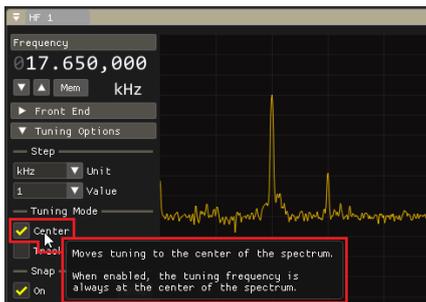


pressing **“CTRL+SHIFT”** and then **“TAB”** will scroll through open windows in the opposite direction; holding down **“CTRL”** and using the arrow keys will move the selected window; holding down **“CTRL”** and **“SHIFT”** and using the arrow keys will resize the selected window;

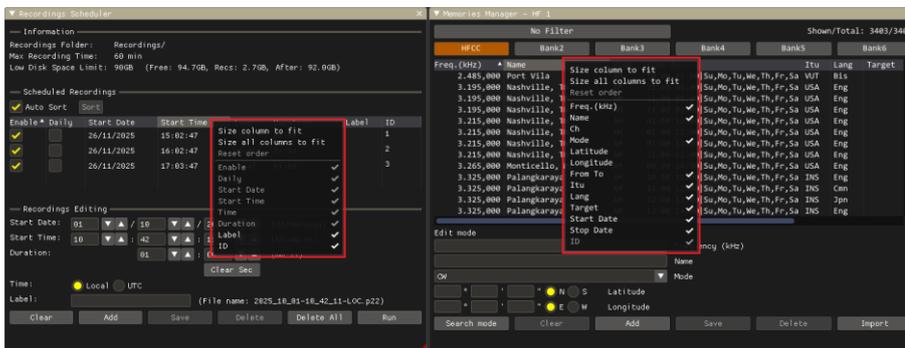
- **right-clicking** on a control (checkbox, button) for an open window brings it back to the foreground;



- placing the mouse cursor over a control (checkbox, button, etc.) where **tooltips** are present allows you to view them;



- all **tables** have a context menu accessible by right-clicking on the column title that allows you to manage the columns: adapt the width and activate or deactivate individual column.



6.3 General Settings panel

As explained in section [6.2 - User interface](#), the “General Settings” panel is located on the left side of the main software window. This panel groups together the most important settings and provides quick access to useful windows. It consists of four drop-down menus:

- the data source selection: “**Source Selection**”;
- the channel selection: “**ADC Channels Selection**”;
- the recording management: “**Recording/Playback**”;
- and a section with all other settings: “**Miscellaneous**”.



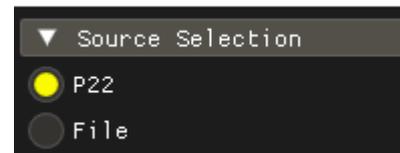
View of the four drop-down menus in the “General Settings” panel.

6.3.1 Source Selection

The Source Selection menu allows you to choose the source from which data will be processed and displayed by the Perseus22 software.

If “**P22**” is selected, data come from the Perseus22 receiver. From the antennas, they pass through the front end, the ADC, and the digital electronics of the Perseus22.

If “**File**” is selected, data come from a file (“*.p22*” extension) previously recorded using the Perseus22 software.



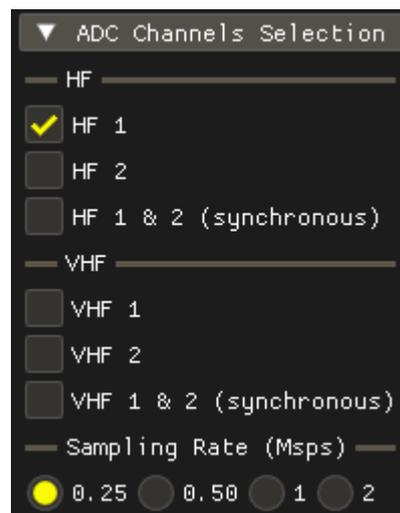
Note that the availability of the “ADC Channels Selection” and “Recording/Playback” menu controls changes depending on the choice made.

6.3.2 ADC Channels Selection

The “ADC Channels Selection” menu allows you to choose which of the four reception channels to enable, each channel has its own dedicated front end. There are six choices in total: “HF1”, “HF2”, “HF1&2 synchronous”, “VHF1”, “VHF2”, and “VHF1&2 synchronous”. You can have one to four channels enabled at a time.

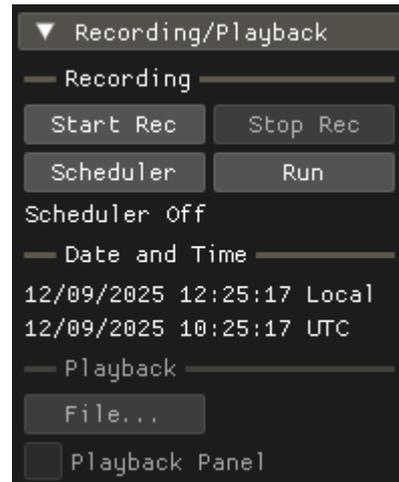
Choosing the **synchronous** feature activates the “**Decorrelation**” and “**Blending**” menus in the channel window.

This menu also allows you to choose the “**Sampling Rate**” to use; 250ksps, 500ksps, 1Msps, or 2Msps. Choosing a sampling rate also determines the maximum span available for displaying the spectrum and waterfall. Since the **span** is limited to 80% of the available bandwidth, the respective maximum values are: 1600kHz, 800kHz, 400kHz, and 200kHz.



6.3.3 Recording/Playback

The “Recording/Playback” menu is the starting point for managing both RF **recording** and **playback**. Depending on the source selected in the “Source Selection” menu, either the Recording section (Source Selection equals P22) or the Playback section (Source Selection equals File) is active. The date and time displayed in the middle are always present, in Local and UTC format.

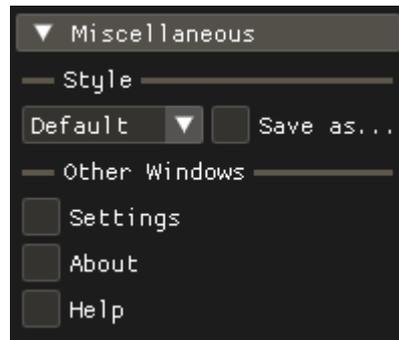


In addition to manually starting and stopping recordings, this menu allows you to open the “Recordings Scheduler” - a window for setting up and scheduling recordings - and close or reopen the “Playback Panel” - a panel for managing the playback of a recording (“.p22” file).

More details regarding recording and playback are provided in section **6.8 - Recording and playback**.

6.3.4 Miscellaneous

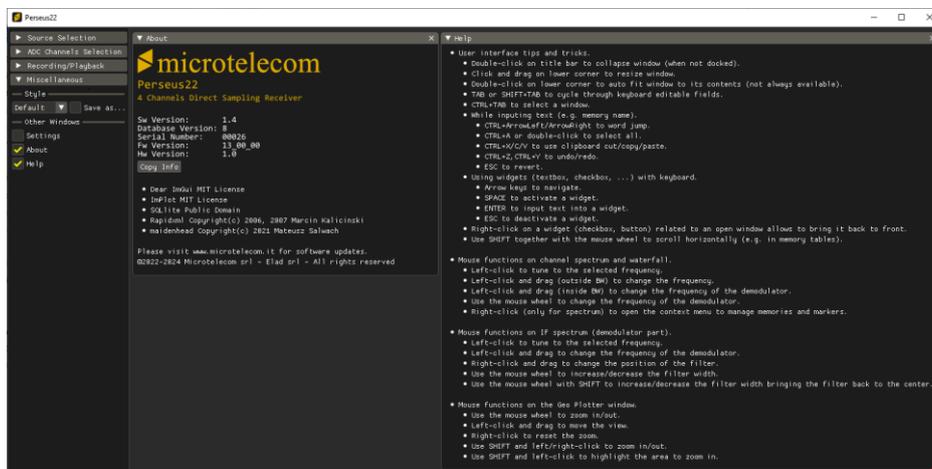
In addition to providing access to the “Settings” window, this menu also allows you to open the “About” window which provides information about the hardware and software and the “Help” window which lists some features of the software regarding the user interface.



The “Settings” window has its own dedicated section presented in **6.4 - Settings window**.

The “About” window displays important information such as the software version, the memory database version, the Perseus22 serial number, the firmware version and the hardware version. You can click the “Copy Info” button to quickly copy all this information, for example, for technical support.

The “Help” window provides specific explanations on the user interface, such as how to use the mouse on spectrums and waterfalls.



View of the “About” and “Help” windows.

The other option offered by the “Miscellaneous” menu is to choose a **style** from the predefined ones. Styles allow you to modify the colors and some shapes used for the user interface. Through a dedicated menu, you can change one of the six predefined styles using one of the three user styles.

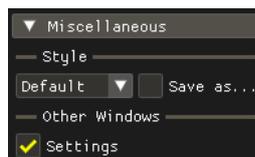


Predefined styles: Army, Classic and Dark at the top and Default, Hewlett and Light at the bottom.

More details regarding styles are provided in section **6.9 - Style management**.

6.4 Settings window

To open the “Settings” window, enable the corresponding checkbox in the “Miscellaneous” drop-down menu of the “General Settings” panel.

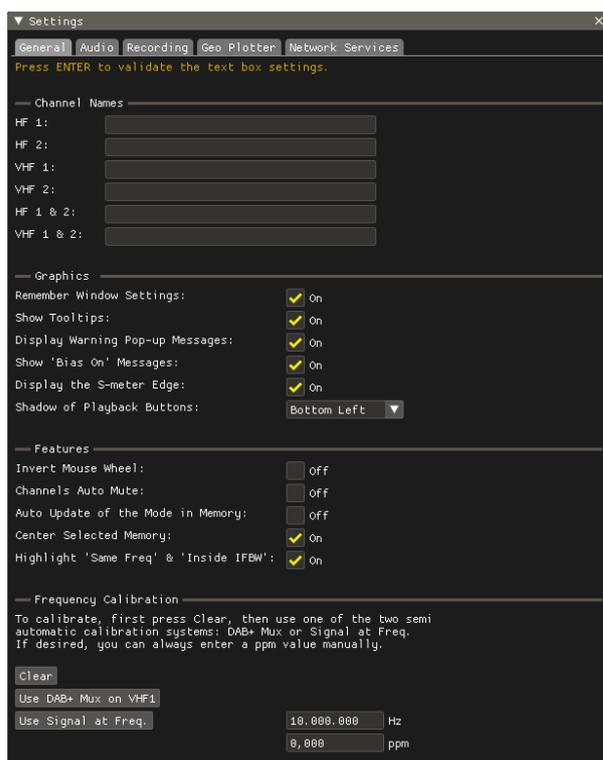


The “Settings” window has several tabs: “General”, “Audio”, “Recording”, “Geo Plotter” and “Network Services”, each of which allows you to set various parameters, features, and behaviors of the software. Several controls have a **tooltip** that appears when you hover the mouse over them. As specified at the top of each tab, text box-type fields require you to **press “ENTER”** to validate the new values entered.

6.4.1 General tab

The various settings available in the “General” tab are:

- enter a custom name for each channel window;
- modify some graphic settings;
- enable or disable some features;
- perform a frequency calibration.



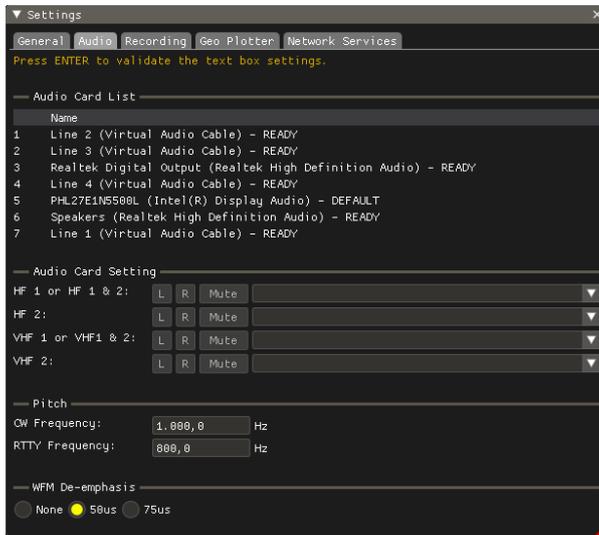
View of the “General” tab of the “Settings” window.

All controls (checkboxes, buttons) on this tab have a tooltip with a short description.

To perform the **frequency calibration**, choose one of three methods (enter a ppm value, tune a signal, or use the DAB+ Mux) following the instructions provided in the description and tooltips. Calibration is software-based; it is not saved within the Perseus22. More details about the frequency calibration are provided in section [6.10 - Frequency calibration](#).

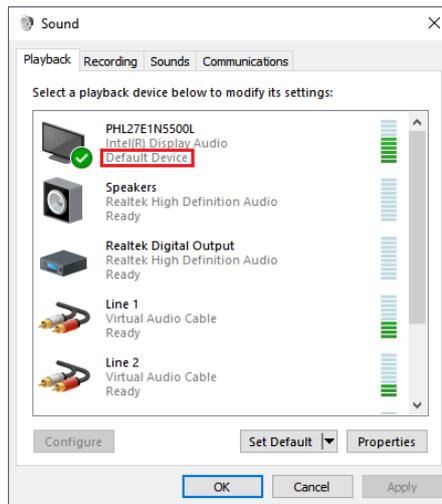
6.4.2 Audio tab

In addition to allowing you to enter the **pitch** value and the **de-emphasis** value for Wide-band FM, the “Audio” tab lists, in the “Audio Card List” section, the **sound cards available** for audio playback.



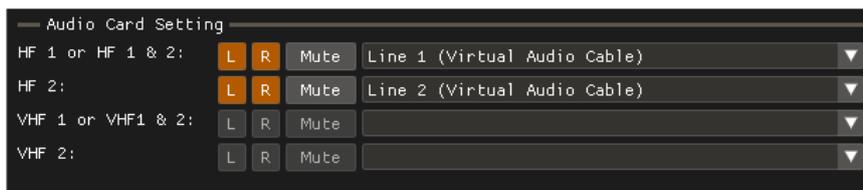
View of the “Audio” tab of the “Settings” window.

The software uses the sound card set as **Default** in Windows settings to play audio.



Default sound card in Windows sound settings.

In the “Audio Card Settings” section, you can specify a sound card for each RF channel to which you want to **redirect audio**, for example to third-party software. You can enable or disable the left/right channels and mute the redirection.

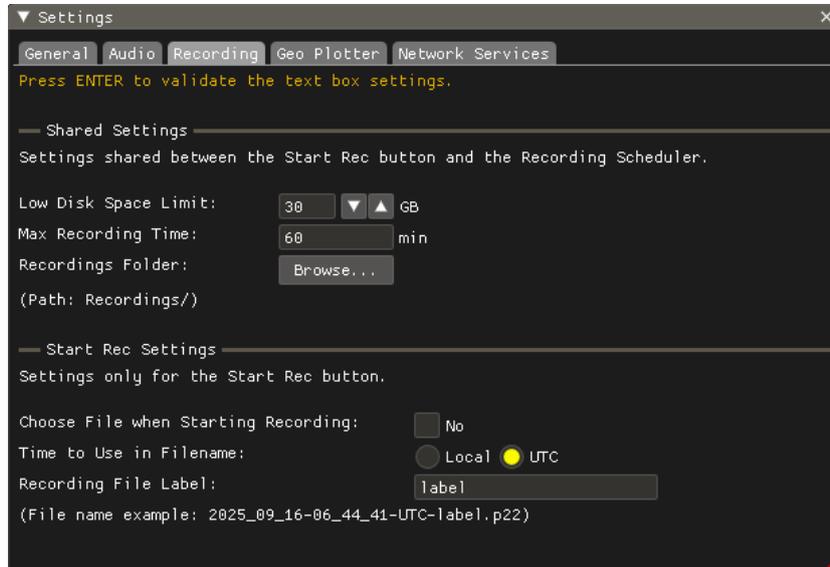


“Audio Card Setting” section of the “Audio” tab with two channels set.

6.4.3 Recording tab

The “Recording” tab is divided into two parts:

1. the “**Shared Settings**” between manual recording start and automatic recording start via the “**Recordings Scheduler**”;
2. the settings for starting recording manually: “**Start Rec Settings**”.

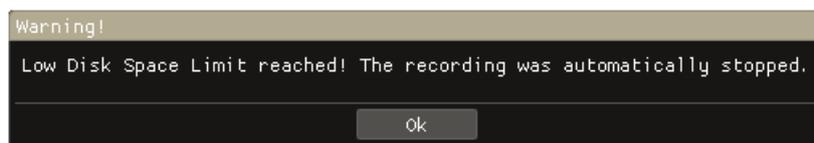
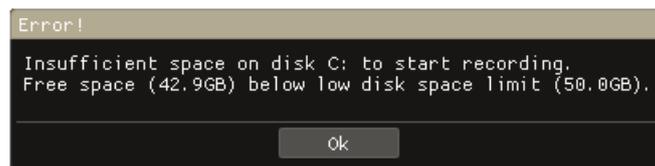


View of the “Recording” tab of the “Settings” window.

“**Shared Settings**” section:

- “**Low Disk Space Limit**”: this is the low disk space limit below which recordings are disabled;
- “**Max Recording Time**”: this is the maximum recording time after which recordings are automatically stopped;
- “**Recordings Folder**”: this is the folder where recordings are saved, the “**Recordings**” folder in the Perseus22 software folder is suggested by default, but this choice is absolutely not mandatory.

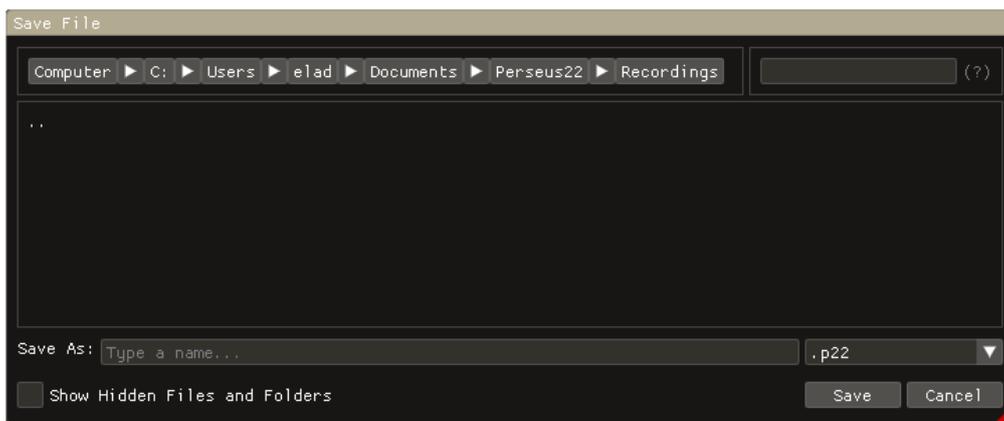
These settings apply to both manual recordings - using the “**Start Rec**” button in the “**General Settings**” panel - and scheduled recordings - using the “**Recordings Scheduler**”. They may result in error messages such as the following:



“Start Rec Settings” section:

- **“Choose File when Starting Recording”**: allows you to specify whether or not to choose the file when starting a recording:
 - o choosing **“Yes”**, you will be given the option to choose/create the file where the recording will be saved, in this case the disk space control is not enabled;
 - o choosing **“No”**, the file is automatically created with a name composed of the date and time, also taking into account the following two settings;
- **“Time to Use in Filename”** (Choose File = No): adds LOC for local or UTC to the file name;
- **“Recording File Label”** (Choose File = No): allows you to add a label to the file name.

These settings are therefore only valid for manual recordings - using the **“Start Rec”** button in the **“General Settings”** panel. If you set the **“Choose File when Starting Recording”** option to **“Yes”**, when you press the **“Start Rec”** button a window like the one below will appear to allow you to choose the file where to save the recording.

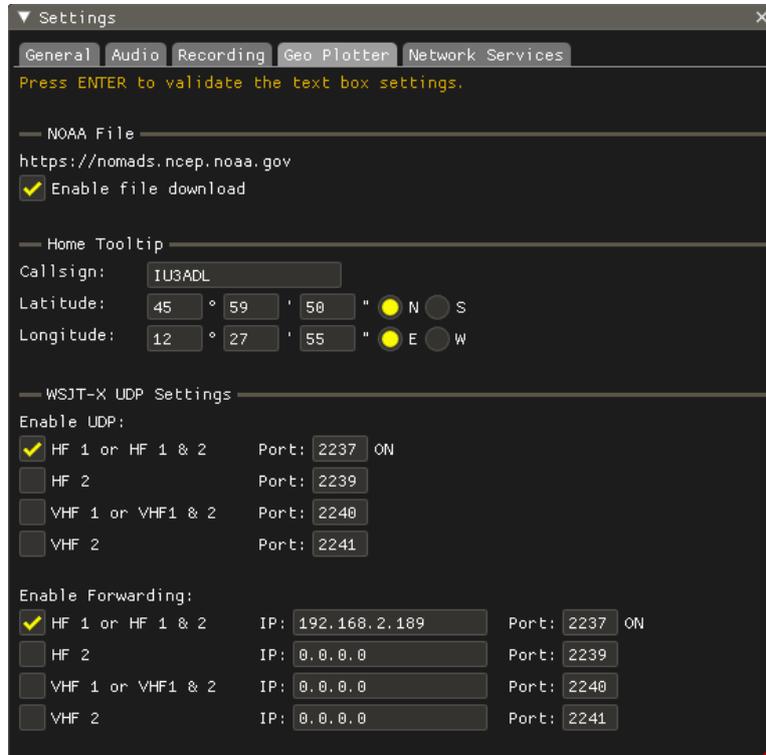


The most important controls (checkboxes, buttons) on this tab have a tooltip with a brief description to help you make decisions.

More details about recording and playback are provided in section **6.8 - Recording and playback**.

6.4.4 Geo Plotter tab

The “Geo Plotter” tab of the “Settings” window allows you to configure the features that affect the data displayed in the “Geo Plotter” window. This window displays a planisphere overlaid with both a colored map representing the state of the ionosphere and cursors indicating the positions of stations or users, depending on the selected mode: “WSJT-X”, “WRTH”, or “Memories”.



View of the “Geo Plotter” tab.

Available settings:

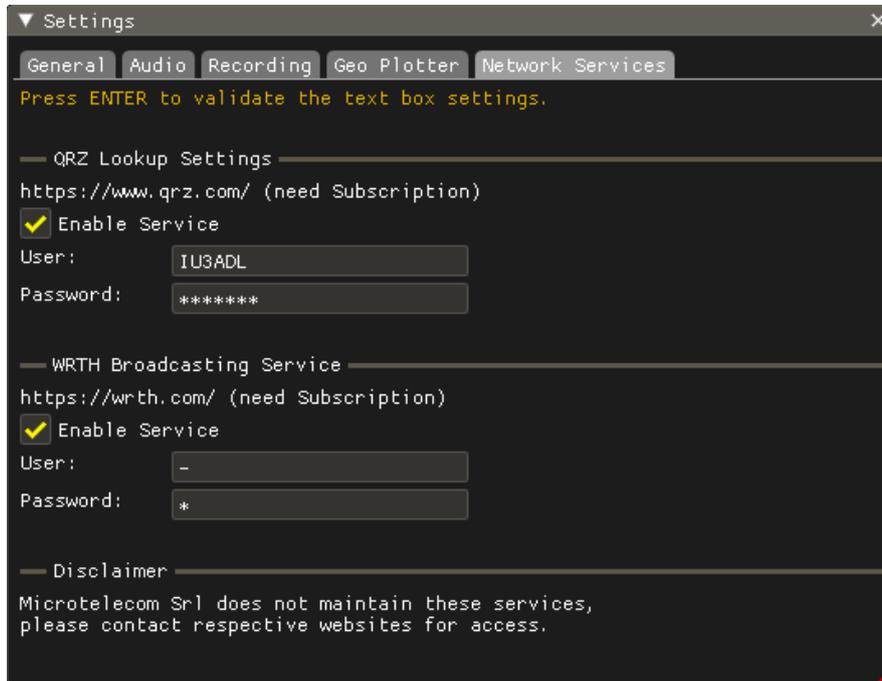
- “NOAA File” section: allows you to enable or disable downloading of forecast files that represent the state of the ionosphere;
- “Home Tooltip” section: allows you to set a name and location for displaying the operating location;
- “WSJT-X UDP Settings” section:
 - “Enable UDP”: allows you to enable, for each RF channel, the decoding of UDP packets from WSJT-X by specifying the operating port;
 - “Enable Forwarding”: allows you to enable and configure, for each RF channel, the forwarding of UDP packets from WSJT-X.

More details about the Geo Plotter window are provided in section [6.7 - Geo Plotter window](#).

6.4.5 Network Services tab

The “*Network Services*” tab allows you to set the username and password for the services used by the Perseus22 software. These are:

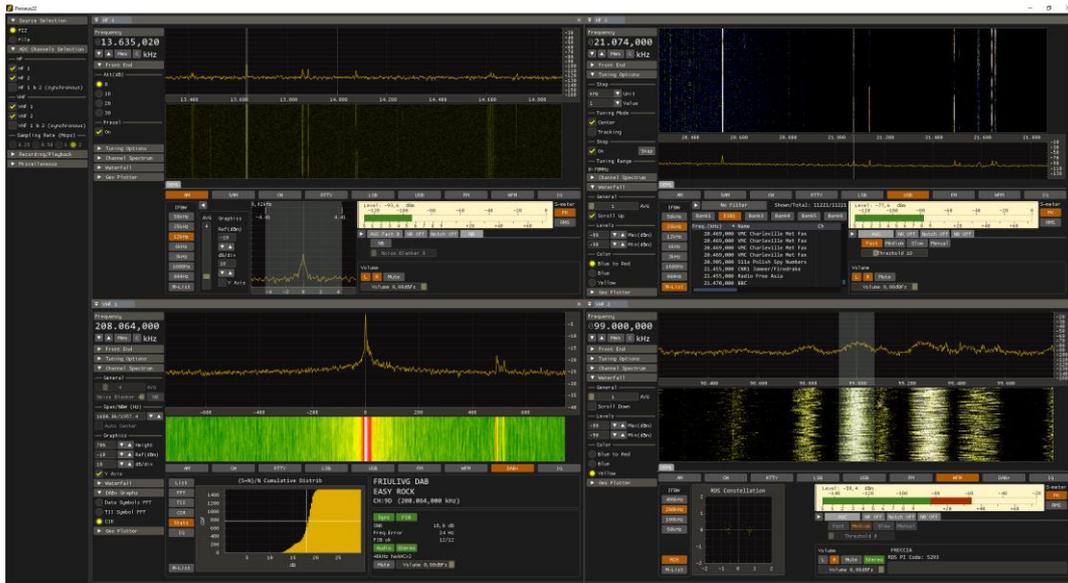
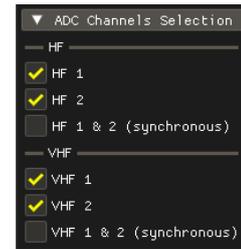
- access to the **QRZ** site to retrieve lookup data when the “*Geo Plotter*” window is running in “*WSJT-X*” mode;
- access to the **WRTH** site to retrieve guide data when the “*Geo Plotter*” window is running in “*WRTH*” mode.



View of the “*Network Services*” tab.

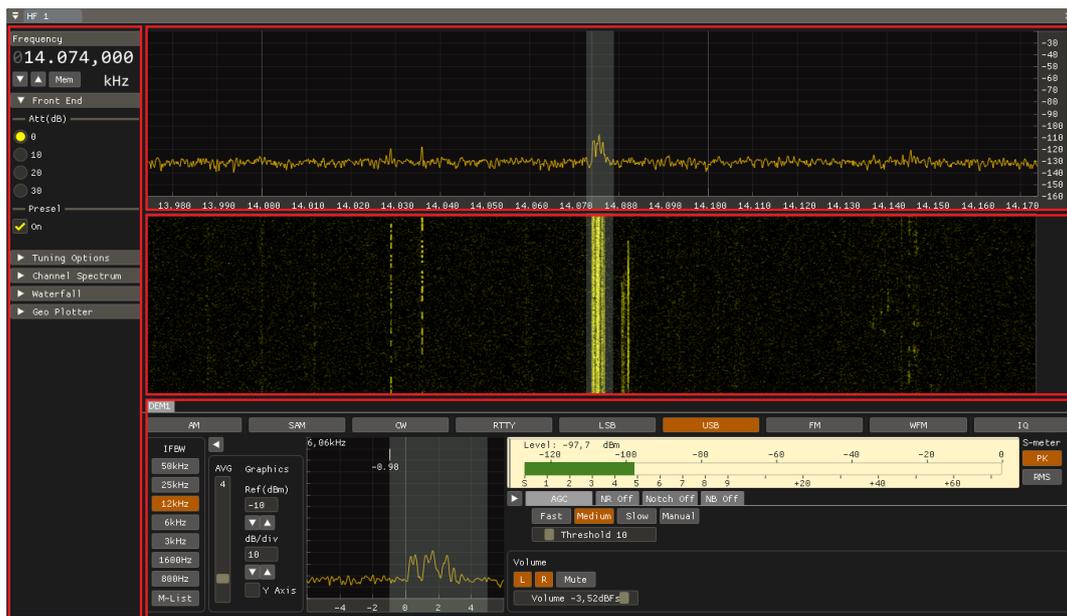
6.5 Channel window

The channel window is enabled from the “ADC Channels Selection” menu in the “General Settings” panel. It allows you to control one of the four available channels: “HF1”, “HF2”, “VHF1” or “VHF2”, and alternatively synchronize the two HF channels - “HF1&2 synchronous” - or the two VHF channels - “VHF1&2 synchronous”. You can therefore have **up to four channels** enabled at the same time, equivalent to having four channel windows open at the same time.



Perseus22 software with four open channel windows.

As anticipated in **6.2 - User interface**, the channel window is composed of a fixed vertical panel on the left which groups the channel settings and in the remaining part a large horizontally divided area which allows you to view the RF spectrum and the related waterfall, and at the bottom the **demodulator** area which houses the controls necessary for managing the signals demodulation.



Channel window with different areas: settings, spectrum, waterfall and demodulator.

6.5.1 Frequency tuning

An important function when using a receiver is frequency tuning. The Perseus22 software has several tuning modes.

Frequency menu

The "Frequency" menu is the first menu in the channel window and is always open; it cannot be collapsed. It allows you to both view the current demodulator frequency and change it.



There are several ways to change the frequency via the "Frequency" menu:

- **enter the frequency from the keyboard;** be careful, the frequency must be entered in kHz and the channel window where you want to enter the frequency must be selected (have focus); to validate the frequency, press "ENTER". You can also use the "BACKSPACE" key to delete one or more digits and the "Del" key to cancel the entry of a new frequency;
- **act on the selected digit;** by positioning the mouse cursor over one of the frequency digits (either at the top of the digit or the bottom of the digit), it is highlighted, indicating that it can be modified (either increased or decreased) using the mouse wheel or a simple click; if the channel window is selected (has focus), you can also use the "UP" and "DOWN" arrows on the keyboard to modify the digit or type a digit directly; be careful, the snap function may block this operation depending on the step value;
- **click on the "down arrow" and "up arrow" buttons** below the frequency, the frequency will be changed by the value of the step set in the "Tuning Options" menu;
- **use the "Set Frequency" window;** the "Set Frequency" window opens by right-clicking on the frequency in the "Frequency" menu; it allows you to enter a new frequency using a numeric keypad and is designed to be used with the mouse; the "Cancel" button deletes the entire frequency value; the "<<" button deletes the last digit entered; the "Apply" button validates the frequency and closes the "Set Frequency" window;
- the "C" button, located under the frequency, allows you to copy the frequency of the other HF/VHF channel and use it for the channel in use; both HF/VHF channels must be open to use this feature.

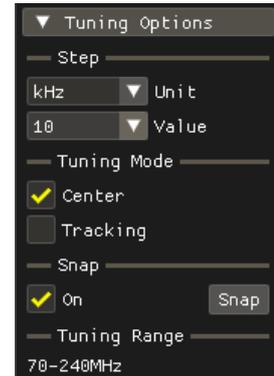


Hovering the mouse over the frequency displays a **tooltip** that summarizes the various frequency setting options.

Tuning Options menu

The “Tuning Options” menu allows you to set various parameters:

- the **frequency step** used to change the frequency value, its value is set by choosing both the unit (Hz, kHz, MHz) and a number from the predefined list (1, 2, 5, 10, etc.);
- the **“Center” mode** status: allows the tuned frequency to always be in the center of the spectrum/waterfall; if this mode is activated and the tuned frequency is not in the center of the spectrum/waterfall, the frequency will be brought to the center;
- the **“Tracking” mode** status: allows you to lock tuning on a frequency (within the span limits) even if the spectrum/waterfall is dragged;
- the **“Snap” mode** status: when this mode is active, the frequency is always rounded to the nearest step value.



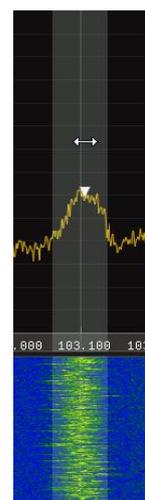
The “Tuning Options” menu also provides an indication of the **possible tuning range**, which depends on the selected channel and the tuning frequency of the other channels. The ranges that can be displayed are as follows:

Displayed range	Selected channel	Condition
0 - 70 MHz	HF	-
70 - 240 MHz	VHF	The other VHF channel is off.
112 - 162 MHz	VHF	The other VHF channel is on and tuned between 112 and 162 MHz.
70 - 112 MHz / 162 - 240 MHz	VHF	The other VHF channel is turned on and tuned below 112 MHz or above 162 MHz.

Tuning to spectrum and waterfall

Tuning on the spectrum/waterfall is identified by a **semi-transparent vertical band** which represents the demodulator filter, it can be done in various ways which are the following:

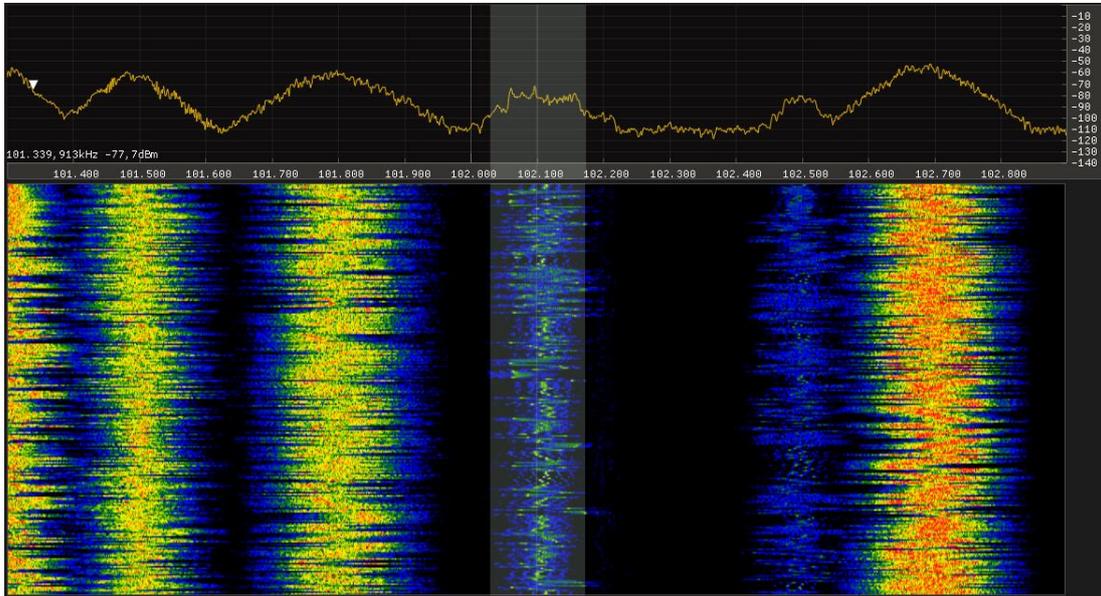
- **by clicking on the spectrum/waterfall** on the signal you want to tune: with the “Center” mode off the tuning moves within the displayed span, with the “Center” mode active the tuning remains in the center and the spectrum moves;
- **using the mouse wheel**: as with clicking, with “Center” mode off the tuning moves within the displayed span, with “Center” mode on the tuning remains at the center and the spectrum moves;
- **clicking on the filter band and dragging it**: this tuning mode only works with the “Center” mode turned off, the mouse cursor becomes a double horizontal arrow when this tuning mode is usable;
- **clicking on the spectrum/waterfall (outside the filter band) and dragging it**: with “Tracking” mode off the spectrum/waterfall is moved to the right or left by decreasing or increasing the tuned frequency, with “Tracking” mode active the spectrum/waterfall is moved to the right or left without changing the tuning.



Having **snap** active at a significant step value can lead to a snap at the end of the tuning movement, to avoid this effect you need to reduce the step value or deactivate snap.

6.5.2 Spectrum and waterfall

The spectrum and waterfall are displayed in a large area of the channel window. The X-axis (abscissa) of the spectrum indicates the frequency value (in kHz), and the Y-axis (ordinate) displays a scale (in dBm) corresponding to the signal level. A **triangular cursor** appears at the mouse position and provides the frequency/level pair in the lower left corner of the spectrum. The spectrum and waterfall can each be configured with their own drop-down menus.



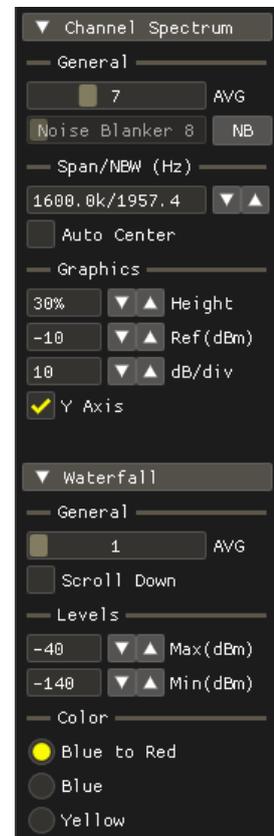
Channel window spectrum and waterfall areas.

The parameters for the “*Channel Spectrum*” menu are as follows:

- “**AVG**”: allows you to adjust the averaging calculation for the spectrum, the higher the level, the more the spectrum is averaged and therefore visually more stable;
- “**Noise Blanker**”: allows you to manage a channel noise blanker;
- “**Span**”: allows you to reduce the displayed span without changing the sampling rate, it can be compared to a zoom function;
- “**Auto Center**”: allows you to decide whether or not the tuning goes to the center of the spectrum when you change the span value;
- “**Graphics**”: allows you to change various spectrum settings such as the spectrum/waterfall ratio, the reference level in dBm, the number of dB per divisions and whether or not to display the Y-axis (ordinate).

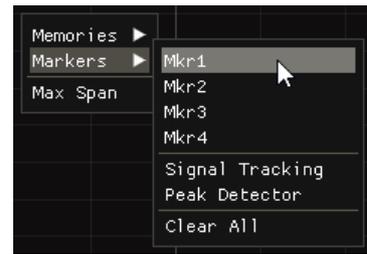
The parameters for the “*Waterfall*” menu are as follows:

- “**AVG**”: allows you to adjust the averaging calculation for the waterfall, the higher the level, the more the waterfall is averaged, producing a visual slowdown effect;
- “**Scroll Up/Down**”: allows you to change the direction of the waterfall scrolling by also inverting the positions of the spectrum and the waterfall;
- “**Levels Max/Min**”: these are the minimum and maximum levels of the spectrum, expressed in dBm, used to define the color gradation applied for the waterfall display;
- “**Color**”: allows you to choose between different colors or color gradations for the waterfall display.



6.5.3 Using markers

Markers are accessible from the spectrum **context menu**. Right-click on the spectrum to access it and select *"Markers"*. Then select the marker you want to place. You can place up to four markers on the spectrum, named *"Mkr1"* to *"Mkr4"*. To activate or deactivate a marker, simply click on its name. The *"Clear All"* menu item allows you to deactivate them all.

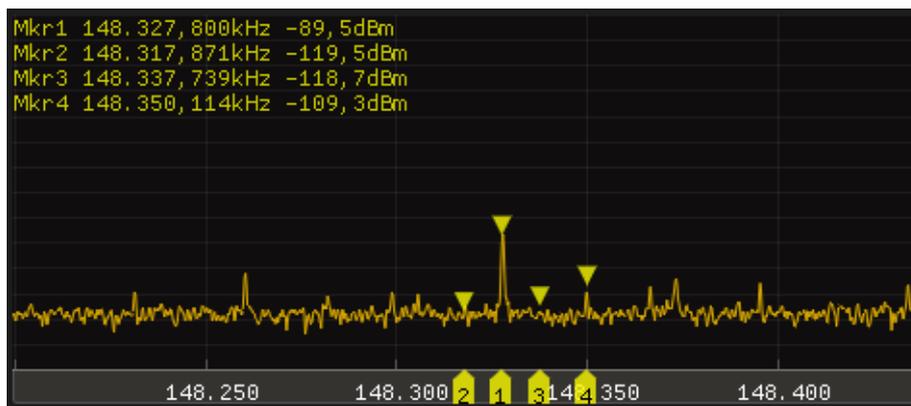


Once a marker is positioned, you can move it by clicking on its label on the x-axis (abscissa) of the spectrum and dragging it to the desired frequency. The position of the markers is relative to the frequency to which they are set using the mouse; changing the tuning by moving the spectrum does not change this relationship; the markers remain at the frequency to which they are set.



Moving a marker.

The information provided by the markers is the frequency expressed in kHz and the corresponding level provided in dBm, which are displayed in the top left of the spectrum area. The color of the markers can be changed following the instructions provided in section [6.9 - Style management](#).



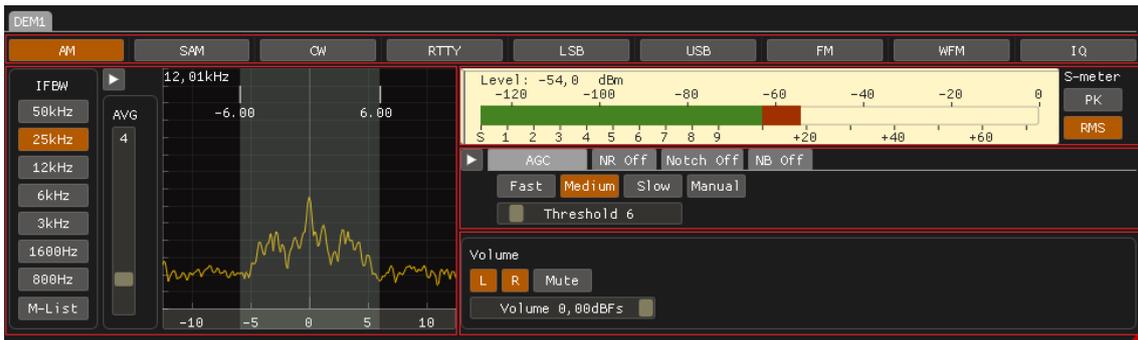
Displaying marker values.

There are two additional but exclusive features for marker management, activated from the context menu and called *"Signal Tracking"* and *"Peak Detector"*. They help with marker placement and signal detection.

6.5.4 Demodulator control

The demodulator area - also known in other contexts as the software receiver or virtual receiver - is located at the bottom of the channel window and is identified as "DEM1". This area provides access to the demodulator controls and allows you to view various information. The parts of the demodulator area are as follows:

- **mode button bar:** allows you to choose the demodulation to be performed;
- **IFBW part:** allows you to choose the bandwidth and display the tuned signal;
- **S-meter display:** provides an indication of the signal reception level and allows you to manage the squelch;
- **signal processing part:** gives access to the modification of some parameters such as AGC;
- **volume control:** allows you to manage the volume and mute function.



Demodulator area.

There are some cases where the demodulator area does not comply with the description above:

- when the chosen modulation is WFM: RDS information is partially supplied to the volume control;
- when the chosen modulation is DAB+: the demodulator area changes radically as the DAB+ modulation does not share the same characteristics as the other modulations.

Mode buttons

The available modulations vary **depending on the channel used**. In some cases, two modulations are accessible from the same button; simply click the button to cycle through the available modulations. The following table summarizes the modes available for each button:

Button	1	2	3	4	5	6	7	8	9
HF Channels	AM	SAM QSAM	CW CW _r	RTTY RTTY _r	LSB	USB	FM	WFM	IQ
VHF Channels	AM	CW CW _r	RTTY RTTY _r	LSB	USB	FM	WFM	DAB+ ⁽¹⁾	IQ

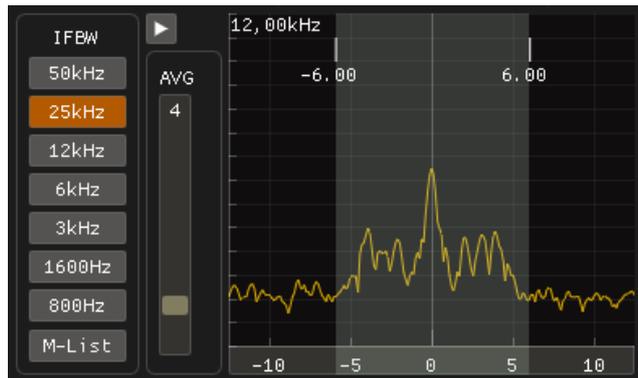
⁽¹⁾ DAB+ modulation is only available at a sampling rate of 2Msps

Notes on modulations:

- SAM stands for Sync AM;
- QSAM stands for Quadrature SAM and allows you to obtain a stereo effect;
- CW and RTTY modulations both have the possibility of having the "reverse" mode by choosing the CW_r and RTTY_r modulations;
- FM modulation is intended as narrow with a maximum bandwidth of 50kHz while WFM (Wide FM) modulation has up to 400kHz bandwidth;
- choosing IQ does not apply any demodulation to the I (phase) and Q (quadrature) data, this is useful when you want to redirect the data to a third-party program.

IFBW part

The IFBW (Intermediate Frequency Band width) section allows you to view the tuned signal spectrum **in greater detail** by choosing between different bandwidths. It provides the ability to **improve the tuning** - even when snap is active - and allows you to adjust the width of the reception filter. On the left, positioned vertically, are the **IFBW buttons** that allow you to choose the bandwidth to display on the adjacent spectrum. When you press a button, it is highlighted to indicate the selected bandwidth and the spectrum display adjusts accordingly. Overlaid on the spectrum, the **bandwidth filter width** is shown in the top left (12kHz in the image above), and the bandwidth filter is highlighted along with its lower and upper limits (-6kHz and 6kHz in the image above).



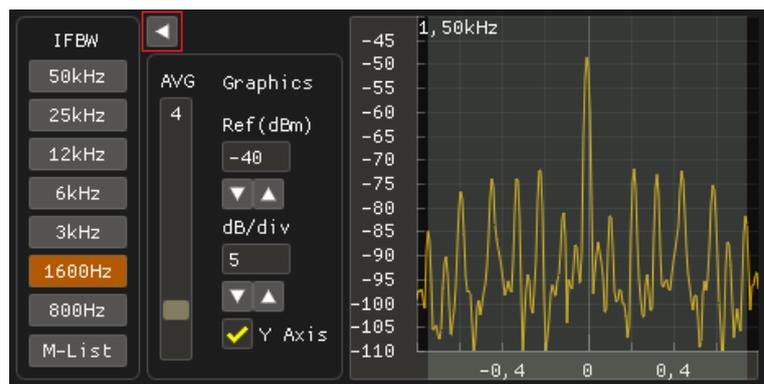
When you press a button, it is highlighted to indicate the selected bandwidth and the spectrum display adjusts accordingly. Overlaid on the spectrum, the **bandwidth filter width** is shown in the top left (12kHz in the image above), and the bandwidth filter is highlighted along with its lower and upper limits (-6kHz and 6kHz in the image above).

The available bandwidths depend on the selected modulation and are as follows:

Modulations	AM/SAM/QSAM/ RTTY/RTTYr /LSB/USB/FM/IQ	CW/CWr	WFM
IFBW	-	-	400kHz ⁽¹⁾
	-	-	200kHz
	-	-	100kHz
	50kHz	-	50kHz
	25kHz	-	-
	12kHz	-	-
	6kHz	6kHz	-
	3kHz	3kHz	-
1600Hz	1600Hz	-	
800Hz	800Hz	-	

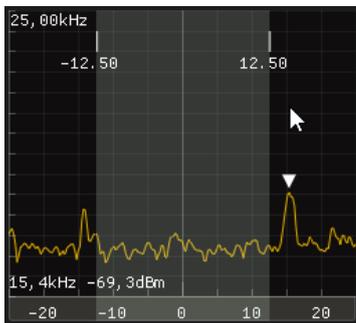
⁽¹⁾ not available if sampling rate is 0.5Msps

By pressing the specific arrow button, you can expand/compress the **graphical settings area** of the IFBW spectrum. The **"AVG"** option, always visible, allows you to adjust the averaging calculation; the higher the level, the more the spectrum is averaged and therefore visually more stable. The other graphical settings that can be hidden concern the reference level in dBm, the number of dB per division, and whether or not to display the Y-axis (ordinate).

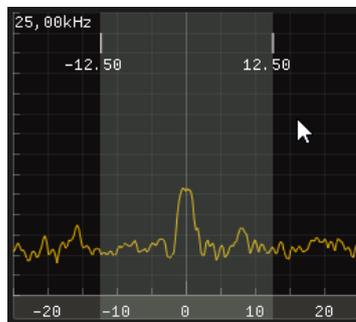
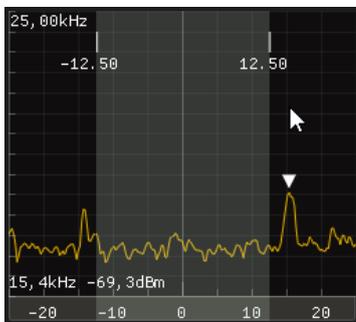


There are several uses of the mouse on the IFBW spectrum, they are listed below:

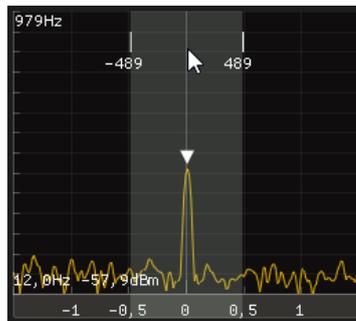
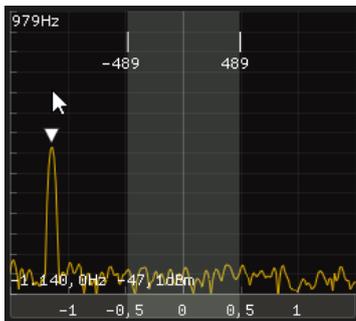
- a triangular cursor appears at the mouse position and provides the **frequency delta** with respect to the central frequency of the IFBW (0Hz) and the **level** in dBm at the bottom left;



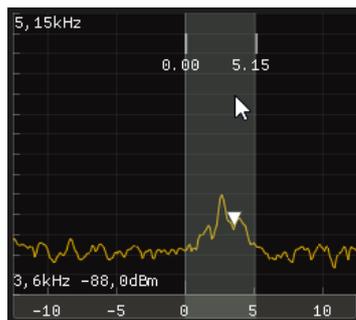
- clicking on the spectrum allows you **to tune** by moving the frequency corresponding to the mouse cursor in the center of the IFBW spectrum, below are two images before and after the click;



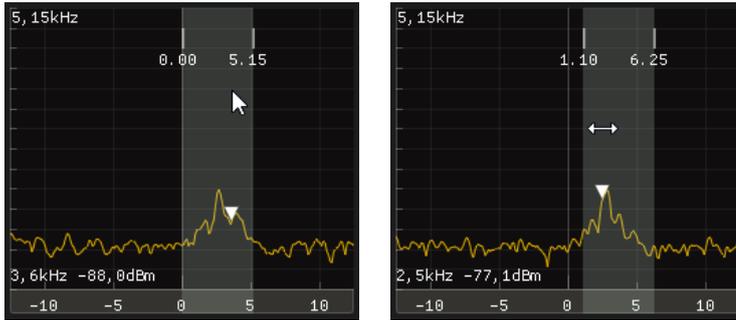
you can also click and drag the mouse to move the tuning, below are two images before and after dragging;



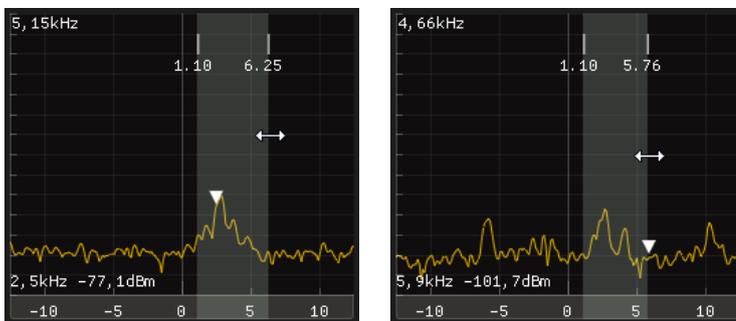
- the mouse wheel allows you to **change the width of the bandwidth filter**, below are two images before and after using the wheel to reduce the filter;



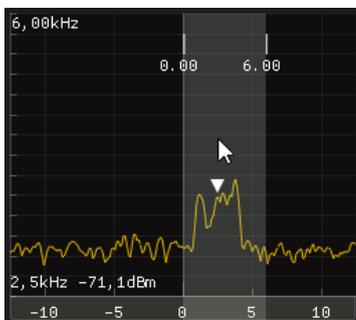
- a right click and drag on the band filter allows you to **move the filter** without changing its width, below is an example;



- by positioning the mouse cursor on the filter limits you can **change the value of the limits**, below are two images before and after using the wheel to change the upper limit of the filter;

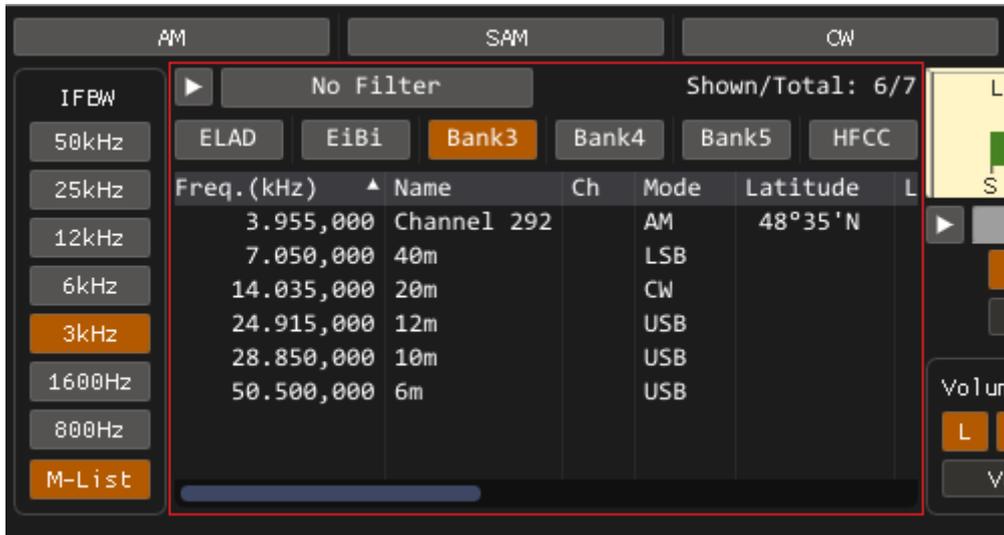


- holding down “*Shift*” and moving the mouse wheel allows you to **reset the band filter** by resetting its limits to default values that are relative to the selected modulation.



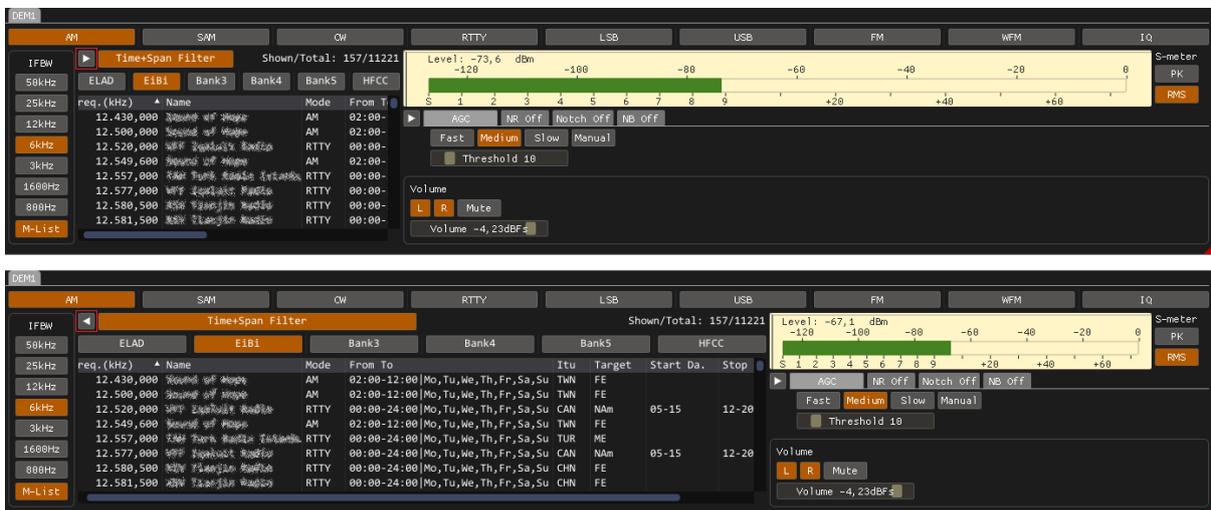
M-List button

The “M-List” button is located below the IFBW buttons and allows you to **access the memories** without having to open the “Memories Manager” window. By pressing the “M-List” button the IFBW part disappears and leaves space for the display of the memory list, bank buttons, and memory filter button.



View of the bank buttons and memory list in the IFBW part.

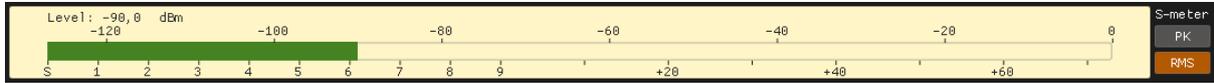
By pressing the appropriate **button with the arrow** it is possible to extend/compress the memory display area to allow better use of the memory list.



Memory view non-extended and extended.

S-meter

The S-meter is the signal strength indicator, providing the signal level in both S-points and dBm. You can choose between two operating modes using the "PK" (Peak) and "RMS" (Root Mean Square) buttons.

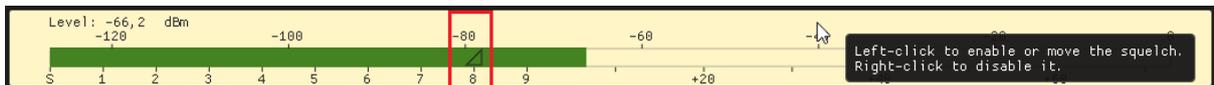


View of the S-meter.

Squelch

The squelch can be activated and adjusted by acting on the S-meter:

- one click activates it, a triangle appears indicating the level;
- another click allows you to change the level;
- a right click allows you to deactivate the squelch, the triangle is no longer displayed.



Squelch activated at two different levels.

Signal processing

The "Signal Processing" section provides access to the adjustment of various parameters such as the automatic gain control (AGC), the noise reduction (NR), the notch filter (Notch), and the noise suppression (NB). These controls are located below the S-meter and have two display modes that are selected using the specific arrow button: normal or extended.



Normal view of parameters (AGC and NR).

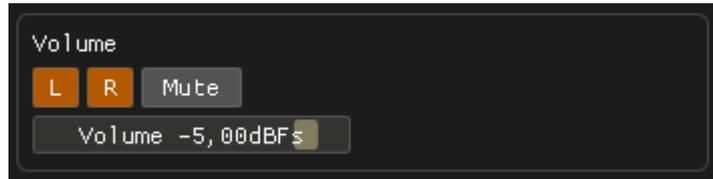


Extended view of parameters (all).

In **normal view**, parameters are organized into tabs, with the titles of the unselected tabs indicating the values of the other parameters; this view is useful when there is limited screen space available. In **extended view**, all parameters are displayed, giving you a complete overview at a glance; this view is best used when there is sufficient screen space.

Volume control

The volume control section allows you to set the volume via a slider, the volume is indicated in dBFS (decibels relative to full scale). The buttons present correspond to the enabling of the left (L) and right (R) channels and the activation of the Mute function which allows you to turn off the audio.



RDS information

When the chosen modulation is WFM and the channel is correctly tuned to an FM station, it is possible to see the RDS (Radio Data System) information on the right side of the volume control.



Always with WFM modulation active, the "Stereo" button appears which allows you to both indicate whether the stereo function is present or not, and to force mono mode.

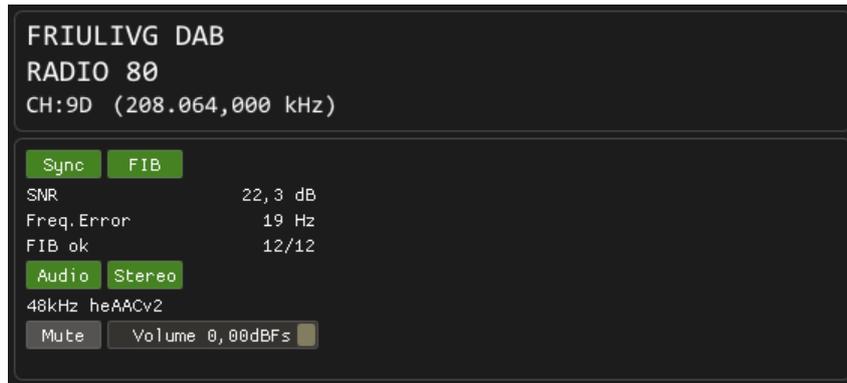


Additionally, you can display the "RDS Constellation" by pressing the "RDS" button located below the IFBW buttons. This feature is only available for a bandwidth of 200kHz or 400kHz.



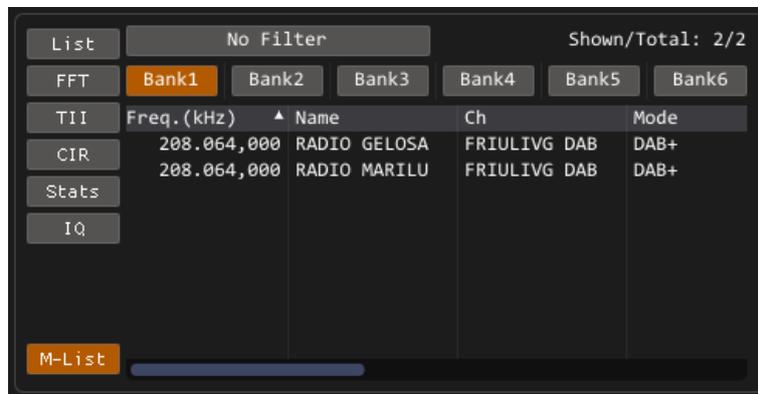
The right half of the demodulator area with DAB+ modulation allows **volume control** and the **display of various information** such as:

- the name, label and frequency of the selected channel;
- the name of the station selected in the list;
- the positive or negative indication of synchronization (Sync) and reception of FIBs (Fast Information Blocks);
- display of the averaged SNR and the frequency error found (used to perform the calibration, see section **6.10 - Frequency calibration**);
- displaying information about the audio (present, stereo, codec used, sampling rate).



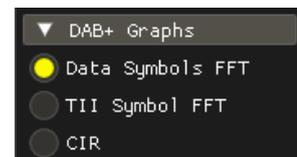
Channel information display and volume control.

The **“M-List”** button remains present even with DAB+ selected and allows access to the memories.

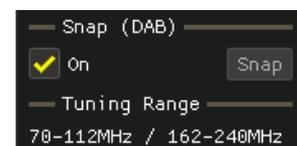


View of the bank buttons and memory list in DAB+.

When DAB+ mode is selected, the **“DAB+ Graphs”** menu appears in the settings part of the channel window (left side), allowing you to choose which graph to display in the main spectrum area: **“Data Symbols FFT”**, **“TII Symbol FFT”** or **“CIR”**.



Note, still in the settings section of the channel window, the **“Snap (DAB)”** option in the **“Tuning Options”** menu allows you to activate the snap on the frequencies of the DAB channels.



6.5.5 Front end management

The Perseus22 front end is managed via the "Front End" drop-down menu. This menu changes significantly depending on the channel in use: HF, VHF, and synchronous channels. It allows you to set **attenuators** to reduce the amplitude of incoming signals, **pre-selection filters** to eliminate or limit interference, **preamplifiers** to improve sensitivity where possible, and **biases** to provide a bias voltage to any accessories connected to the antenna.

HF channel

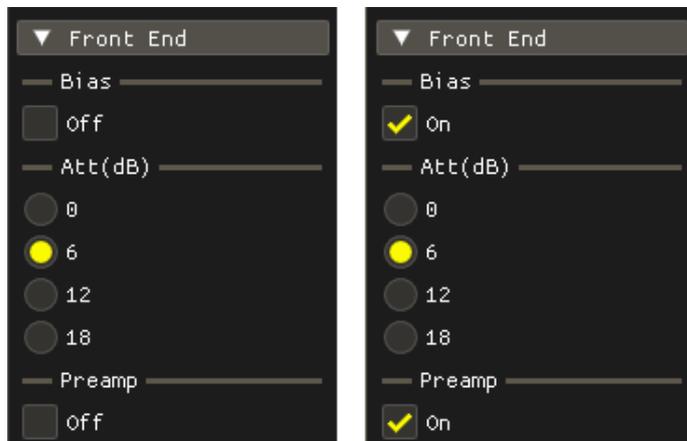
The front end of the HF channels is composed of two 10 dB attenuators in series that allow for four attenuation levels (0, 10, 20 and 30 dB) and a group of preselection filters that each cover a specific frequency range from 10kHz to 70MHz. Preselection filter selection is automatic and depends on the tuning frequency. The on/off option in the "Presel" section allows you to deactivate these filters. In this case, the word "Wideband" is displayed to indicate that no filter is inserted.



Attenuation at 0dB and pre-selection filters engaged (left) and disengaged (right).

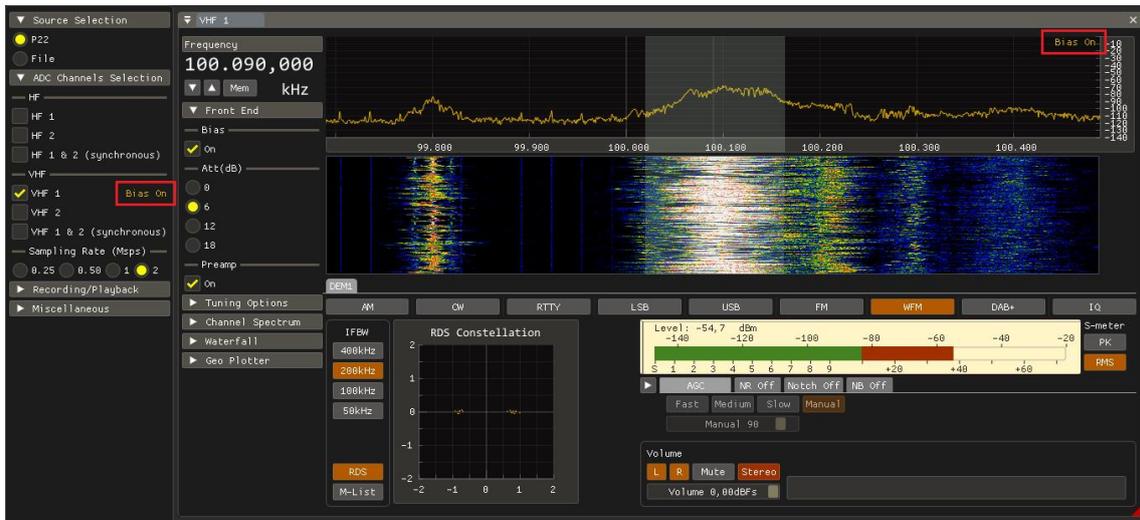
VHF channel

The front end of the VHF channels is composed of two attenuators of 6 dB and 12 dB in series which allow for four levels of attenuation (0, 6, 12 and 18 dB), a group of pre-selection filters which are entirely automated, a preamplifier which can be activated or not and a bias option which can also be activated or not.



Attenuation at 6dB, bias and preamp not engaged (left) and engaged (right).

Enabling a bias on a VHF channel is indicated by the word *“Bias On”* both in the channel window spectrum and in the *“ADC Channels Selection”* menu corresponding to the concerned channel.



Bias active for channel *“VHF 1”*.

Synchronous channels

For synchronous channels, the front-end menu changes to display options for setting both HF or VHF channels, rather than just a single channel. The operation of the controls remains the same as for the individual channels.



“Front End” menu of synchronous channels, HF on the left and VHF on the right.

6.5.6 Using synchronous channels

To use the synchronous channels feature, you need to choose one of the two related options in the “ADC Channels Selection” drop-down menu of the general settings:

- “HF 1 & 2 (synchronous)” for HF channels;
- “VHF 1 & 2 (synchronous)” for VHF channels.

Both synchronous channel windows (HF and VHF) can be opened and used simultaneously. As described in section **6.5.5 - Front end management, Synchronous channels**, the front end control menu provides controls for both channels when the Synchronous Channels option is selected.

Presentation

Channel synchronicity enables the implementation of features often grouped under the term **diversity**; these include noise cancellation/reduction, interference cancellation/reduction and signal SNR improvement.

The available options related to the use of synchronous channels are grouped into the “Decorrelation” and “Blending” menus. The “**Blending**” menu allows you to choose the source of the data displayed on the spectrum/waterfall between the input channels and different data combinations (Manual, Decorrelated Max, Decorrelated Min, Dynamic Auto Max) while the “**Decorrelation**” menu allows you to choose the data decorrelation method (None, Noise, Signal).



The following table presents the different possible Decorrelation/Blending associations (if available) indicating the active decorrelation:

Decorrelation	Blending					
	Input Channel 1	Input Channel 2	Manual	Decorrelated Max	Decorrelated Min	Dynamic Auto Max
None	(1)	(2)	Manual ⁽³⁾	-	-	None
Noise	(1)	(2)	-	Noise	Noise	Noise
Signal	(1)	(2)	-	Signal	Signal	-

⁽¹⁾ no active processing, displaying channel 1 data

⁽²⁾ no active processing, displaying channel 2 data

⁽³⁾ manual mode

It is therefore possible to view data on the spectrum/waterfall and listen to the audio of both the unprocessed single channel inputs (“Input Channel 1” and “Input Channel 2”), as well as the resulting processing dependent on the choices made with the “Decorrelation” and “Blending” menus. The operating modes and available functions are presented in the next section.

Decorrelation and blending

Manual mode

To use manual mode, you must set decorrelation to "None" so that the input signals are restored and select "Manual" blending. In this mode, no decorrelation is performed; the **signals are mixed manually**: the amplitude ratio and phase difference are set with the color picker. The phase difference (parameter Phi2) is set with the hue wheel, while the amplitude ratio (parameters A1 and A2) is set with the brightness/saturation triangle. In addition to displaying the color picker in the general settings menu, you can press the "Undock" button to display it in a separate window, making it easier to use. The "Null<->Max" checkbox allows you to temporarily swap the parameters.



Noise decorrelation function

The "Noise" function is useful for **noise equalization**, it equalizes the two channels so that both produce at the output two noise signals of equal power and decorrelated (orthonormalization), it should only be used when the demodulator is tuned to the noise, i.e. in the absence of a signal at the tuned frequency. This function is used, for example, to calibrate the two channels when a signal subsequently appears on the same frequency and the power (which is calibrated) of both channels is to be evaluated.

Signal decorrelation function

The "Signal" function is used **when a signal is present**, it calculates the correlation matrix between the two channels, producing two uncorrelated signals that do not necessarily have the same power: one could be a combined signal from the two channels, and the other residual noise. Essentially, this function only decorrelates the inputs (orthogonalization).

Decorrelated Max/Min blending functions

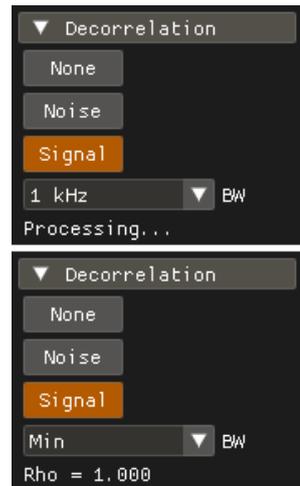
The "Decorrelated Max" and "Decorrelated Min" blending functions allow you to **select what you see and hear** after the decorrelation process. "Decorrelated Max" provides the combined signal with the maximum power, which is usually the signal of interest but could simply be interference if the interference is much stronger than the signal of interest. "Decorrelated Min" instead provides the combined signal with the minimum power, which is usually residual noise, but if the interference is stronger, it will provide the signal of interest.

Dynamic Auto Max blending function

The "Dynamic Auto Max" function is useful, for example, when the input signal is **slowly fading** or when the input signal comes from **satellites with a polar orbit** that is not constant because it depends on the satellite trajectory. This function combines the inputs (decorrelated or not) to obtain maximum output power by dynamically tracking the amplitudes and phase difference between the input signals. If "Noise" decorrelation has been selected, the "Dynamic Auto Max" function also maximizes the signal-to-noise ratio (this is generally not true if the noise coming from the input channels does not have the same RMS power and/or is correlated).

Usage

Pressing one of the three buttons “None”, “Noise” or “Signal” applies the **chosen decorrelation**. The “None” button restores the input signals (no decorrelation), but the “Noise” and “Signal” buttons cause the processing to start (the “Processing...” text appears) taking into account the “BW” parameter and resulting in a “Rho” value.



The “BW” parameter corresponds to the bandwidth used to evaluate the input covariance matrix. The bandwidth should be set approximately to match the bandwidth where the signal power spectral density is strongest. Provided the signal has been properly tuned, this bandwidth could be 1 or 2 kHz for AM signals and 10% to 50% of the expected bandwidth for FM modulated signals.

The “Rho” parameter is the cross-correlation factor, indicating the degree of correlation of the input signals. A value equal to 1 indicates a very high correlation, while a value equal to 0 indicates zero correlation. It is important to inspect the input cross-correlation factor (Rho) to evaluate whether the correlation bandwidth (BW) has been selected correctly; the higher the cross-correlation factor, the better the correlation bandwidth selected.

Once you have chosen the decorrelation and possibly changed the “BW” value, you need to change the **blending type** to understand which is best suited to the desired result.

Achievable results

Below is an example of the results you can achieve using the synchronous channel options.



“Input Channel 1” and “Input Channel 2” (before).

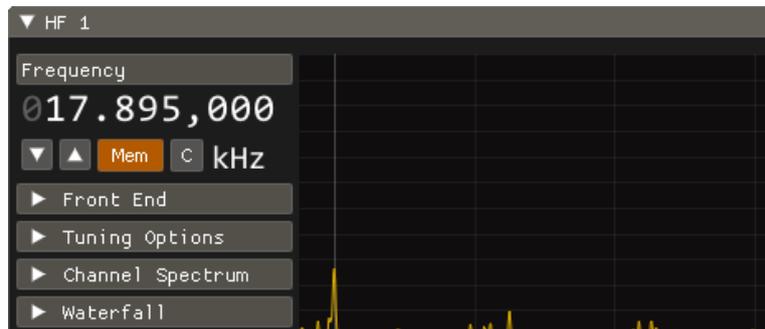


Blending “Decorrelated Min” with Decorrelation “Signal” (after).

6.6 Memories management

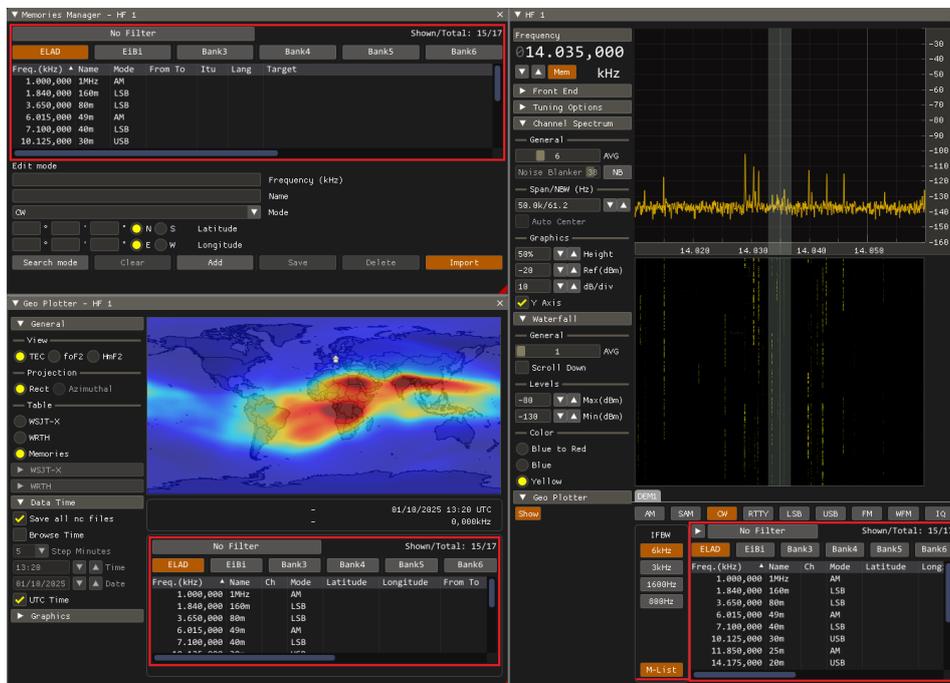
Memories are managed via **memory banks** that allow you to group memories. There are six available banks, Bank 1 to Bank 6, which cannot be deleted but can be renamed. Additional banks with specific memories (EiBi, HFCC, ILG, SWSKEDS) can be added using the memory import utility. Memories are saved in the file "Perseus22\db\dbperseus22.db" along with the recordings, and in certain cases (delete, script, import), backups are made and saved in "Perseus22\db\backup".

Memory management is the same for all channel windows. Each channel window has its own memory management window called "**Memories Manager**", the window title indicates which channel the window belongs to, for example, "**Memories Manager - HF 1**". This memory management window is opened/closed using the "**Mem**" button located under the frequency in the "**Frequency**" menu of the channel window.



"Mem" button to open the "Memories Manager".

The same memories accessible from the "**Memories Manager**" window are accessible from the "**M-List**" view of the channel window and from the "**Geo Plotter**" window when the "**Table**" setting is set to "**Memories**", but only the "**Memories Manager**" window allows you to edit memories.



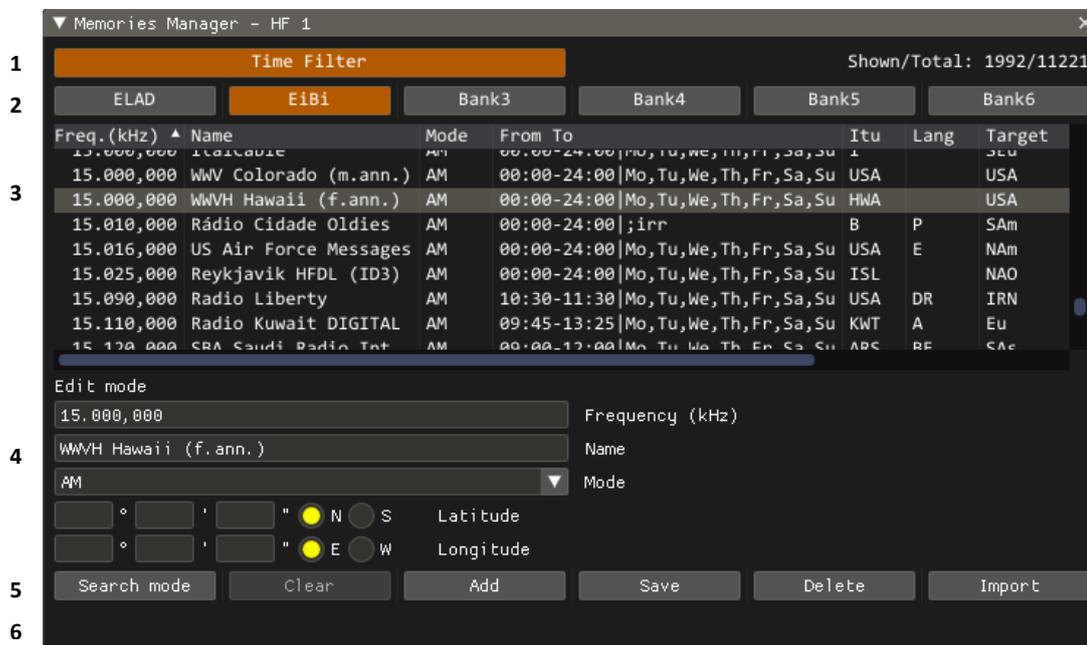
Memories (framed in red) accessible from different locations.

6.6.1 Memories Manager window

Presentation

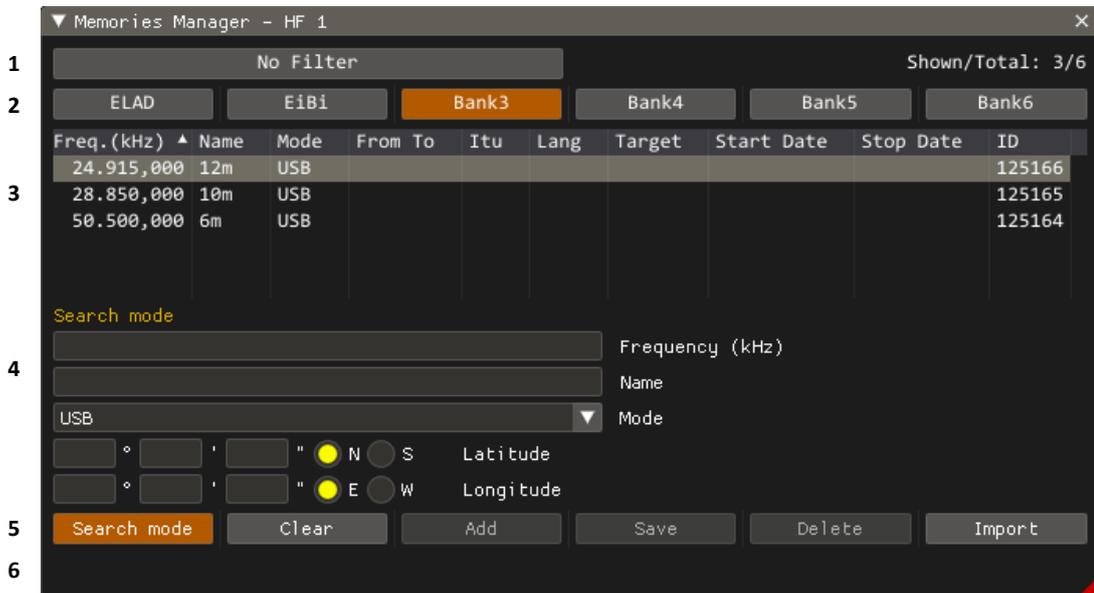
The "Memories Manager" window allows you to manage memories by providing access to memory banks with the ability to add, edit, and delete memories. You can also perform some simple operations on the banks, such as renaming and reordering them. The "Memories Manager" window is composed of six sections:

1. a **generic area** that provides:
 - a button to choose the type of **memory filtering** (none, time, span or time plus span) so you can narrow down the number of memories displayed during a search;
 - information on the **number of memories displayed** which may not be the maximum when a filtering method is active, also the memory list has a maximum number of displayable rows;
2. **the bank buttons**: there are six bank buttons, with the default names Bank1 to Bank6, each button can be associated with a bank, whether it is a default one or one imported via the memory import utility; the button is managed via the contextual menu accessible by right-clicking on the single button;
3. **the memory list**: the memories are displayed via a table that provides a different field for each column such as name, mode, frequency, etc.; the display of the memories is conditional on the channel in use, HF or VHF, a memory with an HF frequency will not be displayed on a VHF channel and vice versa;
4. **the section for editing** a memory, "Edit mode": it allows you to modify some fields of a memory such as the frequency value, the name and the mode; there are also the "Channel" fields (only for DAB+) and the latitude and longitude fields which are important fields for some types of memories;



"Memories Manager" window.

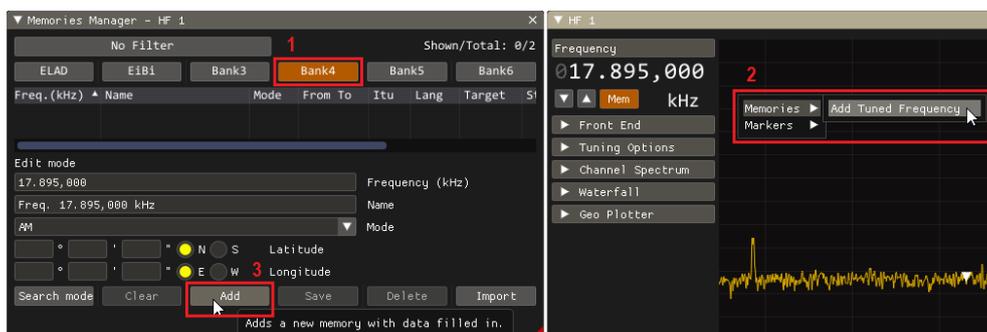
5. **the function buttons:** each button has a very specific function:
 - “Search mode”: allows you to change section 4 from “Edit mode” to “Search mode” by turning the memory editing fields into search fields; when the search function is active, the button turns colored together with the words “Search mode”;
 - “Clear”: this button is active only in “Search mode”, it allows you to clear all fields to start a new search;
 - “Add”: adds a new memory using the data from the fields in the “Edit mode” section;
 - “Save”: saves any changes made to the selected memory;
 - “Delete”: deletes the selected memory;
 - “Import”: starts/closes the memory import utility described in the section [6.6.2 - Import utility](#);
6. **the notification area** to display warnings and error messages.



“Memories Manager” window in “Search mode”.

Add a memory

To add a memory to a bank, first select the desired bank by pressing one of the six **bank buttons**, then **right-click on the spectrum** within the channel window and choose “Memories” and “Add Tuned Frequency”. Once the data has been added in the “Memories Manager” window, press the “Add” button to add the memory to the selected bank.

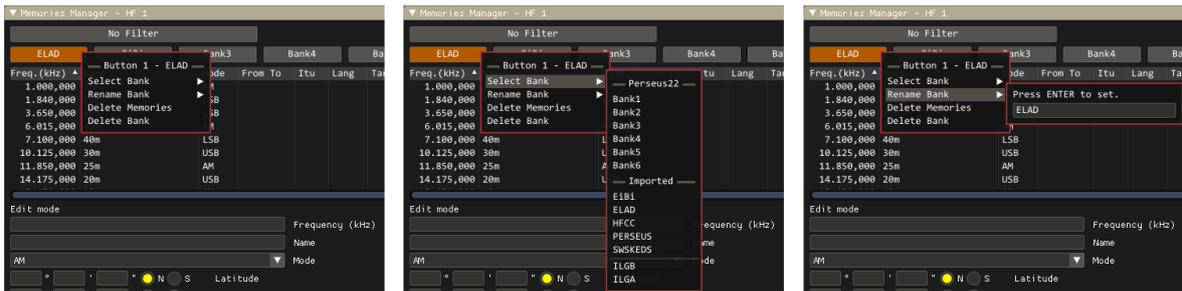


Steps to add a memory to the “Memories Manager” window.

Bank menu

The bank menu is a contextual menu accessible by **right-clicking on the bank buttons** and allows you to manage the related bank by giving you the possibility to:

- *“Select Bank”*: associate one of the available banks to the button, whether it is one of the six default banks or an imported one; if you select a bank already in use, the order of the banks will be automatically rearranged;
- *“Rename Bank”*: change the name that appears on the button (maximum 10 characters);
- *“Delete Memories”*: delete all memories present in the bank;
- *“Delete Bank”*: delete the entire memory bank, this option is only available for imported banks.

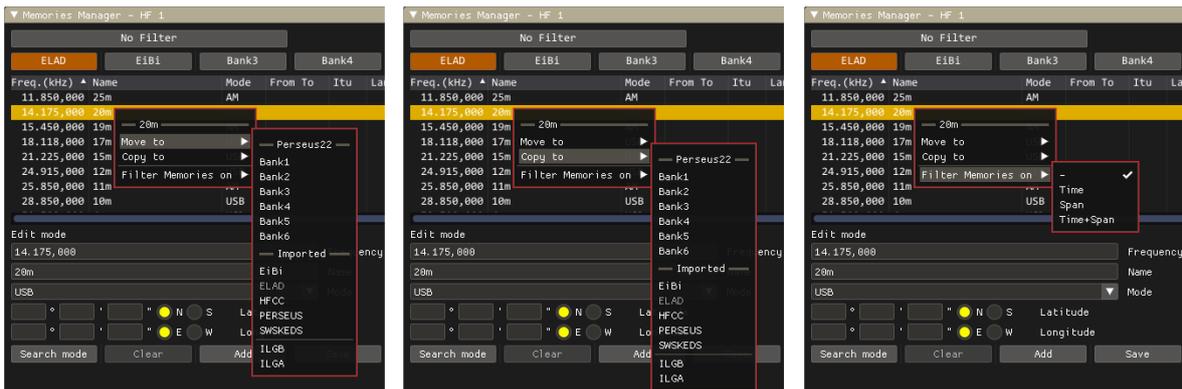


The different items of the bank menu.

Memory menu

The memory menu is a context menu accessible by **right-clicking on a memory**. The menu title takes the name of the selected memory and the menu gives access to some features which are:

- *“Move to”*: move (i.e., cut and paste) the memory to another bank;
- *“Copy to”*: copy (i.e., copy and paste) the memory to another bank;
- *“Filter Memories on”*: allows you to change the memory filtering setting (none, time, span or time plus span), it is the same as the button at the top of the *“Memories Manager”* window.



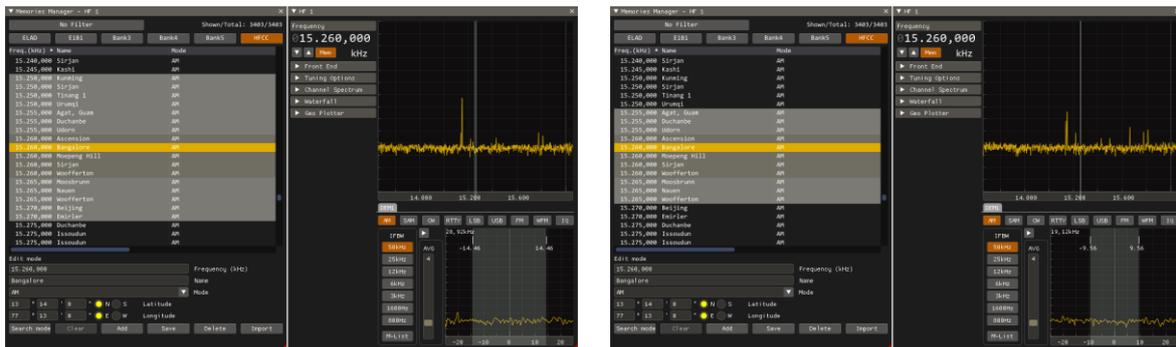
The different items of the memory menu.

Highlighting memories

The Perseus22 software uses a color system for the memory list to indicate:

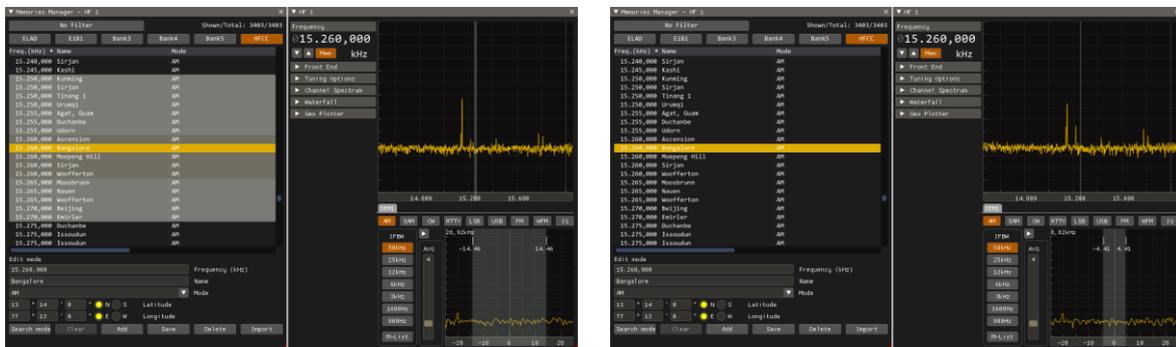
1. the **selected memory**;
2. highlight the memories that have the **same frequency** as the selected memory;
3. highlight the memories that have the frequency **included in the currently set IFBW filter**.

Using the method described in **6.9 - Style management**, you can change the colors used. The colors are called *"Notify Text"* for the selected memory, *"Header Active"* for memories with the same frequency, and *"Header Hovered"* for memories with the same frequency in the IFBW. Note that the *"Notify Text"* color is also used for other texts such as information texts, warnings, or error messages.



The selected memories decrease as IFBW decreases.

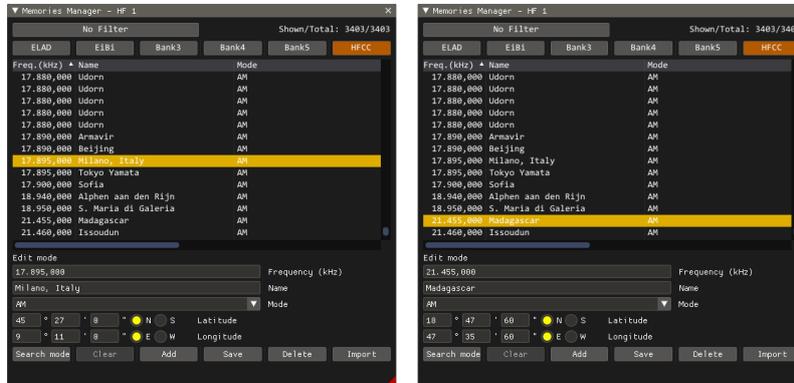
You can disable this memory highlighting feature by unchecking the *"Highlight Same Freq & Inside IFBW"* option in the *"General"* tab of the *"Settings"* window.



Difference between functionality on and off.

Vertical alignment of memory in the list

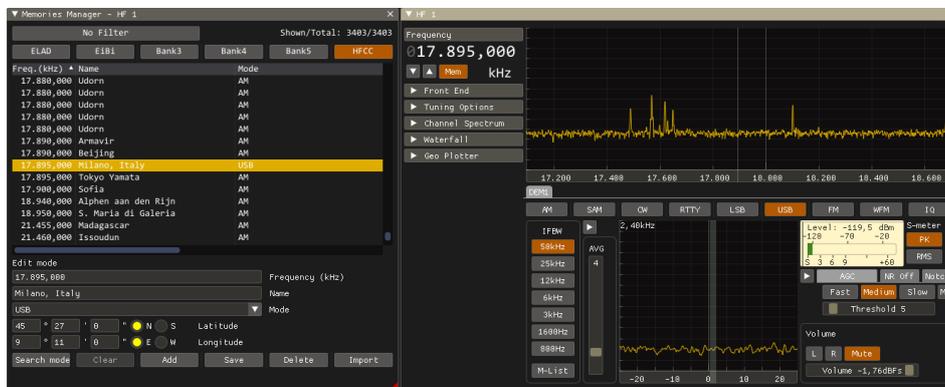
When the **"Center Selected Frequency"** feature in the **"General"** tab of the **"Settings"** window is active, the selected memory is positioned in the center of the memory list. Otherwise, the selected memory remains in its previous position, which is usually done by clicking the mouse or pressing the **"ENTER"** key.



Memory in the center and not in the center.

Automatic update of the mode in memory

This feature corresponds to the **"Auto Update of the Mode in Memory"** option in the **"General"** tab of the **"Settings"** window. When enabled, a mode change from the demodulator section of the channel window also changes the mode of the selected memory.



Changing the memory mode by changing the mode in the channel window.

6.6.2 Import utility

Presentation

The Import utility is a command-line program that allows you to **import memories** into the banks managed by the Perseus22 software from files with known extensions (csv, xml, and txt). To launch it, simply press the "Import" button in the "Memories Manager" window; it appears as shown in the image below.

```

C:\Users\elad\Documents\Perseus22\ImportUtility.exe
Memories import utility for Perseus22
Utility version 1.1

This utility creates memory banks for the Perseus22 software from various file types.

Existing memory banks inside your 'dbperseus22.db' file are:
Fixed Perseus22: Bank1, Bank2, Bank3, Bank4, Bank5, Bank6
Default import : EiBi, ELAD, HFCC, PERSEUS, SWSKEDS
Custom import  : ILGB, ILGA

The file types available for import are as follows:
'b' - EiBi      (csv)
'e' - ELAD     (xml)
'h' - HFCC     (txt)
'i' - ILG      (csv)
'p' - PERSEUS (txt)
's' - SWSKEDS (csv)

Enter your choice and press ENTER:

```

Import utility main screen.

Its operation is based on the presence of certain folders and files within the "**Perseus22\ImportFiles**" folder of the Perseus22 software, where each folder corresponds to a supported file type.

Name	Date modified	Type
EiBi	04/04/2025 09:54	File folder
ELAD	02/04/2025 09:14	File folder
HFCC	04/04/2025 09:54	File folder
ILG	04/04/2025 09:54	File folder
Perseus	02/04/2025 09:14	File folder
SWSKEDS	04/04/2025 09:54	File folder
ImportUtility.db	02/10/2025 16:40	SQLite

"Perseus22\ImportFiles" folder.

To be able to import memories into the Perseus22 software it is therefore necessary to place the csv, xml or txt files you are interested in in the folder corresponding to the file type. The different choices are:

1. **"EiBi"**: **csv** files, for example "*sked-a24.csv*", usually available on the eibispace website;
2. **"ELAD"**: **xml** file, for example "*SW2_preset_buttons.xml*", xml type memory files generated by the ELAD FDM-SW2 software;
3. **"HFCC"**: **txt** file, for example "*A24all100.TXT*", usually available on the HFCC website, the "*site.txt*" file is also used for import;
4. **"ILG"**: **csv** files, for example "*ILGADATA.CSV*", usually available on the ilg website;
5. **"Perseus"**: **txt** file, for example "*perseus exported memories.txt*", txt type memory files generated by Perseus v4 and v5 software;
6. **"SWSKEDS"**: **csv** files, for example "*A24-240723-1600G-CSV.csv*", usually available from the relative group on groups.io.

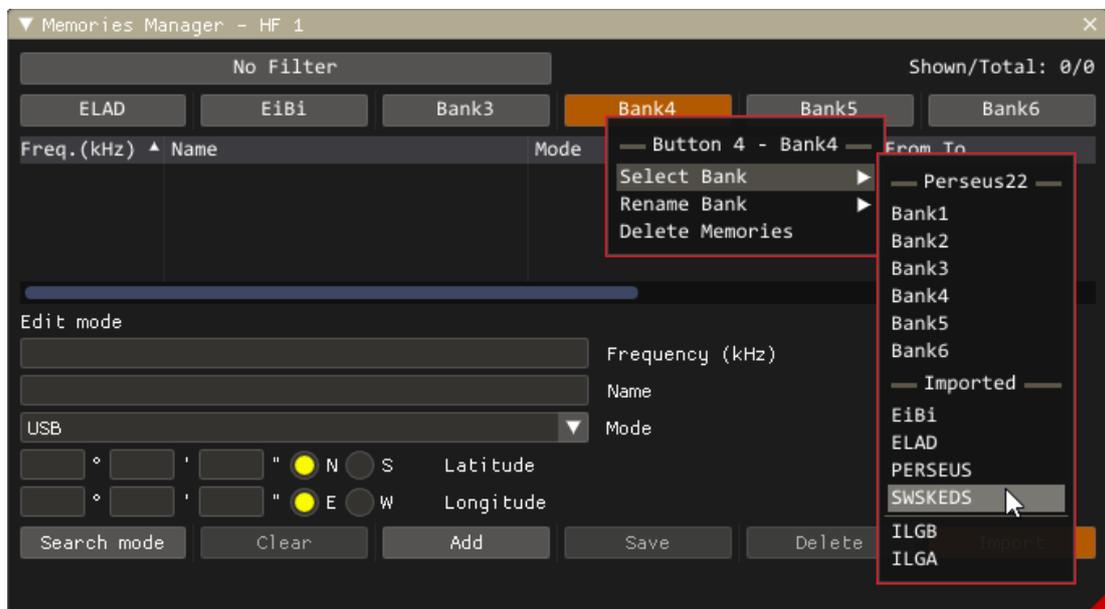
Importing memories with the Import utility will add entries to the *"Perseus22\db\dbperseus22.db"* file where three types of memory banks can be found:

- default bank of the Perseus22 software, *"Fixed Perseus22"*;
- bank imported with default name, *"Default import"*;
- imported bank with custom name, *"Custom import"*.

The utility provides a summary of existing banks on its main screen:

```
Existing memory banks inside your 'dbperseus22.db' file are:
Fixed Perseus22: Bank1, Bank2, Bank3, Bank4, Bank5, Bank6
Default import : EiBi, ELAD, HFCC, PERSEUS, SWSKEDS
Custom import  : ILGB, ILGA
```

Once you have finished importing memories into a *"Default import"* or *"Custom import"* bank, you can associate it with a button in the *"Memory Manager"* window as indicated in the **Bank menu** section.



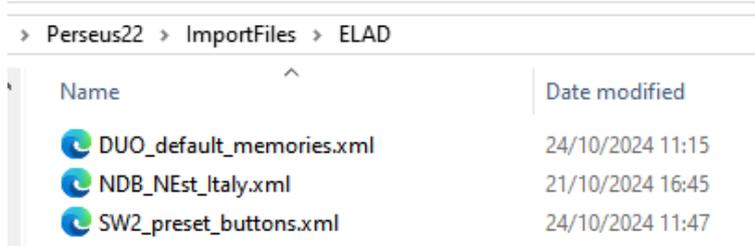
Association of a bank.

The *"Select Bank"* item in the bank menu first presents the *"Fixed Perseus22"* banks and then the imported *"Default import"* (default name) and *"Custom import"* (custom name) banks.

Import procedure

The steps to import a file (csv, xml or txt) are as follows:

1. place the csv, xml or txt file in the folder corresponding to the file type to be imported;



2. launch the Import utility;

```

C:\Users\elad\Documents\Perseus22\ImportUtility.exe
Memories import utility for Perseus22
Utility version 1.1

This utility creates memory banks for the Perseus22 software from various file types.

Existing memory banks inside your 'dbperseus22.db' file are:
  Fixed Perseus22: Bank1, Bank2, Bank3, Bank4, Bank5, Bank6
  Default import : EiBi, ELAD, HFCC, PERSEUS, SWSKEDS
  Custom import  : ILGB, ILGA

The file types available for import are as follows:
  'b' - EiBi   (csv)
  'e' - ELAD   (xml)
  'h' - HFCC   (txt)
  'i' - ILG    (csv)
  'p' - PERSEUS (txt)
  's' - SWSKEDS (csv)

Enter your choice and press ENTER:

```

3. press the letter corresponding to the type of file you want to import and press the “ENTER” key;

```
Enter your choice and press ENTER: e
```

4. if there is more than one usable file, you will be asked to choose it by typing the corresponding number and pressing “ENTER”;

```

You choose ELAD file type.

Choose a file from the following list:
  '1' - 'DUO_default_memories.xml' 24-10-2024 11:15
  '2' - 'NDB_NEst_Italy.xml' 21-10-2024 16:45
  '3' - 'SW2_preset_buttons.xml' 24-10-2024 11:47

Enter your choice and press ENTER: 1

```

5. you are then prompted to enter a custom name for the bank:

- a. if you want to keep the default name (EiBi, ELAD, HFCC, ILG, PERSEUS or SWSKEDS) just press "ENTER";

```
You choose the file 'DUO_default_memories.xml'.  
You can enter a custom bank name (10 chars max allowed) instead of the default one (ELAD).  
Custom bank name (ENTER to continue):
```

- b. if you want to type a custom name (maximum 10 characters), type the name and press "ENTER";

```
You choose the file 'DUO_default_memories.xml'.  
You can enter a custom bank name (10 chars max allowed) instead of the default one (ELAD).  
Custom bank name (ENTER to continue): DUO_MEM
```

6. finally, it indicates what the utility will import, to confirm press "ENTER";

```
ELAD file will be imported with the default bank name: 'ELAD'.  
Press ENTER to continue with import.
```

```
ELAD file will be imported with the custom bank name: 'DUO_MEM'.  
Press ENTER to continue with import.
```

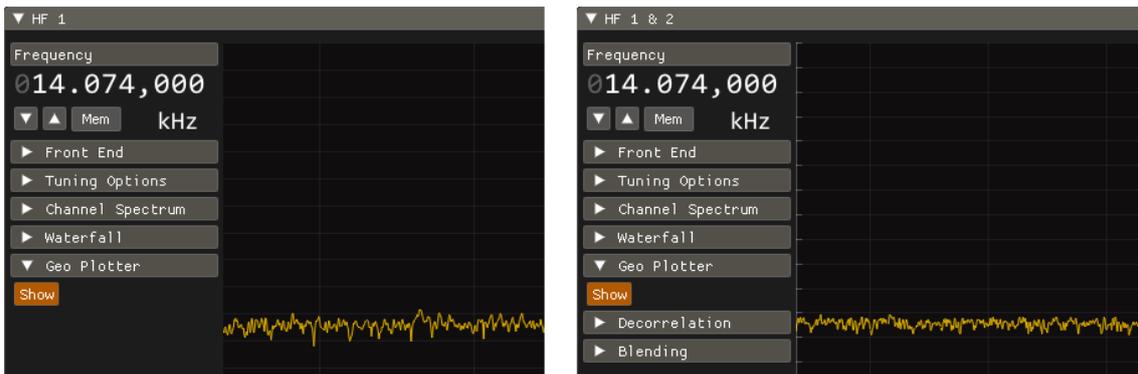
7. at the end of the import you will be prompted to import another file by returning to the menu (pressing "m") or to close the Import utility (pressing "c").

```
Import started..  
File used: 'DUO_default_memories.xml'  
'dbperseus22.db' file information:  
  Version: 8  
  Language: Eng  
  Company: Microtelecom S.r.l  
Processing.  
Backing up file dbPerseus22.db..  
  
File rows processed: 200  
File rows inserted: 11  
File rows skipped: 0  
  
Import finished, press 'm' (menu) to perform another import or 'c' to close the utility.
```

6.7 Geo Plotter window

The **“Geo Plotter”** window is an additional feature available for each channel, whether single (HF 1, HF 2, VHF 1, and VHF 2) or dual (HF 1 & 2 and VHF 1 & 2). It allows you to present on a map both data relating to the ionosphere, in particular the F layer, and geographic coordinates relating to stations, memories, or contacts (using WSJT-X); all accompanied by a summary table of the available stations, memories, or contacts.

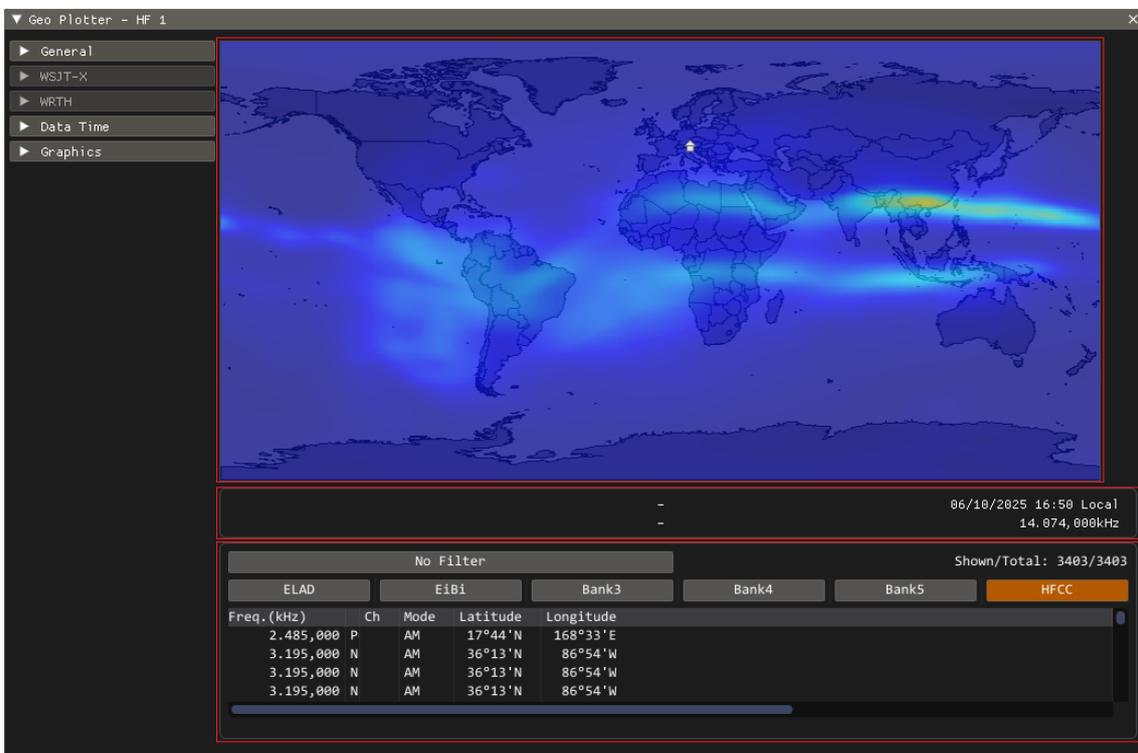
The window title indicates which channel it belongs to, for example **“Geo Plotter - HF 1”** and it is opened/closed using the **“Show”** button in the **“Geo Plotter”** menu of a channel window.



“Show” button to open the **“Geo Plotter”** window, for single channel (left) and dual channel (right).

6.7.1 Presentation

The **“Geo Plotter”** window is organized like the channel window: on the left, a fixed vertical panel with various drop-down menus grouping settings and controls; the remaining part is a large area divided horizontally into three sections: **map**, **information area**, and **station/memory table**.



“Geo Plotter” window.

Map

The map section is used to display ionospheric forecast data on a **planisphere** and geographically position the stations (or contacts for use with WSJT-X) listed in the table of the "Geo Plotter" window. The **ionosphere** is a layer of the earth atmosphere characterized by a high concentration of ions and electrons produced by solar radiation. This condition causes it to refract and reflect radio waves, an important property for long-distance communication. The ionospheric data displayed on the map is downloaded from the NOAA (National Oceanic and Atmospheric Administration) website as a file with the extension ".nc"; further details are provided in the **Data Time menu** section. The possible options regarding ionospheric data are available in the "General" menu, "View" section.

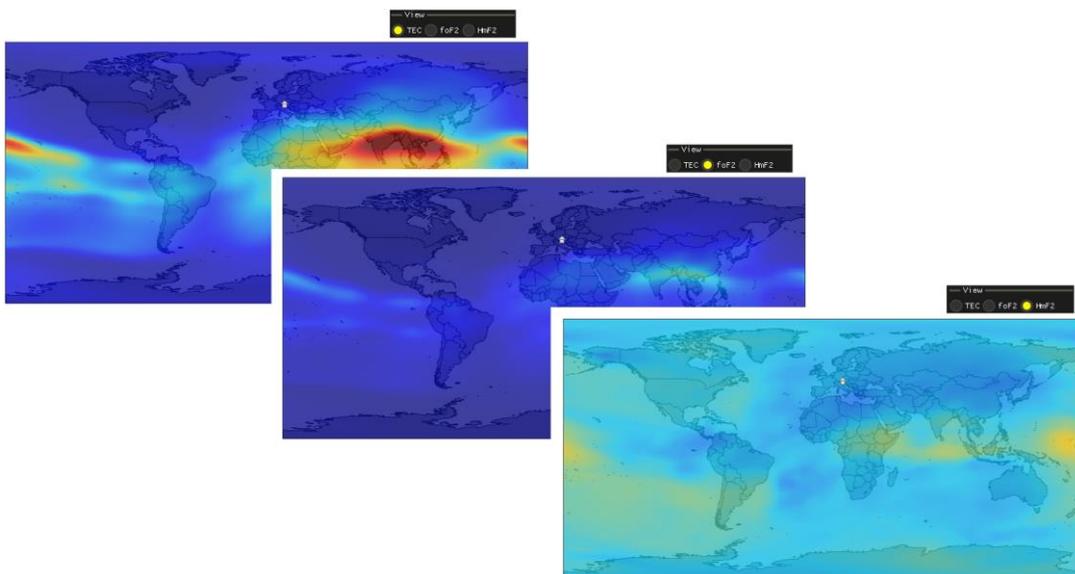


Choices for the "View" section.

The first choice is the **TEC**, Total Electron Content, which is an important descriptive parameter of the earth ionosphere and is measured in TEC units (TECu) which corresponds to a certain value of electrons per square meter.

The second choice is **foF2**, the plasma frequency of the F2 layer of the ionosphere. The critical frequency of the ionospheric F2 layer (foF2) is an important parameter for characterizing the variability of the ionosphere, it is measured in MHz. It is the highest frequency of a radio wave that can be reflected by the F2 layer at vertical incidence.

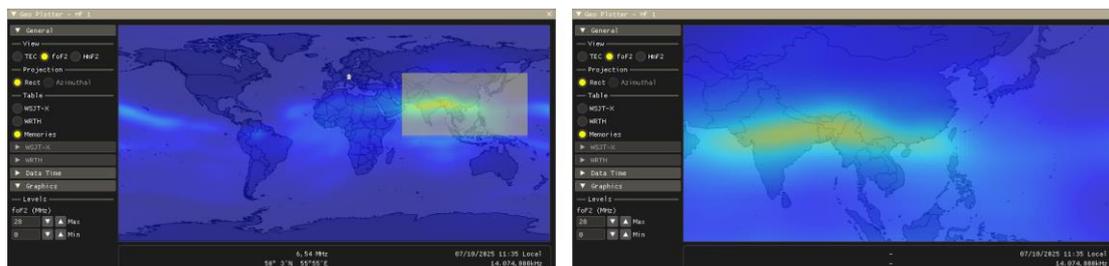
The third and final choice is **HmF2**, the height of the maximum electron density in the F2 ionospheric layer, given in km. This corresponds to the altitude at which the F2 layer reaches its maximum electron density, a key factor for high-frequency (HF) radio propagation.



The different layers for the "View" choice.

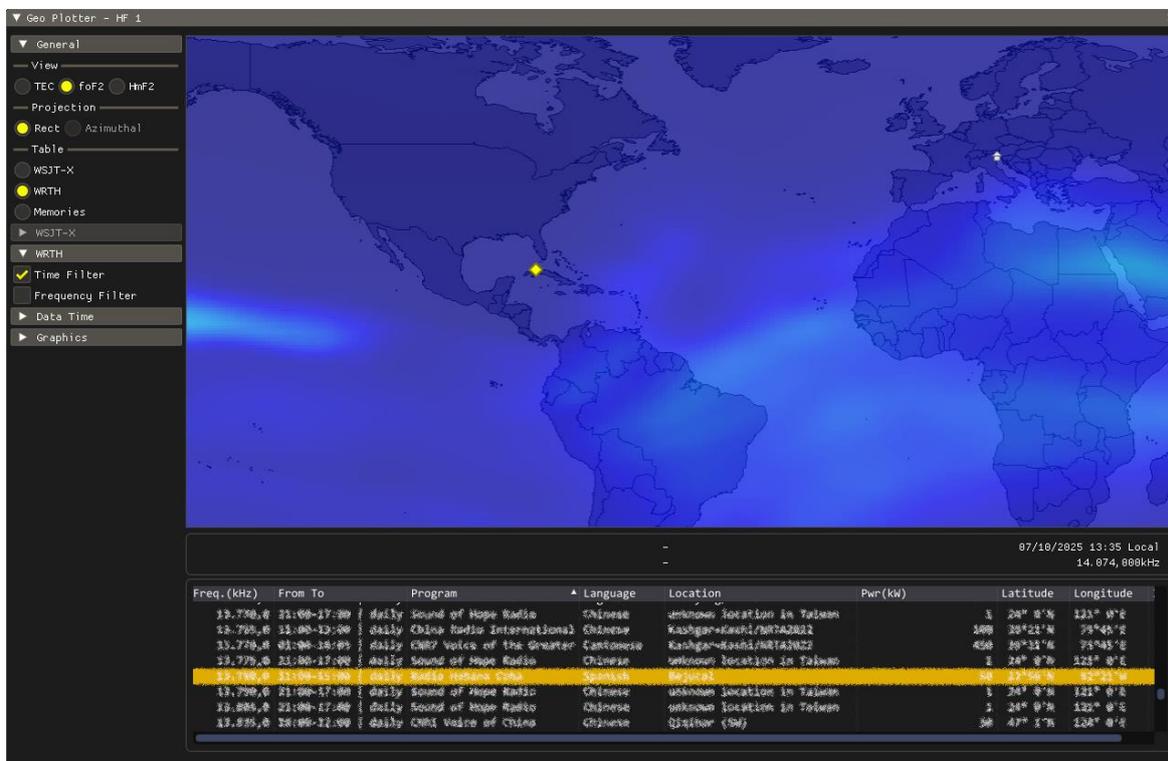
There are several **uses for the mouse and keyboard** to navigate the map:

- to zoom:
 - o use the mouse wheel to zoom in and out;
 - o hold down the "SHIFT" key and left-click or right-click to zoom in or out;
 - o hold down the "SHIFT" key, hold down the left mouse button and drag the mouse to highlight the area you want to magnify, release to validate;
- to move the view: left-click and drag the mouse;
- to reset the zoom to its original size: right-click.



Using zoom on the map.

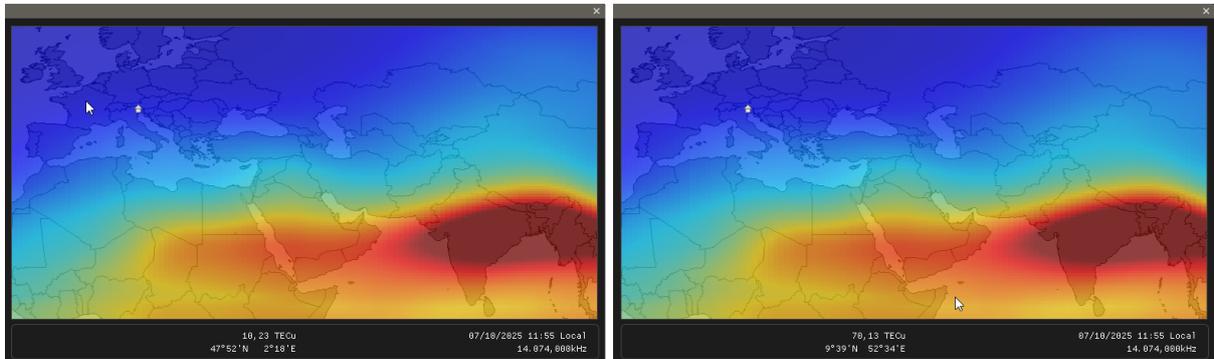
The map section is also used to **geographically locate** stations/memories that have longitude and latitude fields available; their position is indicated by a diamond-shaped (rhombus) cursor. To view the position of a station/memory, simply click on it in the **Station/Memory table** section. In addition to the ability to view the memories of the various banks that may have longitude and latitude fields assigned, this table also allows you to view **WRTH** data if the appropriate option is selected in the "Table" section of the "General" menu.



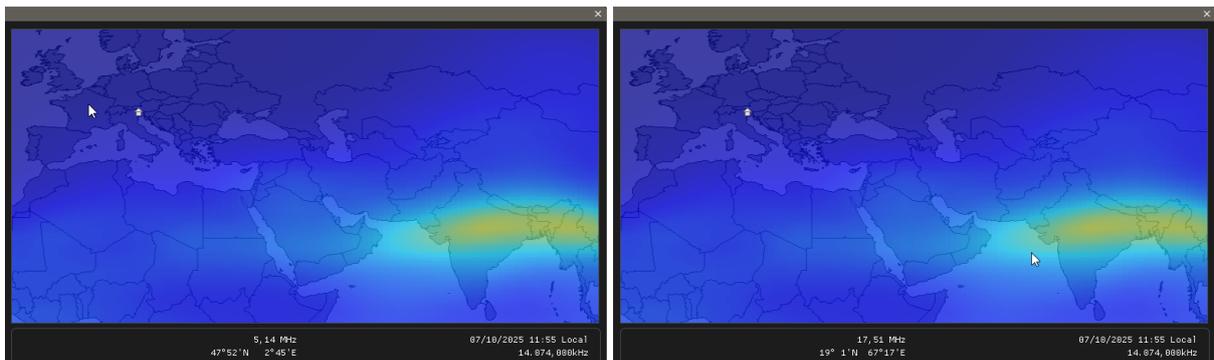
Geographic location of a station/memory.

Information area

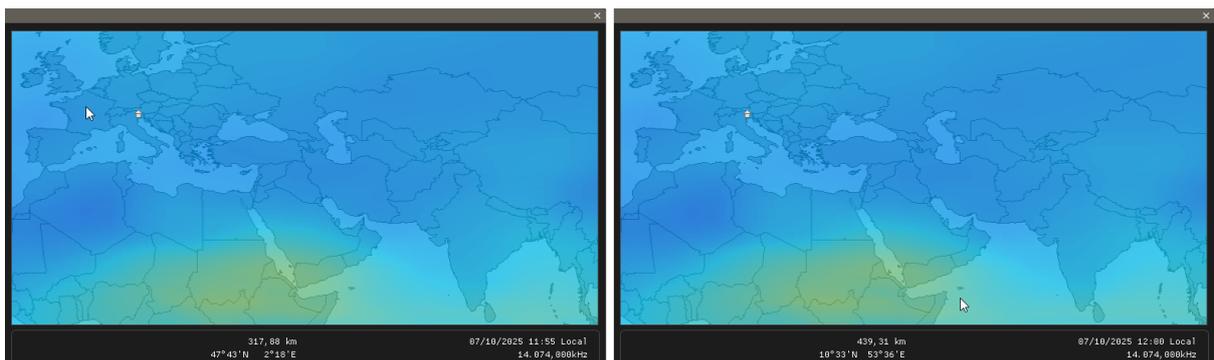
The information area, below the map, allows you to view the value of the physical quantity being displayed on the map - **TEC**, **foF2**, or **HmF2** - relative to the position of the mouse cursor, which specifies the geographic coordinates via **latitude** and **longitude**. The current time is also shown on the right, with the option to choose between local and UTC, and the frequency in use, which can be relative to the frequency/station being listened to or the use of WSJT-X.



Difference in value for the TEC.



Difference in value for the foF2.



Difference in value for the HmF2.

Station/Memory table

The station/memory table displays the data requested in the **“Table”** section of the **“General”** menu, the choices are:

- **“WSJT-X”**: contact data coming from the WSJT-X UDP server, see section [6.7.3 - Specific use with WSJT-X](#) for details;
- **“WRTH”**: data from the World Radio TV Handbook, requires that the feature be enabled in the **“Network Services”** tab of the **“Settings”** window; clicking on a station will indicate its geographical position on the map via a diamond-shaped cursor; note the ability to filter by time/day (Time Filter) and by frequency (Frequency Filter) in a range equal to more or less half the Sampling Rate;
- **“Memories”**: with this choice, the display section of the **“Memory Manager”** window with the bank buttons and the list of memories is displayed instead of the table; the editing section is not displayed in the **“Geo Plotter”** window.



Below is an example for the different choices: **“WSJT-X”**, **“WRTH”** and **“Memories”**.

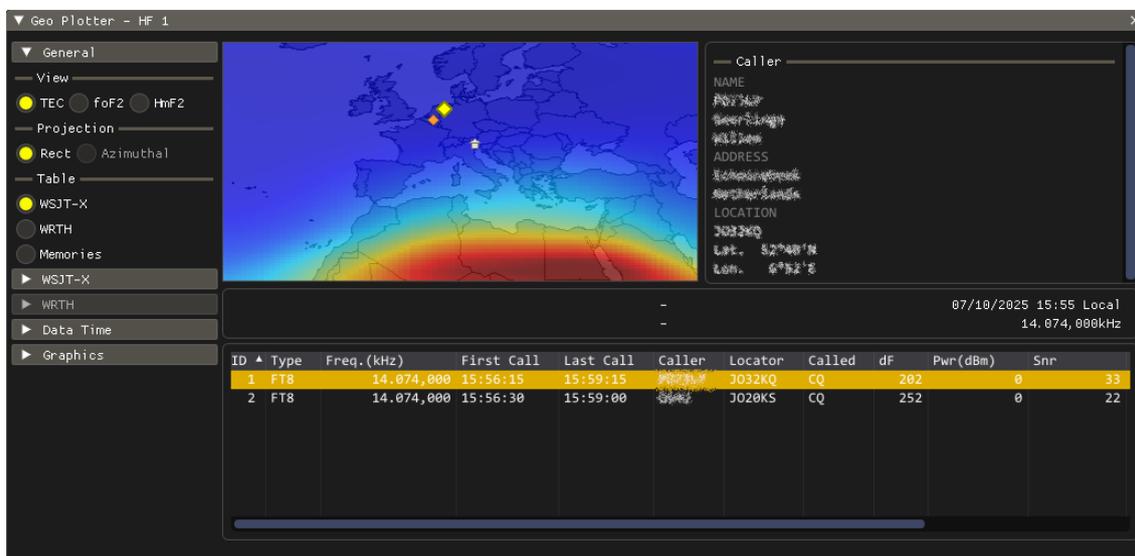


Table with contact data retrieved from WSJT-X.

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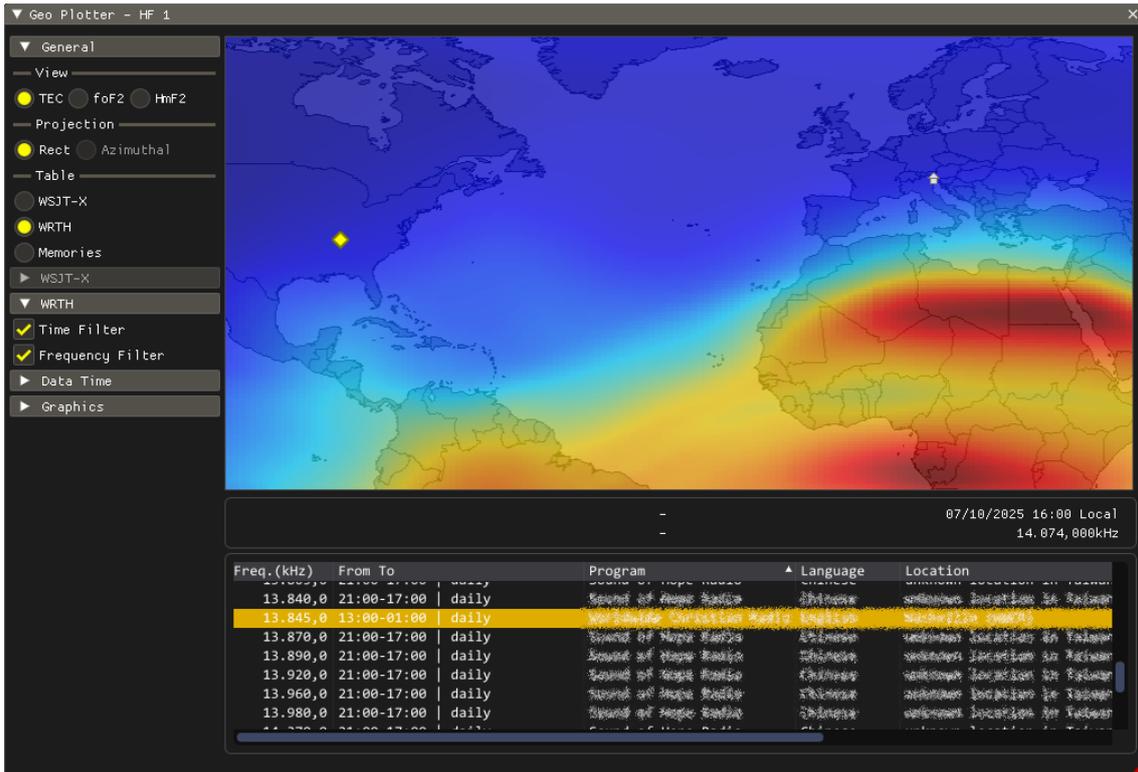
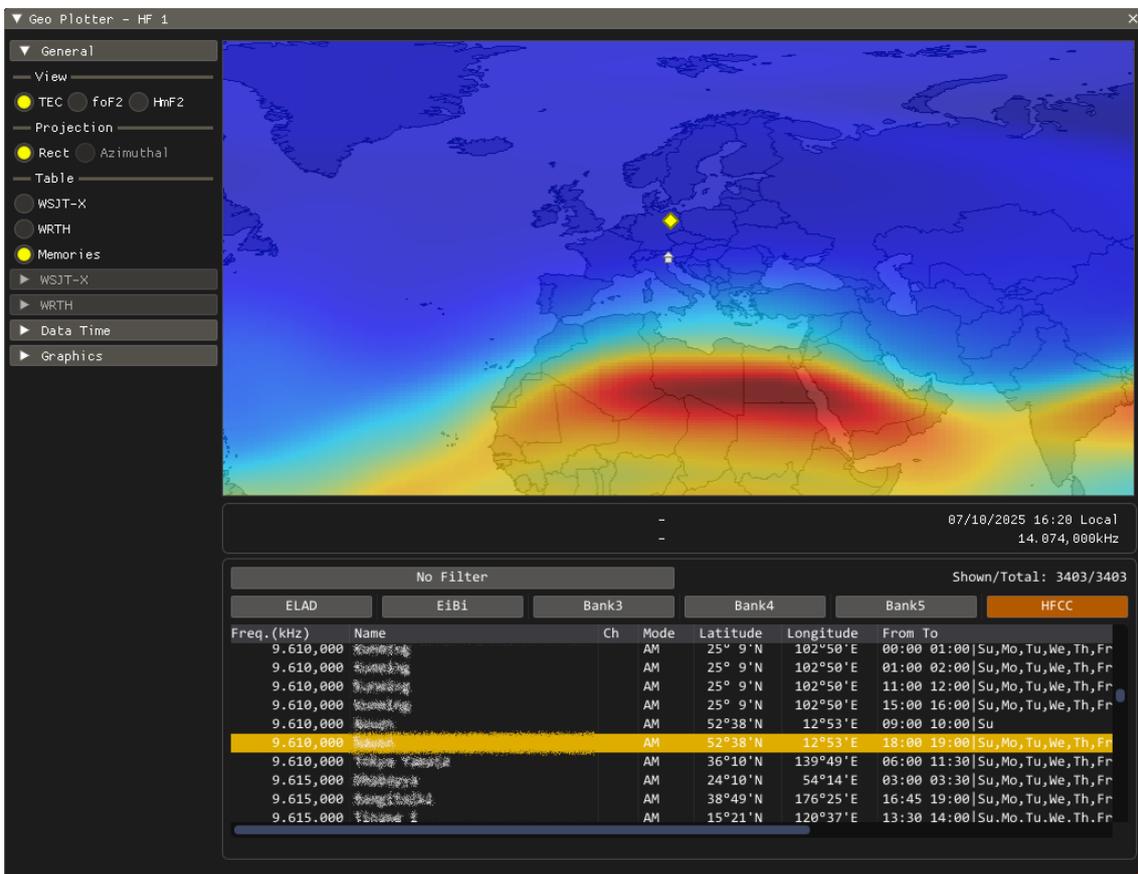


Table with data retrieved from the WRTH website.



Display section of the "Memory Manager" window with imported HFCC data.

6.7.2 Window setup

Settings window

Some settings to be made from the “Settings” window are necessary to be able to use the features of the “Geo Plotter” window, they are listed below by feature:

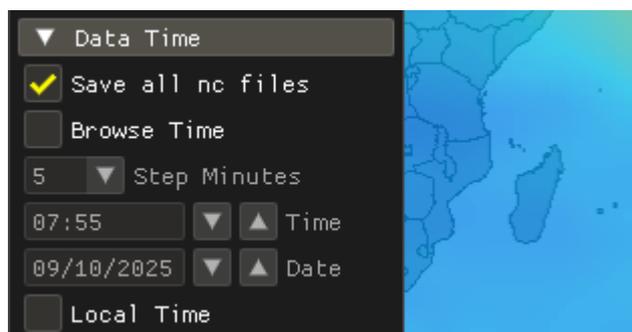
- **visualization of ionospheric data** on the map:
 - tab “Geo Plotter”, section “NOAA File”: enable the download of “.nc” files;
- **displaying the Home icon** on the map:
 - tab “Geo Plotter”, section “Home Tooltip”: enter a name/callsign and the geographic coordinates;
- **view the WRTH stations list** in the table:
 - tab “Network Services”, section “WRTH Broadcasting Service”: enable the service and enter User and Password if necessary;
- **view the contacts received from WSJT-X** in the table:
 - tab “Geo Plotter”, section “WSJT-X UDP Settings”: enable the desired channel(s) (“Enable UDP”) by specifying the correct port number(s), the same as in the WSJT-X software settings;
- **view QRZ Lookup information:**
 - tab “Network Services”, section “QRZ Lookup Settings”: enable the service and enter User and Password.

Data Time menu

The “Data Time” section allows you to change some settings related to the management of ionospheric data contained in the “.nc” files downloaded from the NOAA (National Oceanic and Atmospheric Administration) website. These files are forecast files; if the “**Save all nc files**” option is enabled, they are saved in the “Perseus22\GeoFiles\nc” folder. If the option is always enabled, this folder will be filled with a file every five minutes when a “Geo Plotter” window is open. The typical space requirement is 1.15MB/hour. If you want to manually manage these files, it is important to know that the file names are composed, among other things, of the UTC date and time of the data they contain.

The “**Browse Time**” option, along with the time and date selection controls, allows you to navigate the available data over time and observe how the ionospheric data has/will changed over both the past and future days.

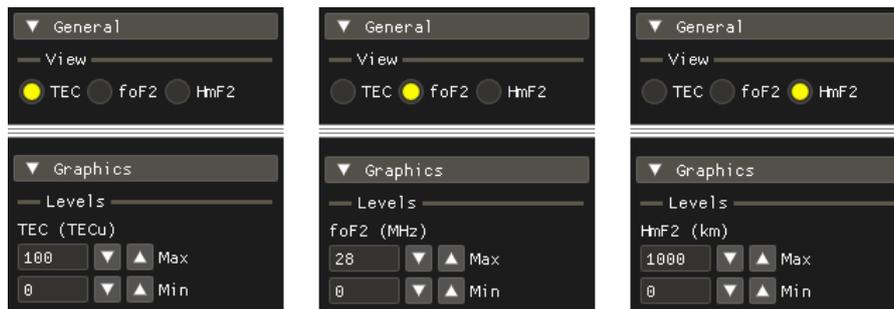
The “**UTC Time**” option allows you to choose whether the time displayed in the **Information area** is local or UTC.



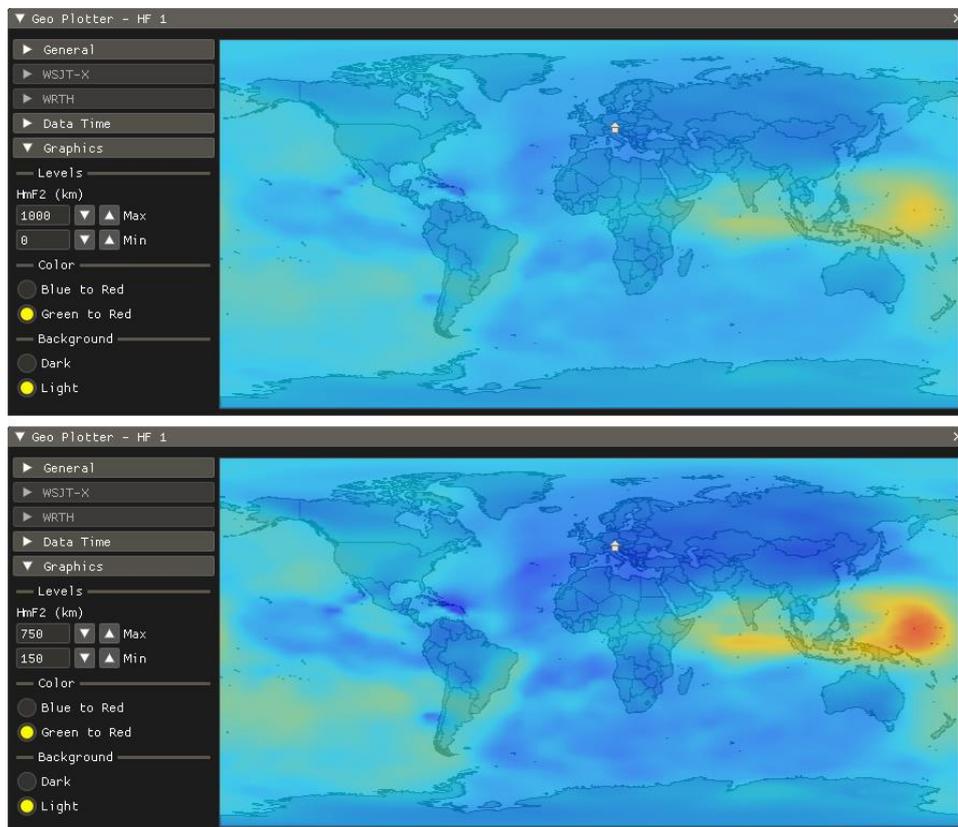
Graphics settings

The graphics settings of the “Geo Plotter” window allow you to change the following options:

- **“Levels”**: the minimum and maximum levels used to represent ionospheric data, this parameter changes depending on the chosen “View” parameter:
 - o for TEC: from 0 to 100 TEC units;
 - o for foF2: from 0 to 28 MHz;
 - o for HmF2: from 0 to 1000 km;
- **“Color”**: the gradation of colors used to illustrate ionospheric data: “Blue to Red” or “Green to Red”;
- **“Background”**: the style used for the background: “Dark” or “Light”.

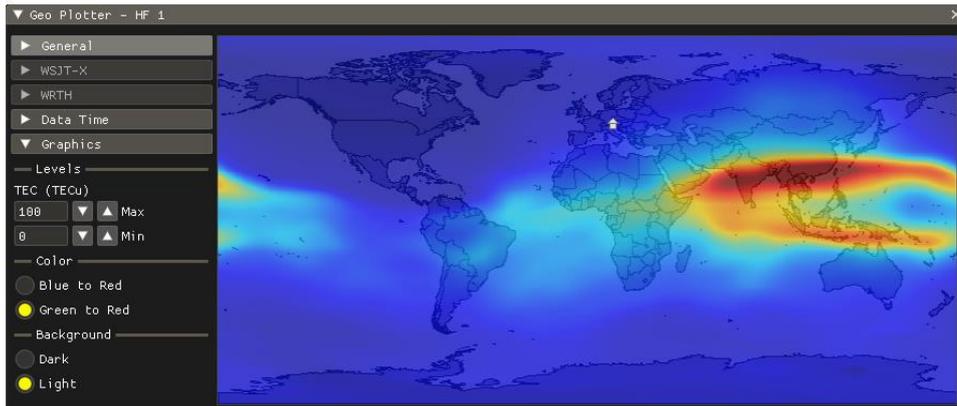
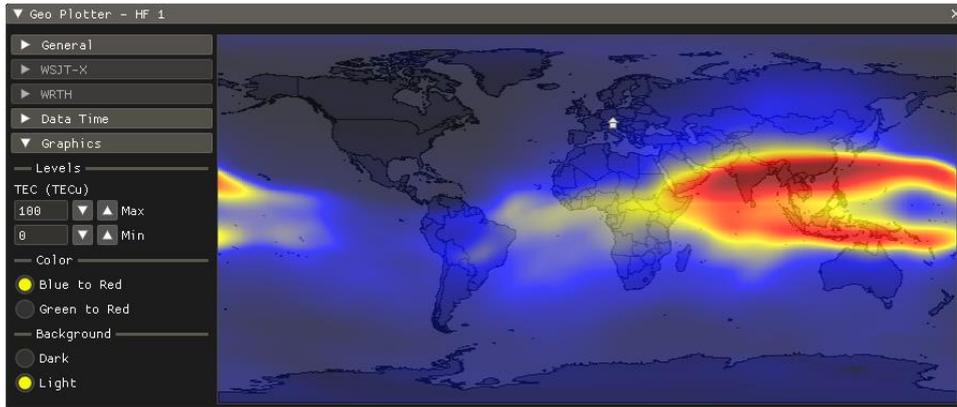


“Levels” option depending on the choice made for “View”.

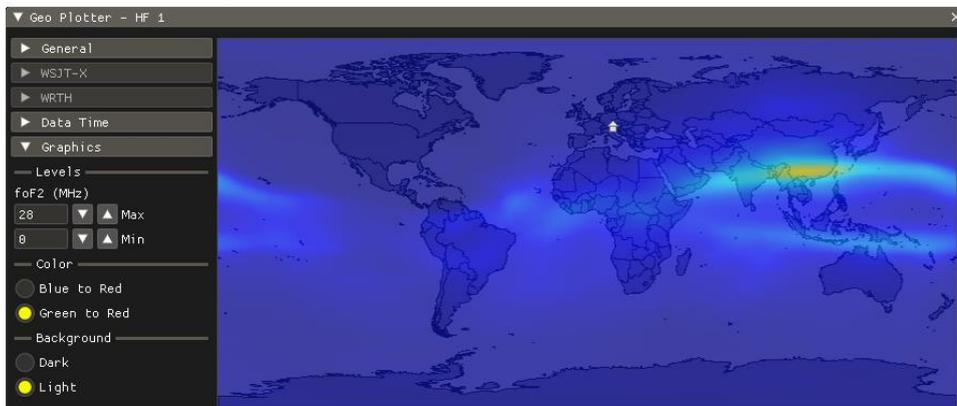


Difference in setting the “Levels” option for the HmF2.

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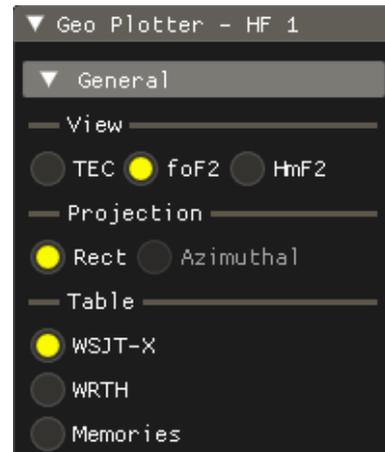
Difference in setting the "Color" option for the TEC.



Difference in setting the "Background" option for foF2.

6.7.3 Specific use with WSJT-X

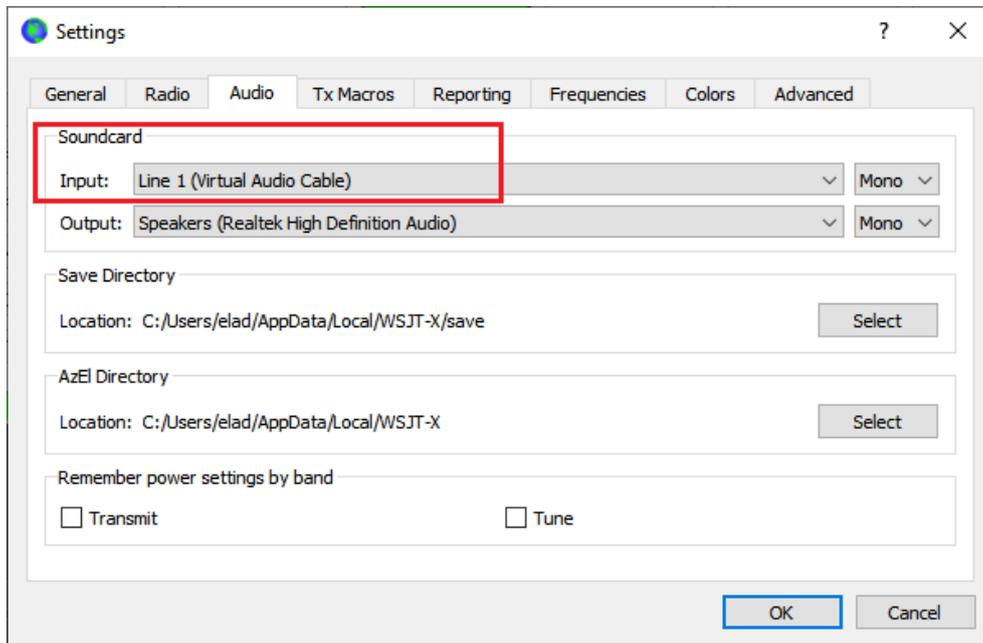
Using the “Geo Plotter” window with WSJT-X combines the functionality of **displaying ionospheric state and ionospheric forecasts** with the **geographic location of contacts** whose details are retrieved by the WSJT-X software. How it works is as follows: the audio received from Perseus22 is sent via virtual audio devices to WSJT-X which decodes the messages and sends the available information via UDP to the Perseus22 software. This functionality requires various settings - described in this section of the manual - on both the WSJT-X software and the Perseus22 software. It also requires that virtual audio device management software (for example VAC) be installed for audio forwarding. To activate this functionality, you need to choose the “WSJT-X” item in the “General” menu as shown in the image on the right.



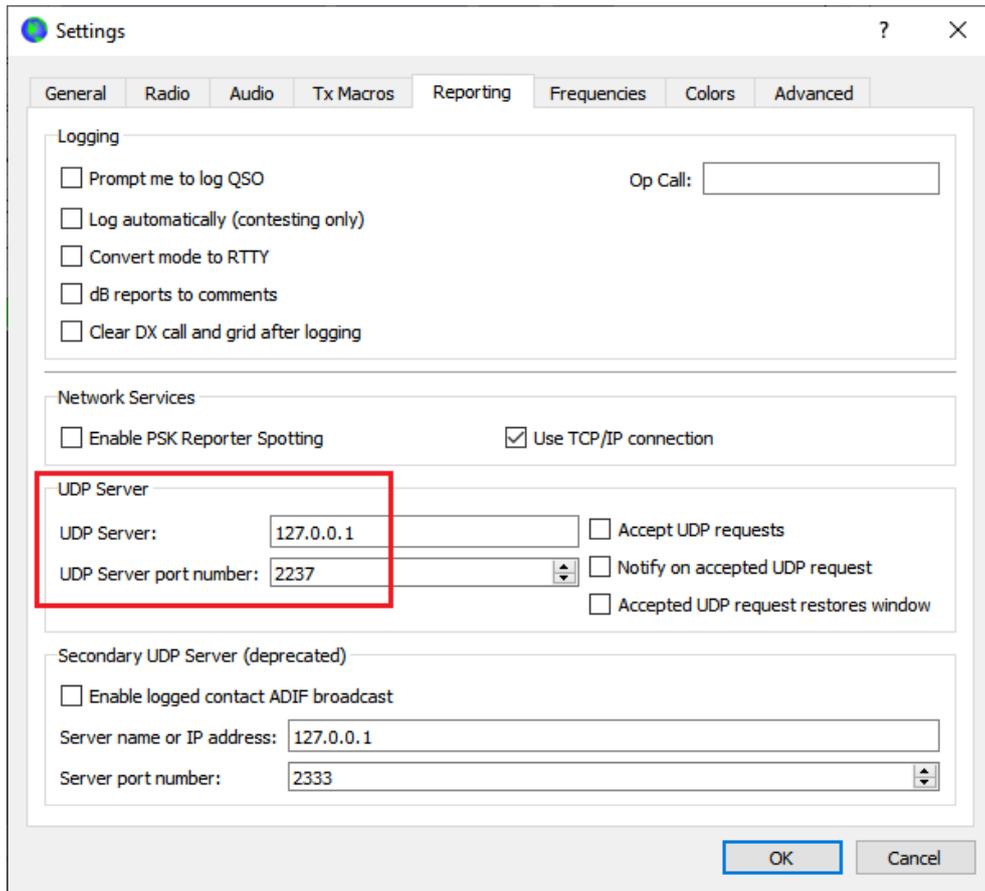
WSJT-X settings

The two important WSJT-X settings to make for the “Geo Plotter” window to work are basically:

1. **audio input** setting: in the menu “File”, “Settings”, tab “Audio”, set one line of the virtual audio devices as input;



2. **UDP port** setting used for sending messages to the Perseus22 software: in the menu “File”, “Settings”, tab “Reporting”, set a port number, typically from 2237 onwards;



It is recommended to leave the loopback IP address: “127.0.0.1”.

NB: other settings may be necessary but are part of the basic setup of the WSJT-X software which is not the subject of this manual.

NB2: it is possible to connect a second instance of WSJT-X to a second channel of the Perseus22 software. In this case, the second instance of WSJT-X must be started via the command line by specifying a different rig name than the first instance, as shown in the image below. Please note that the port number used for the second instance must also be different from the one used by the first instance of WSJT-X, which is 2237 in the image above.

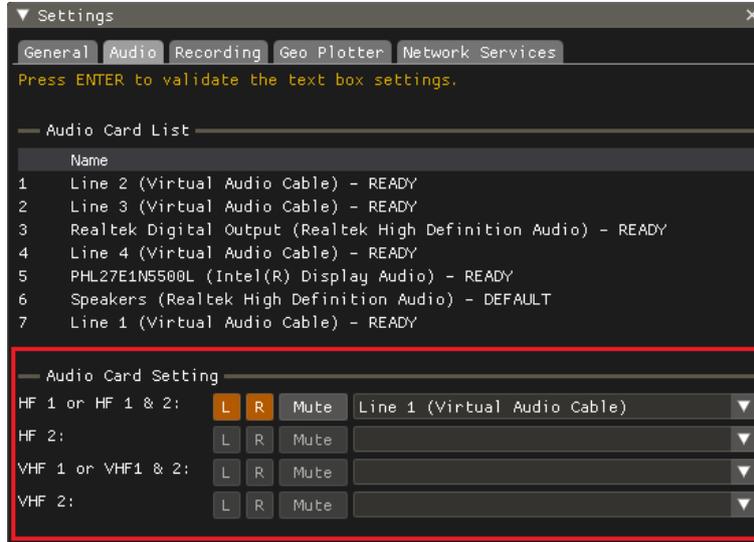
```

Windows PowerShell
PS C:\>
PS C:\> cd .\WSJT\wsjtx\bin\
PS C:\WSJT\wsjtx\bin> .\wsjtx.exe --rig-name="ELAD FDM-DUO"
PS C:\WSJT\wsjtx\bin>
    
```

Perseus22 settings

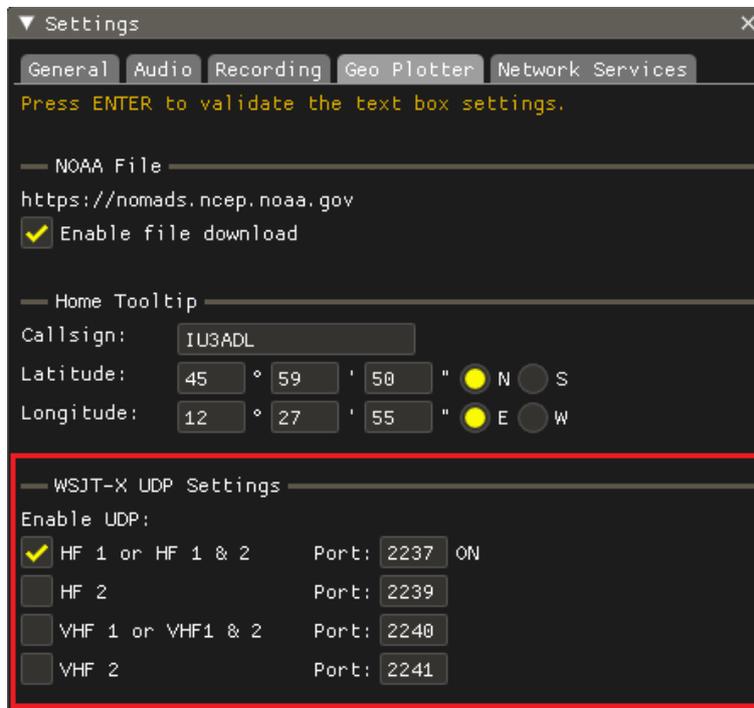
The settings to be made in the Perseus22 software for use with WSJT-X are as follows:

- **“Settings”** window, **“Audio”** tab, **“Audio Card Settings”** section: for each desired channel, select a VAC line, it must correspond to what is set in the WSJT-X software;



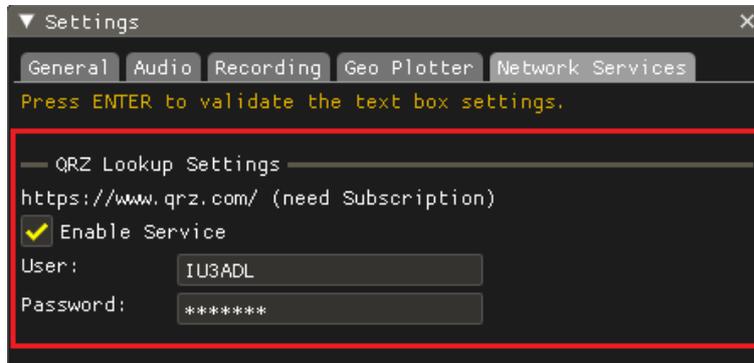
Line 1 set for “HF 1” channel.

- **“Settings”** window, **“Geo Plotter”** tab, **“WSJT-X UDP Settings”** section: enable the feature for each desired channel by activating the relevant checkbox, type the UDP port number and press “ENTER”; the feature is active only if the word “ON” appears on the right;



UDP active for “HF 1” channel on port 2237.

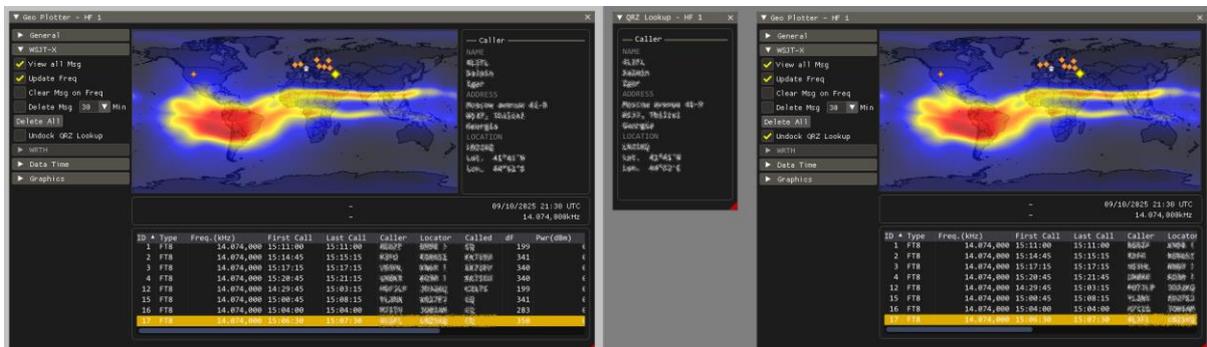
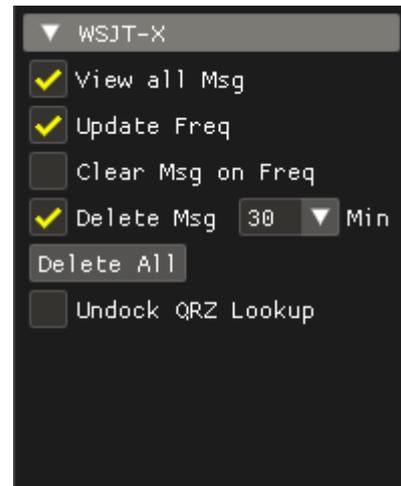
- **“Settings”** window, **“Network Services”** tab, **“QRZ Lookup Settings”** section: this setting is optional, it requires you to enter your Username and Password for the qrz.com site so that the Perseus22 software can retrieve detailed information about contacts and the current link.



QRZ Lookup service active.

- **“Geo Plotter”** window, **“WSJT-X”** menu: this menu offers several options for setting the operation of the Perseus22 software with WSJT-X:

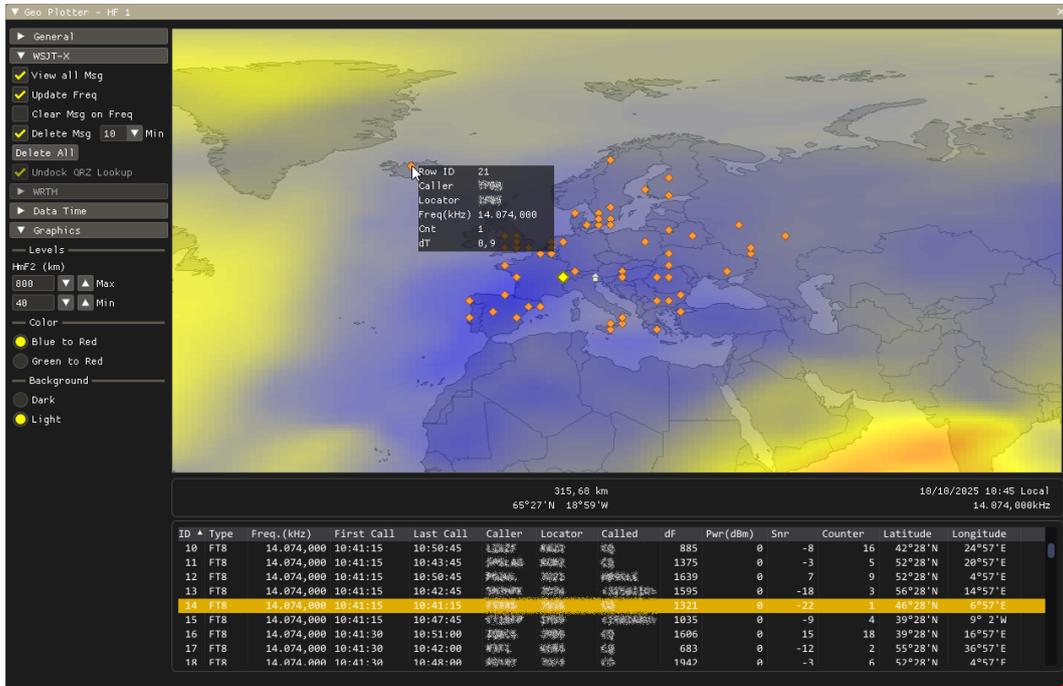
- o **“View all Msg”** option: if active, all callers are displayed in the table; otherwise, only the caller selected in the table is displayed;
- o **“Update Freq”** option: if active, updates the channel window frequency with the latest frequency received from WSJT-X;
- o **“Clear Msg on Freq”** option: if active, clears the table when the frequency is changed;
- o **“Delete Msg”** option: if active, deletes callers from the table after no further messages have been received for the set number of minutes;
- o **“Delete All”** button: deletes the entire table;
- o **“Undock QRZ Lookup”** option: allows you to undock the Lookup section with the caller and called parts from the **“Geo Plotter”** window.



Docked and non-docked lookup in the “Geo Plotter” window.

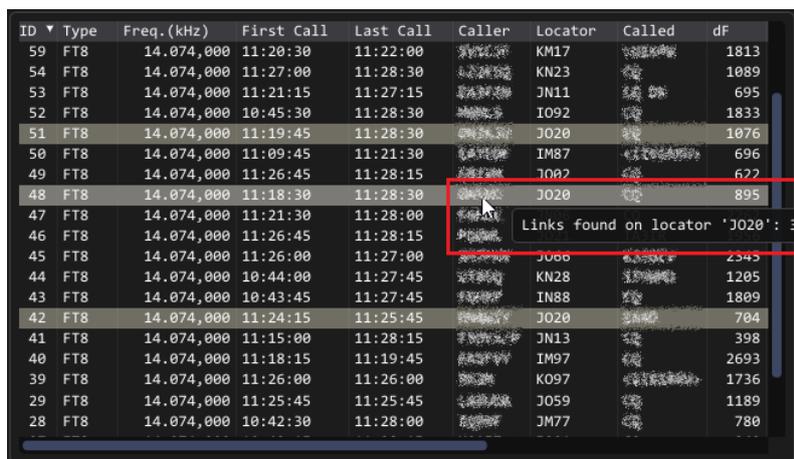
Operation

Clicking on a contact on the map **highlights it in the table** so you can view all available information. Clicking on a contact in the table **highlights it on the map** so you can locate it. You can always hover your mouse over a contact on the map to display a pop-up with key contact information: Caller, Locator, Frequency, etc. Contacts are marked on the map using diamond-shaped (rhombus) cursors; the largest one corresponds to the selected contact, while the other colored cursors are smaller.



Selecting a contact and viewing a pop-up for another contact.

When a selected contact has other contacts with the **same locator** - which usually happens when the locator is four characters long - all contacts with that locator are highlighted in the table. Hovering the mouse over a caller displays a pop-up indicating how many contacts are present in that locator.



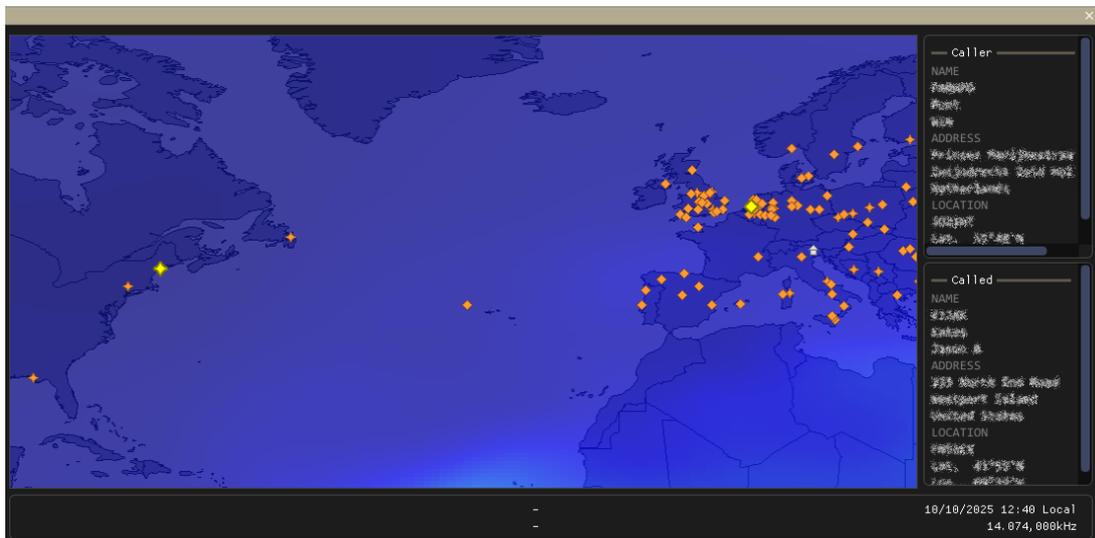
Identifying contacts on a Locator.

There are two operating modes available: **without and with Lookup information** (downloaded from the QRZ website). If the "QRZ Lookup" service is active in the settings window, the "User" and "Password" fields are correct, and the user provided is actually an authorized user, the Lookup information will automatically be displayed in the "QRZ Lookup" section, which can be detached or not from the "Geo Plotter" window as described in Perseus22 settings.

This operating mode, when active and functioning, allows access to further information which is:

- more accurate positioning of contacts on the map as Locators go from four to six characters;
- an association between the caller and the called, the details of which are present in the "QRZ Lookup" section.

On the map, called contacts are no longer indicated by a diamond-shaped cursor but by a four-pointed star cursor.



Selecting a link between contacts.

Additionally, the Locator column of the table provides the following information:

- Locator not found on QRZ site: "!" character is added;
- Locators not equal between information received from WSJT-X and that retrieved on the QRZ website: the "?" character is added.

ID	Type	Freq. (kHz)	First Call	Last Call	Caller	Locator	Called	dF	Pwr(dBm)	Snr	Counter	Latitude	Longitude
55	FT8	14.074,000	12:05:00	13:10:30	呼者呼	呼者呼	呼者呼	495	0	-8	01	59° 8'N	9°39'E
54	FT8	14.074,000	12:53:30	13:04:45	呼者呼	呼者呼 !	呼者呼	1232	0	-19	6	51°28'N	36°57'E
53	FT8	14.074,000	13:09:00	13:10:30	呼者呼	呼者呼	呼者呼	851	0	-17	2	50°48'N	4°39'E
52	FT8	14.074,000	13:08:00	13:08:00	呼者呼	呼者呼	呼者呼	1223	0	-12	1	50°58'N	14°39'E
51	FT8	14.074,000	13:09:00	13:10:30	呼者呼	呼者呼	呼者呼	1789	0	10	4	39°28'N	0°22'E
50	FT8	14.074,000	13:03:45	13:04:15	呼者呼	呼者呼	呼者呼	2658	0	-18	2	52°28'N	24°57'E
49	FT8	14.074,000	13:08:45	13:10:45	呼者呼	呼者呼	呼者呼						
48	FT8	14.074,000	12:44:30	13:04:30	呼者呼	呼者呼	呼者呼						
47	FT8	14.074,000	13:00:15	13:03:45	呼者呼	呼者呼	呼者呼						
46	FT8	14.074,000	12:18:15	13:10:45	呼者呼	呼者呼	呼者呼						

Notes about Locator.
 "?": locator not found on QRZ.
 "!": locator received from WSJT-X does not match the locator found on QRZ.

Notes on the Locator.

6.8 Recording and playback

There are four use cases for the Perseus22 software for recording and playback:

- **setting up recording** using the "Settings" window, "Recording" tab;
- **manual recording**, started via the "Start Rec" button;
- **scheduled recording** using the "Recordings Scheduler" window and started via the "Run" button;
- **playing back** a recording (".p22" file) using or not the "Playback" panel.

Recording and playback therefore requires the use of various graphical components of the Perseus22 software, which are:

- the "**Source Selection**" menu, which allows you to choose between Perseus22 or a ".p22" file;
- the "**Recording**" tab of the "Settings" window, for changing settings if necessary;
- the "**Recording/Playback**" menu of the "General Settings" panel, which is the key point for managing recordings/playbacks;
- the "**Recordings Scheduler**" window, which allows you to schedule recordings;
- the "**Playback**" panel, which is used to manage file playback.

The formats used to display the date and time are as follows:

- date: **dd/mm/yyyy** (day/month/year), or **yyyy/mm/dd** (year/month/day);
- time: **hh:mm:ss** (hours:minutes:seconds), or **mm:ss** (minutes:seconds).

It is specified whether the displayed time is local time or UTC.

An **important note on the size of the ".p22" files** generated by the Perseus22 software: these files save the RF spectrum of the channels open at the time recording is started, so the more channels there are open, the larger the file size will be. Likewise, the higher the sampling rate, the larger the file size will be. You can therefore end up with files of several GB, if not tens of GB, in just a few minutes of recording. You can approximate the calculation of the size of a ".p22" file using the following formula: size equals the number of channels, times the sampling rate, times the number of bytes per sample, and times the recording time.

Also note that **during recording or when the scheduler is active**, the "Recording/Playback" menu is locked in the open position, which is indicated in the menu title by replacing the arrow with a dot; the "ADC Channels Selection" menu controls are also disabled, adding or removing channels or changing the sampling rate is not allowed during recording or when the scheduler is active.

6.8.1 Manual recording

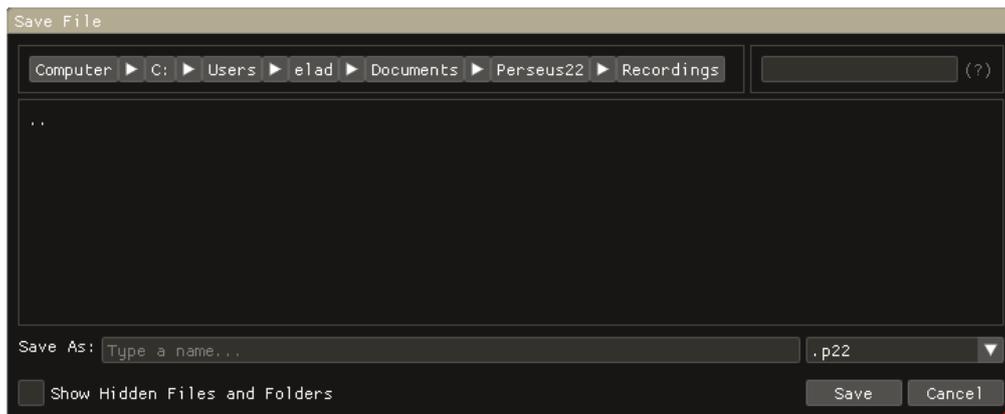
To proceed with a manual recording, you need to select the **"P22"** option in the **"Source Selection"** menu and make sure you have set the **"Recording"** tab in the **"Settings"** window as desired. Section **6.4.3 - Recording tab** presents the various possible settings.

To start a manual recording, press the **"Start Rec"** button in the **"Recording/Playback"** menu of the **"General Settings"** panel. Once recording starts, the **"Stop Rec"** button becomes active and colored, allowing you to stop recording. During recording, the size of the recorded **".p22"** file and the time elapsed since the start of recording are displayed and updated below the buttons.



"Start Rec" and *"Stop Rec"* buttons before and during recording.

If the **"Choose File when Starting Recording"** option is set to **"Yes"**, when you press the **"Start Rec"** button, a window like the one below will appear, allowing you to choose the file where you want to save the recording. More details on this option are available in section **6.4.3 - Recording tab** of this manual.

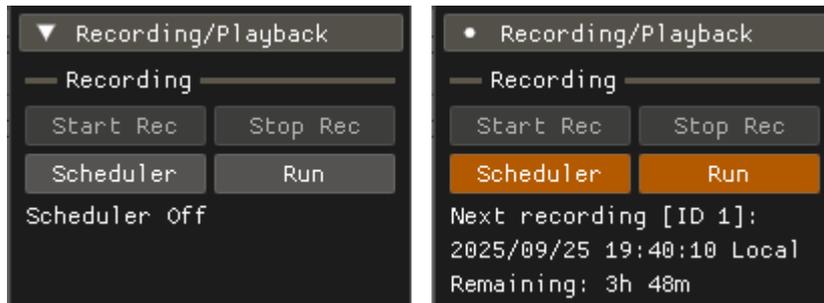


"Save File" window when starting a recording.

6.8.2 Recording with scheduler

To schedule one or more recordings, select the **"P22"** option in the **"Source Selection"** menu and make sure you have set the **"Shared Settings"** section of the **"Recording"** tab of the **"Settings"** window as desired. Section **6.4.3 - Recording tab** presents the various possible settings.

The scheduler is a window for setting up and scheduling recordings. To open it, press the **"Scheduler"** button in the **"Recording/Playback"** menu. When the scheduler is open, the corresponding button is colored. To activate the scheduler, press the **"Run"** button so that it is colored.

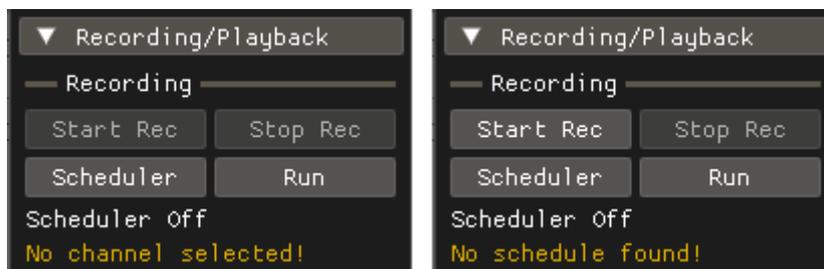


"Scheduler" and "Run" buttons.

The area below the **"Scheduler"** and **"Run"** buttons is used to provide various information such as the scheduler status (on/off, next scheduled recording), possible error messages and information about the recording in progress (size of the recorded **".p22"** file, time elapsed since the start of recording).



Information about the scheduler status and current recording.



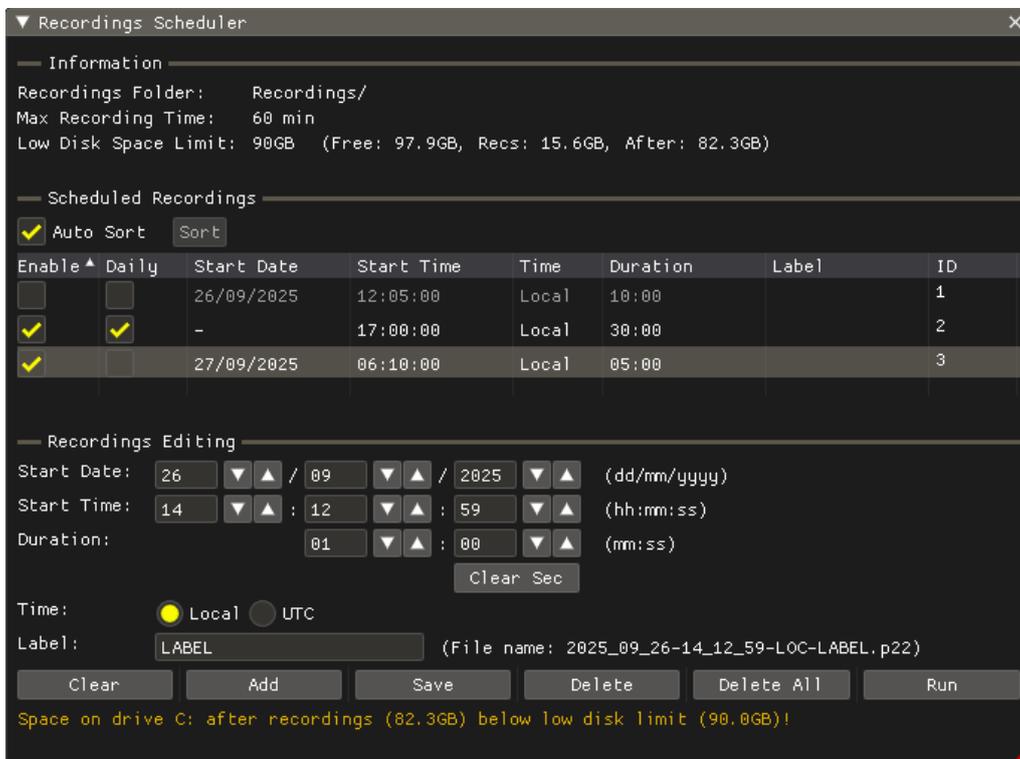
Error messages.

Once recording has started, the **"Stop Rec"** button becomes active and colored, allowing you to interrupt the current recording.

The **scheduler window** allows you to set up and schedule recordings and is composed of three sections:

- **Information:** displays the settings of the *"Shared Settings"* section of the *"Settings"* window: the recording storage location, the maximum recording time, and the low disk space limit; it also provides the available disk space, an estimate of the space required by the recordings, and an estimate of the remaining space after the recordings are completed;
- **Scheduled Recordings:** this section lists previously added recordings, whether they have already been performed or are yet to be performed; it also allows you to enable or disable them for each recording using the *"Enable"* option and specify using the *"Daily"* option whether a recording should be repeated daily or is a one-time event;
- **Recordings Editing:** this section allows you to choose the recording date and time, along with its duration; you can also specify whether the time is local or UTC, and optionally add a label that is used in the file name.

Additionally, at the bottom of the window, there is the button strip and the area below where warnings and error messages can be displayed.



"Recordings Scheduler" window.

The most important controls (checkboxes, buttons) in this window have a tooltip with a short description that explains the functionality of the control (checkbox, button).

The recordings are saved inside the file *"Perseus22\db\dbperseus22.db"* together with the memories.

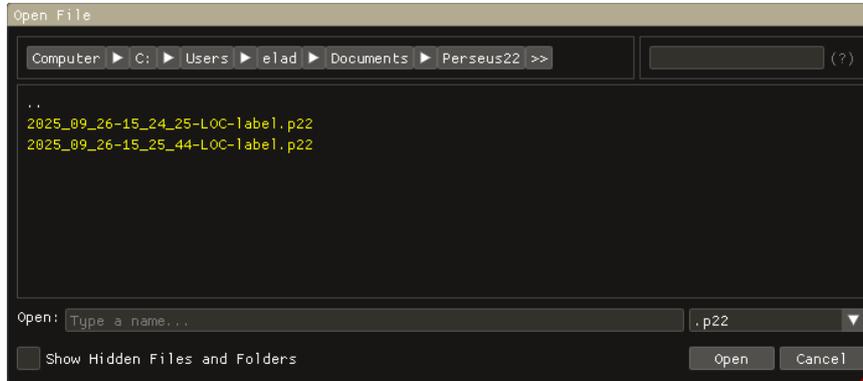
Below is an **overview of the button functions**:

- the *"Clear"* button allows you to set the current date and time in the *"Recordings Editing"* section and sets the other data to their default values; this is useful when you want to add a new recording by first setting the date and time to known values;
- the *"Add"* button adds a new recording to the *"Scheduled Recordings"* list using the data (date, time, etc.) of the *"Recordings Editing"* section;
- the *"Save"* button saves the changes made in the *"Recordings Editing"* section; the changes saved are those of the recording selected in the *"Scheduled Recordings"* list;
- the *"Delete"* button deletes the recording selected in the *"Scheduled Recordings"* list;
- the *"Delete All"* button deletes all recordings in the *"Scheduled Recordings"* list.
- the *"Run"* button allows you to start or stop the scheduler, it has the same functionality as the *"Run"* button in the *"Recording/Playback"* menu of the *"General Settings"* panel.

6.8.3 Playback

To play back a recording, select the **"File"** option in the **"Source Selection"** menu. This will activate the **"File..."** button in the **"Playback"** section of the **"Recording/Playback"** menu.

By pressing the **"File..."** button you will be able to navigate your disks and open one of the **".p22"** files previously saved.



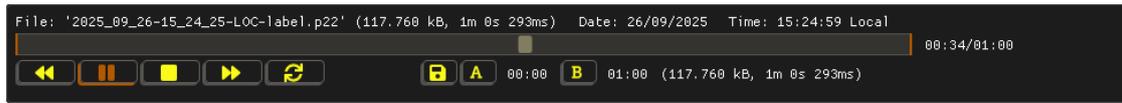
Choice for opening a **".p22"** file.

Once a **".p22"** file of a recording is opened, the channel windows activated at the time of recording are automatically loaded together with the **"Playback"** panel which can optionally be hidden via the specific **"Playback Panel"** checkbox.



Perseus22 software with the **"Playback"** panel open at the bottom.

The **“Playback”** panel allows you to manage the playback of a file by presenting some information about it and providing playback functions via some buttons.



“Playback” panel.

First, some information about the file is displayed:

- file name;
- file size and recording duration;
- date and time, either Local or UTC; the date and time are updated as the file plays.

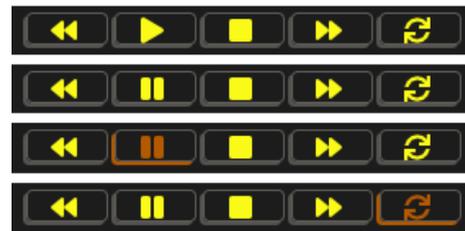


Next is a progress bar that lets you track the playback progress; you can drag it to change the playback time. To the right of this progress bar, the playback time and total recording duration are displayed.



Next, there is a series of buttons with the following functions, in order:

- **“BACKWARD”**: allows you to move the file playback time back;
- **“PLAY/PAUSE”**: allows you to both start and pause playback;
- **“STOP”**: allows you to stop playback resetting the playback time to the beginning;
- **“FORWARD”**: allows you to move the file playback time forward;
- **“LOOP”**: allows playback to automatically restart from the beginning when it reaches the end of the file.



The color change of the button, for **“PAUSE”** and **“LOOP”**, indicates that the related function is active.

Finally, you'll find the **“SAVE”**, **“MARKER A”**, and **“MARKER B”** buttons, which allow you to select a portion of the file and save it as a new file. Proceed as follows:

- start playback with **“PLAY”**;
- during playback, click **“MARKER A”** to indicate the beginning of the portion you want to save, this will be indicated by a colored vertical bar inside the progress bar;
- during playback, click **“MARKER B”** to indicate the end of the portion you want to save, this will be indicated by a colored vertical bar inside the progress bar;
- click **“SAVE”** to open the window that allows you to save the selected portion of the file as a new **“.p22”** file.



Markers inserted in the progress bar.

Note, next to the marker buttons, the time at which they were inserted and the size and total time of the selected file portion.

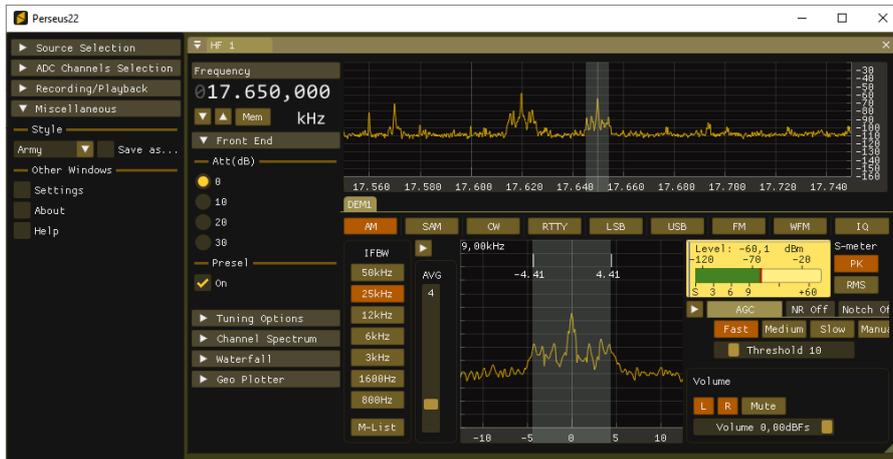
By right-clicking the marker buttons, you can reset their position; to the beginning of the progress bar for marker A, to the end of the progress bar for marker B.

6.9 Style management

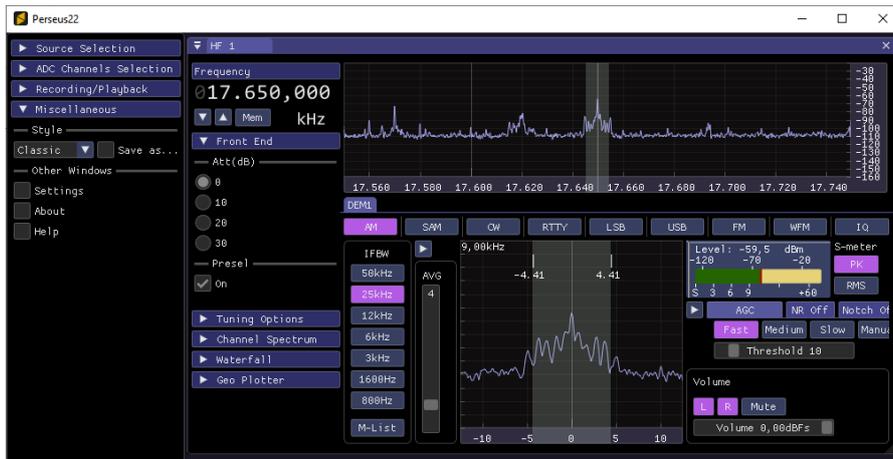
As described in [6.3.4 - Miscellaneous](#), the “Miscellaneous” menu of the “General Settings” panel allows you to change the style starting from one of the predefined styles.

6.9.1 Predefined styles

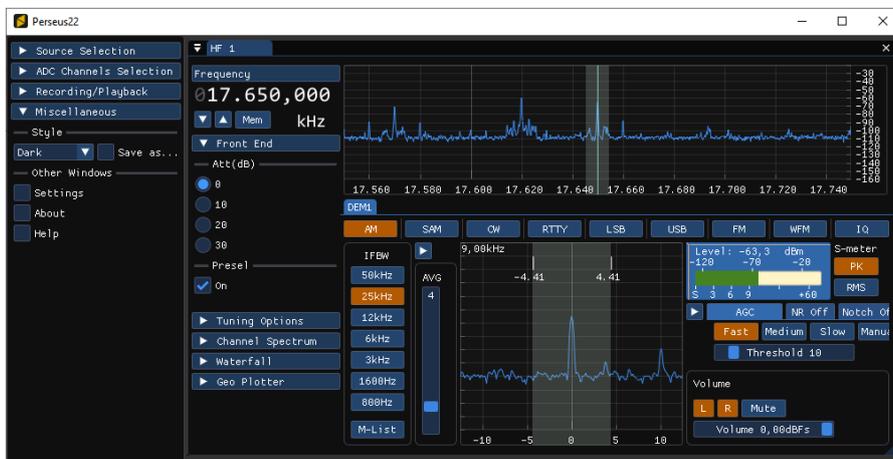
The predefined styles are presented below.



Predefined style Army.

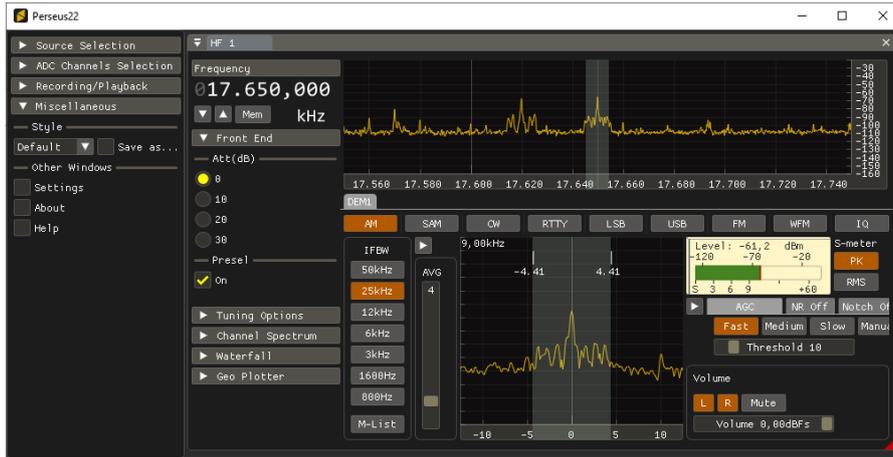


Predefined style Classic.

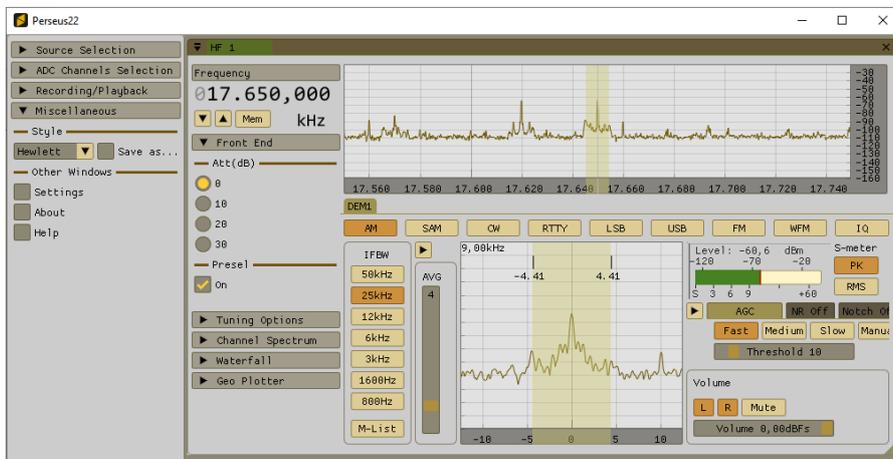


Predefined style Dark.

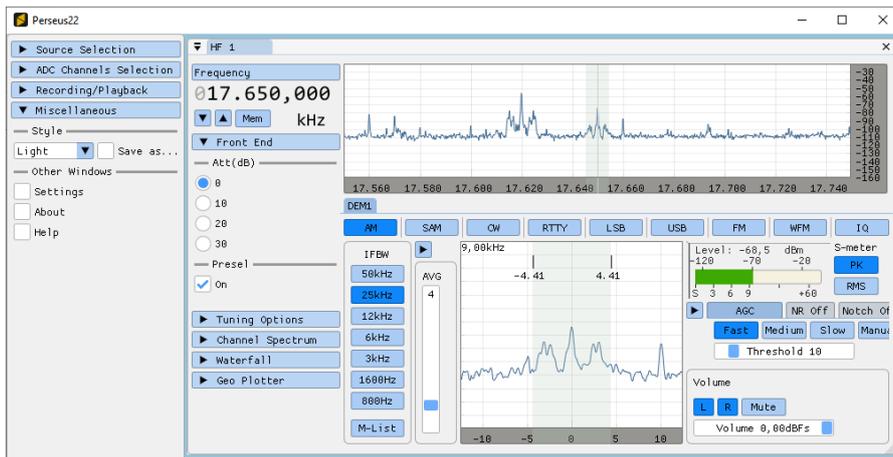
Perseus22 User Manual



Predefined style Default.



Predefined style Hewlett.



Predefined style Light.

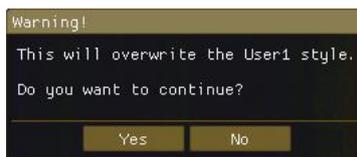
6.9.2 Creating a User style

From the **“Miscellaneous”** menu of the **“General Settings”** panel, choose a starting style, for example the **“Army”** style, and select the **“Save as”** checkbox.



Change style and **“Save as”** selection.

Then choose one of the three **“User”** styles by pressing the related button, for example **“Save as User1 Style”**, a message will appear asking for confirmation of the choice made and warning that the data currently present in the chosen style will be overwritten.



Confirm your choice.

Once you confirm your choice, the **“Modify User1 Style”** checkbox and the **“Save User1 Style”** button appear in the **“Miscellaneous”** menu. Selecting the **“Modify User1 Style”** checkbox displays the style editing window. The window title indicates which style you are working on.



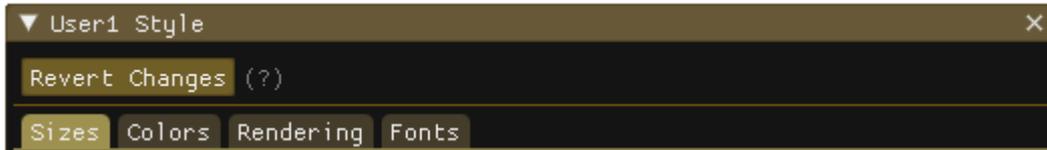
Style editing window opened next to a channel window.

Once you have changed at least one parameter, you can save the style using the **“Save User1 Style”** button.

6.9.3 Editing a User style

To modify a style, you can primarily adjust the size of some graphic components - from the **"Sizes"** tab - and the colors of some graphic components - from the **"Colors"** tab.

The **"Rendering"** tab provides advanced settings with default values compatible with most applications; it is recommended not to change them unless absolutely necessary. Finally, the **"Fonts"** tab allows you to analyze the fonts used in detail, providing a list of available characters; however, it does not allow changes.



Top of the style editing window.

The **"Revert Changes"** button allows you to undo the last changes made. The question mark in brackets **"(?)"** indicates the presence of a tooltip, very useful for correctly using the style editing window.

Change the size and appearance

The **"Sizes"** tab allows you to change the size and appearance of some graphical components, such as thickness, rounding, or alignment. Below is a comparison between the default setting and another setting with some modified parameters.

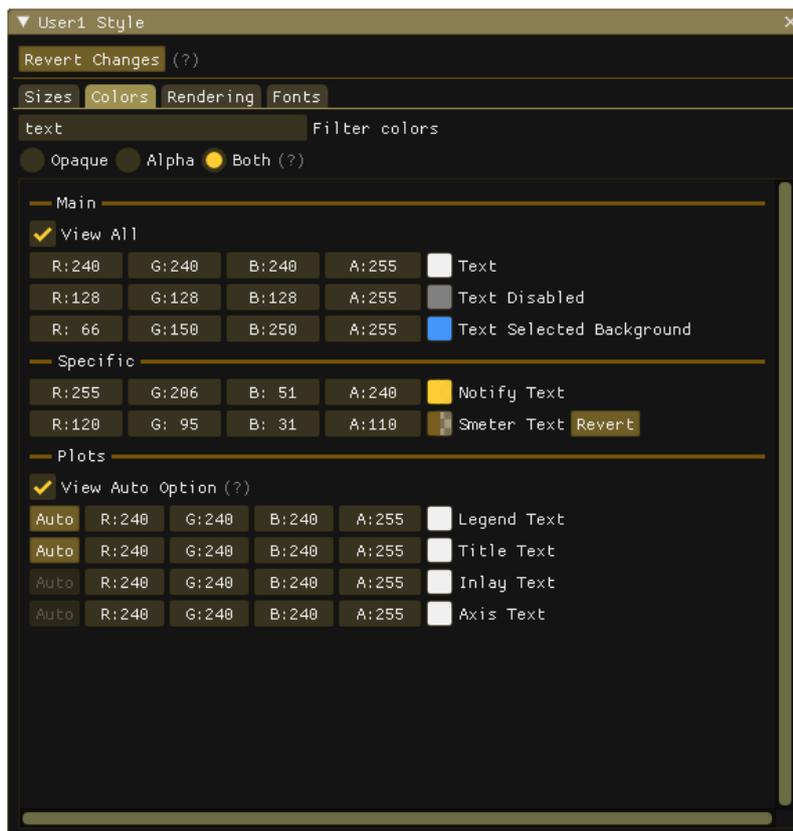


Comparison of two settings for the **"Sizes"** tab.

Change the colors

The "**Colors**" tab allows you to change the colors of various components and graphical elements. It is divided into three sections, each corresponding to a different aspect of the software user interface:

- "**Main**": groups the colors of the main user interface components, such as backgrounds, buttons, or borders; the "**View All**" option allows you to view all the colors in the Main section, even the less important ones;
- "**Specific**": groups the colors added for the Perseus22 software and specific to it, such as the colors of the S-meter, the spectrum bandwidth, or the on/off information;
- "**Plots**": groups the colors related to graphs, such as the RF spectrum; the "**View Auto Option**" option is an advanced option; please refer to its tooltip for details.

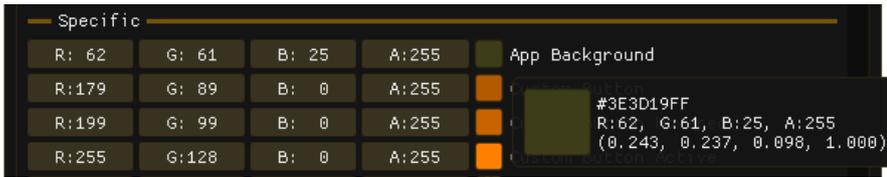


Search in the "**Colors**" tab for colors with the word "text".

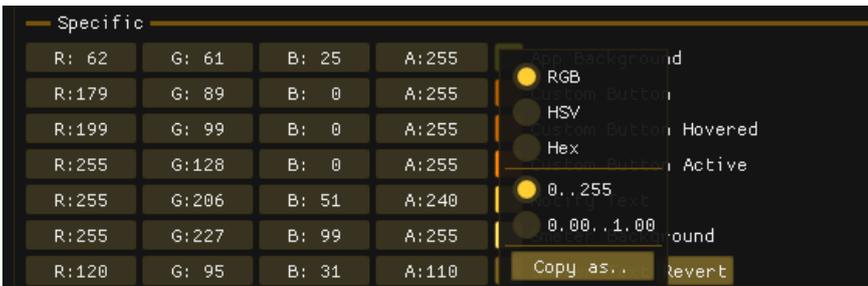
A filter field - "**Filter colors**" - makes it easier to search the color list, and you can also choose whether or not to see the effect of the **transparency** level (Opaque, Alpha, or Both). To change a color component, click on that component (the red component of the RGB+Alpha value, for example) and drag the mouse. Note that a "**Revert**" button appears next to the modified colors, allowing you to undo changes to individual colors.

Other useful functions of the “Colors” tab are the following:

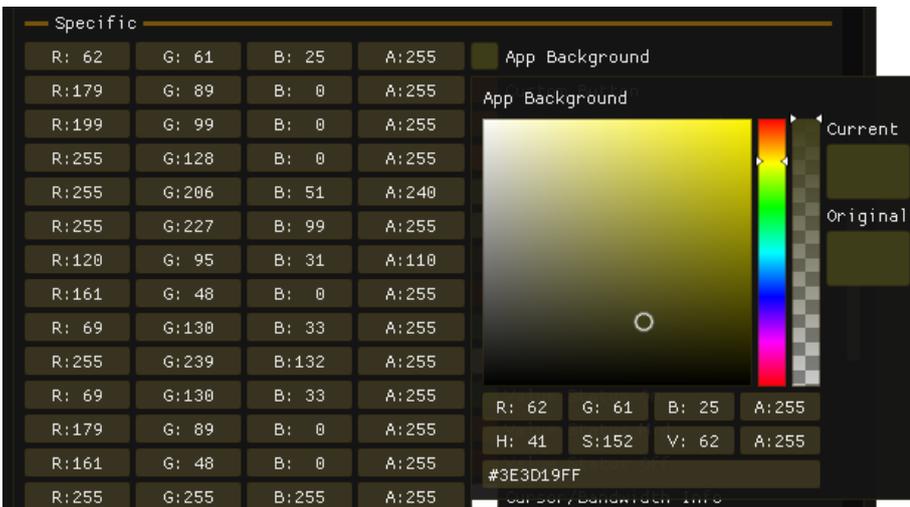
- view color details by hovering the mouse over them;



- change the color presentation type (RGB, HSV, HEX) by right-clicking;



- open a color settings window with a normal click.



6.10 Frequency calibration

Frequency calibration can be performed using one of **three methods**:

- entering a ppm (parts per million) value;
- tuning to a reference signal (e.g., WWV at 10 MHz);
- using the DAB+ Mux.

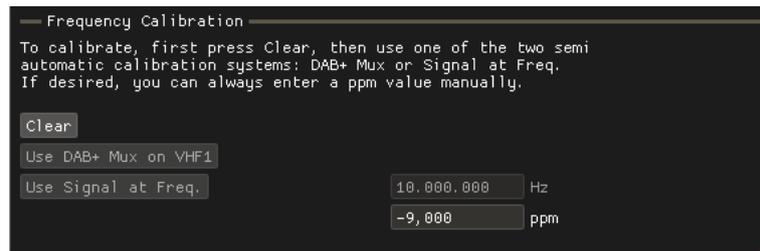
This is done from the “Settings” window, “General” tab, “Frequency Calibration” section. You must first reset the previous calibration by pressing the “Clear” button and then proceed with the calibration by choosing one of three methods: the manual one by entering a **ppm value** or one of the two semi-automatic calibration systems: “DAB+ Mux” or “Signal at Freq”.

It is recommended to perform the **calibration while warm**, that is, not immediately after turning on the Perseus22 receiver but after some time so that it reaches a certain temperature stability.

The calibration is not saved inside the Perseus22 but inside the **software configuration files**.

6.10.1 Manual calibration

To perform a manual calibration, simply press the “Clear” button, enter the **ppm value** in the specific text box, and press “ENTER”. The calibration accuracy is assessed by analyzing, using the spectrum, signals with known nominal frequencies. Entering and adjusting the ppm value should be repeated until a satisfactory result is obtained.



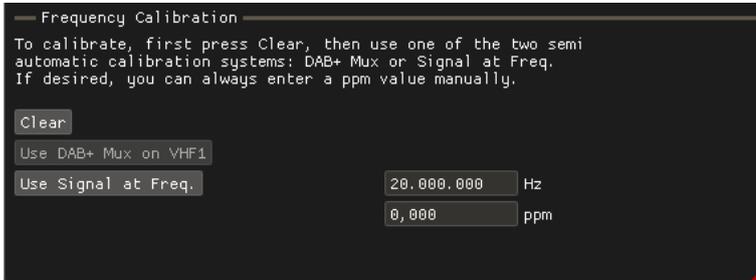
Setting a calibration value directly in ppm.

6.10.2 Semi-automatic with reference signal

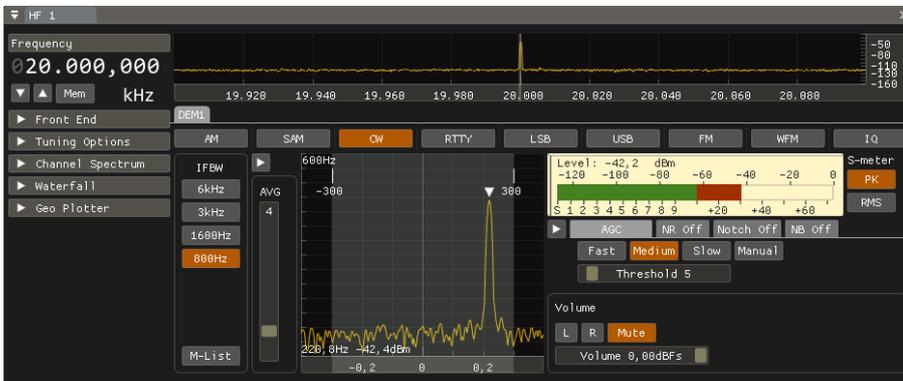
To perform a **"Signal at Freq"** calibration, you need to tune a signal with a known nominal frequency, such as WWV stations at 10 MHz. The important thing is to use the **lowest possible IFBW** to achieve the greatest possible accuracy.

The steps to perform this calibration are as follows:

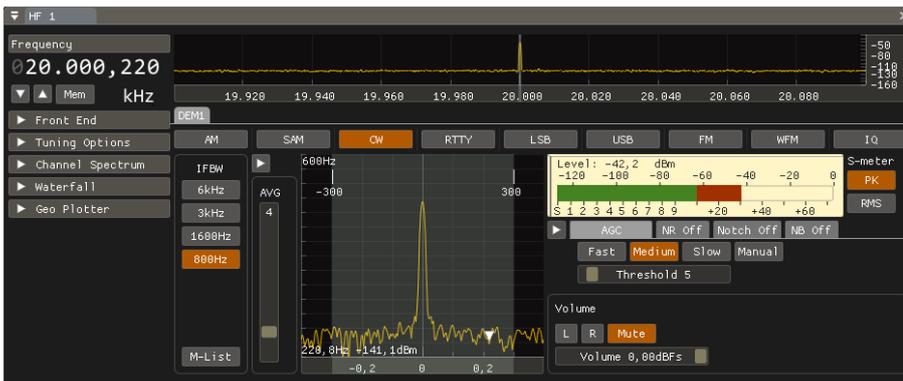
- press the **"Clear"** button, enter the reference signal value and press **"ENTER"**;



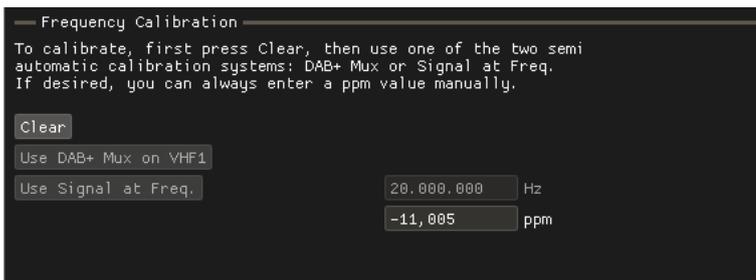
- search for the signal to tune and adjust the IFBW at the lowest possible value;



- tune the signal by clicking on it on the IFBW spectrum;



- press the **"Use Signal at Freq"** button, the calibration value in ppm will be calculated and updated and the signal on the spectrum will adjust.

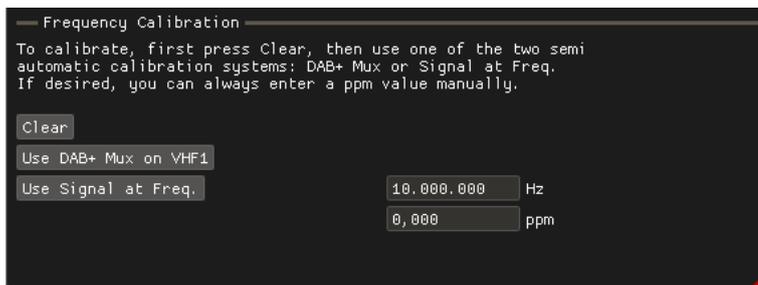


6.10.3 Semi-automatic with use of DAB+ Mux

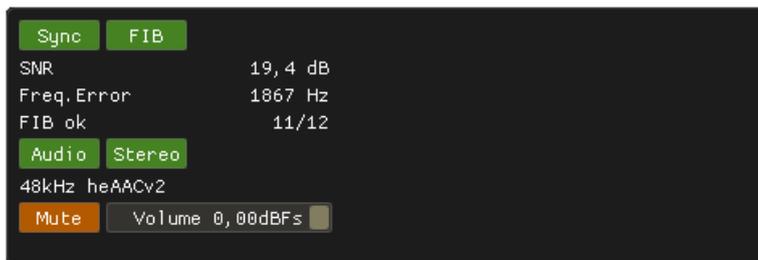
Calibrating with the **"DAB+ Mux"** method is the ideal method, both for its simplicity and the accuracy it achieves. In fact, the higher the frequency, the more accurate the calibrations are. It is also important to note that DAB+ stations have a very precise clock.

The steps to perform this calibration are as follows:

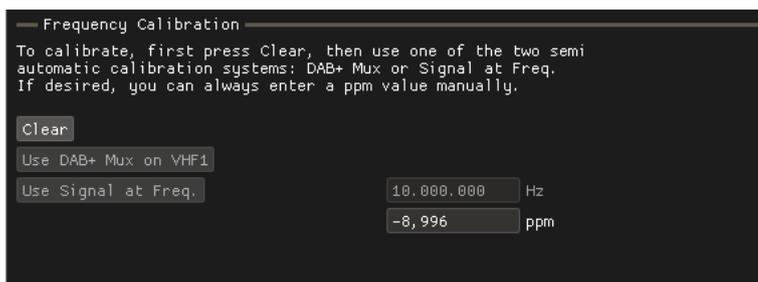
- press the **"Clear"** button in the **"Settings"** window and tune the VHF1 channel to a DAB+ channel so that the **"Use DAB+ Mux on VHF1"** button is enabled;



- wait a few seconds for the **"Freq. Error"** value (value in Hertz) in the channel window to stabilize (a variation of a few Hertz is acceptable);



- press the **"Use DAB+ Mux on VHF1"** button in the **"Settings"** window to launch the calibration, the calibration value is calculated and displayed.



Technical Specifications

HF	HF1 & HF2 antenna connectors
Frequency coverage	10 kHz - 70 MHz
Preselection ¹	LPF filter: 10 kHz - 1700 kHz BPF filters (MHz): 1.6 - 2.1, 2.1 - 3.0, 3.0 - 4.2, 4.2 - 6.0, 6.0 - 8.4, 8.4 - 12.0, 12.0 - 17.0, 17.0 - 24.0, 24.0 - 32.0, 32.0 - 70.0 Wb (Wideband mode): 10 kHz - 70 MHz
Attenuators ²	0 / 10 / 20 / 30 dB
Minimum Detectable Signal _(MDS)	-131 dBm (14 MHz, 2 Msps, CW, BW 500 Hz)
Input clipping level	-7 dBm (14 MHz, 2 Msps)
Modes _(Software defined)	AM, SAM/QSAM, CW/CWr, RTTY/RTTYr, LSB, USB, FM, WFM, IQ
VHF	VHF1 & VHF2 antenna connectors
Frequency coverage	70 - 225 MHz (usable up to 240 MHz)
Preselection ¹	70 - 112 MHz band 112 - 137 MHz band 137 - 174 MHz band 174 - 225 MHz band (usable as wideband IF)
Attenuators ²	0 / 6 / 12 / 18 dB
Preamplifier gain	0 or 15 dB
Switchable DC injection (bias)	5 V +/-5%, 80 mA (for each VHF channel)
Sensitivity	less than -13 dBuV (125 MHz, FM, 12 dB SINAD, 2 Msps, preamp ON) less than -12 dBuV (125 MHz, FM, 12 dB SINAD, 0.25 Msps, preamp ON) less than -6 dBuV (100 MHz, WFM, 12 dB SINAD, 2 Msps, preamp ON) less than -5 dBuV (100 MHz, WFM, 12 dB SINAD, 0.25 Msps, preamp ON)
Minimum Detectable Signal _(MDS)	-132 dBm (125 MHz, 2 Msps, CW, BW 500Hz) -132 dBm (225 MHz, 2 Msps, CW, BW 500Hz)
Input clipping level	-6 dBm (225 MHz, 2 Msps)
Modes _(Software defined)	AM, CW/CWr, RTTY/RTTYr, LSB, USB, FM, WFM, DAB+, IQ
General	
Image rejection	better than 70 dB
ADC sampling rates	200 or 250 Msps
DDC sampling rates	250 Ksps, 500 Ksps, 1 Msps, 2 Msps
PC interface	5 Gbit/s USB 3.0 port
Power supply	9 Vdc, 2A
Operating temperature range	0 - 40 °C
Aluminum cabinet (WxHxD)	215 x 44 x 220 mm (feet included)
Weight	1680 g (without power supply)

1: each channel has its own preselection filters

2: each channel has its own attenuators

Declaration of Conformity (EC)

The product marked as

PERSEUS22

manufactured by

Manufacturer: Microtelecom S.r.l.
Address: Via del Gelso, 15
I-33100 UDINE (UD)

is produced in conformity to the requirements contained in the following EC directives:

- Radio equipment Directive 2014/53/EU
- EMC Directive 2014/30/EU
- Low Voltage Directive 2014/35/EU
- RoHS Directive 2011/65/EU

The product conforms to the following product specifications:

Radio, Emissions & Immunity:

EN 301 489-1 V2.2.3 (2019-11)
EN 301 489-15 V2.2.1 (2019-04)
EN 301 783 V2.1.1 (2016-01)
EN 55032:2015/A11:2020
EN 55035:2017/A11:2020

Safety:

EN 62368-1:2014

and further amendments.

This declaration is under responsibility of the manufacturer

Microtelecom S.r.l.
Via del Gelso, 15
I-33100 UDINE (UD)

Issued by

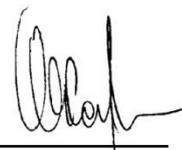
Name: Franco Milan
Function: CEO of Microtelecom S.r.l.

CANEVA

Place

December, 15th 2023

Date


Signature