GLOBAL AUDIO SOLUTIONS



RiTA

USER MANUAL

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ABOUT THIS MANUAL

This manual describes RiTA 2.8.2 for Windows and macOS. RiTA changes from time to time — this document is a Word file so that it can be kept up to date: chapters, text and screenshots can be edited, added or removed freely as the application evolves.

All the screenshots in this manual are in Spanish and come from an example session with demonstration data, not a real project. RiTA is also available in Spanish, Portuguese, French and Chinese; the language is chosen in the RiTA > Language menu and applies at once, without restarting.

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1. INTRODUCTION

RiTA is an application for acoustic measurement and control of sound systems: it measures the response of loudspeakers and rooms, calculates and applies equalization, time-aligns different sources (for example a subwoofer and a top box) and sends the result to an audio processor or leaves it ready to export. It replaces the work that used to be split between a dual-channel analyzer, a spreadsheet with each channel's settings, and the processor's own software.

This manual covers RiTA from top to bottom: the main window, the equalizer of each DSP channel, the signal generator and the different measurement types, the Tools (Auto Align, Auto EQ, AVG Alignment and Polar Pattern), projects, the PDF report, preferences, export to processors and the API for controlling RiTA from outside. Each chapter can be read on its own: you do not need to have read the previous ones to understand a specific one.

1.1 WHAT RITA NEEDS

- Windows: Windows 11 (version 23H2 or later) or Windows 10 (version 22H2), 64-bit. A Windows older than those does not open RiTA: update it before installing.
- Mac with Apple Silicon (M1, M2, M3, M4… chips): macOS 13 or later, up to macOS 27.
- Mac with an Intel processor: macOS 12 or later, up to macOS 27.
- A 64-bit Intel or AMD processor (AVX2 recommended) and 8 GB of RAM (16 GB recommended).
- A sound card with at least one output and one input. To measure with an electrical reference, a two-channel card is enough; for several microphones at once (Live TF, AVG Alignment) you need a card with as many inputs as microphones.
- To export to an external processor: the network or USB connection that processor uses (RiTA does not replace the manufacturer's software, but it can generate the file or talk directly to some models, see chapter 17).

1.2 CONVENTIONS IN THIS MANUAL

- Menu names are written as `RiTA > Preferences`: the menu and, after the arrow, the option inside it.
- Names of buttons, fields and tabs are in **bold**, as they appear on screen.
- The screenshots are in Spanish; if RiTA is set to another language, the same controls are in the same place, only the text changes.
- Every control in RiTA has a tooltip that appears when the mouse rests on it, including the small windows, the tables and the headers of the DSP table, in RiTA's language.

2. INSTALLATION

RiTA is installed with the installer for each system: an .exe file on Windows and an installer for Mac, which comes in a version for Apple Silicon (M1, M2, M3, M4... chips) and another for Intel. You do not need to install MATLAB or any other tool, as RiTA is a standalone application.

2.1 MAC

1. Unzip the .zip file you were sent and double-click the installer for your Mac: Apple Silicon or Intel.
2. If macOS does not let you open it, go to **System Settings > Privacy & Security** and click **Open Anyway**.
3. Follow the installer steps with the options it suggests. RiTA is installed in **Applications > GlobalAudioSolutions > RiTA**.
4. Open RiTA. The first time, the license agreement and the activation appear (chapter 3).

> **Note:** The first installation and the first launch take several minutes, because macOS runs its security checks. Nothing may appear on screen for a while: be patient and do not open RiTA twice. After that it is much faster.
>
> **Note:** The first time you measure, macOS asks whether RiTA may use the microphone: click **Allow**. Without that permission RiTA receives no audio.
>
> **Note:** On some Macs, when RiTA opens, macOS asks to install the “command line developer tools”. This message comes from macOS, not from RiTA: you can click **Not Now**. It may appear again the next time RiTA is opened.

2.2 WINDOWS

1. Unzip the .zip file you were sent and double-click the installer (.exe).
2. If “Windows protected your PC” appears, click **More info** and then **Run anyway**. If Windows asks for permission to make changes, click **Yes**.
3. Follow the installer steps to the end.
4. Open RiTA from the desktop shortcut or the Start menu. The first time, the license agreement and the activation appear (chapter 3).

2.3 IF YOU ALREADY HAVE A PREVIOUS VERSION

Do not uninstall the previous version: install 2.8 over it. When you open it, it will ask for the new license (section 3.2).

2.4 CHECKING FOR UPDATES

RiTA tells you when a newer version is available. At startup, with the window already open, it looks on the Global Audio Solutions server for the latest published version; if it is newer than yours, a notice appears with three buttons, in a window of its own that says the new version and its news. At the top right it has a language selector that changes the notice and its news and also the language of RiTA, as RiTA > Language does, and saves it. Enter downloads; Escape or the X is Later:

- **Download**: opens the download page in the browser.
- **Later**: closes the notice without more.
- **Do not notify me about this version**: it does not warn about that version again, but it does about the next one.

The `RiTA` menu has, below About, two options: **Check for Updates...**, which looks whenever you want and always answers (a new version, you already have the latest, or it could not be checked), and **Check for Updates at Startup**, which switches the check at startup on or off.

> **Note:** RiTA does not download or install anything, and does not send any data of yours: it only reads a file from the server. Without internet, or if the server does not answer, startup goes on as usual and says nothing.

2.5 UNINSTALLING

Remove RiTA with the uninstaller of your system. Before that, if you want to use the license on another computer, deactivate it from RiTA (section 3.3).

> **Note:** Uninstalling RiTA does not deactivate the license: deactivation is a separate action, **License Deactivation**, in the RiTA menu.

3. LICENSE

RiTA is activated for each computer with a signed activation key. The license is checked when it starts, and it can be deactivated on one computer to take it to another.

3.1 LICENSE AGREEMENT

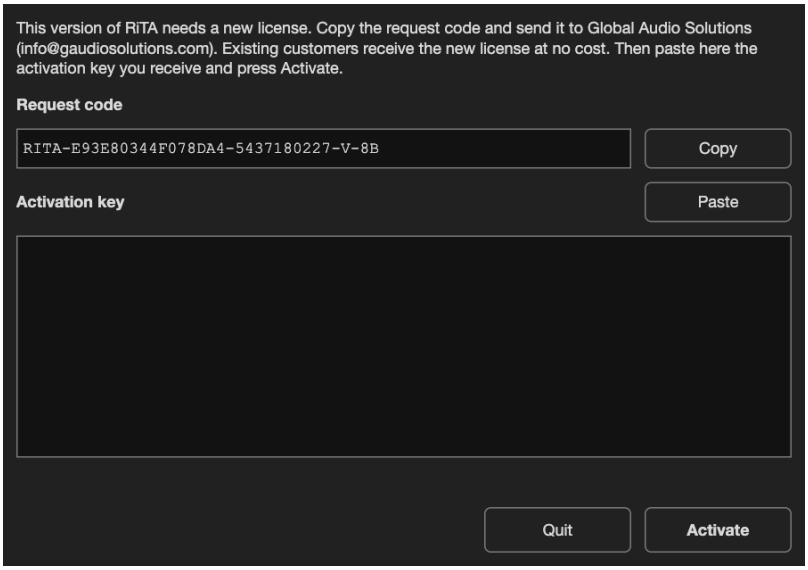
The first time RiTA opens, the license agreement (EULA) appears. To continue, press Yes. If it is not accepted, RiTA closes.

> **Note:** The text of the agreement is in English; RiTA does not translate it.

3.2 ACTIVATION

RiTA 2.8 uses a new license system. Even if RiTA was already activated, the first time 2.8 is opened a new license has to be requested. It is free for customers who already had RiTA.

After the license agreement, the **Activate RiTA** window appears, with the **Request code** of this computer:



The activation window, with the request code of this computer.

1. Click **Copy** to copy the request code. This code identifies your computer.
2. Send it by email to `info@gaudiosolutions.com`, with your name.
3. You will receive a .txt file with your activation key. Open it, select all the text (Cmd+A on Mac, Ctrl+A on Windows) and copy it (Cmd+C or Ctrl+C).
4. In the RiTA window click **Paste**: the key appears in the **Activation key** box.
5. Click **Activate**. RiTA confirms that it is activated and starts. It will not ask again on this computer.

> **Note:** The key only works on the computer that sent the request code. If it is not valid, the window says why (another computer, another program, or copied incompletely), and you can try again as many times as needed.

Note: Paste cleans up what is pasted: line breaks, the text of the email around the key and the "> " marks of a forwarded email. If the key is pasted by mistake into the request code box, it moves by itself to its own.

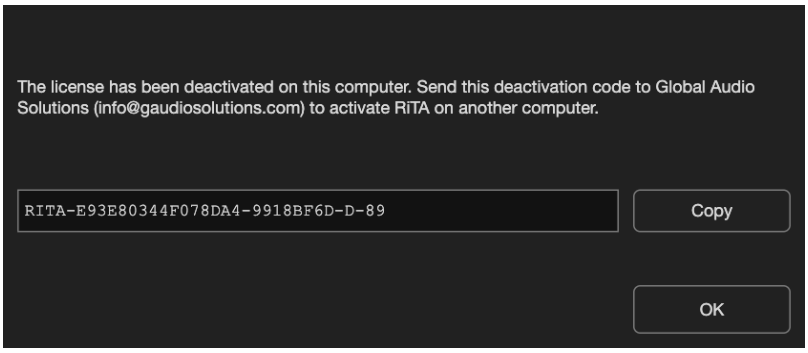
Note: The license windows have a language selector at the top right (English, Español, Português, Français and 中文). The one chosen stays as the language of RiTA, also the following times. Enter sends the request or activates, and Escape quits (there are no shortcuts in the waiting window). If the license is reviewed or rejected, the reason comes out in the language of RiTA.

Note: While you wait for the key you can close the window with **Quit**: the request code of the computer does not change. The window follows the light or dark theme of RiTA.

3.3 DEACTIVATION

The license is for one computer. To use RiTA on another one, first deactivate it on the computer that has it.

1. Open RiTA on the computer that has the license and go to the menu **RiTA > License Deactivation**.
2. Confirm with **Deactivate**. RiTA deletes the key from that computer.
3. RiTA shows a deactivation code. Click **Copy** and then **OK**: RiTA closes.
4. Send that code to `info@gaudiosolutions.com`. On the new computer, follow section 3.2.



The deactivation code you have to send.

Note: Uninstalling RiTA does not deactivate the license. Before formatting, selling or replacing the computer, always deactivate it first.

3.4 GOOD TO KNOW

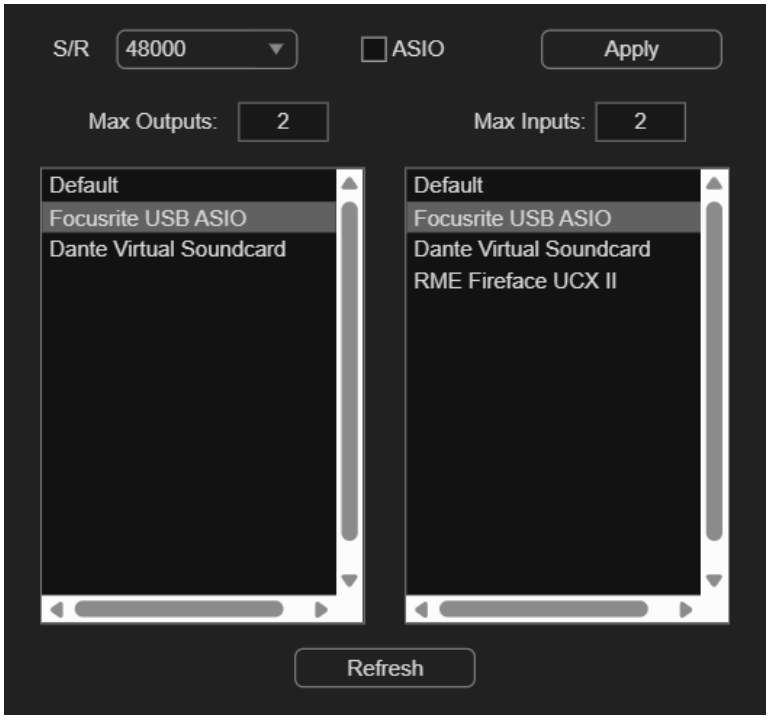
- You do not need to deactivate or uninstall anything to update RiTA.
- The license does not change when macOS is updated: the identifier of the computer no longer comes from the network card (before, with macOS Sequoia and macOS 27, it changed).
- The identifier of your license key appears in the footer of the DSP PDF report (chapter 15) and is saved in the `.rita` project (chapter 14).

4. GETTING STARTED

When you start RiTA for the first time, it asks whether to load the last saved configuration, import a configuration from another computer (a file from RiTA > Load Configuration) or start with the default values.

4.1 CHOOSING THE SOUND CARD

The `Devices > Audio Device` menu opens the device dialog: the sampling rate, whether ASIO is used, how many maximum inputs and outputs you want to use, and the lists of output and input devices offered by the operating system (or the installed ASIO drivers). Pick one from each list and click **Apply**.

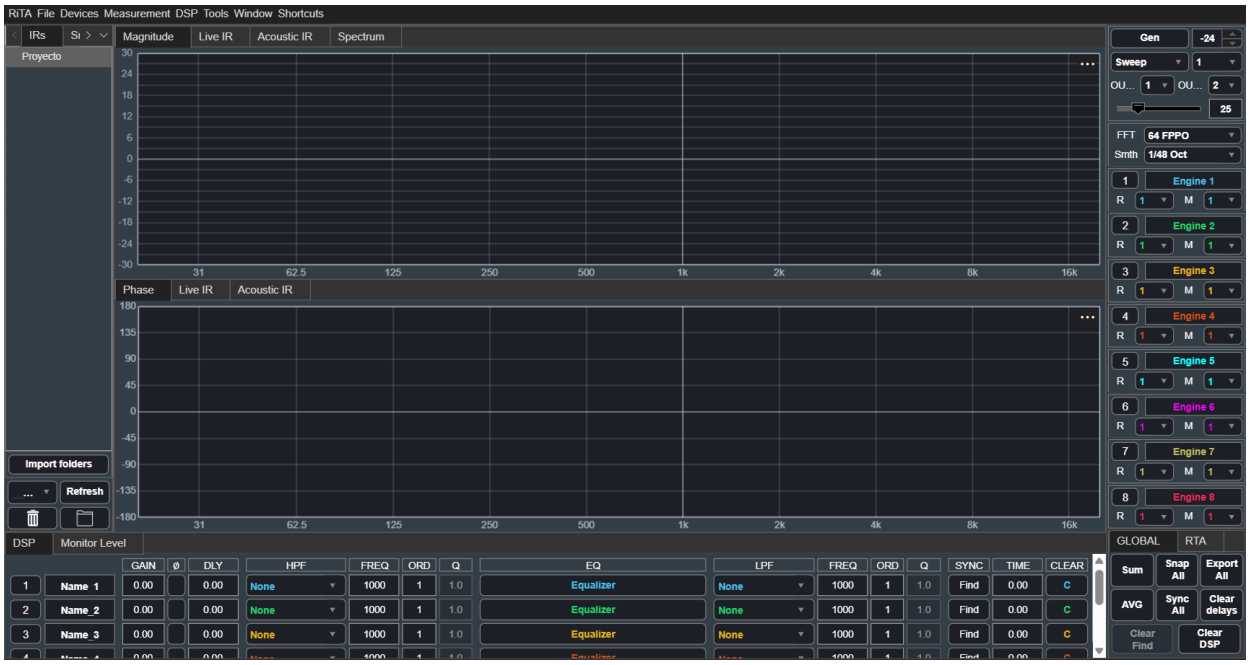


Devices > Audio Device: sampling rate, ASIO, and output and input lists.

- With ASIO ticked, the lists show the installed ASIO drivers instead of the system's generic devices.
- **Refresh** asks the operating system again for the available devices, useful if the card has just been connected.
- Max Outputs and Max Inputs limit how many channels of that card RiTA uses at most (the output and measurement channel drop-downs of each engine do not offer more than indicated here).

4.2 THE MAIN WINDOW AT A GLANCE

The whole working session lives in a single window, with no tabs to open and close: at the top the magnitude and phase graphs (or RTA, impulse response...), on the right the signal generator and the list of the 8 measurement engines, at the bottom the DSP table and, on the left, the Memory Bank with the saved measurements and Snapshots.



The main window just after opening, with no measurements yet.

From top to bottom and left to right:

1. Menu bar: `RiTA` (language, preferences, quit), `File` (projects and PDF report), `Devices`, `Measurements` (microphone correction, time window), `DSP` (export to a processor), `Tools` (Auto Align, Auto EQ, AVG Alignment, Polar Pattern and API), `Window` (show or hide panels) and `Shortcuts` (keyboard shortcuts, see chapter 19).
2. Graph panel, in the centre: magnitude and phase (or RTA with a single signal), with tabs to switch to the live impulse response or the one already synchronized with the DSP, or to the spectrum.
3. Memory Bank, to the left of the graphs: the saved measurements (RIs), the Snapshots and the RTA in tabs; below, the export format and the buttons to export.
4. Generator and engines, on the right: the test signal, its level and outputs, the FFT resolution and smoothing, and a row for each of the 8 measurement engines with its colour, its reference channel (R) and its measurement channel (M).
5. DSP table, at the bottom: one row per engine with its gain, delay, polarity, the two cut-offs (HPF and LPF), the button that opens its equalizer and the buttons to sync, export and clear; on the right, Sum, AVG, Sync All and the interface colour.

> **Note:** All panels can be hidden or shown from the `Window` menu to make more room for the graphs, for example when showing RiTA on a shared screen.

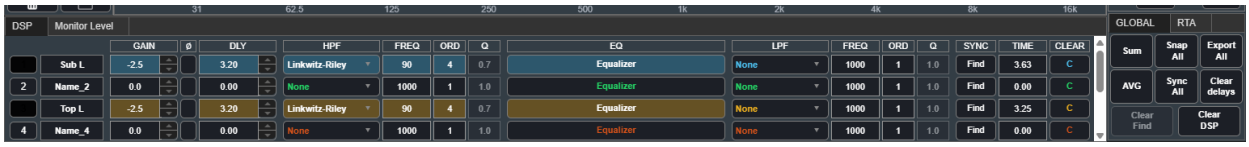
4.3 THE 8 MEASUREMENT ENGINES

RiTA measures up to 8 sources at the same time, called engines ("engines"). Each engine has its own colour (the same in the graph, in the DSP table and in the generator list), its reference channel and its measurement channel, its own complete DSP and its own saved measurement. A typical project uses one engine for each different type of box in the system (for example Sub, Top L, Top R, Front Fill...); you do not need one engine for each physical loudspeaker if several share the same processing. The button of each engine carries its number, from 1 to 8, the same as its power button in the DSP table.

- The name of each engine is typed in the **Name** field of its row in the DSP table; that name is also the one used when exporting its measurements and its DSP.
- The checkbox on the left of each row of the DSP table (the column without a header, before GAIN) is the one that switches the engine on: without it ticked, the engine does not measure and does not count for Sum, AVG or the PDF report.
- With `1 Meas. Channel` (Preferences > Transfer, chapter 16), ticking the measurement engine of one channel automatically turns off the others: only one can measure at a time. With the Spectrum signal it does not act: there each engine has its own channel (chapter 7).

5. THE DSP TABLE

The table at the bottom of the main window is RiTA's processor: what you see and adjust there is exactly what is sent to an external processor when exporting, and what is applied to the on-screen measurement to simulate how the system will sound with those settings. It has one row for each of the 8 engines.



The DSP table, with three engines switched on: the gain, delay, HPF cut and EQ button of each one are shaded with its colour while they act.

5.1 COLUMNS OF EACH ROW

COLUMN	WHAT IT DOES
Checkbox + Name	Switches the engine on and names it. Without the checkbox ticked, the engine does not measure.
GAIN	Output gain of the engine, in dB, with one decimal. The arrows to its right raise and lower it in steps of 0.5 dB, and the steps always land on that grid.
ø	Inverts the polarity (180°) of the output.
DLY	Output delay, in milliseconds. The arrows to its right raise and lower it one sample at a time (1000/fs ms), without going past the limits.
HPF / FREQ / ORD / Q	Low-cut filter: type (Butterworth, Linkwitz-Riley, Bessel...), frequency, order and Q.
EQ	Opens the Equalizer window of that engine (chapter 6): 20 parametric filters, Chingonizer, FIR and Alignment APFs. The button is shaded with the colour of the engine when something inside really acts (a band checked at 0 dB or the Chingonizer at 0 dB do not count), is white (dark with the light theme) while its window is open, and red if the Equalizer is in bypass.
LPF / FREQ / ORD / Q	High-cut filter, the same as the HPF but at the top of the range.
SYNC	Find: adjusts the delay of that engine so that its arrival matches that of the reference engine (see Sync All, below).
TIME	The delay that Sync has found or that has been typed by hand, in milliseconds. An arrival a little before zero comes out negative, also without a Find (for example, a 3D impulse comes out at -1.00 ms). Only what falls in the last 10% of the window counts as before zero; a later arrival (400 ms at 48 kHz, for example) is positive.
CLEAR	The C button of each row: returns that engine to its just-switched-on state, without touching the others.

Note: What is acting in an engine is lightly shaded with the colour of that engine, to see at a glance which ones have something on: the gain (if it is not 0 dB), the delay (if it is greater than 0), the polarity (if inverted) and the whole HPF and LPF cut-offs (if they have a cut-off chosen): the drop-down, the frequency, the order and, on the types that use it, such as Chebyshev and Elliptic, the Q. The M box (the measurement channel) of each engine is also shaded if its input has a mic correction curve, an inverted polarity or a level, on every engine that measures through it; Spectrum carries no correction and is not shaded. The shade is removed with the **Colour active processes** switch in Preferences > Live IR / DSP (chapter 16); the white of the EQ button with its window open and the red of the bypass are always shown.

5.2 THE CUT-OFFS (HPF AND LPF)

The two cut-offs of each engine are normal IIR filters, of the kind every processor already has: Butterworth, Linkwitz-Riley, Bessel or Elliptic, of order 1 to 8; with some Marani, also NXF (below). Unlike the filters in the Equalizer (chapter 6), these two are always there, one high-pass and one low-pass, and "None" as the type leaves them flat without removing them from the chain.

> **Note:** NXF is only on the Marani MIR FI, A, D and VA and on the MDA kDM (not on the MIR E, the kTM or the PDA, nor in the XOVER-IIR + FIR + 4 PEQ modes of the MIR, which go up to 24 dB/oct). Its order, from 1 to 8, is not dB/oct: it is the attenuation, from -40 dB (1) to -70 dB (7), and below -75 dB (8). If one cut is NXF, the other can only be None or NXF: when sending, the other goes as None and RiTA says so.
>
> **Note:** From version 2.8, the magnitude and phase that RiTA draws with an active low cut already include the real group delay of that filter, the same one it will have in the actual processor. Before, a low-pass for the bass (for example a Linkwitz-Riley of order 8 at 35 Hz) appeared to arrive a few milliseconds earlier than it really would; an alignment of sub and tops made on that old view should be repeated.

5.3 SUM, AVG, SYNC ALL AND CLEAR

To the right of the table, several buttons act on the set of switched-on engines:

- **Sum** draws the acoustic sum of all the switched-on engines: the response the complete system will have at the measurement point, with the gain, delay and EQ of each one already applied.
- **AVG** calculates the average of the selected engines (those marked as "selected", not simply switched on) and draws it in grey, thicker than the others. How it averages (complex, magnitude in dB or absolute) is chosen in Preferences > Transfer > Spatial Average. AVG is also what AVG Alignment exports (chapter 12) and what the API's mobile client sees (chapter 18).

Sum and AVG do not go together: with one on, the other's button is disabled until it is switched off, and from the mobile app or the API, switching one on switches the other off first. While they are on, they redo themselves with whatever is done to the engines: switching one on or off, loading or importing a measurement, changing its DSP, the FFT or the Spatial Average. With every engine off, the graph shows neither the sum nor the average.

- **Sync All** clicks Find on all the switched-on engines at once, aligning them all against the chosen reference.
- **Clear delays** sets the TIME field of all the engines to 0, without touching the rest of their DSP or their measurement.
- **Clear Find** removes the Find in one go: the measurements go back to their own arrival. It can only be pressed when a Find is set; while there is one, Sync All and Clear delays are disabled.
- **Clear** asks what you want to clear before doing anything, with Everything as the recommended option:

OPTION	WHAT IT DELETES
DSP	Gain, delay, polarity, cut-offs and the whole Equalizer of the 8 engines; the measurements are recalculated without that DSP, with their own Find and arrival, redoing Sum and AVG if they were switched on.
Measurements	The impulses, their traces, their selection, their arrival, the Find, Sum and AVG. The DSP and its controls stay as they were: a new measurement comes out already with that DSP applied.
Everything	DSP and measurements, and in addition the engine names go back to Name_1, Name_2...

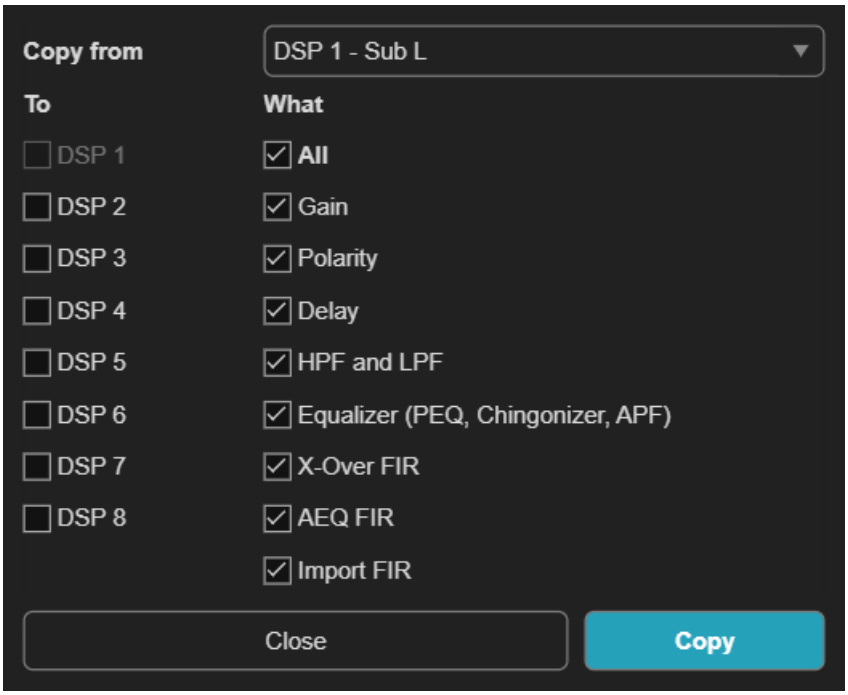
5.4 THE THEME: DARK OR LIGHT

The `RiTA > Theme` menu, below Language, switches the whole RiTA interface between a **Dark** theme, designed for working in a darkened room or live, and a **Light** one for the office. It does not affect any DSP or measurement setting.

RiTA remembers the theme like the language: it is saved when chosen and RiTA always starts with the last one, also if Defaults is chosen at startup. Loading a configuration or opening a project does not change it.

5.5 COPY DSP AND LINK DSP

The `DSP` menu has two options to carry the DSP of one engine over to others: **Copy DSP** copies it once, and **Link DSP** also keeps them tied together, so the follower always has the same as the master. Both open the same window: on the left you choose the source engine and the target engines (with their checkbox), and on the right which parts are carried over, with All ticked by default:



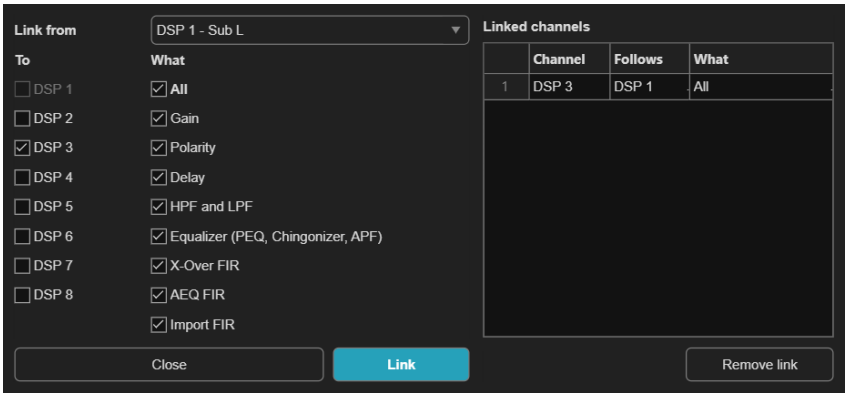
Copy DSP: engine 1 towards the others, with all groups ticked.

GROUP	WHAT IT INCLUDES
Gain	The output gain.
Polarity	The polarity.
Delay	The output delay.
HPF and LPF	The two cut-offs, with their type, frequency, order and Q.
Equalizer (PEQ, Chingonizer, APF)	The 20 parametric filters, the Chingonizer and the two Alignment APFs, together.
X-Over FIR	The linear-phase FIR designed with Edit (chapter 6).
AEQ FIR	The FIR left in place by Auto EQ.
Import FIR	The FIR loaded with Import.

Each group is copied or linked separately, so one engine can follow another only in gain and delay, for example, and have its own EQ.

HOW A LINKED ENGINE LOOKS

With **Link** instead of **Copy**, the window adds, on the right, a table with the links that already exist (engine, whom it follows and which groups) and a **Remove link** button to undo the selected one, without losing the values it has at that moment.

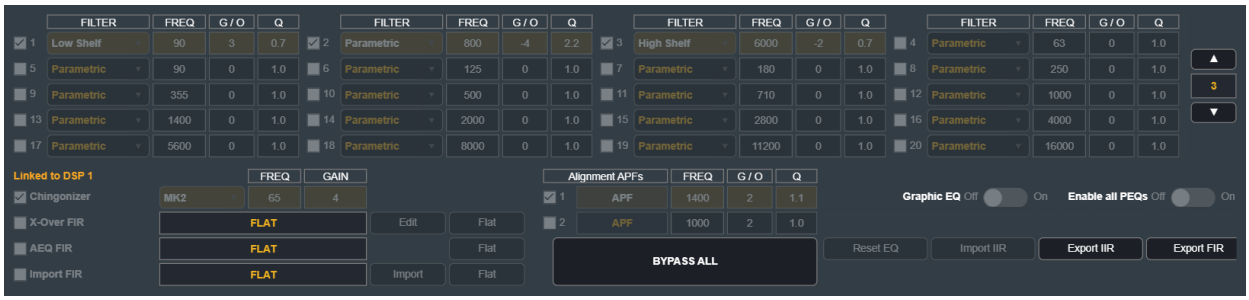


Link DSP: engine 3 linked to 1, in all groups.

The **Equalizer** button in the DSP table of the follower engine changes to say **Linked to DSP X**, and in the row and in the Equalizer window exactly what is linked is switched off: the rest of the engine can still be edited by hand.



The row of engine 3, linked to 1: the Equalizer button says "Linked to DSP 1".



The Equalizer window of engine 3: as it is linked in all groups, everything appears locked.

Note: A follower engine cannot be the master of another or have two masters at once: there are no chains or loops. Linking again an engine that already followed another replaces the previous link with the new one.

6. THE EQUALIZER OF EACH DRIVER

The **EQ** button in each row of the DSP table (chapter 5) opens the **Equalizer** window for that driver: up to 20 parametric filters, the Chingonizer, three FIR filters and the two Alignment APFs used by Auto Align. Everything marked here is added to the HPF/LPF cuts in the table and is counted in the response that is shown, exported and sent to the processor. How many parametric filters are shown, and whether the FIR, the Chingonizer and the APFs are, is chosen in Preferences (below).



The complete Equalizer window: the 20 filters in rows of 4, the Chingonizer, the three FIR and the two Alignment APFs.

> **Note:** If the driver is linked to another one with **Link DSP** (chapter 5), the button at the top says **Linked to DSP X** and whatever is linked appears locked: only what does not follow that other driver can be changed by hand.

What is acting is shaded with the colour of the engine, as in the DSP table (chapter 5): the whole row of each checked filter, within the bands in use and with gain (a bell or a shelf at 0 dB does nothing, so it is not shaded), the Chingonizer, the Alignment APFs and the name of each active FIR. It is removed with the **Colour active processes** switch in Preferences (chapter 16).

6.1 THE 20 PARAMETRIC FILTERS

The filter types depend on the **DSP Type** of Preferences (chapter 16). With RiTA and Kingray they are the usual ones, five in all. With Meyer Sound Galaxy there are three (Parametric, U-Shaping and APF), in fixed rows (see “Meyer Sound Galaxy” below). With a Marani they are those of its software, with its names, and they change with the model and the mode:

MODEL	FILTER TYPES
MIR FI, A, D and E	20: Bell, Bell-Adaptive Q, Bell-Classic Q, Hi-Shelving (1st, 2nd, Slope and VariQ), Lo-Shelving (1st, 2nd, Slope and VariQ), Low Pass and High Pass (1st, 2nd and VariQ), Notch, Band Pass, All Pass and FIR RevPhase.
MDA kTM	18: those of the MIR without Bell-Adaptive Q and Bell-Classic Q.
MDA kDM	17: those of the kTM without the Slope ones, and with Band Pass.
PDA and VA DF	16: those of the kDM without Band Pass.

The G / O column is a gain on the bells and the shelving filters, and is not used on Low Pass, High Pass, Band Pass and Notch; on the Slope ones, the Q column is the slope, from 6 to 12 dB/oct, and it does not go to octaves; and on the shelving filters and the 1st and 2nd order passes the Q is not used. With a Marani, the Q reaches that of its table (up to 128, and from 4 to 104 on the Notch), and choosing Notch sets it to 70. Auto EQ keeps working with the normal bell, between 0.4 and 10.



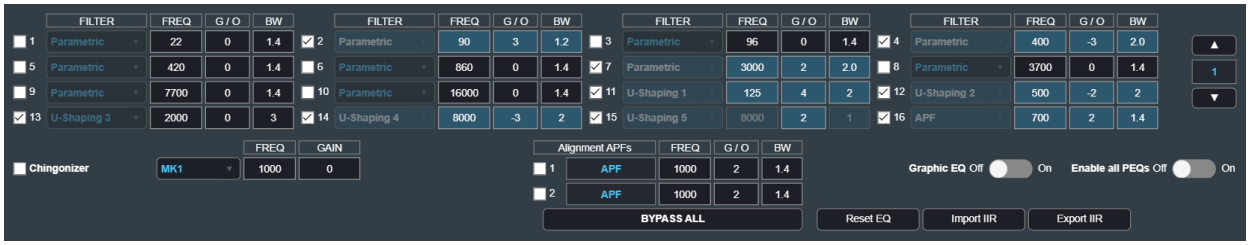
The Equalizer window with a Marani MIR FI: the filter types of the model in the drop-down of each filter.

Each filter has its checkbox, its type, its frequency, the G / O column and its Q. They go in rows of 4 (1 to 4 in the first, 5 to 8 in the second, and so on up to 5 rows) and only the ones chosen in Preferences are shown. The free filters (switched off, parametric and at 0 dB) are spread over the whole band, from 22 Hz to 16 kHz, on a logarithmic scale according to how many there are: with 7 filters, at 22, 67, 200, 600, 1800, 5400 and 16000 Hz. That leaves them ready so that you only touch the ones you need.

TYPE	WHAT G / O IS
Parametric	Gain in dB, with the chosen Q.
Low Shelf / High Shelf	Shelf gain in dB.
APF	Order of the all-pass filter, 1 or 2 (it has no gain: it only changes the phase). With order 1 it has no Q and the Q field is disabled. The GALAXY only has order 2 APFs.
FIR RevPhase	Order, 1 or 2 as for the APF, but calculated as linear-phase FIR coefficients instead of IIR; it is sent together with the rest of the FIR of that driver (see below), not as a filter of the processor. With order 1 it has no Q either.

MEYER SOUND GALAXY: FIXED FILTERS AND U-SHAPING

With the Meyer Sound Galaxy DSP Type (chapter 16) the window has a fixed layout, like the unit, and the type of each filter is locked: on an output, 10 bells (Parametric), 5 U-Shaping bands and 1 APF; on an input, 5 bells and 5 U-Shaping bands, with no APF. PEQ Bands is fixed too. What was already set moves to its place, and what does not fit is switched off and RiTA warns about it.



The Equalizer window with Meyer Sound Galaxy: 10 bells, 5 U-Shaping bands and the APF.

- The **APF** is always order 2, because the GALAXY has no order 1. It applies to the Equalizer, the Alignment APFs, Import IIR, the API and the HF+HF Auto Align. When switching to this type, an order 1 APF becomes 2 and RiTA warns about it; with the RiTA type, an order 1 APF sent to a GALAXY is not sent and the warning says it only has second order APFs.
- The **U-Shaping** bands U1 to U4 carry **gain** (±15 dB), **cut** (the frequency, in the frequency column) and **order** (in the Q column): each order is 6 dB/oct, from 1 to 8 on U1 and U2 and from 1 to 6 on U3 and U4. The cuts go from 20 to 2500 Hz on U1, 40 to 5000 on U2, 80 to 10000 on U3 and 160 to 20000 on U4. U5 only has gain.

- The bands are not loose filters: each cut is the transition between two bands, so a band does not reach its gain if its cuts are close, and moving a cut pushes the next one away, as on the unit.
- With the Chingonizer, U1, U5 and the cut and order of U4 are disabled.
- Export IIR does not carry the U-Shaping and says so: it only exists in Meyer. Going back to another DSP Type removes it, and RiTA warns if it was checked.

> **Note:** This comes from comparing against Compass curves (92 curves of the virtual GALAXY); it has not been tested with a real GALAXY.

- **Enable all PEQs** (in the top right corner) checks or unchecks all 20 filters at once. Checking any filter of a switched-off driver turns that driver on in the DSP table (the checkbox of the row, not the measure one); unchecking or changing values does not change any driver's on checkbox.
- **PEQ Bands** (in Preferences, chapter 16) sets how many of the 20 filters the eight engines use, from 4 to 20 (20 by default); it is the same number for all of them. The filters left out are switched off and are not shown in the window, and they do not count: not in Enable all PEQs, which checks only those in use, nor in Auto EQ, which does not count them as free, nor in Import IIR, which does not go past that number. It is useful to avoid going over the PEQs the processor has. It is saved with the configuration and with the project.
- **Graphic EQ** draws the points of the checked filters directly on the magnitude graph of the main window, and they can be dragged with the mouse to change frequency and gain without returning to this window. It is also switched on and off with the **Graphic_EQ** option of the right-click menu of each engine, which shows a tick when it is on for that engine; each click switches it on or off, also after touching the channel cuts, which do not hide the points.

6.2 WHAT THE WINDOW SHOWS

In `Preferences > Live IR / DSP` you choose what the Equalizer window shows, for all the engines: how many PEQ (**PEQ Bands**) and whether the **FIR**, the **Chingonizer** and the **Alignment APFs** are shown. Everything comes checked.

- If one of those parts is hidden, its row disappears from the window and the window adjusts to what is left; without FIR, Export FIR is not shown either.
- What is hidden does not act: the hidden FIR, Chingonizer and APFs are switched off in all the engines, without being erased, and when shown again they come back checked as they were. What is sent or exported to a processor is what is shown.
- Without FIR, Auto EQ only offers IIR; without Alignment APFs, Auto Align does not offer the option with APF (LF+HF) nor puts APFs in HF+HF, and says so.

The arrows at the top to change engine are smaller and carry only the number of the channel; the name stays in the title of the window.

6.3 THE CHINGONIZER

The Chingonizer is a two-band shelf filter (one low, one high) designed to shape the overall tonality quickly without using two of the 20 parametric filters. It has two versions, MK1 and MK2, which change the slope of each shelf; frequency and gain are adjusted just as on a normal filter.

6.4 THE ALIGNMENT APFS

To the right of the FIR filters there are two more all-pass filters, the Alignment APFs, kept apart from the 20 parametric ones on purpose: they are the ones Auto Align writes (chapter 10) when aligning one driver with another, and each time Auto Align is run again on that driver its two Alignment APFs are replaced entirely, without touching the rest of the Equalizer. They can also be adjusted by hand, with their checkbox, frequency, order (G / O) and Q, exactly like an APF among the 20 filters.

> **Note:** Enable all PEQs does not check or uncheck the Alignment APFs: it only affects the 20 parametric filters. This way all the equalization of a driver can be switched off without losing the alignment calculated by Auto Align.

6.5 THE BYPASS

The **BYPASS ALL** button, under the Alignment APFs in the Equalizer window of each engine, is for comparing with and without equalization. When it is pressed it turns red (**BYPASS ACTIVE**) and RiTA draws that engine without anything from that window: the 20 filters, the Chingonizer, the three FIRs and the two Alignment APFs, without unchecking anything. The Equalizer button of that engine in the DSP table also turns red while it lasts.

- It is on-screen only: what is sent to the processor with Send, Export IIR and Export FIR, and the PDF report, still carry what is checked.
- It is not saved with the project or the configuration, and Clear removes it.
- With the bypass on, Auto EQ and Auto Align cannot be run on that engine: they warn that it has to be turned off first.

6.6 THE FIR FILTERS: THREE ROWS

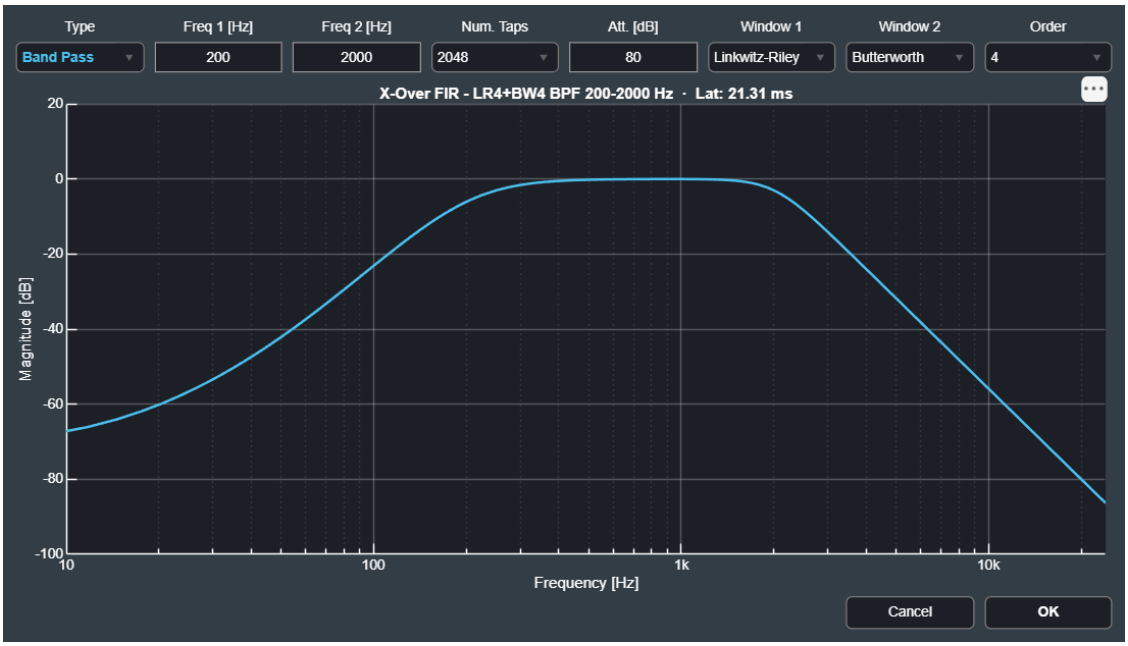
Below the Chingonizer there are three FIR rows, each with its checkbox, its name and its Flat button. They add up with each other and with the rest of the chain. Next to the name, each row says the latency of its FIR (for example "f.txt · Lat: 5.31 ms"), which is where the peak falls: a linear-phase one of 512 taps at 48 kHz gives at most 5.3 ms, and a minimum-phase one almost 0. Without a FIR, the row only says "FLAT". The Edit window of the X-Over FIR carries it in its title too:

ROW	WHERE IT COMES FROM
X-Over FIR	A linear-phase FIR designed inside RiTA, with the Edit button.
AEQ FIR	The one left by Auto EQ when calculating in FIR or IIR+FIR mode (chapter 11). It cannot be loaded by hand: only Auto EQ writes here.
Import FIR	A FIR loaded from outside with the Import button (a coefficient file: txt, csv, wav, fir or F32).

All three can be on at the same time: they add up with each other and with the `FIR RevPhase` of the 20 parametric filters. **Flat** removes a row without deleting what it had, in case it is wanted again later.

Pressing **Edit** on the X-Over FIR opens its designer: the filter type (low pass, high pass or band pass), the cut-off frequencies (**Freq 1**, and **Freq 2** only in band pass, which is the upper cut), the number of coefficients (taps), the attenuation, the design window (**Window 1**, and **Window 2** only in band pass) and the **Order**. The graph

at the bottom shows the response of the filter as it stands, updating at the moment any value is changed; at the bottom right, **OK** keeps the design and **Cancel** (or the X, or Escape) leaves it as it was when the window was opened.



X-Over FIR design: a band pass from 200 Hz to 2000 Hz with 2048 taps, Linkwitz-Riley of order 4 on the lower cut and Butterworth on the upper one, with its OK and Cancel buttons.

The **Window** dropdown chooses how the slope is made:

WINDOW	WHAT IT GIVES
Kaiser, Chebyshev, Hann, Hamming, Blackman, Blackman-Harris, Rectwin, Gauss	A windowed filter, as steep as the taps allow, or with the Order that is chosen (below).
Butterworth	The magnitude of an analogue Butterworth of the chosen order (1 to 8).
Linkwitz-Riley	The magnitude of an analogue Linkwitz-Riley, which is two Butterworths of half the order in a row. It only has even orders (2, 4, 6 and 8).

In band pass, each cut is designed apart with its window and then they are joined: **Window 1** is the one of the lower cut (Freq 1) and **Window 2** the one of the upper cut (Freq 2); "Same as 1", in Window 2, is the same as Window 1 (in the API it is Same). So one cut can be Linkwitz-Riley and the other Butterworth, or a window.

Each unit of **Order** (1 to 8) is 6 dB per octave. If one of the two windows is Butterworth or Linkwitz-Riley, the dropdown is their order and it applies to both; if one is Linkwitz-Riley, the order is even. Butterworth and Linkwitz-Riley are designed with exact linear phase, with no phase rotation: the FIR only sets the magnitude, and it is truncated with a Kaiser window at the attenuation asked for. The taps limit how far down the slope is followed: with few taps and a low corner frequency the filter hardly filters, and a low, steep corner needs more taps. The filter name carries its abbreviation in front (for example "BW4 LPF 1000 Hz" or "LR4 HPF 120 Hz"; with two different ones in band pass, "LR4+BW4 ...").

With one of the usual windows, **Order** is **Auto** (the slope of 1/6 octave as always) or 2, 4, 6 or 8. With a number, RiTA looks for the taps that get closest to a Linkwitz-Riley of that order, down to -40 dB and without going over

Num. Taps. It is only a likeness: the taps change how wide the fall is, not its shape (with Blackman at 1 kHz, 1.9 dB rms from an LR8 and 4.1 from an LR4). The name says so with a "~" ("~LR4 LPF 1000 Hz").

LATENCY OF THE X-OVER FIR

The taps are the maximum length of the FIR. With any window RiTA uses only the ones the slope needs and fills the rest with zeros: with the usual windows, those of a slope of 1/6 octave between -3 and -60 dB (-40 or -20 dB on the windows that do not go down that far); if the taps available are not enough, it uses all of them. So, with the same taps, a higher cut has less latency. The latency is in the window title. For example, a low pass with 4096 taps at 48 kHz:

CUT	KAISER WINDOW	LINKWITZ-RILEY OF ORDER 4
1 kHz	12.15 ms	6.90 ms
2 kHz	6.06 ms	3.44 ms
4 kHz	3.02 ms	1.71 ms

With 512 taps it hardly changes up to about 2.5 kHz, because almost all of them are needed. The latency is the real one of the filter: what is trimmed when sending it to a processor is made up by the channel delay.

> **Note:** The Preferences taps are those of the FIR RevPhase filters: the X-Over FIR has its own in Edit and they do not limit it. The AEQ FIR and the Import FIR stay as before.
>
> **Note:** The attenuation (Att.) only has an effect with the Kaiser, Chebyshev, Butterworth and Linkwitz-Riley windows.
>
> **Note:** Designing an X-Over FIR in Edit, ticking one of the three FIRs or importing one switches that engine on in the DSP table (the button of its row, not the measure checkbox), as ticking a filter does. It only happens in the window, not through the API. As the AVG averages the selected engines, that engine joins the AVG: if an AVG is already calculated, it changes because a FIR (or a filter) was touched.

6.7 EXPORTING AND IMPORTING FROM THE EQUALIZER

The **Import IIR**, **Export IIR** and **Export FIR** buttons, in the bottom right corner, move what is checked in the window, without going through a connected processor (for that, see External Control, chapter 17). To their left is **Reset EQ**, which imports and exports nothing:

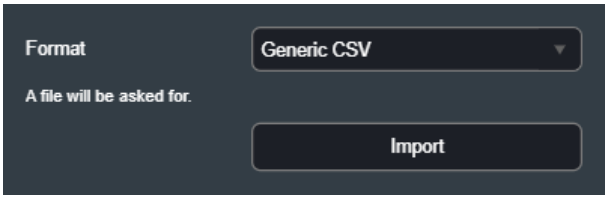
RESET EQ

Reset EQ leaves the equalizer of the driver as freshly opened, after asking: the bands, the Chingonizer and the Alignment APFs go back to their starting values and are switched off, and the three FIR are unchecked without erasing their coefficients. It only touches this window: the gain, delay, polarity and cut-offs of the driver stay as they are.

IMPORT IIR

Import IIR brings in filters from outside and puts them into the 20 parametric filters of the driver, replacing them entirely: choose the format (Generic CSV, R1 d&b, PK Sound Dynamics, RCF RDNet, FabFilter Pro-Q 4, FabFilter Pro-Q 3 or Kirchhoff-EQ) and the file or, with PK Sound, paste the copied JSON. The types are converted to Parametric or shelf depending on what the file contains; a filter that RiTA cannot convert, or that exceeds the 20, is counted at the end in a notice. With Pro-Q 4 there is no file: what has been copied in Pro-Q is pasted from the clipboard (right-click the preset name and Copy); if the clipboard does not hold a Pro-Q 4

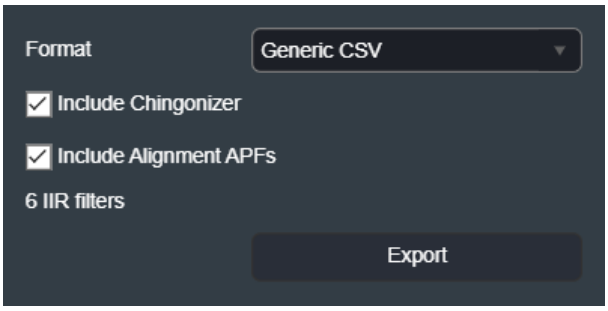
preset, RiTA warns and does not touch the driver. Pro-Q 3, on the other hand, does use a file: choose a .ffp, saved from its preset menu. Kirchhoff-EQ also uses a file: a .keq, saved from its preset menu. What Kirchhoff-EQ has and RiTA does not (bells or shelves with another slope, classic-equipment types...) is left out, with the usual notice. With Pro-Q and with Kirchhoff-EQ the whole channel is brought in, as with RCF RDNet: the gain, the polarity, the HPF and LPF that RiTA recognizes (Butterworth 1 to 8, Linkwitz-Riley 2, 4, 6 and 8, and Bessel 1 to 8) and the filters; a cut that is not one of RiTA's stays at None, with a notice. The delay of the channel is not touched.



Import IIR: format and file, before replacing the 20 filters of the driver.

EXPORT IIR

Opens a dialog with the output format (Generic CSV, R1 d&b, PK Sound Dynamics, RCF RDNet, FabFilter Pro-Q 4, FabFilter Pro-Q 3 or Kirchhoff-EQ) and two checkboxes to include, in addition to the checked parametric filters, the Chingonizer and the Alignment APFs. Each checkbox can only be ticked if that element is switched on; if there is nothing to export, the button is disabled.



Export IIR with 6 filters ready: 3 parametric, the Chingonizer and the 2 Alignment APFs.



Export IIR with the FabFilter Pro-Q 4 format: the button is Copy and it carries the whole channel except the delay.

With **FabFilter Pro-Q 4** the button says **Copy**, as with PK Sound: it saves no file, it copies the preset to the clipboard and warns; in Pro-Q 4, right-click the preset name and Paste. The whole channel except the delay is exported, because Pro-Q has no delay: the HPF and LPF, the filters, the gain in Output Level (with the +G of the MK2 if there is one) and the polarity in Output Invert Phase; the Chingonizer and the Alignment APFs, if ticked in the list. Bells, shelves, APFs and the HPF sound the same; an LPF matches up to its cut-off, and above it Pro-Q falls a little more slowly (up to 1.8 dB at -20 dB) and the phase does not match: it is a limit of Pro-Q.

What does not go through, and RiTA warns about it when exporting, is the FIR, the FIR RevPhase, elliptic, Chebyshev and NXF cuts, the FIR GAS, the Marani types, the delay and whatever does not fit in the 24 bands of Pro-Q.

FabFilter Pro-Q 3 carries the same as Pro-Q 4 (the whole channel except the delay) and sounds the same, but it uses a file: the button says **Export** and asks where to save a .ffp, which Pro-Q 3 opens from its preset menu. Pro-Q 3 has no All Pass filter: the APFs and the Alignment APFs are left out, and RiTA warns about it.

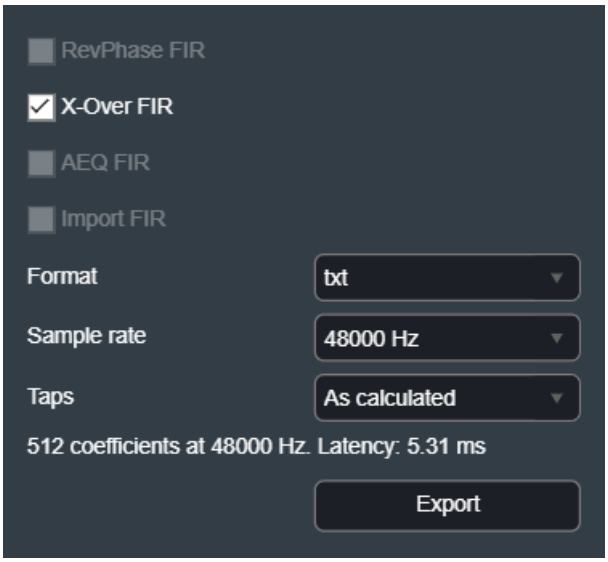
Kirchhoff-EQ also carries the whole channel except the delay (HPF, LPF, filters, gain and polarity; the Chingonizer and the Alignment APFs, if ticked) and uses a file: the button says **Export** and asks where to save a .keq, which Kirchhoff-EQ opens from its preset menu. It sounds the same as in RiTA in the lows and mids; above about 2 kHz, the bells and shelves of Kirchhoff-EQ, which it designs as analog, drift apart by a few tenths of a dB, and RiTA warns about it when exporting. First-order APFs do not go through, because Kirchhoff-EQ does not have them, and that is warned about too.

> **Note:** When exporting to d&b (R1) or RCF (RDNet), a shelf filter takes up two of the available slots, not one; all-pass filters (APF) cannot be exported to either d&b or PK Sound.

EXPORT FIR

Same as Export IIR but for the FIR part: it joins into one coefficient file whatever is checked in FIR RevPhase (within the 20 filters), X-Over FIR, AEQ FIR and Import FIR. The available formats are text, CSV, wav, fir and F32 (float32 without header). The line below says how many coefficients come out, at what frequency and the latency of what is exported (for example "512 coefficients at 96000 Hz. Latency: 2.67 ms").

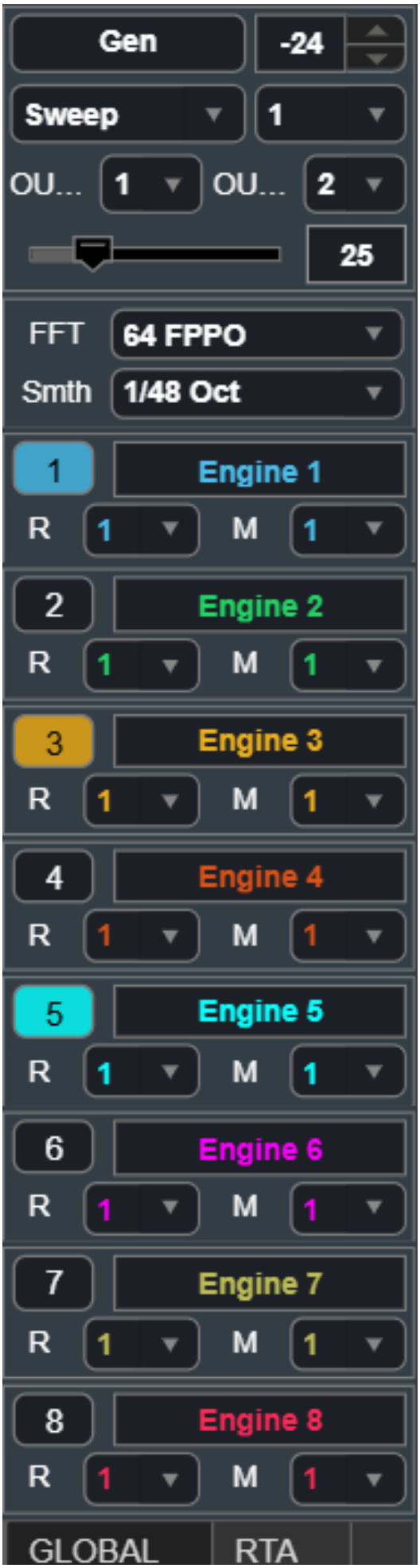
Under the sample rate, the **Taps** row chooses how many coefficients come out: "As calculated" (the default, as before) or from 64 to 4096. It is for processors that accept a fixed number of coefficients: for example, a 512-tap FIR calculated at 48 kHz and exported at 96 kHz is 1024, and with Taps at 512 512 come out. If fewer come out than there are, those around the peak are kept and the line below warns ("Shortened from 1024: less control of the low end"); if more come out, it is padded with zeros, which does not change the filter.



Export FIR, with its four checkboxes: RevPhase, X-Over, AEQ and Import.

7. THE GENERATOR AND THE MEASUREMENT SIGNALS

The panel on the right of the main window controls which signal sounds and how it is measured: the signal type, its level, the physical outputs it uses, the FFT resolution, the smoothing and, below, the list of the 8 drivers with their reference channel (R) and their measurement channel (M).


Gen
-24
Sweep
1
OU...
1
OU...
2
25
FFT
64 FPPO
Smth
1/48 Oct
1
Engine 1
R
1
M
1
2
Engine 2
R
1
M
1
3
Engine 3
R
1
M
1
4
Engine 4
R
1
M
1
5
Engine 5
R
1
M
1
6
Engine 6
R
1
M
1
7
Engine 7
R
1
M
1
8
Engine 8
R
1
M
1
GLOBAL
RTA

The generator, with driver 1 (Sub L) selected.

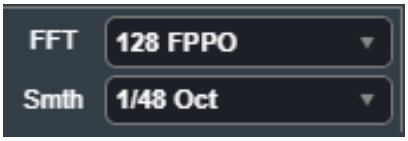
7.1 SIGNAL TYPES

SIGNAL	WHAT IT DOES
Sweep	A logarithmic sweep (ESS), RiTA's reference measurement: one pass, with the Q and the resolution chosen in Preferences.
Multi Sweep	Several sweeps in a row that are averaged together, to improve the signal-to-noise ratio in noisy rooms. The number of repetitions is set in Preferences > Transfer > ESS Measurement.
Pink	Continuous pink noise, useful for listening to the system while adjusting it, or for measuring with a third-party analyzer at the same time.
External	RiTA does not generate a signal: it measures whatever arrives at the input, with an external signal of its own (for example music, or another generator).
Spectrum	Real-time spectrum analyzer (RTA) on the signal arriving at the input, continuous until it is stopped.

Changing to another type while Spectrum is running stops it, and the first click on Measure already measures. While a Sweep, Multi Sweep, Pink or External measurement lasts, the type, Time and Level are disabled until it ends.

> **Note:** With sweeps of 2 s or longer, the measurement reads the low end right: below 125 Hz it no longer comes out 0.3 dB low. With a 1 s sweep in single channel it still comes out 0.3 dB low, so to measure sub-bass accurately a sweep of 2 s or longer is advisable. In dual channel, the measurement is divided by the reference frequency by frequency, as with pink noise: the response does not depend on the duration of the sweep or on the sample rate, and a 1 s sweep does not lose low end either.

- The level drop-down, next to the button that turns on the generator (**Gen** or **Measure**), sets the output level in dBFS: the dBFS at which the sweep is played and, at its peak, also the pink noise.
- The slider and the field below it (in %) are the **coherence threshold**: the curves are only drawn where the coherence reaches that value. Coherence comes out the same with or without Find.
- OUT 1 and OUT 2 choose the physical channels of the sound card through which the signal goes out.
- FFT sets the resolution of the calculation (fixed points or points per octave) and Smooth. the smoothing with which the magnitude is drawn. In Spectrum the FFT list has no 64 FPPO (there it was 32768 under another name): when switching to Spectrum, 64 FPPO changes to 32768, and when leaving, the whole list comes back and, if nobody touched the FFT, so does 64 FPPO. Clear, the reset and opening a project leave 32768 in Spectrum. With Auto FFT Size (Preferences > Transfer) the list goes up to the size of the engines (65536, 131072 or 262144) and adds 128 FPPO. The FFT is not locked with Sum or AVG on: changing it redoes them.



The FFT drop-down with Auto FFT Size: the list goes up to the engine size and adds 128 FPPO.

7.2 MULTI SWEEP AND THE REFERENCE

With `1 Ref. Channel` enabled in Preferences > Transfer (chapter 16), all the drivers share the same reference channel: changing it on one driver changes it on all eight at once, handy when all of them measure

against the same electrical signal from the desk or the processor. With `Several Ref. Channels` each driver keeps its own reference, for setups where each output has its own reference path.

The measurement channel works the same way: with `1 Meas. Channel` (the switch below, in the same tab) the eight engines share the measurement channel: changing it on one engine changes it on all eight, and ticking an engine to measure unticks the others (in Live TF one is measured instead of up to four). With `Several Meas. Channels` each engine keeps its own, which is the factory setting. which is the factory setting.

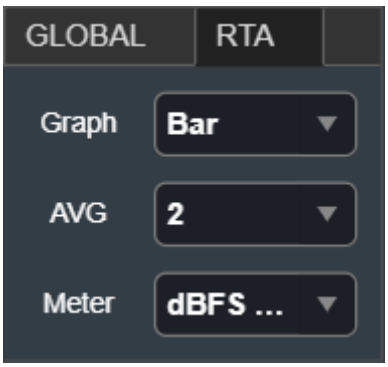
RiTA remembers, for each sound card, how the two switches, the reference one and the measurement one, are set, and restores them when the card is chosen again. A card that has never been used comes out with 1 Ref. Channel and Several Meas. Channels, and a two-input card no longer changes the switches by itself.

> **Note:** With the **Spectrum** signal the measurement channel switch does not act: each engine has its own channel, even with 1 Meas. Channel. When Spectrum is entered the engines take the channels they had in Spectrum the last time; when switching to Sweep, Multi Sweep, Pink or External the eight go back to the common channel. Spectrum remembers its own as long as RiTA stays open. With Spectrum, the reference (R) drop-downs of the engines are disabled, because they are not used; when going back to another signal they are enabled again. They are also blocked with single channel (Preferences > Transfer > ESS Measurement) on Sweep, Multi Sweep and Pink, because those measurements use no reference input: they divide by the signal sent. External, on the other hand, needs the reference, so with single channel it is not in the signal list (Sweep, Multi Sweep, Pink and Spectrum are left): if it was chosen, the signal changes to Sweep, and when going back to dual channel External reappears in the list but the signal stays on Sweep; a configuration or a project with External and single channel opens on Sweep. With dual channel everything is as always. The block is on screen only: the chosen channel is kept and counts when going to dual channel.

7.3 THE RTA

With the signal set to `Spectrum`, the **RTA** tab in the upper left panel draws the real-time spectrum analyzer of the active drivers, as bars or lines depending on Preferences.

The **Meter** drop-down of that tab chooses how the RTA and the level meters measure: **dBFS RMS**, **dBFS Peak**, **dBFS(A) RMS**, **dBFS(A) Peak**, **dBFS(C) RMS** and **dBFS(C) Peak**. The weighting (the A and C curves of the IEC 61672 standard) is applied to the RTA spectrum, in lines and in bars, and to the meters; the memories and the API carry what is weighted. They are weighted dBFS, not dB(A) of pressure, because RiTA is not calibrated. With the A or C weighting, the meter no longer reads too high in the low end.



The RTA tab with the Meter drop-down.

Its **Save** menu saves the trace at that moment to the RTA tab of the Memory Bank (chapter 8): it opens a window asking for the name, with the driver's name already filled in, and **Cancel** saves nothing. The window does not block: the RTA keeps measuring while it is open.

7.4 MONITOR LEVEL

The **Monitor Level** tab shows the input level of each of the eight engines. Next to each number there is a vertical LED meter, with a scale from -60 to 0 dBFS and marks at -60, -40, -20, -12, -6, -3 and 0. The LEDs are green, yellow above -12 dBFS and red above -3 dBFS. The highest LED that has been reached stays lit for a moment (peak hold, 1.5 s). The clip LED, at the top, lights up if the signal reaches 0 dBFS (unweighted) and stays lit until it is clicked. The number and the meter use what is chosen in the Meter drop-down. With an engine switched off, its meter says "--" in grey, with the LEDs off, and does not move until the engine is switched on.

8. MEASURING, THE MEMORY BANK AND EXPORTING

8.1 MAKING A MEASUREMENT

With the chosen sound card (chapter 4), a driver switched on and its measurement and reference channels selected, the large button of the generator (**Gen**, which changes to **Measure** while measuring) starts the chosen signal. With a sweep (Sweep or Multi Sweep) the measurement lasts as long as the sweep takes and the result is drawn automatically when it finishes; with Pink, External, Spectrum or Live TF the measurement is continuous until the same button is pressed again.

- The **TIME** field of the DSP table (chapter 5) is the delay applied to the measurement before it is drawn; **Find** calculates it automatically by aligning the arrival of that driver with that of the reference driver. The arrival is the highest peak of the impulse; if there is another peak less than 1 ms away with more than half its height, the arrival is the delay given by the phase between 1 and 4 kHz, which keeps Find and Sync All from settling on the wrong peak.
- If the sound card cannot be opened (it is disconnected, another program is using it, or it does not support the chosen frequency or channels), RiTA says so with a clear notice and leaves all the measurement modes idle, instead of being left with the button pressed doing nothing.

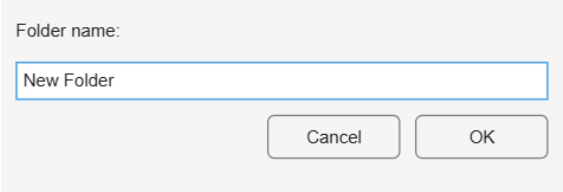
8.2 THE MEMORY BANK

The left panel of the main window stores and organizes the measurements, in three tabs: RIs (the saved impulse responses), Snap (the Snapshots, reference curves or Auto EQ targets) and RTA.



The Memory Bank: the project folder tree, the export format and the export buttons.

- The width of the Memory Bank is changed by dragging its right edge, the one that separates it from the graphs, to see long names: the cursor becomes a double arrow and a blue guide line follows the mouse. The column takes the width on release, not live (placing the whole window again takes 1 to 3 s). The width goes from 100 pixels to 45 % of the window; a double click on the edge sets it back to the usual one, and RiTA remembers it when it opens again.
- The tree at the top is the project folder where exporting takes place: it is chosen with the folder icon, or a new location is typed and RiTA creates it.
- **New Folder** first asks the type, Folder or Subfolder, and then the name, starting from "New Folder" (or "New Folder 2" if it already exists). A name already used, or with characters a folder does not accept (\ / : * ? " < > |), is warned about and asked again; Cancel creates nothing. A subfolder hangs from the selected folder, and with no selection RiTA warns "You must select a folder".



New Folder: the name window.

- In the **AVG** menu of the Memory Bank, **Export** asks for the file name, starting with "AVG_" so that the position is typed, and exports with what is written as it is. A Memory Bank folder has to be selected; if not, it warns before asking for the name.
- **Import folders** adds to the tree a folder that already exists on disk, with its subfolders.
- The **Refresh** button asks what to do: import all the folders, refresh the ones already in the tree, or **Change Memories Folder...**, which lets any folder on the PC be used as the memories folder. Nothing is copied or moved: the tree is emptied and RiTA loads the folders of the chosen one, and from then on Import Folders, New Folder, Refresh and AVG Alignment work from it. It is remembered on that computer (also when opening with Last Configuration) and saved with Save Configuration and with each project; starting with Defaults brings back the usual one. If a configuration or a project carries a folder that does not exist on that PC, the one in use is kept, and changing it with a project open counts as an unsaved change.
- The format drop-down (txt, csv...) decides in which format the files are output when a measurement is exported. When the TF of a Snapshot is exported, the phase always comes out in degrees, whatever phase mode is on screen.

8.3 CLEAR SELECTED

In the RIs and Snap tabs of the Memory Bank, above Clear All and Mute all, the Clear Selected button deletes only the rows with their checkbox ticked, instead of all of them: handy for removing a handful of loose measurements without losing the rest of the folder.

8.4 EXPORT ALL

The export-everything button outputs, in one go, the measurement of each switched-on driver, with the driver's name. It is asynchronous: RiTA keeps responding while it exports, and the result (how many files, whether anything failed) can be checked without blocking the rest of the work.

8.5 REPEATED NAMES

RiTA does not let two things share a name: the second takes the first free name by adding _1, _2... at the end. With “Room”, the next is “Room_1”, then “Room_2”; with “Name_1” already taken, “Name_1_1”. It applies to the files Export writes (they used to take -2, -3), to Snapshots (one engine, Snap All, Sum, AVG and RTA; also one created through the API) and to the drivers, whether the name is typed or comes in through Load Engine, Import, Send to engine, AVG Alignment or the API: giving a driver another driver's name leaves it as “Room_1”. Repeats that were already there are left alone, and renaming a row by hand in the table is still free. A driver called “Name” (that of a deleted driver) or left empty may repeat, and a project opens with the names as it was saved.

8.6 LOADING MEASUREMENTS FROM OTHER PROGRAMS

External IR/TF (in the generator) and **Import** of the Memory Bank load into an engine a file from another program. Among those it reads are the MAPP 3D ones (.txt, .xls and .xlsx) and the .txt that EASE Focus exports from a GLL (Freq [Hz], Magnitude [dB] and Phase [deg], at 1/24 octave and with a decimal comma): it is imported with its magnitude, its phase (at high frequencies smoothed at 1/6 octave from 2 kHz to remove the jumps) and its arrival. The level ends up 100 dB below the dB SPL of the file, which is the scale of the impulses EASE itself exports, so the two kinds of EASE file end up at the same level and the differences between angles are kept.

- If nothing comes out of a file, RiTA warns "The file could not be read" with the name and the reason, instead of leaving the engine empty.
- Impulses without phase (symmetric, zero phase, like those in the impulse folder EASE exports) are imported all the same, but with a warning: only their magnitude is valid, and their time, their phase, Find, Sync All, sums and AVG are not.

Import Snapshot, in the right-click menu of each engine (followed by Snapshot TF and External IR/TF), loads a Snapshot into that engine without going through a file: it comes in with its whole impulse and with the DSP the engine had when it was saved, and the DSP of the engine it is loaded into adds to that one. The list shows the Snapshots of the table; one without an impulse is greyed out, and with no Snapshots the list says "No Snapshots".

8.7 THE ACOUSTIC IR: REVERBERATION, CLARITY AND INTELLIGIBILITY

The **Acoustic IR** tab of the graphs shows the impulse response of an engine as the room would hear it. A drop-down chooses the view: **Linear**, **Log** and **ETC** draw the impulse and its energy curve; **Step** draws its step response; **Spectrogram** shows it in time and frequency; **TR20 TR30** gives the reverberation times by octave, **C50 C80** the clarity (with C7), **D50 Ts** the definition and the centre time, **ITDG** the first stretch of the impulse with the direct sound and the first reflection, and **Parameters** a table with all the parameters. With **Export IR**, at the end of the list, the impulse is saved (in the lower window too). The tab draws any measurement of the engine, also one that comes from the Memory Bank, from a file or from a project. If Import is pressed with no measurement chosen in the Memory Bank, it warns "Select a measurement in the Memory Bank first". With a measurement loaded with Import or External IR/TF, the file name is shown at the top right of the graph, and the project saves it. With a sweep in Single Channel, the impulse lasts as long as the sweep, as in Dual Channel.

The times (T10, T20, T30 and EDT) and the clarity (C50 and C80) are calculated following the ISO 3382 standard. RiTA subtracts the background noise of the measurement from the decay curve (the Schroeder one) and only gives a value when the decay stays at least 5 dB above the noise at the end of its span. That is why T30, which uses a longer span, comes out with less range than T20 and T10. If there is no margin, the legend shows a dash and, in the views by octave, that octave is left without a point. Before, a number always came out, also when the noise falsified it.

In the **TR20 TR30**, **C50 C80** and **D50 Ts** views, each entry of the legend carries its value for the whole band, for example "T30 (Broadband: 4.67 s)". All the whole-band values are in the **Parameters** view.



Acoustic IR, TR20 TR30 view: the times by octave and, in the legend, the whole-band value of each one.



Acoustic IR, C50 C80 view: the clarity by octave, with C7.



Acoustic IR, D50 Ts view: the definition (in %) and the centre time (in ms) by octave.

In those same views, more lines give the single-position averages, each with its entry in the legend: "Tmid 500-1K" in TR20 TR30, "C80 500-1K" (dashed) and "C80 500-2K" (dotted) in C50 C80, and "D50 500-1K" and "Ts 500-1K" in D50 Ts. The Parameters table has a row for each.

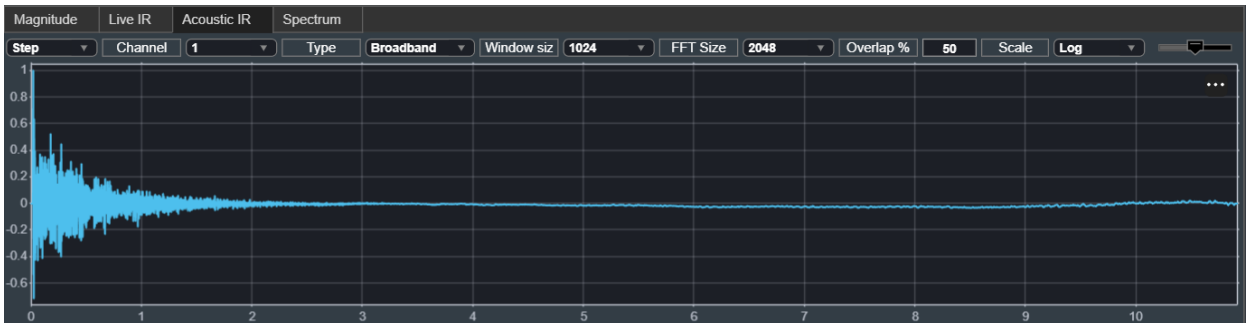
THE PARAMETERS

PARAMETER	WHAT IT IS
T10, T20, T30, EDT	Reverberation times, calculated with the first 10, 20 or 30 dB of decay, and the early decay time. EDT/T30 is their ratio.
Tmid, EDTmid, C80 500-1K, D50 500-1K, Ts 500-1K	Single-position averages of one number, as ISO 3382-1 defines them: that of 500 Hz and 1 kHz (Tmid, from T30, or from T20 where there is no T30). No value if any of their octaves is missing.
C80 500-2K	The average in dB of 500 Hz, 1 kHz and 2 kHz, which is the Beranek one.
C7, C50, C80	Clarity: the energy of the first 7, 50 or 80 ms against the rest, in dB.
D50	Definition: the percentage of the energy that arrives in the first 50 ms.
Ts	Centre time, in ms: the centre of gravity of the energy of the impulse.
D/R	Ratio in dB between the direct and the reverberant sound.
ITDG	Initial time delay gap, in ms: how long the first reflection takes to arrive after the direct sound. A dash comes out if there is no clear reflection in the first 100 ms.
BR and TR	Bass and treble ratios, from the reverberation times by octave.
Speech echo and Music echo	The Dietsch and Kraak criterion: the value has to be below the limit, 1.0 for speech and 1.8 for music; above it, the echo is audible.
STI, STIPA, RASTI	Speech intelligibility indices (IEC 60268-16), from 0 to 1. In the table, the STI comes out as a number and its rating, from A+ to U, in a row of its own, "STI (A+...U)".
%ALcons	Articulation loss of consonants, in %: the lower, the more intelligible.

Note: The STI, the STIPA and the RASTI are those of the room alone: they do not include the background noise or the masking, which need dB SPL to be measured. They always come from the octaves from 125 Hz to 8 kHz.

THE STEP VIEW

The **Step** view, right after ETC and in both windows, draws the step response: the running sum of the impulse, normalized to 1, for the whole band or in the chosen octave. It is useful to see the alignment between ways.



Acoustic IR, Step view: the step response for the whole band.

Note: The impulse is measured from where the ISO 3382-1 standard says: the first sample that is 20 dB below the maximum. ITDG and D/R still count from the direct sound.

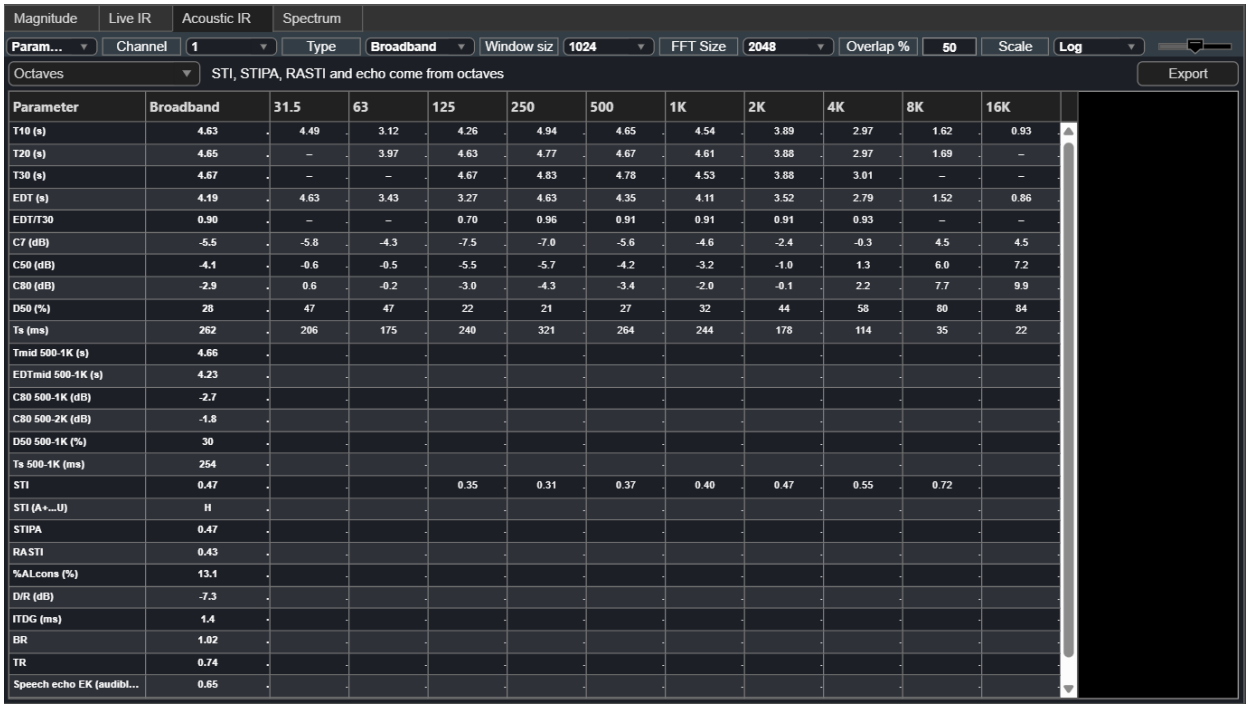
THE ITDG AND PARAMETERS VIEWS

The **ITDG** view draws the envelope of the first 100 ms with the direct sound (a triangle) and the first reflection (a circle) marked; the legend carries D/R and ITDG.



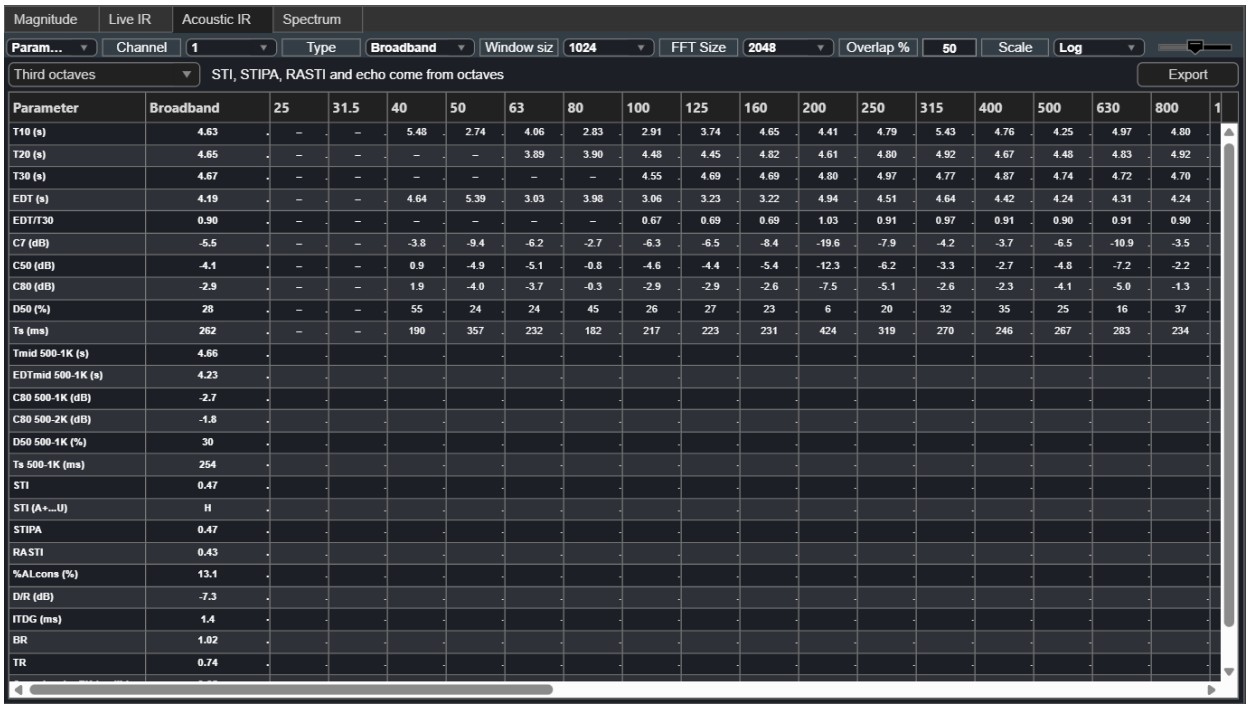
Acoustic IR, ITDG view: the direct sound, the first reflection and, in the legend, D/R and ITDG.

The **Parameters** view puts a table over the graph with all the parameters, for the whole band and by bands. A drop-down at the top chooses **Octaves** or **Third octaves** (from 25 Hz to 20 kHz); with octaves, the STI row gives the modulation transfer index (MTI) of each octave. The **Export** button saves the table to Excel (.xlsx), CSV or MATLAB (.mat).



Parameter	Broadband	31.5	63	125	250	500	1K	2K	4K	8K	16K
T10 (s)	4.63	4.49	3.12	4.26	4.94	4.65	4.54	3.89	2.97	1.62	0.93
T20 (s)	4.65	–	3.97	4.63	4.77	4.67	4.61	3.88	2.97	1.69	–
T30 (s)	4.67	–	–	4.67	4.83	4.78	4.53	3.88	3.01	–	–
EDT (s)	4.19	4.63	3.43	3.27	4.63	4.35	4.11	3.52	2.79	1.52	0.86
EDT/T30	0.90	–	–	0.70	0.96	0.91	0.91	0.91	0.93	–	–
C7 (dB)	-5.5	-5.8	-4.3	-7.5	-7.0	-5.6	-4.6	-2.4	-0.3	4.5	4.5
C50 (dB)	-4.1	-0.6	-0.5	-5.5	-5.7	-4.2	-3.2	-1.0	1.3	6.0	7.2
C80 (dB)	-2.9	0.6	-0.2	-3.0	-4.3	-3.4	-2.0	-0.1	2.2	7.7	9.9
D50 (%)	28	47	47	22	21	27	32	44	58	80	84
Ts (ms)	262	206	175	240	321	264	244	178	114	35	22
Tmid 500-1K (s)	4.66										
EDTmid 500-1K (s)	4.23										
C80 500-1K (dB)	-2.7										
C80 500-2K (dB)	-1.8										
D50 500-1K (%)	30										
Ts 500-1K (ms)	254										
STI	0.47			0.35	0.31	0.37	0.40	0.47	0.55	0.72	
STI (A+...U)	H										
STIPA	0.47										
RASTI	0.43										
%ALcons (%)	13.1										
D/R (dB)	-7.3										
ITDG (ms)	1.4										
BR	1.02										
TR	0.74										
Speech echo EK (audibl...	0.65										

Acoustic IR, Parameters view, by octave.



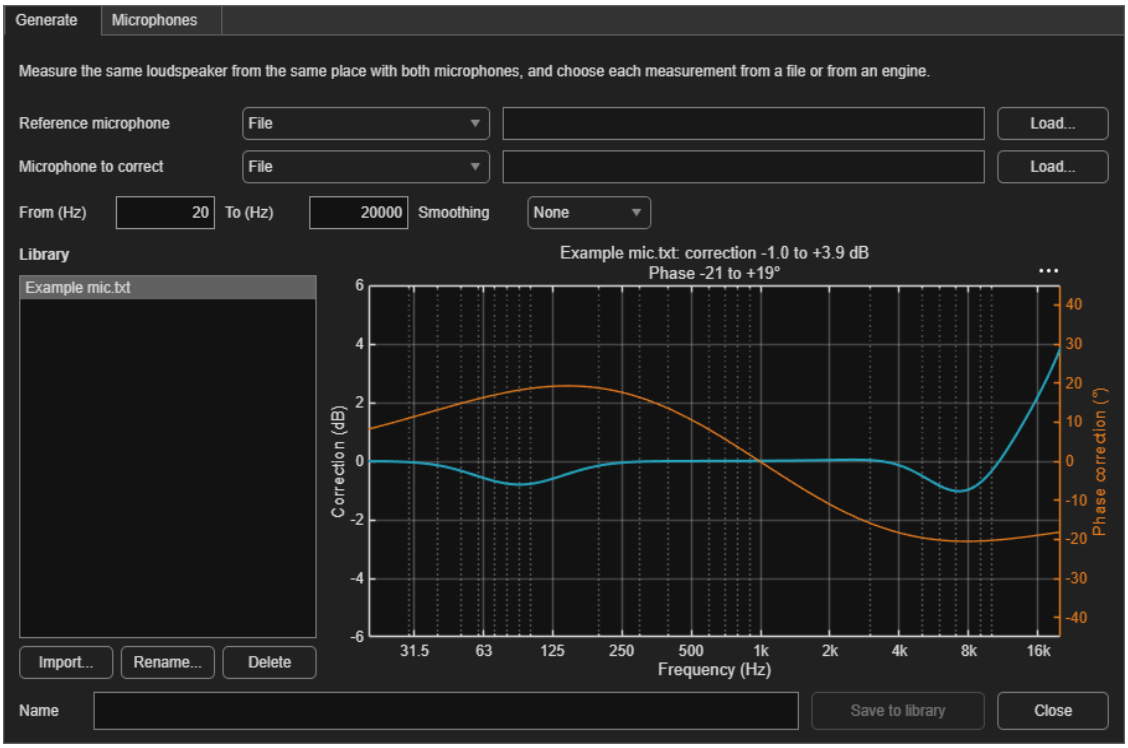
Parameter	Broadband	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1
T10 (s)	4.63	–	–	5.48	2.74	4.06	2.83	2.91	3.74	4.65	4.41	4.79	5.43	4.76	4.25	4.97	4.80	
T20 (s)	4.65	–	–	–	–	3.89	3.90	4.48	4.45	4.82	4.61	4.80	4.92	4.67	4.48	4.83	4.92	
T30 (s)	4.67	–	–	–	–	–	–	4.55	4.69	4.69	4.80	4.97	4.77	4.87	4.74	4.72	4.70	
EDT (s)	4.19	–	–	4.64	5.39	3.03	3.98	3.06	3.23	3.22	4.94	4.51	4.64	4.42	4.24	4.31	4.24	
EDT/T30	0.90	–	–	–	–	–	–	0.67	0.69	0.69	1.03	0.91	0.97	0.91	0.90	0.91	0.90	
C7 (dB)	-5.5	–	–	-3.8	-9.4	-6.2	-2.7	-6.3	-6.5	-8.4	-19.6	-7.9	-4.2	-3.7	-6.5	-10.9	-3.5	
C50 (dB)	-4.1	–	–	0.9	-4.9	-5.1	-0.8	-4.6	-4.4	-5.4	-12.3	-6.2	-3.3	-2.7	-4.8	-7.2	-2.2	
C80 (dB)	-2.9	–	–	1.9	-4.0	-3.7	-0.3	-2.9	-2.9	-2.6	-7.5	-5.1	-2.6	-2.3	-4.1	-5.0	-1.3	
D50 (%)	28	–	–	55	24	24	45	26	27	23	6	20	32	35	25	16	37	
Ts (ms)	262	–	–	190	357	232	182	217	223	231	424	319	270	246	267	283	234	
Tmid 500-1K (s)	4.66																	
EDTmid 500-1K (s)	4.23																	
C80 500-1K (dB)	-2.7																	
C80 500-2K (dB)	-1.8																	
D50 500-1K (%)	30																	
Ts 500-1K (ms)	254																	
STI	0.47																	
STI (A+...U)	H																	
STIPA	0.47																	
RASTI	0.43																	
%ALcons (%)	13.1																	
D/R (dB)	-7.3																	
ITDG (ms)	1.4																	
BR	1.02																	
TR	0.74																	

Acoustic IR, Parameters view, by third octave.

- The values by octave are more reliable in the low end and in rooms with a different reverberation in the low and high frequencies. At 31.5 and 63 Hz, a short room gives few cycles and the value can vary by about 0.1 s from one measurement to another. If the background noise covers the decay in those octaves, a dash comes out instead of an invented time, and an octave never gives a time shorter than its filter allows measuring (0.18 s at 31.5 Hz).
- A long measurement loaded into a channel (External IR/TF or Memory Bank) is analysed in full in Acoustic IR; the channel keeps its 32768 samples (65536 to 262144 with Auto FFT Size, in Preferences > Transfer). A channel measurement without a long copy (0.68 s) that does not reach the noise is completed with the extrapolated tail.
- With a loudspeaker measured up close, with the direct sound much stronger than the room, the whole-band parameters come out and the EDT comes out close to zero. In the Step view, the step of the direct sound reaches 1 and the axis adjusts to it. A double click on the graph goes back to the view as the view itself draws it.
- The C50 and C80 axis now also shows negative clarity.
- Export IR as WAV saves the impulse in 32-bit floating point, without clipping what goes over 1.

9. MICROPHONE CORRECTION

`Measurements > Mic Correction` opens the window to generate and apply microphone correction curves: the difference between what a calibrated reference microphone measures and what the microphone you normally want to use measures, with both measured at the same time from the same place.



Mic Correction, Generate tab: the two measurements of the same loudspeaker and the library; the graph shows the correction (blue) and its phase (orange, right-hand axis).

9.1 GENERATE TAB

1. The source of each measurement is chosen (**Reference microphone** and **Microphone to correct**): a file (**Load...**) or a driver that already has a measurement taken. If the chosen driver already had some correction applied, RiTA removes it before using it, so that corrections do not pile up. The two measurements can each come from a driver or from a file, and they can be mixed (for example, a wireless microphone measured in a driver against a wired one saved in a file). A driver gives the raw measurement, with no DSP and without the correction it was measured with; an exported file carries the DSP the driver had when it was exported (an HPF at 2 kHz, for instance, changes the curve by almost 6 dB between 200 and 500 Hz), so to compute a correction, export with the DSP clean.
2. From (Hz), To (Hz) and Smoothing trim and smooth the resulting curve; they are applied at once, with no separate button. The curve is stored with 384 points per octave, so it follows the fine detail of the difference between two microphones; curves generated before (24 points per octave) do not change: generate them again. The level is still left out of the curve, on purpose.
3. The graph on the right always shows the correction being generated, or the one chosen in the library, whichever was touched last.
4. Generate also calculates the **phase** of the microphone against the reference. The delay between the two measurements (so the arrivals do not move) and the polarity are left out. The graph shows the phase on

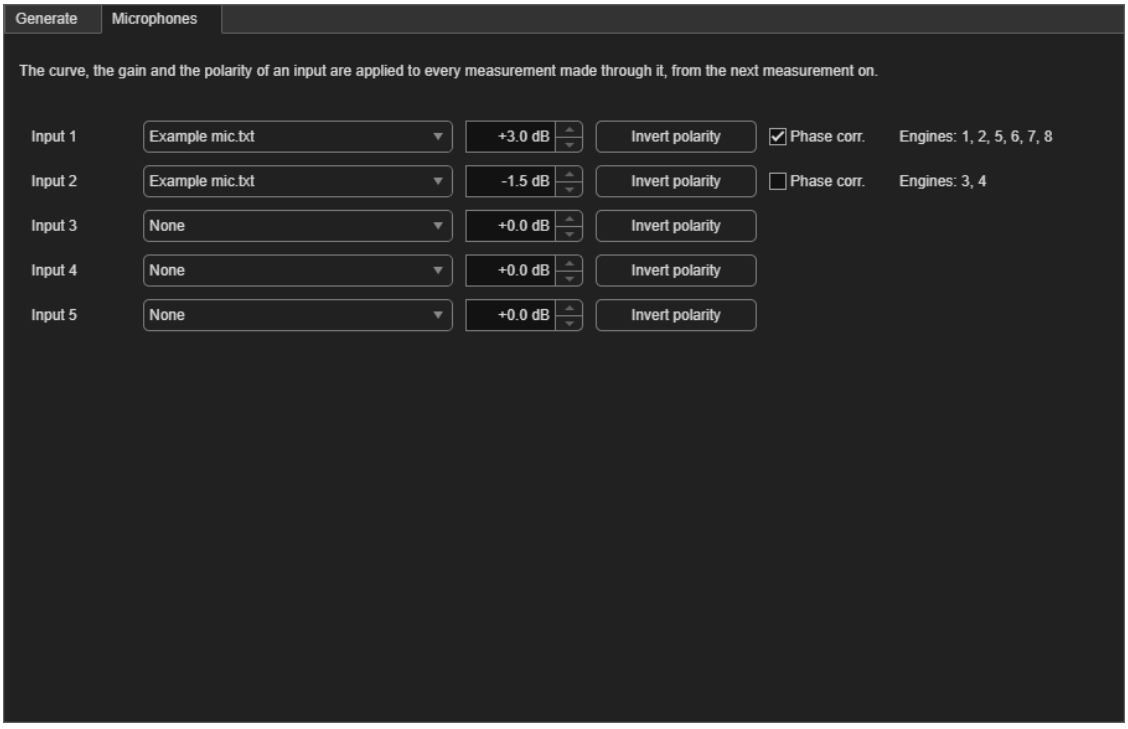
an axis on the right, in orange; its title says the delay that was left out and warns if the microphone is inverted, so that Invert polarity is used in Microphones.

5. **Save to library** keeps it under the name written in the Name field, ready to be assigned to an input of the sound card.

The library (left panel) stores all the curves generated or imported: **Import...** adds curves from the microphone manufacturer, and **Rename...** and **Delete** also update the entries that were using that curve. A curve file can carry a third column with the phase in degrees; earlier curves, configurations and projects, without phase, work the same, in magnitude only.

9.2 MICROPHONES TAB

One row for each physical input of the sound card: which correction curve it has assigned, its gain, a button to invert its polarity, the Phase corr. box (it only appears if the curve has phase) and, at the end, which drivers are measuring through that input at this moment. The correction, the gain and the polarity are applied from the next measurement made through that input, without having to repeat anything else.



Mic Correction, Microphones tab: the curve, the gain, the polarity and the phase of each input.

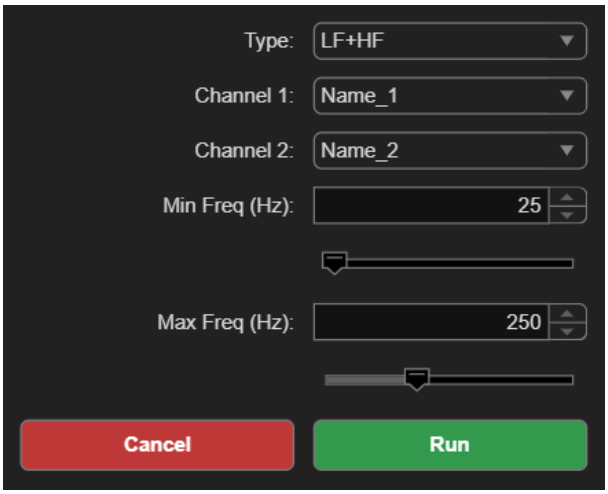
The **gain** of each input goes from -30 to +30 dB, in steps of 0.5, and comes set to 0 dB. It is applied to every measurement made through that input, like the curve and the polarity, and it is saved with the configuration and with the project (an older configuration leaves it at 0 dB). When a curve is generated by comparing two measurements, the gain, like the curve and the polarity, is removed from the measurements before comparing them.

The **Phase corr.** box of each input decides whether the phase is corrected too. It comes ticked when a curve with phase is assigned; unticked, the input corrects only the magnitude, as before. It is saved with the configuration and with the project. The correction never moves the arrival: the latency of a wireless microphone stays as it is, also with files that carry the delay in the phase column.

In measurements made with a sweep, the Acoustic IR, which analyses the long impulse (as long as the sweep lasts), also carries the mic correction of the input: curve, polarity, gain and phase, like the rest of the measurement.

10. AUTO ALIGN

`Tools > Auto Align` calculates the delay, the polarity and, if needed, an all-pass filter to align two drivers that are already measured, for example a subwoofer and a top box, or two boxes in a cardioid configuration.



Auto Align, LF+HF type, ready to calculate between drivers Sub L and Top L.

10.1 THE FOUR TYPES

TYPE	WHAT IT CALCULATES	WRITES
LF+HF	Aligns a low with a high. If delay and polarity are not enough for them to sum properly in the crossover zone, it adds an Alignment APF to the low driver. Without Alignment APFs in Preferences, this option is not offered. It recognizes which one is the high by its high frequencies (4 to 16 kHz), whether it is on Channel 1 or 2, and leaves it in positive polarity: if an inversion is needed, it inverts the low.	Delay, polarity and, if needed, an Alignment APF.
HF+HF	Aligns two mid-high range boxes with each other (for example two delays). It prefers few APFs of low order: it tries no APF, one of 1st order, one of 2nd order and only then two (up to two Alignment APFs, one on each driver), and moves on to the next only if it sums clearly better (more than 0.25 dB on average). The same measurement always gives the same result, and the sum is left in positive polarity at the highs (4 to 16 kHz); if needed, it inverts both paths. Without Alignment APFs in Preferences, it only sets delay and polarity, and says so.	Delay, polarity and up to 2 Alignment APFs.
Gradient	Delay and polarity for a pair in a cardioid configuration (pressure gradient). It is measured behind the array, where it has to cancel.	Delay and polarity.
End Fired	Delay and polarity for an end-fire array. It is measured in front of the array, where they have to add up.	Delay and polarity.

With `Gradient` or `End Fired` selected, the two drivers are called **Front** and **Rear** instead of Channel 1 and Channel 2, and below a notice appears reminding where to measure each one, so that they are not confused with each other.

> **Note:** With `End Fired`, if the rear subwoofer seems to have its polarity inverted from wiring (it would add up the wrong way), Auto Align flags it in the result and still gives the delay and the polarity for when it is wired correctly: it does not correct it on its own, it only says so.

10.2 HOW TO USE IT

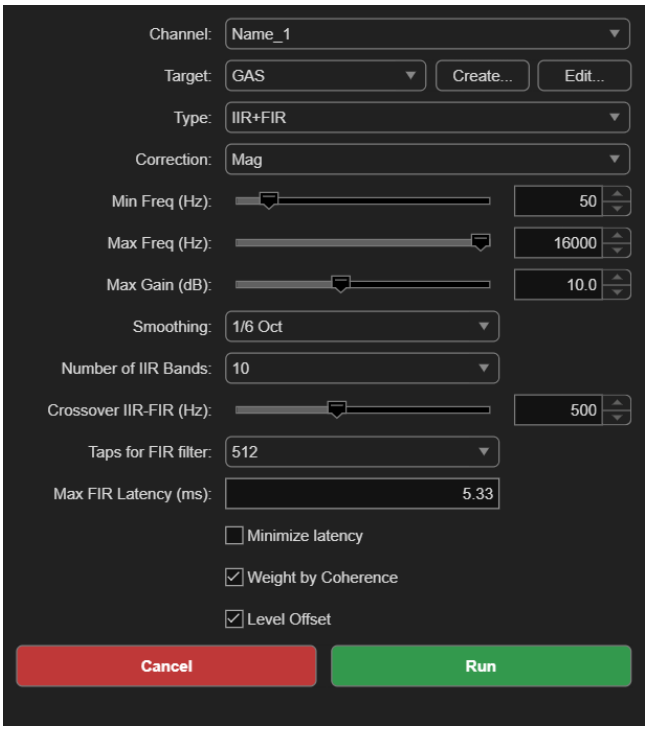
1. With the two drivers already measured (with their final DSP except the delay, which is what is going to be calculated), Auto Align is opened and the **Type** is chosen: the default frequency range changes according to the type chosen, and it can be adjusted by hand between 20 Hz and 20 kHz with the field or the slider.
2. The two drivers to align are selected (Channel 1 and Channel 2, or Front and Rear in Gradient/End Fired) and **Calculate** is pressed.
3. RiTA calculates with the DSP each driver already had, except for the delay and the polarity, and applies the result directly: there is no separate preview; the result is absolute values, so repeating Auto Align on the same pair always gives the same result.

> **Note:** The Alignment APFs written by Auto Align are the two in the Equalizer window of each driver (chapter 6), not two of the 20 parametric filters. Each time Auto Align is run again on a driver, its two Alignment APFs are replaced entirely, whether Auto Align put them there the previous time or they were changed by hand.
>
> **Note:** Auto Align remembers its settings: when it is opened again they come out as it was last run, as long as RiTA stays open; they are not saved between sessions. With the Equalizer Bypass on in one of the two engines (chapter 6), Auto Align does not run and warns.

With LF+HF and HF+HF, Auto Align also sets the Find of the overlap zone on the driver with the better coherence at high frequency, before calculating and again when applying, so as not to depend on a Find made by hand at a point where they do not match well.

11. AUTO EQ

`Tools > Auto EQ` calculates the equalization needed to bring the measurement of a driver closer to a target curve, and shows the result before applying anything.



Auto EQ, IIR+FIR type, on driver 1 with the GAS target.

11.1 THE CALCULATION WINDOW

FIELD	WHAT IT IS
Channel	The driver to correct; it must already have a measurement.
Target	The curve the response is to be brought closer to. RiTA's six factory curves (GAS, LA Nominal, BLUE, GREY, SAPHIRE, WHITE) are always in the list, even if no Snapshot is saved; choosing one creates it and saves it as one more Snapshot. See below how to create, edit or import your own.
Type	IIR, FIR, IIR+FIR or Globcon (an export specific to that format). If FIR is turned off in Preferences (chapter 16), it only offers IIR.
Correction	What part of the response it corrects: magnitude (Mag) or magnitude and phase.
Min. freq. / Max. freq.	The frequency range in which Auto EQ corrects; outside it the response is left as it is.
Max. gain	The limit of boost or cut that Auto EQ allows itself on a single filter.
Smoothing	The smoothing of the measurement that Auto EQ uses to decide where to place each filter.
Number of IIR bands	How many parametric filters at most, in the IIR and IIR+FIR types. If they do not fit because PEQ Bands in Preferences is lower, the warning says so, with the number, and suggests raising it.
IIR-FIR crossover	Only in IIR+FIR: the frequency below which it corrects with IIR and above which with FIR. It cannot go below 50 Hz (Calculate warns and forces it); 500 Hz by default.
FIR filter taps	Length of the resulting FIR, in the FIR and IIR+FIR types: from 64 to 4096, 512 by default. If more taps are chosen than there are in Preferences > FIR, Calculate raises those of Preferences to that value.

FIELD	WHAT IT IS
Max. FIR latency (ms)	Notice of how much latency the chosen number of taps adds.
Minimize latency	When possible, calculates the FIR with the lowest latency possible instead of with strict linear phase.
Weight by coherence	Gives less weight to the zones of the measurement with low coherence, where background noise outweighs the signal.
Level Offset	Ticked, which is the usual behaviour, RiTA brings the measurement to the level of the target and, on applying, adds that difference to the Gain of the channel. Unticked, it neither levels nor touches the Gain: it compares the measurement with the target using the Gain the channel has, so a Gain set by hand beforehand acts as the offset.

Calculate runs the calculation and opens a preview with the response before and after: from there, **Apply** writes the result to the driver's Equalizer (the parametric filters if it is IIR, the AEQ FIR row if it is FIR, or both in IIR+FIR — chapter 6), and **Cancel** discards the calculation without touching anything.

When the window opens, the target that comes out chosen is drawn on the graph, and when it is changed the previous one is hidden and the new one is drawn. With Calculate only the chosen one stays in Snapshots, ticked as the RiTA target; the factory targets that were only tried do not stay, and with Cancel the Snapshots stay as they were. If there is no Snapshot that can be a target, GAS comes out.

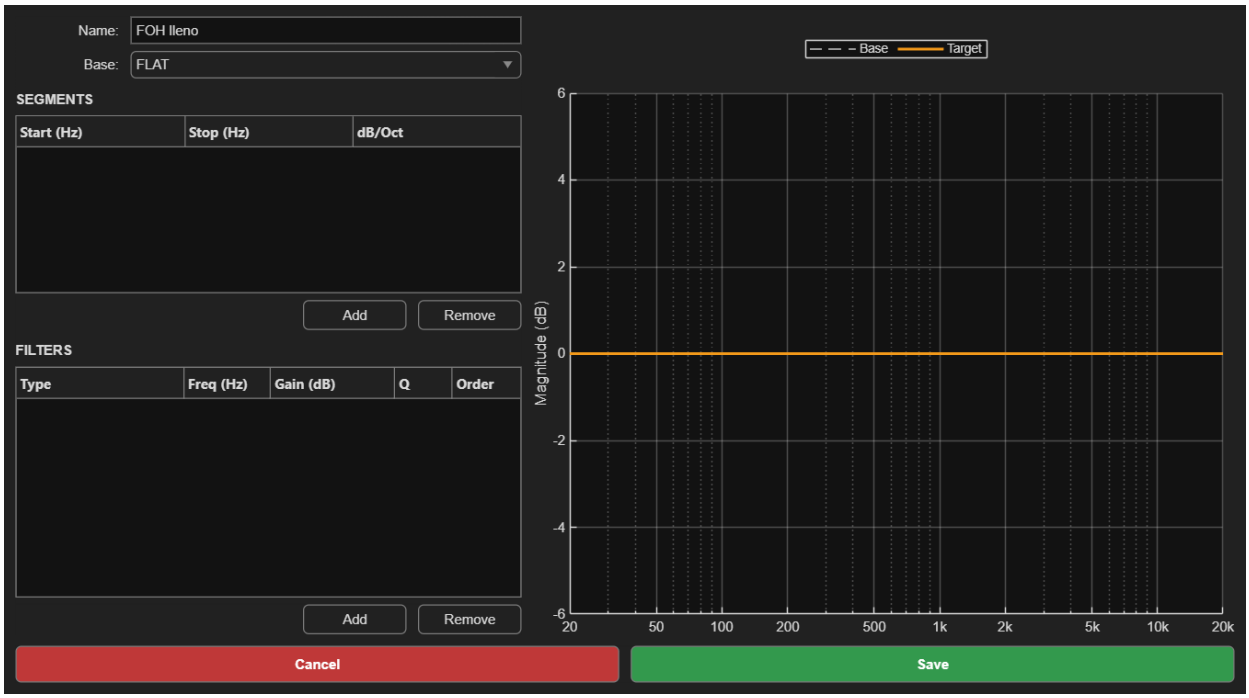
The preview has two sliders with a field, **IIR %** and **FIR %**, from 0 to 100 and at 100 by default, to apply only part of the correction. **IIR %** multiplies the gain of each band by that percentage, with the same frequency and Q; **FIR %** multiplies the FIR correction, which is redesigned with the same latency and the same taps. The curves, the summary and the table are recalculated as they are moved, and Apply applies what you see. At 0 % that part is not applied.

- If the HPF or LPF of the channel cuts the range of the calculation, or leaves everything on one side, the preview says so at the top in red, outside the summary: to equalize the whole range, the channel's HPF/LPF has to be removed.
- The gain offset does not take part in the percentages.
- IIR % is only active with IIR bands (IIR and IIR+FIR types) and FIR % with FIR, IIR+FIR or Globcon: Globcon goes with FIR %.
- The percentages are not remembered between runs: each new calculation starts at 100 %.

> **Note:** With the `Globcon` type, Apply asks where to save the file instead of writing to the Equalizer: it is an export designed for that specific processor, not a correction that stays applied inside RiTA.
>
> **Note:** Auto EQ remembers its settings: when it is opened again they come out as it was last run, as long as RiTA stays open; they are not saved between sessions. With the Equalizer Bypass on in that engine (chapter 6), Auto EQ does not run and warns.

11.2 CREATING AND EDITING A TARGET

Next to the Target drop-down, the **Create...** and **Edit...** buttons open the target editor: a curve starting from a base (flat, one of the six RiTA ships with from the factory, or an already saved Snapshot), to which segments with their own slope and parametric filters are added.



The target editor, in create mode: name, base, segments and filters, with the live graph.

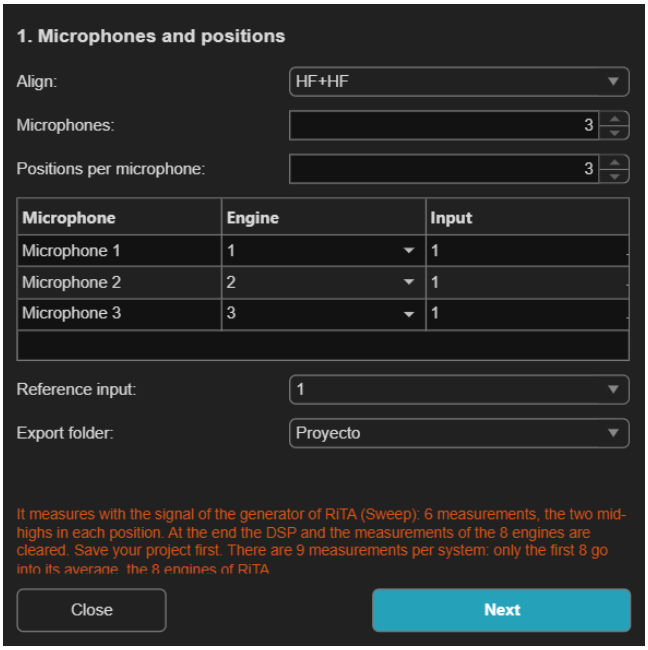
- **Name** and **Base** at the top left.
- **Segments**: frequency ranges, each with a slope in dB/octave, to set the general tilt of the curve (for example, a gentle drop in the highs).
- **Filters**: normal parametric filters (type, frequency, gain, Q or order) to shape specific areas.
- **Save** keeps the target as one more Snapshot, with its recipe saved inside: it can be reopened with Edit and changed further later, and it is recalculated automatically if the FFT resolution changes.

11.3 IMPORTING A TARGET FROM A FILE

The last entry in the Target drop-down, `Import from file...`, opens the same file selector and accepts the same formats as External IR/TF of the drivers: the imported curve is saved just like a target created by hand, magnitude only, ready to use and to edit later.

12. AVG ALIGNMENT

`Tools > AVG Alignment` is a wizard that chains together everything that would otherwise be done by hand to align two boxes using the average of several microphones, or of a single microphone at several positions: it measures each position, calculates the two averages, exports them and loads them into Auto Align, ready to calculate the final alignment. The first screen chooses what is aligned: `LF+HF` (a mid-high with a low, as until now) or `HF+HF` (two mid-highs), and Auto Align then opens in that same type.



First screen of the wizard, in HF+HF: microphones, positions, inputs and export folder. With more than 8 measurements per system (here 9), an orange warning says that only the first 8 are used.

12.1 FIRST SCREEN: WHAT IS ALIGNED, MICROPHONES AND POSITIONS

- **Align**: `LF+HF` (averages `AVG_HF` and `AVG_LF`) or `HF+HF` (the two mid-highs of each position, one after the other, averages `AVG_HF1` and `AVG_HF2`).
- **Microphones** and **Positions per microphone** set how many measurements will be taken. Each system is averaged over RiTA's 8 engines: more than 8 measurements can be requested (microphones × positions), but only the first 8 go into the average, and RiTA warns about it in orange, here and on the last screen.
- By default, the table distributes RiTA's engines that are already on among the microphones, in their order; the engine and the input of each microphone can be changed by hand.
- **Reference input** and **Export folder** complete the settings before starting.
- The measurement is made with the signal of RiTA's generator (a sweep); if Spectrum or Live TF are running, the wizard warns and does not let you continue until they are stopped.

When pressing **Next**, the wizard warns and clears the DSP of the 8 engines before continuing (equivalent to Clear > DSP, chapter 5): this way no setting left over from a previous session gets into the averages.

12.2 MEASURING EACH POSITION

For each position, the wizard asks for two consecutive measurements, without moving the microphone: in `LF+HF`, first the mid-high (HF) and then the low (LF); in `HF+HF`, the two mid-highs, one after the other (HF 1 and HF 2), each with its own button. If something goes wrong, the last measurement can be repeated without going all the way back.

12.3 WHEN FINISHED

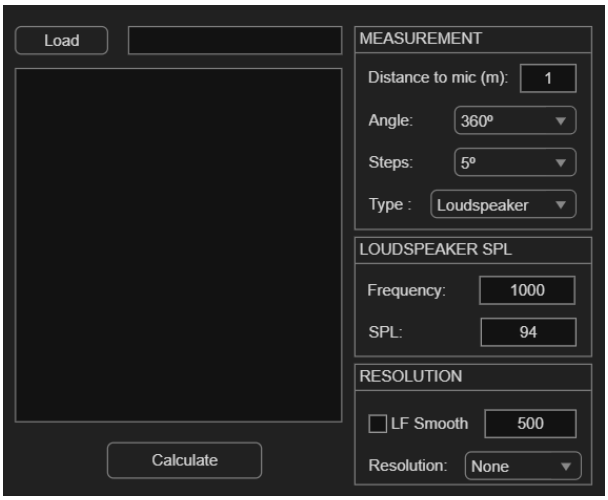
Once all the positions are measured, the wizard:

1. Loads all the measurements of the first band (HF, or HF 1 in HF+HF) into engines 1 onwards, aligns them with each other (Sync All) and calculates their average (AVG), which it exports as AVG_HF or AVG_HF1.
2. Loads the measurements of the second band into the same engines and calculates their average. In `LF+HF`, without synchronizing again (on purpose: this way the average of the lows keeps its relative time with respect to that of the highs); in `HF+HF`, with its own Sync All, unrelated to that of the first band. It exports it as AVG_LF or AVG_HF2.
3. Asks for confirmation before clearing everything, loads the first average into engine 1 and the second into engine 2, and opens Auto Align (chapter 10) in the chosen type, ready to calculate the final alignment between the two averages.

> **Note:** If, when more than 8 measurements per system are requested, any of them is left out of the average, the last screen reminds you before opening Auto Align.

13. POLAR PATTERN

`Tools > Polar Pattern` draws the directivity pattern of a loudspeaker or subwoofer from a series of measurements taken while rotating around it, in regular angle steps.



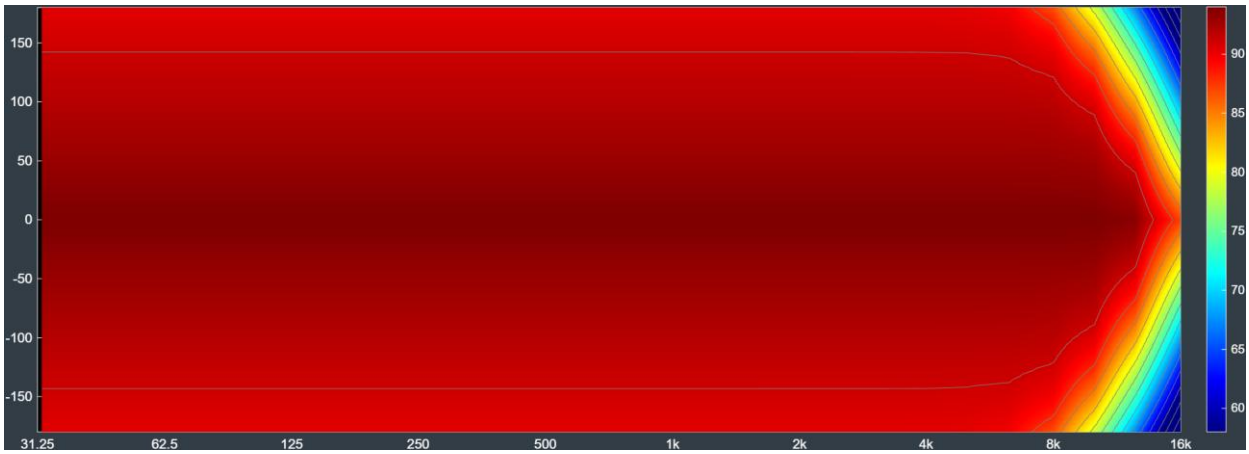
The Polar Pattern panel: distance to the microphone, angle and step, and the reference SPL and frequency.

13.1 THE STARTING DATA

Load loads a folder with one measurement per angle; how many are needed depends on the combination of **Angle** (90°, 180° or 360° coverage) and **Steps** (from 1° to 30° between one measurement and the next) chosen: if the number of loaded measurements does not match what that combination requires, RiTA warns before calculating.

FIELD	WHAT IT IS
Distance to mic (m)	Distance between the loudspeaker and the microphone during the measurements. It is still in the panel, but it no longer affects the calculation.
Type	Loudspeaker or Subwoofer: changes the frequency range that is drawn.
Frequency / SPL	The point (frequency and level) used as the 0 dB reference of the balloon.
LF Smooth	Smooths the lowest frequencies, where a single measurement is noisier.
Resolution	Additional smoothing of the final result.

Calculate interpolates between the measured angles and draws the balloon in a separate window, with frequency on the horizontal axis (logarithmic scale) and angle on the vertical one, colored by relative level. The calculation is the same for any step and any angle, and it is more reliable between the measured angles, especially with steps of 15° and 30°.



The resulting directivity balloon: the response narrows towards high frequencies, as is to be expected from a real loudspeaker.

14. PROJECTS

The `File` menu saves and opens the whole state of RiTA in a single `.rita` file: the complete DSP of the 8 engines, the measurements, the Snapshots that were on screen, the export position and the session settings. A saved project that is reopened leaves RiTA exactly as it was when saved, without having to repeat anything.

OPTION	WHAT IT DOES
New Project	Leaves RiTA as freshly opened (equivalent to Clear > Everything) and empties the project name and the export position.
Open Project	Opens a .rita file; a project saved with an earlier version of RiTA still opens just the same.
Save Project	Saves to the current file; if the project has never been saved, it asks where.
Save Project As	Saves a copy under another name or in another location, without touching the original file.
Recent Projects	The latest projects opened, so you do not have to look for them on disk.

The window title shows an asterisk when there are unsaved changes, and RiTA removes it as soon as the project is saved. Snapshots are not saved inside the project (they belong to RiTA and are shared by all projects), but the project remembers which ones were on screen and shows them again when it is opened. It also saves which Memory Bank folders were loaded, in the order of the tree: when opened, the tree is left with those folders and the others are removed (those no longer in Memories are skipped). A project saved before this does not touch the tree, and changing the folders with a project open counts as an unsaved change.

14.1 LOADING AND SAVING THE SOUND CARD CONFIGURATION

`Load Configuration` and `Save Configuration` are different from a project: they only save the audio configuration and the preferences (not the DSP or the measurements), useful for passing the same sound card and screen settings to another computer. They also save the loaded Memory Bank folders (when RiTA is closed, in Last Configuration and in Save Configuration), and they come back when loaded.

14.2 OPENING A PROJECT BY DOUBLE CLICK

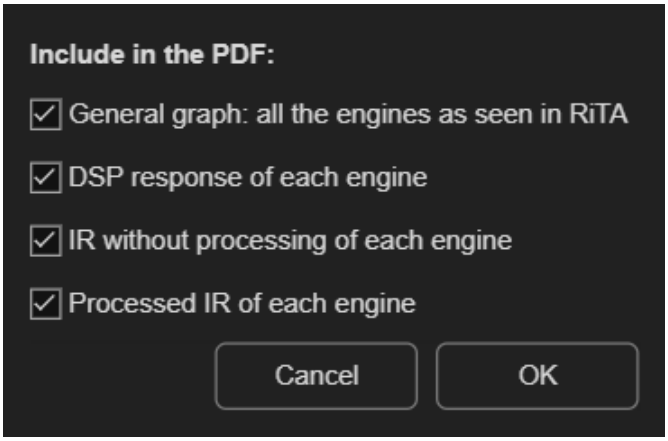
On Windows, `.rita` files carry the RiTA icon and open with a double click from Explorer. With RiTA closed, it starts and opens the project, only asking which audio to open it with. With RiTA already open, it comes to the front and opens it there, first offering to save the changes of the current project. RiTA sets up the file association the first time it starts.

> **Note:** For now it is only available on Windows.

15. PDF REPORT

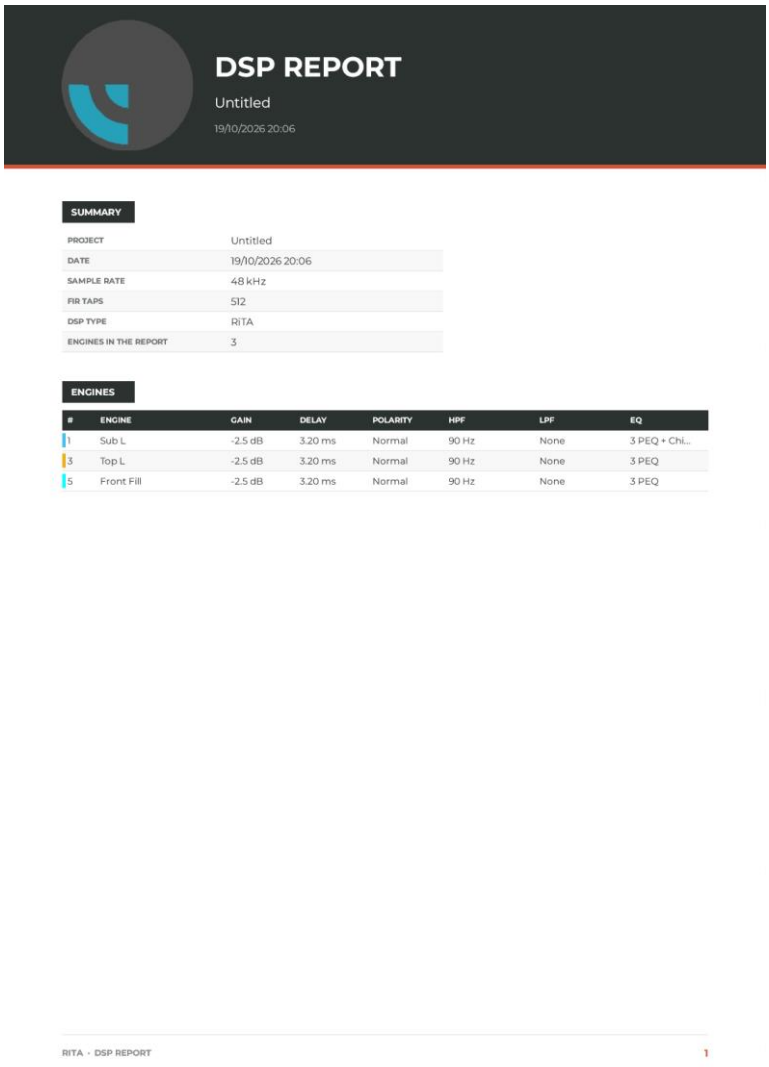
`File > Save PDF Report...` generates a PDF with the state of the DSP of the engines that are on: intended for when the information about a system has to be sent to a processor that RiTA does not connect to directly, or simply to keep a written record of how a system was set up.

Before asking where to save it, RiTA asks what to include in the PDF, with four checkboxes, all checked by default: **General graph** (all the engines as they are seen in RiTA), **DSP response of each engine**, **IR without processing of each engine** and **Processed IR of each engine**. Enter accepts and Escape cancels. The settings tables of each engine always go.



Save PDF Report: what to include.

The report has a summary page (project, date, sampling frequency, FIR taps, the DSP type the values are written with and how many engines go into the report, with one row per engine) and one page for each engine that is on, whether or not it has anything in its DSP:



DSP REPORT

Untitled

19/10/2026 20:06

SUMMARY

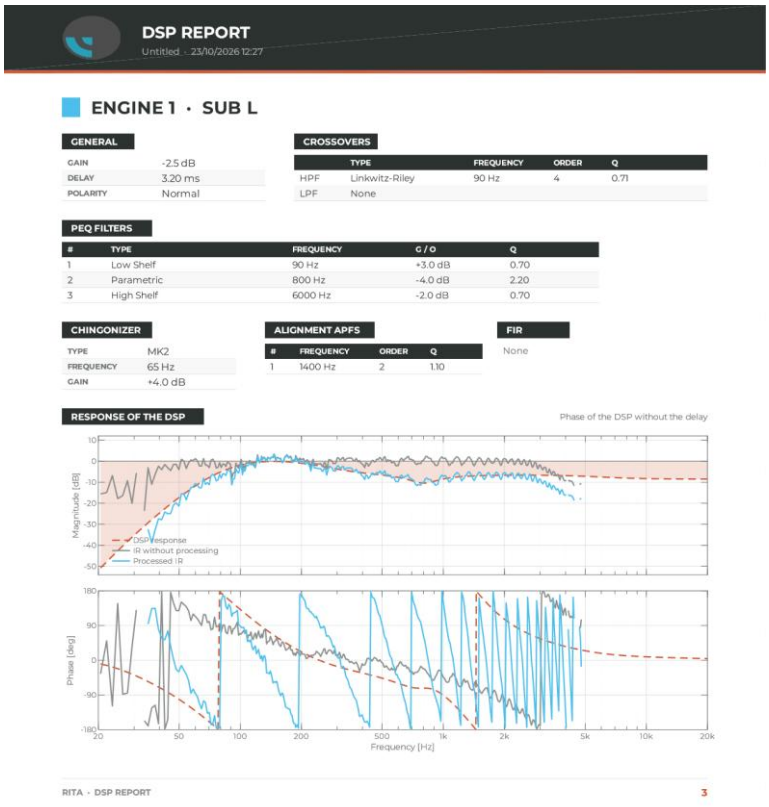
PROJECT	Untitled
DATE	19/10/2026 20:06
SAMPLE RATE	48 kHz
FIR TAPS	512
DSP TYPE	RiTA
ENGINES IN THE REPORT	3

ENGINES

#	ENGINE	GAIN	DELAY	POLARITY	HPF	LPF	EQ
1	Sub L	-2.5 dB	3.20 ms	Normal	90 Hz	None	3 PEQ + Chi...
3	Top L	-2.5 dB	3.20 ms	Normal	90 Hz	None	3 PEQ
5	Front Fill	-2.5 dB	3.20 ms	Normal	90 Hz	None	3 PEQ

RITA · DSP REPORT 1

Report cover: project, date and the list of engines included.



Engine page: gain, delay, polarity, crossovers, PEQ filters, Chingonizer, Alignment APF, FIR and, in a single graph, the DSP response and the IR without processing and processed.



General graph, landscape and behind the summary: the processed IR of each engine with a measurement, in its colour.

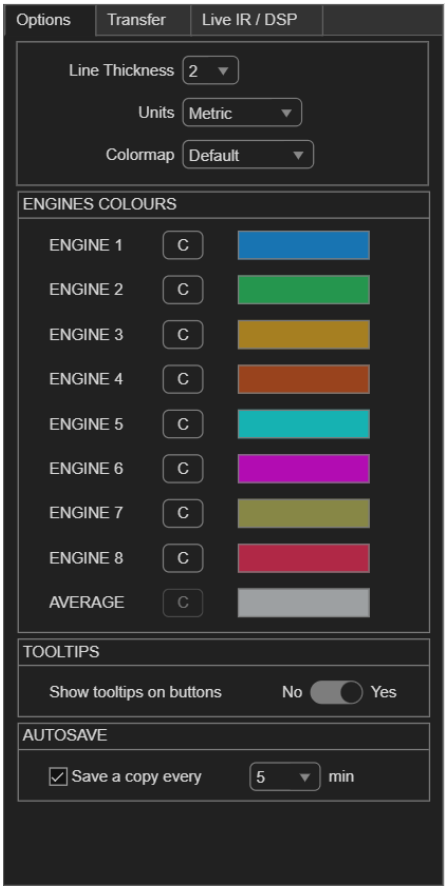
The general graph carries, in magnitude and phase and in the same format as the engines' graphs, the processed IR of each engine with a measurement, in the colour of the engine, and the Sum (in anthracite) and the AVG (in orange) if they are on, with a legend.

- The page of each engine carries its gain, delay and polarity, the two crossovers, the PEQ filters marked, the Chingonizer, the Alignment APFs and the FIR, plus the magnitude and phase response of the DSP.
- Each engine has a single graph, of magnitude and of phase, with what was checked in the dialog, and it takes the rest of the page. The response of the DSP is a dashed line shaded down to 0 dB, like the Graphic EQ, whether the engine has a measurement or not. The IR without processing (the measurement without the DSP), in grey, and the processed IR (the measurement with the DSP), in the colour of the engine, appear only for engines with a measurement and are calculated like RiTA's traces, with their smoothing and coherence; their phase goes from −180° to 180°. With more than one curve there is a legend.
- The phase drawn does not include the engine's delay (which is already in the table, separately) nor the FIR's own latency, so that engines can be compared without that offset.
- If the response does not fit entirely on the engine's page, it continues on one more page.

> **Note:** The report does not need any additional MATLAB toolbox or a special compiled installation: each page is generated as a vector figure. The first time a report is requested, RiTA installs the Montserrat typeface for the user if necessary; if it cannot be installed, it uses Arial.

16. PREFERENCES

`RiTA > Preferences` gathers, across several tabs, everything that changes how a measurement is calculated and drawn, and the look of the interface.



Preferences > Options: line width, units, colormap, the color of each engine, the tooltips and the autosave.

16.1 OPTIONS

- **Line width**, **Units** (metric or imperial) and **Colormap** of the Polar Pattern balloon.
- **Autosave** (**AUTOSAVE** panel, the “Save a copy every” checkbox and the minutes: 1, 2, 5, 10, 15 or 30; it comes checked and set to 5; unchecked, nothing is saved): RiTA keeps a copy of what is on screen, measurements included, on its own, only if there are unsaved changes and nothing is being measured (it waits until it ends). If RiTA does not close properly (a crash, a power cut), when it opens it asks “Recover the automatic copy…?”, with Recover or Discard; what is recovered stays unsaved, with the path of its project, so it can be saved again. A normal close deletes the copy. If another RiTA is open, this one does not copy. What is chosen is kept on that computer.
- **Show tooltips on buttons** (**TOOLTIPS** box, under the engine colors): No/Yes, and it comes set to Yes. With No, all the tooltips that appear when the mouse rests on a control disappear, in RiTA and in all its windows. What is chosen is kept on that computer, like the language and the theme; it is not part of the configuration or the project.
- The color of each of the 8 engines and of the average (AVG), the same one used in the graph, in the DSP table and in the generator list.

16.2 TRANSFER



Preferences > Transfer: grid and axes, spatial average, zoom, the ESS measurement (with Auto FFT Size and its field) and the Find frequency.

- **Magnitude** and **Phase**: the grid and the range of the axes of the graphs. The phase is shown wrapped (0º/180º or 0º/360º), unwrapped (Unwrap Phase), as phase delay or as group delay. When Unwrap Phase is chosen, RiTA asks for the frequency where the phase is 0 (from 1 Hz to half the sample rate; 1000 Hz to start with): each engine passes through 0 there, it is saved with the configuration and the project, and Cancel keeps the previous one. Phase delay and group delay come out right also without Find and in 64 FPPO, and their axis reads in ms without the peaks flattening it. Snapshots keep the phase in degrees and show it in whichever phase mode is on screen, even if it is changed after they were taken.
- **Zoom**: how much each zoom step magnifies, and whether magnitude and phase zoom together (Link mag/phase).
- **Spatial Average** (Spatial Average): how AVG is calculated when it averages several engines — Complex (averages the complex signal), Abs AVG (magnitude in absolute value) or dB AVG (magnitude in dB). Beside it, the **Coherence weighted** box, unticked by default: ticked, each engine counts at each frequency according to its coherence. It does not apply to Live TF.
- **ESS measurement**: single or dual channel, the sound card **Single-channel latency (ms)**, the **M-Sweep repetitions** of Multi Sweep, and the **1 ref. channel / Several ref. channels** and **1 meas. channel / Several meas. channels** switches, described in chapter 7.
- **Normal FFT Size / Auto FFT Size** (below 1 meas. channel): in Normal, the factory setting, each engine keeps 32768 samples (0.68 s at 48 kHz). With Auto, each engine keeps the power of 2 above the length of the sweep, from 65536 to 262144 samples (the cap), for long rooms and late arrivals, and everything uses it: the sweep measurement, the DSP, Find, Sync All, Sum, AVG, imports and projects. At 48 kHz that

is 65536 with a 1 s sweep, 131072 with 2 s and 262144 with 4 s or more; at 96 kHz, 131072 with 1 s and 262144 with 2 s or more. It changes when the sweep or the sample rate changes. Below the switch, a field that cannot be edited shows the size and the time constant (the size divided by the sample rate), for example “131072 (2.73 s)”. The FFT list goes up to that size and adds 128 FPPO, which always runs on 65536 (64 FPPO stays; Spectrum goes up to 32768); the delay limit is 680 ms in Normal and, with Auto, 680 ms for every 32768 samples at 48 kHz (5440 ms with 262144; at 96 kHz, half of that: 2720 ms). If the size goes up, what is measured is lengthened with zeros at the end of the block, but what comes before zero (the last 10 % of the window) stays at the end; if it goes down, it is cut and that is kept too, and RiTA warns about the engines that had something beyond. Switching to 96 kHz keeps everything that fits in the new engine. The sweep is not touched when switching on. The project saves the size (an older one opens in Normal) and Devices > Default sets it back to Normal.

- **FIND** (at the bottom): the **Find frequency (Hz)** and the **Auto** checkbox. With Auto (the default, and the field disabled), Find, TIME and Sync All use the arrival of the whole band, as always. Without Auto, they align the wave at the frequency that is written (crest with crest or valley with valley), with sub-sample precision, and not only its envelope: two paths of a crossover end up in phase at that frequency. It is useful, for example, to synchronize subs with the arrival at 80 Hz, or two paths of a crossover at 1 kHz. It is saved with the configuration and with the project.

Every control in Preferences has a tooltip that appears when the mouse rests on it.

16.3 LIVE IR / DSP

The third tab, **Live IR / DSP**, has three parts:



Preferences > Live IR / DSP: the ranges of the live IR and the DSP and FIR panels.

- At the top, **Live IR Up** and **Live IR Down**: the time and amplitude range of the live impulse responses, already synchronized. With the amplitude on Auto, the vertical scale is calculated from the whole impulse, even if the time window leaves the peak out (for example, after a zoom): only the tail is no longer magnified. A vertical zoom of your own is respected until the initial view.
- The **DSP** panel, from top to bottom: the **DSP Type** (described below) and, under it, the **Mode** row (only with a processor); the **PEQ Q / BW** switch (the Q of the filters or their bandwidth in octaves); **PEQ Bands** (from 4 to 20, 20 by default, the same number for the eight engines); the **FIR**, **Chingonizer** and **Alignment APF** checkboxes, checked by default, which decide whether they are shown in the Equalizer window (chapter 6); and the **Colour active processes** switch, on by default, which shades with the colour of each engine what is acting in its DSP, in the table (chapter 5) and in the Equalizer window.
- The **FIR** panel, with the number of **TAPS** of the FIR that RiTA calculates.

16.4 DSP TYPE

In `Preferences > Live IR / DSP`, the **DSP Type** drop-down chooses the filter model RiTA draws and computes its DSP with: its own, **RiTA** (the default), or that of a processor, **Kingray**, **Marani** or **Meyer Sound Galaxy**. Each processor understands the same numbers in its own way; with the type of one of them, what you see in RiTA is what you will get on the unit, and when the DSP is sent there is nothing to convert.

TYPE	WHAT CHANGES
RiTA	The usual one: everything as in earlier versions.
Kingray	DAP0408F: the bell is the Zolzer one (with the same Q it is wider the more gain it has) and the Bessel is at −3 dB at the cutoff frequency.
Marani	The bell (its width depends on the gain: with little gain it is narrower than the RiTA one with the same number, at 6 dB they coincide and with more it is wider, twice as wide at 12 dB), the shelving filter (its number is the slope S) and the 12 dB/oct Bessel (its own, at −6.4 dB at the cutoff).
Meyer Sound Galaxy	The bell is drawn like the GALAXY one (wider the more gain it has, as in Kingray) and the U-Shaping with the curve of the unit (five bands in fixed rows, see chapter 4); the width of the bells is rounded to 0.1 octaves. The GALAXY has no Bessel and no order 1 APF.

Butterworth, Linkwitz-Riley, all-pass, Chingonizer and FIR are the same in every type.

With a processor, the drop-down also offers each model: **Marani MIR FI**, **MIR A**, **MIR D**, **MIR E**, **MDA kDM**, **MDA kTM**, **PDA** and **VA DF**; Kingray is now called **Kingray DAP0408F** and comes last in the list. Under it, the **Mode** row chooses the input or output mode of that unit, with the names of its software (for example OUT: XOVER-IIR + 8 PEQ). The mode rules: how many PEQ there are (4 to 20), which cuts and slopes, and whether there is a FIR and with how many taps; only what the mode has can be chosen. The FIR, Chingonizer and Alignment APF checkboxes are switched off, with a help text, when the mode does not have them. When the model or the mode is changed by hand, the number of PEQ goes to the maximum of that mode and the free filters are spread over the spectrum; those of a type the new one does not have are switched off and RiTA says so. When Meyer Sound Galaxy is chosen, the PEQ switch goes to BW, and when it is left for another type it goes back to Q; the widths are converted so they sound the same, and changing the mode inside the Galaxy, loading a configuration or opening a project leaves the saved unit. With a Marani, RiTA calculates the filters as the unit does: at 96 kHz, except the MIR E, which works at 48 kHz (the Marani manual says so). Near 20 kHz the curve of the E is different from that of the others.

> **Note:** Kingray and Marani have been measured with audio on real units. The Galaxy model comes from comparing with the curves Compass draws with the virtual GALAXY, not from audio measurements. With the RiTA type, when sending to a GALAXY the width of the bells and the frequency and slope of the U-Shaping are converted so that it sounds like what is drawn.
>
> **Note:** The Marani type applies to the whole family: MIR A, MIR D, MIR E, MIR FI, Vatasa DF and the MDA (kDM and kTM) and PDA stages. It has been measured with audio on the MIR A, the MIR FI, the Vatasa DF, the MDA kDM and the PDA; the MIR D, the MIR E and the MDA kTM use the same filters without having been measured, and the FIR of the stages has not been measured with audio either. With the RiTA type, when sending to those units the Q of the bells and the number of the shelving filters are converted so that it sounds like what is drawn; the 12 dB/oct Bessel has no conversion and RiTA warns about it when sending it.
>
> **Note:** When the type is changed, what is already set is converted so that it keeps sounding the same, as when going from Q to BW: the numbers change (the Q of the bells and the shelving filters in the eight engines, and the frequency of the Bessel cuts), not the curves. What has no conversion, such as the 12 dB/oct Bessel of Marani or the Galaxy rounding, keeps its number and changes curve.

With the type of a processor, the Equalizer window, the Graphic EQ, Import IIR and the Auto EQ do not let you go past what that processor admits. When the type is changed, the filters that do not fit in the new one stay at its limit and RiTA says which. With the RiTA type the limits are the usual ones.

TYPE	LIMITS IN THE EQUALIZER
Kingray	±15 dB and Q from 0.27.
Marani	±15 dB; bell with Q from 0.4; shelving (slope S) from 0.1 to 5.1.
Galaxy	Bell ±18 dB and Q from 0.67; U-Shaping ±15 dB, with the U1 cut from 20 Hz to 2.5 kHz, U2 from 40 Hz to 5 kHz, U3 from 80 Hz to 10 kHz and U4 from 160 Hz to 20 kHz; order from 1 to 8 on U1 and U2 and from 1 to 6 on U3 and U4.

The type is saved with the configuration and with the project; a configuration or a project from before goes back to RiTA. The Auto EQ target curves are always drawn with the RiTA model, because they are not the DSP of any processor.

17. EXPORTING TO AN EXTERNAL PROCESSOR

In addition to the file exports of chapter 6 (Export IIR, Export FIR, with RCF RDNet as one more format; RDNet is only exported to a file, it is not connected live), `DSP > External Control` opens a live connection with a real loudspeaker processor and sends it the filters and crossovers of one engine, channel by channel.

MANUFACTURER	MODELS
Meyer Sound	GALAXY.
Marani	MIR A, MIR D, MIR E, MIR FI, MDA kDM, MDA kTM, PDA, VA DF (in the list, Marani MIR FI, Marani MDA kDM, ...).
Kingray	DAP0408F (in the list, Kingray DAP0408F).

> **Note:** PK Sound does not connect live: its filters go in and out by file or clipboard with **Import IIR** and **Export IIR** in the Equalizer window (chapter 6).

Several External Control windows can be open at the same time, one per processor, each with its own connection; closing RiTA closes them all.

17.1 CONNECTING

The model is chosen in the drop-down at the top, the **IP** is typed in (and, only for GALAXY, the **Port** and the **Virtual** checkbox, which forces the IP 127.0.0.1 and is useful for testing without a real device on the same computer), and **Connect** is pressed. RiTA remembers the last IP of each model separately, and for GALAXY also the port.



External Control, not connected: the processor drop-down, the IP and port, and the two empty channel lists.

Once inside, the window title changes to the device's IP and the indicator in the corner turns green; the two lists (**IN** and **OUT**) are filled with the processor's channels, each one with its number, its Mute and its name.

17.2 SENDING AN ENGINE'S DSP

With **RiTA Channel** the source engine is chosen, and with **DSP Channel** the destination processor channel — it can also be chosen by clicking directly on a row of the list. Below, two tabs decide what is sent:

TAB	WHAT IT CONTAINS
Global	Nine buttons (one at a time), in three rows: GAIN, POL and DELAY; HP/LP, PEQ and CHING; APF, FIR and ALL.
FIR	Checkboxes with what the FIR that is sent carries: RevPhase, X-Over, AEQ, Imported and ALL (which checks and locks the other four, and unlocks them when cleared). Everything checked goes together in a single FIR. Below, Taps and Fs, as in Export FIR.



The FIR tab: the checkboxes for what the FIR carries, with Taps and Fs.

Send sends only what is checked: GAIN, DELAY, POL and HP/LP each send their own; `PEQ` sends only the numbered filters of the PEQ window; `CHING` sends the Chingonizer (with an MK2, also its +G in the gain); `APF` sends the Alignment APFs; `FIR` sends the FIR that the checkboxes of the FIR tab carry (to send the one calculated by Auto EQ, check AEQ there); and `ALL` sends everything: delay, gain, polarity, PEQ, Chingonizer, APF, HP/LP and the checked FIR, if there is one. PEQ, CHING and APF each go to their own filter slots of the processor, so sending one does not erase the others. **Reset** does the same as Send but leaves that processor channel as freshly switched on, instead of with RiTA's values: PEQ, CHING and APF flatten only their own filters (with an MK2, Reset CHING also takes its +G out of the gain), Reset ALL flattens the FIR too, and Reset HP/LP warns if the channel has no cuts.

The **Taps** and **Fs** of the FIR are by default those of the mode of the processor channel it is sent to, and go back to them when another channel is chosen; a value changed by hand holds until then. If an Fs other than the channel's is chosen, RiTA warns about it.

Under **Send** a line says the mode of the chosen channel ("Mode of this channel: N."; on an output of a kDM, "Crossover mode of this channel: N."), on the processors that have modes. When several things are sent at once, the progress bar counts the sends ("Sending... 3 of 6").

> **Note:** With the Chingonizer in MK2 mode, checking only CHING also sends the channel's gain, because the MK2 carries part of its setting there: otherwise the processor's curve would end up below RiTA's. If an engine has more filters checked than the processor supports, RiTA sends the first ones that fit (in the order of the Equalizer window) and warns which ones were left out; if the channel, as configured in the processor, does not support FIR or a crossover, RiTA says so instead of sending it without warning.
>
> **Note:** If the mode of a channel could not be read (on a Marani), RiTA says so instead of assuming it has FIR and crossovers; and on a Marani with old firmware, a filter type it cannot receive is left flat and a warning is given.

Note: The first time since RiTA was opened that a FIR is sent (FIR, or ALL with a FIR checked), RiTA says "Do not forget to compensate the FIR latency in the rest of the channels." If that send already carried another warning, the sentence goes at the end of the same message.

Note: If the processor admits fewer coefficients than a FIR has (for example an output of a Marani MIR in FIR mode at 96 kHz, which admits 416, against a FIR of 1024), RiTA does not cut it straight: it windows it (Kaiser), without moving the peak or the delay. The stop band holds (measured with a MIR FI: from -27 to -58 dB, the floor of the measurement) and what is paid is a wider transition. With under 60 % of the coefficients, RiTA warns about it. While the processor is connected, RiTA draws the FIR as it sounds on that channel, from Send until disconnecting or Reset; with no connection it draws it whole again. It applies to External Control on the MIR, kTM, kDM, PDA and output 8 of the DAP.

Note: PDA: the crossover mode is shared by the two outputs. RiTA reads it on connecting and before each send; if what is sent (HP/LP or an output FIR) needs mode 0 and the unit is in another, such as XOVER FIR + HP or XOVER MIR, it asks before changing it, with No as the default. If the answer is no, the mode stays and what it does not allow is not sent, and RiTA warns about it. An input FIR does not touch the mode. This has not been tested with a real PDA, only with a simulated one.

17.3 MANUFACTURER-SPECIFIC POINTS

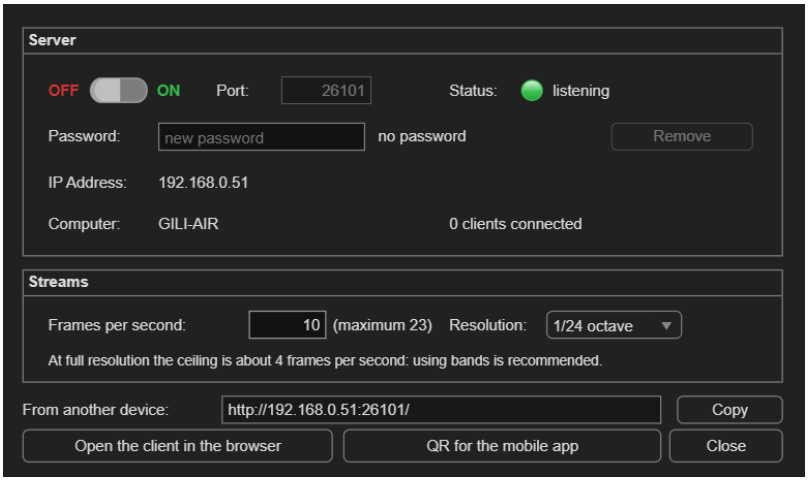
MANUFACTURER	WHAT TO KEEP IN MIND
GALAXY	Sends the type and slope of the crossover, not just the frequency; supports shelf and all-pass (the shelf is sent as U-Shaping, and the slope is rounded to steps of 6 dB/oct, with a warning). Removing a filter also really deletes it from the device.
Marani MIR	Connecting no longer forces the channel's EQ mode (it could previously delete a FIR that was already set): it only changes mode if the channel has no FIR.
Marani MDA (kDM/kTM)	The mode does not change on each send, and the number of available filters is read from the device itself instead of being assumed (the kTM supports up to 24 per channel).
Kingray (DAP0408F)	A shelf filter takes up two of the available slots, not one, just as when exporting to a file in d&b (R1) or RCF (RDNet) (chapter 6).

18. THE API AND THE MOBILE CLIENT

RiTA can be queried and driven from outside: from a room control system such as Companion (Bitfocus), from the phone of someone walking around the room while another person adjusts the DSP on the laptop, or from an application of your own. Everything goes through the same API, which talks over the local network without needing any internet service.

18.1 TURNING ON THE API

`Tools > API` opens the server's control panel.



The API panel: on, without a password, with the address ready to copy or for a QR code.

- The **OFF / ON** switch turns the server on and off; the port can be changed while it is off.
- **Password** is optional: without one, anyone on the same network can connect; with one set, it has to be typed into each client before anything can be changed (reading stays open to anyone who does not know it, depending on what each client decides).
- **IP address** and **Computer** are this computer's identifiers on the network, and **Streams** controls how many frames per second, and at what resolution (bands per octave), the live graphs are sent: lower resolution allows more frames per second.
- **Connect to** is the full address of the server, with **Copy** to paste it into a client, **Open the client in the browser** for the web client without installing anything, and **QR for the mobile app** to connect the phone by pointing its camera at it.

18.2 THE CLIENTS

CLIENT	WHAT IT IS
Desktop client	A separate application (RiTA API Client), for Windows and macOS, that discovers the RiTAs on the network and tests any API command by hand: useful for exploring what can be done or for debugging the integration with a control system.
Web client	The same interface as the desktop one, but served by RiTA itself and opened in any browser, without installing anything. It follows RiTA's language.

CLIENT	WHAT IT IS
Mobile client	Designed for a phone: the level of each engine, the average (AVG) drawn live over the engines' traces, a switch to turn it on and off, and Export AVG to export it with the name typed at that moment.

18.3 WHAT CAN BE DONE THROUGH THE API

Through the API, an external control system can, among other things:

- Read and write the gain, delay, polarity and crossovers of each engine.
- Read and write any of the 20 filters of the Equalizer, the Chingonizer and the Alignment APFs.
- Turn the engines on and off, launch a measurement and read its result.
- Turn AVG on and off, see its curve live and export it with a name.
- Export all the measurements (Export All) and the average, with the position set in the exportPosition setting (empty, no position); the files come out as engine_position. RiTA has no position field: whoever exports on the computer types it in the name.
- Be informed of changes without having to keep asking: the API announces them by itself as soon as something changes, whether it was touched on RiTA's screen, from another client or from the control system itself.

> **Note:** The full API documentation (all objects and all properties, with examples of each message) is a separate document, intended for whoever programs the integration: the RiTA API specification, which is delivered together with this manual.

19. KEYBOARD SHORTCUTS

The `Shortcuts` menu reminds you, so you do not have to memorize them, of the single-key shortcuts that work with focus on the main window:

KEY	ACTION
G	Turns the generator on or off (Gen / Measure).
Y	Sync All: aligns all the engines that are on against the reference.
Space	Export All: exports the measurement of all the engines that are on.
S	Snap All: saves all the current measurements to the Memory Bank.
M	Sum: turns the acoustic sum on or off.
A	AVG: turns the average on or off.

On the magnitude and phase graphs, dragging with the mouse draws a zoom box, and a double click returns the view to its initial state; with `Link mag/phase` active in Preferences (chapter 16), the zoom of one is also applied to the other.

- Escape closes the window or dialog in front, just like pressing Cancel.
- On Windows, `Ctrl+W` closes the window that has the focus; on the main RiTA window it asks first whether to quit.
- Preferences, About, Audio Devices, External Control and Polar Pattern have no menu bar, and on Windows they are closed with `Ctrl+W`. On Mac, with the main window in front, Cmd+Q closes the whole of RiTA, with a single question.
- The `Time Window` and `Mic Correction` menus (Measurements menu) have their own shortcut, `Ctrl+T` and `Ctrl+K` (`Cmd+T` and `Cmd+K` on Mac), the same on both platforms.

APPENDIX: WHAT'S NEW IN VERSION 2.8

Summary of what 2.8 brings compared with the previous version, for those who already knew RiTA. What is marked as "2.8.1" came after 2.8.0, and what is marked as "2.8.2" after 2.8.1; the rest is from 2.8.0:

- The DSP of the eight engines is now in a single table with scrolling, and each engine has its own equalization window (Equalizer) with 20 filters, FIR filters, a graphic equalizer, the Chingonizer and the two Alignment APFs.
- Two new tools in Tools: Auto Align, which aligns engines with each other, and Auto EQ, which calculates the equalization towards a target curve and shows the result before applying it.
- The Auto EQ target curve can be drawn inside RiTA, starting from a flat curve, a factory curve or a Snapshot, and saved to be edited again later; it can also be imported from a file.
- The RTA runs more smoothly.
- Several engines can be measured in a row with Multi Sweep, and a single reference channel can be used for all of them.
- Microphone correction is now done per input, with its own tab for generating curves.
- Projects: all the work (measurements, DSP, settings) is saved in a .rita file and reopened afterwards just as it was.
- PDF report of the DSP of the engines that are on, from File > Save PDF Report.
- On the graphs, zoom is done by dragging a box, and the initial view is restored with a double click.
- Almost all buttons and drop-downs show a tooltip when the mouse rests on them, in RiTA's language.
- If the sound card is not connected or cannot be used, RiTA says so with a clear warning when Measure is pressed, instead of leaving the button stuck down.
- When a low-pass filter is put in the DSP of a low engine (a sub), RiTA now shows its real arrival, the one it will have at the processor. Before, it showed it a few milliseconds early, so an alignment between sub and tops made on that old measurement should be redone.
- When a filter is checked in the Equalizer window of an engine that is off, the engine turns on by itself, in the DSP table.
- An engine's FIR can also be exported as wav, fir and F32, in addition to txt and csv.
- New AVG Alignment wizard, which measures several microphones or positions and leaves ready in Auto Align the averages of a mid-high with a low (`LF+HF`) or of two mid-highs (`HF+HF`), to be chosen on the first screen; more than 8 measurements per system can be requested, although only the first 8 go into the average (chapter 12).
- The Clear button now asks what you want to clear: the DSP, the measurements, or everything. Clear Selected, next to it, deletes only the rows checked in the Memory Bank.
- From the phone, the average (AVG) can be turned on, viewed and exported with a name.
- RiTA can be driven from outside (Companion, a web page, the phone or a desktop application) through its API.

- New DSP > Copy DSP and Link DSP menu (chapter 5): take one engine's DSP to others at once, or leave them linked so they keep following it, group by group (gain, delay, polarity, crossovers, EQ and the three FIRs separately).
- Each engine's FIR goes from two rows to three (chapter 6): X-Over FIR (designed inside), AEQ FIR (only filled by Auto EQ) and Import FIR (loaded from outside). New Import IIR button, the counterpart of Export IIR: it brings in filters from a file or from the PK Sound clipboard and replaces the engine's 20 parametric filters.
- The X-Over FIR editor now has OK and Cancel: Cancel (or Escape, or the X) leaves the design as it was when the window was opened.
- External Control (DSP menu, chapter 17) has been entirely redone: a single window per processor, with two channel lists and the connection (processor, IP, port) in the bar at the top instead of in a separate window. Several can be open at the same time, one per processor — now with support for GALAXY, Marani (MIR, MDA, PDA, VA DF) and Kingray (DAP0408F).
- The six factory curves of Auto EQ (GAS, LA Nominal, BLUE, GREY, SAPHIRE, WHITE) are always in the Target drop-down, without having to create them by hand first.
- RiTA tells you when a newer version is available, and it can also be checked by hand: `RiTA > Check for Updates...` and `Check for Updates at Startup` (chapter 2). It does not download or install anything.
- The Dark or Light theme is now in `RiTA > Theme`, and RiTA remembers it like the language (chapter 5). In its place, next to Clear, there is a **Clear Find** button that removes the Find in one go.
- New **DSP Type** in Preferences > Live IR / DSP (chapter 16): RiTA can draw and compute with the filter model of a processor (Kingray, Marani or Galaxy), so that what you see is what you hear on the unit, and the Equalizer window does not go past the limits of that processor.
- `.rita` files open with a double click on Windows (chapter 14).
- The PDF report states the DSP type the values are written with.
- The Equalizer window has a **Bypass** button to see the engine with and without equalization (chapter 6), and `Select all` is now called **Enable all PEQs**.
- Auto EQ and Auto Align remember their settings as long as RiTA stays open.
- The Galaxy DSP type draws the bell and the shelving filters the way the GALAXY does (chapter 16), and when sending a FIR that the processor cuts a lot, RiTA warns that it will attenuate less than drawn (chapter 17).
- The Marani DSP type now has its three models, measured with audio: the bell, the shelving filter and the 12 dB/oct Bessel, and it applies to the whole Marani family, also to the MDA and PDA stages (chapter 16).
- Preferences > Transfer now also has the 1 Meas. Channel / Several Meas. Channels switch (chapter 16), and the Auto EQ preview has the IIR % and FIR % sliders to apply only part of the correction (chapter 11).
- New license system (chapter 3): RiTA is activated with a signed activation key. All customers need a new license the first time they open 2.8, even if they already had RiTA activated; for those who were already customers it is free. The Activate RiTA window shows a request code with a Copy button and has a Paste button for the key; RiTA > License Deactivation lets you change computer.
- 2.8.1: Acoustic IR: the reverberation times and the clarity subtract the background noise from the decay curve and only give a value when there is enough margin; there is T10 (chapter 8); Export IR as WAV saves

in 32-bit floating point. With sweeps of 2 s or longer, the measurement no longer reads 0.3 dB low below 125 Hz (chapter 7), and in dual channel the response no longer depends on the duration of the sweep or on the sample rate.

- 2.8.1: Colour of what is active: in the DSP table and in the Equalizer window, what is acting (gain, delay, polarity, cut-offs, checked filters, Chingonizer, Alignment APFs and FIR) is shaded with the colour of the engine; the EQ button is white with its window open and red in bypass. It is removed with the Colour active processes switch in Preferences (chapters 5, 6 and 16). Preferences now has three tabs: Options, Transfer and Live IR / DSP, which now also carries the DSP and FIR panels; the FIR panel only has TAPS, because the WINDOW drop-down had no effect. The order of a FIR RevPhase is 1 or 2.
- 2.8.1: Polar Pattern: the map and the polars are calculated the same way for any step and angle, and are more reliable between the measured angles, especially with 15° and 30°; Distance to mic no longer affects it (chapter 13). External Control: under Send the mode of the chosen channel is shown and the bar counts the sends (chapter 17); PEQ sends to a Marani MIR are faster.
- 2.8.1: Measurements from other programs: External IR/TF and Import read the EASE Focus .txt (GLL at 1/24 octave) with magnitude, phase and arrival; a file that yields nothing warns instead of leaving the engine empty, and impulses without phase are imported with a warning that only their magnitude is valid (chapter 8).
- 2.8.1: Memory Bank: New Folder asks for the name (before, a random one was used) and Export in the AVG menu asks for the file name, starting with AVG_; the Position field is no longer on the screen (chapter 8). When the language is changed, the open windows change too.
- 2.8.1: DSP Type: Marani with its eight models and the mode of each one (Preferences, chapter 16), the filter types of each model in the Equalizer and the NXF cut (chapters 5 and 6); PEQ Bands goes from 4 to 20 and only what the mode has can be chosen.
- 2.8.1: Acoustic IR: single-position averages as ISO 3382-1 defines them (C80 500-1K and Ts 500-1K, besides the others) and the Beranek one (C80 500-2K), the STI and its letter in rows of their own in the table, and better reading with a loudspeaker measured up close or a short measurement (chapter 8).
- 2.8.1: Acoustic IR: new Step view (step response), single-position averages (Tmid, EDTmid, C80 500-2K and D50 500-1K) and the impulse measured from 20 dB below the maximum, as ISO 3382-1 asks (chapter 8). RTA: the Meter drop-down offers dBFS weighted with the A or C curve, in RMS or peak (chapter 7).
- 2.8.1: Acoustic IR: new parameters (C7, D50, Ts, EDT/T30, D/R, ITDG, BR, TR, echo, STI, STIPA, RASTI and %ALcons), new views D50 Ts, ITDG and Parameters (by octave or third octave, with Export), and the legends with the whole-band value (chapter 8).
- 2.8.1: Equalizer: new Reset EQ button, to the left of Import IIR, which leaves the equalizer of the driver as freshly opened (chapter 6). Acoustic IR: draws any measurement of the engine, also one from the Memory Bank, from a file or from a project (chapter 8).
- 2.8.1: Equalizer: Preferences decides what the window shows (chapters 6 and 16): PEQ Bands, the number of parametric filters from 1 to 20 for the eight engines, and the FIR, Chingonizer and Alignment APF checkboxes; the PEQ go in rows of 4 and what is hidden does not act. Also, low-order HPF and LPF crossovers are exact with very low frequencies too, in 64 FPPO a flat response no longer comes out 0.1 dB low in some octaves, and designing a high-pass X-Over FIR with an odd number of taps no longer gives an error.
- 2.8.1: Auto EQ: new Level Offset checkbox (chapter 11), and the chosen target is shown when the window opens. The buttons of each engine show their number. With 1 Meas. Channel, Spectrum does not act:

each engine has its own channel, and RiTA remembers for each sound card the reference and measurement switches (chapters 5 and 16).

- The identifier of the computer no longer comes from the network card, so the license does not change when macOS is updated; the identifier of the key appears in the footer of the DSP PDF report and is saved in the project.
- 2.8.2: X-Over FIR: in Edit, Freq 1 and 2 and Window 1 and 2 (2 only in band pass), and Butterworth and Linkwitz-Riley among the windows, with their Order (1 to 8), with linear phase; each cut of the band pass can take its own. The taps are the maximum length: the FIR uses only the ones it needs and a higher cut has less latency, shown in the window title (chapter 6). The Preferences taps are now only for the FIR RevPhase filters. With a normal window, Order (Auto, 2, 4, 6 or 8) brings the FIR closer to a Linkwitz-Riley by changing the taps. Designing, ticking or importing a FIR switches the engine on in the DSP table.
- 2.8.2: Meyer Sound Galaxy as DSP Type: fixed filters per mode (bells, U-Shaping and one APF), APFs of order 2 only and U-Shaping with its ranges (chapters 6 and 16).
- 2.8.2: Autosave: RiTA saves a copy every few minutes and, if it does not close properly, offers to recover it when it opens (Preferences > Options, chapter 16).
- 2.8.2: Single Channel: the R dropdowns are locked in Sweep, Multi Sweep and Pink, and External is not in the signal list, because it needs the reference (chapter 7).
- 2.8.2: Import Snapshot, in the right-click menu of each engine, loads a Snapshot with its impulse and its DSP (chapter 8).
- 2.8.2: Mic correction: new curves have 384 points per octave (generate the old ones again to notice it) and engines measured with the window open appear in the list (chapter 9).
- 2.8.2: Mic correction with a reference that already has a curve: if the reference mic input has its factory curve, the generated curve takes the other mic to the corrected reference, the one that is seen; before, it was left off by exactly the factory curve (chapter 9).
- 2.8.2: RTA with smoothing: the level of a tone or of noise no longer changes when the window (Time Window) is changed; before, Hann read almost 2 dB more than Rectangular and Flat Top almost 6. Without smoothing nothing changes. RTA memories saved before keep the level they had, so a memory with smoothing from before reads above a new measurement (chapter 7).
- 2.8.2: RTA without smoothing: a tone is no longer drawn with a false second peak next to it or with a sawtooth on its skirt; it was seen mostly with the Rectangular window and a lot of zoom (chapter 7).
- 2.8.2: RTA without smoothing, in line mode: the peak of a tone shows at its frequency; before, it could show several hertz away (a 1 kHz tone, at 991 Hz) and, at high frequencies, tens (chapter 7).
- 2.8.2: Shortcuts: Ctrl+W closes the active window on Windows, and the Preferences, About, Audio Devices, External Control and Polar Pattern windows have no menu bar (chapter 19).
- 2.8.2: API: settings.transferMode, read only, says whether RiTA is in Single Channel or Dual Channel; fir/xover adds order, windowOrder and windowHigh, and the Butterworth and Linkwitz-Riley windows (chapter 18).