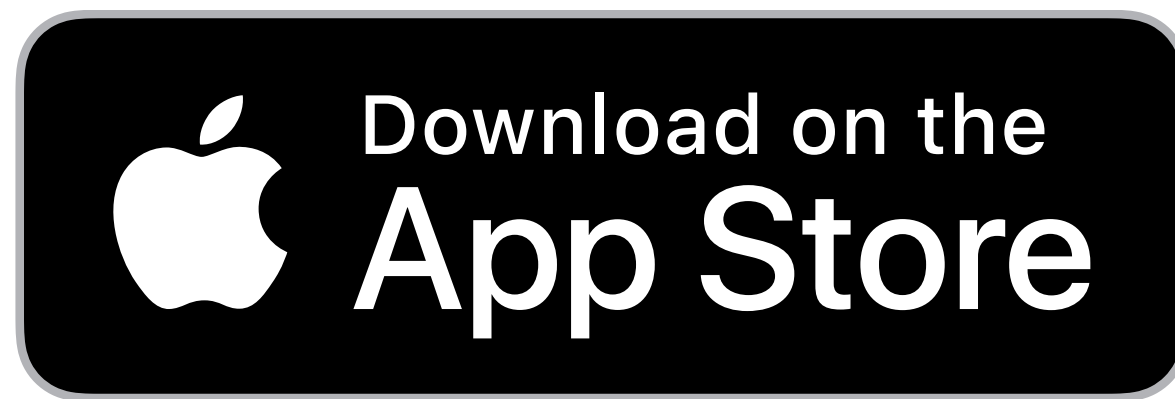


Open Sound Meter



Overview v1.5

iPad OS



Version for the iPadOS/iPhone available at App Store by low reasonable price.



What is Open Sound Meter

Cross-platform
measurement application
for tuning sound systems
in real-time



Main goals

- **K**eep only really needed functions
- **I**ndividual functions should be easily and quickly accessible
- **S**imple interface
- **S**upport young engineers

Similar to a design principle noted by the [U.S. Navy](#) in 1960: keep it simple, stupid



Consulting

If you have any questions about any tools or options – we are here to help.

We provide consulting service and trainings for users.

Visit <https://opensoundmeter.com/consulting> for the details.



Supported systems

iPad, iPhone	from iOS12
macOS	from 10.13
Windows x64	from 7
Linux	ApplImage (Glibc 2.29 or above)

If you can't find binaries for your system, build it with Qt5.15



Is it free? Really?

Desktop versions are distributed by the model
pay what you want

Just remember, every donation is a great help for
further development.

iOS version are distributed by low reasonable price.

<https://opensoundmeter.com/about>

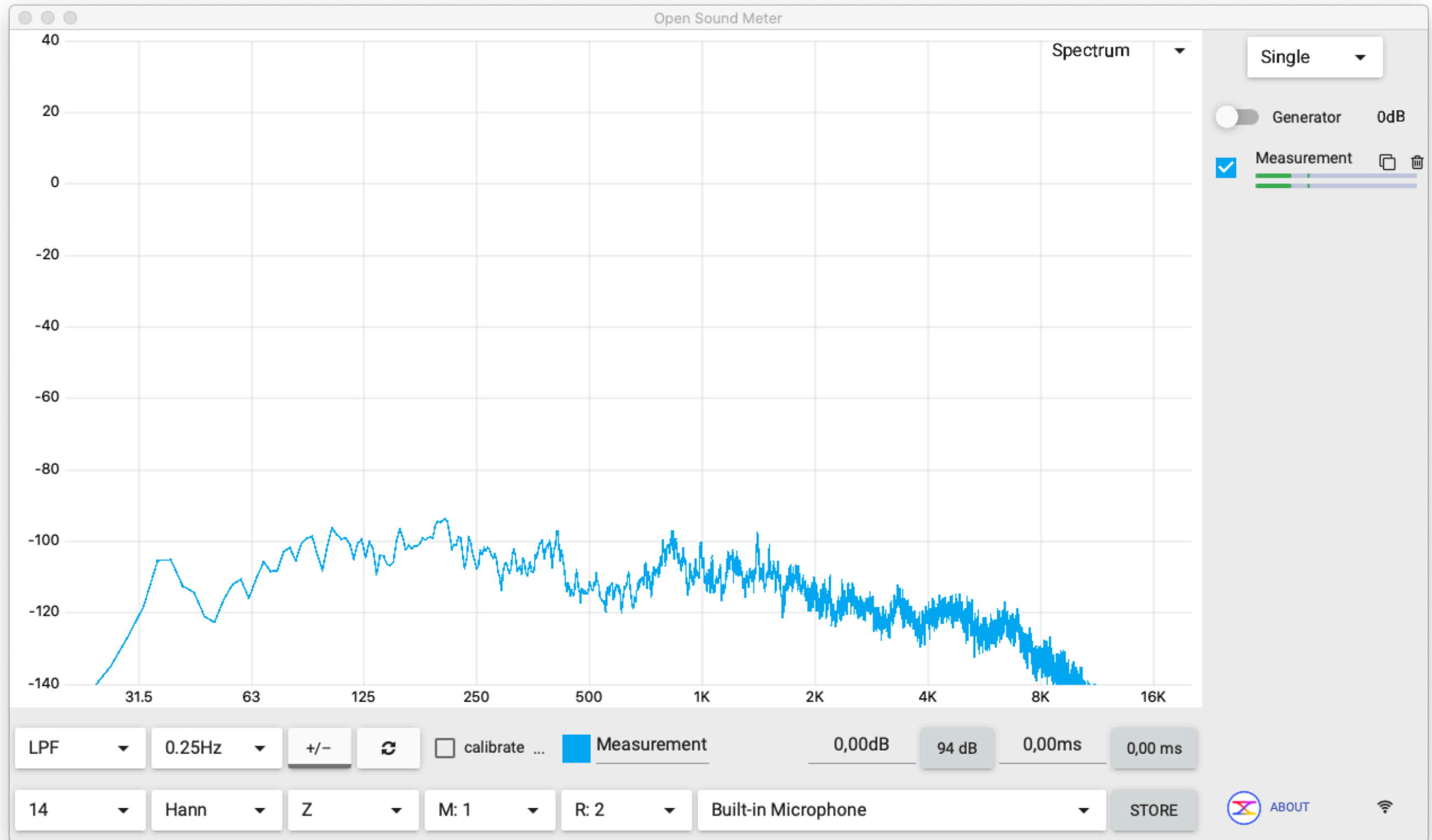


Where can I get it?

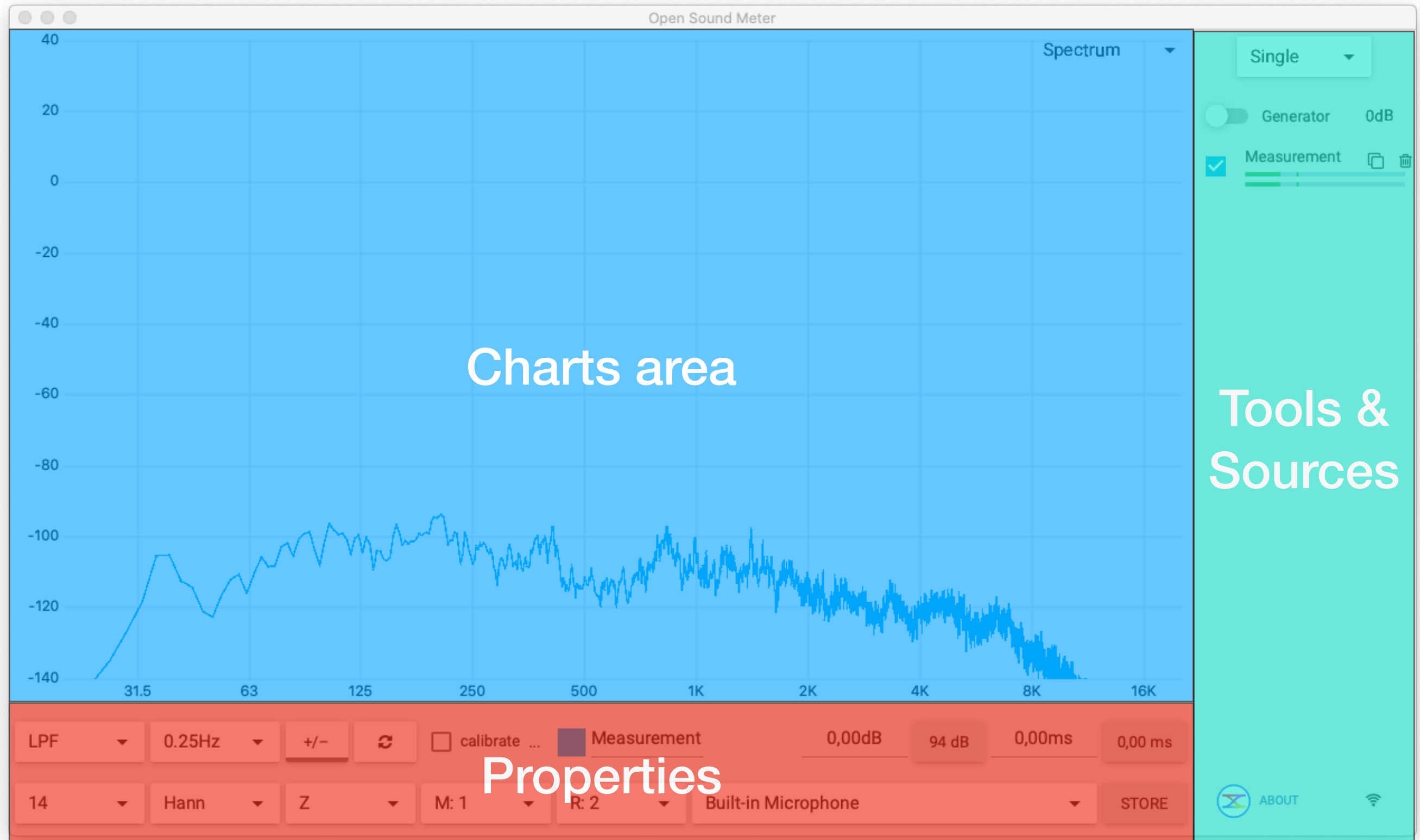
opensoundmeter.com



Let's run



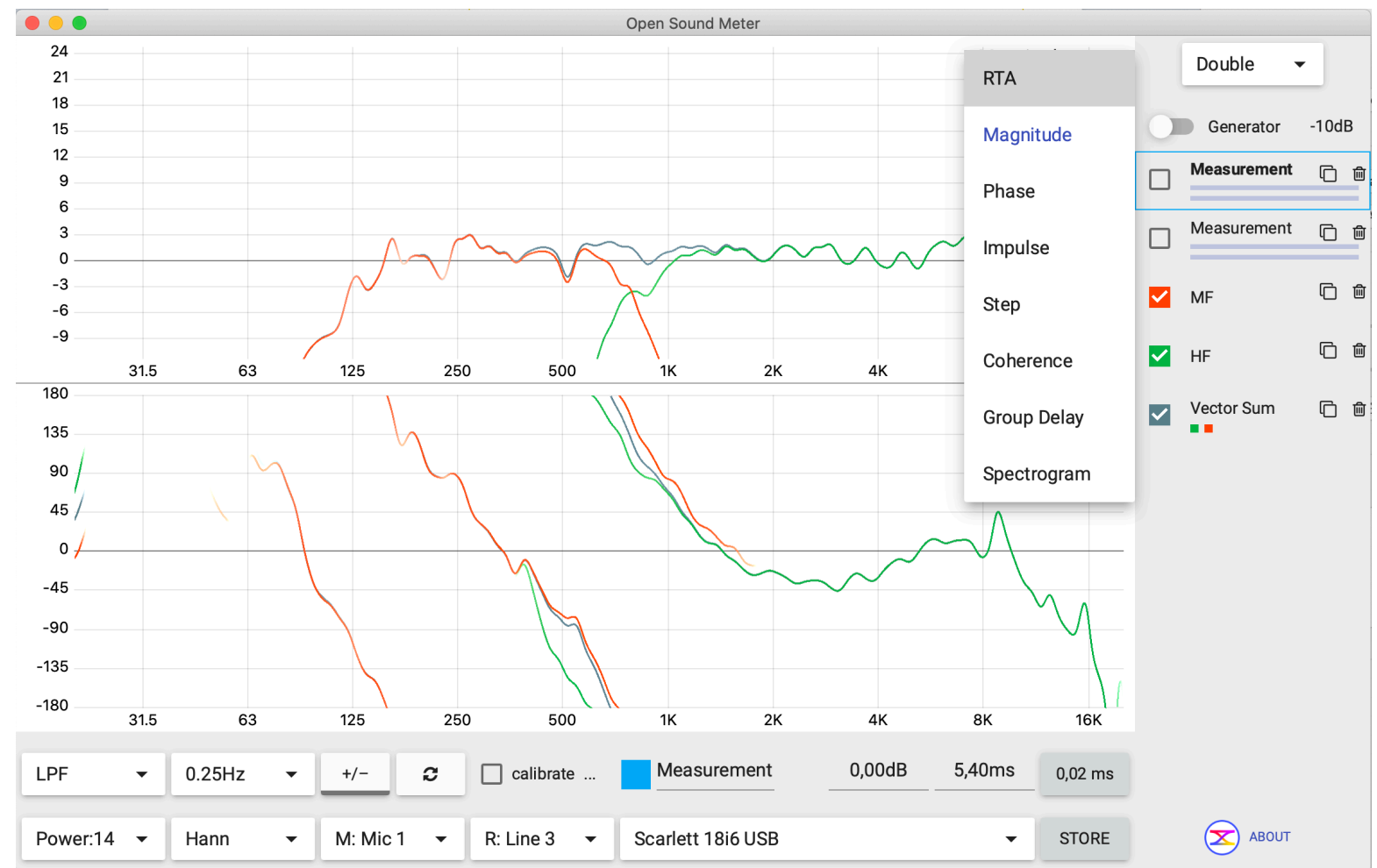
Layout




Charts area

Up to three charts of different types, or numerics values

- Spectrum
- Magnitude
- Phase
- Impulse
- Step
- Coherence
- Group delay
- Spectrogram
- Phase delay
- Level
- Crest factor
- Nyquist plot

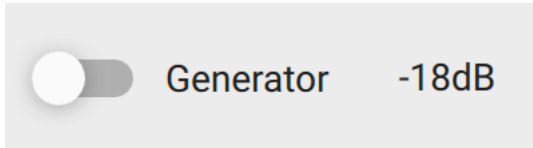


Tools and sources



Single ▼

Charts count



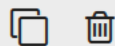
☐ Generator -18dB

Generator's output

Click label to open properties



Measurement



Measurement's processing and visibility

Click label to open properties

Checkbox color = series' color

Levels meter for measuring and reference channels

Icons for delete and clone



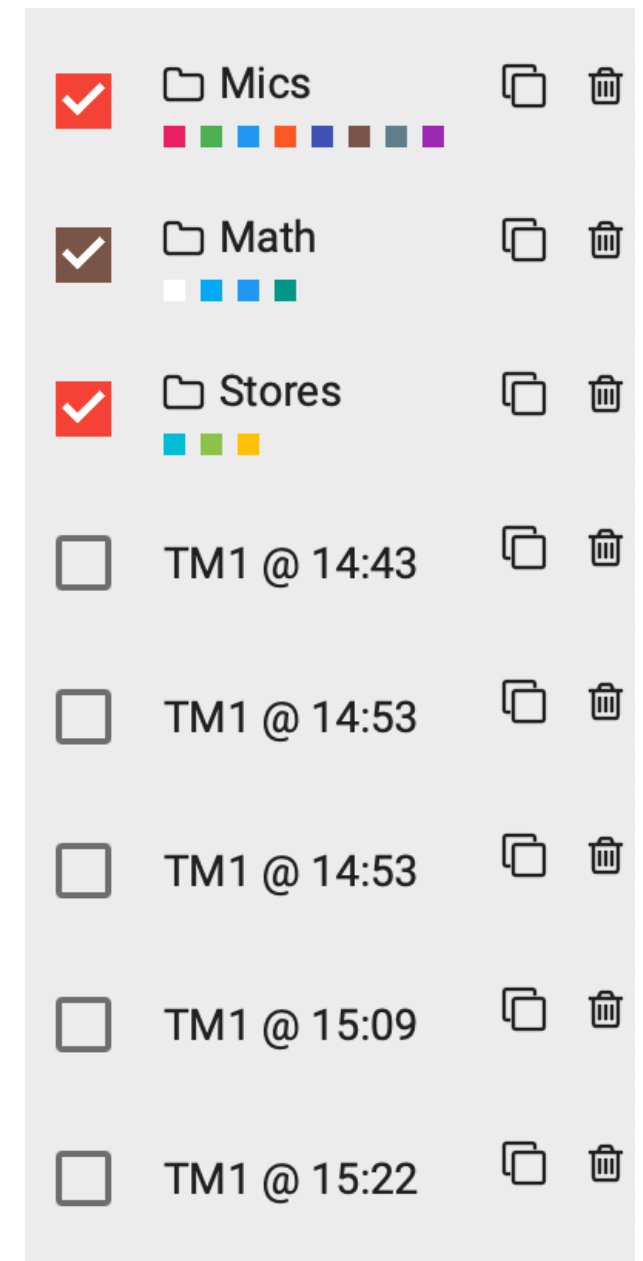
Sources

All data sources are collected on the right

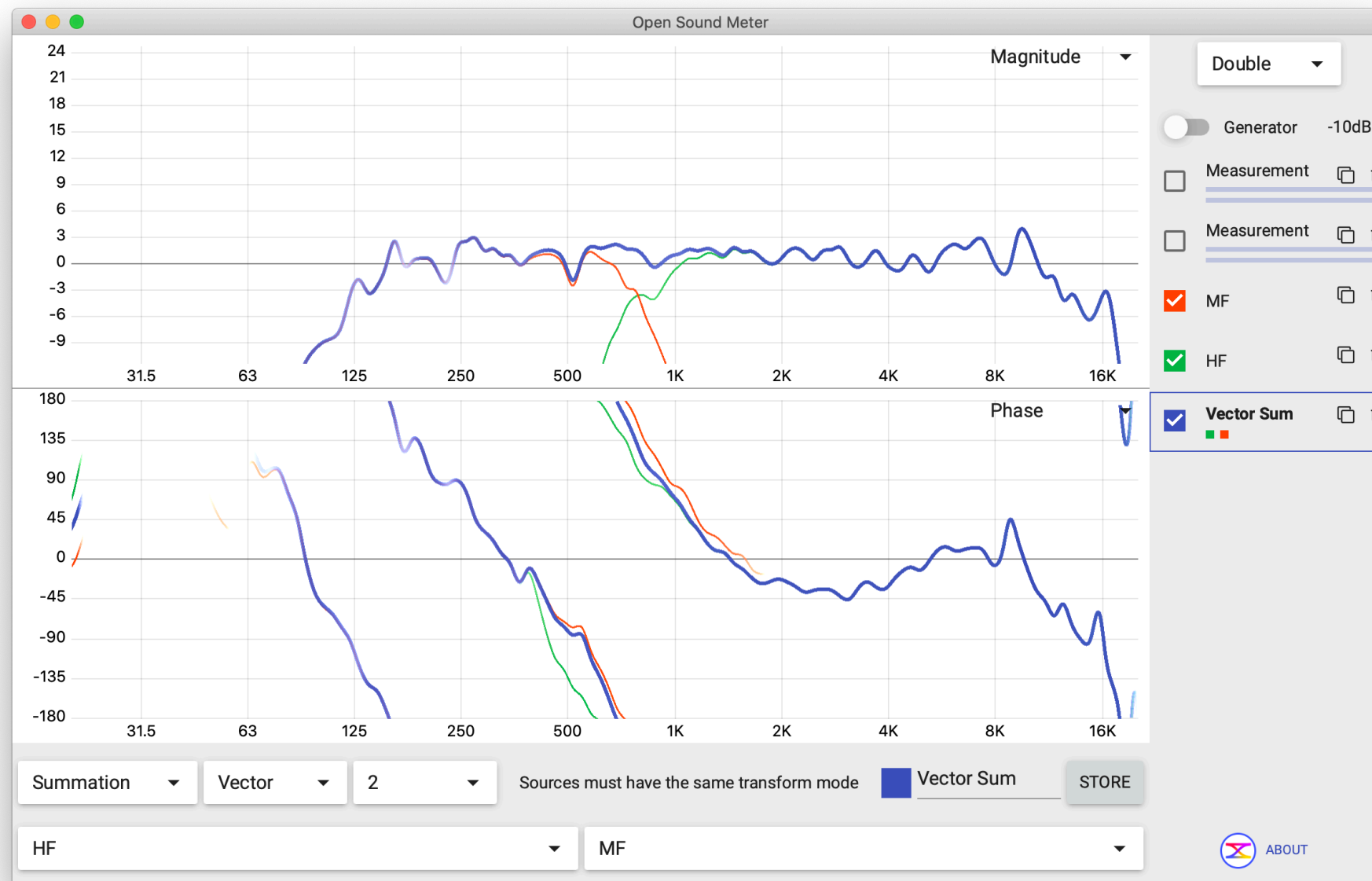
It's possible to combine sources in groups
Use menu or a short-key to add new group

With a drag-n-drop it's possible to sort sources.
Source can be dropped into the group

To activate drag-n-drop press and hold needed
source, then it's possible to move it.



Charts area



Selected source has bold line and always on top on other charts
z-order of charts corresponds to the sources order

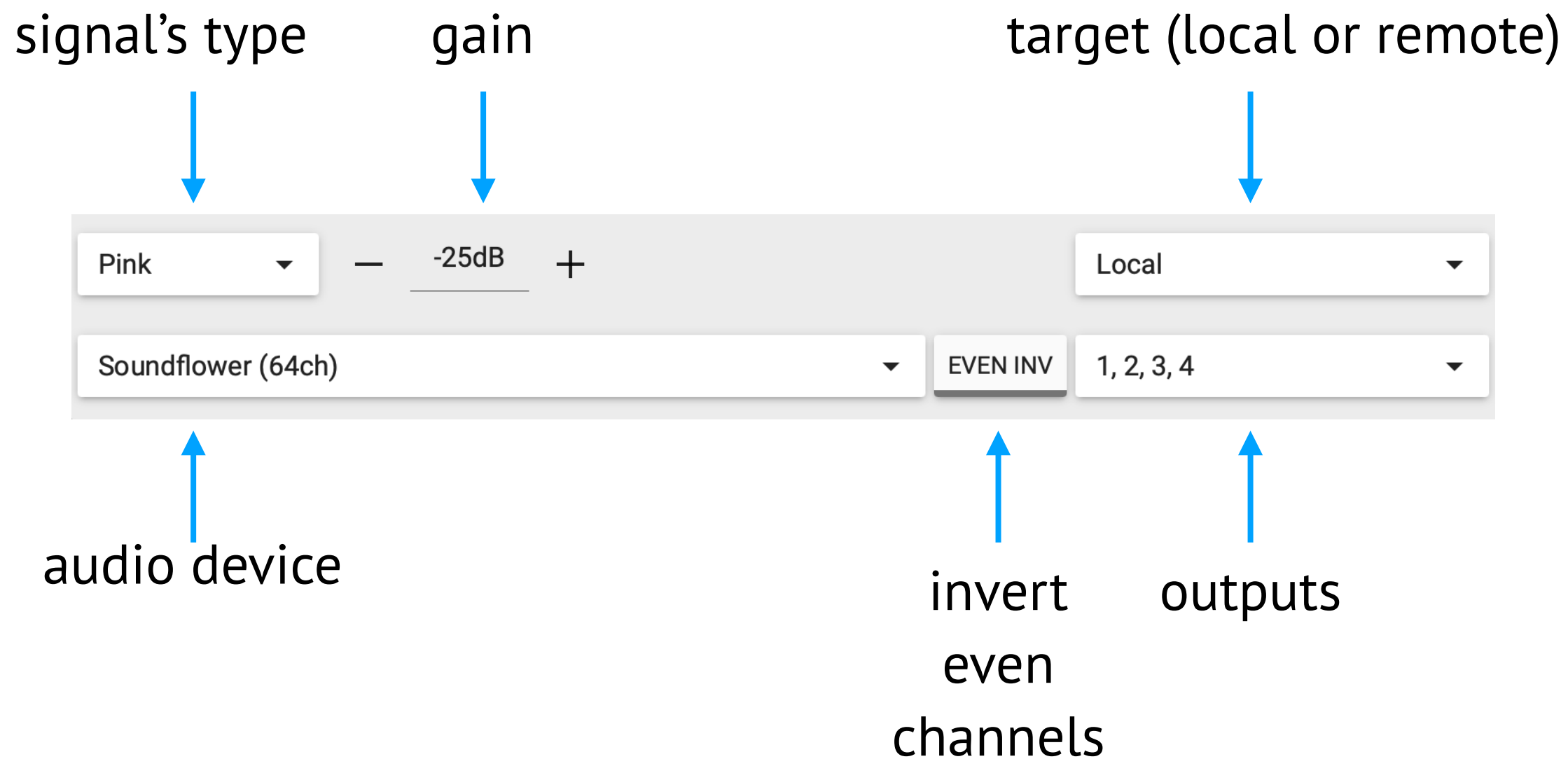


Properties

Click any object (chart, measurement, generator etc) to open properties in the bottom bar.



Generator properties



Generator properties

frequency for *sin* type

current $\div 2$ $\times 2$

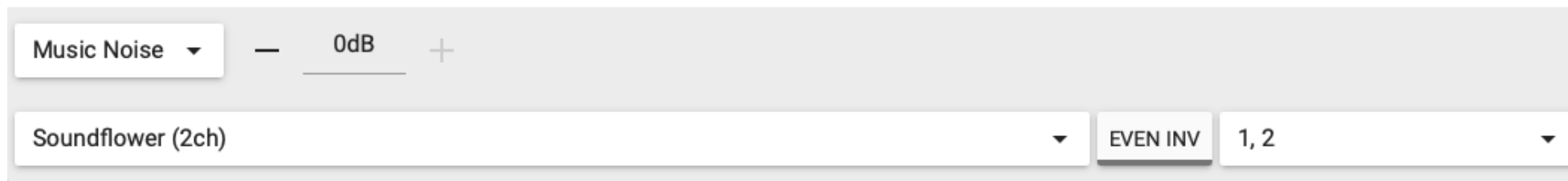
↓ ↓ ↓

Sin - -25dB + - 1000Hz + OCTAVE DOWN OCTAVE UP Local

Soundflower (64ch) EVEN INV 1, 2, 3, 4

Generator properties

Music-Noise for AES75 2023



AES75 2023: AES standard for acoustics - Measuring loudspeaker maximum linear sound levels using noise, details a procedure for measuring maximum linear sound levels of a loudspeaker system or driver using a test signal called Music-Noise.

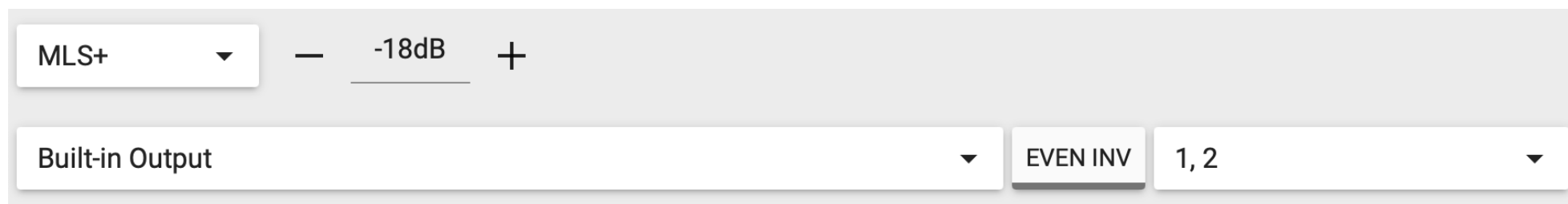
Music Noise is available only when audio device works at 48kHz or 96kHz

<https://www.aes.org/standards/AES75/>



Generator properties

MLS+



The screenshot shows the 'Generator properties' window for the 'MLS+' signal. It features a dropdown menu set to 'MLS+', a level control with a minus sign, '-18dB', and a plus sign. Below this, there is a dropdown menu for 'Built-in Output', a button labeled 'EVEN INV', and a dropdown menu set to '1, 2'.

The MLS+ test signal was created by Pavel Smokotnin for Open Sound Meter.

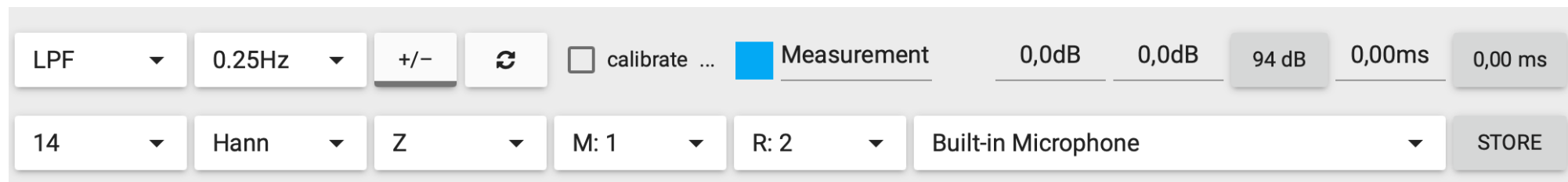
Original MLS noise creation procedure was modified to have period exactly 2 to the power of 16.

MLS+ has very low crest factor and doesn't require time windowing (when power settings is 16)



Measurement properties

invert reset
polarity buffers color title



↑
window function

↑
channel for measure

↑
reference channel

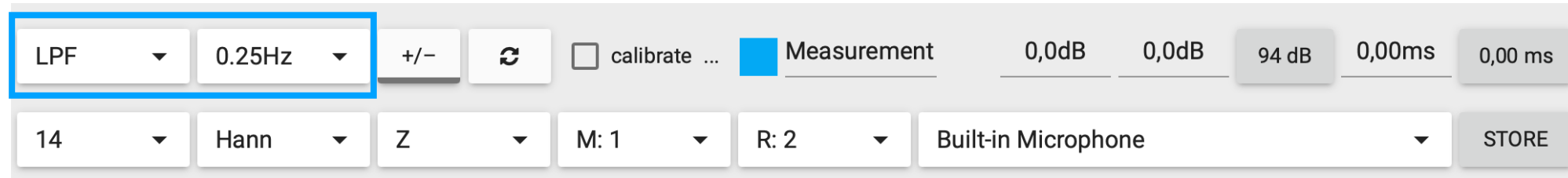
↑
audio device

right click on the color checker applies next color from application's palette



Measurement properties

Averaging



LPF ▼ 0.25Hz ▼ +/- ↺ ☐ calibrate ... Measurement 0,0dB 0,0dB 94 dB 0,00ms 0,00 ms

14 ▼ Hann ▼ Z ▼ M: 1 ▼ R: 2 ▼ Built-in Microphone ▼ STORE

Averaging type: off, FIFO, LPF (low pass filter)

FIFO size from 1 to 100

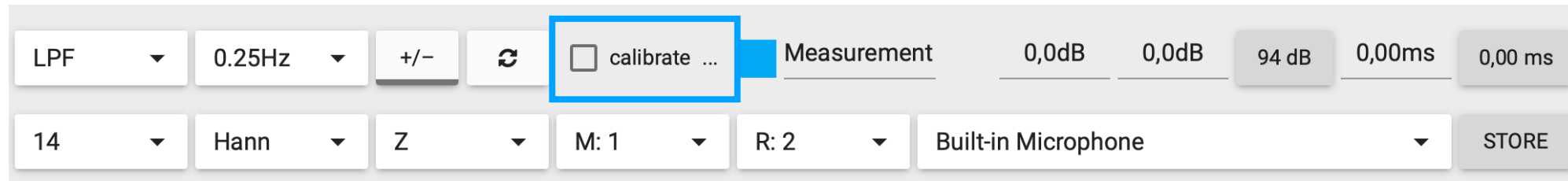
LPF frequencies: $\frac{1}{4}$ Hz, $\frac{1}{2}$ Hz, 1Hz

What is LPF and why use it:

facebook.com/notes/pavel-smokotnin/averaging-of-the-measurements/1070092436507447/

Measurement properties

Applying a calibration file



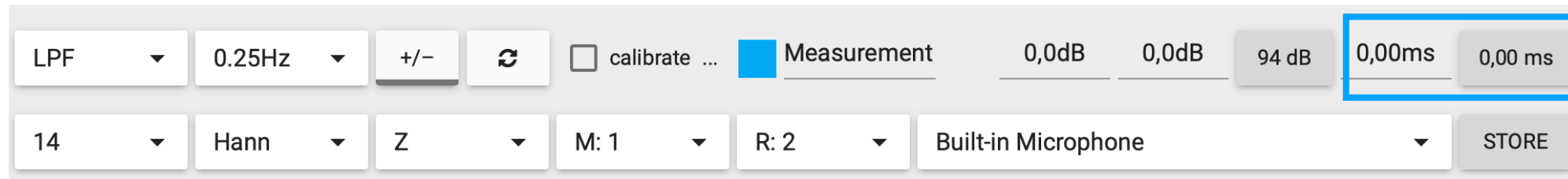
Click to enable or disable

File selection dialogue will appear on first click

If you want to change the file click at ...

Measurement properties

Delay



The screenshot shows the 'Measurement properties' window of the Open Sound Meter v1.5. The 'Delay' section is highlighted with a blue box. It contains two input fields: '0,00ms' and '0,00 ms'. The '0,00ms' field is currently selected. Below the 'Delay' section, there are several other controls: a 'STORE' button, a 'Built-in Microphone' dropdown, and various measurement parameters like 'M: 1', 'R: 2', 'Hann', 'Z', '14', '0,25Hz', 'LPF', '0,0dB', '0,0dB', '94 dB', and 'calibrate ...'.

Button shows the calculated estimated delay value,
click to apply

On mouseover tooltip shows delta between current and
estimated delay

Measurement properties

Gain and offset

offset gain

LPF ▼ 0.25Hz ▼ +/- ↻ ☐ calibrate ... Measurement 0,0dB 0,0dB 94 dB 0,00ms 0,00 ms

14 ▼ Hann ▼ Z ▼ M: 1 ▼ R: 2 ▼ Built-in Microphone ▼ STORE


Offset - offset for 0 at magnitude response
(gain for reference channel)

Use keys ↑ and ↓ to adjust value,
Use Shift key for fine adjustment

Measurement properties

Gain and delay

Apply auto gain for 94 dB SPL A slow



LPF	0.25Hz	+/-		<input type="checkbox"/> calibrate ...	<input checked="" type="checkbox"/> Measurement	0,0dB	0,0dB	94 dB	0,00ms	0,00 ms
14	Hann	Z	M: 1	R: 2	Built-in Microphone	STORE				

Measurement properties

FFT power

LPF ▾

0.25Hz ▾

+/-

↺

☐ calibrate ...

Measurement

0,0dB

0,0dB

94 dB

0,00ms

0,00 ms

14 ▾

Hann ▾

Z ▾

M: 1 ▾

R: 2 ▾

Built-in Microphone ▾

STORE

Select time window size: 2^{power value} samples

power	10	11	12	13	14	15	16
samples	1024	2048	4096	8192	16384	32768	65536
time window*, ms	21,3	42,6	85,3	170,5	341	682,6	1365,3
frequency step*, Hz	47	23,5	11,7	5,9	2,93	1,46	0,73

* - for sample rate: 48 000Hz



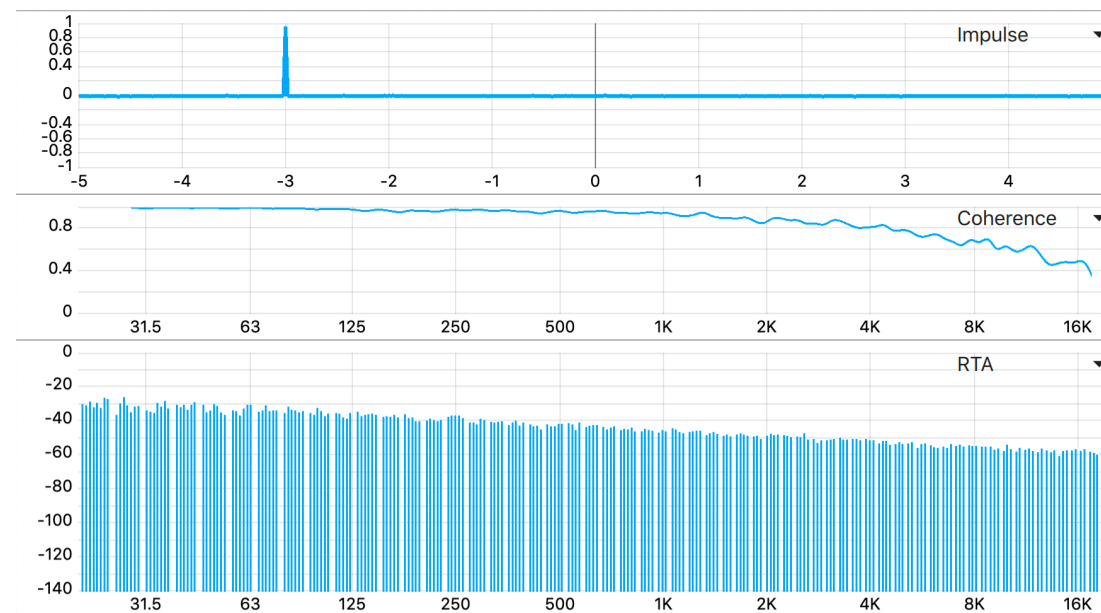
Measurement properties

Logarithm time window

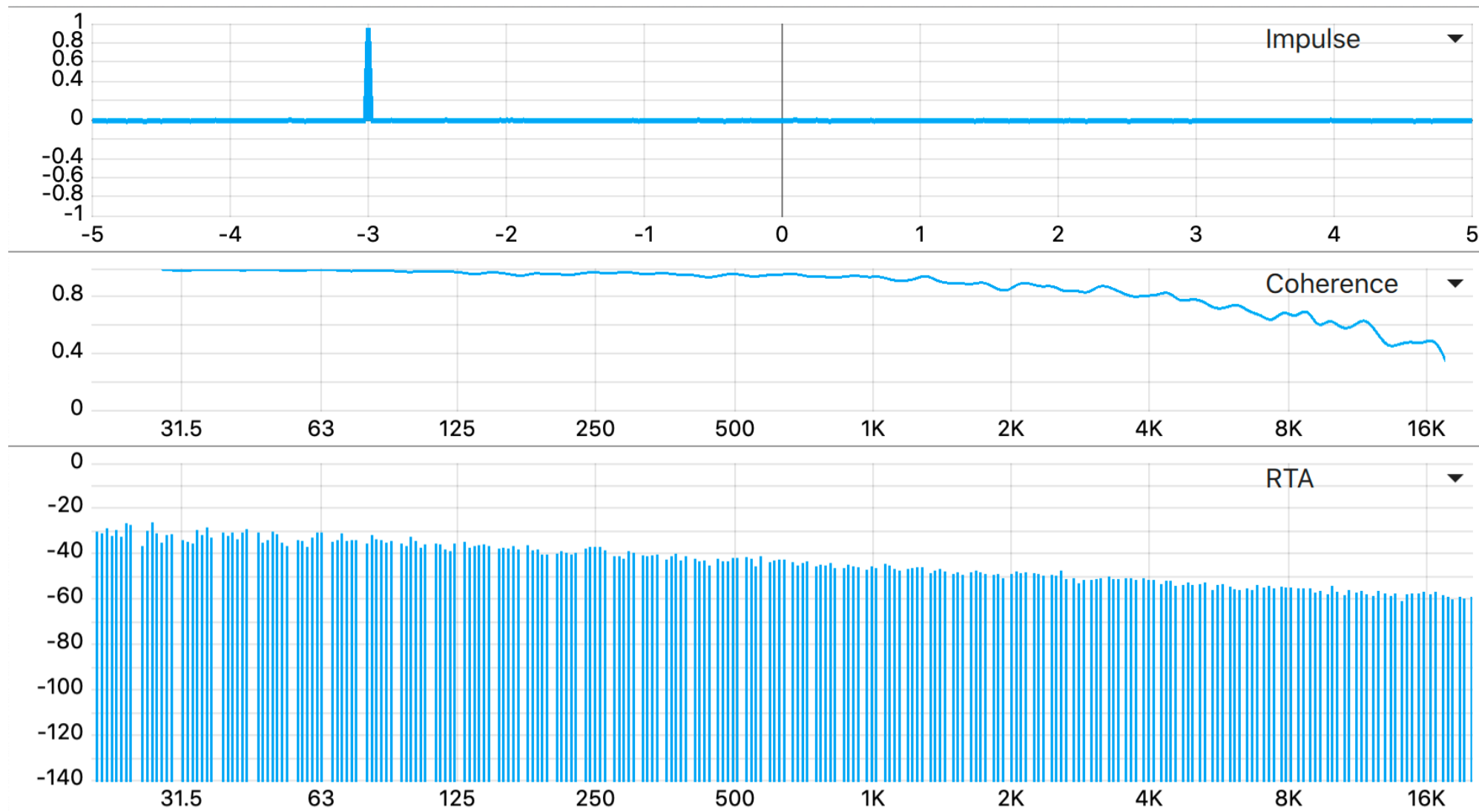
LPF ▼ 0.25Hz ▼ +/- ↺ ☐ calibrate ... Measurement 0,00dB 5,40ms 0,02 ms

LTW ▼ Hann ▼ M: Mic 1 ▼ R: Line 3 ▼ Scarlett 18i6 USB ▼ STORE

- 24 frequencies per octave
- each has its own time window

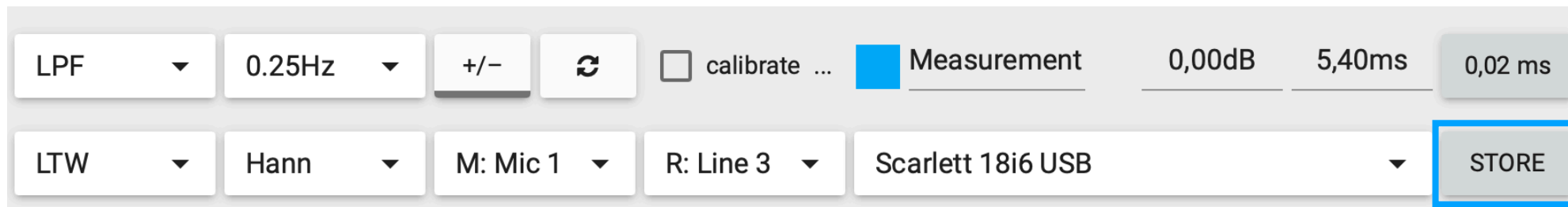


Logarithm time window



Measurement properties

Storing your measurements



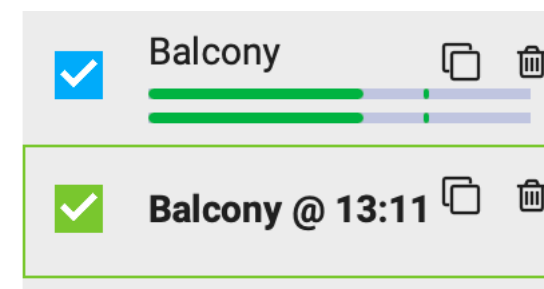
LPF ▼ 0.25Hz ▼ +/- ↺ ☐ calibrate ... Measurement 0,00dB 5,40ms 0,02 ms

LTW ▼ Hann ▼ M: Mic 1 ▼ R: Line 3 ▼ Scarlett 18i6 USB ▼ **STORE**

Push the button to store current measuring data

Stored series will appear at the charts and its label in the right bar

Name of the store will contain the name of the original measurement and time.



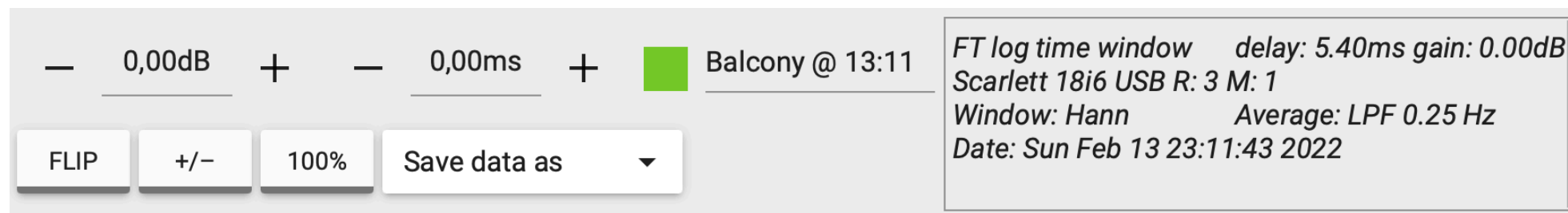
Enable/disable checkbox = view/hide the series

Stored properties

color

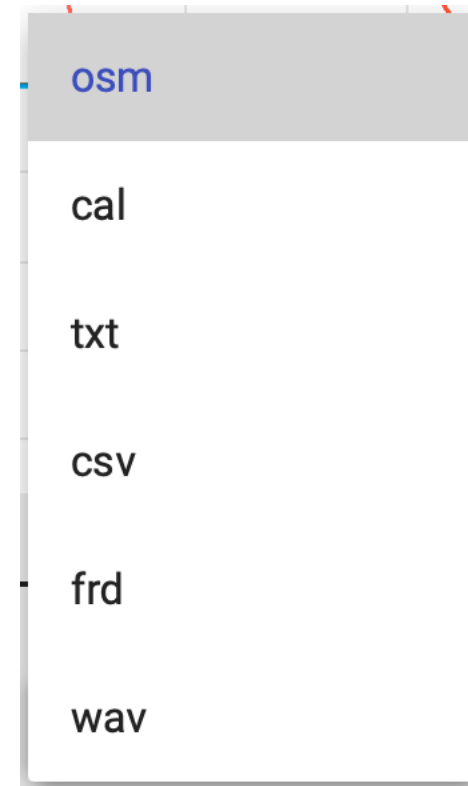
title

editable automatically
created notes



export stored data as:

- OSM file
- calibration file
- TXT
- CSV
- FRD file type
- impulse WAV file

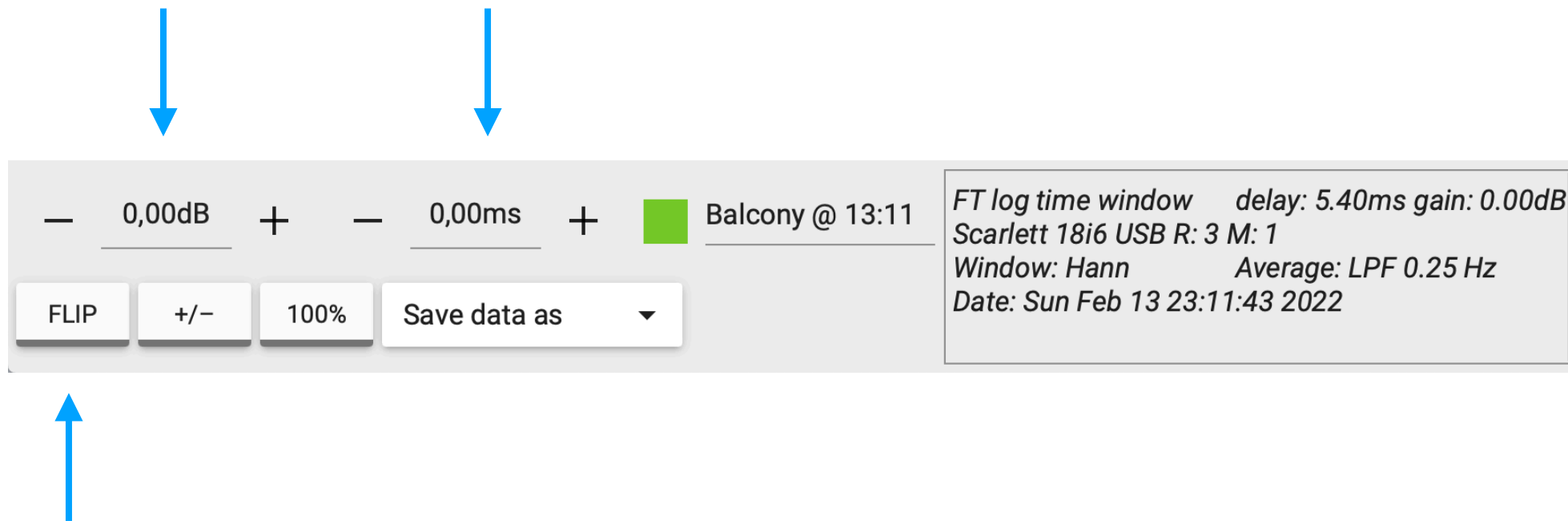


Stored properties

Offline adjustment

gain

delay

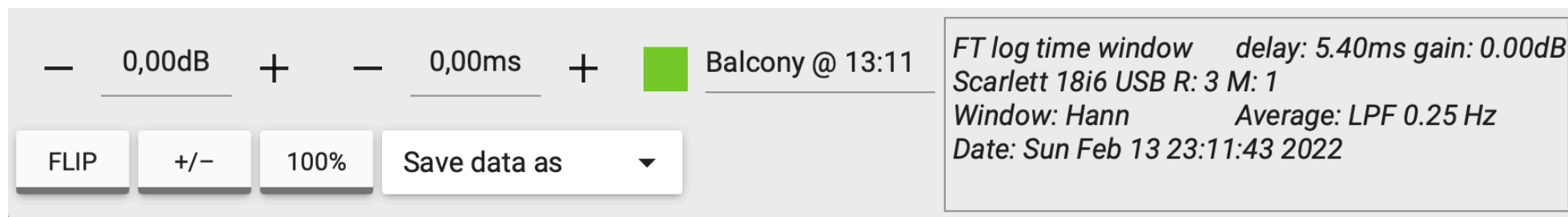


The screenshot shows the 'Stored properties' window of the Open Sound Meter software. It features two main adjustment sliders: 'gain' set to 0,00dB and 'delay' set to 0,00ms. Below these are buttons for 'FLIP', '+/-', '100%', and 'Save data as'. A green square icon and the text 'Balcony @ 13:11' are also visible. On the right, a text box displays the following information: 'FT log time window delay: 5.40ms gain: 0.00dB', 'Scarlett 18i6 USB R: 3 M: 1', 'Window: Hann Average: LPF 0.25 Hz', and 'Date: Sun Feb 13 23:11:43 2022'. Blue arrows point from the 'gain' and 'delay' labels to their respective sliders, and a blue arrow points from the 'inverse magnitude' label to the 'FLIP' button.

inverse magnitude

Stored properties

Offline adjustment



inverse
polarity

force 100% coherence

Math source

function type count color title store the result

↓ ↓ ↓ ↓ ↓ ↓

Summation Vector 2 Sources must have the same transform mode ☒ Vector Sum STORE

HF MF

↑

select from 2 to 10 sources: measurements or stored

Remember, your sources must have the same sample rate and window size for the correct calculation.



Filter source

FFT Power sample rate delay polarity


↓ ↓ ↓ ↓

Power:14 ▾

48000 ▾

— 0,00ms +

+/-

 Peak 1000Hz

Peak ▾

1 ▾

— 1 000,0Hz +

— -6,0dB +

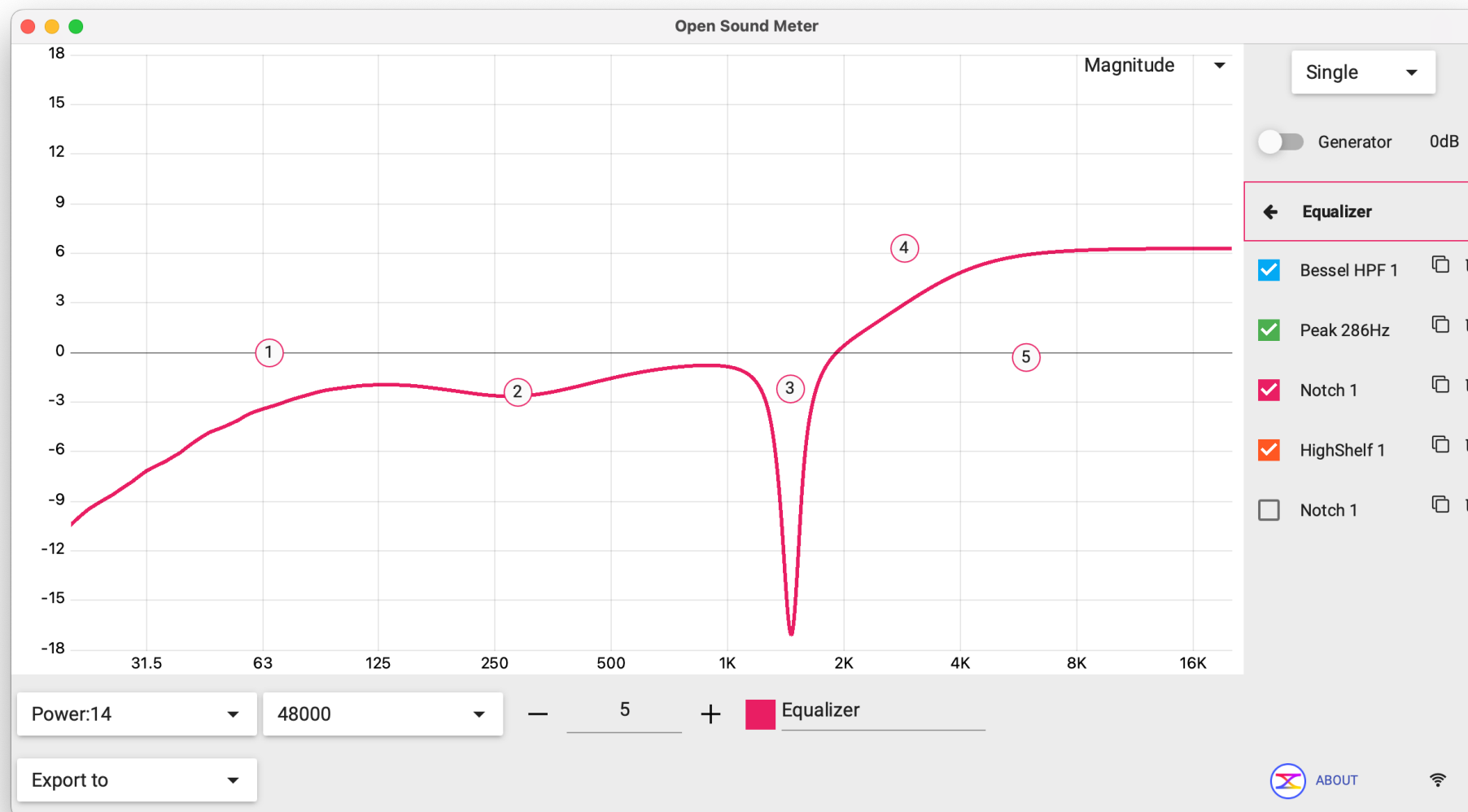
— 0,71 +

STORE

↑ ↑ ↑ ↑ ↑

Filter type order corner frequency level and Q (when applied) store result

Equalizer source



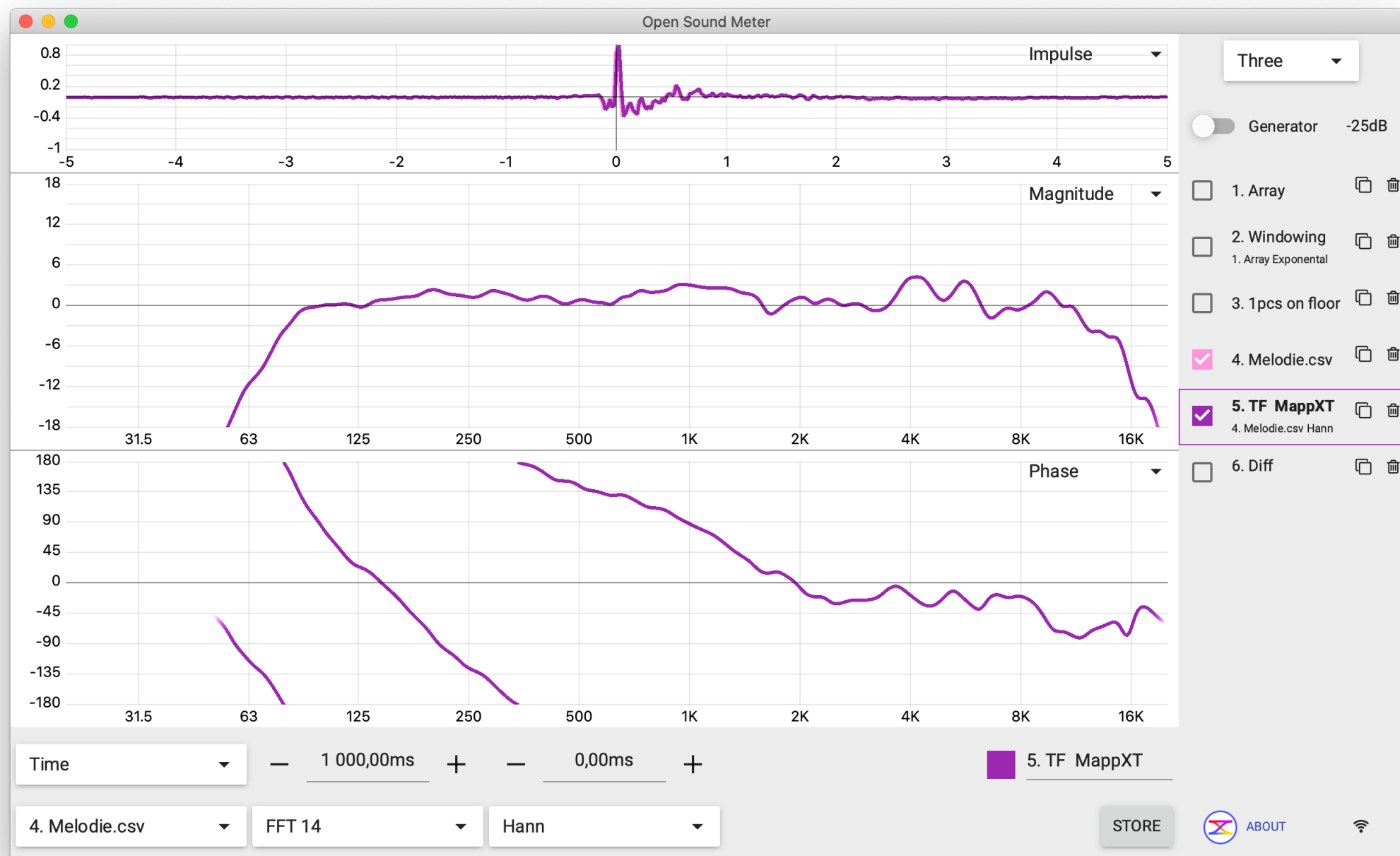
When equalizer is selected, filters' frequencies are marked with draggable points on the magnitude chart.

Q for each filter is changed by mouse wheel, when cursor is on the point.

Double click on equalizer source to see individual filters.



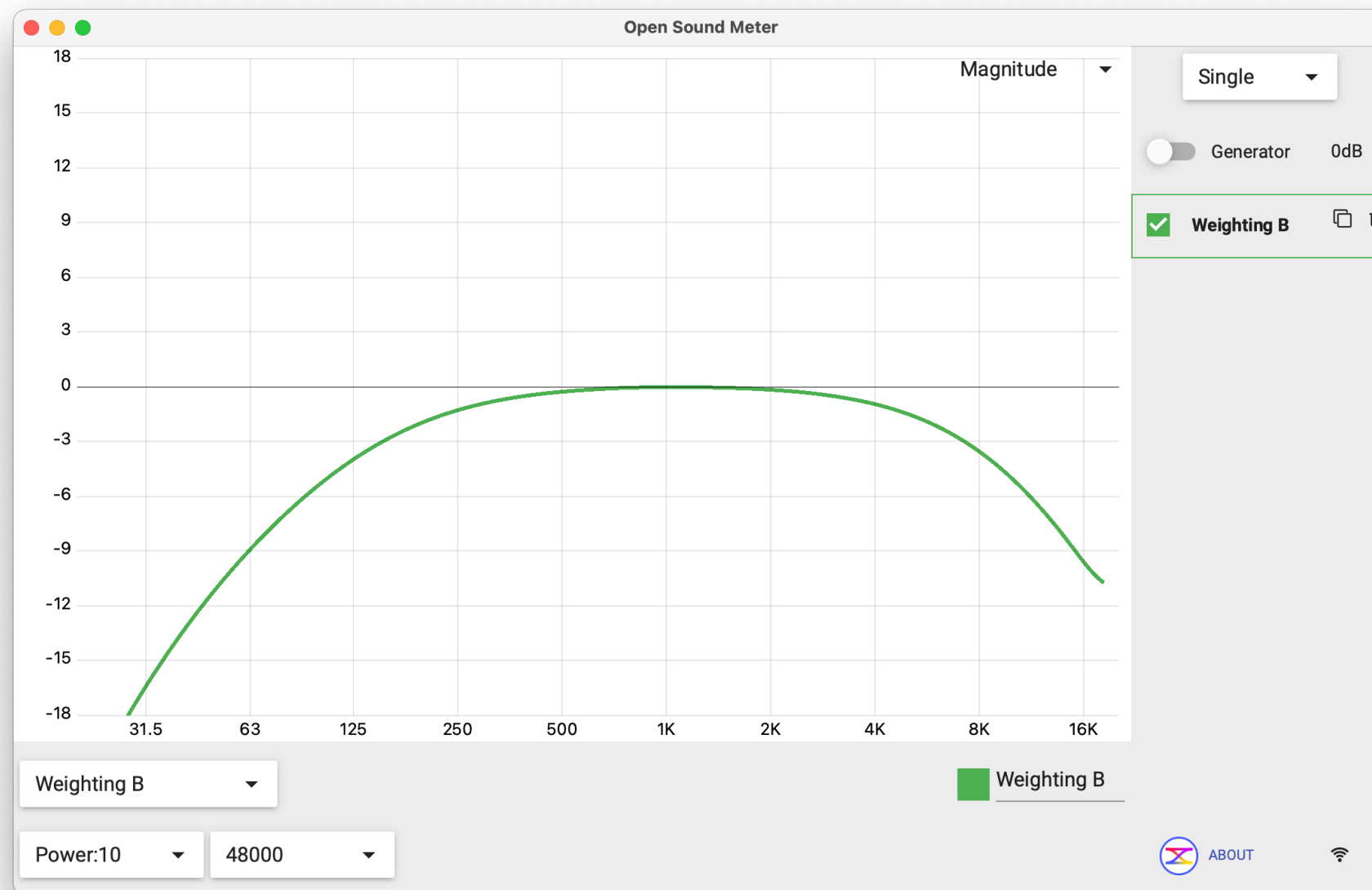
Windowing source



Conversion tool from one domain to another



Standard line source

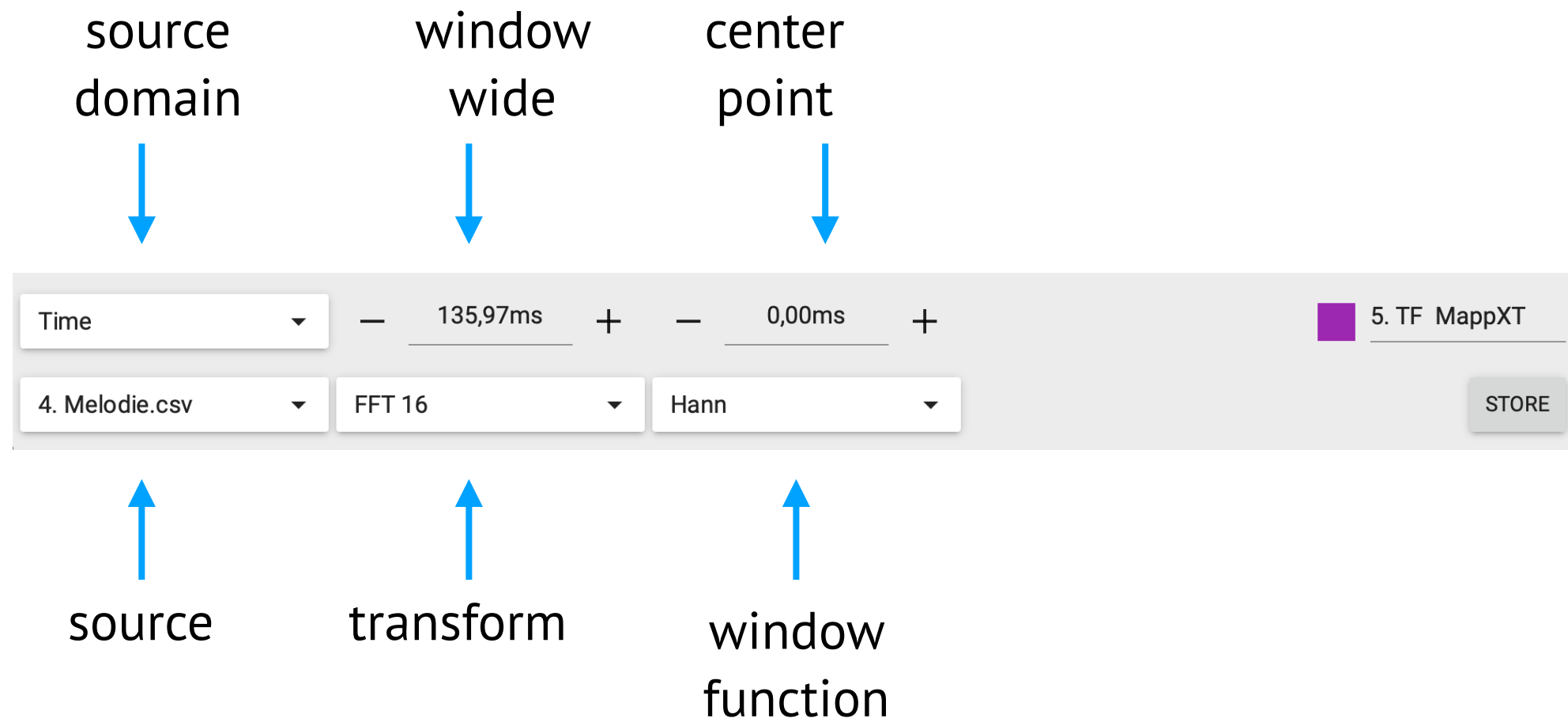


Creates one of the standard lines:

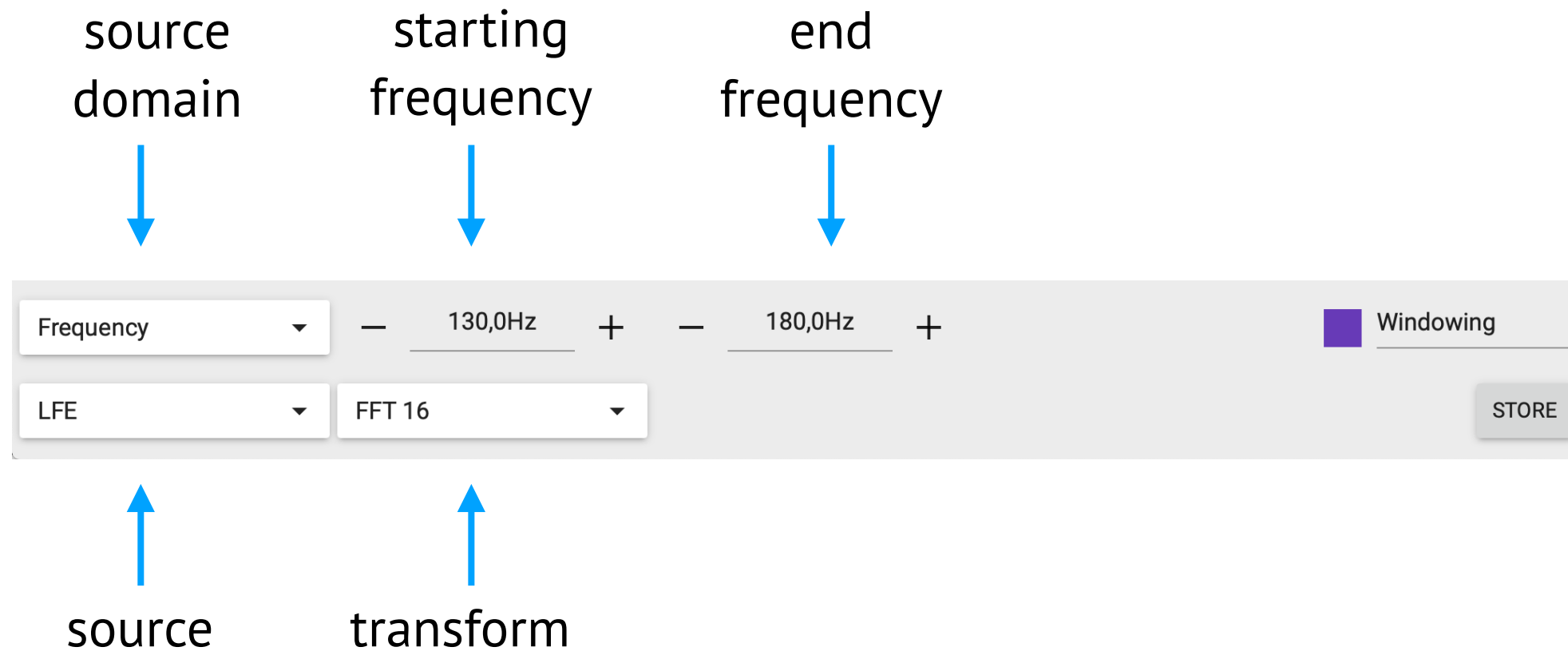
- Weighting filter (A, B, C)
- Equal loudness contour
- Flat response



Windowing source



Windowing source



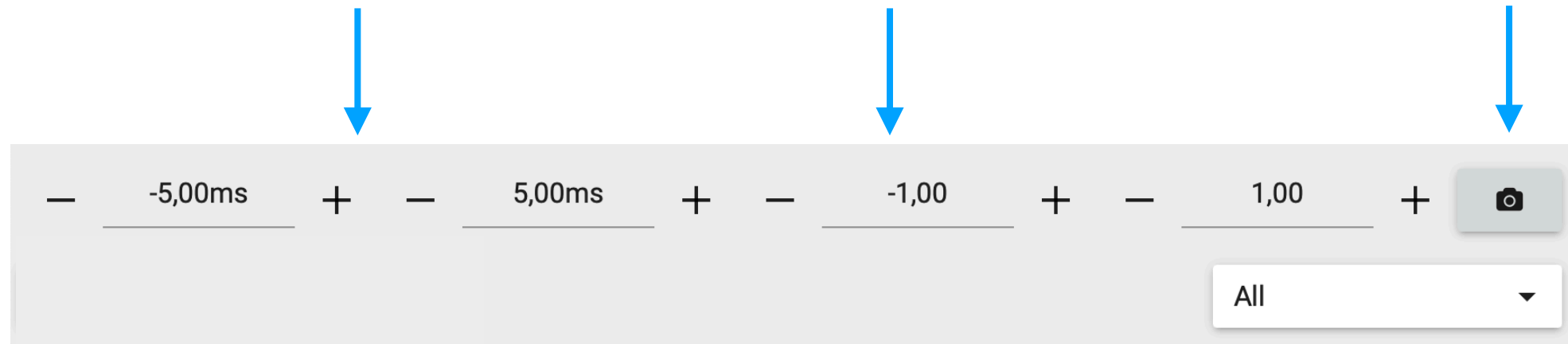
Frequencies outside the selection will be ignored

Basic chart properties

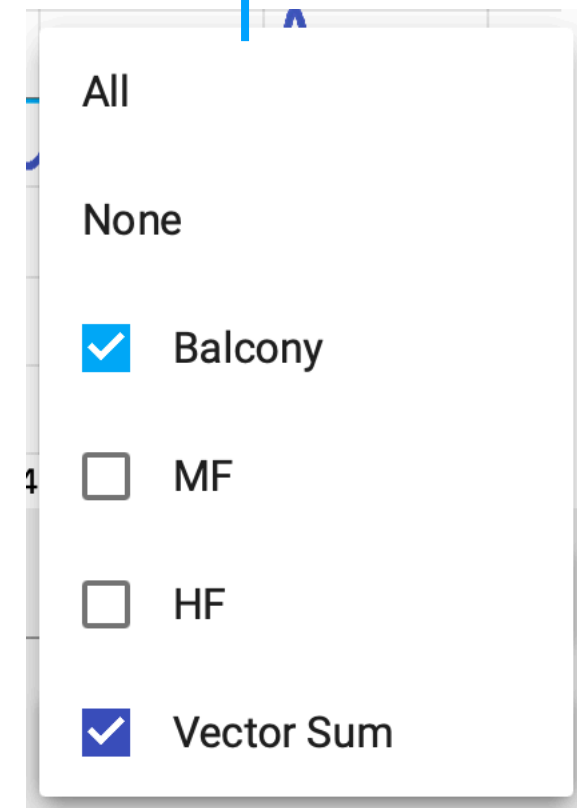
Horizontal
axis range

Vertical
axis range

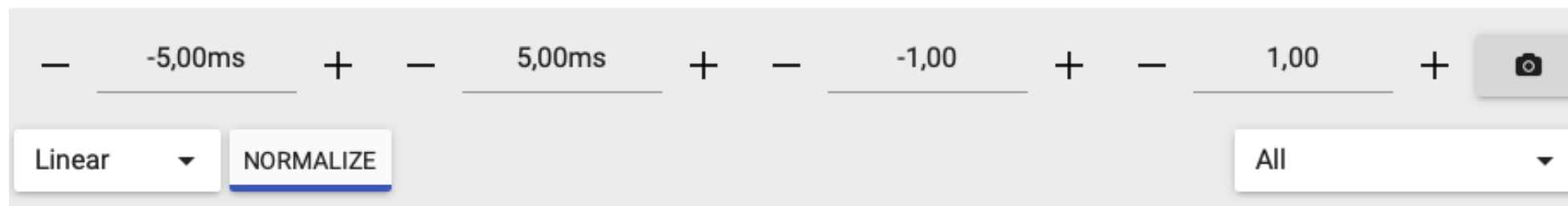
save chart
as an image



If source is selected, just that
will be shown.



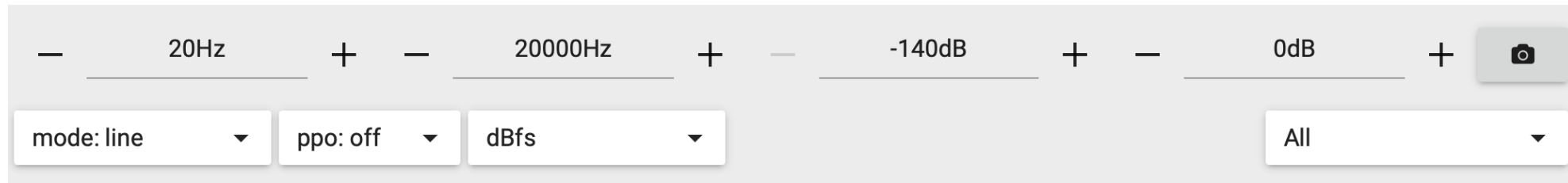
Impulse chart properties



Normalize displayed data

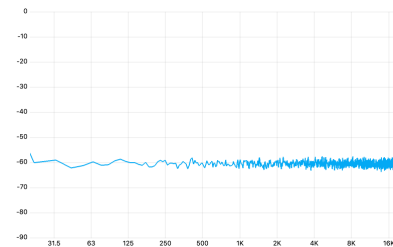
Select linear or log (dB) vertical scale

Spectrum chart properties



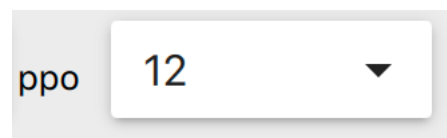
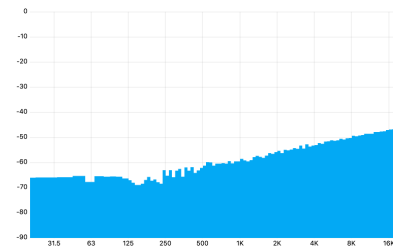
scale
(dBfs, SPL, phons)

line



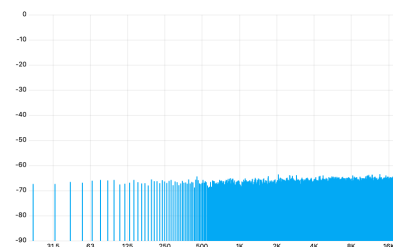
one continuous line
points per octave define smooth

bars



points per octave define the bar width

lines



one line per frequency



Magnitude chart properties

— 20,00Hz + — 20 000,00Hz + — -18,00dB + — 18,00dB + ☐ invert

dB ▼ ppo: 12 ▼ ☒ use coherence — 0,70 + All ▼

↑
Y-axis
scale

↑
Points per octave

↑
Apply coherence value
for the series opacity

↑
Coherence threshold for
the alpha channel

↑
Invert Y axis

Phase chart properties



The screenshot shows a control bar for the Phase chart. It includes frequency range sliders (20Hz to 20000Hz) and phase range sliders (9° to 360°). Below these are input fields for 'ppo' (set to 12), phase range (set to ±180°), a checked 'use coherence' checkbox, a coherence threshold (set to 0,70), and a dropdown menu set to 'All'. A camera icon is on the right.

Points per octave

Apply coherence value
for the series opacity

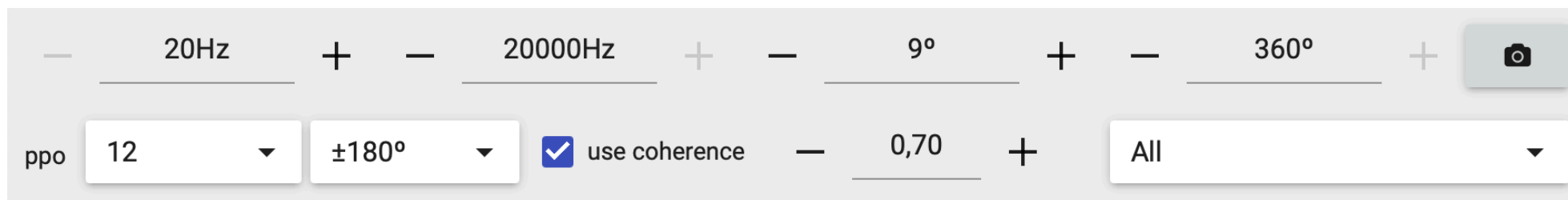
Coherence threshold for
the alpha channel




Phase chart range

center angle

range



— 20Hz + — 20000Hz + — 9° + — 360° + 

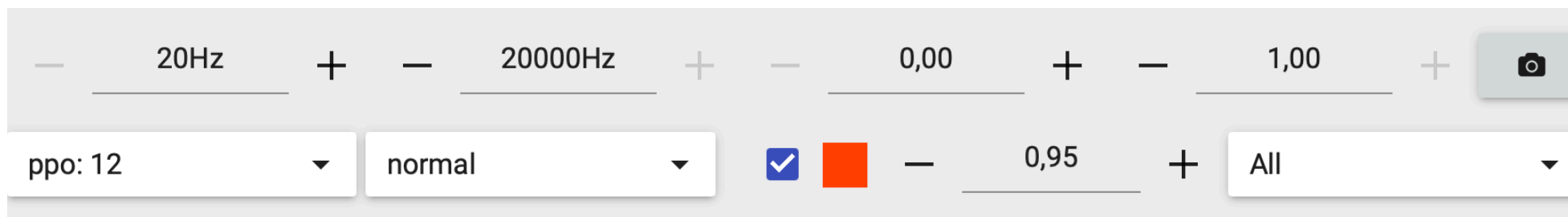
ppo 12 ▼ ±180° ▼ ☒ use coherence — 0,70 + All ▼

Show values:

- -180° to +180°
- 0° to 360°



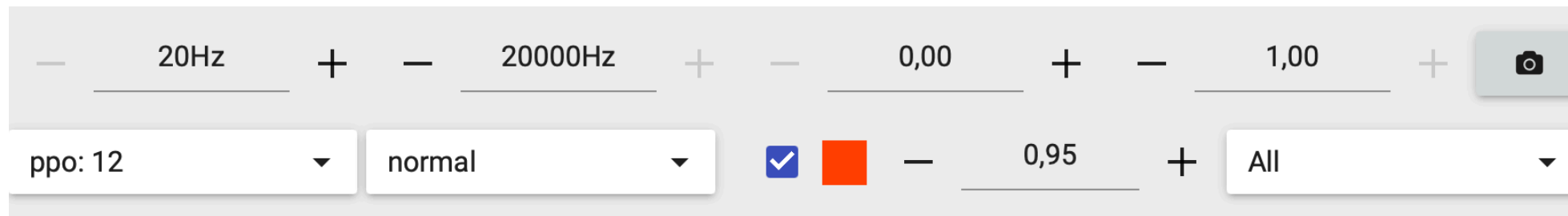
Coherence chart properties



Show normal, squared or SNR value

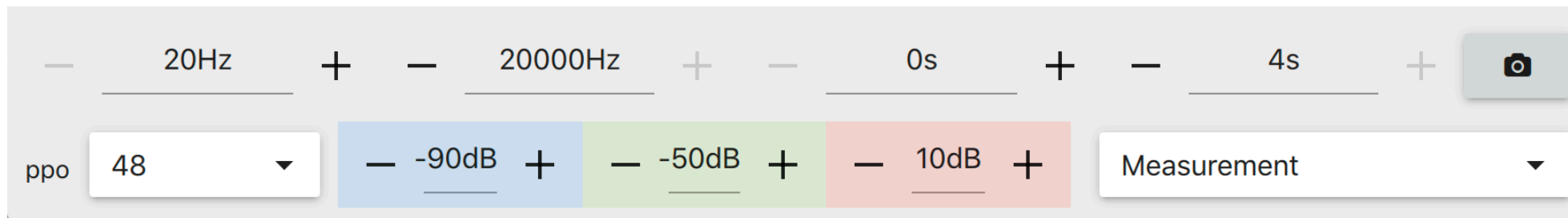
Points per octave

Coherence chart properties



Show help line and its value

Spectrogram chart properties

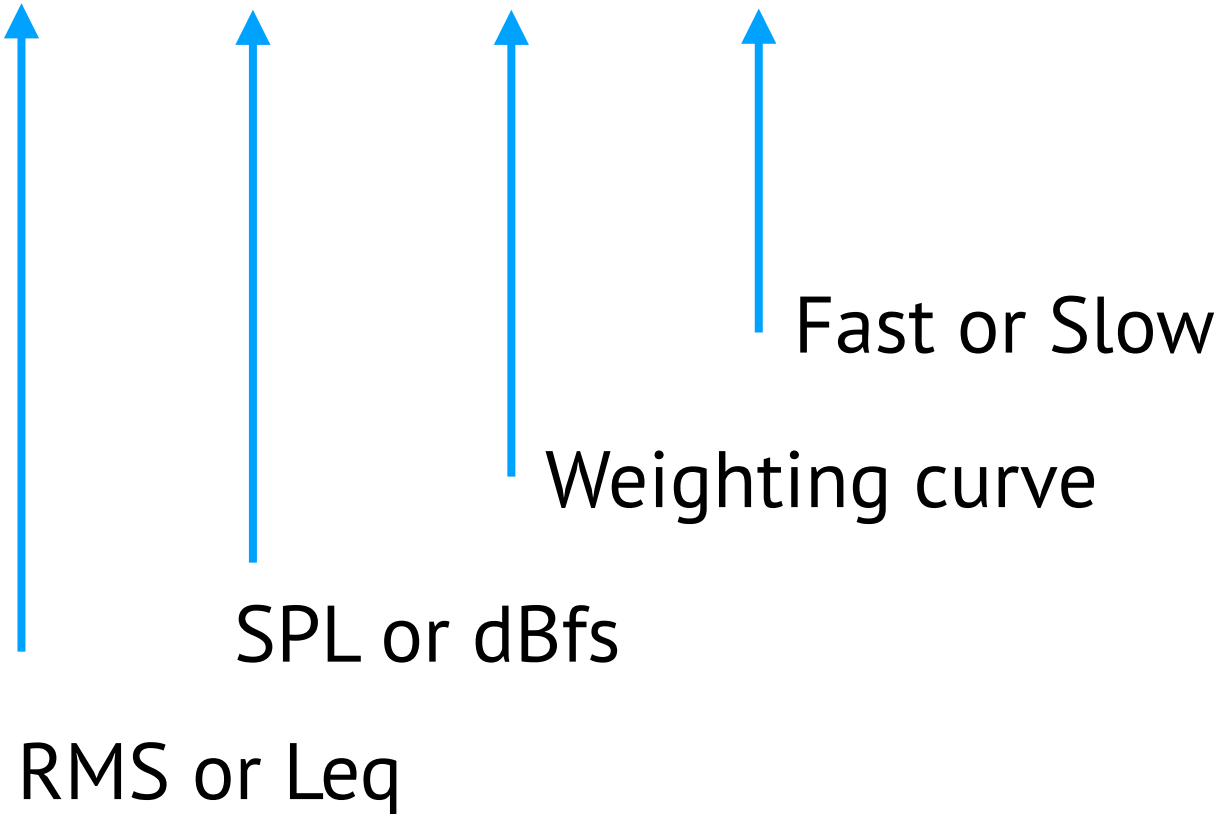
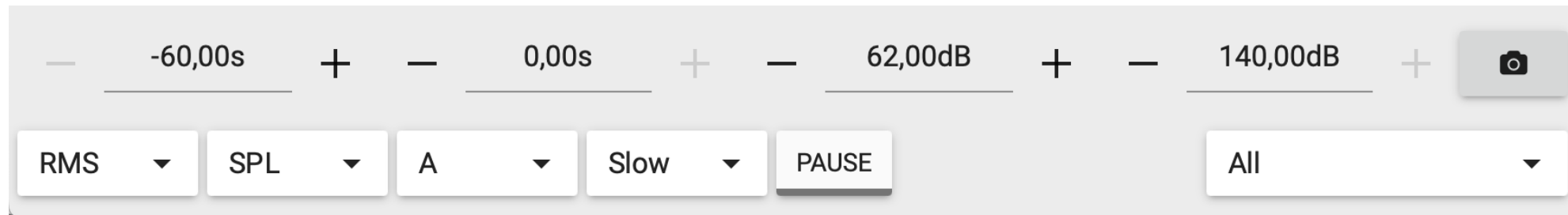


Points per octave

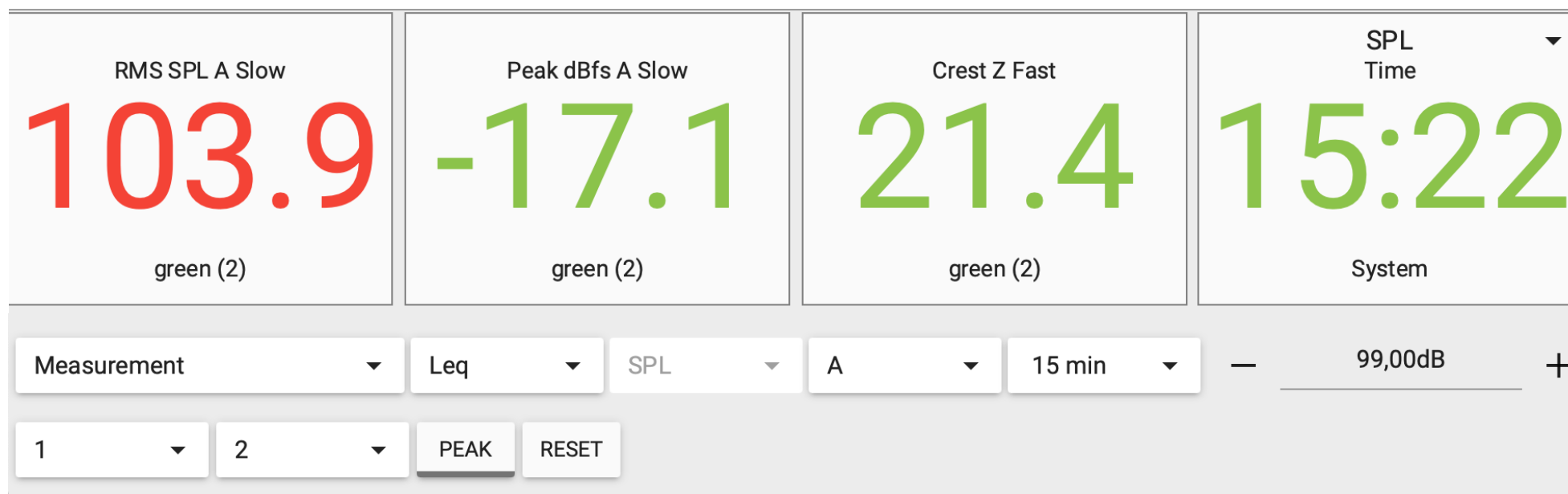
Set colours thresholds

Select a source

Level chart properties



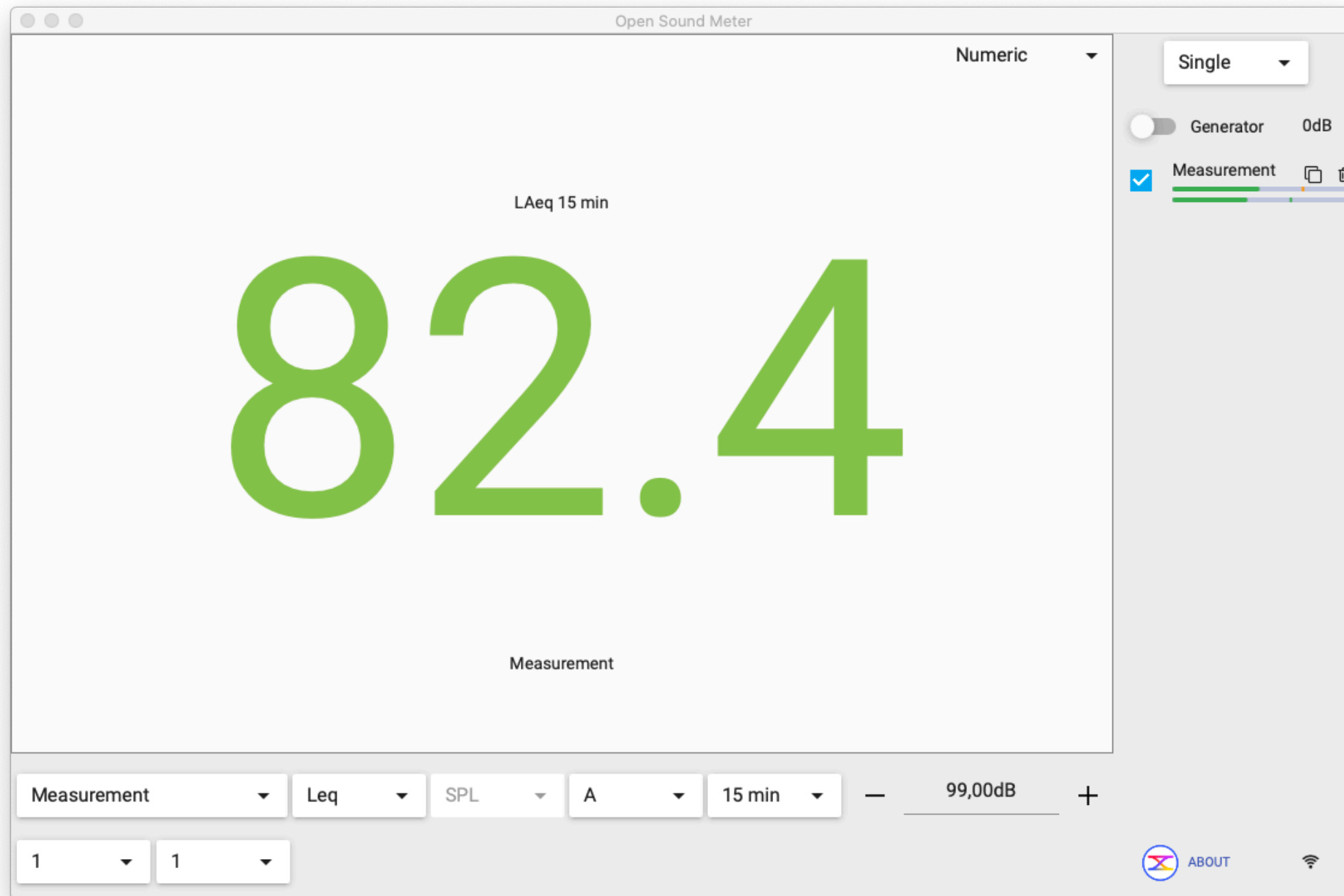
Numeric



↑
rows count

↑
columns count

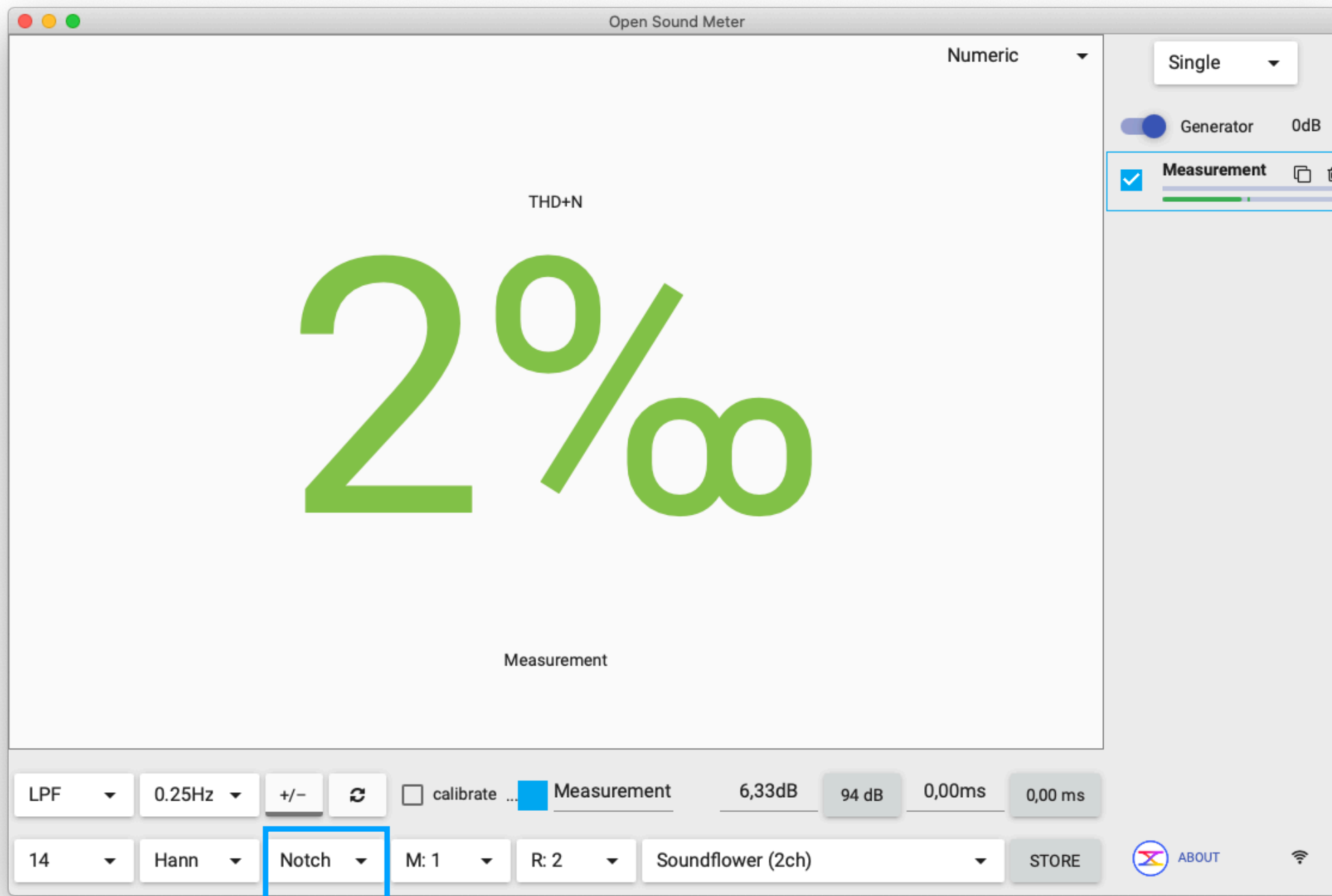
Leq



rows count



THD+N



For THD+N activate Notch filter in the measurement's properties



Numeric properties

Select source

Value

Scale

Weighting curve

Integration time

The screenshot shows the Open Sound Meter v1.5 interface. It features a top row of five dropdown menus: 'Measurement' (set to 'Leq'), 'Scale' (set to 'SPL'), 'Weighting curve' (set to 'A'), and 'Integration time' (set to '15 min'). To the right of these is a warning threshold display showing '99,00dB' with minus and plus adjustment buttons. Below the first two dropdowns are two more dropdowns labeled '1' and '2'. Below the '1' dropdown are two buttons: 'PEAK' and 'RESET'. Blue arrows point from the text labels above to their respective UI elements: 'Select source' to the 'Measurement' dropdown, 'Value' to the 'Leq' dropdown, 'Scale' to the 'SPL' dropdown, 'Weighting curve' to the 'A' dropdown, 'Integration time' to the '15 min' dropdown, 'peak hold' to the 'PEAK' button, and 'Warning threshold' to the '99,00dB' display.

peak hold

Warning threshold



Wavelength calculator

—	<u>1000 Hz</u>	+	—	<u>1,000 ms</u>	+		—	<u>20°C</u>	+	<u>343,3 m/s</u>
—	<u>0,343 m</u>	+	—	<u>0,171 m</u>	+					<div>meter ▼</div>

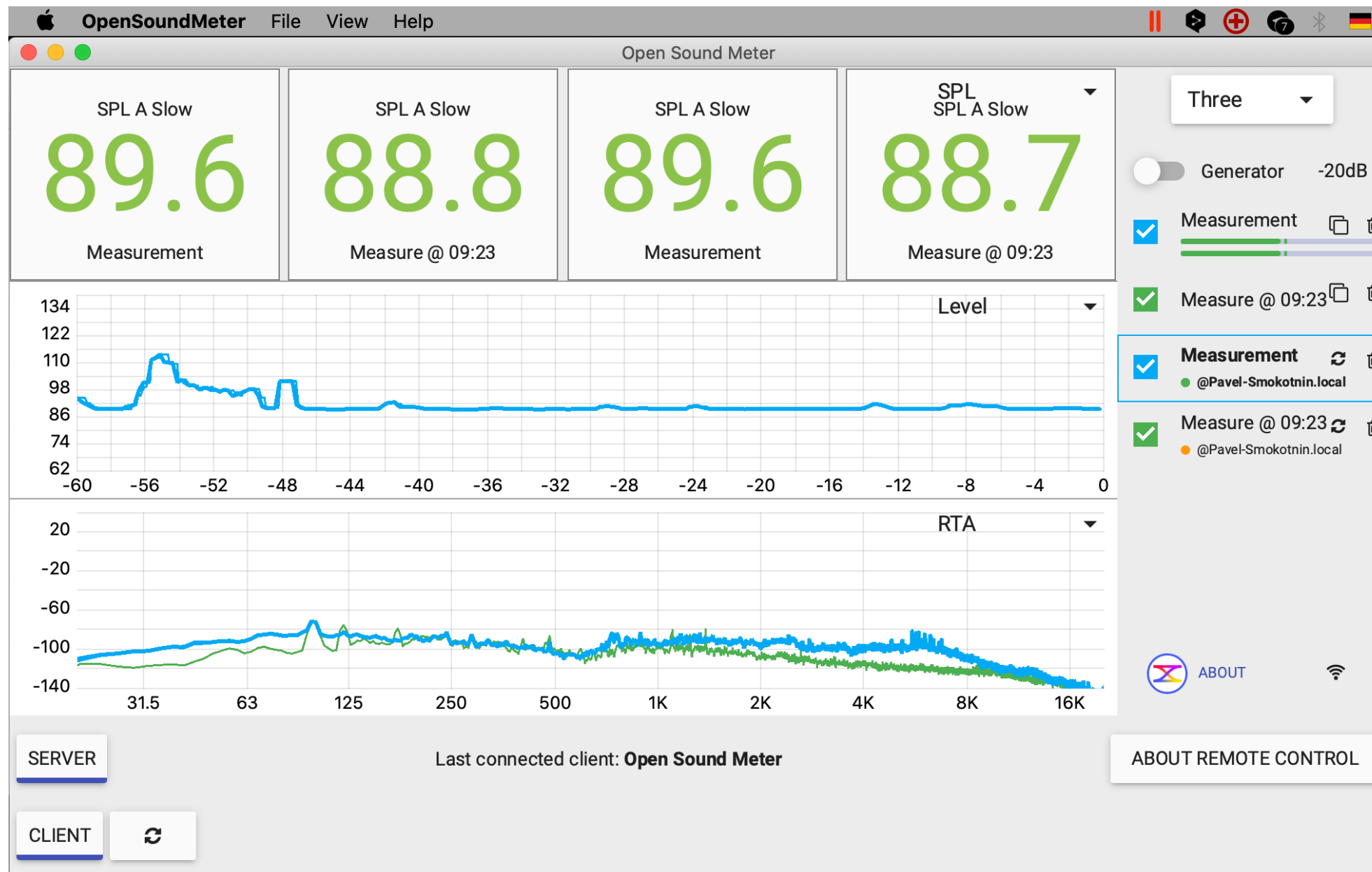
Allows you calculate between frequency, period and wavelength.
You can change any value and get others.
Use Shift key to fine adjust value

To quick open calculator for interested frequency click the right mouse button on a chart.

On iPad put one finger at the interesting point and touch the chart with second one.



Remote API



Different instances of Open Sound Meter on the same network
could share data

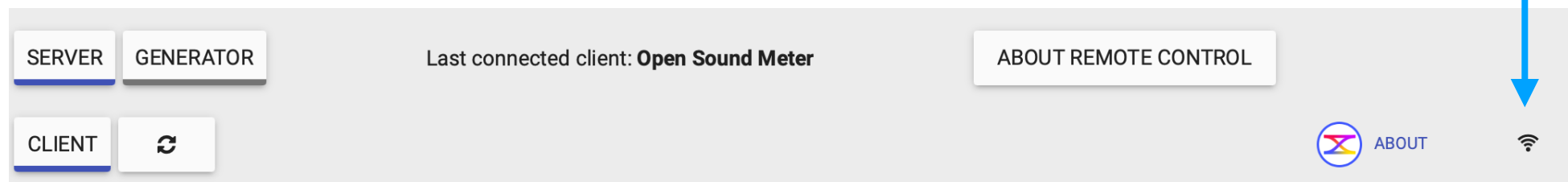


Remote API

Activate API Server

Open remote settings

Enable generator control



Refresh connection

Activate API Client

If you activate Server application will share data

If you activate Client application will receive data from Server

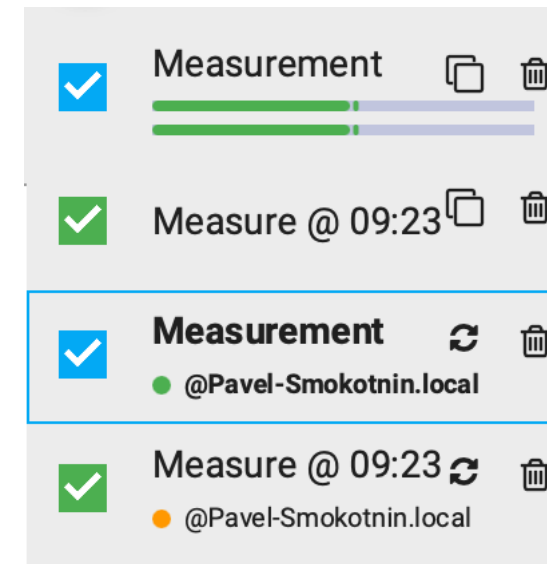


Remote API

Remote measurement



Remote stored data



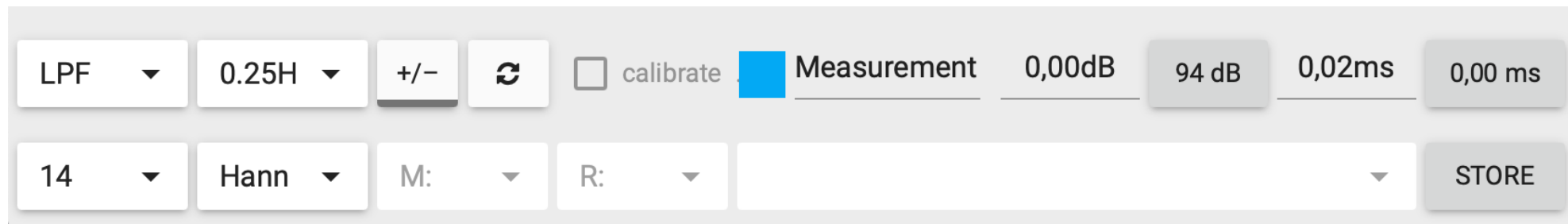
Remote sources shown in the side bar as a regular sources with a label from what host it was taken. Each remote source has coloured label:

- it was just updated less than 1 second ago
- it was updated more than 1 second ago
- error occurred during last update

Refresh button allows to manually update source from the Server.



Remote API



The screenshot shows the Remote API control interface for Open Sound Meter v1.5. It consists of two rows of controls. The top row includes dropdown menus for 'LPF' (set to 0.25H), a '+/-' button, a refresh icon, a 'calibrate' checkbox (unchecked), a blue 'Measurement' button, and numerical displays for '0,00dB', '94 dB', '0,02ms', and '0,00 ms'. The bottom row includes dropdown menus for '14', 'Hann', 'M:', and 'R:', followed by an empty dropdown menu and a 'STORE' button.

For remote sources you can change all settings but audio.
Unavailable options are disabled.

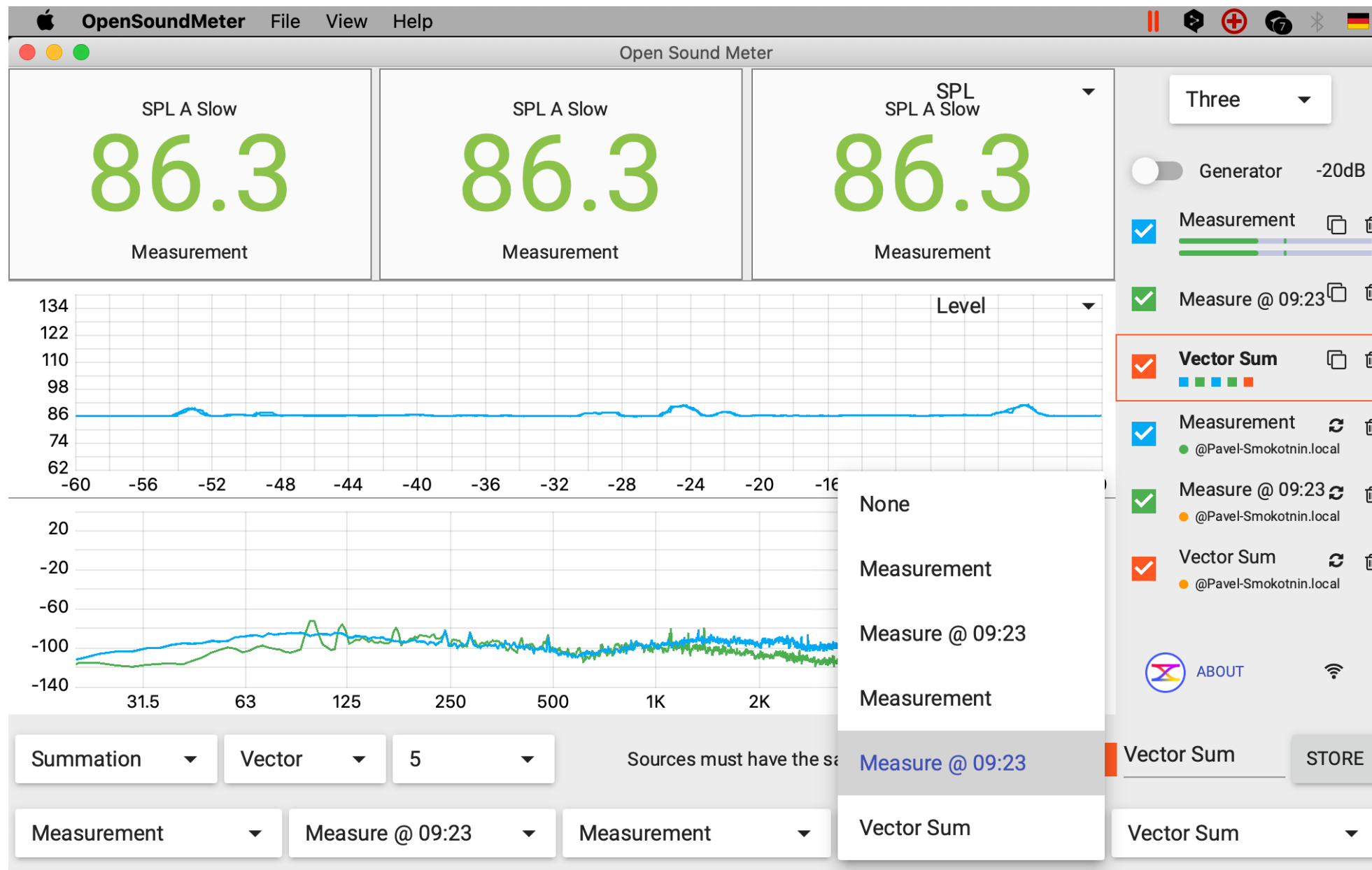
Remote API

REFRESH Vector Sum @ Pavel-Smokotnin.local

If remote source have no settings to edit, you'll see only refresh data button.



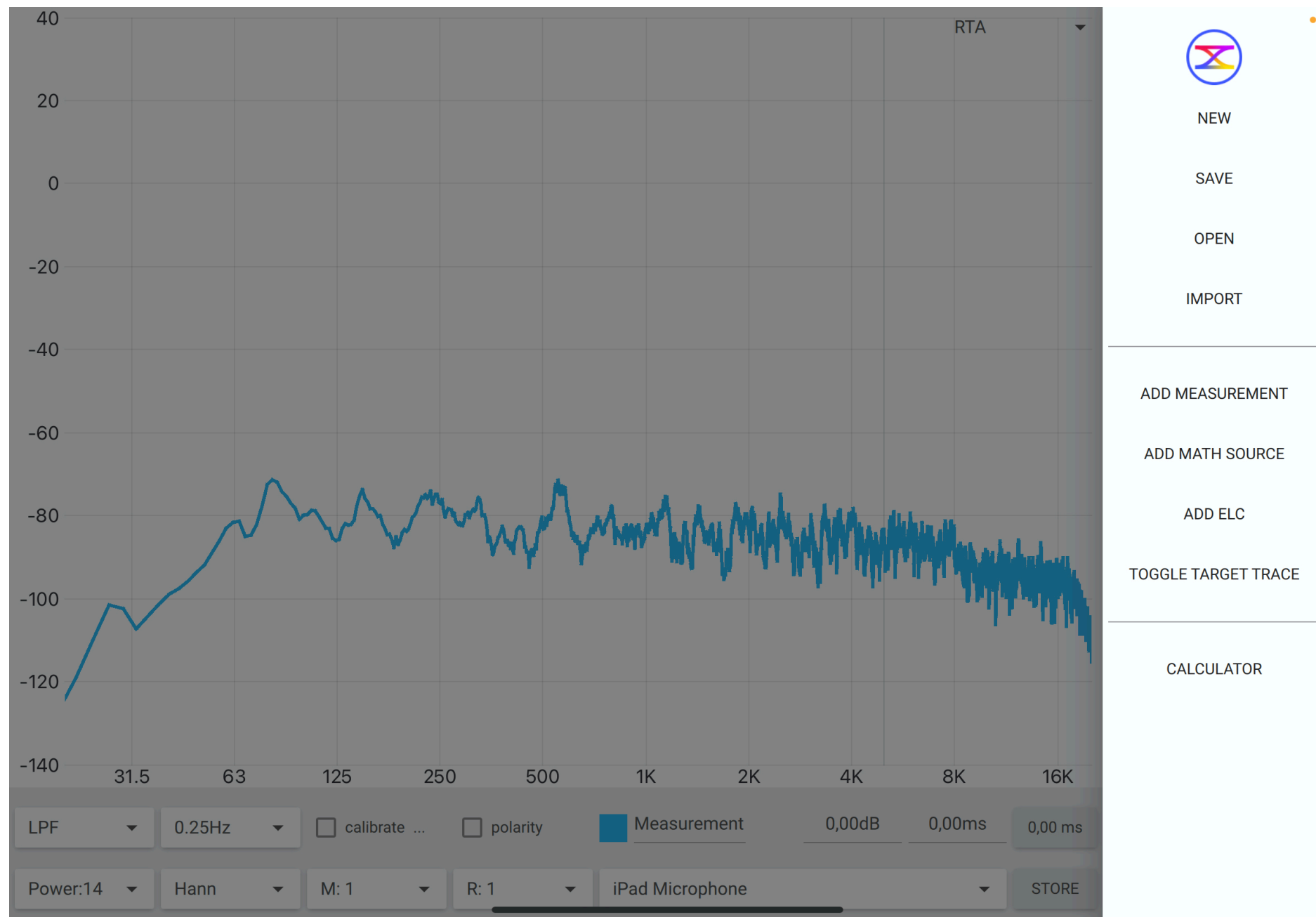
Remote API



You are able to use remote sources in the math operations as well as locals, even mix them.



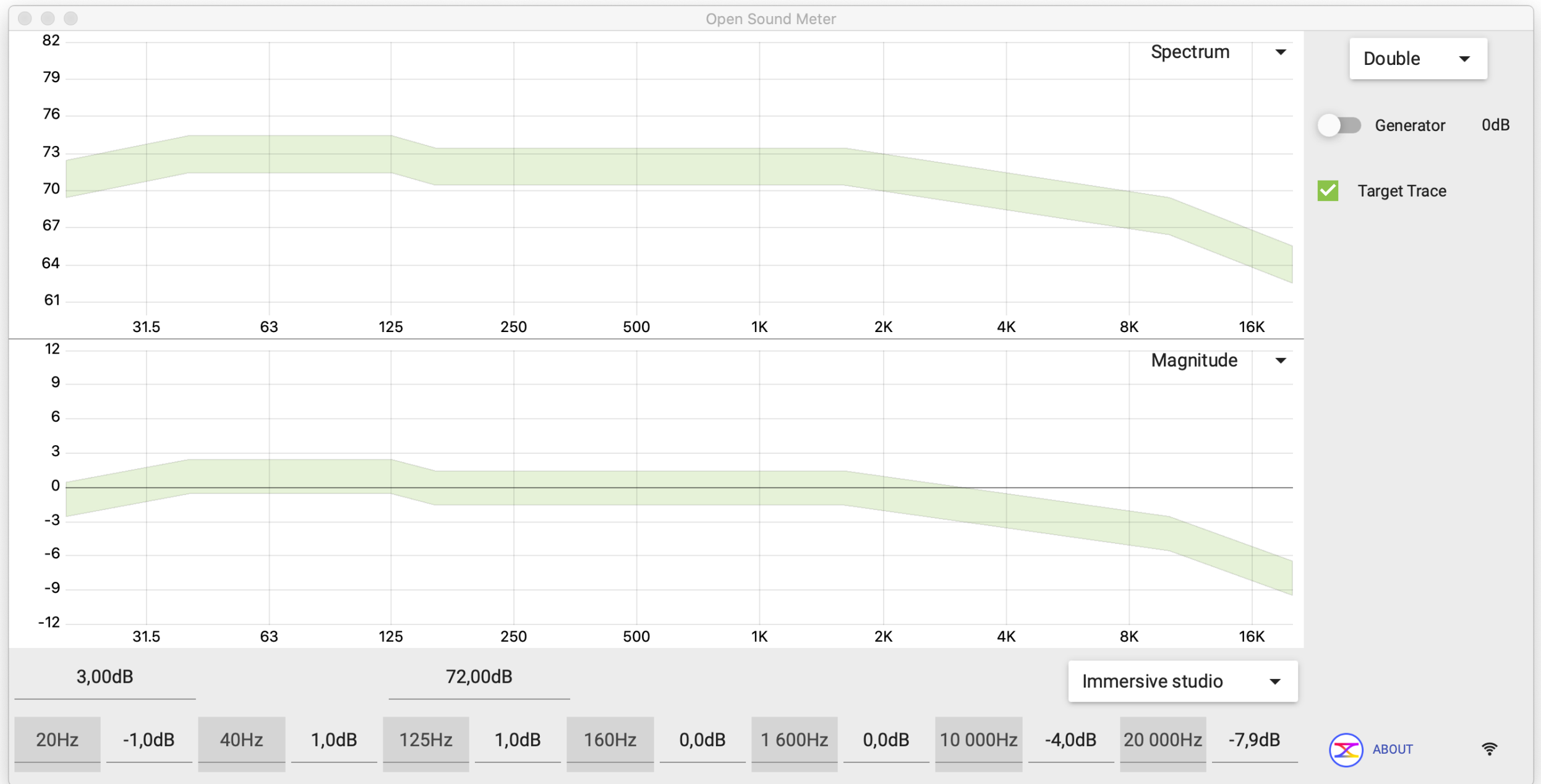
Application menu (iPad)



Swipe from left side to the right to open menu.
Or click menu button in the top right corner.



Target trace

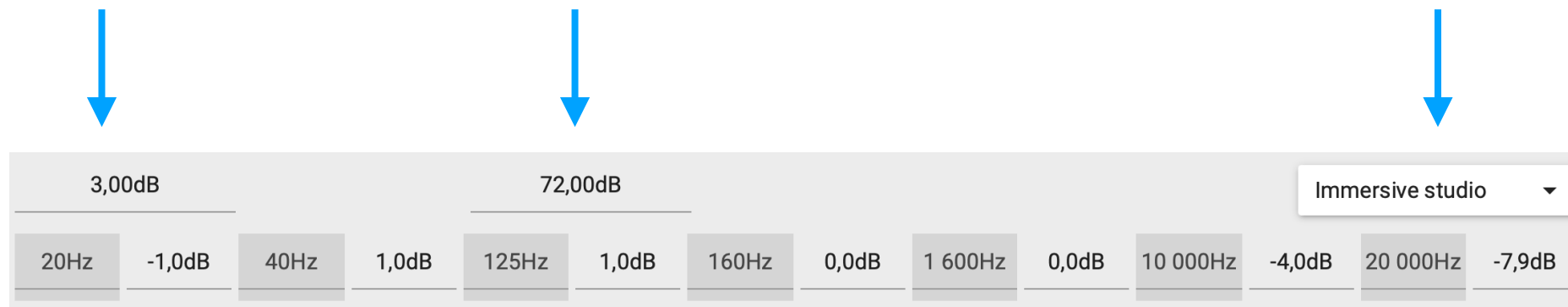


Target trace

width

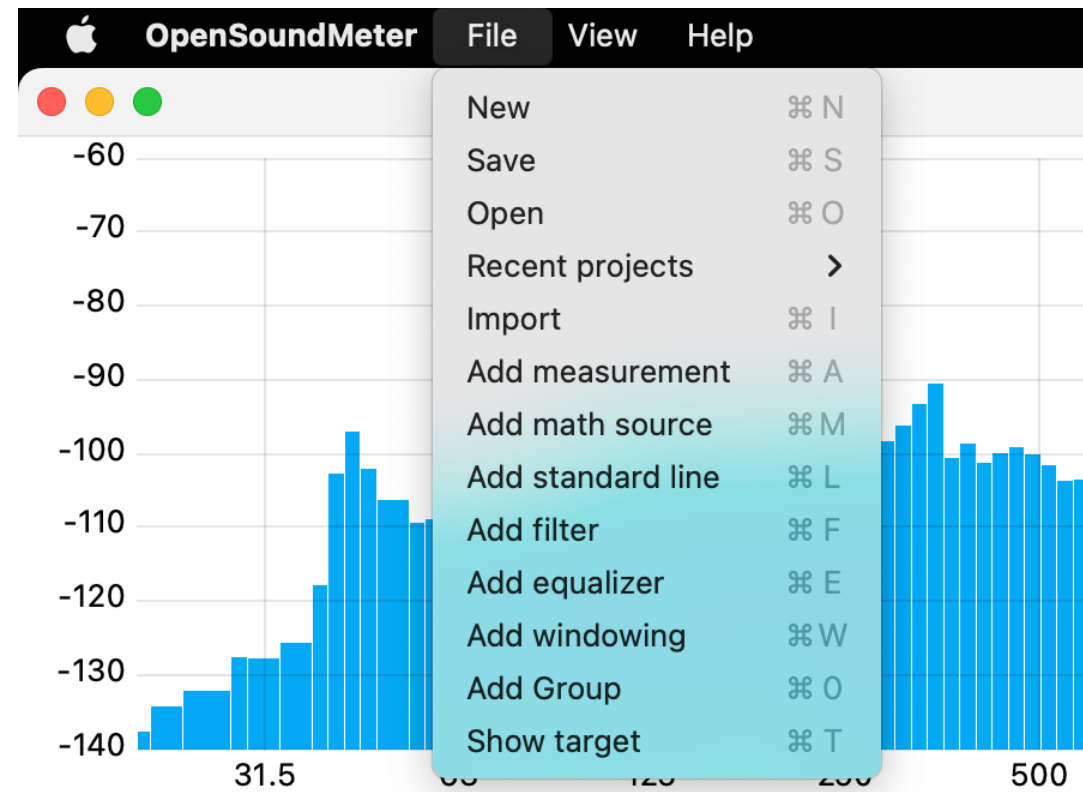
SPL target

presets



7 frequency-gain points

Application menu



New – create empty measuring project

Save – save all current measurements and stored data to a file

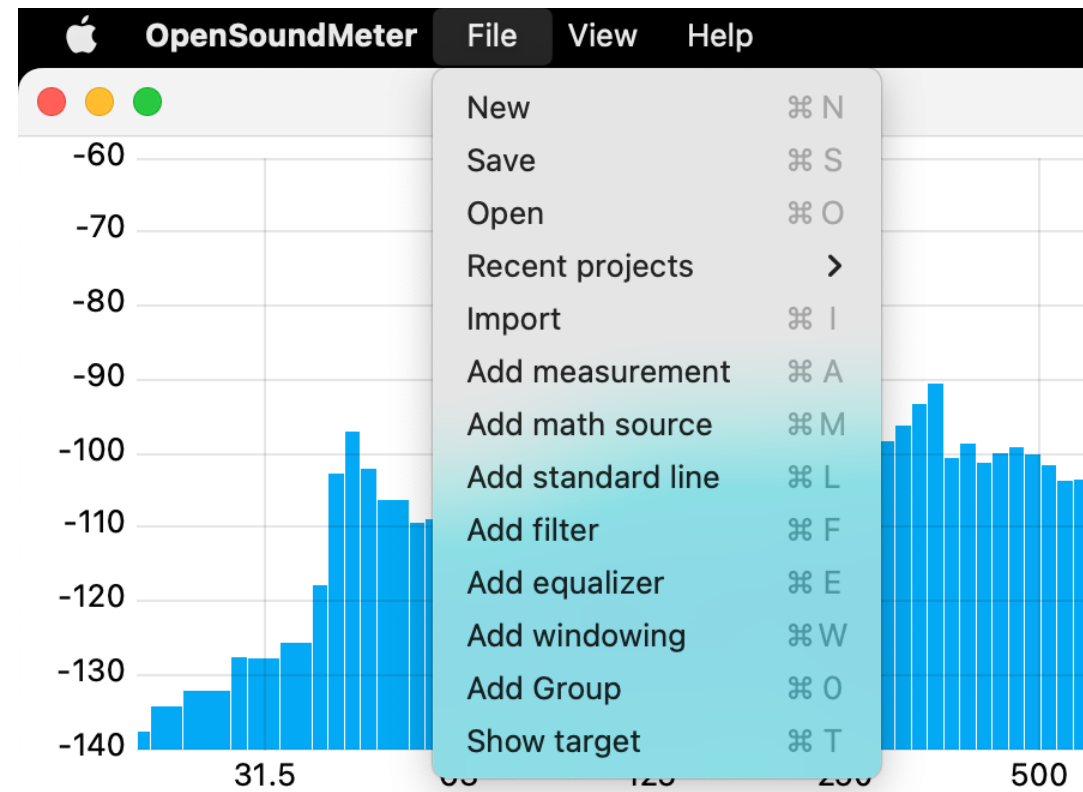
Open – load project file or single stored data

Recent projects – list of the last opened files

Import – import frequency or time domain data



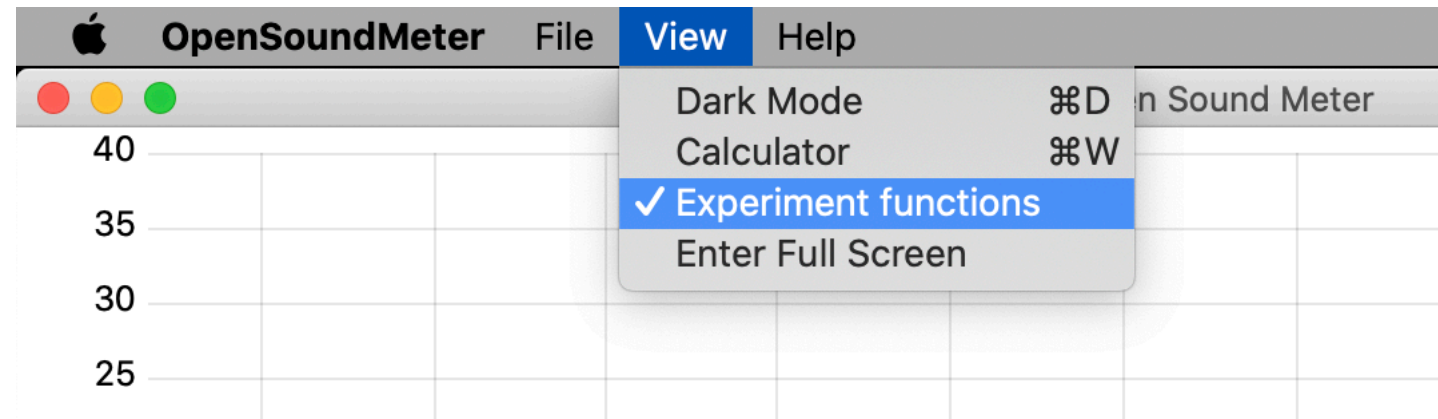
Application menu



Append new:

- measurement
- math source
- standard line
- filter
- equalizer
- windowing
- group
- toggle target trace

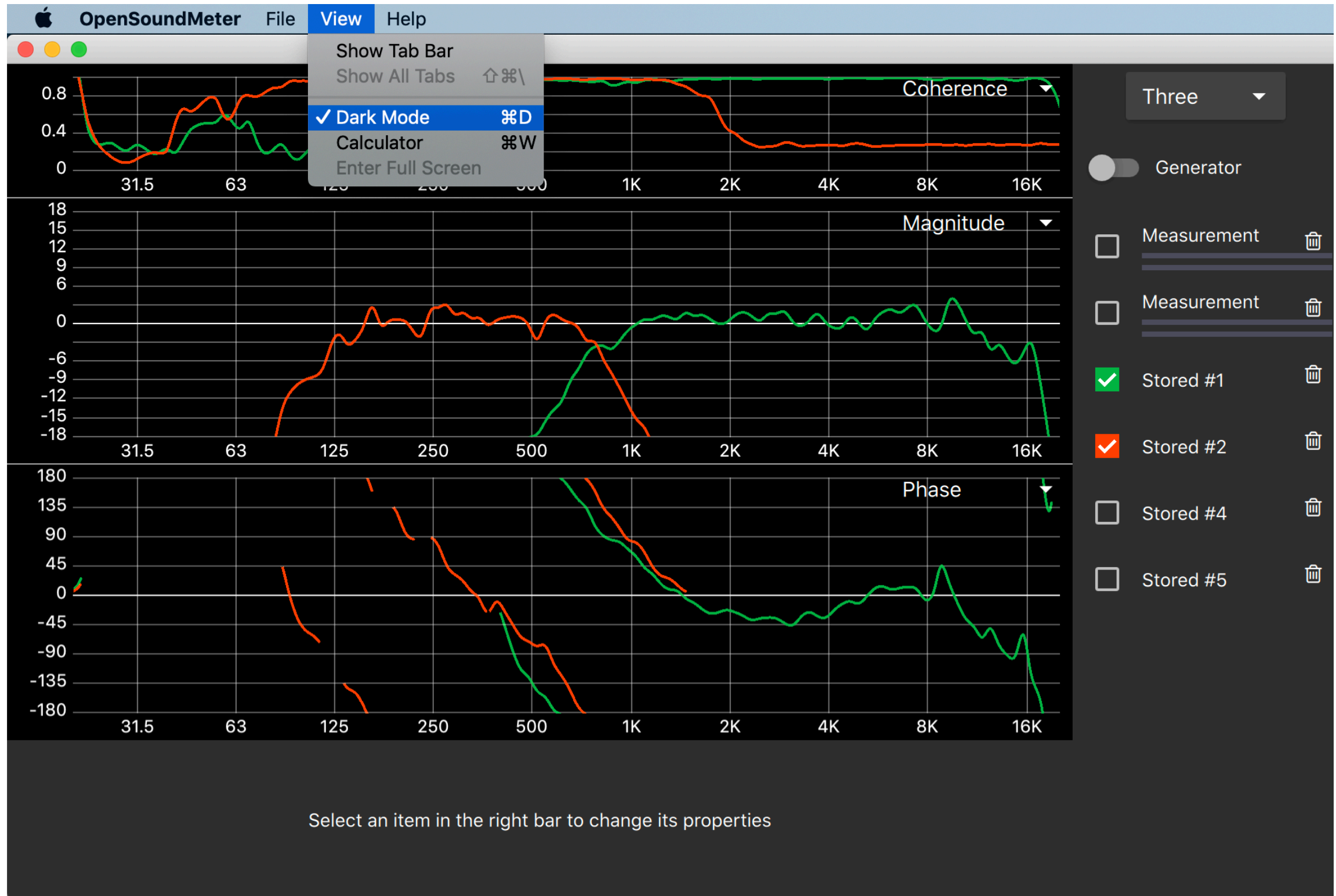
Experimental functions



Adds three more available charts:

- Crest factor of the measurements
- Nyquist plot
- Phase delay

Dark mode



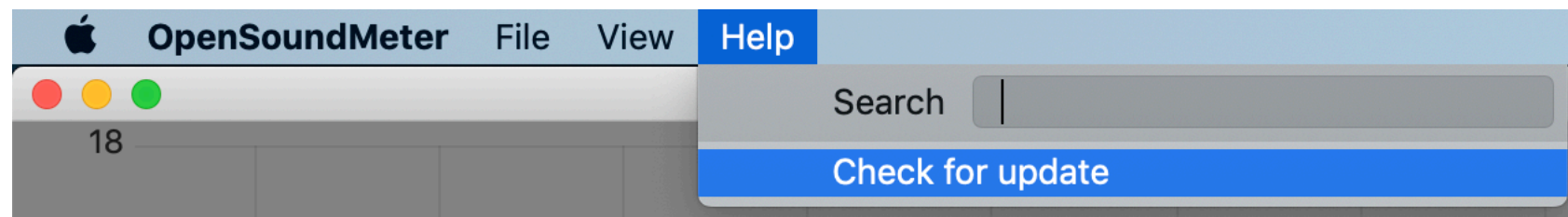
Thanks to Josh Barker for contribution



Update application

Open Sound Meter checks for updates at every start if internet connection is available.
You will see a message about update.

For manually check, use the menu item:
“Help > Check for update”.



Shortcuts

Action	macOS	Windows and Linux
new project	⌘+N	Ctrl+N
save	⌘+S	Ctrl+S
open	⌘+O	Ctrl+O
append measurement	⌘+A	Ctrl+A
append math source	⌘+M	Ctrl+M
append window source	⌘+W	Ctrl+W
append filter source	⌘+F	Ctrl+F
append equalizer source	⌘+E	Ctrl+E
add group	⌘+0	Ctrl+0
add ELC	⌘+L	Ctrl+L
store all measurements	⌘+X	Ctrl+X
store current measurement	⌘+C	Ctrl+C
reset averages	⌘+R	Ctrl+R
apply estimated delay	⌘+D	Ctrl+D
Toggle target trace	⌘+T	Ctrl+T



Shortcuts

Action	macOS	Windows and Linux
toggle generator	⌘+G	Ctrl+G
show 1 chart	⌘+1	Ctrl+1
show 2 chart	⌘+2	Ctrl+2
show 3 chart	⌘+3	Ctrl+3
auto charts height	⌘+4	Ctrl+4
open wavelength calculator	⌘+K	Ctrl+K
toggle dark mod	⌘+D	Ctrl+D
show shortcuts	F1	F1
show info	F2	F2
check for update	F3	F3



Application's data path

macOS

~/Library/Application Support/opensoundmeter/

Windows

C:/Users/{USERNAME}/AppData/Local/opensoundmeter

Linux

~/.local/share/opensoundmeter



Application's data in its folder

autosave.osm	last autosaved project
log.txt	output log in case of support
settings.sosm	Interface settings

Remove those files if you want to completely remove the application



How can you contribute?

- Donate opensoundmeter.com/about
- Share this overview with all the sound engineers
- Send me your ideas and wishes about the project
- Give me detailed reports about the errors or crashes

Thank you for support!



Consulting

If you have any questions about any tools or options – we are here to help.

We provide consulting service and trainings for users.

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