

Open Sound Meter



Overview v1.3

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>

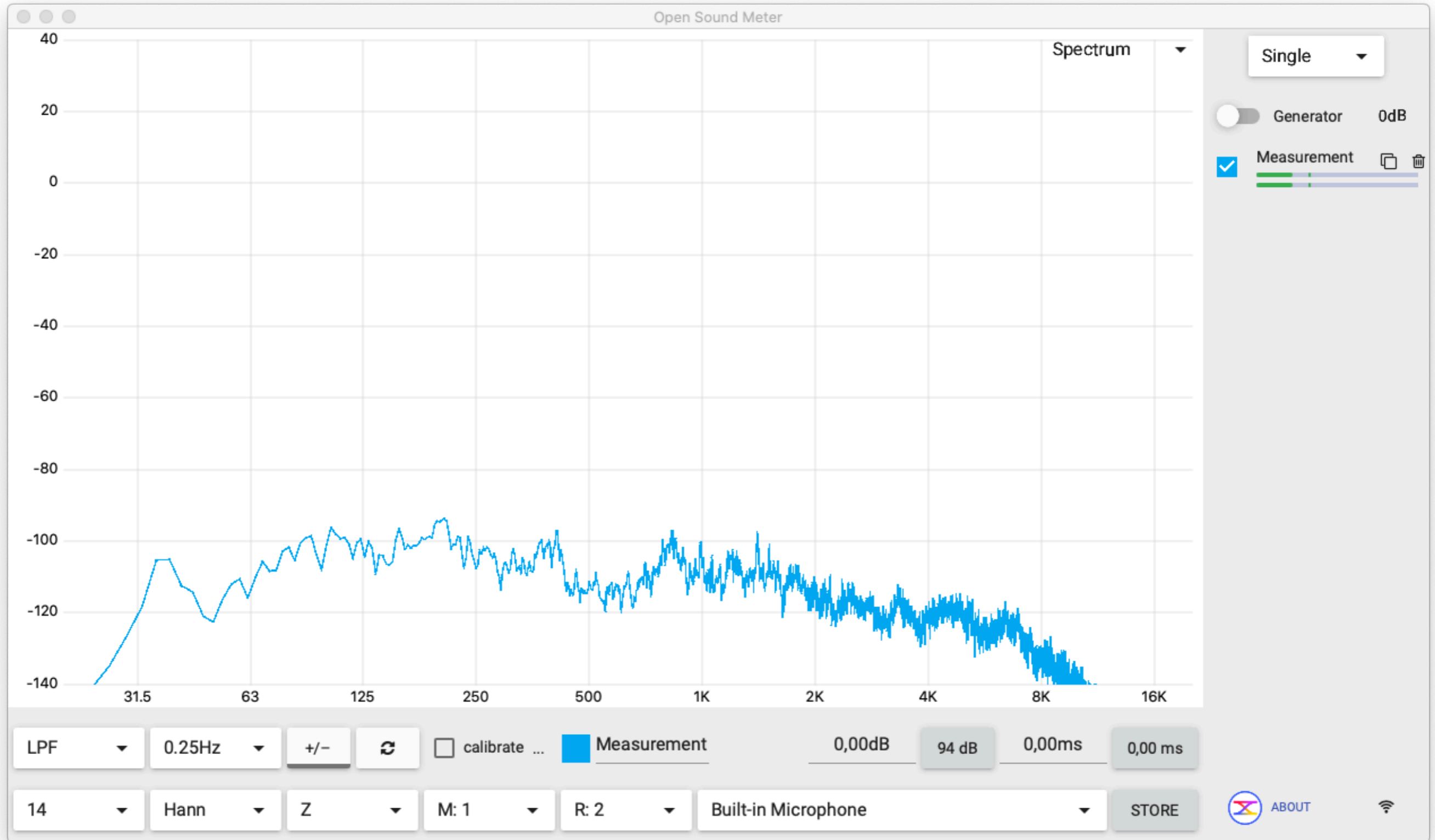


Where can I get it?

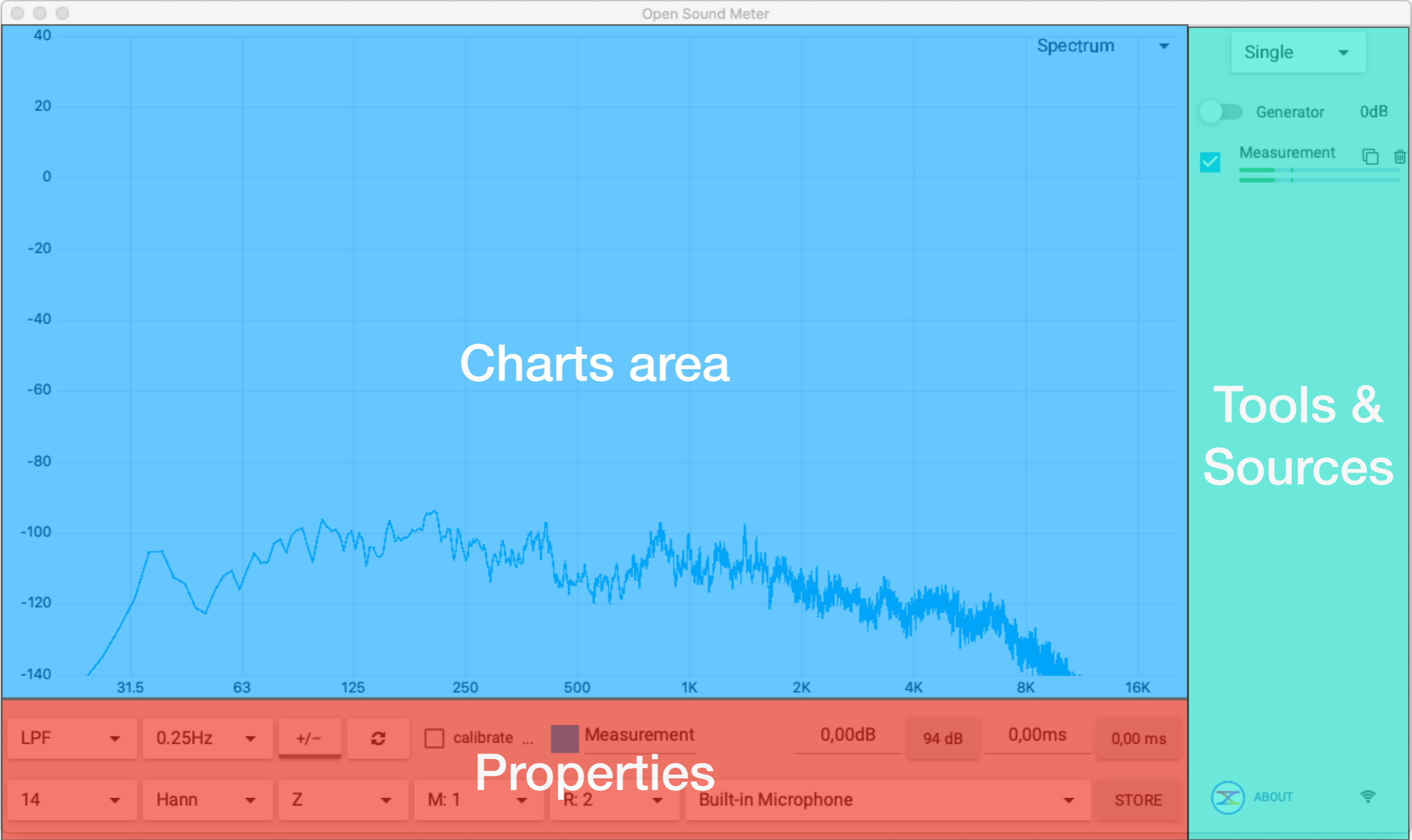
opensoundmeter.com



Let's run



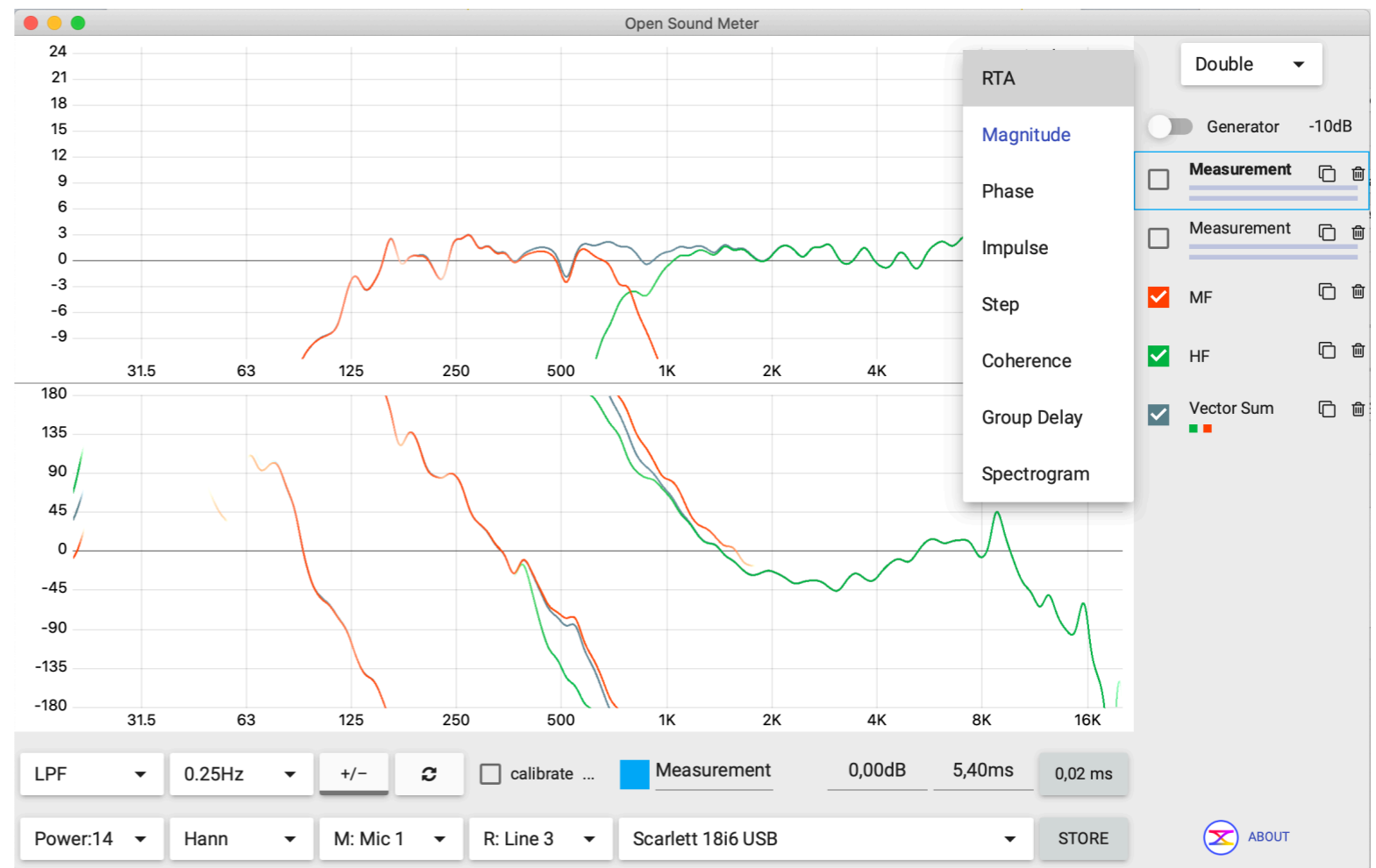
Layout



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

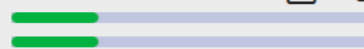
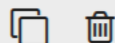
-18dB

Generator's output

Click label to open properties



Measurement



Measurement's processing and visibility

Click label to open properties

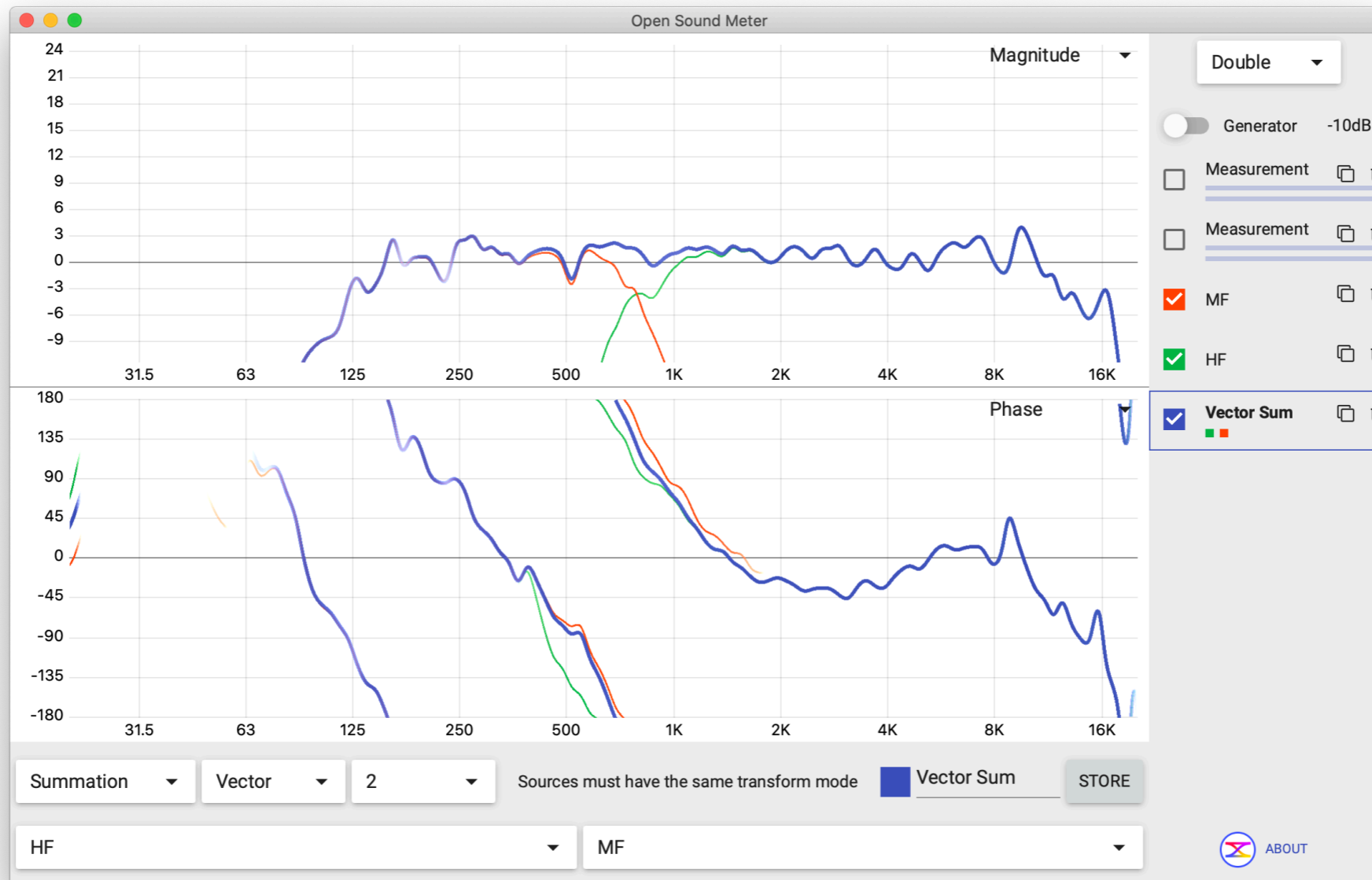
Checkbox color = series' color

Levels meter for measuring and reference channels

Icons for delete and clone



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

signal's type

gain

Pink - -6dB +

Soundflower (2ch) ch: 1 aux: 2

audio device

output channels



Generator properties

frequency for *sin* type

current ÷2 x2

↓ ↓ ↓

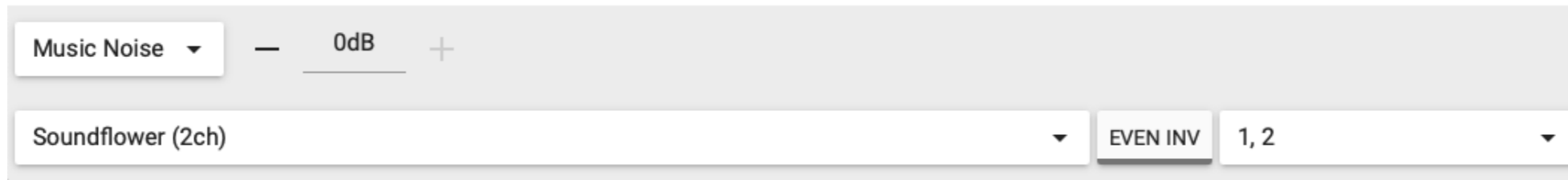
Sin - -6dB + - 1000Hz + OCTAVE DOWN OCTAVE UP

Soundflower (2ch) ch: 1 aux: 2



Generator properties

Music-Noise for AES75 2023



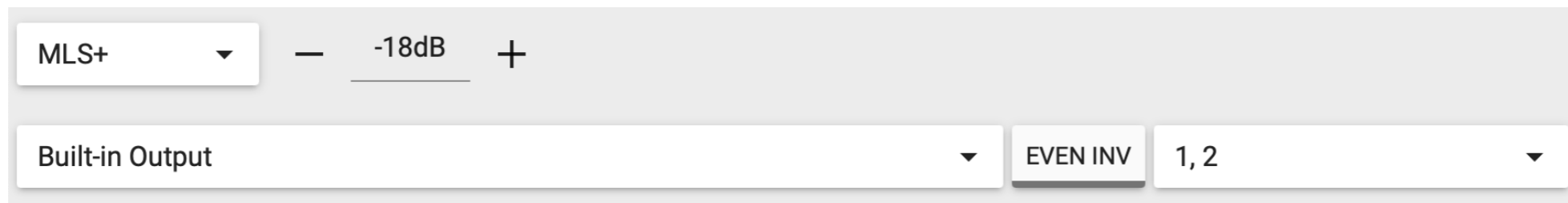
AES75 2023: AES standard for acoustics - Measuring loudspeaker maximum linear sound levels using noise, details a procedure for measuring maximum linear sound levels of a loudspeaker system or driver using a test signal called Music-Noise.

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



Generator properties

MLS+



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

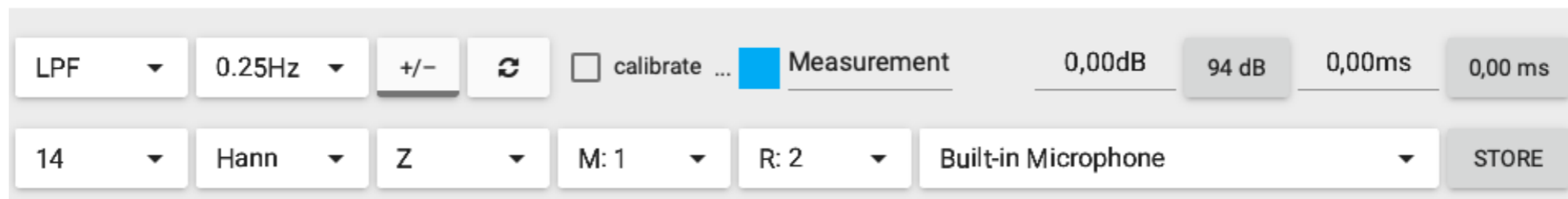
Original MLS noise creation procedure was modified to have period exactly 2 to the power of 16.

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



Measurement properties

reverse reset
polarity buffers color title



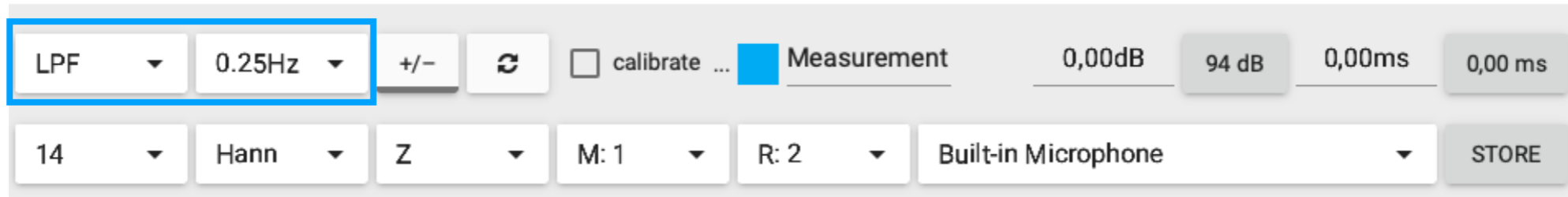
↑ window function ↑ reference channel ↑ audio device
channel for measure

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



Measurement properties

Averaging



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

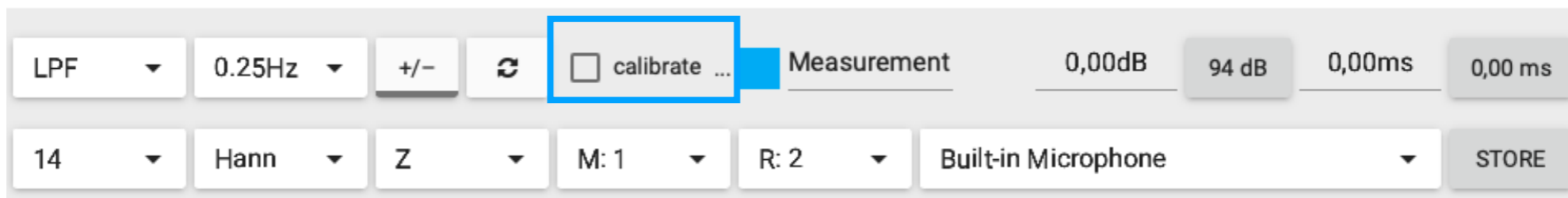
What is LPF and why use it:

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



Measurement properties

Applying a calibration file



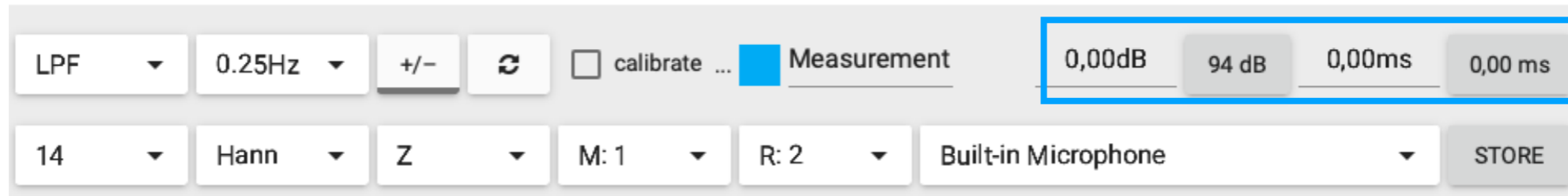
Click to enable or disable

File selection dialogue will appear on first click

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

Measurement properties

Gain and delay



Input value

Use keys ↑ and ↓ to adjust value,

Use Shift key for fine adjustment

Button shows the calculated estimated delay value, click to apply

On mouseover tooltip shows delta between current and estimated

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	0,00dB	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 0,00dB 94 dB 0,00ms 0,00 ms

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

Select time window size: $2^{\text{power value}}$ 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



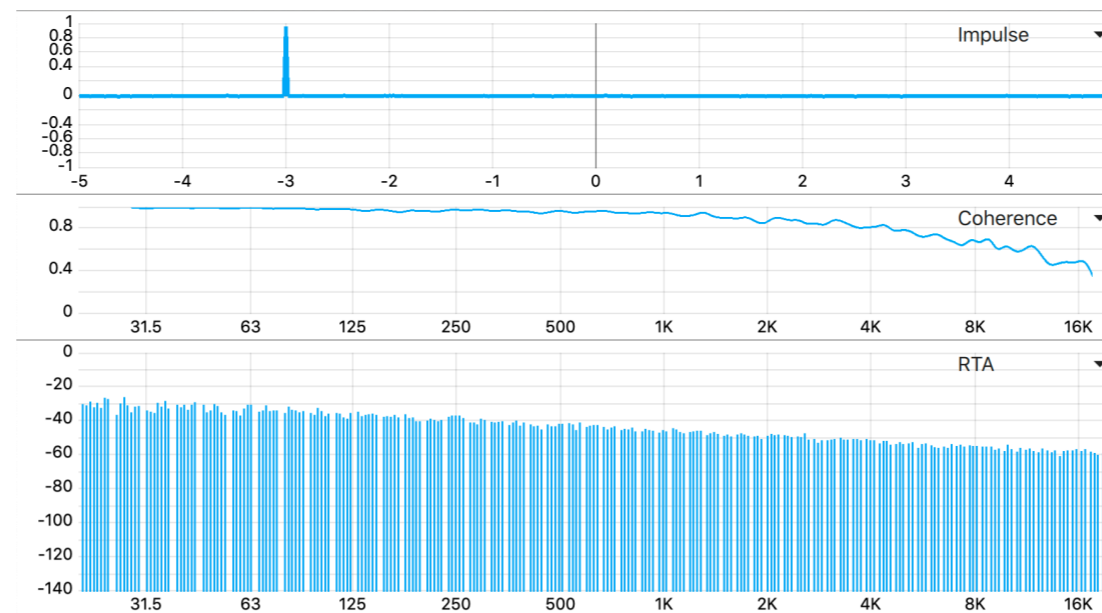
Measurement properties

Logarithm time window

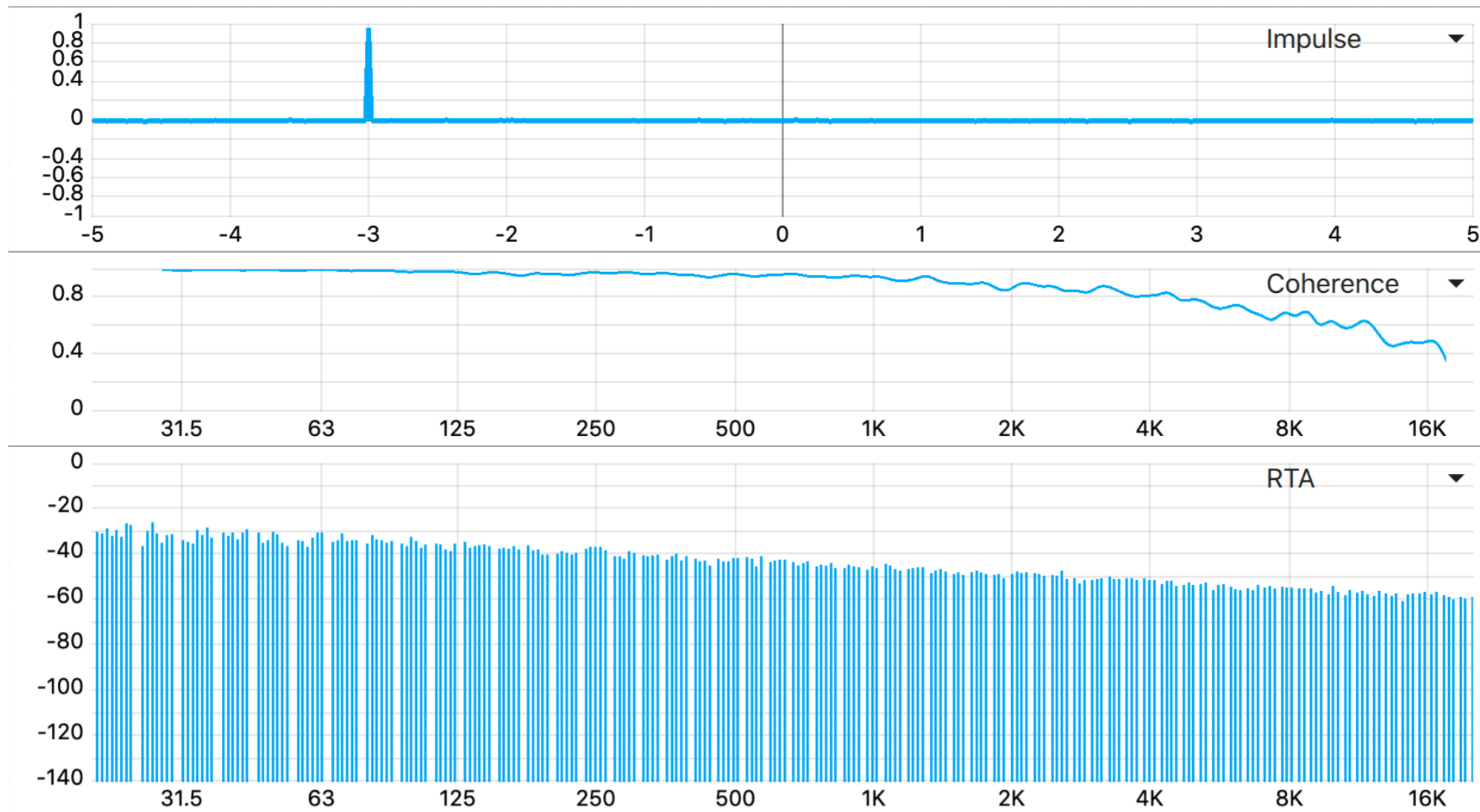
The screenshot shows the measurement properties interface of Open Sound Meter. The 'Logarithm time window' (LTW) option is highlighted with a blue box. The interface includes various controls for measurement settings:

- LPF: 0.25Hz
- Calibration: +/-, calibrate ...
- Measurement: 0,00dB
- Integration time: 5,40ms
- Resolution: 0,02 ms
- Window: Hann
- Input: M: Mic 1
- Output: R: Line 3
- Device: Scarlett 18i6 USB
- STORE button

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

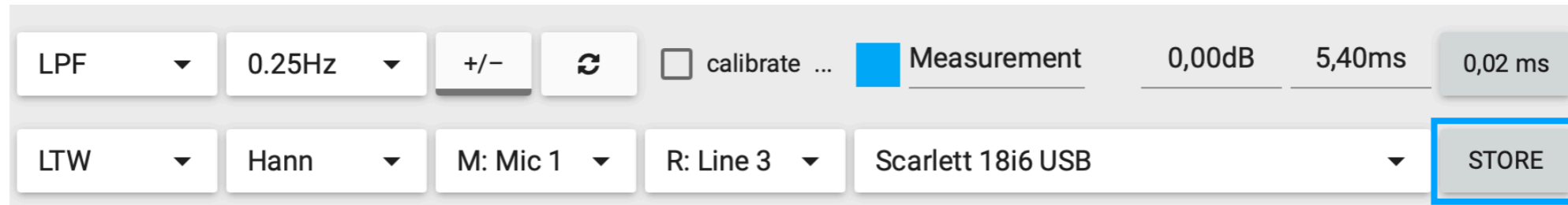


Logarithm time window



Measurement properties

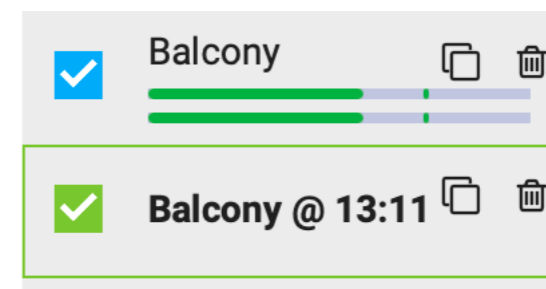
Storing your measurements



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

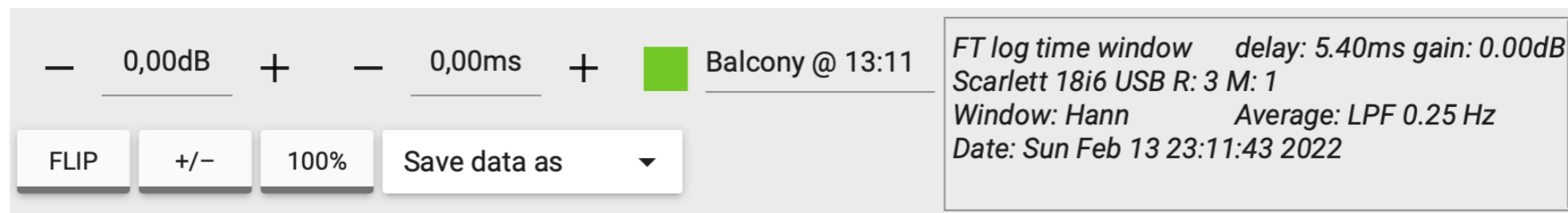
Stored properties

editable automatically

color

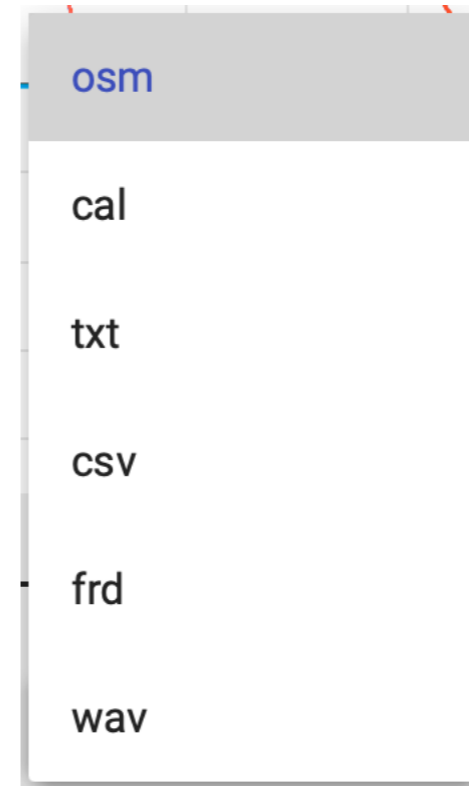
title

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 'Offline adjustment' panel in Open Sound Meter. It features two main sliders: 'gain' set to 0,00dB and 'delay' set to 0,00ms. Below the sliders are buttons for 'FLIP', '+/-', '100%', and 'Save data as'. A status bar on the right displays: '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'. A green square icon and the text 'Balcony @ 13:11' are also visible.

inverse magnitude



Stored properties

Offline adjustment

The screenshot shows the 'Stored properties' window in Open Sound Meter. At the top, there are two gain/offset sliders: the first is set to 0,00dB and the second to 0,00ms. To the right, a green square icon is followed by the text 'Balcony @ 13:11'. Below these are four buttons: 'FLIP', '+/-', '100%', and 'Save data as' with a dropdown arrow. On the right side, a text box contains 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'.

inverse
polarity

force 100% coherence



Filter source

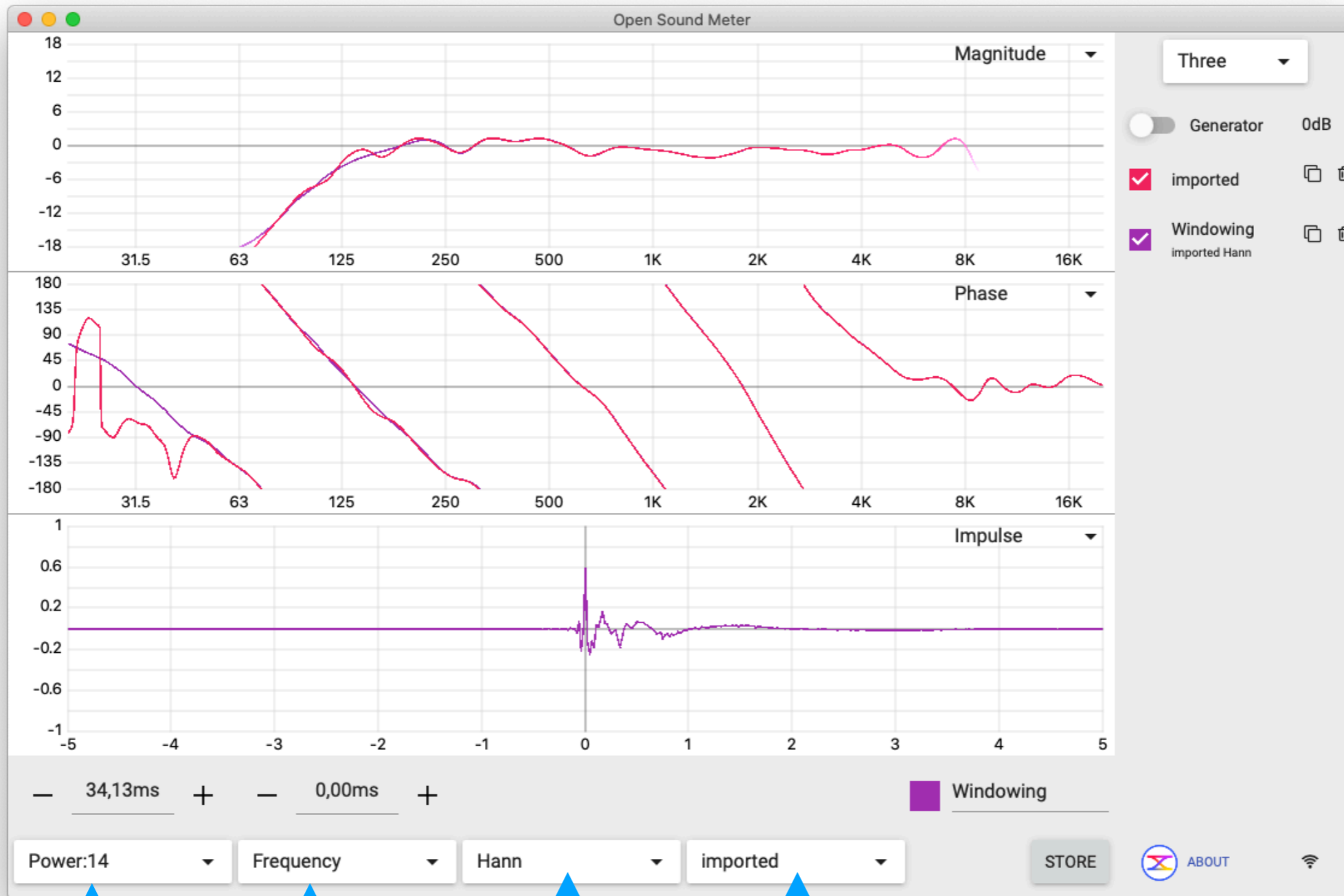
FFT Power sample rate color title store the result

Power:10 48000 ■ LR LPF 2

Linkwitz-Riley LPF 2 — 1 000,0Hz + STORE

Filter type order corner frequency

Windowing source



↑
window
size

↑
source
domain

↑
window
function

↑
source

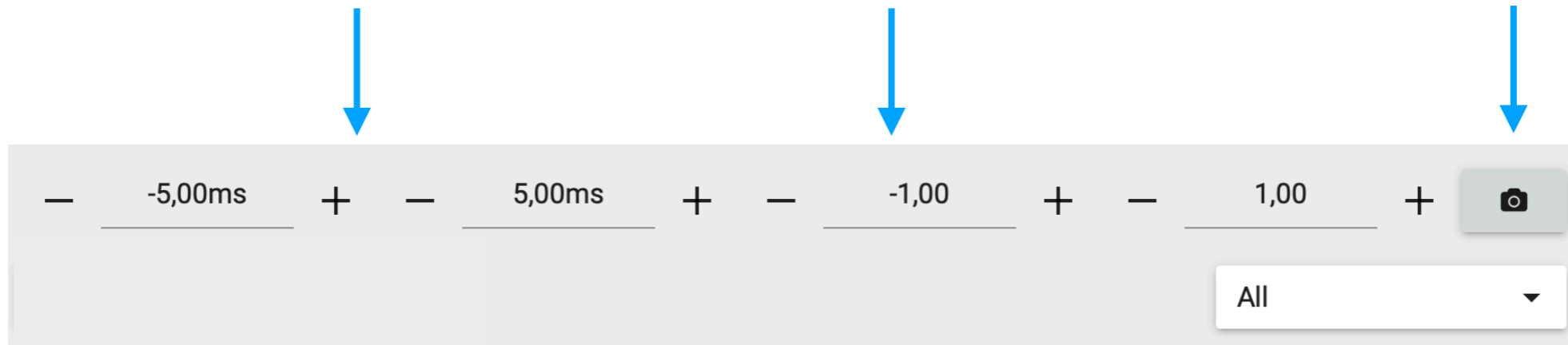


Basic chart properties

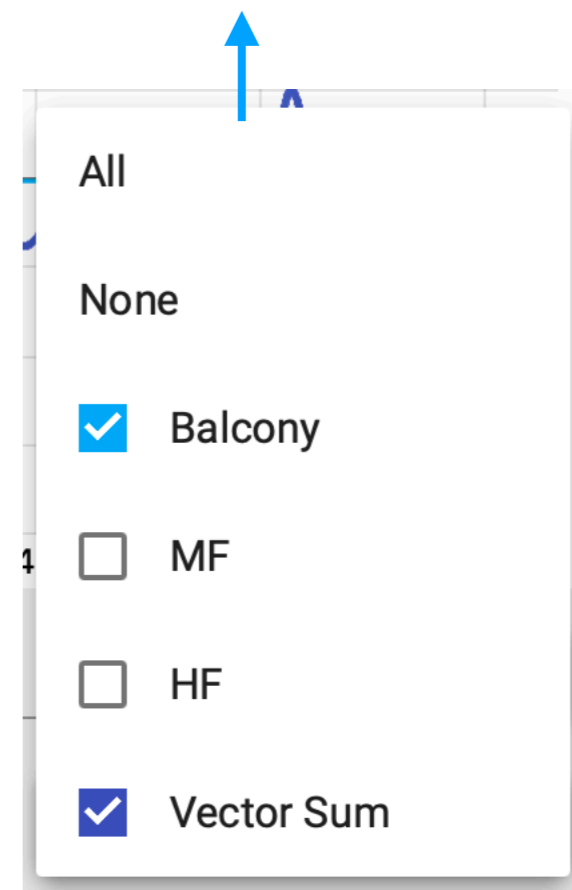
Horizontal axis range

Vertical axis range

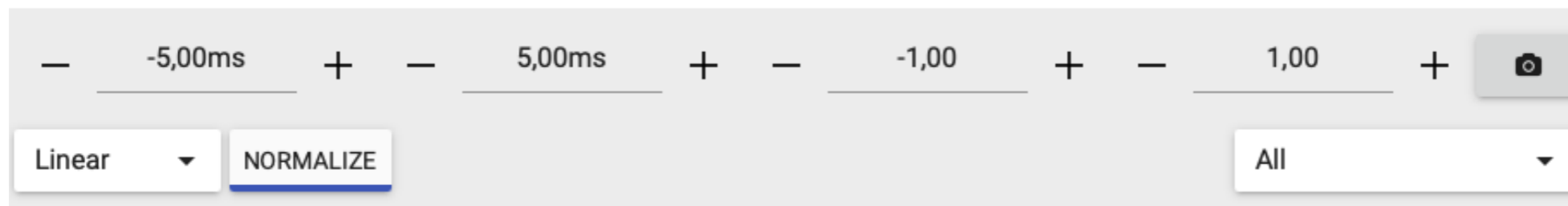
save chart as an image



If source is selected, just that will be shown.



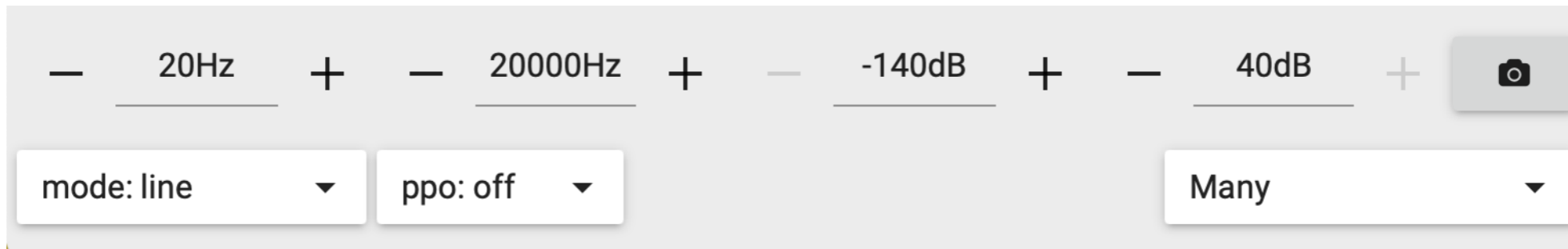
Impulse chart properties



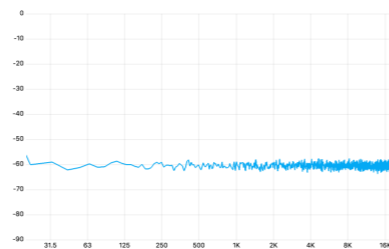
Normalize displayed data

Select linear or log (dB) vertical scale

RTA chart properties



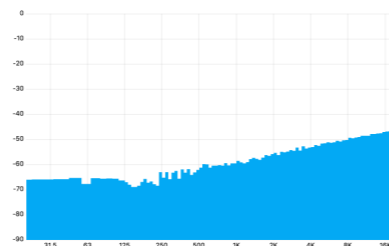
line



one continuous line

points per octave define smooth

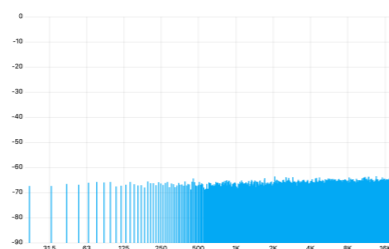
bars



ppo 12

points per octave define the bar width

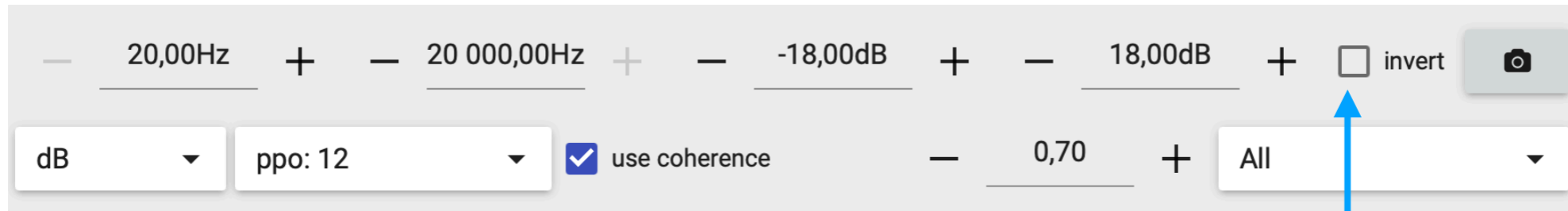
lines



one line per frequency



Magnitude chart properties



↑
Y-axis
scale

↑
Points per octave

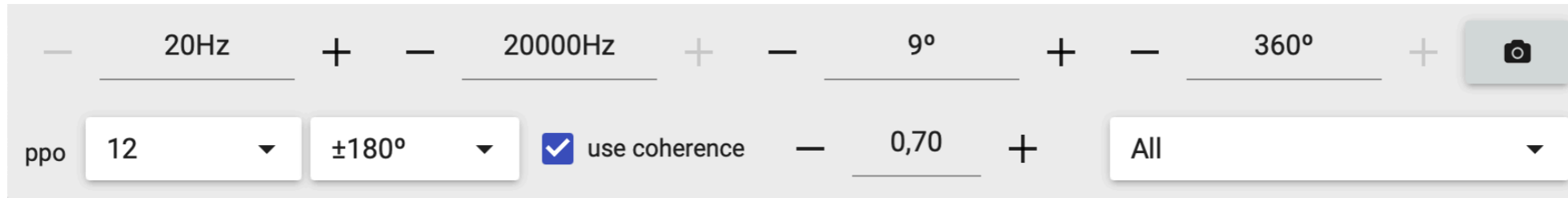
↑
Coherence threshold for
the alpha channel

↑
Invert Y axis

↑
Apply coherence value
for the series opacity



Phase chart properties



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° +

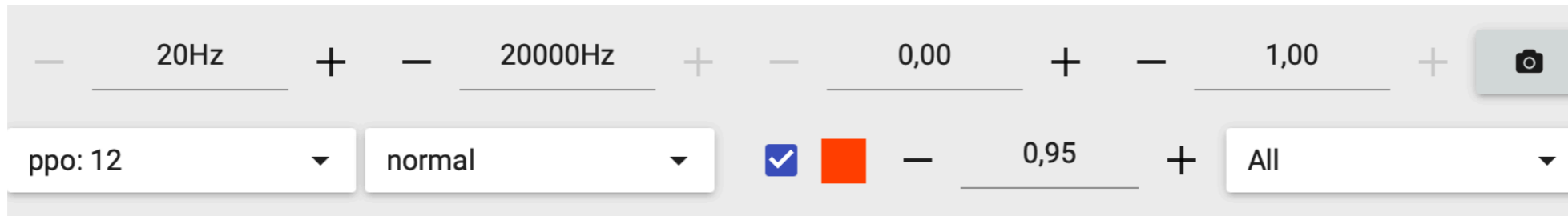
ppo 12 ▼ ±180° ▼ use coherence — 0,70 + All ▼

Show values:

- -180° to +180°
- 0° to 360°



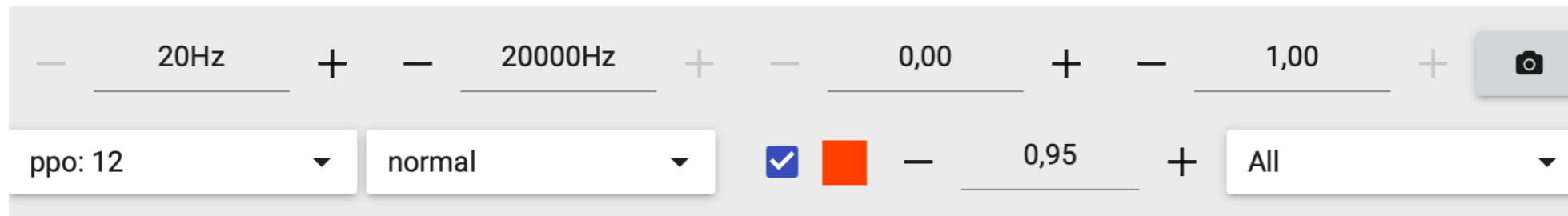
Coherence chart properties



Show normal, squared or SNR value

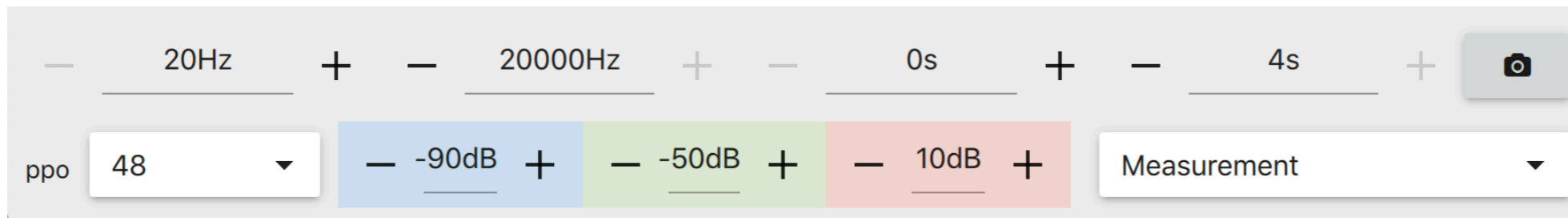
Points per octave

Coherence chart properties



Show help line and its value

Spectrogram chart properties



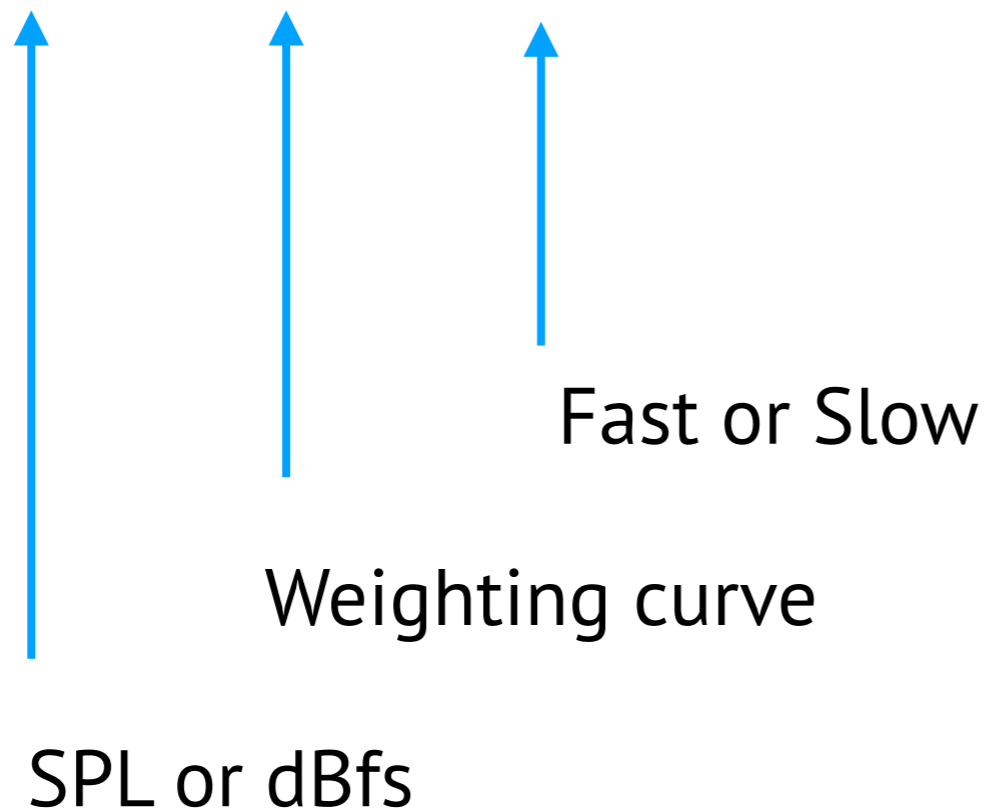
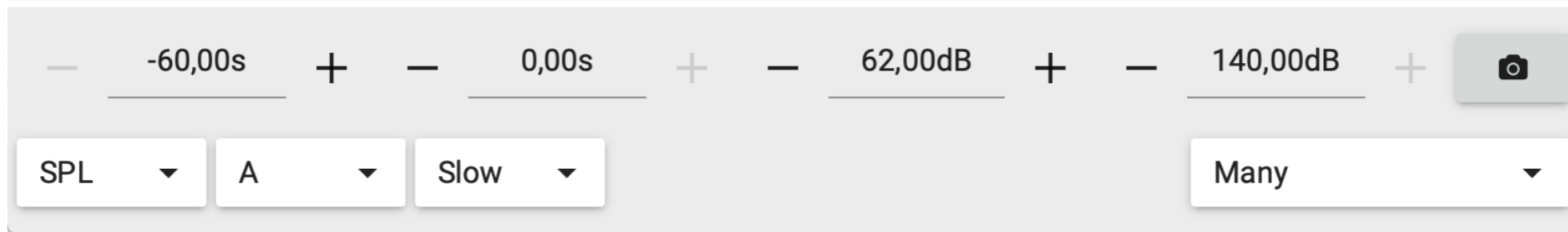
Points per octave

Set colours thresholds

Select a source



Level chart properties



Numeric

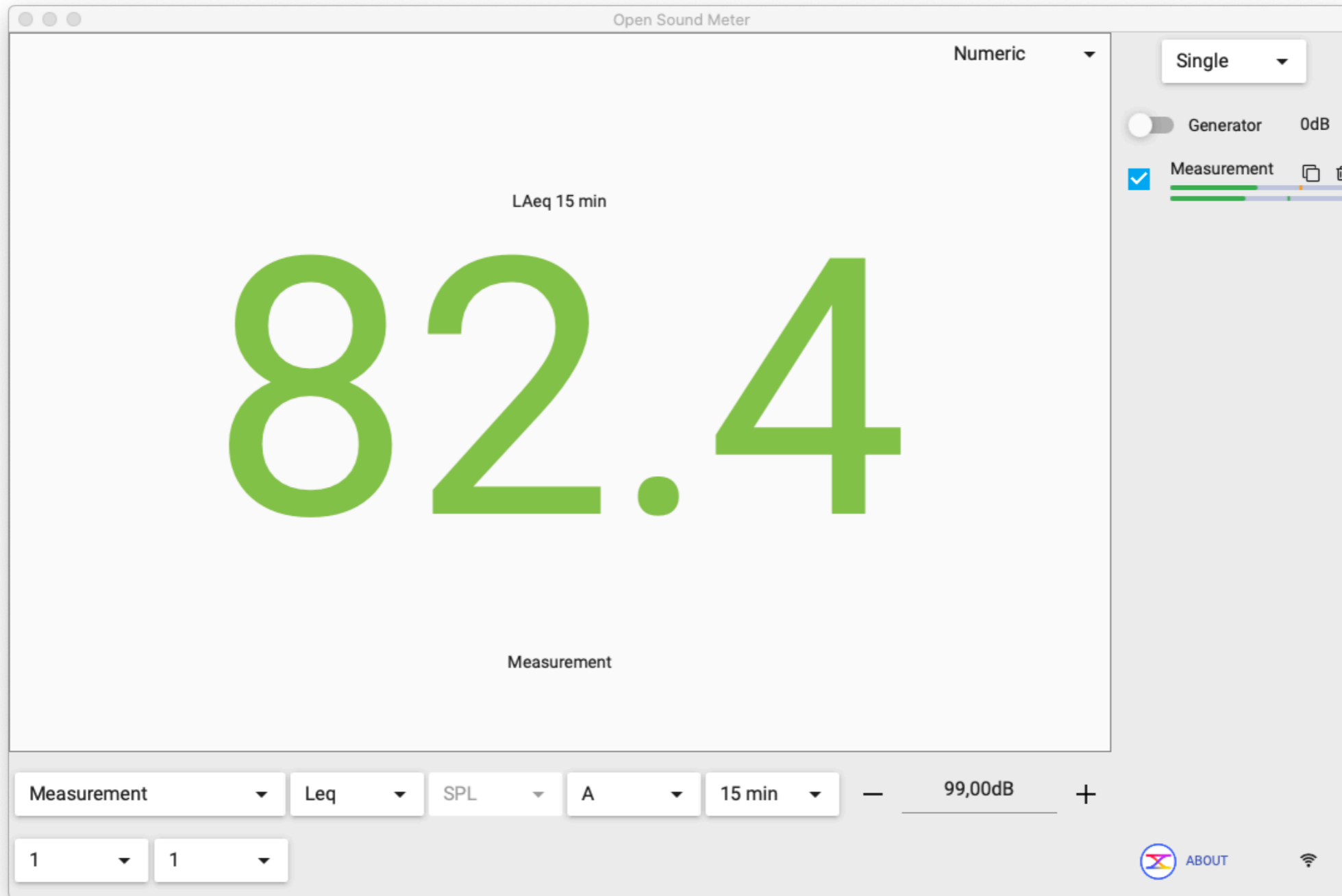
RMS SPL A Slow 103.9 green (2)	Peak dBfs A Slow -17.1 green (2)	Crest Z Fast 21.4 green (2)	SPL Time 15:22 System		
green (2) ▼	RMS ▼	SPL ▼	A ▼	Slow ▼	— 99,00dB +
1 ▼	4 ▼				

↑
rows count

↑
columns count



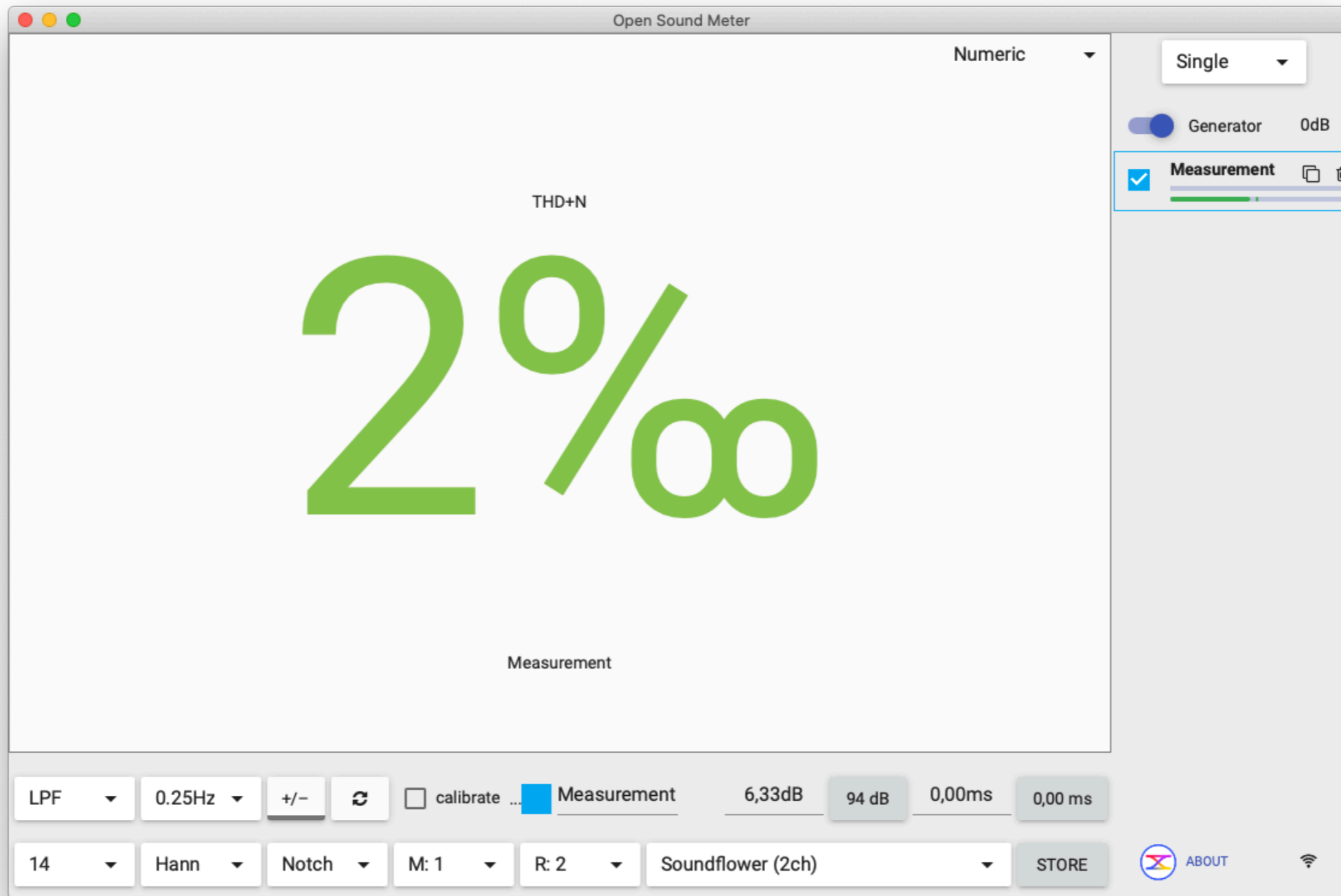
Leq



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 numeric properties interface of Open Sound Meter. It consists of two rows of controls. The top row contains five dropdown menus: 'green (2)', 'RMS', 'SPL', 'A', and 'Slow'. To the right of these is a warning threshold control with a minus sign, a text field containing '99,00dB', and a plus sign. The bottom row contains two dropdown menus with the values '1' and '4'. Blue arrows point from the text labels above to their corresponding controls in the interface.

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>	+				meter ▼

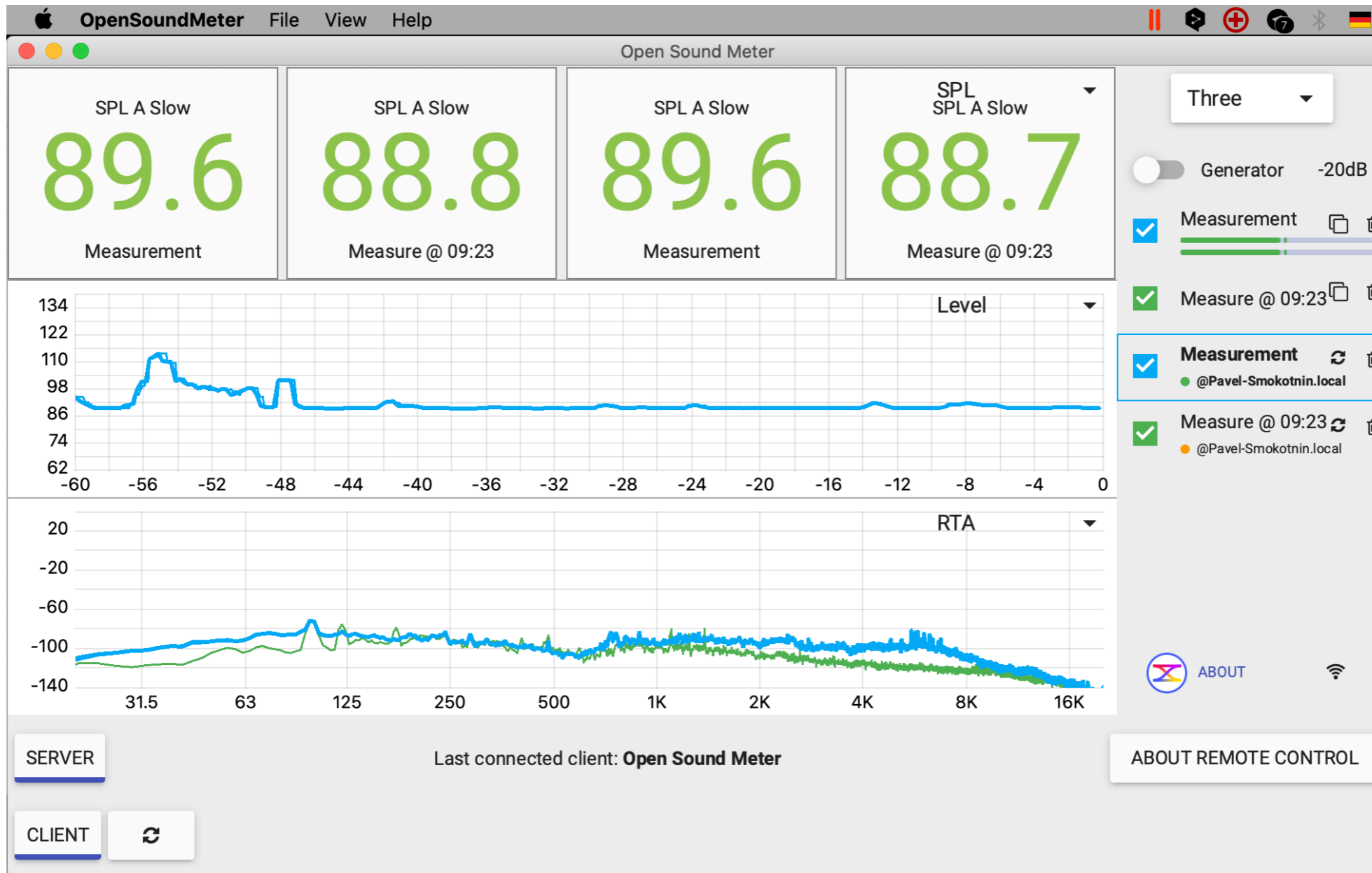
Allows you calculate between frequency, period and wavelength.
You can change any value and get others.
Use Shift key to fine adjust value

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



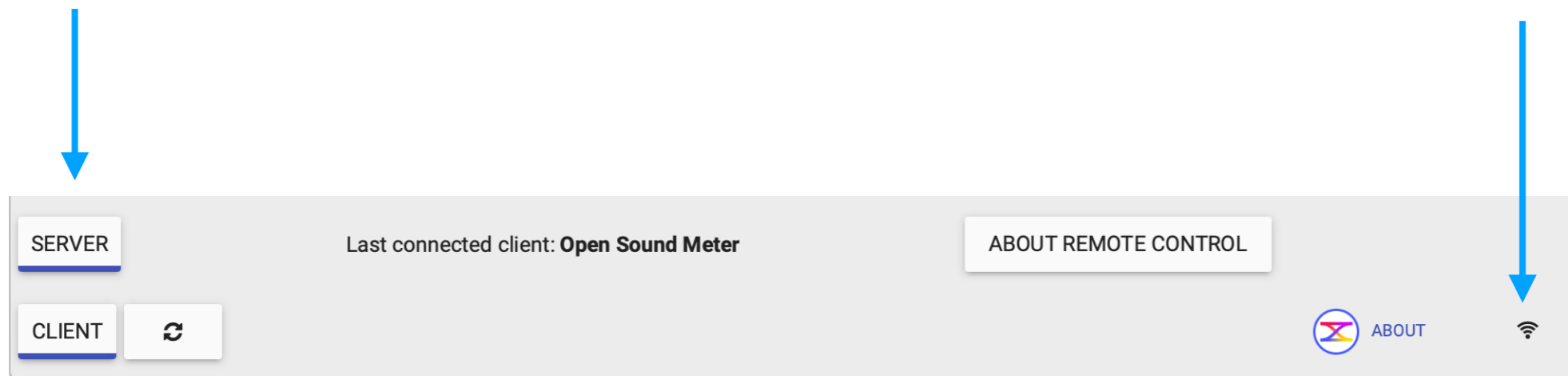
Different instances of Open Sound Meter on the same network could share data



Remote API

Activate API Server

Open remote settings



Refresh connection

Activate API Client

If you activate Server application will share data

If you activate Client application will receive data from Server

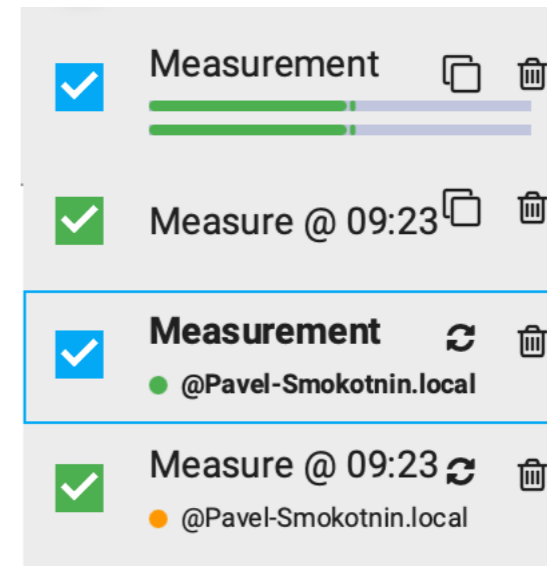


Remote API

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 image shows a control panel for the Remote API. It consists of two rows of controls. The top row includes: a dropdown menu set to 'LPF', a dropdown menu set to '0.25H', a '+/-' button, a refresh button, a checkbox labeled 'calibrate' which is unchecked, a blue square button labeled 'Measurement', a text field containing '0,00dB', a dropdown menu set to '94 dB', a text field containing '0,02ms', and a dropdown menu set to '0,00 ms'. The bottom row includes: a dropdown menu set to '14', a dropdown menu set to 'Hann', a dropdown menu set to 'M:', a dropdown menu set to 'R:', a large empty dropdown menu, and a 'STORE' button.

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

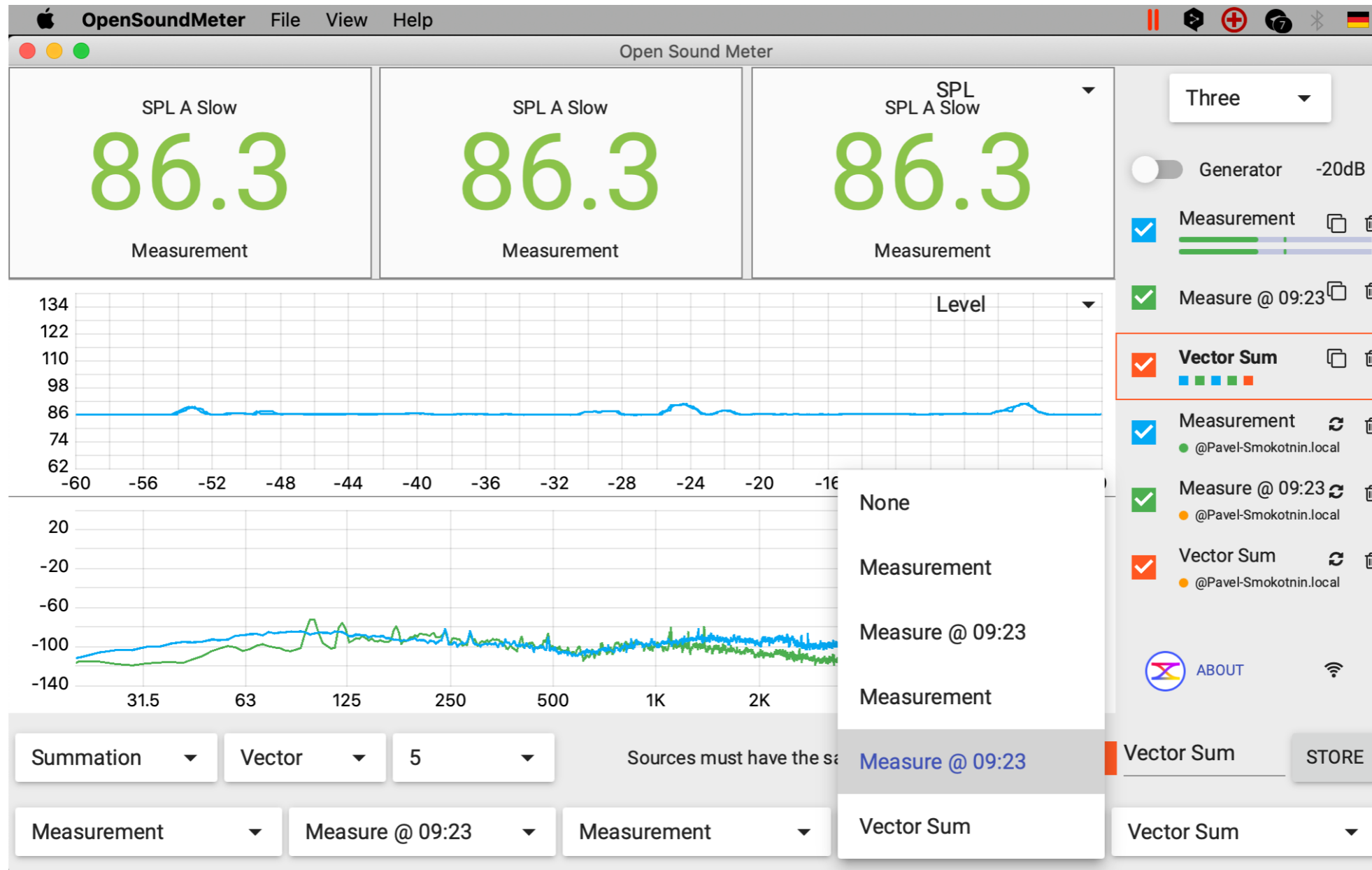
Remote API

REFRESH Vector Sum @ Pavel-Smokotnin.local

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



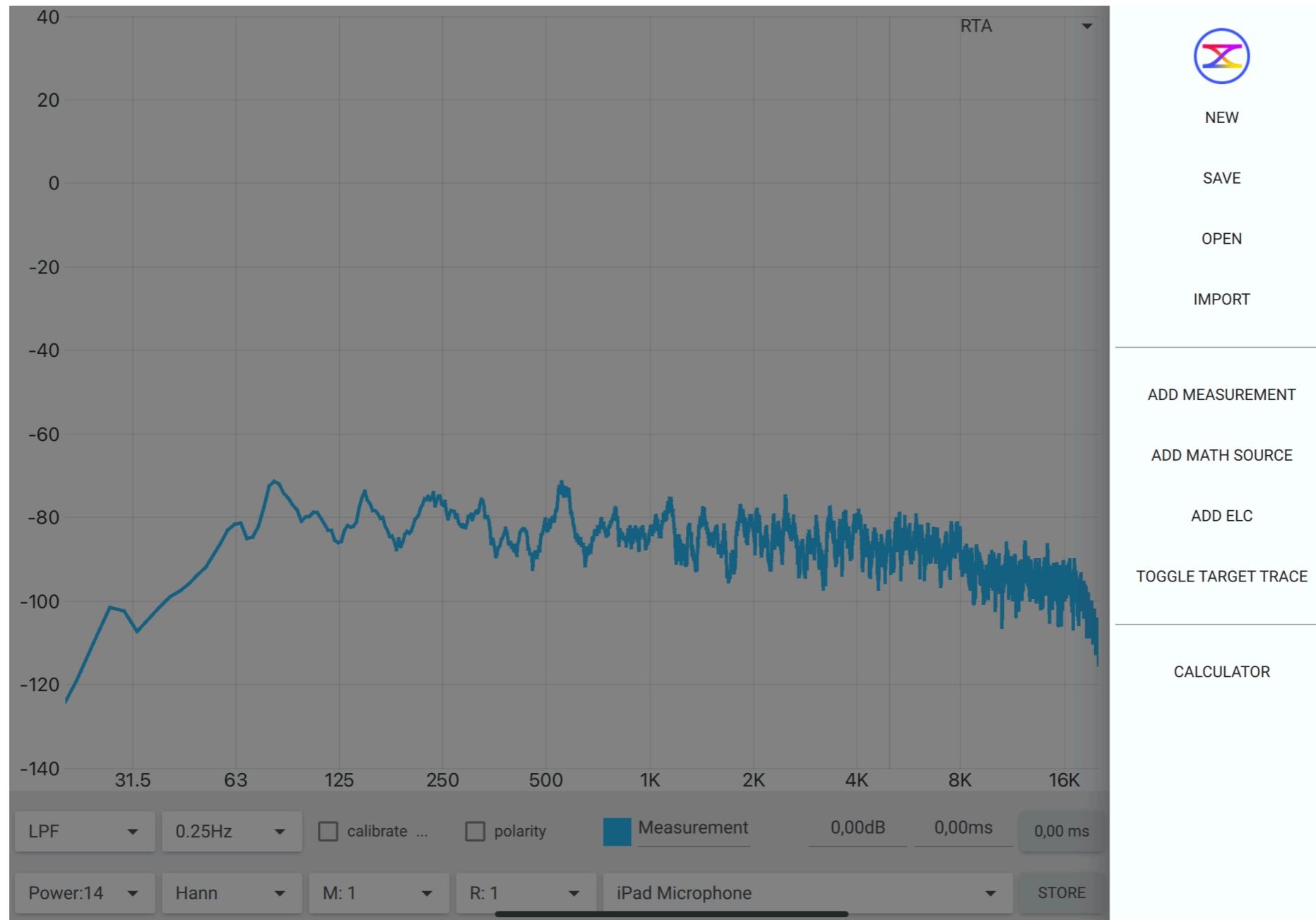
Remote API



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



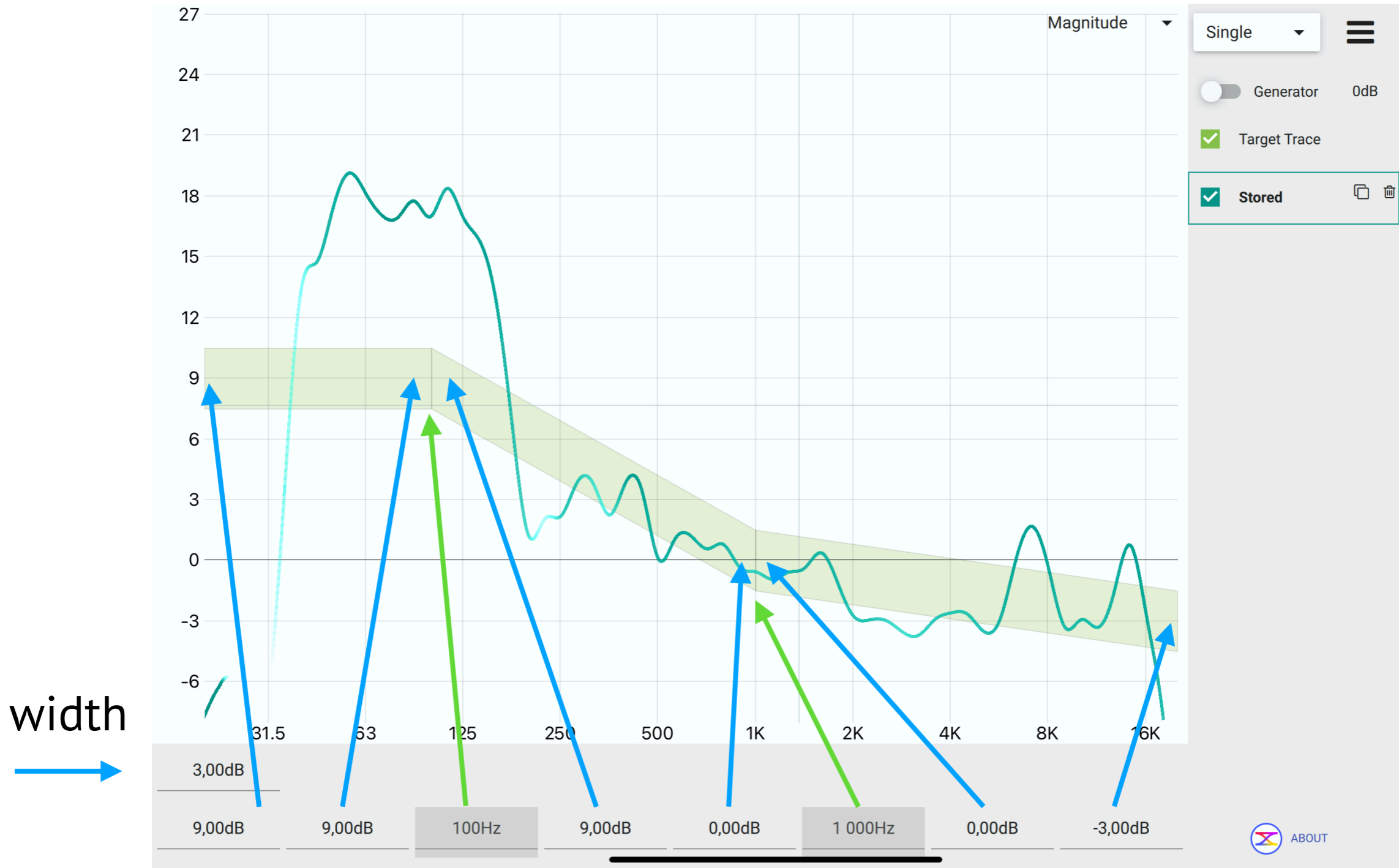
Application menu (iPad)



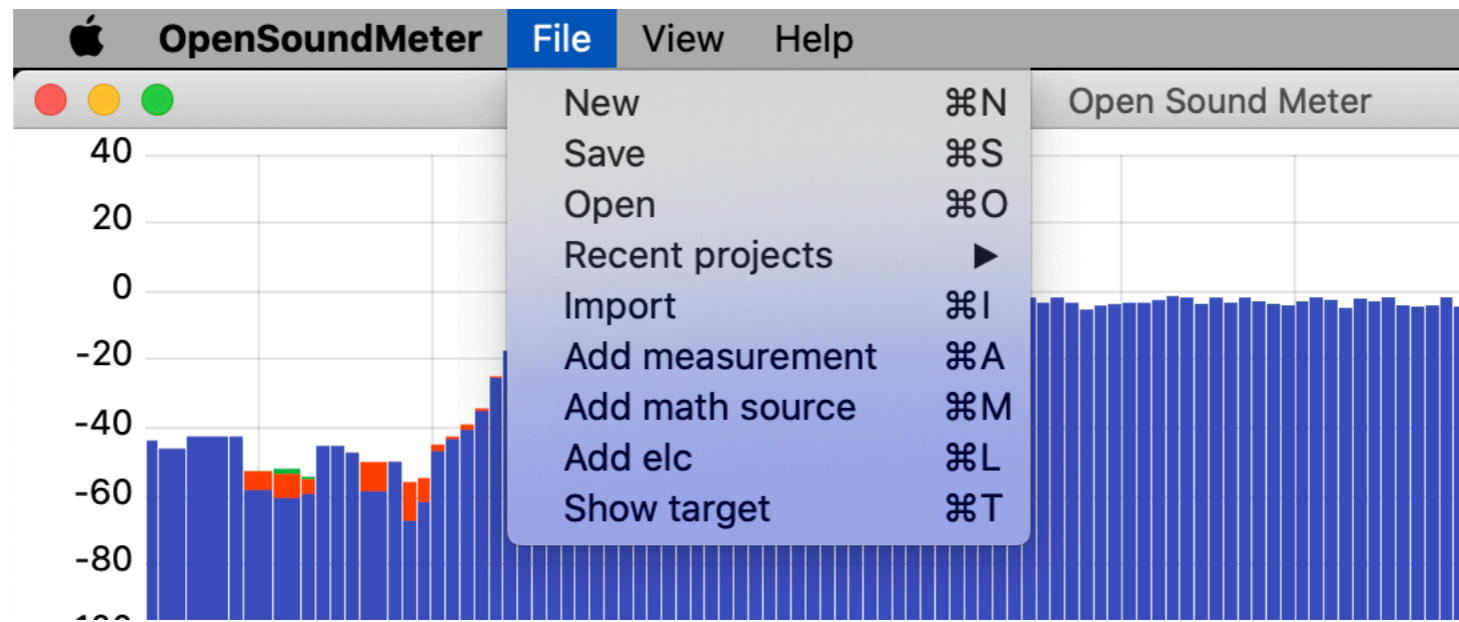
Swipe from left side to the right to open menu.
Or click menu button in the top right corner.



Target trace



Application menu



New – create empty measuring project

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

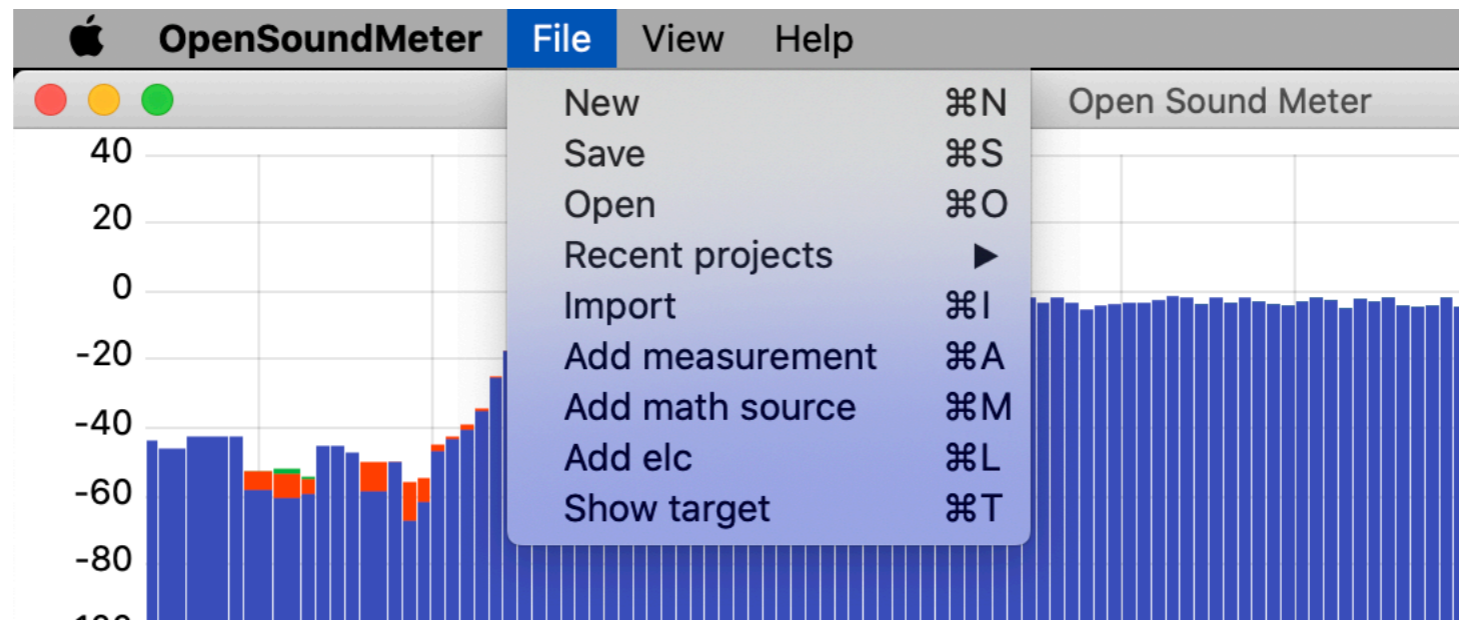
Open – load project file or single stored data

Recent projects – list of the last opened files

Import – data from txt or csv format



Application menu



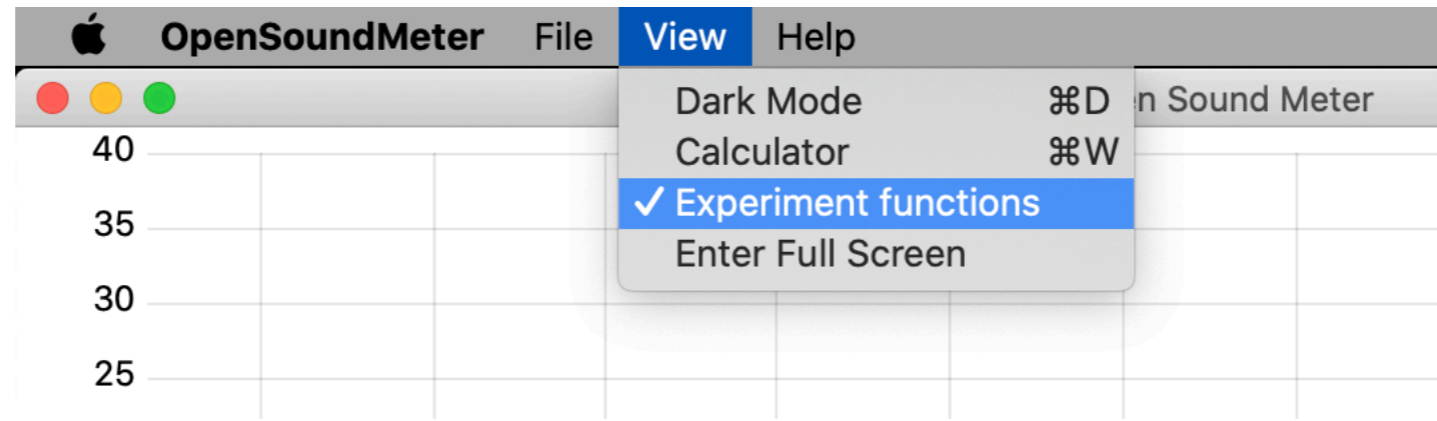
Append measurement – add a single measurement to the project

Add math source – add a single virtual math source

Add elc – add equal loudness contour

Show target – toggle target trace

Experimental functions

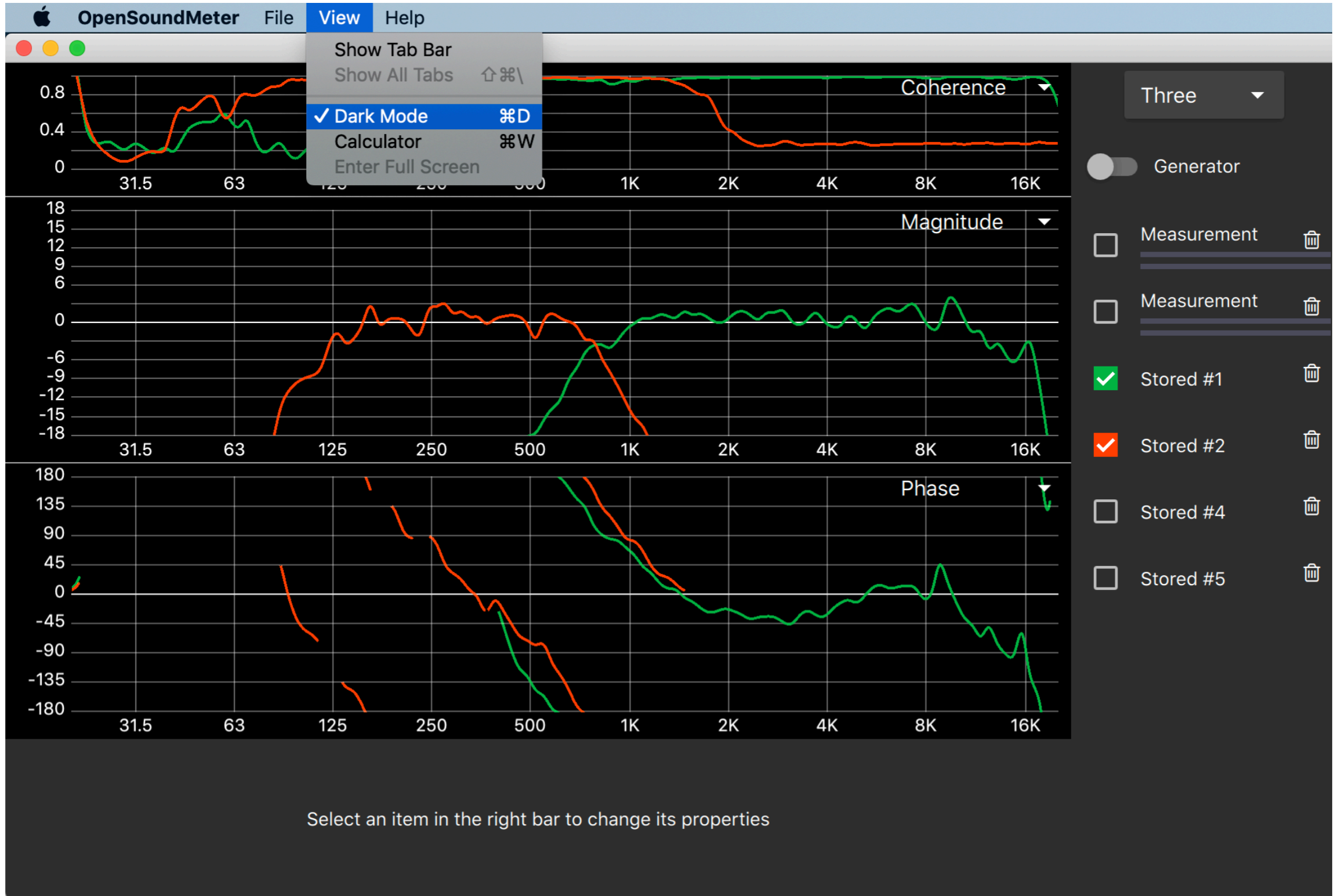


Adds three more available charts:

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



Dark mode



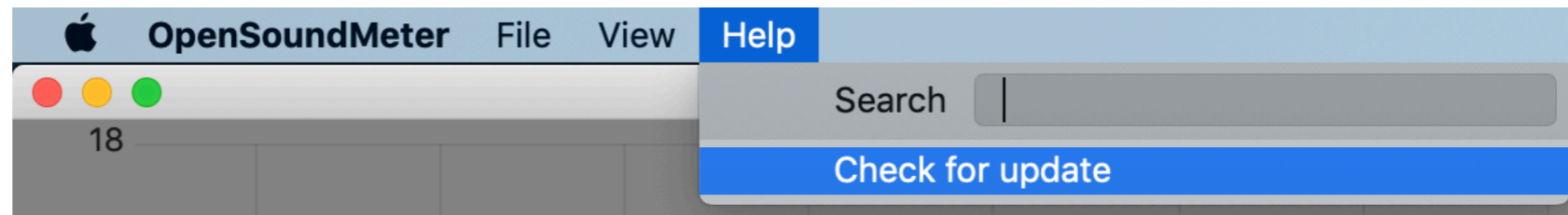
Thanks to Josh Barker for contribution



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
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	⌘+E	Ctrl+E
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



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.

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



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