

# Open Sound Meter



Overview v1.4

# 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>



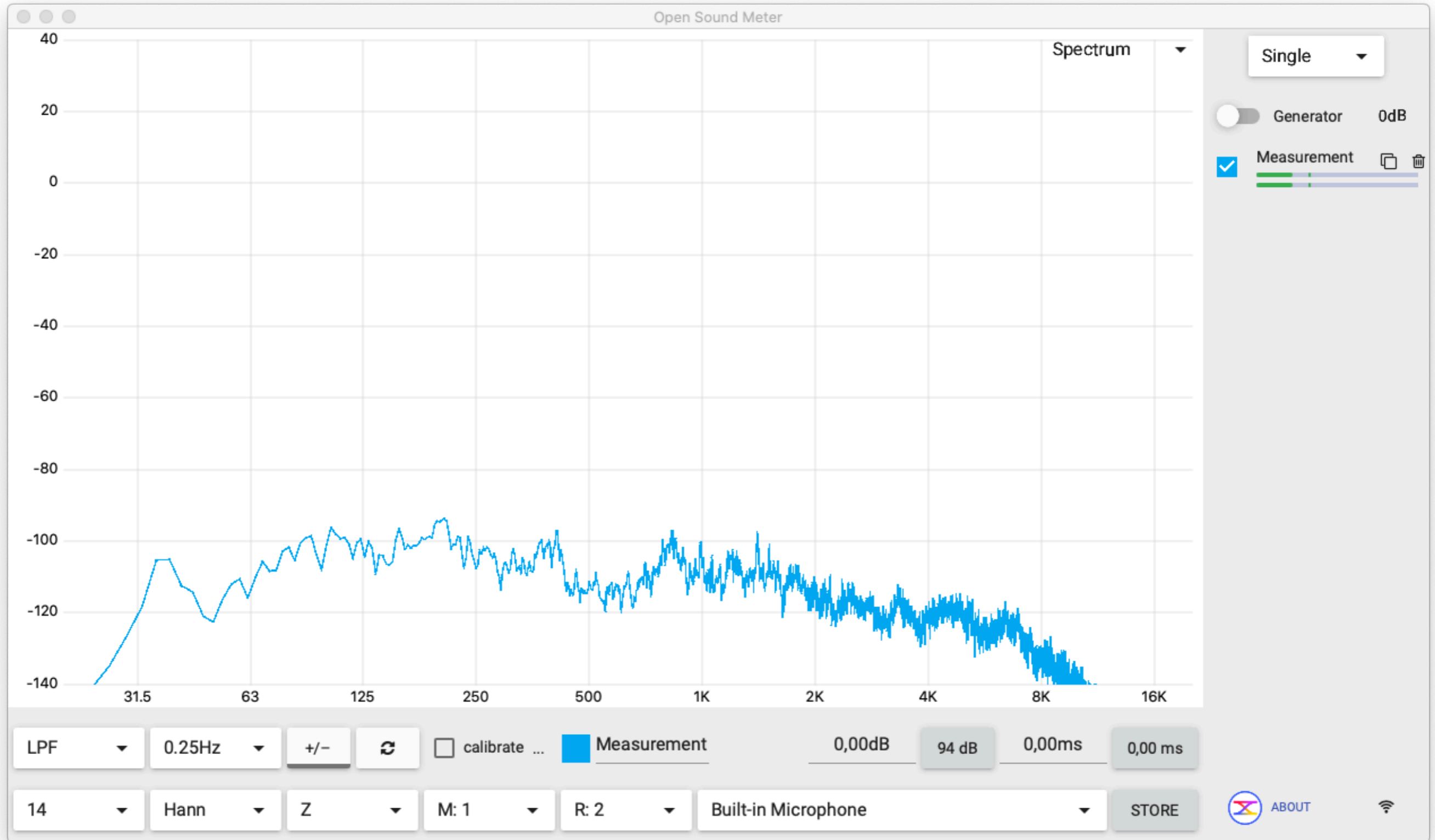
# Where can I get it?

[opensoundmeter.com](https://opensoundmeter.com)

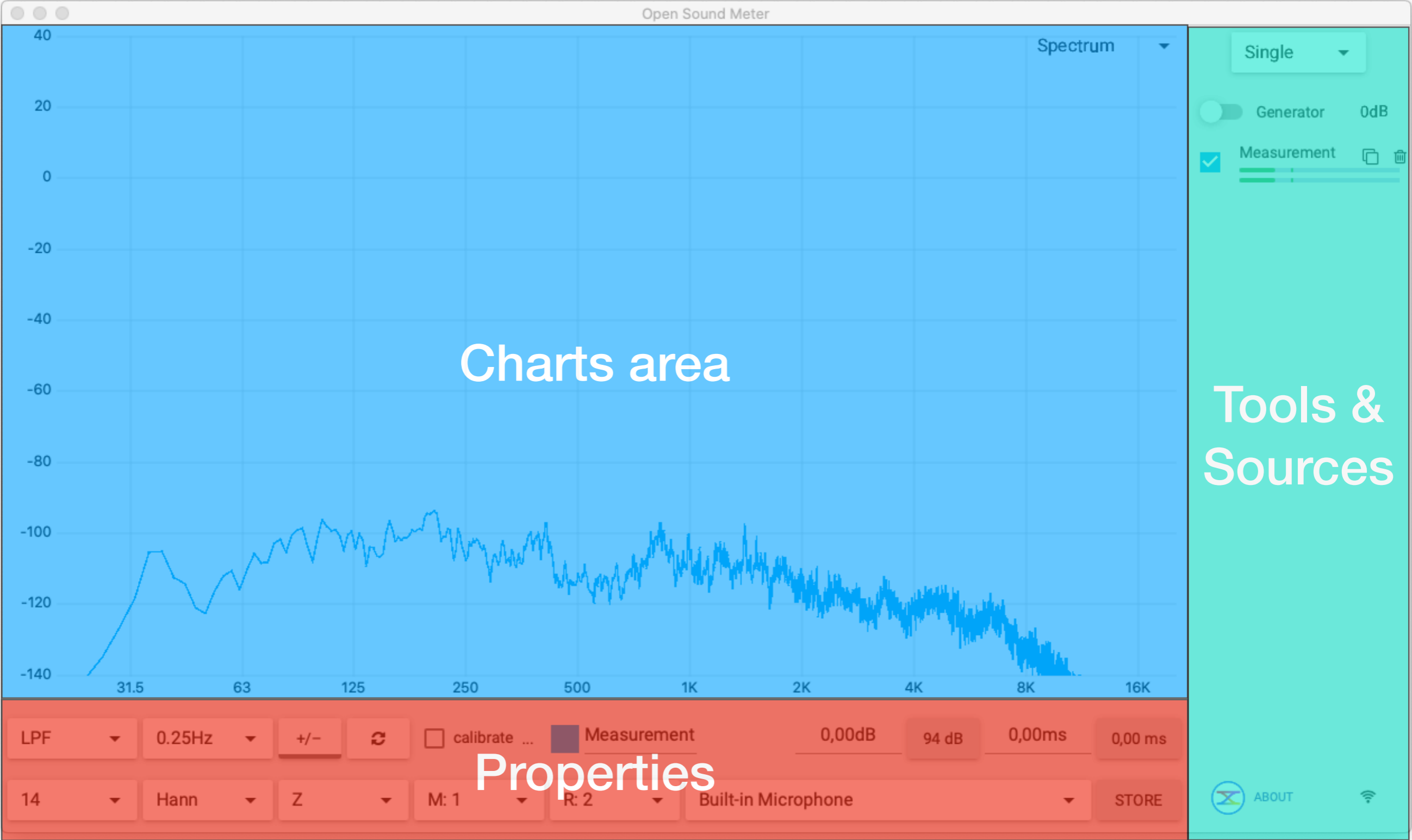




# Let's run



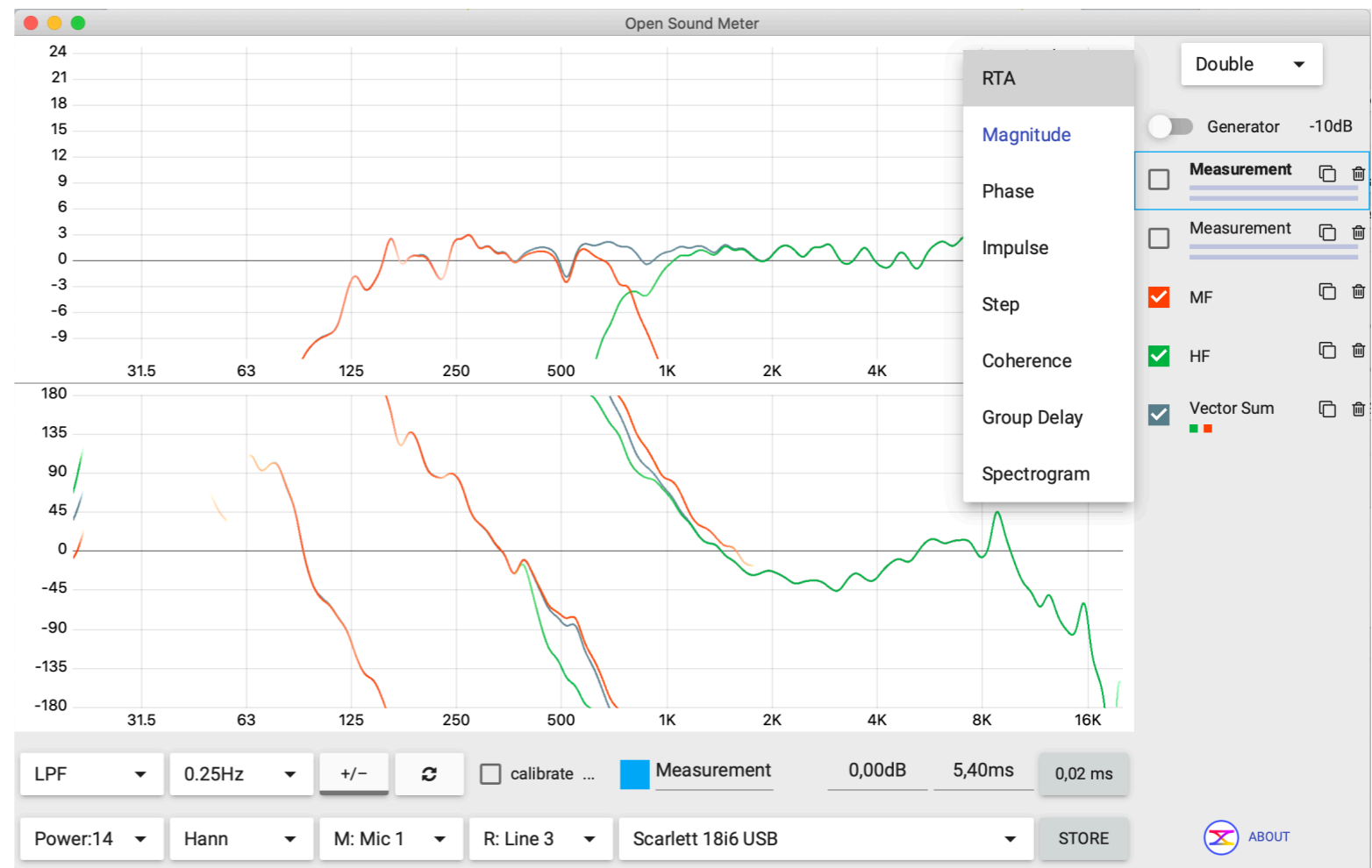
# Layout




# 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

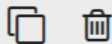
-18dB

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



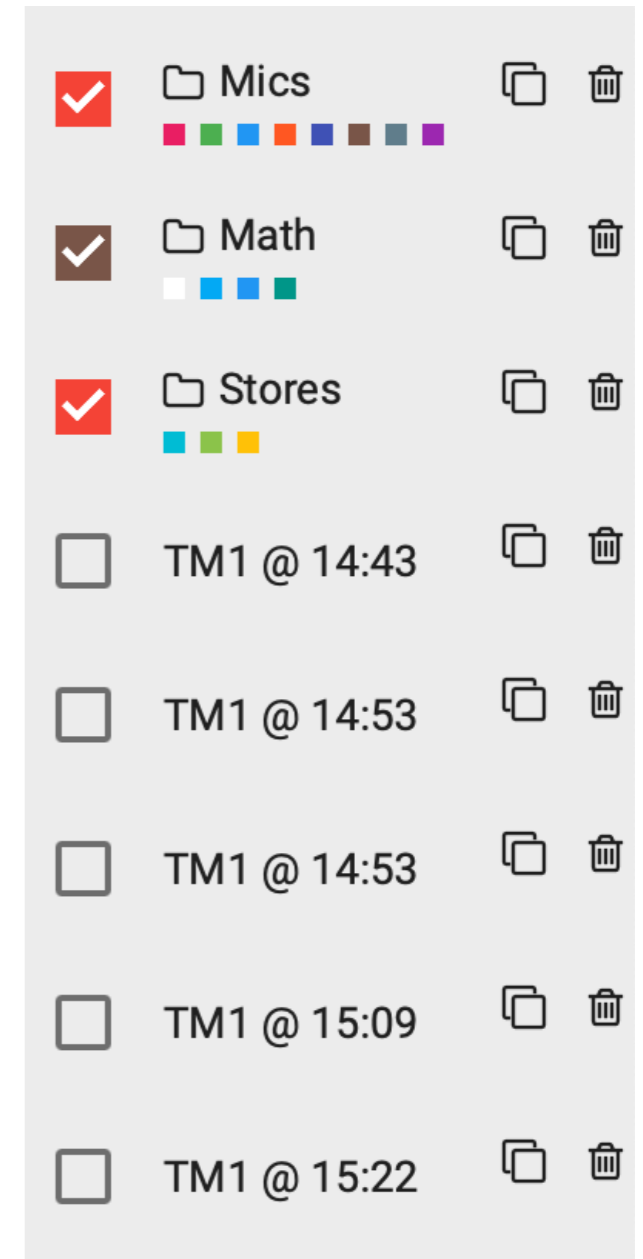
# Sources

All data sources are collected on the right

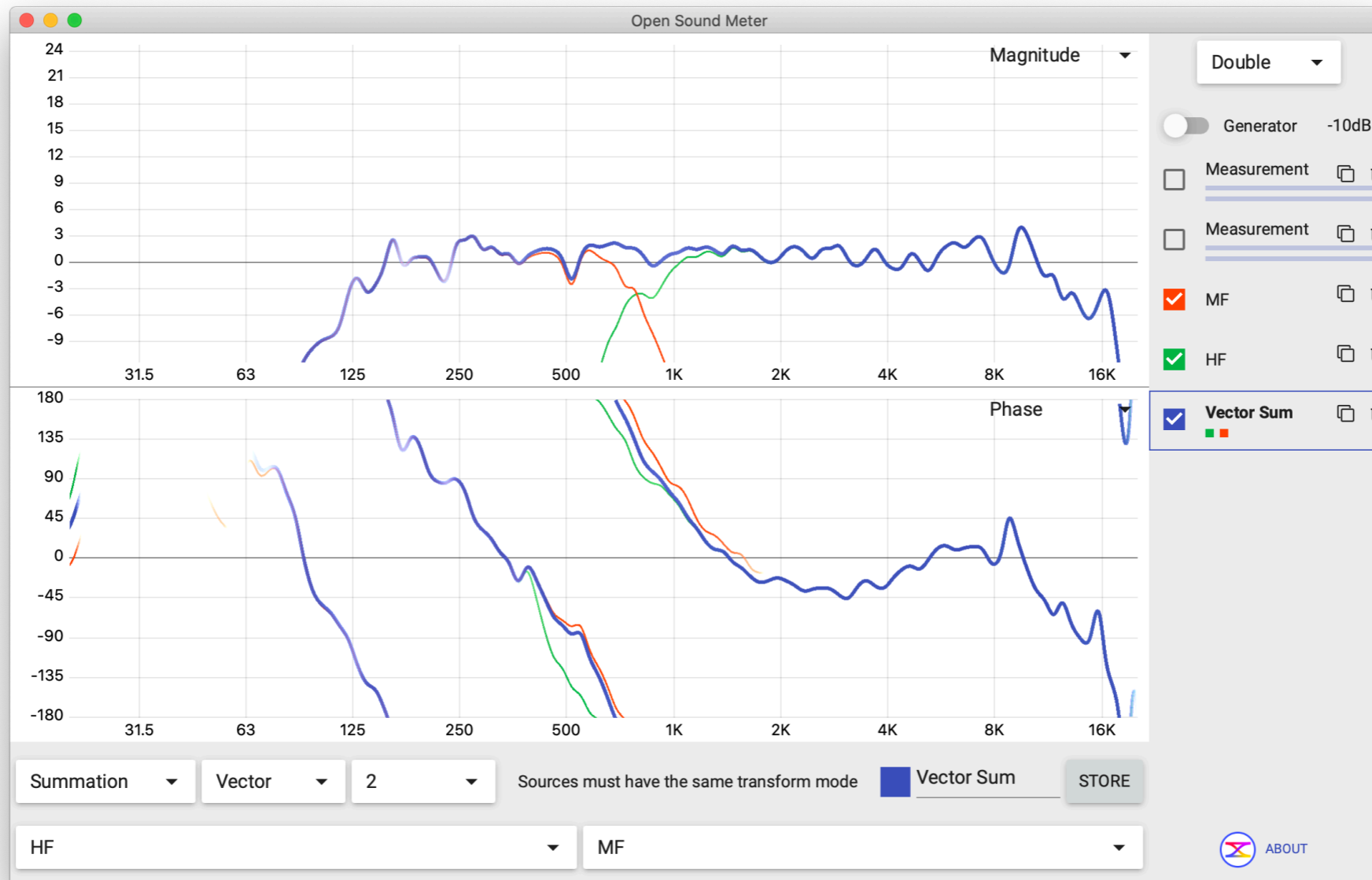
It's possible to combine sources in groups  
Use menu or a short-key to add new group

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

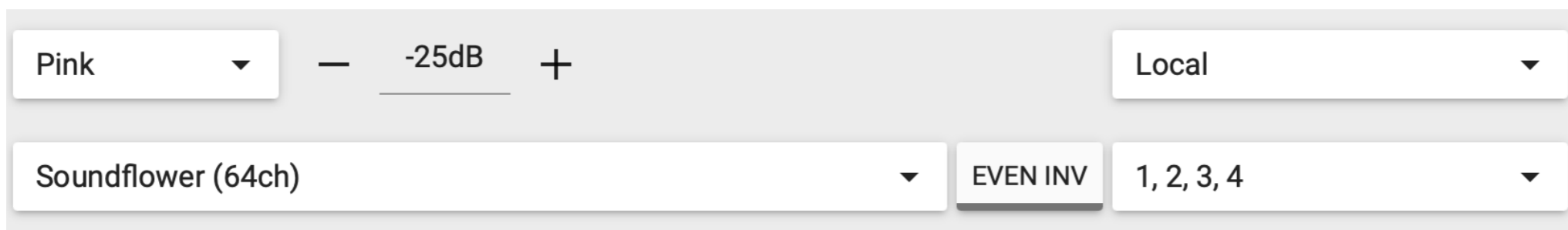
Click any object (chart, measurement, generator etc) to open properties in the bottom bar.



# Generator properties

signal's type

gain



The screenshot shows the generator properties interface with the following elements:

- Signal type dropdown: Pink
- Gain control: -25dB (with minus and plus buttons)
- Local dropdown: Local
- Audio device dropdown: Soundflower (64ch)
- Invert even channels checkbox: EVEN INV (checked)
- Outputs dropdown: 1, 2, 3, 4

audio device

invert  
even  
channels

outputs





# Generator properties

frequency for *sin* type

current    ÷2    x2

↓            ↓            ↓

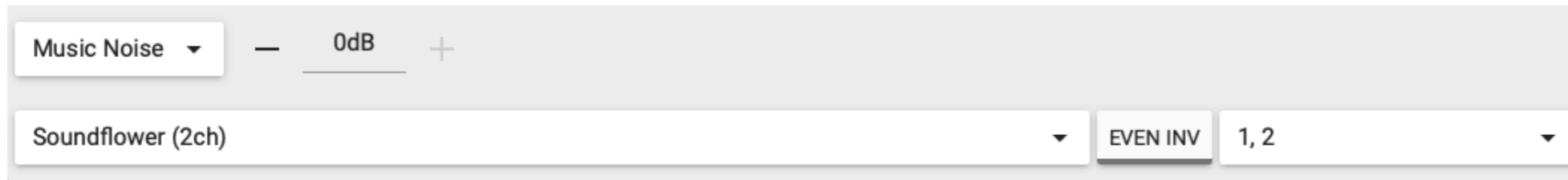
Sin    -    -25dB    +    -    1000Hz    +    OCTAVE DOWN    OCTAVE UP    Local

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



# Generator properties

## Music-Noise for AES75 2023



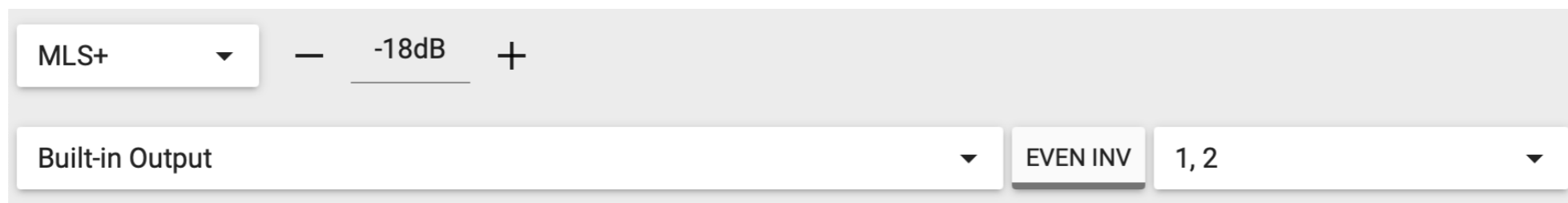
AES75 2023: AES standard for acoustics - Measuring loudspeaker maximum linear sound levels using noise, details a procedure for measuring maximum linear sound levels of a loudspeaker system or driver using a test signal called Music-Noise.

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



# Generator properties

## MLS+



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

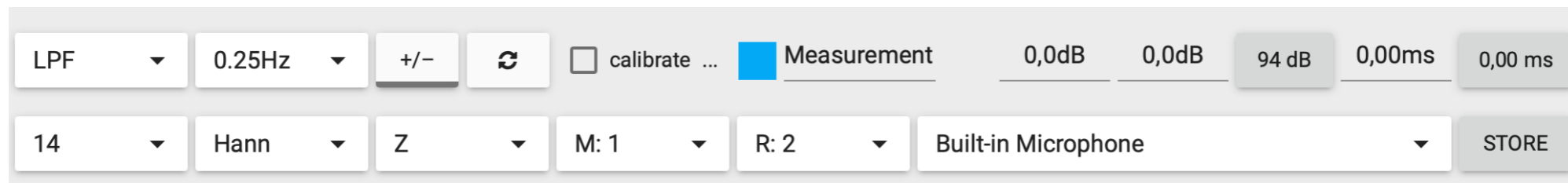
Original MLS noise creation procedure was modified to have period exactly 2 to the power of 16.

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



# Measurement properties

reverse polarity  
reset buffers  
color  
title



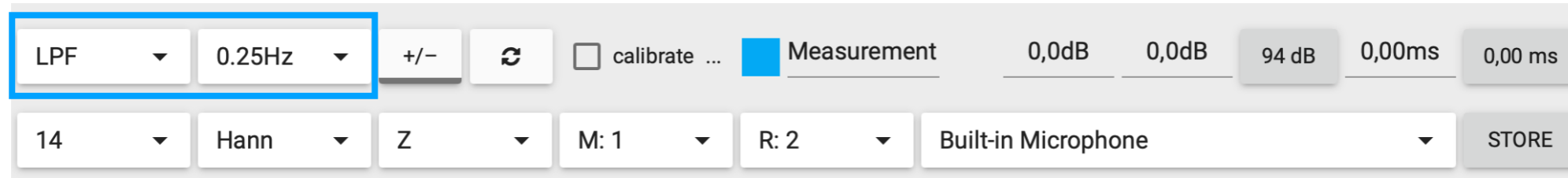
↑ window function  
↑ reference channel  
↑ audio device  
channel for measure

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

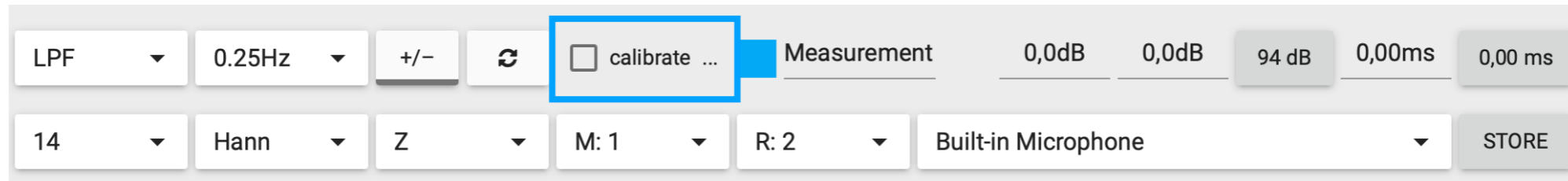
What is LPF and why use it:

[facebook.com/notes/pavel-smokotnin/averaging-of-the-measurements/1070092436507447/](https://facebook.com/notes/pavel-smokotnin/averaging-of-the-measurements/1070092436507447/)



# Measurement properties

## Applying a calibration file



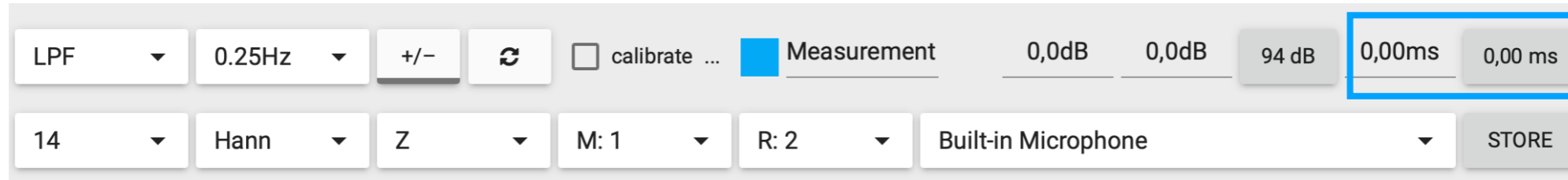
Click to enable or disable

File selection dialogue will appear on first click

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

# Measurement properties

## Delay



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

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

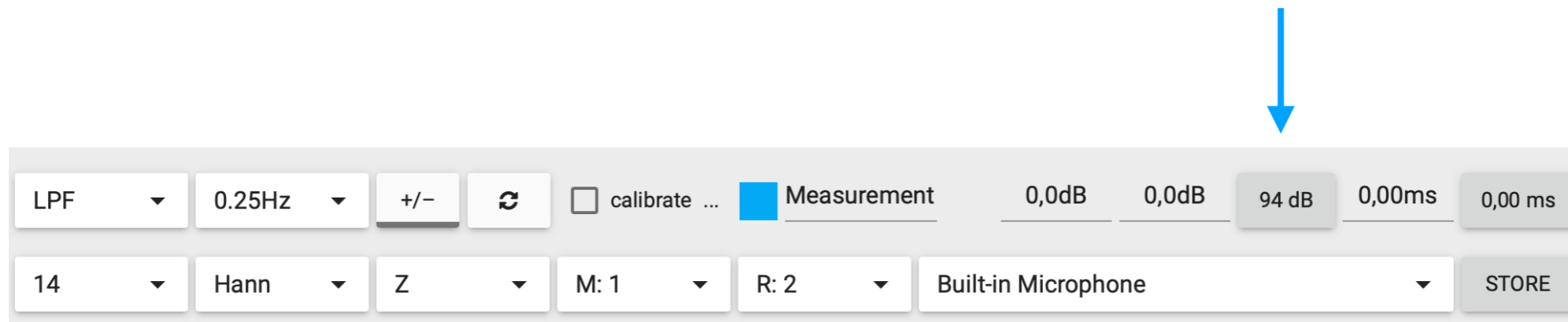




# Measurement properties

## Gain and delay

Apply auto gain for 94 dB SPL A slow



The screenshot shows the measurement properties interface of Open Sound Meter. A blue arrow points to the '94 dB' gain setting. The interface includes various controls for measurement parameters:

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<sup>power value</sup> samples

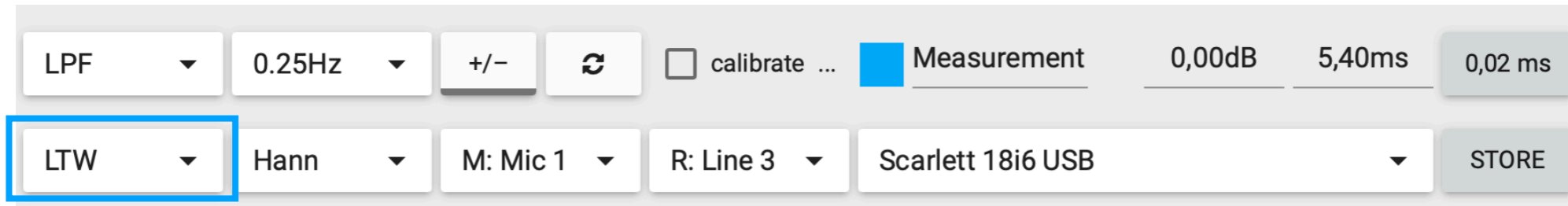
power	10	11	12	13	14	15	16
samples	1024	2048	4096	8192	16384	32768	65536
time window*, ms	21,3	42,6	85,3	170,5	341	682,6	1365,3
frequency step*, Hz	47	23,5	11,7	5,9	2,93	1,46	0,73

\* - for sample rate: 48 000Hz



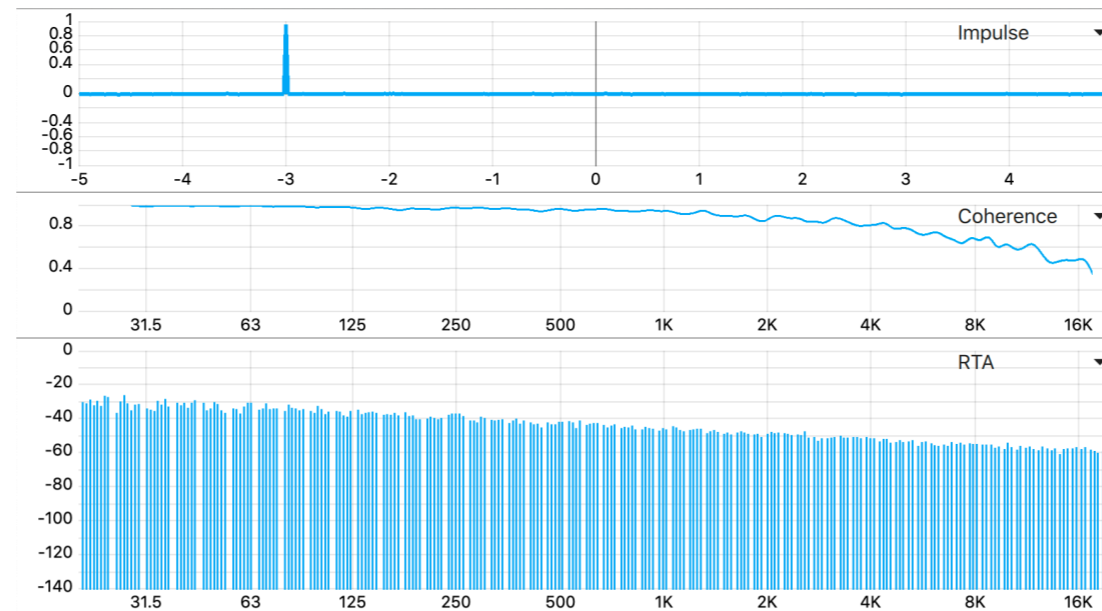
# Measurement properties

## Logarithm time window

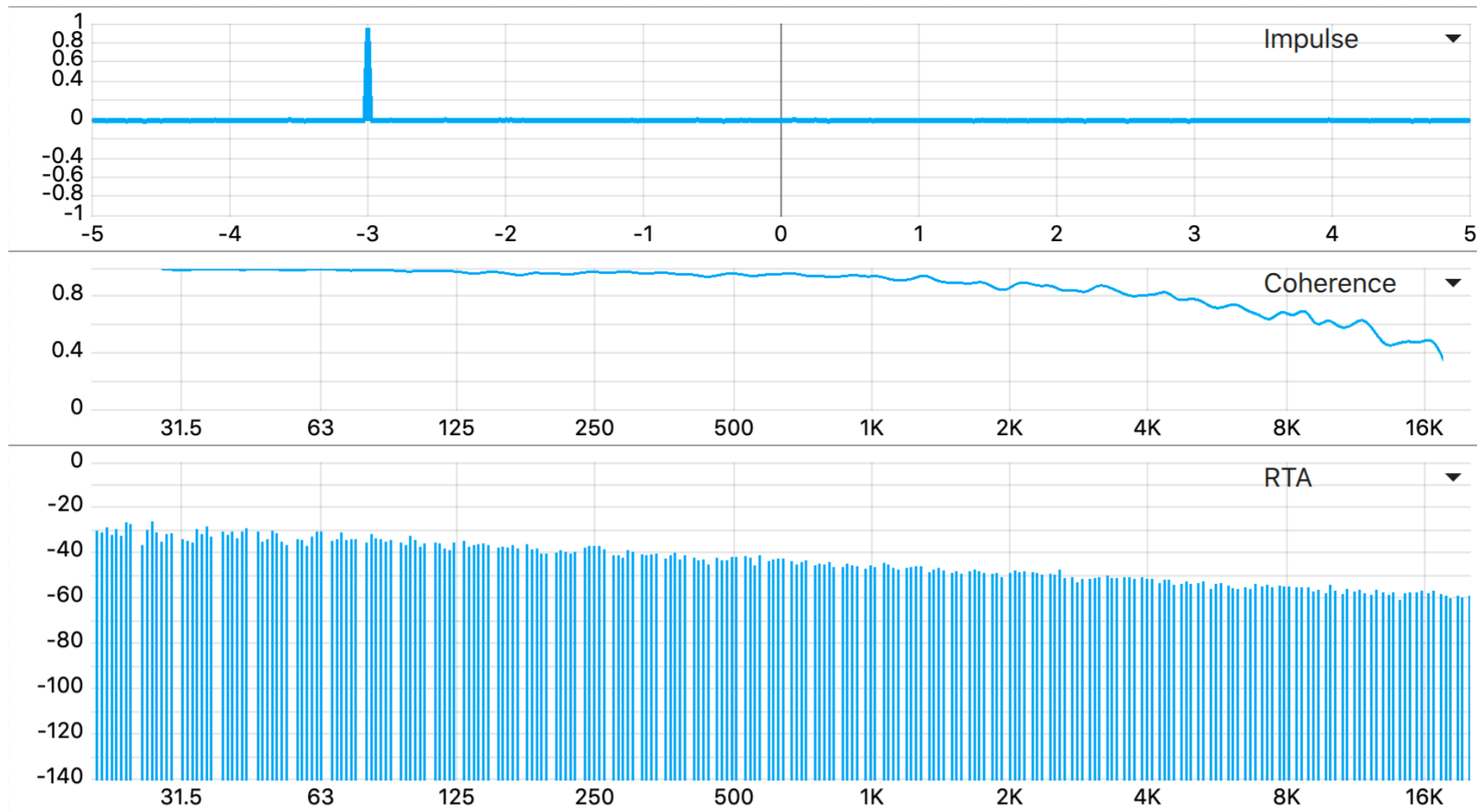


The screenshot shows the software's control panel. The 'LTW' (Logarithm Time Window) dropdown menu is highlighted with a blue border. Other settings include LPF (Low Pass Filter) set to 0.25Hz, a calibration checkbox, a 'Measurement' button, and various input/output options like 'M: Mic 1', 'R: Line 3', and 'Scarlett 18i6 USB'. A 'STORE' button is also visible.

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

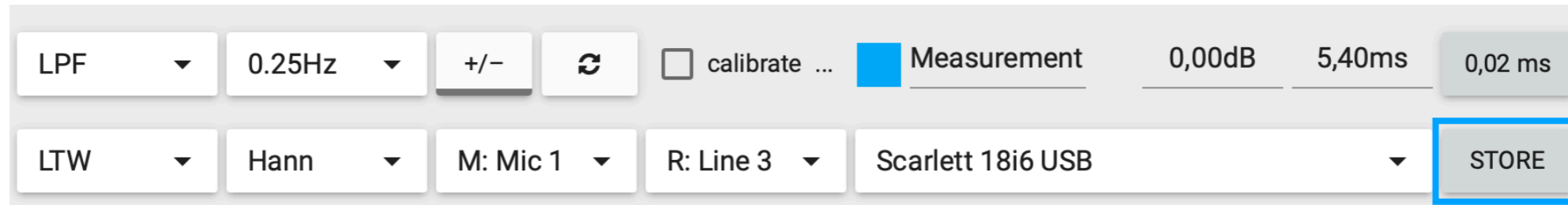


# Logarithm time window



# Measurement properties

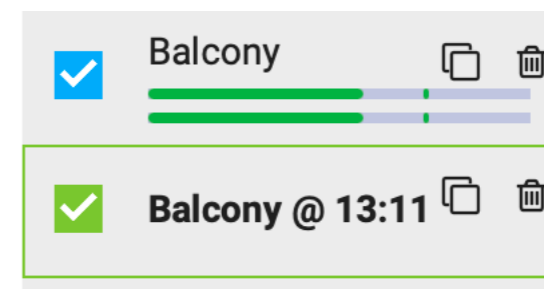
## Storing your measurements



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



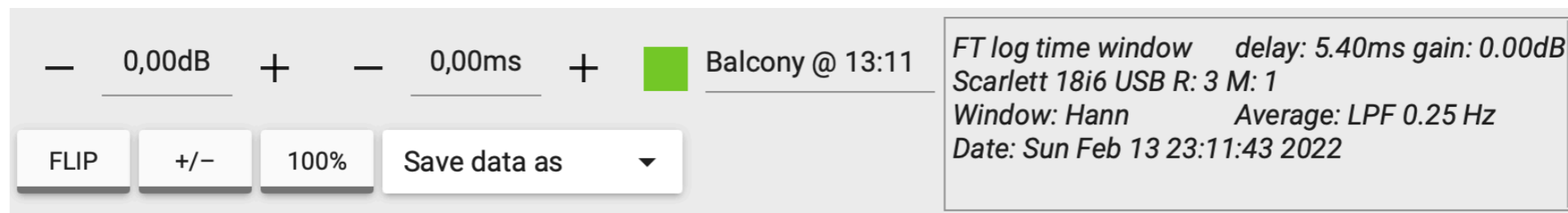
# Stored properties

editable automatically

color

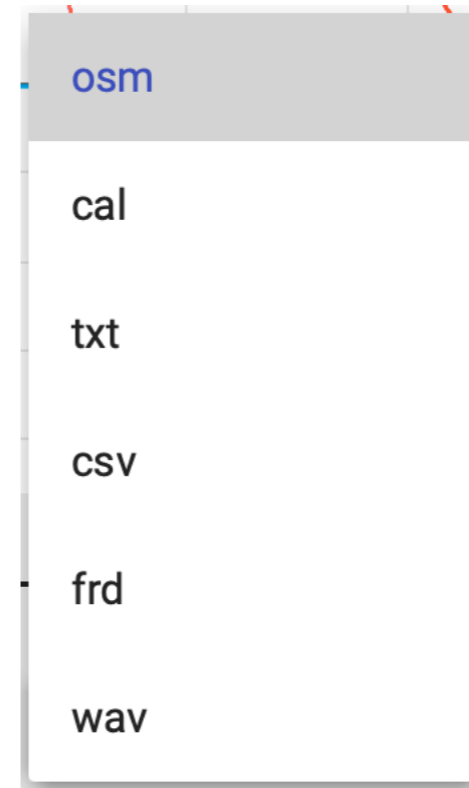
title

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' section of the Open Sound Meter software. It features two main control areas: gain and delay. The gain control is set to 0,00dB, and the delay control is set to 0,00ms. Below these controls are buttons for 'FLIP', '+/-', '100%', and 'Save data as'. To the right, a status 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'. A green square icon and the text 'Balcony @ 13:11' are also visible in the interface.

inverse magnitude



# Stored properties

## Offline adjustment

The screenshot shows the 'Stored properties' section of the Open Sound Meter software. It includes a control bar with the following elements from left to right: a minus sign, a text field containing '0,00dB', a plus sign, another minus sign, a text field containing '0,00ms', another plus sign, a green square icon, and the text 'Balcony @ 13:11'. Below this bar are four buttons: 'FLIP', '+/-', '100%', and 'Save data as' with a dropdown arrow. To the right of these buttons is a text box containing 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

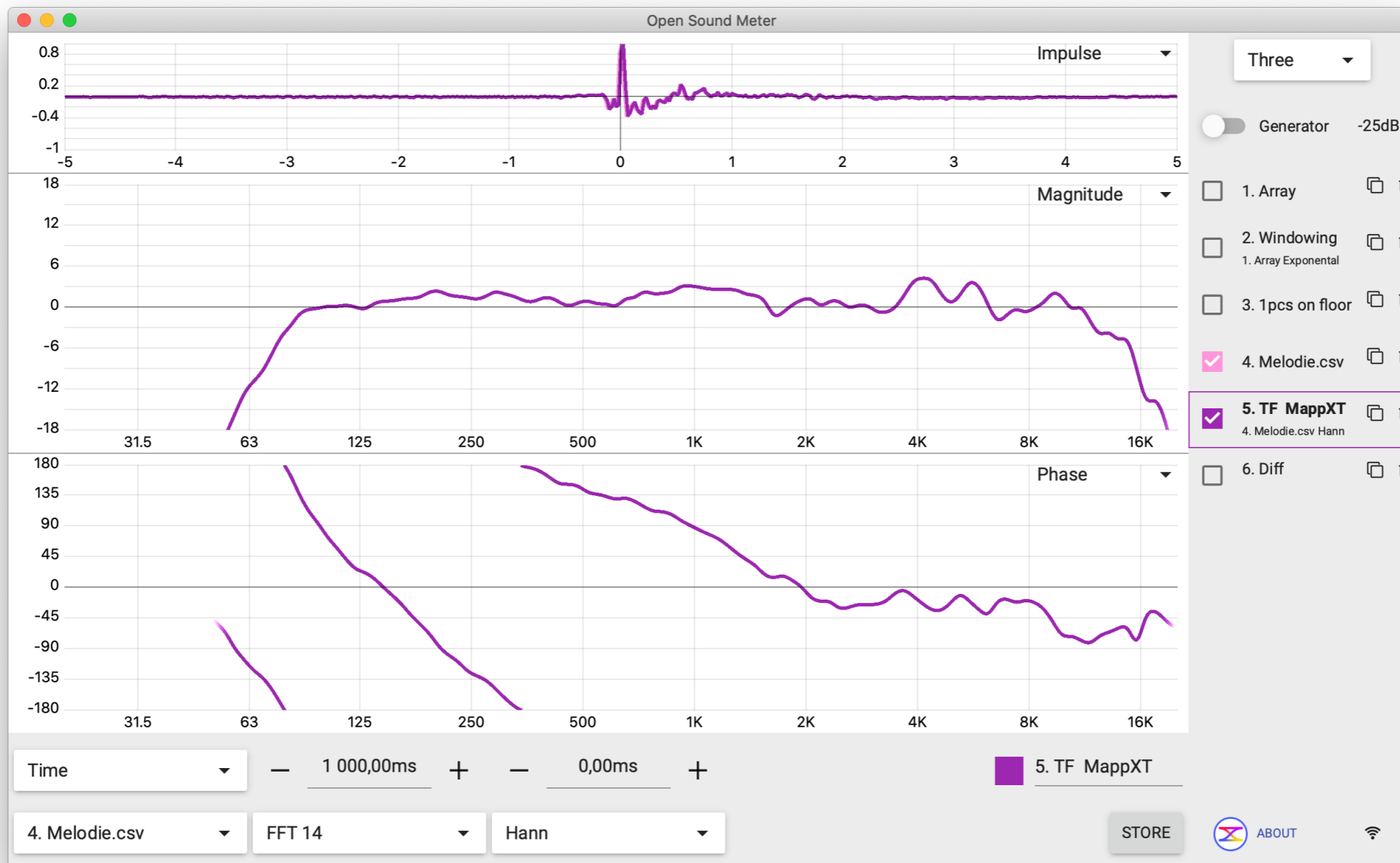
The screenshot shows a control panel for a filter source. It features two rows of settings. The top row includes a dropdown menu for 'Power' (set to 10), a dropdown for 'sample rate' (set to 48000), a color selection box (green), and a text field for 'title' (set to 'LR LPF 2'). The bottom row includes a dropdown for 'Filter type' (set to 'Linkwitz-Riley LPF'), a dropdown for 'order' (set to 2), a frequency slider (set to 1 000,0Hz), and a 'STORE' button. Blue arrows point from the labels above and below to their respective controls in the interface.

Power:10    48000    LR LPF 2

Linkwitz-Riley LPF    2    1 000,0Hz    STORE

Filter type    order    corner frequency

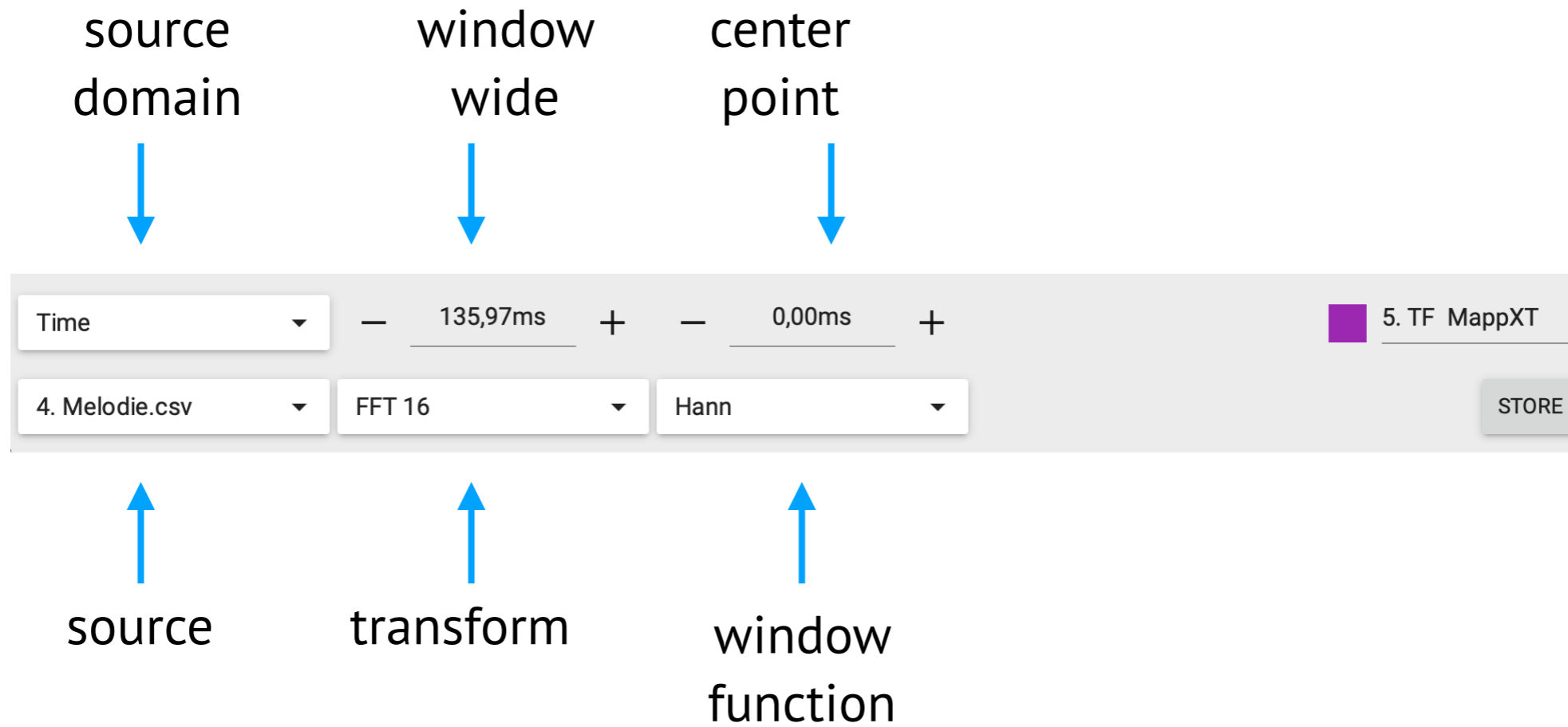
# Windowing source



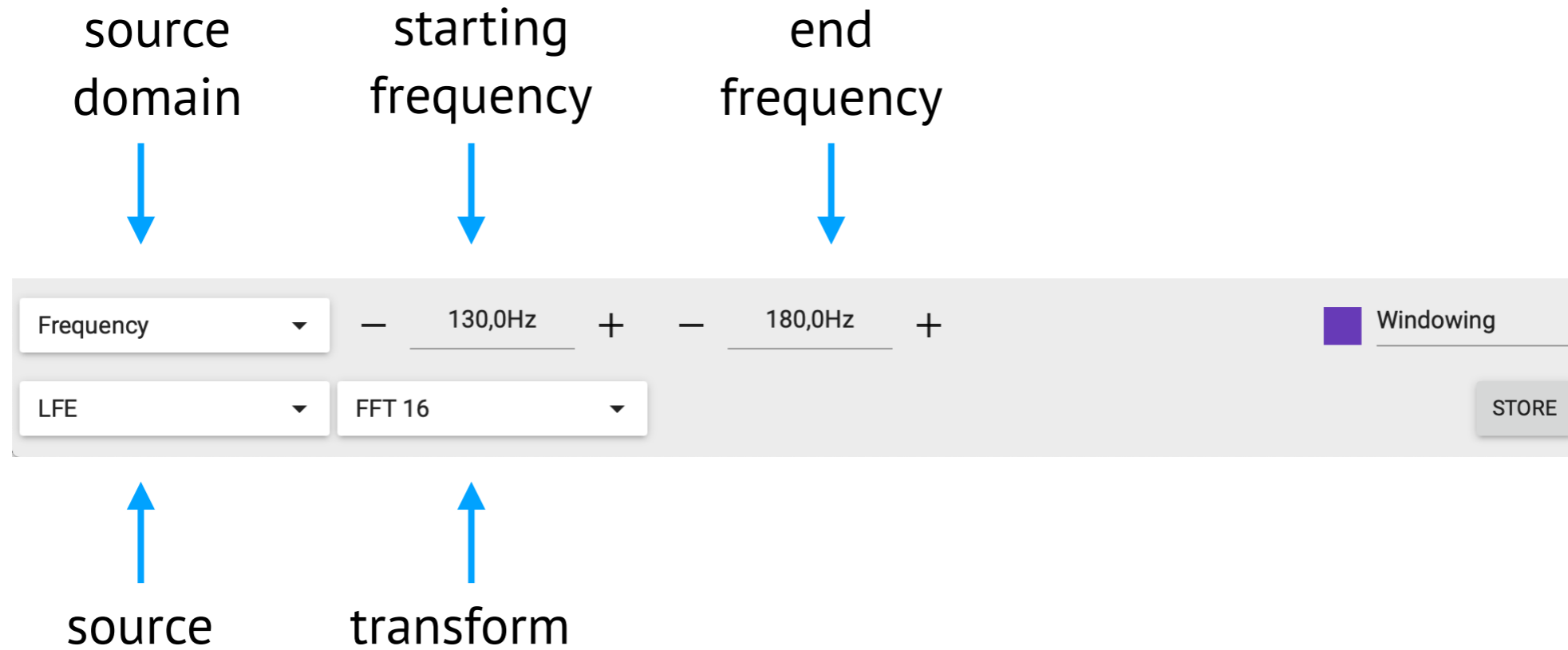
Conversion tool from one domain to another



# Windowing source



# Windowing source



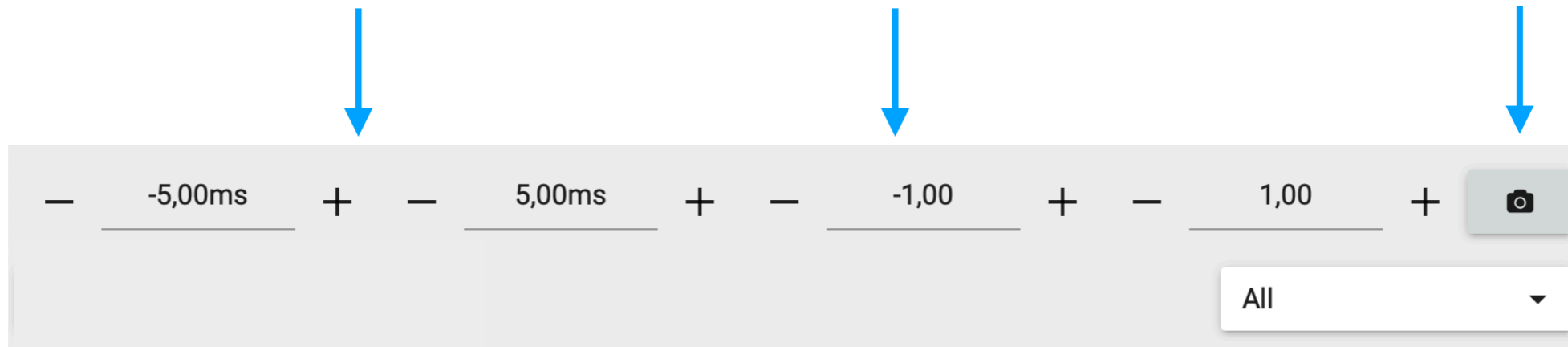
Frequencies outside the selection will be ignored

# Basic chart properties

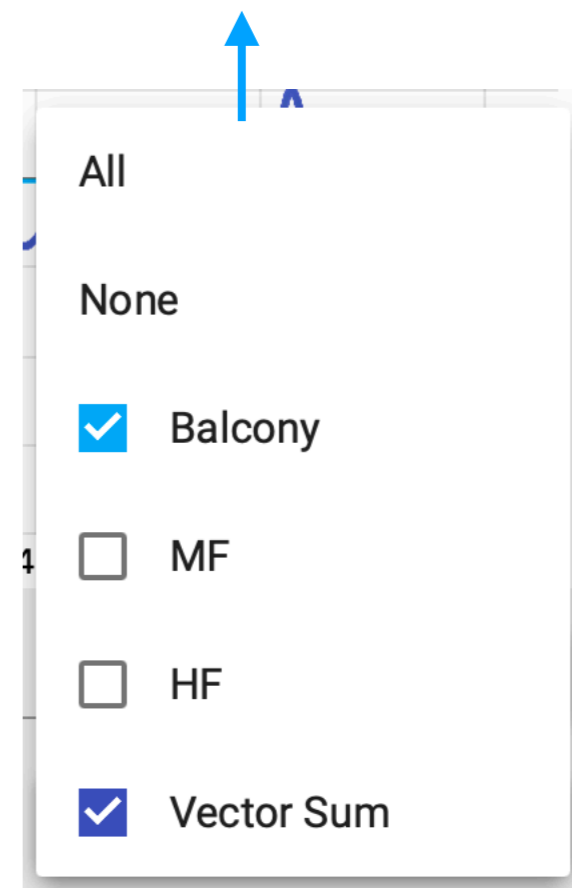
Horizontal axis range

Vertical axis range

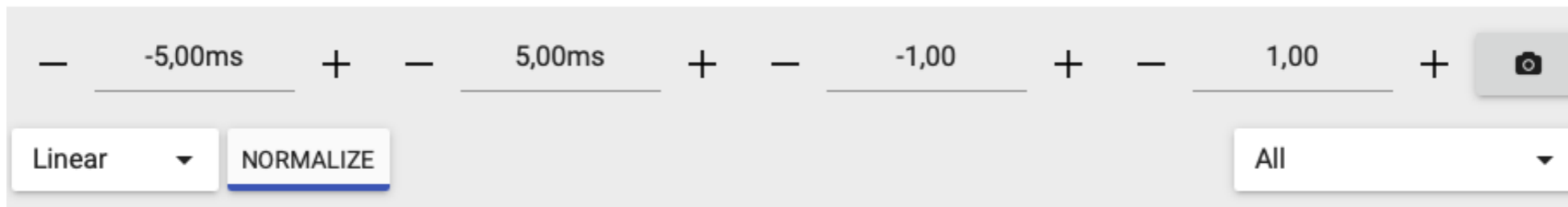
save chart as an image



If source is selected, just that will be shown.



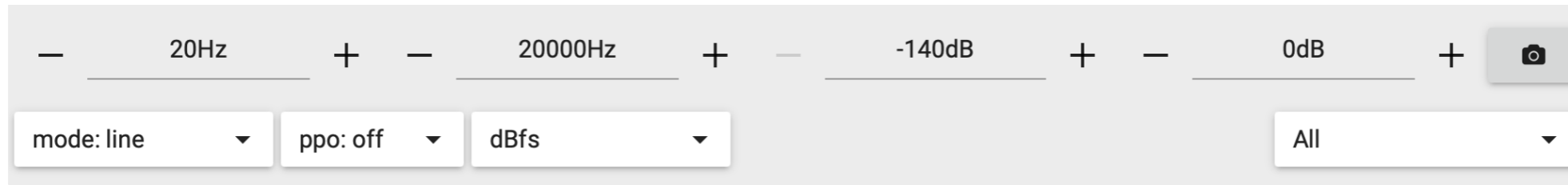
# Impulse chart properties



Normalize displayed data

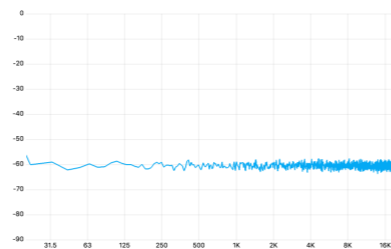
Select linear or log (dB) vertical scale

# Spectrum chart properties



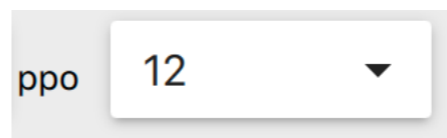
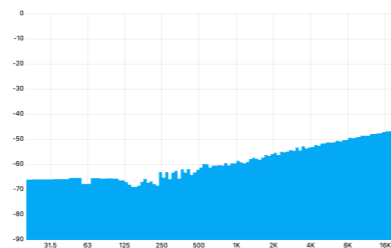
↑  
scale  
(dBfs, SPL, phons)

line



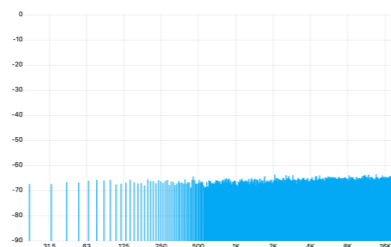
one continuous line  
points per octave define smooth

bars



points per octave define the bar width

lines

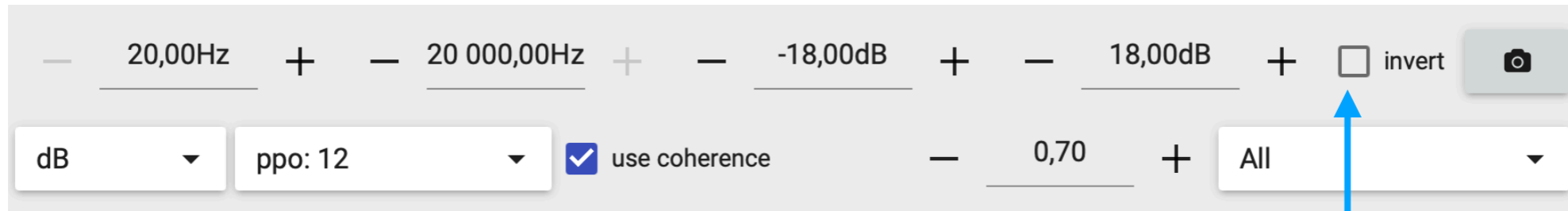


one line per frequency





# Magnitude chart properties



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

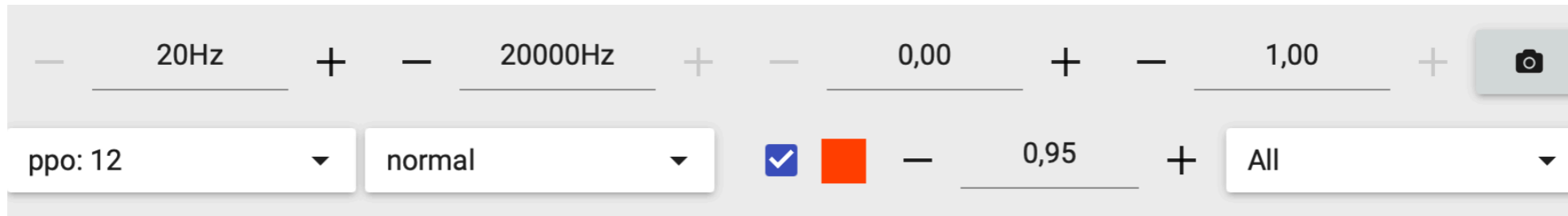
The screenshot shows the software's control panel for the phase chart. It features several adjustable parameters: a frequency range from 20Hz to 20000Hz, a center angle of 9°, and a phase range of 360°. Below these are a ppo value of 12, a phase range dropdown set to ±180°, a checked 'use coherence' box, a resolution of 0,70, and a dropdown menu set to 'All'. A camera icon is visible on the right side of the panel.

Show values:

- -180° to +180°
- 0° to 360°



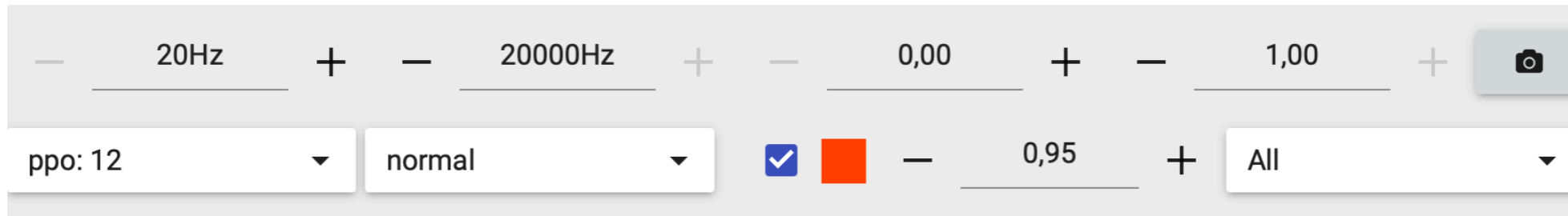
# Coherence chart properties



Show normal, squared or SNR value

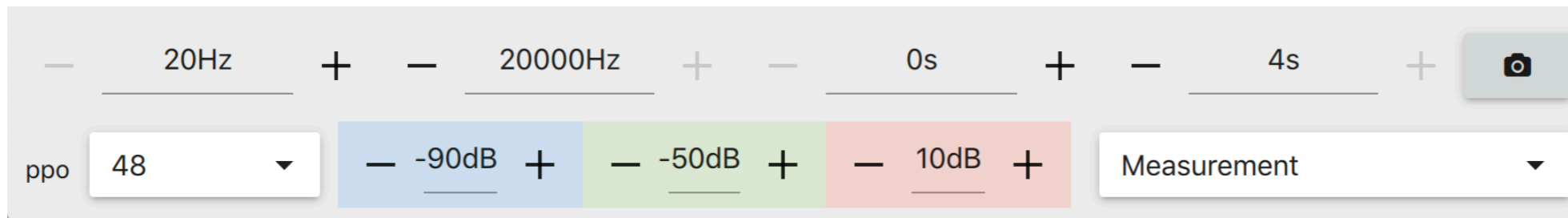
Points per octave

# Coherence chart properties



Show help line and its value

# Spectrogram chart properties



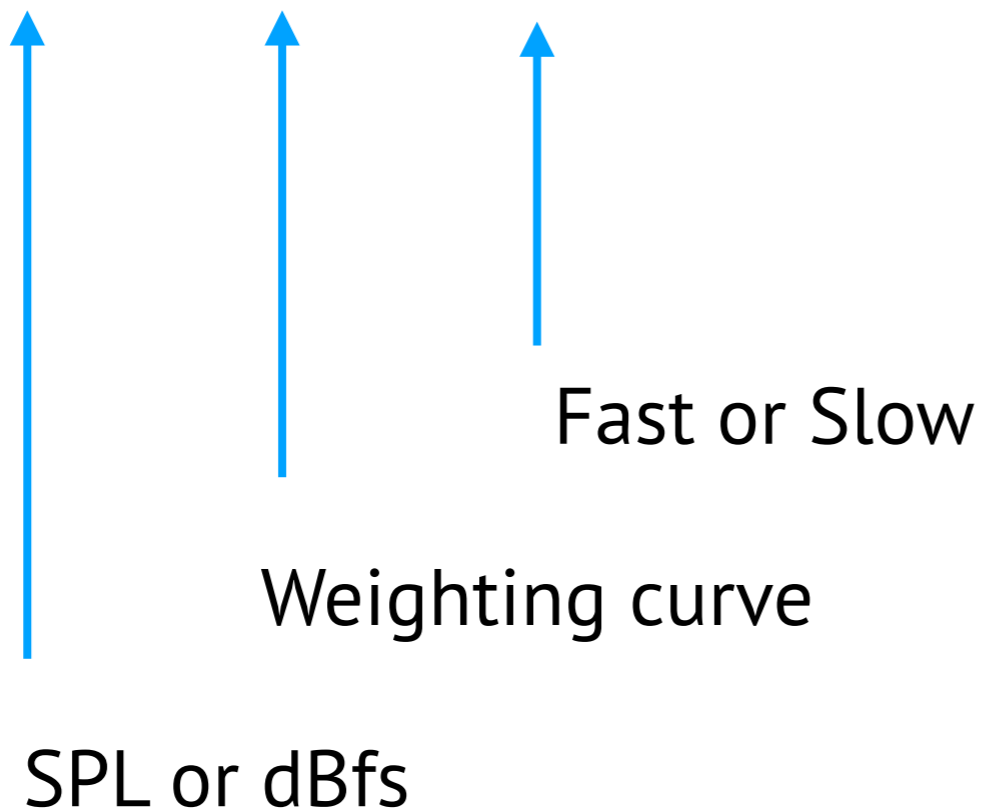
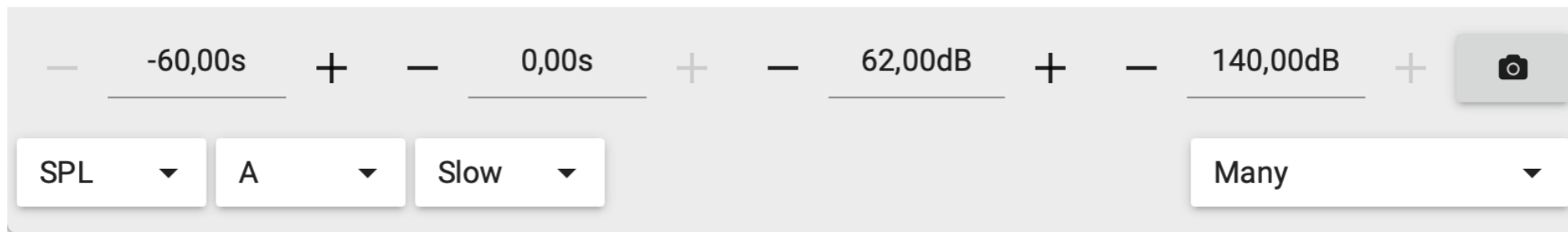
Points per octave

Set colours thresholds

Select a source



# Level chart properties



# Numeric

RMS SPL A Slow <b>103.9</b> green (2)	Peak dBfs A Slow <b>-17.1</b> green (2)	Crest Z Fast <b>21.4</b> green (2)	SPL Time <b>15:22</b> System		
Measurement	Leq	SPL	A	15 min	99,00dB
1	2	PEAK	RESET		

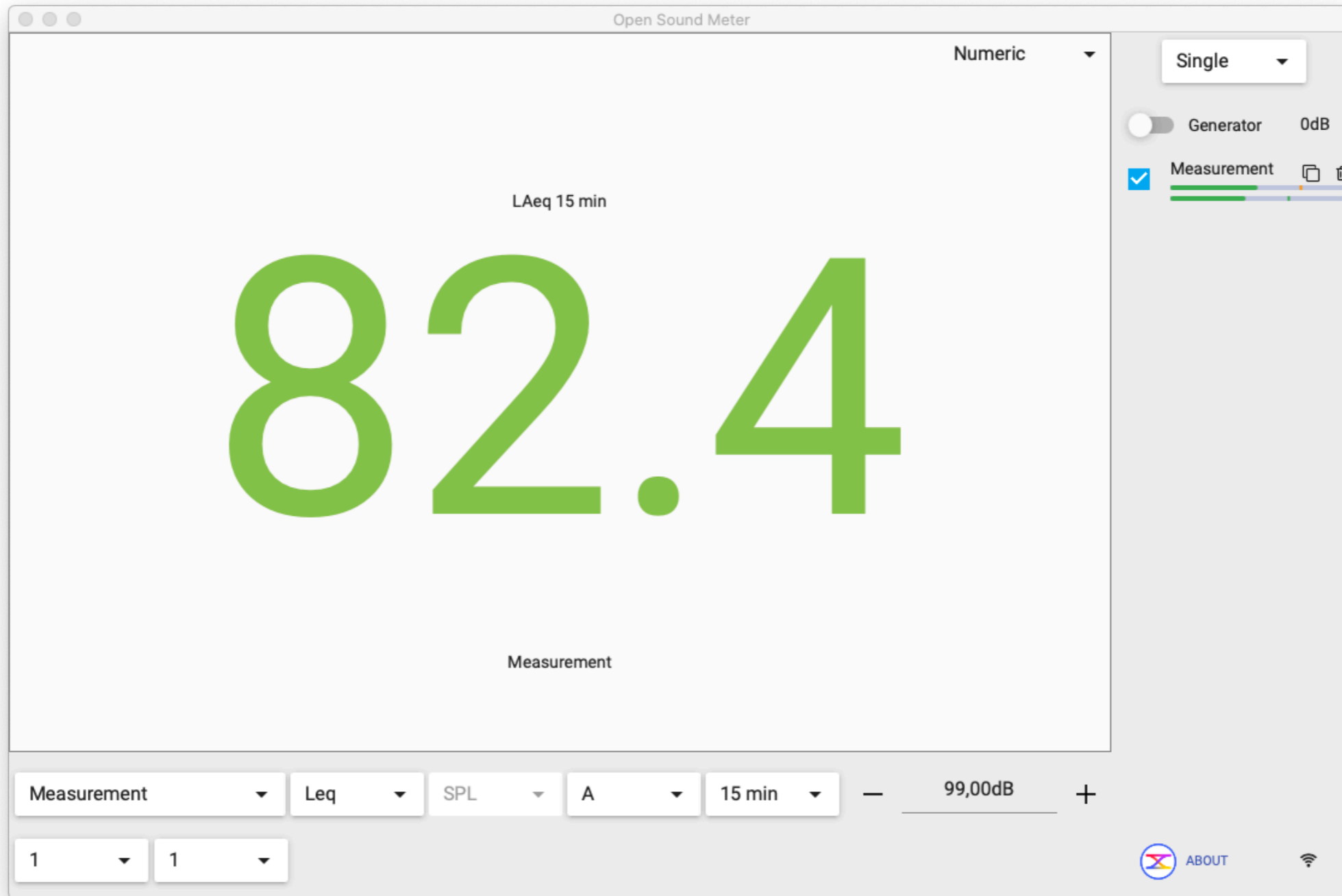
↑  
rows count

↑  
columns count





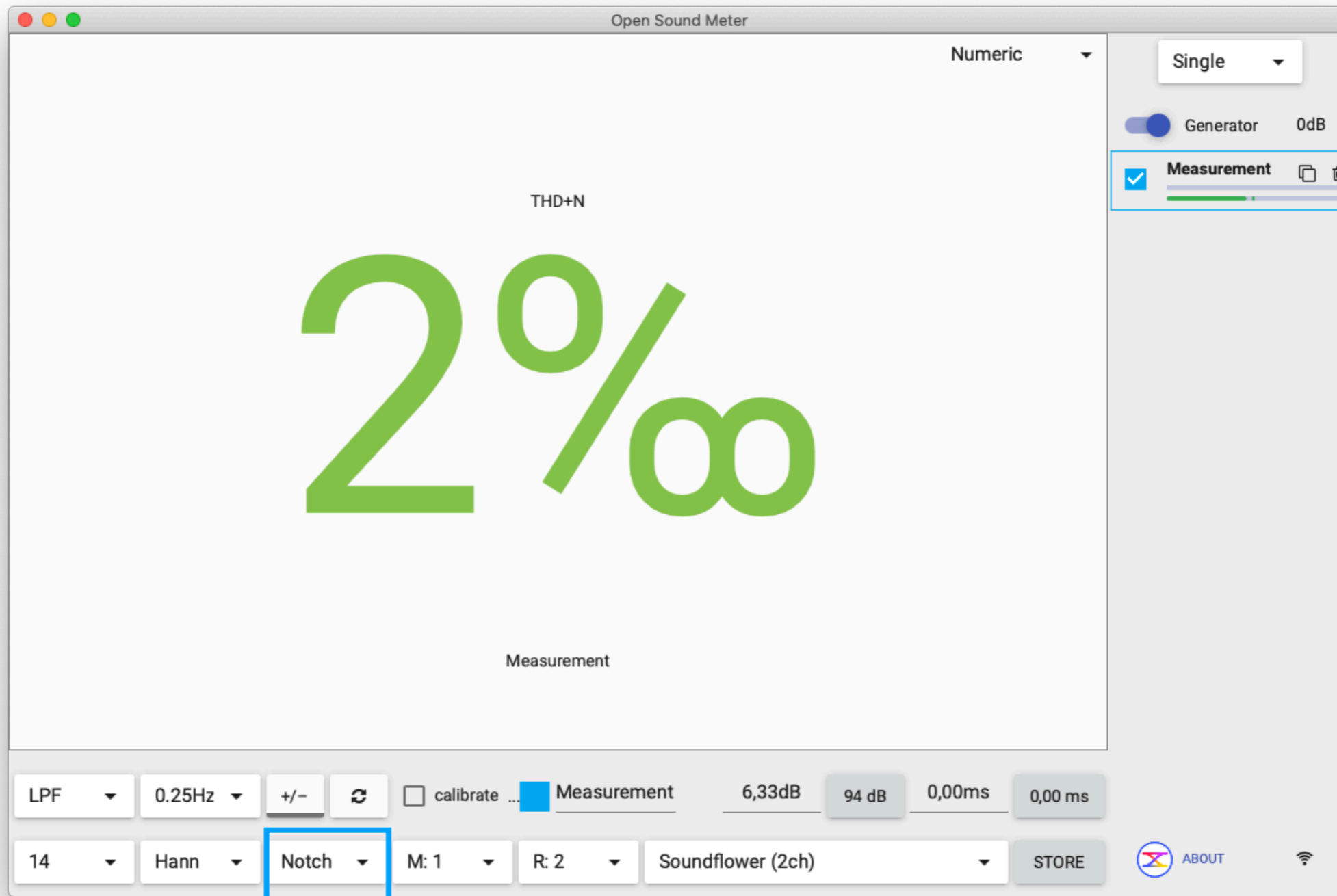
# Leq



rows count



# THD+N



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



# Numeric properties

Select source

The image shows a screenshot of the 'Numeric properties' interface in Open Sound Meter. The interface consists of two rows of controls. The top row contains five dropdown menus: 'Measurement' (set to 'Leq'), 'Value' (set to 'SPL'), 'Scale' (set to 'A'), 'Weighting curve' (set to '15 min'), and 'Integration time' (set to '99,00dB'). The bottom row contains two dropdown menus (set to '1' and '2'), a 'PEAK' button, and a 'RESET' button. A numerical display shows '99,00dB' with minus and plus signs on either side. Blue arrows point from text labels to these elements: 'Select source' to the first dropdown, 'Value' to the second, 'Scale' to the third, 'Weighting curve' to the fourth, 'Integration time' to the fifth, 'peak hold' to the 'PEAK' button, and 'Warning threshold' to the numerical display.

Value

Scale

Weighting curve

Integration time

Measurement ▾ Leq ▾ SPL ▾ A ▾ 15 min ▾ — 99,00dB +

1 ▾ 2 ▾ PEAK RESET

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>	+				meter ▼

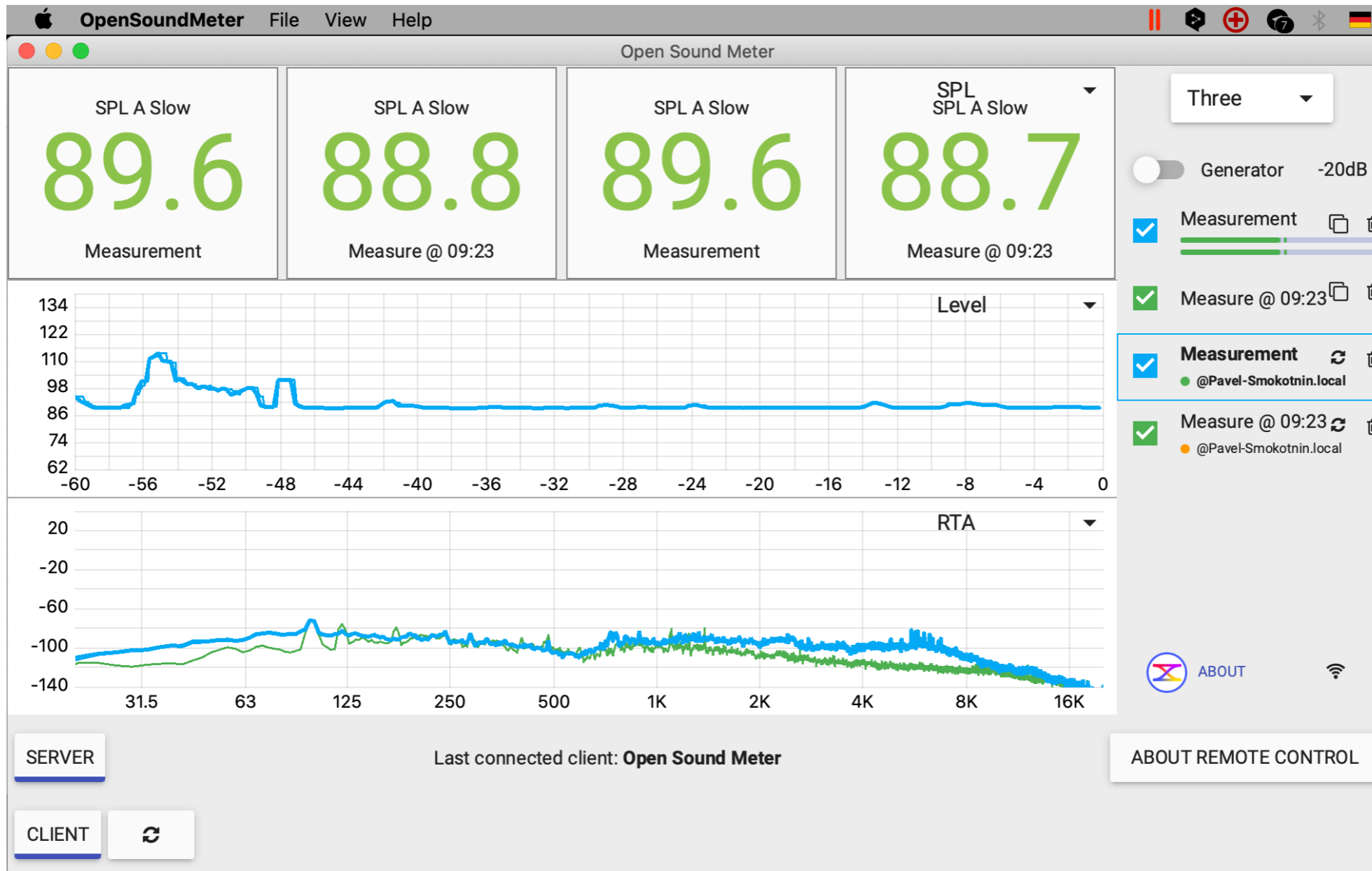
Allows you calculate between frequency, period and wavelength.  
You can change any value and get others.  
Use Shift key to fine adjust value

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

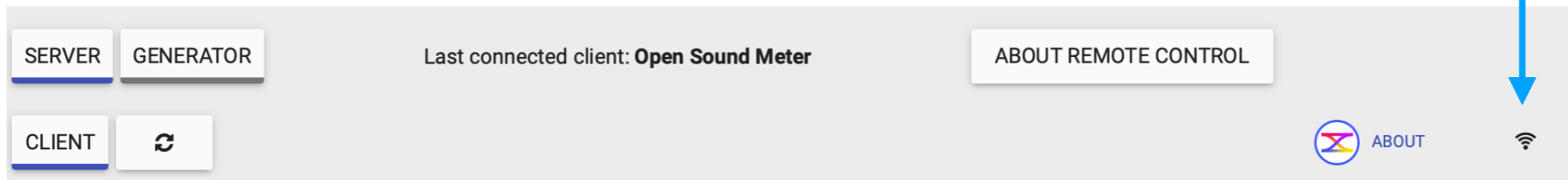


# Remote API

Activate API Server

Open remote settings

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

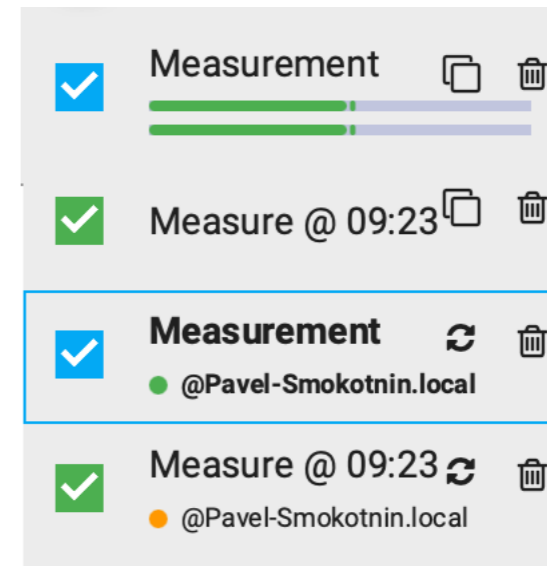


# Remote API

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 image shows a control panel for the Remote API. It consists of two rows of controls. The top row includes: a dropdown menu for 'LPF', a dropdown menu for '0.25H', a '+/-' button, a refresh button, a checkbox for 'calibrate', a blue 'Measurement' button, a '0,00dB' display, a '94 dB' button, a '0,02ms' display, and a '0,00 ms' button. The bottom row includes: a dropdown menu for '14', a dropdown menu for 'Hann', a dropdown menu for 'M:', a dropdown menu for '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.



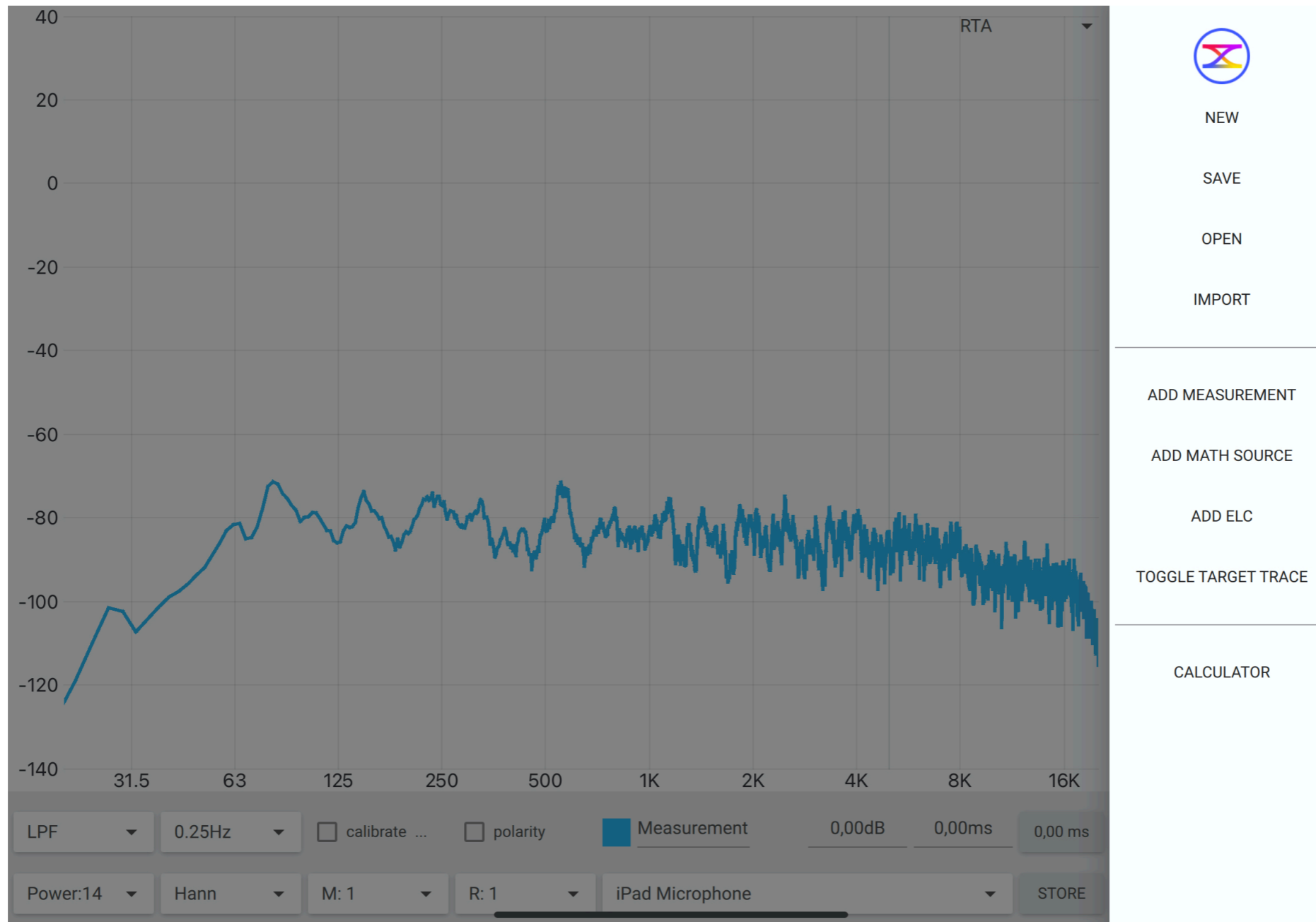
# Remote API



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

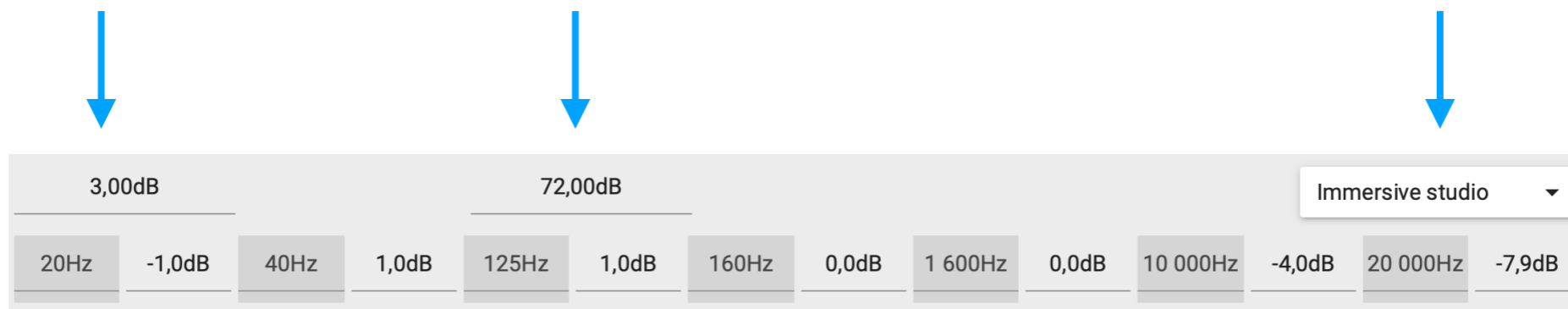


# Target trace

width

SPL target

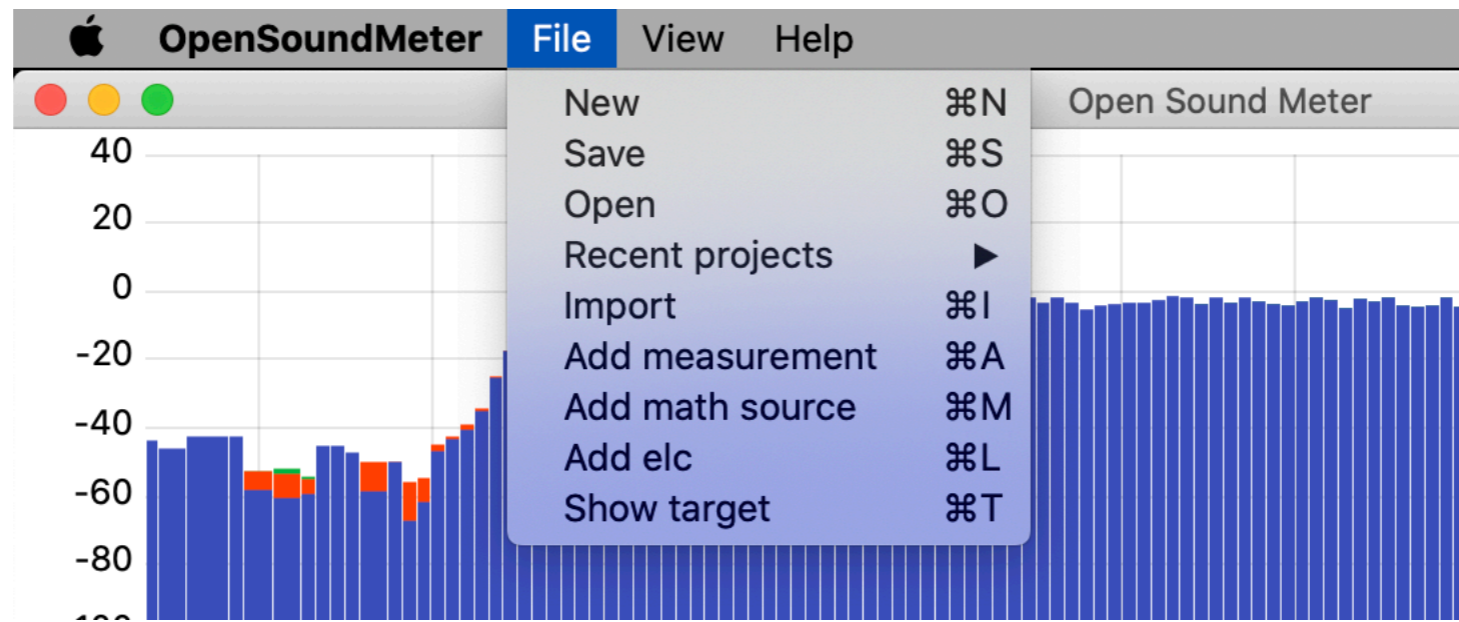
presets



7 frequency-gain points



# Application menu



**New** – create empty measuring project

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

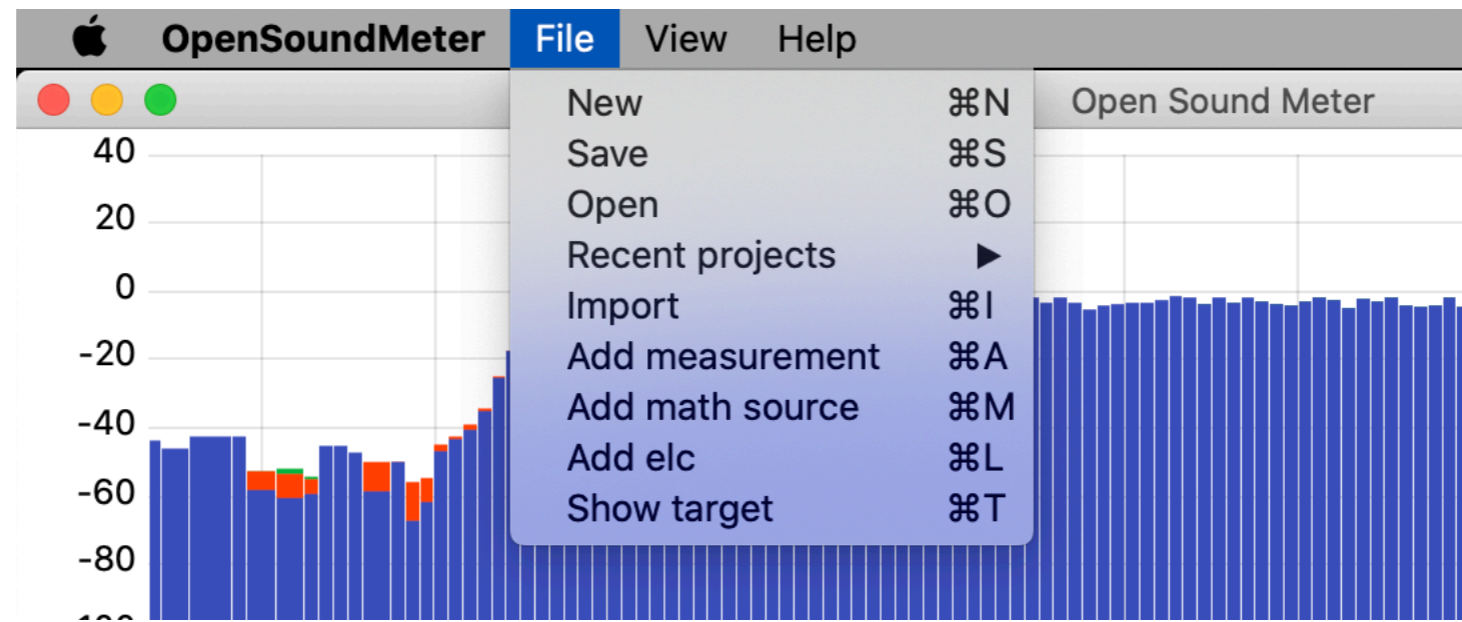
**Open** – load project file or single stored data

**Recent projects** – list of the last opened files

**Import** – 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

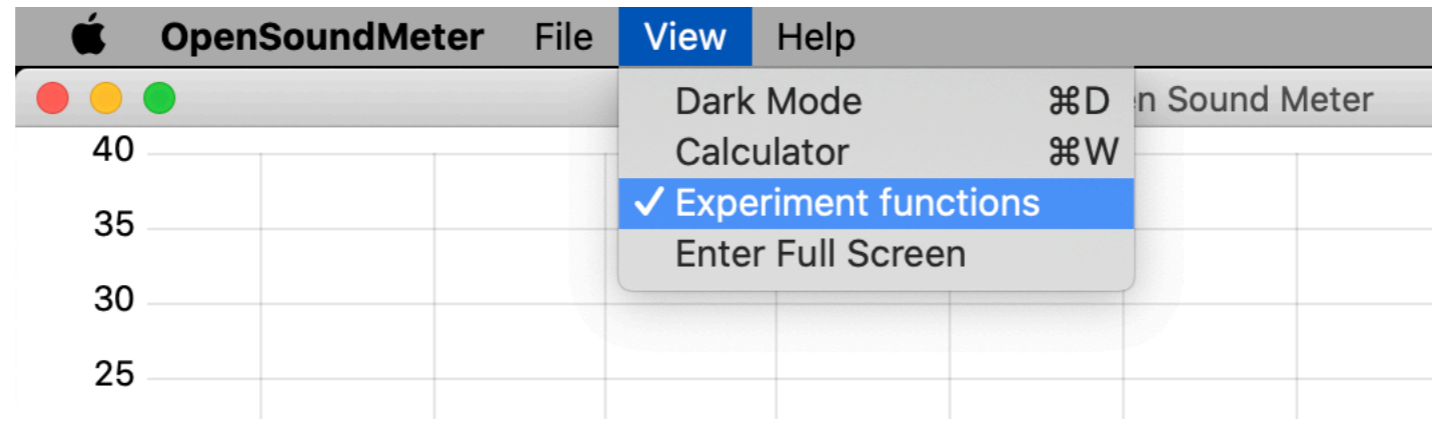
**Add elc** – add equal loudness contour

**Add group** – add sources group

**Show target** – toggle target trace



# Experimental functions



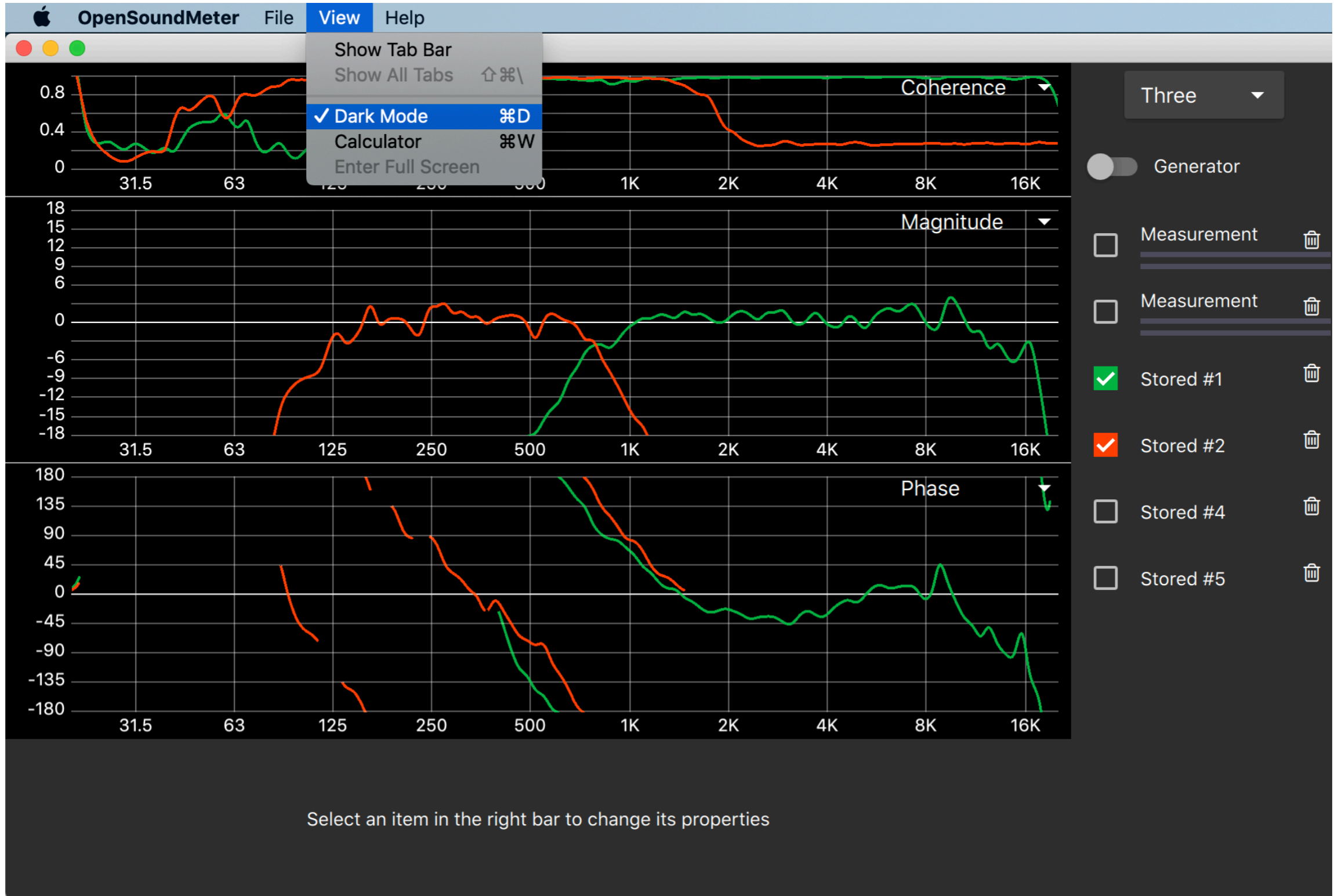
Adds three more available charts:

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





# Dark mode



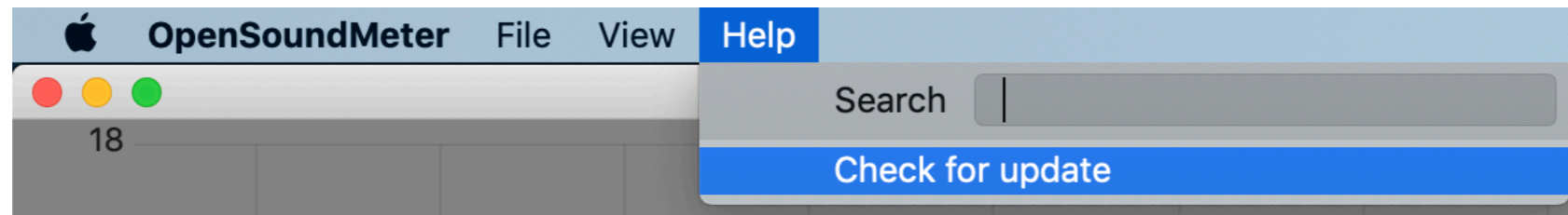
Thanks to Josh Barker for contribution



# 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 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	⌘+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](https://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

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