

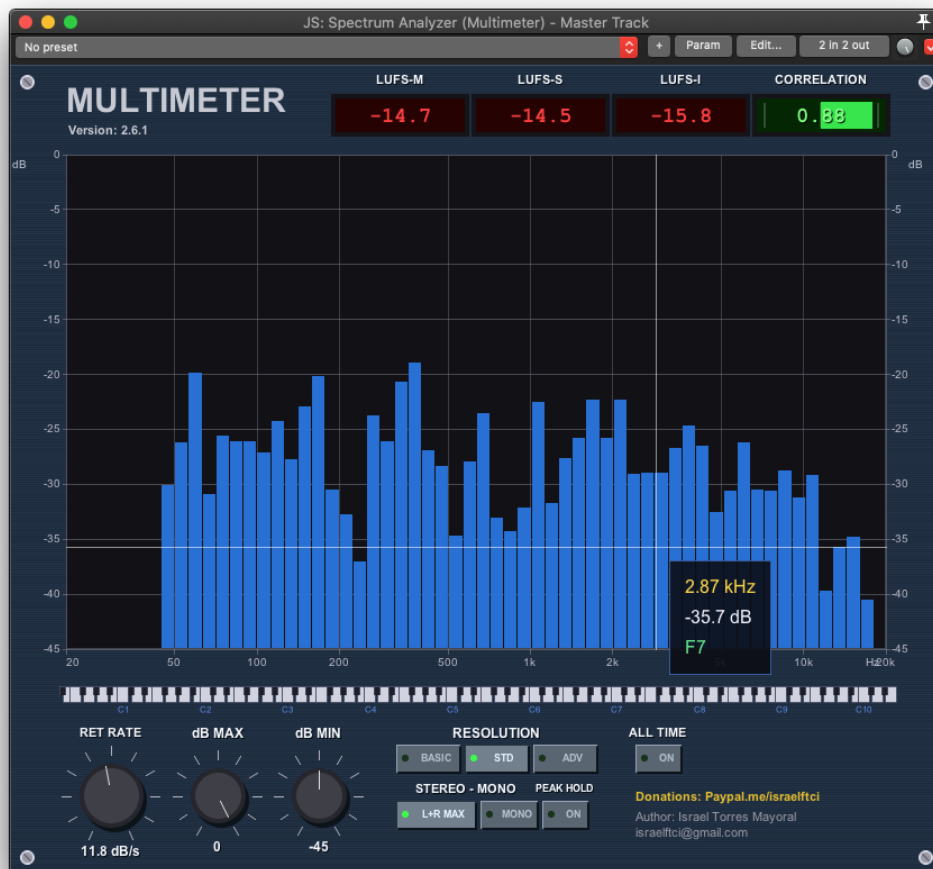
User Manual

Spectrum Analyzer (Multimeter)

v2.6.1

Introduction

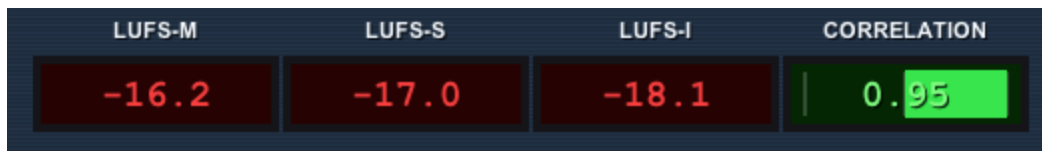
Multimeter is an advanced spectrum analyzer and signal meter (LUFS/Correlation), designed specifically as a JSFX plugin for REAPER. It is built with a focus on visual precision, extreme CPU optimization, and readability, allowing producers and mix engineers to make fast, informed decisions.



1. Top Panel: Loudness and Phase Meters

At the top of the main interface, you will find four critical digital meters for mastering and mixing:

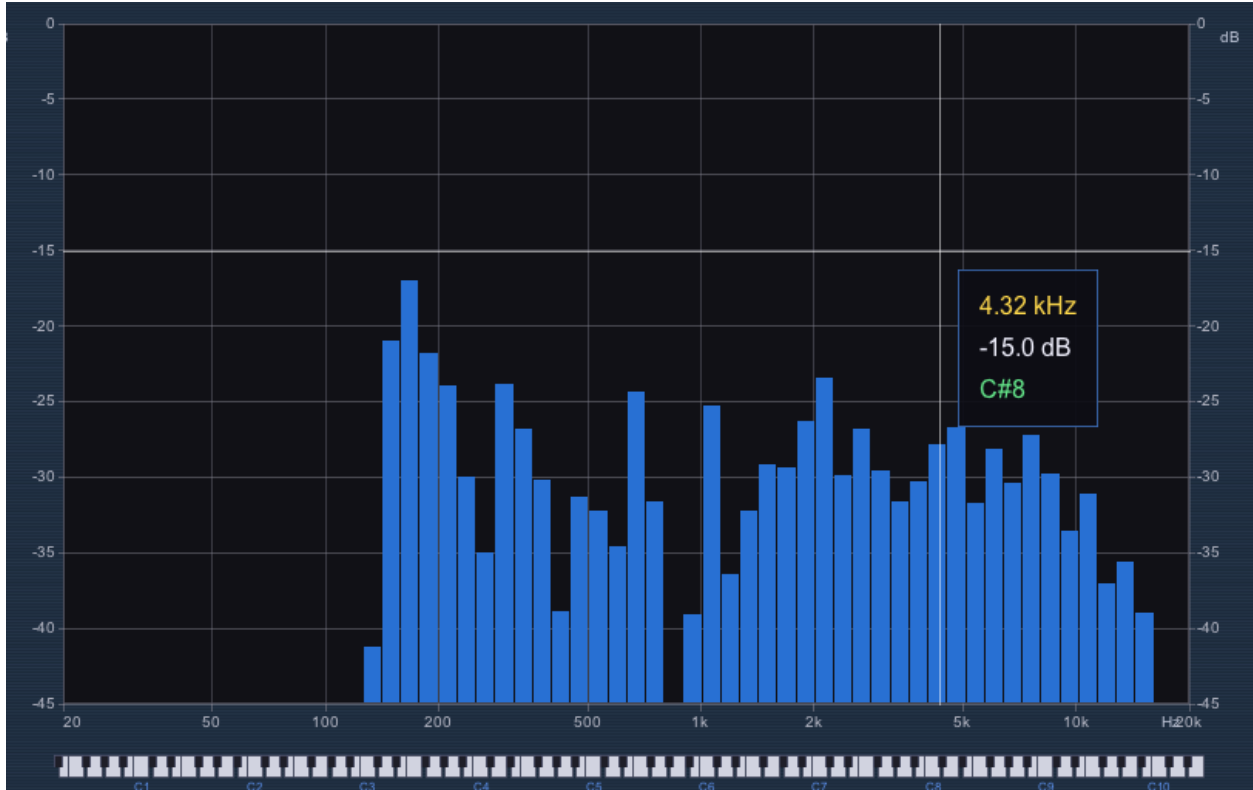
- **LUFs-M (Momentary):** Measures perceived loudness over a very short time span (400 ms). Ideal for viewing immediate energy peaks.
- **LUFs-S (Short-term):** Measures average loudness over a 3-second span. Excellent for measuring the overall intensity of a song section (e.g., the chorus).
- **LUFs-I (Integrated):** The average loudness from the moment "Play" was pressed. This is the standard measurement requested by platforms like Spotify or Apple Music (usually aiming for around -14 LUFs).
- **CORRELATION (Phase Correlation):** A visual meter (VU) ranging from -1.0 to +1.0.
 - **Green (+1.0 to 0.0):** The audio is in phase and mono-compatible.
 - **Red (0.0 to -1.0):** Phase issues exist (cancellation). If played on a mono speaker (like a smartphone), parts of your audio will disappear.



2. Central Screen: Spectrum Analyzer

The main graphical window displays your audio's real-time frequency response, spanning from 20 Hz to 20,000 Hz (20 kHz).

- **Guides and Scales:** Features faint horizontal (dB) and vertical (Hz) lines to easily locate where volume peaks occur.
- **Bottom Piano Roll:** Just below the graph, there is an integrated piano keyboard (with octave labels like C0, C1, C2...) that helps you relate visual frequencies directly to musical notes.
- **Interactive HUD (Cursor):** Hovering the mouse over the graph brings up a floating panel showing the exact information at your cursor's position:
 - Exact frequency (Hz or kHz).
 - Volume at that point (dB).
 - The **Musical Note** corresponding to the indicated frequency (e.g., C#4, G2).



3. Bottom Panel: Controls and Settings

Here you can customize the analyzer's real-time behavior. To adjust the circular knobs, **click and drag up or down**. (Double-click a knob to reset it to its default value).

- **RET RATE (Return Rate - dB/s):** Controls how fast the blue analyzer bars "fall" after a peak. A low value (e.g., 1 dB/s) makes the bars drop very slowly, while a high value (e.g., 24 dB/s) makes them react quickly to transients.
- **dB MAX:** Defines the upper limit (the ceiling) of the graph in decibels.
- **dB MIN:** Defines the lower limit (the floor) of the graph. Bringing MAX and MIN closer together visually "zooms in" on a specific dynamic range.
- **RESOLUTION:** Changes the number of bands calculated in the spectrum (requires more or less CPU).
 - **BASIC:** 1/3 octave resolution (Ideal for saving resources or very broad views).
 - **STD (Standard):** 1/6 octave resolution (Mixing or Mastering).
 - **ADV (Advanced):** 1/12 octave resolution (Maximum precision for extremely detailed mastering, FILM, or SURROUND).
- **STEREO - MONO: * L+R MAX:** Analyzes both channels (Left and Right) and draws the bar based on whichever has the highest volume at that frequency.
 - **MONO:** Mathematically sums the Left and Right channels and analyzes the result.
- **PEAK HOLD:** When activated (**ON**), the analyzer draws a thin white line at the top of the

bars, indicating the historical maximum volume reached by each frequency.

- **ALL TIME:** Controls the DSP processing behavior based on the DAW's playback state.
 - **OFF (Default):** The plugin enters a *Total Bypass* when the DAW stops (Stop/Pause), freeing up 100% of the CPU usage for this instance.
 - **ON:** The audio engine continuously analyzes inputs, even if the DAW is stopped. Useful if you are monitoring live microphones or instruments and need to see the spectrum before recording.



4. Embedded Mode (TCP/MCP)

If you set this plugin to be visible in REAPER's track control panel (TCP) or mixer control panel (MCP) in an "embedded" manner, the plugin will intelligently switch to a compact mode to save resources and visual space.

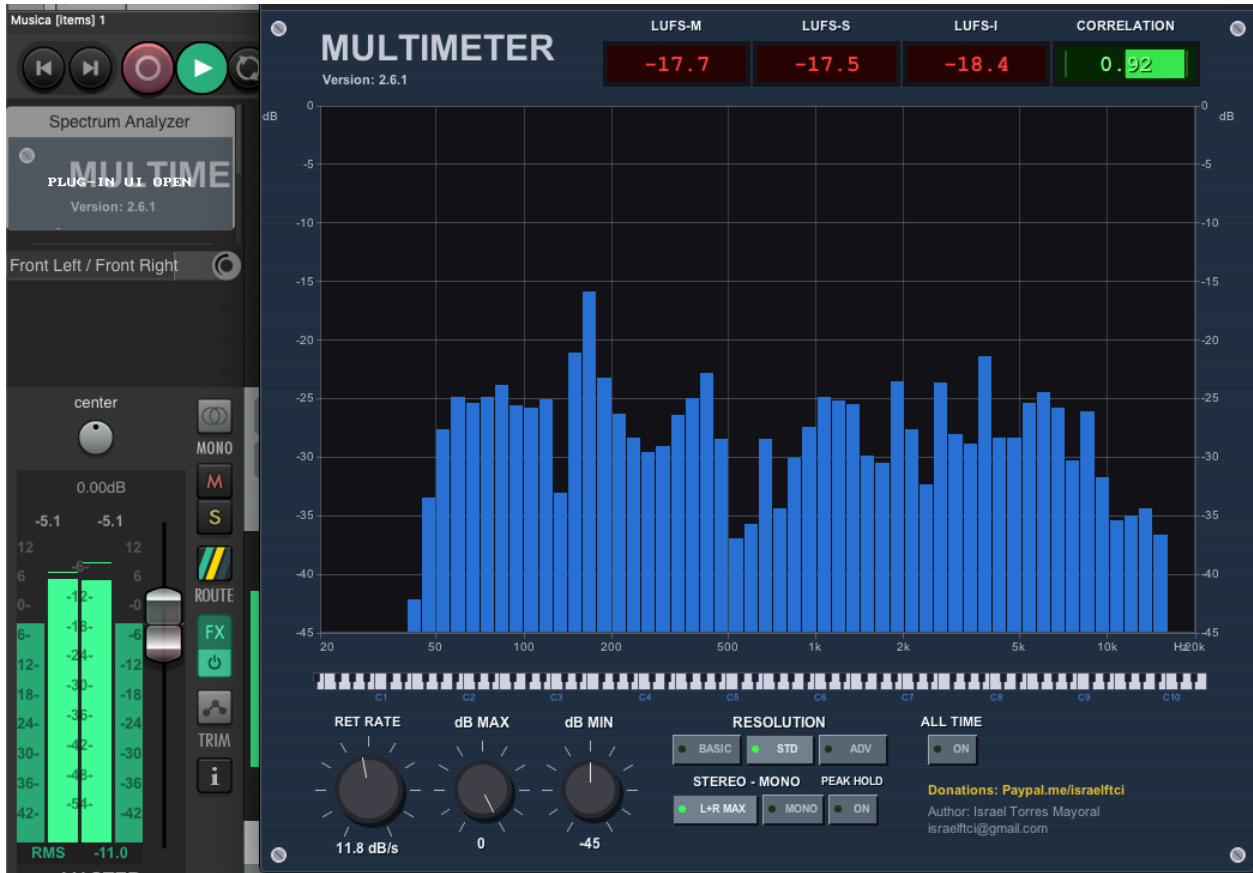
In this mode, the Multimeter displays a pure black oscilloscope and a floating **white text box** in the center providing the following readout:

- The **Absolute Maximum Peak** detected (in dB).
- The exact **Frequency** where that peak occurred.

Hold Behavior (Embedded Peak Hold):

To allow you to read the numbers comfortably, this readout freezes for **2 seconds**. If an even louder sound comes in during that time, the numbers update immediately. If the volume drops, it will wait for the 2 seconds to pass before refreshing the information and showing the new peak.

MPC visualization view when the interface is in Full Mode



Embedded Mode view in MPC or TCP



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