

Friday for Features will take a look on not so well-known features in SATlive, thus helping you to improve your user experience with SATlive.

The topic of today's Fridays for Features is:

Relative or Absolute? Level, SPL and other things

Looking at SATlive, you'll notice immediately the VU meters at the upper right area. But taking a closer look might confuse you.

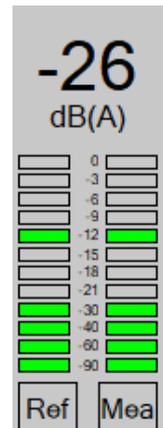
Why is there a number showing above the two meters?

Why does it show a negative number?

Lets take a closer look on level measurement and display in SATlive.

The two VU meters are the most intuitive displays here. They show the level of the input signals. Their maximum display is 0 dB, which means digital – full scale. Digital – full scale is defined by the A/D converters and indicates the highest possible numeric value that the audio driver could deliver. Clipping occurring in the analogue section of the interface will not necessarily show here. On the other hand some I/O devices might use internal limiting to prohibit digital clipping.

The VU meters visualize two different values. The first one is the peak value, which indicates the highest amplitude of a single sample and the other one is an averaged level. You can set the time constant used for averaging in the setup assigned to this area. The peak will show as a single element while the averaged value will show as a bar.



The number on top of the VU meter shows the averaged level of the Mic input.

The setup allows you to configure this display. To open the setup simply click on the number.

The section *Weighting* at the top of the allows you to apply an A – type or a C – type weighting filter to the display.

Both weighting filter affect the frequency response of the meter, with the A – type filter reducing the lower frequencies more than the C – type filter.

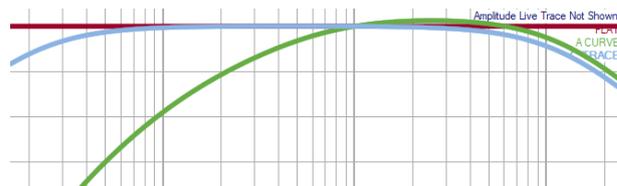
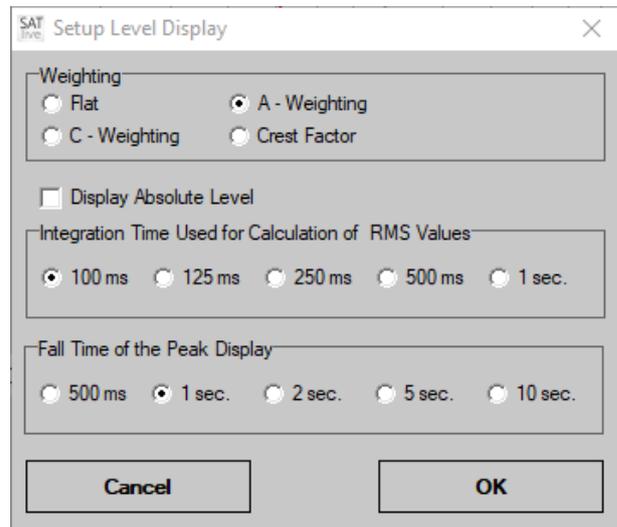
The *Crest Factor* setting will show the difference between the peak and the averaged (RMS) level.

The setting *Integration Time Used for the Calculation of RMS values* configures the time used for the averaging, both for the VU – meter and for the numeric display.

The value of 125ms equals the averaging time *Fast* on a hand – held spl meter and the value of 1 second equals the averaging time *Slow*.

As you might know, a dB value always indicates the relation of two levels. The VU – meters relate the input to the digital – full scale, while the transfer – function relates the mic input to the ref input. This are all relative levels.

Opposite to this, SPL (Sound Pressure Level) means a certain sound – pressure. The level of this sound – pressure is shown related to a defined standard reference, called p_0 , which equals $20 \mu\text{Pa}$. Because this is a very low level, our SPL readings will be positive all of the time. We know the reference value, so we could calculate the actual level. Therefore we refer to that kind of display as *Absolute Level*.

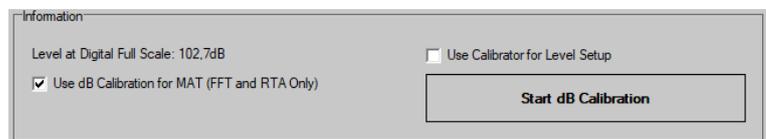


SATlive supports absolute level display. Due to the fact that SATlive does not know the real voltage at the input of the I/O device it is not able to calculate absolute SPL values by itself.

To overcome this SATlive needs to know the relation of the input level value and the current SPL. This can be done in the *Set dB Reference* setup.



There are two ways to perform this setup. The first one is a comparison between a SPL



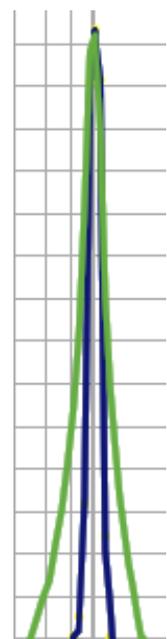
meter and SATlive, the other one the use of a calibration device.

The use of a calibration device will lead to a more precise reading. When you want to use a calibration device make sure that you check the *Use Calibrator for Level Setup* option. To perform the calibration click on *Start dB Calibration* and follow the steps that will display on the screen.

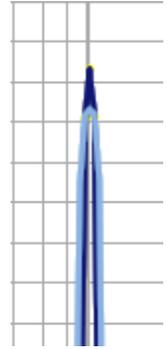
After completing the calibration process you can check the *Use dB Calibration in MAT* option and / or activate the absolute level for the numeric display using the entry *Display Absolute Level* in the setup. While displaying the absolute level in the numeric display works fine there are some pitfalls when you use absolute level display in the FFT.

Because the FFT algorithm will calculate only values on discrete frequencies the level will distribute between frequencies when the signal frequency will not match the FFT frequencies exactly. For example there is no FFT frequency at exactly 1 kHz, but one at 984 Hz and another at 1007 Hz. Therefore a sine wave with 1 kHz will not show the exact SPL value when you read peak in the display, because the energy will distribute mainly on those two frequencies.

The picture shows 1 kHz as green and 1.007 Hz as blue trace.



The other pitfall is windowing. Beside the positive effect of reducing calculation based erratic values at frequencies other than the frequency of the input signal, windowing will also broaden the frequency range of the signal. That will distribute the energy to a wider frequency range, resulting in a lower than real reading on each frequency. The picture at the right shows the same signal windowed using a *Flat - top* window (light blue) and a *Hanning* window (dark blue).



So take care if you want to use FFT or RTA for SPL measurements in SATlive. Because no FFT functionality and no windowing is involved in the SPL - Meter functionality of the numeric display, the numeric display will be fine.

To summarize: SATlive can display absolute SPL values, either weighted using A - type or C - type filters or using no filter at all. Using the setting 125 ms will simulate the *Fast* setting and using the 1 sec setting will simulate the *Slow* setting of a spl - meter.

If you want more SPL functions like recording, reports or user information I'd suggest that you take a look at LevelCheck (www.LevelCheck.de) a product focused on that purpose.