Peak vs RMS Meters

Audio meters are used to measure the level of an audio signal. However, not all audio meters work the same, and it's important to know the differences between them. Biamp DSP platforms support Peak metering and RMS metering.

This article aims to give you clear information about Peak Meters and RMS Meters, and the situations where one might be more beneficial to use than the other.

Audio metering

There are literally dozens of different audio metering systems in common use around the world — and they will often display different signal levels when fed with the same signal! However, there are perfectly good reasons why this should be the case and below is an explanation of two common meter types, RMS and Peak.

What are meters really used for?

All audio material has a certain dynamic range - the difference between the highest and lowest acceptable levels. We typically arrange for the loudest peaks to be below the maximum level which the system can handle, and for the quietest signals to be kept well above the noise floor, maximizing signal-to-noise ratio. If signals roam beyond these boundaries then your ears will usually tell you something is wrong, regardless of whether you are using analog or digital systems. However, metering can help to make the process of setting optimum signal levels much quicker and easier, warning you of potential problems before they occur.

What's the difference between RMS and Peak meters?

RMS (‘Root Mean Square’) voltage is a complicated-sounding engineering measure of the average voltage level of electrical signals. Because the RMS meter measures ‘average’ levels, a sustained sound reads much higher than a brief percussive one, even when both sounds have the same maximum voltage level: the reading is dependent on both the amplitude and the duration of peaks in the signal. It is intentionally a "slow" measurement, averaging out peaks and troughs of short duration to reflect the perceived loudness of the material. RMS meters approximate the way your ear perceives sound levels; your ear will typically not perceive sharp peaks to be as loud as they really are.

A peak meter is a type of visual measuring instrument that indicates the instantaneous level of an audio signal that is passing through it (a sound level meter). Peak type metering is designed to respond so quickly that the meter display reacts in exact proportion to the voltage of the audio signal. This can be useful in many applications, but it should be noted that the human ear works much more like an average meter than a peak meter, and thus, many audio engineers and sound professionals prefer to use older analog style metering because it more accurately relates to what a human listener will experience in terms of relative loudness.
Pretend the graph, above, represents a music signal, as it might be viewed on an oscilloscope.

The peak value is the highest voltage that the waveform will ever reach, like the peak is the highest point on a mountain.

The RMS (Root-Mean-Square) value is the effective value of the total waveform. It is equal to the level of the DC signal that would provide the same average power as the periodic signal.

Which meter should I use?

Unfortunately, there is no definitive answer as to which type of meter to use when and where. Every engineer has his or her preference as to what is expected from a meter block.

When choosing a meter, you should consider what you are looking for at that point in your system. If you are looking to ensure your system is not going to clip, a peak meter may be the best choice. If you looking to ensure the average signal levels are going to be present at a point of a reference or threshold block, an RMS meter could be your best bet (think Ducker and Automixer blocks). In the end, the type of meter to use is a personal preference but knowing how the meters work should give you a more educated idea as to what meter to use.

Further reading

- Gain structure
- Gain structure: input and output levels