1 THE DECIBEL, SPL AND MEASURING SOUND LEVELS

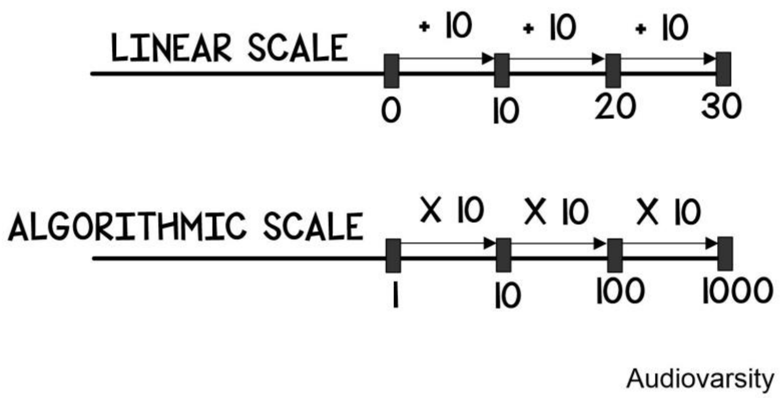
1.1 WHAT IS DECIBEL AND SPL?

A decibel, abbreviated dB, is not a physical unit like meters or volts. It's a relative measurement — it compares one value to another on a logarithmic scale.

Instead of increasing in equal steps, a logarithmic scale increases in multiples. So:

- An increase of 10 dB means the sound is 10 times more powerful.
- An increase of 20 dB is 100 times more powerful.
- And 30 dB is 1,000 times more powerful.

The difference between a linear scale and a logarithmic scale



Our ears also work logarithmically. That's why the decibel scale feels natural to us — a jump from 40 dB to 50 dB sounds like a noticeable increase, but not twice as loud, even though the energy has increased tenfold.

When we use decibels in audio, we're measuring:

- Loudness
- Gain
- Signal strength
- Attenuation

SPL stands for Sound Pressure Level — it's a specific application of the decibel. SPL tells us how loud a sound is in a physical space. measured in decibels relative to a reference pressure, which is typically 20 micro pascals. (quietest sound the average human ear can detect).

1.2 TYPES OF DECIBELS

- dB SPL (Sound Pressure Level) – Measures air pressure, used for live sound and acoustic analysis.
- dBu or dBV – Measures electrical signal level, used in analogue equipment.
- dBFS (Full Scale) – Used in digital audio systems. 0 dBFS is the maximum peak before clipping.

1.3 SOUND LEVEL METERS AND USAGE

There are two common types of meters which are used to measure audio levels:

- Volume unit Meter (VU Meter)
- Peak Program Meter (PPM Meter)

Both types of meters are available in various forms including stand-alone units, components in larger systems, and software applications.

Whatever the type of meter, two characteristics are important:

- The scale which defines which units are being measured.
- The ballistics of the meter which determine how fast it responds to sound and returns to a lower level.

Vu meter

A VU (volume unit) meter is an audio metering device that is designed to visually measure the "loudness" of an audio signal.

The VU meter was developed in the late 1930s to help standardize transmissions over telephone lines. It went on to become a standard metering tool throughout the audio industry.

VU meters measure average sound levels and are designed to represent the way human ears perceive volume.

The rise time of a VU meter (the time it takes to register the level of a sound) and the fall time (the time it takes to return to a lower reading) are both 300 milliseconds.

The optimum audio level for a VU meter is generally around 0VU, often referred to as "0dB". Technically speaking, 0VU is equal to +4 dBm, or 1.228 volts RMS across a 600 ohm load.

VU meters work well with continuous sounds but poorly with fast transient sounds.

Peak Program Meter (PPM)

A Peak Program Monitor (PPM), sometimes referred to as a Peak Reading Meter (PRM), is an audio metering device. Its general function is similar to a VU meter but there are some important differences.

The rise time of a PPM (the time it takes to register the level of a sound) is much faster than a VU meter, typically 10 milliseconds compared to 300 milliseconds. This makes transient peaks easier to measure.

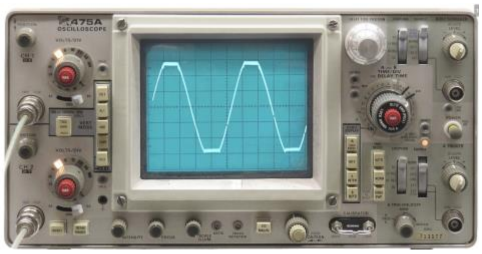
The fall time of a PPM (the time it takes the meter to return to a lower reading) is much slower.

PPM meters are very good for reading fast, transient sounds. This is especially useful in situations where pops and distortion are a problem.

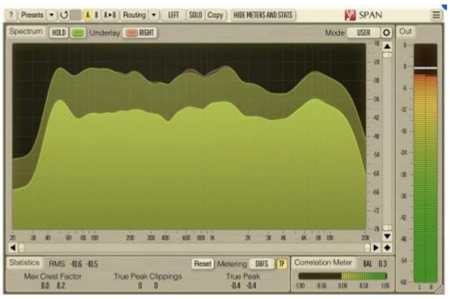
There are literally dozens of different audio metering systems in common use around the world — and they will often display different signal levels when fed with the same signal! However, there are perfectly good reasons why this should be the case and below is an explanation of two common meter types,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

1.4 SOUND MEASUREMENT DEVICES.

An **oscilloscope** will show a waveform shape (such as Sine, Square, or even complex sound waves such as human speech).



A **spectrum analyzer** will analyze the amounts of sound at different frequencies and chart them in a frequency response curve.



The Spectroscope shows a continuous graphical representation of the frequency spectrum, analyzed into 60 separate frequency bands, represented as vertical bars.

The pan meters show the difference in level between the left and right channel, only applicable when monitorin