All Those Decibels

Usually, “dB” expresses ratios between two levels, like S/N ratio. But there are other kinds dB, like dBm, dBu, dBv and dBV, and dBFS. These are absolute measurements of power (watts), and voltage.

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dBm is a *power-referenced* decibel. The reference for dBm is one milliwatt.

0 dBm = 1mW

The dBm is handy when talking about small but significant power values such as those that exist in most professional audio equipment. In fact, dBm is typically used to specify the nominal signal level in professional gear.

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dBu is a *voltage-referenced* decibel. The “u” stands for *unloaded*, and refers to the very small load that high-impedance circuits present to the voltage source. The reference for dBu is 0.775V (RMS).

0 dBu = 0.775V (RMS)

(The term dBv (lower case v) means the same thing as dBu, though the term dBu is more commonly used).

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dBV is also a voltage referenced decibel. A reference voltage level of 0.775 Volts (dBu) is clumsy when you’re doing math - 1 Volt would be easier to manage. And that's where the dBV comes in (note the upper case V). dBV signifies a voltage level of 1V.

0 dBV = 1V

+4dBu - an operating level used in pro audio, corresponding to an RMS signal level of 1.23 Volts. This is good for use with modern op-amp circuitry as it leaves a sensible amount of headroom before the circuitry runs into clipping.

-10dBV - corresponds to 0.316 Volts, roughly a third of a volt. Again this is reasonable for use with op-amp circuitry, but many purists feel the +4dBu system provides a better balance between noise and headroom.

3dB is a doubling of power. If **0 dBm = 1mW,** then **3 dBm = 2mW.**

- A 10 Watt amplifier can produce 3dB more power than a 5 Watt amplifier.
- A 20 Watt amplifier can produce 3dB more power than a 10 Watt amplifier.

6dB is a doubling of voltage. If **0 dBV = 1V,** then **6 dBV = 2V.**

- Double the voltage and the level goes up by 6dB.
- Halve the voltage and the level goes down by 6dB.

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INCREASES IN POWER LEVELS (WATTS)

   DeciBels   Output Signal Strength
       3dB            2x
       6dB            4x
      10dB (1 Bel)   10x
      20dB          100x
      30dB        1,000x

ATTENUATION OF AMPLITUDE (VOLTS or AMPS)

   DeciBels   Output Signal Strength
      -3dB         0.707x
      -6dB         0.5x
     -10dB         0.316x
     -20dB         0.1x
     -30dB         0.032x
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dB (SPL)

Measured relative to a pressure level of 20 micropascals, the quietest sound a human can hear. This is roughly the sound of a mosquito flying 3 metres away. This is often abbreviated to just "dB", which gives some the mistaken notion that "dB" is an absolute unit by itself.
Like voltage, doubling the Sound Pressure raises the SPL by 6 dB.

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dBfs

In digital systems, 0 dB indicates the maximum possible digital level. It's called dBFS. FS stands for Full Scale.