**The Difference Between Gain,****Volume, Level, and****Loudness**

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When working with sound amplification equipment, we often misuse these terms. Probably because you’ll see them often, and two or three on the same piece of equipment! That can seriously make your brain want to go flip upside-down and jump into a pool of boiling acoustic particle velocity soup. On top of that, you might have channel volume, master volume, guitar volume, fader levels, guitar amp gain, mixer board gain … etc. But, it’s pretty important stuff to understand if you want to get a good sound from your equipment.

**Gain增益**

Gain is one of the harder terms to define, mainly because its used in a lot more places than just the audio world. Quite simply it means an increase in some kind of value. So for example, you can have a power gain, voltage gain, or current gain; and they all increase those respective values. Typically when referring to gain, we refer to transmission gain, which is the increase in the power of the signal. This increase is almost always expressed in dB (decibels). This could be the increase in the raw signal from your guitar or microphone before it goes into any of the other electronic components. For the curious, here’s the equation to calculate gain:

Gain = 10 x log (Power out/Power in)

expressed in dB.

通常我们说增益的时候,都指的是传输增益, 指的是信号功率的增加. 这个增加通常用dB (分贝)表示.

它的计算公式是: Gain = 10 x log (输出功率/输入功率).

**Practical Use of Gain 增益的应用实践**

For all non-rocket scientist purposes, you’re probably going to see a gain control in two places. One of them is on your mixer board or PA(Power Amplifier, 功放), and the other is on a guitar amp. These both mean the same thing as far as electronics go, but serve different purposes in each.

On the mixer board, you’ll see the gain at the top of the board. It’s the first control that the raw mic signal sees, and it will boost the signal to a sufficient level for the rest of the controls to work properly. You’ll want to set this gain level high enough to bring up the level of the signal, but not so high that you’ll get clipping (削波) or distortion(失真) in the signal. For this purpose, many boards come with a PFL (Pre-Fader Listen, 衰前监听) button. This button will let you see the actual signal strength by looking at the LEDs on the board. Use the mic at normal sound levels and set the gain knob so that the peaks in sound don’t send the signal into the red, and you’re good to go.

On a guitar amp, the gain’s main intention is to create distortion (as my blood tingles with ground shaking delight). You already know what it does, so there’s no point in telling you, but I do have a small tip – turn your gain down! Yes, I also love the gut wrenching melodies of face-meltifying solos, but you seriously don’t need your gain sitting on 10 all the time. Novices will go into the recording studio thinking their sound is redonkulously awesome, only to have the sound engineer take their distortion down to a 5 or 6 cause they sound terrible. The distortion shouldn’t hide your skills, but accentuate them. IMHO(in my humble opinion, 恕我直言).

**Volume 音量**

Besides defining three dimensional space, volume can also be used to describe the power level of a signal. So when you turn up the “master volume” knob on your amp, it simply means you’re increasing the amount of power used by the amp to increase the signal. This term is quite ambiguous since it’s used in so many different places, mainly to mean the actual sound you perceive in your ears, which is not exactly true. Use with caution.

用来描述信号功率水平. 指用放大器来放大信号时所用的功率的量.

Ps:很多时候是从整个系统的角度来描述, 我喜欢理解成为系统上限, 是一个乘数关系.

**Level 电平**

This term is used to describe the magnitude of the sound in reference to some arbitrary reference. More specifically we use SPL (Sound Pressure Level, 声压级) to describe sound waves. SPL is a term calculated from the log of the rms(Root Mean Square,均方根) sound pressure of a measured sound related to a reference value. Basically meaning we create a measurement scale with zero starting at the lowest threshold of human hearing. The SPL scale is shown in dB and goes up to 130 dB (well, infinity, but whatever), which is the threshold of pain for the human ear. Now I just need to find a way to rock as loud as [Krakatoa](http://en.wikipedia.org/wiki/Krakatoa) (180 dB standing 100 miles away).

这个术语是用来描述声音的大小，更具体地说，我们用声压级来描述声波。

声压级是根据与参考值相关的测量声音的均方根声压的对数计算得出的一个术语。

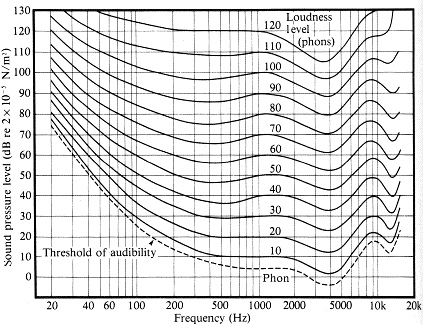
声压表从人类最低的听力阈值开始, 作为0分贝。

声压级以分贝显示，最高可达130分贝，这是人类耳朵疼痛的阈值。

**Loudness 响度**

Loudness, even though similar to volume and level, is another whol’nother monster. Since human ears are not able to hear each frequency at the same level, perceived loudness is different as we move up and down in frequency. The following graph shows the level that a human ear “thinks” its hearing, which as you can see is not correct most of the time. The lower frequencies, like the bass guitar at 40-220 Hz, need more sound pressure for us to believe it’s equally as loud as a sound at 1 kHz.

响度，与音量(volume)和音级(level)相似。由于人类的耳朵不能在同一水平上听到每个频率，当我们在频率上上下移动时，感知的响度是不同的。下图显示了人的耳朵“认为”对它所到声音音级的判断，正如你所看到的，这种判断错的离谱。



Equal Loudness Contours (等响度曲线)

Here we introduce a term called a “**phon**“, which is used to describe loudness. 2 You can see on the graph that the **phon contour** is different for each dB level. The 120 phon contour requires less boost in the low frequencies than the 10 phon contour. Mostly because of the shape of the ear, you can also see from the graph that we hear the 3-4 kHz range the best, which happens to be on the slightly higher end of human speech. If you lost it, you’d have a hard time understanding people.

使用术语phon(响度级, 方)来描述响度。

因为人耳结构的原因，每个分贝的phon轮廓是不同的。

120 phon轮廓比10 phon轮廓在低频段需要的增强要小。

人耳在3-4千赫听到的范围最好，这恰好是在人类语音稍高的一端。

**In Conclusion 结论**

Now the whole point of this article is to get you all learned up about music terminology, and how to use it. But don’t go around hitting people on the head with your “terminology hammer” and pretending like you own the universe now that you know this stuff. Know-it-alls are annoying. The point is the ideas behind the words, so don’t get so hung up on the specific words unless you have to go writing text someplace.

So that’s it, no more. I was gonna say “As always, yada yada”, but realized that this is only the second article I’ve written so far, so I can’t exactly say “As always”. Well, hold on a sec. Why the heck not? Yeah. There’s no rules for writing blogs right?

As always, stay cool, and hash it up in the comments.