

## Amplifiers - Why Do Amps Sound Better When Loud?

According to research done back in 1933 by Fletcher and Munson, it was discovered that the human hearing has a frequency response which altered according to the intensity of sound. That means that bass frequencies are heard disproportionately less prominently than higher frequencies, when music is played at a low level of volume!

I hear cry of... "Rubbish!" No, it's very true. If you Google Fletcher and Munson, you can read lots about this. However, this is just a simple explanation of the 'audio trickery' that is going on with your hearing and mind.

Why would our hearing be like this then? Well, it has been said that the human hearing has evolved to reject unwanted signals at very low sound volume levels, so we could hear the sound of rustling leaves and snapping twigs more easily whilst hunting for food. Low frequency wind noises would have masked many sounds. I believe this to be a very likely cause.

In a nutshell, the bass and treble are severely attenuated at low volumes. Bass signals are attenuated by as much as -42dB in relation to the mid frequencies at very low volumes. Because dB (DeciBels) is a logarithmic scale, that's a huge reduction by any imagination, when you realise that each 6dB reduction is half the volume! Assuming that the mid frequencies have an average volume level represented by 1, then the bass is attenuated to only 1/128th of the mid frequency average!

If you look at the difference between the bass plots on the graph opposite, you can see it all visually... but remember it's logarithmic, so a lot steeper than it appears.

This is also why telephone lines have restricted bandwidth... The engineers know your hearing is very sensitive to this narrow audio bands at low volume, so they can save juice powering the lines by not having to amplify the volume hardly at all... Simple eh?

In relation to guitar amplifiers, and any other amplifier for that matter, we all 'believe' an amplifier performs better at high volume, when in fact it does not! There may be some additional speaker distortions added, but the most significant contribution to the effect is the human brain and how it translates what we hear depending on the sound volume.

Try the radio test in your car. Turn down the volume until you can hardly hear the music. Where has the bass gone? So... Next time your favourite record is played on the radio and you reach out to 'pump up the volume', you know what is really happening!

### Did you know... The human hearing also has a built in 'compressor'?

Yes, that's right. In order to protect help our hearing, our brains turn down the volume when it all gets too loud. Eventually it runs out of control and pain is felt in your ear drums. This is when the sound level reaches 120dB.

Many guitar players believe that their 15 watt class AB amp is as loud as a 100W amp! Nonsense of course, it's just due to your brain acting as a limiter in a confined space or room! Put the two amps in a field 100 yards/metres away and see which will be the loudest amp! The 100W amp's sound will be far louder than the 15 watt amp... Fact.

### Are valve/Tube watts really louder than Tranny watts?

Err... NO! A transistor watt and a valve/tube watt are exactly the same. Calculated by  $V_{rms}^2/R$  or  $I^2/R$  or  $V_{rms} \times I$ . There cannot be any difference. **However, many tranny amps have their power ratings way are over stated and employ inefficient speakers.** This would definitely contribute to such an occurrence.

Example: The 40W rated 1990s Marshall 8040 is only 28 watts and has a speaker with a tiny magnet. That's why it's not so loud! The fact that it's

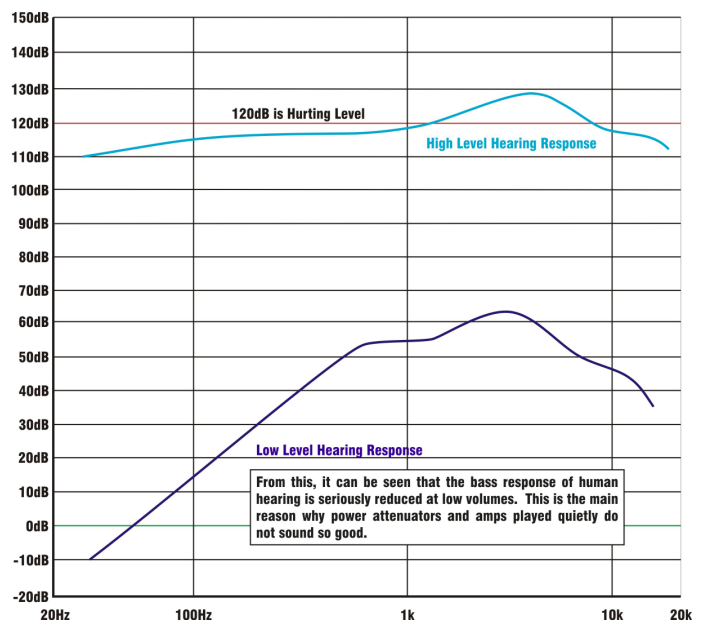
a transistor amplifier is nothing to do with it at all!

Any amp with an output transformer, commonly a tube amp, demonstrates a unique phenomenon. Because valve/tube amps have an output transformer causes the amp to have a 'high output impedance'. This 'under damps' the speaker's movements and allows the speaker to travel further backwards and forwards before changing direction due to the cone's inertia, and causes 'cone overshoot'. This overshoot can vary by an amount from amp design to amp design. But it is present in all amps with an output transformer.

This 'overshoot' is translated as extra volume by our hearing, because the cone has travelled further back and forth than it should have done. This is a form of distortion, as the speaker is not following exactly the signal the amplifier is feeding to the speaker. This is the only reason a tube amp 'can' sound louder than a elderly transistor amp design.

Modern transistor amplifiers are equipped with 'constant current drive' which is practically the same as having an output transformer. This allows tranny amps to sound identical to a tube amp, and provides the amp with the 'overshoot' ability as well. So modern transistor amplifiers can compete with almost any tube amp for loudness.

I work with three bands and use a 25 Watt (Constant Current) tranny Session 'Rockette:25', fitted with a 102db Eminence 'Swamp Thang' speaker. It can compete with any similarly rated tube amp. My 1963 Tele sound gorgeous through it!!



This graph can be used to help explain many 'amplifier' related fables, so you will see this graph above many times in my articles! It's called the 'Law Of Equal Loudness'

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