Micro vibrations - Why do so many people think that microvibration control is a myth? All those tricky footers, and weird cables, and stands. Isn’t it a business founded on trickery and hypnotism? On the selling of snake-oil?

Microvibration control is serious business. After all, your entire hearing is based on it. And after reading this article, your entire thinking about audio will be, too. The logic is right here in front of you. All you have to do is look at the numbers.

And those numbers are, Mr. Wise Guy?

The loudest sound you can withstand before sustaining temporary damage to your ears is about 123 dB SPL. You know, the sound from right behind a jet plane. In order to produce this amount of sound pressure, you may find it surprising to learn that the air molecules themselves get displaced all of 11 microns. That’s right. 10 TIMES LESS than your average human hair is thick.

Fast forward. It is now late at night. All in the house is quiet. You can’t sleep. Far, far away, outside, you can make out the chirping of a lonely cricket. It is very faint, yet you are sure that you hear it distinctly. This sound is caused by a vibration of air molecules which are displaced by only 11 picometers. This is about 1/20th the diameter of an average sized atom.

You can begin to appreciate that the human ear is a remarkably sensitive detector of vibrations. Your bare hearing already functions on a subatomic level of precision.

But what about your equipment? What should it care about microvibrations? It doesn’t have hears, does it? Well, you are wrong. It does have ears, and by far more sensitive ones than even yours.

Metal conducts electricity because it contains countless shared electrons amongst its atoms. Together, the zillions and gazillions of these individual outer shell electronics make up a cloud of negative charge. This is similar to the way in which the zillions and gazillions of individual atoms in the air make up an invisible cloud of something we breath (and sneeze into) which we call air. Air provides a conduit for pressure vibrations to traverse. Likewise, the electron cloud in a metal provides a conduit for charge vibrations to traverse.

Now that you understand that electrons together make up something akin to a malleable gas of charge, you can see how it can be vibrated just like air pressure is vibrated to create a sound wave in air. The air is stuck to the earth via gravity, yet remains a fluid. Electrons are stuck to the metal via subatomic bonds, yet they act like a fluid as well.

So how much does this fluid vibrate in YOUR sound system, and where did Diana Krall’s voice come from in the first place? When the needle vibrates in the record groove, a microvibration of its tip causes a small current to form. How small? About 0.191 nW (nanowatts). A nanowatt is a thousand millionth of a watt. That’s 1/1000000000 of a watt. So 0.191 nW is only about a fifth of a nanowatt.

You can’t be serious! Nobody can ever hear that!

Of course not. That’s why your system first amplifies it. How many times? Well, let’s say your speakers play at a comfortable listening level when they are getting 12 Watts of power. That’s a typical real-world number for most speakers’ sensitivity. So we have to amplify the original signal which was 0.191 nW 63 BILLION times, in order to get 12 Watts of power that we can enjoy.

0.000000000191 x 63,000,000,000 = 12

Let’s say that these 12 watts generate a sound at 80 dB SPL at your listening chair. That’s where you’ve placed your ears last time you checked. When the sound wave of Diana Krall’s 500 Hz note finally hits your eardrum at 80 dB SPL, the actual molecules in the air are vibrating at only 0.15 micrometers maximum displacement. That’s only 0.00015 millimeters.

Next time your wife tells you to turn it down, you are now well-equipped to respond, “but it’s only 0.15 microns displacement, dear!”

That’s for analogue, but this is a Digital World today. With digital, it makes no difference.

Boy are you wrong! In digital, the problem is the placement of all the samples in the time domain (Jitter). People can hear the results of digital signal Jitter amounts of less than 50 pS. That’s picoseconds, which would be 50/100000000000 of a second). The samples are going by so fast, but we have, with redbook CD audio, 44.1 thousand (x2 for stereo) chances of hearing this tiny displacement of time per second, so we do pretty well at it, since they are all more or less imperfect.

Next time you are at a football field, go to one of the goal lines, and stand on it. Look all the way across the field at the other goal line. You are looking at one sample. Yes, the far goal line is the next sample in the audio. Now take but one step towards it. Make it a millimeter step, please. That is the amount of Jitter you can hear in an audio stream! Of course it never occurs only once, but in a statistical way, this small deviation from the perfect goal line is what you are able to hear in the audio signal as an artificial distortion, when it is off each time by a maximum amount of that much.

So, as you can see, we are well equipped to hear tiny microvibrations, especially when these are amplified 63 billion times before we take a listen with our very sensitive hearing to investigate what it is that might really be going on at a sub-atomic level in our sound systems’ circuitry.