Subject: THD
Posted by Magnus on Thu, 17 Jun 2004 13:24:11 GMT
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Manualblock,If you apply a pure sine wave of say 1 kHz to a speaker or amp, ideally that is all you would get at the output if the speaker was perfectly linear. This is in practice however not the case, since the speaker or amp in slightly nonlinear it will produce harmonics or overtones which are integer multiples of the fundamental frequency, in this case 2 kHz, 3 kHz etc. (This has nothing to do with frequency response which is sometimes said to be linear when you really mean flat.)If you add upp the squares of the amplitudes of all harmonics and divide them with the amplitude of the fundamental frequency you get THD or Total Harmonic Distortion, usually expressed as a percentage or in decibels. A lower THD generally indicates a more linear system and thus lower distortion.The trouble with THD is that it not correlates much with perceived sound quality, nor is it a very good way of describing distortion of most practical systems. Consider playing a 15 kHz pure sine wave through a tweeter. The first harmonic will be at 30 kHz and thus beyond hearing. So no matter how much distortion the tweeter has, the 15 kHz tone will sound the same! Another example is say a 3 kHz tone applied to a woofer. If the frequency response of the woofer rolls off above 3 kHz the harmonic at 6 kHz will be attenuated and the THD number will look great! In these cases, THD will not be of much value.IMD (Intermodulation Distortion) shows greater promise in these cases and generally correlates quite good with perceived sound quality. In a simple 2-tone test two sine waves of say 15 kHz and 16 kHz are added together and fed to the speaker. If the speaker is nonlinear it will produce mixing products, in this case at 14 kHz, 17 kHz, 30 kHz, 32 kHz etc (there is a bit of mathematics involved here). So our bad sounding tweeter will show its true colors in an IMD test. Even better is to apply two line spectra and look at all the mixing products, tests have shown that this method correlates quite well with perceived sound quality.There are a lot of more things to say about distortion theory and measurement and the fact that we rarely listen to sine waves...CheersMagnus