

Comments on “Weighting Up” by Keith Howard

First we want to thank Mr. Howard for his careful reading and discussion of our work. It's nice to know that someone actually reads what one writes. We would also like to thank Ed Dell for reprinting this article to a wider audience.

Mr. Howard is correct in all that he says about the previous work in the area of perception aware distortion measurements. We were aware of this work (and should have referenced it! Shame on us.) and in fact when Dr. Geddes was with Ford's audio group, this harmonic scaling was often used in internal measurements. However, it was also apparent that simply scaling the harmonics was not enough. Indeed, in our most recent data, scaling the harmonics alone produced only a small correlation with the subjective assessment - much better than THD or IMD, but worse than our proposed GedLee metric.

It was therefore our intent to derive a new measurement approach from basic psycho-acoustical principles, without resorting to anything previously done. We arrived at the same harmonic scaling as previous works from a completely different set of principles. In this regard then, the similarity in our metric with the previous work was more coincidental than derivative.

The raised cosine weighting function was not intended to simulate the amplitude distribution of typical signals, but was intended to simulate the change in the masking effect with signal level. An additional factor for signal statistical distribution was actually tried in order to account for differences in the regression slope of the GedLee Metric for different musical pieces. This was found to be somewhat effective but was not pursued owing to our loss of interest in this project. Why the loss of interest? Mr. Howard gets that mostly right too.

After a serious quest for continued support for more than a year we gave up. Our conclusion; people are satisfied with THD and IMD. It's like the story of the cop who asks a drunk under a street light what he is doing on his hands and knee's. The drunk replies “I'm looking for my car keys.” The officer asks “Where did you loose them?” and the drunk replies “Over there by my car.” Baffled, the officer asks “Then why are you looking for them here?” to which the drunk replies, “Because the light is better.” Everyone knows that THD is meaningless, but it's easy to do and “the light is better.”

To add to this situation, we have also found that nonlinear distortion in loudspeakers is, for the most part, not a significant issue. There are, to be sure, subjective distortions that are level dependent and as such are thought to be nonlinear distortion, but they are in fact linear effects that have a nonlinear perception. The testing of this hypothesis is currently underway and the results will probably be available in the future.

The bottom line here is that we know so little about how humans perceive the sound quality of an audio system, and in particular the loudspeaker, that one should question almost everything that we think we know about measuring it. From what we have found most of what is being done in this regard is naive. Things like distortion measurements that don't consider masking, or axial frequency response that does not consider the reverberant field or arrival time issues of group delay. Maybe someday in the future we will be able to quantify perceived sound quality and move audio away from a marketing dominated situation to a data driven one.

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