Technical Note

Amplifier Power Measurement

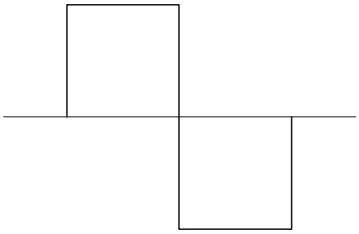
Introduction

At MC² we realised some years ago that with the requirement for increasingly higher powered amplifiers was unrealistic., This is due to the demands placed upon mains supplies to satisfy continuous 'laboratory-style' high powered sine wave signals. We decided to engineer the amplifiers to detect and control these 'non-musical' type signals, so that the current drawn from the mains supply was controlled within safe limits. At the same time we carefully set the limits by extensive testing AND listening, so that musical signals were not affected.

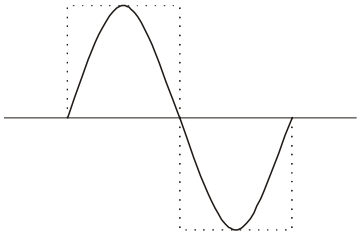
Specifications

We also realised that the traditional method of quoting output power (using RMS sine wave derived power measurements) was no longer valid. What customers really needed was a power rating (or ratings) that indicated power delivery in a real world situation. To do this we looked at many music samples and measured the average intensity of these using a measurement called the Crest Factor (CF). The Crest Factor of a waveform is defined as the ratio of the peak amplitude level divided by the RMS signal level. As such, it is a dimensionless value, but can be represented, in audio applications expressed in decibels (dB).

The minimum possible Crest Factor has a value of 1, where the peak amplitude is the same as the RMS amplitude. This is the CF of a square wave (assuming this swings symmetrically about zero Volts).



A pure sine wave, also swinging symmetrically about zero of the same peak amplitude will have a CF of 1.414 as the RMS value is now $(\sqrt{2})/2$ so we have $CF = 1/((\sqrt{2})/2) = 1.414$.



Measurement Technique

Following analysis of various music types and spoken program material, we settled upon three different measurement values based on the Crest Factors of 2.8, 4.8 & 7.8 (9dB, 14dB & 18dB). These represent a program material 'type', with 2.8 being classed as 'heavy', 4.8 as 'average' and 7.8 as 'light'.

We simulate these music signals using a burst tone set to give the appropriate Crest Factor and then actually measure the power outputs of all our amplifiers. In order that you can judge what the average Crest Factor is of any specific music that you might want to use, we have developed a small application for measuring this. If you would like a copy of this software, please contact us. Available on-line via our website are short samples of (non copy-righted!) music with approximate Crest Factors at each measurement level. In this way you can determine which quoted power level is appropriate to your main usage.

It is worth noting that the vast majority of music falls into the 4.8 to 7.8 groups and only music which is already dynamically compromised is likely to reach the 2.8 figure. Heavily compressed dance music would fall into the CF2.8 category, due in the main to the large amount of synthesised bass present. In general, all MC² amplifiers will sustain continuous music in any of the above groups, and only begin to reduce power when driving into 2 Ohm loads *and* with signals which have a continuous CF lower than 2.8.

Please also see associated technical notes:

Crest Factor and Amplifier Power
Dynamic Amplifier Testing

available from our website at www.mc2-audio.co.uk

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