Crest Factor

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Crest factor is a measure of the ratio of *peak* power to *RMS* power $C = \dfrac{\left|P_{peak}\right|}{P_{RMS}}$.

Given voltage, the crest factor in decibels is given by $C_{dB} = 20\log_{10}\dfrac{\left|V_{peak}\right|}{V_{RMS}}$.

For music, the crest factor gives an indication of how much clean headroom the system must posses with respect to the average listening level. Using MATLAB it is possible to perform analysis on typical CD reference material.

For the following peak power estimates it is assumed that the audio system has an effective efficiency of **85dB/1W** at the listening position and the desired average (rms) listening level is **90dB**.

Franz Schubert – *Mass No. 6 in E-flat – Kyrie*

$C_{dB} = 23.2dB$ $\qquad\qquad\qquad\qquad$ $P_{peak} = 661W$

Glen Miller Orchestra – *Pennsylvania 6-5000*

$C_{dB} = 21.6dB$ $\qquad\qquad\qquad\qquad$ $P_{peak} = 457W$

Aaron Copland – *Fanfare for the Common Man*

$C_{dB} = 20.5dB$ $\qquad\qquad\qquad\qquad$ $P_{peak} = 355W$

Edvard Grieg – *In the Hall of the Mountain King*

$C_{dB} = 19.1dB$ $\qquad\qquad\qquad\qquad$ $P_{peak} = 257W$

The Rod Blumenau Trio – *It's Only a Paper Moon*

$C_{dB} = 16.7dB$ $\qquad\qquad\qquad\qquad$ $P_{peak} = 148W$

Sergio Mendes – *Magano*

$C_{dB} = 13.6dB$ $\qquad\qquad\qquad\qquad$ $P_{peak} = 72W$

In general, the larger the collection of individual instruments the higher the probability that there will be a group of peaks that line up to produce a very large transient. This however assumes the recording and subsequent playback process is sophisticated enough to capture and reproduce it without limiting.