SINAD, SNR, THD calculator

A commonly used specification is signal to noise-plus-distortion (S/[N+D], or S/[THD+N]), also called **SINAD**. This is essentially the **inverse of THD+N**, when referred to the signal; its dB number is the same, but with opposite polarity.

Another performance measure describing the test results is the signal to noise ratio, S/N or **SNR**, which is a measure of the relative noise power, most useful for estimating response to small signals in the absence of harmonics.

If S/N is not specified, but **THD** and THD+N are provided, relative to the input signal, THD can be **rss**-subtracted from THD+N to obtain the noise to signal ratio [= 1/(S/N]. If the numbers are given in dB, the **rss** subtraction formula for logarithmic quantities in the **APPENDIX** can be used as follows

$$SNR = -10\log_{10}\left(10^{(THD+N)/10} - 10^{THD/10}\right)$$

to yield the input signal power relative to noise power expressed in dB.

APPENDIX

RSS addition of logarithmic quantities:

The **root-square sum** of two rms signals, S_1 and S_2, has an rms value of $\sqrt{S_1^2+S_2^2}$.
One often needs to calculate the rss sum of two numbers that are **expressed in dB** relative a given reference. To do this one has to take the antilogs, perform the rss addition, then convert the result back to dB. These three operations can be *combined* into *one* convenient formula: If D1 and D2 are ratios expressed in dB, their sum, expressed in dB, is

$$10\log_{10}\left(10^{D_1/10} + 10^{D_2/10}\right)$$

Similarly, to find the difference between two rms quantities,

$$x = \sqrt{S_2^2 - S_1^2}$$

the result, x, expressed in dB, is

$$10\log_{10}\left(10^{D_2/10} - 10^{D_1/10}\right)$$

http://www.analog.com/library/analogDialogue/Anniversary/16.html

Note:

$$THD_{dBc} = 10\log\left(\frac{\sum_{i=2}^{6} P_i}{P_1}\right) \quad ; \quad SNR_{dBc} = 10\log\left(\frac{P_1}{P_{all} - \sum_{i=0}^{6} P_i}\right)$$

$$SINAD_{dBc} = 10\log\left(\frac{P_1}{P_{all} - \sum_{i=o}^{1} P_i - \sum_{i=2}^{6} P_i + \sum_{i=2}^{6} P_i}\right) = -10\log\left(10^{\frac{THD}{10}} + 10^{-\frac{SNR}{10}}\right)$$

1/SNR THD

P_1 : signal (sine) power, P_i , $_{i = 2, 3, \ldots}$: harmonic components, P_0 : DC component