Noise Floor Correction

Contents

1 Introduction

In the following the formula for correcting power measurements done close to the noise floor in e.g. a spectrum analyzer is derived.

1.1 Noise and Signal Calculations

P_m: Measured Level.
P_n: Noise floor level
P_s: Signal level

Where Ps is the real true signal level.

The distance 'x' in dB between the measured level and the noise floor, sometimes also referred to as the baseline drop (the amount the measured level drops when the signal is removed in a zero span measurement), is defined:

$$x = 10 \cdot \log\left(\frac{P_m}{P_n}\right) = P_{m,dB} - P_{n,dB}$$

$$\Downarrow$$

$$\frac{P_m}{P_n} = 10^{x/10} \tag{0.1}$$

$$\Downarrow$$

$$P_n = \frac{P_m}{10^{x/10}}$$

The measured signal level is found by adding the noise power with the signal power:

$$P_m = P_n + P_s$$

$$\Downarrow$$

$$\frac{P_m}{P_n} = 1 + \frac{P_s}{P_n} \tag{0.2}$$

$$\Downarrow$$

$$\left(\frac{P_m}{P_n} - 1\right) \cdot P_n = P_s$$

Utilising the result from (0.1) we get:

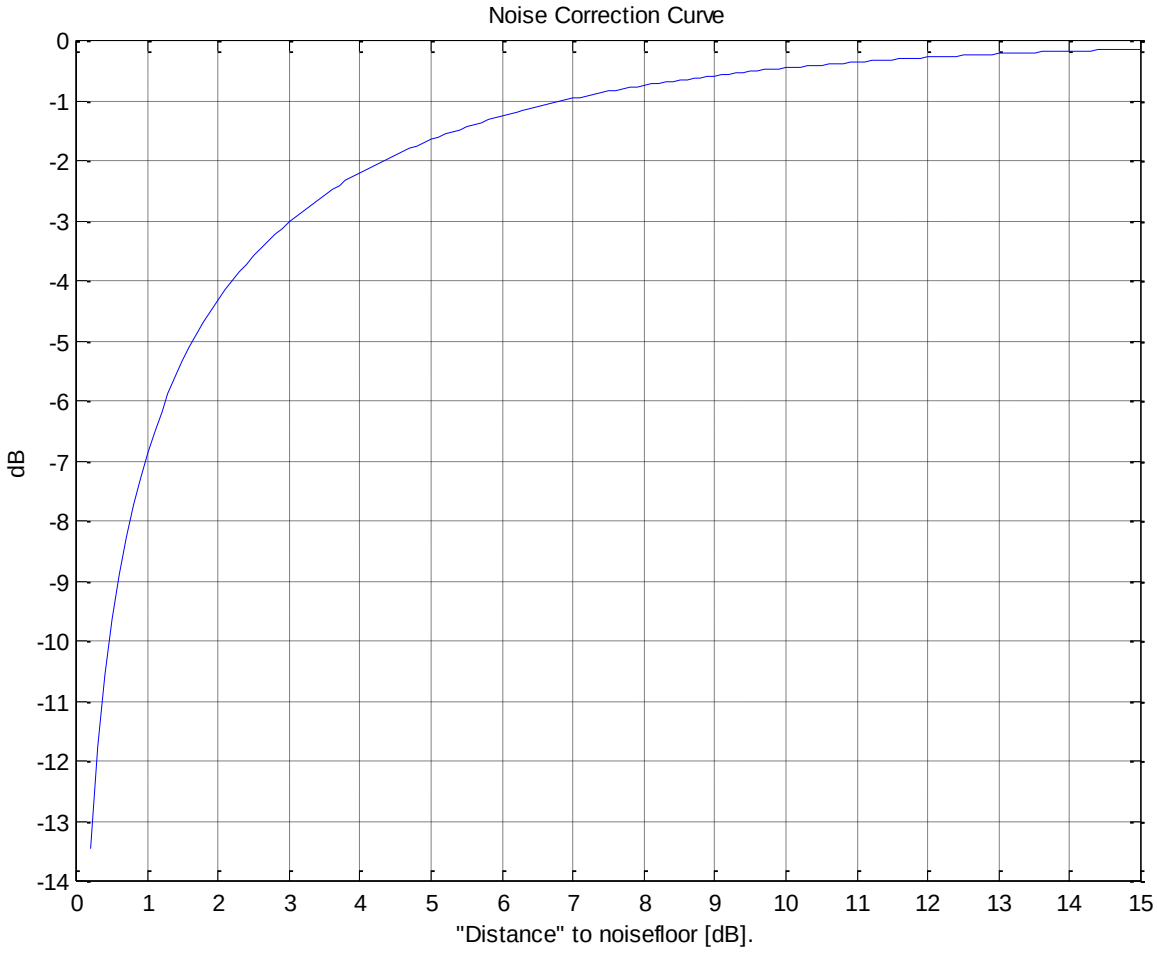
$$P_s = P_m \cdot \frac{10^{x/10}-1}{10^{x/10}}$$

or in dB:

$$P_{s,dBm} = P_{m,dBm} + 10\log\left(\frac{10^{x/10}-1}{10^{x/10}}\right) = P_{m,dBm} + k$$

here k is the correction factor that has to be used.

Plotting 'k' as a function of 'x' yields the following result:



This result is identical to the curve presented by Rohde&Schwarz in the application note 1EPAN11E (p. 5) accept for the sign. The present curve shows k, which is a number that should be added to the measured result while the curve presented by Rohde&Schwarz gives the figure that should be subtracted from measured result.