

The Decibel

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The decibel is a relative unit of measure. The power P in decibels with respect to the reference power P_0 is,

$$10 \log_{10} \left(\frac{P}{P_0} \right) \text{ [dB]} \quad (0.1)$$

When referring to a field (i.e. root-power) quantity F relative to the reference field F_0 ,

$$10 \log_{10} \left(\frac{F^2}{F_0^2} \right) = 20 \log_{10} \left(\frac{F}{F_0} \right) \text{ [dB]} \quad (0.2)$$

The dBm, decibel milliwatt, describes power relative to 1 mW.

dB	Power ratio (P/P_0)	Power ratio (F/F_0)
30	1000	31.62
20	100	10
10	10	3.162
6	$3.981 \approx 4$	$1.995 \approx 2$
3	$1.995 \approx 2$	$1.413 \approx \sqrt{2}$
1	1.259	1.122
0	1	1
-1	0.794	0.891
-3	$0.501 \approx 1/2$	$0.708 \approx \sqrt{1/2}$
-6	$0.251 \approx 1/4$	$0.501 \approx 1/2$
-10	0.1	0.3162
-20	0.01	0.1
-30	0.001	0.03162

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