

# 1.2.1 Receiver thermal noise

The thermal noise (in Watts) expressed in power level is defined as:

$$N_0(\text{Watts}) = k_B T B$$

where:

- $k_B$  is the Boltzmann's constant  $1.38 \times 10^{-23}$  in joules per kelvin (J/K),
- T is the receiver absolute temperature in Kelvin (K),
- B is the bandwidth in Hertz (Hz) over which the noise is measured.

It can be seen that the noise power of eq1 is dependent on the temperature and on the bandwidth. This figure is then normally expressed in terms of dBm and is defined as:

$$N_0(\text{dBm}) = -173.977 + 10 * \log_{10}(\text{SystemBandwidth}(\text{Hz}))$$

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Revision #2

Created 2026-02-26 14:20:59 UTC by ECO TECH

Updated 2026-04-14 06:43:06 UTC by ECO TECH