Measuring the noise temperature of an HP-461 and a Chinese noise source

Using a spectrum analyzer (Anritsu MS2035B) I measured the power level output in dBm from my HP461 amplifier (noise source). Analyzer settings included Preamp ON, Ref Level = -50 dBm, Detector= RMS/AVG and Resolution bandwidth = 10 kHz. Measurements were made at 15, 20, 25, and 30 MHz. Five measurements were made at each frequency and averaged.

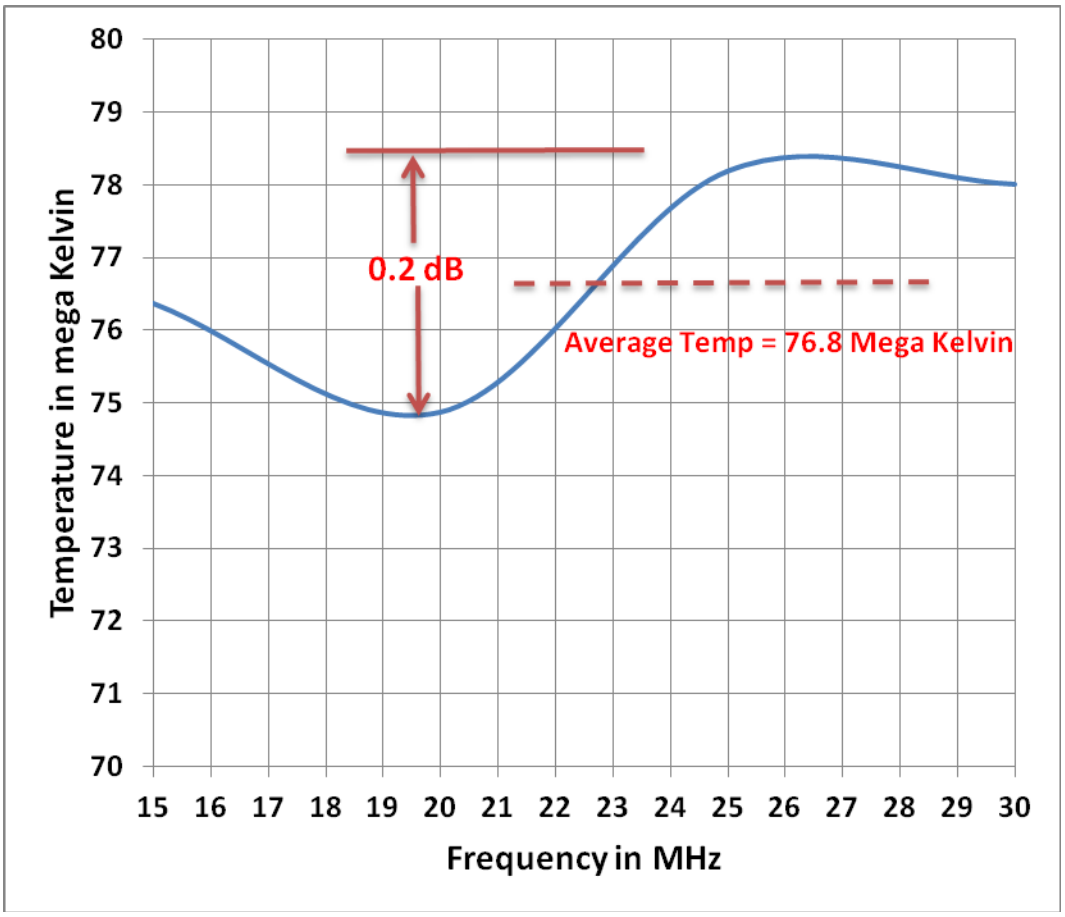
The average dBm reading was then converted to watts.

P in watts = 10^((dBm-30)/10)

The equivalent noise temperature (T) was then calculated.

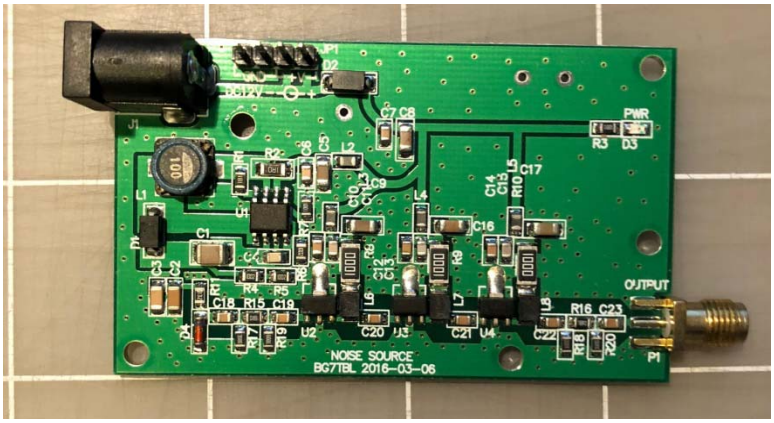
T=P/kB

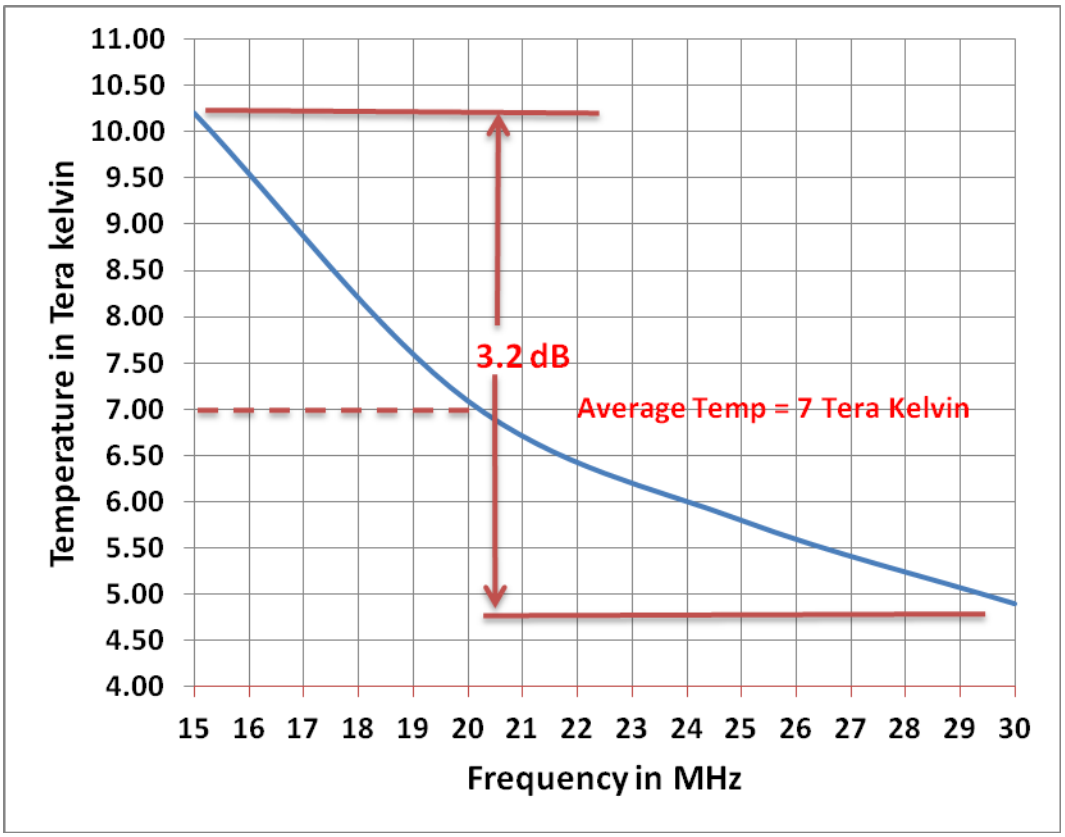
Where P = power in watts, k = Boltzmann's constant (1.38E-23 j/k), and B= bandwidth in hertz (10E4 in this case, equal to the resolution bandwidth of the spectrum analyzer).



My HP461 average output temperature is 76.8 Mk with a peak to peak variation of 0.2dB across the 15-30 MHz band.

The identical measurement procedure was followed for a Chinese noise source (e-bay).





My Chinese noise source average output temperature is 7 Tera kelvin (yes – that's right Tera kelvin, 10^12). This is about 81 dB above the 20 MHz 50kK galactic background level. This source exhibited over a 3dB drop in temperature across the 15-30 MHz band. For calibration purposes a much flatter frequency response is desirable. Measurements of the temperature vs frequency response of these Chinese noise sources are suggested before attempting to use them for accurate calibration purposes.

RF, 2 April 2018