Degradation of SNR by receiver with specific N.F.

Miroslav Kasal, OK2AQ

$$T_{sys} = T_{sky} + T_G + T_M + T_{RX} = T_e + T_{Rx}$$

,

where

T_{sys} - equivalent noise temperature of the system,
T_{sky} - brightness temperature of the sky,
T_G - antenna spill over effect from the ground,
T_M- Moon noise contribution if the antenna is pointed to the Moon.

$T_{RX} = 290\left(10^{\frac{F}{10}} - 1\right)$, where *F* is N.F. [dB] .

T_e - equivalent noise temperature except contribution of the receiver.

Then

$$Degradation\,[\text{dB}] = 10\log\left((T_e + T_{RX})/T_e\right).$$

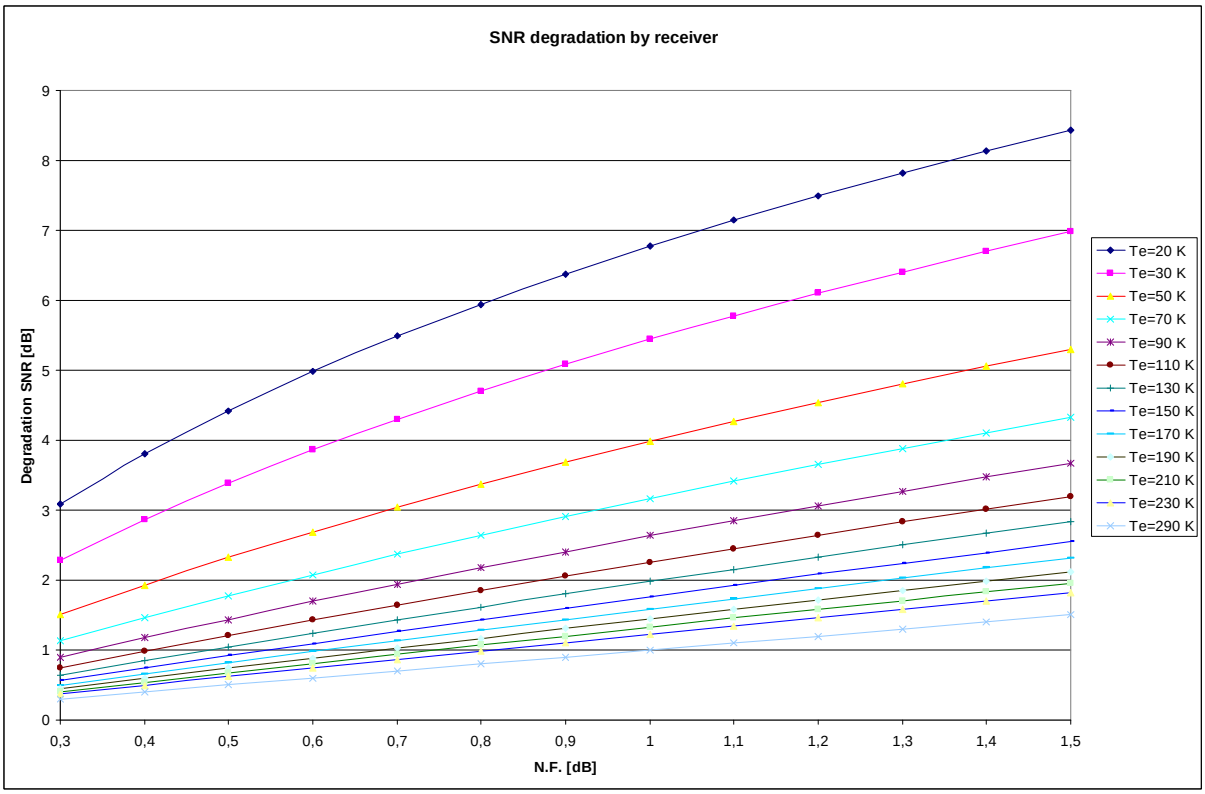
From the figure below we can read for example:

1. If Te is 290 K (terrestrial), then an improvement of receiver N.F. from 1 dB to 0,7 dB brings SNR higher about 0,3 dB.

2. If Te is 130 K, then an improvement of receiver N.F. from 1 dB to 0,7 dB brings SNR higher about 0,5 dB.

3. If Te is 70 K, then an improvement of receiver N.F. from 1 dB to 0,7 dB brings SNR higher about 0,7 dB.

4. If Te is 50 K, then an improvement of receiver N.F. from 1 dB to 0,7 dB brings SNR higher about 1,0 dB.


SNR degradation by receiver
Degradation SNR [dB]
N.F. [dB]
0
1
2
3
4
5
6
7
8
9
0,3
0,4
0,5
0,6
0,7
0,8
0,9
1
1,1
1,2
1,3
1,4
1,5
Te=20 K
Te=30 K
Te=50 K
Te=70 K
Te=90 K
Te=110 K
Te=130 K
Te=150 K
Te=170 K
Te=190 K
Te=210 K
Te=230 K
Te=290 K