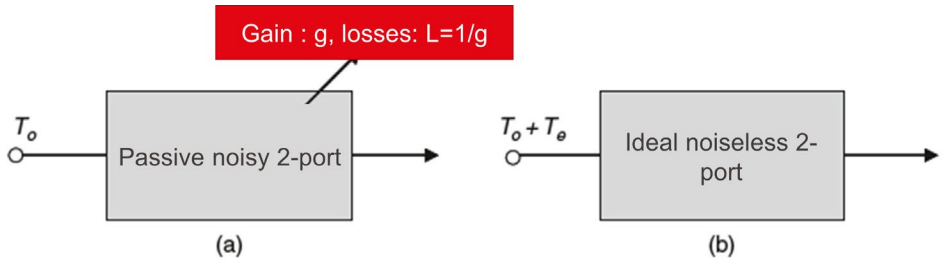
Analog Circuits for Biochip: exercises on antennas, antenna systems and RFID antennas

Exercise 1

Consider an antenna having a gain of 28.5 dBi and a system noise temperature (antenna + LNA) of 100 K. How much will the overall G/T of this antenna increase if we decrease the losses of the cable connecting the antenna and the LNA by 0.1 dB ? We consider an ambient temperature of 20° corresponding to 293 K.

Note: to do this exercise, it is useful to find eh link between noise figure and loss in the case of a passive two port device. To this aim, a passive noisy two port device can be described in two ways:



Exercise 2

Consider an urban cellular digital communication link (path loss exponent 3) where the data rate of the transmission is 10Mbits/s at a frequency of 5 GHz. The transmitter has a power of 2 W, and an antenna having an effective surface of 0.0028. The distance to the receiver is of 500m, and the receiver has an antenna having a gain of 10. The effective temperature of the receiver (antenna + 1st stage+ cable losses) is 300 K. What is the energy per bit to noise power spectral density ratio at the receiver?