Homework 1 Report

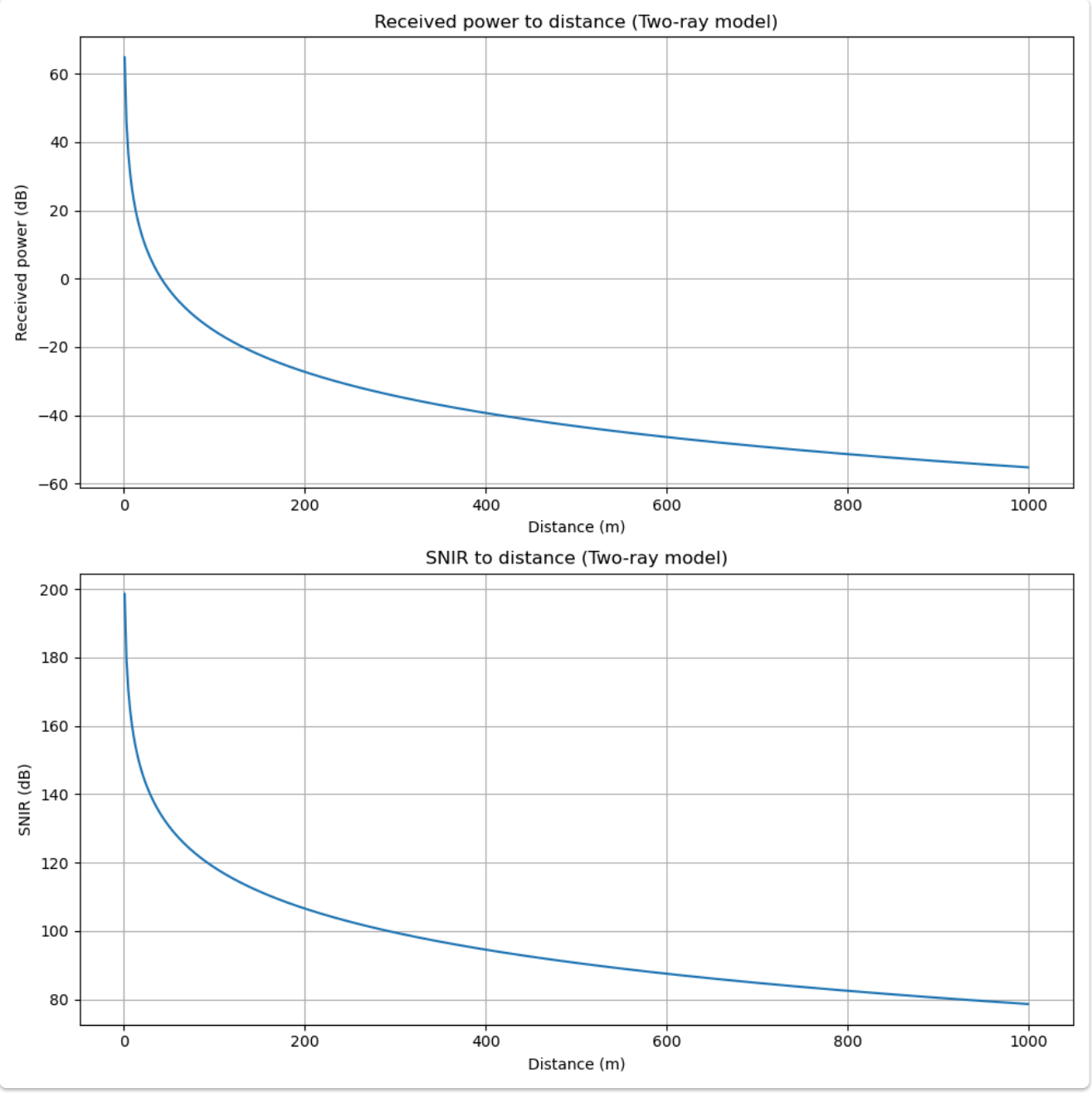
For both plots, there're total 500 data points within the distance of 1000m.
Notations:

- P_t is power of base station (in dBm)
- G_t is gain of transmitter antenna (in dB)
- G_r is gain of receiver antenna (in dB)
- h_t, h_r are height of transmitter and receiver (in m)
- d is the distance (in m)
- T is temperature (in Kelvin)
- B is bandwidth (in Hz)
- k is boltzmann constant = 1.38×10^{-23}

Problem 1 - Path loss only

For this problem, the received power (in dB) is calculated by $S = P_t + G_t + G_r + 10 \times log(h_t^2 h_r^2 / d^4) - 30$.

Noise here is the constant $N = k \times T \times B$, there's no interference thus $I = 0$, SNIR is calculated by S/N.



Problem 2 - Path loss with shadowing

Basically the same as P1, but S has to add X where X is a random variable (in dB) sampled normal distribution (`numpy.random.normal`) of zero-mean and $\sigma = 6$. In other words, $S = P_t + G_t + G_r + 10 \times log(h_t^2 h_r^2 / d^4) + X - 30, X \sim N(0, 6)$.

SNIR calculation is identical.