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Report

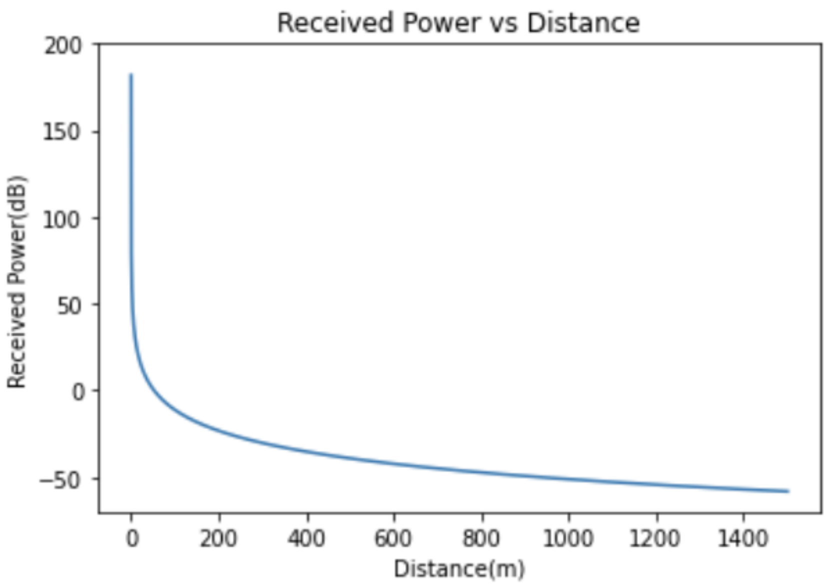
In this code, I used python, importing math, numpy, and matplotlib.pyplot for mathematical computation and graph plotting.

1.1)
This graph shows the received power vs distance between the Base station and the mobile. In this model, the path loss is $g(d) = ((h_t)(h_r))^2/d^4$. $P(r) = g(d)P_TG_TG_R$ if we don't take into consideration of shadowing and fading.

We can see that the receiving power is $P \sim 1/d^4$.

Theoretical Calculation:
h_t = 51.5 m
h_r = 1.5m
P_T = 33 dBm ~ 1.995 W
G_T = 14 dB ~ 25.119 W/W
G_R = 14 dB ~ 25.119 W/W

$P(r) = g(d)P_TG_TG_R$ —> change to dB



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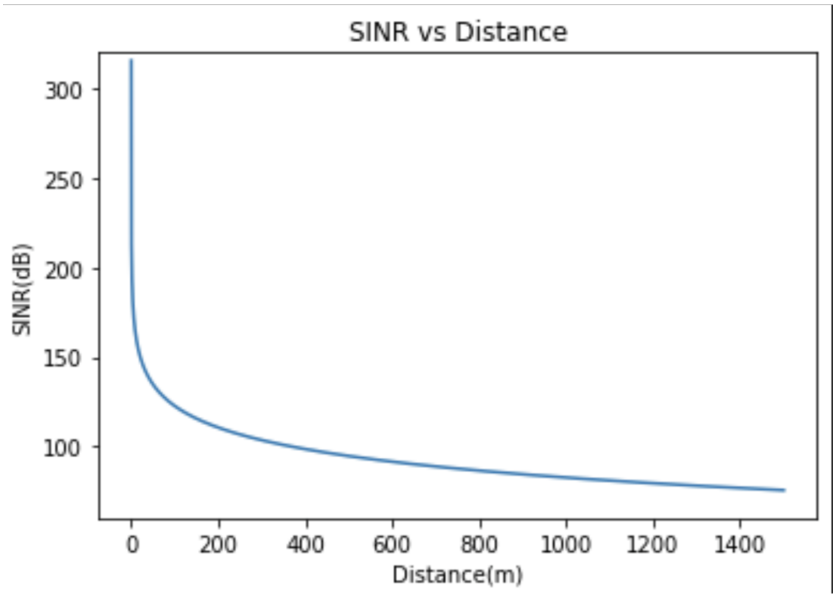
1.2) This plot shows SINR of the mobile device(in dB) as the y-axis and the distance between the BS and the mobile device (in meter) as the x-axis.

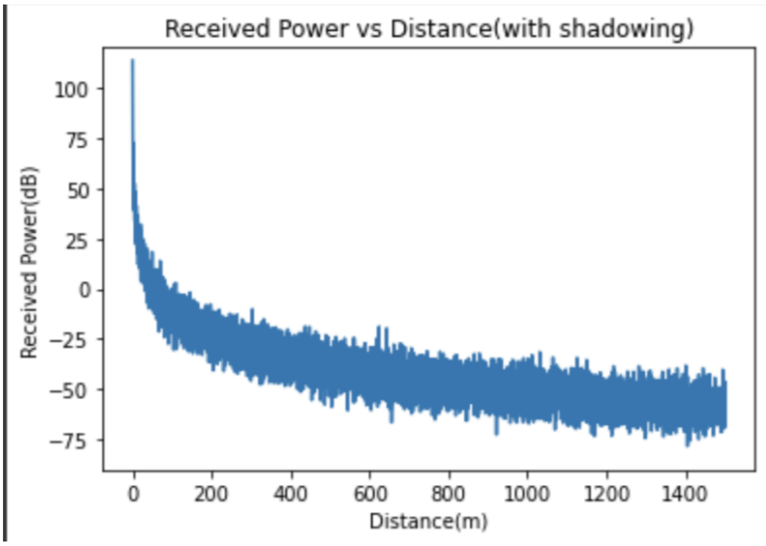
Since I(interference power) is not clearly stated in this example, so we set it to I = 0. SINR is given as SINR = Signal Power/(Interference Power + Noise Power), where P_R from the last part is signal power. Noise power is modeled as N = kTB, where k = $1.38*10^{-23}$, T = 300.15 K, B = 10MHz.

Calculate all in power, then change it to dB to get the following plot



2.1) The plot shows received power of the mobile device (in dB) as the y-axis and the distance (in meter) between the BS and the mobile device as the x-axis, but including shadowing. Sigma is 6, which uses a log-normal distribution with mean of 0.

Receiving power is original received power added on with shadowing
→ $P_R(dB) = \underline{P}_R(dB) + S$.



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2.2) This plot shows SINR of the mobile device(in dB) as the y-axis and the distance between the BS and the mobile device (in meter) as the x-axis, but with shadowing

Since I(interference power) is not clearly stated in this example, so we set it to I = 0. SINR is given as SINR = Signal Power/(Interference Power + Noise Power), where P_R from the last part is signal power. Noise power is modeled as N = kTB, where k = $1.38*10^{-23}$, T = 300.15 K, B = 10MHz.

Calculate all in power, then change it to dB to get the following plot