Introduction to Wireless and Mobile Networking: Homework 1

Submission rule

1. The file name of the report should be **b09901xxx_hw1_report.pdf**
2. The file name of the readme should be **b09901xxx_hw1_readme.pdf**
3. The readme should describe **how to "USE" your code** to get the result in your report
4. If you use C++, please DON'T submit .exe
5. Put the <u>report</u>, <u>readme</u> and <u>codes (MATLAB or C++ or Python)</u> in the same folder, which is named **b09901xxx_hw1**
6. Compress the folder to **b09901xxx_hw1.rar/b09901xxx_hw1.zip**
7. Submit the .rar/.zip to NTU Cool before deadline
   Please note that the homework submission system will turn off upon deadline.
   If you have troubles so that you cannot submit on time, please email to TA.
   However, the grade of late submission will be lower compared to those submitted on time.

Problem description

A base station and a mobile device locate in an urban area with temperature $27°C$. Here, we consider a downlink case. The channel bandwidth is 10MHz. The power of the base station is 33dBm. The transmitter gain and the receiver gain are both 14 dB. The height of the base station is 1.5m, which is located on the top of a 50m high building. The position of the mobile device is 1.5m high from the ground.

1. Consider the **path loss** only radio propagation (without shadowing and fading). Use Two-ray-ground model as the propagation model for your simulation.
   HINT: Please refer to slide 48 of Lec 2 for two-ray-ground model.
   1. Please plot a figure with the 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.
   2. According to 1-1, please plot a figure with **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.

2. Consider both the **path loss** and **shadowing** (without fading). Apply log-normal shadowing to model the shadowing effect. The path loss model should be the same as 1-1.
   HINT: Please refer to slide 52 and slide 53 of Lec 2 for log-normal distribution. Please set $σ = 6dB$ in the simulation.
   1. Please plot a figure with the 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.
   2. According to 2-1, please plot a figure with **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.