Exercise 2: Review of Coverage in Indian Homes/Hostels

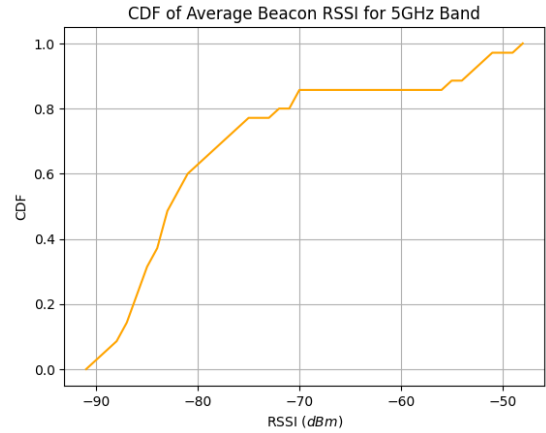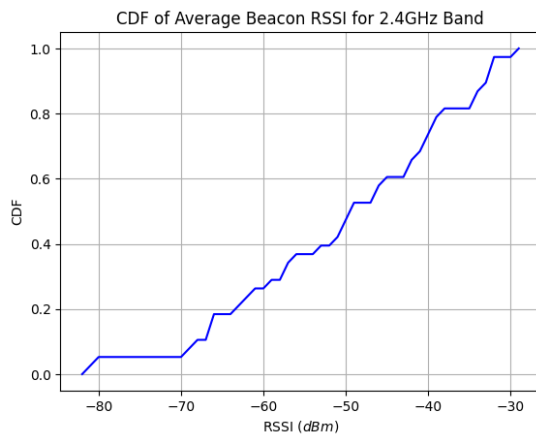**Arnav Mahajan**
EP21B004

I. INTRODUCTION

This exercise aims to analyse the performance of Wi-Fi coverage in the IIT Madras Hostel zone. Two sets of measurements have been made, each for 2.4GHz and 5GHz bands. Each of the bands has received about 30 pcap files.

The data extraction from pcap files was carried out using the file `process_pcap.py`, whose execution format is: `python3 process_pcap.py <pcaps_containing_directory> <search_ssid>`. Here, the file will iterate over all the pcaps in the input directory and return the average RSSI, number of beacons, number of walls, and distance from AP. Note that the directory can only contain either pcaps for 2.4GHz or 5GHz.
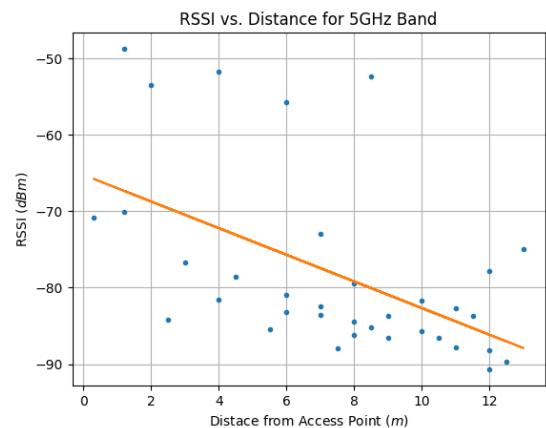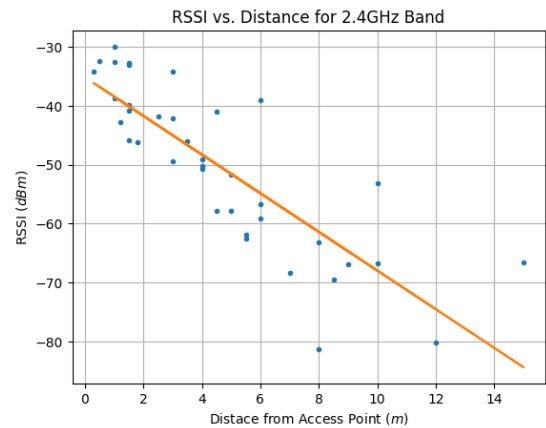
Further, plots were made in the Jupyter Notebook `analyse_pcaps.ipynb`.

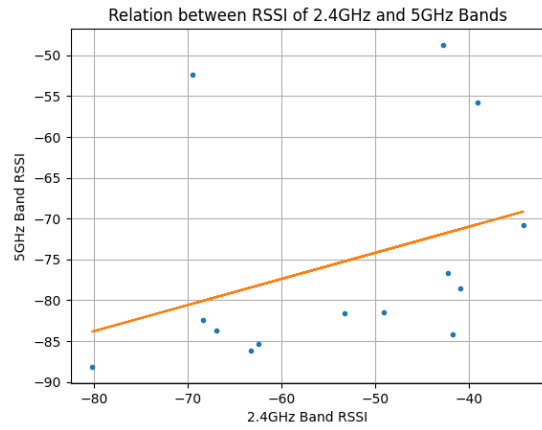## II. CDF OF RSSI

The Cumulative Distribution Functions of RSSI are plotted below. We can see that there is a higher density at lower signal strengths for the 5GHz band, which could be due to greater attenuation.

CDF of Average Beacon RSSI for 5GHz Band

CDF of Average Beacon RSSI for 2.4GHz Band

III. RSSI SCATTER PLOT

RSSI vs. Distance for 2.4GHz Band

RSSI vs. Distance for 5GHz Band

Relation between RSSI of 2.4GHz and 5GHz Bands

RSSI vs. Distance for Target AP & Interferer AP - 2.4GHz

RSSI vs. Distance for Target AP & Interferer AP - 5GHz

IV. PATH LOSS RELATIONS

The Path Loss Relation is of the form,

$$RSSI_{dB} = RSSI_{dB}^{Ref} + 10\gamma \log_{10} Distance + n\beta$$

Where,
γ is Path Loss Exponent
n is Number of Walls
β is Wall Attenuation Factor

Parameters obtained for both the bands were as follows,

	RSSI Ref. (dBm)	**Path Loss Exp.**	**Wall Att. Factor**
2.4GHz	-32.485	-0.8996	-5.625
5GHz	-69.783	-0.7764	16.193

Although the parameter values seem to be somewhat arbitrary, we can infer the lower RSSI for 5GHz. We expect the path loss to be higher as the frequency increases. The apparently lower value could be due to most of the values being saturated in the lower region.

V. INTERFERER ACCESS POINTS

Below are plots for a second Access Point, an Interferer, and the "Target AP". For the 2.4GHz case, we can see that the Interferer AP has significantly less contribution to the spectrum than the desired AP. For 5GHz case, it is seen that most of the points overlap and thus have an almost equal contribution to the spectrum.