

COMP4336/9336 Mobile Data Networking

Lab 6: Frequency Planning and RSS Measurement of Cellular Networks

Objectives

- To draw cellular frequency re-use patterns
- To measure and map cellular signal strength

Prerequisites

- Knowledge of cellular frequency re-use techniques
- Access to a mobile phone

Task-1 Frequency re-use [2 marks]

In this set of experiments, you will draw cellular frequency re-use patterns on tessellated hexagon maps.

- [0.5 mark]** For a frequency re-use factor of $1/9$ (cluster size = 9), show the nearest co-channel cells for cell-A shown in the map of Figure 1 (A blank hexagonal tessellation map is available from the following URL: <https://bblu.org/2014/11/27/jo/>). [Hint: you will have to work out the values of i and j first.]
- [0.75 mark]** For a frequency re-use factor of $1/12$ (cluster size = 12), show the nearest co-channel cells for cell-A shown in the map of Figure 1.
- [0.75 mark]** Using the map of Figure 1, show clusters of size 9 repeated all over the map. Use the letters A to I to represent the 9 members of each cluster. For ease of visualisation, outline the cluster borders with a different colour.

Submit the maps in your PDF report.

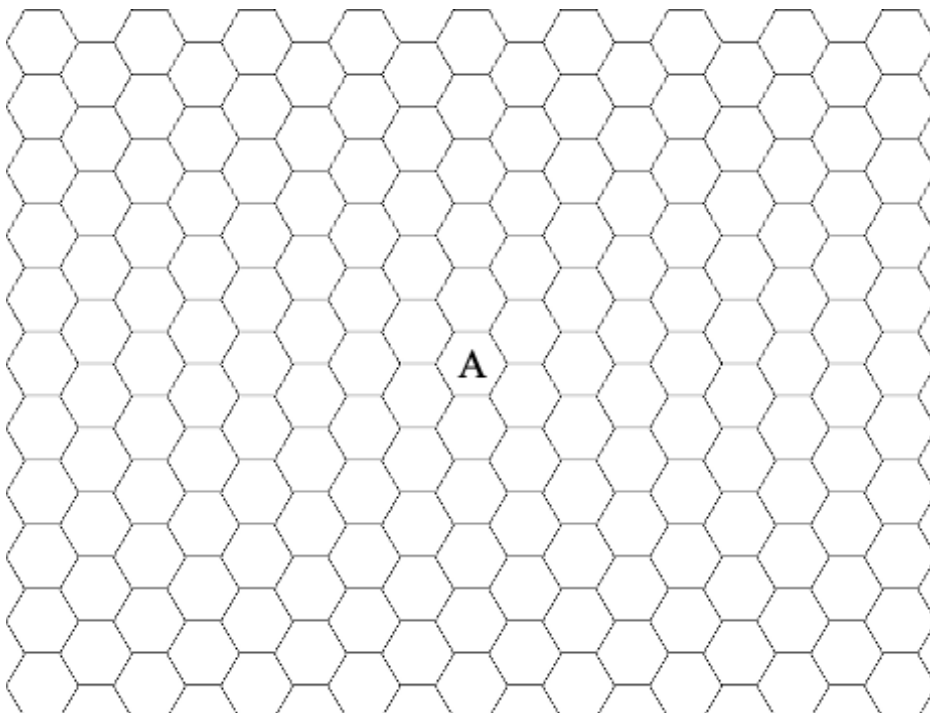


Figure 1: Tessellated hexagon map

Task-2 Measuring cellular signal strength [2 marks]

In this task, you will measure and analyse cellular network signal strength in your home. You will measure signal strength at different locations of your home and indicate them on a basic map of your home (optionally, you can create a MATLAB *temperature plot* to present your data, which is more visually appealing). The measurement should be repeated for two different heights, on the floor and at an elevated position, e.g., when the mobile phone is placed on a chair. Your measurement spots should not be further than 1 metre (horizontally) from the nearest spot.

The parameter you will measure is called Reference Signals Received Power (RSRP), which is type of RSSI measurement. It is actually the power of the LTE Reference Signals over a narrowband channel.

The measurement tool:

- **iPhone:** Open the "Phone" app on your iPhone and enter the following number exactly:
`*3001#12345#*`

Press the Call button to dial the number, this will immediately launch the hidden "Field Test Mode" app on the iPhone. Older iPhones may get a different menu than recent models. You can find RSRP or RSSI in dBm by searching in the app.

- **Android:** There are plenty of apps for android to observe RSRP. We recommend:
https://play.google.com/store/apps/details?id=com.wilysis.cellinfo&hl=en_AU
- **Other phones:** You can find an appropriate method similar to the above phones. If you have difficulty contact your tutor.

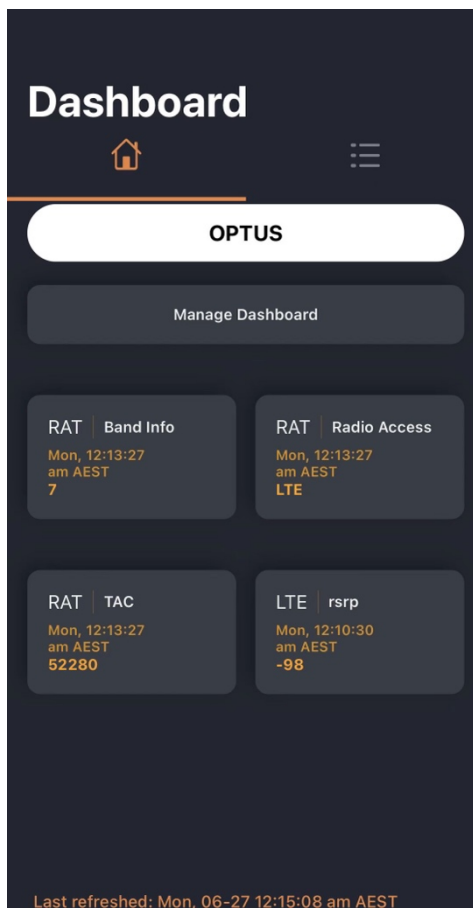


Figure2: iOS 15 RSRP

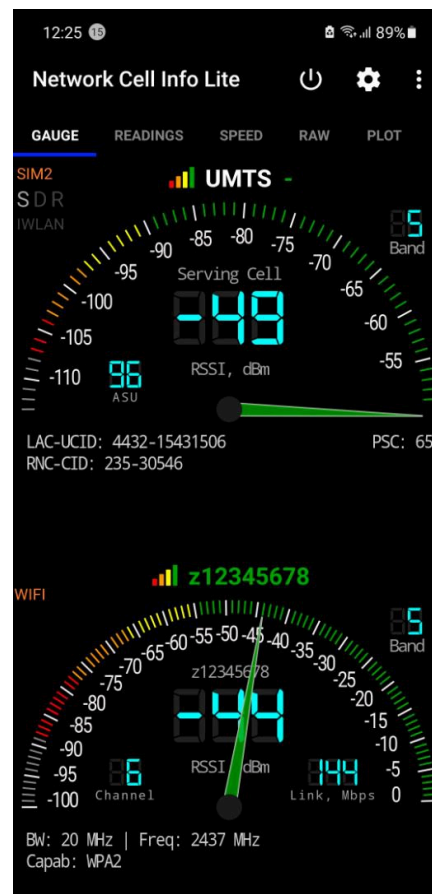


Figure3: Network Cell Info APP in Android

For both android and iPhone users, you may also find the second strong base station signal as a neighbour. If applicable please measure and compare the RSRP or RSSI of the current cell and the neighbour in three location and show them on another map.

Submit your report that includes the above tasks outcomes.

Penalty at the rate of 5% for each day late will be strictly enforced for all lab submissions. All submissions will be subject to strict UNSW plagiarism rules.

End of Lab 6 – Hope you enjoyed this lab.
