Lab 6: Observation of Bluetooth Low Energy Frequency Hopping

Objectives

- To observe and analyse BLE (Bluetooth 4) Frequency Hopping (Algorithm #1)

Prerequisites
- Access to MATLAB (All UNSW students have free access to MATLAB)
- Knowledge of Bluetooth 4 (BLE) frequency hopping Algorithm #1. This is covered in Lecture 5. You can also access more details of this algorithm from the following core Bluetooth document (page 2644): https://inst.eecs.berkeley.edu/~ee290c/sp18/note/BLE_Vol6.pdf

Your Tasks

1. Read Lecture 5 notes, listen lec5-video, and master the concept of Bluetooth frequency hopping in general and BLE fixed hop increment frequency hopping algorithm, a.k.a. Algorithm #1.
2. Install MATLAB and Communications Toolbox™ (UNSW provides free license to all students). Available from the following URL:
   https://www.it.unsw.edu.au/students/software/matlab.html
3. Read the Bluetooth frequency hopping example provided by MATLAB, which can be accessed at URL: https://au.mathworks.com/help/comm/examples/ble-channel-selection-algorithms.html#BLEChannelHoppingExample-28
4. Open the frequency hopping example in Matlab by running the following command:

```
openExample('bluetooth/BLEChannelHoppingExample')
```

A new file will be opened in Editor and you should click on the Run button to execute it. You are **not** going to edit the code or understand all the lines. After running the example, answer the following questions and submit them as a PDF report:
   1- Explain Algorithm #1's calculations and equation when *unmappedChannel* is a *good* channel. **(1 mark)**
   2- Explain algorithm #1's calculations and equation when *unmappedChannel* is a *bad* channel. **(1 mark)**
   3- Use the "graphical user interface" in the example to run algorithm #1. Now consider that, in the vicinity of the Bluetooth network, a 2.4GHz WLAN is operating on WiFi Channel 1. Work out and select the *good* and *bad* channels for this scenario. Select a *hop increment* of your choice, set the *number of channel hops* to 10, tick the Visualization and generate the hopping sequence for these 10 hops. Add the resulting figures to your report and explain the figures in one paragraph. **(2 marks)**

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 5 – Hope you enjoyed this lab.