# Section C – Final Report

Before doing real-world tests on the two network protocols theoretical studies were done on each protocol. The protocols had their performance assessed on five key metrics:

Which are the following: (i) coverage area, (ii) Data rate (iii) transmission rate (iv) signal strength and (v) Efficiency

Theoretical study

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| --- | --- | --- |
|  | **802.11a (5GHz)** | **802.11g(2.4GHz)** |
| **Coverage range** | 35-125m | 38-140m |
| **Network Bandwidth** | 54MBps | 53MBps |
| **Data rate** | 12.1-134 MBps | 70-78MBps |
| **Transmitting rate** | 80MBps | 64.5MBps |
| **Signal strength** | 31 Dbm | 31 Dbm |
| **Efficiency** | 134 hours | 134 hours |

Real-world test results

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| --- | --- | --- |
|  | 802.11a (5GHz) | 802.11g(2.4GHz) |
| Coverage area | 24m | 44m |
| Transmission rate | 12 - 120 MBps | 66-68MBps |
| Signal strength | 36 DBm | 36 Dbm |
| Efficiency | 50 hours | 50 hours |

In the first criteria the coverage area the real-world tests conducted proven that the networks are not as efficient as what was identified in the theoretical study. This was mostly noticed for the 802.11a protocol where at a range of 24 meters the Receiver(laptop) started to experience connection issues which further on lost the connection. On the other hand, the 802.11g network coverage area was found to be between the between the values displayed in the theoretical study

For the second criteria Data rate, these values were obtained from doing the real-world tests. The reason for these figures is to determine the maximum theoretical value that the channel can transmit bits in a second if there were no losses or interference the wireless link. Although this exact number will never be true as there will always be some minimal loss when emitting a wireless network this gives an idea of what to expect when from the throughput.

Transmitting rate also knows is throughput is the practical values that the wireless link can achieve. As already explained here will be some losses and interferences in a network which will decrease its performance. The values obtained in the real world tests were 12 – 120 MBps for the 5GHz protocol and 66-68 MBps for the 2.4GHz protocol. Both of these values are lower than what was recorded in the data rate which proven that some losses were occurred.

In the fourth criteria the signal strength was measured, first the theoretical values were identified, This was done by checking maximum transmitting power provided by the raspberry Pi 3 b+ through the config. The results from this research was a value of 31Dbm. Like the data rate this value is very difficult or impossible to reach due to having some losses and interferences. After doing real-world tests to obtain the real transmitting power which are provided in table 2 it was identified that both protocols have the same power of 36Dbm which resulted into a 5Dbm loss for each.

The last criteria which the setup was assessed on is the efficiency of the raspberry Pi with the portable battery. By determining the raspberry pi’s current consumption under the two different operational modes and supporting several traffic loads, its battery can be accurately dimensioned. This is a crucial factor due to the strict load’s weight restrictions which is imposed by drones. For this research study a power bank of 100,000mAh was used and a raspberry Pi 3b + which has a current Consumption of 0.55A. Using mathematical equations, I was able to identify the theoretical maximum amount of time the Raspberry Pi would last which I a total of 134hrs. When testing the setup in real world the result was much different to what the theoretical value was. Due to the age of the power bank and other loss factors it was able to stay powered on for around 50 hours. Although this amount of time is less than what was obtained in the research this is more then enough time for this research study as a single drone flight is around 20 minutes.