

**Taste of Research
Gough Yumu LUI
Engineer's Log Book**

Week 6

- Monday 3rd January 2011

Today is a public holiday, and therefore the uni is closed. This means that the normal Monday meetings are going to be cancelled – and we'll be jumping straight into work on Tuesday.

You will notice that there is no log for Week 5 – this is because Week 5 was spent recovering from surgery – see the following photos for dramatic effect:



Before Surgery



At Maximum Swelling

These images have not been digitally altered. Anyway, I'm pretty much all recovered – there's still some swelling inside and some gum pockets which I have to keep clean, but at least, I look normal, I can eat pretty much normally, I can talk normally and there's no pain. I couldn't say that about Week 5 when I was still in so much pain that showering, and even walking, induced pain into my swollen jaw area. I did see my doctor for a post-operative appointment – he told me everything was going well and there should be no problems.

Meanwhile, in the two week uni shutdown – I had a chance to go back to my dad's and live with him for the two weeks. After the family divorce, during uni session, I live with my mum for almost all of the time and I don't usually have a chance to see my dad because of time. Mum's is closer to uni and makes travelling easier (but it's still 3-4 hours a day on a good day). Over with dad's – we had the chance to catch up a bit, and I ran experiments on my SDR receiver. I did 2Mhz DDC Bandwidth captures for about 10 days – which spat out 10Tb of data for me to analyse later (when I do have some time) – I managed to capture a lot of HF transmissions I could never hear when I was at my mum's (owing to the better noise conditions at my dad's and the ability to string out a 30m antenna). I even managed to capture the boats doing the Sydney to Hobart race – all of them were audible! Those two weeks managed to provide me time to recover further from the surgery as well.

- Tuesday 4th January 2011

Today, I was back at uni ready to get back to work. Unfortunately, I was met with a few challenges – the powerpoint that I normally use to power the router has since gone dead, all of the power was switched off to my laptops and devices – preventing them from staying topped up – so they decided to flatten their batteries over the break. I had to turn everything on and get things charging before I could start testing – most crucially, the PDA with the GPS app which I use as a clock. Unfortunately, I couldn't afford to wait a day for it to completely charge, so I started with it half charged.

I managed to borrow the HP laptop from Binghao and run tests on that. I also ran tests on the MSI Wind U100 that I own – with the Broadcom BCM4312. The issue with the powerpoint not working was resolved by using a different powerpoint that was further away and leading an extension lead to it. The inverter was not used for this set of tests – we didn't need it because we would be relying on the batteries inside the laptop as each laptop would only be doing one run – and that way – we won't need the extra bulk of the battery and the inverter. The data was collected for analysis later.

Binghao also told me that he would not be in the office on Wednesday and Thursday and that Thomas Gallagher would be back on Thursday so I could deal with him on the tag and phone.

- Wednesday 5th January 2011

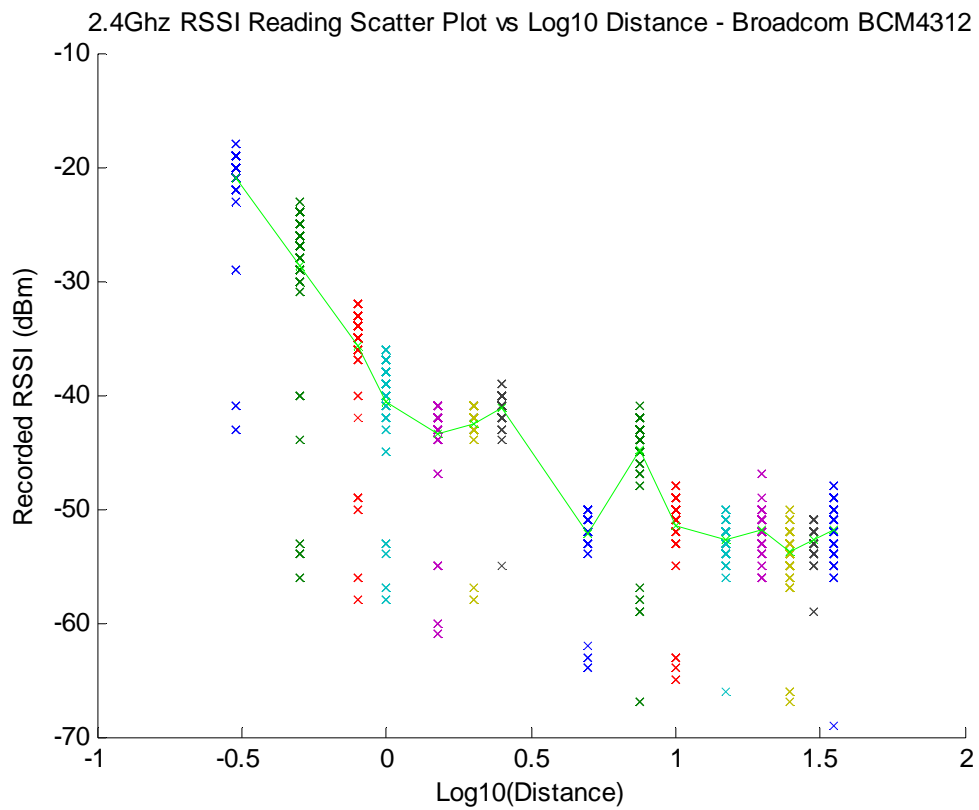
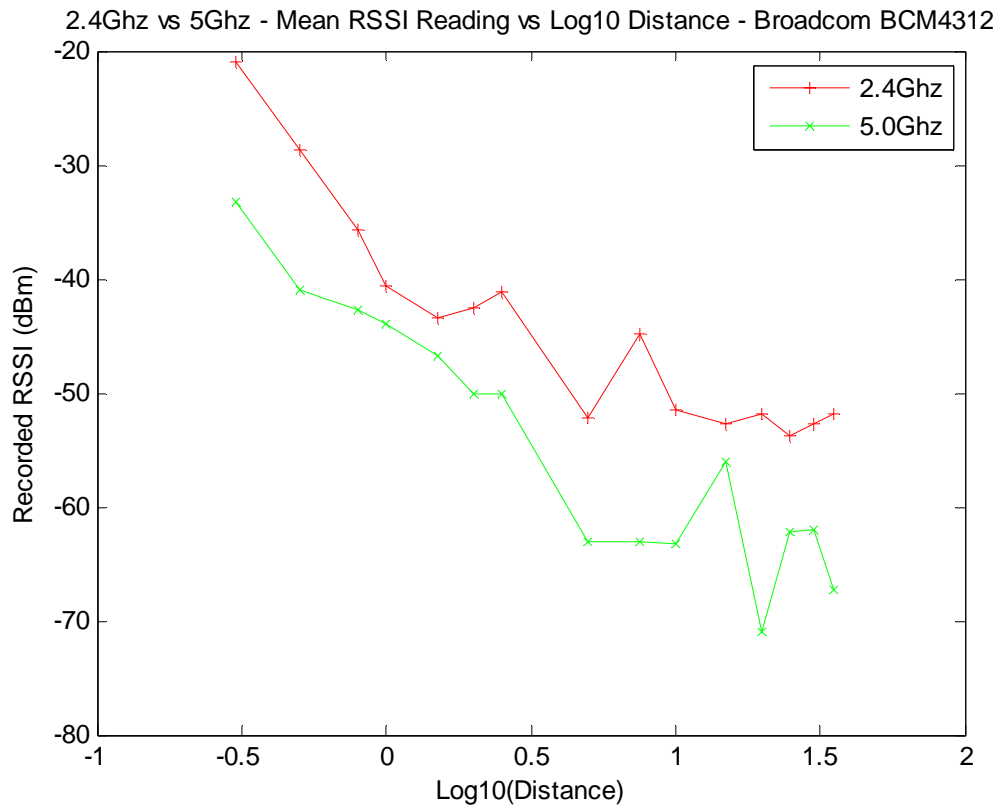
I didn't go into uni today. I told Binghao that I may or may not be in – unfortunately due to personal circumstances, I didn't make it. But I did do a little data analysis at home of the results collected yesterday.

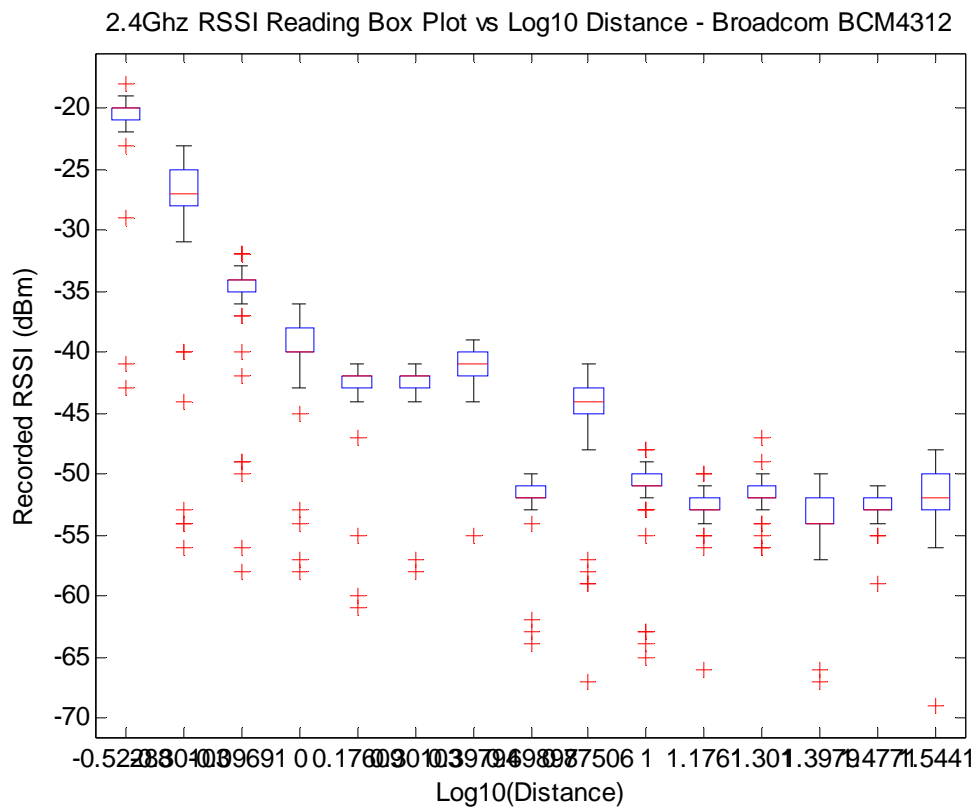
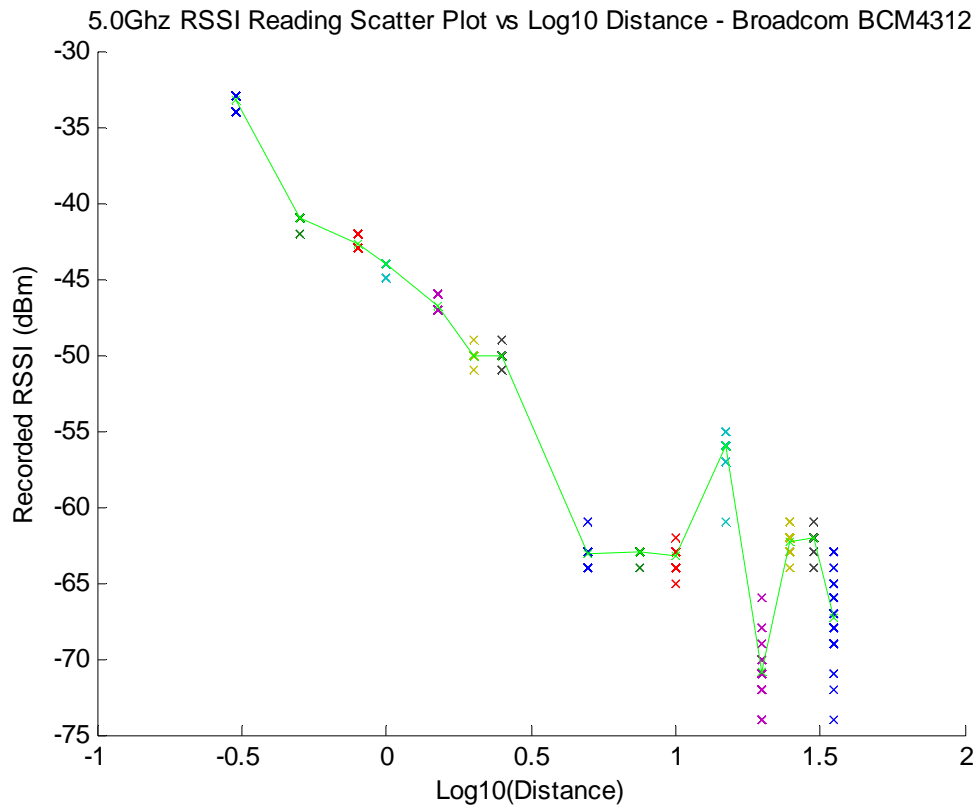
Unfortunately, as I didn't realize the version of inSSIDer was modified on Binghao's laptop, the results collected were completely unusable as the GPS timestamp was fixed somehow. This resulted in files with no distinguishing time, except for in another tag, which appeared to be based on system time which was out by a whole day due to drift (possibly). This means that the laptop will have to be retested.

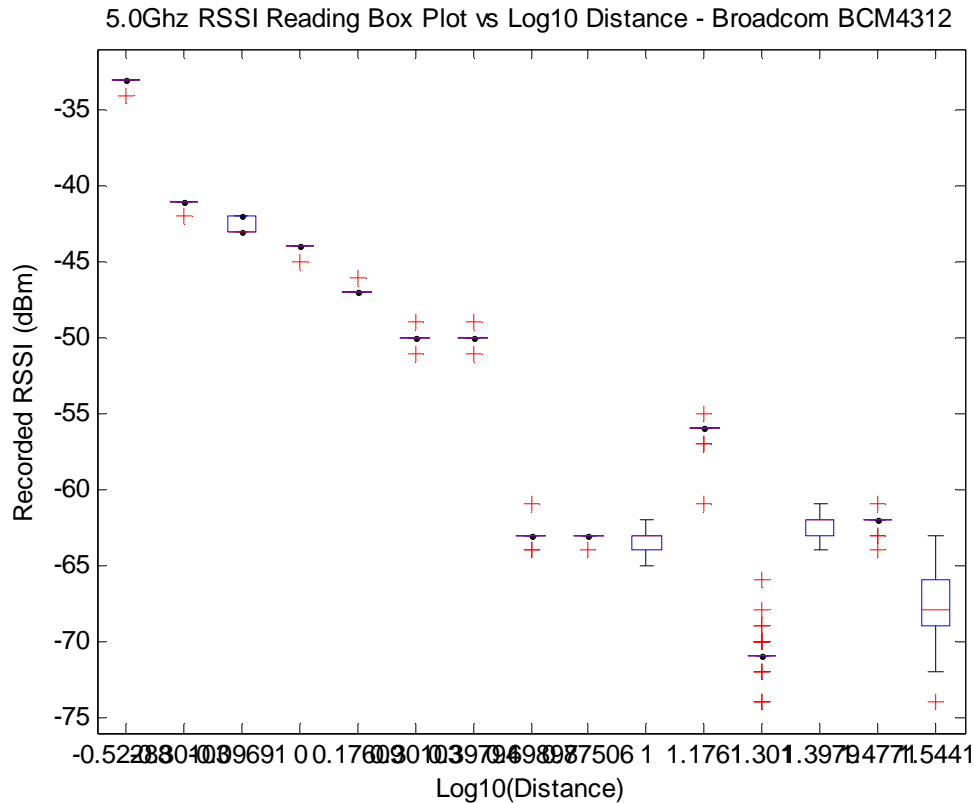
There was no such problem with the MSI Wind U100 laptop though – the results are as follows:

Distance	2.4Ghz	5Ghz
0.3m	212	212
0.5m	205	205
0.8m	199	199
1m	175	187
1.5m	174	179
2m	153	167
2.5m	147	161
5m	126	160
7.5m	199	220
10m	195	211
15m	195	198
20m	167	186
25m	172	181
30m	155	167
35m	151	152

The sample numbers are a bit lower than expected even with the revised technique due to the low CPU power of the laptop involved in the test. As the card is an internal card, there is no way around it short of transplanting the card into a different laptop (which I was not prepared to do).







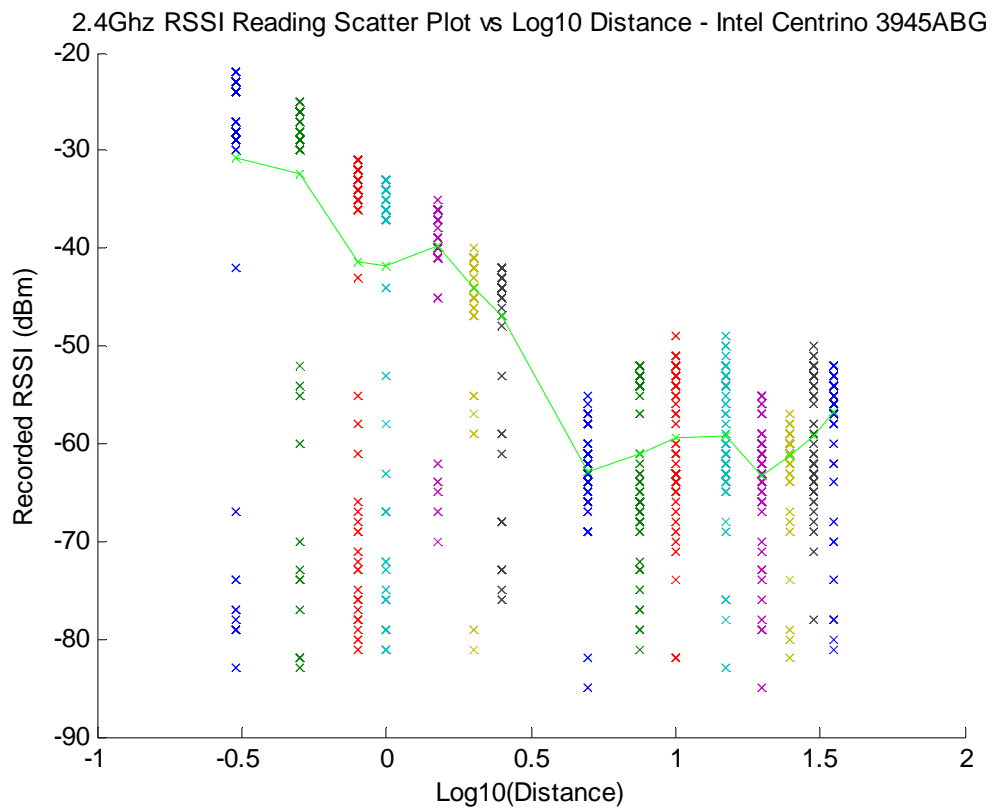
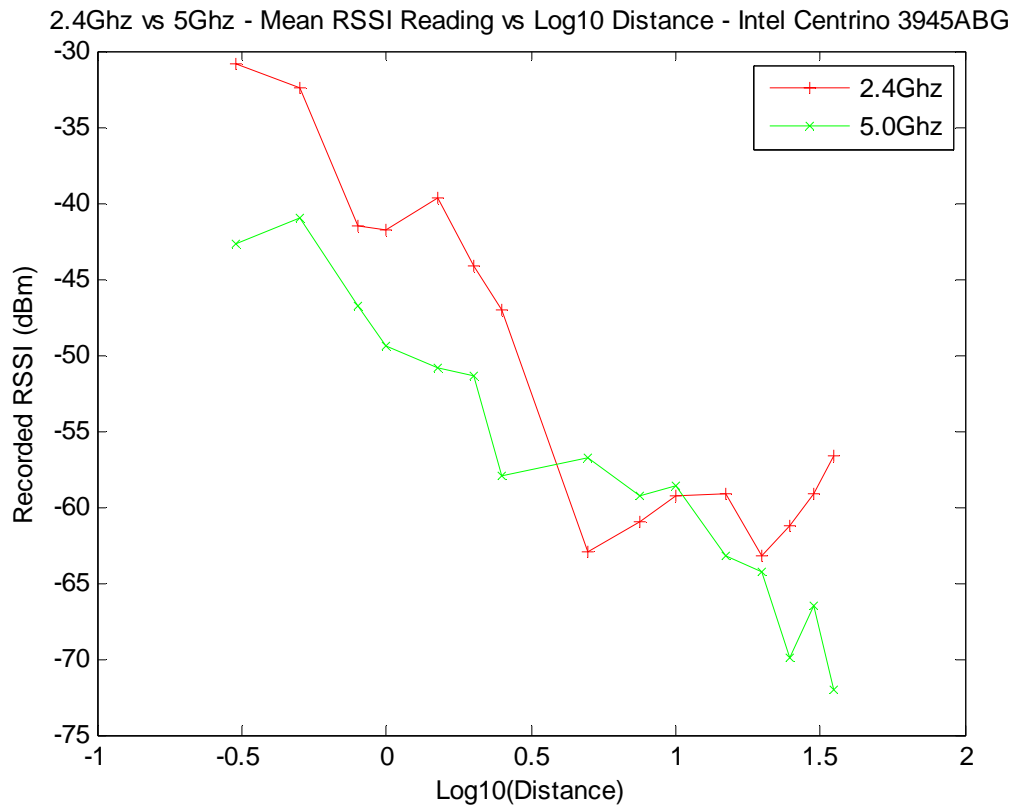
- Thursday 6th January 2011

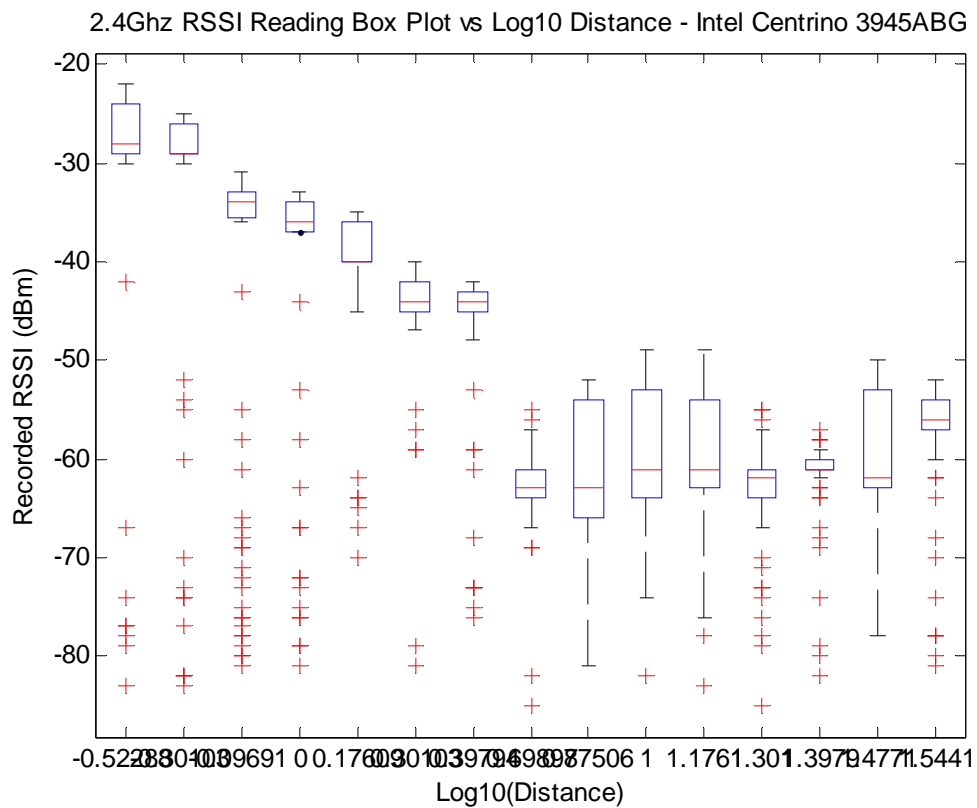
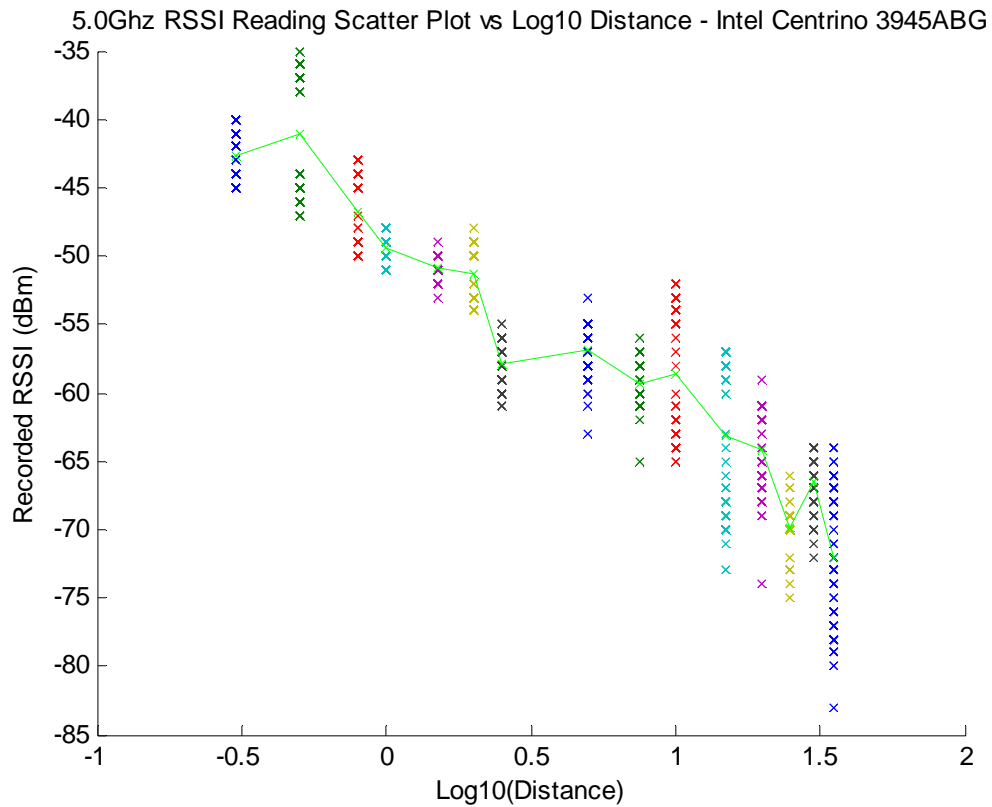
Today, I went back to uni as promised to continue testing. Binghao was not in, as he informed me prior, but I continued testing laptops – slowly inching forward toward finishing all the laptop tests. Today, the BenQ R55UV10 laptop with the 3945ABG was tested, as was the eeePC701 with the 5006UG and a HP Pavillion dv4000 laptop with a 2500BG. Note that it is not a 2915ABG as I thought it was earlier – and hence the table in the later text has been updated to correct this error.

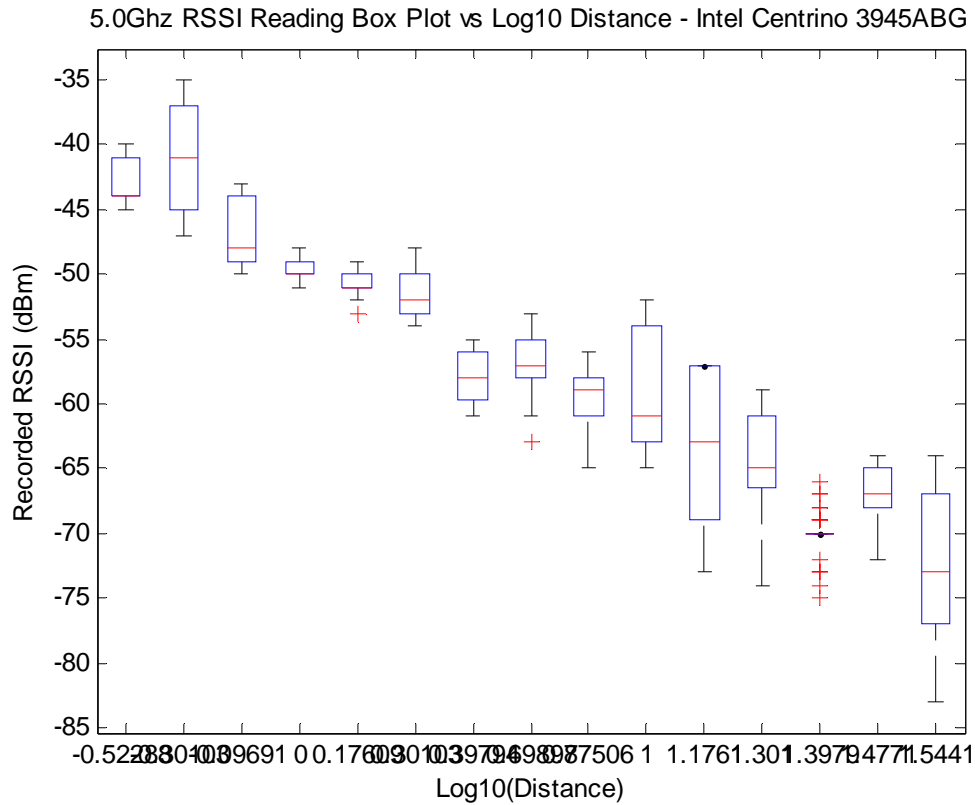
First – the test results for the 3945ABG:

Distance	2.4Ghz	5Ghz
0.3m	228	229
0.5m	218	228
0.8m	228	228
1m	227	226
1.5m	224	224
2m	224	224
2.5m	221	223
5m	222	224
7.5m	231	231
10m	230	230
15m	226	229
20m	218	228
25m	223	223
30m	222	221
35m	218	219

Sample numbers all look good, above 200 samples for each point is a good result. Which is expected since this is a dual core laptop with good amount of processing power – seems to correlate well with less lost samples.



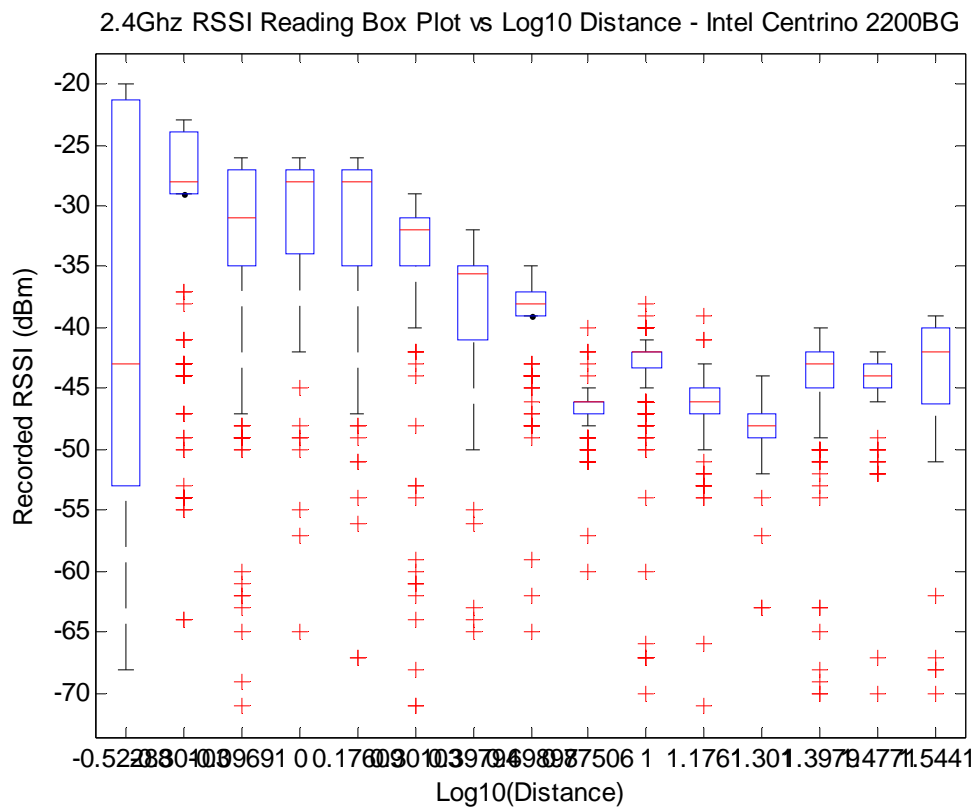
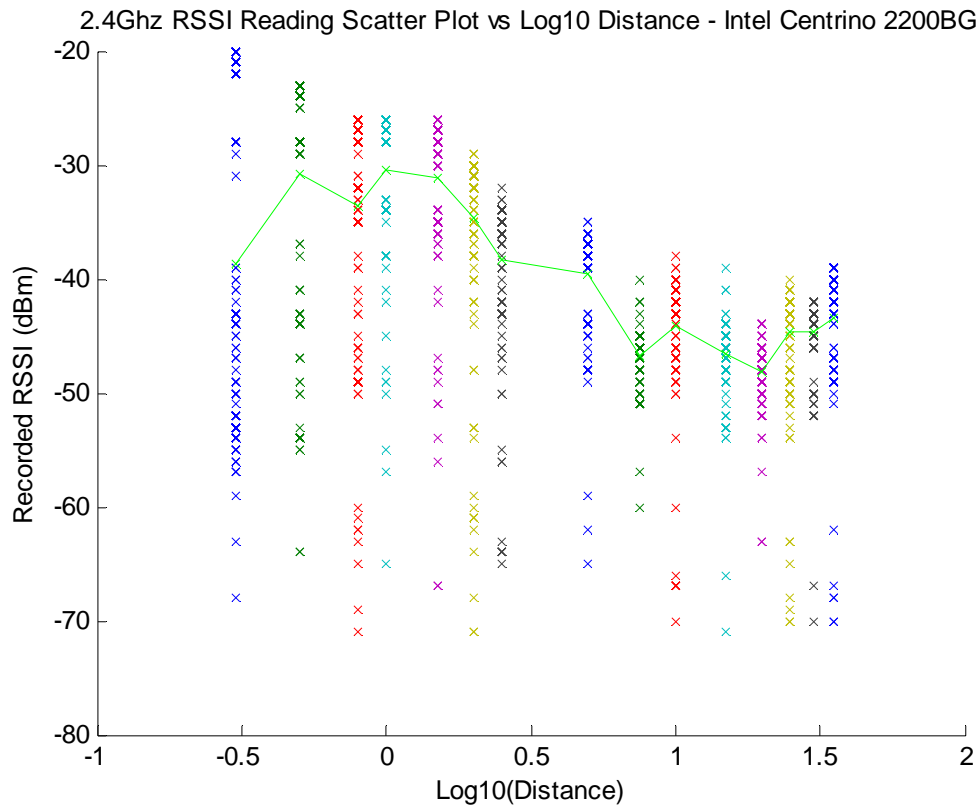




First – the test results for the 2200BG:

Distance	2.4Ghz
0.3m	203
0.5m	202
0.8m	195
1m	195
1.5m	196
2m	197
2.5m	192
5m	195
7.5m	210
10m	205
15m	204
20m	206
25m	197
30m	195
35m	189

Sample numbers are pretty good. CPU was not as powerful, it can be seen in the figures that the number of samples were somehow distorted to below 200 figures. It can be seen that the closest distance shows a lot of variation for unknown reason – this maybe an environmental effect. I think that the nearest distance suffers from alignment issues since the antenna is inside the laptop lid – it maybe at a different level to that of the access point and therefore shows a reduced signal level similar to what is seen in the 3945ABG.



And finally, onto the eeePC701 with the Atheros card where we hit a snag, yet again. This time, unfortunately, the same problem encountered earlier reared its head – an incomplete GPX file. This required the data to be re-collected in order to complete the set of data. This was a job for tomorrow.

Thomas did turn up after midday having just disembarked from his flight. He did not have the key for his laptop so he decided to call it a day and head home and do testing on his devices tomorrow.

- Friday 7th January 2011

All of the data analysis seen was actually performed on this day. In the prior days, we were mainly concerned with collecting data only as I was busy with personal issues with family. The data for the eeePC701 was completed by retaking the missing data – the results are as follows:

Distance	2.4Ghz
0.3m	185
0.5m	172
0.8m	174
1m	163
1.5m	144
2m	135
2.5m	132
5m	200
7.5m	193
10m	190
15m	184
20m	175
25m	169
30m	154
35m	136

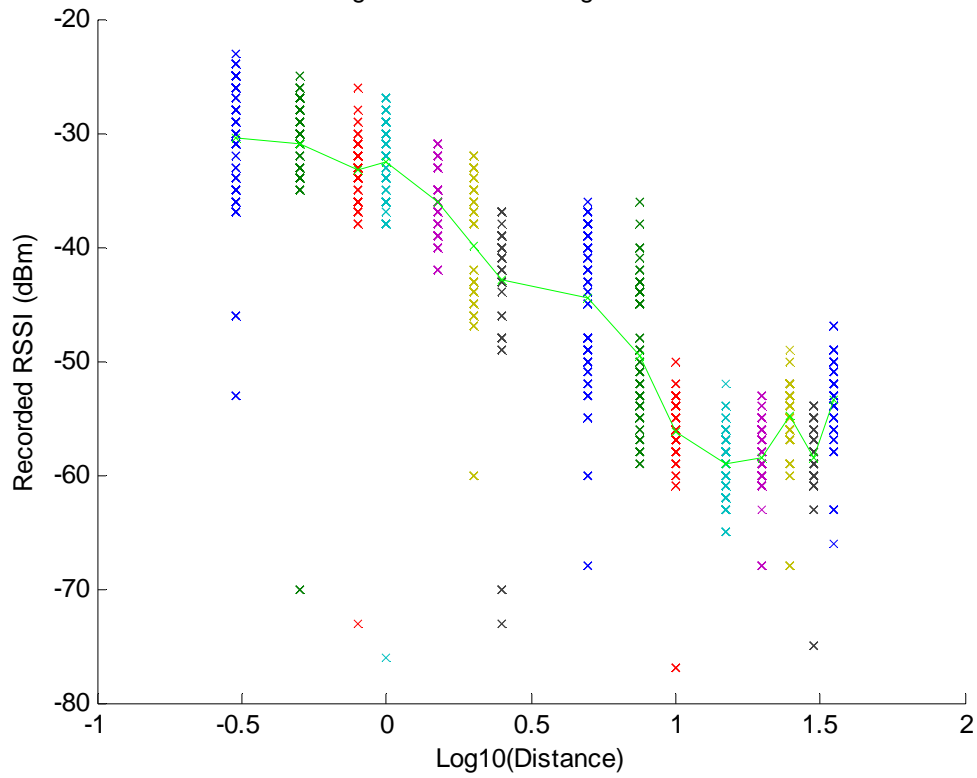
As you can see, the sample numbers vary through a pretty large range on this device. This is due to its very limited CPU ability. However, that being said, the target of 100 samples at every point was achieved. The graphs are shown overleaf.

I also met with Thomas who, again, had forgotten his key. He went to retrieve it while the test setup was being prepared and the eeePC701 being retested. Initially, he believed the phone was ready to do testing, but a preliminary check showed the phone didn't behave as expected. I told him that we would worry about it after he had gotten back from getting the key. Due to a few factors, we only commenced testing the HTC Android based phone after lunch, while Thomas helped me try and find a way to work the tag from a power supply.

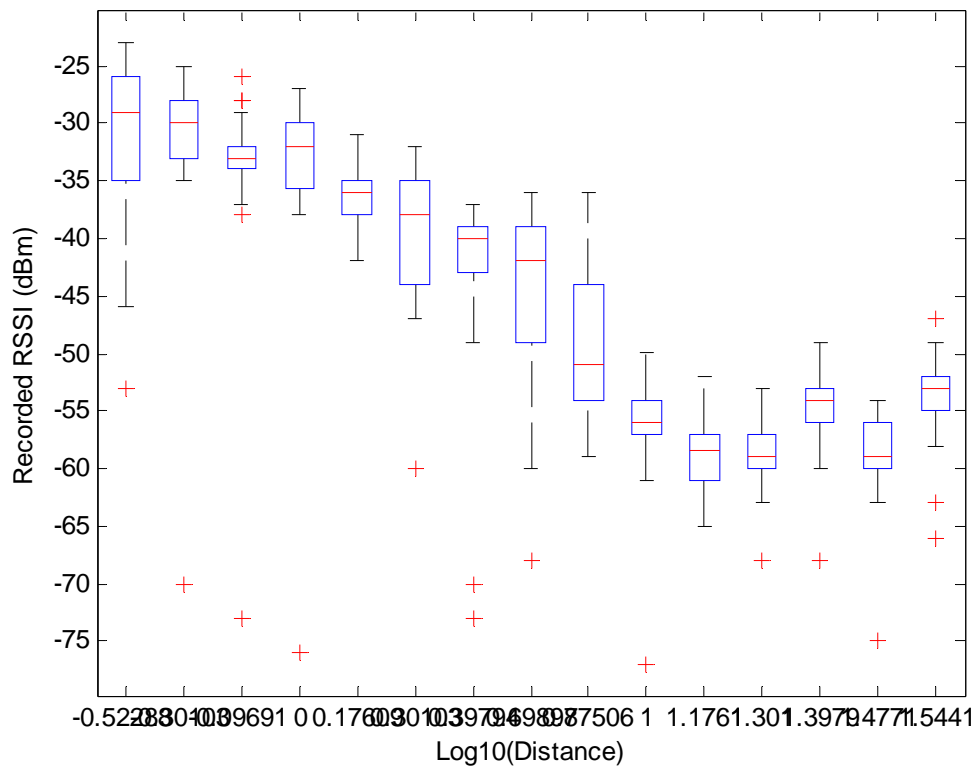
The android phone was tested, and Thomas helped me download the data into a text file and e-mailed it to me. I will have to modify my program to process this format of data in a similar way to what is done with the other devices in order to be fair. I decided to call it a day early since I had to analyse the data collected earlier in the week.

Meanwhile, Thomas was testing batteries on the bench and we realized that almost all the chargers and good batteries have been taken away by another team. There was a battery left on the table – I'm not sure it's the same one I used before the break, but it seemed to be dead and only measuring 5 volts. The charger even refused to charge it. The only batteries left had corrosion signs, and sometimes were scribed with the word "dead" on them. Luckily I didn't have to use the inverter for these tests – so I didn't have to worry about it yet – but I will have to worry about it soon as I will need to do outdoor testing. Unfortunately, the weather outlook is not especially rosy – the weather is apparently going to be rainy (again) which spoils the fun. Best for it not to be sunny though – as it would make it uncomfortable to do testing.

2.4Ghz RSSI Reading Scatter Plot vs Log10 Distance - Atheros 5006UG



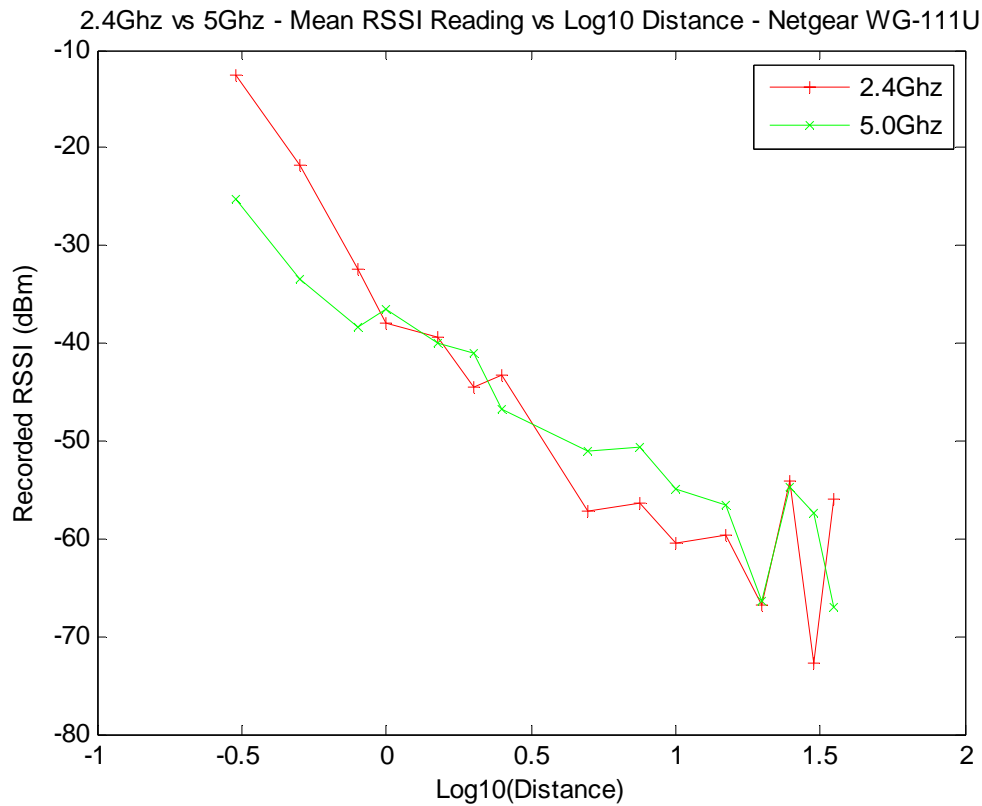
2.4Ghz RSSI Reading Box Plot vs Log10 Distance - Atheros 5006UG



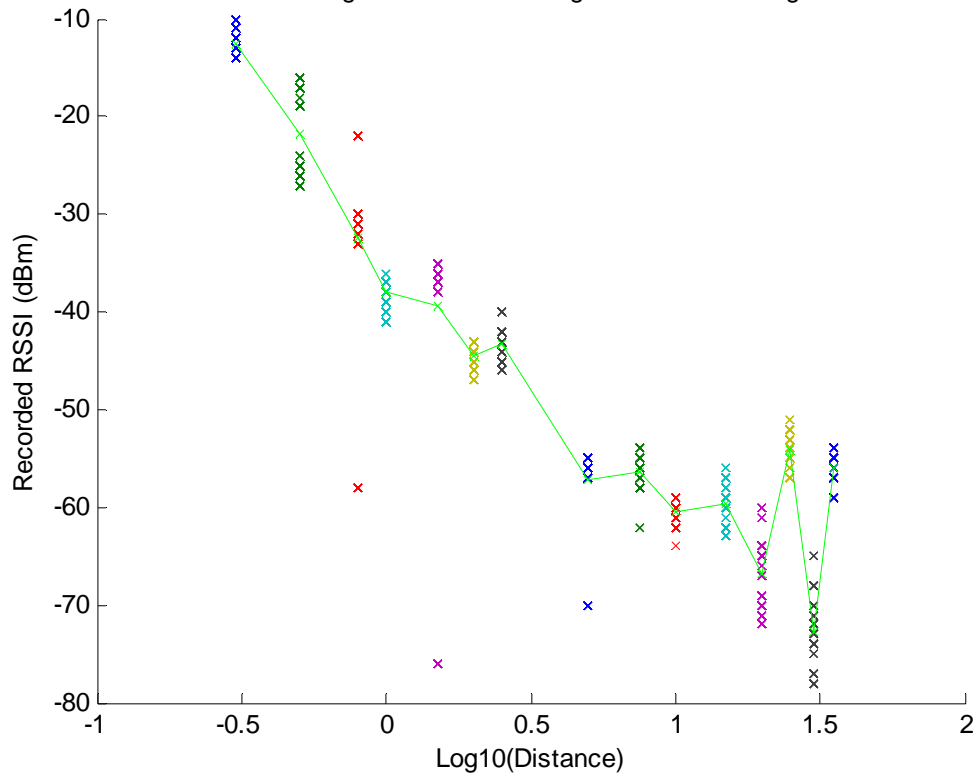
And I almost forgot, I decided to begin retesting cards with a low number of samples – first up was the Netgear WG111U with the new test method:

Distance	2.4Ghz	5Ghz
0.3m	225	225
0.5m	222	222
0.8m	220	220
1m	217	217
1.5m	215	215
2m	211	211
2.5m	211	211
5m	215	215
7.5m	225	225
10m	222	222
15m	220	220
20m	220	220
25m	215	215
30m	215	215
35m	209	209

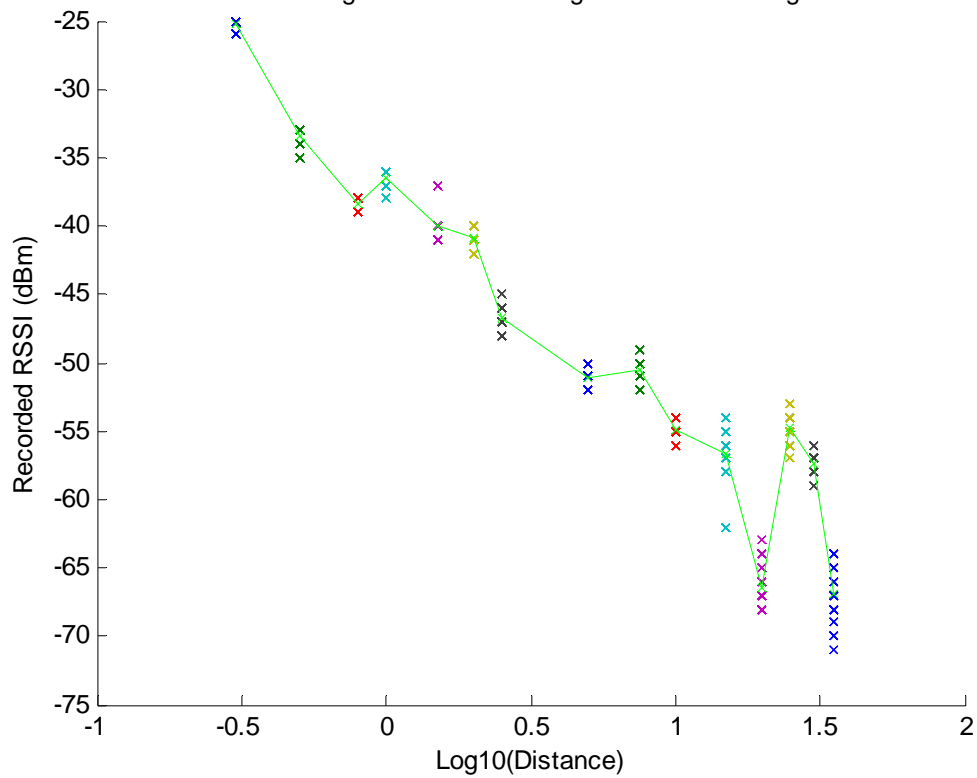
A quick cursory glance of the means in the graph below suggests that the test method is very valid as the resulting means are very close together and have very similar trends. Unusually, this card seemed to be just as good at picking up the 2.4Ghz signal despite having other access points competing for the channel as the 5Ghz where it was on a clear channel by itself. The sample numbers usually don't match so well – this maybe suggestive of Atheros behaviour of “caching” scan results to return to the OS.



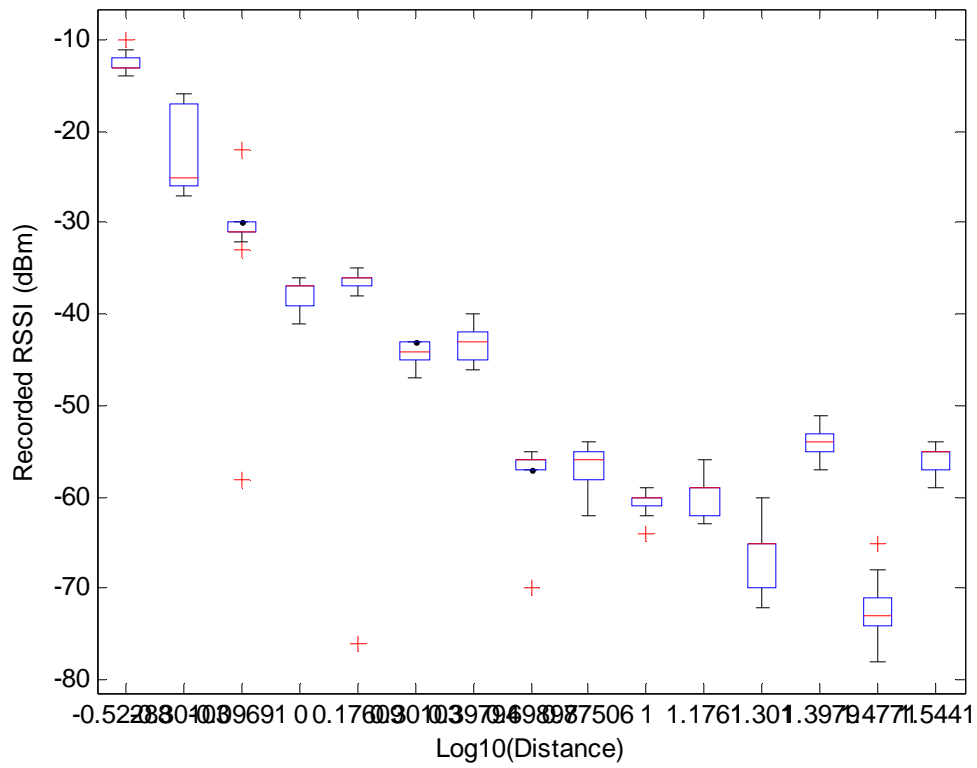
2.4Ghz RSSI Reading Scatter Plot vs Log10 Distance - Netgear WG-111U



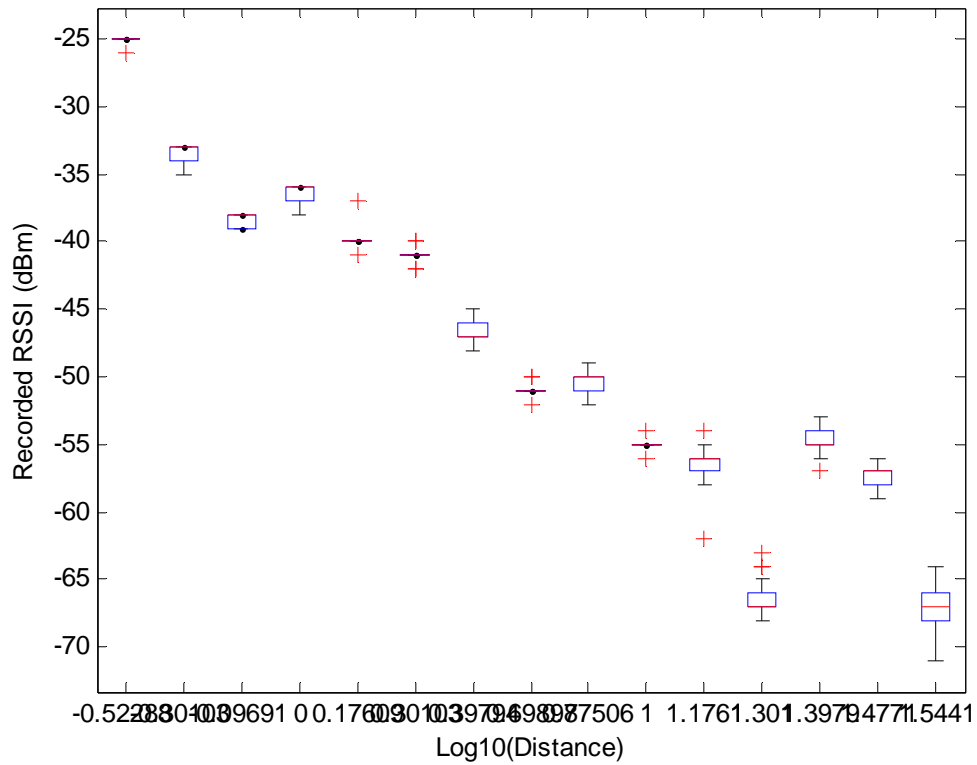
5.0Ghz RSSI Reading Scatter Plot vs Log10 Distance - Netgear WG-111U



2.4Ghz RSSI Reading Box Plot vs Log10 Distance - Netgear WG-111U



5.0Ghz RSSI Reading Box Plot vs Log10 Distance - Netgear WG-111U



The updated list of devices and statuses are below:

Number	Card	Status
1	Belkin Play	Awaiting Retest (inSSIDer issue)
2	Netgear WG111U	Retested - OK
3	Billion BiPAC 3011G –A	Tested
4	Billion BiPAC 3011G –B	Tested
5	Billion BiPAC 3011G –C	Tested
6	Netgear WPN111	Tested
7	Netgear WG111v2 –A	Tested
8	Netgear WG111v2 – B	Tested
9	D-Link DWA-140	Tested
10	D-Link DWL-122G	Tested
11	Netgear MA101	Tested
12	Diamond Digital A101 –A	Tested
13	Diamond Digital A101 –B	Tested
14	Broadcomm BCM4312	Tested
15	Intel Centrino 3945ABG	Tested
16	Intel Centrino 2500BG	Tested
17	Atheros 5006UG	Tested
18	Android Mobile Phone	Tested (Analysis Pending)
19	Roving Networks Wireless Tag	Not Yet Tested
20	Intel Wifi Link 5300	Awaiting Retest (inSSIDer issue)
21	Nokia N95	Not Yet Tested

The plotall.m file will not be updated until all the analysis is complete (to save time).