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| <input type="checkbox"/> Test Plan (TP) | <input type="checkbox"/> Release Note (RN) |
| <input type="checkbox"/> Bug Report (BR) | <input type="checkbox"/> Training Material (TM) |
| <input checked="" type="checkbox"/> Other <u>Outdoor Test Report 3KM</u> (OT) | |

Document ID.

OT-2011-09-1901

Subject

Outdoor Test Report
of
IOP – APM -10xRH

Revision History

Rev.	Date	Author	Reason for Changes
1.0	Sep. 20, 2011	Jacky Cheng	• Initial draft(繁體中文版)
			•
			•



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1.0 Scope

1.1 Introduction

本文件主要說明 IO-Power APM-10xRH Outdoor Access Point 戶外測試報告。

1.2 Date/Time

- 測試日期：2011/09/19
- 測試時間：PM 16:00 ~ PM 19:30

1.3 Location

- 測試點 A：高鐵站旁大樓
- 測試點 B：竹中橋邊

1.4 Equipment

- 無線設備：APM-103RH x 2
- 天線設備：5GHz 2x2 MIMO 20dBi Panel Antenna x 2
- 電腦設備：ASUS A43F Series 筆電 x 2
- 軟體設備：Windows XP SP3、IxChariot 5.40
- APM-103RH Firmware Version：1.0(1109.1901)

1.5 Topology

- PtP 點對點

IP :
192.168.77.12



NB IP : 192.168.77.170



IP :
192.168.77.13

NB IP : 192.168.77.171



2.0 Environment

本章節描述本次測試之環境條件因素。

2.1 GPS Location

圖一、“Google Earth GPS Location 標示點”。

距離：

Point A-高鐵站旁大樓(N24°48'26.40" E121°2'12.72")

Point B-竹中橋 (N24°47'16.95" E121°3'48.53")

Distance : 3,442m



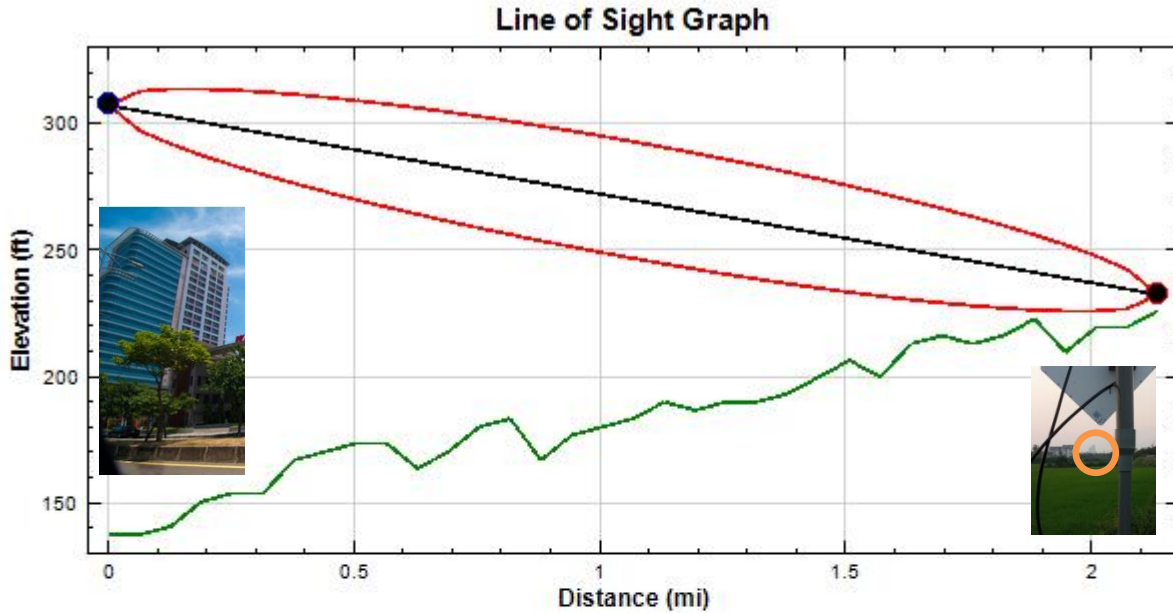


2.2 Fresnel Zone Graph

圖二、“Line of Sight 示意圖”。

Point A Antenna Height : 170ft (14 樓)

Point B Antenna Height : 6.6ft (馬路邊)



	Elevation Data Line Plot		
	Line of Sight Line Plot (Adjusted to Consider Obstruction Caused by Earth Curvature)		
	First Fresnel Zone Line Plot		
	Point 1 Terrain Elevation: 137.80 ft Latitude: 24.807500000077	TX/RX Elevation: 170.00 ft Longitude: 121.035833333319	Total Elevation: 307.80 ft
	Point 2 Terrain Elevation: 226.38 ft Latitude: 24.788333333418	TX/RX Elevation: 6.60 ft Longitude: 121.063333333308	Total Elevation: 232.98 ft

Earth Curvature Adjustment: Off On

Saved Line of Sight Profile Name: **3_4KM**
 Approx. Distance Between Points: **2.13 Miles**
 Earth Obstruction Adjusted For: **0.57 Feet**
 First Fresnel Zone Peak Radius: **23.04 Feet**
 Transmission Frequency: **5.220.000000 MHz**



2.3 Spectrum

本次測試：

使用 Frequency 為 5,220MHz、IEEE802.11A/N Channel 44

Noise Level 約為-98dBm

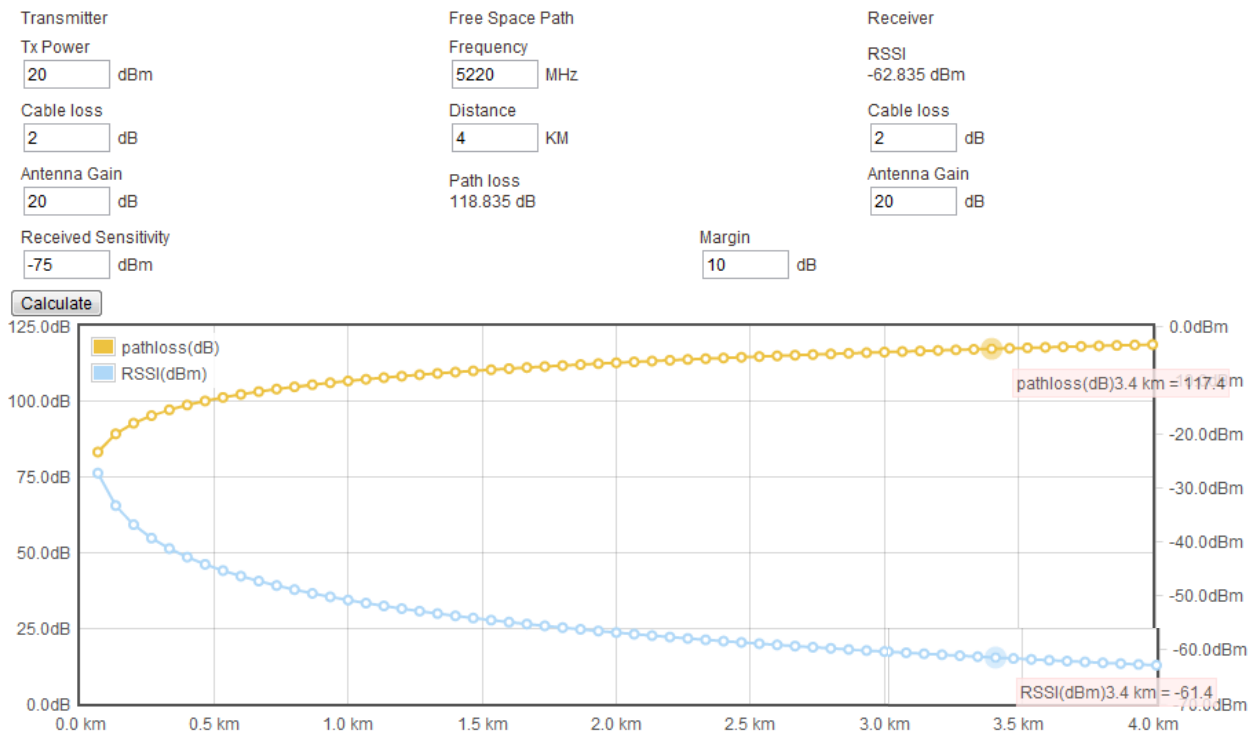
RF TX power 約為 20dBm

TX/RX Antenna Gain 為 20dBi

Cable Loss 約為 2dB

則 Pathloss 與 RSSI 理論值分別為：117.4dB 與-61.4dBm

Simple RSSI Calculator



本次測試於 Point A 與 Point B 兩邊實際所量得之 RSSI 約分別為：

Point A：-64dBm ~ -67dBm

Point B：-65dBm ~ -69dBm



3.0 Test Results

測試部份以下列參數組合進行：

- Distance 參數設定為 4Km
- IxChariot test pair numbers
- Frequency Channel Width
- Tx/Rx antenna numbers
- Short GI(Guard Interval) On/Off

所有測試使用 IxChariot Throughput.scr script。

3.1 Test1 :

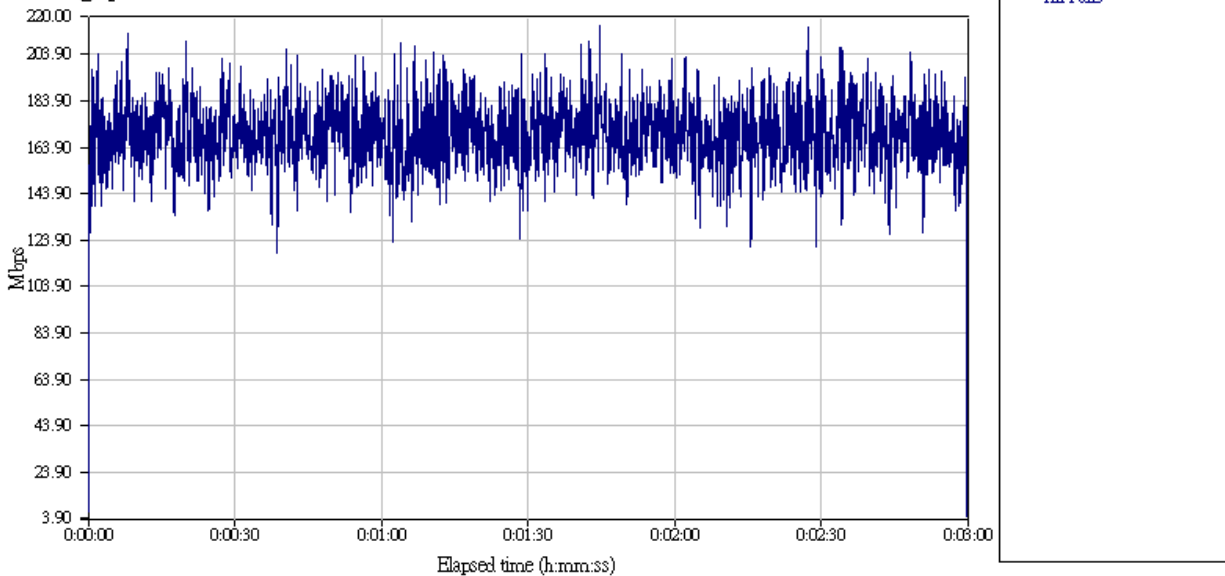
一張 MIMO 網卡以 40MHz 擴頻 + 20dBi 5GHz 雙極化 MIMO 天線 + 15 傳 15 收'間隔縮減 距離 3Km 可傳 168Mbps

Channel Width	Tx/Rx Antenna Number	Short GI	IxChariot pairs
40MHz	2T2R	On(400)	15T15R
Report	Total Throughput(Mbps)	Response Time	Transaction Rate
	168.048	0.143	211.014

Throughput

Pair 30	5.230	0.704	13.333	0.179
Totals:	168.048	0.303	20.000	

Throughput

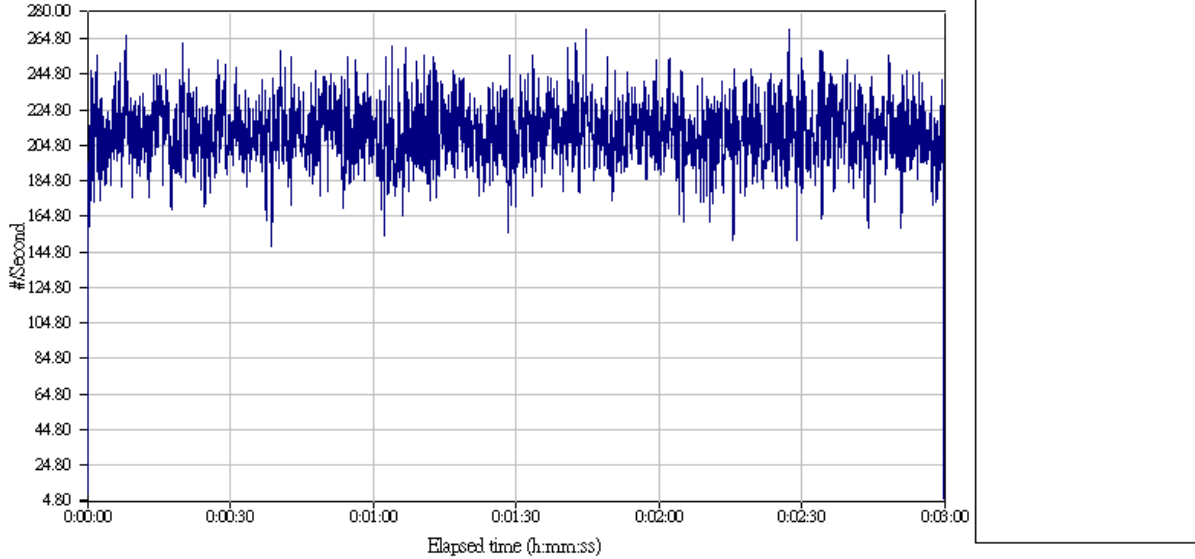




Transaction Rate

Pair 30	6.537	0.880	16.667
Totals:	211.014	0.379	25.000

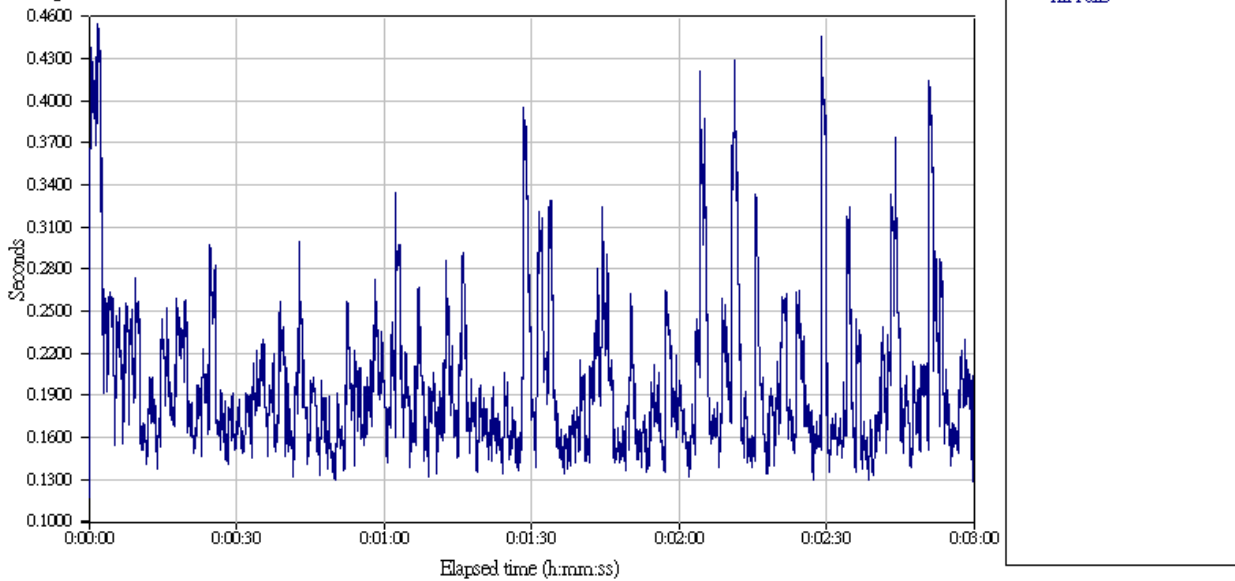
Transaction rate



Response Time

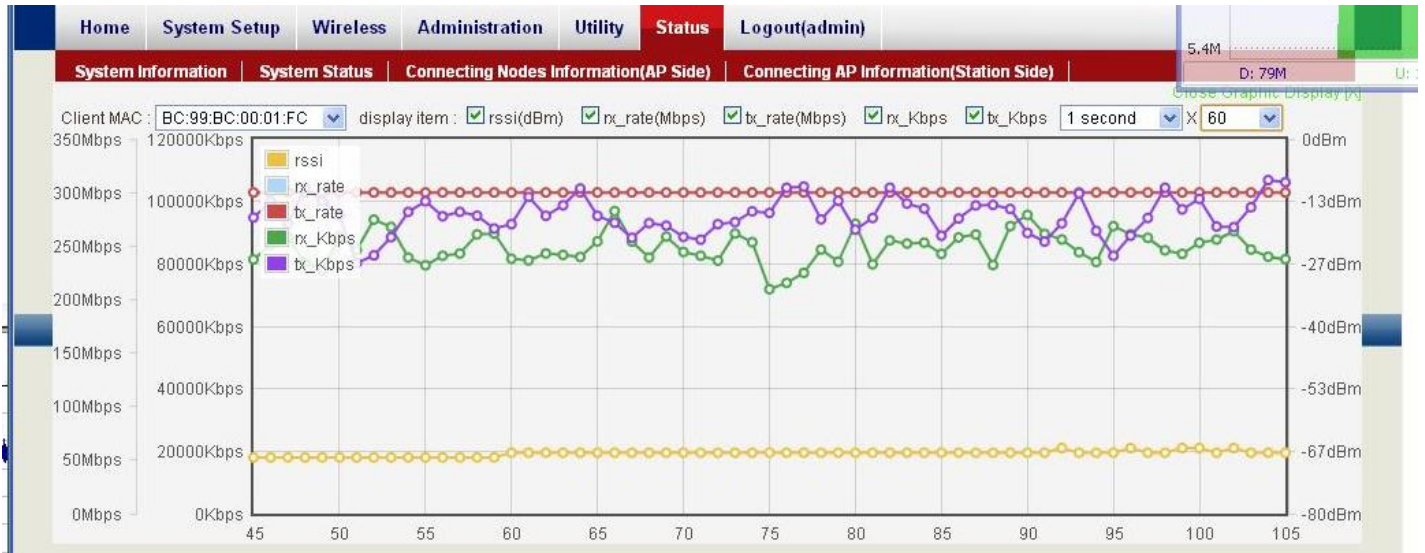
Pair 30	0.153	0.060	1.137
Totals:	0.143	0.040	2.641

Response time

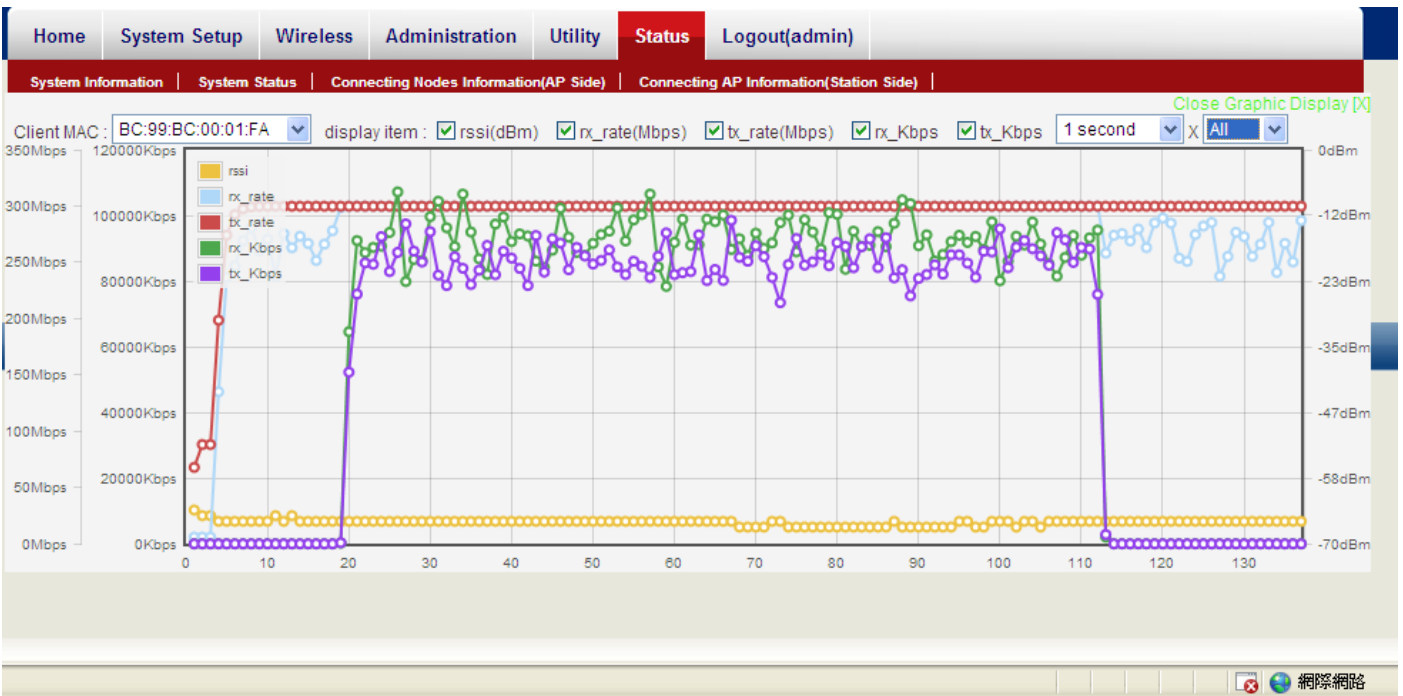




AP Side Screen



Station Side Screen





3.2 Test2

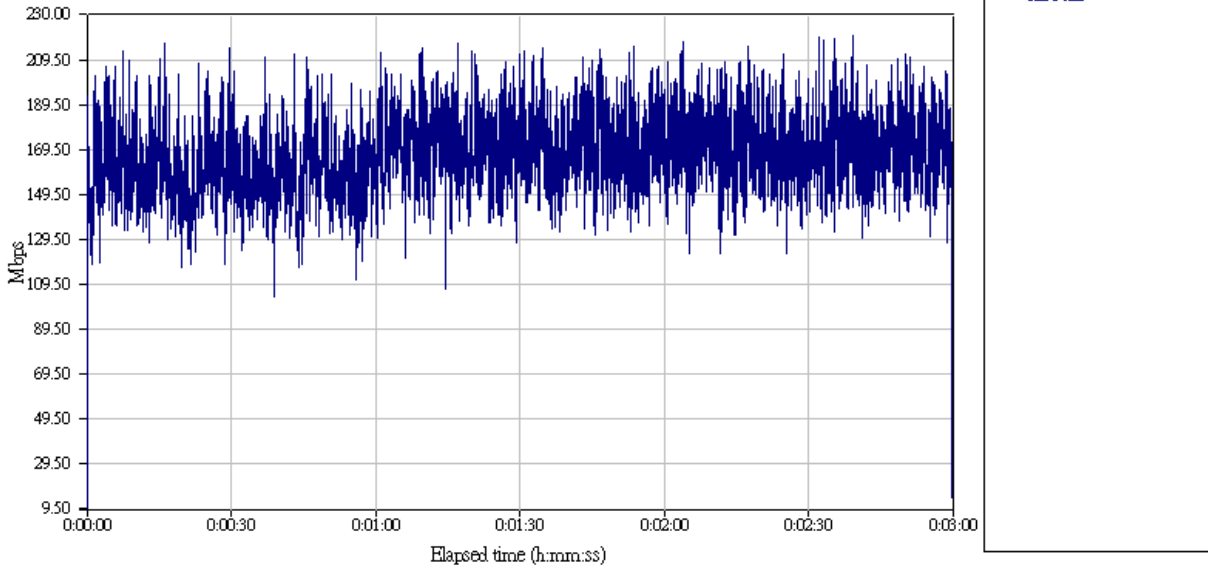
一張 MIMO 網卡以 40MHz 擴頻 + 20dBi 5GHz 雙極化 MIMO 天線 + 8 傳 8 收’ 間隔縮減 距離 3Km 可傳 165Mbps

Channel Width	Tx/Rx Antenna Number	Short GI	IxChariot pairs
40MHz	2T2R	On(400)	8T8R
Report	Total Throughput(Mbps)	Response Time	Transaction Rate
	165.811	0.077	208.857

Throughput

Pair 16	10.542	1.389	23.530	0.127
Totals:	165.811	0.710	29.630	

Throughput

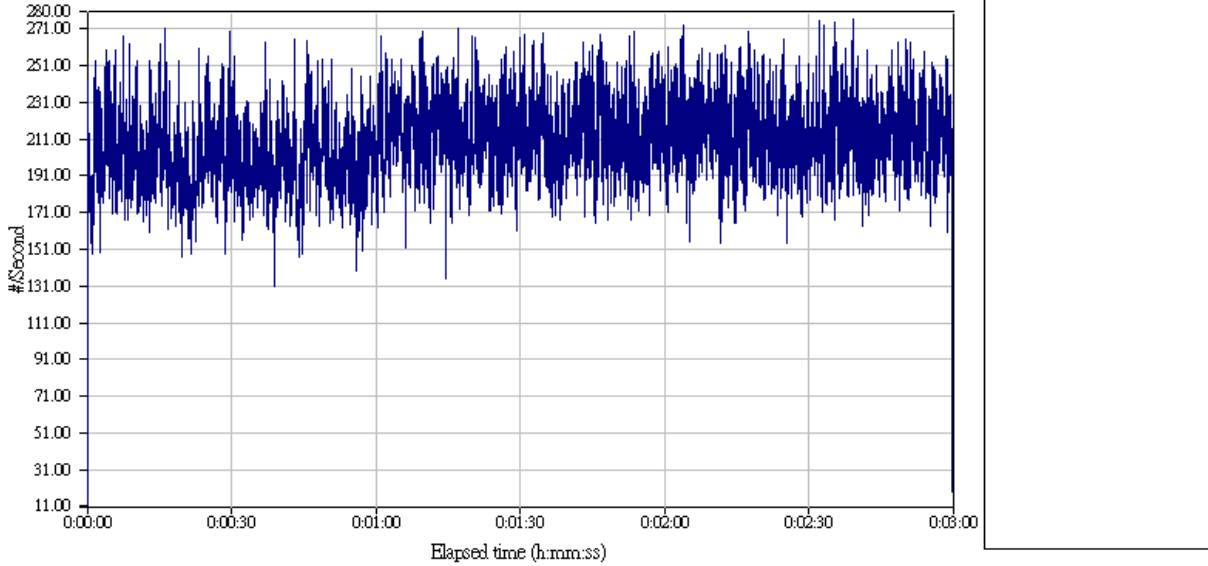




Transaction Rate

Pair 16	13.177	1.736	29.412
Totals:	208.857	0.887	37.037

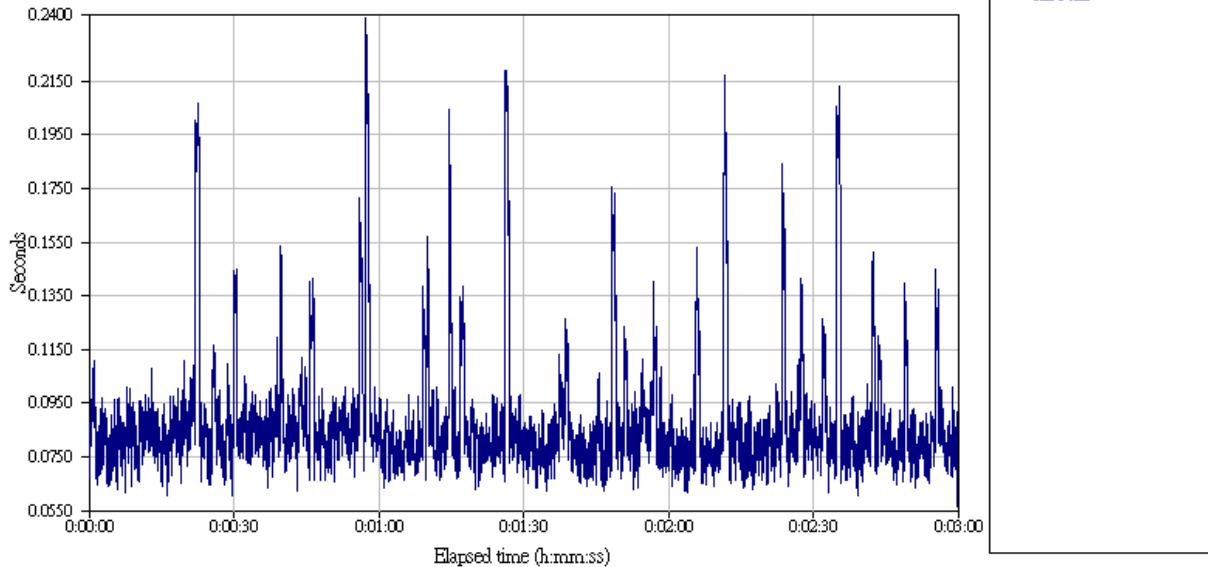
Transaction rate



Response Time

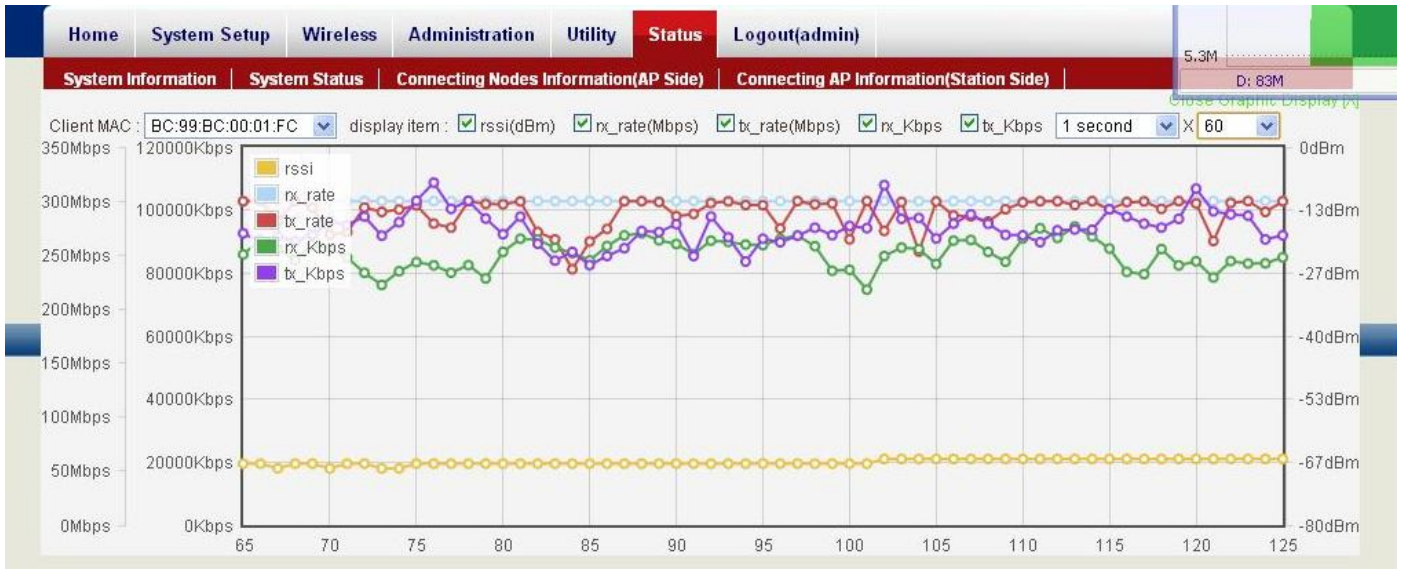
Pair 16	0.076	0.034	0.576
Totals:	0.077	0.027	1.127

Response time

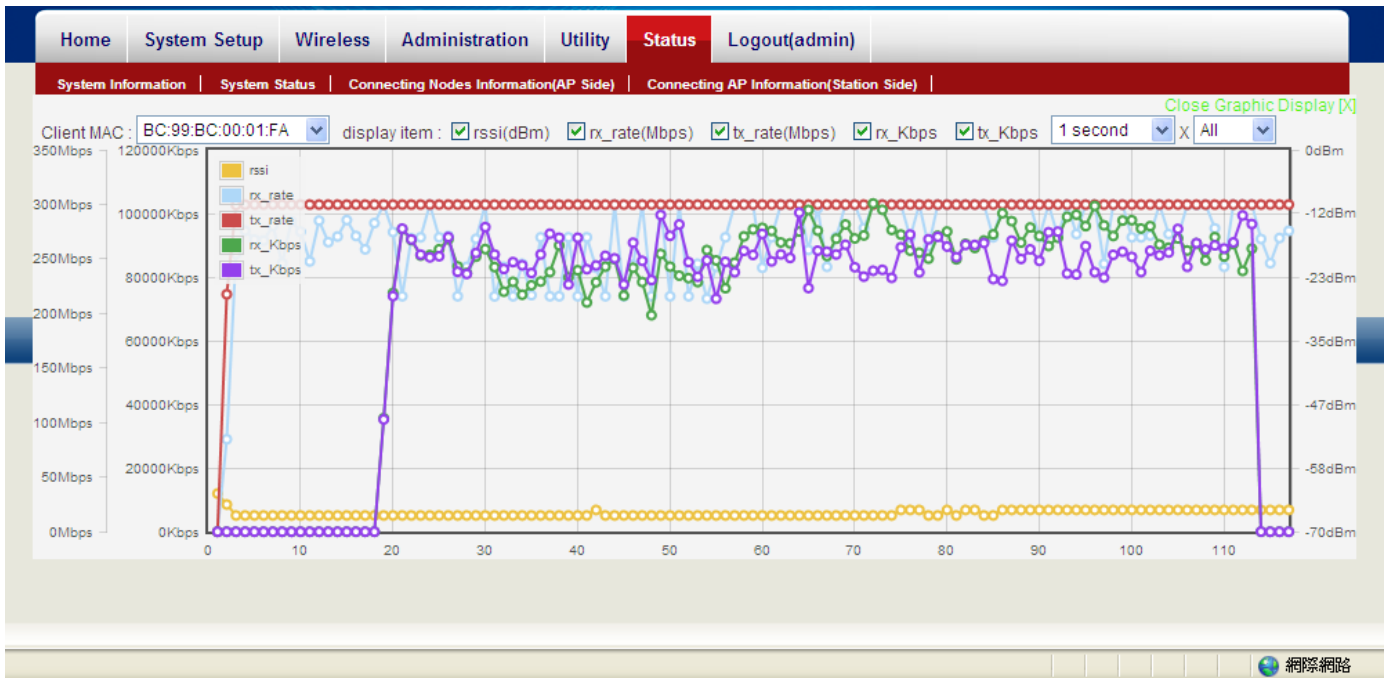




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3.3 Test3

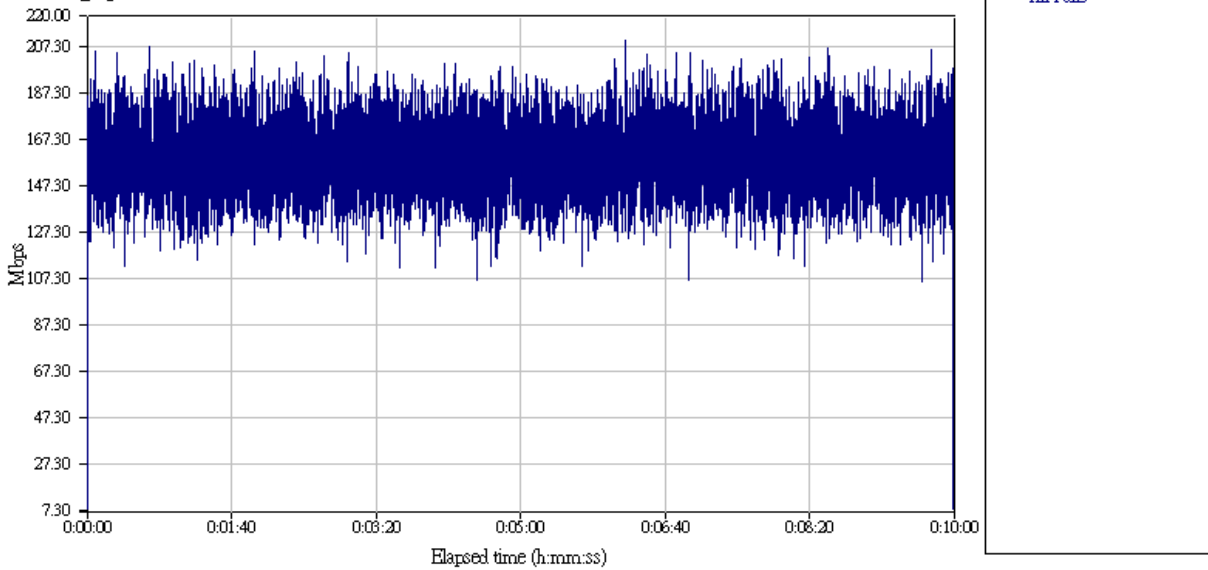
一張 MIMO 網卡以 40MHz 擴頻 + 20dBi 5GHz 雙極化 MIMO 天線 + 8 傳 8 收’ 間隔不縮減 距離 3Km 可傳 156Mbps

Channel Width	Tx/Rx Antenna Number	Short GI	IxChariot pairs
40MHz	2T2R	Off(800)	8T8R
Report	Total Throughput(Mbps)	Response Time	Transaction Rate
	156.812	0.081	197.410

Throughput

Pair 16	9.691	0.576	21.053	0.082
Totals:	156.812	0.521	26.667	

Throughput

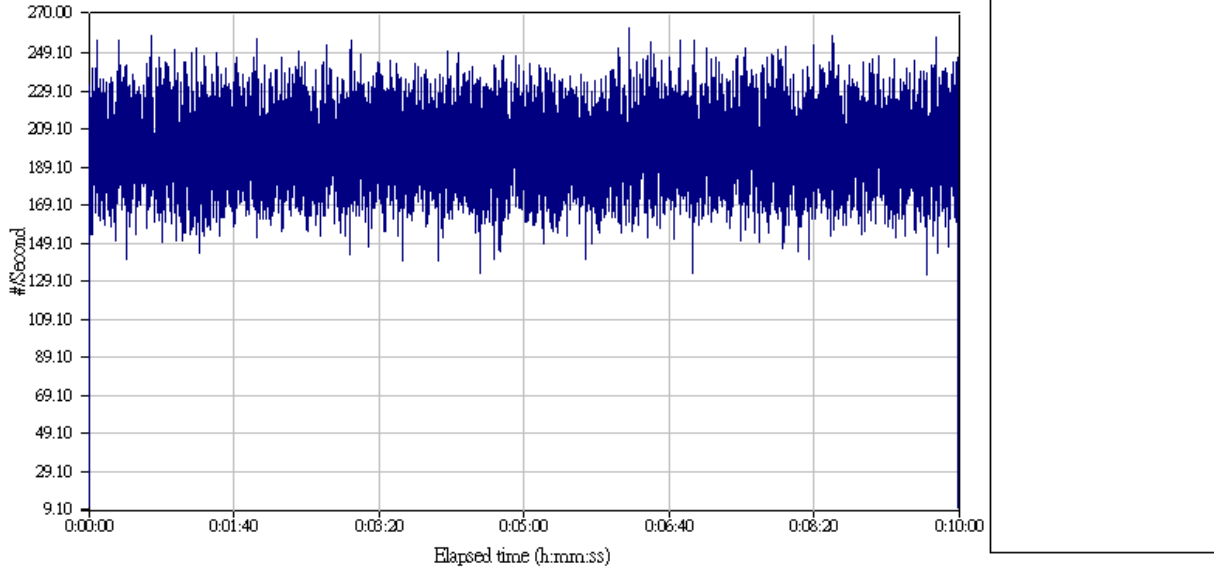




Transaction Rate

Pair 16	12.113	0.720	26.316
Totals:	197.410	0.651	33.333

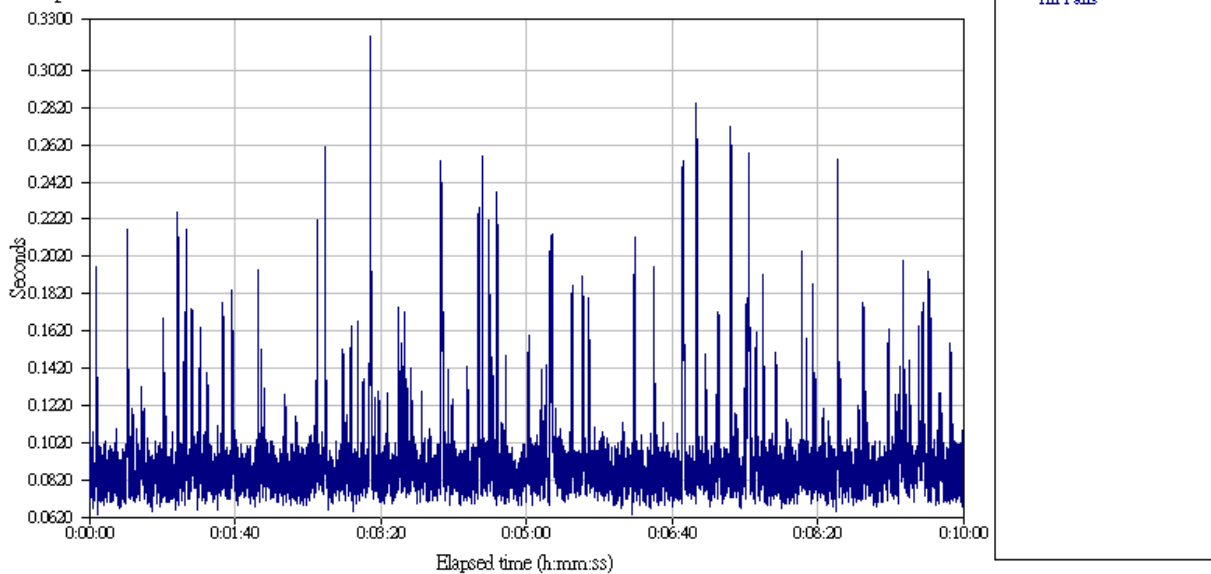
Transaction rate



Response Time

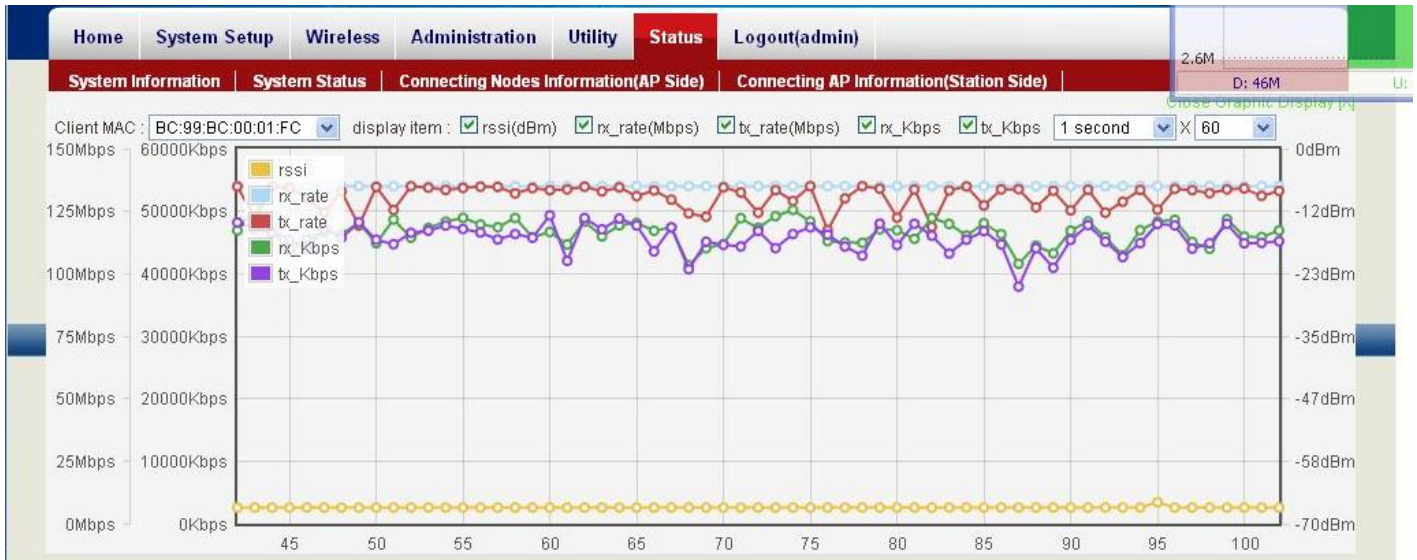
Pair 16	0.083	0.038	1.389
Totals:	0.081	0.030	1.536

Response time

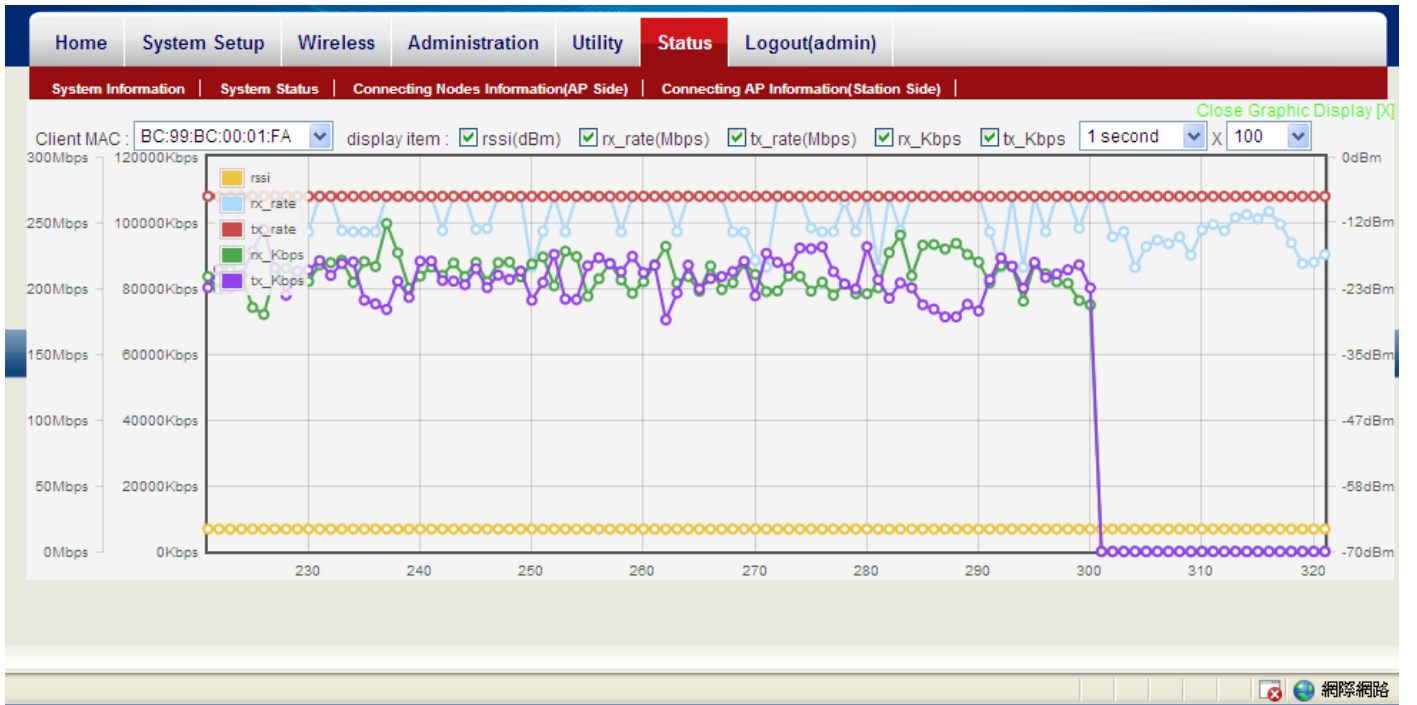




AP Side Screen



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3.4 Test4

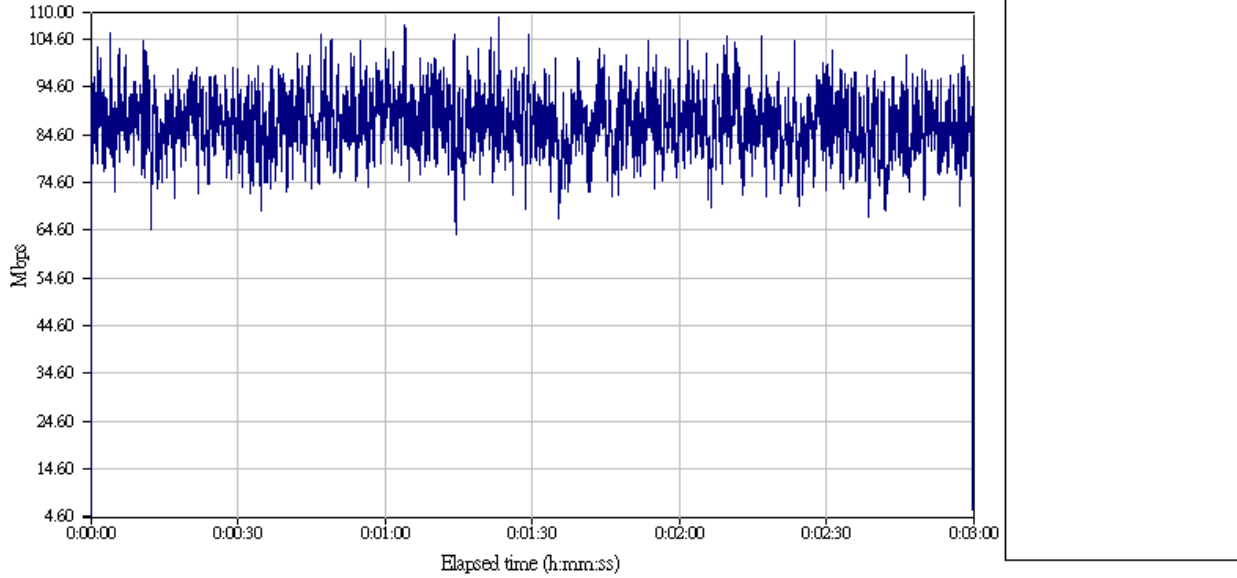
一張 MIMO 網卡以 40MHz 擴頻 + 20dBi 5GHz 單極化 MIMO 天線 + 8 傳 8 收’ 間隔不縮減 距離 3Km 可傳 86Mbps

Channel Width	Tx/Rx Antenna Number	Short GI	IxChariot pairs
40MHz	1T1R	Off(800)	8T8R
Report	Total Throughput(Mbps)	Response Time	Transaction Rate
	86.379	0.148	108.428

Throughput

Pair 16	5.428	1.431	8.602	0.059
Totals:	86.379	1.431	9.524	

Throughput

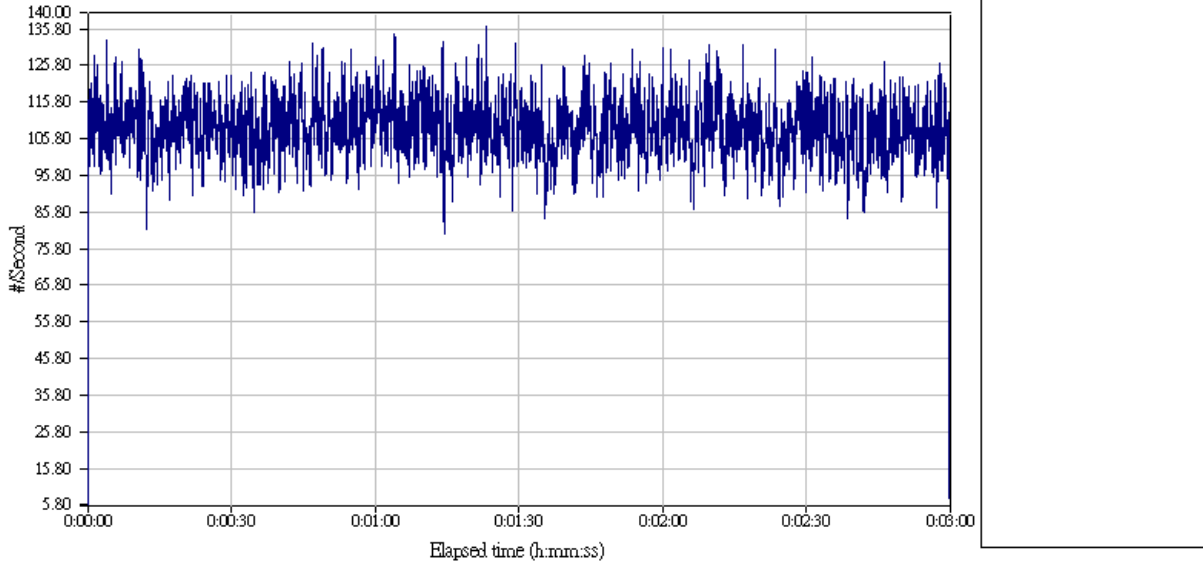




Transaction Rate

Pair 16	6.784	1.789	10.753
Totals:	108.428	1.789	11.905

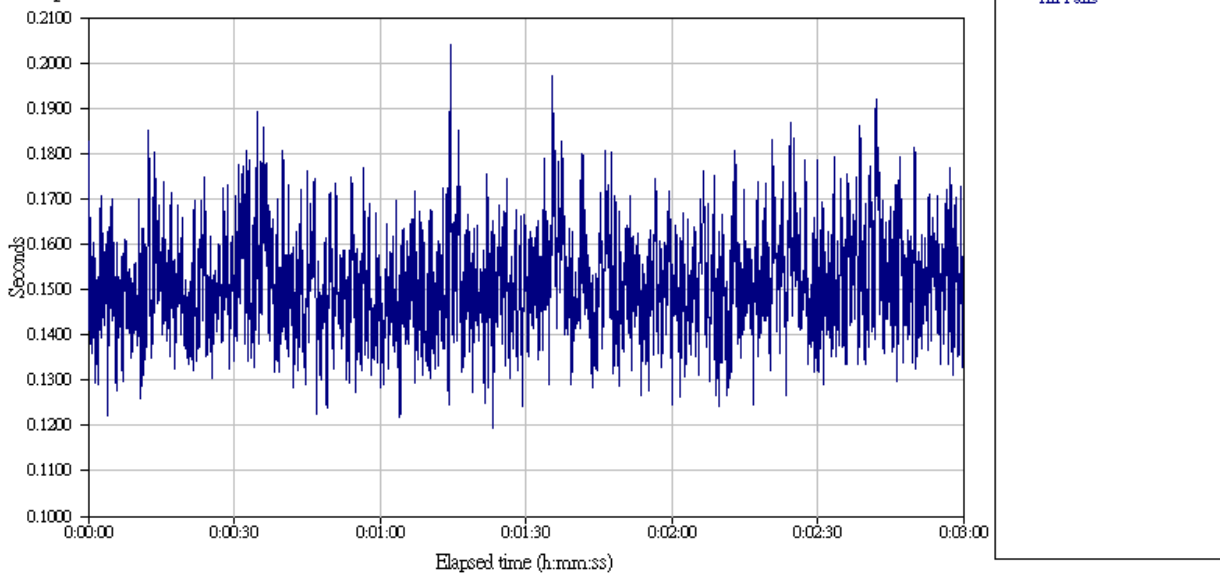
Transaction rate



Response Time

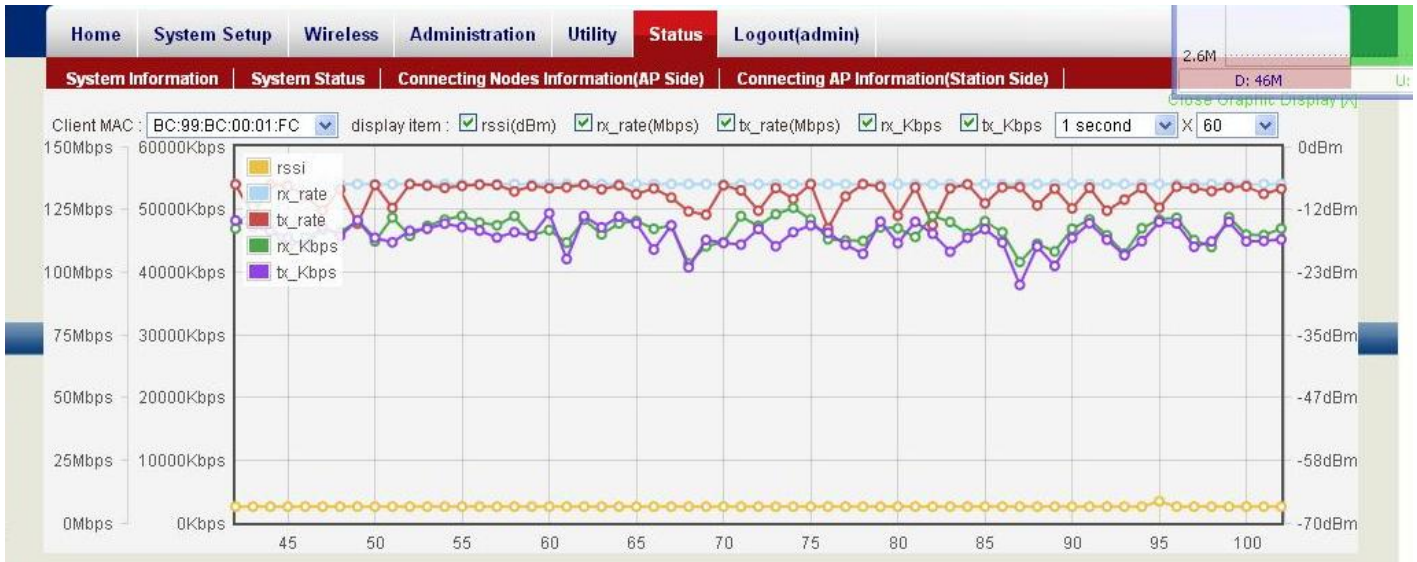
Pair 16	0.147	0.093	0.559
Totals:	0.148	0.084	0.559

Response time

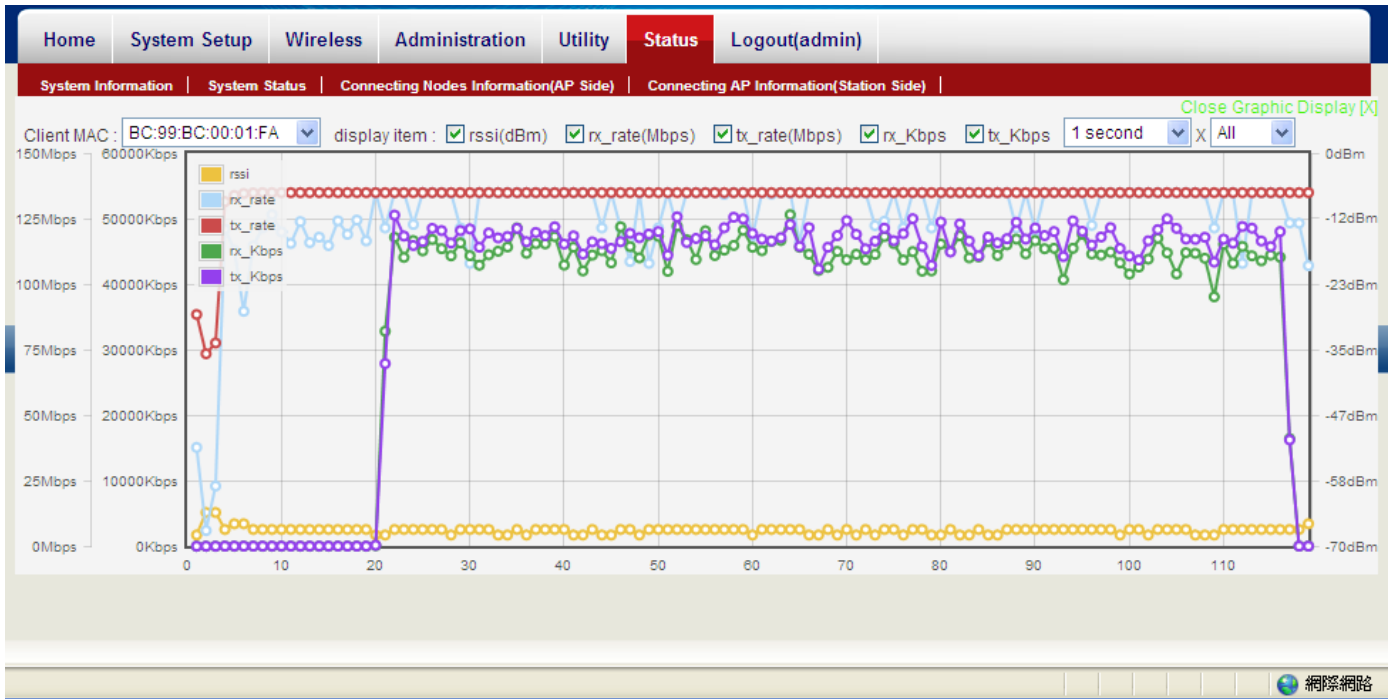




AP Side Screen



Station Side Screen





3.5 Test5

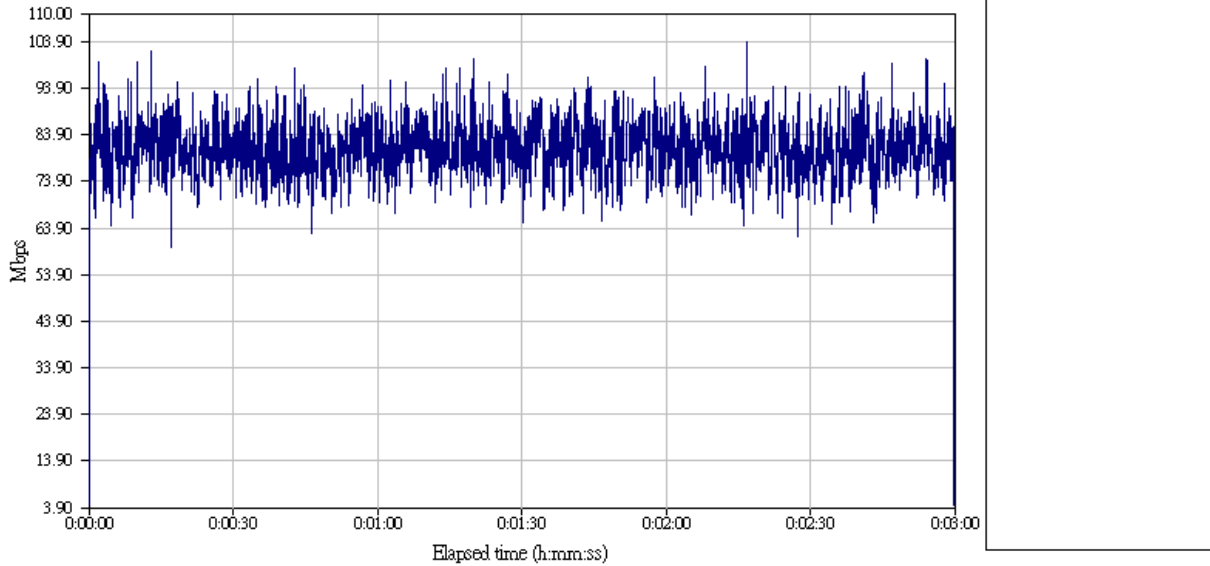
一張 MIMO 網卡以 20MHz + 20dBi 5GHz 雙極化 MIMO 天線 + 8 傳 8 收' 間隔縮減
 距離 3Km 可傳 80Mbps

Channel Width	Tx/Rx Antenna Number	Short GI	IxChariot pairs
20MHz	2T2R	On(400)	8T8R
Report	Total Throughput(Mbps)	Response Time	Transaction Rate
	80.360	0.159	100.861

Throughput

Pair 16	5.066	3.030	8.333	0.049
Totals:	80.360	1.171	10.526	

Throughput

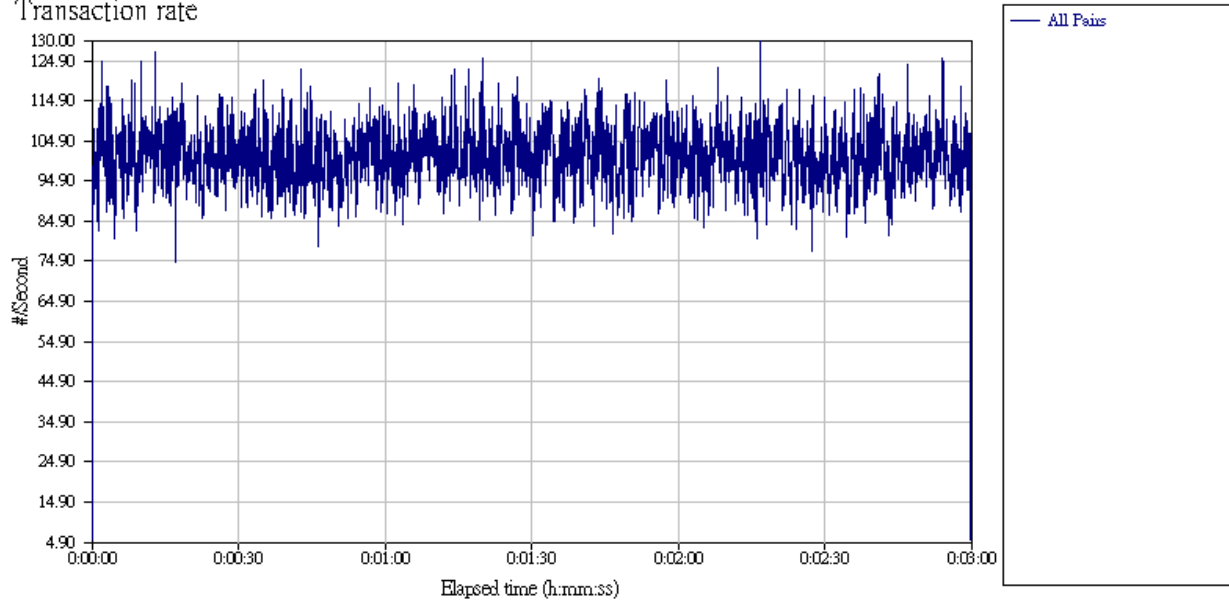




Transaction Rate

Pair 16	6.332	3.788	10.417
Totals:	100.861	1.464	13.158

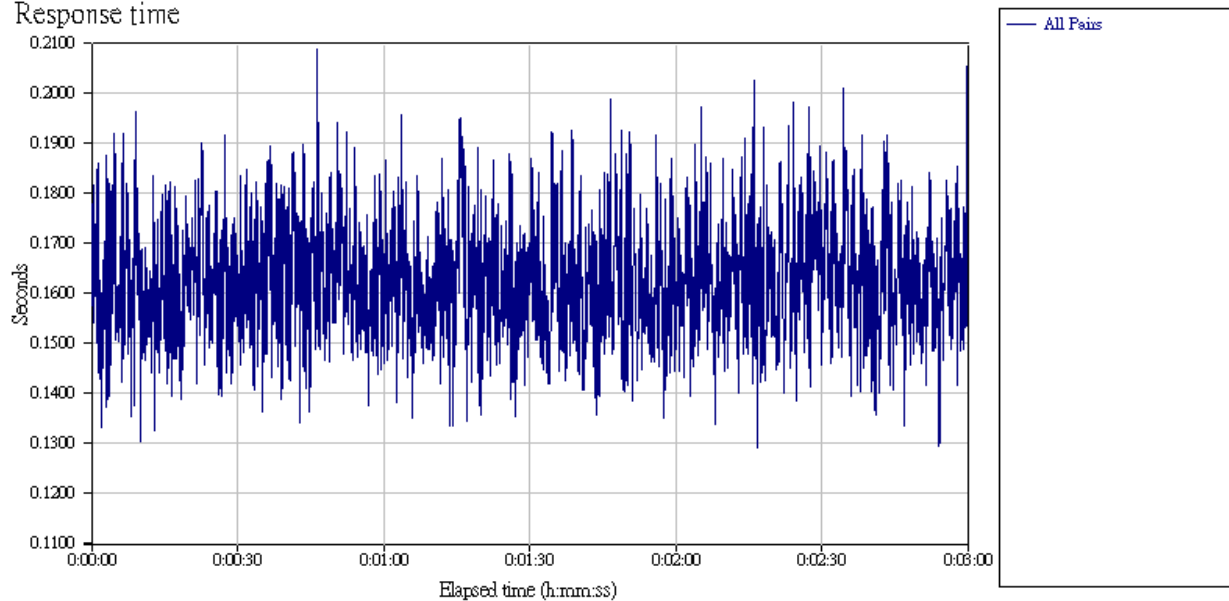
Transaction rate



Response Time

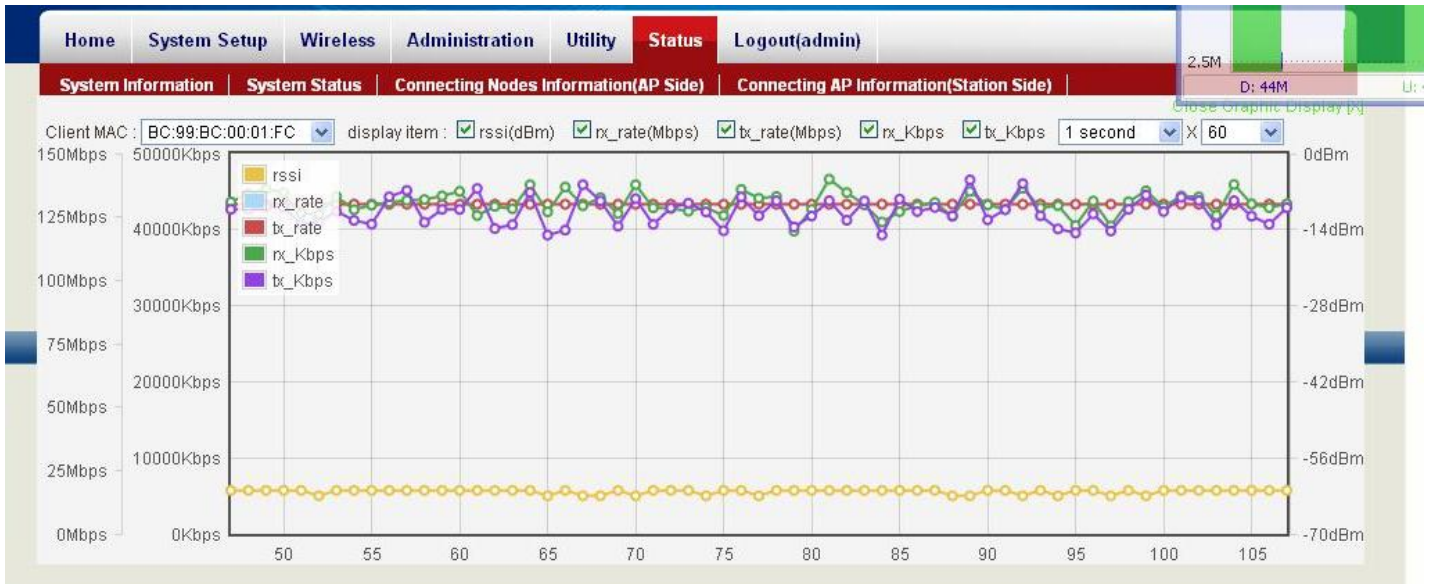
Pair 16	0.158	0.096	0.264
Totals:	0.159	0.076	0.683

Response time

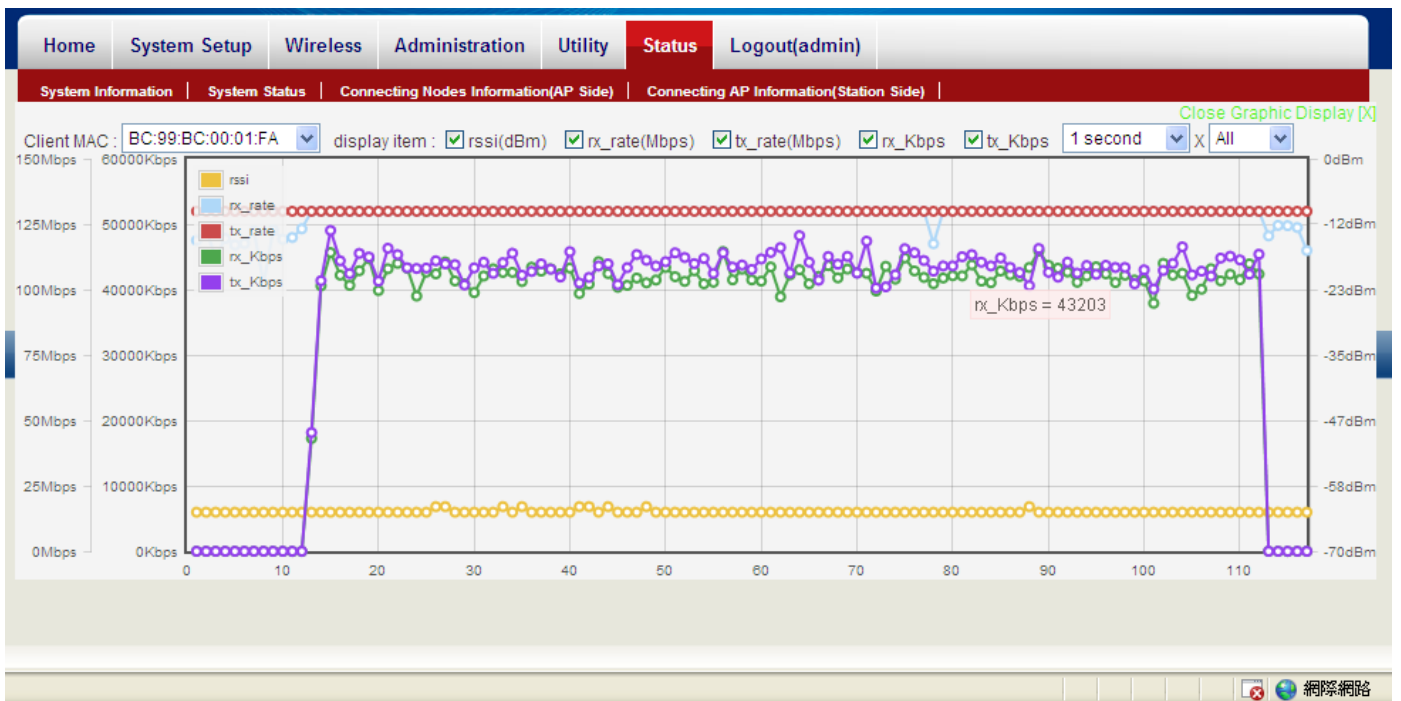




AP Side Screen



Station Side Screen





3.6 Test6

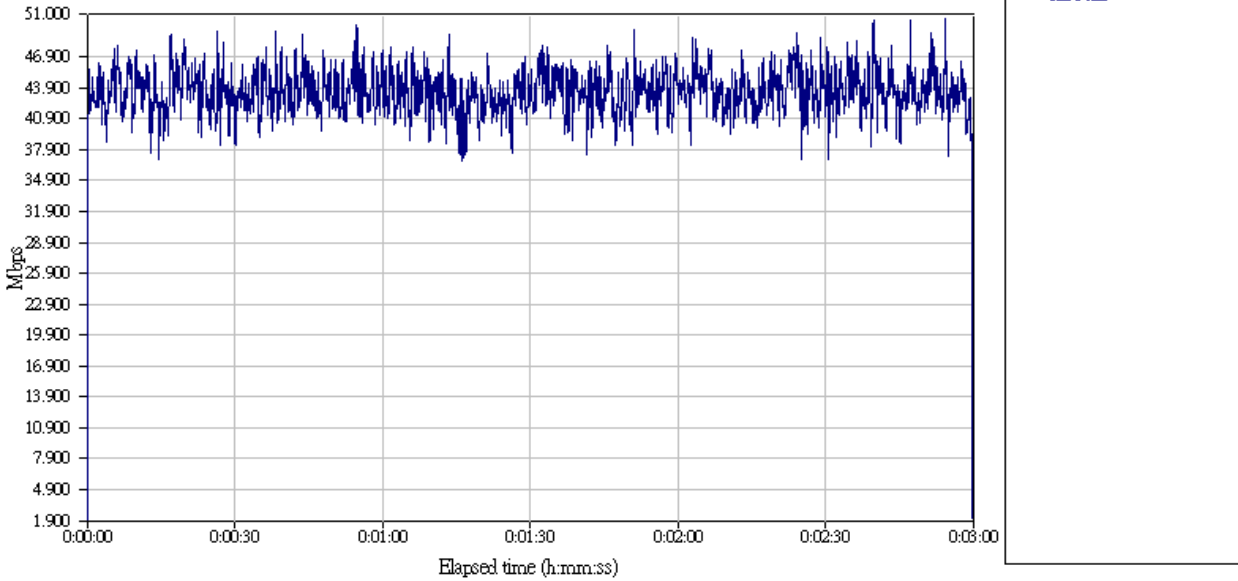
一張 MIMO 網卡以 20MHz + 20dBi 5GHz 單極化 MIMO 天線 + 8 傳 8 收’ 間隔不縮減 距離 3Km 可傳 43Mbps

Channel Width	Tx/Rx Antenna Number	Short GI	IxChariot pairs
20MHz	1T1R	Off(800)	8T8R
Report	Total Throughput(Mbps)	Response Time	Transaction Rate
	43.463	0.294	54.473

Throughput

Pair 16	2.748	1.794	3.756	0.031
Totals:	43.463	1.623	4.124	

Throughput

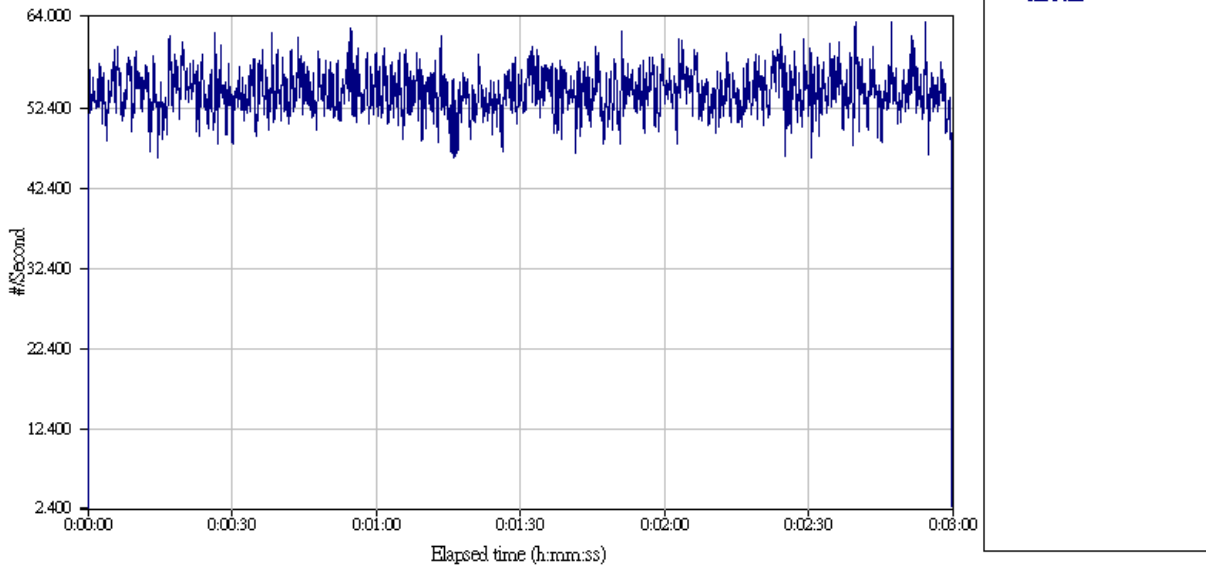




Transaction Rate

Pair 16	3.435	2.242	4.695
Totals:	54.473	2.028	5.155

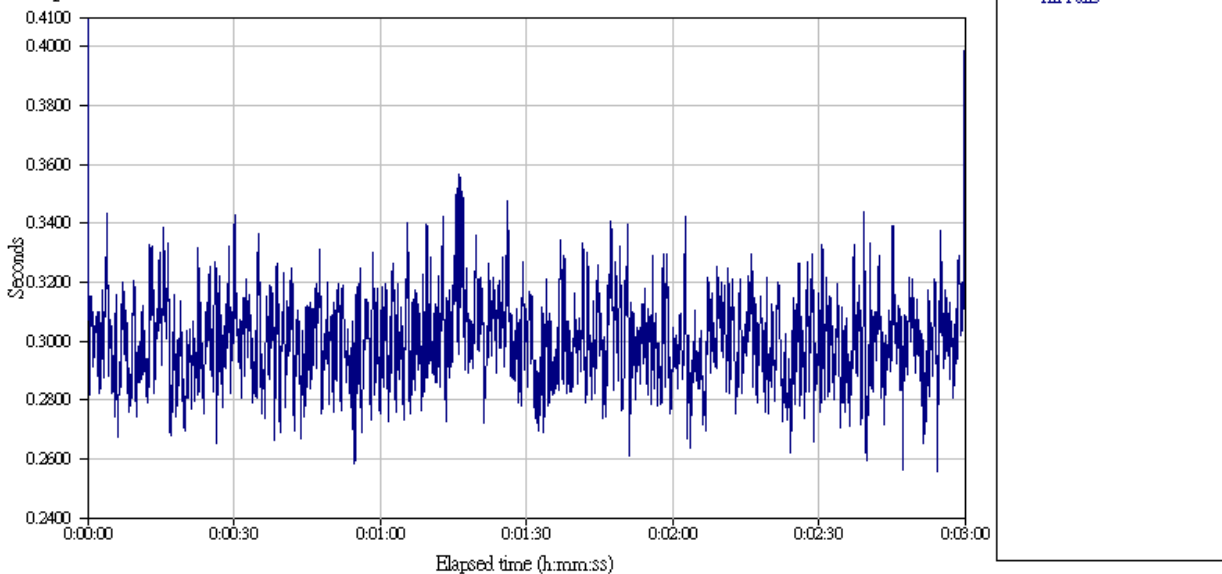
Transaction rate



Response Time

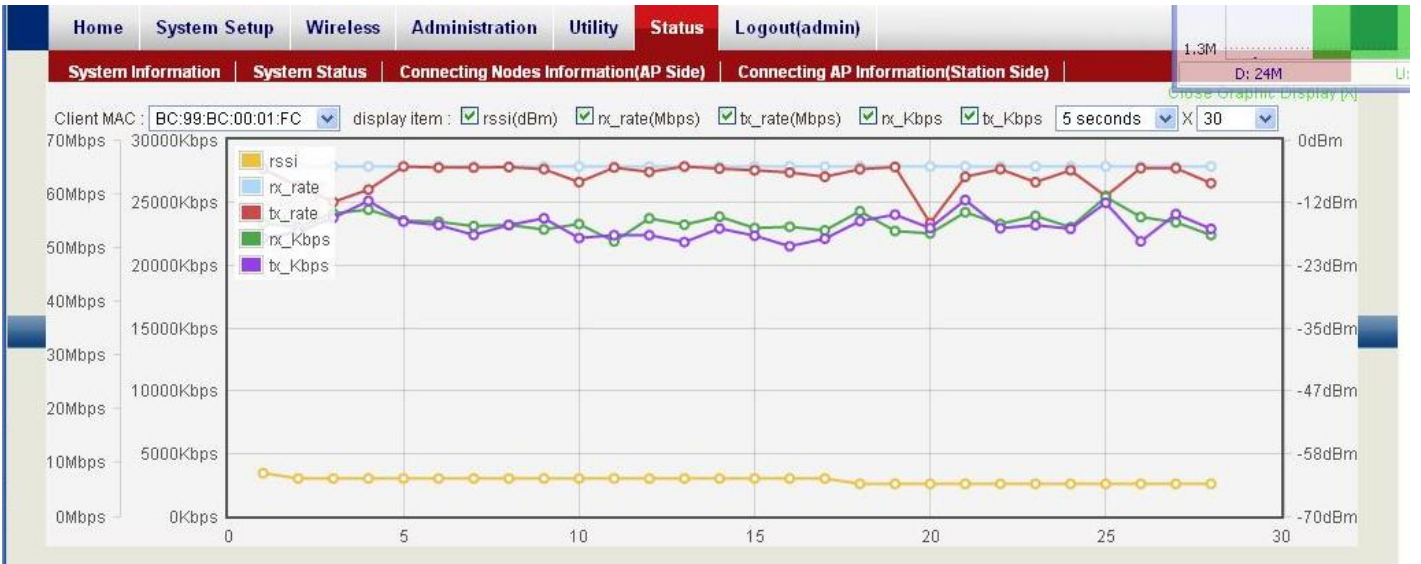
Pair 16	0.291	0.213	0.446
Totals:	0.294	0.194	0.493

Response time

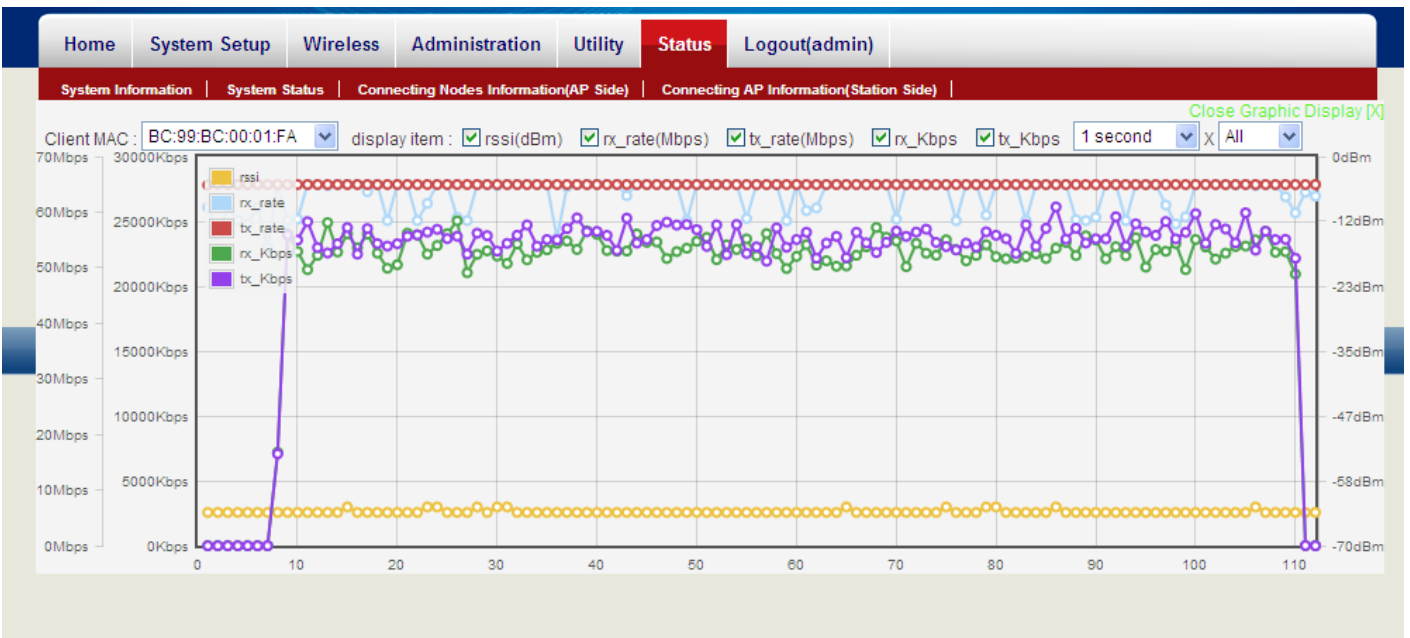




AP Side Screen



Station Side Screen



Appendix I

無。