



**NEW WORLD  
TELECOMMUNICATIONS  
LIMITED**

***2<sup>nd</sup> Trial Test Report on 3.5GHz  
Broadband Wireless Access Technology***

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**GLOSSARY**

<b>Glossary</b>	<b>Description</b>
Bps	Bits Per Second
BPSK	Binary Phase Shift Keying
BRS	Broadband Radio Service
BS	Base Station
BWA	Broadband Wireless Access
CINR	Ratio of Carrier/(Interference + Noise)
CPE	Customer Premises Equipment
ETSI	European Telecommunication Standards Institute
FDD	Frequency Division Duplex
FE	Fast Ethernet
IEEE	Institute of Electrical and Electronics Engineers
IAD	Integrated Access Device
IP	Internet Protocol
LAN	Local Area Network
LOS	Line of Sight
MAN	Metropolitan Area Network
NGN	Next Generation Network
NLOS	Non Line of Sight
OFDM	Orthogonal Frequency Division Multiplexing
PTP	Point-to-point
PMP	Point-to-multipoint
QAM	Quadrature Amplitude Modulation

<b>Glossary</b>	<b>Description</b>
QPSK	Quadrature Phase Shift Keying
RSSI	Received Signal Strength Indicator
SC	Sector Controller
SS	Subscriber Station
SU	Subscriber Unit
TDD	Time Division Duplex
TDMA	Time Division Multiple Access
UNII	Universal National Information Infrastructure
VoIP	Voice Over IP
WiMax	Worldwide Interoperability for Microwave Access

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## **1. Objective**

- To test the performance of Broadband Wireless Access (BWA) Technology based on the “WiMAX” product working at 3.4 ~ 3.6 GHz frequency spectrum.
- To test the capability and performance of the BWA product on providing Line-of-Sight (LOS) and Non-Line-of-Sight (NLOS) data transmission over the air.

## **2. Introduction**

A product trial test based on the “WiMax” product was conducted during permitted trial period by New World Telecommunications Ltd. The objective of the test is to assess the feasibility and performance of WiMax BWA systems in typical urban environment in Hong Kong. Both Line-of-Sight (LOS) and Non-Line-of-Sight (NLOS) scenarios were tested.

## **3. Trial Test Details**

### **3.1 Trial Equipment List**

1. Equipment List:
  - 1 x Sector Controller unit with 60° antenna
  - 1 x Subscriber Station units with 9° antenna
  - 2 x Ethernet switches
  - 2 x Traffic Generators
  - 2 x Notebook computers
2. Central Station transmit frequency: 3400 - 3414 MHz  $\pm$  4 ppm
3. Subscriber Station transmit frequency: 3400 - 3414 MHz  $\pm$  4 ppm

### **3.2 Test Location**

**Site A:** Rooftop, Section Controller (SC)

**Site B:** Rooftop, Subscriber Station (SS)



## 4. Point-to-Point Test between Site A and B

Antenna placement: Line of Sight

Radio Power: RSSI = -48dBm, CINR = 26dB

Channel Bandwidth: 7MHz & 14MHz TDD

Modulation: 64QAM

### 4.1 Max Throughput Test between Site A and Site B

**Steps:**

1. Setup appropriate devices at SC and SS side
2. Run data transfer between site A and B
3. Record the throughput result

**Result:**

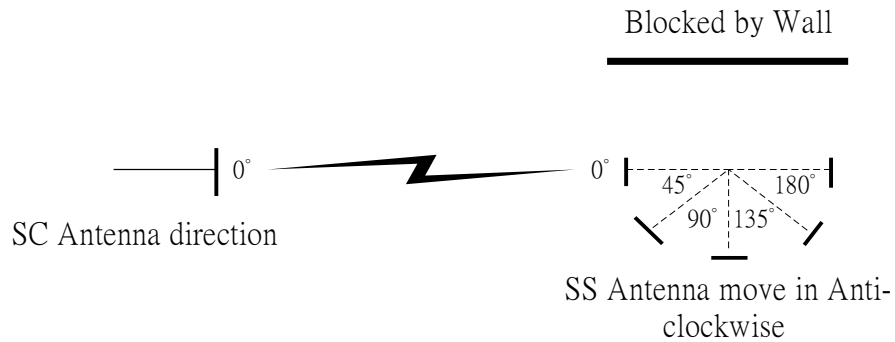
Bandwidth	7MHz		14MHz	
	Packet Size	Test Results	Packet Size	Test Results
Maximum Throughput Test	64 Bytes	21.2Mbps	64+512 +1500 Bytes	26Mbps
	512 Bytes	21.0Mbps		
	1500 Bytes	20.5Mbps		

### 4.2 Non Line of Sight Test by SS Antenna Rotation at Site B

**Steps:**

1. Setup appropriate devices at SC and SS side
2. Run uni-directional data transfer.
3. Rotate the SS antenna in anti-clockwise direction in steps of 45 degree.
4. Record the result of throughput test and radio power.

### SS Antenna Rotation Diagram



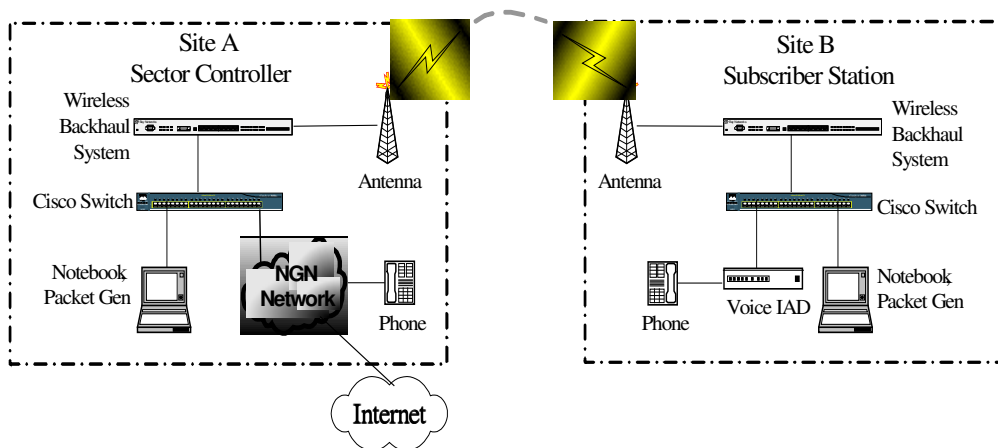
**Result:**

	SS Rotating Angle	Test Results (bps)	CINR (dB)	RSSI (dBm)
<b>Maximum Throughput Test*</b>	<b>45°</b>	<b>13.6M</b>	<b>24</b>	<b>-57</b>
	<b>90°</b>	<b>12.6M</b>	<b>22.5</b>	<b>-60</b>
	<b>180°</b>	<b>6.7M</b>	<b>12.8</b>	<b>-67</b>

\*Packet size with equal mixture of 64, 512 and 1500 Bytes

## 5. Application Test

### 5.1 Configuration Diagram



## 5.2 VoIP and Internet Broadband Access Test

### Steps:

1. The wireless equipment is connected to NWT IP backbone network
2. Set up the IAD at Site B.
3. Run the test for voice and broadband access.
4. Record the test result.

### Result:

Item	Result
Voice over IP	Applicable
Broadband Access	Applicable
L2 Capability on 802.1q Tagging	Applicable
VPN Access	Applicable

## 6. Observations and Conclusion

According to the test results, performance of the wireless broadband link is satisfactory at 1 km distance under line of sight condition. The modulation is maintained at 64QAM as well as 14MHz frequency channel space can provide 26Mbps bandwidth during trial. Moreover its application for VoIP and Internet Broadband Access are verified.

Therefore, it is successful to prove that the 3.5GHz wireless broadband technology can be applied for wireless broadband access in Hong Kong environment. In mass deployment, the bandwidth utilization is necessarily planned especially for those services requiring committed bandwidth.

In addition to the success for running voice over IP and broadband access test over BWA, it can provide an alternative option to replace conventional access technologies by time saving for road opening, easy installation, flexible configuration and cost effectiveness. Furthermore, BWA can replace the copper loop as last mile access solution and resolve the problem of insufficient and technical difficulties on in-building block wiring system for telecommunication services.

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