## FCC CFR47 PART 90 SUBPART Z

## **Test Report**

3.65 GHz Fixed Wireless Base Station Transceiver – 6x6 MIMO Configuration

Model Number: Quantum 6636

FCC ID: XN3-QUANTUM6636 IC: 8974A-QUANTUM6636

**Report Number: 10PRO017** 

Issue Date: 2 September 2010

Prepared for **PureWave Networks Inc.** 2660-C Marine Way Mountain View, CA 94043

Prepared by T.N. Cokenias Consulting P.O. Box 1086 El Granada CA 94018

## **Report Revision History**

Revision No.	Description	Revised by	Date
-	Original issue	T.N. Cokenias	2 Sept 2010

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## 1. TEST AND TEST LOCATION INFORMATION

COMPANY NAME:	PureWave Networks, Inc. 2660-C Marine Way Mountain View, CA 94043
EUT DESCRIPTION:	FCC Part 90Z Base Station Frequency Range: 3650-3675MHz WiMax 6x6 MIMO Configuration Channel Bandwidths: 5 MHz, 10 MHz Modulations: QPSK, 16QAM, 64QAM
FCC ID: IC:	XN3-QUANTUM6636 8974A-QUANTUM6636
MODEL:	Quantum 6636

Radiated and Occupied Bandwidth antenna port conducted tests were performed by

22 June, 28-30 June, 8-13 July, 26 and 30 August 2010

Compliance Certification Services 47173 Benicia Street Fremont, CA 94538

DATE TESTED:

Other antenna port and frequency stability tests were performed at

PureWave Networks, Inc. 2660-C Marine Way Mountain View, CA 94043

1. M. Loken

2 September 2010

T.N. Cokenias Agent for PureWave Networks, Inc.

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with EIA/TIA 603, FCC CFR 47 Part 2 and FCC CFR 47 Part 90Subpart Z.

## 3. EQUIPMENT UNDER TEST

## **3.1. DESCRIPTION OF EUT**

The EUT is a WiMAX base station radio operating in the 3650-3675 MHz restricted contention-based protocol frequency band. Modulation is 802.16d/e in 5 MHz and 10 MHz channel bandwidths. The EUT is capable of operation in 2x2 MIMO and 6x6 MIMO modes. This report will cover only 6x6 MIMO operation measurements. A separate report will cover 2x2 MIMO operation.

## **3.2. MAXIMUM OUTPUT POWER SETTINGS FOR TESTS**

5 MHz EBV	V	QPSK	16QAM	64QAM
	(MHz)	(dBm)	(dBm)	(dBm)
Low	3652.5	26	26	26
Middle	3662.5	30	30	30
High	3672.5	28	28	28

10 MHz EB	W	QPSK	16QAM	64QAM
	(MHz)	(dBm)	(dBm)	(dBm)
Low	3655	26	26	26
Middle	3662.5	33	33	33
High	3670	28	28	28

All other 5 MHz Channels: 30 dBm power setting All other 10 MHz channels: 33 dBm power setting

## **3.3. ANTENNA SELECTION AND EIRP LIMITS**

The licensee can select a variety of antenna types and gains from a variety of manufacturers in addition to PureWave Networks. It is the responsibility of the licensee to adjust transmitter output power such that the eirp limits specified in section 90.1321 (a) of the Rules are not exceeded:

90.1321(a) Base stations and fixed stations are limited to 25watts/25 MHz equivalent isotropic radiated power (EIRP). In any event the EIRP power density shall not exceed 1 watt in any on-megahertz slice of spectrum.

The antenna port output powers for this product are calculated based on the following typical installation parameters:

- 1. A minimum 6 dBi antenna for use with base stations,
- 2. 30m cable loss for TMC LMR-400 at 3.65 MHz = 8.3 dB
- 3. Effective antenna gain: 6 8.3 = -2.3 dBi

The PureWave installation manual provides the installer guidance on how to calculate the maximum input power to the antenna so as to remain within the regulatory EIRP limits.

## 3.4. SOFTWARE AND FIRMWARE

The software controlling the EUT during testing was PureWave OS v1.1.1.

## 3.5. WORST-CASE CONFIGURATION AND MODE

Radiated and conducted emissions tests were performed for both 5 MHz and 10 MHz emission bandwidth channels. Testing was performed for all available modulations: QPSK, 16QAM and 64QAM. Worst-case emissions for both emissions bandwidths are reported.

## **3.6. DESCRIPTION OF TEST SETUP**

#### SETUP DIAGRAM FOR TESTS



## **3.7** Modifications to EUT

None.

## 3.8 TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report CCS: Radiated Emissions

TEST EQUIPMENT LIST					
Description	Manufacturer	Model	Asset Number	Cal Due	
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01179	08/24/10	
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	07/14/10	
Antenna, Horn, 18 GHz	EMCO	3115	C00945	07/29/10	
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	07/06/10	
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	08/04/10	

#### CCS: Antenna Port Conducted Emissions (Occupied Bandwidth)

TEST EQUIPMENT LIST					
Description	Manufacturer	Model	Asset/Serial	Cal Due	
			Number		
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01069	01/05/11	
Vector signal generator, 20GHz	Agilent / HP	E8267C	C01066	11/16/10	

## PureWave: Antenna Port Conducted Tests

Description	Manufacturer	Model	Asset/Serial Number	Cal Due
N9020A Signal Analyze	Agilent	N9020A	MY46472174	07/09/11

## PureWave: Frequency Stability Test Equipment

TEST EQUIPMENT LIST					
Description	Manufacturer	Model	Asset Number	Cal Due	
Wireless Networking Test Set	Agilent	N8300A	GB47350121	20Sept2010	
Variable Voltage Source	Lambda	GENH60-12.5	27M4950F	N/A	
	Associated				
	Envoronmental				
Temperature Chamber	Systems	ZBD-108	6381	N/A	
Multi meter	GW Instek	GDM-8245	CH881834	N/A	

## 4. LIMITS AND RESULTS

## 4.1ANTENNA PORT CHANNEL TESTS

## 4.1.1 -26 dB and 99% OCCUPIED BANDWIDTH

#### **REQUIREMENT**

#### 2.1049 Measurements required: Occupied bandwidth.

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured.

#### TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 1% to 3% of the 99% bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The internal OCC BW function of the spectrum analyzer was activated to display both 99% BW and -26 dB BW values.

#### TEST RESULTS

For each EBW and modulation, occupied bandwidth was measured for each chain. The values obtained were very similar chain by chain, within 2% of each other. The same can be said for the different modulations – for a given EBW, the measured value changed very little from modulation to modulation or from chain to chain.

Spectrum analyzer plots for all chains and all modulations at Low channel are presented below to document the fact that there are only small variations in value from chain to chain (B).

The second set of spectrum analyzer plots (C) show only the highest value single chain occupied bandwidth for each modulation at Low, Mid, and High channels. These values are summarized in the table below (A).

#### Report No: 10PRO017 3.65 GHz Fixed Wireless Transceiver FCC ID: XN3-QUANTUM6636

#### IC: 8974A-QUANTUM6636

#### A. Occupied BW Summay

#### 5MHz EBW QPSK

Channel	Frequency	99% Occupied	-26 dB
	MHz	Bandwidth, MHz	Bandwidth, MHz
Low	3652.5	4.5527	4.780
Middle	3662.5	4.5737	4.7248
High	3672.5	4.5466	4.782

#### 5MHz EBW 16QAM

Channel	Frequency MHz	99% Occupied Bandwidth, MHz	-26 dB Bandwidth, MHz
Low	3652.5	4.5601	4.743
Middle	3662.5	4.5501	4.743
High	3672.5	4.5441	4.744

#### 5MHz EBW 64QAM

Channel	Frequency	99% Occupied	-26 dB
	MHz	Bandwidth, MHz	Bandwidth, MHz
Low	3652.5	4.542	4.747
Middle	3662.5	4.547	4.788
High	3672.5	4.5488	4.866

#### 10 MHz EBW QPSK

Channel	Frequency	99% Occupied	-26 dB
	MHz	Bandwidth, MHz	Bandwidth, MHz
Low	3655	9.0825	9.409
Middle	3662.5	9.1128	9.379
High	3670	9.1363	9.409

#### 10 MHz EBW 16QAM

Channel	Frequency	99% Occupied	-26 dB
	MHz	Bandwidth, MHz	Bandwidth, MHz
Low	3655	9.1157	9.409
Middle	3662.5	9.0961	9.4
High	3670	9.1028	9.369

#### 10 MHz EBW 64QAM

Channel	Frequency	99% Occupied	-26 dB
	MHz	Bandwidth, MHz	Bandwidth, MHz
Low	3655	9.1231	9.379
Middle	3662.5	9.0837	9.383
High	3670	9.0966	9.395

## B. Chains 1-6, 5 MHz EBW, Low Channel QPSK



#### Chain 3 Chain 4 Agilent 11:23:41 Jun 30, 2010 Agilent 11:24:12 Jun 30, 2010 R R Т Freq/Channel Т Freq/Channel Center Freq 3.65250000 GHz Center Freq 3.65250000 GHz Ch Freq Ch Freg 3.6525.GHz Triq Fre 3.6525 GHz Occupied Bandwidth Occupied Bandwidth Start Freq 3.64000000 GHz Start Freq 3.64000000 GHz Ref 40 dBm #Peak Atten 30 dB Ref 40 dBm Atten 30 dB Stop Freq 3.66500000 GHz Stop Freq 3.66500000 GHz Pea og og dB/ 4 CF Step 2.5000000 MHz dB/ → CF Step 2.5000000 MHz Offst Offst ψp Wheel was M uto Ma зB Freq Offset 0.00000000 Hz Freq Offset 0.00000000 Hz enter 3.652 500 GHz Center 3.652 500 GHz Span 25 MHz Span 25 Mł #VBW 160 kHz #Res BW 51 kHz #VBW 160 kHz Sweep 45.8 ms (1001 pts) Res BW 51 kHz Sweep 45.8 ms (1001 pts) Signal Track Signal Track Occupied Bandwidth Occ BW % Pwr 99.00 % Occupied Bandwidth Occ BW % Pwr 99.00 % -26.00 dB -26.00 dB x dB x dB 4.5481 MHz 4.5370 MHz 1.894 kHz Transmit Freq Error 10.504 kHz Transmit Freq Error x dB Bandwidth 5 119 MHz x dB Bandwidth 4.852 MHz



Highest OccBW: 4.5527 MHz (Chain 6)

#### Report No: 10PRO017 3.65 GHz Fixed Wireless Transceiver FCC ID: XN3-QUANTUM6636 P. Choing 1.6 5MUz FRW Low

#### IC: 8974A-QUANTUM6636

B. Chains 1-6, 5MHz EBW, Low Channel 16QAM

Chain 1		Chain 2	
		₩ Agilent 11:30:58 Jun 30, 2010 R T	Freq/Channel
	Center Freq	Ch Freq 3.6525 GHz Trig Free	Center Freq 3.65250000 GHz
Occupied Bandwidth	Start Freq 3.64000000 GHz		Start Freq 3.64000000 GHz
Ref 40 dBm Atten 30 dB Free Atten 20 dB	Stop Freq 3.66500000 GHz	Ref 40 dBm Atten 30 dB #Peak Log	Stop Freq 3.66500000 GHz
10	CF Step 2.5000000 MHz Auto Man	dB/ Offst 21	CF Step 2.5000000 MHz <u>Auto Mar</u>
dB conter 3.652 500 GHz Span 25 MHz	Freq Offset 0.00000000 Hz	dB Center 3.652 500 GHz Span 25 MHz	Freq Offset 0.00000000 Hz
#Res BW 51 kHz         #VBW 160 kHz         Sweep 45.8 ms (1001 pts)           Occupied Bandwidth         Occ BW % Pwr         99.00 %           4.5202 ML         x dB         -26.00 dB	Signal Track <sup>On <u>Off</u></sup>	#Res BW 51 kHz         #VBW 160 kHz         Sweep 45.8 ms (1001 pts)           Occupied Bandwidth         Occ BW % Pwr         99.00 %           4 5601         MHz         × dB         -26.00 dB	Signal Track <sup>On <u>Off</u></sup>
4.3323 IVITZ           Transmit Freq Error         2.216 kHz           x dB Bandwidth         4.744 MHz*		Transmit Freq Error -11.860 kHz x dB Bandwidth 4.743 MHz*	
Copyright 2000-2010 Agilent Technologies		Copyright 2000-2010 Agilent Technologies	





Highest OccBW: 4.5601 MHz



Highest OccBW: 4.5452 MHz

#### IC: 8974A-QUANTUM6636

#### 5MHz QPSK

Low Channel Chain6	Mid Channel Chain1	High Channel Chain5
# Agitent 11 25 22 Jun 30, 2010 R T Freight	hannel 🕸 Aglent 11 21 11 Jun 30, 2010 R. T. E	reg/Channel R Aglant 11:14.32 Jun 30, 2010 R T Meas Setup
Ch Freq 3.6525 GHz Trg Free 36525 GHz 36555 GHz 365555 GHz 365555 GHz 365555 GHZ 365555 GHZ 3655555 GHZ 365555555 GHz 36555555555555555555555555555555555555	der Freq 0000 OHz Occupied Bandwidth	Center Freq 66250000 GHz Try Free Occupied Bandwidth Dn <u>Dr</u>
S 36400	art Freq 000 GHz	Start Freq Avg Mode
Ref 40 dBm Atten 30 dB HPeak S Log Quierum manuto 30 dB	SOF Freq. Prest 40 dBm Atten 30 dB 0000 Oftic Log Quite states 0 dB 2000 Oftic Log 2000 Oftic L	Stop Freq Preck Heat Max Hold Max Hold Stop Freq Max Hold On Off
40/ 0fbs 25000 21 21 21 24 25000 21 21 25000 21 25000 21 25000 21 25000 21 25000 21 25000 21 25000 21 25000 21 25000 21 25000 21 25000 21 25000 21 25000 21 25000 21 25000 21 25000 25 25000 25 25000 25 25000 25 25000 25 25 25000 25 25 25000 25 25 25 25 25 25 25 25 25 25 25 25 25	CF Step ut 2000 Mer Other → € 2000 Mer Other Mag Dr	CCC Step atterned to the state
HI         Free         Free           Center 3.652 500 GHz         Span 25 MHz         0.0000           FRee BW 510 kHz         Sweep 45.8 mc (100 Hz)         100 Hz	2 Offset Context 3 JAS2 300 GHz Center 3 JAS2 300 GHz VIIW 160 kHz Swoon 618 mp (100 mh)	Freq Offset 00000000 to Center 3.527 500 GHz VIII 100 MHz Sweep 6.55 ml (001 ml) Week 8W 51 HHz VIII 100 MHz Sweep 6.55 ml (001 ml)
Occupied Bandwidth Occ 8W % Per 99.00 % 0r Sign 4.5527 MHz r 68 -36.00 r8	al Track Or Occupied Bandwidth Occ BW % Part 99:00 % 4.5737 MHz x e8 -26:00 e8	Signal Track Decupied Bandwidth Occ 8W % Per 9500 % -25 00 48 4,5466 MHz rdf -26 00 48
Transmit Freq Error 519.304 Hz x dB Bandwidth 4 780 MHz*	Transmit Preq Error 2.700 kHz e d8 Bandwidh 4.748 MHz*	Transmit Fires Error 2,859 kHz Optimize a dB Bandwidth 4,782 MHz* Ref Level
Copylight 2000-2018 Aplant Technologies	Crayvight 2003-2018 Agitwet Technologies	Copylight 2000-2010 Aglant Technologies

## 5MHz 16QAM Low Channel Chain2

Mid Channel Chain1

1 High Channel Chain6



#### 5MHz 64QAM Low Channel Chain1

Mid Channel Chain2 Hig

High Channel Chain5

# Agitent 11.49.42 Jun 30, 2010 R T Ch Freq. 3.6625 Citz. Trg. Free Ch Freq. 3.6625 Citz.	Center Freq 3.65250000 GHz	※ Agitent 11:43:00 Jun 30, 2010         R         T           Ch Freq. 3:6625 OHz         Trig. Free           Convolute R bandwidth         Trig. Free	Center Freq 3.66250000 GHz	S Agrent 11.44.26 Jun 30, 2010 R T	FreqCharnel Center Freq
Occupied Bandwidth	Start Freq 3 6400000 GHz Stop Freq	Occupied Dandwillin Control of the second se	Start Freq 3 6500000 GHz Stop Freq	Ch Freq 36/25 GHz Trg Free Occupied Bandwidth Ref 48 dBm Atten 20 40	3 67260000 0Hz Start Freq 3 66000000 0Hz
Conj         Open         Open <th< td=""><td>CF Step 2 5000000 Mitz Auto Mar Freq Offset 0 00000000 Hz</td><td>K<sup>a</sup>y dU dU Onte 21 de Center 3.562 500 GHz Span 25 MHz</td><td>CF Step 2.5000000 MHz Adda Mar Freq Offset 0.00000000 Hz</td><td>ntreat Leg U du Other All du du du du du du du du du du du du du</td><td>CF Step 2 6000000 GHu CF Step 2 6000000 MHz 640 Ma</td></th<>	CF Step 2 5000000 Mitz Auto Mar Freq Offset 0 00000000 Hz	K <sup>a</sup> y dU dU Onte 21 de Center 3.562 500 GHz Span 25 MHz	CF Step 2.5000000 MHz Adda Mar Freq Offset 0.00000000 Hz	ntreat Leg U du Other All du du du du du du du du du du du du du	CF Step 2 6000000 GHu CF Step 2 6000000 MHz 640 Ma
Plane BW 51 Mite         2VBW 160 Mite         Sweep 65.8 ms (1001 pti)           Occupied Bandwidth         Occ 6W %, Par. 9900 %, 4,5452 MHz         rd8 - 9500 %           Travenite Fing Error         -10.719 Mite         rd8 - 55.00 dB           14 dB bioloded         4 2/2 MHz*         rd8 - 55.00 dB	Signal Track On <u>Of</u>	Interest DW 51 Mitz         Invite Visit Mitz         Sweep 45.8 ms (1001 pb)           Occupied Bandwidth         Occ BV % Par         99.00 %           4,5470 MHz         x 65         35.00 d5           Transmit Fing Enror         -11.48 Mitz         x 65         35.00 d5           4 25 Bindwidth         4 200 Mitz         x 65         35.00 d5	Signal Track On <u>Of</u>	Center 20/2000 GHz         Spen 25 MBZ           Weller IM 50 MHz         sweep 8.2 mm (2001 m)           Occupied Bandwidth         Occ 8/W % Pwr         90 00 %           4.5488 MHz         well         36.00 /8           Townell Fing Errer         4.258 MHz         well         36.00 /8	Signal Track On St
Copyright 2000-2010 Agriant Technologies		Copyright 2005-2010 Agricut Technologies		CopergN 2000-2010 Agreet Technologies	

#### C. OCC BW Highest Values

10MHz QPSK



#### 10MHz 16QAM Low Channel Chain3

Mid Channel Chain6

6 High Channel Chain4



# 10MHz 64QAM

Low Channel Chain5

Mid Channel

Chain3

High Channel Chain1

		Aglent 12:01:01 Jun 30, 2010 R T	FregiChannel	Agilent 12:09:17 Jun 30, 2010	RT	Freq <sup>3</sup> Channel
* Agient 11:57 08 Jun 30, 2010 R T	BW/Avg Res BV	Ch Freq 36625 GHz Trg Free	Center Freq 3.66250000 GHz	Ch Freq 3.67 GHz Occupied Bandwidth	Trig Free	Center Freq 3 67000000 GHz
Occupied Bandwidth	Auto Mar Video BV 300.0 kHz		Start Freq 3 6500000 GHz			Start Freq 3.65750000 GHz
Ref 40 dBm Atten 30 dB	Auto Mar VEW/REV 3.00000	Ref 40 dBm Atten 30 dB	Stop Freq 3.6750000 GHz	Ref 40 dBm Atten 30 dB		Stop Freq 3.68250000 GHz
Ang 10 48/ → Other 01/2 → 01/2 → 0	Auto Mar Average 10		CF Step 2 5000000 MHz Auto Ma	dely	-	CF Step 2.5000000 MHz Exto Mar
dB Center 3,655 000 GHz Span 25 MHz	Avg/VBW Type Log-Pwr (Videe) Asts Mar	dB Center 3,662 500 GHz Day DB 401 501 501 500 HHz Stanson 12 or 400 Hz	Freq Offset 0.00000000 Hz	Center 3.570 000 GHz	Span 25 MHz	Freq Offset 0.00000000 Hz
United NM 100 bits         V00W 300 bits         Sweep 12 ms (1001 ph)           Occupied Bandwidth         Occ 8W % Part         9900 %           9,1231 MHz         x e80         -36.00 e8           Tracent Fing Error         2.993 bits         -	SpanRtBW 106	process the flow two two weeks by the flow period         Sweeks by the flow pe	Signal Track On <u>Qf</u>	Occupied Bandwidth         Occ BW % Per           9.0966 MHz         x dB           Transmit FreqEmm         3765 Hzr           vdB Bandwidth         3765 Hzr	99.00 % -26.00 dB	Signal Track On Of
E do Gartawith 3.3/3 winz Cravink 2003-2010 Anixet Technicoles	ear er	Copyright 2000-2010 Aglant Technologies		Copyright 2000-2010 Aerient Technologies		<u></u>

#### PEAK EIRP LIMIT

90.1321(a) Base stations and fixed stations are limited to 25watts/25 MHz equivalent isotropic radiated power (EIRP). In any event the EIRP power density shall not exceed 1 watt in any on-megahertz slice of spectrum.

The maximum permitted antenna port output powers for this product are calculated based on the following typical installation parameters:

-A minimum 6 dBi antenna for use with base stations,

- -30m cable loss for TMC LMR-400 at 3.65 MHz = 8.3 dB
- -Effective antenna gain: 6 8.3 = -2.3 dBi

#### TEST PROCEDURE

Channel power measurements were made using the spectrum analyzer built-in function. The settings and procedures followed are found in FCC KDB document 965270 D01 Pwr Meas Part 90 Z Equipment v01.

Measurements were taken for each modulation and for each chain at Low, Mid, and High frequencies, and the results summed algebraically to determine total output power and EIRP.

Power output calculations are found in the spread sheet below. Spectrum analyzer plots of conducted antenna port channel power are located in Annex A of this report for reference.

Note: PSD and band edge emissions were limiting factors for output power.

18-Aug-10

PureWave Quantum 6636 Output Power FCC Part 90Z IC RSS-197

Single Element Minimum Antenna Gain = 6dBi

Single Element Maximum Cable Loss = 8.3dB (e.g. 30 meters TMC LMR-400) Single Element Net Antenna Gain = 6dBi - 8.3dB = -2.3dBi

Specification Limit: EIRP 25Watts/25MHz Maximum, 1Watt/MHz Maximum. 5MHz Channel = 5Watts/5MHz, 10MHz Channel = 10Watts/10MHz

Low Peak         3652.5         23.11         22.27         22.67         22.67         22.67         22.67         22.67         22.67         22.67         23.31         0.681         5.           Mid Peak         3662.5         26.05         26.81         27.42         26.52         25.51         34.23         -2.30         31.93         1.558         5.           High Peak         3672.5         25.04         25.25         25.47         25.12         25.2         33.04         -2.30         30.74         1.187         5.           Mid Peak         3672.5         25.04         25.25         25.47         25.12         25.2         33.04         -2.30         30.74         1.187         5.           Maximum Chain Output         Net Antenna Array         Maximum Output Power         Maximum Output         Specification           10 MHz QPSK         Chain 1         Chain 3         Chain 5         Chain 6         Power, dBm         Factor, dBi         dBm         Power, Watts         Watts           Low Peak         3655         2.1         2.1         2.3         30.58         -3.30         28.28         0.673         10	5.00 5.00 5.00 tion Max EIRP ts/10MHz 10.00 10.00
Mid Peak     3662.5     26.05     26.81     27.42     26.12     26.5     25.1     34.23     -2.30     31.93     1.558     5.5       High Peak     3672.5     25.04     25.54     25.47     25.12     25.2     33.04     -2.30     31.93     1.558     5.5       Ubb Peak     3672.5     25.04     25.54     25.12     25.12     33.04     -2.30     30.74     1.187     5.7       Dot Mid OPSK     Chain 5     Chain 6     Power, dBm     Power, dBm     Mat/mum Output Power     Maximum Output Power <td>5.00 5.00 tion Max EI RP ts/10MHz 10.00 10.00</td>	5.00 5.00 tion Max EI RP ts/10MHz 10.00 10.00
High Peak         3672.5         25.04         25.25         25.47         25.47         25.12         25.2         33.04         -2.30         30.74         1.187         5.           Migh Peak         3672.5         25.04         25.47         25.47         25.12         25.2         33.04         -2.30         30.74         1.187         5.           Migh Peak         Chain 1         Chain 2         Chain 3         Chain 4         Chain 5         Chain 6         Power, dBm         Factor, dBl         dBm         Power, Watts         Watts           Low Peak         3655         22.11         22.14         23.92         23.44         22.59         30.58         -3.30         28.28         0.673         10	5.00 tion Max EI RP ts/10MHz 10.00 10.00
Maximum Chain Output         Net Antenna Array         Maximum Output Power         Maximum Output         Specificatio           10 MHz QPSK         Chain 1         Chain 3         Chain 4         Chain 5         Chain 6         Power, dBm         Factor, dBi         dBm         Power, Watts         Watts           Low Peak         3655         22.11         22.14         23.92         23.64         22.59         21.98         30.58         -2.30         28.28         0.673         10	tion Max EIRP ts/10MHz 10.00 10.00
10 MHz OPSK         Chain 1         Chain 3         Chain 4         Chain 5         Chain 6         Power, dBm         Factor, dBi         dBm         Power, Watts         Watts/ Watts           Low Peak         3655         22.11         22.14         23.92         23.44         22.59         21.98         30.58         -3.30         28.28         0.073         10	ts/10MHz 10.00 10.00
Low Peak 3655 22.11 22.14 23.92 23.64 22.59 21.98 30.58 -2.30 28.28 0.673 10.	10.00 10.00
	10.00
Mid Peak 3662.5 29.86 29.17 30.32 30.34 28.78 29.37 37.46 -2.30 35.16 3.281 10	
High Peak 3670 24.57 24.84 23.92 24.65 24.26 24.3 32.22 -2.30 29.92 0.981 10.	10.00
Maximum Chain Output Net Antenna Array Maximum Output EIRP Maximum Output EIRP, Specificatio	tion Max EI RP
5 MHZ 16QAM F, MHz Chain 1 Chain 2 Chain 3 Chain 4 Chain 5 Chain 6 Power, dBm Factor, dBi dBm Watts Watts	tts/5MHz
Low Peak 3652.5 23.07 22.32 21.74 22.68 23.41 22.86 30.49 2.30 28.19 0.660 5.	5.00
Mid Peak 3662.5 25.95 26.83 27.51 26.31 26.36 25.47 34.24 -2.30 31.94 1.561 5.0	5.00
High Peak 3672.5 25 22.2 24.32 25.44 25.03 25.11 32.42 -2.30 30.12 1.028 5.4	5.00
Maximum Chain Output Net Antenna Array Maximum Output Power Maximum Output Specificatio	tion Max EI RP
10 MHz 16QAM Chain 1 Chain 2 Chain 3 Chain 4 Chain 5 Chain 6 Power, dBm Factor, dBi dBm Power, Watts Watts/	ts/10MHz
Low Peak 3655 22.14 22.52 22.25 23.22 22.86 22.86 30.44 -2.30 28.14 0.652 10	10.00
Mid Peak 3662.5 29.79 29.22 30.35 30.46 28.72 29.38 37.48 -2.30 35.18 3.295 10	10.00
High Peak 3670 24.56 24.81 24 24.62 24.58 24.67 32.33 -2.30 30.03 1.007 10.	10.00
Maximum Chain Output A Net Antenna Array Maximum Output EIRP Maximum Output EIRP. Specificatio	tion Max EI RP
5 MHZ 64QAM F. MHz Chain 1 Chain 2 Chain 3 Chain 4 Chain 5 Chain 6 Power, dBm Factor, dBi dBm Watts Watts	tts/5MHz
Low Peak 3652.5 23.11 22.32 21.74 22.73 23.45 22.89 30.52 -2.30 28.22 0.664 5.0	5.00
Mid Peak 3662.5 25.96 26.75 27.31 26.09 26.52 25.44 34.17 -2.30 31.87 1.537 5.4	5.00
High Peak 3672.5 24.94 25.18 24.24 25.43 25.01 25.07 32.77 -2.30 30.47 1.116 5.4	5.00
Maximum Chain Output Net Antenna Array Maximum Output Power Maximum Output Specificatio	tion Max EI RP
10 MHz 64QAM Chain 1 Chain 2 Chain 3 Chain 4 Chain 5 Chain 6 Power, dBm Factor, dBi dBm Power, Watts Watts/	ts/10MHz
Low Peak 3655 22.03 22.45 22.61 23.6 22.97 22.41 30.49 -2.30 28.19 0.659 10	10.00
Mid Peak 3662.5 29.94 29.18 30.35 30.36 28.69 29.27 37.46 -2.30 35.16 3.280 10	10.00
High Peak 3670 24.12 24.73 23.84 24.61 25.01 24.66 32.29 -2.30 29.99 0.999 10	10.00

#### Power settings:

Low channels, all modulations: 26 dBm

High channels, all modulations: 28 dBm

5 MHz Mid channel and all other channels removed by 2.5 MHz from L or H channel: 30 dBm 10 MHz Mid channel and all other channels removed by 2.5 MHz from L or H channel: 33 dBm

## 4.6.1.3 PEAK EIRP POWER DENSITY LIMIT

90.1321(a) Base stations and fixed stations are limited to 25watts/25 MHz equivalent isotropic radiated power (EIRP). In any event the EIRP power density shall not exceed 1 watt in any on-megahertz slice of spectrum.

#### TEST PROCEDURE

Peak PSD measurements were made using the settings and procedures in FCC KDB document 965270 D01 Pwr Meas Part 90 Z Equipment v01.

Measurements were taken for each modulation and for each chain at Low, Mid, and High frequencies, and the results summed algebraically to determine total output power and EIRP.

Peak PSD EIRP calculations are found in the spread sheet below. Spectrum analyzer plots of conducted antenna port PSD measurements are located in Annex B of this report for reference.

Power settings for PSD were the same as for maximum power settings for power (30 dBm or 33 dBm).

18-Aug-10

PureWave Quantum 6636 PSD FCC Part 90Z IC RSS-197

Single Element Minimum Antenna Gain = 6dBi (e.g. Mobile Mark 6dBi Omni, ECO6-3500) Single Element Maximum Cable Loss = 8.3dB (e.g. 30 meters TMC LMR-400) Single Element Net Antenna Gain = 6dBi : 8.3dB = 2.3dBi

Specification Limit: EIRP 1Watt/MHz Maximum.

								Sum 6 Chains Output	Net Antenna Array	Maximum Output EIRP	Maximum Output EIRP,	Specification Max EIRP,
5 MHZ QPSK	F, MHz	Chain 1	Chain 2	Chain 3	Chain 4	Chain 5	Chain 6	Power, dBm/MHz	Factor, dBi	dBm/MHz	Watts/MHz	Watts/MHz
Low Peak	3652.5	24.19	23.61	24.3	24.31	23.77	22.79	31.64	-2.30	29.34	0.859	1.00
Mid Peak	3662.5	23.36	23.63	24.32	23.94	24.21	23.04	31.56	-2.30	29.26	0.842	1.00
High Peak	3672.5	23.17	24.11	24.15	23.66	23.75	22.75	31.41	-2.30	29.11	0.814	1.00
								7.78				
								Sum 6 Chains Output	Net Antenna Array	Maximum Output EIRP	Maximum Output EIRP,	Specification Max EIRP,
10 MHz QPSK		Chain 1	Chain 2	Chain 3	Chain 4	Chain 5	Chain 6	Power, dBm/MHz	Factor, dBi	dBm/MHz	Watts/MHz	Watts/MHz
Low Peak	3655	23.13	23.21	23.82	22.71	22.79	23.53	31.00	-2.30	28.70	0.741	1.00
Mid Peak	3662.5	23.45	22.76	23.41	24.13	23.43	23.18	31.19	-2.30	28.89	0.775	1.00
High Peak	3670	24.04	23.64	24.19	22.37	22.55	23.32	31.19	-2.30	28.89	0.774	1.00
3								7 78				
								Sum 6 Chains Output	Net Antenna Array	Maximum Output EIRP	Maximum Output EI RP.	Specification Max EIRP.
5 MHZ 160AM	F. MHz	Chain 1	Chain 2	Chain 3	Chain 4	Chain 5	Chain 6	Power, dBm/MHz	Factor, dBi	dBm/MHz	Watts/MHz	Watts/MHz
Low Peak	3652.5	23.45	23.54	24.41	23.78	23.9	22.87	31.47	-2.30	29.17	0.825	1.00
Mid Peak	3662.5	23.5	24.32	24.16	23.5	23.66	22.65	31.45	-2.30	29.15	0.821	1.00
High Peak	3672 5	23 74	24	24.34	23.64	23.7	22.78	31.51	-2.30	29.21	0.833	1.00
								7.78				
								Sum 6 Chains Output	Net Antenna Array	Maximum Output EIRP	Maximum Output EI RP.	Specification Max EIRP.
10 MHz 16QAM		Chain 1	Chain 2	Chain 3	Chain 4	Chain 5	Chain 6	Sum 6 Chains Output Power, dBm/MHz	Net Antenna Array Factor, dBi	Maximum Output EIRP dBm/MHz	Maximum Output EIRP, Watts/MHz	Specification Max EIRP, Watts/MHz
10 MHz 16QAM	3655	Chain 1 23.47	Chain 2	Chain 3	Chain 4 24.37	Chain 5	Chain 6 23.85	Sum 6 Chains Output Power, dBm/MHz 31.41	Net Antenna Array Factor, dBi -2.30	Maximum Output EIRP dBm/MHz 29 11	Maximum Output EI RP, Watts/MHz 0.814	Specification Max EIRP, Watts/MHz
10 MHz 16QAM Low Peak Mid Peak	3655 3662.5	Chain 1 23.47 23.58	Chain 2 22.63 23.06	Chain 3 24.29 24.04	Chain 4 24.37 23.68	Chain 5 22.84 22.98	Chain 6 23.85 23.33	Sum 6 Chains Output Power, dBm/MHz 31.41 31.24	Net Antenna Array Factor, dBi -2.30 -2.30	Maximum Output EIRP dBm/MHz 29.11 28.94	Maximum Output EIRP, Watts/MHz 0.814 0.784	Specification Max EIRP, Watts/MHz 1.00 1.00
10 MHz 16QAM Low Peak Mid Peak High Peak	3655 3662.5 3670	Chain 1 23.47 23.58 24	Chain 2 22.63 23.06 24 19	Chain 3 24.29 24.04 23.91	Chain 4 24.37 23.68 22.44	Chain 5 22.84 22.98 22.76	Chain 6 23.85 23.33 23.52	Sum 6 Chains Output Power, dBm/MHz 31.41 31.24 31.30	Net Antenna Array Factor, dBi -2.30 -2.30 -2.30	Maximum Output EIRP dBm/MHz 29.11 28.94 29.00	Maximum Output EIRP, Watts/MHz 0.814 0.784 0.794	Specification Max EI RP, Watts/MHz 1.00 1.00 1.00
<b>10 MHz 16QAM</b> Low Peak Mid Peak High Peak	3655 3662.5 3670	Chain 1 23.47 23.58 24	Chain 2 22.63 23.06 24.19	Chain 3 24.29 24.04 23.91	Chain 4 24.37 23.68 22.44	Chain 5 22.84 22.98 22.76	Chain 6 23.85 23.33 23.52	Sum 6 Chains Output Power, dBm/MHz 31.41 31.24 31.30 7 78	Net Antenna Array Factor, dBi -2.30 -2.30 -2.30	Maximum Output EIRP dBm/MHz 29.11 28.94 29.00	Maximum Output EIRP, Watts/MHz 0.814 0.784 0.794	Specification Max EIRP, Watts/MHz 1.00 1.00 1.00
10 MHz 16QAM Low Peak Mid Peak High Peak 5 MHZ 64QAM	3655 3662.5 3670	<b>Chain 1</b> 23.47 23.58 24	<b>Chain 2</b> 22.63 23.06 24.19	<b>Chain 3</b> 24.29 24.04 23.91	<b>Chain 4</b> 24.37 23.68 22.44	Chain 5 22.84 22.98 22.76	<b>Chain 6</b> 23.85 23.33 23.52	Sum 6 Chains Output Power, dBm/MHz 31.41 31.24 31.30 7.78 Sum 6 Chains Output	Net Antenna Array Factor, dBi -2.30 -2.30 -2.30 Net Antenna Array	Maximum Output EIRP dBm/MHz 29.11 28.94 29.00 Maximum Output EIRP	Maximum Output EI RP, Watts/MHz 0.814 0.784 0.794 Maximum Output EI RP.	Specification Max EIRP, Watts/MHz 1.00 1.00 1.00 Specification Max EIRP.
10 MHz 16QAM Low Peak Mid Peak High Peak 5 MHZ 64QAM 27dBm Pset	3655 3662.5 3670	Chain 1 23.47 23.58 24 Chain 1	Chain 2 22.63 23.06 24.19 Chain 2	Chain 3 24.29 24.04 23.91 Chain 3	Chain 4 24.37 23.68 22.44 Chain 4	Chain 5 22.84 22.98 22.76 Chain 5	Chain 6 23.85 23.33 23.52 Chain 6	Sum 6 Chains Output Power, dBm/MHz 31.41 31.24 31.30 7.78 Sum 6 Chains Output Power, dBm/MHz	Net Antenna Array Factor, dBi -2.30 -2.30 -2.30 Net Antenna Array Factor, dBi	Maximum Output EIRP dBm/MHz 29.11 28.94 29.00 Maximum Output EIRP dBm/MHz	Maximum Output EI RP, Watts/MHz 0.814 0.784 0.794 Maximum Output EI RP, Watts/MHz	Specification Max EIRP, Watts/MHz 1.00 1.00 1.00 Specification Max EIRP, Watts/MHz
10 MHz 16QAM Low Peak Mid Peak High Peak 5 MHZ 64QAM 27dBm Pset Low Peak	3655 3662.5 3670 <b>F, MHz</b> 3652.5	Chain 1 23.47 23.58 24 Chain 1 23.33	Chain 2 22.63 23.06 24.19 Chain 2 24.3	Chain 3 24.29 24.04 23.91 Chain 3 24.15	Chain 4 24.37 23.68 22.44 Chain 4 23.69	Chain 5 22.84 22.98 22.76 Chain 5 23.6	Chain 6 23.85 23.33 23.52 Chain 6 22.98	Sum 6 Chains Output Power, dBm/MHz 31.41 31.24 31.30 7.78 Sum 6 Chains Output Power, dBm/MHz 31.48	Net Antenna Array Factor, dBi - 2.30 - 2.30 - 2.30 Net Antenna Array Factor, dBi - 2.30	Maximum Output EIRP dBm/MHz 29.11 28.94 29.00 Maximum Output EIRP dBm/MHz 29.18	Maximum Output EIRP, Watts/MHz 0.814 0.784 0.794 Maximum Output EIRP, Watts/MHz 0.828	Specification Max EIRP, Watts/MHz 1.00 1.00 1.00 Specification Max EIRP, Watts/MHz 1.00
10 MHz 16QAM Low Peak Mid Peak High Peak 5 MHZ 64QAM 27dBm Pset Low Peak Mid Peak	3655 3662.5 3670 <b>F, MHz</b> 3652.5 3662.5	Chain 1 23.47 23.58 24 Chain 1 23.33 23.5	Chain 2 22.63 23.06 24.19 Chain 2 24.3 23.89	Chain 3 24.29 24.04 23.91 Chain 3 24.15 24.24	Chain 4 24.37 23.68 22.44 Chain 4 23.69 23.6	Chain 5 22.84 22.98 22.76 Chain 5 23.6 24.04	Chain 6 23.85 23.33 23.52 Chain 6 22.98 22.76	Sum 6 Chains Output Power, dBm/MHz 31.41 31.24 31.30 7.78 Sum 6 Chains Output Power, dBm/MHz 31.48 31.48	Net Antenna Array Factor, dBi -2.30 -2.30 -2.30 Net Antenna Array Factor, dBi -2.30 -2.30 -2.30	Maximum Output EIRP dBm/MHz 29.11 28.94 29.00 Maximum Output EIRP dBm/MHz 29.18 29.18	Maximum Output EI RP, Watts/MHz 0.814 0.784 0.794 Maximum Output EI RP, Watts/MHz 0.828 0.828	Specification Max EIRP, Watts/MHz 1.00 1.00 1.00 Specification Max EIRP, Watts/MHz 1.00 1.00
10 MHz 16QAM Low Peak Mid Peak High Peak 5 MHZ 64QAM 27dBm Peak Low Peak Mid Peak	3655 3662.5 3670 <b>F, MHz</b> 3652.5 3662.5 3662.5	Chain 1 23.47 23.58 24 Chain 1 23.33 23.5 23.74	Chain 2 22.63 23.06 24.19 Chain 2 24.3 23.89 22.98	Chain 3 24.29 24.04 23.91 Chain 3 24.15 24.24 23.91	Chain 4 24.37 23.68 22.44 Chain 4 23.69 23.6 24.02	Chain 5 22.84 22.98 22.76 Chain 5 23.6 24.04 22.51	Chain 6 23.85 23.33 23.52 Chain 6 22.98 22.76 23.03	Sum 6 Chains Output Power, dBm/MHz 31.41 31.24 31.30 7.78 Sum 6 Chains Output Power, dBm/MHz 31.48 31.48 31.48	Net Antenna Array Factor, dBi -2.30 -2.30 -2.30 Net Antenna Array Factor, dBi -2.30 -2.30 -2.30 -2.30	Maximum Output EIRP dBm/MHz 29.11 28.94 29.00 Maximum Output EIRP dBm/MHz 29.18 29.18 29.88	Maximum Output EIRP, Watts/MHz 0.814 0.784 0.794 Maximum Output EIRP, Watts/MHz 0.828 0.828 0.828	Specification Max EIRP, Watts/MHz 1.00 1.00 Specification Max EIRP, Watts/MHz 1.00 1.00 1.00 1.00
10 MHz 16QAM Low Peak Mid Peak High Peak 5 MHZ 64QAM 27dBm Pset Low Peak Mid Peak High Peak	3655 3662.5 3670 <b>F, MHz</b> 3652.5 3662.5 3662.5 3672.5	Chain 1 23.47 23.58 24 Chain 1 23.33 23.5 23.74	Chain 2 22.63 23.06 24.19 Chain 2 24.3 23.89 22.98	Chain 3 24.29 24.04 23.91 Chain 3 24.15 24.24 23.91	Chain 4 24.37 23.68 22.44 Chain 4 23.69 23.6 24.02	Chain 5 22.84 22.98 22.76 Chain 5 23.6 24.04 22.51	Chain 6 23.85 23.33 23.52 Chain 6 22.98 22.76 23.03	Sum 6 Chains Output Power, dBm/MHz 31.41 31.24 31.30 7.78 Sum 6 Chains Output Power, dBm/MHz 31.48 31.48 31.18 7.78	Net Antenna Array Factor, dBi -2.30 -2.30 -2.30 Net Antenna Array Factor, dBi -2.30 -2.30 -2.30	Maximum Output EIRP dBm/MHz         29.11           28.94         29.00           Maximum Output EIRP dBm/MHz         29.18           29.18         28.88	Maximum Output EIRP, Watts/MHz 0.814 0.784 0.794 Maximum Output EIRP, Watts/MHz 0.828 0.828 0.773	Specification Max EIRP, Watts/MHz 1.00 1.00 Specification Max EIRP, Watts/MHz 1.00 1.00 1.00
10 MHz 16QAM Low Peak Mid Peak High Peak 5 MHZ 64QAM 27dBm Pset Low Peak Mid Peak High Peak	3655 3662.5 3670 <b>F, MHz</b> 3652.5 3662.5 3672.5	Chain 1 23.47 23.58 24 Chain 1 23.33 23.5 23.74	<b>Chain 2</b> 22.63 23.06 24.19 <b>Chain 2</b> 24.3 23.89 22.98	Chain 3 24.29 24.04 23.91 Chain 3 24.15 24.24 23.91	Chain 4 24.37 23.68 22.44 Chain 4 23.69 23.6 24.02	Chain 5 22.84 22.98 22.76 Chain 5 23.6 24.04 22.51	Chain 6 23.85 23.33 23.52 Chain 6 22.98 22.76 23.03	Sum 6 Chains Output Power, d8m/MHz 31.41 31.24 31.30 7.78 Sum 6 Chains Output Power, d8m/MHz 31.48 31.18 7.78 Sum 6 Chains Output 7.78 Sum 6 Chains Output	Net Antenna Array Factor, dBi -2.30 -2.30 -2.30 Net Antenna Array Factor, dBi -2.30 -2.30 -2.30 -2.30 Net Antenna Array	Maximum Output EIRP dim/WHz 29.11 29.00 Maximum Output EIRP dBm/WHz 29.18 29.18 29.18 29.18 28.88 Maximum Output EIRP	Maximum Output EIRP, Watts:/MHz 0.814 0.784 0.794 Maximum Output EIRP, Watts/MHz 0.828 0.828 0.773 Maximum Output EIRP,	Specification Max EIRP, Watts/WHz 1.00 1.00 Specification Max EIRP, Watts/WHz 1.00 1.00 5.00 1.00 5.00 1.00 5.00 1.00
10 MHz 16QAM Low Peak Mid Peak High Peak 5 MHZ 64QAM 27dBm Pset Low Peak Mid Peak High Peak	3655 3662.5 3670 <b>F, MHz</b> 3652.5 3662.5 3672.5	Chain 1 23.47 23.58 24 Chain 1 23.33 23.5 23.74 Chain 1	Chain 2 22.63 23.06 24.19 Chain 2 24.3 23.89 22.98 Chain 2	Chain 3 24.29 24.04 23.91 Chain 3 24.15 24.24 23.91 Chain 3	Chain 4 24.37 23.68 22.44 Chain 4 23.69 23.6 24.02 Chain 4	Chain 5 22.84 22.98 22.76 Chain 5 23.6 24.04 22.51 Chain 5	Chain 6 23.85 23.33 23.52 Chain 6 22.98 22.76 23.03 Chain 6	Sum 6 Chains Output Power, 48m/MHz 31.41 31.24 31.30 7.78 Sum 6 Chains Output Power, 48m/MHz 31.48 31.48 31.18 7.78 Sum 6 Chains Output Power, 48m/MHz	Net Antenna Array Factor, dBi -2.30 -2.30 -2.30 Net Antenna Array Factor, dBi -2.30 -2.30 -2.30 -2.30 -2.30 Net Antenna Array Factor, dBi	Maximum Output EIRP dBm/MHz 29.11 28.94 29.00 Maximum Output EIRP dBm/MHz 28.88 Maximum Output EIRP dBm/MHz	Maximum Output EIRP, Watts:/MHz 0.814 0.784 0.794 Maximum Output EIRP, Watts/MHz 0.828 0.773 Maximum Output EIRP, Watts/MHz	Specification Max EIRP, Watts:/MHz 1.00 1.00 Specification Max EIRP, Watts:/MHz 1.00 1.00 Specification Max EIRP, Watts:/MHz
10 MHz 16QAM Low Peak Mid Peak High Peak 27dBm Pset Low Peak Mid Peak High Peak 10 MHz 64QAM Low Peak	3655 3662.5 3670 <b>F, MHz</b> 3652.5 3662.5 3672.5	Chain 1 23.47 23.58 24 Chain 1 23.33 23.5 23.74 Chain 1 24.2	Chain 2 22.63 23.06 24.19 Chain 2 24.3 23.89 22.98 Chain 2 22.88	Chain 3 24.29 24.04 23.91 Chain 3 24.15 24.24 23.91 Chain 3 24.13	Chain 4 24.37 23.68 22.44 Chain 4 23.69 23.6 24.02 Chain 4 24.25	Chain 5 22:84 22:98 22:76 Chain 5 23:6 24:04 22:51 Chain 5 23:18	Chain 6 23.85 23.33 23.52 Chain 6 22.98 22.76 23.03 Chain 6 23.06	Sum 6 Chains Output Power, d8m/MHz 31.41 31.24 31.30 7.78 Sum 6 Chains Output Power, d8m/MHz 31.48 31.18 7.78 Sum 6 Chains Output Power, d8m/MHz 31.44 31.43	Net Antenna Array Factor, dBi -2.30 -2.30 -2.30 Net Antenna Array Factor, dBi -2.30 -2.30 -2.30 -2.30 Net Antenna Array Factor, dBi -2.30	Maximum Output EIRP dBm/MHz 29.11 29.00 Maximum Output EIRP dBm/MHz 29.18 29.18 29.18 29.18 29.88 Maximum Output EIRP dBm/MHz 29.14	Maximum Output EIRP, Watts:/MHz 0.814 0.784 0.794 Maximum Output EIRP, 0.828 0.828 0.773 Maximum Output EIRP, Watts/MHz 0.820	Specification Max EIRP, Watts/MHz 1.00 1.00 Specification Max EIRP, Watts/MHz 1.00 1.00 Specification Max EIRP, Watts/MHz 1.00
10 MHz 16QAM Low Peak Mid Peak High Peak 5 MHz 64QAM Z7dBm Peat Low Peak Mid Peak High Peak Do MHz 64QAM Low Peak	3655 3662.5 3670 <b>F, MHz</b> 3652.5 3662.5 3672.5 3655 36655	Chain 1 23.47 23.58 24 Chain 1 23.33 23.5 23.74 Chain 1 24.2 23.41	Chain 2 22.63 23.06 24.19 Chain 2 24.3 23.89 22.98 Chain 2 22.88 23.53	Chain 3 24.29 24.04 23.91 Chain 3 24.15 24.24 23.91 Chain 3 24.13 24.13 24.13 24.13	Chain 4 24.37 23.68 22.44 Chain 4 23.69 23.6 24.02 Chain 4 24.25 24.14	Chain 5 22:84 22:98 22:76 Chain 5 23:6 24:04 22:51 Chain 5 23:18 22:87	Chain 6 23.85 23.33 23.52 Chain 6 22.98 22.76 23.03 Chain 6 23.06 23.05	Sum 6 Chains Output Power, d8m/MHz 31.41 31.24 31.30 7.78 Sum 6 Chains Output Power, d8m/MHz 31.48 31.48 31.18 7.78 Sum 6 Chains Output Power, d8m/MHz 31.44 31.44 31.44	Net Antenna Array Factor, dBi 2.30 2.30 2.30 Net Antenna Array Factor, dBi 2.30 2.30 Net Antenna Array Factor, dBi 2.30 2.30 Net Antenna Array Factor, dBi 2.30 2.30	Maximum Output EIRP dim/MHz 29.11 28.94 29.00 Maximum Output EIRP dim/MHz 29.18 28.88 Maximum Output EIRP dim/MHz 29.14 29.14 29.16	Maximum Output EIRP, Watts:/MHz 0.814 0.784 0.794 Maximum Output EIRP, Watts:/MHz 0.828 0.773 Maximum Output EIRP, Watts:/MHz 0.820 0.820 0.820	Specification Max EIRP, Watts:/MHz 1.00 1.00 Specification Max EIRP, Watts:/MHz 1.00 1.00 Specification Max EIRP, Watts:/MHz 1.00 1.00
10 MHz 16QAM Low Peak Mid Peak High Peak 27dBm Pset Low Peak Mid Peak High Peak 10 MHz 64QAM Low Peak Mid Peak Mid Peak	3655 3662.5 3670 <b>F, MHz</b> 3652.5 3662.5 3672.5 3655 3662.5 3662.5 3670	Chain 1 23.47 23.58 24 Chain 1 23.33 23.5 23.74 Chain 1 24.2 23.41 23.16	Chain 2 22.63 23.06 24.19 Chain 2 24.3 23.89 22.98 Chain 2 22.88 23.53 23.15	Chain 3 24.29 24.04 23.91 Chain 3 24.15 24.24 23.91 Chain 3 24.13 24.12 24.05	Chain 4 24.37 23.68 22.44 Chain 4 23.69 23.6 24.02 Chain 4 24.25 24.14 23.02	Chain 5 22:84 22:98 22:76 Chain 5 23:6 24:04 22:51 Chain 5 23:18 22:87 22:28	Chain 6 23.85 23.33 23.52 Chain 6 22.98 22.76 23.03 Chain 6 23.06 23.85 23.85	Sum 6 Chains Output Power, d8m/MHz 31.41 31.24 31.30 7.78 Sum 6 Chains Output Power, d8m/MHz 31.48 31.18 7.78 Sum 6 Chains Output Power, d8m/MHz 31.14 31.44 31.44 31.44 31.44 31.44 31.44 30.98	Net Antenna Array Factor, dBi - 2.30 - 2.30 - 2.30 Net Antenna Array Factor, dBi - 2.30 - 2.30 - 2.30 Net Antenna Array Factor, dBi - 2.30 - 2.30	Maximum Output EIRP dBm/WHz           29.11           29.00           Maximum Output EIRP dBm/WHz           29.18           29.18           29.18           29.18           29.18           29.18           29.18           29.18           29.18           29.18           29.18           29.18           29.16           29.14           29.16           28.68	Maximum Output EIRP, Watts/MHz 0.814 0.784 0.794 Maximum Output EIRP, Watts/MHz 0.828 0.828 0.773 Maximum Output EIRP, Watts/MHz 0.820 0.824 0.824 0.820	Specification Max EIRP, Watts/MHz 1.00 1.00 Specification Max EIRP, Watts/MHz 1.00 1.00 Specification Max EIRP, Watts/MHz Watts/MHz 1.00 1.00 1.00

## 4.6.1.4 MAXIMUM PERMISSIBLE EXPOSURE

#### LIMITS

\$1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm²)	Averaging time (minutes)
(A) Lim	nits for Occupational	l/Controlled Exposu	res	
0.3–3.0 3.0–30 30–300 300–1500 1500–100,000	614 1842/f 61.4	1.63 4.89/f 0.163	*(100) *(900/f²) 1.0 f/300 5	6 6 6 6
(B) Limits	for General Populati	on/Uncontrolled Exp	posure	
0.3–1.34 1.34–30	614 824/f	1.63 2.19/f	*(100) *(180/f <sup>2</sup> )	30 30

TABLE 1-LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

#### TABLE 1-LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)-Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm²)	Averaging time (minutes)
30–300	27.5	0.073	0.2	30
300-1500			f/1500	30
1500-100,000			1.0	30

f = frequency in MHz
 \* = Plane-wave equivalent power density
 NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.
 NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

#### **CALCULATIONS**

Given

 $E = \sqrt{(30 * P * G)} / d$ 

and

 $S = E^{2}/3770$ 

where

- E = Field Strength in Volts/meter
- P = Power in Watts
- G = Numeric antenna gain
- d = Distance in meters
- S = Power Density in milliwatts/square centimeter

Combining equations and rearranging the terms to express the distance as a function of the remaining variables yields:

 $d = \sqrt{((30 * P * G) / (3770 * S))}$ 

Changing to units of Power to mW and Distance to cm, using:

P(mW) = P(W) / 1000 andd (cm) =100 \* d (m)

yields

 $d = 100 * \sqrt{((30 * (P / 1000) * G) / (3770 * S))}$  $d = 0.282 * \sqrt{(P * G / S)}$ 

where

d = distance in cm P = Power in mW G = Numeric antenna gain S = Power Density in mW/cm^2

Substituting the logarithmic form of power and gain using:

 $P (mW) = 10 ^ (P (dBm) / 10) and$   $G (numeric) = 10 ^ (G (dBi) / 10)$ yields  $d = 0.282 * 10 ^ ((P + G) / 20) / \sqrt{S}$ Equation (1)
where d = MPE distance in cm P = Power in dBm G = Antenna Gain in dBi  $S = Power Density Limit in mW/cm^{2}$ 

Equation (1) and the measured peak power is used to calculate the MPE distance.

## **LIMITS**

From §1.1310 Table 1 (B), S = 1.0 mW/cm^2

## **RESULTS**

RF exposure considerations will be addressed by the licensee at the time of installation. The maximum eirp allowed under Part 90 for this product is 10 Watts/10 MHz channels, or 40 dBm EIRP. The MPE distance for 40 dBm eirp calculated below:

<b>Power Density</b>	Output	Antenna	MPE
Limit	Power	Gain	Distance
(mW/cm^2)	(dBm)	(dBi)	( <b>cm</b> )
1.0	40.00	0.00	28.20

## 4.6.1.5 CONDUCTED SPURIOUS EMISSIONS

#### **REQUIREMENT**

#### 2.1051 Measurements required: Spurious emissions at antenna terminals.

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in §2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

## 90.1323(a) Emission limits.

(a) The power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or less, but at least one percent of the emission bandwidth of the fundamental emission of the transmitter, provided the measured energy is integrated over a 1 MHz bandwidth.

#### TEST PROCEDURE

The transmitter outputs are connected to a spectrum analyzer using a combiner. At the Low and High channels, in the 1 MHz band immediately adjacent to the band edge, RBW=1% EBW, VBW=3xRBW. Elsewhere RBW = 1 MHZ, VBW=3 MHz.

## RESULTS

No non-compliance noted:

## 5 MHZ QPSK CONDUCTED SPURIOUS, LOW CHANNEL 3652.5 MHz, P=26 dBm



100 M1 S2 S3 FC

AA ⊏(f): FTun Swp

Start 30 MHz #Res BW 1 MHz

pyright 2000-2010 Agilent Techr

Mun

#VBW 3 MHz

Span Pair

<u>Center</u>

Off

More 1 of 2

Span

Stop 37.00 GHz

Sweep 184.9 ms (1001 pts)

## 5 MHZ QPSK CONDUCTED SPURIOUS, MID CHANNEL, P=30 dBm



## 5 MHZ QPSK CONDUCTED SPURIOUS, HIGH CHANNEL 3672.5 MHz, P=28







## 5 MHZ 16QAM CONDUCTED SPURIOUS, LOW CHANNEL, P=26 dBm







#### 🔆 Agilent 18:35:19 Aug 30, 2010 R Т Marker Mkr1 36.45 GHz Select Marker Ref 30 dBm #Atten 12 dB -17.787 dBm 2 3 4 #Peak Log 10 Normal dB/ Offst 32 dB Delta DI -13.0 Delta Pair dBm ٥ (Tracking Ref) #PA∨g Ref ≙ when 100 manno الم المديقة M1 S2 Span Pair S3 FC Span <u>Center</u> AA ¤(f): FTun Off Swp More Start 30 MHz Stop 37.00 GHz 1 of 2 #Res BW 1 MHz #VBW 3 MHz Sweep 184.9 ms (1001 pts) Copyright 2000-2010 Agilent Technologies

## 5 MHZ 16QAM CONDUCTED SPURIOUS, MID CHANNEL, P=30 dBm

## 5 MHZ 16QAM CONDUCTED SPURIOUS, 3672.5 MHz, HIGH CHANNEL, P=28



Date: 20 August 2010

IC: 8974A-QUANTUM6636

## 5 MHZ 64QAM CONDUCTED SPURIOUS, 3652.5 MHZLOW CHANNEL, P=26 dBm





#### Report No: 10PRO017 3.65 GHz Fixed Wireless Transceiver FCC ID: XN3-QUANTUM6636

IC: 8974A-QUANTUM6636

## 5 MHZ 64QAM CONDUCTED SPURIOUS, MID CHANNEL, P=30 dBm

🔆 Agilent 18	3:46:15 Aug 30,	2010				R	Т	Tr	ace
Ref 30 dBm #Peak	#Atten ′	I2 dB			Mkr 	1 36.5) 17.721	2 GHz dBm	<u>1</u>	Trace 2 <u>3</u>
Log 10 dB/ Offst								Cle	ear Write
32 dB DI									Max Hold
-13.0 dBm #PA∨g 100					<b>W</b>	مىعل	× *		Min Hold
M1 S2 S3 FC AA	month	W	والعلاقة والمعرب ويتعاص منار						View
¤(f): FTun Swp									Blank
Start 30 MHz #Res BW 1 MI	l	#VBW	3 MHz	Sweep 1	Sto  84.9 ms	р 37.0( (1001	) GHz pts)		More 1 of 2
Copyright 2000	-2010 Agilent Te	chnologies							

## 5 MHZ 64QAM CONDUCTED SPURIOUS, 3672.5 MHz, HIGH CHANNEL, P=28 dBm



## 10 MHZ QPSK CONDUCTED SPURIOUS, 3655 MHz, LOW CHANNEL, P=28



#### Т 🔆 Agilent 18:03:06 Aug 30, 2010 R Trace Mkr1 36.45 GHz Trace Ref 30 dBm #Atten 12 dB -18.207 dBm 2 <u>3</u> #Peak Log 10 Clear Write dB/ Offst 32 dB Max Hold DI -13.0 dBm ٥ Min Hold #PA∨g Way Mary 100 Million . mound M1 S2 man helder View S3 FC AA ¤(f): FTun Blank Swp More Stop 37.00 GHz Start 30 MHz 1 of 2 #Res BW 1 MHz #VBW 3 MHz Sweep 184.9 ms (1001 pts) Copyright 2000-2010 Agilent Technologies

## 10 MHZ QPSK CONDUCTED SPURIOUS, MID CHANNEL, P=33 dBm

## 10 MHZ QPSK CONDUCTED SPURIOUS, 3670 MHz, HIGH CHANNEL, P=28







## 10 MHZ 16QAM CONDUCTED SPURIOUS, 3655 MHz, LOW CHANNEL, P=26 dBm



## 10 MHZ 16QAM CONDUCTED SPURIOUS, MID CHANNEL, P=33 dBm



## Report No: 10PRO017 3.65 GHz Fixed Wireless Transceiver FCC ID: XN3-QUANTUM6636

IC: 8974A-QUANTUM6636

## 10 MHZ 16QAM CONDUCTED SPURIOUS, 3670 MHz, HIGH CHANNEL, P=28



## 10 MHZ 64QAM CONDUCTED SPURIOUS, 3655 MHz, LOW CHANNEL, P=26



#### 🔆 Agilent 19:01:50 Aug 30, 2010 R Т Marker Mkr1 36.52 GHz Select Marker Ref 30 dBm -16.781 dBm #Atten 12 dB 2 3 4 #Peak Log 10 Normal dB/ Offst 32 dB Delta DI -13.0 Delta Pair ¢ dBm (Tracking Ref) #PAvg Ref ₫ Now Man 100 Adams يسيوون Mahmunn M1 S2 حرياوه Span Pair \$3 FC <u>Center</u> Span AA ¤(f): FTun Off Swp More Start 30 MHz Stop 37.00 GHz 1 of 2 #Res BW 1 MHz #VBW 3 MHz Sweep 184.9 ms (1001 pts) Copyright 2000-2010 Agilent Technologies

## 10 MHZ 64QAM CONDUCTED SPURIOUS, MID CHANNEL, P=33 dBm

## 10 MHZ 64QAM CONDUCTED SPURIOUS, HIGH CHANNEL, P=28





#VBW 3.0 MHz

## **REQUIREMENT**

## 2.1053 Measurements required: Field strength of spurious radiation

Information submitted shall include the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from half wave dipole antennas.

## 90.1323(a) Emission limits.

(a) The power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or less, but at least one percent of the emission bandwidth of the fundamental emission of the transmitter, provided the measured energy is integrated over a 1 MHz bandwidth.

## TEST PROCEDURE

Testing was performed using the substitution method.

Power settings for all channels during tests: 5MHz channels: 30 dBm 10MHz channels: 33 dBm

1. The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna port was terminated with a resistive non-radiating 50 ohm termination.

2. The spectrum from 30 MHz to 37 GHz was investigated with the transmitter set to the lowest, middle, and highest channels in each 5 GHz band.

3. The frequency range of interest was monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

4. The EUT was replaced by a signal generator and antenna. The signal generator was set to produce field strengths matching the levels obtained in step 3 above. The equivalent eirp was calculated from the signal generator output and antenna gain with respect to isotropic.

Note: For emissions below 1 GHz, the field strength of the emission is also compared against the EN55022 class A limits for digital devices

## TEST RESULTS

Refer to plots and tabulated data below. All emissions below 1 GHz were at least 20 dB below -13 dBm limit and were determined to be from the digital section of the product.

For all modulations for 5/10 MHz bandwidths, worst-case emissions above 1 GHz are at least 24 dB below limits. Worst-case emissions were for 5 MHz QPSK, refer to spread sheet below.

# **4.6.2.1** TRANSMITTER RADIATED EMISSIONS ABOVE 1 GHZ HARMONICS AND SPURIOUS EMISSIONS

## **QPSK 5 MHz Channels**

			Con Above 1GHz	npliance Cert High Freque	tification Sei	vices ution Measu	urement			
Company: Project #: Date: Test Engin Configurat Mode:	eer: tion:	Purewave Net 10U13276 6/22/10 Thanh Nguye EUT and remo Tx QPSK, 5 M	tworks, Inc. en ote support equ Hz BW	uipment						
	Chambe	r	Р	re-amplifer			Filter			Limit
5n	n Chamber A	A 🖵	T144	8449B	-			-		-
f	SA reading	Ant. Pol.	Distance	Path Loss	Preamp	Filter	EIRP	Limit	Delta	Notes
GHz	(dBm)	(H/V)	(m)	(dB)	(dB)	(dB)	(dBm)	(dBm)	(dB)	
Tx QPSK, 5	MHz BW									
Low Ch 3.65	52.5GHz	Y	2.0	24.4	20.4		50.5	42.0	45.5	
1.08	-50.6	v	3.0	31.4	39.4		-58.5	-13.0	-45.5	
1.87	-56.5	v	3.0	39.3	37.9		-55.0	-13.0	-42.0	
2.49	-58.6	v	3.0	41.8	37.5		-54.3	-13.0	-41.3	
3.02	-60.3	v	3.0	43.4	37.3		-54.3	-13.0	-41.3	
Harmonis S	purious									
7.31	-59.0	V	3.0	51.7	36.6		-43.8	-13.0	-30.8	
10.96	-59.7	<u>v</u>	3.0	56.2	36.9		-40.5	-13.0	-27.5	Naiss flags
14.01	-65.9	v	3.0	59.9	35.0		-41.0	-13.0	-28.0	Noise floor
			3.0							
7.31	-59.8	н	3.0	52.8	36.6		-43.6	-13.0	-30.6	
10.96	-58.6	н	3.0	55.9	36.9		-39.7	-13.0	-26.7	
14.61	-64.0	н	3.0	60.1	35.0		-38.9	-13.0	-25.9	Noise floor
Mid Ch 366	2501									
7 33	-57.9	v	3.0	51.7	36.6		-42 7	-13.0	-29 7	
10.99	-61.3	v	3.0	56.2	36.9		-42.0	-13.0	-29.0	
14.65	-64.0	v	3.0	59.9	34.9		-39.1	-13.0	-26.1	Noise floor
7.33	-58.1	Н	3.0	52.8	36.6		-41.9	-13.0	-28.9	
10.99	-56.0	н	3.0	55.9	36.9		-37.0	-13.0	-24.0	
14.65	-63.5	н	3.0	60.2	34.9		-38.3	-13.0	-25.3	Noise floor
High Ch 367	72 5MH <del>7</del>									
7 35	-57.1	v	3.0	51.8	36.6		-41 9	-13.0	-28.9	
11.01	-61.7	v	3.0	56.2	36.9		-42.4	-13.0	-29.4	
14.68	-62.8	v	3.0	59.9	34.9		-37.7	-13.0	-24.7	Noise floor
7.35	-63.4	н	3.0	52.8	36.6		-47.1	-13.0	-34.1	
11.02	-57.8	н	3.0	55.9	36.9		-38.8	-13.0	-25.8	
14.69	-64.0	н	3.0	60.2	34.9		-38.7	-13.0	-25.7	Noise floor
							1			
							1			
							1			
<u> </u>							+			
<u> </u>							+			
							1			
Rev. 03.03.0	)9									

## 4.6.2.2 TRANSMITTER RADIATED EMISSIONS BELOW 1 GHZ SPURIOUS AND DIGITAL SECTION EMISSIONS

## 64 QAM5 MHz Channels (Worst case emissions)





30-1000MHz Frequency Measurement													
Compliance Certification Services, Fremont 5m Chamber													
_													
Test Engr:	ngr: Thanh Nguyen												
Date:		06/22/10											
Project #:		10U13276											
Company:	mpany: PureWave Networsks Inc.												
EUT Descripti	escription: 6X6 3.65GHz WIMAX Base Station												
EUT M/N:	M/N: Quantum 6600												
Test Target:	rget: EN55022 Class A												
Mode Oper:		Tx 64QAM 5	5MHz BW,	Low Ch	3652.5MH	[z							
	f	Measurement Frequency			Amp	Preamp Gain				Margin	Margin vs. Li	imit	
	Dist	Distance to Antenna			D Corr	Distance Co	orrect to 3 i	neters					
	Read	Analyzer Reading			Filter	Filter Inser	t Loss						
	AF	Antenna Factor			Corr.	Calculated Field Strength							
	CL	Cable Loss L			Limit	Field Stren	gth Limit						
f	Dist	Read	AF	CL	Amp	D Corr	Filter	Corr.	Limit	Margin	Ant. Pol.	Det.	
MHz	(m)	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dB	V/H	P/A/QP	
98.163	3.0	58.3	9.5	0.9	28.3	-10.5	0.0	29.9	40.0	-10.1	V	Р	
136.684	3.0	55.5	13.3	1.1	28.3	-10.5	0.0	31.2	40.0	-8.8	V	Р	
215.528	3.0	57.8	11.9	1.3	28.2	-10.5	0.0	32.4	40.0	-7.6	V	Р	
249.969	3.0	60.5	11.8	1.4	28.2	_10.5	0.0	35.0			<b>X</b> 7	P	
336.013	3.0	(1 =				-10.5	0.0	35.0	47.0	-12.0	v	1	
340.933		61.5	14.0	1.6	28.1	-10.5	0.0	35.0 38.6	47.0 47.0	-12.0 -8.4	V V	P	
599.904	3.0	61.5 66.8	14.0 14.0	1.6 1.6	28.1 28.1	-10.5 -10.5 -10.5	0.0	35.0 38.6 43.9	47.0 47.0 47.0	-12.0 -8.4 -3.1	V V V	P P	
	3.0 3.0	61.5 66.8 50.5	14.0 14.0 18.4	1.6 1.6 2.2	28.1 28.1 27.5	-10.5 -10.5 -10.5 -10.5	0.0 0.0 0.0	38.6 43.9 33.1	47.0 47.0 47.0 47.0	-12.0 -8.4 -3.1 -13.9	V V V V	P P P	
733.349	3.0 3.0 3.0 3.0	61.5 66.8 50.5 49.4	14.0           14.0           18.4           20.0	1.6 1.6 2.2 2.5	28.1 28.1 27.5 27.3	-10.5 -10.5 -10.5 -10.5 -10.5	0.0 0.0 0.0 0.0 0.0	35.0 38.6 43.9 33.1 34.3	47.0 47.0 47.0 47.0 47.0	-12.0 -8.4 -3.1 -13.9 -12.7	V           V           V           V           V           V           V           V           V           V           V	P P P P	
733.349 212.768	3.0           3.0           3.0           3.0           3.0	61.5 66.8 50.5 49.4 53.4	14.0           14.0           18.4           20.0           11.9	1.6 1.6 2.2 2.5 1.3	28.1 28.1 27.5 27.3 28.2	-10.5 -10.5 -10.5 -10.5 -10.5 -10.5	0.0 0.0 0.0 0.0 0.0 0.0	35.0         38.6         43.9         33.1         34.3         28.0	47.0 47.0 47.0 47.0 47.0 47.0 40.0	-12.0 -8.4 -3.1 -13.9 -12.7 -12.0	V           V           V           V           V           H	P P P P P	
733.349 212.768 250.089	3.0           3.0           3.0           3.0           3.0           3.0           3.0	61.5           66.8           50.5           49.4           53.4           56.7	14.0           14.0           18.4           20.0           11.9           11.8	1.6 1.6 2.2 2.5 1.3 1.4	28.1 28.1 27.5 27.3 28.2 28.2 28.2	-10.5 -10.5 -10.5 -10.5 -10.5 -10.5 -10.5	0.0 0.0 0.0 0.0 0.0 0.0 0.0	35.0 38.6 43.9 33.1 34.3 28.0 31.2	47.0 47.0 47.0 47.0 47.0 40.0 47.0	-12.0 -8.4 -3.1 -13.9 -12.7 -12.0 -15.8	V V V V H H	P P P P P P	
733.349 212.768 250.089 340.933	3.0         3.0           3.0         3.0           3.0         3.0           3.0         3.0           3.0         3.0	61.5           66.8           50.5           49.4           53.4           56.7           61.9	14.0           14.0           18.4           20.0           11.9           11.8           14.0	1.6 1.6 2.2 2.5 1.3 1.4 1.6	28.1 28.1 27.5 27.3 28.2 28.2 28.2 28.1	-10.5 -10.5 -10.5 -10.5 -10.5 -10.5 -10.5 -10.5	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	35.0 38.6 43.9 33.1 34.3 28.0 31.2 39.0	47.0 47.0 47.0 47.0 47.0 40.0 47.0 47.0	-12.0 -8.4 -3.1 -13.9 -12.7 -12.0 -15.8 -8.0	V           V           V           H           H           H	P P P P P P P	
733.349 212.768 250.089 340.933 600.024	3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0	61.5           66.8           50.5           49.4           53.4           56.7           61.9           52.0	14.0           14.0           18.4           20.0           11.9           11.8           14.0           18.4	1.6           1.6           2.2           2.5           1.3           1.4           1.6           2.2	28.1 28.1 27.5 27.3 28.2 28.2 28.2 28.1 27.5	-10.5 -10.5 -10.5 -10.5 -10.5 -10.5 -10.5 -10.5 -10.5	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	35.0 38.6 43.9 33.1 34.3 28.0 31.2 39.0 34.7	47.0 47.0 47.0 47.0 47.0 40.0 47.0 47.0	-12.0 -8.4 -3.1 -13.9 -12.7 -12.0 -15.8 -8.0 -12.3	V           V           V           H           H           H           H           H	P P P P P P P P	
733.349         212.768         250.089         340.933         600.024         733.349	3.0         3.0           3.0         3.0           3.0         3.0           3.0         3.0           3.0         3.0           3.0         3.0           3.0         3.0	61.5           66.8           50.5           49.4           53.4           56.7           61.9           52.0           55.4	14.0           14.0           18.4           20.0           11.9           11.8           14.0           18.4           20.0	1.6           1.6           2.2           2.5           1.3           1.4           1.6           2.2	28.1 28.1 27.5 27.3 28.2 28.2 28.2 28.1 27.5 27.3	-10.5 -10.5 -10.5 -10.5 -10.5 -10.5 -10.5 -10.5 -10.5 -10.5 -10.5	0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0           0.0	35.0           38.6           43.9           33.1           34.3           28.0           31.2           39.0           34.7           40.2	47.0 47.0 47.0 47.0 47.0 40.0 47.0 47.0	-12.0 -8.4 -3.1 -13.9 -12.7 -12.0 -15.8 -8.0 -12.3 -6.8	V V V V H H H H H	P P P P P P P P P	
733.349 212.768 250.089 340.933 600.024 733.349 Rev. 1.27.09	3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0	61.5           66.8           50.5           49.4           53.4           56.7           61.9           52.0           55.4	14.0         14.0         18.4         20.0         11.9         11.8         14.0         18.4         20.0	$ \begin{array}{r} 1.6\\ 1.6\\ 2.2\\ 2.5\\ 1.3\\ 1.4\\ 1.6\\ 2.2\\ 2.5\\ \end{array} $	28.1 28.1 27.5 27.3 28.2 28.2 28.2 28.1 27.5 27.3	$\begin{array}{r} -10.5 \\ -10.5 \\ -10.5 \\ -10.5 \\ -10.5 \\ -10.5 \\ -10.5 \\ -10.5 \\ -10.5 \\ -10.5 \\ -10.5 \\ -10.5 \\ \end{array}$	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	35.0 38.6 43.9 33.1 34.3 28.0 31.2 39.0 34.7 40.2	47.0 47.0 47.0 47.0 47.0 40.0 47.0 47.0	-12.0 -8.4 -3.1 -13.9 -12.7 -12.0 -15.8 -8.0 -12.3 -6.8	V V V V H H H H H H	P P P P P P P P P	

## 4.6.3 FREQUENCY STABILITY TEST

#### REQUIREMENT

## 2.1055 Measurements required: Frequency stability

(a) The frequency stability shall be measured with variation of ambient temperature as follows:

(1) From  $-30^{\circ}$  to  $+50^{\circ}$  centigrade

(d) The frequency stability shall be measured with variation of primary supply voltage as follows:

(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

#### Test Set-up



#### Test Procedures

- 1. Wireless Networking Test Set center frequency was set to 3662.5 MHZ operating frequency. Frequency was measured at +20C using Wireless Test Set frequency error function.
- 2. The transmitter was allowed to stabilize at every 10 degrees C from -30C to +50C and measurements were recorded at each temperature.

## Test Results

Refer to table below. Frequency remains within 6.91 kHz throughout all required temperature and supply voltage variations. The fundamental emissions of the transmitter remain within the authorized bands of operation under all conditions of temperature and operating voltage

Quantum 6636 Frequency Accuracy Test Data Center frequency = 3.6625GHz -30C to + 50C in 10C steps 45 minute minimum soak time at each temperature between readings.

Frequency measured using Agilent MXA spectrum analyzer in VSA mode to demodulate WiMAX signal.

Temperature C	Measured Center Frequency kHz	Deviation from nominal @ 20C kHz
-30	3662494.63	-6.91
-20	3662495.5	-6.04
-10	3662496.81	-4.73
0	3662498.9	-2.64
10	3662500.258	-1.282
20	3662501.54	0
30	3662502.18	0.64
40	3662503.05	1.51
50	3662502.6	1.06

Frequency Variation with voltage @ 20C

Voltage	Measured Center Frequency kHz	Deviation from nominal @ -48VDC kHz
-40.	3 3662501.54	0
-4	3 3662501.54	0
-55.	3662501.51	-0.03

## **5. SETUP PHOTOS**

## ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP





RADIATED RF MEASUREMENT SETUP



## FREQUENCY STABILITY MEASUREMENT SETUP





# **END OF REPORT**

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