

# FCC RF Test Report

APPLICANT : Green Packet Berhad, Taiwan Branch  
EQUIPMENT : WiMAX 802.16e Indoor IAD  
BRAND NAME : Greenpacket  
MODEL NAME : DX-250  
FCC ID : W9V-DX250-GP  
STANDARD : 47 CFR Part 2, 27(M)  
CLASSIFICATION : Licensed Non-Broadcast Station Transmitter (TNB)  
TX FREQUENCY RANGE : 2496 MHz ~ 2690 MHz  
Rx FREQUENCY RANGE : 2496 MHz ~ 2690 MHz  
MAX. EIRP POWER : 1.2218 W (QPSK, BW 5MHz)  
1.1220 W (QPSK, BW 10MHz)  
1.2274 W (16QAM, BW 5MHz)  
1.1272 W (16QAM, BW 10MHz)  
EMISSION DESIGNATOR : 4M46G7D (QPSK, BW 5MHz)  
9M32G7D (QPSK, BW 10MHz)  
4M48W7D (16QAM, BW 5MHz)  
9M24W7D (16QAM, BW 10MHz)

The product was received on Mar. 13, 2012 and completely tested on Apr. 19, 2012. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.4-2003 and 47 CFR FCC Part 27 Subpart M and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by:



Jones Tsai / Manager



## SPORTON INTERNATIONAL INC.

No. 52, Hwa Ya 1<sup>st</sup> Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.

SPORTON INTERNATIONAL INC.

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FCC ID : W9V-DX250-GP

Page Number : 1 of 47

Report Issued Date : May 10, 2012

Report Version : Rev. 01



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### SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	§2.1033 §2.1046 §27.50	Maximum Output Power	< 2 Watts	PASS	-
3.1	§2.1033 §2.1046 §27.50	Band Edge Emissions	< 5.5MHz: -13 dBm ≥5.5MHz: -25 dBm	PASS	-
3.1	§27.50	Equivalent Isotropic Radiated Power	< 2 Watts	PASS	-
3.2	§2.1049 §27.53	Emissions Bandwidth	N/A	PASS	-
3.3	§2.1051 §27.53	Conducted Spurious Emissions	$< 55+10\log_{10}(P[\text{Watts}])$	PASS	-
3.4	§2.1053 §27.53	Field Strength of Spurious Radiation	$< 55+10\log_{10}(P[\text{Watts}])$	PASS	Under limit 4.71 dB at 7779.000 MHz
3.5	§2.1055 §27.54	Frequency Stability for Temperature & Voltage	2.5 ppm	PASS	-

# 1 General Description

## 1.1 Applicant

**Green Packet Berhad, Taiwan Branch**

6F., No. 21, Lane 583, Rueiguang Rd., Neihu District, Taipei City, Taiwan (R.O.C.)

## 1.2 Manufacturer

**Green Packet Berhad, Taiwan Branch**

1. 6F., No. 21, Lane 583, Rueiguang Rd., Neihu District, Taipei City, Taiwan (R.O.C.)
2. Suite 21211, No. 498, Guoshoujing Road, Pudong New Area, Shanghai, P.C.201203, China

## 1.3 Feature of Equipment Under Test

Product Feature & Specification	
Equipment	WiMAX 802.16e Indoor IAD
Brand Name	Greenpacket
Model Name	DX-250
FCC ID	W9V-DX250-GP
Tx Frequency	2496 MHz ~ 2690 MHz
Rx Frequency	2496 MHz ~ 2690 MHz
Channel Bandwidth	5MHz / 10MHz
Maximum Output Power to Antenna	25.91 dBm (QPSK, BW 5MHz) 25.90 dBm (QPSK, BW 10MHz) 25.92 dBm (16QAM, BW 5MHz) 25.96 dBm (16QAM, BW 10MHz)
Antenna Type	Dipole Antenna
Type of Modulation	Uplink : OFDMA (QPSK / 16QAM)
EUT Stage	Production Unit

**Remark:**

1. For other wireless features of this EUT, the test report will be issued separately.
2. This test report recorded only product characteristics and test results of Licensed Non-Broadcast Station Transmitter (TNB).
3. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

## 1.4 Emission Designator and Maximum ERP/EIRP Power

FCC Rule	System	Type of Modulation	BW	Emission Designator	Maximum ERP/EIRP
Part 27M	WiMAX	QPSK	BW 5MHz	4M46G7D	1.2218 W
Part 27M	WiMAX	QPSK	BW 10MHz	9M32G7D	1.1220 W
Part 27M	WiMAX	16QAM	BW 5MHz	4M48W7D	1.2274 W
Part 27M	WiMAX	16QAM	BW 10MHz	9M24W7D	1.1272 W

## 1.5 Testing Site

<b>Test Site</b>	SPORTON INTERNATIONAL INC.		
<b>Test Site Location</b>	No. 52, Hwa Ya 1 <sup>st</sup> Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL: +886-3-327-3456 FAX: +886-3-328-4978		
<b>Test Site No.</b>	<b>Sporton Site No.</b>		<b>FCC / IC Registration No.</b>
	TH02-HY	03CH06-HY	722060/4086B-1

## 1.6 Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ 47 CFR Part 2, 27(M)
- ♦ ANSI C63.4-2003
- ♦ ANSI TIA-603-C-2004

### Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

## 1.7 Ancillary Equipment List

Item	Equipment	Trade Name	Model No.	FCC ID	Data Cable	Power Cord
1.	System Simulator	Agilent	E6651A	N/A	N/A	Unshielded, 1.8 m

## 2 Test Configuration of Equipment Under Test

### 2.1 Test Mode

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report. The spurious emission measurements were carried out in semi-anechoic chamber with 3-meter test range.

Test Modes		
Band	Radiated TCs	Conducted TCs
<b>802.16e</b> <b>(Modulation : OFDMA)</b>	<ul style="list-style-type: none"> <li>■ 16QAM BW 5MHz Link</li> <li>■ 16QAM BW 10MHz Link</li> </ul>	<ul style="list-style-type: none"> <li>■ QPSK BW 5MHz Link</li> <li>■ QPSK BW 10MHz Link</li> <li>■ 16QAM BW 5MHz Link</li> <li>■ 16QAM BW 10MHz Link</li> </ul>

**Note:** The maximum average power levels are on zone type, PUSC and coding rate, 1/2 mode for QPSK, QPSK, 16QAM, and 16QAM Link; only these modes were used for all tests.

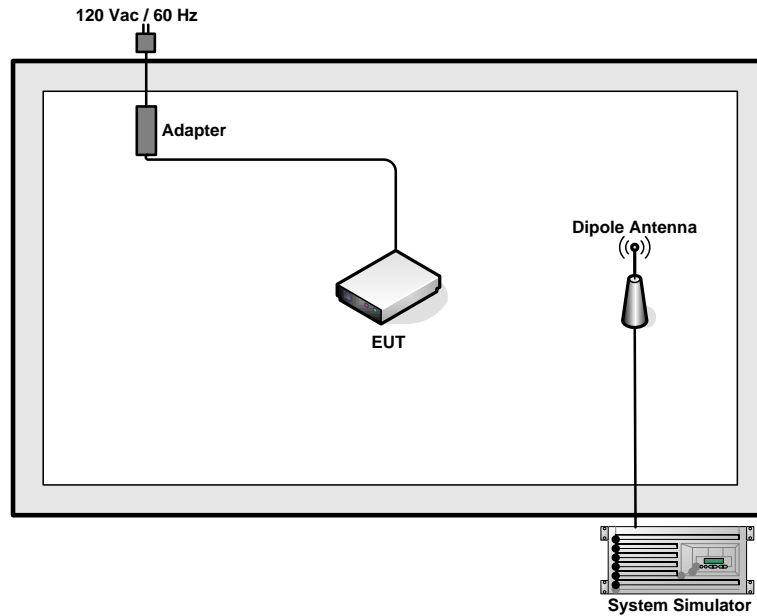
The conducted power tables are as follows:

Zone Type	Modulation	Coding Rate	Channel	Peak Power	Average Power	PAP
PUSC	QPSK (BW 5MHz)	1/2	Low	32.69	25.17	7.52
			Middle	33.45	25.85	7.60
			High	32.63	25.91	6.72
		3/4	Low	32.71	25.15	7.56
			Middle	33.42	25.82	7.60
			High	32.63	25.91	6.72
	16QAM (BW 5MHz)	1/2	Low	32.91	25.35	7.56
			Middle	33.43	25.79	7.64
			High	32.64	25.92	6.72
		3/4	Low	32.65	25.01	7.64
			Middle	33.44	25.72	7.72
			High	32.66	25.78	6.88
	QPSK (BW 10MHz)	1/2	Low	33.23	25.39	7.84
			Middle	33.42	25.58	7.84
			High	33.21	25.89	7.32
		3/4	Low	33.22	25.38	7.84
			Middle	33.53	25.61	7.92
			High	33.22	25.90	7.32
	16QAM (BW 10MHz)	1/2	Low	33.28	25.44	7.84
			Middle	33.78	25.78	8.00
			High	33.28	25.96	7.32
		3/4	Low	33.22	25.30	7.92
			Middle	33.59	25.55	8.04
			High	33.18	25.78	7.40

Note: PAR = Peak to Average Ratio



## 2.2 Connection Diagram of Test System



### 3 Test Result

#### 3.1 Maximum Output Power, Band Edge, and Effective Isotropic Radiated Power Measurement

##### 3.1.1 Limit

For mobile and other user stations, mobile stations are limited to 2.0 watts EIRP and all user stations are limited to 2.0 watts transmitter output power. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power ( $p$ ) by a factor of mobile digital stations, the attenuation factor shall be not less than  $43 + 10 \log (p)$  dB at the channel edge and  $55 + 10 \log (p)$  dB at 5.5 MHz from the channel edges.

##### 3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

##### 3.1.3 Test Procedures

###### For Conducted Power and Band Edge Measurement:

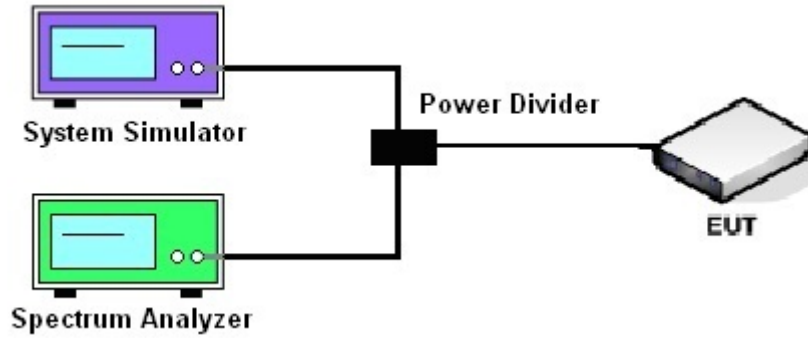
The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

###### For Effective Isotropic Radiated Power Measurement:

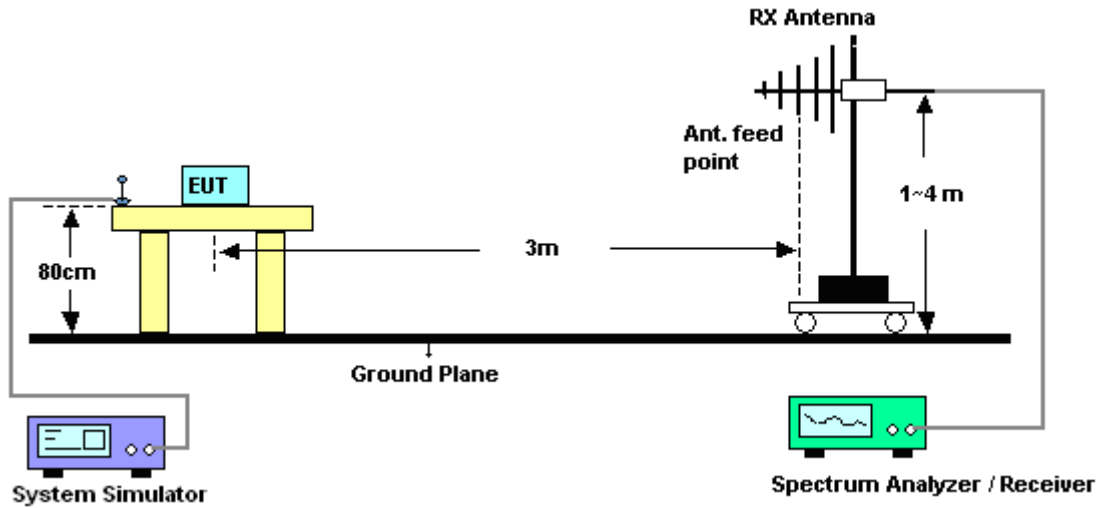
1. The EUT was placed on a non-conductive rotating platform with 0.8 meter height in a semi-anechoic chamber. The radiated emission at the fundamental frequency was measured at 3 m.
2. During the measurement, the EUT was enforced in maximum power. The highest emission was recorded from analyzer power level (LVL) from the 360 degrees rotation of the turntable and the test antenna raised and lowered over a range from 1 to 4 meters in both horizontally and vertically polarized orientations.
3. Effective Isotropic Radiated Power (EIRP) was measured by substitution method according to TIA/EIA-603-C. The EUT was replaced by dipole antenna (substitution antenna) at same location, and then a known power from S.G. was applied into the dipole antenna through a Tx cable, and then recorded the maximum Analyzer reading through raised and lowered the test antenna. The correction factor (in dB) = S.G. - Tx Cable loss + Substitution antenna gain - Analyzer reading. Then the EUT's EIRP was calculated with the correction factor,  $EIRP = LVL + \text{Correction factor}$ .

### 3.1.4 Test Setup

<Conducted Power and Band Edge Measurement>



<Effective Isotropic Radiated Power Measurement>



3.1.5 Test Result of Maximum Output Power

Channel	Modulation Type	Zone Type	Coding Rate	5MHz Bandwidth			10MHz Bandwidth		
				Peak Power (dBm)	Average Power (dBm)	PAR (dB)	Peak Power (dBm)	Average Power (dBm)	PAR (dB)
Low	QPSK	PUSC	1/2	32.69	25.17	7.52	33.23	25.39	7.84
Middle	QPSK	PUSC	1/2	33.45	25.85	7.60	33.42	25.58	7.84
High	QPSK	PUSC	1/2	32.63	25.91	6.72	33.21	25.89	7.32

Note: PAR = Peak to Average Ratio

Channel	Modulation Type	Zone Type	Coding Rate	5MHz Bandwidth			10MHz Bandwidth		
				Peak Power (dBm)	Average Power (dBm)	PAR (dB)	Peak Power (dBm)	Average Power (dBm)	PAR (dB)
Low	16QAM	PUSC	1/2	32.91	25.35	7.56	33.28	25.44	7.84
Middle	16QAM	PUSC	1/2	33.43	25.79	7.64	33.78	25.78	8.00
High	16QAM	PUSC	1/2	32.64	25.92	6.72	33.28	25.96	7.32

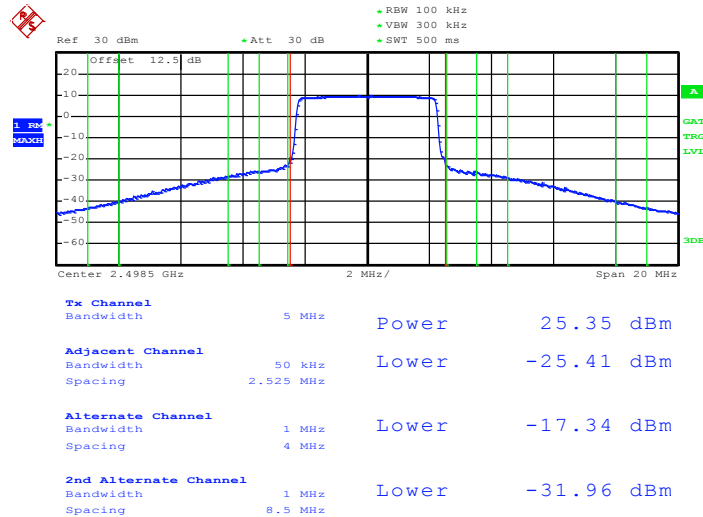
Note: PAR = Peak to Average Ratio



### 3.1.6 Test Result of Band Edge Measurement

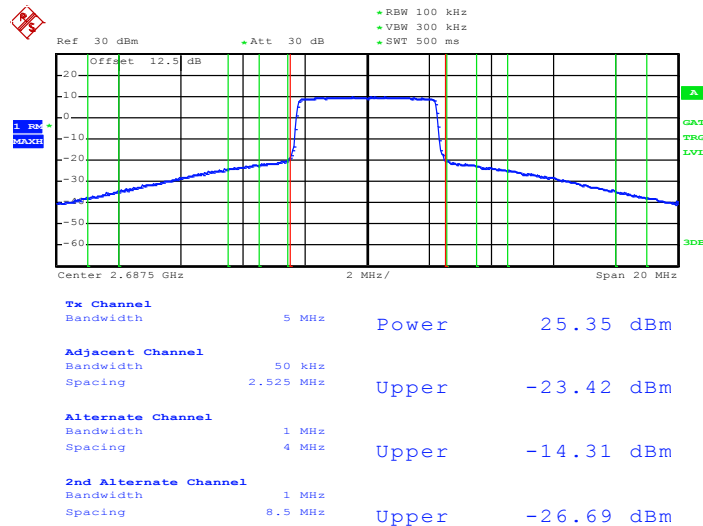
<b>Band :</b>	802.16e	<b>Power Stage :</b>	High
<b>Test Mode :</b>	QPSK BW 5MHz		

#### Band Edge Plot on Low Channel



Date: 17.APR.2012 19:45:49

#### Band Edge Plot on High Channel

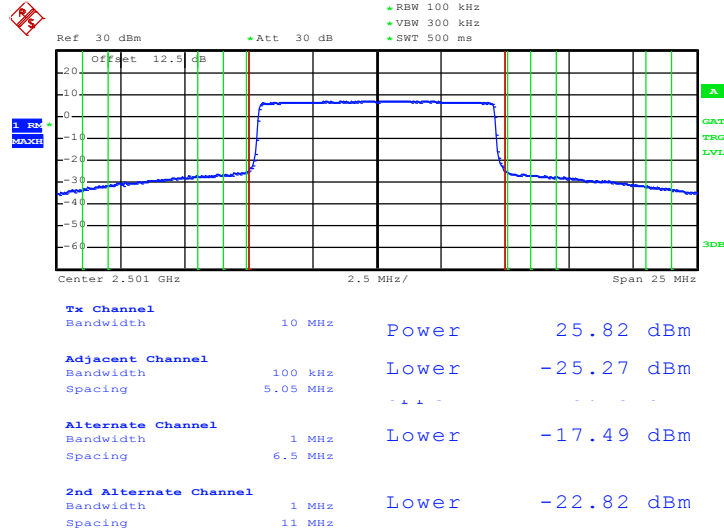


Date: 17.APR.2012 19:49:51



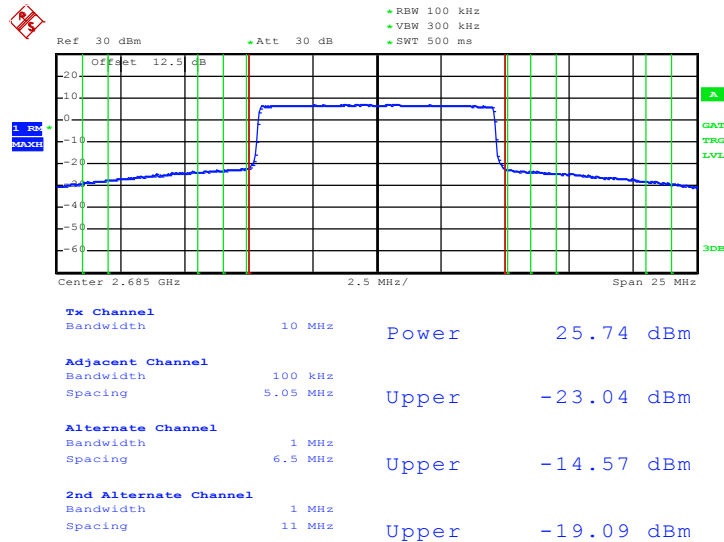
<b>Band :</b>	802.16e	<b>Power Stage :</b>	High
<b>Test Mode :</b>	QPSK BW 10MHz		

**Edge Plot on Low Channel**



Date: 17.APR.2012 19:14:25

**Band Edge Plot on High Channel**

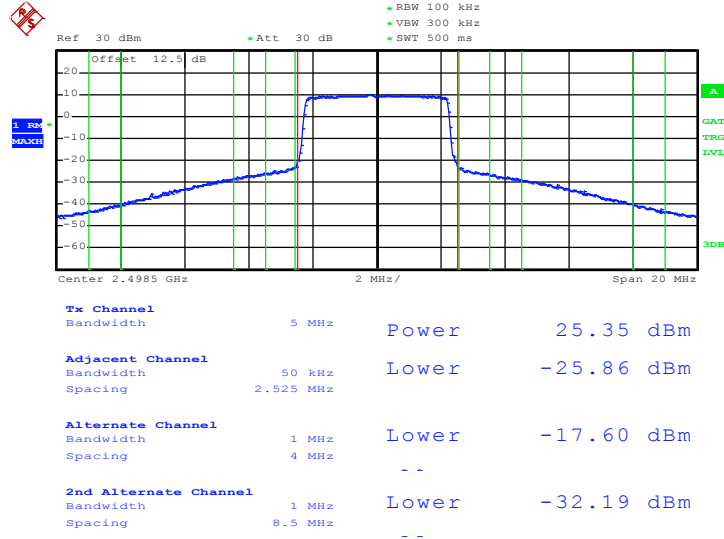


Date: 17.APR.2012 18:51:10



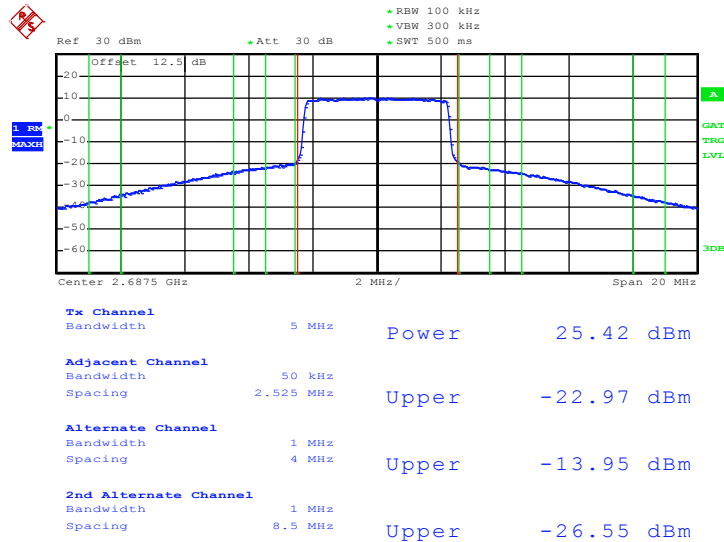
<b>Band :</b>	802.16e	<b>Power Stage :</b>	High
<b>Test Mode :</b>	16QAM BW 5MHz		

**Band Edge Plot on Low Channel**



Date: 17.APR.2012 19:46:11

**Band Edge Plot on High Channel**

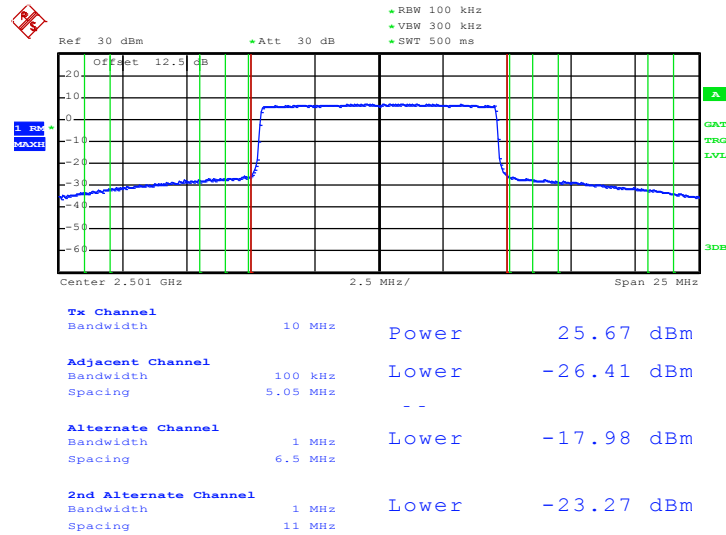


Date: 17.APR.2012 19:52:01



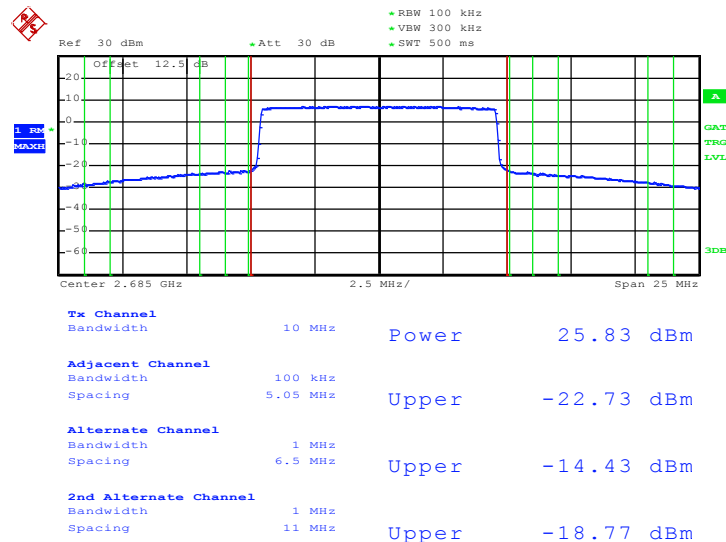
<b>Band :</b>	802.16e	<b>Power Stage :</b>	High
<b>Test Mode :</b>	16QAM BW 10MHz		

**Band Edge Plot on Low Channel**



Date: 17.APR.2012 19:11:47

**Band Edge Plot on High Channel**



Date: 17.APR.2012 18:57:10



3.1.7 Test Result of Effective Isotropic Radiated Power

802.16e (QPSK BW 5MHz) Radiated Power (EIRP)				
Horizontal Polarization				
Channel	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (W)
Low	-25.76	44.98	19.22	0.0836
Middle	-27.13	47.05	19.92	0.0982
High	-28.00	47.52	19.52	0.0895
Vertical Polarization				
Channel	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (W)
Low	-18.14	48.15	30.01	1.0023
Middle	-17.58	48.03	30.45	1.1092
High	-18.37	49.24	30.87	1.2218

802.16e (QPSK BW 10MHz) Radiated Power (EIRP)				
Horizontal Polarization				
Channel	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (W)
Low	-25.53	44.98	19.45	0.0881
Middle	-27.93	47.05	19.12	0.0817
High	-27.68	47.52	19.84	0.0964
Vertical Polarization				
Channel	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (W)
Low	-17.89	48.15	30.26	1.0617
Middle	-17.66	48.03	30.37	1.0889
High	-18.74	49.24	30.50	1.1220



802.16e (16QAM BW 5MHz) Radiated Power (EIRP)				
Horizontal Polarization				
Channel	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (W)
Low	-25.85	44.98	19.13	0.0818
Middle	-27.09	47.05	19.96	0.0991
High	-27.59	47.52	19.93	0.0984
Vertical Polarization				
Channel	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (W)
Low	-18.08	48.15	30.07	1.0162
Middle	-17.39	48.03	30.64	1.1588
High	-18.35	49.24	30.89	1.2274

802.16e (16QAM BW 10MHz) Radiated Power (EIRP)				
Horizontal Polarization				
Channel	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (W)
Low	-25.28	44.98	19.70	0.0933
Middle	-27.29	47.05	19.76	0.0946
High	-27.70	47.52	19.82	0.0959
Vertical Polarization				
Channel	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (W)
Low	-17.88	48.15	30.27	1.0641
Middle	-17.51	48.03	30.52	1.1272
High	-18.78	49.24	30.46	1.1117

## 3.2 Emission Bandwidth

### 3.2.1 Description of Emission Bandwidth Measurement

The emission bandwidth is defined as the width of the signal between two points, located at the 2 sides of the carrier frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

The occupied bandwidth is the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5% of the total mean transmitted power.

The designated emission bandwidth using a resolution bandwidth of at least 1% of the emission bandwidth of the fundamental emission and a video bandwidth is more than resolution bandwidth.

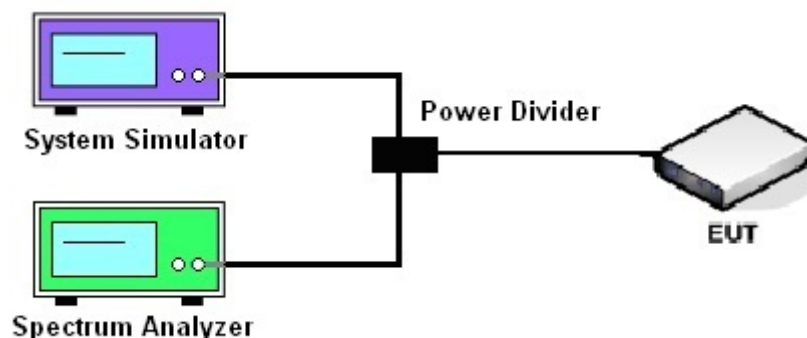
### 3.2.2 Measuring Instruments

See list of measuring instruments of this test report.

### 3.2.3 Test Procedures

1. The EUT was connected to Spectrum Analyzer and System Simulator via power divider.
2. The 99% and 26 dB occupied bandwidth (BW) of the middle channel for the highest RF powers were measured.

### 3.2.4 Test Setup

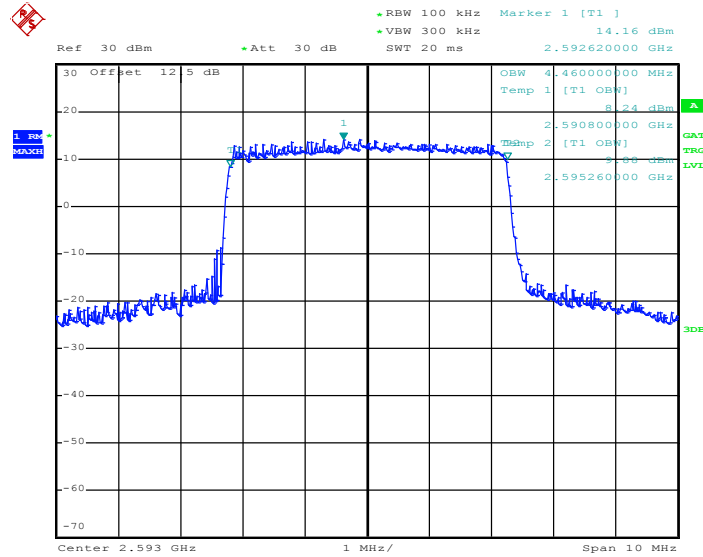




### 3.2.5 Test Result of Emission Bandwidth

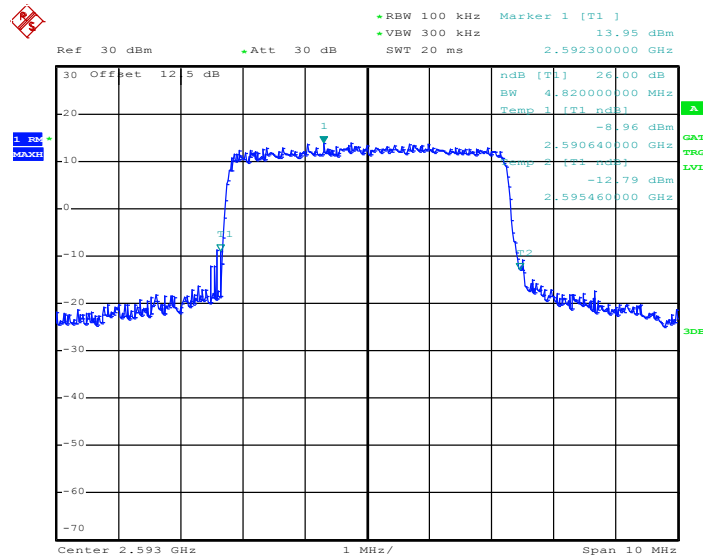
<b>Band :</b>	802.16e	<b>Power Stage :</b>	High
<b>Test Mode :</b>	QPSK BW 5MHz		

99% Occupied Bandwidth Plot on Middle Channel



Date: 12.APR.2012 16:42:21

26dB Bandwidth Plot on Middle Channel

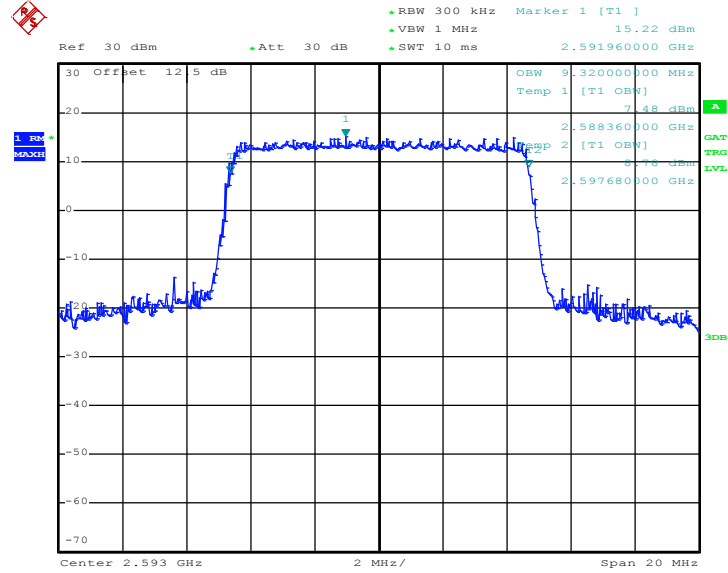


Date: 17.APR.2012 14:04:14



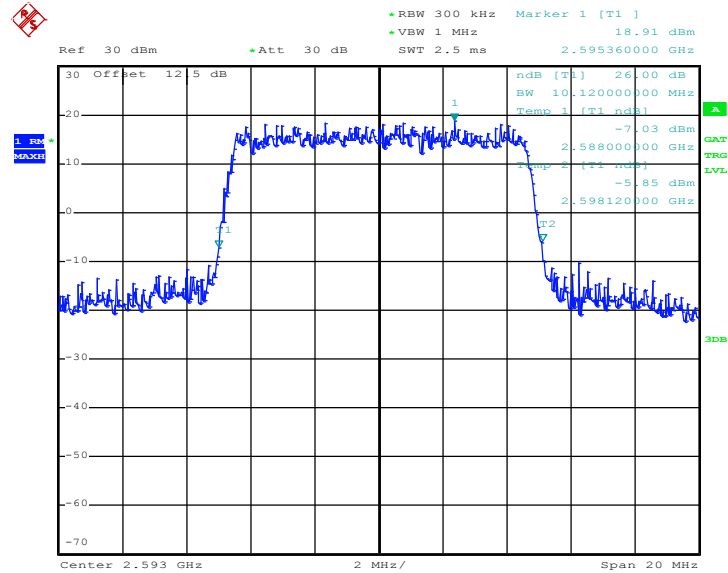
<b>Band :</b>	802.16e	<b>Power Stage :</b>	High
<b>Test Mode :</b>	QPSK BW 10MHz		

99% Occupied Bandwidth Plot on Middle Channel



Date: 12.APR.2012 16:23:58

26dB Bandwidth Plot on Middle Channel

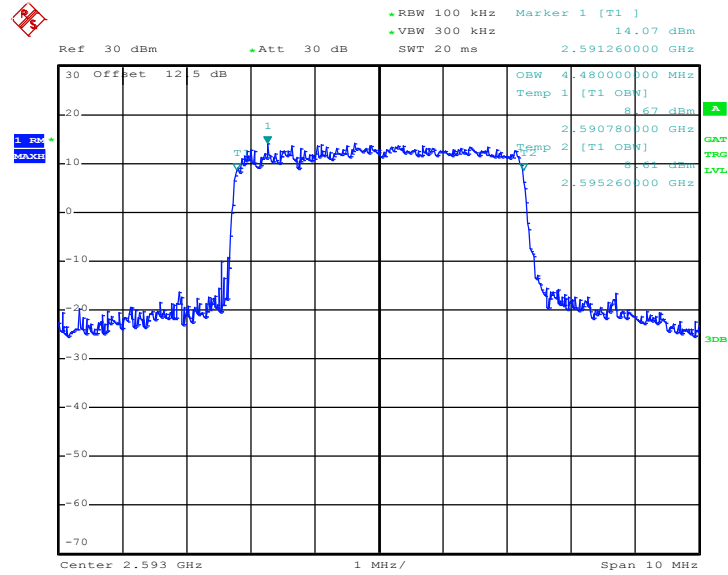


Date: 17.APR.2012 13:53:01



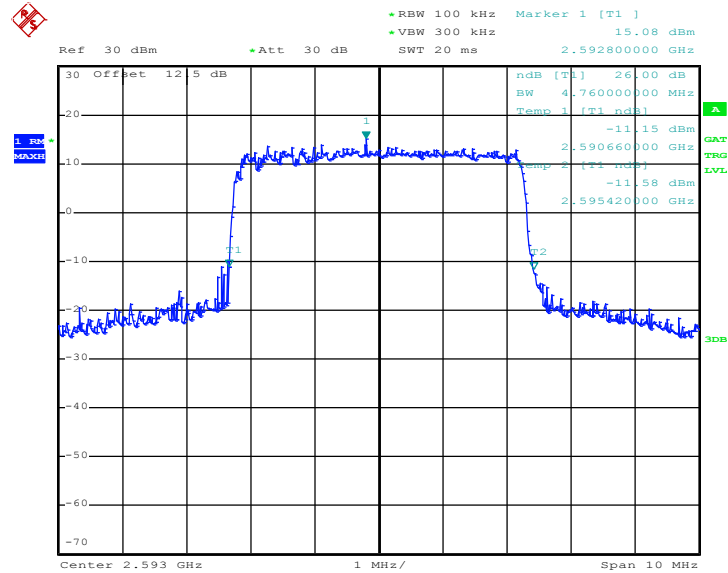
Band :	802.16e	Power Stage :	High
Test Mode :	16QAM BW 5MHz		

99% Occupied Bandwidth Plot on Middle Channel



Date: 12.APR.2012 16:43:32

26dB Bandwidth Plot on Middle Channel

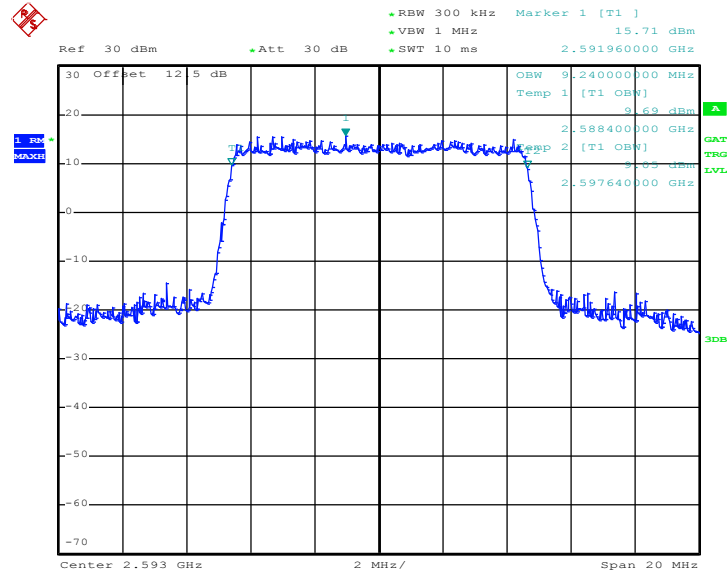


Date: 17.APR.2012 14:05:12



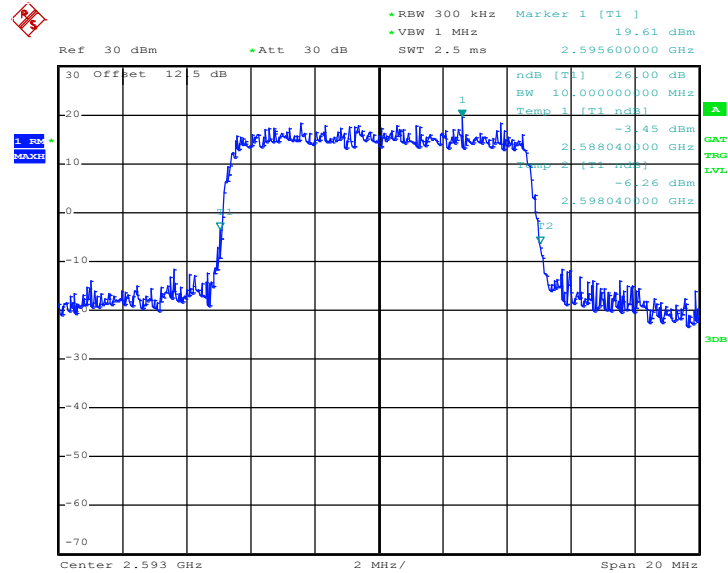
<b>Band :</b>	802.16e	<b>Power Stage :</b>	High
<b>Test Mode :</b>	16QAM BW 10MHz		

99% Occupied Bandwidth Plot on Middle Channel



Date: 12.APR.2012 16:24:50

26dB Bandwidth Plot on Middle Channel



Date: 17.APR.2012 13:54:10

### 3.3 Conducted Spurious Emission Measurement

#### 3.3.1 Description of Conducted Spurious Emission Measurement

The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of mobile digital stations, the attenuation factor shall be not less than  $43 + 10 \log (P)$  dB at the channel edge and  $55 + 10 \log (P)$  dB at 5.5 MHz from the channel edges. It is measured by means of a calibrated spectrum analyzer and scanned from 30 MHz up to a frequency including its 10<sup>th</sup> harmonic.

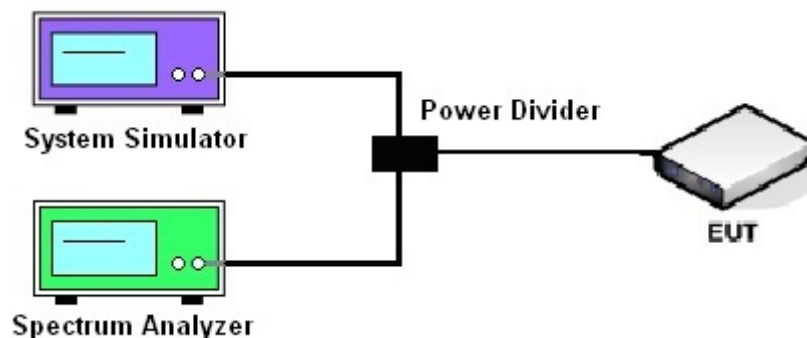
#### 3.3.2 Measuring Instruments

See list of measuring instruments of this test report.

#### 3.3.3 Test Procedures

1. The EUT was connected to spectrum analyzer and System Simulator via power divider.
2. The conducted spurious emission for the whole frequency range was taken.

#### 3.3.4 Test Setup

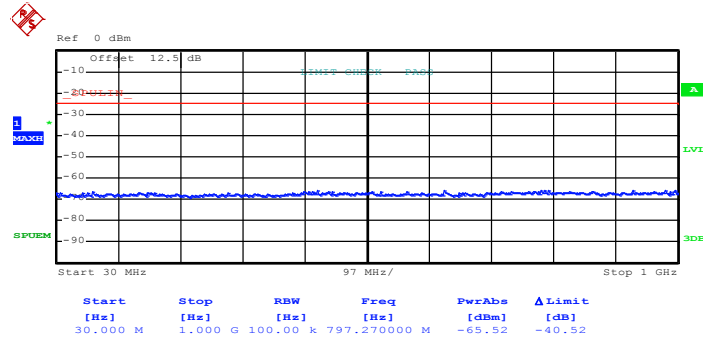




### 3.3.5 Test Plots of Spurious Emission

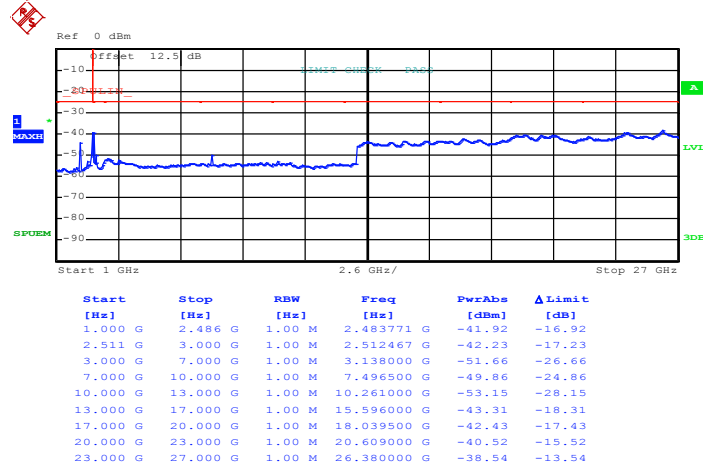
<b>Band :</b>	802.16e	<b>Power Stage :</b>	High
<b>Test Mode :</b>	QPSK BW 5MHz	<b>Channel :</b>	Low

#### Conducted Spurious Emission Plot between 30MHz ~ 1GHz



Date: 17.APR.2012 21:39:33

#### Conducted Spurious Emission Plot between 1GHz ~ 27GHz

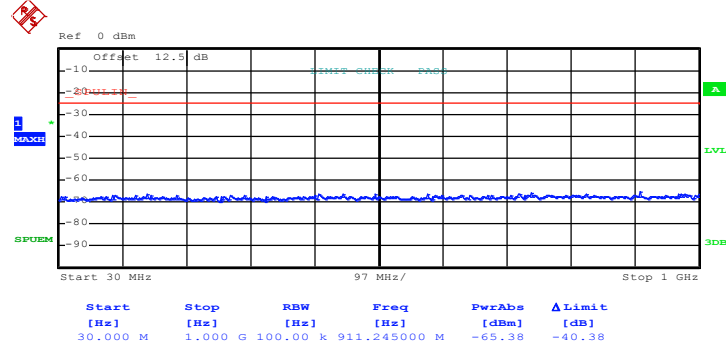


Date: 17.APR.2012 21:43:22



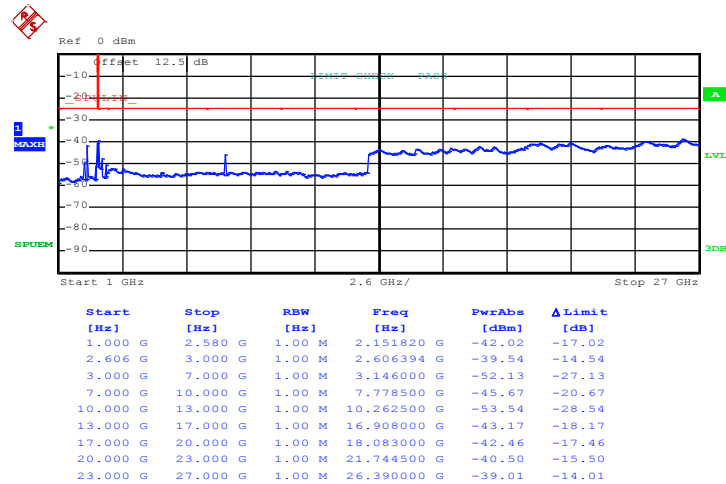
<b>Band :</b>	802.16e	<b>Power Stage :</b>	High
<b>Test Mode :</b>	QPSK BW 5MHz	<b>Channel :</b>	Middle

**Conducted Spurious Emission Plot between 30MHz ~ 1GHz**



Date: 17.APR.2012 21:39:59

**Conducted Spurious Emission Plot between 1GHz ~ 27GHz**

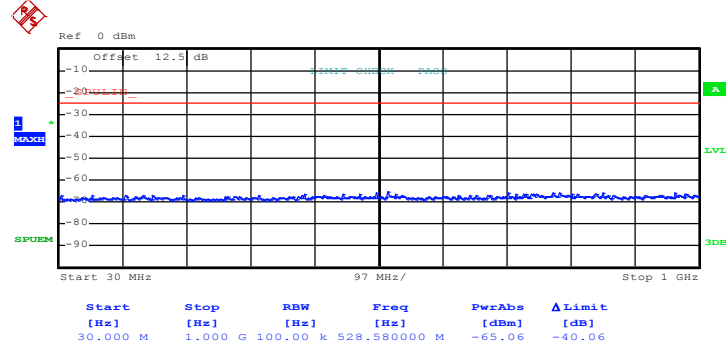


Date: 17.APR.2012 21:45:45



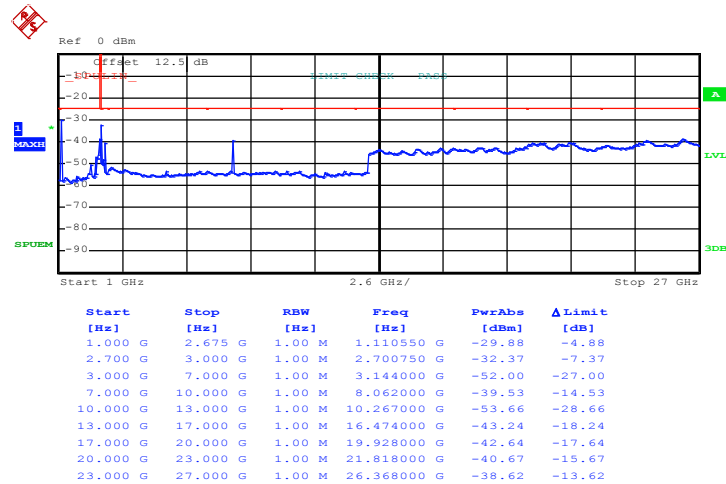
<b>Band :</b>	802.16e	<b>Power Stage :</b>	High
<b>Test Mode :</b>	QPSK BW 5MHz	<b>Channel :</b>	High

**Conducted Spurious Emission Plot between 30MHz ~ 1GHz**



Date: 17.APR.2012 21:40:29

**Conducted Spurious Emission Plot between 1GHz ~ 27GHz**

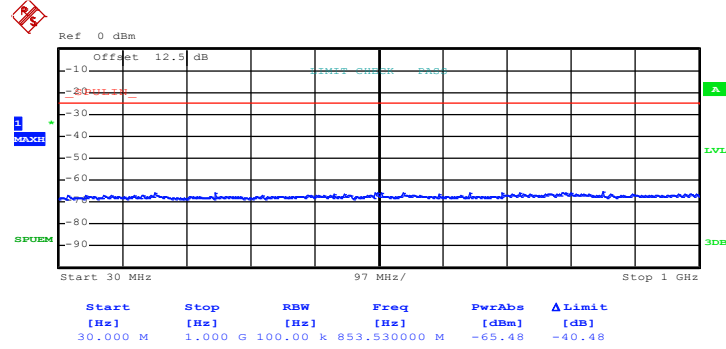


Date: 17.APR.2012 21:50:11



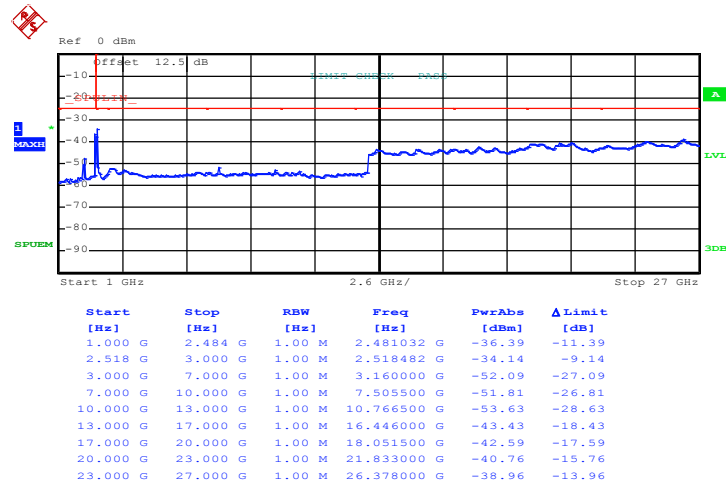
<b>Band :</b>	802.16e	<b>Power Stage :</b>	High
<b>Test Mode :</b>	QPSK BW 10MHz	<b>Channel :</b>	Low

**Conducted Spurious Emission Plot between 30MHz ~ 1GHz**



Date: 17.APR.2012 21:35:23

**Conducted Spurious Emission Plot between 1GHz ~ 27GHz**

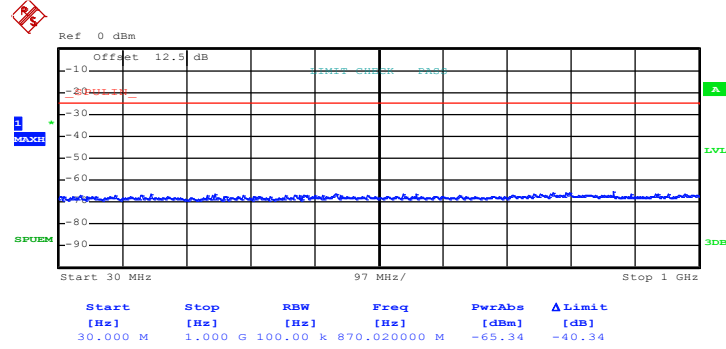


Date: 17.APR.2012 21:29:47



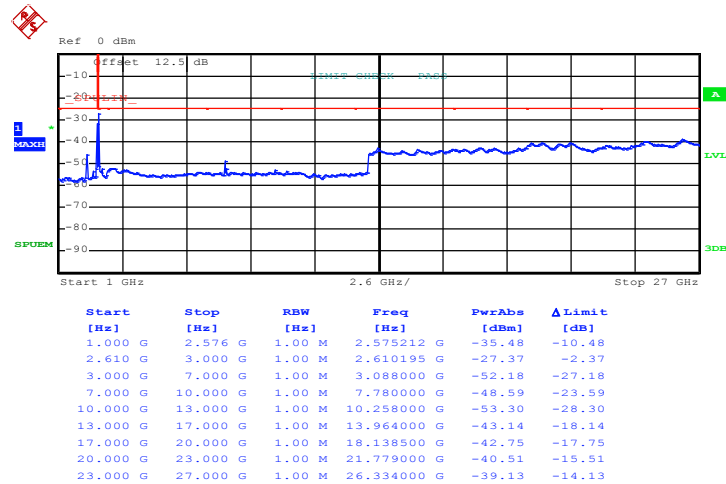
<b>Band :</b>	802.16e	<b>Power Stage :</b>	High
<b>Test Mode :</b>	QPSK BW 10MHz	<b>Channel :</b>	Middle

**Conducted Spurious Emission Plot between 30MHz ~ 1GHz**



Date: 17.APR.2012 21:35:55

**Conducted Spurious Emission Plot between 1GHz ~ 27GHz**

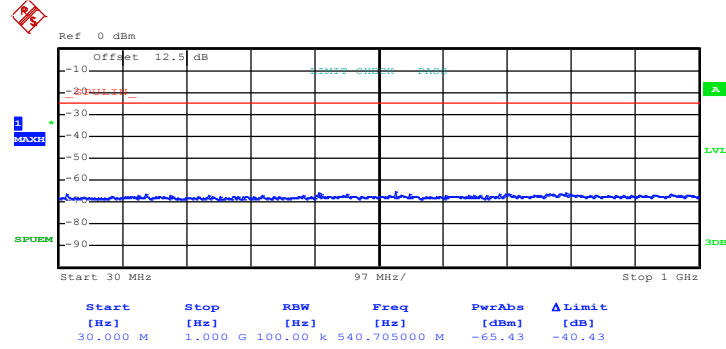


Date: 17.APR.2012 21:25:58



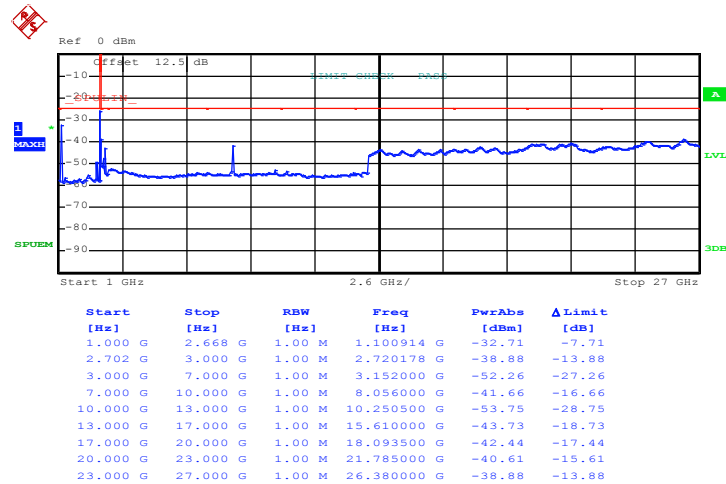
<b>Band :</b>	802.16e	<b>Power Stage :</b>	High
<b>Test Mode :</b>	QPSK BW 10MHz	<b>Channel :</b>	High

**Conducted Spurious Emission Plot between 30MHz ~ 1GHz**



Date: 17.APR.2012 21:37:25

**Conducted Spurious Emission Plot between 1GHz ~ 27GHz**

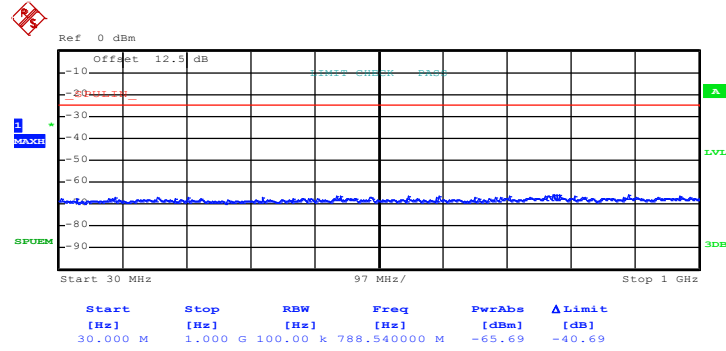


Date: 17.APR.2012 21:22:50



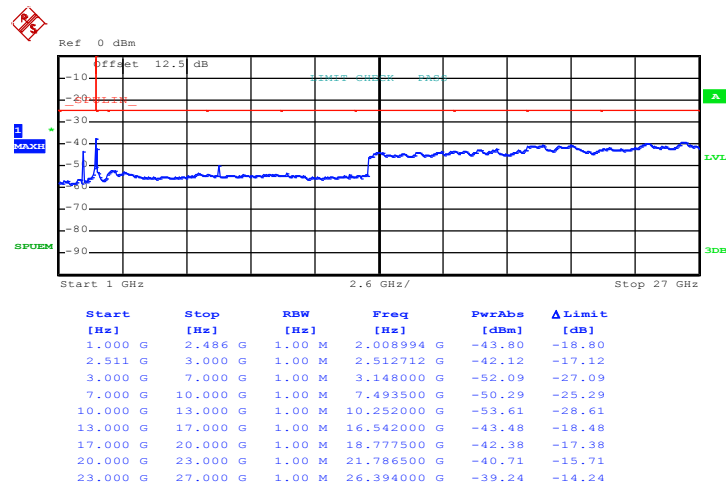
<b>Band :</b>	802.16e	<b>Power Stage :</b>	High
<b>Test Mode :</b>	16QAM BW 5MHz	<b>Channel :</b>	Low

**Conducted Spurious Emission Plot between 30MHz ~ 1GHz**



Date: 17.APR.2012 21:39:44

**Conducted Spurious Emission Plot between 1GHz ~ 27GHz**

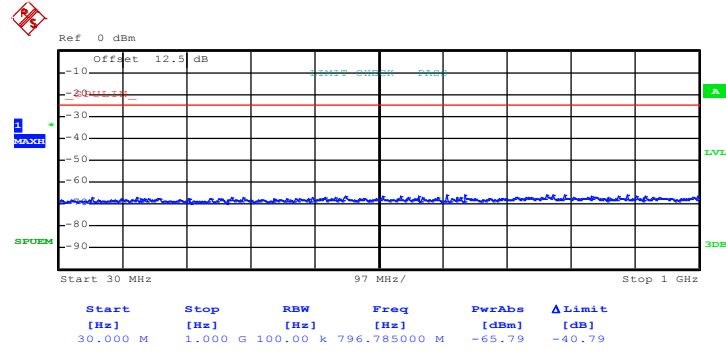


Date: 17.APR.2012 21:44:08



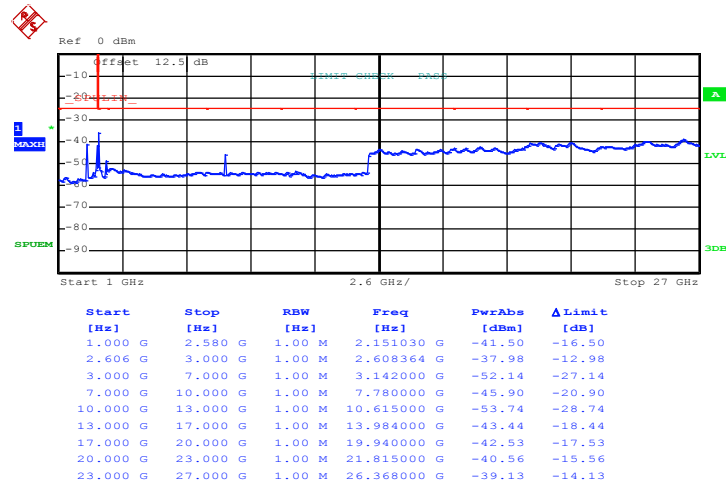
<b>Band :</b>	802.16e	<b>Power Stage :</b>	High
<b>Test Mode :</b>	16QAM BW 5MHz	<b>Channel :</b>	Middle

**Conducted Spurious Emission Plot between 30MHz ~ 1GHz**



Date: 17.APR.2012 21:40:13

**Conducted Spurious Emission Plot between 1GHz ~ 27GHz**



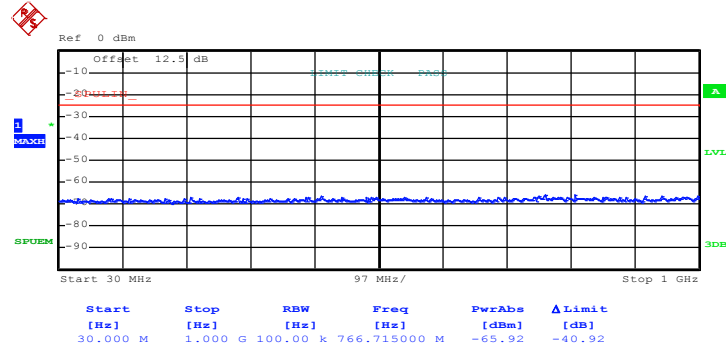
Date: 17.APR.2012 21:46:08





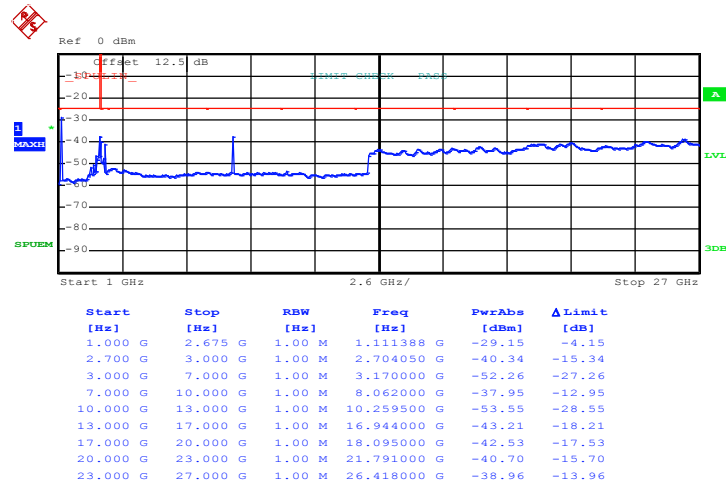
<b>Band :</b>	802.16e	<b>Power Stage :</b>	High
<b>Test Mode :</b>	16QAM BW 5MHz	<b>Channel :</b>	High

**Conducted Spurious Emission Plot between 30MHz ~ 1GHz**



Date: 17.APR.2012 21:40:41

**Conducted Spurious Emission Plot between 1GHz ~ 27GHz**

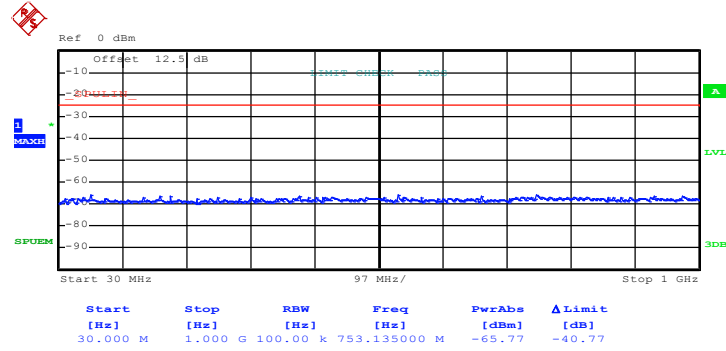


Date: 17.APR.2012 21:50:37



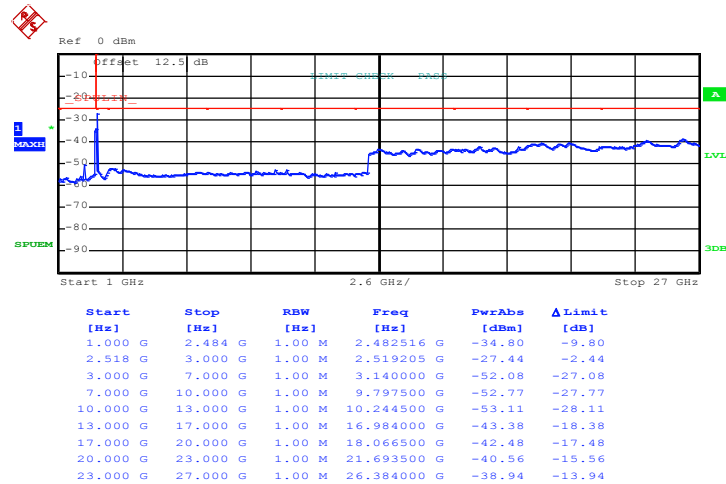
<b>Band :</b>	802.16e	<b>Power Stage :</b>	High
<b>Test Mode :</b>	16QAM BW 10MHz	<b>Channel :</b>	Low

**Conducted Spurious Emission Plot between 30MHz ~ 1GHz**



Date: 17.APR.2012 21:35:37

**Conducted Spurious Emission Plot between 1GHz ~ 27GHz**

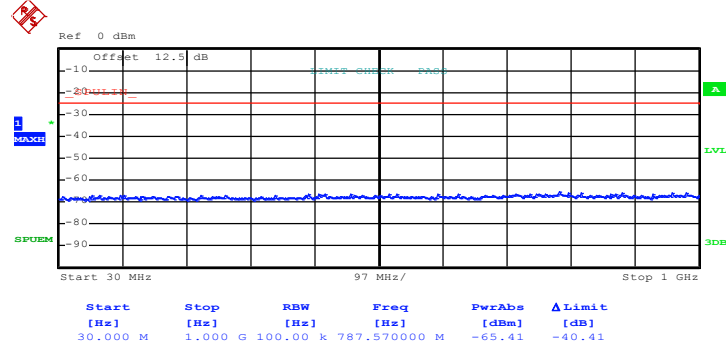


Date: 17.APR.2012 21:29:09



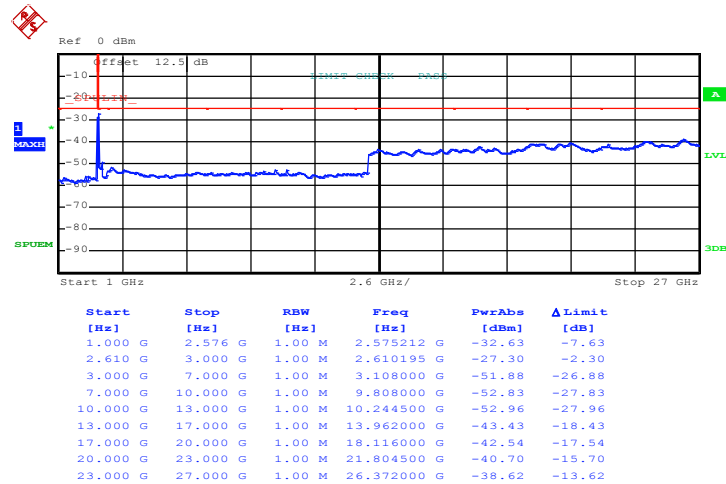
<b>Band :</b>	802.16e	<b>Power Stage :</b>	High
<b>Test Mode :</b>	16QAM BW 10MHz	<b>Channel :</b>	Middle

**Conducted Spurious Emission Plot between 30MHz ~ 1GHz**



Date: 17.APR.2012 21:36:19

**Conducted Spurious Emission Plot between 1GHz ~ 27GHz**

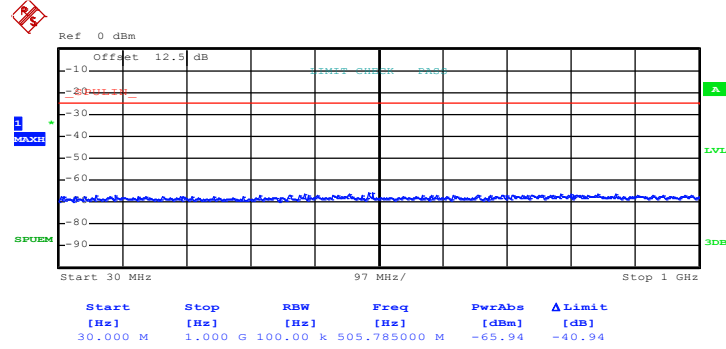


Date: 17.APR.2012 21:26:29



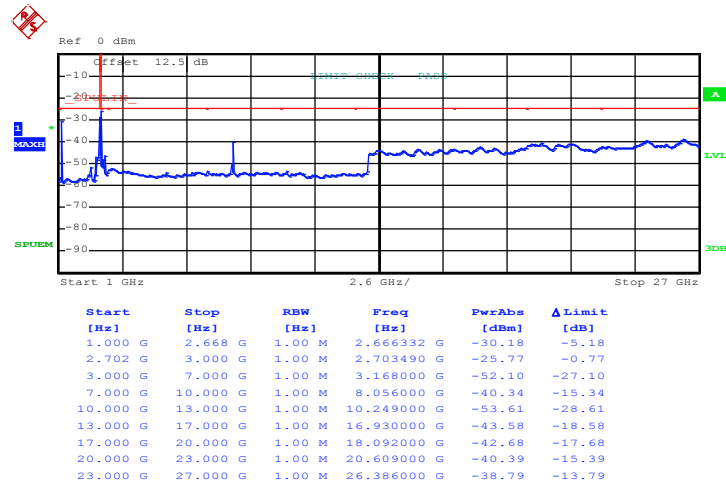
<b>Band :</b>	802.16e	<b>Power Stage :</b>	High
<b>Test Mode :</b>	16QAM BW 10MHz	<b>Channel :</b>	High

**Conducted Spurious Emission Plot between 30MHz ~ 1GHz**



Date: 17.APR.2012 21:37:38

**Conducted Spurious Emission Plot between 1GHz ~ 27GHz**



Date: 17.APR.2012 21:21:55

## 3.4 Radiated Emissions Measurement

### 3.4.1 Description of Radiated Emissions Measurement

The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of mobile digital stations, the attenuation factor shall be not less than  $43 + 10 \log (P)$  dB at the channel edge and  $55 + 10 \log (P)$  dB at 5.5 MHz from the channel edges. It is measured by means of a calibrated spectrum analyzer and scanned from 30 MHz up to a frequency including its 10<sup>th</sup> harmonic.

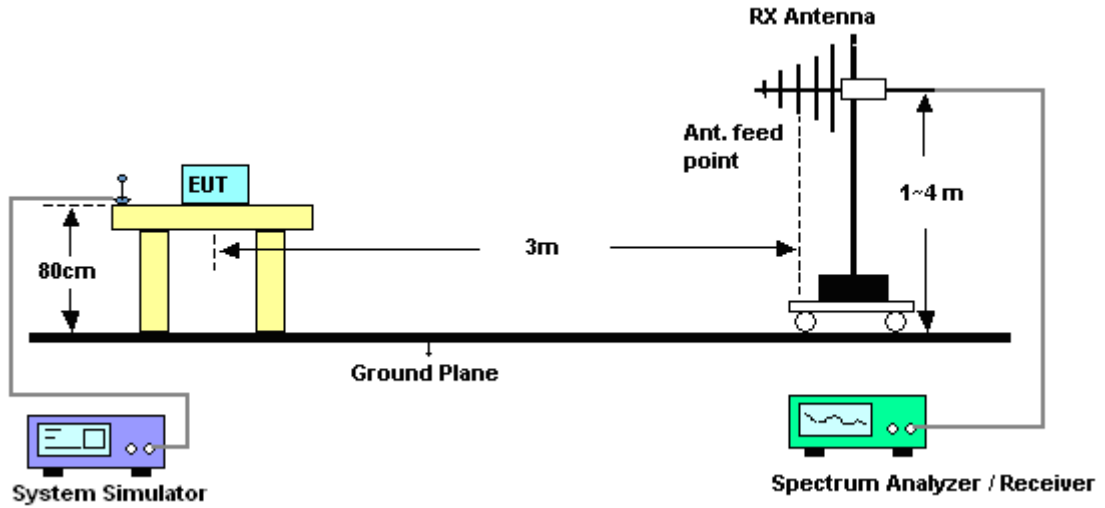
### 3.4.2 Measuring Instruments

See list of measuring instruments of this test report.

### 3.4.3 Test Procedures

1. The EUT was placed on a rotatable wooden table with 0.8 meter about ground.
2. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest spurious emission.
4. The height of the receiving antenna is varied between one meter and four meters to search the maximum spurious emission for both horizontal and vertical polarizations.
5. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 1MHz, Sweep = 500ms, Taking the record of maximum spurious emission.
6. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
7. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
8. Taking the record of output power at antenna port.
9. Repeat step 7 to step 8 for another polarization.
10. Emission level (dBm) = output power + substitution Gain.

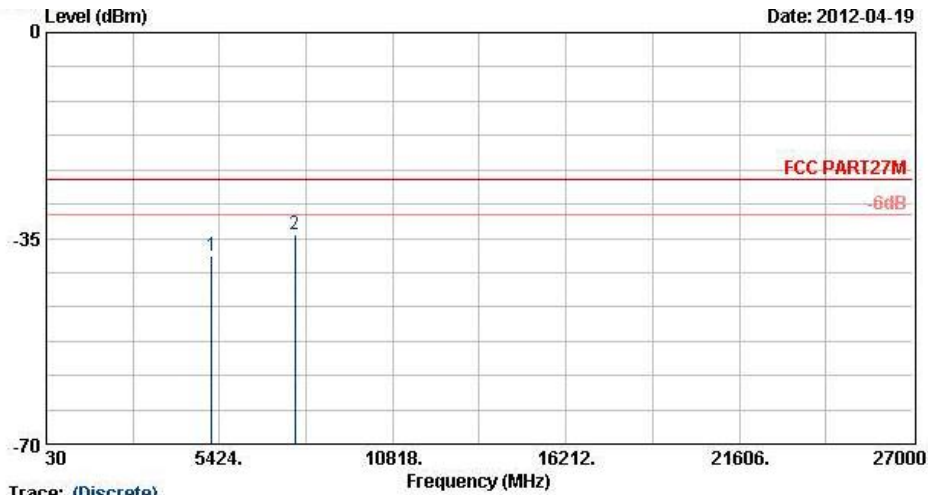
### 3.4.4 Test Setup





3.4.5 Test Result of Radiated Emissions

<b>Band :</b>	802.16e	<b>Temperature :</b>	21~23°C
<b>Test Mode :</b>	16QAM BW 5MHz, Middle Ch (2593MHz)	<b>Relative Humidity :</b>	49~51%
<b>Test Engineer :</b>	Eric Shih	<b>Polarization :</b>	Horizontal
<b>Remark :</b>	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		

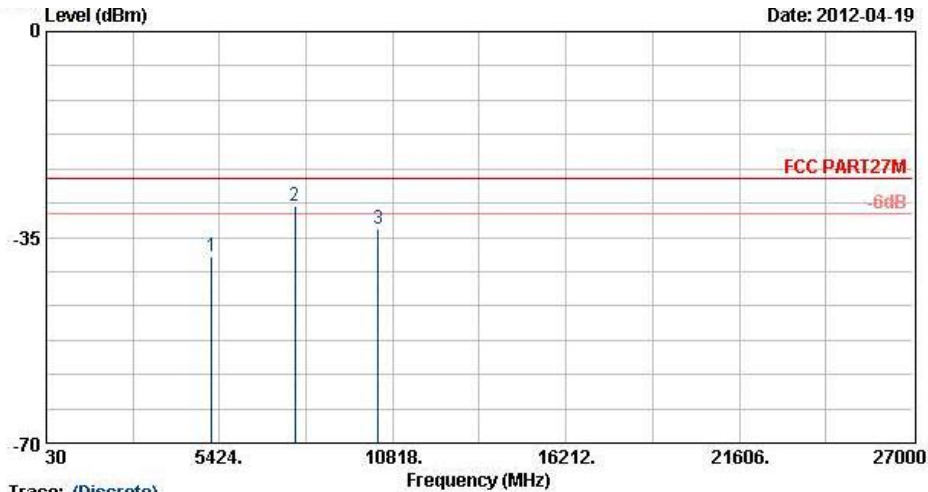


Trace: (Discrete)  
 Site : 03CH06-RY  
 Condition : FCC PART27M EIRP\_100524 HORIZONTAL  
 Project : FW 231328

Frequency ( MHz )	EIRP ( dBm )	Limit ( dBm )	Over Limit ( dB )	SPA Reading ( dBm )	S.G. Power ( dBm )	TX Cable loss ( dB )	TX Antenna Gain ( dBi )	Polarization ( H/V )	Result
5186	-38.12	-25	-13.12	-59.54	-47.00	1.29	10.17	H	Pass
7779	-34.31	-25	-9.31	-60.92	-44.80	1.63	12.12	H	Pass



<b>Band :</b>	802.16e	<b>Temperature :</b>	21~23°C
<b>Test Mode :</b>	16QAM BW 5MHz, Middle Ch (2593MHz)	<b>Relative Humidity :</b>	49~51%
<b>Test Engineer :</b>	Eric Shih	<b>Polarization :</b>	Vertical
<b>Remark :</b>	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		



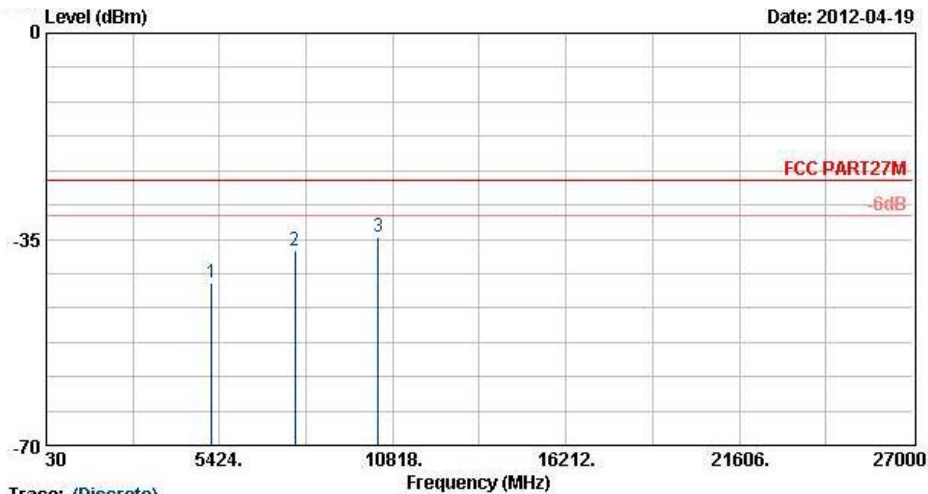
Trace: (Discrete)  
 Site : 03CH06-RY  
 Condition : FCC PART27M ETRP\_100524 VERTICAL  
 Project : FW 231328

Frequency ( MHz )	EIRP ( dBm )	Limit ( dBm )	Over Limit ( dB )	SPA Reading ( dBm )	S.G. Power ( dBm )	TX Cable loss ( dB )	TX Antenna Gain ( dBi )	Polarization ( H/V )	Result
5186	-38.32	-25	-13.32	-60.76	-47.20	1.29	10.17	V	Pass
7779	-29.71	-25	-4.71	-57.29	-40.20	1.63	12.12	V	Pass
10372	-33.58	-25	-8.58	-63.45	-43.40	2.58	12.40	V	Pass





<b>Band :</b>	802.16e	<b>Temperature :</b>	21~23°C
<b>Test Mode :</b>	16QAM BW 10MHz, Middle Ch (2593MHz)	<b>Relative Humidity :</b>	49~51%
<b>Test Engineer :</b>	Eric Shih	<b>Polarization :</b>	Horizontal
<b>Remark :</b>	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		

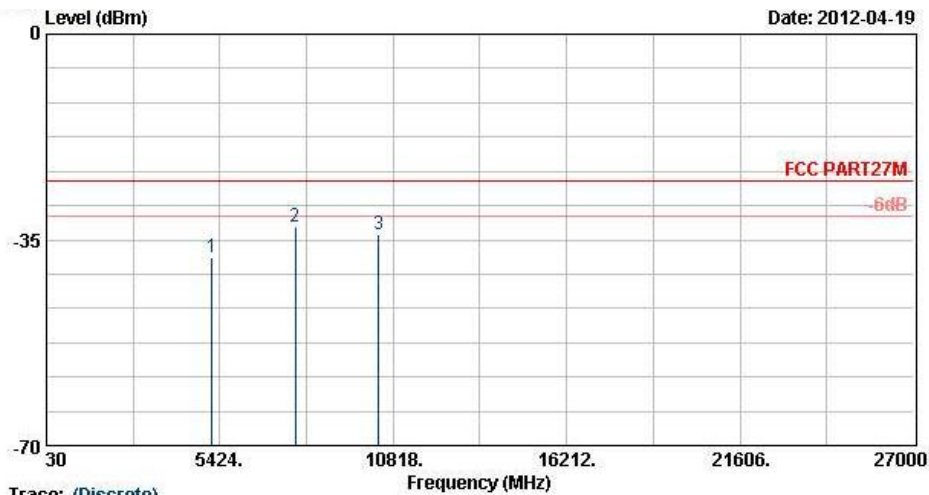


Trace: (Discrete)  
 Site : 03CH06-RY  
 Condition : FCC PART27M EIRP\_100524 HORIZONTAL  
 Project : FW 231328

Frequency ( MHz )	EIRP ( dBm )	Limit ( dBm )	Over Limit ( dB )	SPA Reading ( dBm )	S.G. Power ( dBm )	TX Cable loss ( dB )	TX Antenna Gain ( dBi )	Polarization ( H/V )	Result
5186	-42.42	-25	-17.42	-64.55	-51.30	1.29	10.17	H	Pass
7779	-37.01	-25	-12.01	-64.18	-47.50	1.63	12.12	H	Pass
10372	-34.58	-25	-9.58	-63.97	-44.40	2.58	12.40	H	Pass



<b>Band :</b>	802.16e	<b>Temperature :</b>	21~23°C
<b>Test Mode :</b>	16QAM BW 10MHz, Middle Ch (2593MHz)	<b>Relative Humidity :</b>	49~51%
<b>Test Engineer :</b>	Eric Shih	<b>Polarization :</b>	Vertical
<b>Remark :</b>	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		



Trace: (Discrete)  
 Site : 03CH06-HY  
 Condition : FCC PART27M ETRP\_100524 VERTICAL  
 Project : FW 231328

Frequency ( MHz )	EIRP ( dBm )	Limit ( dBm )	Over Limit ( dB )	SPA Reading ( dBm )	S.G. Power ( dBm )	TX Cable loss ( dB )	TX Antenna Gain ( dBi )	Polarization ( H/V )	Result
5186	-38.02	-25	-13.02	-60.28	-46.90	1.29	10.17	V	Pass
7779	-32.71	-25	-7.71	-59.73	-43.20	1.63	12.12	V	Pass
10372	-33.98	-25	-8.98	-63.64	-43.80	2.58	12.40	V	Pass



## **3.5 Frequency Stability Measurement**

### **3.5.1 Description of Frequency Stability Measurement**

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized frequency band. For equipment authorization purposes, this is a reporting requirement only.

### **3.5.2 Measuring Instruments**

See list of measuring instruments of this test report.

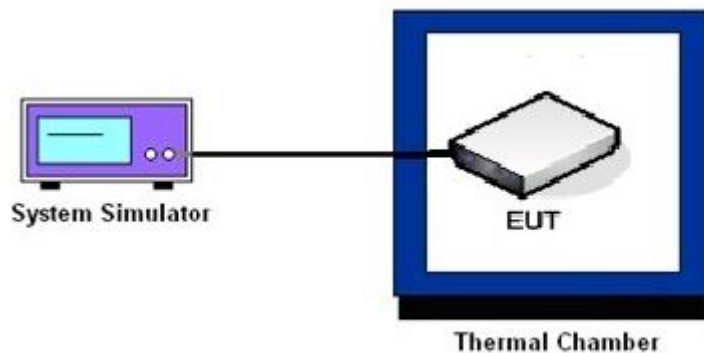
### **3.5.3 Test Procedures for Temperature Variation**

1. The EUT was set up in the thermal chamber and connected with the System Simulator.
2. With power OFF, the temperature was decreased to -30°C and the EUT was stabilized before testing. Power was applied and the maximum change in frequency was recorded within one minute.
3. With power OFF, the temperature was raised in 10°C step up to 50°C. The EUT was stabilized at each step for at least half an hour. Power was applied and the maximum frequency change was recorded within one minute.
4. If the EUT can not be turned on at -30°C, the testing lowest temperature will be raised in 10°C step until the EUT can be turned on.

### **3.5.4 Test Procedures for Voltage Variation**

1. The EUT was placed in a temperature chamber at 25±5° C and connected with the System Simulator.
2. The power supply voltage to the EUT was varied from BEP to 115% of the nominal value measured at the input to the EUT.
3. The variation in frequency was measured for the worst case.

### 3.5.5 Test Setup



### 3.5.6 Test Result of Temperature Variation

Band :	802.16e	Channel :	Middle (2593MHz)
Limit (ppm) :	2.5		

Temperature (°C)	QPSK BW 5MHz		QPSK BW 10MHz		Result
	Freq. Dev. (Hz)	Deviation (ppm)	Freq. Dev. (Hz)	Deviation (ppm)	
-30	N/A	N/A	N/A	N/A	PASS
-20	N/A	N/A	N/A	N/A	
-10	N/A	N/A	N/A	N/A	
0	-21.22	-0.0082	-25.16	-0.0097	
10	-19.13	-0.0074	-24.18	-0.0093	
20	-23.78	-0.0092	-26.5	-0.0102	
30	-20.06	-0.0077	-24.64	-0.0095	
40	-25.73	-0.0099	-26.75	-0.0103	
50	N/A	N/A	N/A	N/A	

**Note:** The manufacturer declared that the EUT could work properly between temperatures -0°C~40°C.



3.5.7 Test Result of Voltage Variation

Band & Channel	Mode	Voltage (Volt)	Freq. Dev. (Hz)	Deviation (ppm)	Result
802.16e Middle (2593MHz)	QPSK BW 5MHz	12.6	-28.14	-0.0109	PASS
		12.0	-24.85	-0.0096	
		11.4	-28.84	-0.0111	
	QPSK BW 10MHz	12.6	-31.51	-0.0122	PASS
		12.0	-30.34	-0.0117	
		11.4	-28.18	-0.0109	
	16QAM BW 5MHz	12.6	-26.72	-0.0103	PASS
		12.0	-27.91	-0.0108	
		11.4	-29.51	-0.0114	
	16QAM BW 10MHz	12.6	-31.09	-0.0120	PASS
		12.0	-25.59	-0.0099	
		11.4	-33.31	-0.0128	

Note: Normal Voltage = 12.6V.



## 4 List of Measuring Equipments

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSP40	100055	9kHz~40GHz	Jun. 13, 2011	Apr. 12, 2012 ~ Apr. 17, 2012	Jun. 12, 2012	Conducted (TH02-HY)
Thermal Chamber	Ten Billion	TTH-D35P	TBN-930701	N/A	Jul. 27, 2011	Apr. 12, 2012 ~ Apr. 17, 2012	Jul. 26, 2012	Conducted (TH02-HY)
Spectrum Analyzer	Agilent	E4408B	MY44211030	9KHz ~ 26.5GHz	Nov. 23, 2011	Apr. 19, 2012	Nov. 22, 2012	Radiation (03CH06-HY)
Spectrum Analyzer	R&S	FSP40	100057	9KHz ~ 40GHz	Oct. 27, 2011	Apr. 19, 2012	Oct. 26, 2012	Radiation (03CH06-HY)
EMI Test Receiver	R&S	ESVS10	834468/003	20MHz ~ 1000MHz	May 10, 2011	Apr. 19, 2012	May 09, 2012	Radiation (03CH06-HY)
Bilog Antenna	SCHAFFNER	CBL6112B	2885	30MHz ~ 2GHz	Oct. 22, 2011	Apr. 19, 2012	Oct. 21, 2012	Radiation (03CH06-HY)
Double Ridge Horn Antenna	EMCO	3117	00066583	1GHz ~ 18GHz	Aug. 01, 2011	Apr. 19, 2012	Jul. 31, 2012	Radiation (03CH06-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA917025 1	15GHz ~ 40GHz	Oct. 21, 2011	Apr. 19, 2012	Oct. 20, 2012	Radiation (03CH06-HY)
Pre Amplifier	Agilent	8449B	3008A01917	1GHz ~ 26.5GHz	Apr. 13, 2012	Apr. 19, 2012	Apr. 12, 2013	Radiation (03CH06-HY)
Amplifier	Agilent	310N	186713	9KHz ~ 1GHz	Apr. 11, 2012	Apr. 19, 2012	Apr. 10, 2013	Radiation (03CH06-HY)
Pre Amplifier	EMCI	EMC051845	SN980048	1GHz ~ 18GHz	Jul. 18, 2011	Apr. 19, 2012	Jul. 17, 2012	Radiation (03CH06-HY)
WiMAX Base Station (System Simulator)	Agilent	E6651A	N/A	N/A	N/A	Apr. 12, 2012 ~ Apr. 19, 2012	N/A	-

## 5 Uncertainty of Evaluation

### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Contribution	Uncertainty of $X_i$		$u(X_i)$
	dB	Probability Distribution	
Receiver Reading	0.41	Normal (k=2)	0.21
Antenna Factor Calibration	0.83	Normal (k=2)	0.42
Cable Loss Calibration	0.25	Normal (k=2)	0.13
Pre-Amplifier Gain Calibration	0.27	Normal (k=2)	0.14
RCV/SPA Specification	2.50	Rectangular	0.72
Antenna Factor Interpolation for Frequency	1.00	Rectangular	0.29
Site Imperfection	1.43	Rectangular	0.83
Mismatch	+0.39 / -0.41	U-Shape	0.28
<b>Combined Standard Uncertainty <math>U_c(y)</math></b>	<b>1.27</b>		
<b>Measuring Uncertainty for a Level of Confidence of 95% (<math>U = 2U_c(y)</math>)</b>	<b>2.54</b>		

### Uncertainty of Radiated Emission Measurement (1 GHz ~ 40 GHz)

Contribution	Uncertainty of $X_i$		$u(X_i)$	$C_i$	$C_i * u(X_i)$
	dB	Probability Distribution			
Receiver Reading	$\pm 0.10$	Normal (k=2)	0.10	1	0.10
Antenna Factor Calibration	$\pm 1.70$	Normal (k=2)	0.85	1	0.85
Cable Loss Calibration	$\pm 0.50$	Normal (k=2)	0.25	1	0.25
Receiver Correction	$\pm 2.00$	Rectangular	1.15	1	1.15
Antenna Factor Directional	$\pm 1.50$	Rectangular	0.87	1	0.87
Site Imperfection	$\pm 2.80$	Triangular	1.14	1	1.14
Mismatch Receiver VSWR $\Gamma_1 = 0.197$ Antenna VSWR $\Gamma_2 = 0.194$ Uncertainty = $20\text{Log}(1-\Gamma_1*\Gamma_2)$	+0.34 / -0.35	U-Shape	0.244	1	0.244
<b>Combined Standard Uncertainty <math>U_c(y)</math></b>	<b>2.36</b>				
<b>Measuring Uncertainty for a Level of Confidence of 95% (<math>U = 2U_c(y)</math>)</b>	<b>4.72</b>				



## **Appendix A. Photographs of EUT**

Please refer to Sporton report number EP231328 as below.