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# Report On

FCC Part 15.247 Testing of the  
Frontier Silicon Ltd Venice 8 FS2028 Radio Module  
In accordance with FCC Part 15.247

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FCC ID: YYX-HA-FS2028-F

Document 75910757 Report 02 Issue 1

December 2010



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COMMERCIAL-IN-CONFIDENCE

**REPORT ON**

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Frontier Silicon Ltd Venice 8 FS2028 Radio Module  
In accordance with FCC Part 15.247

Document 75910757 Report 02 Issue 1

December 2010

**PREPARED FOR**

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**PREPARED BY**

  
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Senior Administrator

**APPROVED BY**

  
**M Jenkins**  
Authorised Signatory

**DATED**


09 December 2010


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**ENGINEERING STATEMENT**

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC CFR 47: Part 15C. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

  
**B Aires**

  
**G Lawler**



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## **SECTION 1**

### **REPORT SUMMARY**

FCC Part 15.247 Testing of the  
Frontier Silicon Ltd Venice 8 FS2028 Radio Module  
In accordance with FCC Part 15.247



## 1.1 INTRODUCTION

The information contained in this report is intended to show verification of Frontier Silicon Ltd Venice 8 FS2028 Radio Module to the requirements of FCC CFR 47 Part 15C.

Objective	To perform FCC Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Frontier Silicon Ltd
Model Number(s)	Venice 8 FS2028 Radio Module
Serial Number(s)	RAD100912 RAD100905
Number of Samples Tested	Two
Test Specification/Issue/Date	FCC CFR 47 Part 15C: 2009
Incoming Release Date	Declaration of Build Status 15 November 2010
Disposal Reference Number Date	Held Pending Disposal Not Applicable Not Applicable
Order Number Date	FS081034 20 August 2010
Start of Test	27 October 2010
Finish of Test	11 November 2010
Name of Engineer(s)	B Airs G Lawler
Related Document(s)	ANSI C63.4: 2003



## 1.2 BRIEF SUMMARY OF RESULTS

A brief summary of results for each configuration, in accordance with FCC CFR 47 Part 15C is shown below.

Configuration 1: DC Supplied						
Section	Spec Clause	Test Description	Mode	Mod State	Result	Base Standard
2.1	15.247 (a)(2)	6dB Bandwidth	2412MHz Tx	0	Pass	ANSI C63.4
			2437MHz Tx	0	Pass	
			2462MHz Tx	0	Pass	
2.2	15.247 (b)(3)	Maximum Peak Conducted Output Power	2412MHz Tx	0	Pass	ANSI C63.4
			2437MHz Tx	0	Pass	
			2462MHz Tx	0	Pass	
2.3	15.247 (b)(4)	EIRP Peak Power	2412MHz Tx	0	Pass	ANSI C63.4
			2437MHz Tx	0	Pass	
			2462MHz Tx	0	Pass	
2.4	15.247 (d)	Radiated Emissions (Enclosure Port)	2412MHz Tx	0	Pass	ANSI C63.4
			2437MHz Tx	0	Pass	
			2462MHz Tx	0	Pass	
2.5	15.247 (d)	Spurious Emissions	2412MHz Tx	0	Pass	ANSI C63.4
			2437MHz Tx	0	Pass	
			2462MHz Tx	0	Pass	
2.6	15.247 (d)	Band Edge Measurements	2412MHz Tx	0	Pass	ANSI C63.4
			2437MHz Tx		N/A	
			2462MHz Tx	0	Pass	
2.7	15.247 (e)	Power Spectral Density	2412MHz Tx	0	Pass	ANSI C63.4
			2437MHz Tx	0	Pass	
			2462MHz Tx	0	Pass	

N/A – Not Applicable



### 1.3 DECLARATION OF BUILD STATUS

MAIN EUT	
MANUFACTURING DESCRIPTION	Venice 8 FS2028 Radio Module
MANUFACTURER	Frontier Silicon Ltd
TYPE	
PART NUMBER	HA-FS2028-Fxxxxxx (xxxxxx=customer variant)
HARDWARE VERSION	FS0114-5 (Revision 5)
SOFTWARE VERSION	IR3.1 SDK V3.1.3
TRANSMITTER OPERATING RANGE	2.4-2.4835GHz
RECEIVER OPERATING RANGE	2.4-2.4835GHz
COUNTRY OF ORIGIN	China
INTERMEDIATE FREQUENCIES	N/A
EMISSION DESIGNATOR(S): (i.e. G1D, GXW)	22M0D1D
MODULATION TYPES: (i.e. GMSK, QPSK)	802.11b = DSSS , 802.11g = OFDM
HIGHEST INTERNALLY GENERATED FREQUENCY	2.4835GHz
OUTPUT POWER (W or dBm)	15dBm (nominal at antenna port)
FCC ID	YYX-HA-FS2028-F
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	The Venice 8 FS2028 is a radio module supporting Internet radio (WiFi or Ethernet), Audio Streaming (WiFi, Ethernet or USB), iPod/iPhone control and FM-RDS reception when installed in a consumer audio product.
BATTERY/POWER SUPPLY	
MANUFACTURING DESCRIPTION	Not supplied with module. Has onboard regulator.
MANUFACTURER	
TYPE	
PART NUMBER	
VOLTAGE	
COUNTRY OF ORIGIN	

Signature

Date

15/11/2010

Note: This document has been prepared to enable manufacturers with no mechanism for producing their own Declaration of Build Status, to declare the build state of the equipment submitted for test.

No responsibility will be accepted by TÜV Product Service as to the accuracy of the information declared in this document by the manufacturer.



## 1.4 PRODUCT INFORMATION

### 1.4.1 Technical Description

The Equipment Under Test (EUT) was a Frontier Silicon Ltd Venice 8 FS2028 Radio Module. A full technical description can be found in the manufacturer's documentation.

### 1.4.2 Test Configuration

#### Configuration 1: DC Supplied

The EUT was configured in accordance with FCC CFR 47 Part 15C.

### 1.4.3 EUT Cable / Port Identification

Port	Max Cable Length specified	Usage	Type	Screened
DC Power	1.5m	DC Power Lead	2 core	No

### 1.4.4 Modes of Operation

Modes of operation of each EUT during testing were as follows:

Mode 1 - 2412MHz Transmit

Mode 2 - 2437MHz Transmit

Mode 3 - 2462MHz Transmit

Information on the specific test modes utilised are detailed in the test procedure for each individual test.





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## **1.5 TEST CONDITIONS**

For all tests the EUT was set up in accordance with the relevant test standard and to represent typical operating conditions. Tests were applied with the EUT situated in a shielded enclosure or test laboratories as appropriate.

The EUT was powered from three DC power supplies. Each supply was used to power a different part of the module. The voltages were set to 3.3 V, 1.2 V and 5.0 V.

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## **1.6 DEVIATIONS FROM THE STANDARD**

No deviations from the applicable test standards or test plan were made during testing.

## **1.7 MODIFICATION RECORD**

No modifications were made to the EUT during testing.



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## **SECTION 2**

### **TEST DETAILS**

FCC Part 15.247 Testing of the  
Frontier Silicon Ltd Venice 8 FS2028 Radio Module  
In accordance with FCC Part 15.247



Product Service

**2.1 6dB BANDWIDTH****2.1.1 Specification Reference**

FCC CFR 47 Part 15C, Clause 15.247 (a)(2)

**2.1.2 Equipment Under Test**

Venice 8 FS2028 Radio Module, S/N: RAD100912

**2.1.3 Date of Test and Modification State**

10 November 2010 - Modification State 0

**2.1.4 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

**2.1.5 Test Method and Operating Modes**

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 15.

The EUT was transmitted at maximum power at all data rates via a cable to the Spectrum Analyser. The Analyser settings were adjusted to display the resultant trace on screen. The peak point of the trace was measured and the markers positioned to give the -6dBc points of the displayed spectrum.

The test was performed with the EUT in the following configurations and modes of operation:

Configuration 1 - Mode 1  
- Mode 2  
- Mode 3

**2.1.6 Environmental Conditions**

10 November 2010

Ambient Temperature 22°C

Relative Humidity 26%



Product Service

### 2.1.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 15C for 6dB Bandwidth.

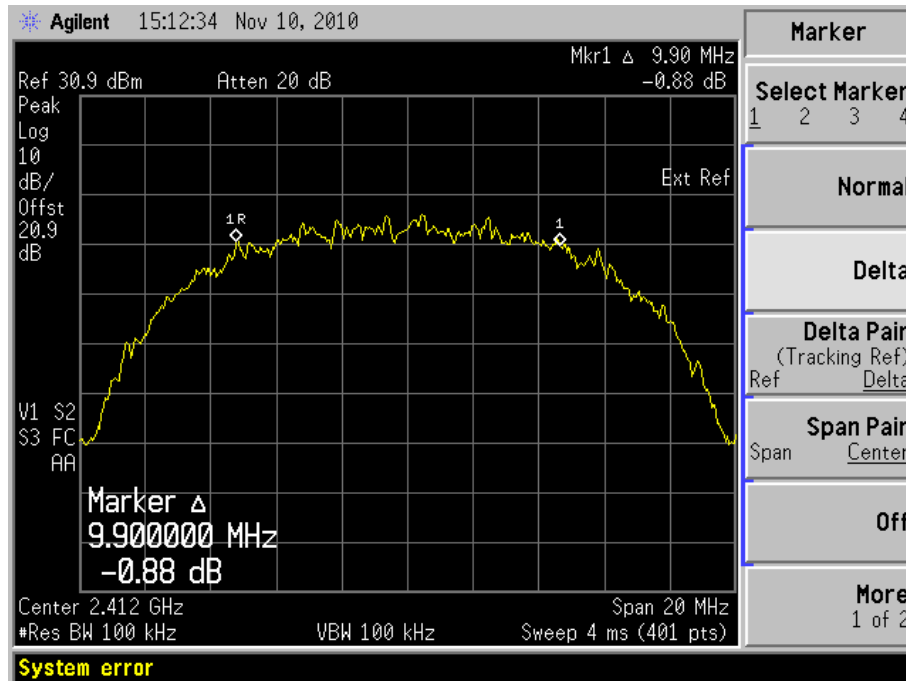
The test results are shown below.

802.11(b)

3.3/1.2/5 V DC Supply

Configuration 1 – Mode 1

Frequency (MHz)	Data Rate (Mbps)	6dB Bandwidth (kHz)
2412	11	9900

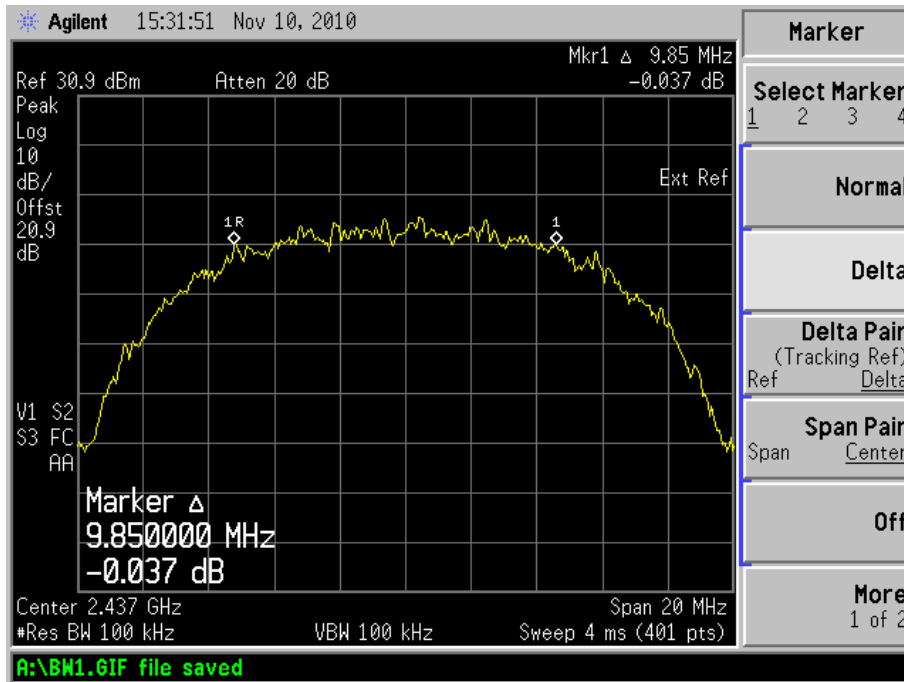




Product Service

Configuration 1 – Mode 2

Frequency (MHz)	Data Rate (Mbps)	6dB Bandwidth (kHz)
2437	11	9850

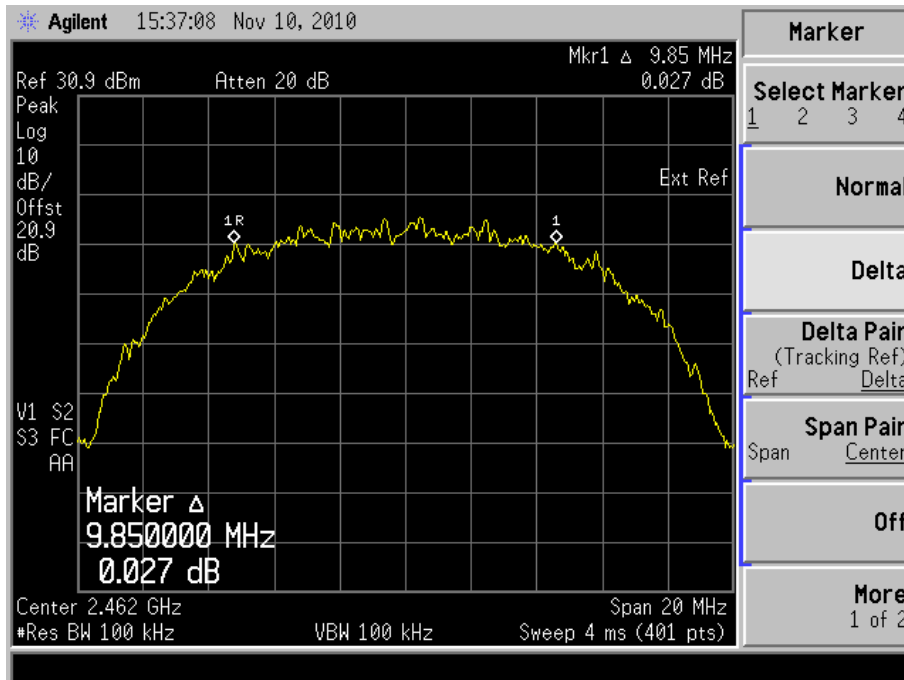




Product Service

Configuration 1 – Mode 3

Frequency (MHz)	Data Rate (Mbps)	6dB Bandwidth (kHz)
2462	11	9850





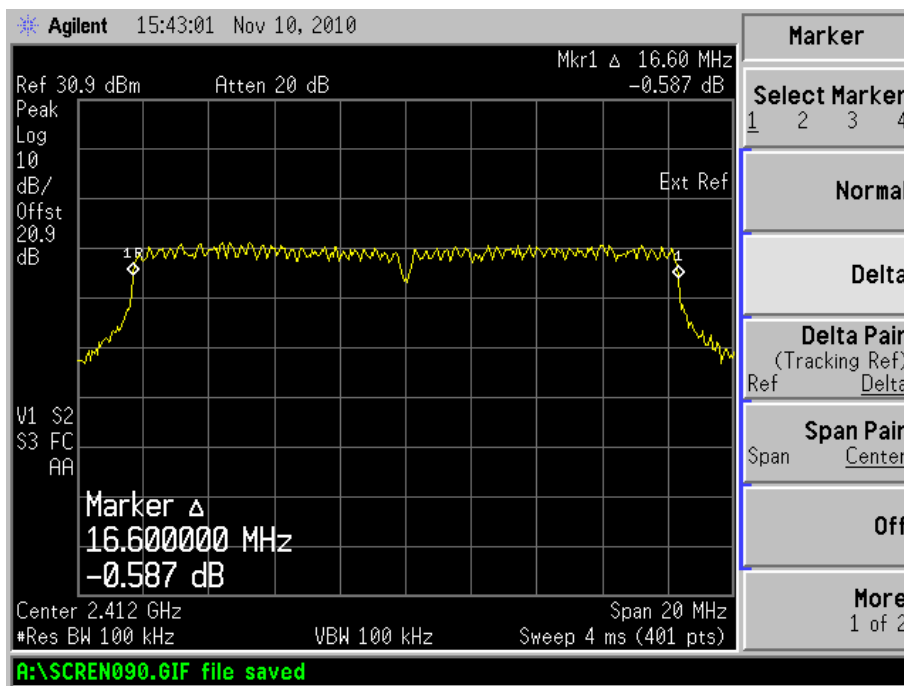
Product Service

802.11(g)

3.3/1.2/5 V DC Supply

Configuration 1 – Mode 1

Frequency (MHz)	Data Rate (Mbps)	6dB Bandwidth (kHz)
2412	54	16600

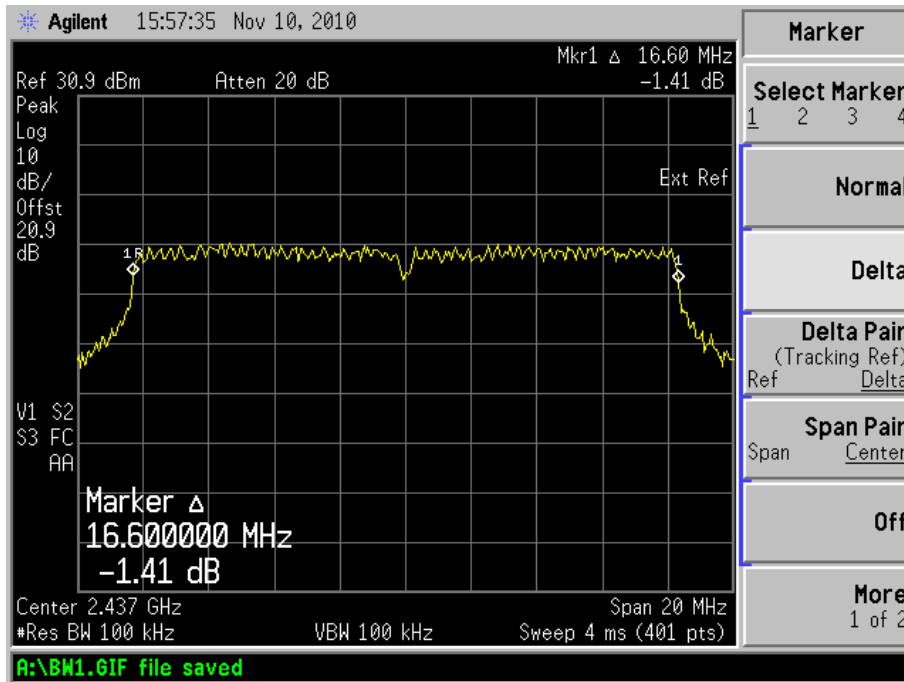




Product Service

Configuration 1 – Mode 2

Frequency (MHz)	Data Rate (Mbps)	6dB Bandwidth (kHz)
2437	54	16600



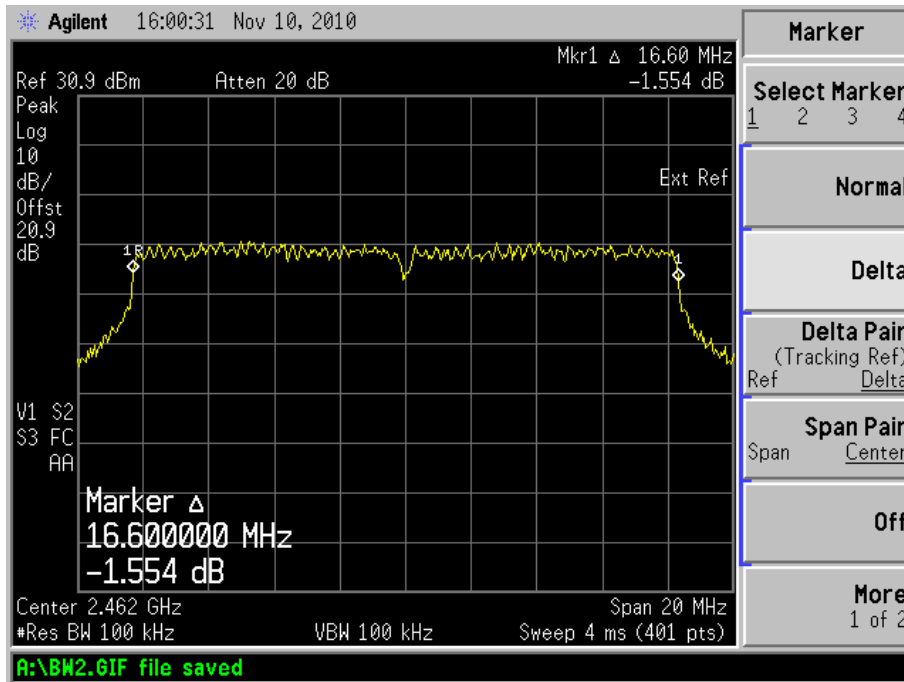




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Configuration 1 – Mode 3

Frequency (MHz)	Data Rate (Mbps)	6dB Bandwidth (kHz)
2462	54	16600

Limit Clause

The maximum 6dB bandwidth shall be at least 500 kHz.



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## **2.2 MAXIMUM PEAK CONDUCTED OUTPUT POWER**

### **2.2.1 Specification Reference**

FCC CFR 47 Part 15C, Clause 15.247 (b)(3)

### **2.2.2 Equipment Under Test**

Venice 8 FS2028 Radio Module, S/N: RAD100912

### **2.2.3 Date of Test and Modification State**

10 November 2010 - Modification State 0

### **2.2.4 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

### **2.2.5 Test Method and Operating Modes**

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 15.

The EUT was transmitted at maximum power at specific data rates via a cable to the Peak Power Analyser. The Analyser settings were adjusted to display the resultant trace on screen and a reference level offset was entered to account for the measurement path loss. The measurement bandwidth was set according to the signal being measured and the peak and average levels were recorded.

The test was performed with the EUT in the following configurations and modes of operation:

Configuration 1 - Mode 1  
- Mode 2  
- Mode 3

### **2.2.6 Environmental Conditions**

10 November 2010

Ambient Temperature 22°C

Relative Humidity 26%



## 2.2.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 15C for Maximum Peak Conducted Output Power.

The test results are shown below.

### 802.11(b)

3.3/1.2/5 V DC Supply

#### Configuration 1 - Modes 1, 2 and 3

Modulation Data Rate	Maximum Peak Conducted Output Power					
	dBm			mW		
	2412 MHz	2437 MHz	2462 MHz	2412 MHz	2437 MHz	2462 MHz
11 Mbps	+18.53	+18.23	+18.21	71.29	66.53	66.22

### 802.11(g)

3.3/1.2/5 V DC Supply

#### Configuration 1 - Modes 1, 2 and 3

Modulation Data Rate	Maximum Peak Conducted Output Power					
	dBm			mW		
	2412 MHz	2437 MHz	2462 MHz	2412 MHz	2437 MHz	2462 MHz
54 Mbps	+18.64	+18.51	+18.49	73.11	70.96	70.63

### Limit Clause

< 1 Watt.



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**2.3 EIRP PEAK POWER****2.3.1 Specification Reference**

FCC CFR 47 Part 15C, Clause 15.247 (b)(3)

**2.3.2 Equipment Under Test**

Venice 8 FS2028 Radio Module, S/N: RAD100905

**2.3.3 Date of Test and Modification State**

28 October 2010 - Modification State 0

**2.3.4 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

**2.3.5 Test Method and Operating Modes**

The test was applied in accordance with the test method requirements of ANSI C63.4.

The test was performed with the EUT in the following configurations and modes of operation:

Configuration 1 - Mode 1  
                          - Mode 2  
                          - Mode 3

**2.3.6 Environmental Conditions**

28 October 2010

Ambient Temperature 26.2°C

Relative Humidity 23%



### 2.3.7 Test Results

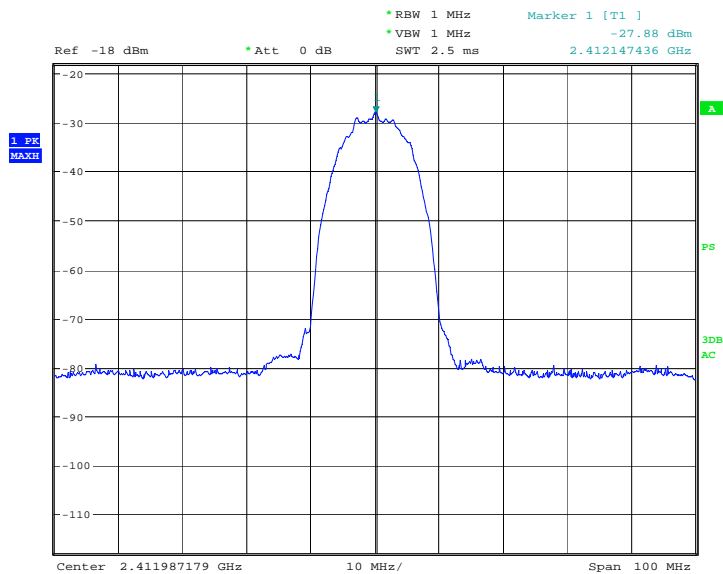
For the period of test the EUT met the requirements of FCC CFR 47 Part 15C for EIRP Peak Power.

The test results are shown below.

#### Configuration 1 - Mode 1

#### 802.11 (b)

Freq GHz	Result EIRP dBm	Limit EIRP dBm	Result EIRP mW	Limit EIRP mW
2.412	17.8	30.0	60.26	1000



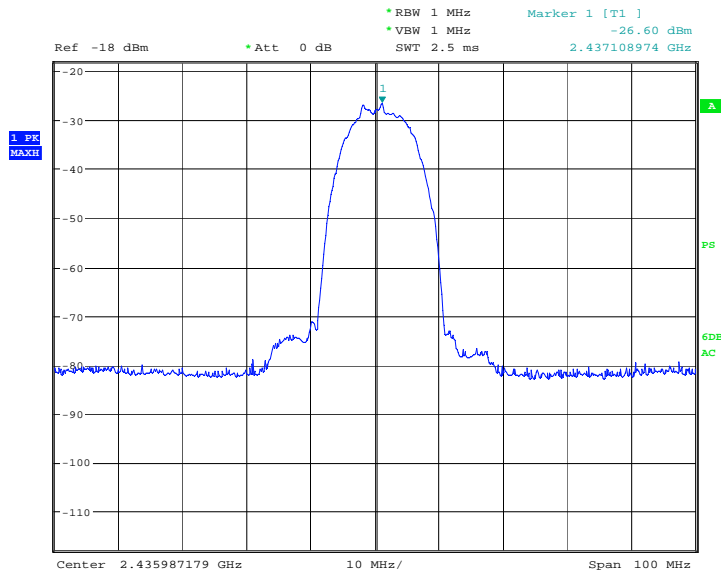
Date: 28.OCT.2010 16:49:49



Product Service

Configuration 1 - Mode 2

Freq GHz	Result EIRP dBm	Limit EIRP dBm	Result EIRP mW	Limit EIRP mW
2.437	19.3	30.0	85.11	1000



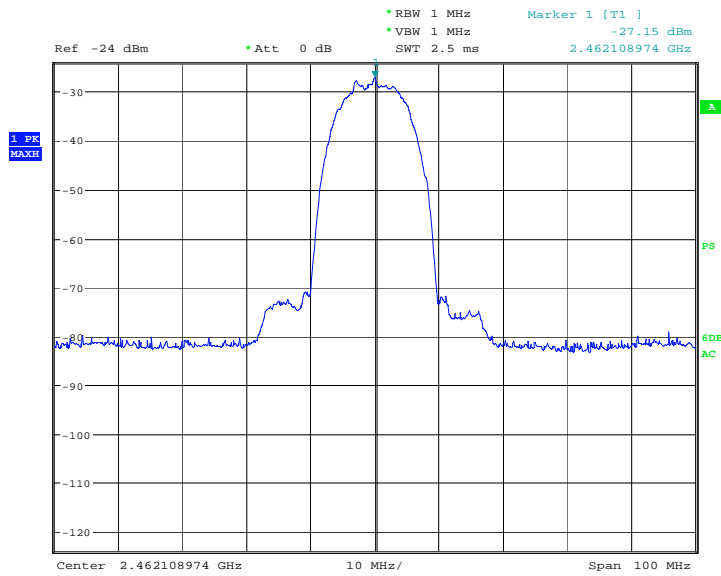
Date: 28.OCT.2010 17:03:16



Product Service

Configuration 1 - Mode 3

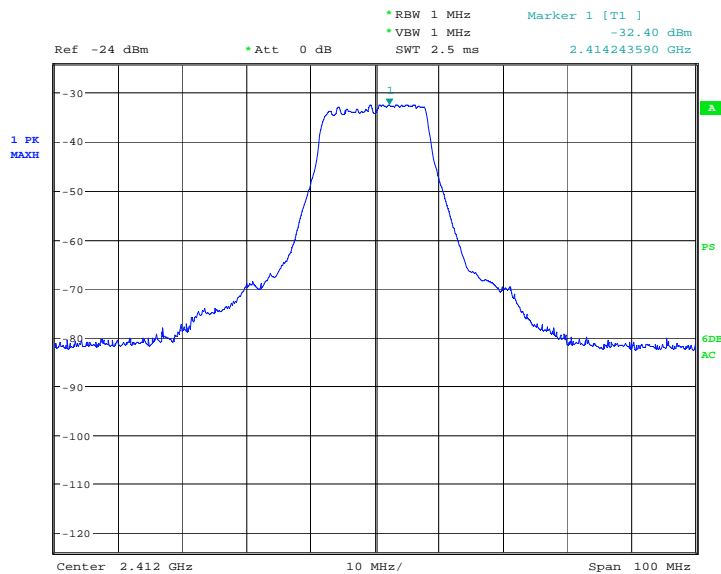
Freq GHz	Result EIRP dBm	Limit EIRP dBm	Result EIRP mW	Limit EIRP mW
2.462	18.7	30.0	74.13	1000



Date: 28.OCT.2010 17:39:47

802.11 (g)

Freq GHz	Result EIRP dBm	Limit EIRP dBm	Result EIRP mW	Limit EIRP mW
2.412	18.8	30.0	75.86	1000



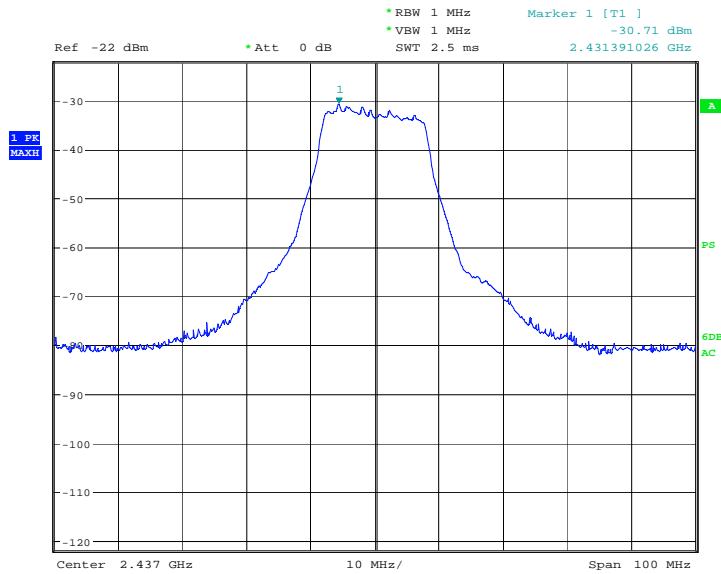
Date: 28.OCT.2010 18:32:46





### Configuration 1 - Mode 2

Freq GHz	Result EIRP dBm	Limit EIRP dBm	Result EIRP mW	Limit EIRP mW
2.437	19.9	30.0	97.72	1000



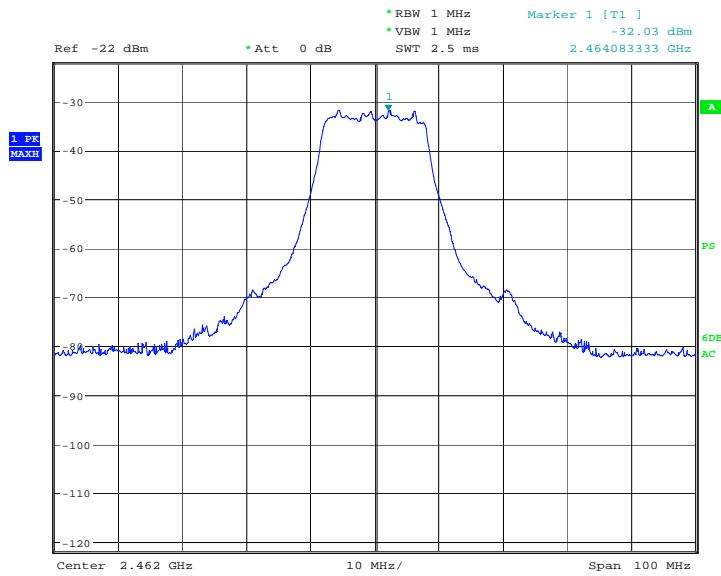
Date: 28.OCT.2010 18:50:30



Product Service

Configuration 1 - Mode 3

Freq GHz	Result EIRP dBm	Limit EIRP dBm	Result EIRP mW	Limit EIRP mW
2.462	16.5	30.0	44.67	1000



Date: 28.OCT.2010 19:13:01



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## **2.4 RADIATED EMISSIONS (ENCLOSURE PORT)**

### **2.4.1 Specification Reference**

FCC CFR 47 Part 15C, Clause 15.247 (d)

### **2.4.2 Equipment Under Test**

Venice 8 FS2028 Radio Module, S/N: RAD100905

### **2.4.3 Date of Test and Modification State**

27 October 2010 - Modification State 0

### **2.4.4 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

### **2.4.5 Test Method and Operating Modes**

The test was applied in accordance with the test method requirements of ANSI C63.4.

A preliminary profile of the Spurious Radiated Emissions was obtained by operating the EUT on a remotely controlled turntable within a semi-anechoic chamber. Measurements of emissions from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisations. The profiling produced a list of the worst-case emissions together with the EUT azimuth and antenna polarisation.

Using the information from the preliminary profiling of the EUT, the list of emissions was then confirmed or updated under Alternative Open Site conditions. Emission levels were maximised by adjusting the antenna height, antenna polarisation and turntable azimuth.

Emissions within the restricted bands defined in 15.205 were measured in accordance with 15.209. Emissions measured below 1GHz employed a quasi peak detector, in accordance with 15.35(a). Emissions measured above 1GHz employed an average detector as defined in 15.35(b). The peak level of the emission was also measured to ensure that a difference of 20dB from the average level was not exceeded, as defined in 15.35(b). Emissions identified within the range 30MHz – 1GHz were then formally measured using a CISPR Quasi-Peak detector. Other emissions from 30MHz to 25GHz excluding the restricted bands were measured using a peak detector.

The test was performed with the EUT in the following configurations and modes of operation:

Configuration 1 - Mode 1  
                          - Mode 2  
                          - Mode 3



## 2.4.6 Environmental Conditions

27 October 2010

Ambient Temperature 26.2°C

Relative Humidity 23%

## 2.4.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 15C for Radiated Emissions (Enclosure Port).

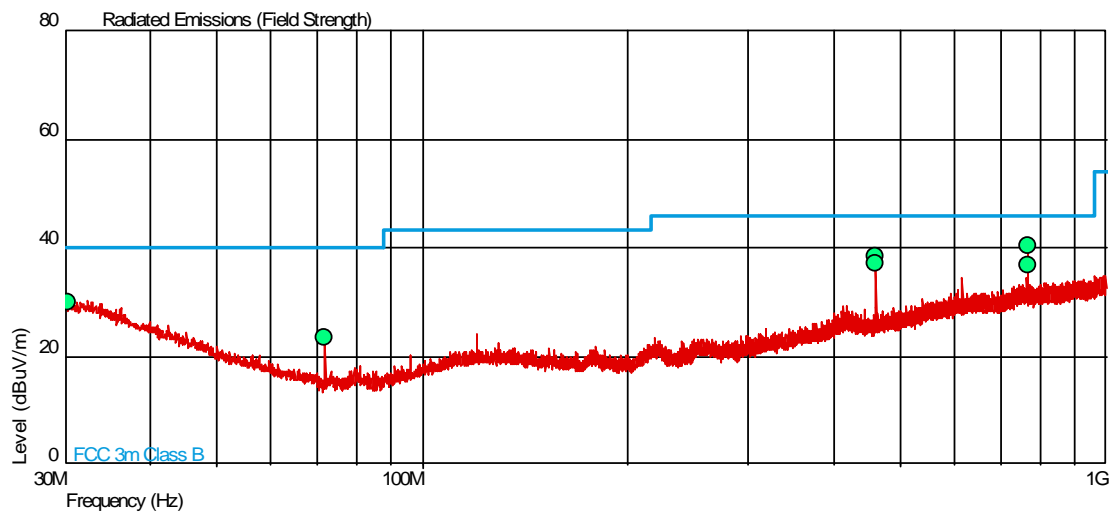
The test results are shown below.

802.11(b)

3.3/1.2/5 V DC Supply

Configuration 1 - Mode 1

30 MHz to 1 GHz

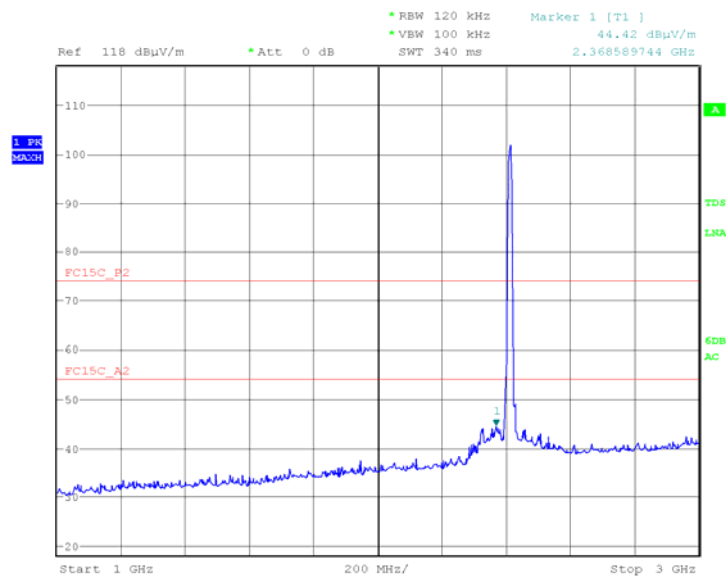


Frequency (MHz)	QP Level (dBuV/m)	QP Level (uV/m)	QP Limit (dBuV/m)	QP Limit (uV/m)	QP Margin (dBuV/m)	QP Margin (uV/m)	Angle (deg)	Height (m)	Polarity
30.320	30.1	31.99	40.0	100	-9.9	68.01	217	1.69	Vertical
71.999	23.6	15.14	40.0	100	-16.4	84.86	160	1.39	Vertical
460.793	38.5	84.14	46.0	200	-7.5	115.86	16	1.34	Horizontal
460.800	37.1	71.61	46.0	200	-8.9	128.39	144	1.00	Vertical
767.975	40.4	104.71	46.0	200	-5.6	95.29	298	1.00	Horizontal
768.012	37.0	70.79	46.0	200	-9.0	129.21	125	1.00	Vertical

1GHz to 25GHz

Emissions detected are presented below in the table and plot form.

Freq. GHz	Ant Pol	Ant Hgt cm	EUT Arc Deg	Final Peak dBμV/m	Final Average dBμV/m	Peak Limit dBμV/m	Average Limit dBμV/m
2.371	Horizontal	100	0	55.3	42.6	74.0	54.0

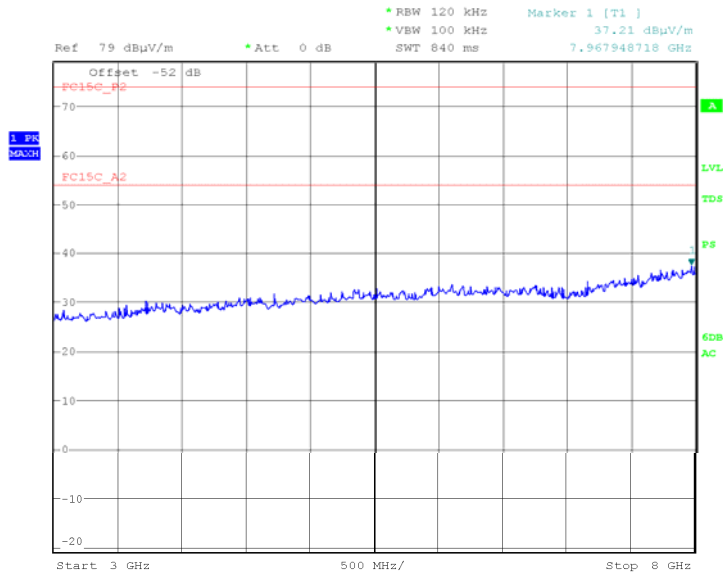
1GHz to 3GHz

Date: 3.NOV.2010 20:14:36



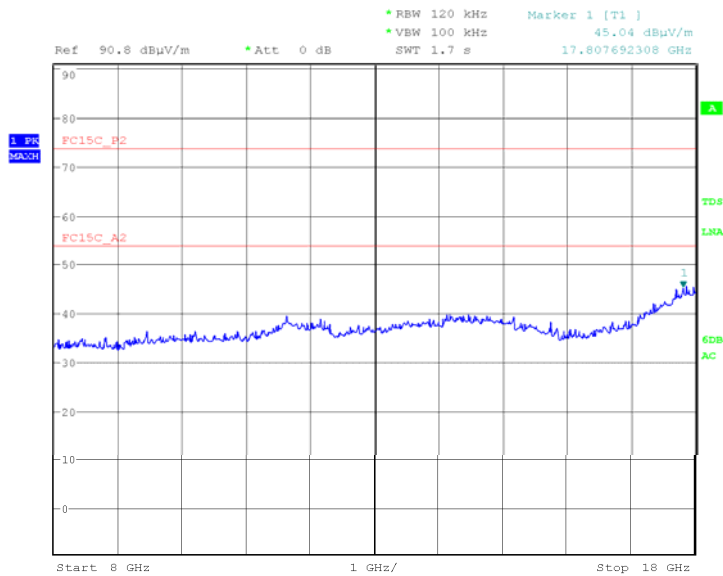
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### 3GHz to 8GHz



Date: 3.NOV.2010 21:08:01

### 8GHz to 18GHz

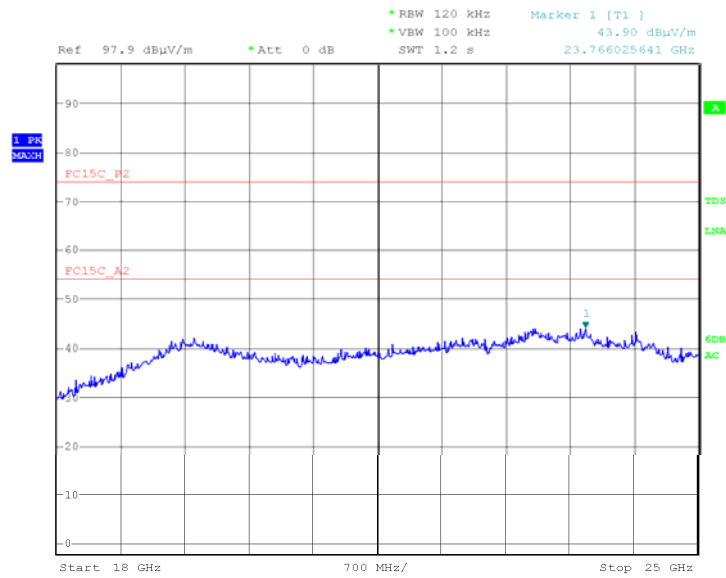


Date: 3.NOV.2010 22:30:11

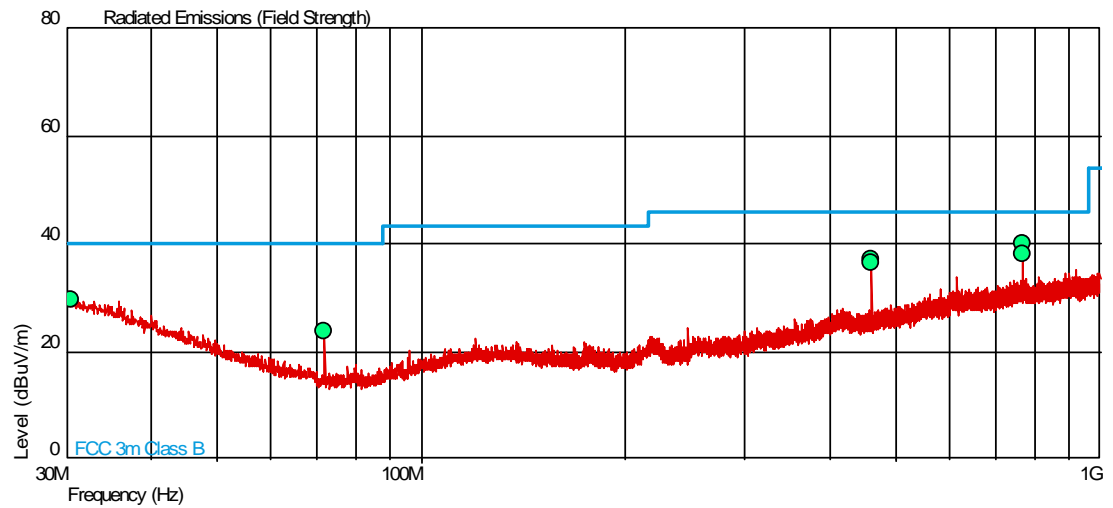


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18GHz to 25GHz



Date: 7.NOV.2010 13:58:23

Configuration 1 - Mode 230 MHz to 1 GHz

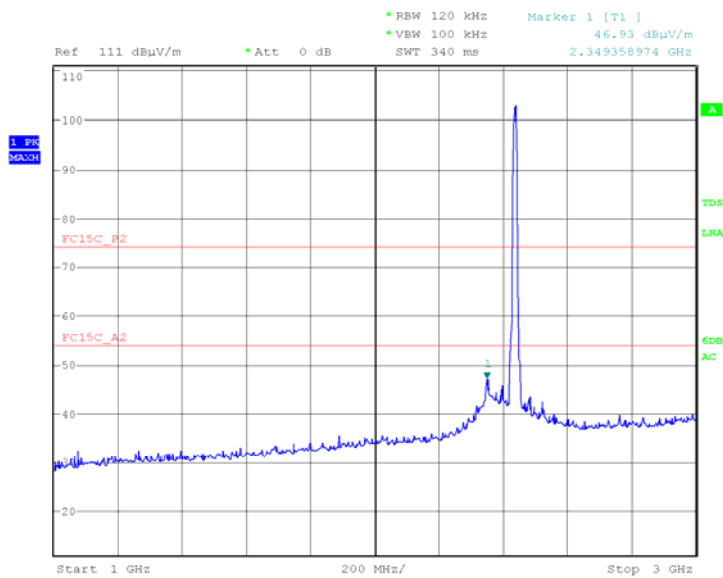
Frequency (MHz)	QP Level (dBuV/m)	QP Level (uV/m)	QP Limit (dBuV/m)	QP Limit (uV/m)	QP Margin (dBuV/m)	QP Margin (uV/m)	Angle (deg)	Height (m)	Polarity
30.531	29.9	31.26	40.0	100	-10.1	68.74	360	1.00	Horizontal
72.007	23.8	15.49	40.0	100	-16.2	84.51	156	1.00	Vertical
460.800	36.6	67.61	46.0	200	-9.4	132.39	0	1.00	Vertical
460.808	37.4	74.13	46.0	200	-8.6	125.87	360	1.50	Horizontal
767.976	40.3	103.51	46.0	200	-5.7	96.49	297	1.20	Horizontal
768.001	38.3	82.22	46.0	200	-7.7	117.78	138	1.02	Vertical



1GHz to 25GHz

Emissions detected are presented below in the table and plot form.

Freq. GHz	Ant Pol	Ant Hgt cm	EUT Arc Deg	Final Peak dB $\mu$ V/m	Final Average dB $\mu$ V/m	Peak Limit dB $\mu$ V/m	Average Limit dB $\mu$ V/m
2.350	Horizontal	100	7	58.1	45.9	74.0	54.0

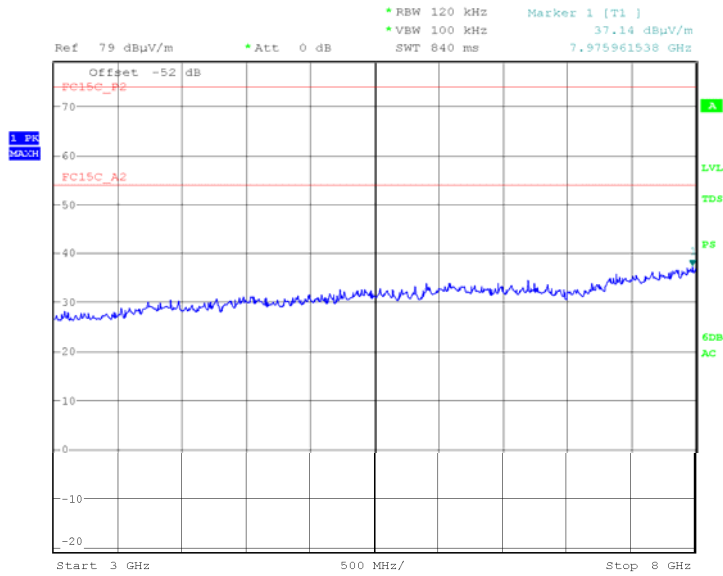
1GHz to 3GHz

Date: 3.NOV.2010 20:21:46



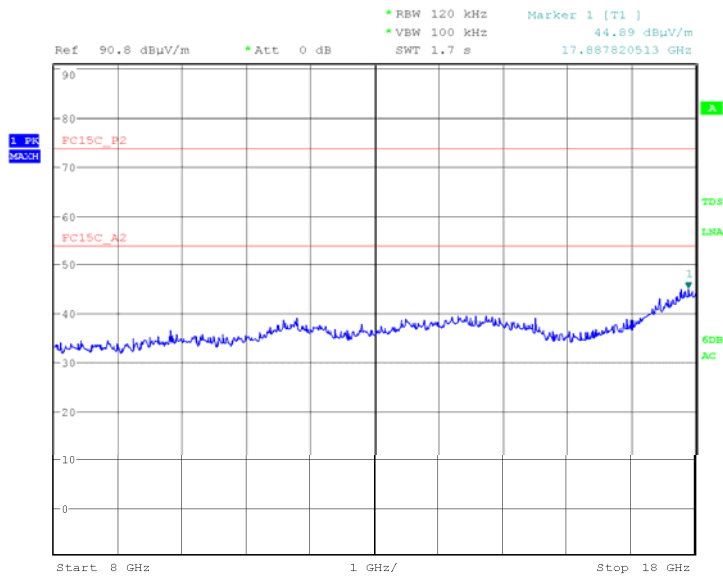
Product Service

### 3GHz to 8GHz



Date: 3.NOV.2010 20:59:58

### 8GHz to 18GHz

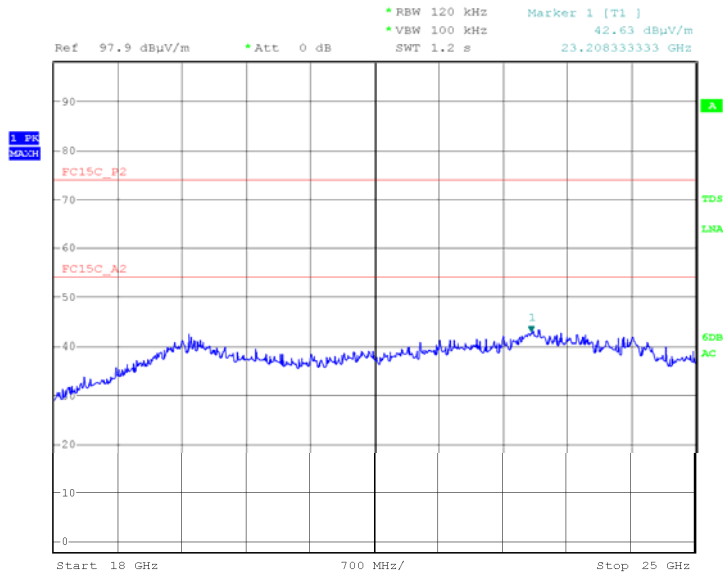


Date: 3.NOV.2010 22:43:24



Product Service

18GHz to 25GHz

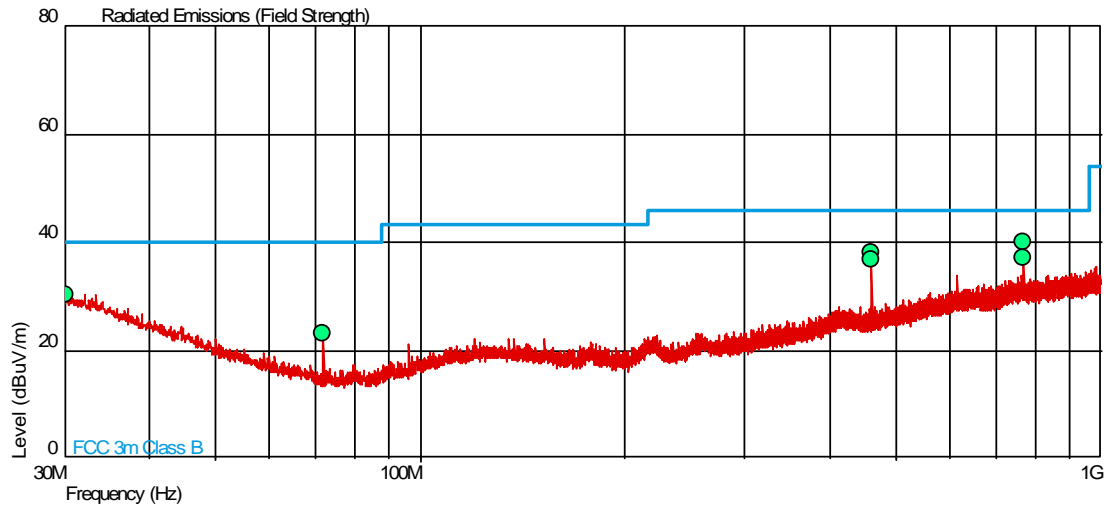


Date: 7.NOV.2010 14:03:46



### Configuration 1 - Mode 3

### 30 MHz to 1 GHz



Frequency (MHz)	QP Level (dBuV/m)	QP Level (uV/m)	QP Limit (dBuV/m)	QP Limit (uV/m)	QP Margin (dBuV/m)	QP Margin (uV/m)	Angle (deg)	Height (m)	Polarity
30.140	30.3	32.73	40.0	100	-9.7	67.27	360	1.00	Horizontal
72.015	23.3	14.62	40.0	100	-16.7	85.38	142	1.00	Vertical
460.795	36.8	69.10	46.0	200	-9.2	130.90	350	1.00	Vertical
460.810	38.2	81.28	46.0	200	-7.8	118.72	16	1.45	Horizontal
768.025	40.2	102.33	46.0	200	-5.8	97.67	299	1.06	Horizontal
768.025	37.2	72.44	46.0	200	-8.8	127.56	137	1.06	Vertical

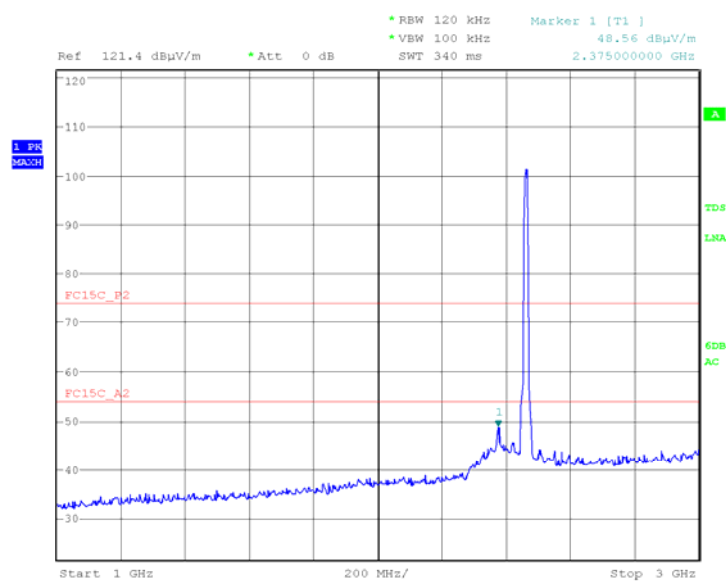


### 1GHz to 25GHz

Emissions detected are presented below in the table and plot form.

Freq. GHz	Ant Pol	Ant Hgt cm	EUT Arc Deg	Final Peak dBμV/m	Final Average dBμV/m	Peak Limit dBμV/m	Average Limit dBμV/m
2.374	Horizontal	100	0	59.1	47.2	74.0	54.0

### 1GHz to 3GHz

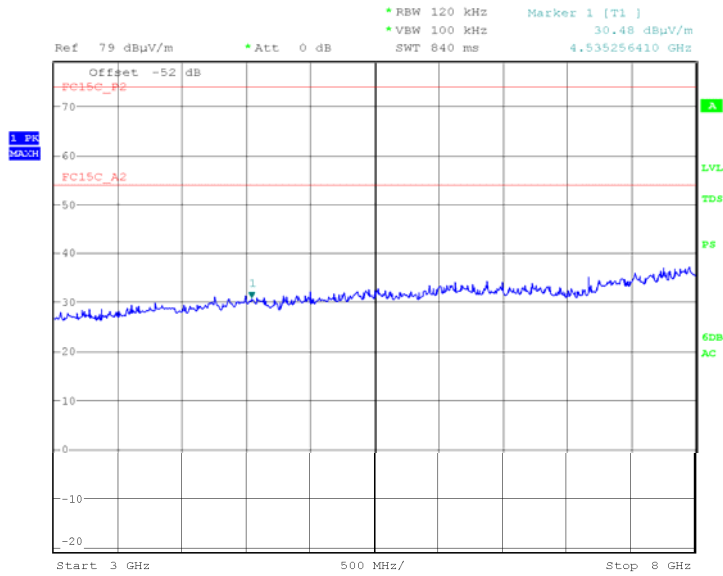


Date: 3.NOV.2010 20:29:18



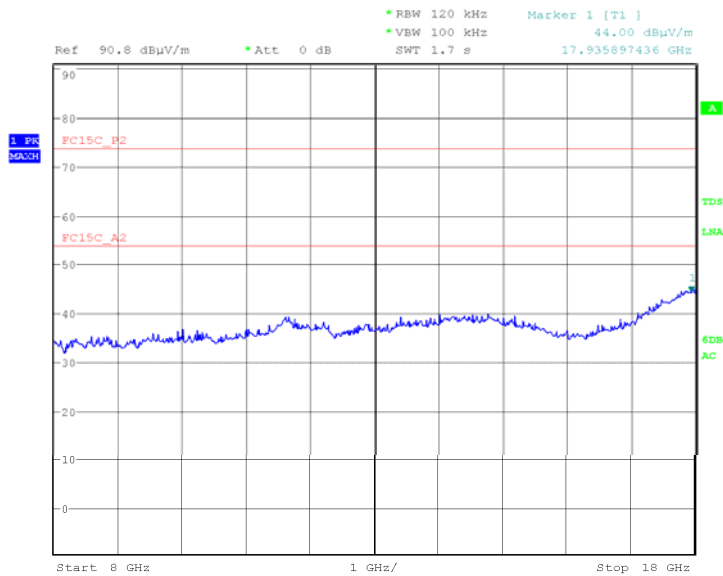
Product Service

### 3GHz to 8GHz



Date: 3.NOV.2010 20:50:49

### 8GHz to 18GHz

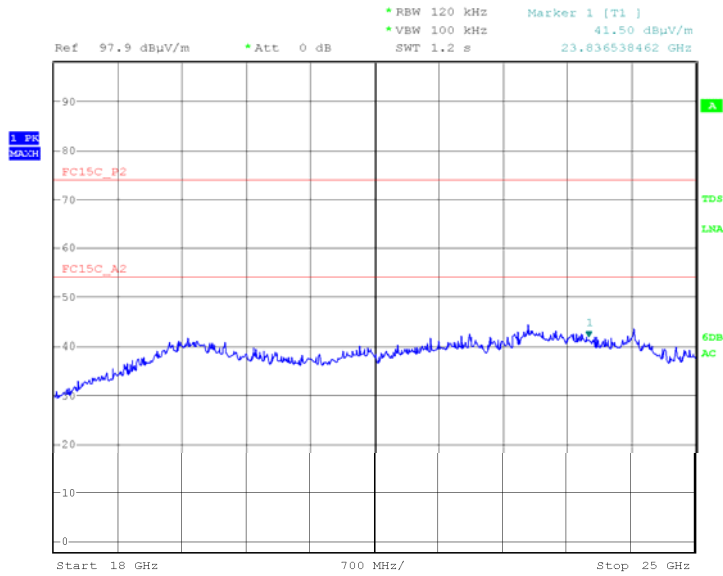


Date: 3.NOV.2010 23:07:23



Product Service

18GHz to 25GHz



Date: 7.NOV.2010 14:14:33

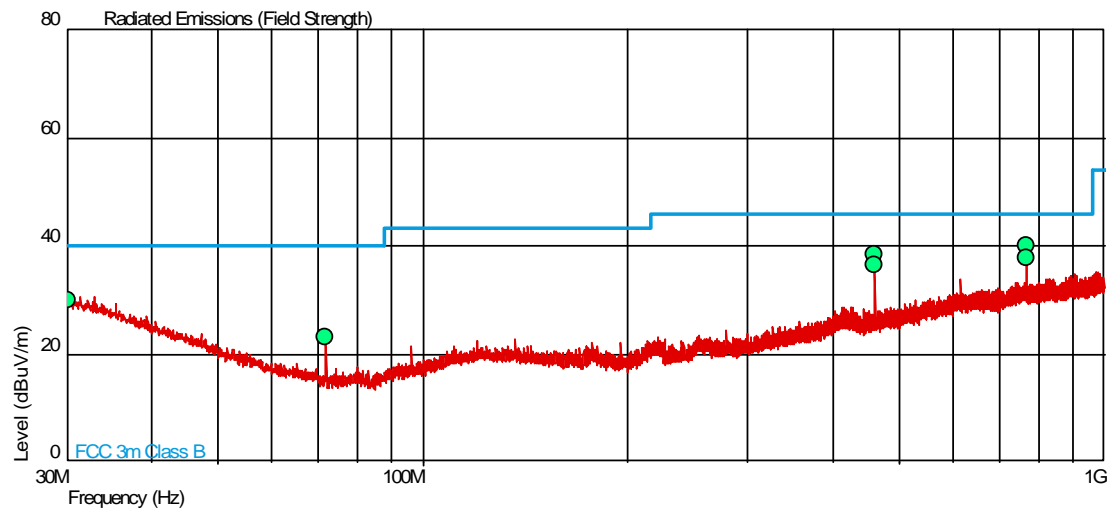


802.11(g)

3.3/1.2/5 V DC Supply

Configuration 1 - Mode 1

30 MHz to 1 GHz



Frequency (MHz)	QP Level (dBuV/m)	QP Level (uV/m)	QP Limit (dBuV/m)	QP Limit (uV/m)	QP Margin (dBuV/m)	QP Margin (uV/m)	Angle (deg)	Height (m)	Polarity
30.007	30.1	31.99	40.0	100	-9.9	68.01	260	1.00	Horizontal
72.021	23.2	14.45	40.0	100	-16.8	85.55	149	1.00	Vertical
460.800	38.4	83.18	46.0	200	-7.6	116.82	34	1.44	Horizontal
460.800	36.6	67.61	46.0	200	-9.4	132.39	360	1.00	Vertical
767.987	38.0	79.43	46.0	200	-8.0	120.57	144	1.06	Vertical
768.024	40.3	103.51	46.0	200	-5.7	96.49	295	1.00	Horizontal

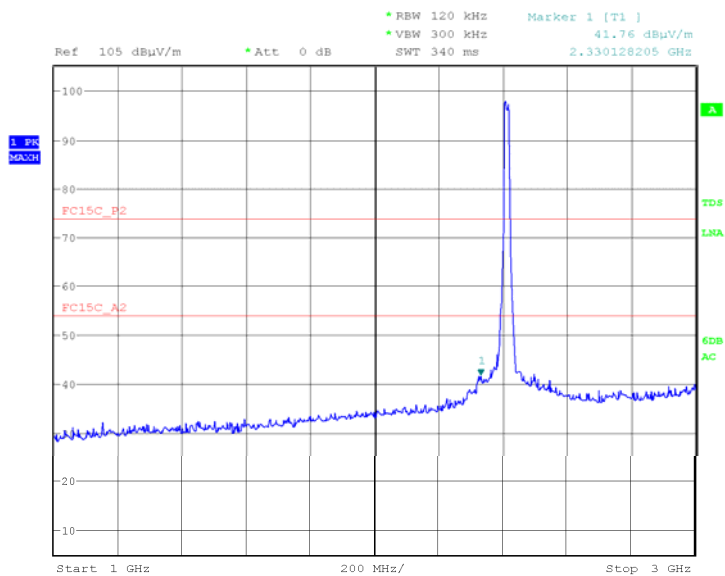




Product Service

1GHz to 25GHz

No emissions were measured.

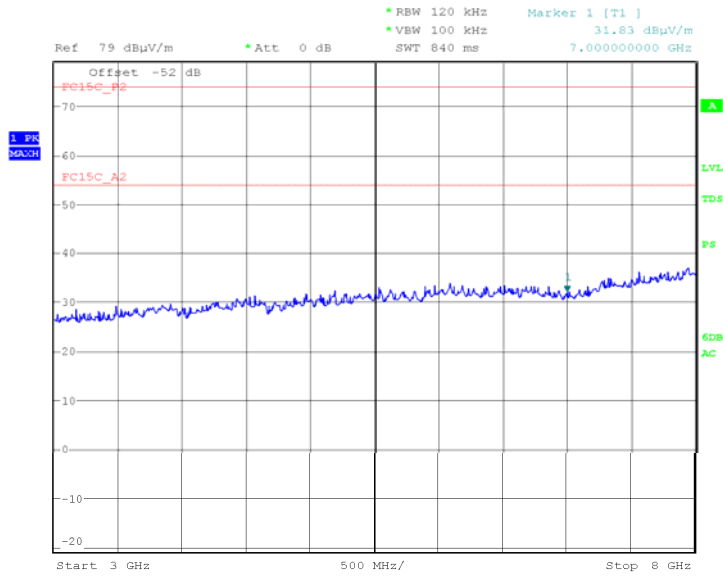
1GHz to 3GHz

Date: 3.NOV.2010 19:58:23



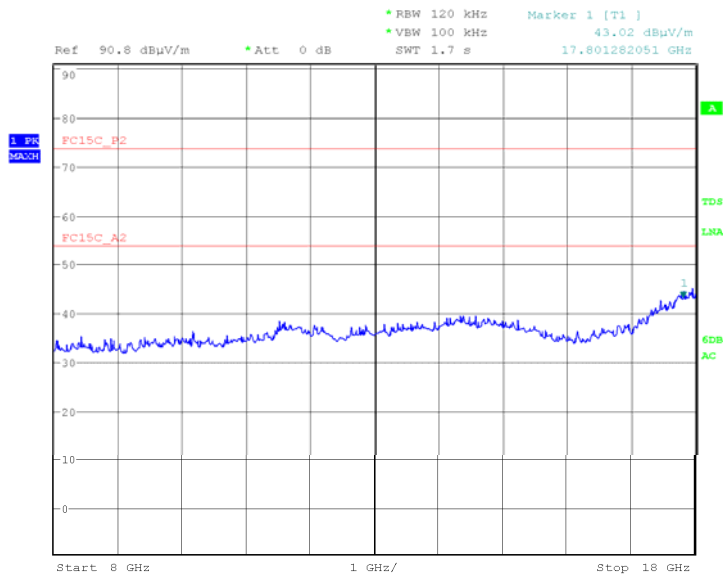
Product Service

### 3GHz to 8GHz



Date: 3.NOV.2010 21:23:39

### 8GHz to 18GHz

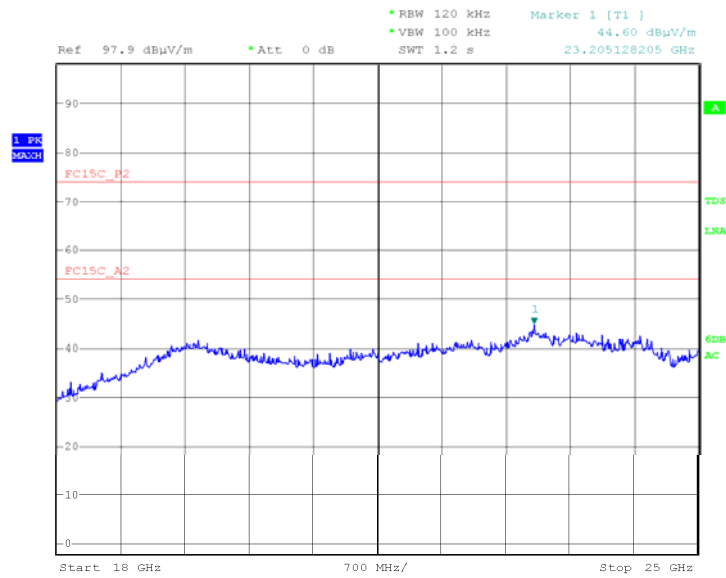


Date: 3.NOV.2010 23:22:55

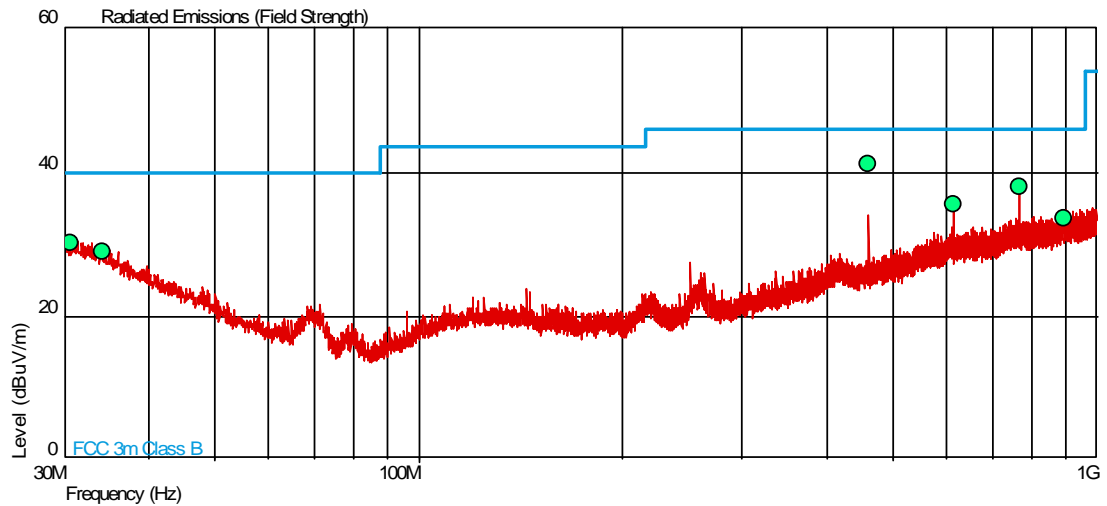


Product Service

18GHz to 25GHz



Date: 7.NOV.2010 14:47:28

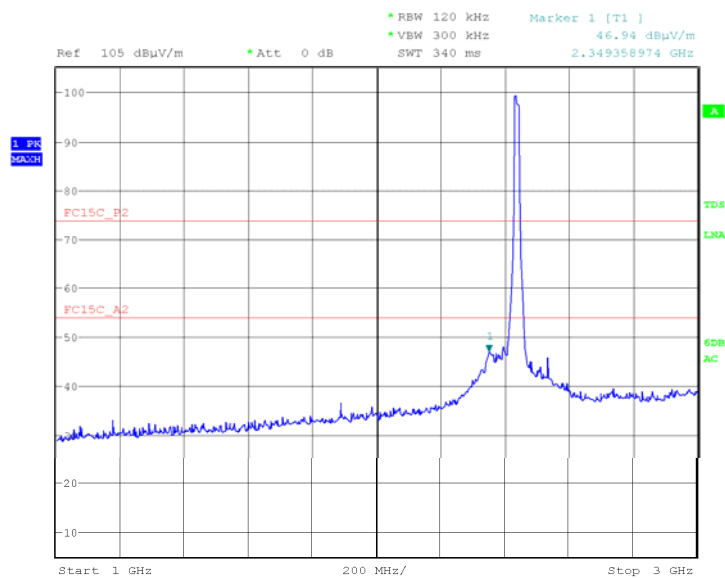
Configuration 1 - Mode 230 MHz to 1 GHz

Frequency (MHz)	QP Level (dBuV/m)	QP Level (uV/m)	QP Limit (dBuV/m)	QP Limit (uV/m)	QP Margin (dBuV/m)	QP Margin (uV/m)	Angle (deg)	Height (m)	Polarity
30.560	30.1	31.99	40.0	100	-9.9	68.01	360	1.00	Vertical
34.255	28.8	27.54	40.0	100	-11.2	72.46	215	1.00	Vertical
460.809	41.2	114.82	46.0	200	-4.8	85.18	320	1.83	Horizontal
614.391	35.4	58.88	46.0	200	-10.6	141.12	91	1.00	Vertical
767.999	38.0	79.43	46.0	200	-8.0	120.57	162	1.00	Vertical
892.328	33.5	47.32	46.0	200	-12.5	152.68	162	1.50	Horizontal

1GHz to 25GHz

Emissions detected are presented below in the table and plot form.

Freq. GHz	Ant Pol	Ant Hgt cm	EUT Arc Deg	Final Peak dBμV/m	Final Average dBμV/m	Peak Limit dBμV/m	Average Limit dBμV/m
2.352	Horizontal	100	2	58.4	45.2	74.0	54.0

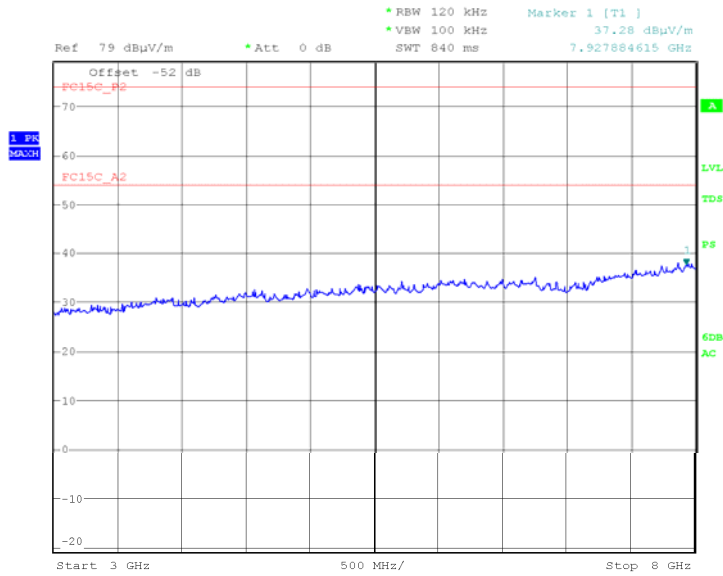
1GHz to 3GHz

Date: 3.NOV.2010 19:48:12



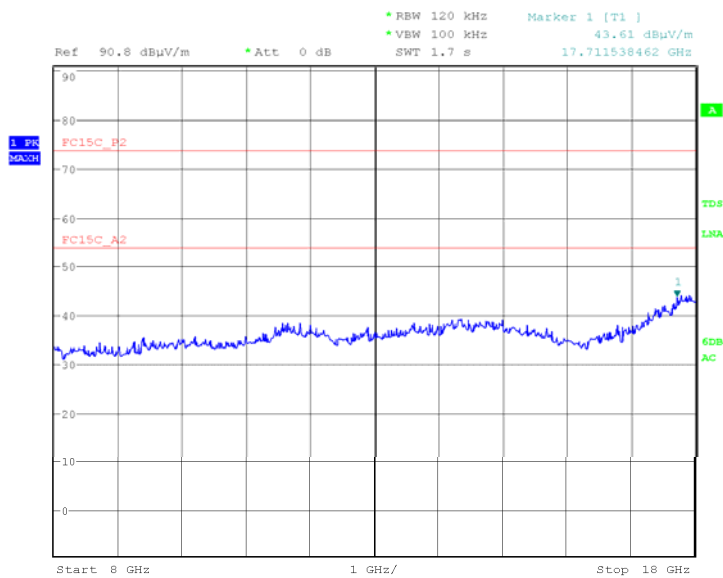
Product Service

### 3GHz to 8GHz



Date: 3.NOV.2010 22:06:23

### 8GHz to 18GHz

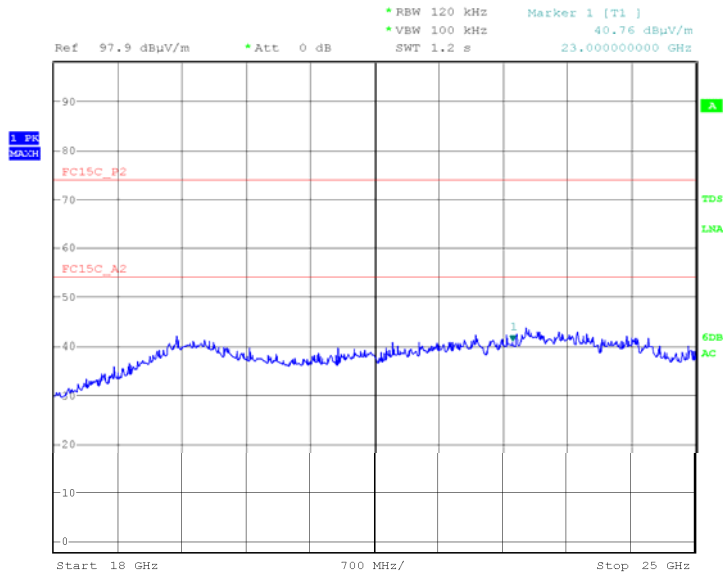


Date: 3.NOV.2010 23:47:07

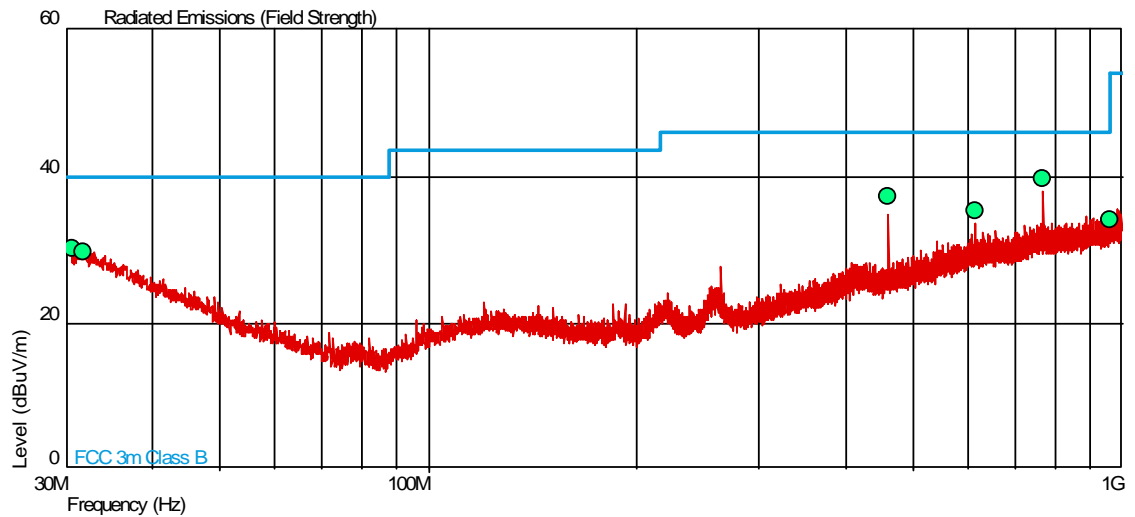


Product Service

18GHz to 25GHz



Date: 7.NOV.2010 14:38:56

Configuration 1 - Mode 330 MHz to 1 GHz

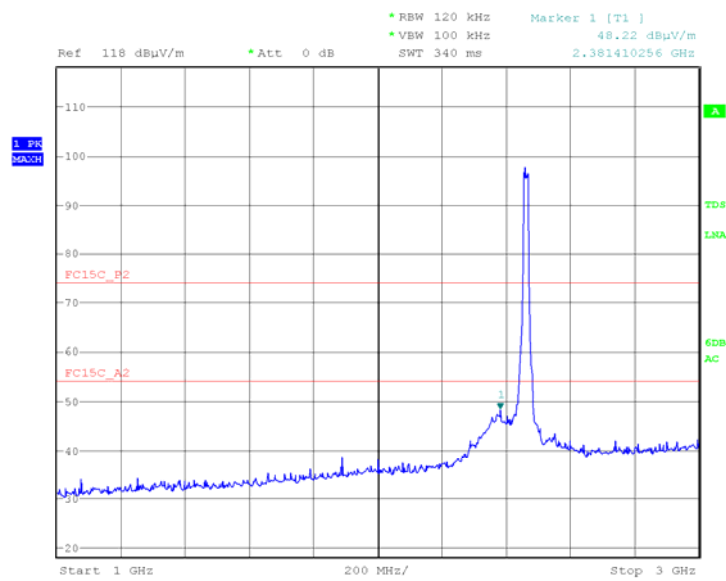
Frequency (MHz)	QP Level (dBuV/m)	QP Level (uV/m)	QP Limit (dBuV/m)	QP Limit (uV/m)	QP Margin (dBuV/m)	QP Margin (uV/m)	Angle (deg)	Height (m)	Polarity
30.588	30.1	31.99	40.0	100	-9.9	68.01	31	1.00	Horizontal
31.828	29.7	30.55	40.0	100	-10.3	69.45	152	1.61	Horizontal
460.802	37.2	72.44	46.0	200	-8.8	127.56	156	1.10	Vertical
614.418	35.1	56.89	46.0	200	-10.9	143.11	101	1.00	Vertical
767.998	39.7	96.61	46.0	200	-6.3	103.39	360	1.36	Vertical
959.859	34.0	50.12	46.0	200	-12.0	149.88	0	1.00	Vertical



1GHz to 25GHz

Emissions detected are presented below in the table and plot form.

Freq. GHz	Ant Pol	Ant Hgt cm	EUT Arc Deg	Final Peak dBμV/m	Final Average dBμV/m	Peak Limit dBμV/m	Average Limit dBμV/m
2.381	Horizontal	100	0	59.0	46.4	74.0	54.0

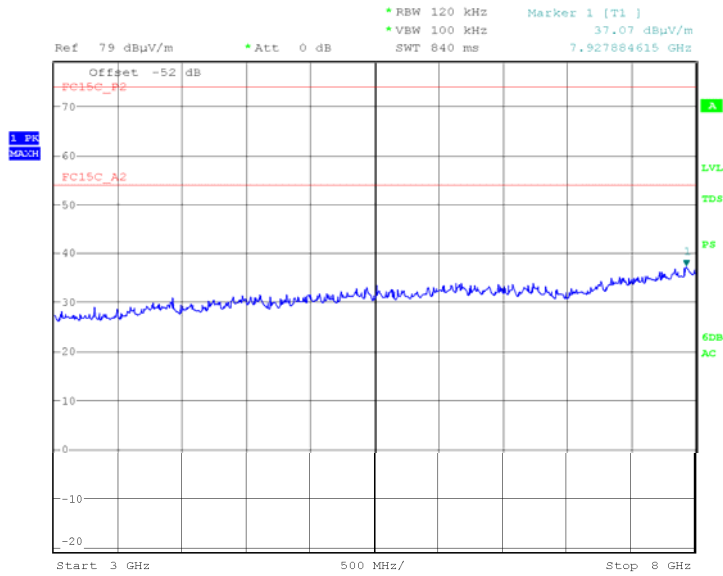
1GHz to 3GHz

Date: 3.NOV.2010 20:02:43



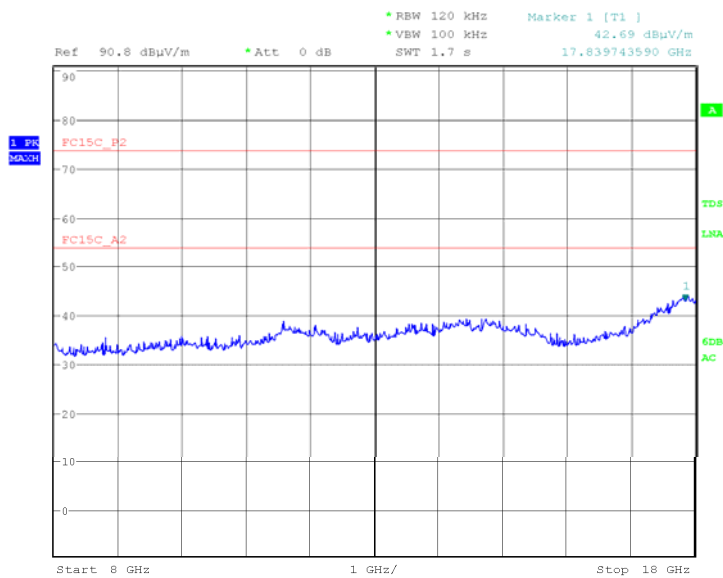
Product Service

### 3GHz to 8GHz



Date: 3.NOV.2010 21:44:27

### 8GHz to 18GHz

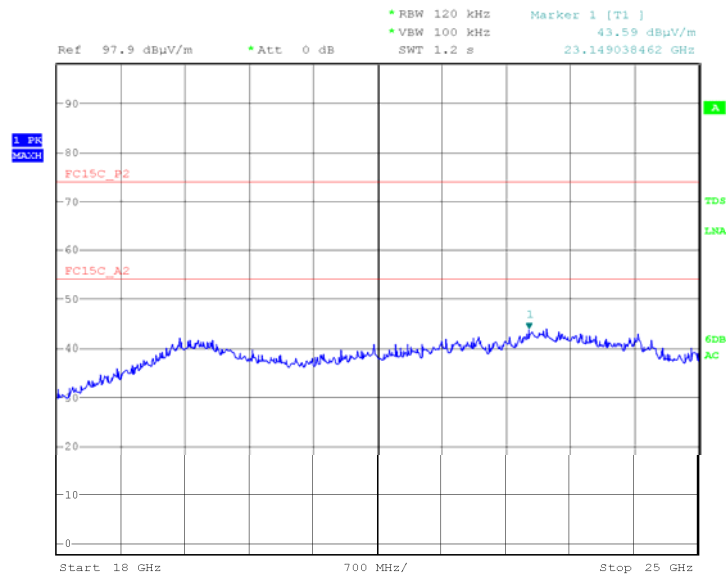


Date: 3.NOV.2010 23:49:44



Product Service

18GHz to 25GHz



Date: 7.NOV.2010 14:39:07



Product Service

## **2.5 SPURIOUS EMISSIONS**

### **2.5.1 Specification Reference**

FCC CFR 47 Part 15C, Clause 15.247 (d)

### **2.5.2 Equipment Under Test**

Venice 8 FS2028 Radio Module, S/N: RAD100912

### **2.5.3 Date of Test and Modification State**

11 November 2010 - Modification State 0

### **2.5.4 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

### **2.5.5 Test Method and Operating Modes**

The test was applied in accordance with FCC CFR 47 Part 15.

In accordance with Part 15.247(d), the Spurious Conducted Emissions from the antenna terminal were measured. The transmitter output power was attenuated using a combination of filters and attenuators and the frequency spectrum investigated from 9 kHz to 25 GHz. The EUT was set to transmit on full power. The resolution and video bandwidths were set to 100 kHz in accordance with Part 15.247. The spectrum analyser detector was set to Max Hold.

With the EUT transmitting at maximum power, the Spectrum Analyser was set to Max Hold and the fundamental peak measured in a RBW and VBW of 100 kHz. This level was used to determine the limit line as displayed on the plots of -20dBc.

The maximum path loss across each measurement band was used as the reference level offset to ensure worst case results.

The test was performed with the EUT in the following configurations and modes of operation:

Configuration 1 - Mode 1  
- Mode 2  
- Mode 3

### **2.5.6 Environmental Conditions**

11 November 2010

Ambient Temperature 23°C

Relative Humidity 49%



Product Service

## 2.5.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 15C for Spurious Emissions.

The test results are shown below.

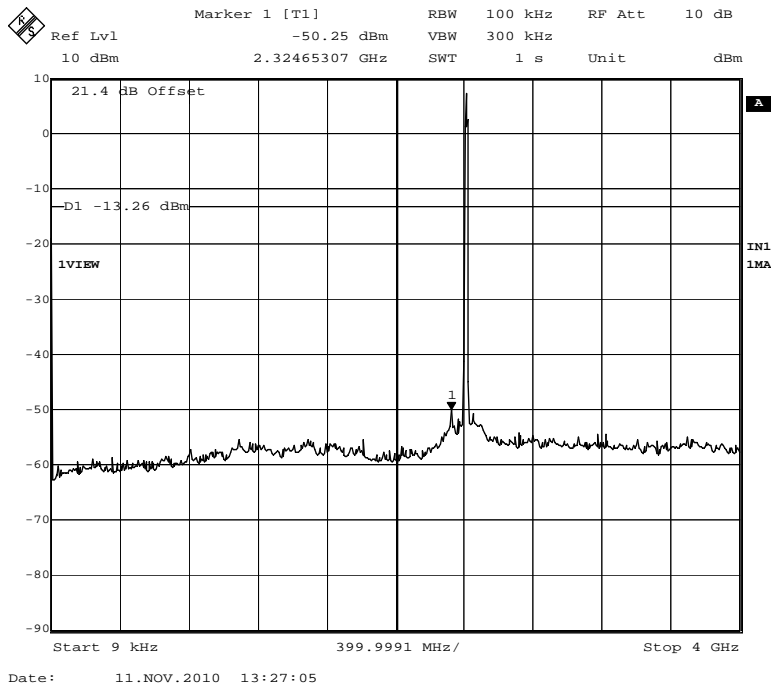
802.11(b)

3.3/1.2/5 V DC Supply

11 Mbps

Configuration 1 – Mode 1

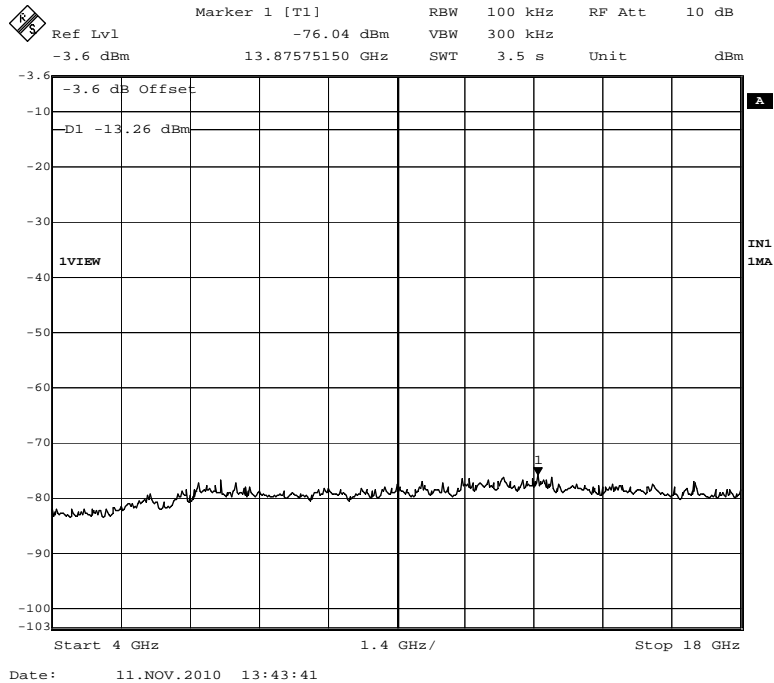
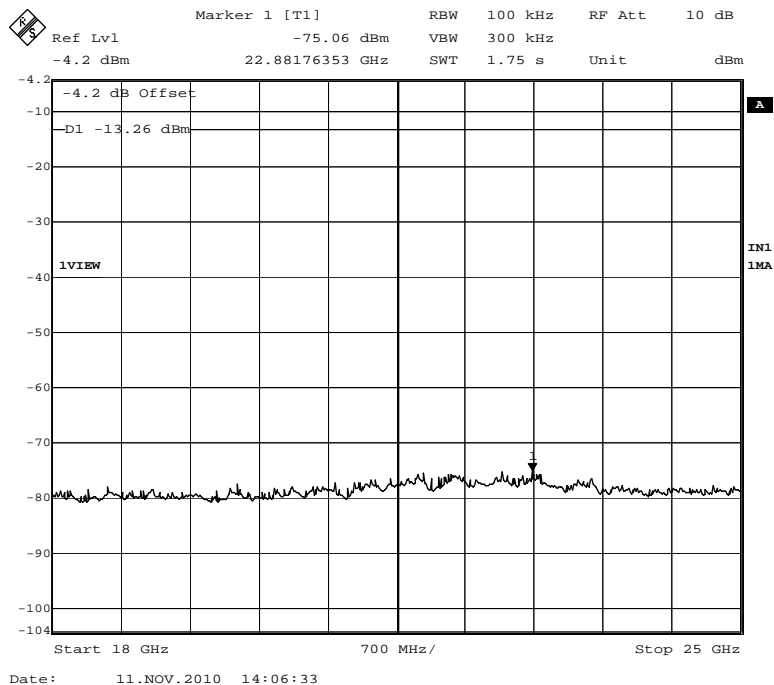
9 kHz to 4 GHz



Date: 11.NOV.2010 13:27:05



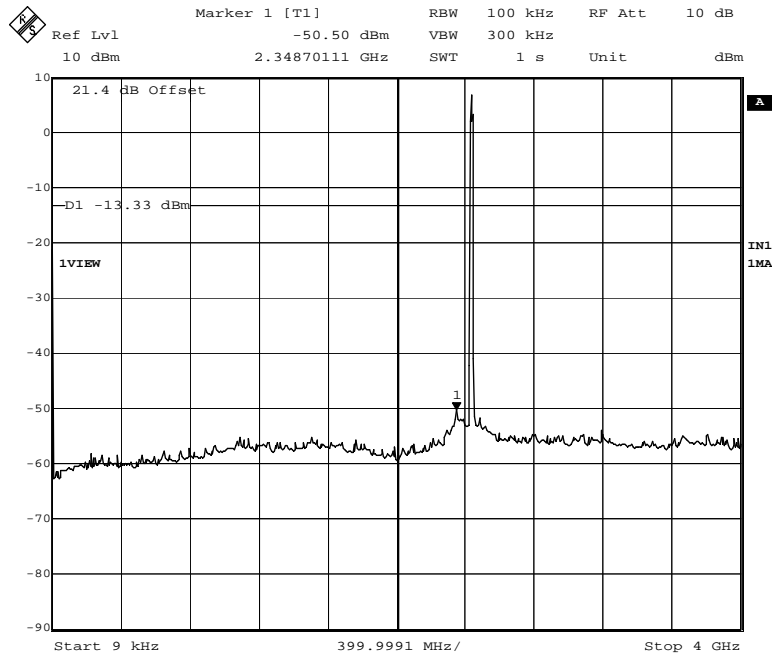
Product Service

4 GHz to 18 GHz18 GHz to 25 GHz



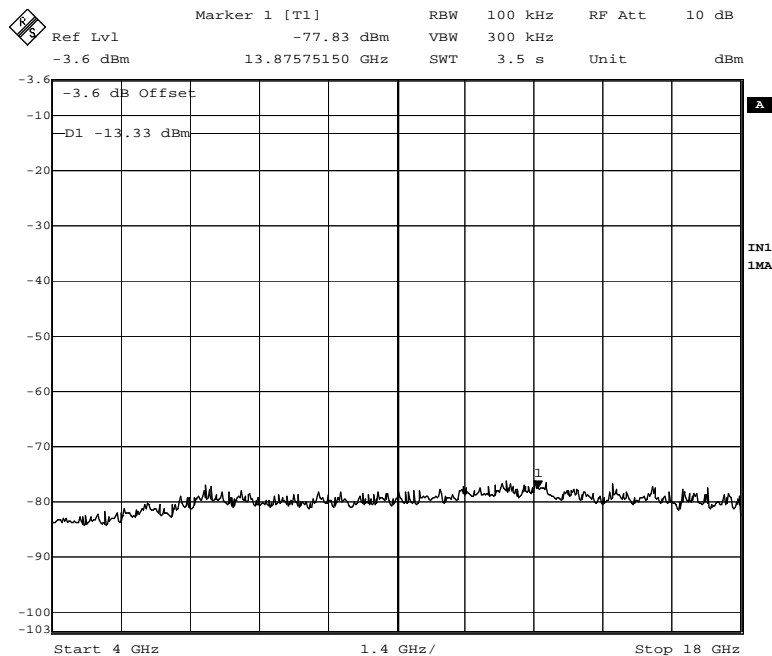
### Configuration 1 – Mode 2

#### 9 kHz to 4 GHz

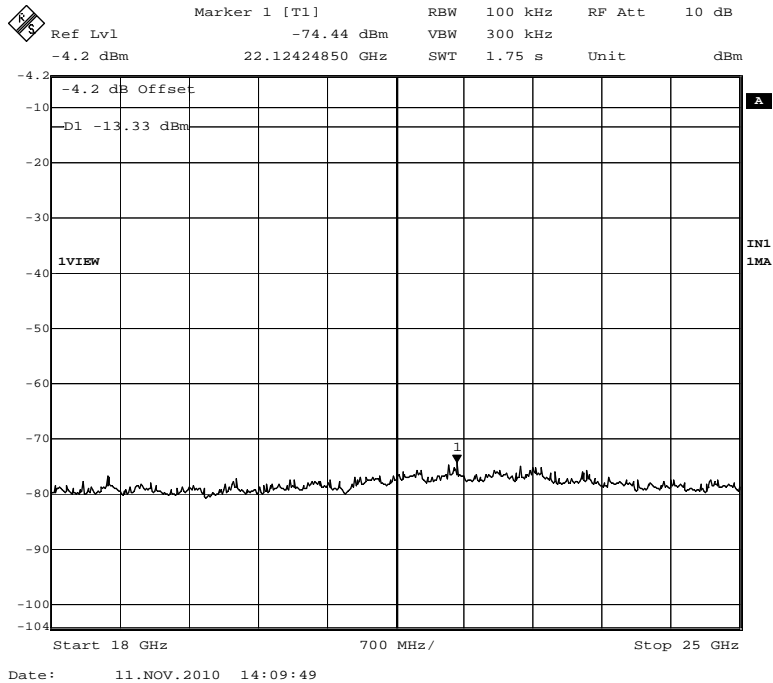
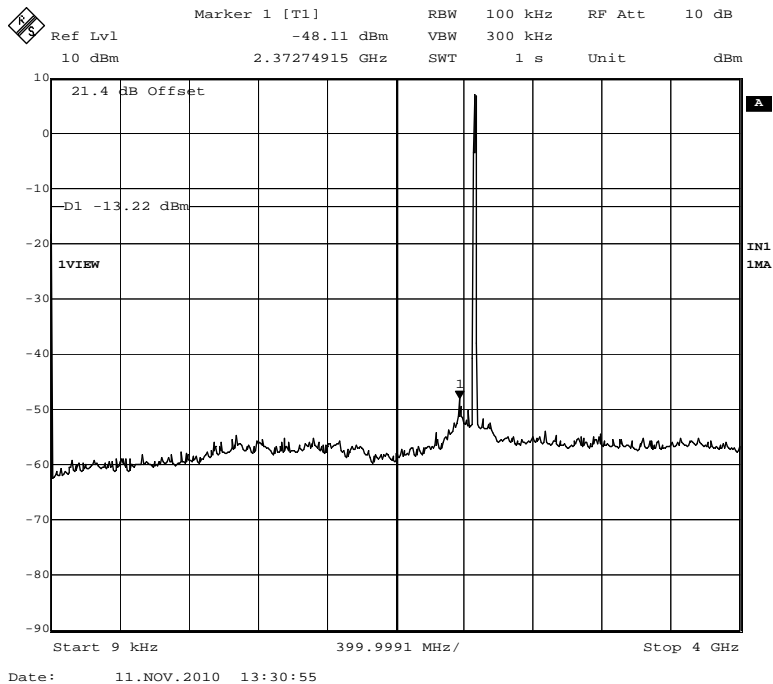


Date: 11.NOV.2010 13:29:37

#### 4 GHz to 18 GHz



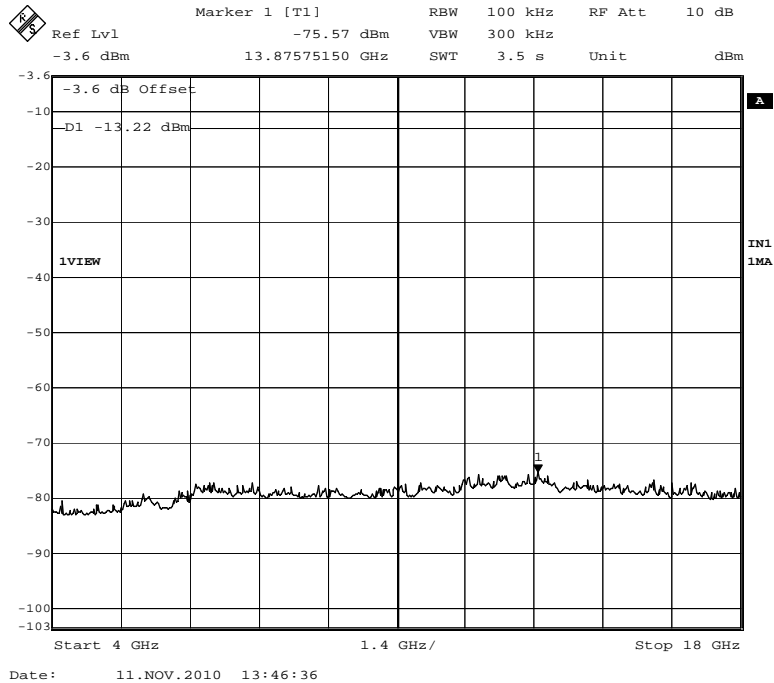
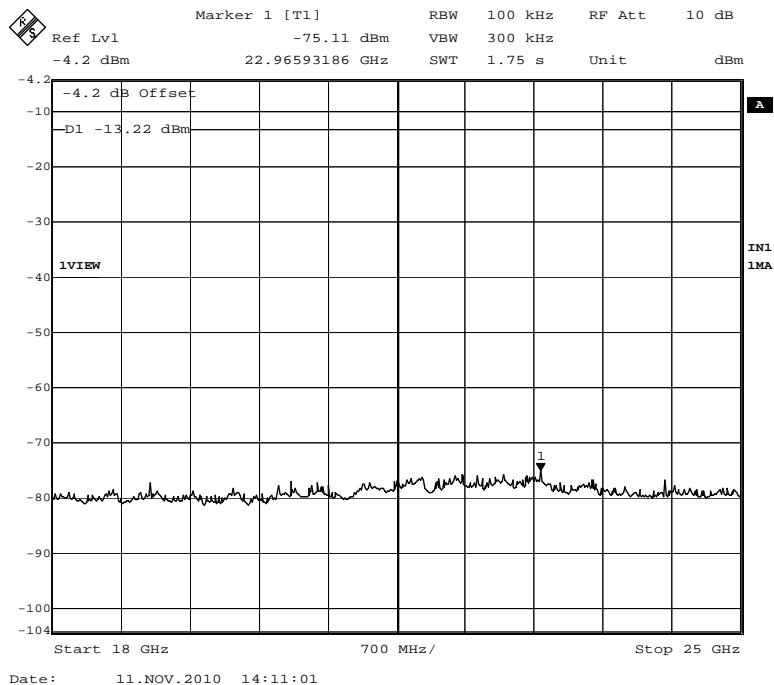
Date: 11.NOV.2010 13:44:51

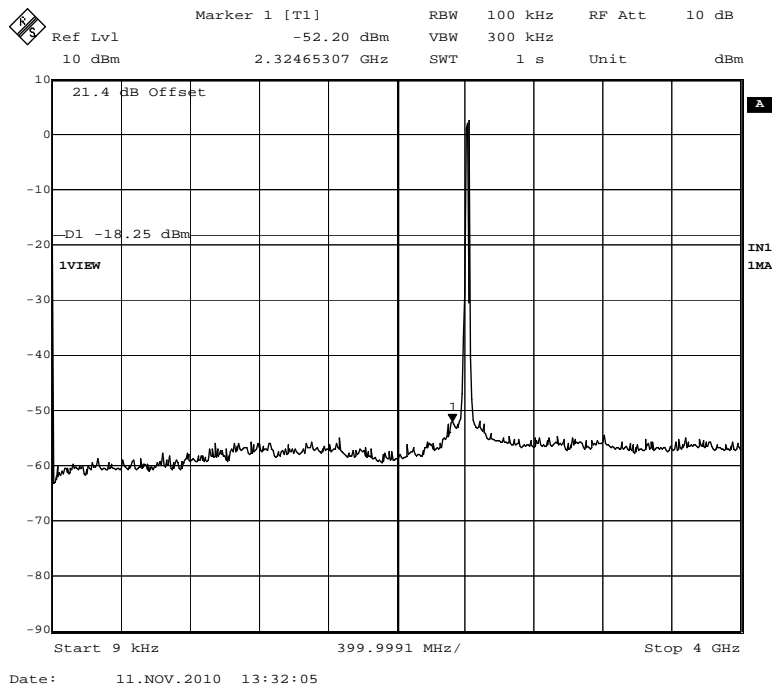
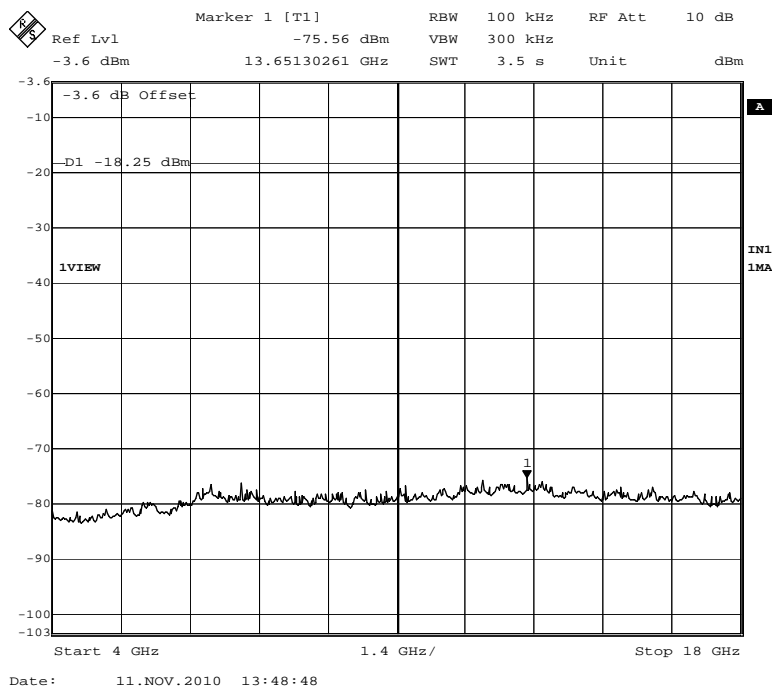
18 GHz to 25 GHzConfiguration 1 – Mode 39 kHz to 4 GHz





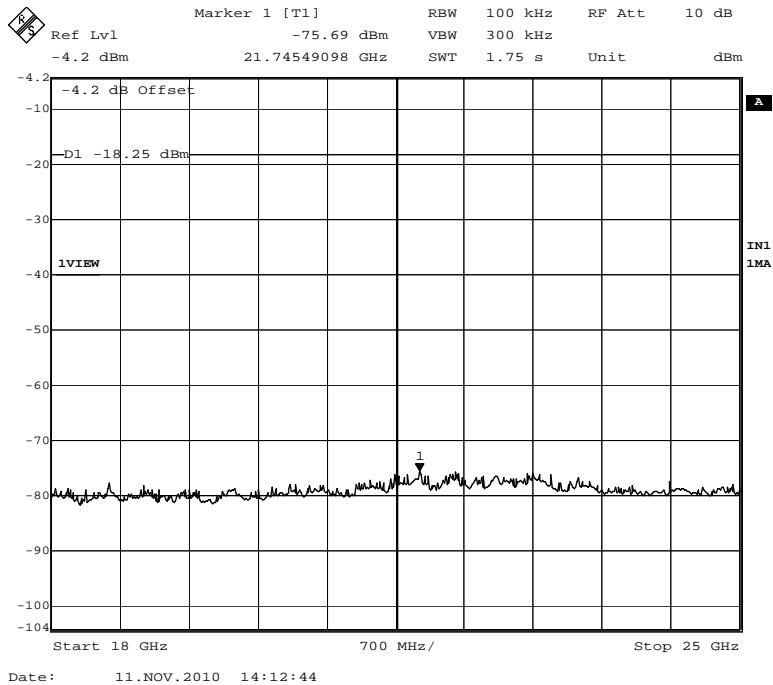
Product Service

4 GHz to 18 GHz18 GHz to 25 GHz

802.11(g)3.3/1.2/5 V DC Supply54 MbpsConfiguration 1 – Mode 19 kHz to 4 GHz4 GHz to 18 GHz

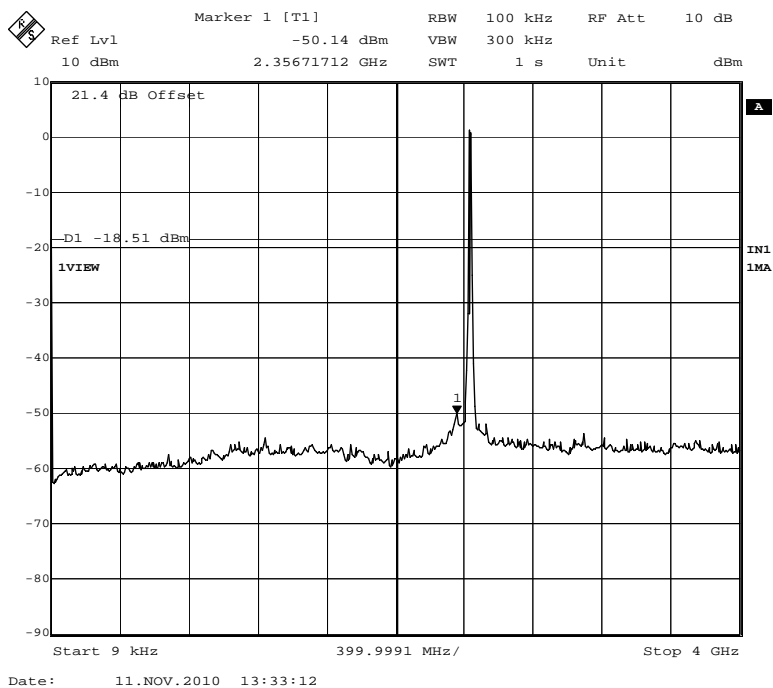


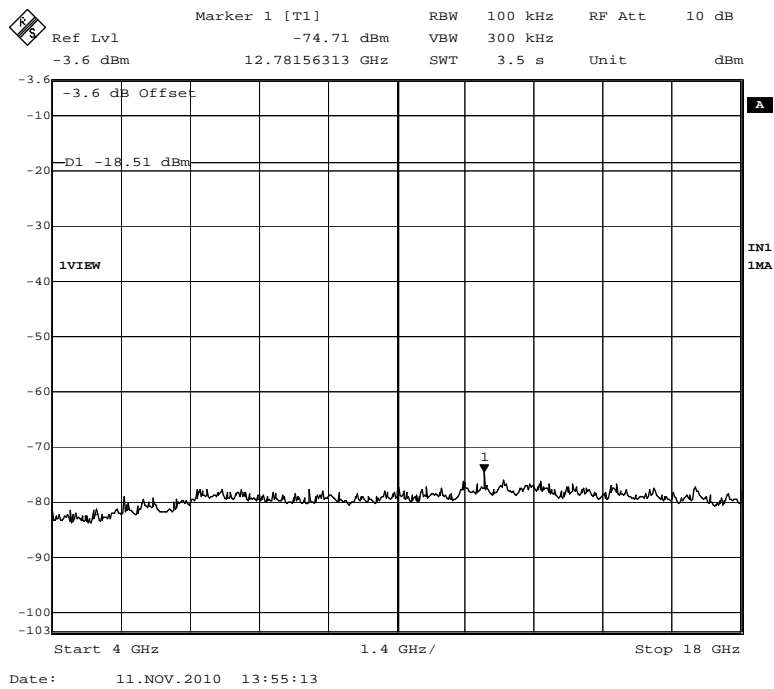
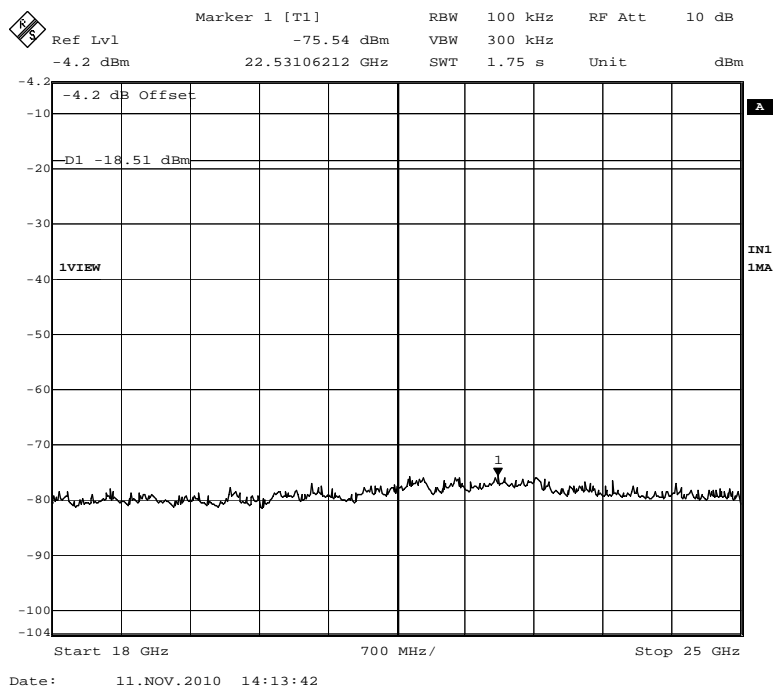
### 18 GHz to 25 GHz



### Configuration 1 – Mode 2

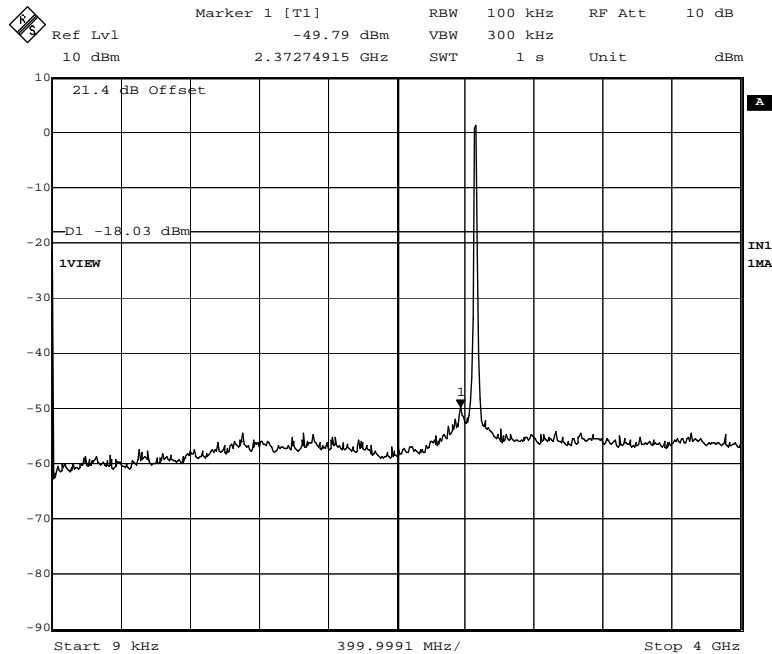
### 9 kHz to 4 GHz



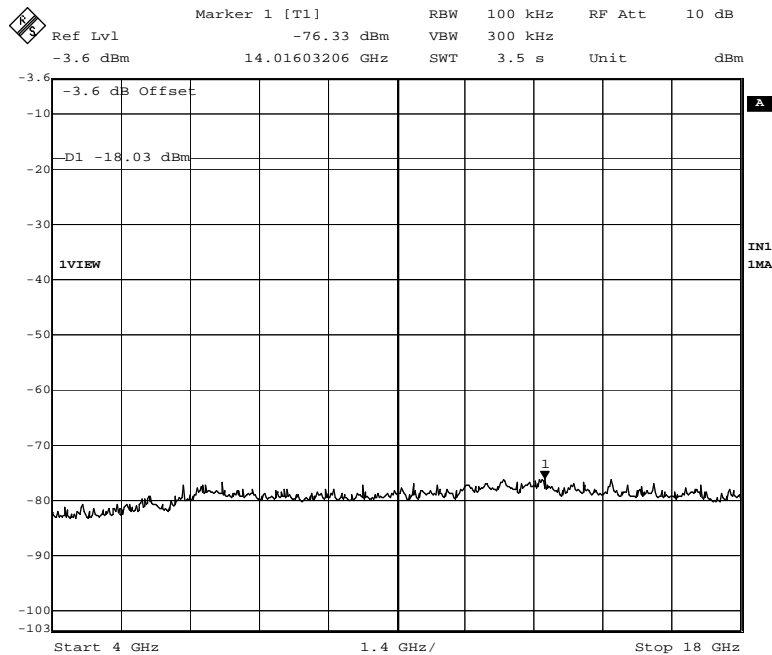
4 GHz to 18 GHz18 GHz to 25 GHz



Product Service

Configuration 1 – Mode 39 kHz to 4 GHz

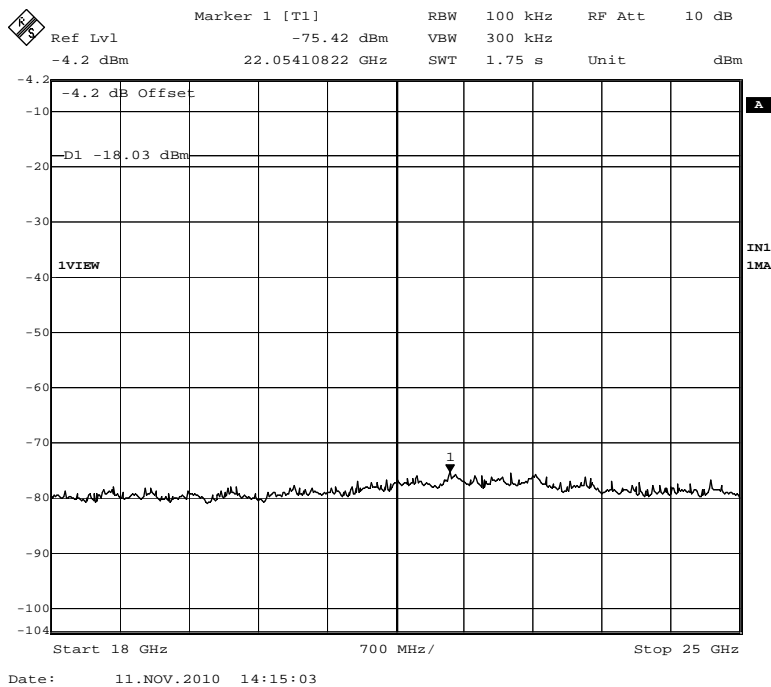
Date: 11.NOV.2010 13:34:18

4 GHz to 18 GHz

Date: 11.NOV.2010 13:59:05



### 18 GHz to 25 GHz



### Limit Clause

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval the attenuation required shall be 30 dB instead of 20 dB.



Product Service

**2.6 BAND EDGE EMISSIONS****2.6.1 Specification Reference**

FCC CFR 47 Part 15C, Clause 15.247 (d)

**2.6.2 Equipment Under Test**

Venice 8 FS2028 Radio Module, S/N: RAD100905

**2.6.3 Date of Test and Modification State**

27 October 2010 - Modification State 0

**2.6.4 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

**2.6.5 Test Method and Operating Modes**

The test was applied in accordance with the test method requirements of ANSI C63.4.

The test was performed with the EUT in the following configurations and modes of operation:

Configuration 1 - Mode 1  
                          - Mode 3

**2.6.6 Environmental Conditions**

27 October 2010

Ambient Temperature 26.2°C

Relative Humidity 23%



## 2.6.7 Test Results

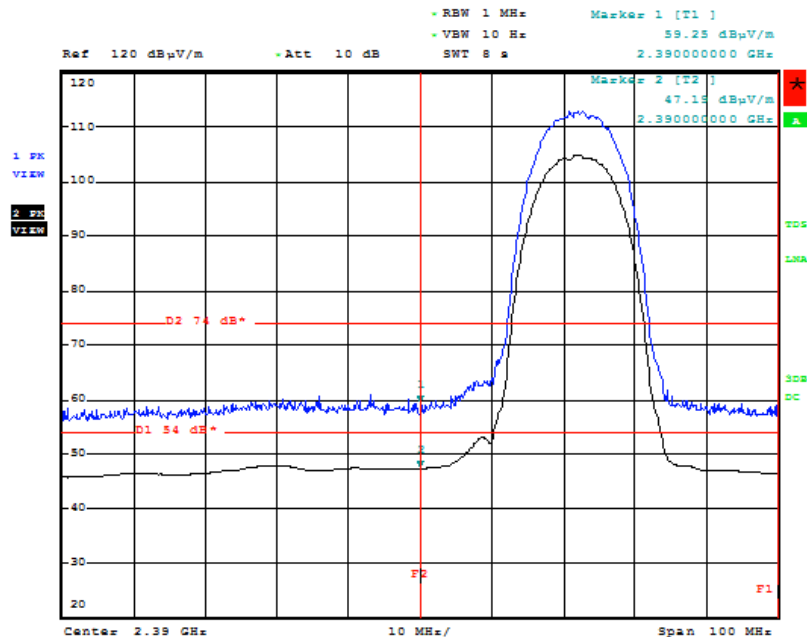
For the period of test the EUT met the requirements of FCC CFR 47 Part 15C for Band Edge Emissions.

The test results are shown below.

### Configuration 1 - Mode 1

#### 802.11 (b)

Freq in GHz	Polarisation	Final Peak dB $\mu$ V/m	Final Peak Limit dB $\mu$ V/m	Final Average dB $\mu$ V/m
2.390	Vertical	57.1	74.0	45.2



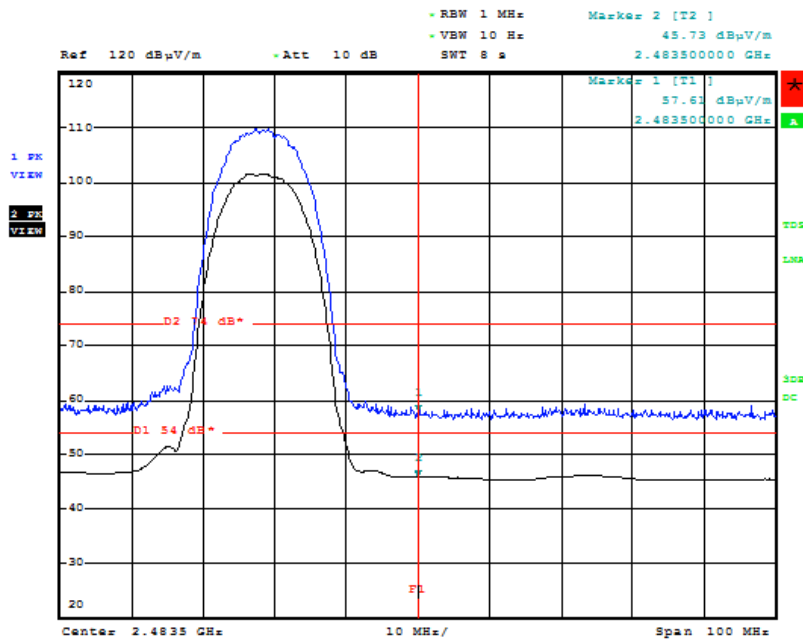
The plot shows the marker at the band edge frequency with a resolution and video bandwidth of 1 MHz and 10 Hz respectively. This is purely for illustration purposes. The peak was measured with a resolution and video bandwidth of 1 MHz and 1 MHz respectively and the average was measured with a resolution and video bandwidth 1 MHz and 10 Hz respectively in accordance with the specification.





### Configuration 1 - Mode 3

Freq in GHz	Polarisation	Final Peak dB $\mu$ V/m	Final Peak Limit dB $\mu$ V/m	Final Average dB $\mu$ V/m
2.4835	Vertical	51.6	74.0	40.5
2.4835	Horizontal	51.2	74.0	42.3

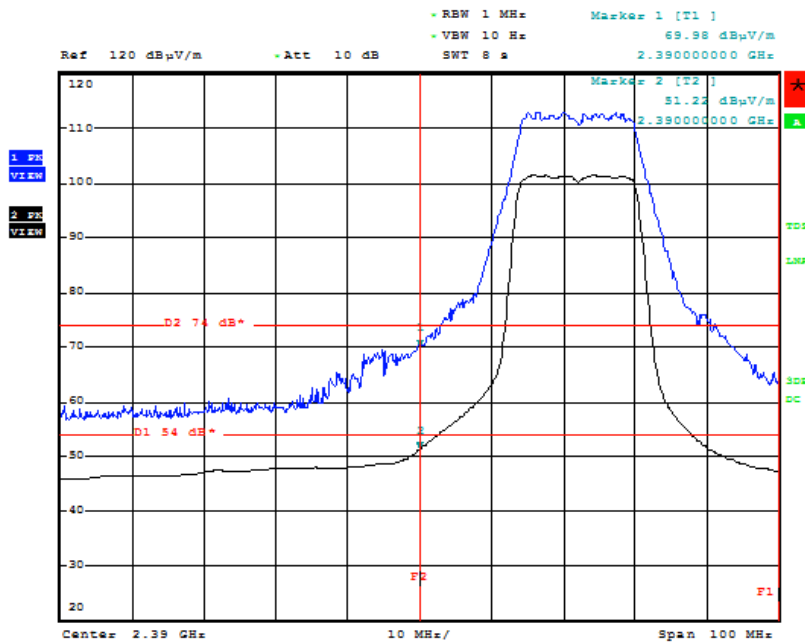


The plot shows the marker at the band edge frequency with a resolution and video bandwidth of 1 MHz and 10 Hz respectively. This is purely for illustration purposes. The peak was measured with a resolution and video bandwidth of 1 MHz and 1 MHz respectively and the average was measured with a resolution and video bandwidth 1 MHz and 10 Hz respectively in accordance with the specification.



## 802.11 (g)

Freq in GHz	Polarisation	Final Peak dB $\mu$ V/m	Final Peak Limit dB $\mu$ V/m	Final Average dB $\mu$ V/m
2.390	Vertical	65.2	74.0	50.2

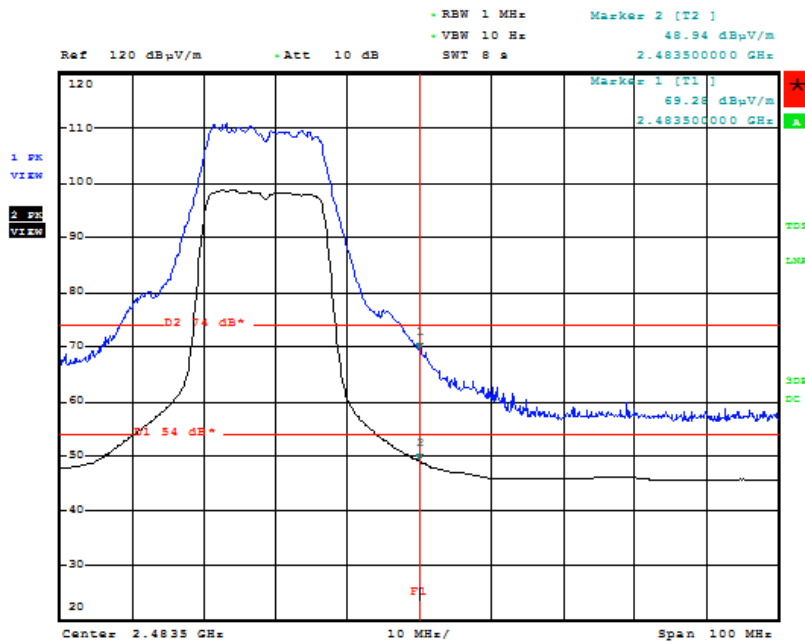


The plot shows the marker at the band edge frequency with a resolution and video bandwidth of 1 MHz and 10 Hz respectively. This is purely for illustration purposes. The peak was measured with a resolution and video bandwidth of 1 MHz and 1 MHz respectively and the average was measured with a resolution and video bandwidth 1 MHz and 10 Hz respectively in accordance with the specification.



### Configuration 1 - Mode 3

Freq in GHz	Polarisation	Final Peak dB $\mu$ V/m	Final Peak Limit dB $\mu$ V/m	Final Average dB $\mu$ V/m
2.4835	Vertical	69.8	74.0	51.5



The plot shows the marker at the band edge frequency with a resolution and video bandwidth of 1 MHz and 10 Hz respectively. This is purely for illustration purposes. The peak was measured with a resolution and video bandwidth of 1 MHz and 1 MHz respectively and the average was measured with a resolution and video bandwidth 1 MHz and 10 Hz respectively in accordance with the specification.



Product Service

**2.7 POWER SPECTRAL DENSITY****2.7.1 Specification Reference**

FCC CFR 47 Part 15C, Clause 15.247 (e)

**2.7.2 Equipment Under Test**

Venice 8 FS2028 Radio Module, S/N: RAD100912

**2.7.3 Date of Test and Modification State**

10 November 2010 - Modification State 0

**2.7.4 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

**2.7.5 Test Method and Operating Modes**

The test was applied in accordance with the test method requirements of ANSI C63.4.

The EUT was connected to a Spectrum Analyser via a 20 dB attenuator. The path loss was measured between the EUT and the Spectrum Analyser and entered as a reference level offset. The trace was set to max hold and using a peak detector the maximum response was established. With the Spectrum Analyser RBW at 3 kHz and VBW at 3 kHz, the power spectral density in a 3 kHz bandwidth was measured.

The test was performed with the EUT in the following configurations and modes of operation:

Configuration 1 - Mode 1  
                          - Mode 2  
                          - Mode 3

**2.7.6 Environmental Conditions**

10 November 2010

Ambient Temperature 22°C

Relative Humidity 27%



Product Service

### 2.7.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 15C for Power Spectral Density.

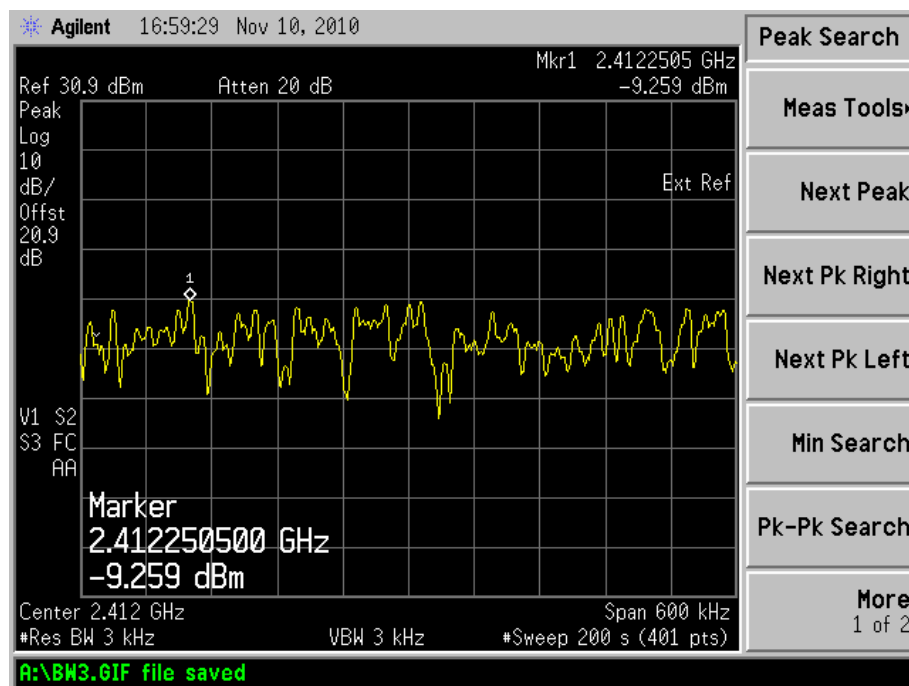
The test results are shown below.

802.11(b)

3.3/1.2/5 V DC Supply

Configuration 1 – Mode 1

Frequency (MHz)	Modulation Rate (Mbps)	Power Spectral Density in 3 kHz Band (dBm)
2412	11	-9.26

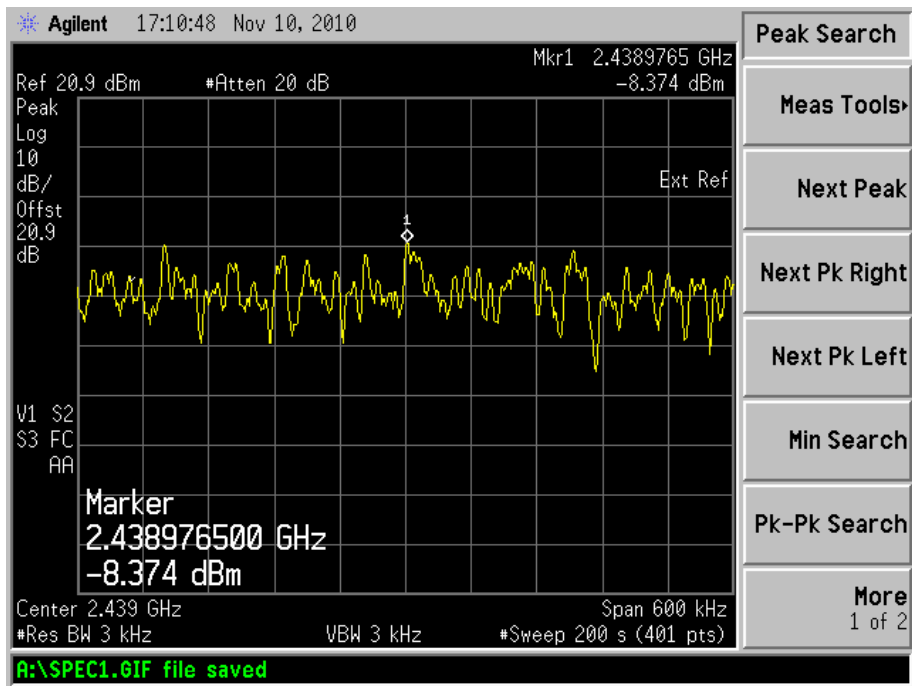




Product Service

Configuration 1 – Mode 2

Frequency (MHz)	Modulation Rate (Mbps)	Power Spectral Density in 3 kHz Band (dBm)
2437	11	-8.37

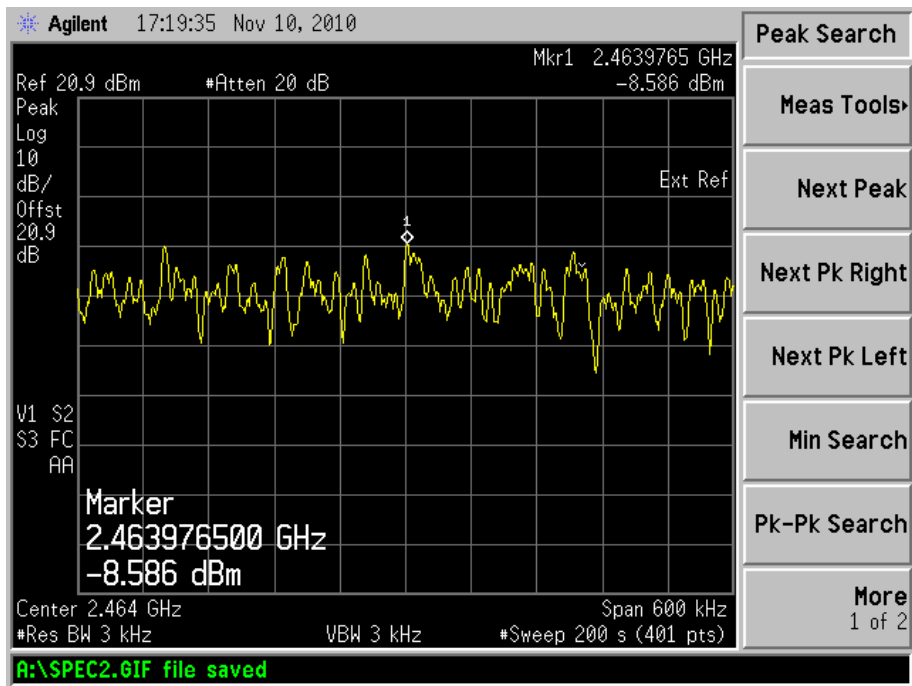




Product Service

Configuration 1 – Mode 3

Frequency (MHz)	Modulation Rate (Mbps)	Power Spectral Density in 3 kHz Band (dBm)
2462	11	-8.59





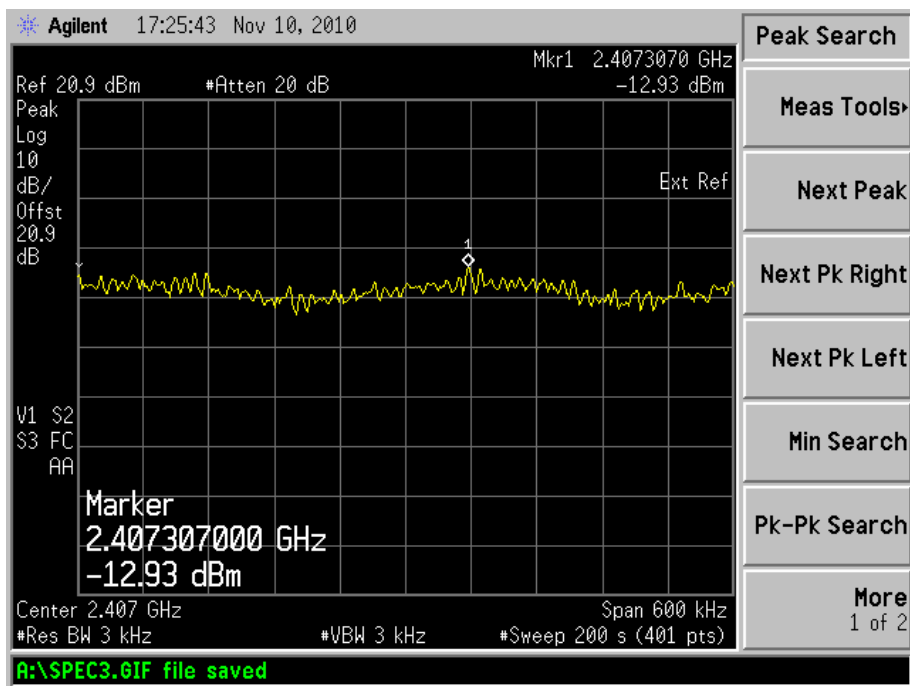
Product Service

802.11(g)

3.3/1.2/5 V DC Supply

Configuration 1 – Mode 1

Frequency (MHz)	Modulation Rate (Mbps)	Power Spectral Density in 3 kHz Band (dBm)
2412	54	-12.93



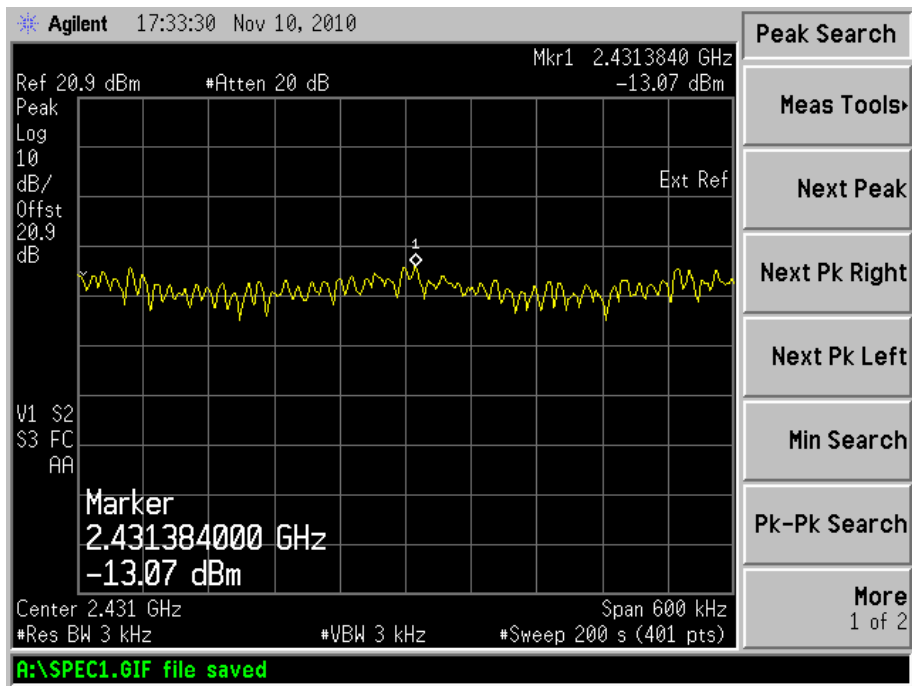




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Configuration 1 – Mode 2

Frequency (MHz)	Modulation Rate (Mbps)	Power Spectral Density in 3 kHz Band (dBm)
2437	54	-13.07

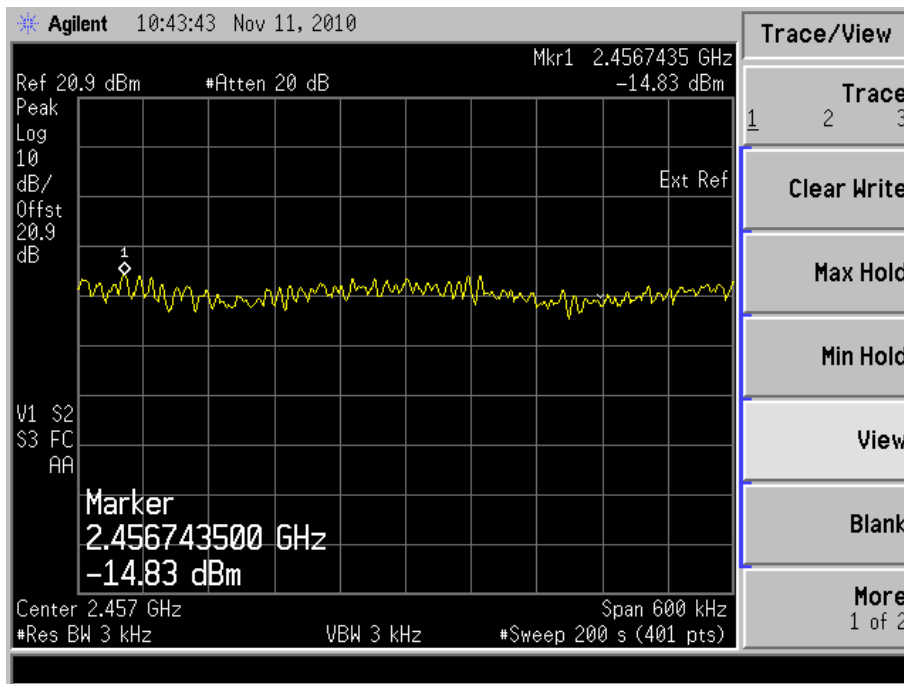




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Configuration 1 – Mode 3

Frequency (MHz)	Modulation Rate (Mbps)	Power Spectral Density in 3 kHz Band (dBm)
2462	54	-14.83

Limit Clause

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.



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## **SECTION 3**

### **TEST EQUIPMENT USED**



### 3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
<b>Section 2.1 - 6dB Bandwidth</b>					
Attenuator 20dB/2W	Weinschel	Model 2	379	12	28-Nov-2010
Combiner	Anzac	T-1000	418	-	TU
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	9-Mar-2011
Programmable Power Supply	Iso-tech	IPS 2010	2436	-	O/P Mon
Hygrometer	Rotronic	I-1000	3220	12	27-Apr-2011
ESA-E Series Spectrum Analyser	Agilent	E4402B	3348	12	2-Jun-2011
<b>Section 2.2 - Maximum Peak Conducted Output Power</b>					
Peak Power Analyser	Hewlett Packard	8990A	107	12	10-Feb-2011
Attenuator 20dB/2W	Weinschel	Model 2	379	12	28-Nov-2010
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	9-Mar-2011
Screened Room (5)	Rainford	Rainford	1545	36	11-Feb-2011
Power Sensor	Hewlett Packard	84812A	2743	-	TU
Hygrometer	Rotronic	I-1000	3220	12	27-Apr-2011
ESA-E Series Spectrum Analyser	Agilent	E4402B	3348	12	2-Jun-2011
Signal Generator, 9kHz to 3GHz	Rohde & Schwarz	SMA 100A	3494	12	15-Jan-2011
<b>Section 2.3 Radio (Tx) - Effective Radiated Power</b>					
Peak Power Analyser	Hewlett Packard	8990A	107	12	10-Feb-2011
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	234	12	12-Oct-2010
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	235	12	12-Oct-2010
Screened Room (5)	Rainford	Rainford	1545	36	11-Feb-2011
Mast Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Turntable/Mast Controller	EMCO	2090	1607	-	TU
Multimeter	Iso-tech	IDM101	2417	12	20-Sep-2011
Power Sensor	Hewlett Packard	84812A	2743	-	TU
Thermohygrometer	Rotronic	A1	2749	12	8-Dec-2010
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	3171	12	12-Aug-2011
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	9-Sep-2011
<b>Section 2.4 Radio - Radiated Emissions (Enclosure Port)</b>					
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	235	12	11-Nov-2010
Pre-Amplifier	Phase One	PS04-0086	1533	12	15-Sep-2011
Screened Room (5)	Rainford	Rainford	1545	36	11-Feb-2011
Amplifier (1 - 8GHz)	Phase One	PS06-0060	3175	12	2-Jul-2011
1m RF Cable sma(m)-sma(m)	Reynolds	262-0248-1000	3453	-	TU
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	9-Sep-2011
'3.5mm' - '3.5mm' RF Cable (2m)	Rhophase	3PS-1803-2000-3PS	3703	12	26-Jan-2011
9m RF Cable (N Type)	Rhophase	NPS-2303-9000-NPS	3791	12	10-Aug-2011



Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
<b>Section 2.5 - Spurious Emissions</b>					
Attenuator 20dB/2W	Weinschel	Model 2	379	12	28-Nov-2010
Combiner	Anzac	T-1000	418	-	TU
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	9-Mar-2011
Multimeter	Iso-tech	IDM101	2419	12	3-Sep-2011
Programmable Power Supply	Iso-tech	IPS 2010	2436	-	O/P Mon
High Pass Filter (4GHz)	RLC Electronics	F-100-4000-5-R	2773	12	6-Sep-2011
Test Receiver	Rohde & Schwarz	ESIB40	2941	12	28-Apr-2011
Hygrometer	Rotronic	I-1000	3220	12	27-Apr-2011
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	25-Feb-2011
'3.5mm' - '3.5mm' RF Cable (2m)	Rhophase	3PS-1803-2000-3PS	3702	12	26-Jan-2011
<b>Section 2.6 Radio - Band Edge Emissions</b>					
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	234	12	12-Oct-2010
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	235	12	12-Oct-2010
Screened Room (5)	Rainford	Rainford	1545	36	11-Feb-2011
Mast Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Turntable/Mast Controller	EMCO	2090	1607	-	TU
Multimeter	Iso-tech	IDM101	2417	12	20-Sep-2011
Thermohygrometer	Rotronic	A1	2749	12	8-Dec-2010
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	3171	12	12-Aug-2011
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	9-Sep-2011
<b>Section 2.7 - Power Spectral Density</b>					
Attenuator 20dB/2W	Weinschel	Model 2	379	12	28-Nov-2010
Combiner	Anzac	T-1000	418	-	TU
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	9-Mar-2011
Programmable Power Supply	Iso-tech	IPS 2010	2436	-	O/P Mon
Hygrometer	Rotronic	I-1000	3220	12	27-Apr-2011
ESA-E Series Spectrum Analyser	Agilent	E4402B	3348	12	2-Jun-2011
Signal Generator, 9kHz to 3GHz	Rohde & Schwarz	SMA 100A	3494	12	15-Jan-2011

TU – Traceability Unscheduled

O/P Mon – Output monitored using calibrated equipment.



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## **SECTION 4**

### **ACCREDITATION, DISCLAIMERS AND COPYRIGHT**



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#### 4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



This report relates only to the actual item/items tested.

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA  
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