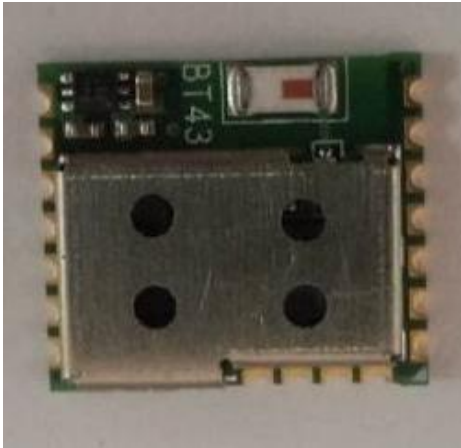


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<b>Kunden-Referenz-Nr.:</b> <i>Client Reference No.:</i>	<b>460398</b>	<b>Auftragsdatum:</b> <i>Order date:</i>	<b>2013.10.17</b>		
<b>Auftraggeber:</b> <i>Client:</i>	<b>Amp'ed RF Technology Inc.</b> 1879 Lundy Ave, Suite 138, San Jose, CA95131, USA				
<b>Prüfgegenstand:</b> <i>Test item:</i>	Bluetooth module				
<b>Bezeichnung / Typ-Nr.:</b> <i>Identification / Type No.:</i>	<b>BT43</b> FCC ID :X3ZBTMOD7 IC :8828A-MOD7				
<b>Auftrags-Inhalt:</b> <i>Order content:</i>	Complete test				
<b>Prüfgrundlage:</b> <i>Test specification:</i>	FCC CFR47 Part 15, Subpart C, §15.247 ANSI C63.10-2009 ANSI C63.10-2009 KDB 558074 D01 DTS Meas Guidance v03 Public Notice DA 00-705: Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems (March 30, 2000)				
<b>Wareneingangsdatum:</b> <i>Date of receipt:</i>	17.10.2013				
<b>Prüfmuster-Nr.:</b> <i>Test sample No.:</i>	A000028691-001				
<b>Prüfzeitraum:</b> <i>Testing period:</i>	09.08.2013 – 01.03.2014				
<b>Ort der Prüfung:</b> <i>Place of testing:</i>	QuieTek Technology(Suzhou)Co., Ltd.				
<b>Prüflaboratorium:</b> <i>Testing laboratory:</i>	TÜV Rheinland (Shanghai) Co., Ltd.				
<b>Prüfergebnis*:</b> <i>Test result*:</i>	Pass				
<b>geprüft von / tested by:</b>	<i>Shi Li</i>				
11.03.2014	ShiLi / Project Engineer	11.03.2014	Jesse huang / Project Manager		
<b>Datum</b> <i>Date</i>	<b>Name / Stellung</b> <i>Name / Position</i>	<b>Unterschrift</b> <i>Signature</i>	<b>Datum</b> <i>Date</i>	<b>Name / Stellung</b> <i>Name / Position</i>	<b>Unterschrift</b> <i>Signature</i>
<b>Sonstiges / Other:</b>					
<b>Zustand des Prüfgegenstandes bei Anlieferung:</b> <i>Condition of the test item at delivery:</i>		Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>			
* Legende: 1 = sehr gut 2 = gut 3 = befriedigend 4 = ausreichend 5 = mangelhaft P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet Legend: 1 = very good 2 = good 3 = satisfactory 4 = sufficient 5 = poor P(ass) = passed a.m. test specification(s) F(ail) = failed a.m. test specification(s) N/A = not applicable N/T = not tested					
<b>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.</b> <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>					

v04

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## TEST SUMMARY

### **3.2.1 VOLTAGE REQUIREMENTS, FCC 15.31(E)**

RESULT: PASS

### **3.2.2 ANTENNA REQUIREMENTS, FCC 15.203, FCC 15.204 AND RSS-GEN 7.1.4**

RESULT: PASS

### **5.1.1 CONDUCTED OUTPUT POWER, FCC 15.247(B)(1)& (3) AND RSS-210 A8.4(2)**

RESULT: PASS

### **5.1.2 CARRIER FREQUENCY SEPARATION, FCC 15.247(A)(1) AND RSS-210 A8.1(B)**

RESULT: PASS

### **5.1.3 20DB BANDWIDTH AND 6DB&99% BANDWIDTH, FCC 15.247(A)(1)& (2) AND RSS-210 A8.2(A)**

### **5.1.4 NUMBER OF HOPPING FREQUENCIES, FCC 15.247(A)(1)(III) AND RSS-210 A8.1(D)**

RESULT: PASS

### **5.1.5 AVERAGE TIME OF OCCUPANCY, FCC 15.247(A)(1)(III) AND RSS-210 A8.1(D)**

RESULT: PASS

### **5.1.6 POWER SPECTRAL DENSITY (PSD), FCC 15.247(E) AND RSS-210 A8.2**

RESULT: PASS

### **5.1.7 CONDUCTED SPURIOUS EMISSION, FCC 15.247(D) AND RSS-210 A8.5**

RESULT: PASS

### **5.1.8 BAND EDGE COMPLIANCE OF RF CONDUCTED EMISSION, FCC 15.247(D) AND RSS-210 A8.5**

RESULT: PASS

### **6.1.1 BAND EDGE RADIATED EMISSION, FCC 15.205, FCC 15.209, FCC 15.247(D), RSS-210 2.2, RSS-210 2.6 AND RSS-210 A8.5**

RESULT: Pass

### **6.1.2 RADIATED SPURIOUS EMISSION OF TRANSMITTER, FCC 15.205, FCC 15.209, FCC 15.247(D), RSS-210 2.2, RSS-210 2.6 AND RSS-210 A8.5**

RESULT: PASS

### **6.2.1 RADIATED SPURIOUS EMISSION OF RECEIVER, FCC 15.109, RSS-210 2.2, RSS-210 2.6, RSS-210 A8.5, RSS-GEN 7.2.3.2**

RESULT: PASS

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## **1. General Remarks**

### **1.1 Complementary Materials**

All attachments are integral parts of this test report.

## **2. Test Sites**

### **2.1 Test Facilities**

QuieTek Technology(Suzhou)Co.,Ltd.

No.99 Hongye RD.Suzhou Industnal Park Loufeng Hi-Tech Development  
Zone.,Suzhou,China

The used test equipment is in accordance with CISPR 16 for measurement of radio  
interference.

The Federal Communications Commission has reviewed the technical characteristics of  
the radiated and conducted emission facility, and has found these test facilities to be in  
compliance with the requirements of section 2.948 of the FCC rules. The description of  
the test facility is listed under FCC registration number 800392.

The Industry Canada has reviewed the technical characteristics of the radiated and  
conducted emission facility, and has found these test facilities to be in compliance. The  
description of the test facility is listed under chambers filing number 4075B.

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## 2.2 List of Test and Measurement Instruments

**Table 1: List of Test and Measurement Equipment**

Equipment	Model	Serial no.	Cal. due date
3m modified semi-anechoic chamber	SAC	N/A	10.12.2014
EMI test receiver	ESCI	100280	08.11.2014
broadband antenna	BTA-H	040005H	28.07.2014
Spectrum analyzer	FSP30	100192	21.07.2014
Spectrum analyzer	E4440A	MY42510355	08.05.2014
Broadband coaxial preamplifier	BBV 9718	9718-012	04.07.2014
Double ridged broadband horn antenna	BBHA 9120 D	9120D-433	15.05.2014

## 2.3 Measurement Uncertainty

**Table 2: Emission Measurement Uncertainty**

Measurement Type	Frequency	Uncertainty
Antenna Port Conducted Emission	< 1GHz	±0.39dB
	> 1GHz	±0.68dB
Radiated Emission	30MHz - 1GHz	±5.34dB
	> 1GHz	±5.40dB

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## 3. General Product Information

### 3.1 Product Function and Intended Use

The EUT (Equipment Under Test) is a Bluetooth module.

### 3.2 System Details

Radio standard:	Bluetooth 4.0 dual mode
Max output power:	8.89dBm
Antenna gain:	0.5dBi
Antenna type:	Ceramic antenna
Antenna Manufactory:	Johanson Technology & ACX
Antenna cable length:	N/A
Frequency range:	2402 – 2480MHz
EDR Number of channels:	79
BLE Number of channels:	40
EDR Channel spacing:	1MHz
BLE Channel spacing:	2MHz
Modulation type:	EDR (GFSK; $\pi/4$ -DQPSK ;8DPSK) BLE (GFSK)
Rated voltage:	2.5V
Test voltage:	2.5V

#### 3.2.1 Voltage Requirements, FCC 15.31(e)

**RESULT:**

**PASS**

All the tests were performed using steady DC 2.5V. Hence it complies with the power supply requirements.

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### **3.2.2 Antenna Requirements, FCC 15.203, FCC 15.204 and RSS-Gen 7.1.4**

**RESULT:**

**PASS**

The EUT has an internal antenna which is not user accessible. Hence it complies with the requirements.

### **3.3 Independent Operation Modes**

The EUT was tested on a stand-alone basis (only attached to the test jig) and the test system was configured in a typical fashion (as a customer would normally use it).

The justification and manipulation of cables and equipment in order to simulate a worst-case behavior of the test setup has been carried out as prescribed in ANSI C63.4:2009.

Bluetooth BDR and EDR mode :

Testing was performed at the lowest operating frequency (2402MHz), at the operating frequency in the middle of the specified frequency band (2441MHz) and at the highest operating frequency (2480MHz) with different modulation types.

Bluetooth LE 4.0 mode:

Testing was performed at the lowest operating frequency (2402MHz), at the operating frequency in the middle of the specified frequency band (2442MHz) and at the highest operating frequency (2480MHz) with different modulation types.

Bluetooth BDR and EDR mode basic operation in (GFSK;  $\pi/4$ -DQPSK ;8DPSK) :

- A. EUT transmits (TX mode), with full power, at lowest channel (2402MHz), a continuous modulated signal streaming with 100% duty cycle.
- B. EUT transmits (TX mode), with full power, at middle channel (2441MHz), a continuous modulated signal streaming with 100% duty cycle.
- C. EUT transmits (TX mode), with full power, at highest channel (2480MHz), a continuous modulated signal streaming with 100% duty cycle.
- D. EUT receives (RX mode), at lowest channel (2402MHz), continuously.
- E. EUT receives (RX mode), at middle channel (2441MHz), continuously.
- F. EUT receives (RX mode), at highest channel (2480MHz), continuously.
- M. EUT transmits on pseudo-random sequence on all channels (hopping mode).

Bluetooth 4.0 BLE mode basic operation in :

- G. EUT transmits (TX mode), with full power, at lowest channel (2402MHz), a continuous modulated signal streaming with 100% duty cycle.



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- H. EUT transmits (TX mode), with full power, at middle channel (2442MHz), a continuous modulated signal streaming with 100% duty cycle.
- I. EUT transmits (TX mode), with full power, at highest channel (2480MHz), a continuous modulated signal streaming with 100% duty cycle.
- J. EUT receives (RX mode), at lowest channel (2402MHz), continuously.
- K. EUT receives (RX mode), at middle channel (2442MHz), continuously.
- L. EUT receives (RX mode), at highest channel (2480MHz), continuously.

### **3.4 Noise Suppressing Parts**

Refer to schematics and internal photos.

## **4. Test Set-up and Operation Modes**

### **4.1 Test Methodology**

The test methodology used is based on the requirements of 47 CFR Part 15, Sections 15.31, 15.33, 15.35, 15.205, 15.207, 15.209

The test methods, which have been used, are based on ANSI C63.10-2009 and KDB 558074 D01 DTS Meas Guidance v03 and Public Notice DA 00-705 and ANSI C63.4-2009

For details, see under each test item.

Note : Bluetooth 4.0 BLE is following KDB 558074 D01 DTS Meas Guidance v03  
Bluetooth 4.0 BDR and EDR is following Public Notice DA 00-705

### **4.2 Physical Configuration for Testing**

The EUT was designed to get into related working mode with the control of a laptop computer through USB interface.

Notes:

Two test sample was available:

For antennas conducted measurements with 50Ω connector and radiated measurements.more details, refer to section: Photographs of the Test Set-Up.

### **4.3 Test Operation and Test Software**

Software used for testing: Term\_44

This software was running on the laptop computer connected to the EUT. It was used to enable the test operation modes listed in section 3.3 as appropriate.

### **4.4 Special Accessories and Auxiliary Equipment**

The product has been tested together with a PCB Development kit (Control the module ).

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## **4.5 Countermeasures to achieve EMC Compliance**

No additional measures were employed to achieve compliance.

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## **5. Test Results of Conducted Measurements at Antenna Port**

### **5.1 Transmitter Parameters**

#### **5.1.1 Conducted Output Power, FCC 15.247(b)(1)& (3) and RSS-210 A8.4(2)**

**RESULT:**

**PASS**

Date of testing: 2013-12-19

Ambient temperature: 22.3°C

Relative humidity: 40.1%

Atmospheric pressure: 101.7hPa

Requirements:

For frequency hopping systems operating in the 2400-2483.5MHz band employing at least 75 non-overlapping hopping channels, the maximum peak output power shall be 1W (30dBm). For other hopping systems operating in the 2400-2483.5MHz band, the maximum peak output power shall be 0.125W (21dBm).

Test procedure:

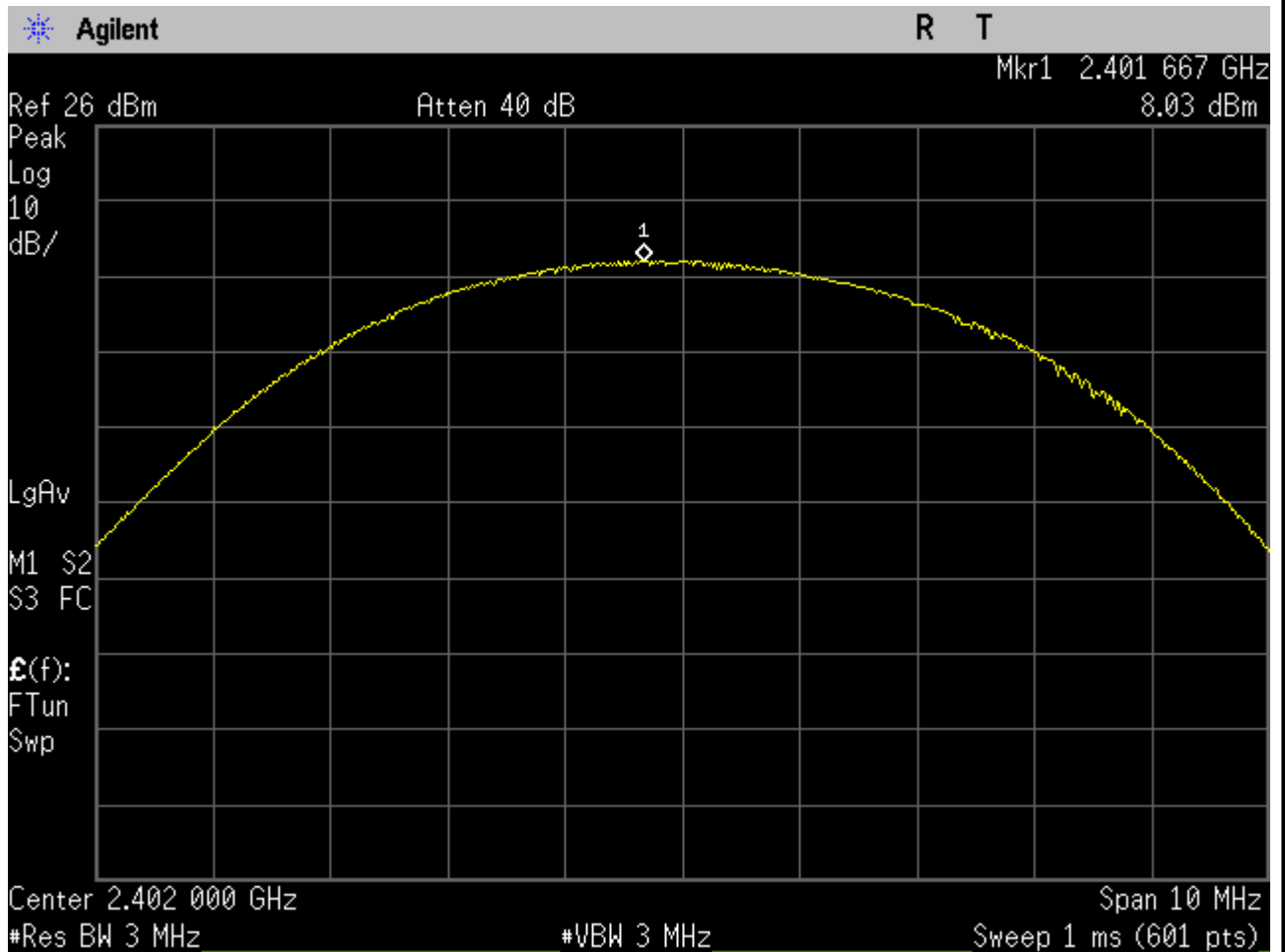
ANSI C63.10-2009 and KDB 558074 D01 DTS Meas Guidance v03 and Public Notice DA 00-705 and ANSI C63.4-2009

The maximum peak output power (conducted) was measured at the antenna connector with a spectrum analyzer. The analyzer resolution bandwidth was set to 3MHz and the video bandwidth to 10MHz. The final measurement takes into account the loss generated by all the involved cables.

**Table 3: Conducted Output Power, Mode A**

Data Rate [Mbps]	RBW [MHz]	Output Power [dBm]	Cable Loss [dBm]	Corrected Power [dBm]	Limit [dBm]
1	3	8.03	0.5	8.53	21
2	3	8.01	0.5	8.51	21
3	3	7.98	0.5	8.48	21

**Figure 1: Conducted Output Power, Mode A**



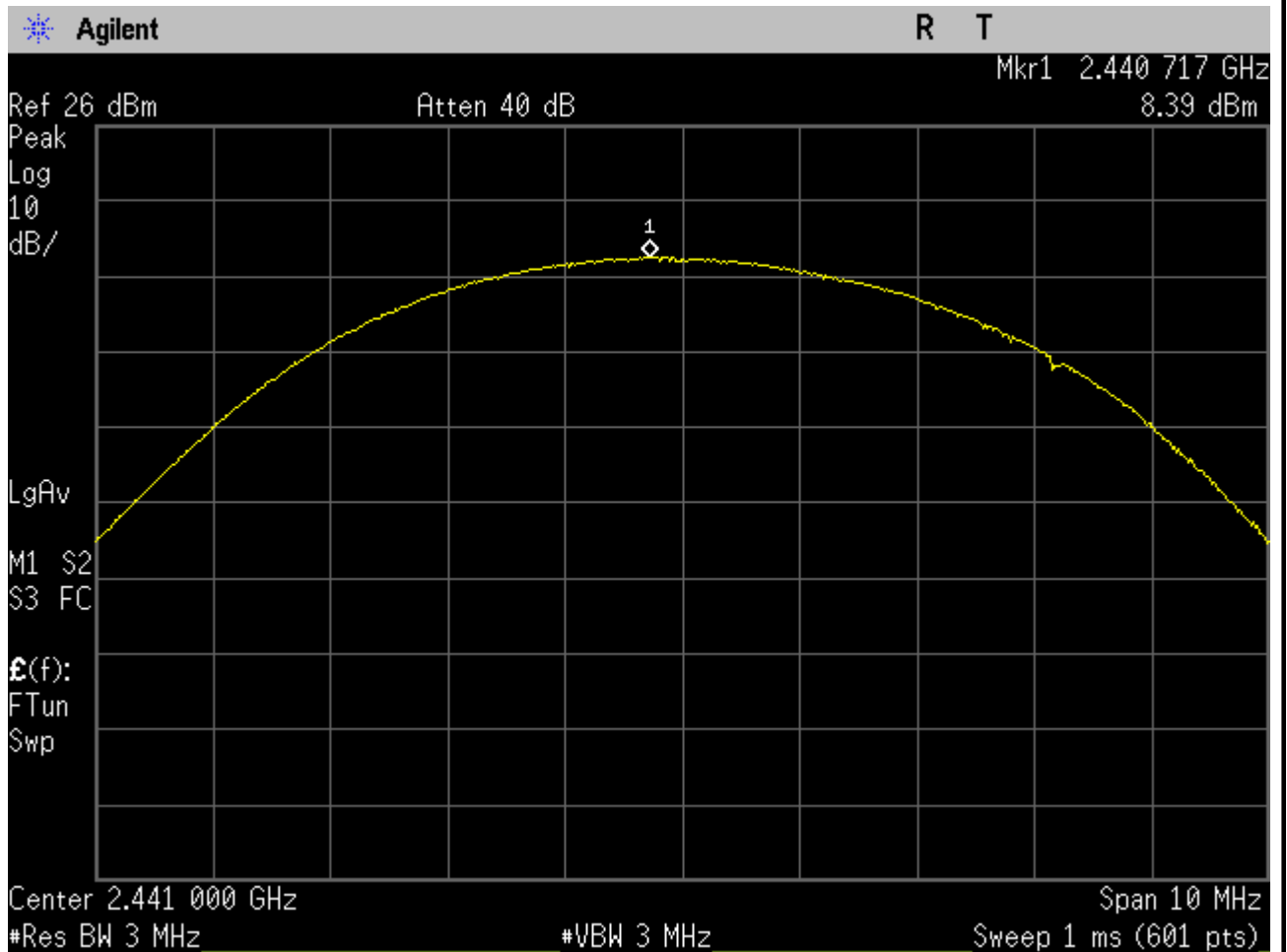
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**Table 4: Conducted Output Power, Mode B**

Data Rate [Mbps]	RBW [MHz]	Output Power [dBm]	Cable Loss [dBm]	Corrected Power [dBm]	Limit [dBm]
1	3	8.39	0.5	8.89	21
2	3	8.30	0.5	8.80	21
3	3	8.32	0.5	8.82	21

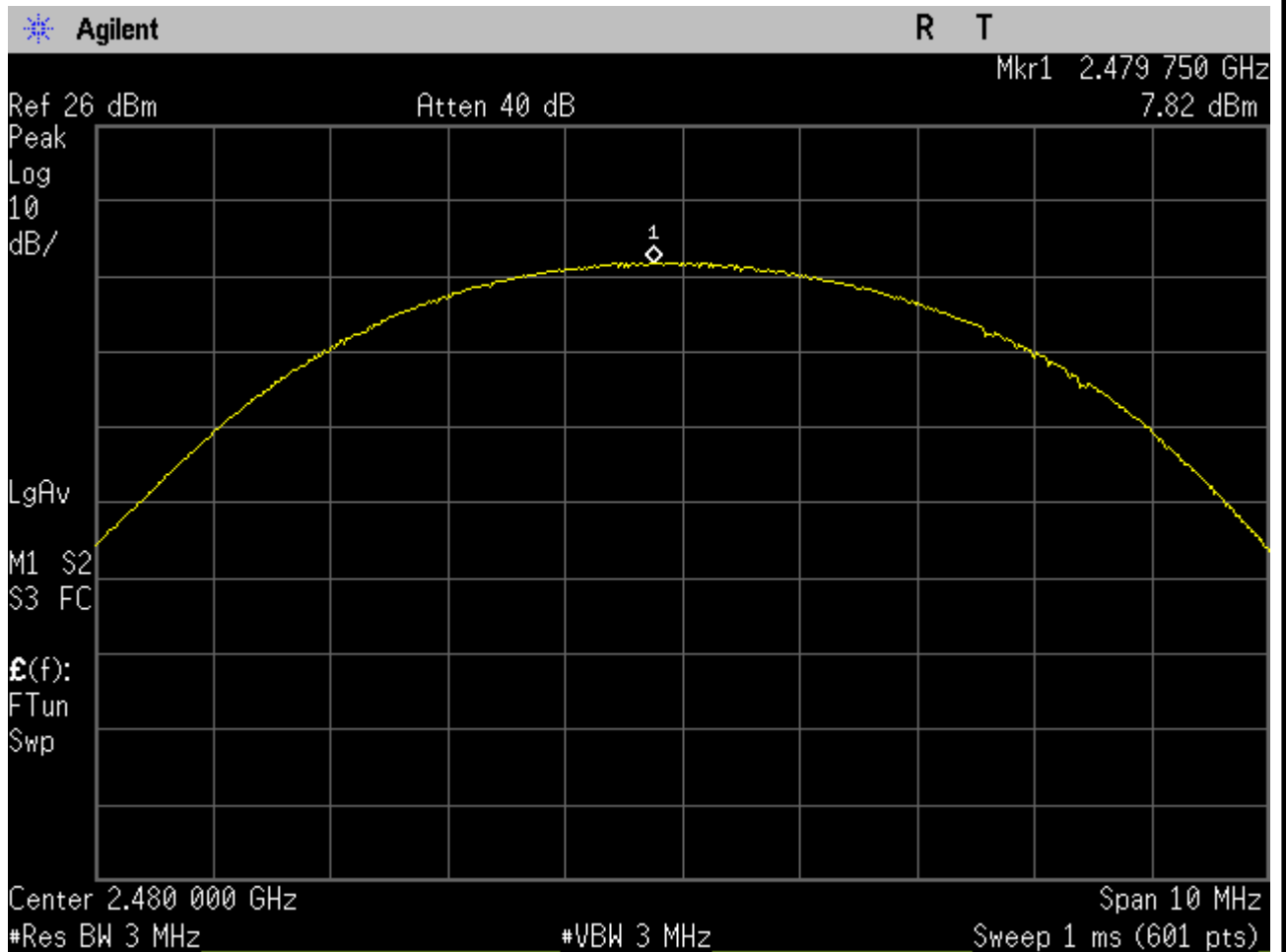
**Figure 2: Conducted Output Power, Mode B**



**Table 5: Conducted Output Power, Mode C**

Data Rate [Mbps]	RBW [MHz]	Output Power [dBm]	Cable Loss [dBm]	Corrected Power [dBm]	Limit [dBm]
1	3	7.82	0.5	8.32	21
2	3	7.81	0.5	8.31	21
3	3	7.82	0.5	8.32	21

**Figure 3: Conducted Output Power, Mode C**



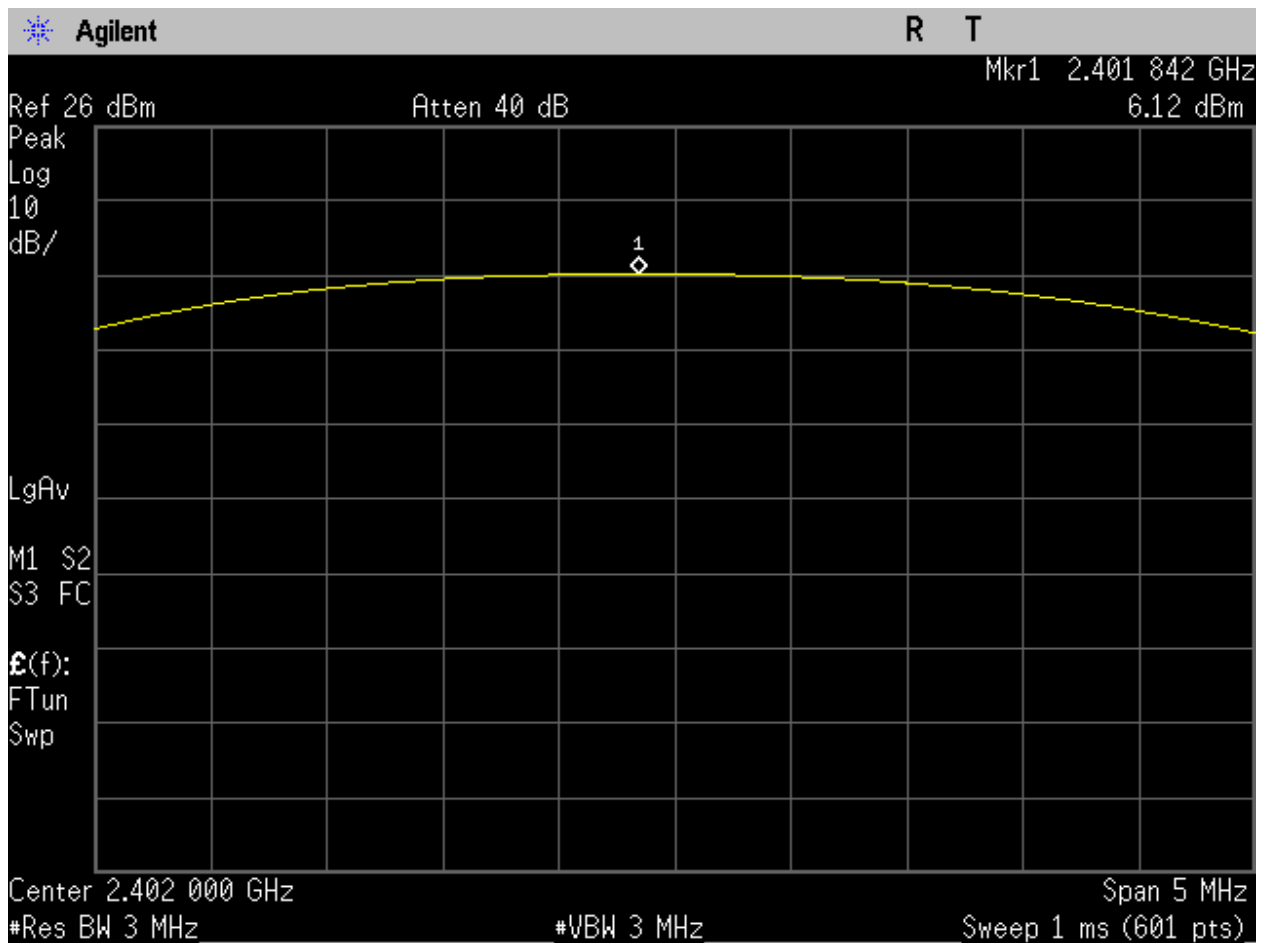
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**Table 6: Conducted Output Power, Mode G**

RBW [MHz]	Output Power [dBm]	Cable Loss [dBm]	Corrected Power [dBm]	Limit [dBm]
3	6.12	0.5	6.62	30

**Figure 4: Conducted Output Power, Mode G**





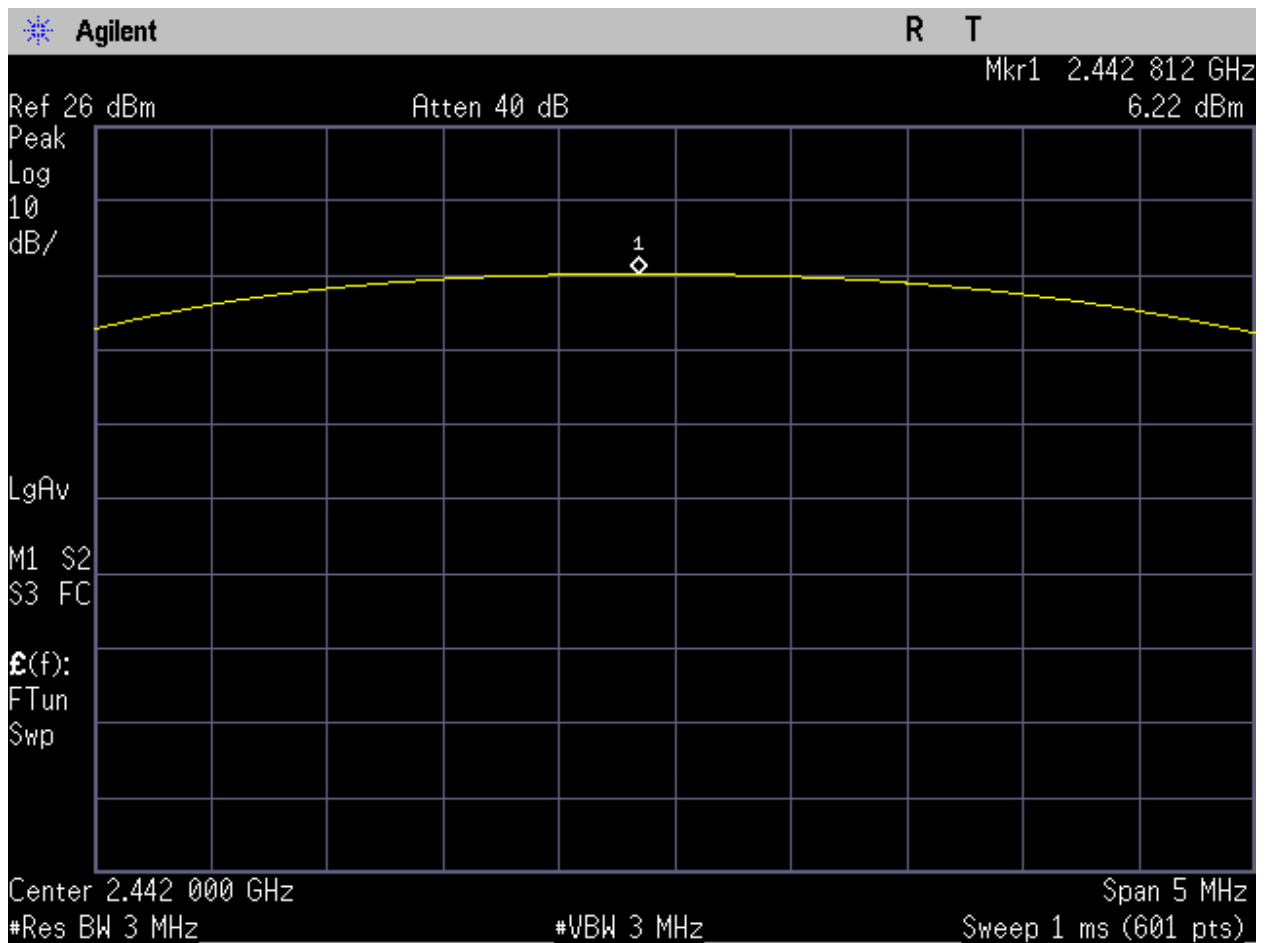
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**Table 7: Conducted Output Power, Mode H**

RBW [MHz]	Output Power [dBm]	Cable Loss [dBm]	Corrected Power [dBm]	Limit [dBm]
3	6.22	0.5	6.72	30

**Figure 5: Conducted Output Power, Mode H**



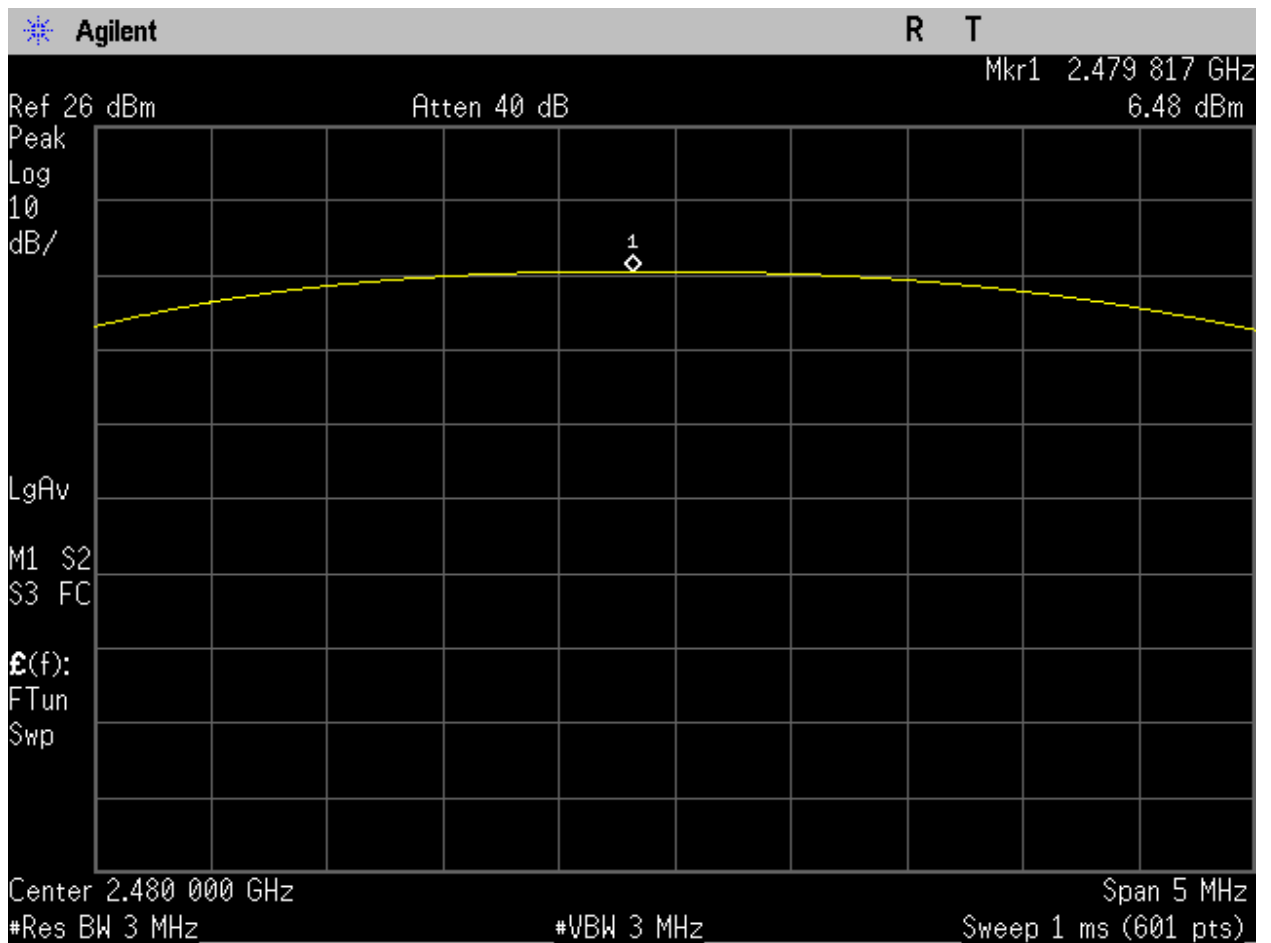
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**Table 8: Conducted Output Power, Mode I**

RBW [MHz]	Output Power [dBm]	Cable Loss [dBm]	Corrected Power [dBm]	Limit [dBm]
3	6.48	0.5	6.98	30

**Figure 6: Conducted Output Power, Mode I**



Remark:

The above results show that the BDR and EDR worst case output power is found at the data rate of 1Mbps. And the BLE worst case output power is High channel.

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### **5.1.2 Carrier Frequency Separation, FCC 15.247(a)(1) and RSS-210 A8.1(b)**

**RESULT:**

**PASS**

Date of testing: 2013-12-19

Ambient temperature: 22.3°C

Relative humidity: 40.1%

Atmospheric pressure: 101.7hPa

Requirements:

Frequency hopping systems operating in the 2400-2483.5MHz band shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 20dB bandwidth of the hopping channel, whichever is greater. In case of an output power less than 125mW, the frequency hopping system may have channels separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater.

Test procedure:

ANSI C63.4-2009 and Public Notice DA 00-705.

A spectrum analyzer

was connected to the antenna port of the EUT. The analyzer resolution bandwidth was set to 30kHz and the video bandwidth to 100kHz. The Delta Marker function was used to determine the separation between the peaks of two adjacent channels.

**Table 9: Carrier Frequency Separation**

Channel	Channel Separation [kHz]	20dB Bandwidth [kHz](8DPSK)	Limit [kHz]
Low	1002	1116	744
Middle	1020	1128	752
High	1001	1116	744

Notes: Limit = 20dB bandwidth \* 2/3 since it is greater than 25kHz and the output power is less than 125mW.

**Figure 7: Carrier Frequency Separation-Low Channel**

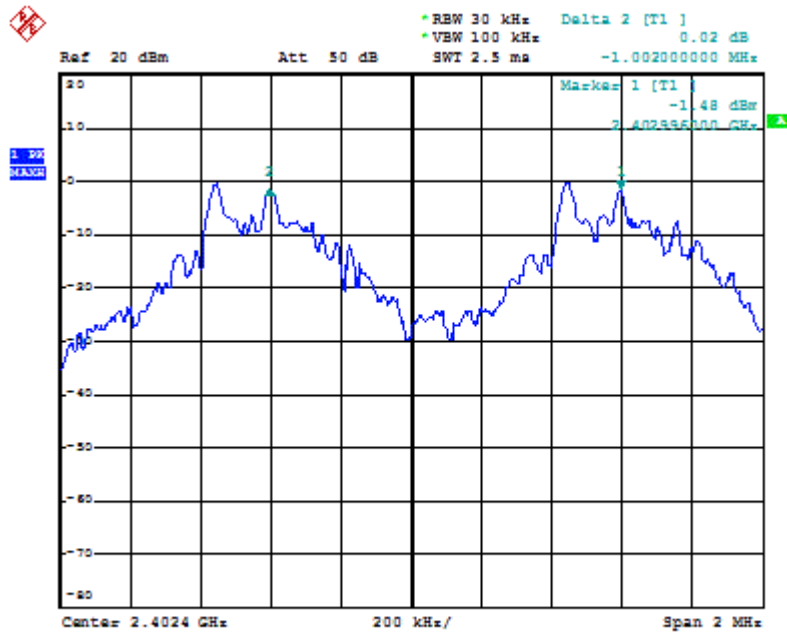
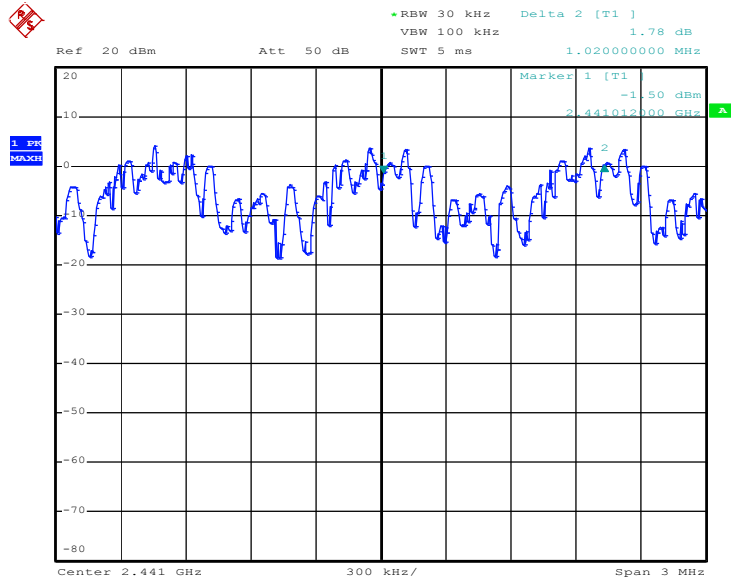
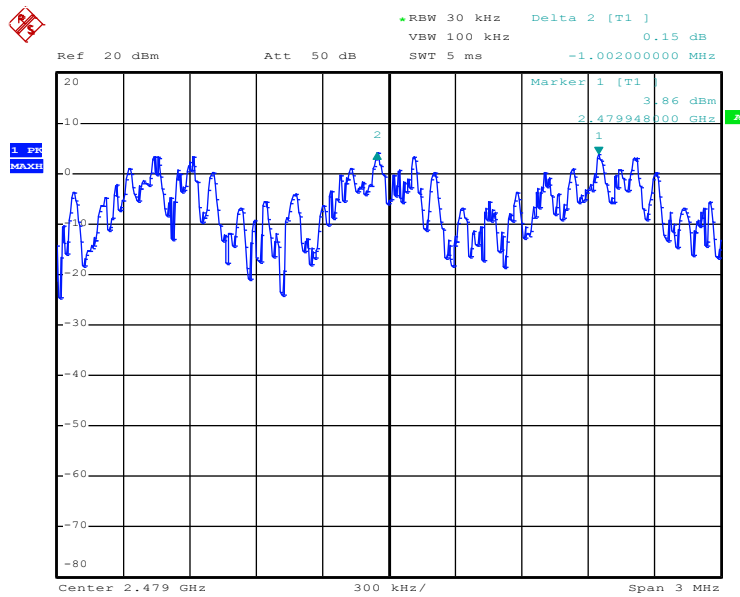


Figure 8: Carrier Frequency Separation-Middle Channel



Date: 10.JAN.2014 01:06:57

Figure 9: Carrier Frequency Separation-High Channel



Date: 10.JAN.2014 01:12:49

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### **5.1.3 20dB Bandwidth and 6dB&99% Bandwidth, FCC 15.247(a)(1)& (2) and RSS-210 A8.2(a)**

Date of testing: 2013-12-19

Ambient temperature: 22.3°C

Relative humidity: 40.1%

Atmospheric pressure: 101.7hPa

#### Requirements:

For frequency hopping systems operating in the 2400-2483.5MHz band, no bandwidth limit is specified. Test data is provided for reference.

#### Test procedure:

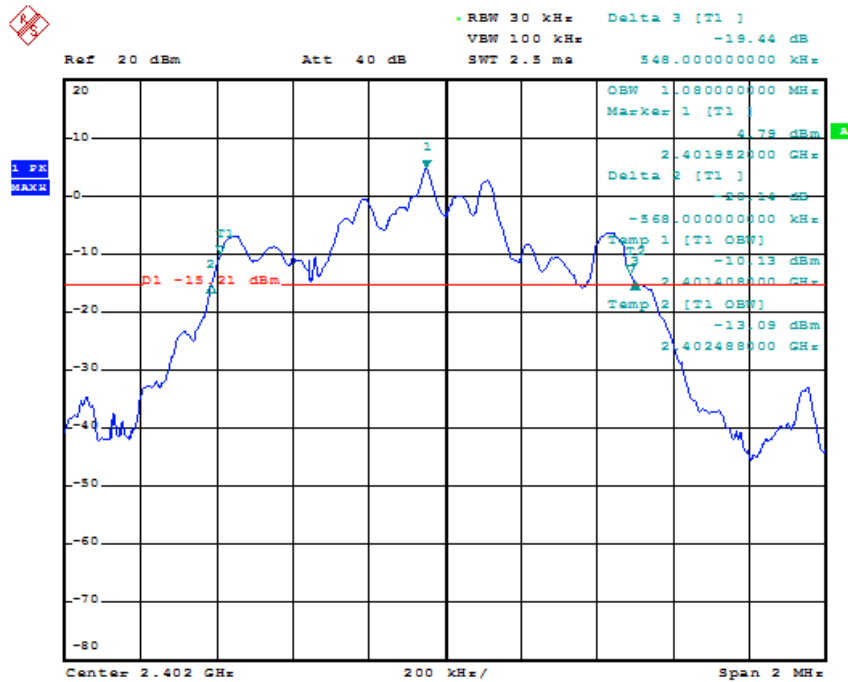
ANSI C63.10-2009 and KDB 558074 D01 DTS Meas Guidance v03 and Public Notice DA 00-705 and ANSI C63.4-2009

A spectrum analyzer was connected to the antenna port of the EUT. The spectrum analyzer resolution bandwidth was set to 100kHz, the video bandwidth to 300kHz and the span to 2MHz.

Table 10: 20dB &99% Bandwidth (bluetooth 4.0 BDR and EDR)

Operating Frequency [MHz]	20dB Bandwidth [kHz](8DPSK)	20dB Bandwidth [kHz](GFSK)	99% Bandwidth [kHz](8DPSK)	99% Bandwidth [kHz](GFSK)
2402	1116	796	1080	844
2441	1128	844	1080	844
2480	1116	828	1068	848

Figure 10: 20dB &99% Bandwidth, Mode A (2402MHz 8DPSK and GFSK)

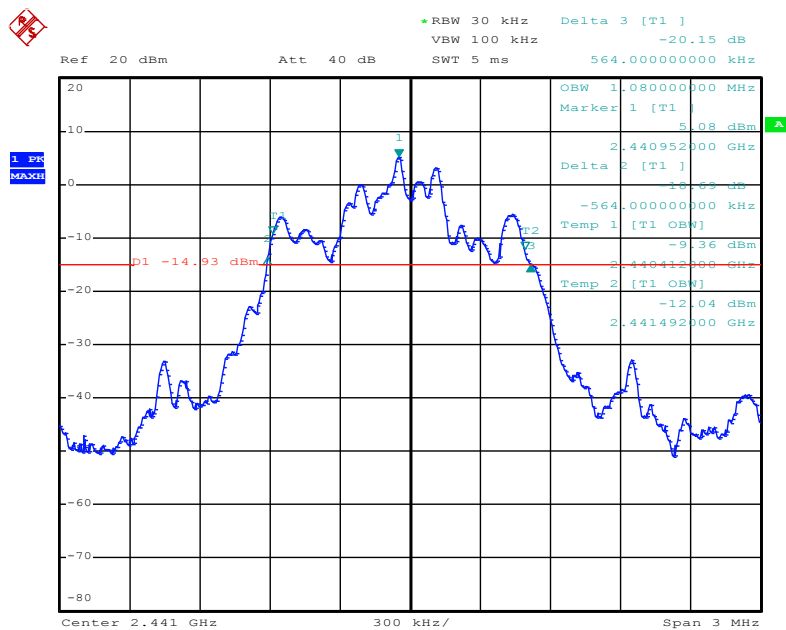


8DPSK



GFSK

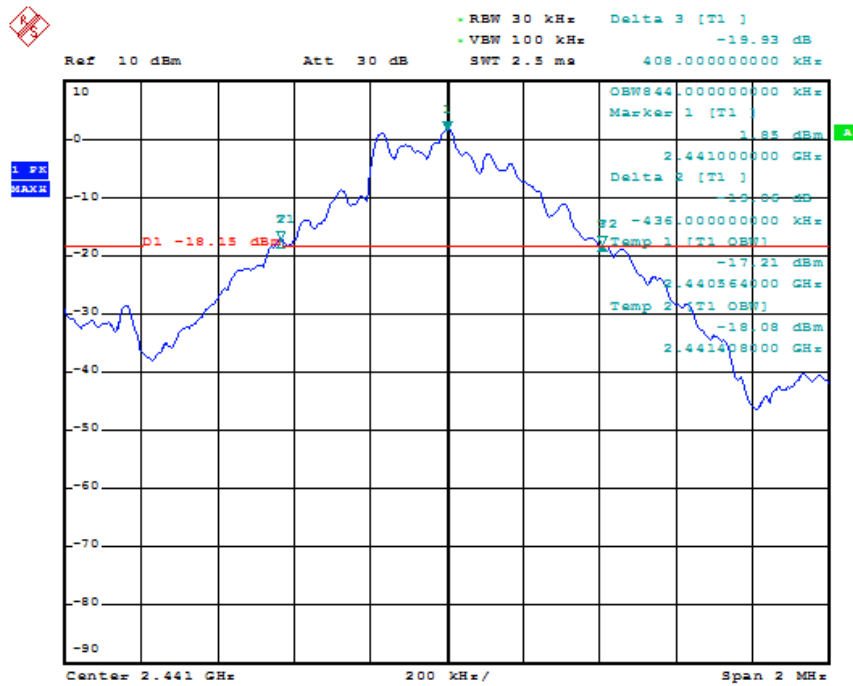
Figure 11: 20dB Bandwidth, Mode B (2441MHz 8DPSK and GFSK)



Date: 10.JAN.2014 03:02:34

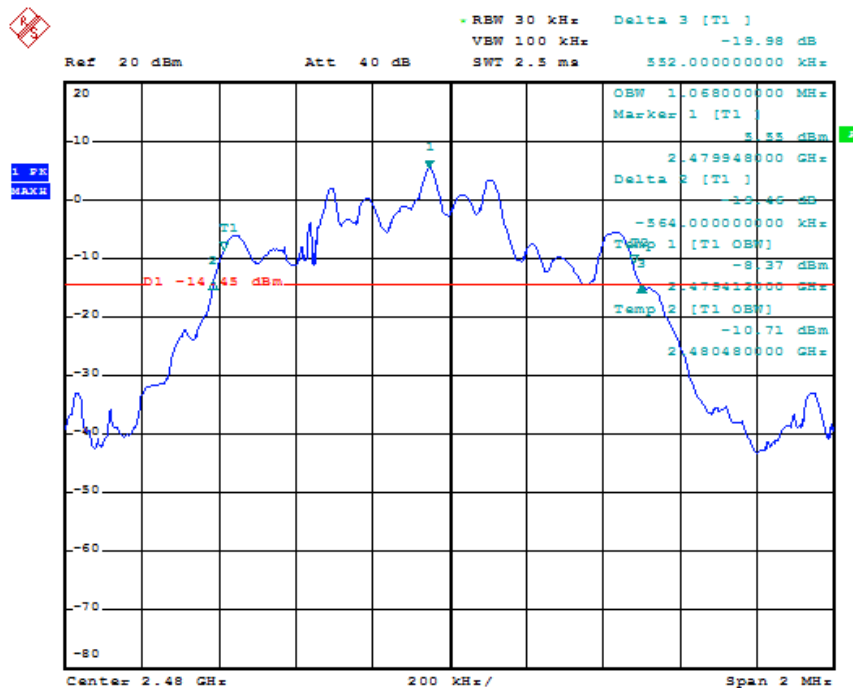
8DPSK



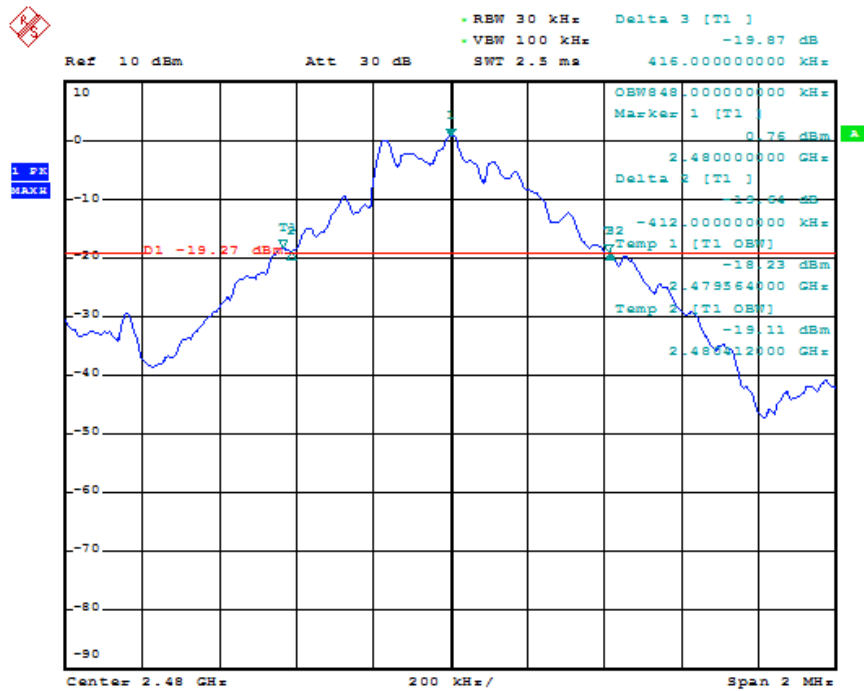


GFSK

Figure 12: 20dB Bandwidth, Mode C (2480MHz 8DPSK and GFSK)



8DPSK

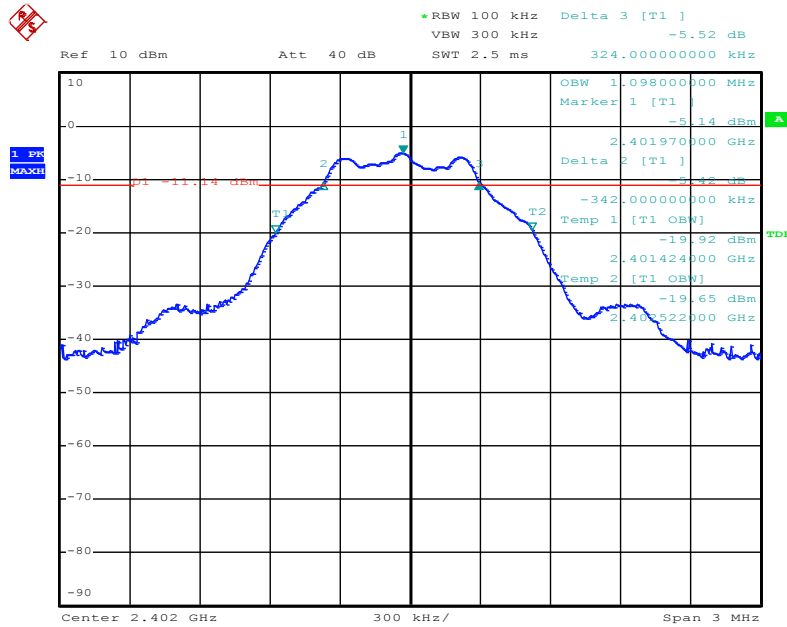


GFSK

Table 11: 6dB&99% Bandwidth (Bluetooth 4.0 BLE)

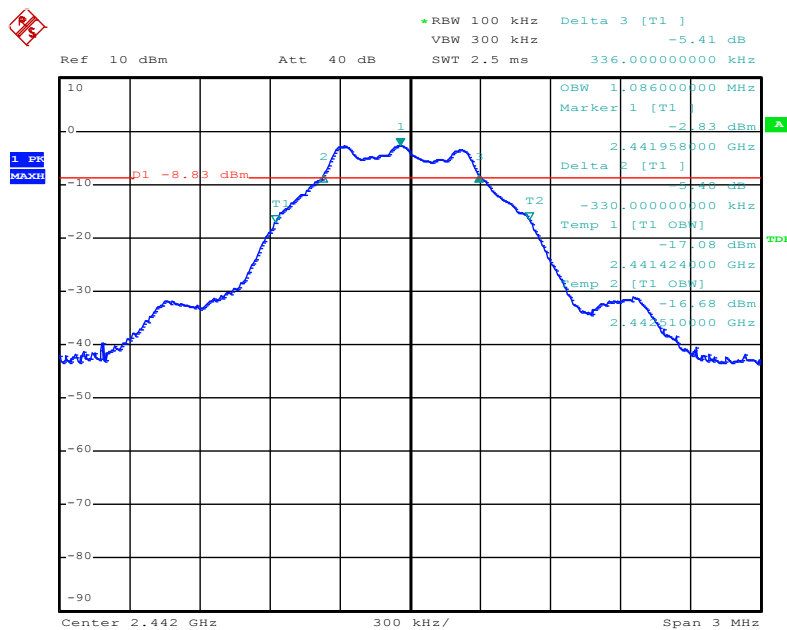
Operating Frequency [MHz]	99%dB Bandwidth[KHz]	6dB Bandwidth[KHz] limit 500KHz
2402	1098	666
2442	1086	666
2480	1086	672

Figure 13: 6dB &99%Bandwidth, Mode G



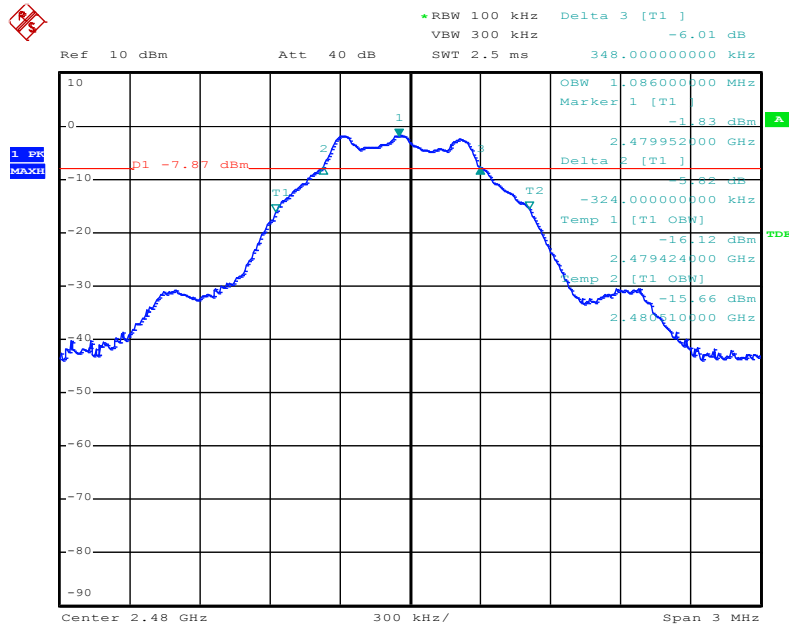
Date: 1.JAN.2000 04:47:37

Figure 14: 6dB &99%Bandwidth, Mode H



Date: 1.JAN.2000 05:13:56

Figure 15: 6dB & 99%Bandwidth, Mode I



Date: 1.JAN.2000 05:37:09

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#### **5.1.4 Number of Hopping Frequencies, FCC 15.247(a)(1)(iii) and RSS-210 A8.1(d)**

**RESULT:**

**PASS**

Date of testing: 2013-12-19

Ambient temperature: 22.3°C

Relative humidity: 40.1%

Atmospheric pressure: 101.7hPa

Requirements:

Frequency hopping systems operating in the 2400-2483.5MHz band shall use at least 15 channels.

Test procedure:

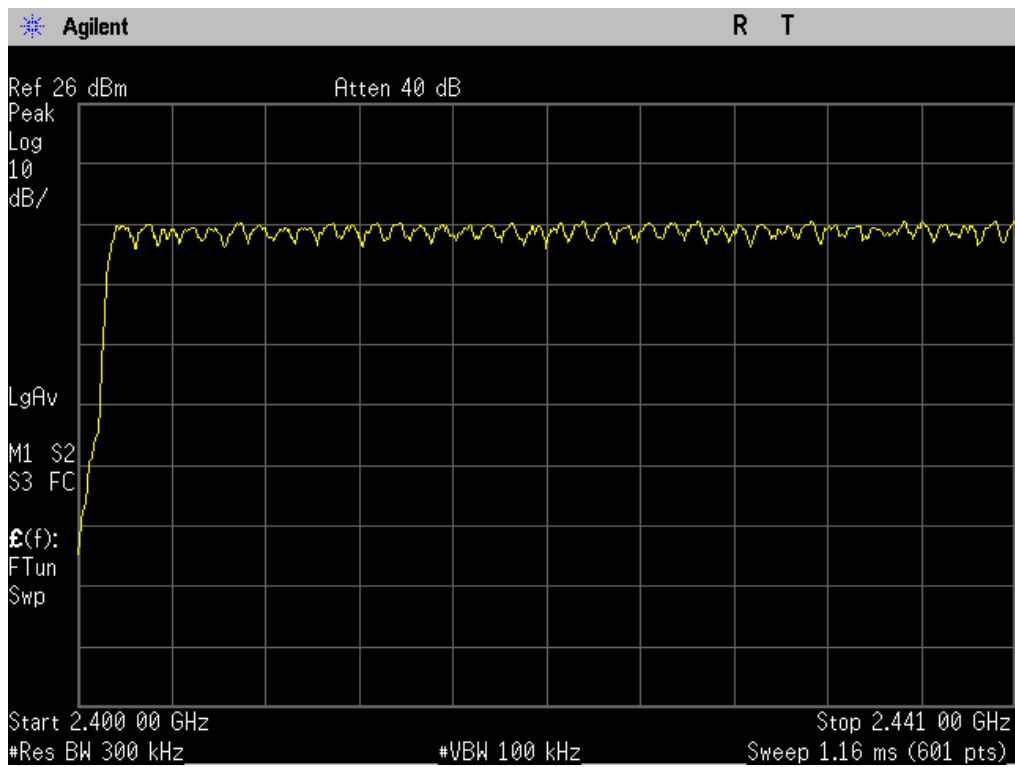
ANSI C63.4-2009 and Public Notice DA 00-705.

A spectrum analyzer was connected to the antenna port of the EUT. The analyzer resolution bandwidth was set to 300kHz and video bandwidth was set to 1MHz. The spectrum was broken in three plots to show all the hopping frequencies.

**Table 12: Number of Hopping Frequencies**

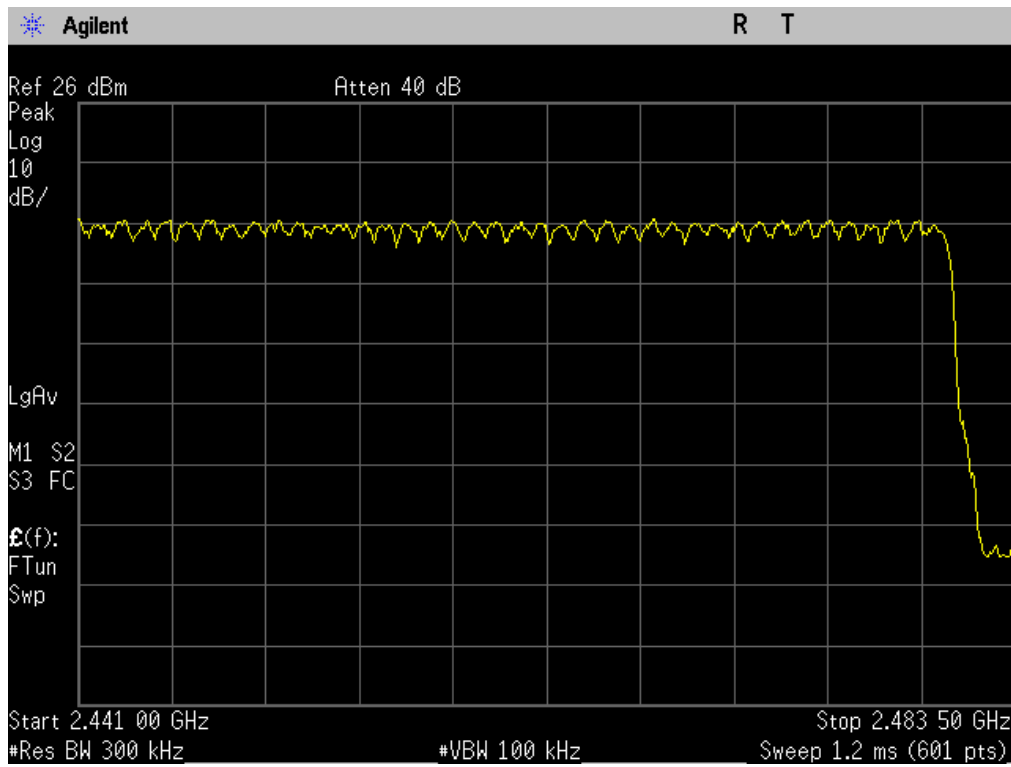
Number of Hopping Frequencies	Limit	BDR AND EDR
79	15	
Number of Hopping Frequencies	Limit	BLE
40	15	

**Figure 16: Hopping Frequencies BDR and EDR**



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### **5.1.5 Average Time of Occupancy, FCC 15.247(a)(1)(iii) and RSS-210 A8.1(d)**

**RESULT:**

**PASS**

Date of testing: 2014-1-10

Ambient temperature: 22.3°C

Relative humidity: 40.1%

Atmospheric pressure: 101.7hPa

Requirements:

For frequency hopping systems operating in the 2400-2483.5MHz band, the average time of occupancy on any channel shall not be greater than 0.4s within a period of 0.4s multiplied by the number of hopping channels employed.

Test procedure:

ANSI C63.4-2009 and Public Notice DA 00-705.

A spectrum analyzer was connected to the antenna port of the EUT. The analyzer resolution bandwidth and video bandwidth were set to 1MHz. The average time of occupancy was obtained by measuring first the dwell time of a single packet with the Delta Marker function using a zero span centered on a hopping channel and by counting then the number of hops per channel in a 31.6s period (0.4s times the number of hopping channels).

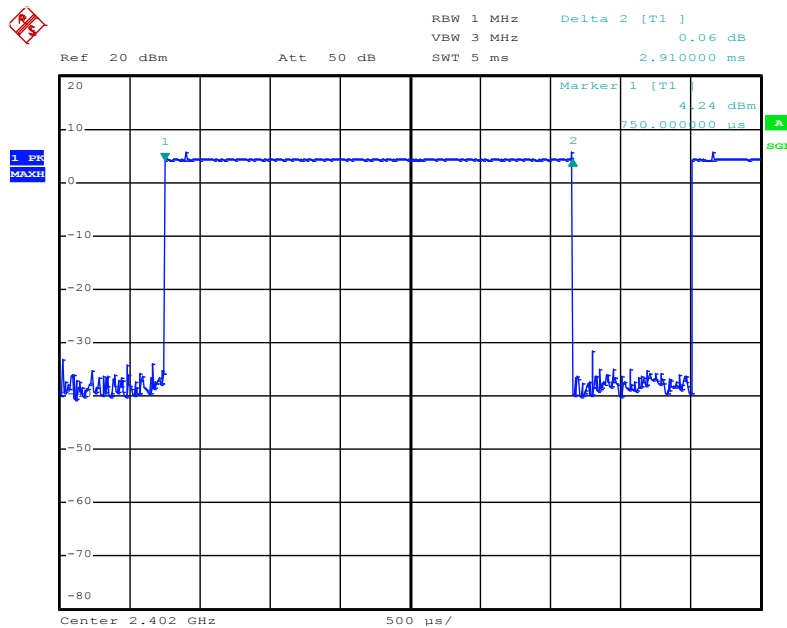


**Table 13: Average Time of Occupancy**

Channel	Packet Type	Packet Duration [ms]	Number of Hops per Channel in a 31.6s Period	Average Time of Occupancy [ms]	Limit [ms]
Low	1M-DH5	2.91	106.81	310.81	400
Mid	1M-DH5	2.91	106.81	310.81	400
High	1M-DH5	2.91	106.81	310.81	400

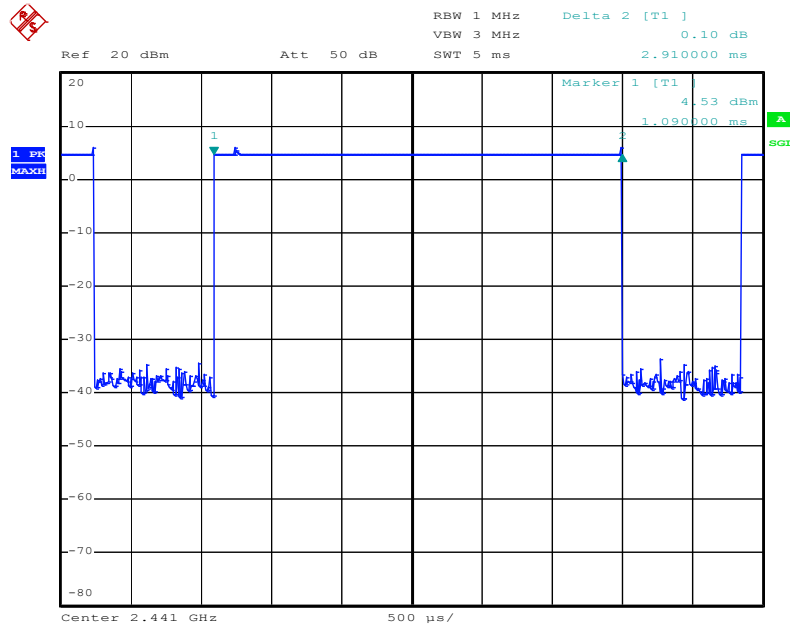
Notes: Average time of occupancy = Packet duration \* Number of hops per channel in a 31.6s period

**Figure 17: Dwell Time, Mode (Hopping), 1M-DH5, Low channel**



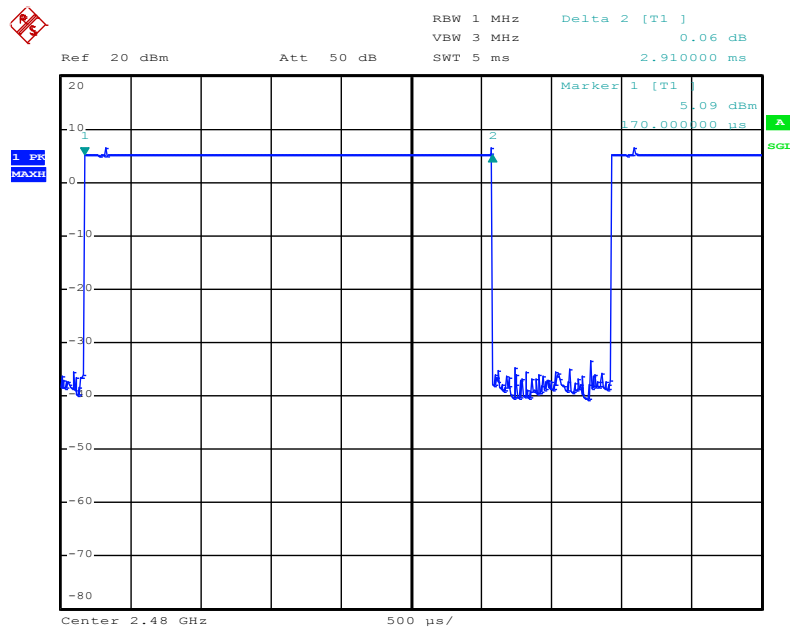
Date: 10.JAN.2014 04:15:51

Figure 18: Dwell Time, Mode (Hopping), 1M-DH5, Mid channel



Date: 10.JAN.2014 04:14:59

Figure 19: Dwell Time, Mode (Hopping), 1M-DH5, High channel



Date: 10.JAN.2014 04:13:47

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### **5.1.6 Power Spectral Density (PSD), FCC 15.247(e) and RSS-210 A8.2**

**RESULT: PASS**

Date of testing: 2013-12-19

Ambient temperature: 22.3°C

Relative humidity: 40.1%

Atmospheric pressure: 101.7hPa

#### Requirements:

According to FCC section 15.247(e) and RSS-A8.2(b), the same method of determining the conducted output power shall be used to determine the power spectral density. If a peak output power is measured, then a peak power spectral density measurement is required. If an average output power is measured, then an average power spectral density measurement should be used.

#### Test procedure:

KDB 558074 D01 DTS Meas Guidance v03

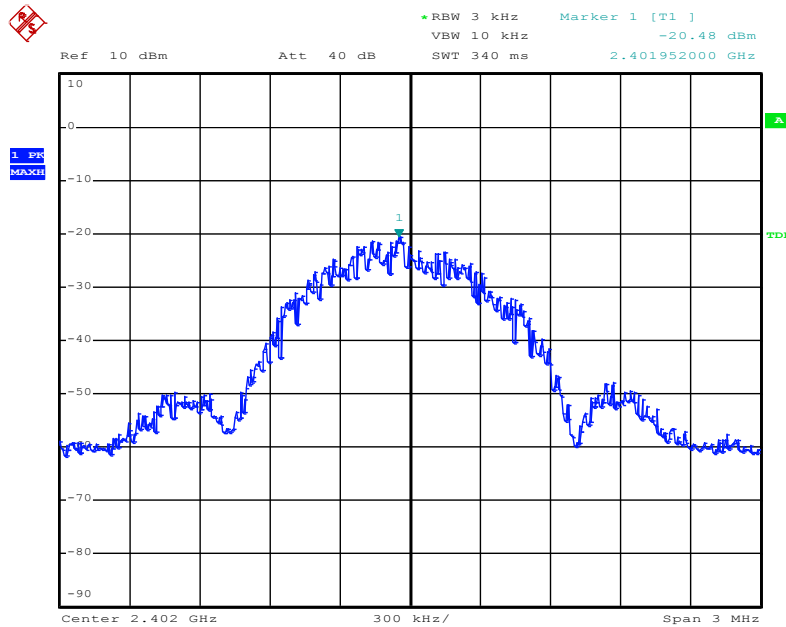
A spectrum analyzer was connected to the antenna port of the EUT. The analyzer resolution bandwidth was set to 3kHz.

The final measurement takes into account the loss generated by all the involved cables.

Table 14: Power spectral density

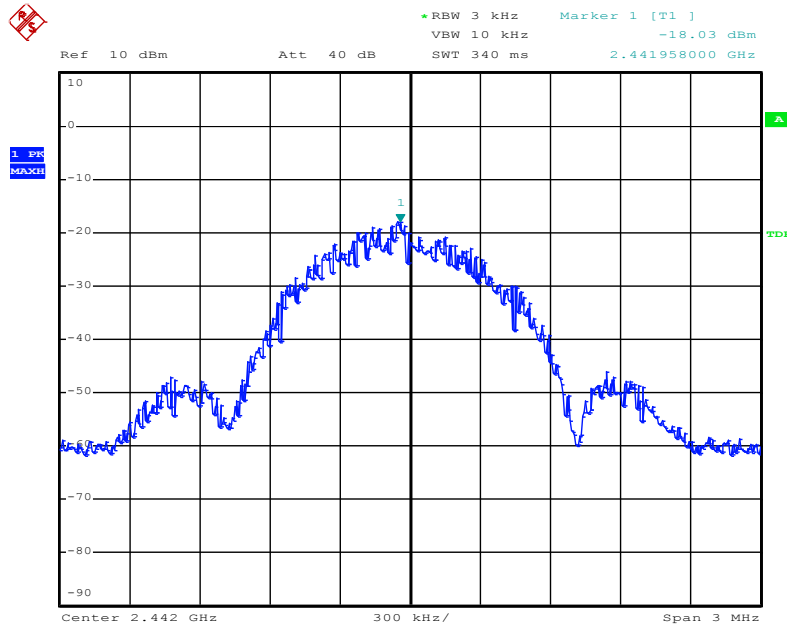
Frequency [MHz]	PSD [dBm/3KHz]	Limit [dBm/3kHz]
Low	-20.48	8
Middle	-18.03	8
High	-17.16	8

Figure 20: Power spectral density, Mode G



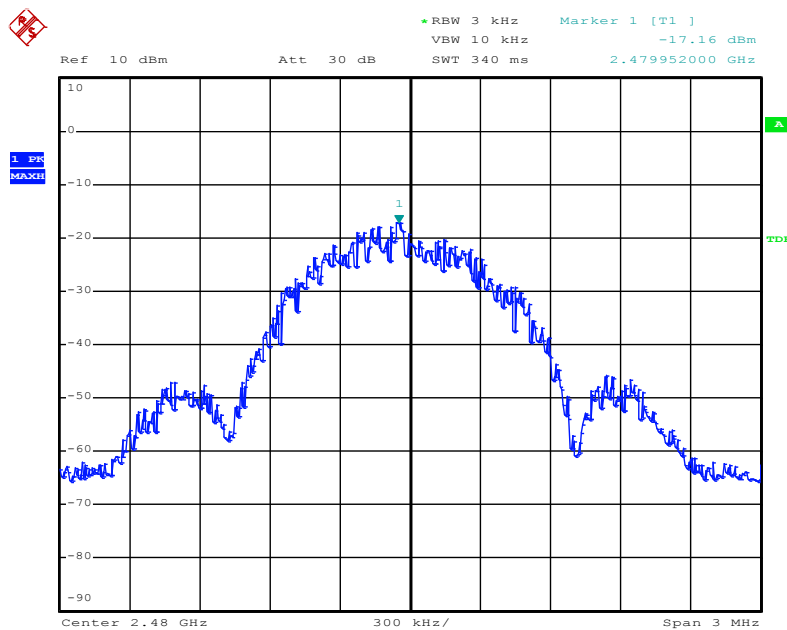
Date: 1.JAN.2000 06:08:15

Figure 21: Power spectral density, Mode H



Date: 1.JAN.2000 07:21:01

Figure 22: Power spectral density, Mode I



Date: 1.JAN.2000 05:38:01

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### **5.1.7 Conducted Spurious Emission, FCC 15.247(d) and RSS-210 A8.5**

**RESULT: PASS**

Date of testing: 2013-12-19

Ambient temperature: 22.3°C

Relative humidity: 40.1%

Atmospheric pressure: 101.7hPa

#### Requirements:

In any 100kHz bandwidth outside the frequency band, the RF power shall be at least 20dB below that of the maximum in-band 100kHz emission.

#### Test procedure:

ANSI C63.10-2009, RSS-Gen 4.9 and KDB 558074 D01 DTS Meas Guidance v03

Public Notice DA 00-705.

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A spectrum analyzer was connected to the antenna port of the EUT. The analyzer resolution bandwidth was set to 100kHz. For each channel investigated, the in-band and out-of-band emission measurements were performed. The out-of-band emissions were measured from 30MHz to 25GHz (10<sup>th</sup> harmonics).

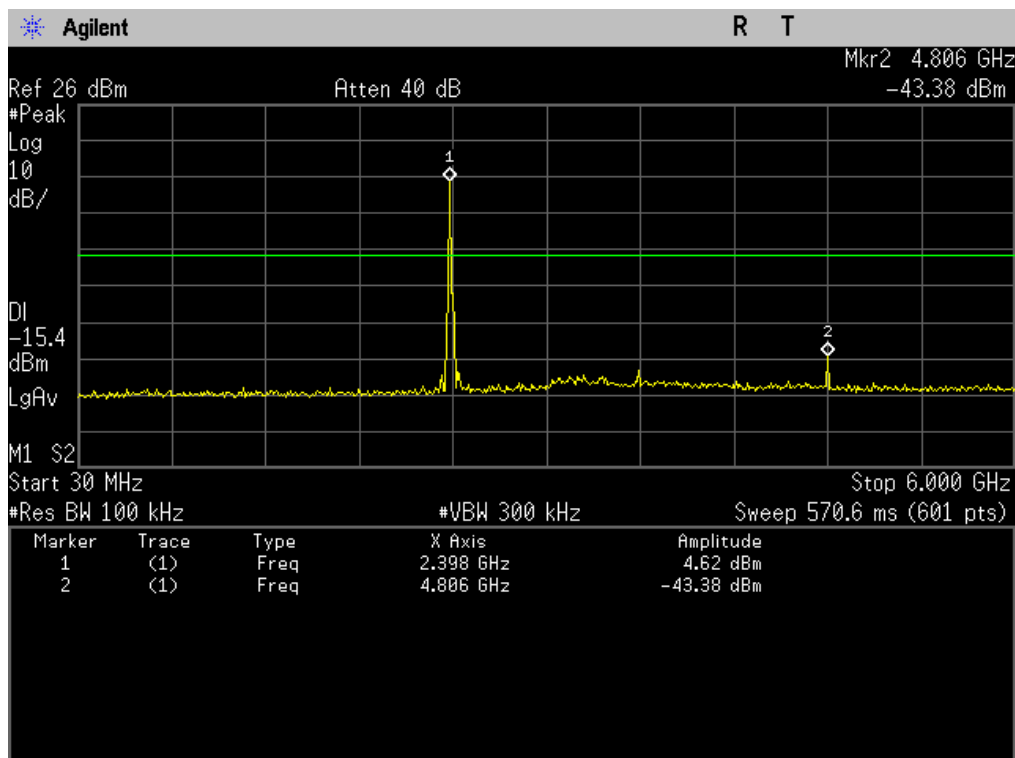
The final measurement takes into account the loss generated by all the involved cables.

**Table 15: Conducted Spurious Emission, Mode A**

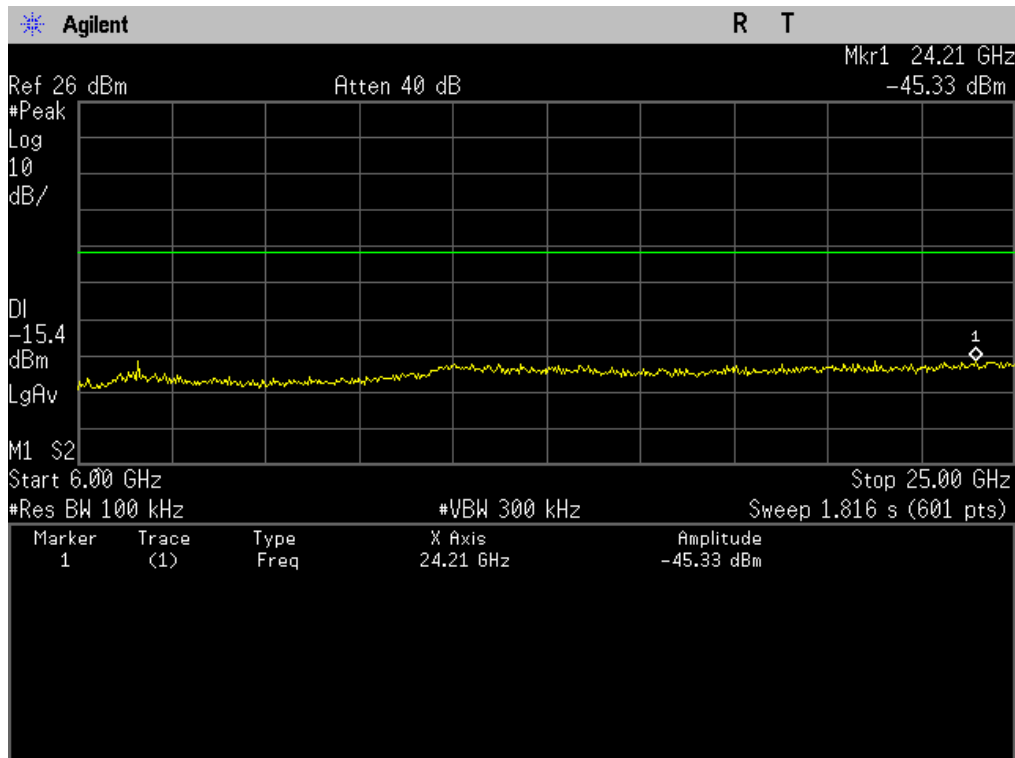
Frequency [MHz]	Reading [dBm]	Cable Loss [dBm]	Emission Level [dBm]	Limit [dBm]	Margin [dB]
24210	-45.33	0.5	-44.83	-15.4	29.43
4806	-43.38	0.5	-42.88	-15.4	27.48
2398	4.62	0.5	5.12	N/A	N/A

Notes: Limit = Reading of fundamental + Correction factor – 20dB

**Figure 23: Conducted Spurious Emission, 30MHz – 6GHz, Mode A**



**Figure 24: Conducted Spurious Emission, 6 – 26GHz, Mode A**



**Table 16: Conducted Spurious Emission, Mode B**

Frequency [MHz]	Reading [dBm]	Cable Loss [dBm]	Emission Level [dBm]	Limit [dBm]	Margin [dB]
7330	-44.80	0.5	-44.30	-15	29.3
4886	-43.74	0.5	-43.24	-15	28.24
2438	4.96	0.5	5.46	NA	N/A

Notes: Limit = Reading of fundamental + Correction factor – 20dB



Figure 25: Conducted Spurious Emission, 30MHz – 6GHz, Mode B

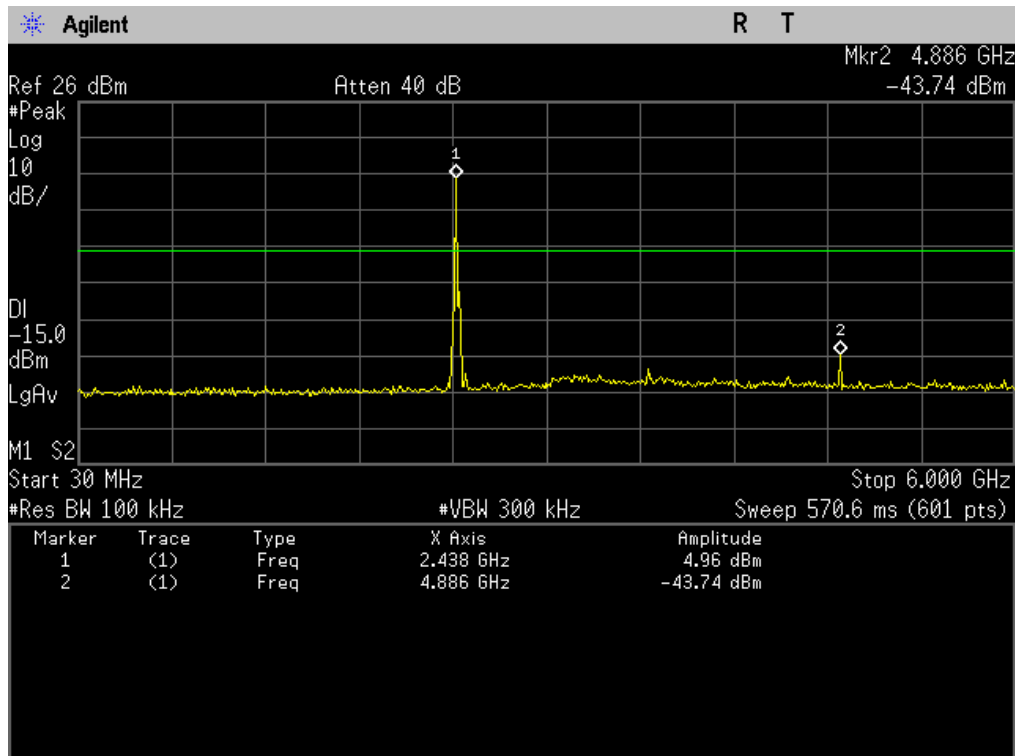
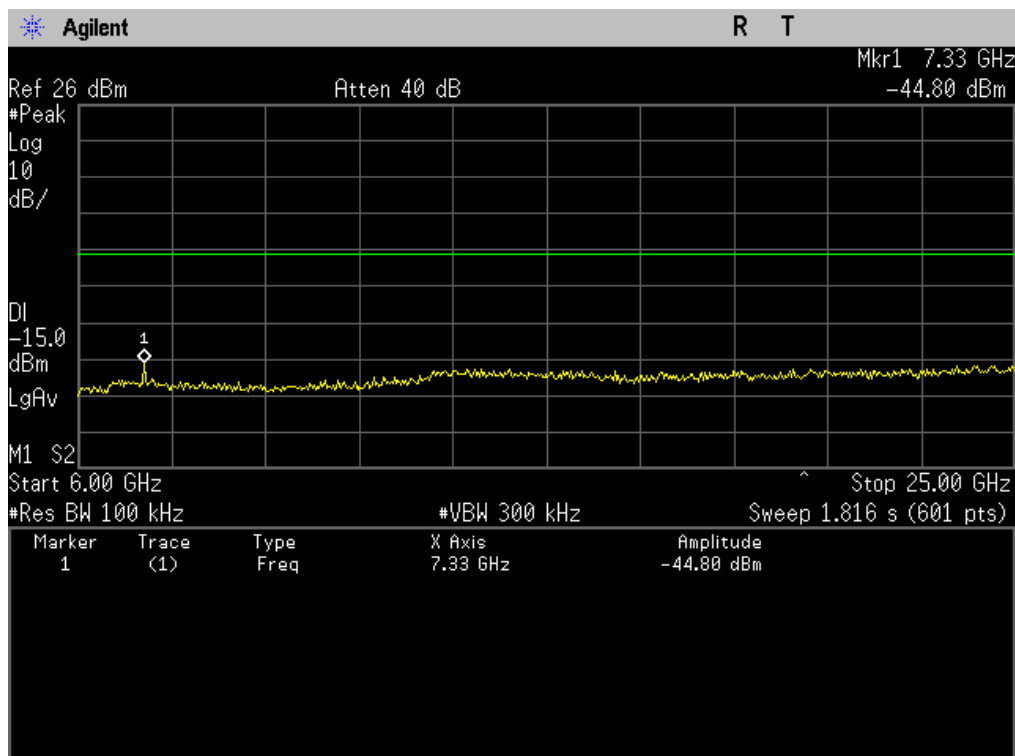


Figure 26: Conducted Spurious Emission, 6 – 26GHz, Mode B

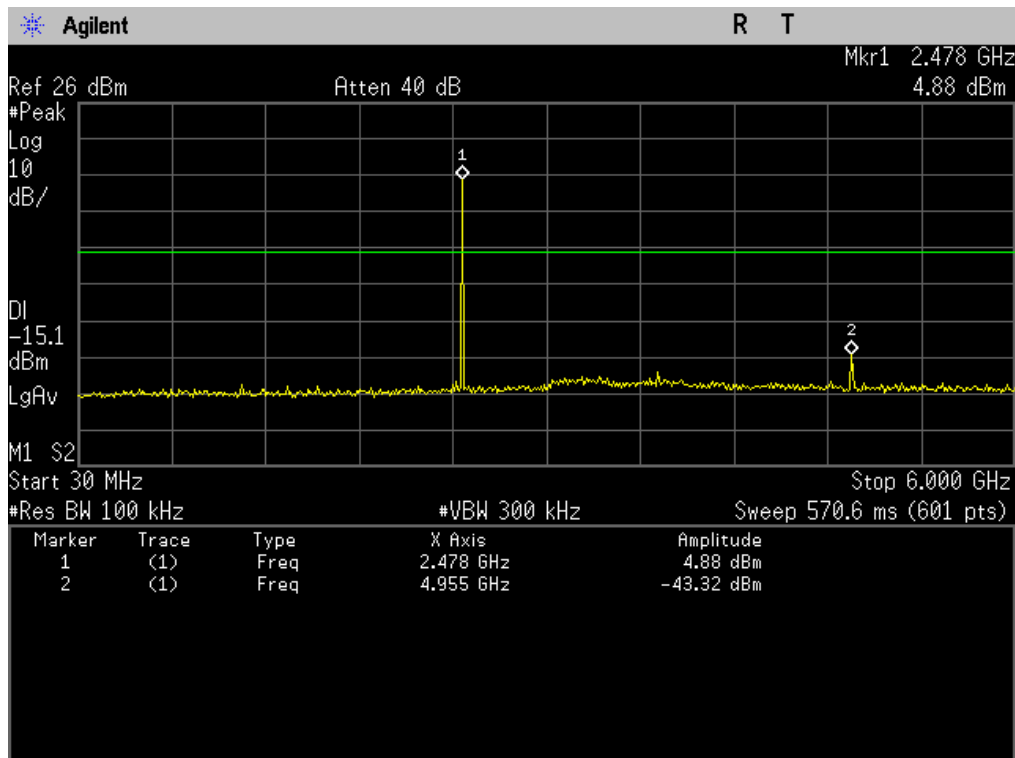


**Table 17: Conducted Spurious Emission, Mode C**

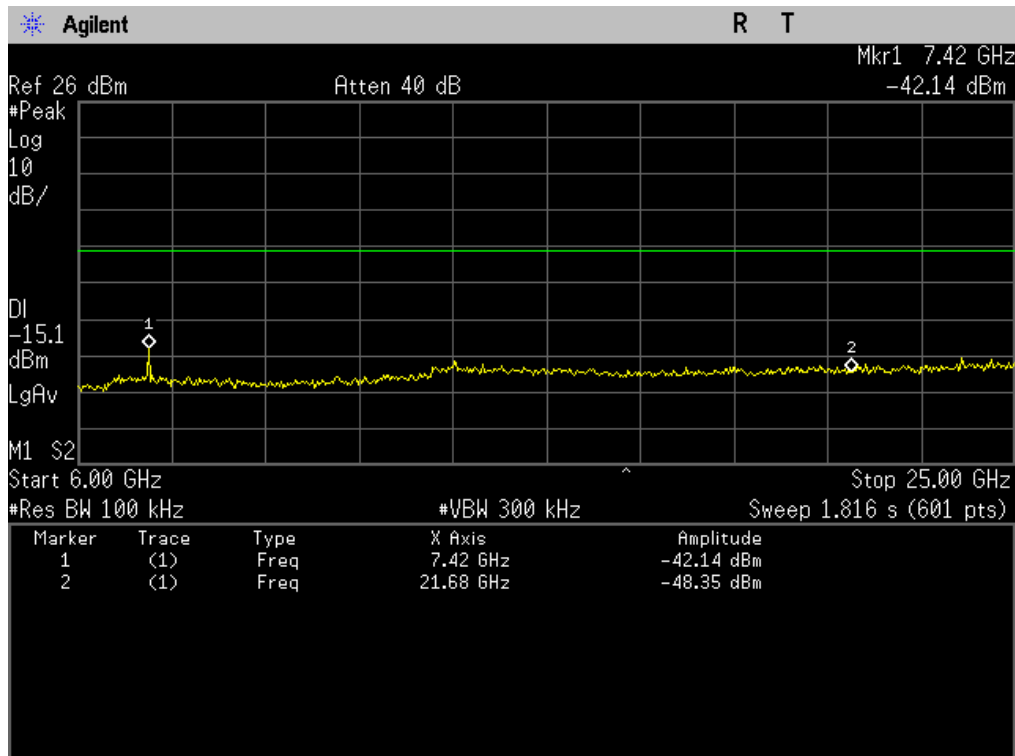
Frequency [MHz]	Reading [dBm]	Cable Loss [dBm]	Emission Level [dBm]	Limit [dBm]	Margin [dB]
7420	-42.14	0.5	-41.64	-15.1	26.54
4955	-43.32	0.5	-42.82	-15.1	27.72
2478	4.88	0.5	5.38	N/A	N/A

Notes: Limit = Reading of fundamental + Correction factor – 20dB

**Figure 27: Conducted Spurious Emission, 30MHz – 6GHz, Mode C**



**Figure 28: Conducted Spurious Emission, 6 – 26GHz, Mode C**

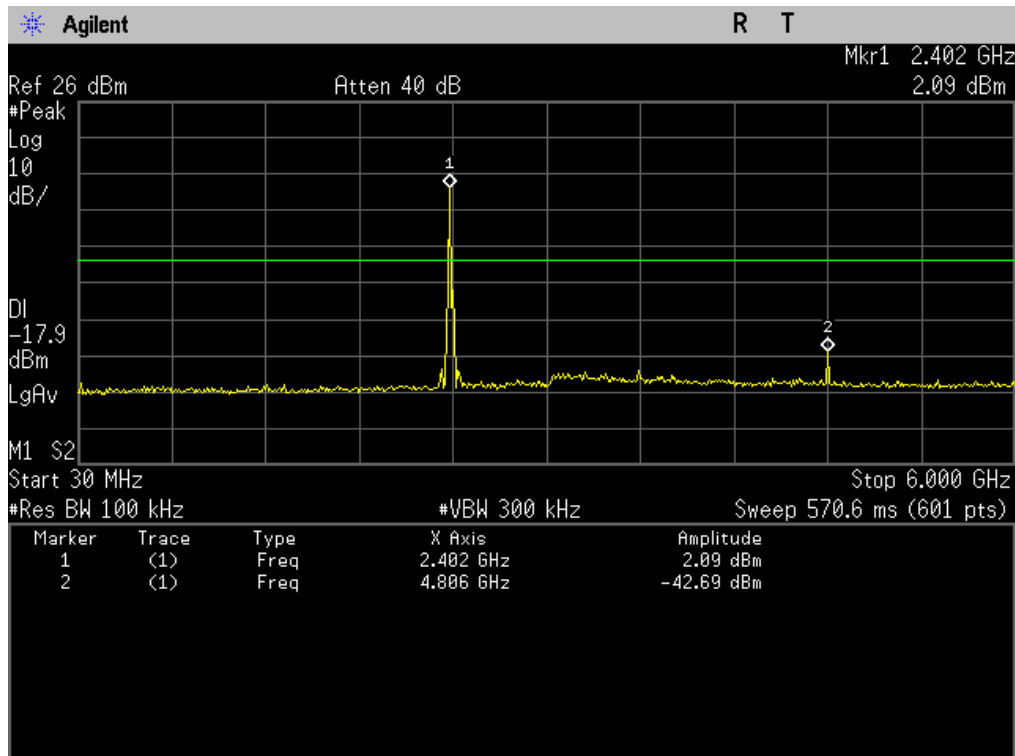


**Table 18: Conducted Spurious Emission, Mode G**

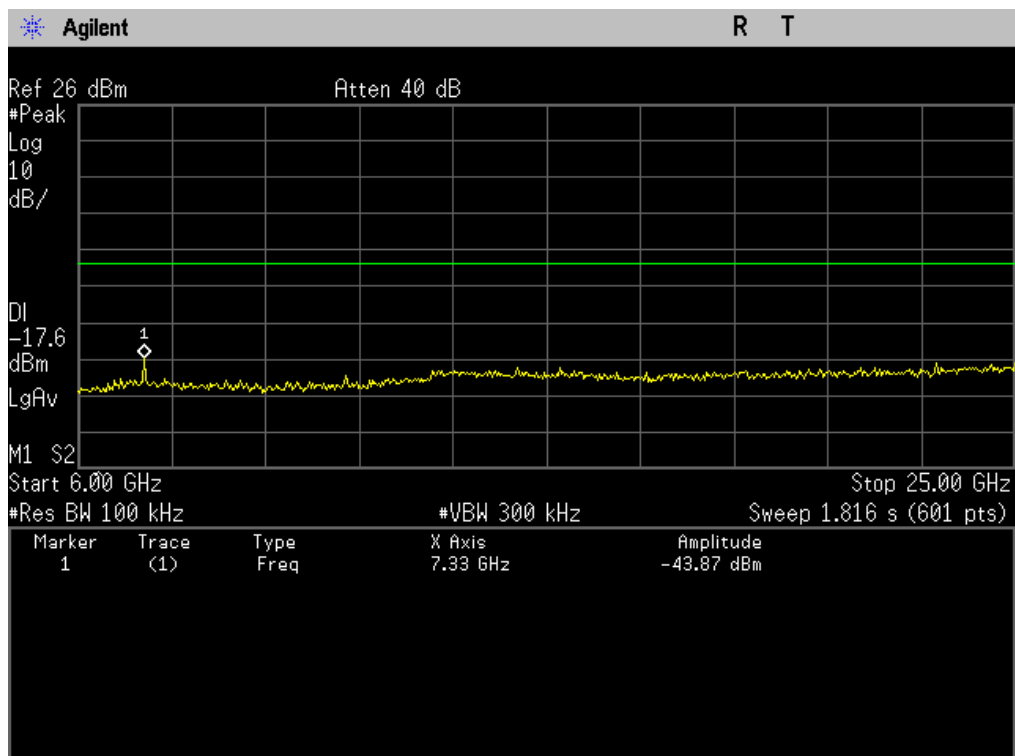
Frequency [MHz]	Reading [dBm]	Cable Loss [dBm]	Emission Level [dBm]	Limit [dBm]	Margin [dB]
7330	-43.87	0.5	-43.37	-17.9	25.47
4806	-42.69	0.5	-42.19	-17.9	24.29
2402	2.09	0.5	2.59	N/A	N/A

Notes: Limit = Reading of fundamental + Correction factor – 20dB

**Figure 29: Conducted Spurious Emission, 30MHz – 6GHz, Mode G**



**Figure 30: Conducted Spurious Emission, 6 – 26GHz, Mode G**

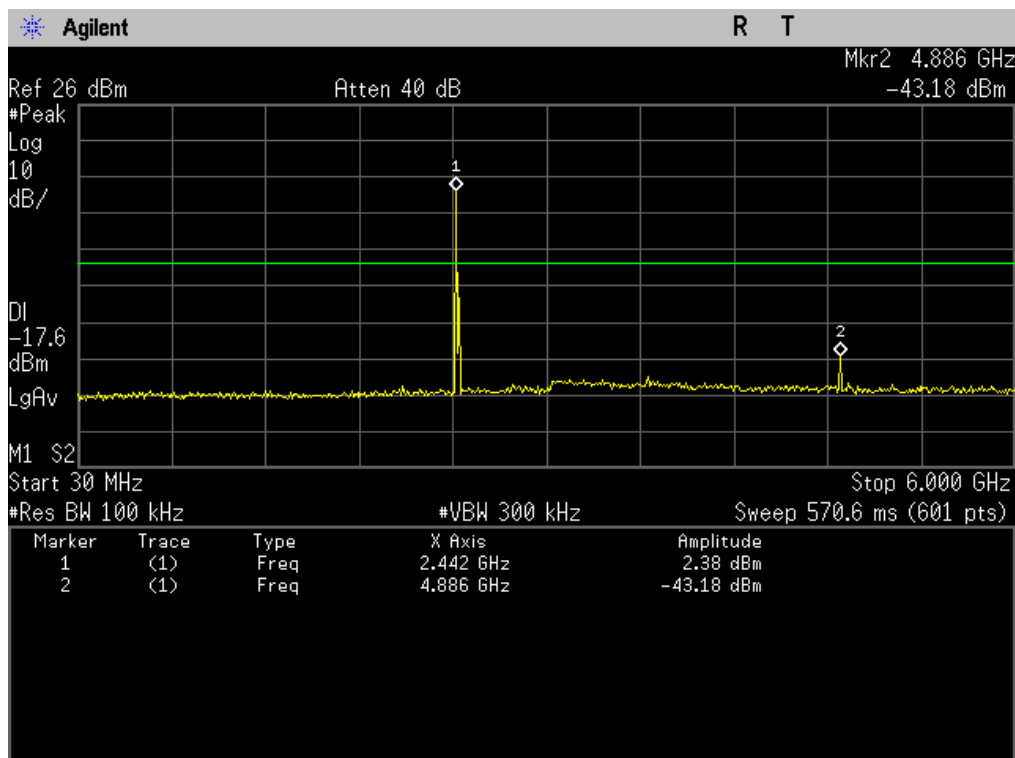


**Table 19: Conducted Spurious Emission, Mode H**

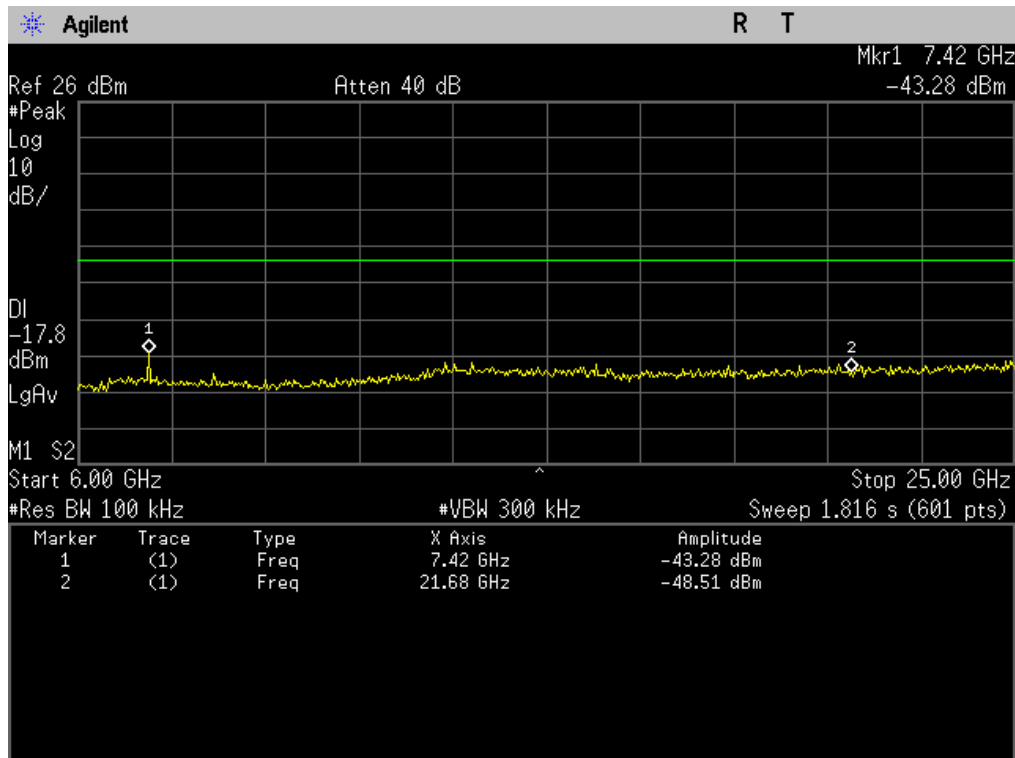
Frequency [MHz]	Reading [dBm]	Cable Loss [dBm]	Emission Level [dBm]	Limit [dBm]	Margin [dB]
7420	-43.28	0.5	-42.78	-17.6	25.18
4886	-43.18	0.5	-42.68	-17.6	25.08
2442	2.38	0.5	2.88	NA	N/A

Notes: Limit = Reading of fundamental + Correction factor – 20dB

**Figure 31: Conducted Spurious Emission, 30MHz – 6GHz, Mode H**



**Figure 32: Conducted Spurious Emission, 6 – 26GHz, Mode H**



**Table 20: Conducted Spurious Emission, Mode I**

Frequency [MHz]	Reading [dBm]	Cable Loss [dBm]	Emission Level [dBm]	Limit [dBm]	Margin [dB]
7420	-43.28	0.5	-42.88	-17.8	24.98
4955	-43.75	0.5	-43.25	-17.8	25.45
2480	2.24	0.5	2.74	N/A	N/A

Notes: Limit = Reading of fundamental + Correction factor – 20dB

Figure 33: Conducted Spurious Emission, 30MHz – 6GHz, Mode I

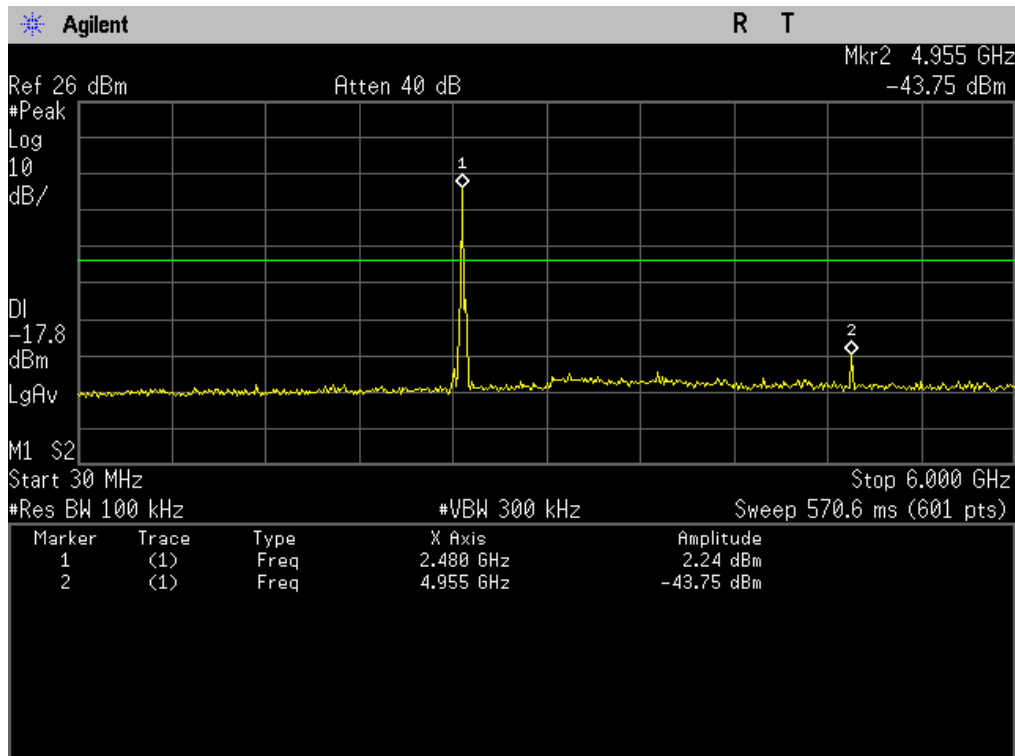
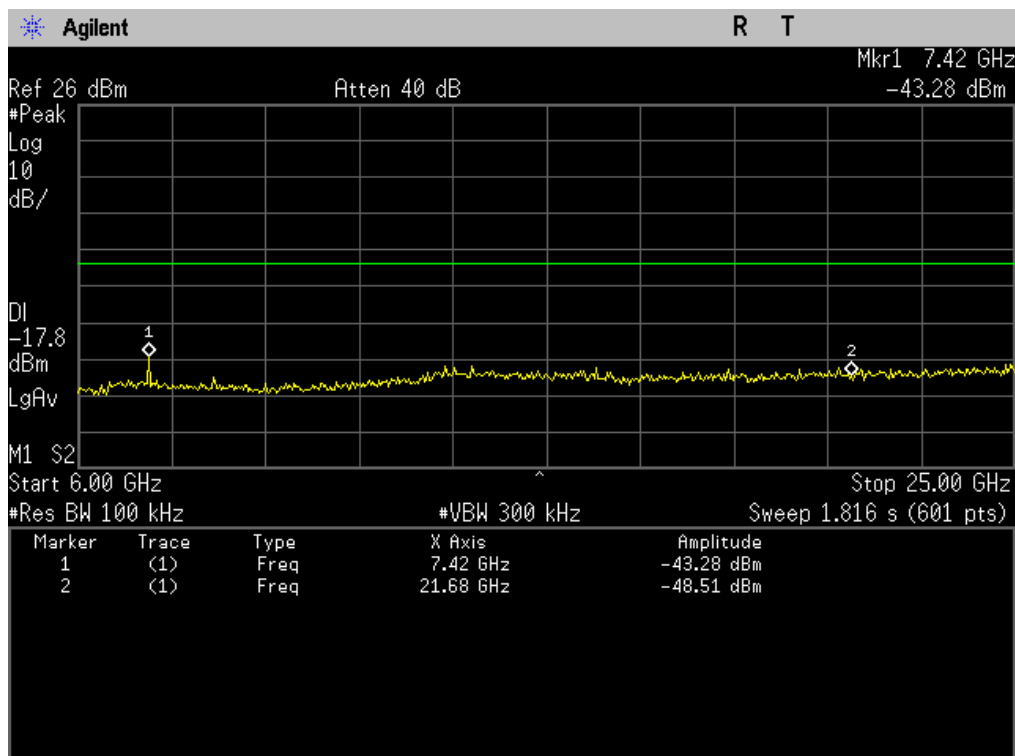


Figure 34: Conducted Spurious Emission, 6 – 26GHz, Mode I



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### **5.1.8 Band Edge Compliance of RF Conducted Emission, FCC 15.247(d) and RSS-210 A8.5**

**RESULT:**

**PASS**

Date of testing: 2013-4-12

Ambient temperature: 20°C

Relative humidity: 39.6%

Atmospheric pressure: 101.5hPa

Requirements:

In any 100kHz bandwidth outside the frequency band, the RF power shall be at least 20dB below that of the maximum in-band 100kHz emission.

Test procedure:

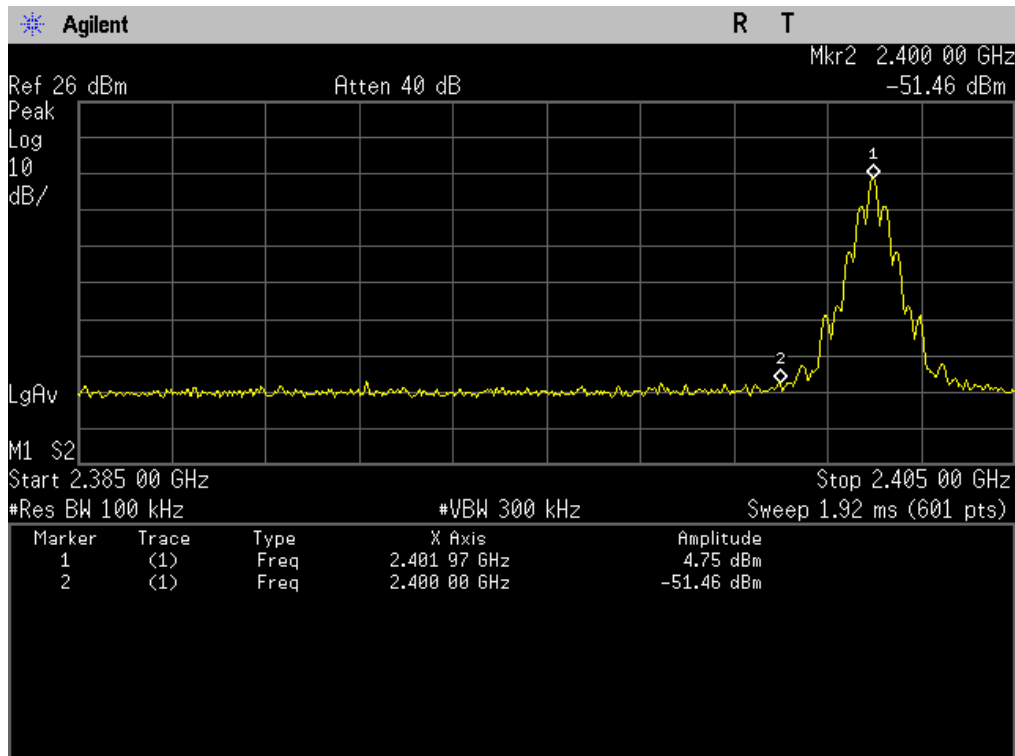
ANSI C63.10-2009 and KDB 558074 D01 DTS Meas Guidance v03 and Public Notice DA 00-705.

A spectrum analyzer was connected to the antenna port of the EUT. The analyzer resolution bandwidth was set to 100kHz and video bandwidth was set to 300kHz. Allow the trace to stabilize. Set the marker on the emission at the band edge, or on the highest modulation product outside of the band, if this level is greater than that at the band edge. Enable the marker-delta function, and then use the marker-to-peak function to move the marker to the peak of the in-band emission.

The final measurement takes into account the loss generated by all the involved cables.



**Figure 35: Lower Band Edge Conducted Mode A**



**Figure 36: Upper Band Edge Conducted Mode C**

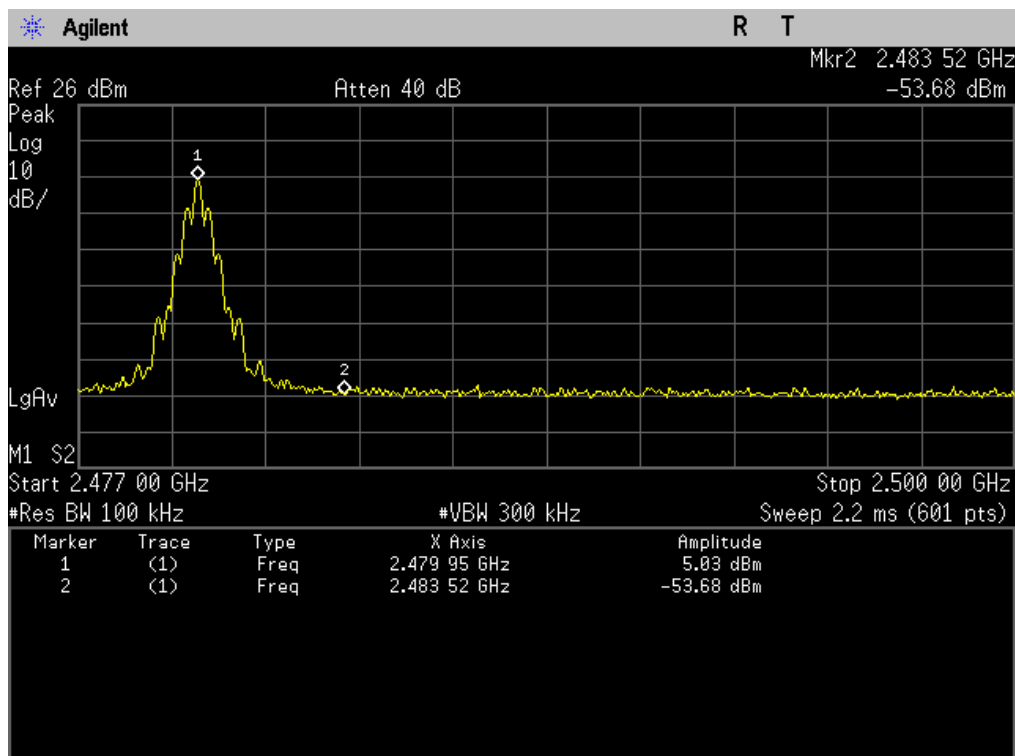


Figure 37: Lower Band Edge Conducted Mode A(Hopping)

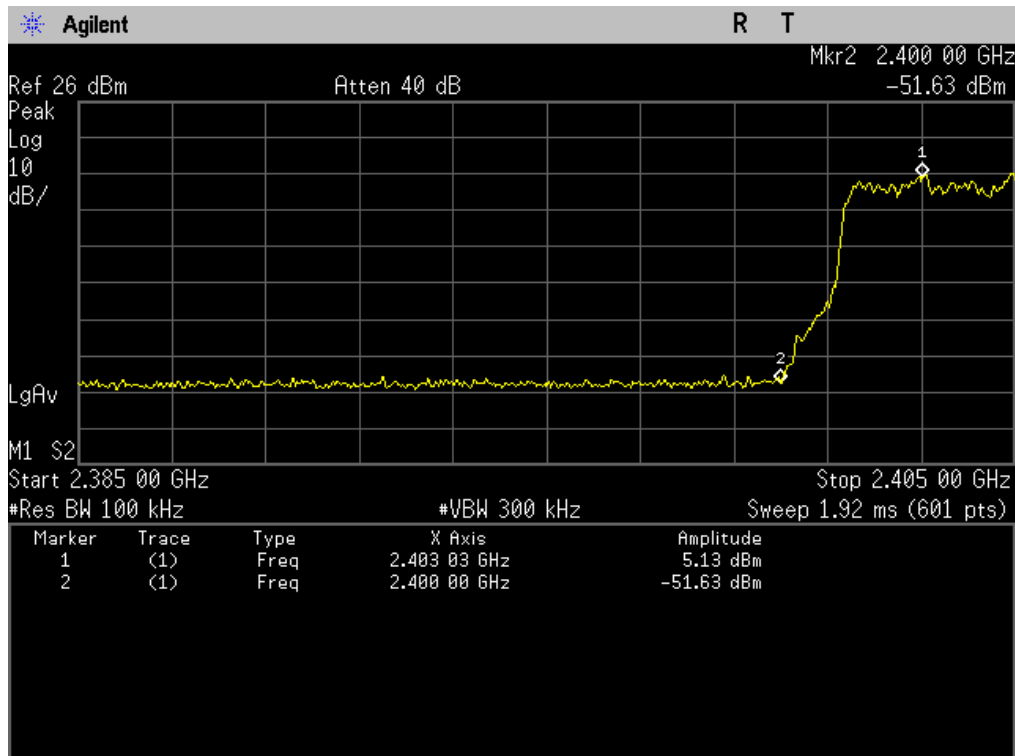


Figure 38: Lower Band Edge Conducted Mode C(Hopping)

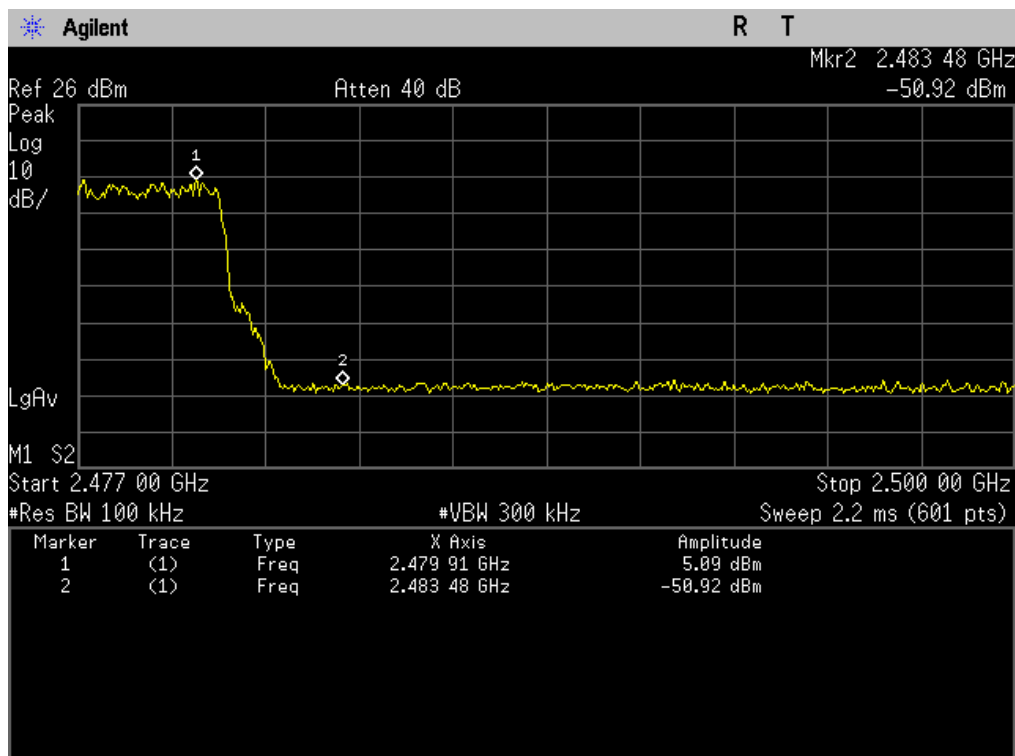
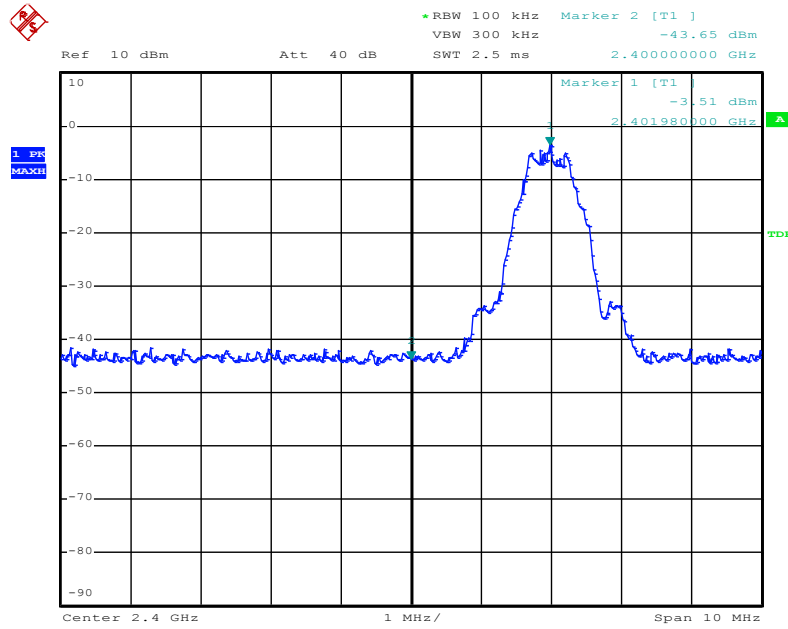
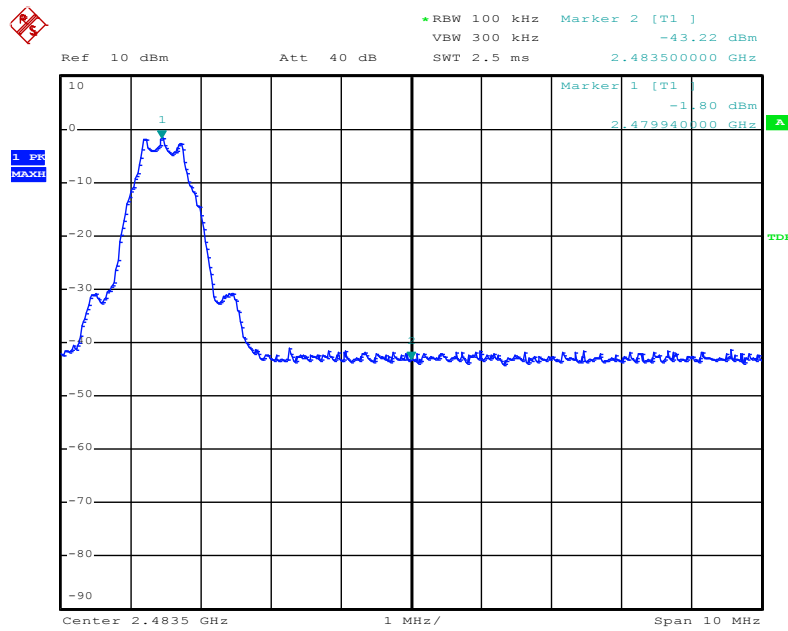


Figure 39: Lower Band Edge Conducted Mode G



Date: 1.JAN.2000 06:03:23

Figure 40: Lower Band Edge Conducted Mode I



Date: 1.JAN.2000 06:01:42

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## **6. Test Results of Radiated Measurements**

### **6.1 Transmitter Parameters**

#### **6.1.1 Band Edge Radiated Emission, FCC 15.205, FCC 15.209, FCC 15.247(d), RSS-210 2.2, RSS-210 2.6 and RSS-210 A8.5**

**RESULT:**

**Pass**

Date of testing: 2014-1-12

Ambient temperature: 22.3°C

Relative humidity: 40.1%

Atmospheric pressure: 101.7hPa

Measurement distance: 3m

Kind of test site: Semi Anechoic Chamber

Requirements:

Radiated emissions which fall in the restricted bands, as defined in FCC 15.205(a) and RSS-210 2.7 (Table 1), must comply with the radiated emission limits specified in FCC 15.209(a) and RSS-210 2.7 (Table 2 and 3).

Test procedure:

ANSI C63.10-2009, RSS-Gen 4.9 and KDB 558074 D01 DTS Meas Guidance v03  
Public Notice DA 00-705.

The EUT was placed on a nonconductive turntable 0.8m above the ground plane. Measurements were made at 3m distance. The EUT was rotated 360° and the antenna was raised and lowered from 1 to 4m in order to determine the emission's maximum level.

Measurements were taken using both horizontal and vertical antenna polarization. The rotation through the three orthogonal axes is normally not needed for equipment that is not hand-held or body-worn. The EUT was pretested in floor-standing condition and in the table position and the worst case condition was table position which was used for the final measurements.

Measurements were performed using a spectrum analyzer with a suitable span to encompass the peak of the fundamental and using the following settings: Peak: RBW & VBW = 1MHz, Average: RBW = 1MHz, VBW = 10Hz.

The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.

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**Table 21: Band Edge Radiated Emission**

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Horizontal	2390	61.435	25.993	-12.565	74	35.442	PK
2	Horizontal	2399.898	62.224	26.702	-11.776	74	35.522	PK
3	Horizontal	2402.214	81.123	45.581	N/A	N/A	35.542	PK

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Horizontal	2390	45.567	10.125	-8.433	54	35.442	AV
2	Horizontal	2399.898	45.543	10.021	-8.457	54	35.522	AV
3	Horizontal	2401.885	76.546	41.007	N/A	N/A	35.539	AV

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Vertical	2390	63.456	28.674	-10.544	74	34.782	PK
2	Vertical	2399.898	62.567	27.744	-11.433	74	34.823	PK
3	Vertical	2402.026	80.585	45.753	N/A	N/A	34.832	PK

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Vertical	2390	48.345	13.563	-5.655	54	34.782	AV
2	Vertical	2399.898	45.563	10.74	-8.437	54	34.823	AV
3	Vertical	2401.744	75.541	40.71	N/A	N/A	34.831	AV

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Horizontal	2479.848	85.548	49.362	N/A	N/A	36.186	PK
2	Horizontal	2483.5	64.378	28.161	-9.622	74	36.217	PK
3	Horizontal	2484.9	64.571	28.343	-9.429	74	36.228	PK

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Horizontal	2479.881	75.647	39.459	N/A	N/A	36.188	AV
2	Horizontal	2483.5	47.569	11.352	-6.431	54	36.217	AV
3	Horizontal	2484.9	47.654	11.426	-6.346	54	36.228	AV

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Vertical	2479.782	84.436	49.269	N/A	N/A	35.167	PK
2	Vertical	2483.5	62.435	27.252	-11.565	74	35.183	PK
3	Vertical	2484.9	62.453	27.264	-11.547	74	35.189	PK

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Vertical	2479.914	77.345	42.177	N/A	N/A	35.168	AV
2	Vertical	2483.5	48.431	13.248	-5.569	54	35.183	AV
3	Vertical	2484.9	46.345	11.156	-7.655	54	35.189	AV

**Table 22: Band Edge Radiated Emission (BLE)**

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Horizontal	2390	63.467	28.025	-10.533	74	35.442	PK
2	Horizontal	2399.898	64.356	28.834	-9.644	74	35.522	PK
3	Horizontal	2402.073	83.976	48.435	N/A	N/A	35.541	PK

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Horizontal	2390	46.567	11.125	-7.433	54	35.442	AV
2	Horizontal	2399.898	49.412	13.89	-4.588	54	35.522	AV
3	Horizontal	2402.026	71.456	35.916	N/A	N/A	35.54	AV

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Vertical	2390	63.565	28.783	-10.435	74	34.782	PK
2	Vertical	2399.898	62.456	27.633	-11.544	74	34.823	PK
3	Vertical	2402.12	83.567	48.734	N/A	N/A	34.833	PK

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Vertical	2390	46.562	11.78	-7.438	54	34.782	AV
2	Vertical	2399.898	48.562	13.739	-5.438	54	34.823	AV
3	Vertical	2402.026	71.564	36.732	N/A	N/A	34.832	AV

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Horizontal	2479.947	84.564	48.376	N/A	N/A	36.188	PK
2	Horizontal	2483.5	63.458	27.241	-10.542	74	36.217	PK
3	Horizontal	2484.9	63.427	27.199	-10.573	74	36.228	PK

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Horizontal	2479.98	74.458	38.27	N/A	N/A	36.188	AV
2	Horizontal	2483.5	49.431	13.214	-4.569	54	36.217	AV
3	Horizontal	2484.9	49.563	13.335	-4.437	54	36.228	AV

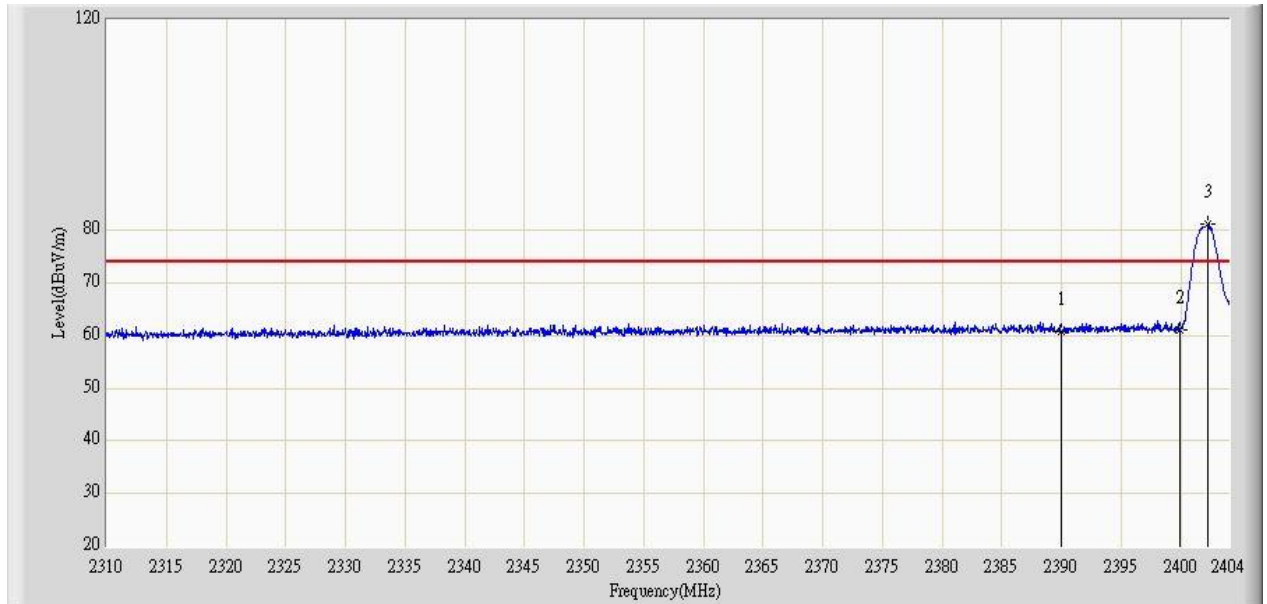
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Vertical	2479.98	83.541	48.372	N/A	N/A	35.169	PK
2	Vertical	2483.5	63.538	28.355	-10.462	74	35.183	PK
3	Vertical	2484.9	62.443	27.254	-11.557	74	35.189	PK

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Vertical	2479.98	70.345	35.176	N/A	N/A	35.169	AV
2	Vertical	2483.5	48.453	13.27	-5.547	54	35.183	AV
3	Vertical	2484.9	48.541	13.352	-5.459	54	35.189	AV

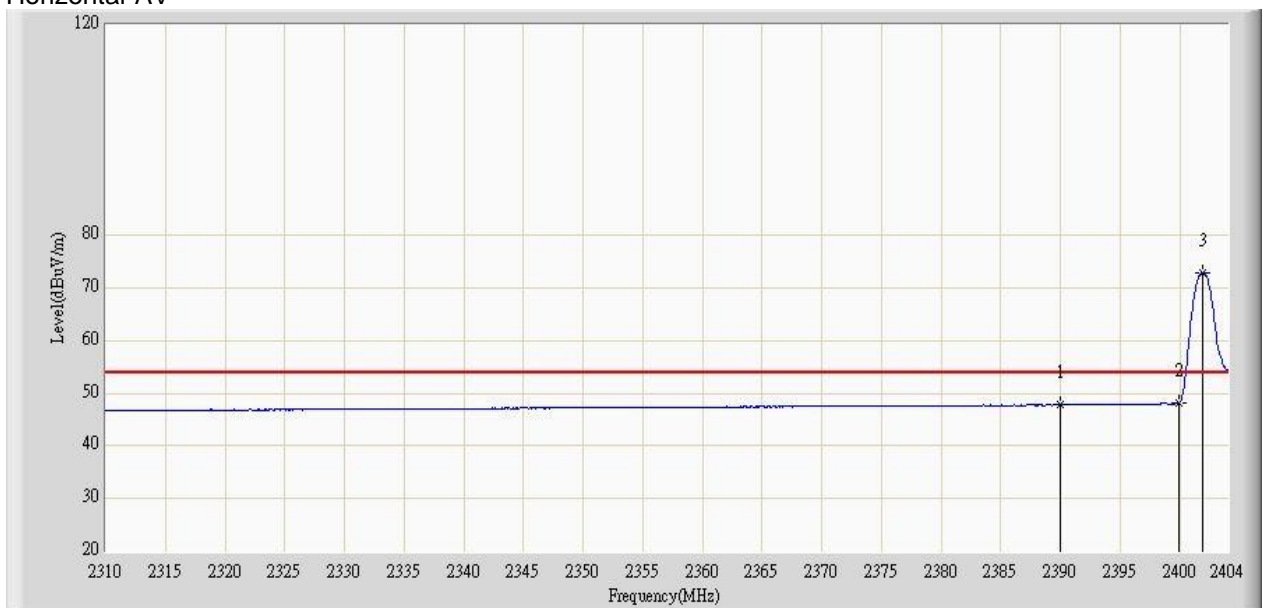
Notes: All correction factors (antenna, cable, pre-amplifier) are included in the measurement values.  
Average limit in dBuV/m is calculated as follows: Average limit = 20 x log(500uV/m).  
Peak limit in dBuV/m is calculated as follows: Peak limit = Average limit + 20dB.

**Figure 41: Band Edge Radiated Emission, Spectral Diagram, Mode A**

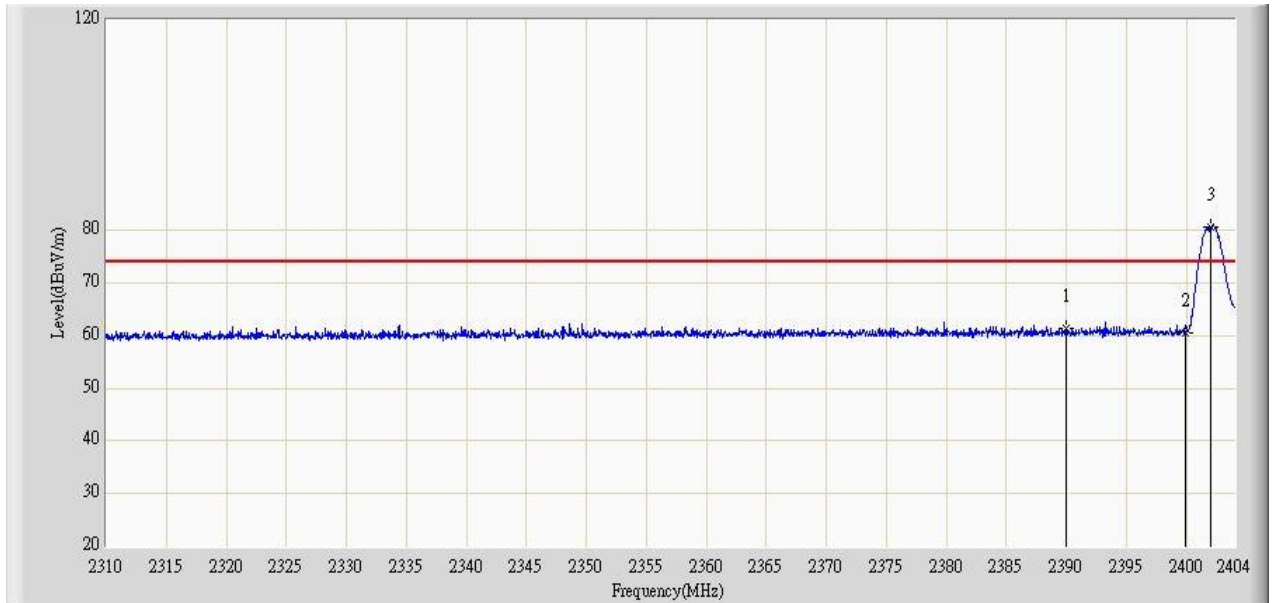
Horizontal-PK



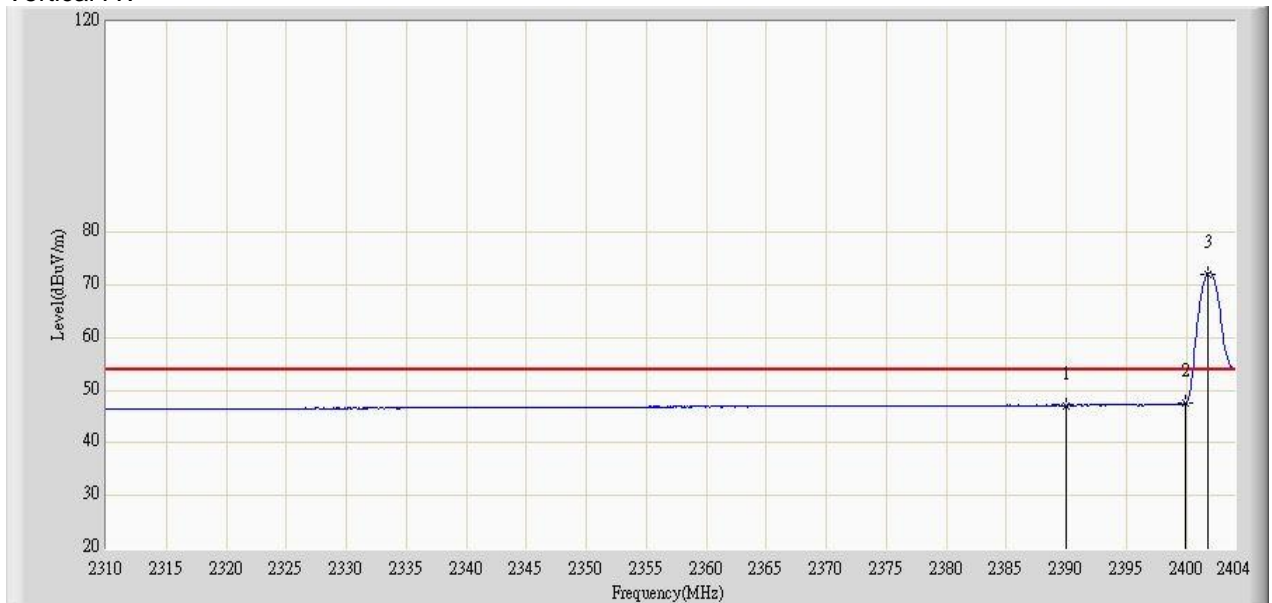
Horizontal-AV



Vertical-PK



Vertical-AV

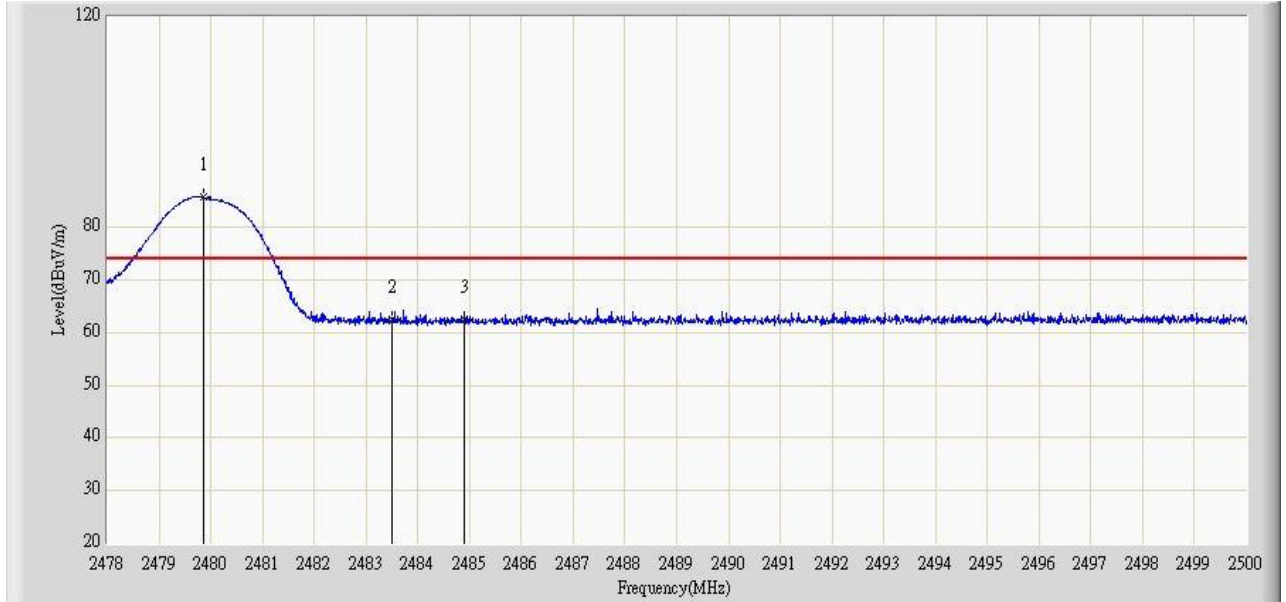


Note: The upper diagram shows the vertical peak value and the lower diagram shows the horizontal value.

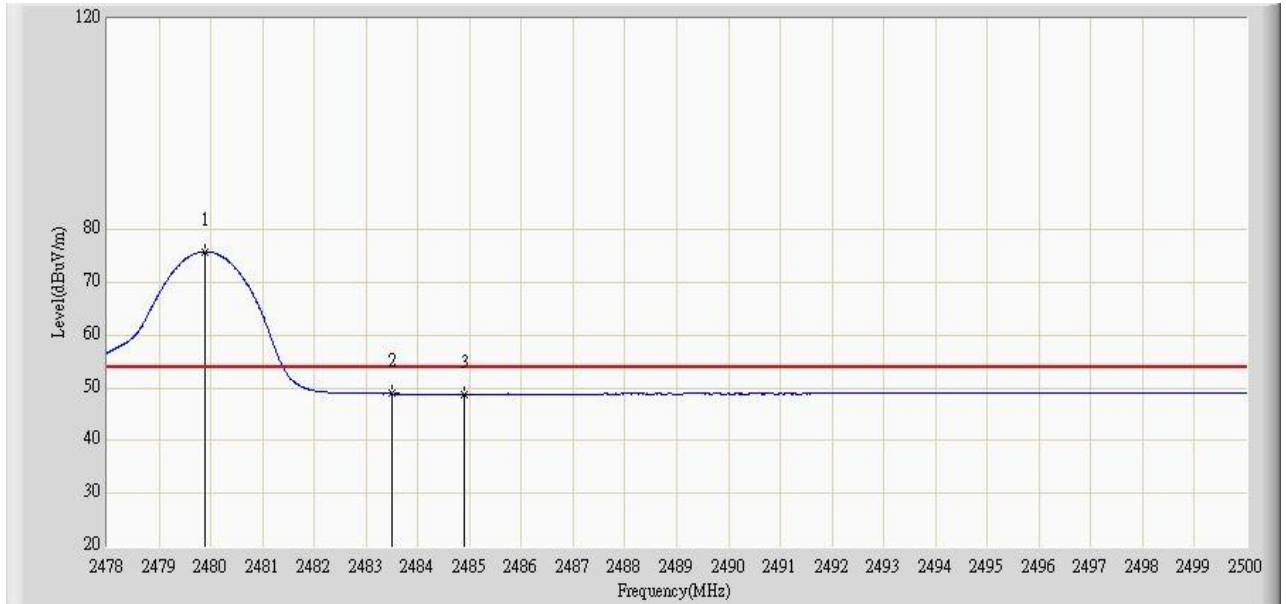


Figure 42: Band Edge Radiated Emission, Spectral Diagram, Mode C

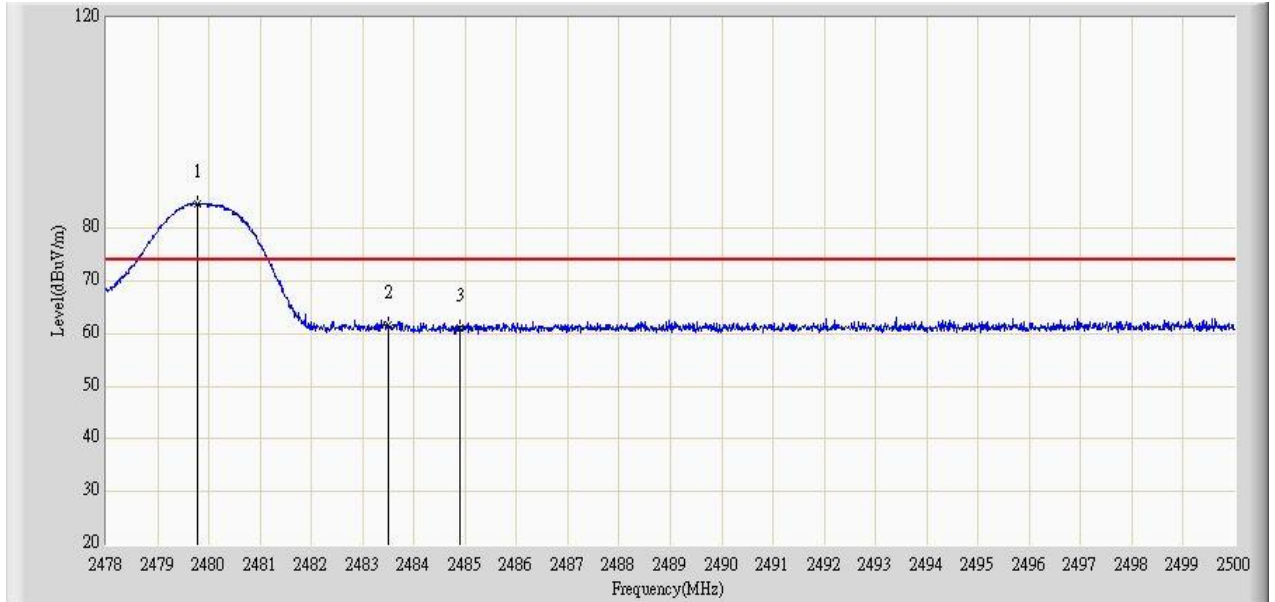
Horizontal-PK



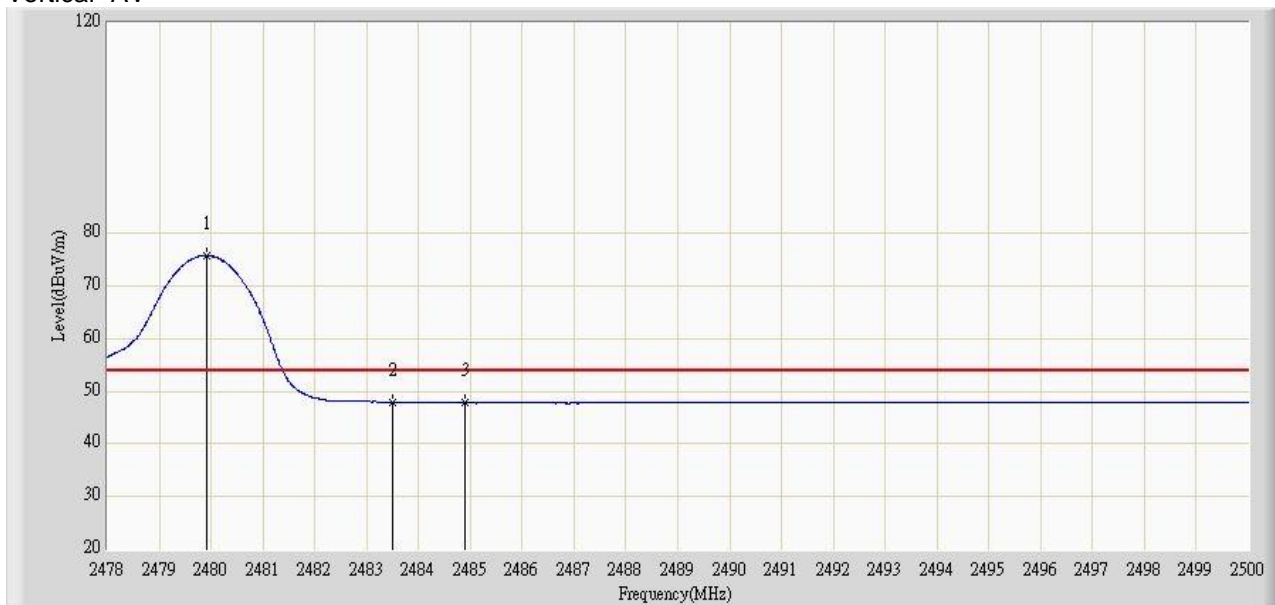
Horizontal-AV



Vertical -PK



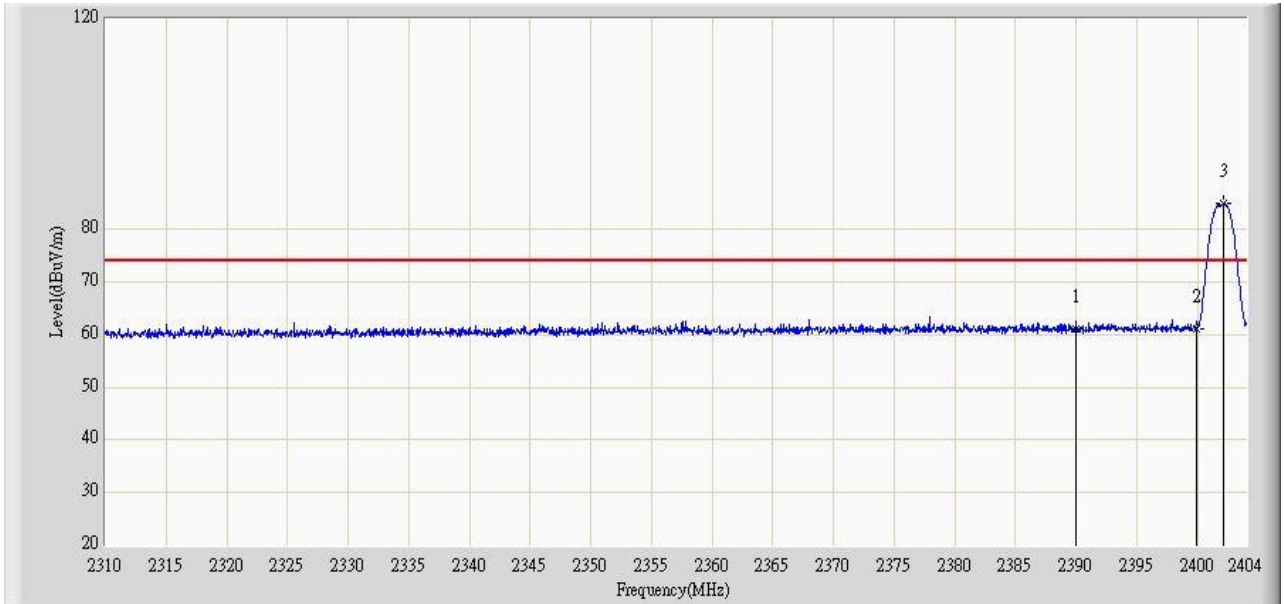
Vertical -AV



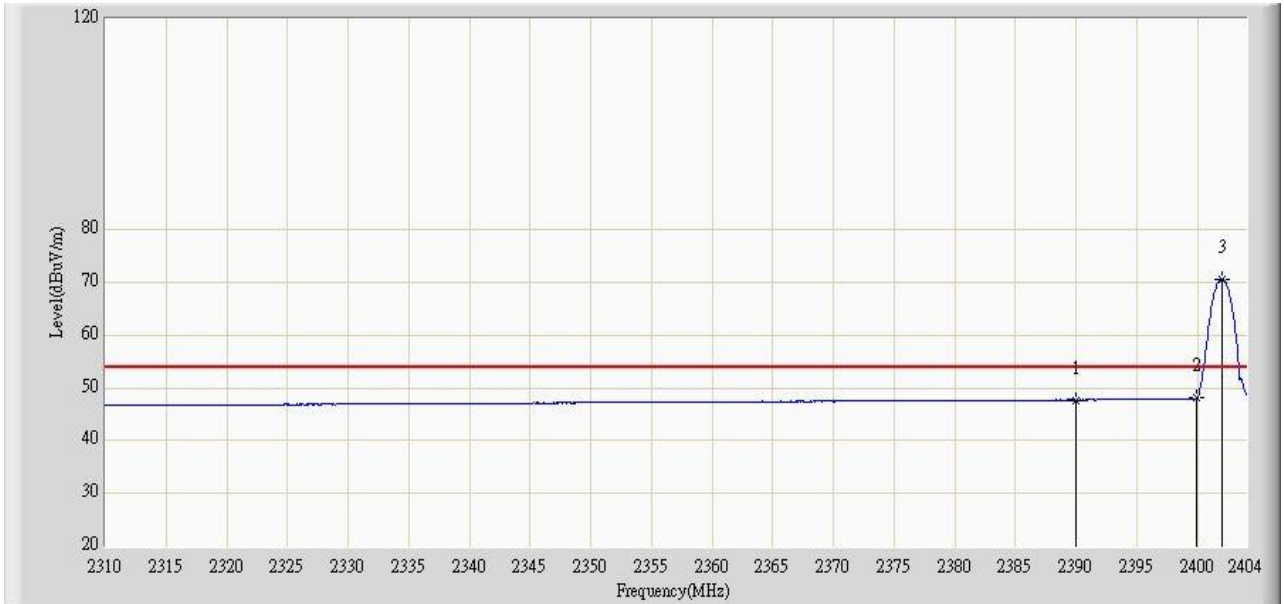
Note: The upper diagram shows the vertical peak value and the lower diagram shows the horizontal value.

Figure 43: Band Edge Radiated Emission, Spectral Diagram, Mode G

Horizontal-PK



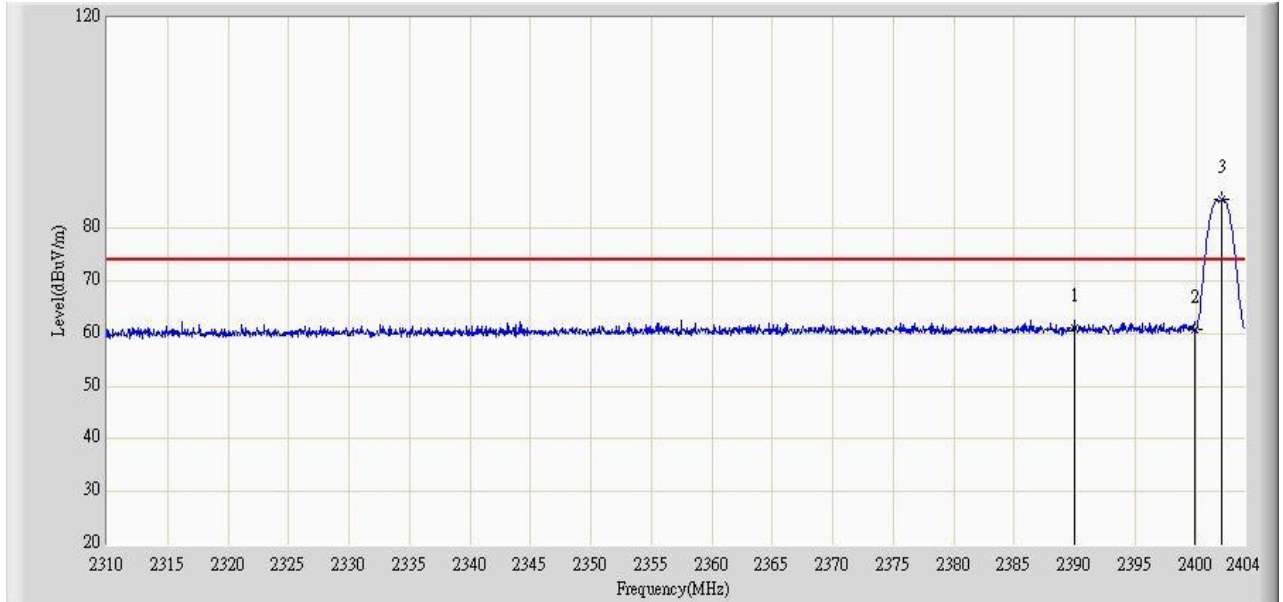
Horizontal-AV



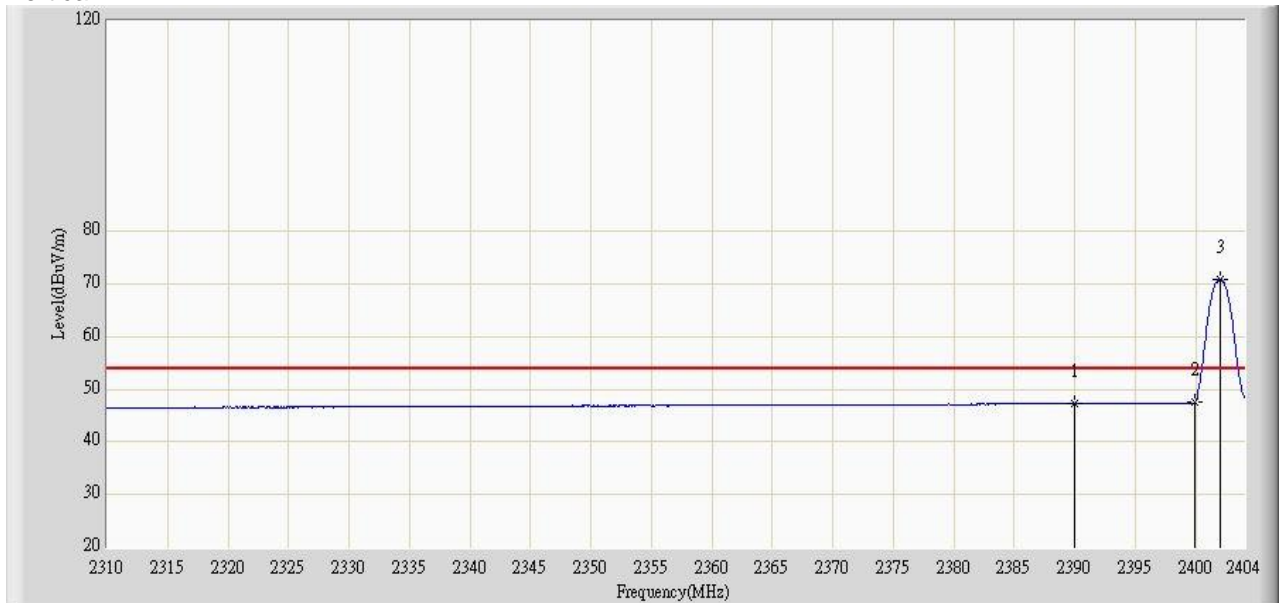
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Vertical -PK



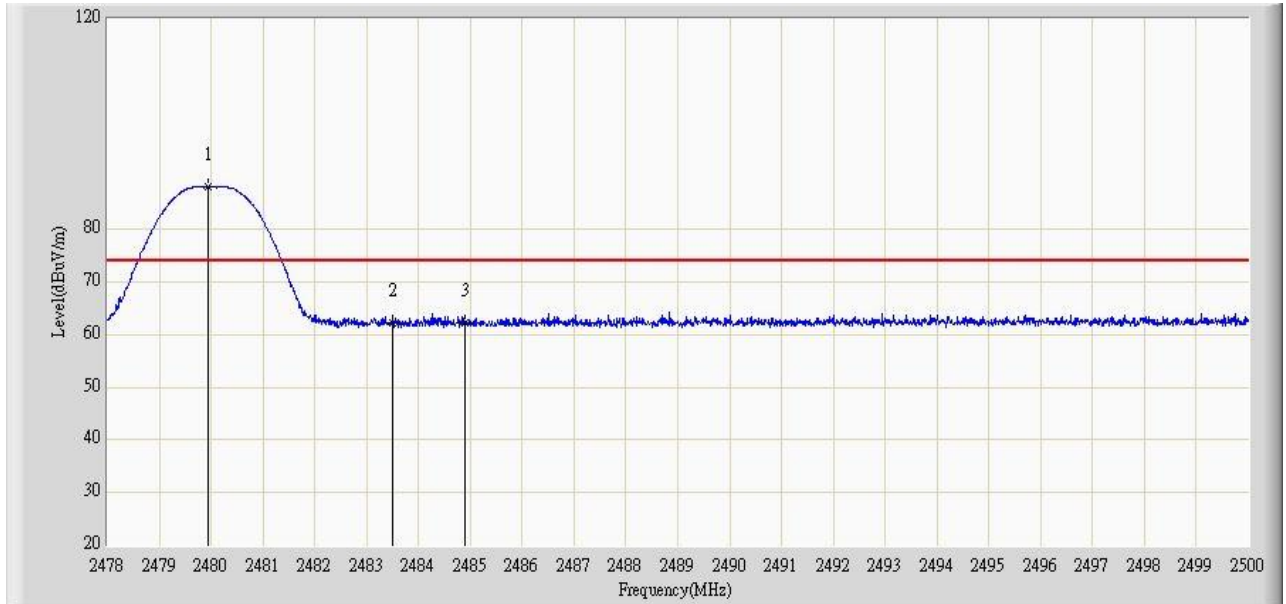
Vertical -AV



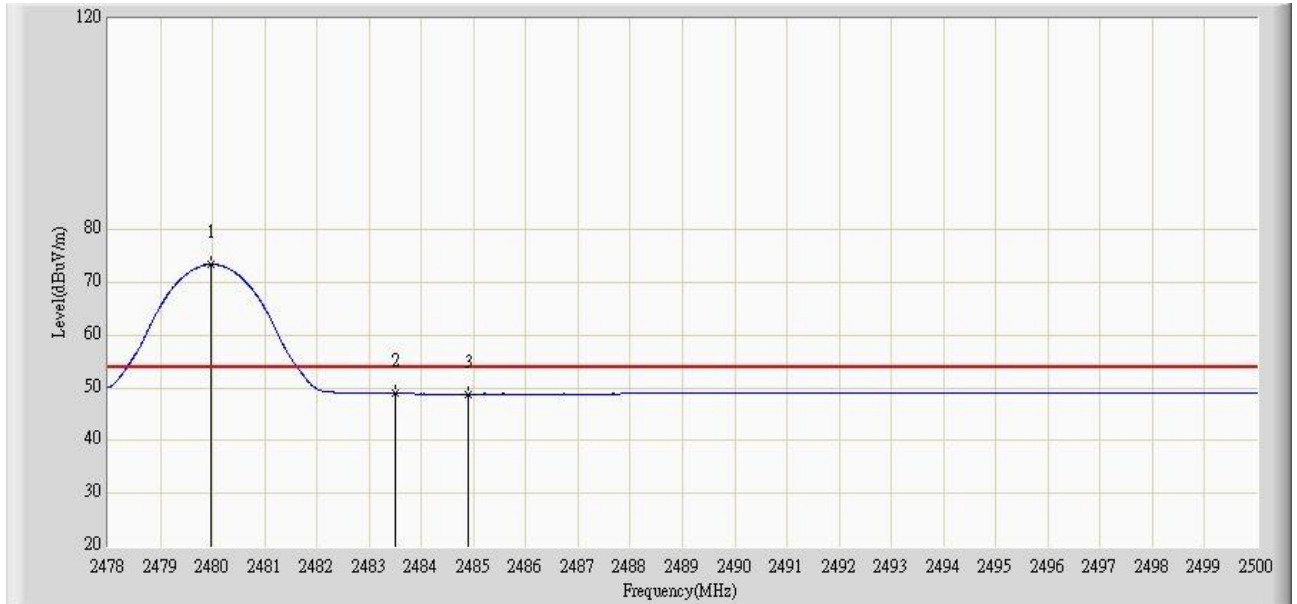
Note: The upper diagram shows the vertical peak value and the lower diagram shows the horizontal value.

**Figure 44: Band Edge Radiated Emission, Spectral Diagram, Mode I**

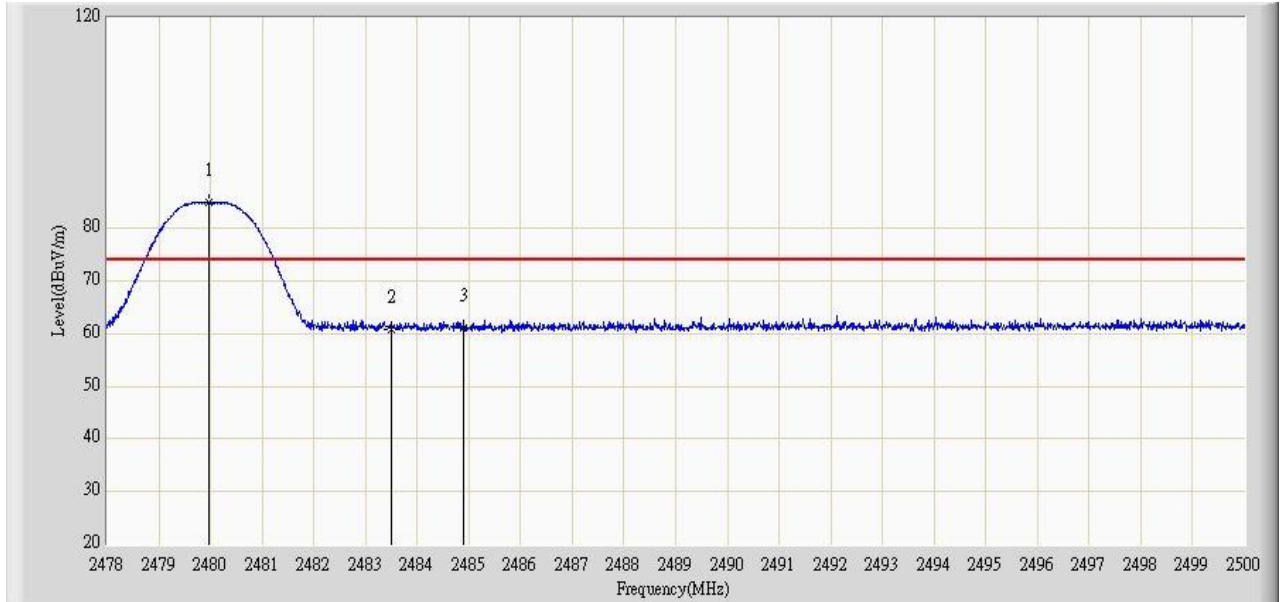
Horizontal-PK



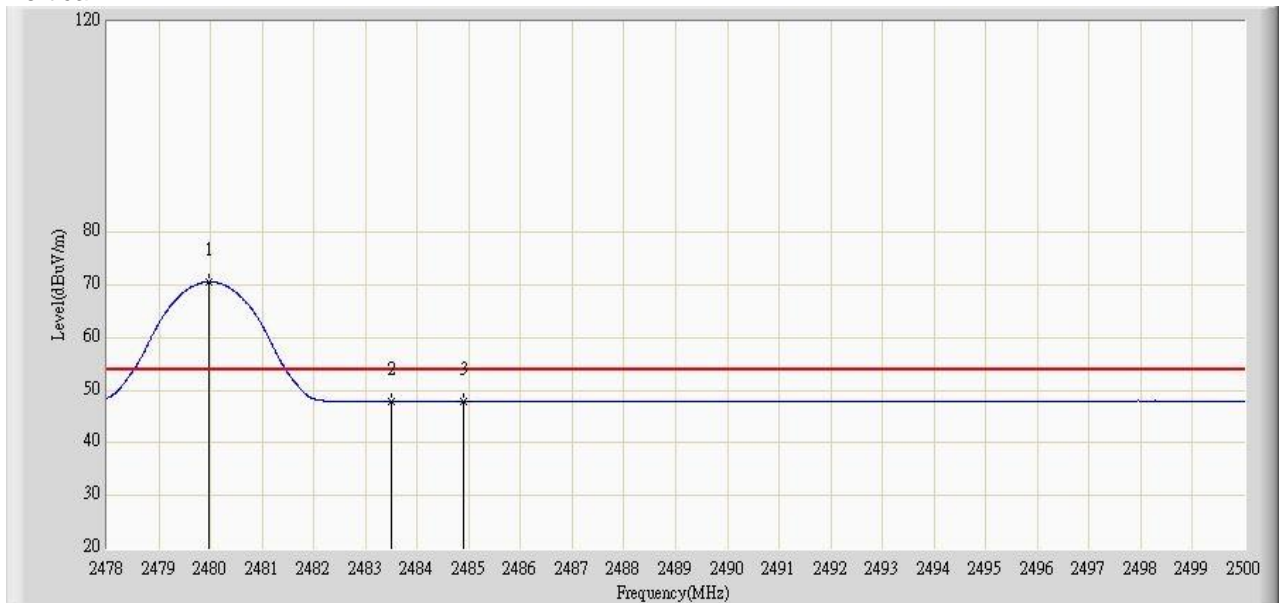
Horizontal-AV



Vertical -PK



Vertical -AV



Note: The upper diagram shows the vertical peak value and the lower diagram shows the horizontal value.

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### 6.1.2 Radiated Spurious Emission of Transmitter, FCC 15.205, FCC 15.209, FCC 15.247(d), RSS-210 2.2, RSS-210 2.6 and RSS-210 A8.5

**RESULT:**

**PASS**

Date of testing: 2013-12-19

Ambient temperature: 22.3°C

Relative humidity: 40.1%

Atmospheric pressure: 101.7hPa

Frequency range: 30MHz – 25GHz

Measurement distance: 3m

Kind of test site: Semi Anechoic Chamber

**Requirements:**

Radiated emissions which fall in the restricted bands, as defined in FCC 15.205(a) and RSS-210 2.7 (Table 1), must comply with the radiated emission limits specified in FCC 15.209(a) and RSS-210 2.7 (Table 2 and 3).

**Test procedure:**

ANSI C63.10-2009, RSS-Gen 4.9 and KDB 558074 D01 DTS Meas Guidance v03 And Public Notice DA 00-705.

The EUT was placed on a nonconductive turntable 0.8m above the ground plane. Before final measurements of radiated emissions were performed, the EUT was scanned to determine its emission spectrum profile. The EUT was pretested in floor-standing condition and in the table position and the worst case condition was table position which was used for the final measurements. The rotation through the three orthogonal axes is normally not needed for equipment that is not hand-held or body-worn.

The spectrum was examined from 30MHz to the 10th harmonic of the highest fundamental transmitter frequency (25GHz). Final radiated emission measurements were made at 3m distance.

At each frequency where a spurious emission was found, the EUT was rotated 360° and the antenna was raised and lowered from 1 to 4m in order to determine the emission's maximum level. Measurements were taken using both horizontal and vertical antenna polarizations.

For frequencies between 30MHz and 1GHz, the spectrum analyzer's 6 dB bandwidth was set to 120 kHz, and the analyzer was operated in the CISPR quasi-peak detection mode. For emissions above 1GHz, measurements were performed using the following settings: Peak: RBW & VBW = 1MHz, Average: RBW = 1MHz, VBW = 10Hz.

The highest emission amplitudes relative to the appropriate limit were recorded in this report. Emissions other than those mentioned are small or not detectable.



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**Table 23: Radiated Emission, Average and Peak Data, 1 – 25GHz, Horizontal and Vertical Antenna Orientations, Mode A (2402MHz)**

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Horizontal	7618.8	42.92	10.93	-31.08	74	31.99	PK
2	Vertical	7818.4	44.73	12.4	-29.27	74	32.33	PK

Note: All correction factors (antenna, cable, pre-amplifier) are included in the measurement values.

**Table 24: Radiated Emission, Average and Peak Data, 1 – 25GHz, Horizontal and Vertical Antenna Orientations, Mode B (2441MHz)**

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Horizontal	7618.4	42.47	10.48	-31.53	74	31.99	PK
2	Vertical	7818.1	42.46	10.14	-31.54	74	32.32	PK

**Table 25: Radiated Emission, Average and Peak Data, 1 – 25GHz, Horizontal and Vertical Antenna Orientations, Mode C (2442MHz)**

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Horizontal	7618.5	42.56	10.57	-31.44	74	31.99	PK
2	Vertical	7818.2	42.97	10.63	-31.03	74	32.34	PK

**Table 26: Radiated Emission, Average and Peak Data, 1 – 25GHz, Horizontal and Vertical Antenna Orientations, Mode G (2402MHz)**

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Horizontal	7618.8	42.12	10.13	-31.88	74	31.99	PK
2	Vertical	7818.3	42.56	10.22	-31.44	74	32.34	PK

Note: All correction factors (antenna, cable, pre-amplifier) are included in the measurement values.

**Table 27: Radiated Emission, Average and Peak Data, 1 – 25GHz, Horizontal and Vertical Antenna Orientations, Mode H (2442MHz)**

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Horizontal	7618.5	42.45	10.46	-31.55	74	31.99	PK
2	Vertical	7818.5	42.57	10.24	-31.43	74	32.33	PK



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**Table 28: Radiated Emission, Average and Peak Data, 1 – 25GHz, Horizontal and Vertical Antenna Orientations, Mode I (2442MHz)**

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Horizontal	7618.23	42.49	10.52	-31.51	74	31.97	PK
2	Vertical	7818.45	42.67	10.36	-31.33	74	32.31	PK

Note: All correction factors (antenna, cable, pre-amplifier) are included in the measurement values. Above 18 GHz emission far below limit

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## 6.2 Receiver Parameters

### 6.2.1 Radiated Spurious Emission of Receiver, FCC 15.109, RSS-210 2.2, RSS-210 2.6, RSS-210 A8.5, RSS-Gen 7.2.3.2

**RESULT:**

**PASS**

Date of testing:	2013-12-19
Ambient temperature:	22.3°C
Relative humidity:	40.1%
Atmospheric pressure:	101.7hPa
Frequency range:	30MHz – 12.5GHz
Measurement distance:	3m
Kind of test site:	Semi Anechoic Chamber

**Requirements:**

The emissions from the unintentional radiator shall not exceed the field strength specified in 15.109(a) and RSS-210 Table 2 (and RSS-Gen Table 1).

**Test procedure:**

ANSI C63.4-2009 and RSS-Gen 4.10.

The EUT was placed on a nonconductive turntable 0.8m above the ground plane. Before final measurements of radiated emissions were performed, the EUT was scanned to determine its emission spectrum profile. The EUT was pretested in floor-standing condition and in the table position and the worst case condition was table position which was used for the final measurements. The rotation through the three orthogonal axes is normally not needed for equipment that is not hand-held or body-worn. The spectrum was examined from 30MHz to the 5th harmonic of the highest fundamental operation frequency (12.5GHz). Final radiated emission measurements were made at 3m distance.

Measurements were taken using both horizontal and vertical antenna polarizations.

For frequencies between 30MHz and 1GHz, the spectrum analyzer's 6 dB bandwidth was set to 120 kHz, and the analyzer was operated in the CISPR quasi-peak detection mode. For emissions above 1GHz, measurements were performed using the following settings: Peak: RBW & VBW = 1MHz, Average: RBW = 1MHz, VBW = 10Hz. The highest emission amplitudes relative to the appropriate limit were recorded in this report. No spurious emission was found in the range 30MHz – 12500MHz. emission in mode D, E, F, J, K, L. all signals found in the pre-testing were more than 20 dB below the limit .

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## 7. Photographs of the Test Setup

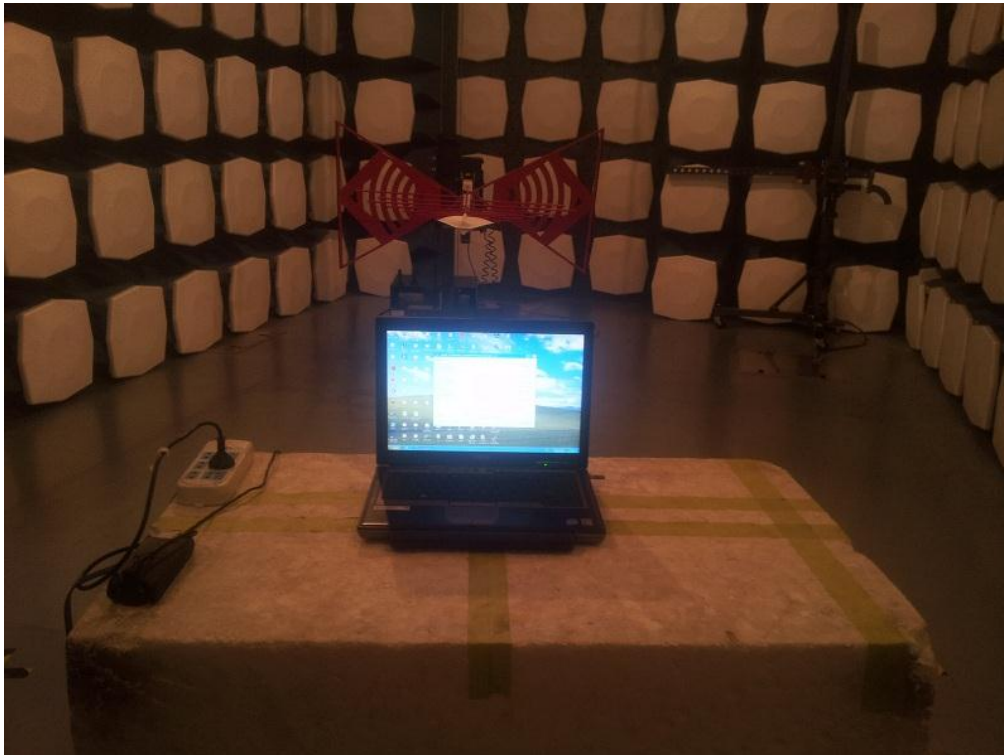
**Photograph 1: Set-up for Conducted RF test at Antenna Port**



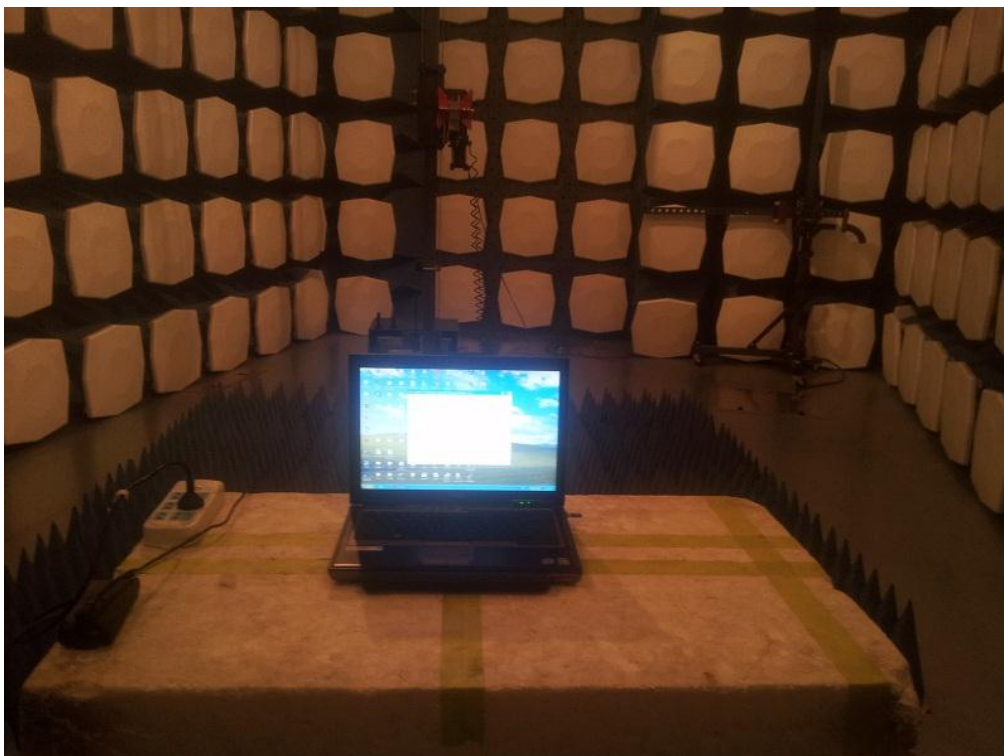
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**Photograph 3: Set-up for Radiated Spurious Emission, Above 1GHz**



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