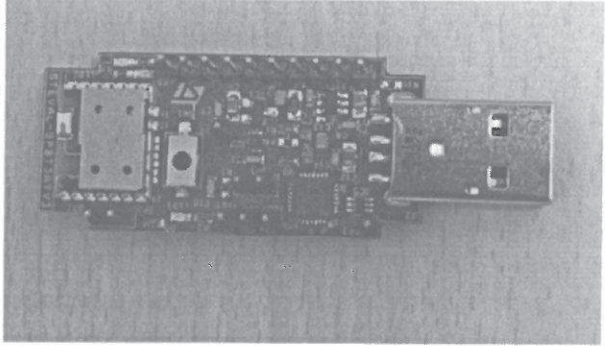


<b>Prüfbericht-Nr.:</b> <i>Test Report No.:</i>	<b>15061569 001</b>	<b>Auftrags-Nr.:</b> <i>Order No.:</i>	<b>154008662</b>	Seite 1 von 42 Page 1 of 42
<b>Kunden-Referenz-Nr.:</b> <i>Client Reference No.:</i>	<b>460398</b>	<b>Auftragsdatum:</b> <i>Order date:</i>	<b>22.10.2012</b>	
<b>Auftraggeber:</b> <i>Client:</i>	<b>Amp'ed RF Technology Inc.</b> 1879 LUNDY Ave, Suite 138, San Jose, C95131,USA			
<b>Prüfgegenstand:</b> <i>Test item:</i>	<b>Bluetooth Module</b>			
<b>Bezeichnung / Typ-Nr.:</b> <i>Identification / Type No.:</i>	<b>BT33,SPBT2632C2</b> <b>FCC ID:X3ZBTMOD5</b>			
<b>Auftrags-Inhalt:</b> <i>Order content:</i>	<b>Complete test</b>			
<b>Prüfgrundlage:</b> <i>Test specification:</i>	<b>FCC 47 CFR Part 15, Subpart C, Section 15.247 (October 1, 2009)</b> <b>ANSI C63.4-2003</b> <b>Public Notice DA 00-705: Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems (March 30, 2000)</b>			
<b>Wareneingangsdatum:</b> <i>Date of receipt:</i>	<b>22.10.2012</b>			
<b>Prüfmuster-Nr.:</b> <i>Test sample No.:</i>	<b>N.A</b>			
<b>Prüfzeitraum:</b> <i>Testing period:</i>	<b>25.10.2012 – 29.05.2013</b>			
<b>Ort der Prüfung:</b> <i>Place of testing:</i>	<b>QuieTek</b> Technology(Suzhou)Co., Ltd.			
<b>Prüflaboratorium:</b> <i>Testing laboratory:</i>	<b>TÜV Rheinland (Shanghai)</b> Co., Ltd.			
<b>Prüfergebnis*:</b> <i>Test result*:</i>	<b>Pass</b>			
<b>geprüft von / tested by:</b>		<b>kontrolliert von / reviewed by:</b>		
25.06.2013	ShiLi / PE	<i>Shi Li</i>	25.06.2013	Jesse.huang / Reviewer
<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>
				<i>Jesse Huang</i>
<b>Sonstiges / Other:</b>	<b>N.A</b>			
<b>Zustand des Prüfgegenstandes bei Anlieferung:</b> <i>Condition of the test item at delivery:</i>	<b>Prüfmuster vollständig und unbeschädigt</b> <i>Test item complete and undamaged</i>			
* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend N/A = nicht anwendbar	4 = ausreichend N/T = nicht getestet
Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory	4 = sufficient N/A = not applicable
			5 = mangelhaft N/T = nicht getestet	5 = poor 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

**Prüfbericht - Nr.: 15061569 001**

Test Report No.:

Seite 2 von 42

Page 2 of 42

## TEST SUMMARY

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

RESULT: PASS

### **3.2.2 ANTENNA REQUIREMENTS, FCC 15.203, FCC 15.204**

RESULT: Pass

### **5.1.1 CONDUCTED OUTPUT POWER, FCC 15.247(B)**

RESULT: PASS

### **5.1.2 CARRIER FREQUENCY SEPARATION, FCC 15.247(A)(1)**

RESULT: PASS

### **5.1.3 20dB BANDWIDTH, FCC 15.247(A)(1)**

### **5.1.4 NUMBER OF HOPPING FREQUENCIES, FCC 15.247(A)(1)(III)**

RESULT: PASS

### **5.1.5 AVERAGE TIME OF OCCUPANCY, FCC 15.247(A)(1)(III)**

RESULT: PASS

### **5.1.6 CONDUCTED SPURIOUS EMISSION, FCC 15.247(D)**

RESULT: PASS

### **5.1.7 BAND EDGE COMPLIANCE OF RF CONDUCTED EMISSION, FCC 15.247(D)**

RESULT: PASS

### **6.1.1 BAND EDGE RADIATED EMISSION, FCC 15.205, FCC 15.209, FCC 15.247(D)**

RESULT: Pass

### **6.1.2 RADIATED SPURIOUS EMISSION OF TRANSMITTER, FCC 15.205, FCC 15.209, FCC 15.247(D)**

RESULT: PASS

### **6.2.1 RADIATED SPURIOUS EMISSION OF RECEIVER, FCC 15.109**

RESULT: PASS

## CONTENTS

<b>1.</b>	<b>GENERAL REMARKS .....</b>	<b>5</b>
<b>1.1</b>	<b>COMPLEMENTARY MATERIALS .....</b>	<b>5</b>
<b>2.</b>	<b>TEST SITES .....</b>	<b>5</b>
<b>2.1</b>	<b>TEST FACILITIES .....</b>	<b>5</b>
<b>2.2</b>	<b>LIST OF TEST AND MEASUREMENT INSTRUMENTS .....</b>	<b>6</b>
<b>2.3</b>	<b>MEASUREMENT UNCERTAINTY .....</b>	<b>6</b>
<b>3.</b>	<b>GENERAL PRODUCT INFORMATION .....</b>	<b>7</b>
<b>3.1</b>	<b>PRODUCT FUNCTION AND INTENDED USE.....</b>	<b>7</b>
<b>3.2</b>	<b>SYSTEM DETAILS .....</b>	<b>7</b>
3.2.1	<i>Voltage Requirements, FCC 15.31(e).....</i>	<i>7</i>
3.2.2	<i>Antenna Requirements, FCC 15.203, FCC 15.204 .....</i>	<i>7</i>
<b>3.3</b>	<b>INDEPENDENT OPERATION MODES .....</b>	<b>8</b>
<b>3.4</b>	<b>NOISE SUPPRESSING PARTS.....</b>	<b>8</b>
<b>4.</b>	<b>TEST SET-UP AND OPERATION MODES .....</b>	<b>9</b>
<b>4.1</b>	<b>TEST METHODOLOGY .....</b>	<b>9</b>
<b>4.2</b>	<b>PHYSICAL CONFIGURATION FOR TESTING .....</b>	<b>9</b>
<b>4.3</b>	<b>TEST OPERATION AND TEST SOFTWARE.....</b>	<b>9</b>
<b>4.4</b>	<b>SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT .....</b>	<b>9</b>
<b>4.5</b>	<b>COUNTERMEASURES TO ACHIEVE EMC COMPLIANCE.....</b>	<b>9</b>
<b>5.</b>	<b>TEST RESULTS OF CONDUCTED MEASUREMENTS AT ANTENNA PORT .....</b>	<b>10</b>
<b>5.1</b>	<b>TRANSMITTER PARAMETERS.....</b>	<b>10</b>
5.1.1	<i>Conducted Output Power, FCC 15.247(b).....</i>	<i>10</i>
5.1.2	<i>Carrier Frequency Separation, FCC 15.247(a)(1) .....</i>	<i>12</i>
5.1.3	<i>20dB Bandwidth, FCC 15.247(a)(1).....</i>	<i>15</i>
5.1.4	<i>Number of Hopping Frequencies, FCC 15.247(a)(1)(iii).....</i>	<i>19</i>
5.1.5	<i>Average Time of Occupancy, FCC 15.247(a)(1)(iii) .....</i>	<i>21</i>
5.1.6	<i>Conducted Spurious Emission, FCC 15.247(d).....</i>	<i>24</i>
5.1.7	<i>Band Edge Compliance of RF Conducted Emission, FCC 15.247(d) .....</i>	<i>30</i>
<b>6.</b>	<b>TEST RESULTS OF RADIATED MEASUREMENTS .....</b>	<b>33</b>
<b>6.1</b>	<b>TRANSMITTER PARAMETERS.....</b>	<b>33</b>
6.1.1	<i>Band Edge Radiated Emission, FCC 15.205, FCC 15.209, FCC 15.247(d) .....</i>	<i>33</i>
6.1.2	<i>Radiated Spurious Emission of Transmitter, FCC 15.205, FCC 15.209, FCC 15.247(d) .....</i>	<i>37</i>
<b>6.2</b>	<b>RECEIVER PARAMETERS .....</b>	<b>39</b>
6.2.1	<i>Radiated Spurious Emission of Receiver, FCC 15.109.....</i>	<i>39</i>

**Prüfbericht - Nr.: 15061569 001**

**Seite 4 von 42**

*Test Report No.:*

*Page 4 of 42*

<b>7.</b>	<b>PHOTOGRAPHS OF THE TEST SETUP.....</b>	<b>40</b>
<b>8.</b>	<b>LIST OF TABLES.....</b>	<b>41</b>
<b>9.</b>	<b>LIST OF FIGURES .....</b>	<b>42</b>
<b>10.</b>	<b>LIST OF PHOTOGRAPHS.....</b>	<b>42</b>

**Prüfbericht - Nr.:** 15061569 001  
*Test Report No.:*

**Seite 5 von 42**  
*Page 5 of 42*

## **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.

**Prüfbericht - Nr.:** 15061569 001  
*Test Report No.:*

Seite 6 von 42  
Page 6 of 42

## 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	08.11.2013
broadband antenna	BTA-H	040005H	28.07.2013
Spectrum analyzer	FSP30	100192	21.07.2013
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

**Prüfbericht - Nr.:** 15061569 001

*Test Report No.:*

**Seite 7 von 42**

*Page 7 of 42*

## 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
Max output power:	-1.36dBm
Antenna gain:	2.1dBi
Antenna type:	PCB antenna
Antenna cable length:	N/A
Frequency range:	2402 – 2480MHz
Number of channels:	79
Channel spacing:	1MHz
Modulation type:	GFSK; $\pi/4$ -DQPSK ;8DPSK
Rated voltage:	3.3V
Protection class:	III
Test voltage:	3.3V

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

**RESULT:Pass**

All the tests were performed using steady DC 3.3V. Hence it complies with the power supply requirements.

#### 3.2.2 Antenna Requirements, FCC 15.203, FCC 15.204

**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 C63.4:2003.

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 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.
- EUT transmits on pseudo-random sequence on all channels (hopping mode).

### **3.4 Noise Suppressing Parts**

Refer to schematics and internal photos.



**Prüfbericht - Nr.:** 15061569 001

*Test Report No.:*

**Seite 9 von 42**

*Page 9 of 42*

## **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 Public Notice DA 00-705 and ANSI C63.4-2003

For details, see under each test item.

Note : Bluetooth 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 samples were available.

One is for conducted measurements : remove antenna and add 50 ohm SMA connector; Another one with antenna for radiated measurements.

More detail, refer to section: Photographs of the Test Set-Up.

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

Software used for testing:Term\_49

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 ).

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

No additional measures were employed to achieve compliance.

Prüfbericht - Nr.: 15061569 001  
Test Report No.:

Seite 10 von 42  
Page 10 of 42

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

### 5.1 Transmitter Parameters

#### 5.1.1 Conducted Output Power, FCC 15.247(b)

**RESULT:**

**PASS**

Date of testing:	2013-06-05
Ambient temperature:	22~26°C
Relative humidity:	50~65%
Atmospheric pressure:	100~103hPa

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 C63.10-2003, RSS-Gen 4.8 and And Public Notice DA 00-705

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]	Reading [dBm]	Correction Factor [dB]	RBW [MHz]	Output Power [dBm]	Limit [dBm]
1	-1.76	0.63	3	-1.76	21
2	-2.95	0.63	3	-2.95	21
3	-3.10	0.63	3	-3.10	21

Notes: Cable loss was included in reading as offset.

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

Data Rate [Mbps]	Reading [dBm]	Correction Factor [dB]	RBW [MHz]	Output Power [dBm]	Limit [dBm]
1	-1.36	0.63	3	-1.36	21
2	-2.33	0.63	3	-2.33	21
3	-2.49	0.63	3	-2.49	21

Notes: Cable loss was included in reading as offset.

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

Data Rate [Mbps]	Reading [dBm]	Correction Factor [dB]	RBW [MHz]	Output Power [dBm]	Limit [dBm]
1	-1.62	0.69	3	-1.62	21
2	-2.82	0.69	3	-2.82	21
3	-3.09	0.69	3	-3.09	21

Notes: Cable loss was included in reading as offset.

**Remark:**

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

**Prüfbericht - Nr.: 15061569 001**

**Seite 12 von 42**

*Test Report No.:*

*Page 12 of 42*

### **5.1.2 Carrier Frequency Separation, FCC 15.247(a)(1)**

**RESULT:**

**PASS**

Date of testing: 2013-06-05

Ambient temperature: 22~26°C  
Relative humidity: 50~65%  
Atmospheric pressure: 100~103hPa

**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 C63.4-2003 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 6: Carrier Frequency Separation**

Channel	Channel Separation [kHz]	20dB Bandwidth [kHz](8DPSK)	Limit [kHz]
Low	996	1290	860
Middle	996	1290	860
High	996	1270	850

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

**Figure 1: Carrier Frequency Separation-Low Channel**

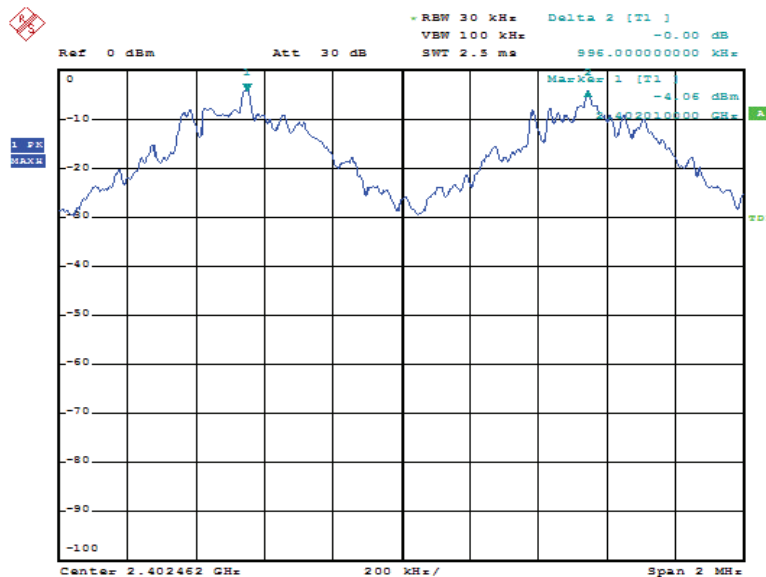


Figure 2: Carrier Frequency Separation-Middle Channel

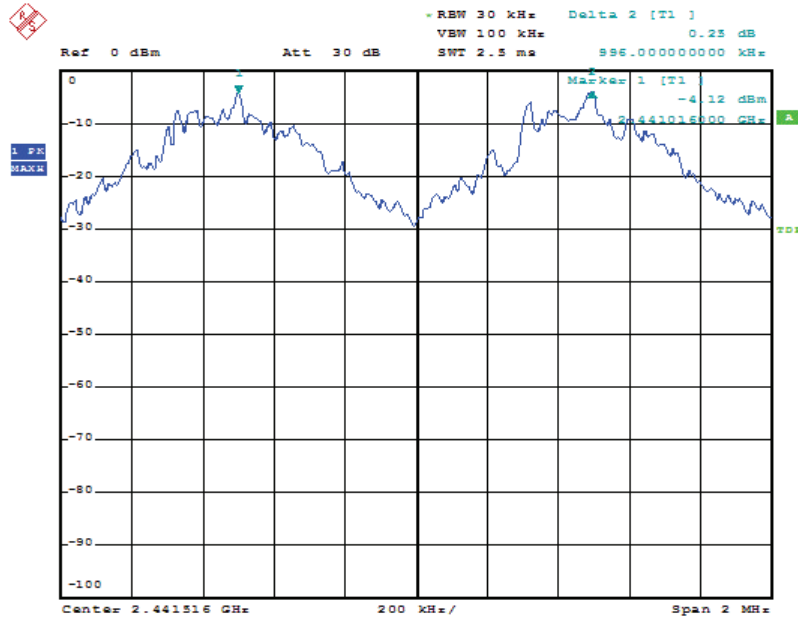
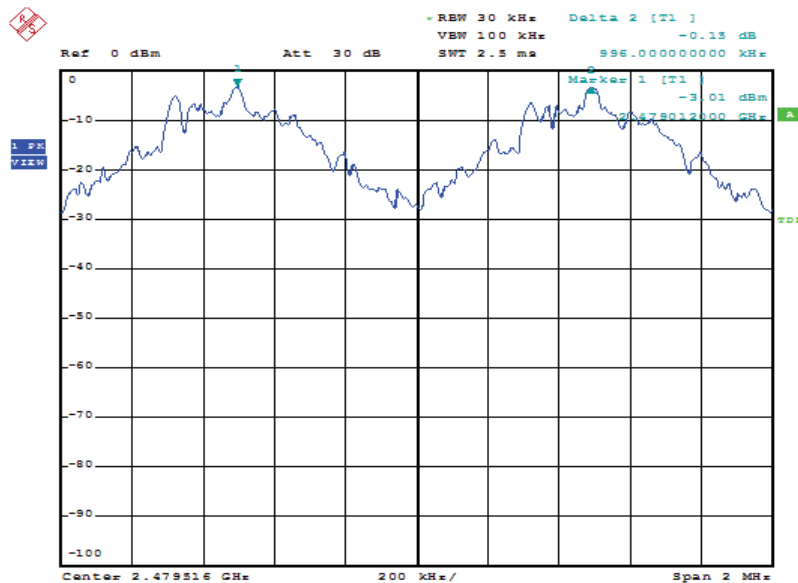


Figure 3: Carrier Frequency Separation-High Channel



**Prüfbericht - Nr.: 15061569 001**

**Seite 15 von 42**

*Test Report No.:*

*Page 15 of 42*

### 5.1.3 20dB Bandwidth, FCC 15.247(a)(1)

Date of testing: 2013-06-05

Ambient temperature: 22~26°C

Relative humidity: 50~65%

Atmospheric pressure: 100~103hPa

Requirements:

For frequency hopping systems operating in the 2400-2483.5MHz band, test data is provided for reference.

Test procedure:

ANSI C63.4-2003 and Public Notice DA 00-705.

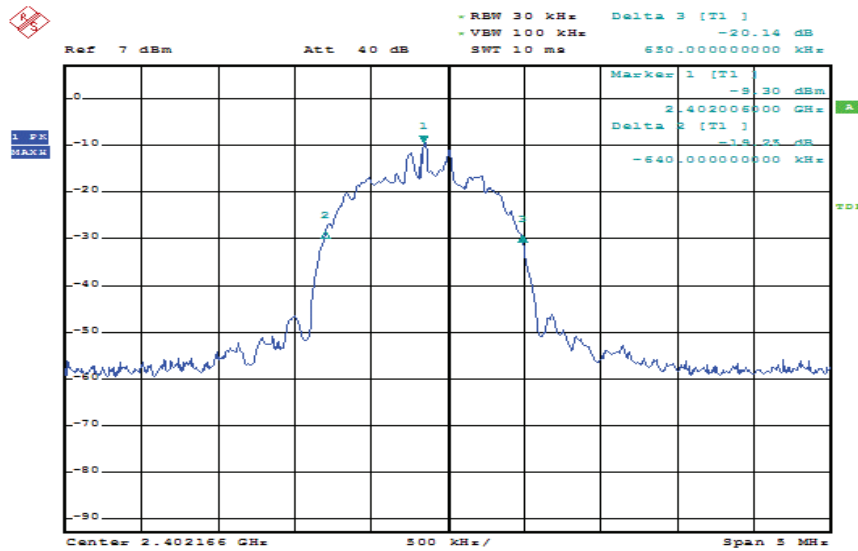
A spectrum analyzer was connected to the antenna port of the EUT. The spectrum analyzer resolution bandwidth was set to 30kHz, the video bandwidth to 100kHz and the span to 2MHz.

**Table 7: 20dB Bandwidth (bluetooth BDR and EDR)**

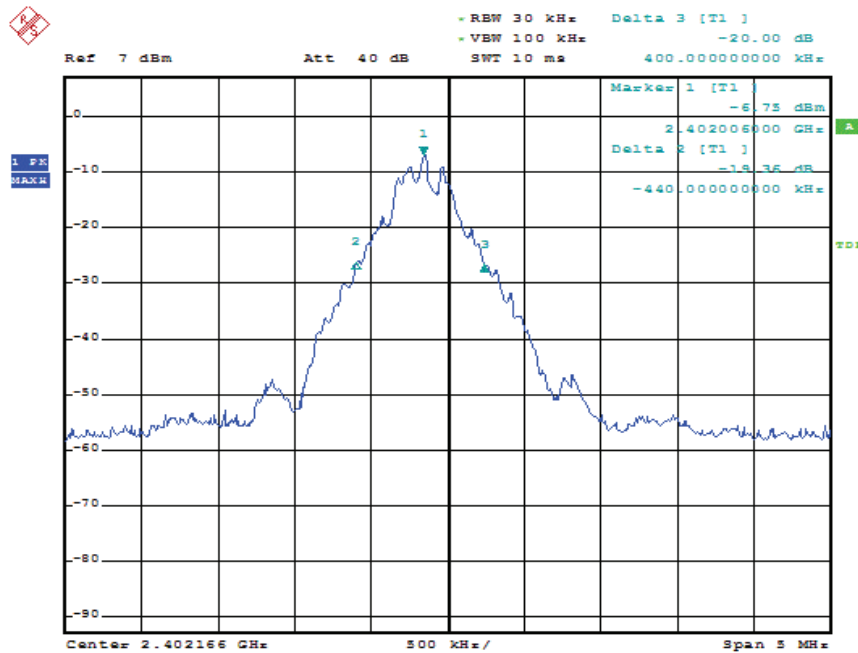
Operating Frequency [MHz]	20dB Bandwidth [kHz](8DPSK)	20dB Bandwidth [kHz](GFSK)
2402	1290	840
2441	1290	830
2480	1270	830



Figure 4: 20dB Bandwidth, Mode A (8DPSK and GFSK)

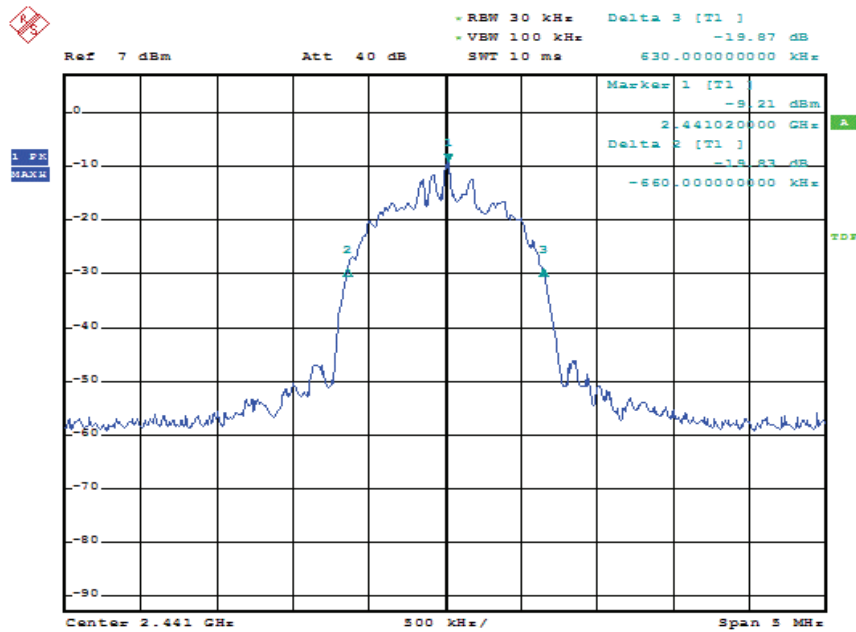


8DPSK

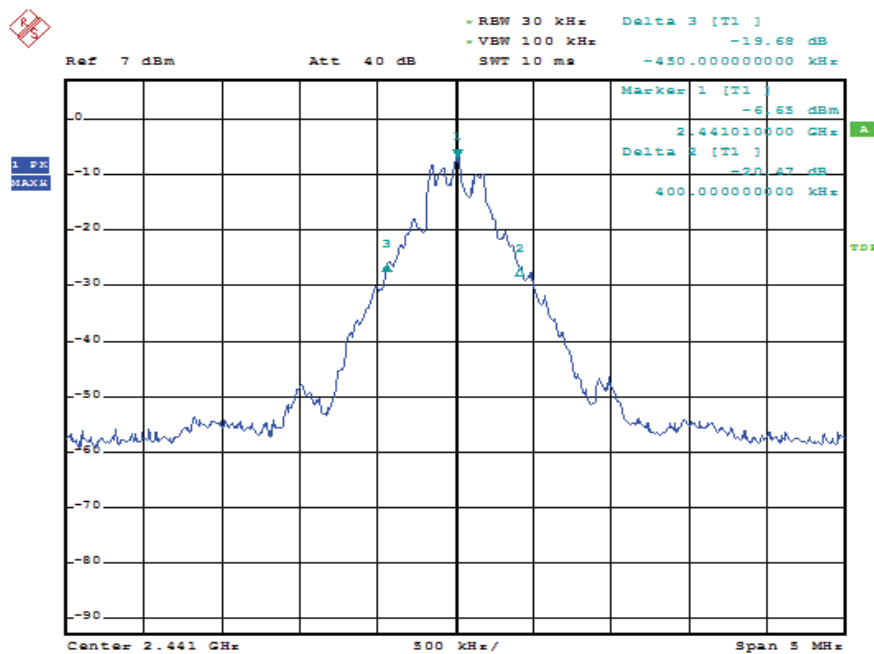


GFSK

Figure 5: 20dB Bandwidth, Mode B (8DPSK and GFSK)

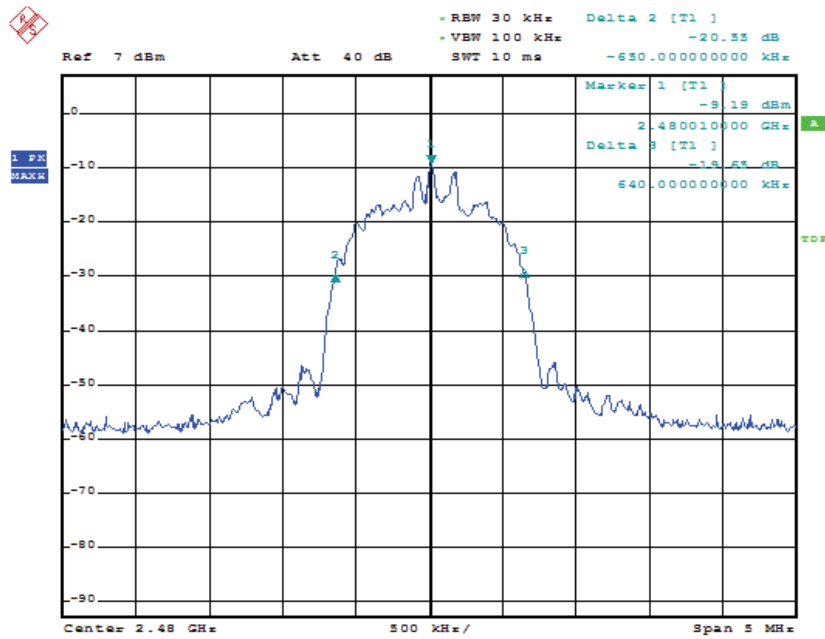


8DPSK

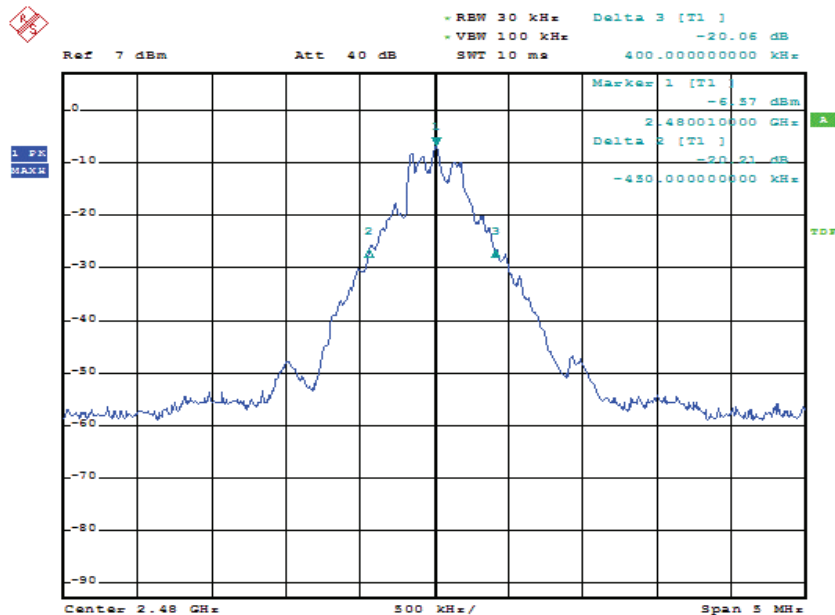


GFSK

Figure 6: 20dB Bandwidth, Mode C (8DPSK and GFSK)



8DPSK



GFSK

**Prüfbericht - Nr.: 15061569 001**

**Seite 19 von 42**

*Test Report No.:*

*Page 19 of 42*

#### **5.1.4 Number of Hopping Frequencies, FCC 15.247(a)(1)(iii)**

**RESULT:**

**PASS**

Date of testing: 2013-06-05

Ambient temperature: 22~26°C

Relative humidity: 50~65%

Atmospheric pressure: 100~103hPa

Requirements:

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

Test procedure:

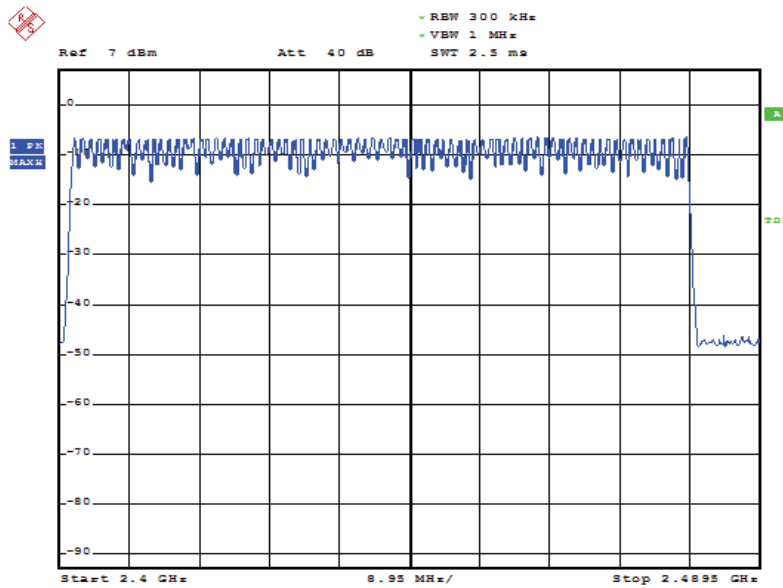
ANSI C63.4-2003 and Public Notice DA 00-705.

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 8: Number of Hopping Frequencies**

Number of Hopping Frequencies	Limit
79	15

**Figure 7: Hopping Frequencies**



**Prüfbericht - Nr.: 15061569 001**

**Seite 21 von 42**

*Test Report No.:*

*Page 21 of 42*

### **5.1.5 Average Time of Occupancy, FCC 15.247(a)(1)(iii)**

**RESULT:**

**PASS**

Date of testing: 2013-06-05

Ambient temperature: 22~26°C

Relative humidity: 50~65%

Atmospheric pressure: 100~103hPa

**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 C63.4-2003 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 9: 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	2.87	106.81	306.5	400
Mid	1M-DH5	2.86	106.81	305.5	400
High	1M-DH5	2.86	106.81	305.5	400

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

**Figure 8: Dwell Time, Mode (Hopping), 1M-DH5, Low channel**

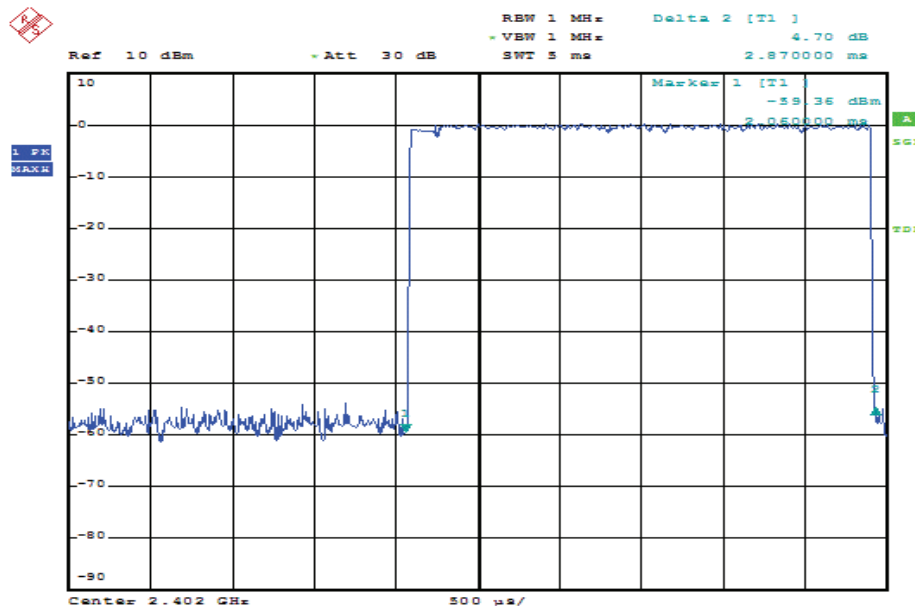




Figure 9: Dwell Time, Mode (Hopping), 1M-DH5, Mid channel

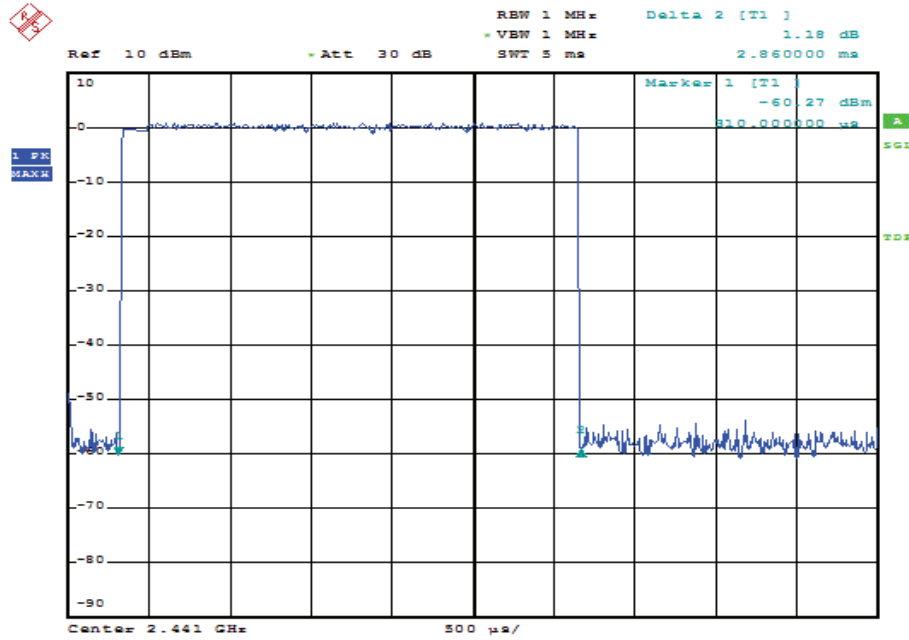
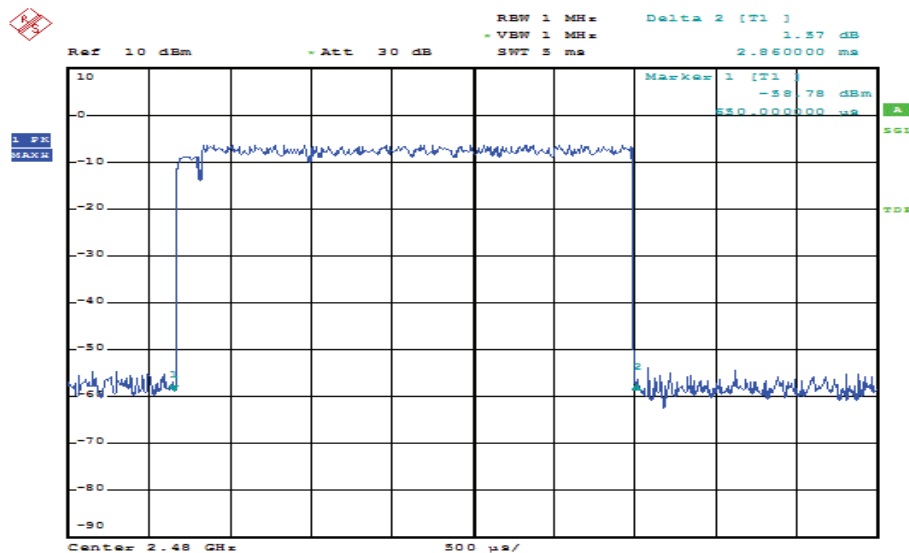


Figure 10: Dwell Time, Mode (Hopping), 1M-DH5, High channel



**Prüfbericht - Nr.:** 15061569 001

Seite 24 von 42

Test Report No.:

Page 24 of 42

### 5.1.6 Conducted Spurious Emission, FCC 15.247(d)

**RESULT:**

**PASS**

Date of testing: 2013-06-05

Ambient temperature: 22~26°C

Relative humidity: 50~65%

Atmospheric pressure: 100~103hPa

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 C63.4-2003, 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. 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.

**Prüfbericht - Nr.: 15061569 001**  
Test Report No.:

Seite 25 von 42  
Page 25 of 42

**Table 10: Conducted Spurious Emission, Mode A**

Frequency [MHz]	Reading [dBm]	Emission Level [dBm]	Limit [dBm]	Margin [dB]
24392.000	-38.44	-38.44	-24.47	13.97
2406.0600	-4.47	-4.47	NA	NA

Notes: Cable loss was included in reading as offset.  
Limit = Reading of fundamental + Correction factor – 20dB

**Figure 11: Conducted Spurious Emission, 30MHz – 6GHz, Mode A**

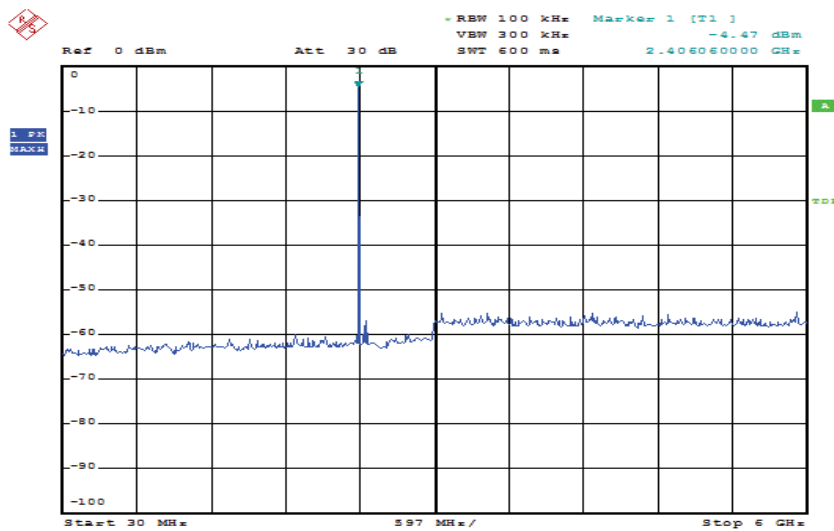


Figure 12: Conducted Spurious Emission, 6 – 25GHz, Mode A

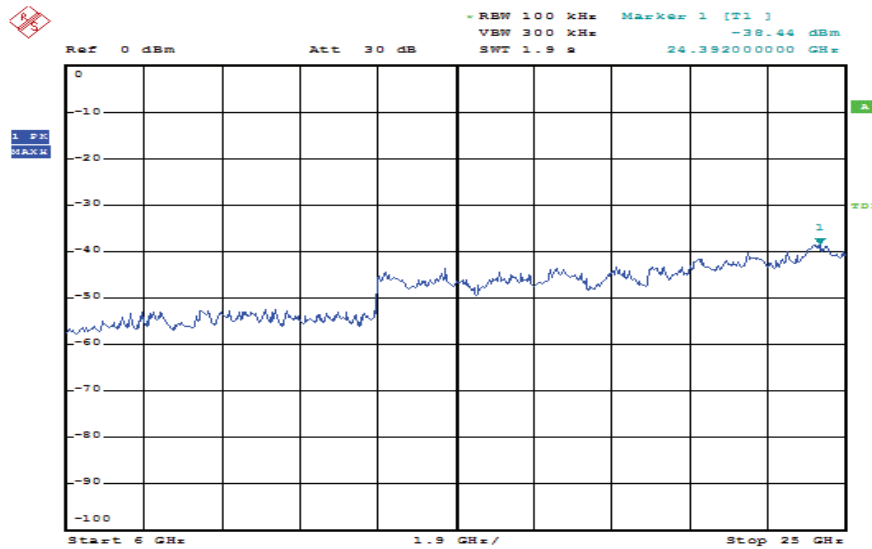


Table 11: Conducted Spurious Emission, Mode B

Frequency [MHz]	Reading [dBm]	Emission Level [dBm]	Limit [dBm]	Margin [dB]
3898.5600	-55.26	-55.26	-24.84	30.42
24392.000	-39.32	-39.32	-24.84	14.48
2441.8800	-4.84	-4.84	NA	NA

Notes: Cable loss was included in reading as offset.  
Limit = Reading of fundamental + Correction factor – 20dB

Figure 13: Conducted Spurious Emission, 30MHz – 6GHz, Mode B

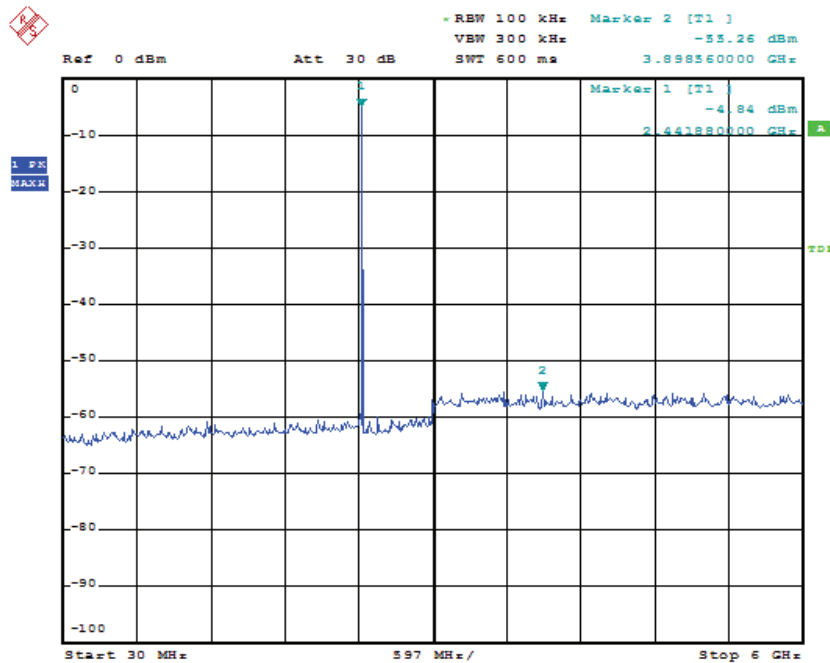
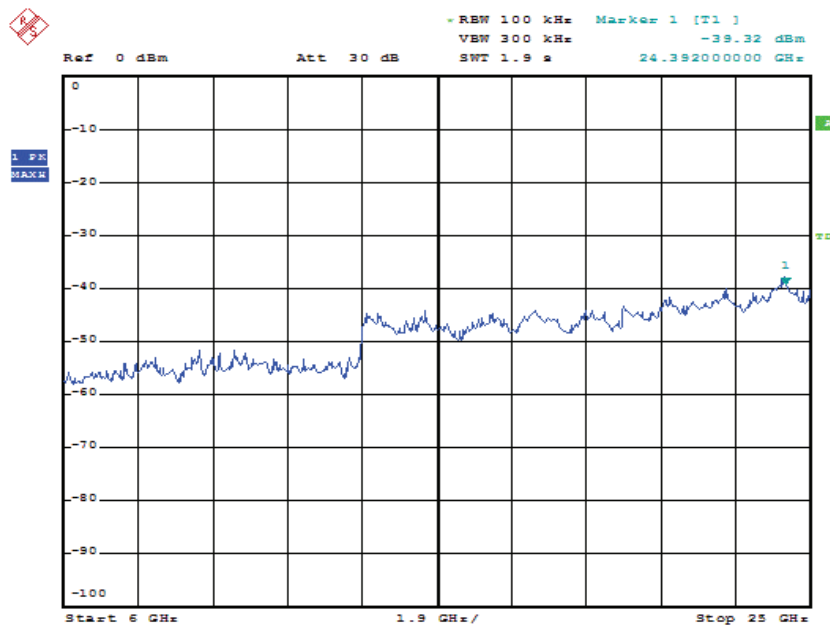


Figure 14: Conducted Spurious Emission, 6 – 25GHz, Mode B

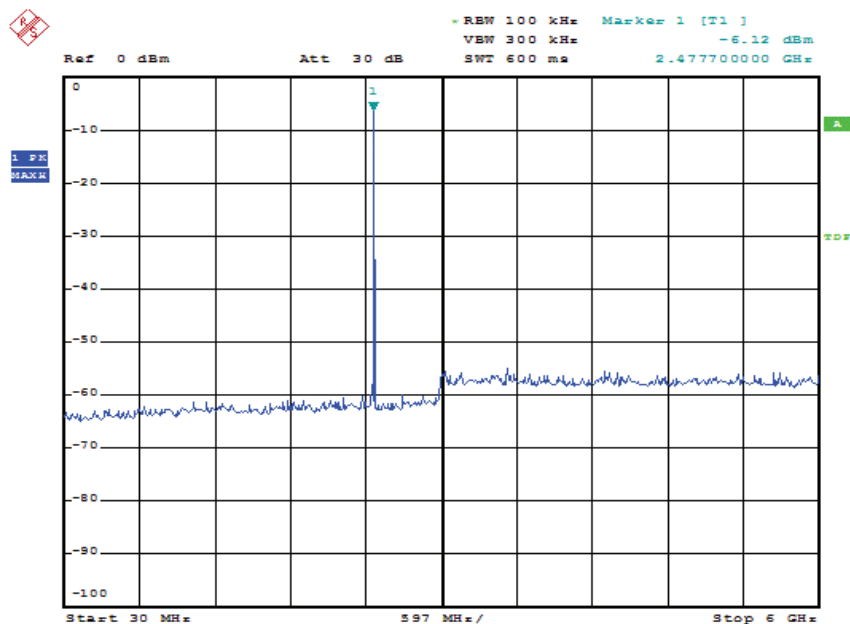


**Table 12: Conducted Spurious Emission, Mode C**

Frequency [MHz]	Reading [dBm]	Emission Level [dBm]	Limit [dBm]	Margin [dB]
24202.00	-38.74	-38.74	-26.12	12.62
2477.700	-6.12	-6.12	NA	NA

Notes: Cable loss was included in reading as offset.  
Limit = Reading of fundamental + Correction factor – 20dB

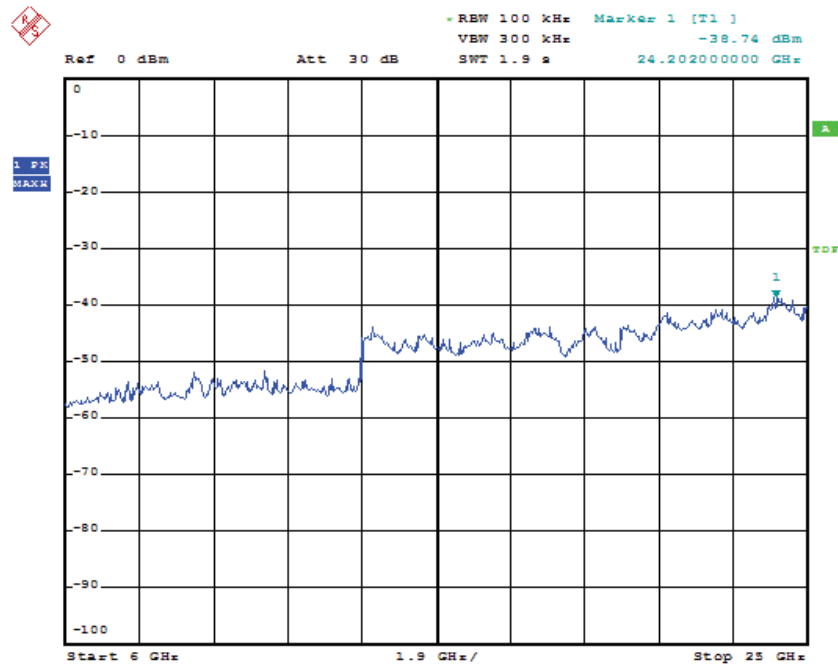
**Figure 15: Conducted Spurious Emission, 30MHz – 6GHz, Mode C**



Prüfbericht - Nr.: 15061569 001  
Test Report No.:

Seite 29 von 42  
Page 29 of 42

Figure 16: Conducted Spurious Emission, 6 – 25GHz, Mode C





**Prüfbericht - Nr.: 15061569 001**

Seite 30 von 42

Test Report No.:

Page 30 of 42

### **5.1.7 Band Edge Compliance of RF Conducted Emission, FCC 15.247(d)**

**RESULT:**

**PASS**

Date of testing: 2013-06-05

Ambient temperature: 22~26°C

Relative humidity: 50~65%

Atmospheric pressure: 100~103hPa

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 C63.4-2003 and 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 17: Lower Band Edge Conducted Mode A(Disable hopping)

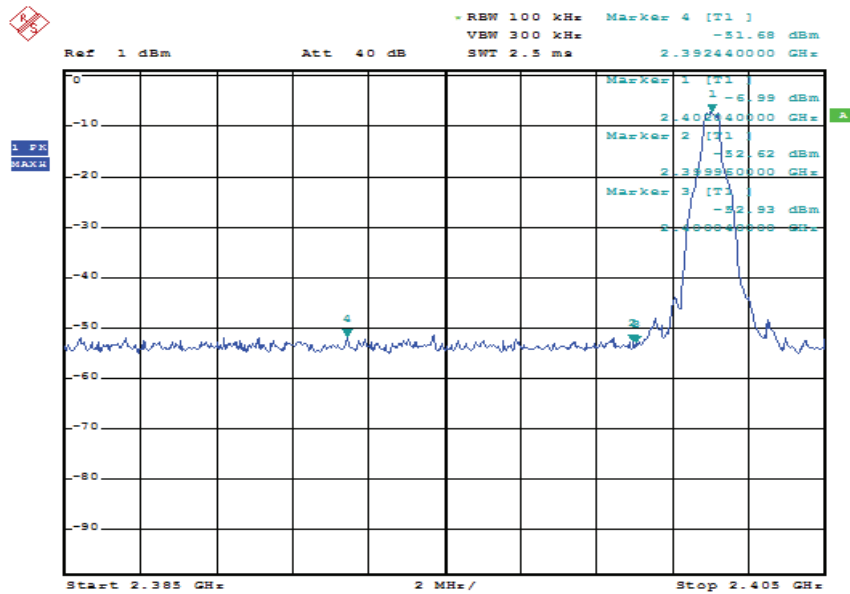


Figure 18: Upper Band Edge Conducted Mode C

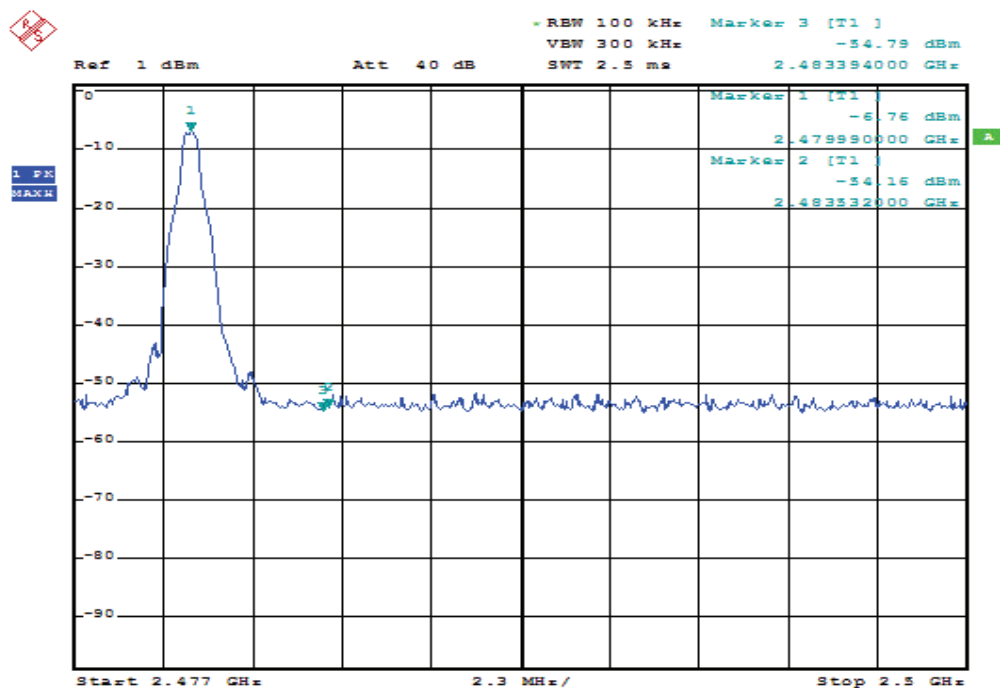


Figure 19: Lower Band Edge Conducted Mode A(Hopping)

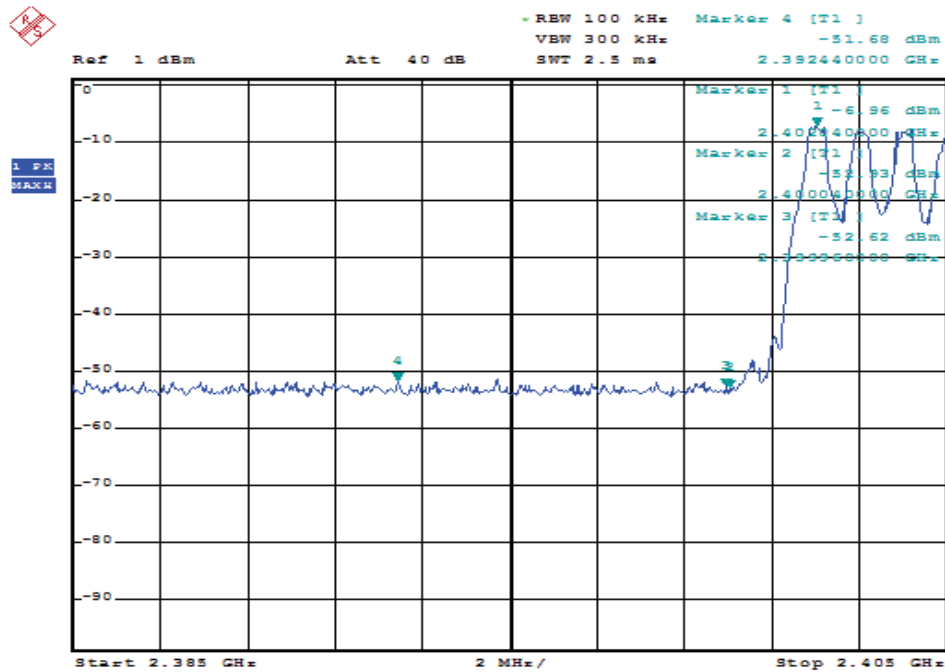
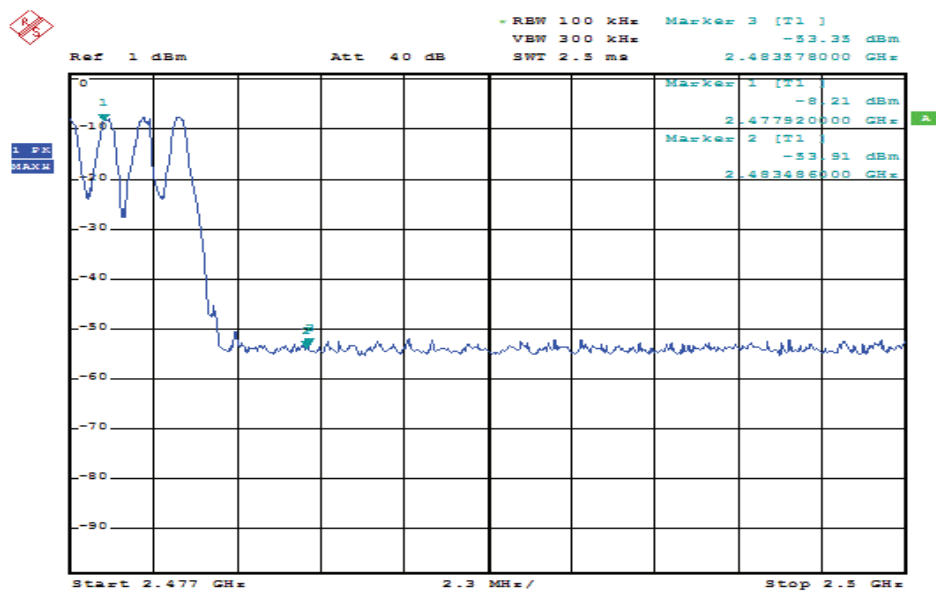


Figure 20: Lower Band Edge Conducted Mode C(Hopping)



**Prüfbericht - Nr.:** 15061569 001  
*Test Report No.:*

**Seite 33 von 42**  
*Page 33 of 42*

## 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)

**RESULT:**

**Pass**

Date of testing: 2013-05-29

Ambient temperature: 22~26°C

Relative humidity: 50~65%

Atmospheric pressure: 100~103hPa

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), must comply with the radiated emission limits specified in FCC 15.209(a).

**Test procedure:**

ANSI C63.10-2009 and KDB 558074 D01 DTS Meas Guidance v02  
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.

**Table 13: 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	2390.000	61.089	24.788	-12.911	74.000	36.302	PK
2	Horizontal	2399.898	60.948	24.545	-13.052	74.000	36.382	PK
3	Horizontal	2402.208	83.719	47.317	N/A	N/A	36.402	PK

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Horizontal	2390.000	49.707	13.406	-4.293	54.000	36.302	AV
2	Horizontal	2399.898	49.661	13.278	-4.339	54.000	36.382	AV
3	Horizontal	2402.208	83.247	46.845	N/A	N/A	36.402	AV

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Vertical	2390.000	60.865	25.224	-13.135	74.000	35.642	PK
2	Vertical	2399.898	60.856	25.173	-13.144	74.000	35.683	PK
3	Vertical	2402.112	82.988	47.296	N/A	N/A	35.693	PK

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Vertical	2390.000	49.049	13.408	-4.951	54.000	35.642	AV
2	Vertical	2399.898	48.978	13.295	-5.022	54.000	35.683	AV
3	Vertical	2402.112	82.314	46.622	N/A	N/A	35.693	AV

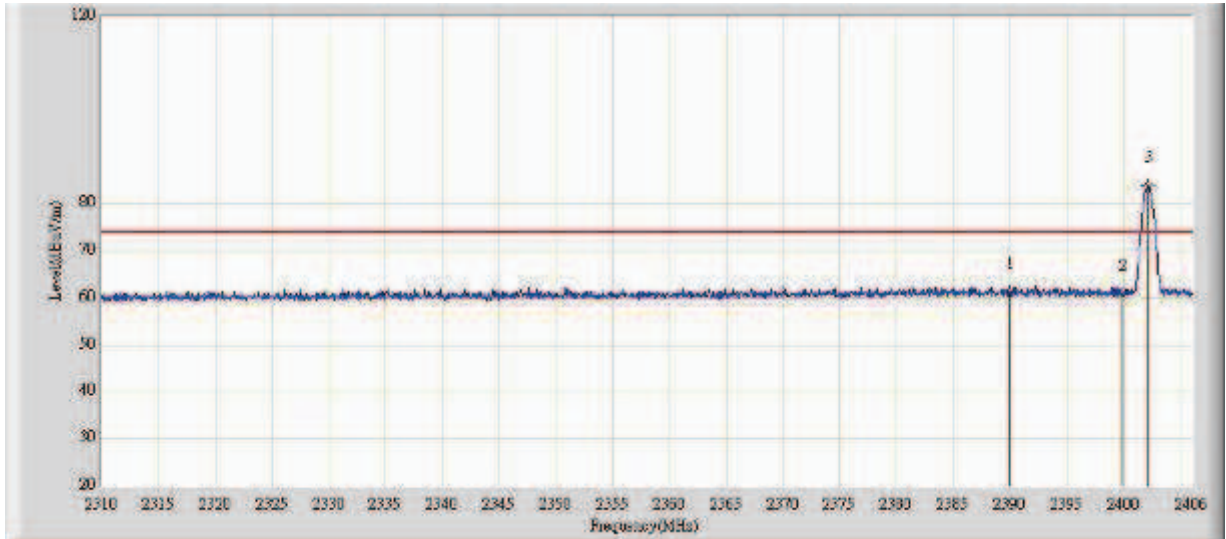
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Horizontal	2480.112	82.899	45.839	N/A	N/A	37.060	PK
2	Horizontal	2483.500	61.861	24.771	-12.139	74.000	37.089	PK
3	Horizontal	2484.000	62.499	25.405	-11.501	74.000	37.094	PK

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Horizontal	2480.112	82.292	45.232	N/A	N/A	37.060	AV
2	Horizontal	2483.500	50.526	13.436	-3.474	54.000	37.089	AV
3	Horizontal	2484.000	50.510	13.416	-3.490	54.000	37.094	AV

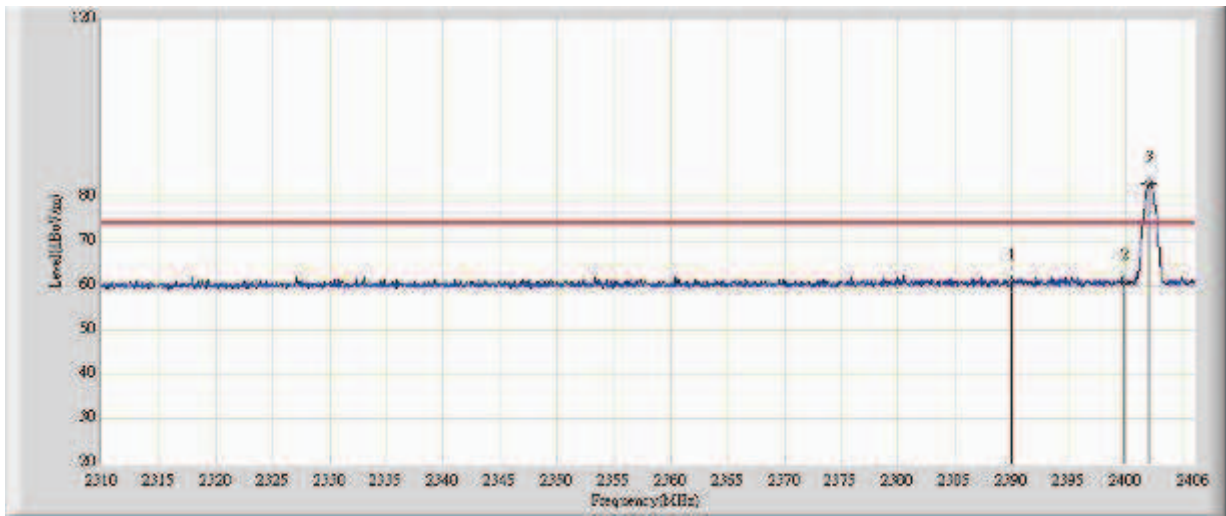
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Vertical	2480.134	86.305	50.266	N/A	N/A	36.039	PK
2	Vertical	2483.500	60.611	24.555	-13.389	74.000	36.055	PK
3	Vertical	2484.000	61.245	25.187	-12.755	74.000	36.058	PK

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Vertical	2480.112	84.186	48.147	N/A	N/A	36.039	AV
2	Vertical	2483.500	49.525	13.469	-4.475	54.000	36.055	AV
3	Vertical	2484.000	49.566	13.508	-4.434	54.000	36.058	AV

Figure 21: Lower Band Edge Conducted Mode A(Hopping)

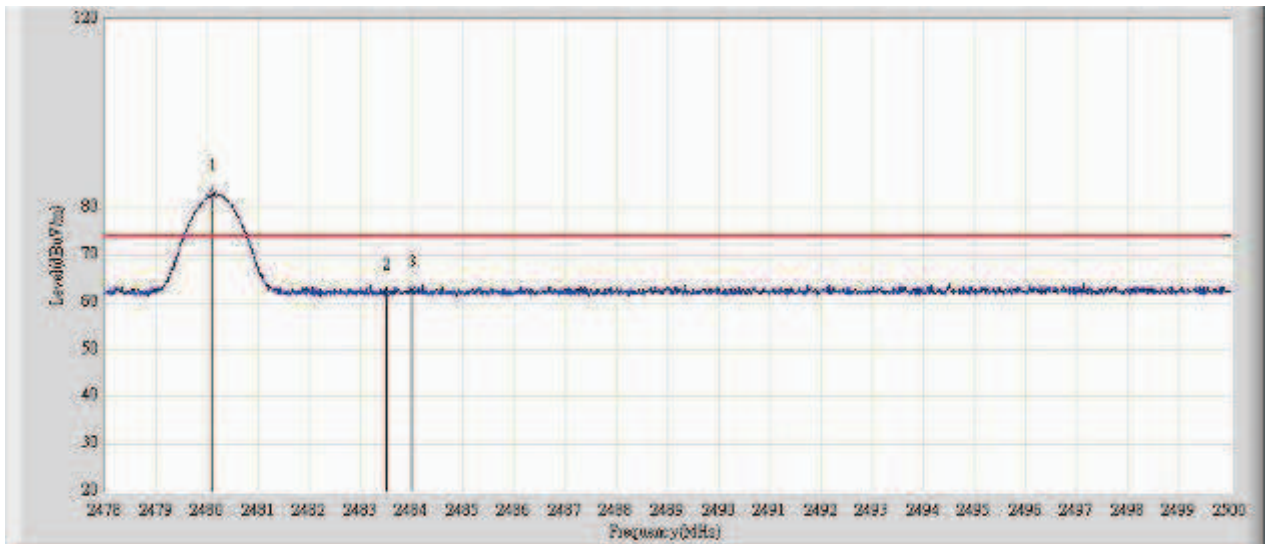


Horizontal(PK)

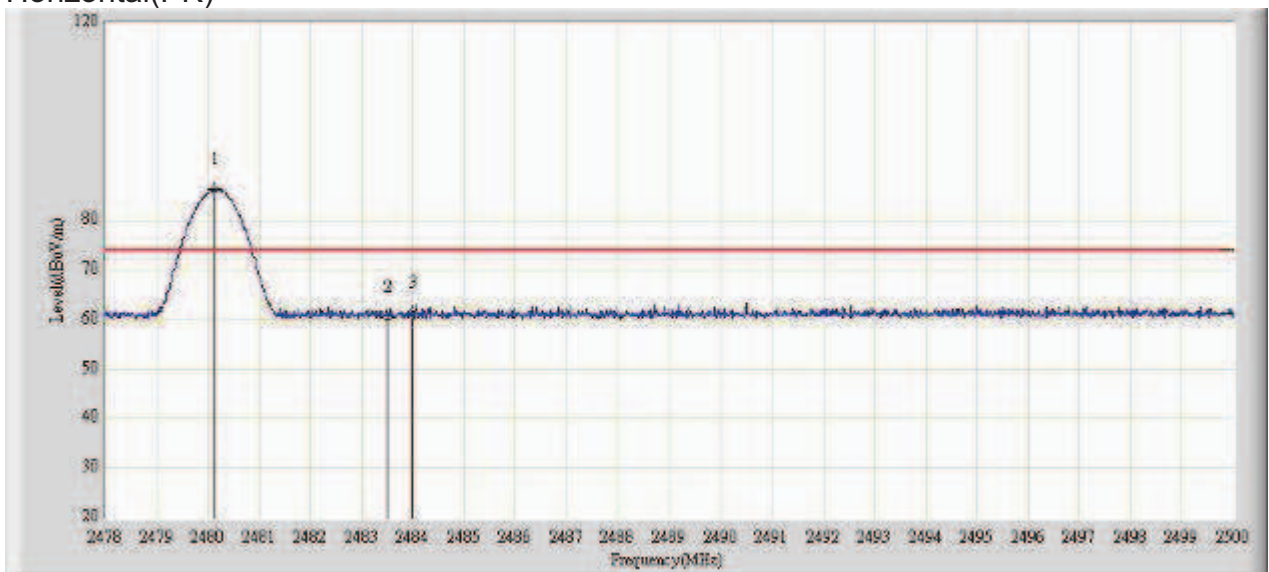


Vertical(PK)

Figure 22: Lower Band Edge Conducted Mode A(Hopping)



Horizontal(PK)



Vertical(PK)



**Prüfbericht - Nr.: 15061569 001**

**Seite 37 von 42**

Test Report No.:

Page 37 of 42

### **6.1.2 Radiated Spurious Emission of Transmitter, FCC 15.205, FCC 15.209, FCC 15.247(d)**

**RESULT:**

**PASS**

Date of testing:	2013-05-29
Ambient temperature:	22~26°C
Relative humidity:	50~65%
Atmospheric pressure:	100~103hPa
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), must comply with the radiated emission limits specified in FCC 15.209(a).

**Test procedure:**

ANSI C63.04-2003 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.



**Prüfbericht - Nr.: 15061569 001**

**Seite 38 von 42**

Test Report No.:

Page 38 of 42

**Table 14: Radiated Emission, Average and Peak Data, 1 – 25GHz, Horizontal and Vertical Antenna Orientations, Mode A**

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Horizontal	4804.000	37.167	45.485	-36.833	74.000	-8.318	PK
2	Horizontal	7205.000	45.544	49.004	-28.456	74.000	-3.460	PK
3	Vertical	4804.000	36.671	45.103	-37.329	74.000	-8.432	PK
4	Vertical	7205.000	43.124	46.620	-30.876	74.000	-3.496	PK

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

**Table 15: Radiated Emission, Average and Peak Data, 1 – 25GHz, Horizontal and Vertical Antenna Orientations, Mode B**

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Horizontal	4882.000	36.586	44.885	-37.414	74.000	-8.299	PK
2	Horizontal	7323.000	38.085	41.345	-35.915	74.000	-3.260	PK
3	Vertical	4882.000	36.167	44.455	-37.833	74.000	-8.287	PK
4	Vertical	7323.000	38.605	41.865	-35.395	74.000	-3.260	PK

**Table 16: Radiated Emission, Average and Peak Data, 1 – 25GHz, Horizontal and Vertical Antenna Orientations, Mode C**

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Horizontal	4960.000	39.271	47.612	-34.729	74.000	-8.340	PK
2	Horizontal	7440.000	40.309	43.212	-33.691	74.000	-2.903	PK
3	Vertical	4960.000	38.412	46.616	-35.588	74.000	-8.204	PK
4	Vertical	7440.000	40.250	43.153	-33.750	74.000	-2.903	PK

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

**Prüfbericht - Nr.:** 15061569 001

**Seite 39 von 42**

*Test Report No.:*

*Page 39 of 42*

## 6.2 Receiver Parameters

### 6.2.1 Radiated Spurious Emission of Receiver, FCC 15.109

**RESULT:**

**PASS**

Date of testing: 2013-05-29

Ambient temperature: 22~26°C

Relative humidity: 50~65%

Atmospheric pressure: 100~103hPa

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).

**Test procedure:**

ANSI C63.4-2003

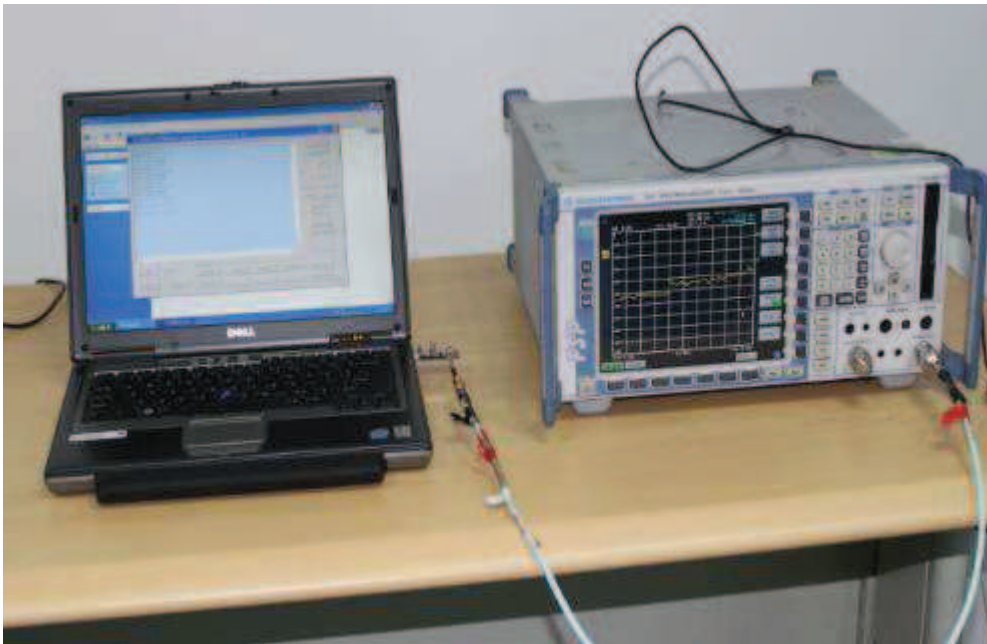
The EUT was placed on a nonconductive turntable 0.8m above the ground plane. Before final measurements of radiated emissions were performed, the EUT was scanned to determine its emission spectrum profile. The EUT was pretested in floor-standing condition and in the table position and the worst case condition 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.

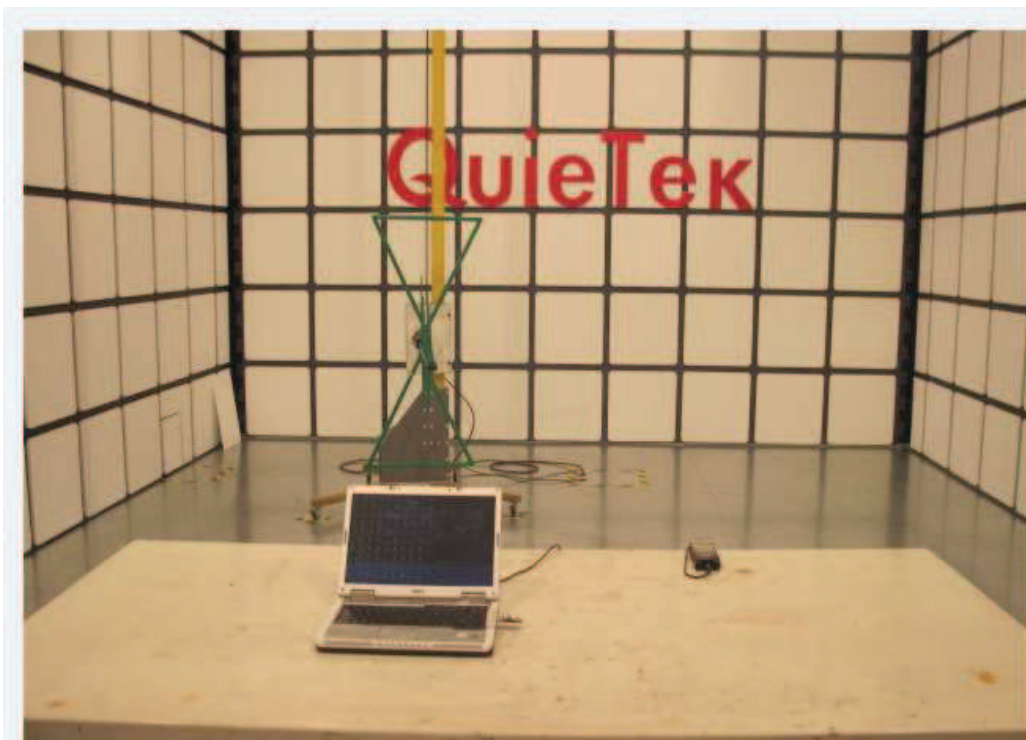
For frequencies between 30MHz and 1GHz, the spectrum analyzer's 6 dB bandwidth was set to 120 kHz, and the analyzer was operated in the CISPR quasi-peak detection mode. For emissions above 1GHz, measurements were performed using the following settings: Peak: RBW & VBW = 1MHz, Average: RBW = 1MHz, VBW = 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 . all signals found in the pre-testing were more than 20 dB below the limit .

## 7. Photographs of the Test Setup

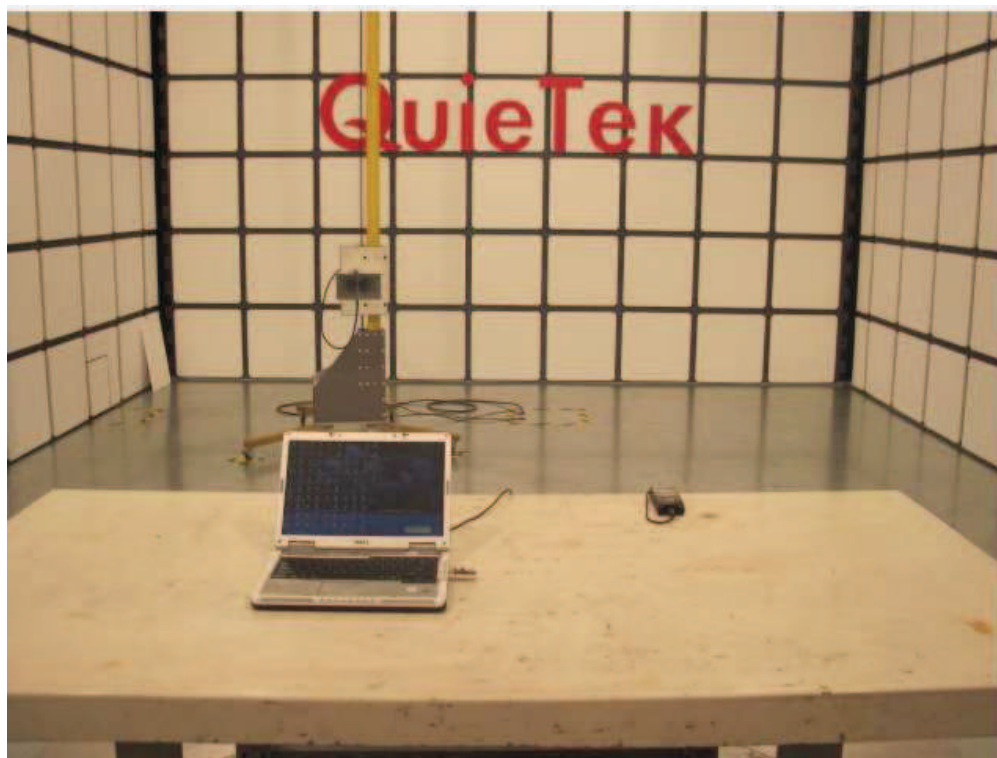
**Photograph 1: Set-up for Conducted RF test at Antenna Port**



**Photograph 2: Set-up for Radiated Emission, 30MHz-1000MHz**



**Photograph 3: Set-up for Radiated Spurious Emission, 1G-18GHz**



## 8. List of Tables

Table 1: List of Test and Measurement Equipment .....	6
Table 2: Emission Measurement Uncertainty .....	6
Table 3: Conducted Output Power, Mode A .....	11
Table 4: Conducted Output Power, Mode B .....	11
Table 5: Conducted Output Power, Mode C .....	11
Table 6: Carrier Frequency Separation .....	13
Table 7: 20dB &99% Bandwidth (bluetooth BDR and EDR) .....	15
Table 8: Number of Hopping Frequencies .....	20
Table 9: Average Time of Occupancy .....	22
Table 10: Conducted Spurious Emission, Mode A.....	25
Table 11: Conducted Spurious Emission, Mode B.....	26
Table 12: Conducted Spurious Emission, Mode C .....	28
Table 13: Band Edge Radiated Emission .....	34
Table 14: Radiated Emission, Average and Peak Data, 1 – 25GHz, Horizontal and Vertical Antenna Orientations, Mode A.....	38
Table 15: Radiated Emission, Average and Peak Data, 1 – 25GHz, Horizontal and Vertical Antenna Orientations, Mode B.....	38
Table 16: Radiated Emission, Average and Peak Data, 1 – 25GHz, Horizontal and Vertical Antenna Orientations, Mode C .....	38

## 9. List of Figures

Figure 1: Carrier Frequency Separation-Low Channel .....	13
Figure 2: Carrier Frequency Separation-Middle Channel .....	14
Figure 3: Carrier Frequency Separation-High Channel.....	14
Figure 4: 20dB &99% Bandwidth, Mode A (8DPSK and GFSK).....	16
Figure 5: 20dB Bandwidth, Mode B (8DPSK and GFSK) .....	17
Figure 6: 20dB Bandwidth, Mode C (8DPSK and GFSK) .....	18
Figure 7: Hopping Frequencies .....	20
Figure 8: Dwell Time, Mode (Hopping), 1M-DH5, Low channel.....	22
Figure 9: Dwell Time, Mode (Hopping), 1M-DH5, Mid channel .....	23
Figure 10: Dwell Time, Mode (Hopping), 1M-DH5, High channel.....	23
Figure 11: Conducted Spurious Emission, 30MHz – 6GHz, Mode A.....	25
Figure 12: Conducted Spurious Emission, 6 – 26GHz, Mode A.....	26
Figure 13: Conducted Spurious Emission, 30MHz – 6GHz, Mode B.....	27
Figure 14: Conducted Spurious Emission, 6 – 26GHz, Mode B .....	27
Figure 15: Conducted Spurious Emission, 30MHz – 6GHz, Mode C .....	28
Figure 16: Conducted Spurious Emission, 6 – 26GHz, Mode C.....	29
Figure 17: Lower Band Edge Conducted Mode A.....	31
Figure 18: Upper Band Edge Conducted Mode C .....	31
Figure 19: Lower Band Edge Conducted Mode A(Hopping).....	32
Figure 20: Lower Band Edge Conducted Mode C(Hopping) .....	32

## 10. List of Photographs

Photograph 1: Set-up for Conducted RF test at Antenna Port.....	40
Photograph 2: Set-up for Radiated Emission, 30MHz-1000MHz.....	40
Photograph 3: Set-up for Radiated Spurious Emission, 1G-18GHz .....	41