

# FCC Test Report

Product Name	Barcode Scanner
Model No.	BD-5200ZB, BC-5200ZB, BL-5200ZB
FCC ID.	YKH-B5000ZB

Applicant	NUMA Electronics Inc.
Address	7F-8, No.107, Sec. 1 Zhongshan Rd. Xinzhuang Taiwan

Date of Receipt	Nov. 20, 2014
Issued Date	Feb. 03, 2015
Report No.	14B0492R-RFUSP26V00
Report Version	V1.0



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration of the equipment and evaluated measurement uncertainty herein.

This report must not be used to claim product endorsement by TAF or any agency of the government.

The test report shall not be reproduced without the written approval of QuieTek Corporation.

# Test Report

Issued Date: Feb. 03, 2015

Report No.: 14B0492R-RFUSP26V00



Product Name	Barcode Scanner
Applicant	NUMA Electronics Inc.
Address	7F-8, No.107, Sec. 1 Zhongshan Rd. Xinzhuang Taiwan
Manufacturer	NUMA Electronics Inc.
Model No.	BD-5200ZB, BC-5200ZB, BL-5200ZB
FCC ID.	YKH-B5000ZB
EUT Rated Voltage	DC 3.7V (Power by Battery)
EUT Test Voltage	DC 3.7V (Power by Battery)
Trade Name	NUMA
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2013 ANSI C63.10: 2013, KDB 558074 D01 DTS Meas Guidance v03r02
Test Result	Complied

Documented By : Jinn Chen  
( Senior Adm. Specialist / Jinn Chen )

Tested By : Nova chu  
( Assistant Engineer / Nova Chu )

Approved By :   
( Director / Vincent Lin )

# TABLE OF CONTENTS

Description	Page
<b>1. GENERAL INFORMATION .....</b>	<b>4</b>
1.1. EUT Description .....	4
1.2. Operational Description .....	6
1.3. Tested System Details .....	7
1.4. Configuration of Tested System .....	7
1.5. EUT Exercise Software .....	8
1.6. Test Facility .....	9
<b>2. CONDUCTED EMISSION .....</b>	<b>10</b>
2.1. Test Equipment .....	10
2.2. Test Setup .....	10
2.3. Limits .....	11
2.4. Test Procedure .....	11
2.5. Uncertainty .....	11
2.6. Test Result of Conducted Emission .....	12
<b>3. PEAK POWER OUTPUT .....</b>	<b>14</b>
3.1. Test Equipment .....	14
3.2. Test Setup .....	14
3.3. Limit .....	14
3.4. Test Procedure .....	14
3.5. Uncertainty .....	14
3.6. Test Result of Peak Power Output .....	15
<b>4. RADIATED EMISSION .....</b>	<b>16</b>
4.1. Test Equipment .....	16
4.2. Test Setup .....	16
4.3. Limits .....	17
4.4. Test Procedure .....	19
4.5. Uncertainty .....	19
4.6. Test Result of Radiated Emission .....	20
<b>5. RF ANTENNA CONDUCTED TEST .....</b>	<b>24</b>
5.1. Test Equipment .....	24
5.2. Test Setup .....	24
5.3. Limits .....	24
5.4. Test Procedure .....	24
5.5. Uncertainty .....	24
5.6. Test Result of RF Antenna Conducted Test .....	25
<b>6. BAND EDGE .....</b>	<b>26</b>
6.1. Test Equipment .....	26
6.2. Test Setup .....	27
6.3. Limit .....	28
6.4. Test Procedure .....	28
6.5. Uncertainty .....	28
6.6. Test Result of Band Edge .....	29
<b>7. OCCUPIED BANDWIDTH (6DB BW).....</b>	<b>33</b>
7.1. Test Equipment .....	33
7.2. Test Setup .....	33
7.3. Limits .....	33
7.4. Test Procedure .....	33
7.5. Uncertainty .....	33
7.6. Test Result of Occupied Bandwidth .....	34
<b>8. POWER DENSITY .....</b>	<b>37</b>
8.1. Test Equipment .....	37
8.2. Test Setup .....	37
8.3. Limits .....	37
8.4. Test Procedure .....	37
8.5. Uncertainty .....	37
8.6. Test Result of Power Density .....	38
<b>9. EMI REDUCTION METHOD DURING COMPLIANCE TESTING .....</b>	<b>41</b>
Attachment 1: EUT Test Photographs	
Attachment 2: EUT Detailed Photographs	

## 1. GENERAL INFORMATION

### 1.1. EUT Description

Product Name	Barcode Scanner
Trade Name	NUMA
Model No.	BD-5200ZB, BC-5200ZB, BL-5200ZB
FCC ID.	YKH-B5000ZB
Frequency Range	2405 – 2470MHz
Channel Number	10
Type of Modulation	GFSK
Antenna Type	Multilayer Chip Antenna
Channel Control	Auto
Antenna Gain	Refer to the table “Antenna List”

#### Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	ACX	AT7020-E3R0HBA	Multilayer Chip Antenna	1.3 dBi for 2.4 GHz

Note: The antenna of EUT is conforming to FCC 15.203.

Center Frequency of Each Channel:

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 05:	2405MHz	Channel 08:	2408MHz	Channel 11:	2411 MHz	Channel 32:	2432 MHz
Channel 35:	2435MHz	Channel 39:	2439MHz	Channel 41:	2441 MHz	Channel 65:	2465 MHz
Channel 68:	2468 MHz	Channel 70:	2470 MHz				

Note:

1. The EUT is a Barcode Scanner, with a built-in 2.4GHz transmitter.
2. The different of each model is shown as below:

Model Number	Description
BC-5200ZB	Linear CCD SCANNER
BD-5200ZB	2D Area Imager SCANNER
BL-5200ZB	Laser SCANNER

3. These tests are conducted on a sample for the purpose of demonstrating compliance of 2.4GHz transmitter with Part 15 Subpart C Paragraph 15.247 of spread spectrum devices.
4. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
5. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

Test Mode	Mode 1: Transmit
-----------	------------------

### 1.3. Tested System Details

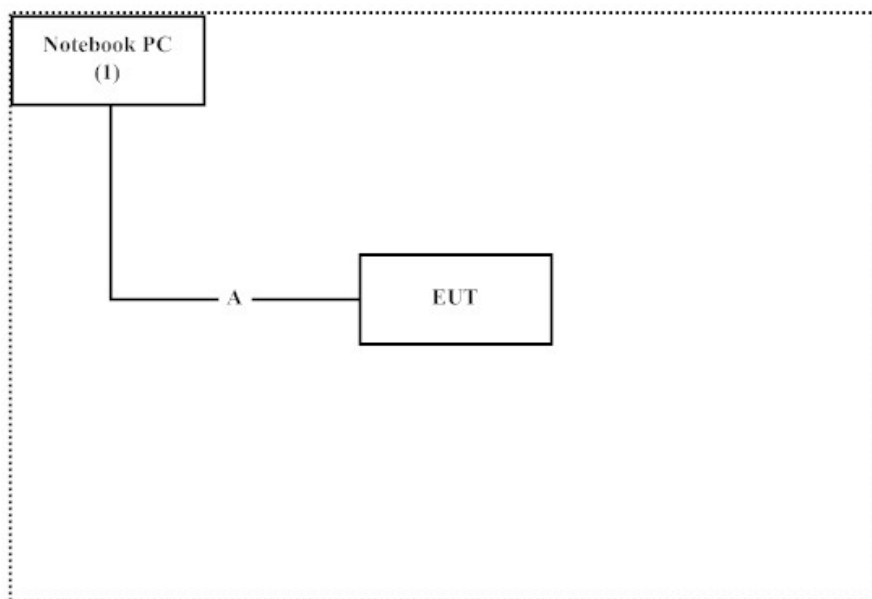
The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

	Product	Manufacturer	Model No.	Serial No.	Power Cord
1	Notebook PC	DELL	PPT	N/A	Non-Shielded, 0.8m

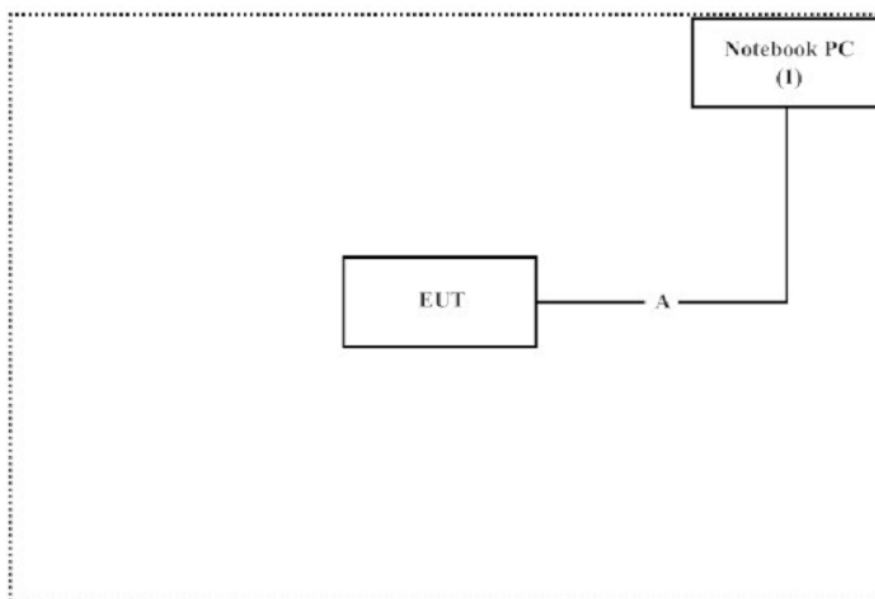
Signal Cable Type	Signal cable Description
A USB Cable	Shielded, 0.8m

### 1.4. Configuration of Tested System

Radiated Emission



Conducted Emission



**1.5. EUT Exercise Software**

- 1 Setup the EUT as shown in Section 1.4.
- 2 Press and hold the button.
- 3 Configure the test mode, the test channel, and the data rate.
- 4 Start transmits continually.
- 5 Verify that the EUT works properly.

## 1.6. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	30-65
Barometric pressure (mbar)	860-1060	950-1000

The related certificate for our laboratories about the test site and management system can be downloaded from

QuieTek Corporation's Web Site: <http://www.quietek.com/tw/ctg/cts/accreditations.htm>

The address and introduction of Quietek Corporation's laboratories can be founded in our Web site:  
<http://www.quietek.com/>

Site Description: File on  
 Federal Communications Commission  
 FCC Engineering Laboratory  
 7435 Oakland Mills Road  
 Columbia, MD 21046  
 Registration Number: 92195

Site Name: Quietek Corporation  
 Site Address: No.5-22, Ruishukeng,  
 Linkou Dist. New Taipei City 24451,  
 Taiwan, R.O.C.  
 TEL: 886-2-8601-3788 / FAX : 886-2-8601-3789  
 E-Mail : [service@quietek.com](mailto:service@quietek.com)

FCC Accreditation Number: TW1014



## 2. Conducted Emission

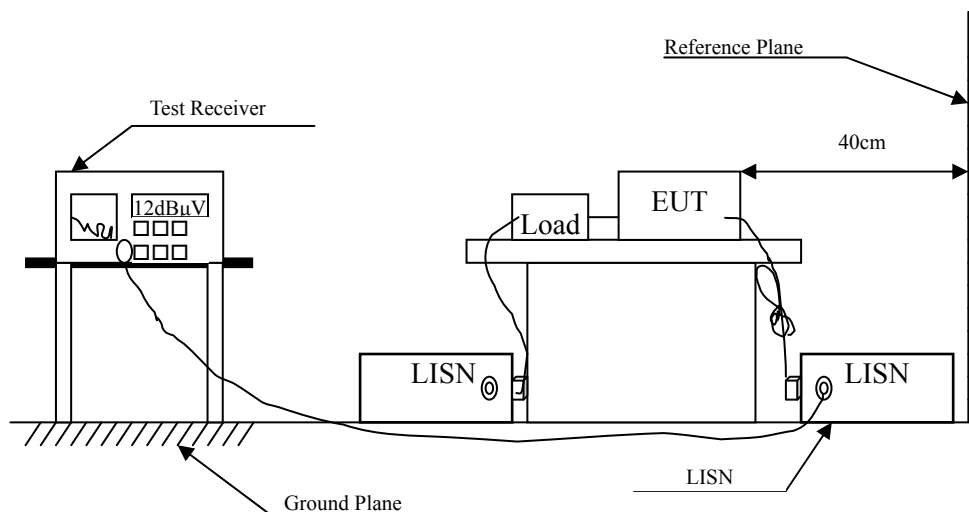
### 2.1. Test Equipment

	Equipment	Manufacturer	Model No. / Serial No.	Last Cal.	Remark
X	Test Receiver	R & S	ESCS 30 / 825442/018	Sep., 2014	
X	Artificial Mains Network	R & S	ENV4200 / 848411/10	Feb., 2015	Peripherals
X	LISN	R & S	ESH3-Z5 / 825562/002	Feb., 2015	EUT
	DC LISN	Schwarzbeck	8226 / 176	Mar., 2014	EUT
X	Pulse Limiter	R & S	ESH3-Z2 / 357.8810.52	Feb., 2015	
	No.1 Shielded Room				

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked by "X" are used to measure the final test results.

### 2.2. Test Setup



### 2.3. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dBμV) Limit		
Frequency MHz	Limits	
	QP	AV
0.15 - 0.50	66-56	56-46
0.50-5.0	56	46
5.0 - 30	60	50

Remarks: In the above table, the tighter limit applies at the band edges.

### 2.4. Test Procedure

The EUT and Peripherals are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all the interface cables must be changed according to ANSI C63.10: 2013 on conducted measurement.

Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

The EUT was setup to ANSI C63.10, 2013; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

### 2.5. Uncertainty

± 2.26 dB

## 2.6. Test Result of Conducted Emission

Product : Barcode Scanner  
 Test Item : Conducted Emission Test  
 Power Line : Line 1  
 Test Mode : Mode 1: Transmit (2405MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV	Margin dB	Limit dBuV
<b>LINE 1</b>					
<b>Quasi-Peak</b>					
0.212	9.651	36.100	45.751	-18.478	64.229
0.287	9.655	27.570	37.225	-24.861	62.086
0.353	9.659	28.380	38.039	-22.161	60.200
0.498	9.667	25.810	35.477	-20.580	56.057
0.588	9.672	15.850	25.522	-30.478	56.000
0.713	9.678	16.690	26.368	-29.632	56.000
<b>Average</b>					
0.212	9.651	26.770	36.421	-17.808	54.229
0.287	9.655	21.260	30.915	-21.171	52.086
0.353	9.659	23.670	33.329	-16.871	50.200
0.498	9.667	23.700	33.367	-12.690	46.057
0.588	9.672	5.300	14.972	-31.028	46.000
0.713	9.678	13.510	23.188	-22.812	46.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. “ ” means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : Barcode Scanner  
Test Item : Conducted Emission Test  
Power Line : Line 2  
Test Mode : Mode 1: Transmit (2405MHz)

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dBuV	dBuV	dB	dBuV
<b>LINE 2</b>					
<b>Quasi-Peak</b>					
0.212	9.661	34.250	43.911	-20.318	64.229
0.255	9.663	2.930	12.593	-50.407	63.000
0.287	9.662	25.310	34.973	-27.113	62.086
0.427	9.663	21.860	31.523	-26.563	58.086
0.498	9.667	23.530	33.197	-22.860	56.057
0.599	9.672	16.630	26.302	-29.698	56.000
<b>Average</b>					
0.212	9.661	25.950	35.611	-18.618	54.229
0.255	9.663	-2.810	6.853	-46.147	53.000
0.287	9.662	23.750	33.413	-18.673	52.086
0.427	9.663	17.840	27.503	-20.583	48.086
0.498	9.667	21.490	31.157	-14.900	46.057
0.599	9.672	-0.240	9.432	-36.568	46.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. “ ” means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

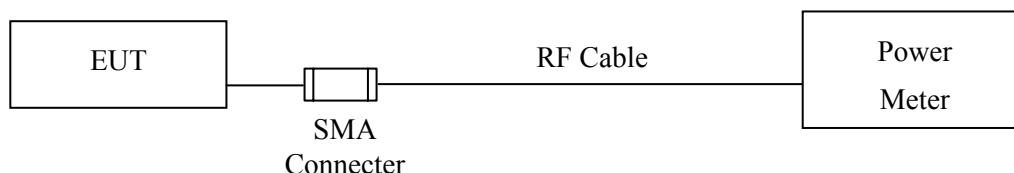
### 3. Peak Power Output

#### 3.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Power Meter	Anritsu	ML2495A/6K00003357	May, 2014
X	Power Sensor	Anritsu	MA2411B/0738448	Jun., 2014

Note: 1. All equipments are calibrated every one year.  
2. The test instruments marked by “X” are used to measure the final test results.

#### 3.2. Test Setup



#### 3.3. Limit

The maximum peak power shall be less 1Watt.

#### 3.4. Test Procedure

Tested according to DTS test procedure of KDB 558074 for compliance to FCC 47CFR 15.247 requirements. The maximum peak conducted output power using KDB 558074 section 9.1.2 PKPM1 Peak power meter method.

#### 3.5. Uncertainty

$\pm 1.27$  dB

### 3.6. Test Result of Peak Power Output

Product : Barcode Scanner  
 Test Item : Peak Power Output  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit

Channel No.	Frequency (MHz)	Measurement (dBm)	Required Limit	Result
Channel 05	2405.00	9.63	1 Watt= 30 dBm	Pass
Channel 41	2441.00	9.34	1 Watt= 30 dBm	Pass
Channel 70	2470.00	8.82	1 Watt= 30 dBm	Pass

#### 4. Radiated Emission

##### 4.1. Test Equipment

The following test equipments are used during the radiated emission test:

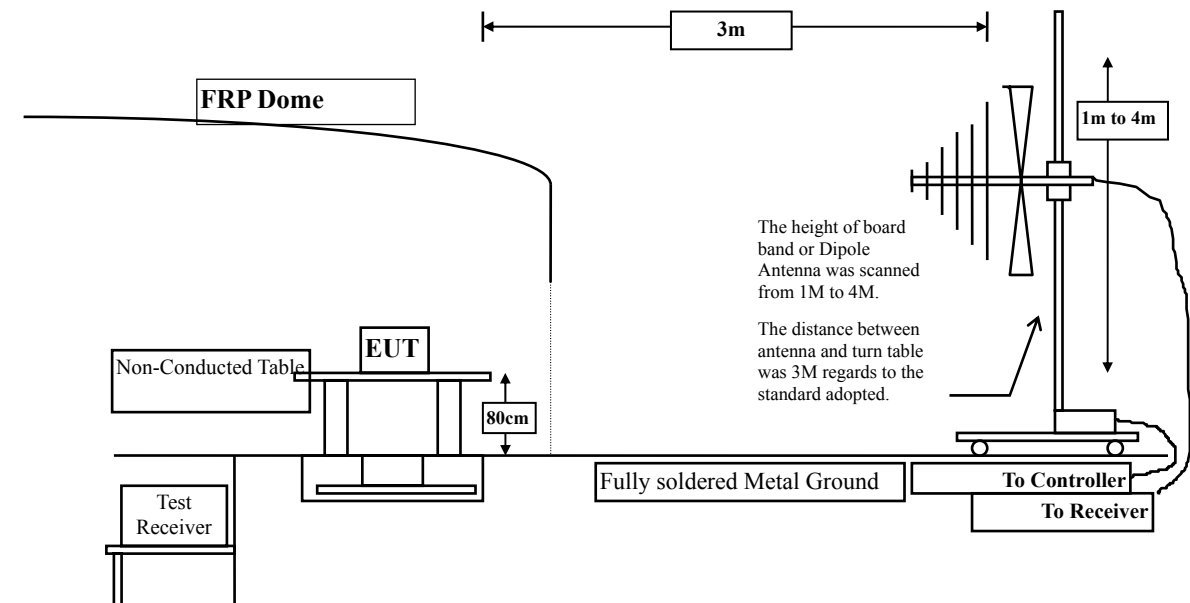
Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.
<input checked="" type="checkbox"/> Site # 3	X	Magnetic Loop Antenna	Teseq	HLA6121/ 37133	Sep, 2014
	X	Bilog Antenna	Schaffner Chase	CBL6112B/ 2707	Jun, 2014
	X	EMI Test Receiver	R&S	ESCS 30/838251/ 001	Jun, 2014
	X	Coaxial Cable	QTK(Arnist)	RG 214/ LC003-RG	Jun, 2014
	X	Coaxial signal switch	Arnist	MP59B/ 6200798682	Jun, 2014

Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.
<input checked="" type="checkbox"/> CB # 8	X	Spectrum Analyzer	R&S	FSP40/ 100339	Oct, 2014
	X	Horn Antenna	ETS-Lindgren	3117/ 35205	Mar, 2014
	X	Horn Antenna	Schwarzbeck	BBHA9170/209	Jan, 2015
	X	Horn Antenna	TRC	AH-0801/95051	Aug, 2014
	X	Pre-Amplifier	EMCI	EMC012630SE/980210	Jan, 2015
	X	Pre-Amplifier	MITEQ	JS41-001040000-58-5P/153945	Jul, 2014
	X	Pre-Amplifier	NARDA	DBL-1840N506/013	Jul, 2014

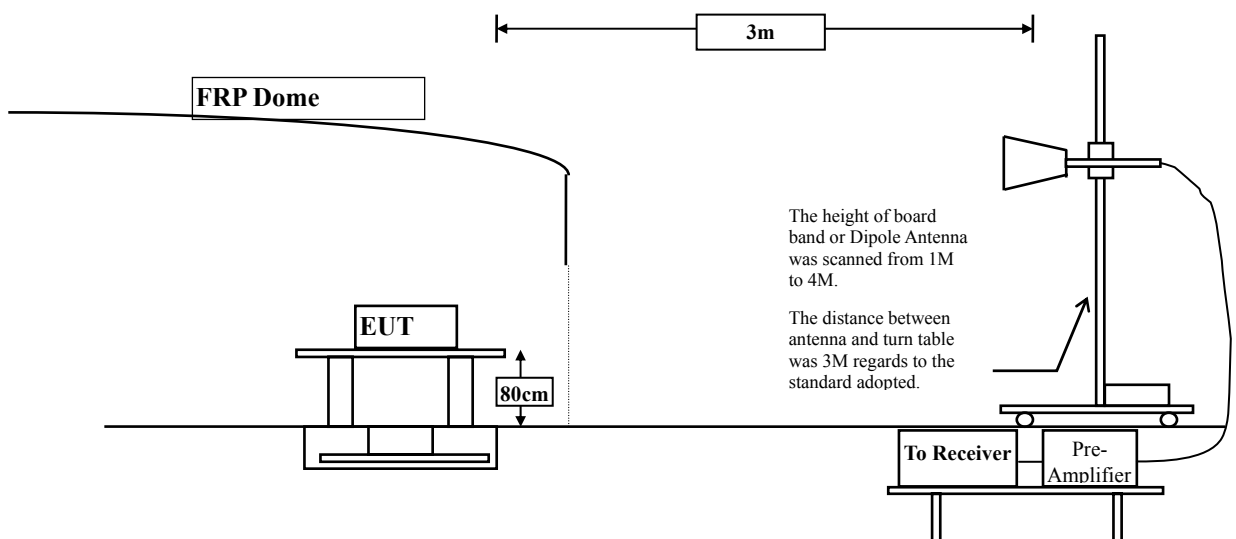
- Note:
1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
  2. The test instruments marked with "X" are used to measure the final test results.

## 4.2. Test Setup

Below 1GHz



Above 1GHz



## 4.3. Limits

### ► General Radiated Emission Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.



FCC Part 15 Subpart C Paragraph 15.209 Limits		
Frequency MHz	Field strength (microvolts/meter)	Measurement distance (meter)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

- Remarks:
1. RF Voltage (dBμV) = 20 log RF Voltage (uV)
  2. In the Above Table, the tighter limit applies at the band edges.
  3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

#### **4.4. Test Procedure**

The EUT was setup according to ANSI C63.10, 2013 and tested according to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

The EUT is placed on a turn table which is 0.8 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.

The resolution bandwidth below 30MHz setting on the field strength meter is 9kHz and 30MHz~1GHz is 120kHz and above 1GHz is 1MHz.

Radiated emission measurements below 30MHz are made using Loop Antenna and 30MHz~1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna.

The worst radiated emission is measured on the Final Measurement.

The measurement frequency range from 9kHz - 10th Harmonic of fundamental was investigated.

#### **4.5. Uncertainty**

± 3.9 dB above 1GHz

± 3.8 dB below 1GHz

#### 4.6. Test Result of Radiated Emission

Product : Barcode Scanner  
 Test Item : Harmonic Radiated Emission  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit (2405MHz)

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dB $\mu$ V	dB $\mu$ V/m	dB	dB $\mu$ V/m
<b>Horizontal</b>					
<b>Peak Detector:</b>					
4810.000	3.323	53.820	57.143	-16.857	74.000
7215.000	10.289	38.150	48.440	-25.560	74.000
9620.000	13.595	38.260	51.856	-22.144	74.000
<b>Average</b>					
<b>Detector:</b>					
4810.000	3.323	36.320	39.643	-14.357	54.000
<b>Vertical</b>					
<b>Peak Detector:</b>					
4810.000	6.591	55.160	61.751	-12.249	74.000
7215.000	11.151	33.760	44.912	-29.088	74.000
9620.000	14.014	35.330	49.345	-24.655	74.000
<b>Average</b>					
<b>Detector:</b>					
4810.000	6.591	26.300	32.891	-21.109	54.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Barcode Scanner  
Test Item : Harmonic Radiated Emission  
Test Site : No.3 OATS  
Test Mode : Mode 1: Transmit (2441MHz)

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dBμV	dBμV/m	dB	dBμV/m
<b>Horizontal</b>					
<b>Peak Detector:</b>					
4882.000	3.010	53.240	56.250	-17.750	74.000
7323.000	11.833	34.000	45.834	-28.166	74.000
9764.000	12.580	35.610	48.191	-25.809	74.000
<b>Average</b>					
<b>Detector:</b>					
4882.000	3.010	25.990	29.000	-25.000	54.000
<b>Vertical</b>					
<b>Peak Detector:</b>					
4882.000	5.738	53.410	59.148	-14.852	74.000
7323.000	12.703	33.210	45.913	-28.087	74.000
9764.000	13.052	35.610	48.662	-25.338	74.000
<b>Average</b>					
<b>Detector:</b>					
4882.000	5.738	25.970	31.708	-22.292	54.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Barcode Scanner  
Test Item : Harmonic Radiated Emission  
Test Site : No.3 OATS  
Test Mode : Mode 1: Transmit (2470MHz)

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dB $\mu$ V	dB $\mu$ V/m	dB	dB $\mu$ V/m
<b>Horizontal</b>					
<b>Peak Detector:</b>					
4940.000	2.816	50.350	53.165	-20.835	74.000
7410.000	13.386	33.430	46.816	-27.184	74.000
9880.000	13.741	34.960	48.701	-25.299	74.000
<b>Average</b>					
<b>Detector:</b>					
--					
<b>Vertical</b>					
<b>Peak Detector:</b>					
4940.000	5.538	50.220	55.757	-18.243	74.000
7410.000	13.386	33.570	46.956	-27.044	74.000
9880.000	13.741	36.160	49.901	-24.099	74.000
<b>Average</b>					
<b>Detector:</b>					
4940.000	5.538	24.990	30.527	-23.473	54.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Barcode Scanner  
Test Item : General Radiated Emission  
Test Site : No.3 OATS  
Test Mode : Mode 1: Transmit (2441MHz)

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dB $\mu$ V	dB $\mu$ V/m	dB	dB $\mu$ V/m
<b>Horizontal</b>					
229.820	-8.162	47.123	38.961	-7.039	46.000
363.680	-1.433	44.465	43.032	-2.968	46.000
431.580	-2.099	39.677	37.578	-8.422	46.000
482.020	-0.505	34.058	33.553	-12.447	46.000
666.320	2.031	34.433	36.465	-9.535	46.000
800.180	5.141	32.285	37.426	-8.574	46.000
<b>Vertical</b>					
142.520	-6.267	32.871	26.604	-16.896	43.500
301.600	-6.785	45.954	39.170	-6.830	46.000
509.180	-0.158	28.051	27.893	-18.107	46.000
666.320	-1.809	38.048	36.240	-9.760	46.000
800.180	2.801	30.774	33.575	-12.425	46.000
968.960	8.191	23.870	32.061	-21.939	54.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.
8. No emission found between lowest internal used/generated frequency to 30MHz.

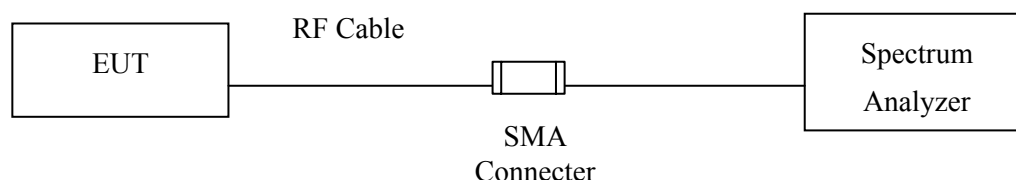
## 5. RF Antenna Conducted Test

### 5.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun., 2014
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun., 2014
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2014

Note: 1. All equipments are calibrated every one year.  
2. The test instruments Marked "X" are used to measure the final test results.

### 5.2. Test Setup



### 5.3. Limits

According to FCC Section 15.247(d). In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

### 5.4. Test Procedure

The EUT was tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.

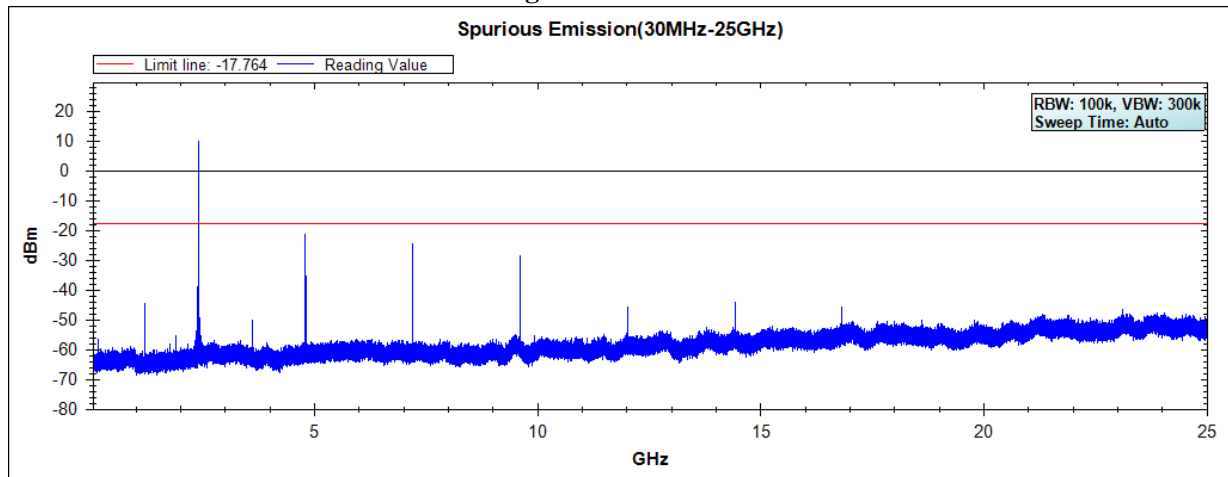
### 5.5. Uncertainty

$\pm 150\text{Hz}$

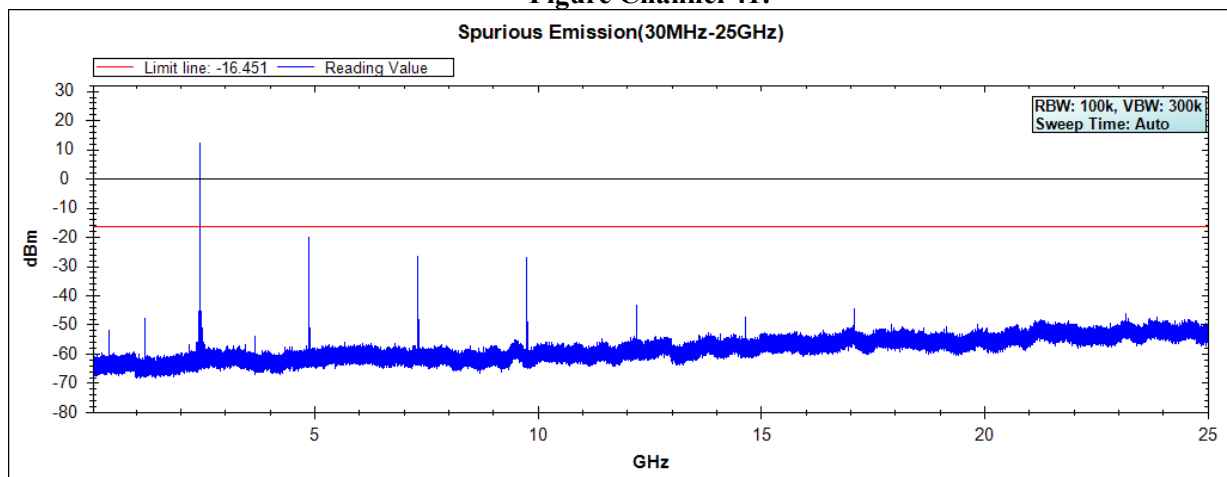
## 5.6. Test Result of RF Antenna Conducted Test

Product : Barcode Scanner  
 Test Item : RF Antenna Conducted Test  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit

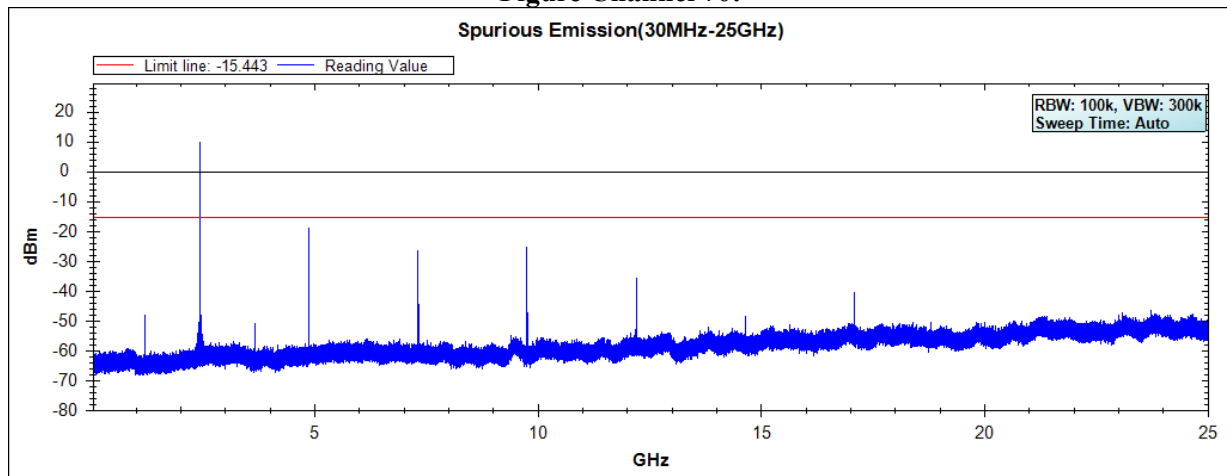
**Figure Channel 05:**



**Figure Channel 41:**



**Figure Channel 70:**



Note: The above test pattern is synthesized by multiple of the frequency range.



## 6. Band Edge

### 6.1. Test Equipment

#### RF Conducted Measurement

The following test equipments are used during the band edge tests:

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun., 2014
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun., 2014
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2014

#### RF Radiated Measurement:

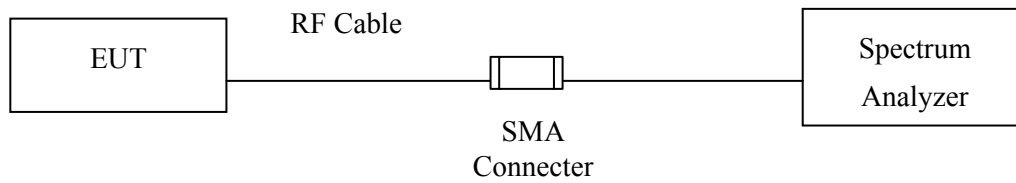
The following test equipments are used during the band edge tests:

Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.
☒ Site # 3		Bilog Antenna	Schaffner Chase	CBL6112B/2673	Sep., 2014
	X	Horn Antenna	Schwarzbeck	BBHA9120D/D305	Sep., 2014
		Horn Antenna	Schwarzbeck	BBHA9170/208	Jul., 2014
	X	Pre-Amplifier	Agilent	8447D/2944A09549	Sep., 2014
	X	Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2014
		Test Receiver	R & S	ESCS 30/ 825442/018	Sep., 2014
	X	Coaxial Cable	QuieTek	QTK-CABLE/ CAB5	Feb., 2015
	X	Controller	QuieTek	QTK-CONTROLLER/ CTRL3	N/A
	X	Coaxial Switch	Anritsu	MP59B/6200265729	N/A

- Note:
1. All equipments are calibrated every one year.
  2. The test instruments marked by "X" are used to measure the final test results.

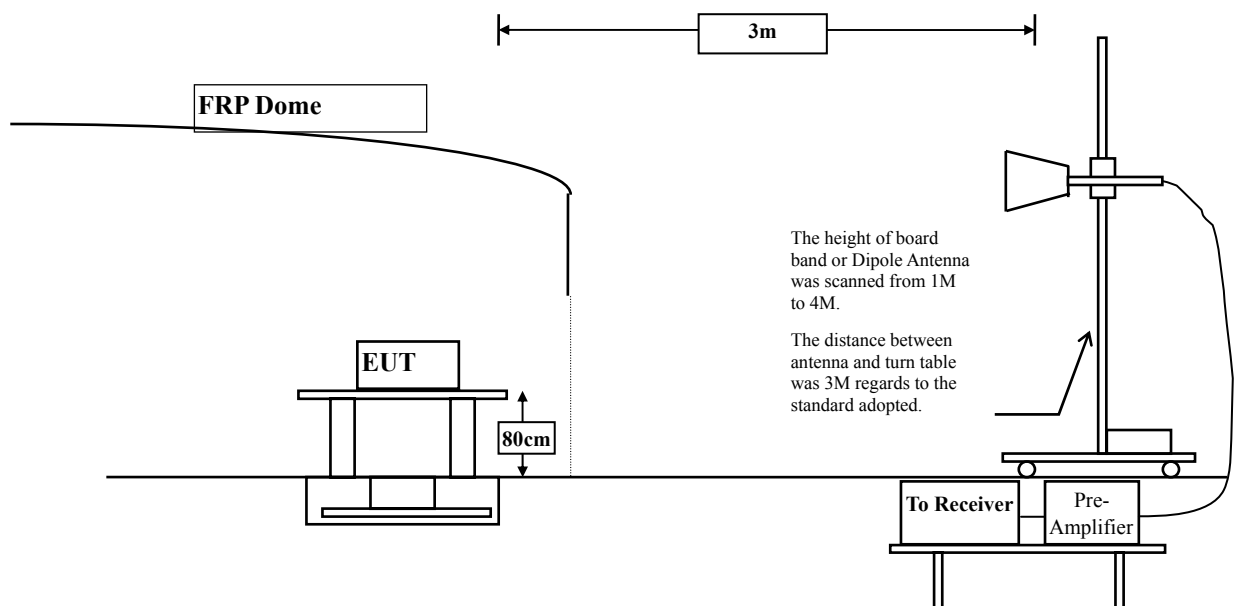
## 6.2. Test Setup

### RF Conducted Measurement



### RF Radiated Measurement:

Above 1GHz



### 6.3. Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

### 6.4. Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10:2013 on radiated measurement.

The bandwidth below 1GHz setting on the field strength meter is 120 kHz, above 1GHz are 1 MHz. The EUT was setup to ANSI C63.10, 2013.

### 6.5. Uncertainty

± 3.9 dB above 1GHz

± 3.8 dB below 1GHz

## 6.6. Test Result of Band Edge

Product : Barcode Scanner  
 Test Item : Band Edge  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit (2405MHz)

### RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
05 (Peak)	2390.000	31.509	34.435	65.944	74.00	54.00	Pass
05 (Peak)	2400.000	31.561	49.791	81.352	--	--	--
05 (Peak)	2405.200	31.594	72.539	104.133	--	--	--
05 (Average)	2390.000	31.509	14.123	45.632	74.00	54.00	Pass
05 (Average)	2400.000	31.561	21.839	53.400	--	--	--
05 (Average)	2405.200	31.594	72.447	104.041	--	--	--

Figure Channel 05: Horizontal (Peak)

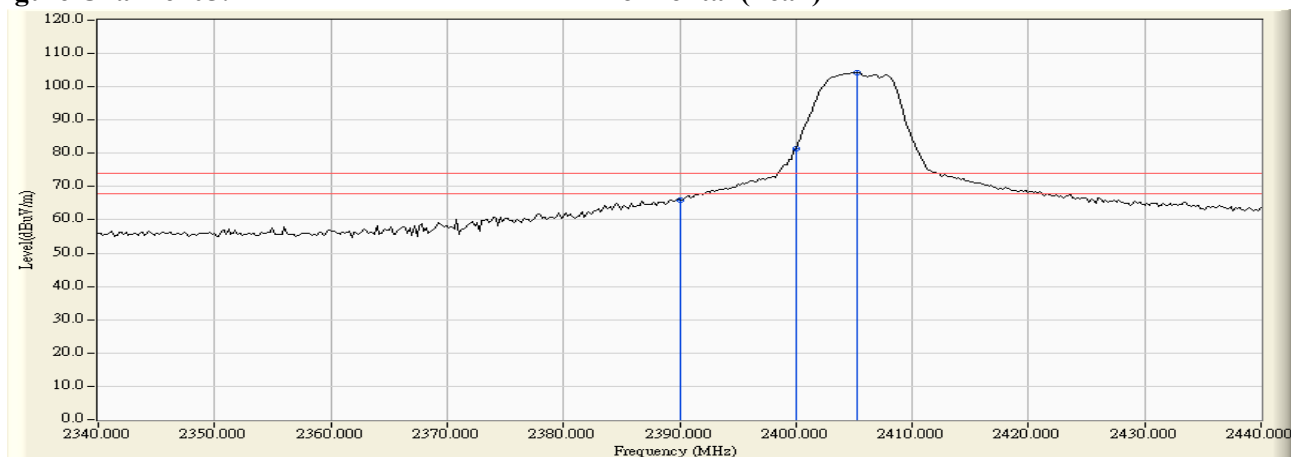
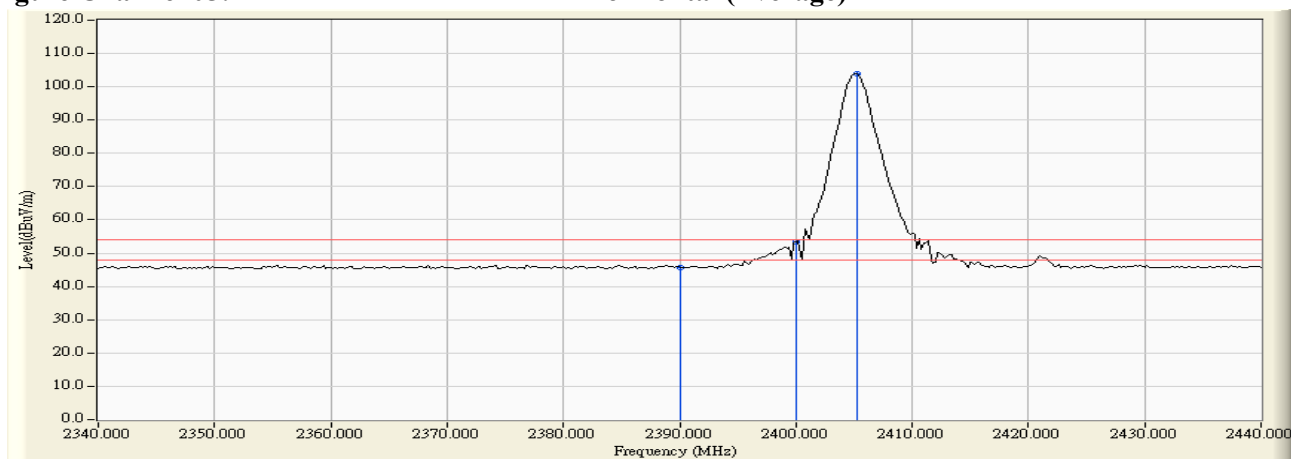


Figure Channel 05: Horizontal (Average)



Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “ \* ”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : Barcode Scanner  
 Test Item : Band Edge  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit (2405MHz)

## RF Radiated Measurement (Vertical):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
05 (Peak)	2390.000	30.915	35.141	66.056	74.00	54.00	Pass
05 (Peak)	2400.000	30.912	50.549	81.461	--	--	--
05 (Peak)	2405.000	30.926	72.533	103.459	--	--	--
05 (Average)	2389.200	30.919	14.993	45.912	74.00	54.00	Pass
05 (Average)	2390.000	30.915	14.156	45.071	74.00	54.00	Pass
05 (Average)	2400.000	30.912	17.154	48.066	--	--	--
05 (Average)	2405.200	30.926	72.457	103.383	--	--	--

Figure Channel 05: Vertical (Peak)

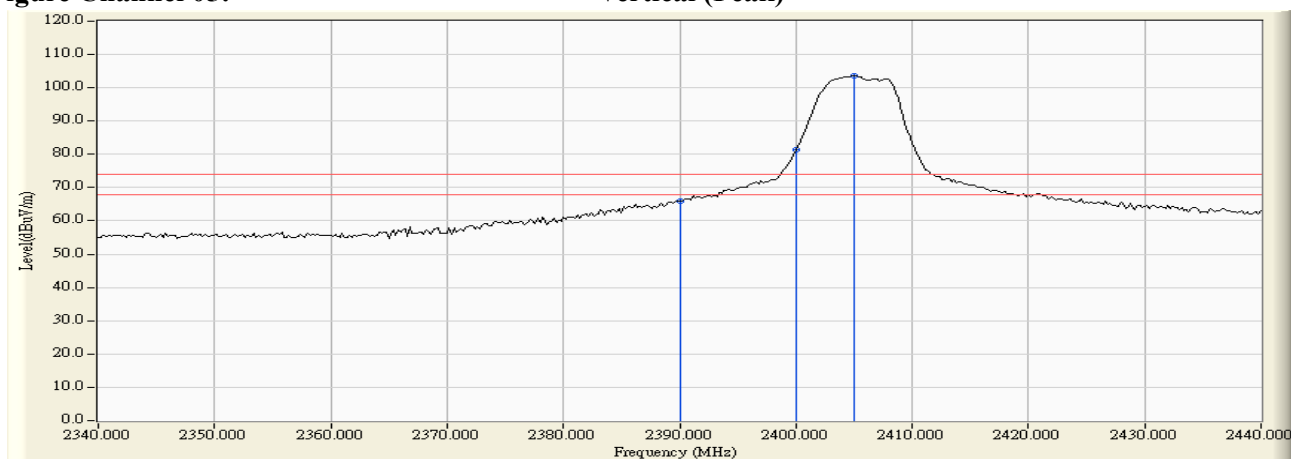
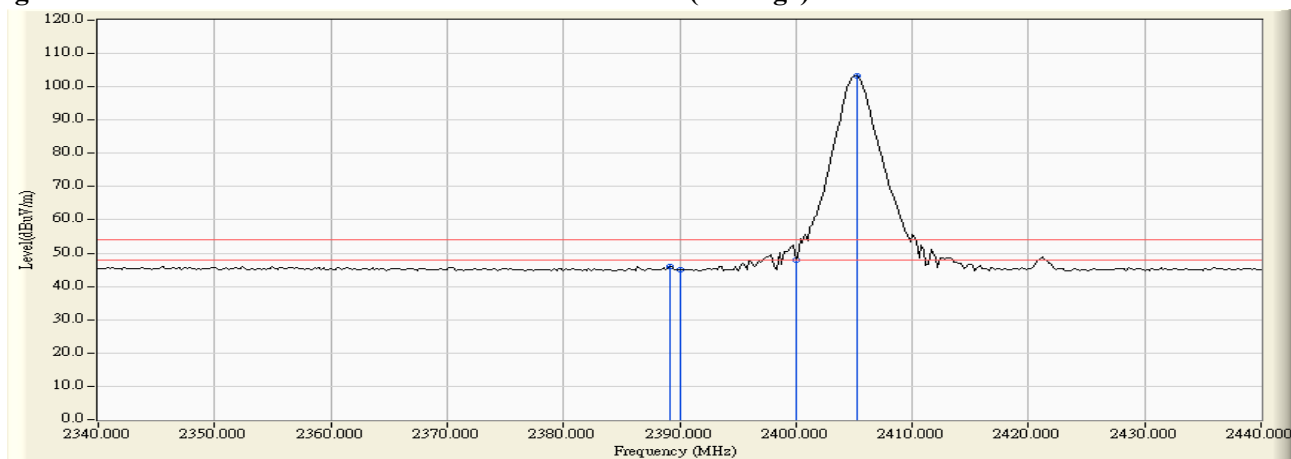


Figure Channel 05: Vertical (Average)



Note:

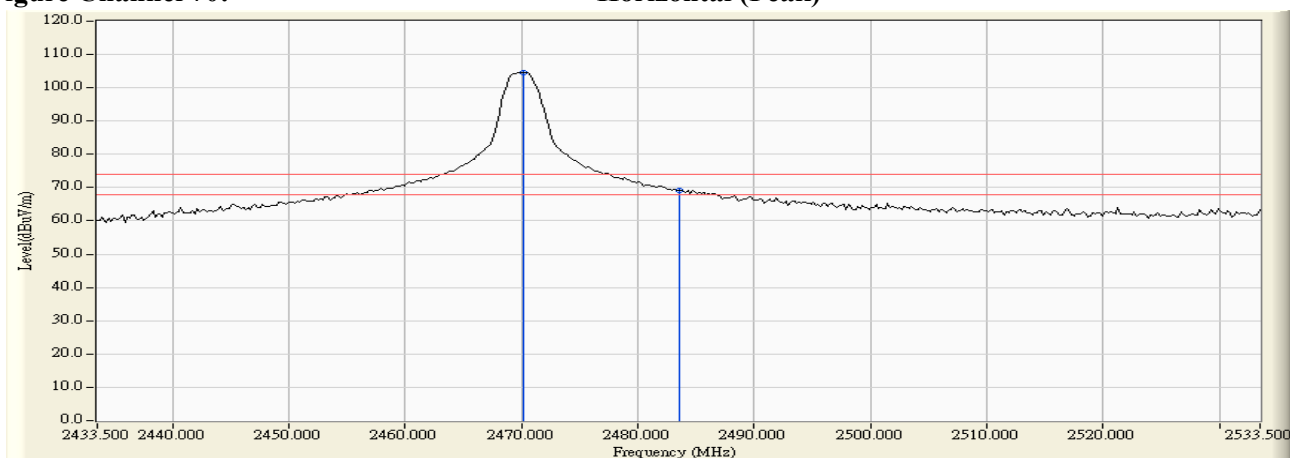
1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “ \* ”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : Barcode Scanner  
 Test Item : Band Edge  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit (2470MHz)

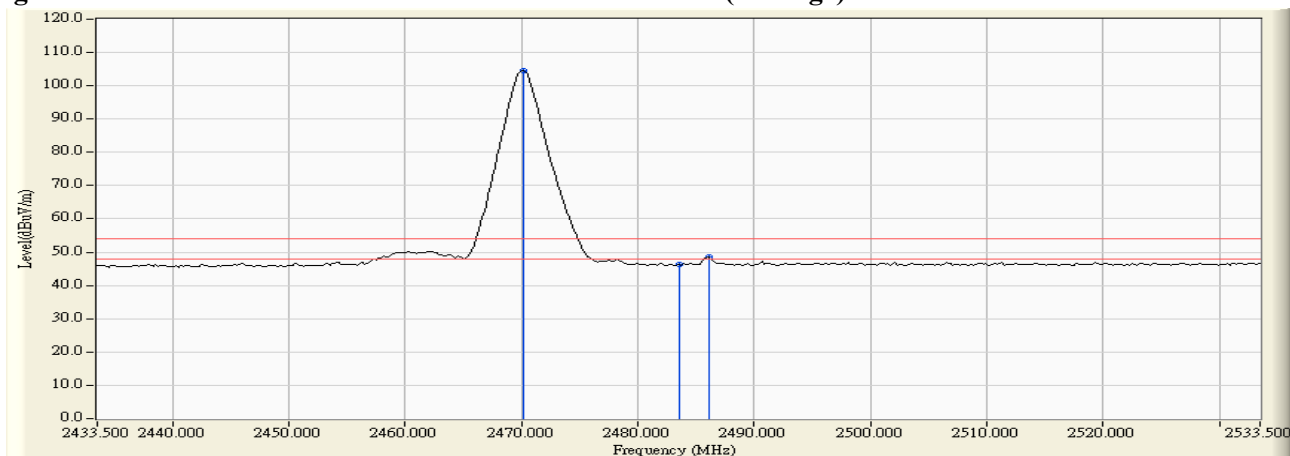
**RF Radiated Measurement (Horizontal):**

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
70 (Peak)	2470.100	32.080	72.469	104.550	--	--	--
70 (Peak)	2483.500	32.182	37.067	69.249	74.00	54.00	Pass
70 (Average)	2470.100	32.080	72.357	104.438	--	--	--
70 (Average)	2483.500	32.182	14.202	46.384	74.00	54.00	Pass
70 (Average)	2486.100	32.201	16.326	48.528	74.00	54.00	Pass

**Figure Channel 70: Horizontal (Peak)**



**Figure Channel 70: Horizontal (Average)**



Note:

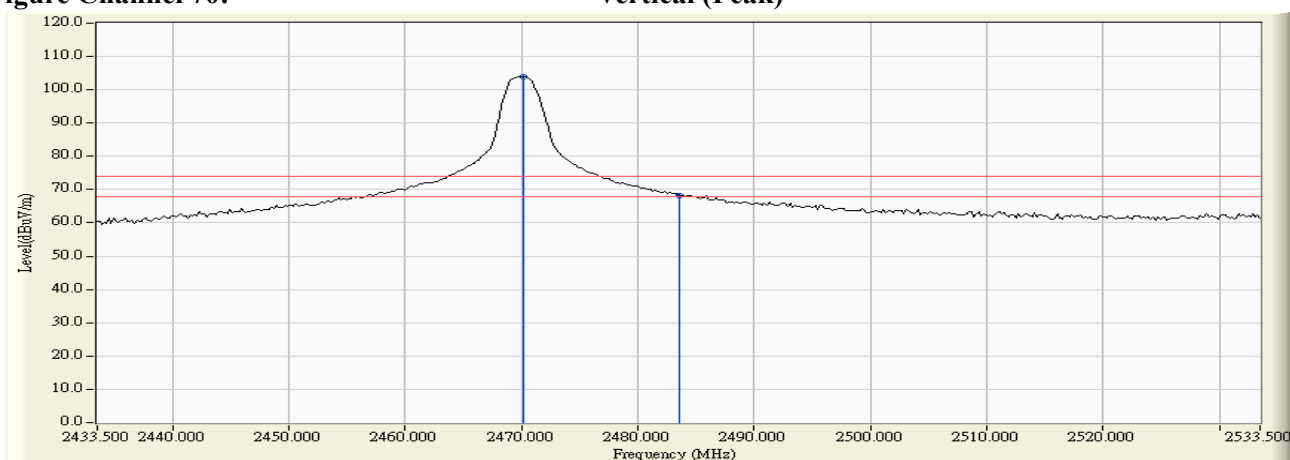
1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “ \* ”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : Barcode Scanner  
 Test Item : Band Edge  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit (2470MHz)

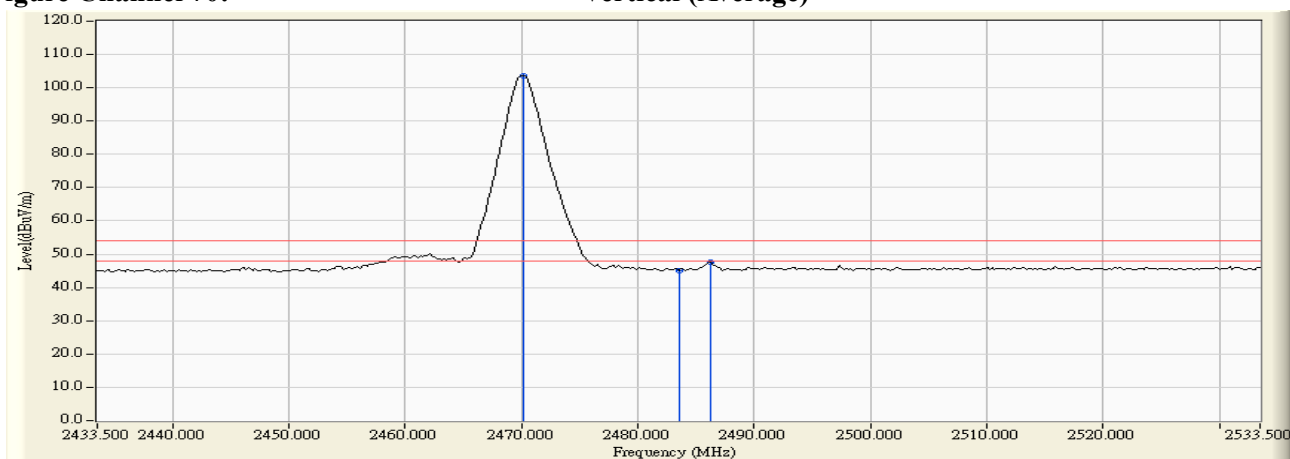
**RF Radiated Measurement (Vertical):**

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
70 (Peak)	2470.100	31.345	72.449	103.794	--	--	--
70 (Peak)	2483.500	31.435	36.896	68.331	74.00	54.00	Pass
70 (Average)	2470.100	31.345	72.348	103.693	--	--	--
70 (Average)	2483.500	31.435	13.748	45.183	74.00	54.00	Pass
70 (Average)	2486.300	31.454	16.039	47.493	74.00	54.00	Pass

**Figure Channel 70: Vertical (Peak)**



**Figure Channel 70: Vertical (Average)**



**Note:**

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “ \* ”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

## 7. Occupied Bandwidth (6dB BW)

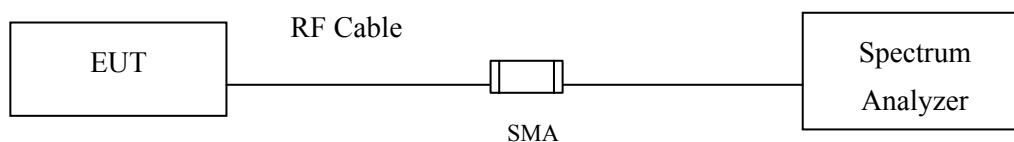
### 7.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun., 2014
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun., 2014
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2014

Note:

1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
2. The test instruments marked with “X” are used to measure the final test results.

### 7.2. Test Setup



### 7.3. Limits

The minimum bandwidth shall be at least 500 kHz.

### 7.4. Test Procedure

The EUT was setup according to ANSI C63.10 2013; tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.

Set RBW = 1-5% of the emission bandwidth, VBW $\geq$ 3\*RBW

### 7.5. Uncertainty

$\pm 150\text{Hz}$

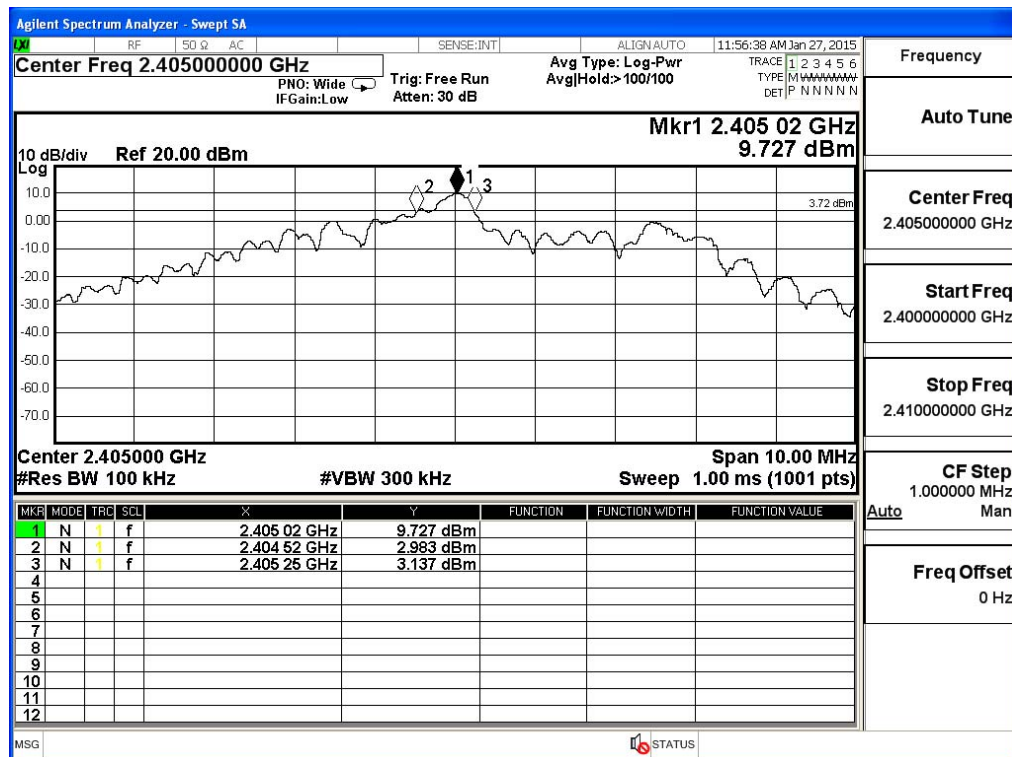


## 7.6. Test Result of Occupied Bandwidth

Product : Barcode Scanner  
 Test Item : Occupied Bandwidth Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit (2405MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
05	2405	730	>500	Pass

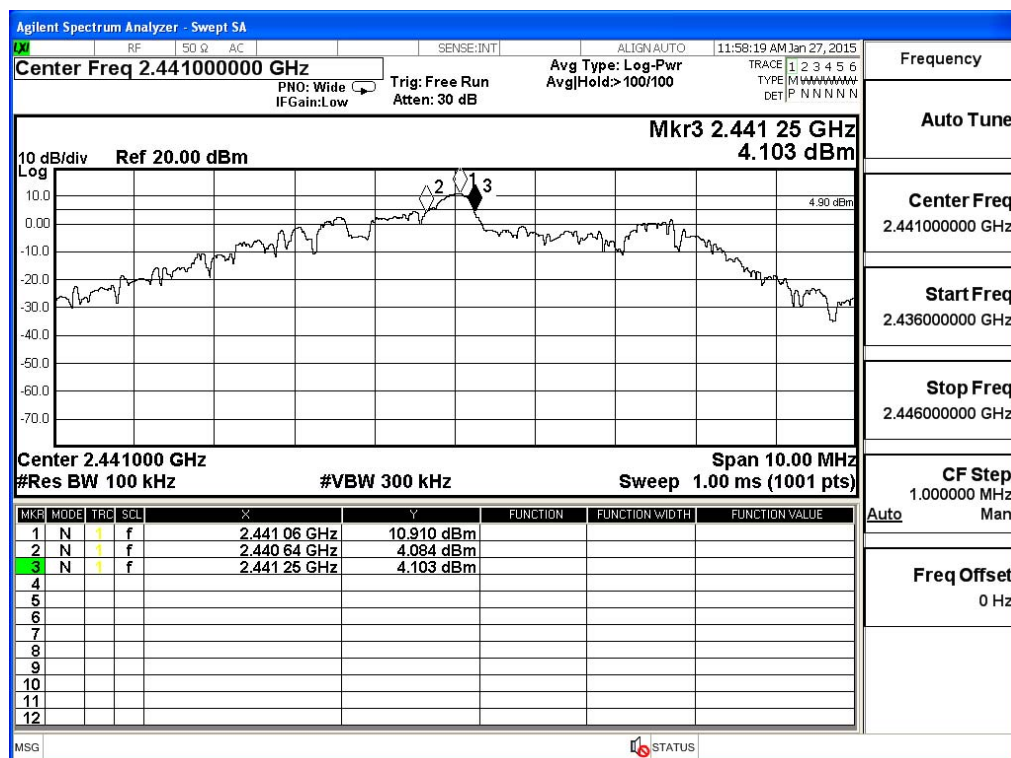
Figure Channel 05:



Product : Barcode Scanner  
 Test Item : Occupied Bandwidth Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit (2441MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
41	2441	610	>500	Pass

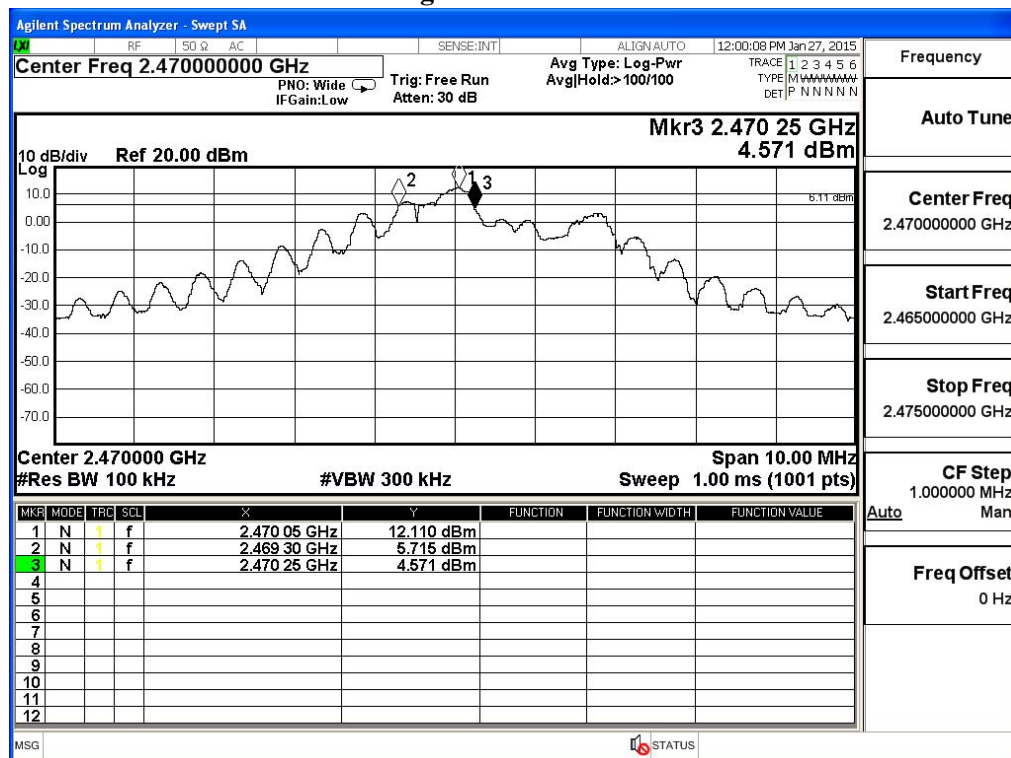
Figure Channel 41:



Product : Barcode Scanner  
Test Item : Occupied Bandwidth Data  
Test Site : No.3 OATS  
Test Mode : Mode 1: Transmit (2470MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
70	2470	950	>500	Pass

Figure Channel 70:



## 8. Power Density

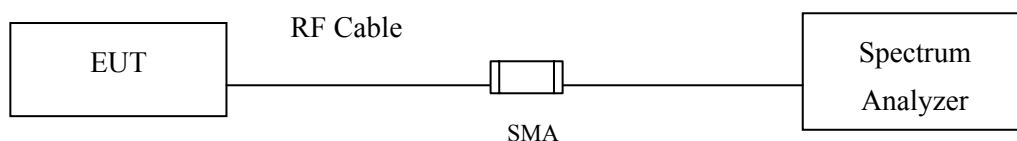
### 8.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun., 2014
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun., 2014
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2014

Note:

1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
2. The test instruments marked with “X” are used to measure the final test results.

### 8.2. Test Setup



### 8.3. Limits

The transmitted power density averaged over any 1 second interval shall not be greater +8dBm in any 3kHz bandwidth.

### 8.4. Test Procedure

The EUT was setup according to ANSI C63.10: 2013, the maximum power spectral density using KDB 558074 section 10.2 PKPSD (peak PSD) method.

### 8.5. Uncertainty

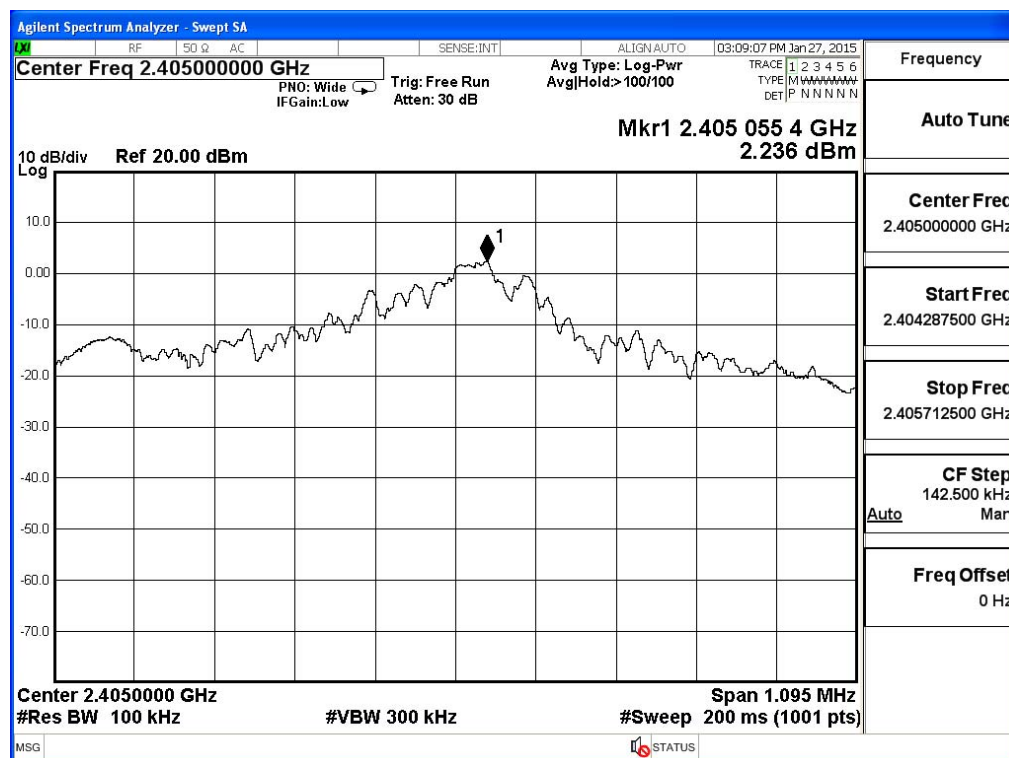
$\pm 1.27$  dB

## 8.6. Test Result of Power Density

Product : Barcode Scanner  
 Test Item : Power Density Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit (2405MHz)

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
05	2405	2.236	< 8dBm	Pass

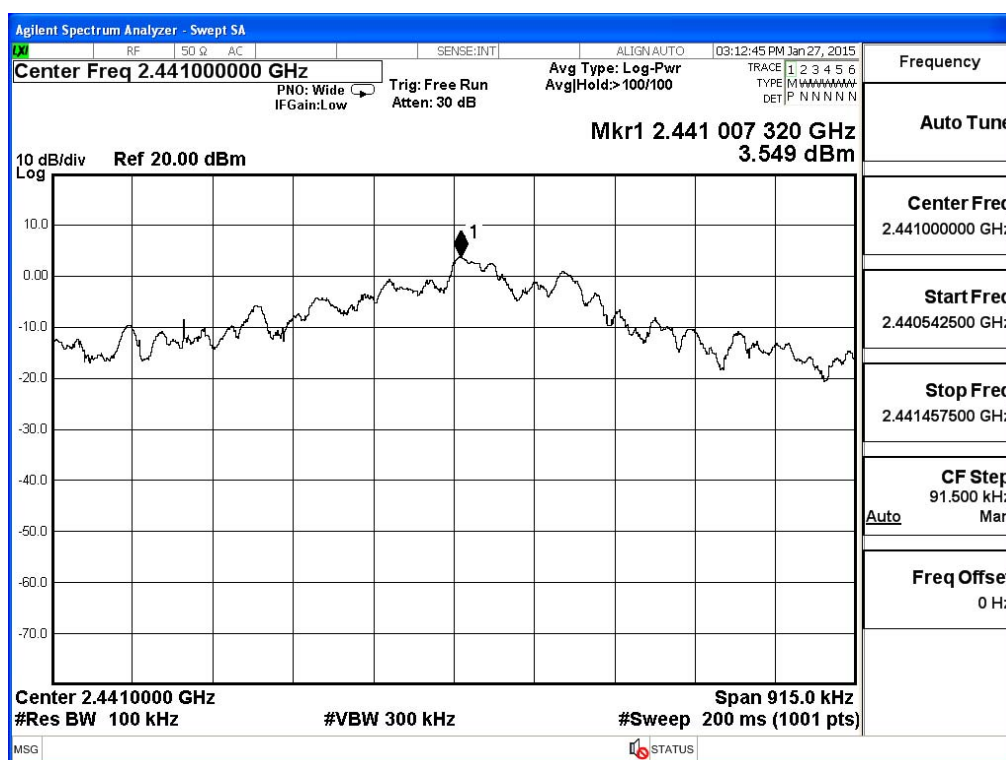
Figure Channel 05:



Product : Barcode Scanner  
 Test Item : Power Density Data  
 Test Site : No.3OATS  
 Test Mode : Mode 1: Transmit (2441MHz)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
41	2441	3.549	< 8dBm	Pass

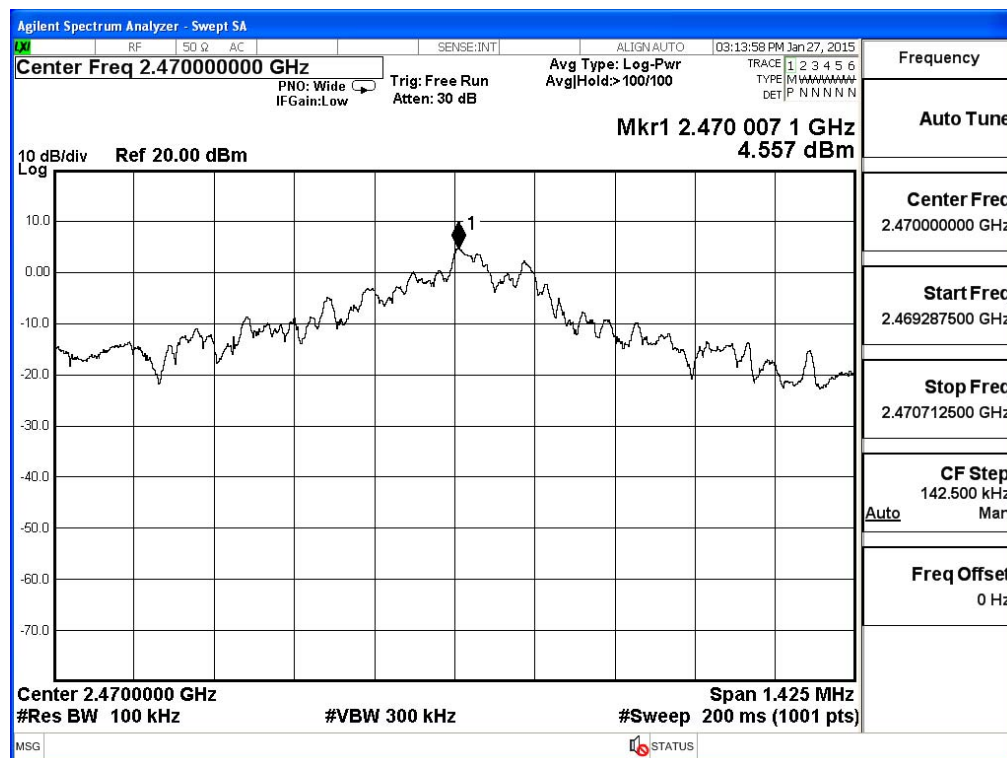
Figure Channel 41:



Product : Barcode Scanner  
 Test Item : Power Density Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit (2470MHz)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
70	2470	4.557	< 8dBm	Pass

Figure Channel 70:



**9. EMI Reduction Method During Compliance Testing**

No modification was made during testing.