



## Test Report

Product Name	Barcode scanner
Model No.	KC-3200ZB
FCC ID	YKH3200ZB

Applicant	NUMA Electronics Inc.
Address	7F.-8, No. 107, Sec.1, Zhongshan Rd., Xinzhuang City, Taipei Hsien, 242, Taiwan

Date of Receipt	June. 30, 2010
Issued Date	July. 13, 2010
Report No.	107032R-RFUSP44V01
Report Version	V1.0

The test results relate only to the samples tested.

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

This report must not be used to claim product endorsement by NVLAP any agency of the U.S. Government

# Test Report Certification

Issued Date: July. 13, 2010

Report No.: 107032R-RFUSP44V01



Product Name	Barcode scanner
Applicant	NUMA Electronics Inc.
Address	7F.-8, No. 107, Sec.1, Zhongshan Rd., Xinzhuang City, Taipei Hsien, 242, Taiwan
Manufacturer	NUMA Electronics Inc.
Model No.	KC-3200ZB
EUT Rated Voltage	DC 5V (Power by USB)
EUT Test Voltage	AC 120V/60Hz
Trade Name	NUMA
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2009 ANSI C63.4: 2003
Test Result	Complied



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This report must not be used to claim product endorsement by NVLAP any agency of the U.S. Government

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Testing Laboratory

0914

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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.	KC-3200ZB
FCC ID	YKH3200ZB
Frequency Range	2425-2480MHz
Type of Modulation	FSK
Channel Separation	25MHz
Antenna Type	Chip Antenna
Channel Number	4
Antenna Gain	Refer to the table "Antenna List"
Channel Control	Auto

#### Antenna List

No.	Manufacturer	Part No.	Antenna Type
1	Advanced Ceramic X Corp.	AT5020-B2R8HAAT/LF	0dBi for 2.4 GHz

Note: The antenna of EUT is conform to FCC 15.203

#### Frequency of Each Channel

Channel Frequency Channel Frequency Channel Frequency Channel Frequency  
Channel 01: 2425MHz Channel 02: 2450 MHz Channel 03: 2475 MHz Channel 04: 2480 MHz

Note:

1. The EUT is a Barcode scanner with a built-in 2.4GHz transceiver.
2. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
3. These tests are conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15 Subpart C Paragraph 15.249 for spread spectrum devices.
4. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

## 1.2. Operational Description

The EUT is Barcode scanner built-in 2.4GHz transceiver. The operation frequency is from 2425 MHz to 2480MHz with FSK modulation. The signal will be transmitted through 2.4 GHz RF signal from the Chip antenna. DC 5V (Power by USB) shall be provided for EUT operation.

Test Mode	Mode 1: Transmit
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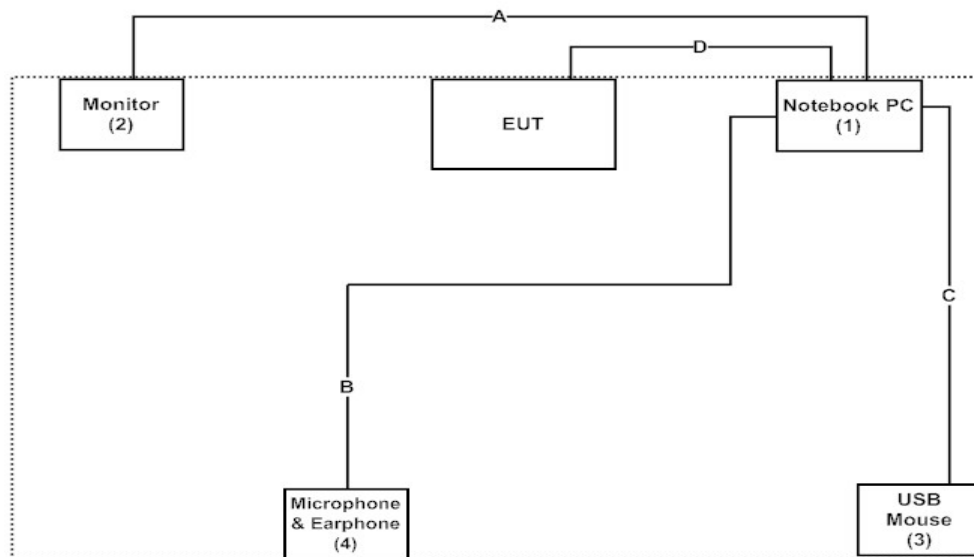
### 1.3. Tested System Details

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
(2)	Monitor	DELL	U2410	CN-0J257M-728-01I -04NL	Non-Shielded, 1.8m
(3)	USB Mouse	DELL	MO56UC	G0X01JK0	N/A
(4)	Microphone & Earphone	PCHOME	N/A	N/A	N/A

	Signal Cable Type	Signal cable Description
A.	D-SUB Cable	Shielded,1.8m, with two ferrite cores bonded.
B.	Microphone & Earphone Cable	Non-shielded,1.2m
C.	USB Mouse Cable	Shielded,1.8m
D.	USB Cable	Shielded,1.5m

### 1.4. Configuration of Test System



### 1.5. EUT Exercise Software

- (1) Setup the EUT as shown in section 1.4
- (2) Inserts the battery, start continuous transmit
- (3) Verify that the EUT works correctly.

## 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	50-65
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  
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Accreditation on NVLAP  
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## 2. Conducted Emission

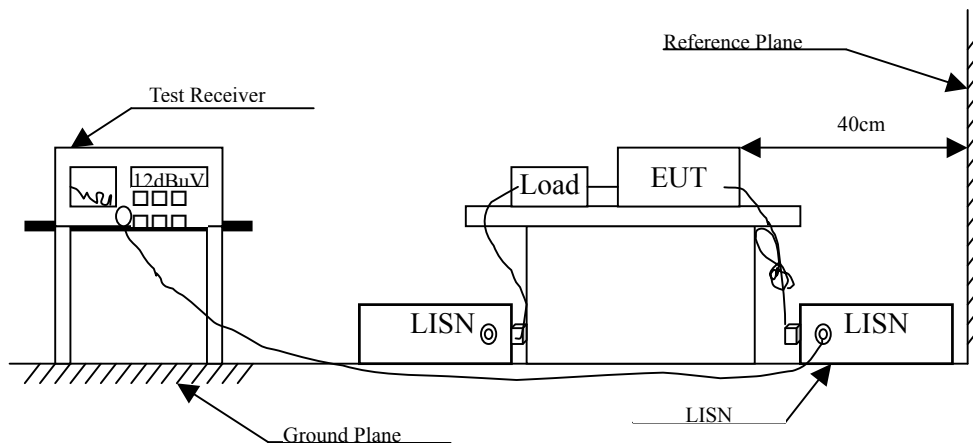
### 2.1. Test Equipment

The following test equipment are used during the conducted emission test:

Item	Instrument	Manufacturer	Type No./Serial No	Last Cal.	Remark
1	Test Receiver	R & S	ESCS 30/825442/17	May, 2010	
2	L.I.S.N.	R & S	ESH3-Z5/825016/6	May, 2010	EUT
3	L.I.S.N.	Kyoritsu	KNW-407/8-1420-3	May, 2010	Peripherals
4	Pulse Limiter	R & S	ESH3-Z2	May, 2010	
5	No.1 Shielded Room			N/A	

Note: All instruments are calibrated every one year.

### 2.2. Test Setup



### 2.3. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dBuV) 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 simulators 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 refers 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 of the interface cables must be changed according to ANSI C63.4: 2003 on conducted measurement.

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

## 2.5. Uncertainty

$\pm 2.26$  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

Frequency	Correct	Reading	Measurement	Margin	Limit
	Factor	Level	Level		
MHz	dB	dBuV	dBuV	dB	dBuV
<b>LINE 1</b>					
<b>Quasi-Peak</b>					
0.181	9.724	41.690	51.414	-13.700	65.114
0.244	9.679	36.680	46.359	-16.955	63.314
0.302	9.650	28.860	38.510	-23.147	61.657
1.759	9.680	19.860	29.540	-26.460	56.000
3.459	9.690	22.270	31.960	-24.040	56.000
4.005	9.700	27.180	36.880	-19.120	56.000
<b>Average</b>					
0.181	9.724	28.020	37.744	-17.370	55.114
0.244	9.679	32.600	42.279	-11.035	53.314
0.302	9.650	23.240	32.890	-18.767	51.657
1.759	9.680	18.070	27.750	-18.250	46.000
3.459	9.690	17.110	26.800	-19.200	46.000
4.005	9.700	17.670	27.370	-18.630	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

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dBuV	dBuV	dB	dBuV
<b>LINE 2</b>					
<b>Quasi-Peak</b>					
0.181	9.732	41.560	51.292	-13.822	65.114
0.240	9.690	35.440	45.130	-18.299	63.429
0.302	9.660	28.460	38.120	-23.537	61.657
1.880	9.680	19.370	29.050	-26.950	56.000
3.337	9.690	22.040	31.730	-24.270	56.000
3.638	9.700	26.290	35.990	-20.010	56.000
<b>Average</b>					
0.181	9.732	34.910	44.642	-10.472	55.114
0.240	9.690	26.650	36.340	-17.089	53.429
0.302	9.660	24.560	34.220	-17.437	51.657
1.880	9.680	16.420	26.100	-19.900	46.000
3.337	9.690	14.680	24.370	-21.630	46.000
3.638	9.700	17.410	27.110	-18.890	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. Radiated Emission

#### 3.1. Test Equipment

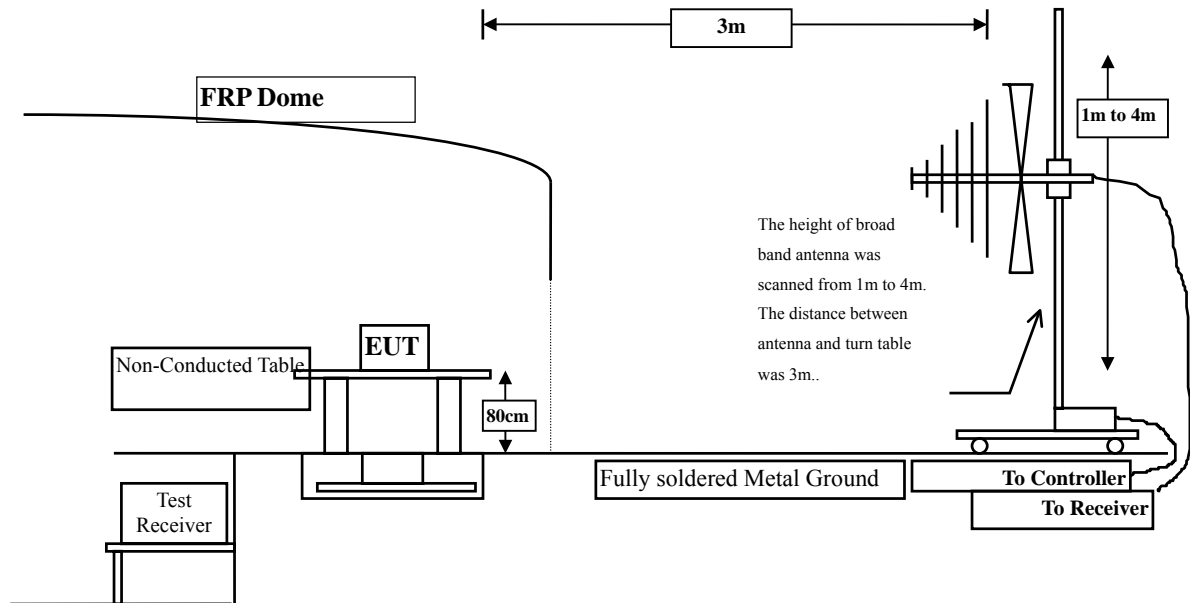
The following test equipment are used during the radiated emission test:

Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.
<input checked="" type="checkbox"/> Site # 3	X	Bilog Antenna	Schaffner Chase	CBL6112B/2673	Sep., 2009
	X	Loop Antenna	Teseq	HLA6120 / 26739	Jul., 2009
	X	Horn Antenna	Schwarzbeck	BBHA9120D/D305	Sep., 2009
	X	Horn Antenna	Schwarzbeck	BBHA9170/208	Jul., 2010
	X	Pre-Amplifier	Agilent	8447D/2944A09549	Sep., 2009
	X	Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2010
	X	Test Receiver	R & S	ESCS 30/ 825442/018	Sep., 2009
	X	Coaxial Cable	QuieTek	QTK-CABLE/ CAB5	Feb., 2010
	X	Controller	QuieTek	QTK-CONTROLLER/ CTRL3	N/A
	X	Coaxial Switch	Anritsu	MP59B/6200265729	N/A

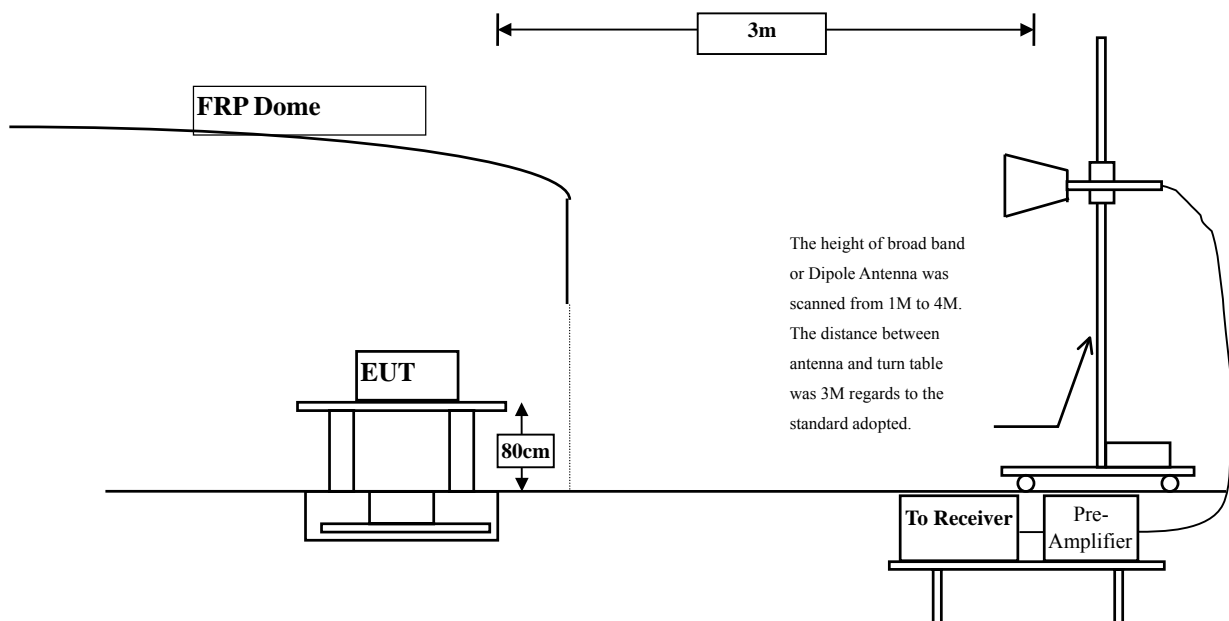
- Note:
1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
  2. The test instruments marked with “X” are used to measure the final test results.

### 3.2. Test Setup

#### Radiated Emission Below 1GHz



#### Radiated Emission Above 1GHz



### 3.3. 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(a) Limits		
Frequency MHz	uV/m @3m	dBuV/m@3m
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Remarks: E field strength (dBuV/m) = 20 log E field strength (uV/m)

### 3.4. Test Procedure

The EUT was setup according to ANSI C63.4, 2003 and tested according to DTS test procedure of Oct 2002 KDB558074 for compliance to FCC 47CFR 15.249 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 between 1 meter and 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 C63.4: 2003 on radiated measurement.

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

Radiated emission measurements below 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 30MHz - 10th Harmonic of fundamental was investigated.

### 3.5. Uncertainty

$\pm 3.9$  dB above 1GHz

$\pm 3.8$  dB below 1GHz

### 3.6. Test Result of Radiated Emission

Product : Barcode scanner  
Test Item : Fundamental Radiated Emission  
Test Site : No.3OATS  
Test Mode : Mode 1: Transmit (X- Axis)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
<b>Horizontal</b>					
<b>Peak Detector:</b>					
2425.000	31.737	62.700	94.438	-19.562	114.000
2450.000	31.928	60.550	92.478	-21.522	114.000
2480.000	32.155	57.470	89.626	-24.374	114.000
<b>Vertical</b>					
<b>Peak Detector:</b>					
2425.000	31.037	61.760	92.798	-21.202	114.000
2450.000	31.207	59.020	90.228	-23.772	114.000
2480.000	31.412	57.050	88.462	-25.538	114.000

Note:

1. Measurement Level = Reading Level + Correct Factor.
2. Correct Factor = Antenna Factor + Cable Loss – PreAMP.
3. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.



**Average Detector:**

Frequency	Peak	Duty Cycle	Measurement	Margin	Limit
MHz	Measurement	Correct Factor	Level		
	dBuV/m	dB	dBuV/m	dB	dBuV/m
<b>Horizontal</b>					
<b>Average Detector:</b>					
2425	94.438	-32.277	62.161	-31.839	94.000

**Vertical**

**Average Detector:**

--

Note:

1.  $AVG\ Measurement = Peak\ Measurement + Duty\ Cycle\ Correct\ Factor$
2. The Duty Cycle is refer to section 4.

Product : Barcode scanner  
 Test Item : Fundamental Radiated Emission  
 Test Site : No.3OATS  
 Test Mode : Mode 1: Transmit (Y- Axis)

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dBuV	dBuV/m	dB	dBuV/m
<b>Horizontal</b>					
<b>Peak Detector:</b>					
2425.000	31.737	63.740	95.478	-18.522	114.000
2450.000	31.928	61.270	93.198	-20.802	114.000
2480.000	32.155	58.310	90.466	-23.534	114.000
<b>Vertical</b>					
<b>Peak Detector:</b>					
2425.000	31.037	62.490	93.528	-20.472	114.000
2450.000	31.207	60.120	91.328	-22.672	114.000
2480.000	31.412	57.870	89.282	-24.718	114.000

Note:

1. Measurement Level = Reading Level + Correct Factor.
2. Correct Factor = Antenna Factor + Cable Loss – PreAMP.
3. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

**Average Detector:**

Frequency	Peak	Duty Cycle	Measurement	Margin	Limit
MHz	Measurement	Correct Factor	Level		
	dBuV/m	dB	dBuV/m	dB	dBuV/m

**Horizontal**
**Average Detector:**

2425	95.478	-32.277	63.201	-30.799	94.000
------	--------	---------	--------	---------	--------

**Vertical**
**Average Detector:**

--

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 4.

Product : Barcode scanner  
 Test Item : Fundamental Radiated Emission  
 Test Site : No.3OATS  
 Test Mode : Mode 1: Transmit (Z- Axis)

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dBuV	dBuV/m	dB	dBuV/m
<b>Horizontal</b>					
<b>Peak Detector:</b>					
2425.000	31.737	60.620	92.358	-21.642	114.000
2450.000	31.928	58.520	90.448	-23.552	114.000
2480.000	32.155	54.650	86.806	-27.194	114.000
<b>Vertical</b>					
<b>Peak Detector:</b>					
2425.000	31.037	63.200	94.238	-19.762	114.000
2450.000	31.207	60.700	91.908	-22.092	114.000
2480.000	31.412	58.200	89.612	-24.388	114.000

Note:

1. Measurement Level = Reading Level + Correct Factor.
2. Correct Factor = Antenna Factor + Cable Loss – PreAMP.
3. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

**Average Detector:**

Frequency	Peak	Duty Cycle	Measurement	Margin	Limit
	Measurement	Correct Factor	Level		
MHz	dBuV/m	dB	dBuV/m	dB	dBuV/m

**Horizontal**

**Average Detector:**

--

**Vertical**

**Average Detector:**

2425	94.238	-32.277	61.961	-32.039	94.000
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Note:

1. AVG Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 4.

Product : Barcode scanner  
 Test Item : Harmonic Radiated Emission Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit (2425MHz)

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dBuV	dBuV/m	dB	dBuV/m
<b>Horizontal</b>					
<b>Peak Detector:</b>					
4850.000	3.144	53.820	56.965	-17.035	74.000
7275.000	11.315	35.330	46.645	-27.355	74.000
9700.000	12.867	36.000	48.866	-25.134	74.000
<b>Vertical</b>					
<b>Peak Detector:</b>					
4850.000	6.104	53.270	59.374	-14.626	74.000
7275.000	12.129	34.770	46.899	-27.101	74.000
9700.000	13.423	35.800	49.222	-24.778	74.000

Note:

1. The reading levels below 1GHz and above 1GHz are quasi-peak values and peak/average values, respectively.
2. Receiver setting (Peak Detector) : RBW:1MHz; VBW:1MHz; Span:100MHz °
3. Emission Level = Reading Level + Correct Factor.
4. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.
5. 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 Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit (2425 MHz)

**Average Detector:**

Frequency	Peak	Duty Cycle	Measurement	Margin	Limit
MHz	Measurement	Factor	Level		
	dBuV/m	dB	dBuV/m	dB	dBuV/m

**Horizontal**
**Average Detector:**

4850	56.965	-32.277	24.688	-29.312	54.000
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**Vertical**
**Average Detector:**

4850	59.374	-32.277	27.097	-26.903	54.000
------	--------	---------	--------	---------	--------

Note:

1.  $AVG \text{ Measurement} = \text{Peak Measurement} + \text{Duty Cycle}$
2. The Duty Cycle is refer to section 4.

Product : Barcode scanner  
 Test Item : Harmonic Radiated Emission Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit (2450 MHz)

Frequency	Correct	Reading	Measurement	Margin	Limit
	Factor	Level	Level		
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
<b>Horizontal</b>					
<b>Peak Detector:</b>					
4900.000	2.929	54.130	57.059	-16.941	74.000
7350.000	11.967	35.350	47.317	-26.683	74.000
9800.000	12.454	36.430	48.884	-25.116	74.000
<b>Vertical</b>					
<b>Peak Detector:</b>					
4900.000	5.549	53.240	58.789	-15.211	74.000
7350.000	12.953	34.260	47.214	-26.786	74.000
9800.000	12.877	36.020	48.896	-25.104	74.000

Note:

1. The reading levels below 1GHz and above 1GHz are quasi-peak values and peak/average values, respectively.
2. Receiver setting (Peak Detector) : RBW:1MHz; VBW:1MHz; Span:100MHz °
3. Emission Level = Reading Level + Correct Factor.
4. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.
5. 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 Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit (2450 MHz)

**Average Detector:**

Frequency	Peak Measurement	Duty Cycle Factor	Measurement Level	Margin	Limit
MHz	dBuV/m	dB	dBuV/m	dB	dBuV/m

**Horizontal**
**Average Detector:**

4900	57.095	-32.277	24.818	-29.182	54.000
------	--------	---------	--------	---------	--------

**Vertical**
**Average Detector:**

4900	58.789	-32.277	26.512	-27.488	54.000
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Note:

1. AVG Measurement=Peak Measurement + Duty Cycle
2. The Duty Cycle is refer to section 4.

Product : Barcode scanner  
 Test Item : Harmonic Radiated Emission Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit (2480 MHz)

Frequency	Correct	Reading	Measurement	Margin	Limit
	Factor	Level	Level		
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
<b>Horizontal</b>					
<b>Peak Detector:</b>					
4960.000	2.760	53.420	56.180	-17.820	74.000
7440.000	12.567	34.710	47.276	-26.724	74.000
9920.000	13.456	35.360	48.816	-25.184	74.000
<b>Vertical</b>					
<b>Peak Detector:</b>					
4960.000	5.557	51.670	57.227	-16.773	74.000
7440.000	13.426	33.950	47.375	-26.625	74.000
9920.000	13.958	35.900	49.858	-24.142	74.000

Note:

1. The reading levels below 1GHz and above 1GHz are quasi-peak values and peak/average values, respectively.
2. Receiver setting (Peak Detector) : RBW:1MHz; VBW:1MHz; Span:100MHz °
3. Emission Level = Reading Level + Correct Factor.
4. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.
5. 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 Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit (2480 MHz)

**Average Detector:**

Frequency MHz	Peak Measurement dBuV/m	Duty Cycle Factor dB	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
<b>Horizontal</b>					
<b>Average Detector:</b>					
4960	56.18	-32.277	23.903	-30.097	54.000
<b>Vertical</b>					
<b>Average Detector:</b>					
4960	57.227	-32.277	24.95	-29.05	54.000

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle
2. The Duty Cycle is refer to section 4.

Product : Barcode scanner  
 Test Item : General Radiated Emission Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit (2450MHz)

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dBuV	dBuV/m	dB	dBuV/m
<b>Horizontal</b>					
288.020	-4.579	27.473	22.894	-23.106	46.000
365.620	-1.329	30.300	28.971	-17.029	46.000
386.960	-1.524	30.815	29.291	-16.709	46.000
464.560	0.526	27.646	28.172	-17.828	46.000
629.460	1.560	28.140	29.700	-16.300	46.000
829.280	6.344	24.818	31.162	-14.838	46.000
<b>Vertical</b>					
61.040	-4.316	31.062	26.746	-13.254	40.000
344.280	-3.171	27.802	24.632	-21.368	46.000
365.620	-2.179	30.456	28.277	-17.723	46.000
386.960	-3.064	29.985	26.921	-19.079	46.000
509.180	-0.158	24.224	24.066	-21.934	46.000
965.080	7.932	22.565	30.497	-23.503	54.000

Note:

1. The reading levels below 1GHz are quasi-peak values.
2. "■" means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.
4. The radiated emissions below 1GHz of the lowest, middle, highest frequency are pretested. Only the worst case is shown on the report.
5. The emission levels below 30MHz are very lower than the limit and not show in test report.

## 4. Band Edge

### 4.1. 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, 2010
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2010
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2010

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.

#### RF Radiated Measurement:

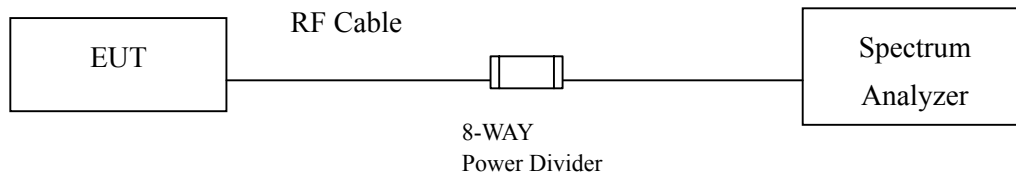
The following test equipments are used during the band edge tests:

Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.
☒ Site # 3		Bilog Antenna	Schaffner Chase	CBL6112B/2673	Sep., 2009
	X	Horn Antenna	Schwarzbeck	BBHA9120D/D305	Sep., 2009
		Horn Antenna	Schwarzbeck	BBHA9170/208	Jul., 2010
	X	Pre-Amplifier	Agilent	8447D/2944A09549	Sep., 2009
	X	Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2010
		Test Receiver	R & S	ESCS 30/ 825442/018	Sep., 2009
	X	Coaxial Cable	Quietek	QTK-CABLE/ CAB5	Feb., 2010
	X	Controller	Quietek	QTK-CONTROLLER/ CTRL3	N/A
	X	Coaxial Switch	Anritsu	MP59B/6200265729	N/A

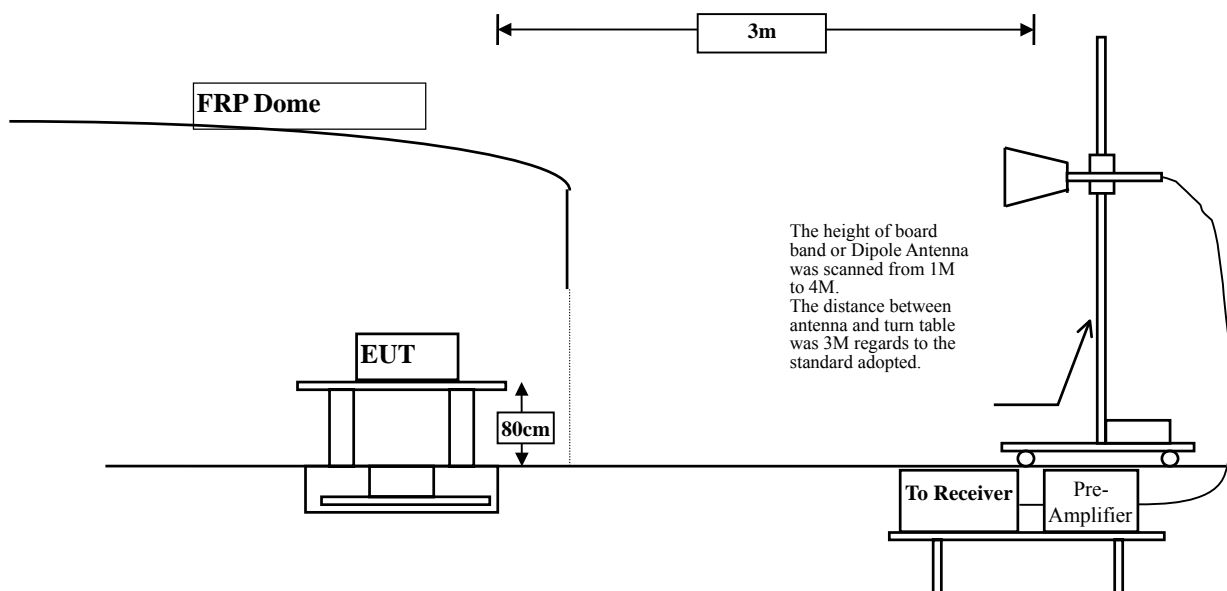
- Note:
1. All equipments are calibrated every one year.
  2. The test equipments marked by “X” are used to measure the final test results.

## 4.2. Test Setup

### RF Conducted Measurement



### RF Radiated Measurement:



### **4.3. Limits**

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)).

### **4.4. 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 C63.4: 2003 on radiated measurement.

The bandwidth setting below 1GHz and above 1GHz on the field strength meter is 120 kHz and 1MHz, respectively.

### **4.5. Uncertainty**

Conducted is  $\pm 1.27$  dB

Radiated is  $\pm 3.9$  dB

#### 4.6. Test Result of Band Edge

Product : Barcode scanner  
 Test Item : Band Edge Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit

##### Fundamental Filed Strength

Antenna Pole	Frequency [MHz]	Correction Factor [dB/m]	Reading Level [dBuV]	Emission Level [dBuV/m]	Detector
Horizontal	2425	31.737	63.74	95.478	Peak
Vertical	2425	31.037	62.49	93.528	Peak

Note: 1:Spectrum Analyzer setting:

Peak detector: RBW=1MHz, VBW=1MHz

##### Band Edge Test Data

Antenna Pole	Test Frequency (MHz)	Fundamental (dBuV/m)	$\Delta$ (dB)	Band Edge Field Strength (dBuV/m)	Detector
Horizontal	2365.9	95.478	53.054	42.424	Peak
Vertical	2365.9	93.528	53.054	40.474	Peak

Note:

The Band Edge Field Strength was calculated using the Fundamental and Conducted Band Edge measurements per the Marker-Delta Method with the following formula:

Band Edge field Strength = F -  $\Delta$

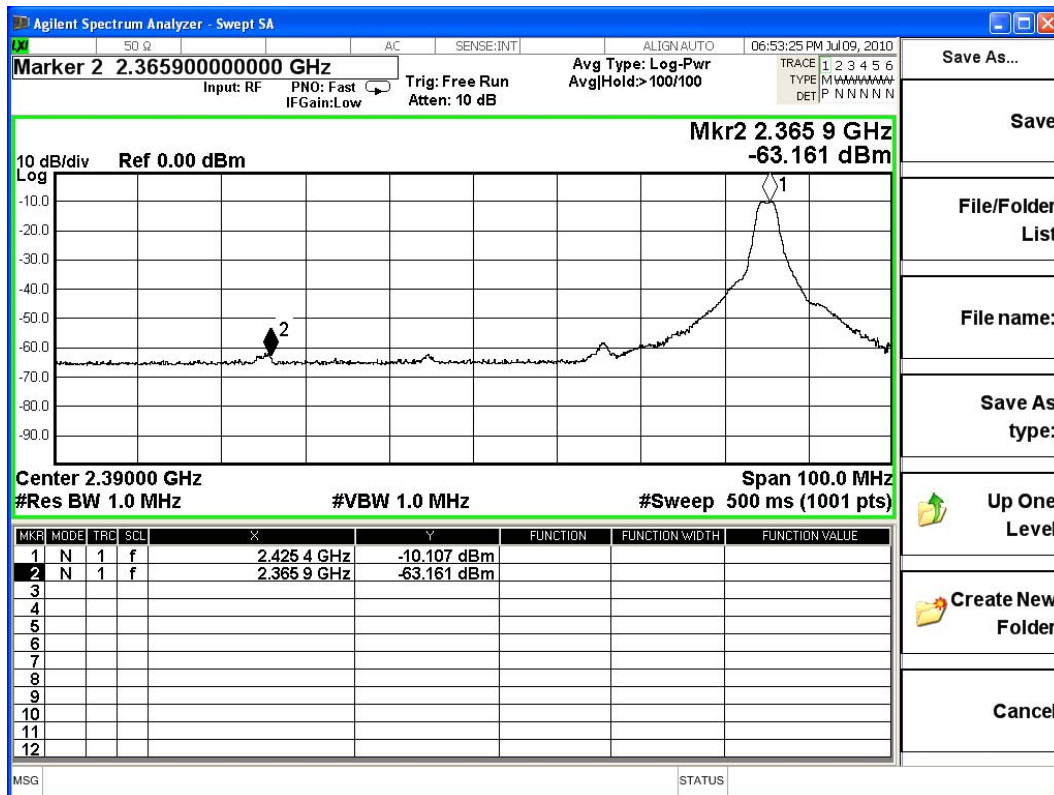
F = Fundamental field Strength (Peak or Average)

$\Delta$  = Conducted Band Edge Delta (Peak or Average)

Peak limit = 74dBuV/m, Average limit = 54dBuV/m



### Peak Detector of conducted Band Edge Delta



Product : Barcode scanner  
Test Item : Band Edge Data  
Test Site : No.3 OATS  
Test Mode : Mode 1: Transmit

### Fundamental Filed Strength

Antenna Pole	Frequency [MHz]	Correction Factor [dB/m]	Reading Level [dB(uV)]	Emission Level [dB(uV/m)]	Detector
Horizontal	2480	32.155	58.31	90.466	Peak
Vertical	2480	31.412	57.87	89.282	Peak

Note: 1:Spectrum Analyzer setting:

Peak detector: RBW=1MHz, VBW=1MHz

### Band Edge Test Data

Antenna Pole	Test Frequency (MHz)	Fundamental (dBuV/m)	$\Delta$ (dB)	Band Edge Field Strength (dBuV/m)	Detector
Horizontal	2483.5	90.466	26.733	63.733	Peak
Vertical	2483.5	89.282	26.733	62.549	Peak

Note:

The Band Edge Field Strength was calculated using the Fundamental and Conducted Band Edge measurements per the Marker-Delta Method with the following formula:

Band Edge field Strength = F -  $\Delta$

F = Fundamental field Strength (Peak or Average)

$\Delta$  = Conducted Band Edge Delta (Peak or Average)

Peak limit = 74dBuV/m, Average limit = 54dBuV/m

**Average Detector:**

Frequency	Peak Measurement	Duty Cycle Factor	Measurement Level	Margin	Limit	Result
MHz	dBuV/m	dB	dBuV/m	dB	dBuV/m	Pass

**Horizontal Average Detector:**

2483.5	63.733	-32.277	31.456	-22.544	54.000	Pass
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**Vertical**

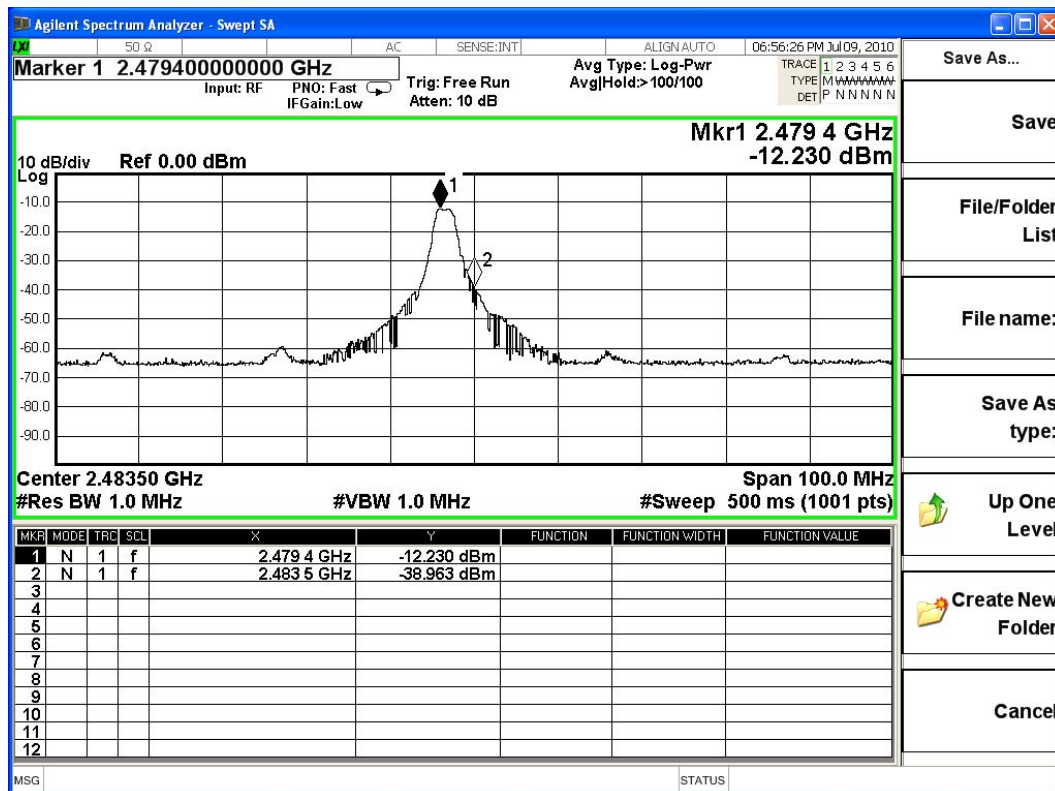
**Average Detector:**

2483.5	62.549	-32.277	30.272	-23.728	54.000	Pass
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Note:

1. AVG Measurement=Peak Measurement + Duty Cycle
2. The Duty Cycle is refer to section 4.

**Peak Detector of conducted Band Edge Delta**



## 5. Duty Cycle

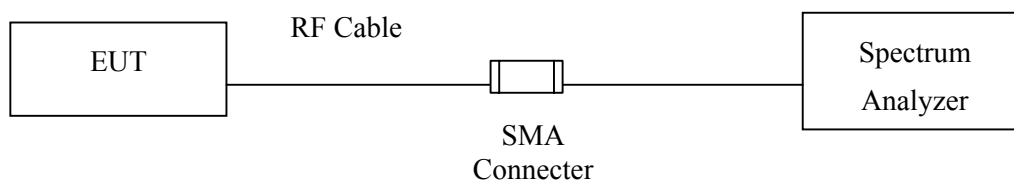
### 5.1. Test Equipment

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, 2010
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2010
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2010

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

### 5.2. Test Setup

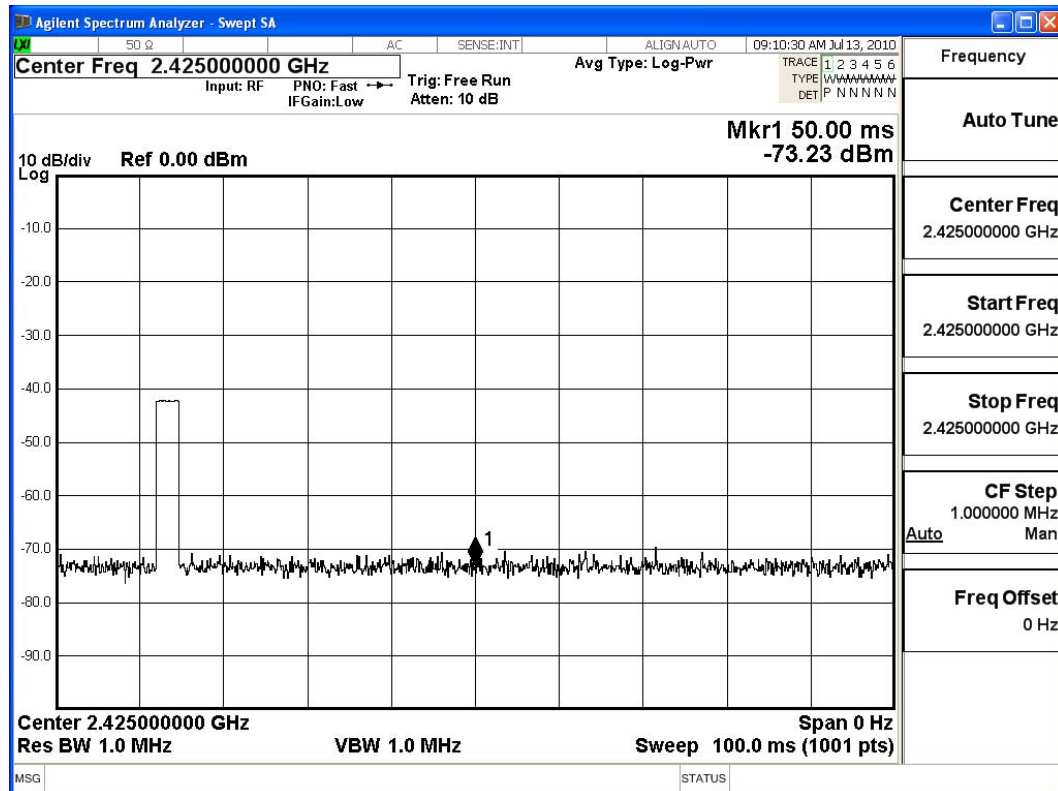


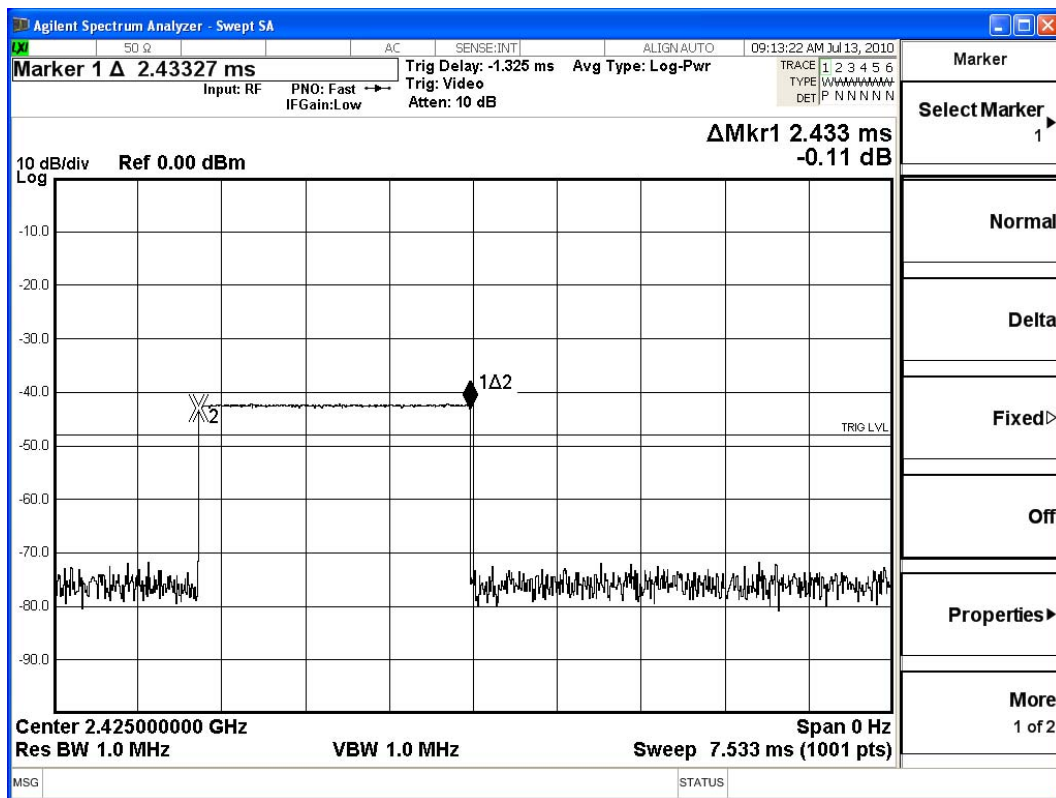
### 5.3. Uncertainty

$\pm 150\text{Hz}$

## 5.4. Test Result of Duty Cycle

Product : Barcode scanner  
 Test Item : Duty Cycle Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit





Time on of 100ms= 2.433 ms

Duty Cycle= 2.433ms / 100ms= 0.02433

Duty Cycle correction factor= 20 LOG 0.0243= -32.277 dB

Duty Cycle correction factor	-32.277	dB
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## **6. EMI Reduction Method During Compliance Testing**

No modification was made during testing.