



Test Report

Product Name	USB Receiver
Model No.	ZB-3100
FCC ID	YKHZB3100

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-A
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

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Product Name	USB Receiver
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.	ZB-3100
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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Documented By :

Leven Huang

(Senior Adm. Specialist / Leven Huang)



Tested By :

Henk Huang

(Engineer / Henk Huang)



Testing Laboratory

0914

Approved By :

Vincent Lin

(Manager / Vincent Lin)

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Attachment 1: EUT Test Photographs

Attachment 2: EUT Detailed Photographs

1. GENERAL INFORMATION

1.1. EUT Description

Product Name	USB Receiver
Trade Name	NUMA
Model No.	ZB-3100
FCC ID	YKHZB3100
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 USB Receiver 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 USB Receiver built-in 2.4GHz transceiver. The operation frequency is from 2425MHz to 2480MHz with FSK modulation. The signal will be transmitted through 2.4 GHz RF signal from the Chip antenna. Power by PC shall be provided for EUT operation.

Test Mode	Mode 1: Transmit
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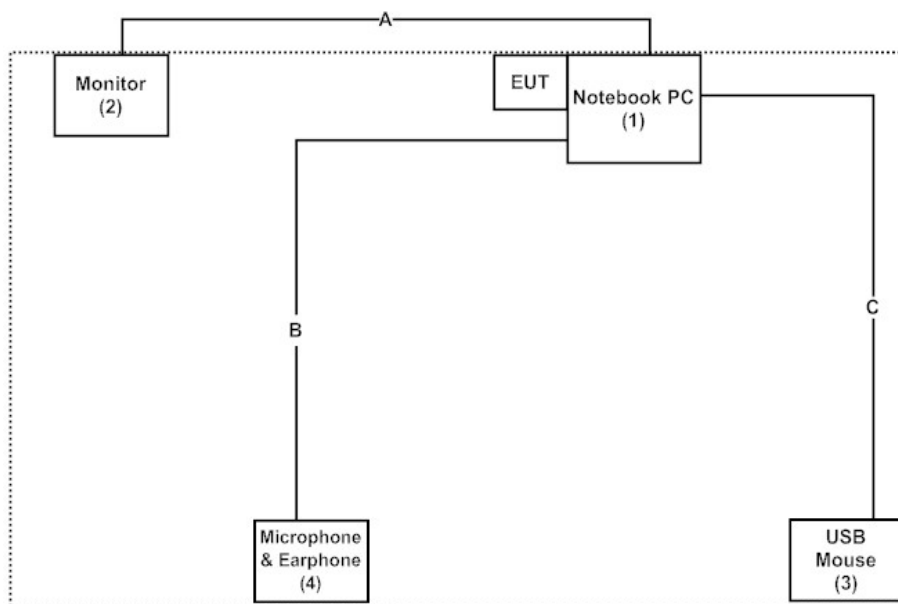
1.3. Tested System Details

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

1.4. Configuration of Test System



1.5. EUT Exercise Software

- (1) Setup the EUT as shown in section 1.4
- (2) Inserts to the USB, 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
Federal Communications Commission
FCC Engineering Laboratory
7435 Oakland Mills Road
Columbia, MD 21046
Registration Number: 92195



Accreditation on NVLAP
NVLAP Lab Code: 200533-0



Site Name: Quietek Corporation
Site Address: No. 5-22, Ruei-Shu Valley, Ruei-Ping Tsuen,
Lin-Kou Shiang, Taipei,
Taiwan, R.O.C.
TEL: 886-2-8601-3788 / FAX : 886-2-8601-3789
E-Mail : service@quietek.com

FCC Accreditation Number: TW1014



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

± 2.26 dB

2.6. Test Result of Conducted Emission

Product : USB Receiver
 Test Item : Conducted Emission Test
 Power Line : Line 1
 Test Mode : Mode 1: Transmit

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dBuV	dBuV	dB	dBuV
LINE 1					
Quasi-Peak					
0.162	9.750	39.300	49.050	-16.607	65.657
0.205	9.703	32.440	42.143	-22.286	64.429
0.291	9.653	34.630	44.283	-17.688	61.971
1.068	9.670	9.800	19.470	-36.530	56.000
4.533	9.700	17.200	26.900	-29.100	56.000
17.853	9.980	17.380	27.360	-32.640	60.000
Average					
0.162	9.750	19.410	29.160	-26.497	55.657
0.205	9.703	19.030	28.733	-25.696	54.429
0.291	9.653	27.390	37.043	-14.928	51.971
1.068	9.670	3.640	13.310	-32.690	46.000
4.533	9.700	6.980	16.680	-29.320	46.000
17.853	9.980	12.180	22.160	-27.840	50.000

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 : USB Receiver
 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
LINE 2					
Quasi-Peak					
0.158	9.756	38.040	47.796	-17.975	65.771
0.181	9.732	34.690	44.422	-20.692	65.114
0.298	9.660	34.700	44.360	-17.411	61.771
3.275	9.690	12.990	22.680	-33.320	56.000
4.451	9.700	17.590	27.290	-28.710	56.000
17.298	10.000	15.470	25.470	-34.530	60.000
Average					
0.158	9.756	28.700	38.456	-17.315	55.771
0.181	9.732	19.740	29.472	-25.642	55.114
0.298	9.660	20.620	30.280	-21.491	51.771
3.275	9.690	5.000	14.690	-31.310	46.000
4.451	9.700	8.210	17.910	-28.090	46.000
17.298	10.000	10.940	20.940	-29.060	50.000

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

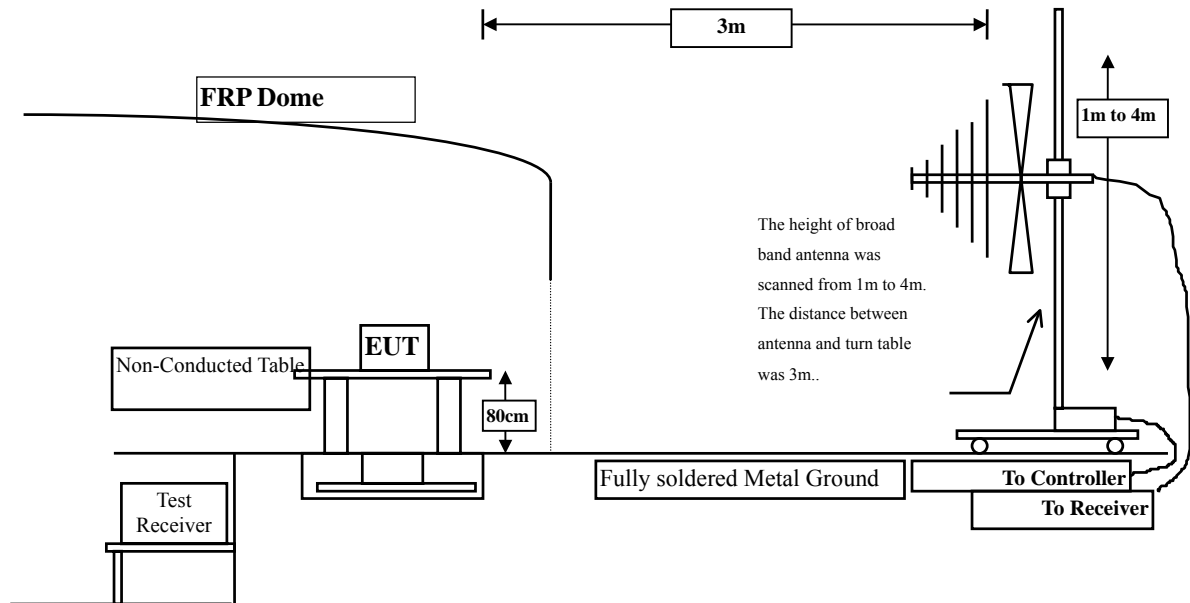
The following test equipment are used during the radiated emission test:

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

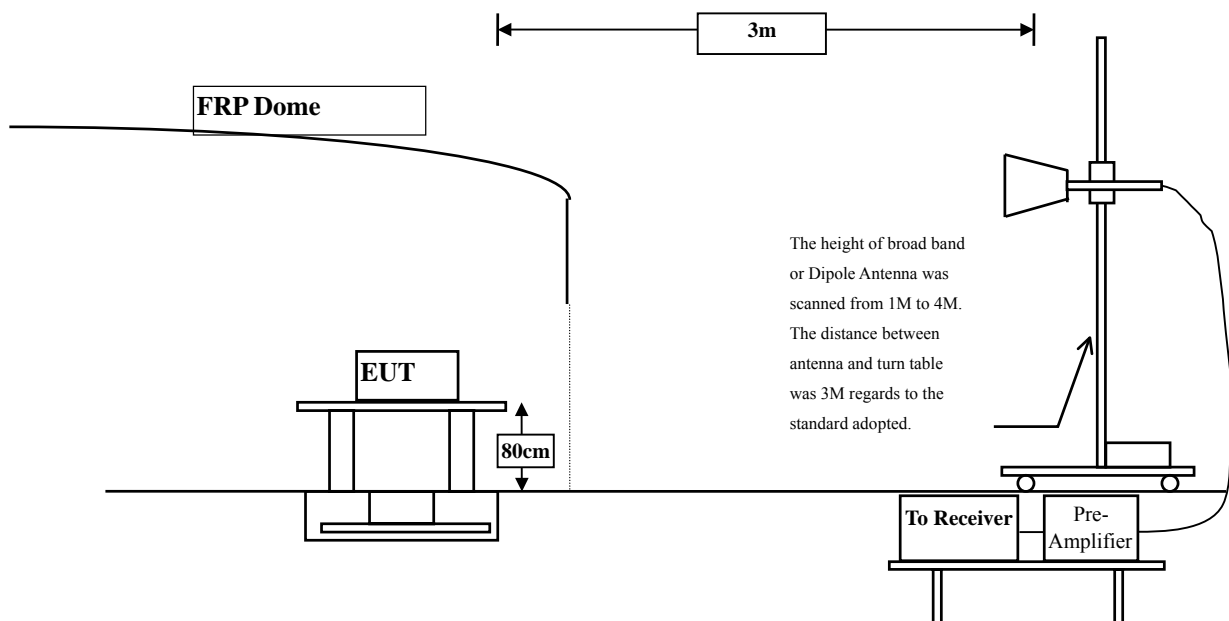
- Note:
1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
 2. The test instruments marked with “X” are used to measure the final test results.

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

± 3.9 dB above 1GHz

± 3.8 dB below 1GHz

3.6. Test Result of Radiated Emission

Product : USB Receiver
 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
Horizontal					
Peak Detector:					
2425.000	-0.933	69.880	68.948	-45.052	114.000
2450.000	-0.772	69.010	68.238	-45.762	114.000
2480.000	-0.581	68.220	67.639	-46.361	114.000
Vertical					
Peak Detector:					
2425.000	-1.633	80.930	79.297	-34.703	114.000
2450.000	-1.493	79.120	77.628	-36.372	114.000
2480.000	-1.324	78.430	77.106	-36.894	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.

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

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
2425.000	-0.933	73.410	72.478	-41.522	114.000
2450.000	-0.772	72.220	71.448	-42.552	114.000
2480.000	-0.581	71.340	70.759	-43.241	114.000
Vertical					
Peak Detector:					
2425.000	-1.633	79.890	78.257	-35.743	114.000
2450.000	-1.493	78.980	77.488	-36.512	114.000
2480.000	-1.324	78.010	76.686	-37.314	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.

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

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
2425.000	-0.933	79.540	78.608	-35.392	114.000
2450.000	-0.772	78.220	77.448	-36.552	114.000
2480.000	-0.581	77.110	76.529	-37.471	114.000
Vertical					
Peak Detector:					
2425.000	-1.633	79.100	77.467	-36.533	114.000
2450.000	-1.493	78.220	76.728	-37.272	114.000
2480.000	-1.324	76.950	75.626	-38.374	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.

Product : USB Receiver
 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
Horizontal					
Peak Detector:					
4850.000	0.239	48.640	48.879	-25.121	74.000
7275.000	7.154	38.600	45.754	-28.246	74.000
9700.000	7.586	38.890	46.476	-27.524	74.000
Vertical					
Peak Detector:					
4850.000	0.671	46.180	46.851	-27.149	74.000
7275.000	7.680	41.270	48.950	-25.050	74.000
9700.000	8.225	39.460	47.685	-26.315	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 : USB Receiver
 Test Item : Harmonic Radiated Emission Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (2450 MHz)

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
Peak Detector:					
4900.000	-0.016	47.780	47.764	-26.236	74.000
7350.000	8.238	38.310	46.548	-27.452	74.000
9800.000	7.822	39.020	46.842	-27.158	74.000
Vertical					
Peak Detector:					
4900.000	0.482	47.150	47.632	-26.368	74.000
7350.000	8.934	40.410	49.344	-24.656	74.000
9800.000	8.467	39.010	47.477	-26.523	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 : USB Receiver
 Test Item : Harmonic Radiated Emission Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (2480 MHz)

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
Peak Detector:					
4960.000	0.582	47.550	48.132	-25.868	74.000
7440.000	8.555	39.260	47.815	-26.185	74.000
9920.000	8.206	38.720	46.926	-27.074	74.000
Vertical					
Peak Detector:					
4960.000	1.398	46.590	47.989	-26.011	74.000
7440.000	9.214	38.310	47.524	-26.476	74.000
9920.000	9.245	39.770	49.015	-24.985	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 : USB Receiver
 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
Horizontal					
43.580	-4.496	34.968	30.472	-9.528	40.000
256.980	-5.073	37.048	31.975	-14.025	46.000
567.380	1.664	33.847	35.511	-10.489	46.000
648.860	2.038	33.377	35.415	-10.585	46.000
709.000	3.458	31.191	34.649	-11.351	46.000
827.340	6.302	28.006	34.308	-11.692	46.000
Vertical					
33.880	-1.972	37.255	35.283	-4.717	40.000
256.980	-7.573	41.630	34.057	-11.943	46.000
499.480	-0.852	36.281	35.429	-10.571	46.000
542.160	-0.269	37.940	37.671	-8.329	46.000
565.440	-5.379	40.309	34.930	-11.070	46.000
967.020	8.071	31.801	39.872	-14.128	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:

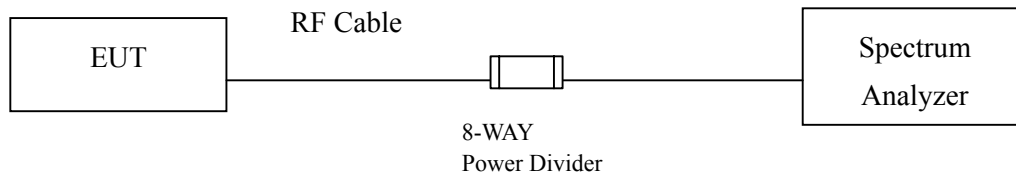
The following test equipments are used during the band edge tests:

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

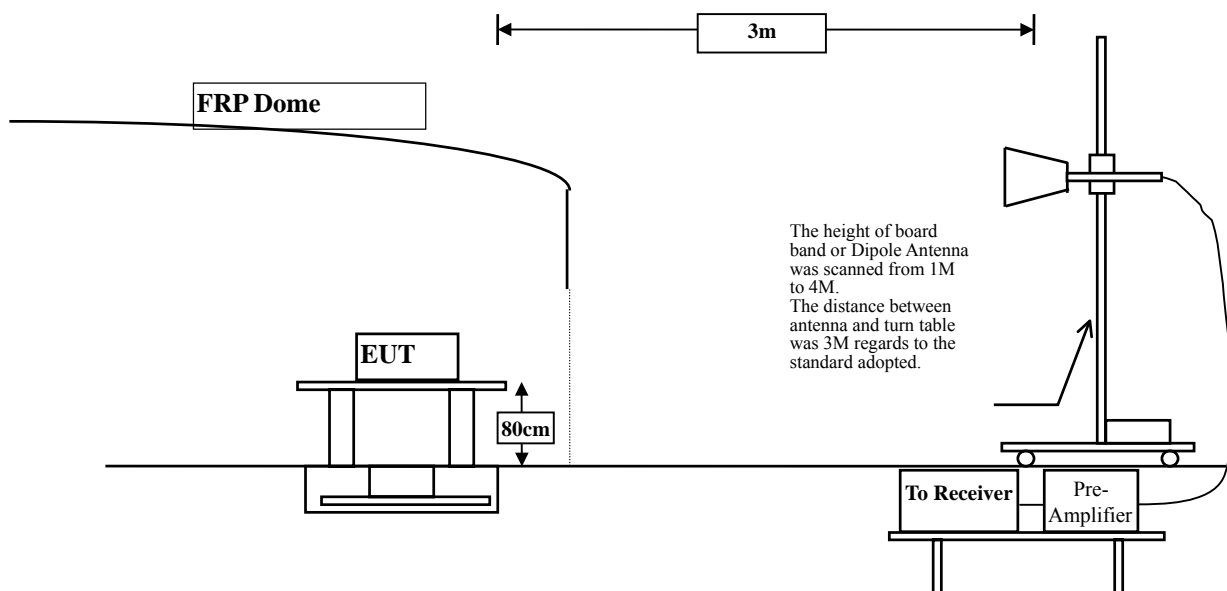
- Note:
1. All equipments are calibrated every one year.
 2. The test equipments marked by “X” are used to measure the final test results.

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 ± 1.27 dB

Radiated is ± 3.9 dB

4.6. Test Result of Band Edge

Product : USB Receiver
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	-0.933	69.88	68.948	Peak
Vertical	2425	-1.633	80.93	79.297	Peak

Note: 1:Spectrum Analyzer setting:

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

Band Edge Test Data

Antenna Pole	Test Frequency (MHz)	Fundamental (dBuV/m)	Δ (dB)	Band Edge Field Strength (dBuV/m)	Detector
Horizontal	2365.3	68.948	52.005	16.943	Peak
Vertical	2365.3	79.297	52.005	27.292	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:

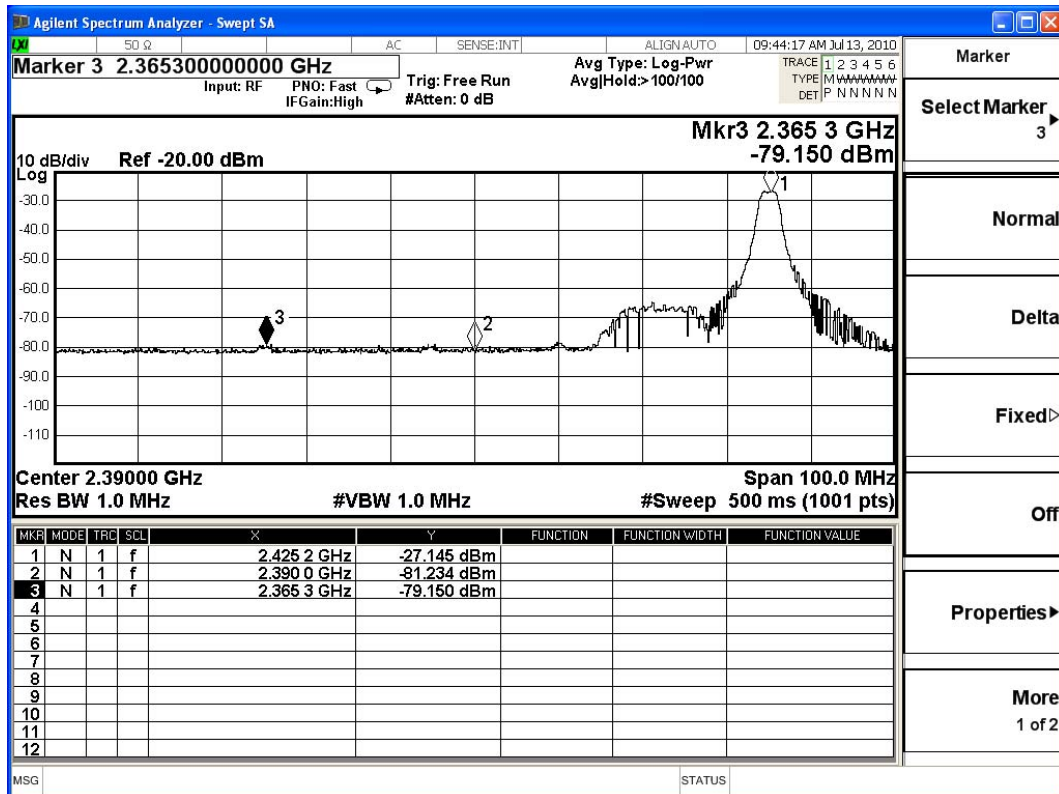
Band Edge field Strength = F - Δ

F = Fundamental field Strength (Peak or Average)

Δ = Conducted Band Edge Delta (Peak or Average)

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

Peak Detector of conducted Band Edge Delta



Product : USB Receiver
 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	-0.581	68.22	67.639	Peak
Vertical	2480	-1.324	78.43	77.106	Peak

Note: 1:Spectrum Analyzer setting:

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

Band Edge Test Data

Antenna Pole	Test Frequency (MHz)	Fundamental (dBuV/m)	Δ (dB)	Band Edge Field Strength (dBuV/m)	Detector
Horizontal	2483.5	67.639	27.445	40.194	Peak
Vertical	2483.5	77.106	27.445	49.661	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:

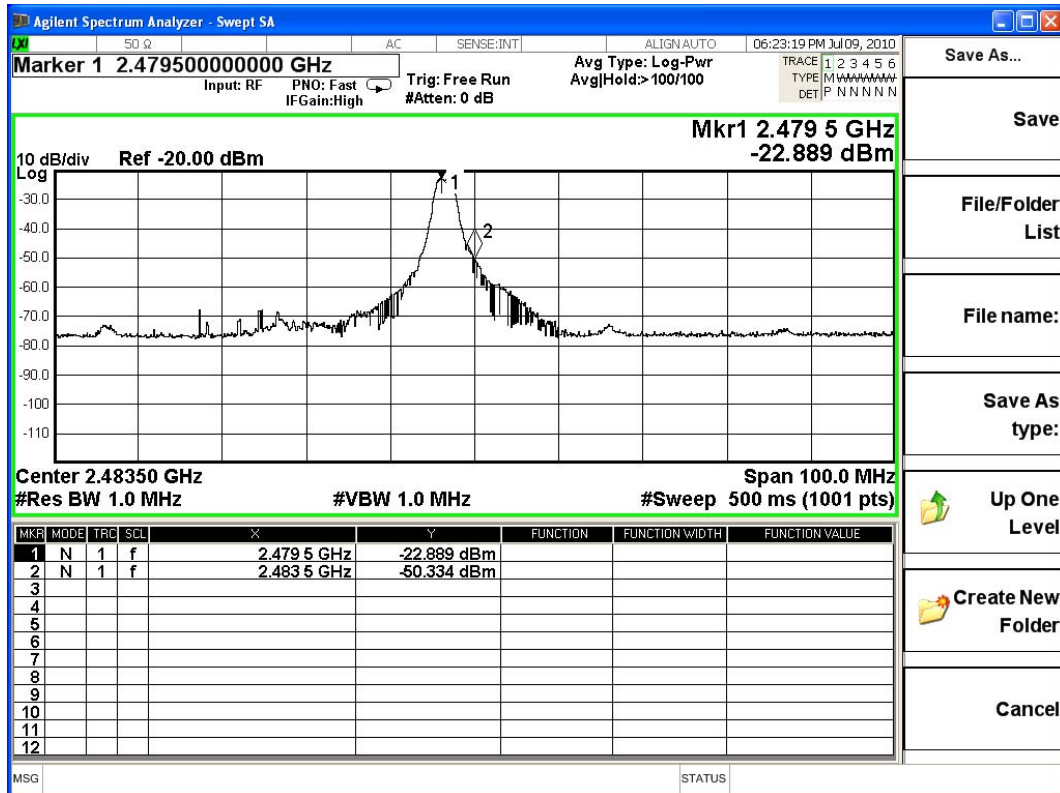
Band Edge field Strength = F - Δ

F = Fundamental field Strength (Peak or Average)

Δ = Conducted Band Edge Delta (Peak or Average)

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

Peak Detector of conducted Band Edge Delta



5. Duty Cycle

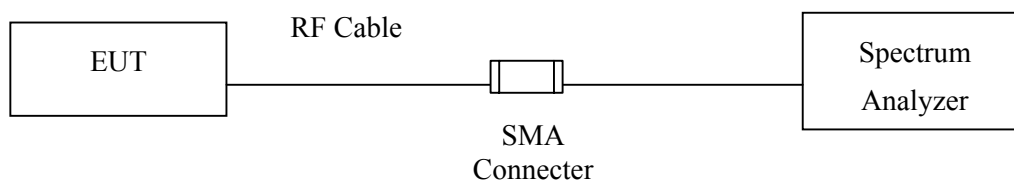
5.1. Test Equipment

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

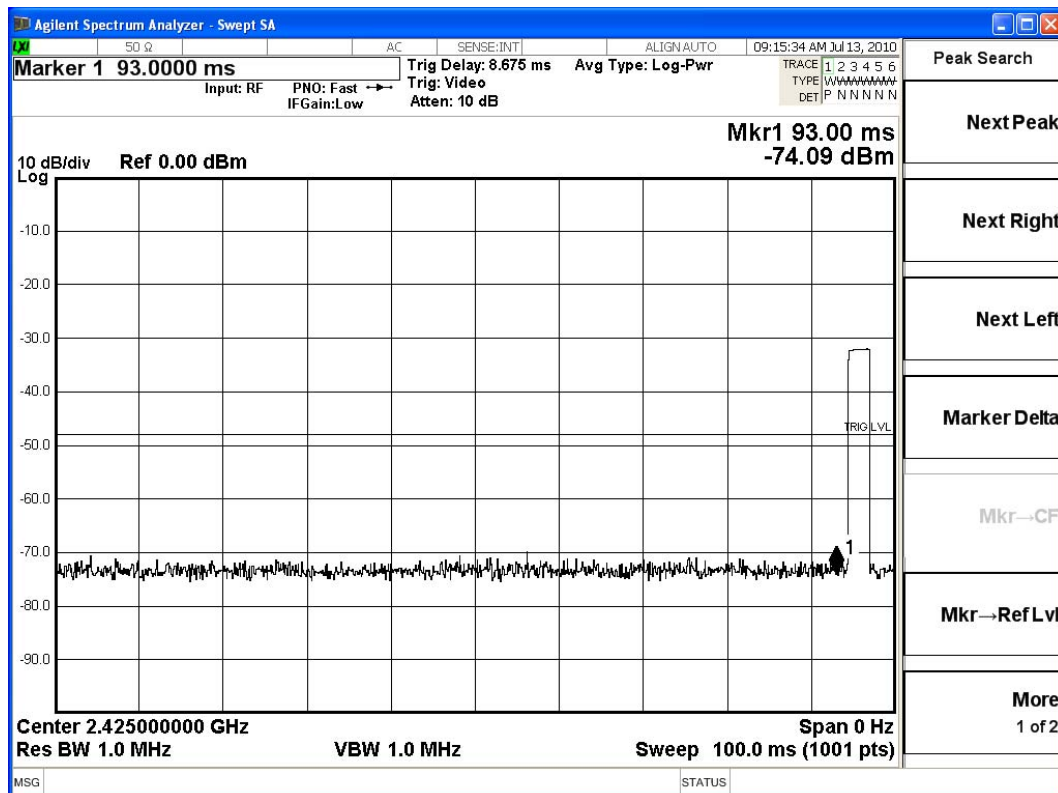


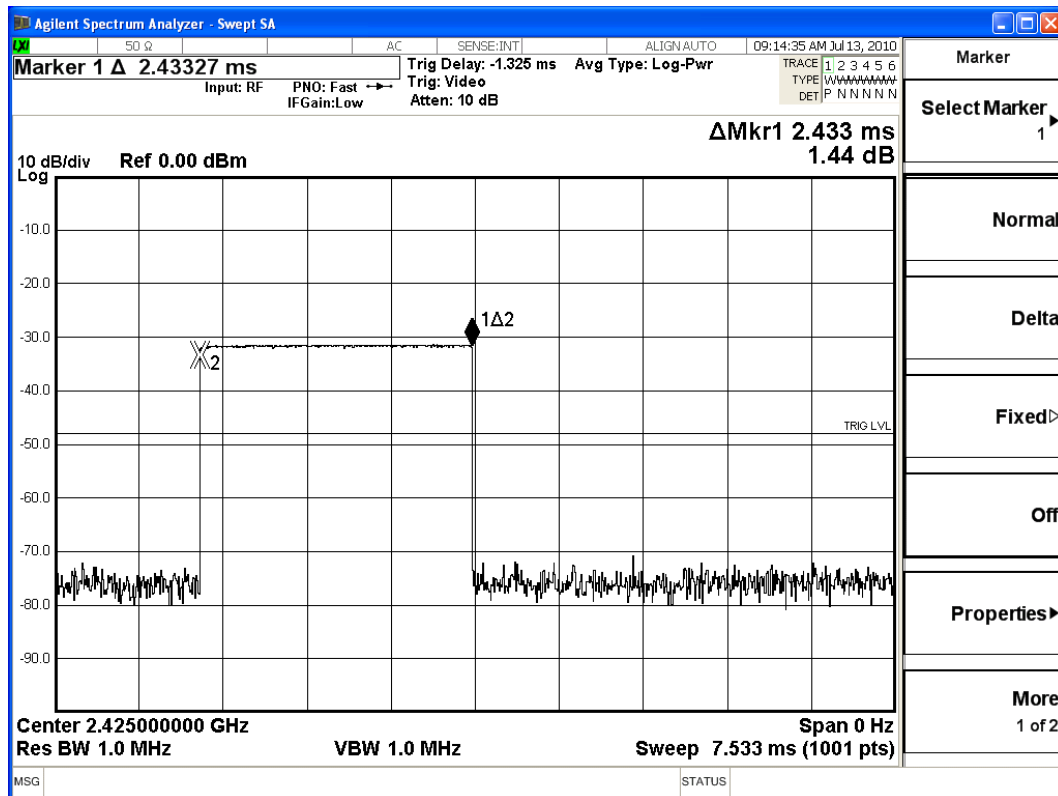
5.3. Uncertainty

$\pm 150\text{Hz}$

5.4. Test Result of Duty Cycle

Product : USB Receiver
 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 0.02433= -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.