



Test Report

Product Name	Wireless Dongle
Model No	DONGLE D
FCC ID.	I4LSW130

Applicant	MICRO-STAR INT'L Co., LTD.
Address	No. 69, Li-De St., Jung-He City, Taipei Hsien, Taiwan, R.O.C.

Date of Receipt	Jul. 30, 2009
Issue Date	Oct. 01, 2009
Report No.	098089R-RFUSP42V01
Report Version	V1.0

The test results relate only to the samples tested.

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Test Report Certification

Issue Date: Oct. 01, 2009

Report No.: 098089R-RFUSP42V01



Accredited by NIST (NVLAP)
NVLAP Lab Code: 200533-0

Product Name	Wireless Dongle
Applicant	MICRO-STAR INT'L Co., LTD.
Address	No. 69, Li-De St., Jung-He City, Taipei Hsien, Taiwan, R.O.C.
Manufacturer	MICRO-STAR INT'L Co., LTD.
Model No.	DONGLE D
EUT Rated Voltage	DC 5V (Power by USB)
EUT Test Voltage	AC 120V / 60Hz
Trade Name	MSI
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2008 ANSI C63.4: 2003
Test Result	Complied



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Testing Laboratory
0914

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1. GENERAL INFORMATION

1.1. EUT Description

Product Name	Wireless Dongle
Trade Name	MSI
Model No.	DONGLE D
FCC ID.	I4LSW130
Frequency Range	2404~2480MHz
Number of Channels	77
Type of Modulation	GFSK
Antenna Type	Printed On PCB
Antenna Gain	Refer to the table "Antenna List"
Channel Control	Auto

Antenna List

No.	Manufacturer	Part No.	Peak Gain
1	MSI	N/A	1.20dBi for 2.4 GHz

Frequency of Each Channel

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 1:	2404 MHz	Channel 22:	2425 MHz	Channel 43:	2446 MHz	Channel 64:	2467 MHz
Channel 2:	2405 MHz	Channel 23:	2426 MHz	Channel 44:	2447 MHz	Channel 65:	2468 MHz
Channel 3:	2406 MHz	Channel 24:	2427 MHz	Channel 45:	2448 MHz	Channel 66:	2469 MHz
Channel 4:	2407 MHz	Channel 25:	2428 MHz	Channel 46:	2449 MHz	Channel 67:	2470 MHz
Channel 5:	2408 MHz	Channel 26:	2429 MHz	Channel 47:	2450 MHz	Channel 68:	2471 MHz
Channel 6:	2409 MHz	Channel 27:	2430 MHz	Channel 48:	2451 MHz	Channel 69:	2472 MHz
Channel 7:	2410 MHz	Channel 28:	2431 MHz	Channel 49:	2452 MHz	Channel 70:	2473 MHz
Channel 8:	2411 MHz	Channel 29:	2432 MHz	Channel 50:	2453 MHz	Channel 71:	2474 MHz
Channel 9:	2412 MHz	Channel 30:	2433 MHz	Channel 51:	2454 MHz	Channel 72:	2475 MHz
Channel 10:	2413 MHz	Channel 31:	2434 MHz	Channel 52:	2455 MHz	Channel 73:	2476 MHz
Channel 11:	2414 MHz	Channel 32:	2435 MHz	Channel 53:	2456 MHz	Channel 74:	2477 MHz
Channel 12:	2415 MHz	Channel 33:	2436 MHz	Channel 54:	2457 MHz	Channel 75:	2478 MHz
Channel 13:	2416 MHz	Channel 34:	2437 MHz	Channel 55:	2458 MHz	Channel 76:	2479 MHz
Channel 14:	2417 MHz	Channel 35:	2438 MHz	Channel 56:	2459 MHz	Channel 77:	2480 MHz
Channel 15:	2418 MHz	Channel 36:	2439 MHz	Channel 57:	2460 MHz		
Channel 16:	2419 MHz	Channel 37:	2440 MHz	Channel 58:	2461 MHz		
Channel 17:	2420 MHz	Channel 38:	2441 MHz	Channel 59:	2462 MHz		
Channel 18:	2421 MHz	Channel 39:	2442 MHz	Channel 60:	2463 MHz		
Channel 19:	2422 MHz	Channel 40:	2443 MHz	Channel 61:	2464 MHz		
Channel 20:	2423 MHz	Channel 41:	2444 MHz	Channel 62:	2465 MHz		
Channel 21:	2424 MHz	Channel 42:	2445 MHz	Channel 63:	2466 MHz		

Note:

1. The EUT is a Wireless Dongle 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. Lowest and highest data rates are tested in each mode. Only worst case is shown in the report.
4. These tests are conducted on a sample for the purpose of demonstrating compliance with Part 15 Subpart C Paragraph 15.247 of spread spectrum devices
5. 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 2.4GHz Wireless Dongle built-in 2.4GHz transceiver. The operation frequency is from 2404 MHz to 2480MHz with GFSK modulation. The signal will be transmitted through 2.4 GHz RF signal from the Printed antenna. DC 5V shall be provided for EUT operation.

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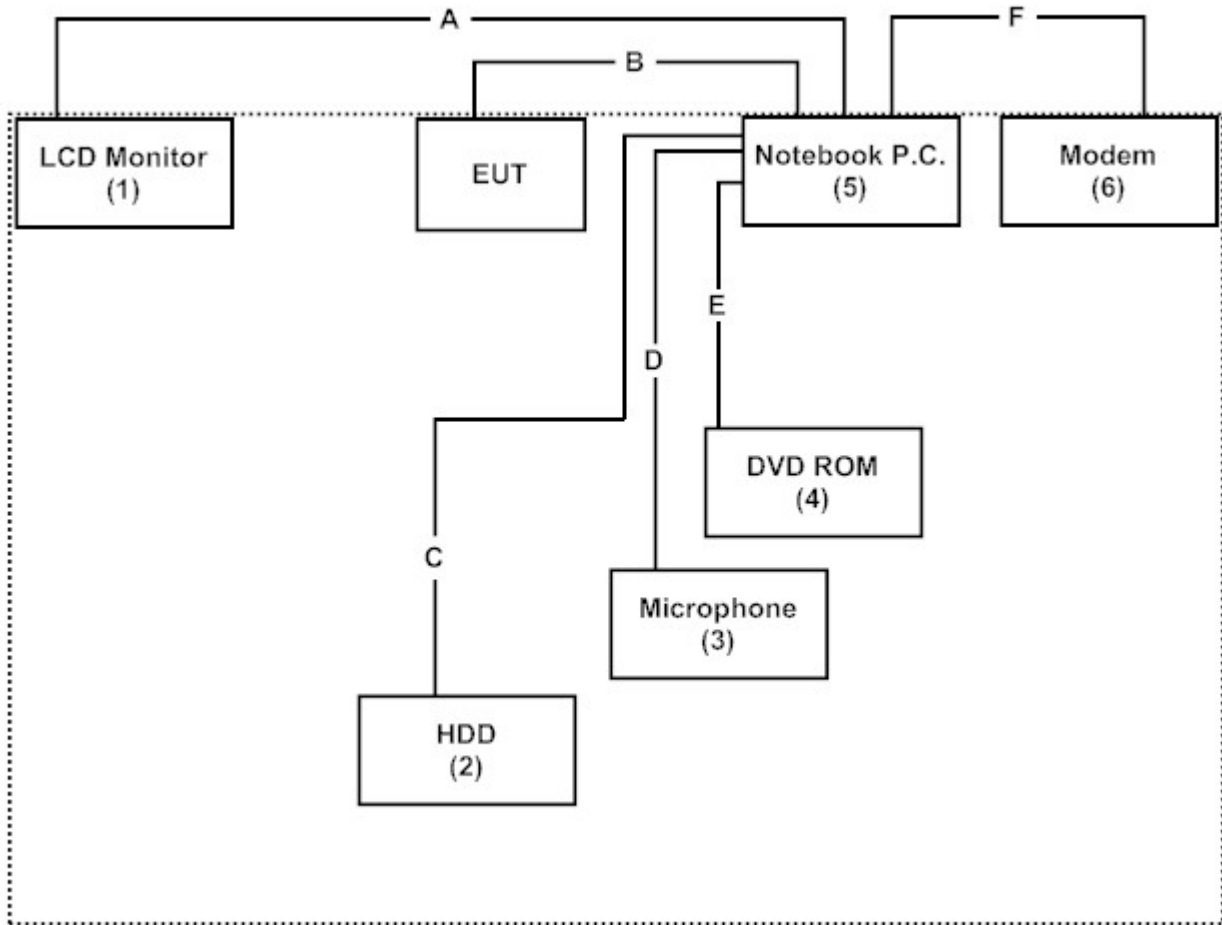
1.3. Tested System Details

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	LCD Monitor	CMV	CT-730D	FNC122F57CA1062	Non-Shielded, 1.8m
2	DELL HDD (80G)	DELL	RD1000	58PWZD1 848200184260	Non-Shielded, 1.8m
3	Microphone	Yi Sheng	S-124	N/A	N/A
4	DVD ROM	DELL	PD01S	CN-OH7531-42940- 4BB-0180	N/A
5	Notebook P.C.	DELL	PPT	N/A	Non-Shielded, 0.8m
6	Modem	ACEEX	DM-1414	0102027536	Non-Shielded, 1.8m

	Signal Cable Type	Signal cable Description
A.	VGA Cable	Shielded,1.8m,with two ferrite cores bonded.
B.	USB Cable	Shielded,1.5m
C.	USB Cable	Shielded,1.8m
D.	Microphone Cable	Non-Shielded,1m
E.	USB Cable	Shielded,0.5m
F.	Modem Cable	Shielded,1.5m

1.4. Configuration of Tested System



1.5. EUT Exercise Software

1	Setup the EUT as shown in section 1.4.
2	Insert the Dongle via USB port to Notebook.
3	Configure the test mode, the test channel, and the data rate.
4	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	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://tw.quietek.com/modules/myalbum/>
 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



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 E-Mail : service@quietek.com

FCC Accreditation Number: TW1014



2. Conducted Emission

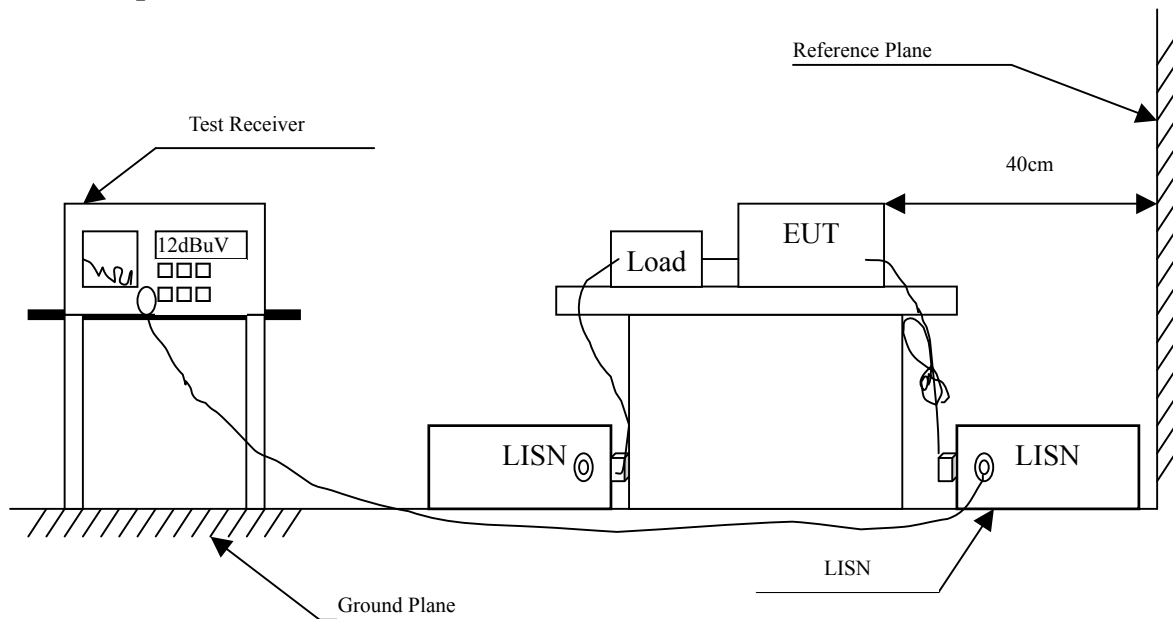
2.1. Test Equipment

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, 2009	
2	L.I.S.N.	R & S	ESH3-Z5/825016/6	May, 2009	EUT
3	L.I.S.N.	Kyoritsu	KNW-407/8-1420-3	May, 2009	Peripherals
4	Pulse Limiter	R & S	ESH3-Z2	May, 2009	
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	AVG
0.15 - 0.50	66-56	56-46
0.50-5.0	56	46
5.0 - 30	60	50

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 : Wireless Dongle
 Test Item : Conducted Emission Test
 Power Line : Line 1
 Test Mode : Mode 1: Transmit (2442MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV	Margin dB	Limit dBuV
Line 1					
Quasi-Peak					
0.154	9.760	34.090	43.851	-22.035	65.886
0.201	9.706	26.990	36.696	-27.847	64.543
0.244	9.679	35.870	45.549	-17.765	63.314
0.306	9.650	27.190	36.840	-24.703	61.543
0.912	9.670	25.840	35.510	-20.490	56.000
4.193	9.700	22.520	32.220	-23.780	56.000
Average					
0.154	9.760	9.650	19.411	-36.475	55.886
0.201	9.706	15.840	25.546	-28.997	54.543
0.244	9.679	27.820	37.499	-15.815	53.314
0.306	9.650	21.280	30.930	-20.613	51.543
0.912	9.670	15.250	24.920	-21.080	46.000
4.193	9.700	11.570	21.270	-24.730	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 : Wireless Dongle
 Test Item : Conducted Emission Test
 Power Line : Line 2
 Test Mode : Mode 1: Transmit (2442MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV	Margin dB	Limit dBuV
Line 2					
Quasi-Peak					
0.181	9.732	41.460	51.192	-13.922	65.114
0.201	9.716	26.560	36.276	-28.267	64.543
0.240	9.690	34.290	43.980	-19.449	63.429
0.302	9.660	27.480	37.140	-24.517	61.657
0.814	9.670	22.500	32.170	-23.830	56.000
3.880	9.700	30.950	40.650	-15.350	56.000
Average					
0.181	9.732	32.700	42.432	-12.682	55.114
0.201	9.716	15.580	25.296	-29.247	54.543
0.240	9.690	23.970	33.660	-19.769	53.429
0.302	9.660	17.630	27.290	-24.367	51.657
0.814	9.670	2.550	12.220	-33.780	46.000
3.880	9.700	17.270	26.970	-19.030	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

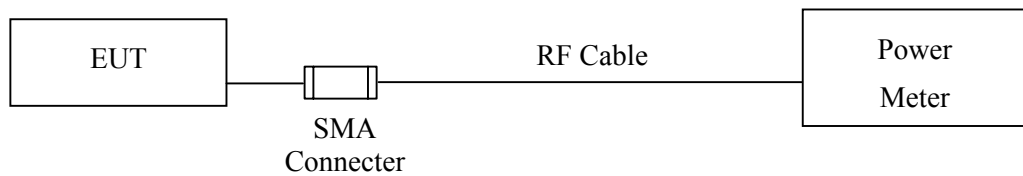
The following test equipments are used during the radiated emission tests:

Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X Power Meter	Anritsu	ML2495A/6K00003357	May, 2009
X Power Sensor	Anritsu	MA2411B/0738448	May, 2009

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

3.2. Test Setup

Conducted Measurement



3.3. Limits

The maximum peak power shall be less 1 Watt.

3.4. Test Procedure

The EUT was tested according to DTS test procedure of Mar. 2005 KDB558074 for compliance to FCC 47CFR 15.247 requirements.

3.5. Uncertainty

± 1.27 dB

3.6. Test Result of Peak Power Output

Product : Wireless Dongle
Test Item : Peak Power Output Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit

Channel No.	Frequency(MHz)	Measurement	Required Limit	Result
01	2404.00	-1.24 dBm	1Watt= 30 dBm	Pass
39	2442.00	-1.17 dBm	1Watt= 30 dBm	Pass
77	2480.00	-1.16 dBm	1Watt= 30 dBm	Pass

Note: Peak Power Output Value =Reading value on peak power meter + cable loss

4. Radiated Emission

4.1. Test Equipment

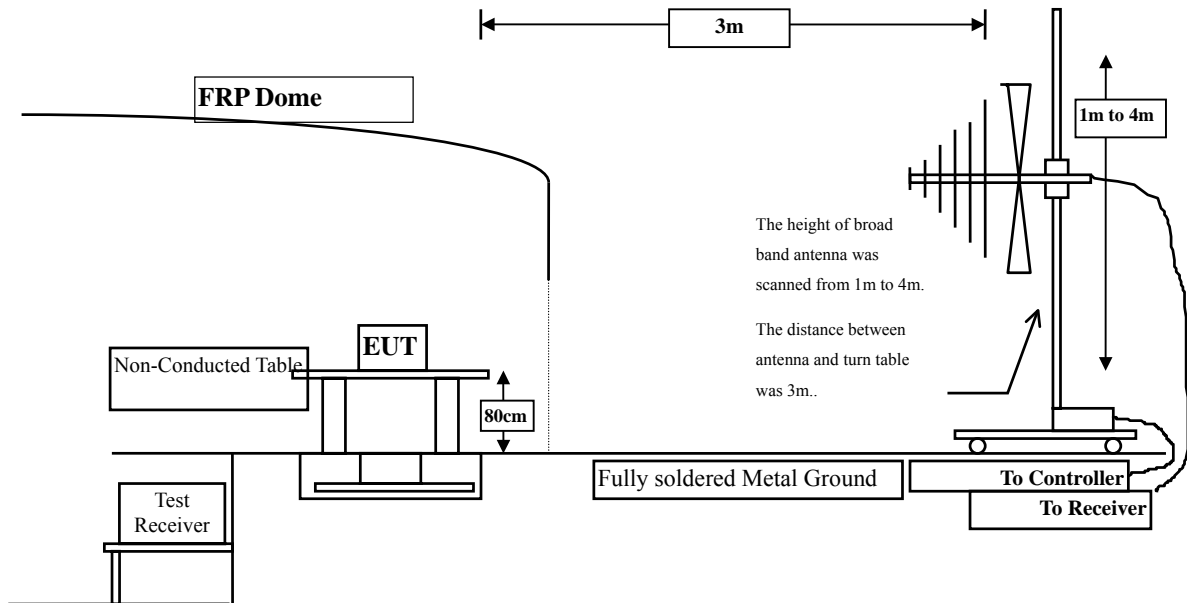
The following test equipment are used during the radiated emission test:

Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.
☒ Site # 3	X	Bilog Antenna	Schaffner Chase	CBL6112B/2673	Sep., 2009
	X	Horn Antenna	Schwarzbeck	BBHA9120D/D305	Sep., 2009
	X	Horn Antenna	Schwarzbeck	BBHA9170/208	Jul., 2009
	X	Pre-Amplifier	AGILENT	8447D/2944A09549	Sep., 2009
	X	Test Receiver	R & S	ESCS 30/ 825442/018	Sep., 2009
	X	Spectrum Analyzer	Advantest	R3162/91700283	Oct., 2009
	X	Coaxial Cable	Quietek	QTK-CABLE/ CAB5	Feb., 2009
	X	Controller	Quietek	QTK-CONTROLLER/ CTRL3	N/A
	X	Coaxial Switch	Anritsu	MP59B/6200265729	N/A

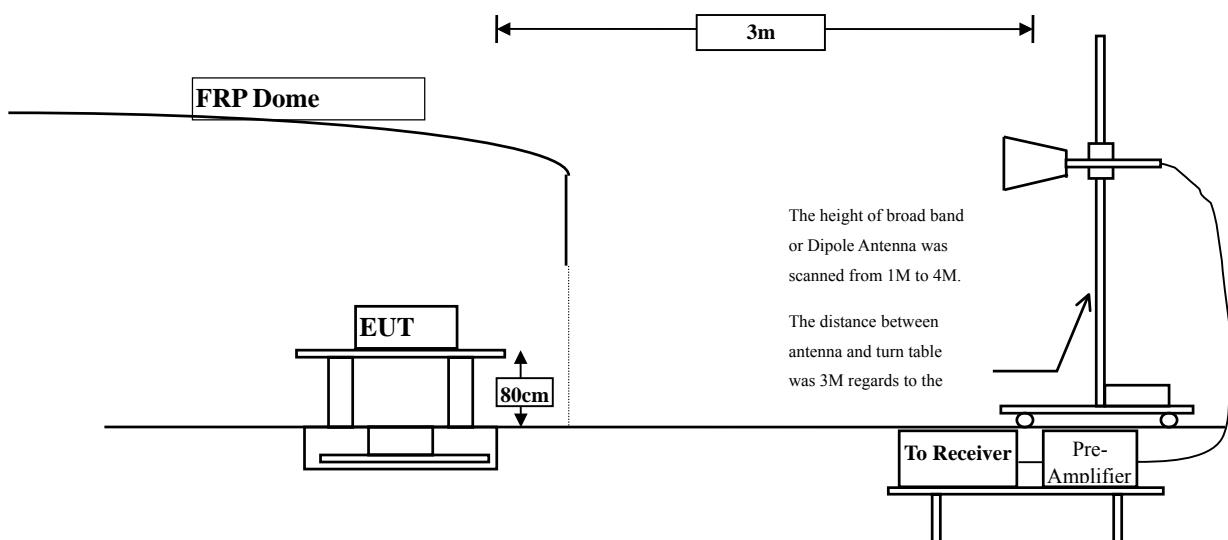
- Note:
1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
 2. The test instruments marked with “X” are used to measure the final test results.

4.2. Test Setup

Radiated Emission Below 1GHz



Radiated Emission Above 1GHz



4.3. 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)

4.4. Test Procedure

The EUT was setup according to ANSI C63.4, 2003 and tested according to DTS test procedure of Mar. 2005 KDB558074 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 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 in the Open Area Test Site on the Final Measurement.

The measurement frequency range from 30MHz - 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 : Wireless Dongle
 Test Item : Harmonic Radiated Emission Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (2404MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
4808.000	9.610	49.170	58.780	-15.220	74.000
7212.000	14.321	35.780	50.101	-23.899	74.000
9616.000	19.692	36.400	56.092	-17.908	74.000
--					
Vertical					
Peak Detector:					
4808.000	8.330	45.840	54.170	-19.830	74.000
7212.000	15.416	36.340	51.756	-22.244	74.000
9616.000	18.902	36.110	55.012	-18.988	74.000
--					

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. The average measurement was not performed when the peak measured data under the limit of average detection.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.

Frequency MHz	Peak Measurement dBuV/m	Duty Cycle Factor dB	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Average Detector:					
4808.000	58.780	-20.000	38.780	-15.220	54.000
7212.000	50.101	-20.000	30.101	-23.899	54.000
9616.000	56.092	-20.000	36.092	-17.908	54.000
Vertical					
Average Detector:					
4808.000	54.170	-20.000	34.170	-19.830	54.000
7212.000	51.756	-20.000	31.756	-22.244	54.000
9616.000	55.012	-20.000	35.012	-18.988	54.000

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle
2. The Duty Cycle is refer to section 9.
3. If Duty Cycle is smaller than -20dB,based on FCC part15 the duty cycle correction factor is -20dB for calculating average emission.
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.

Product : Wireless Dongle
 Test Item : Harmonic Radiated Emission Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (2442 MHz)

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level	dB	dBuV/m
	dB	dBuV	dBuV/m		

Horizontal

Peak Detector:

4884.000	9.496	49.580	59.076	-14.924	74.000
7326.000	14.581	34.680	49.261	-24.739	74.000
9768.000	20.061	36.620	56.681	-17.319	74.000

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Vertical

Peak Detector:

4884.000	39.925	46.100	55.106	-18.894	74.000
7326.000	45.929	34.640	49.904	-24.096	74.000
9768.000	50.411	36.940	56.201	-17.799	74.000

--

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. The average measurement was not performed when the peak measured data under the limit of average detection.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.

Frequency MHz	Peak Measurement dBuV/m	Duty Cycle Factor dB	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Average Detector:					
4884.000	59.076	-20.000	39.076	-14.924	54.000
7326.000	49.261	-20.000	29.261	-24.739	54.000
9768.000	56.681	-20.000	36.681	-17.319	54.000
Vertical					
Average Detector:					
4884.000	55.106	-20.000	35.106	-18.894	54.000
7326.000	49.904	-20.000	29.904	-24.096	54.000
9768.000	56.201	-20.000	36.201	-17.799	54.000

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle
2. The Duty Cycle is refer to section 9.
3. If Duty Cycle is smaller than -20dB,based on FCC part15 the duty cycle correction factor is -20dB for calculating average emission.
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.

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

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
4960.000	9.418	49.160	58.577	-15.423	74.000
7440.000	15.012	35.030	50.043	-23.957	74.000
9920.000	19.754	35.880	55.634	-18.366	74.000
--					
Vertical					
Peak Detector:					
4960.000	9.717	45.730	55.446	-18.554	74.000
7440.000	15.386	35.000	50.386	-23.614	74.000
9920.000	18.897	35.730	54.627	-19.373	74.000
--					

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. The average measurement was not performed when the peak measured data under the limit of average detection.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.

Frequency MHz	Peak Measurement dBuV/m	Duty Cycle Factor dB	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Average Detector:					
4960.000	58.577	-20.000	38.577	-15.423	54.000
7440.000	50.043	-20.000	30.043	-23.957	54.000
9920.000	55.634	-20.000	35.634	-18.366	54.000
Vertical					
Average Detector:					
4960.000	55.446	-20.000	35.446	-18.554	54.000
7440.000	50.386	-20.000	30.386	-23.614	54.000
9920.000	54.627	-20.000	34.627	-19.373	54.000

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle
2. The Duty Cycle is refer to section 9.
3. If Duty Cycle is smaller than -20dB,based on FCC part15 the duty cycle correction factor is -20dB for calculating average emission.
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.

Product : Wireless Dongle
 Test Item : General Radiated Emission Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (2442 MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
45.520	-7.685	41.002	33.317	-6.683	40.000
66.860	-12.742	34.132	21.390	-18.610	40.000
371.440	-1.634	26.285	24.650	-21.350	46.000
544.100	2.992	25.950	28.942	-17.058	46.000
646.920	1.284	26.736	28.020	-17.980	46.000
745.860	2.793	25.390	28.184	-17.816	46.000
Vertical					
39.700	-1.450	33.194	31.744	-8.256	40.000
68.800	-6.670	37.448	30.778	-9.222	40.000
107.600	-0.710	34.080	33.370	-10.130	43.500
127.000	-4.393	36.395	32.002	-11.498	43.500
371.440	-3.274	25.903	22.628	-23.372	46.000
515.000	-1.596	25.706	24.110	-21.890	46.000

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. “ * ”, 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.

5. RF antenna conducted test

5.1. Test Equipment

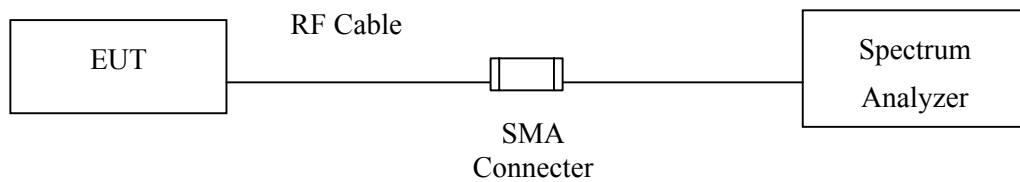
The following test equipments are used during the radiated emission tests:

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Nov, 2008
	Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2009
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2009

- 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.

5.2. Test Setup

RF antenna Conducted Measurement:



5.3. 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)).

5.4. Test Procedure

The EUT was tested according to DTS test procedure of Mar. 2005 KDB558074 for compliance to FCC 47CFR 15.247 requirements.

Set RBW = 100 kHz, Set VBW > RBW, scan up through 10th harmonic.

5.5. Uncertainty

The measurement uncertainty

Conducted is defined as $\pm 1.27\text{dB}$

5.6. Test Result of RF antenna conducted test

Product : Wireless Dongle
 Test Item : RF antenna conducted test
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit

Channel 01 (2404MHz)



Channel 39 (2442MHz)



Channel 77 (2480MHz)



6. Band Edge

6.1. Test Equipment

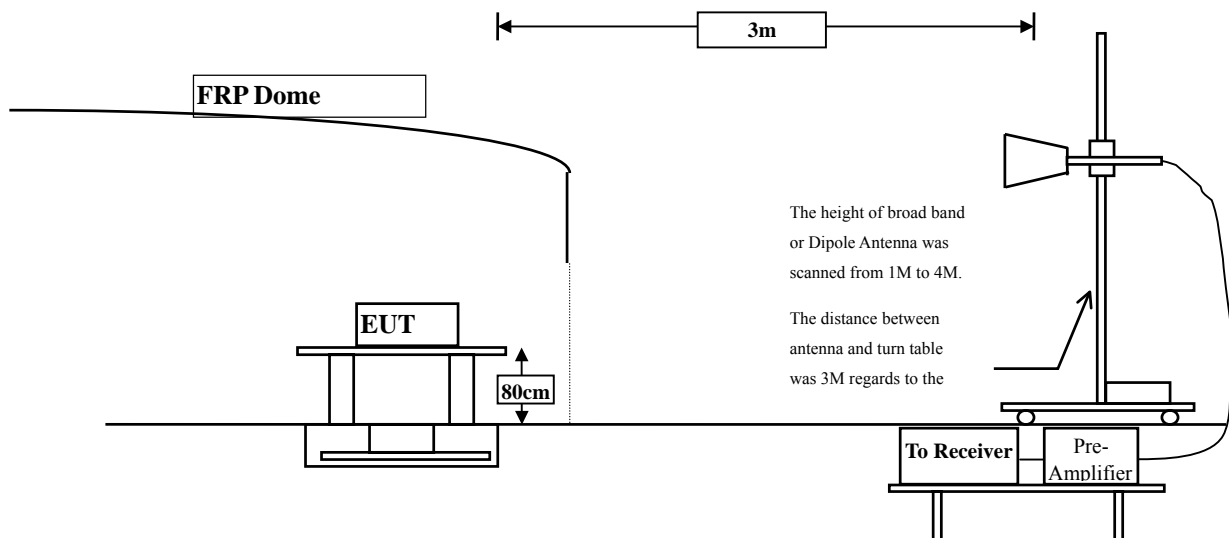
The following test equipments are used during the band edge tests:

Test Site	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
☒ Site # 3	X Bilog Antenna	Schaffner Chase	CBL6112B/2673	Sep., 2009
	X Pre-Amplifier	AGILENT	8447D/2944A09549	Sep., 2009
	X Test Receiver	R & S	ESCS 30/ 825442/018	Sep., 2009
	X Spectrum Analyzer	Advantest	R3162/91700283	Oct., 2009
	X Coaxial Cable	Quietek	QTK-CABLE/ CAB5	Feb., 2009
	X Controller	Quietek	QTK-CONTROLLER/ CTRL3	N/A
	X Coaxial Switch	Anritsu	MP59B/6200265729	N/A

- Note:
1. All instruments 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 Radiated Measurement:



6.3. 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.

6.4. Test Procedure

The EUT was setup according to ANSI C63.4, 2003 and tested according to DTS test procedure of Mar. 2005 KDB558074 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 C63.4:2003 on radiated measurement.

6.5. Uncertainty

± 3.9 dB above 1GHz

± 3.8 dB below 1GHz

6.6. Test Result of Band Edge

Product : Wireless Dongle
 Test Item : Band Edge Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit

Fundamental Filed Strength

Antenna Pole	Frequency [MHz]	Reading Level [dBuV]	Correction Factor [dB/m]	Emission Level [dBuV/m]	Detector
Horizontal	2404	49.307	36.601	85.908	Peak
Vertical	2404	44.498	35.595	80.093	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	2388.3	85.908	56.167	29.741	Peak
Horizontal	--	--	--	--	Average
Vertical	2388.3	80.093	56.167	23.926	Peak
Vertical	--	--	--	--	Average

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:

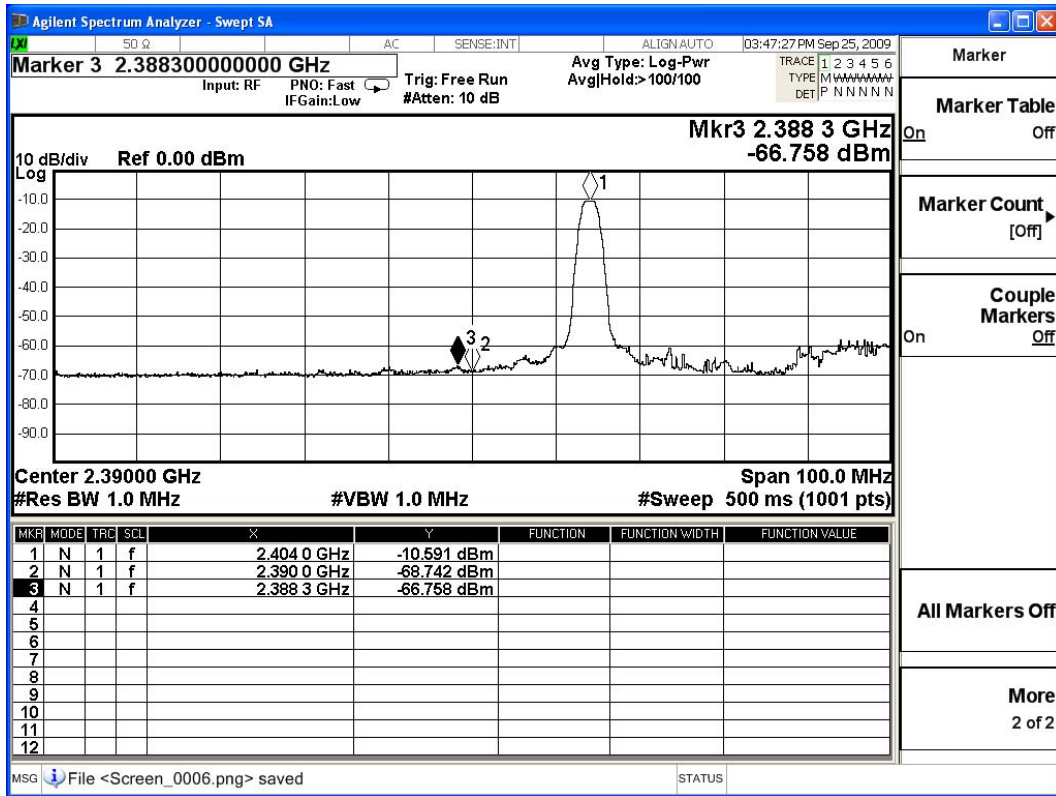
$$\text{Band Edge field Strength} = F - \Delta$$

F = Fundamental field Strength (Peak or Average)

Δ = Conducted Band Edge Delta (Peak or Average)

The Average Field Strength is Peak Field Strength + duty cycle

Peak Detector of conducted Band Edge Delta



Product : Wireless Dongle
 Test Item : Band Edge Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit

Fundamental Filed Strength

Antenna Pole	Frequency [MHz]	Reading Level [dB(uV)]	Correction Factor [dB/m]	Emission Level [dB(uV/m)]	Detector
Horizontal	2480	48.652	36.706	85.358	Peak
Vertical	2480	44.222	36.162	80.384	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	2484.9	85.358	38.72	46.638	Peak
Horizontal	--	--	--	--	Average
Vertical	2484.9	80.384	38.72	41.628	Peak
Vertical	--	--	--	--	Average

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:

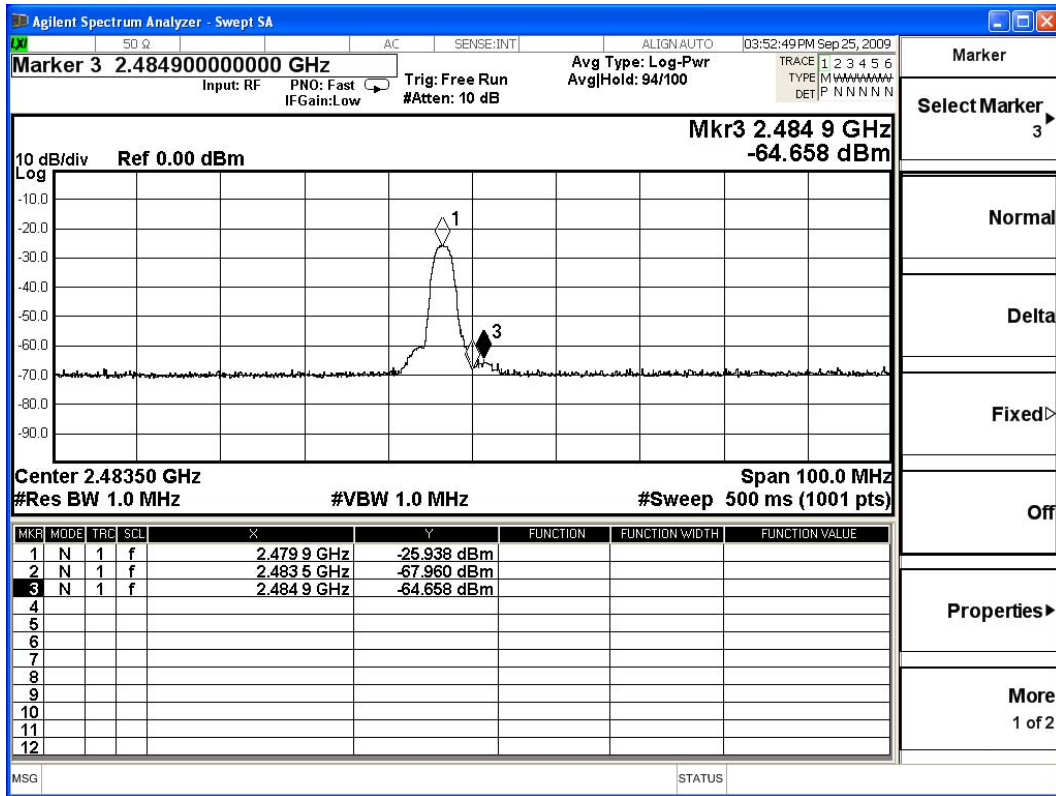
$$\text{Band Edge field Strength} = F - \Delta$$

F = Fundamental field Strength (Peak or Average)

Δ = Conducted Band Edge Delta (Peak or Average)

The Average Field Strength is Peak Field Strength + duty cycle

Peak Detector of conducted Band Edge Delta



7. Occupied Bandwidth

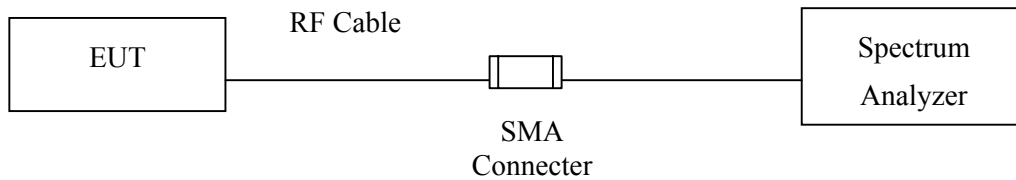
7.1. Test Equipment

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

Equipment	Manufacturer	Model No./Serial No.	Last Cal.
Spectrum Analyzer	R&S	FSP40 / 100170	Nov, 2008
Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2009
X Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2009

Note: 1. All instruments are calibrated every one year.
 2. The test instruments marked by “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 C63.4, 2003; tested according to DTS test procedure of Mar. 2005 KDB558074 for compliance to FCC 47CFR 15.247 requirements.

Set RBW = 100 kHz, Span greater than RBW.

7.5. Uncertainty

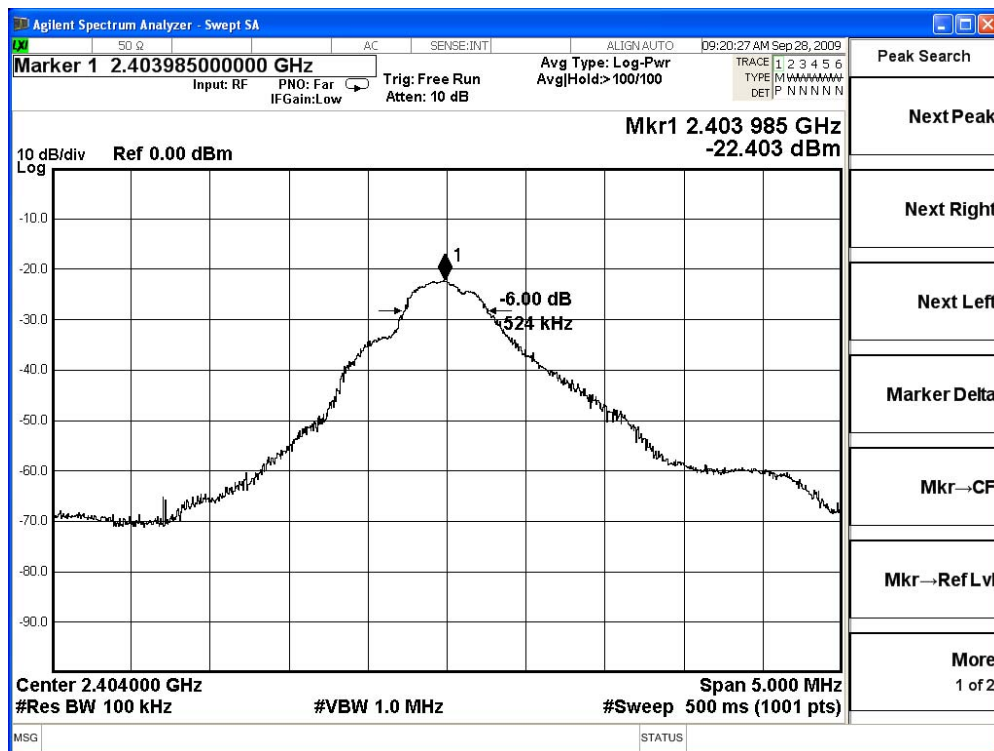
± 150Hz

7.6. Test Result of Occupied Bandwidth

Product : Wireless Dongle
 Test Item : Occupied Bandwidth Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (2404MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
1	2404.00	524	>500	Pass

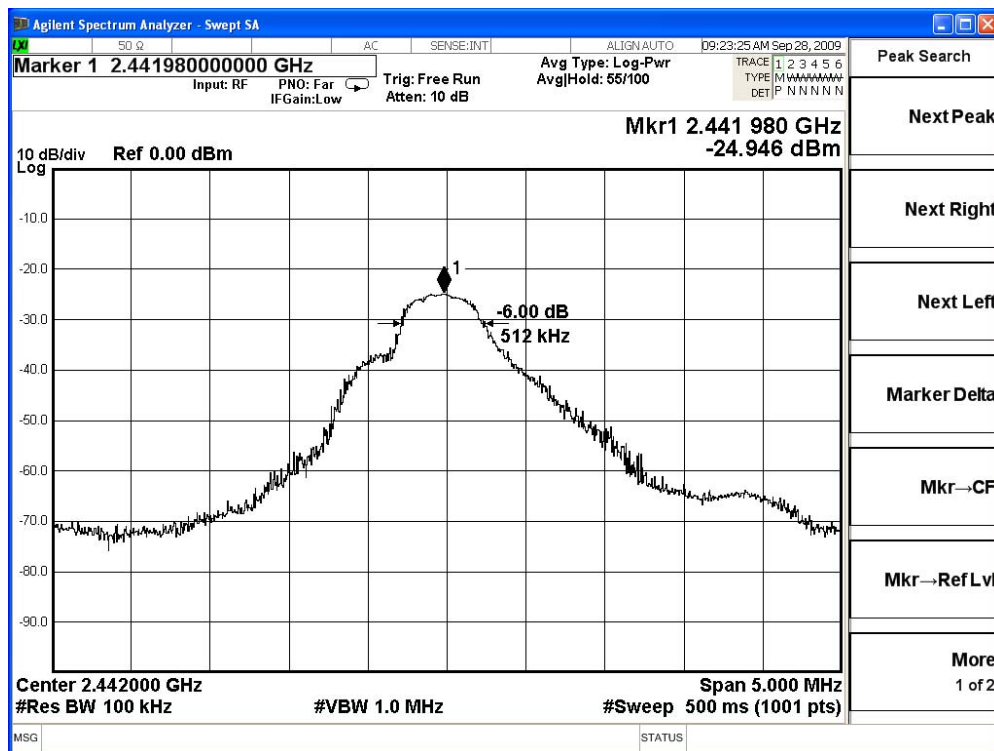
Figure Channel 1:



Product : Wireless Dongle
 Test Item : Occupied Bandwidth Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (2442MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
39	2442.00	512	>500	Pass

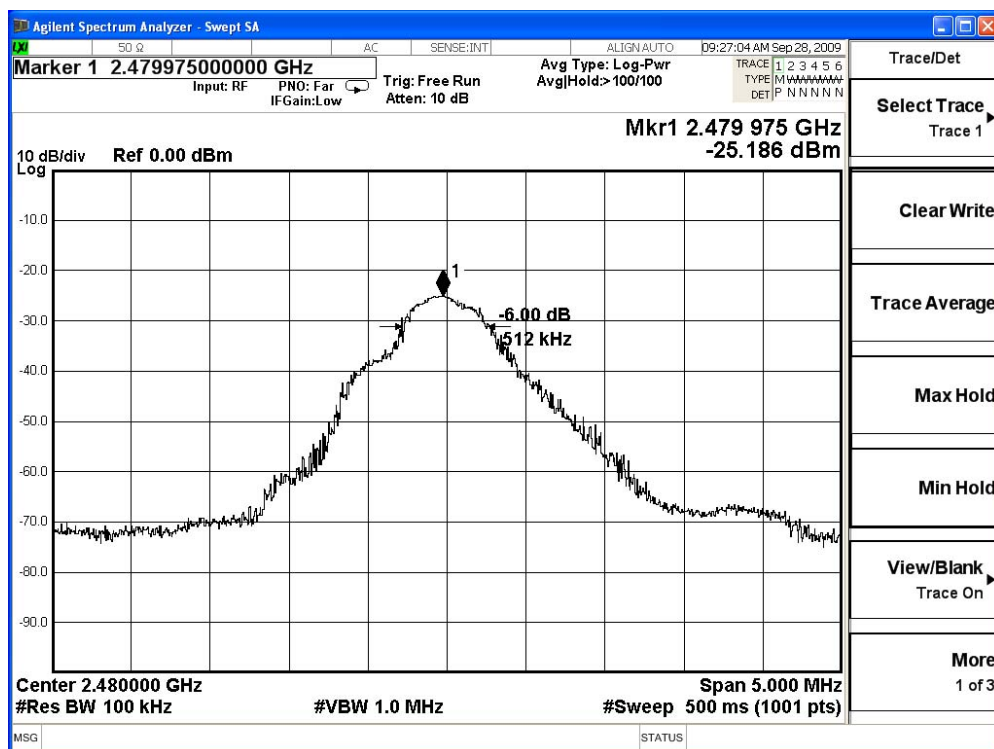
Figure Channel 39:



Product : Wireless Dongle
 Test Item : Occupied Bandwidth Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (2480MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
77	2480.00	512	>500	Pass

Figure Channel 77:



8. Power Density

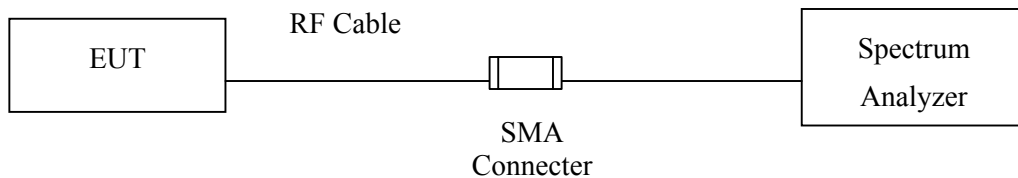
8.1. Test Equipment

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

Equipment	Manufacturer	Model No./Serial No.	Last Cal.
Spectrum Analyzer	R&S	FSP40 / 100170	Nov, 2008
Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2009
X Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2009

Note: 1. All equipments are calibrated every one year.
 2. The test instruments marked by “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 C63.4, 2003; tested according to DTS test procedure of Mar. 2005 KDB558074 for compliance to FCC 47CFR 15.247 requirements.
 Set RBW= 3 kHz, VBW=10KHz, Sweep time=(SPAN/3KHz), detector=Peak detector

8.5. Uncertainty

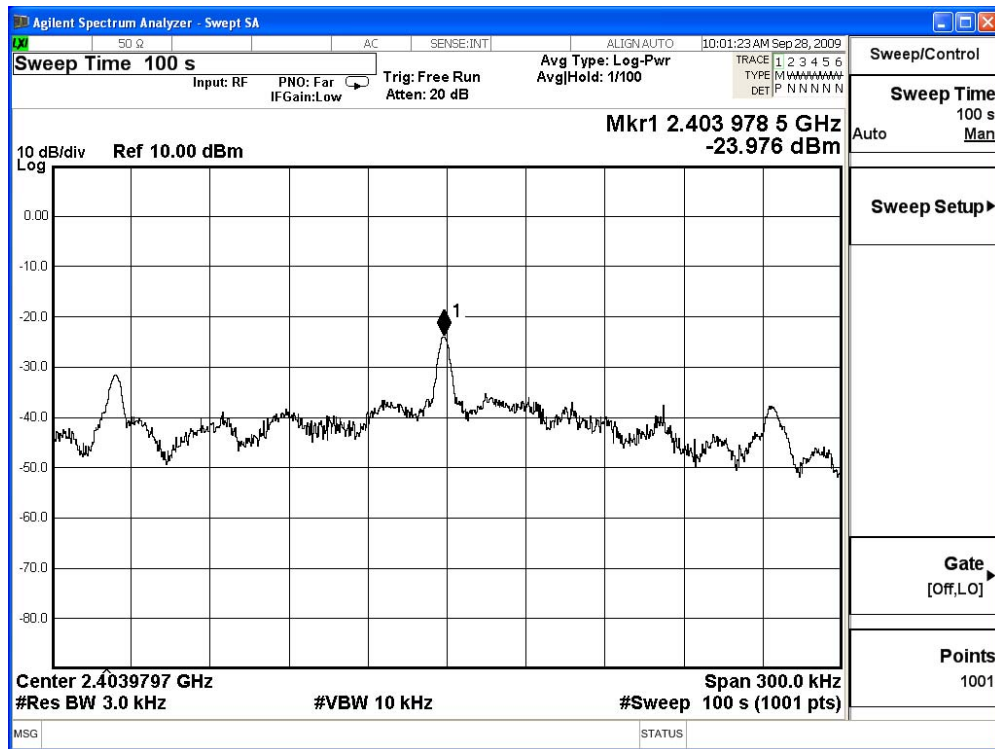
± 1.27 dB

8.6. Test Result of Power Density

Product : Wireless Dongle
 Test Item : Power Density Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (2404MHz)

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
1	2404.00	-23.976	< 8dBm	Pass

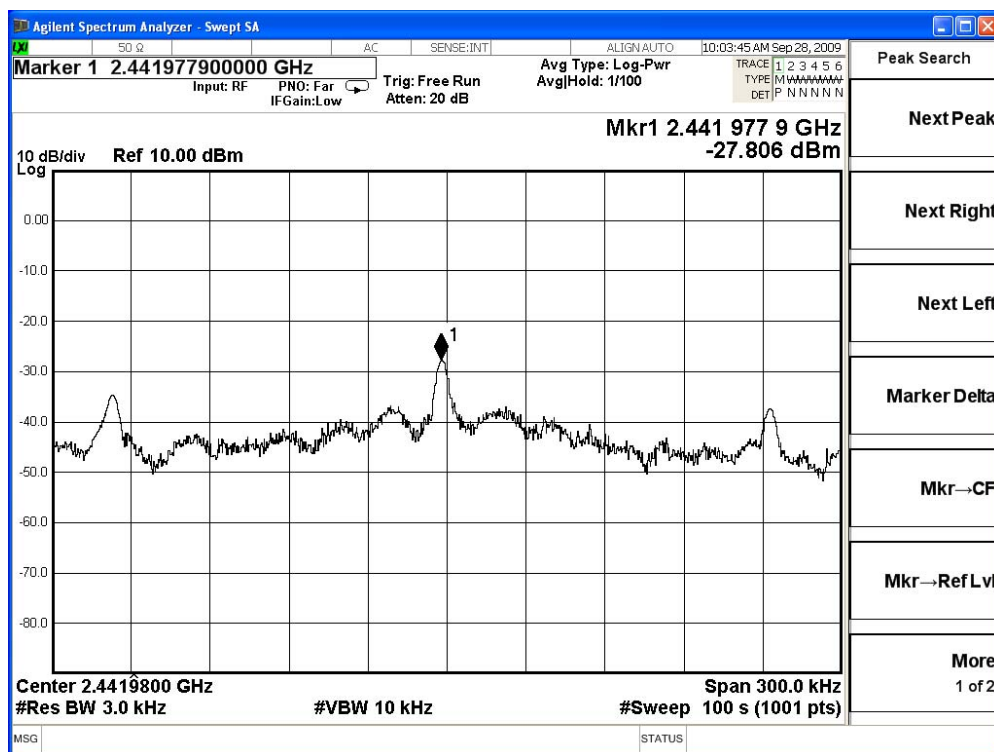
Figure Channel 1:



Product : Wireless Dongle
 Test Item : Power Density Data
 Test Site : No.3OATS
 Test Mode : Mode 1: Transmit (2442MHz)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
39	2442.000	-27.806	< 8dBm	Pass

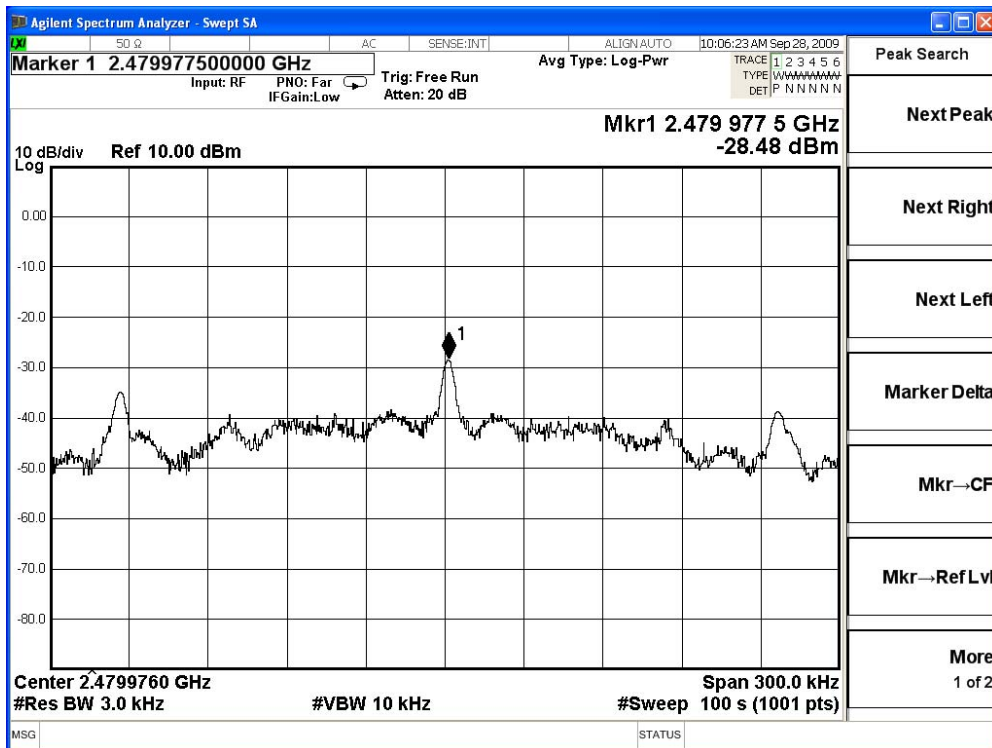
Figure Channel 39:



Product : Wireless Dongle
 Test Item : Power Density Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (2480MHz)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
77	2480.00	-28.480	< 8dBm	Pass

Figure Channel 77:



9. Duty Cycle

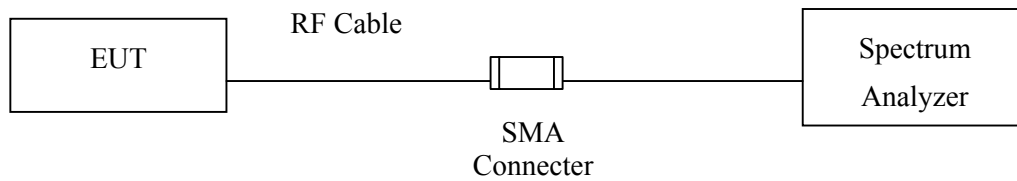
9.1. Test Equipment

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

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Spectrum Analyzer	R&S	FSP40 / 100170	Nov, 2008

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

9.2. Test Setup

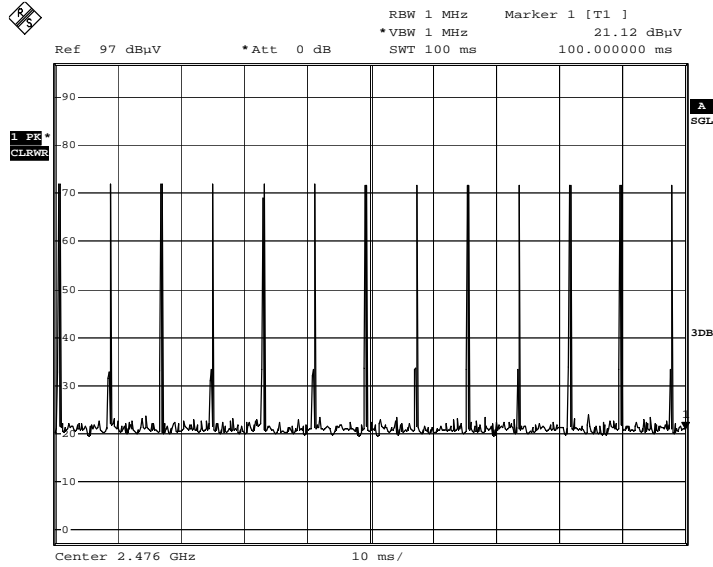


9.3. Uncertainty

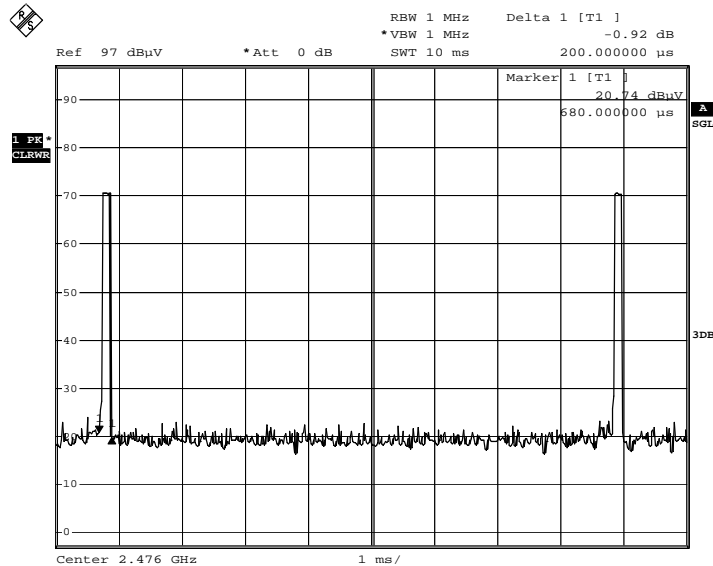
± 150Hz

9.4. Test Result of Duty Cycle

Product : Wireless Dongle
 Test Item : Duty Cycle Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit



Date: 4.SEP.2009 10:17:19



Date: 4.SEP.2009 10:21:10

$$T_{on} = 200\mu s * 13 = 2.6 \text{ ms}$$

$$\text{Duty Cycle} = 2.6 \text{ ms} / 100 \text{ ms} = 0.026$$

$$\text{Duty Cycle correction factor} = 20 \text{ LOG } 0.026 = -31.7 \text{ dB}$$

Duty Cycle correction factor	-20.00	dB
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Remark:

If Duty Cycle is smaller than -20dB, based on FCC part15 the duty cycle correction factor is -20dB for calculating average emission.

10. EMI Reduction Method During Compliance Testing

No modification was made during testing.