

ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR LOW-POWER, NON-LICENSED TRANSMITTER

Test Report No. : E09DR-019

AGR No : A09NA-015R

Applicant : D&A Corporation
Address : #C-601 Digital Empire, 980-3, Youngtong-dong, Youngtong-gu, Suwon-si, Gyeonggi-do, Korea

Manufacturer : D&A Corporation
Address : #C-601 Digital Empire, 980-3, Youngtong-dong, Youngtong-gu, Suwon-si, Gyeonggi-do, Korea

Type of Equipment : Wireless Audio Dongle

FCC ID. : XY5-OPERARX1

Model Name : Opera-S5RX

Multiple Model Name : Opera-S5RXW, Opera-S5RXB, Opera-S5RXR, Opera-S5RXO, RX1

Serial number : None

Total page of Report : 33 pages (including this page)

Date of Incoming : November 06, 2009

Date of issue : December 04, 2009

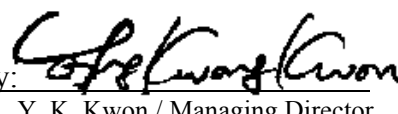
SUMMARY

The equipment complies with the regulation; **FCC Part 15 Subpart C Section 15.249.**

This test report only contains the result of a single test of the sample supplied for the examination.

It is not a generally valid assessment of the features of the respective products of the mass-production.

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Revision History

Issued Report No.	Issued Date	Revisions	Effect Section
E09DR-019	December 04, 2009	Initial Issue	All

1. VERIFICATION OF COMPLIANCE

APPLICANT : D&A Corporation
 ADDRESS : #C-601 Digital Empire, 980-3, Youngtong-dong, Youngtong-gu, Suwon-si, Gyeonggi-do, Korea
 CONTACT PERSON : Mr. Yongho, Lee / CTO
 TELEPHONE NO : +82-31-303-8585
 FCC ID : XY5-OPERARX1
 MODEL NAME : Opera-S5RX
 SERIAL NUMBER : N/A
 DATE : December 04, 2009

EQUIPMENT CLASS	<i>DXX - Part 15 Low Power Communication Device Transmitter</i>
KIND OF EQUIPMENT	Wireless Audio Dongle
THIS REPORT CONCERNS	ORIGINAL GRANT
MEASUREMENT PROCEDURES	ANSI C63.4: 2003
TYPE OF EQUIPMENT TESTED	PRE-PRODUCTION
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	CERTIFICATION
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC PART 15 SUBPART C Section 15.249
MODIFICATIONS ON THE EQUIPMENT TO ACHIEVE COMPLIANCE	None
FINAL TEST WAS CONDUCTED ON	3 m open area test site

-. The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

2. TEST SUMMARY

2.1 Test items and results

SECTION	TEST ITEMS	RESULTS
15.249 (a)	Field Strength of Emission	Met the Limit / PASS
15.249 (d)	Emissions Radiated Outside of the Specified Frequency Band	Met the Limit / PASS
15.249 (e)	Radiated Emissions above 1 000 MHz	Met the Limit / PASS
15.209	Radiated Emission Limits, General Requirement	Met the Limit / PASS
15.207	Conducted Limits	Met the Limit / PASS
15.203	Antenna Requirement	Met the Requirement / PASS

2.2 Additions, deviations, exclusions from standards

No additions, deviations or exclusions have been made from standard.

2.3 Related Submittal(s) / Grant(s)

Original submittal only

2.4 Purpose of the test

To determine whether the equipment under test fulfills the requirements of the regulation stated in section 2.1.

2.5 Test Methodology

Radiated testing was performed according to the procedures in ANSI C63.4: 2003 and performed at a distance of 3 m from EUT to the antenna.

2.6 Test Facility

The open area test site and conducted measurement facilities are located on at 307-51 Daessangryung-ri, Chowol-eup, Gwangju-si, Gyeonggi-do, 464-862, Korea. Description details of test facilities were submitted to the Commission on August 21, 2008. (Registration Number: 340658)

3. GENERAL INFORMATION

3.1 Product Description

The D&A Corporation, Model: Opera-S5RX (referred to as the EUT in this report) is a Wireless Audio Dongle used with wireless speaker and iPod. Product specification information described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	Portable Device
APPLICATION	General Use
RECEIVER CATEGOTY	Class III
OPERATING FREQUENCY	2 403 MHz ~ 2 478 MHz
RATED RF OUTPUT POWER	-4 dBm
USED ANTENNA	Chip Type Antenna 1. Mfr.: AMOTECH / Model No.: ALA131C3 (Gain: 1.90 dBi) 2. Mfr.: AMOTECH / Model No.: ALA321C3 (Gain: 1.80 dBi)
CHANNEL	16 Channels
MODULATION METHOD	MSK
Tx DATA SPEED	2.37 Mb/s
USED RF CHIP	Kleer, KLR3012
LIST OF EACH OSC. OR CRY. FREQ.(FREQ.>= 1 MHz)	22.576 649 MHz
POWER REQUIREMENT	DC 5 V
EXTERNAL CONNECTOR	iPod connector

3.2 Alternative type(s)/model(s); also covered by this test report.

-. The following lists consist of the added model and their differences.

Model Name	Differences	Tested
Opera-S5RX	Basic Model	<input checked="" type="checkbox"/>
Opera-S5RXW, Opera-S5RXB, Opera-S5RXR, Opera-S5RXO, RX1	These models are identical to basic model except for the model designation and color only.	<input type="checkbox"/>

Note: 1. Applicant consigns only basic model to test, therefore this test report just guarantees the units which have been tested.

2. The Applicant/manufacture is responsible for the compliance of all variants.

4. EUT MODIFICATIONS

-. None

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(TEL: 82-31-746-8500 FAX: 82-31-746-8700)

EMC Testing Dept : 307-51 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea. (TEL: 82-31-765-8289 FAX: 82-31-766-2904)

5. SYSTEM TEST CONFIGURATION

5.1 Justification

This device was configured for testing in a typical way as a normal customer is supposed to be used. During the test, the following components were installed inside of the EUT.

DEVICE TYPE	MANUFACTURER	MODEL/PART NUMBER	FCC ID
Main Board	N/A	N/A	N/A

5.3 Peripheral equipment

Defined as equipment needed for correct operation of the EUT, but not considered as tested:

Model	Manufacturer	FCC ID	Description	Connected to
Opera-S5RX	D&A Corporation	XY5-OPERARX1	Wireless Audio Dongle (EUT)	-
PP10L	Dell Computer	DoC	Notebook PC	EUT
OCJ339	Dell Computer	DoC	Mouse	Notebook PC
DRP-305DN	Digital Elec.	N/A	DC Power Supply	EUT
200iD	JBL	N/A	iPod Speaker	EUT
Opera S5T	Digifi Co.,Ltd.	N/A	iPod Dongle	iPod
A1137	Apple Computer	DoC	iPod	Opera S5T

5.4 Mode of operation during the test

-. For the testing, software used to control the EUT for staying in continuous transmitting and receiving mode is programmed. For final testing, the EUT was set at Low Channel (2 403 MHz), Middle Channel (2 438 MHz), and High Channel (2 478 MHz). The EUT uses 2 antennas has different antenna gain, so all used antennas were tested and recorded in this test report.

-. The EUT was connected to iPod speaker and iPod dongle was connected to iPod and than music playing mode by iPod was operated through the iPod speaker during the test.

5.5 Configuration of Test System

Line Conducted Test: The EUT was connected to iPod speaker and the power of iPod speaker was connected to LISN. All supporting equipments were connected to another LISN. Preliminary Power line Conducted Emission tests were performed by using the procedure in ANSI C63.4: 2003 7.2.3 to determine the worse operating conditions.

Radiated Emission Test: Preliminary radiated emissions test were conducted using the procedure in ANSI C63.4: 2003 8.3.1.1 and 13.1.4.1 to determine the worse operating conditions. Final radiated emission tests were conducted at 3 m open area test site.
The turntable was rotated through 360° and the EUT was tested by positioned three orthogonal planes to obtain the highest reading on the field strength meter. Once maximum reading was determined, the search antenna was raised and lowered in both vertical and horizontal polarization.

5.6 Antenna Requirement

According to section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Antenna Construction:

The antenna of the EUT is a chip antenna on the main board in the EUT, so no consideration of replacement by the user.

6. PRELIMINARY TEST

6.1 AC Power line Conducted Emissions Tests

During Preliminary Tests, the following operating mode was investigated

Operation Mode	The Worse operating condition
Music playing mode by iPod	X

6.2 General Radiated Emissions Tests

During Preliminary Tests, the following operating modes were investigated

Operation Mode	The Worse operating condition
Continuous Transmitting Mode W/ 1.9 dBi Antenna Gain	X
Continuous Transmitting Mode W/ 1.8 dBi Antenna Gain	-

7. CONDUCTED EMISSION TEST

7.1 Operating environment

Temperature : 23.1 °C
Relative humidity : 42 % R.H.

7.2 Test set-up

The EUT and all local support equipments were placed on a wooden table, 0.8 m height above the floor. The EUT was connected to iPod speaker and the power of iPod speaker was fed through a 50 Ω / 50 μ H + 5 Ω Artificial Mains Network (AMN). The ground plane was electrically bonded to the reference ground system and all power lines were filtered from ambient.

7.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Valid Cal.
■ -	ESHS10	Rohde & Schwarz	EMI Test Receiver	834467/007	May 21, 2010
■ -	NSLK 8128	Schwarzbeck	AMN	8128-216	June 16, 2010
□ -	3825/2	EMCO	AMN	9109-1867	June 16, 2010

All test equipment used is calibrated on a regular basis.

7.4 Test data

- Test Date : November 10, 2009
- Resolution bandwidth : 9 kHz
- Frequency range : 0.15 MHz ~ 30 MHz

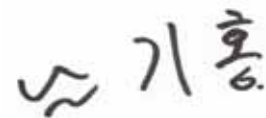
Frequency (MHz)	Line	Peak (dBμV)		Margin (dB)
		Emission level	Q.P Limits	
0.15	N	50.64	66.00	-15.36
0.16	H	50.69	65.46	-14.77
0.17	H	50.15	64.72	-14.57
0.20	N	45.82	63.61	-17.79
0.25	H	43.59	61.59	-18.00
14.77	N	40.25	60.00	-19.75
Frequency (MHz)	Line	Average (dBμV)		Margin (dB)
		Emission level	Limits	
-				
-				

Tabulated test data for Mains Terminal Continuous Disturbance Voltage

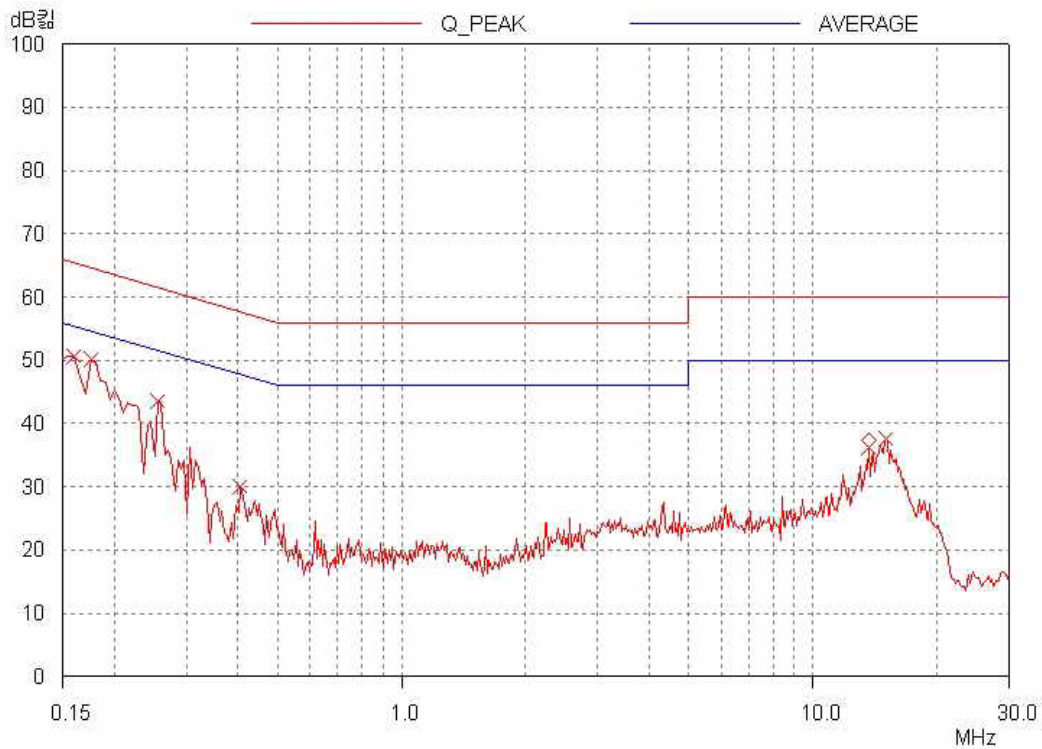
Remark : "H": Hot Line, "N": Neutral Line

Average mode was not measured, because peak values were under the Average limit.

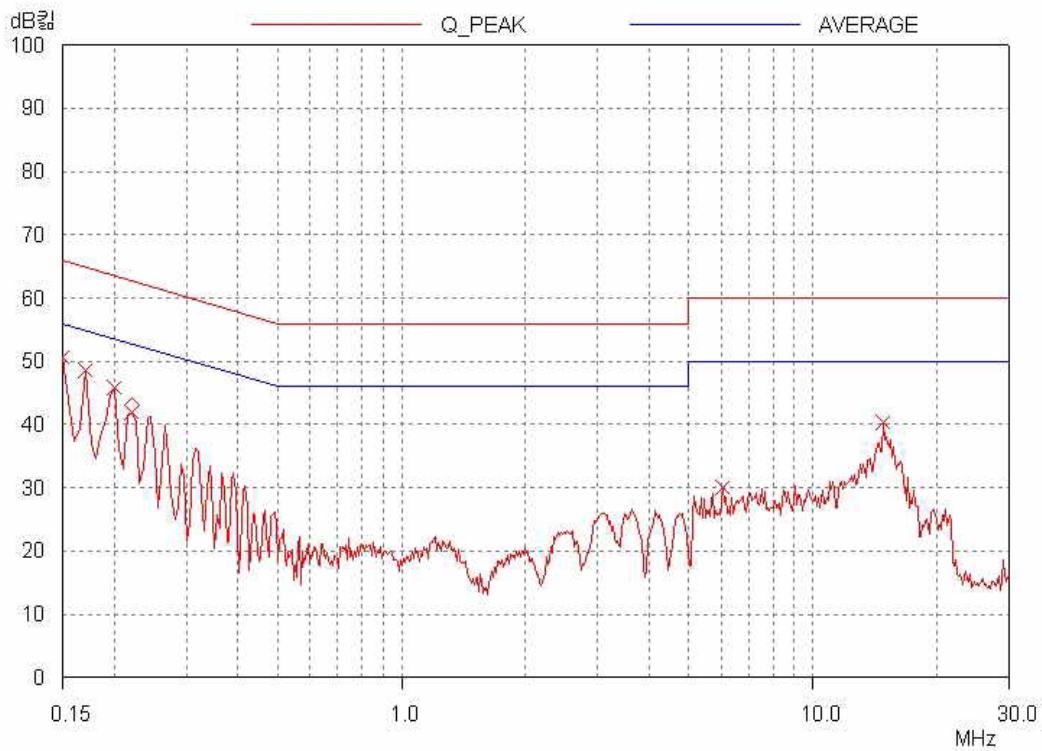
See next page for an overview sweep performed with peak detector.



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HOT LINE



NEUTRAL LINE

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8. RADIATED EMISSION TEST

8.1 Test set-up

The radiated emissions measurements were on the 3 m, open-field test site. The EUT and other support equipment were placed on a non-conductive turntable above the ground plane. The interconnecting cables from outside test site were inserted into ferrite clamps at the point where the cables reach the turntable.

The frequency spectrum from 30 MHz to 10th harmonic frequency of carrier frequency was scanned and emission levels maximized at each frequency recorded. The system was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

Test set-up photos are included in appendix I.

8.2 Measurement uncertainty

Radiated emission electric field intensity, 30 MHz ~ 300 MHz : ± 4.43 dB

Radiated emission electric field intensity, 300 MHz ~ 1 000 MHz : ± 3.80 dB

Radiated emission electric field intensity, 1 000 MHz ~ 3 000 MHz: ± 4.40 dB

Measurement uncertainty is calculated in accordance with WECC 19-1990. The measurement uncertainty is given with a confidence of 95 % with the coverage factor, $k = 2$.

8.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Valid Cal.
■ - ESiB26	Rohde & Schwarz	EMI Test Receiver	100296	Apr. 03, 2010
■ - 8566B	HP	Spectrum Analyzer	3407A08547	June 16, 2010
■ - 8564E	Hewlett-Packard	Spectrum Analyzer	3650A00756	June 15, 2010
■ - 8447D	Hewlett Packard	Amplifier	2727A04987	June 15, 2010
■ - 83051A	Agilent	RF Amplifier	3950M00201	June 15, 2010
■ - 83650L	Hewlett-Packard	Signal Generator	3844A00415	June 16, 2010
■ - VHA9103	Schwarzbeck	Biconical Antenna	91031852	Feb. 13, 2010
■ - 9108-A(494)	Schwarzbeck	Log Periodic Antenna	62281001	Feb. 13, 2010
□- 3121C	EMCO	Dipole Antenna	9002-530	Nov. 16, 2011
■ - BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D294	June 17, 2011
■ - MA240	HD GmbH	Antenna Master	N/A	N/A
■ - HD100	HD GmbH	Position Controller	N/A	N/A
■ - DS420S	HD GmbH	Turn Table	N/A	N/A

All test equipment used is calibrated on a regular basis.

8.4 Final result for used antenna: ALA131C3

8.4.1 Field Strength of the Fundamental Frequency


The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

Humidity Level : 42 % R.H. Temperature: 14 °C
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.249(a)
Result : PASSED BY -10.19 dB at 2 478.00 MHz

EUT : Wireless Audio Dongle Date: November 25, 2009
Operating Condition : TX mode
Distance : 3 m

Channel	Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
	Carrier Freq. (MHz)	Amplitude (dBμV)	Detect Mode	Pol.	Antenna (dB/m)	Cable (dB)	Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
Low	2 403.00	60.33	Peak	H	27.09	2.50	89.92	113.98	-24.06
		51.17	Average	H			80.76	93.98	-13.22
		62.50	Peak	V			92.09	113.98	-21.89
		53.33	Average	V			82.92	93.98	-11.06
Middle	2 438.00	60.83	Peak	H	27.18	2.50	90.51	113.98	-23.47
		51.67	Average	H			81.35	93.98	-12.63
		63.17	Peak	V			92.85	113.98	-21.13
		53.80	Average	V			83.48	93.98	-10.50
High	2 478.00	61.00	Peak	H	27.29	2.50	90.79	113.98	-23.19
		51.50	Average	H			81.29	93.98	-12.69
		63.00	Peak	V			92.79	113.98	-21.19
		54.00	Average	V			83.79	93.98	-10.19

*Remark: To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ, and YZ planes.



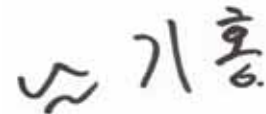
Tested by: Ki-Hong, Nam / Senior Engineer

8.4.2 Emissions Conducted Outside of the Specified Frequency Bands

Humidity Level : 42 % R.H. Temperature: 14 °C
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.249(d)
Result : PASS

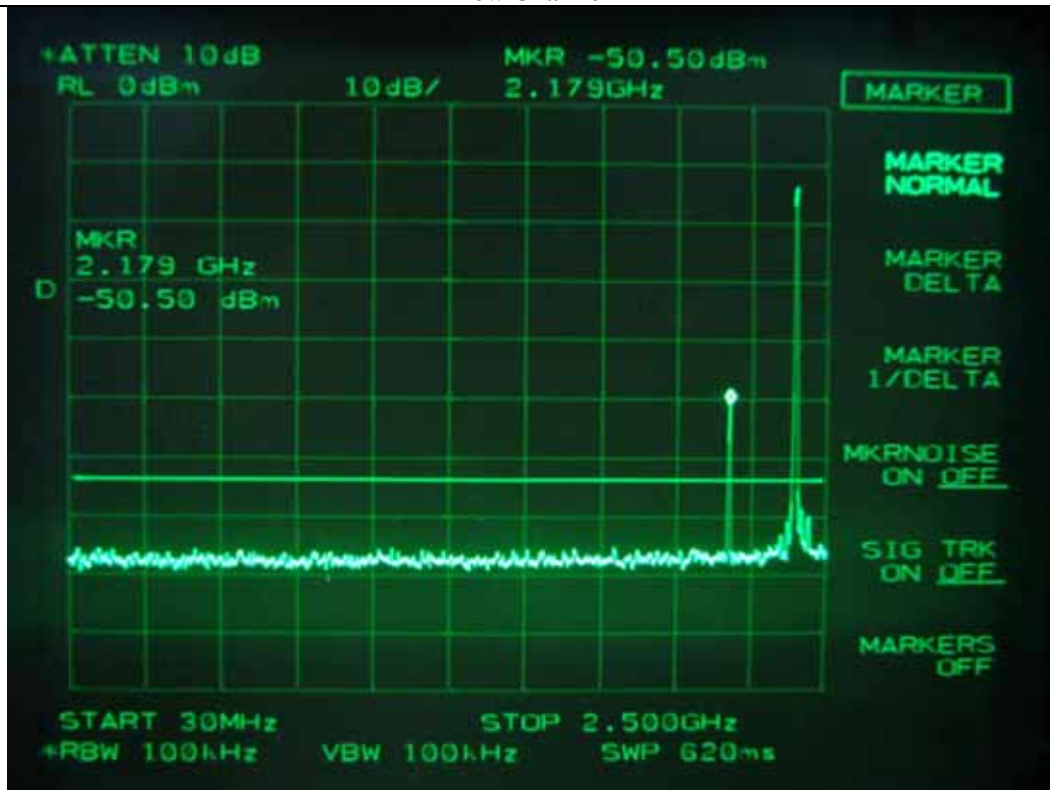
EUT : 2.4 GHz Band Low-Power Data Date: November 25, 2009
Communication System Transmitter
Operating Condition : TX mode
Distance : 3 m

Channel	Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
	Carrier Freq. (MHz)	Amplitude (dBμV)	Detect Mode	Pol.	Antenna (dB/m)	Cable (dB)	Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
Low	Spurious frequencies except harmonics have margin more than 50 dB, and were scanned up to 26.5 GHz. See next page for graph data, which was obtained by conducted measurement.								
Middle									
High									

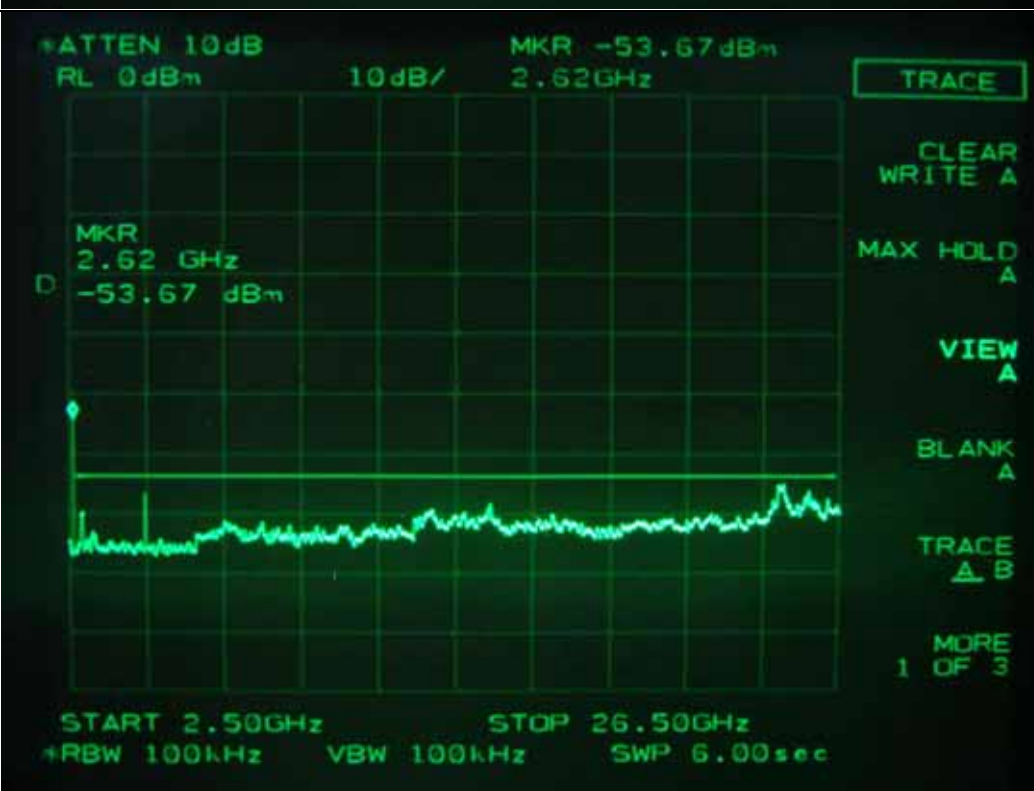
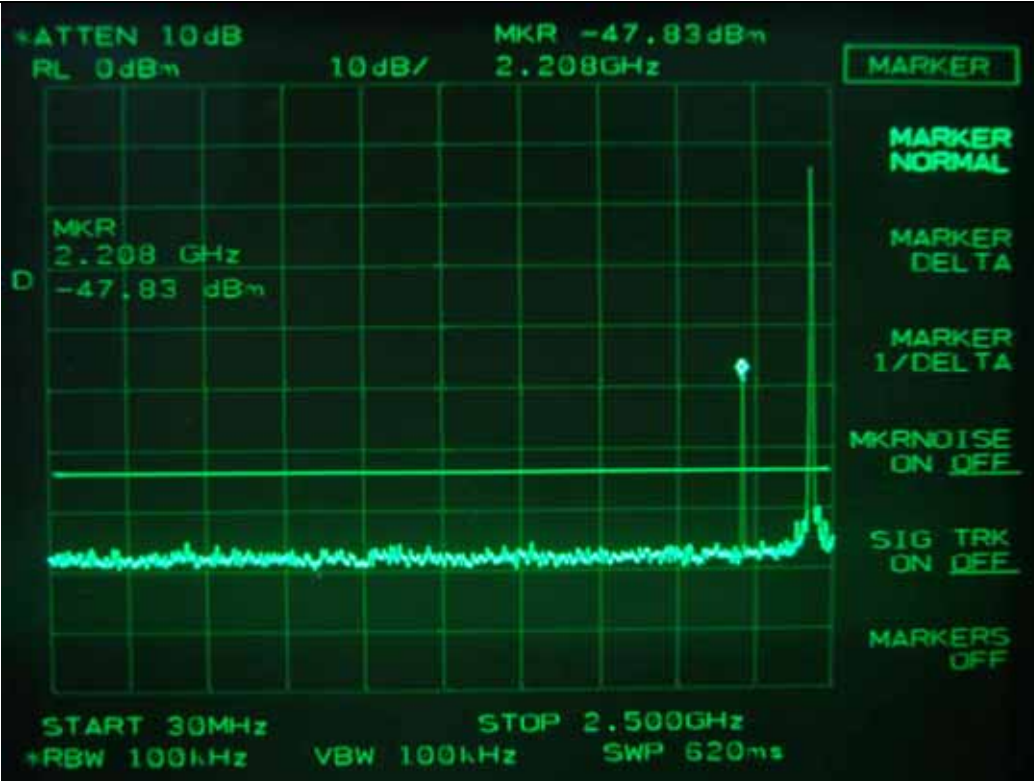


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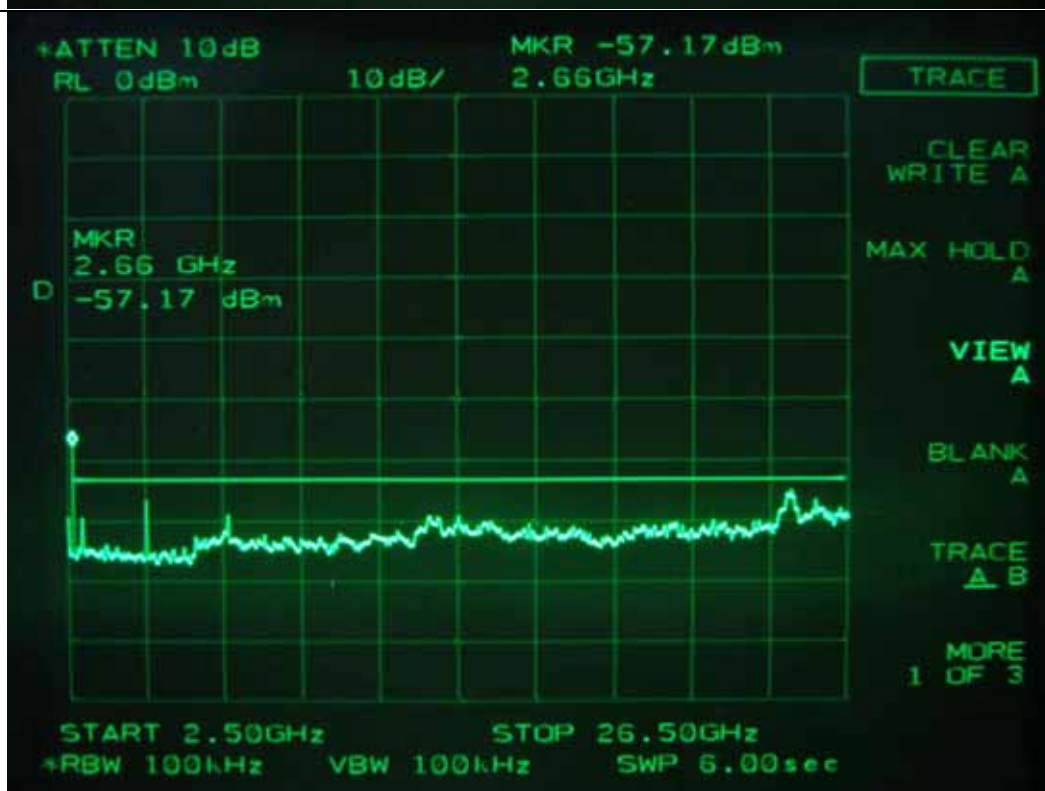
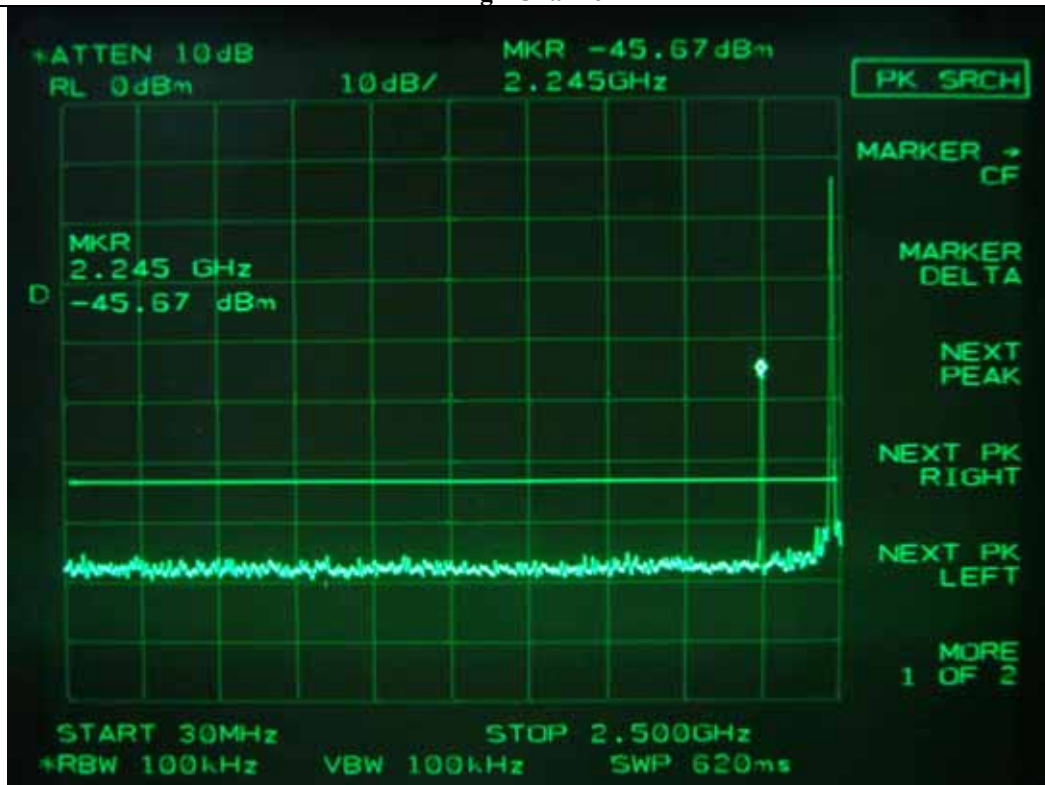
Low Channel



Middle Channel



High Channel



8.4.3 Emissions Radiated Outside of the Specified Frequency Bands

8.4.3.1 Test Data for Spurious except for Harmonic above 1 000 MHz

Humidity Level : 42 % R.H. Temperature: 14 °C
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.249(d)
Result : PASSED BY -10.04 dB at 2 704.00

EUT : 2.4 GHz Band Low-Power Data Date: November 25, 2009
Communication System Transmitter
Operating Condition : TX mode
Distance : 3 m

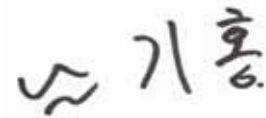
Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel									
2 184.70*	48.12	Peak	H	26.50	2.50	29.32	47.80	73.98	-26.18
	39.00	Average	H				38.68	53.98	-15.30
	50.15	Peak	V				49.83	73.98	-24.15
	41.17	Average	V				40.85	53.98	-13.13
2 622.00*	47.84	Peak	H	27.68	3.00	28.59	49.93	73.98	-24.05
	38.83	Average	H				40.92	53.98	-13.06
	49.92	Peak	V				52.01	73.98	-21.97
	40.83	Average	V				42.92	53.98	-11.06
Test Data for Middle Channel									
2 216.30*	48.46	Peak	H	26.58	2.50	29.26	48.28	73.98	-25.70
	39.33	Average	H				39.15	53.98	-14.83
	50.26	Peak	V				50.08	73.98	-23.90
	41.25	Average	V				41.07	53.98	-12.91
2 660.00*	48.03	Peak	H	27.78	3.00	28.53	50.28	73.98	-23.70
	39.00	Average	H				41.25	53.98	-12.73
	50.20	Peak	V				52.45	73.98	-21.53
	41.00	Average	V				43.25	53.98	-10.73

Tabulated test data for Restricted Band

Test Data for High Channel									
2 252.83*	49.03	Peak	H	26.68	2.50	29.20	49.01	73.98	-24.97
	39.67	Average	H				39.65	53.98	-14.33
	50.70	Peak	V				50.68	73.98	-23.30
	41.67	Average	V				41.65	53.98	-12.33
2 704.00*	48.46	Peak	H	27.90	3.00	28.46	50.90	73.98	-23.08
	39.33	Average	H				41.77	53.98	-12.21
	50.63	Peak	V				53.07	73.98	-20.91
	41.50	Average	V				43.94	53.98	-10.04

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical, "*" Frequency fall in restricted band



Tested by: Ki-Hong, Nam / Senior Engineer

8.4.3.2 Test Data for Harmonic

Humidity Level : 42 % R.H. Temperature: 14 °C
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.249(a)
Result : PASSED BY -12.89 dB at 4 956.00 MHz

EUT : 2.4 GHz Band Low-Power Data Date: November 25, 2009
Communication System Transmitter
Operating Condition : TX mode
Distance : 3 m

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel									
4 806.00*	41.34	Peak	H	31.07	4.00	28.84	47.57	73.98	-26.41
	32.33	Average	H				38.56	53.98	-15.42
	44.51	Peak	V				50.74	73.98	-23.24
	34.00	Average	V				40.23	53.98	-13.75
Other frequencies were not found up to 26.5 GHz.									
Test Data for Middle Channel									
4 876.00*	41.11	Peak	H	31.18	4.00	28.78	47.51	73.98	-26.47
	32.17	Average	H				38.57	53.98	-15.41
	43.95	Peak	V				50.35	73.98	-23.63
	33.83	Average	V				40.23	53.98	-13.75
Other frequencies were not found up to 26.5 GHz.									
Test Data for High Channel									
4 956.00*	41.72	Peak	H	31.31	4.00	28.72	48.31	73.98	-25.67
	32.50	Average	H				39.09	53.98	-14.89
	45.05	Peak	V				51.64	73.98	-22.34
	34.50	Average	V				41.09	53.98	-12.89
Other frequencies were not found up to 26.5 GHz.									

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical, "*" Frequency fall in restricted band



Tested by: Ki-Hong, Nam / Senior Engineer

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EMC-003(Rev.1)

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8.4.3.3 Test Data for Spurious except for Harmonic below 1 000 MHz

Humidity Level : 42 % R.H. Temperature: 14 °C
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.249(d)
Result : PASS

EUT : 2.4 GHz Band Low-Power Data Date: November 25, 2009
Communication System Transmitter
Operating Condition : TX mode
Distance : 3 m

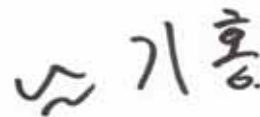
Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel									
67.50	26.33	V	1.00	280.00	6.08	2.00	34.41	40.00	-5.59
79.00	21.00	V	1.30	150.00	6.49	2.02	29.51	40.00	-10.49
125.00	15.67	V	1.00	330.00	13.42	2.45	31.54	43.52	-11.98
135.83	15.33	V	1.00	150.00	14.30	2.50	32.13	43.52	-11.39
175.50	12.00	V	1.00	220.00	15.64	3.03	30.67	43.52	-12.85
360.20	15.83	H	1.00	160.00	16.17	3.68	35.68	46.02	-10.34
Test Data for Middle Channel									
67.50	26.17	V	1.00	280.00	6.08	2.00	34.25	40.00	-5.75
79.00	21.17	V	1.30	150.00	6.49	2.02	29.68	40.00	-10.32
125.00	15.33	V	1.00	330.00	13.42	2.45	31.20	43.52	-12.32
135.83	15.50	V	1.00	150.00	14.30	2.50	32.30	43.52	-11.22
175.50	12.33	V	1.00	220.00	15.64	3.03	31.00	43.52	-12.52
360.20	15.50	H	1.00	160.00	16.17	3.68	35.35	46.02	-10.67

Tabulated test data for Radiated Electromagnetic Field

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for High Channel									
67.50	26.50	V	1.00	280.00	6.08	2.00	34.58	40.00	-5.42
79.00	20.83	V	1.30	150.00	6.49	2.02	29.34	40.00	-10.66
125.00	15.00	V	1.00	330.00	13.42	2.45	30.87	43.52	-12.65
135.83	15.92	V	1.00	150.00	14.30	2.50	32.72	43.52	-10.80
175.50	12.50	V	1.00	220.00	15.64	3.03	31.17	43.52	-12.35
360.20	15.42	H	1.00	160.00	16.17	3.68	35.27	46.02	-10.75

Tabulated test data for Radiated Electromagnetic Field

Remark: "H": Horizontal, "V": Vertical



Tested by: Ki-Hong, Nam / Senior Engineer

8.5 Final result for used antenna: ALA321C3

8.5.1 Field Strength of the Fundamental Frequency

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

Humidity Level : 42 % R.H. Temperature: 14 °C
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.249(a)
Result : PASSED BY -10.19 dB at 2 478.00 MHz

EUT : Wireless Audio Dongle Date: November 25, 2009
Operating Condition : TX mode
Distance : 3 m

Channel	Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
	Carrier Freq. (MHz)	Amplitude (dBμV)	Detect Mode	Pol.	Antenna (dB/m)	Cable (dB)	Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
Low	2 403.00	60.17	Peak	H	27.09	2.50	89.76	113.98	-24.22
		51.33	Average	H			80.92	93.98	-13.06
		62.67	Peak	V			92.26	113.98	-21.72
		53.50	Average	V			83.09	93.98	-10.89
Middle	2 438.00	60.67	Peak	H	27.18	2.50	90.35	113.98	-23.63
		51.50	Average	H			81.18	93.98	-12.80
		63.00	Peak	V			92.68	113.98	-21.30
		53.78	Average	V			83.46	93.98	-10.52
High	2 478.00	60.83	Peak	H	27.29	2.50	90.62	113.98	-23.36
		51.67	Average	H			81.46	93.98	-12.52
		63.17	Peak	V			92.96	113.98	-21.02
		54.00	Average	V			83.79	93.98	-10.19

*Remark: To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ, and YZ planes.



Tested by: Ki-Hong, Nam / Senior Engineer

8.5.2 Emissions Conducted Outside of the Specified Frequency Bands

Humidity Level : 42 % R.H. Temperature: 14 °C
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.249(d)
Result : PASS

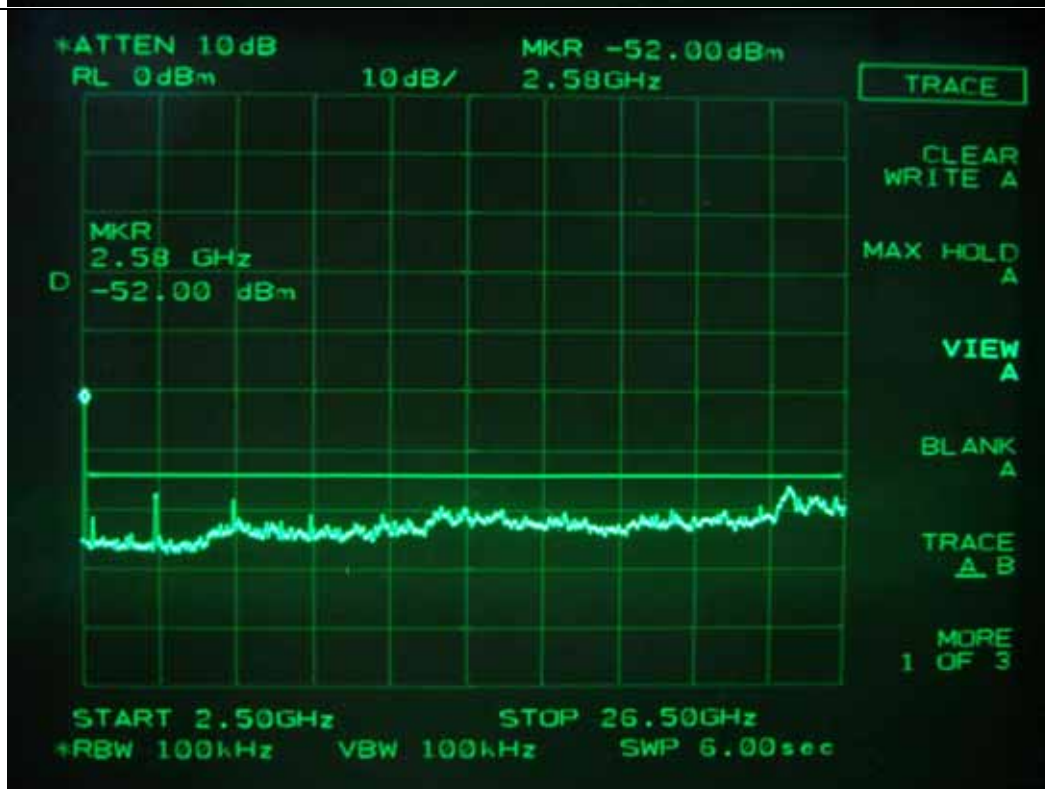
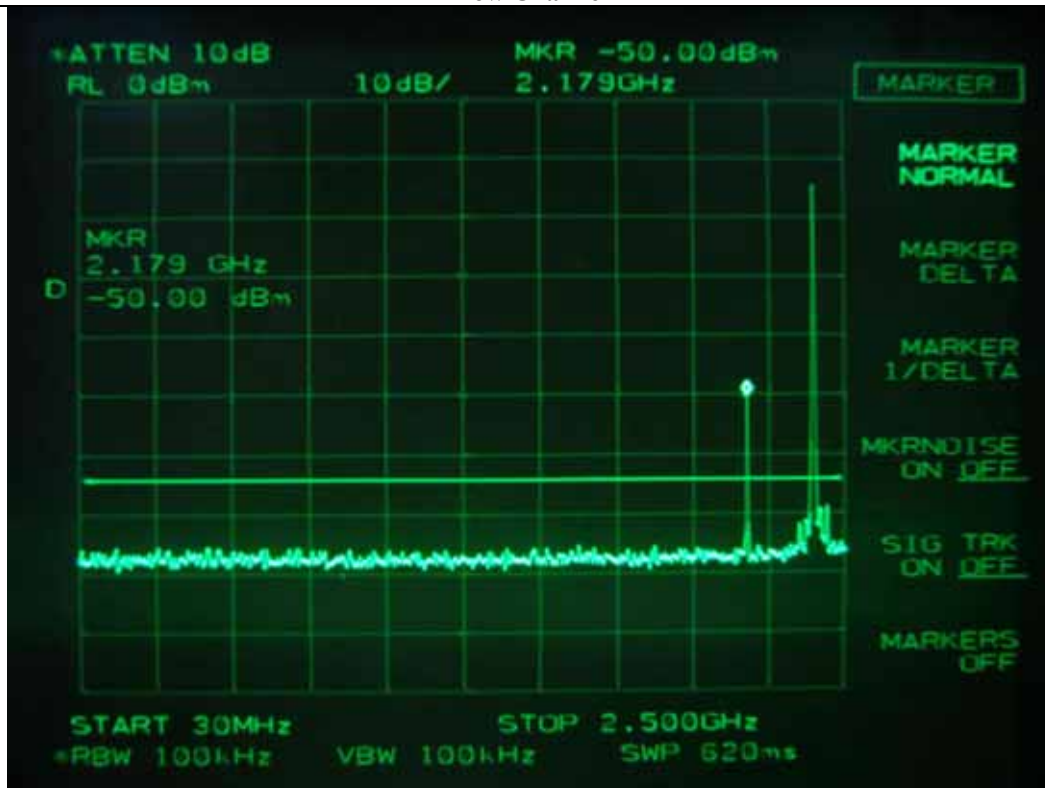
EUT : 2.4 GHz Band Low-Power Data Date: November 25, 2009
Communication System Transmitter
Operating Condition : TX mode
Distance : 3 m

Channel	Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
	Carrier Freq. (MHz)	Amplitude (dBμV)	Detect Mode	Pol.	Antenna (dB/m)	Cable (dB)	Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
Low	Spurious frequencies except harmonics have margin more than 50 dB, and were scanned up to 26.5 GHz. See next page for graph data, which was obtained by conducted measurement.								
Middle									
High									

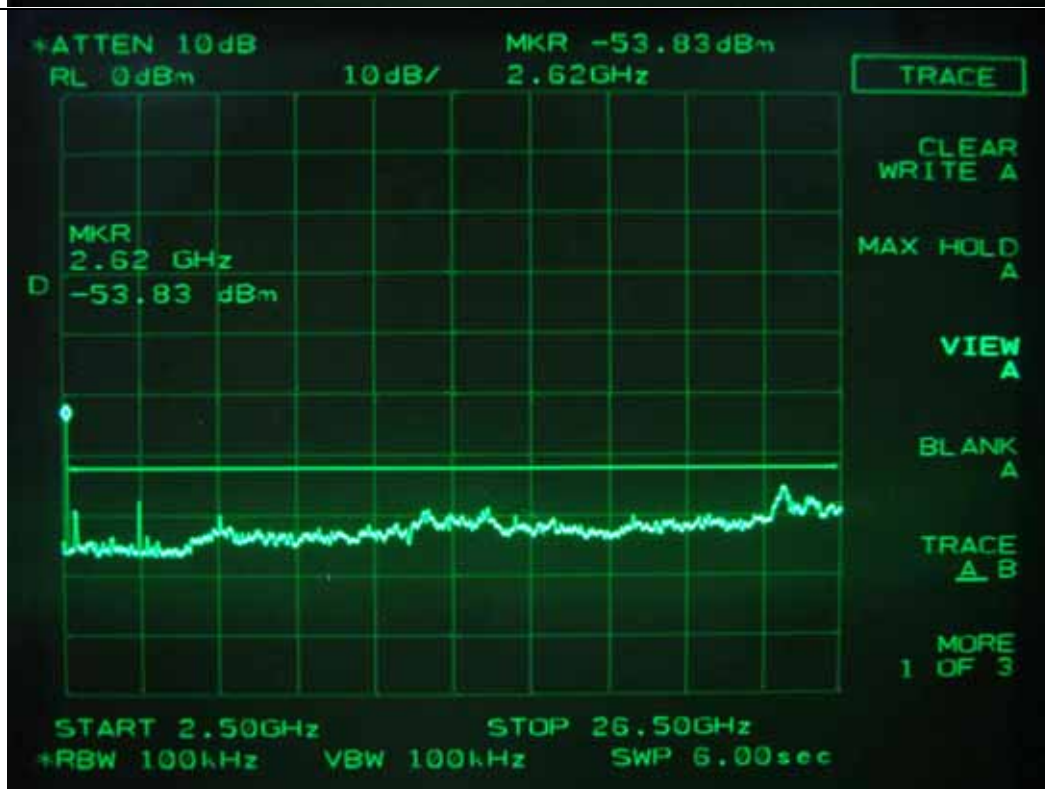
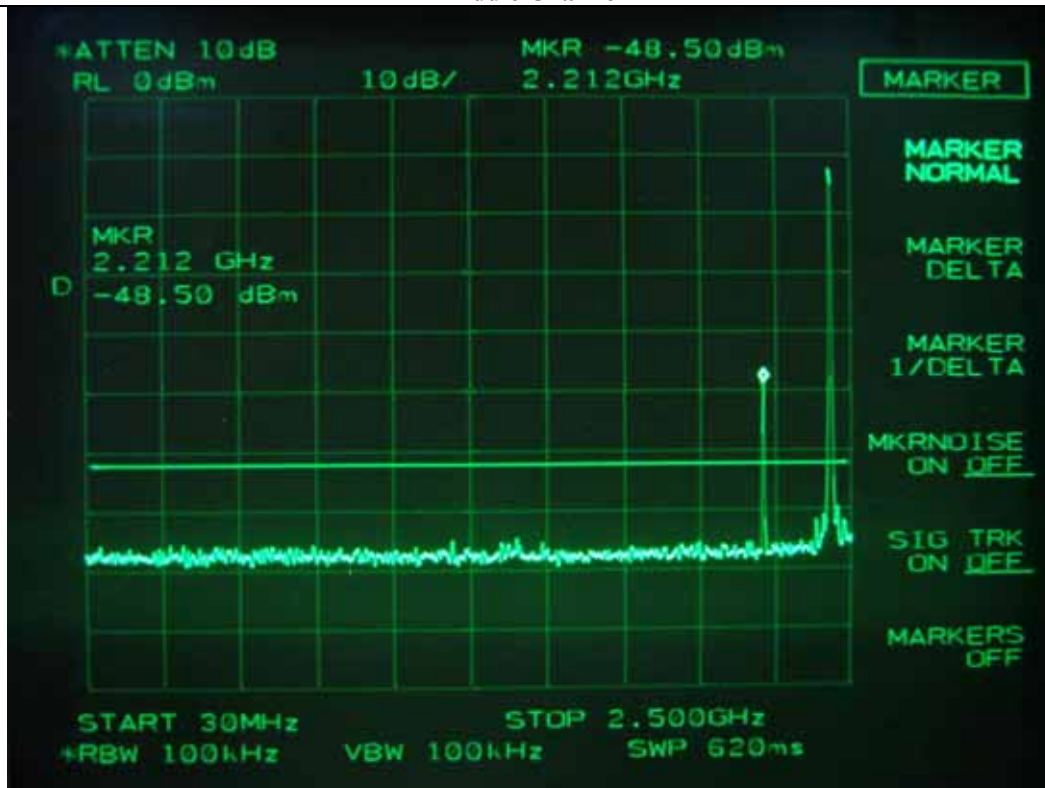


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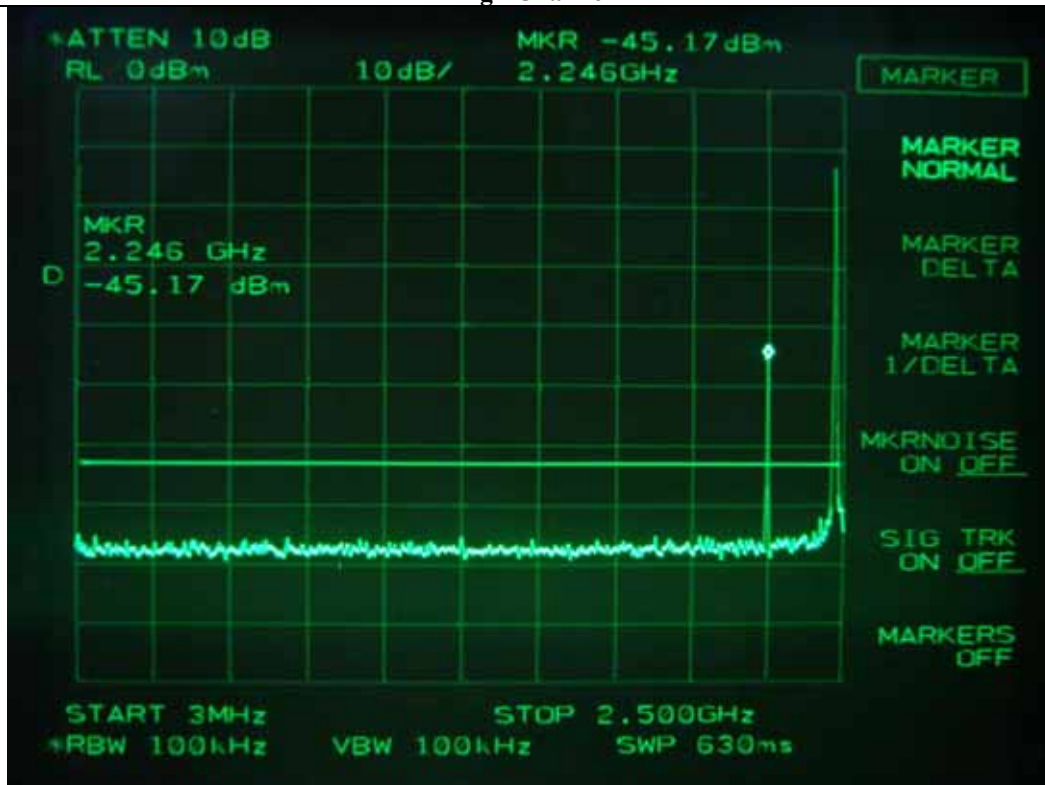
Low Channel



Middle Channel



High Channel



8.5.3 Emissions Radiated Outside of the Specified Frequency Bands

8.5.3.1 Test Data for Spurious except for Harmonic above 1 000 MHz

Humidity Level : 42 % R.H. Temperature: 14 °C
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.249(d)
Result : PASSED BY -10.37 dB at 2 704.00

EUT : 2.4 GHz Band Low-Power Data Date: November 25, 2009
Communication System Transmitter
Operating Condition : TX mode
Distance : 3 m

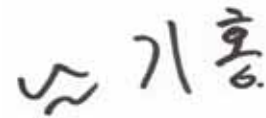
Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel									
2 184.70*	48.49	Peak	H	26.50	2.50	29.32	48.17	73.98	-25.81
	39.33	Average	H				39.01	53.98	-14.97
	49.82	Peak	V				49.50	73.98	-24.48
	40.50	Average	V				40.18	53.98	-13.80
2 622.00*	48.42	Peak	H	27.68	3.00	28.59	50.51	73.98	-23.47
	39.17	Average	H				41.26	53.98	-12.72
	50.31	Peak	V				52.40	73.98	-21.58
	41.25	Average	V				43.34	53.98	-10.64
Test Data for Middle Channel									
2 216.30*	48.76	Peak	H	26.58	2.50	29.26	48.58	73.98	-25.40
	39.50	Average	H				39.32	53.98	-14.66
	50.43	Peak	V				50.25	73.98	-23.73
	41.42	Average	V				41.24	53.98	-12.74
2 660.00*	47.86	Peak	H	27.78	3.00	28.53	50.11	73.98	-23.87
	38.83	Average	H				41.08	53.98	-12.90
	50.03	Peak	V				52.28	73.98	-21.70
	41.00	Average	V				43.25	53.98	-10.73

Tabulated test data for Restricted Band

Test Data for High Channel									
2 252.83*	49.70	Peak	H	26.68	2.50	29.20	49.68	73.98	-24.30
	40.00	Average	H				39.98	53.98	-14.00
	50.47	Peak	V				50.45	73.98	-23.53
	41.50	Average	V				41.48	53.98	-12.50
2 704.00*	48.96	Peak	H	27.90	3.00	28.46	51.40	73.98	-22.58
	39.83	Average	H				42.27	53.98	-11.71
	50.18	Peak	V				52.62	73.98	-21.36
	41.17	Average	V				43.61	53.98	-10.37

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical, "*" Frequency fall in restricted band



Tested by: Ki-Hong, Nam / Senior Engineer

8.5.3.2 Test Data for Harmonic

Humidity Level : 42 % R.H. Temperature: 14 °C
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.249(a)
Result : PASSED BY -13.91 dB at 4 876.00 MHz

EUT : 2.4 GHz Band Low-Power Data Date: November 25, 2009
Communication System Transmitter
Operating Condition : TX mode
Distance : 3 m

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel									
4 806.00*	41.51	Peak	H	31.07	4.00	28.84	47.74	73.98	-26.24
	32.50	Average	H				38.73	53.98	-15.25
	44.17	Peak	V				50.40	73.98	-23.58
	33.83	Average	V				40.06	53.98	-13.92
Other frequencies were not found up to 26.5 GHz.									
Test Data for Middle Channel									
4 876.00*	40.95	Peak	H	31.18	4.00	28.78	47.35	73.98	-26.63
	32.00	Average	H				38.40	53.98	-15.58
	44.11	Peak	V				50.51	73.98	-23.47
	33.67	Average	V				40.07	53.98	-13.91
Other frequencies were not found up to 26.5 GHz.									
Test Data for High Channel									
4 956.00*	41.72	Peak	H	31.31	4.00	28.72	48.31	73.98	-25.67
	32.67	Average	H				39.26	53.98	-14.72
	45.22	Peak	V				51.81	73.98	-22.17
	33.00	Average	V				39.59	53.98	-14.39
Other frequencies were not found up to 26.5 GHz.									

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical, "*" Frequency fall in restricted band



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8.5.3.3 Test Data for Spurious except for Harmonic below 1 000 MHz

Humidity Level : 42 % R.H. Temperature: 14 °C
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.249(d)
Result : PASS

EUT : 2.4 GHz Band Low-Power Data Date: November 25, 2009
Communication System Transmitter
Operating Condition : TX mode
Distance : 3 m

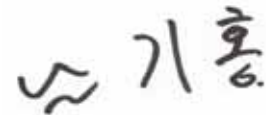
Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel									
67.50	26.50	V	1.00	280.00	6.08	2.00	34.58	40.00	-5.42
79.00	20.30	V	1.30	150.00	6.49	2.02	28.81	40.00	-11.19
125.00	15.33	V	1.00	330.00	13.42	2.45	31.20	43.52	-12.32
135.83	15.40	V	1.00	150.00	14.30	2.50	32.20	43.52	-11.32
175.50	12.50	V	1.00	220.00	15.64	3.03	31.17	43.52	-12.35
360.20	15.17	H	1.00	160.00	16.17	3.68	35.02	46.02	-11.00
Test Data for Middle Channel									
67.50	26.33	V	1.00	280.00	6.08	2.00	34.41	40.00	-5.59
79.00	20.50	V	1.30	150.00	6.49	2.02	29.01	40.00	-10.99
125.00	15.50	V	1.00	330.00	13.42	2.45	31.37	43.52	-12.15
135.83	15.67	V	1.00	150.00	14.30	2.50	32.47	43.52	-11.05
175.50	12.00	V	1.00	220.00	15.64	3.03	30.67	43.52	-12.85
360.20	15.00	H	1.00	160.00	16.17	3.68	34.85	46.02	-11.17

Tabulated test data for Radiated Electromagnetic Field

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for High Channel									
67.50	26.78	V	1.00	280.00	6.08	2.00	34.86	40.00	-5.14
79.00	20.17	V	1.30	150.00	6.49	2.02	28.68	40.00	-11.32
125.00	15.00	V	1.00	330.00	13.42	2.45	30.87	43.52	-12.65
135.83	15.78	V	1.00	150.00	14.30	2.50	32.58	43.52	-10.94
175.50	12.20	V	1.00	220.00	15.64	3.03	30.87	43.52	-12.65
360.20	15.17	H	1.00	160.00	16.17	3.68	35.02	46.02	-11.00

Tabulated test data for Radiated Electromagnetic Field

Remark: "H": Horizontal, "V": Vertical



Tested by: Ki-Hong, Nam / Senior Engineer