

Certification of Compliance

CFR 47 Part 15 Subpart B, C

Order No. : CSTS-C1001-033
Test Report No. : CSTS-A10-FCC009
Applicant : DOALLTECH CO.,LTD.
Address of Applicant : DMC Hightech Industry Center #705, 1580 Sangam-dong, Mapo-gu, Seoul, KOREA

Equipment Under Test (EUT)

Kind of Product : Security Control System

Model Name : Gateware EM

FCC ID : X8JGATEWAREEM

Buyer Model(s) : N/A

Standards : FCC Part 15 Subpart B,C(Section 15.247):2006
ANSI C63.4:2003

Date of Receipt : 02 March, 2010
Date of Test : 08~30 March, 2010
Date of Issue : 30 March, 2010

Test Result : Positive

Negative



Jae Yeon, Choi / Testing By Engineer

Chang Woo, Kim / General Manager

In the configuration tested, the EUT complied with the standards specified above.

Remarks :

This report details the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards.

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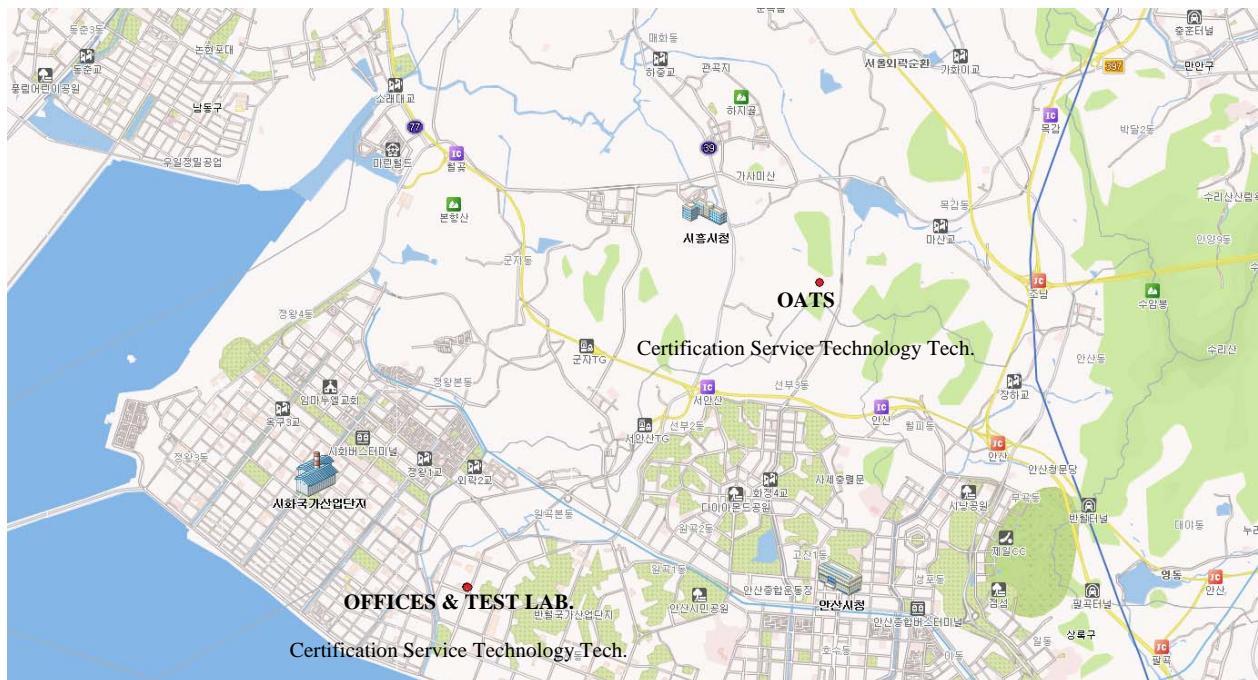
1. General Information

1.1 Information of Test Laboratory.

FCC E-Failing : Registration Number:289252

Name	:	Certification Service Technology Inc.
Address 3mFullChamber Conducted Emission	:	2F/1055, Shingil-Dong, Danwon-Gu, Ansan-City, Gyeonggi-Do Korea, 425-839
Radiated Emission (OATS)	:	456 Sanhyeun-Dong, Sihung-City, Gyeonggi-Do Korea
Tel/Fax	:	+82-31-493-2001 / +82-31-493-2055

Web site : <http://www.cstlab.co.kr> E-mail : wwkim@cstlab.co.kr



We , Certification Service Technology Inc. are an independent EMC and RF consultancy that was established the whole facility in our laboratories. The test facility has been accredited by the following accreditation Bodies in compliance with ISO 17025:

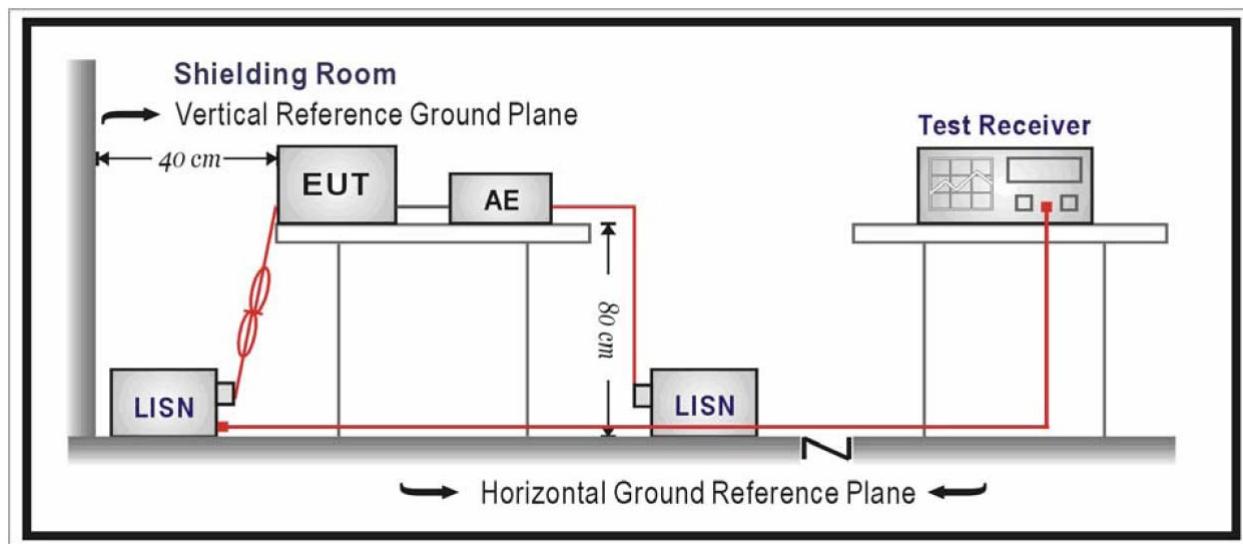
1.2 Description of Test

Conducted Emissions:

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 on conducted measurement.

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



Limit Of Conducted Emission:

Test Specification

- According to FCC CFR Title 47 Part 15 Subpart B Section 15.107
- According to FCC CFR Title 47 Part 15 Subpart B Section 15.207

FREQUENCY (MHz)	Limit	
	Quasi-peak	Average
0.15 to 0.5	66 to 56 *	56 to 46
0.5 to 5	56	46
5 to 30	60	50

*Decrease with the logarithm of the frequency

Radiated Emissions:

The measurement was performed over the frequency range of 30MHz to 1GHz using antenna as the input transducer to a Spectrum analyzer or a Field Intensity Meter. The measurement was made with the detector set for "quasi-peak" within a bandwidth of 120kHz.

Procedure of Test Preliminary measurements were made at 3 meter using bi-log antennas, and spectrum analyzer to determine the frequency producing the max. emission in anechoic chamber. Appropriate precaution was taken to ensure that all emission from the EUT were maximized and investigated. The system configuration, mode of operation, turn-table azimuth and height with respect to the antenna were noted for each frequency found. The spectrum was scanned from 30MHz to 1000MHz using bi-log antenna. Above 1GHz, linearly polarized double ridge horn antennas were used. Final measurements were made at open site with 3-meters test distance using bi-log antenna or horn antenna. The OATS have been verified in regular for its normalized site attenuation. The test equipment was placed on a wooden table. Sufficient time for the EUT, peripheral equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. Each frequency found during pre-scan measurements was re-examined by manual. The detector function was set to CISPR quasi-peak mode and the bandwidth of the receiver was set to 120kHz or 1MHz depending on the frequency of type of signal. The EUT, peripheral equipment and interconnecting cables were re-configured to the set-up producing the max. emission for the frequency and were placed on top of a 0.8-meter high nonmetallic 1 x 1.5 meter table. The EUT, peripheral equipment, and interconnecting cables were re-arranged and manipulated to maximize each emission. The turntable containing the system was rotated; the antenna height was varied 1 to 4 meters and stopped at the azimuth or height producing the maximum emission. Each emission was maximized by: varying the mode of operation to the EUT and/or peripheral equipment and changing the polarity of the antenna, whichever determined the worst-case emission.(The bandwidth below 1GHz setting on the field strength meter is 120kHz and above 1GHz is 1MHz.)

Radiated Emissions Test, 9 kHz to 30 MHz(Magnetic Field Test):

1. The preliminary radiated measurements were performed to determine the frequency producing the maximum emissions at a distance of 3 meters according to Section 15.31(f)(2).
2. The EUT was placed on the top of the 0.8-meter height, 1 x 1.5 meter non-metallic table.
3. Emissions from the EUT are maximized by adjusting the orientation of the Loop antenna and rotating the EUT on the turntable. Manipulating the system cables also maximizes EUT emissions if applicable.
4. To obtain the final measurement data, each frequency found during preliminary measurements was re-examined and investigated. The test-receiver system was set up to average, peak, and quasi-peak detector with specified bandwidth.

Limit Of Radiated Emission :**Test Specification**

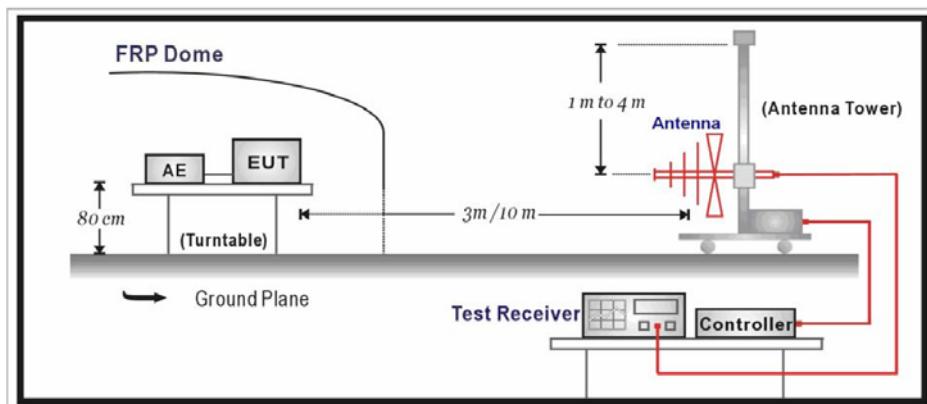
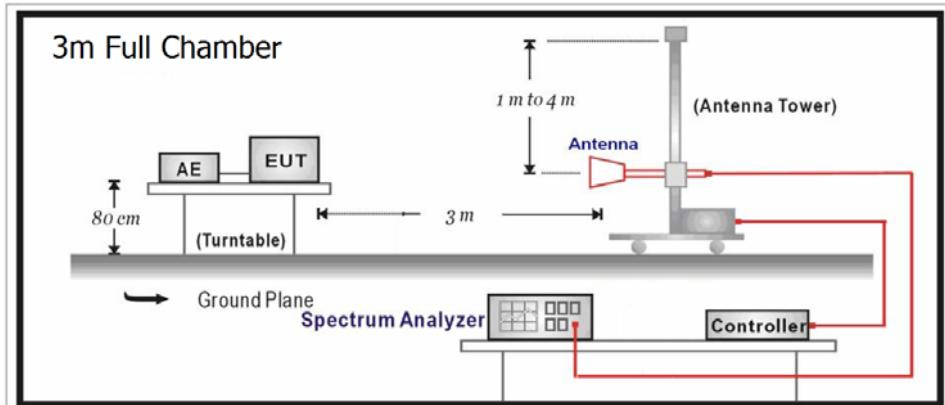
: According to FCC CFR Title 47 Part 15 Subpart B Section 15.109

According to FCC CFR Title 47 Part 15 Subpart B Section 15.209

Limits		
Frequency (MHz)	µV/meter	dBµV/meter
30-88	100	40.00
88-216	150	43.52
216-960	200	46.02
Above 960	500	53.98

Remarks :

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

Below 1GHz Test Setup:**Above 1GHz Test Setup:**

1.3 Measurement Uncertainty Calculations

Conducted Emissions

TYPE	Contribution	Probability Distribution	Uncertainty	Remark
B	LISN	normal(k=2)	±1.3	
	Impedance	normal(k=2)	±0.12	CAL.
	Voltage Division Factor	normal (k=2)	±0.2	CAL.
	cable	normal (k=2)	±0.2	NONCAL.
	Receiver	normal(k=1.64)	±0.0070	
	Input Impedance	normal(k=2)	±0.20 dB	
	QP Sine-Wave Voltage Accuracy	normal(k=2)	±0.40 dB	
	QP-Pulse Amplitude Sensibility	normal(k=2)	±0.57 dB	
	QP-Pulse Frequency Response	normal(k=2)	±0.35 dB	
	Random Noise	U-Shaped	+0.7 / -0.8	CISPR Theory
A	System Repeatability	Std deviation	±0.0721	
	Combined Standard Uncertainty	normal	± 1.1155 [dB]	
	Expanded Uncertainty U	normal(k=2)	± 2.23	95.45 %

Radiated Emission

TYPE	Contribution	Probability Distribution	Uncertainty 3/10m	Remark
B	Antenna factor	normal(k=2)	±0.5 dB	
	frequency interpolation	rectangular	±0.1039 dB	NPL
	height variation	rectangular	+1.5 / -2.6 dB	NAMAS
	direcvalupsy difference	rectangular	+0 / -1.0 dB	NAMAS
	phase center location	rectangular	±1.0 dB	
	Cable loss	normal(k=2)	±0.5 dB	
	Receiver	normal(k=1.64)	±0.0070	
	Input Impedance	normal(k=2)	±0.20 dB	
	QP Sine-Wave Voltage Accuracy	normal(k=2)	±0.40 dB	
	QP-Pulse Amplitude Sensibility	normal(k=2)	±0.57 dB	
	QP-Pulse Frequency Response	normal(k=2)	±0.35 dB	
	Random Noise	U-Shaped	+0.9 / -1.0 dB	CISPR
	Mismatch : AMN – receiver Γ _{antenna} = 0.33 Γ _{receiver} = 0.33			
A	System repeatability	Std deviation	±0.1149 dB	
	Combined standard Uncertainty	normal	±1.3193 [dB]	
	Expanded Uncertainty U	normal(k=2)	± 2.63	95.45 %

1.4 Manufacturer Information

Manufacturer	:	DOALLTECH CO.,LTD.
Address	:	DMC Hightech Industry Center #705, 1580 Sangam-dong, Mapo-gu, Seoul, KOREA

1.5 General Description of EUT

Name : Security Control System
 Model No. : Gateware EM
 Alt. Name : N/A
 FCC ID : X8JGATEWAREEM
 Serial No. : N/A

1.6 Details of EUT

Index	Function
CPU	Processor Marvell PXA320-P(ARM11 Core 806 MHz)
Memory RAM	133 MHz DDR SDRAM 512 MByte
Memory Nand Flash	NANA Flash 128 Mbyte
EPLD	Lattice isp MACH LC4128V
Display	800 X 480 (7" Wide TFT Color LCD)
Touch Screen	Touch Screen Controller
SD/MMC	SD / MMC 1 Slot
LAN	10/100 M Ethernet
Wi-Fi	Wireless LAN (Max 56 Mbps, IEEE 802.11 b/g)
Camera	CCD Camera
Audio	AC 97 (WM9712) Internal x 3, External x 1
UART	Max3232 (Debugger x1, Serial x3)
Video Controller	Video In x3, Video OUT x1 (Techwell TW2835)
KEY PAD	4x4 Push Button
RFID	ATMEGA 13.56 MHz Reader
CPU-JTAG	JTAG Emulator – 20 pin
E-JTAG	JTAG Emulator – 8 pin
Relay	Signal Out Relay x 4
Sensor	Signal Input Sensor x 8
Battery	Li-ion 14 V, 8800mAh
O/S	Windows CE 5.0 Core
Application	DOALLTECH GatewareEM / GatewareCS

- Please refer to user's manual.

1.7 Description of Support Units

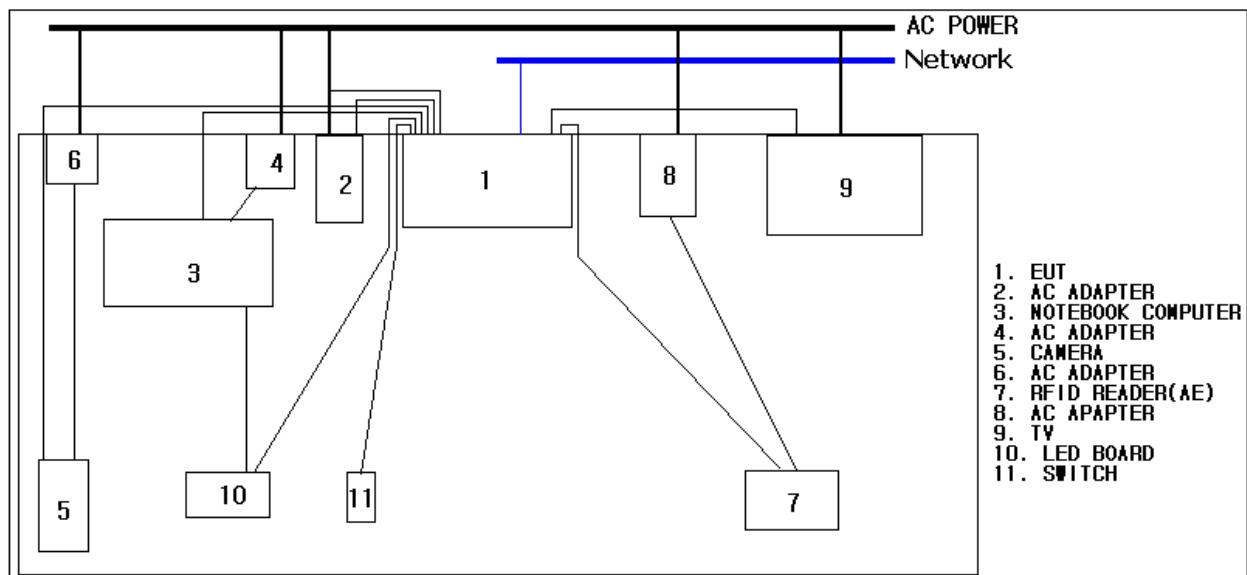
Product	Model No.	Serial No.	Manufacturer	Certification
Security Control System	Gateware EM	N/A	DOALLTECH CO.,LTD.	EUT
AC Adapter(EUT)	FS-P1990	N/A	Shenzhen Lusun Electronic Technology Co.,Ltd	-
Note Book Computer	AVERATEC HS-106	P10S-DVT-9123011210011	TriGem computer Inc.	-
AC Adapter(Note Book Computer)	0225C2040	N/A	Suzhou Li Shin Electronic Co.,Ltd.	-
TV	CT-1413	933432FH600597	SAMSUNG	-
DIGITAL COLOR CAMERA	SCC-421	62ZTA00126M	SAMSUNG	-
RFID READER (125 kHz)	DAC100	CYRD08220149	Seyeon Technology Co.,Ltd.	-
LED BOARD	N/A	N/A	N/A	-
SWITCH	N/A	N/A	N/A	-
Serial Converter	N/A	N/A	N/A	-
AC Adapter (DIGITAL COLOR CAMERA)	JS-1203R	N/A	N/A	-
AC Adapter (RFID READER(125kHz))	PA-090100L	N/A	PERFECT POWER CO.,LTD	-

Note : RFID READER(125 kHz) was used the termination of the COM2 port.

1.8 Cable List

Device Form		Device To		Cable Spec.	
Name	I/O Port	Name	I/O port	Length(m)	Shield
EUT	CAM2	DIGITAL COLOR CAMERA	VIDEO-OUT	6.4	Shielded
	VIDEO-OUT	TV	VIDEO-IN	3.0	Shielded
	UART	Serial Converter	RS-232	1.6	Unshielded
	COM2	RFID READER (125 kHz)	DATA LINE	9.2	Unshielded
	LAN(RJ-45)	Note Book Computer	LAN(RJ-45)	5.4	Unshielded
	SENSOR	LED BOARD	-	11.2	Unshielded
	RELAY	SWITCH	-	4.2	Unshielded
	PWR	AC ADAPTER	DC-OUT	1.2	Unshielded
AC ADAPTER (EUT)	AC-IN	POWER	AC-POWER	1.5	Unshielded
LED BOARD	DC-IN	Note Book Computer	USB	0.8	Unshielded
Note Book Computer	USB	Serial Converter	USB	-	-
TV	AC-IN	POWER	AC-POWER	2.0	Unshielded
DIGITAL COLOR CAMERA	DC-IN	AC ADAPTER	DC-OUT	1.2	Unshielded
RFID READER	DC-IN	AC ADAPTER	DC-OUT	2.0	Unshielded
AC ADAPTER (RFID READER)	AC-IN	POWER	AC-POWER	2.0	Unshielded
AC ADAPTER (DIGITAL COLOR CAMERA)	AC-IN	POWER	AC-POWER	2.0	Unshielded

1.10 Test Set-Up Configuration



1.11 Test Methodology And Configuration

RFID(13.56MHz), Wireless Lan, WireLAN, Camera, RFID(125kHz), all device activating state.

1.12 Standards Applicable for Testing

Table of tests to be carried out under FCC Part 15 Subpart B,C

Test Standards	Status
FCC Part 15 Subpart B, C	A
Deviation from Standard	No Deviation

Note) N/A : Indicates that the test is not applicable

A : Indicates that the test is applicable

2. SUMMARY

WIFI Mode(2412 ~ 2472 MHz)

Test Descriptions

- Conducted Emission	PASS
- Conducted Emission result	
- Radiated Emission	PASS
- Radiated Emission Result	
- Peak power output	PASS
- Test result	
- Band edge	PASS
- Test result	
- 6dB Band	PASS
- Test Result	
- Power Density	PASS
- Test Result	

RFID Mode(13.5595 MHz)

Test Descriptions

- Conducted Emission	PASS
- Conducted Emission result	
- Radiated Emission-15.225(a)	PASS
- Radiated Emission Result	
- Radiated Electric Field Emission-15.225(b)(c)	PASS
- Test result	
- Radiated Electric Field Emission-15.209, 15.225(d)	PASS
- Test result	
- Frequency stability-15.225(e)	PASS
- Test Result	

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

3. Equipment Under Test

3.1 Conducted Emission

3.1.1 Test Instruments

Description	Manufacturer	Model No.	Serial No.	Next of Calibration
Test Receiver	LIG NEX1	ER-30	L0804A003	Sep. 24, 2010
LISN	EMCO	3825/2	8912-1576	Oct. 06, 2010
LISN	EMCO	3825/2	9006-1666	Mar. 30, 2011
Transient Limiter	HAMEG	HZ560	N/A	Jul. 30, 2010
Shielded Room	BRADEN	N/A	DAC-60-005	-

Note : 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to RRL, KRISS, KTL and HCT.
2. The calibration interval of horn ant. and loop ant. is 24 months

3.1.2 Test Area

Conducted Room(Shielded Room)

3.1.3 Operation of EUT

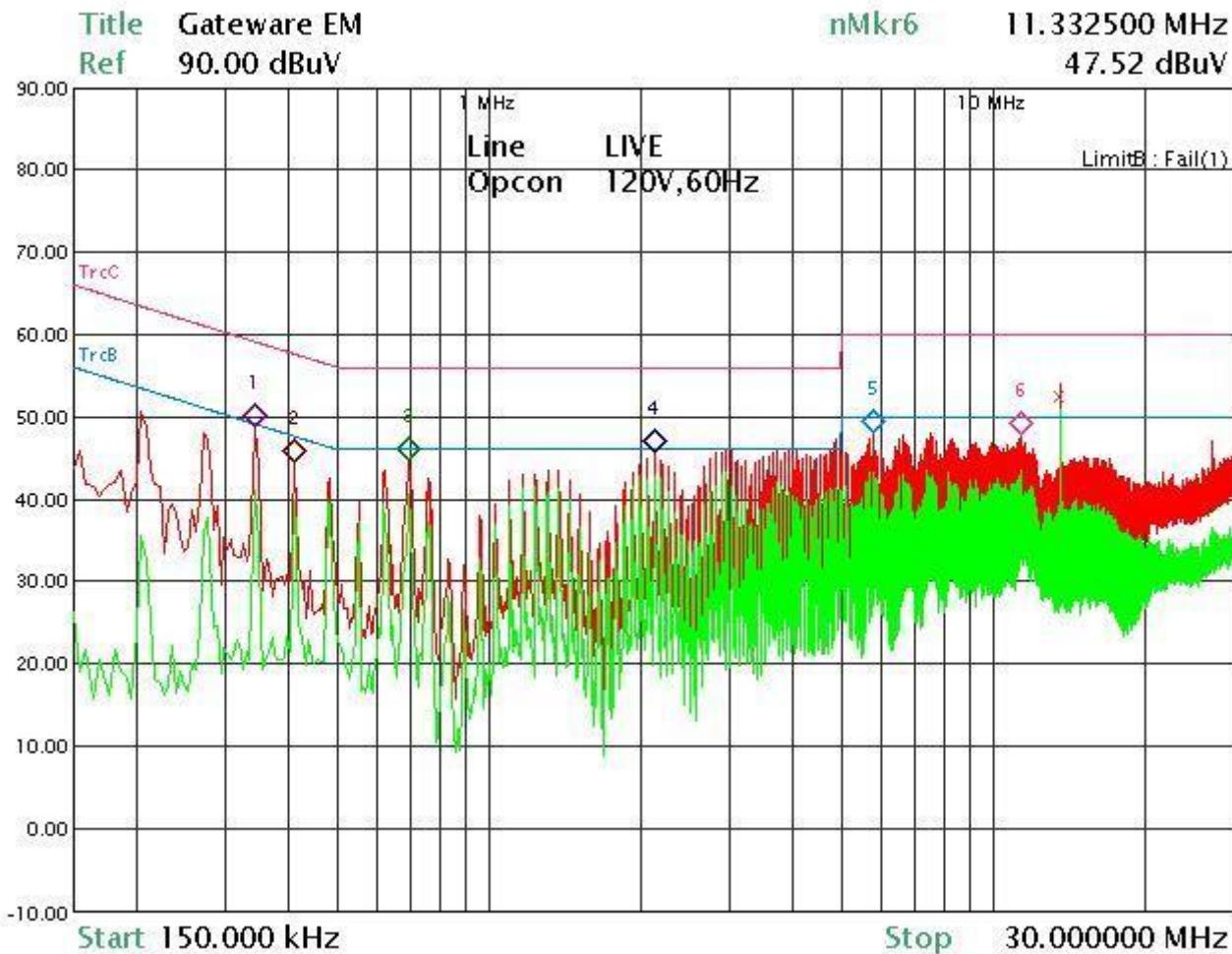
Operating Environment
Temperature : 24.4 degree C
Humidity : 47 %RH
Atmospheric Pressure : 986 mBar

3.1.4 Test Date

March 29, 2010

3.1.5 Conducted Emissions Result(Subpart B(15.107),C(15.207))

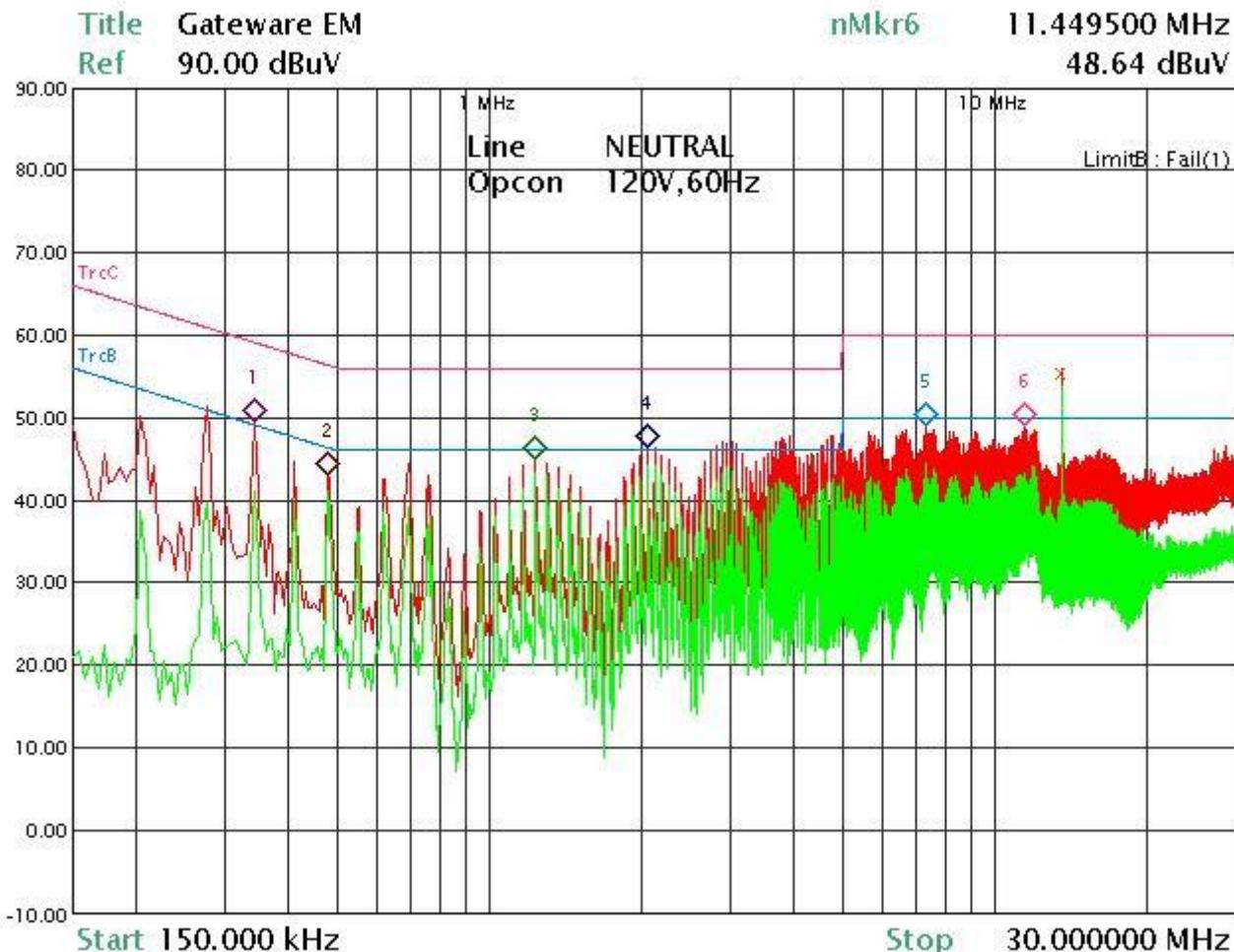
Phase : Live



Freq. [MHz]	Measurement [dB μ V]		Limit [dB μ V]		Insertion Loss [dB]	Cable Loss [dB μ V]	Result [dB μ V]		Margin [dB]	
	Q-peak	Average	Q-peak	Average			Q-peak	Average	Q-peak	Average
0.344	47.60	40.26	59.11	49.11	0.06	0.07	47.73	40.39	11.38	8.72
0.411	43.76	39.59	57.63	47.63	0.04	0.07	43.87	39.70	13.76	7.93
0.695	42.55	39.19	56.00	46.00	0.04	0.06	42.65	39.29	13.35	6.71
2.130	43.23	40.27	56.00	46.00	0.03	0.04	43.30	40.34	12.70	5.66
5.771	45.29	41.84	60.00	50.00	0.05	0.21	45.55	42.10	14.45	7.90
11.333	44.37	40.49	60.00	50.00	0.07	0.51	44.95	41.07	15.05	8.93

Note : RFID(13.56MHz), Wireless Lan, WLAN, Camera, RFID(125kHz), all device activating state.

Phase : Neutral



Freq. [MHz]	Measurement [dB μ N]		Limit [dB μ N]		Insertion Loss	Cable Loss	Result [dB μ N]		Margin [dB]	
	Q-peak	Average	Q-peak	Average			Q-peak	Average	Q-peak	Average
0.344	46.75	40.74	59.11	49.11	0.05	0.07	46.87	40.86	12.24	8.25
0.479	44.64	41.27	56.36	46.36	0.03	0.07	44.74	41.37	11.62	4.99
1.235	45.49	41.95	56.00	46.00	0.02	0.06	45.57	42.03	10.43	3.97
2.058	44.65	42.51	56.00	46.00	0.02	0.04	44.71	42.57	11.29	3.43
7.337	43.62	41.90	60.00	50.00	0.04	0.37	44.03	42.31	15.97	7.69
11.450	44.50	41.50	60.00	50.00	0.05	0.51	45.06	42.06	14.94	7.94

Note : RFID(13.56MHz), Wireless Lan, WLAN, Camera, RFID(125kHz), all device activating state.

3.2 Radiated Emission

3.2.1 Test Instruments

Description	Manufacturer	Model No.	Serial No.	Next of Calibration
Test Receiver	LIG NEX1	ER-265	L0804B002	Jul. 10, 2010
BICONILOG ANT.	EMCO	3142	9701-1128	Nov. 13, 2010
Horn Antenna	R&S	BBHA9120D233	0501	Sep. 10, 2010
Horn Antenna	R&S	BBHA9170	BBHA9170152	Sep. 16, 2010
BICONICAL ANT.	EMCO	3104C	9012-4380	Feb. 28, 2010
LOGPERIODIC ANT.	EMCO	3146	91071232	Feb. 28, 2010
LOOP ANT.	R&S	HFH2-Z2	100187	Jul. 07, 2011
Turn Table	EMCO	D-TT 06	N/A	-
Ant. Mast	EMCO	D-AM 06	N/A	-
Controller	EMCO	D-CTR 06	N/A	-
T-TABLE CONTROLLER	EMCO	1060-1.511	9101-1517	N/A
CHAMBER	BRADEN	RF Shielded door Assembly	DAC-60-004	N/A

Note :

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to RRL, KRISS, KTL and HCT.
2. The calibration interval of horn ant. and loop ant. is 24 months

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. For the limit is employed average value, therefore the peak value can be transferred to average value by subtracting the duty factor. The basic equation with a sample calculation is as follows:

$$\text{Peak} = \text{Reading} + \text{Corrected Factor}$$

Where

Corr. Factor = Antenna Factor + Cable Factor - Amplifier Gain (if any)

3.2.2 Test Area

3m Full Chamber

3.2.3 Operation of EUT

Operating Environment
 Temperature : 24.4 degree C
 Humidity : 46 %RH
 Atmospheric Pressure : 986 mBar

3.2.4 Test Date

March 29, 2010

3.2.5 Radiated Emission Limit

All emission from a digital device, including any network of conductors and apparatus connected thereto shall not exceed the level of field strength specified below:

FCC Part 15 Subpart C paragraph 15.249(a) Limit

Fundamental Frequency (MHz)	Field Strength of Fundamental (3m)			Field Strength of Harmonics (3m)		
	mV/m	dBuV/m		uV/m	dBuV/m	
2400-2483.5	50	94(Average)	114(Peak)	500	54(Average)	74(Peak)

Note : 1. RF Field Strength (dBuV) = 20log RF Voltage(uV)

- 2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.*
- 3. The emission limit in this paragraph is based on measurement instrumentation employing an average detector*

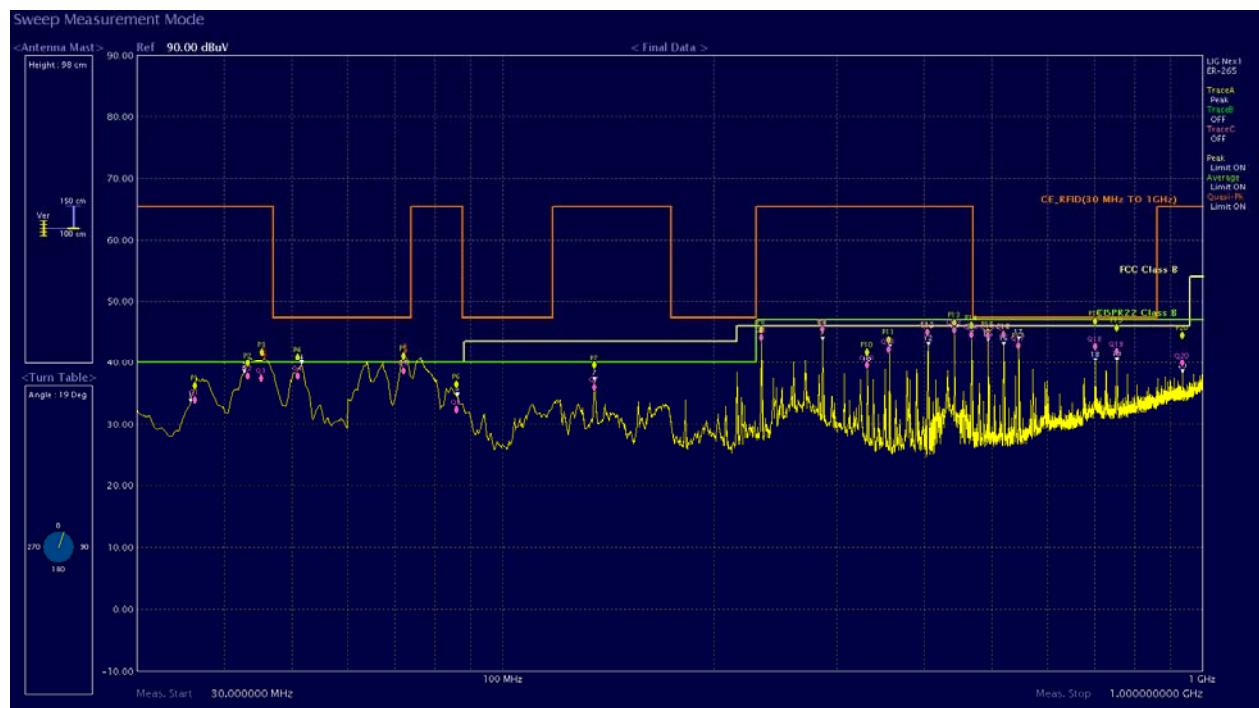
Frequencies in restricted band are complied to limit on Paragraph 15.209

Frequency Range (MHz)	Distance (m)	Field strength (dBuV/m)
0.009-0.490	3	20log 2400/F (kHz) + 80
0.490-1.705	3	20log 24000/F (kHz) + 40
1.705-30	3	20log 30 + 40
30-88	3	40.0
88-216	3	43.5
216-960	3	46.0
Above 960	3	54.0

Note : 1. RF voltage (dBuV) = 20 log RF Voltage (uV)

- 2. In the Above Table, the tighter limit applies at the band edges.*
- 3. Distance refers to the distance in meters between the measuring instrument antenna and the EUT*
- 4. This device used to install a wall device. The location of EUT measurements has the Y-plane(Stand).*
- 5. All scanning using PK detector. And the final emission level was get using QP detector for frequency range from 30 – 1000 MHz. As to 1 - 26 GHz, the final emission level got using PK and AV detector.*
- 6. If measurement is made at 3m distance.*

3.2.5.1 Radiated Emission Result(30 to 1000 MHz)



Frequency MHz	Reading dBuV/m	P (H, V)	Ant. Factor dB	Cable Loss dB	AMP GAIN dB	Limit dBuV/m	Total dBuV/m	Margin dB
36.32	23.00	V	10.85	0.95	0.0	40.00	34.80	5.20
43.23	26.49	V	10.65	1.16	0.0	40.00	38.30	1.70
45.31	26.37	V	10.64	1.21	0.0	40.00	38.22	1.78
51.00	26.54	V	10.52	1.32	0.0	40.00	38.38	1.62
72.18	29.55	V	7.26	1.54	0.0	40.00	38.35	1.65
85.94	22.69	V	7.71	1.82	0.0	40.00	32.22	7.78
135.16	20.79	H	12.46	2.40	0.0	43.50	35.65	7.85
234.00	23.98	H	15.61	3.34	0.0	46.00	42.93	3.07
285.99	21.30	V	19.18	3.79	0.0	46.00	44.27	1.73
331.78	22.00	V	13.75	4.09	0.0	46.00	39.84	6.16
356.35	23.84	V	14.03	4.25	0.0	46.00	42.12	3.88
405.00	24.42	H	14.95	4.65	0.0	46.00	44.02	1.98
441.99	23.45	V	15.66	5.02	0.0	46.00	44.13	1.87
467.99	22.18	V	16.45	5.24	0.0	46.00	43.87	2.13

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Frequency MHz	Reading dBuV/m	P (H, V)	Ant. Factor dB	Cable Loss dB	AMP GAIN dB	Limit dBuV/m	Total dBuV/m	Margin dB
519.99	20.51	V	17.56	5.58	0.0	46.00	43.65	2.35
545.98	19.58	H	17.56	5.68	0.0	46.00	42.82	3.18
702.00	15.90	H	20.18	6.62	0.0	46.00	42.70	3.30
753.97	14.38	H	20.32	7.15	0.0	46.00	41.85	4.15
935.99	9.53	H	22.36	8.03	0.0	46.00	39.92	6.08

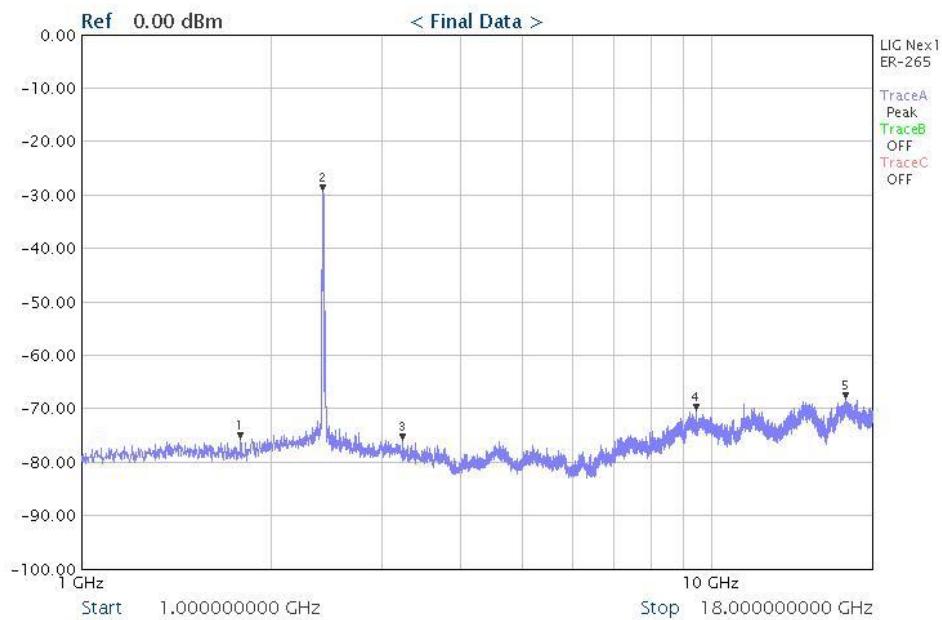
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C.S.Tech., Inc: 1055, Singil-dong ,Danwon-gu ,Ansan-si, Gyeonggi-do, Korea 425-839

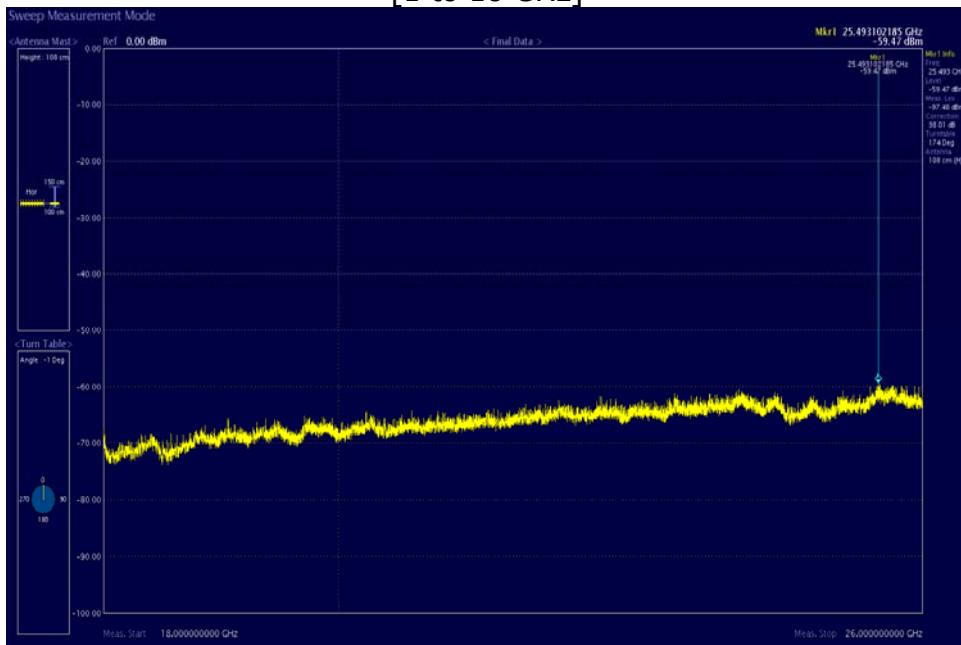
Tel: +82 31 493 2001 Fax: +82 31 493 2055 www.cstlab.co.kr

3.2.5.2 Fundamental & Harmonics Radiated Emission Result(1 to 26 GHz)

Test Mode	IEEE802.11b	Test Channel	1 CH (2412 MHz)
Test Item	Fundamental & Harmonics Radiated Emission Test Result	Polarization	Hor.
Test Result	PASS		



[1 to 18 GHz]



[18 to 26 GHz]

Frequency (MHz)	Emission PK/AV (dBuV/m)	Polarization	Limits PK/AV (dBuV/m)	Margin (dB)
2412	77.64(PK)	Hor.	114/94	36.36
1780	35.68(PK)	Hor.	74/54	38.32
3220	30.02(PK)	Hor.	74/54	43.98
9455	36.49(PK)	Hor.	74/54	37.51
16279	38.71(PK)	Hor.	74/54	35.29
25493	47.52(PK)	Hor.	74/54	26.48
-	-	-	-	-

Note : 1. Other emissions don't exceed the level of 20 dB below the applicable Limit.

2. Measurement level = reading level + correct factor

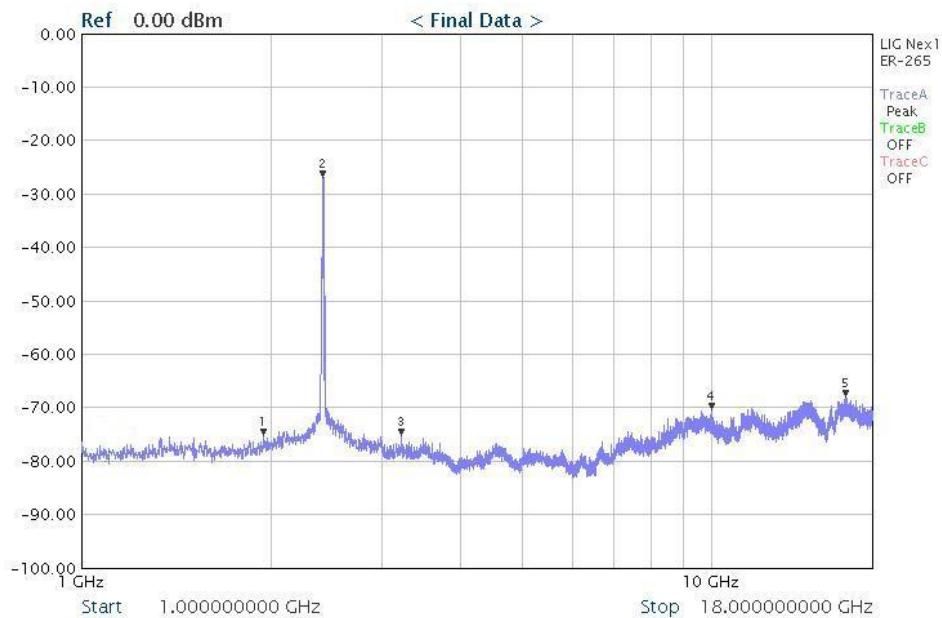
3. This device used to install a wall device. The location of EUT measurements has the Y-Plane.

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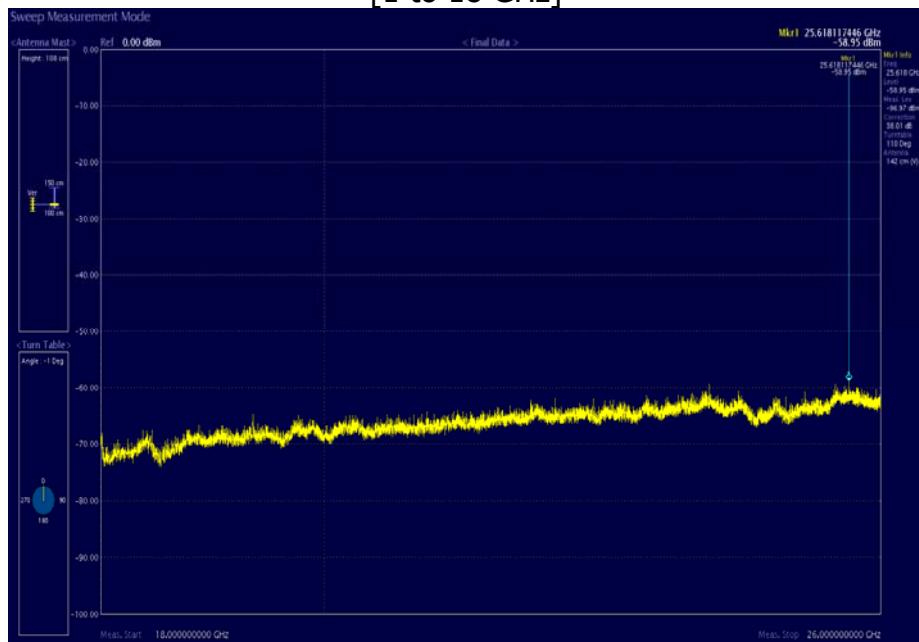
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Test Mode	IEEE802.11b	Test Channel	1 CH (2412 MHz)
Test Item	Fundamental & Harmonics Radiated Emission Test Result	Polarization	Ver.
Test Result	PASS		



[1 to 18 GHz]



[18 to 26 GHz]

Frequency (MHz)	Emission PK/AV (dBuV/m)	Polarization	Limits PK/AV (dBuV/m)	Margin (dB)
2412	79.97(PK)	Ver.	114/94	34.03
1946	29.46(PK)	Ver.	74/54	44.54
3220	31.60(PK)	Ver.	74/54	42.40
9999	36.61(PK)	Ver.	74/54	37.39
16300	38.91(PK)	Ver.	74/54	35.09
25618	47.04(PK)	Ver.	74/54	26.96
-	-	-	-	-

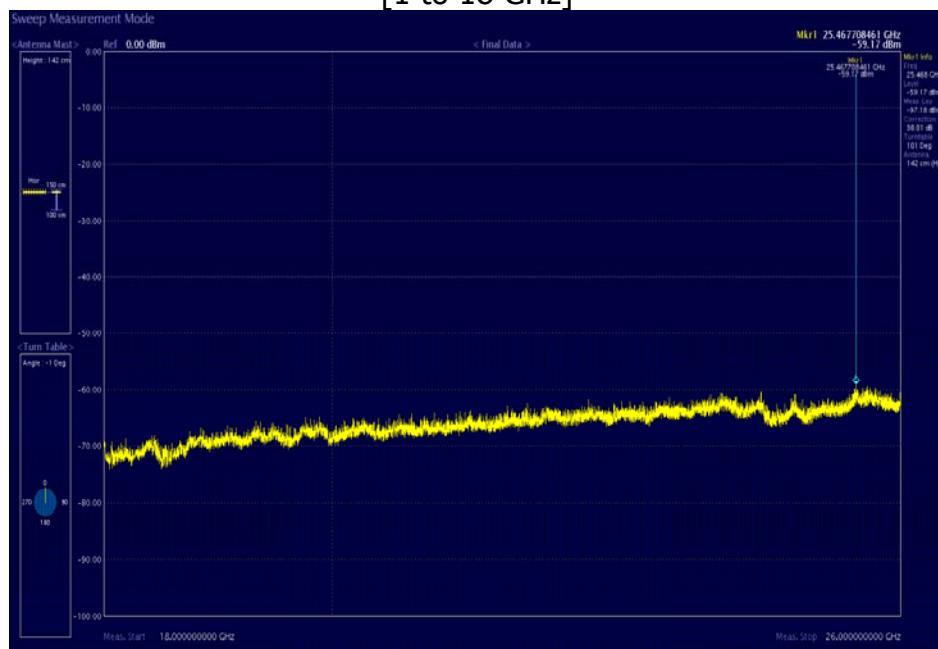
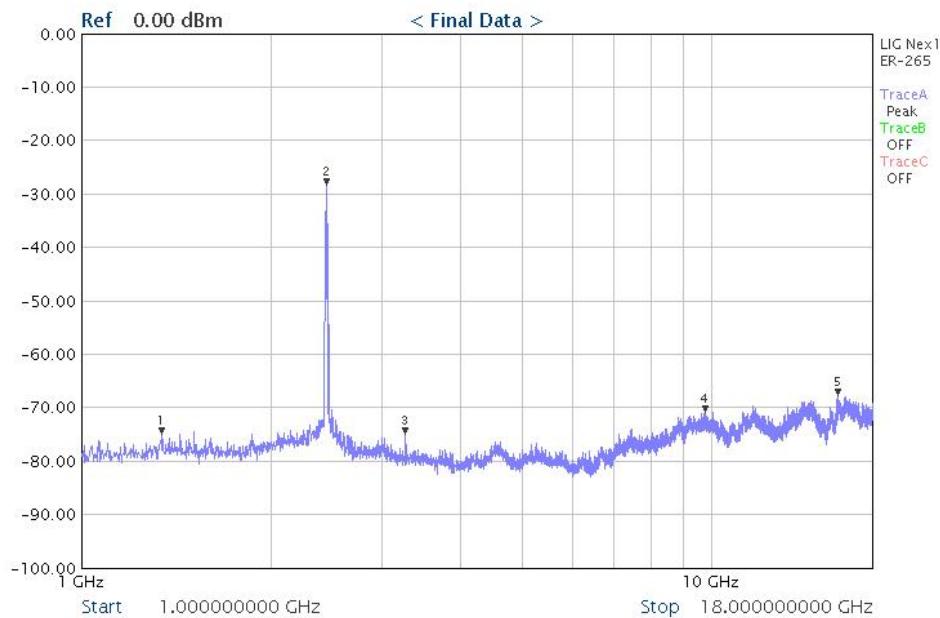
Note : 1. Other emissions don't exceed the level of 20 dB below the applicable Limit.

2. Measurement level = reading level + correct factor

3. This device used to install a wall device. The location of EUT measurements has the Y-Plane.

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Test Mode	IEEE802.11b	Test Channel	7 CH (2442 MHz)
Test Item	Fundamental & Harmonics Radiated Emission Test Result	Polarization	Hor.
Test Result	PASS		



Frequency (MHz)	Emission PK/AV (dBuV/m)	Polarization	Limits PK/AV (dBuV/m)	Margin (dB)
2442	78.59(PK)	Hor.	114/94	35.41
1336	32.21(PK)	Hor.	74/54	41.79
3260	32.80(PK)	Hor.	74/54	41.20
9764	36.00(PK)	Hor.	74/54	38.00
15887	39.15(PK)	Hor.	74/54	34.85
25618	48.04(PK)	Hor.	74/54	25.96
-	-	-	-	-

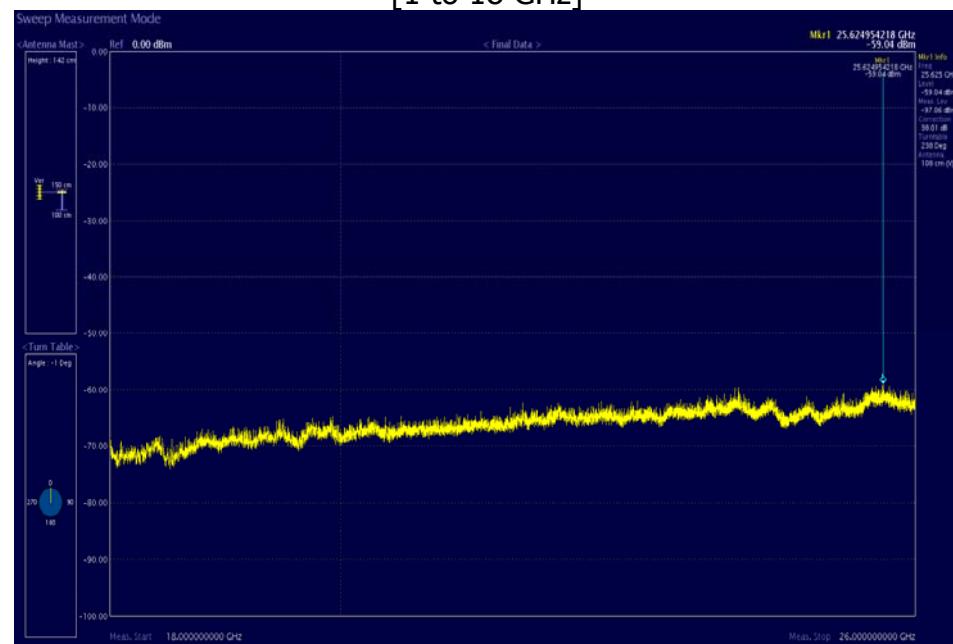
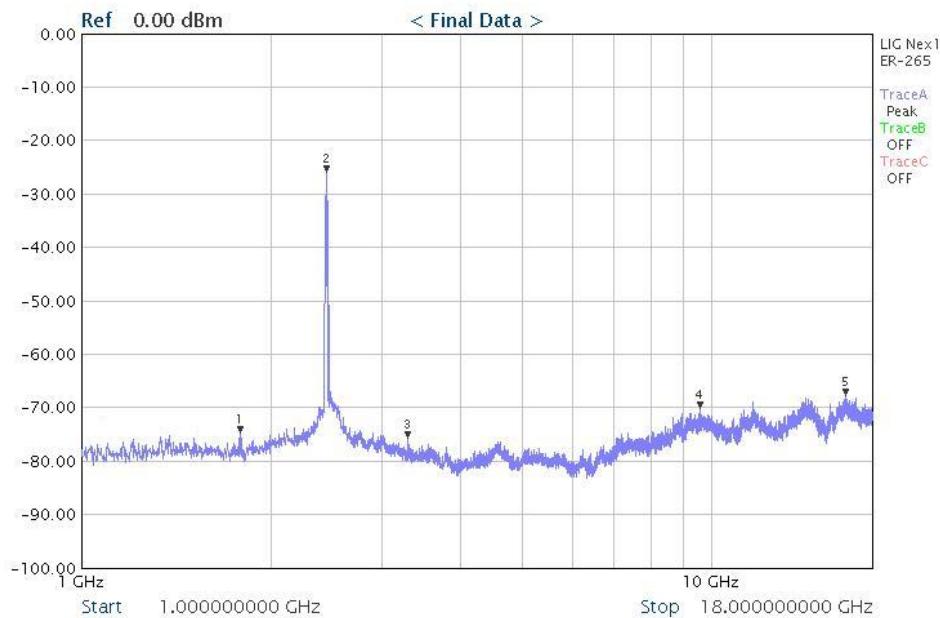
Note : 1. Other emissions don't exceed the level of 20 dB below the applicable Limit.

2. Measurement level = reading level + correct factor

3. This device used to install a wall device. The location of EUT measurements has the Y-Plane.

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Test Mode	IEEE802.11b	Test Channel	7 CH (2442 MHz)
Test Item	Fundamental & Harmonics Radiated Emission Test Result	Polarization	Ver.
Test Result	PASS		



Frequency (MHz)	Emission PK/AV (dBuV/m)	Polarization	Limits PK/AV (dBuV/m)	Margin (dB)
2442	81.84(PK)	Ver.	114/94	32.16
1780	31.40(PK)	Ver.	74/54	42.60
3260	31.15(PK)	Ver.	74/54	42.85
9563	36.71(PK)	Ver.	74/54	37.29
16327	39.34(PK)	Ver.	74/54	34.66
25624	47.95(PK)	Ver.	74/54	26.05
-	-	-	-	-

Note :

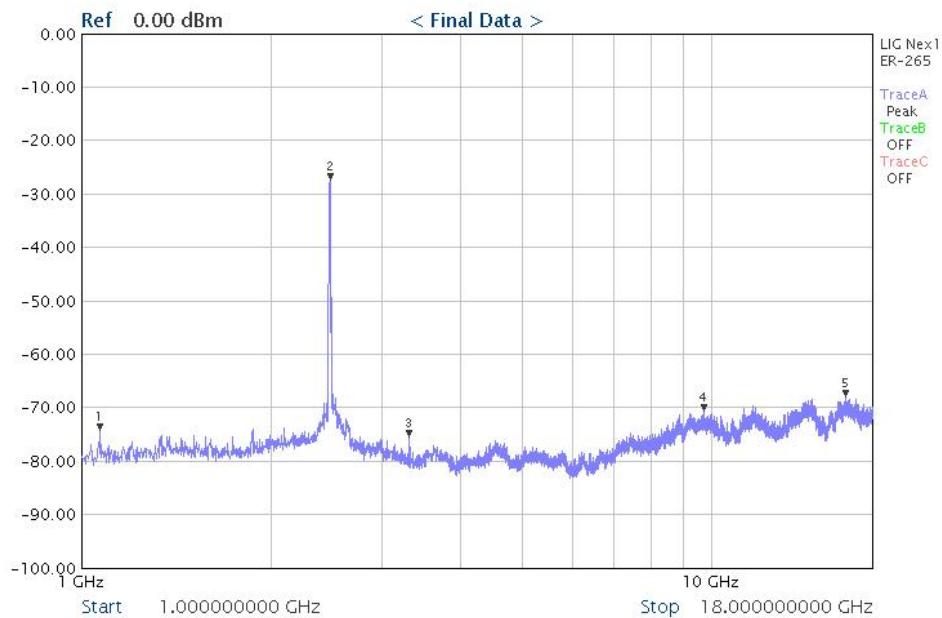
- 1. Other emissions don't exceed the level of 20 dB below the applicable Limit.*
- 2. Measurement level = reading level + correct factor*
- 3. This device used to install a wall device. The location of EUT measurements has the Y-Plane.*

Certification Service Technology Inc.

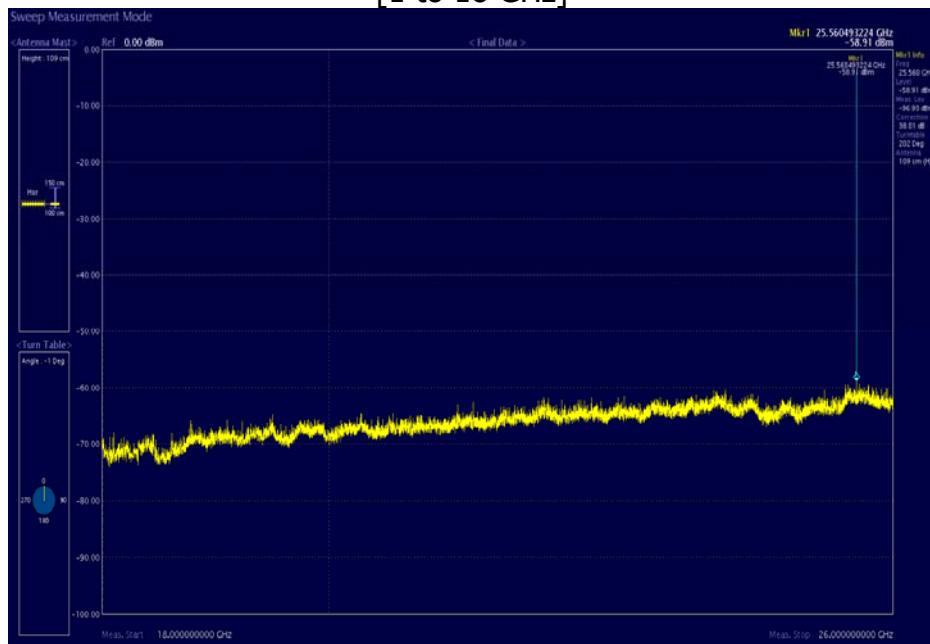
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Test Mode	IEEE802.11b	Test Channel	13 CH (2472 MHz)
Test Item	Fundamental & Harmonics Radiated Emission Test Result	Polarization	Hor.
Test Result	PASS		



[1 to 18 GHz]



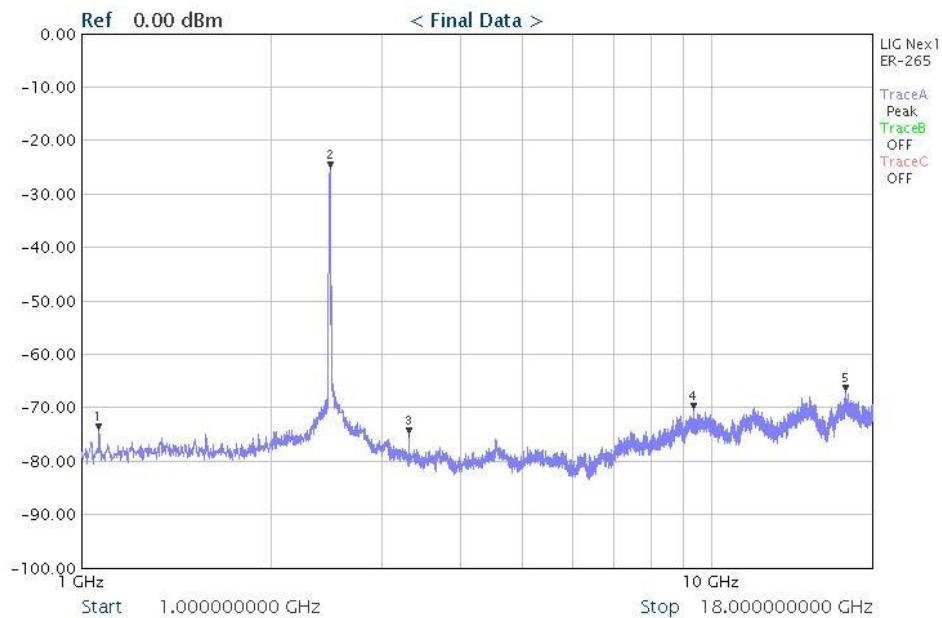
[18 to 26 GHz]

Frequency (MHz)	Emission PK/AV (dBuV/m)	Polarization	Limits PK/AV (dBuV/m)	Margin (dB)
2472	79.58(PK)	Hor.	114/94	34.42
1068	32.63(PK)	Hor.	74/54	41.73
3299	31.53(PK)	Hor.	74/54	42.47
9700	36.30(PK)	Hor.	74/54	37.70
16291	39.04(PK)	Hor.	74/54	34.96
25560	48.03(PK)	Hor.	74/54	25.97
-	-	-	-	-

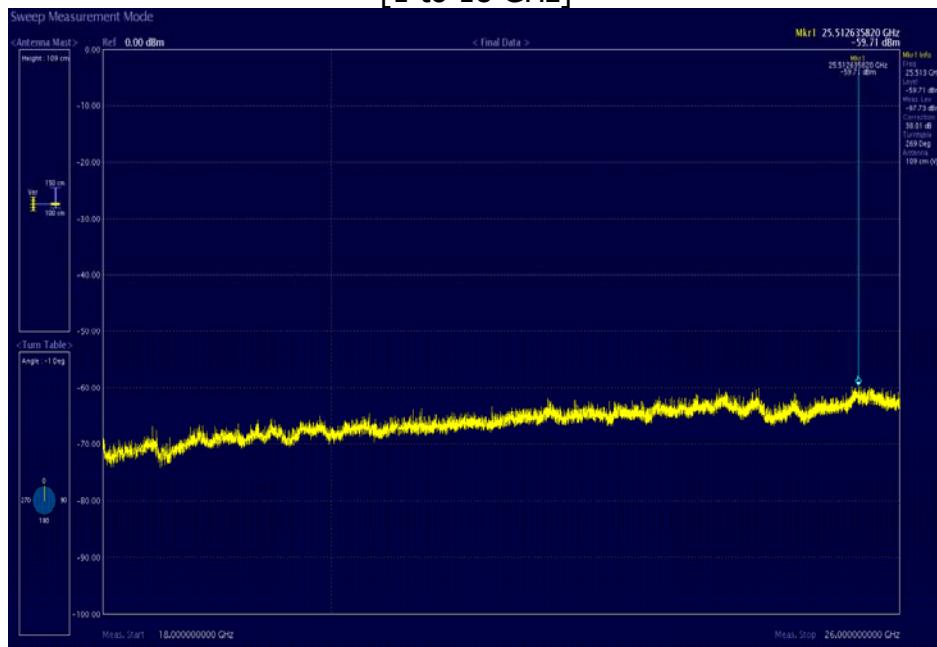
Note :

- 1. Other emissions don't exceed the level of 20 dB below the applicable Limit.*
- 2. Measurement level = reading level + correct factor*
- 3. This device used to install a wall device. The location of EUT measurements has the Y-Plane.*

Test Mode	IEEE802.11b	Test Channel	13 CH (2472 MHz)
Test Item	Fundamental & Harmonics Radiated Emission Test Result	Polarization	Ver.
Test Result	PASS		



[1 to 18 GHz]



[18 to 26 GHz]

Frequency (MHz)	Emission PK/AV (dBuV/m)	Polarization	Limits PK/AV (dBuV/m)	Margin (dB)
2472	81.69(PK)	Ver.	114/94	32.31
1064	32.76(PK)	Ver.	74/54	41.24
3299	31.91(PK)	Ver.	74/54	42.09
9361	36.50(PK)	Ver.	74/54	37.50
16269	39.91(PK)	Ver.	74/54	34.09
25512	47.28(PK)	Ver.	74/54	26.72
-	-	-	-	-

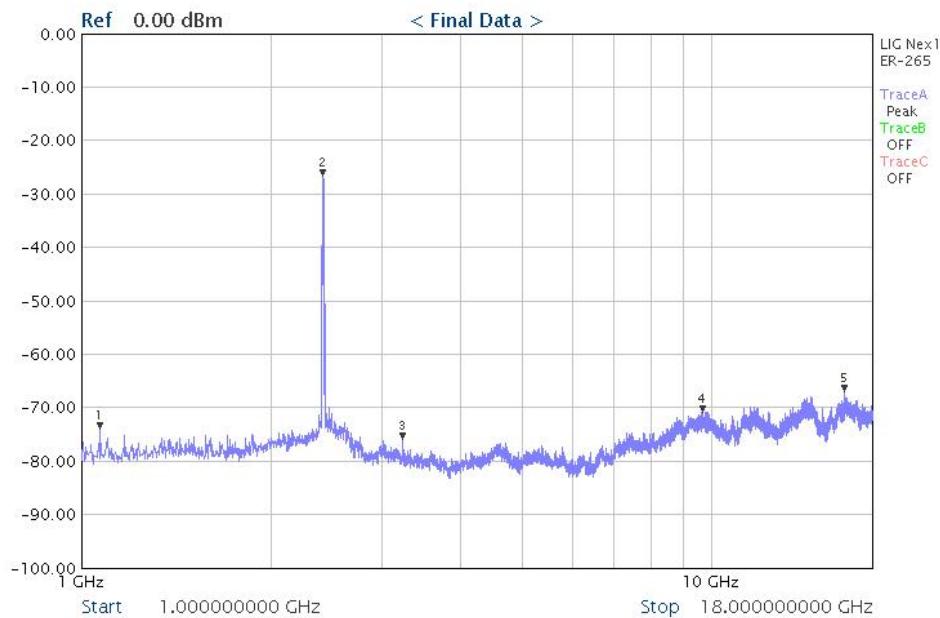
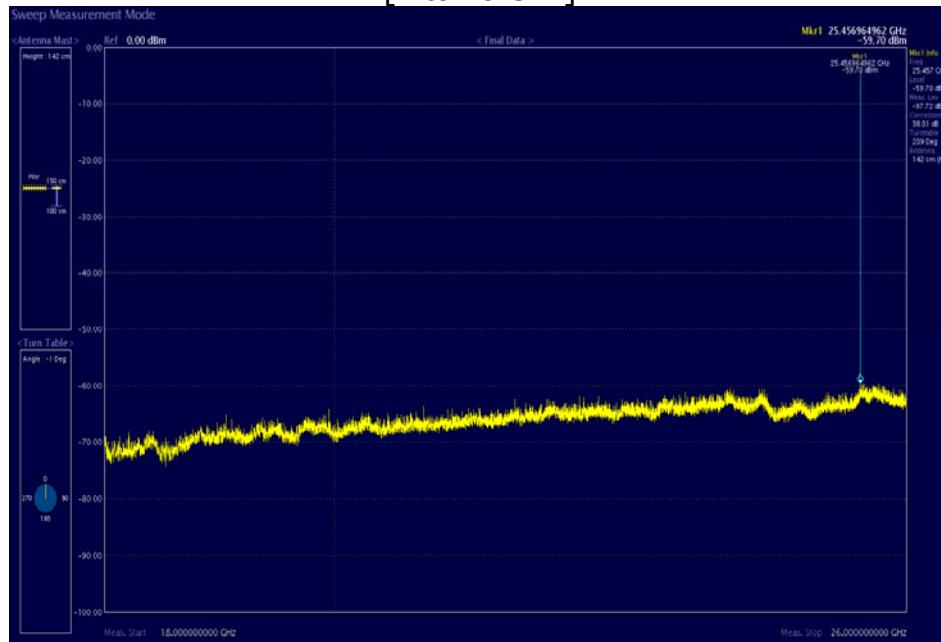
Note : 1. Other emissions don't exceed the level of 20 dB below the applicable Limit.

2. Measurement level = reading level + correct factor

3. This device used to install a wall device. The location of EUT measurements has the Y-Plane.

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Test Mode	IEEE802.11g	Test Channel	1 CH (2412 MHz)
Test Item	Fundamental & Harmonics Radiated Emission Test Result	Polarization	Hor.
Test Result	PASS		

**[1 to 18 GHz]****[18 to 26 GHz]**

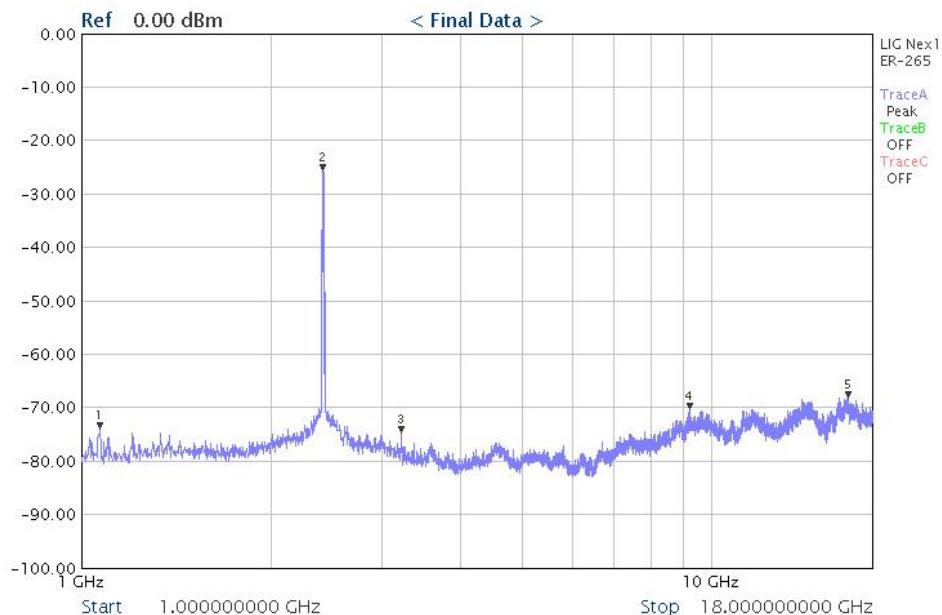
Frequency (MHz)	Emission PK/AV (dBuV/m)	Polarization	Limits PK/AV (dBuV/m)	Margin (dB)
2412	80.26(PK)	Hor.	114/94	33.74
1068	32.97(PK)	Hor.	74/54	41.03
3220	37.24(PK)	Hor.	74/54	36.76
9667	36.20(PK)	Hor.	74/54	37.80
16227	39.88(PK)	Hor.	74/54	34.12
25456	47.29(PK)	Hor.	74/54	26.71
-	-	-	-	-

Note : 1. Other emissions don't exceed the level of 20 dB below the applicable Limit.

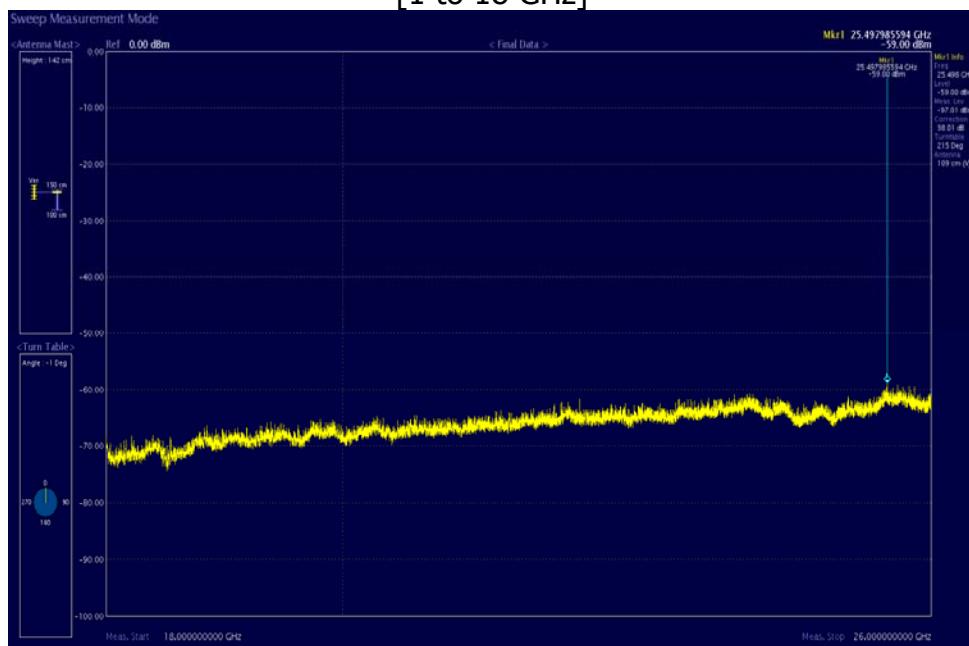
2. Measurement level = reading level + correct factor

3. This device used to install a wall device. The location of EUT measurements has the Y-Plane.

Test Mode	IEEE802.11g	Test Channel	1 CH (2412 MHz)
Test Item	Fundamental & Harmonics Radiated Emission Test Result	Polarization	Ver.
Test Result	PASS		



[1 to 18 GHz]



[18 to 26 GHz]

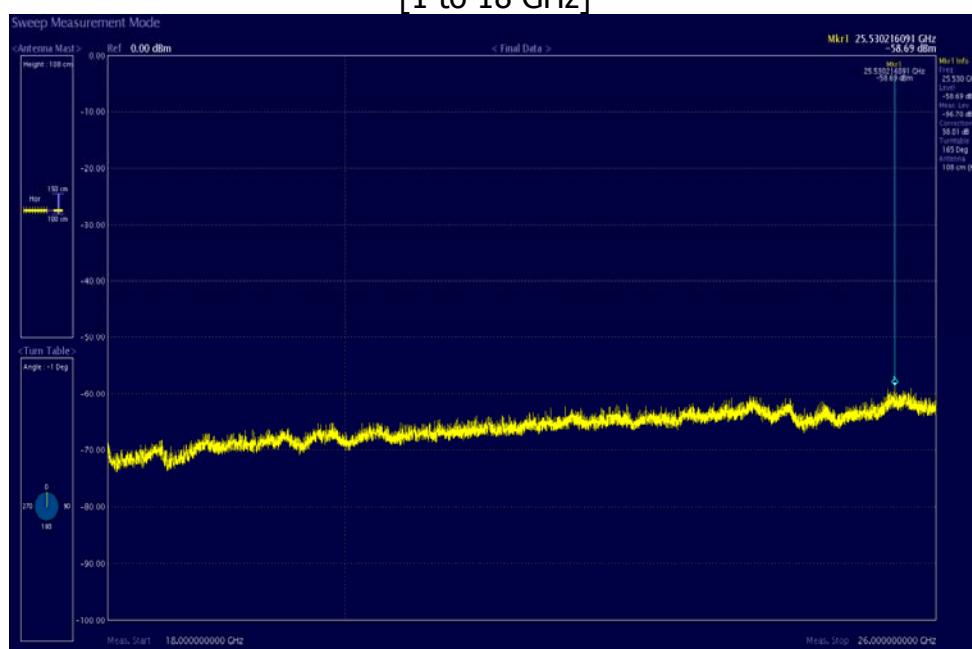
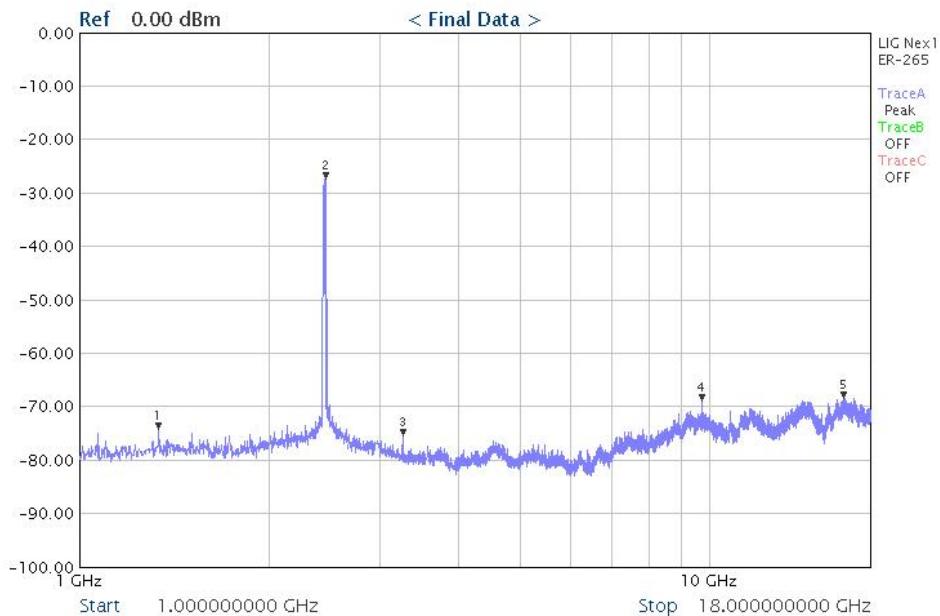
Frequency (MHz)	Emission PK/AV (dBuV/m)	Polarization	Limits PK/AV (dBuV/m)	Margin (dB)
2412	81.27(PK)	Ver.	114/94	32.73
1066	32.90(PK)	Ver.	74/54	41.10
3220	32.06(PK)	Ver.	74/54	41.94
9214	36.68(PK)	Ver.	74/54	37.32
16453	38.79(PK)	Ver.	74/54	35.21
25497	47.99(PK)	Ver.	74/54	26.01
-	-	-	-	-

Note : 1. Other emissions don't exceed the level of 20 dB below the applicable Limit.

2. Measurement level = reading level + correct factor

3. This device used to install a wall device. The location of EUT measurements has the Y-Plane.

Test Mode	IEEE802.11g	Test Channel	7 CH (2442 MHz)
Test Item	Fundamental & Harmonics Radiated Emission Test Result	Polarization	Hor.
Test Result	PASS		

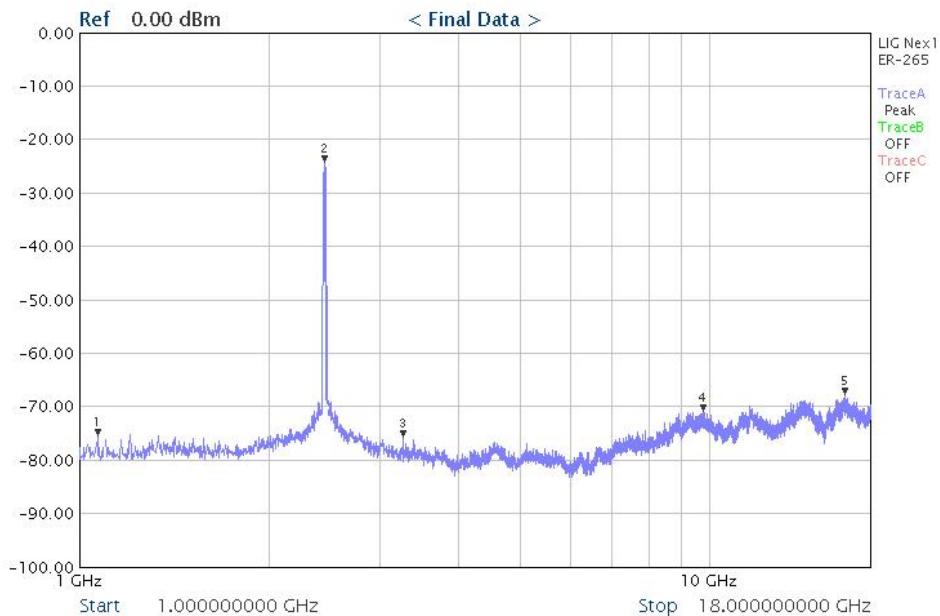


Frequency (MHz)	Emission PK/AV (dBuV/m)	Polarization	Limits PK/AV (dBuV/m)	Margin (dB)
2442	79.64(PK)	Hor.	114/94	34.36
1329	32.34(PK)	Hor.	74/54	41.66
3260	31.74(PK)	Hor.	74/54	42.26
9735	38.05(PK)	Hor.	74/54	35.95
16316	38.59(PK)	Hor.	74/54	35.50
25530	48.30(PK)	Hor.	74/54	25.70
-	-	-	-	-

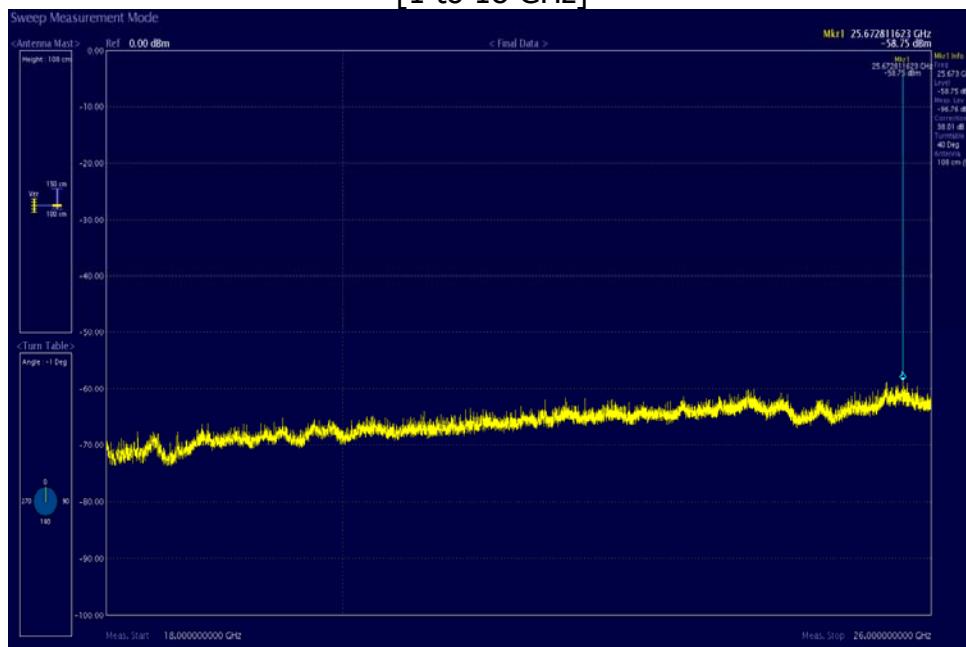
Note :

- 1. Other emissions don't exceed the level of 20 dB below the applicable Limit.*
- 2. Measurement level = reading level + correct factor*
- 3. This device used to install a wall device. The location of EUT measurements has the Y-Plane.*

Test Mode	IEEE802.11g	Test Channel	7 CH (2442 MHz)
Test Item	Fundamental & Harmonics Radiated Emission Test Result	Polarization	Ver.
Test Result	PASS		



[1 to 18 GHz]



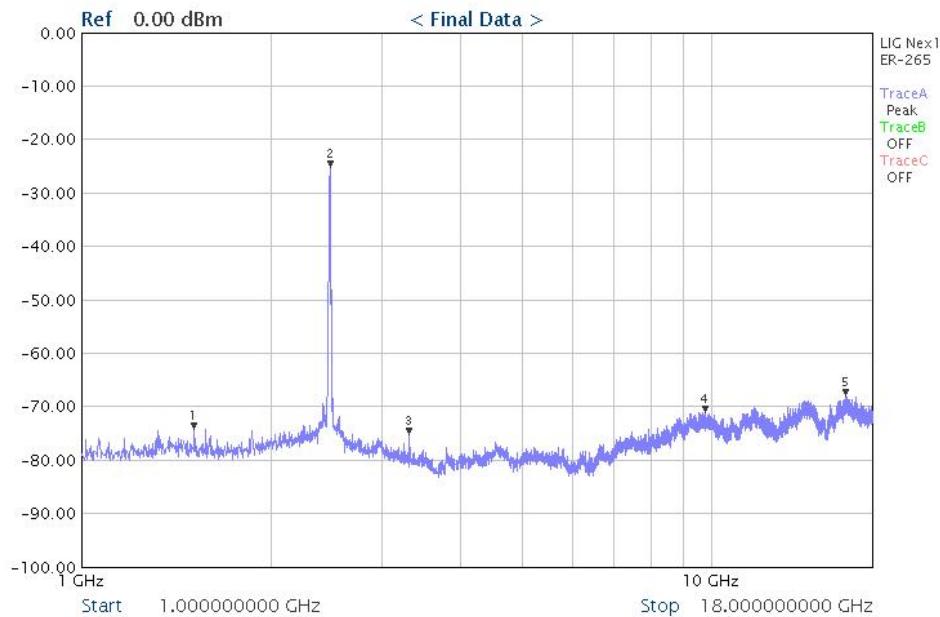
[18 to 26 GHz]

Frequency (MHz)	Emission PK/AV (dBuV/m)	Polarization	Limits PK/AV (dBuV/m)	Margin (dB)
2442	82.75(PK)	Ver.	114/94	34.25
1068	35.52(PK)	Ver.	74/54	38.48
3260	31.84(PK)	Ver.	74/54	42.16
9741	35.98(PK)	Ver.	74/54	38.02
16420	39.34(PK)	Ver.	74/54	34.66
25672	48.24(PK)	Ver.	74/54	25.76
-	-	-	-	-

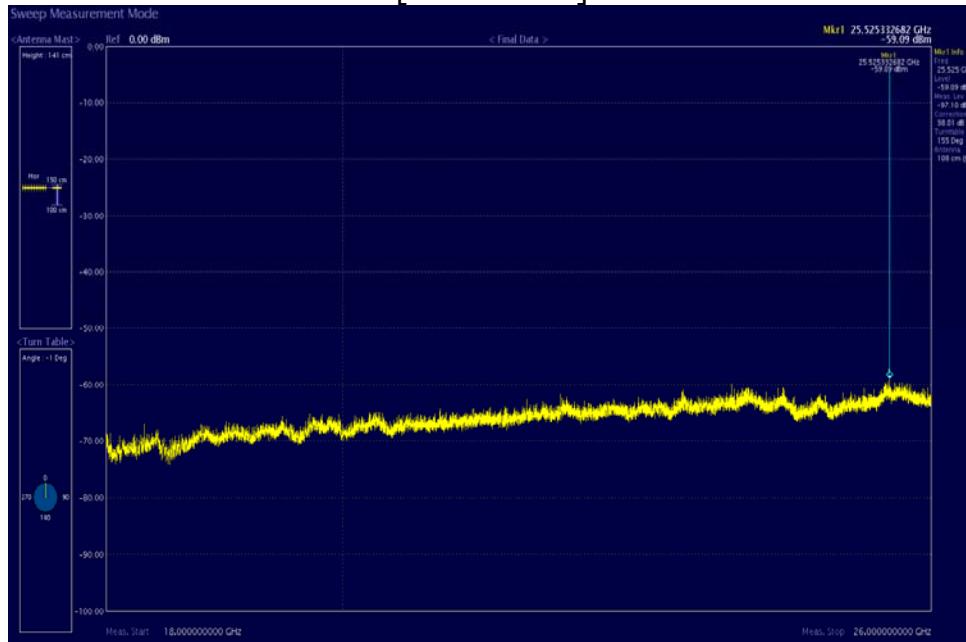
Note :

- 1. Other emissions don't exceed the level of 20 dB below the applicable Limit.*
- 2. Measurement level = reading level + correct factor*
- 3. This device used to install a wall device. The location of EUT measurements has the Y-Plane.*

Test Mode	IEEE802.11g	Test Channel	13 CH (2472 MHz)
Test Item	Fundamental & Harmonics Radiated Emission Test Result	Polarization	Hor.
Test Result	PASS		



[1 to 18 GHz]



[18 to 26 GHz]

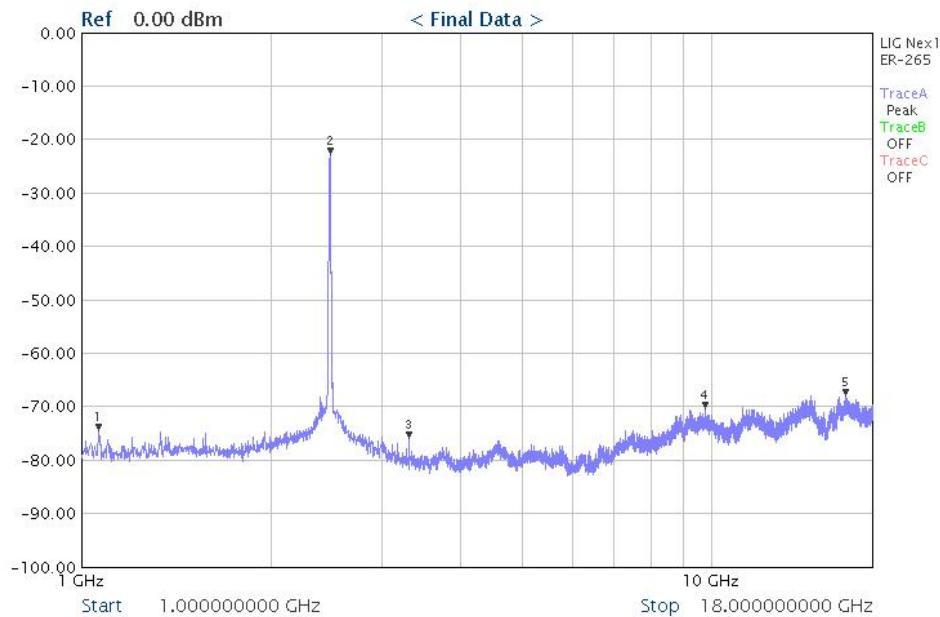
Frequency (MHz)	Emission PK/AV (dBuV/m)	Polarization	Limits PK/AV (dBuV/m)	Margin (dB)
2472	81.72(PK)	Hor.	114/94	32.28
1504	33.17(PK)	Hor.	74/54	40.83
3299	32.47(PK)	Hor.	74/54	41.53
9762	35.87(PK)	Hor.	74/54	38.13
16281	39.06(PK)	Hor.	74/54	34.94
25525	47.90(PK)	Hor.	74/54	26.10
-	-	-	-	-

Note : 1. Other emissions don't exceed the level of 20 dB below the applicable Limit.

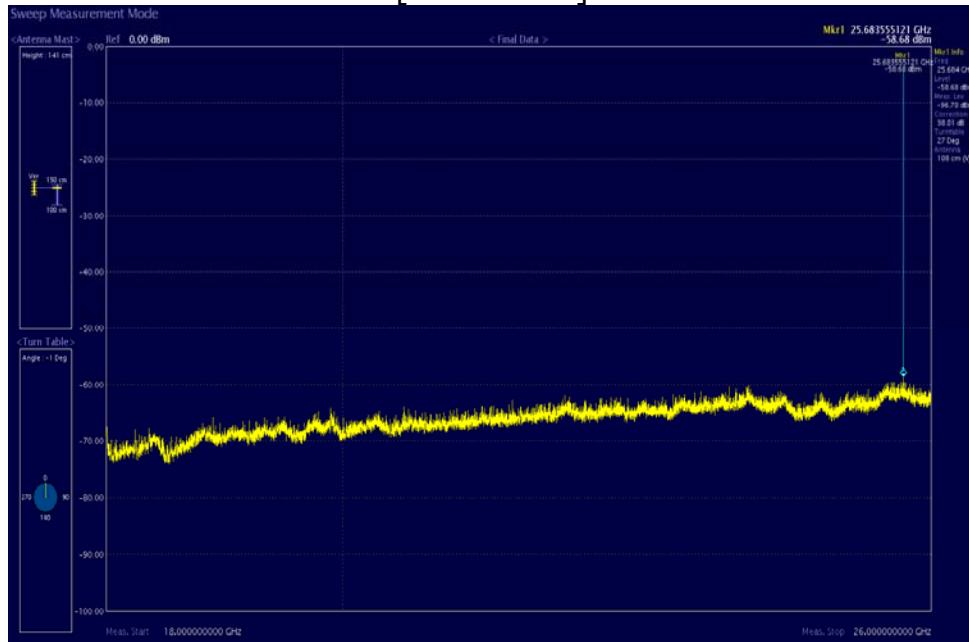
2. Measurement level = reading level + correct factor

3. This device used to install a wall device. The location of EUT measurements has the Y-Plnae.

Test Mode	IEEE802.11g	Test Channel	13 CH (2472 MHz)
Test Item	Fundamental & Harmonics Radiated Emission Test Result	Polarization	Ver.
Test Result	PASS		



[1 to 18 GHz]



[18 to 26 GHz]

Frequency (MHz)	Emission PK/AV (dBuV/m)	Polarization	Limits PK/AV (dBuV/m)	Margin (dB)
2472	84.13(PK)	Ver.	114/94	29.87
1064	33.10(PK)	Ver.	74/54	40.90
3299	31.75(PK)	Ver.	74/54	42.25
9752	36.58(PK)	Ver.	74/54	37.42
16298	39.08(PK)	Ver.	74/54	34.92
25683	48.31(PK)	Ver.	74/54	25.69
-	-	-	-	-

Note : 1. Other emissions don't exceed the level of 20 dB below the applicable Limit.

2. Measurement level = reading level + correct factor

3. This device used to install a wall device. The location of EUT measurements has the Y-Plnae.

3.3 Peak Power Output

3.3.1 Test Instruments

Description	Manufacturer	Model No.	Serial No.	Next of Calibration
Spectrum Analyzer	Advantest	R3273	121100554	Jun. 15, 2010
RF Test Room	-	-	-	-

Note : 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to RRL, KRISS, KTL and HCT.
2. The calibration interval of horn ant. and loop ant. is 24 months

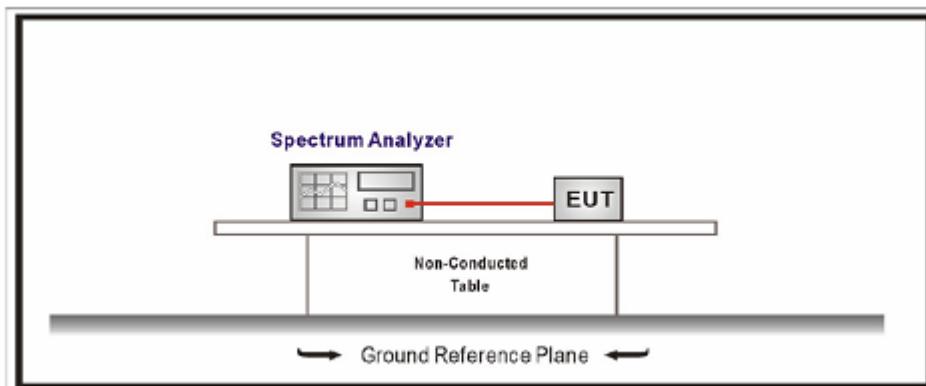
3.3.2 Limit

The maximum peak output power of the intentional radiator shall not exceed the following :

1. According to § 15.247(b)(3), for systems using digital modulation in the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz : 1Watt.
2. According to § 15.247(b)(4), the conducted output power limit specified in paragraph(b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph(c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs(b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi

3.3.3 Test Configuration

RF Conducted Measurement:



3.3.4 Test Procedure

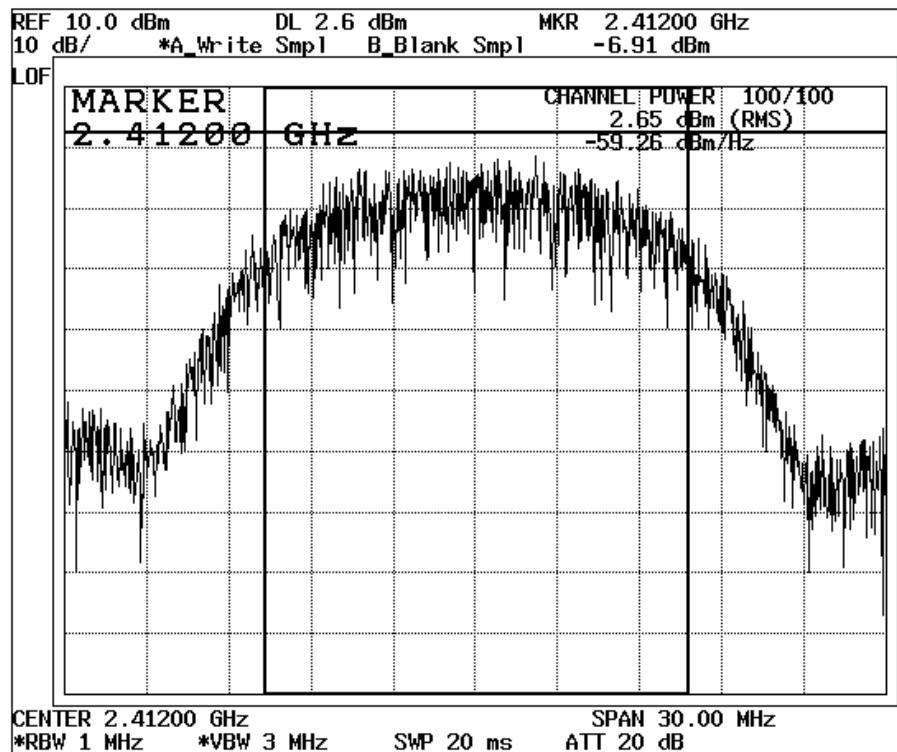
The transmitter output is connected to the Spectrum analyzer. The Spectrum analyzer is set to the peak power detection.

3.3.5 Peak Power Test Result

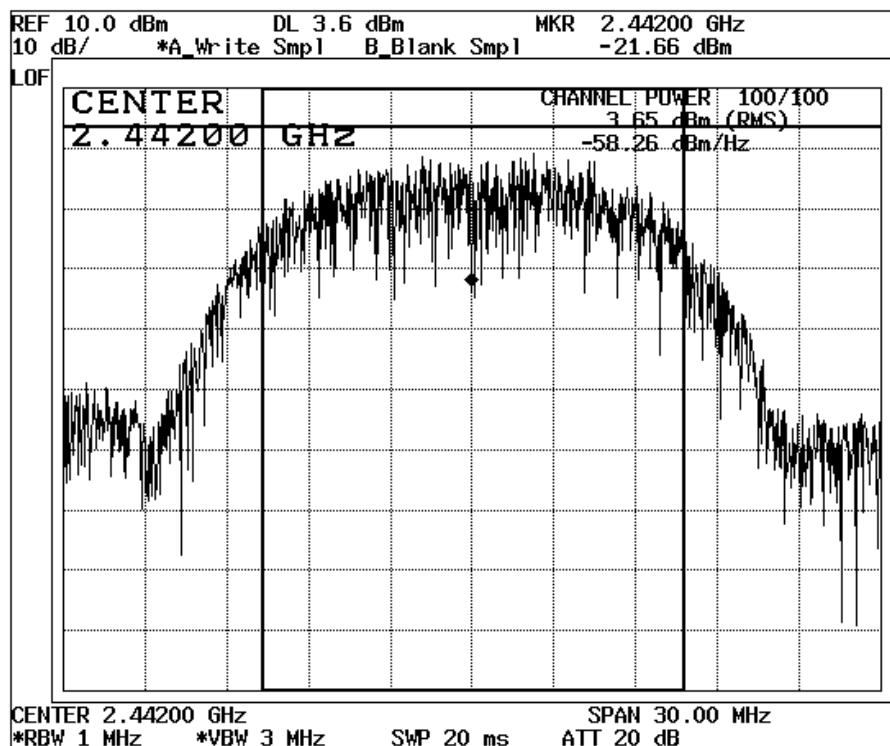
Test Item	Peak Power Output
Test Mode	802.11b
Test Site	RF Room
Measurement Method	Conducted

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
1	2412	2.65	1Watt=30dBm	Pass
7	2442	3.65	1Watt=30dBm	Pass
13	2472	3.96	1Watt=30dBm	Pass

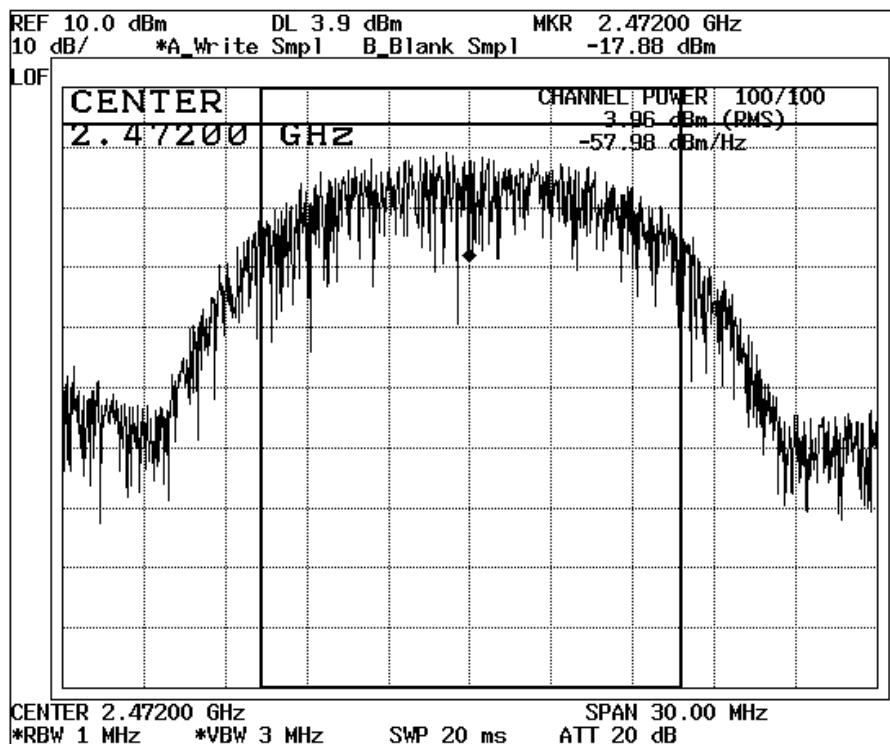
Channel 1.



Channel 7.



Channel 13.

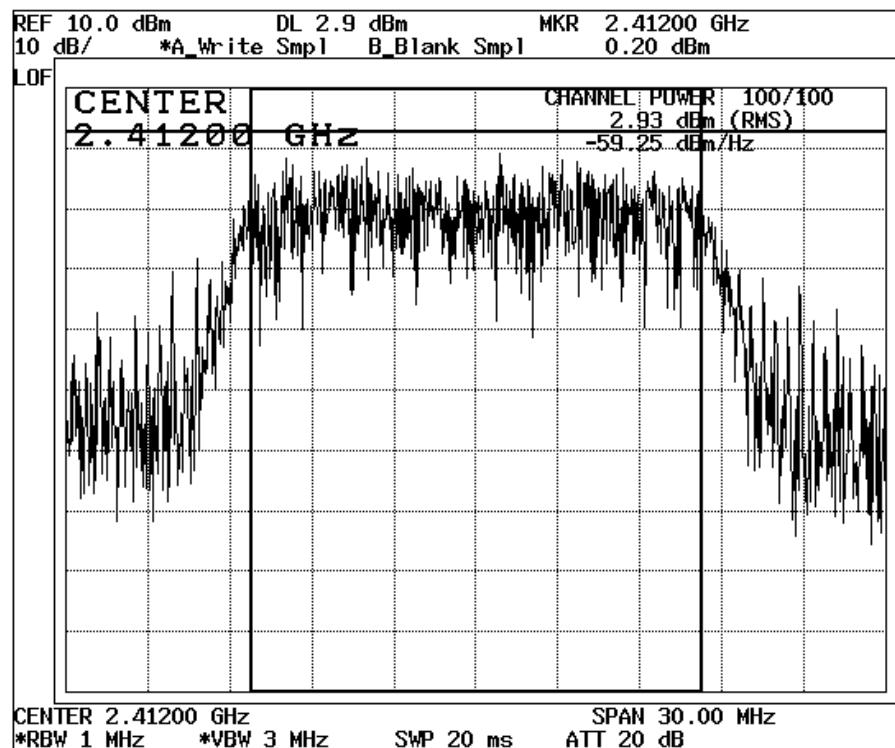


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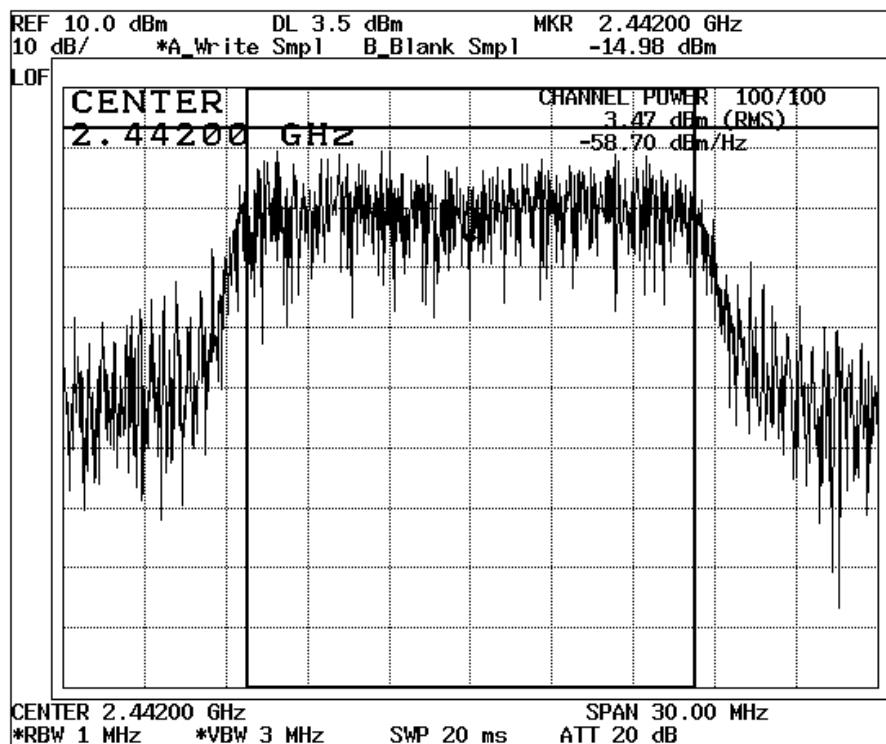
Test Item	Peak Power Output
Test Mode	802.11g
Test Site	RF Room
Measurement Method	Conducted

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
1	2412	2.93	1Watt=30dBm	Pass
7	2442	3.47	1Watt=30dBm	Pass
13	2472	3.64	1Watt=30dBm	Pass

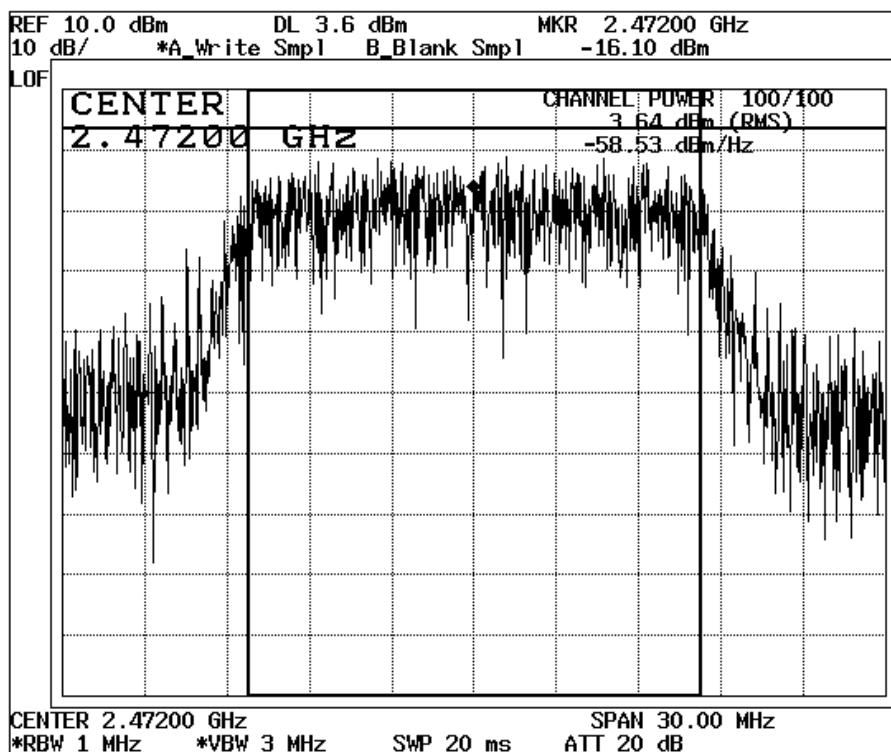
Channel 1.



Channel 7.



Channel 13.



3.4 Band Edge

3.4.1 Test Instruments

Description	Manufacturer	Model No.	Serial No.	Next of Calibration
Test Receiver	LIG NEX1	ER-265	L0804A002	Jul. 10, 2010
Horn Antenna	EMCO	3115	9012-3602	Jun. 26. 2011
Horn Antenna	R&S	HF906	100530	Jun. 26. 2011

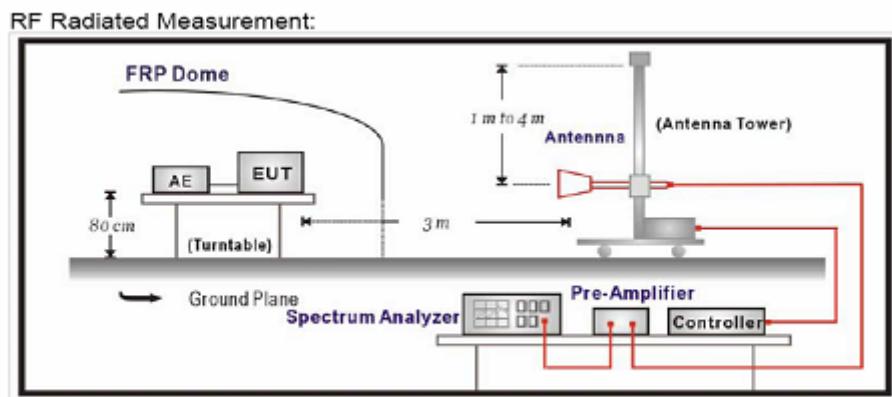
Note : 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to RRL, KRISS, KTL and HCT.
2. The calibration interval of horn ant. and loop ant. is 24 months

3.4.2 Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio Frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within The band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

Attenuation below the general limits specified in section 15.209(a) is not required. In addition, radiated emission 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)).

3.4.3 Test Configuration



3.4.4 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 fine 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 below 1 GHz setting on the field strength meter is 120 kHz, above 1GHz are 1MHz.

3.4.5 Test Result Method of Band Edge Test Result of Radiated Test.

Emission Level(dBuV/m) = Reading Level + Correct Factor.

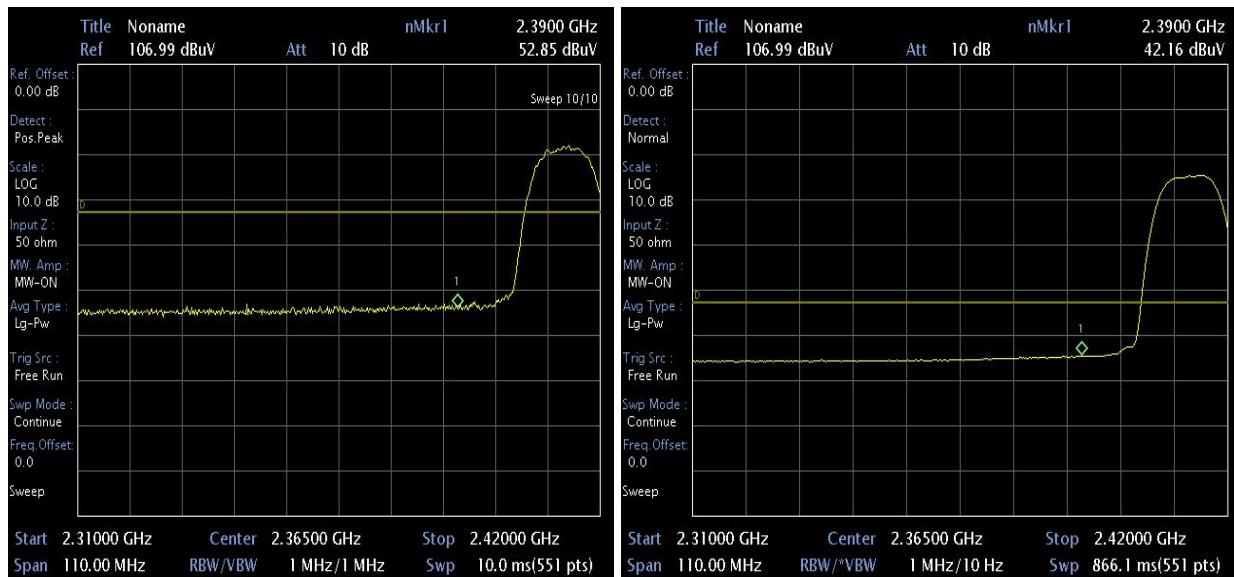
Test Frequency (MHz)	Correct Factor (dB)
2390	27.38
2483.5	27.54

Note : Correct Factor = AF + CL

AF – Antenna Factor , CL-Cable Loss

3.4.6 Band Edge Test Result

Detect mode	Peak / Average Mode	Test Site	3m Full Chamber
Note	IEEE802.11b- CH1 (2412 MHz)		
Ant. Pol.	Vertical		



Frequency (MHz)	Reading PK/AV (dBuV/m)	Factor(dB) CL+AF	Limits PK/AV (dBuV/m)	Result PK/AV (dBuV/m)	Margin PK/AV (dB)
2390	25.47/14.78	27.38	74/54	52.85/42.16	21.15/11.84

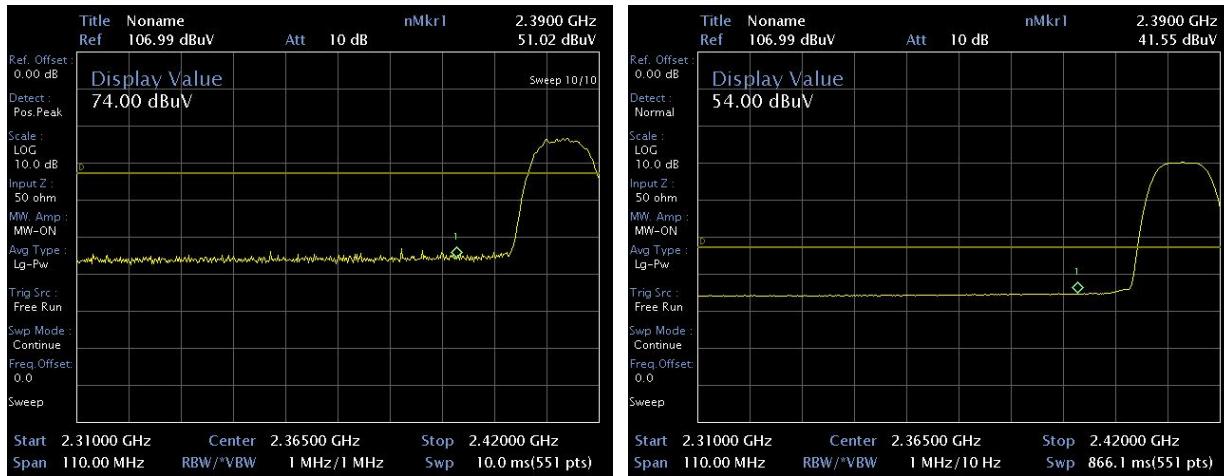
Note : Emission Level(dBuV/m) = Reading Level + Correct Factor

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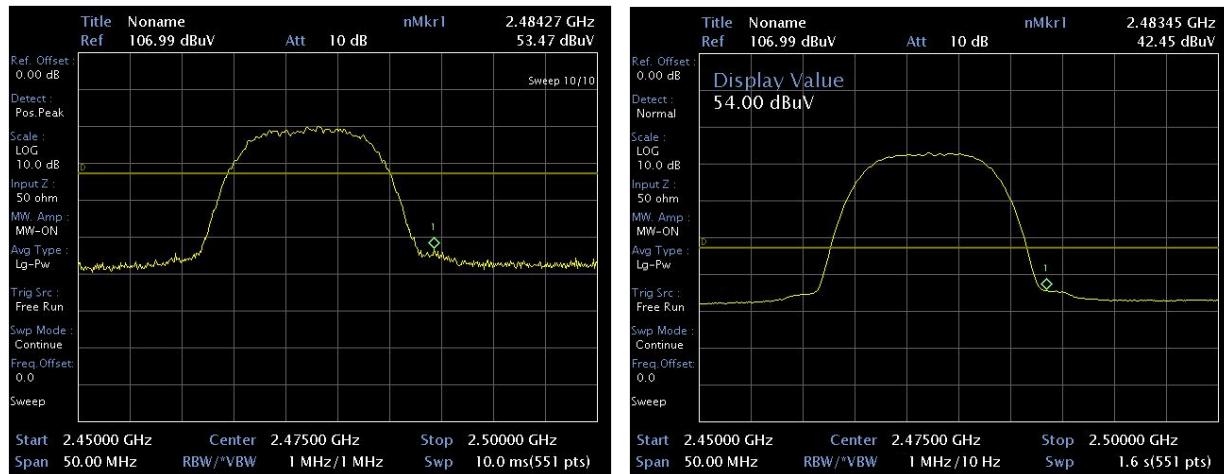
Detect mode	Peak / Average Mode	Test Site	3m Full Chamber
Note	IEEE802.11b- CH1 (2412 MHz)		
Ant. Pol.	Horizontal		



Frequency (MHz)	Reading PK/AV (dBuV/m)	Factor(dB) CL+AF	Limits PK/AV (dBuV/m)	Result PK/AV (dBuV/m)	Margin PK/AV (dB)
2390	23.64/14.17	27.38	74/54	51.02/41.55	22.98/12.45

Note : Emission Level(dBuV/m) = Reading Level + Correct Factor

Detect mode	Peak / Average Mode	Test Site	3m Full Chamber
Note	IEEE802.11b- CH13 (2472 MHz)		
Ant. Pol.	Vertical		



Frequency (MHz)	Reading PK/AV (dBuV/m)	Factor(dB) CL+AF	Limits PK/AV (dBuV/m)	Result PK/AV (dBuV/m)	Margin PK/AV (dB)
2483.5	29.83/14.91	27.54	74/54	53.47/42.45	20.53/11.55

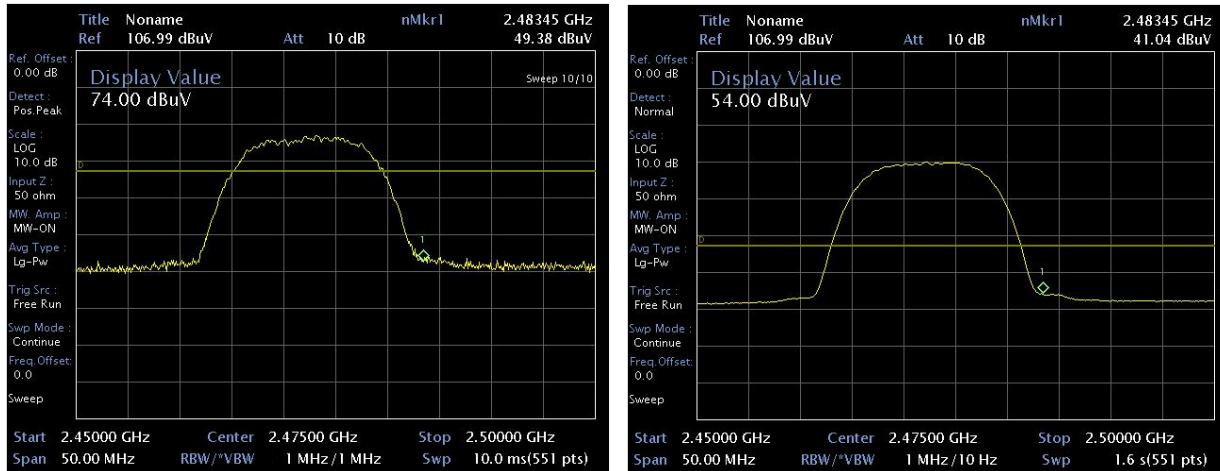
Note : Emission Level(dBuV/m) = Reading Level + Correct Factor

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Detect mode	Peak / Average Mode	Test Site	3m Full Chamber
Note	IEEE802.11b- CH13 (2472 MHz)		
Ant. Pol.	Horizontal		



Frequency (MHz)	Reading PK/AV (dBuV/m)	Factor(dB) CL+AF	Limits PK/AV (dBuV/m)	Result PK/AV (dBuV/m)	Margin PK/AV (dB)
2483.5	21.84/13.50	27.54	74/54	49.38/41.04	24.62/12.99

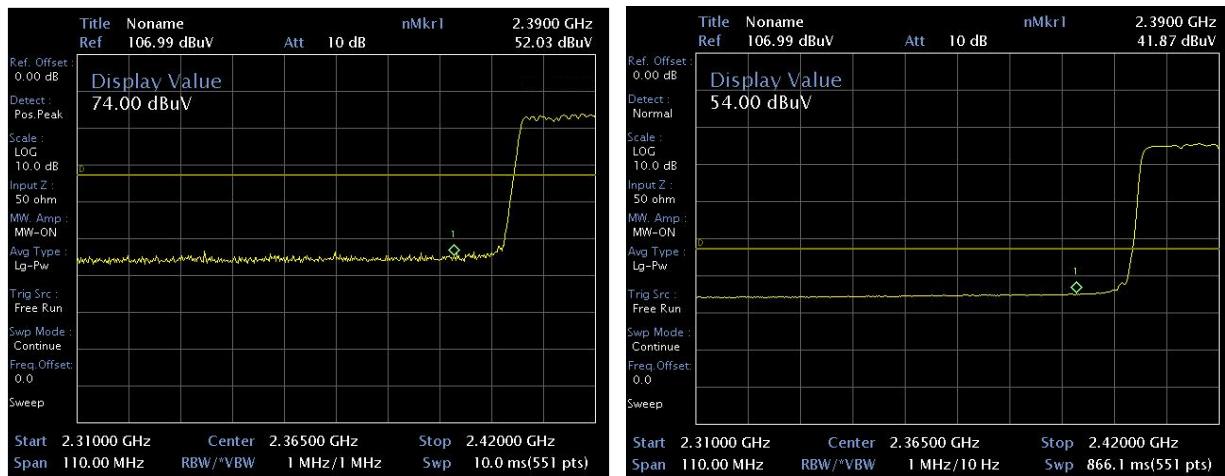
Note : Emission Level(dBuV/m) = Reading Level + Correct Factor

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Detect mode	Peak / Average Mode	Test Site	3m Full Chamber
Note	IEEE802.11g- CH1 (2412 MHz)		
Ant. Pol.	Vertical		



Frequency (MHz)	Reading PK/AV (dBuV/m)	Factor(dB) CL+AF	Limits PK/AV (dBuV/m)	Result PK/AV (dBuV/m)	Margin PK/AV (dB)
2390	24.65/14.49	27.38	74/54	52.03/41.87	21.97/12.13

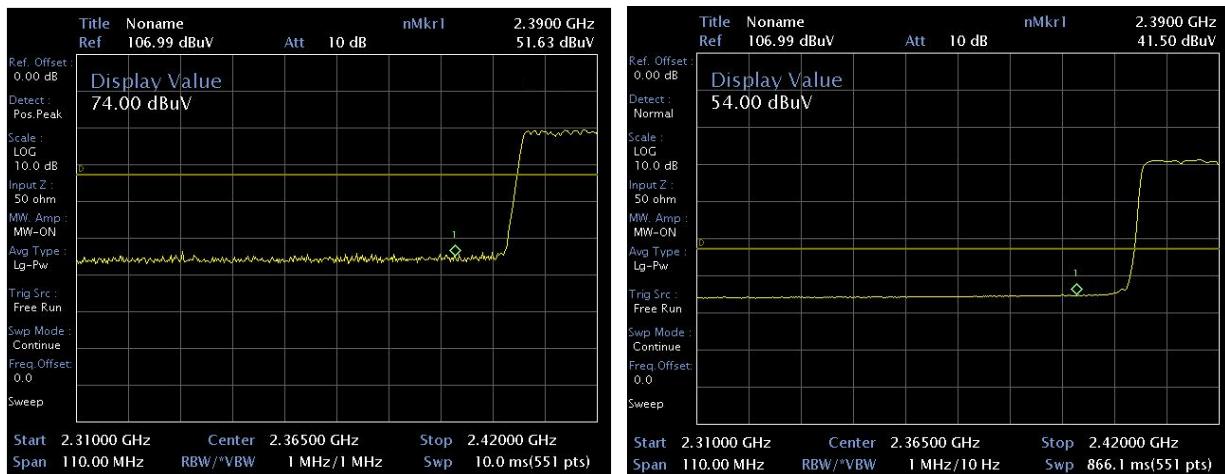
Note : Emission Level(dBuV/m) = Reading Level + Correct Factor

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Detect mode	Peak / Average Mode	Test Site	3m Full Chamber
Note	IEEE802.11g- CH1 (2412 MHz)		
Ant. Pol.	Horizontal		



Frequency (MHz)	Reading PK/AV (dBuV/m)	Factor(dB) CL+AF	Limits PK/AV (dBuV/m)	Result PK/AV (dBuV/m)	Margin PK/AV (dB)
2390	24.25/14.12	27.38	74/54	51.63/41.50	22.37/12.50

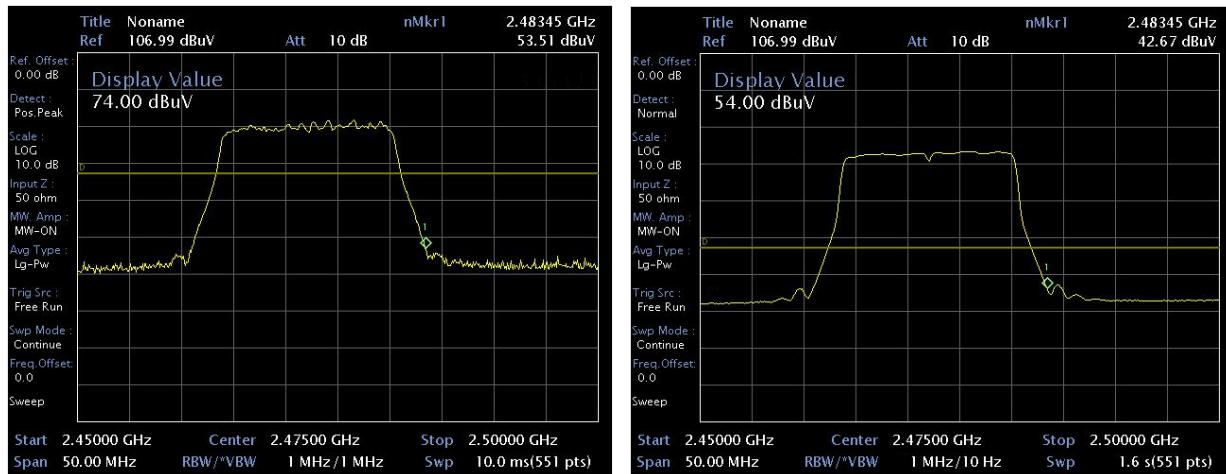
Note : Emission Level(dBuV/m) = Reading Level + Correct Factor

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Detect mode	Peak / Average Mode	Test Site	3m Full Chamber
Note	IEEE802.11g- CH13 (2472 MHz)		
Ant. Pol.	Vertical		



Frequency (MHz)	Reading PK/AV (dBuV/m)	Factor(dB) CL+AF	Limits PK/AV (dBuV/m)	Result PK/AV (dBuV/m)	Margin PK/AV (dB)
2483.5	25.97/15.13	27.54	74/54	53.51/42.67	20.49/11.33

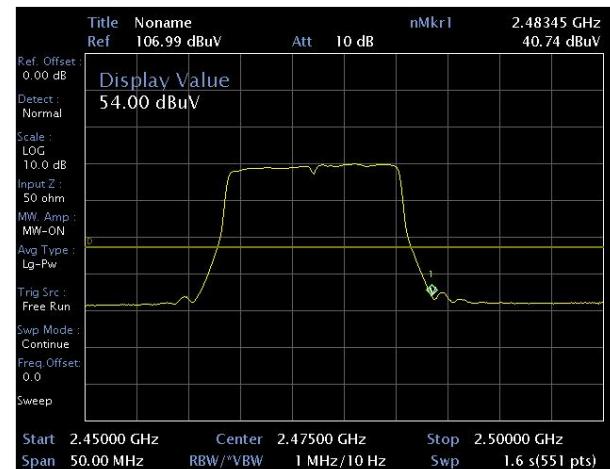
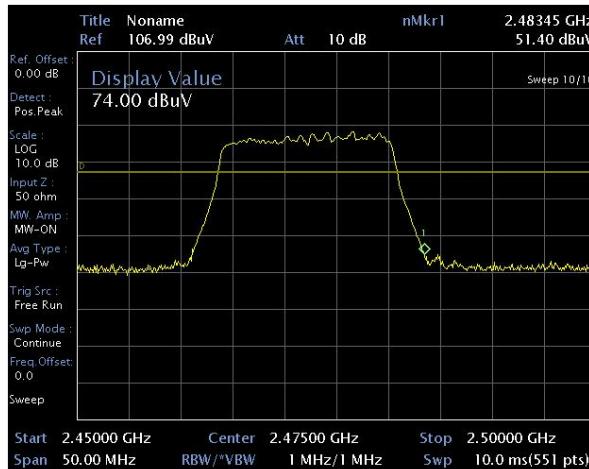
Note : Emission Level(dBuV/m) = Reading Level + Correct Factor

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Detect mode	Peak / Average Mode	Test Site	3m Full Chamber
Note	IEEE802.11g- CH13 (2472 MHz)		
Ant. Pol.	Horizontal		



Frequency (MHz)	Reading PK/AV (dBuV/m)	Factor(dB) CL+AF	Limits PK/AV (dBuV/m)	Result PK/AV (dBuV/m)	Margin PK/AV (dB)
2483.5	23.86/13.20	27.54	74/54	51.40/40.74	22.60/13.26

Note : Emission Level(dBuV/m) = Reading Level + Correct Factor

3.5 6 dB Band

3.5.1 Test Instruments

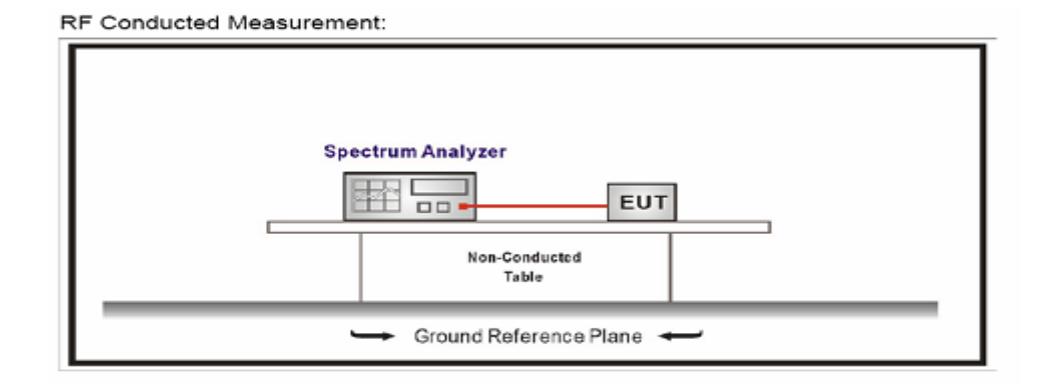
Description	Manufacturer	Model No.	Serial No.	Next of Calibration
Spectrum Analyzer	Advantest	R3273	121100554	Jun. 15, 2010
RF Test Room	-	-	-	-

Note : 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to RRL, KRISS, KTL and HCT.
2. The calibration interval of horn ant. and loop ant. is 24 months

3.5.2 Limit

(a) Operation under the provisions of this Section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions :
(2) systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

3.5.3 Test Configuration



3.5.4 Test Procedure

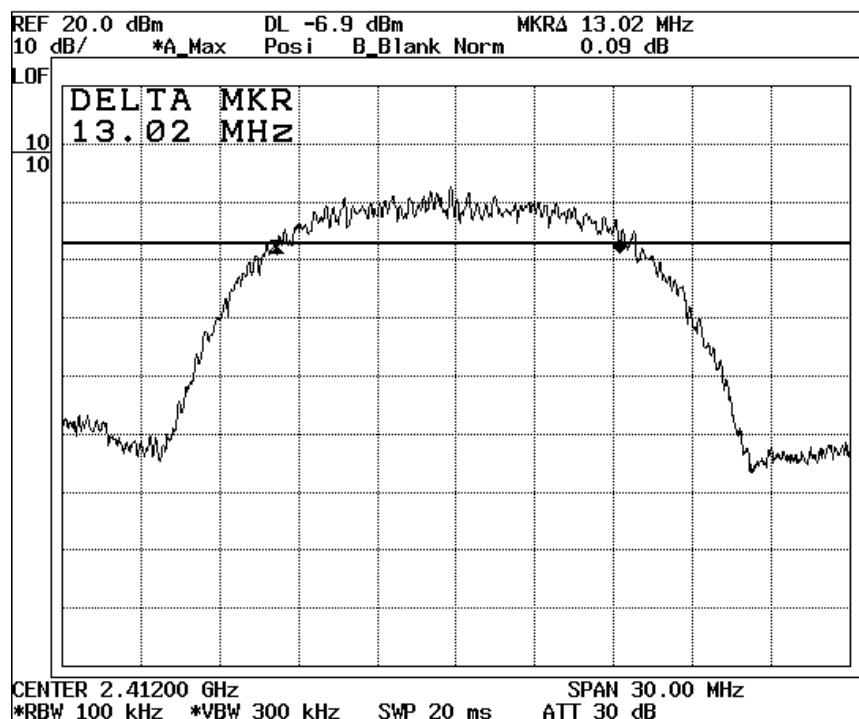
The transmitter output is connected to the Spectrum analyzer. The Spectrum analyzer is set to the 6dB Band.

3.5.5 6 dB Band Test Result

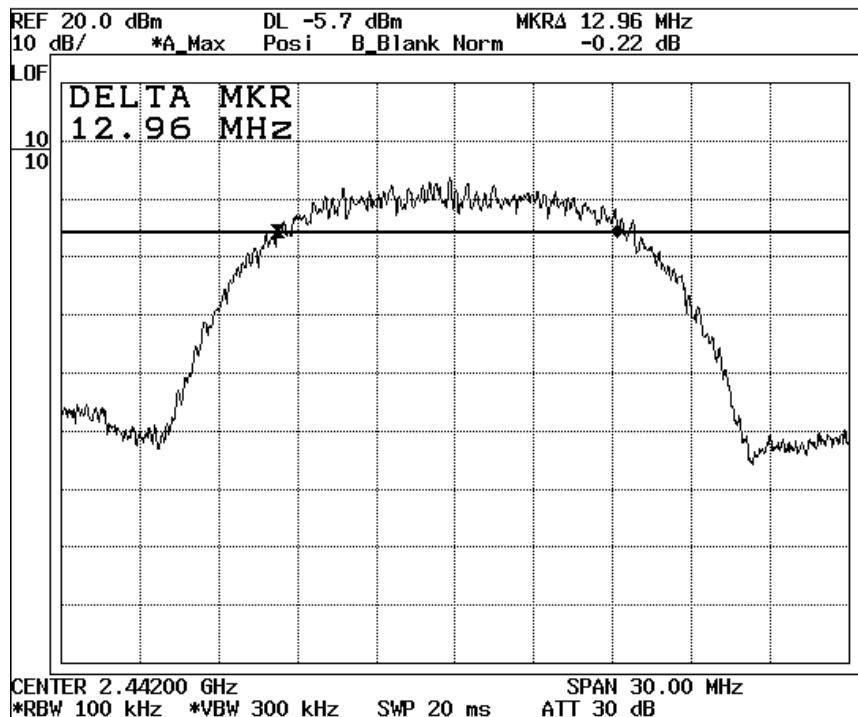
Test Item	6 dB Band
Test Mode	802.11b
Test Site	RF Room
Measurement Method	Conducted

Channel No.	Frequency (MHz)	Measure (kHz)	Limit (kHz)	Result
1	2412	13020	>500	Pass
7	2442	12960	>500	Pass
13	2472	12360	>500	Pass

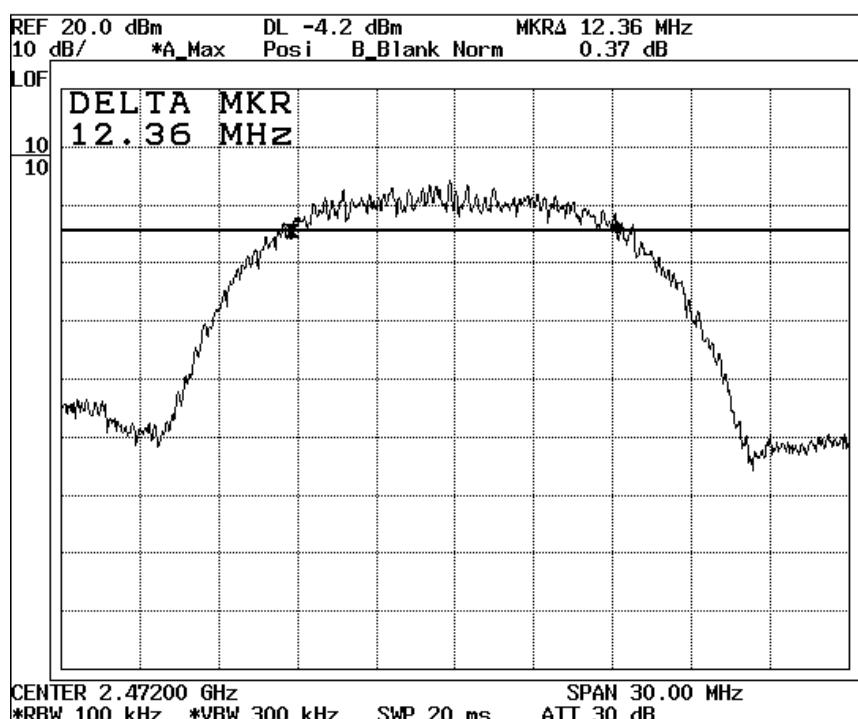
Channel 1.



Channel 7.



Channel 13.



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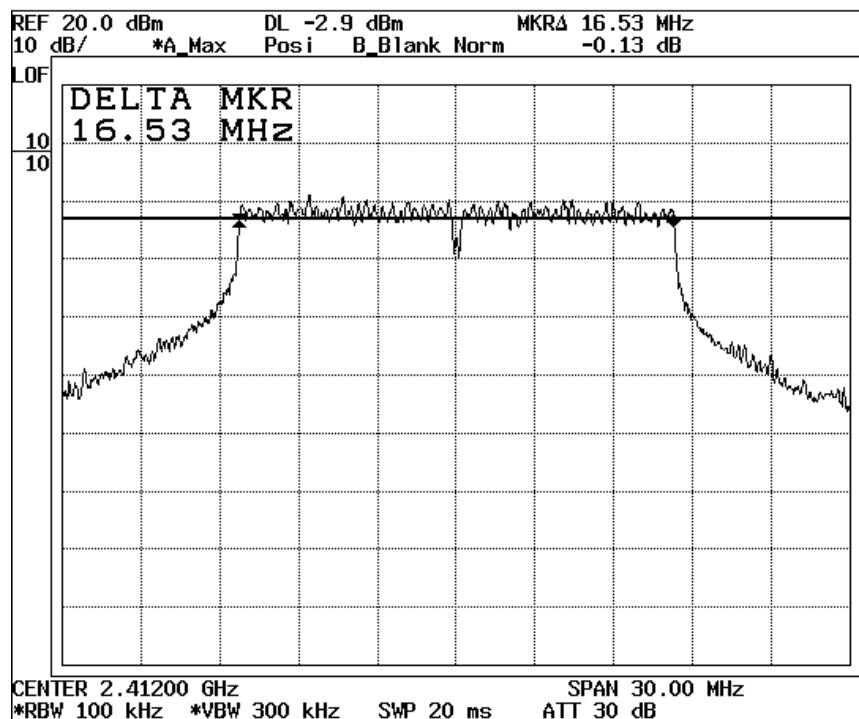
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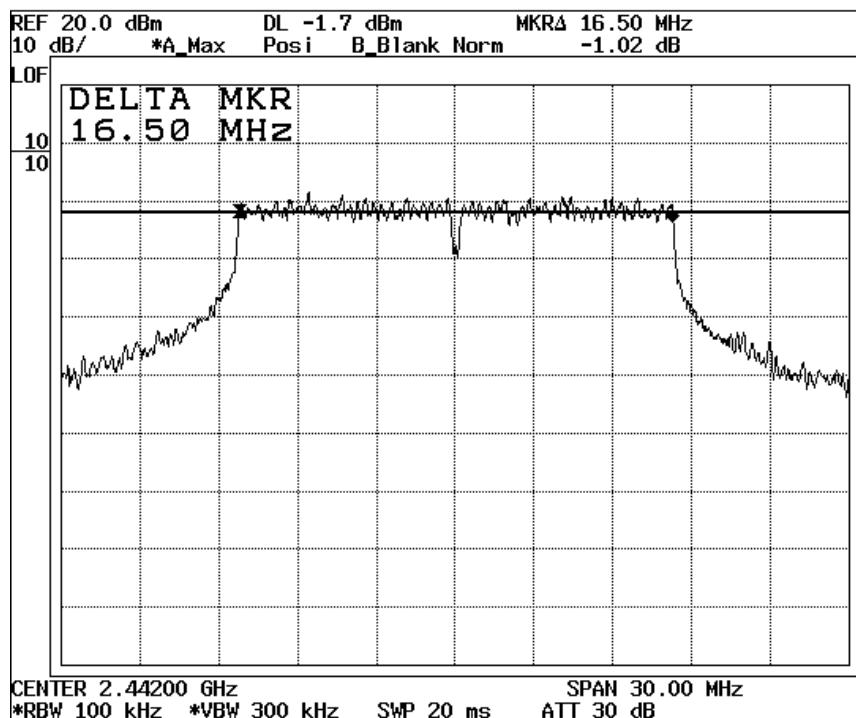
Test Item	6 dB Band
Test Mode	802.11g
Test Site	RF Room
Measurement Method	Conducted

Channel No.	Frequency (MHz)	Measure (kHz)	Limit (kHz)	Result
1	2412	16530	>500	Pass
7	2442	16500	>500	Pass
13	2472	16500	>500	Pass

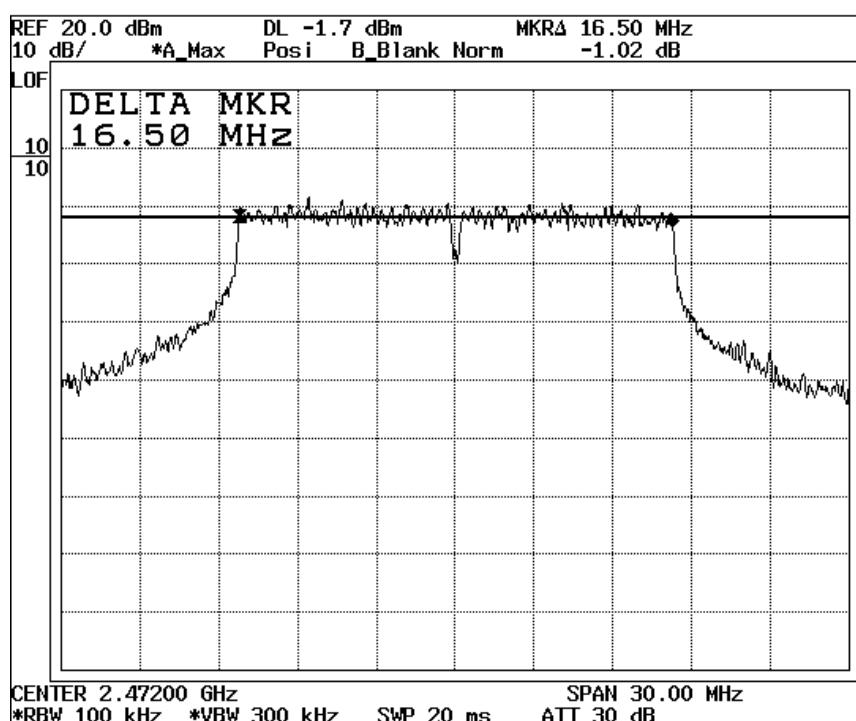
Channel 1.



Channel 7.



Channel 13.



3.6 Power Density

3.6.1 Test Instruments

Description	Manufacturer	Model No.	Serial No.	Next of Calibration
Spectrum Analyzer	Advantest	R3273	121100554	Jun. 15, 2010
RF Test Room	-	-	-	-

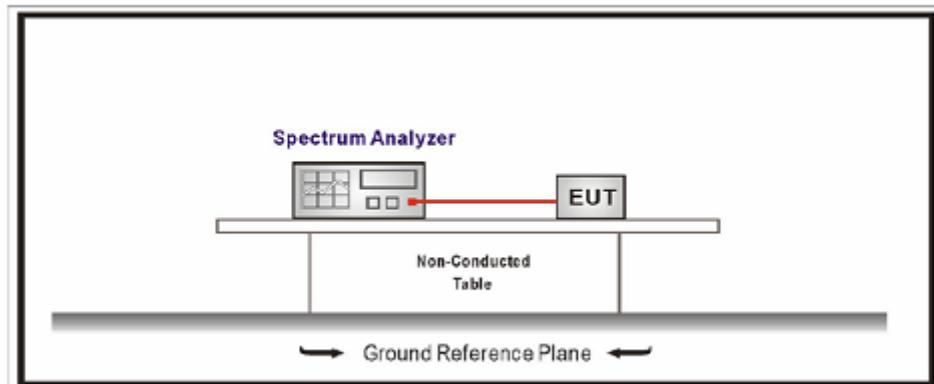
Note : 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to RRL, KRISS, KTL and HCT.
2. The calibration interval of horn ant. and loop ant. is 24 months

3.6.2 Limit

Section 15.247 (e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (v) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

3.6.3 Test Configuration

RF Conducted Measurement:



3.6.4 Test Procedure

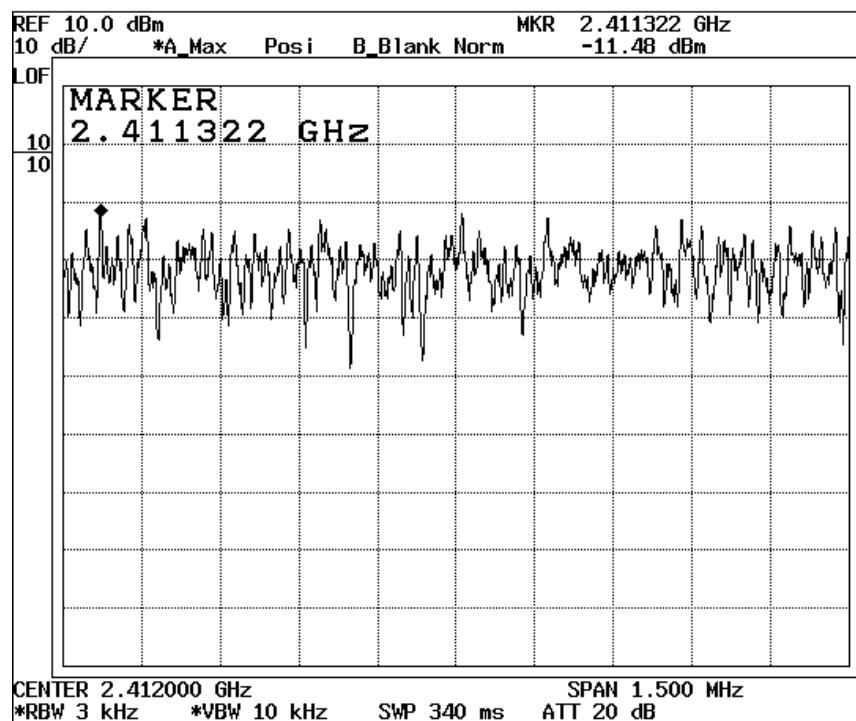
The transmitter output is connected to the Spectrum analyzer. The Spectrum analyzer is set to the Power Density.

3.6.5 Power Density Test Result

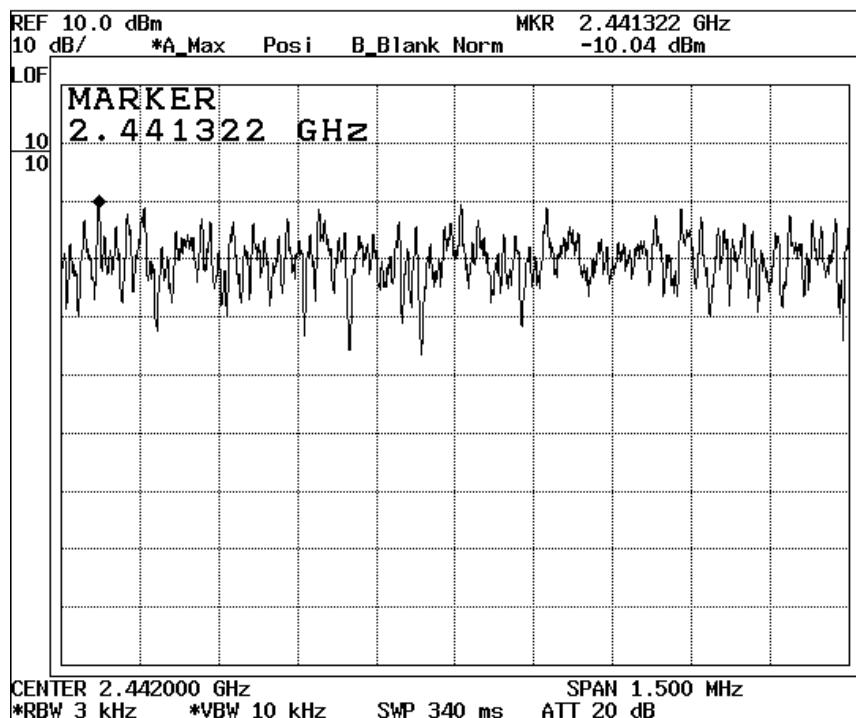
Test Item	Power Density
Test Mode	802.11b
Test Site	RF Room
Measurement Method	Conducted

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
1	2412	-11.48	< 8	Pass
7	2442	-10.04	< 8	Pass
13	2472	-10.48	< 8	Pass

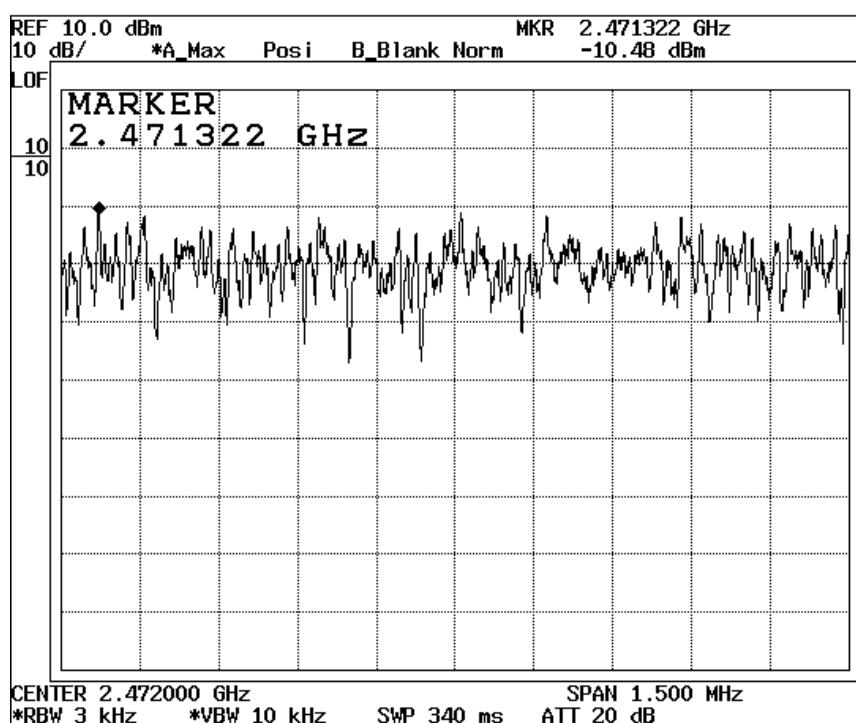
Channel 1.



Channel 7.



Channel 13.

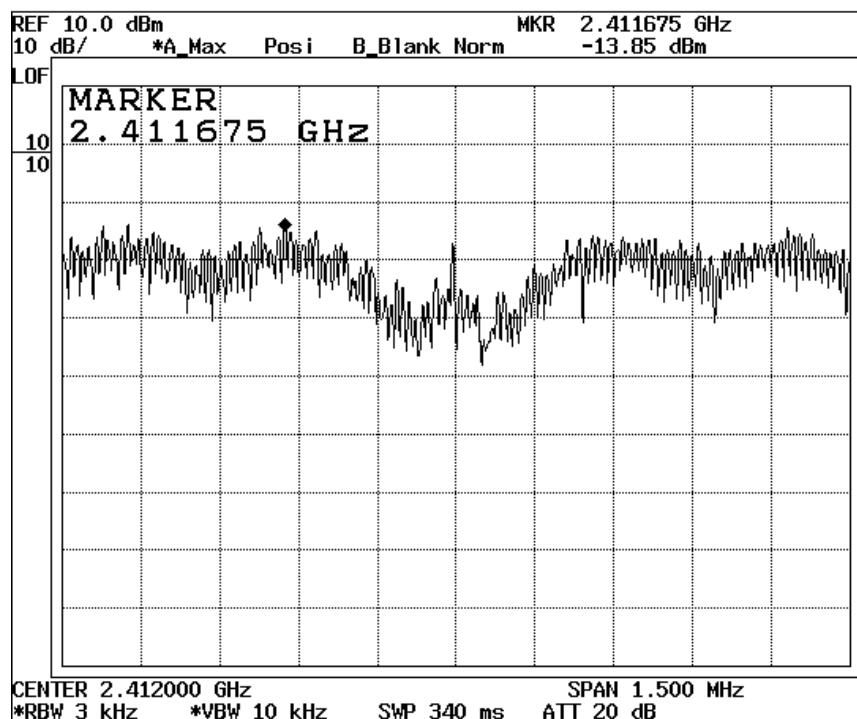


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Test Item	Power Density
Test Mode	802.11g
Test Site	RF Room
Measurement Method	Conducted

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
1	2412	-13.85	< 8	Pass
7	2442	-12.66	< 8	Pass
13	2472	-13.17	< 8	Pass

Channel 1.

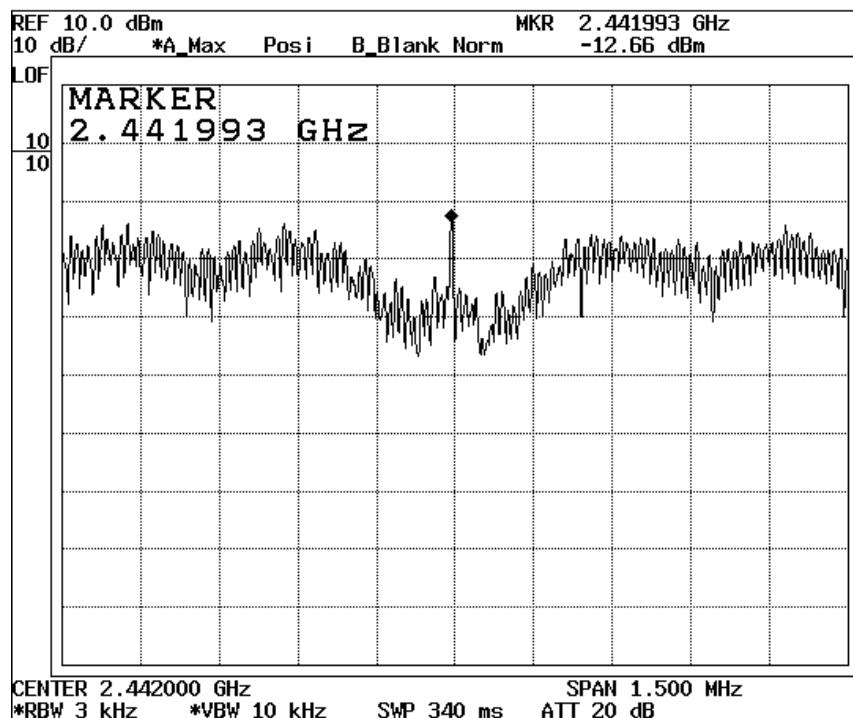


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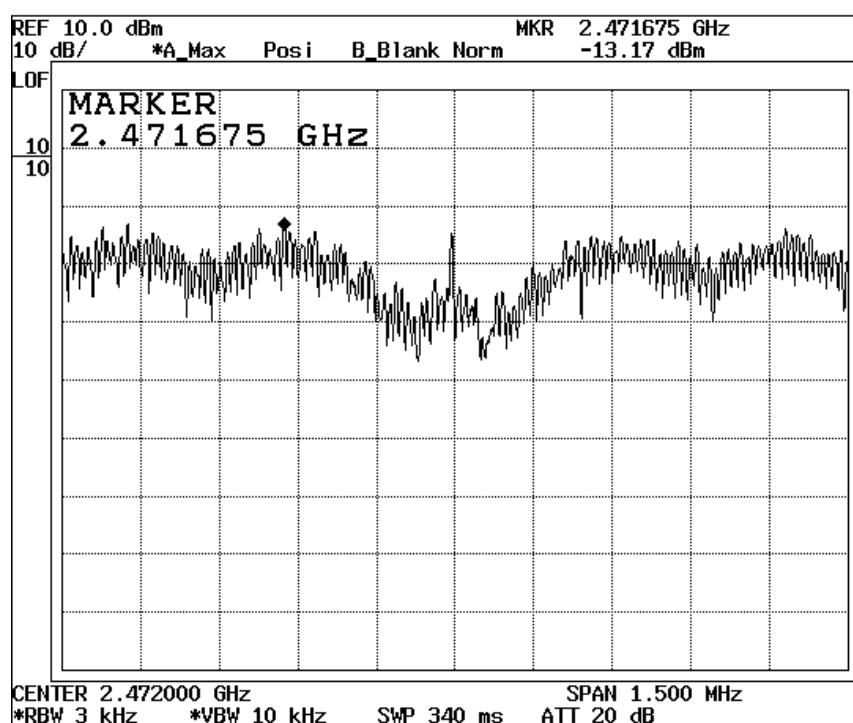
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Channel 7.



Channel 13.



4.1 Radiated Field emission-15.225(a)

4.1.1 Test Instruments

Description	Manufacturer	Model No.	Serial No.	Next of Calibration
Loop ANT.	Schwarz beck	HFH2-Z2	100187	2010.06.16
Receiver	LIG Nex 1	ER-265	L0804B002	2010.06.30
Bi-Log Ant.	EMCO	3142	9701-1128	2010.11.13

Note :

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to RRL, KRISS, KTL and HCT.
2. The calibration interval of horn ant. and loop ant. is 24 months

4.1.2 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. For the limit is employed average value, therefore the peak value can be transferred to average value by subtracting the duty factor. The basic equation with a sample calculation is as follows:

$$\text{Peak} = \text{Reading} + \text{Corrected Factor}$$

Where

Corr. Factor = Antenna Factor + Cable Factor - Amplifier Gain (if any)

4.1.3 Test Result – Radiated Field Emission-15.225(a)

Frequency(MHz)	Field Strength of Fundamental uV/m	Field Strength of Fundamental dBuV/m(30m)	Field Strength of Fundamental dBuV/m(3m)
13.553 – 13.567	15,848	83.9	123.9

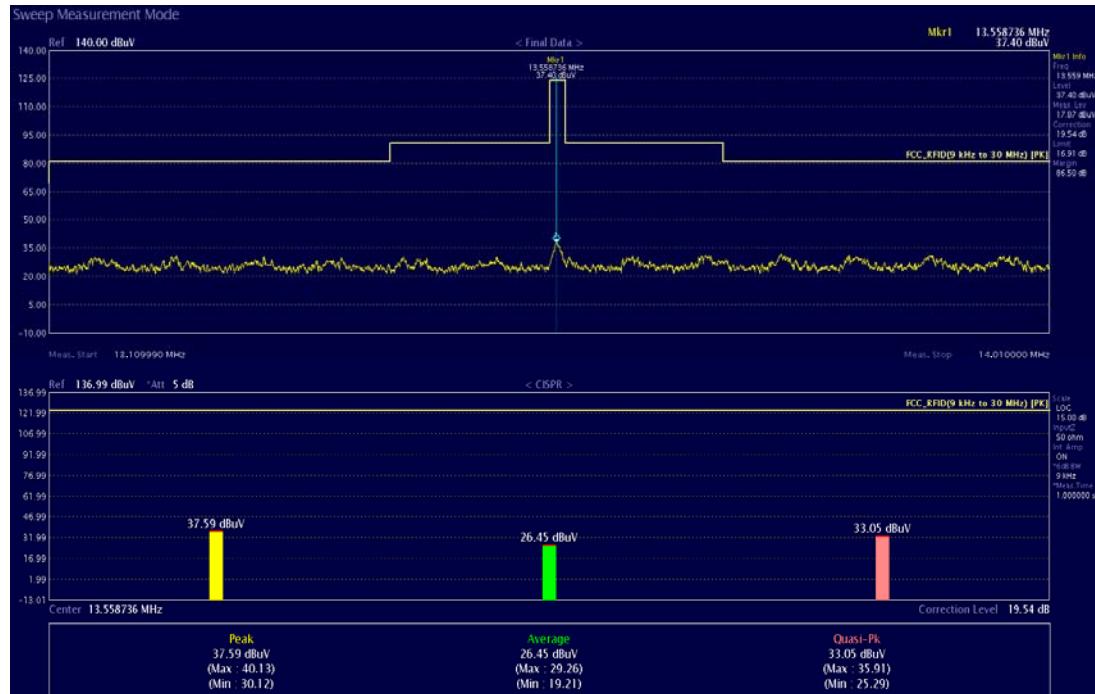
[Applicable]

Freq. [MHz]	Reading [dBuV/m]	Antenna Factor [dB/m]	Cable Loss [dB]	Polar. [H/V]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]
13.5595	16.39	18.70	0.82	H	35.91	123.9	87.99
13.5595	22.43	18.70	0.82	V	41.95	123.9	81.95

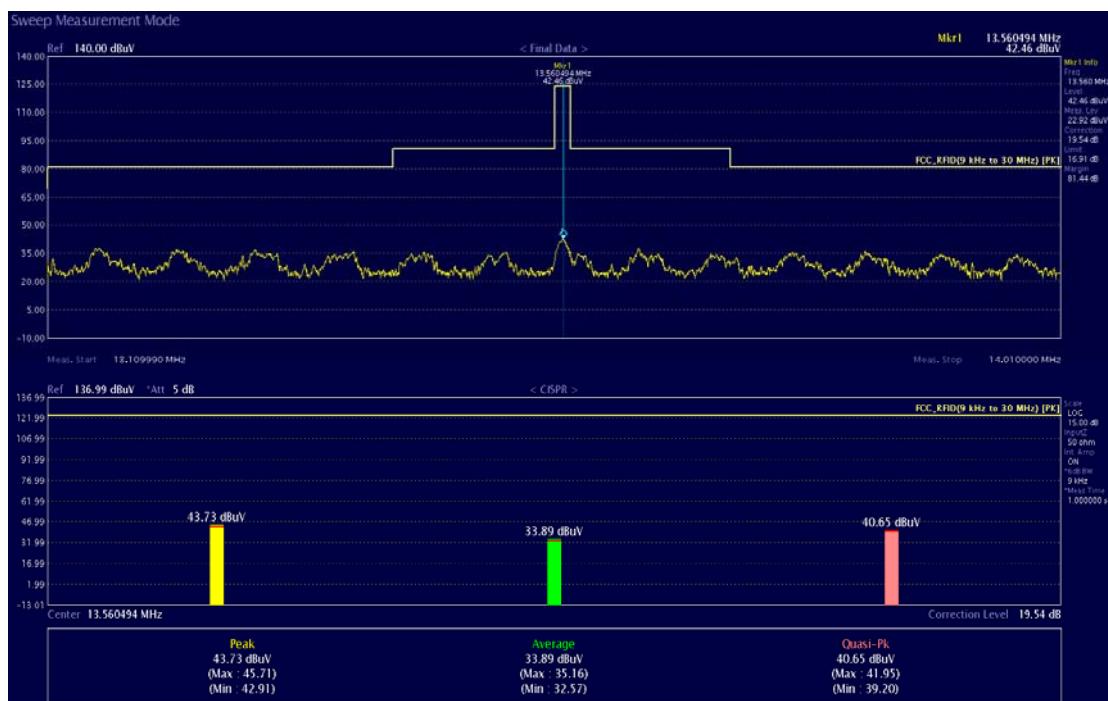
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[HOR.]



[VER.]

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4.2 Radiated Electric Emission-15.225(b) (c)

Frequency (MHz)	Field Strength of Fundamental uV/m	Field Strength of Fundamental dBuV/m(30m)	Field Strength of Fundamental dBuV/m(3m)
13.110 – 13.410	106	40.5	80.5
13.410 – 13.553	334	50.4	90.4
13.567 – 13.710	334	50.4	90.4
13.710 – 14.010	106	40.5	80.5

[Applicable]

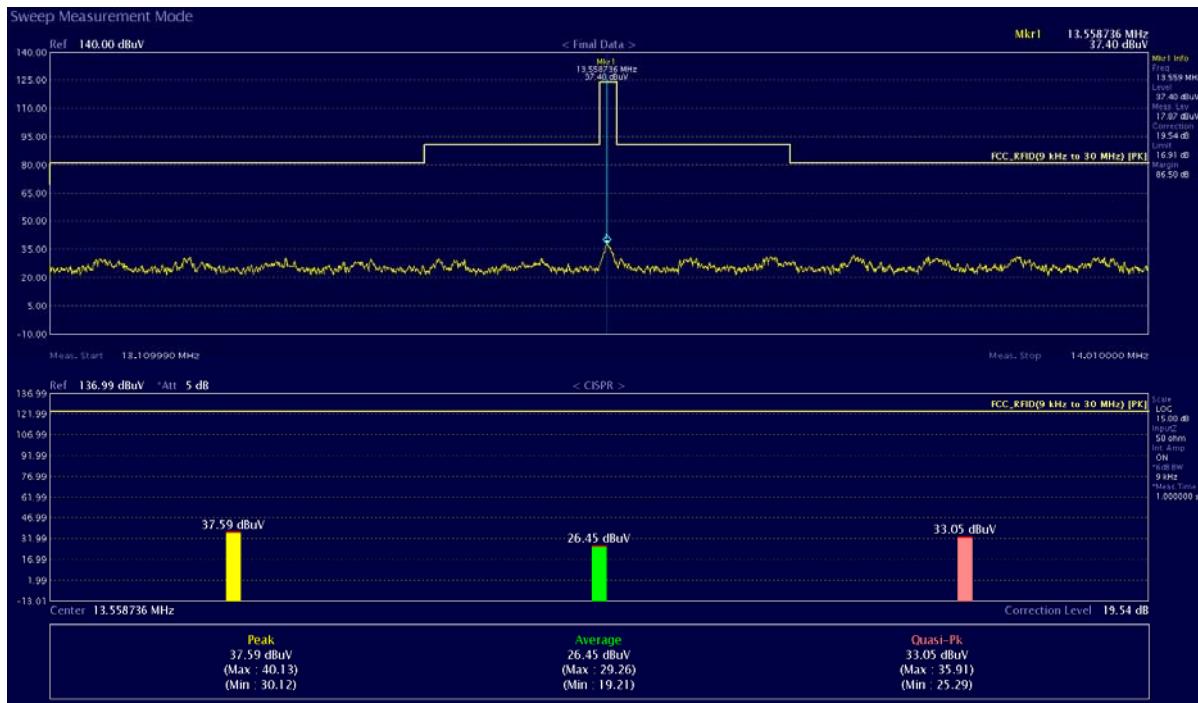
Freq. [MHz]	Reading [dBuV/m]	Height [m]	Antenna Factor [dB/m]	Cable Loss [dB]	Polar. [H/V]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]
-	-	-	-	-	-	-	-	-

Note : Other emission don't exceed the level 20dB below the applicable limit.

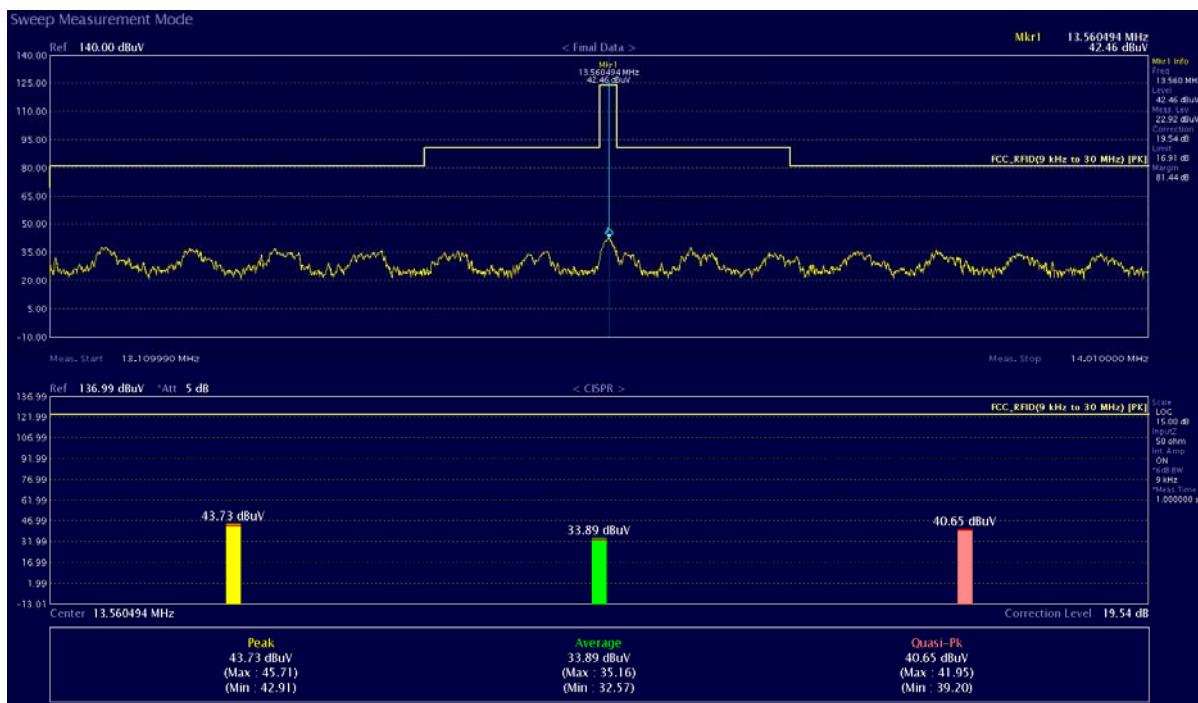
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[HOR.]



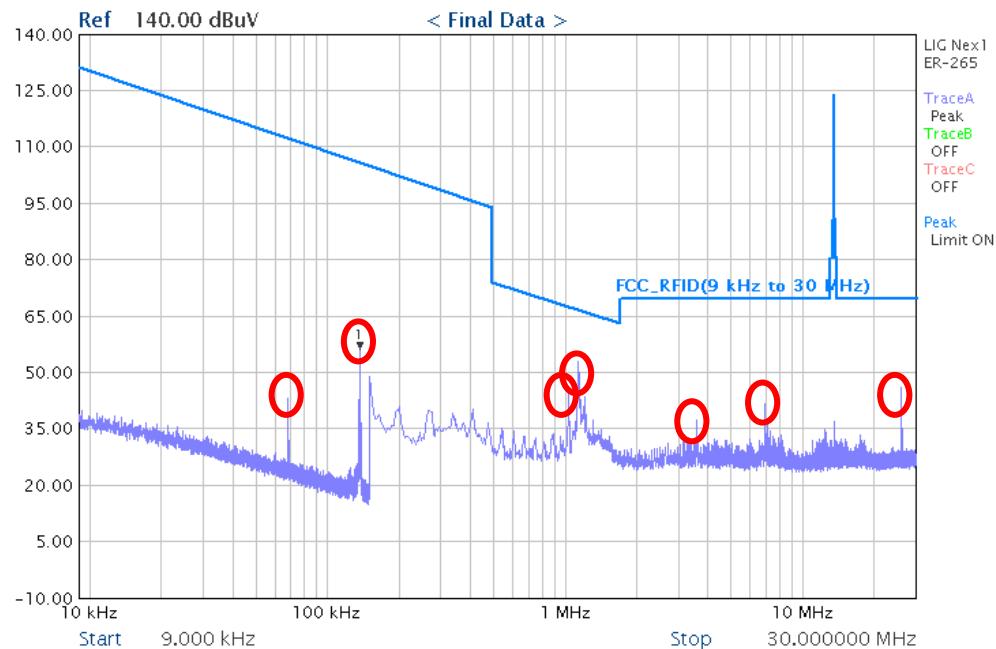
[VER.]

4.3 Radiated Field Emission-15.109,15.209, 15.225(d)

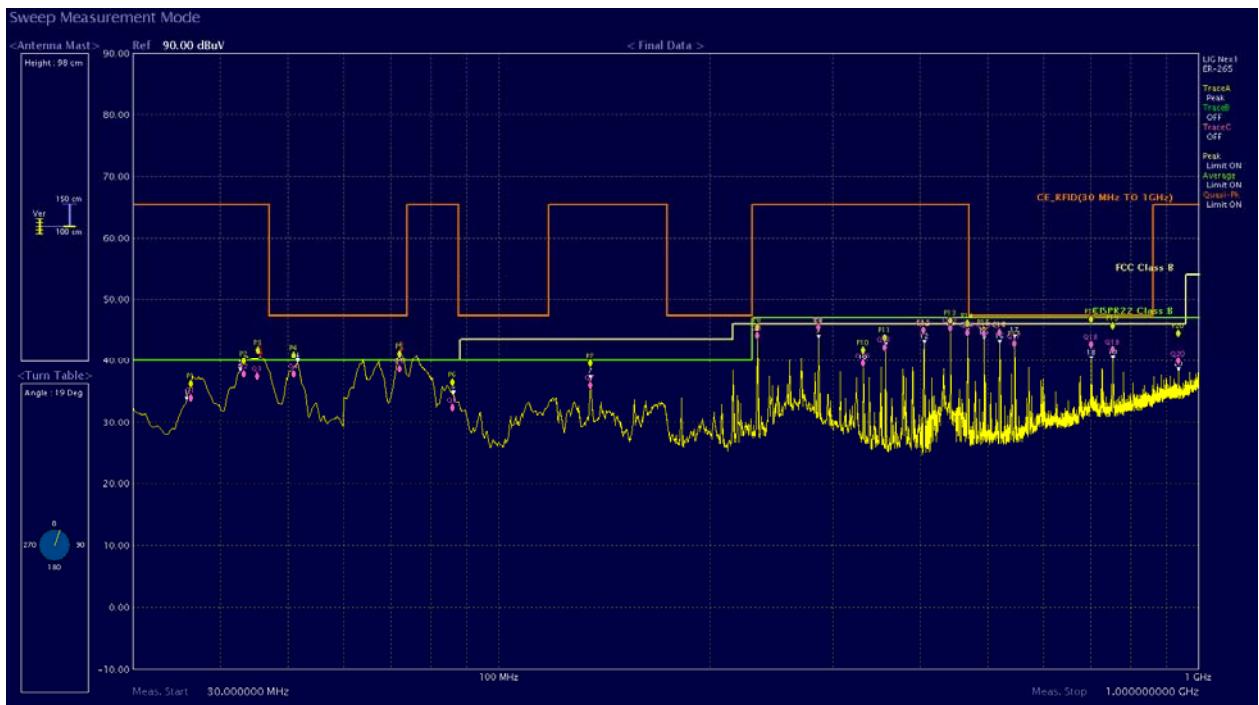
Frequency (MHz)	Field Strength of Fundamental uV/m	Field Strength of Fundamental dBuV/m(3m)
1.705 – 30.0	30 (at 30m)	49.5
30 – 88	100 (at 3m)	40
88 – 216	150 (at 3m)	43.5
216 - 960	200 (at 3m)	46
Above 960	500 (at 3m)	54

Frequency MHz	Reading dBuV/m	P (H, V)	Ant. Factor dB	Cable Loss dB	AMP GAIN dB	Limit dBuV/m	Total dBuV/m	Margin dB
234.00	25.14	H	15.61	3.34	0.0	46.00	44.09	1.91
441.99	22.58	H	15.66	5.02	0.0	46.00	43.26	2.74
390.00	24.43	H	14.66	4.52	0.0	46.00	43.61	2.39
432.00	21.27	H	15.47	4.92	0.0	46.00	41.66	4.34
493.98	19.20	H	17.35	5.45	0.0	46.00	42.00	4.00
519.99	19.59	V	17.56	5.58	0.0	46.00	42.73	3.27
546.00	18.79	V	17.56	5.68	0.0	46.00	42.03	3.97
571.99	17.81	V	17.82	5.88	0.0	46.00	41.51	4.49
598.00	17.17	H	18.14	6.08	0.0	46.00	41.39	4.61
649.99	15.87	H	19.82	6.40	0.0	46.00	42.09	3.91
701.98	15.89	V	20.18	6.62	0.0	46.00	42.69	3.64

[Below 30 MHz]



[30 to 1000 MHz]



Note : Remark "O" means that the data is Compat chamber ambient.

4.4 Frequency Stability-15.225(e)

4.4.1 Test Instruments

Description	Manufacturer	Model No.	Serial No.	Next of Calibration
Spectrum Analyzer	Advantest	R3273	121100554	2010.06.12
TEM&HUMID CHAMBER	SukSan Tech.	SE-CT-02	20080204-01	2011.02.04

Note :

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to RRL, KRISS, KTL and HCT.
2. The calibration interval of horn ant. and loop ant. is 24 months

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery

4.4.2 Test Results.

Table 1 : Frequency Tolerance

Reference Frequency : 13.5595 MHz, Limit : within ± 1355.95 Hz

Environment Temperature [°C]	Power Supplied [Vac]	Carrier Frequency Measured with Time Elapsed							
		SRARTUP		2 minutes		5 minutes		10 minutes	
		[Hz]	Err[Hz]	[Hz]	Err[Hz]	[Hz]	Err[Hz]	[Hz]	Err[Hz]
+50	120	13559609	109	13559573	73	13559577	77	13559582	82
+40	120	13559585	85	13559576	76	13559574	74	13559572	72
+30	120	13559596	96	13559588	88	13559589	89	13559584	84
+20	120	13559621	121	13559611	111	13559602	102	13559595	95
+10	120	13559606	106	13559622	122	13559620	120	13559613	113
0	120	13559617	117	13559586	86	13559597	97	13559617	117
-10	120	13559609	109	13559609	109	13559585	85	13559587	87
-20	120	13559523	23	13559554	54	13559584	84	13559575	75

Table 2 : Frequency Tolerance

Reference Frequency : 13.5595 MHz, Limit : within ± 1355.95 Hz

Power Supplied[Vdc]	Carrier Frequency Measured with Time Elapsed							
	SRARTUP		2 minutes		5 minutes		10 minutes	
	[Hz]	Err[Hz]	[Hz]	Err[Hz]	[Hz]	Err[Hz]	[Hz]	Err[Hz]
85 %	13559589	89	13559589	89	13559585	85	13559582	82
100 %	13559588	88	13559589	89	13559585	85	13559582	82
115 %	13559588	88	13559588	88	13559584	84	13559582	82

Err[Hz] = Measured carrier frequency (MHz) – Reference Frequency (13.5595 MHz)

5.0 ANTENNA REQUIREMENT

5.1 RFID Antenna

5.1.1 Applicable Standard

According to § 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.

5.1.2 Antenna Construction

The antenna is permanently mounted on PCB, no consideration of replacement.

5.1.3 Test Result : Pass

5.2 WIFI Antenna

5.1.1 Applicable Standard

According to § 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.

5.1.2 Antenna Construction

The antenna is permanently fixed on product case, no consideration of replacement
Helical antenna SMA connector of the RF board through the device is fixed and the Maximum gain of the antennas is 2.0 dBi.

5.1.3 Test Result : Pass

Appendix A. The Photo of Test Setup

- **Front View of Conducted Emission**



- **Rear View of Conducted Emission**



● **View of Radiated Emission (9 kHz to 30 MHz)**



● **View of Radiated Emission (30 MHz to 1GHz)**



● View of Radiated Emission (Above 1GHz)



Appendix B. The Photo of Equipment Under Test

Front View of EUT



Rear View of EUT



Inside View of EUT

