



FCC EVALUATION REPORT FOR CERTIFICATION

Manufacturer: LG Electronics Inc.

391-2, Gaeumjeong-dong, Changwon City,

Gyeongnam 641-711, Korea

Attn: Mr. Kwang-Mu Son, Chief research engineer

Date of Issue: August 23, 2012

Order Number: GETEC-C1-12-252

Test Report Number: GETEC-E3-12-089

Test Site: GUMI COLLEGE EMC CENTER

FCC Registration Number: (100749, 443957)

FCC ID. : BEJWB3012

Applicant : LG Electronics Inc.

Rule Part(s) : FCC Part 15 Subpart C-Intentional Radiator § 15.247

Test Method : ANSI C63.10-2009

Equipment Class : Digital Transmission System(DTS)

EUT Type : WiFi module

Type of Authority : Certification

Model Name : HWM-300

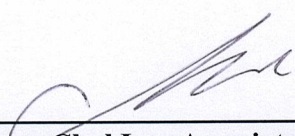
Trade Name : LG

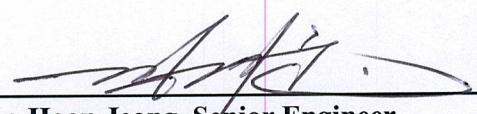
This equipment has been shown to be in compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4-2009

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Tested by,

Reviewed by,


**Seung-Chul Lee, Associate Engineer
GUMI COLLEGE EMC CENTER**


**Jae-Hoon Jeong, Senior Engineer
GUMI COLLEGE EMC CENTER**



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Scope: Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and / or unintentional radiators for compliance with technical rules and regulations of the Federal Communications Commission.

1. General Information

Applicant: LG Electronics Inc.

Applicant Address: 391-2, Gaeumjeong-dong, Changwon City, Gyeongnam 641-711, Korea

Manufacturer: LG Electronics Inc.

Manufacturer Address: 391-2, Gaeumjeong-dong, Changwon City, Gyeongnam 641-711, Korea

Contact Person: Mr. Kwang-Mu Son, Chief research engineer

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- **FCC ID.** BEJWB3012
- **Equipment Class** Digital Transmission System (DTS)
- **EUT Type** WiFi module
- **Model Name** HWM-300
- **Rule Part(s)** FCC Part 15, Subpart C-Intentional Radiator § 15.247
- **Test Method** ANSI C63.10 (2009)
- **Type of Authority** Certification
- **Test Procedure(s)** ANSI C63.4 (2009)
- **Dates of Test** August 17 ~ 23, 2012
- **Place of Test** GUMI COLLEGE EMC CENTER (FCC Registration No.: 100749, 443957)
407, Bugok-Dong, Gumi-City, Gyungbok, 730-711, Republic of Korea
- **Test Report Number** GETEC-E3-12-089
- **Dates of Issue** August 23, 2012

EUT Type: WiFi module

FCC ID.: BEJWB3012



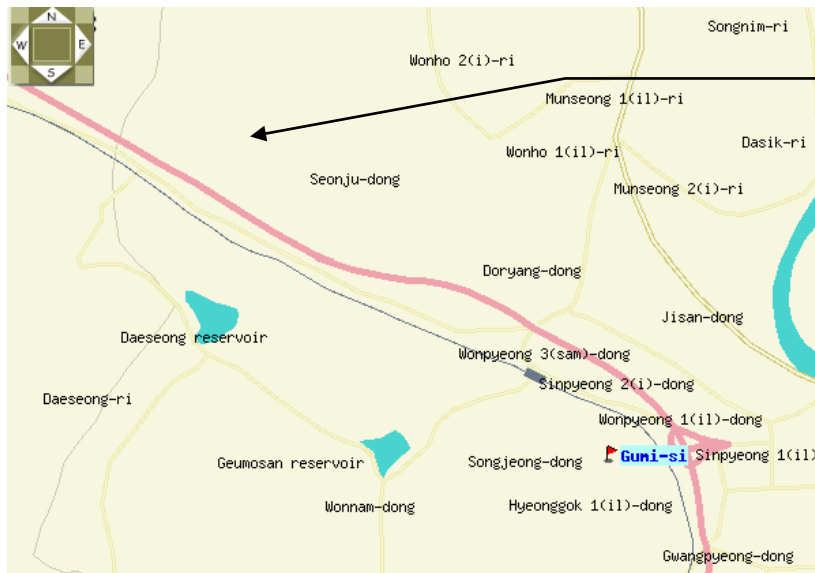
2. Introduction

The measurement procedure described in American National Standard for Methods of Measurement of Radio-Nose Emissions From Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ANSI C63.4-2009) was used in determining radiated and conducted emissions emanating from **LG Electronics Inc. WiFi module (Model name: HWM-300)**

These measurement tests were conducted at **GUMI COLLEGE EMC CENTER**.

The site address is 407, Bugok-Dong, Gumi-City, Gyungbok, 730-711, Republic of Korea.

This test site is one of the highest point of Gumi 1 college at about 200 kilometers away from Seoul city and 40 kilometers away from Daege city. It is located in the valley surrounded by mountains in all directions where ambient radio signal conditions are quiet and a favorable area to measure the radio frequency interference on open field test site for the computing and ISM devices manufactures. The detailed description of the measurement facility was found to be in compliance with the requirements of §2.948 according to ANSI C63.4 (2009)



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Fig 1. The map above shows the Gumi College in vicinity area.



3. Product Information

3.1 Description of EUT

The Equipment under Test (EUT) is the **LG Electronics Inc. WiFi module**
(Model Name: HWM-300) FCC ID.: BEJWB3012

- . Technology	IEEE 802.11b/g, WiFi compliant
- . Frequency	2 400.0 MHz to 2 483.5 MHz (US/Canada/Europe)
- . Modulation Technology	DSSS, CCK, OFDM
- . Modulation Type	DBPSK, DQPSK, CCK, BPSK, QPSK, 16QAM, 64QAM
- . Network Access Modes	Access Point, Infrastructure
- . Channels	USA/Canada: 11 channels
- . Wireless Data Rate	802.11b = 11, 5.5, 2, 1 Mbps 802.11g = 54, 48, 36, 24, 18, 12, 9, 6 Mbps
- . MAC	CSMA/CA with ACK, RTS, CTS
- . Network Protocols	TCP/IP, ARP, ICMP, DHCP, DNS, UDP, TFTP, UDP, PING
- . Security Protocols	Disabled, WEP 64 & 128bit, WPA (TKIP), WPA (AES), WPA2 (AES), 802.1x (EAP) Supplicant 802.11I, WPA & WPA2 Enterprise supplicants (EAP-TLS, EAP-TTLS(MSCHAPv2), EAPTTLS(MD5), EAP-PEAPv0(MSCHAPv2, LEAP), EAP-FAST, LEAP) Supports Certificates and Private Key Upload and Storage (Multiple) *Enterprise and EAP available in client mode only
- . Antenna	coaxial connectors, 50 ohms



3.2 Support Equipment / Cables used

3.2.1 Used Support Equipment

Description	Manufacturer	Model Name	S/N & FCC ID.
None.	-	-	S/N: - FCC ID.: -

See “Appendix E – Test Setup Photographs” for actual system test set-up

3.2.2 System configuration

Description	Manufacturer	Model Name	S/N & FCC ID.
None.	-	-	S/N: None. FCC ID.: N/A

3.2.3 Used Cable(s)

Cable Name	Condition	Description
None.	-	-

3.3 Modification Item(s)

-. None



4. Description of tests

4.1 Test Condition

The EUT was installed, arranged and operated in a manner that is most representative of equipment as typically used.

The measurements were carried out while varying operating modes and cable positions within typically arrangement to determine maximum emission level.

The representative and worst test mode(s) were noted in the test report.

- Test Voltage / Frequency: AC 120 V / 60 Hz (DC 5.0 V supplied from the PC via SDIO extension cable)
- Test Mode(s):

Executed "Tera term (Copyright by T.Teranishi)" to control the EUT continuously transmit RF signal

Test Software Version	Tera term (Ver 4.64)		
Frequency	2 412 MHz	2 437 MHz	2 462 MHz
IEEE 802.11 B	13	13	13
IEEE 802.11 G	11	11	11

Mode	Available channel	Modulation Technology	Data rate (Mbps)
IEEE 802.11 B	1 to 11	DSSS	11
IEEE 802.11 G	1 to 11	OFDM	54

5. Antenna Requirement - §15.203

An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the applicant can be used with the device. The use of permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with this requirement.

5.1 Description of Antenna

The **LG Electronics Inc. WiFi module** comply with the requirement of §15.203 with a module antenna permanently attached to the transmitter.



5.2 Conducted Emission

The Line conducted emission test facility is inside a 4 m × 8 m × 2.5 m shielded enclosure. (FCC Registration No.: 100749)

The EUT was placed on a non-conducting 1.0 m by 1.5 m table, which is 0.8 m in height and 0.4 m away from the vertical wall of the shielded enclosure.

The EUT is powered from the Rohde & Schwarz LISN (ESH2-Z5) and the support equipment is powered from the Rohde & Schwarz LISN (ESH3-Z5). Powers to the LISN are filtered by high-current high insertion loss power line filter.

Sufficient time for EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition.

The RF output of the LISN was connected to the EMI test receiver (Rohde & Schwarz, ESCS30).

The EMI test receiver was scanned from 150 kHz to 30 MHz with 20 ms sweep time to determine the frequency producing the maximum EME from the EUT. The frequency producing the maximum level was re-examined using Quasi-Peak mode of the EMI test receiver.

The bandwidth of Quasi-peak mode was set to 9 kHz. Each emission was maximized consistent with typical applications by varying the configuration of the test sample. Interface cables were connected to the available interface ports of the test unit. The effect of varying the position of cables was investigated to find the configuration that produces maximum diagram emission. Excess cable lengths were bundled at center with 30 cm ~ 40 cm.

Each EME reported was calibrated using the R/S signal generator

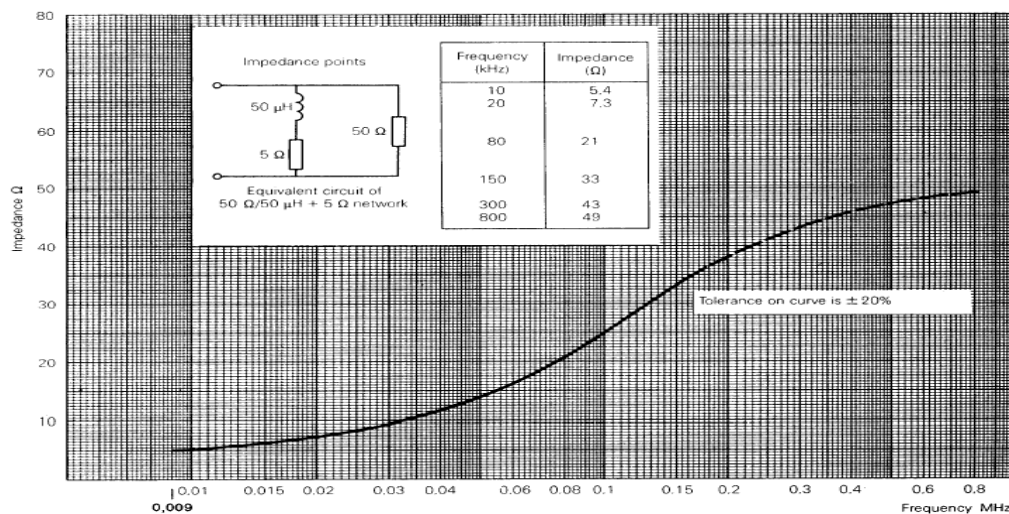


Fig 2. Impedance of LISN



5.3 Radiated Emission

Measurements (below 1 GHz) were made at Open area test site that complies to CISPR 16/ANSI C63.4/ANSI C63.10. Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 10 m. The EUT was rotated 360° about its azimuth with the receive antenna located at 1, 2, 3 and 4 meter heights in both horizontal and vertical polarities. Final measurements (quasi-peak or average as noted) were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1.0 m to 4.0 m. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable.

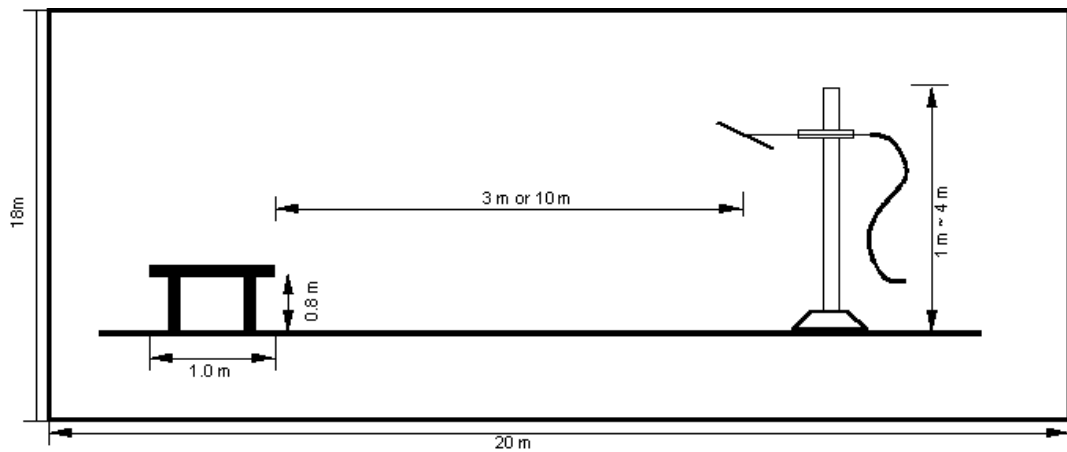


Fig 3. Dimensions of test site

The measurements (above 1 GHz) were made 3 m distance test site that complies to CISPR 16-1-4 (2007). In order to meet SVSWR Limit (Within 6 dB), the bottom side of test site was installed with absorbers. The EUT was placed on a non-conductive turntable approximately 0.8 m above the ground plane. The turntable with EUT 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. The measurements were conducted with Average and Peak value.

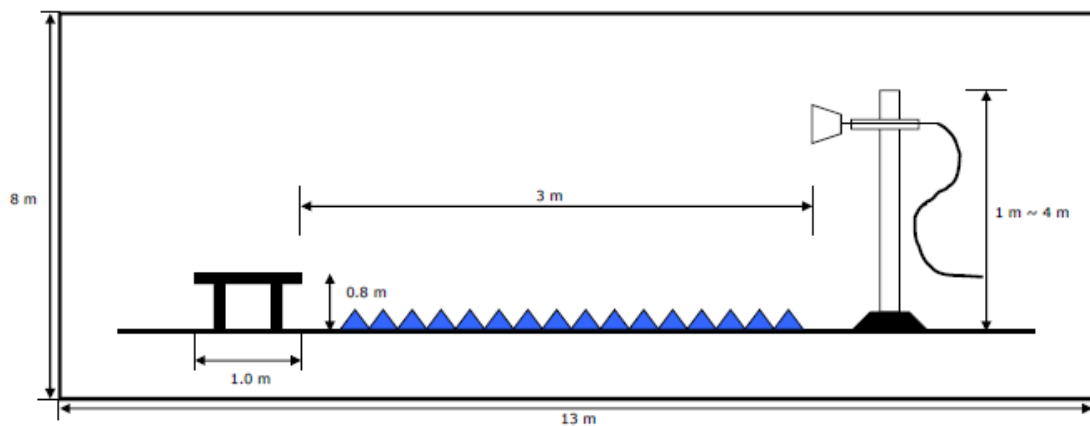


Fig 4. Dimensions of test site



6. Conducted Emission

6.1 Operating Environment

Temperature : 23.0 °C
Relative Humidity : 44.0 % R.H.

6.2 Test Set-up

The conducted emission measurements were performed in the shielded room.

The EUT was placed on wooden table, 0.8 m heights above the floor, 0.4 m from the reference ground plane (GRP) wall and 0.8 m from AMN & ISN.

AMN is bonded on horizontal reference ground plane.

The ground plane, which was electrically bonded to the shield room, ground system and all power lines entering the shield room, were filtered.

6.3 Measurement Uncertainty

The measurement uncertainty was calculated in accordance with ISO “Guide to the expression of uncertainty in measurement.”

The measurement uncertainty was given with a confidence of 95 %.

Test Items	Uncertainty	Remark
Conducted emission (9 kHz ~ 150 kHz)	± 2.71 dB	Confidence levels of 95 % ($k = 2$)
Conducted emission (150 kHz ~ 30 MHz)	± 3.34 dB	Confidence levels of 95 % ($k = 2$)



6.4 Limit

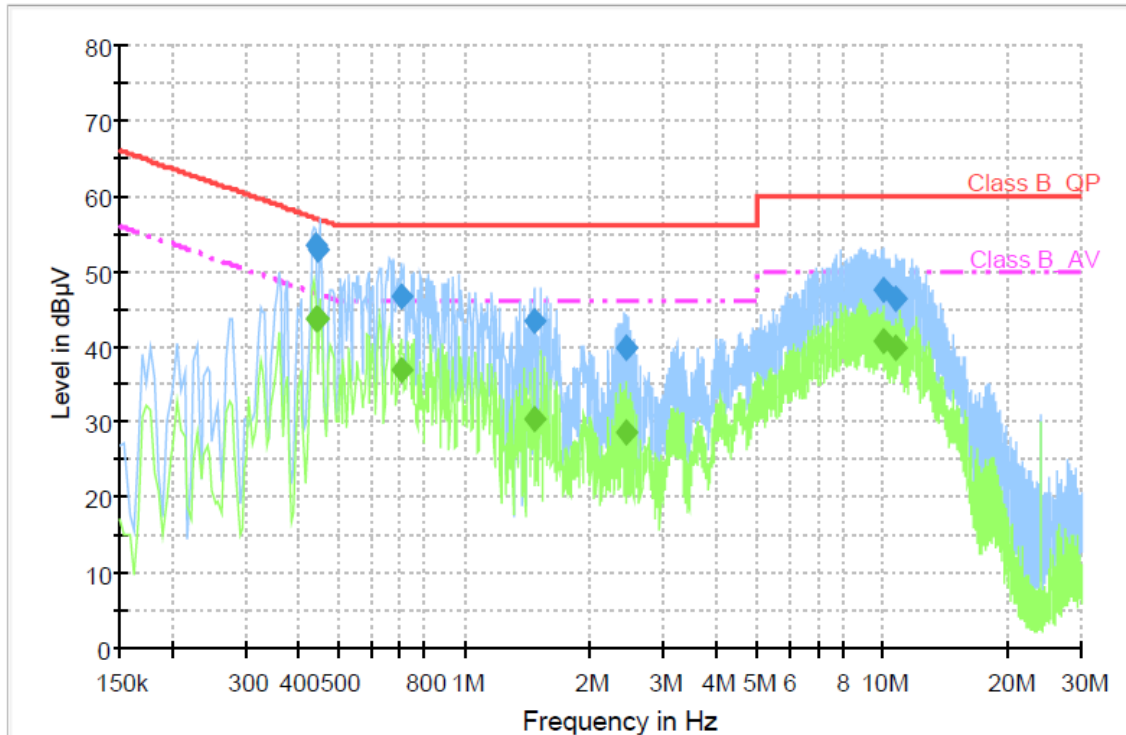
RFI Conducted	FCC Limit(dB μ V/m) Class B	
Freq. Range	Quasi-Peak	Average
150 kHz ~ 0.5 MHz	66 ~ 56*	56 ~ 46*
0.5 MHz ~ 5 MHz	56	46
5 MHz ~ 30 MHz	60	50
*Limits decreases linearly with the logarithm of frequency.		

6.5 Test Equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - ESCS30	Rohde & Schwarz	EMI test receiver	839809/003	05. 22. 2013
□- ESH3-Z5	Rohde & Schwarz	LISN	838979/020	05. 23. 2013
■ - ESH2-Z5	Rohde & Schwarz	LISN	829991/009	05. 23. 2013
□ - ISN T8	TESEQ. GmbH	ISN	24568	07. 04. 2013

6.6 Test data for Conducted Emission

- . Test Date	: August 23, 2012
- . Reference Standard	: Part 15 Subpart C, Sec. 15.207
- . Channel (Worst Case)	: 802.11 G (Low: 2 412 MHz)
- . Operating Condition	: RF transmitting mode
- . Frequency rage	: 0.15MHz ~ 30 MHz



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.444000	53.3	1000.0	9.000	GND	L1	10.1	3.7	57.0	
0.448000	53.0	1000.0	9.000	GND	L1	10.1	3.9	56.9	
0.708000	46.7	1000.0	9.000	GND	L1	10.1	9.3	56.0	
1.480000	43.4	1000.0	9.000	GND	L1	10.2	12.6	56.0	
2.440000	39.8	1000.0	9.000	GND	L1	10.2	16.2	56.0	
10.028000	47.4	1000.0	9.000	GND	N	10.3	12.6	60.0	
10.780000	46.4	1000.0	9.000	GND	N	10.3	13.6	60.0	

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.444000	43.6	1000.0	9.000	GND	L1	10.1	3.4	47.0	
0.448000	43.7	1000.0	9.000	GND	L1	10.1	3.2	46.9	
0.708000	37.0	1000.0	9.000	GND	L1	10.1	9.0	46.0	
1.480000	30.5	1000.0	9.000	GND	L1	10.2	15.5	46.0	
2.440000	28.8	1000.0	9.000	GND	L1	10.2	17.2	46.0	
10.028000	40.9	1000.0	9.000	GND	N	10.3	9.1	50.0	
10.780000	39.9	1000.0	9.000	GND	N	10.3	10.1	50.0	

< Fig 5. Conducted emission result >

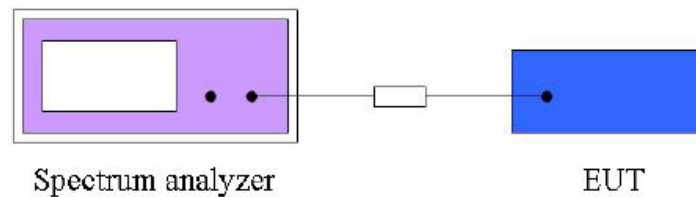


7. Maximum Peak Output Power Measurement

7.1 Operating environment

Temperature : 25.0 °C
Relative Humidity : 42.0 % R.H.

7.2 Test Set-up (Layout)



7.3 Limit

For systems using digital modulation in the (2 400~2 483.5) MHz, the limit for peak output power is 30 dBm. The limit has to be reduced by the amount in dB that the gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

7.4 Test Equipment used

Model Number	Manufacturer	Description	Serial Number	Due to Calibration
■ - FSP	Rohde & Schwarz	Spectrum Analyzer	101431	04. 26. 2013

7.5 Test Result

- Test Date : August 17, 2012
- Reference Standard : Part 15 Subpart C, Sec. 15.247(b)(3) / ANSI C63.10 Clause 6.10.2.1 (a)
- Channel : 802.11 B/G (Low: 2 412 MHz, Middle: 2 437 MHz, High: 2 462 MHz)
- Operating Condition : RF transmitting mode
- Power Source : DC 5.0 V supplied from the PC via SDIO extension cable.

Parameter

- Filter no: Auto
- Measurement time: 0.135 s ~ 26 s



Configuration IEEE 802.11 B

Frequency (MHz)	Conducted Power (dBm)	Conducted Power (mW)	Max. Limit (dBm)	Result
2 412	13.32	21.48	30.00	Complies
2 437	13.50	22.39	30.00	Complies
2 462	13.06	20.23	30.00	Complies

Configuration IEEE 802.11 G

Frequency (MHz)	Conducted Power (dBm)	Conducted Power (mW)	Max. Limit (dBm)	Result
2 412	16.19	41.59	30.00	Complies
2 437	16.85	48.42	30.00	Complies
2 462	16.87	48.64	30.00	Complies

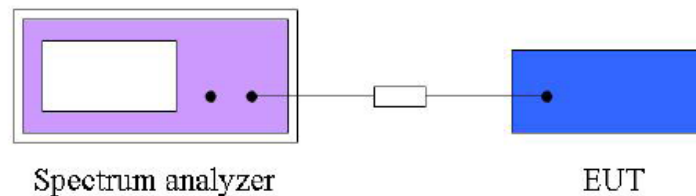


8. Power Spectral Density Measurement

8.1 Operating Environment

Temperature : 25.0 °C
Relative Humidity : 42.0 % R.H.

8.2 Test Set-up (Layout)



8.3 Limit

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

8.4 Test Equipment used

	Model Number	Manufacturer	Description	Serial Number	Due to Calibration
■ -	ESIB26	Rohde & Schwarz	EMI test receiver	830482/010	05. 23. 2013

8.5 Test Result

- Test Date : August 17, 2012
- Reference Standard : Part 15 Subpart C, Sec. 15.247(e)
- Channel : 802.11 B/G (Low: 2 412 MHz, Middle: 2 437 MHz, High: 2 462 MHz)
- Operating Condition : RF transmitting mode
- Power Source : DC 5.0 V supplied from the PC via SDIO extension cable.

Spectrum Parameter

- Attenuation : Auto
- Span frequency : 1.5 MHz
- Resolution band width : 3 kHz
- Video band with : 30 kHz
- Sweep time : 500 s



Configuration IEEE 802.11 B

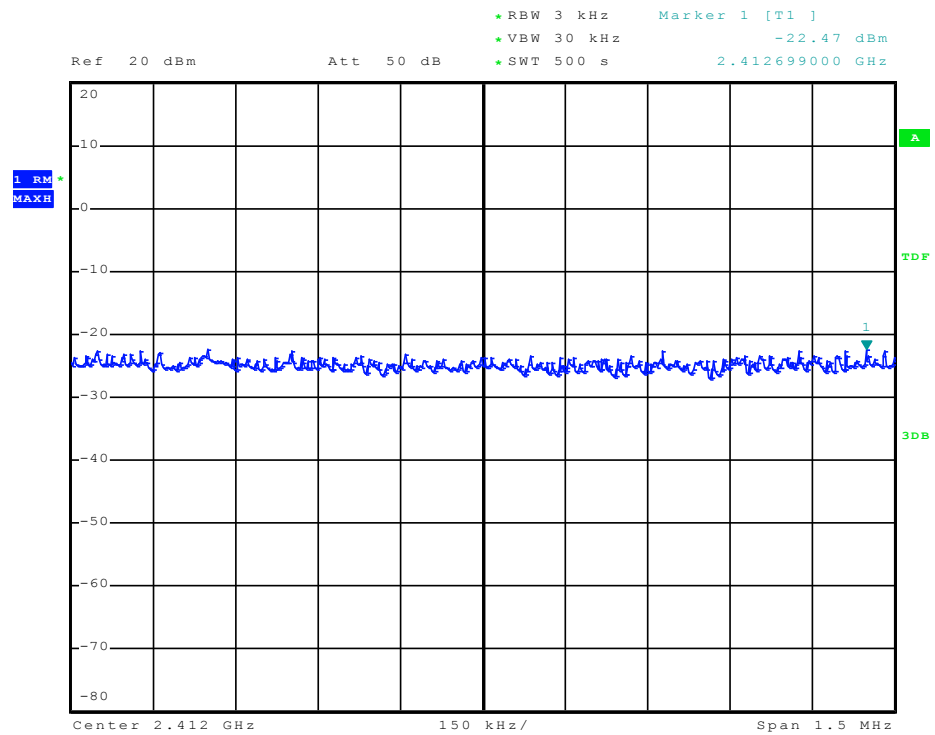
Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
2 412 MHz	- 22.47	8.00	Complies
2 437 MHz	- 22.40	8.00	Complies
2 462 MHz	- 22.31	8.00	Complies

Configuration IEEE 802.11 G

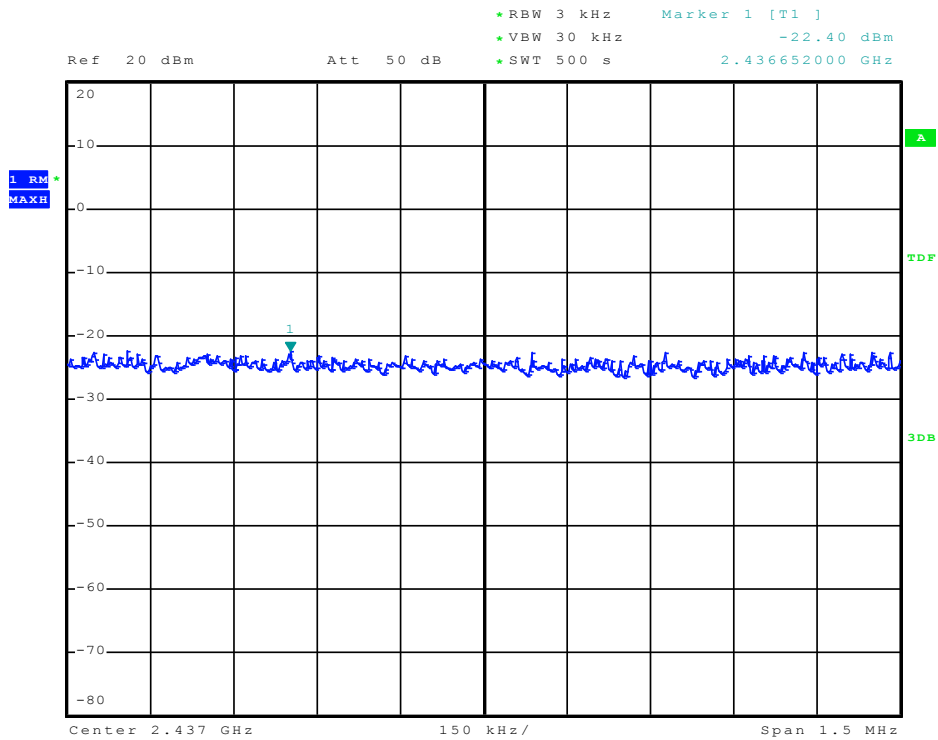
Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
2 412 MHz	- 26.40	8.00	Complies
2 437 MHz	- 26.03	8.00	Complies
2 462 MHz	- 25.72	8.00	Complies



Power Density Plot on configuration IEEE 802.11 B / 2 412 MHz

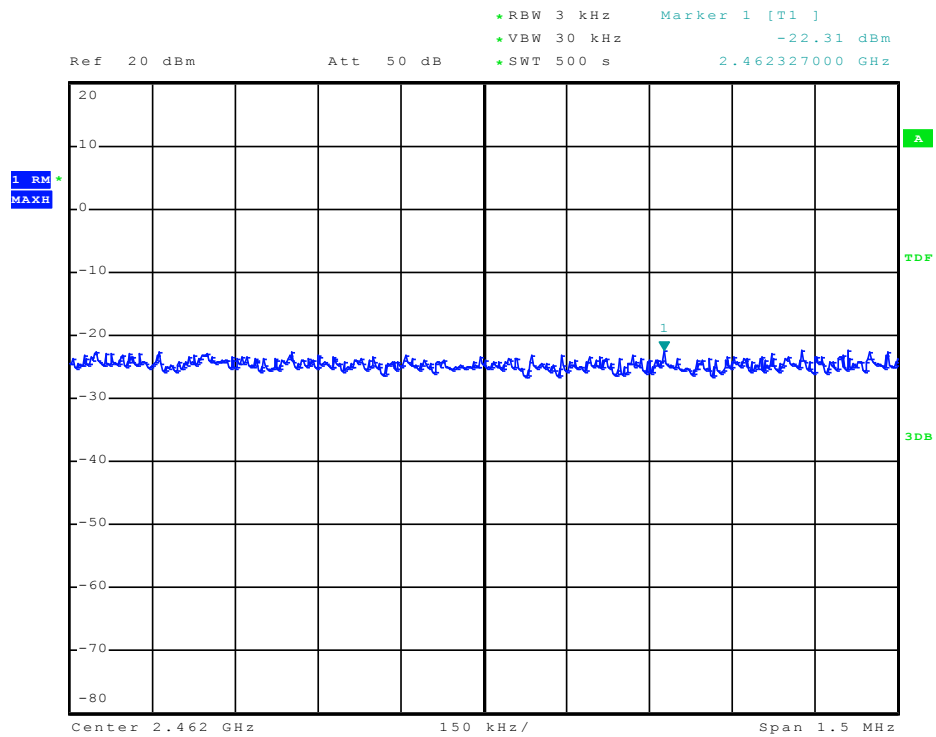


Power Density Plot on configuration IEEE 802.11 B / 2 437 MHz

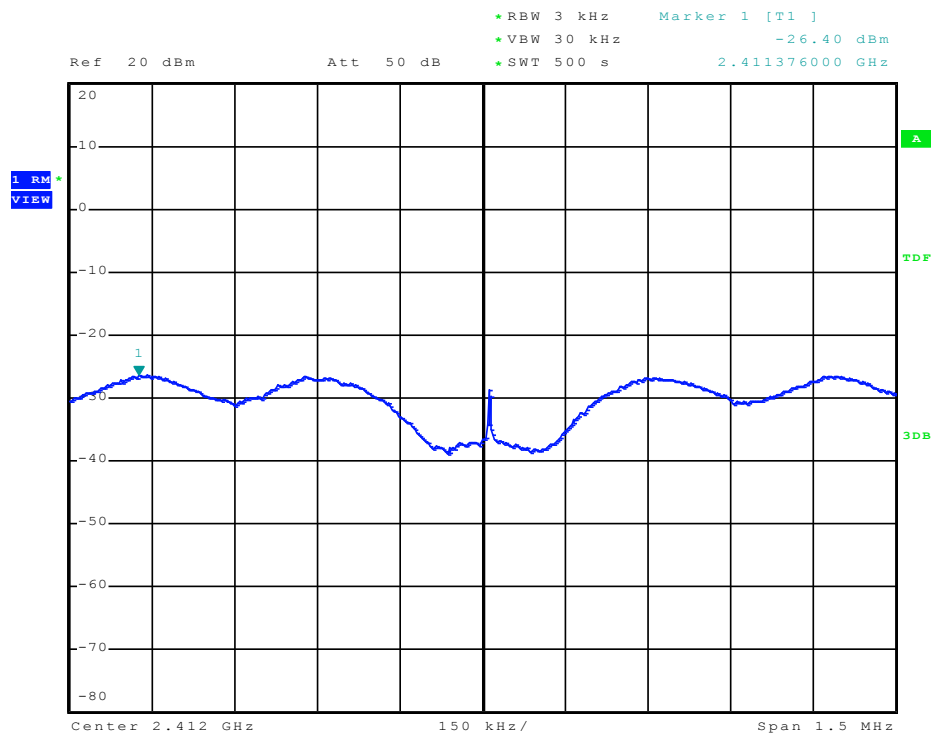




Power Density Plot on configuration IEEE 802.11 B / 2 462 MHz

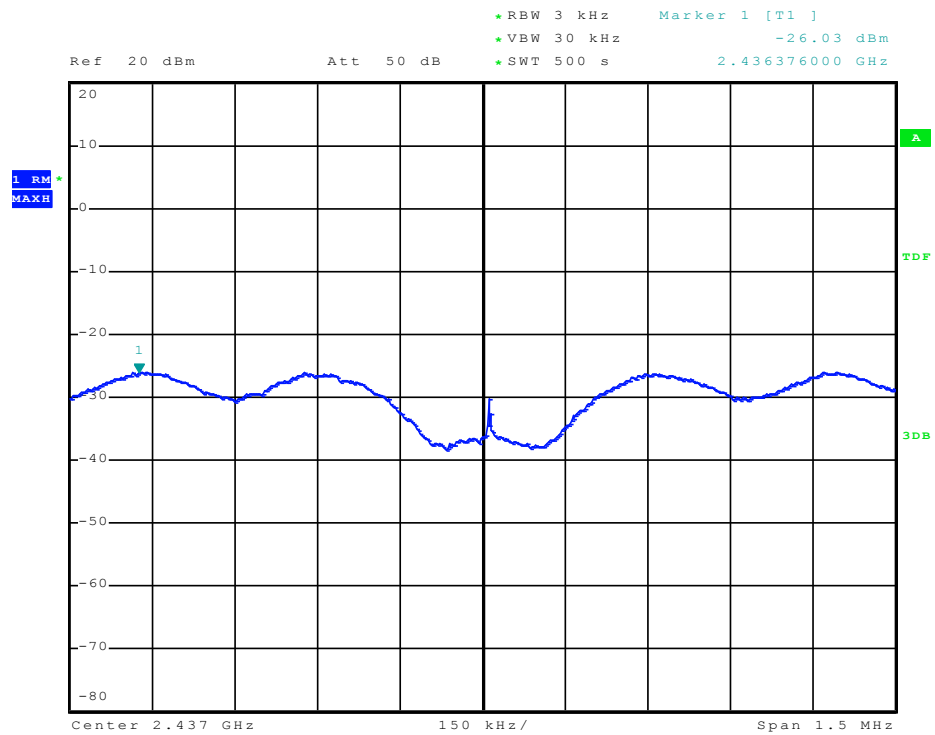


Power Density Plot on configuration IEEE 802.11 G / 2 412 MHz

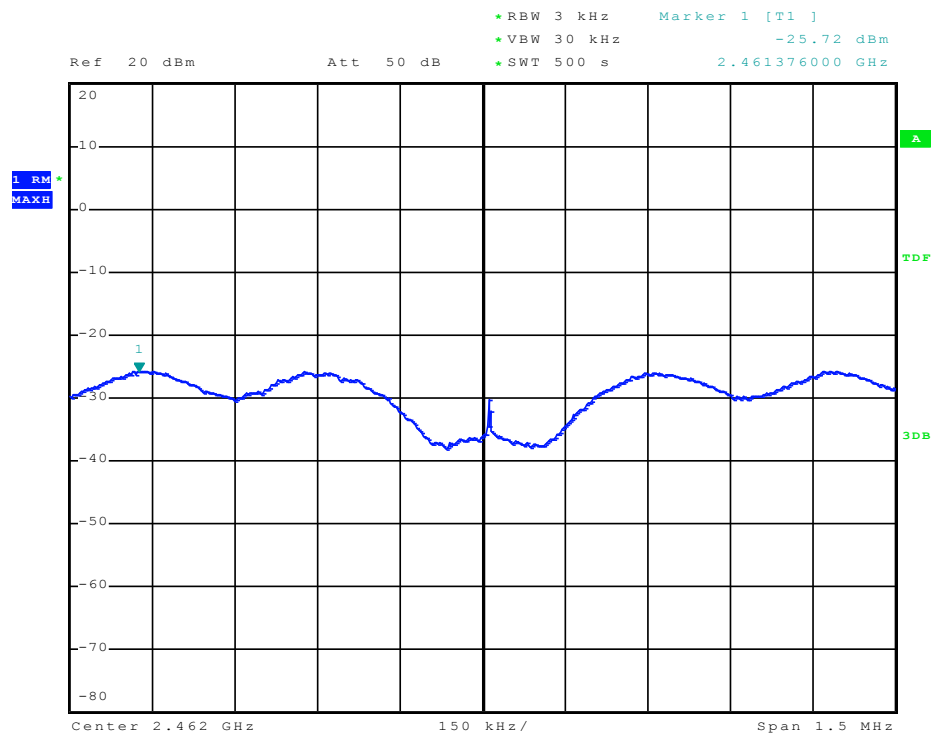




Power Density Plot on configuration IEEE 802.11 G / 2 437 MHz



Power Density Plot on configuration IEEE 802.11 G / 2 462 MHz



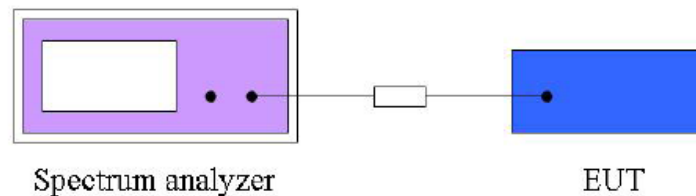


9. 6 dB Spectrum bandwidth Measurement

9.1 Operating environment

Temperature : 25.0 °C
Relative Humidity : 42.0 % R.H.

9.2 Test Set-up (Layout)



9.3 Limit

For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz

9.4 Test Equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - ESIB26	Rohde & Schwarz	EMI test receiver	830482/010	05. 23. 2013

9.5 Test result

- Test Date : August 17, 2012
- Reference Standard : Part 15 Subpart C, Sec. 15.247(a)(2)
- Channel : 802.11 B/G (Low: 2 412 MHz, Middle: 2 437 MHz, High: 2 462 MHz)
- Operating Condition : RF transmitting mode
- Power Source : DC 5.0 V supplied from the PC via SDIO extension cable.

Spectrum Parameter

- Attenuation : Auto
- Span frequency : > 6 dB bandwidth
- Resolution band width : 100 kHz
- Video band with : 100 kHz
- Detector : Peak
- Trace : Maxhold
- Sweep time : Auto



Configuration IEEE 802.11 B

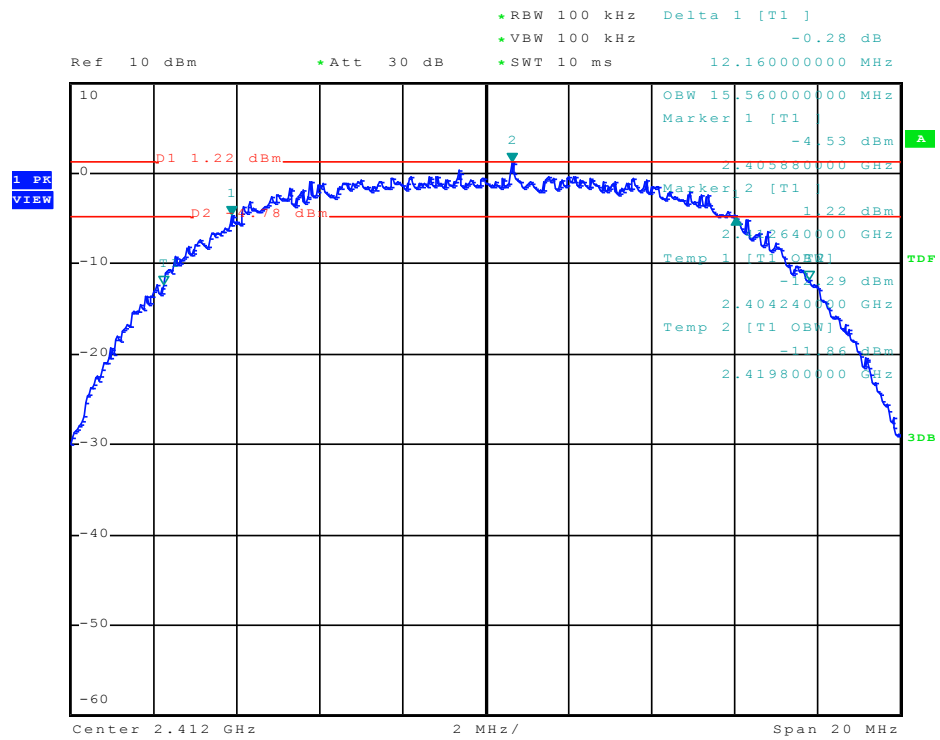
Frequency (MHz)	6 dB Bandwidth (MHz)	99 % Occupied bandwidth (MHz)	Min. Limit (kHz)	Result
2 412	12.16	15.56	500	Complies
2 437	11.88	15.52	500	Complies
2 462	12.20	15.48	500	Complies

Configuration IEEE 802.11 G

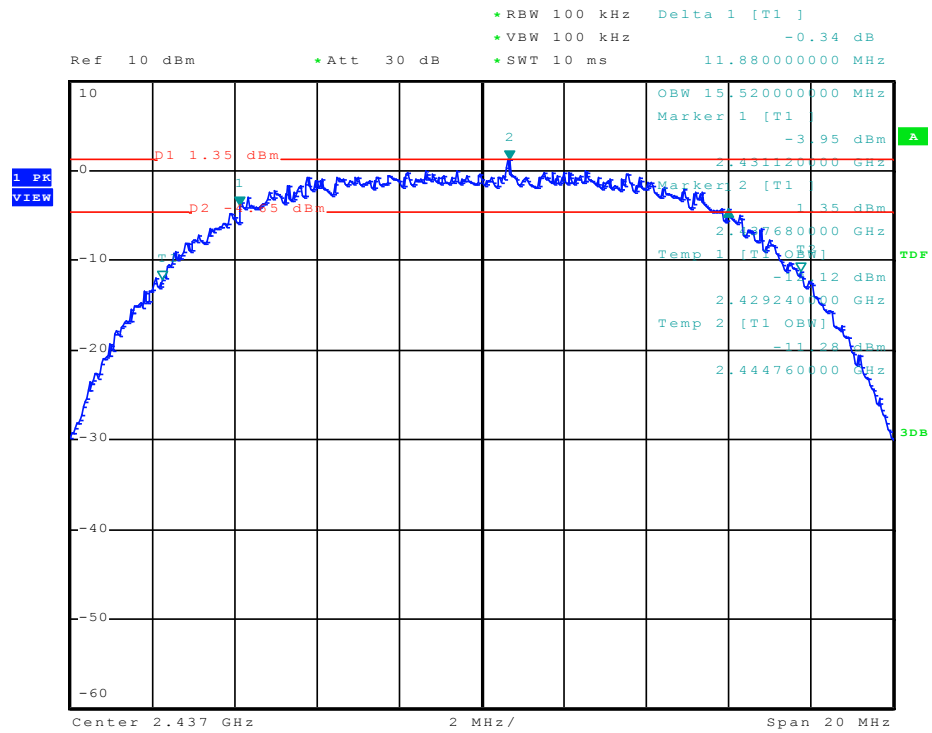
Frequency (MHz)	6 dB Bandwidth (MHz)	99 % Occupied bandwidth (MHz)	Min. Limit (kHz)	Result
2 412	16.56	16.52	500	Complies
2 437	16.52	16.52	500	Complies
2 462	16.52	16.52	500	Complies



6 dB Bandwidth Plot on Configuration IEEE 802.11 B / 2 412 MHz

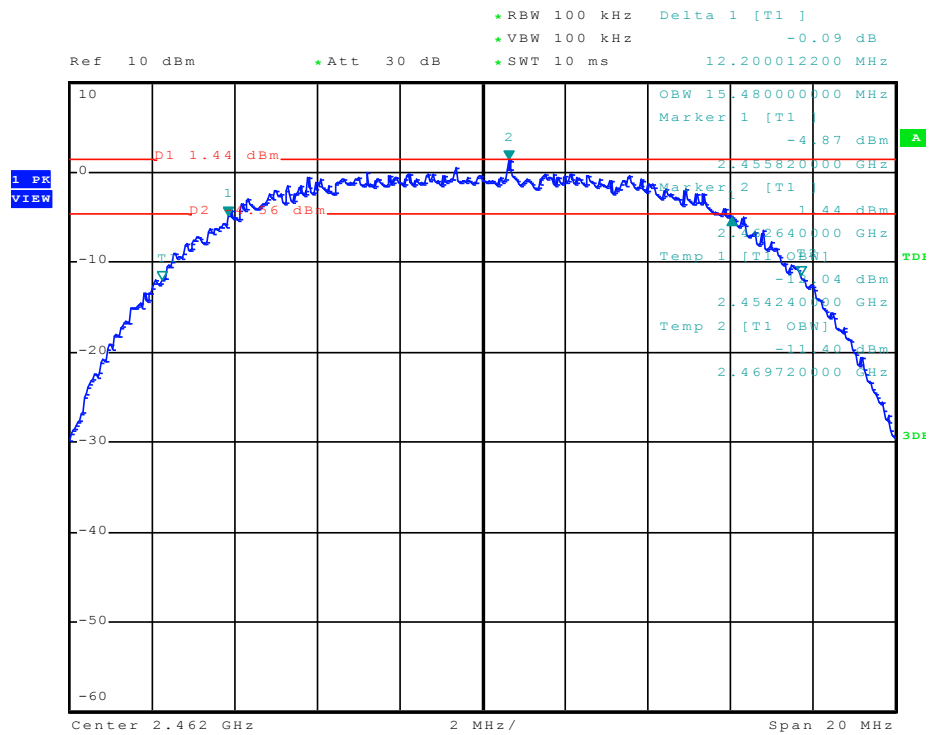


6 dB Bandwidth Plot on Configuration IEEE 802.11 B / 2 437 MHz

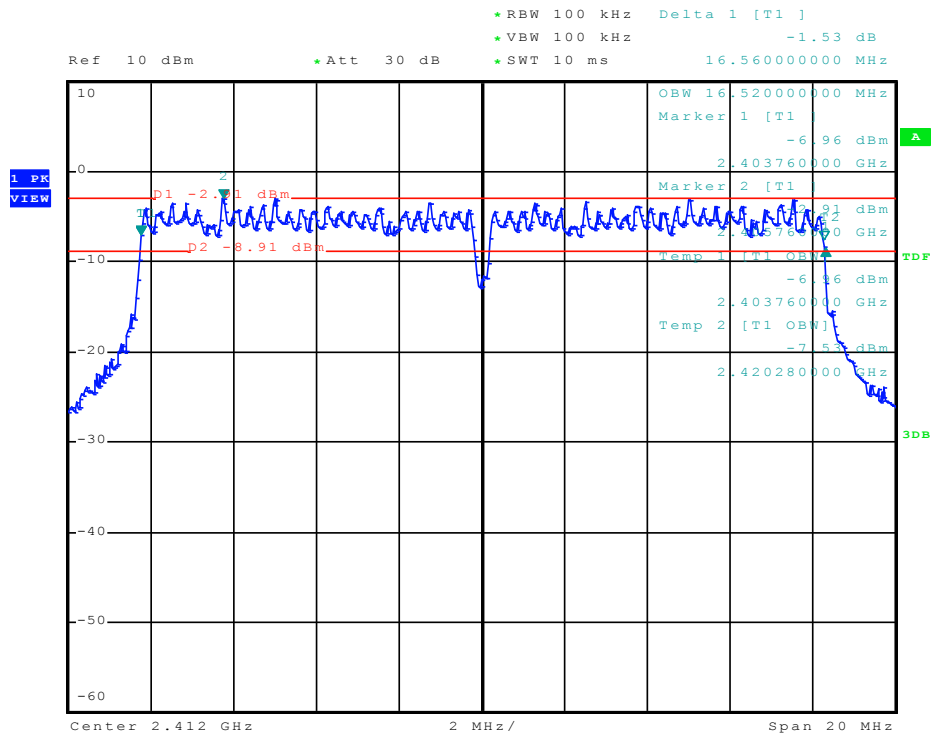




6 dB Bandwidth Plot on Configuration IEEE 802.11 B / 2 462 MHz

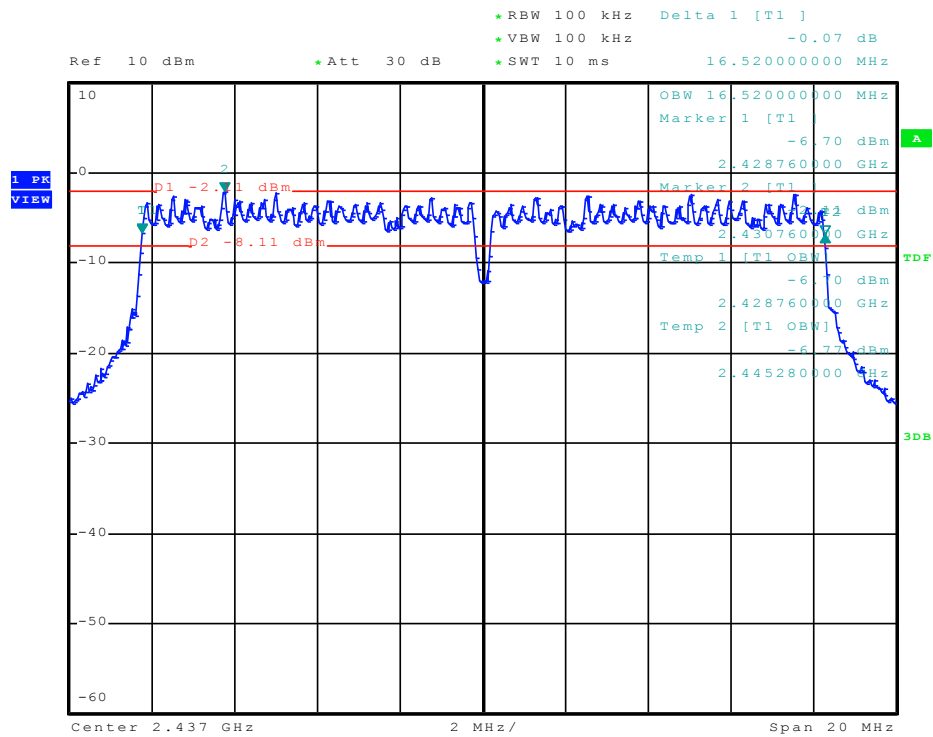


6 dB Bandwidth Plot on Configuration IEEE 802.11 G / 2 412 MHz

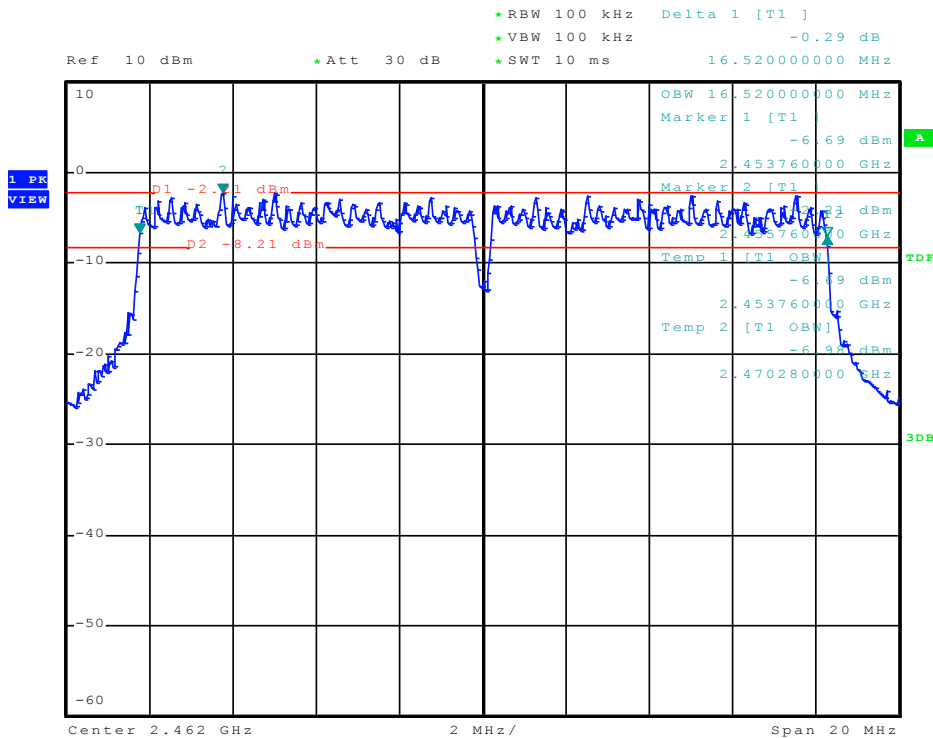




6 dB Bandwidth Plot on Configuration IEEE 802.11 G / 2 437 MHz



6 dB Bandwidth Plot on Configuration IEEE 802.11 G / 2 462 MHz



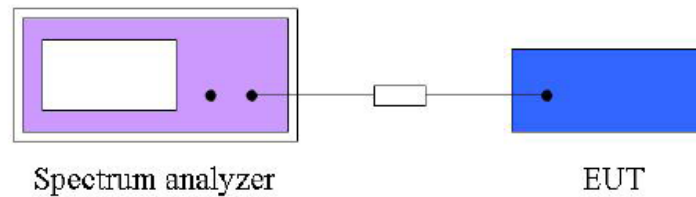


10. Band Edge Measurement

10.1 Operating environment

Temperature : 25.0 °C
Relative Humidity : 42.0 % R.H.

10.2 Test set-up (Lay-out)



10.3 Limit

Below -20 dB of the highest emission level of operating band (in 100 kHz resolution band width)

10.4 Test equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - ESIB26	Rohde & Schwarz	EMI Test Receiver	830482/010	05. 23. 2013

10.5 Test Result

- Test Date : August 17, 2012
- Reference standard : Part 15 Subpart C, Sec. 15.247(d)
- Channel : 802.11 B/G (Low: 2 412 MHz, High: 2 462 MHz)
- Operating condition : RF transmitting mode
- Measuring distance : 3 m
- Power Source : DC 5.0 V supplied from the PC via SDIO extension cable.

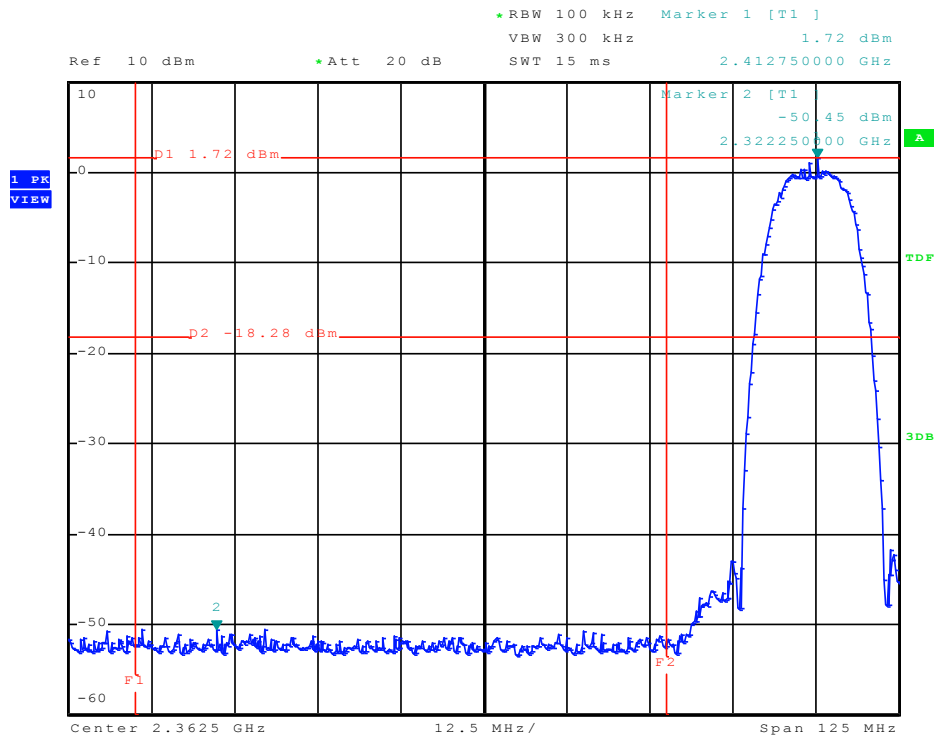
The spectrum plots are attached on the following 8 images, D1 line indicates the highest level, D2 line indicates the 20 dB offset below D1. It shows compliance with the requirement in part 15.247(d)

Spectrum Parameter

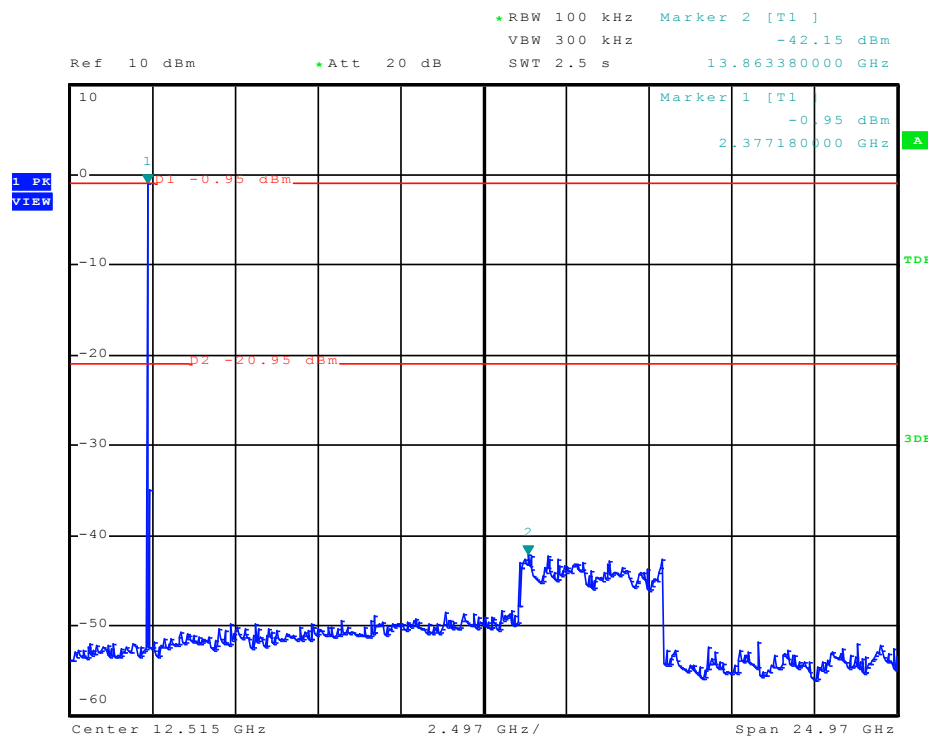
- Attenuation : Auto
- Resolution bandwidth : 100 kHz
- Video bandwidth : 100 kHz

For Emission not in Restricted Band

Low Band Edge Plot on Configuration IEEE 802.11 B / 2 412 MHz



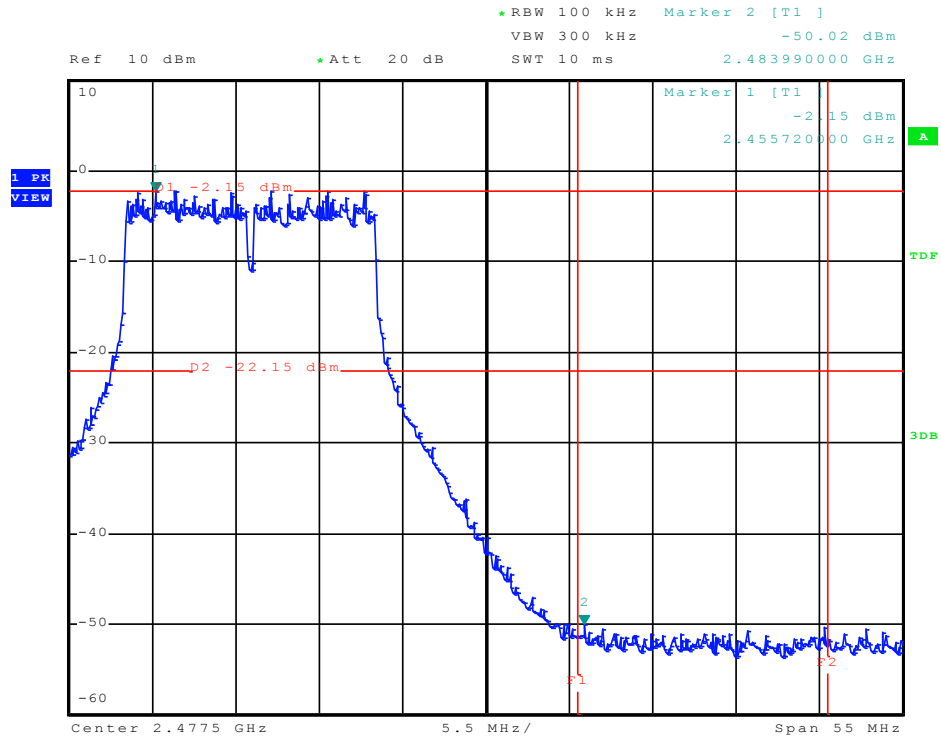
High Band Edge Plot on Configuration IEEE 802.11 B / 2 462 MHz



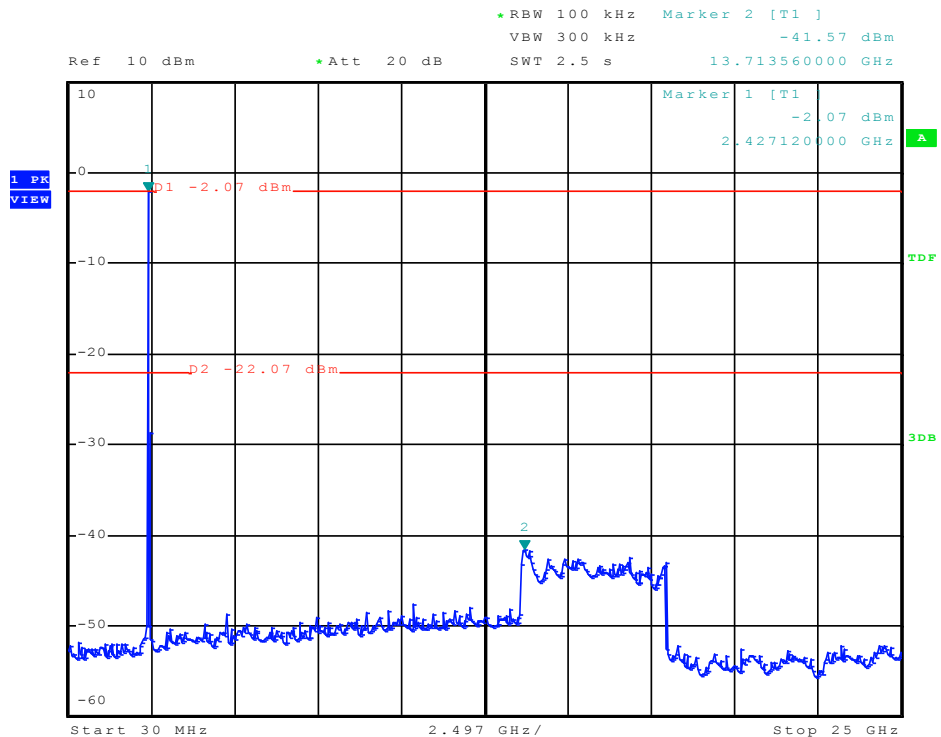


For Emission not in Restricted Band

Low Band Edge Plot on Configuration IEEE 802.11 G / 2 412 MHz



High Band Edge Plot on Configuration IEEE 802.11 G / 2 462 MHz





11. Radiated Emission

11.1 Operating Environment

Temperature : 24.0 °C
Relative Humidity : 42.0 % R.H.

11.2 Test set-up

The formal radiated emission was measured at 3 m distance anechoic chamber.

The EUT was placed on a non-conductive turntable approximately 0.8 m above the ground plane.

The turntable with EUT 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.

11.3 Measurement uncertainty

The measurement uncertainty was calculated in accordance with ISO “Guide to the expression of uncertainty in measurement”.

The measurement uncertainty was given with a confidence of 95 %.

Test Items (Semi anechoic chamber)	Uncertainty	Remark
Radiated emission (30 MHz ~ 300 MHz, 3 m, Vertical)	± 4.35 dB	Confidence level of approximately 95 % ($k = 2$)
Radiated emission (30 MHz ~ 300 MHz, 3 m, Horizontal)	± 4.29 dB	Confidence level of approximately 95 % ($k = 2$)
Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Vertical)	± 4.43 dB	Confidence level of approximately 95 % ($k = 2$)
Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Horizontal)	± 4.21 dB	Confidence level of approximately 95 % ($k = 2$)

11.4 Limit

20 dB in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (microvolt/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F (kHz)	300
0.490 ~ 1.705	2400/F (kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3



11.5 Test equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - ESIB26	Rohde & Schwarz	EMI Test Receiver	830482/010	05. 23. 2013
■ - VULB9160	Schwarzbeck	Broadband test antenna	3193	03. 14. 2013
■ - MCU066	maturo GmbH	Position Controller	1390306	N/A
■ - TT2.5SI	maturo GmbH	Turntable	1390307	N/A
■ - AM4.0	maturo GmbH	Antenna Mast	1390308	N/A
■ - BBHA9120D	Schwarzbeck	Horn antenna	597	01. 23. 2013
■ - 3160-09	ETS LINDGREN	Horn antenna	LM3423	11. 14. 2013
■ - AFS44-00101800-25-10P-44	MITEQ	Preamplifier	1258942	11. 12. 2012
■ - AFS44-00101800-25-10P-44	MITEQ	Preamplifier	1258943	11. 12. 2012

11.6 Radiated emission test data

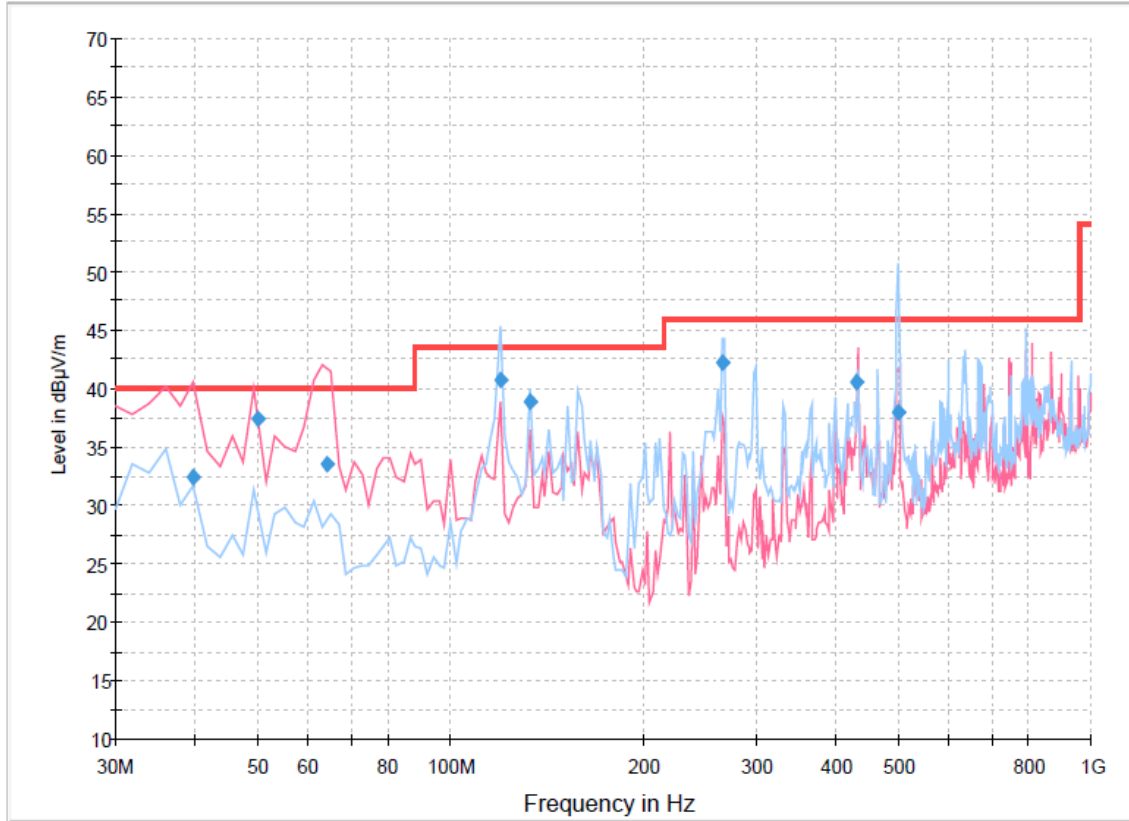
- Test Date	: August 20 ~ 21, 2012
- Reference standard	: Part 15 Subpart C, Sec. 15.247(d) / ANSI C63.10
- Channel (Worst Case)	: 802.11 G (Low: 2 412 MHz, Middle: 2 437 MHz, High: 2 462 MHz)
- Operating condition	: RF transmitting mode
- Measuring distance	: 3 m
- Spectrum resolution bandwidth(6dB)	: 120 kHz / 1 MHz/ 10 Hz / 100 kHz
- Detector mode	: Peak detector mode / Quasi Peak detector mode / Average detector mode
- Power Source	: DC 5.0 V supplied from the PC via SDIO extension cable.
- Note	: None.



Result of radiated emission (9 kHz to 30 MHz)

No emission found between lowest internal used/generated frequency to 30 MHz.

Result of radiated emission (30 MHz to 1 000 MHz)



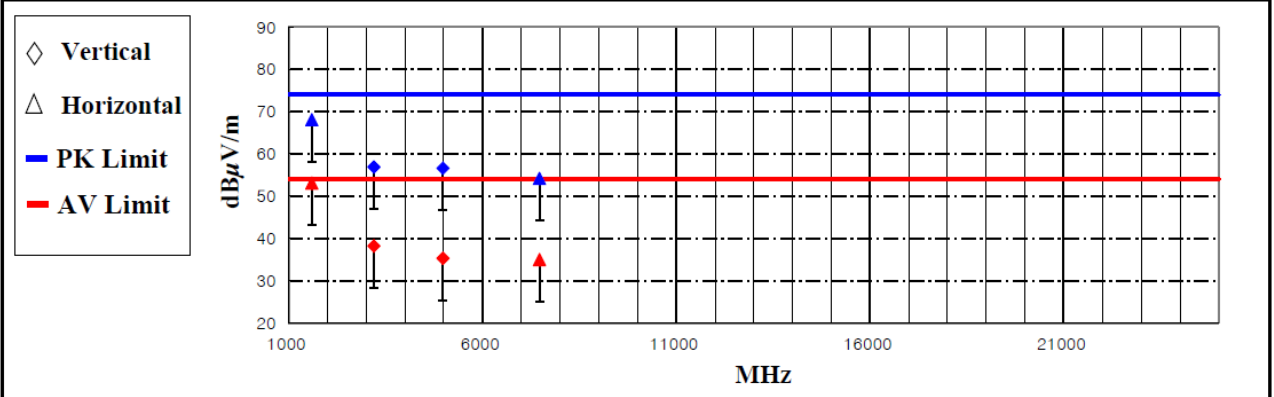
Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
39.499439	32.4	1000.0	120.000	100.0	V	278.0	12.2	7.6	40.0
50.138878	37.3	1000.0	120.000	100.0	V	130.0	12.7	2.7	40.0
64.386092	33.5	1000.0	120.000	100.0	V	264.0	11.7	6.5	40.0
119.998838	40.8	1000.0	120.000	150.0	H	238.0	11.8	2.7	43.5
133.246052	38.9	1000.0	120.000	150.0	H	239.0	13.4	4.6	43.5
265.550421	42.3	1000.0	120.000	100.0	H	220.0	14.7	3.7	46.0
431.484770	40.6	1000.0	120.000	100.0	V	233.0	19.7	5.4	46.0
500.560842	38.1	1000.0	120.000	216.0	H	268.0	21.2	7.9	46.0



Worst case result of radiated emission (1 GHz to 25 GHz)

Frequency (MHz)	Measurement Level						Limit (dBμ V/m)		Margin (dB)		Positioning System		
	Reading Value (dBμ V/m)		AF	AMP / CL	Test Result (dBμ V/m)						Pol.	Height	Angle
	Peak	Average	(dB/m)	(dB)	Peak	Average	Peak	Average	Peak	Average	(H/V)	(cm)	(°)
1593.39	80.82	65.82	25.55	-38.27	68.10	53.10	74.00	54.00	5.90	0.90	H	100	205
3195.36	63.55	44.85	28.81	-35.46	56.90	38.20	74.00	54.00	17.10	15.80	V	115	222
4978.57	57.78	36.48	31.51	-32.69	56.60	35.30	74.00	54.00	17.40	18.70	V	115	186
7469.16	44.85	25.65	36.24	-26.89	54.20	35.00	74.00	54.00	19.80	19.00	H	149	196



*Comment : AMP/CL_Cable loss value + AMP gain value
AF : Antenna factor value
Pol. : H(Horizontal), V(Vertical)

Result of radiated emission (Band Edge)

802.11 G, 2 412 MHz

Frequency (MHz)	Measurement Level						Limit (dBμ V/m)		Margin (dB)		Positioning System		
	Reading Value (dBμ V)		AF	AMP / CL	Test Result (dBμ V/m)						Pol.	Height	Angle
	Peak	Average	(dB/m)	(dB)	Peak	Average	Peak	Average	Peak	Average	(H/V)	(cm)	(°)
2390.00	75.57	55.97	26.96	-36.93	65.60	46.00	74.00	54.00	8.40	8.00	-	-	-

802.11 G, 2 462 MHz

Frequency (MHz)	Measurement Level						Limit (dBμ V/m)		Margin (dB)		Positioning System		
	Reading Value (dBμ V)		AF	AMP / CL	Test Result (dBμ V/m)						Pol.	Height	Angle
	Peak	Average	(dB/m)	(dB)	Peak	Average	Peak	Average	Peak	Average	(H/V)	(cm)	(°)
2483.50	76.77	57.17	27.21	-36.78	67.20	47.60	74.00	54.00	6.80	6.40	-	-	-

Note:

The amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

Emission level (dBμV/m) = 20 log Emission level (μV/m).

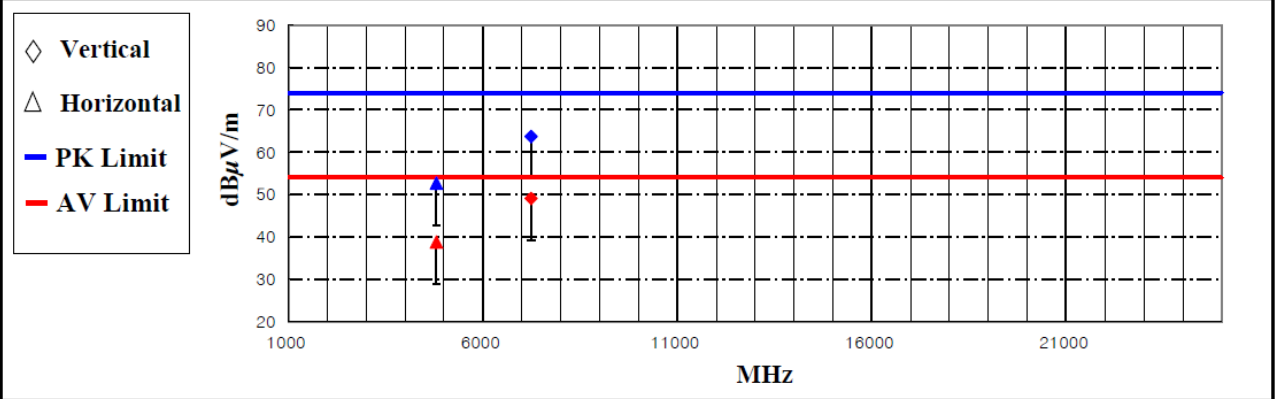
Corrected reading: Antenna factor + Cable loss + Preamplifier gain + Read value = Test result



Result of radiated emission (1 GHz to 10th harmonics)

(802.11 G, 2 412 MHz)

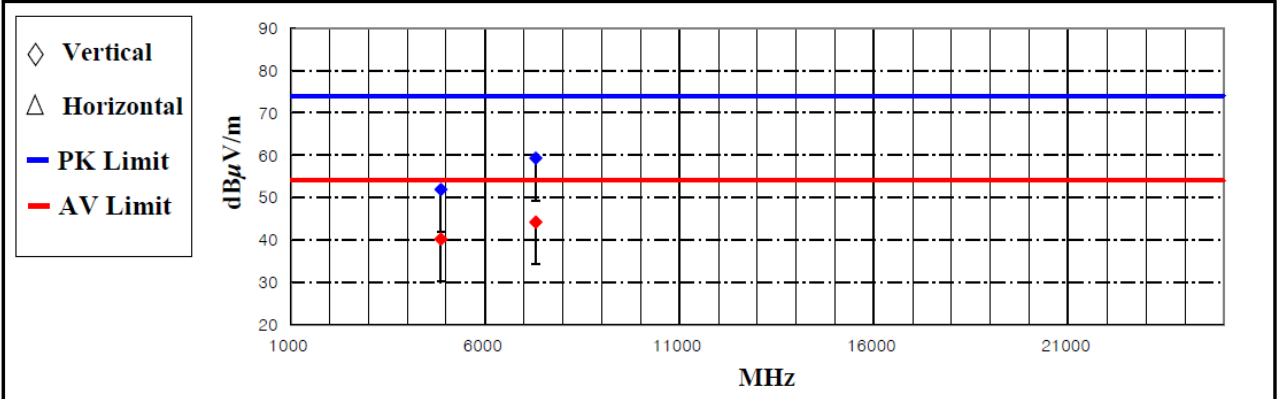
Frequency (MHz)	Measurement Level						Limit (dBμ V/m)		Margin (dB)		Positioning System		
	Reading Value (dBμ V/m)		AF	AMP / CL	Test Result (dBμ V/m)						Pol.	Height	Angle
	Peak	Average	(dB/m)	(dB)	Peak	Average	Peak	Average	Peak	Average	(H/V)	(cm)	(°)
4803.60	54.33	40.43	31.20	-32.83	52.70	38.80	74.00	54.00	21.30	15.20	H	150	36
7239.48	55.22	40.62	35.81	-27.33	63.70	49.10	74.00	54.00	10.30	4.90	V	159	46



*Comment : AMP/CL_Cable loss value + AMP gain value
AF : Antenna factor value
Pol. : H(Horizontal), V(Vertical)

(802.11 G, 2 437 MHz)

Frequency (MHz)	Measurement Level						Limit (dBμ V/m)		Margin (dB)		Positioning System		
	Reading Value (dBμ V/m)		AF	AMP / CL	Test Result (dBμ V/m)						Pol.	Height	Angle
	Peak	Average	(dB/m)	(dB)	Peak	Average	Peak	Average	Peak	Average	(H/V)	(cm)	(°)
4863.72	53.37	41.67	31.31	-32.78	51.90	40.20	74.00	54.00	22.10	13.80	V	100	227
7302.80	50.58	35.48	35.93	-27.21	59.30	44.20	74.00	54.00	14.70	9.80	V	159	5

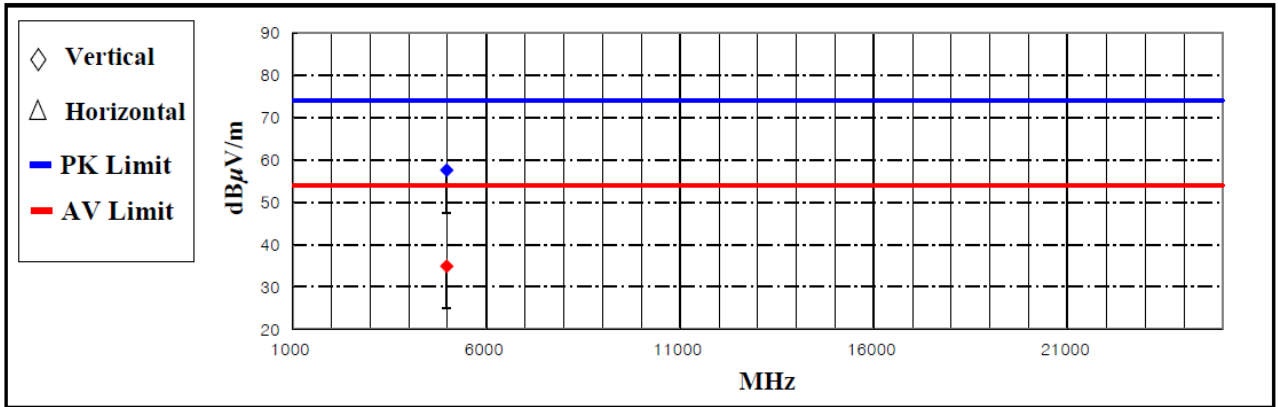


*Comment : AMP/CL_Cable loss value + AMP gain value
AF : Antenna factor value
Pol. : H(Horizontal), V(Vertical)



(802.11 G, 2.462 MHz)

Frequency (MHz)	Measurement Level						Limit (dBμ V/m)		Margin (dB)		Positioning System		
	Reading Value (dBμ V/m)		AF	AMP / CL	Test Result (dBμ V/m)						Pol.	Height	Angle
	Peak	Average	(dB/m)	(dB)	Peak	Average	Peak	Average	Peak	Average	(H/V)	(cm)	(°)
4977.31	58.78	36.08	31.51	-32.69	57.60	34.90	74.00	54.00	16.40	19.10	V	100	186



*Comment : AMP/CL_Cable loss value + AMP gain value
AF : Antenna factor value
Pol. : H(Horizontal), V(Vertical)

Note:

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Reading value + AF (Antenna Factor) + AMP/CL (Cable Loss + Preamp factor) = Test result

- The end -