TEST REPORT

1. Applicant		
Name	:	ELIM Co.,Ltd.
Brand Name	:	N/A
Address	:	A-dong, 3F ElimB/D Sanoepro 155beon-gil 50, Gwonsoen-gu, Suwon-si, Gyeonggi-do, 441-811 Korea
FCC ID	:	2AFE2ELS-1000
2. Products		
Name	:	Smart Guide
Model No.	:	ELS-1000
Variant Model No.	:	N/A
Manufacturer		ELIM Co.,Ltd.
Address		A-dong, 3F ElimB/D Sanoepro 155beon-gil 50, Gwonsoen-gu, Suwon-si, Gyeonggi-do, 441-811 Korea
3. Test Standard	:	47 CFR Part 15, Subpart C
4. Test Method	:	ANSI C63.10-2009
5. Test Result	:	PASS
6. Dates of Test	:	July 07, 2015 to July 13, 2015
7. Date of Issue	:	July 14, 2015
8. Test Laboratory	:	Standard Engineering Co. Ltd. FCC Designation Number : 624439

Tested by	Approved by
SoonHo, Kim / Test Engineer	SeongSeok, Seo / Compliance Engineer

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1. Test Summary

Test	Test Requirement	Test method	Result
Antenna Requirement	47 CFR Part 15, Subpart C Section 15.203/15.247 (c)	ANSI C63.10 2009	PASS
AC Power Line Conducted Emission	47 CFR Part 15, Subpart C Section 15.207	ANSI C63.10 2009	PASS
Conducted Peak Output Power	47 CFR Part 15, Subpart C Section 15.247 (b)(3)	KDB558074 D01	PASS
6dB Occupied Bandwidth	47 CFR Part 15, Subpart C Section 15.247 (a)(2)	KDB558074 D01	PASS
Power Spectral Density	47 CFR Part 15, Subpart C Section 15.247 (e)	KDB558074 D01	PASS
Band-edge for RF Conducted Emissions	47 CFR Part 15, Subpart C Section 15.247(d)	KDB558074 D01	PASS
RF Conducted Spurious Emissions	47 CFR Part 15, Subpart C Section 15.247(d)	KDB558074 D01	PASS
Radiated Spurious Emissions	47 CFR Part 15, Subpart C Section 15.205/15.209	ANSI C63.10 2009	PASS
Band Edge (Radiated Emission)	47 CFR Part 15, Subpart C Section 15.205/15.209	ANSI C63.10 2009	PASS

2. TABLE OF CONTENTS

1. Test Summary **2**

2. Table of Contents **3**

3. General Information **4**
3.1 Client Information 4
3.2 General Description of E.U.T 4
3.3 Details of E.U.T 4
3.4 Operation Frequency each of channel 5
3.5 Description of Support Units 5
3.6 Abnormalities from Standard Conditions 5
3.7 Other Information Requested by the Customer 5
3.8 Test Location 5

4. Equipment Used during Test **6**

5. Test Results and Measurement Data **7**
5.1 Antenna Requirement 7
5.2 Conducted Peak Output Power 8
5.3 6dB Occupy Bandwidth 13
5.4 Power Spectral Density 17
5.5 Band-edge for RF Conducted Emissions 21
5.6 RF Conducted Spurious Emissions 23
5.7 Radiated Spurious Emissions 26
5.7.1Harmonic and other spurious emissions 31
5.7.1.1 Test at Lowest Channel in transmitting status(b mode) 31
5.7.1.2 Test at middle Channel in transmitting status(b mode) 34
5.7.1.3 Test at Highest Channel in transmitting status(b mode) 37
5.8 Band Edge (Radiated Emission) 40
5.9 Conducted Emissions at Mains Terminals 150 kHz to 30 MHz 45
5.9.1 Measurement Data 47
5.10 Radio Frequency Exposure Procedures 49

**** APPENDIX** **51**

3. General Information

3.1. Client Information

Applicant : ELIM Co.,Ltd.
Address of Applicant : A-dong, 3F ElimB/D Sanoepro 155beon-gil 50, Gwonsoen-gu, Suwon-si, Gyeonggi-do, 441-811 Korea

3.2. General Description of E.U.T.

Product Name : Smart Guide
Model No. : ELS-1000

3.3. Details of E.U.T.

Operation Frequency	:	802.11b : 2412MHz to 2462MHz
Channel Numbers	:	802.11b : 11 Channels
Channel Separation	:	5MHz
Type of Modulation	:	802.11b : DSSS
Transfer Spacing	:	802.11b : 11 / 5.5 / 2 / 1 Mbps
Antenna Type	:	Integral Chip Antenna
Antenna Gain	:	-0.5 dBi
Power Supply	:	Input Voltage: AC 100-240V/50-60Hz, 0.6A Output Voltage: DC 12.0V, 2A
Test Voltage	:	DC 12.0 V

3.4. Operation Frequency each of channel

Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2412MHz	5	2432MHz	9	2452MHz
2	2417MHz	6	2437MHz	10	2457MHz
3	2422MHz	7	2442MHz	11	2462MHz
4	2427MHz	8	2447MHz		

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency
Lowest channel	2412MHz
Middle channel	2437MHz
Highest channel	2462MHz

3.5. Description of Support Units

The EUT has been tested with corresponding accessories as below:

Supplied by Standard Engineering Laboratory.:

Description	Manufacturer	Model No.	Serial No.
NoteBook	COMPAQ	PP2140	1V2CKSBZ52C0
USB Cable	-	-	-
Jig	-	-	-
Power Supply	Provice	PWS-5005D	205050

3.6. Abnormalities from Standard Conditions

None.

3.7. Other Information Requested by the Customer

None.

3.8. Test Location

145, Hwanggeumteo-gil, Eumam-myeon, Seosan-si, Chungcheongnam-do, Republic of korea. (FCC Designation Number : 624439)

This test site is in compliance with ISO/IEC 17025 for general requirements for the competence of testing and calibration laboratories.

4. Equipment Used during Test

No.	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Data	Used equipment
1	EMI Test Receiver	LIG	LSA-265	L07098033	20/12/2014	12/20/2015	■
2	EMI Test Receiver	Rhode & Schwarz	ESIB7	3311	02/11/2015	02/11/2016	■
2	Bi-log Antenna	Schwarzbeck	VULB9163	164	09/15/2014	09/15/2016	■
5	Loop Antenna	EMCO	6502	9206-2769	02/13/2014	02/13/2016	■
6	Spectrum Analyzer	Agilent	E4440A	US45303130	02/04/2015	01/26/2016	■
8	Frequency Counter	HP	5347A	3009A02742	02/04/2015	01/26/2016	■
13	Attenuator	Agilent	8495B	3308A22485	02/04/2015	01/26/2016	□
15	Power Meter	Agilent	E4418B	MY405111655	02/04/2015	01/26/2016	□
16	Power Sensor	HP	8485A	2347A02746	02/04/2015	01/26/2016	□
18	RF Cable	Gigalane	SMS102-MF141-SMS102-1.0M	PB1252301285	N/A	N/A	■
20	Signal Generator	HP	83630A	3420A00728	02/04/2015	01/26/2016	■
21	Oscilloscope	HP	54815A	US38380122	02/04/2015	01/26/2016	□
23	Pre Amplifier	Agilent	8449B	3008A02105	02/04/2015	01/26/2016	■
25	Signal Generator	Rhode & Schwarz	SML03	102330	01/23/2015	01/26/2016	■
26	POWER DIVIDER	Agilent	11636B	50309	02/04/2015	01/26/2016	□
27	Power Sensor	Agilent	8482B	3318A05111	02/04/2015	01/26/2016	□
29	DC Power Supply	HP	6032A	US35420383	02/04/2015	01/26/2016	□
30	Slidacs	Sunchang Electrics	5KV	N/A	02/04/2015	01/26/2016	□
32	Bandreject Filter	K&L Microwave	50140	555	02/04/2015	01/26/2016	□
33	Horn Antenna	SCHWARZBECK	BBHA9120A	346	01/27/2014	01/27/2016	■
34	Horn Antenna	A.H. SYSTEMS	SAS-572	269	09/07/2013	09/07/2015	■
35	DC Power Supply	Provice	PWS-5005D	205050	02/04/2015	01/26/2016	■
36	Artificial Mains	Rhode & Schwarz	ESH2-Z5	100164	01/27/2015	12/01/2015	■
38	Pulse Limiter	Rhode & Schwarz	ESH3-Z2	100137	11/15/2014	11/12/2015	■

5. Test Results and Measurement Data

5.1. Antenna Requirement

Standard requirement: 47 CFR Part 15C Section 15.203 /247(c)

15.203 requirement:

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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

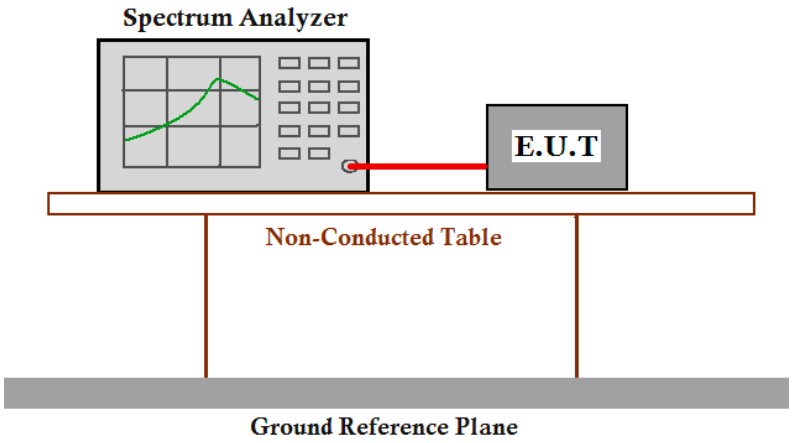
15.247(b) (4) requirement:

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.

EUT Antenna **PASS**

The transmitter has an Internal antenna. The directional gain of the antenna is -0.5 dBi. please refer to the EUT internal photos and Antenna gain.

5.2. Conducted Peak Output Power

Test Requirement:	47 CFR Part 15C Section 15.247 (b)(3)
Test Method:	KDB558074 D01
Test Configuration: 	
Test Instruments:	Refer to section 4.10 for details
Exploratory Test Mode:	Transmitting mode
Final Test Mode:	Through Pre-scan, find the 11Mbps of rate is the worst case of 802.11b
Limit:	30dBm
Test Results:	Pass

Pre-scan under all rate at lowest channel 1								
Mode	802.11b							
Data Rate	1Mbps	2Mbps	5.5Mbps	11Mbps				
Power (dBm)	15.65	15.18	15.41	16.45				
Through Pre-scan, 11Mbps of rate is the worst case of 802.11b								

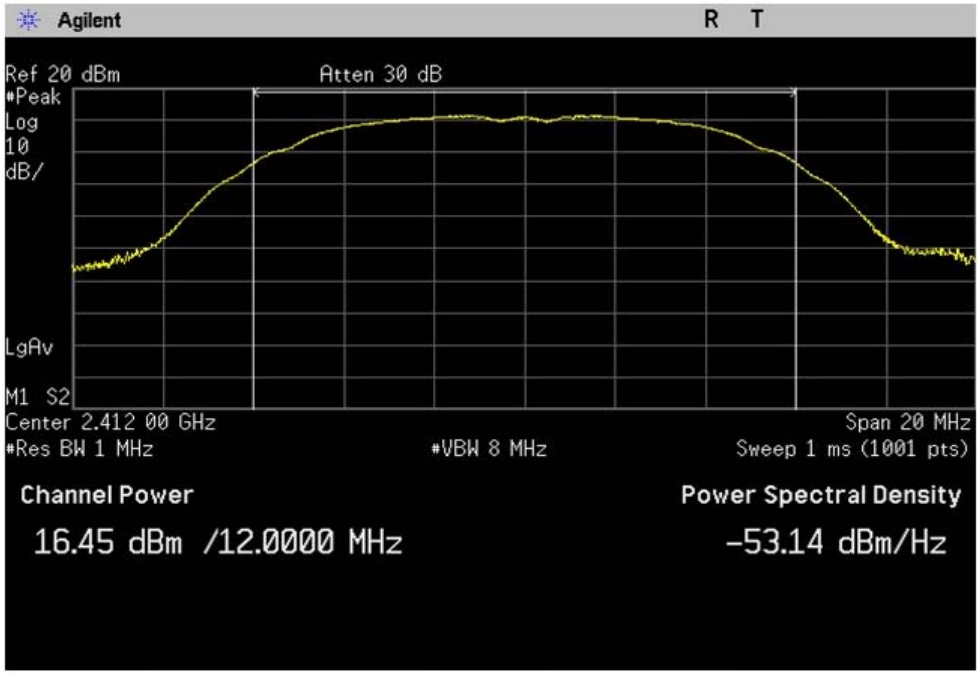
Measurement Data

802.11b mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	16.45	30.0	Pass
Middle	16.26	30.0	Pass
Highest	16.21	30.0	Pass

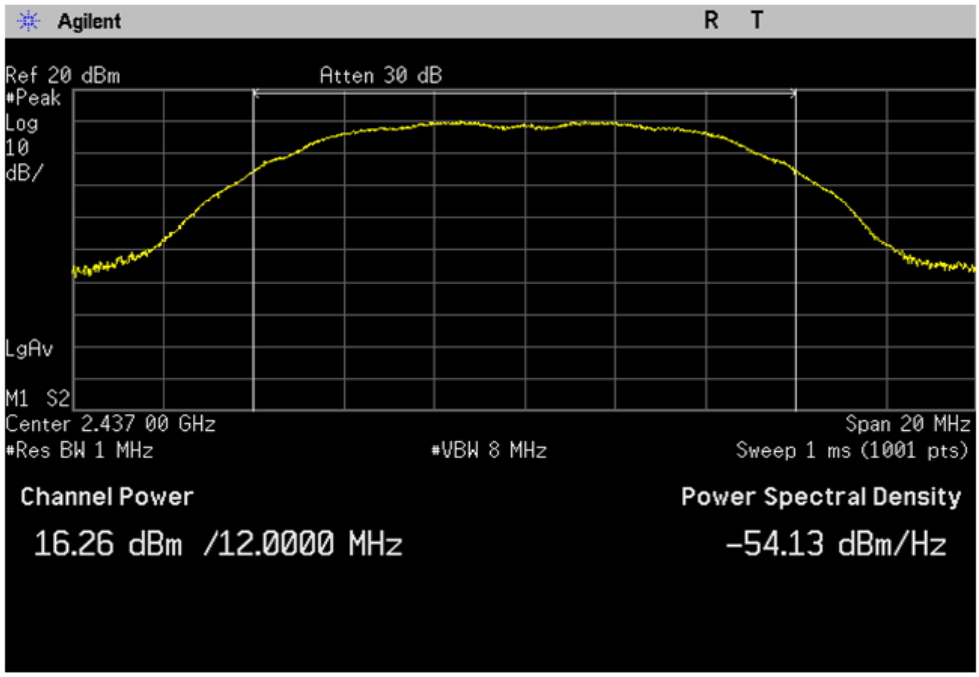
Result plot as follows:

Test mode: 802.11.b

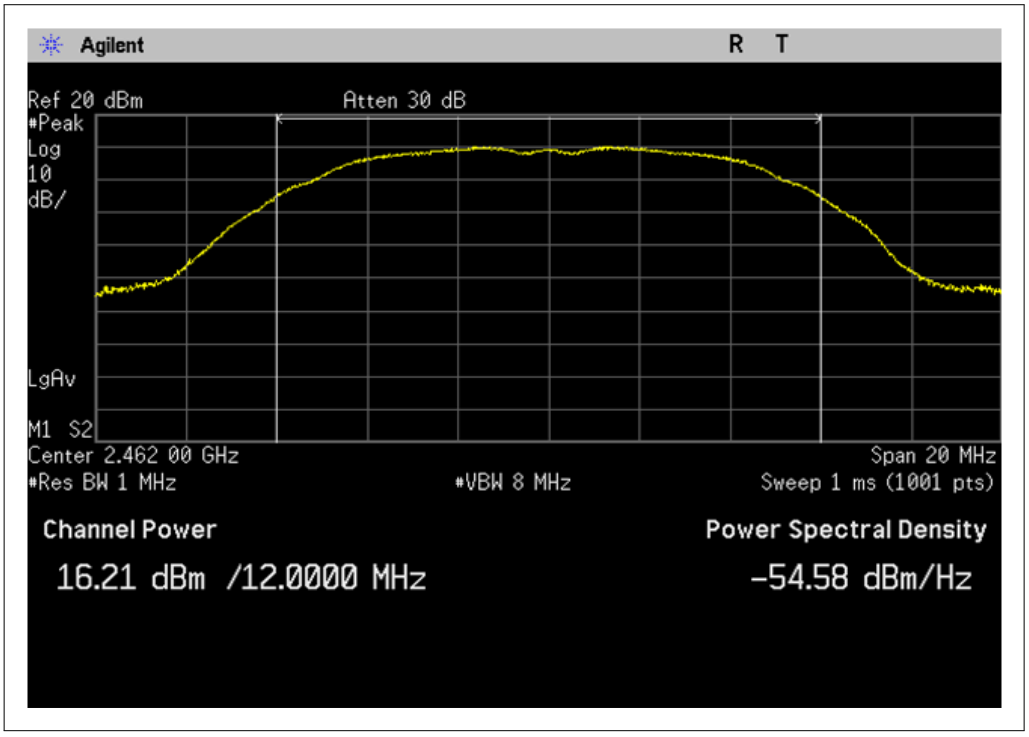
Lowest Channel:



Middle Channel:



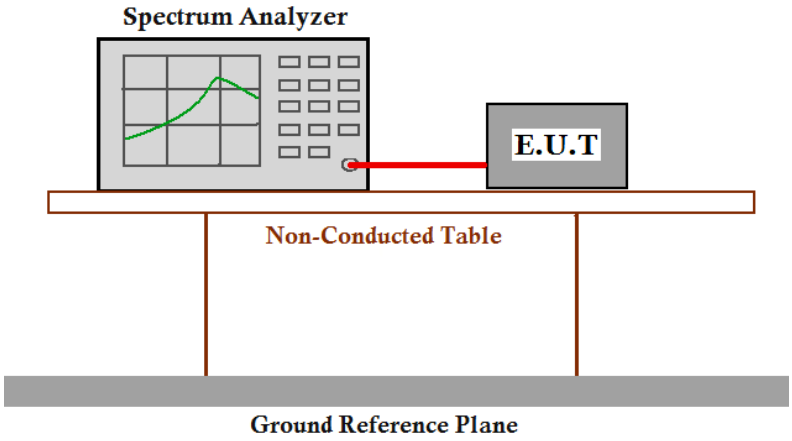
Highest Channel:



5.3. 6dB Occupy Bandwidth

Test Requirement:	47 CFR Part 15C Section 15.247 (a)(2)
Test Method:	KDB558074 D01

Test Configuration:



Instruments Used:	Refer to section 4.10 for details
Exploratory Test Mode:	Transmitting mode
Final Test Mode:	Through Pre-scan, find the 11Mbps of rate is the worst case of 802.11b
Limit:	≥ 500 kHz
Test Results:	Pass

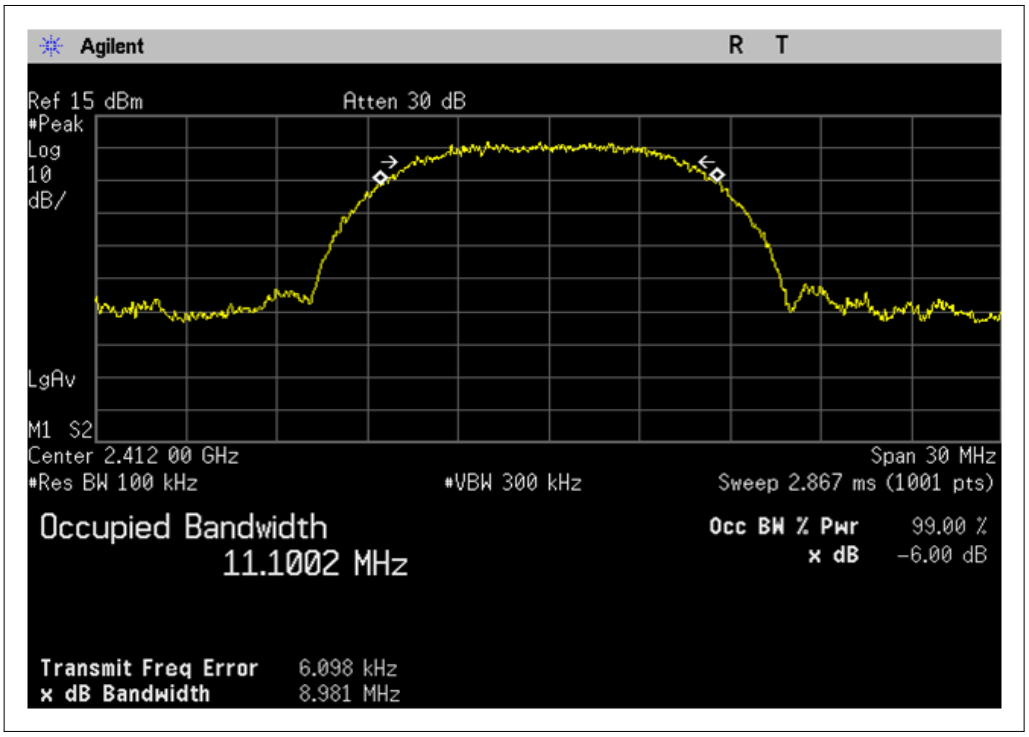
Measurement Data

802.11b mode			
Test channel	6dB Occupy Bandwidth (kHz)	Limit (kHz)	Result
Lowest	8981	≥500	Pass
Middle	8709	≥500	Pass
Highest	8765	≥500	Pass

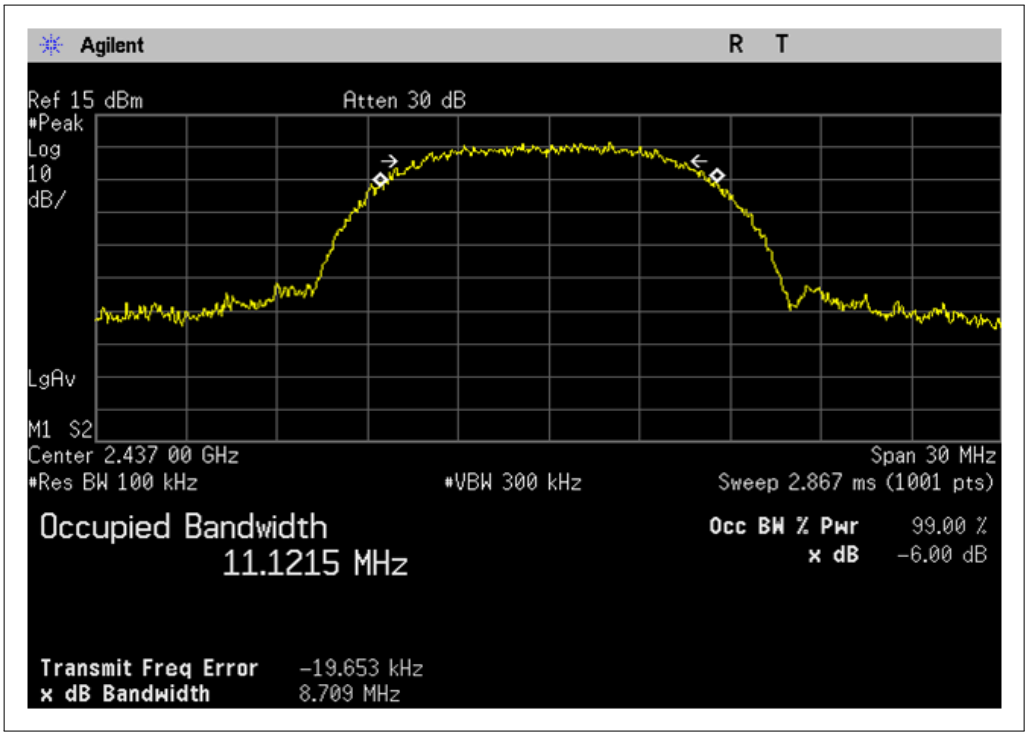
Result plot as follows:

Test mode: 802.11.b

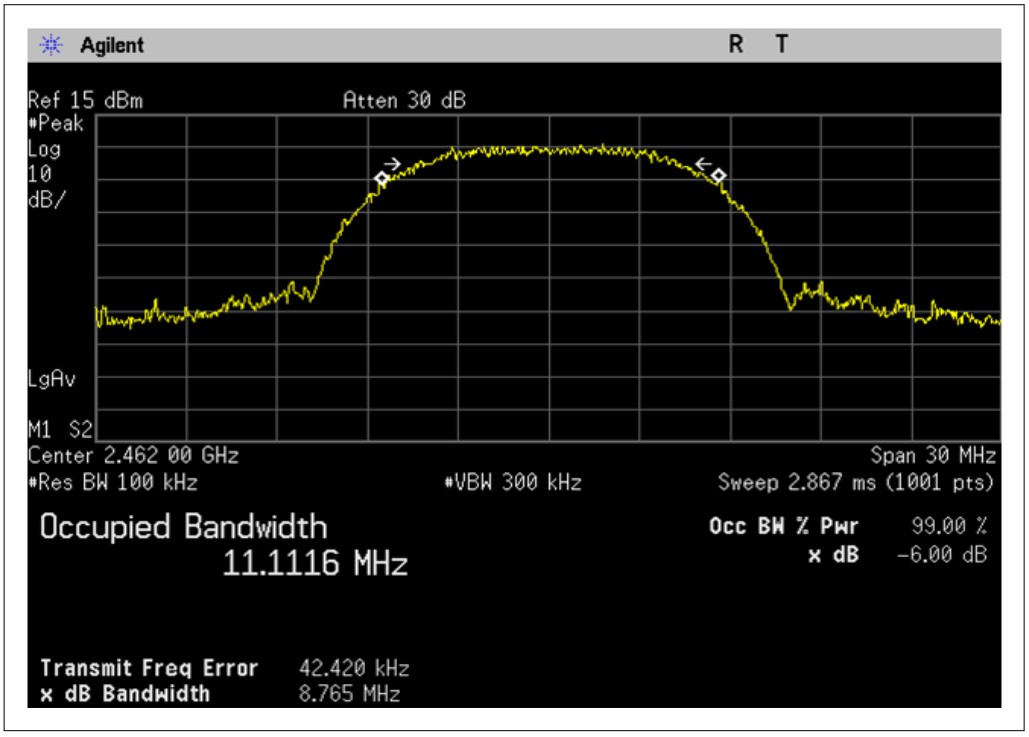
Lowest Channel:



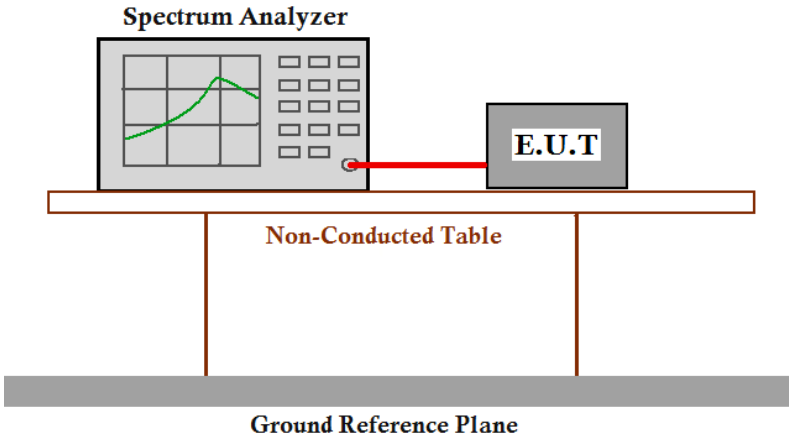
Middle Channel:



Highest Channel:



5.4. Power Spectral Density

Test Requirement:	47 CFR Part 15C Section 15.247 (e)
Test Method:	KDB558074 D01
Test Configuration: 	
Test Instruments:	Refer to section 4.10 for details
Exploratory Test Mode:	Transmitting mode
Final Test Mode:	Through Pre-scan, find the 11Mbps of rate is the worst case of 802.11b
Limit:	≤8.00dBm
Test Results:	Pass

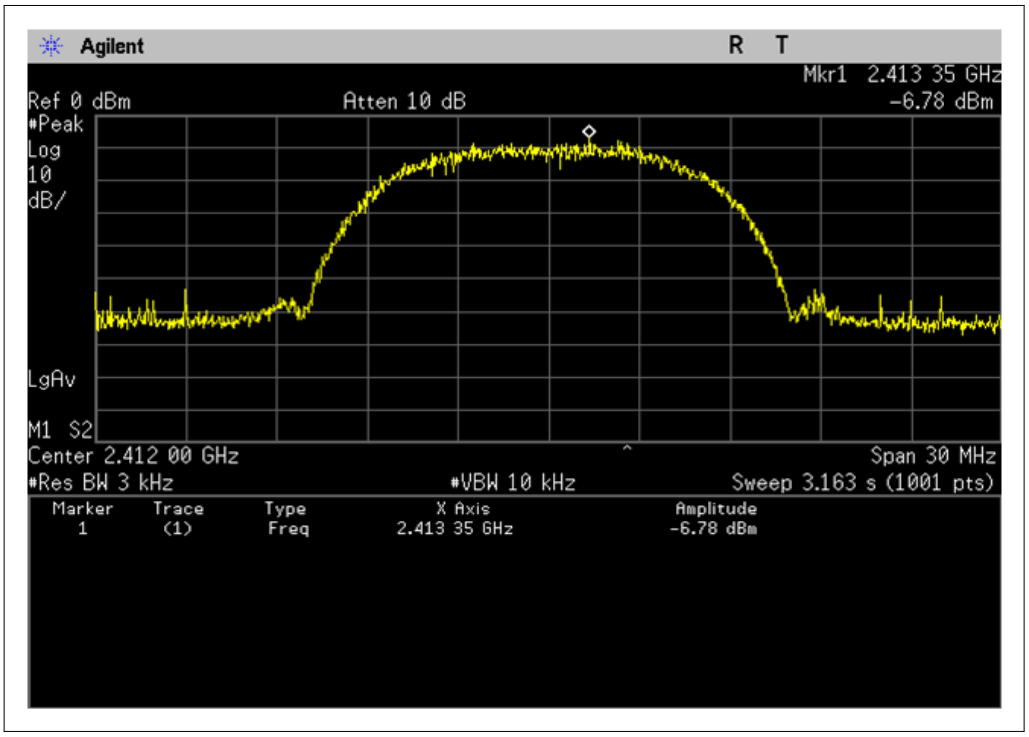
Measurement Data

802.11b mode			
Test channel	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
Lowest	-6.78	≤8.00	Pass
Middle	-7.60	≤8.00	Pass
Highest	-8.56	≤8.00	Pass

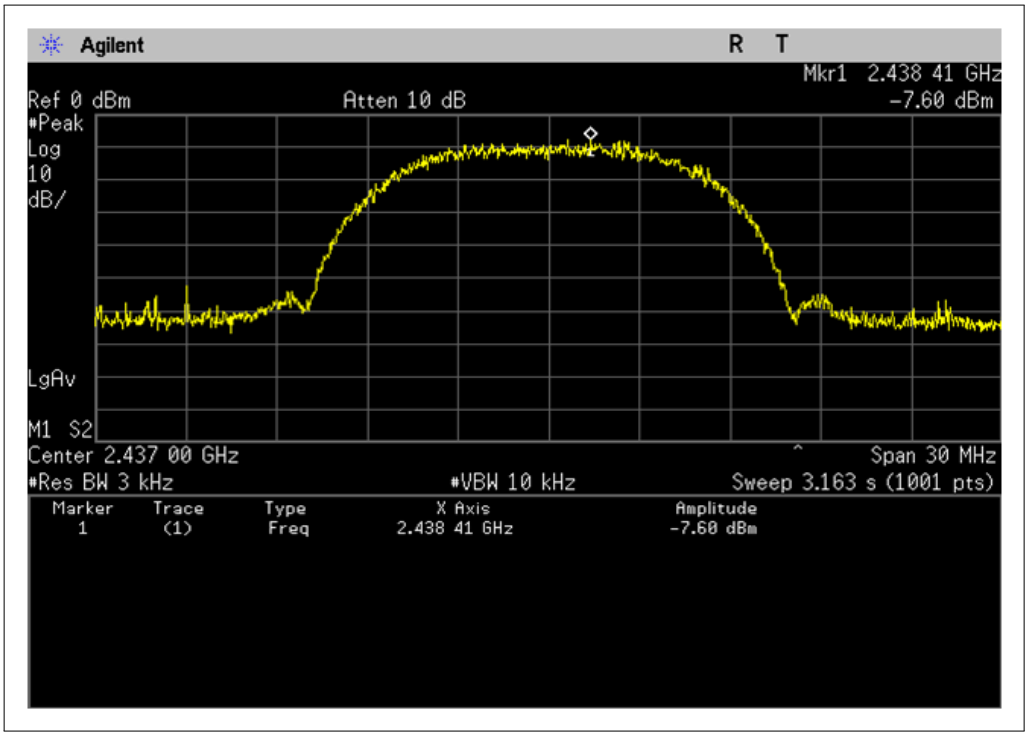
Result plot as follows:

Test mode: 802.11.b

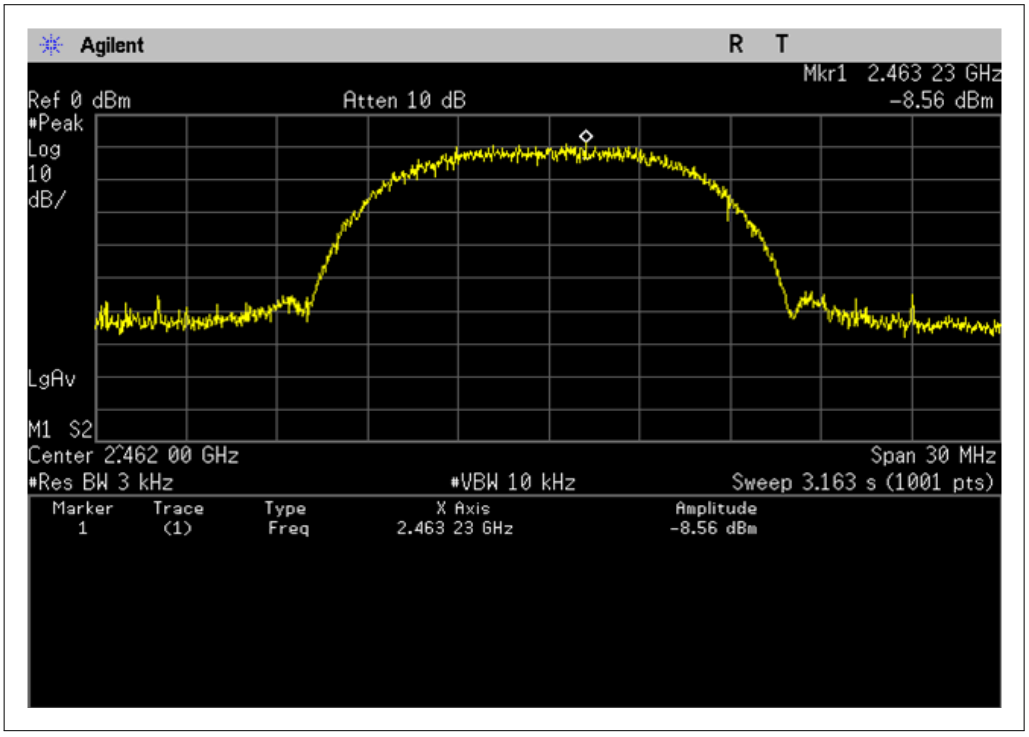
Lowest Channel:



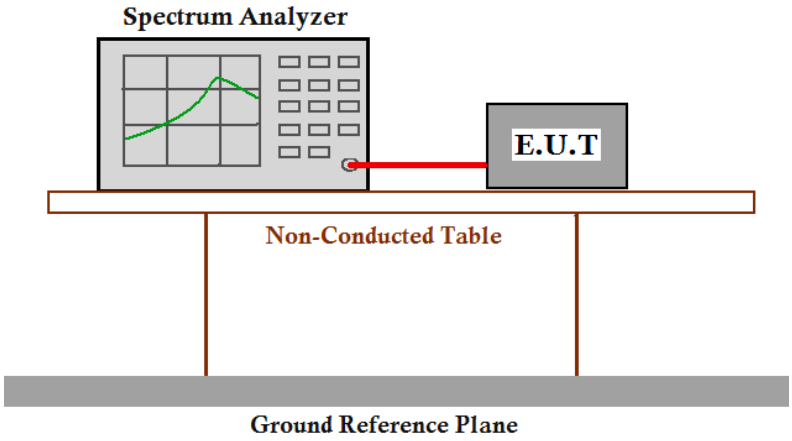
Middle Channel:



Highest Channel:



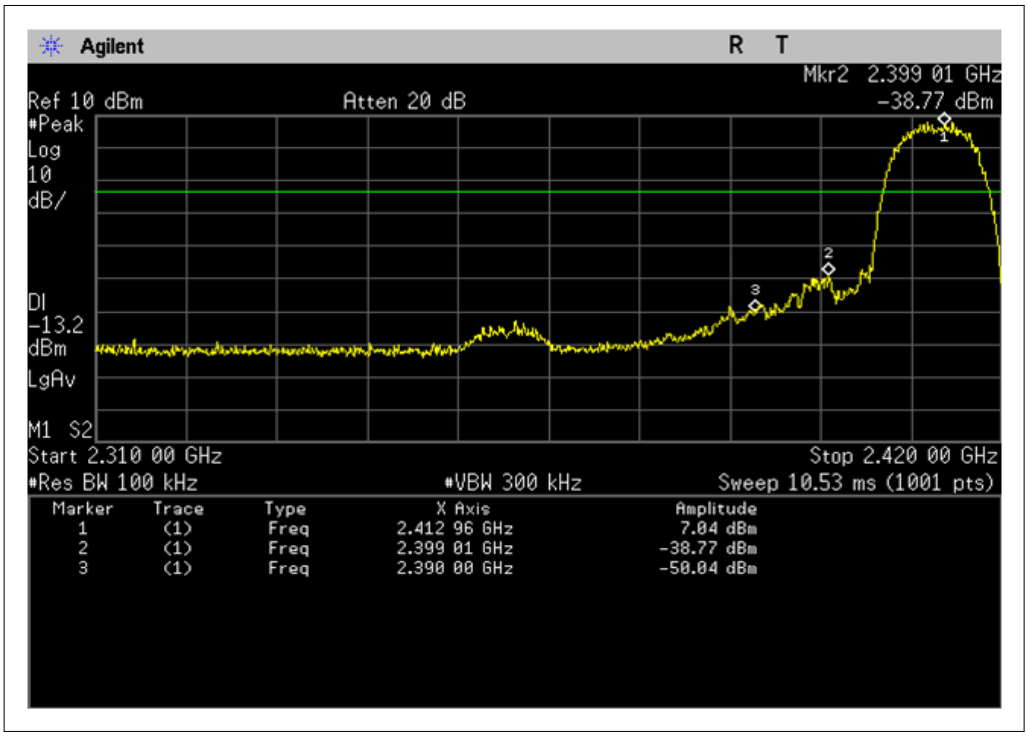
5.5. Band-edge for RF Conducted Emissions

Test Requirement:	FCC Part15 C section 15.247
Test Method:	KDB558074 D01
Test Configuration: 	
Exploratory Test Mode:	Transmitting mode
Final Test Mode:	Through Pre-scan, find the 11Mbps of rate is the worst case of 802.11b
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.
Instruments Used:	Refer to section 4.10 for details
Test Results:	Pass

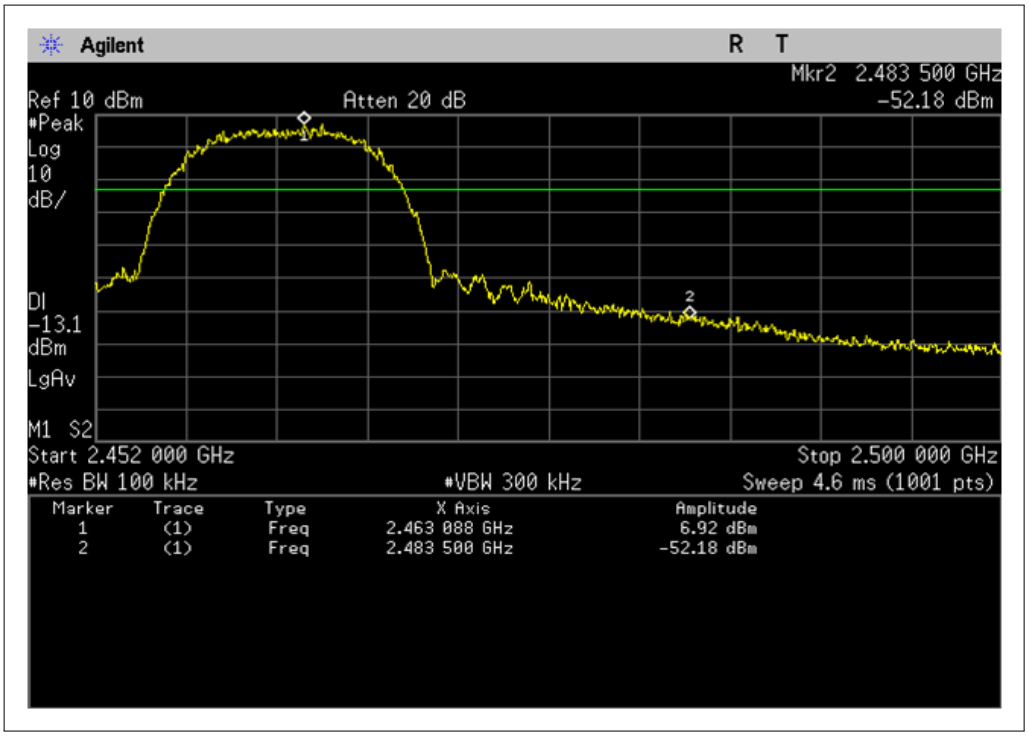
Result plot as follows:

Test mode: 802.11.b

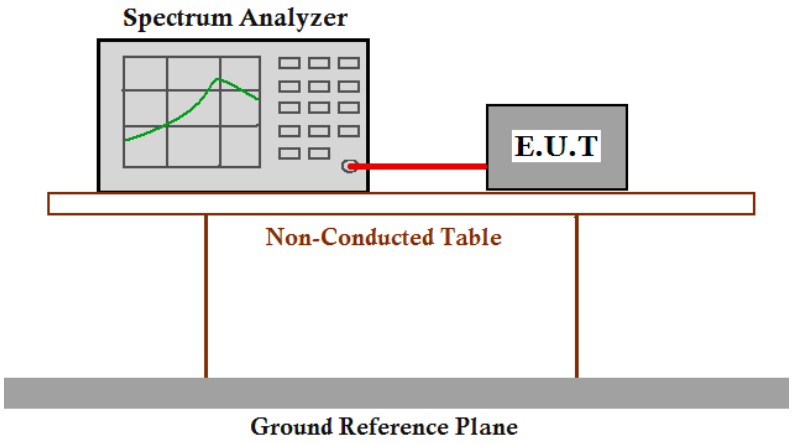
Lowest Channel:



Highest Channel:



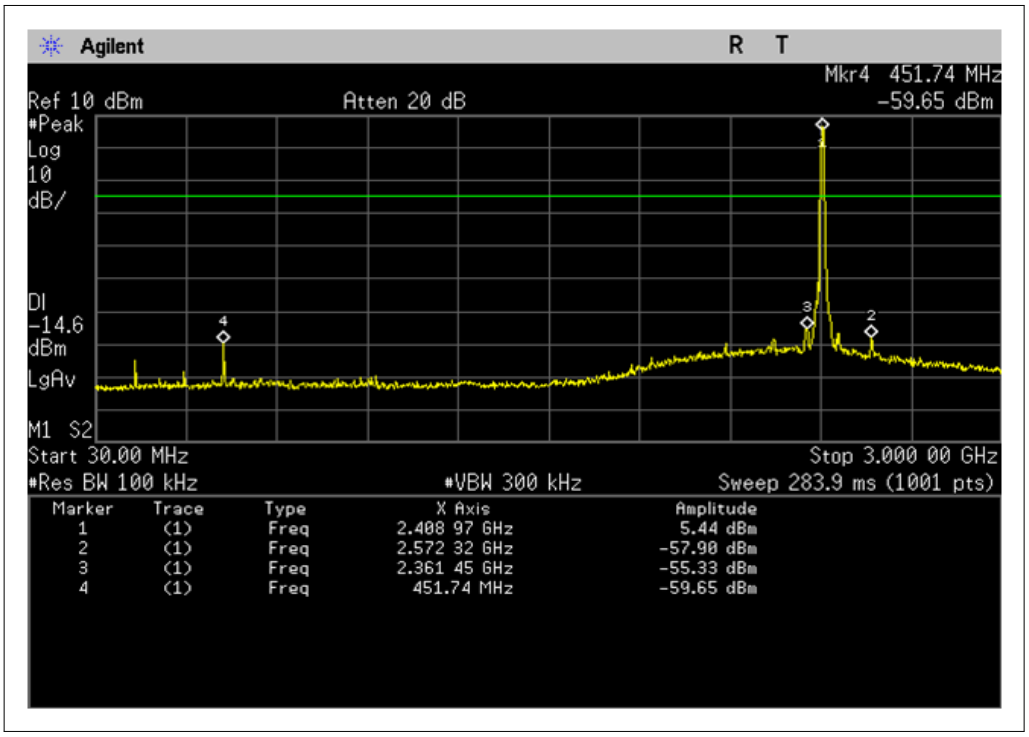
5.6. RF Conducted Spurious Emissions

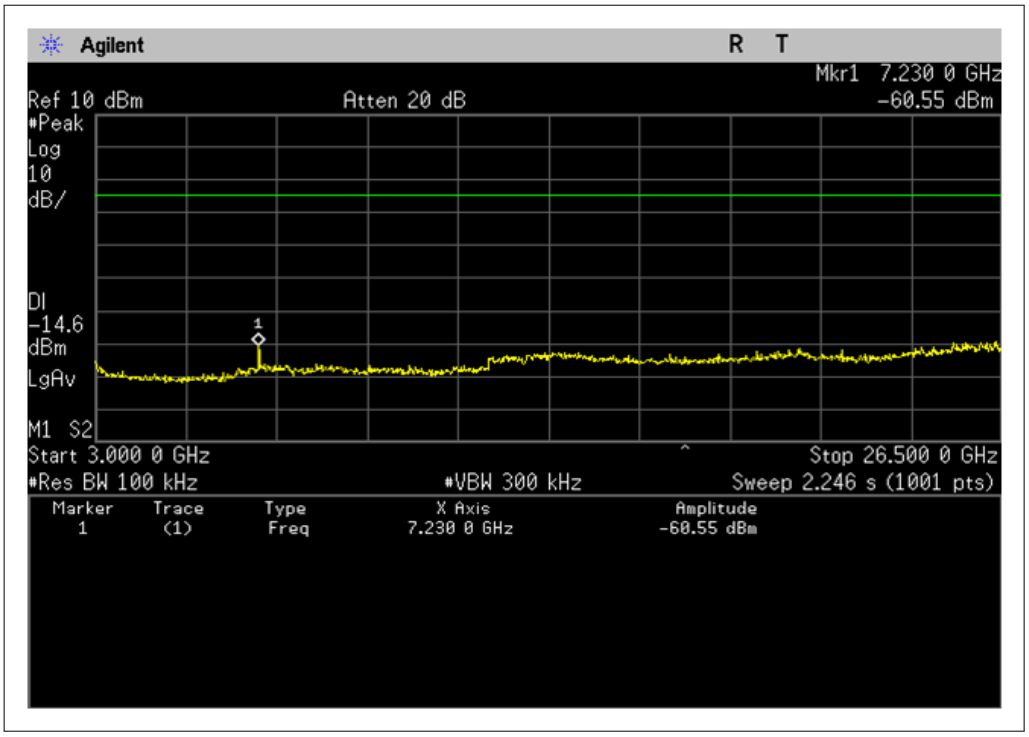
Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	KDB558074 D01
Test Configuration: 	
Exploratory Test Mode:	Transmitting mode
Final Test Mode:	Through Pre-scan, find the 11Mbps of rate is the worst case of 802.11b
Limit:	In any 100 kHz bandwidth outside the frequency band in which the 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.
Instruments Used:	Refer to section 4.10 for details
Test Results:	Pass

Result plot as follows:

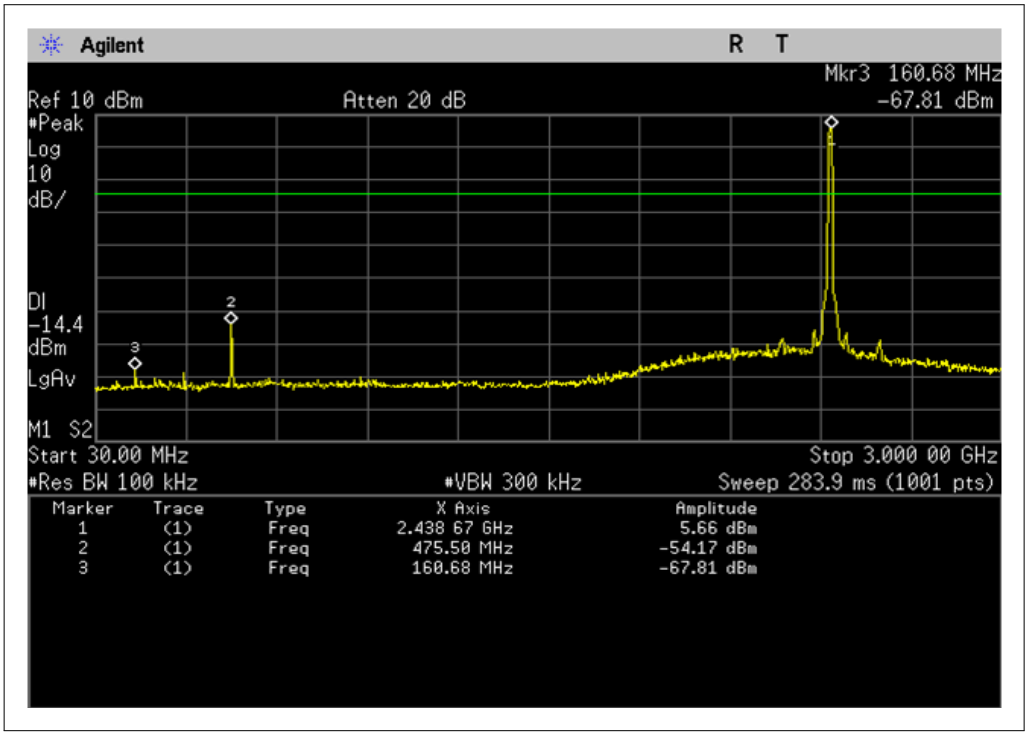
Test mode: 802.11.b

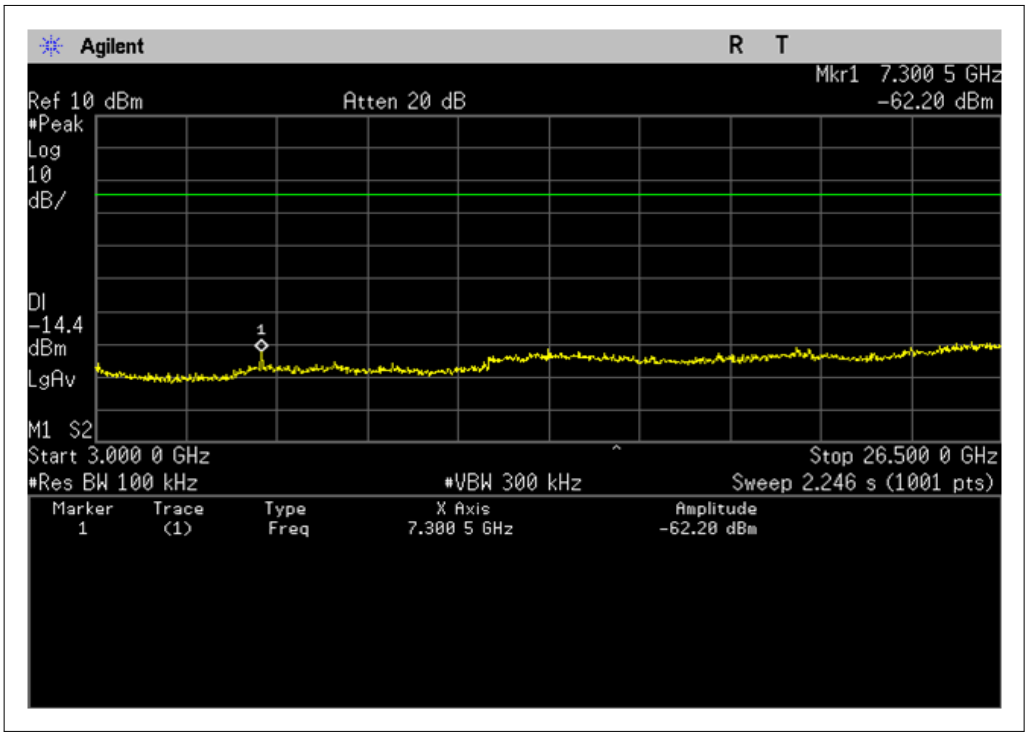
Lowest Channel:



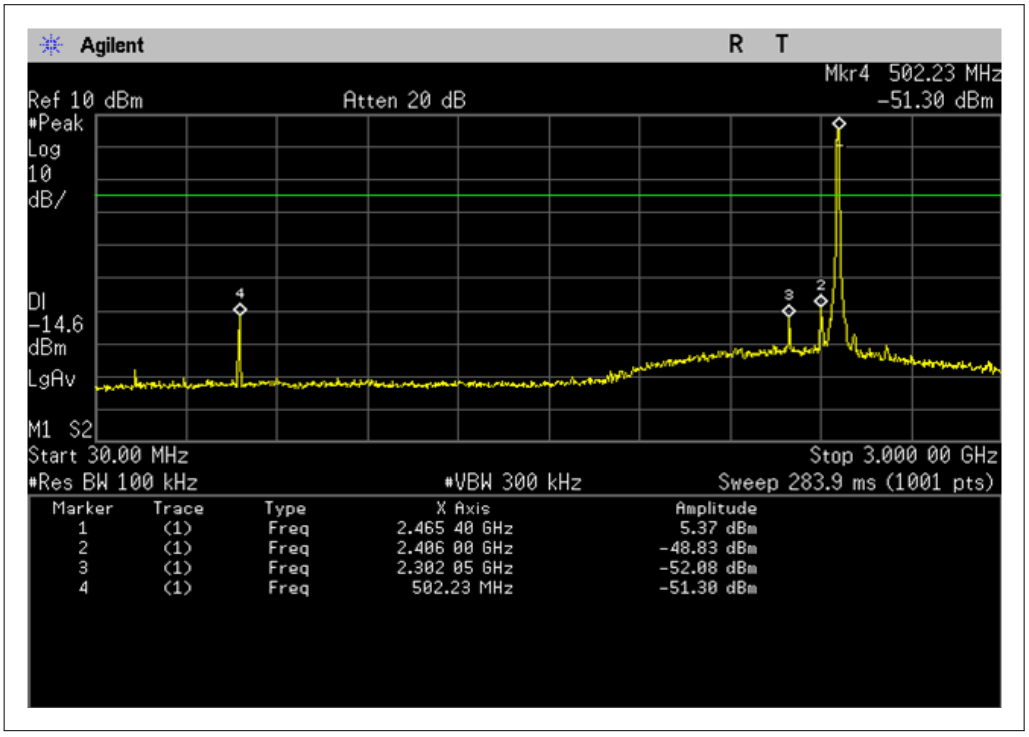


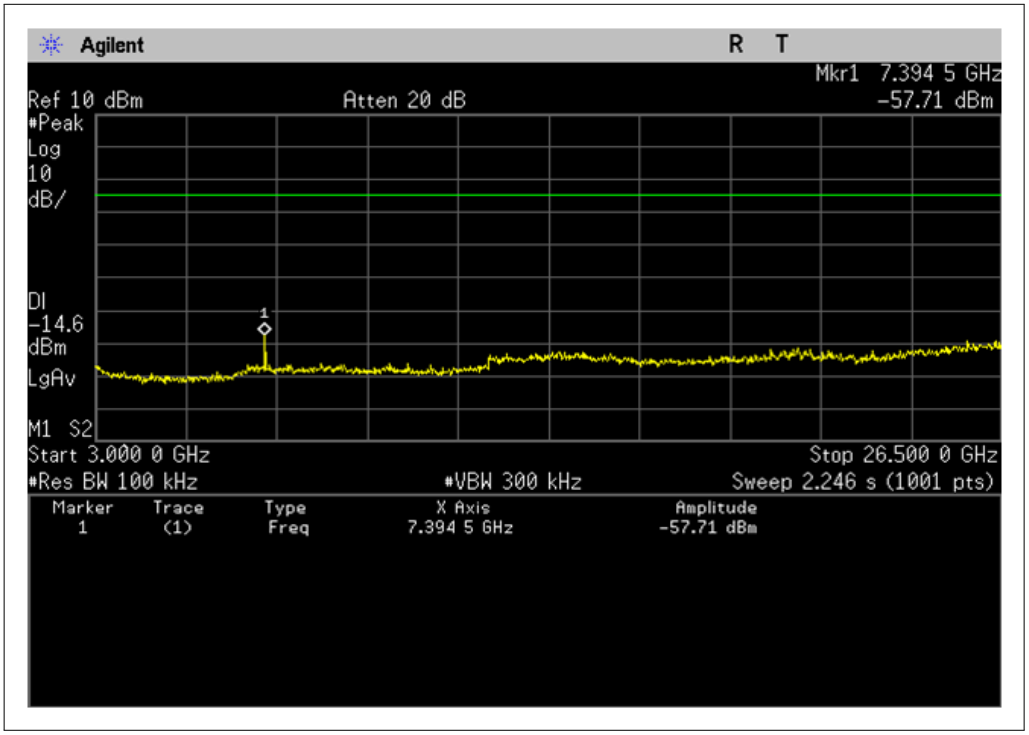
Middle Channel:





Highest Channel:



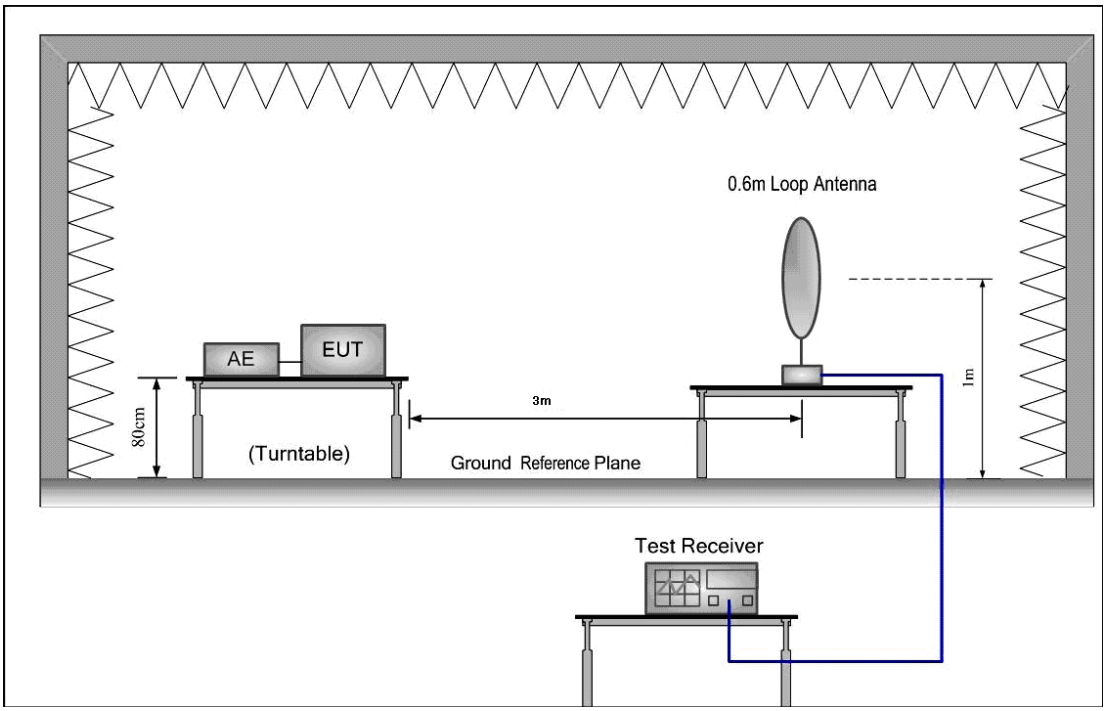


5.7. Radiated Spurious Emissions

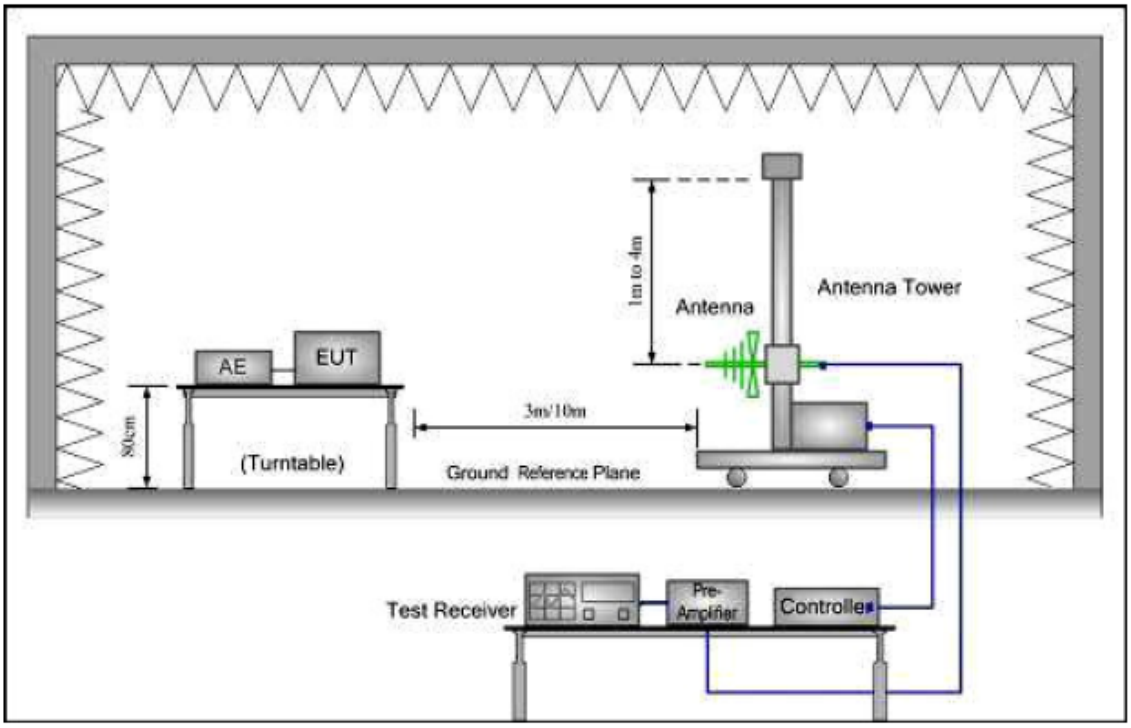
Test equirement:	47 CFR Part 15C Section 15.209 and 15.205				
Test Method:	ANSI C63.10 2009				
Test Site:	Measurement Distance: 3m				
Receiver Setup:	Frequency	Detector	RBW	VBW	Remark
	0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
	0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
	0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
	0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
	0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
	0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
	30MHz-1GHz	Quasi-peak	100kHz	300kHz	Quasi-peak
	Above 1GHz	Peak	1MHz	3MHz	Peak
		Peak	1MHz	10Hz	Average
Limit:	Frequency	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
	0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
	0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
	1.705MHz-30MHz	30	-	-	30
	30MHz-88MHz	100	40.0	Quasi-peak	3
	88MHz-216MHz	150	43.5	Quasi-peak	3
	216MHz-960MHz	200	46.0	Quasi-peak	3
	960MHz-1GHz	500	54.0	Quasi-peak	3
	Above 1GHz	500	54.0	Average	3
	Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.				

Test Configuration:

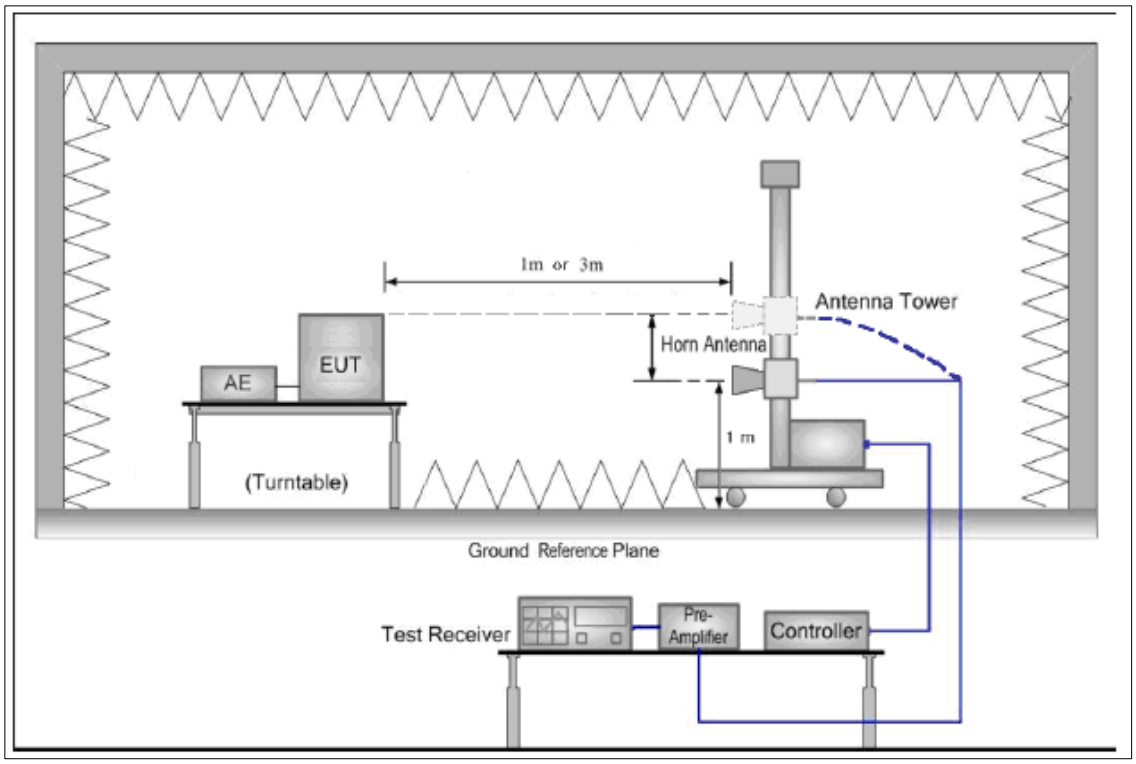
1) 9 kHz to 30 MHz emissions:



2) 30 MHz to 1 GHz emissions:



3) 1 GHz to 25 GHz emissions:



Test Procedure:	a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation. b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters(for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

Test Procedure:	e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. g. Test the EUT in the lowest channel ,the middle channel ,the Highest channel h. The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, Only the test worst case mode is recorded in the report. i. Repeat above procedures until all frequencies measured was complete.
Exploratory Test Mode:	Transmitting mode.
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b
Instruments Used: Refer	Refer to section 4.10 for details
Test Results:	Pass

5.7.1. Harmonic and other spurious emissions

5.7.1.1. Test at Lowest Channel in transmitting status

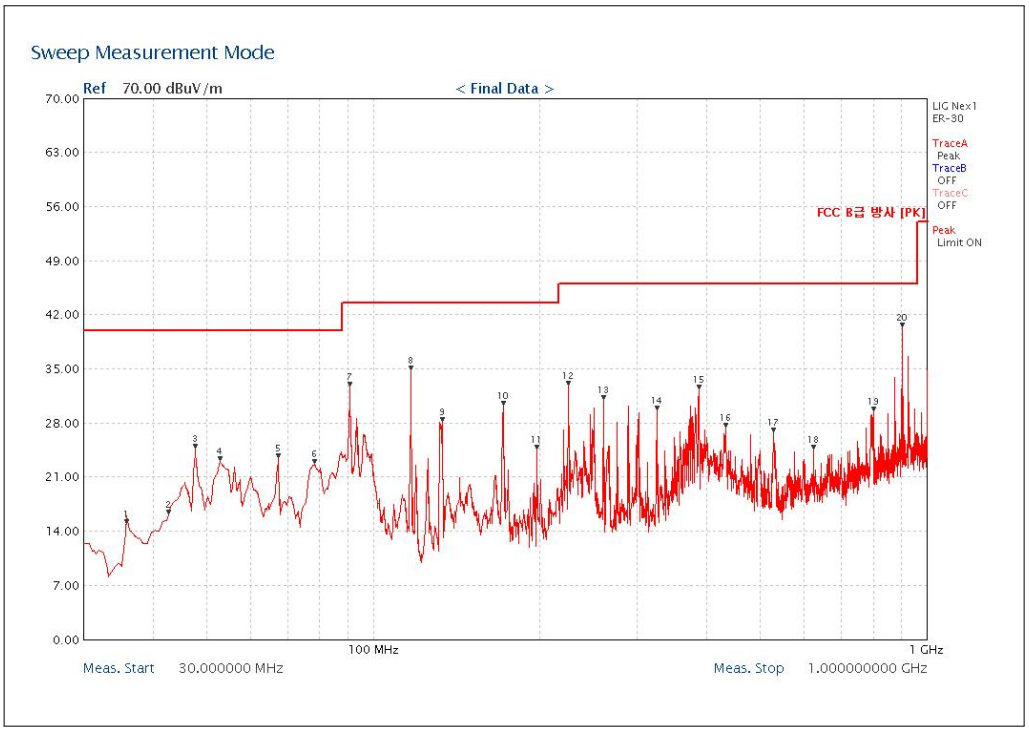
9 kHz~30 MHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement

The measurements with active loop antenna were greater than 20dB below the limit, so the test data were not recorded in the test report.

30 MHz~1 GHz Spurious Emissions. Quasi-Peak Measurement

Test Mode: 802.11b Test channel: Lowest

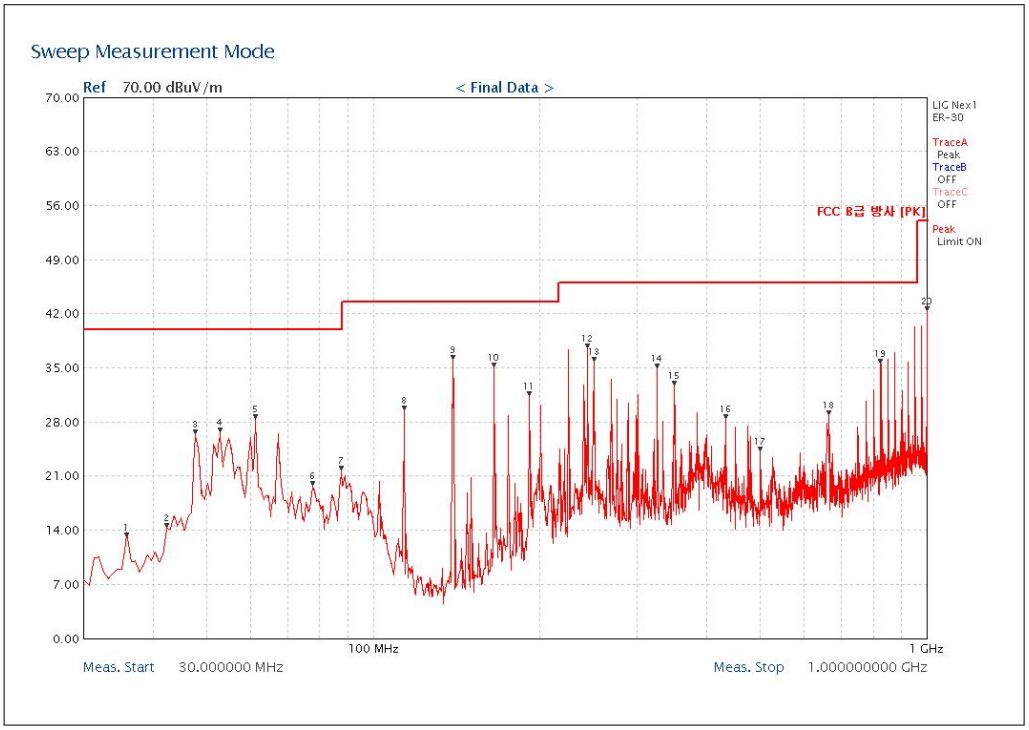
Vertical: Level (dBμV/m)



Quasi-peak measurement

Frequency (MHz)	Detect Mode	Polarization (V/H)	Measured Value (dBμV)	Antenna Factor + Cable Loss (dB/m)	Emission Level (dBμV/m)	Limit (dBμV/m)
90.75	QP	V	32.62	12.07	20.55	43.50
116.92	QP	V	34.71	10.68	24.03	43.50
197.33	QP	V	24.56	11.89	12.67	43.50
387.99	QP	V	32.25	17.66	14.59	46.0
900.52	QP	V	40.33	25.68	14.65	46.0

Horizontal: Level (dBμV/m)



Quasi-peak measurement

Frequency (MHz)	Detect Mode	Polarization (V/H)	Measured Value (dBμV)	Antenna Factor + Cable Loss (dB/m)	Emission Level (dBμV/m)	Limit (dBμV/m)
61.38	QP	H	28.39	13.68	14.71	40.0
139.18	QP	H	35.95	9.87	26.08	43.5
165.35	QP	H	35.05	10.28	24.77	43.5
243.51	QP	H	37.47	14.02	23.45	46.0
250.62	QP	H	35.75	14.33	21.42	46.0
325.58	QP	H	34.91	16.02	18.89	46.0
824.97	QP	H	35.54	24.57	10.97	46.0
986.53	QP	H	42.32	26.01	16.31	54.0

1~25 GHz Harmonics & Spurious Emissions. Peak & Average Measurement

Peak / Average Measurement:

Frequency (MHz)	Polarization (V/H)	Measured Value (dBμV)	Antenna Factor + Cable Loss (dB/m)	Amplifier Gain (dB)	Emission Level (dBμV/m)	Limit (dBμV/m)
The amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.						

5.7.1.2. Test at middle Channel in transmitting status

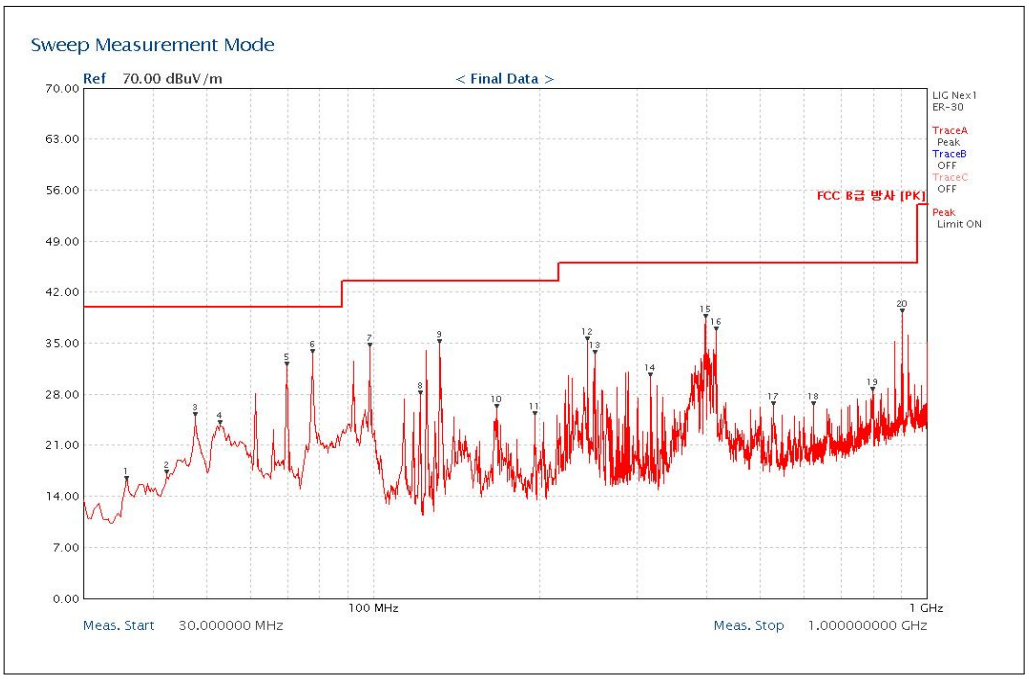
9 kHz~30 MHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement

The measurements with active loop antenna were greater than 20dB below the limit, so the test data were not recorded in the test report.

30 MHz~1 GHz Spurious Emissions. Quasi-Peak Measurement

Test Mode: 802.11b Test channel: Middle

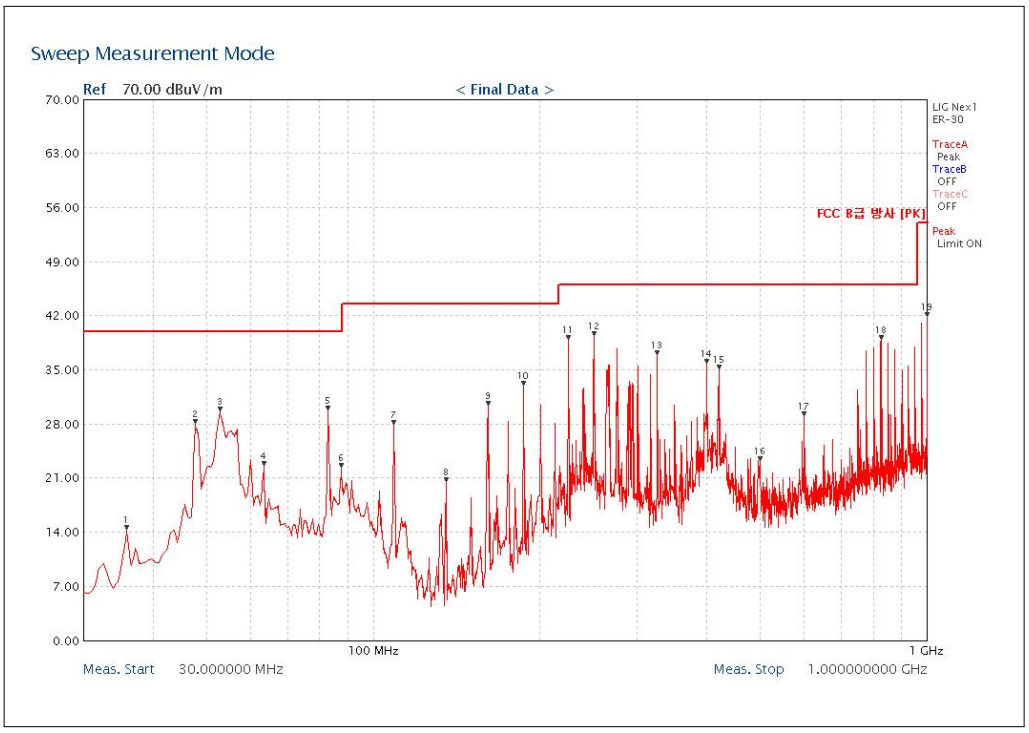
Vertical: Level (dBμV/m)



Quasi-peak measurement

Frequency (MHz)	Detect Mode	Polarization (V/H)	Measured Value (dBμV)	Antenna Factor + Cable Loss (dB/m)	Emission Level (dBμV/m)	Limit (dBμV/m)
52.85	QP	V	23.71	14.93	8.78	40.0
77.72	QP	V	33.51	9.18	24.33	40.0
98.65	QP	V	34.42	13.06	21.36	43.5
131.96	QP	V	34.93	10.00	24.93	43.5
243.51	QP	V	35.22	14.02	21.2	46.0
399.00	QP	V	38.27	17.94	20.33	46.0
900.52	QP	V	39.11	25.68	13.43	46.0

Horizontal: Level (dBμV/m)



Quasi-peak measurement

Frequency (MHz)	Detect Mode	Polarization (V/H)	Measured Value (dBμV)	Antenna Factor + Cable Loss (dB/m)	Emission Level (dBμV/m)	Limit (dBμV/m)
47.64	QP	H	27.93	15.61	12.32	40.0
52.85	QP	H	29.57	14.93	14.64	40.0
82.93	QP	H	29.64	9.56	20.08	40.0
161.44	QP	H	30.33	10.11	20.22	43.5
186.91	QP	H	32.95	11.31	21.64	43.5
225.27	QP	H	38.81	13.19	25.62	46.0
250.62	QP	H	39.30	14.33	24.97	46.0
325.58	QP	H	36.90	16.02	20.88	46.0
400.30	QP	H	35.74	17.97	17.77	46.0
420.55	QP	H	34.95	18.30	16.65	46.0
825.68	QP	H	38.87	24.58	14.29	46.0
986.54	QP	H	41.83	26.01	15.82	54.0

1~25 GHz Harmonics & Spurious Emissions. Peak & Average Measurement

Peak / Average Measurement:

Frequency (MHz)	Polarization (V/H)	Measured Value (dBμV)	Antenna Factor + Cable Loss (dB/m)	Amplifier Gain (dB)	Emission Level (dBμV/m)	Limit (dBμV/m)
The amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.						

5.7.1.3. Test at Highest Channel in transmitting status

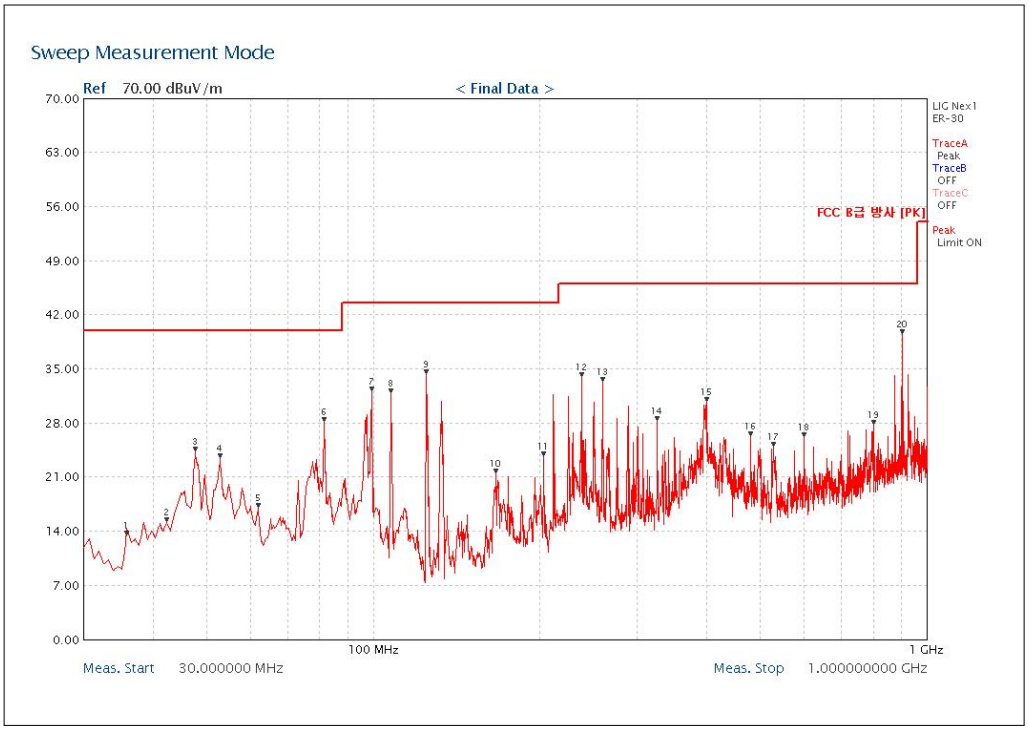
9 kHz~30 MHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement

The measurements with active loop antenna were greater than 20dB below the limit, so the test data were not recorded in the test report.

30 MHz~1 GHz Spurious Emissions. Quasi-Peak Measurement

Test Mode: 802.11b Test channel: Highest

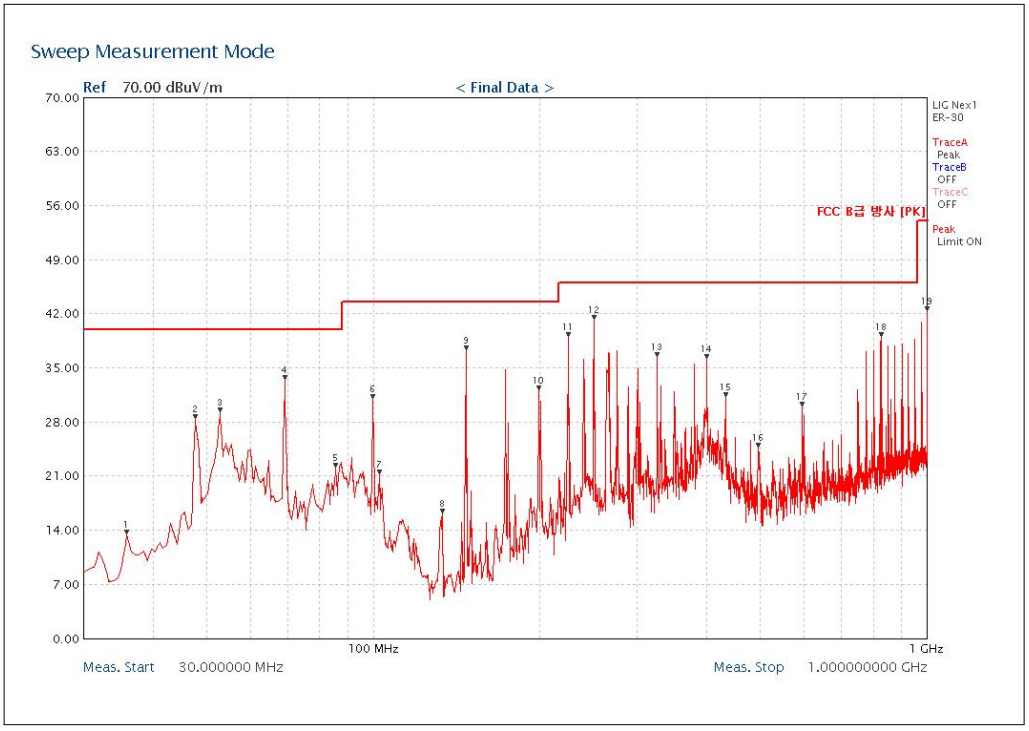
Vertical: Level (dBμV/m)



Quasi-peak measurement

Frequency (MHz)	Detect Mode	Polarization (V/H)	Measured Value (dBμV)	Antenna Factor + Cable Loss (dB/m)	Emission Level (dBμV/m)	Limit (dBμV/m)
99.27	QP	V	32.07	13.13	18.94	43.5
107.80	QP	V	31.83	12.05	19.78	43.5
124.73	QP	V	34.30	10.13	24.17	43.5
237.59	QP	V	33.85	13.75	20.1	46.0
259.73	QP	V	33.24	14.52	18.72	46.0
900.52	QP	V	39.44	25.68	13.76	46.0

Horizontal: Level (dBμV/m)



Quasi-peak measurement

Frequency (MHz)	Detect Mode	Polarization (V/H)	Measured Value (dBμV)	Antenna Factor + Cable Loss (dB/m)	Emission Level (dBμV/m)	Limit (dBμV/m)
69.19	QP	H	33.38	11.54	21.84	40.0
99.98	QP	H	30.95	13.22	17.73	43.5
147.00	QP	H	37.26	9.92	27.34	43.5
225.27	QP	H	38.90	13.19	25.71	46.0
250.62	QP	H	41.18	14.33	26.85	46.0
325.58	QP	H	36.30	16.02	20.28	46.0
400.30	QP	H	36.15	17.97	18.18	46.0
825.68	QP	H	38.98	24.58	14.4	46.0
968.57	QP	H	42.23	26.01	16.22	54.0

1~25 GHz Harmonics & Spurious Emissions. Peak & Average Measurement

Peak / Average Measurement:

Frequency (MHz)	Polarization (V/H)	Measured Value (dBμV)	Antenna Factor + Cable Loss (dB/m)	Amplifier Gain (dB)	Emission Level (dBμV/m)	Limit (dBμV/m)
The amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.						

Remark:

1). The field strength is calculated by adding the Antenna Factor. Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Emission = Measured Value + Antenna Factor + Cable Loss –Amplifier Gain.

2). As shown in Section, for frequencies above 1000 MHz. the above field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

3). The test only perform the EUT in transmitting status since the test frequencies were over 1GHz only required transmitting status.

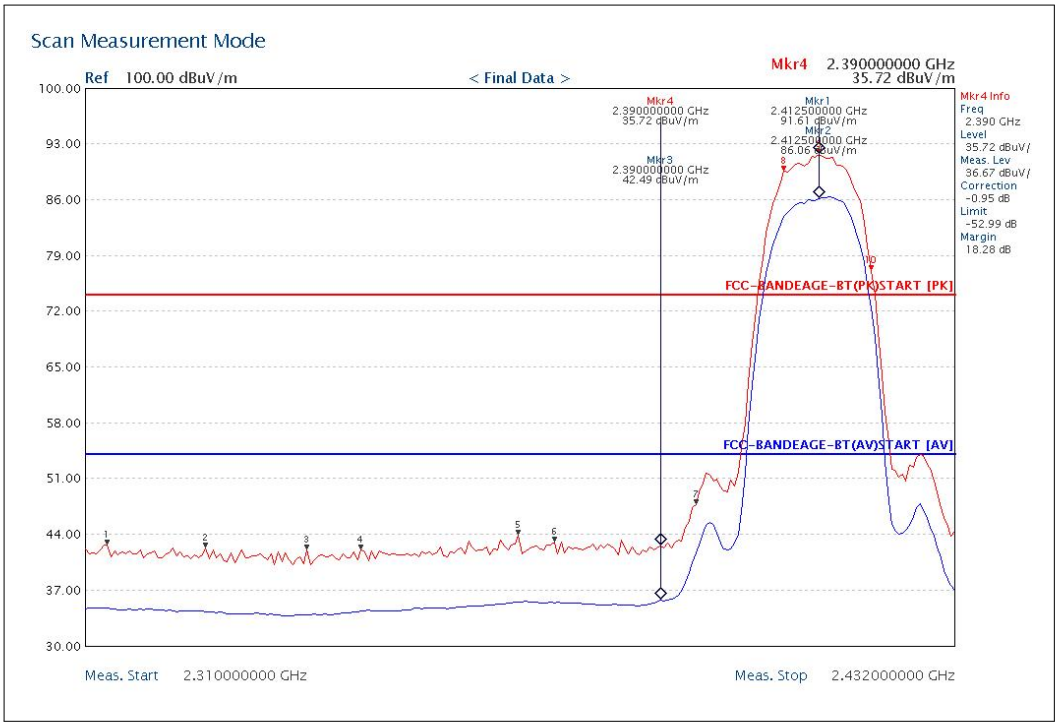
5.8. Band Edge (Radiated Emission)

Test Requirement:	FCC Part15 C Section 15.247 (d) In addition, radiated emissions which fall in the restricted bands. as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).
Test Method:	ANSI C63.10: 2009
Measurement	3m (Semi-Anechoic Chamber)
Limit:	Section 15.209(a) 40.0 dBμV/m between 30MHz & 88MHz; Quasi-peak Value 43.5 dBμV/m between 88MHz & 216MHz; Quasi-peak Value 46.0 dBμV/m between 216MHz & 960MHz; Quasi-peak Value 54.0 dBμV/m between 960MHz.& 1GHz; Quasi-peak Value 54.0 dBμV/m Above 1GHz; Average Value 74.0 dBμV/m Above 1GHz; Peak Value
Test Procedure:	a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation. b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. f. Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel g. Test the EUT in the lowest channel , the Highest channel h. The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, only the test worst case mode is recorded in the report. i. Repeat above procedures until all frequencies measured was complete.

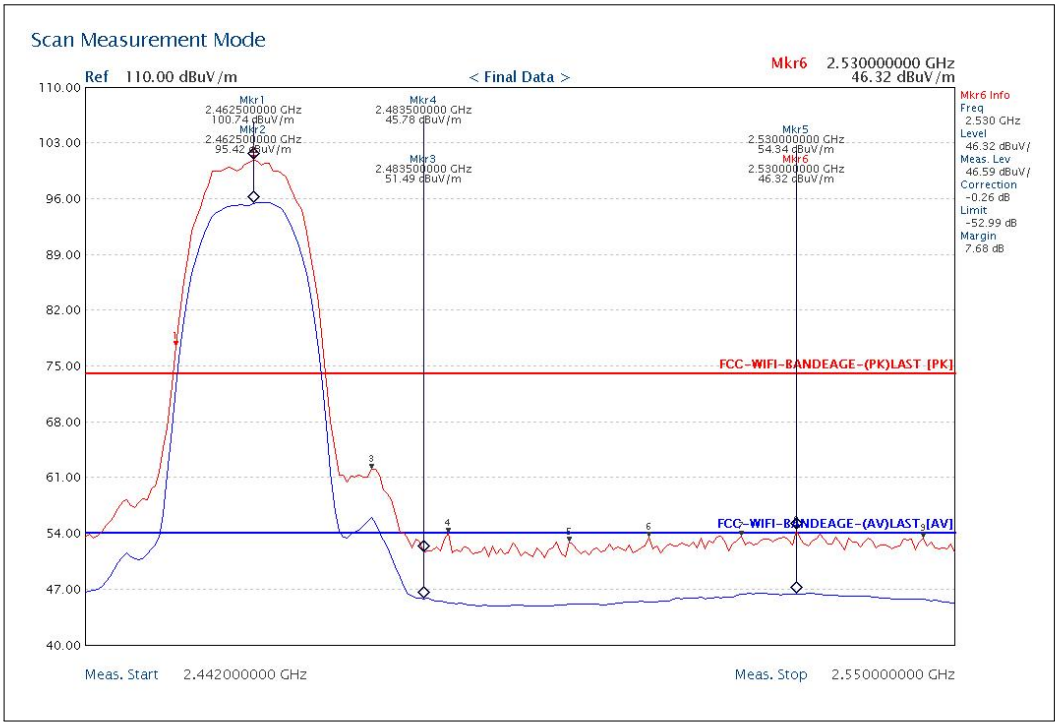
Exploratory Test Mode:	Transmitting mode
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b;
Instruments Used:	Refer to section 4.10 for details
Test Results:	Pass

Measurement Result:

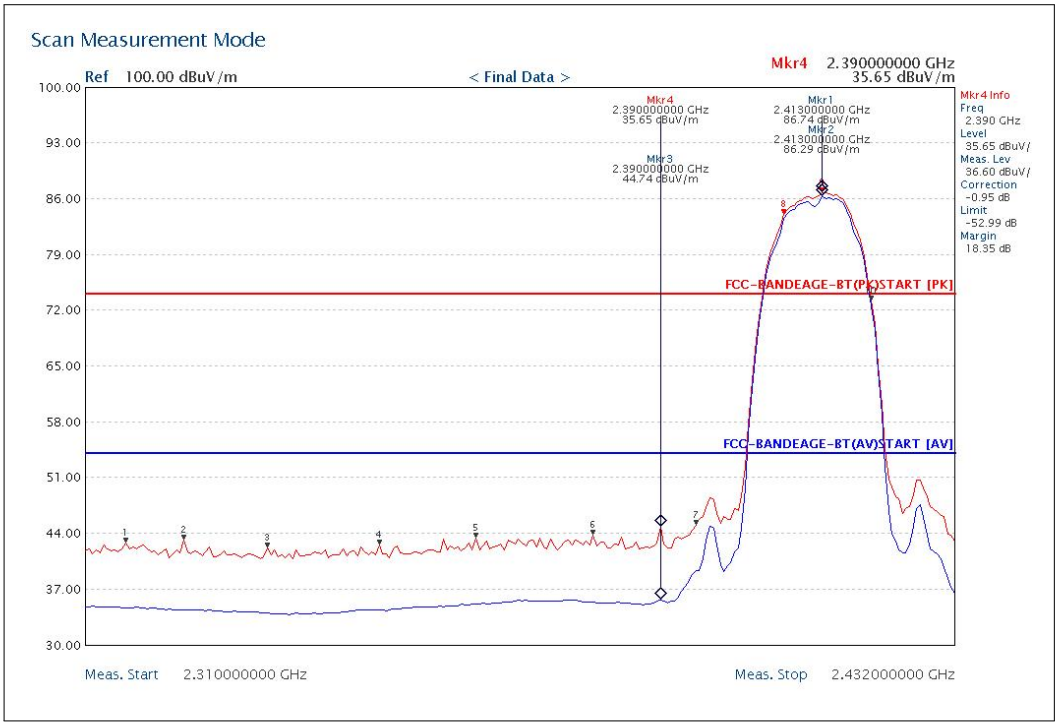
802.11b- Lowest Channel , Horizontal , Peak/Average Detector



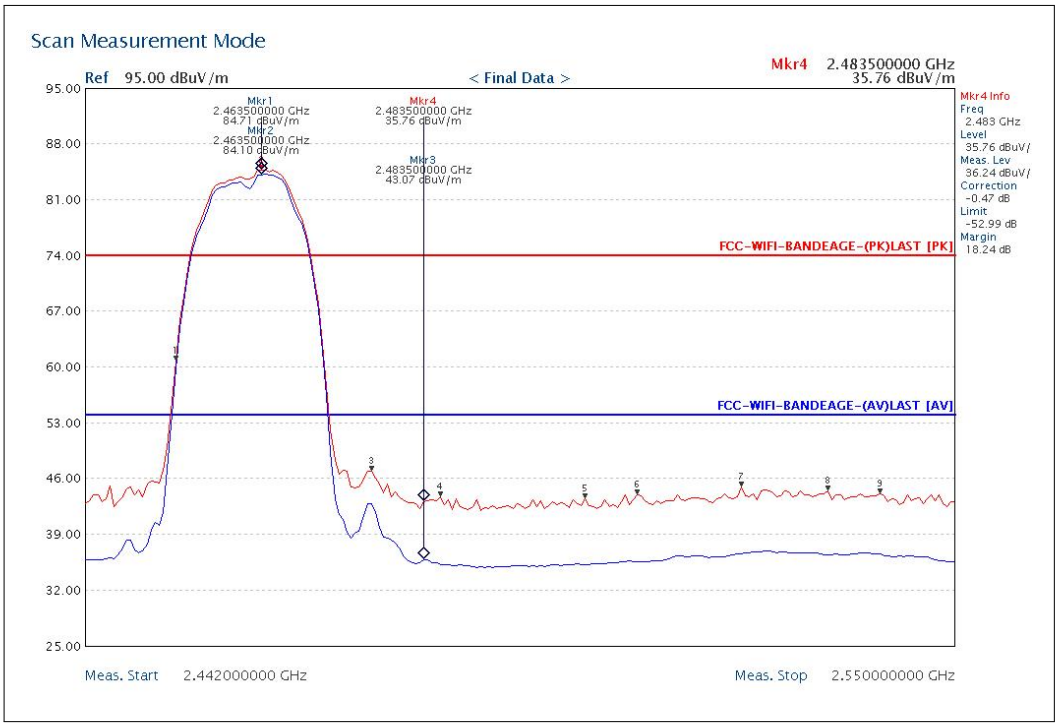
802.11b- High Channel , Horizontal , Peak/Average Detector



802.11b- Low Channel , Vertical , Peak/Average Detector



802.11b- High Channel , Vertical , Peak/Average Detector



Section 15.205 Restricted bands of operation.

(a) Except as shown in paragraph (d) of this section. only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	
13.36 - 13.41			

5.9. Conducted Emissions at Mains Terminals 150 kHz to 30 MHz

Test Requirement: FCC Part 15 C section 15.207
Test Method: ANSI C63.10: ANSI C63.10: 2009
Frequency Range: 150 kHz to 30 MHz
Detector: Peak for pre-scan (9 kHz Resolution Bandwidth)

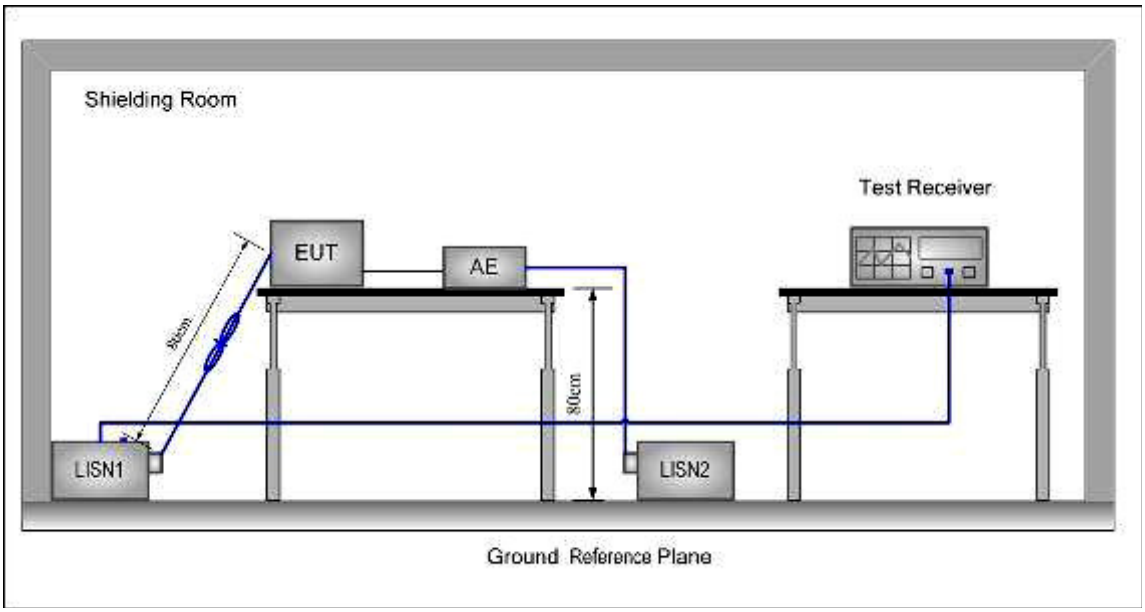
Test Limit

Limits for conducted disturbance at the mains ports of class B

Frequency Range (MHz)	Class B Limit dB(μV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
NOTE 1 The limit decreases linearly with the logarithm of the frequency in the range 0,15 MHz to 0,50 MHz.		

EUT Operation: Test in normal operating mode. For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage.
Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Test Configuration:



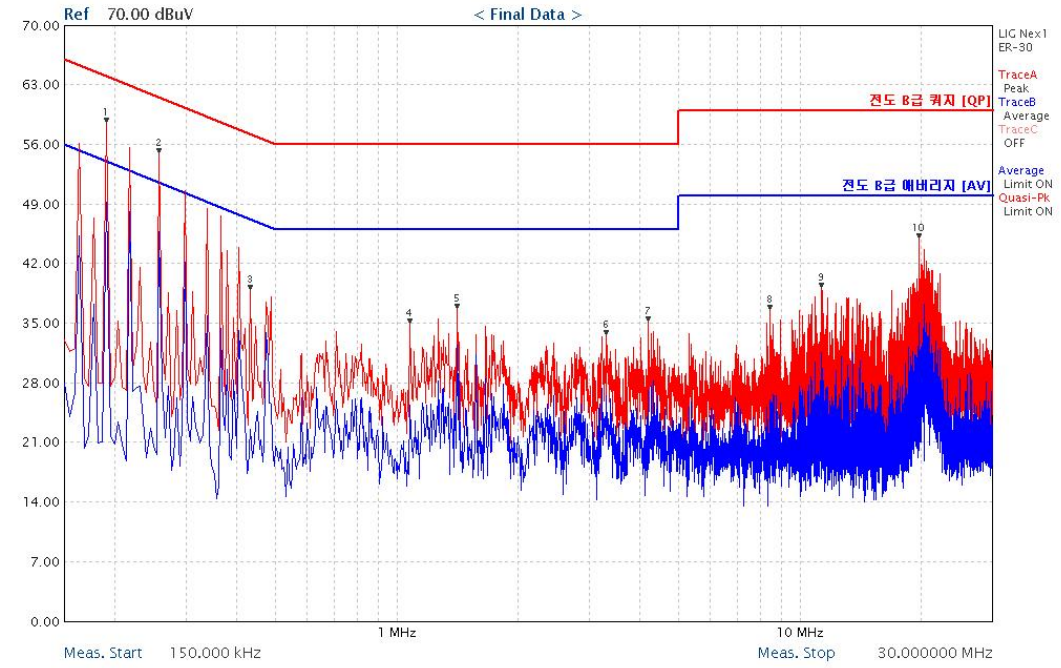
Test procedure:

1. The mains terminal disturbance voltage test was conducted in a shielded room.
2. The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50/50μH + 5linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
3. The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane, but separated from metallic contact with the ground reference plane by 0.1m of insulation.
4. The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0,4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0,8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0,8 m from the LISN 2.
5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2009 on conducted measurement.

5.9.1. Measurement Data

Pre-scan was performed with peak detected on all ports, Quasi-peak & average measurements were performed at the frequencies at which maximum peak emission level were detected. Please see the attached Quasi-peak and Average test results.

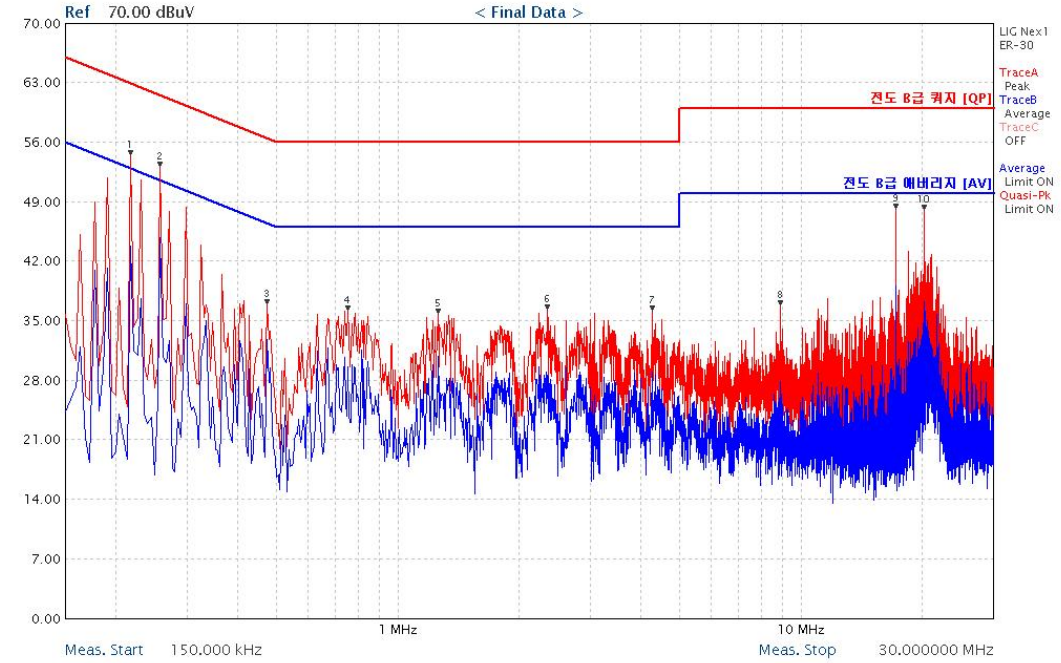
Line - PE(QusiPeak and Average detector used)



REDUCTION TABLE

No	Freq (MHz)	Level (dBuV)	Corr (dB)	Limit (dBuV)	Margin (dB)	State	Reference
1	0.190	56.05	10.12	64.04	7.99	Pass	QP
2	0.217	52.39	10.12	63.21	10.82	Pass	QP
3	0.258	52.71	10.13	61.76	9.05	Pass	QP
4	20.260	41.03	13.18	60.00	18.97	Pass	QP
5	0.190	36.92	10.12	54.04	17.12	Pass	AV
6	0.217	33.38	10.12	53.21	19.83	Pass	AV
7	0.258	36.32	10.13	51.76	15.44	Pass	AV
8	20.260	31.64	13.18	50.00	18.36	Pass	AV

Neutral – PE(QusiPeak and Average detector used)



REDUCTION TABLE

No	Freq (MHz)	Level (dBuV)	Corr (dB)	Limit (dBuV)	Margin (dB)	State	Reference
1	0.217	52.02	10.11	63.21	11.19	Pass	QP
2	0.258	51.65	10.12	61.76	10.11	Pass	QP
3	17.146	32.12	12.38	60.00	27.88	Pass	QP
4	20.197	38.62	12.89	60.00	21.38	Pass	QP
5	0.217	34.86	10.11	53.21	18.35	Pass	AV
6	0.258	38.01	10.12	51.76	13.75	Pass	AV
7	17.146	21.48	12.38	50.00	28.52	Pass	AV
8	20.197	30.13	12.89	50.00	19.87	Pass	AV

Measurement data:

* Detector function was set into Quasi-peak & Average mode.

* Corr = LISN Factor + Cable loss + Pulse Limiter

5.10. Radio Frequency Exposure Procedures

Regulation

According to §15.247(i) and § 1.1307(b)(1) , systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.

KDB 447498 D01: Approximate SAR test exclusion power thresholds at selected frequencies and test separation distances are illustrated in the following table:

MHz	5	10	15	20	25	mm
150	39	77	116	155	194	SAR Test Exclusion Threshold (mW)
300	27	55	82	110	137	
450	22	45	67	89	112	
835	16	33	49	66	82	
900	16	32	47	63	79	
1500	12	24	37	49	61	
1900	11	22	33	44	54	
2450	10	19	29	38	48	
3600	8	16	24	32	40	
5200	7	13	20	26	33	
5400	6	13	19	26	32	
5800	6	12	19	25	31	

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

Maximum Measured Transmitter Power:

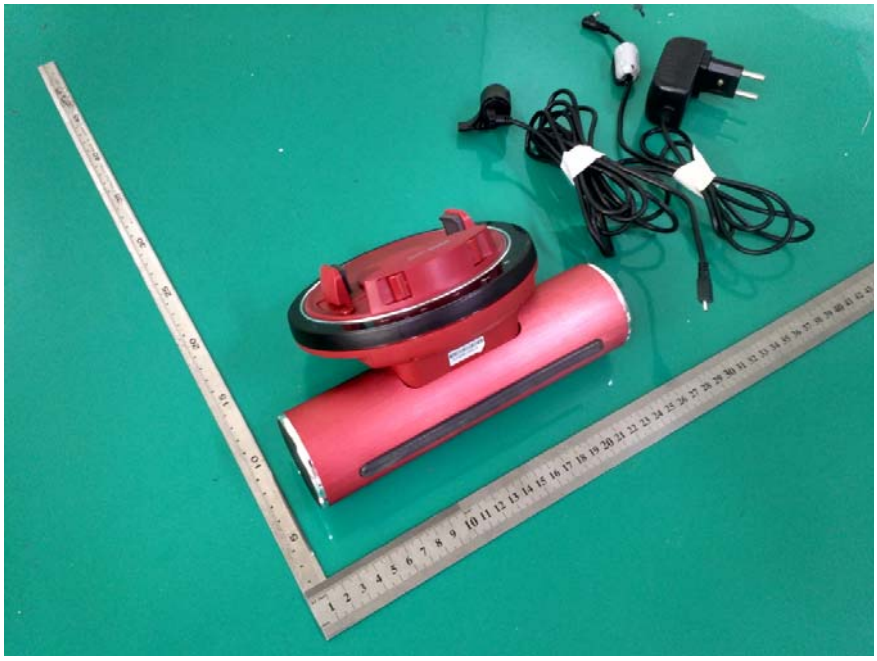
Channel Frequency (MHz)	Maximum Peak Conducted Output Power		Max Antenna Gain (dBi)	Numeric antenna gain (mW)
	(dBm)	(mW)		
2412	16.45	44.15	-0.5	0.891

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)]

· [√f(GHz)] = 44.15/25*√2.412 = 2.74 ≤ 3.0

Threshold at which no SAR required is 48mW and ≤ 3.0 for 1-g SAR, Separation distance is 25mm.

Conclusion : The SAR measurement is exempt.

APPENDIX

1. EUT photo