NCC Test Report

Equipment	:	**802.11a/b/g/n module**
Model No.	:	**PH45N**
Brand Name	:	**Laird**
Applicant	:	萊爾德電子材料股份有限公司
Address	:	新北市五股區五權六路 **22** 號
Standard	:	**LP0002 Section 3.10.1 (2018-01-10)**
Received Date	:	**Jan. 12, 2018**
Tested Date	:	**Jan. 16 ~ Jan. 22, 2018**

We, International Certification Corp., would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It may be duplicated completely for legal use with the approval of the applicant. It shall not be reproduced except in full without the written approval of our laboratory.

Reviewed by:

Along Chen / Assistant Manager

Approved by:

Gary Chang / Manager

Testing Laboratory 2732

Table of Contents

1 GENERAL DESCRIPTION 5

1.1 Information 5
1.2 Local Support Equipment List 7
1.3 Test Setup Chart 7
1.4 The Equipment List 8
1.5 Test Standards 9
1.6 Measurement Uncertainty 9

2 TEST CONFIGURATION 10

2.1 Testing Condition 10
2.2 The Worst Test Modes and Channel Details 10

3 TRANSMITTER TEST RESULTS 11

3.1 Conducted Emissions 11
3.2 6dB and Occupied Bandwidth 14
3.3 RF Output Power 17
3.4 Power Spectral Density 19
3.5 Unwanted Emissions into Restricted Frequency Bands 21
3.6 Emissions in Non-Restricted Frequency Bands 43

4 RECEIVER TEST RESULTS 53

4.1 Conducted Emissions 53
4.2 Radiated Emissions 56

5 TEST LABORATORY INFORMATION 62

Release Record

Report No.	Version	Description	Issued Date
TR811202-01AC	Rev. 01	Initial issue	Sep. 14, 2018

Summary of Test Results

NCC Rules	Test Items	Measured	Result
2.3	Conducted Emissions	[dBuV]: 0.469MHz 28.70 (Margin -17.84dB) - AV	Pass
3.10.1.5 2.8	Radiated Emissions	[dBuV/m at 3m]: 2483.50MHz 53.85 (Margin -0.15dB) - AV	Pass
3.10.1.2(1)(C)	Maximum Output Power	Max Power [dBm]: 22.02	Pass
3.10.1.6(2)(A)	6dB Bandwidth	Meet the requirement of limit	Pass
3.10.1.6(2)(B)	Power Spectral Density	Meet the requirement of limit	Pass
3.10.1.4	Antenna Requirement	Meet the requirement of limit	Pass

1 General Description

1.1 Information

1.1.1 Specification of the Equipment under Test (EUT)

RF General Information					
Frequency Range (MHz)	**IEEE Std. 802.11**	**Ch. Freq. (MHz)**	**Channel Number**	**Transmit Chains (N_{TX})**	**Data Rate / MCS**
2400-2483.5	b	2412-2462	1-11 [11]	1	1-11 Mbps
2400-2483.5	g	2412-2462	1-11 [11]	1	6-54 Mbps
2400-2483.5	n (HT20)	2412-2462	1-11 [11]	1	MCS 0-7
Note 1: RF output power specifies that Maximum Peak Conducted Output Power. Note 2: 802.11b uses a combination of DSSS-DBPSK, DQPSK, CCK modulation. Note 3: 802.11g/n uses a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM modulation.					

1.1.2 Antenna Details

Ant No.	Brand	Model	Type	Connector	Operating Frequencies (MHz) / Antenna Gain (dBi)				
					2400~2483.5	5150~5250	5250~5350	5470~5725	5725~5850
1	Laird	NanoBlade-IP04	PCB Dipole	IPEX U.FL	2	3.9		4	

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	3.3Vdc from host

1.1.4 Accessories

N/A

1.1.5 Channel List

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

1.1.6 Test Tool and Duty Cycle

Test Tool	SRU, v3.03.10.00		
Duty Cycle and Duty Factor	Mode	Duty cycle (%)	Duty factor (dB)
	11b	100.00%	0.00
	11g	99.78%	0.01
	HT20	99.74%	0.01

1.1.7 Power Setting

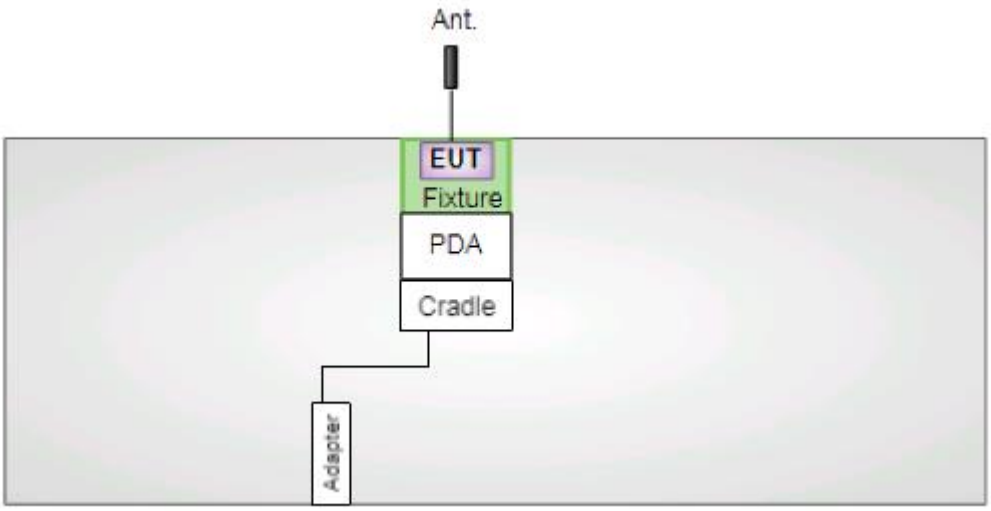
Modulation Mode	Test Frequency (MHz)	Power Set
11b	2412	100%
11b	2437	100%
11b	2462	100%
11g	2412	100%
11g	2437	100%
11g	2462	100%
HT20	2412	100%
HT20	2437	100%
HT20	2462	100%

1.2 Local Support Equipment List

Support Equipment List					
No.	**Equipment**	**Brand**	**Model**	**FCC ID**	**Signal cable / Length (m)**
1	PDA	HP	HSTNH-L05C-BT	---	---
2	Fixture	---	---	---	---

1.3 Test Setup Chart

Test Setup Diagram



1.4 The Equipment List

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Tested Date	Jan. 19, 2018				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Receiver	R&S	ESR3	101657	Jan. 05, 2018	Jan. 04, 2019
LISN	SCHWARZBECK	Schwarzbeck 8127	8127-667	Nov. 13, 2017	Nov. 12, 2018
LISN (Support Unit)	SCHWARZBECK	Schwarzbeck 8127	8127-666	Nov. 24, 2017	Nov. 23, 2018
RF Cable-CON	EMC	EMCCFD300-BM-BM-6000	50821	Dec. 18, 2017	Dec. 17, 2018
50 ohm terminal (Support Unit)	NA	50	04	May. 12, 2017	May. 11, 2018
Measurement Software	AUDIX	e3	6.120210k	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	Radiated Emission				
Test Site	966 chamber 3 / (03CH03-WS)				
Tested Date	Jan. 16 ~ Jan. 17, 2018				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	R&**S**	FSV40	101499	Jan. 03, 2018	Jan. 02, 2019
Receiver	R&**S**	ESR3	101658	Nov. 20, 2017	Nov. 19, 2018
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-685	Apr. 28, 2017	Apr. 27, 2018
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1206	Feb. 09, 2017	Feb. 08, 2018
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 23, 2017	Nov. 22, 2018
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 13, 2017	Nov. 12, 2018
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Dec. 07, 2017	Dec. 06, 2018
Preamplifier	EMC	EMC02325	980187	Sep. 04, 2017	Sep. 03, 2018
Preamplifier	Agilent	83017A	MY53270014	Aug. 21, 2017	Aug. 20, 2018
Preamplifier	EMC	EMC184045B	980192	Aug. 22, 2017	Aug. 21, 2018
RF cable-3M	HUBER+SUHNER	SUCOFLEX104	MY22620/4	Nov. 27, 2017	Nov. 26, 2018
RF cable-8M	HUBER+SUHNER	SUCOFLEX104	MY32487/4	Nov. 27, 2017	Nov. 26, 2018
RF cable-1M	HUBER+SUHNER	SUCOFLEX104	MY22624/4	Nov. 27, 2017	Nov. 26, 2018
LF cable-0.8M	EMC	EMC8D-NM-NM-800	EMC8D-NM-NM-800-001	Nov. 27, 2017	Nov. 26, 2018
LF cable-3M	EMC	EMC8D-NM-NM-3000	131103	Nov. 27, 2017	Nov. 26, 2018
LF cable-13M	EMC	EMC8D-NM-NM-13000	131104	Nov. 27, 2017	Nov. 26, 2018
Measurement Software	AUDIX	e3	6.120210g	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	RF Conducted				
Test Site	(TH01-WS)				
Tested Date	Jan. 22, 2018				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	R&S	FSV40	101063	Mar. 15, 2017	Mar. 14, 2018
Power Meter	Anritsu	ML2495A	1241002	Oct. 16, 2017	Oct. 15, 2018
Power Sensor	Anritsu	MA2411B	1207366	Oct. 16, 2017	Oct. 15, 2018
DC POWER SOURCE	GW INSTEK	GPC-6030D	EM892433	Oct. 26, 2017	Oct. 25, 2018
Measurement Software	Sporton	Sporton_1	1.3.30	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

1.5 Test Standards

According to the specification of EUT, the EUT must comply with following standards and KDB documents.

LP0002 Section 3.10.1 (2018-01-10)
ANSI C63.10-2013
ANSI C63.4-2014
FCC KDB 558074D01 15.247 Meas Guidance v05

1.6 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)

Measurement Uncertainty	
Parameters	**Uncertainty**
Bandwidth	±34.134 Hz
Conducted power	±0.808 dB
Power density	±0.463 dB
Conducted emission	±2.670 dB
AC conducted emission	±2.90 dB
Radiated emission ≤ 1GHz	±3.66 dB
Radiated emission > 1GHz	±5.37 dB

2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
AC Conduction	CO01-WS	23°C / 59%	Alex Tsai
Radiated Emissions	03CH03-WS	21-25°C / 62-66%	Roger Lu Akan Chung
RF Conducted	TH01-WS	22°C / 64%	Brad Wu

- FCC Designation No.: TW0009
- FCC site registration No.: 207696
- IC site registration No.: 10807C-1

2.2 The Worst Test Modes and Channel Details

Test item	Modulation Mode	Test Frequency (MHz)	Data Rate	Mode
Conducted Emissions	11g	2437	6 Mbps	TX
Radiated Emissions ≤1GHz	11g	2437	6 Mbps	TX
Radiated Emissions >1GHz Maximum Output Power 6dB bandwidth Power spectral density	11b 11g HT20	2412 / 2437 / 2462 2412 / 2437 / 2462 2412 / 2437 / 2462	1 Mbps 6 Mbps MCS 0	TX

NOTE:

1. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The **Y-plane** results were found as the worst case and were shown in this report.

Test item	Modulation Mode	Test Frequency (MHz)	Data Rate	Mode
Conducted Emissions	11g	2437	6 Mbps	RX
Radiated Emissions	11g	2437	6 Mbps	RX

NOTE:

1. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The **Y-plane** results were found as the worst case and were shown in this report.

3 Transmitter Test Results

3.1 Conducted Emissions

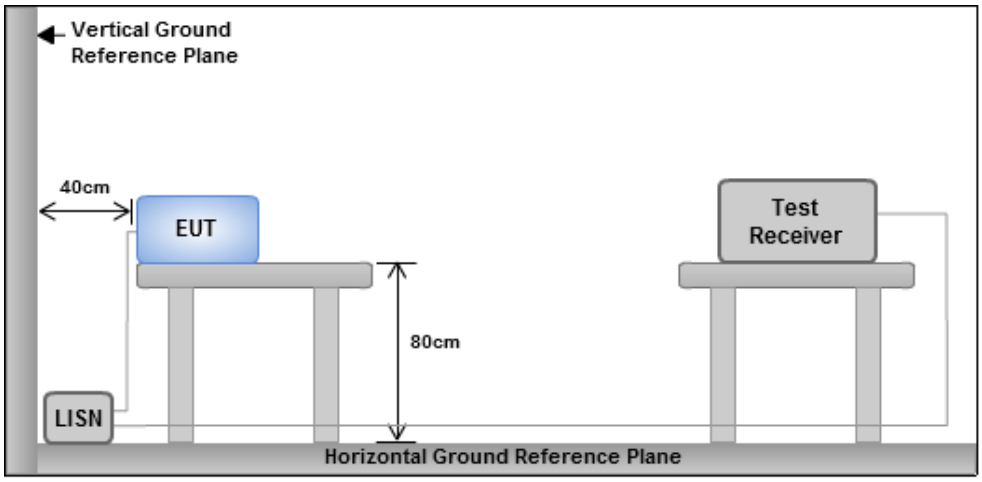
3.1.1 Limit of Conducted Emissions

Conducted Emissions Limit		
Frequency Emission (MHz)	**Quasi-Peak**	**Average**
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50
Note 1: * Decreases with the logarithm of the frequency.		

3.1.2 Test Procedures

1. The device is placed on a test table, raised 80 cm above the reference ground plane. The vertical conducting plane is located 40 cm to the rear of the device.
2. The device is connected to line impedance stabilization network (LISN) and other accessories are connected to other LISN. Measured levels of AC power line conducted emission are across the 50 Ω LISN port.
3. AC conducted emission measurements is made over frequency range from 150 kHz to 30 MHz.
4. This measurement was performed with AC 120V / 60Hz.

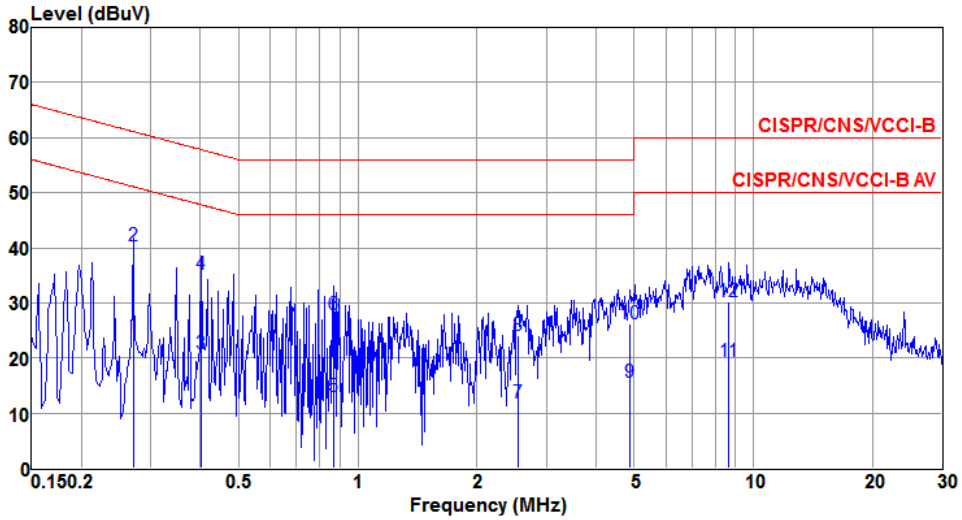
3.1.3 Test Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

3.1.4 Test Result of Conducted Emissions

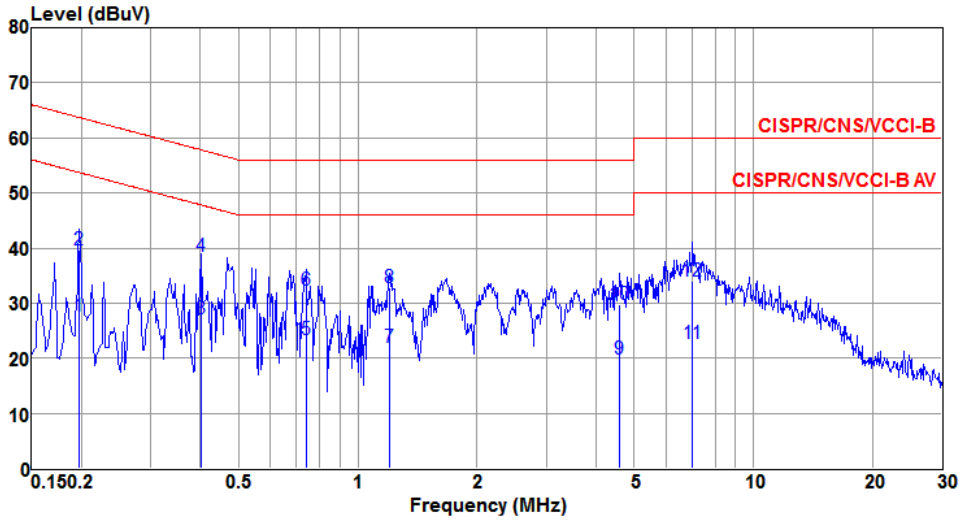
Modulation	11g	Test Freq. (MHz)	2437
Power Phase	Line		



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.270	24.01	51.12	-27.11	23.67	0.31	0.03	Average
2@	0.270	40.25	61.12	-20.87	39.91	0.31	0.03	QP
3	0.402	20.76	47.81	-27.05	20.40	0.34	0.02	Average
4	0.402	35.12	57.81	-22.69	34.76	0.34	0.02	QP
5	0.866	12.97	46.00	-33.03	12.56	0.38	0.03	Average
6	0.866	27.86	56.00	-28.14	27.45	0.38	0.03	QP
7	2.540	11.73	46.00	-34.27	11.15	0.44	0.14	Average
8	2.540	24.19	56.00	-31.81	23.61	0.44	0.14	QP
9	4.874	15.50	46.00	-30.50	14.77	0.49	0.24	Average
10	4.874	26.17	56.00	-29.83	25.44	0.49	0.24	QP
11	8.683	19.33	50.00	-30.67	18.48	0.55	0.30	Average
12	8.683	30.15	60.00	-29.85	29.30	0.55	0.30	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).

Modulation	11g	Test Freq. (MHz)	2437
Power Phase	Neutral		



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.198	27.58	53.71	-26.13	27.40	0.15	0.03	Average
2	0.198	39.63	63.71	-24.08	39.45	0.15	0.03	QP
3	0.402	27.04	47.81	-20.77	26.83	0.19	0.02	Average
4@	0.402	38.51	57.81	-19.30	38.30	0.19	0.02	QP
5	0.739	23.34	46.00	-22.66	23.07	0.24	0.03	Average
6	0.739	32.39	56.00	-23.61	32.12	0.24	0.03	QP
7	1.203	22.03	46.00	-23.97	21.71	0.27	0.05	Average
8	1.203	32.76	56.00	-23.24	32.44	0.27	0.05	QP
9	4.598	19.88	46.00	-26.12	19.27	0.37	0.24	Average
10	4.598	29.86	56.00	-26.14	29.25	0.37	0.24	QP
11	7.025	22.68	50.00	-27.32	21.98	0.42	0.28	Average
12	7.025	33.95	60.00	-26.05	33.25	0.42	0.28	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).

3.2 6dB and Occupied Bandwidth

3.2.1 Limit of 6dB Bandwidth

The minimum 6dB bandwidth shall be at least 500 kHz.

3.2.2 Test Procedures

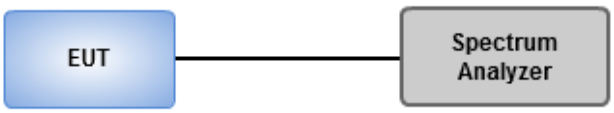
6dB Bandwidth

1. Set resolution bandwidth (RBW) = 100 kHz, Video bandwidth = 300 kHz.
2. Detector = Peak, Trace mode = max hold.
3. Sweep = auto couple, Allow the trace to stabilize.
4. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6dB relative to the maximum level measured in the fundamental emission.

Occupied Bandwidth

1. Set resolution bandwidth (RBW) = 1 MHz, Video bandwidth = 3 MHz.
2. Detector = Sample, Trace mode = max hold.
3 Sweep = auto couple, Allow the trace to stabilize.
4. Use the OBW measurement function of spectrum analyzer to measure the occupied bandwidth.

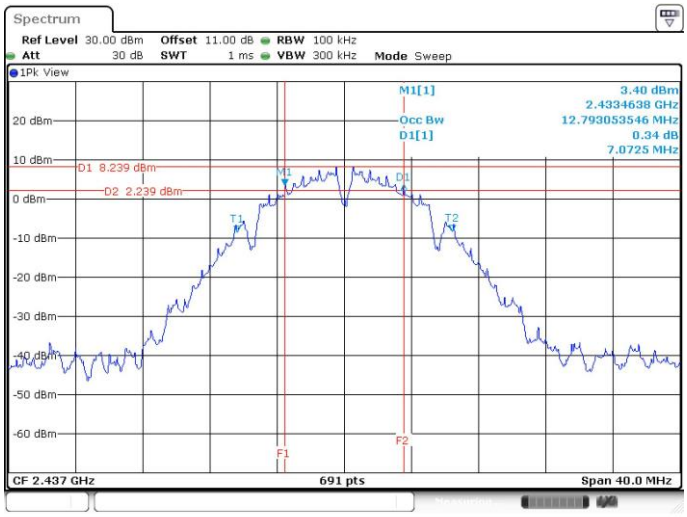
3.2.3 Test Setup



3.2.4 Test Result of 6dB and Occupied Bandwidth

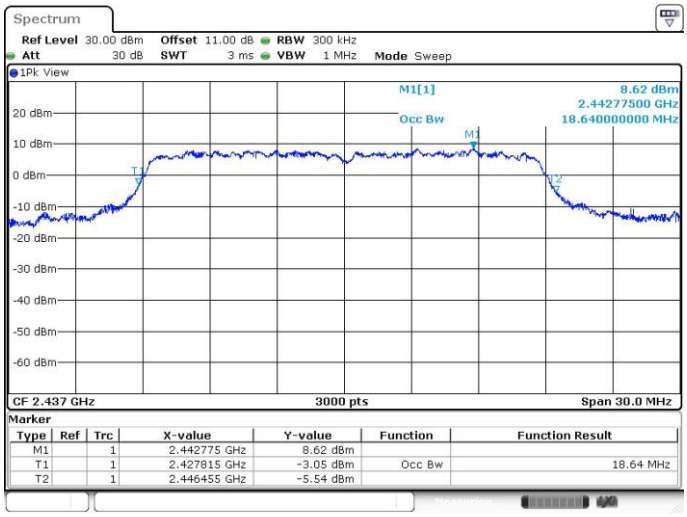
Modulation Mode	N_{TX}	Freq. (MHz)	6dB Bandwidth (MHz)				Limit (kHz)
			Chain 0	Chain 1	Chain 2	Chain 3	
11b	1	2412	7.13	---	---	---	500
11b	1	2437	7.07	---	---	---	500
11b	1	2462	7.07	---	---	---	500
11g	1	2412	16.29	---	---	---	500
11g	1	2437	16.29	---	---	---	500
11g	1	2462	16.29	---	---	---	500
HT20	1	2412	17.28	---	---	---	500
HT20	1	2437	16.81	---	---	---	500
HT20	1	2462	17.28	---	---	---	500

Worst Plot



Modulation Mode	N_{TX}	Freq. (MHz)	99% Occupied Bandwidth (MHz)			
			Chain 0	Chain 1	Chain 2	Chain 3
11b	1	2412	12.67	---	---	---
11b	1	2437	12.84	---	---	---
11b	1	2462	12.06	---	---	---
11g	1	2412	16.94	---	---	---
11g	1	2437	17.80	---	---	---
11g	1	2462	16.94	---	---	---
HT20	1	2412	18.02	---	---	---
HT20	1	2437	18.64	---	---	---
HT20	1	2462	18.04	---	---	---

Worst Plot



3.3 RF Output Power

3.3.1 Limit of RF Output Power

Conducted power shall not exceed 1Watt.

☒ Antenna gain <= 6dBi, no any corresponding reduction is in output power limit.

☐ Antenna gain > 6dBi

☐ Non Fixed, point to point operations.
The conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dB

☐ Fixed, point to point operations
Systems operating in the 2400–2483.5 MHz band that are used exclusively for fixed, point-to-point Operations, maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

Systems operating in the 5725–5850 MHz band that are used exclusively for fixed, point-to-point operations ,no any corresponding reduction is in transmitter peak output power

3.3.2 Test Procedures

☒ Maximum Peak Conducted Output Power

☐ **Spectrum analyzer**

1. Set RBW = 1MHz, VBW = 3MHz, Detector = Peak.
2. Sweep time = auto, Trace mode = max hold, Allow trace to fully stabilize.
3. Use the spectrum analyzer channel power measurement function with the band limits set equal to the DTS bandwidth edges.

☒ **Power meter**

1. A broadband Peak RF power meter is used for output power measurement. The video bandwidth of power meter is greater than DTS bandwidth of EUT. If duty cycle of test signal is not 100 %, trigger and gating function of power meter will be enabled to capture transmission burst for measuring output power.

☒ Maximum Conducted Output Power (For reference only)

☒ **Power meter**

1. A broadband Average RF power meter is used for output power measurement. The video bandwidth of power meter is greater than DTS bandwidth of EUT. If duty cycle of test signal is not 100 %, trigger and gating function of power meter will be enabled to capture transmission burst for measuring output power.

3.3.3 Test Setup

3.3.4 Test Result of Maximum Output Power

Modulation Mode	N_{TX}	Freq. (MHz)	Peak conducted Output Power (dBm)							Ant. Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)
			Chain 0	Chain 1	Chain 2	Chain 3	Total Power (mW)	Total Power (dBm)	Limit (dBm)			
11b	1	2412	20.08	---	---	---	101.859	20.08	30.00	2.00	22.08	36.00
11b	1	2437	20.06	---	---	---	101.391	20.06	30.00	2.00	22.06	36.00
11b	1	2462	18.32	---	---	---	67.920	18.32	30.00	2.00	20.32	36.00
11g	1	2412	21.73	---	---	---	148.936	21.73	30.00	2.00	23.73	36.00
11g	1	2437	22.02	---	---	---	159.221	**22.02**	30.00	2.00	24.02	36.00
11g	1	2462	21.45	---	---	---	139.637	21.45	30.00	2.00	23.45	36.00
HT20	1	2412	21.12	---	---	---	129.420	21.12	30.00	2.00	23.12	36.00
HT20	1	2437	21.94	---	---	---	156.315	21.94	30.00	2.00	23.94	36.00
HT20	1	2462	20.96	---	---	---	124.738	20.96	30.00	2.00	22.96	36.00

Modulation Mode	N_{TX}	Freq. (MHz)	Conducted (Average) Output Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)
			Chain 0	Chain 1	Chain 2	Chain 3			
11b	1	2412	17.46	---	---	---	55.719	17.46	---
11b	1	2437	17.53	---	---	---	56.624	17.53	---
11b	1	2462	15.45	---	---	---	35.075	15.45	---
11g	1	2412	14.95	---	---	---	31.261	14.95	---
11g	1	2437	17.11	---	---	---	51.404	17.11	---
11g	1	2462	14.31	---	---	---	26.977	14.31	---
HT20	1	2412	14.74	---	---	---	29.785	14.74	---
HT20	1	2437	17.12	---	---	---	51.523	17.12	---
HT20	1	2462	14.41	---	---	---	27.606	14.41	---

Note: Conducted average output power is for reference only.

3.4 Power Spectral Density

3.4.1 Limit of Power Spectral Density

Power spectral density shall not be greater than 8 dBm in any 3 kHz band.

3.4.2 Test Procedures

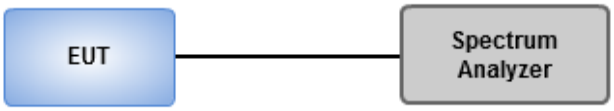
☒ Maximum peak conducted output power was used to demonstrate compliance to the fundamental output power limit.

1. Set the RBW = 3kHz, VBW = 10kHz.
2. Detector = Peak, Sweep time = auto couple.
3. Trace mode = max hold, allow trace to fully stabilize.
4. Use the peak marker function to determine the maximum amplitude level.

☐ Maximum (average) conducted output power was used to demonstrate compliance to the fundamental output power limit.

1. Set the RBW = 100kHz, VBW = 300 kHz.
2. Detector = RMS, Sweep time = auto couple.
3. Set the sweep time to: ≥ 10 x (number of measurement points in sweep) x (maximum data rate per stream).
4. Perform the measurement over a single sweep.
5. Use the peak marker function to determine the maximum amplitude level.

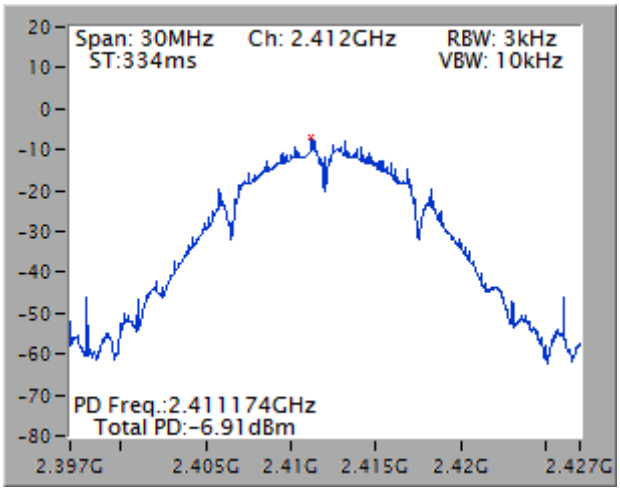
3.4.3 Test Setup



3.4.4 Test Result of Power Spectral Density

Modulation Mode	N_{TX}	Freq. (MHz)	Total Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
11b	1	2412	-6.91	8.00
11b	1	2437	-7.58	8.00
11b	1	2462	-10.05	8.00
11g	1	2412	-12.96	8.00
11g	1	2437	-9.74	8.00
11g	1	2462	-11.11	8.00
HT20	1	2412	-11.77	8.00
HT20	1	2437	-8.76	8.00
HT20	1	2462	-12.21	8.00

Worst Plot



3.5 Unwanted Emissions into Restricted Frequency Bands

3.5.1 Limit of Unwanted Emissions into Restricted Frequency Bands

Restricted Band Emissions Limit			
Frequency Range (MHz)	**Field Strength (uV/m)**	**Field Strength (dBuV/m)**	**Measure Distance (m)**
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

Note 1:
Qusai-Peak value is measured for frequency below 1GHz except for 9–90 kHz, 110–490 kHz frequency band. Peak and average value are measured for frequency above 1GHz. The limit on average radio frequency emission is as above table. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit
Note 2:
Measurements may be performed at a distance other than what is specified provided. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor as below, Frequency at or above 30 MHz: 20 dB/decade Frequency below 30 MHz: 40 dB/decade.

3.5.2 Test Procedures

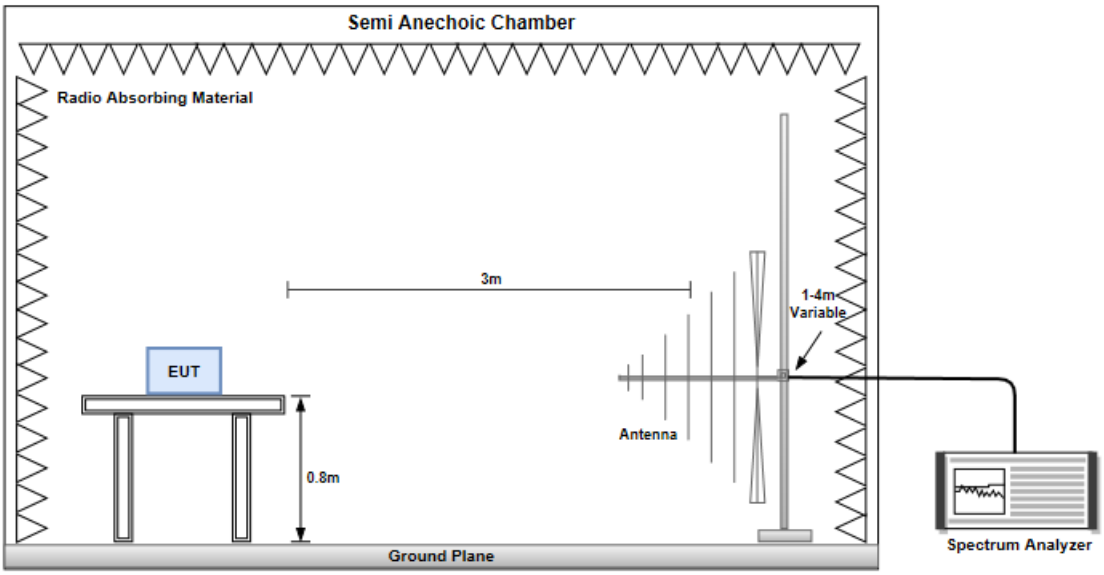
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at test table. For emissions testing at or below 1 GHz, the table height is 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height is 1.5 m
2. Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m ~ 4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3 m.
3. This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

Note:

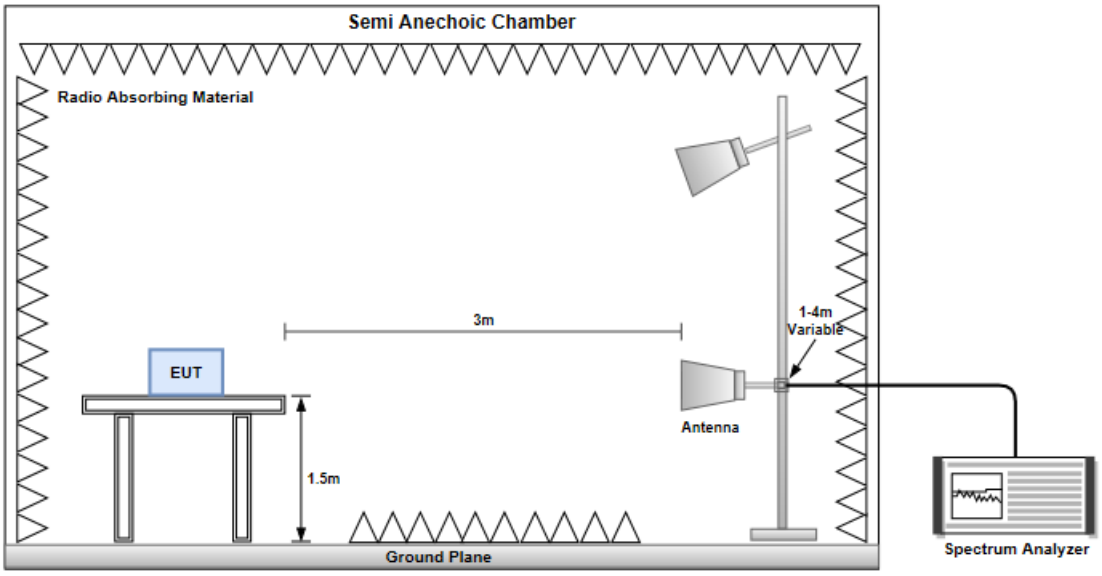
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above 1GHz.

3.5.3 Test Setup

Radiated Emissions below 1 GHz

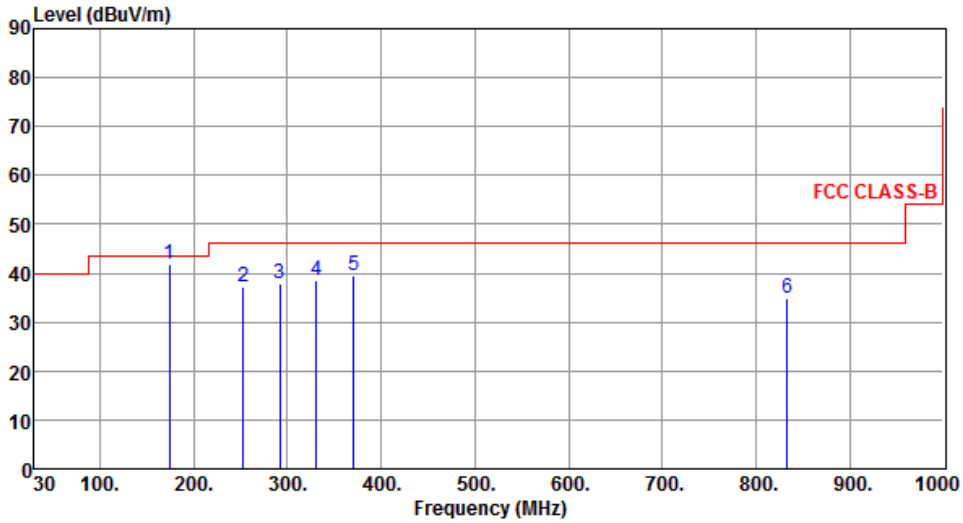


Radiated Emissions above 1 GHz



3.5.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

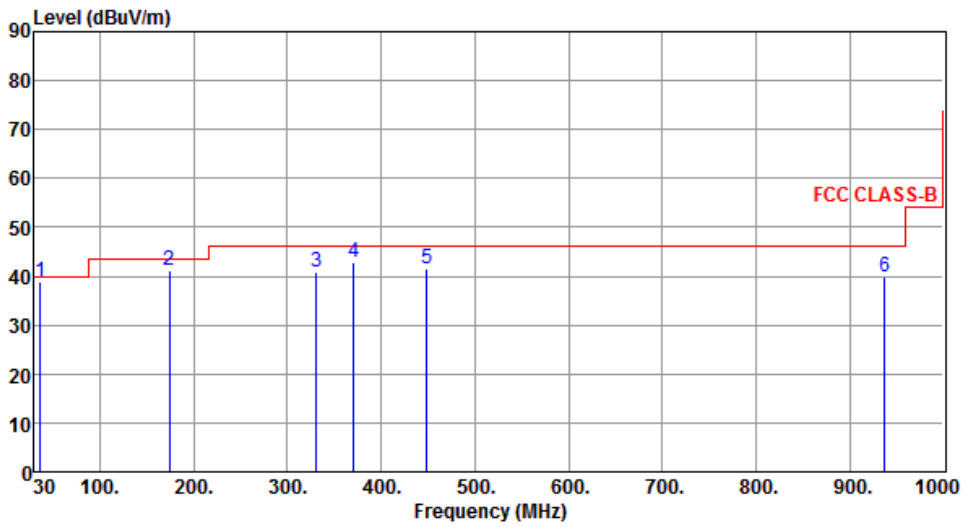
Modulation	11g	**Test Freq. (MHz)**	2437
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	174.53	41.98	43.50	-1.52	51.06	-9.08	QP	176	93
2	253.10	37.05	46.00	-8.95	46.31	-9.26	Peak	---	---
3	291.90	37.94	46.00	-8.06	45.91	-7.97	Peak	---	---
4	330.70	38.67	46.00	-7.33	45.73	-7.06	Peak	---	---
5	370.47	39.39	46.00	-6.61	45.38	-5.99	Peak	---	---
6	833.16	34.77	46.00	-11.23	31.97	2.80	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

Modulation	11g	Test Freq. (MHz)	2437
Polarization	Vertical		

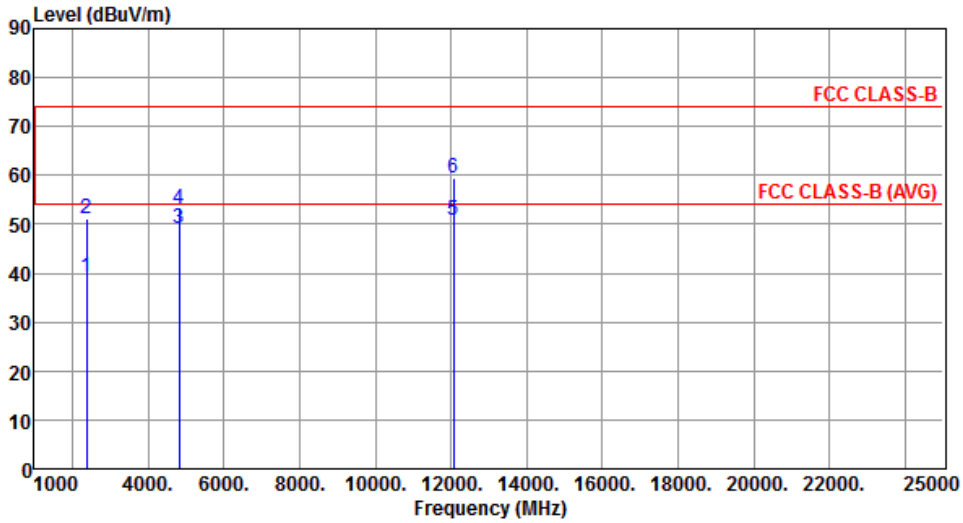


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	36.79	38.98	40.00	-1.02	47.93	-8.95	QP	100	16
2	174.53	41.17	43.50	-2.33	50.25	-9.08	QP	100	215
3	330.70	40.95	46.00	-5.05	48.01	-7.06	Peak	---	---
4	370.47	42.96	46.00	-3.04	48.95	-5.99	Peak	---	---
5	449.04	41.56	46.00	-4.44	45.44	-3.88	Peak	---	---
6	936.95	39.79	46.00	-6.21	35.21	4.58	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

3.5.5 Transmitter Radiated Unwanted Emissions (Above 1GHz) for 11b

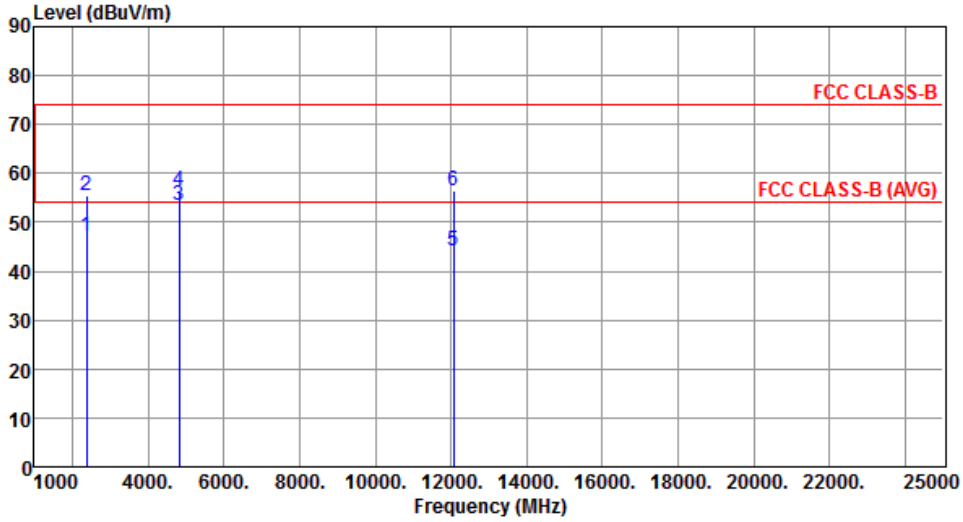
Modulation	11b	**Test Freq. (MHz)**	2412
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	39.07	54.00	-14.93	40.20	-1.13	Average	100	216
2	2390.00	51.04	74.00	-22.96	52.17	-1.13	Peak	100	216
3	4824.00	49.28	54.00	-4.72	43.51	5.77	Average	129	236
4	4824.00	53.00	74.00	-21.00	47.23	5.77	Peak	129	236
5	12060.00	50.95	54.00	-3.05	35.07	15.88	Average	182	355
6	12060.00	59.34	74.00	-14.66	43.46	15.88	Peak	182	355

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

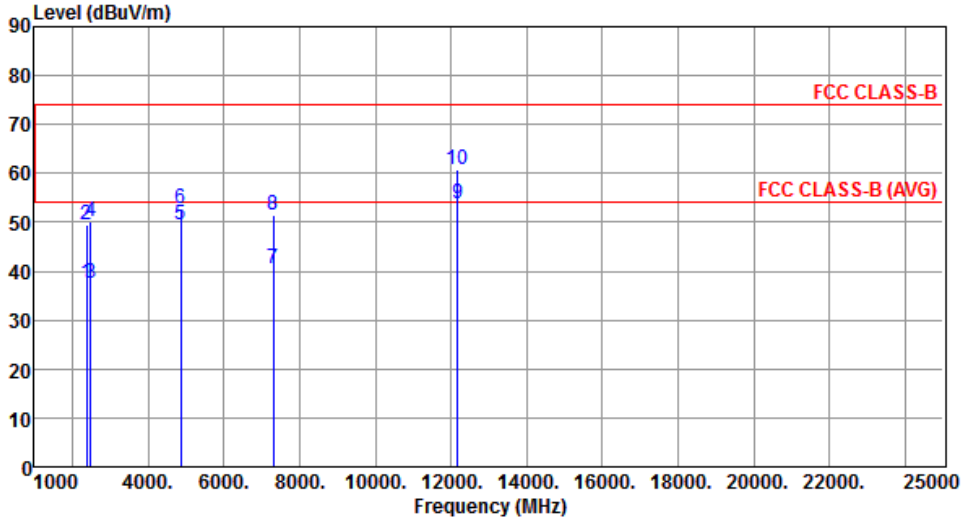
Modulation	11b	Test Freq. (MHz)	2412
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	47.28	54.00	-6.72	48.41	-1.13	Average	157	155
2	2390.00	55.45	74.00	-18.55	56.58	-1.13	Peak	157	155
3	4824.00	53.44	54.00	-0.56	47.67	5.77	Average	107	177
4	4824.00	56.30	74.00	-17.70	50.53	5.77	Peak	107	177
5	12060.00	44.14	54.00	-9.86	28.26	15.88	Average	148	317
6	12060.00	56.44	74.00	-17.56	40.56	15.88	Peak	148	317

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

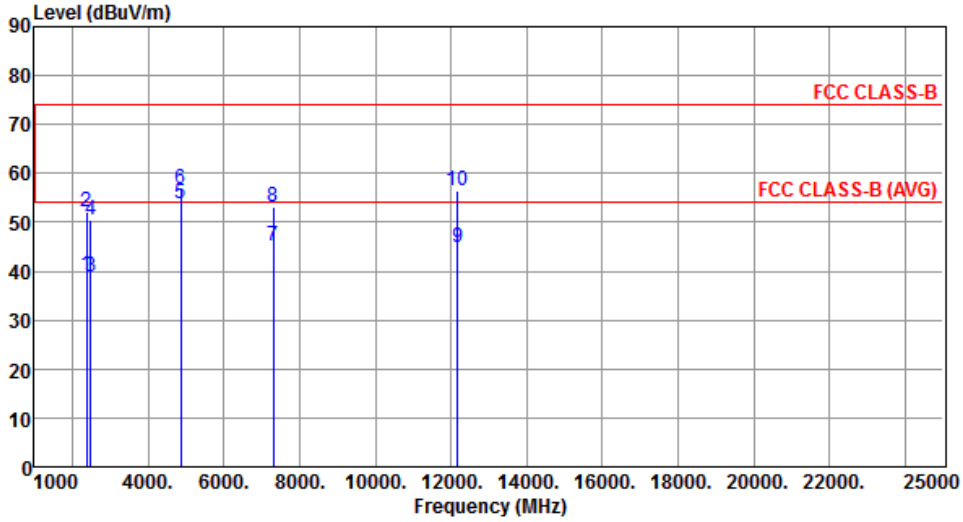
Modulation	11b	Test Freq. (MHz)	2437
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	37.40	54.00	-16.60	38.53	-1.13	Average	100	217
2	2390.00	49.64	74.00	-24.36	50.77	-1.13	Peak	100	217
3	2483.50	37.47	54.00	-16.53	38.24	-0.77	Average	100	217
4	2483.50	50.19	74.00	-23.81	50.96	-0.77	Peak	100	217
5	4874.00	49.35	54.00	-4.65	43.44	5.91	Average	196	167
6	4874.00	52.83	74.00	-21.17	46.92	5.91	Peak	196	167
7	7311.00	40.60	54.00	-13.40	29.72	10.88	Average	202	20
8	7311.00	51.51	74.00	-22.49	40.63	10.88	Peak	202	20
9	12185.00	53.67	54.00	-0.33	37.95	15.72	Average	156	2
10	12185.00	60.84	74.00	-13.16	45.12	15.72	Peak	156	2

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

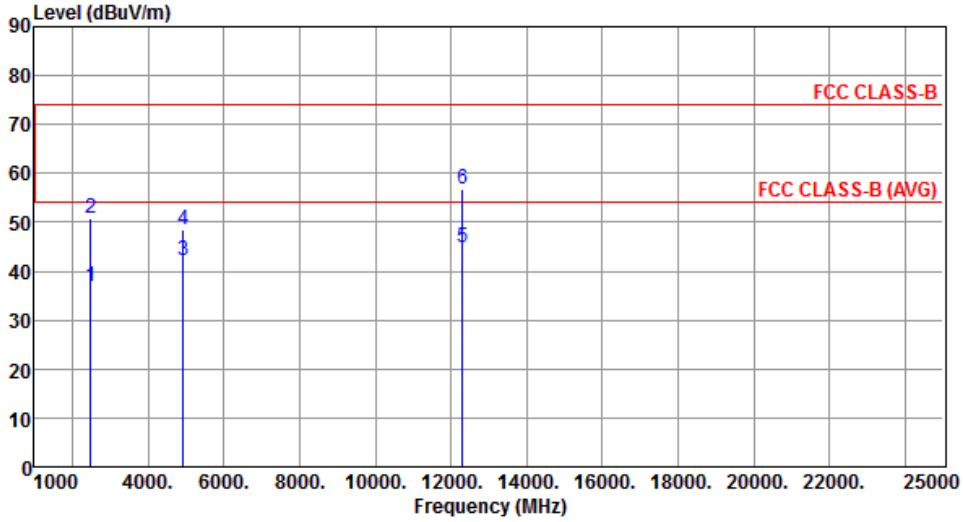
Modulation	11b	Test Freq. (MHz)	2437
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	39.24	54.00	-14.76	40.37	-1.13	Average	178	145
2	2390.00	52.15	74.00	-21.85	53.28	-1.13	Peak	178	145
3	2483.50	38.93	54.00	-15.07	39.70	-0.77	Average	178	145
4	2483.50	50.53	74.00	-23.47	51.30	-0.77	Peak	178	145
5	4874.00	53.84	54.00	-0.16	47.93	5.91	Average	100	177
6	4874.00	56.76	74.00	-17.24	50.85	5.91	Peak	100	177
7	7311.00	45.06	54.00	-8.94	34.18	10.88	Average	171	26
8	7311.00	53.07	74.00	-20.93	42.19	10.88	Peak	171	26
9	12185.00	44.96	54.00	-9.04	29.24	15.72	Average	156	323
10	12185.00	56.58	74.00	-17.42	40.86	15.72	Peak	156	323

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

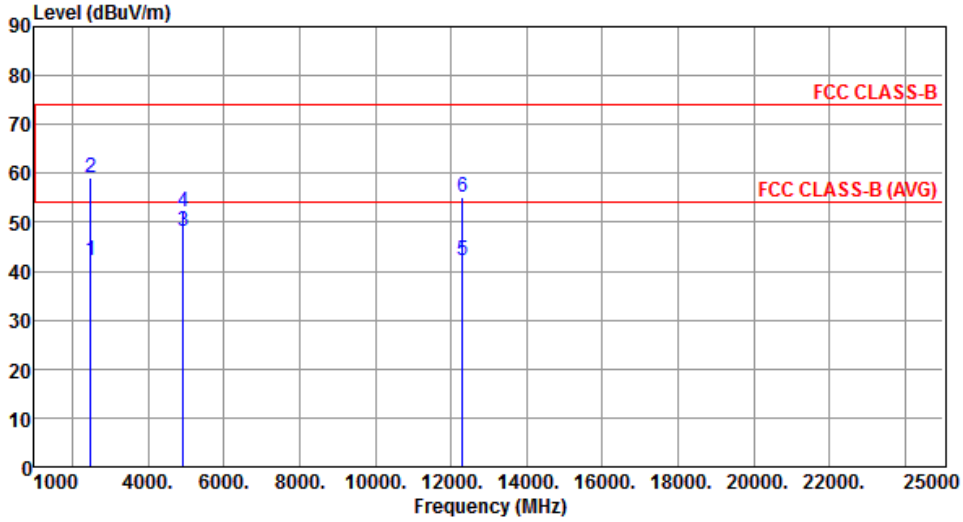
Modulation	11b	Test Freq. (MHz)	2462
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	36.90	54.00	-17.10	37.67	-0.77	Average	116	219
2	2483.50	50.75	74.00	-23.25	51.52	-0.77	Peak	116	219
3	4924.00	42.13	54.00	-11.87	36.08	6.05	Average	198	172
4	4924.00	48.33	74.00	-25.67	42.28	6.05	Peak	198	172
5	12310.00	44.96	54.00	-9.04	29.38	15.58	Average	154	356
6	12310.00	56.68	74.00	-17.32	41.10	15.58	Peak	154	356

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	11b	Test Freq. (MHz)	2462
Polarization	Vertical		

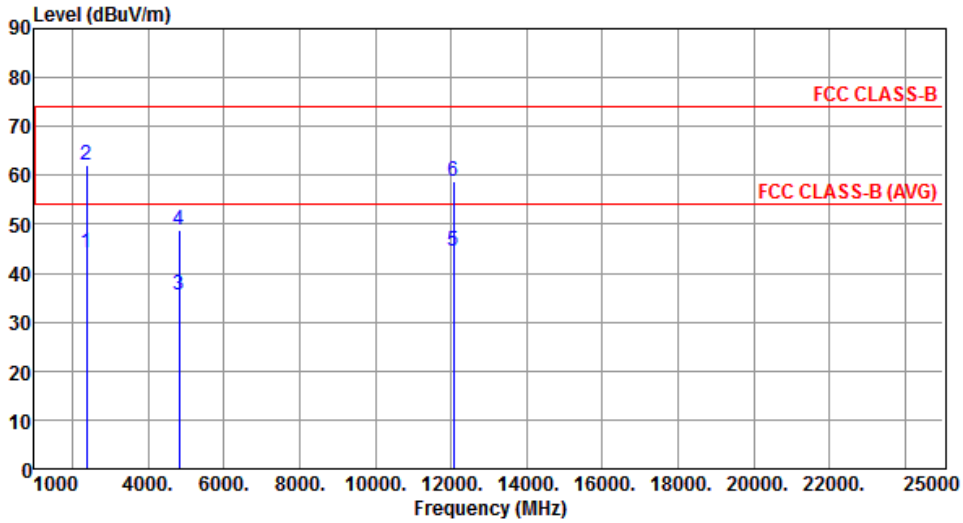


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	42.21	54.00	-11.79	42.98	-0.77	Average	163	160
2	2483.50	58.99	74.00	-15.01	59.76	-0.77	Peak	163	160
3	4924.00	48.16	54.00	-5.84	42.11	6.05	Average	100	172
4	4924.00	52.15	74.00	-21.85	46.10	6.05	Peak	100	172
5	12310.00	42.27	54.00	-11.73	26.69	15.58	Average	100	50
6	12310.00	55.00	74.00	-19.00	39.42	15.58	Peak	100	50

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

3.5.6 Transmitter Radiated Unwanted Emissions (Above 1GHz) for 11g

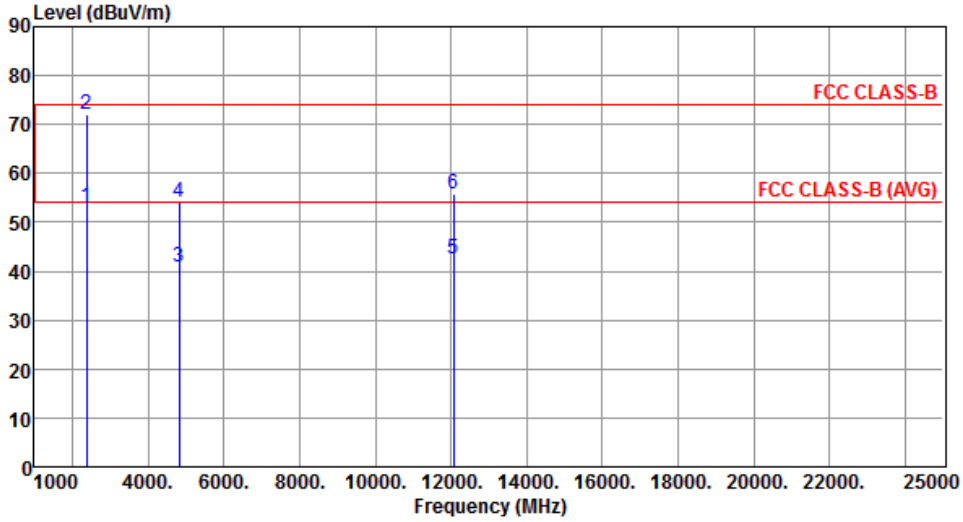
Modulation	11g	**Test Freq. (MHz)**	2412
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	44.02	54.00	-9.98	45.15	-1.13	Average	100	218
2	2390.00	62.09	74.00	-11.91	63.22	-1.13	Peak	100	218
3	4824.00	35.63	54.00	-18.37	29.86	5.77	Average	205	165
4	4824.00	48.96	74.00	-25.04	43.19	5.77	Peak	205	165
5	12060.00	44.45	54.00	-9.55	28.57	15.88	Average	153	2
6	12060.00	58.64	74.00	-15.36	42.76	15.88	Peak	153	2

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

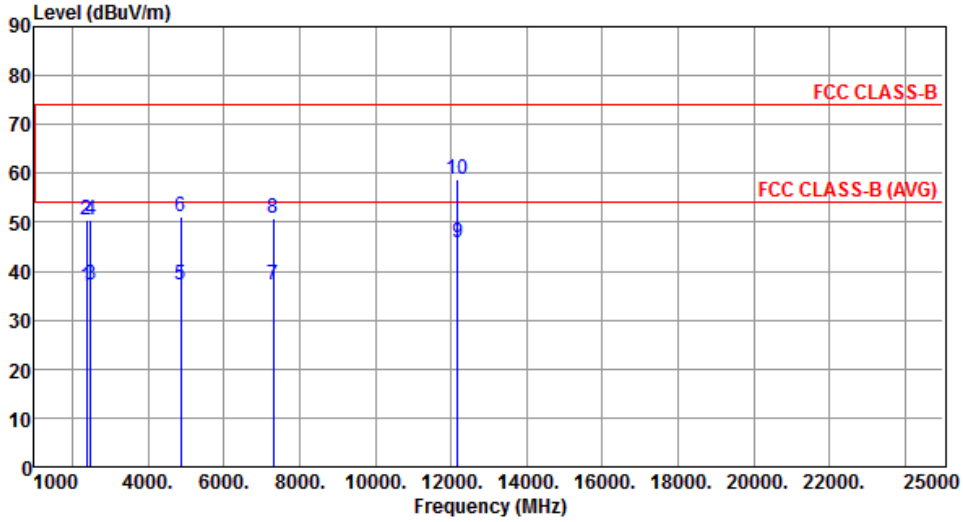
Modulation	11g	Test Freq. (MHz)	2412
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	53.21	54.00	-0.79	54.34	-1.13	Average	164	156
2	2390.00	72.12	74.00	-1.88	73.25	-1.13	Peak	164	156
3	4824.00	40.96	54.00	-13.04	35.19	5.77	Average	106	163
4	4824.00	54.03	74.00	-19.97	48.26	5.77	Peak	106	163
5	12060.00	42.67	54.00	-11.33	26.79	15.88	Average	100	30
6	12060.00	55.91	74.00	-18.09	40.03	15.88	Peak	100	30

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

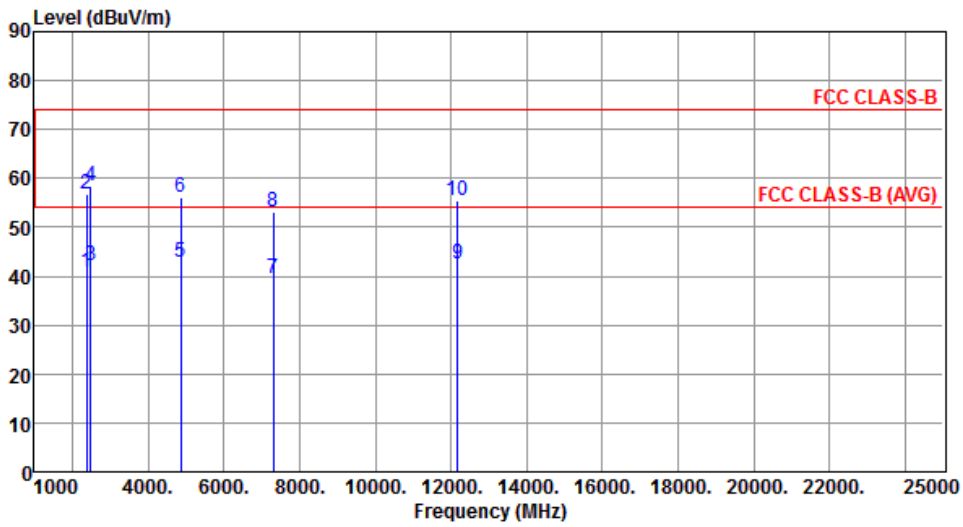
Modulation	11g	Test Freq. (MHz)	2437
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	37.01	54.00	-16.99	38.14	-1.13	Average	100	217
2	2390.00	50.56	74.00	-23.44	51.69	-1.13	Peak	100	217
3	2483.50	37.14	54.00	-16.86	37.91	-0.77	Average	100	217
4	2483.50	50.62	74.00	-23.38	51.39	-0.77	Peak	100	217
5	4874.00	37.07	54.00	-16.93	31.16	5.91	Average	211	169
6	4874.00	51.04	74.00	-22.96	45.13	5.91	Peak	211	169
7	7311.00	37.33	54.00	-16.67	26.45	10.88	Average	100	50
8	7311.00	50.71	74.00	-23.29	39.83	10.88	Peak	100	50
9	12185.00	45.76	54.00	-8.24	30.04	15.72	Average	155	359
10	12185.00	58.65	74.00	-15.35	42.93	15.72	Peak	155	359

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

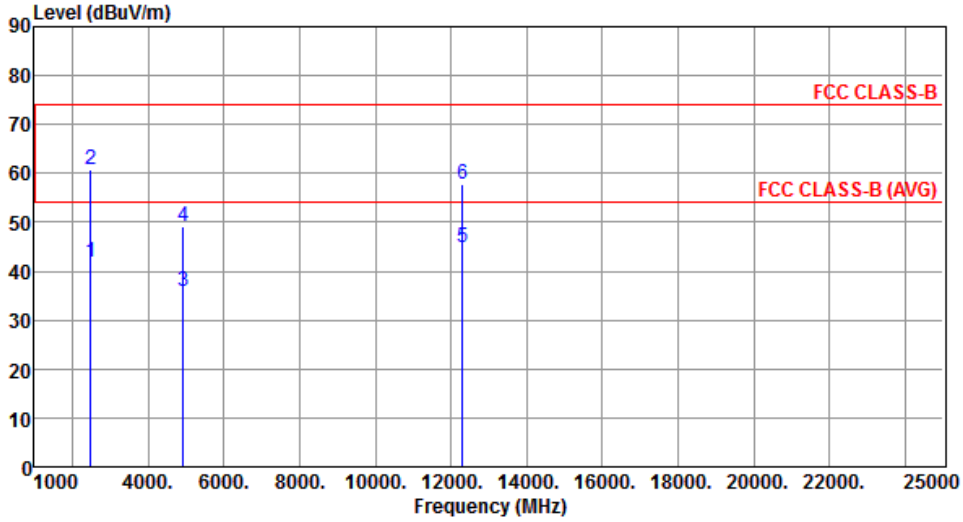
Modulation	11g	Test Freq. (MHz)	2437
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	40.72	54.00	-13.28	41.85	-1.13	Average	170	149
2	2390.00	56.75	74.00	-17.25	57.88	-1.13	Peak	170	149
3	2483.50	42.17	54.00	-11.83	42.94	-0.77	Average	170	149
4	2483.50	58.54	74.00	-15.46	59.31	-0.77	Peak	170	149
5	4874.00	42.98	54.00	-11.02	37.07	5.91	Average	107	165
6	4874.00	56.26	74.00	-17.74	50.35	5.91	Peak	107	165
7	7311.00	39.56	54.00	-14.44	28.68	10.88	Average	168	33
8	7311.00	52.97	74.00	-21.03	42.09	10.88	Peak	168	33
9	12185.00	42.56	54.00	-11.44	26.84	15.72	Average	100	25
10	12185.00	55.35	74.00	-18.65	39.63	15.72	Peak	100	25

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

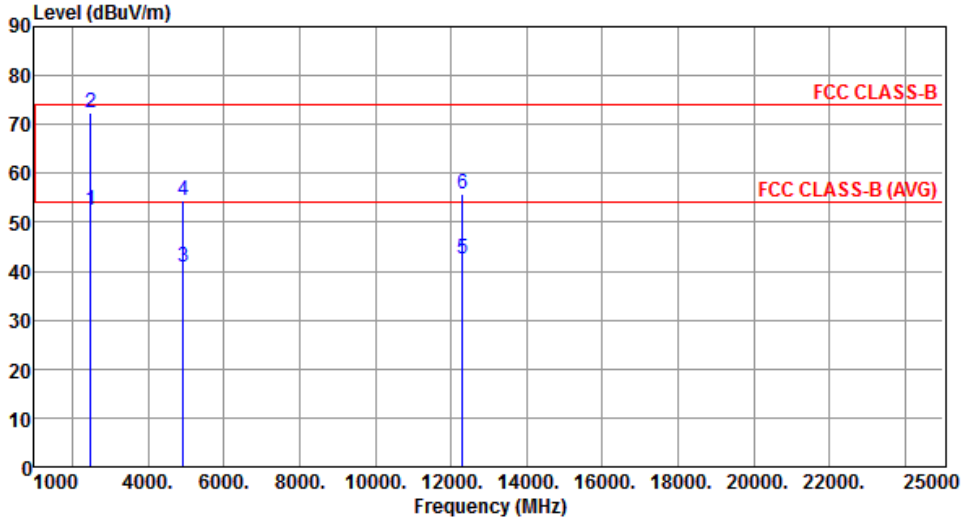
Modulation	11g	Test Freq. (MHz)	2462
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	41.71	54.00	-12.29	42.48	-0.77	Average	116	215
2	2483.50	60.92	74.00	-13.08	61.69	-0.77	Peak	116	215
3	4924.00	35.91	54.00	-18.09	29.86	6.05	Average	206	168
4	4924.00	49.23	74.00	-24.77	43.18	6.05	Peak	206	168
5	12310.00	44.76	54.00	-9.24	29.18	15.58	Average	150	3
6	12310.00	57.63	74.00	-16.37	42.05	15.58	Peak	150	3

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	11g	Test Freq. (MHz)	2462
Polarization	Vertical		

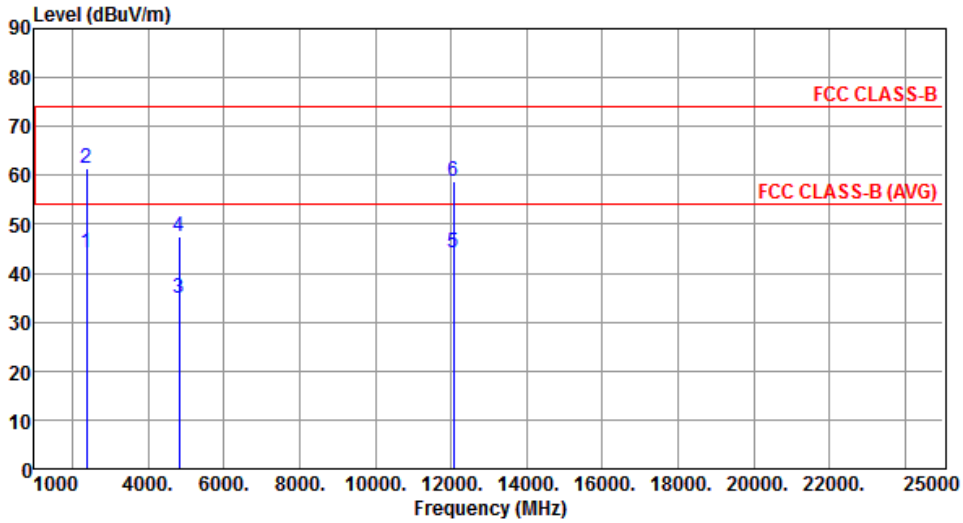


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	52.44	54.00	-1.56	53.21	-0.77	Average	163	163
2	2483.50	72.25	74.00	-1.75	73.02	-0.77	Peak	163	163
3	4924.00	40.82	54.00	-13.18	34.77	6.05	Average	106	163
4	4924.00	54.35	74.00	-19.65	48.30	6.05	Peak	106	163
5	12310.00	42.50	54.00	-11.50	26.92	15.58	Average	100	40
6	12310.00	55.69	74.00	-18.31	40.11	15.58	Peak	100	40

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

3.5.7 Transmitter Radiated Unwanted Emissions (Above 1GHz) for HT20

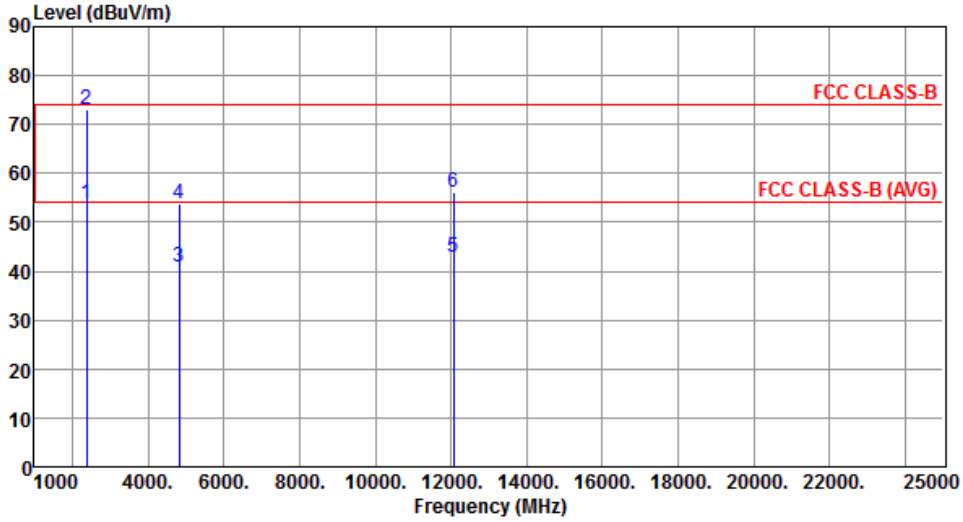
Modulation	HT20	**Test Freq. (MHz)**	2412
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	44.16	54.00	-9.84	45.29	-1.13	Average	100	216
2	2390.00	61.57	74.00	-12.43	62.70	-1.13	Peak	100	216
3	4824.00	34.96	54.00	-19.04	29.19	5.77	Average	200	162
4	4824.00	47.43	74.00	-26.57	41.66	5.77	Peak	200	162
5	12060.00	44.34	54.00	-9.66	28.46	15.88	Average	145	5
6	12060.00	58.91	74.00	-15.09	43.03	15.88	Peak	145	5

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

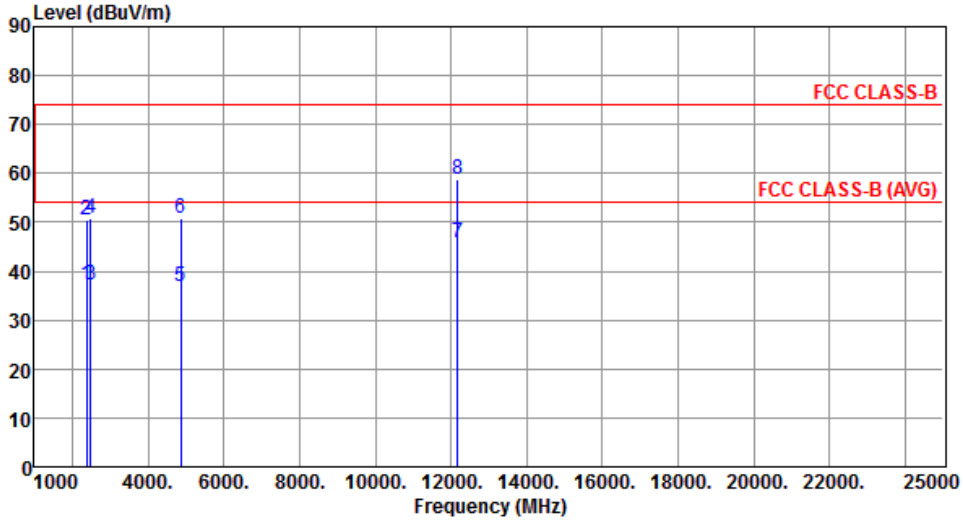
Modulation	HT20	Test Freq. (MHz)	2412
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	53.83	54.00	-0.17	54.96	-1.13	Average	140	144
2	2390.00	73.17	74.00	-0.83	74.30	-1.13	Peak	140	144
3	4824.00	40.69	54.00	-13.31	34.92	5.77	Average	105	160
4	4824.00	53.69	74.00	-20.31	47.92	5.77	Peak	105	160
5	12060.00	42.80	54.00	-11.20	26.92	15.88	Average	100	10
6	12060.00	56.00	74.00	-18.00	40.12	15.88	Peak	100	10

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

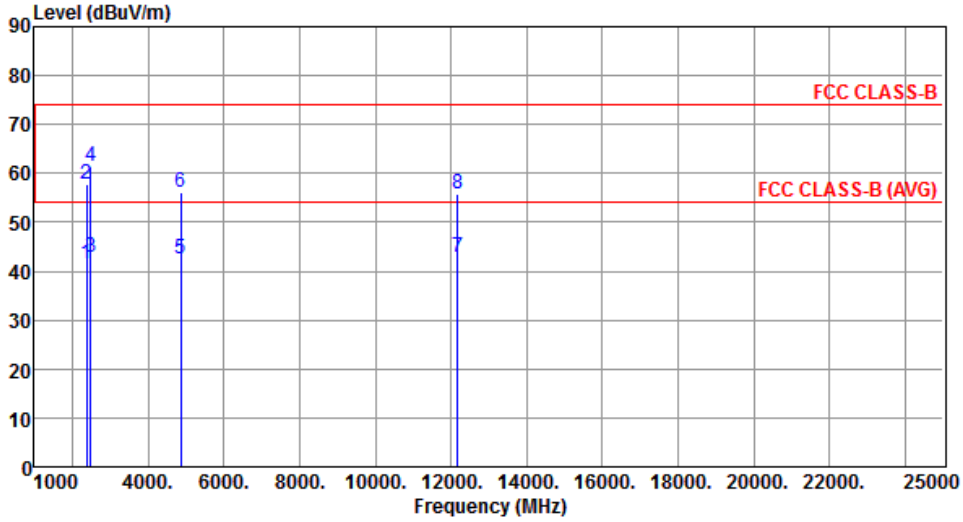
Modulation	HT20	Test Freq. (MHz)	2437
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	37.04	54.00	-16.96	38.17	-1.13	Average	105	215
2	2390.00	50.42	74.00	-23.58	51.55	-1.13	Peak	105	215
3	2483.50	37.25	54.00	-16.75	38.02	-0.77	Average	105	215
4	2483.50	50.73	74.00	-23.27	51.50	-0.77	Peak	105	215
5	4874.00	36.84	54.00	-17.16	30.93	5.91	Average	206	167
6	4874.00	50.82	74.00	-23.18	44.91	5.91	Peak	206	167
7	12185.00	45.77	54.00	-8.23	30.05	15.72	Average	150	0
8	12185.00	58.88	74.00	-15.12	43.16	15.72	Peak	150	0

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

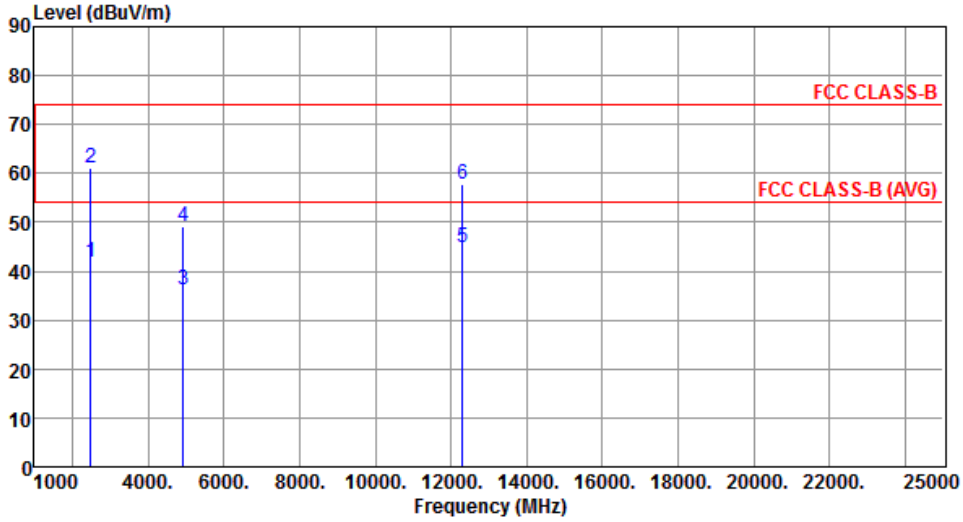
Modulation	HT20	Test Freq. (MHz)	2437
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	41.66	54.00	-12.34	42.79	-1.13	Average	169	163
2	2390.00	57.77	74.00	-16.23	58.90	-1.13	Peak	169	163
3	2483.50	42.74	54.00	-11.26	43.51	-0.77	Average	169	163
4	2483.50	61.47	74.00	-12.53	62.24	-0.77	Peak	169	163
5	4874.00	42.47	54.00	-11.53	36.56	5.91	Average	109	162
6	4874.00	55.99	74.00	-18.01	50.08	5.91	Peak	109	162
7	12185.00	42.69	54.00	-11.31	26.97	15.72	Average	100	35
8	12185.00	55.74	74.00	-18.26	40.02	15.72	Peak	100	35

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

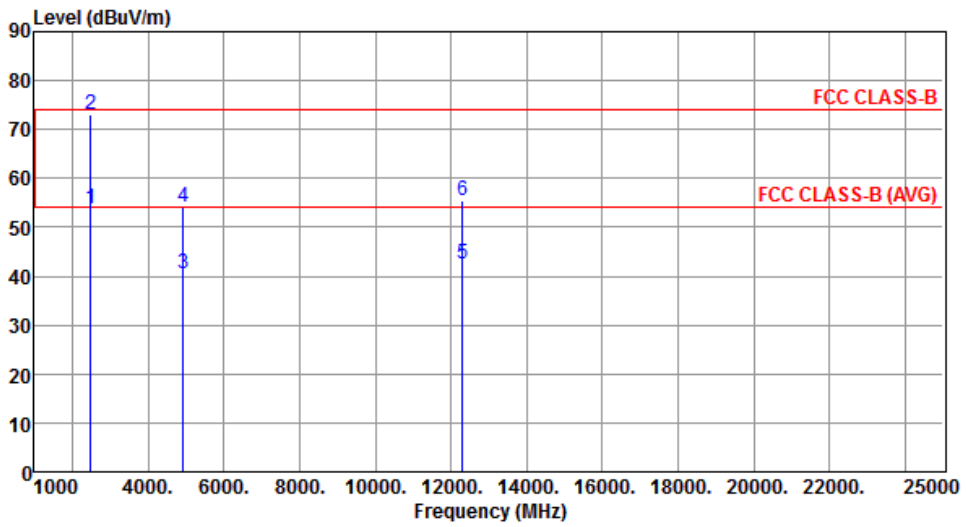
Modulation	HT20	Test Freq. (MHz)	2462
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	41.96	54.00	-12.04	42.73	-0.77	Average	115	210
2	2483.50	61.15	74.00	-12.85	61.92	-0.77	Peak	115	210
3	4924.00	36.05	54.00	-17.95	30.00	6.05	Average	202	163
4	4924.00	49.17	74.00	-24.83	43.12	6.05	Peak	202	163
5	12310.00	44.93	54.00	-9.07	29.35	15.58	Average	147	1
6	12310.00	57.77	74.00	-16.23	42.19	15.58	Peak	147	1

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	HT20	Test Freq. (MHz)	2462
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	53.85	54.00	-0.15	54.62	-0.77	Average	159	158
2	2483.50	72.98	74.00	-1.02	73.75	-0.77	Peak	159	158
3	4924.00	40.55	54.00	-13.45	34.50	6.05	Average	103	160
4	4924.00	54.25	74.00	-19.75	48.20	6.05	Peak	103	160
5	12310.00	42.53	54.00	-11.47	26.95	15.58	Average	100	60
6	12310.00	55.61	74.00	-18.39	40.03	15.58	Peak	100	60

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

3.6 Emissions in Non-Restricted Frequency Bands

3.6.1 Emissions in Non-Restricted Frequency Bands Limit

Peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz

3.6.2 Test Procedures

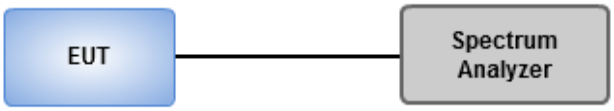
Reference level measurement

1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
2. Trace = max hold , Allow Trace to fully stabilize
3. Use the peak marker function to determine the maximum PSD level

Emission level measurement

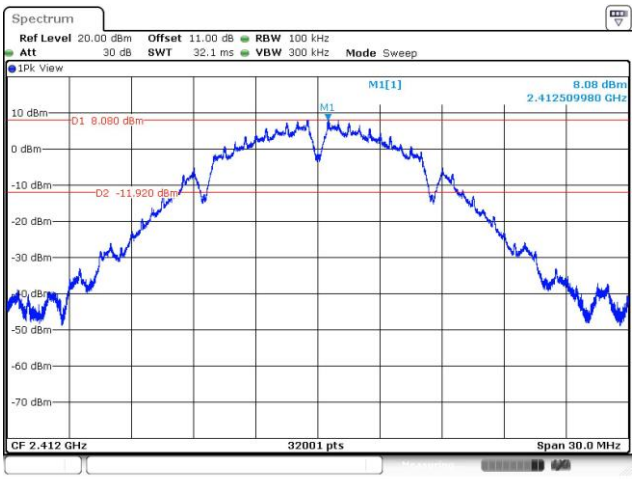
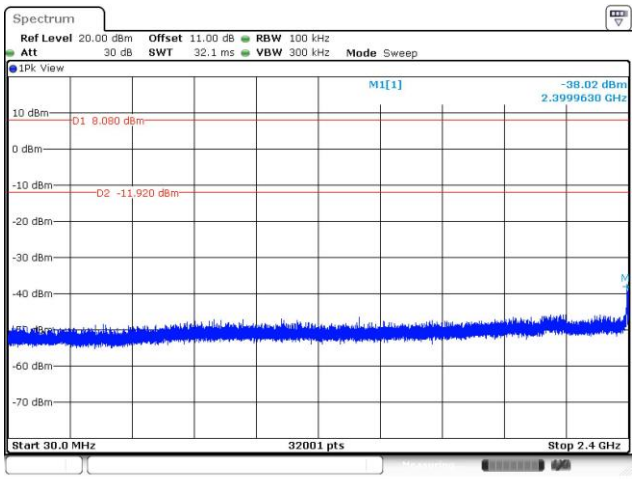
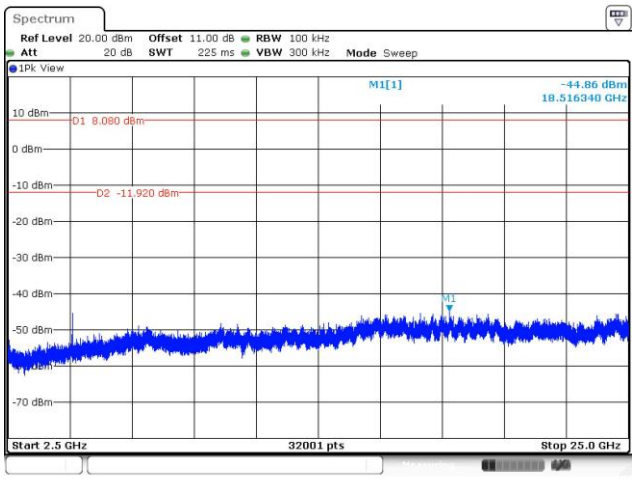
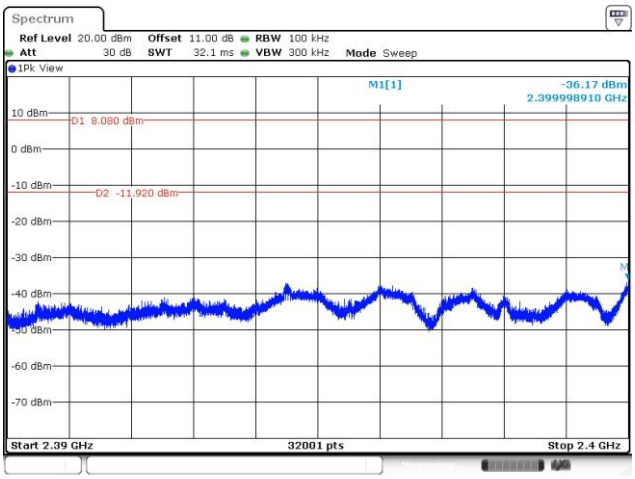
1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
2. Trace = max hold , Allow Trace to fully stabilize
3. Scan Frequency range is up to 25GHz
4. Use the peak marker function to determine the maximum amplitude level

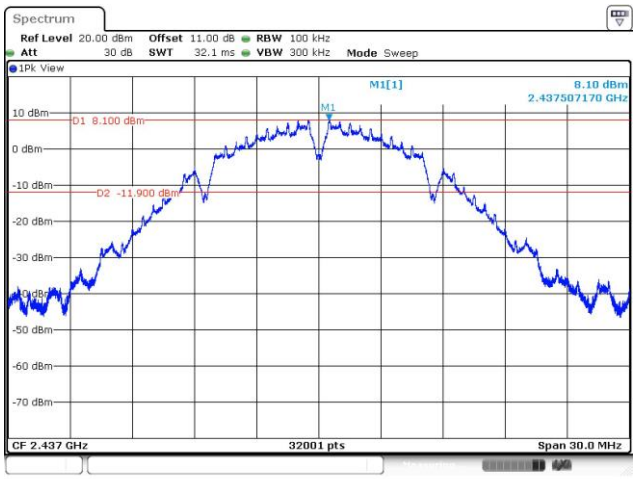
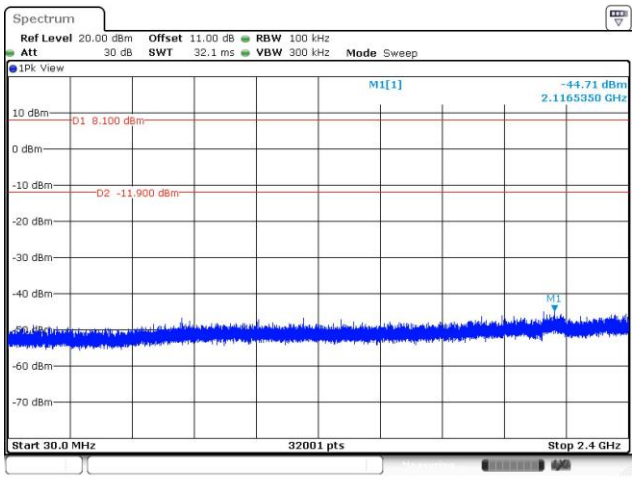
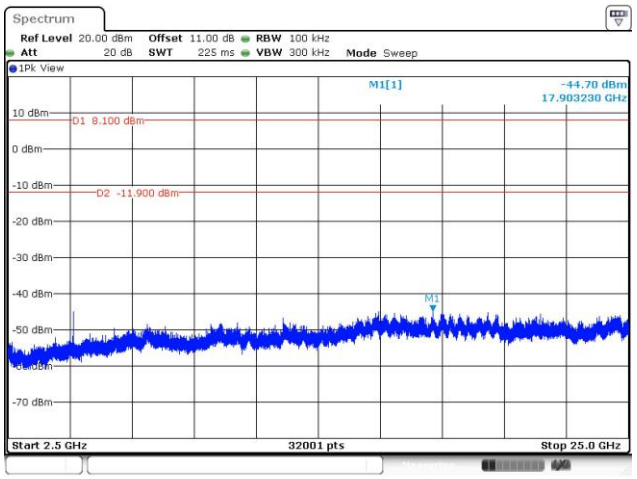
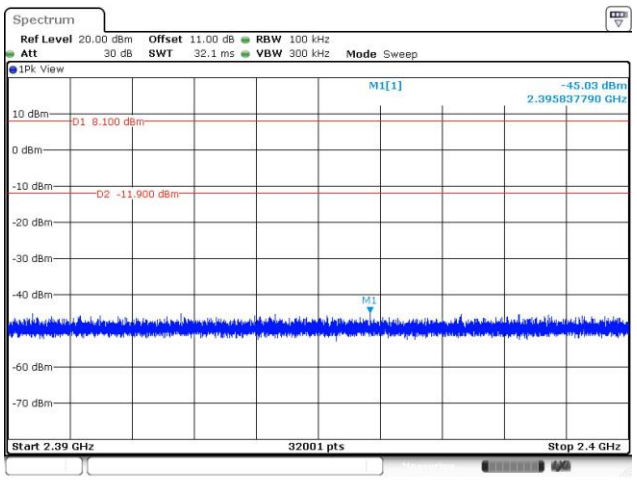
3.6.3 Test Setup

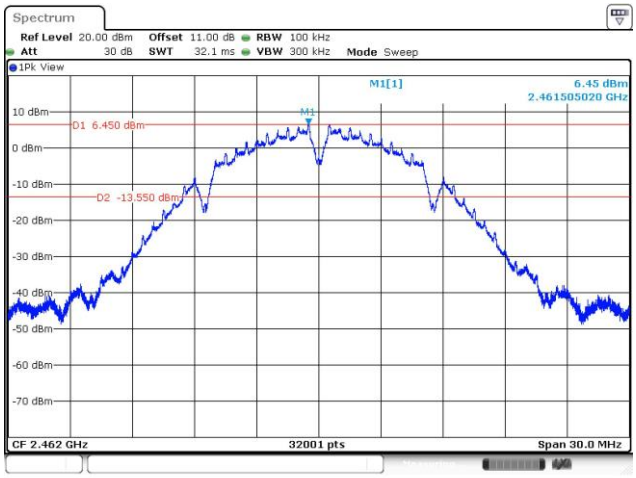
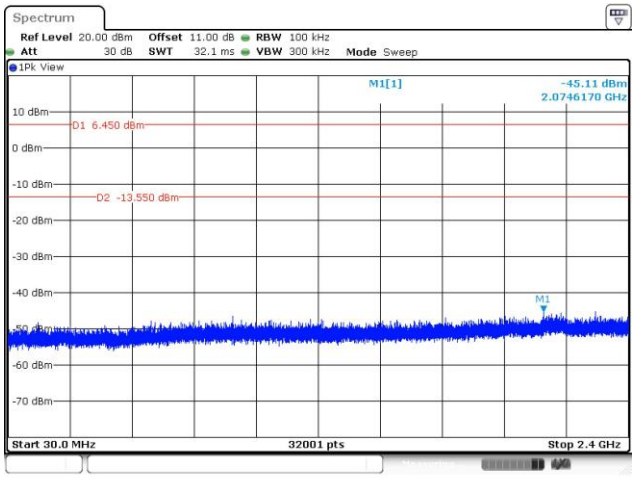
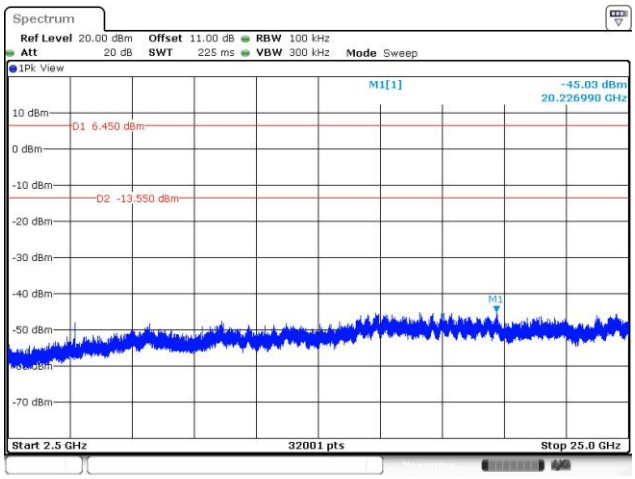
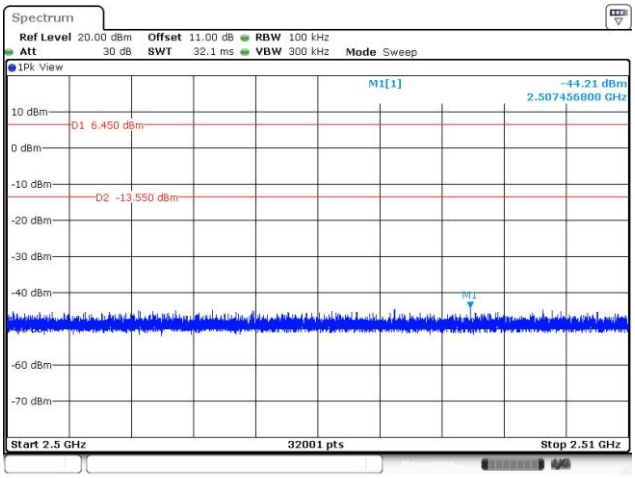


3.6.4 Unwanted Emissions into Non-Restricted Frequency Bands

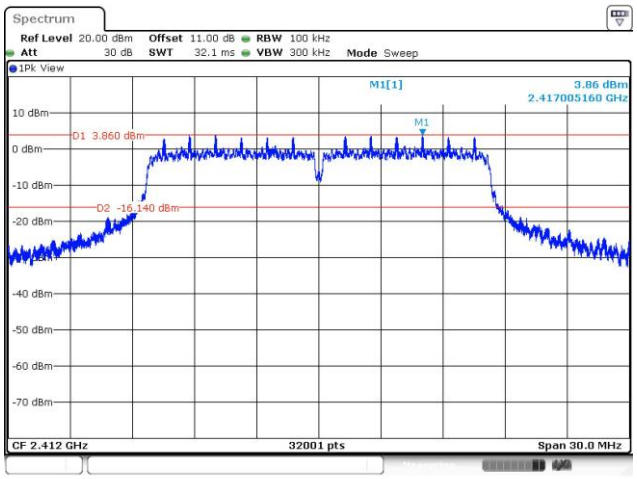
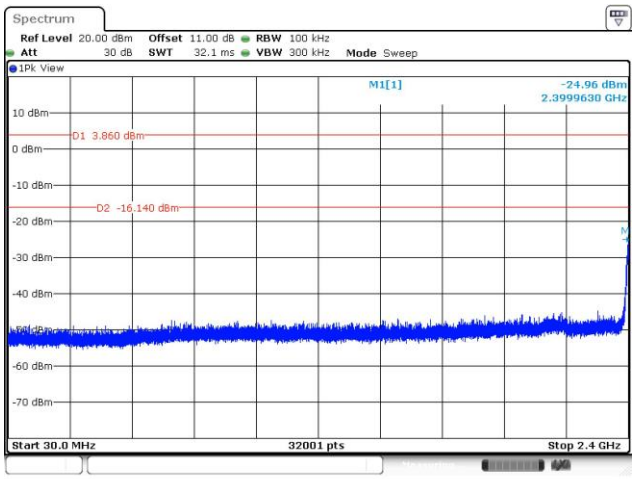
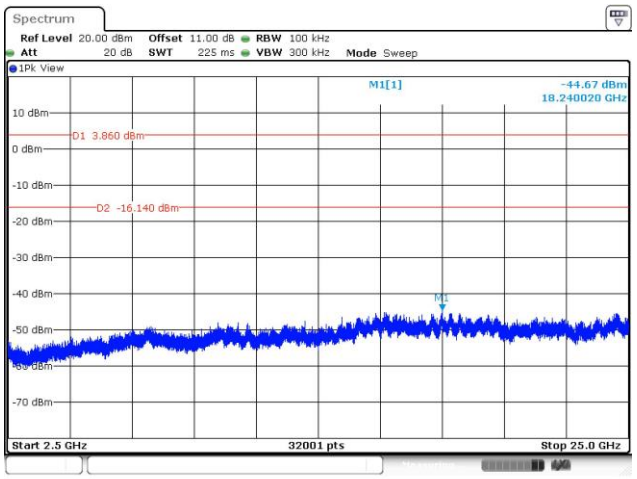
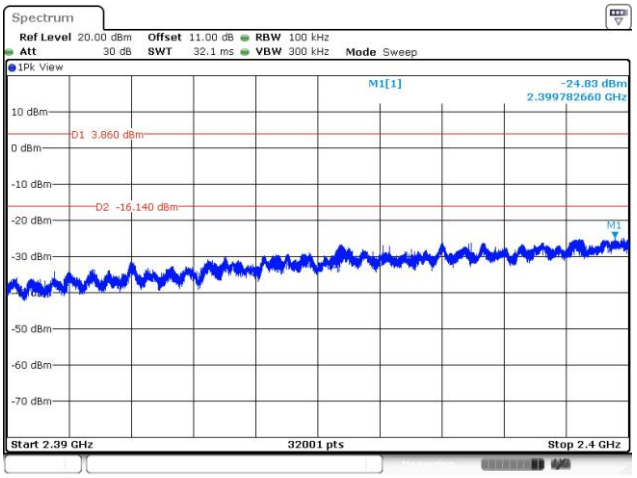
802.11b

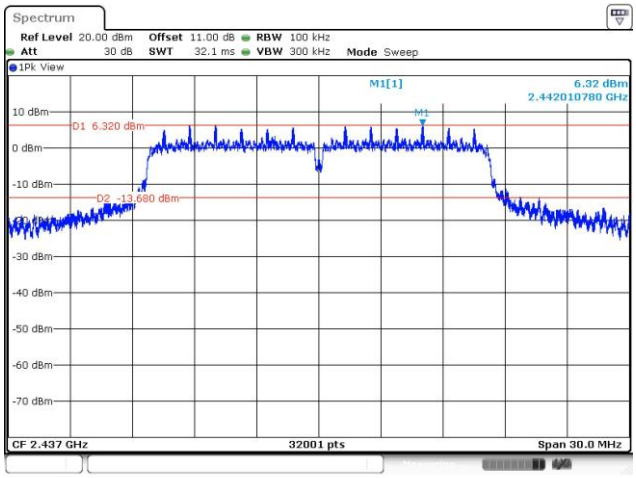
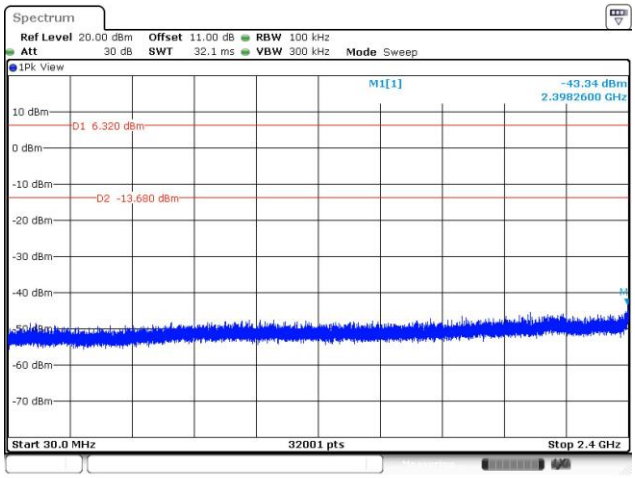
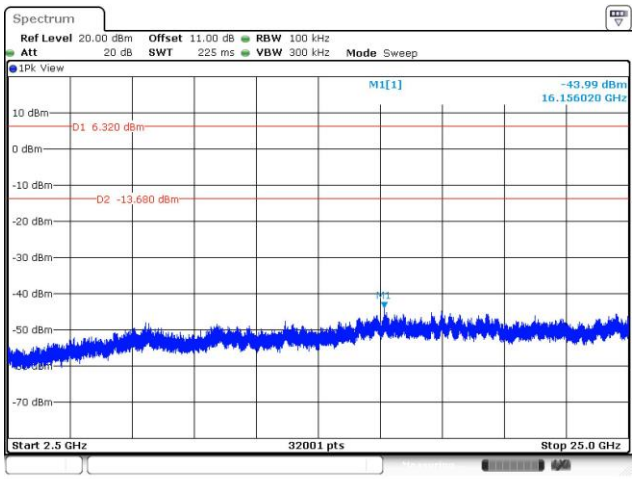
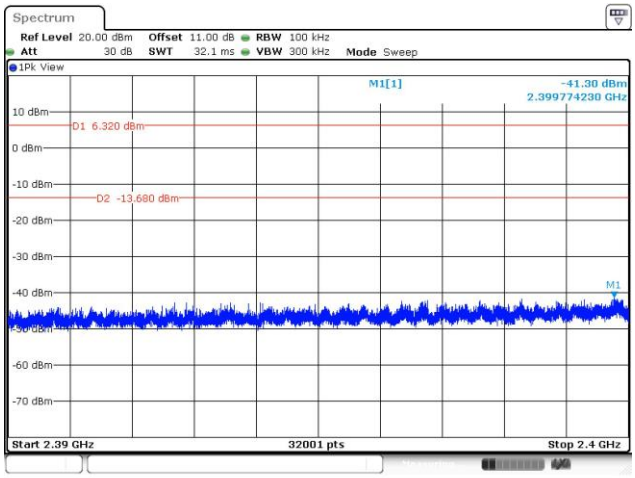
Reference Level	Tx 2412MHz / 30MHz~25GHz (down 20dBc)
	
---	
---	

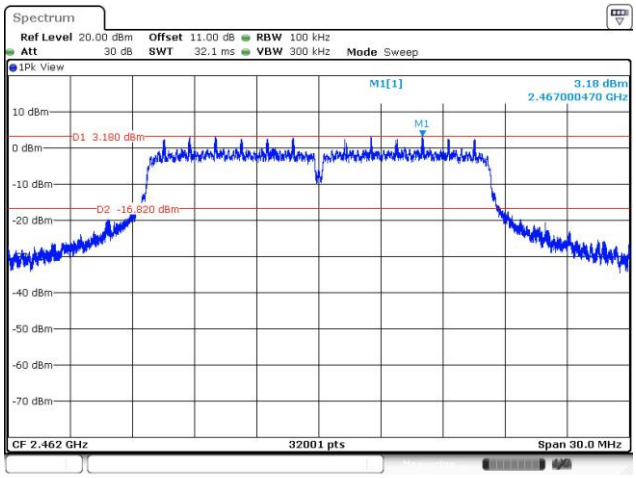
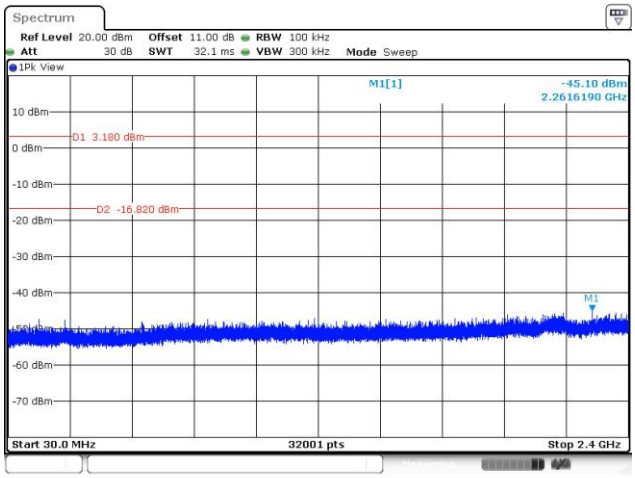
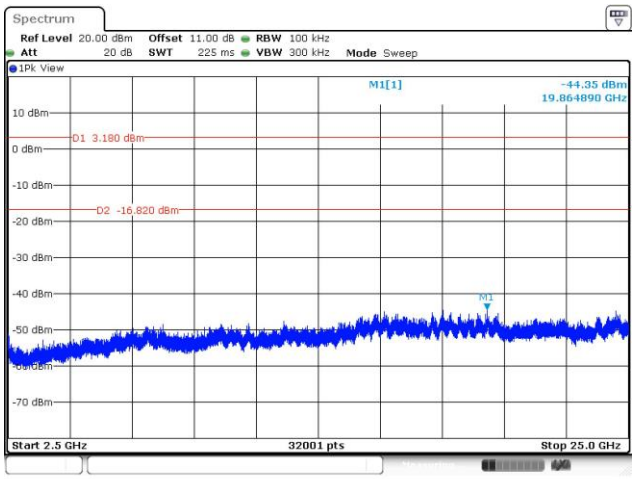
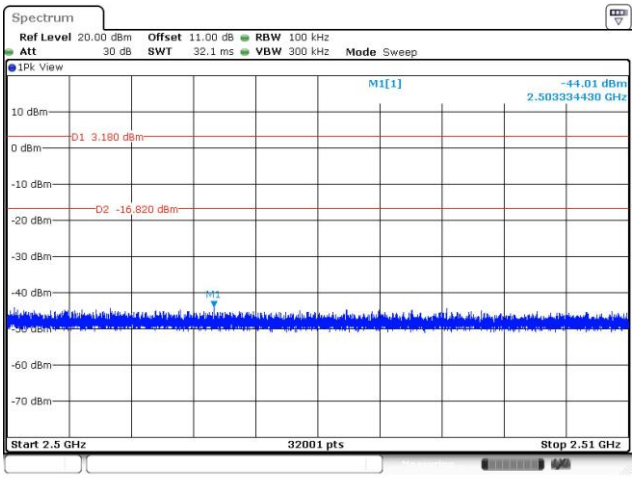
Reference Level	Tx 2437MHz / 30MHz~25GHz (down 20dBc)
	
---	
---	

Reference Level	Tx 2462MHz / 30MHz~25GHz (down 20dBc)
	
---	
---	

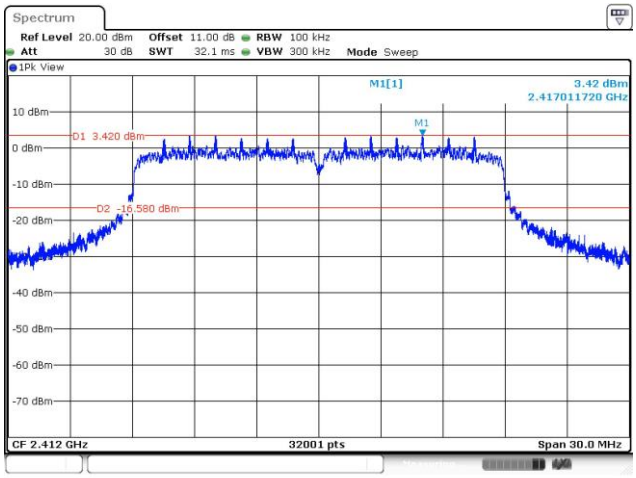
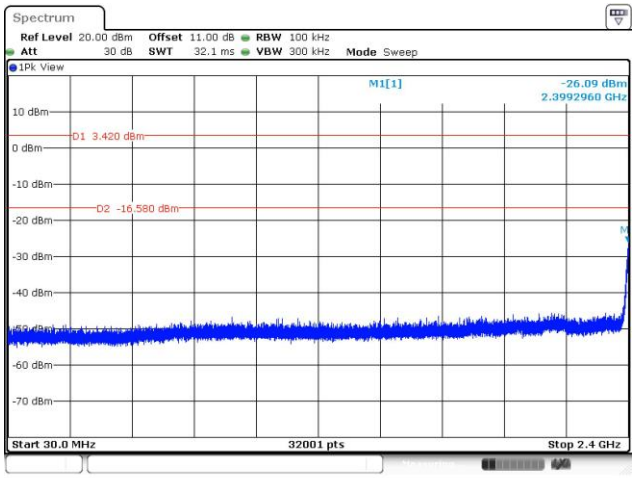
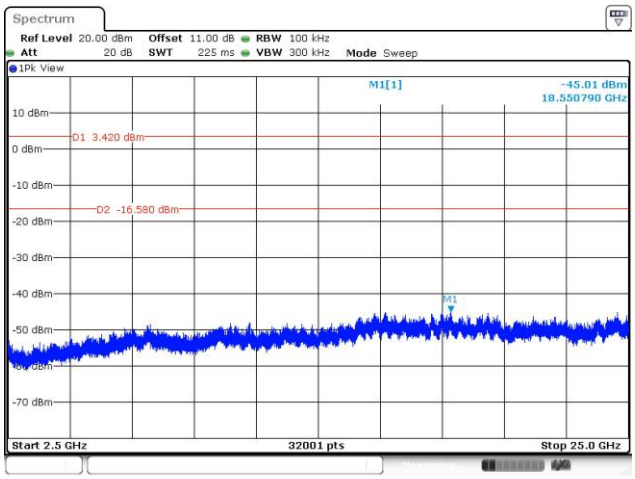
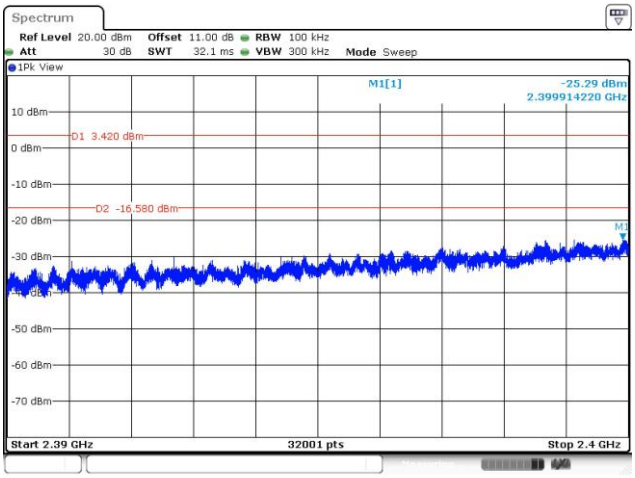
802.11g

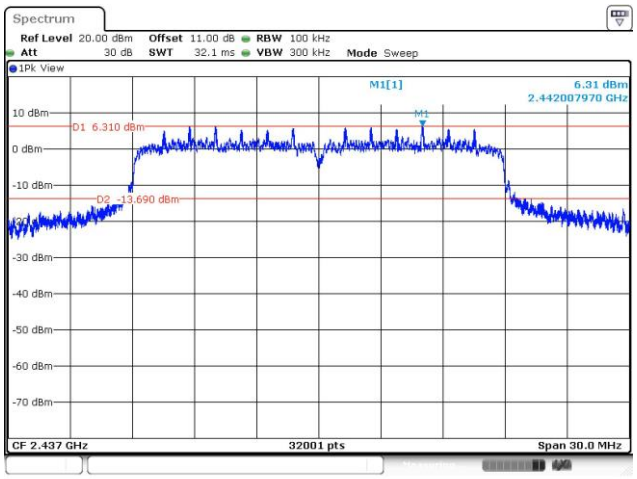
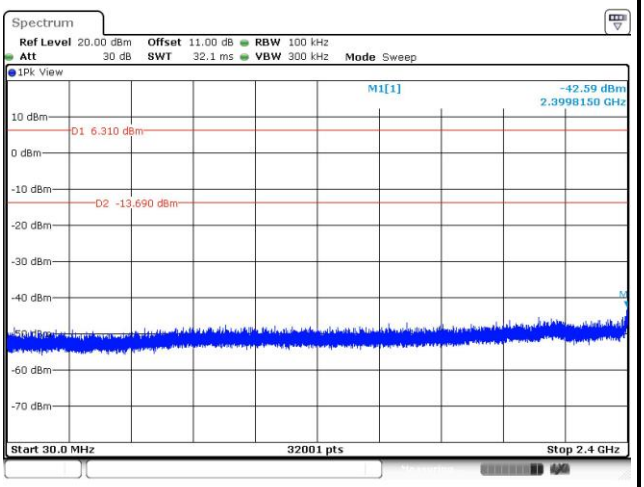
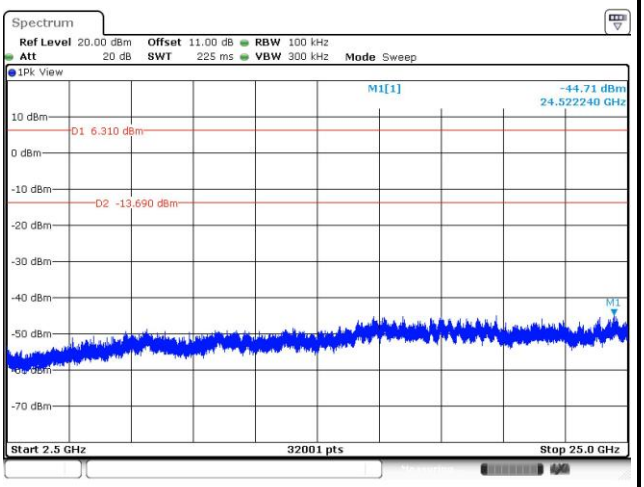
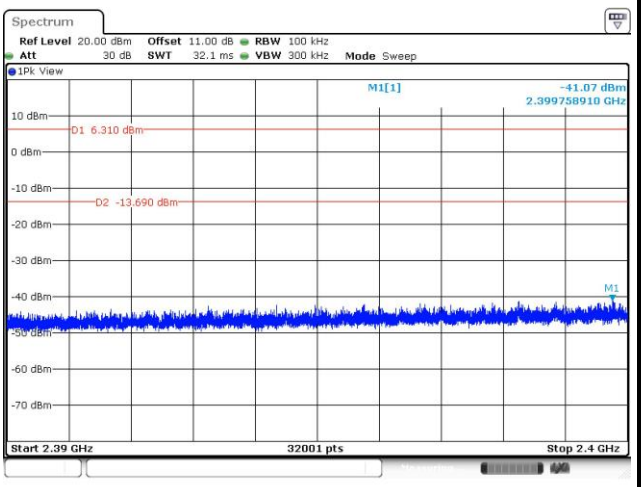
Reference Level	Tx 2412MHz / 30MHz~25GHz (down 20dBc)
	
---	
---	

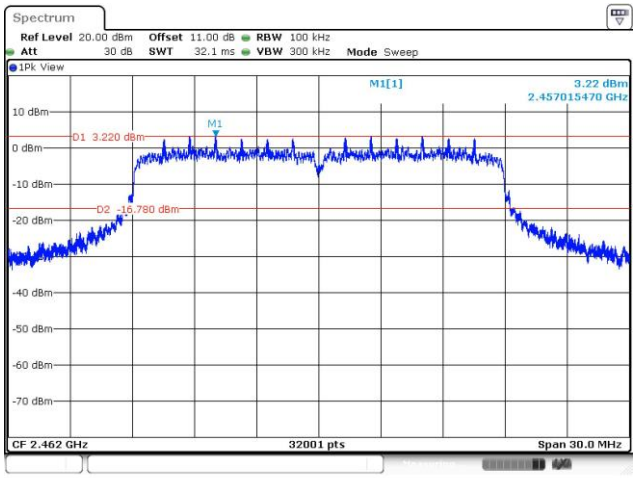
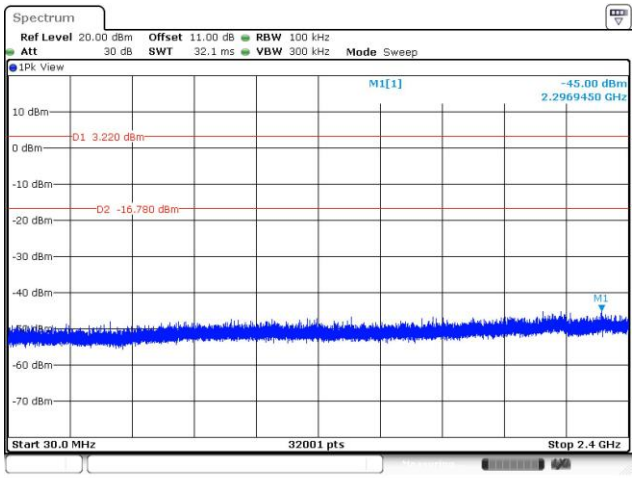
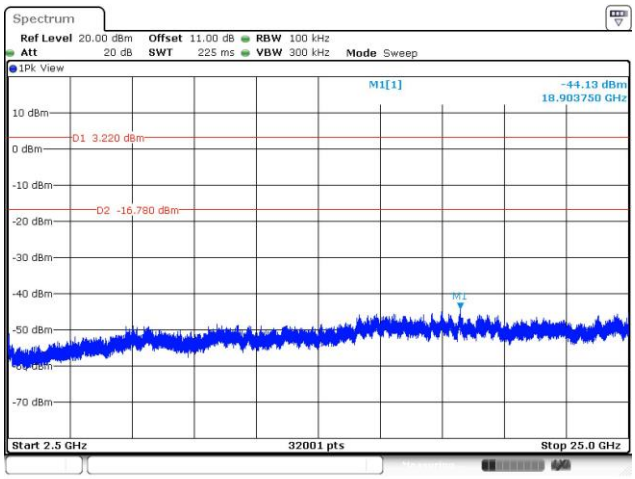
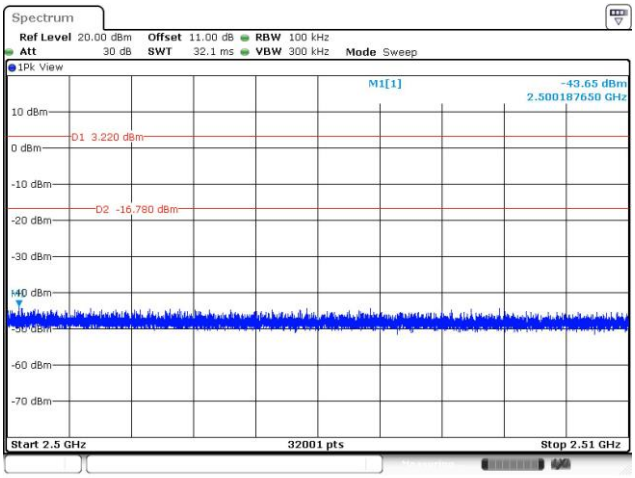
Reference Level	Tx 2437MHz / 30MHz~25GHz (down 20dBc)
	
---	
---	

Reference Level	Tx 2462MHz / 30MHz~25GHz (down 20dBc)
	
---	
---	

802.11n HT20

Reference Level	Tx 2412MHz / 30MHz~25GHz (down 20dBc)
	
---	
---	

Reference Level	Tx 2437MHz / 30MHz~25GHz (down 20dBc)
	
---	
---	

Reference Level	Tx 2462MHz / 30MHz~25GHz (down 20dBc)
	
---	
---	

4 Receiver Test Results

4.1 Conducted Emissions

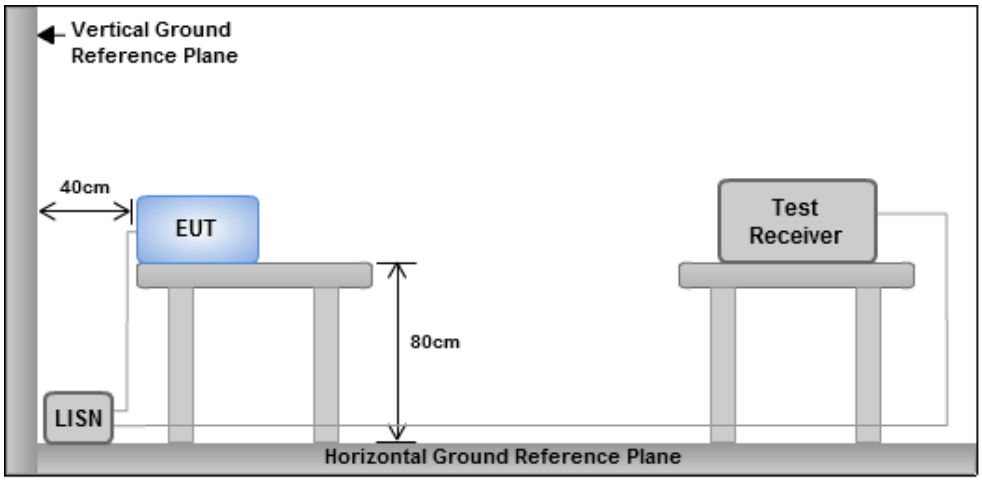
4.1.1 Limit of Conducted Emissions

Conducted Emissions Limit		
Frequency Emission (MHz)	**Quasi-Peak**	**Average**
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50
Note 1: * Decreases with the logarithm of the frequency.		

4.1.2 Test Procedures

1. The device is placed on a test table, raised 80 cm above the reference ground plane. The vertical conducting plane is located 40 cm to the rear of the device.
2. The device is connected to line impedance stabilization network (LISN) and other accessories are connected to other LISN. Measured levels of AC power line conducted emission are across the 50 Ω LISN port.
3. AC conducted emission measurements is made over frequency range from 150 kHz to 30 MHz.
4. This measurement was performed with AC 120V / 60Hz.

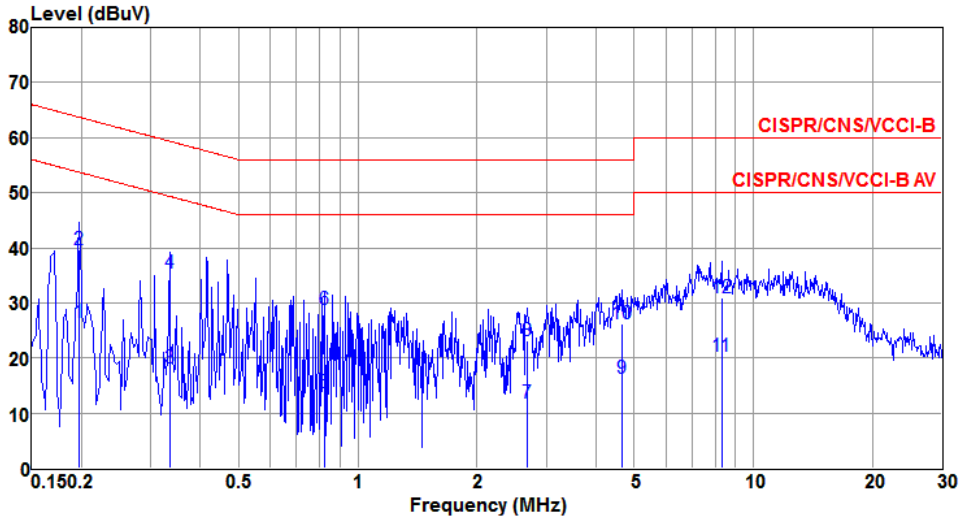
4.1.3 Test Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

4.1.4 Test Result of Conducted Emissions

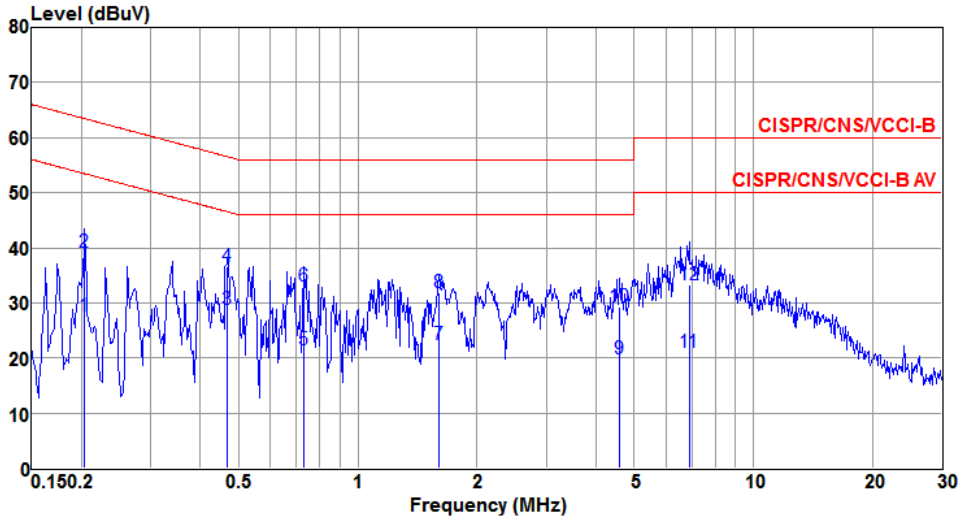
Modulation	11g	Test Freq. (MHz)	2437
Power Phase	Line		



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.198	26.45	53.71	-27.26	26.13	0.29	0.03	Average
2	0.198	39.73	63.71	-23.98	39.41	0.29	0.03	QP
3	0.334	18.30	49.35	-31.05	17.95	0.33	0.02	Average
4@	0.334	35.39	59.35	-23.96	35.04	0.33	0.02	QP
5	0.826	13.70	46.00	-32.30	13.29	0.38	0.03	Average
6	0.826	28.77	56.00	-27.23	28.36	0.38	0.03	QP
7	2.678	11.70	46.00	-34.30	11.10	0.45	0.15	Average
8	2.678	23.17	56.00	-32.83	22.57	0.45	0.15	QP
9	4.672	16.38	46.00	-29.62	15.65	0.49	0.24	Average
10	4.672	26.22	56.00	-29.78	25.49	0.49	0.24	QP
11	8.323	20.20	50.00	-29.80	19.35	0.55	0.30	Average
12	8.323	30.86	60.00	-29.14	30.01	0.55	0.30	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).

Modulation	11g	Test Freq. (MHz)	2437
Power Phase	Neutral		



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.204	27.64	53.45	-25.81	27.46	0.15	0.03	Average
2	0.204	39.19	63.45	-24.26	39.01	0.15	0.03	QP
3@	0.469	28.70	46.54	-17.84	28.48	0.20	0.02	Average
4	0.469	36.63	56.54	-19.91	36.41	0.20	0.02	QP
5	0.727	21.48	46.00	-24.52	21.21	0.24	0.03	Average
6	0.727	33.04	56.00	-22.96	32.77	0.24	0.03	QP
7	1.602	22.33	46.00	-23.67	21.96	0.29	0.08	Average
8	1.602	31.96	56.00	-24.04	31.59	0.29	0.08	QP
9	4.598	19.81	46.00	-26.19	19.20	0.37	0.24	Average
10	4.598	29.30	56.00	-26.70	28.69	0.37	0.24	QP
11	6.878	20.92	50.00	-29.08	20.23	0.41	0.28	Average
12	6.878	33.37	60.00	-26.63	32.68	0.41	0.28	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).

4.2 Radiated Emissions

4.2.1 Limit of Radiated Emissions

Restricted Band Emissions Limit			
Frequency Range (MHz)	**Field Strength (uV/m)**	**Field Strength (dBuV/m)**	**Measure Distance (m)**
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

Note 1:
Qusai-Peak value is measured for frequency below 1GHz except for 9–90 kHz, 110–490 kHz frequency band. Peak and average value are measured for frequency above 1GHz. The limit on average radio frequency emission is as above table. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit
Note 2:
Measurements may be performed at a distance other than what is specified provided. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor as below, Frequency at or above 30 MHz: 20 dB/decade Frequency below 30 MHz: 40 dB/decade.

4.2.2 Test Procedures

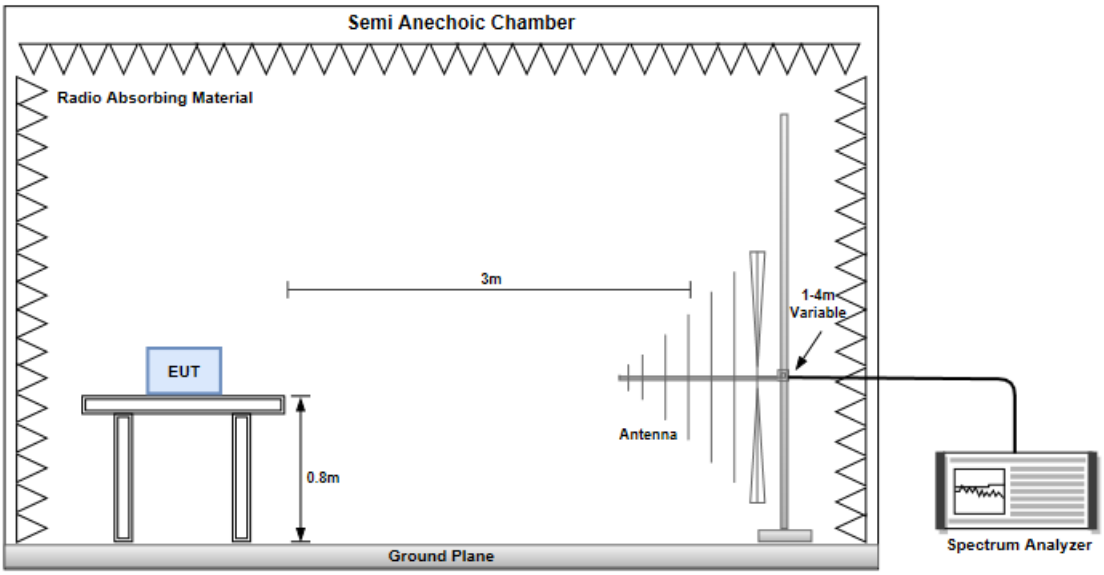
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at test table. For emissions testing at or below 1 GHz, the table height is 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height is 1.5 m
2. Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m ~ 4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3 m.
3. This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

Note:

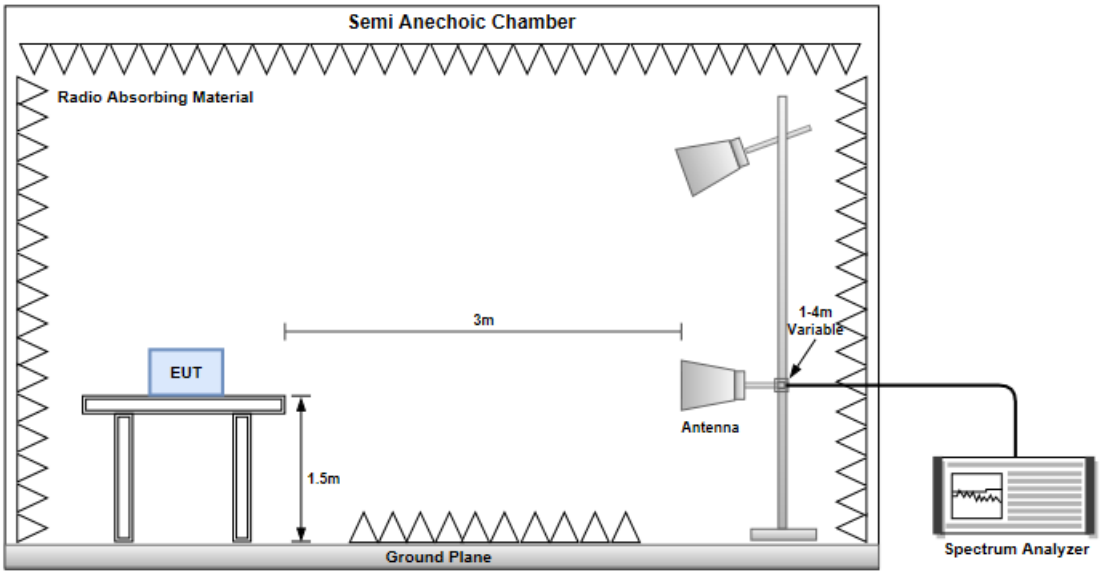
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=3MHz and RMS detector is for average measured value of radiated emission above 1GHz.

4.2.3 Test Setup

Radiated Emissions below 1 GHz

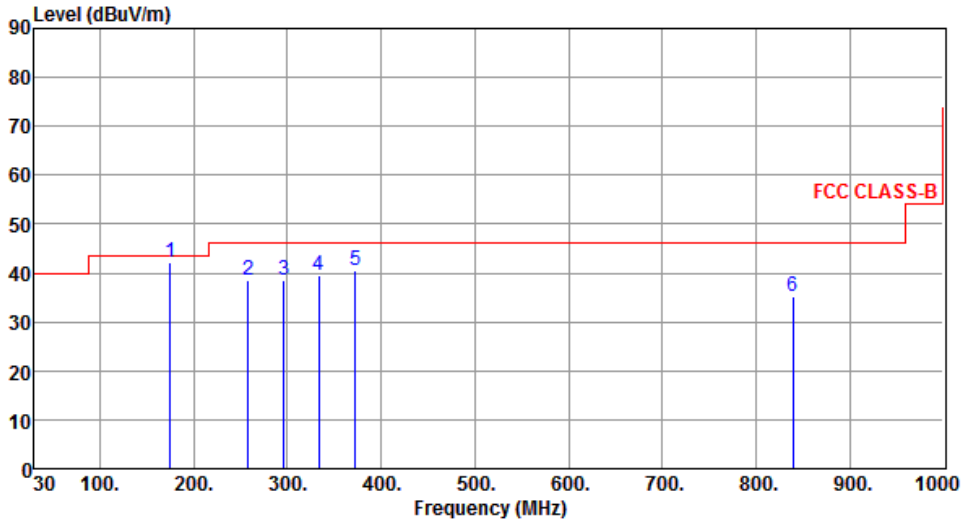


Radiated Emissions above 1 GHz



4.2.4 Receiver Emissions (Below 1GHz)

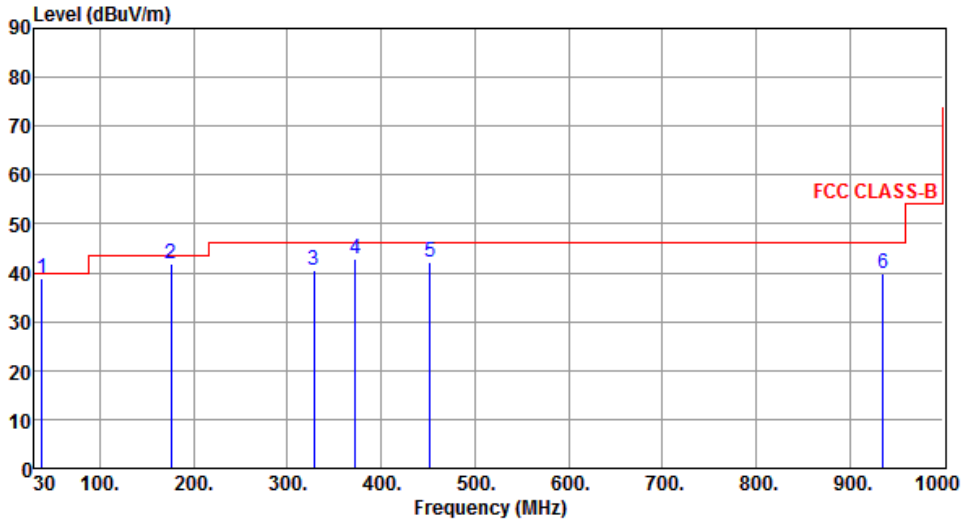
Modulation	11g	Test Freq. (MHz)	2437
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	175.36	42.21	43.50	-1.29	51.41	-9.20	QP	175	92
2	258.55	38.65	46.00	-7.35	47.78	-9.13	Peak	---	---
3	296.24	38.65	46.00	-7.35	46.52	-7.87	Peak	---	---
4	333.25	39.47	46.00	-6.53	46.45	-6.98	Peak	---	---
5	372.68	40.57	46.00	-5.43	46.49	-5.92	Peak	---	---
6	839.58	35.15	46.00	-10.85	32.27	2.88	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

Modulation	11g	Test Freq. (MHz)	2437
Polarization	Vertical		

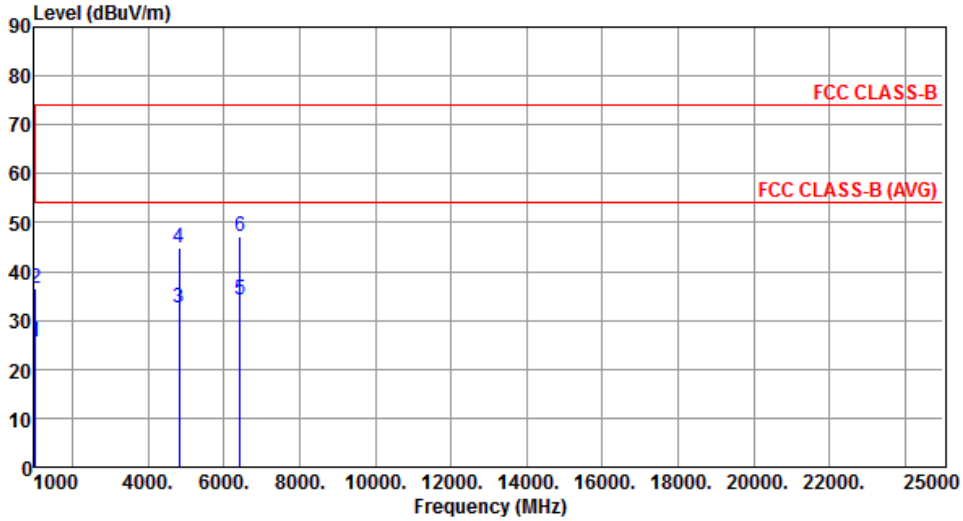


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	38.27	38.87	40.00	-1.13	47.67	-8.80	QP	100	23
2	176.25	41.85	43.50	-1.65	51.15	-9.30	QP	100	219
3	328.00	40.52	46.00	-5.48	47.64	-7.12	Peak	---	---
4	372.69	42.98	46.00	-3.02	48.90	-5.92	Peak	---	---
5	452.23	42.23	46.00	-3.77	46.05	-3.82	Peak	---	---
6	935.71	39.81	46.00	-6.19	35.26	4.55	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

4.2.5 Receiver Emissions (Above 1GHz)

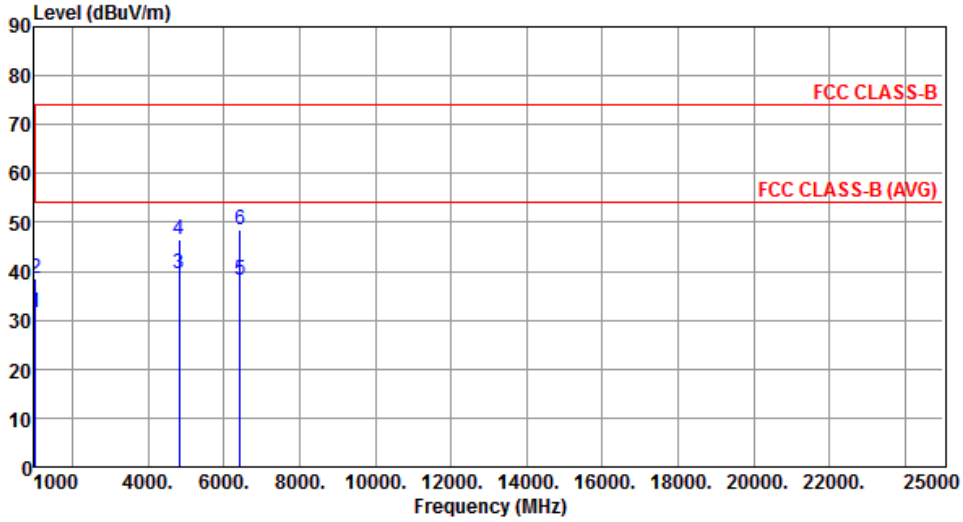
Modulation	11g	Test Freq. (MHz)	2437
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	1034.00	25.48	54.00	-28.52	33.28	-7.80	Average	100	155
2	1034.00	36.66	74.00	-37.34	44.46	-7.80	Peak	100	155
3	4824.00	32.69	54.00	-21.31	26.92	5.77	Average	100	20
4	4824.00	44.76	74.00	-29.24	38.99	5.77	Peak	100	20
5	6432.00	34.22	54.00	-19.78	25.49	8.73	Average	100	200
6	6432.00	47.26	74.00	-26.74	38.53	8.73	Peak	100	200

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	11g	Test Freq. (MHz)	2437
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	1034.00	31.62	54.00	-22.38	39.42	-7.80	Average	107	20
2	1034.00	38.63	74.00	-35.37	46.43	-7.80	Peak	107	20
3	4824.00	39.36	54.00	-14.64	33.59	5.77	Average	100	176
4	4824.00	46.58	74.00	-27.42	40.81	5.77	Peak	100	176
5	6432.00	38.10	54.00	-15.90	29.37	8.73	Average	111	0
6	6432.00	48.33	74.00	-25.67	39.60	8.73	Peak	111	0

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

5 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corp (EMC and Wireless Communication Laboratory), it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff.

Our Test sites are located at Linkou District and Kwei Shan District. Location map can be found on our website http://www.icertifi.com.tw.

Linkou	**Kwei Shan**	**Kwei Shan Site II**
Tel: 886-2-2601-1640	Tel: 886-3-271-8666	Tel: 886-3-271-8640
No. 30-2, Ding Fwu Tsuen, Lin Kou District, New Taipei City, Taiwan, R.O.C.	No. 3-1, Lane 6, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C.	No. 14-1, Lane 19, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C.

If you have any suggestion, please feel free to contact us as below information.

Tel: 886-3-271-8666
Fax: 886-3-318-0155
Email: ICC_Service@icertifi.com.tw

═END═