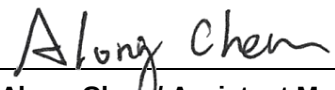


NCC Test Report

Equipment : Multy X 三頻全覆蓋無線延伸系統
Model No. : WSQ50
Brand Name : ZYXEL
Applicant : 合勤科技股份有限公司
Address : 新北市新店區北新路 3 段 223 號 11 樓
Standard : LP0002 Section 3.10.1 (2018-01-10)
Received Date : Aug. 11, 2017
Tested Date : Aug. 18, 2017
Mar. 07 ~ Mar. 31, 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:

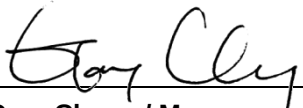

Gary Chang / Manager



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Release Record

Report No.	Version	Description	Issued Date
TR760801-02AC	Rev. 01	Initial issue	Jun. 01, 2018

Summary of Test Results

NCC Rules	Test Items	Measured	Result
2.3	Conducted Emissions	[dBuV]: 0.484MHz 29.50 (Margin -16.77dB) - AV	Pass
3.10.1.5 2.8	Radiated Emissions	[dBuV/m at 3m]: 2390.00MHz 53.86 (Margin -0.14dB) - AV	Pass
3.10.1.2(1)(C)	Maximum Output Power	Max Power [dBm]: 29.52	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]	2	1-11 Mbps
2400-2483.5	g	2412-2462	1-11 [11]	2	6-54 Mbps
2400-2483.5	n (HT20)	2412-2462	1-11 [11]	2	MCS 0-15
2400-2483.5	n (HT40)	2422-2452	3-9 [7]	2	MCS 0-15

Note 1: RF output power specifies that Maximum Conducted (Average) 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 Main Chipset / RF Chipset

Function	Model No.
Main Chipset	IPQ4019
2.4G	IPQ4019
5G 2T2R	IPQ4019
5G 4T4R	QCA9984
Bluetooth LE	CSR8811

1.1.3 Antenna Details

Ant. No.	Model	Type	Connector	Operating Frequency (MHz) / Gain (dBi)		
				2400~2483.5	5150~5250	5725~5850
1	ALX17P-051XXB-00	PCB dipole	UFL	0	0	0
2	ALX17P-051XXC-00	PCB dipole	UFL	0	0	0
3	ALX17P-091XX5-00	PCB dipole	UFL	0	0	0
4	ALX17P-091XX6-00	PCB dipole	UFL	0	0	0
5	ALX17P-091XX7-00	PCB dipole	UFL	0	0	0
6	ALX17P-091XX8-00	PCB dipole	UFL	0	0	0
7	ALX17P-091XX9-00	PCB dipole	UFL	0	0	0
8	ALX17P-091XXA-00	PCB dipole	UFL	0	0	0

1.1.4 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	12Vdc from adapter
--------------------------	--------------------

1.1.5 Accessories

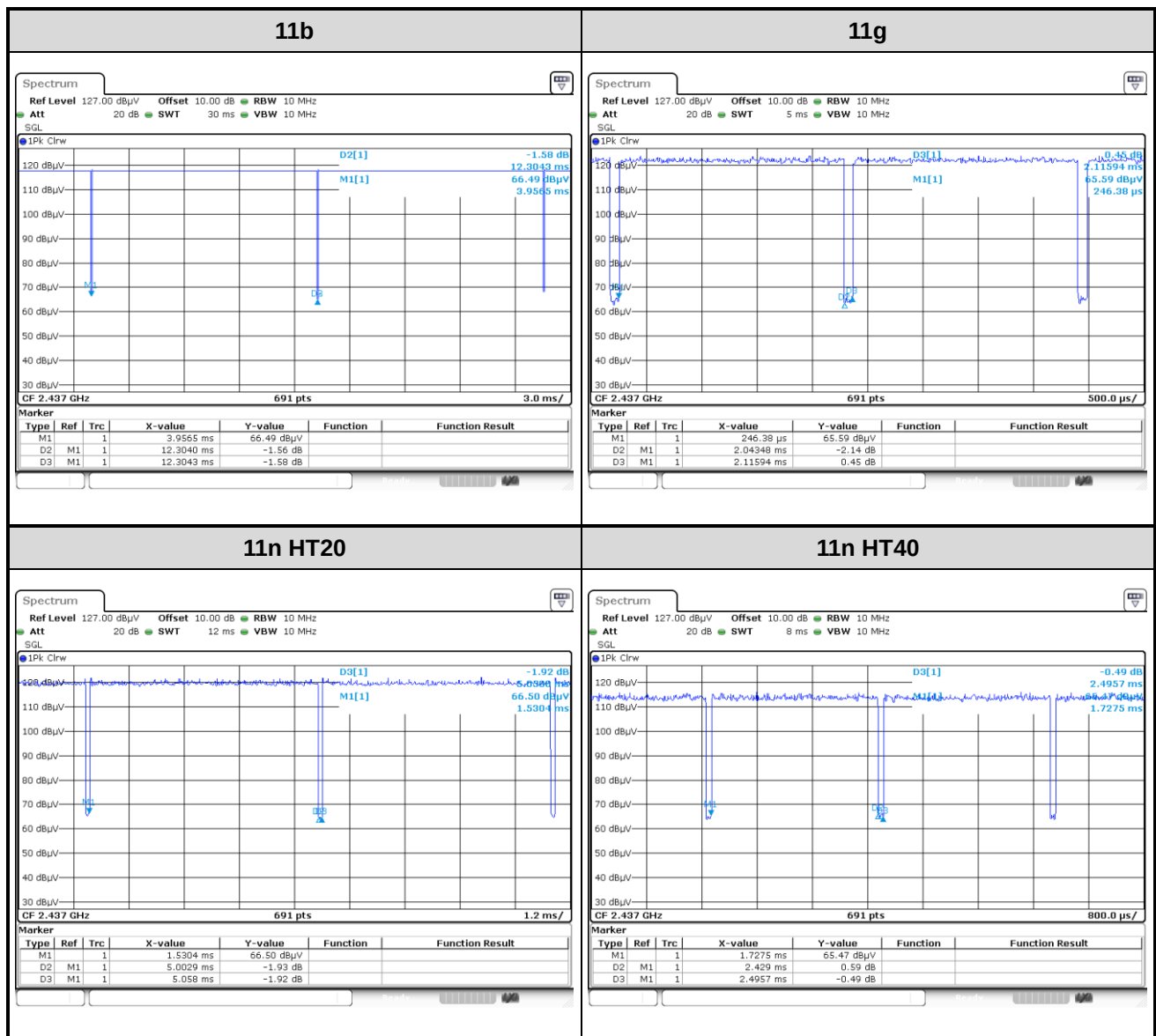
Accessories		
No.	Equipment	Description
1	AC adapter	Brand Name: APD Model Name: WA-36A12FU I/P: 100-240Vac, 50-60Hz 0.9 Max O/P: 12Vdc, 3A Power line: 1.75m non-shielded without core
2	AC adapter	Brand Name: APD Model Name: WA-36A12R I/P: 100-240Vac, 50-60Hz 0.9 Max O/P: 12Vdc, 3A Power line: 1.75m non-shielded without core
3	RJ45 cable	1.9m non-shielded without core

1.1.6 Channel List

Frequency band (MHz)		2400~2483.5	
802.11 b / g / n HT20		802.11n HT40	
Channel	Frequency(MHz)	Channel	Frequency(MHz)
1	2412	3	2422
2	2417	4	2427
3	2422	5	2432
4	2427	6	2437
5	2432	7	2442
6	2437	8	2447
7	2442	9	2452
8	2447	---	---
9	2452	---	---
10	2457	---	---
11	2462	---	---

1.1.7 Test Tool and Duty Cycle

Test Tool	QRCT, V3.0.144.0		
Duty Cycle and Duty Factor	Mode	Duty cycle (%)	Duty factor (dB)
	11b	100.00%	0.00
	11g	96.58%	0.15
	HT20	98.91%	0.05
	HT40	97.33%	0.12



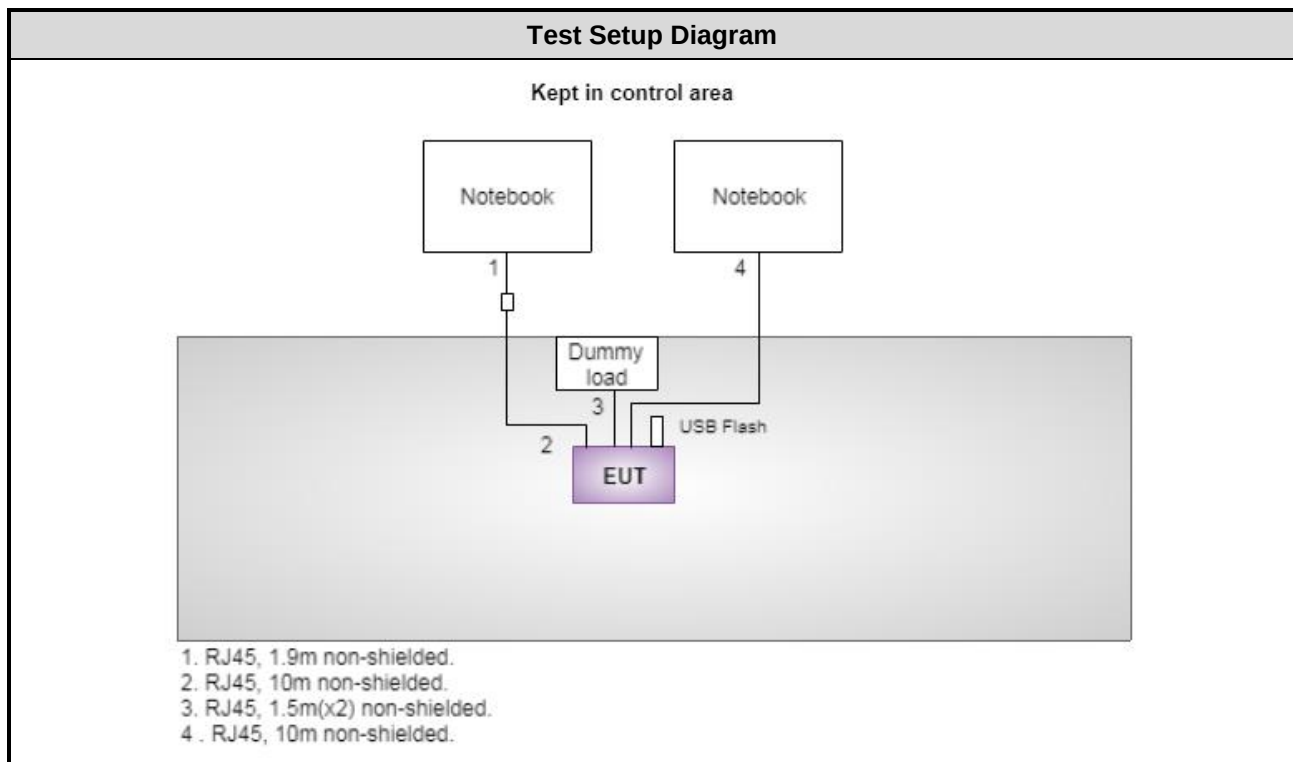
1.1.8 Power Setting

Modulation Mode	Test Frequency (MHz)	Power Set
11b	2412	26
11b	2437	27
11b	2462	25.5
11g	2412	21.5
11g	2437	26
11g	2462	20
HT20	2412	21.5
HT20	2437	26
HT20	2462	20
HT40	2422	19
HT40	2437	21.5
HT40	2452	17.5

1.2 Local Support Equipment List

Support Equipment List					
No.	Equipment	Brand	Model	FCC ID	Signal cable / Length (m)
1	Notebook	DELL	Latitude E6430	DoC	RJ45, 10m non-shielded.
2	Notebook	DELL	Latitude E5420	DoC	RJ45, 10m non-shielded.
3	USB Flash	Kingston	DTSE9	---	---
4	Dummy Load	---	---	---	RJ45, 1m(x2) non-shielded.

1.3 Test Setup Chart



1.4 The Equipment List

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Tested Date	Mar. 31, 2018				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Receiver	Agilent	N9038A	MY53290044	Sep. 26, 2017	Sep. 25, 2018
LISN	R&S	ENV216	101579	Feb. 13, 2018	Feb. 12, 2019
RF Cable-CON	EMC	EMCCFD300-BM-B M-6000	50821	Dec. 18, 2017	Dec. 17, 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 chamber1 / (03CH01-WS)				
Tested Date	Mar. 07 ~ Mar. 17, 2018				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101498	Dec. 04, 2017	Dec. 03, 2018
Receiver	R&S	ESR3	101658	Nov. 20, 2017	Nov. 19, 2018
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Jul. 25, 2017	Jul. 24, 2018
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Dec. 20, 2017	Dec. 19, 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	980225	Jul. 28, 2017	Jul. 27, 2018
Preamplifier	Agilent	83017A	MY39501308	Oct. 06, 2017	Oct. 05, 2018
Preamplifier	EMC	EMC184045B	980192	Aug. 22, 2017	Aug. 21, 2018
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16014/4	Dec. 07, 2017	Dec. 06, 2018
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Dec. 07, 2017	Dec. 06, 2018
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16139/4	Dec. 07, 2017	Dec. 06, 2018
LF cable 1M	EMC	EMCCFD400-NM-N M-1000	16052	Dec. 07, 2017	Dec. 06, 2018
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Dec. 07, 2017	Dec. 06, 2018
LF cable 10M	Woken	CFD400NL-LW	CFD400NL-002	Dec. 07, 2017	Dec. 06, 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	Aug. 18, 2017				
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. 06, 2016	Oct. 05, 2017
Power Sensor	Anritsu	MA2411B	1207366	Oct. 06, 2016	Oct. 05, 2017
AC POWER SOURCE	APC	AFC-500W	F312060012	Oct. 28, 2016	Oct. 27, 2017
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 558074 D01 DTS Meas Guidance v04

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

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 ≤ 1 GHz	± 3.66 dB
Radiated emission > 1 GHz	± 5.63 dB

2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
AC Conduction	CO01-WS	24°C / 57%	Alex Tsai
Radiated Emissions	03CH01-WS	20-22°C / 63-64%	Vincent Yeh Roger Lu
RF Conducted	TH01-WS	22°C / 62%	Felix Sung

- FCC Designation No.: TW2732
- FCC site registration No.: 181692
- IC site registration No.: 10807A-1

2.2 The Worst Test Modes and Channel Details

Test item	Modulation Mode	Test Frequency (MHz)	Data Rate	Mode
Conducted Emissions	11b	2437	1 Mbps	TX
Radiated Emissions ≤1GHz	11b	2437	1 Mbps	TX
Radiated Emissions >1GHz	11b	2412 / 2437 / 2462	1 Mbps	TX
Maximum Output Power	11g	2412 / 2437 / 2462	6 Mbps	
6dB bandwidth	HT20	2412 / 2437 / 2462	MCS 0	
Power spectral density	HT40	2422 / 2437 / 2452	MCS 0	

Note:

- Two adapters (WA-36A12FU and WA-36A12R) had been covered during the pretest, and found that **WA-36A12FU adapter** was the worst case and was selected for final test.
- The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The **X-plane** results were found as the worst case and were shown in this report.

Test item	Modulation Mode	Test Frequency (MHz)	Mode
Conducted Emissions	11b	2437	RX
Radiated Emissions	11b	2437	RX

Note:

- Two adapters (WA-36A12FU and WA-36A12R) had been covered during the pretest, and found that **WA-36A12FU adapter** was the worst case and was selected for final test.
- The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The **X-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

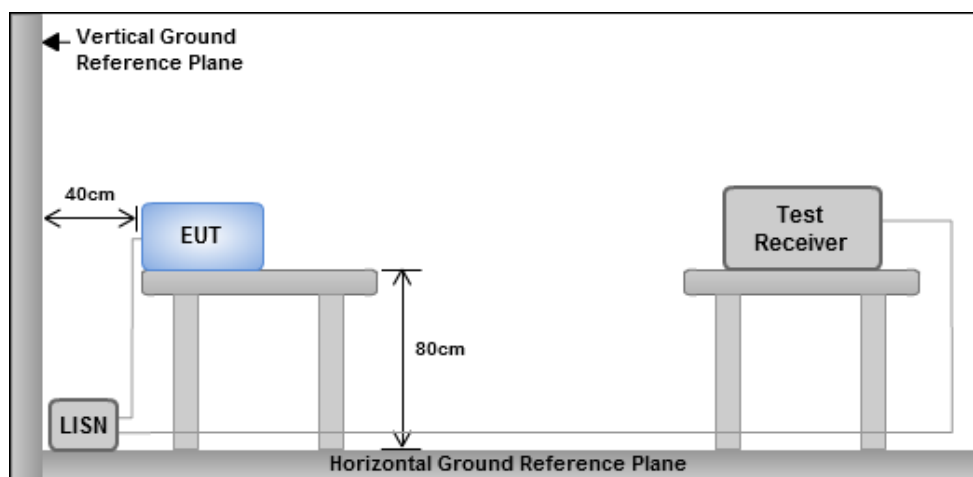
Conducted Emissions Limit		
Frequency Emission (MHz)	Quasi-Peak	Average
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50

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.

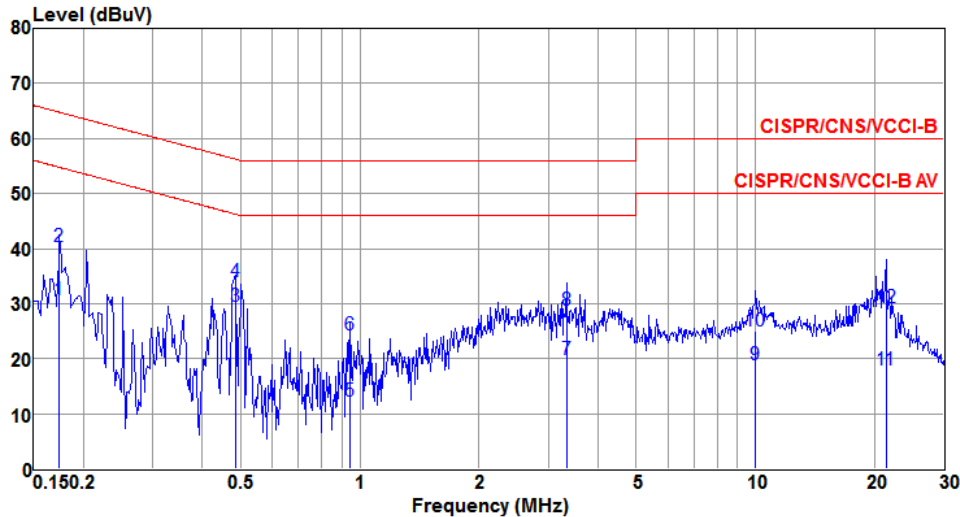
3.1.3 Test Setup



- 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	11b	Test Freq. (MHz)	2437
Power Phase	Line		



	Freq	Level	Limit	Over	Read	LISN	cable	Remark
	MHz	dBuV	dBuV	Limit	Level	factor	loss	
				dB	dBuV	dB	dB	
1	0.174	30.60	54.77	-24.17	20.85	9.73	0.02	Average
2	0.174	40.33	64.77	-24.44	30.58	9.73	0.02	QP
3	0.484	29.50	46.27	-16.77	19.75	9.73	0.02	Average
4	0.484	34.11	56.27	-22.16	24.36	9.73	0.02	QP
5	0.943	12.36	46.00	-33.64	2.60	9.73	0.03	Average
6	0.943	24.38	56.00	-31.62	14.62	9.73	0.03	QP
7	3.328	19.94	46.00	-26.06	10.00	9.75	0.19	Average
8	3.328	28.79	56.00	-27.21	18.85	9.75	0.19	QP
9	10.019	18.93	50.00	-31.07	8.83	9.78	0.32	Average
10	10.019	25.01	60.00	-34.99	14.91	9.78	0.32	QP
11	21.373	18.06	50.00	-31.94	8.01	9.70	0.35	Average
12	21.373	29.24	60.00	-30.76	19.19	9.70	0.35	QP

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

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

Level (dBUV)

Frequency (MHz)

	Freq	Level	Limit	Over	Read	LISN	cable	
	MHz	dBuV	Line	Limit	Level	factor	loss	Remark
			dBuV	dB	dBuV	dB	dB	
1	0.159	28.17	55.52	-27.35	18.48	9.68	0.01	Average
2@	0.159	40.19	65.52	-25.33	30.50	9.68	0.01	QP
3	0.240	15.81	52.08	-36.27	6.11	9.67	0.03	Average
4	0.240	29.72	62.08	-32.36	20.02	9.67	0.03	QP
5	0.505	15.21	46.00	-30.79	5.52	9.67	0.02	Average
6	0.505	19.88	56.00	-36.12	10.19	9.67	0.02	QP
7	1.433	7.79	46.00	-38.21	-1.96	9.68	0.07	Average
8	1.433	15.99	56.00	-40.01	6.24	9.68	0.07	QP
9	3.436	14.71	46.00	-31.29	4.83	9.69	0.19	Average
10	3.436	24.68	56.00	-31.32	14.80	9.69	0.19	QP
11	20.924	11.56	50.00	-38.44	1.38	9.83	0.35	Average
12	20.924	25.06	60.00	-34.94	14.88	9.83	0.35	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

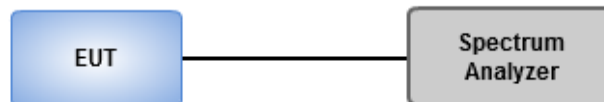
6dB Bandwidth

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.

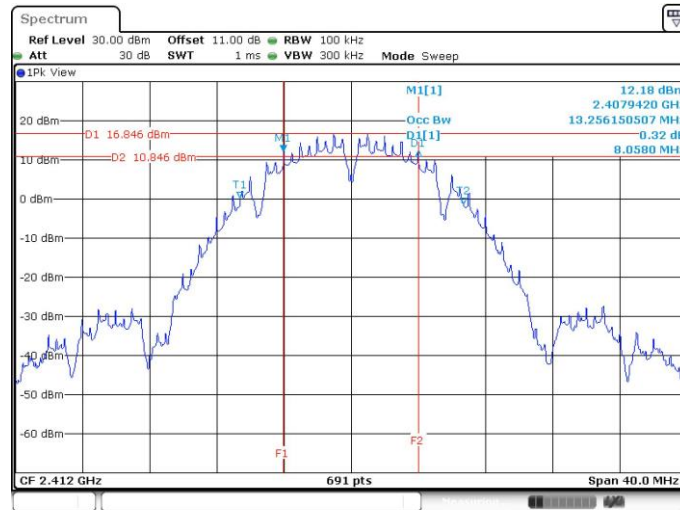
3.2.3 Test Setup



3.2.4 Test Result of 6dB and Occupied Bandwidth

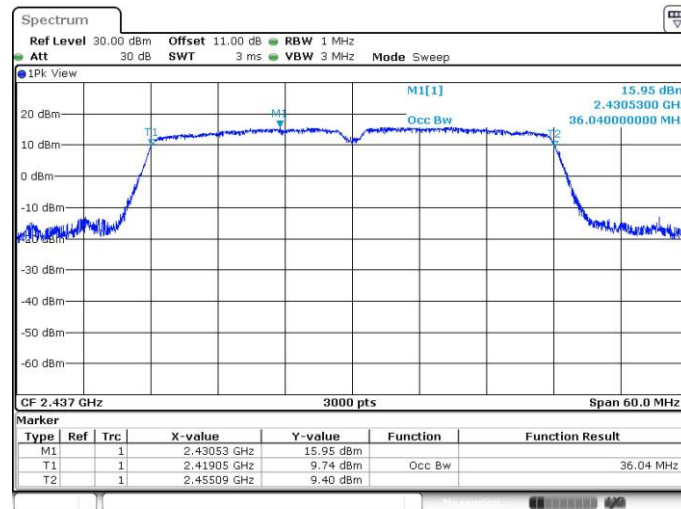
Modulation Mode	N _{TX}	Freq. (MHz)	6dB Bandwidth (MHz)				Limit (kHz)
			Chain 0	Chain 1	Chain 2	Chain 3	
11b	2	2412	8.06	8.06	---	---	500
11b	2	2437	8.06	8.06	---	---	500
11b	2	2462	8.06	8.06	---	---	500
11g	2	2412	16.35	16.29	---	---	500
11g	2	2437	16.29	16.29	---	---	500
11g	2	2462	16.35	16.35	---	---	500
HT20	2	2412	17.22	17.57	---	---	500
HT20	2	2437	17.57	17.57	---	---	500
HT20	2	2462	17.57	17.57	---	---	500
HT40	2	2422	35.25	35.25	---	---	500
HT40	2	2437	35.25	35.25	---	---	500
HT40	2	2452	35.25	35.25	---	---	500

Worst Plot



Modulation Mode	N _{TX}	Freq. (MHz)	99% Occupied Bandwidth (MHz)			
			Chain 0	Chain 1	Chain 2	Chain 3
11b	2	2412	13.44	13.20	---	---
11b	2	2437	14.05	13.90	---	---
11b	2	2462	13.21	13.11	---	---
11g	2	2412	16.43	16.47	---	---
11g	2	2437	16.69	16.69	---	---
11g	2	2462	16.42	16.45	---	---
HT20	2	2412	17.61	17.60	---	---
HT20	2	2437	17.87	17.79	---	---
HT20	2	2462	17.62	17.61	---	---
HT40	2	2422	35.96	36.00	---	---
HT40	2	2437	36.04	36.02	---	---
HT40	2	2452	35.96	35.96	---	---

Worst Plot



3.3 RF Output Power

3.3.1 Limit of RF Output Power

Conducted power shall not exceed 1Watt.

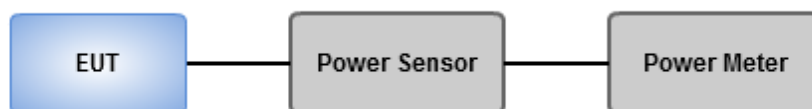
- ☒ Antenna gain $\leq 6\text{dBi}$, no any corresponding reduction is in output power limit.
- ☐ Antenna gain $> 6\text{dBi}$
 - ☐ Non Fixed, point to point operations.
The conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna 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
 - ☒ **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)	Conducted (Average) 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	2	2412	24.88	25.26	---	---	643.347	28.08	24.88	0.00	28.08	36.00
11b	2	2437	26.42	26.59	---	---	894.568	29.52	26.42	0.00	29.52	36.00
11b	2	2462	24.76	25.08	---	---	621.333	27.93	24.76	0.00	27.93	36.00
11g	2	2412	20.62	20.81	---	---	235.849	23.73	20.62	0.00	23.73	36.00
11g	2	2437	24.99	24.82	---	---	618.890	27.92	24.99	0.00	27.92	36.00
11g	2	2462	19.49	19.76	---	---	183.544	22.64	19.49	0.00	22.64	36.00
HT20	2	2412	20.51	20.78	---	---	232.135	23.66	20.51	0.00	23.66	36.00
HT20	2	2437	24.92	24.76	---	---	609.682	27.85	24.92	0.00	27.85	36.00
HT20	2	2462	19.37	19.65	---	---	178.754	22.52	19.37	0.00	22.52	36.00
HT40	2	2422	18.32	18.71	---	---	142.222	21.53	18.32	0.00	21.53	36.00
HT40	2	2437	20.97	21.53	---	---	267.259	24.27	20.97	0.00	24.27	36.00
HT40	2	2452	17.23	17.41	---	---	107.925	20.33	17.23	0.00	20.33	36.00

3.4 Power Spectral Density

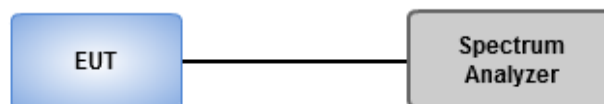
3.4.1 Limit of Power Spectral Density

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 = 30kHz, VBW = 100 kHz.
 2. Detector = RMS, Sweep time = auto couple.
 3. Set the sweep time to: $\geq 10 \times (\text{number of measurement points in sweep}) \times (\text{maximum data rate per stream})$.
 4. Perform the measurement over a single sweep.
 5. Use the peak marker function to determine the maximum amplitude level.

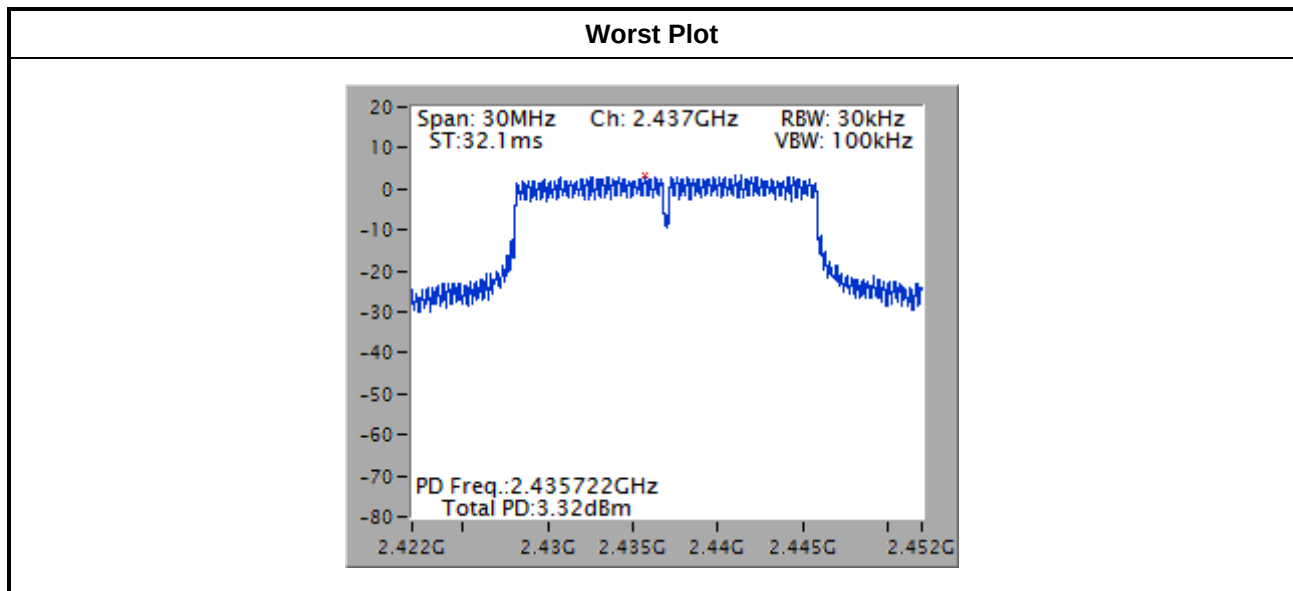
3.4.3 Test Setup



3.4.4 Test Result of Power Spectral Density

Modulation Mode	N _{TX}	Freq. (MHz)	Total Power Spectral Density (dBm/30kHz)	Limit (dBm/3kHz)
11b	2	2412	1.80	8.00
11b	2	2437	3.00	8.00
11b	2	2462	1.74	8.00
11g	2	2412	-1.07	8.00
11g	2	2437	3.11	8.00
11g	2	2462	-2.23	8.00
HT20	2	2412	-1.03	8.00
HT20	2	2437	3.32	8.00
HT20	2	2462	-1.77	8.00
HT40	2	2422	-6.22	8.00
HT40	2	2437	-3.45	8.00
HT40	2	2452	-7.43	8.00

Note: Test result for is bin-by-bin summing measured value of each TX port.



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:
Quasi-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

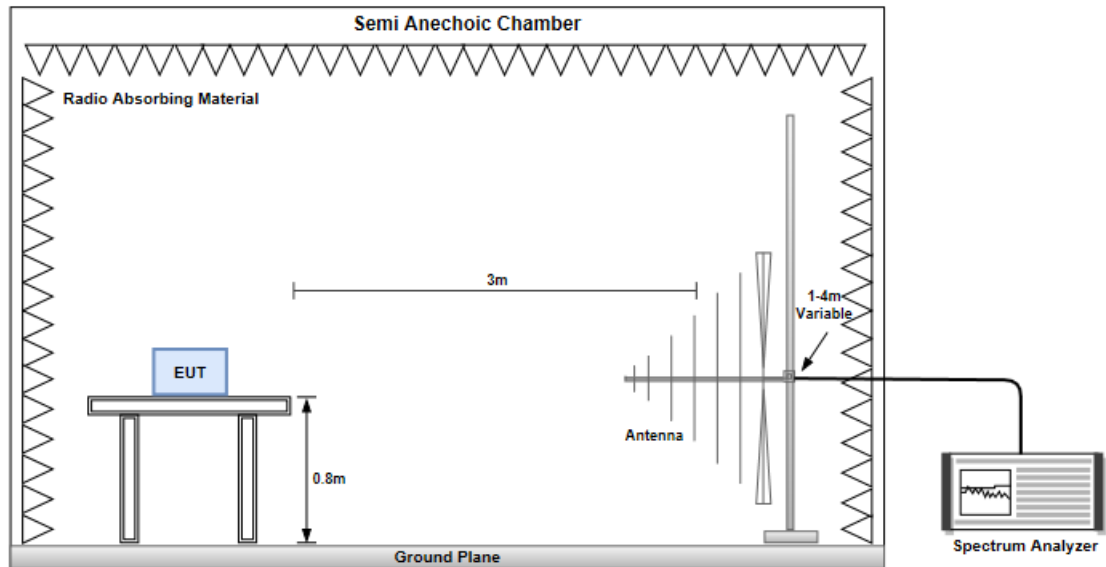
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission 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:

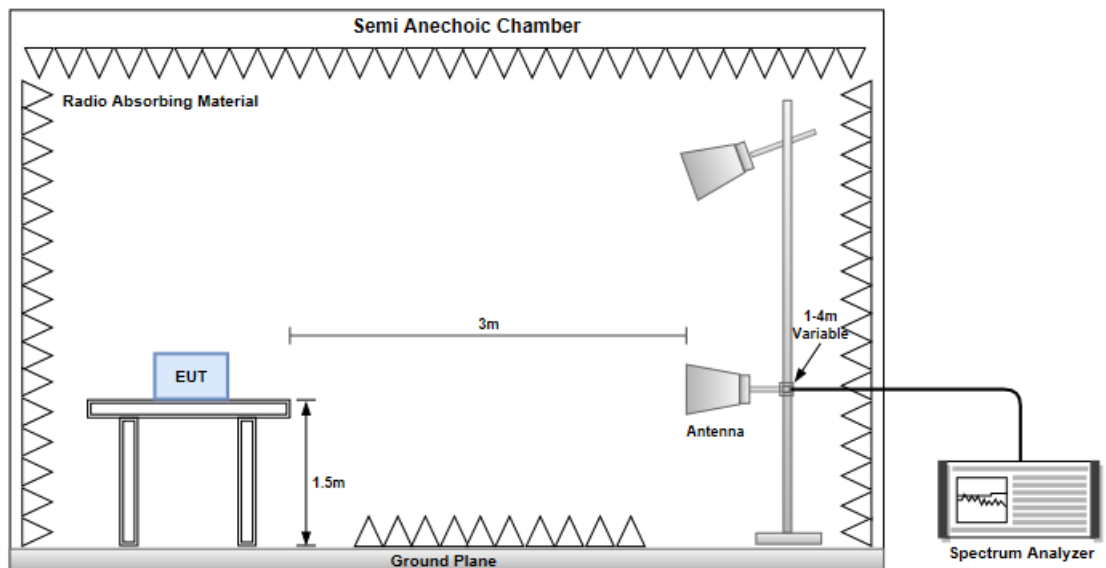
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above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

3.5.3 Test Setup

Radiated Emissions below 1 GHz

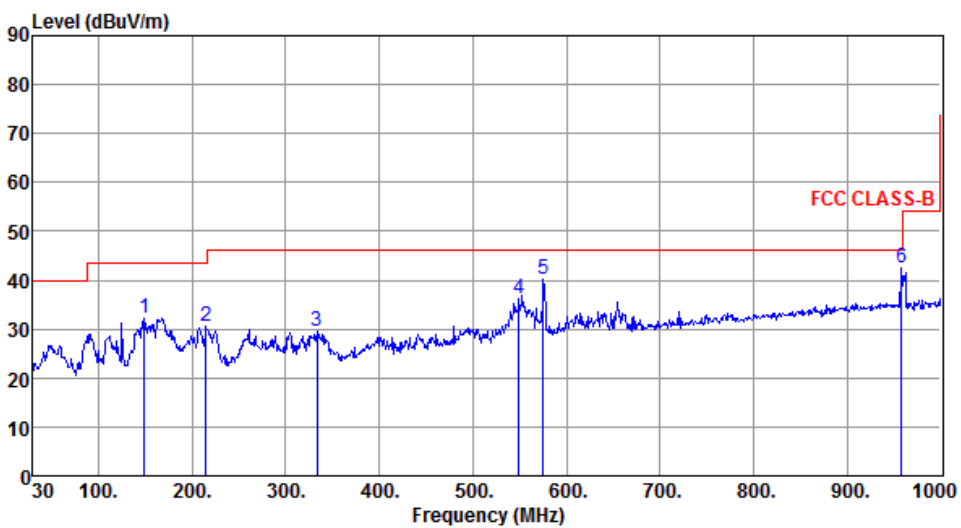


Radiated Emissions above 1 GHz



3.5.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

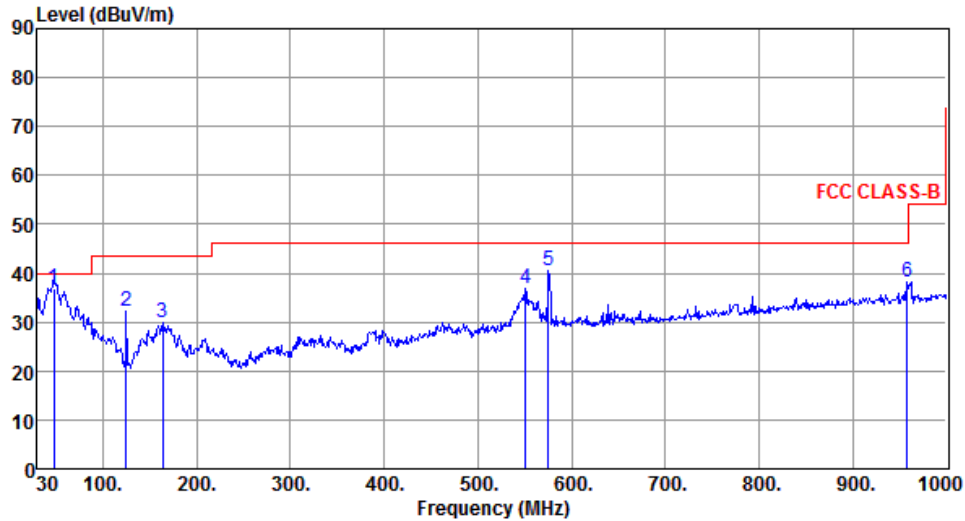
Modulation	11b	Test Freq. (MHz)	2437
Polarization	Horizontal		



	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	149.31	32.36	43.50	-11.14	40.68	-8.32	Peak	---	---
2	215.27	30.48	43.50	-13.02	41.26	-10.78	Peak	---	---
3	333.61	29.54	46.00	-16.46	36.35	-6.81	Peak	---	---
4	548.95	36.21	46.00	-9.79	37.96	-1.75	Peak	---	---
5	575.14	40.08	46.00	-5.92	41.28	-1.20	Peak	---	---
6	958.29	42.48	46.00	-3.52	37.49	4.99	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	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	47.46	36.89	40.00	-3.11	44.61	-7.72	QP	100	205
2	125.06	32.16	43.50	-11.34	42.23	-10.07	Peak	---	---
3	163.86	29.93	43.50	-13.57	38.26	-8.33	Peak	---	---
4	550.89	36.98	46.00	-9.02	38.69	-1.71	Peak	---	---
5	575.14	40.45	46.00	-5.55	41.65	-1.20	Peak	---	---
6	958.29	38.11	46.00	-7.89	33.12	4.99	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					

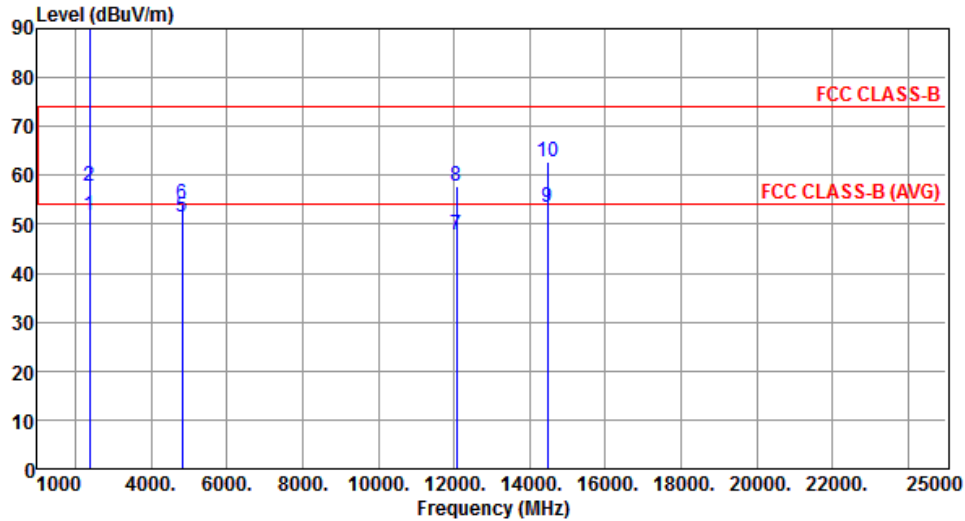
Level (dBUV/m)

Frequency (MHz)

	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2390.00	52.49	54.00	-1.51	56.09	-3.60	Average	100	348
2	2390.00	59.01	74.00	-14.99	62.61	-3.60	Peak	100	348
3 *	2412.00	113.30			116.81	-3.51	Average	100	348
4 *	2412.00	116.23			119.74	-3.51	Peak	100	348
5	4824.00	45.26	54.00	-8.74	41.66	3.60	Average	108	125
6	4824.00	50.13	74.00	-23.87	46.53	3.60	Peak	108	125
7	12060.00	44.15	54.00	-9.85	31.01	13.14	Average	100	333
8	12060.00	55.95	74.00	-18.05	42.81	13.14	Peak	100	333
9	14472.00	48.62	54.00	-5.38	31.01	17.61	Average	100	130
10	14472.00	60.77	74.00	-13.23	43.16	17.61	Peak	100	130

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: "*" is Peak / Average value of fundamental frequency

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	51.91	54.00	-2.09	55.51	-3.60	Average	301	0
2	2390.00	57.90	74.00	-16.10	61.50	-3.60	Peak	301	0
3 *	2412.00	112.50			116.01	-3.51	Average	301	0
4 *	2412.00	115.27			118.78	-3.51	Peak	301	0
5	4824.00	51.41	54.00	-2.59	47.81	3.60	Average	278	256
6	4824.00	54.02	74.00	-19.98	50.42	3.60	Peak	278	256
7	12060.00	47.85	54.00	-6.15	34.71	13.14	Average	100	43
8	12060.00	57.89	74.00	-16.11	44.75	13.14	Peak	100	43
9	14472.00	53.60	54.00	-0.40	35.99	17.61	Average	100	225
10	14472.00	62.72	74.00	-11.28	45.11	17.61	Peak	100	225

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

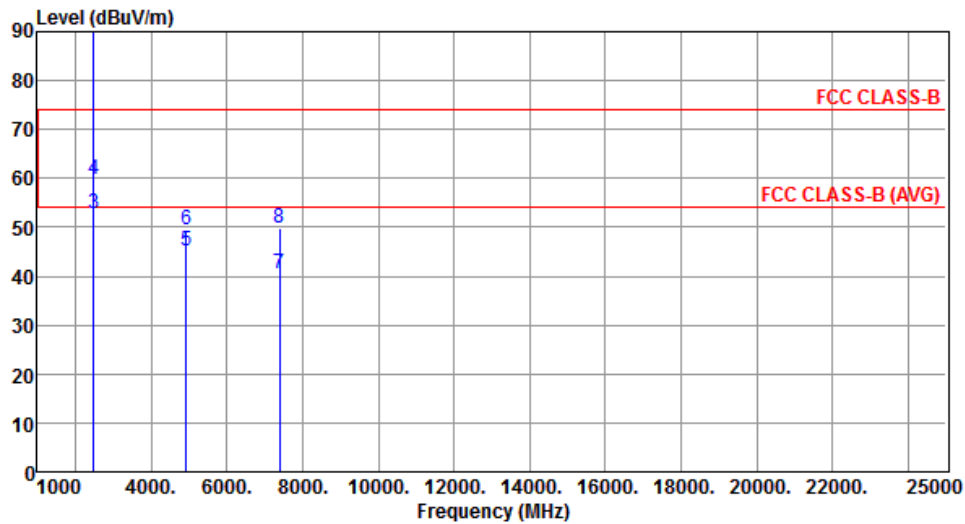
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: "*" is Peak / Average value of fundamental frequency

Modulation	11b	Test Freq. (MHz)	2437
Polarization	Horizontal		
Level (dBUV/m)			

Modulation	11b	Test Freq. (MHz)	2437
Polarization	Vertical		
Level (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	*	2462.00	114.16			117.44	-3.28	Average	100	15
2	*	2462.00	116.85			120.13	-3.28	Peak	100	15
3		2483.50	52.83	54.00	-1.17	56.02	-3.19	Average	100	330
4		2483.50	59.94	74.00	-14.06	63.13	-3.19	Peak	100	330
5		4924.00	45.26	54.00	-8.74	41.34	3.92	Average	116	124
6		4924.00	49.50	74.00	-24.50	45.58	3.92	Peak	116	124
7		7386.00	40.58	54.00	-13.42	32.35	8.23	Average	100	45
8		7386.00	49.86	74.00	-24.14	41.63	8.23	Peak	100	45

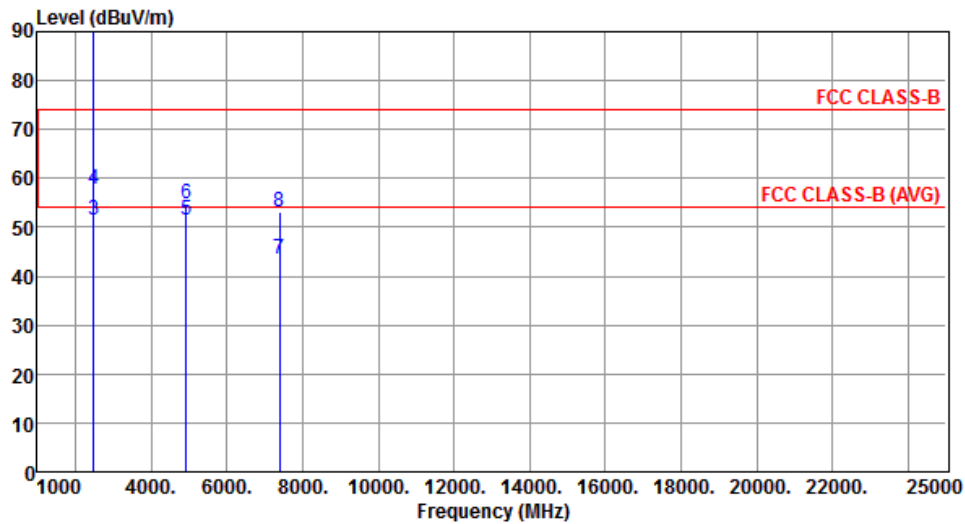
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: "*" is Peak / Average value of fundamental frequency

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	*	2462.00	113.03			116.31	-3.28	Average	288	0
2	*	2462.00	115.75			119.03	-3.28	Peak	288	0
3		2483.50	51.39	54.00	-2.61	54.58	-3.19	Average	288	0
4		2483.50	57.83	74.00	-16.17	61.02	-3.19	Peak	288	0
5		4924.00	51.36	54.00	-2.64	47.44	3.92	Average	284	275
6		4924.00	54.67	74.00	-19.33	50.75	3.92	Peak	284	275
7		7386.00	43.40	54.00	-10.60	35.17	8.23	Average	100	262
8		7386.00	52.99	74.00	-21.01	44.76	8.23	Peak	100	262

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: "*" is Peak / Average value of fundamental frequency

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

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

	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn
	MHz	level			reading			High	Table
		dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2390.00	53.75	54.00	-0.25	57.35	-3.60	Average	256	5
2	2390.00	72.15	74.00	-1.85	75.75	-3.60	Peak	256	5
3 *	2412.00	105.30			108.81	-3.51	Average	256	5
4 *	2412.00	115.95			119.46	-3.51	Peak	256	5
5	4824.00	34.10	54.00	-19.90	30.50	3.60	Average	100	125
6	4824.00	45.10	74.00	-28.90	41.50	3.60	Peak	100	125
7	14472.00	47.71	54.00	-6.29	30.10	17.61	Average	100	139
8	14472.00	58.58	74.00	-15.42	40.97	17.61	Peak	100	139

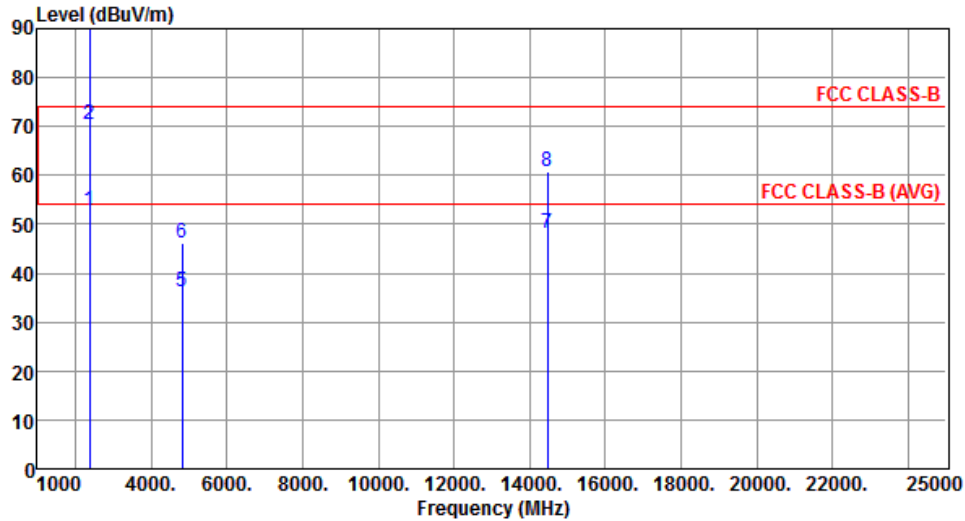
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: "*" is Peak / Average value of fundamental frequency

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	52.80	54.00	-1.20	56.40	-3.60	Average	309	2
2	2390.00	70.47	74.00	-3.53	74.07	-3.60	Peak	309	2
3 *	2412.00	104.10			107.61	-3.51	Average	309	2
4 *	2412.00	115.64			119.15	-3.51	Peak	309	2
5	4824.00	36.29	54.00	-17.71	32.69	3.60	Average	268	277
6	4824.00	46.07	74.00	-27.93	42.47	3.60	Peak	268	277
7	14472.00	48.24	54.00	-5.76	30.63	17.61	Average	100	224
8	14472.00	60.70	74.00	-13.30	43.09	17.61	Peak	100	224

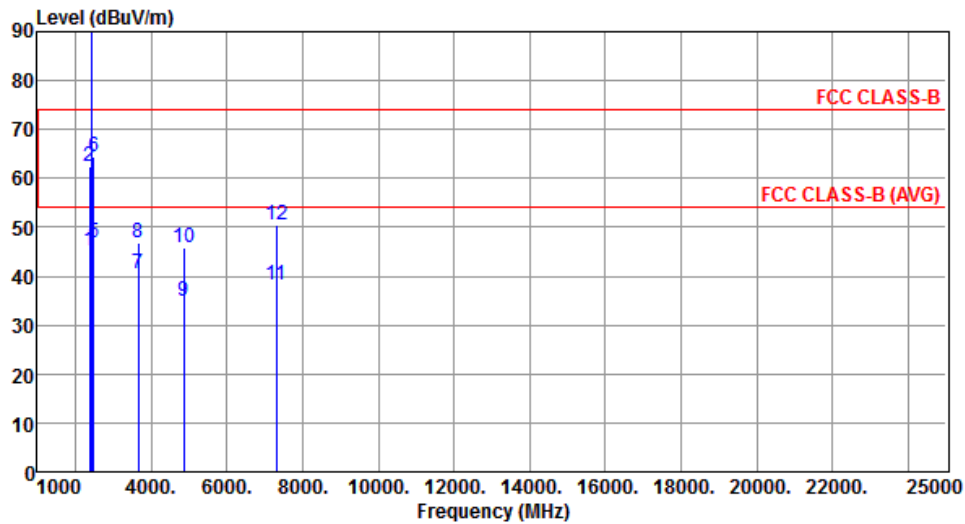
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: "*" is Peak / Average value of fundamental frequency

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	45.03	54.00	-8.97	48.63	-3.60	Average	195	6
2	2390.00	62.50	74.00	-11.50	66.10	-3.60	Peak	195	6
3 *	2437.00	109.11			112.51	-3.40	Average	195	6
4 *	2437.00	120.00			123.40	-3.40	Peak	195	6
5	2483.50	46.96	54.00	-7.04	50.15	-3.19	Average	195	6
6	2483.50	64.44	74.00	-9.56	67.63	-3.19	Peak	195	6
7	3655.50	40.67	54.00	-13.33	40.67	0.00	Average	100	293
8	3655.50	46.77	74.00	-27.23	46.77	0.00	Peak	100	293
9	4874.00	34.81	54.00	-19.19	31.06	3.75	Average	119	127
10	4874.00	45.81	74.00	-28.19	42.06	3.75	Peak	119	127
11	7311.00	38.19	54.00	-15.81	30.06	8.13	Average	100	48
12	7311.00	50.35	74.00	-23.65	42.22	8.13	Peak	100	48

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

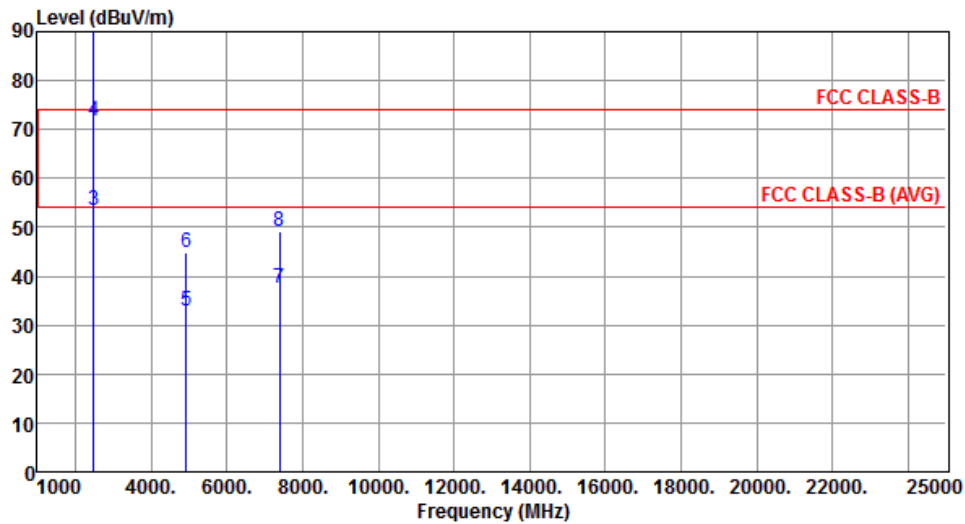
*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: "*" is Peak / Average value of fundamental frequency

Modulation	11g	Test Freq. (MHz)	2437
Polarization	Vertical		
Level (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	*	2462.00	104.10			107.38	-3.28	Average	275	353
2	*	2462.00	114.68			117.96	-3.28	Peak	275	353
3		2483.50	53.56	54.00	-0.44	56.75	-3.19	Average	275	353
4		2483.50	71.73	74.00	-2.27	74.92	-3.19	Peak	275	353
5		4924.00	32.74	54.00	-21.26	28.82	3.92	Average	106	123
6		4924.00	44.74	74.00	-29.26	40.82	3.92	Peak	106	123
7		7386.00	37.68	54.00	-16.32	29.45	8.23	Average	100	56
8		7386.00	49.12	74.00	-24.88	40.89	8.23	Peak	100	56

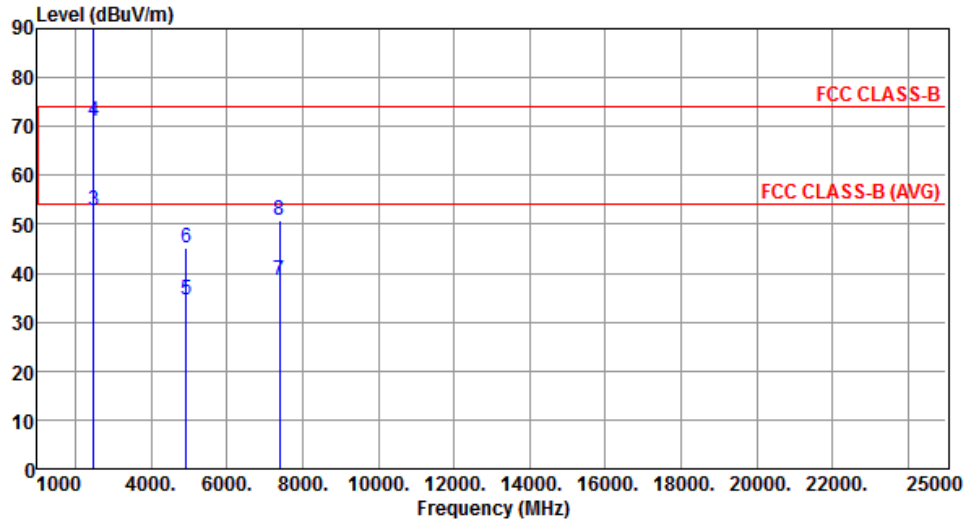
Note 1: Emission Level (dBUV/m) = SA Reading (dBUV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBUV/m) – Limit (dBUV/m).

Note 3: "*" is Peak / Average value of fundamental frequency

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	*	2462.00	103.34			106.62	-3.28	Average	317	5
2	*	2462.00	114.22			117.50	-3.28	Peak	317	5
3		2483.50	52.66	54.00	-1.34	55.85	-3.19	Average	317	5
4		2483.50	71.09	74.00	-2.91	74.28	-3.19	Peak	317	5
5		4924.00	34.38	54.00	-19.62	30.46	3.92	Average	262	270
6		4924.00	45.30	74.00	-28.70	41.38	3.92	Peak	262	270
7		7386.00	38.63	54.00	-15.37	30.40	8.23	Average	100	263
8		7386.00	50.66	74.00	-23.34	42.43	8.23	Peak	100	263

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

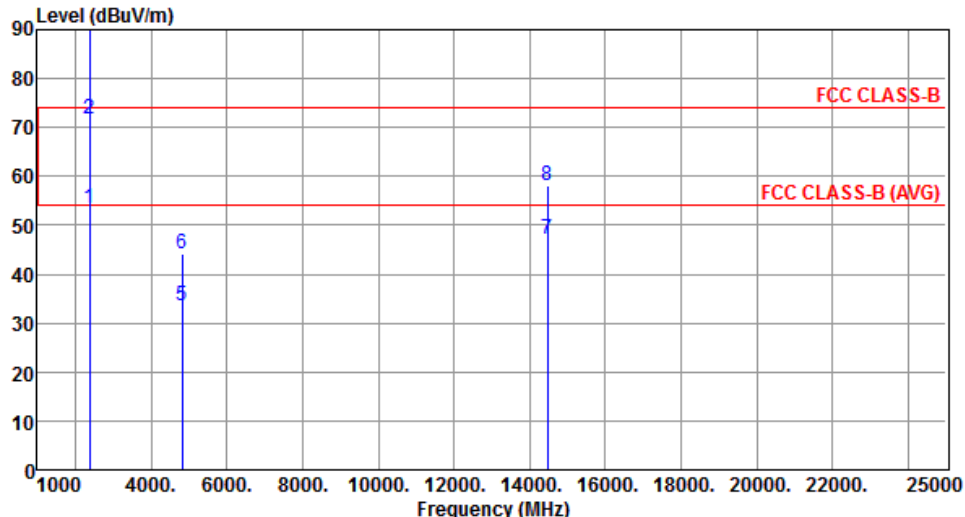
*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: "*" is Peak / Average value of fundamental frequency

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

Modulation	HT20		Test Freq. (MHz)		2412	
Polarization	Horizontal					



	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn
	MHz	level			reading			High	Table
		dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2390.00	53.56	54.00	-0.44	57.16	-3.60	Average	251	2
2	2390.00	71.86	74.00	-2.14	75.46	-3.60	Peak	251	2
3 *	2412.00	104.24			107.75	-3.51	Average	251	2
4 *	2412.00	116.79			120.30	-3.51	Peak	251	2
5	4824.00	33.67	54.00	-20.33	30.07	3.60	Average	100	121
6	4824.00	44.23	74.00	-29.77	40.63	3.60	Peak	100	121
7	14472.00	47.32	54.00	-6.68	29.71	17.61	Average	100	145
8	14472.00	57.98	74.00	-16.02	40.37	17.61	Peak	100	145

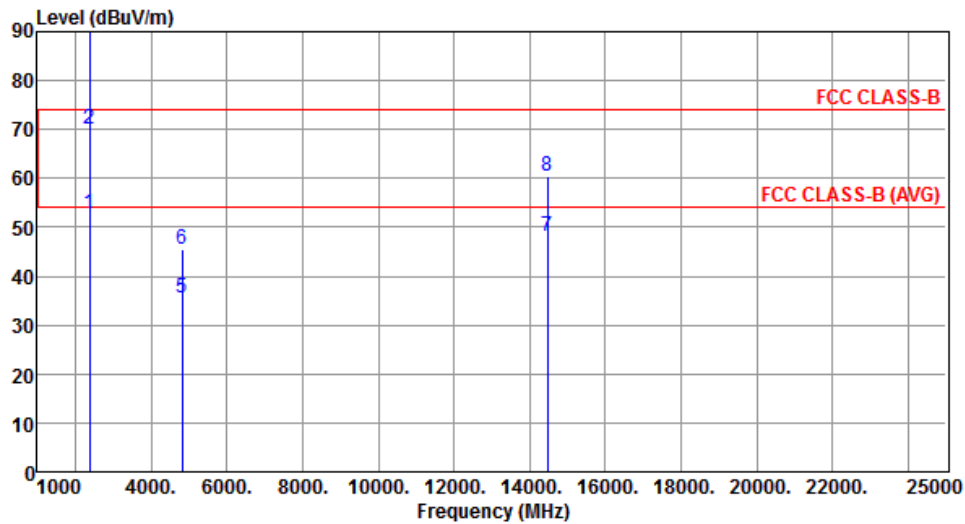
Note 1: Emission Level (dBUV/m) = SA Reading (dBUV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBUV/m) – Limit (dBUV/m).

Note 3:"*" is Peak / Average value of fundamental frequency

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	52.69	54.00	-1.31	56.29	-3.60	Average	305	6
2	2390.00	70.07	74.00	-3.93	73.67	-3.60	Peak	305	6
3 *	2412.00	103.38			106.89	-3.51	Average	305	6
4 *	2412.00	116.42			119.93	-3.51	Peak	305	6
5	4824.00	35.56	54.00	-18.44	31.96	3.60	Average	263	268
6	4824.00	45.42	74.00	-28.58	41.82	3.60	Peak	263	268
7	14472.00	48.03	54.00	-5.97	30.42	17.61	Average	100	236
8	14472.00	60.28	74.00	-13.72	42.67	17.61	Peak	100	236

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

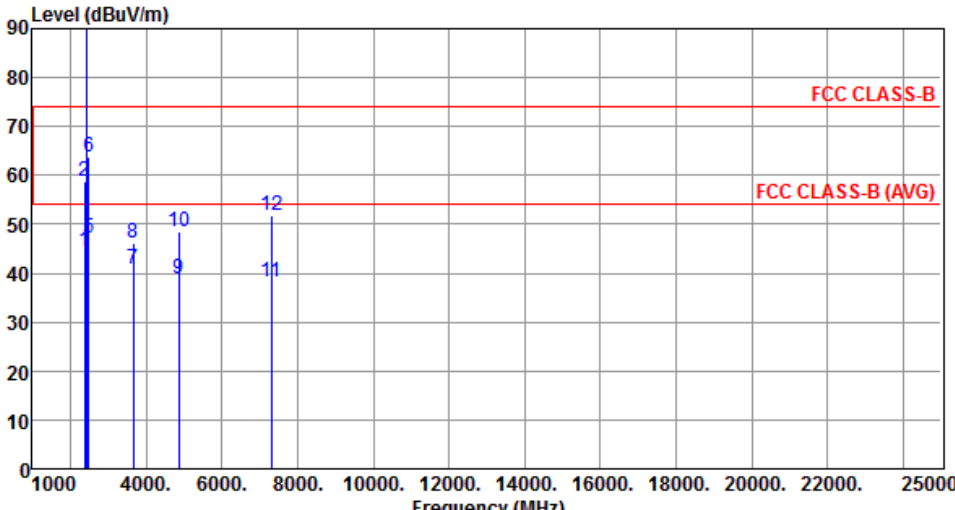
*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: "*" is Peak / Average value of fundamental frequency

Modulation	HT20		Test Freq. (MHz)		2437	
Polarization	Horizontal					
Level (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	44.44	54.00	-9.56	48.04	-3.60	Average	297	5
2	2390.00	58.85	74.00	-15.15	62.45	-3.60	Peak	297	5
3 *	2437.00	106.23	---	---	109.63	-3.40	Average	297	5
4 *	2437.00	120.21	---	---	123.61	-3.40	Peak	297	5
5	2483.50	47.31	54.00	-6.69	50.50	-3.19	Average	297	5
6	2483.50	63.80	74.00	-10.20	66.99	-3.19	Peak	297	5
7	3655.50	40.99	54.00	-13.01	40.99	0.00	Average	100	37
8	3655.50	46.10	74.00	-27.90	46.10	0.00	Peak	100	37
9	4874.00	38.94	54.00	-15.06	35.19	3.75	Average	274	279
10	4874.00	48.48	74.00	-25.52	44.73	3.75	Peak	274	279
11	7311.00	38.26	54.00	-15.74	30.13	8.13	Average	100	262
12	7311.00	51.65	74.00	-22.35	43.52	8.13	Peak	100	262

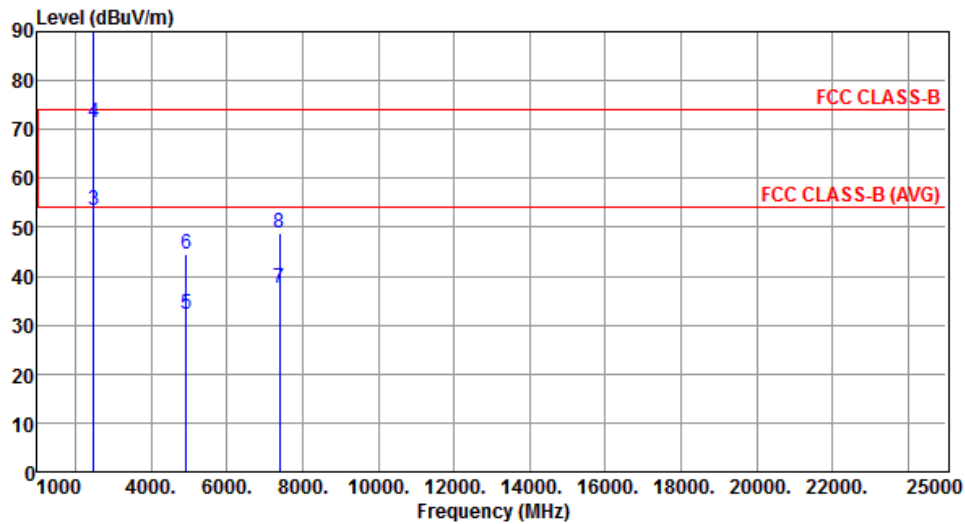
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: "*" is Peak / Average value of fundamental frequency

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	*	2462.00	103.18			106.46	-3.28	Average	269	1
2	*	2462.00	115.30			118.58	-3.28	Peak	269	1
3		2483.50	53.51	54.00	-0.49	56.70	-3.19	Average	269	1
4		2483.50	71.52	74.00	-2.48	74.71	-3.19	Peak	269	1
5		4924.00	32.26	54.00	-21.74	28.34	3.92	Average	100	135
6		4924.00	44.44	74.00	-29.56	40.52	3.92	Peak	100	135
7		7386.00	37.55	54.00	-16.45	29.32	8.23	Average	100	61
8		7386.00	48.67	74.00	-25.33	40.44	8.23	Peak	100	61

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

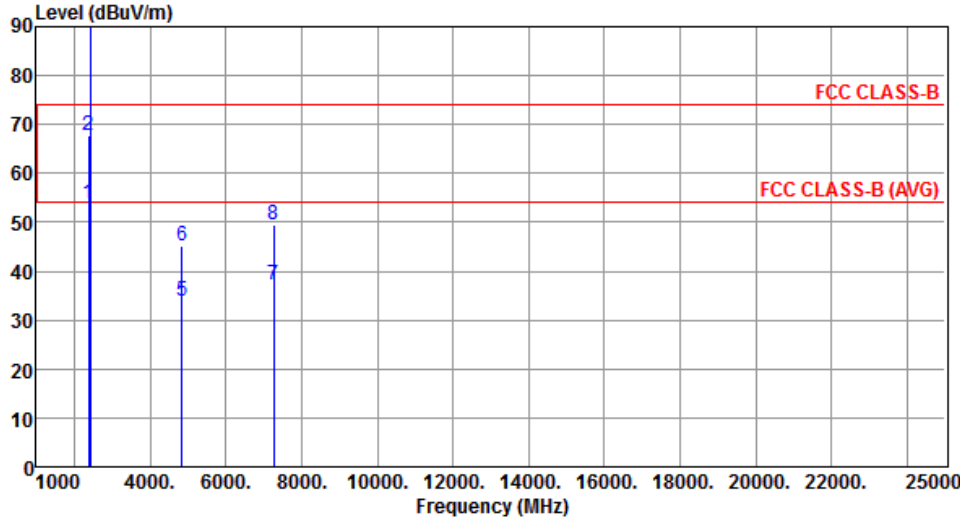
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: "*" is Peak / Average value of fundamental frequency

Modulation		HT20			Test Freq. (MHz)		2462			
Polarization		Vertical								
Level (dBuV/m)										

3.5.8 Transmitter Radiated Unwanted Emissions (Above 1GHz) for HT40

Modulation	HT40	Test Freq. (MHz)	2422
Polarization	Horizontal		

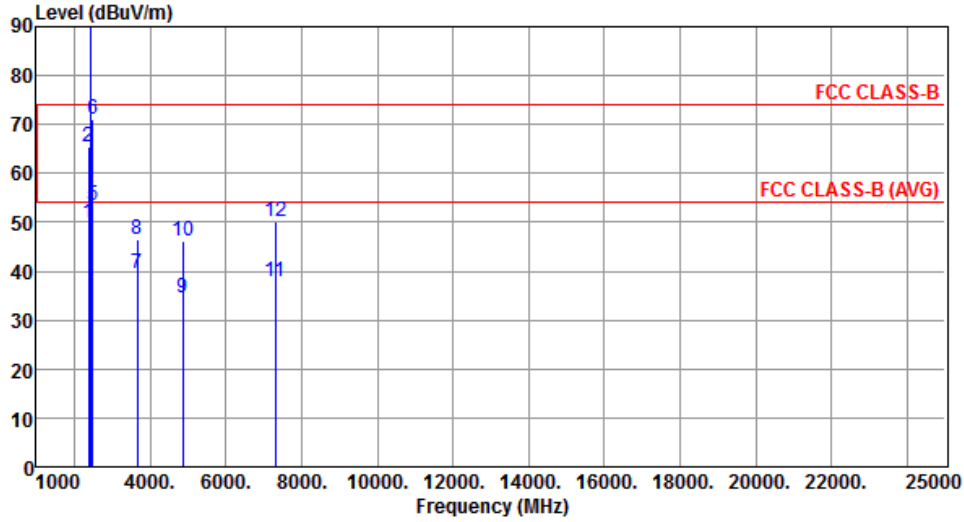


	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	53.86	54.00	-0.14	57.46	-3.60	Average	197	1
2	2390.00	67.91	74.00	-6.09	71.51	-3.60	Peak	197	1
3 *	2422.00	100.66			104.13	-3.47	Average	197	1
4 *	2422.00	110.92			114.39	-3.47	Peak	197	1
5	4844.00	33.73	54.00	-20.27	30.06	3.67	Average	106	122
6	4844.00	45.10	74.00	-28.90	41.43	3.67	Peak	106	122
7	7266.00	37.12	54.00	-16.88	29.06	8.06	Average	100	58
8	7266.00	49.34	74.00	-24.66	41.28	8.06	Peak	100	58

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: "*" is Peak / Average value of fundamental frequency

Modulation	HT40	Test Freq. (MHz)	2422
Polarization	Vertical		
Level (dBuV/m) </			

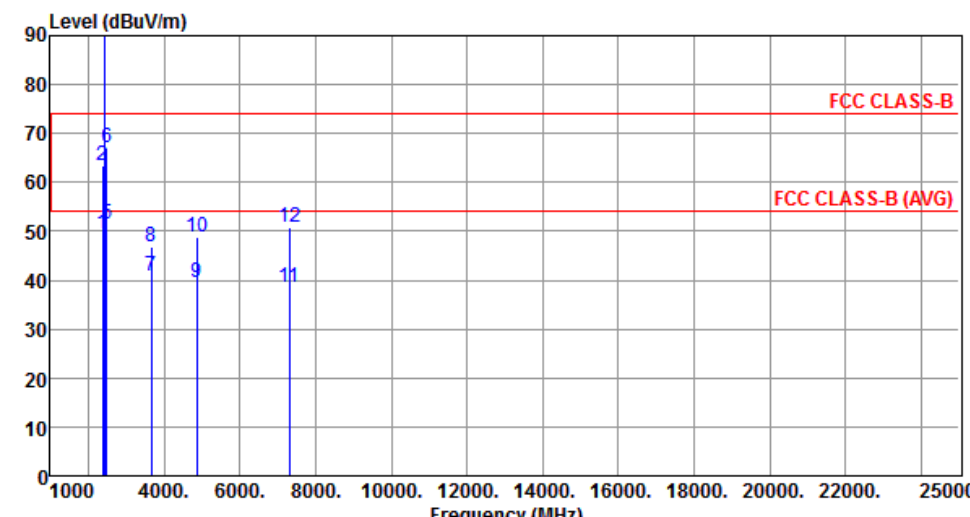
Modulation	HT40	Test Freq. (MHz)	2437
Polarization	Horizontal		



	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	49.80	54.00	-4.20	53.40	-3.60	Average	199	0
2	2390.00	65.36	74.00	-8.64	68.96	-3.60	Peak	199	0
3 *	2437.00	101.36			104.76	-3.40	Average	199	0
4 *	2437.00	113.73			117.13	-3.40	Peak	199	0
5	2483.50	53.51	54.00	-0.49	56.70	-3.19	Average	199	0
6	2483.50	71.21	74.00	-2.79	74.40	-3.19	Peak	199	0
7	3655.50	39.50	54.00	-14.50	39.50	0.00	Average	100	294
8	3655.50	46.63	74.00	-27.37	46.63	0.00	Peak	100	294
9	4874.00	34.56	54.00	-19.44	30.81	3.75	Average	120	125
10	4874.00	46.26	74.00	-27.74	42.51	3.75	Peak	120	125
11	7311.00	37.98	54.00	-16.02	29.85	8.13	Average	100	52
12	7311.00	50.31	74.00	-23.69	42.18	8.13	Peak	100	52

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: "*" is Peak / Average value of fundamental frequency

Modulation	HT40	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	49.45	54.00	-4.55	53.05	-3.60	Average	296	3
2	2390.00	63.43	74.00	-10.57	67.03	-3.60	Peak	296	3
3 *	2437.00	100.37			103.77	-3.40	Average	296	3
4 *	2437.00	112.11			115.51	-3.40	Peak	296	3
5	2483.50	51.49	54.00	-2.51	54.68	-3.19	Average	296	3
6	2483.50	67.17	74.00	-6.83	70.36	-3.19	Peak	296	3
7	3655.50	40.80	54.00	-13.20	40.80	0.00	Average	100	37
8	3655.50	46.74	74.00	-27.26	46.74	0.00	Peak	100	37
9	4874.00	39.41	54.00	-14.59	35.66	3.75	Average	276	285
10	4874.00	48.73	74.00	-25.27	44.98	3.75	Peak	276	285
11	7311.00	38.58	54.00	-15.42	30.45	8.13	Average	100	272
12	7311.00	50.65	74.00	-23.35	42.52	8.13	Peak	100	272

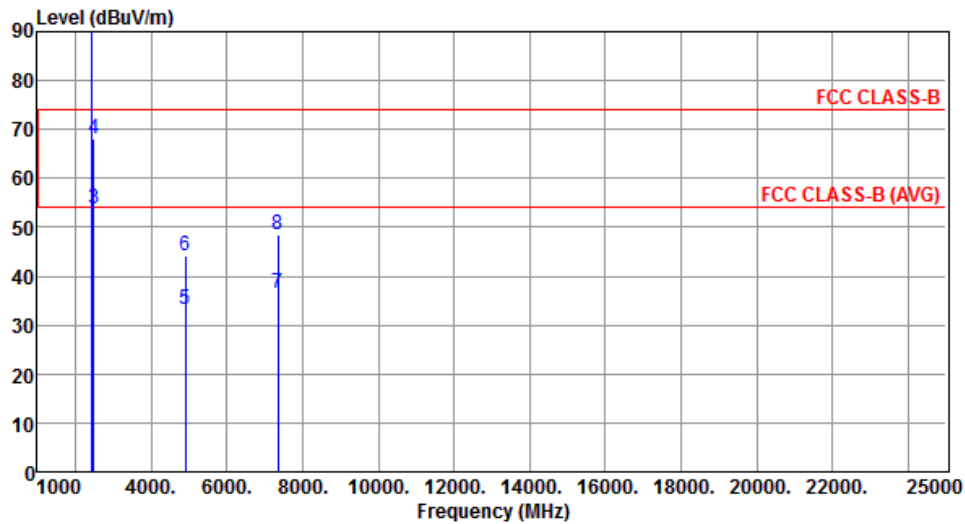
Note 1: Emission Level (dBUV/m) = SA Reading (dBUV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBUV/m) – Limit (dBUV/m).

Note 3: "*" is Peak / Average value of fundamental frequency

Modulation	HT40	Test Freq. (MHz)	2452
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	*	2452.00	98.53			101.86	-3.33	Average	183	2
2	*	2452.00	107.97			111.30	-3.33	Peak	183	2
3		2483.50	53.85	54.00	-0.15	57.04	-3.19	Average	183	2
4		2483.50	68.04	74.00	-5.96	71.23	-3.19	Peak	183	2
5		4904.00	33.11	54.00	-20.89	29.25	3.86	Average	100	116
6		4904.00	44.13	74.00	-29.87	40.27	3.86	Peak	100	116
7		7356.00	36.69	54.00	-17.31	28.49	8.20	Average	100	63
8		7356.00	48.55	74.00	-25.45	40.35	8.20	Peak	100	63

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: "*" is Peak / Average value of fundamental frequency

Modulation		HT40			Test Freq. (MHz)		2452			
Polarization		Vertical								
Level (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 30 dB relative to the maximum in-band peak PSD level in 100 kHz

3.6.2 Test Procedures

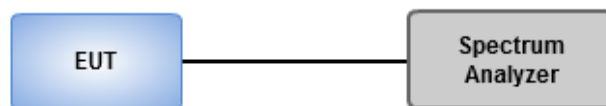
Reference level measurement

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

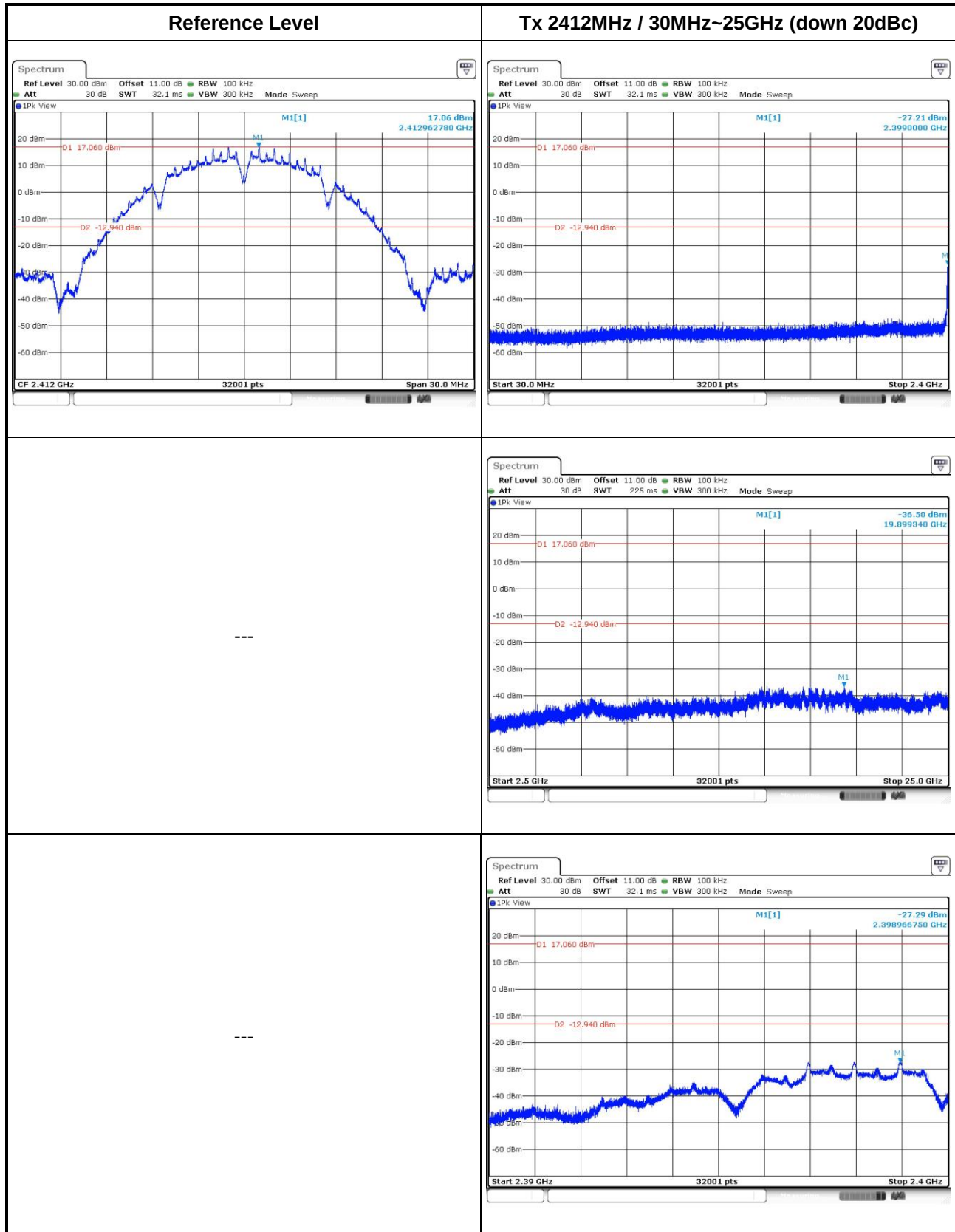


3.6.4 Test Result of Emissions in non-restricted frequency bands

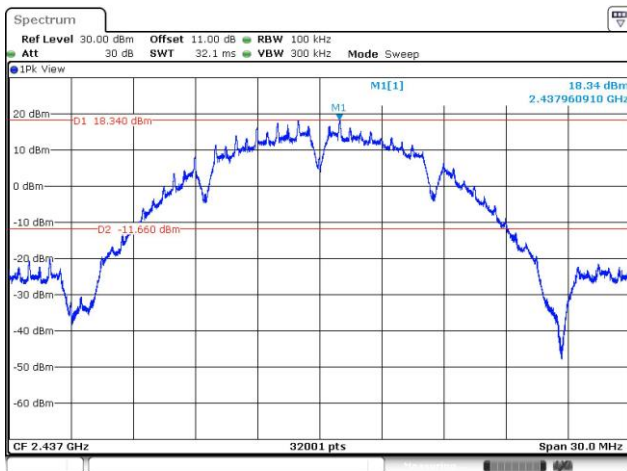
This test item is performed on each TX output individually without summing or adding $10 \log(N_{ANT})$ since measurements are made relative to the in-band emissions on the individual outputs. Only worst test result of each operating mode is presented.

3.6.5 Unwanted Emissions into Non-Restricted Frequency Bands

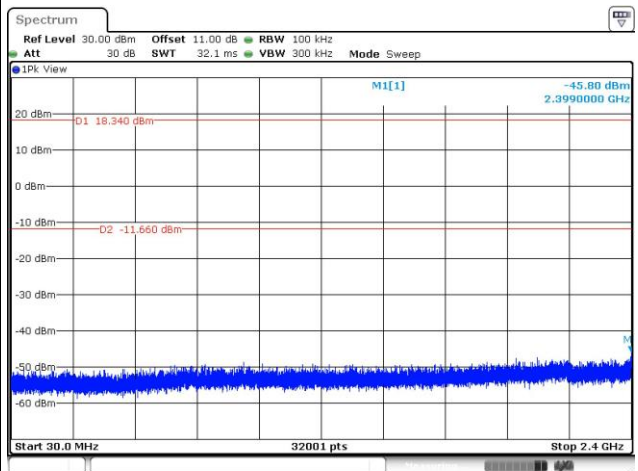
802.11b

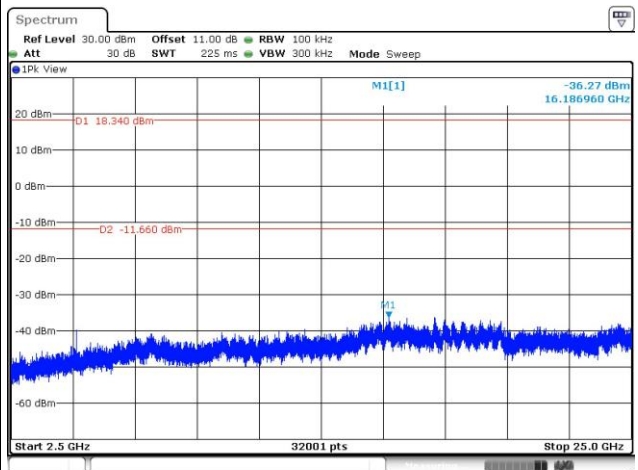


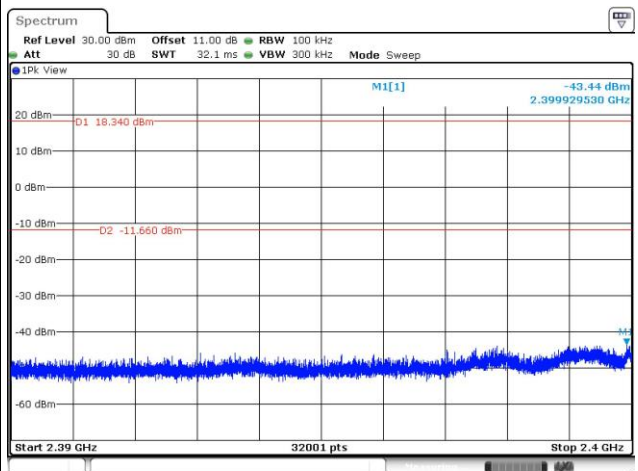
Reference Level



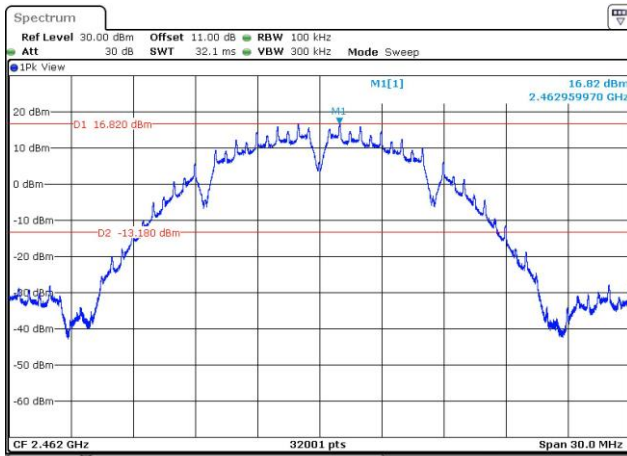
Tx 2437MHz / 30MHz~25GHz (down 20dBc)



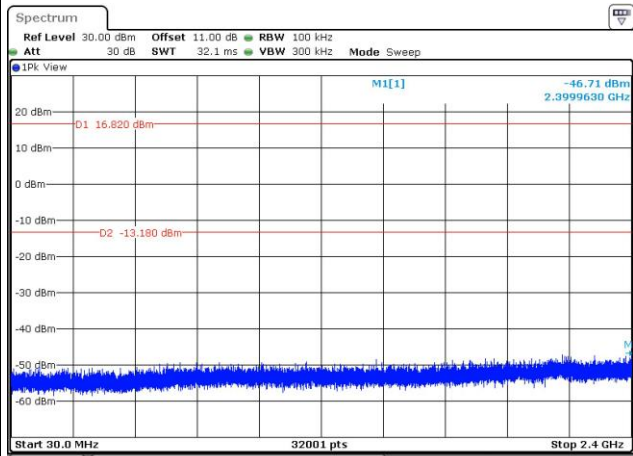


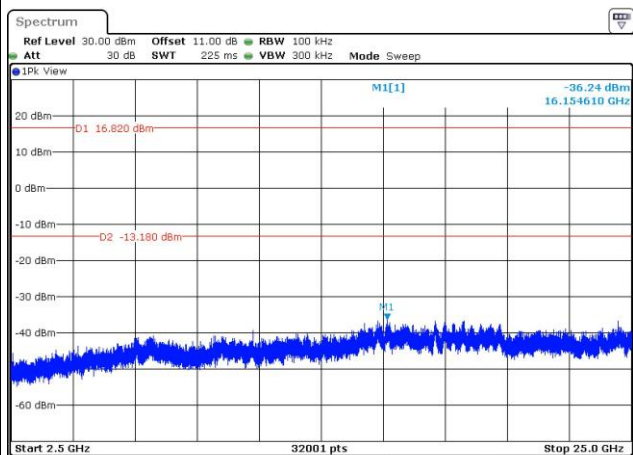


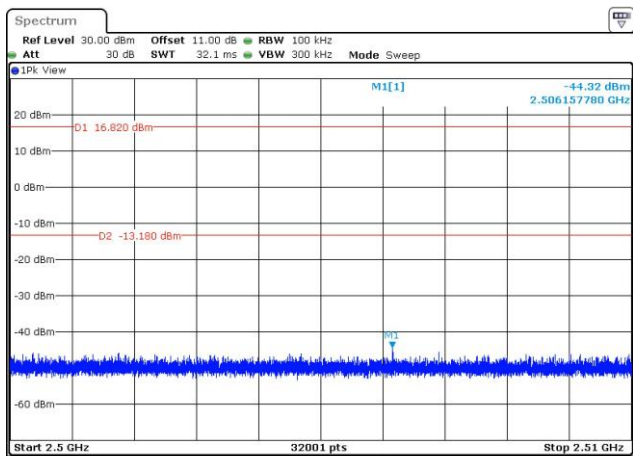
Reference Level



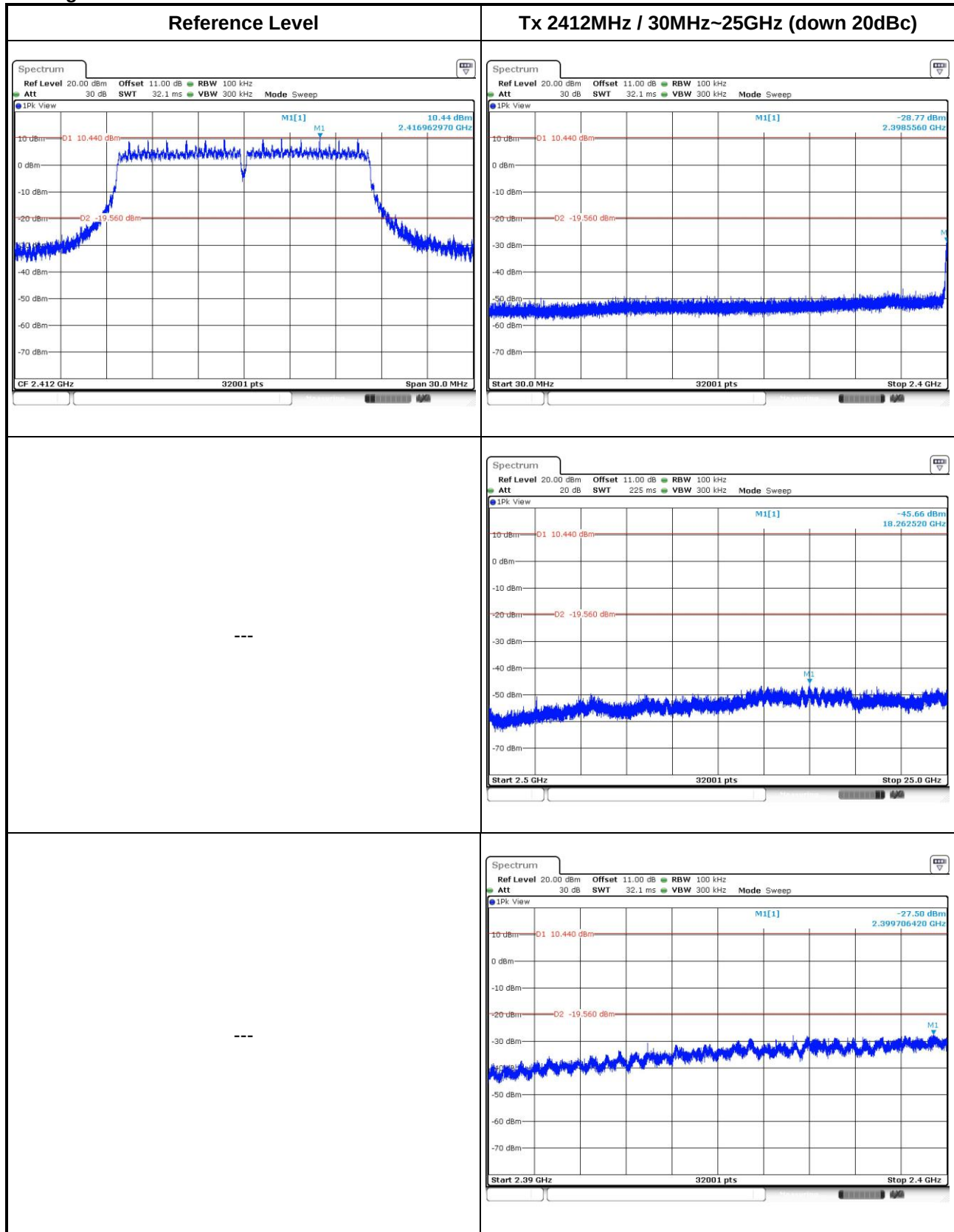
Tx 2462MHz / 30MHz~25GHz (down 20dBc)



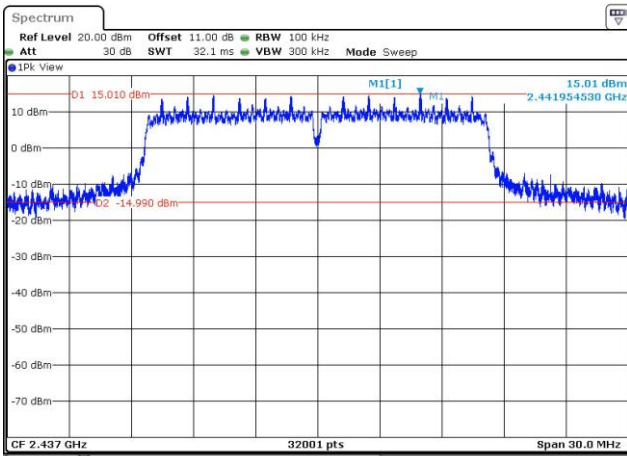




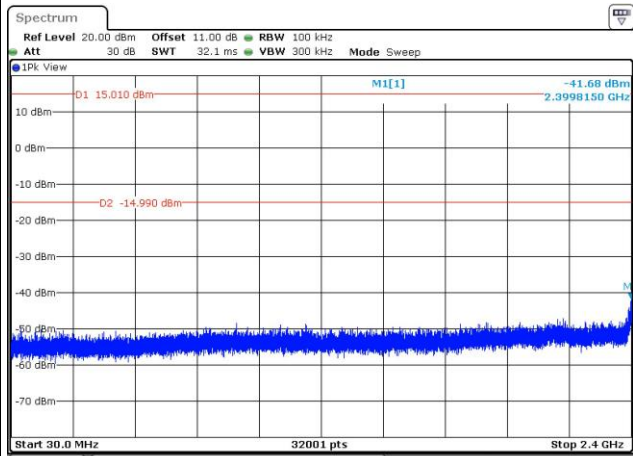
802.11g

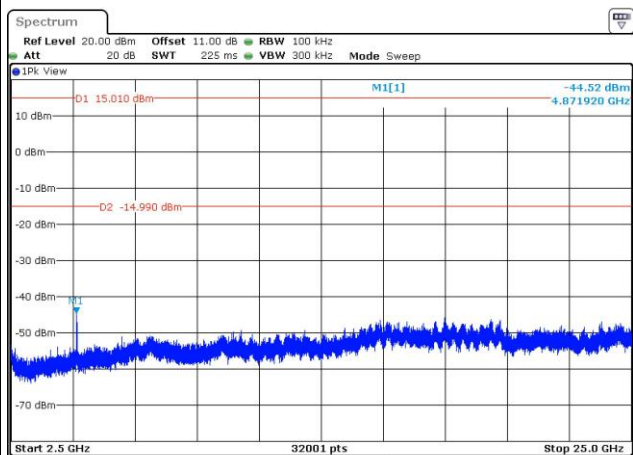


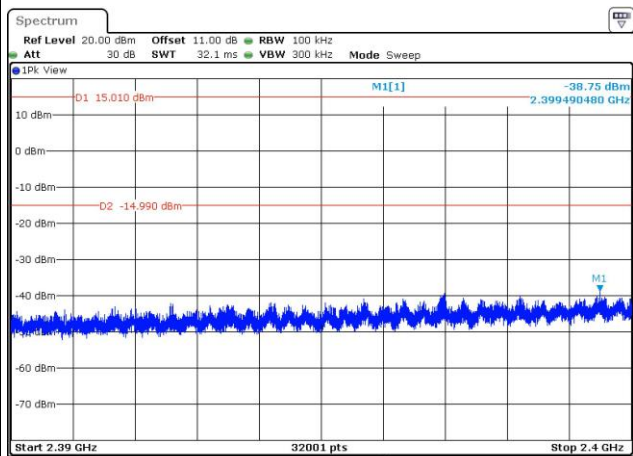
Reference Level



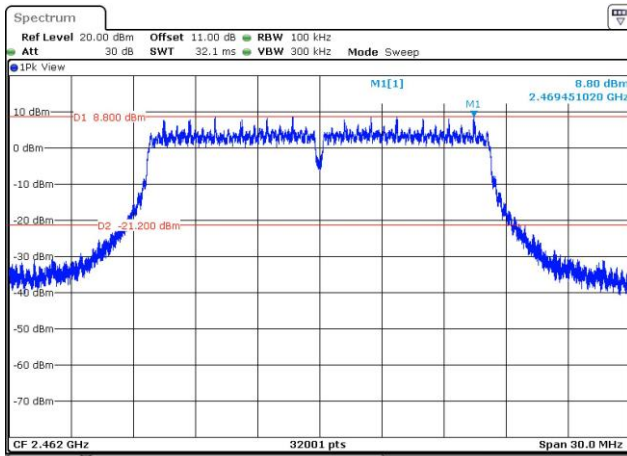
Tx 2437MHz / 30MHz~25GHz (down 20dBc)



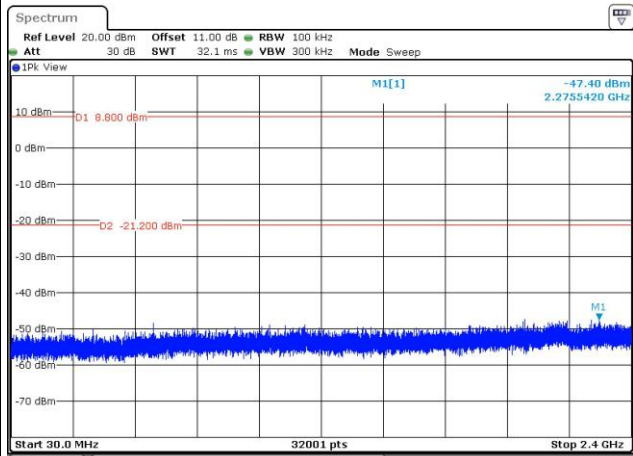


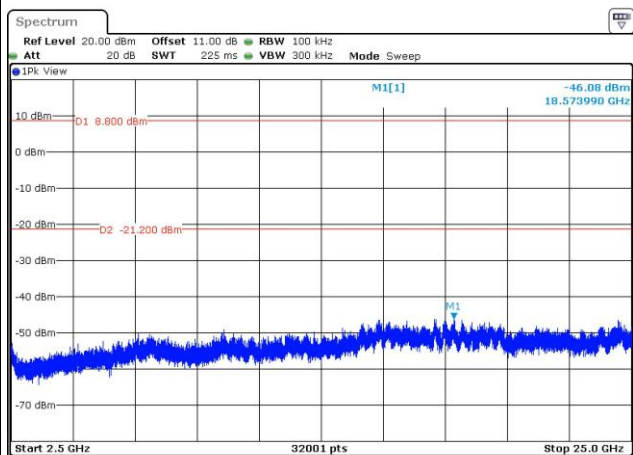


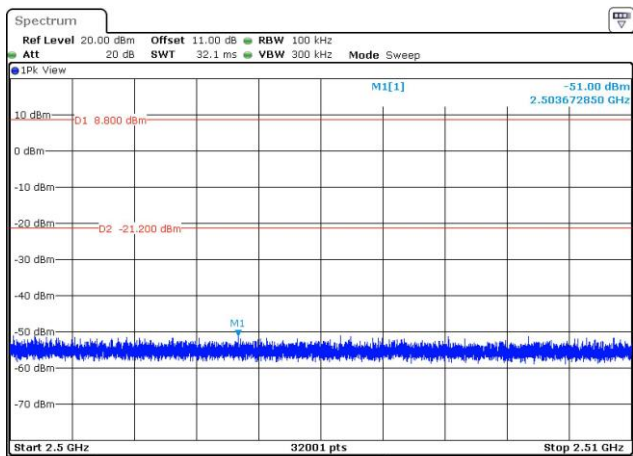
Reference Level



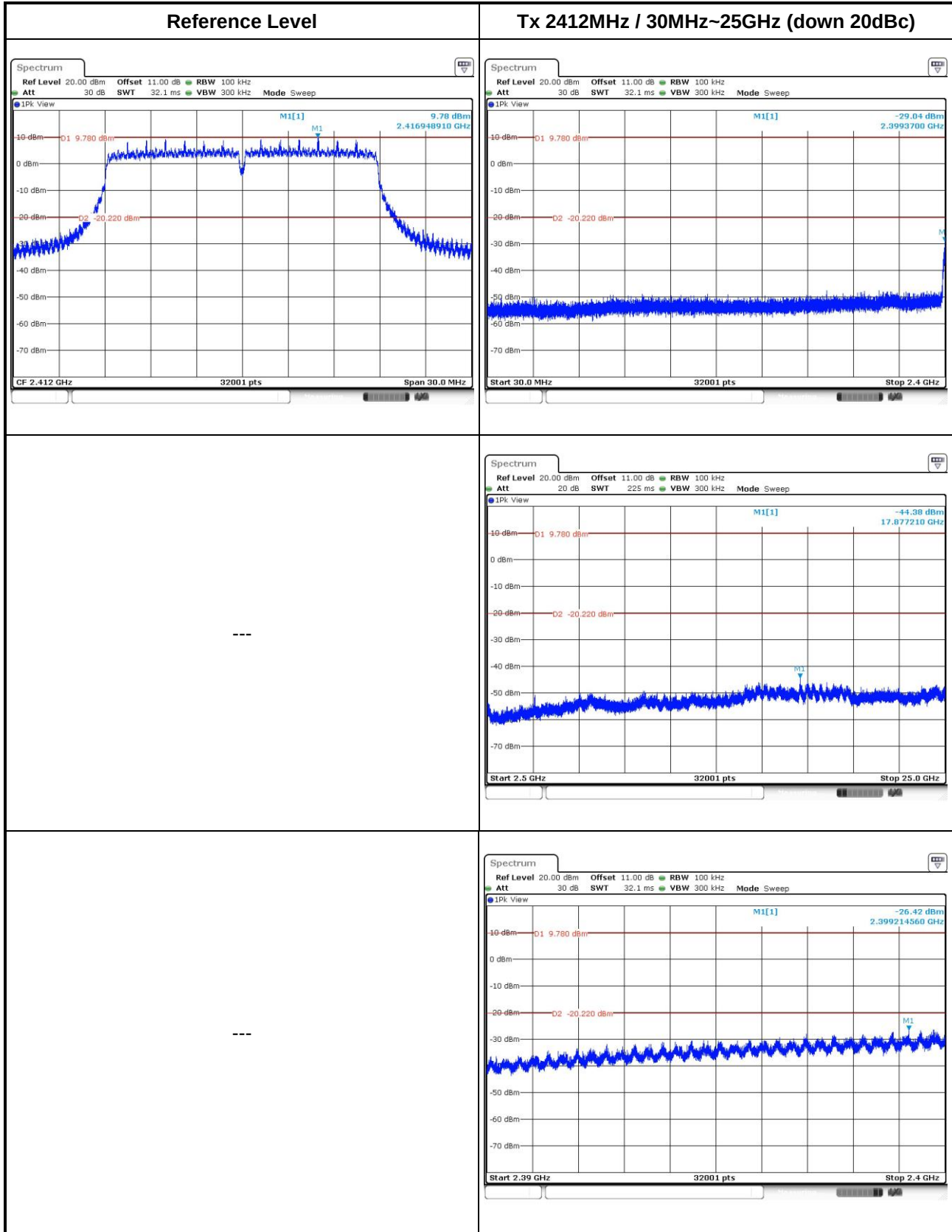
Tx 2462MHz / 30MHz~25GHz (down 20dBc)

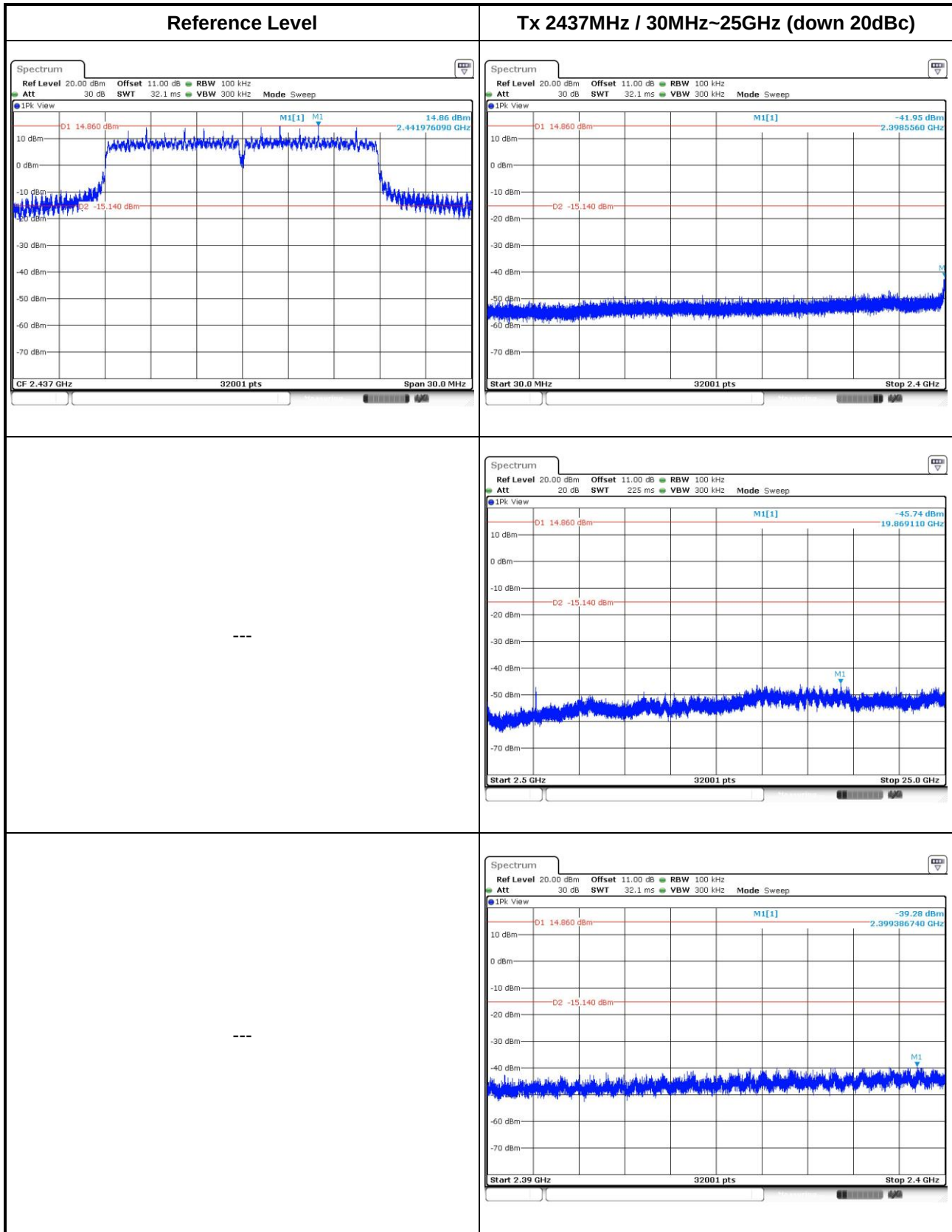




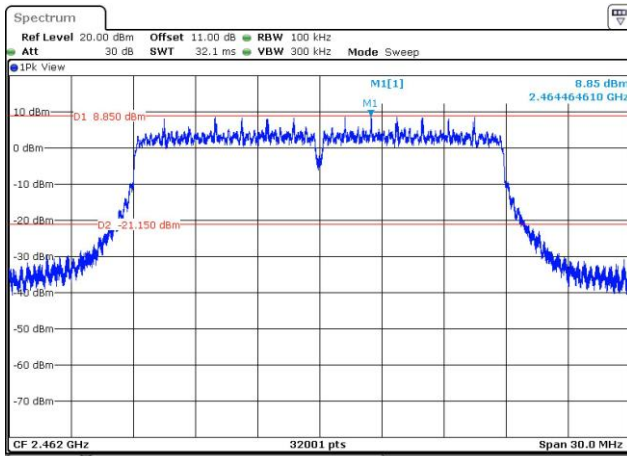


802.11n HT20

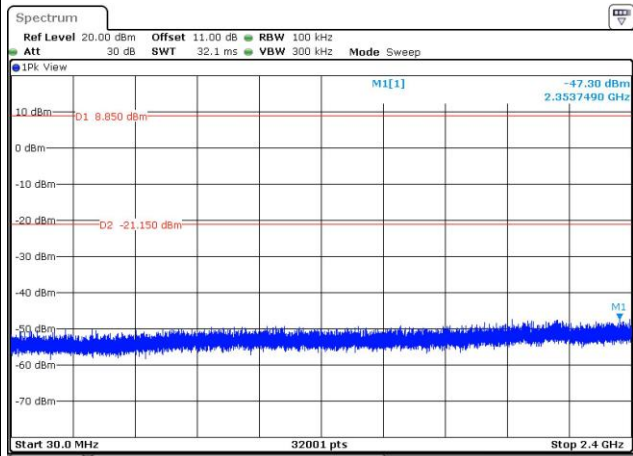


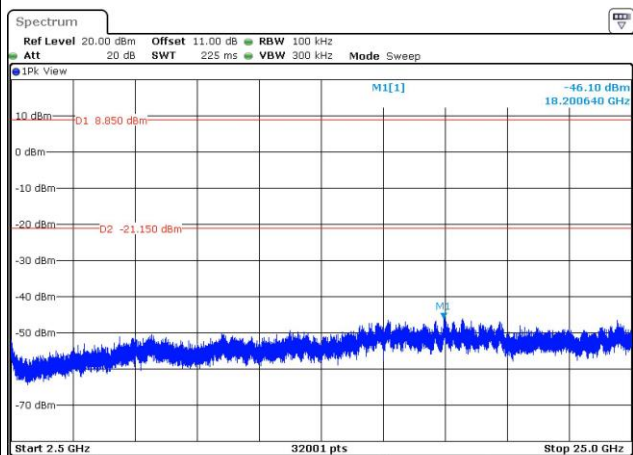


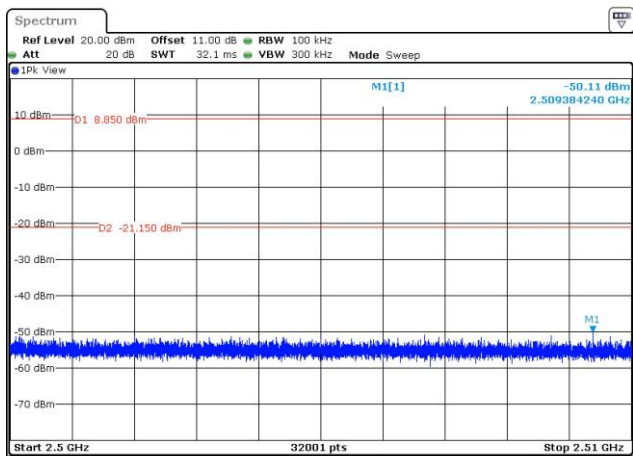
Reference Level



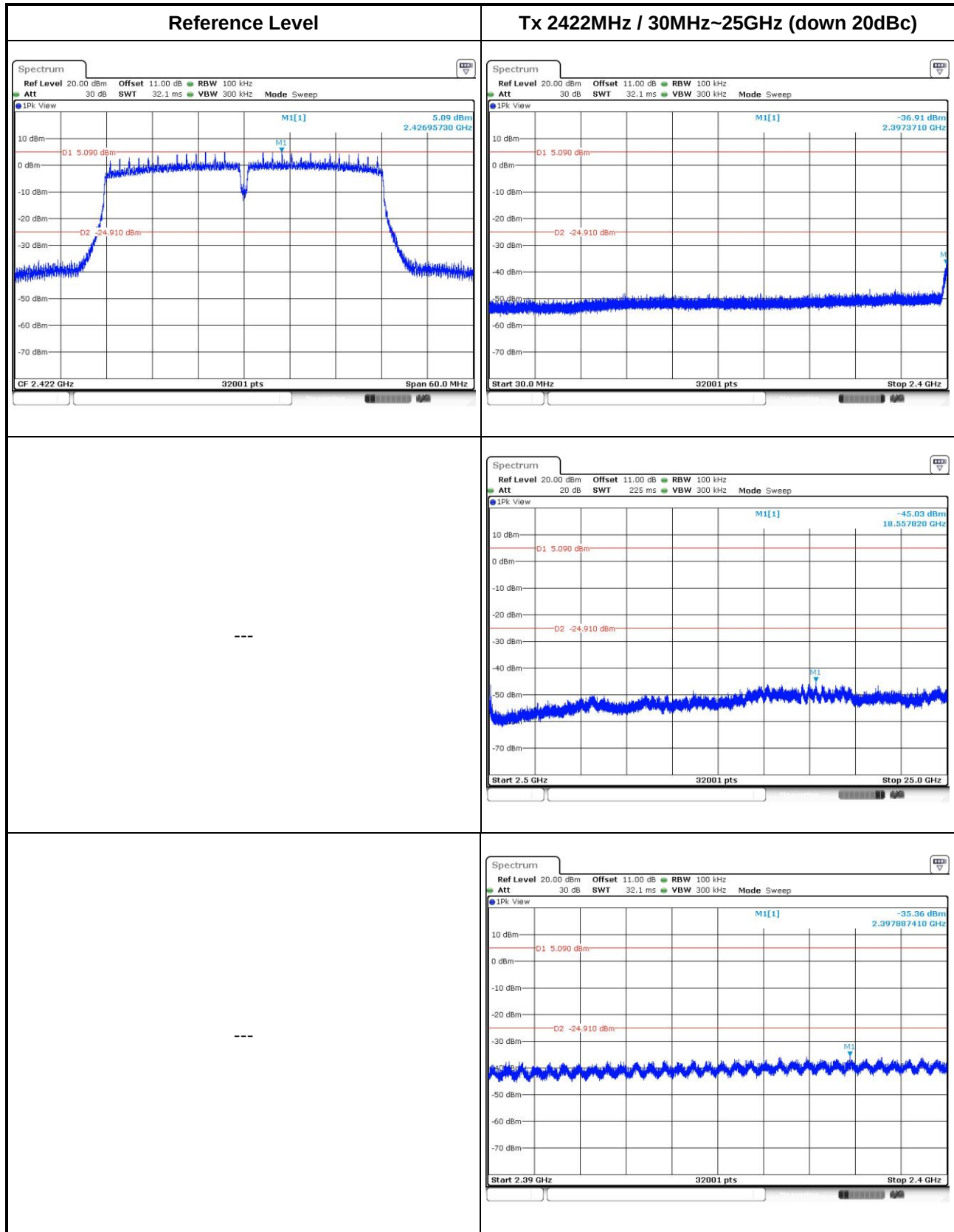
Tx 2462MHz / 30MHz~25GHz (down 20dBc)



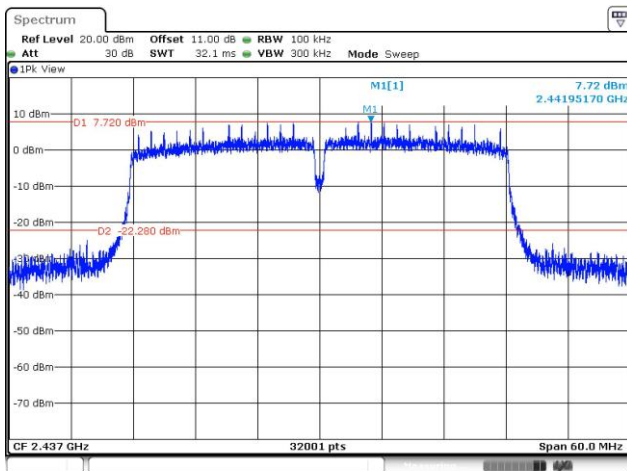




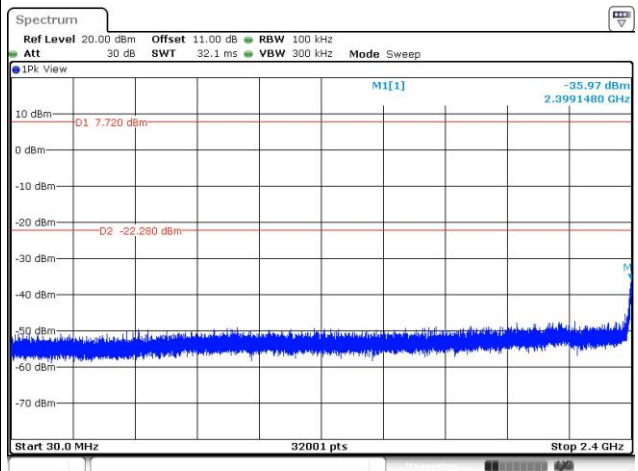
802.11n HT40

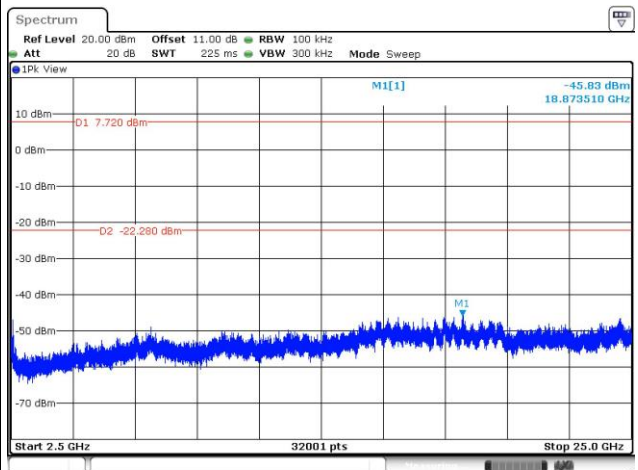


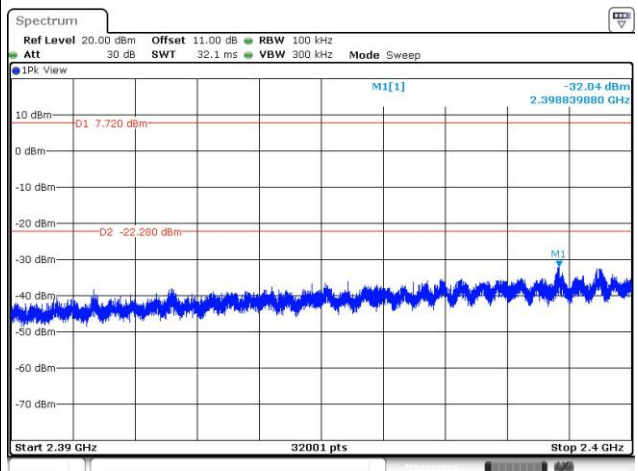
Reference Level

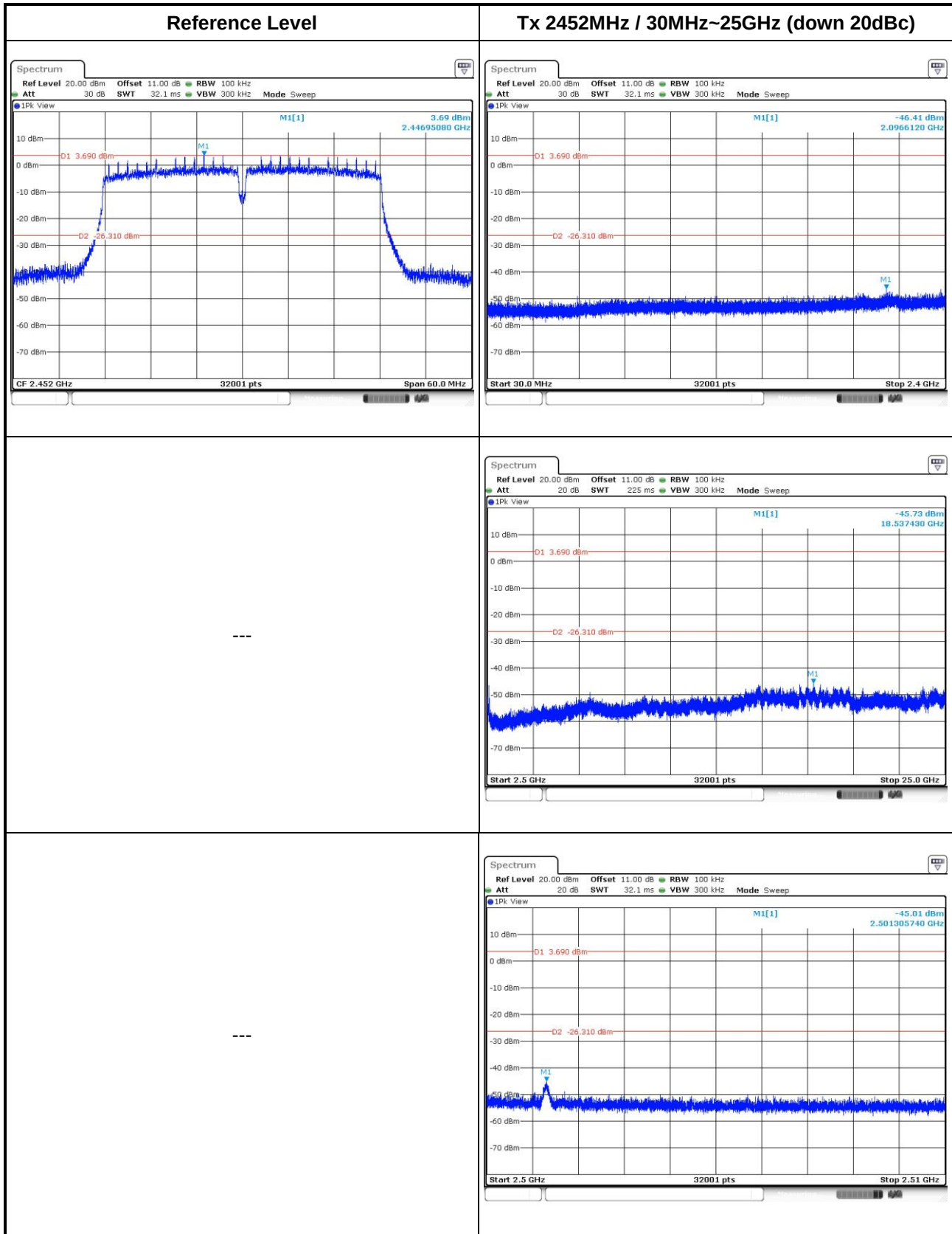


Tx 2437MHz / 30MHz~25GHz (down 20dBc)









4 Receiver Test Results

4.1 Conducted Emissions

4.1.1 Limit of Conducted Emissions

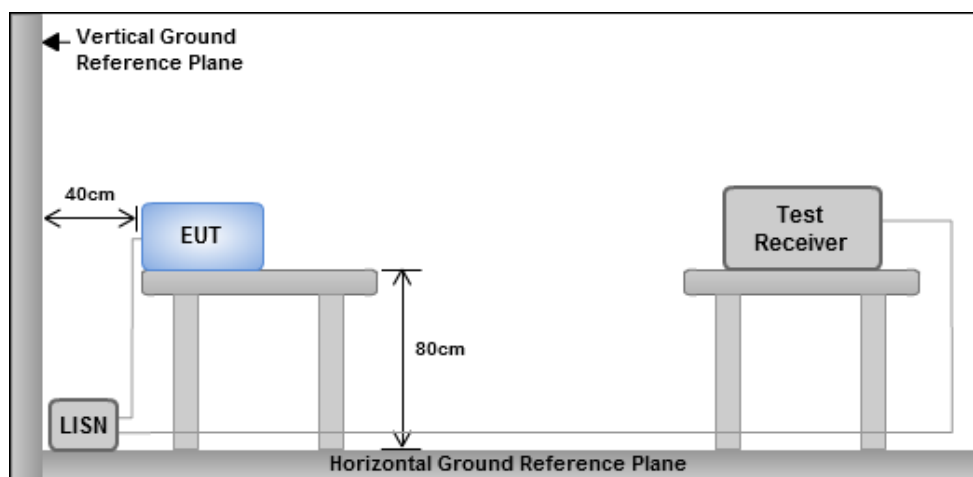
Conducted Emissions Limit		
Frequency Emission (MHz)	Quasi-Peak	Average
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50

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.

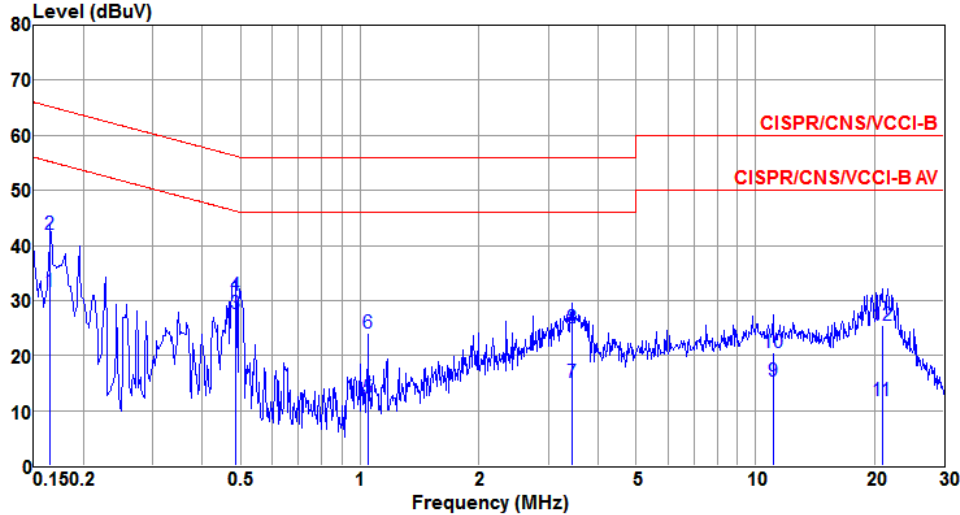
4.1.3 Test Setup



- 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

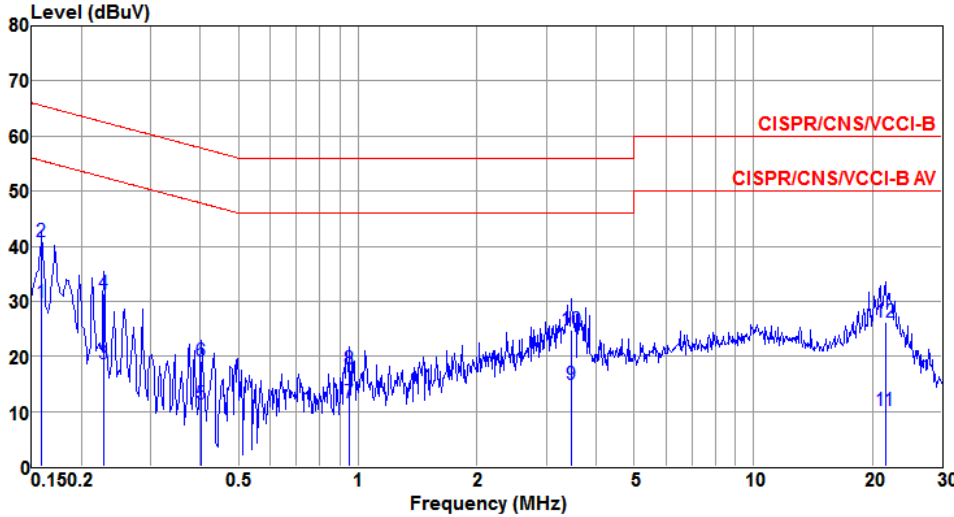
Modulation	11b	Test Freq. (MHz)	2437
Power Phase	Line		



	Freq	Level	Limit	Over	Read	LISN	cable	
	MHz	dBuV	Line	Limit	Level	factor	loss	Remark
			dBuV	dB	dBuV	dB	dB	
1	0.165	31.74	55.21	-23.47	21.99	9.73	0.02	Average
2	0.165	42.02	65.21	-23.19	32.27	9.73	0.02	QP
3@	0.486	27.63	46.23	-18.60	17.88	9.73	0.02	Average
4	0.486	30.85	56.23	-25.38	21.10	9.73	0.02	QP
5	1.049	12.17	46.00	-33.83	2.41	9.73	0.03	Average
6	1.049	24.07	56.00	-31.93	14.31	9.73	0.03	QP
7	3.436	15.02	46.00	-30.98	5.08	9.75	0.19	Average
8	3.436	24.98	56.00	-31.02	15.04	9.75	0.19	QP
9	11.080	15.45	50.00	-34.55	5.36	9.77	0.32	Average
10	11.080	20.55	60.00	-39.45	10.46	9.77	0.32	QP
11	20.924	11.91	50.00	-38.09	1.85	9.71	0.35	Average
12	20.924	25.57	60.00	-34.43	15.51	9.71	0.35	QP

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

Modulation	11b	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	0.159	29.66	55.52	-25.86	19.97	9.68	0.01	Average
2@	0.159	40.81	65.52	-24.71	31.12	9.68	0.01	QP
3	0.228	18.60	52.52	-33.92	8.90	9.67	0.03	Average
4	0.228	31.43	62.52	-31.09	21.73	9.67	0.03	QP
5	0.402	11.30	47.81	-36.51	1.61	9.67	0.02	Average
6	0.402	19.18	57.81	-38.63	9.49	9.67	0.02	QP
7	0.953	11.64	46.00	-34.36	1.94	9.67	0.03	Average
8	0.953	17.62	56.00	-38.38	7.92	9.67	0.03	QP
9	3.472	14.81	46.00	-31.19	4.93	9.69	0.19	Average
10	3.472	24.69	56.00	-31.31	14.81	9.69	0.19	QP
11	21.600	10.12	50.00	-39.88	-0.07	9.83	0.36	Average
12	21.600	26.20	60.00	-33.80	16.01	9.83	0.36	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:
Quasi-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

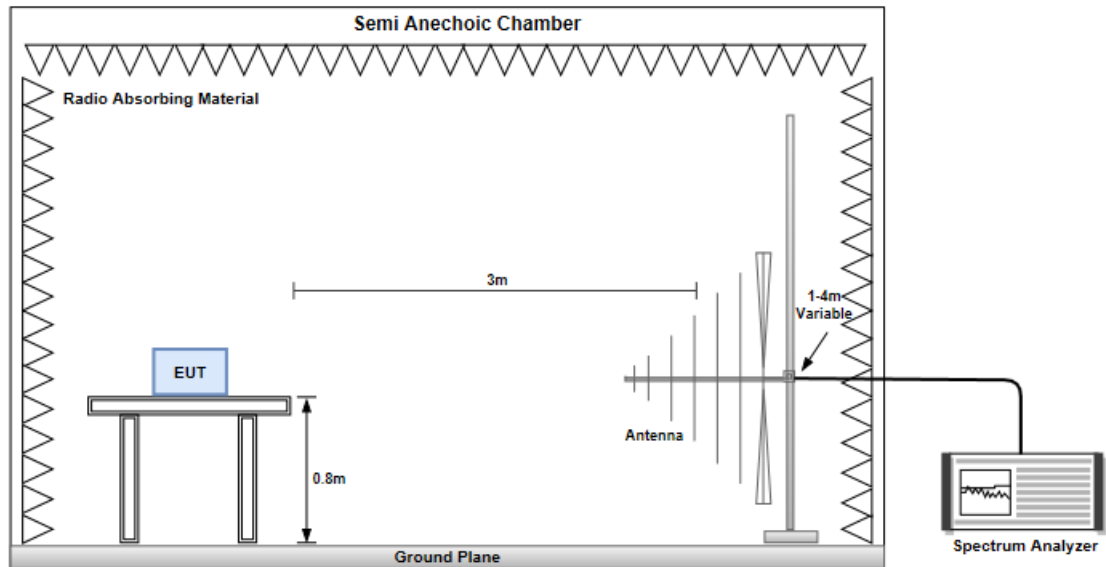
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission 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:

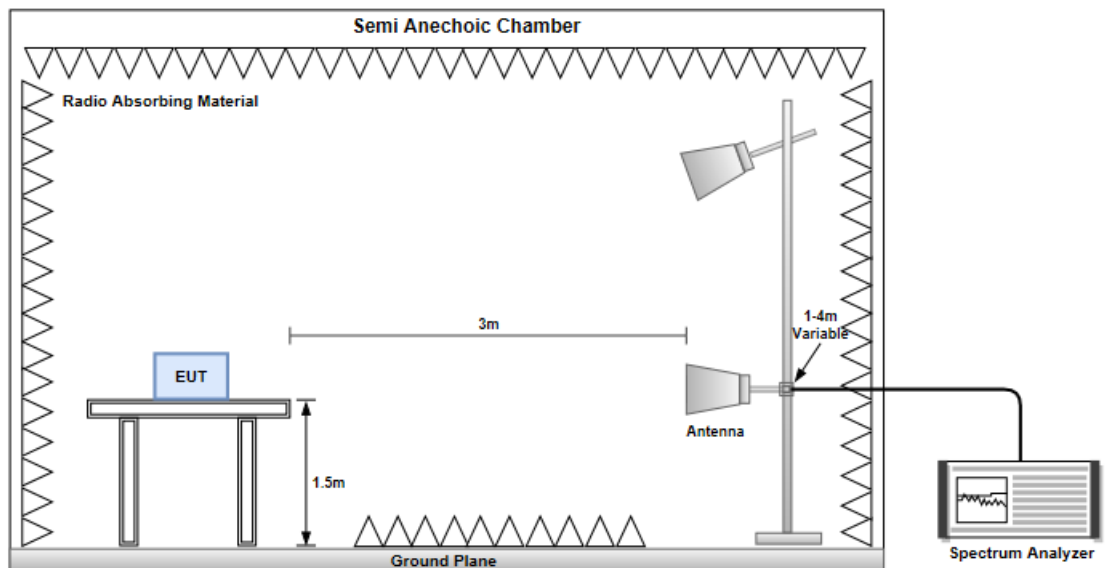
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=3MHz and RMS detector is for average measured value of radiated emission above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

4.2.3 Test Setup

Radiated Emissions below 1 GHz

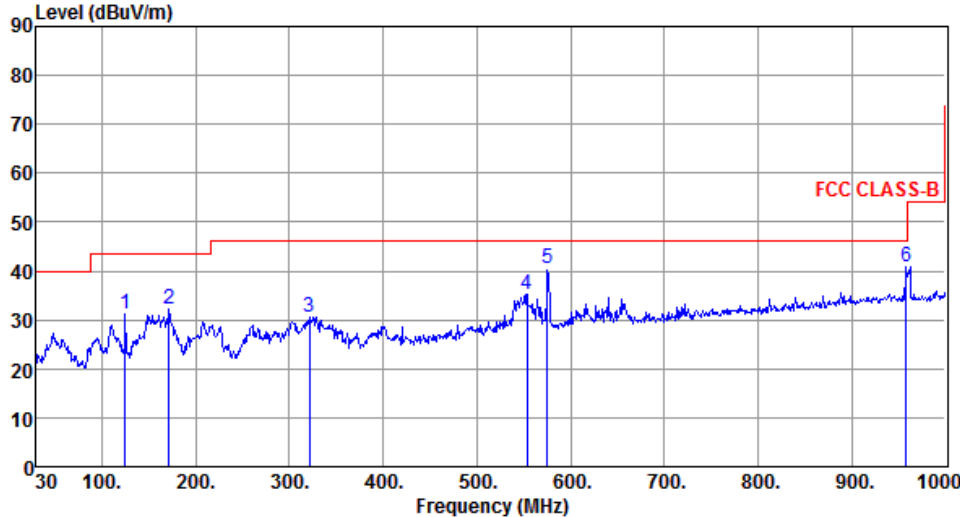


Radiated Emissions above 1 GHz



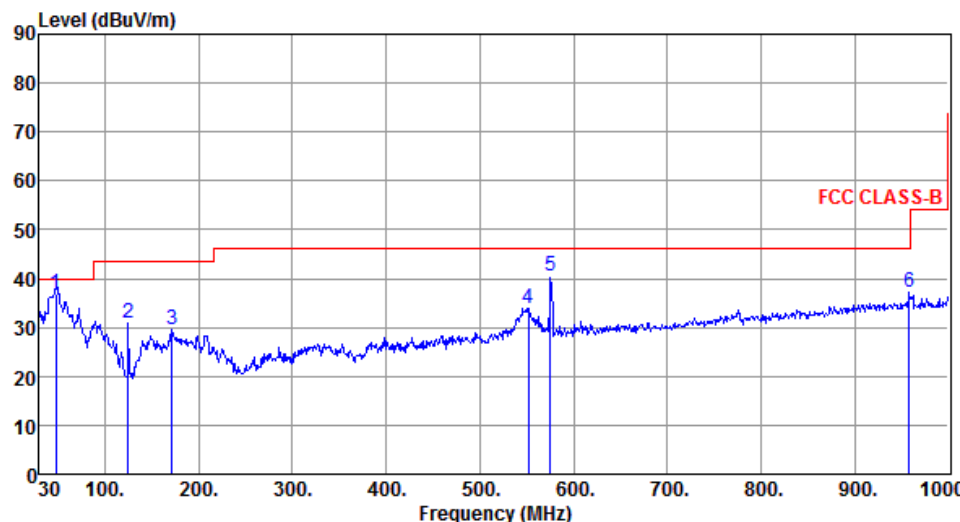
4.2.4 Receiver Emissions (Below 1GHz)

Modulation	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	125.06	31.11	43.50	-12.39	41.18	-10.07	Peak	---	---
2	171.62	32.31	43.50	-11.19	41.05	-8.74	Peak	---	---
3	321.00	30.51	46.00	-15.49	37.64	-7.13	Peak	---	---
4	553.80	35.21	46.00	-10.79	36.86	-1.65	Peak	---	---
5	575.14	40.67	46.00	-5.33	41.87	-1.20	Peak	---	---
6	958.29	40.89	46.00	-5.11	35.90	4.99	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	11b	Test Freq. (MHz)	2437																																																																						
Polarization	Vertical																																																																								
Level (dBUV/m)  <table><tr><th></th><th>Freq. MHz</th><th>Emission level dBUV/m</th><th>Limit dBUV/m</th><th>Margin dB</th><th>SA reading dBUV</th><th>Factor dB</th><th>Remark</th><th>ANT High cm</th><th>Turn Table deg</th></tr><tr><td>1</td><td>47.51</td><td>36.97</td><td>40.00</td><td>-3.03</td><td>44.69</td><td>-7.72</td><td>QP</td><td>100</td><td>206</td></tr><tr><td>2</td><td>125.06</td><td>30.87</td><td>43.50</td><td>-12.63</td><td>40.94</td><td>-10.07</td><td>Peak</td><td>---</td><td>---</td></tr><tr><td>3</td><td>171.62</td><td>29.57</td><td>43.50</td><td>-13.93</td><td>38.31</td><td>-8.74</td><td>Peak</td><td>---</td><td>---</td></tr><tr><td>4</td><td>551.86</td><td>33.88</td><td>46.00</td><td>-12.12</td><td>35.58</td><td>-1.70</td><td>Peak</td><td>---</td><td>---</td></tr><tr><td>5</td><td>575.14</td><td>40.40</td><td>46.00</td><td>-5.60</td><td>41.60</td><td>-1.20</td><td>Peak</td><td>---</td><td>---</td></tr><tr><td>6</td><td>958.29</td><td>37.15</td><td>46.00</td><td>-8.85</td><td>32.16</td><td>4.99</td><td>Peak</td><td>---</td><td>---</td></tr></table>					Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg	1	47.51	36.97	40.00	-3.03	44.69	-7.72	QP	100	206	2	125.06	30.87	43.50	-12.63	40.94	-10.07	Peak	---	---	3	171.62	29.57	43.50	-13.93	38.31	-8.74	Peak	---	---	4	551.86	33.88	46.00	-12.12	35.58	-1.70	Peak	---	---	5	575.14	40.40	46.00	-5.60	41.60	-1.20	Peak	---	---	6	958.29	37.15	46.00	-8.85	32.16	4.99	Peak	---	---
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4.2.5 Receiver Emissions (Above 1GHz)

Modulation	11b	Test Freq. (MHz)	2437
Polarization	Horizontal		
Level (dBuV/m)			

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

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

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