

FCC Test Report

FCC ID : NKR-SY75
Equipment : WiFi module
Model No. : DNUA-SY75
Brand Name : WNC
Applicant : Wistron NeWeb Corporation
Address : 20 Park Avenue II, Hsinchu Science Park,
Hsinchu 308,Taiwan, R.O.C.
Standard : 47 CFR FCC Part 15.247
Received Date : Aug. 03, 2015
Tested Date : Aug. 25 ~ Sep. 03, 2015

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.

Approved & Reviewed by:



Gary Chang / Manager



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	TEST LABORATORY INFORMATION	53

Release Record

Report No.	Version	Description	Issued Date
FR580301AC	Rev. 01	Initial issue	Sep. 17, 2015

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	Conducted Emissions	[dBuV]: 0.159MHz 44.77 (Margin -10.75dB) - AV	Pass
15.247(d) 15.209	Radiated Emissions	[dBuV/m at 3m]: 2390.00MHz 53.30 (Margin -0.70dB) - AV	Pass
15.247(b)(3)	Maximum Output Power	Max Power [dBm]: 27.38	Pass
15.247(a)(2)	6dB Bandwidth	Meet the requirement of limit	Pass
15.247(e)	Power Spectral Density	Meet the requirement of limit	Pass
15.203	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
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.	Model	Type	Connector	Operating Frequencies (MHz) / Antenna Gain (dBi)				
				2400~2483.5	5150~5250	5250~5350	5470~5725	5725~5850
1	DNUA-SY75 ANT0	Printed	in-line switch	0.39	2.57	3.11	4.13	4.13
2	DNUA-SY75 ANT1	Printed	in-line switch	-0.2	1.1	1.64	2.32	2.19

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	ART2-GUI, Version 2.3		
Duty Cycle and Duty Factor	Mode	Duty cycle (%)	Duty factor (dB)
	11b	100.00%	0.00
	11g	98.76%	0.05
	HT20	98.13%	0.08

1.1.7 Power Setting

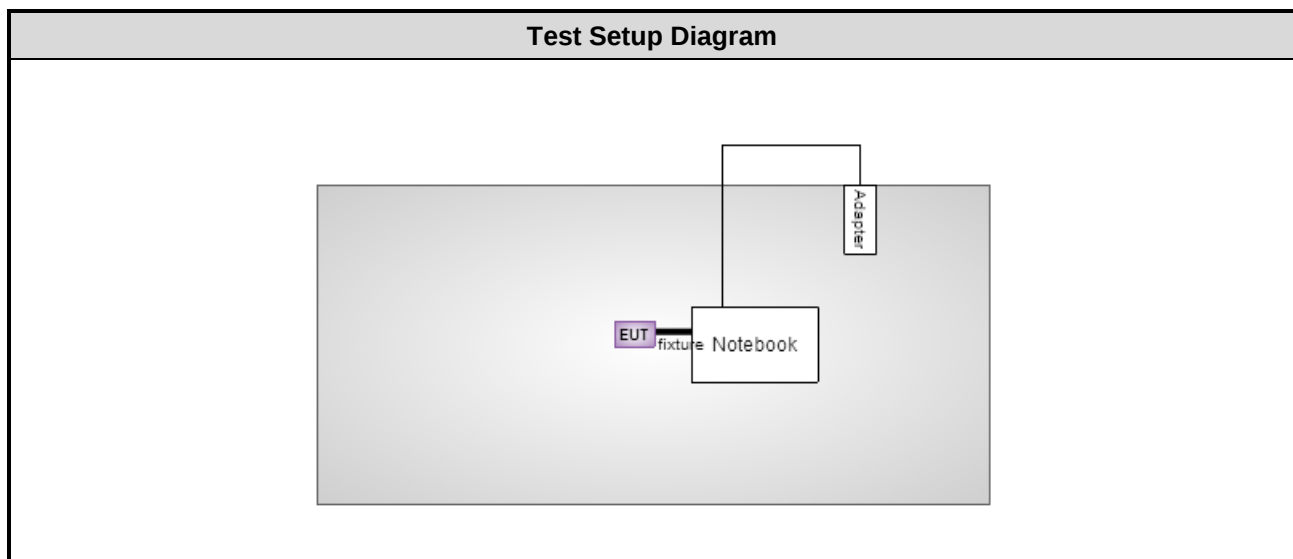
Modulation Mode	Test Frequency (MHz)	Power Set
11b	2412	17
11b	2437	20.5
11b	2462	20
11g	2412	11
11g	2437	22
11g	2462	15.5
HT20	2412	10
HT20	2437	22
HT20	2462	14.5

1.2 Local Support Equipment List

Support Equipment List						
No.	Equipment	Brand	Model	S/N	FCC ID	Signal cable / Length (m)
1	Notebook	DELL	Latitude E6440	DPXMD12	DoC	---
2	Fixture	---	---	---	---	---

Note: The Fixture was provided by applicant.

1.3 Test Setup Chart



1.4 The Equipment List

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
EMC Receiver	R&S	ESCS 30	100169	Oct. 17, 2014	Oct. 16, 2015
LISN	SCHWARZBECK	Schwarzbeck 8127	8127-667	Nov. 17, 2014	Nov. 16, 2015
RF Cable-CON	Woken	CFD200-NL	CFD200-NL-001	Dec. 31, 2014	Dec. 30, 2015
Measurement Software	AUDIX	e3	6.120210k	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	Radiated Emission above 1GHz				
Test Site	966 chamber 2 / (03CH02-WS)				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101499	Dec. 31, 2014	Dec. 30, 2015
Receiver	R&S	ESR3	101657	Jan. 15, 2015	Jan. 14, 2016
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-524	Oct. 16, 2014	Oct. 15, 2015
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1095	Oct. 14, 2014	Oct. 13, 2015
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 10, 2014	Nov. 09, 2015
Loop Antenna	R&S	HFH2-Z2	11900	Nov. 10, 2014	Nov. 09, 2015
Preamplifier	Burgeon	BPA-530	100218	Nov. 10, 2014	Nov. 09, 2015
Preamplifier	Agilent	83017A	MY39501309	Sep. 29, 2014	Sep. 28, 2015
Pre-Amplifier	WM	TF-130N-R1	923365	Feb. 10, 2015	Feb. 09, 2016
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16140/4	Dec. 16, 2014	Dec. 15, 2015
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16018/4	Dec. 16, 2014	Dec. 15, 2015
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16015/4	Dec. 16, 2014	Dec. 15, 2015
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-003	Dec. 16, 2014	Dec. 15, 2015
LF cable 10M	Woken	CFD400NL-LW	CFD400NL-004	Dec. 16, 2014	Dec. 15, 2015
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)				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101063	Feb. 03, 2015	Feb. 02, 2016
Power Meter	Anritsu	ML2495A	1241002	Sep. 29, 2014	Sep. 28, 2015
Power Sensor	Anritsu	MA2411B	1207366	Sep. 29, 2014	Sep. 28, 2015
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.

47 CFR FCC Part 15.247

ANSI C63.10-2013

FCC KDB 558074 D01 DTS Meas Guidance v03r03

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	± 2.92 dB
Radiated emission ≤ 1 GHz	± 3.62 dB
Radiated emission > 1 GHz	± 5.60 dB

2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
AC Conduction	CO01-WS	22°C / 58%	Kevin Ma
Radiated Emissions	03CH02-WS	23-26°C / 65-69%	Anderson Hung
RF Conducted	TH01-WS	22°C / 63%	Felix Sung

➤ FCC site registration No.: 657002

➤ IC site registration No.: 10807A-2

2.2 The Worst Test Modes and Channel Details

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

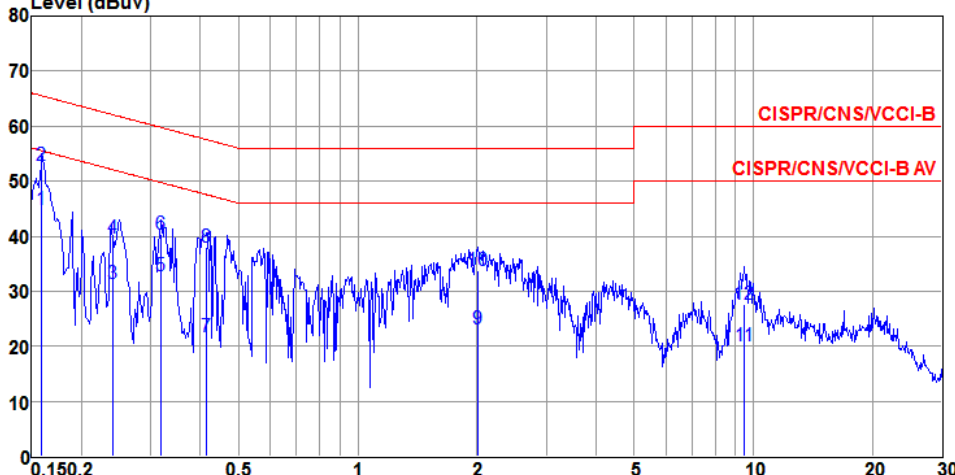
1. The device is placed on a test table, raised 80 cm above the reference ground plane. The vertical conducting plane is located 40 cm to the rear of the device.
2. The device is connected to line impedance stabilization network (LISN) and other accessories are connected to other LISN. Measured levels 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

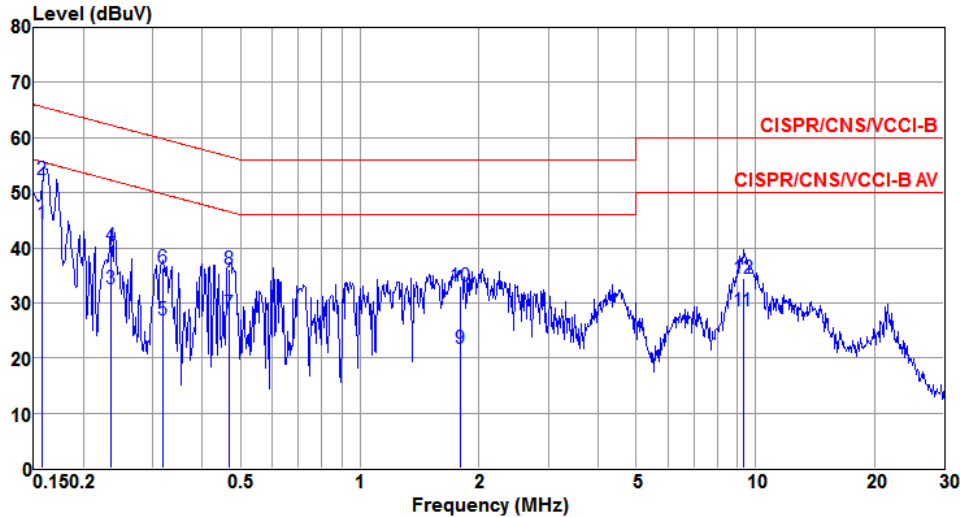


- Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

3.1.4 Test Result of Conducted Emissions

Modulation	HT20	Test Freq. (MHz)	2437																																																																																																																					
Power Phase	Line																																																																																																																							
Level (dBuV)  Frequency (MHz) <table><thead><tr><th></th><th>Freq MHz</th><th>Level dBuV</th><th>Limit Line dBuV</th><th>Over Limit dB</th><th>Read Level dBuV</th><th>LISN factor dB</th><th>cable loss dB</th><th>Remark</th></tr></thead><tbody><tr><td>1@</td><td>0.159</td><td>44.77</td><td>55.52</td><td>-10.75</td><td>44.62</td><td>0.07</td><td>0.08</td><td>Average</td></tr><tr><td>2</td><td>0.159</td><td>52.94</td><td>65.52</td><td>-12.58</td><td>52.79</td><td>0.07</td><td>0.08</td><td>QP</td></tr><tr><td>3</td><td>0.241</td><td>31.29</td><td>52.08</td><td>-20.79</td><td>31.12</td><td>0.07</td><td>0.10</td><td>Average</td></tr><tr><td>4</td><td>0.241</td><td>39.63</td><td>62.08</td><td>-22.45</td><td>39.46</td><td>0.07</td><td>0.10</td><td>QP</td></tr><tr><td>5</td><td>0.318</td><td>32.70</td><td>49.75</td><td>-17.05</td><td>32.53</td><td>0.07</td><td>0.10</td><td>Average</td></tr><tr><td>6</td><td>0.318</td><td>40.34</td><td>59.75</td><td>-19.41</td><td>40.17</td><td>0.07</td><td>0.10</td><td>QP</td></tr><tr><td>7</td><td>0.414</td><td>21.73</td><td>47.58</td><td>-25.85</td><td>21.55</td><td>0.07</td><td>0.11</td><td>Average</td></tr><tr><td>8</td><td>0.414</td><td>37.96</td><td>57.58</td><td>-19.62</td><td>37.78</td><td>0.07</td><td>0.11</td><td>QP</td></tr><tr><td>9</td><td>2.012</td><td>23.16</td><td>46.00</td><td>-22.84</td><td>22.82</td><td>0.10</td><td>0.24</td><td>Average</td></tr><tr><td>10</td><td>2.012</td><td>33.70</td><td>56.00</td><td>-22.30</td><td>33.36</td><td>0.10</td><td>0.24</td><td>QP</td></tr><tr><td>11</td><td>9.502</td><td>20.06</td><td>50.00</td><td>-29.94</td><td>19.56</td><td>0.20</td><td>0.30</td><td>Average</td></tr><tr><td>12</td><td>9.502</td><td>27.60</td><td>60.00</td><td>-32.40</td><td>27.10</td><td>0.20</td><td>0.30</td><td>QP</td></tr></tbody></table> Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB). Note 2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).					Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark	1@	0.159	44.77	55.52	-10.75	44.62	0.07	0.08	Average	2	0.159	52.94	65.52	-12.58	52.79	0.07	0.08	QP	3	0.241	31.29	52.08	-20.79	31.12	0.07	0.10	Average	4	0.241	39.63	62.08	-22.45	39.46	0.07	0.10	QP	5	0.318	32.70	49.75	-17.05	32.53	0.07	0.10	Average	6	0.318	40.34	59.75	-19.41	40.17	0.07	0.10	QP	7	0.414	21.73	47.58	-25.85	21.55	0.07	0.11	Average	8	0.414	37.96	57.58	-19.62	37.78	0.07	0.11	QP	9	2.012	23.16	46.00	-22.84	22.82	0.10	0.24	Average	10	2.012	33.70	56.00	-22.30	33.36	0.10	0.24	QP	11	9.502	20.06	50.00	-29.94	19.56	0.20	0.30	Average	12	9.502	27.60	60.00	-32.40	27.10	0.20	0.30	QP
	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark																																																																																																																
1@	0.159	44.77	55.52	-10.75	44.62	0.07	0.08	Average																																																																																																																
2	0.159	52.94	65.52	-12.58	52.79	0.07	0.08	QP																																																																																																																
3	0.241	31.29	52.08	-20.79	31.12	0.07	0.10	Average																																																																																																																
4	0.241	39.63	62.08	-22.45	39.46	0.07	0.10	QP																																																																																																																
5	0.318	32.70	49.75	-17.05	32.53	0.07	0.10	Average																																																																																																																
6	0.318	40.34	59.75	-19.41	40.17	0.07	0.10	QP																																																																																																																
7	0.414	21.73	47.58	-25.85	21.55	0.07	0.11	Average																																																																																																																
8	0.414	37.96	57.58	-19.62	37.78	0.07	0.11	QP																																																																																																																
9	2.012	23.16	46.00	-22.84	22.82	0.10	0.24	Average																																																																																																																
10	2.012	33.70	56.00	-22.30	33.36	0.10	0.24	QP																																																																																																																
11	9.502	20.06	50.00	-29.94	19.56	0.20	0.30	Average																																																																																																																
12	9.502	27.60	60.00	-32.40	27.10	0.20	0.30	QP																																																																																																																

Modulation	HT20	Test Freq. (MHz)	2437
Power Phase	Neutral		



The graph displays the radio frequency interference (RFI) level in dBuV across a frequency range from 0.150 to 30 MHz. Two red lines represent the CISPR/CNS/VCCI-B and CISPR/CNS/VCCI-B AV limits. The blue line shows the measured RFI level, which is generally below the limits, with some peaks around 0.15 MHz, 0.3 MHz, 0.5 MHz, 1.8 MHz, and 9.3 MHz.

	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
10	0.158	44.46	55.59	-11.13	44.31	0.07	0.08	Average
2	0.158	52.36	65.59	-13.23	52.21	0.07	0.08	QP
3	0.234	32.64	52.30	-19.66	32.48	0.07	0.09	Average
4	0.234	40.28	62.30	-22.02	40.12	0.07	0.09	QP
5	0.318	26.91	49.75	-22.84	26.74	0.07	0.10	Average
6	0.318	36.31	59.75	-23.44	36.14	0.07	0.10	QP
7	0.467	28.00	46.56	-18.56	27.81	0.07	0.12	Average
8	0.467	36.11	56.56	-20.45	35.92	0.07	0.12	QP
9	1.800	21.69	46.00	-24.31	21.36	0.10	0.23	Average
10	1.800	33.03	56.00	-22.97	32.70	0.10	0.23	QP
11	9.302	28.48	50.00	-21.52	27.96	0.22	0.30	Average
12	9.302	34.39	60.00	-25.61	33.87	0.22	0.30	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
 Note 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

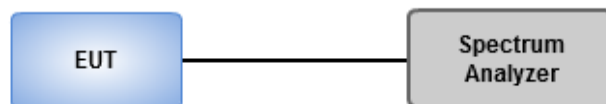
6dB Bandwidth

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

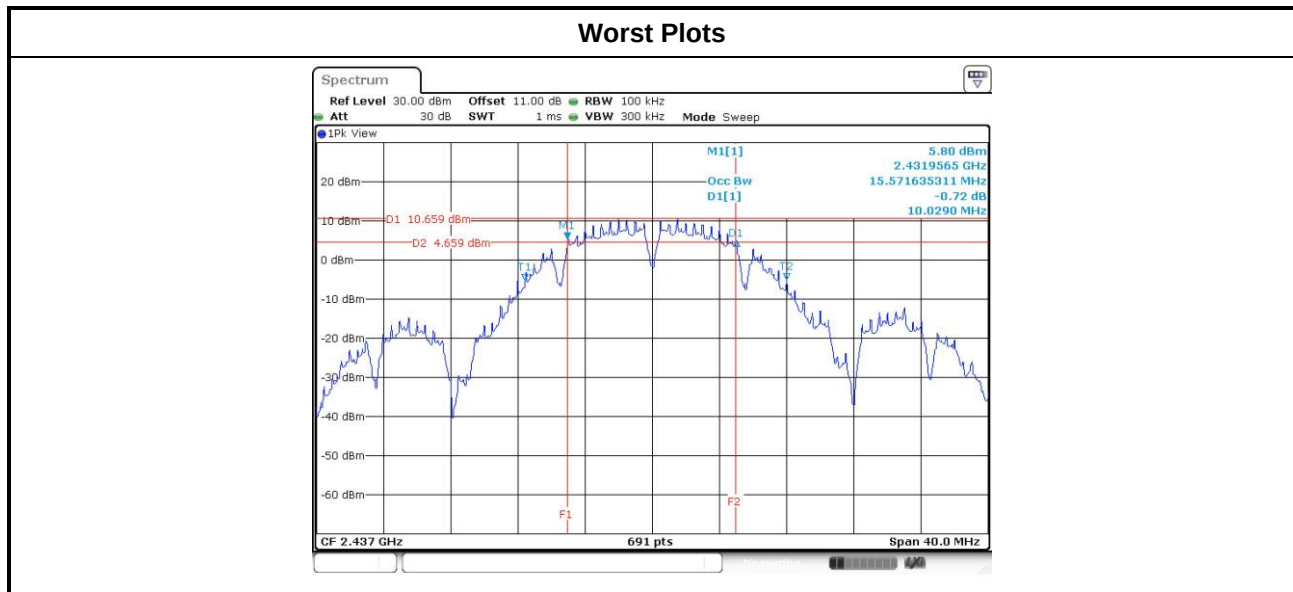
1. Set resolution bandwidth (RBW) = 300 kHz, Video bandwidth = 1 MHz.
2. Detector = Sample, Trace mode = max hold.
3. Sweep = auto couple, Allow the trace to stabilize.
4. Use the OBW measurement function of spectrum analyzer to measure the occupied bandwidth.

3.2.3 Test Setup

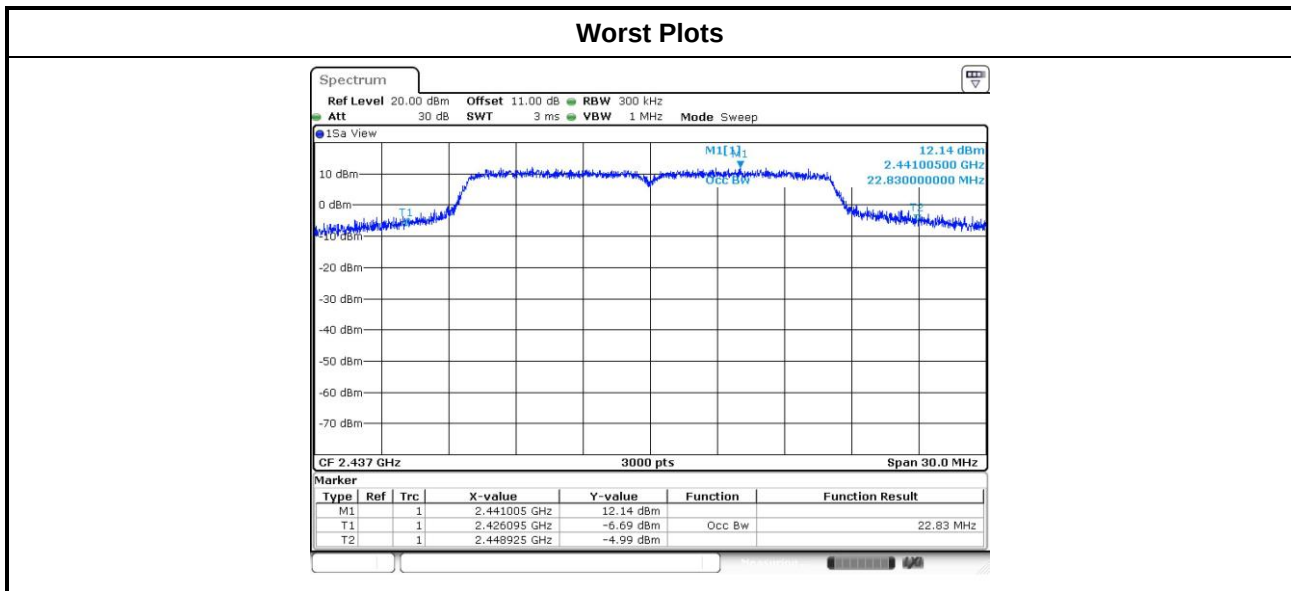


3.2.4 Test Result of 6dB and Occupied Bandwidth

Modulation Mode	N _{TX}	Freq. (MHz)	6dB Bandwidth (MHz)				Limit (kHz)
			Chain 0	Chain 1	Chain 2	Chain 3	
11b	2	2412	10.09	10.09	---	---	500
11b	2	2437	10.03	10.09	---	---	500
11b	2	2462	10.09	10.09	---	---	500
11g	2	2412	16.35	16.35	---	---	500
11g	2	2437	16.35	16.35	---	---	500
11g	2	2462	16.35	16.35	---	---	500
HT20	2	2412	17.57	17.62	---	---	500
HT20	2	2437	16.70	15.77	---	---	500
HT20	2	2462	17.22	17.22	---	---	500



Modulation Mode	N _{TX}	Freq. (MHz)	99% Occupied Bandwidth (MHz)			
			Chain 0	Chain 1	Chain 2	Chain 3
11b	2	2412	13.98	14.09	---	---
11b	2	2437	15.21	14.47	---	---
11b	2	2462	14.92	14.27	---	---
11g	2	2412	16.95	16.79	---	---
11g	2	2437	22.83	19.61	---	---
11g	2	2462	17.23	16.89	---	---
HT20	2	2412	18.03	17.98	---	---
HT20	2	2437	22.72	22.82	---	---
HT20	2	2462	18.11	18.03	---	---



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 (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)				Total Power (mW)	Total Power (dBm)	Limit (dBm)
			Chain 0	Chain 1	Chain 2	Chain 3			
11b	2	2412	19.15	19.02	---	---	162.024	22.10	30.00
11b	2	2437	21.86	21.96	---	---	310.498	24.92	30.00
11b	2	2462	21.22	21.58	---	---	276.314	24.41	30.00
11g	2	2412	19.83	19.69	---	---	189.272	22.77	30.00
11g	2	2437	24.03	24.57	---	---	539.348	27.32	30.00
11g	2	2462	22.21	22.63	---	---	349.573	25.44	30.00
HT20	2	2412	18.82	18.36	---	---	144.757	21.61	30.00
HT20	2	2437	24.04	24.68	---	---	547.278	27.38	30.00
HT20	2	2462	21.63	21.78	---	---	296.207	24.72	30.00

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	2	2412	17.04	16.95	---	---	100.127	20.01	30.00
11b	2	2437	20.18	20.08	---	---	206.091	23.14	30.00
11b	2	2462	19.61	19.66	---	---	183.881	22.65	30.00
11g	2	2412	11.51	11.58	---	---	28.546	14.56	30.00
11g	2	2437	20.50	20.52	---	---	224.922	23.52	30.00
11g	2	2462	15.72	15.67	---	---	74.223	18.71	30.00
HT20	2	2412	10.32	10.38	---	---	21.679	13.36	30.00
HT20	2	2437	20.53	20.58	---	---	227.267	23.57	30.00
HT20	2	2462	14.64	14.52	---	---	57.421	17.59	30.00

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: $\geq 10 \times (\text{number of measurement points in sweep}) \times (\text{maximum data rate per stream})$.
 4. Perform the measurement over a single sweep.
 5. Use the peak marker function to determine the maximum amplitude level.

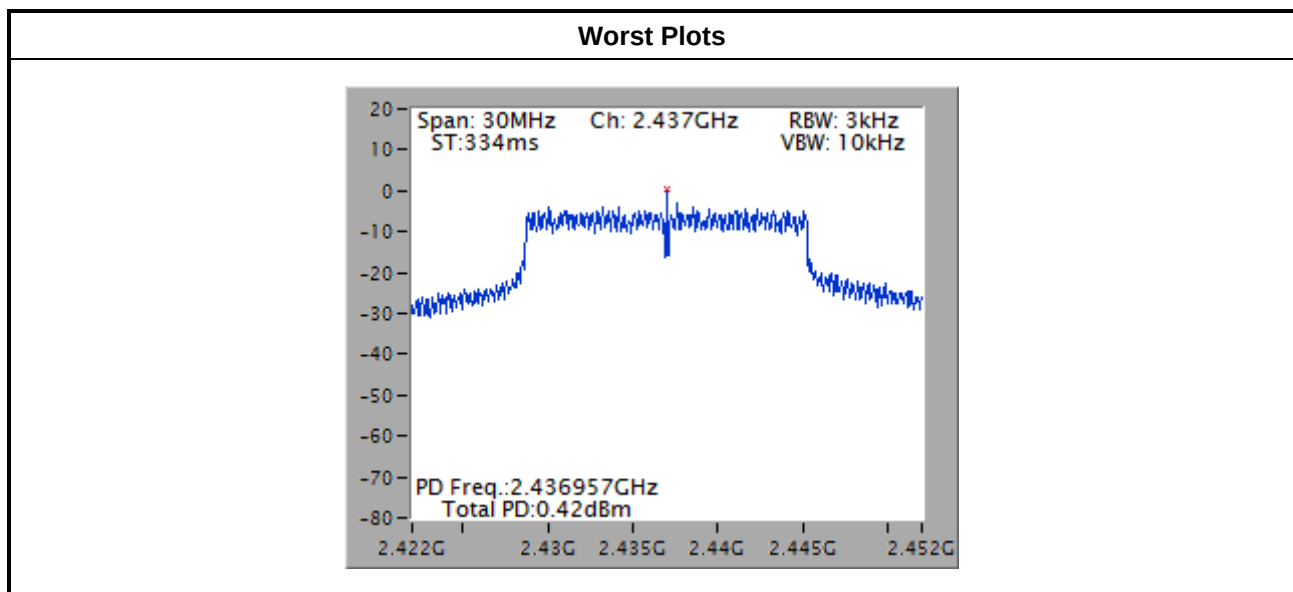
3.4.3 Test Setup



3.4.4 Test Result of Power Spectral Density

Modulation Mode	N _{TX}	Freq. (MHz)	Total Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
11b	2	2412	-5.61	8.00
11b	2	2437	-2.45	8.00
11b	2	2462	-3.68	8.00
11g	2	2412	-12.97	8.00
11g	2	2437	0.42	8.00
11g	2	2462	-7.37	8.00
HT20	2	2412	-14.64	8.00
HT20	2	2437	-0.18	8.00
HT20	2	2462	-9.14	8.00

Note: Test result 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

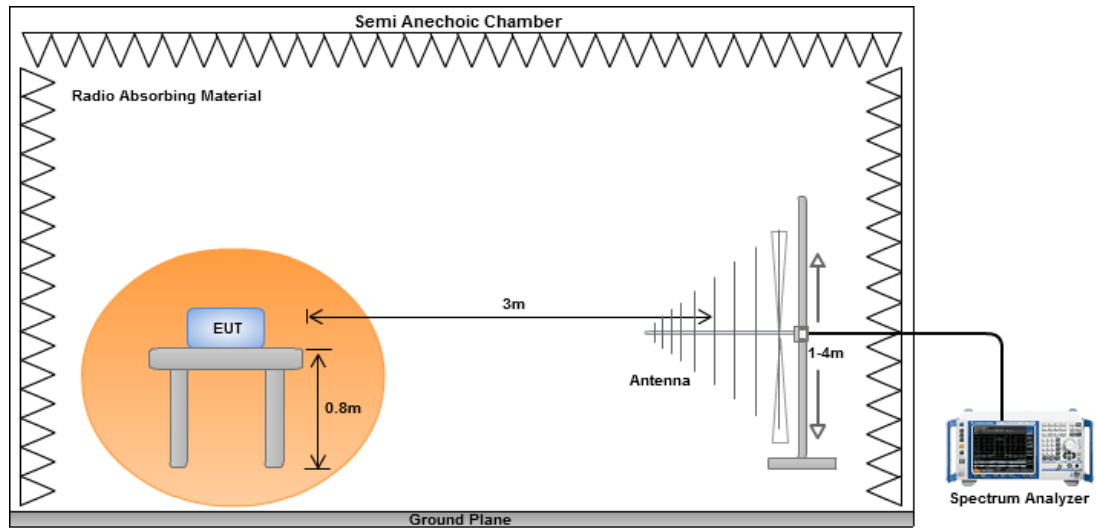
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission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

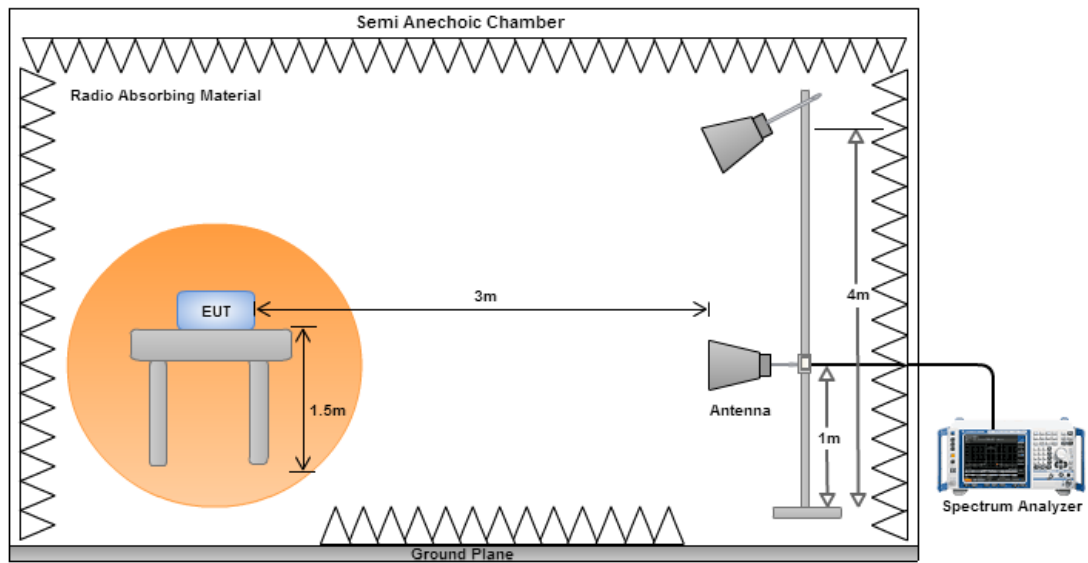
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above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

3.5.3 Test Setup

Radiated Emissions below 1 GHz

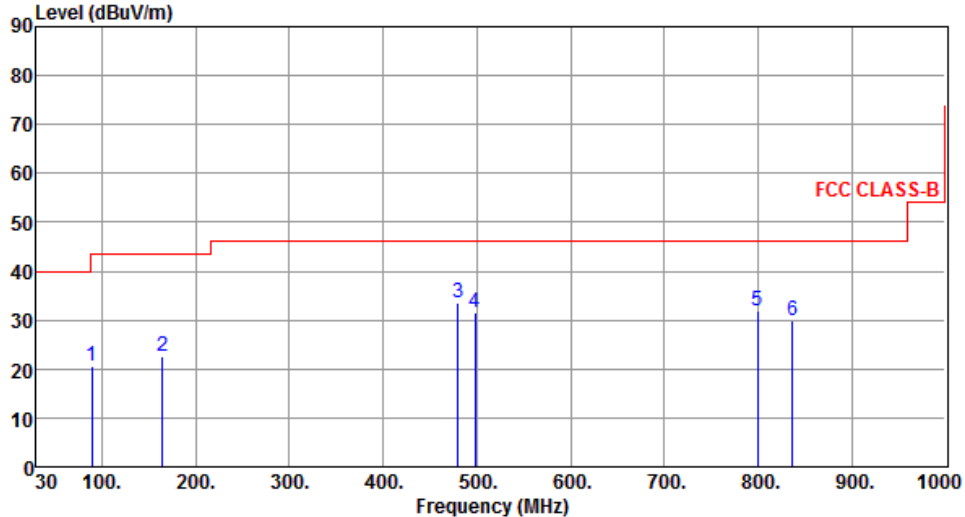


Radiated Emissions above 1 GHz



3.5.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

Modulation	HT20	Test Freq. (MHz)	2437
Polarization	Horizontal		



The graph displays the radiated unwanted emissions for a transmitter. The y-axis represents the Level in dBuV/m, ranging from 0 to 90. The x-axis represents the Frequency in MHz, ranging from 30 to 1000. A red line indicates the FCC CLASS-B limit, which is 40 dBuV/m from 30 to 100 MHz, 45 dBuV/m from 100 to 1000 MHz, and 55 dBuV/m from 1000 to 10000 MHz. Six measured peaks are labeled with numbers 1 through 6. The data for these peaks is provided in the table below.

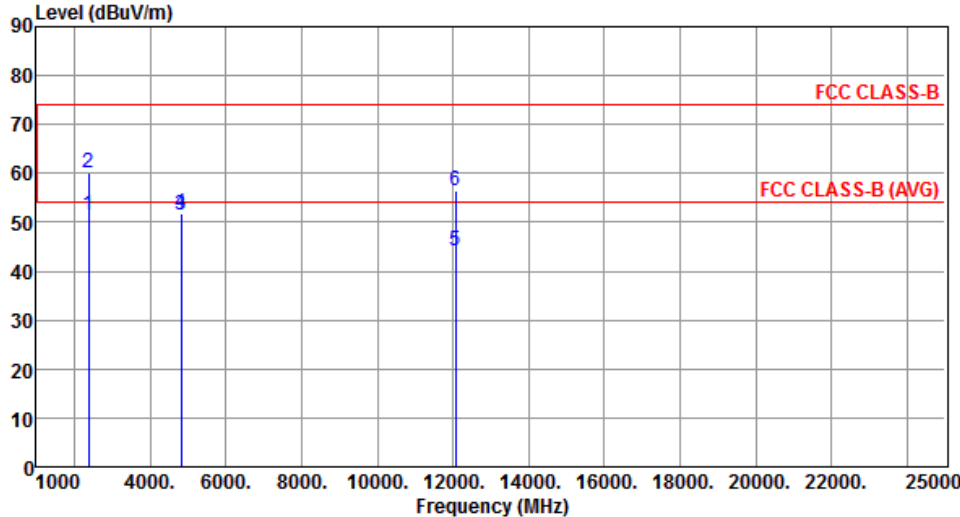
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	89.17	20.44	43.50	-23.06	43.60	-23.16	Peak	---	---
2	164.83	22.60	43.50	-20.90	39.82	-17.22	Peak	---	---
3	480.08	33.38	46.00	-12.62	45.41	-12.03	Peak	---	---
4	498.51	31.39	46.00	-14.61	43.13	-11.74	Peak	---	---
5	799.21	31.83	46.00	-14.17	38.75	-6.92	Peak	---	---
6	837.04	29.83	46.00	-16.17	36.10	-6.27	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	HT20	Test Freq. (MHz)	2437
Polarization	Vertical		
Level (dBuV/m)			

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

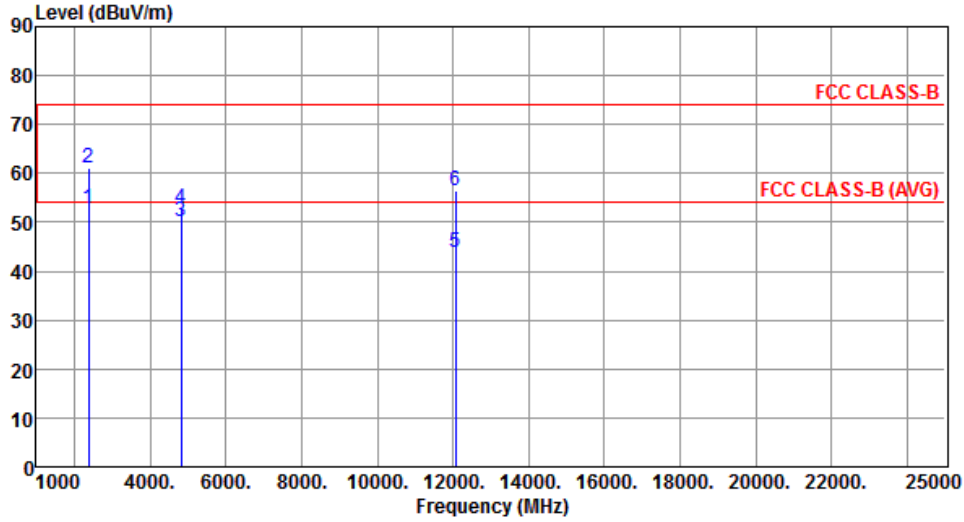
Modulation	11b	Test Freq. (MHz)	2412
Polarization	Horizontal		



	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2385.00	51.62	54.00	-2.38	54.29	-2.67	Average	149	324
2	2385.00	60.19	74.00	-13.81	62.86	-2.67	Peak	149	324
3	4824.00	51.39	54.00	-2.61	46.42	4.97	Average	182	302
4	4824.00	51.86	74.00	-22.14	46.89	4.97	Peak	182	302
5	12060.00	44.22	54.00	-9.78	28.73	15.49	Average	211	87
6	12060.00	56.47	74.00	-17.53	40.98	15.49	Peak	211	87

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	2385.00	52.76	54.00	-1.24	55.43	-2.67	Average	214	273
2	2385.00	60.95	74.00	-13.05	63.62	-2.67	Peak	214	273
3	4824.00	50.22	54.00	-3.78	45.25	4.97	Average	134	25
4	4824.00	52.78	74.00	-21.22	47.81	4.97	Peak	134	25
5	12060.00	43.91	54.00	-10.09	28.42	15.49	Average	135	327
6	12060.00	56.57	74.00	-17.43	41.08	15.49	Peak	135	327

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		
Level (dBuV/m) </			

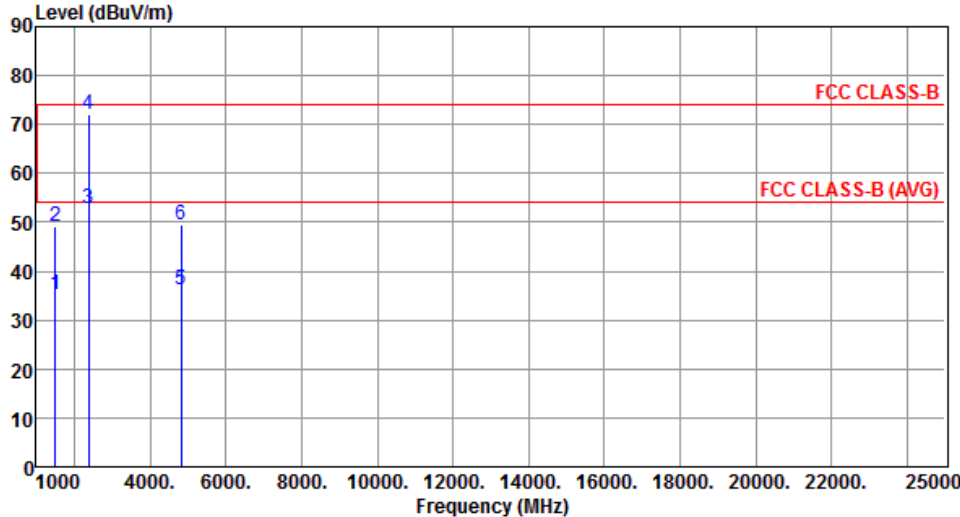
Modulation	11b	Test Freq. (MHz)	2437
Polarization	Vertical		
Level (dBuV/m) </			

Modulation	11b	Test Freq. (MHz)	2462
Polarization	Horizontal		
Level (dBUV/m) </			

Modulation	11b	Test Freq. (MHz)	2462
Polarization	Vertical		
Level (dBUV/m) </			

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

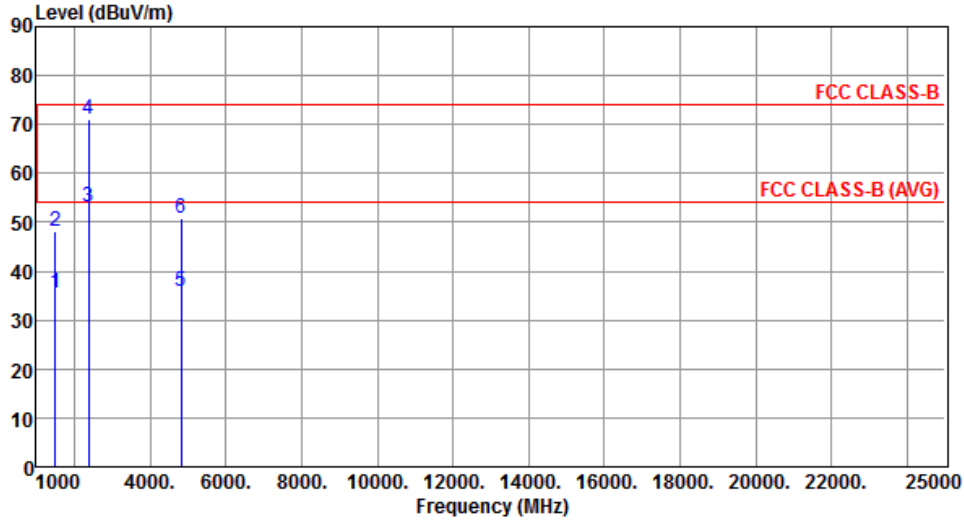
Modulation	11g	Test Freq. (MHz)	2412
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	1500.00	35.14	54.00	-18.86	40.71	-5.57	Average	198	68
2	1500.00	49.03	74.00	-24.97	54.60	-5.57	Peak	198	68
3	2390.00	52.83	54.00	-1.17	55.48	-2.65	Average	146	323
4	2390.00	72.13	74.00	-1.87	74.78	-2.65	Peak	146	323
5	4824.00	36.15	54.00	-17.85	31.18	4.97	Average	100	308
6	4824.00	49.58	74.00	-24.42	44.61	4.97	Peak	100	308

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	1500.00	35.52	54.00	-18.48	41.09	-5.57	Average	101	39
2	1500.00	48.13	74.00	-25.87	53.70	-5.57	Peak	101	39
3	2390.00	53.30	54.00	-0.70	55.95	-2.65	Average	208	271
4	2390.00	71.22	74.00	-2.78	73.87	-2.65	Peak	208	271
5	4824.00	35.96	54.00	-18.04	30.99	4.97	Average	100	93
6	4824.00	50.89	74.00	-23.11	45.92	4.97	Peak	100	93

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		
Level (dBUV/m) </			

Modulation	11g	Test Freq. (MHz)	2437
Polarization	Vertical		
Level (dBuV/m) </			

Modulation	11g	Test Freq. (MHz)	2462
Polarization	Horizontal		
Level (dBUV/m) </			

Modulation	11g	Test Freq. (MHz)	2462
Polarization	Vertical		
Level (dBUV/m) <			

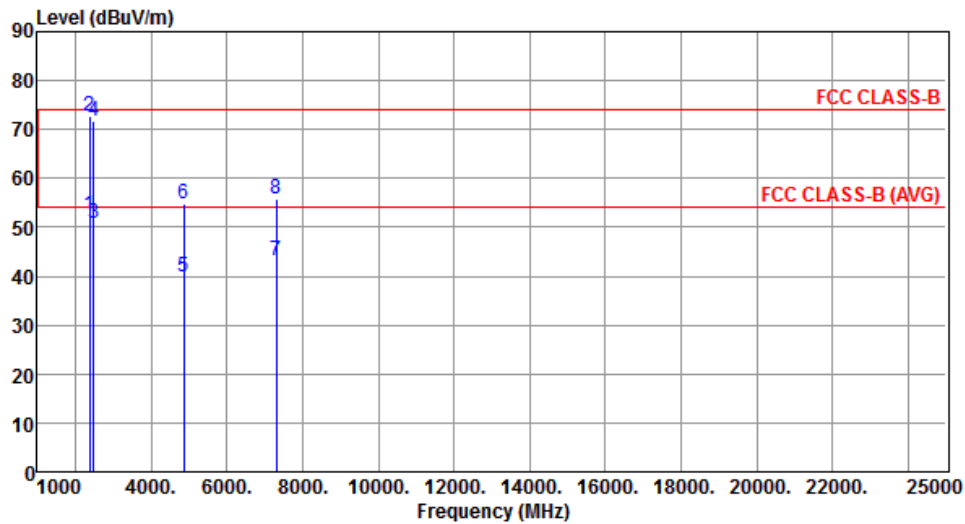
3.5.7 Transmitter Radiated Unwanted Emissions (Above 1GHz) for HT20

Modulation	HT20		Test Freq. (MHz)		2412	
Polarization	Horizontal					
Level (dBuV/m)						

Modulation	HT20	Test Freq. (MHz)	2412
Polarization	Vertical		
Level (dBuV/m) </			

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	52.64	54.00	-1.36	55.29	-2.65	Average	286	253
2	2390.00	72.59	74.00	-1.41	75.24	-2.65	Peak	286	253
3	2483.50	50.71	54.00	-3.29	53.05	-2.34	Average	286	253
4	2483.50	71.59	74.00	-2.41	73.93	-2.34	Peak	286	253
5	4874.00	39.96	54.00	-14.04	34.88	5.08	Average	100	80
6	4874.00	54.87	74.00	-19.13	49.79	5.08	Peak	100	80
7	7311.00	43.31	54.00	-10.69	33.20	10.11	Average	196	337
8	7311.00	55.95	74.00	-18.05	45.84	10.11	Peak	196	337

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		
Level (dBUV/m) </			

Modulation	HT20	Test Freq. (MHz)	2462
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 20 dB relative to the maximum in-band peak PSD level in 100 kHz

3.6.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.6.3 Test Procedures

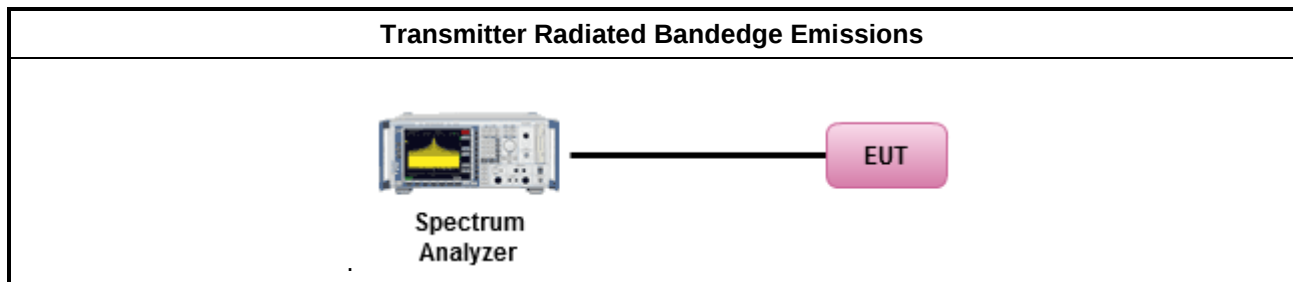
Reference level measurement

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

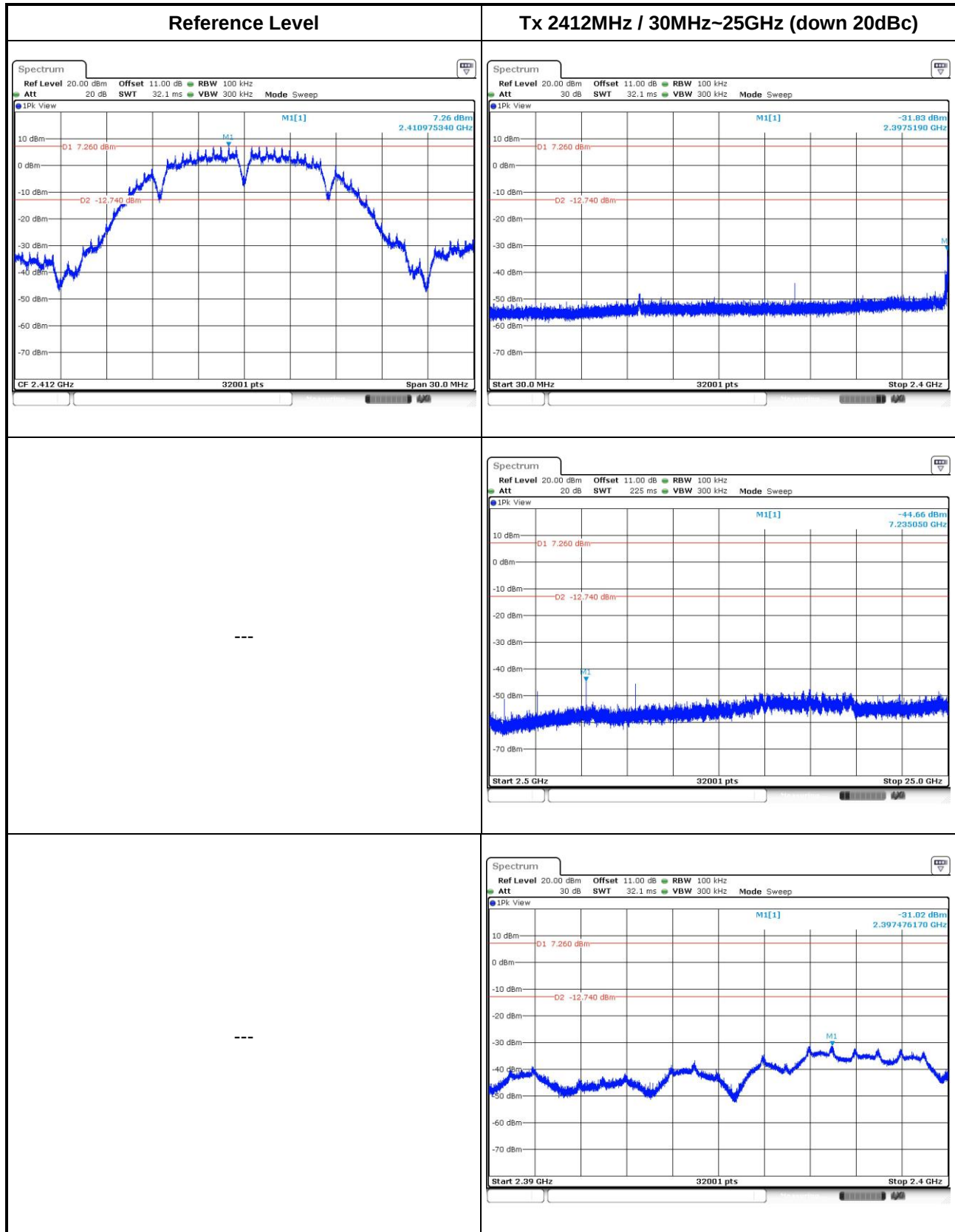
1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
2. Trace = max hold , Allow Trace to fully stabilize
3. Scan Frequency range is up to 25GHz
4. Use the peak marker function to determine the maximum amplitude level

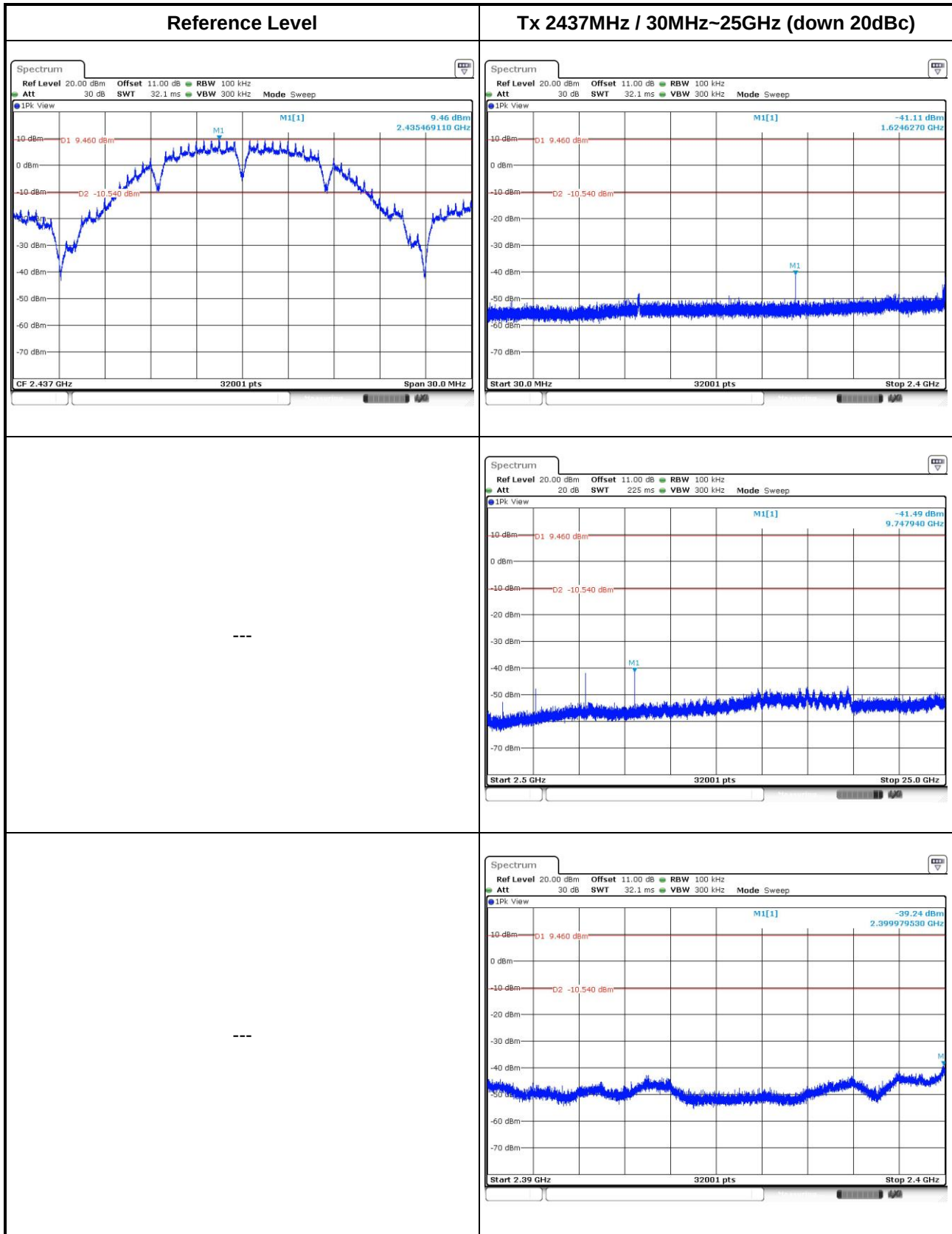
3.6.4 Test Setup



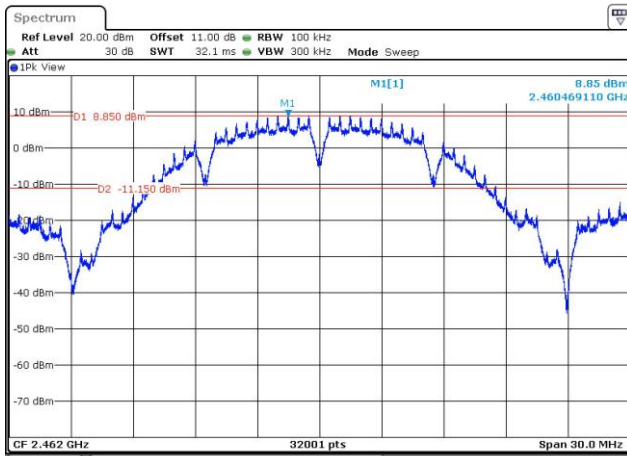
3.6.5 Unwanted Emissions into Non-Restricted Frequency Bands

802.11b

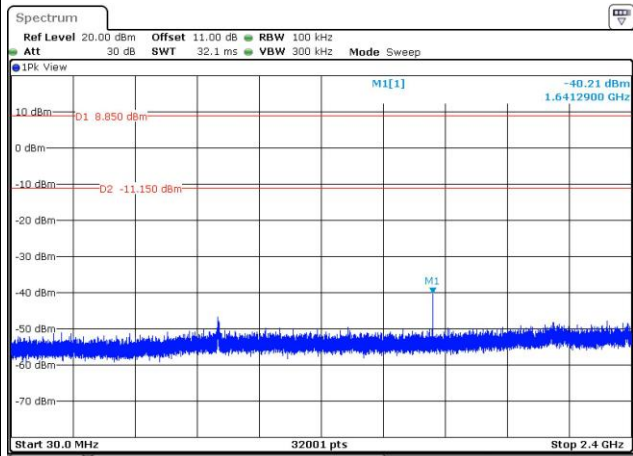


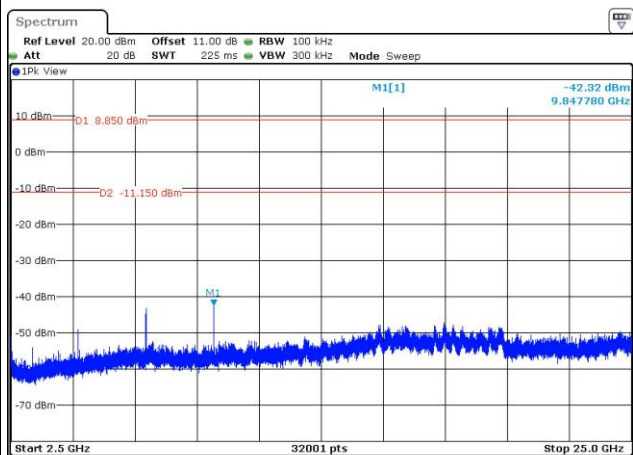


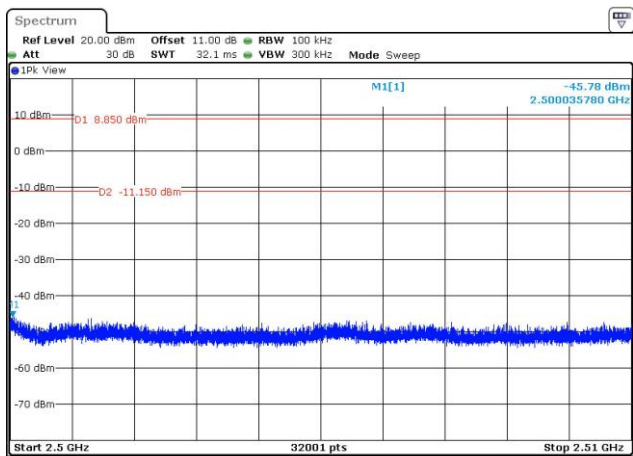
Reference Level



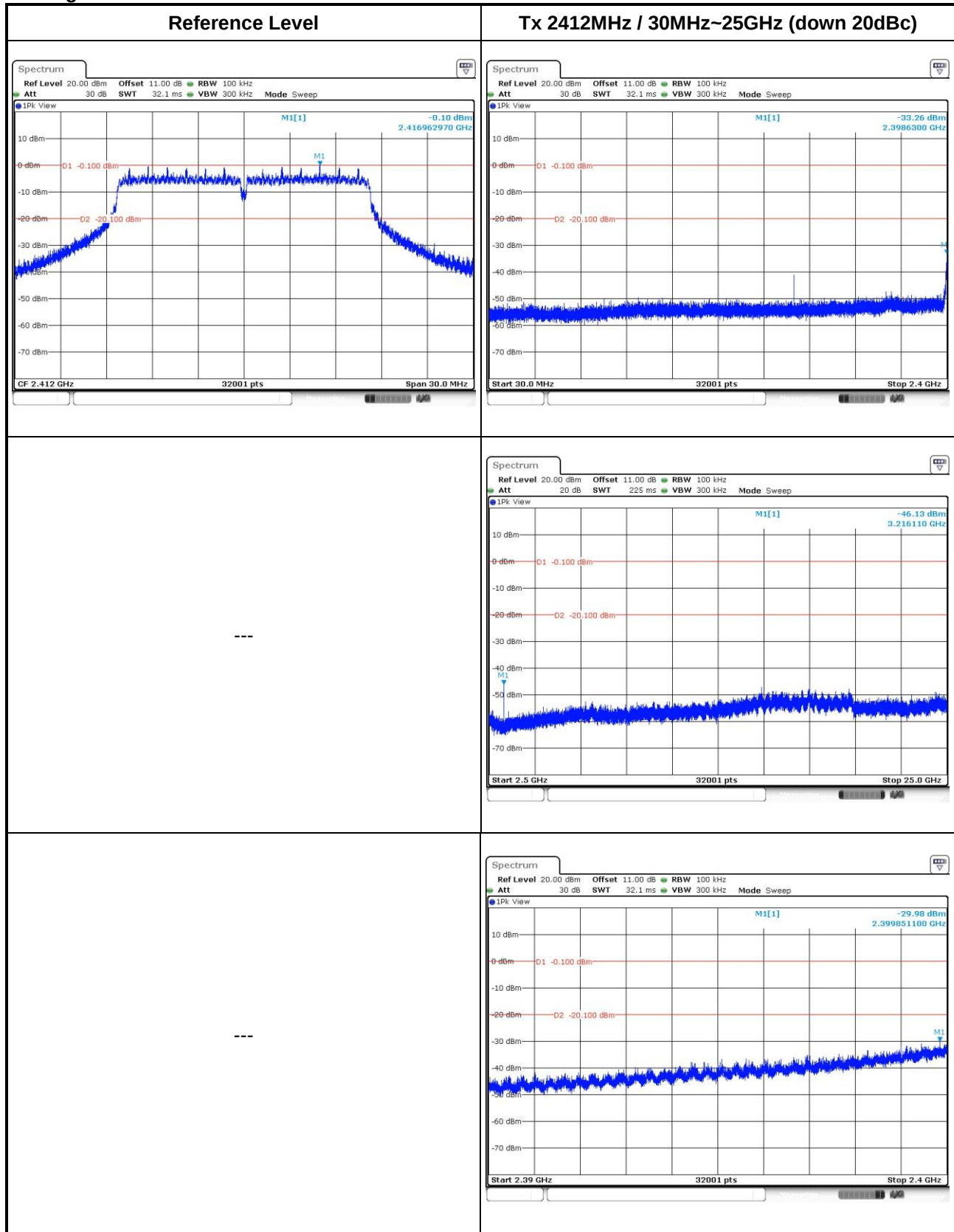
Tx 2462MHz / 30MHz~25GHz (down 20dBc)

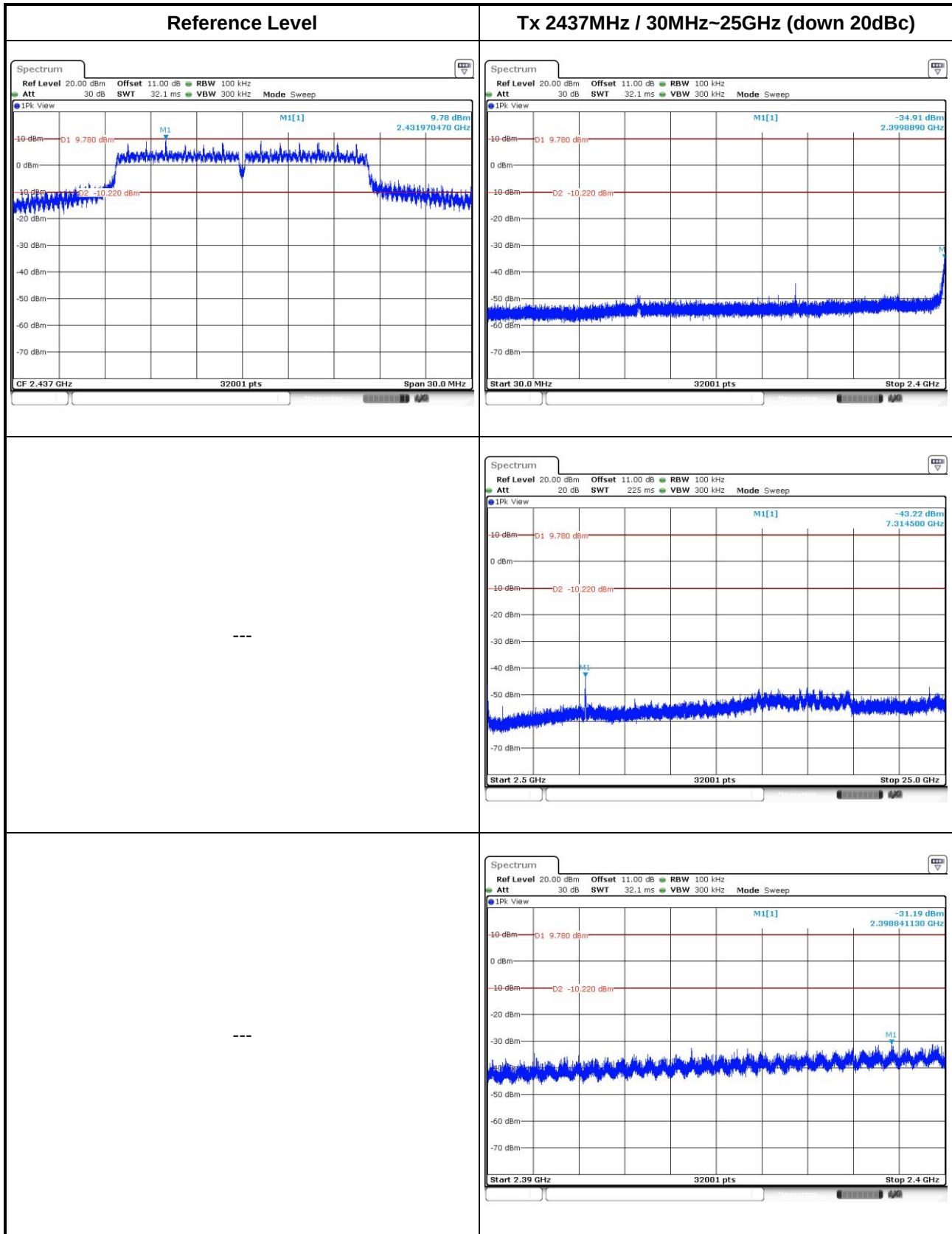




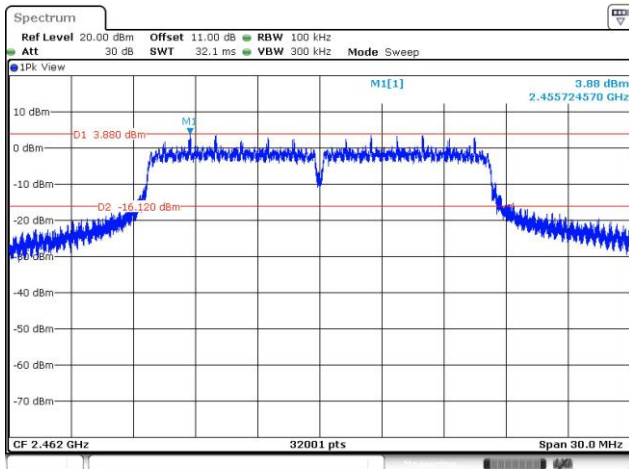


802.11g

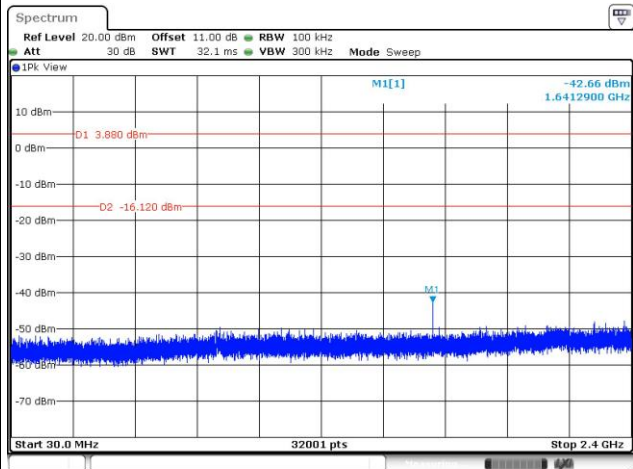


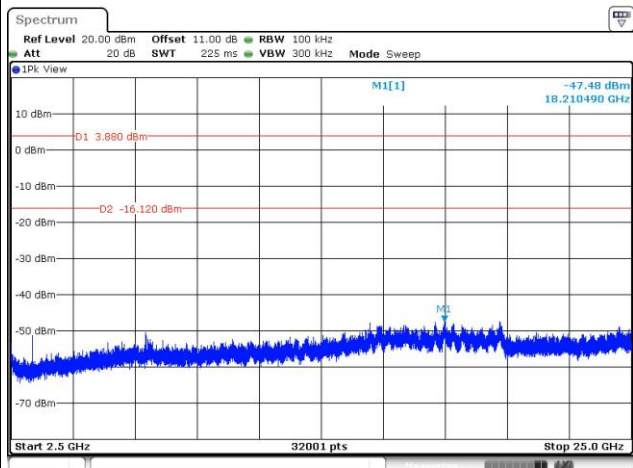


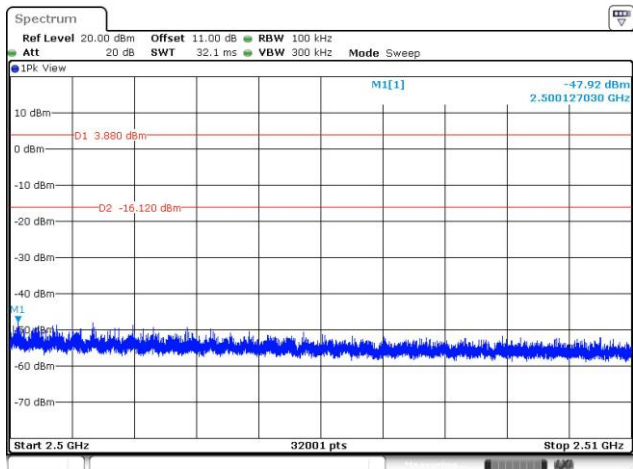
Reference Level



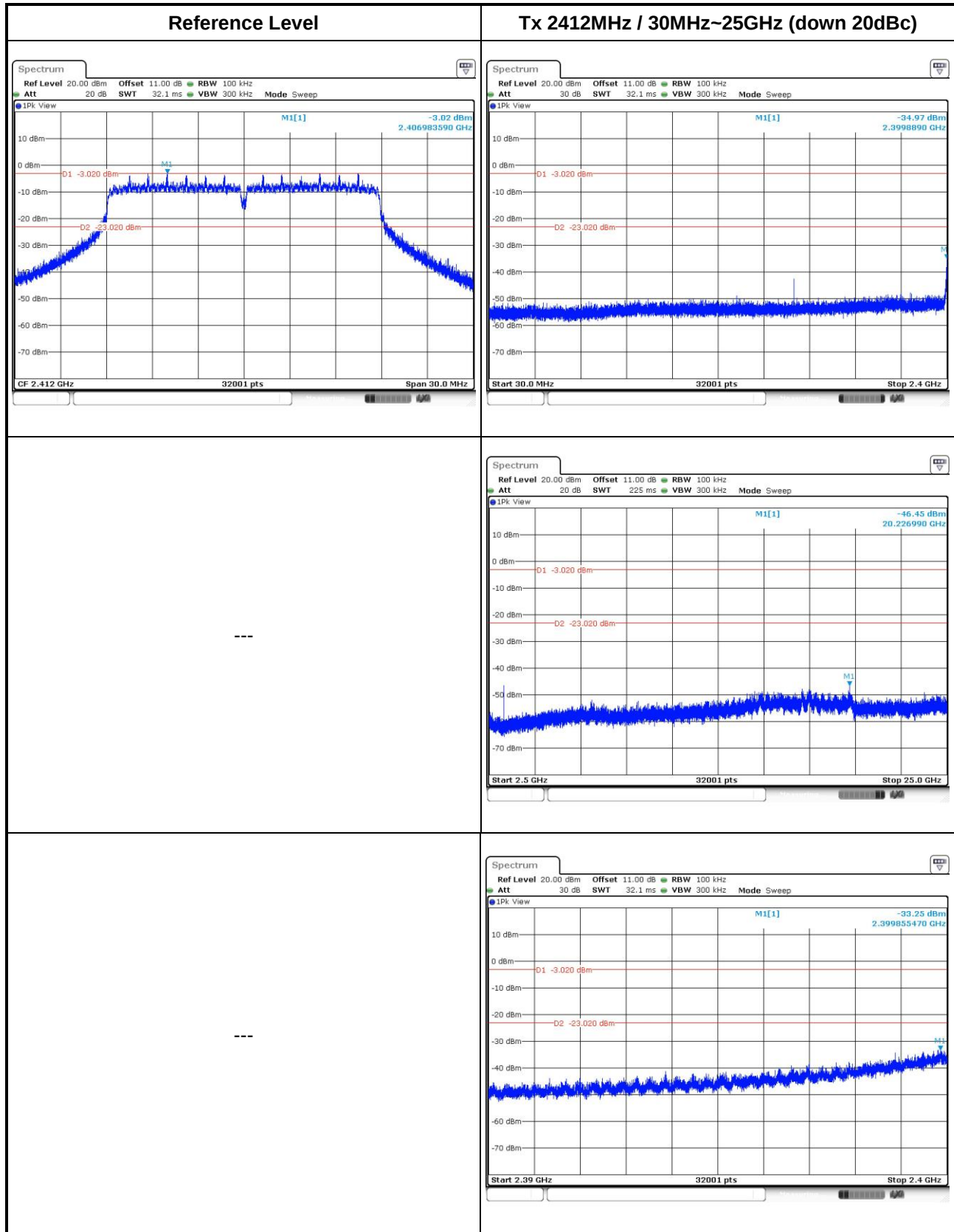
Tx 2462MHz / 30MHz~25GHz (down 20dBc)



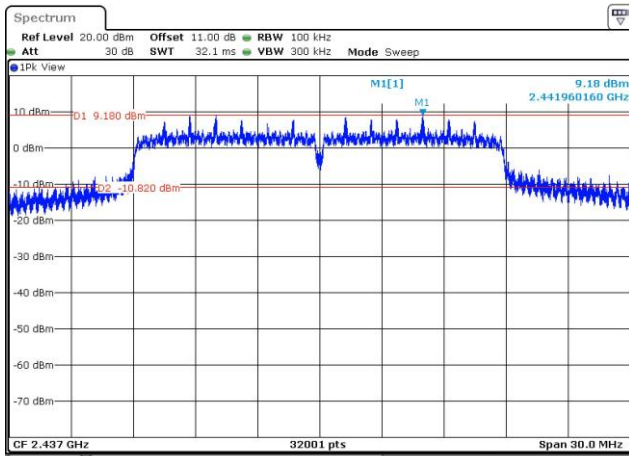




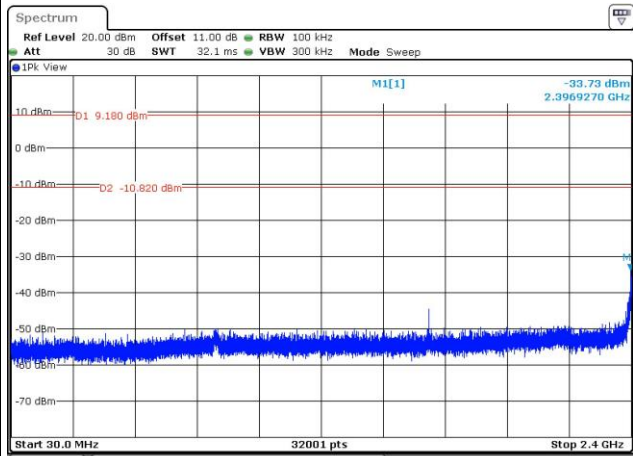
802.11n HT20

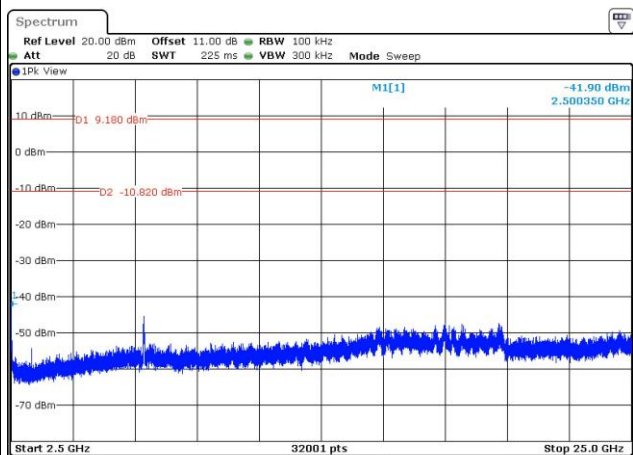


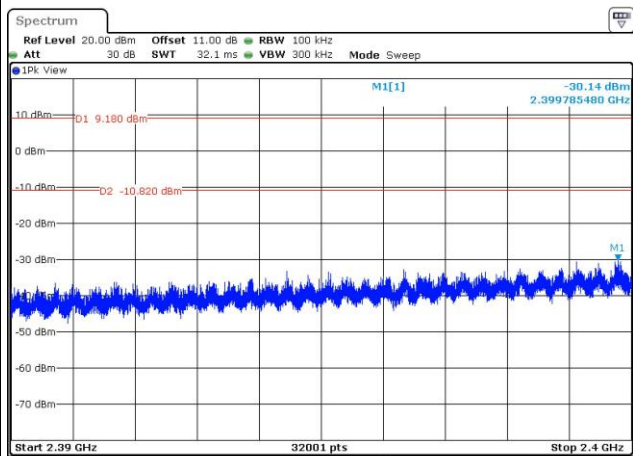
Reference Level



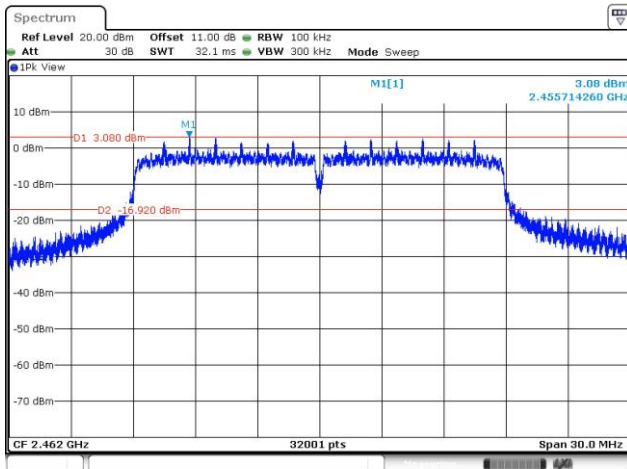
Tx 2437MHz / 30MHz~25GHz (down 20dBc)



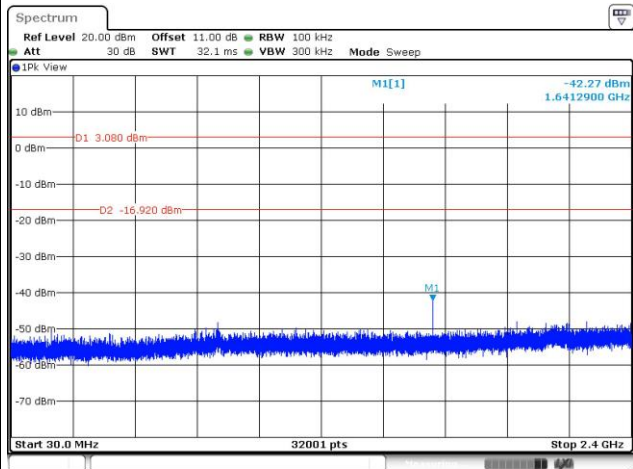


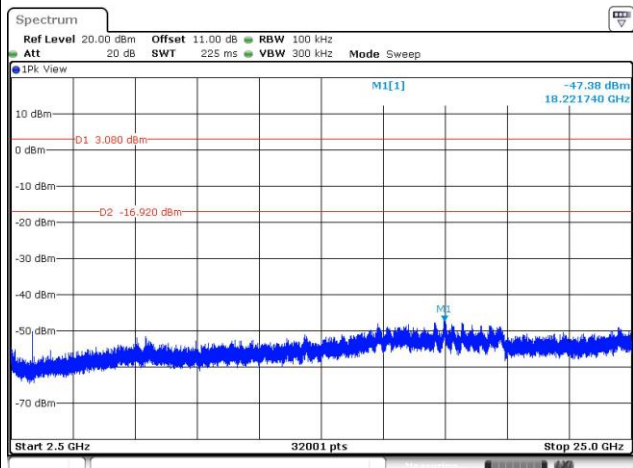


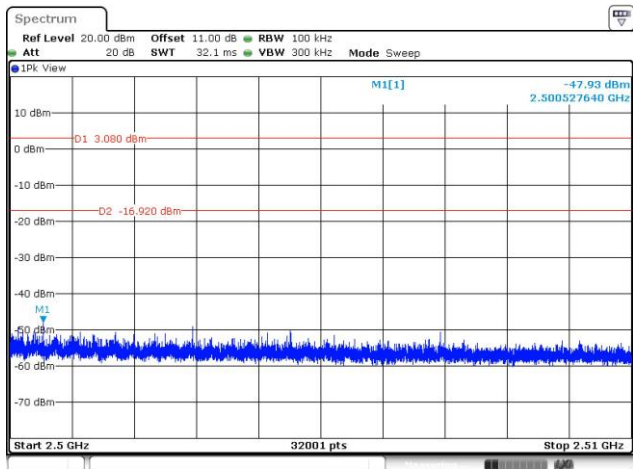
Reference Level



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







4 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, 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 Hsiang. Location map can be found on our website <http://www.icertifi.com.tw>.

Linkou

Tel: 886-2-2601-1640

No. 30-2, Ding Fwu Tsuen, Lin Kou
District, New Taipei City, Taiwan,
R.O.C.

Kwei Shan

Tel: 886-3-271-8666

No. 3-1, Lane 6, Wen San 3rd
St., Kwei Shan Hsiang, Tao Yuan
Hsien 333, Taiwan, R.O.C.

Kwei Shan Site II

Tel: 886-3-271-8640

No. 14-1, Lane 19, Wen San 3rd
St., Kwei Shan Hsiang, Tao Yuan
Hsien 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==