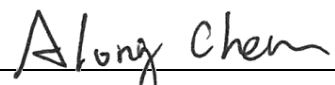


FCC Test Report

FCC ID : QIS-B2338-168IDU
Equipment : Indoor Dual Band Wi-Fi Router
Model No. : B2338-168IDU
Brand Name : Huawei
Applicant : Huawei Technologies Co., Ltd.
Address : Administration Building, Headquarters of
Huawei Technologies Co., Ltd., Bantian,
Longgang District, Shenzhen, 518129, China.
Standard : 47 CFR FCC Part 15.247
Received Date : Aug. 27, 2016
Tested Date : Sep. 14 ~ Oct. 25, 2016

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:

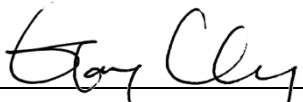

Gary Chang / Manager



Table of Contents

1	GENERAL DESCRIPTION	5
1.1	Information.....	5
1.2	Local Support Equipment List	8
1.3	Test Setup Chart	8
1.4	The Equipment List	9
1.5	Test Standards	11
1.6	Measurement Uncertainty	11
2	TEST CONFIGURATION	12
2.1	Testing Condition	12
2.2	The Worst Test Modes and Channel Details	12
3	TRANSMITTER TEST RESULTS.....	13
3.1	Conducted Emissions.....	13
3.2	6dB and Occupied Bandwidth	16
3.3	RF Output Power	19
3.4	Power Spectral Density	21
3.5	Unwanted Emissions into Restricted Frequency Bands	23
3.6	Emissions in Non-Restricted Frequency Bands.....	51
4	TEST LABORATORY INFORMATION	64

Release Record

Report No.	Version	Description	Issued Date
FR682701-02AC	Rev. 01	Initial issue	Mar. 01, 2017

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	Conducted Emissions	[dBuV]: 4.354MHz 43.83 (Margin -2.17dB) - AV	Pass
15.247(d) 15.209	Radiated Emissions	[dBuV/m at 3m]: 4874.00MHz 52.99 (Margin -1.01dB) – AV 2390.00MHz 52.99 (Margin -1.01dB) - AV	Pass
15.247(b)(3)	Maximum Output Power	Max Power [dBm]: 26.98	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 Product Details

The device B2338-168 / LTE Outdoor CPE = (B2338-168ODU) + (B2338-168IDU) is a product family consists of LTE Outdoor CPE + Indoor Dual Band Wi-Fi Router.

Brand name	Product name	Model name	FCC ID
Huawei	LTE Outdoor CPE	B2338-168ODU	QIS-B2338-168ODU
	Indoor Dual Band Wi-Fi Router	B2338-168IDU	QIS-B2338-168IDU

1.1.2 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 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.

1.1.3 Antenna Details

Ant. No.	Type	Connector	Operating Frequency (MHz) / Gain (dBi)		
			2400~2483.5	5150~5250	5725~5850
1	PIFA	N/A	2.5	3	3

1.1.4 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	56Vdc from adapter
-------------------	--------------------

1.1.5 Accessories

Accessories		
No.	Equipment	Description
1	Adapter	Brand Name: PHIHONG Model Name: PSAA30R-560 Power Rating: I/P: 100-240Vac, 0.8A, 50-60Hz O/P: 56Vdc, 0.536A Power Line: 1.46m non-shielded without core Efficiency Level: VI
2	Adapter	Brand Name: Gspell Model Name: G0753-560-054 Power Rating: I/P: 100-240Vac, 0.75A, 50/60Hz O/P: 56Vdc, 0.54A Power Line: 1.2m non-shielded without core Efficiency Level: VI
3	RJ45 cable	1.5m 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	QATool, version: 0.0.0.68		
Duty Cycle and Duty Factor	Mode	Duty cycle (%)	Duty factor (dB)
	11b	99.53%	0.02
	11g	94.97%	0.22
	HT20	92.07%	0.36
	HT40	85.53%	0.68

1.1.8 Power Setting

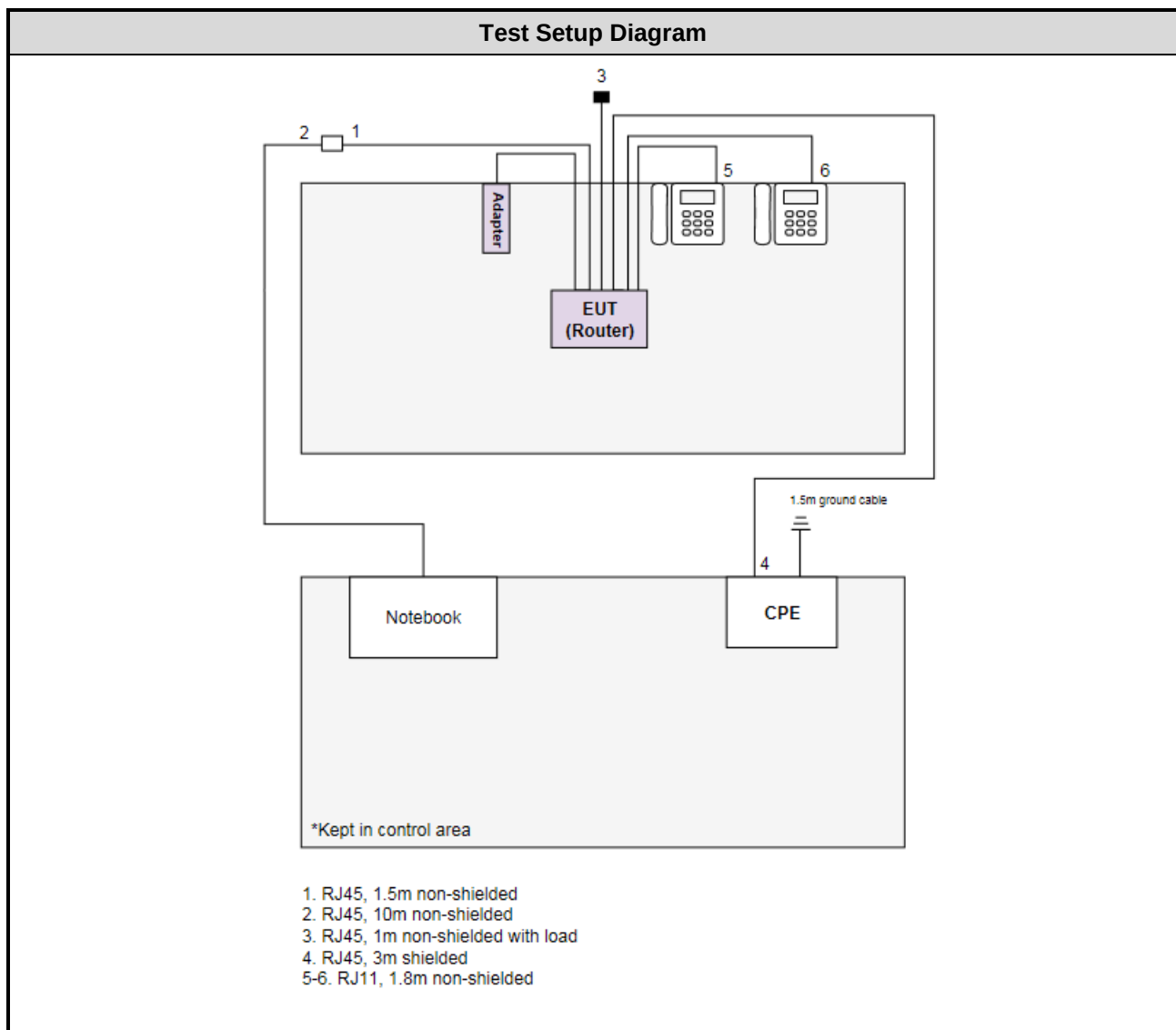
Modulation Mode	Test Frequency (MHz)	Power Set
11b	2412	20
11b	2437	25
11b	2462	26
11g	2412	21
11g	2437	28
11g	2462	20
HT20	2412	20
HT20	2437	28
HT20	2462	1F
HT40	2422	1A
HT40	2437	24
HT40	2452	1A

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 E6430	C0GB4X1	DoC	RJ45, 10m non-shielded
2	Telephone	HTT	HTT-806	187118	---	RJ11, 1.8m non-shielded
3	Telephone	HTT	HTT-806	188597	---	RJ11, 1.8m non-shielded
4	CPE	Huawei	B2338-168 ODU	---	---	RJ45, 3m shielded

Note: CPE is provided by applicant.

1.3 Test Setup Chart



1.4 The Equipment List

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Tested Date	Oct. 25, 2016				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Receiver	R&S	ESR3	101658	Nov. 04, 2015	Nov. 03, 2016
LISN	SCHWARZBECK	Schwarzbeck 8127	8127-667	Nov. 13, 2015	Nov. 12, 2016
RF Cable-CON	EMC	EMCCFD300-BM-BM-6000	50821	Dec. 21, 2015	Dec. 20, 2016
Measurement Software	AUDIX	e3	6.120210k	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	Radiated Emission				
Test Site	966 chamber 3 / (03CH03-WS)				
Tested Date	Sep. 14 ~ Sep. 19, 2016				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	Agilent	N9010A	MY53400091	Sep. 09, 2016	Sep. 08, 2017
Receiver	Agilent	N9038A	MY53290044	Oct. 14, 2015	Oct. 13, 2016
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-685	Apr. 26, 2016	Apr. 25, 2017
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1206	Feb. 24, 2016	Feb. 23, 2017
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 04, 2015	Nov. 03, 2016
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 16, 2015	Nov. 15, 2016
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Dec. 10, 2015	Dec. 09, 2016
Preamplifier	EMC	EMC02325	980187	Sep. 08, 2016	Sep. 07, 2017
Preamplifier	Agilent	83017A	MY53270014	Aug. 22, 2016	Aug. 21, 2017
Preamplifier	EMC	EMC184045B	980192	Aug. 24, 2016	Aug. 23, 2017
RF cable-3M	HUBER+SUHNER	SUCOFLEX104	MY22620/4	Feb. 05, 2016	Feb. 04, 2017
RF cable-8M	HUBER+SUHNER	SUCOFLEX104	MY22600/4	Feb. 05, 2016	Feb. 04, 2017
RF cable-1M	HUBER+SUHNER	SUCOFLEX104	MY22624/4	Feb. 05, 2016	Feb. 04, 2017
LF cable-0.8M	EMC	EMC8D-NM-NM-800	EMC8D-NM-NM-800-001	Feb. 05, 2016	Feb. 04, 2017
LF cable-3M	EMC	EMC8D-NM-NM-3000	131103	Feb. 05, 2016	Feb. 04, 2017
LF cable-13M	EMC	EMC8D-NM-NM-13000	131104	Feb. 05, 2016	Feb. 04, 2017
Measurement Software	AUDIX	e3	6.120210g	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	Radiated Emission				
Test Site	966 chamber 3 / (03CH03-WS)				
Tested Date	Oct. 21, 2016				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	Agilent	N9010A	MY53400091	Sep. 09, 2016	Sep. 08, 2017
Receiver	Agilent	N9038A	MY53290044	Oct. 06, 2016	Oct. 05, 2017
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-685	Apr. 26, 2016	Apr. 25, 2017
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1206	Feb. 24, 2016	Feb. 23, 2017
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 04, 2015	Nov. 03, 2016
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 16, 2015	Nov. 15, 2016
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Dec. 10, 2015	Dec. 09, 2016
Preamplifier	EMC	EMC02325	980187	Sep. 08, 2016	Sep. 07, 2017
Preamplifier	Agilent	83017A	MY53270014	Aug. 22, 2016	Aug. 21, 2017
Preamplifier	EMC	EMC184045B	980192	Aug. 24, 2016	Aug. 23, 2017
RF cable-3M	HUBER+SUHNER	SUCOFLEX104	MY22620/4	Feb. 05, 2016	Feb. 04, 2017
RF cable-8M	HUBER+SUHNER	SUCOFLEX104	MY22600/4	Feb. 05, 2016	Feb. 04, 2017
RF cable-1M	HUBER+SUHNER	SUCOFLEX104	MY22624/4	Feb. 05, 2016	Feb. 04, 2017
LF cable-0.8M	EMC	EMC8D-NM-NM-800	EMC8D-NM-NM-800-00 1	Feb. 05, 2016	Feb. 04, 2017
LF cable-3M	EMC	EMC8D-NM-NM-3000	131103	Feb. 05, 2016	Feb. 04, 2017
LF cable-13M	EMC	EMC8D-NM-NM-1300 0	131104	Feb. 05, 2016	Feb. 04, 2017
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	Oct. 04, 2016				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101063	Feb. 17, 2016	Feb. 16, 2017
Power Meter	Anritsu	ML2495A	1241001	Aug. 24, 2016	Aug. 23, 2017
Power Sensor	Anritsu	MA2411B	1207362	Aug. 24, 2016	Aug. 23, 2017
AC POWER SOURCE	APC	AFC-500W	F312060012	Oct. 26, 2015	Oct. 25, 2016
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.

47 CFR FCC Part 15.247

ANSI C63.10-2013

FCC KDB 558074 D01 DTS Meas Guidance v03r05

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	± 5.37 dB

2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
AC Conduction	CO01-WS	20°C / 68%	Howard Huang
Radiated Emissions	03CH03-WS	23°C / 64-66%	Aska Huang Vincent Yeh
RF Conducted	TH01-WS	22°C / 64%	Brad Wu

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

2.2 The Worst Test Modes and Channel Details

Test item	Modulation Mode	Test Frequency (MHz)	Data Rate (Mbps) / MCS	Test Configuration
Conducted Emissions	11g	2437	6 Mbps	---
Radiated Emissions ≤1GHz	11g	2437	6 Mbps	---
Radiated Emissions >1GHz	11b	2412 / 2437 / 2462	1 Mbps	---
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:

- 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. Note:
- Two adapters (PHIHONG & Gospell) had been covered during the pretest and found that PHIHONG adapter was the worst case and was selected for final test.

3 Transmitter Test Results

3.1 Conducted Emissions

3.1.1 Limit of Conducted Emissions

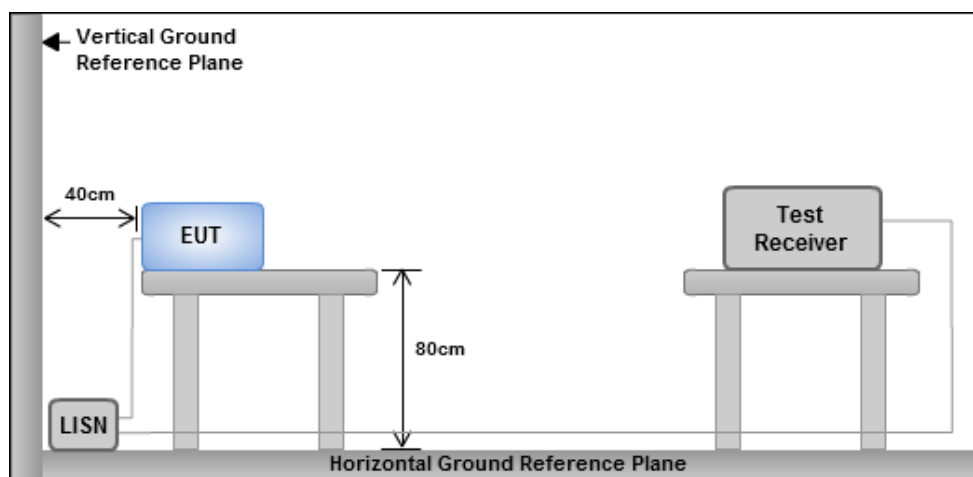
Conducted Emissions Limit		
Frequency Emission (MHz)	Quasi-Peak	Average
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50

Note 1: * Decreases with the logarithm of the frequency.

3.1.2 Test Procedures

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

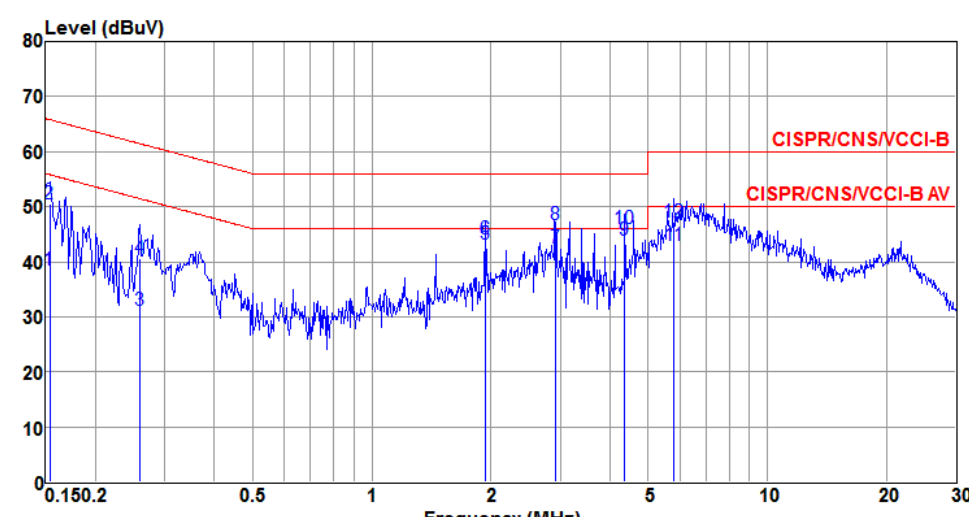
3.1.3 Test Setup



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

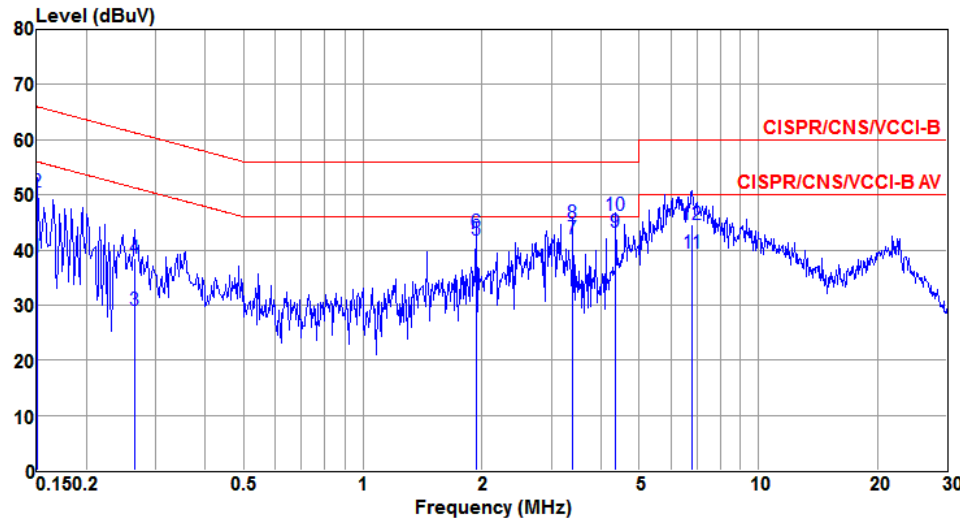
3.1.4 Test Result of Conducted Emissions

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



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.153	38.55	55.82	-17.27	37.65	0.88	0.02	Average
2	0.153	50.60	65.82	-15.22	49.70	0.88	0.02	QP
3	0.259	31.05	51.47	-20.42	30.81	0.22	0.02	Average
4	0.259	40.63	61.47	-20.84	40.39	0.22	0.02	QP
5	1.939	43.18	46.00	-2.82	42.50	0.60	0.08	Average
6	1.939	44.03	56.00	-11.97	43.35	0.60	0.08	QP
7	2.903	42.38	46.00	-3.62	41.85	0.43	0.10	Average
8	2.903	46.81	56.00	-9.19	46.28	0.43	0.10	QP
9	4.354	43.83	46.00	-2.17	43.41	0.30	0.12	Average
10	4.354	46.11	56.00	-9.89	45.69	0.30	0.12	QP
11	5.805	42.93	50.00	-7.07	42.36	0.43	0.14	Average
12	5.805	47.18	60.00	-12.82	46.61	0.43	0.14	QP

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

Modulation	11g	Test Freq. (MHz)	2437																																																																																																																																							
Power Phase	Neutral																																																																																																																																									
Level (dBuV)  Frequency (MHz) <table><thead><tr><th></th><th>Freq</th><th>Level</th><th>Limit</th><th>Over</th><th>Read</th><th>LISN</th><th>cable</th><th></th></tr><tr><th></th><th>MHz</th><th>dBuV</th><th>Line</th><th>Limit</th><th>Level</th><th>factor</th><th>loss</th><th>Remark</th></tr><tr><th></th><th></th><th></th><th>dBuV</th><th>dB</th><th>dBuV</th><th>dB</th><th>dB</th><th></th></tr></thead><tbody><tr><td>1</td><td>0.150</td><td>38.78</td><td>56.00</td><td>-17.22</td><td>37.91</td><td>0.85</td><td>0.02</td><td>Average</td></tr><tr><td>2</td><td>0.150</td><td>50.52</td><td>66.00</td><td>-15.48</td><td>49.65</td><td>0.85</td><td>0.02</td><td>QP</td></tr><tr><td>3</td><td>0.264</td><td>28.99</td><td>51.29</td><td>-22.30</td><td>28.77</td><td>0.20</td><td>0.02</td><td>Average</td></tr><tr><td>4</td><td>0.264</td><td>38.38</td><td>61.29</td><td>-22.91</td><td>38.16</td><td>0.20</td><td>0.02</td><td>QP</td></tr><tr><td>5</td><td>1.934</td><td>41.75</td><td>46.00</td><td>-4.25</td><td>41.45</td><td>0.22</td><td>0.08</td><td>Average</td></tr><tr><td>6</td><td>1.934</td><td>43.25</td><td>56.00</td><td>-12.75</td><td>42.95</td><td>0.22</td><td>0.08</td><td>QP</td></tr><tr><td>7</td><td>3.389</td><td>42.12</td><td>46.00</td><td>-3.88</td><td>41.40</td><td>0.61</td><td>0.11</td><td>Average</td></tr><tr><td>8</td><td>3.389</td><td>44.88</td><td>56.00</td><td>-11.12</td><td>44.16</td><td>0.61</td><td>0.11</td><td>QP</td></tr><tr><td>9@</td><td>4.355</td><td>43.11</td><td>46.00</td><td>-2.89</td><td>42.27</td><td>0.72</td><td>0.12</td><td>Average</td></tr><tr><td>10</td><td>4.355</td><td>46.18</td><td>56.00</td><td>-9.82</td><td>45.34</td><td>0.72</td><td>0.12</td><td>QP</td></tr><tr><td>11</td><td>6.805</td><td>39.33</td><td>50.00</td><td>-10.67</td><td>38.58</td><td>0.61</td><td>0.14</td><td>Average</td></tr><tr><td>12</td><td>6.805</td><td>44.58</td><td>60.00</td><td>-15.42</td><td>43.83</td><td>0.61</td><td>0.14</td><td>QP</td></tr></tbody></table>					Freq	Level	Limit	Over	Read	LISN	cable			MHz	dBuV	Line	Limit	Level	factor	loss	Remark				dBuV	dB	dBuV	dB	dB		1	0.150	38.78	56.00	-17.22	37.91	0.85	0.02	Average	2	0.150	50.52	66.00	-15.48	49.65	0.85	0.02	QP	3	0.264	28.99	51.29	-22.30	28.77	0.20	0.02	Average	4	0.264	38.38	61.29	-22.91	38.16	0.20	0.02	QP	5	1.934	41.75	46.00	-4.25	41.45	0.22	0.08	Average	6	1.934	43.25	56.00	-12.75	42.95	0.22	0.08	QP	7	3.389	42.12	46.00	-3.88	41.40	0.61	0.11	Average	8	3.389	44.88	56.00	-11.12	44.16	0.61	0.11	QP	9@	4.355	43.11	46.00	-2.89	42.27	0.72	0.12	Average	10	4.355	46.18	56.00	-9.82	45.34	0.72	0.12	QP	11	6.805	39.33	50.00	-10.67	38.58	0.61	0.14	Average	12	6.805	44.58	60.00	-15.42	43.83	0.61	0.14	QP
	Freq	Level	Limit	Over	Read	LISN	cable																																																																																																																																			
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11	6.805	39.33	50.00	-10.67	38.58	0.61	0.14	Average																																																																																																																																		
12	6.805	44.58	60.00	-15.42	43.83	0.61	0.14	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

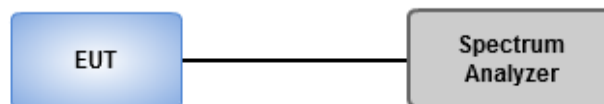
6dB Bandwidth

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.

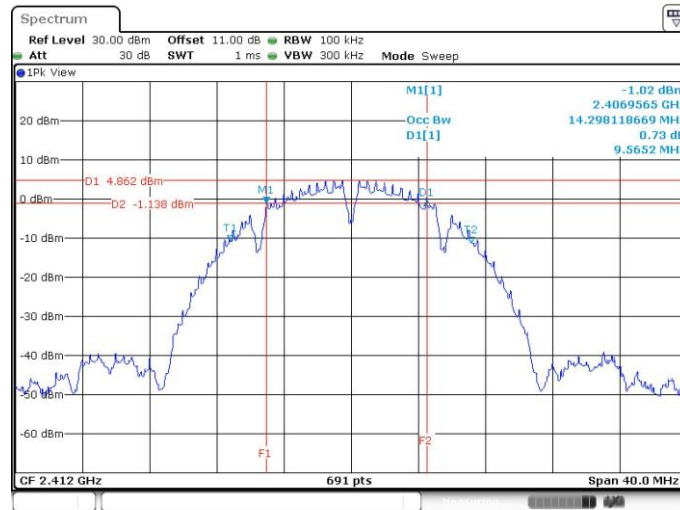
3.2.3 Test Setup



3.2.4 Test Result of 6dB and Occupied Bandwidth

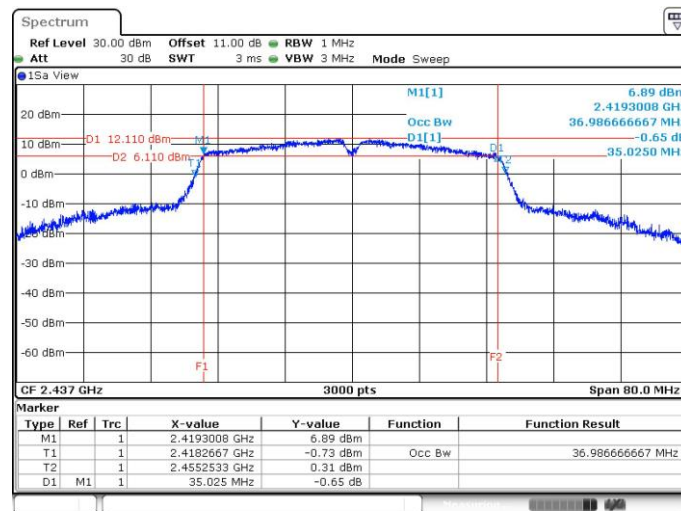
Modulation Mode	N _{TX}	Freq. (MHz)	6dB Bandwidth (MHz)				Limit (kHz)
			Chain 0	Chain 1	Chain 2	Chain 3	
11b	2	2412	10.03	9.57	---	---	500
11b	2	2437	10.03	10.03	---	---	500
11b	2	2462	10.03	10.03	---	---	500
11g	2	2412	15.07	15.71	---	---	500
11g	2	2437	15.13	15.07	---	---	500
11g	2	2462	15.13	15.13	---	---	500
HT20	2	2412	15.13	16.52	---	---	500
HT20	2	2437	15.13	15.13	---	---	500
HT20	2	2462	15.13	14.67	---	---	500
HT40	2	2422	35.01	35.01	---	---	500
HT40	2	2437	35.01	35.01	---	---	500
HT40	2	2452	35.13	35.01	---	---	500

Worst Plot



Modulation Mode	N _{TX}	Freq. (MHz)	99% Occupied Bandwidth (MHz)			
			Chain 0	Chain 1	Chain 2	Chain 3
11b	2	2412	14.61	14.27	---	---
11b	2	2437	15.01	14.41	---	---
11b	2	2462	15.12	14.43	---	---
11g	2	2412	17.07	16.48	---	---
11g	2	2437	21.81	16.96	---	---
11g	2	2462	17.04	16.44	---	---
HT20	2	2412	17.89	17.53	---	---
HT20	2	2437	22.87	18.03	---	---
HT20	2	2462	17.87	17.52	---	---
HT40	2	2422	36.03	36.19	---	---
HT40	2	2437	36.99	36.32	---	---
HT40	2	2452	36.03	36.16	---	---

Worst Plot



3.3 RF Output Power

3.3.1 Limit of RF Output Power

Conducted power shall not exceed 1Watt.

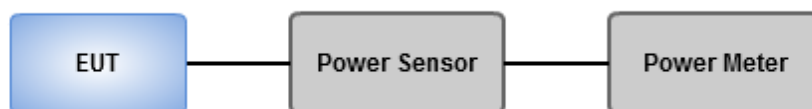
- ☒ Antenna gain $\leq 6\text{dBi}$, no any corresponding reduction is in output power limit.
- ☐ Antenna gain $> 6\text{dBi}$
 - ☐ Non Fixed, point to point operations.
The conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna 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 (For reference only)
 - ☒ **Power meter**
 1. A broadband Average RF power meter is used for output power measurement. The video bandwidth of power meter is greater than DTS bandwidth of EUT. If duty cycle of test signal is not 100 %, trigger and gating function of power meter will be enabled to capture transmission burst for measuring output power.

3.3.3 Test Setup



3.3.4 Test Result of Maximum Output Power

Modulation Mode	N _{TX}	Freq. (MHz)	Peak conducted Output Power (dBm)							Ant. Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)
			Chain 0	Chain 1	Chain 2	Chain 3	Total Power (mW)	Total Power (dBm)	Limit (dBm)			
11b	2	2412	17.89	17.30	---	---	115.221	20.62	30.00	2.5	23.12	36.00
11b	2	2437	20.11	19.91	---	---	200.514	23.02	30.00	2.5	25.52	36.00
11b	2	2462	20.40	20.42	---	---	219.802	23.42	30.00	2.5	25.92	36.00
11g	2	2412	22.19	23.09	---	---	369.281	25.67	30.00	2.5	28.17	36.00
11g	2	2437	23.28	24.56	---	---	498.573	26.98	30.00	2.5	29.48	36.00
11g	2	2462	21.70	22.61	---	---	330.300	25.19	30.00	2.5	27.69	36.00
HT20	2	2412	21.90	22.80	---	---	345.428	25.38	30.00	2.5	27.88	36.00
HT20	2	2437	23.20	24.54	---	---	493.376	26.93	30.00	2.5	29.43	36.00
HT20	2	2462	21.53	22.46	---	---	318.430	25.03	30.00	2.5	27.53	36.00
HT40	2	2422	19.97	19.87	---	---	196.363	22.93	30.00	2.5	25.43	36.00
HT40	2	2437	22.42	23.40	---	---	393.358	25.95	30.00	2.5	28.45	36.00
HT40	2	2452	19.89	20.33	---	---	205.394	23.13	30.00	2.5	25.63	36.00

Modulation Mode	N _{TX}	Freq. (MHz)	Conducted (Average) Output Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)
			Chain 0	Chain 1	Chain 2	Chain 3			
11b	2	2412	16.08	15.41	---	---	75.304	18.77	---
11b	2	2437	18.40	18.05	---	---	133.009	21.24	---
11b	2	2462	18.74	18.55	---	---	146.431	21.66	---
11g	2	2412	16.58	16.26	---	---	87.766	19.43	---
11g	2	2437	19.43	19.57	---	---	178.273	22.51	---
11g	2	2462	16.02	15.59	---	---	76.219	18.82	---
HT20	2	2412	15.95	15.67	---	---	76.253	18.82	---
HT20	2	2437	19.29	19.40	---	---	172.014	22.36	---
HT20	2	2462	15.30	15.20	---	---	66.998	18.26	---
HT40	2	2422	12.84	12.30	---	---	36.213	15.59	---
HT40	2	2437	17.57	17.35	---	---	111.473	20.47	---
HT40	2	2452	12.83	12.28	---	---	36.091	15.57	---

Note: Conducted average output power is for reference only.

3.4 Power Spectral Density

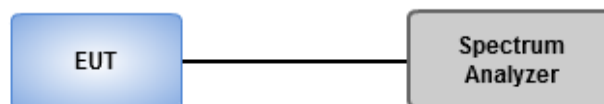
3.4.1 Limit of Power Spectral Density

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.

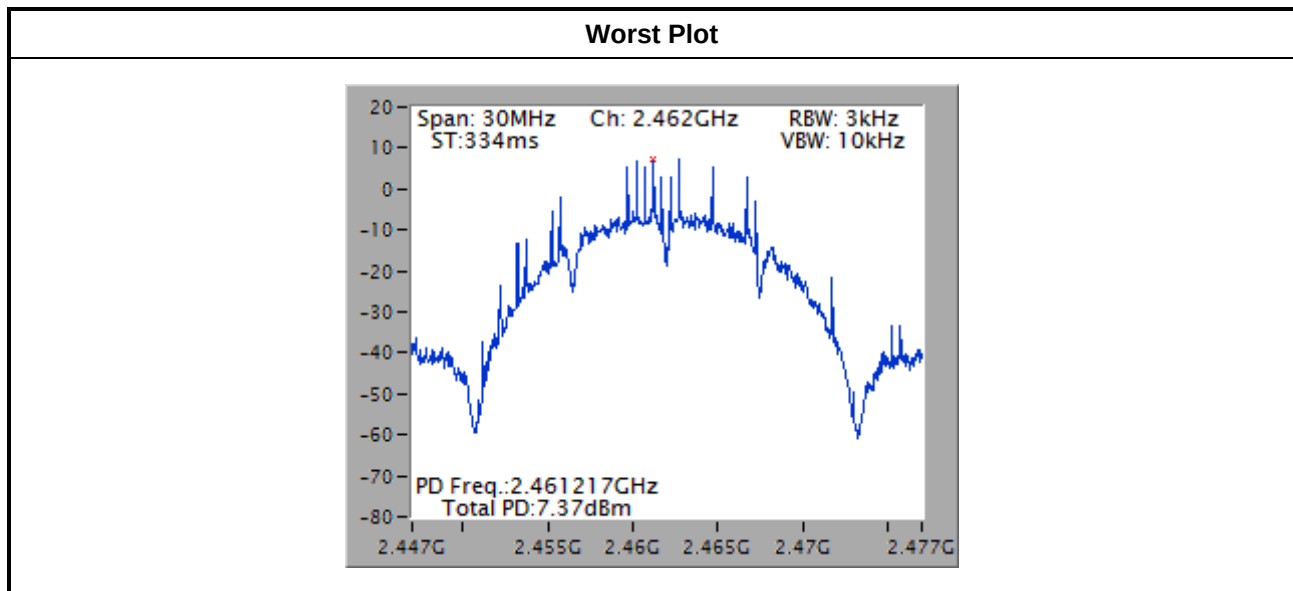
3.4.3 Test Setup



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	4.88	8.00
11b	2	2437	5.95	8.00
11b	2	2462	7.37	8.00
11g	2	2412	-7.07	8.00
11g	2	2437	-4.12	8.00
11g	2	2462	-8.10	8.00
HT20	2	2412	-7.83	8.00
HT20	2	2437	-4.23	8.00
HT20	2	2462	-7.68	8.00
HT40	2	2422	-14.13	8.00
HT40	2	2437	-9.33	8.00
HT40	2	2452	-13.83	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

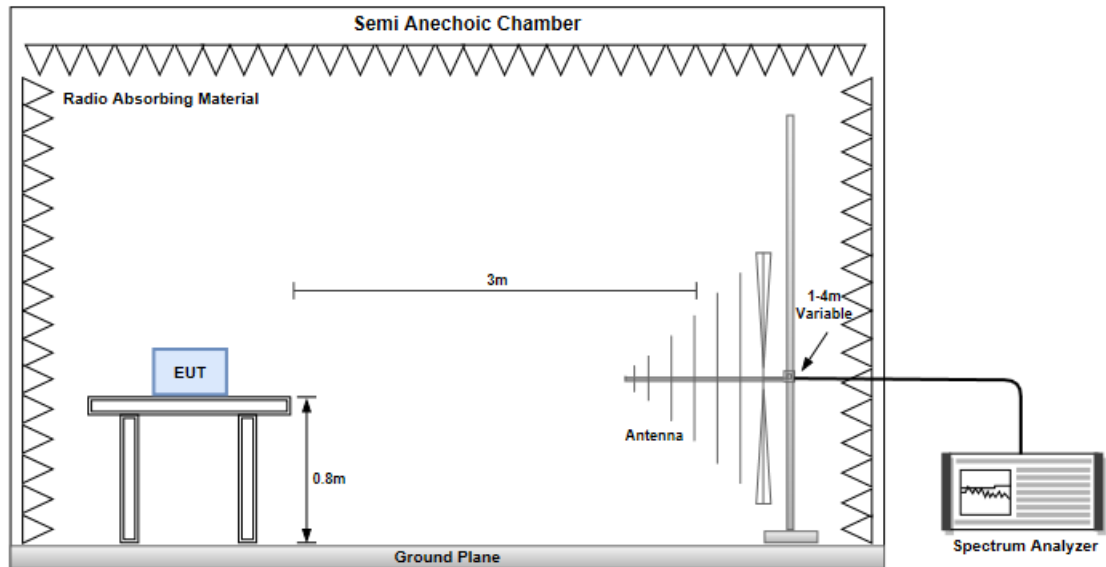
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission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

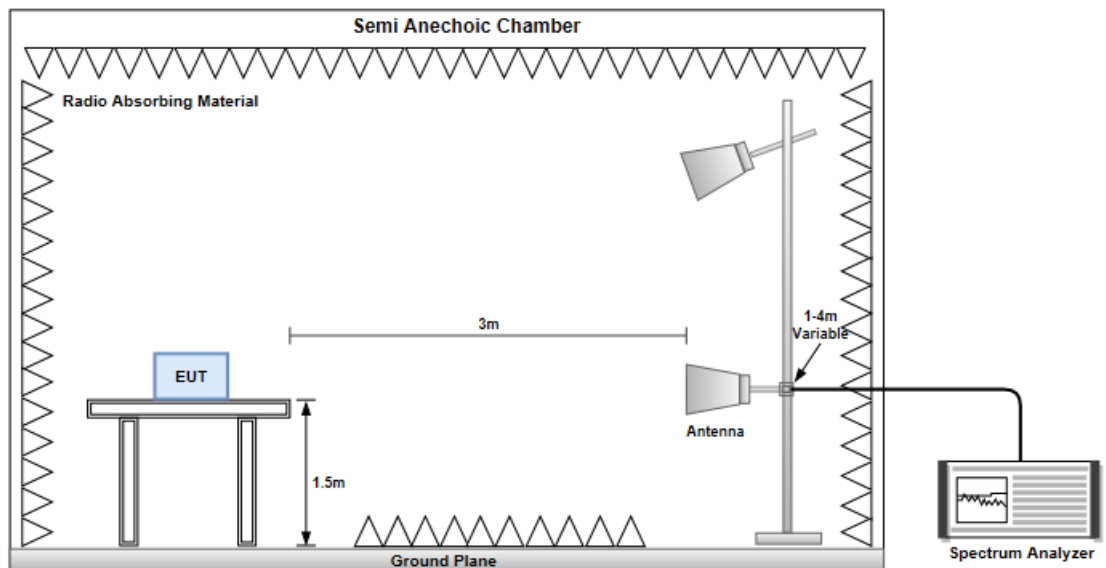
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above 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	11g	Test Freq. (MHz)	2437
Polarization	Horizontal		
Level (dBuV/m)			

Modulation	11g	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		
Level (dBuV/m) <			

Modulation	11b	Test Freq. (MHz)	2412
Polarization	Vertical		
Level (dBUV/m) </			

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

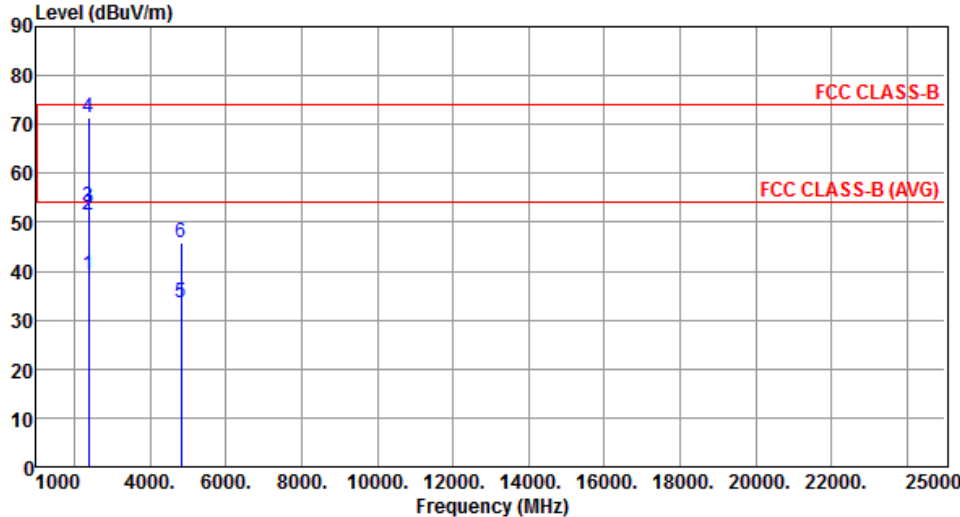
Modulation	11b	Test Freq. (MHz)	2437
Polarization	Vertical		
Level (dBuV/m) </			

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		

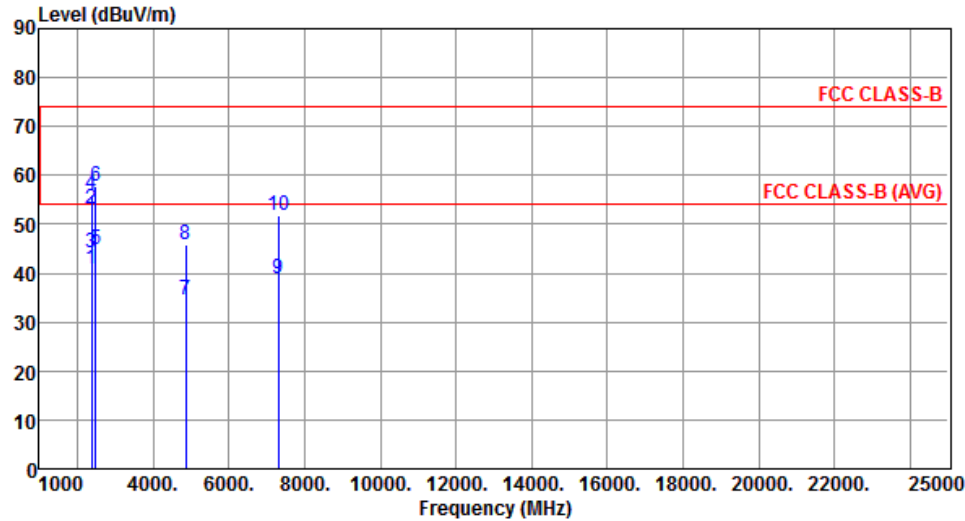


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2375.00	39.35	54.00	-14.65	40.53	-1.18	Average	100	308
2	2375.00	51.38	74.00	-22.62	52.56	-1.18	Peak	100	308
3	2390.00	52.99	54.00	-1.01	54.10	-1.11	Average	100	308
4	2390.00	71.53	74.00	-2.47	72.64	-1.11	Peak	100	308
5	4824.00	33.47	54.00	-20.53	28.16	5.31	Average	100	153
6	4824.00	45.69	74.00	-28.31	40.38	5.31	Peak	100	153

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		
Level (dBuV/m)			

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



	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2375.00	40.76	54.00	-13.24	41.94	-1.18	Average	100	286
2	2375.00	53.05	74.00	-20.95	54.23	-1.18	Peak	100	286
3	2390.00	44.01	54.00	-9.99	45.12	-1.11	Average	100	286
4	2390.00	56.10	74.00	-17.90	57.21	-1.11	Peak	100	286
5	2483.50	44.69	54.00	-9.31	45.31	-0.62	Average	100	286
6	2483.50	57.88	74.00	-16.12	58.50	-0.62	Peak	100	286
7	4874.00	34.67	54.00	-19.33	29.24	5.43	Average	100	216
8	4874.00	45.91	74.00	-28.09	40.48	5.43	Peak	100	216
9	7311.00	38.88	54.00	-15.12	28.62	10.26	Average	100	168
10	7311.00	51.69	74.00	-22.31	41.43	10.26	Peak	100	168

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

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

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

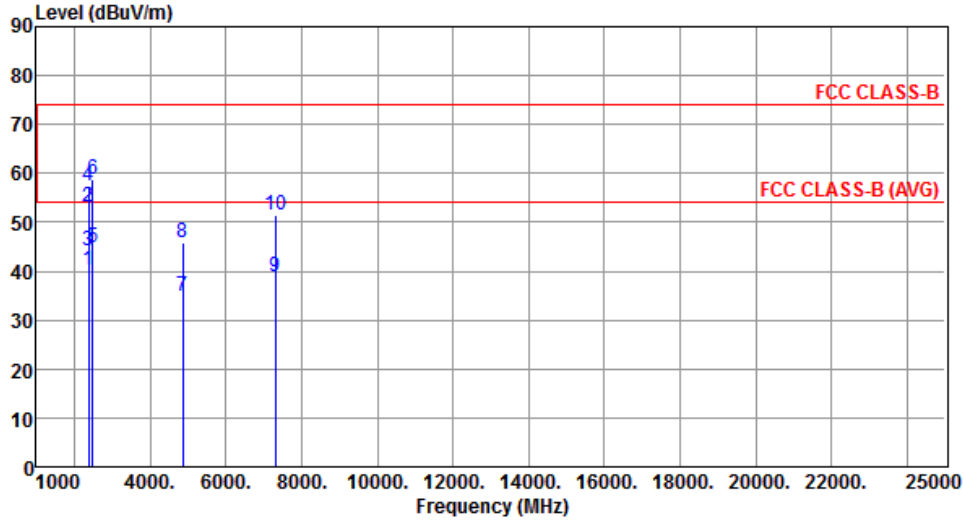
Modulation	11g	Test Freq. (MHz)	2462
Polarization	Vertical		
Level (dBUV/m) <			

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) 90 80 70 60 50 40 30 20 10 0 1 2 3 4 5 6 1000 4000 6000 8000 10000 12000 14000 16000 18000 20000 22000 25000 Frequency (MHz) FCC CLASS-B FCC CLASS-B (AVG) <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>2375.00</td><td>44.13</td><td>54.00</td><td>-9.87</td><td>45.31</td><td>-1.18</td><td>Average</td><td>100</td><td>3</td></tr><tr><td>2</td><td>2375.00</td><td>54.29</td><td>74.00</td><td>-19.71</td><td>55.47</td><td>-1.18</td><td>Peak</td><td>100</td><td>3</td></tr><tr><td>3</td><td>2390.00</td><td>50.33</td><td>54.00</td><td>-3.67</td><td>51.44</td><td>-1.11</td><td>Average</td><td>100</td><td>54</td></tr><tr><td>4</td><td>2390.00</td><td>68.45</td><td>74.00</td><td>-5.55</td><td>69.56</td><td>-1.11</td><td>Peak</td><td>100</td><td>54</td></tr><tr><td>5</td><td>4824.00</td><td>36.96</td><td>54.00</td><td>-17.04</td><td>31.65</td><td>5.31</td><td>Average</td><td>222</td><td>21</td></tr><tr><td>6</td><td>4824.00</td><td>49.27</td><td>74.00</td><td>-24.73</td><td>43.96</td><td>5.31</td><td>Peak</td><td>222</td><td>21</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	2375.00	44.13	54.00	-9.87	45.31	-1.18	Average	100	3	2	2375.00	54.29	74.00	-19.71	55.47	-1.18	Peak	100	3	3	2390.00	50.33	54.00	-3.67	51.44	-1.11	Average	100	54	4	2390.00	68.45	74.00	-5.55	69.56	-1.11	Peak	100	54	5	4824.00	36.96	54.00	-17.04	31.65	5.31	Average	222	21	6	4824.00	49.27	74.00	-24.73	43.96	5.31	Peak	222	21
	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg																																																																
1	2375.00	44.13	54.00	-9.87	45.31	-1.18	Average	100	3																																																																
2	2375.00	54.29	74.00	-19.71	55.47	-1.18	Peak	100	3																																																																
3	2390.00	50.33	54.00	-3.67	51.44	-1.11	Average	100	54																																																																
4	2390.00	68.45	74.00	-5.55	69.56	-1.11	Peak	100	54																																																																
5	4824.00	36.96	54.00	-17.04	31.65	5.31	Average	222	21																																																																
6	4824.00	49.27	74.00	-24.73	43.96	5.31	Peak	222	21																																																																
Note 1: Emission Level (dBUV/m) = SA Reading (dBUV/m) + Factor* (dB) *Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBUV/m) – Limit (dBUV/m).																																																																									

Modulation	HT20	Test Freq. (MHz)	2437
Polarization	Horizontal		



	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn
	MHz	level	dBuV/m	dB	reading	dB		High	Table
		dBuV/m			dBuV			cm	deg
1	2375.00	40.13	54.00	-13.87	41.31	-1.18	Average	100	285
2	2375.00	52.98	74.00	-21.02	54.16	-1.18	Peak	100	285
3	2390.00	44.15	54.00	-9.85	45.26	-1.11	Average	100	285
4	2390.00	57.34	74.00	-16.66	58.45	-1.11	Peak	100	285
5	2483.50	44.87	54.00	-9.13	45.49	-0.62	Average	100	285
6	2483.50	58.69	74.00	-15.31	59.31	-0.62	Peak	100	285
7	4874.00	34.87	54.00	-19.13	29.44	5.43	Average	100	215
8	4874.00	45.96	74.00	-28.04	40.53	5.43	Peak	100	215
9	7311.00	38.70	54.00	-15.30	28.44	10.26	Average	100	165
10	7311.00	51.54	74.00	-22.46	41.28	10.26	Peak	100	165

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

Modulation	HT20	Test Freq. (MHz)	2437
Polarization	Vertical		
Level (dBuV/m)			

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

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

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

Modulation	HT40	Test Freq. (MHz)	2422
Polarization	Horizontal		
Level (dBUV/m)			

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

Modulation	HT40	Test Freq. (MHz)	2437
Polarization	Horizontal		
Level (dBuV/m) <			

Modulation	HT40	Test Freq. (MHz)	2437
Polarization	Vertical		
Level (dBuV/m) </			

Modulation	HT40	Test Freq. (MHz)	2452
Polarization	Horizontal		
Level (dBuV/m)			

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 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

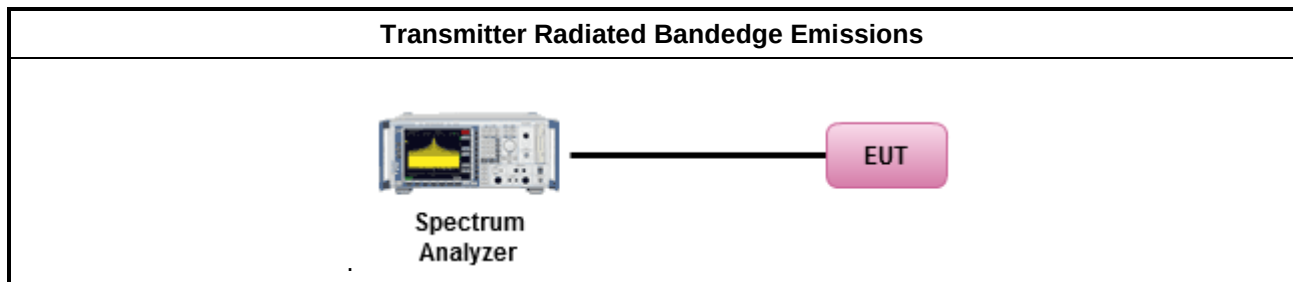
Reference level measurement

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

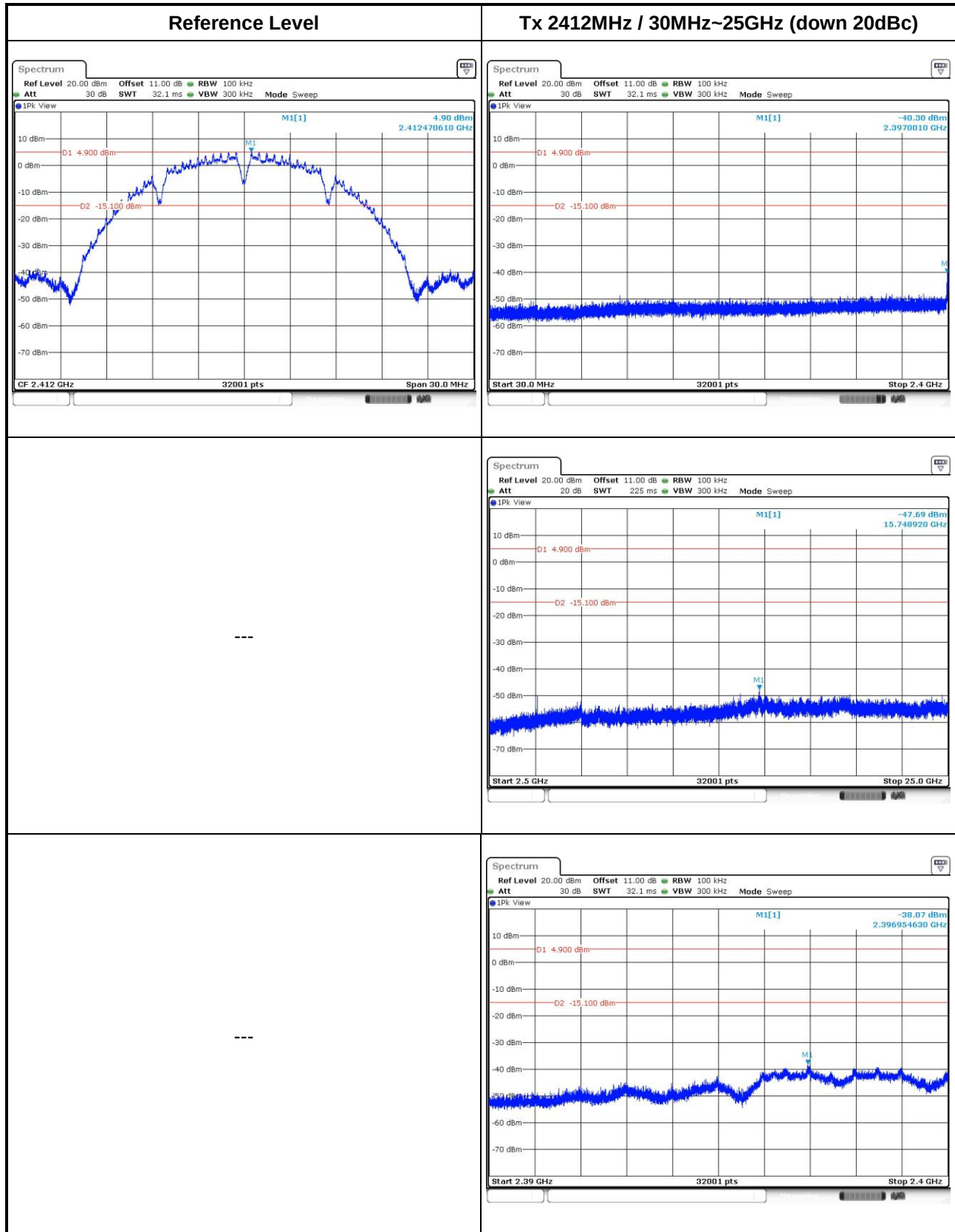


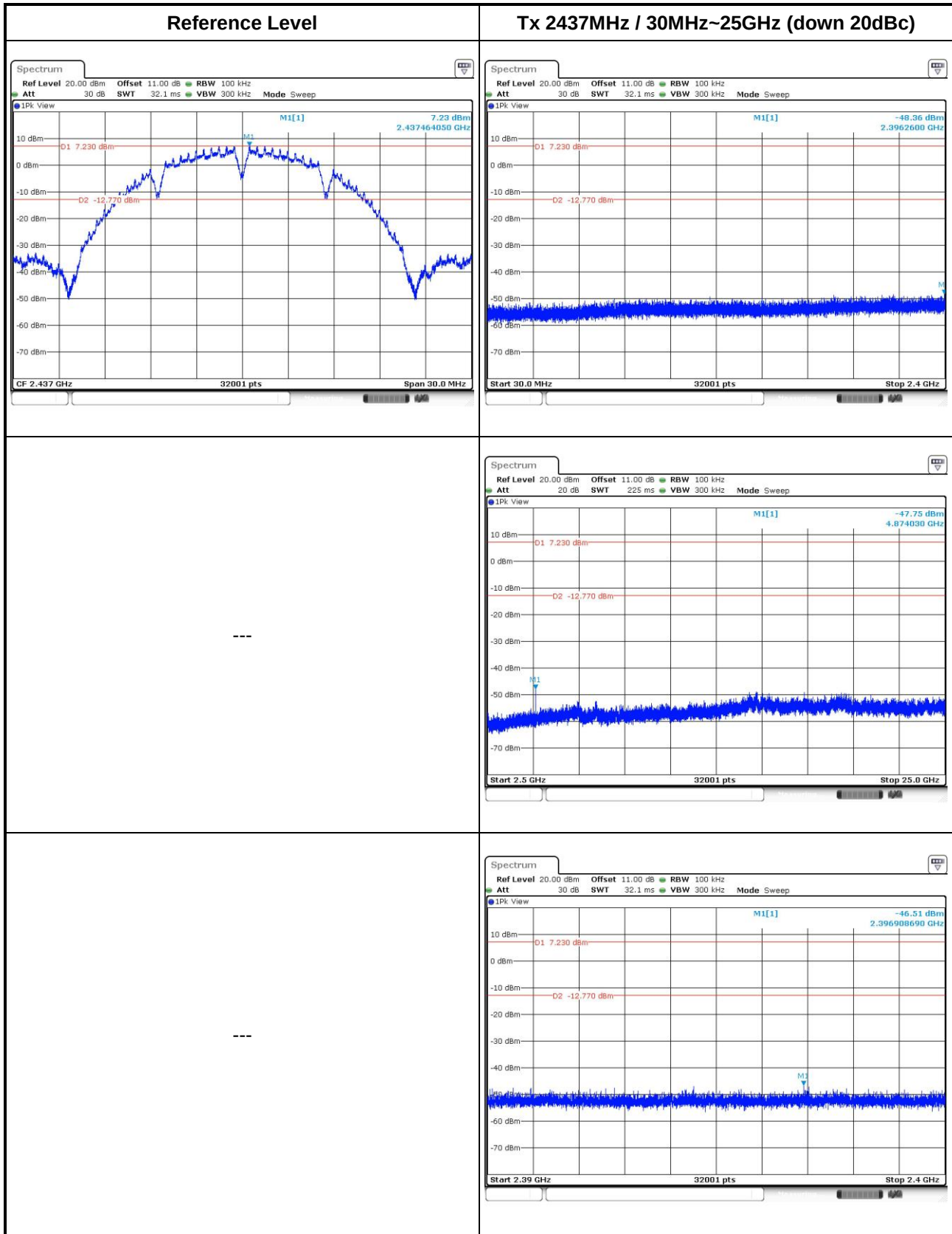
3.6.5 Test Result of Emissions in non-restricted frequency bands

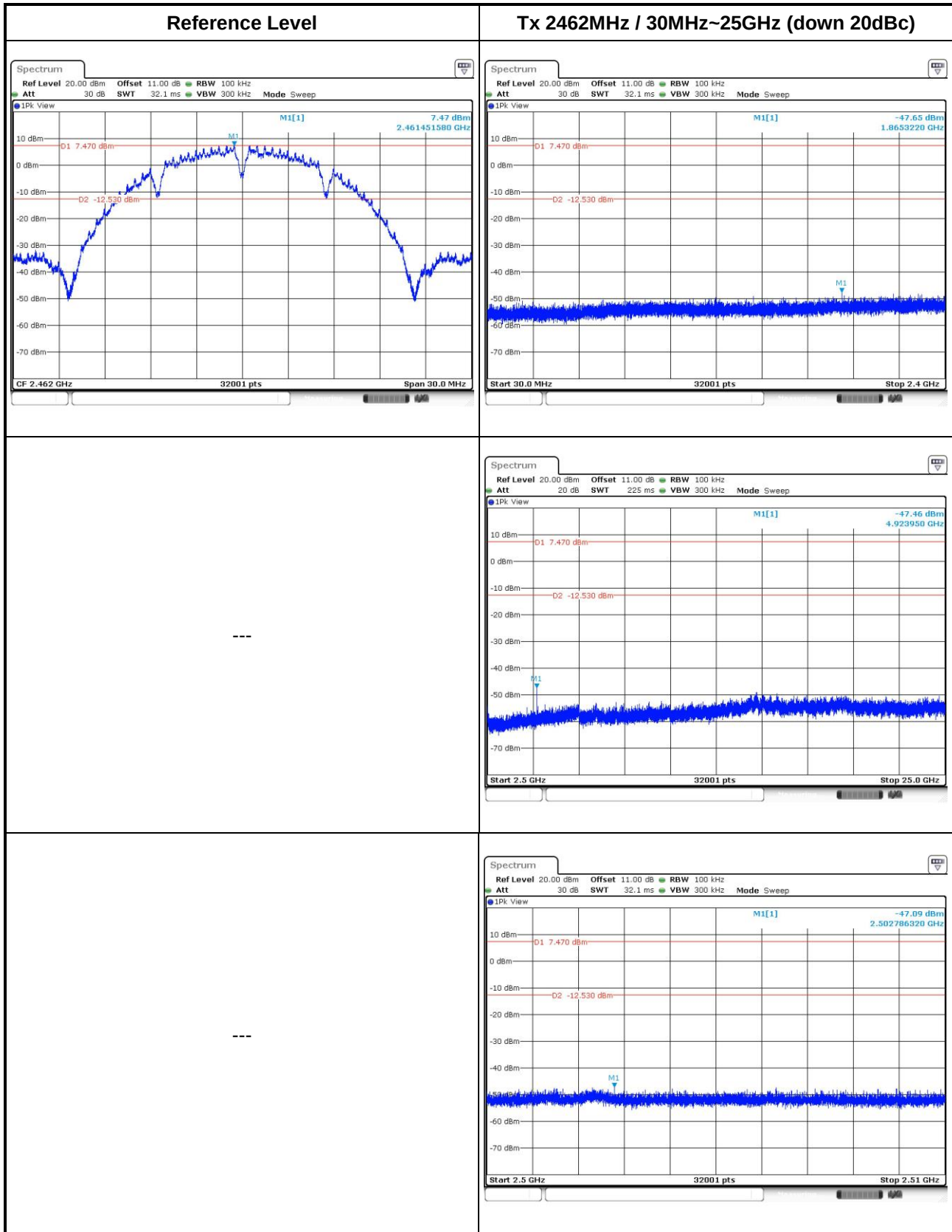
This test item is performed on each TX output individually without summing or adding $10 \log(N_{ANT})$ since measurements are made relative to the in-band emissions on the individual outputs. Only worst test result of each operating mode is presented.

3.6.6 Unwanted Emissions into Non-Restricted Frequency Bands

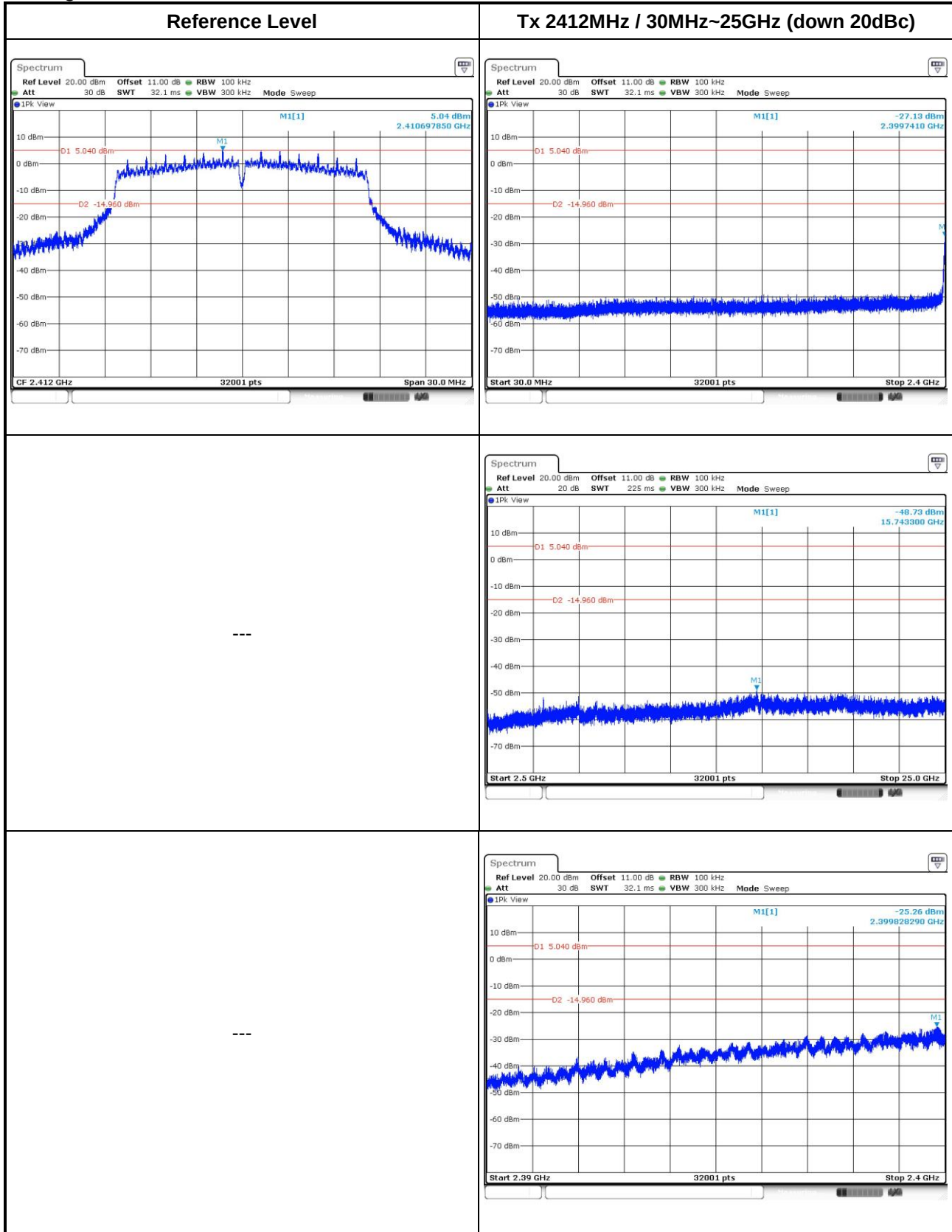
802.11b

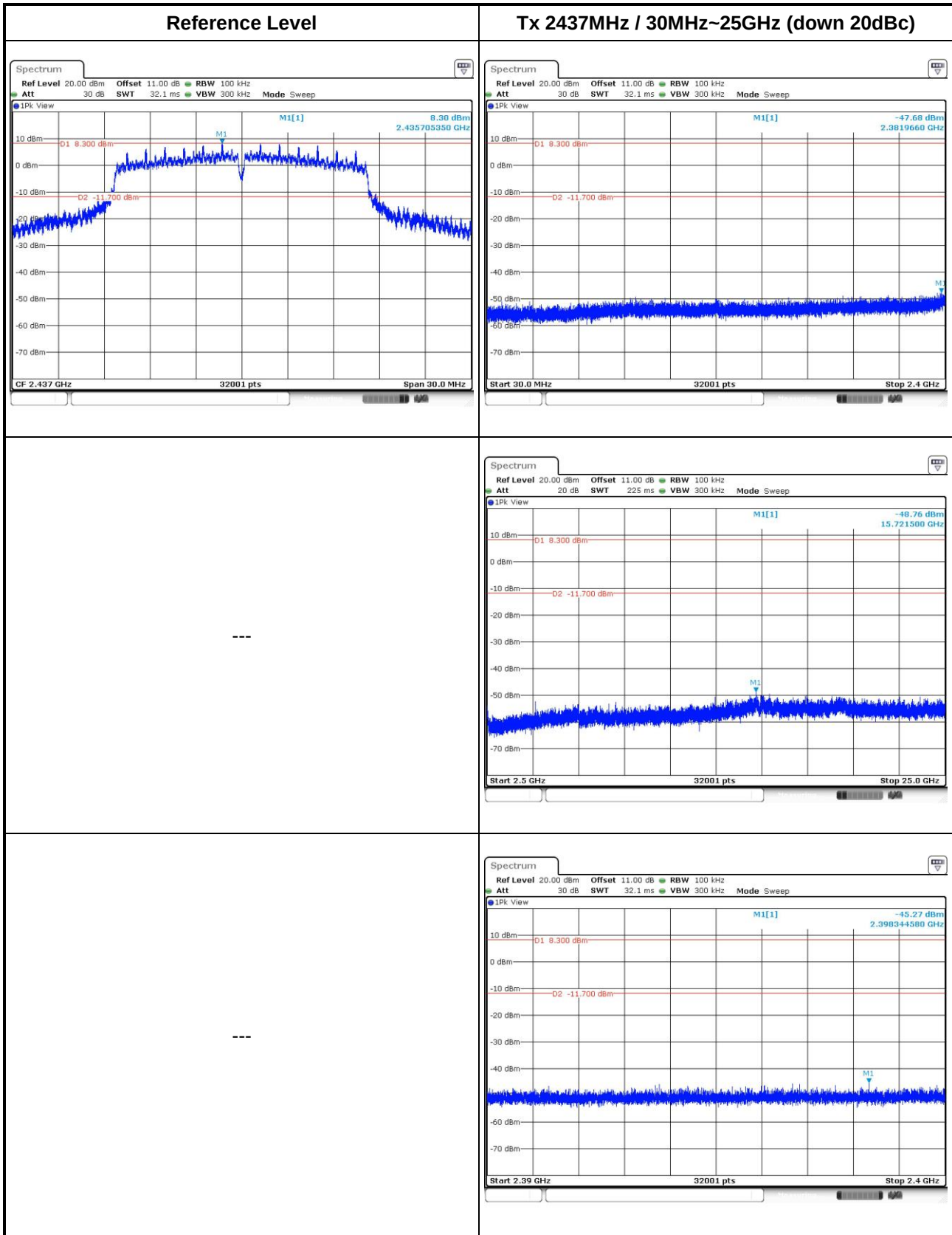


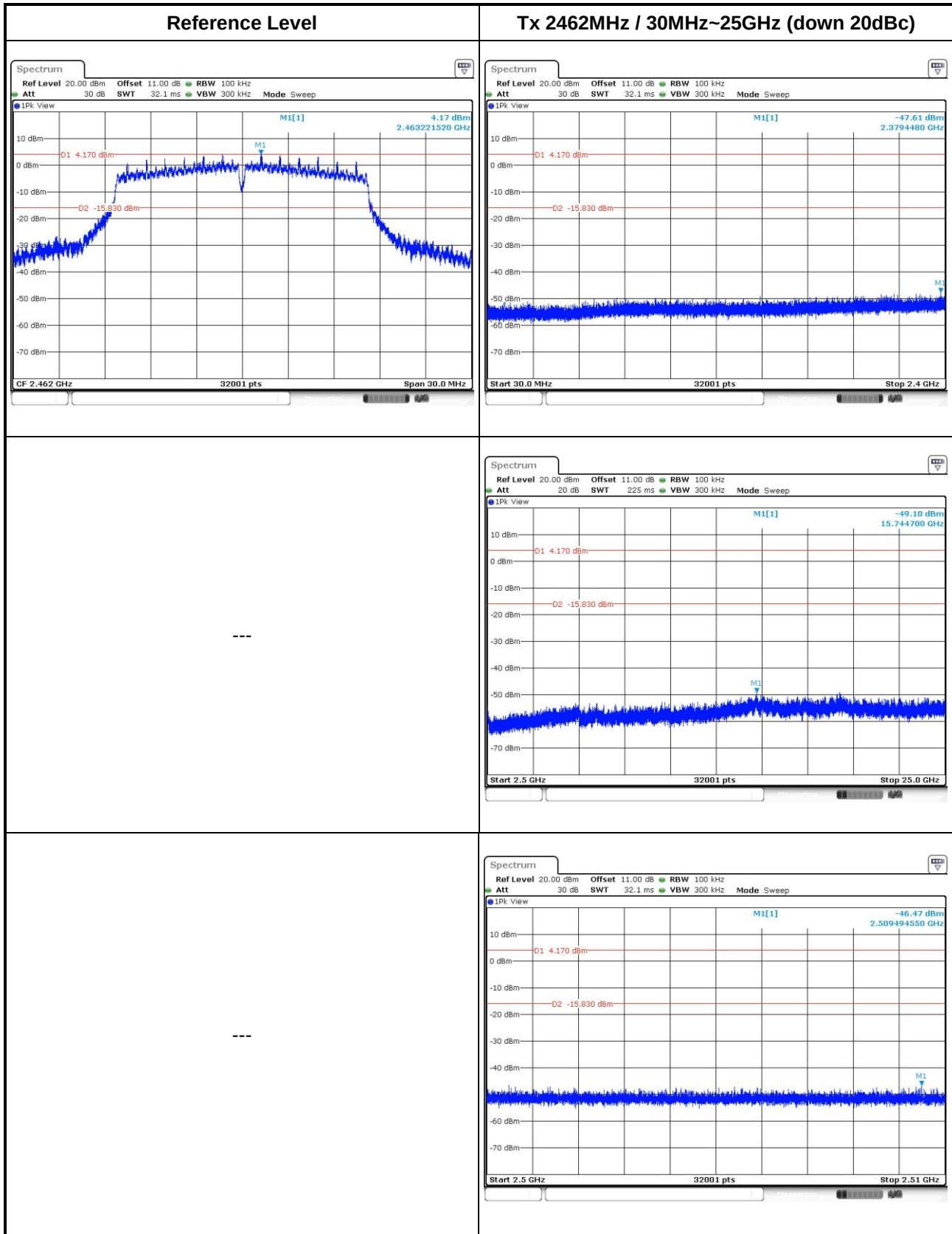




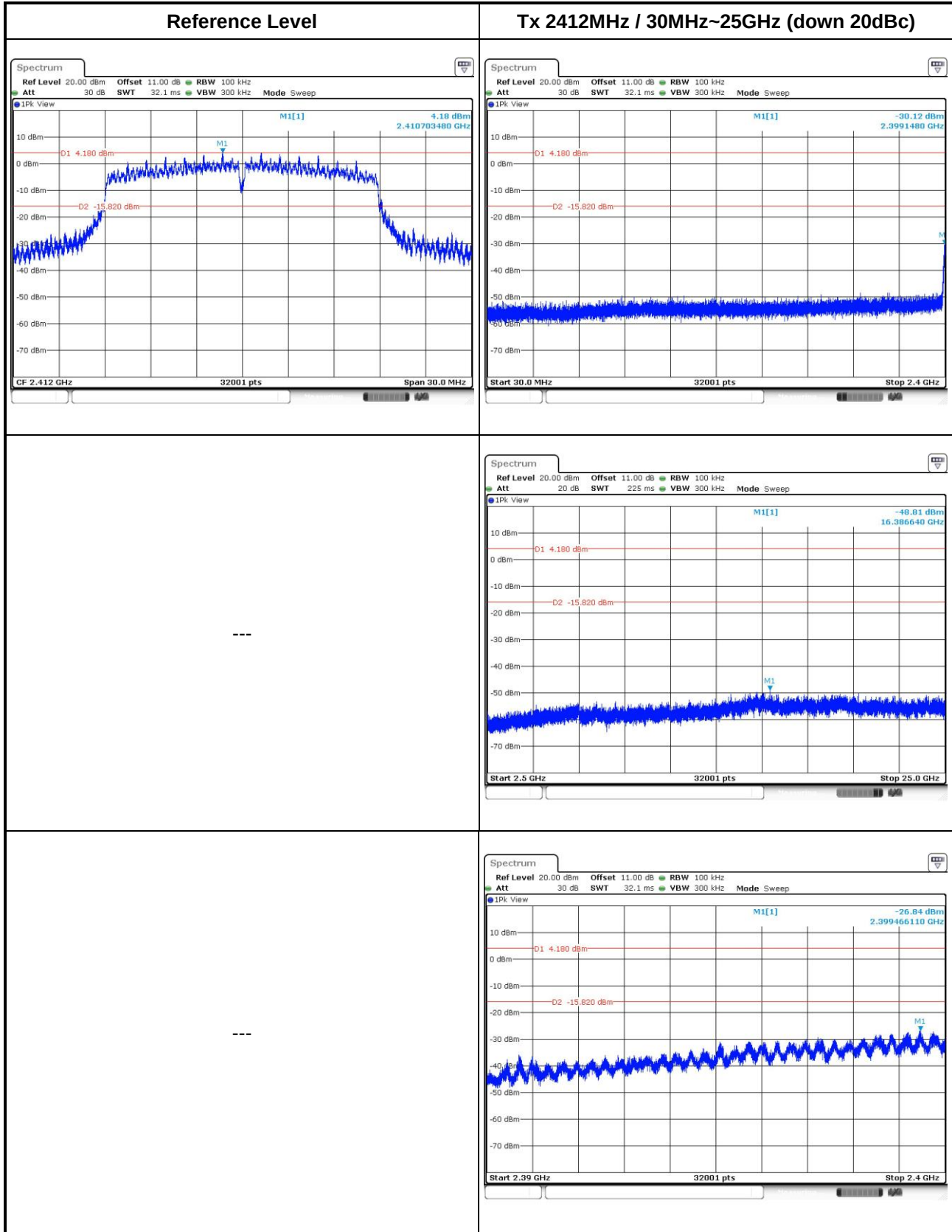
802.11g



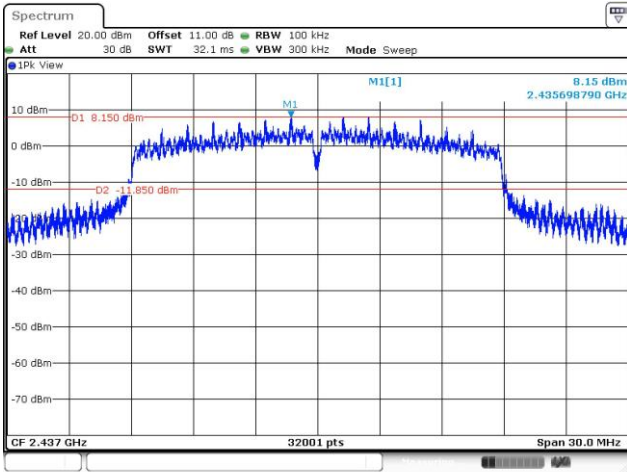




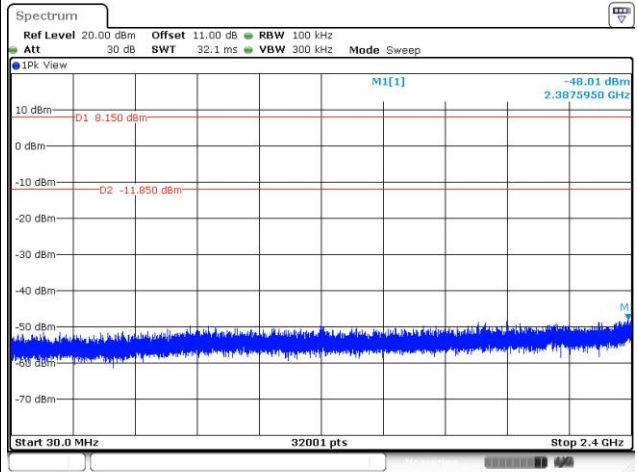
802.11n HT20

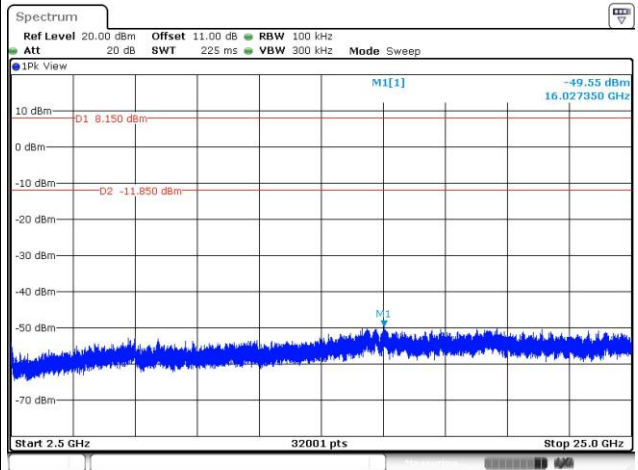


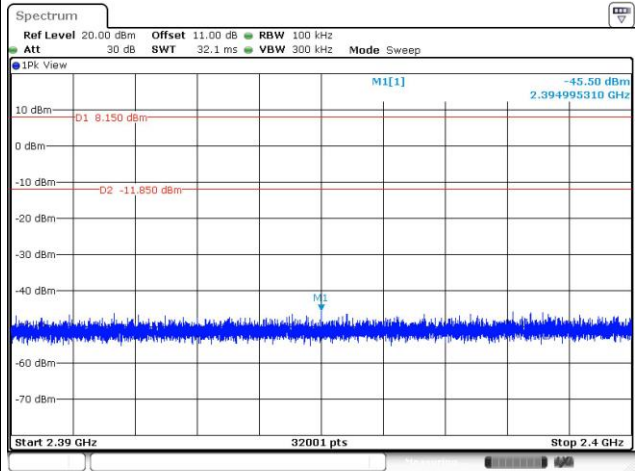
Reference Level



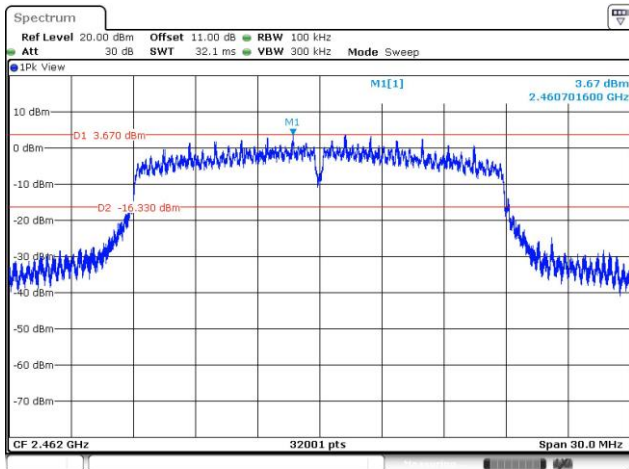
Tx 2437MHz / 30MHz~25GHz (down 20dBc)



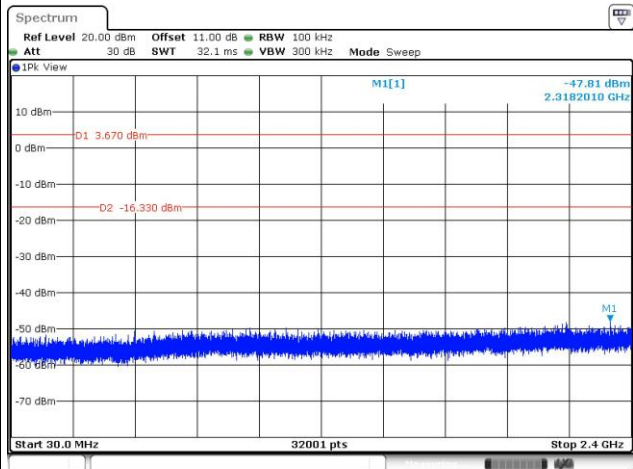


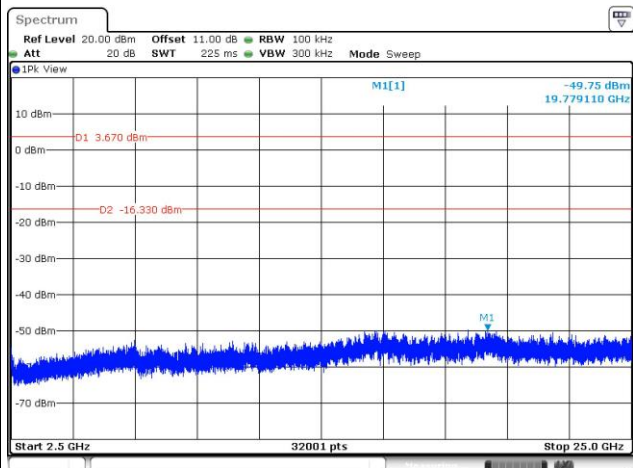


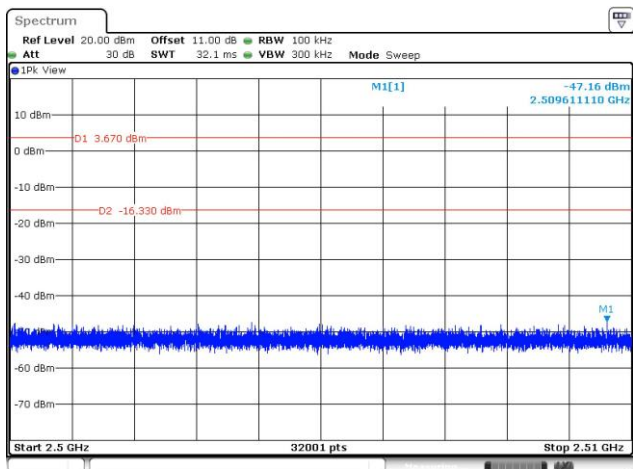
Reference Level



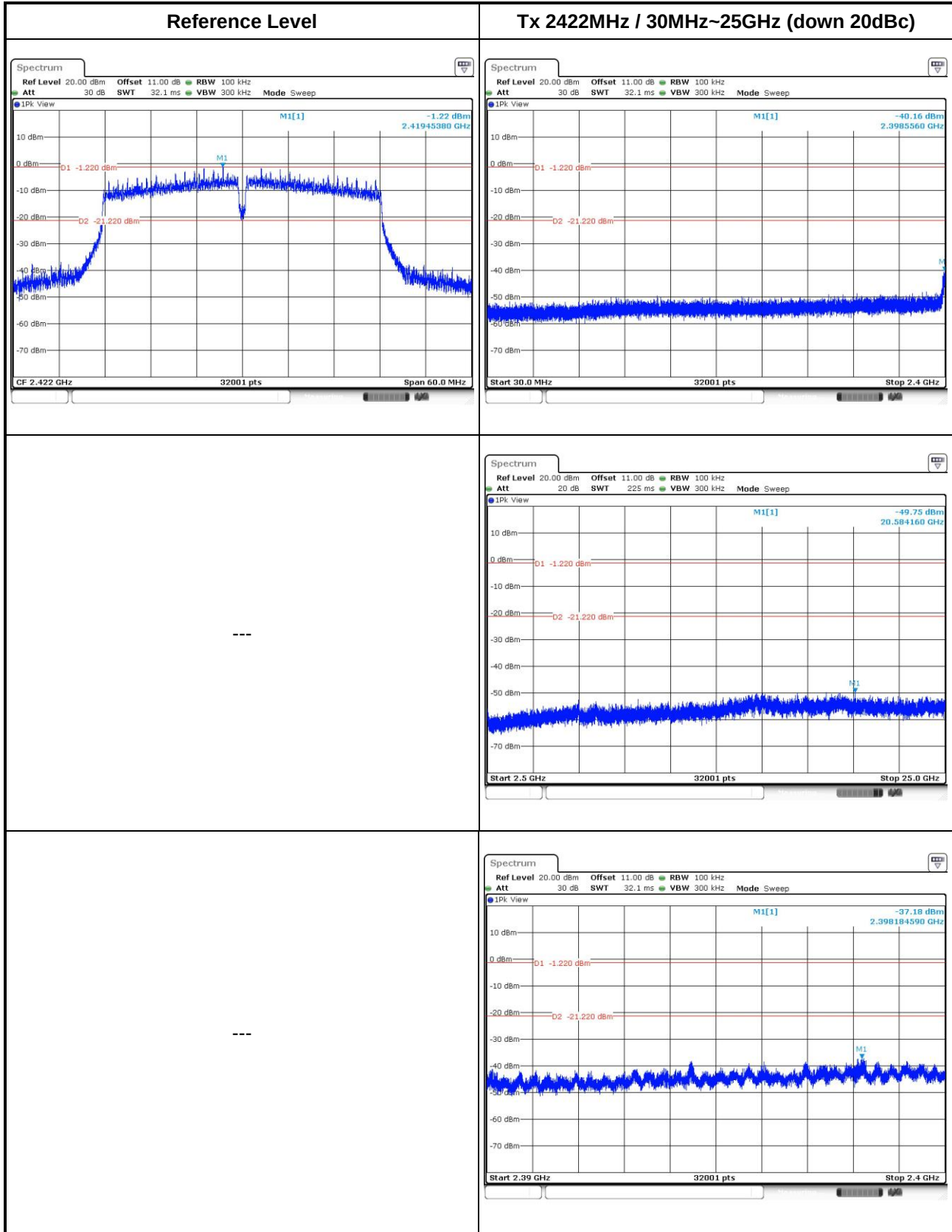
Tx 2462MHz / 30MHz~25GHz (down 20dBc)

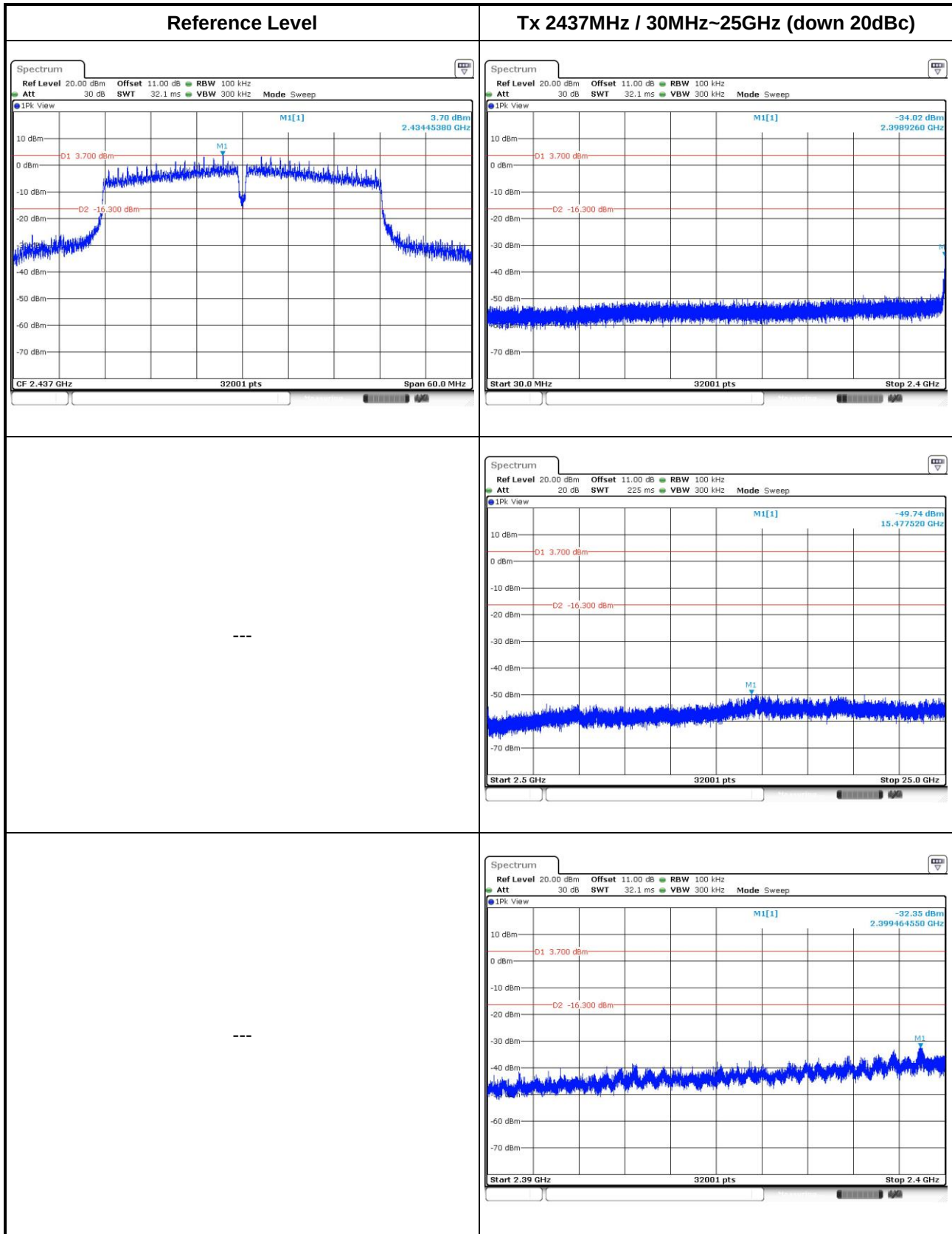


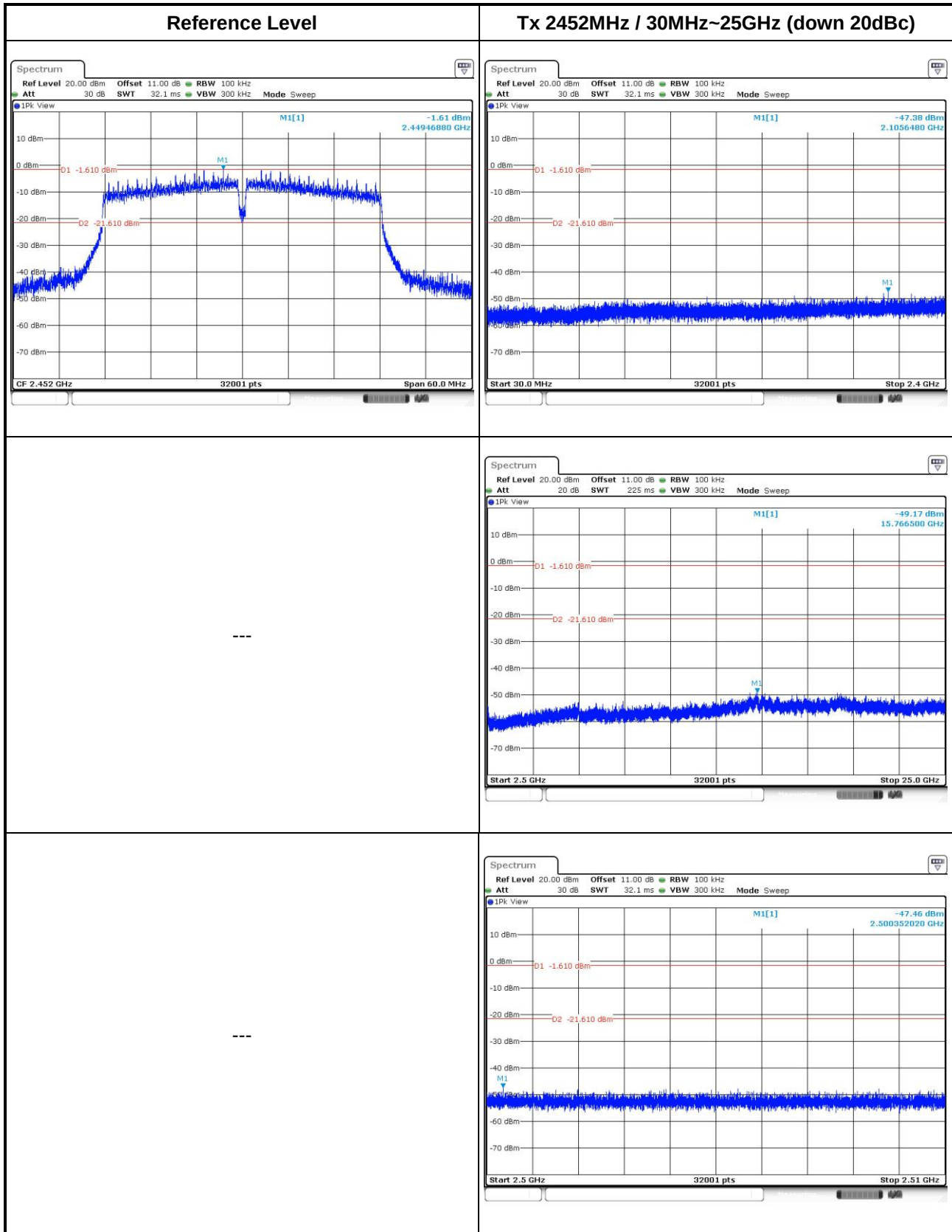




802.11n HT40







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

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

Linkou

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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 District, Tao Yuan City
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 District, Tao Yuan
City 333, Taiwan, R.O.C.

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

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Email: ICC_Service@icertifi.com.tw

==END==