

FCC Test Report

FCC ID : XNAWBS04
Equipment : Withings Body Cardio
Model No. : WBS04
Brand Name : Withings
Applicant : Withings
Address : 2 rue Maurice Hartmann 92130
Issy-les-Moulineaux 92130 France
Standard : 47 CFR FCC Part 15.247
Received Date : Mar. 02, 2016
Tested Date : Mar. 02 ~ Apr. 14, 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.

Approved & Reviewed by:



Gary Chang / Manager



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Release Record

Report No.	Version	Description	Issued Date
FR632101AC	Rev. 01	Initial issue	Apr. 22, 2016

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	Conducted Emissions	[dBuV]: 0.592MHz 32.34 (Margin -13.66dB) - AV	Pass
15.247(d) 15.209	Radiated Emissions	[dBuV/m at 3m]: 7386.00MHz 52.97 (Margin -1.03dB) - AV	Pass
15.247(b)(3)	Maximum Output Power	Max Power [dBm]: 27.13	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]	1	1-11 Mbps
2400-2483.5	g	2412-2462	1-11 [11]	1	6-54 Mbps
2400-2483.5	n (HT20)	2412-2462	1-11 [11]	1	MCS 0-7

Note 1: RF output power specifies that Maximum Peak Conducted Output Power.
 Note 2: 802.11b uses a combination of DSSS-DBPSK, DQPSK, CCK modulation.
 Note 3: 802.11g/n uses a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM modulation.

1.1.2 Antenna Details

Ant. No.	Type	Brand	Model	Gain (dBi)	Connector
1	PCB	BROADCOM	BCM9Fractal	2.8	N/A

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	3.8Vdc from Rechargeable li-ion battery 5Vdc from host
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1.1.4 Accessories

Accessories		
No.	Equipment	Description
1	Rechargeable li-ion battery	Brand: WITHINGS Model: TMB i9300 Rating: 3.8Vdc, 2100mAh, 7.98Wh
2	USB cable	1.23m shielded w/o core (For charging only.)

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	wl command		
Duty Cycle and Duty Factor	Mode	Duty cycle (%)	Duty factor (dB)
	11b	99.66%	0.01
	11g	94.18%	0.26
	HT20	93.85%	0.28

1.1.7 Power Setting

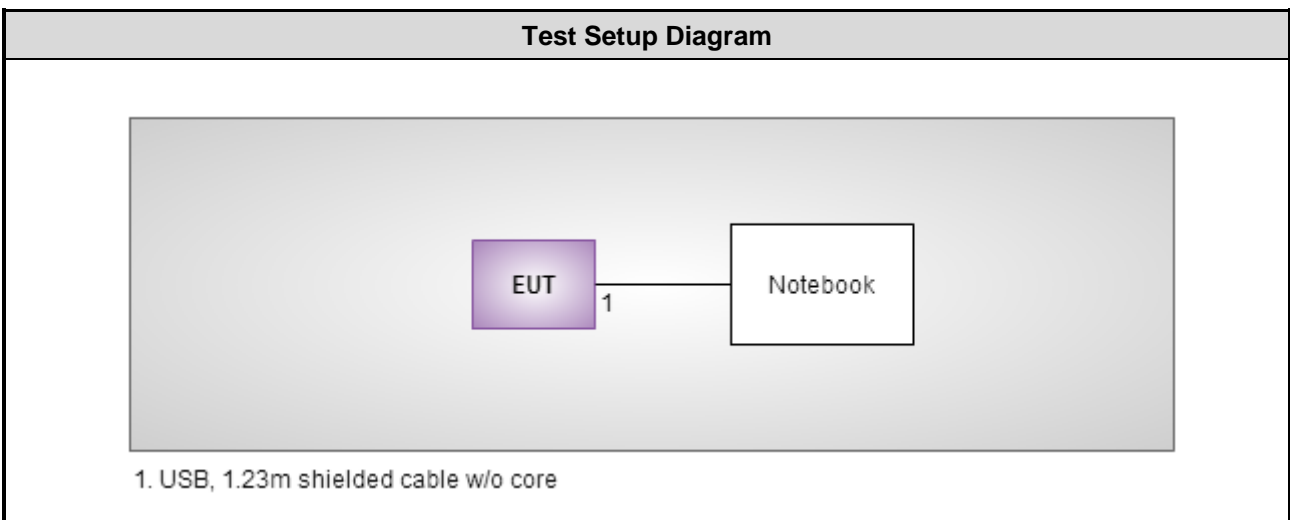
Modulation Mode	Test Frequency (MHz)	Power Set
11b	2412	24
11b	2437	22
11b	2462	22
11g	2412	23
11g	2437	23
11g	2462	23
HT20	2412	23
HT20	2437	23
HT20	2462	22

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	G3GB4X1	DoC	---
2	Fixture	--	---	---	---	---

Note: The fixture was supplied by applicant.

1.3 Test Setup Chart



Note: The support fixture is disconnected from EUT and removed from test table when EUT is set to transmit continuously.

1.4 The Equipment List

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Test date	Apr. 14, 2016				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
EMC Receiver	R&S	ESCS 30	100169	Oct. 21, 2015	Oct. 20, 2016
LISN	SCHWARZBECK	Schwarzbeck 8127	8127-667	Nov. 13, 2015	Nov. 12, 2016
LISN (Support Unit)	SCHWARZBECK	Schwarzbeck 8127	8127-666	Nov. 26, 2015	Nov. 25, 2016
RF Cable-CON	EMC	EMCCFD300-BM-BM-6000	50821	Dec. 21, 2015	Dec. 20, 2016
50 ohm terminal (Support Unit)	NA	50	04	Apr. 12, 2016	Apr. 11, 2017
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)				
Test date	Mar. 02 ~ Apr. 13, 2016				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101498	Dec. 13, 2015	Dec. 12, 2016
Receiver	R&S	ESR3	101658	Nov. 04, 2015	Nov. 03, 2016
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Aug. 20, 2015	Aug. 19, 2016
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Dec. 16, 2015	Dec. 15, 2016
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 04, 2015	Nov. 03, 2016
Preamplifier	Burgeon	BPA-530	SN:100219	Sep. 10, 2015	Sep. 09, 2016
Preamplifier	Agilent	83017A	MY39501308	Oct. 02, 2015	Oct. 01, 2016
Preamplifier	EMC	EMC184045B	980192	Sep. 01, 2015	Aug. 31, 2016
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16014/4	Dec. 10, 2015	Dec. 09, 2016
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Dec. 10, 2015	Dec. 09, 2016
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16139/4	Dec. 10, 2015	Dec. 09, 2016
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Dec. 10, 2015	Dec. 09, 2016
LF cable 10M	Woken	CFD400NL-LW	CFD400NL-002	Dec. 10, 2015	Dec. 09, 2016
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)				
Test date	Apr. 13, 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	1241002	Sep. 21, 2015	Sep. 20, 2016
Power Sensor	Anritsu	MA2411B	1207366	Sep. 21, 2015	Sep. 20, 2016
Signal Generator	R&S	SMB100A	175727	Oct. 05, 2015	Oct. 04, 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

1.6 Measurement Uncertainty

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

Measurement Uncertainty	
Parameters	Uncertainty
Bandwidth	±34.134 Hz
Conducted power	±0.808 dB
Power density	±0.463 dB
Conducted emission	±2.670 dB
AC conducted emission	±2.90 dB
Radiated emission ≤ 1GHz	±3.66 dB
Radiated emission > 1GHz	±5.63 dB

2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
AC Conduction	CO01-WS	21°C / 59%	Howard Huang
Radiated Emissions	03CH01-WS	22-23°C / 62-63%	Felix Sung Vincent Yeh
RF Conducted	TH01-WS	22°C / 63%	Anderson Hung

➤ 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	Test Configuration
Conducted Emissions	HT20	2462	MCS 0	---
Radiated Emissions ≤1GHz	HT20	2462	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	

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

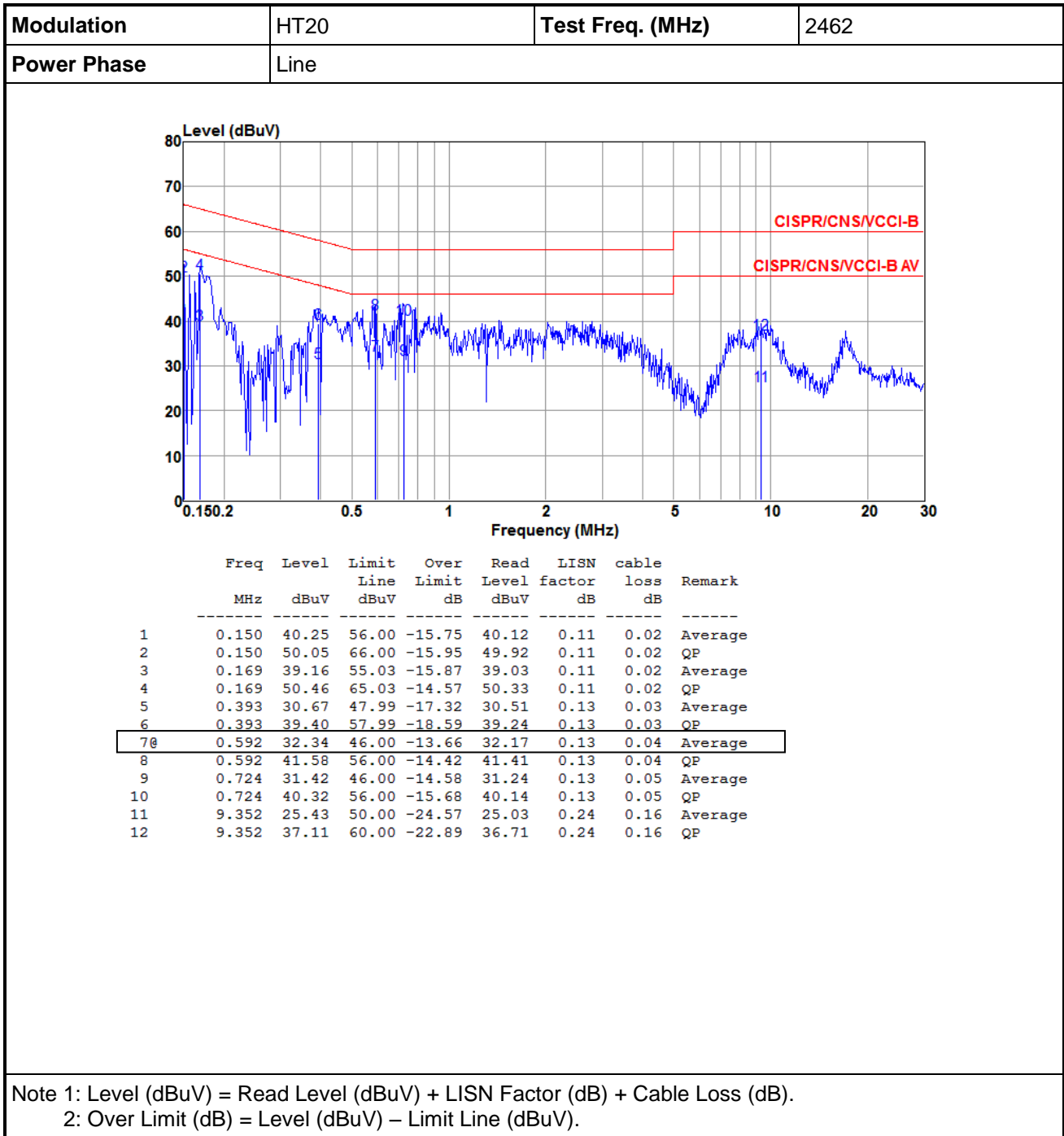
1. The device is placed on a test table, raised 80 cm above the reference ground plane. The vertical conducting plane is located 40 cm to the rear of the device.
2. The device is connected to line impedance stabilization network (LISN) and other accessories are connected to other LISN. Measured levels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

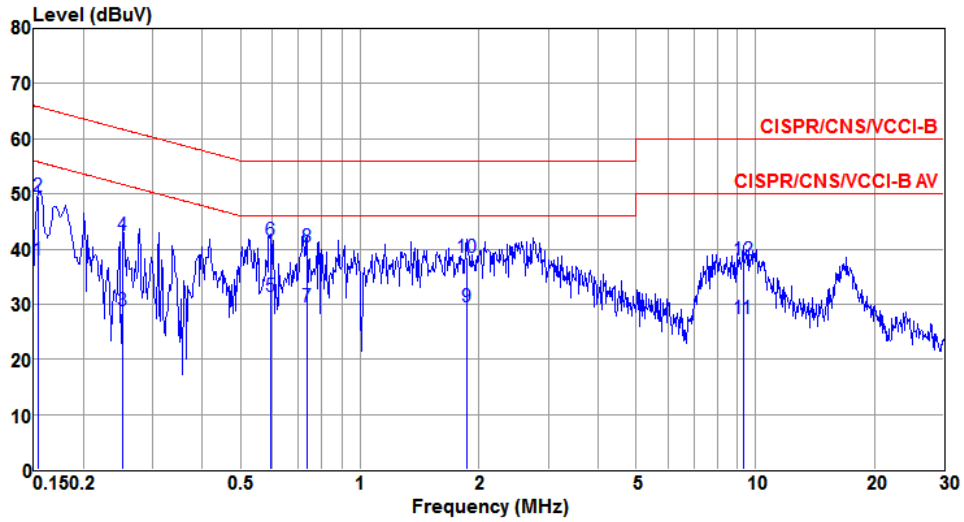


- Note: 1. Support units were connected to second LISN.
 2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

3.1.4 Test Result of Conducted Emissions



Modulation	HT20	Test Freq. (MHz)	2462
Power Phase	Neutral		



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.154	38.03	55.78	-17.75	37.88	0.13	0.02	Average
2	0.154	49.62	65.78	-16.16	49.47	0.13	0.02	QP
3	0.252	28.90	51.69	-22.79	28.77	0.11	0.02	Average
4	0.252	42.45	61.69	-19.24	42.32	0.11	0.02	QP
5	0.595	31.33	46.00	-14.67	31.15	0.14	0.04	Average
6@	0.595	41.58	56.00	-14.42	41.40	0.14	0.04	QP
7	0.735	29.55	46.00	-16.45	29.37	0.13	0.05	Average
8	0.735	40.36	56.00	-15.64	40.18	0.13	0.05	QP
9	1.858	29.50	46.00	-16.50	29.25	0.17	0.08	Average
10	1.858	38.36	56.00	-17.64	38.11	0.17	0.08	QP
11	9.302	27.45	50.00	-22.55	27.03	0.26	0.16	Average
12	9.302	38.07	60.00	-21.93	37.65	0.26	0.16	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

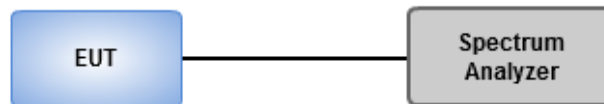
6dB Bandwidth

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

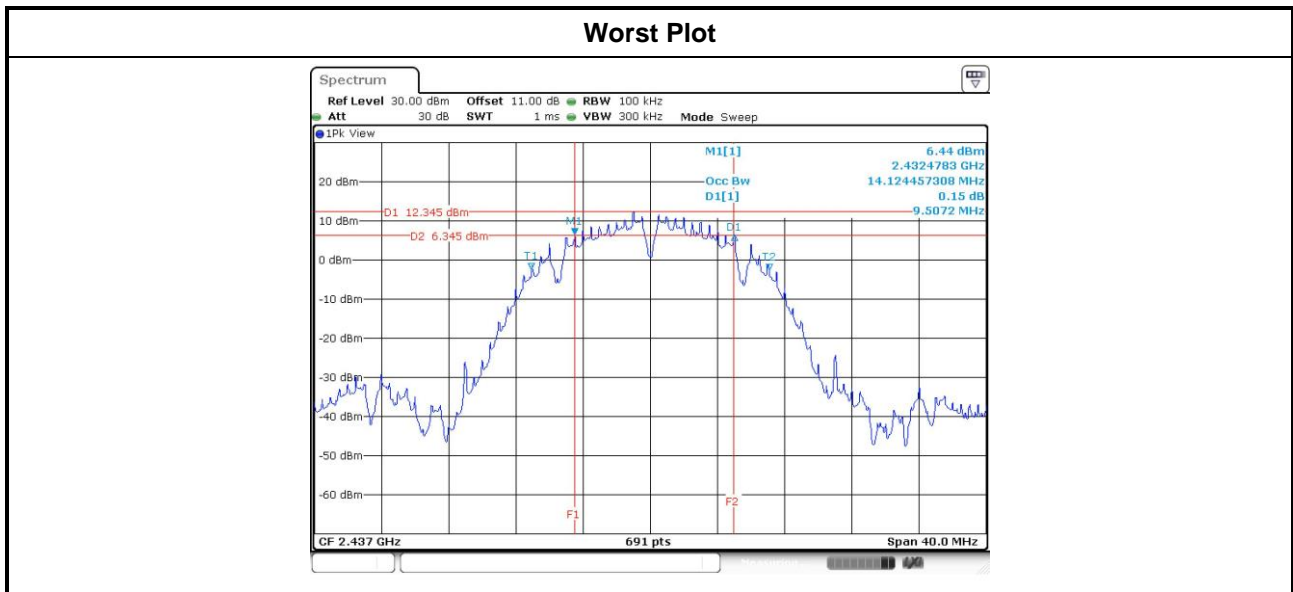
1. Set resolution bandwidth (RBW) = 300 kHz, Video bandwidth = 1 MHz.
2. Detector = Sample, Trace mode = max hold.
3. Sweep = auto couple, Allow the trace to stabilize.
4. Use the OBW measurement function of spectrum analyzer to measure the occupied bandwidth.

3.2.3 Test Setup

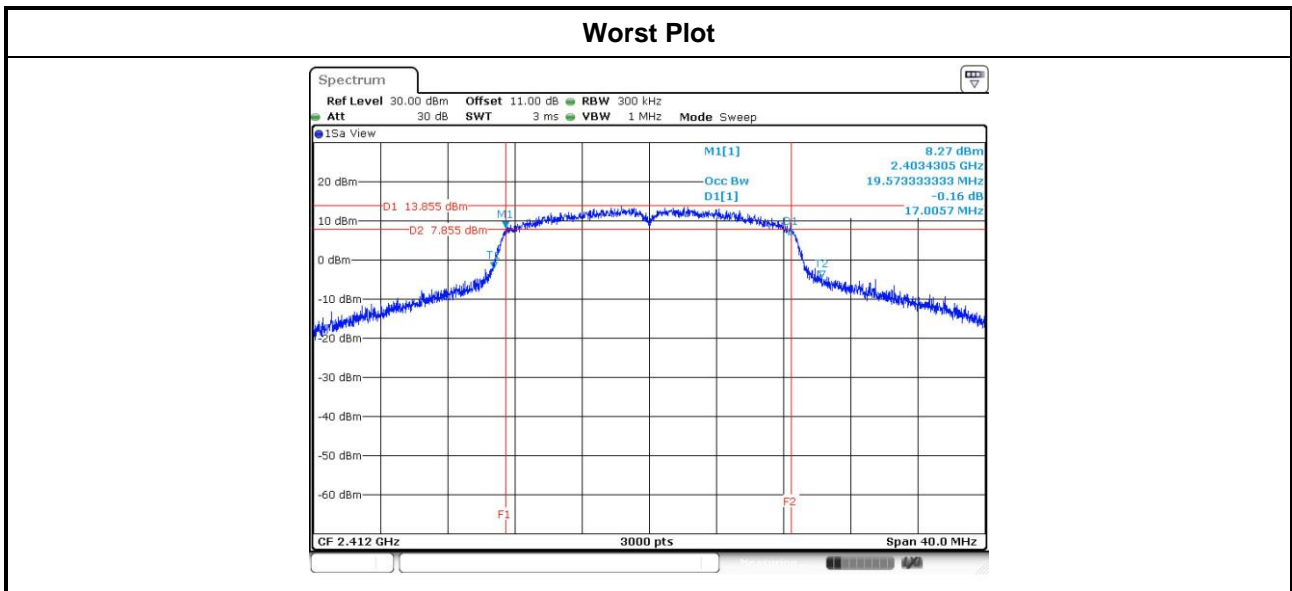


3.2.4 Test Result of 6dB and Occupied Bandwidth

Modulation Mode	N _{TX}	Freq. (MHz)	6dB Bandwidth (MHz)				Limit (kHz)
			Chain 0	Chain 1	Chain 2	Chain 3	
11b	1	2412	10.03	---	---	---	500
11b	1	2437	9.51	---	---	---	500
11b	1	2462	9.57	---	---	---	500
11g	1	2412	15.07	---	---	---	500
11g	1	2437	13.86	---	---	---	500
11g	1	2462	15.07	---	---	---	500
HT20	1	2412	15.07	---	---	---	500
HT20	1	2437	15.13	---	---	---	500
HT20	1	2462	15.13	---	---	---	500



Modulation Mode	N _{Tx}	Freq. (MHz)	99% Occupied Bandwidth (MHz)			
			Chain 0	Chain 1	Chain 2	Chain 3
11b	1	2412	15.85	---	---	---
11b	1	2437	14.12	---	---	---
11b	1	2462	14.09	---	---	---
11g	1	2412	18.89	---	---	---
11g	1	2437	18.95	---	---	---
11g	1	2462	19.45	---	---	---
HT20	1	2412	19.57	---	---	---
HT20	1	2437	19.56	---	---	---
HT20	1	2462	18.01	---	---	---



3.3 RF Output Power

3.3.1 Limit of RF Output Power

Conducted power shall not exceed 1Watt.

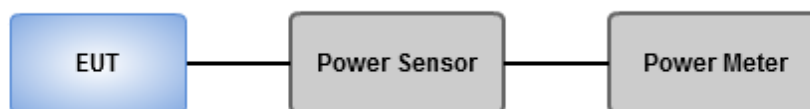
- Antenna gain \leq 6dBi, no any corresponding reduction is in output power limit.
- Antenna gain $>$ 6dBi
 - Non Fixed, point to point operations.
The conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dB
 - Fixed, point to point operations
Systems operating in the 2400–2483.5 MHz band that are used exclusively for fixed, point-to-point Operations, maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

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

3.3.2 Test Procedures

- Maximum Peak Conducted Output Power
 - Spectrum analyzer**
 1. Set RBW = 1MHz, VBW = 3MHz, Detector = Peak.
 2. Sweep time = auto, Trace mode = max hold, Allow trace to fully stabilize.
 3. Use the spectrum analyzer channel power measurement function with the band limits set equal to the DTS bandwidth edges.
 - Power meter**
 1. A broadband Peak RF power meter is used for output power measurement. The video bandwidth of power meter is greater than DTS bandwidth of EUT. If duty cycle of test signal is not 100 %, trigger and gating function of power meter will be enabled to capture transmission burst for measuring output power.
- Maximum Conducted Output Power (For reference only)
 - Power meter**
 1. A broadband Average RF power meter is used for output power measurement. The video bandwidth of power meter is greater than DTS bandwidth of EUT. If duty cycle of test signal is not 100 %, trigger and gating function of power meter will be enabled to capture transmission burst for measuring output power.

3.3.3 Test Setup



3.3.4 Test Result of Maximum Output Power

Modulation Mode	N _{TX}	Freq. (MHz)	Peak conducted Output Power (dBm)							Ant. Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)
			Chain 0	Chain 1	Chain 2	Chain 3	Total Power (mW)	Total Power (dBm)	Limit (dBm)			
11b	1	2412	25.76	---	---	---	376.704	25.76	30.00	2.80	28.56	36.00
11b	1	2437	23.55	---	---	---	226.464	23.55	30.00	2.80	26.35	36.00
11b	1	2462	23.53	---	---	---	225.424	23.53	30.00	2.80	26.33	36.00
11g	1	2412	26.54	---	---	---	450.817	26.54	30.00	2.80	29.34	36.00
11g	1	2437	26.84	---	---	---	483.059	26.84	30.00	2.80	29.64	36.00
11g	1	2462	27.02	---	---	---	503.501	27.02	30.00	2.80	29.82	36.00
HT20	1	2412	26.50	---	---	---	446.684	26.50	30.00	2.80	29.30	36.00
HT20	1	2437	26.77	---	---	---	475.335	26.77	30.00	2.80	29.57	36.00
HT20	1	2462	27.13	---	---	---	516.416	27.13	30.00	2.80	29.93	36.00

Modulation Mode	N _{TX}	Freq. (MHz)	Conducted (Average) Output Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)
			Chain 0	Chain 1	Chain 2	Chain 3			
11b	1	2412	24.11	---	---	---	257.632	24.11	---
11b	1	2437	21.25	---	---	---	133.352	21.25	---
11b	1	2462	21.20	---	---	---	131.826	21.20	---
11g	1	2412	22.02	---	---	---	159.221	22.02	---
11g	1	2437	22.29	---	---	---	169.434	22.29	---
11g	1	2462	22.72	---	---	---	187.068	22.72	---
HT20	1	2412	22.01	---	---	---	158.855	22.01	---
HT20	1	2437	22.23	---	---	---	167.109	22.23	---
HT20	1	2462	22.82	---	---	---	191.426	22.82	---

Note: Conducted average output power is for reference only.

3.4 Power Spectral Density

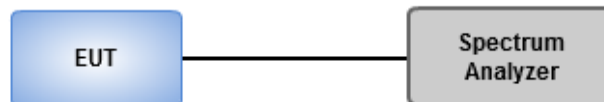
3.4.1 Limit of Power Spectral Density

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

3.4.2 Test Procedures

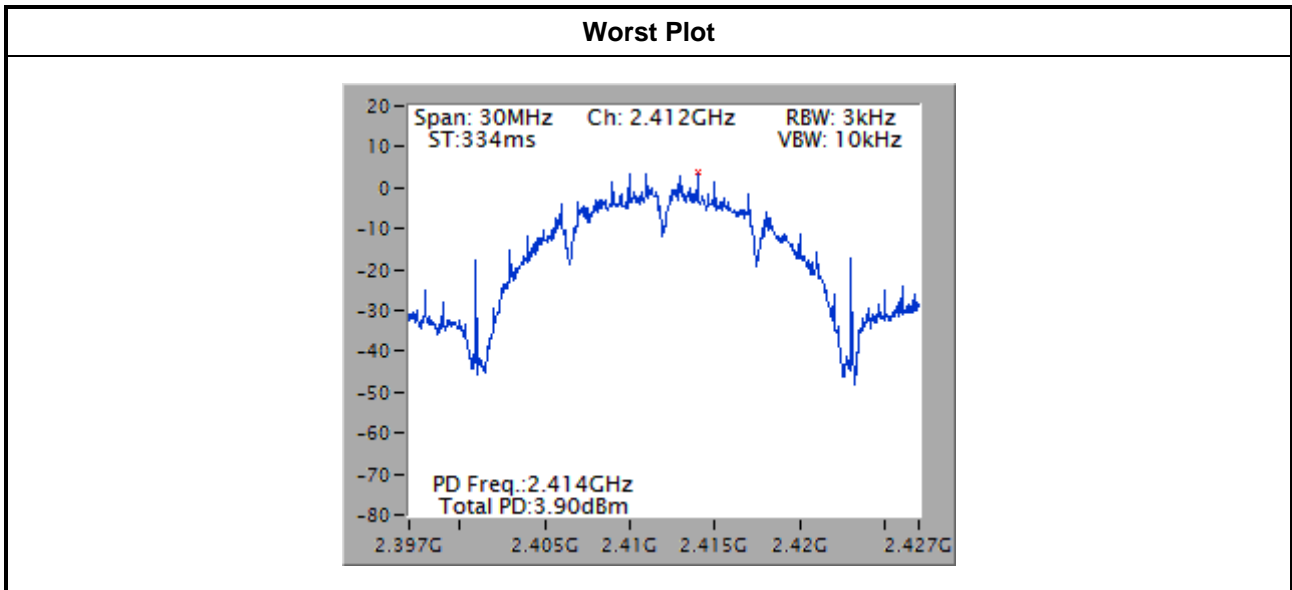
- Maximum peak conducted output power was used to demonstrate compliance to the fundamental output power limit.
 1. Set the RBW = 3kHz, VBW = 10kHz.
 2. Detector = Peak, Sweep time = auto couple.
 3. Trace mode = max hold, allow trace to fully stabilize.
 4. Use the peak marker function to determine 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. Perform the measurement over a single sweep.
 4. Use the peak marker function to determine the maximum amplitude level.

3.4.3 Test Setup



3.4.4 Test Result of Power Spectral Density

Modulation Mode	N _{TX}	Freq. (MHz)	Total Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
11b	1	2412	3.90	8.00
11b	1	2437	-1.43	8.00
11b	1	2462	-0.62	8.00
11g	1	2412	-3.43	8.00
11g	1	2437	-3.23	8.00
11g	1	2462	-3.04	8.00
HT20	1	2412	-3.75	8.00
HT20	1	2437	-3.00	8.00
HT20	1	2462	-2.53	8.00



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

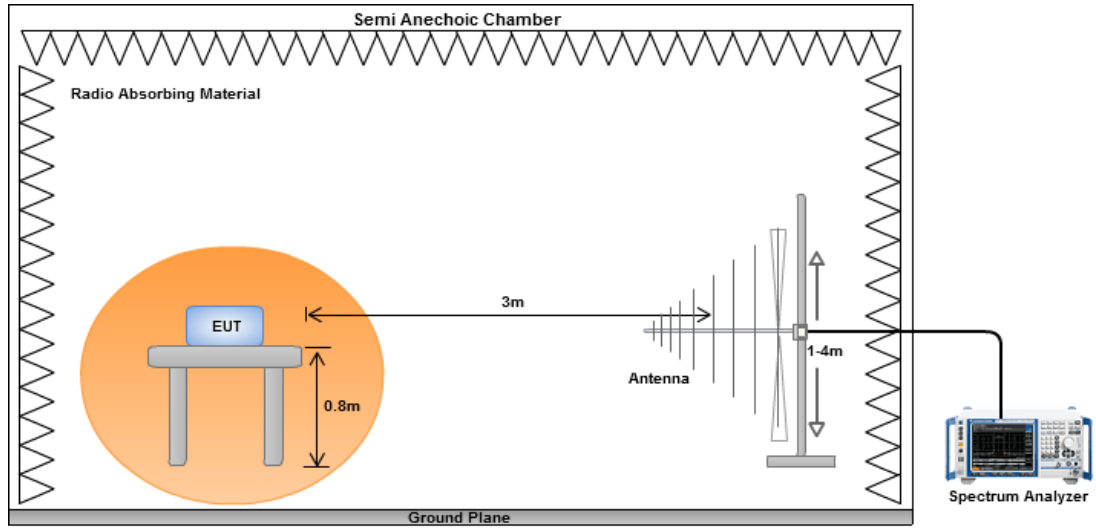
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission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

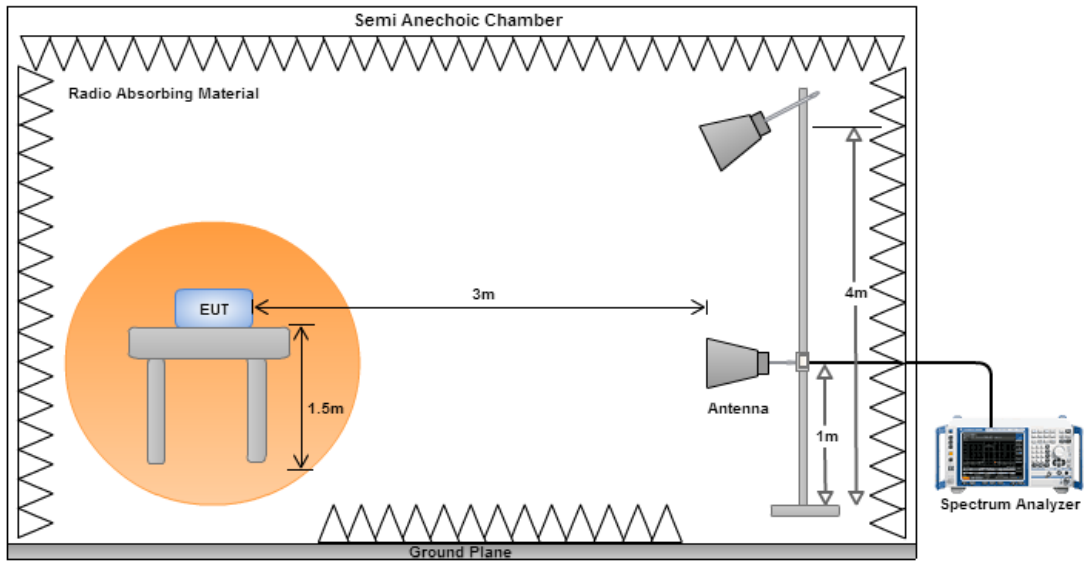
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above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

3.5.3 Test Setup

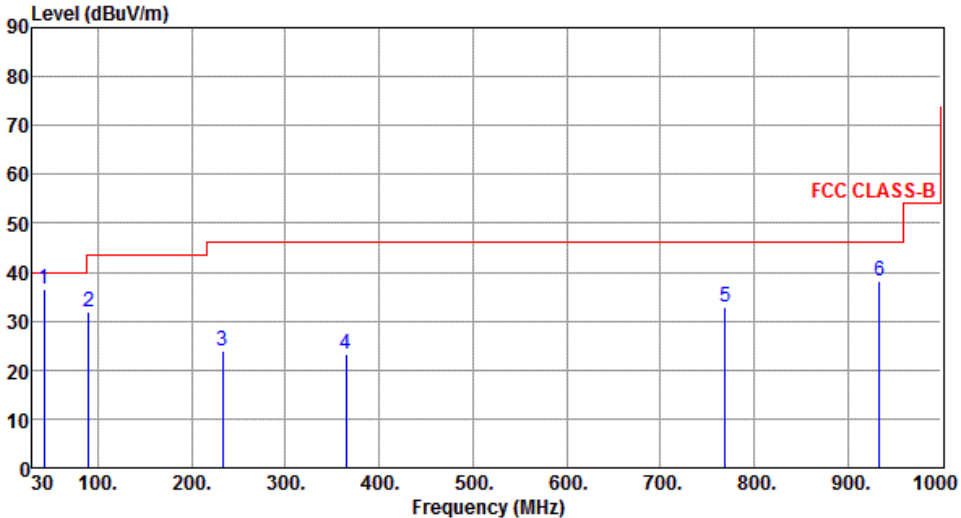
Radiated Emissions below 1 GHz



Radiated Emissions above 1 GHz

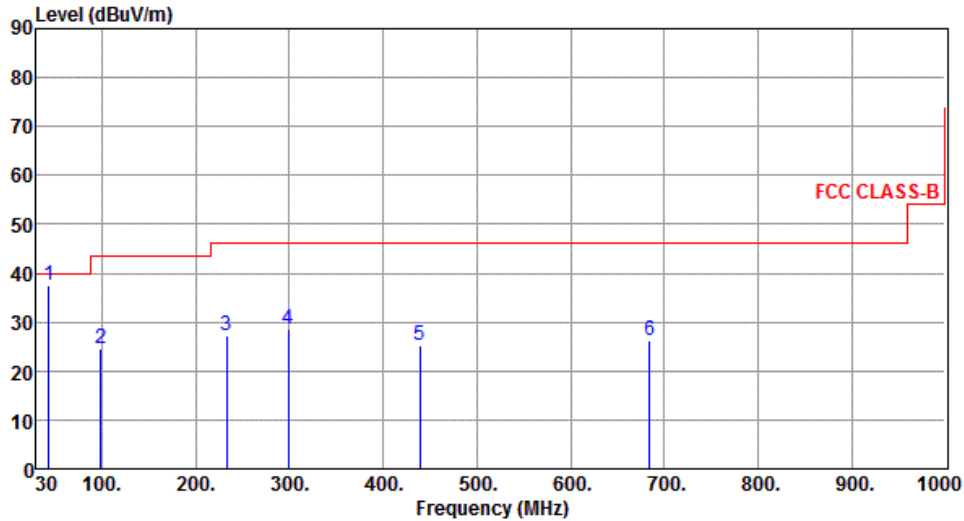


3.5.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

Modulation	HT20	Test Freq. (MHz)	2462						
Polarization	Horizontal								
									
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	42.61	36.66	40.00	-3.34	53.22	-16.56	Peak	---	---
2	90.14	31.80	43.50	-11.70	54.77	-22.97	Peak	---	---
3	232.73	23.80	46.00	-22.20	42.22	-18.42	Peak	---	---
4	364.65	23.40	46.00	-22.60	37.79	-14.39	Peak	---	---
5	769.14	32.80	46.00	-13.20	39.58	-6.78	Peak	---	---
6	934.04	38.10	46.00	-7.90	42.82	-4.72	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)	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	43.21	37.51	40.00	-2.49	54.01	-16.50	QP	100	254
2	98.87	24.60	43.50	-18.90	46.10	-21.50	Peak	---	---
3	232.73	27.30	46.00	-18.70	45.72	-18.42	Peak	---	---
4	298.69	28.60	46.00	-17.40	44.42	-15.82	Peak	---	---
5	439.34	25.20	46.00	-20.80	37.63	-12.43	Peak	---	---
6	684.75	26.36	46.00	-19.64	34.61	-8.25	Peak	---	---

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

*Factor includes antenna factor , cable loss and amplifier gain

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

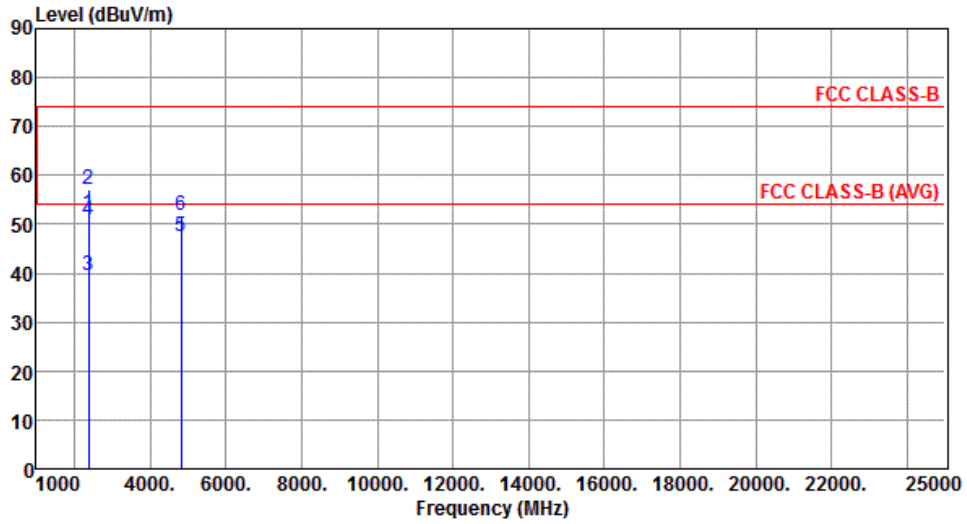
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

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

Modulation	11b	Test Freq. (MHz)	2412						
Polarization	Horizontal								
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2383.00	51.29	54.00	-2.71	54.65	-3.36	Average	270	99
2	2383.00	56.72	74.00	-17.28	60.08	-3.36	Peak	270	99
3	2390.00	44.94	54.00	-9.06	48.29	-3.35	Average	270	99
4	2390.00	53.82	74.00	-20.18	57.17	-3.35	Peak	270	99
5	4824.00	40.54	54.00	-13.46	36.95	3.59	Average	260	140
6	4824.00	47.12	74.00	-26.88	43.53	3.59	Peak	260	140

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		



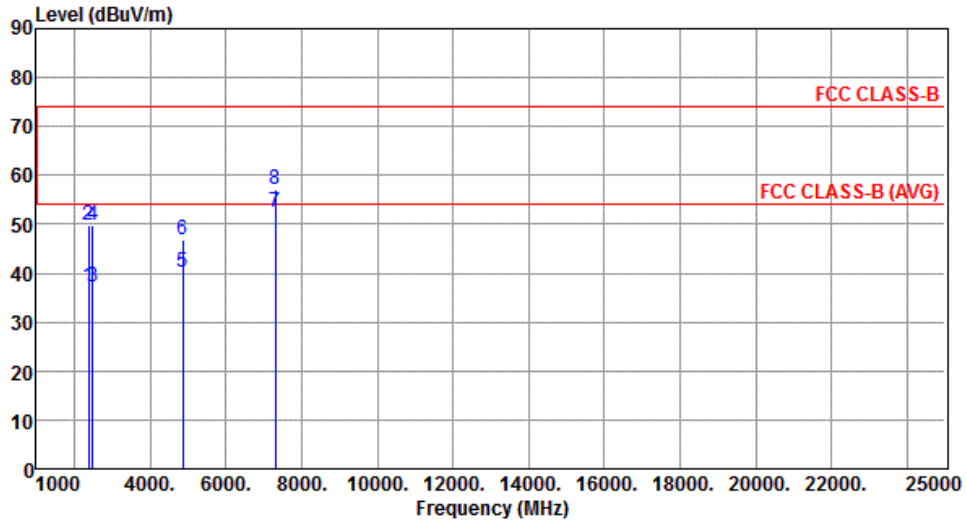
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2383.00	52.18	54.00	-1.82	55.54	-3.36	Average	392	327
2	2383.00	57.22	74.00	-16.78	60.58	-3.36	Peak	392	327
3	2390.00	39.40	54.00	-14.60	42.75	-3.35	Average	392	327
4	2390.00	50.97	74.00	-23.03	54.32	-3.35	Peak	392	327
5	4824.00	47.62	54.00	-6.38	44.03	3.59	Average	277	240
6	4824.00	51.94	74.00	-22.06	48.35	3.59	Peak	277	240

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

*Factor includes antenna factor , cable loss and amplifier gain

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

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



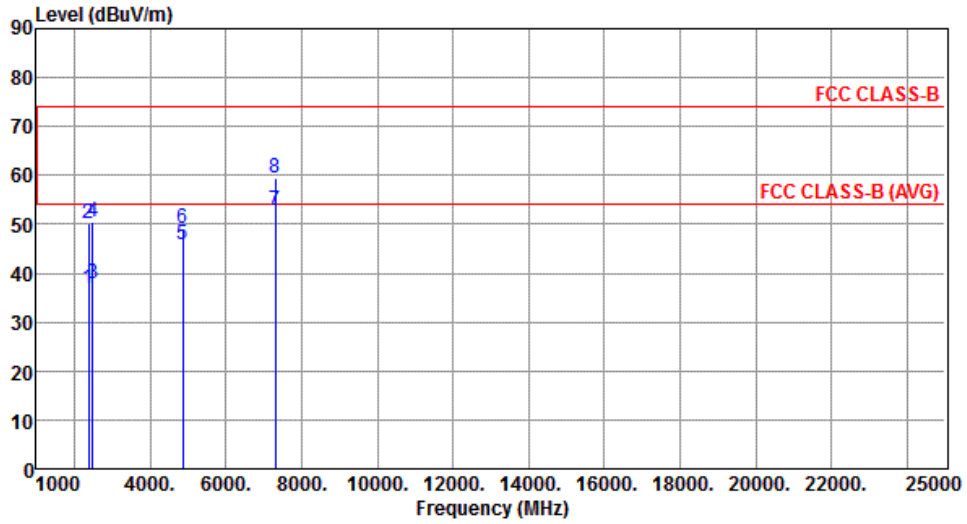
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	37.27	54.00	-16.73	40.62	-3.35	Average	267	100
2	2390.00	49.68	74.00	-24.32	53.03	-3.35	Peak	267	100
3	2483.50	37.26	54.00	-16.74	40.19	-2.93	Average	267	100
4	2483.50	49.78	74.00	-24.22	52.71	-2.93	Peak	267	100
5	4874.00	40.30	54.00	-13.70	36.55	3.75	Average	388	238
6	4874.00	46.91	74.00	-27.09	43.16	3.75	Peak	388	238
7	7311.00	52.46	54.00	-1.54	44.04	8.42	Average	387	181
8	7311.00	57.10	74.00	-16.90	48.68	8.42	Peak	387	181

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

*Factor includes antenna factor , cable loss and amplifier gain

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

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



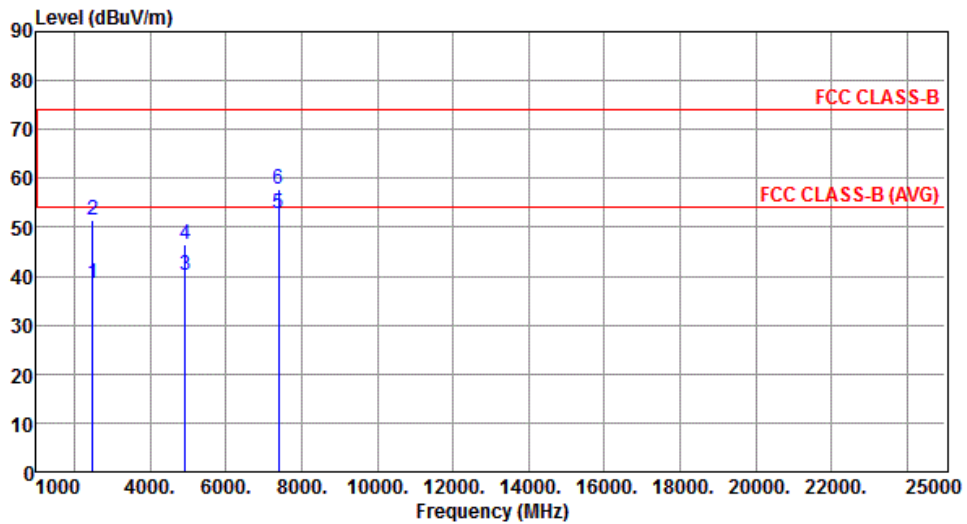
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	36.90	54.00	-17.10	40.25	-3.35	Average	397	327
2	2390.00	50.28	74.00	-23.72	53.63	-3.35	Peak	397	327
3	2483.50	37.82	54.00	-16.18	40.75	-2.93	Average	397	327
4	2483.50	50.39	74.00	-23.61	53.32	-2.93	Peak	397	327
5	4874.00	45.97	54.00	-8.03	42.22	3.75	Average	268	240
6	4874.00	49.14	74.00	-24.86	45.39	3.75	Peak	268	240
7	7311.00	52.96	54.00	-1.04	44.54	8.42	Average	293	86
8	7311.00	59.42	74.00	-14.58	51.00	8.42	Peak	293	86

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

*Factor includes antenna factor , cable loss and amplifier gain

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

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



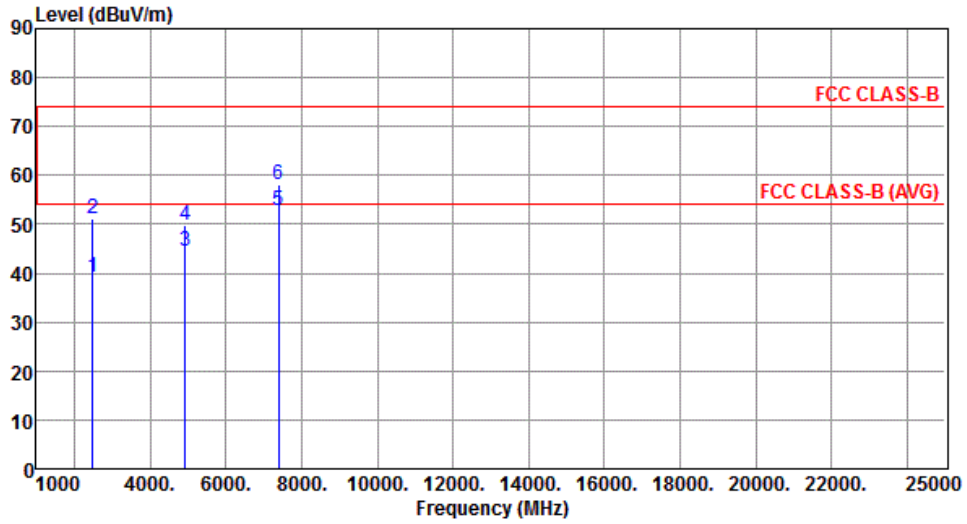
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	38.58	54.00	-15.42	41.51	-2.93	Average	254	100
2	2483.50	51.41	74.00	-22.59	54.34	-2.93	Peak	254	100
3	4924.00	40.15	54.00	-13.85	36.24	3.91	Average	255	143
4	4924.00	46.50	74.00	-27.50	42.59	3.91	Peak	255	143
5	7386.00	52.93	54.00	-1.07	44.47	8.46	Average	331	181
6	7386.00	57.89	74.00	-16.11	49.43	8.46	Peak	331	181

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

*Factor includes antenna factor , cable loss and amplifier gain

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

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



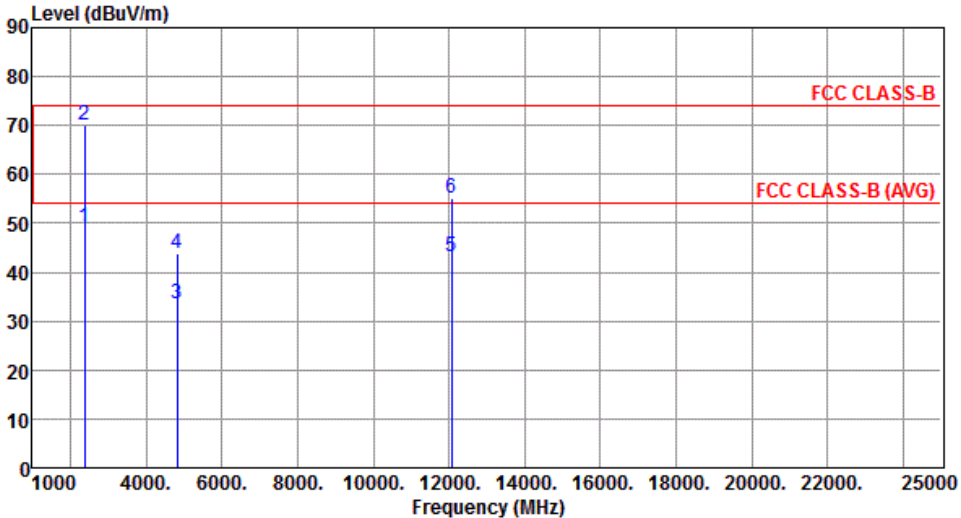
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	39.06	54.00	-14.94	41.99	-2.93	Average	395	329
2	2483.50	51.15	74.00	-22.85	54.08	-2.93	Peak	395	329
3	4924.00	44.47	54.00	-9.53	40.56	3.91	Average	266	196
4	4924.00	49.91	74.00	-24.09	46.00	3.91	Peak	266	196
5	7386.00	52.97	54.00	-1.03	44.51	8.46	Average	232	83
6	7386.00	58.09	74.00	-15.91	49.63	8.46	Peak	232	83

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

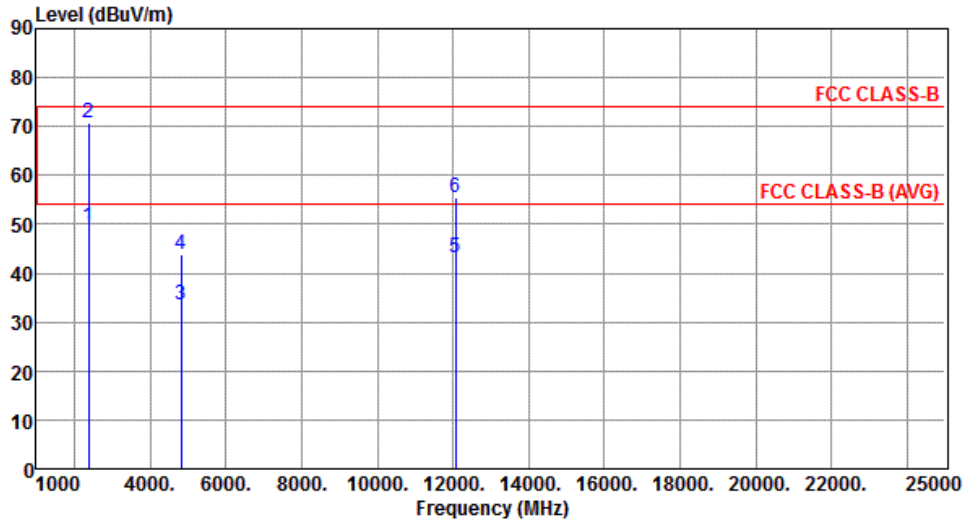
*Factor includes antenna factor , cable loss and amplifier gain

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

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

Modulation	11g	Test Freq. (MHz)	2412						
Polarization	Horizontal								
									
	Freq.	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	49.12	54.00	-4.88	52.47	-3.35	Average	269	99
2	2390.00	70.10	74.00	-3.90	73.45	-3.35	Peak	269	99
3	4824.00	33.61	54.00	-20.39	30.02	3.59	Average	259	138
4	4824.00	43.82	74.00	-30.18	40.23	3.59	Peak	259	138
5	12060.00	43.02	54.00	-10.98	28.89	14.13	Average	211	189
6	12060.00	54.99	74.00	-19.01	40.86	14.13	Peak	211	189
<p>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).</p>									

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



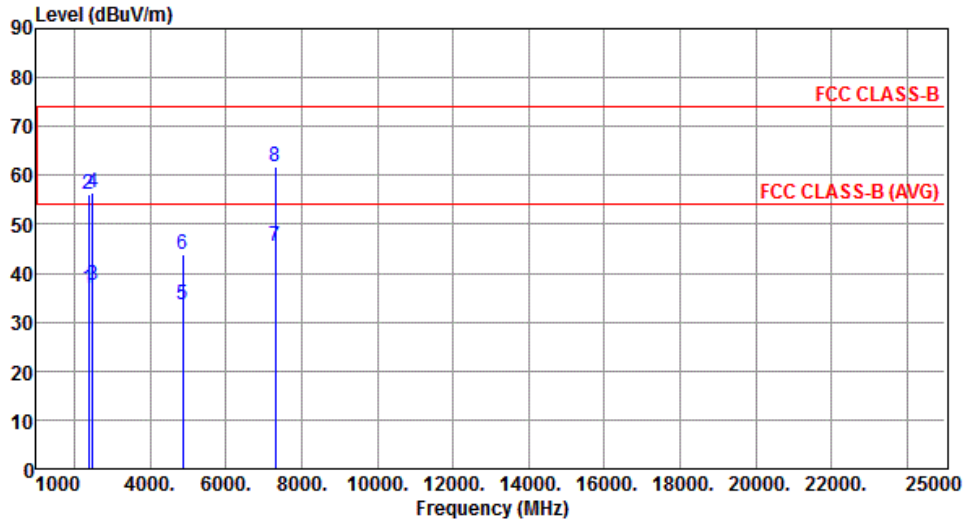
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	49.49	54.00	-4.51	52.84	-3.35	Average	399	325
2	2390.00	70.77	74.00	-3.23	74.12	-3.35	Peak	399	325
3	4824.00	33.70	54.00	-20.30	30.11	3.59	Average	262	211
4	4824.00	43.84	74.00	-30.16	40.25	3.59	Peak	262	211
5	12060.00	43.24	54.00	-10.76	29.11	14.13	Average	222	165
6	12060.00	55.38	74.00	-18.62	41.25	14.13	Peak	222	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	11g	Test Freq. (MHz)	2437
Polarization	Horizontal		



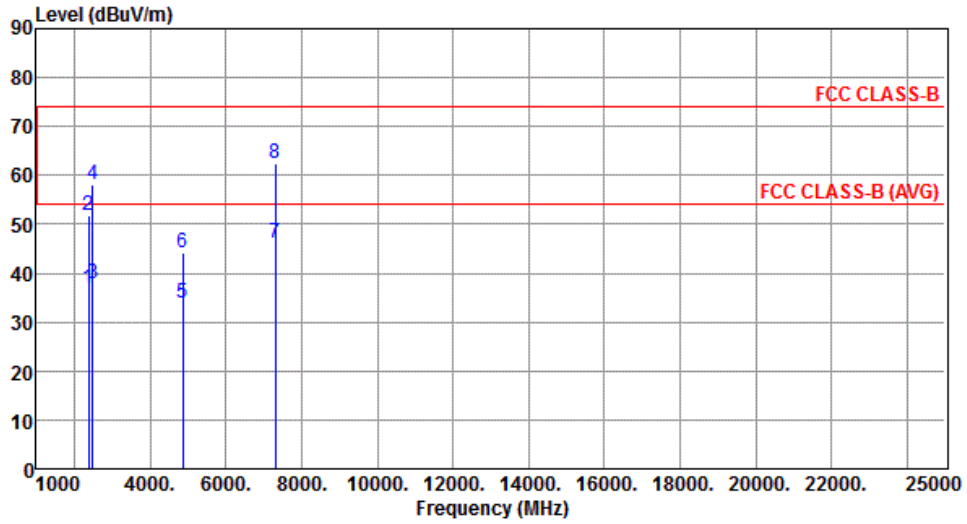
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	37.01	54.00	-16.99	40.36	-3.35	Average	269	99
2	2390.00	56.09	74.00	-17.91	59.44	-3.35	Peak	269	99
3	2483.50	37.53	54.00	-16.47	40.46	-2.93	Average	269	99
4	2483.50	56.42	74.00	-17.58	59.35	-2.93	Peak	269	99
5	4874.00	33.62	54.00	-20.38	29.87	3.75	Average	258	163
6	4874.00	43.84	74.00	-30.16	40.09	3.75	Peak	258	163
7	7311.00	45.59	54.00	-8.41	37.17	8.42	Average	333	188
8	7311.00	61.68	74.00	-12.32	53.26	8.42	Peak	333	188

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

*Factor includes antenna factor , cable loss and amplifier gain

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

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



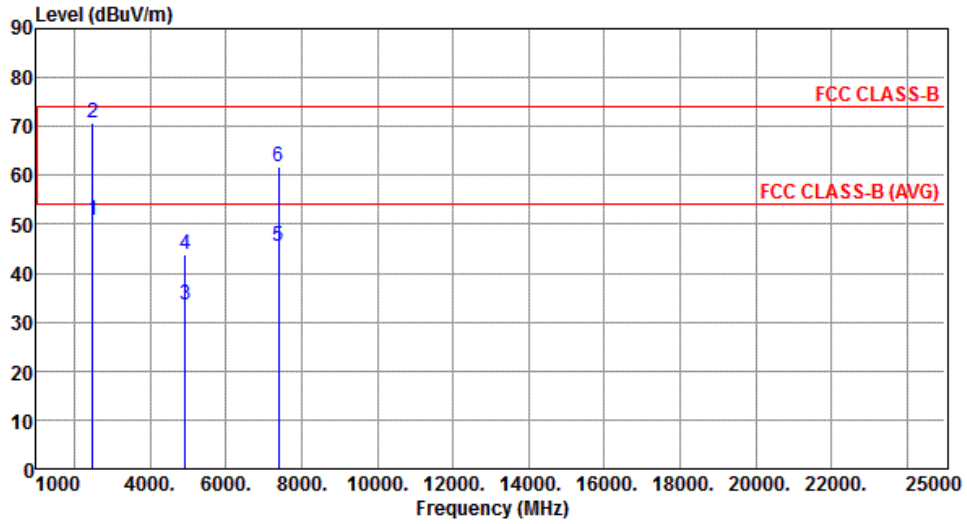
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	36.87	54.00	-17.13	40.22	-3.35	Average	395	328
2	2390.00	51.78	74.00	-22.22	55.13	-3.35	Peak	395	328
3	2483.50	37.99	54.00	-16.01	40.92	-2.93	Average	395	328
4	2483.50	57.96	74.00	-16.04	60.89	-2.93	Peak	395	328
5	4874.00	33.91	54.00	-20.09	30.16	3.75	Average	266	211
6	4874.00	44.08	74.00	-29.92	40.33	3.75	Peak	266	211
7	7311.00	46.04	54.00	-7.96	37.62	8.42	Average	229	86
8	7311.00	62.29	74.00	-11.71	53.87	8.42	Peak	229	86

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

*Factor includes antenna factor , cable loss and amplifier gain

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

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



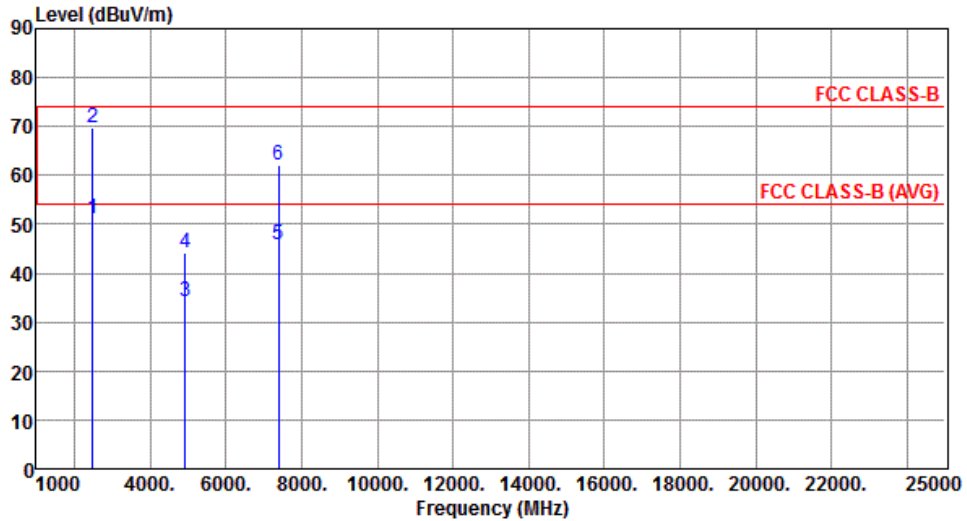
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	50.79	54.00	-3.21	53.72	-2.93	Average	245	100
2	2483.50	70.61	74.00	-3.39	73.54	-2.93	Peak	245	100
3	4924.00	33.47	54.00	-20.53	29.56	3.91	Average	255	153
4	4924.00	43.76	74.00	-30.24	39.85	3.91	Peak	255	153
5	7386.00	45.35	54.00	-8.65	36.89	8.46	Average	333	211
6	7386.00	61.61	74.00	-12.39	53.15	8.46	Peak	333	211

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

*Factor includes antenna factor , cable loss and amplifier gain

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

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



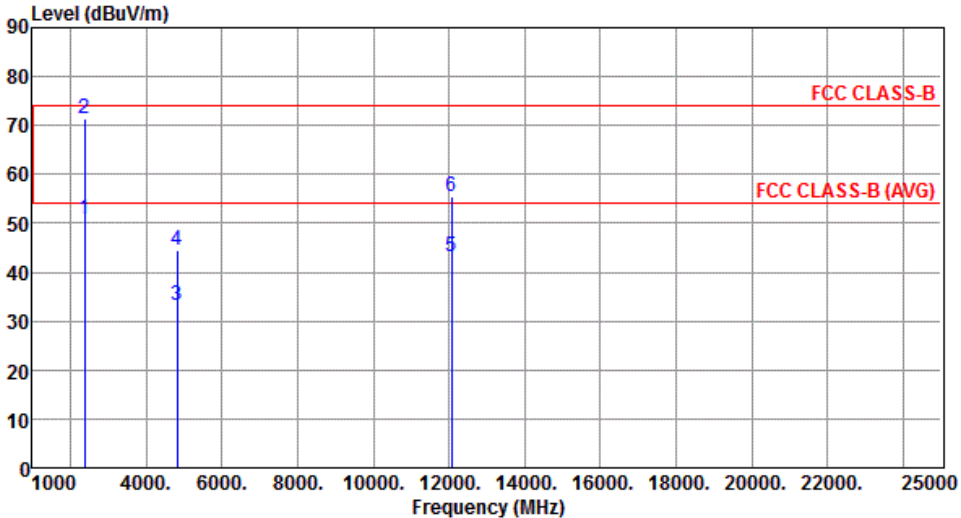
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	51.05	54.00	-2.95	53.98	-2.93	Average	399	329
2	2483.50	69.89	74.00	-4.11	72.82	-2.93	Peak	399	329
3	4924.00	34.07	54.00	-19.93	30.16	3.91	Average	261	199
4	4924.00	44.16	74.00	-29.84	40.25	3.91	Peak	261	199
5	7386.00	45.87	54.00	-8.13	37.41	8.46	Average	232	84
6	7386.00	61.98	74.00	-12.02	53.52	8.46	Peak	232	84

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

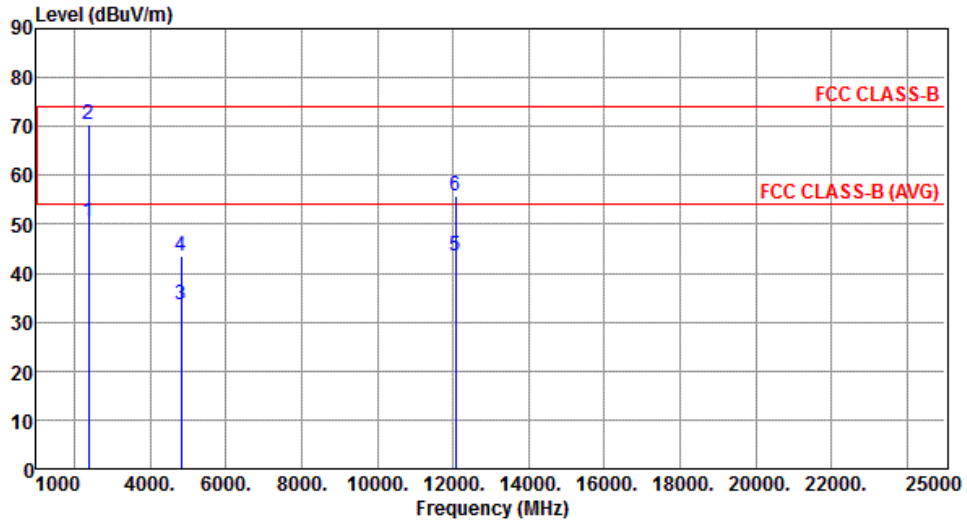
*Factor includes antenna factor , cable loss and amplifier gain

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

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

Modulation	HT20	Test Freq. (MHz)	2412						
Polarization	Horizontal								
									
	Freq.	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	50.74	54.00	-3.26	54.09	-3.35	Average	268	102
2	2390.00	71.34	74.00	-2.66	74.69	-3.35	Peak	268	102
3	4824.00	33.12	54.00	-20.88	29.53	3.59	Average	266	138
4	4824.00	44.48	74.00	-29.52	40.89	3.59	Peak	266	138
5	12060.00	43.24	54.00	-10.76	29.11	14.13	Average	211	188
6	12060.00	55.39	74.00	-18.61	41.26	14.13	Peak	211	188
<p>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).</p>									

Modulation	HT20	Test Freq. (MHz)	2412
Polarization	Vertical		



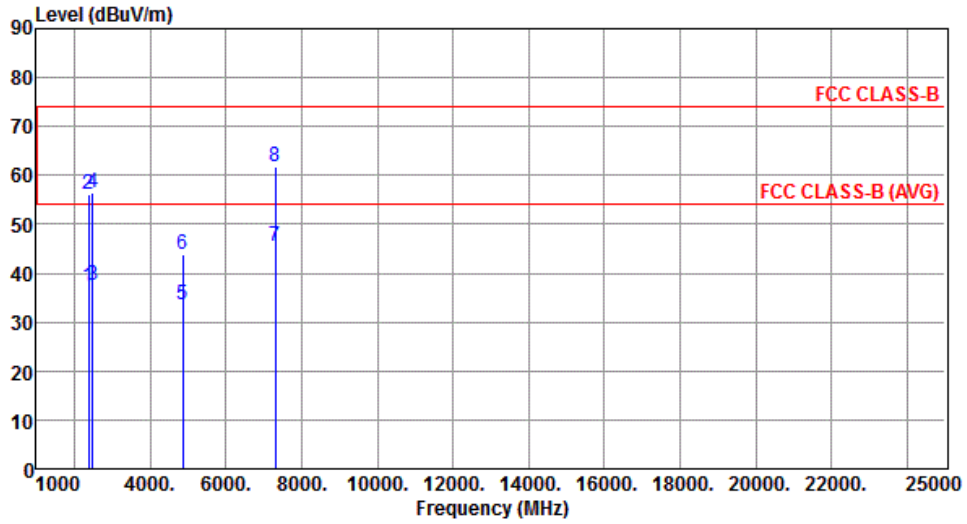
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	50.32	54.00	-3.68	53.67	-3.35	Average	390	326
2	2390.00	70.54	74.00	-3.46	73.89	-3.35	Peak	390	326
3	4824.00	33.47	54.00	-20.53	29.88	3.59	Average	266	211
4	4824.00	43.45	74.00	-30.55	39.86	3.59	Peak	266	211
5	12060.00	43.48	54.00	-10.52	29.35	14.13	Average	222	186
6	12060.00	55.66	74.00	-18.34	41.53	14.13	Peak	222	186

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

*Factor includes antenna factor , cable loss and amplifier gain

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

Modulation	HT20	Test Freq. (MHz)	2437
Polarization	Horizontal		



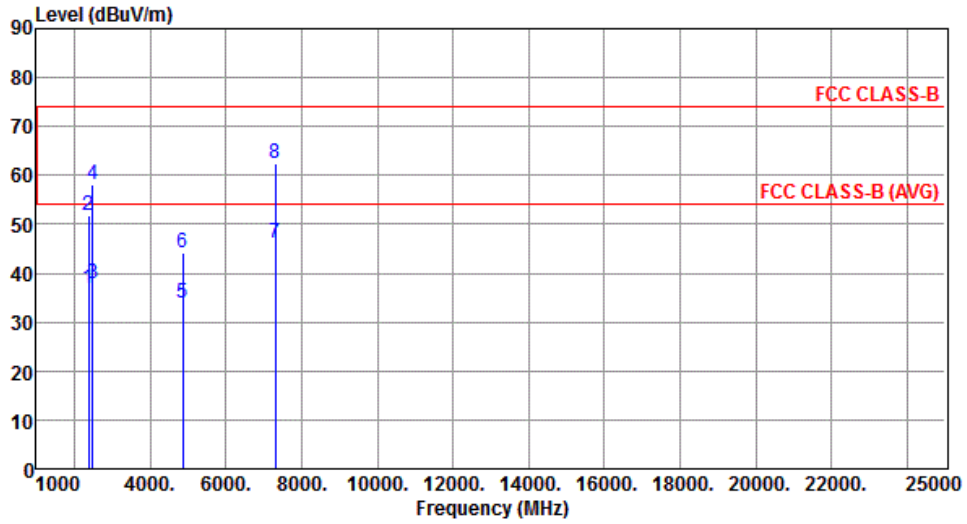
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	37.09	54.00	-16.91	40.44	-3.35	Average	259	102
2	2390.00	56.21	74.00	-17.79	59.56	-3.35	Peak	259	102
3	2483.50	37.69	54.00	-16.31	40.62	-2.93	Average	259	102
4	2483.50	56.62	74.00	-17.38	59.55	-2.93	Peak	259	102
5	4874.00	33.64	54.00	-20.36	29.89	3.75	Average	259	166
6	4874.00	43.93	74.00	-30.07	40.18	3.75	Peak	259	166
7	7311.00	45.64	54.00	-8.36	37.22	8.42	Average	332	184
8	7311.00	61.78	74.00	-12.22	53.36	8.42	Peak	332	184

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

*Factor includes antenna factor , cable loss and amplifier gain

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

Modulation	HT20	Test Freq. (MHz)	2437
Polarization	Vertical		



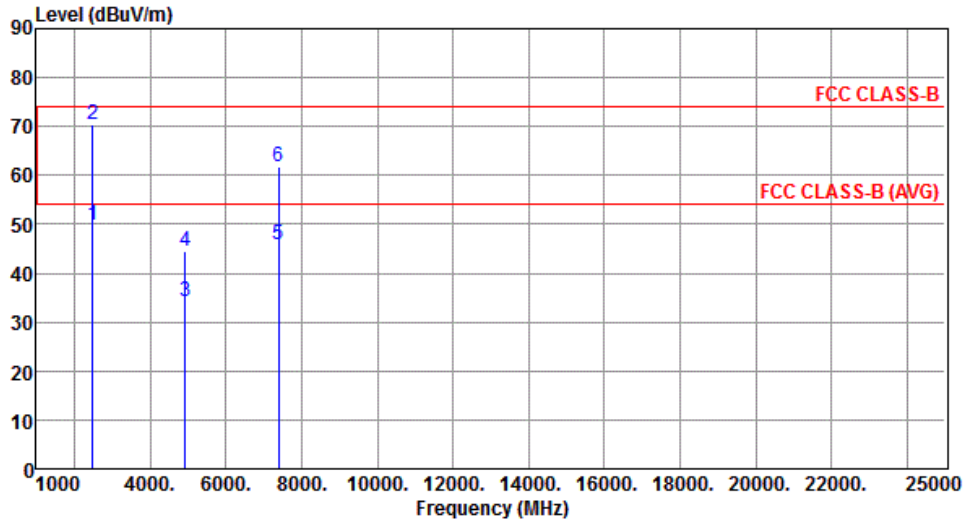
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	36.87	54.00	-17.13	40.22	-3.35	Average	395	328
2	2390.00	51.78	74.00	-22.22	55.13	-3.35	Peak	395	328
3	2483.50	37.99	54.00	-16.01	40.92	-2.93	Average	395	328
4	2483.50	57.96	74.00	-16.04	60.89	-2.93	Peak	395	328
5	4874.00	33.91	54.00	-20.09	30.16	3.75	Average	266	211
6	4874.00	44.08	74.00	-29.92	40.33	3.75	Peak	266	211
7	7311.00	46.04	54.00	-7.96	37.62	8.42	Average	229	86
8	7311.00	62.29	74.00	-11.71	53.87	8.42	Peak	229	86

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

*Factor includes antenna factor , cable loss and amplifier gain

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

Modulation	HT20	Test Freq. (MHz)	2462
Polarization	Horizontal		



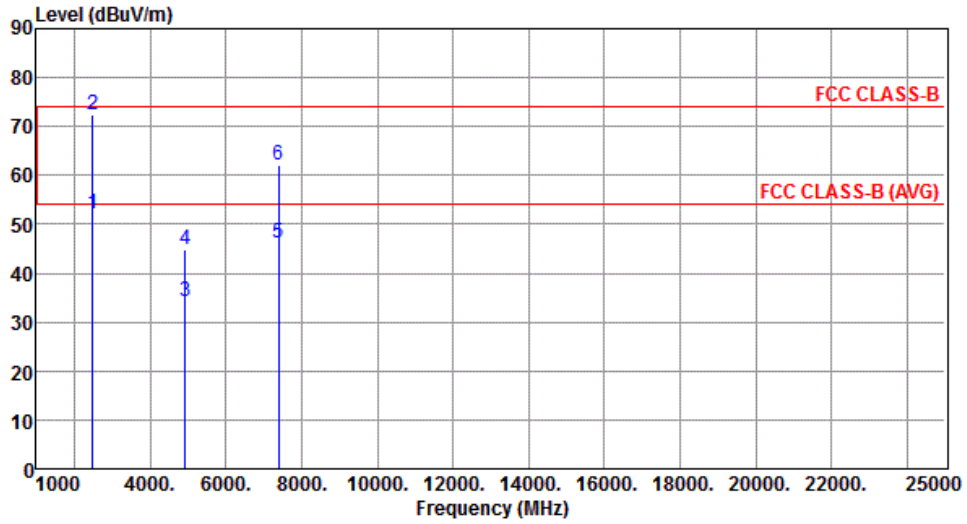
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	49.98	54.00	-4.02	52.91	-2.93	Average	258	98
2	2483.50	70.49	74.00	-3.51	73.42	-2.93	Peak	258	98
3	4924.00	34.14	54.00	-19.86	30.23	3.91	Average	255	153
4	4924.00	44.45	74.00	-29.55	40.54	3.91	Peak	255	153
5	7386.00	45.80	54.00	-8.20	37.34	8.46	Average	333	189
6	7386.00	61.65	74.00	-12.35	53.19	8.46	Peak	333	189

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

*Factor includes antenna factor , cable loss and amplifier gain

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

Modulation	HT20	Test Freq. (MHz)	2462
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	52.06	54.00	-1.94	54.99	-2.93	Average	396	331
2	2483.50	72.48	74.00	-1.52	75.41	-2.93	Peak	396	331
3	4924.00	34.13	54.00	-19.87	30.22	3.91	Average	263	222
4	4924.00	44.76	74.00	-29.24	40.85	3.91	Peak	263	222
5	7386.00	46.29	54.00	-7.71	37.83	8.46	Average	243	89
6	7386.00	62.08	74.00	-11.92	53.62	8.46	Peak	243	89

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

*Factor includes antenna factor , cable loss and amplifier gain

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

3.6 Emissions in Non-Restricted Frequency Bands

3.6.1 Emissions in Non-Restricted Frequency Bands Limit

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

3.6.2 Measuring Instruments

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

3.6.3 Test Procedures

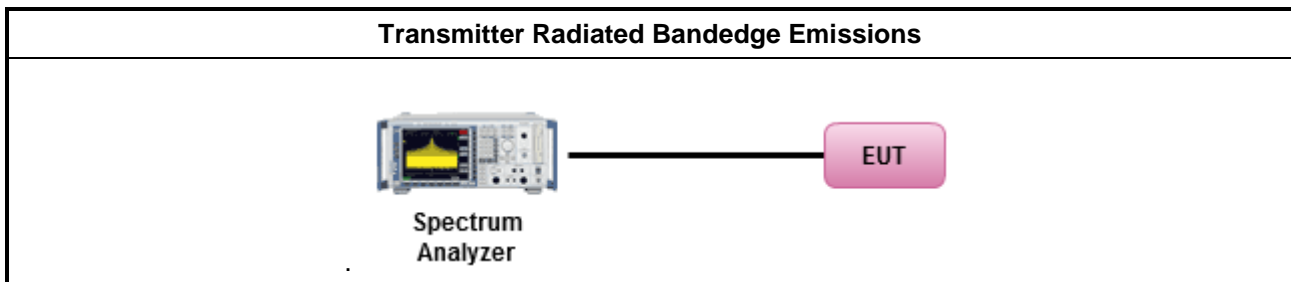
Reference level measurement

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

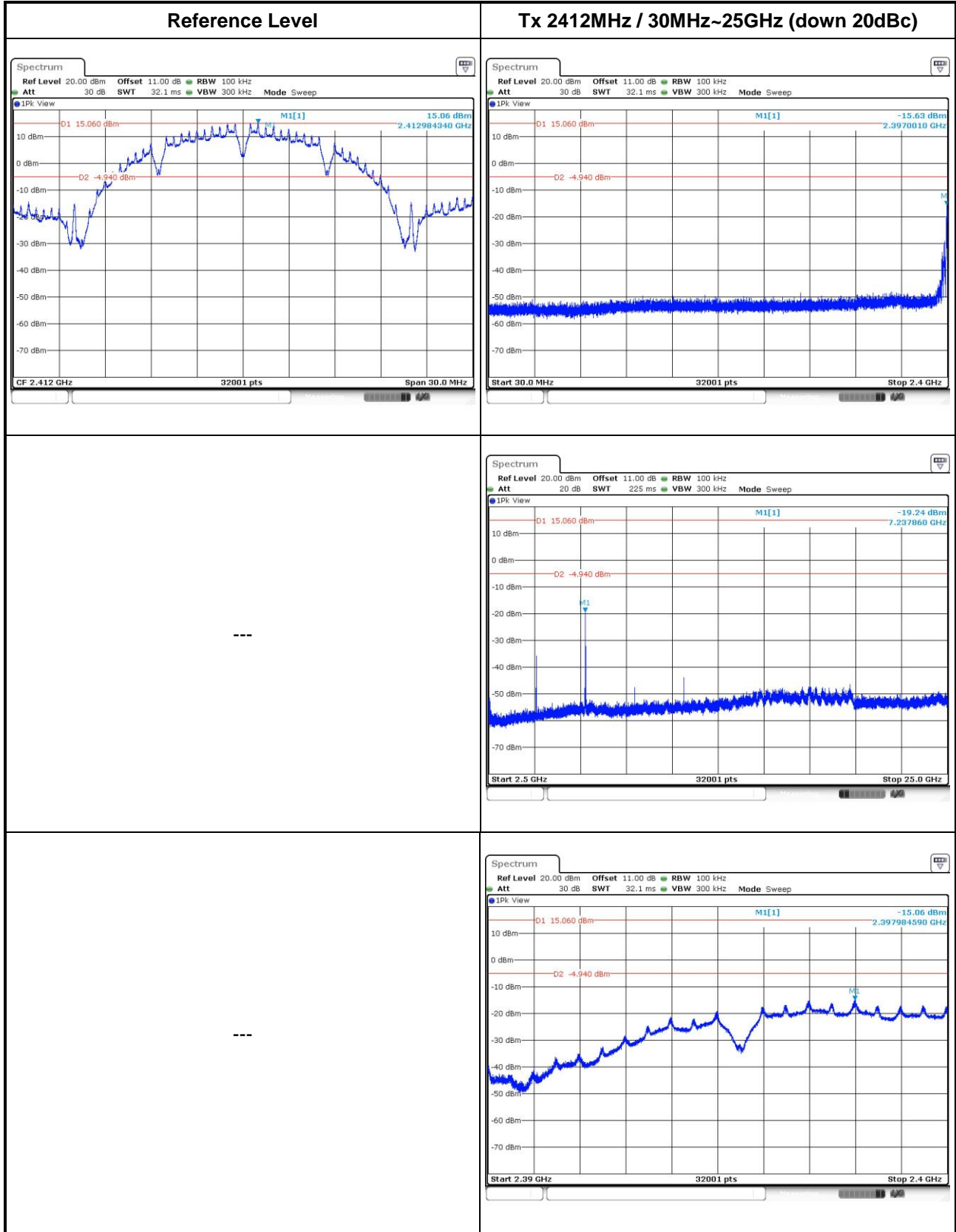
1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
2. Trace = max hold , Allow Trace to fully stabilize
3. Scan Frequency range is up to 25GHz
4. Use the peak marker function to determine the maximum amplitude level

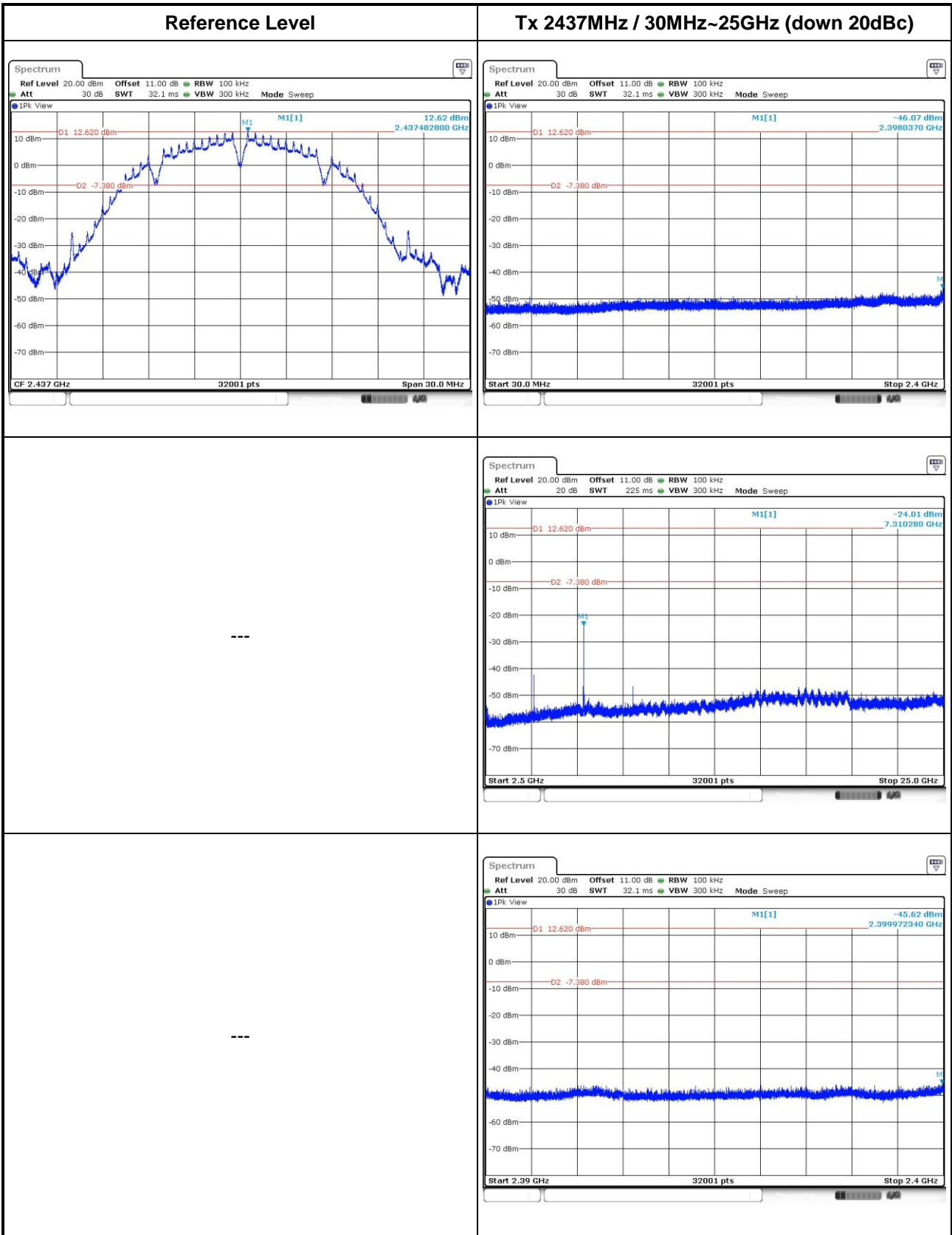
3.6.4 Test Setup

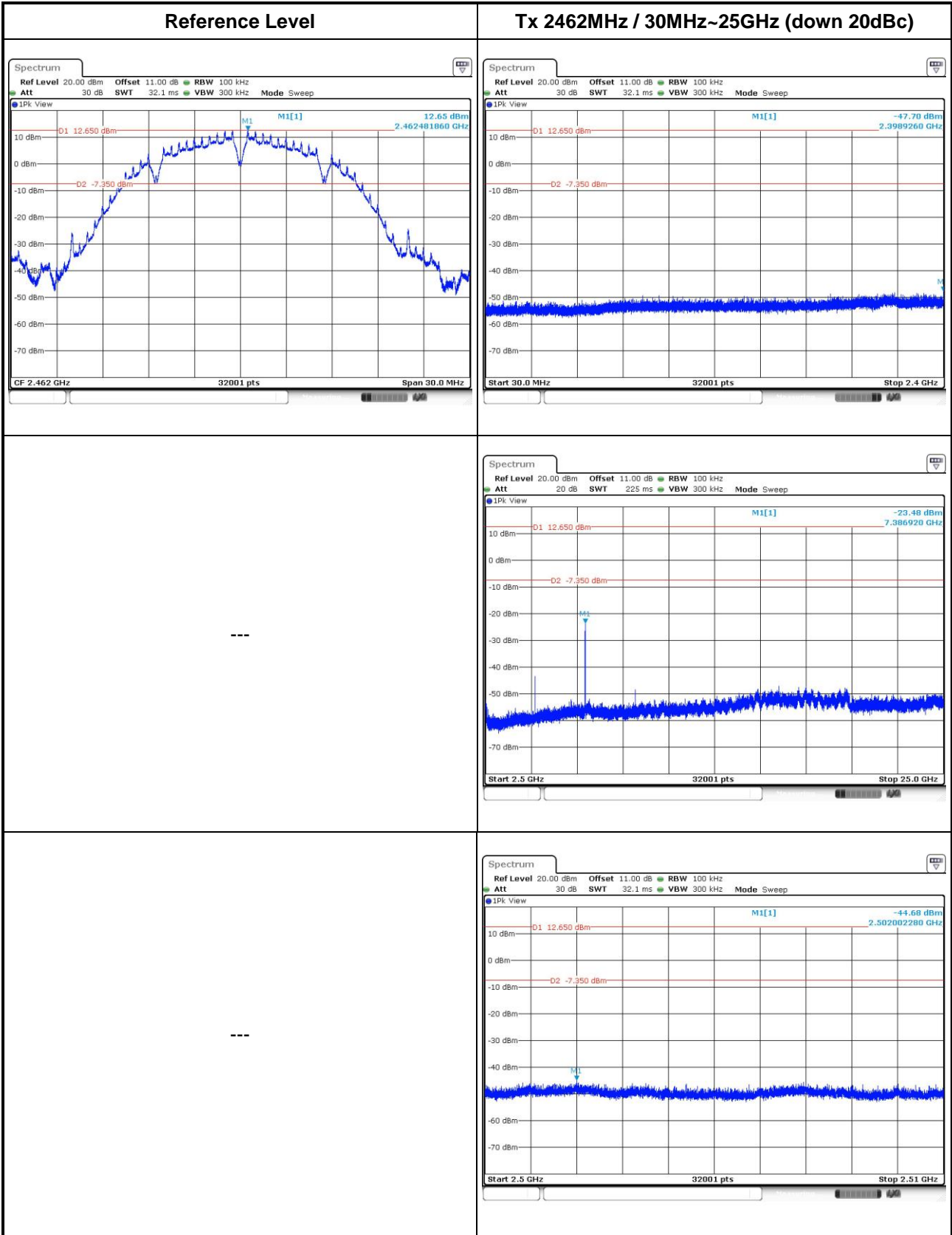


3.6.5 Unwanted Emissions into Non-Restricted Frequency Bands

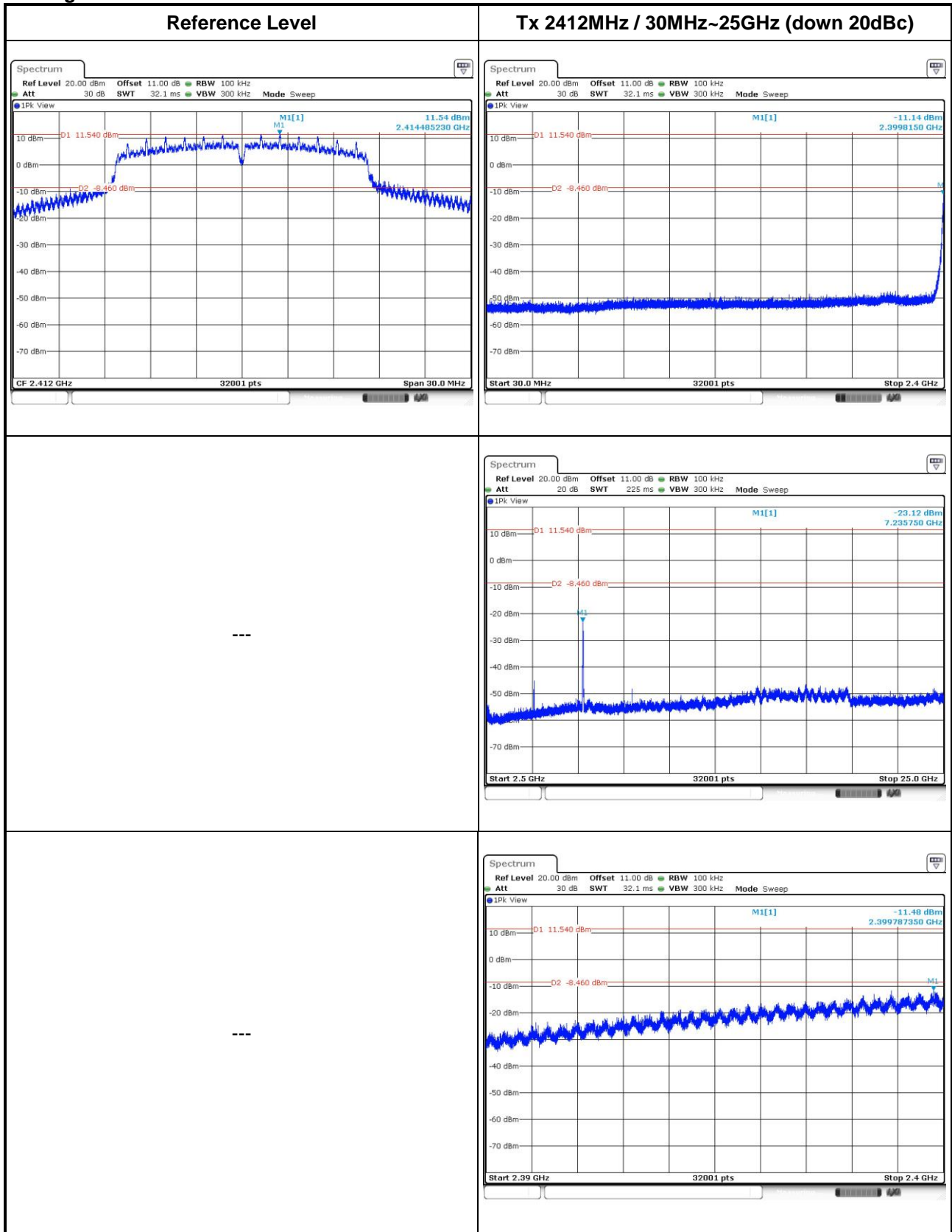
802.11b

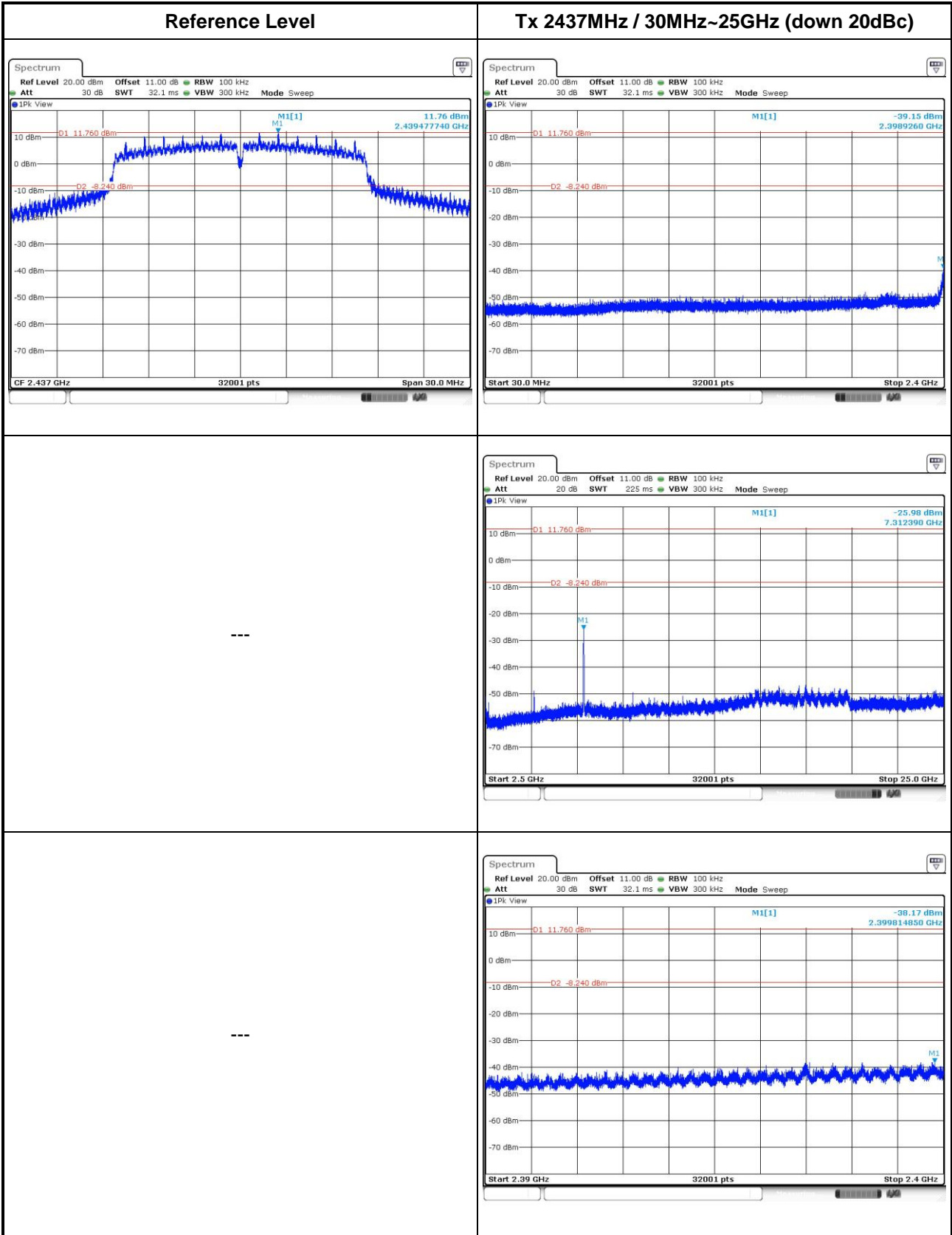


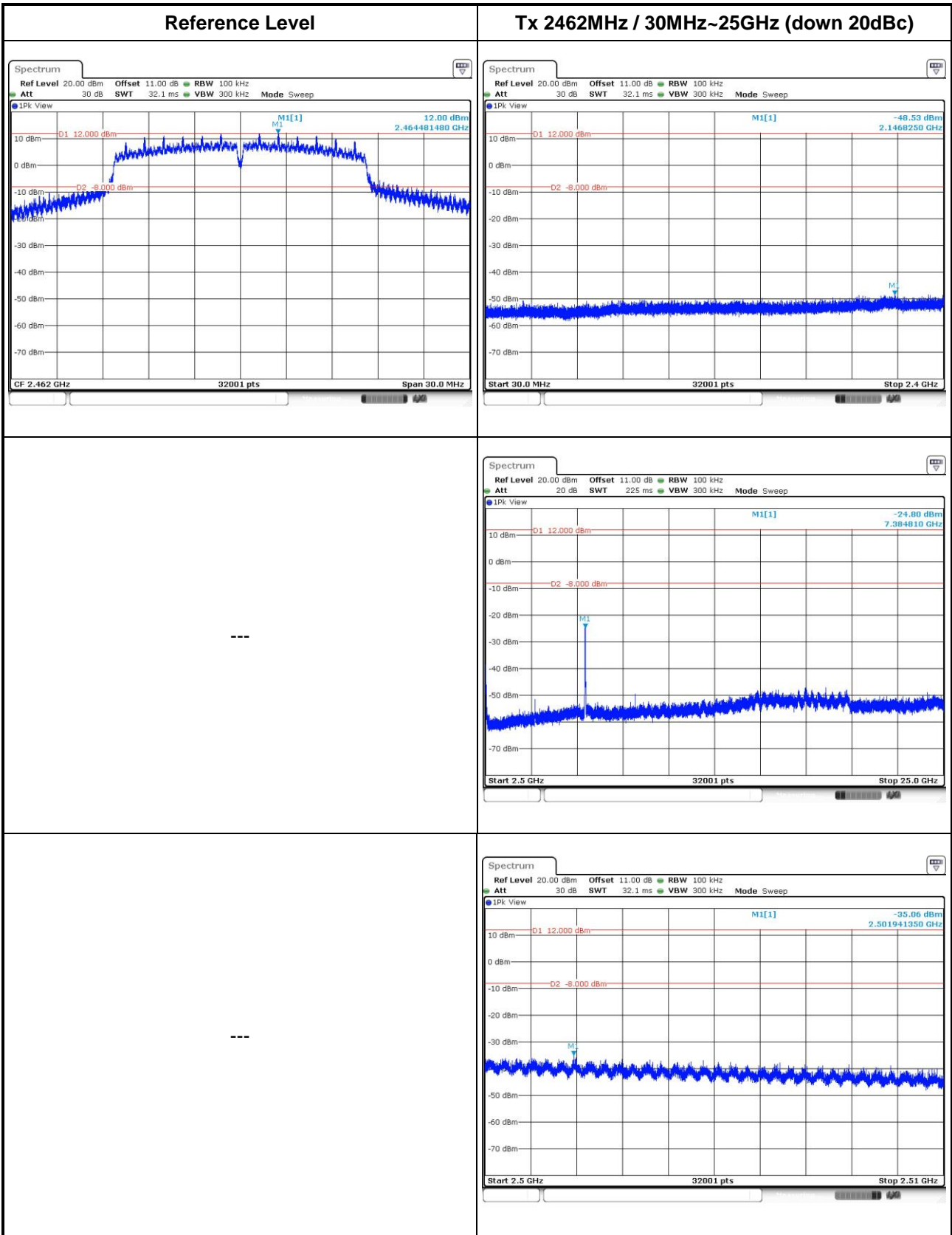




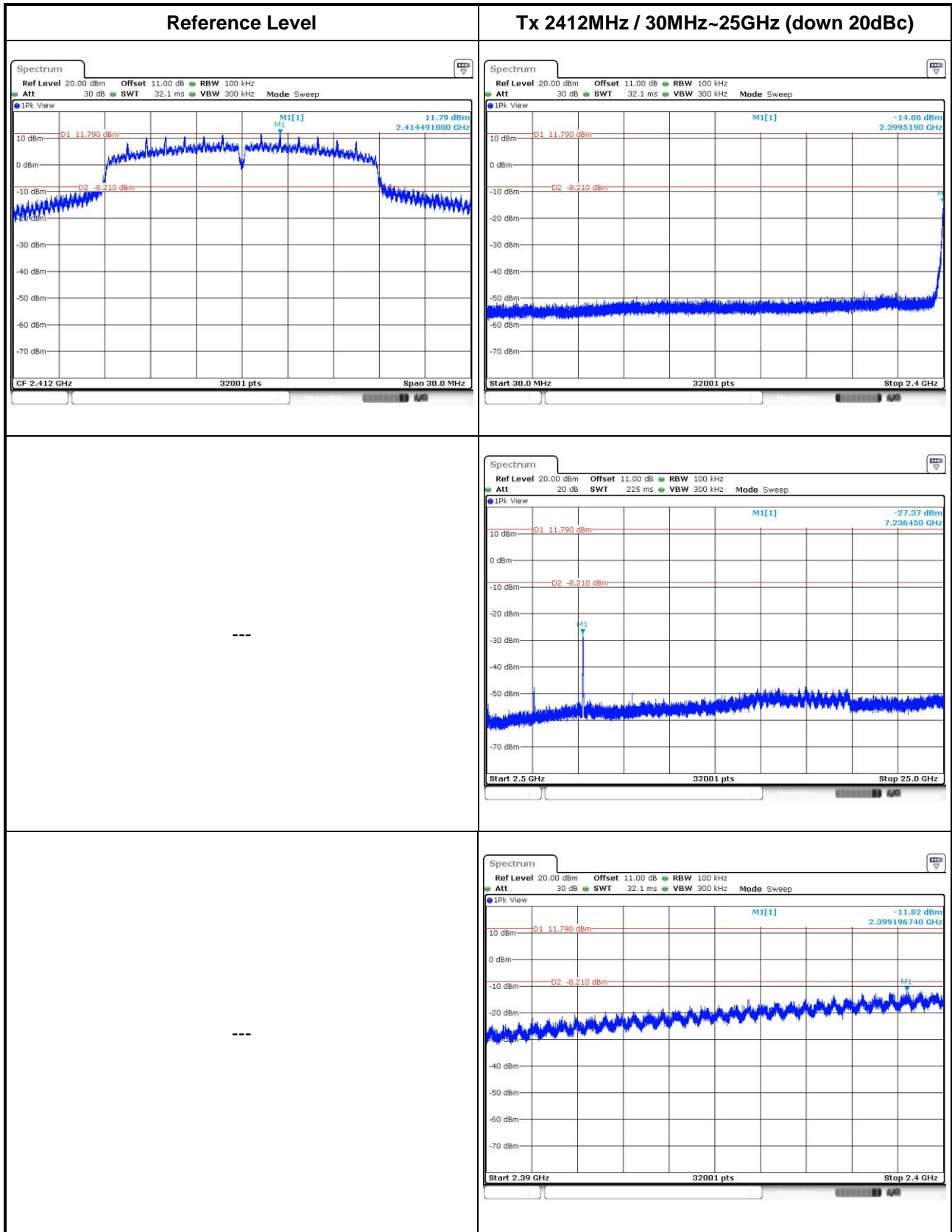
802.11g

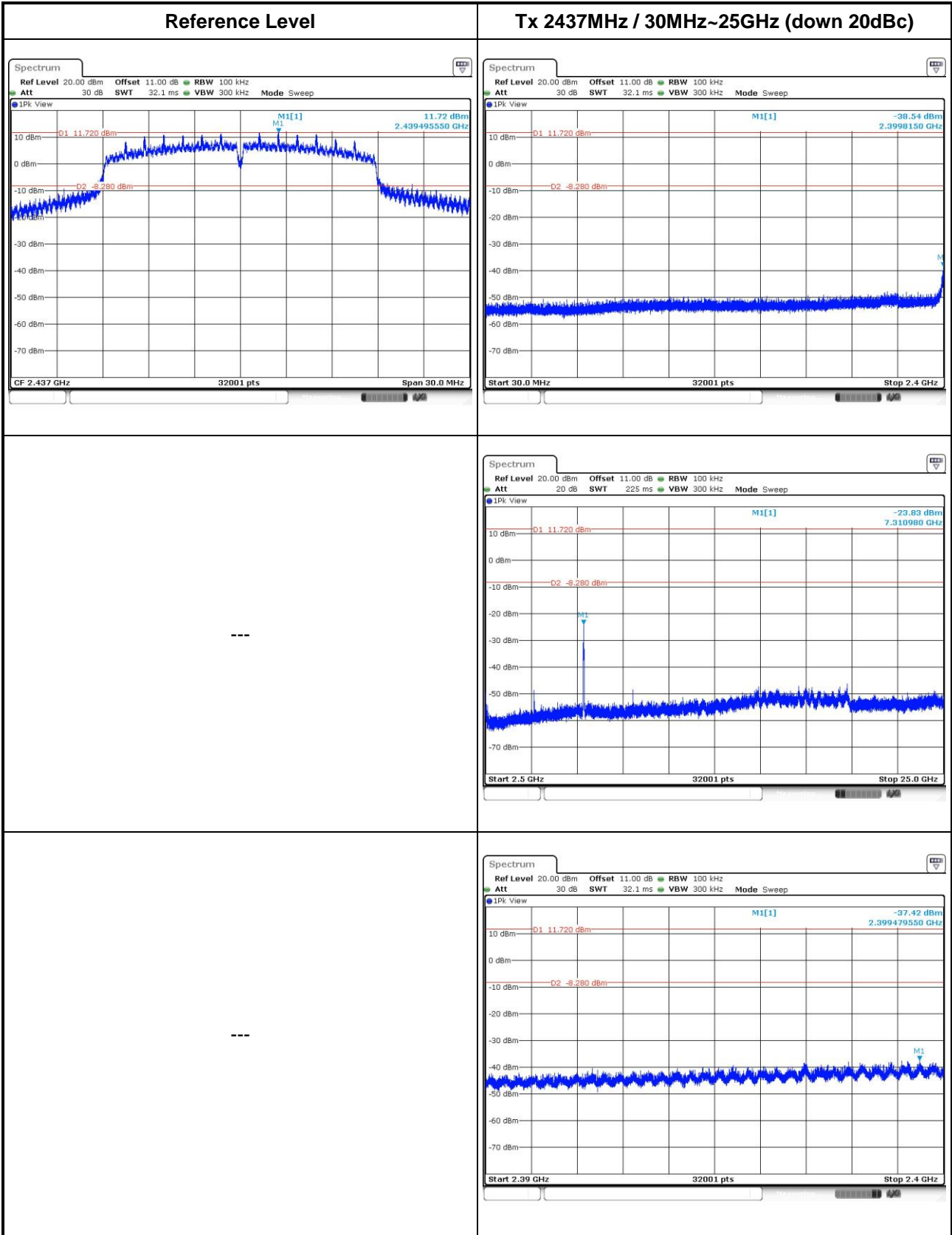


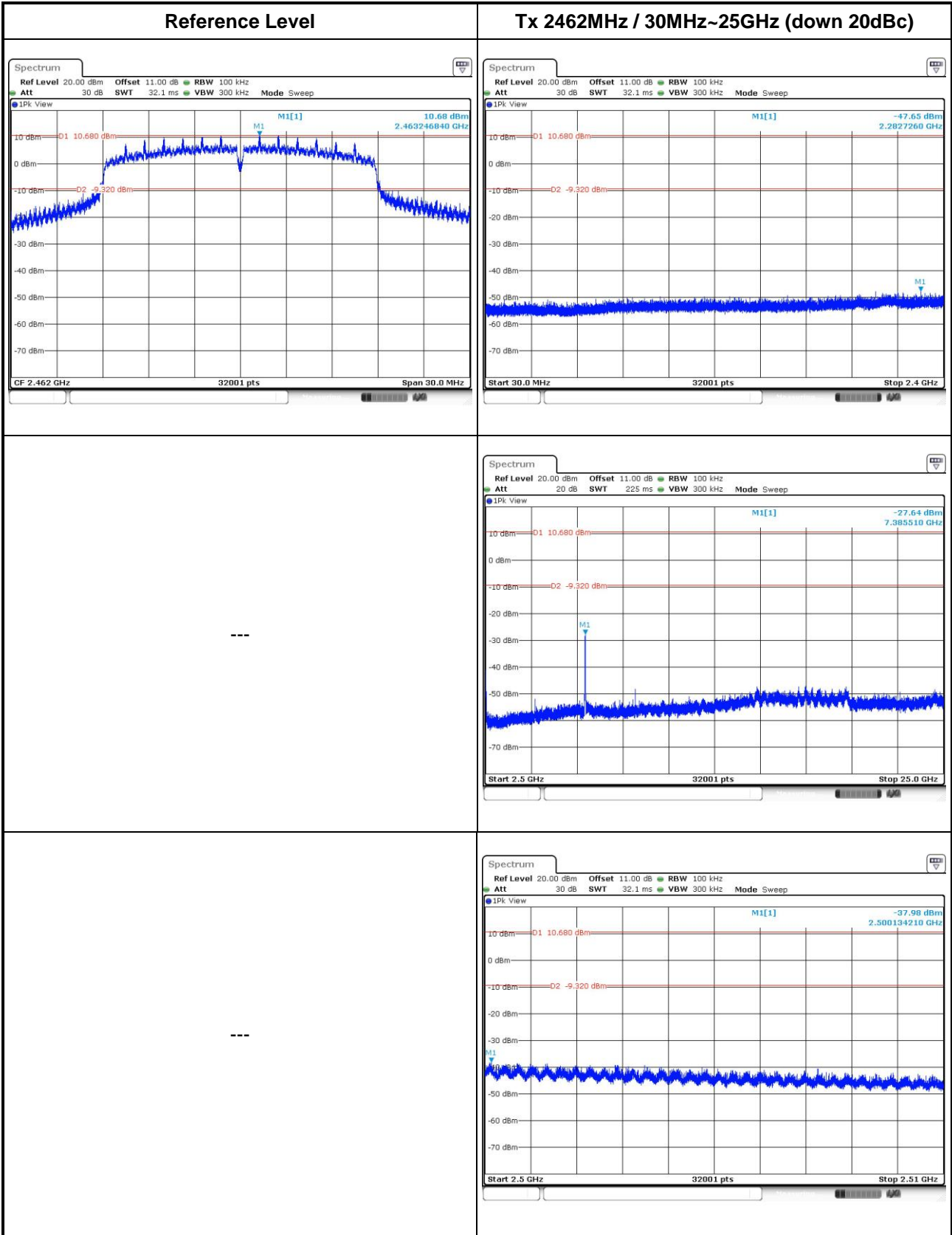




802.11n HT20







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==