

FCC Test Report

FCC ID : ARA-CPE7000IDU2X
Equipment : DM-CPE7000-Si-2D-1V-WiFi-2.x
Model No. : WLTXFSR-105GN
Brand Name : Telrad
Applicant : Telrad Networks Ltd
Address : Industrial Center PO Box 6118, Lod, 711600
Israel
Standard : 47 CFR FCC Part 15.247
Received Date : Sep. 11, 2015
Tested Date : Sep. 19 ~ Nov. 10, 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



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Release Record

Report No.	Version	Description	Issued Date
FR591105	Rev. 01	Initial issue	Nov. 25, 2015

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	Conducted Emissions	[dBuV]: 0.387MHz 41.64 (Margin -6.48dB) - AV	Pass
15.247(d) 15.209	Radiated Emissions	[dBuV/m at 3m]: 2385.00MHz 53.04 (Margin -0.96dB) - AV	Pass
15.247(b)(3)	Maximum Output Power	Max Power [dBm]: 26.53	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
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.					

1.1.2 Antenna Details

Ant. No.	Model	Type	Gain (dBi)	Connector
1	Ant No. 1 Ant - R	Directional PCB antenna	4.28	MHF Plug
2	Ant No. 2 Ant - L	Directional PCB antenna	2.41	MHF Plug

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	12Vdc from AC adapter
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1.1.4 Accessories

Accessories		
No.	Equipment	Description
1	AC adapter	Brand Name: APD Model Name: WB-18D12FU Power Rating: I/P: 100-240Vac, 50-60Hz, 0.5A Max. O/P: 12Vdc, 1.5A Power Line: 1.45m non-shielded cable w/o core
2	AC adapter	Brand Name: LEI Model Name: MU18A2120150-A1 Power Rating: I/P: 100-240Vac, 50-60Hz, 0.5A O/P: 12Vdc, 1.5A Power Line: 1.5m non-shielded cable w/o core
3	RJ45 cable	1.45m non-shielded cable w/o core.

1.1.5 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	---	---

1.1.6 Test Tool and Duty Cycle

Test Tool	RT5x9x QA, version: v1.0.8.0		
Duty Cycle and Duty Factor	Mode	Duty cycle (%)	Duty factor (dB)
	11b	100.00%	0.00
	11g	100.00%	0.00
	HT20	100.00%	0.00
	HT40	100.00%	0.00

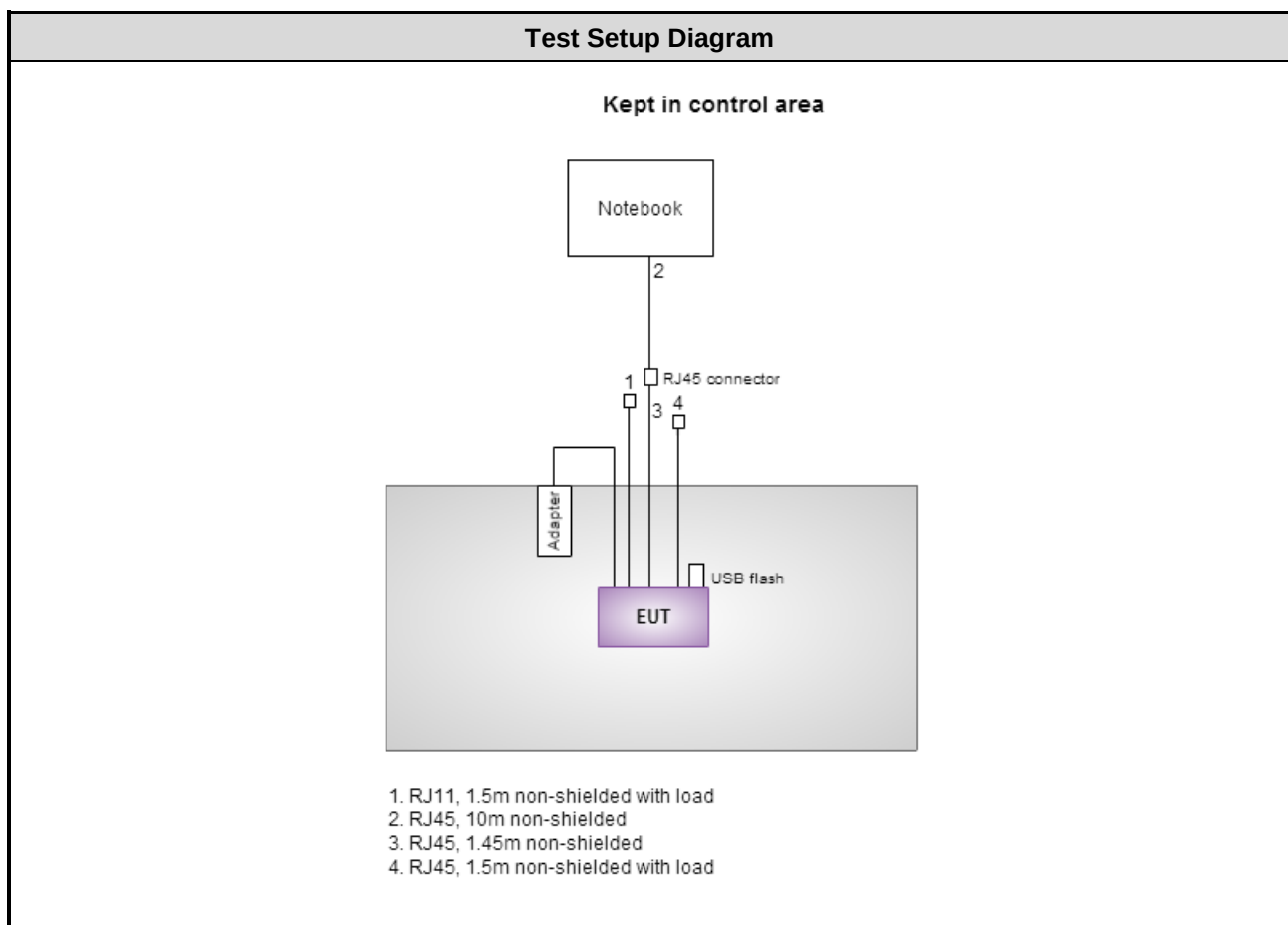
1.1.7 Power Setting

Modulation Mode	Test Frequency (MHz)	Power Set
11b	2412	1C/1C
11b	2437	20/21
11b	2462	1C/20
11g	2412	1B/1B
11g	2437	1D/1D
11g	2462	18/18
HT20	2412	15/15
HT20	2437	1D/1D
HT20	2462	16/16
HT40	2422	13/13
HT40	2437	1A/1A
HT40	2452	12/12

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	USB Flash	Kingston	DTSE9	LXVW1	---	---

1.3 Test Setup Chart



1.4 The Equipment List

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Tested Date	Nov. 10, 2015				
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. 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				
Test Site	966 chamber1 / (03CH01-WS)				
Tested Date	Sep. 19 ~ Sep. 25, 2015				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101498	Dec. 09, 2014	Dec. 08, 2015
Receiver	R&S	ESR3	101658	Nov. 10, 2014	Nov. 09, 2015
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. 11, 2014	Dec. 10, 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	SN:100219	Sep. 10, 2015	Sep. 09, 2016
Preamplifier	Agilent	83017A	MY39501308	Oct. 09, 2014	Oct. 08, 2015
Preamplifier	EMC	EMC184045B	980192	Sep. 01, 2015	Aug. 31, 2016
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16014/4	Dec. 15, 2014	Dec. 14, 2015
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Dec. 15, 2014	Dec. 14, 2015
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16139/4	Dec. 15, 2014	Dec. 14, 2015
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Dec. 15, 2014	Dec. 14, 2015
LF cable 10M	Woken	CFD400NL-LW	CFD400NL-002	Dec. 15, 2014	Dec. 14, 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)				
Tested Date	Oct. 22 ~ Oct. 23, 2015				
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. 21, 2015	Sep. 20, 2016
Power Sensor	Anritsu	MA2411B	1207366	Sep. 21, 2015	Sep. 20, 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 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	± 3.72 dB
Radiated emission > 1 GHz	± 5.65 dB

2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
AC Conduction	CO01-WS	21°C / 59%	Peter Lin
Radiated Emissions	03CH01-WS	22-23°C / 65-68%	Warren Lee
RF Conducted	TH01-WS	22°C / 65%	Alex Huang

➤ FCC site registration No.: 657002

➤ IC site registration No.: 10807A-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: 1. Two adapters had been covered during the pretest, and found that LEI adapter was the worst case and was selected for final test. (APD adapter, model WB-18D12FU; LEI adapter, model MU18A2120150-A1.)				

3 Transmitter Test Results

3.1 Conducted Emissions

3.1.1 Limit of Conducted Emissions

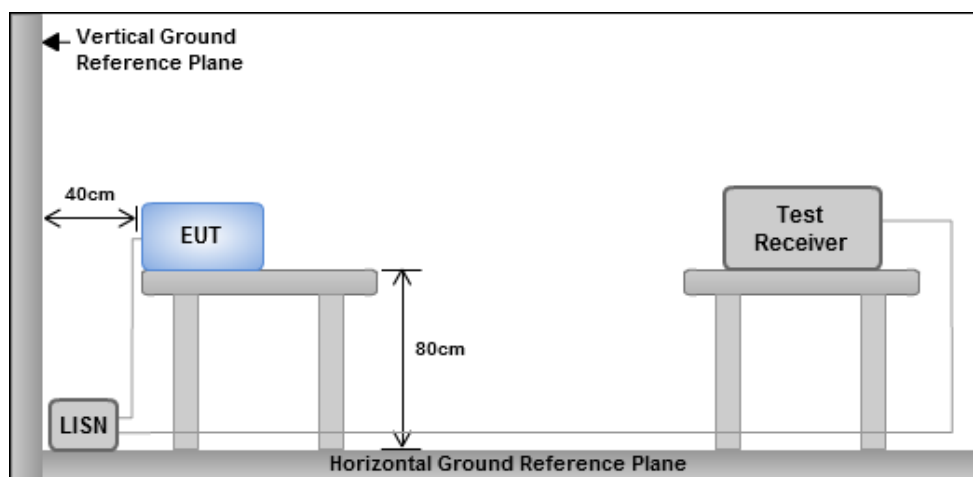
Conducted Emissions Limit		
Frequency Emission (MHz)	Quasi-Peak	Average
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50

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.

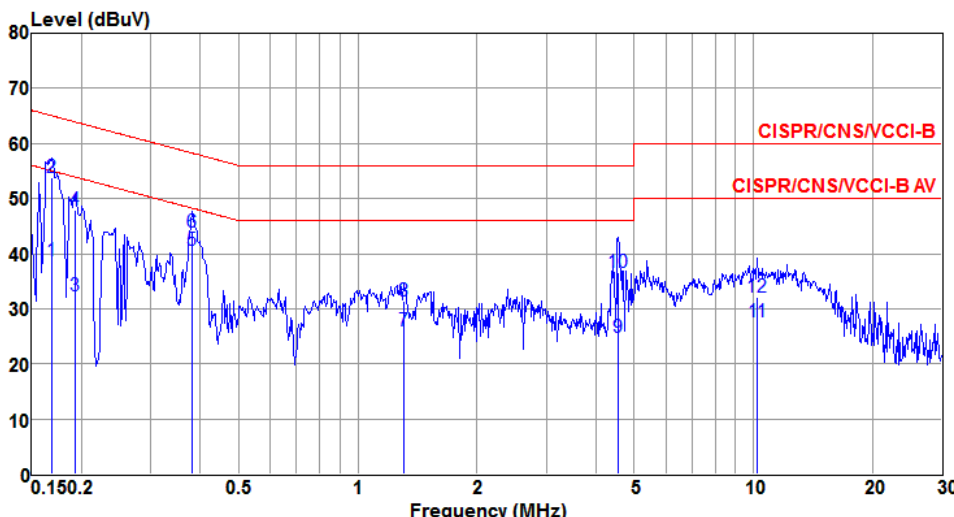
3.1.3 Test Setup



- 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)	2412
Power Phase	Line		

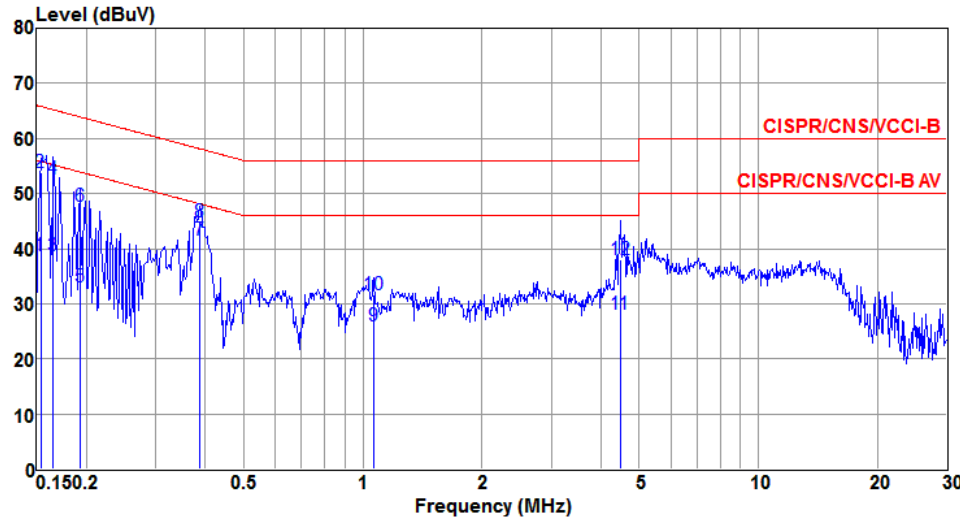


	Freq MHz	Level dBUV	Limit Line dBUV	Over Limit dB	Read Level dBUV	LISN factor dB	cable loss dB	Remark
1	0.169	38.68	55.03	-16.35	37.95	0.65	0.08	Average
2	0.169	53.85	65.03	-11.18	53.12	0.65	0.08	QP
3	0.192	32.26	53.93	-21.67	31.84	0.33	0.09	Average
4	0.192	47.86	63.93	-16.07	47.44	0.33	0.09	QP
5@	0.381	40.58	48.25	-7.67	40.29	0.18	0.11	Average
6	0.381	43.85	58.25	-14.40	43.56	0.18	0.11	QP
7	1.303	26.00	46.00	-20.00	25.52	0.29	0.19	Average
8	1.303	31.31	56.00	-24.69	30.83	0.29	0.19	QP
9	4.549	24.90	46.00	-21.10	24.28	0.31	0.31	Average
10	4.549	36.48	56.00	-19.52	35.86	0.31	0.31	QP
11	10.233	27.69	50.00	-22.31	26.72	0.67	0.30	Average
12	10.233	32.04	60.00	-27.96	31.07	0.67	0.30	QP

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

2: Over Limit (dB) = Level (dBUV) – Limit Line (dBUV).

Modulation	11g	Test Freq. (MHz)	2412
Power Phase	Neutral		



The graph displays the measured level in dBuV against frequency in MHz. Two red lines represent the CISPR/CNS/VCCI-B and CISPR/CNS/VCCI-B AV limits. The blue line shows the measured signal, which is generally below the limits, with some peaks around 0.15 MHz and 0.38 MHz.

	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.153	38.64	55.82	-17.18	37.74	0.82	0.08	Average
2	0.153	53.74	65.82	-12.08	52.84	0.82	0.08	QP
3	0.165	38.68	55.21	-16.53	37.96	0.64	0.08	Average
4	0.165	52.73	65.21	-12.48	52.01	0.64	0.08	QP
5	0.192	33.10	53.93	-20.83	32.70	0.31	0.09	Average
6	0.192	47.72	63.93	-16.21	47.32	0.31	0.09	QP
7	0.387	41.64	48.12	-6.48	41.39	0.14	0.11	Average
8	0.387	44.74	58.12	-13.38	44.49	0.14	0.11	QP
9	1.065	25.98	46.00	-20.02	25.54	0.27	0.17	Average
10	1.065	31.72	56.00	-24.28	31.28	0.27	0.17	QP
11	4.478	27.99	46.00	-18.01	26.97	0.71	0.31	Average
12	4.478	37.90	56.00	-18.10	36.88	0.71	0.31	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

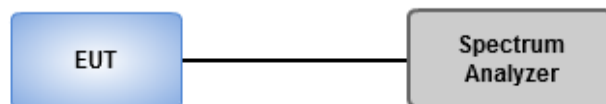
6dB Bandwidth

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) = 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.

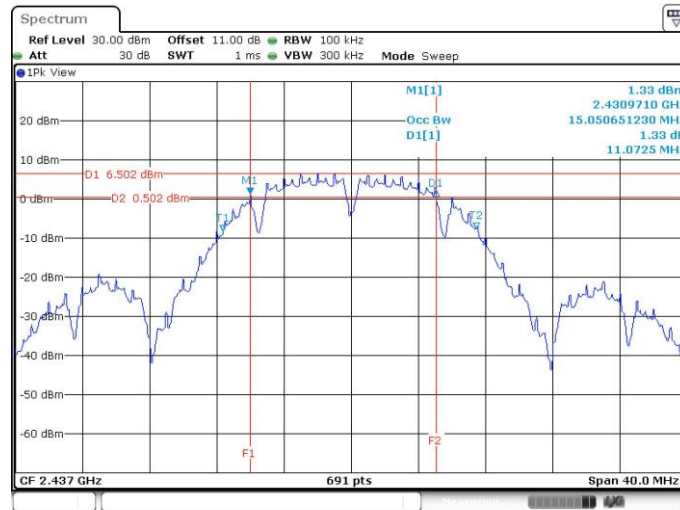
3.2.3 Test Setup



3.2.4 Test Result of 6dB and Occupied Bandwidth

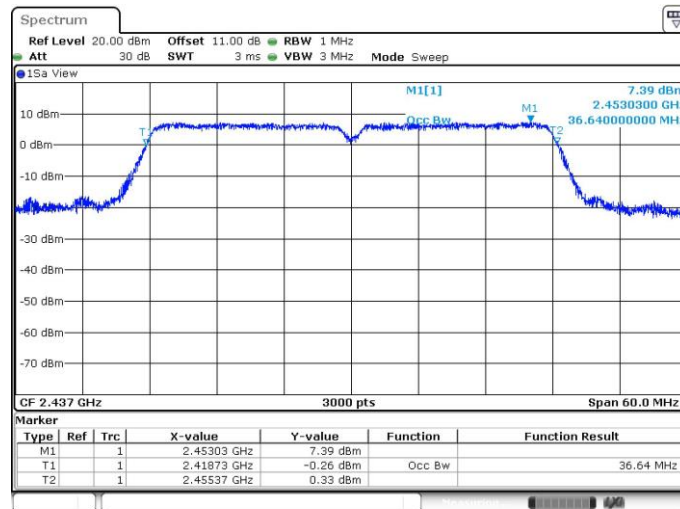
Modulation Mode	N _{TX}	Freq. (MHz)	6dB Bandwidth (MHz)				Limit (kHz)
			Chain 0	Chain 1	Chain 2	Chain 3	
11b	2	2412	12.06	12.06	---	---	500
11b	2	2437	12.06	11.07	---	---	500
11b	2	2462	12.06	12.06	---	---	500
11g	2	2412	16.52	16.46	---	---	500
11g	2	2437	16.52	16.46	---	---	500
11g	2	2462	16.46	16.46	---	---	500
HT20	2	2412	17.62	17.62	---	---	500
HT20	2	2437	17.62	17.57	---	---	500
HT20	2	2462	17.62	17.62	---	---	500
HT40	2	2422	36.41	36.41	---	---	500
HT40	2	2437	36.41	36.41	---	---	500
HT40	2	2452	36.41	36.41	---	---	500

Worst Plot



Modulation Mode	N _{TX}	Freq. (MHz)	99% Occupied Bandwidth (MHz)			
			Chain 0	Chain 1	Chain 2	Chain 3
11b	2	2412	15.00	14.92	---	---
11b	2	2437	15.08	14.92	---	---
11b	2	2462	14.98	14.90	---	---
11g	2	2412	16.87	16.85	---	---
11g	2	2437	16.81	16.77	---	---
11g	2	2462	16.75	16.73	---	---
HT20	2	2412	17.60	17.62	---	---
HT20	2	2437	17.67	17.61	---	---
HT20	2	2462	17.61	16.57	---	---
HT40	2	2422	36.46	36.38	---	---
HT40	2	2437	36.64	36.42	---	---
HT40	2	2452	36.36	36.32	---	---

Worst Plot



3.3 RF Output Power

3.3.1 Limit of RF Output Power

Conducted power shall not exceed 1Watt.

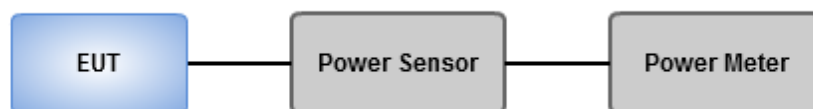
- ☒ Antenna gain $\leq 6\text{dBi}$, no any corresponding reduction is in output power limit.
- ☐ Antenna gain $> 6\text{dBi}$
 - ☐ Non Fixed, point to point operations.
The conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna 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	19.89	19.99	---	---	197.269	22.95	30.00	4.28	27.23	36.00
11b	2	2437	21.07	21.02	---	---	254.412	24.06	30.00	4.28	28.34	36.00
11b	2	2462	20.03	20.42	---	---	210.847	23.24	30.00	4.28	27.52	36.00
11g	2	2412	23.11	23.89	---	---	449.551	26.53	30.00	4.28	30.81	36.00
11g	2	2437	23.22	23.6	---	---	438.981	26.42	30.00	4.28	30.70	36.00
11g	2	2462	21.33	21.33	---	---	271.663	24.34	30.00	4.28	28.62	36.00
HT20	2	2412	21.03	21.22	---	---	259.199	24.14	30.00	4.28	28.42	36.00
HT20	2	2437	22.66	23.25	---	---	395.850	25.98	30.00	4.28	30.26	36.00
HT20	2	2462	20.63	19.88	---	---	212.886	23.28	30.00	4.28	27.56	36.00
HT40	2	2422	18.95	19.32	---	---	164.030	22.15	30.00	4.28	26.43	36.00
HT40	2	2437	21.62	21.22	---	---	277.645	24.43	30.00	4.28	28.71	36.00
HT40	2	2452	18.39	19.11	---	---	150.494	21.78	30.00	4.28	26.06	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	18.03	18.05	---	---	127.359	21.05	---
11b	2	2437	19.15	19.15	---	---	164.449	22.16	---
11b	2	2462	18.15	18.65	---	---	138.596	21.42	---
11g	2	2412	15.37	15.22	---	---	67.701	18.31	---
11g	2	2437	15.82	15.4	---	---	72.868	18.63	---
11g	2	2462	14.28	13.05	---	---	46.975	16.72	---
HT20	2	2412	12.77	12.83	---	---	38.110	15.81	---
HT20	2	2437	15.43	15.26	---	---	68.488	18.36	---
HT20	2	2462	13.22	12.26	---	---	37.816	15.78	---
HT40	2	2422	11.78	11.86	---	---	30.412	14.83	---
HT40	2	2437	14.55	13.92	---	---	53.171	17.26	---
HT40	2	2452	11.05	11.59	---	---	27.156	14.34	---

Note: Conducted average output power is for reference only.

3.4 Power Spectral Density

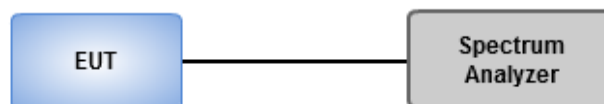
3.4.1 Limit of Power Spectral Density

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.

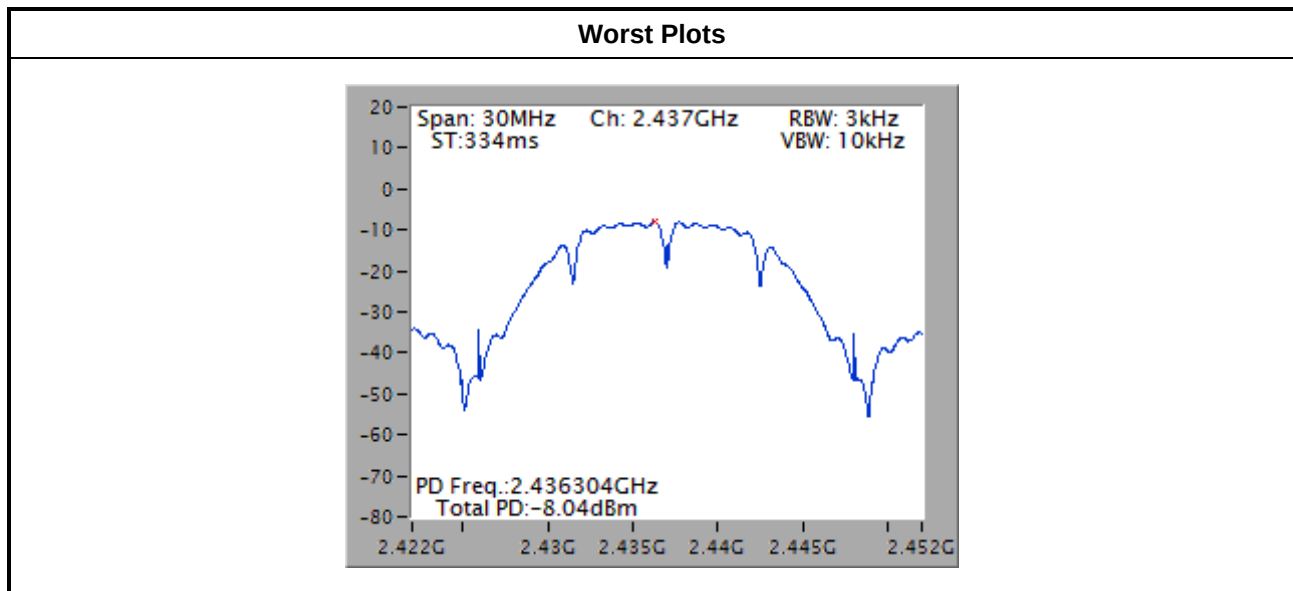
3.4.3 Test Setup



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	-8.84	8.00
11b	2	2437	-8.04	8.00
11b	2	2462	-8.99	8.00
11g	2	2412	-11.47	8.00
11g	2	2437	-10.55	8.00
11g	2	2462	-12.59	8.00
HT20	2	2412	-12.35	8.00
HT20	2	2437	-9.90	8.00
HT20	2	2462	-12.43	8.00
HT40	2	2422	-15.61	8.00
HT40	2	2437	-12.85	8.00
HT40	2	2452	-16.60	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

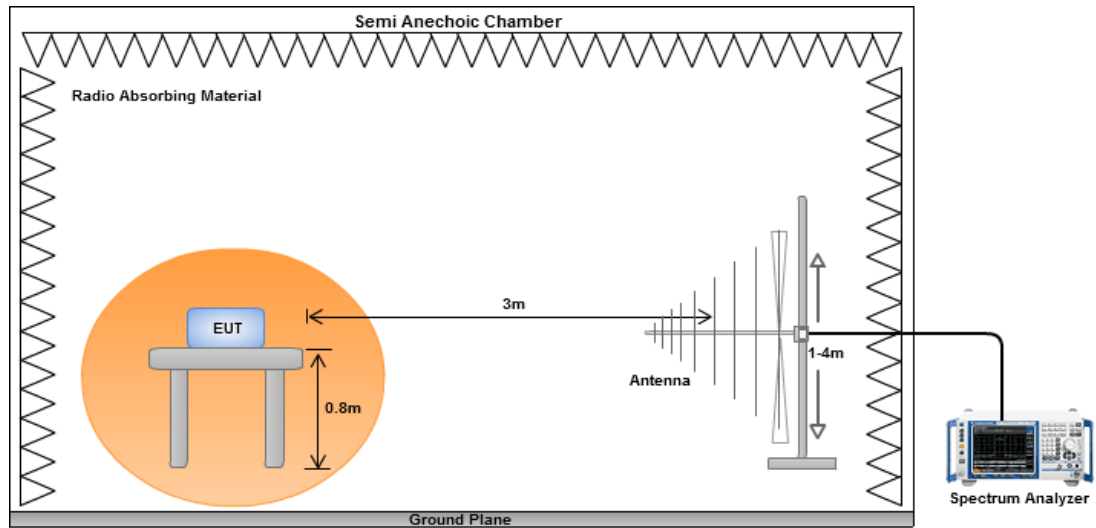
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission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

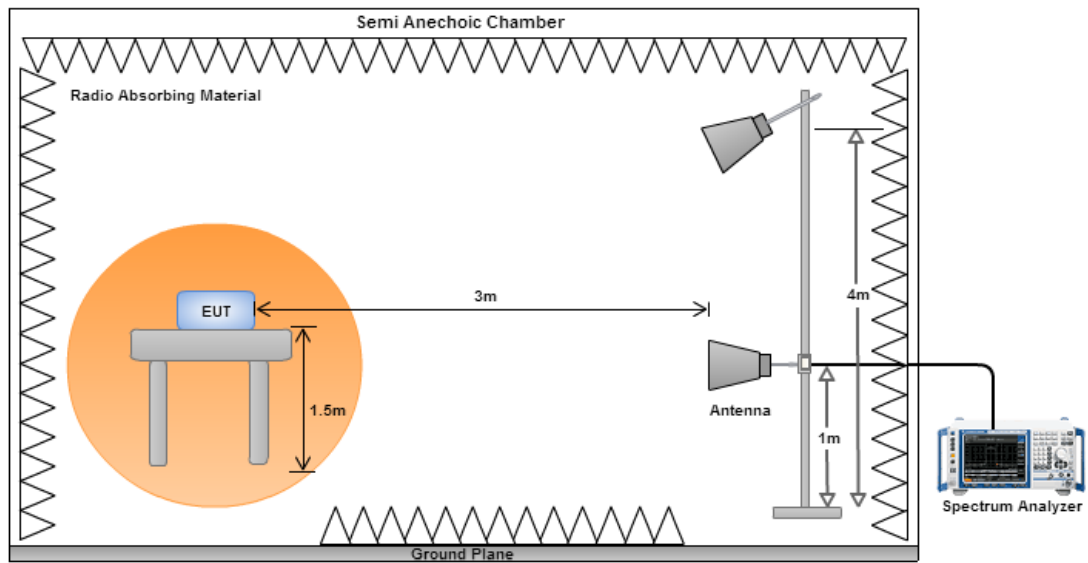
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above 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)	2412
Polarization	Horizontal		
Level (dBuV/m) <			

Modulation	11g	Test Freq. (MHz)	2412
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	2390.00	42.75	54.00	-11.25	46.02	-3.27	Average	283	221
2	2390.00	57.80	74.00	-16.20	61.07	-3.27	Peak	283	221
3	2483.50	37.56	54.00	-16.44	40.38	-2.82	Average	283	221
4	2483.50	48.04	74.00	-25.96	50.86	-2.82	Peak	283	221
5	4824.00	33.55	54.00	-20.45	28.62	4.93	Average	177	309
6	4824.00	46.01	74.00	-27.99	41.08	4.93	Peak	177	309

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		
Level (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	2385.00	53.04	54.00	-0.96	56.33	-3.29	Average	245	200
2	2385.00	63.60	74.00	-10.40	66.89	-3.29	Peak	245	200
3	2390.00	42.07	54.00	-11.93	45.34	-3.27	Average	245	200
4	2390.00	54.76	74.00	-19.24	58.03	-3.27	Peak	245	200
5	4874.00	31.34	54.00	-22.66	26.28	5.06	Average	271	189
6	4874.00	43.41	74.00	-30.59	38.35	5.06	Peak	271	189
7	7311.00	36.41	54.00	-17.59	26.93	9.48	Average	254	173
8	7311.00	49.63	74.00	-24.37	40.15	9.48	Peak	254	173

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		
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		
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) 90 80 70 60 50 40 30 20 10 0 1 2 3 4 5 6 1000 2000 3000 4000 5000 6000 8000 10000 12000 14000 16000 18000 20000 22000 25000 Frequency (MHz) FCC CLASS-B FCC CLASS-B (AVG) <table><tr><td></td><td>Freq.</td><td>Emission</td><td>Limit</td><td>Margin</td><td>SA</td><td>Factor</td><td>Remark</td><td>ANT</td><td>Turn</td></tr><tr><td></td><td></td><td>level</td><td></td><td></td><td>reading</td><td></td><td></td><td>High</td><td>Table</td></tr><tr><td></td><td>MHz</td><td>dBuV/m</td><td>dBuV/m</td><td>dB</td><td>dBuV</td><td>dB</td><td></td><td>cm</td><td>deg</td></tr><tr><td>1</td><td>2390.00</td><td>43.62</td><td>54.00</td><td>-10.38</td><td>46.89</td><td>-3.27</td><td>Average</td><td>150</td><td>237</td></tr><tr><td>2</td><td>2390.00</td><td>56.48</td><td>74.00</td><td>-17.52</td><td>59.75</td><td>-3.27</td><td>Peak</td><td>150</td><td>237</td></tr><tr><td>3</td><td>3229.00</td><td>28.29</td><td>54.00</td><td>-25.71</td><td>28.96</td><td>-0.67</td><td>Average</td><td>174</td><td>235</td></tr><tr><td>4</td><td>3229.00</td><td>38.92</td><td>74.00</td><td>-35.08</td><td>39.59</td><td>-0.67</td><td>Peak</td><td>174</td><td>235</td></tr><tr><td>5</td><td>4844.00</td><td>31.32</td><td>54.00</td><td>-22.68</td><td>26.33</td><td>4.99</td><td>Average</td><td>185</td><td>271</td></tr><tr><td>6</td><td>4844.00</td><td>42.77</td><td>74.00</td><td>-31.23</td><td>37.78</td><td>4.99</td><td>Peak</td><td>185</td><td>271</td></tr></table>								Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn			level			reading			High	Table		MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg	1	2390.00	43.62	54.00	-10.38	46.89	-3.27	Average	150	237	2	2390.00	56.48	74.00	-17.52	59.75	-3.27	Peak	150	237	3	3229.00	28.29	54.00	-25.71	28.96	-0.67	Average	174	235	4	3229.00	38.92	74.00	-35.08	39.59	-0.67	Peak	174	235	5	4844.00	31.32	54.00	-22.68	26.33	4.99	Average	185	271	6	4844.00	42.77	74.00	-31.23	37.78	4.99	Peak	185	271
	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn																																																																																							
		level			reading			High	Table																																																																																							
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg																																																																																							
1	2390.00	43.62	54.00	-10.38	46.89	-3.27	Average	150	237																																																																																							
2	2390.00	56.48	74.00	-17.52	59.75	-3.27	Peak	150	237																																																																																							
3	3229.00	28.29	54.00	-25.71	28.96	-0.67	Average	174	235																																																																																							
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5	4844.00	31.32	54.00	-22.68	26.33	4.99	Average	185	271																																																																																							
6	4844.00	42.77	74.00	-31.23	37.78	4.99	Peak	185	271																																																																																							
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	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

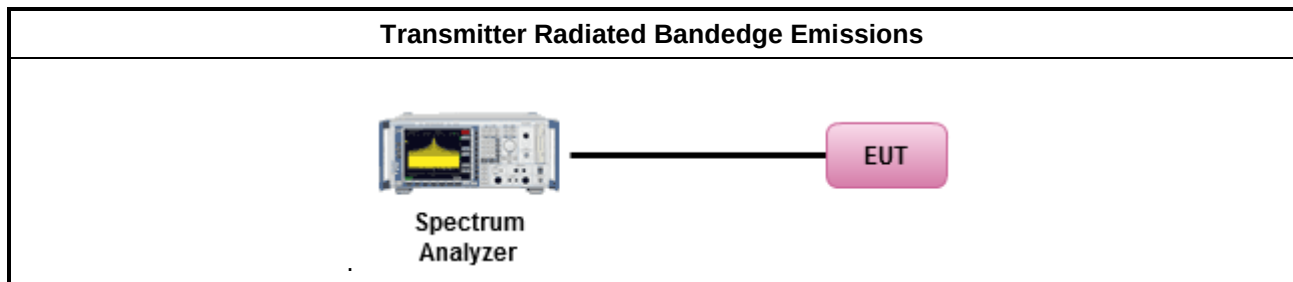
Reference level measurement

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

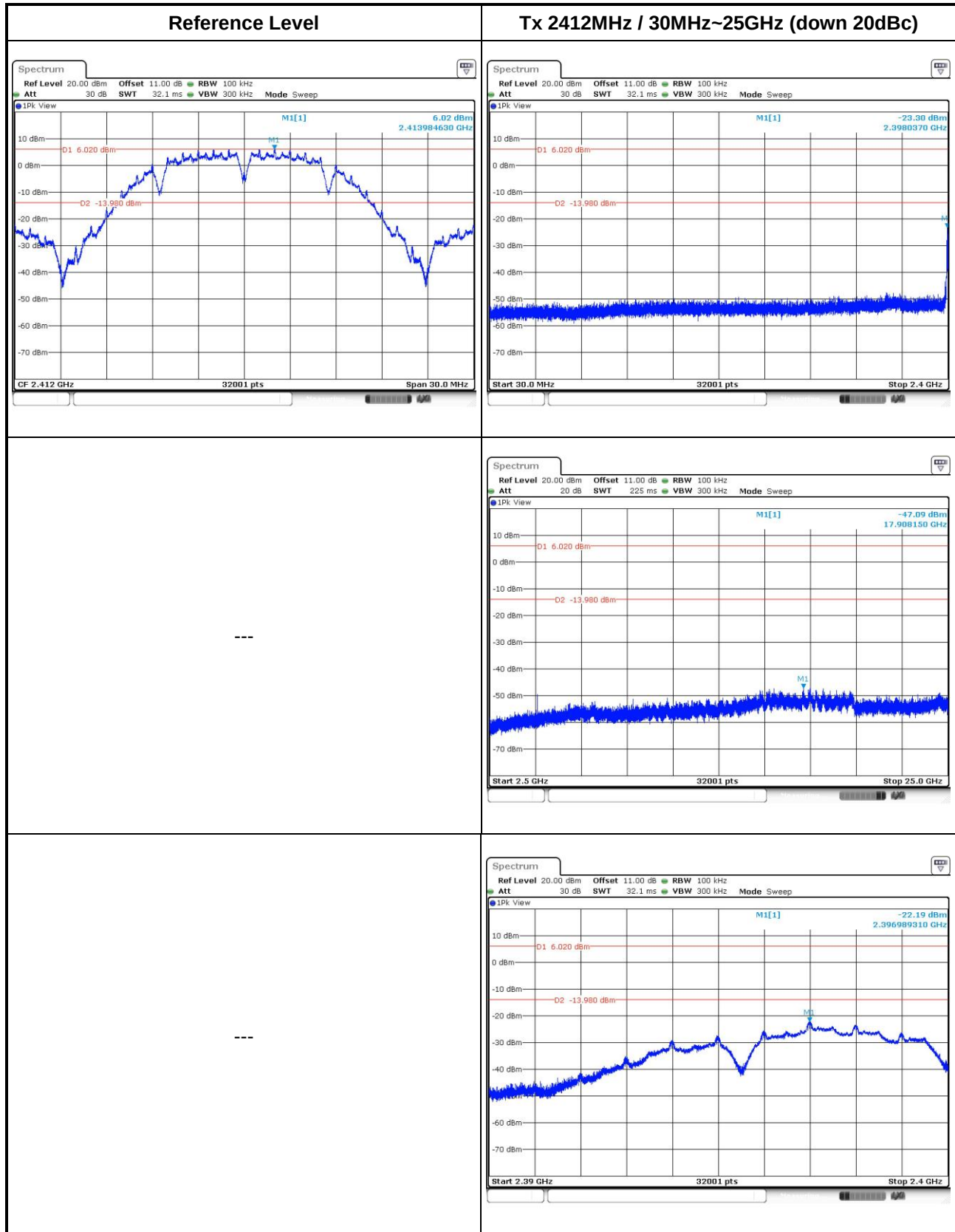


3.6.5 Test Result of Emissions in non-restricted frequency bands

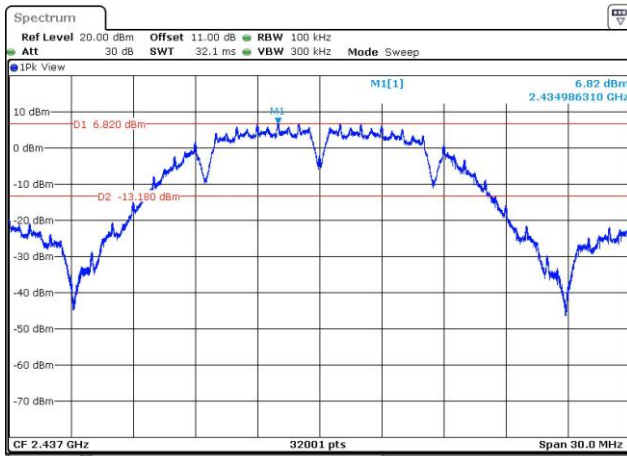
This test item is performed on each TX output individually without summing or adding $10 \log(N_{ANT})$ since measurements are made relative to the in-band emissions on the individual outputs. Only worst test result of each operating mode is presented.

3.6.6 Unwanted Emissions into Non-Restricted Frequency Bands

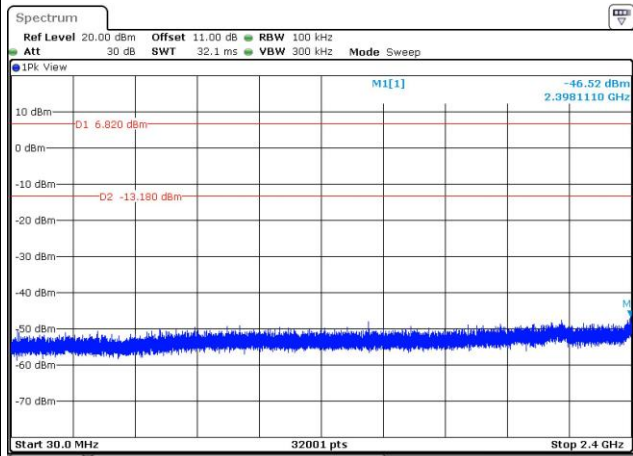
802.11b

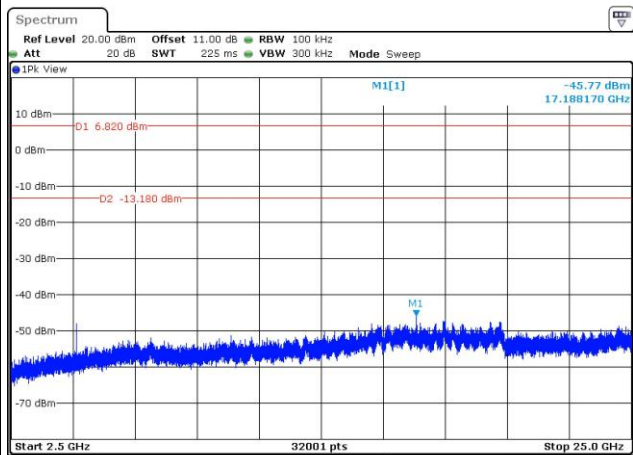


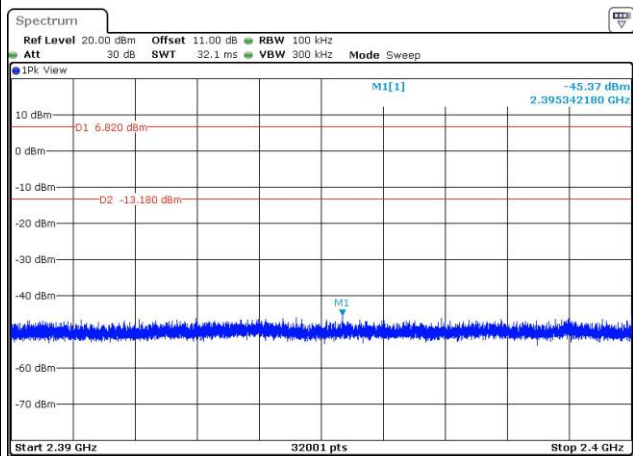
Reference Level



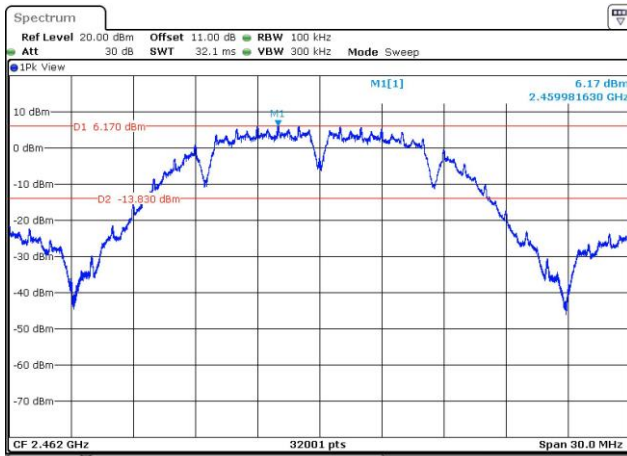
Tx 2437MHz / 30MHz~25GHz (down 20dBc)



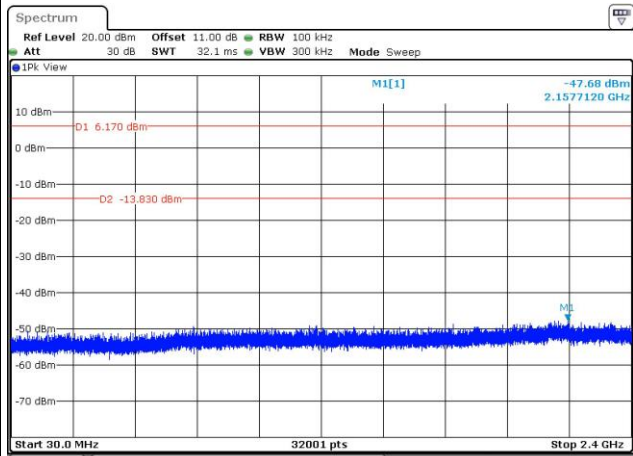


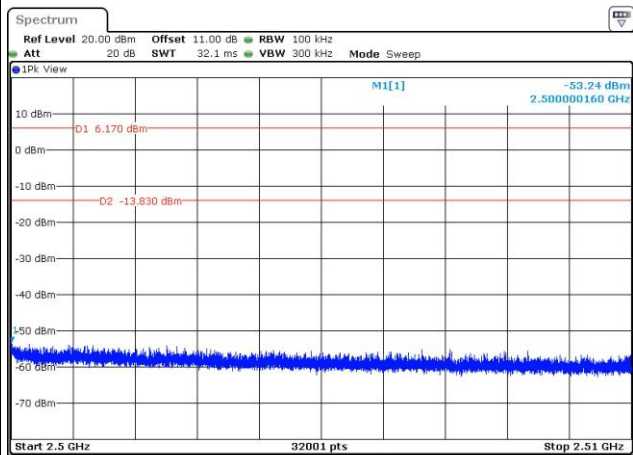


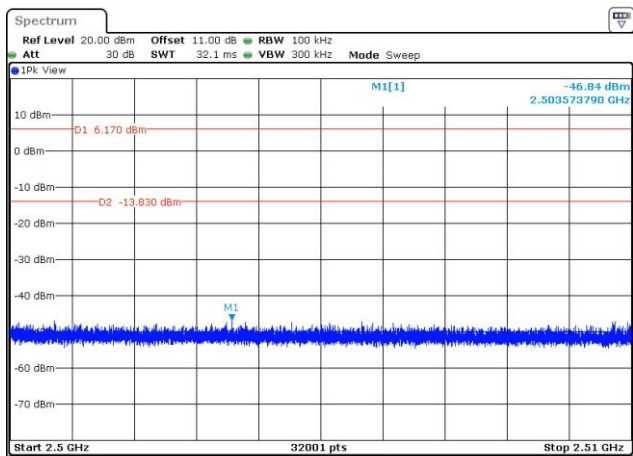
Reference Level



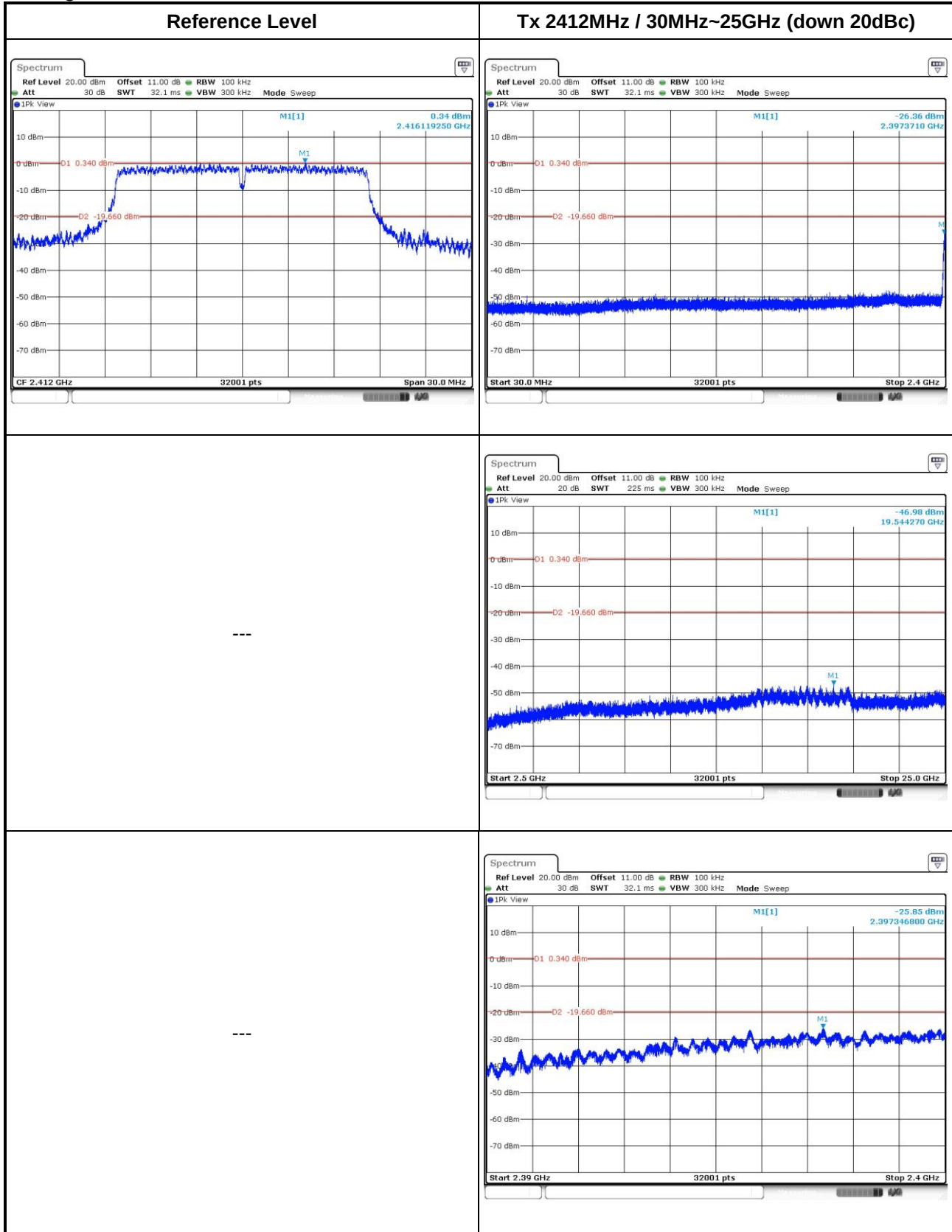
Tx 2462MHz / 30MHz~25GHz (down 20dBc)



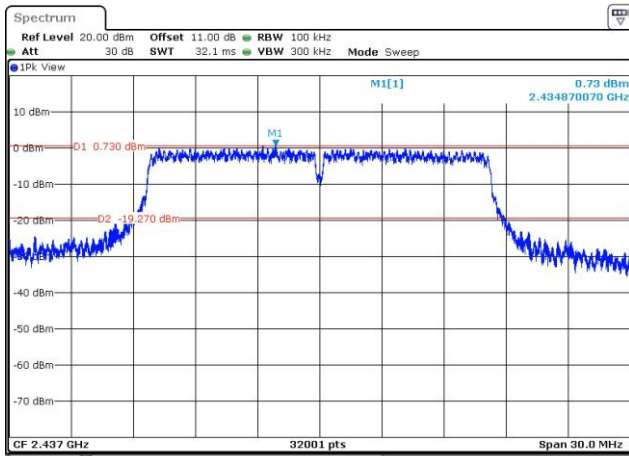




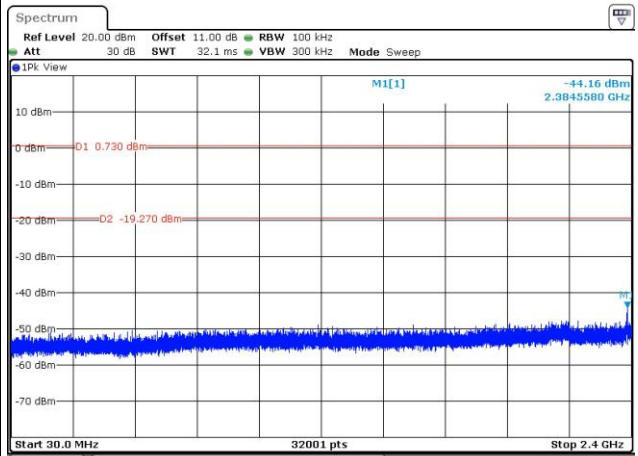
802.11g

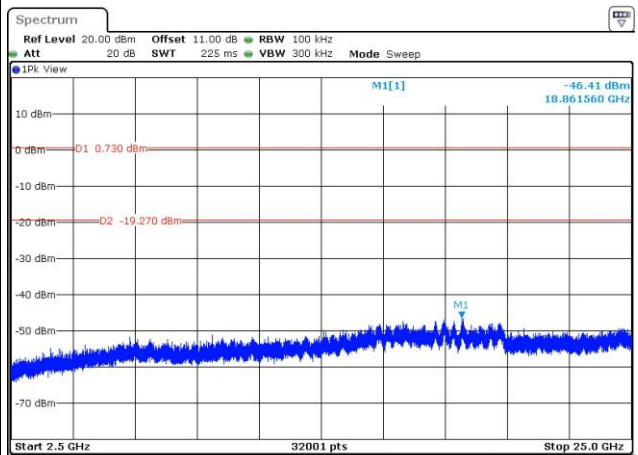


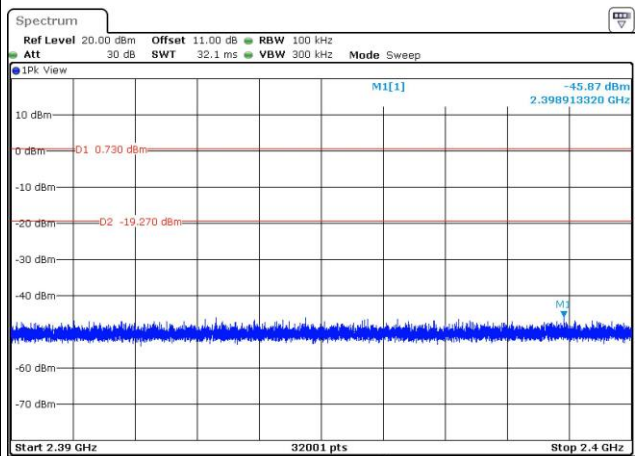
Reference Level



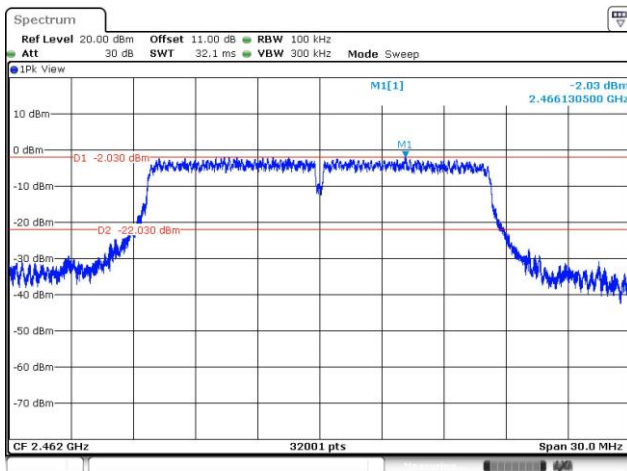
Tx 2437MHz / 30MHz~25GHz (down 20dBc)



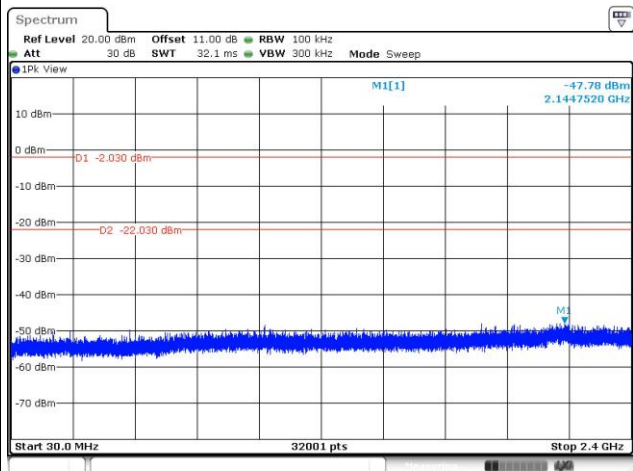


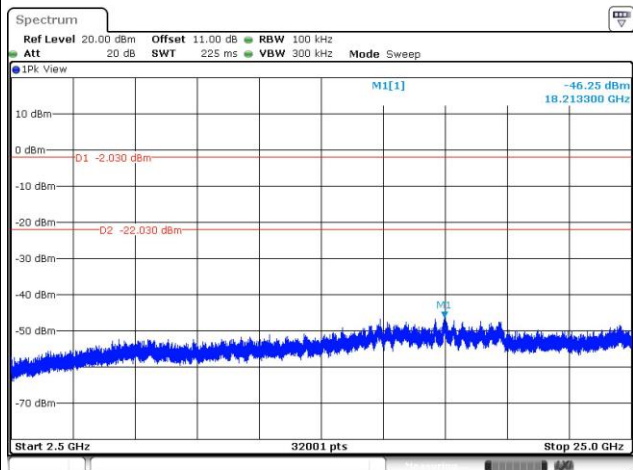


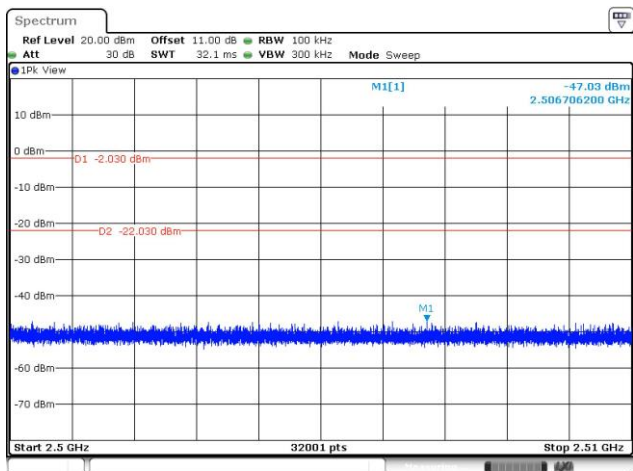
Reference Level



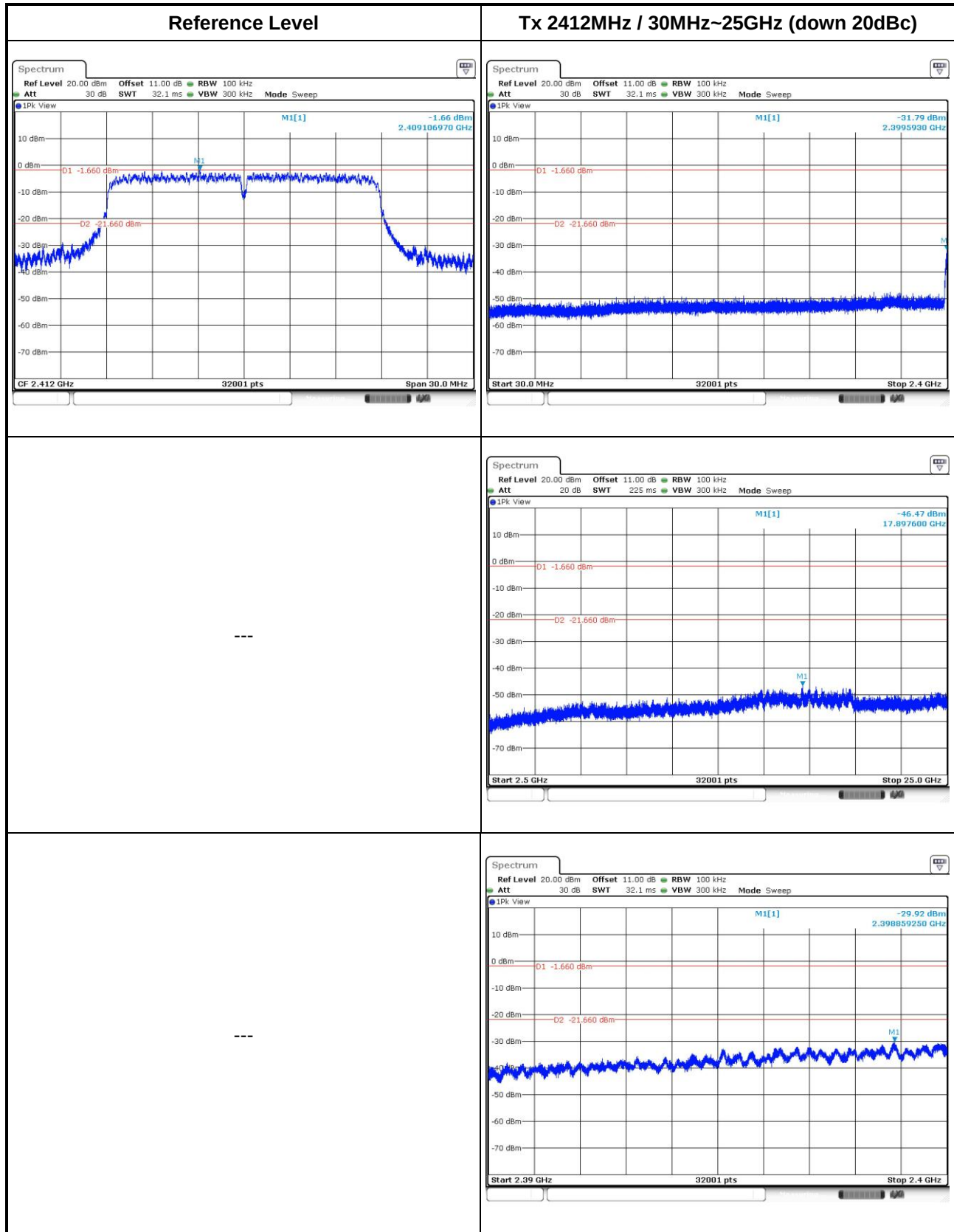
Tx 2462MHz / 30MHz~25GHz (down 20dBc)

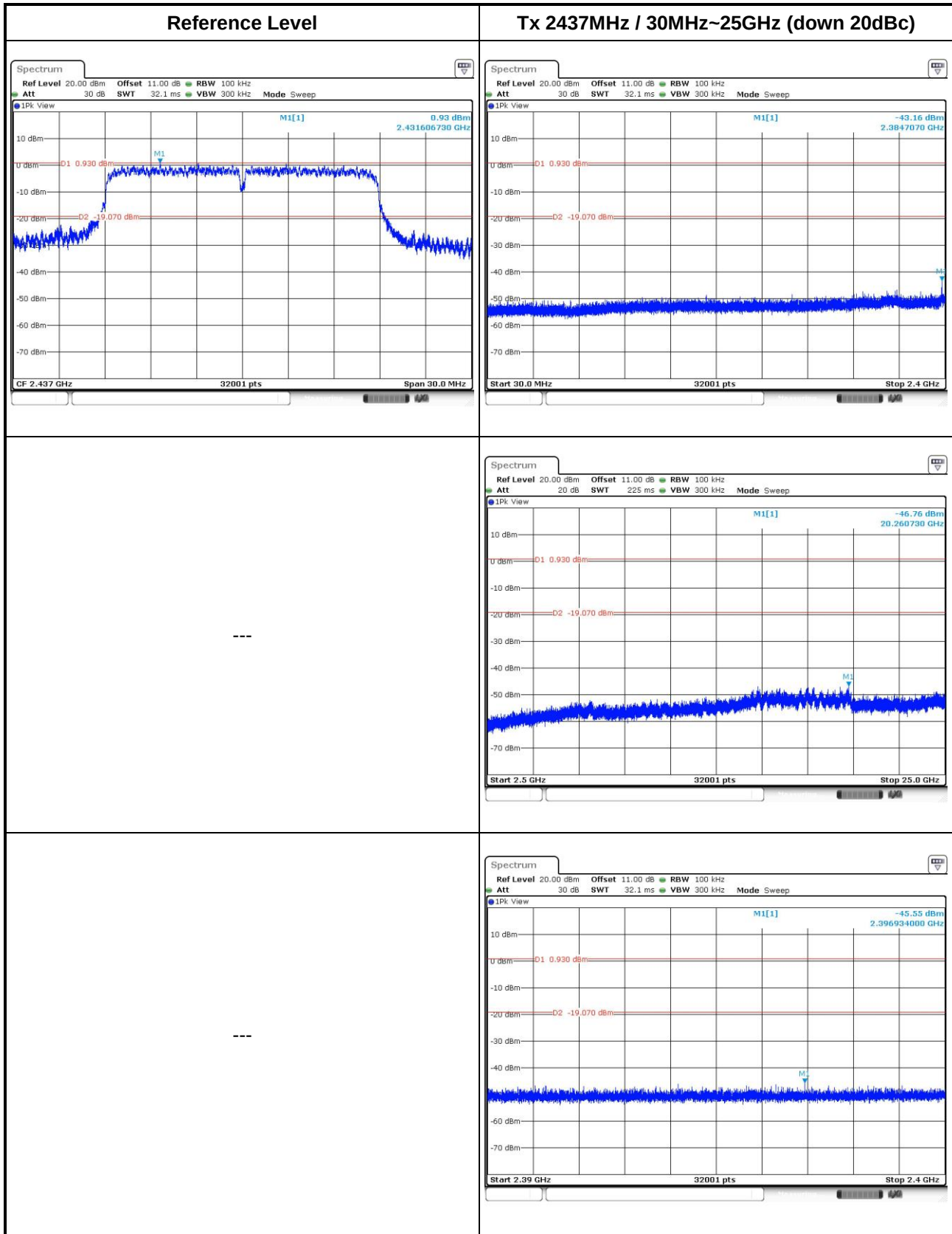




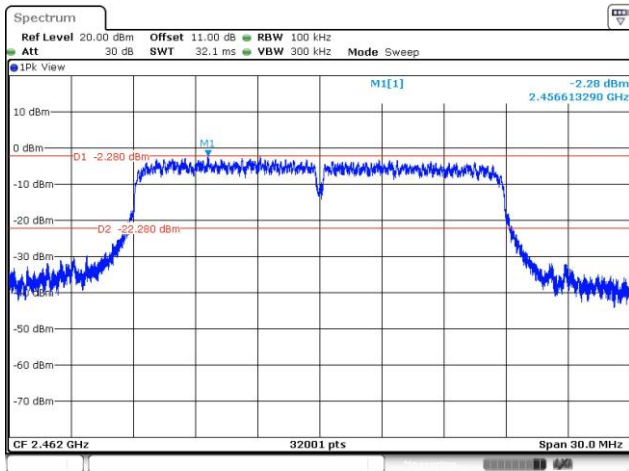


802.11n HT20

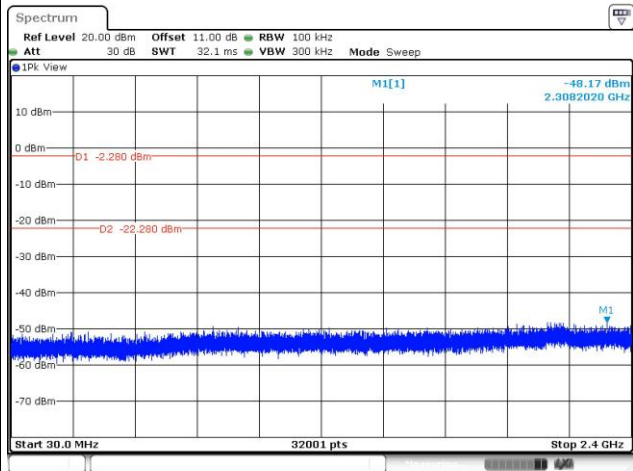


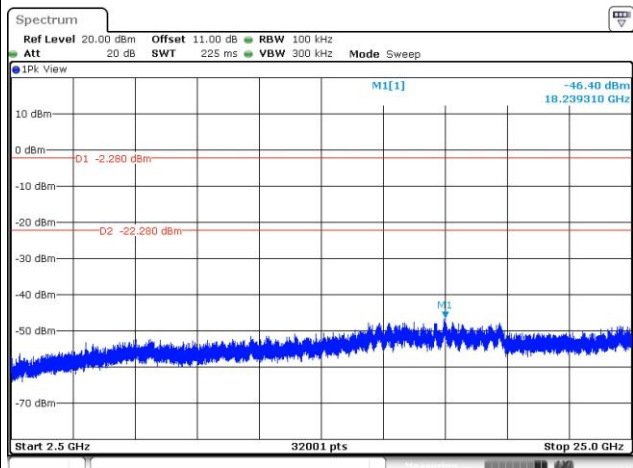


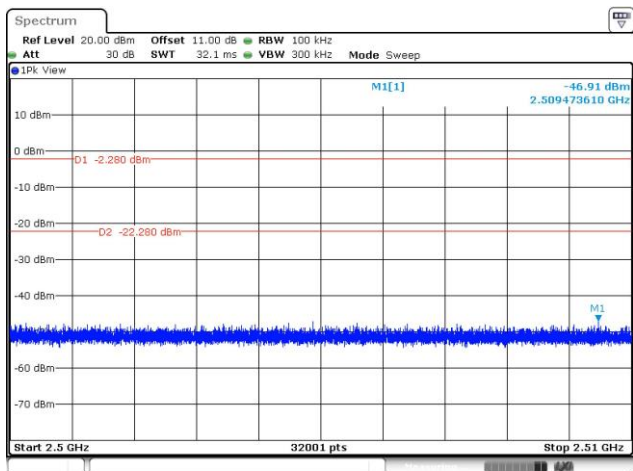
Reference Level



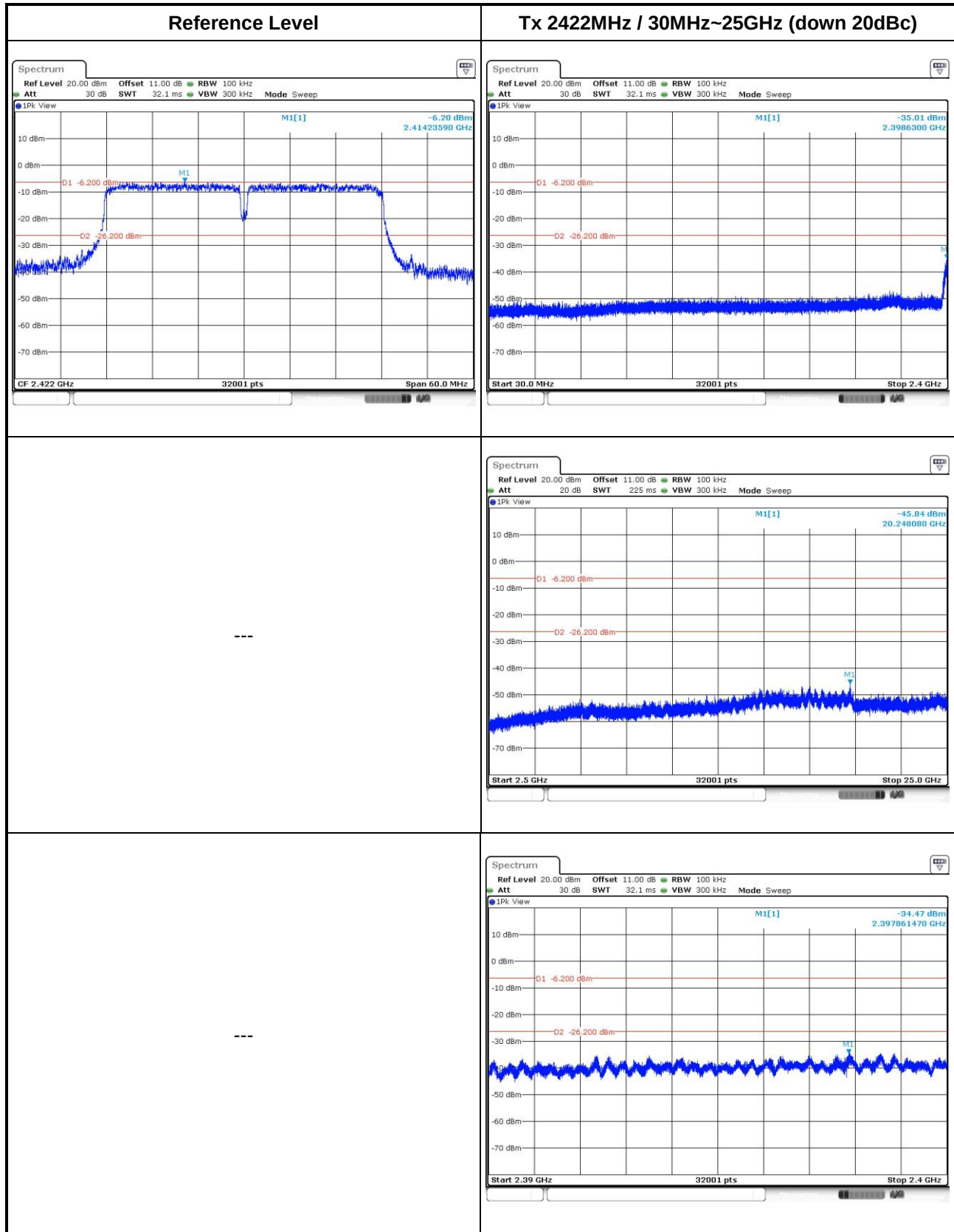
Tx 2462MHz / 30MHz~25GHz (down 20dBc)

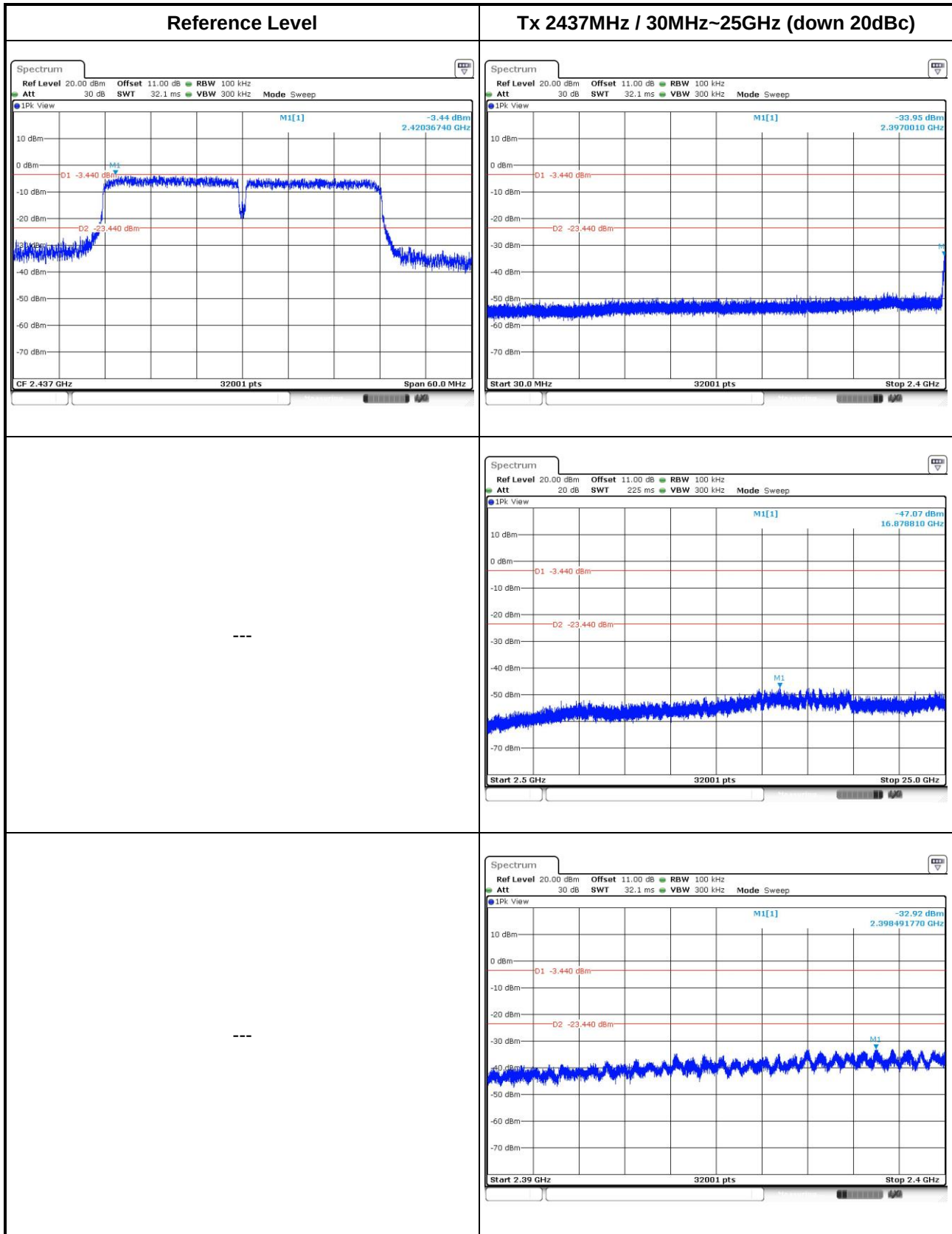




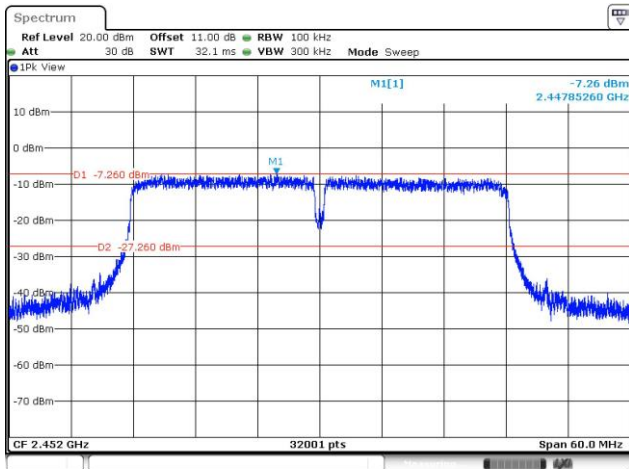


802.11n HT40

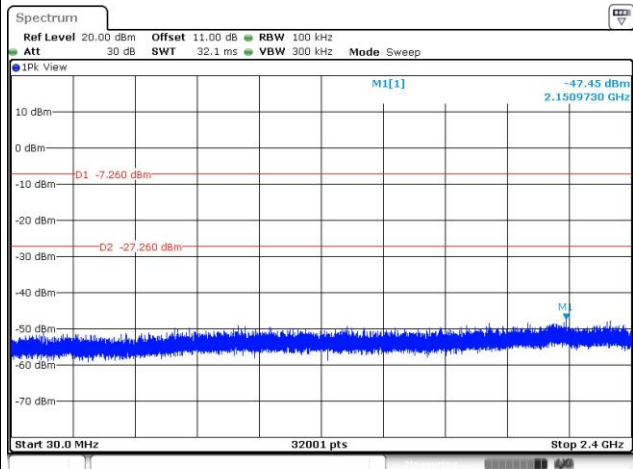


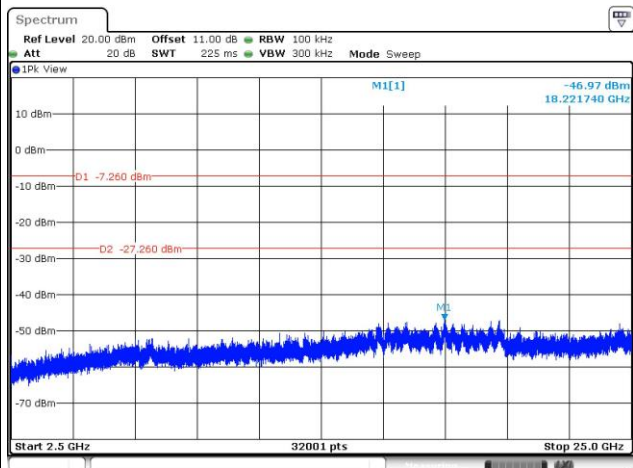


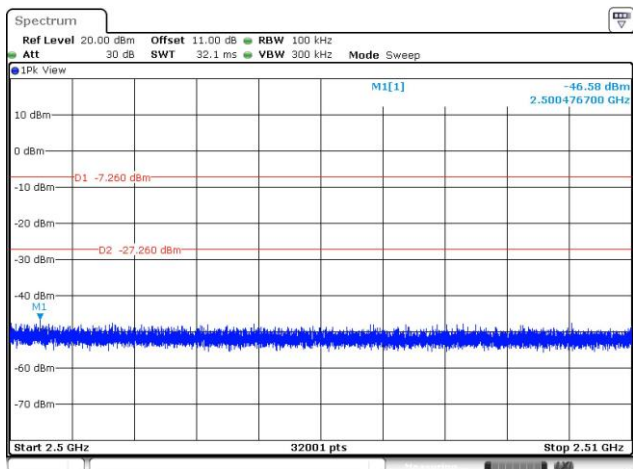
Reference Level



Tx 2452MHz / 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

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

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