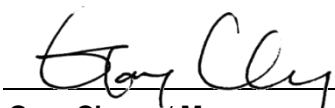


FCC Test Report

FCC ID : MXF-WAPS232N
Equipment : RFID IOT Access Point
Model No. : WAPS-232N
Brand Name : Gemtek
Applicant : Gemtek Technology Co., Ltd.
Address : No.15-1 Zhonghua Rd, Hsinchu Industrial
Park, Hukou, Hsinchu, Taiwan, R.O.C
Standard : 47 CFR FCC Part 15.247
Received Date : Jun. 22, 2015
Tested Date : Aug. 17 ~ Sep. 05, 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
FR562201-03	Rev. 01	Initial issue	Apr. 08, 2016

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	Conducted Emissions	[dBuV]: 0.424MHz 36.42 (Margin -10.95dB) - AV	Pass
15.247(d) 15.209	Radiated Emissions	[dBuV/m at 3m]: 2483.50MHz 52.99 (Margin -1.01dB) - AV	Pass
15.247(b)(3)	Maximum Output Power	Max Power [dBm]: 24.70	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. Note 4: 802.11n supports HT20 only.					

1.1.2 Antenna Details

Ant. No.	Brand	Model	Type	Gain (dBi)	Connector	Remarks
1	TSKY Co., Ltd.	A8-A003-00109	Dipole	1.38	N type	---

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	55Vdc from POE
-------------------	----------------

1.1.4 Accessories

Accessories		
No.	Equipment	Description
1	POE	Brand Name: Microsemi Model Name: PD-9001GR/AC Power Rating: I/P: 100-240Vac, 50-60Hz, 0.67A O/P: 55Vdc, 0.6A

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	WI command		
Duty Cycle and Duty Factor	Mode	Duty cycle (%)	Duty factor (dB)
	11b	100.00%	0.00
	11g	94.16%	0.26
	HT20	98.67%	0.06

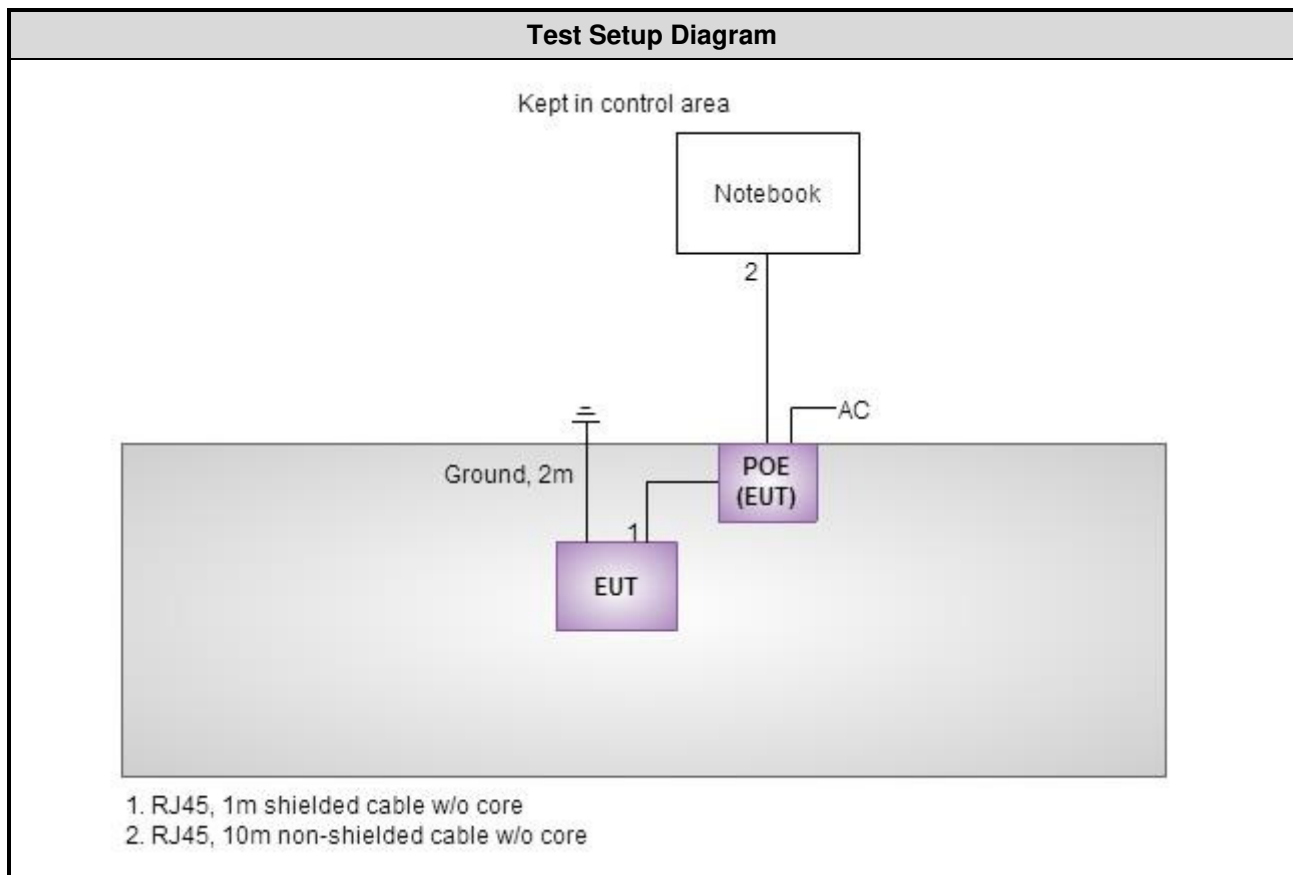
1.1.7 Power Setting

Modulation Mode	Test Frequency (MHz)	Power Set
11b	2412	66
11b	2437	70
11b	2462	68
11g	2412	58
11g	2437	90
11g	2462	66
HT20	2412	56
HT20	2437	90
HT20	2462	62

1.2 Local Support Equipment List

Support Equipment List					
No.	Equipment	Brand	Model	FCC ID	Signal cable / Length (m)
1	Notebook	DELL	Latitude E6430	DoC	RJ45, 10m non-shielded w/o core.

1.3 Test Setup Chart



1.4 The Equipment List

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Test Date	Sep. 03, 2015				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
EMC Receiver	R&S	ESCS 30	100169	Oct. 17, 2014	Oct. 16, 2015
LISN	SCHWARZBECK	Schwarzbeck 8127	8127-667	Nov. 17, 2014	Nov. 16, 2015
RF Cable-CON	Woken	CFD200-NL	CFD200-NL-001	Dec. 31, 2014	Dec. 30, 2015
Measurement Software	AUDIX	e3	6.120210k	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	Radiated Emission				
Test Site	966 chamber1 / (03CH01-WS)				
Test Date	Aug. 17, 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	Sep. 05, 2014	Sep. 04, 2015
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. 09, 2014	Sep. 08, 2015
Preamplifier	Agilent	83017A	MY39501308	Oct. 09, 2014	Oct. 08, 2015
Preamplifier	EMC	EMC184045B	980192	Aug. 26, 2014	Aug. 25, 2015
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	Radiated Emission				
Test Site	966 chamber1 / (03CH01-WS)				
Test Date	Sep. 02, 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. 09, 2014	Sep. 08, 2015
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)				
Test Date	Sep. 05, 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. 29, 2014	Sep. 28, 2015
Power Sensor	Anritsu	MA2411B	1207366	Sep. 29, 2014	Sep. 28, 2015
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 v03r04

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	± 3.72 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	22°C / 59%	Kevin Ma
Radiated Emissions	03CH01-WS	22-25°C / 62-65%	Warren Lee Aska Huang
RF Conducted	TH01-WS	22°C / 61%	Felix Sung

➤ 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	11g	2437	6 Mbps	---
Radiated Emissions ≤1GHz	11g	2437	6 Mbps	---
Radiated Emissions >1GHz	11b 11g HT20	2412 / 2437 / 2462 2412 / 2437 / 2462 2412 / 2437 / 2462	1 Mbps 6 Mbps MCS 0	---
Maximum Output Power				
6dB bandwidth				
Power spectral density				

3 Transmitter Test Results

3.1 Conducted Emissions

3.1.1 Limit of Conducted Emissions

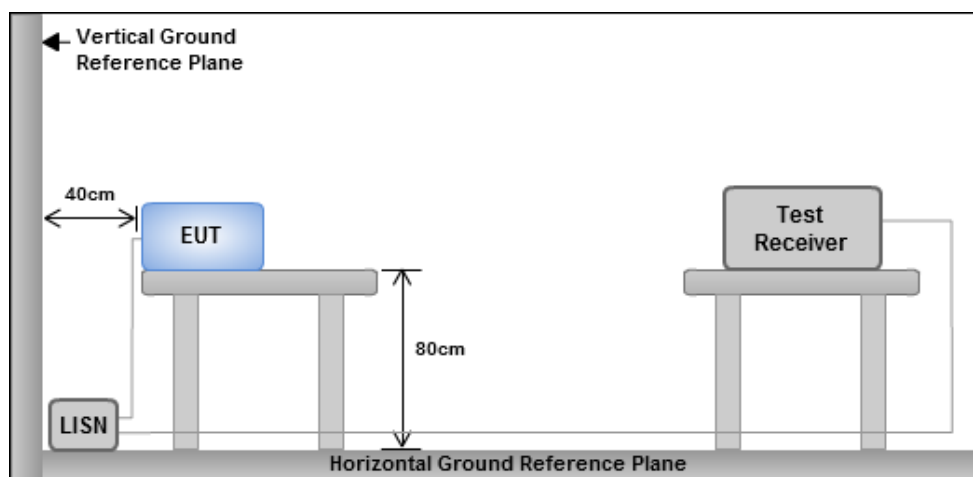
Conducted Emissions Limit		
Frequency Emission (MHz)	Quasi-Peak	Average
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50

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.

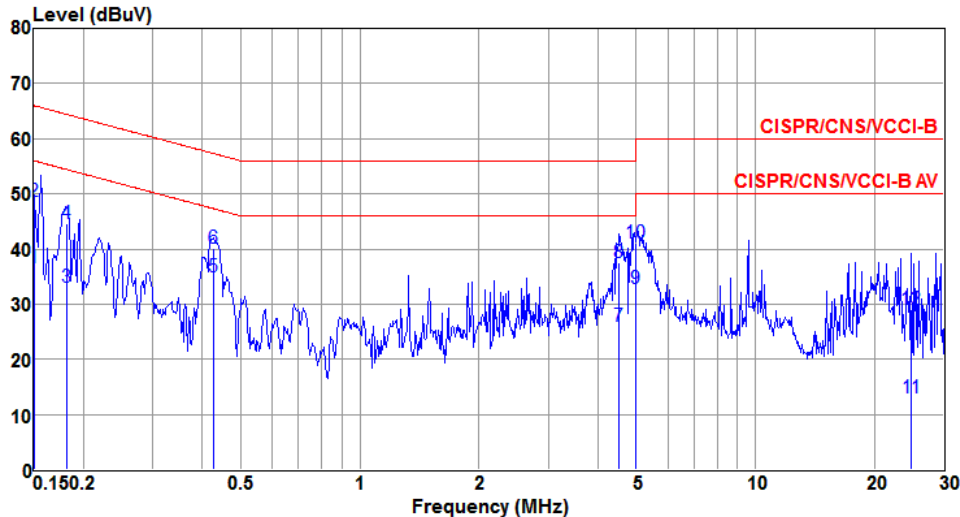
3.1.3 Test Setup



- 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

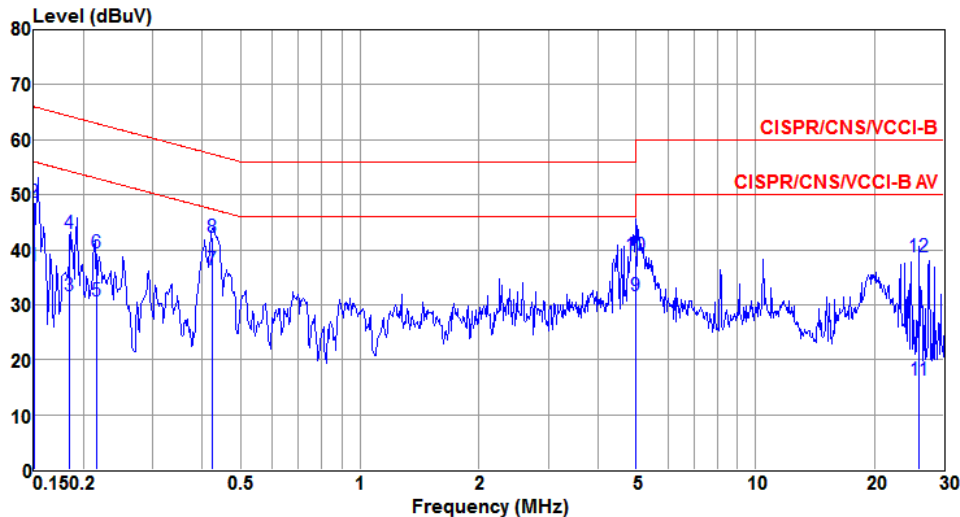
Modulation	11g	Test Freq. (MHz)	2437
Power Phase	Line		



	Freq	Level	Limit	Over	Read	LISN	cable	Remark
	MHz	dBuV	Line	Limit	Level	factor	loss	
			dBuV	dB	dBuV	dB	dB	
1	0.150	36.58	56.00	-19.42	36.43	0.07	0.08	Average
2	0.150	48.73	66.00	-17.27	48.58	0.07	0.08	QP
3	0.182	33.13	54.40	-21.27	32.97	0.07	0.09	Average
4	0.182	44.72	64.40	-19.68	44.56	0.07	0.09	QP
5	0.428	34.99	47.29	-12.30	34.81	0.07	0.11	Average
6	0.428	40.13	57.29	-17.16	39.95	0.07	0.11	QP
7	4.525	25.87	46.00	-20.13	25.43	0.13	0.31	Average
8	4.525	37.58	56.00	-18.42	37.14	0.13	0.31	QP
9	5.000	32.82	46.00	-13.18	32.37	0.14	0.31	Average
10	5.000	41.03	56.00	-14.97	40.58	0.14	0.31	QP
11	24.790	13.03	50.00	-36.97	12.59	0.35	0.09	Average
12	24.790	28.99	60.00	-31.01	28.55	0.35	0.09	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)	2437
Power Phase	Neutral		



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.150	37.01	56.00	-18.99	36.86	0.07	0.08	Average
2	0.150	48.59	66.00	-17.41	48.44	0.07	0.08	QP
3	0.185	31.65	54.28	-22.63	31.49	0.07	0.09	Average
4	0.185	42.91	64.28	-21.37	42.75	0.07	0.09	QP
5	0.216	30.72	52.95	-22.23	30.56	0.07	0.09	Average
6	0.216	39.53	62.95	-23.42	39.37	0.07	0.09	QP
7	0.424	36.42	47.37	-10.95	36.24	0.07	0.11	Average
8	0.424	42.28	57.37	-15.09	42.10	0.07	0.11	QP
9	5.000	31.74	46.00	-14.26	31.28	0.15	0.31	Average
10	5.000	38.98	56.00	-17.02	38.52	0.15	0.31	QP
11	26.012	16.24	50.00	-33.76	15.75	0.40	0.09	Average
12	26.012	38.67	60.00	-21.33	38.18	0.40	0.09	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

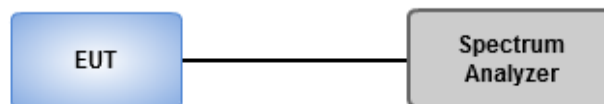
6dB Bandwidth

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.

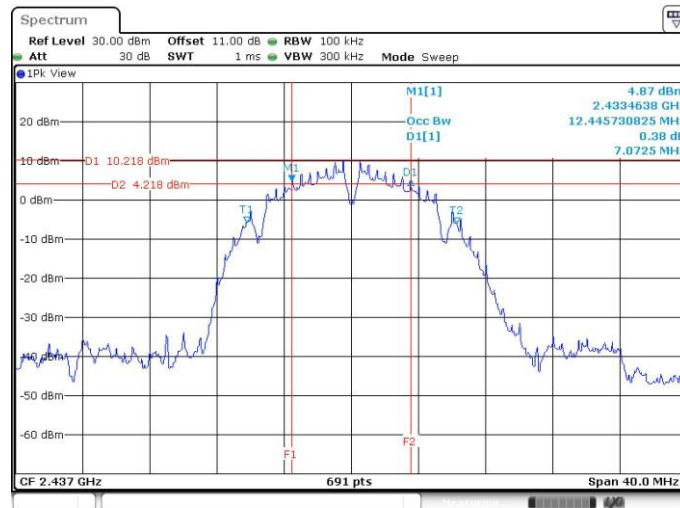
3.2.3 Test Setup



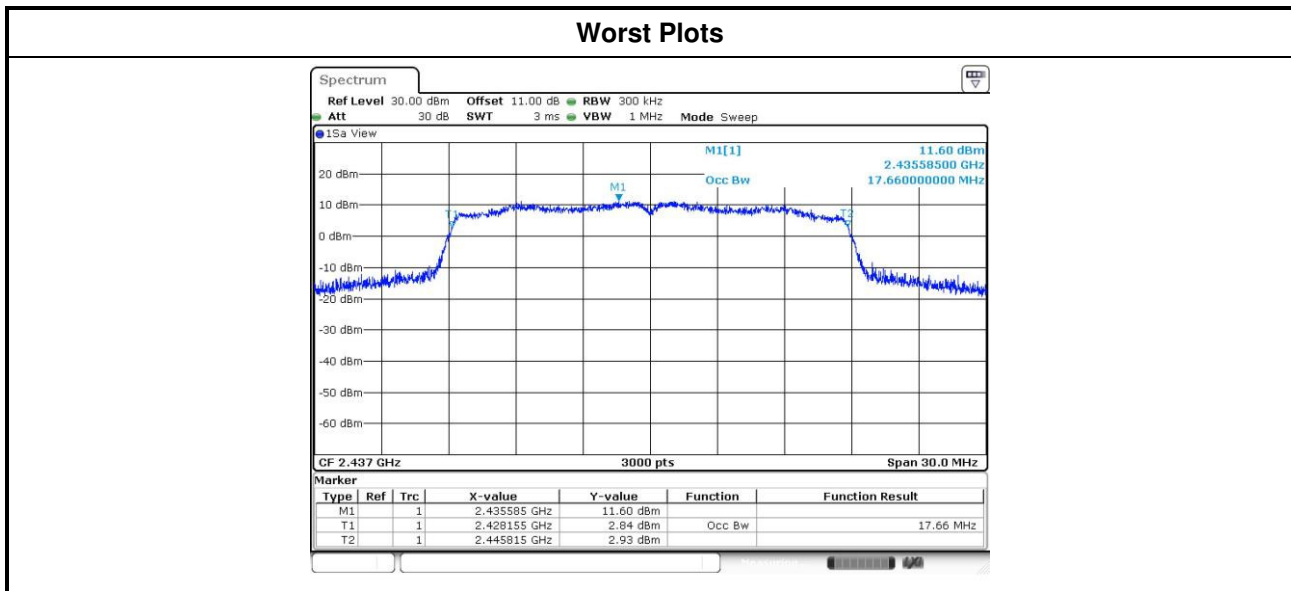
3.2.4 Test Result of 6dB and Occupied Bandwidth

Modulation Mode	N _{TX}	Freq. (MHz)	6dB Bandwidth (MHz)				Limit (kHz)
			Chain 0	Chain 1	Chain 2	Chain 3	
11b	1	2412	8.58	---	---	---	500
11b	1	2437	7.07	---	---	---	500
11b	1	2462	8.06	---	---	---	500
11g	1	2412	15.01	---	---	---	500
11g	1	2437	15.13	---	---	---	500
11g	1	2462	15.13	---	---	---	500
HT20	1	2412	15.65	---	---	---	500
HT20	1	2437	15.71	---	---	---	500
HT20	1	2462	14.20	---	---	---	500

Worst Plots



Modulation Mode	N _{TX}	Freq. (MHz)	99% Occupied Bandwidth (MHz)			
			Chain 0	Chain 1	Chain 2	Chain 3
11b	1	2412	12.40	---	---	---
11b	1	2437	12.47	---	---	---
11b	1	2462	12.41	---	---	---
11g	1	2412	16.45	---	---	---
11g	1	2437	16.74	---	---	---
11g	1	2462	16.52	---	---	---
HT20	1	2412	17.49	---	---	---
HT20	1	2437	17.66	---	---	---
HT20	1	2462	17.50	---	---	---



3.3 RF Output Power

3.3.1 Limit of RF Output Power

Conducted power shall not exceed 1Watt.

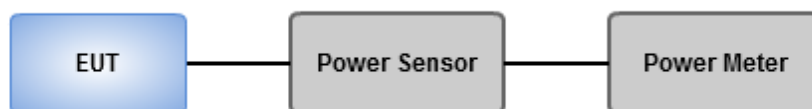
- ☒ Antenna gain $\leq 6\text{dBi}$, no any corresponding reduction is in output power limit.
- ☐ Antenna gain $> 6\text{dBi}$
 - ☐ Non Fixed, point to point operations.
The conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna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

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

3.3.2 Test Procedures

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

3.3.3 Test Setup



3.3.4 Test Result of Maximum Output Power

Modulation Mode	N _{TX}	Freq. (MHz)	Peak conducted output power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)
			Chain 0	Chain 1	Chain 2	Chain 3			
11b	1	2412	20.11	---	---	---	102.565	20.11	30.00
11b	1	2437	21.24	---	---	---	133.045	21.24	30.00
11b	1	2462	20.49	---	---	---	111.944	20.49	30.00
11g	1	2412	23.90	---	---	---	245.471	23.90	30.00
11g	1	2437	24.70	---	---	---	295.121	24.70	30.00
11g	1	2462	24.46	---	---	---	279.254	24.46	30.00
HT20	1	2412	23.42	---	---	---	219.786	23.42	30.00
HT20	1	2437	24.66	---	---	---	292.415	24.66	30.00
HT20	1	2462	23.66	---	---	---	232.274	23.66	30.00

Modulation Mode	N _{TX}	Freq. (MHz)	Conducted (average) output power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)
			Chain 0	Chain 1	Chain 2	Chain 3			
11b	1	2412	17.16	---	---	---	52.000	17.16	30.00
11b	1	2437	18.26	---	---	---	66.988	18.26	30.00
11b	1	2462	17.46	---	---	---	55.719	17.46	30.00
11g	1	2412	15.02	---	---	---	31.769	15.02	30.00
11g	1	2437	19.55	---	---	---	90.157	19.55	30.00
11g	1	2462	17.04	---	---	---	50.582	17.04	30.00
HT20	1	2412	14.55	---	---	---	28.510	14.55	30.00
HT20	1	2437	19.51	---	---	---	89.331	19.51	30.00
HT20	1	2462	15.92	---	---	---	39.084	15.92	30.00

Note: Conducted average output power is for reference only.

3.4 Power Spectral Density

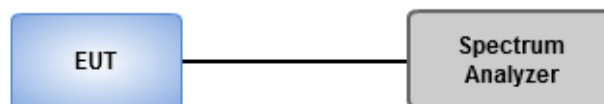
3.4.1 Limit of Power Spectral Density

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

3.4.2 Test Procedures

- ☒ Maximum peak conducted output power was used to demonstrate compliance to the fundamental output power limit.
 1. Set the RBW = 3kHz, VBW = 10kHz.
 2. Detector = Peak, Sweep time = auto couple.
 3. Trace mode = max hold, allow trace to fully stabilize.
 4. Use the peak marker function to determine the maximum amplitude level.
- ☐ Maximum (average) conducted output power was used to demonstrate compliance to the fundamental output power limit.
 1. Set the RBW = 100kHz, VBW = 300 kHz.
 2. Detector = RMS, Sweep time = auto couple.
 3. Set the sweep time to: $\geq 10 \times (\text{number of measurement points in sweep}) \times (\text{maximum data rate per stream})$.
 4. Perform the measurement over a single sweep.
 5. Use the peak marker function to determine the maximum amplitude level.

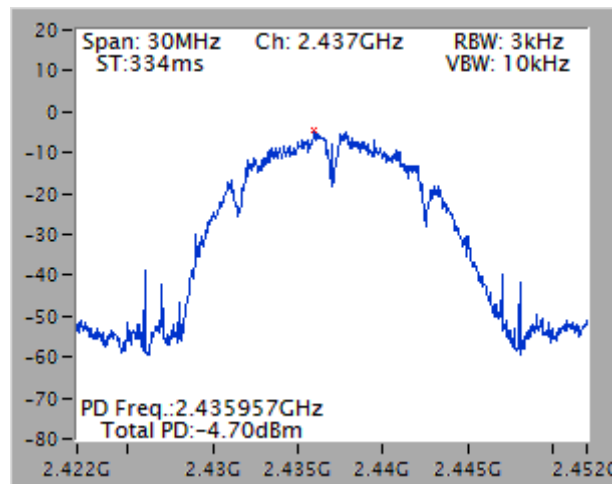
3.4.3 Test Setup



3.4.4 Test Result of Power Spectral Density

Modulation Mode	N _{TX}	Freq. (MHz)	Total Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
11b	1	2412	-4.94	8.00
11b	1	2437	-4.70	8.00
11b	1	2462	-5.82	8.00
11g	1	2412	-10.40	8.00
11g	1	2437	-4.75	8.00
11g	1	2462	-8.19	8.00
HT20	1	2412	-10.96	8.00
HT20	1	2437	-5.23	8.00
HT20	1	2462	-9.93	8.00

Worst Plots



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

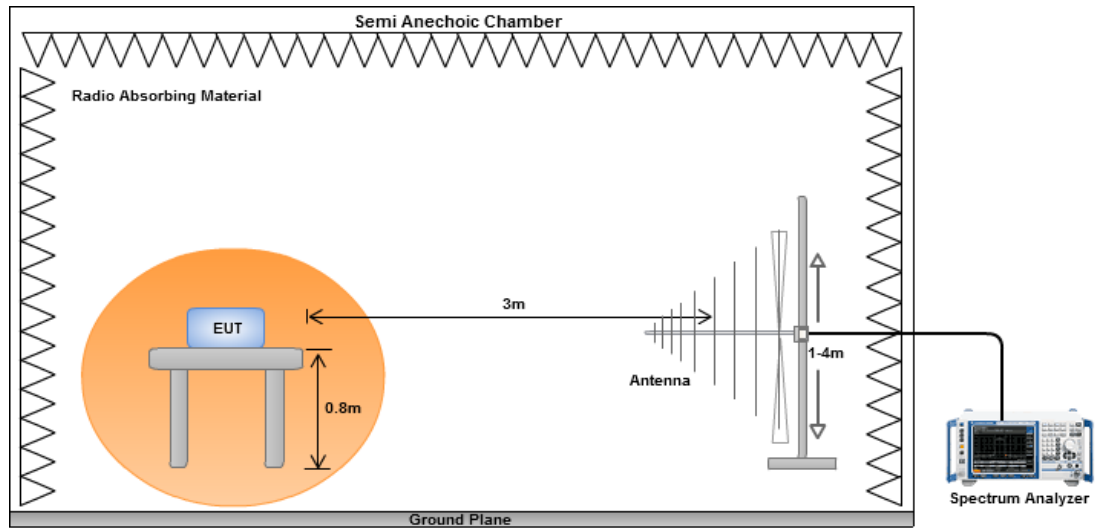
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission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

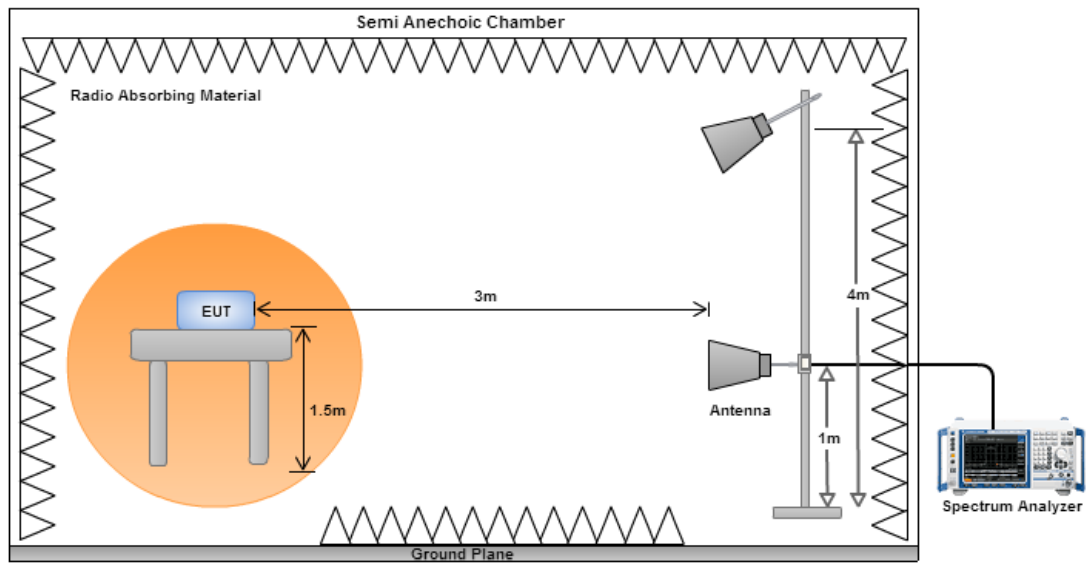
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above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

3.5.3 Test Setup

Radiated Emissions below 1 GHz



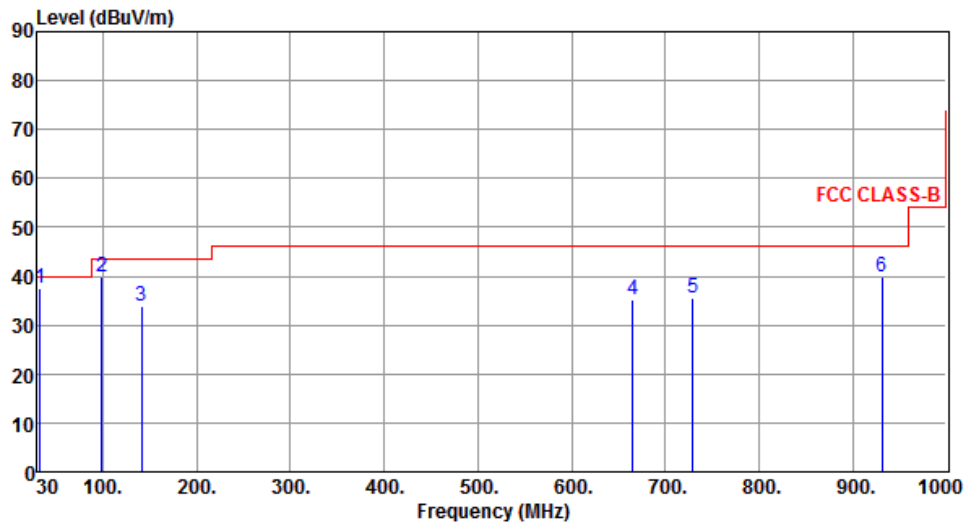
Radiated Emissions above 1 GHz



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		



	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	32.91	37.67	40.00	-2.33	55.26	-17.59	Peak	---	---
2	98.87	39.91	43.50	-3.59	61.38	-21.47	Peak	---	---
3	141.55	33.89	43.50	-9.61	50.81	-16.92	Peak	---	---
4	665.35	35.35	46.00	-10.65	43.81	-8.46	Peak	---	---
5	729.37	35.46	46.00	-10.54	42.88	-7.42	Peak	---	---
6	931.13	39.70	46.00	-6.30	44.55	-4.85	Peak	---	---

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

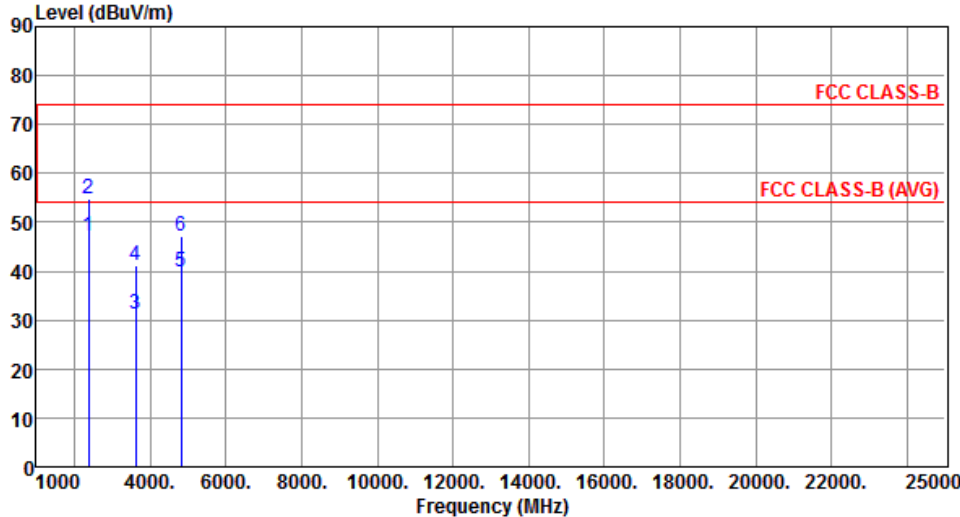
*Factor includes antenna factor , cable loss and amplifier gain

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		

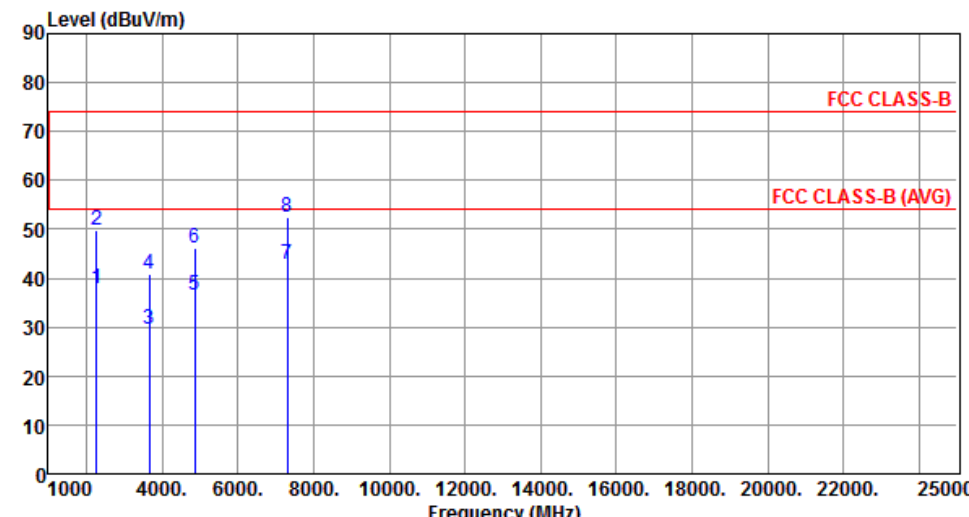


	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	47.27	54.00	-6.73	50.61	-3.34	Average	103	140
2	2390.00	54.78	74.00	-19.22	58.12	-3.34	Peak	103	140
3	3618.00	31.27	54.00	-22.73	31.51	-0.24	Average	100	208
4	3618.00	41.21	74.00	-32.79	41.45	-0.24	Peak	100	208
5	4824.00	39.77	54.00	-14.23	34.93	4.84	Average	100	322
6	4824.00	47.18	74.00	-26.82	42.34	4.84	Peak	100	322

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		
Level (dBUV/m) </			

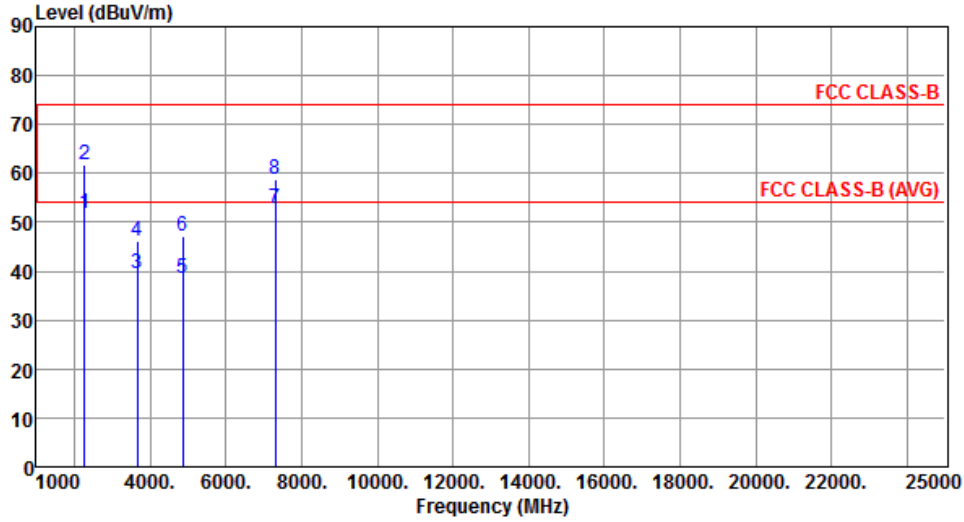
Modulation	11b	Test Freq. (MHz)	2437
Polarization	Horizontal		



	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2277.00	37.87	54.00	-16.13	41.64	-3.77	Average	106	130
2	2277.00	49.95	74.00	-24.05	53.72	-3.77	Peak	106	130
3	3655.50	29.57	54.00	-24.43	29.57	0.00	Average	105	211
4	3655.50	40.98	74.00	-33.02	40.98	0.00	Peak	105	211
5	4874.00	36.47	54.00	-17.53	31.50	4.97	Average	101	137
6	4874.00	46.22	74.00	-27.78	41.25	4.97	Peak	101	137
7	7311.00	42.78	54.00	-11.22	33.25	9.53	Average	118	173
8	7311.00	52.61	74.00	-21.39	43.08	9.53	Peak	118	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	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	2277.00	51.89	54.00	-2.11	55.66	-3.77	Average	100	179
2	2277.00	61.80	74.00	-12.20	65.57	-3.77	Peak	100	179
3	3655.50	39.39	54.00	-14.61	39.39	0.00	Average	152	130
4	3655.50	46.12	74.00	-27.88	46.12	0.00	Peak	152	130
5	4874.00	38.41	54.00	-15.59	33.44	4.97	Average	100	344
6	4874.00	46.99	74.00	-27.01	42.02	4.97	Peak	100	344
7	7311.00	52.97	54.00	-1.03	43.44	9.53	Average	100	193
8	7311.00	58.65	74.00	-15.35	49.12	9.53	Peak	100	193

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		
Level (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	52.75	54.00	-1.25	55.65	-2.90	Average	100	224
2	2483.50	60.01	74.00	-13.99	62.91	-2.90	Peak	100	224
3	3693.00	41.12	54.00	-12.88	40.88	0.24	Average	100	186
4	3693.00	47.94	74.00	-26.06	47.70	0.24	Peak	100	186
5	4924.00	37.89	54.00	-16.11	32.78	5.11	Average	100	222
6	4924.00	46.37	74.00	-27.63	41.26	5.11	Peak	100	222
7	7386.00	52.88	54.00	-1.12	43.21	9.67	Average	102	186
8	7386.00	58.14	74.00	-15.86	48.47	9.67	Peak	102	186

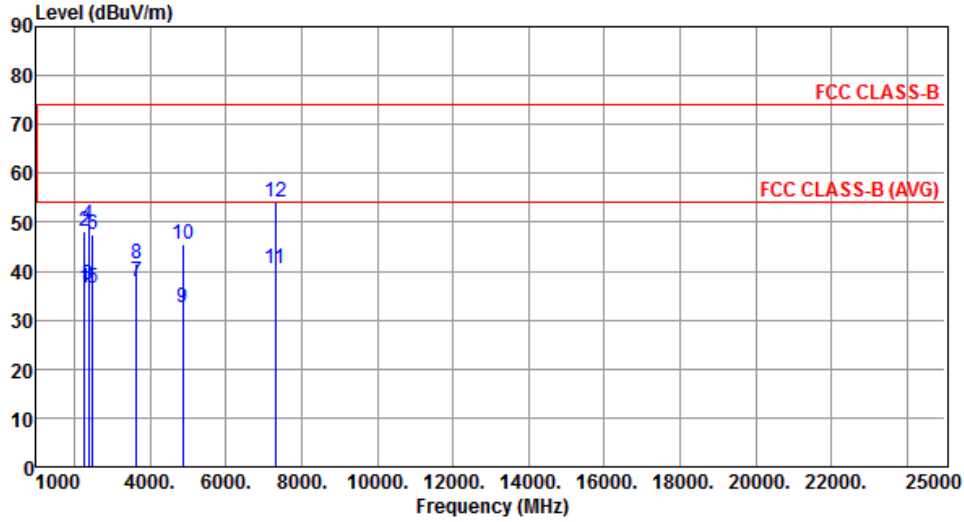
Note 1: Emission Level (dBUV/m) = SA Reading (dBUV/m) + Factor* (dB)
 *Factor includes antenna factor , cable loss and amplifier gain
 Note 2: Margin (dB) = Emission level (dBUV/m) – Limit (dBUV/m).

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

Modulation	11g	Test Freq. (MHz)	2412
Polarization	Horizontal		
Level (dBUV/m) </			

Modulation	11g	Test Freq. (MHz)	2412
Polarization	Vertical		
Level (dBuV/m) </			

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



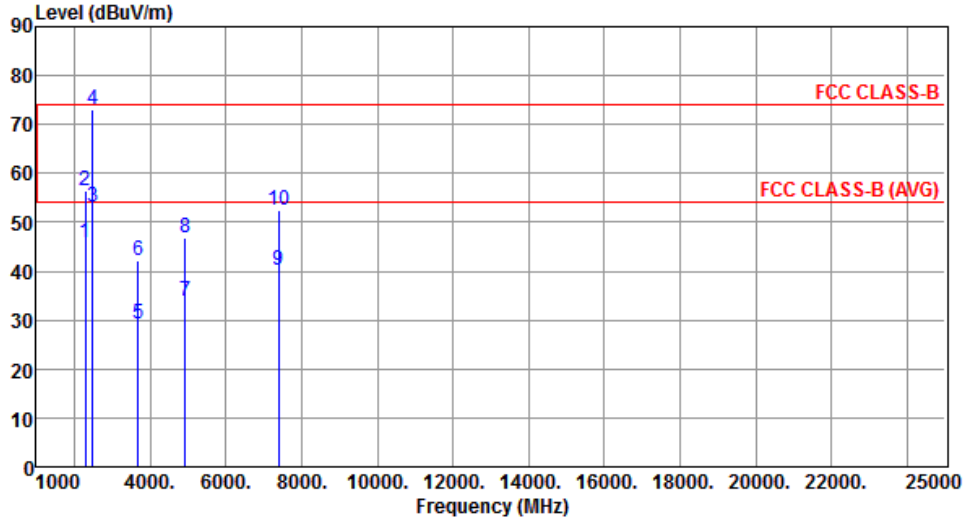
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2277.00	36.49	54.00	-17.51	40.26	-3.77	Average	105	202
2	2277.00	48.25	74.00	-25.75	52.02	-3.77	Peak	105	202
3	2390.00	37.04	54.00	-16.96	40.38	-3.34	Average	105	202
4	2390.00	49.49	74.00	-24.51	52.83	-3.34	Peak	105	202
5	2483.50	36.67	54.00	-17.33	39.57	-2.90	Average	105	202
6	2483.50	47.63	74.00	-26.37	50.53	-2.90	Peak	105	202
7	3655.00	37.82	54.00	-16.18	37.82	0.00	Average	115	321
8	3655.00	41.56	74.00	-32.44	41.56	0.00	Peak	115	321
9	4874.00	32.66	54.00	-21.34	27.69	4.97	Average	113	88
10	4874.00	45.36	74.00	-28.64	40.39	4.97	Peak	113	88
11	7311.00	40.65	54.00	-13.35	31.12	9.53	Average	103	225
12	7311.00	54.21	74.00	-19.79	44.68	9.53	Peak	103	225

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

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)

Frequency (MHz)

FCC CLASS-B

FCC CLASS-B (AVG)

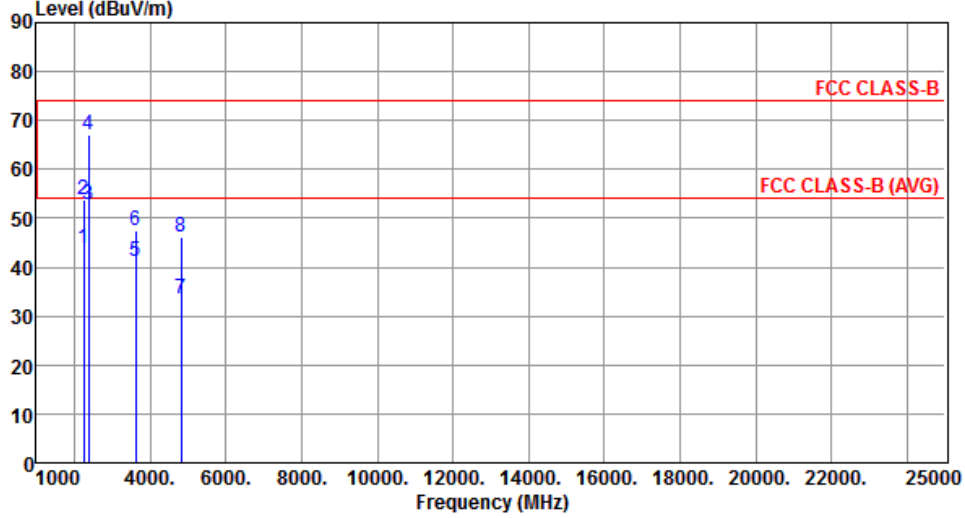
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2302.00	45.79	54.00	-8.21	49.46	-3.67	Average	103	212
2	2302.00	56.62	74.00	-17.38	60.29	-3.67	Peak	103	212
3	2483.50	52.99	54.00	-1.01	55.89	-2.90	Average	101	210
4	2483.50	72.98	74.00	-1.02	75.88	-2.90	Peak	101	210
5	3693.00	29.13	54.00	-24.87	28.89	0.24	Average	101	210
6	3693.00	42.09	74.00	-31.91	41.85	0.24	Peak	101	210
7	4924.00	33.78	54.00	-20.22	28.67	5.11	Average	110	28
8	4924.00	46.86	74.00	-27.14	41.75	5.11	Peak	110	28
9	7386.00	40.26	54.00	-13.74	30.59	9.67	Average	100	190
10	7386.00	52.55	74.00	-21.45	42.88	9.67	Peak	100	190

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					
Level (dBuV/m)						

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	2252.00	43.88	54.00	-10.12	47.73	-3.85	Average	101	213
2	2252.00	53.79	74.00	-20.21	57.64	-3.85	Peak	101	213
3	2390.00	52.76	54.00	-1.24	56.10	-3.34	Average	100	212
4	2390.00	67.21	74.00	-6.79	70.55	-3.34	Peak	100	212
5	3618.00	41.12	54.00	-12.88	41.36	-0.24	Average	100	321
6	3618.00	47.62	74.00	-26.38	47.86	-0.24	Peak	100	321
7	4824.00	33.39	54.00	-20.61	28.55	4.84	Average	122	352
8	4824.00	46.26	74.00	-27.74	41.42	4.84	Peak	122	352

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		
Level (dBuV/m) <			

Modulation	HT20	Test Freq. (MHz)	2437																																																																																																																																		
Polarization	Vertical																																																																																																																																				
Level (dBuV/m) 4 3 2 1 5 6 7 8 9 10 11 12 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>2277.00</td><td>48.01</td><td>54.00</td><td>-5.99</td><td>51.78</td><td>-3.77</td><td>Average</td><td>104</td><td>177</td></tr><tr><td>2</td><td>2277.00</td><td>58.05</td><td>74.00</td><td>-15.95</td><td>61.82</td><td>-3.77</td><td>Peak</td><td>104</td><td>177</td></tr><tr><td>3</td><td>2390.00</td><td>47.58</td><td>54.00</td><td>-6.42</td><td>50.92</td><td>-3.34</td><td>Average</td><td>104</td><td>177</td></tr><tr><td>4</td><td>2390.00</td><td>60.65</td><td>74.00</td><td>-13.35</td><td>63.99</td><td>-3.34</td><td>Peak</td><td>104</td><td>177</td></tr><tr><td>5</td><td>2483.50</td><td>43.58</td><td>54.00</td><td>-10.42</td><td>46.48</td><td>-2.90</td><td>Average</td><td>104</td><td>177</td></tr><tr><td>6</td><td>2483.50</td><td>55.82</td><td>74.00</td><td>-18.18</td><td>58.72</td><td>-2.90</td><td>Peak</td><td>104</td><td>177</td></tr><tr><td>7</td><td>3655.00</td><td>41.19</td><td>54.00</td><td>-12.81</td><td>41.19</td><td>0.00</td><td>Average</td><td>100</td><td>278</td></tr><tr><td>8</td><td>3655.00</td><td>47.81</td><td>74.00</td><td>-26.19</td><td>47.81</td><td>0.00</td><td>Peak</td><td>100</td><td>278</td></tr><tr><td>9</td><td>4874.00</td><td>33.29</td><td>54.00</td><td>-20.71</td><td>28.32</td><td>4.97</td><td>Average</td><td>100</td><td>212</td></tr><tr><td>10</td><td>4874.00</td><td>46.12</td><td>74.00</td><td>-27.88</td><td>41.15</td><td>4.97</td><td>Peak</td><td>100</td><td>212</td></tr><tr><td>11</td><td>7311.00</td><td>48.87</td><td>54.00</td><td>-5.13</td><td>39.34</td><td>9.53</td><td>Average</td><td>100</td><td>202</td></tr><tr><td>12</td><td>7311.00</td><td>61.98</td><td>74.00</td><td>-12.02</td><td>52.45</td><td>9.53</td><td>Peak</td><td>100</td><td>202</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	2277.00	48.01	54.00	-5.99	51.78	-3.77	Average	104	177	2	2277.00	58.05	74.00	-15.95	61.82	-3.77	Peak	104	177	3	2390.00	47.58	54.00	-6.42	50.92	-3.34	Average	104	177	4	2390.00	60.65	74.00	-13.35	63.99	-3.34	Peak	104	177	5	2483.50	43.58	54.00	-10.42	46.48	-2.90	Average	104	177	6	2483.50	55.82	74.00	-18.18	58.72	-2.90	Peak	104	177	7	3655.00	41.19	54.00	-12.81	41.19	0.00	Average	100	278	8	3655.00	47.81	74.00	-26.19	47.81	0.00	Peak	100	278	9	4874.00	33.29	54.00	-20.71	28.32	4.97	Average	100	212	10	4874.00	46.12	74.00	-27.88	41.15	4.97	Peak	100	212	11	7311.00	48.87	54.00	-5.13	39.34	9.53	Average	100	202	12	7311.00	61.98	74.00	-12.02	52.45	9.53	Peak	100	202
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg																																																																																																																												
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3	2390.00	47.58	54.00	-6.42	50.92	-3.34	Average	104	177																																																																																																																												
4	2390.00	60.65	74.00	-13.35	63.99	-3.34	Peak	104	177																																																																																																																												
5	2483.50	43.58	54.00	-10.42	46.48	-2.90	Average	104	177																																																																																																																												
6	2483.50	55.82	74.00	-18.18	58.72	-2.90	Peak	104	177																																																																																																																												
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12	7311.00	61.98	74.00	-12.02	52.45	9.53	Peak	100	202																																																																																																																												
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB) *Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).																																																																																																																																					

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

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

3.6 Emissions in Non-Restricted Frequency Bands

3.6.1 Emissions in Non-Restricted Frequency Bands Limit

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

3.6.2 Measuring Instruments

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

3.6.3 Test Procedures

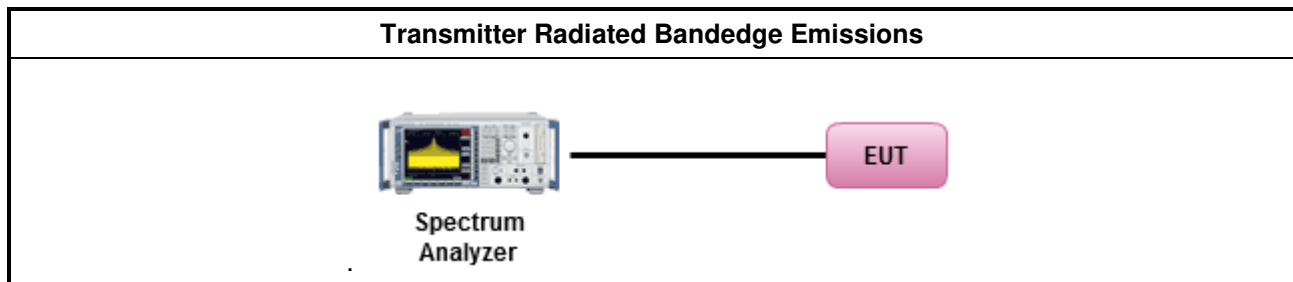
Reference level measurement

1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
2. Trace = max hold , Allow Trace to fully stabilize
3. Use the peak marker function to determine the maximum PSD level

Emission level measurement

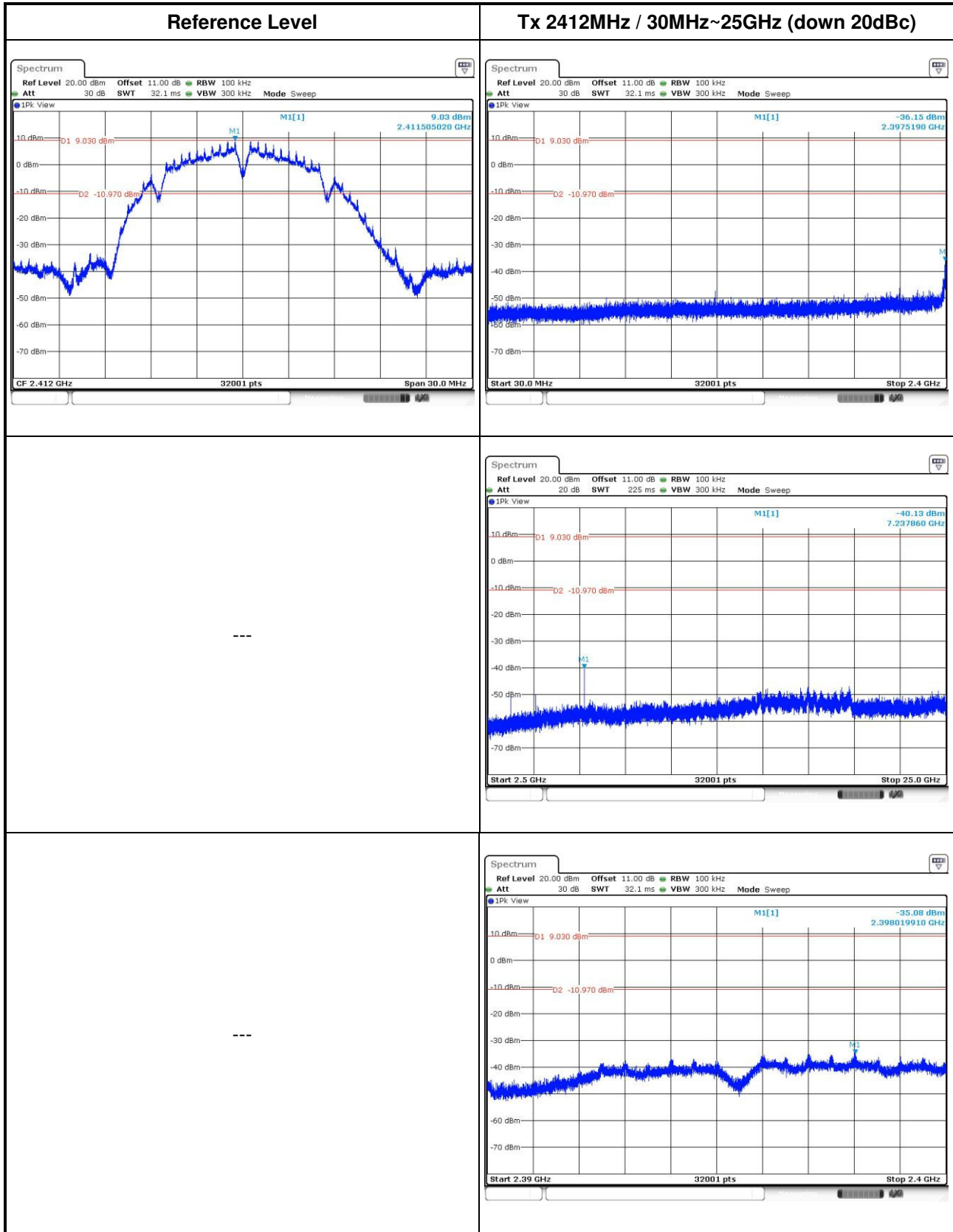
1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
2. Trace = max hold , Allow Trace to fully stabilize
3. Scan Frequency range is up to 25GHz
4. Use the peak marker function to determine the maximum amplitude level

3.6.4 Test Setup

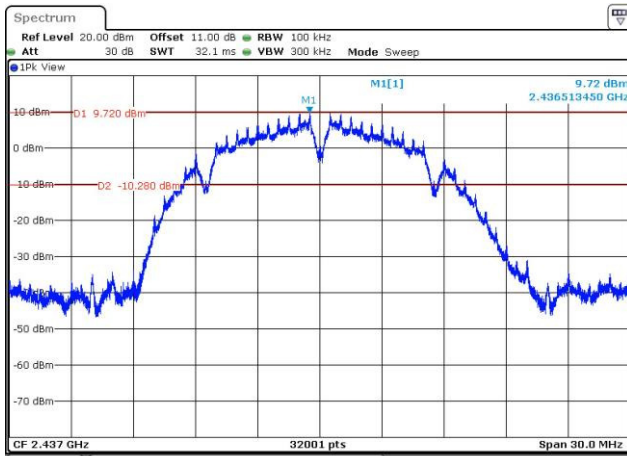


3.6.5 Unwanted Emissions into Non-Restricted Frequency Bands

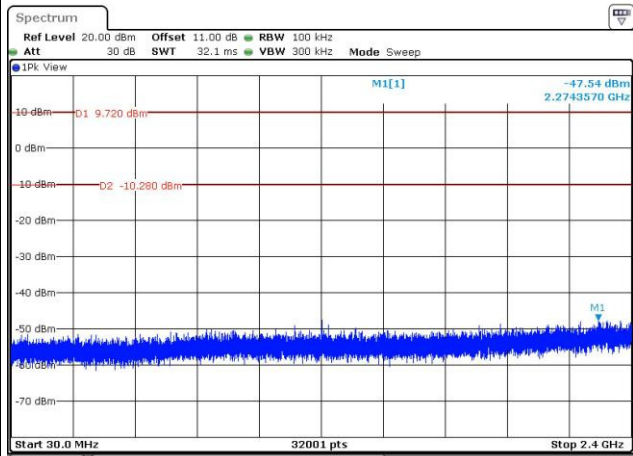
802.11b

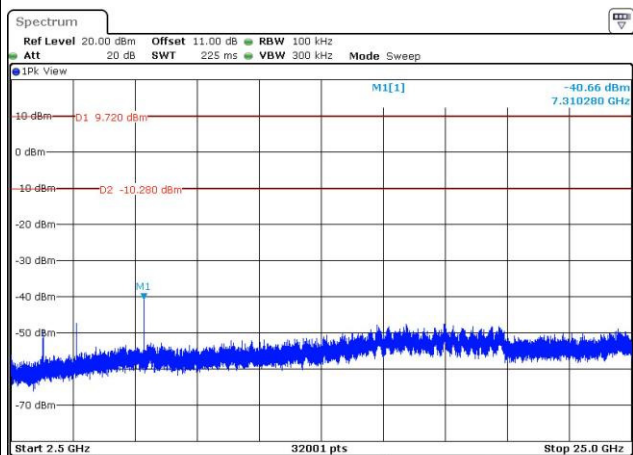


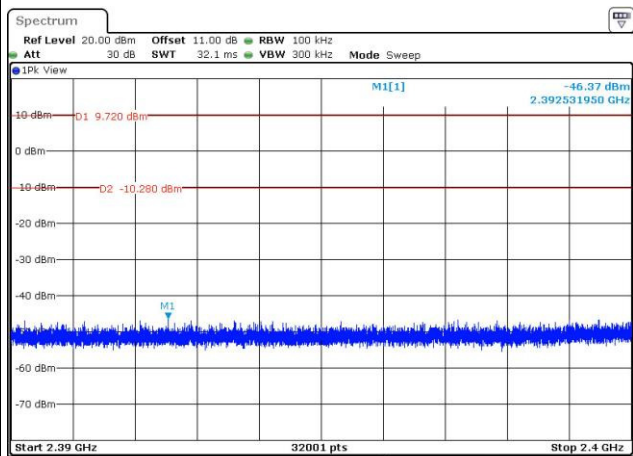
Reference Level

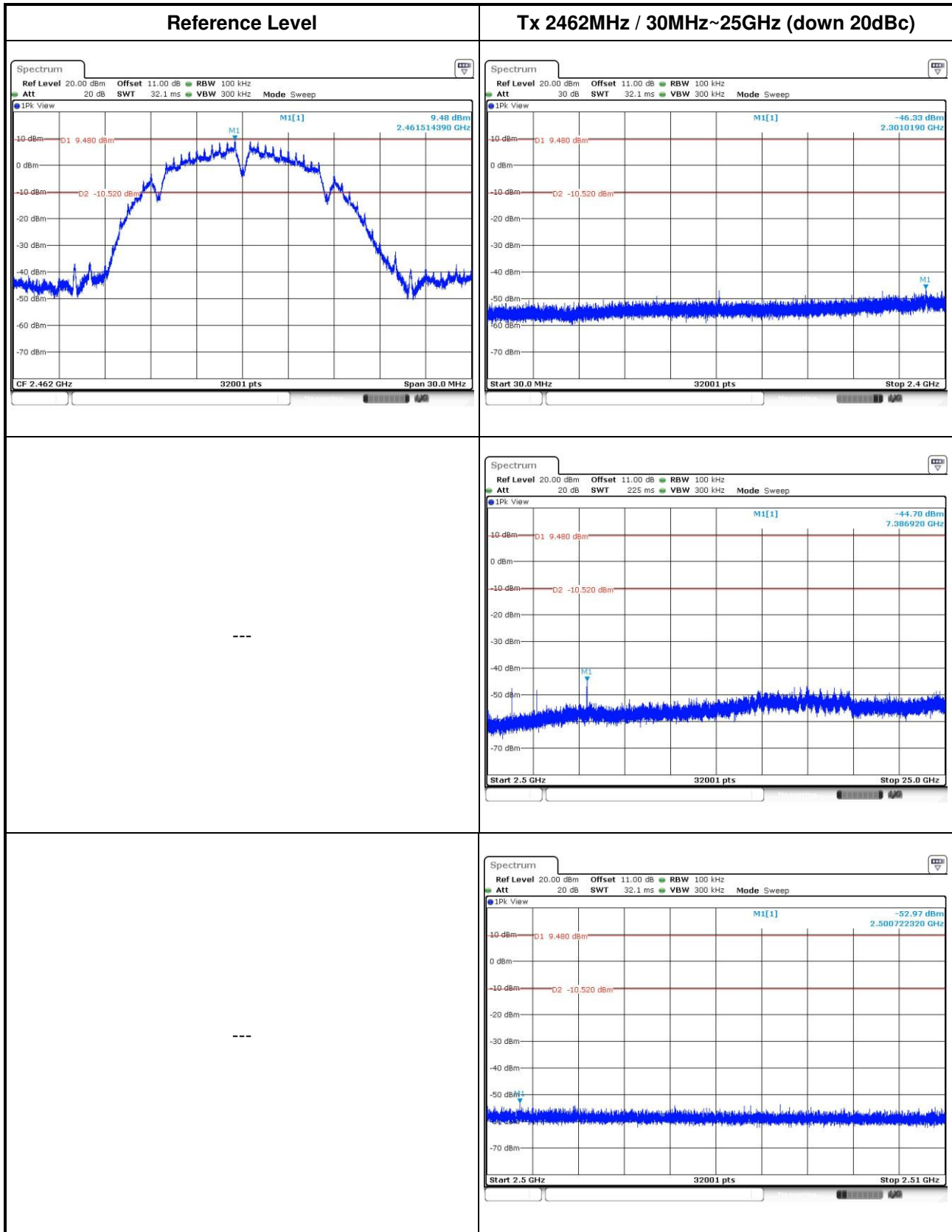


Tx 2437MHz / 30MHz~25GHz (down 20dBc)

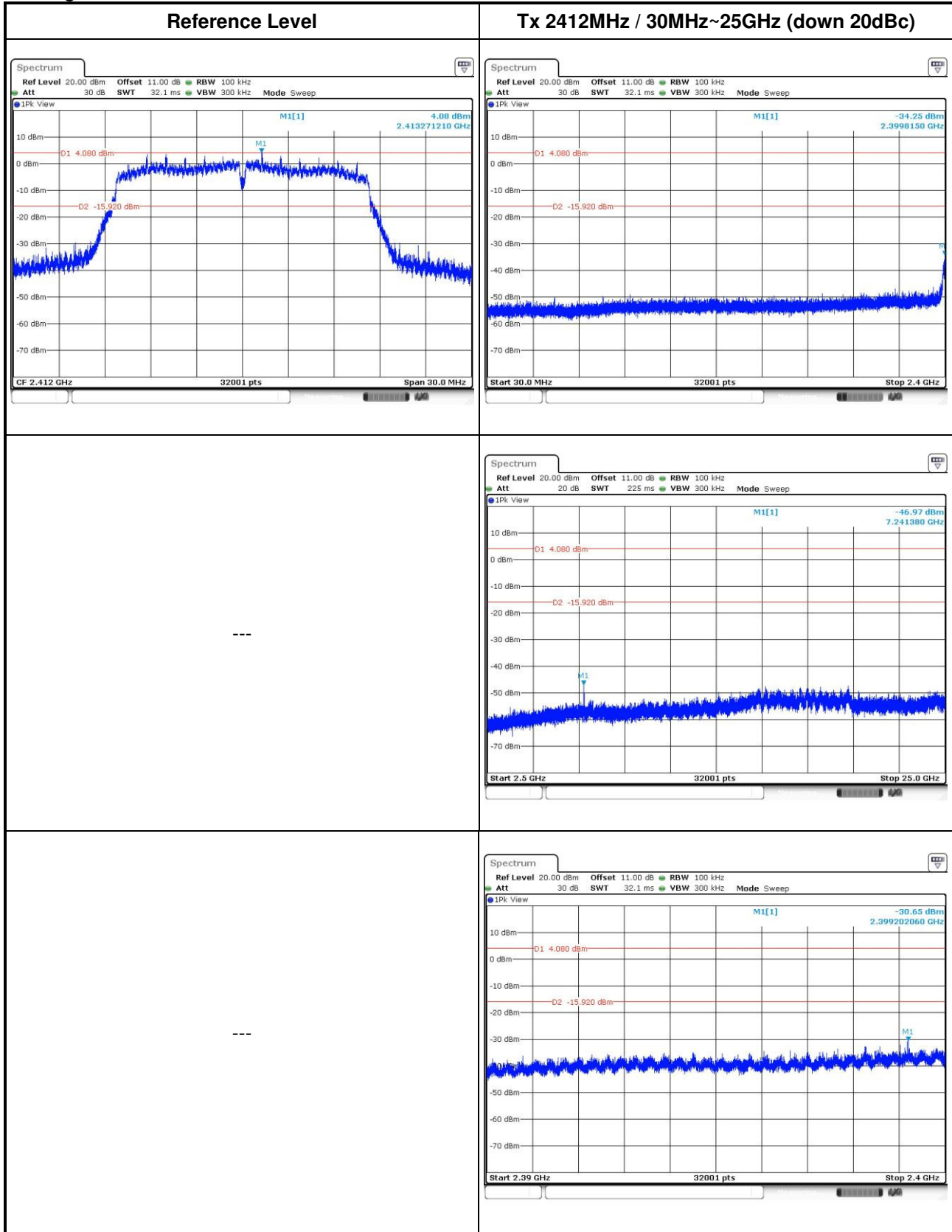




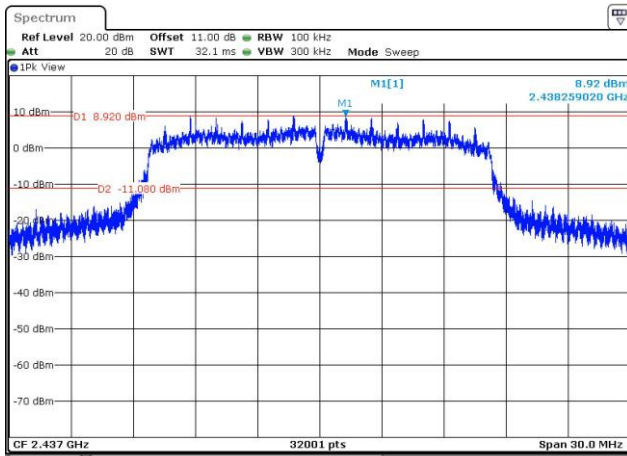




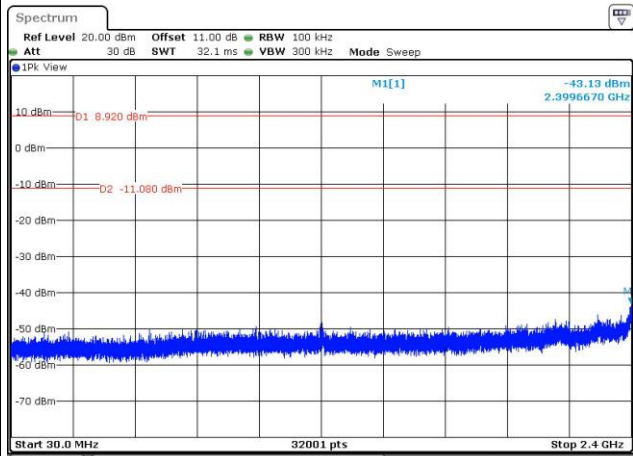
802.11g

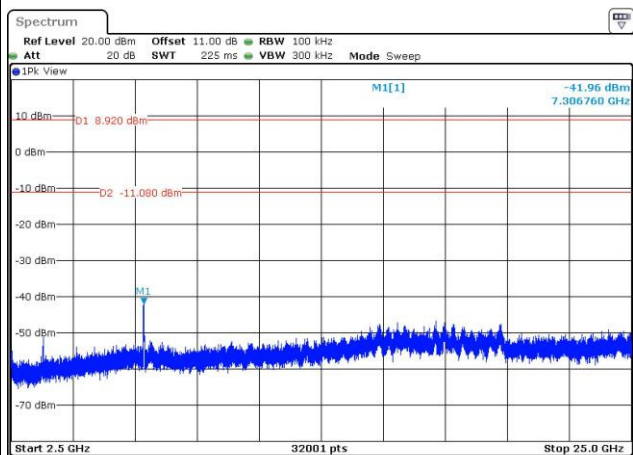


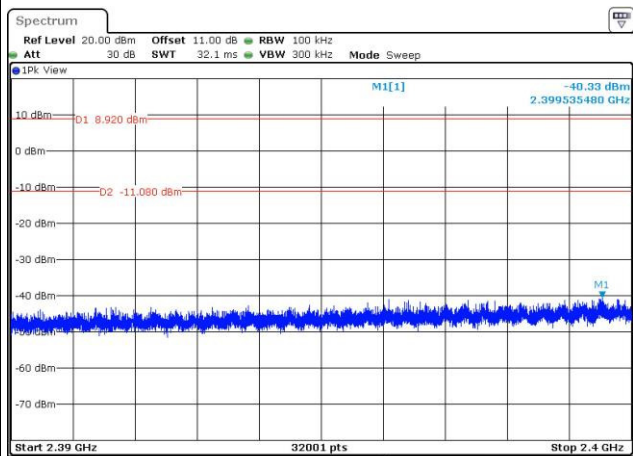
Reference Level



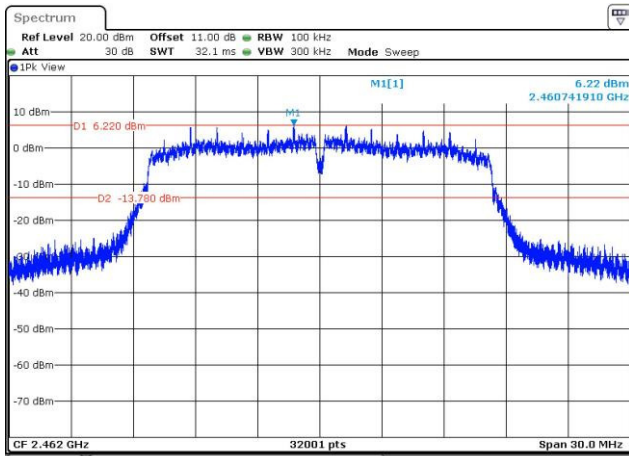
Tx 2437MHz / 30MHz~25GHz (down 20dBc)



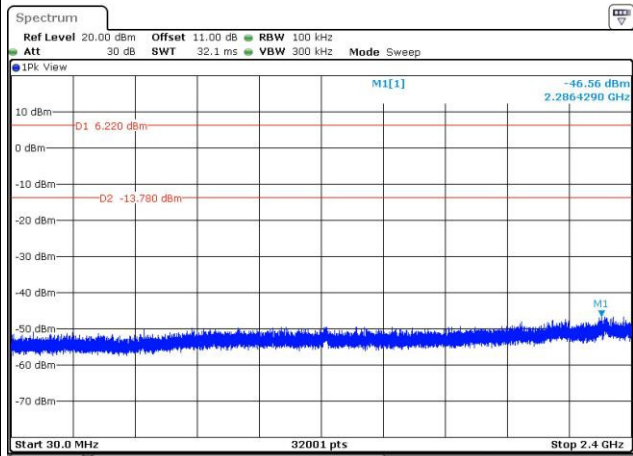


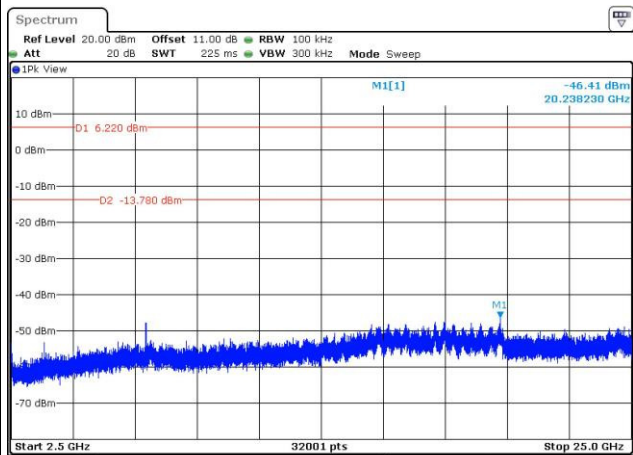


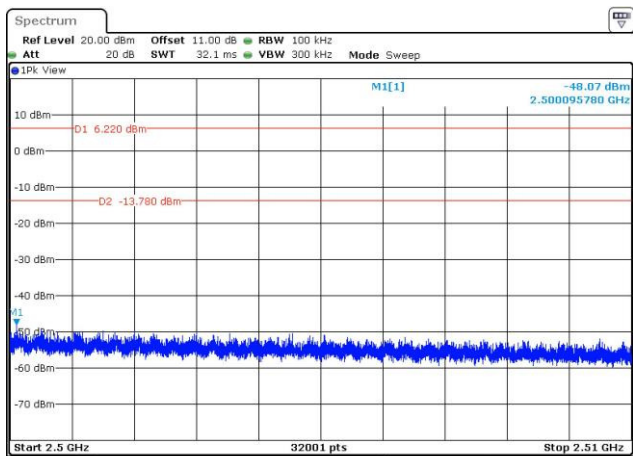
Reference Level



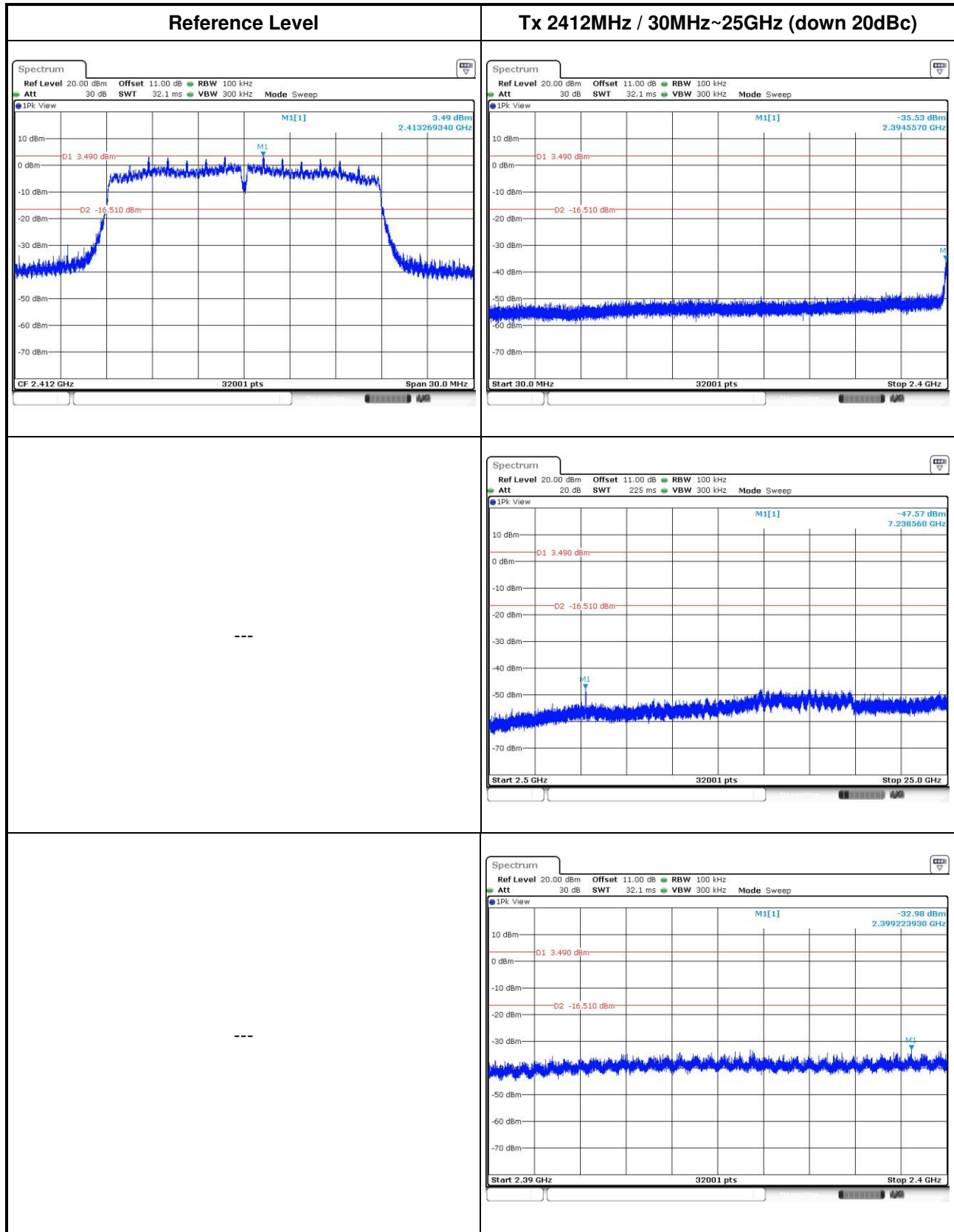
Tx 2462MHz / 30MHz~25GHz (down 20dBc)



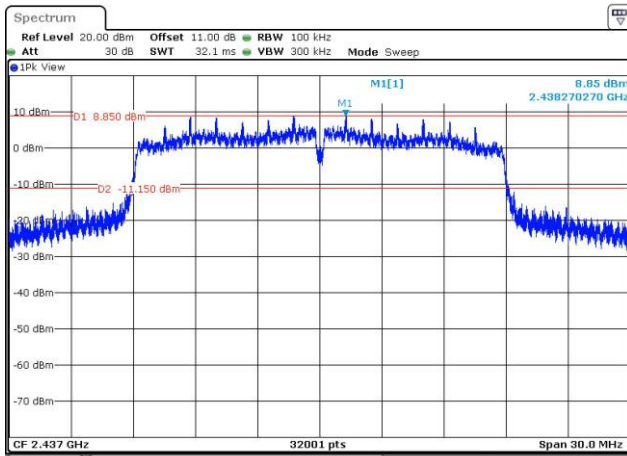




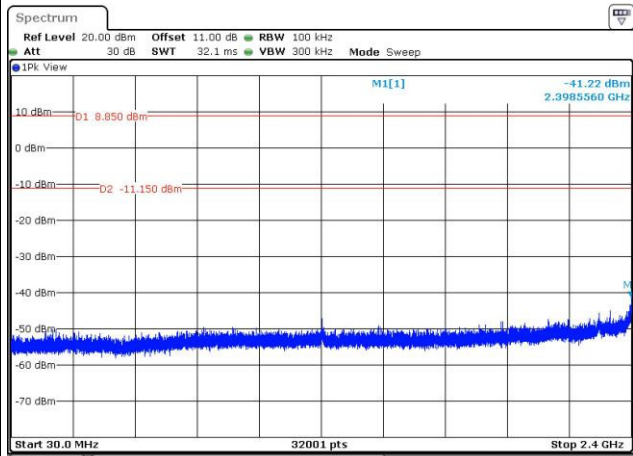
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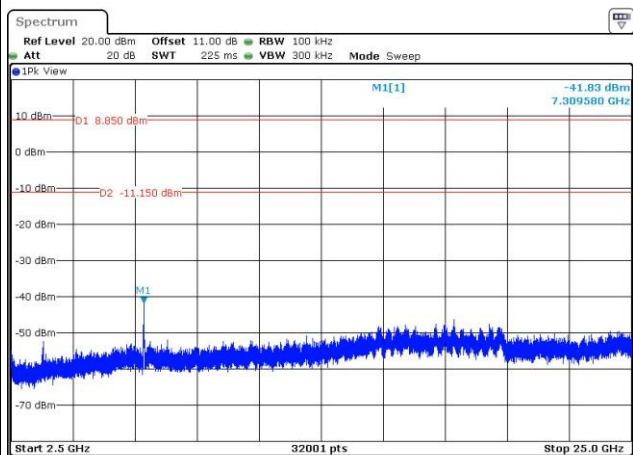


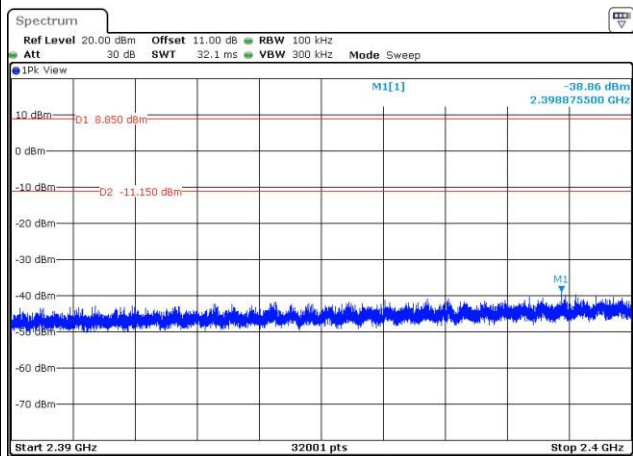
Reference Level



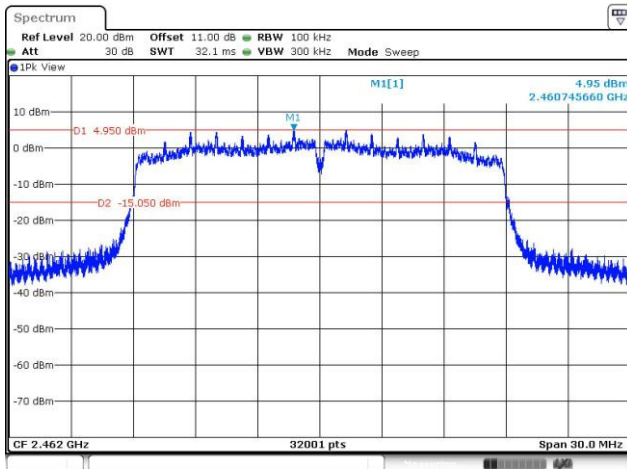
Tx 2437MHz / 30MHz~25GHz (down 20dBc)



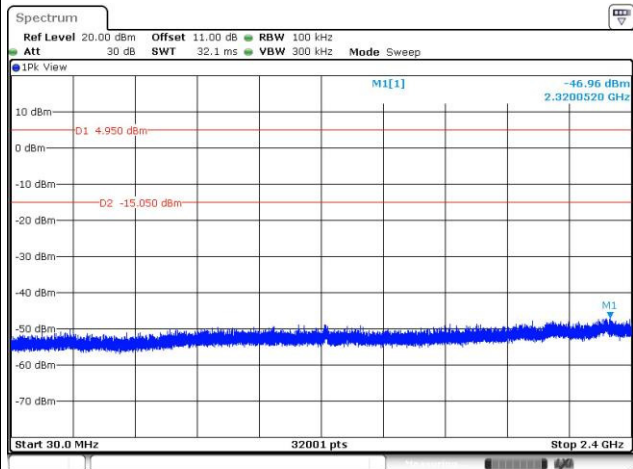


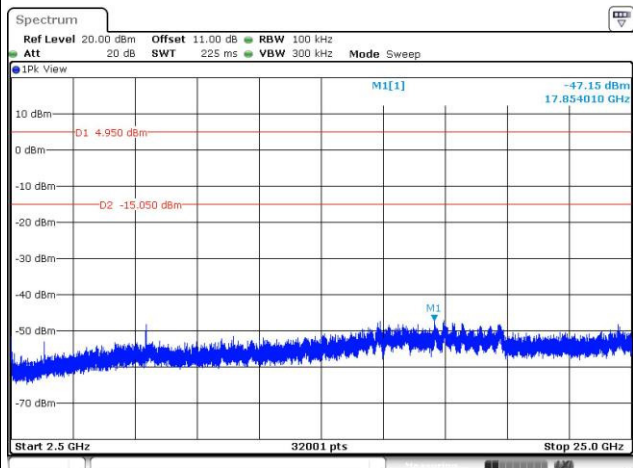


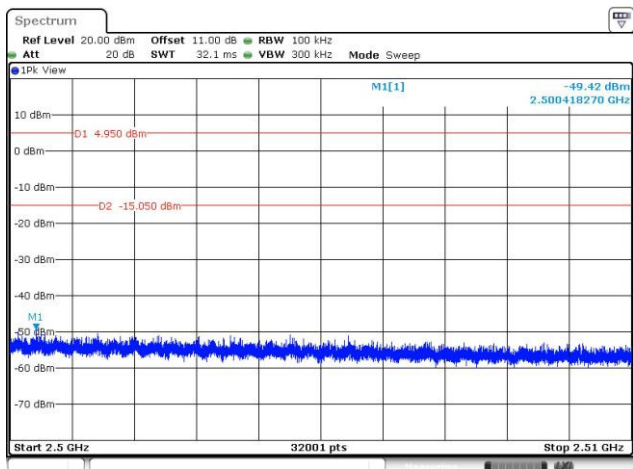
Reference Level



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







4 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

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

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

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Kwei Shan

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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

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Fax: 886-3-318-0155

Email: ICC_Service@icertifi.com.tw

==END==