

FCC C2PC Test Report

FCC ID : RYK-WPEA128N

Equipment : 802.11abgn Mini PCle module

Model No. : WPEA-128N

Brand Name : SparkLAN

Applicant : SparkLAN Communications, Inc

Address : 8F., No.257, Sec. 2, Tiding Blvd., Neihu

District, Taipei City 11493, Taiwan.

Standard : 47 CFR FCC Part 15.247

Received Date : Jun. 07, 2017

Tested Date : Jun. 07 ~ Jun. 09, 2017

We, International Certification Corp., would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It may be duplicated completely for legal use with the approval of the applicant. It shall not be reproduced except in full without the written approval of our laboratory.

Reviewed by: Approved by:

Along Chew Assistant Manager Gary Chang / Manager

TAF Testing Laboratory

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Release Record

Report No.	Version	Description	Issued Date
FR470302-05AC	Rev. 01	Initial issue	Jul. 14, 2017

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Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	Conducted Emissions	[dBuV]: 0.168MHz 49.92 (Margin -15.16dB) - QP	Pass
15.247(d)	Radiated Emissions	[dBuV/m at 3m]: 4874.00MHz	Pass
15.209	Natiated Liffissions	53.47 (Margin -0.53dB) - AV	rass
15.247(b)(3)	Maximum Output Power	Max Power [dBm]: 28.97	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

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1 General Description

1.1 Information

This report is issued as a FCC Class II Permissive Change. The modification is only concerned with adding one antenna.

1.1.1 Specification of the Equipment under Test (EUT)

RF General Information							
Frequency Range (MHz) IEEE Std. Ch. Freq. (MHz) Channel Transmit Chains (N _{TX})							
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]	3	MCS 0-23		
2400-2483.5	n (HT40)	2422-2452	3-9 [7]	3	MCS 0-23		

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 (New addition is marked in boldface.)

Ant.	Model	Turna	Connector	Operating Frequ	encies (MHz) / An	tenna Gain (dBi)
No.	Wodei	Туре	Connector	2400~2483.5	5150~5250	5725~5850
1	GEC6200	Dipole	RP-SMA Plug	3	5	5
2	RFA-25-T42-M32-N	Dipole	RP-SMA Plug	2.9	4.5	4.5
3	C1685-510008-A	Dipole	RP-SMA Plug	3.5	4.5	4.5

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	3.3Vdc from host
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1.1.4 Accessories

N/A

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1.1.5 Channel List

Frequenc	y band (MHz)	2400-	~2483.5	
802.11 b	/ g / n HT20	802.11n HT40		
Channel	Channel Frequency(MHz)		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	ART2-GUI, Version: 1.5				
	Mode	Duty cycle (%)	Duty factor (dB)		
	11b	100.00%	0.00		
Duty Cycle and Duty Factor	11g	98.34%	0.07		
	HT20	98.24%	0.08		
	HT40	95.26%	0.21		

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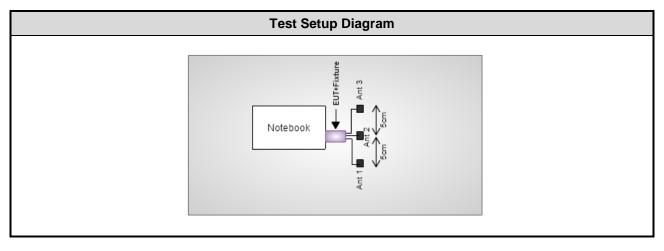
1.1.7 Power Setting

Modulation Mode	Test Frequency (MHz)	Power Set
11b	2412	15.5
11b	2437	14
11b	2462	14
11g	2412	12.5
11g	2437	22.5
11g	2462	13.5
HT20	2412	8
HT20	2437	20
HT20	2462	7.5
HT40	2422	4
HT40	2437	8.5
HT40	2452	4.5

1.2 Local Support Equipment List

	Support Equipment List						
No.	No. Equipment Brand Model FCC ID Signal cable / Length (m)						
1	Notebook	DELL	Latitude E6430	DoC			

1.3 Test Setup Chart



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1.4 The Equipment List

Test Item	Conducted Emission							
Test Site	Conduction room 1 /	Conduction room 1 / (CO01-WS)						
Instrument	Manufacturer Model No. Serial No. Calibration Date Calibration Until							
Receiver	R&S	ESR3	101657	Dec. 21, 2016	Dec. 20, 2017			
LISN SCHWARZBECK Schwarzbeck 8127 8127-667 Nov. 08, 2016 Nov.					Nov. 07, 2017			
RF Cable-CON EMC EMCCFD300-BM-BM-6000 50821 Dec. 20, 2016 D					Dec. 19, 2017			
Measurement Software AUDIX e3 6.120210k NA NA NA								
Note: Calibration Interval of instruments listed above is one year.								

Test Item	Radiated Emission							
Test Site	966 chamber 1 / (03C	966 chamber 1 / (03CH01-WS)						
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until			
Spectrum Analyzer	R&S	FSV40	101498	Nov. 25, 2016	Nov. 24, 2017			
Receiver	R&S	ESR3	101658	Nov. 24, 2016	Nov. 23, 2017			
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Aug. 04, 2016	Aug. 03, 2017			
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Dec. 21, 2016	Dec. 20, 2017			
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Oct. 25, 2016	Oct. 24, 2017			
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 10, 2016	Nov. 09, 2017			
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Dec. 09, 2016	Dec. 08, 2017			
Preamplifier	EMC	EMC02325	980225	Aug. 05, 2016	Aug. 04, 2017			
Preamplifier	Agilent	83017A	MY39501308	Oct. 06, 2016	Oct. 05, 2017			
Preamplifier	EMC	EMC184045B	980192	Aug. 24, 2016	Aug. 23, 2017			
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16014/4	Dec. 09, 2016	Dec. 08, 2017			
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Dec. 09, 2016	Dec. 08, 2017			
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16139/4	Dec. 09, 2016	Dec. 08, 2017			
LF cable 1M	EMC	EMCCFD400-NM-N M-1000	16052	Dec. 09, 2016	Dec. 08, 2017			
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Dec. 09, 2016	Dec. 08, 2017			
LF cable 10M	Woken	CFD400NL-LW	CFD400NL-002	Dec. 09, 2016	Dec. 08, 2017			
Measurement Software	AUDIX	e3	6.120210g	NA	NA			
Note: Calibration Inter	rval of instruments liste	d above is one year.						

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Test Item	RF Conducted									
Test Site	(TH01-WS)	(TH01-WS)								
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until					
Spectrum Analyzer	R&S	FSV40	101063	Mar. 15, 2017	Mar. 14, 2018					
Power Meter	Anritsu	ML2495A	1241002	Oct. 06, 2016	Oct. 05, 2017					
Power Sensor	Anritsu	MA2411B	1207366	Oct. 06, 2016	Oct. 05, 2017					
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 v04
FCC KDB 662911 D01 Multiple Transmitter Output v02r01

1.6 Measurement Uncertainty

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

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

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2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
AC Conduction	CO01-WS	20°C / 57%	Alex Tsai
Radiated Emissions	03CH01-WS	24°C / 60-62%	Vincent Yeh Kevin Lee
RF Conducted	TH01-WS	23°C / 64%	Brad Wu

FCC Designation No.: TW2732
 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	2437	MCS 0	
Radiated Emissions ≤1GHz	HT20	2437	MCS 0	
Radiated Emissions >1GHz Maximum Output Power 6dB bandwidth Power spectral density	11b 11g HT20 HT40	2412 / 2437 / 2462 2412 / 2437 / 2462 2412 / 2437 / 2462 2422 / 2437 / 2452	1 Mbps 6 Mbps MCS 0 MCS 0	

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3 Transmitter Test Results

3.1 Conducted Emissions

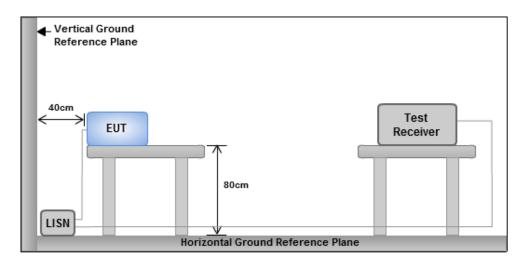
3.1.1 Limit of Conducted Emissions

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



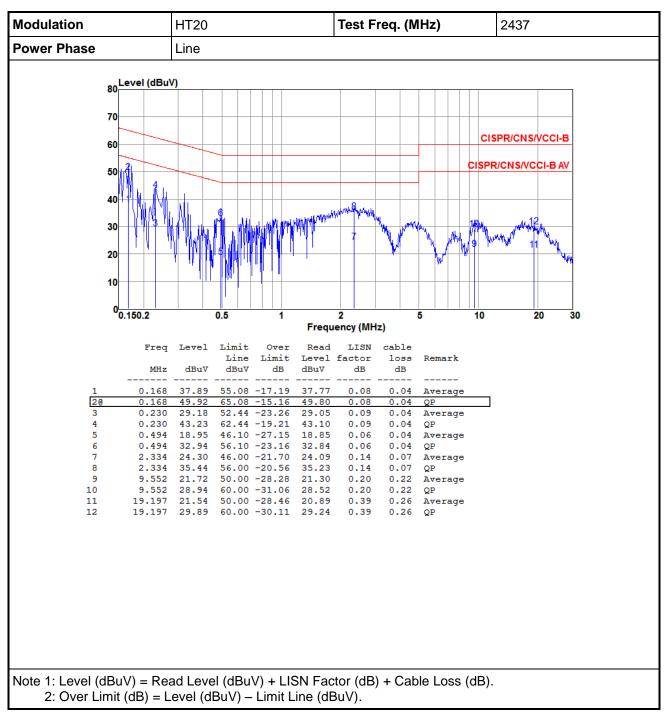
Note: 1. Support units were connected to second LISN.

Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

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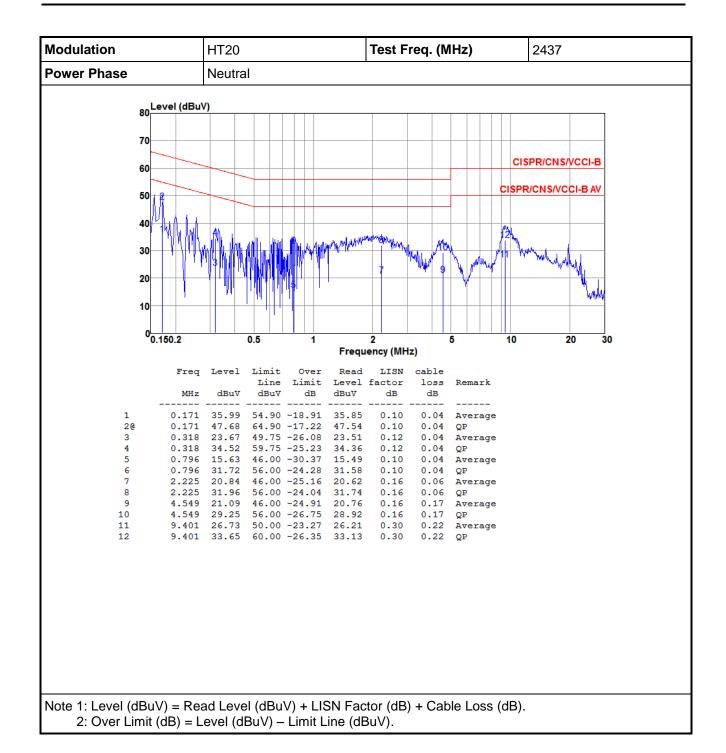


3.1.4 Test Result of Conducted Emissions



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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

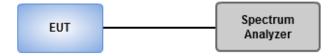
6dB Bandwidth

- 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

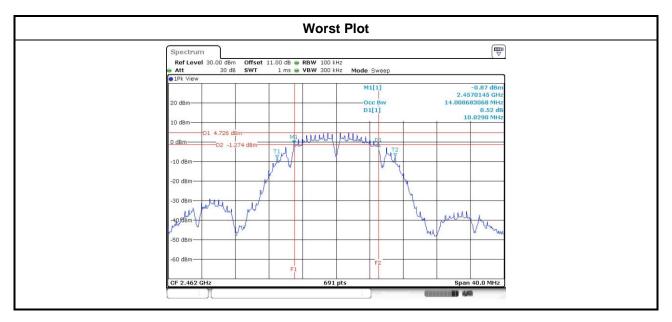


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3.2.4 Test Result of 6dB and Occupied Bandwidth

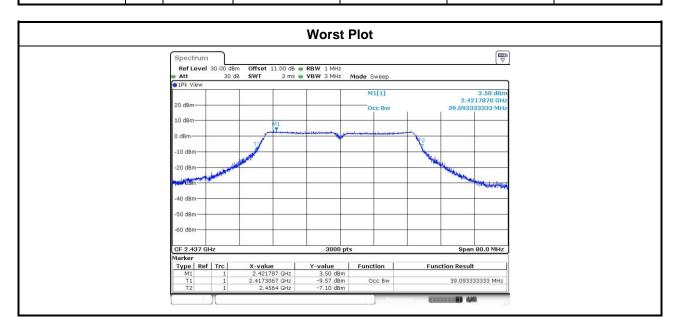
Modulation	N	Eros (MU=)		6dB Bandwidth (MHz)					
Mode	N _{TX}	Freq. (MHz)	Chain 0	Chain 1	Chain 2	Chain 3	Limit (kHz)		
11b	1	2412	10.09				500		
11b	1	2437	10.09				500		
11b	1	2462	10.03				500		
11g	1	2412	16.35				500		
11g	1	2437	16.29				500		
11g	1	2462	16.35				500		
HT20	3	2412	17.62	17.62	17.62		500		
HT20	3	2437	17.57	17.57	17.57		500		
HT20	3	2462	17.57	17.62	17.57		500		
HT40	3	2422	36.41	36.41	36.41		500		
HT40	3	2437	36.41	36.41	36.41		500		
HT40	3	2452	36.41	36.41	36.41		500		



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Modulation	N	Freq.	99% Occupied Bandwidth (MHz)					
Mode	N _{TX}	(MHz)	Chain 0	Chain 1	Chain 2	Chain 3		
11b	1	2412	14.13					
11b	1	2437	14.09					
11b	1	2462	14.03					
11g	1	2412	17.24					
11g	1	2437	25.12					
11g	1	2462	17.27					
HT20	3	2412	18.16	18.15	18.07			
HT20	3	2437	21.39	19.36	20.41			
HT20	3	2462	18.28	18.09	18.04			
HT40	3	2422	38.85	38.45	38.40			
HT40	3	2437	39.09	38.48	38.40			
HT40	3	2452	38.72	38.35	38.35			



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3.3 RF Output Power

3.3.1 Limit of RF Output Power

Conducted power shall not exceed 1Watt.

Antenna gain <= 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

- 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.

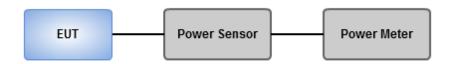
Nower meter

- 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)

Nower meter

 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



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3.3.4 Test Result of Maximum Output Power

				Peak	conduct	ed Outpu	t Power (dBm)		Ant.	(dRm)	FIDD
Modulation Mode	N _{TX}	Freq. (MHz)	Chain 0	Chain 1	Chain 2	Chain 3	Total Power (mW)	Total Power (dBm)	Limit (dBm)	Gain (dBi)		EIRP Limit (dBm)
11b	1	2412	17.51				56.364	17.51	30.00	3.50	21.01	36.00
11b	1	2437	16.29				42.560	16.29	30.00	3.50	19.79	36.00
11b	1	2462	15.98				39.628	15.98	30.00	3.50	19.48	36.00
11g	1	2412	20.68				116.950	20.68	30.00	3.50	24.18	36.00
11g	1	2437	24.71				295.801	24.71	30.00	3.50	28.21	36.00
11g	1	2462	20.92				123.595	20.92	30.00	3.50	24.42	36.00
HT20	3	2412	16.43	16.46	16.63		134.239	21.28	30.00	3.50	24.78	36.00
HT20	3	2437	23.75	24.6	24.2		788.567	28.97	30.00	3.50	32.47	36.00
HT20	3	2462	15.38	16.24	16.66		122.932	20.90	30.00	3.50	24.40	36.00
HT40	3	2422	12.77	12.79	12.68		56.470	17.52	30.00	3.50	21.02	36.00
HT40	3	2437	16.83	16.29	16.94		140.186	21.47	30.00	3.50	24.97	36.00
HT40	3	2452	13.94	13.2	13.94		70.441	18.48	30.00	3.50	21.98	36.00

Modulation		Freg.	Cond	Conducted (Average) Output Power (dBm)				Total	Limit
Mode	N _{TX}	(MHz)	Chain 0	Chain 1	Chain 2	Chain 3	Power (mW)	Power (dBm)	(dBm)
11b	1	2412	15.38				34.514	15.38	
11b	1	2437	14.18				26.182	14.18	
11b	1	2462	13.98				25.003	13.98	
11g	1	2412	13.02				20.045	13.02	
11g	1	2437	20.98				125.314	20.98	
11g	1	2462	13.46				22.182	13.46	
HT20	3	2412	8.11	7.88	7.95		18.846	12.75	
HT20	3	2437	18.68	18.91	18.93		229.757	23.61	
HT20	3	2462	6.98	7.65	7.86		16.919	12.28	
HT40	3	2422	4.79	4.79	4.59		8.903	9.50	
HT40	3	2437	8.78	8.6	8.66		22.140	13.45	
HT40	3	2452	4.68	4.69	4.71		8.840	9.46	

Note: Conducted average output power is for reference only.

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3.4 Power Spectral Density

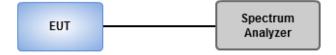
3.4.1 Limit of Power Spectral Density

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.
 - 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.
 - Set the RBW = 100kHz, VBW = 300 kHz.
 - 2. Detector = RMS, Sweep time = auto couple.
 - 3. Set the sweep time to: ≥ 10 x (number of measurement points in sweep) x (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



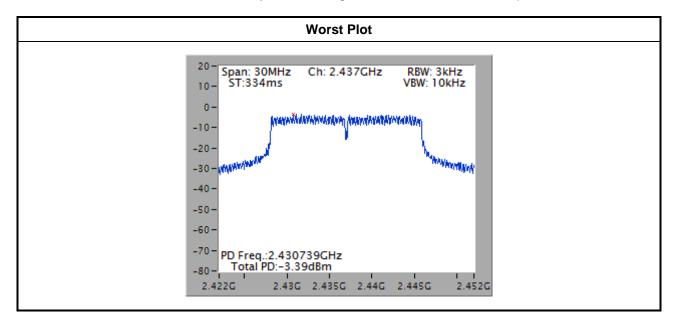
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3.4.4 Test Result of Power Spectral Density

Modulation Mode	N _{TX}	Freq. (MHz)	Total Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
11b	1	2412	-9.19	8.00
11b	1	2437	-10.58	8.00
11b	1	2462	-10.75	8.00
11g	1	2412	-11.90	8.00
11g	1	2437	-4.12	8.00
11g	1	2462	-12.14	8.00
HT20	3	2412	-14.15	8.00
HT20	3	2437	-3.39	8.00
HT20	3	2462	-14.80	8.00
HT40	3	2422	-19.35	8.00
HT40	3	2437	-15.25	8.00
HT40	3	2452	-20.15	8.00

Note: Test result for HT20 / HT40 is bin-by-bin summing measured value of each TX port.



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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:

Qusai-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.

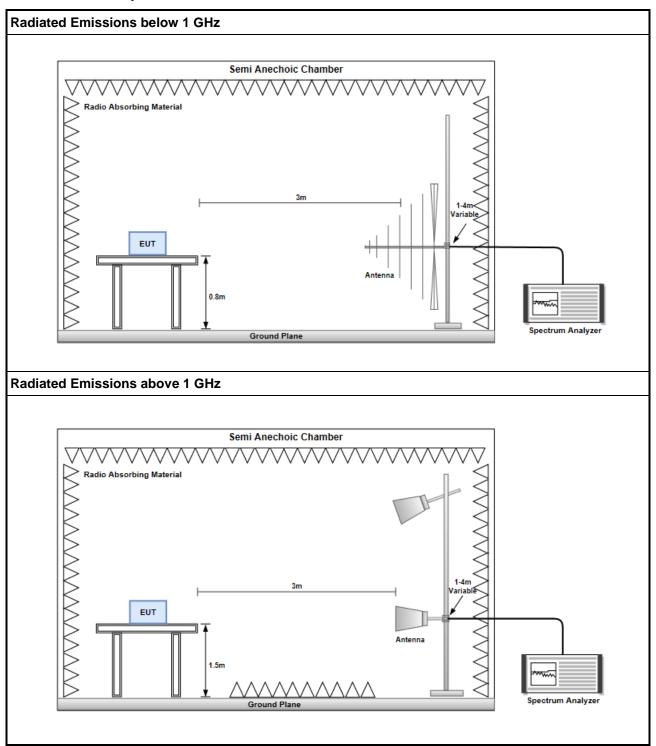
Note:

- 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.
- RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above 1GHz.

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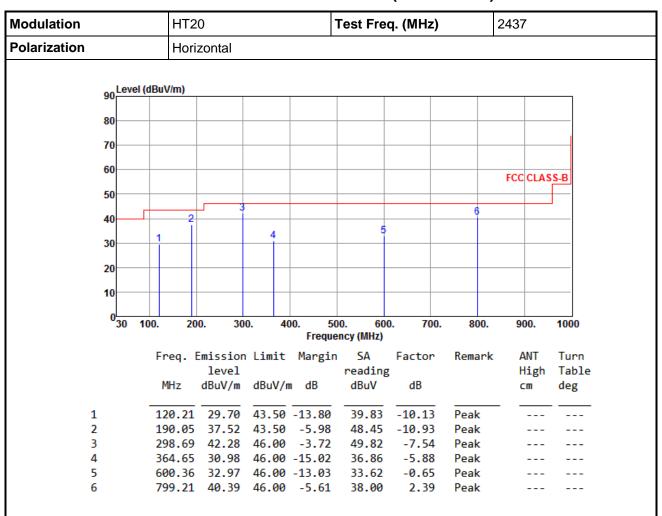
3.5.3 Test Setup



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3.5.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)



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

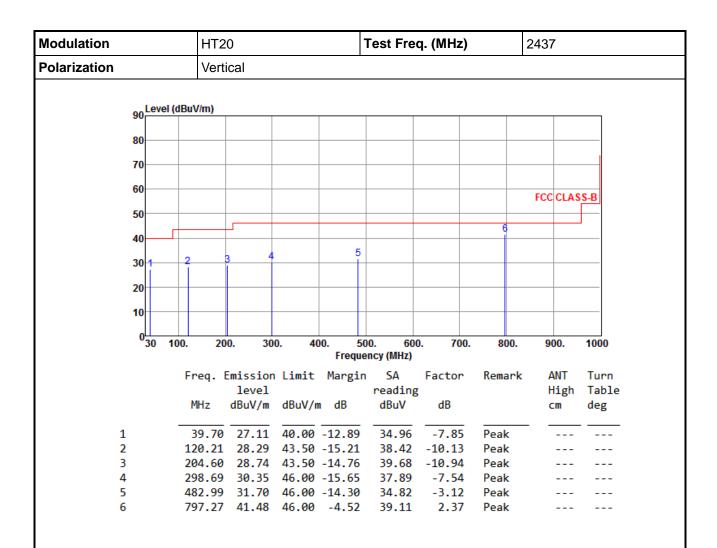
*Factor includes antenna factor, cable loss and amplifier gain

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.

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*Factor includes antenna factor, cable loss and amplifier gain

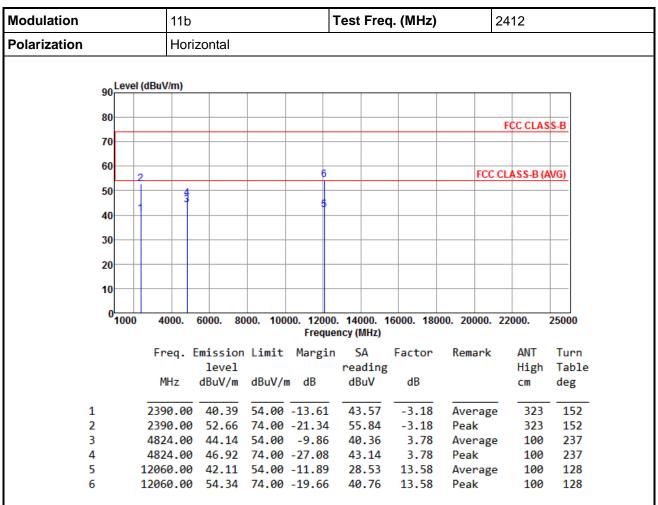
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

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

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



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

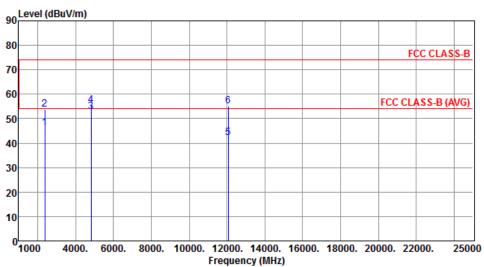
*Factor includes antenna factor, cable loss and amplifier gain

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

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

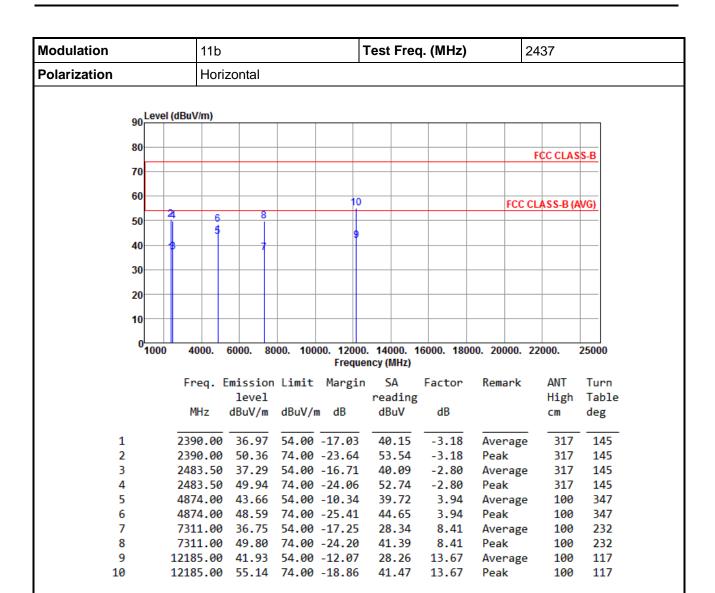


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Ū	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	46.07	54.00	-7.93	49.25	-3.18	Average	243	261
2	2390.00	53.95	74.00	-20.05	57.13	-3.18	Peak	243	261
3	4824.00	52.89	54.00	-1.11	49.11	3.78	Average	100	119
4	4824.00	55.46	74.00	-18.54	51.68	3.78	Peak	100	119
5	12060.00	42.19	54.00	-11.81	28.61	13.58	Average	140	64
6	12060.00	55.11	74.00	-18.89	41.53	13.58	Peak	140	64

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

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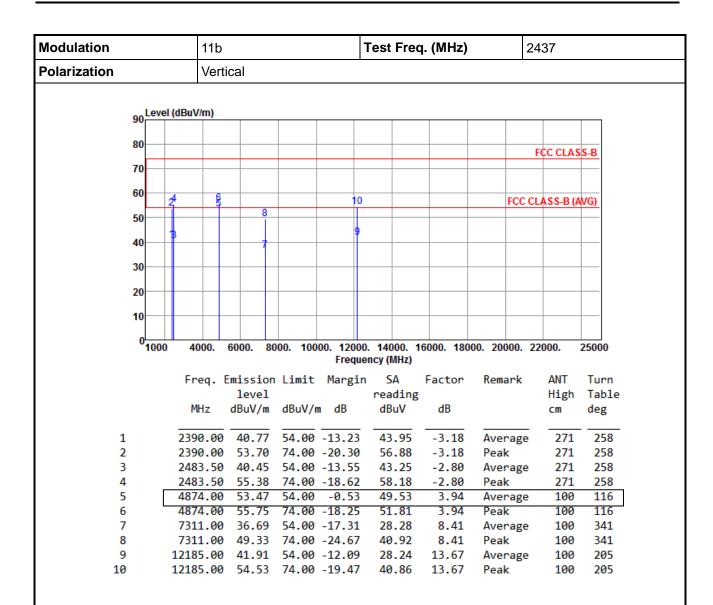


*Factor includes antenna factor, cable loss and amplifier gain

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

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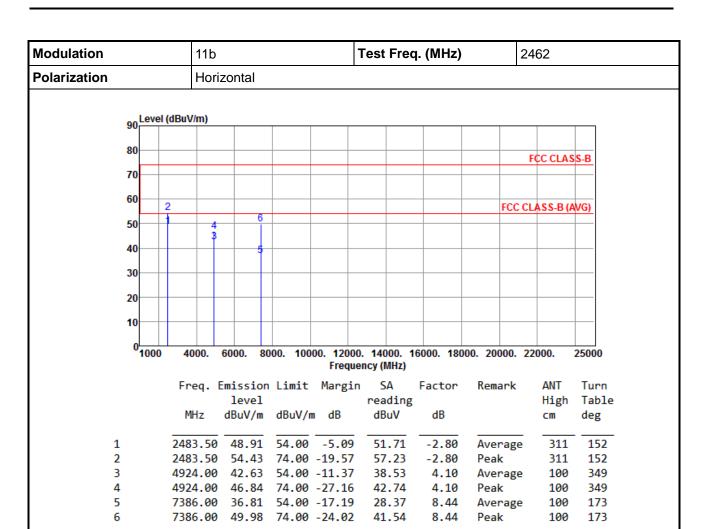


*Factor includes antenna factor, cable loss and amplifier gain

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

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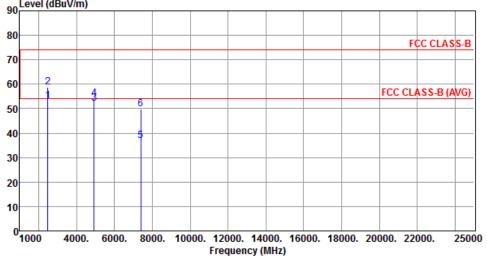
*Factor includes antenna factor, cable loss and amplifier gain

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

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Modulation		11b			Test	Test Freq. (MHz)				2462		
Polarization		Vertical										
oo L	evel (dBu\	//m)										
90_ 80_												
80									F	C CLAS	S.B	



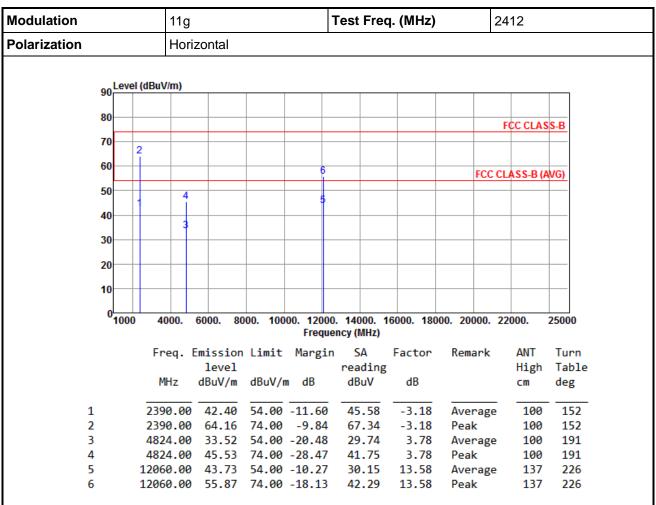
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Ū	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2/83 50	53.20	54.00	-0.80	56.00	-2.80	Average	294	268
2		58.77			61.57	-2.80	Peak	294	268
3		52.12			48.02	4.10	Average	100	116
4	4924.00				50.18	4.10	Peak	100	116
5	7386.00	36.74	54.00	-17.26	28.30	8.44	Average	100	82
6	7386.00	49.70	74.00	-24.30	41.26	8.44	Peak	100	82

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

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



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

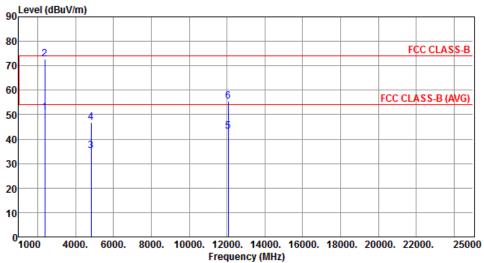
*Factor includes antenna factor, cable loss and amplifier gain

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

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

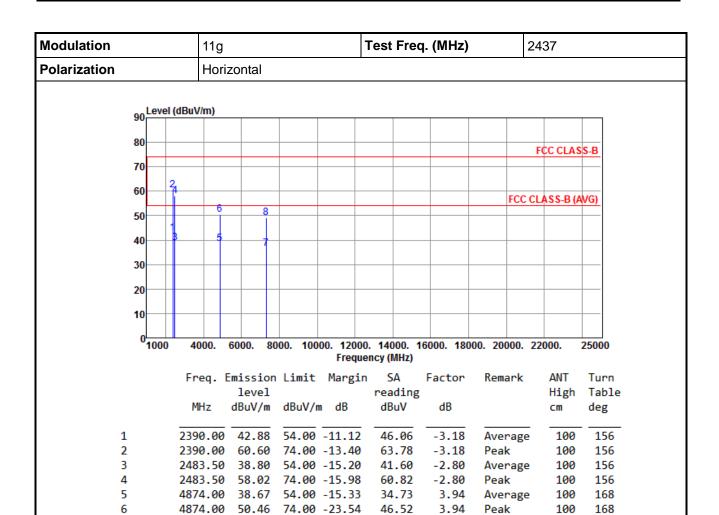


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Ū	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	50.87	54.00	-3.13	54.05	-3.18	Average	284	251
2	2390.00	72.72	74.00	-1.28	75.90	-3.18	Peak	284	251
3	4824.00	35.04	54.00	-18.96	31.26	3.78	Average	100	123
4	4824.00	46.71	74.00	-27.29	42.93	3.78	Peak	100	123
5	12060.00	43.19	54.00	-10.81	29.61	13.58	Average	100	148
6	12060.00	55.44	74.00	-18.56	41.86	13.58	Peak	100	148

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

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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).

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7

8

7311.00

36.67

7311.00 49.15 74.00 -24.85

54.00 -17.33

28.26

40.74

8.41

8.41

Average

Peak

100

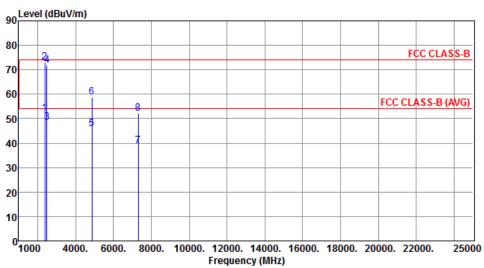
100

69

69



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

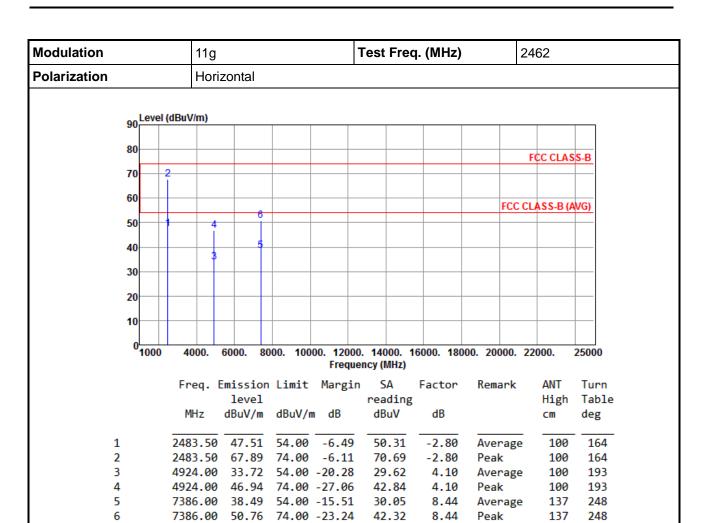


	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2390.00	51.98	54.00	-2.02	55.16	-3.18	Average	199	106
2	2390.00	73.22	74.00	-0.78	76.40	-3.18	Peak	199	106
3	2483.50	48.61	54.00	-5.39	51.41	-2.80	Average	199	106
4	2483.50	71.87	74.00	-2.13	74.67	-2.80	Peak	199	106
5	4874.00	45.74	54.00	-8.26	41.80	3.94	Average	101	115
6	4874.00	58.77	74.00	-15.23	54.83	3.94	Peak	101	115
7	7311.00	38.84	54.00	-15.16	30.43	8.41	Average	100	231
8	7311.00	52.01	74.00	-21.99	43.60	8.41	Peak	100	231

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

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*Factor includes antenna factor, cable loss and amplifier gain

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

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40 30 20

4

5

6

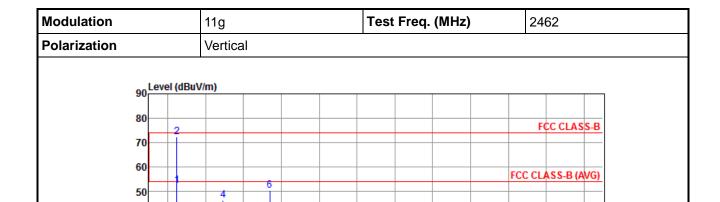
4924.00

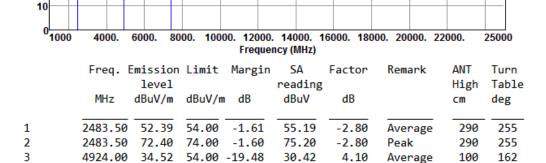
7386.00

46.48

38.57

7386.00 50.49 74.00 -23.51





42.38

30.13

42.05

4.10

8.44

8.44

Peak

Peak

Average

100

185

185

162

74

74

74.00 -27.52

54.00 -15.43

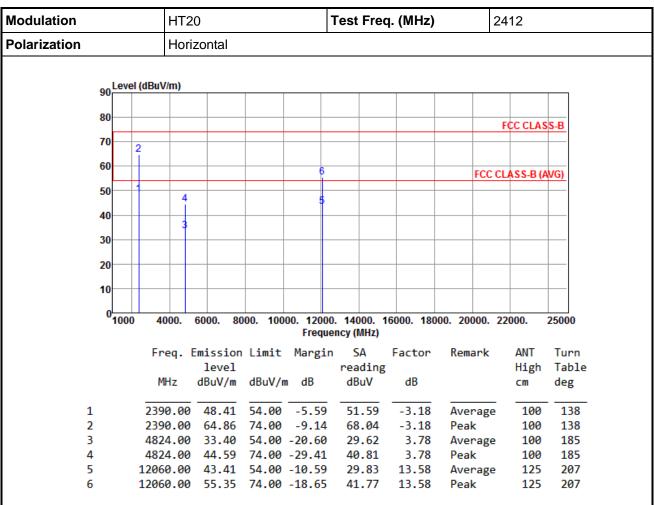
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

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

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



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

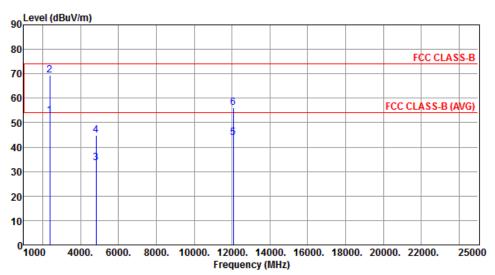
*Factor includes antenna factor, cable loss and amplifier gain

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

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Modulation	HT20	Test Freq. (MHz)	2412
Polarization	Vertical		



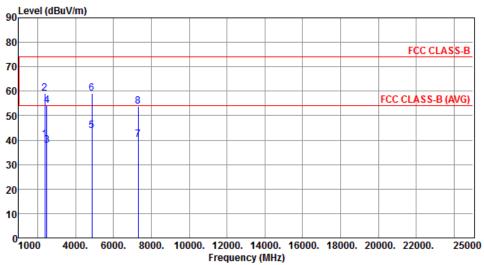
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Ū	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	52.94	54.00	-1.06	56.12	-3.18	Average	275	76
2	2390.00	69.54	74.00	-4.46	72.72	-3.18	Peak	275	76
3	4824.00	33.55	54.00	-20.45	29.77	3.78	Average	173	236
4	4824.00	44.73	74.00	-29.27	40.95	3.78	Peak	173	236
5	12060.00	43.96	54.00	-10.04	30.38	13.58	Average	100	194
6	12060.00	56.27	74.00	-17.73	42.69	13.58	Peak	100	194

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

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Modulation	HT20	Test Freq. (MHz)	2437
Polarization	Horizontal		
Lovel (dRu)	lim)		



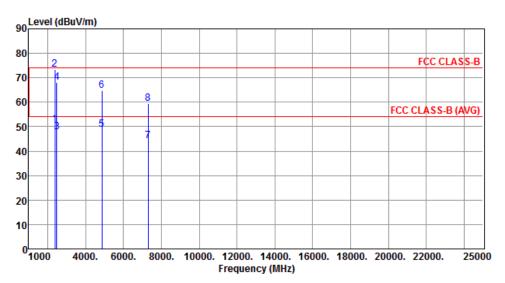
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2390.00	40.29	54.00	-13.71	43.47	-3.18	Average	100	145
2	2390.00	59.05	74.00	-14.95	62.23	-3.18	Peak	100	145
3	2483.50	38.01	54.00	-15.99	40.81	-2.80	Average	100	145
4	2483.50	54.09	74.00	-19.91	56.89	-2.80	Peak	100	145
5	4874.00	43.71	54.00	-10.29	39.77	3.94	Average	100	41
6	4874.00	59.25	74.00	-14.75	55.31	3.94	Peak	100	41
7	7311.00	40.25	54.00	-13.75	31.84	8.41	Average	100	127
8	7311.00	53.77	74.00	-20.23	45.36	8.41	Peak	100	127

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

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Modulation	HT20	Test Freq. (MHz)	2437
Polarization	Vertical		



	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	50.80	54.00	-3.20	53.98	-3.18	Average	256	113
2	2390.00	73.32	74.00	-0.68	76.50	-3.18	Peak	256	113
3	2483.50	47.85	54.00	-6.15	50.65	-2.80	Average	256	113
4	2483.50	68.20	74.00	-5.80	71.00	-2.80	Peak	256	113
5	4874.00	48.75	54.00	-5.25	44.81	3.94	Average	100	64
6	4874.00	64.78	74.00	-9.22	60.84	3.94	Peak	100	64
7	7311.00	44.31	54.00	-9.69	35.90	8.41	Average	233	309
8	7311.00	59.48	74.00	-14.52	51.07	8.41	Peak	233	309

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

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Modulation	HT2	20		Т	est Freq	ı. (MHz)	2	2462	
Polarization	Hor	izontal		•			1		
	al (albantina)								
90 Leve	el (dBuV/m)								
80									
70								FCC CLAS	S-B
70	2								
60							FCC (CLASS-B (A	MG)
50		6					1000	JER33-D (F	(00)
40	3	1							
30									
20									
20									
10									
00	0 4000.	6000. 80	000. 100	00 42000	44000 4	6000 4000	00. 20000. :	22000	25000
1000	4000.	0000. 60	, 100 100		ncy (MHz)	0000. 1600	JU. 20000. /	22000.	23000
	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn
		level			reading			High	Table
	MHz	dBuV/m	dBuV/n	n dB	dBuV	dB		cm	deg
1	2483.50	47.72	54.00	-6.28	50.52	-2.80	Average	100	137
2	2483.50		74.00		68.47	-2.80	Peak	100	137
3	4924.00	33.46	54.00	-20.54	29.36	4.10	Average	175	204
4		46.04			41.94	4.10	Peak	175	204
5	7386.00	38.25	54.00	-15.75	29.81	8.44	Average	121	283

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

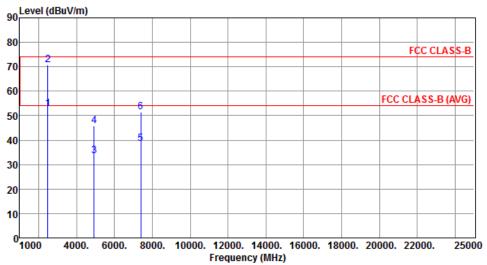
*Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

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Modulation	HT20	Test Freq. (MHz)	2462
Polarization	Vertical		
90 Level (dBu	V/m)		
90			



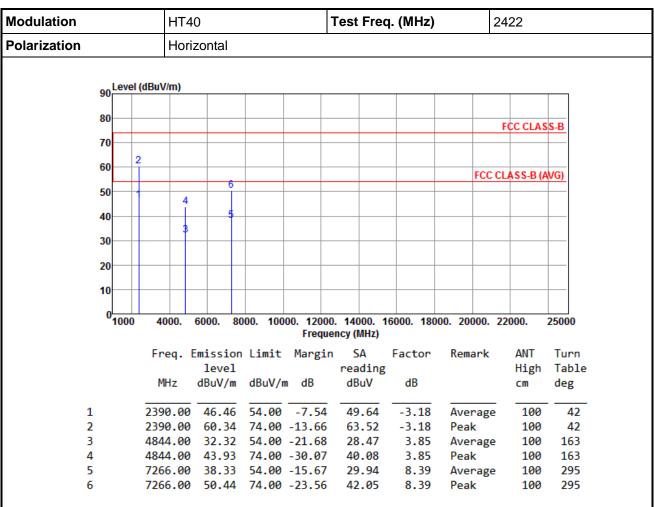
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Ū	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
	_								
1	2483.50	52.91	54.00	-1.09	55.71	-2.80	Average	225	97
2	2483.50	70.88	74.00	-3.12	73.68	-2.80	Peak	225	97
3	4924.00	33.41	54.00	-20.59	29.31	4.10	Average	100	128
4	4924.00	45.96	74.00	-28.04	41.86	4.10	Peak	100	128
5	7386.00	38.57	54.00	-15.43	30.13	8.44	Average	193	141
6	7386.00	51.46	74.00	-22.54	43.02	8.44	Peak	193	141

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

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



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

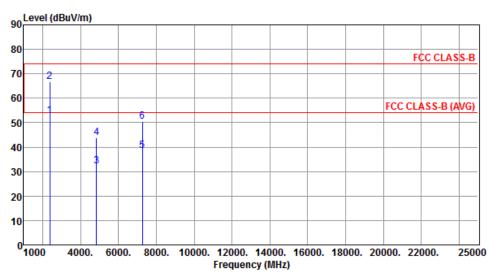
*Factor includes antenna factor, cable loss and amplifier gain

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

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Modulation	HT40	Test Freq. (MHz)	2422
Polarization	Vertical		



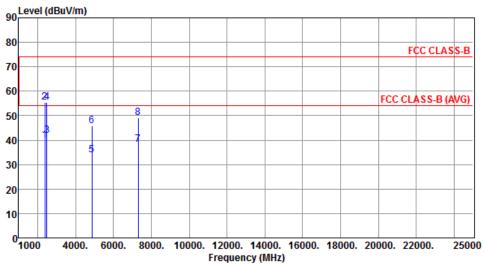
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Ū	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
			,						
1	2390.00	52.81	54.00	-1.19	55.99	-3.18	Average	140	278
2	2390.00	66.66	74.00	-7.34	69.84	-3.18	Peak	140	278
3	4844.00	32.37	54.00	-21.63	28.52	3.85	Average	100	127
4	4844.00	43.68	74.00	-30.32	39.83	3.85	Peak	100	127
5	7266.00	38.49	54.00	-15.51	30.10	8.39	Average	100	13
6	7266.00	50.36	74.00	-23.64	41.97	8.39	Peak	100	13

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

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Modulation	HT40	Test Freq.	(MHz)	24	37		
Polarization	Horizontal						
90 Level (dBu)	//m)						



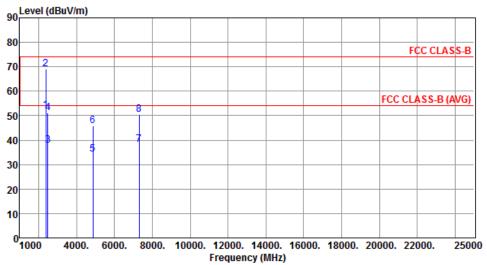
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Ū	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	39.94	54.00	-14.06	43.12	-3.18	Average	100	31
2	2390.00	55.35	74.00	-18.65	58.53	-3.18	Peak	100	31
3	2483.50	41.90	54.00	-12.10	44.70	-2.80	Average	100	31
4	2483.50	55.35	74.00	-18.65	58.15	-2.80	Peak	100	31
5	4874.00	34.00	54.00	-20.00	30.06	3.94	Average	100	146
6	4874.00	45.78	74.00	-28.22	41.84	3.94	Peak	100	146
7	7311.00	38.14	54.00	-15.86	29.73	8.41	Average	163	248
8	7311.00	49.17	74.00	-24.83	40.76	8.41	Peak	163	248

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

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



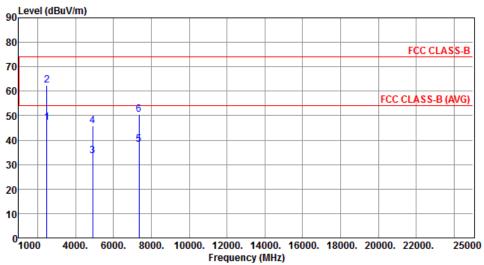
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Ū	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	52.24	54.00	-1.76	55.42	-3.18	Average	277	252
2	2390.00	69.11	74.00	-4.89	72.29	-3.18	Peak	277	252
3	2483.50	37.84	54.00	-16.16	40.64	-2.80	Average	272	267
4	2483.50	51.24	74.00	-22.76	54.04	-2.80	Peak	272	267
5	4874.00	34.19	54.00	-19.81	30.25	3.94	Average	100	124
6	4874.00	45.80	74.00	-28.20	41.86	3.94	Peak	100	124
7	7311.00	38.22	54.00	-15.78	29.81	8.41	Average	152	190
8	7311.00	50.48	74.00	-23.52	42.07	8.41	Peak	152	190

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

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



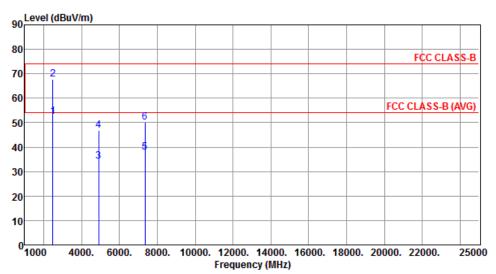
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2483.50	47.22	54.00	-6.78	50.02	-2.80	Average	152	139
2	2483.50	62.48	74.00	-11.52	65.28	-2.80	Peak	152	139
3	4904.00	33.63	54.00	-20.37	29.58	4.05	Average	100	177
4	4904.00	45.67	74.00	-28.33	41.62	4.05	Peak	100	177
5	7356.00	38.27	54.00	-15.73	29.84	8.43	Average	164	258
6	7356.00	50.59	74.00	-23.41	42.16	8.43	Peak	164	258

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

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Modulation	HT40	Test Freq. (MHz)	2452
Polarization	Vertical		



	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
_									
1	2483.50	52.55	54.00	-1.45	55.35	-2.80	Average	258	100
2	2483.50	67.69	74.00	-6.31	70.49	-2.80	Peak	258	100
3	4904.00	34.09	54.00	-19.91	30.04	4.05	Average	100	304
4	4904.00	46.76	74.00	-27.24	42.71	4.05	Peak	100	304
5	7356.00	38.02	54.00	-15.98	29.59	8.43	Average	139	173
6	7356.00	50.27	74.00	-23.73	41.84	8.43	Peak	139	173

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

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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 Test Procedures

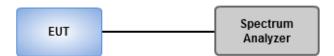
Reference level measurement

- 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
- 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

3.6.3 Test Setup



3.6.4 Test Result of Emissions in non-restricted frequency bands

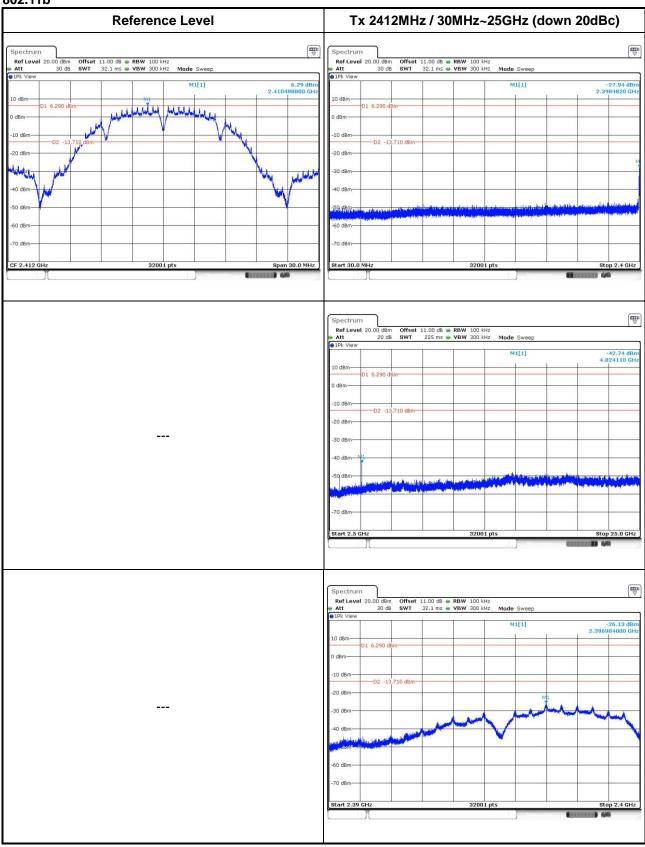
This test item is performed on each TX output individually without summing or adding 10 $log(N_{ANT})$ since measurements are made relative to the in-band emissions on the individual outputs. Only worst test result of each operating mode is presented.

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3.6.5 Unwanted Emissions into Non-Restricted Frequency Bands

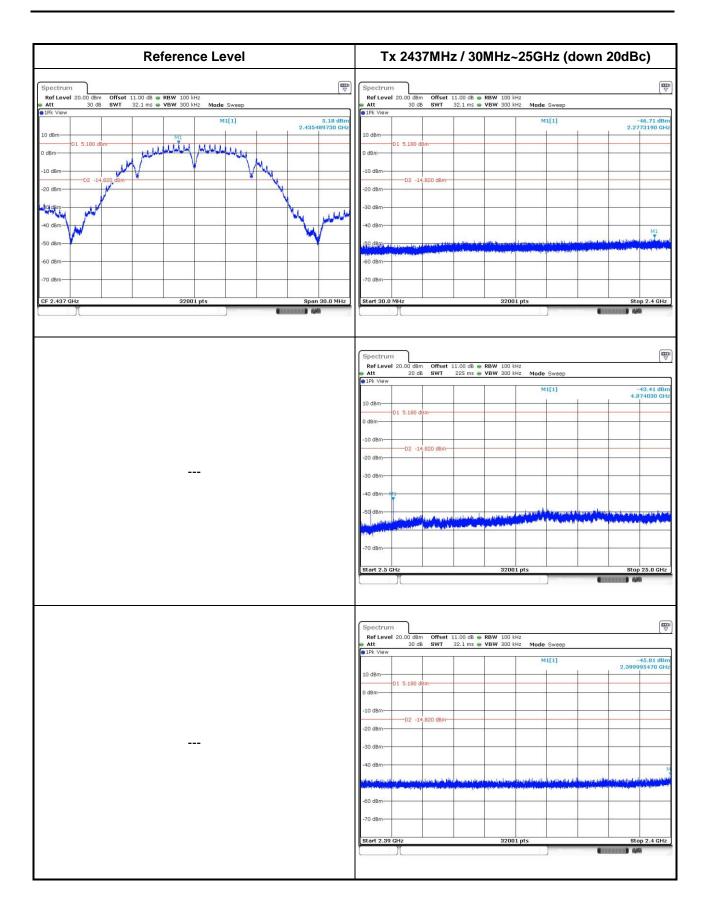
802.11b



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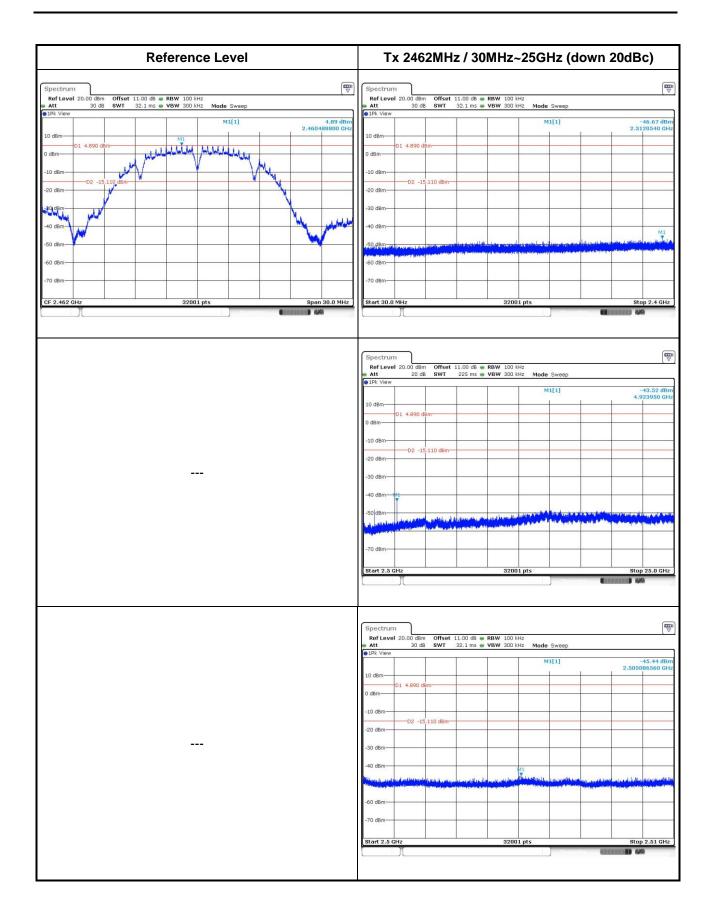
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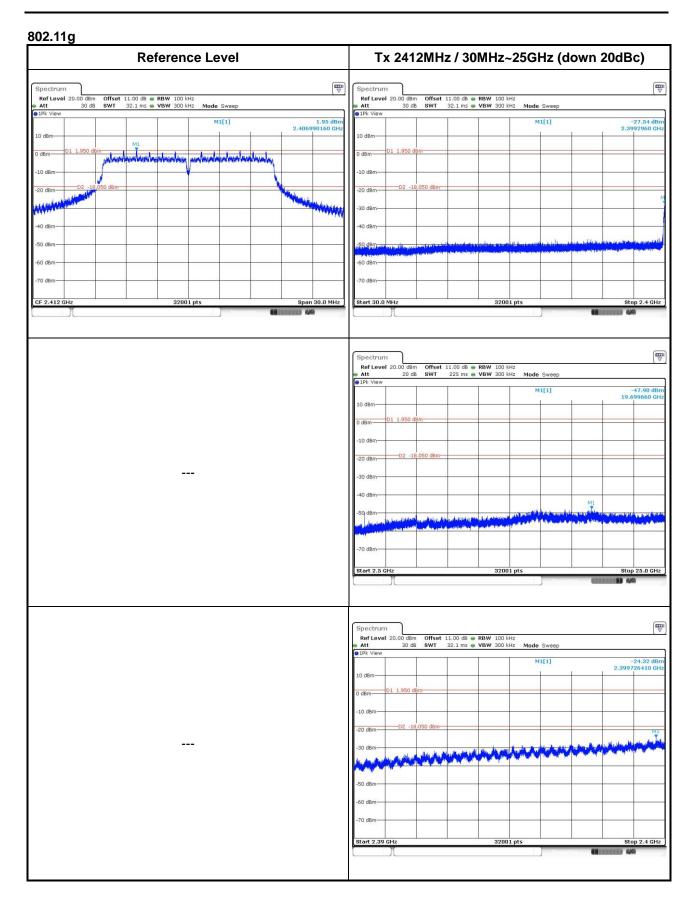
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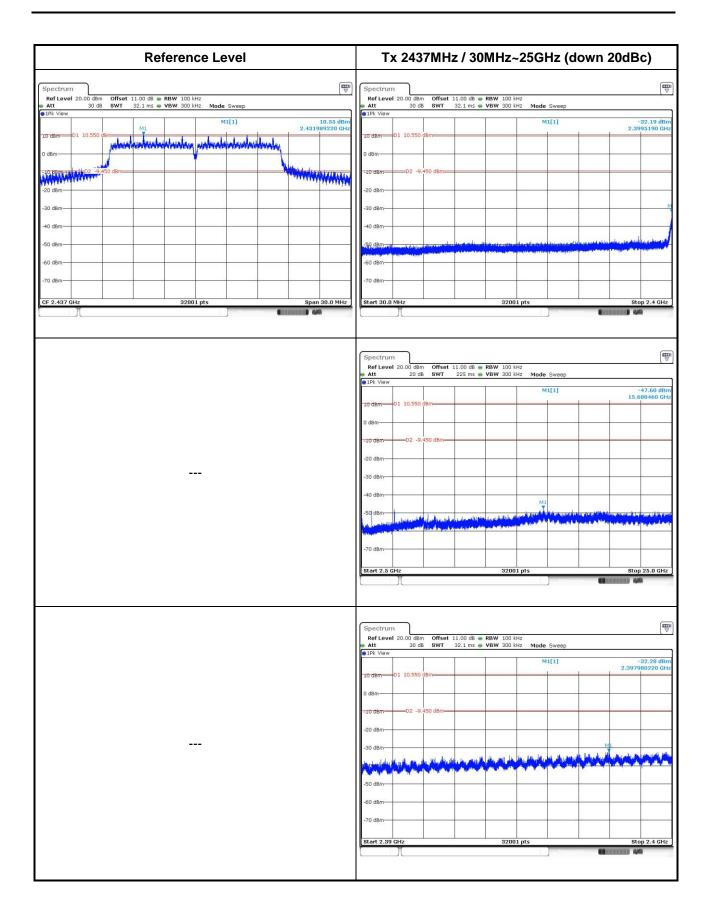
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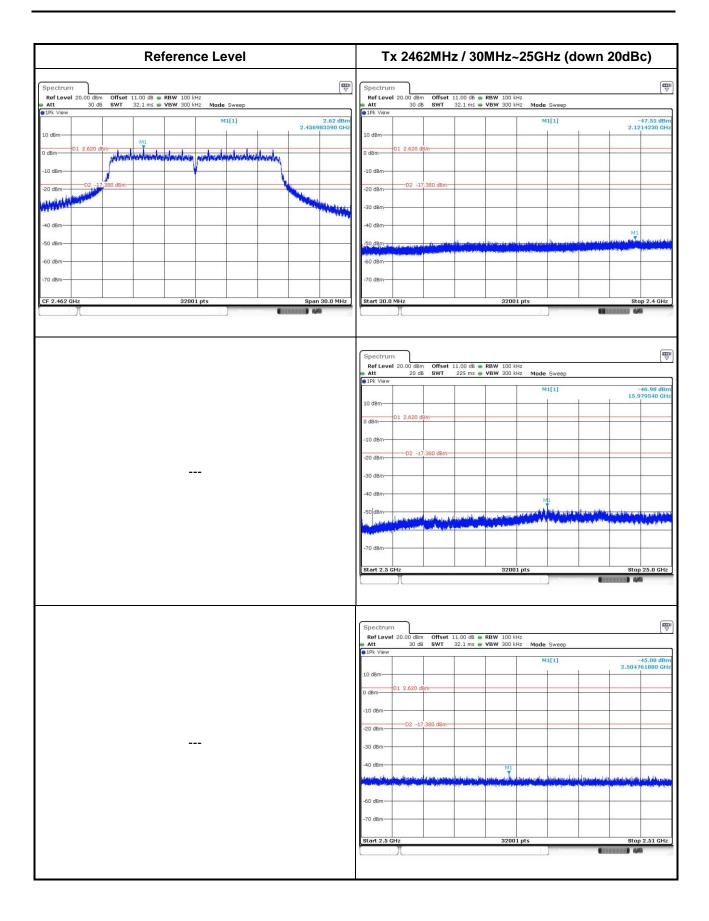
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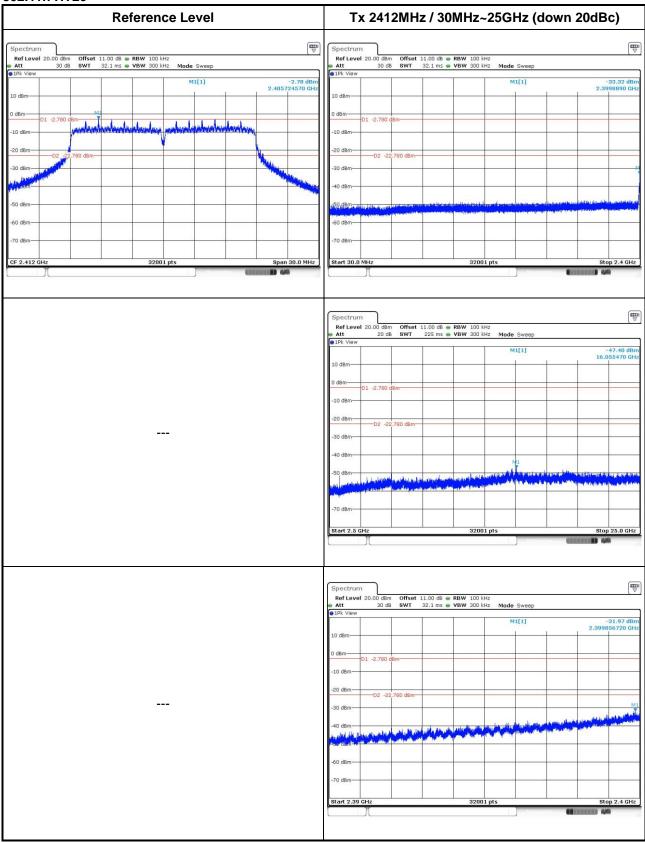




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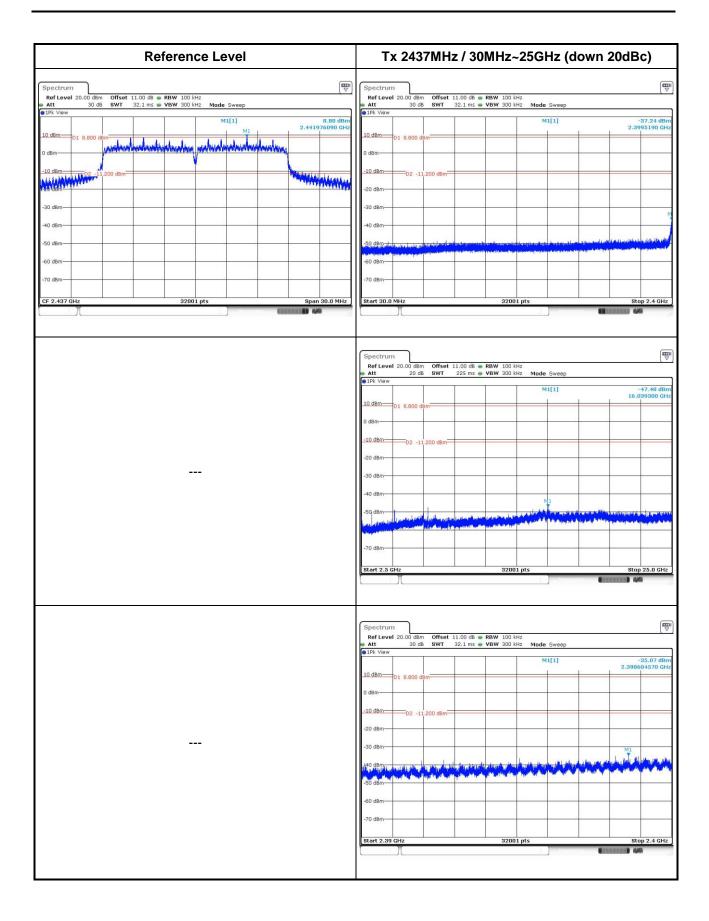


802.11n HT20



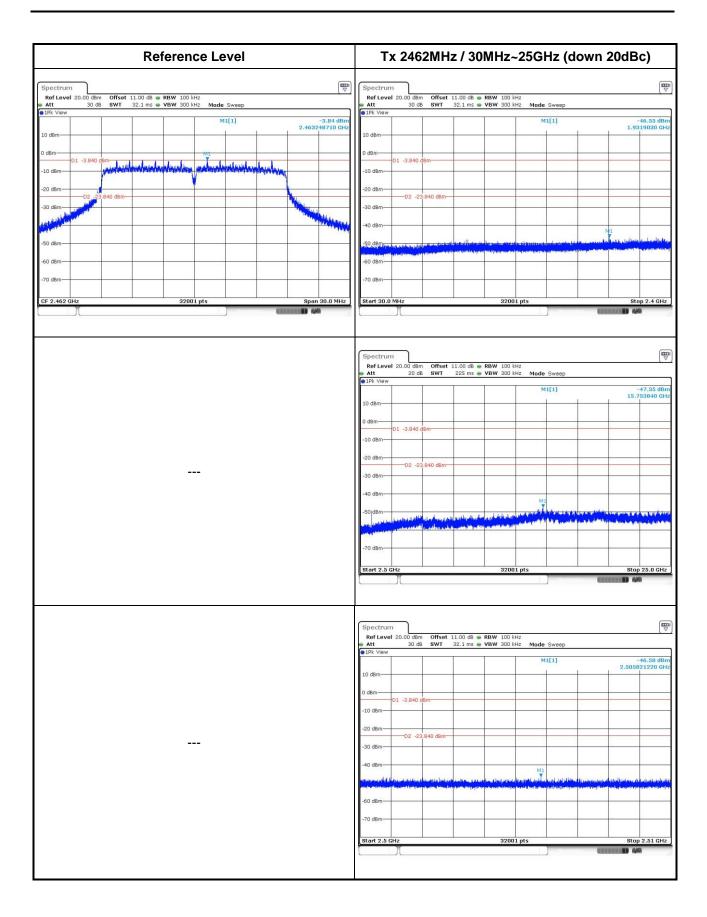
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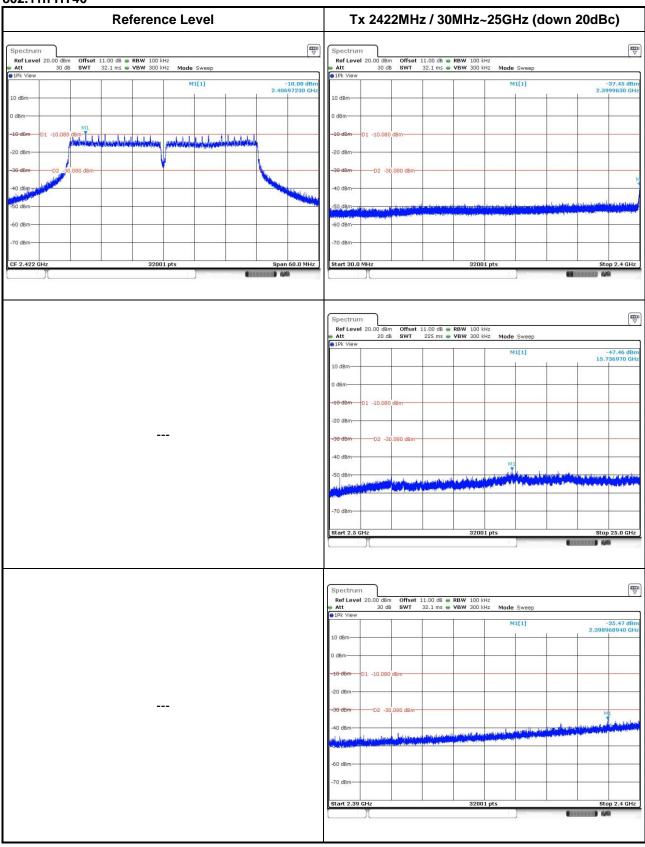




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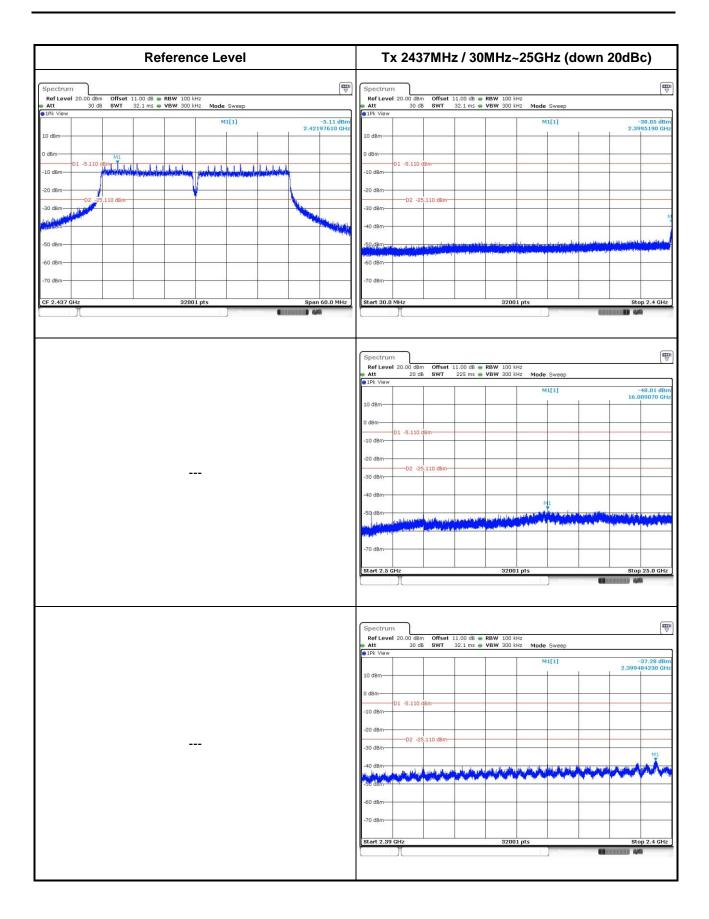


802.11n HT40



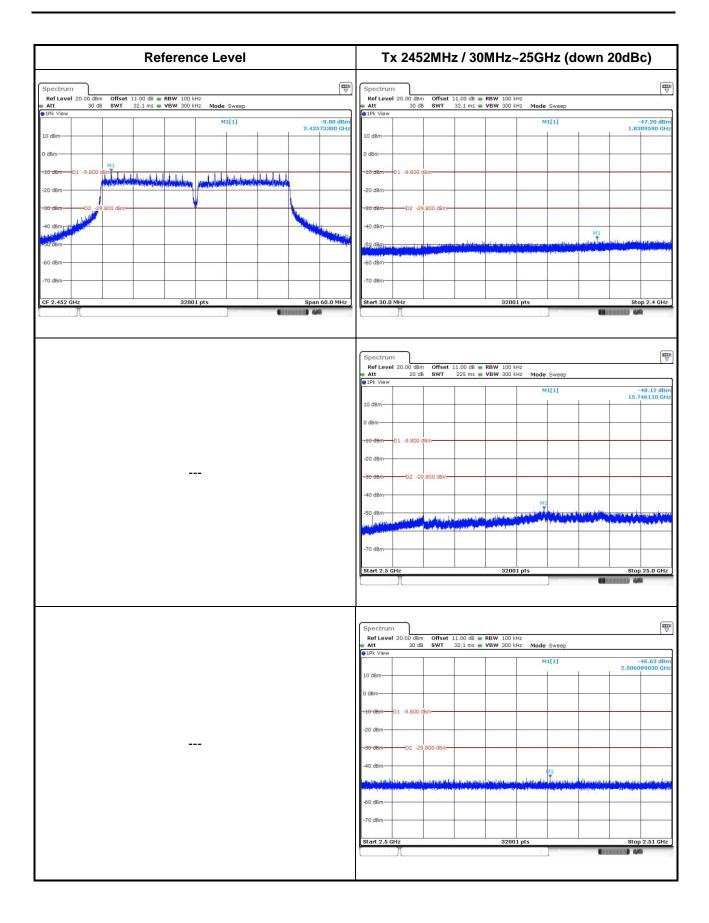
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4 Test laboratory information

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

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

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

Linkou

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

Kwei Shan Site II

Tel: 886-3-271-8640

No. 14-1, Lane 19, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C.

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

Tel: 886-3-271-8666 Fax: 886-3-318-0155

Email: ICC_Service@icertifi.com.tw

==END==

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