

FCC Test Report

FCC ID : MCLGPE810U

Equipment : LoRa Express Gateway

Model No. : GPE810U

Brand Name : ufiSpace

Applicant : HON HAI PRECISION IND.CO., LTD.

Address : 5F-1, 5 Hsin-An Road, Hsinchu, Science

Industrial Park, Taiwan, R.O.C.

Standard : 47 CFR FCC Part 15.247

Received Date : Mar. 28, 2017

Tested Date : Apr. 28 ~ May 04, 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 Chen / Assistant Manager Gary Chang / Manager

Testing Laboratory

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Release Record

Report No.	Version	Description	Issued Date
FR732802AC	Rev. 01	Initial issue	May 10, 2017

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Summary of Test Results

FCC Rules	Test Items	Measured	Result	
15.207	Conducted Emissions	[dBuV]: 0.343MHz 31.09 (Margin -18.04dB) - AV	Pass	
15.247(d)	Radiated Emissions	[dBuV/m at 3m]: 2390.00MHz	Pass	
15.209	INdulated Emissions	72.99 (Margin -1.01dB) - PK	rass	
15.247(b)(3)	Maximum Output Power	Max Power [dBm]: 21.41	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

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		
2400-2483.5	n (HT40)	2422-2452	3-9 [7]	1	MCS 0-7		

Note 1: RF output power specifies that Maximum Peak Conducted Output Power.

Note 2: 802.11b uses a combination of DSSS-DBPSK, DQPSK, CCK modulation.

Note 3: 802.11g/n uses a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM modulation.

1.1.2 Antenna Details

Ant. No.	Model	Туре	Connector	Gain (dBi)
1	WA-P-LA-03-216	Dipole	I-PEX	4.77

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	12Vdc from adapter
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1.1.4 Accessories

	Accessories				
No.	Equipment	Description			
1	AC adapter	Brand: DVE Model: DSA-18PFM-12FUS 120150 Power Rating: I/P: 100-240Vac, 50/60Hz, 0.6A O/P: 12Vdc, 1.5A Power Line: 1.5m non-shielded without core			

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1.1.5 Channel List

Frequency	band (MHz)	2400~2483.5		
802.11 b /	802.11 b / g / n HT20		n 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	Tera Term, V4.8				
	Mode	Duty cycle (%)	Duty factor (dB)		
	11b	100.00%	0.00		
Duty Cycle and Duty Factor	11g	96.96%	0.13		
	HT20	96.38%	0.16		
	HT40	92.18%	0.35		

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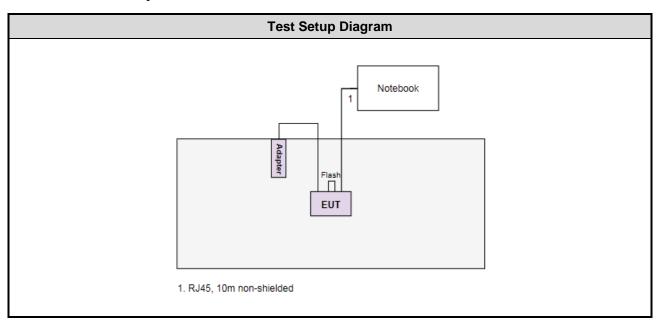
1.1.7 Power Setting

Modulation Mode	Test Frequency (MHz)	Power Set
11b	2412	16000
11b	2437	16000
11b	2462	16000
11g	2412	13500
11g	2437	16000
11g	2462	13500
HT20	2412	13500
HT20	2437	15000
HT20	2462	13500
HT40	2422	14500
HT40	2437	16500
HT40	2452	15000

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	USB, 1m shielded.		
2	USB 3.0 Flash	SONY	USM16GU				

1.3 Test Setup Chart



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1.4 The Equipment List

Test Item Conducted Emission Test Site Conduction room 1 / (CO01-WS)							
						Manufacturer	Manufacturer Model No. Serial No. Calibration Date Calibration Until
R&S ESR3 101657 Dec. 21, 2016 Dec. 2							
SCHWARZBECK	Schwarzbeck 8127	8127-667	Nov. 08, 2016	Nov. 07, 2017			
DN EMC EMCCFD300-BM-BM-6000 50821 Dec. 20, 2016				Dec. 19, 2017			
Measurement Software AUDIX e3 6.120210k NA NA							
	Conduction room 1 / Manufacturer R&S SCHWARZBECK EMC	Conduction room 1 / (CO01-WS) Manufacturer Model No. R&S ESR3 SCHWARZBECK Schwarzbeck 8127 EMC EMCCFD300-BM-BM-6000	Manufacturer Model No. Serial No. R&S ESR3 101657 SCHWARZBECK Schwarzbeck 8127 8127-667 EMC EMCCFD300-BM-BM-6000 50821	Manufacturer Model No. Serial No. Calibration Date R&S ESR3 101657 Dec. 21, 2016 SCHWARZBECK Schwarzbeck 8127 8127-667 Nov. 08, 2016 EMC EMCCFD300-BM-BM-6000 50821 Dec. 20, 2016			

Test Item	Radiated Emission							
Test Site	966 chamber1 / (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			
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			
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)								
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				
AC POWER SOURCE	APC	AFC-500W	F312060012	Oct. 28, 2016	Oct. 27, 2017				
Measurement Software	Sporton	Sporton_1	1.3.30	NA	NA				
Note: Calibration Inte	rval of instruments liste	d 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

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	21°C / 57%	Howard Huang
Radiated Emissions	03CH01-WS	24°C / 62%	Kevin Lee Vincent Yeh
RF Conducted	TH01-WS	22°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	11g	2437	6 Mbps	
Radiated Emissions ≤1GHz	11g	2437	6 Mbps	
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

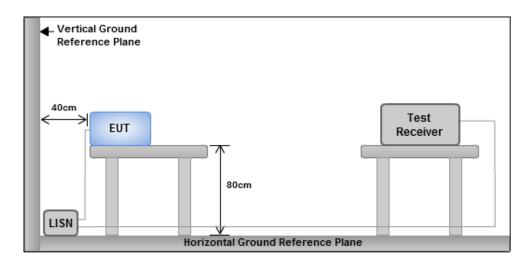
3.1.1 Limit of Conducted Emissions

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



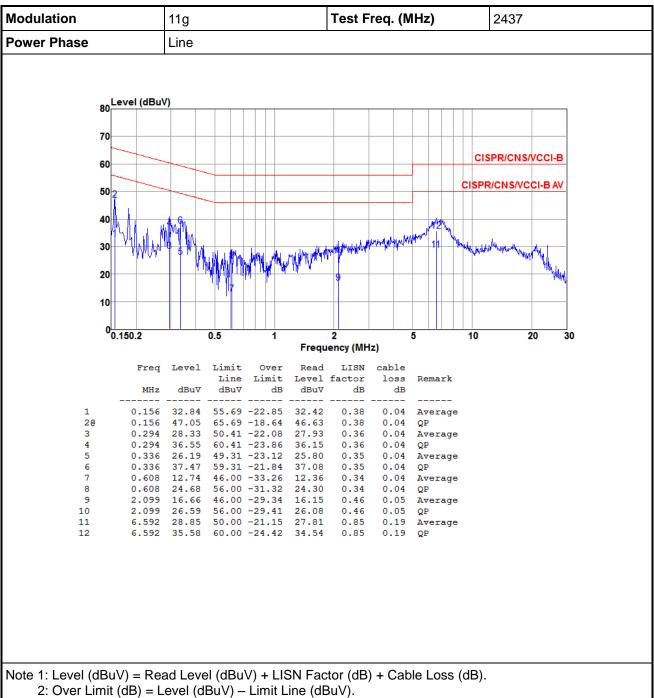
Note: 1. Support units were connected to second LISN.

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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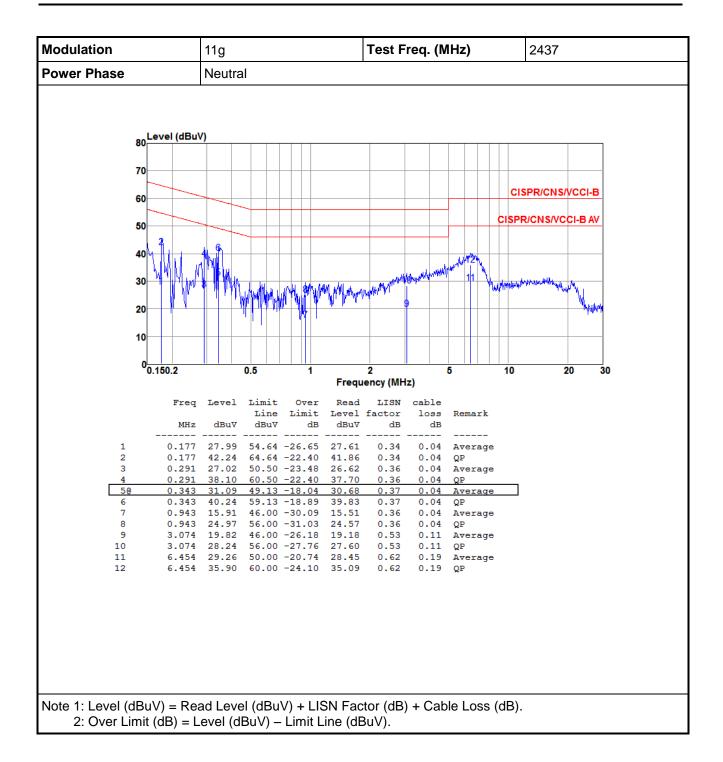
Test Result of Conducted Emissions 3.1.4



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

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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

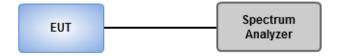
6dB Bandwidth

- 1. Set resolution bandwidth (RBW) = 100 kHz, Video bandwidth = 300 kHz.
- 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

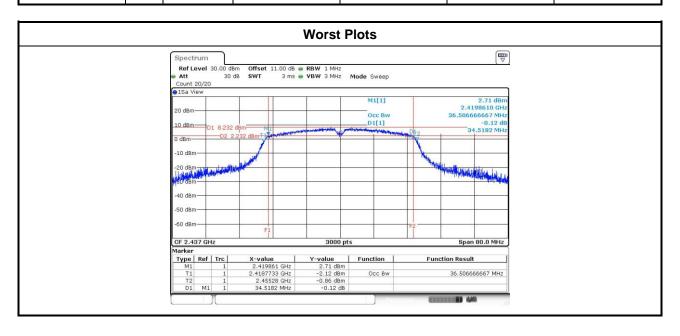
Modulation	N	Eron (MU=)		6dB Bandv	vidth (MHz)		Limit (ItU=)
Mode	N _{TX}	Freq. (MHz)	Chain 0	Chain 1	Chain 2	Chain 3	Limit (kHz)
11b	1	2412	10.03				500
11b	1	2437	9.62				500
11b	1	2462	9.10				500
11g	1	2412	12.87				500
11g	1	2437	12.64				500
11g	1	2462	14.43				500
HT20	1	2412	13.80				500
HT20	1	2437	14.49				500
HT20	1	2462	14.49				500
HT40	1	2422	35.01				500
HT40	1	2437	35.13				500
HT40	1	2452	35.01				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	14.63					
11b	1	2437	14.71					
11b	1	2462	14.68					
11g	1	2412	16.41					
11g	1	2437	17.23					
11g	1	2462	16.40					
HT20	1	2412	17.60					
HT20	1	2437	18.05					
HT20	1	2462	17.59					
HT40	1	2422	35.95					
HT40	1	2437	36.51					
HT40	1	2452	35.97					



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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 conducted Output Power (dBm)						Amt		FIDD
Modulation Mode	N _{TX}	Freq. (MHz)	Chain 0	Chain 1	Chain 2	Chain 3	Total Power (mW)	Total Power (dBm)	Limit (dBm)	Ant. Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)
11b	1	2412	18.70				74.131	18.70	30.00	4.77	23.47	36.00
11b	1	2437	18.77				75.336	18.77	30.00	4.77	23.54	36.00
11b	1	2462	18.75				74.989	18.75	30.00	4.77	23.52	36.00
11g	1	2412	21.38				137.404	21.38	30.00	4.77	26.15	36.00
11g	1	2437	21.41				138.357	21.41	30.00	4.77	26.18	36.00
11g	1	2462	21.05				127.350	21.05	30.00	4.77	25.82	36.00
HT20	1	2412	21.34				136.144	21.34	30.00	4.77	26.11	36.00
HT20	1	2437	21.34				136.144	21.34	30.00	4.77	26.11	36.00
HT20	1	2462	21.38				137.404	21.38	30.00	4.77	26.15	36.00
HT40	1	2422	20.76				119.124	20.76	30.00	4.77	25.53	36.00
HT40	1	2437	20.96				124.738	20.96	30.00	4.77	25.73	36.00
HT40	1	2452	19.54				89.950	19.54	30.00	4.77	24.31	36.00

Modulation		Freq.	Condi	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	16.82				48.084	16.82	
11b	1	2437	16.96				49.659	16.96	
11b	1	2462	16.93				49.317	16.93	
11g	1	2412	13.61				22.961	13.61	
11g	1	2437	16.16				41.305	16.16	
11g	1	2462	13.74				23.659	13.74	
HT20	1	2412	13.62				23.014	13.62	
HT20	1	2437	15.21				33.189	15.21	
HT20	1	2462	13.75				23.714	13.75	
HT40	1	2422	11.63				14.555	11.63	
HT40	1	2437	13.66				23.227	13.66	
HT40	1	2452	12.16				16.444	12.16	

Note: Conducted average output power is for reference only.

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3.4 Power Spectral Density

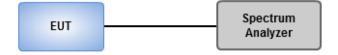
3.4.1 Limit of Power Spectral Density

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.
 - 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

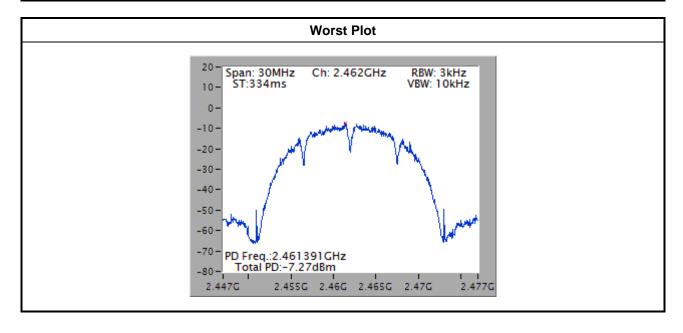


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3.4.4 Test Result of Power Spectral Density

Modulation Mode	N _{TX}	Freq. (MHz)	Total Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
11b	1	2412	-8.11	8.00
11b	1	2437	-7.99	8.00
11b	1	2462	-7.27	8.00
11g	1	2412	-12.36	8.00
11g	1	2437	-9.15	8.00
11g	1	2462	-11.79	8.00
HT20	1	2412	-11.36	8.00
HT20	1	2437	-10.30	8.00
HT20	1	2462	-10.81	8.00
HT40	1	2422	-17.39	8.00
HT40	1	2437	-15.48	8.00
HT40	1	2452	-16.07	8.00



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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.

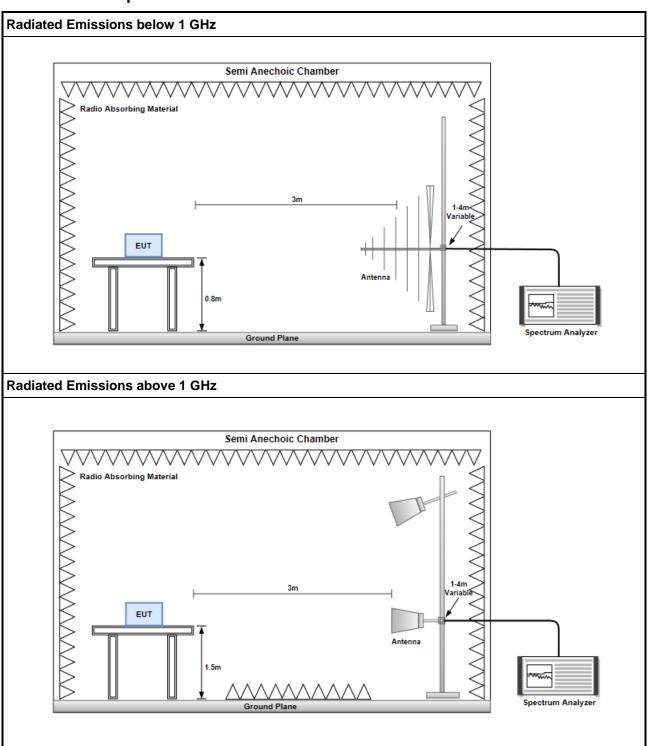
Note:

- 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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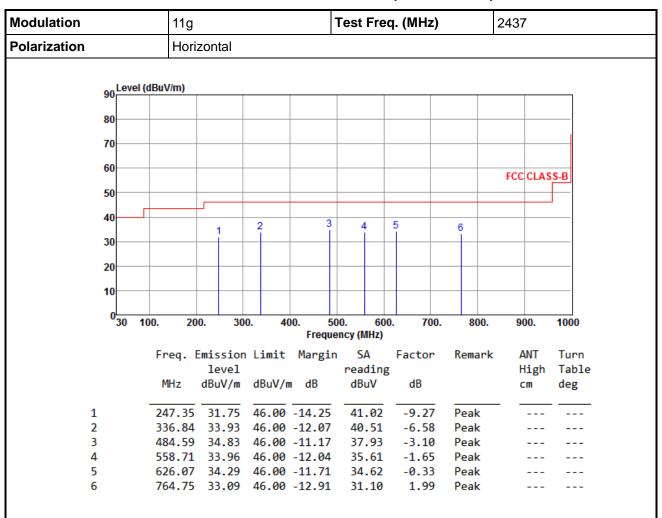
3.5.3 Test Setup



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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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Modulation				11g				Test Fre	eq. (MHz)		2437	
Polarization				Vertica	I			•				
	90	Leve	l (dBu\	//m)								
	00											
	80											
	70											
	60										500 01 4	
	50										FCC CLA	22-B
	50											_
	40	1		2		3	4	5	6			
	30	H.										
	20											
	10											
	0	30	100.	200.	300). 4		500. 60 Jency (MHz)	00. 700	. 800.	900.	1000
			Fr	eq. Emi	ssion	Limit	Margi	n SA	Factor	Remark	ANT	Turn
					evel		Ū	readin	_		High	
			M	MHz dB	BuV/m	dBuV/ı	n dB	dBuV	dB		cm	deg
	1			16.72	2.75	40.00	-7.2	40.33	-7.58	Peak		
	2				3.41		-10.09			Peak		
	3				5.44		-10.56			Peak		
	4						-13.73 -11.07			Peak		
	5 6				4.93	46.00				Peak Peak		

*Factor includes antenna factor, cable loss and amplifier gain

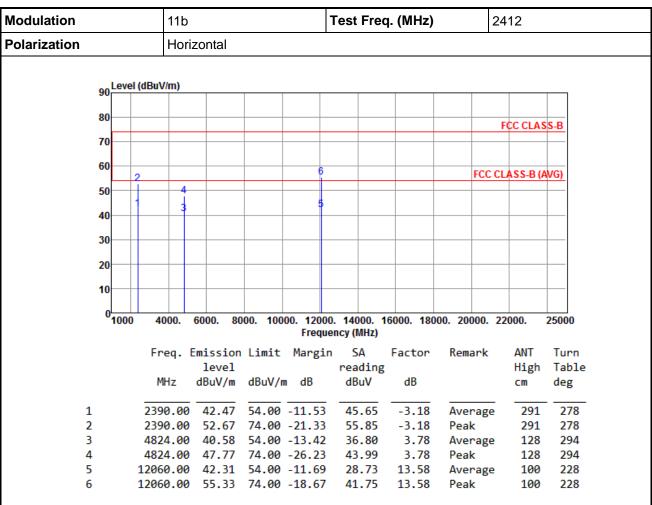
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

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)

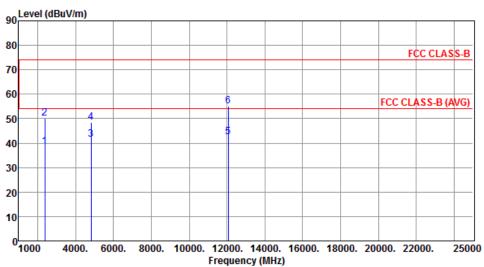
*Factor includes antenna factor, cable loss and amplifier gain

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

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

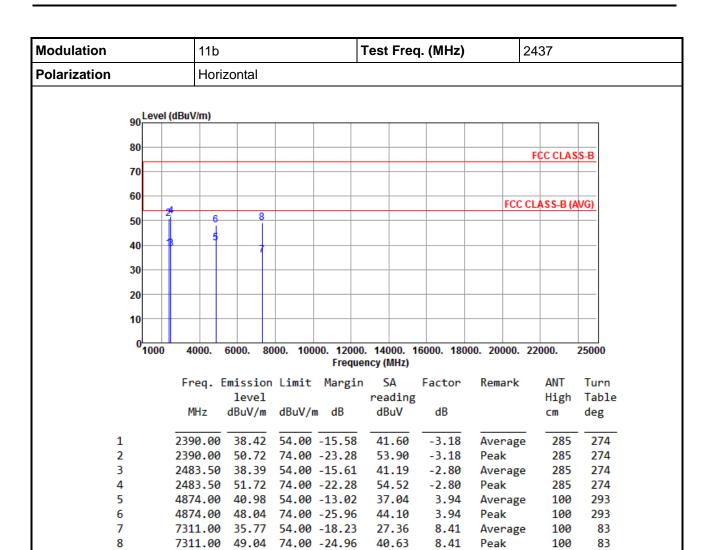


	Freq.	Emission level dBuV/m	Limit dBuV/m	Ü	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
4	2200 00	20.54	<u></u> .	45 40	44 60			250	24.6
1	2390.00	38.51	54.00	-15.49	41.69	-3.18	Average	358	216
2	2390.00	50.17	74.00	-23.83	53.35	-3.18	Peak	358	216
3	4824.00	41.64	54.00	-12.36	37.86	3.78	Average	390	130
4	4824.00	48.45	74.00	-25.55	44.67	3.78	Peak	390	130
5	12060.00	42.38	54.00	-11.62	28.80	13.58	Average	100	244
6	12060.00	55.01	74.00	-18.99	41.43	13.58	Peak	100	244

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

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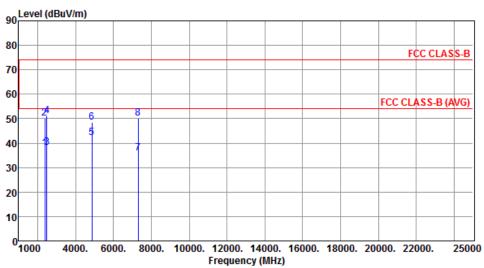
*Factor includes antenna factor, cable loss and amplifier gain

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

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

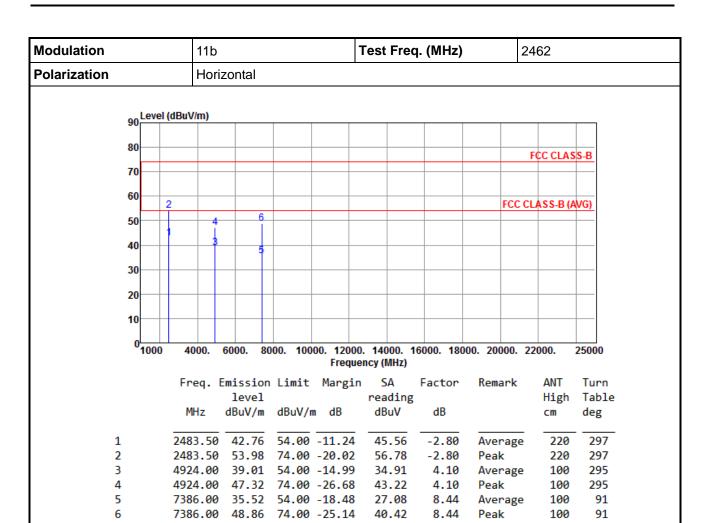


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Ü	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	37.71	54.00	-16.29	40.89	-3.18	Average	362	220
2	2390.00	50.21	74.00	-23.79	53.39	-3.18	Peak	362	220
3	2483.50	38.11	54.00	-15.89	40.91	-2.80	Average	362	220
4	2483.50	51.00	74.00	-23.00	53.80	-2.80	Peak	362	220
5	4874.00	42.30	54.00	-11.70	38.36	3.94	Average	383	130
6	4874.00	48.61	74.00	-25.39	44.67	3.94	Peak	383	130
7	7311.00	35.94	54.00	-18.06	27.53	8.41	Average	100	229
8	7311.00	49.99	74.00	-24.01	41.58	8.41	Peak	100	229

*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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4

5

6

4924.00

7386.00

48.11

35.75

7386.00 49.71 74.00 -24.29

74.00 -25.89

54.00 -18.25

44.01

27.31

41.27

4.10

8.44

8.44

Peak

Peak

Average

355

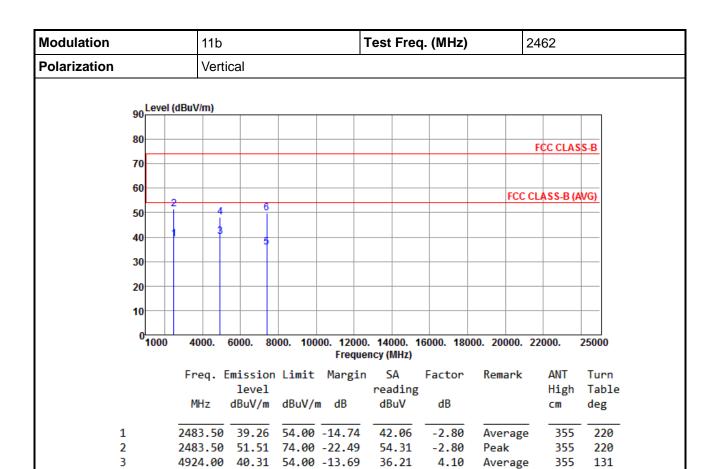
100

100

131

235

235



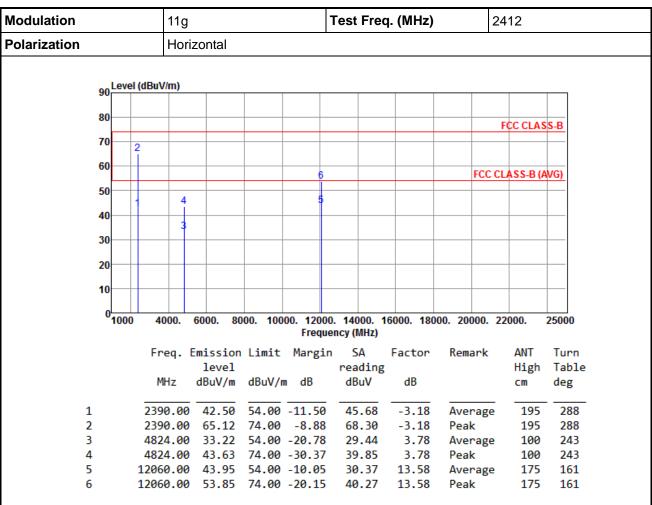
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB) *Factor includes antenna factor, cable loss and amplifier gain

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

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



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

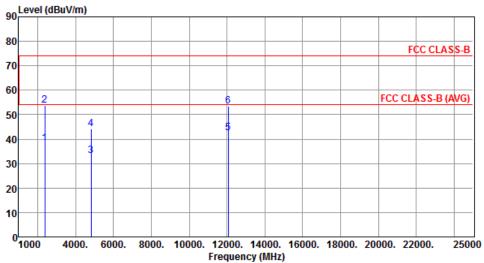
*Factor includes antenna factor, cable loss and amplifier gain

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)							

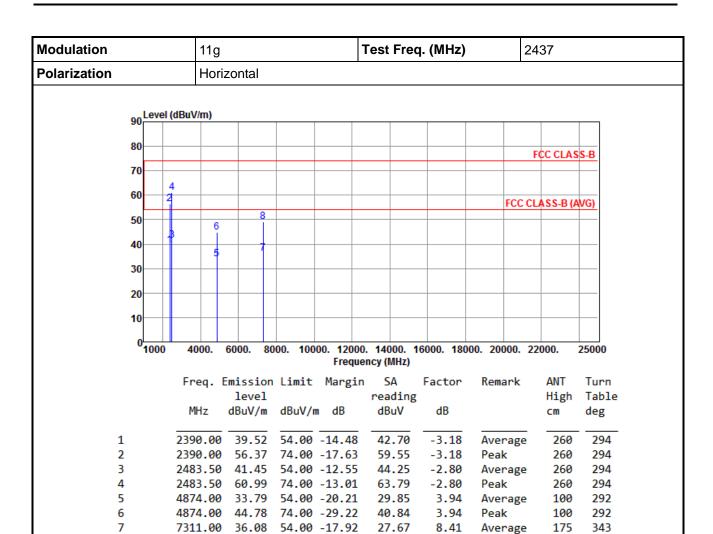


	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2390.00	38.32	54.00	-15.68	41.50	-3.18	Average	330	220
2	2390.00	53.96	74.00	-20.04	57.14	-3.18	Peak	330	220
3	4824.00	33.32	54.00	-20.68	29.54	3.78	Average	127	100
4	4824.00	44.10	74.00	-29.90	40.32	3.78	Peak	127	100
5	12060.00	42.43	54.00	-11.57	28.85	13.58	Average	268	152
6	12060.00	53.44	74.00	-20.56	39.86	13.58	Peak	268	152

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

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40.64

8.41

Peak

175

343

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

7311.00 49.05 74.00 -24.95

*Factor includes antenna factor, cable loss and amplifier gain

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

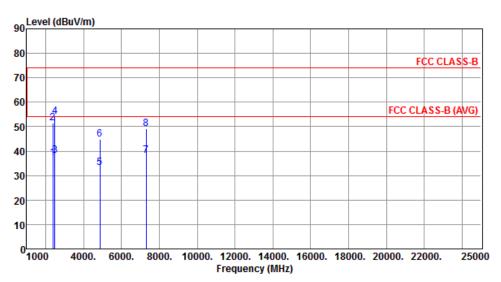
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8



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

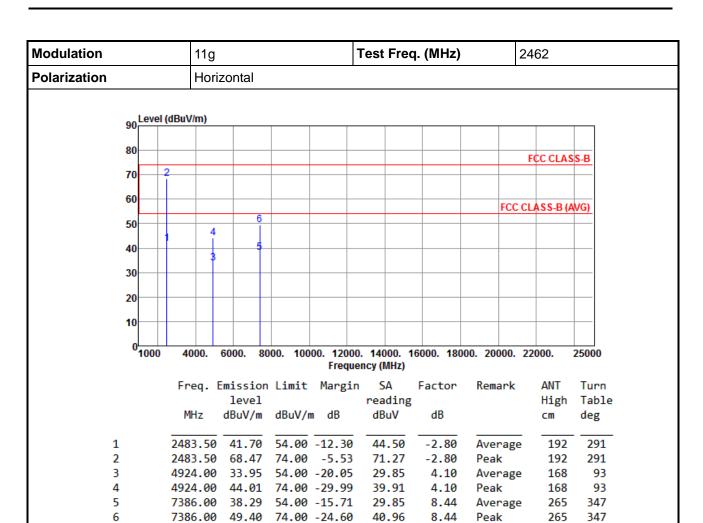


	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2390.00	37.33	54.00	-16.67	40.51	-3.18	Average	390	206
2	2390.00	51.33	74.00	-22.67	54.51	-3.18	Peak	390	206
3	2483.50	38.11	54.00	-15.89	40.91	-2.80	Average	390	206
4	2483.50	54.28	74.00	-19.72	57.08	-2.80	Peak	390	206
5	4874.00	33.17	54.00	-20.83	29.23	3.94	Average	201	185
6	4874.00	44.77	74.00	-29.23	40.83	3.94	Peak	201	185
7	7311.00	38.26	54.00	-15.74	29.85	8.41	Average	120	24
8	7311.00	49.01	74.00	-24.99	40.60	8.41	Peak	120	24

*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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3

4

5

6

4924.00

4924.00

7386.00

32.93

44.77

38.52

7386.00 48.55 74.00 -25.45

54.00 -21.07

74.00 -29.23

54.00 -15.48

28.83

40.67

30.08

40.11

4.10

4.10

8.44

8.44

Average

Average

Peak

Peak

218

218

263

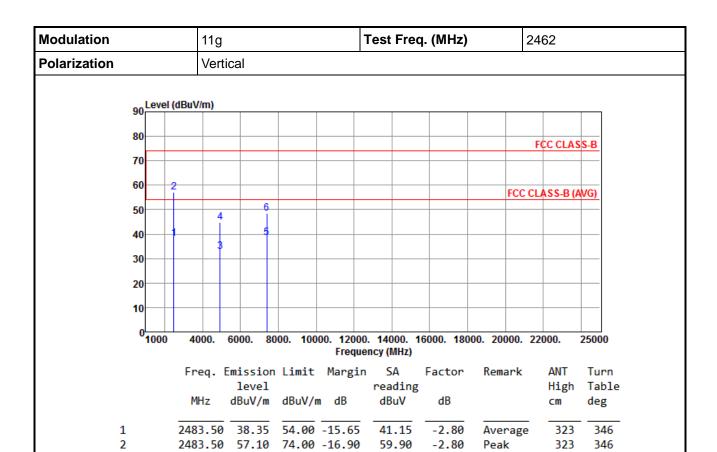
263

162

162

129

129



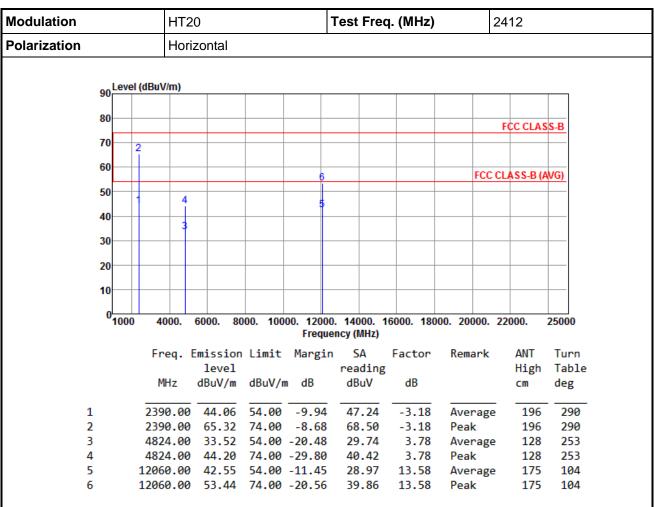
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB) *Factor includes antenna factor, cable loss and amplifier gain

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)

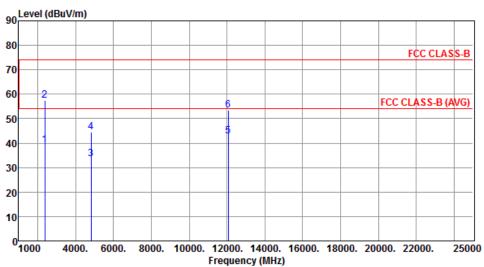
*Factor includes antenna factor, cable loss and amplifier gain

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	J	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	39.30	54.00	-14.70	42.48	-3.18	Average	330	227
2	2390.00	57.41	74.00	-16.59	60.59	-3.18	Peak	330	227
3	4824.00	33.41	54.00	-20.59	29.63	3.78	Average	128	103
4	4824.00	44.43	74.00	-29.57	40.65	3.78	Peak	128	103
5	12060.00	42.93	54.00	-11.07	29.35	13.58	Average	251	309
6	12060.00	53.54	74.00	-20.46	39.96	13.58	Peak	251	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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8

Modulation		Н	T20				Test Fre	q. (MHz)	2	2437	
Polarization		Н	oriz	ontal							
9	Leve	l (dBuV/m)								
	30										
•	50									FCC CLAS	S-B
1	70										
	60	2							500		
	50			8					FCC	CLASS-B (A	WG)
;	00		6								
4	10	1	-	+ 7							
;	30		\perp								
	20										
•	20										
•	10										
	01000	4000) 6	000. 80	000. 100	00 1200	0 14000 4	16000 190	00. 20000.	22000	25000
	1000	4000). U	000. ot	,00. 100		ency (MHz)	10000. 100	00. 20000.	22000.	23000
		Freq	. En	ission	Limit	Margi	n SA	Factor	Remark	ANT	Turn
				level			reading			High	Table
		MHz	d	IBuV/m	dBuV/ı	n dB	dBuV	dB		cm	deg
1		2390.	00	38.14	54.00	-15.86	41.32	-3.18	Average	219	294
2				55.92		-18.08		-3.18	Peak	219	294
3		2483.	50	40.09	54.00	-13.91	42.89	-2.80	Average	219	294

62.44

29.27

41.69

28.73

41.02

-2.80

3.94

3.94

8.41

8.41

Peak

Peak

Peak

Average

Average

219

125

125

125

125

294

197

197

103

103

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

2483.50 59.64 74.00 -14.36

7311.00 37.14 54.00 -16.86

7311.00 49.43 74.00 -24.57

33.21 54.00 -20.79

74.00 -28.37

4874.00

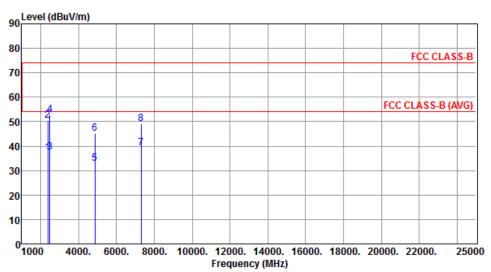
4874.00 45.63

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

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Modulation	HT20	Test Freq. (MHz)	2437
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m		SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	37.03	54.00	-16.97	40.21	-3.18	Average	390	206
2	2390.00	50.38	74.00	-23.62	53.56	-3.18	Peak	390	206
3	2483.50	37.55	54.00	-16.45	40.35	-2.80	Average	390	206
4	2483.50	52.74	74.00	-21.26	55.54	-2.80	Peak	390	206
5	4874.00	32.81	54.00	-21.19	28.87	3.94	Average	175	318
6	4874.00	45.02	74.00	-28.98	41.08	3.94	Peak	175	318
7	7311.00	39.13	54.00	-14.87	30.72	8.41	Average	100	310
8	7311.00	49.25	74.00	-24.75	40.84	8.41	Peak	100	310

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

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6

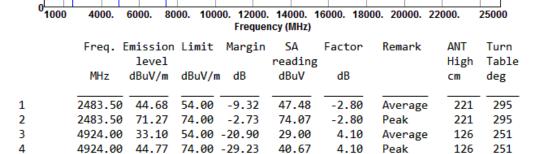
7386.00

36.96

7386.00 48.27 74.00 -25.73

54.00 -17.04

Modulation Polarization			HT20				Test Fi	eq. (MH	lz)	24	2462		
			Horizo	Horizontal									
	90	Level (dB	uV/m)										
	80									F	CC CLAS	SS-B	
	70	2											
	60									FCC CL	ASS-B (A	WG)	
	50			- 6									



28.52

39.83

8.44

8.44

Average

Peak

100

100

241

241

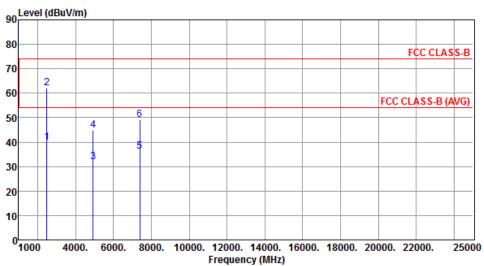
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*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		



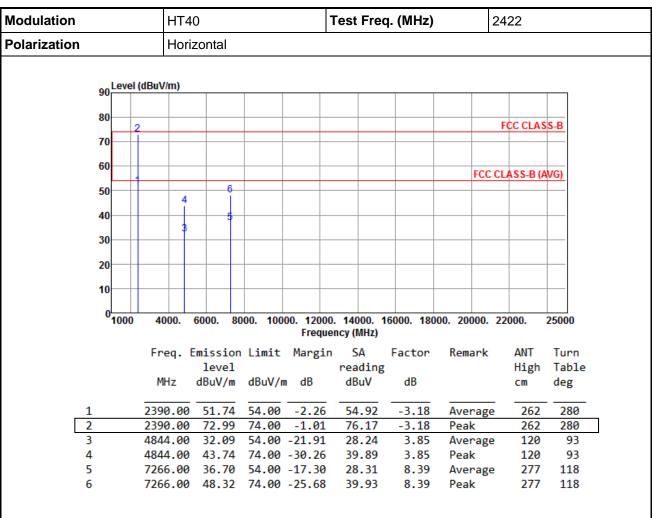
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Ū	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	40.01	54.00	-13.99	42.81	-2.80	Average	360	344
2	2483.50				65.01	-2.80	Peak	360	344
3	4924.00	32.05	54.00	-21.95	27.95	4.10	Average	196	284
4	4924.00	44.86	74.00	-29.14	40.76	4.10	Peak	196	284
5	7386.00	36.26	54.00	-17.74	27.82	8.44	Average	153	129
6	7386.00	49.27	74.00	-24.73	40.83	8.44	Peak	153	129

*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)

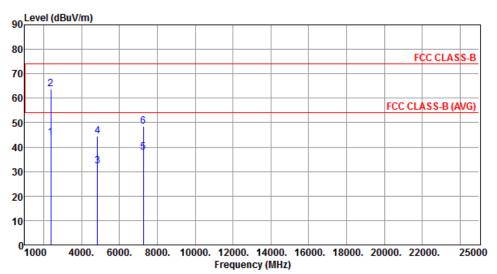
*Factor includes antenna factor, cable loss and amplifier gain

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

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Modulation	HT40	Test Freq. (MHz)	2422
Polarization	Vertical		



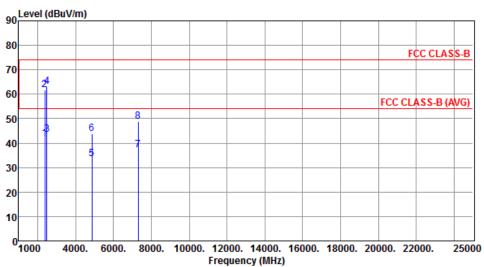
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2390.00	43.72	54.00	-10.28	46.90	-3.18	Average	329	228
2	2390.00	63.62	74.00	-10.38	66.80	-3.18	Peak	329	228
3	4844.00	32.17	54.00	-21.83	28.32	3.85	Average	203	141
4	4844.00	44.49	74.00	-29.51	40.64	3.85	Peak	203	141
5	7266.00	37.74	54.00	-16.26	29.35	8.39	Average	100	248
6	7266.00	48.37	74.00	-25.63	39.98	8.39	Peak	100	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	Horizontal		



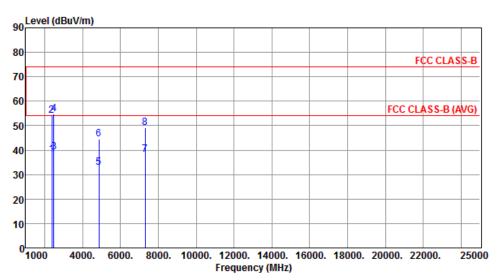
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Ū	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	41.75	54.00	-12.25	44.93	-3.18	Average	218	288
2	2390.00	61.93	74.00	-12.07	65.11	-3.18	Peak	218	288
3	2483.50	43.51	54.00	-10.49	46.31	-2.80	Average	218	288
4	2483.50	63.05	74.00	-10.95	65.85	-2.80	Peak	218	288
5	4874.00	33.38	54.00	-20.62	29.44	3.94	Average	161	213
6	4874.00	43.91	74.00	-30.09	39.97	3.94	Peak	161	213
7	7311.00	37.26	54.00	-16.74	28.85	8.41	Average	100	96
8	7311.00	48.92	74.00	-25.08	40.51	8.41	Peak	100	96

*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		



	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	38.15	54.00	-15.85	41.33	-3.18	Average	390	208
2	2390.00	54.27	74.00	-19.73	57.45	-3.18	Peak	390	208
3	2483.50	39.03	54.00	-14.97	41.83	-2.80	Average	390	208
4	2483.50	54.71	74.00	-19.29	57.51	-2.80	Peak	390	208
5	4874.00	32.80	54.00	-21.20	28.86	3.94	Average	371	168
6	4874.00	44.43	74.00	-29.57	40.49	3.94	Peak	371	168
7	7311.00	38.17	54.00	-15.83	29.76	8.41	Average	252	214
8	7311.00	49.24	74.00	-24.76	40.83	8.41	Peak	252	214

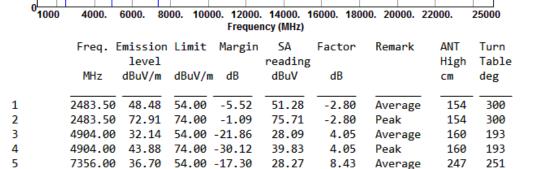
*Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

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6

Modulation			HT40			Test	Test Freq. (MHz)				2452			
Polarization				Horizontal										
		evel (dBuV	//m)										
	80	2										F	CC CLAS	S-B
	70													
	60											FCC CL	ASS-B (A	WG)
	50			4	6									



40.08

8.43

Peak

247

251

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

*Factor includes antenna factor, cable loss and amplifier gain

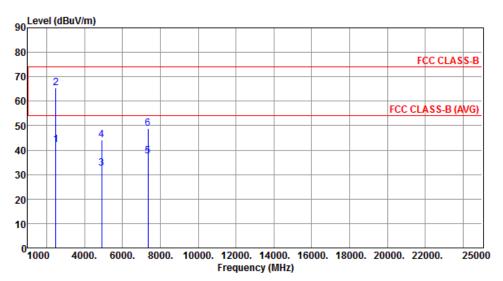
7356.00 48.51 74.00 -25.49

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	42.28	54.00	-11.72	45.08	-2.80	Average	361	343
2	2483.50	65.54	74.00	-8.46	68.34	-2.80	Peak	361	343
3	4904.00	32.61	54.00	-21.39	28.56	4.05	Average	100	173
4	4904.00	44.31	74.00	-29.69	40.26	4.05	Peak	100	173
5	7356.00	37.45	54.00	-16.55	29.02	8.43	Average	208	164
6	7356.00	48.75	74.00	-25.25	40.32	8.43	Peak	208	164

*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 Measuring Instruments

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

3.6.3 Test Procedures

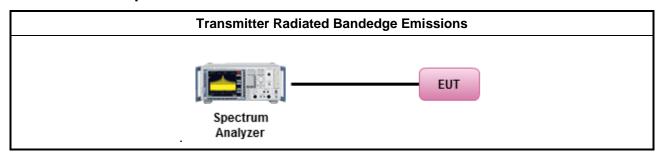
Reference level measurement

- 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

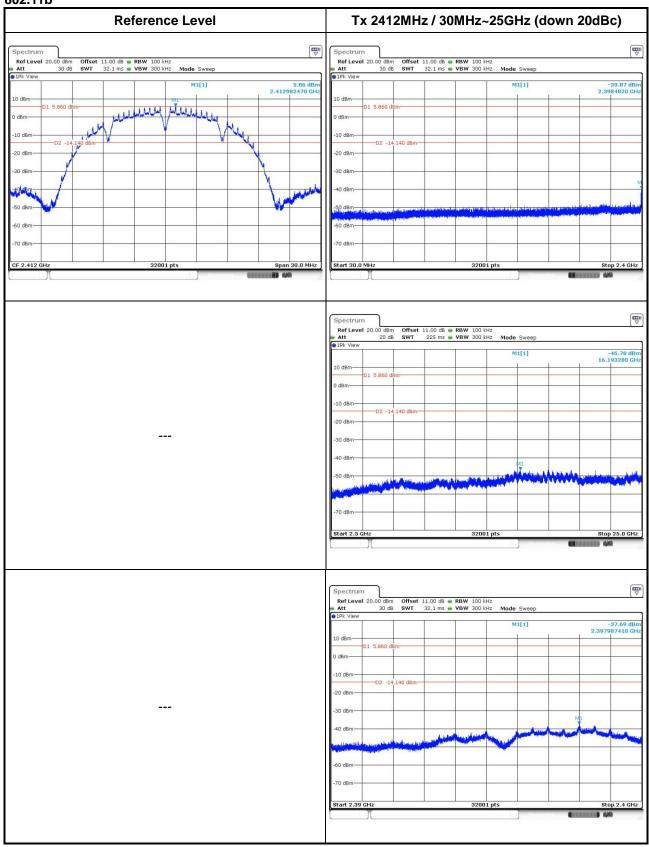


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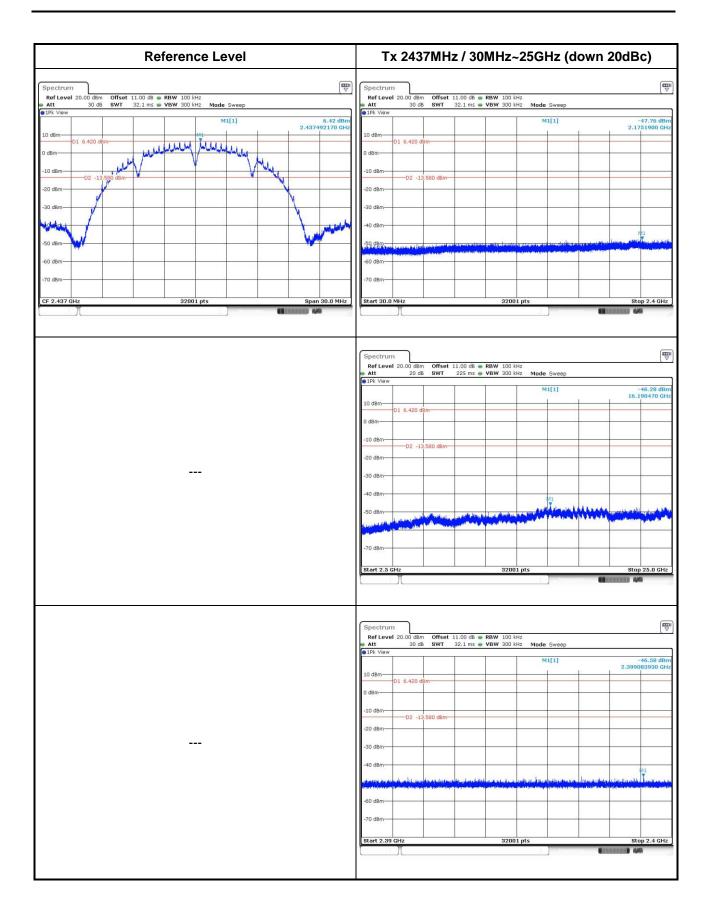
3.6.5 Unwanted Emissions into Non-Restricted Frequency Bands

802.11b



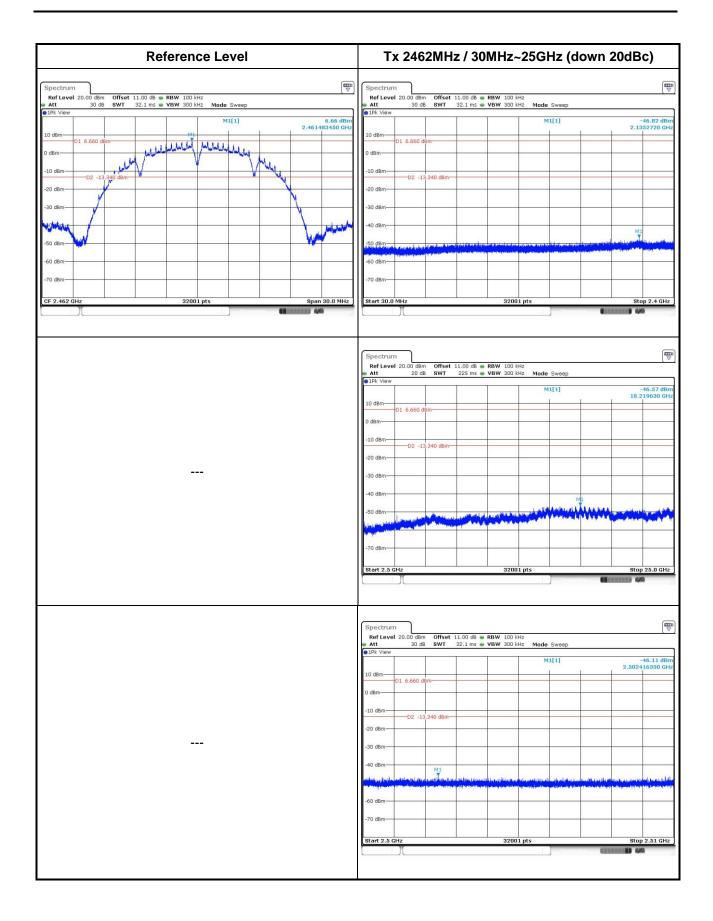
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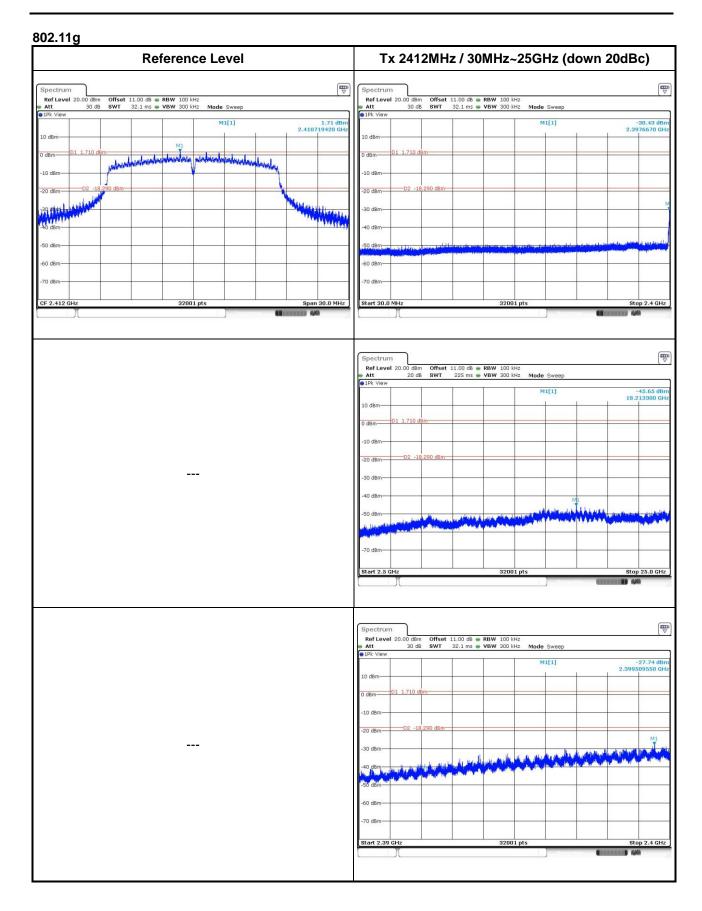
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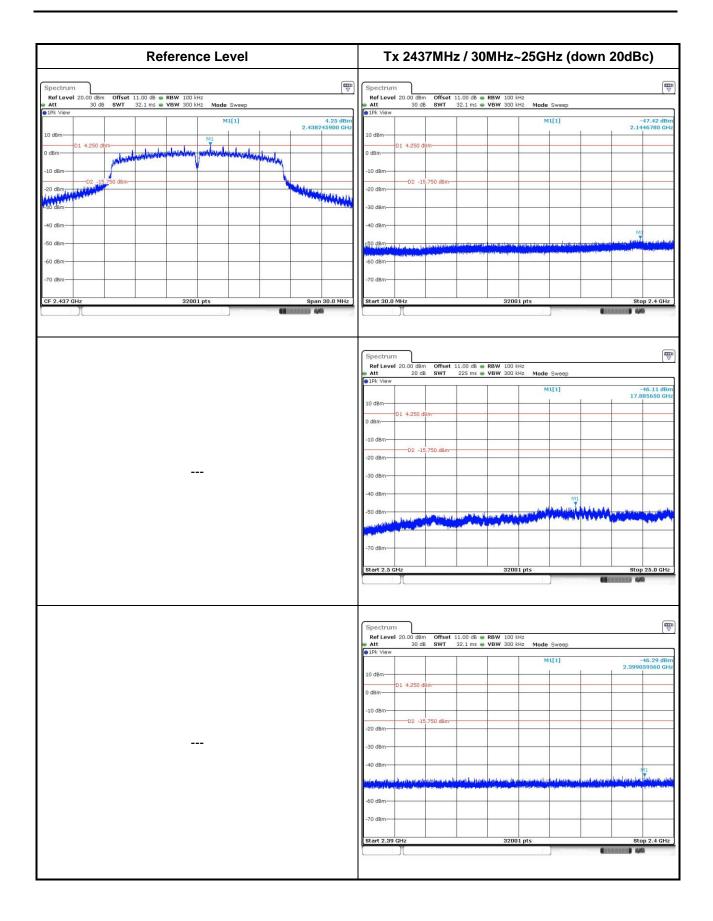
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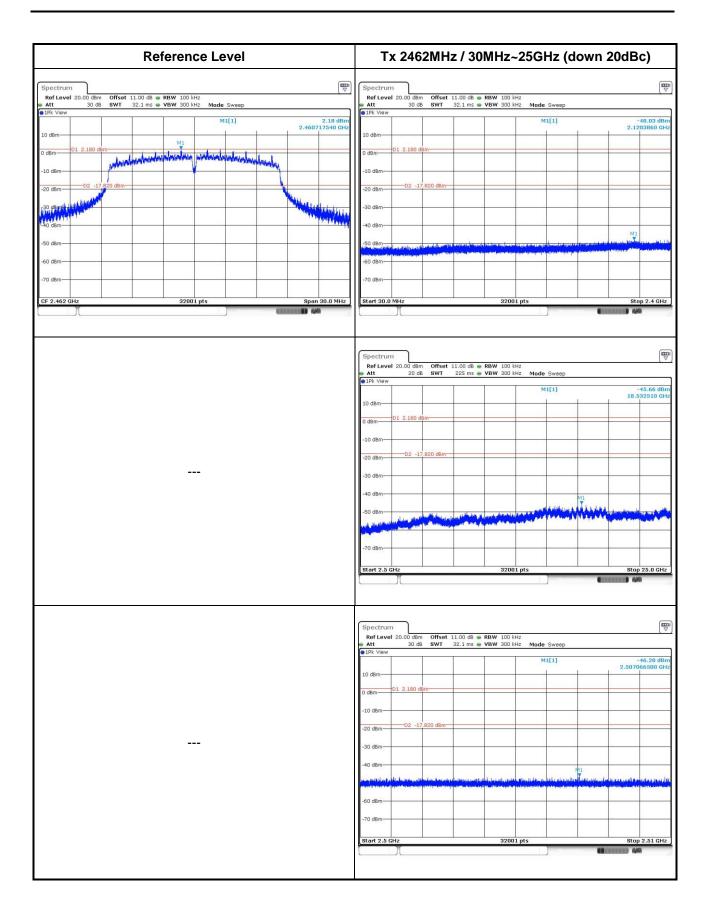
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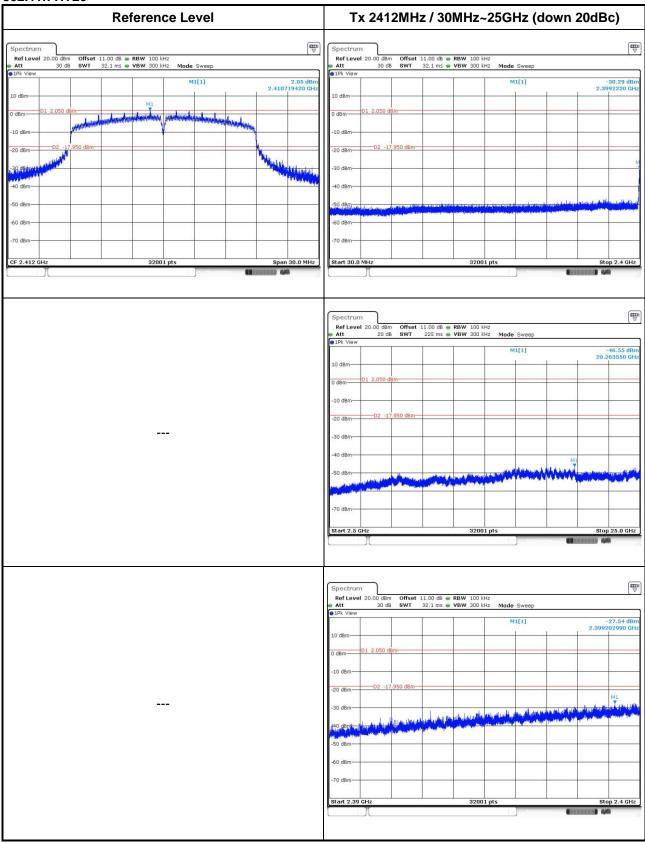




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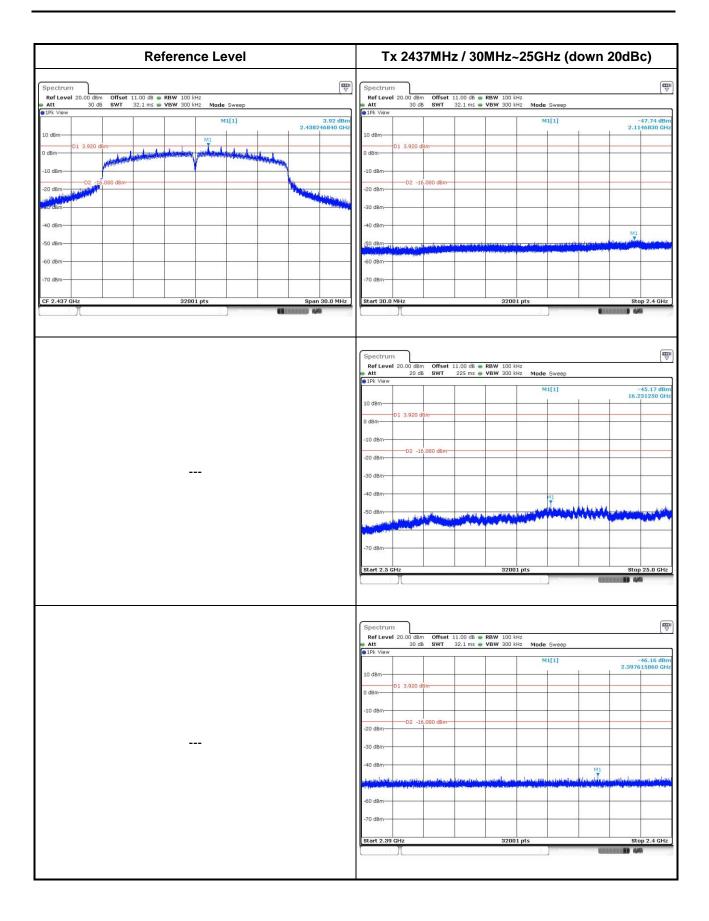


802.11n HT20



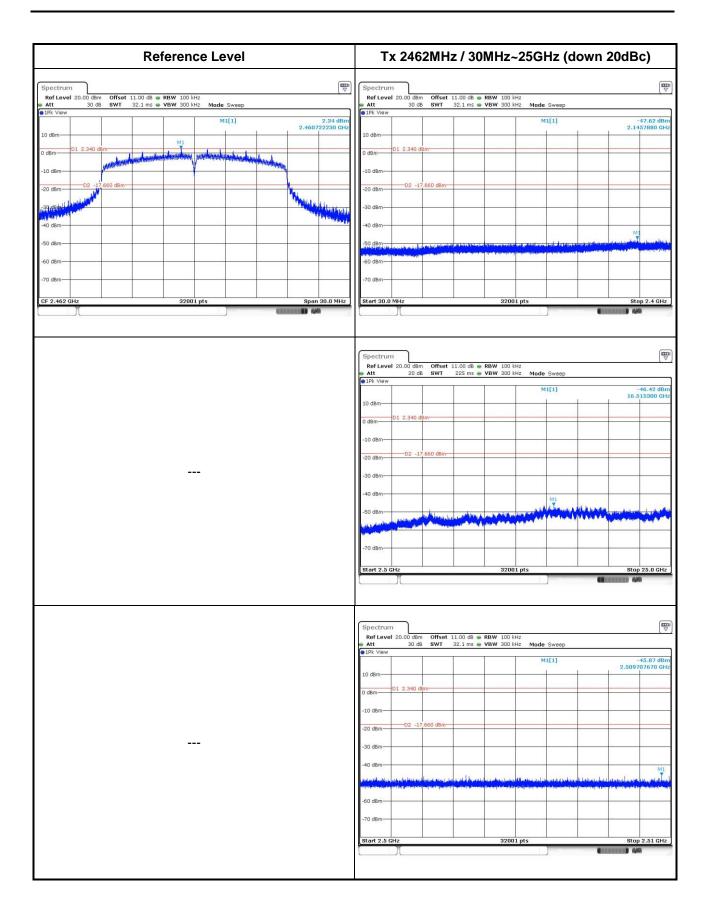
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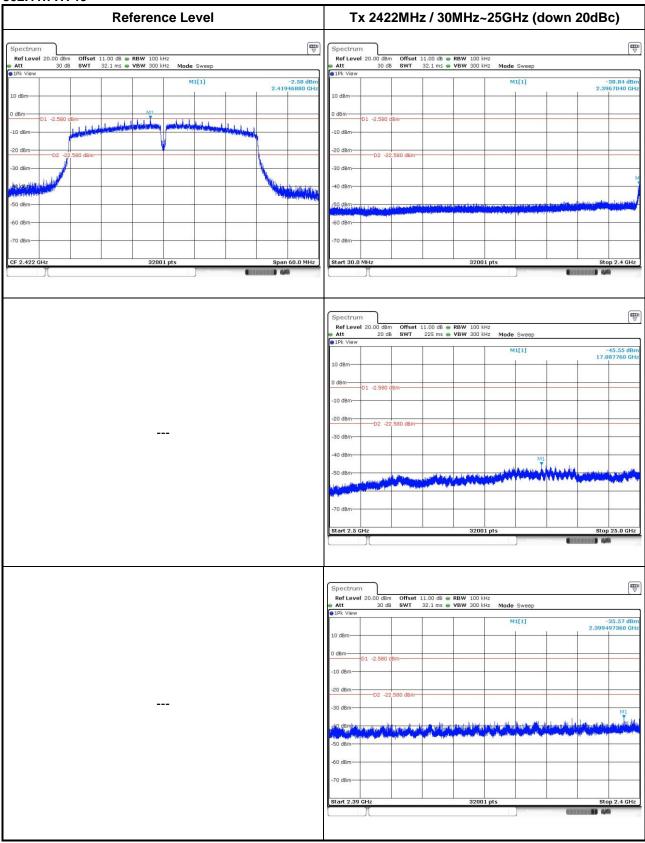




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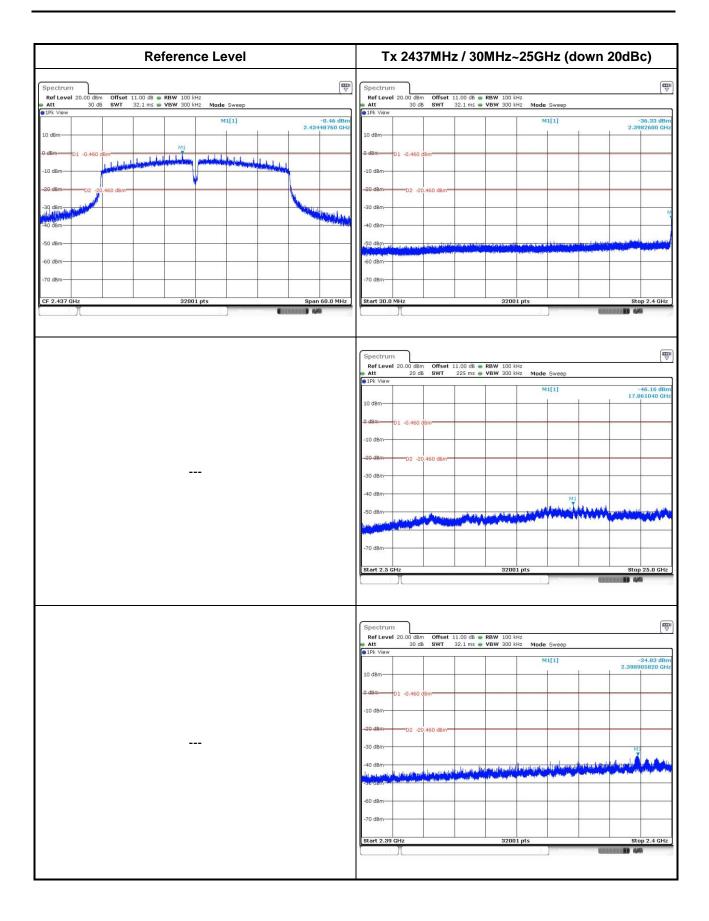


802.11n HT40



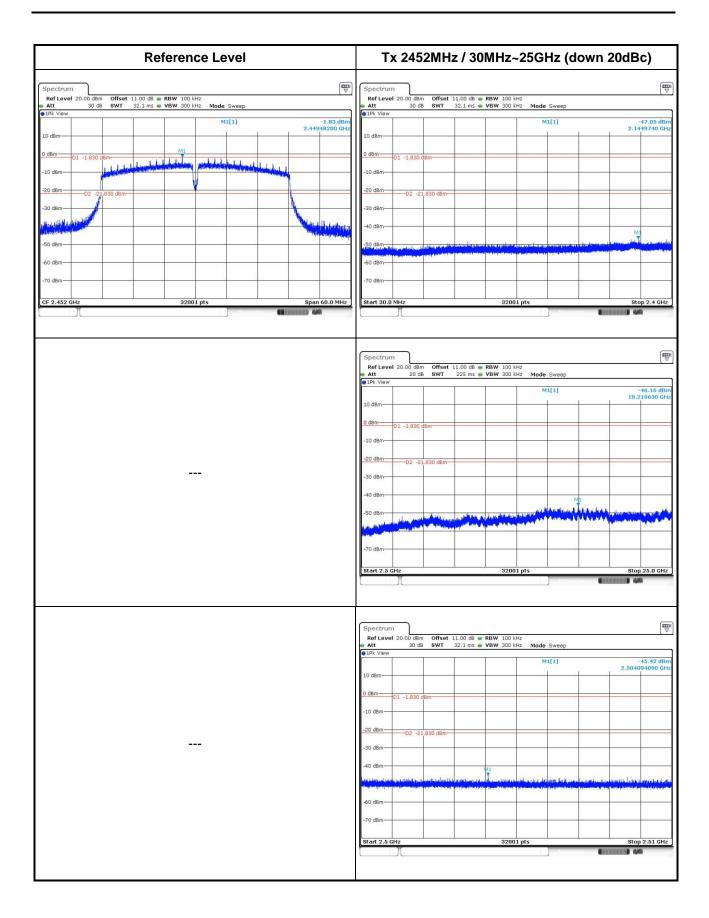
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4 Test laboratory information

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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