

# **FCC Test Report**

FCC ID : MXF-F240WA

Equipment : 7368 ISAM CPE

Model No. : F-240W-A

Brand Name : Alcatel-Lucent

Applicant : Gemtek Technology Co., Ltd.

Address : No. 15-1 Zhonghua Road, Hsinchu Industrial

Park, Hukou, Hsinchu, Taiwan, 30352.

Standard : 47 CFR FCC Part 15.247

Received Date : Jun. 10, 2015

Tested Date : Jun. 23 ~ Jul. 07, 2015

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

Approved & Reviewed by:

Gary Chang / Manager

lac-MRA

TAF

Testing Laboratory

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# **Release Record**

Report No.	Version	Description	Issued Date
FR561002AC	Rev. 01	Initial issue	Sep. 10, 2015
FR561002AC	Rev. 02	Modified power setting (page 7.)	Oct. 15, 2015

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# **Summary of Test Results**

FCC Rules	Test Items	Measured	Result
15.207	Conducted Emissions	[dBuV]: 0.437MHz 38.92 (Margin -8.19dB) - AV	Pass
15.247(d)	Radiated Emissions	[dBuV/m at 3m]: 4924.00MHz	Pass
15.209	INdulated Lillissions	52.90 (Margin -1.10dB) - AV	F 033
15.247(b)(3)	Maximum Output Power	Max Power [dBm]: 29.85	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 <sub>TX</sub> )	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]	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.

Note 4: TX diversity function is not supported. Only chain 0 transmits 11b/g 1TX signal.

#### 1.1.2 Antenna Details

Ant. No.	Model	Turno	Connector	Operating Frequency (MHz) / Gain			
Ant. No.	Wodei	Туре	Connector	2400~2483.5	5150~5250 5725~5850		
1	WVVDB-104ACN Wi-Fi ant_1	Dipole	IPEX	3.74			
2	WVVDB-104ACN Wi-Fi ant_2	Dipole	IPEX	3.02			
3	WVVDB-104ACN Wi-Fi ant_3	Dipole	IPEX	3.71			
4	WVVDB-104ACN Wi-Fi ant_4	Dipole	IPEX		4.47	4.15	
5	WVVDB-104ACN Wi-Fi ant_5	Dipole	IPEX		3.78	4.03	
6	WVVDB-104ACN Wi-Fi ant_6	Dipole	IPEX		4.71	4.84	
7	WVVDB-104ACN Wi-Fi ant_7	Dipole	IPEX		4.13	4.80	

# 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 Name: FSP GROUP INC Model Name: FSP090-AHAT2 I/P: 100-240Vac, 50-60Hz, 1.2A O/P: 12Vdc, 7.5A Power Line: DC 1.92m non-shielded cable with one core AC 1.5m non-shielded cable w/o core				
2	RJ45 cable	1.45m non-shielded cable w/o core				
3	RJ11 - A	1.76m non-shielded cable w/o core				
4	RJ11 - B	1.45m non-shielded cable w/o core				
5	Cradle					

### 1.1.5 Channel List

Frequency	band (MHz)	2400~	2483.5	
802.11 b /	g / n HT20	802.11n HT40		
Channel	Frequency(MHz)	Channel	Frequency(MHz)	
1	2412	3	2422	
2	2417	4	2427	
3	2422	5	2432	
4	2427	6	2437	
5	2432	7	2442	
6	2437	8	2447	
7	2442	9	2452	
8	2447			
9	2452			
10	2457			
11	2462			

# 1.1.6 Test Tool and Duty Cycle

Test Tool	Telnet				
	Mode	Duty cycle (%)	Duty factor (dB)		
	11b	100.00%	0.00		
<b>Duty Cycle and Duty Factor</b>	11g	99.66%	0.02		
	HT20	99.63%	0.02		
	HT40	98.52%	0.06		

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# 1.1.7 Power Setting

Modulation Mode	Test Frequency (MHz)	Power Set
11b	2412	74
11b	2437	76
11b	2462	74
11g	2412	70
11g	2437	83
11g	2462	70
HT20	2412	59
HT20	2437	59
HT20	2462	59
HT40	2422	42
HT40	2437	56
HT40	2452	42

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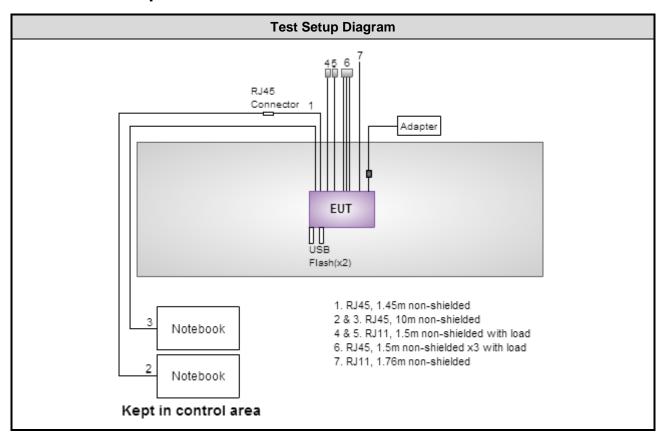
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# 1.2 Local Support Equipment List

	Support Equipment List								
No.	No. Equipment Brand Model FCC ID Signal cable / Length (m)								
1	Notebook	DELL	Latitude E6430	DoC	RJ45, 10m non-shielded.				
2	Notebook	DELL	Latitude E5420	DoC	RJ45, 10m non-shielded.				
3	USB 2.0 flash	Kingston	DTSE9						
4	USB 2.0 flash	Kingston	DTSE9						

# 1.3 Test Setup Chart



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# 1.4 The Equipment List

Conducted Emission  Conduction room 1 / (CO01-WS)								
							Instrument Manufacturer Model No. Serial No. Calibration Date Calibration	
R&S	ESCS 30	100169	Oct. 17, 2014	Oct. 16, 2015				
SCHWARZBECK	Schwarzbeck 8127	8127-667	Nov. 17, 2014	Nov. 16, 2015				
SCHWARZBECK	Schwarzbeck 8127	8127-666	Nov. 26, 2014	Nov. 25, 2015				
Woken	CFD200-NL	CFD200-NL-001	Dec. 31, 2014	Dec. 30, 2015				
NA	50	04	Apr. 15, 2015	Apr. 14, 2016				
AUDIX	e3	6.120210k	NA	NA				
	Conduction room 1 / (  Manufacturer  R&S  SCHWARZBECK  SCHWARZBECK  Woken  NA	Conduction room 1 / (CO01-WS)  Manufacturer Model No.  R&S ESCS 30  SCHWARZBECK Schwarzbeck 8127  SCHWARZBECK Schwarzbeck 8127  Woken CFD200-NL  NA 50	Conduction room 1 / (CO01-WS)           Manufacturer         Model No.         Serial No.           R&S         ESCS 30         100169           SCHWARZBECK         Schwarzbeck 8127         8127-667           SCHWARZBECK         Schwarzbeck 8127         8127-666           Woken         CFD200-NL         CFD200-NL-001           NA         50         04	Conduction room 1 / (CO01-WS)           Manufacturer         Model No.         Serial No.         Calibration Date           R&S         ESCS 30         100169         Oct. 17, 2014           SCHWARZBECK         Schwarzbeck 8127         8127-667         Nov. 17, 2014           SCHWARZBECK         Schwarzbeck 8127         8127-666         Nov. 26, 2014           Woken         CFD200-NL         CFD200-NL-001         Dec. 31, 2014           NA         50         04         Apr. 15, 2015				

Test Item	Radiated Emission								
Test Site	966 chamber1 / (03CH01-WS)								
Instrument	Manufacturer Model No. Serial No. Calibration Date Calibration L								
Spectrum Analyzer	R&S	FSV40	101498	Dec. 09, 2014	Dec. 08, 2015				
Receiver	R&S	ESR3	101658	Nov. 10, 2014	Nov. 09, 2015				
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Sep. 05, 2014	Sep. 04, 2015				
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Dec. 11, 2014	Dec. 10, 2015				
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 10, 2014	Nov. 09, 2015				
Loop Antenna	R&S	HFH2-Z2	11900	Nov. 10, 2014	Nov. 09, 2015				
Preamplifier	Burgeon	BPA-530	SN:100219	Sep. 09, 2014	Sep. 08, 2015				
Preamplifier	Agilent	Agilent 83017A MY39501308		Oct. 09, 2014	Oct. 08, 2015				
Preamplifier	EMC EMC184045B		980192	Aug. 26, 2014	Aug. 25, 2015				
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16014/4	Dec. 15, 2014	Dec. 14, 2015				
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Dec. 15, 2014	Dec. 14, 2015				
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16139/4	Dec. 15, 2014	Dec. 14, 2015				
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Dec. 15, 2014	Dec. 14, 2015				
LF cable 10M	Woken	CFD400NL-LW	CFD400NL-002	Dec. 15, 2014	Dec. 14, 2015				
Measurement Software	AUDIX	e3	6.120210g	NA	NA				
Note: Calibration Inter	rval of instruments listed	d above is one year.							

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	Feb. 03, 2015	Feb. 02, 2016				
Power Meter	Anritsu	ML2495A	1241002	Sep. 29, 2014	Sep. 28, 2015				
Power Sensor	Anritsu	MA2411B	1207366	Sep. 29, 2014	Sep. 28, 2015				
Measurement Software	Sporton	Sporton_1	1.3.30	NA	NA				
Note: Calibration Interval of instruments listed above is one year.									

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### 1.5 Test Standards

According to the specification of EUT, the EUT must comply with following standards and KDB documents.

47 CFR FCC Part 15.247
ANSI C63.10-2013
FCC KDB 558074 D01 DTS Meas Guidance v03r03
FCC KDB 662911 D01 Multiple Transmitter Output v02r01

# 1.6 Measurement Uncertainty

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

Measurement Uncertainty							
Parameters	Uncertainty						
Bandwidth	±34.134 Hz						
Conducted power	±0.808 dB						
Power density	±0.463 dB						
Conducted emission	±2.670 dB						
AC conducted emission	±2.92 dB						
Radiated emission ≤ 1GHz	±3.72 dB						
Radiated emission > 1GHz	±5.65 dB						

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# 2 Test Configuration

# 2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
AC Conduction	CO01-WS	23°C / 64%	Kevin Ma
Radiated Emissions	03CH01-WS	22-25°C / 63-68%	Felix Sung Morgan Chen
RF Conducted	TH01-WS	22°C / 66%	Brad Wu

FCC site registration No.: 657002IC site registration No.: 10807A-1

### 2.2 The Worst Test Modes and Channel Details

Test item	Modulation Mode	Test Frequency (MHz)	Data Rate (Mbps) / MCS	Test Configuration
Conducted Emissions	11g	2437	6 Mbps	
Radiated Emissions ≤1GHz	11g	2437	6 Mbps	
Radiated Emissions >1GHz	11b	2412 / 2437 / 2462	1 Mbps	
Maximum Output Power	11g	2412 / 2437 / 2462	6 Mbps	
6dB bandwidth	HT20	2412 / 2437 / 2462	MCS 0	
Power spectral density	HT40	2422 / 2437 / 2452	MCS 0	

**NOTE:** The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement -X, Y, and Z-plane. The X-plane results were found as the worst case and were shown in this report.

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# 3 Transmitter Test Results

### 3.1 Conducted Emissions

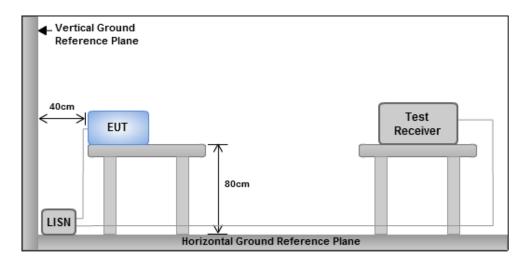
#### 3.1.1 Limit of Conducted Emissions

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  $\Omega$  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



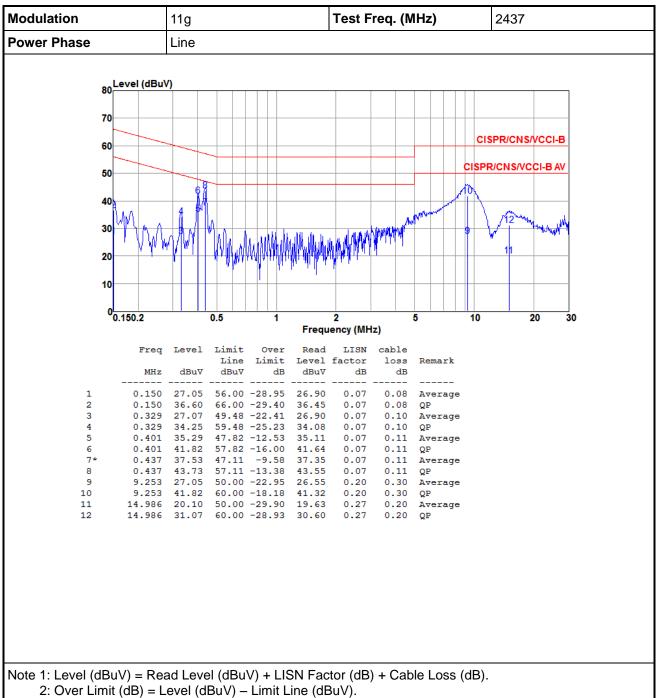
Note: 1. Support units were connected to second LISN.

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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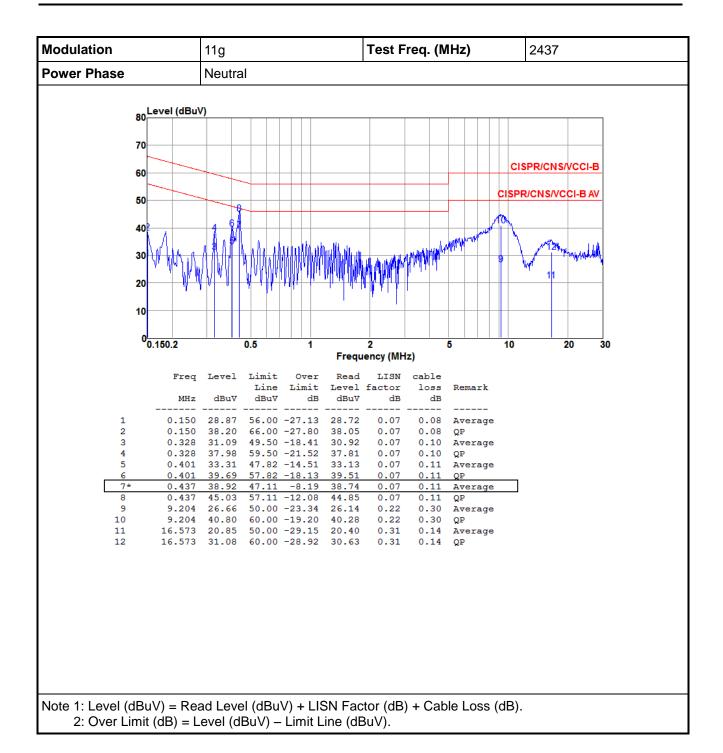


#### **Test Result of Conducted Emissions** 3.1.4



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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

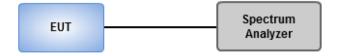
#### 6dB Bandwidth

- 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

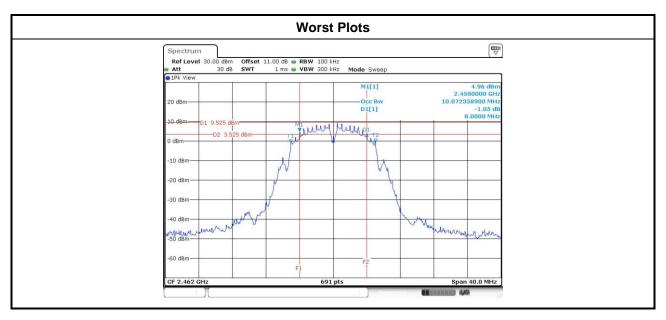


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# 3.2.4 Test Result of 6dB and Occupied Bandwidth

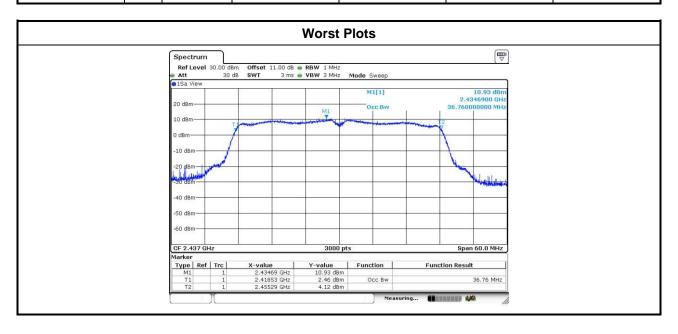
Modulation	N	Eron (MU=)			Limit (ItU=)		
Mode	N <sub>TX</sub>	Freq. (MHz)	Chain 0	Chain 1	Chain 2	Chain 3	Limit (kHz)
11b	1	2412	8.06				500
11b	1	2437	8.06				500
11b	1	2462	8.00				500
11g	1	2412	16.35				500
11g	1	2437	16.35				500
11g	1	2462	16.41				500
HT20	3	2412	17.62	17.62	17.62		500
HT20	3	2437	17.62	17.62	17.62		500
HT20	3	2462	17.62	17.62	17.62		500
HT40	3	2422	36.17	36.41	36.41		500
HT40	3	2437	35.83	36.41	36.41		500
HT40	3	2452	36.17	36.41	36.41		500



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Modulation	N	Freq.		Bandwidth (MHz)		
Mode	N <sub>TX</sub>	(MHz)	Chain 0	Chain 1	Chain 2	Chain 3
11b	1	2412	10.21			
11b	1	2437	10.21			
11b	1	2462	10.21			
11g	1	2412	17.10			
11g	1	2437	17.10			
11g	1	2462	17.09			
HT20	3	2412	18.01	17.85	17.92	
HT20	3	2437	18.01	17.86	17.92	
HT20	3	2462	18.00	17.86	17.93	
HT40	3	2422	36.70	36.72	36.66	
HT40	3	2437	36.76	36.72	36.66	
HT40	3	2452	36.68	36.70	36.62	



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# 3.3 RF Output Power

### 3.3.1 Limit of RF Output Power

Con	duct	ed power shall not exceed 1Watt.
$\boxtimes$	Ante	enna gain <= 6dBi, no any corresponding reduction is in output power limit.
	Ante	enna gain > 6dBi
		Non Fixed, point to point operations.  The conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dB
		Fixed, point to point operations Systems operating in the 2400–2483.5 MHz band that are used exclusively for fixed, point-to-point Operations, maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.
		Systems operating in the 5725–5850 MHz band that are used exclusively for fixed, point-to-point operations ,no any corresponding reduction is in transmitter peak output power

#### 3.3.2 Test Procedures

Maximum Peak Conducted Output Power

#### □ Spectrum analyzer

- 1. Set RBW = 1MHz, VBW = 3MHz, Detector = Peak.
- 2. Sweep time = auto, Trace mode = max hold, Allow trace to fully stabilize.
- 3. Use the spectrum analyzer channel power measurement function with the band limits set equal to the DTS bandwidth edges.

#### 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

Modulation Mode	N <sub>TX</sub>	Freq.	Peak conducted output power (dBm)				Total Power	Total Power	Limit
Wode		(MHz)	Chain 0	Chain 1	Chain 2	Chain 3	(mW)	(dBm)	(dBm)
11b	1	2412	22.79				190.108	22.79	30.00
11b	1	2437	22.83				191.867	22.83	30.00
11b	1	2462	22.63				183.231	22.63	30.00
11g	1	2412	27.26				532.108	27.26	30.00
11g	1	2437	29.85				966.051	29.85	30.00
11g	1	2462	26.45				441.570	26.45	30.00
HT20	3	2412	24.55	25.39	22.01		789.896	28.98	30.00
HT20	3	2437	23.25	25.41	23.45		780.195	28.92	30.00
HT20	3	2462	23.89	24.35	25.18		846.786	29.28	30.00
HT40	3	2422	20.88	21.03	20.39		358.622	25.55	30.00
HT40	3	2437	23.30	24.60	24.21		765.832	28.84	30.00
HT40	3	2452	20.03	20.52	20.10		315.742	24.99	30.00

Modulation Mode	N <sub>TX</sub>	Freq.	Conducted (average) output power (dBm)				Total Power	Total Power	Limit
Wiode		(MHz)	Chain 0	Chain 1	Chain 2	Chain 3	(mW)	(dBm)	(dBm)
11b	1	2412	18.84				76.560	18.84	30.00
11b	1	2437	18.91				77.804	18.91	30.00
11b	1	2462	18.71				74.302	18.71	30.00
11g	1	2412	18.31				67.764	18.31	30.00
11g	1	2437	20.65				116.145	20.65	30.00
11g	1	2462	17.68				58.614	17.68	30.00
HT20	3	2412	15.33	15.88	15.71		110.084	20.42	30.00
HT20	3	2437	15.18	16.03	15.20		106.161	20.26	30.00
HT20	3	2462	15.09	15.91	15.81		109.386	20.39	30.00
HT40	3	2422	10.34	11.98	11.65		41.212	16.15	30.00
HT40	3	2437	15.21	15.87	15.51		107.389	20.31	30.00
HT40	3	2452	10.31	11.63	11.38		39.035	15.91	30.00

Note: Conducted average output power is for reference only.

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# 3.4 Power Spectral Density

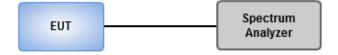
#### 3.4.1 Limit of Power Spectral Density

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.
  - 2. Detector = Peak, Sweep time = auto couple.
  - 3. Trace mode = max hold, allow trace to fully stabilize.
  - 4. Use the peak marker function to determine the maximum amplitude level.
- Maximum (average) conducted output power was used to demonstrate compliance to the fundamental output power limit.
  - 1. Set the RBW = 100kHz, VBW = 300 kHz.
  - 2. Detector = RMS, Sweep time = auto couple.
  - 3. Set the sweep time to: ≥ 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



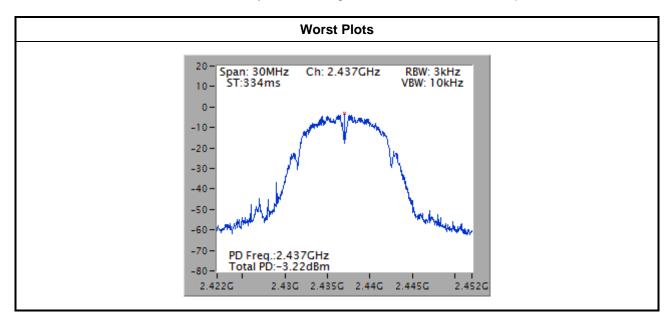
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# 3.4.4 Test Result of Power Spectral Density

Modulation Mode	N <sub>TX</sub>	Freq. (MHz)	Total Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
11b	1	2412	-3.61	8.00
11b	1	2437	-3.22	8.00
11b	1	2462	-3.93	8.00
11g	1	2412	-7.42	8.00
11g	1	2437	-5.07	8.00
11g	1	2462	-8.10	8.00
HT20	3	2412	-5.64	8.00
HT20	3	2437	-6.25	8.00
HT20	3	2462	-6.29	8.00
HT40	3	2422	-12.44	8.00
HT40	3	2437	-8.23	8.00
HT40	3	2452	-12.90	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.

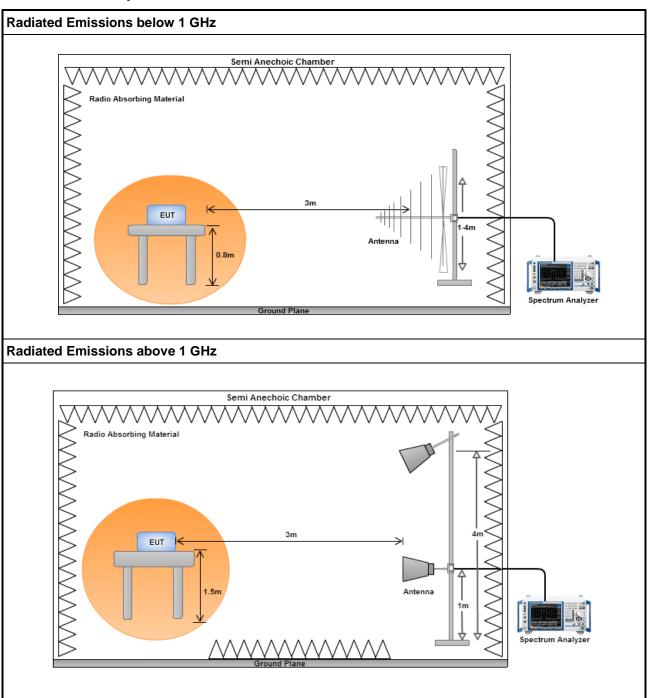
#### Note:

- 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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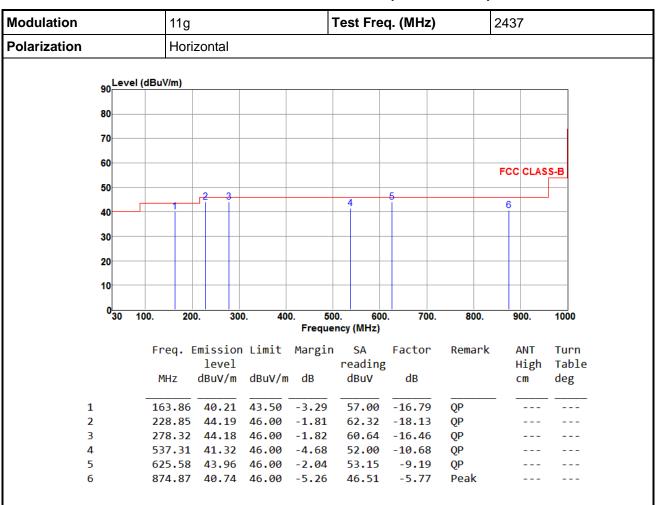
# 3.5.3 Test Setup



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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)

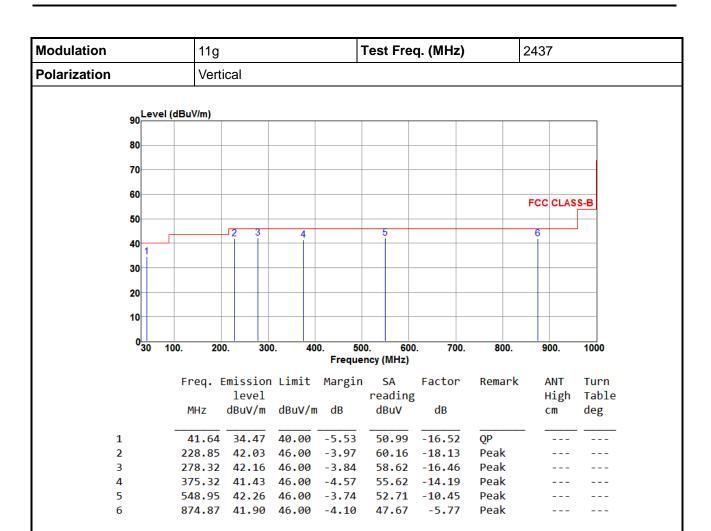
\*Factor includes antenna factor, cable loss and amplifier gain

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

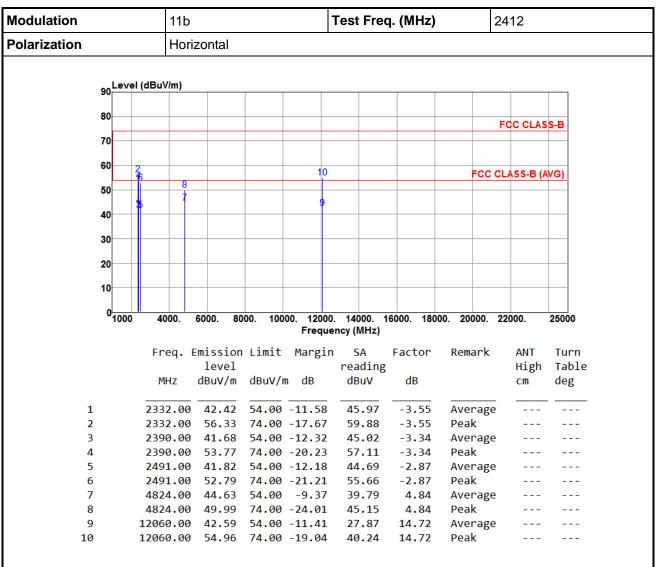
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

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



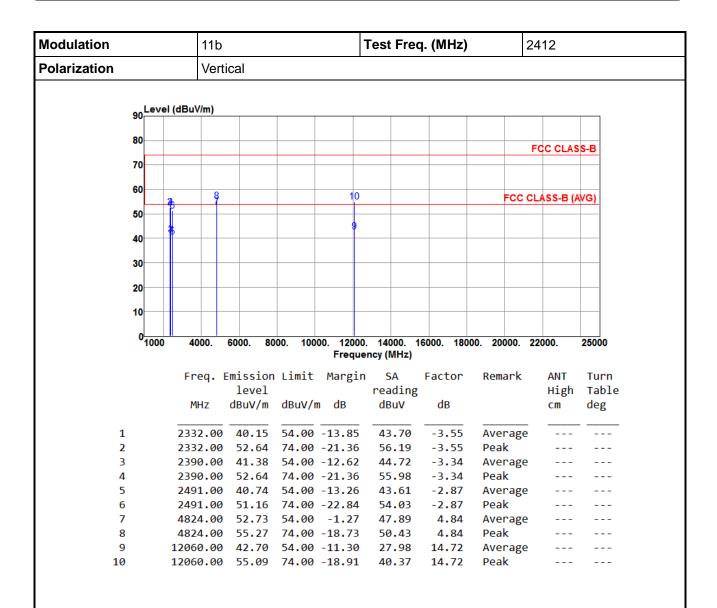
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor\* (dB)

\*Factor includes antenna factor, cable loss and amplifier gain

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

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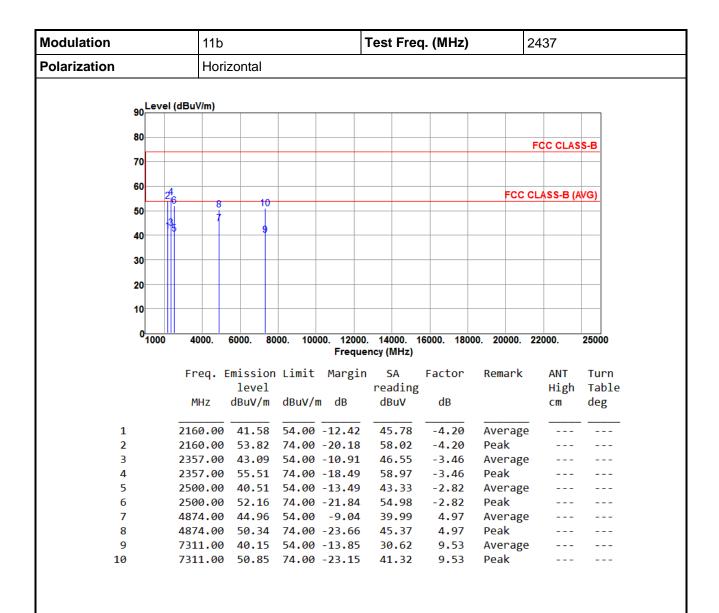


\*Factor includes antenna factor, cable loss and amplifier gain

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

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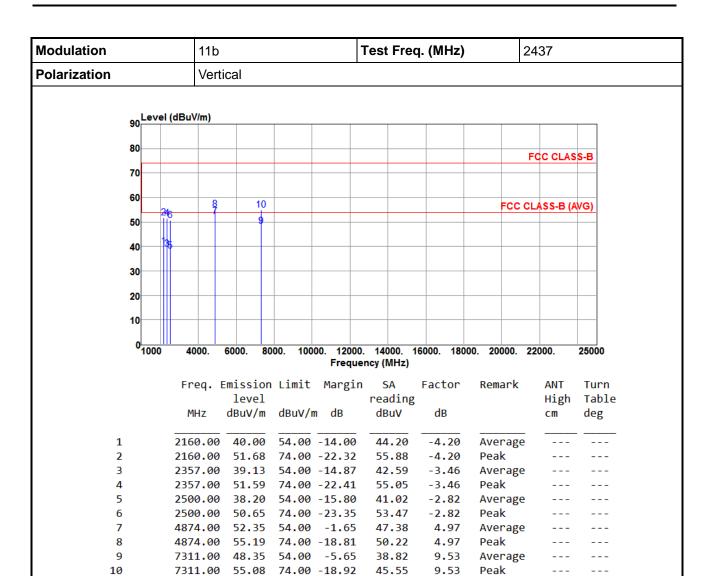


\*Factor includes antenna factor, cable loss and amplifier gain

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

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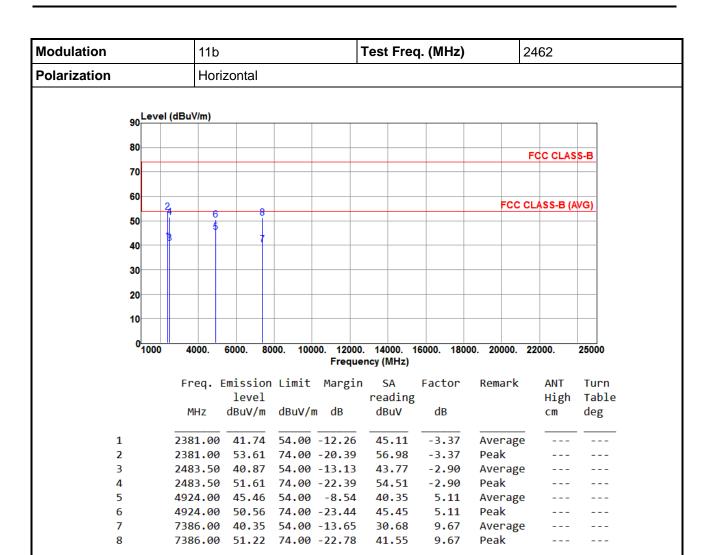


\*Factor includes antenna factor, cable loss and amplifier gain

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

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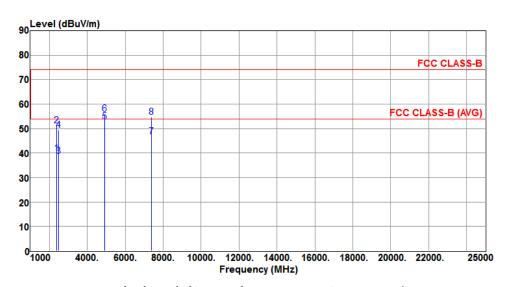
\*Factor includes antenna factor, cable loss and amplifier gain

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

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



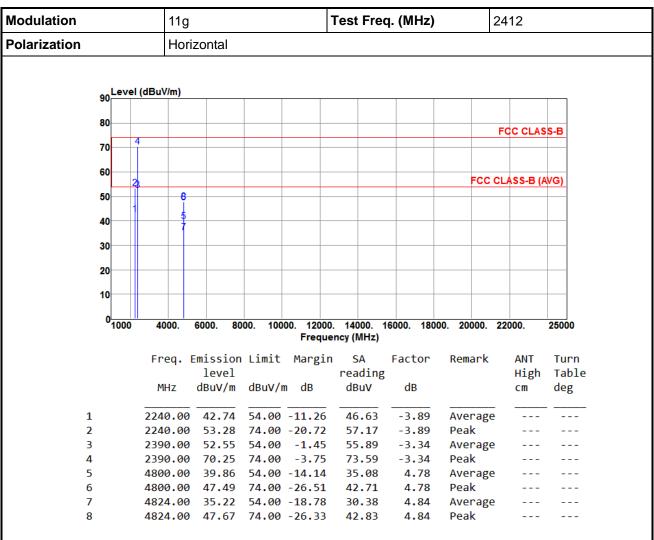
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHZ	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2381.00	39.85	54.00	-14.15	43.22	-3.37	Average		
2	2381.00	51.20	74.00	-22.80	54.57	-3.37	Peak		
3	2483.50	38.65	54.00	-15.35	41.55	-2.90	Average		
4	2483.50	49.44	74.00	-24.56	52.34	-2.90	Peak		
5	4924.00	52.90	54.00	-1.10	47.79	5.11	Average		
6	4924.00	55.91	74.00	-18.09	50.80	5.11	Peak		
7	7386.00	46.84	54.00	-7.16	37.17	9.67	Average		
8	7386.00	54.72	74.00	-19.28	45.05	9.67	Peak		

\*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)

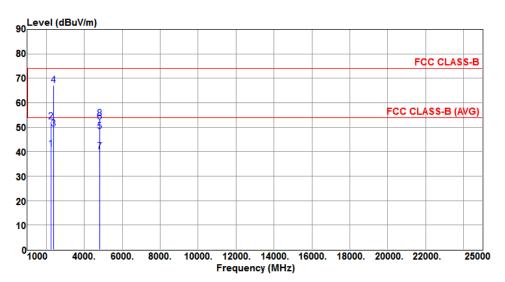
\*Factor includes antenna factor, cable loss and amplifier gain

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

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

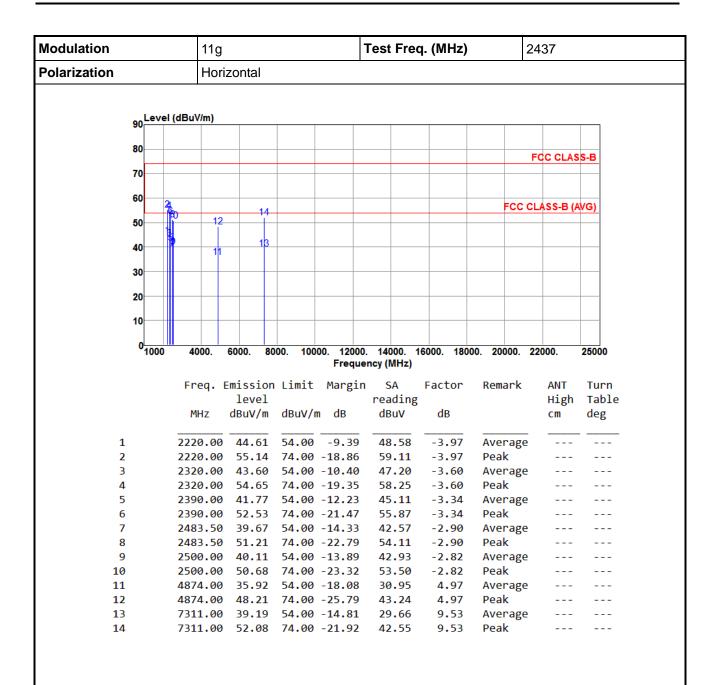


	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHZ	dBuV/m	dBuV/m	ı dB	dBuV	dB		cm	deg
1	2240.00	41.26	54.00	-12.74	45.15	-3.89	Average		
2	2240.00	52.39	74.00	-21.61	56.28	-3.89	Peak		
3	2390.00	49.42	54.00	-4.58	52.76	-3.34	Average		
4	2390.00	67.18	74.00	-6.82	70.52	-3.34	Peak		
5	4800.00	48.40	54.00	-5.60	43.62	4.78	Average		
6	4800.00	52.28	74.00	-21.72	47.50	4.78	Peak		
7	4824.00	40.05	54.00	-13.95	35.21	4.84	Average		
8	4824.00	53.54	74.00	-20.46	48.70	4.84	Peak		

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

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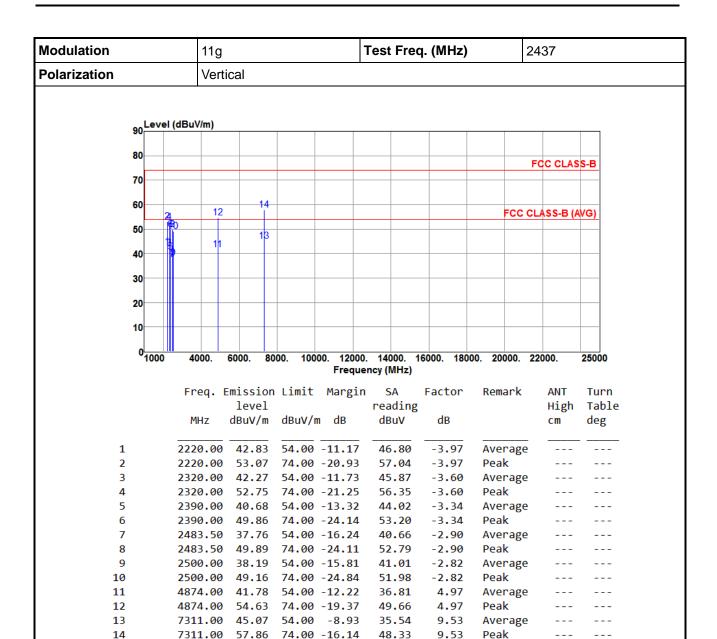


\*Factor includes antenna factor, cable loss and amplifier gain

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

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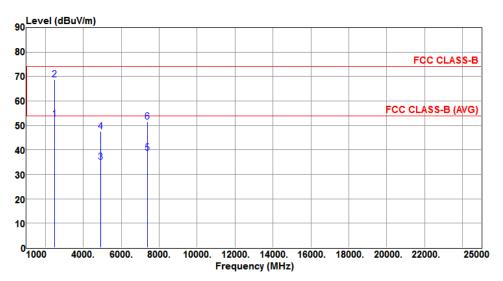
\*Factor includes antenna factor, cable loss and amplifier gain

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

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



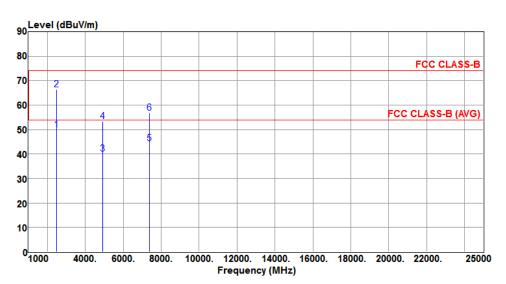
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHZ	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2402 50		<u> </u>	1 45		2.00	Augnaga		
1	2483.50	52.55	54.00	-1.45	55.45	-2.90	Average		
2	2483.50	68.75	74.00	-5.25	71.65	-2.90	Peak		
3	4924.00	35.10	54.00	-18.90	29.99	5.11	Average		
4	4924.00	47.43	74.00	-26.57	42.32	5.11	Peak		
5	7386.00	38.68	54.00	-15.32	29.01	9.67	Average		
6	7386.00	51.65	74.00	-22.35	41.98	9.67	Peak		

\*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)	2462
Polarization	Vertical		



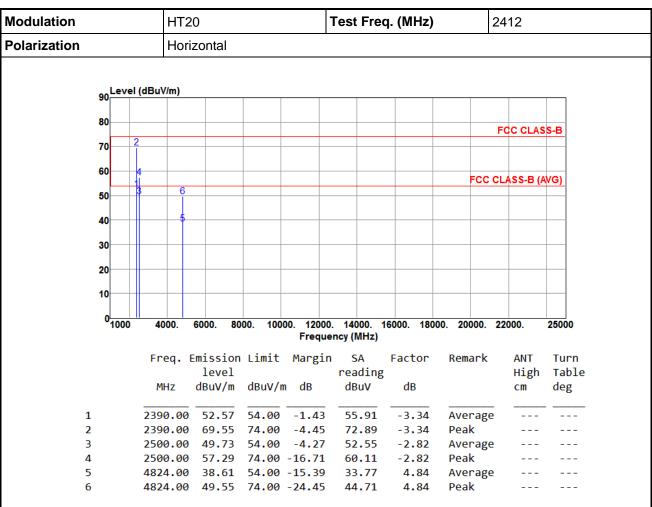
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHZ	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2483.50	50.02	54.00	-3.98	52.92	-2.90	Average		
2	2483.50	66.30	74.00	-7.70	69.20	-2.90	Peak		
3	4924.00	40.12	54.00	-13.88	35.01	5.11	Average		
4	4924.00	53.37	74.00	-20.63	48.26	5.11	Peak		
5	7386.00	44.28	54.00	-9.72	34.61	9.67	Average		
6	7386.00	56.96	74.00	-17.04	47.29	9.67	Peak		

\*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)

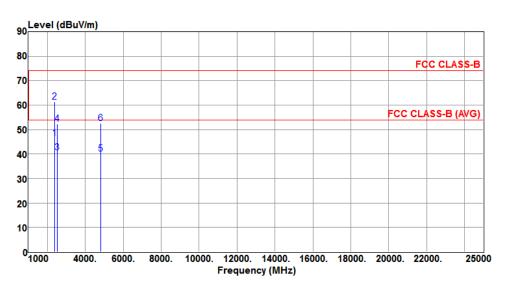
\*Factor includes antenna factor, cable loss and amplifier gain

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

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Modulation	HT20	Test Freq. (MHz)	2412
Polarization	Vertical		



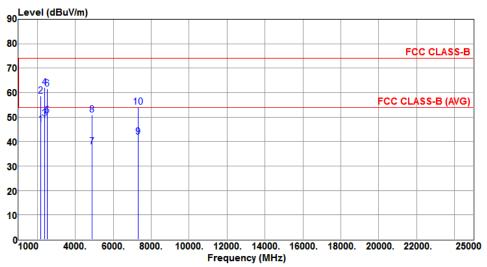
	Freq.	Emission level	Limit	Margin	SA reading		Remark	ANT High	Turn Table
	MHZ	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2390.00	46.46	54.00	-7.54	49.80	-3.34	Average		
2	2390.00	61.27	74.00	-12.73	64.61	-3.34	Peak		
3	2500.00	40.76	54.00	-13.24	43.58	-2.82	Average		
4	2500.00	52.34	74.00	-21.66	55.16	-2.82	Peak		
5	4824.00	39.97	54.00	-14.03	35.13	4.84	Average		
6	4824.00	52.67	74.00	-21.33	47.83	4.84	Peak		

\*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		



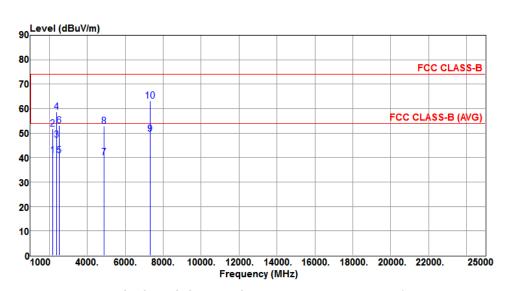
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHZ	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2160.00	47.02	54.00	-6.98	51.22	-4.20	Average		
2	2160.00	58.67	74.00	-15.33	62.87	-4.20	Peak		
3	2390.00	49.51	54.00	-4.49	52.85	-3.34	Average		
4	2390.00	62.02	74.00	-11.98	65.36	-3.34	Peak		
5	2500.00	50.73	54.00	-3.27	53.55	-2.82	Average		
6	2500.00	61.51	74.00	-12.49	64.33	-2.82	Peak		
7	4874.00	37.95	54.00	-16.05	32.98	4.97	Average		
8	4874.00	51.02	74.00	-22.98	46.05	4.97	Peak		
9	7311.00	42.08	54.00	-11.92	32.55	9.53	Average		
10	7311.00	54.21	74.00	-19.79	44.68	9.53	Peak		

\*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		



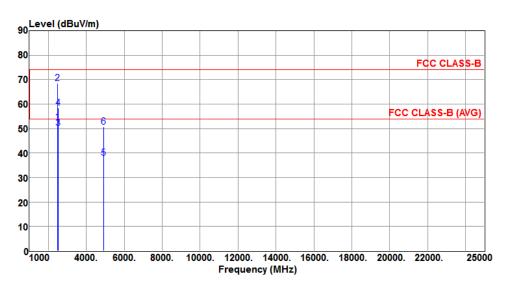
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHZ	dBuV/m	dBuV/m	ı dB	dBuV	dB		cm	deg
1	2160.00	40.92	54.00	-13.08	45.12	-4.20	Average		
2	2160.00	51.82	74.00	-22.18	56.02	-4.20	Peak		
3	2390.00	47.30	54.00	-6.70	50.64	-3.34	Average		
4	2390.00	58.65	74.00	-15.35	61.99	-3.34	Peak		
5	2500.00	40.88	54.00	-13.12	43.70	-2.82	Average		
6	2500.00	52.98	74.00	-21.02	55.80	-2.82	Peak		
7	4874.00	40.12	54.00	-13.88	35.15	4.97	Average		
8	4874.00	52.85	74.00	-21.15	47.88	4.97	Peak		
9	7311.00	49.55	54.00	-4.45	40.02	9.53	Average		
10	7311.00	63.28	74.00	-10.72	53.75	9.53	Peak		

\*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	Horizontal		



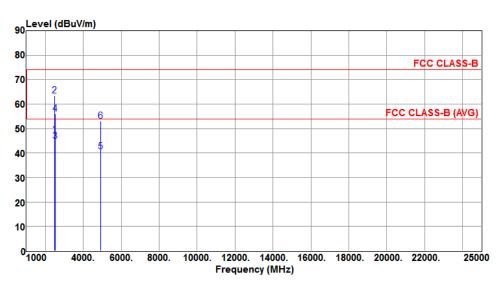
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
_									
1	2483.50	52.54	54.00	-1.46	55.44	-2.90	Average		
2	2483.50	68.48	74.00	-5.52	71.38	-2.90	Peak		
3	2500.00	50.30	54.00	-3.70	53.12	-2.82	Average		
4	2500.00	58.30	74.00	-15.70	61.12	-2.82	Peak		
5	4924.00	37.89	54.00	-16.11	32.78	5.11	Average		
6	4924.00	50.78	74.00	-23.22	45.67	5.11	Peak		

\*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		



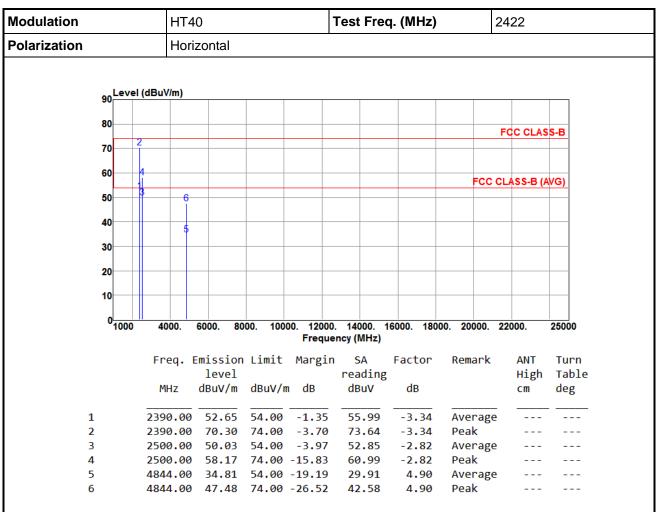
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Ü	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	47.58	54.00			2.00	Augnaga		
1	2483.50	47.58	54.00	-0.42	50.48	-2.90	Average		
2	2483.50	63.44	74.00	-10.56	66.34	-2.90	Peak		
3	2500.00	44.85	54.00	-9.15	47.67	-2.82	Average		
4	2500.00	55.91	74.00	-18.09	58.73	-2.82	Peak		
5	4924.00	40.55	54.00	-13.45	35.44	5.11	Average		
6	4924.00	53.01	74.00	-20.99	47.90	5.11	Peak		

\*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)

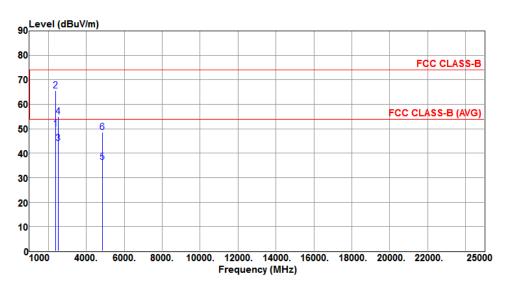
\*Factor includes antenna factor, cable loss and amplifier gain

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

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Modulation	HT40	Test Freq. (MHz)	2422
Polarization	Vertical		



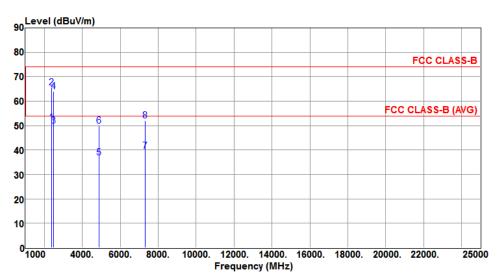
	Freq.	Emission level	Limit	Margin	SA reading		Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2390.00	49.87	54.00	-4.13	53.21	-3.34	Average		
2	2390.00	65.55	74.00	-8.45	68.89	-3.34	Peak		
3	2500.00	44.11	54.00	-9.89	46.93	-2.82	Average		
4	2500.00	55.02	74.00	-18.98	57.84	-2.82	Peak		
5	4844.00	36.28	54.00	-17.72	31.38	4.90	Average		
6	4844.00	48.61	74.00	-25.39	43.71	4.90	Peak		

\*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		



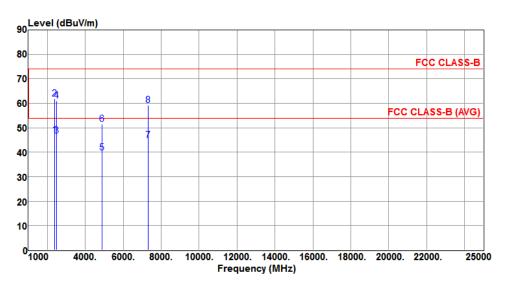
	Freq.	Emission level dBuV/m	Limit dBuV/m	J	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
		•							Ü
1	2390.00	51.21	54.00	-2.79	54.55	-3.34	Average		
2	2390.00	65.54	74.00	-8.46	68.88	-3.34	Peak		
3	2483.50	49.95	54.00	-4.05	52.85	-2.90	Average		
4	2483.50	63.95	74.00	-10.05	66.85	-2.90	Peak		
5	4874.00	36.94	54.00	-17.06	31.97	4.97	Average		
6	4874.00	49.87	74.00	-24.13	44.90	4.97	Peak		
7	7311.00	39.45	54.00	-14.55	29.92	9.53	Average		
8	7311.00	51.98	74.00	-22.02	42.45	9.53	Peak		

\*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		



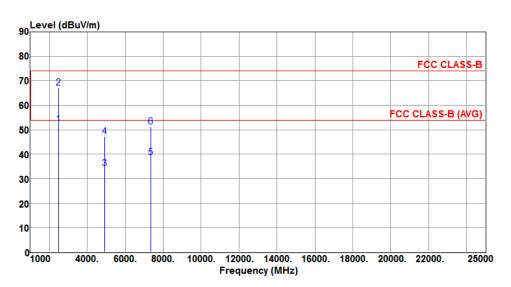
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHZ	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2390.00	46.98	54.00	-7.02	50.32	-3.34	Average		
2	2390.00	61.98	74.00	-12.02	65.32	-3.34	Peak		
3	2483.50	46.65	54.00	-7.35	49.55	-2.90	Average		
4	2483.50	61.12	74.00	-12.88	64.02	-2.90	Peak		
5	4874.00	39.85	54.00	-14.15	34.88	4.97	Average		
6	4874.00	51.39	74.00	-22.61	46.42	4.97	Peak		
7	7311.00	44.85	54.00	-9.15	35.32	9.53	Average		
8	7311.00	59.16	74.00	-14.84	49.63	9.53	Peak		

\*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		



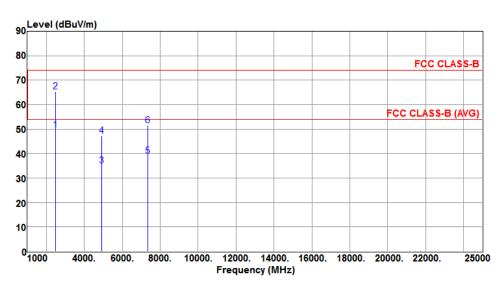
	Freq.	Emission level	Limit	Margin	SA reading		Remark	ANT High	Turn Table
	MHZ	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2483.50	52.22	54.00	-1.78	55.12	-2.90	Average		
2	2483.50	67.13	74.00	-6.87	70.03	-2.90	Peak		
3	4904.00	34.15	54.00	-19.85	29.09	5.06	Average		
4	4904.00	47.31	74.00	-26.69	42.25	5.06	Peak		
5	7356.00	38.68	54.00	-15.32	29.07	9.61	Average		
6	7356.00	51.36	74.00	-22.64	41.75	9.61	Peak		

\*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	49.68	54.00	-4.32	52.58	-2.90	Average		
2	2483.50	65.41	74.00	-8.59	68.31	-2.90	Peak		
3	4904.00	34.95	54.00	-19.05	29.89	5.06	Average		
4	4904.00	47.24	74.00	-26.76	42.18	5.06	Peak		
5	7356.00	38.98	54.00	-15.02	29.37	9.61	Average		
6	7356.00	51.54	74.00	-22.46	41.93	9.61	Peak		

\*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

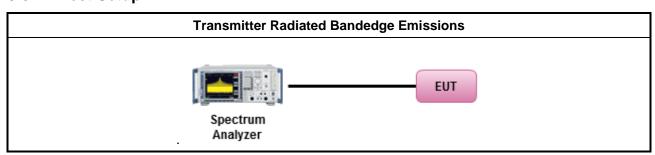
#### Reference level measurement

- 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



## 3.6.5 Test Result of Emissions in non-restricted frequency bands

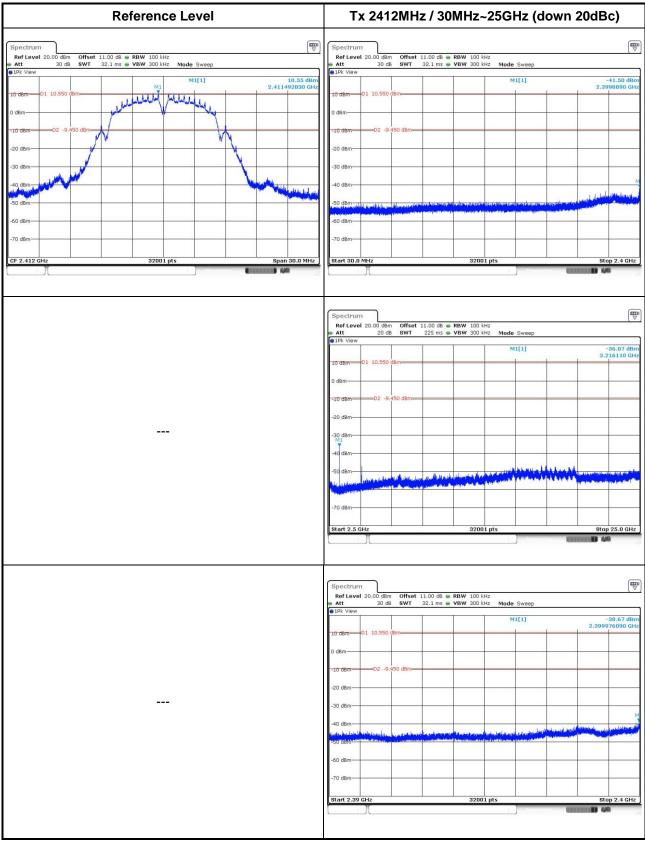
This test item is performed on each TX output individually without summing or adding 10  $log(N_{ANT})$  since measurements are made relative to the in-band emissions on the individual outputs. Only worst test result of each operating mode is presented.

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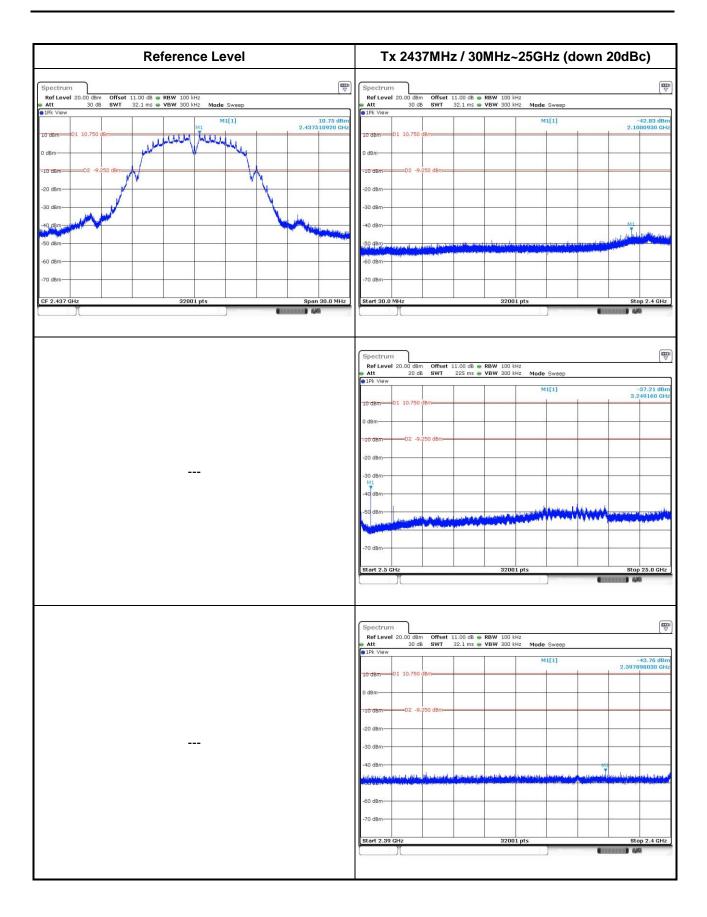
# 3.6.6 Unwanted Emissions into Non-Restricted Frequency Bands

### 802.11b



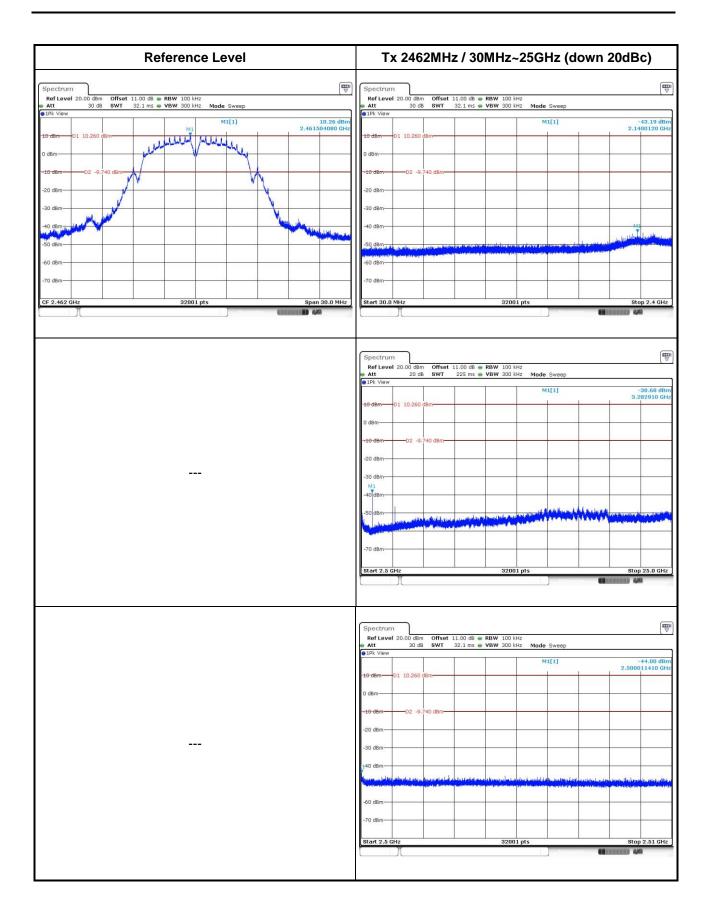
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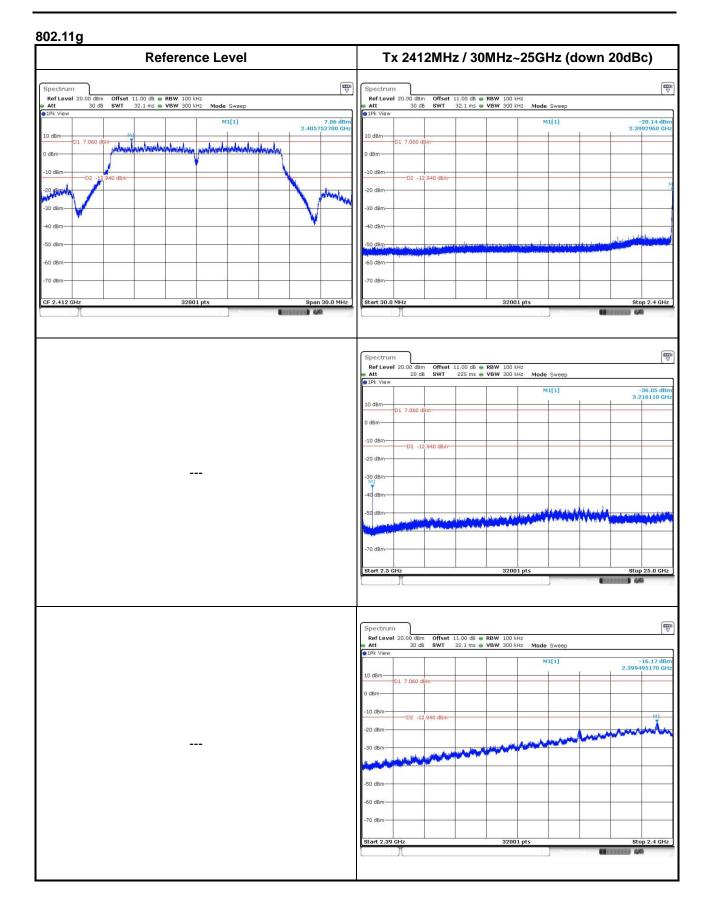
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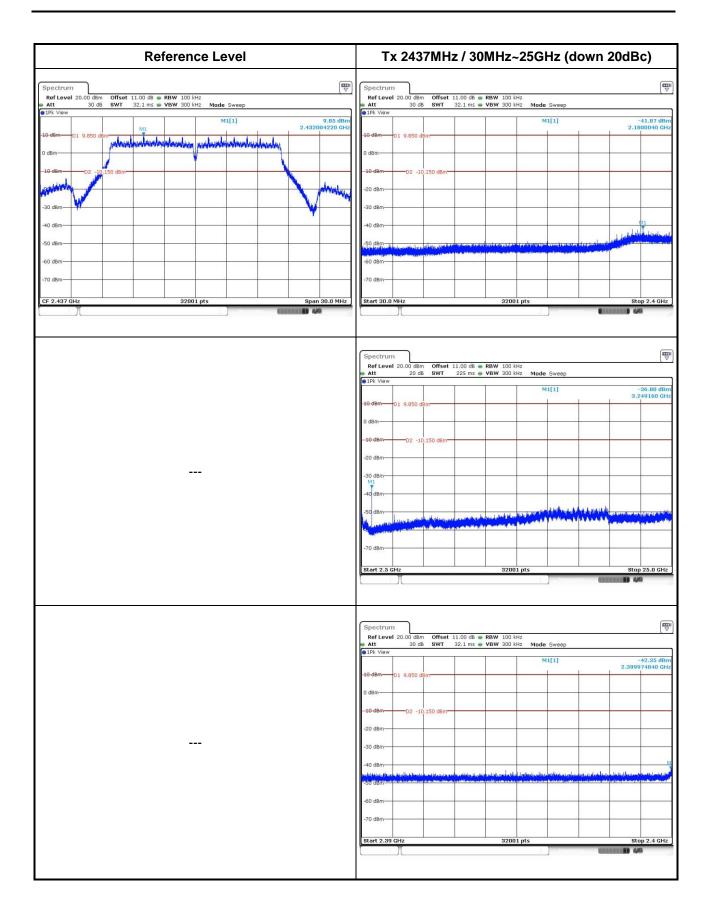
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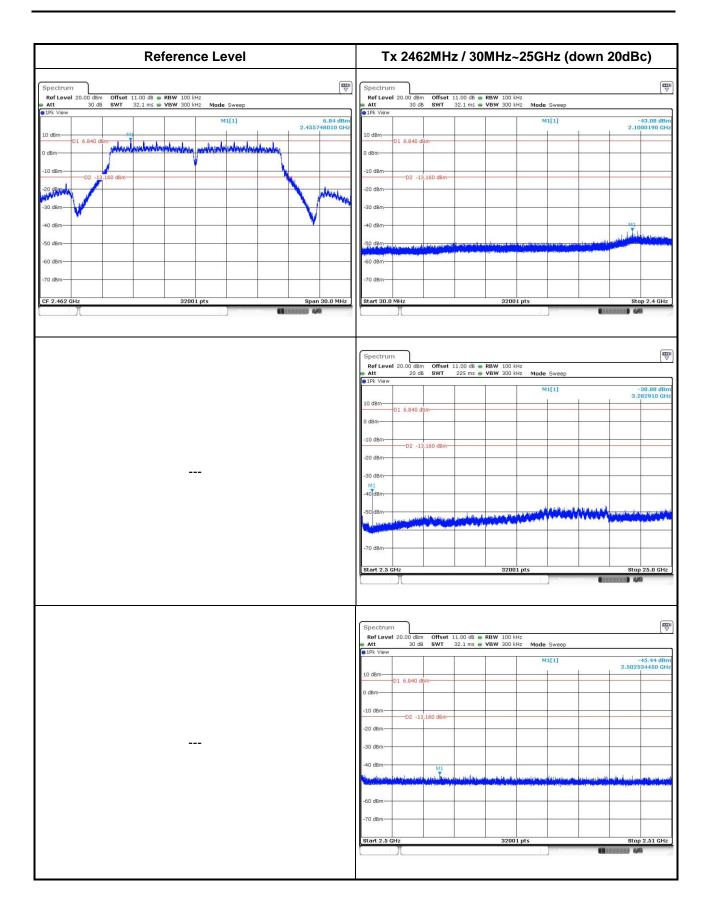
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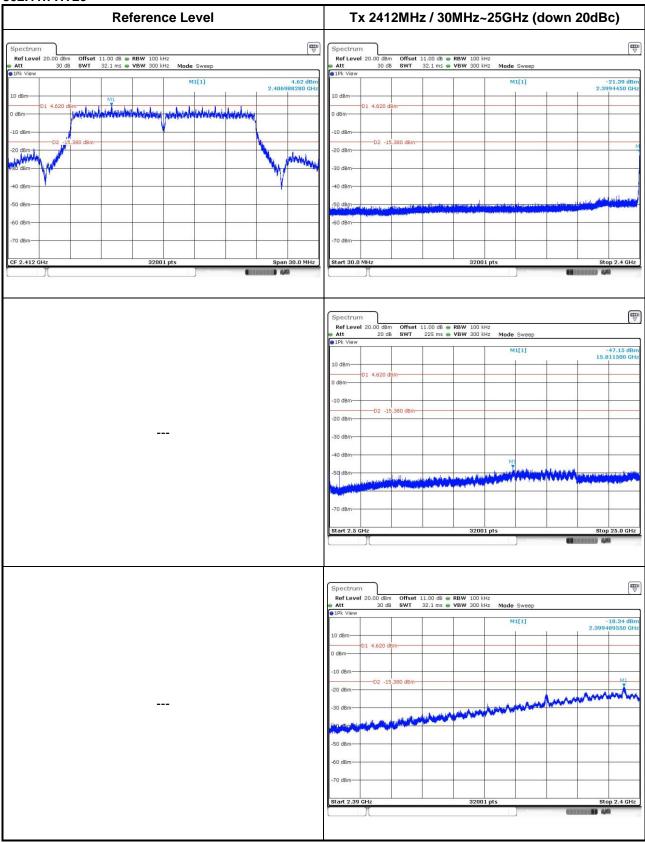




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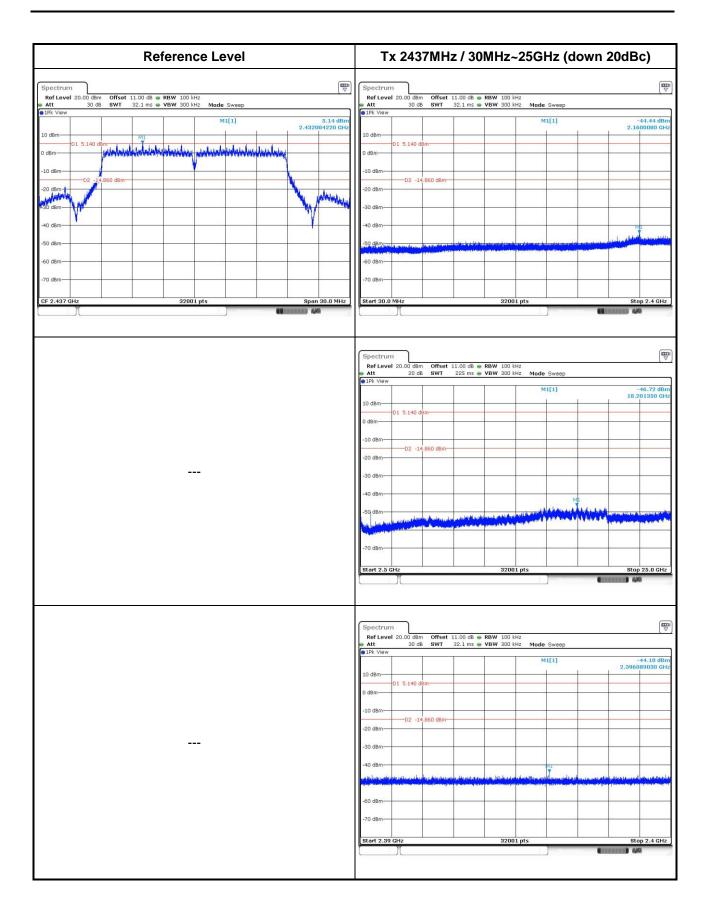


### 802.11n HT20



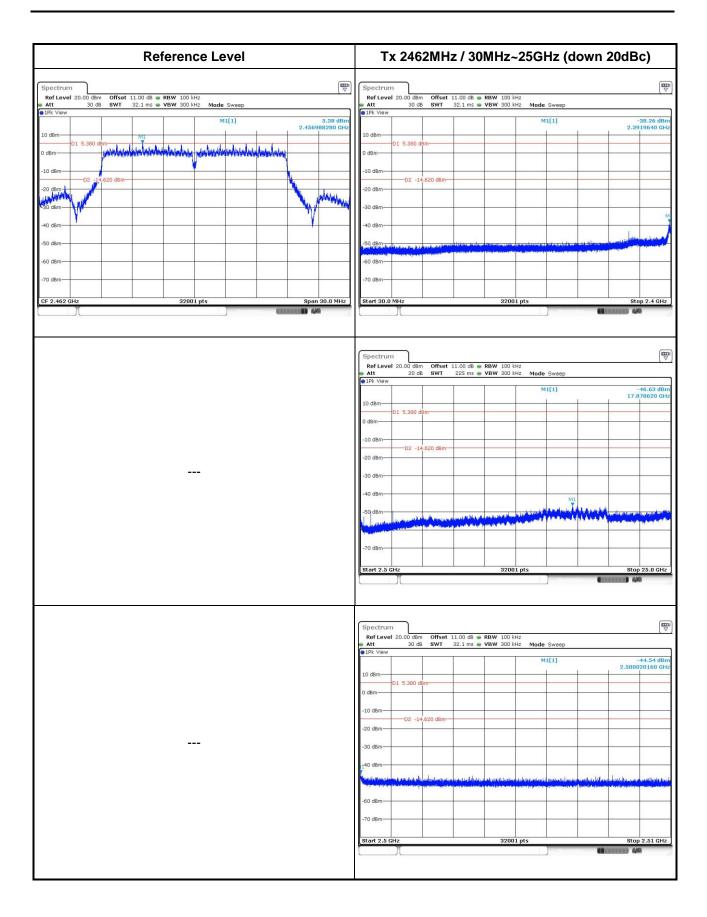
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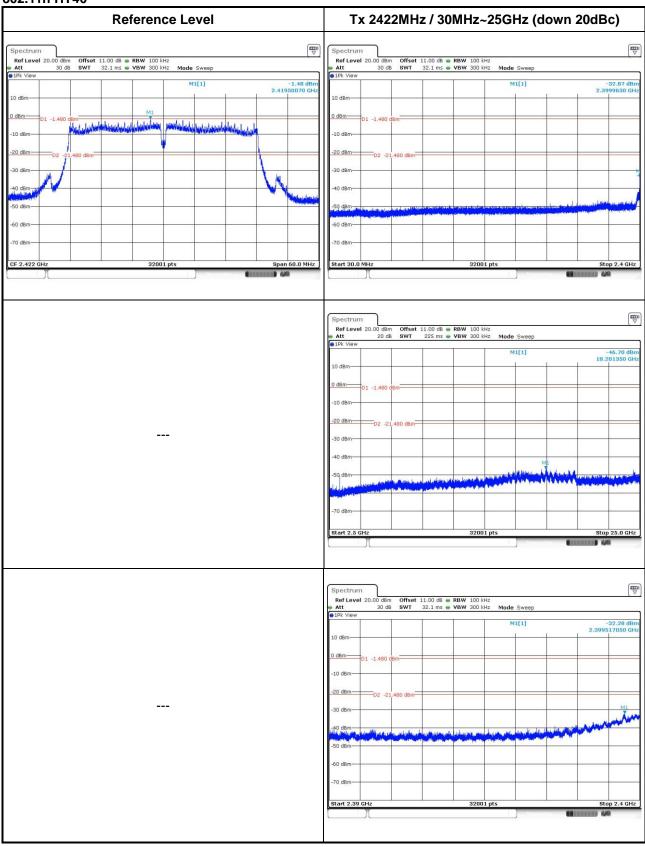




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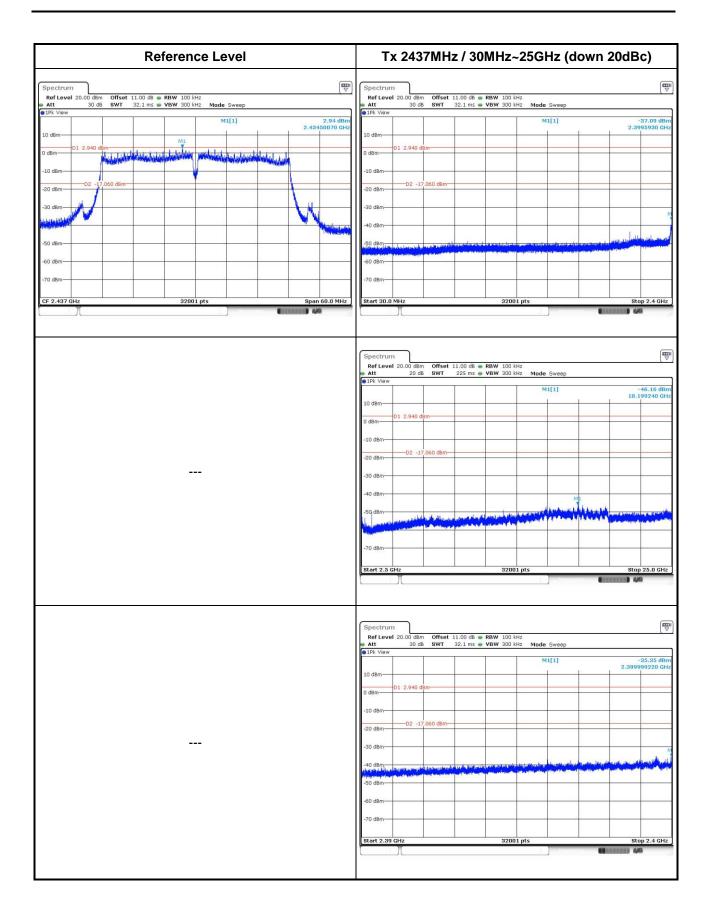


## 802.11n HT40



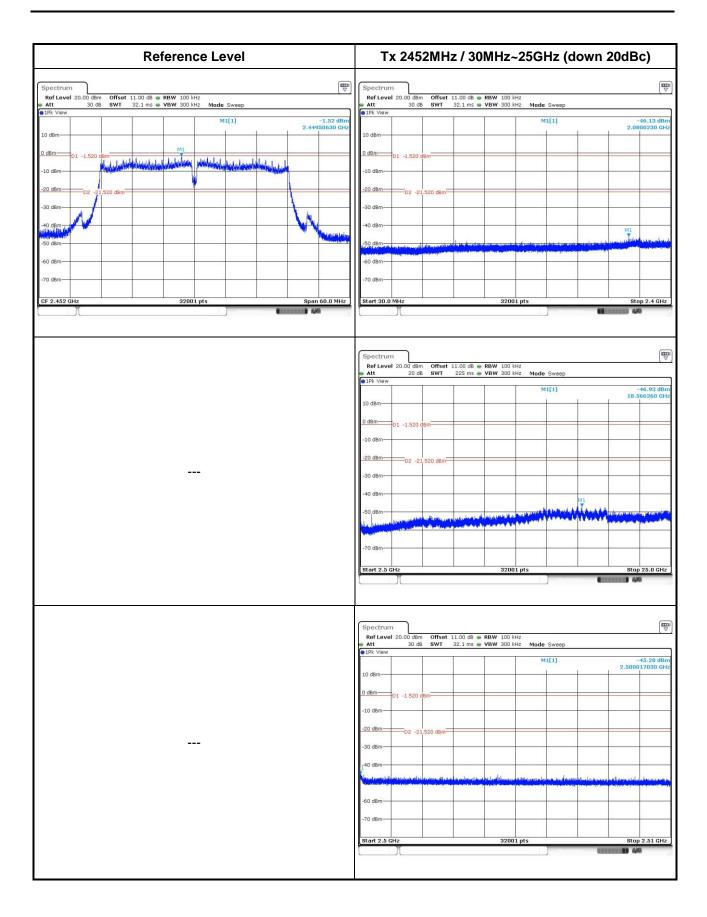
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# 4 Test laboratory information

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

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

Linkou

Tel: 886-2-2601-1640

No. 30-2, Ding Fwu Tsuen, Lin Kou District, New Taipei City, Taiwan,

R.O.C.

Kwei Shan

Tel: 886-3-271-8666 No. 3-1, Lane 6, Wen San 3rd St., Kwei Shan Hsiang, Tao Yuan Hsien 333, Taiwan, R.O.C. Kwei Shan Site II

Tel: 886-3-271-8640 No. 14-1, Lane 19, Wen San 3rd St., Kwei Shan Hsiang, Tao Yuan

Hsien 333, Taiwan, R.O.C.

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

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

Email: ICC\_Service@icertifi.com.tw

<u>==END</u>==

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