

# **FCC Test Report**

FCC ID : XNAWBP02

Equipment : IP CAM Model No. : WBP02

Brand Name : Withings
Applicant : Withings

Address : 20 rue Rouget de Lisle, Issy-les-Moulineaux,

France, 92130

Standard : 47 CFR FCC Part 15.247

Received Date : Aug. 14, 2014

Tested Date : Aug. 28 ~ Sep. 11, 2014

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

ilac-MRA



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## **Release Record**

Report No.	Version	Description	Issued Date
FR481403AC	Rev. 01	Initial issue	Sep. 24, 2014

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# **Summary of Test Results**

FCC Rules	Test Items	Measured	Result
15.207	Conducted Emissions	[dBuV]: 16.226MHz 47.69 (Margin -2.31dB) - AV	Pass
15.247(d)	Radiated Emissions	[dBuV/m at 3m]: 2483.50MHz	Pass
15.209	Naulated Lillissions	53.00 (Margin -1.00dB) - AV	rass
15.247(b)(3)	Fundamental Emission Output Power	Max Power [dBm]: 28.42	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]	2	1-11 Mbps
2400-2483.5	g	2412-2462	1-11 [11]	2	6-54 Mbps
2400-2483.5	n (HT20)	2412-2462	1-11 [11]	2	MCS 0-15
2400-2483.5	n (HT40)	2422-2452	3-9 [7]	2	MCS 0-15

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

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

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

#### 1.1.2 Antenna Details

Ant. No.	Model	Туре	Connector	Gain (dBi)	Remarks
1	WIPC-208N Ant_1_wifi_left	PIFA	IPEX	2.26	
2	WIPC-208N Ant_2_wifi_right	PIFA	IPEX	1.8	

## 1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Supply Type 5Vdc from adapter	
-------------------------------------	--

#### 1.1.4 Accessories

		Accessories
No.	Equipment	Description
		Brand Name: Ktec
		Model Name: KSAS0120500200D5
1	AC Adapter	Power Rating: I/P: 100-240Vac, 50-60Hz, 0.4A O/P: 5Vdc, 2.0A
		Power Line: 1.8m non-shielded cable w/o core

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## 1.1.5 Channel List

Frequency	band (MHz)	2400~	2483.5
802.11 b /	g / n HT20	802.11	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	MT7620QA, V1.0.6.0		
	Mode	Duty cycle (%)	Duty factor (dB)
	11b	100.00%	0.00
Duty Cycle and Duty Factor	11g	100.00%	0.00
	HT20	100.00%	0.00
	HT40	100.00%	0.00

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## 1.1.7 Power Setting

Modulation Mode	Test Frequency (MHz)	Power Set
11b	2412	14/0F
11b	2437	12/0D
11b	2462	12/0D
11g	2412	0F/0A
11g	2437	23/1C
11g	2462	13/0C
HT20	2412	0B/06
HT20	2437	23/1C
HT20	2462	13/0C
HT40	2422	08/03
HT40	2437	12/0C
HT40	2452	0E/07

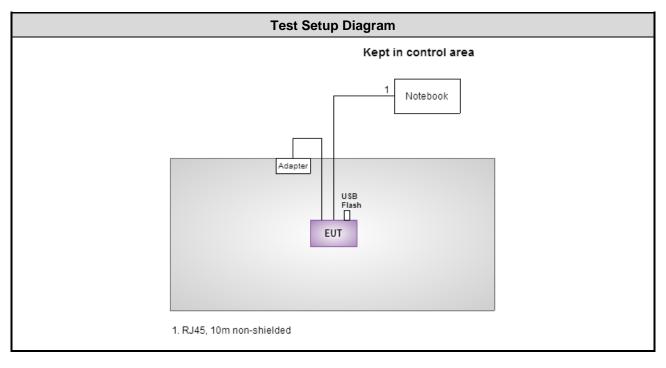
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## 1.2 Local Support Equipment List

Support Equipment List						
No.	Equipment	Brand	Model	S/N	FCC ID	Signal cable / Length (m)
1	Notebook	DELL	E6430		DoC	RJ45, 10m non-shielded.
2	USB Flash	Transcend	JetFlash V85	A61643 1071		

## 1.3 Test Setup Chart



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## 1.4 The Equipment List

(CO01-WS)  Model No.  ESCS 30  Schwarzbeck 8127	<b>Serial No.</b> 100169 8127-667	Calibration Date Oct. 15, 2013 Nov. 23, 2013	Calibration Until Oct. 14, 2014 Nov. 22, 2014
ESCS 30	100169	Oct. 15, 2013	Oct. 14, 2014
		· · · · · · · · · · · · · · · · · · ·	,
Schwarzbeck 8127	8127-667	Nov. 23, 2013	Nov. 22, 2014
Schwarzbeck 8127	8127-666	Dec. 04, 2013	Dec. 03, 2014
CFD200-NL	CFD200-NL-001	Apr. 23, 2014	Apr. 22, 2015
50	04	Apr. 18, 2014	Apr. 17, 2015
	50	50 04	

Test Item	Radiated Emission	Radiated Emission									
Test Site	966 chamber1 / (03CH	966 chamber1 / (03CH01-WS)									
Instrument	Manufacturer	Calibration Date	Calibration Until								
Spectrum Analyzer	R&S	FSV40	101498	Jan. 25, 2014	Jan. 24, 2015						
Receiver	R&S	ESR3	101658	Jan. 10, 2014	Jan. 09, 2015						
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Jan. 02, 2014	Jan. 01, 2015						
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Feb. 13, 2014	Feb. 12, 2015						
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Dec. 27, 2013	Dec. 26, 2014						
Preamplifier	Burgeon	BPA-530	SN:100219 Nov. 28, 2013		Nov. 27, 2014						
Preamplifier	Agilent	83017A	MY39501308	Dec. 16, 2013	Dec. 15, 2014						
Preamplifier	WM	TF-130N-R1	923365 Oct. 23, 2013		Oct. 22, 2014						
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16014/4	Dec. 16, 2013	Dec. 15, 2014						
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Dec. 16, 2013	Dec. 15, 2014						
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16139/4	Dec. 16, 2013	Dec. 15, 2014						
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Dec. 16, 2013	Dec. 15, 2014						
LF cable 10M	Woken	CFD400NL-LW	CFD400NL-002	Dec. 16, 2013	Dec. 15, 2014						
Note: Calibration Inte	Note: Calibration Interval of instruments listed above is one year.										

Loop Antenna	R&S	HFH2-Z2	100330	Nov. 15, 2012	Nov. 14, 2014					
Note: Calibration Inter	Note: Calibration Interval of instruments listed above is two 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. 17, 2014	Feb. 16, 2015					
Power Meter	Anritsu	ML2495A	1241002	Oct. 24, 2013	Oct. 23, 2014					
Power Sensor	Anritsu	MA2411B	1207366	Oct. 24, 2013	Oct. 23, 2014					
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 C63.10-2009

FCC KDB 558074 D01 DTS Meas Guidance v03r02

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						
Frequency error	±34.134 Hz						
Temperature	±0.6 °C						
Conducted emission	±2.670 dB						
AC conducted emission	±2.92 dB						
Radiated emission ≤ 1GHz	±3.26 dB						
Radiated emission > 1GHz	±4.94 dB						

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## 2 Test Configuration

## 2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
AC Conduction	CO01-WS	22°C / 62%	Skys Huang
Radiated Emissions	03CH01-WS	21-22°C / 60-68%	Anderson Hong Aska Huang
RF Conducted	TH01-WS	22°C / 63%	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	
Fundamental Emission 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	

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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



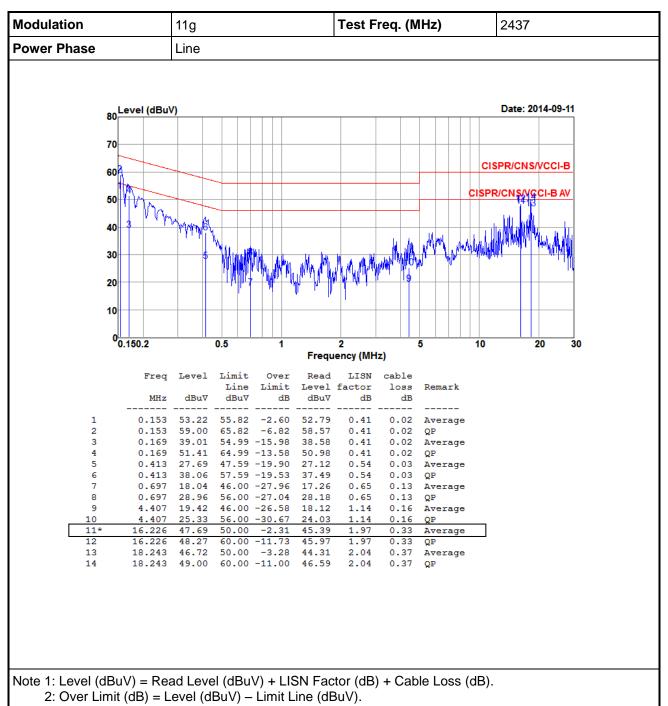
Note: 1. Support units were connected to second LISN.

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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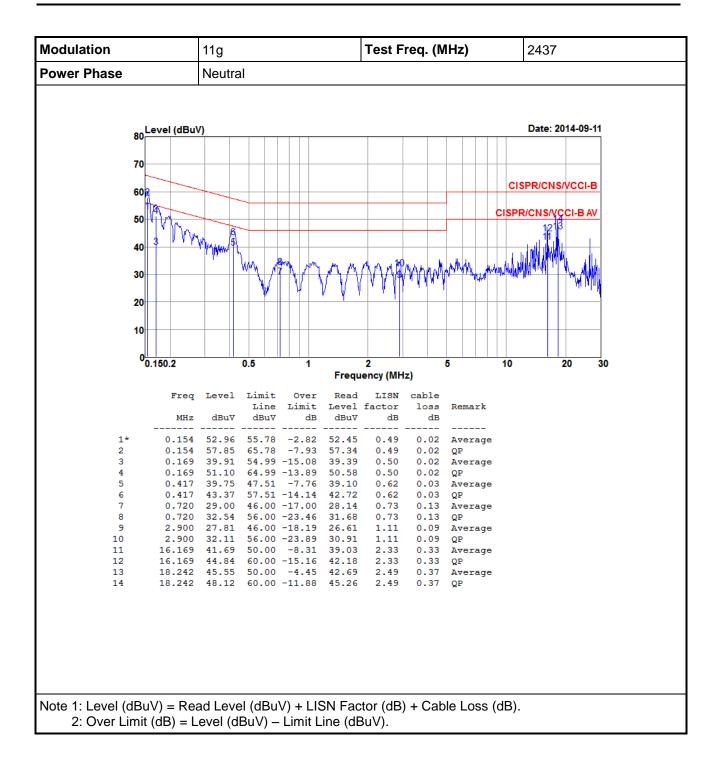


#### 3.1.4 Test Result of Conducted Emissions



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## 3.2 6dB and Occupied Bandwidth

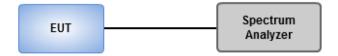
#### 3.2.1 Limit of 6dB Bandwidth

The minimum 6dB bandwidth shall be at least 500 kHz.

#### 3.2.2 Test Procedures

- 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.

### 3.2.3 Test Setup

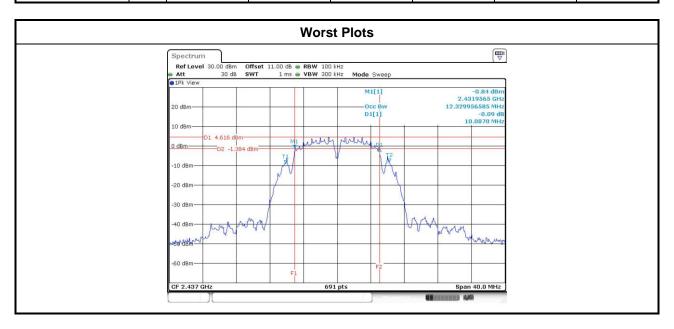


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## 3.2.4 Test Result of 6dB and Occupied Bandwidth

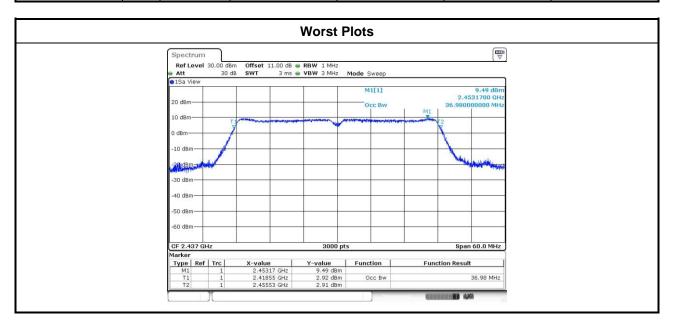
Modulation	N	Eros (MU=)		Limit (kHz)			
Mode	N <sub>TX</sub>	Freq. (MHz)	Chain 0	Chain 1	Chain 2	Chain 3	Lilliit (KHZ)
11b	2	2412	10.09	10.09			500
11b	2	2437	10.09	10.09			500
11b	2	2462	10.09	10.09			500
11g	2	2412	16.64	16.58			500
11g	2	2437	16.52	16.52			500
11g	2	2462	16.64	16.64			500
HT20	2	2412	17.74	17.74			500
HT20	2	2437	17.80	17.80			500
HT20	2	2462	17.68	17.74			500
HT40	2	2422	36.64	36.64			500
HT40	2	2437	36.64	36.64			500
HT40	2	2452	36.64	36.64			500



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Modulation	N	Freq.		99% Occupied E	Bandwidth (MHz)	
Mode	$N_{TX}$ (MH		Chain 0	Chain 1	Chain 2	Chain 3
11b	2	2412	12.34	12.33		
11b	2	2437	12.32	12.23		
11b	2	2462	12.29	12.28		
11g	2	2412	16.89	16.88		
11g	2	2437	19.89	17.94		
11g	2	2462	17.05	17.02		
HT20	2	2412	17.67	17.69		
HT20	2	2437	20.43	19.10		
HT20	2	2462	17.69	17.69		
HT40	2	2422	36.90	36.88		
HT40	2	2437	36.92	36.98		
HT40	2	2452	36.88 36.96			



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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

- 1. A broadband Peak RF power meter is used for output power measurement. The video bandwidth of power meter is greater than DTS bandwidth of EUT. If duty cycle of test signal is not 100 %, trigger and gating function of power meter will be enabled to capture transmission burst for measuring output power.
- Maximum Conducted Output Power (For reference only)

#### Nower meter

1. A broadband Average RF power meter is used for output power measurement. The video bandwidth of power meter is greater than DTS bandwidth of EUT. If duty cycle of test signal is not 100 %, trigger and gating function of power meter will be enabled to capture transmission burst for measuring output power.

#### 3.3.3 Test Setup



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## 3.3.4 Test Result of Maximum Output Power

Modulation Mode	N <sub>TX</sub>	Freq.	Peak	Peak conducted output power (dBm)			Total Power	Total Power	Limit
Wode		(MHz)	Chain 0	Chain 1	Chain 2	Chain 3	(mW)	(dBm)	(dBm)
11b	2	2412	18.64	19.32			158.621	22.00	30.00
11b	2	2437	17.96	18.53			133.803	21.26	30.00
11b	2	2462	17.89	18.67			135.138	21.31	30.00
11g	2	2412	23.81	23.91			486.473	26.87	30.00
11g	2	2437	25.08	25.72			695.357	28.42	30.00
11g	2	2462	23.79	24.11			496.964	26.96	30.00
HT20	2	2412	21.29	21.80			285.942	24.56	30.00
HT20	2	2437	25.12	25.58			686.497	28.37	30.00
HT20	2	2462	22.70	23.01			386.195	25.87	30.00
HT40	2	2422	19.44	20.32			195.549	22.91	30.00
HT40	2	2437	23.01	23.52			424.892	26.28	30.00
HT40	2	2452	21.66	21.93			302.510	24.81	30.00

Modulation Mode	N <sub>TX</sub>	Freq.	Conduc	Conducted (average) output power (dBm)				Total Power	Limit
Wiode		(IVITIZ)	Chain 0	Chain 1	Chain 2	Chain 3	(mW)	(dBm)	(dBm)
11b	2	2412	15.39	15.76			72.264	18.59	30.00
11b	2	2437	14.45	14.94			59.050	17.71	30.00
11b	2	2462	14.64	15.21			62.297	17.94	30.00
11g	2	2412	14.90	15.49			66.303	18.22	30.00
11g	2	2437	21.05	20.80			247.577	23.94	30.00
11g	2	2462	15.92	16.09			79.728	19.02	30.00
HT20	2	2412	13.19	13.61			43.806	16.42	30.00
HT20	2	2437	21.16	20.90			253.644	24.04	30.00
HT20	2	2462	14.58	15.02			60.477	17.82	30.00
HT40	2	2422	11.20	11.92			28.742	14.59	30.00
HT40	2	2437	15.25	15.72			70.822	18.50	30.00
HT40	2	2452	13.30	13.76			45.148	16.55	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.
  - 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



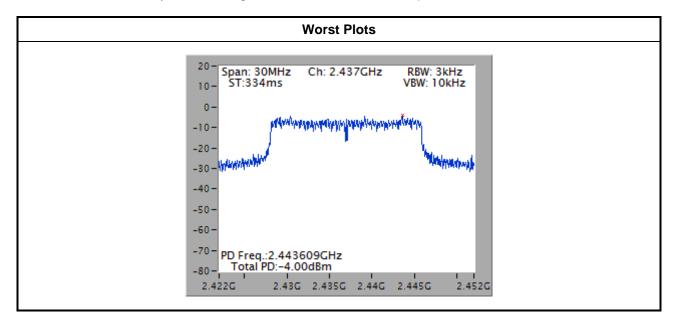
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## 3.4.4 Test Result of Power Spectral Density

Modulation Mode	N <sub>TX</sub>	Freq. (MHz)	Total Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
11b	2	2412	-9.53	8.00
11b	2	2437	-11.45	8.00
11b	2	2462	-11.88	8.00
11g	2	2412	-11.07	8.00
11g	2	2437	-4.57	8.00
11g	2	2462	-6.97	8.00
HT20	2	2412	-11.71	8.00
HT20	2	2437	-4.00	8.00
HT20	2	2462	-10.84	8.00
HT40	2	2422	-14.07	8.00
HT40	2	2437	-11.74	8.00
HT40	2	2452	-12.60	8.00

Note: Test result 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

- 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 a height of 0.8 m test table above the ground plane.
- 2. Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m ~ 4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3 m.
- 3. This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

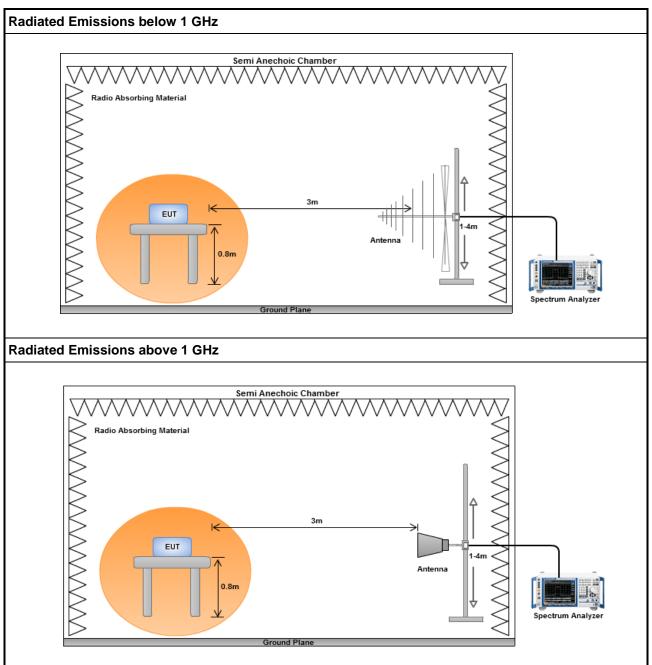
#### Note:

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

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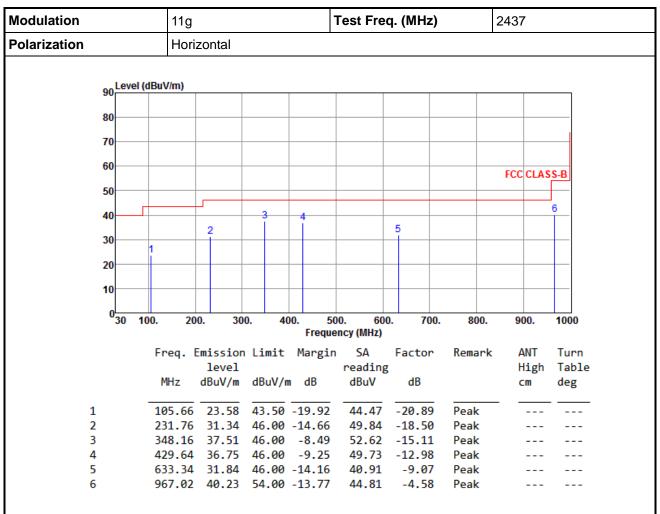
## 3.5.3 Test Setup



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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)

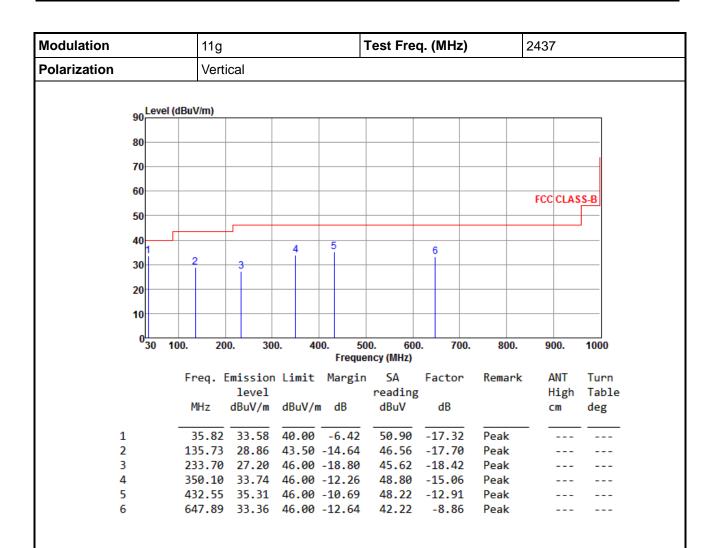
\*Factor includes antenna factor, cable loss and amplifier gain

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

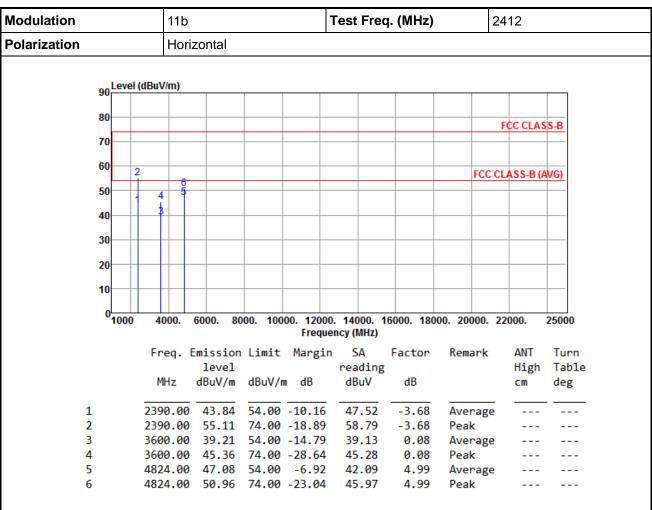
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

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



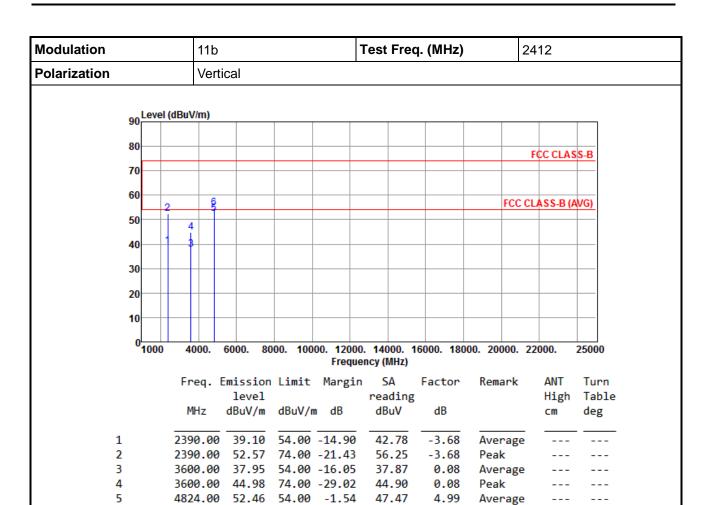
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor\* (dB)

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

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

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49.93

4.99

Peak

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

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

4824.00 54.92 74.00 -19.08

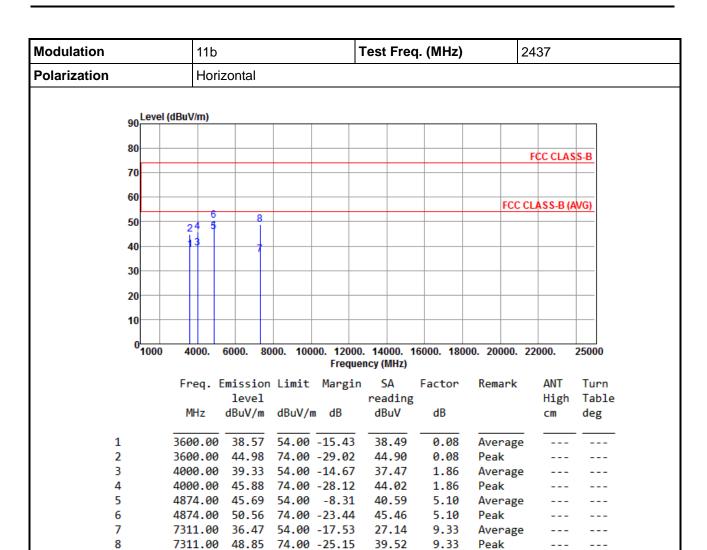
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

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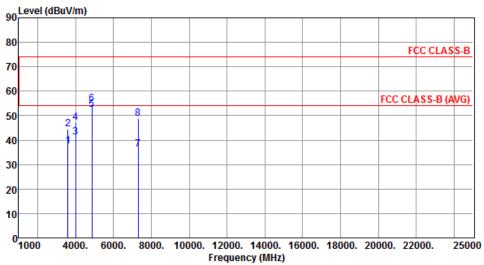
\*Factor includes antenna factor, cable loss and amplifier gain

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

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Modulation	11b	Test Freq.	(MHz)	24	37		
Polarization	Vertical						
90 Level (dBi	ıV/m)						

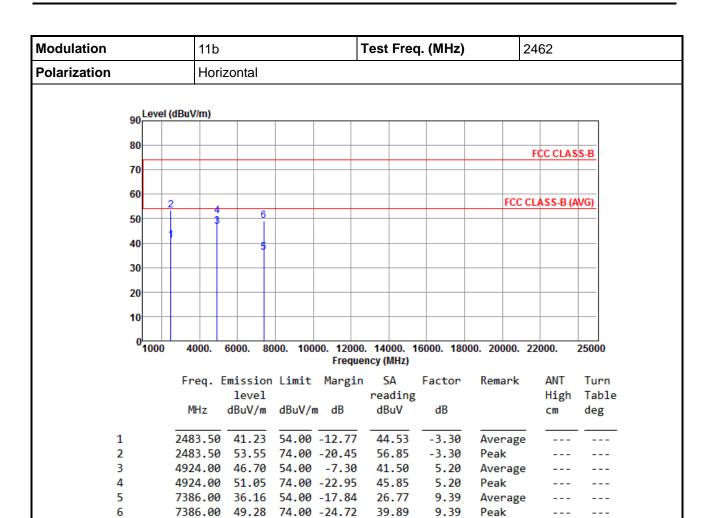


	•	Emission level		Ū	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		CM	deg
1	3600.00	37.57	54.00	-16.43	37.49	0.08	Average		
2	3600.00	44.62	74.00	-29.38	44.54	0.08	Peak		
3	4000.00	41.22	54.00	-12.78	39.36	1.86	Average		
4	4000.00	47.05	74.00	-26.95	45.19	1.86	Peak		
5	4874.00	52.46	54.00	-1.54	47.36	5.10	Average		
6	4874.00	54.67	74.00	-19.33	49.57	5.10	Peak		
7	7311.00	36.28	54.00	-17.72	26.95	9.33	Average		
8	7311.00	48.76	74.00	-25.24	39.43	9.33	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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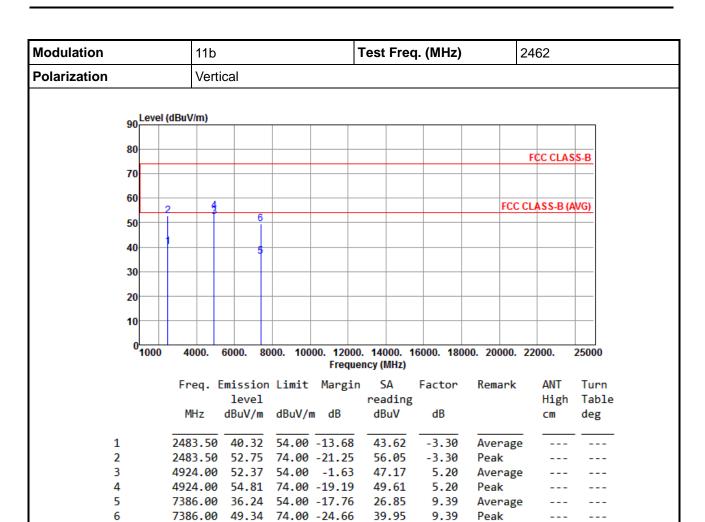


Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor\* (dB) \*Factor includes antenna factor, cable loss and amplifier gain

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

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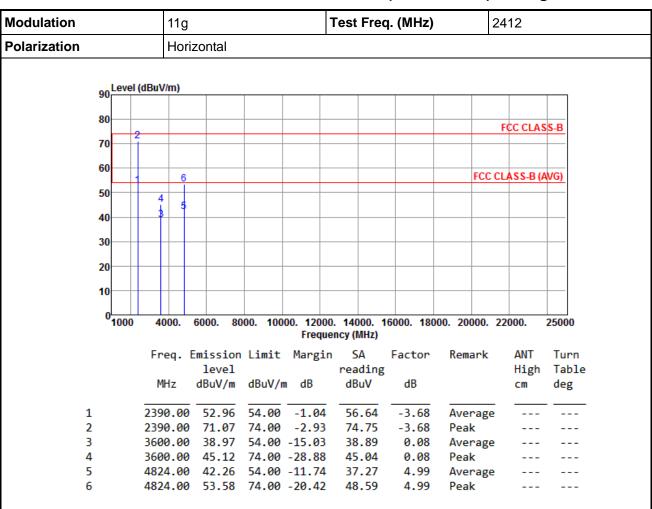
\*Factor includes antenna factor, cable loss and amplifier gain

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

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### 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 <b>Test Freq. (MHz)</b> 2412								
Polarization			Vertical								
	90 Leve	el (dBu\	//m)								
	80										
	70									FCC CLAS	SS-B
		2									
	60		6						FCC	CLASS-B (A	AVG)
	50	1 4	1 5								
	40	-									
	30										
	20										
	10										
	01000	) 4	000.	6000.	8000. 10		). 14000. ency (MHz)	16000. 180	00. 20000.	22000.	25000
		Fr	eq.	Emissio	on Limit	Margir	s SA	Factor	Remark	ANT	Turn
				level	_	/ JD	reading			High	
		ľ	1Hz	aBuV/n	n dBuV/	m dB	dBuV	dB		cm	deg
1				48.12		-5.88	51.80	-3.68	Average		
2			00.00				69.07	-3.68	Peak		
3 4						-16.16 -29.14	37.76 44.78	0.08 0.08	Average Peak		
5						9 -29.14		4.99	Average		
6						18.37	50.64	4.99	Peak		

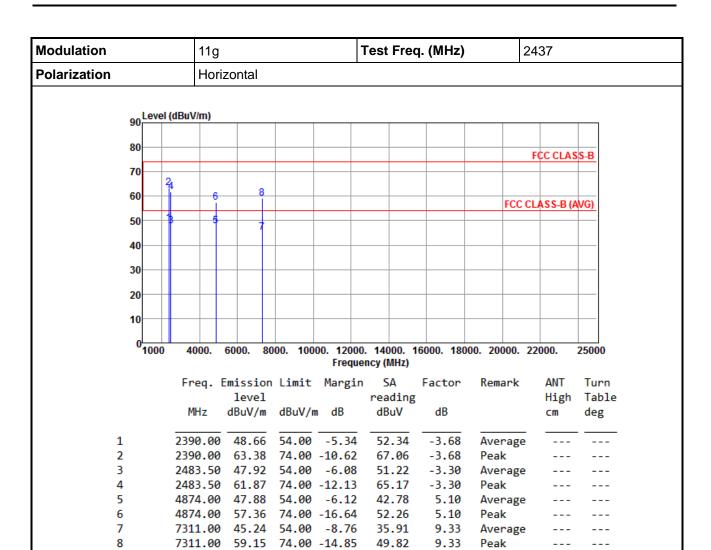
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor\* (dB) \*Factor includes antenna factor, cable loss and amplifier gain

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

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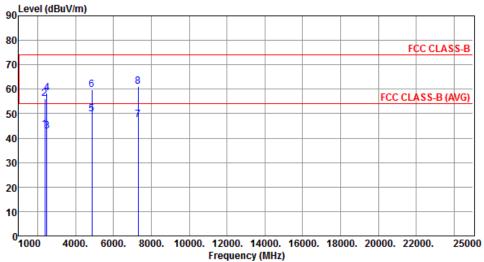
\*Factor includes antenna factor, cable loss and amplifier gain

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

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Modulation	11g	Test Freq. (MHz)	2437
Polarization	Vertical		
oo Level (dBuV	//m)		

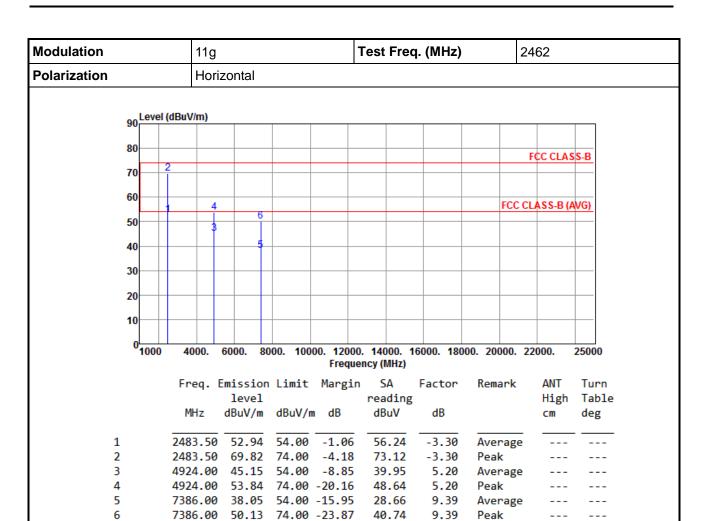


	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2390.00	43.61	54.00	-10.39	47.29	-3.68	Average		
2	2390.00	56.20	74.00	-17.80	59.88	-3.68	Peak		
3	2483.50	42.85	54.00	-11.15	46.15	-3.30	Average		
4	2483.50	58.34	74.00	-15.66	61.64	-3.30	Peak		
5	4874.00	49.94	54.00	-4.06	44.84	5.10	Average		
6	4874.00	59.64	74.00	-14.36	54.54	5.10	Peak		
7	7311.00	47.35	54.00	-6.65	38.02	9.33	Average		
8	7311.00	61.26	74.00	-12.74	51.93	9.33	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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5

Modulation		11	g				Test Fred	q. (MHz)	2	2462	
Polarization		Ve	ertica	al		1			•		
!	90 Lev	el (dBuV/m)		1							
	80-										
,										FCC CLAS	S-B
	70	2									
	60		4								
	_		<del>-</del>	6					FCC	CLASS-B (A	WG)
	50		3								
	40		+	- 5							
	30-										
,	,										
	20										
	10										
	0 100	0 4000	. 60	00. 80	000. 100			6000. 180	00. 20000.	22000.	25000
						-	ency (MHz)				
		Freq			Limit	Margi	n SA	Factor	Remark	ANT	Turn
		MII		level	JD: 377-	4D	reading			High	Table
		MHz	a	buV/M	dBuV/n	i as	dBuV	dB		cm	deg
1		2483.5	50	46.02	54.00	-7.98	49.32	-3.30	Average		
2					74.00			-3.30	Peak		
3					54.00			5.20	Average		
					74 00	40 04	E0 70				

5.20

9.39

9.39

28.77

Peak

Peak

Average

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

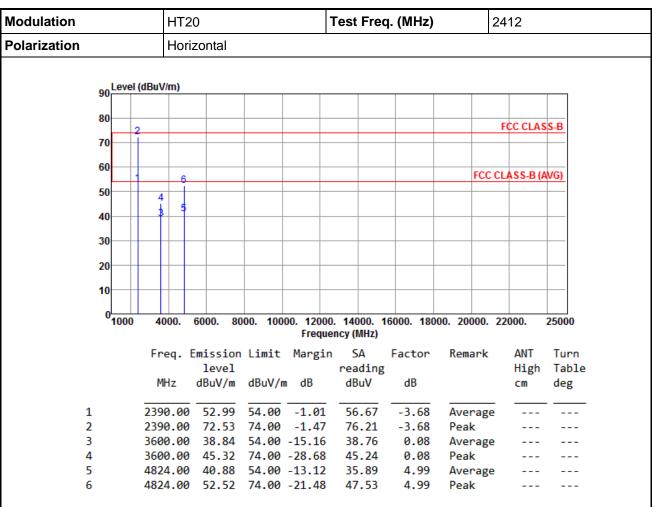
4924.00 55.99 74.00 -18.01 50.79 7386.00 38.16 54.00 -15.84 28.77 7386.00 49.78 74.00 -24.22 40.39

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)

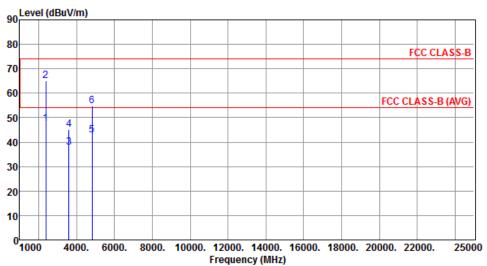
\*Factor includes antenna factor, cable loss and amplifier gain

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

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Modulation	HT20	Test Freq. (MHz)	2412
Polarization	Vertical		



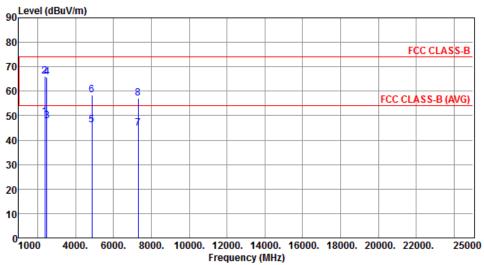
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2390.00	47.36	54.00	-6.64	51.04	-3.68	Average		
2	2390.00	65.15	74.00	-8.85	68.83	-3.68	Peak		
3	3600.00	37.91	54.00	-16.09	37.83	0.08	Average		
4	3600.00	45.17	74.00	-28.83	45.09	0.08	Peak		
5	4824.00	42.92	54.00	-11.08	37.93	4.99	Average		
6	4824.00	54.64	74.00	-19.36	49.65	4.99	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		
Level (dBu)	//m\		



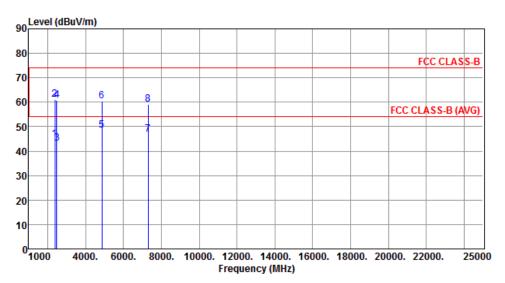
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	J	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	49.47	54.00	-4.53	53.15	-3.68	Average		
2	2390.00		74.00	-7.93	69.75	-3.68	Peak		
3	2483.50	47.91	54.00	-6.09	51.21	-3.30	Average		
4	2483.50	65.70	74.00	-8.30	69.00	-3.30	Peak		
5	4874.00	46.24	54.00	-7.76	41.14	5.10	Average		
6	4874.00	58.52	74.00	-15.48	53.42	5.10	Peak		
7	7311.00	44.73	54.00	-9.27	35.40	9.33	Average		
8	7311.00	57.20	74.00	-16.80	47.87	9.33	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		

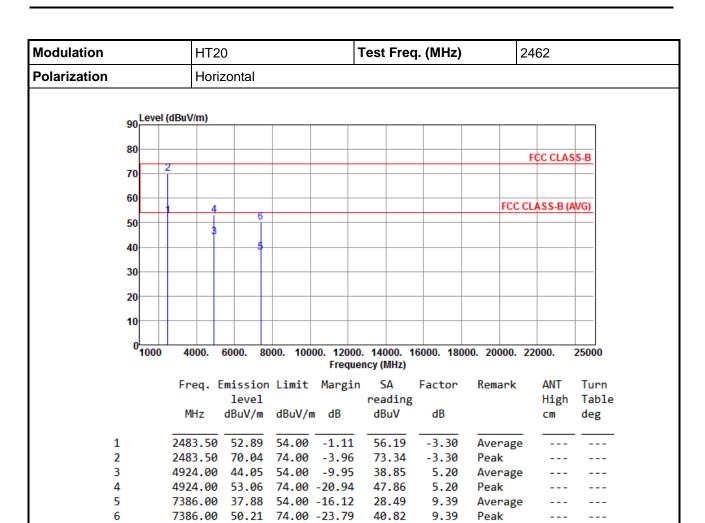


	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2390.00	44.96	54.00	-9.04	48.64	-3.68	Average		
2	2390.00	61.19	74.00	-12.81	64.87	-3.68	Peak		
3	2483.50	43.23	54.00	-10.77	46.53	-3.30	Average		
4	2483.50	60.77	74.00	-13.23	64.07	-3.30	Peak		
5	4874.00	48.49	54.00	-5.51	43.39	5.10	Average		
6	4874.00	60.56	74.00	-13.44	55.46	5.10	Peak		
7	7311.00	46.87	54.00	-7.13	37.54	9.33	Average		
8	7311.00	59.24	74.00	-14.76	49.91	9.33	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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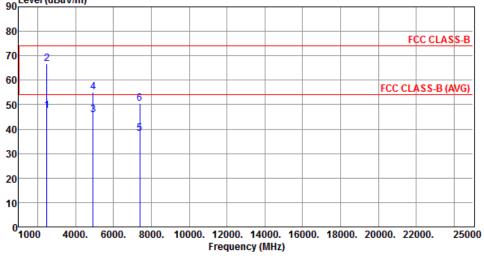
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor\* (dB) \*Factor includes antenna factor, cable loss and amplifier gain

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

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Modulation		HT20	HT20				Test Freq. (MHz)			2462		
Polarization		Vertical										
90	Level (dBı	ıV/m)										



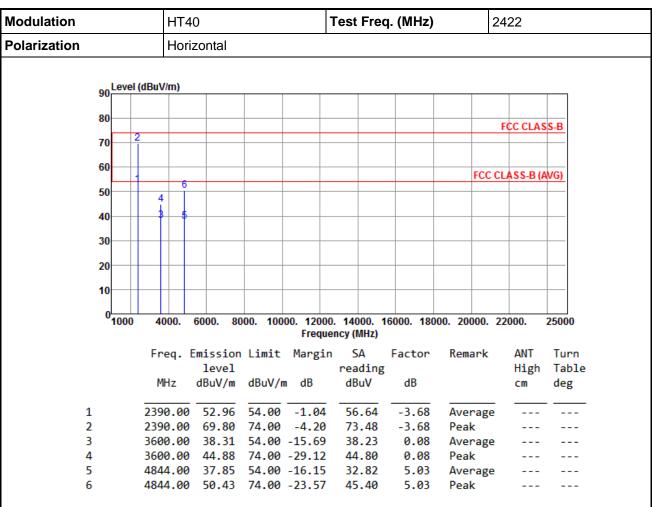
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2483.50	47.37	54.00	-6.63	50.67	-3.30	Average		
2	2483.50	66.88	74.00	-7.12	70.18	-3.30	Peak		
3	4924.00	46.00	54.00	-8.00	40.80	5.20	Average		
4	4924.00	55.13	74.00	-18.87	49.93	5.20	Peak		
5	7386.00	38.10	54.00	-15.90	28.71	9.39	Average		
6	7386.00	50.48	74.00	-23.52	41.09	9.39	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)

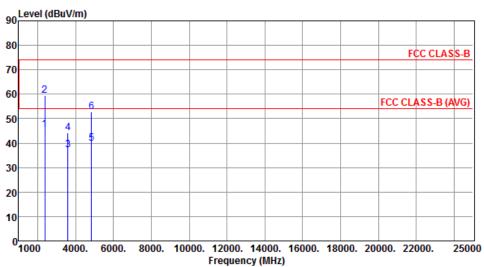
\*Factor includes antenna factor, cable loss and amplifier gain

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

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Modulation	HT40	Test Freq. (MHz)	2422
Polarization	Vertical		

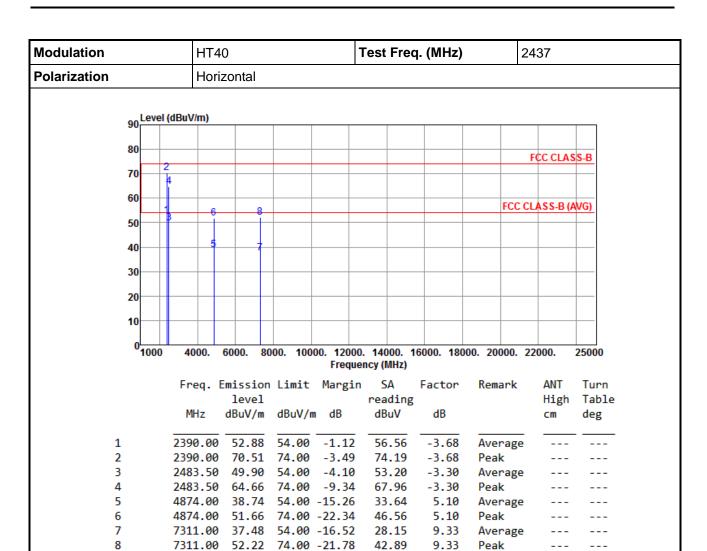


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Ū	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	45.40	54.00	-8.60	49.08	-3.68	Average		
2	2390.00		74.00		63.12	-3.68	Peak		
3	3600.00				37.16	0.08	Average		
4	3600.00		74.00		44.20	0.08	Peak		
5	4844.00	39.79	54.00	-14.21	34.76	5.03	Average		
6	4844.00	52.65	74.00	-21.35	47.62	5.03	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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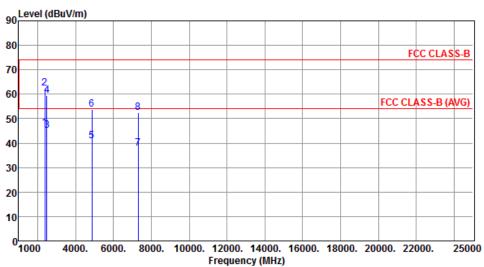
\*Factor includes antenna factor, cable loss and amplifier gain

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

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Modulation	HT40	Test Freq. (MHz)	2437
Polarization	Vertical		

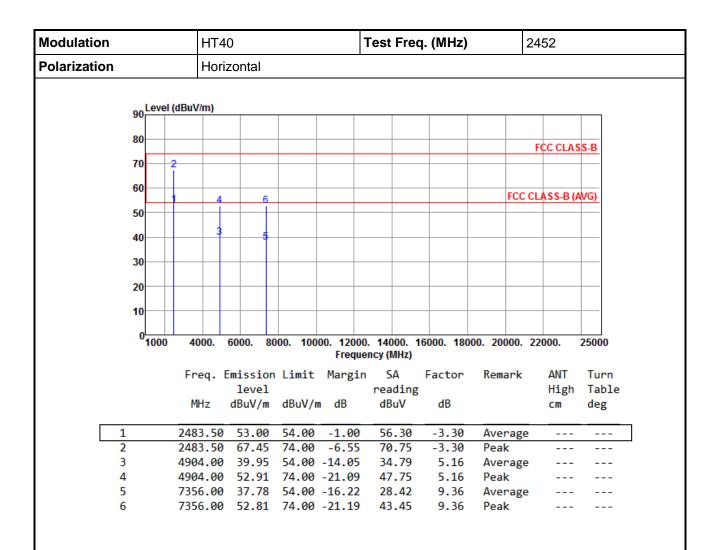


		Emission level		Ū	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2390.00	46.11	54.00	-7.89	49.79	-3.68	Average		
2	2390.00	62.38	74.00	-11.62	66.06	-3.68	Peak		
3	2483.50	45.17	54.00	-8.83	48.47	-3.30	Average		
4	2483.50	59.38	74.00	-14.62	62.68	-3.30	Peak		
5	4874.00	40.95	54.00	-13.05	35.85	5.10	Average		
6	4874.00	53.79	74.00	-20.21	48.69	5.10	Peak		
7	7311.00	37.76	54.00	-16.24	28.43	9.33	Average		
8	7311.00	52.56	74.00	-21.44	43.23	9.33	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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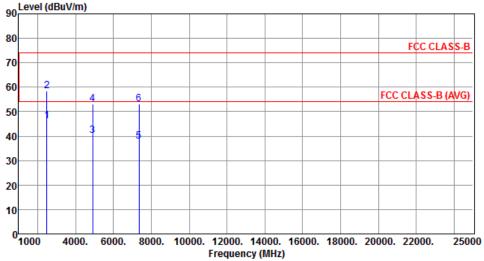
\*Factor includes antenna factor, cable loss and amplifier gain

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

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



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Ū	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	46.03	54.00	-7.97	49.33	-3.30	Average		
2		58.60			61.90	-3.30	Peak		
3	4904.00	40.12	54.00	-13.88	34.96	5.16	Average		
4	4904.00	53.06	74.00	-20.94	47.90	5.16	Peak		
5	7356.00	37.89	54.00	-16.11	28.53	9.36	Average		
6	7356.00	52.98	74.00	-21.02	43.62	9.36	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

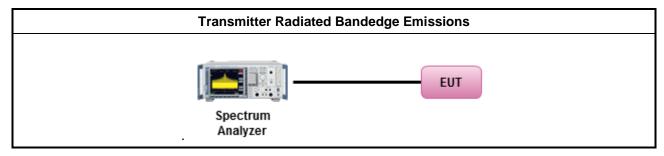
#### Reference level measurement

- 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**

- 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

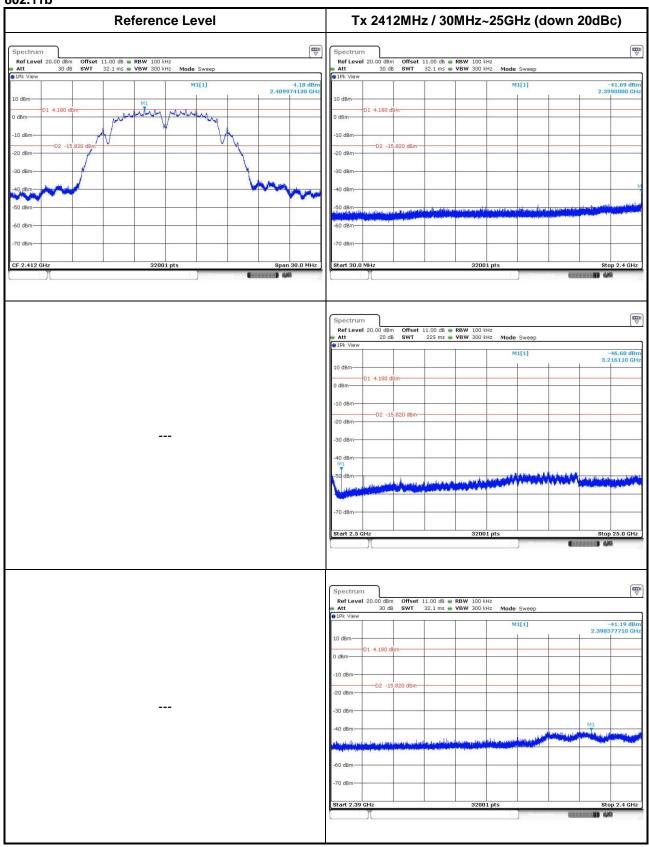
This test item is performed on each TX output individually without summing or adding 10  $log(N_{ANT})$  since measurements are made relative to the in-band emissions on the individual outputs. Only worst test result of each operating mode is presented.

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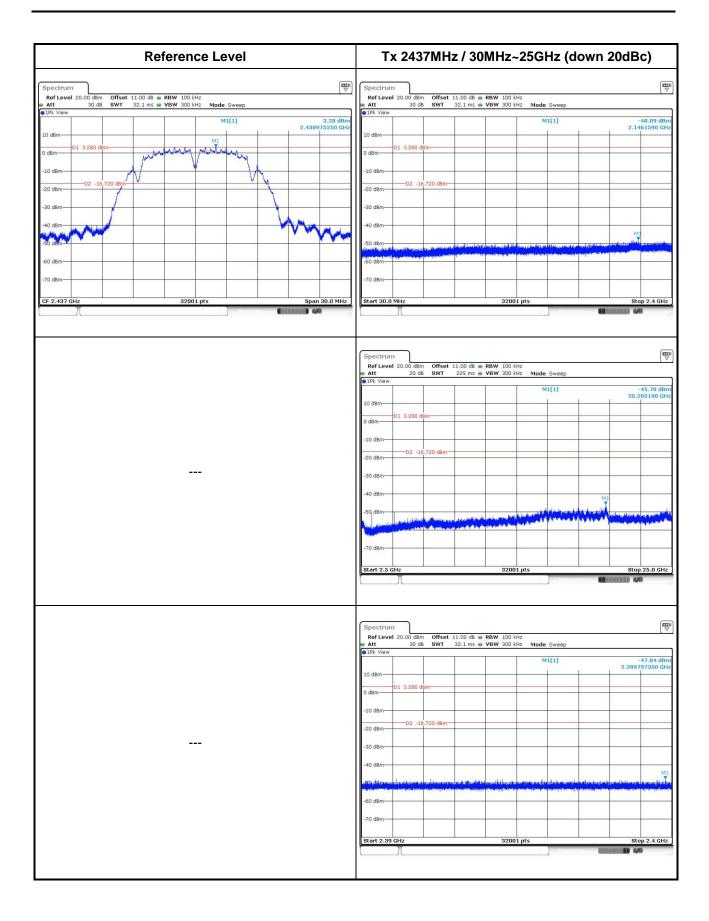
### 3.6.6 Unwanted Emissions into Non-Restricted Frequency Bands

### 802.11b



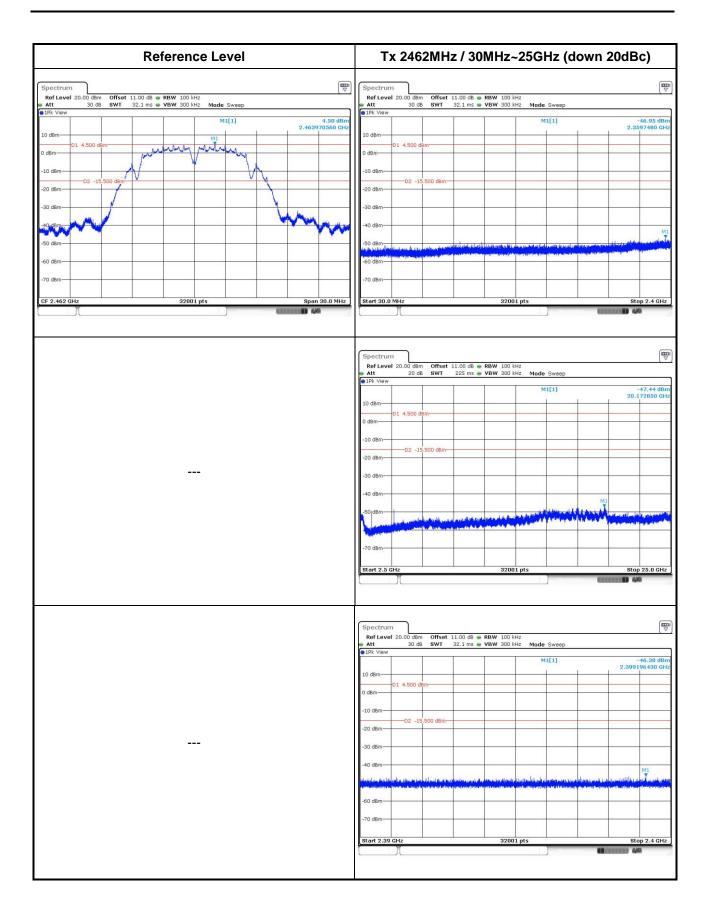
Report No.: FR481403AC Report Version: Rev. 01





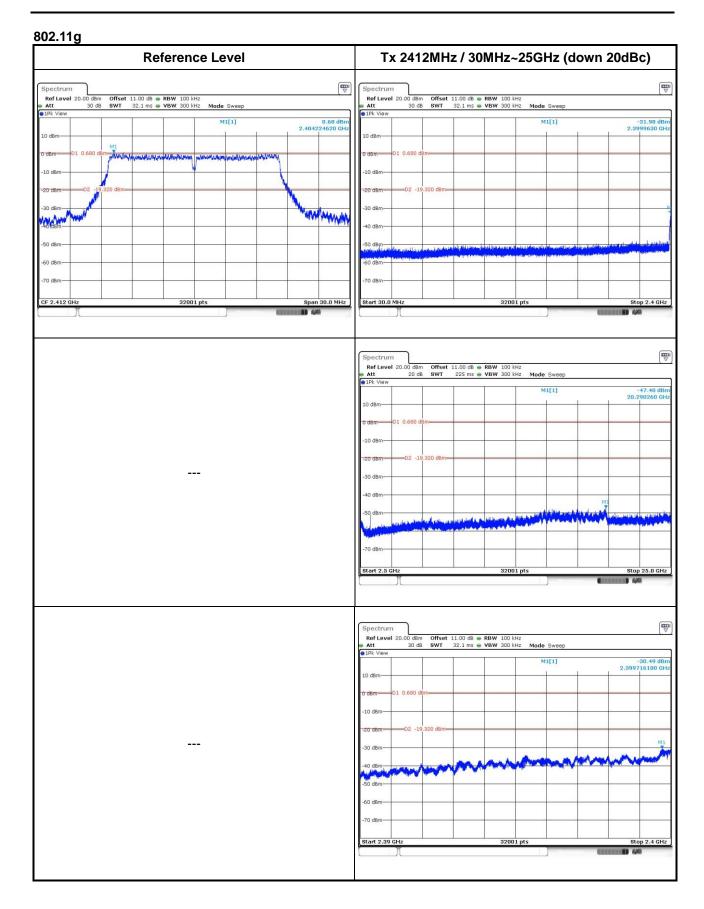
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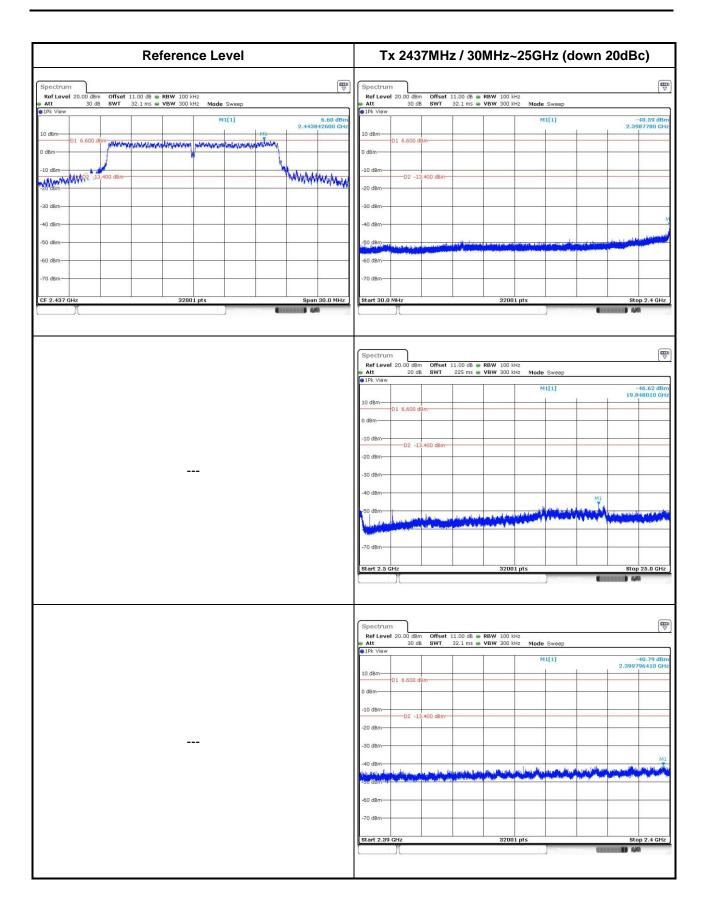
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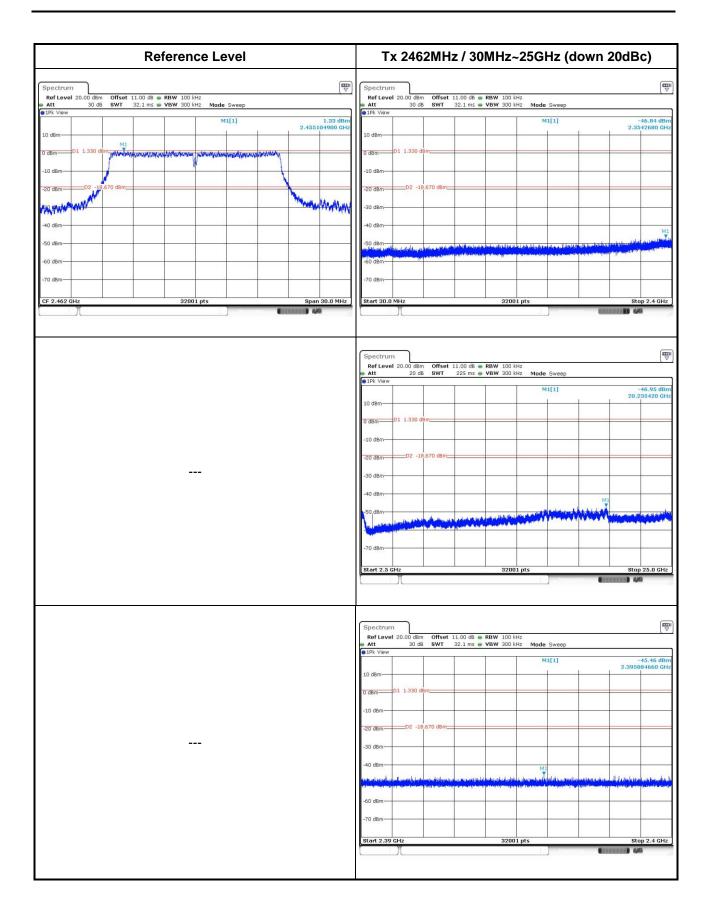
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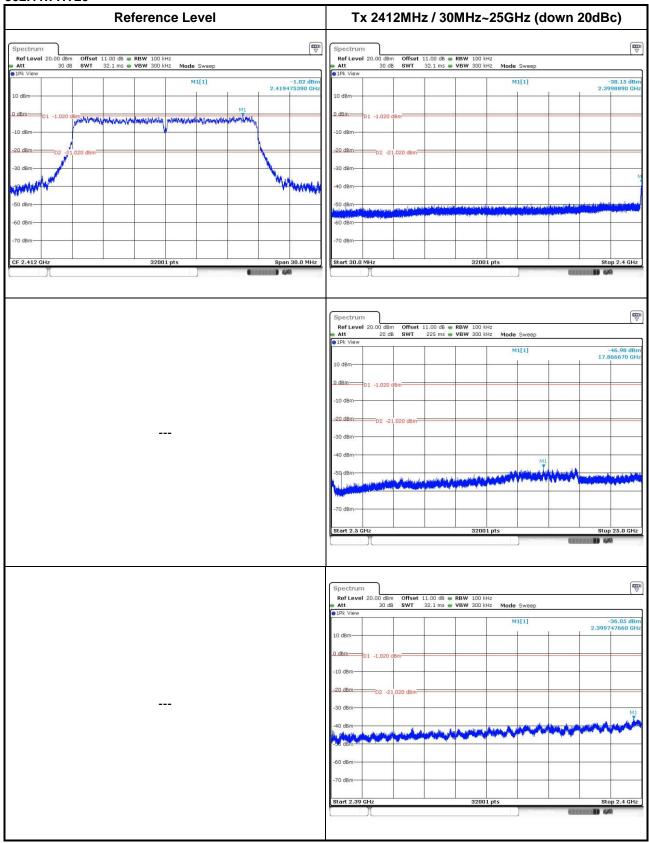




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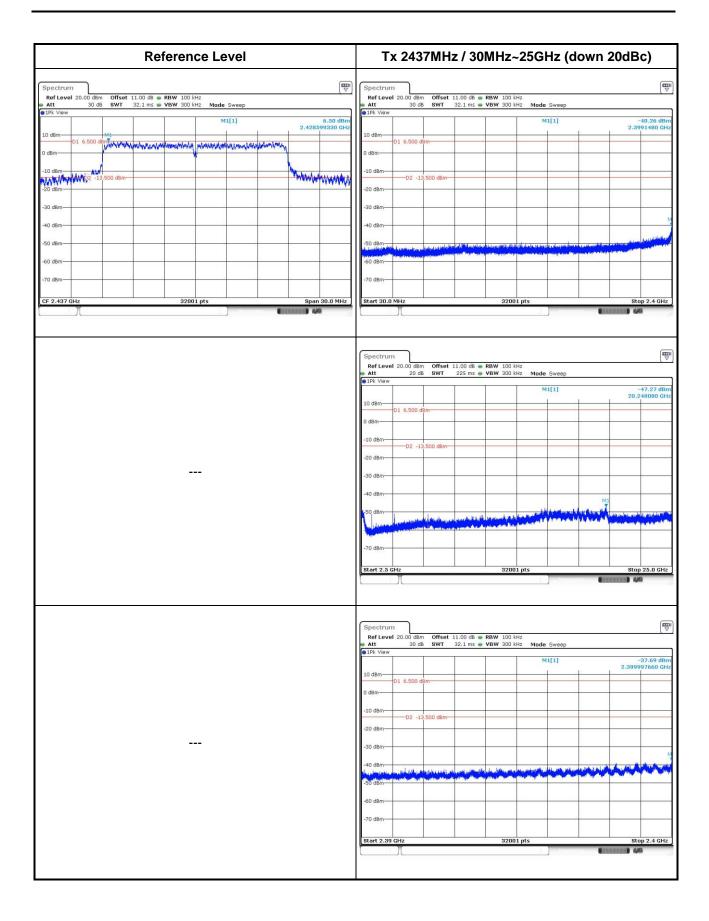


## 802.11n HT20



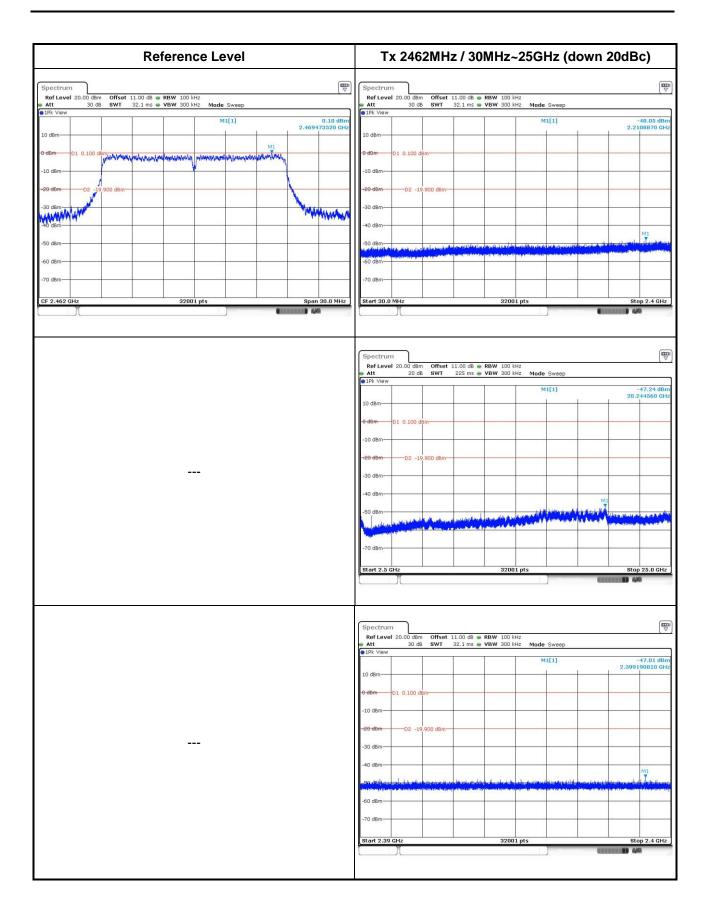
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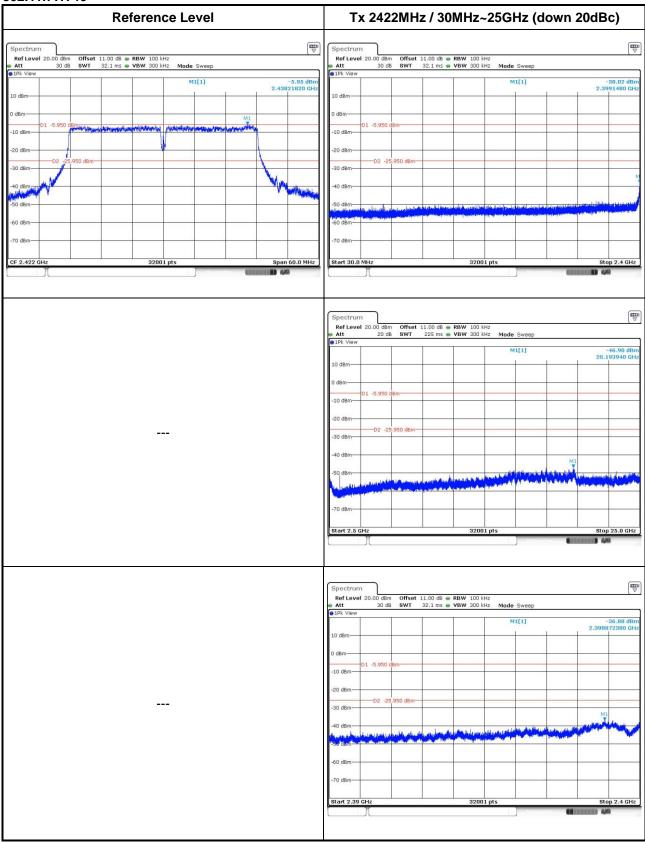




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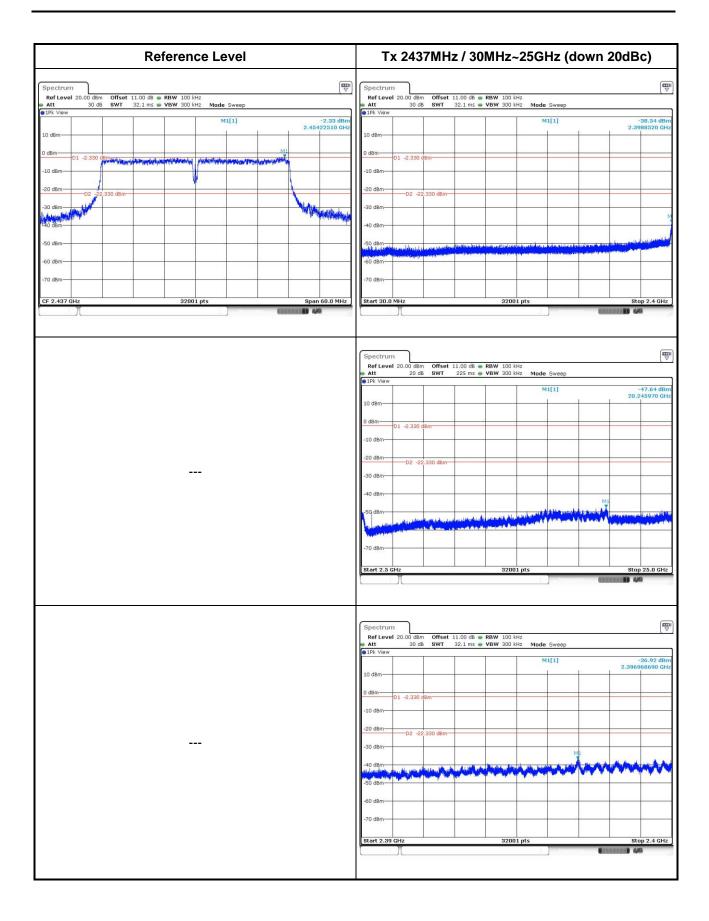


### 802.11n HT40



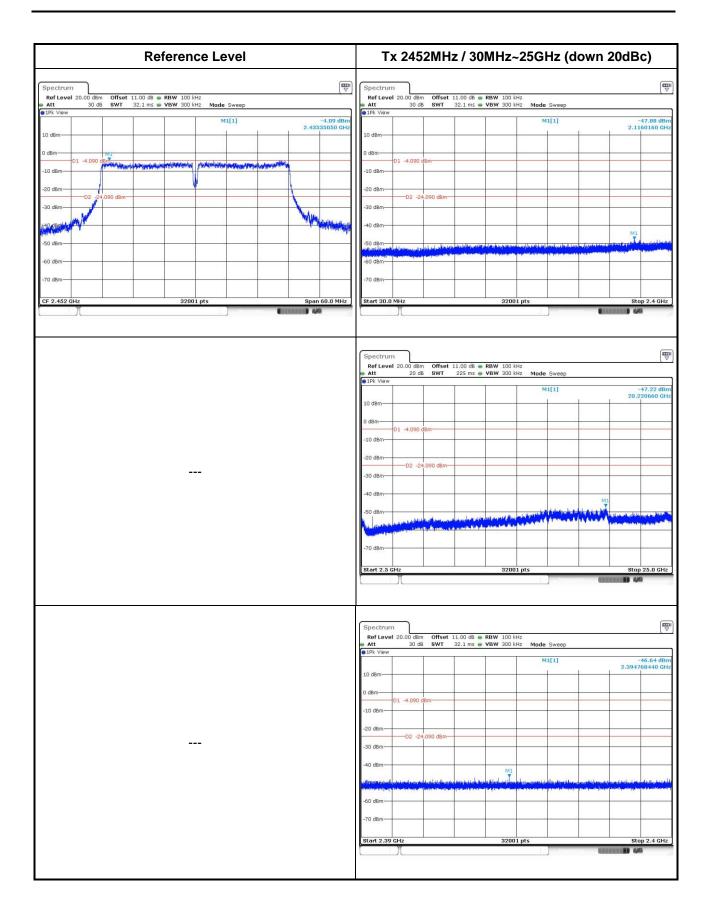
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# 4 Test laboratory information

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

==END==

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