

# **FCC Test Report**

FCC ID : 2ACF3BUZZI

Equipment : BUZZI

Model No. : WSMM-109, WSMM-109X

Brand Name : BLACKLOUD

Applicant : Blackloud Inc.

Address : 42 Corporate Park #250 Irvine, CA 92606 USA

Standard : 47 CFR FCC Part 15.247

Received Date : Jun. 19, 2014

Tested Date : Jun. 19 ~ Aug. 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



Report No.: FR471101 Report Version: Rev. 01



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## **Release Record**

Report No.	Version	Description	Issued Date
FR471101	Rev. 01	Initial issue	Aug. 21, 2014

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# **Summary of Test Results**

FCC Rules	Test Items	Measured	Result	
15.207	Conducted Emissions	[dBuV]: 0.459MHz 45.68 (Margin -1.03dB) - AV	Pass	
15.247(d)	Radiated Emissions	[dBuV/m at 3m]: 4924.00MHz	Pass	
15.209	INdulated Emissions	53.00 (Margin -1.00dB) - AV	rass	
15.247(b)(3)	Fundamental Emission Output Power	Max Power [dBm]: 25.13	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 Product Details

The following models are provided to this EUT.

Brand Name	Model Name	Product Name	Description
BLACKLOUD	WSMM-109		Housing color: White, Black
BLACKLOOD	WSMM-109X	BUZZI	Housing color: White

<sup>+</sup> All models are electrically identical, different model names are for marketing purpose.

### 1.1.2 Specification of the Equipment under Test (EUT)

RF General Information						
Frequency Range (MHz) IEEE Std. 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]	1	MCS 0-7	

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

#### 1.1.3 Antenna Details

Ant. No.	Туре	Type Gain (dBi) Co		Remark
1	Printed	3.71	N/A	

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

Power Supply Type	Input: 100-120Vac, 50/60Hz, 15A Max Output: 100-120Vac, 50/60Hz, 15A
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The above models, model **WSMM-109 with white color** was selected as a representative one for final test and only its data was recorded in this report.

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.



## 1.1.5 Accessories

	Accessories				
No. Equipment Description					
1	IR extender for White (HUIZHOU)	1m non-shielded cable with one core			
2	IR extender for Black (HUIZHOU)	1m non-shielded cable with one core			
3	IR extender for White (WINPOINT)	1m non-shielded cable with one core			
4	IR extender for Black (WINPOINT)	1m non-shielded cable with one core			

## 1.1.6 Channel List

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

## 1.1.7 Test Tool and Duty Cycle

Test Tool	Hyperterminal, Version 5.1			
	Mode	Duty cycle (%)	Duty factor (dB)	
Duty Cycle and Duty Factor	11b	98.32%	0.07	
Duty Cycle and Duty Factor	11g	94.78%	0.23	
	HT20	87.98%	0.56	

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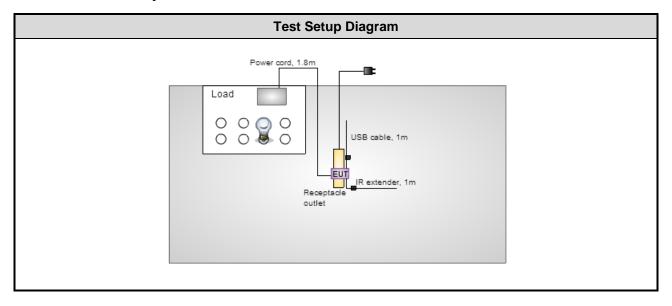
## 1.1.8 Power Setting

Modulation Mode	Test Frequency (MHz)	Power Set
11b	2412	18
11b	2437	18
11b	2462	18
11g	2412	30
11g	2437	31
11g	2462	27
HT20	2412	27
HT20	2437	31
HT20	2462	25

## 1.2 Local Support Equipment List

Support Equipment List						
No.	No. Equipment Brand Model S/N FCC ID Signal cable / Length (m)					
1	General Bulb	TFC	PS75			

## 1.3 Test Setup Chart



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## 1.4 The Equipment List

Conducted Emission									
Conduction room 1 / (	Conduction room 1 / (CO01-WS)								
Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until					
R&S	ESCS 30	100169	Oct. 15, 2013	Oct. 14, 2014					
SCHWARZBECK	Schwarzbeck 8127	8127-667	Nov. 23, 2013	Nov. 22, 2014					
SCHWARZBECK	Schwarzbeck 8127	8127-666	Dec. 04, 2013	Dec. 03, 2014					
Woken	CFD200-NL	CFD200-NL-001	Apr. 23, 2014	Apr. 22, 2015					
NA	50	04	Apr. 18, 2014	Apr. 17, 2015					
	Conduction room 1 / (  Manufacturer  R&S  SCHWARZBECK  SCHWARZBECK  Woken	Conduction room 1 / (CO01-WS)  Manufacturer Model No.  R&S ESCS 30  SCHWARZBECK Schwarzbeck 8127  SCHWARZBECK Schwarzbeck 8127  Woken CFD200-NL	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	Conduction room 1 / (CO01-WS)           Manufacturer         Model No.         Serial No.         Calibration Date           R&S         ESCS 30         100169         Oct. 15, 2013           SCHWARZBECK         Schwarzbeck 8127         8127-667         Nov. 23, 2013           SCHWARZBECK         Schwarzbeck 8127         8127-666         Dec. 04, 2013           Woken         CFD200-NL         CFD200-NL-001         Apr. 23, 2014					

Test Item	Radiated Emission								
Test Site	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				

Loop Antenna	Loop Antenna R&S		100330	Nov. 15, 2012	Nov. 14, 2014
Note: Calibration Inte	rval of instruments liste	d 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 Inte	rval of instruments listed	d 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

## 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 / 69%	Peter Lin
Radiated Emissions	03CH01-WS	21-22°C / 60-66%	Aska Huang Anderson Hong
RF Conducted	TH01-WS	25°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	HT20	2437	6 Mbps	
Radiated Emissions ≤1GHz	HT20	2437	6 Mbps	
Radiated Emissions >1GHz	11b	2412 / 2437 / 2462	1 Mbps	
Fundamental Emission Output Power	11g	2412 / 2437 / 2462	6 Mbps	
6dB bandwidth Power spectral density	HT20	2412 / 2437 / 2462	MCS 0	

#### NOTE:

- 1. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement X, Y, and Z-plane. The **Y-plane** results were found as the worst case and were shown in this report.
- 2. Four IR extender cables (refer to item 1.1.5) had been pre-tested and found that **IR extender for White** (HUIZHOU) was the worst case and was selected for final test.

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### 3 Transmitter Test Results

#### 3.1 Conducted Emissions

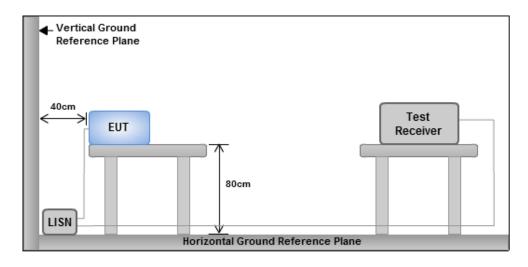
#### 3.1.1 Limit of Conducted Emissions

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 logarith	m 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



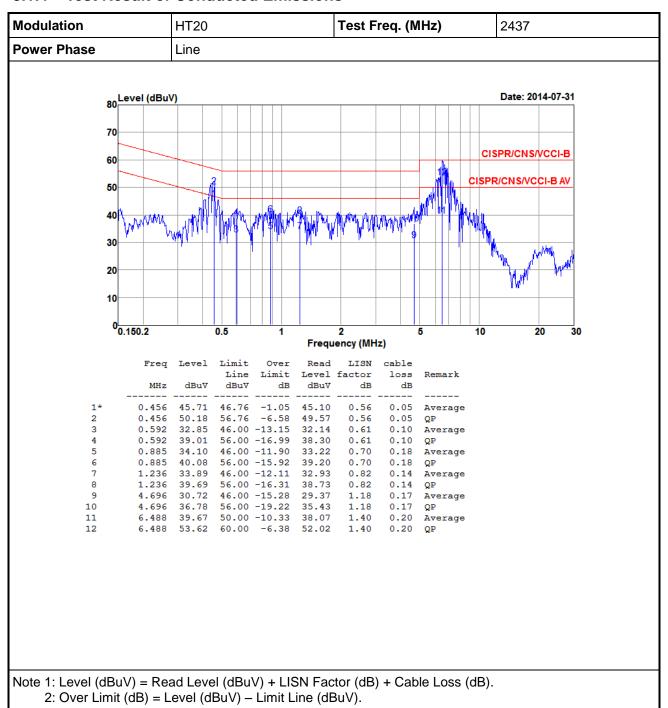
Note: 1. Support units were connected to second LISN.

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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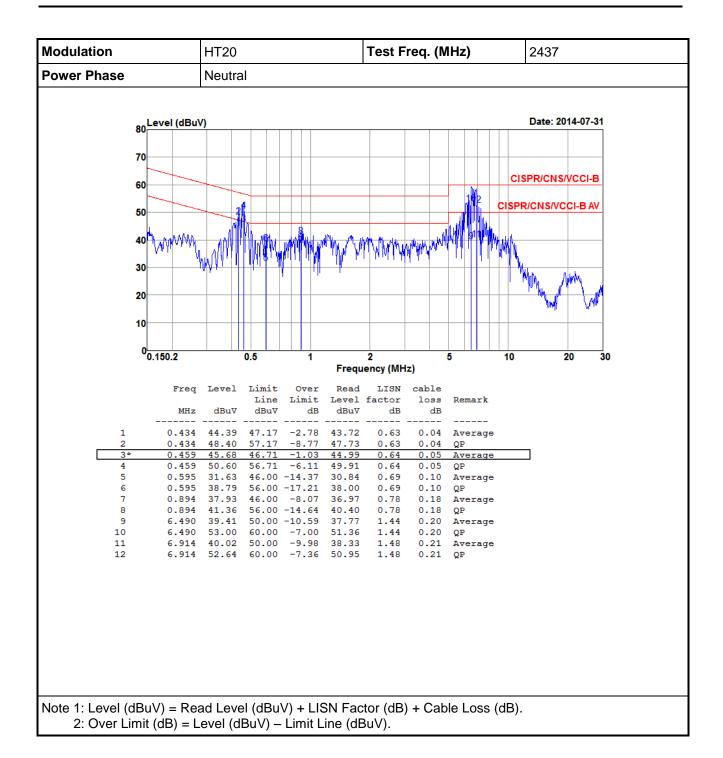


#### 3.1.4 Test Result of Conducted Emissions



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## 3.2 6dB and Occupied Bandwidth

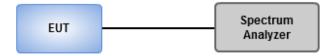
#### 3.2.1 Limit of 6dB Bandwidth

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

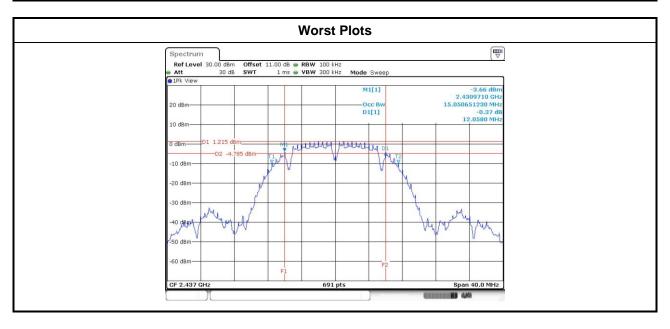


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## 3.2.4 Test Result of 6dB and Occupied Bandwidth

Modulation	N	Eros (MU=)		6dB Bandv	vidth (MHz)		Limit (ItU=)
Mode	N <sub>TX</sub>	Freq. (MHz)	Chain 0	Chain 1	Chain 2	Chain 3	Limit (kHz)
11b	1	2412	12.06				500
11b	1	2437	12.06				500
11b	1	2462	12.06				500
11g	1	2412	16.35				500
11g	1	2437	16.35				500
11g	1	2462	16.35				500
HT20	1	2412	17.10				500
HT20	1	2437	17.04				500
HT20	1	2462	17.28				500



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Modulation	N	Freq.		99% Occupied E	Bandwidth (MHz)	
Mode	N <sub>TX</sub>	(MHz)	Chain 0	Chain 0 Chain 1		Chain 3
11b	1	2412	15.12			
11b	1	2437	15.12			
11b	1	2462	15.09			
11g	1	2412	16.93			
11g	1	2437	16.93			
11g	1	2462	16.86			
HT20	1	2412	17.80			
HT20	1	2437	17.87			
HT20	1	2462	17.76			



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## 3.3 RF Output Power

#### 3.3.1 Limit of RF Output Power

Conducted power shall not exceed 1Watt.

Antenna gain <= 6dBi, no any corresponding reduction is in output power limit.

Antenna gain > 6dBi

Non Fixed, point to point operations.
The conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dB

Fixed, point to point operations
Systems operating in the 2400–2483.5 MHz band that are used exclusively for fixed, point-to-point Operations, maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

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

#### 3.3.2 Test Procedures

Maximum Peak Conducted Output Power

#### 

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

#### Nower meter

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

#### Nower meter

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

#### 3.3.3 Test Setup



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## 3.3.4 Test Result of Maximum Output Power

Modulation Mode	N <sub>TX</sub>	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	17.82				60.534	17.82	30.00
11b	1	2437	17.96				62.517	17.96	30.00
11b	1	2462	17.93				62.087	17.93	30.00
11g	1	2412	24.16				260.615	24.16	30.00
11g	1	2437	24.65				291.743	24.65	30.00
11g	1	2462	23.55				226.464	23.55	30.00
HT20	1	2412	23.85				242.661	23.85	30.00
HT20	1	2437	25.13				325.837	25.13	30.00
HT20	1	2462	23.55				226.464	23.55	30.00

Modulation	Modulation N <sub>TX</sub> Freq. (MHz)		Conducted (average) output power (dBm)				Total Power	Total Power	Limit (dBm)
Wiode		(IVITIZ)	Chain 0	Chain 1	Chain 2	Chain 3	(mW)	(dBm)	(ubili)
11b	1	2412	15.36				34.356	15.36	30.00
11b	1	2437	15.31				33.963	15.31	30.00
11b	1	2462	15.35				34.277	15.35	30.00
11g	1	2412	16.43				43.954	16.43	30.00
11g	1	2437	17.30				53.703	17.30	30.00
11g	1	2462	15.73				37.411	15.73	30.00
HT20	1	2412	15.41				34.754	15.41	30.00
HT20	1	2437	17.44				55.463	17.44	30.00
HT20	1	2462	15.07				32.137	15.07	30.00

Note: Conducted average output power is for reference only.

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### 3.4 Power Spectral Density

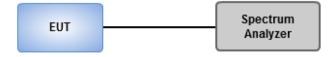
#### 3.4.1 Limit of Power Spectral Density

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.
  - 1. Set the RBW = 30kHz, VBW = 100kHz.
  - 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.
  - 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

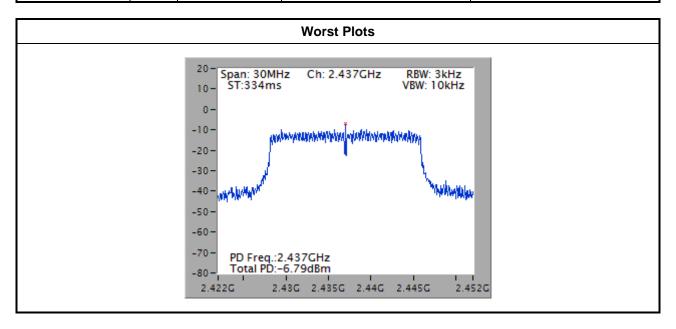


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## 3.4.4 Test Result of Power Spectral Density

Modulation Mode	N <sub>TX</sub>	Freq. (MHz)	Total Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
11b	1	2412	-13.24	8.00
11b	1	2437	-13.57	8.00
11b	1	2462	-14.20	8.00
11g	1	2412	-7.32	8.00
11g	1	2437	-6.80	8.00
11g	1	2462	-8.31	8.00
HT20	1	2412	-8.70	8.00
HT20	1	2437	-6.79	8.00
HT20	1	2462	-7.94	8.00



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### 3.5 Unwanted Emissions into Restricted Frequency Bands

#### 3.5.1 Limit of Unwanted Emissions into Restricted Frequency Bands

	Restricted Band	Emissions Limit	
Frequency Range (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Measure Distance (m)
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

#### Note 1:

Qusai-Peak value is measured for frequency below 1GHz except for 9–90 kHz, 110–490 kHz frequency band. Peak and average value are measured for frequency above 1GHz. The limit on average radio frequency emission is as above table. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit **Note 2:** 

Measurements may be performed at a distance other than what is specified provided. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor as below, Frequency at or above 30 MHz: 20 dB/decade Frequency below 30 MHz: 40 dB/decade.

#### 3.5.2 Test Procedures

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

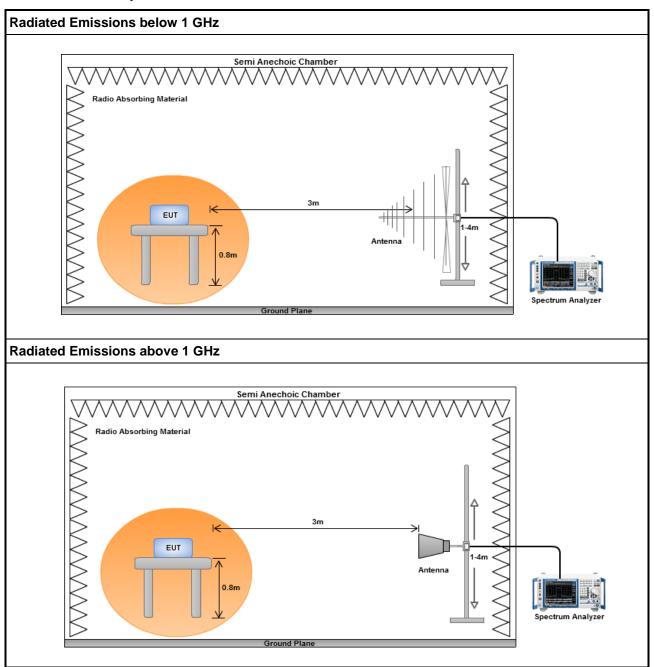
#### Note:

- 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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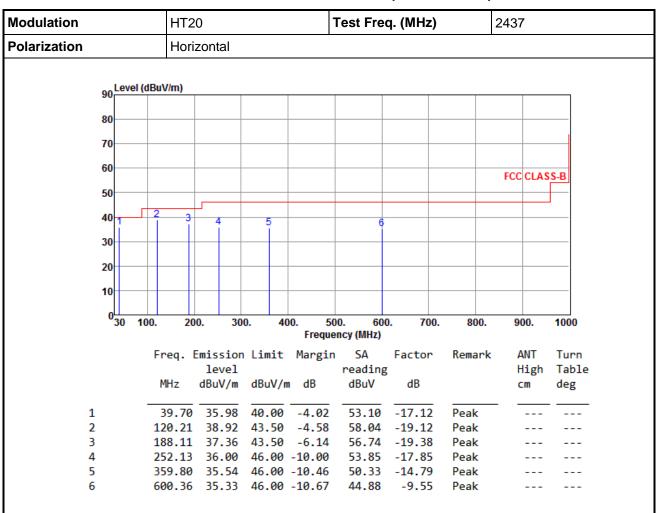
## 3.5.3 Test Setup



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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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Modulation				HT2	0			-	Γest Fre	q. (MHz	)	243	7	
Polarization				Verti	ical							•		
	90 Le	evel (	dBuV	/m)									T	
	80													
	70													
	70													
	60											FCC	CLAS	S-B
	50													
	40		2	3 4	5		l							
		1	ĺ											
	30													
	20													
	10													
	030	0 1	00.	20	0. 3	00.	40		0. 60 ncy (MHz)	0. 70	0. 80	0. 9	00.	1000
			En		Emiccio	n lin	.:+	Margin		Factor	Rema	nle /	ANT	Turn
			FIG	eq. ı	level		iic	nar.8111	reading		Kellia		High	Table
			M	Ηz	dBuV/m	dBu	ıV/m	dB	dBuV	dB			cm	deg
1				7.83	32.07	40.	99	-7.93	50.98	-18.91	Peak			
2				7.83 8.21	37.14			-6.36	56.26					
3				5.10	40.71	43.	50	-2.79	57.51	-16.80	Peak			
4					41.62			-1.88		-18.54	-			
5 6				3.63	38.91 42.50			-4.59 -3.50	58.57 57.29					

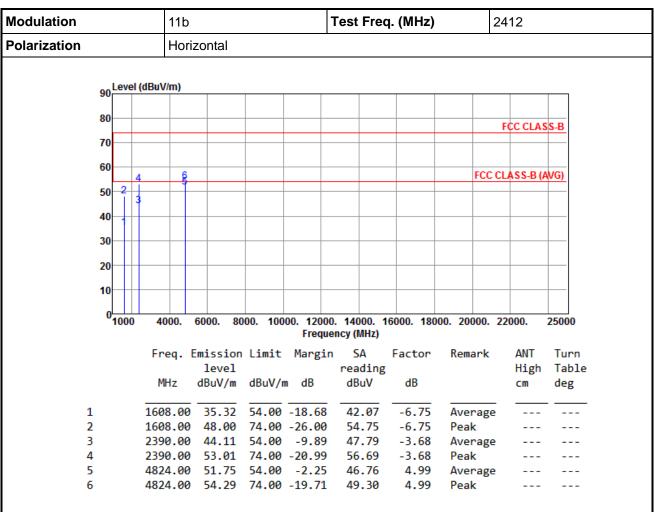
\*Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

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

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



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

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

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

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Modulation			11b	)		-	Test Free	q. (MHz)		2412	
Polarization			Vei	tical		•			•		
	90	Level	(dBuV/m)								
	80										
										FCC CLAS	SS-B
	70										
	60		4 8						FCC	CLASS-B (A	WG)
	50		4 ;						100	CENSS-D (F	<del>100</del>
			3								
	40										
	30	+++									
	20										
	10										
	0	1000	4000.	6000.	3000. 100		. 14000. 1 ncy (MHz)	16000. 180	00. 20000.	22000.	25000
			Freq.	Emissio	n Limit	Margin	SA	Factor	Remark	ANT	Turn
				level			reading			High	Table
			MHz	dBuV/m	dBuV/	m dB	dBuV	dB		cm	deg
	1		1608.00	35.90	54.00	-18.10	42.65	-6.75	Average		
	2		1608.00			-25.48	55.27	-6.75	Peak		
	3		2390.00			-9.35	48.33	-3.68	Average		
	4 5			) 53.58 3 52 98		-20.42 -1.02	57.26 47.99	-3.68 4.99	Peak Average		
	6			55.97			50.98	4.99	Peak		

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

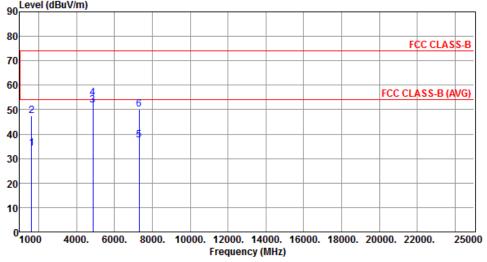
\*Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

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Modulation		11b		Test	Freq.	(MHz)	24	37	
Polarization		Horizontal							
	Level (dBu	V/m)							
90									



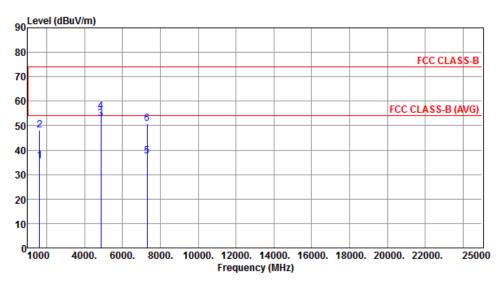
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Ū	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	1624.70	34.19	54.00	-19.81	40.87	-6.68	Average		
2	1624.70	47.61	74.00	-26.39	54.29	-6.68	Peak		
3	4874.00	51.96	54.00	-2.04	46.86	5.10	Average		
4	4874.00	54.77	74.00	-19.23	49.67	5.10	Peak		
5	7311.00	37.66	54.00	-16.34	28.33	9.33	Average		
6	7311.00	50.27	74.00	-23.73	40.94	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	11b	Test Freq. (MHz)	2437
Polarization	Vertical		

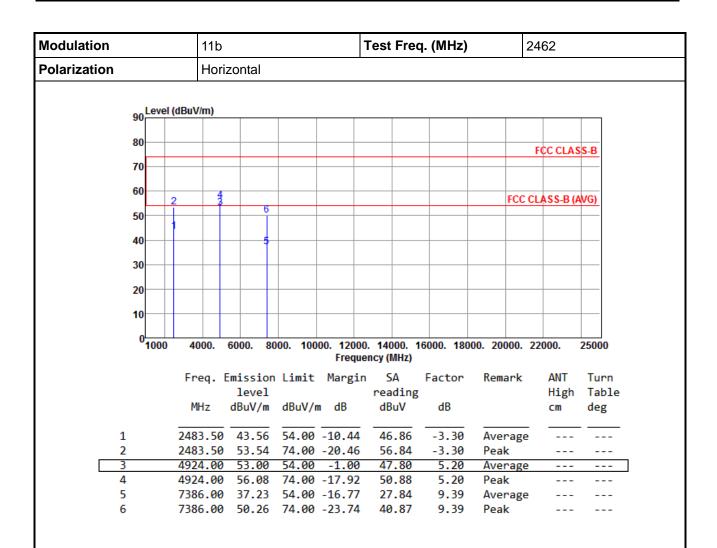


	Freq.	Emission level	Limit	Margin	SA reading		Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		CM	deg
1	1624.70	35.40	54.00	-18.60	42.08	-6.68	Average		
2	1624.70	48.07	74.00	-25.93	54.75	-6.68	Peak		
3	4874.00	52.95	54.00	-1.05	47.85	5.10	Average		
4	4874.00	55.78	74.00	-18.22	50.68	5.10	Peak		
5	7311.00	37.40	54.00	-16.60	28.07	9.33	Average		
6	7311.00	50.78	74.00	-23.22	41.45	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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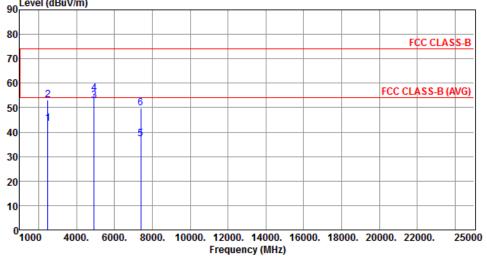
\*Factor includes antenna factor, cable loss and amplifier gain

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

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Modulation					Test	Freq.	(MHz)	24	62	
Polarization		Vertica	al							
	Do Level (c	dBuV/m)								
	30									
	,							F(	CCIAS	S B



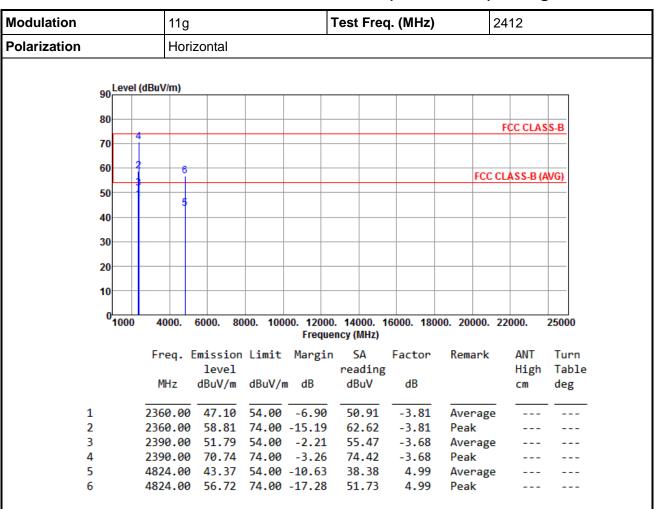
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Ü	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
4	2402 50	43.50	<u></u>	40.42	46.00				
1	2483.50	43.58	54.00	-10.42	46.88	-3.30	Average		
2	2483.50	53.06	74.00	-20.94	56.36	-3.30	Peak		
3	4924.00	52.97	54.00	-1.03	47.77	5.20	Average		
4	4924.00	55.91	74.00	-18.09	50.71	5.20	Peak		
5	7386.00	37.07	54.00	-16.93	27.68	9.39	Average		
6	7386.00	49.91	74.00	-24.09	40.52	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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### 3.5.6 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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3

4

5

Modulation			11g				Test Fre	q. (MHz)		2412	
Polarization			Vert	ical		•					
	90 Le	vel (dBu	V/m)								
	80										
	00	4								FCC CLAS	S-B
	70										
	60	12	6								
	<u> </u>	1							FCC	CLASS-B (A	WG)
	50		- 5								
	40										
	30										
	30										
	20	+									
	10										
	0100	00 4	1000.	6000. 80	00. 100		0. 14000. ( ency (MHz)	16000. 180	00. 20000.	22000.	25000
		F	rea. I	mission	Limit		n SA	Factor	Remark	ANT	Turn
			-4-	level			reading			High	Table
		ı	MHz	dBuV/m	dBuV/ı	n dB	dBuV	dB		cm	deg
	1	230	60.00	46.88	54.00	-7.12	50.69	-3.81	Average	<u> </u>	
	2			57.91				-3.81	Peak		
	_			F2 00				2 60	Α		

56.57

75.41

41.82

-3.68

-3.68

4.99

4.99

Average

Average

Peak

Peak

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

2390.00 52.89 54.00 -1.11

2390.00 71.73 74.00 -2.27 75.41 4824.00 46.81 54.00 -7.19 41.82 4824.00 60.35 74.00 -13.65 55.36

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

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Modulation			11g				Test Fr	eq. (MHz)	2	437	
Polarization			Hor	izontal			1		•		
	90 Le	evel (	(dBuV/m)								
	00										
	80									FCC CLAS	SS-B
	70	+									
	60	_ 2			,						
	L			8	<u> </u>				FCC C	LASS-B (A	AVG)
	50	$\exists 1$	5	-	,						
	40										
	20										
	30										
	20										+-
	10										
	010	000	4000.	6000.	8000. 1				000. 20000. 2	2000.	25000
							uency (MHz				
			Freq.			it Marg		Factor	Remark	ANT	Turn
			MHz	leve		//m dD	readi dBuV			High	Table
			МПZ	ubuv/i	ıı abu	//m dB	ubuv	uв		cm	deg
1	L		2384.00	47.80	54.0	-6.20	51.52	-3.72	Average		
2	2		2384.00	58.1	5 74.0	00 -15.84	4 61.88	3 -3.72	_		
3			2489.00			90 -3.98					
4						00 -12.2					
-						9.50			_		
6			4874.00			00 -16.18 00 -11.50					
,	_		/311.00	42.3	J4.		, ,,,,,,,	, 9.33	Average		

9.33 Peak

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

7311.00 56.58 74.00 -17.42 47.25

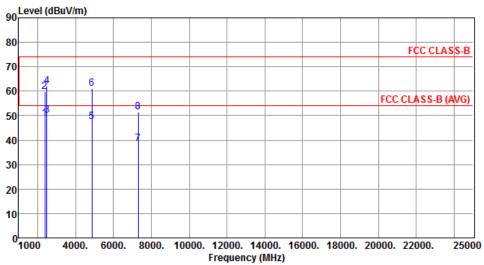
\*Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

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

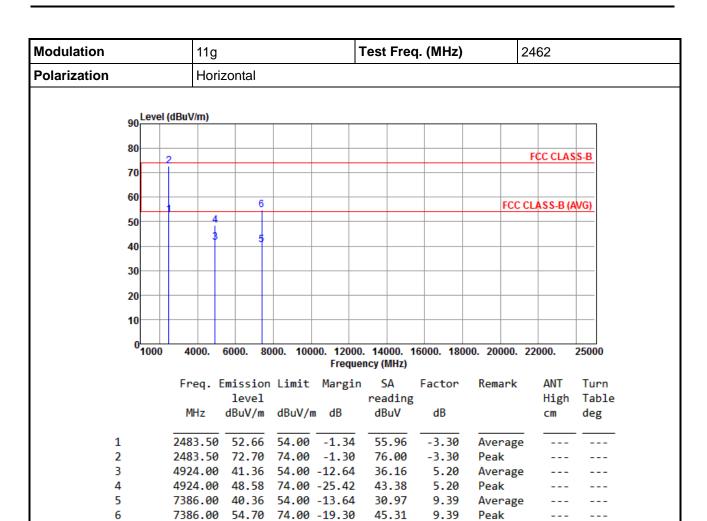


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Ū	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2384.00	48.78	54.00	-5.22	52.50	-3.72	Average		
2	2384.00	59.80	74.00	-14.20	63.52	-3.72	Peak		
3	2489.00	50.10	54.00	-3.90	53.38	-3.28	Average		
4	2489.00	62.09	74.00	-11.91	65.37	-3.28	Peak		
5	4874.00	47.50	54.00	-6.50	42.40	5.10	Average		
6	4874.00	61.10	74.00	-12.90	56.00	5.10	Peak		
7	7311.00	38.52	54.00	-15.48	29.19	9.33	Average		
8	7311.00	51.56	74.00	-22.44	42.23	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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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	11g			Test Freq. (MHz)			2462		
Polarization		Vert	ical					<u> </u>			
		•									
	90 Level	(dBuV/m)									
	80										
		2							FCC CLAS	S-B	
	70										
	60	4						ECC /	CLASS-B (A	VC)	
	50		6					rcc	CLASS-D (F	(VG)	
		3									
	40		1								
	30										
	20										
	10										
	01000	4000.	6000. 80	00 100	00 12000	14000 1	16000 180	00. 20000.	22000	25000	
	1000	4000.	0000. 00			ency (MHz)	10000. 100	20000.	22000.	25000	
		Freq.	Emission	Limit	Margir	s SA	Factor	Remark	ANT	Turn	
			level			reading			High	Table	
		MHz	dBuV/m	dBuV/n	ı dB	dBuV	dB		cm	deg	
	1	2483.50	52.35	54.00	-1.65	55.65	-3.30	Average			
	_							6-			

75.77

39.04

53.17

-3.30

5.20

5.20

9.39

9.39

Peak Average

Peak

Peak

Average

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

2483.50 72.47 74.00 -1.53

4924.00 44.24 54.00 -9.76

4924.00 58.37 74.00 -15.63

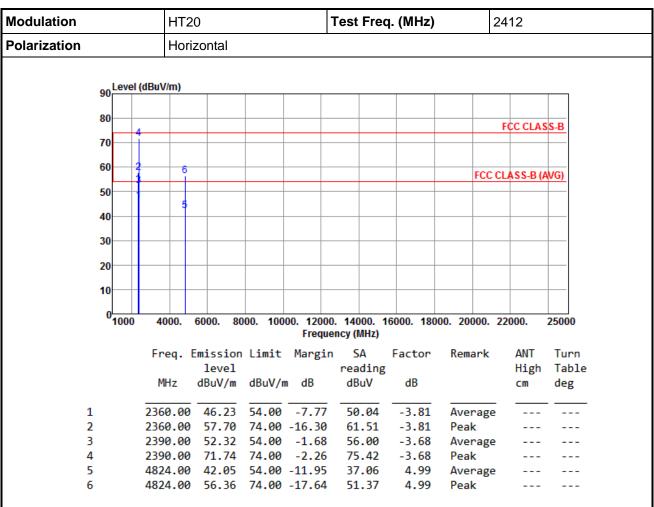
7386.00 38.24 54.00 -15.76 28.85 7386.00 51.27 74.00 -22.73 41.88

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)

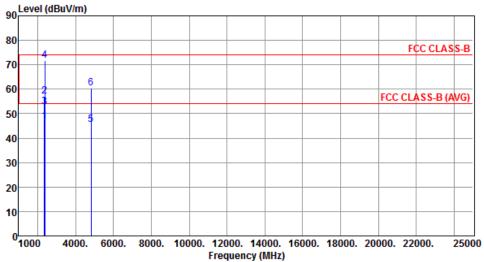
\*Factor includes antenna factor, cable loss and amplifier gain

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

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Modulation	HT20	Test Freq	(MHz)	)	24	12		
Polarization	Vertical							
Lovel (dP	uV/m)							
90 Level (dB	uvillij		T					



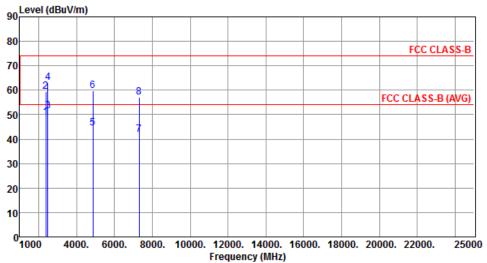
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Ū	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2360.00	46.72	54.00	-7.28	50.53	-3.81	Average		
2	2360.00		74.00		60.81	-3.81	Peak		
3	2390.00	52.94	54.00	-1.06	56.62	-3.68	Average		
4	2390.00	71.82	74.00	-2.18	75.50	-3.68	Peak		
5	4824.00	45.35	54.00	-8.65	40.36	4.99	Average		
6	4824.00	60.57	74.00	-13.43	55.58	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	Tes	Freq. (MHz)	24	37		
Polarization	Horizontal						
90 Level (dBu	V/m)						



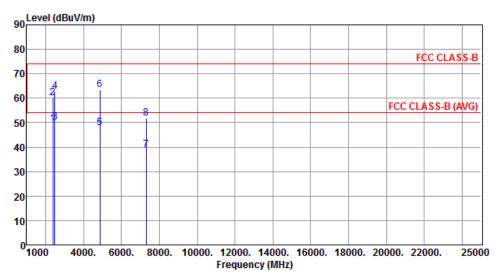
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Ū	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2384.00	48.68	54.00	-5.32	52.40	-3.72	Average		
2	2384.00	59.46	74.00	-14.54	63.18	-3.72	Peak		
3	2489.00	51.57	54.00	-2.43	54.85	-3.28	Average		
4	2489.00	63.25	74.00	-10.75	66.53	-3.28	Peak		
5	4874.00	44.65	54.00	-9.35	39.55	5.10	Average		
6	4874.00	59.82	74.00	-14.18	54.72	5.10	Peak		
7	7311.00	41.90	54.00	-12.10	32.57	9.33	Average		
8	7311.00	57.07	74.00	-16.93	47.74	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		

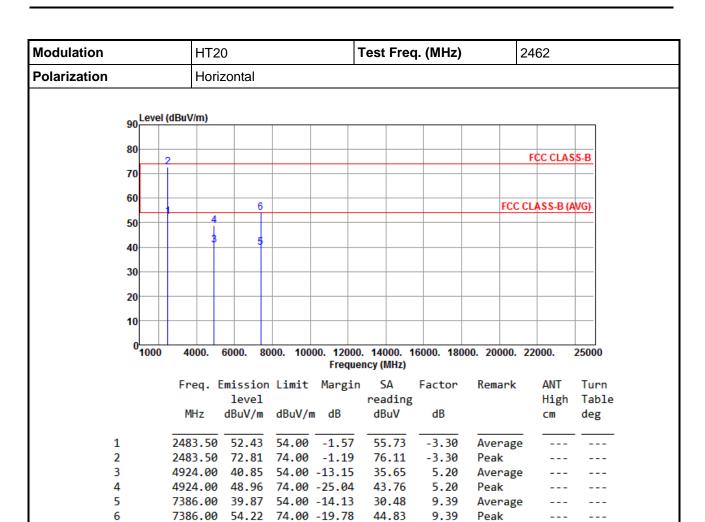


	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2384.00	49.49	54.00	-4.51	53.21	-3.72	Average		
2	2384.00	60.18	74.00	-13.82	63.90	-3.72	Peak		
3	2489.00	50.25	54.00	-3.75	53.53	-3.28	Average		
4	2489.00	62.73	74.00	-11.27	66.01	-3.28	Peak		
5	4874.00	47.82	54.00	-6.18	42.72	5.10	Average		
6	4874.00	63.54	74.00	-10.46	58.44	5.10	Peak		
7	7311.00	38.75	54.00	-15.25	29.42	9.33	Average		
8	7311.00	51.88	74.00	-22.12	42.55	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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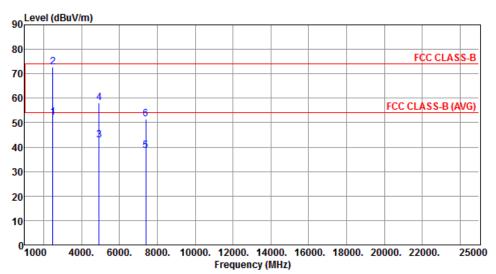
\*Factor includes antenna factor, cable loss and amplifier gain

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

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Modulation	HT20	Test Freq. (MHz)	2462
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Ū	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	52.20	54.00	-1.80	55.50	-3.30	Average		
2		72.72			76.02	-3.30	Peak		
3	4924.00	42.87	54.00	-11.13	37.67	5.20	Average		
4	4924.00	58.11	74.00	-15.89	52.91	5.20	Peak		
5	7386.00	38.52	54.00	-15.48	29.13	9.39	Average		
6	7386.00	51.55	74.00	-22.45	42.16	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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# 3.6 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

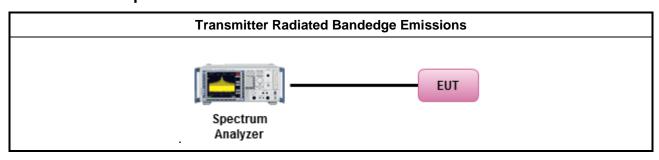
#### Reference level measurement

- 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 26.5GHz
- 4. Use the peak marker function to determine the maximum amplitude level

### 3.6.4 Test Setup

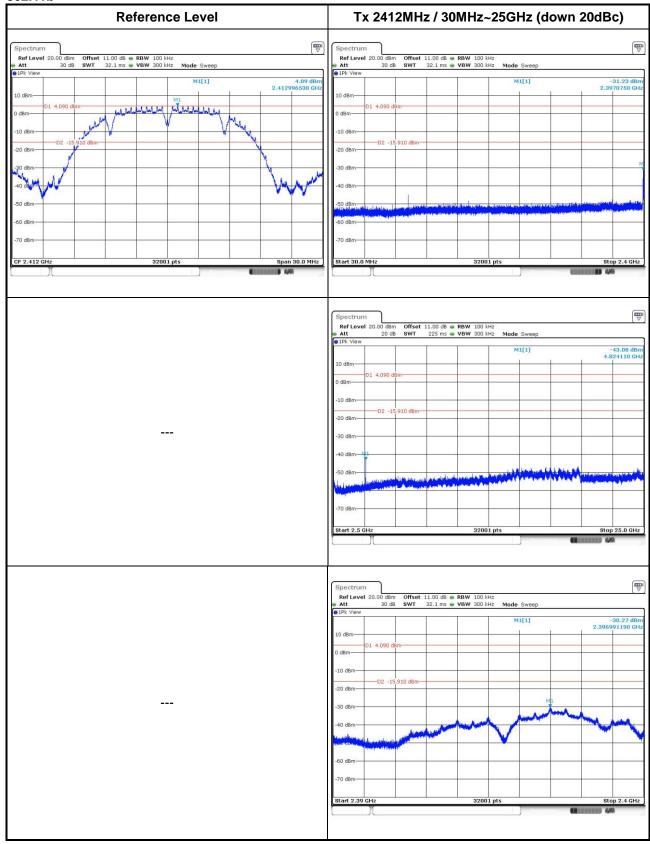


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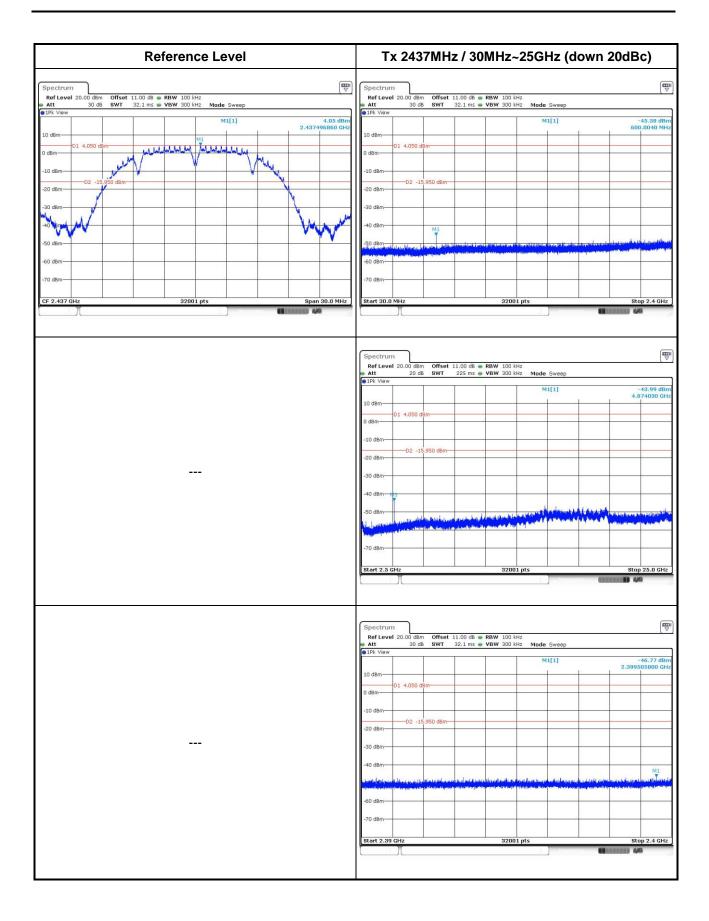
## 3.6.5 Test Result of Emissions in non-restricted frequency bands

### 802.11b



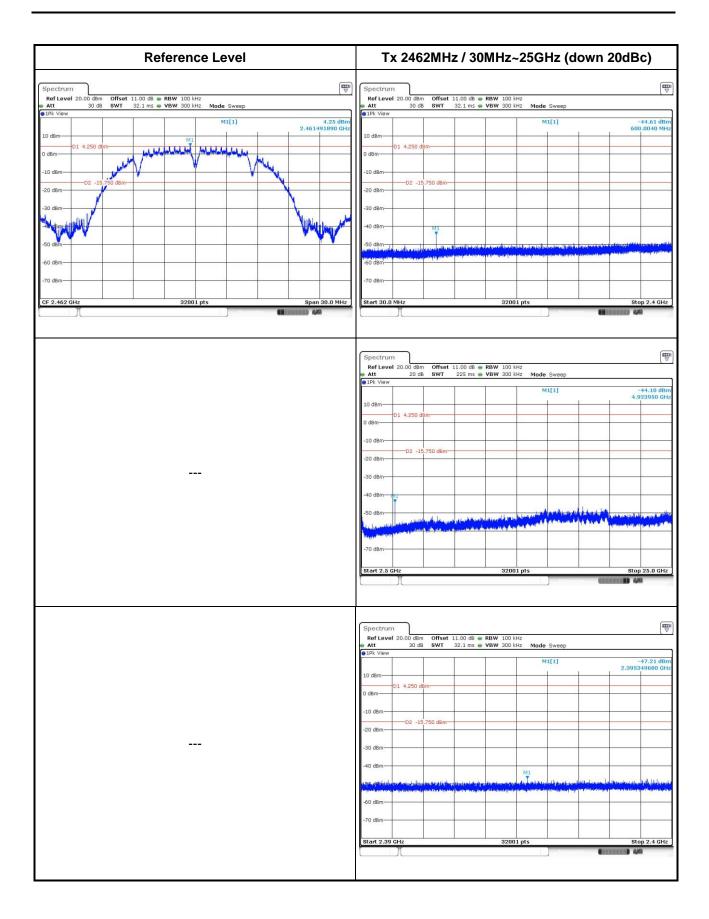
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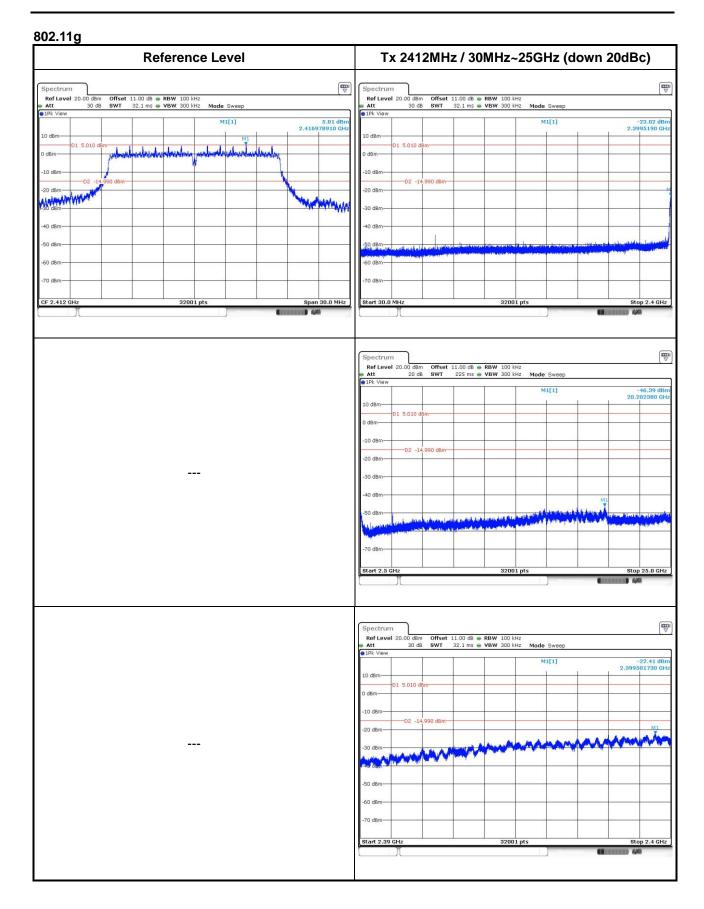
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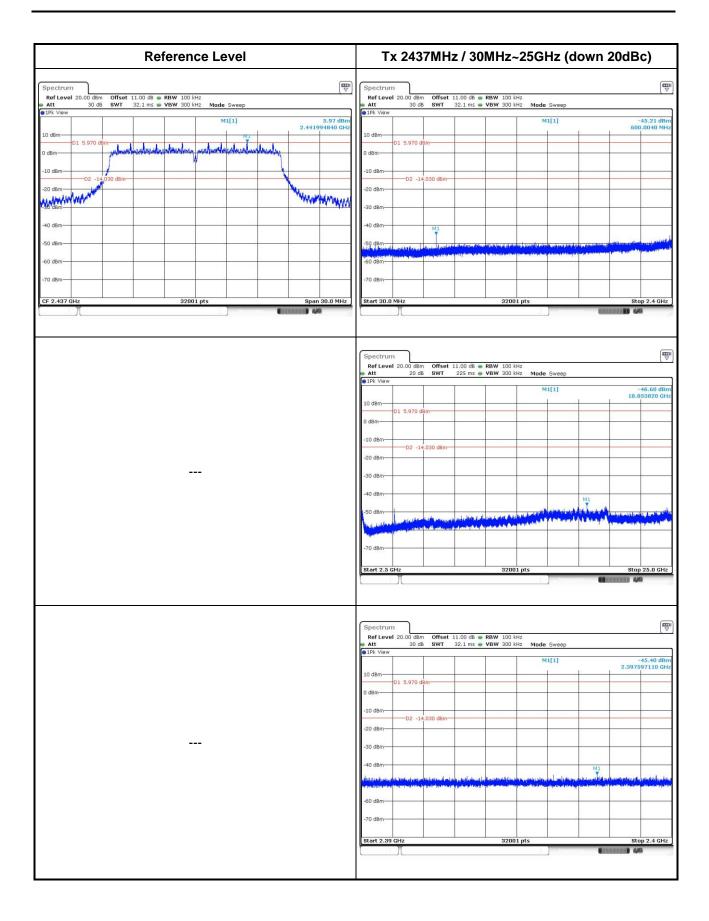
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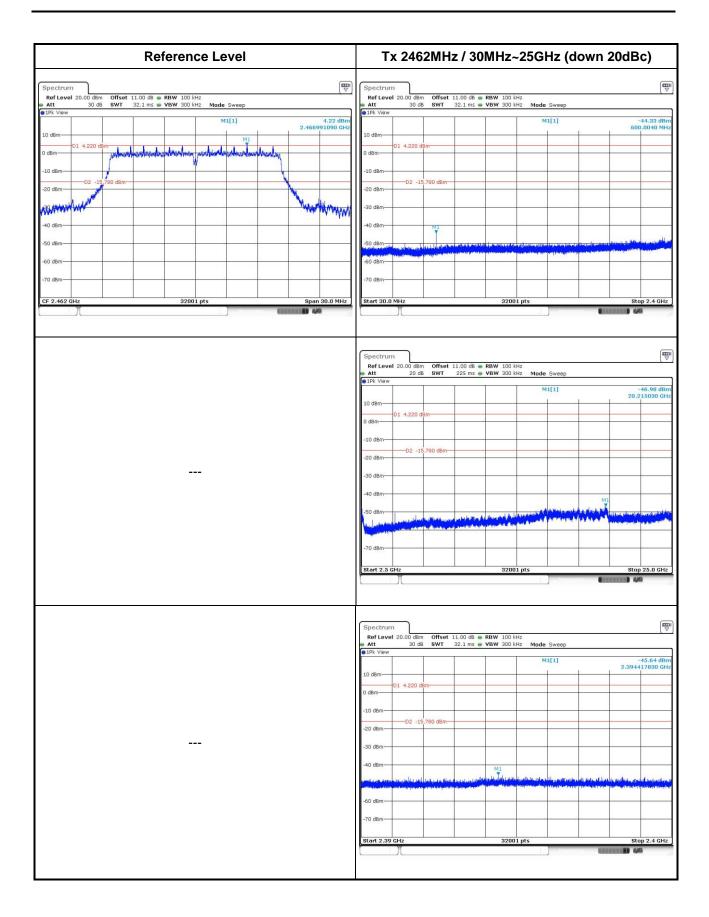
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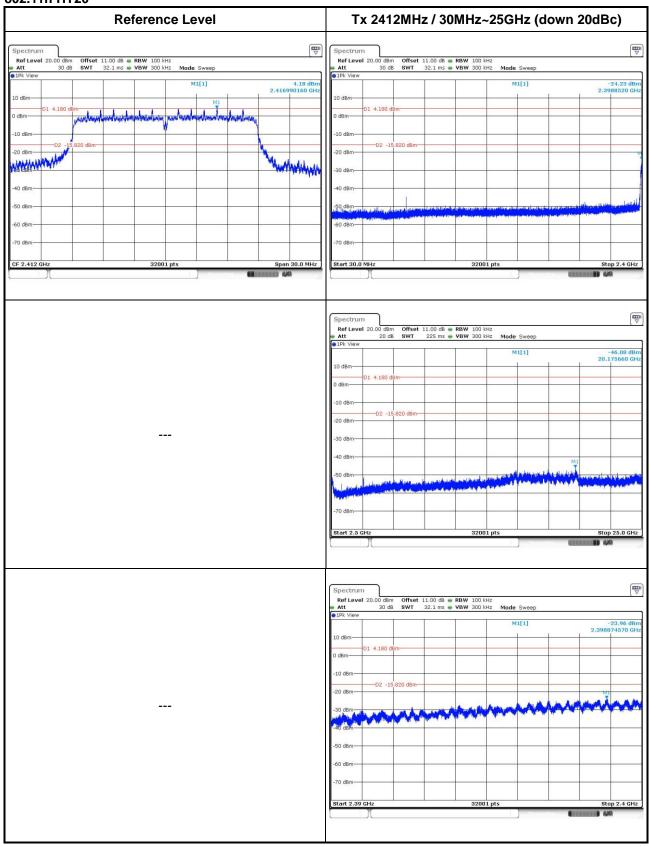




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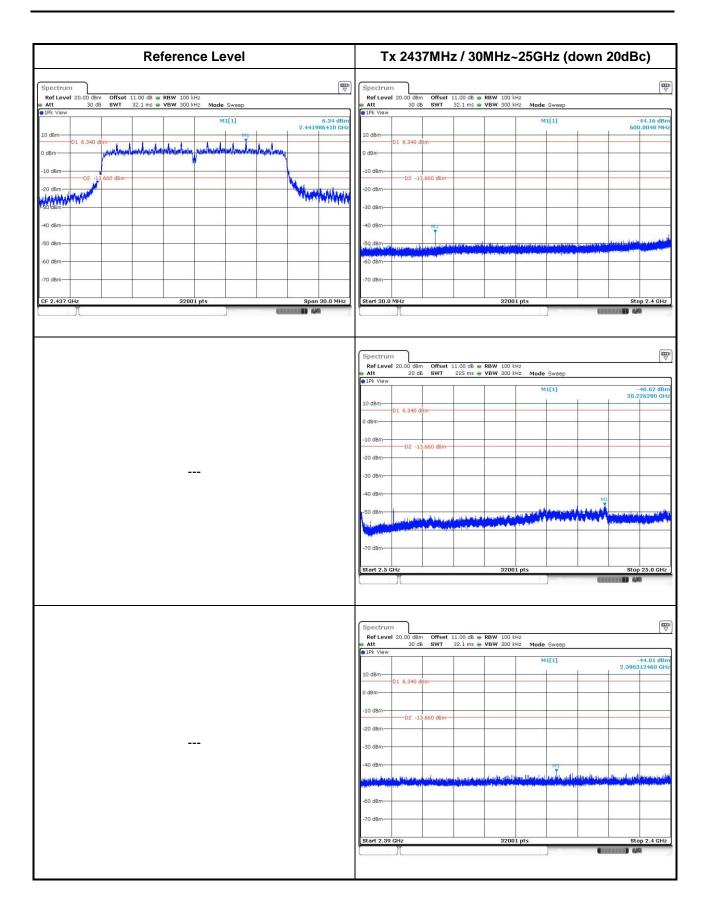


### 802.11n HT20



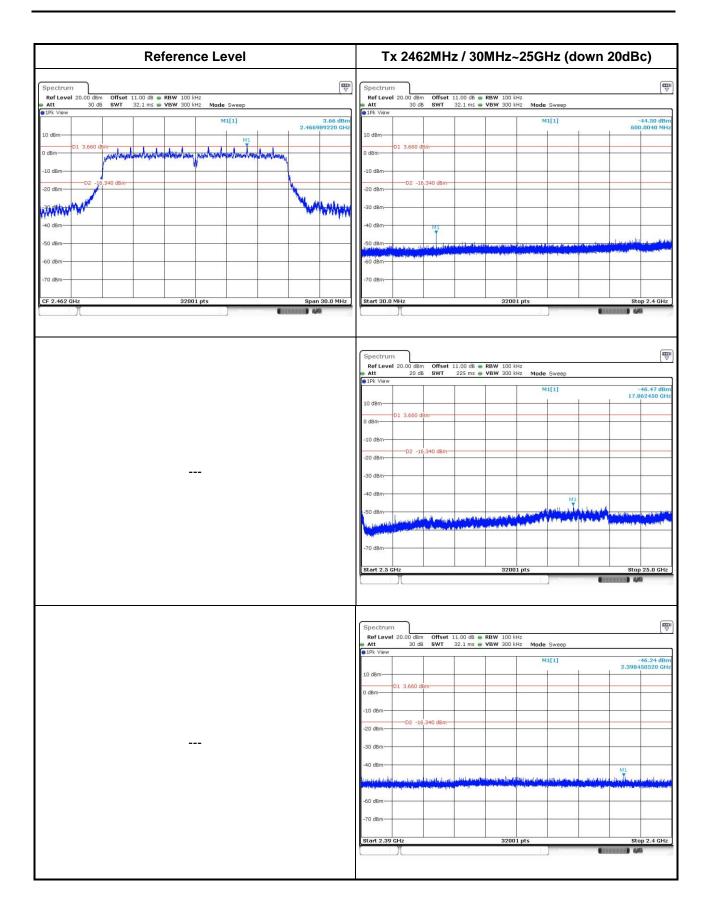
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# 4 Test laboratory information

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

St., Kwei Shan Hsiang, Tao Y 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

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