

FCC Test Report

FCC ID : 2ACF3-WIPCO-201N

Equipment : ICE 360

Model No. : WIPCO-201N

Brand Name : BLACKLOUD

Applicant : Blackloud Inc.

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

Standard : 47 CFR FCC Part 15.247

Received Date : Sep. 01, 2014

Tested Date : Sep. 15 ~ Oct. 13, 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
FR490101	Rev. 01	Initial issue	Oct. 29, 2014

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Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	07 Conducted Emissions [dBuV]: 0.152MHz 51.63 (Margin -4.24dB) - AV		Pass
15.247(d)	Radiated Emissions	[dBuV/m at 3m]: 2483.50MHz	Pass
15.209	INdulated Lillissions	72.99 (Margin -1.01dB) - PK	
15.247(b)(3)	Fundamental Emission Output Power	Max Power [dBm]: 26.75	Pass
15.247(a)(2)	6dB Bandwidth	Meet the requirement of limit	Pass
15.247(e)	Power Spectral Density	Meet the requirement of limit	Pass
15.203	Antenna Requirement	Meet the requirement of limit	Pass

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1 General Description

1.1 Information

1.1.1 Specification of the Equipment under Test (EUT)

RF General Information							
Frequency Range (MHz)	IEEE Std. 802.11	Ch. Freq. (MHz)	Channel Number	Transmit Chains (N _{TX})	Data Rate / MCS		
2400-2483.5	b	2412-2462	1-11 [11]	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.	Туре	Gain (dBi)	Connector	Remark
1	pifa	2.25	ipex	
2	pifa	2.25	ipex	

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	5Vdc from adapter
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1.1.4 Accessories

	Accessories					
No.	Equipment	Description				
1	AC Adapter 1	Brand Name: PHIHONG Model Name: PSAA10A-050Q Power Rating: I/P: 100-240Vac, 50-60Hz, 0.5A, 23-31VA O/P: 5Vdc, 2A				
2	AC Adapter 2	Brand Name: LEI Model Name: MU10-Q050200-A1 Power Rating: I/P: 100-240Vac, 50-60Hz, 0.3A O/P: 5Vdc, 2A				
3	AC Adapter 3	Brand Name: FRECOM Model Name: F12L6-050200SPAU Power Rating: I/P: 100-240Vac, 50-60Hz, 0.3A O/P: 5Vdc, 2A				
4	USB cable 1	EKSON, 3m shielded cable without core				
5	USB cable 2	Tung-Li, 3m shielded cable without core				

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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	MT7620QA.exe, V1.0.6.0				
	Mode	Duty cycle (%)	Duty factor (dB)		
	11b	100.00%	0.00		
Duty Cycle and Duty Factor	11g	89.47%	0.48		
	HT20	89.67%	0.47		
	HT40	78.78%	1.04		

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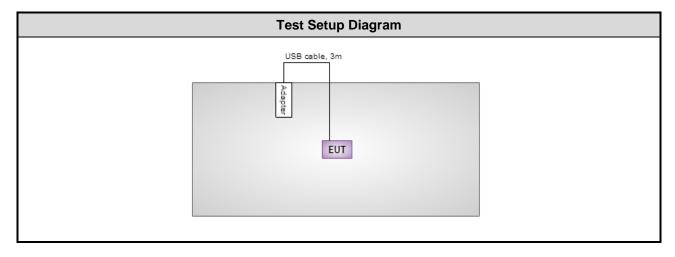
1.1.7 Power Setting

Modulation Mode	Test Frequency (MHz)	Power Set
11b	2412	19/1C
11b	2437	1B/1D
11b	2462	1A/1C
11g	2412	15/18
11g	2437	18/1A
11g	2462	10/11
HT20	2412	12/15
HT20	2437	18/1B
HT20	2462	0E/0F
HT40	2422	0E/11
HT40	2437	14/16
HT40	2452	0A/0B

1.2 Local Support Equipment List

N/A

1.3 Test Setup Chart



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1.4 The Equipment List

Test Item	Conducted Emission	Conducted Emission							
Test Site	Conduction room 1 / (CO01-WS)								
Instrument	Manufacturer	Manufacturer Model No. Serial No. Calibration Date Calibration Until							
EMC Receiver	R&S	ESCS 30	100169	Oct. 15, 2013	Oct. 14, 2014				
LISN	SCHWARZBECK	Schwarzbeck 8127	8127-667	Nov. 23, 2013	Nov. 22, 2014				
LISN (Support Unit)	SCHWARZBECK	Schwarzbeck 8127	8127-666	Dec. 04, 2013	Dec. 03, 2014				
RF Cable-CON	Woken	CFD200-NL	CFD200-NL-001	Apr. 23, 2014	Apr. 22, 2015				
50 ohm terminal (Support Unit)	NA	50	04	Apr. 18, 2014	Apr. 17, 2015				
Measurement Software	AUDIX	e3	6.120210k	NA	NA				
Note: Calibration Inte	rval of instruments liste	d above is one year.							

Test Item	Radiated Emission						
Test Site	966 chamber1 / (03CH01-WS)						
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until		
Spectrum Analyzer	R&S	FSV40	101498	Jan. 25, 2014	Jan. 24, 2015		
Receiver	R&S	ESR3	101658	Jan. 10, 2014	Jan. 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	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	Sep. 09, 2014	Sep. 08, 2015		
Preamplifier	Agilent	83017A	MY39501308	Dec. 16, 2013	Dec. 15, 2014		
Preamplifier	EMC	EMC184045B	980192	Aug. 26, 2014	Aug. 25, 2015		
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		
Measurement Software	AUDIX	e3	6.120210g	NA	NA		
Note: Calibration Inter	rval of instruments listed	d 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.								

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Test Item	RF Conducted								
Test Site	(TH01-WS)	(TH01-WS)							
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until				
Spectrum Analyzer	R&S	FSV40	101063	Feb. 17, 2014	Feb. 16, 2015				
Power Meter	Anritsu	ML2495A	1218007	Oct. 31, 2013	Oct. 30, 2014				
Power Sensor	Anritsu	MA2411B	1207367	Oct. 31, 2013	Oct. 30, 2014				
Measurement Software	Sporton	Sporton_1	1.3.30	NA	NA				
Note: Calibration Interval of instruments listed above is one year.									

1.5 Test Standards

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

47 CFR FCC Part 15.247

ANSI C63.10-2009

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	23°C / 62%	Skys Huang
Radiated Emissions	03CH01-WS	23°C / 63%	Haru Yang
RF Conducted	TH01-WS	22°C / 64%	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	

NOTE:

- 1. Adapter 1, Adapter 2 and Adapter 3 had been pretested and found that **Adapter 1** was the worst case and was selected for final testing (Adapter 1: PHIHONG adapter; Adapter 2: LEI adapter; Adapter 3: FRECOM adapter).
- 2. USB cable 1 and USB cable 2 had been pretested and found that **USB cable 2** was the worst case and was selected for final testing (USB cable 1: EKSON; USB cable 2: Tung-Li).

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3 Transmitter Test Results

3.1 Conducted Emissions

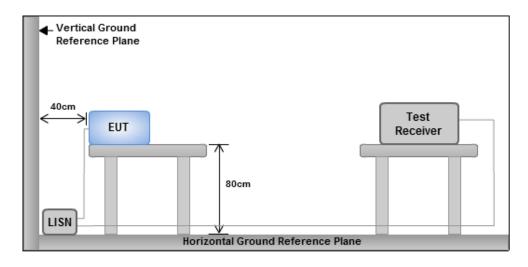
3.1.1 Limit of Conducted Emissions

Conducted Emissions Limit							
Frequency Emission (MHz) Quasi-Peak Average							
0.15-0.5	66 - 56 *	56 - 46 *					
0.5-5	56	46					
5-30	60	50					
Note 1: * Decreases with the logarithm of the frequency.							

3.1.2 Test Procedures

- 1. The device is placed on a test table, raised 80 cm above the reference ground plane. The vertical conducting plane is located 40 cm to the rear of the device.
- 2. The device is connected to line impedance stabilization network (LISN) and other accessories are connected to other LISN. Measured levels of AC power line conducted emission are across the 50 Ω LISN port.
- 3. AC conducted emission measurements is made over frequency range from 150 kHz to 30 MHz.
- 4. This measurement was performed with AC 120V / 60Hz.

3.1.3 Test Setup



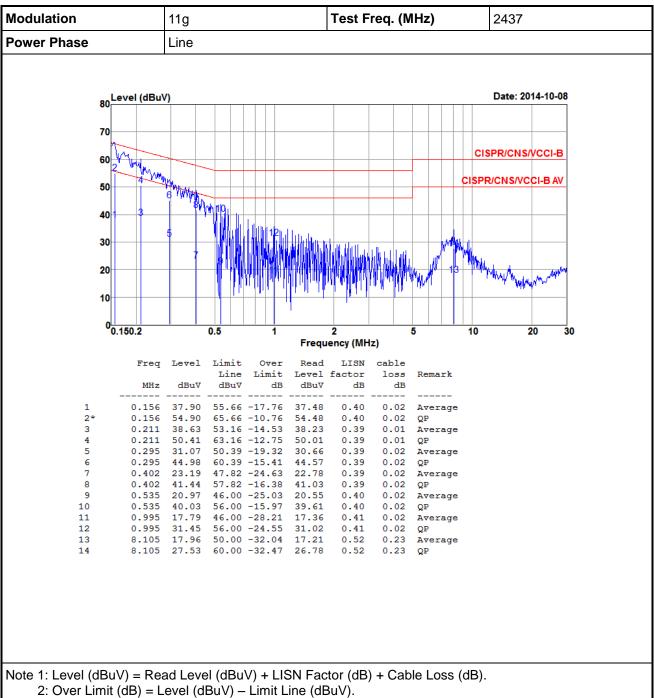
Note: 1. Support units were connected to second LISN.

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

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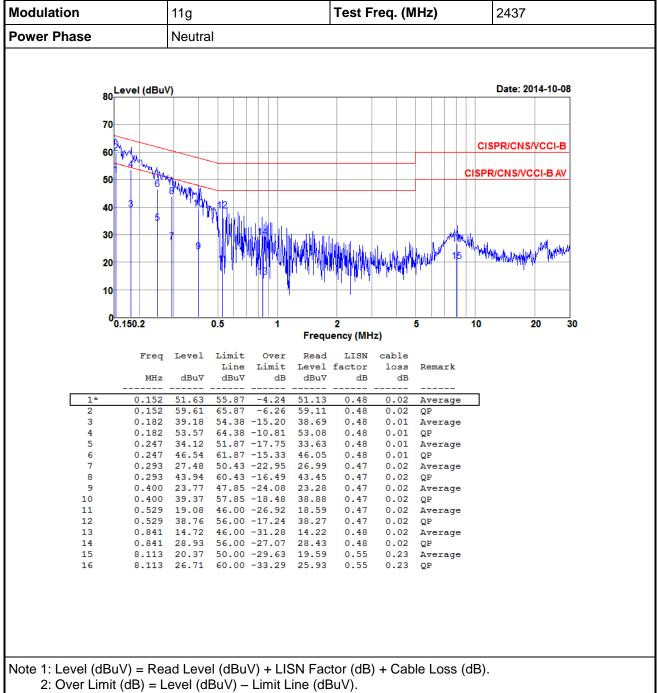


Test Result of Conducted Emissions 3.1.4



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3.2 6dB and Occupied Bandwidth

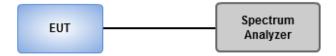
3.2.1 Limit of 6dB Bandwidth

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

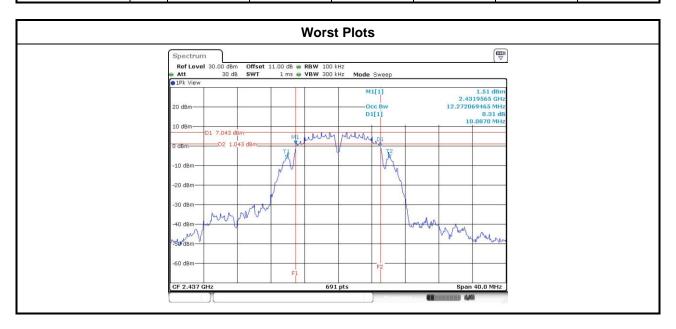


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3.2.4 Test Result of 6dB and Occupied Bandwidth

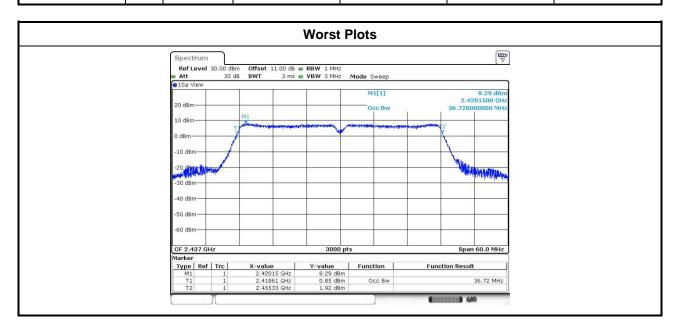
Modulation	N	Eros (MU=)	6dB Bandwidth (MHz)					
Mode	N _{TX}	Freq. (MHz)	Chain 0	Chain 1	Chain 2	Chain 3	Limit (kHz)	
11b	2	2412	10.09	10.09			500	
11b	2	2437	10.09	10.09			500	
11b	2	2462	10.09	10.09			500	
11g	2	2412	16.35	16.35			500	
11g	2	2437	16.35	16.35			500	
11g	2	2462	16.35	16.35			500	
HT20	2	2412	17.16	17.10			500	
HT20	2	2437	17.04	17.28			500	
HT20	2	2462	17.10	17.57			500	
HT40	2	2422	36.29	36.29			500	
HT40	2	2437	36.41	36.29			500	
HT40	2	2452	36.29	36.29			500	



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Modulation	N	Freq.	99% Occupied Bandwidth (MHz)				
Mode	N _{TX}	(MHz)	Chain 0	Chain 1	Chain 2	Chain 3	
11b	2	2412	12.28	12.25			
11b	2	2437	12.33	12.25			
11b	2	2462	12.29	12.25			
11g	2	2412	16.96	16.97			
11g	2	2437	17.00	17.00			
11g	2	2462	16.91	16.89			
HT20	2	2412	17.73	17.73			
HT20	2	2437	17.81	17.83			
HT20	2	2462	17.72	17.70			
HT40	2	2422	36.64	36.64			
HT40	2	2437	36.72	36.70			
HT40	2	2452	36.66	36.64			



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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 _{TX}	Freq. (MHz)	Peak	Peak conducted output power (dBm)		ower	Total Power	Total Power	Limit
Wode		(IVITIZ)	Chain 0	Chain 1	Chain 2	Chain 3	(mW)	(dBm)	(dBm)
11b	2	2412	20.37	20.44			219.555	23.42	30.00
11b	2	2437	21.05	21.20			259.176	24.14	30.00
11b	2	2462	20.99	21.01			251.786	24.01	30.00
11g	2	2412	23.13	23.32			420.372	26.24	30.00
11g	2	2437	23.66	23.82			473.264	26.75	30.00
11g	2	2462	20.93	21.23			256.619	24.09	30.00
HT20	2	2412	22.36	22.88			366.275	25.64	30.00
HT20	2	2437	23.32	23.77			453.015	26.56	30.00
HT20	2	2462	20.57	20.54			227.265	23.57	30.00
HT40	2	2422	20.23	21.11			234.561	23.70	30.00
HT40	2	2437	22.56	23.02			380.749	25.81	30.00
HT40	2	2452	18.51	18.91			148.761	21.72	30.00

Modulation Mode	N _{TX}	Freq.	Conduc		d (average) output power (dBm)		Total Power	Total Power	Limit
Wode		(MHz)	Chain 0	Chain 1	Chain 2	Chain 3	(mW)	(dBm)	(dBm)
11b	2	2412	16.85	17.14			100.178	20.01	30.00
11b	2	2437	17.85	17.92			122.898	20.90	30.00
11b	2	2462	17.75	17.79			119.684	20.78	30.00
11g	2	2412	15.61	16.25			78.561	18.95	30.00
11g	2	2437	16.98	17.23			102.733	20.12	30.00
11g	2	2462	13.21	13.65			44.115	16.45	30.00
HT20	2	2412	14.52	15.17			61.199	17.87	30.00
HT20	2	2437	16.83	17.35			102.520	20.11	30.00
HT20	2	2462	12.21	12.75			35.471	15.50	30.00
HT40	2	2422	12.46	12.98			37.481	15.74	30.00
HT40	2	2437	15.01	15.45			66.771	18.25	30.00
HT40	2	2452	10.38	10.56			22.291	13.48	30.00

Note: Conducted average output power is for reference only.

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3.4 Power Spectral Density

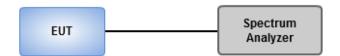
3.4.1 Limit of Power Spectral Density

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



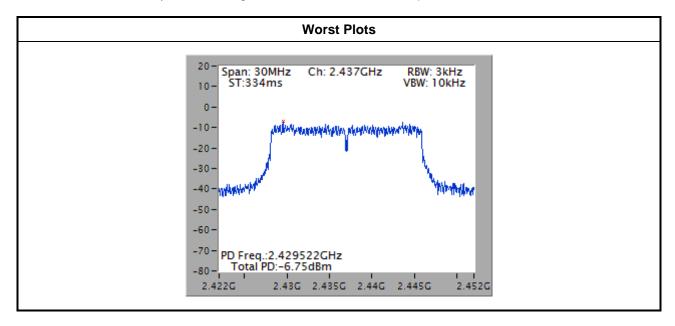
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3.4.4 Test Result of Power Spectral Density

Modulation Mode	N _{TX}	Freq. (MHz)	Total Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
11b	2	2412	-9.55	8.00
11b	2	2437	-8.82	8.00
11b	2	2462	-9.28	8.00
11g	2	2412	-8.95	8.00
11g	2	2437	-8.64	8.00
11g	2	2462	-12.03	8.00
HT20	2	2412	-9.78	8.00
HT20	2	2437	-6.75	8.00
HT20	2	2462	-12.42	8.00
HT40	2	2422	-14.78	8.00
HT40	2	2437	-11.95	8.00
HT40	2	2452	-16.88	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

- 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.

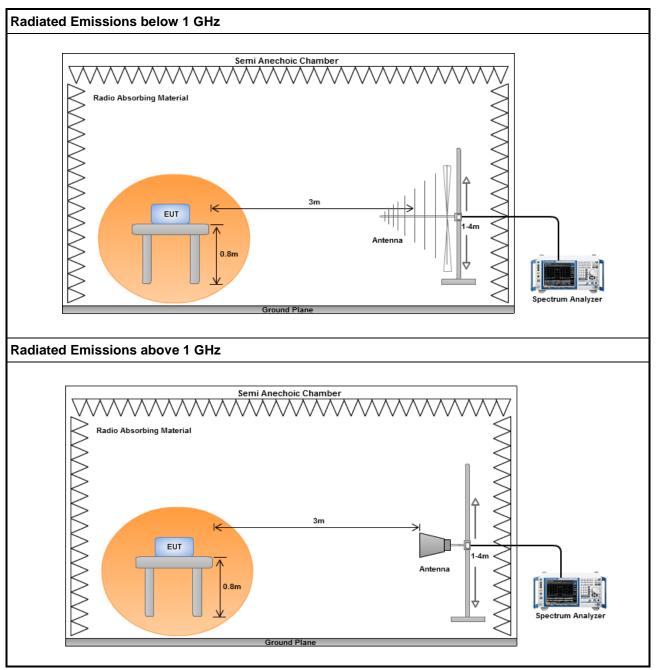
Note:

- 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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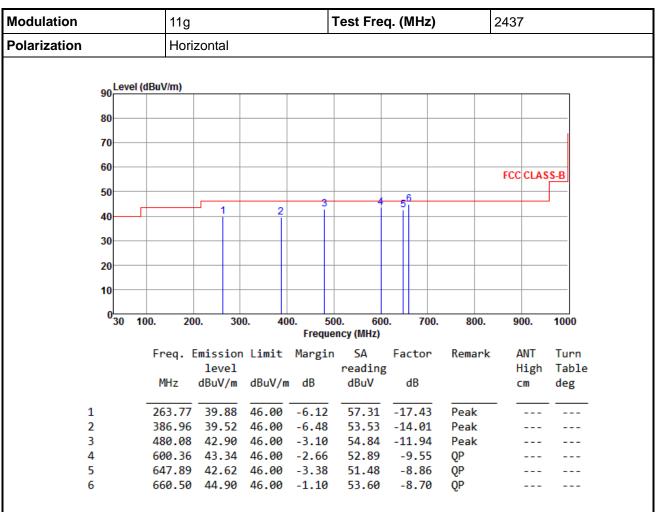
3.5.3 Test Setup



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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)

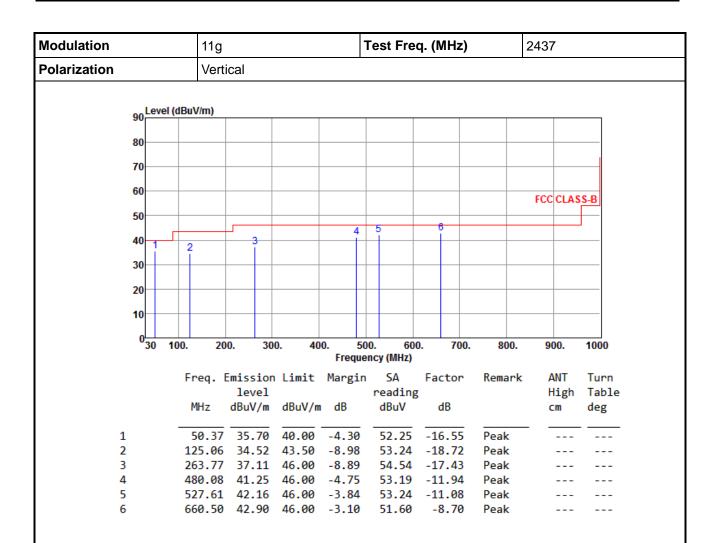
*Factor includes antenna factor, cable loss and amplifier gain

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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*Factor includes antenna factor, cable loss and amplifier gain

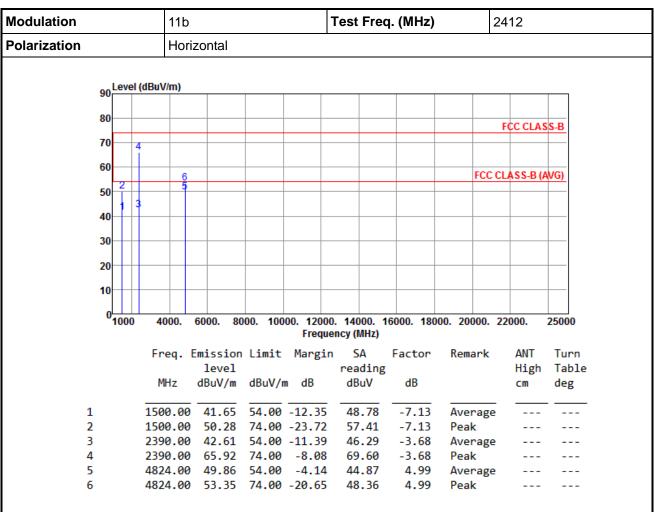
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

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)

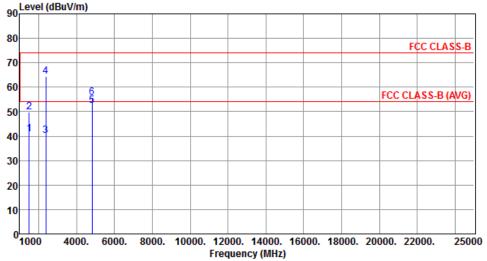
*Factor includes antenna factor, cable loss and amplifier gain

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

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Modulation		11b			Test	Test Freq. (MHz)			24	2412		
Polarization	Vertical											
Leve	el (dRuV	//m)										
90 Level (dBu												
80										E/	C CLAS	e D



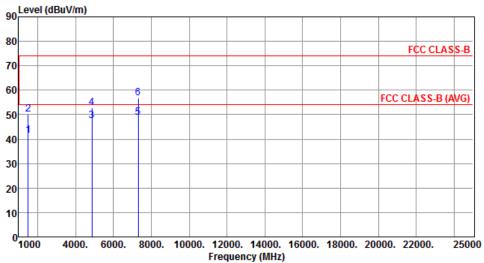
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	1500.00	41.00	54.00	-13.00	48.13	-7.13	Average		
2	1500.00	49.89	74.00	-24.11	57.02	-7.13	Peak		
3	2390.00	40.11	54.00	-13.89	43.79	-3.68	Average		
4	2390.00	64.33	74.00	-9.67	68.01	-3.68	Peak		
5	4824.00	52.43	54.00	-1.57	47.44	4.99	Average		
6	4824.00	55.88	74.00	-18.12	50.89	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	11b	Test Freq. (MHz)	2437
Polarization	Horizontal		
90_Level (dBu\	//m)		



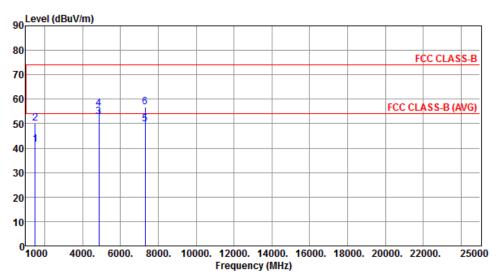
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Ü	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	1500.00	41.38	<u> </u>	12 62	48.51	-7.13	Average		
_						-/.13			
2	1500.00	50.22	74.00	-23.78	57.35	-7.13	Peak		
3	4874.00	47.56	54.00	-6.44	42.46	5.10	Average		
4	4874.00	52.79	74.00	-21.21	47.69	5.10	Peak		
5	7311.00	48.68	54.00	-5.32	39.35	9.33	Average		
6	7311.00	56.71	74.00	-17.29	47.38	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		

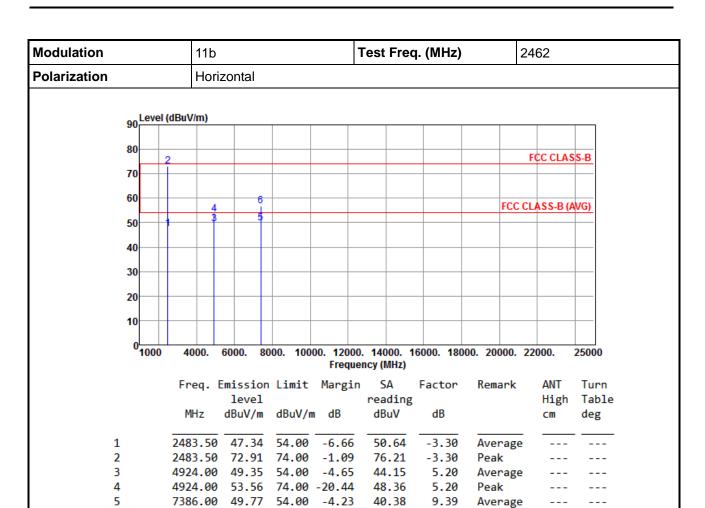


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Ū	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	1500.00	41.38	54.00	-12.62	48.51	-7.13	Average		
2	1500.00	50.22	74.00	-23.78	57.35	-7.13	Peak		
3	4874.00	52.92	54.00	-1.08	47.82	5.10	Average		
4	4874.00	56.25	74.00	-17.75	51.15	5.10	Peak		
5	7311.00	49.68	54.00	-4.32	40.35	9.33	Average		
6	7311.00	56.71	74.00	-17.29	47.38	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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47.46

9.39

Peak

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

7386.00 56.85 74.00 -17.15

*Factor includes antenna factor, cable loss and amplifier gain

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

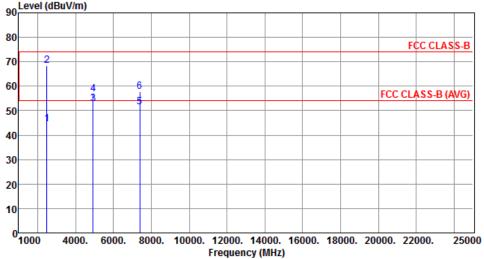
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Modulation		11b			Test	Test Freq. (MHz)			24	2462		
Polarization Vertical												
l e	vel (dRu\	//m)										
90	vel (dBu\											
80—									E/	C CLAS	c D	



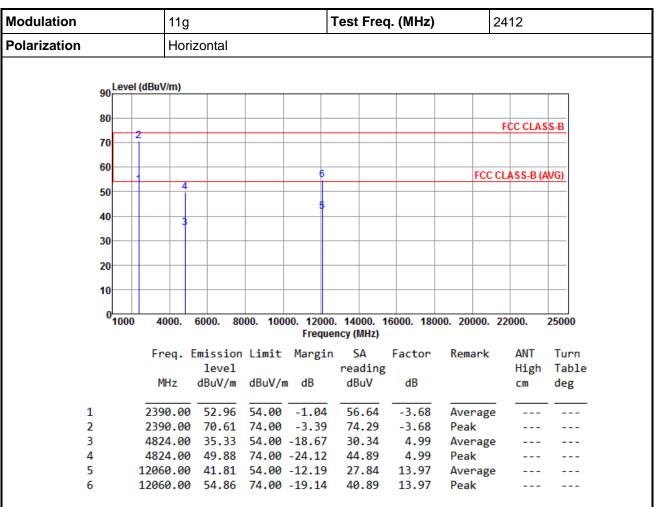
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Ū	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	44.65	54.00	-9.35	47.95	-3.30	Average		
2	2483.50	68.54	74.00	-5.46	71.84	-3.30	Peak		
3	4924.00	52.94	54.00	-1.06	47.74	5.20	Average		
4	4924.00	56.70	74.00	-17.30	51.50	5.20	Peak		
5	7386.00	51.39	54.00	-2.61	42.00	9.39	Average		
6	7386.00	57.71	74.00	-16.29	48.32	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)

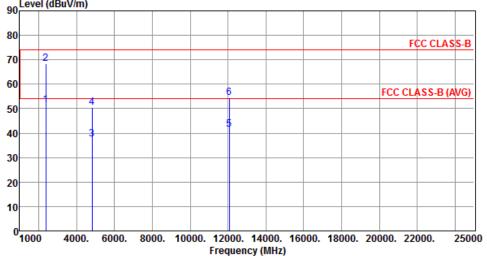
*Factor includes antenna factor, cable loss and amplifier gain

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

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



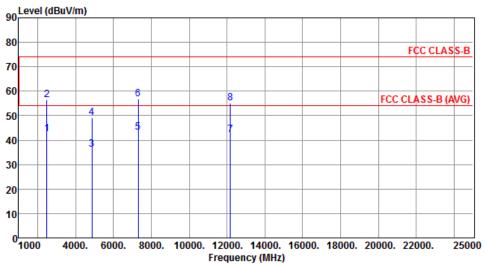
		Emission level		Ū	SA reading		Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		CM	deg
1	2390.00	51.58	54.00	-2.42	55.26	-3.68	Average		
2	2390.00	68.26	74.00	-5.74	71.94	-3.68	Peak		
3	4824.00	37.40	54.00	-16.60	32.41	4.99	Average		
4	4824.00	50.50	74.00	-23.50	45.51	4.99	Peak		
5	12060.00	41.61	54.00	-12.39	27.64	13.97	Average		
6	12060.00	54.55	74.00	-19.45	40.58	13.97	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	Test Freq. (MHz)			24	37			
Polarization Horizontal												
Le	vel (dBuV/ı	m)										
90												



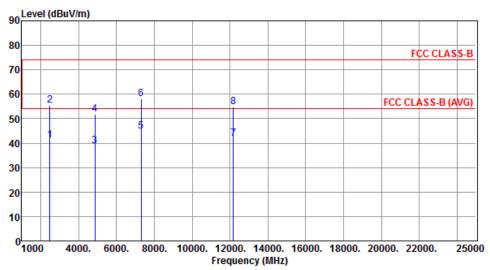
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Ū	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	42.57	54.00	-11.43	45.87	-3.30	Average		
2	2483.50	56.42	74.00	-17.58	59.72	-3.30	Peak		
3	4874.00	36.25	54.00	-17.75	31.15	5.10	Average		
4	4874.00	49.21	74.00	-24.79	44.11	5.10	Peak		
5	7311.00	43.24	54.00	-10.76	33.91	9.33	Average		
6	7311.00	56.93	74.00	-17.07	47.60	9.33	Peak		
7	12185.00	42.01	54.00	-11.99	28.11	13.90	Average		
8	12185.00	54.97	74.00	-19.03	41.07	13.90	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	11g	Test Freq. (MHz)	2437
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	41.19	54.00	-12.81	44.49	-3.30	Average		
2	2483.50	55.38	74.00	-18.62	58.68	-3.30	Peak		
3	4874.00	38.84	54.00	-15.16	33.74	5.10	Average		
4	4874.00	51.90	74.00	-22.10	46.80	5.10	Peak		
5	7311.00	44.99	54.00	-9.01	35.66	9.33	Average		
6	7311.00	57.95	74.00	-16.05	48.62	9.33	Peak		
7	12185.00	42.00	54.00	-12.00	28.10	13.90	Average		
8	12185.00	54.87	74.00	-19.13	40.97	13.90	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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4

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Modulation			11g				Test Fre	q. (MHz)		246	62	
Polarization			Horizontal									
	90	Level	(dBuV/m)									
	80											
	00		2							FC	CC CLAS	S-B
	70											
	60			6								
			4	+					FC	C CLA	ASS-B (A	WG)
	50			5								
	40		3									
	30											
	20											
	10											
	0											
		1000	4000.	6000. 80	00. 1000		0. 14000. ency (MHz)	16000. 180	00. 2000	0. 220	000.	25000
			Freq.	Emission	Limit	Margi	n SA	Factor	Remar	k	ANT	Turi
				level			reading	g			High	Tab:
			MHz	dBuV/m	dBuV/m	dB	dBuV	dB			cm	deg
	1		2483 50	52.52	54 00	-1 48	55.82	-3.30	Avera	<u>σ</u>		
	2			72.39					Peak	8-		

4924.00 35.46 54.00 -18.54 30.26

4924.00 50.22 74.00 -23.78 45.02 7386.00 42.84 54.00 -11.16 33.45 7386.00 56.77 74.00 -17.23 47.38 Average

Average

Peak

Peak

5.20

5.20

9.39

9.39

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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6

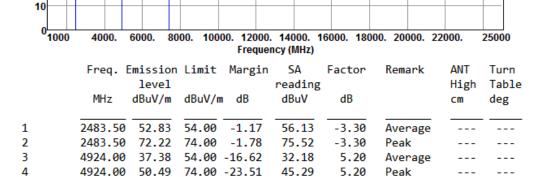
7386.00

44.41

7386.00 57.56 74.00 -16.44

54.00 -9.59

Modulation				11g				Tes	Test Freq. (MHz)				2462		
Polarization			Vertical												
	90 80	Level (dBuV	/m)								F	CC CLAS	S-B	
	70 60														
	00				1 1							FCC CLA	ASS-B (WG)	



35.02

48.17

Average

Peak

9.39

9.39

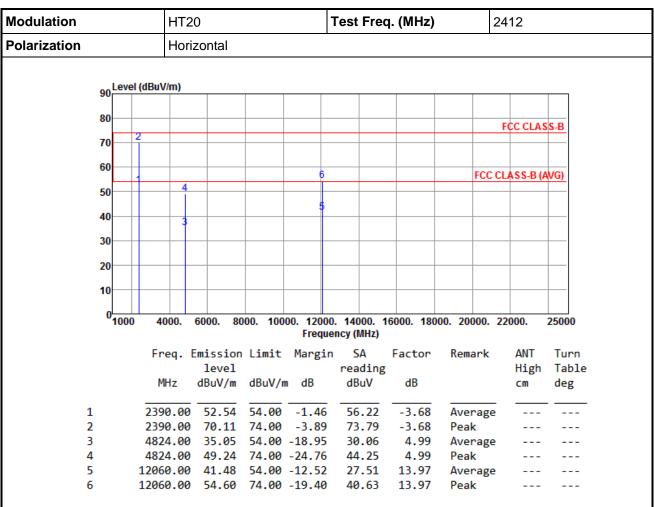
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB) *Factor includes antenna factor , cable loss and amplifier gain

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

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



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

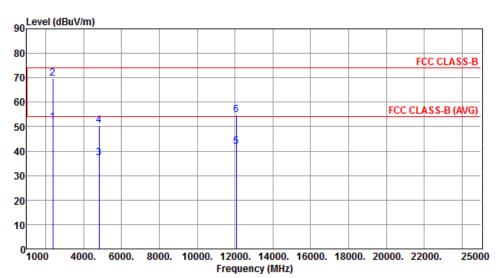
*Factor includes antenna factor, cable loss and amplifier gain

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

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Modulation	HT20	Test Freq. (MHz)	2412
Polarization	Vertical		



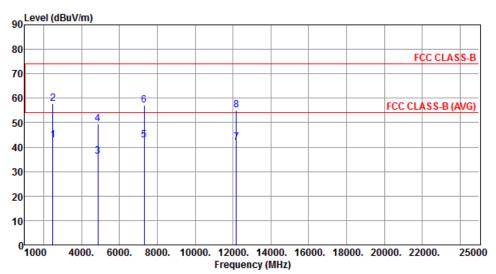
		Emission level		Ū	SA reading		Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2390.00	51.95	54.00	-2.05	55.63	-3.68	Average		
2	2390.00	69.71	74.00	-4.29	73.39	-3.68	Peak		
3	4824.00	37.12	54.00	-16.88	32.13	4.99	Average		
4	4824.00	50.43	74.00	-23.57	45.44	4.99	Peak		
5	12060.00	41.84	54.00	-12.16	27.87	13.97	Average		
6	12060.00	54.81	74.00	-19.19	40.84	13.97	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		



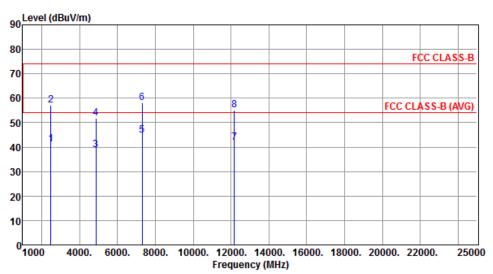
		Emission level		Ū	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2483.50	42.93	54.00	-11.07	46.23	-3.30	Average		
2	2483.50	57.71	74.00	-16.29	61.01	-3.30	Peak		
3	4874.00	36.36	54.00	-17.64	31.26	5.10	Average		
4	4874.00	49.44	74.00	-24.56	44.34	5.10	Peak		
5	7311.00	42.87	54.00	-11.13	33.54	9.33	Average		
6	7311.00	57.15	74.00	-16.85	47.82	9.33	Peak		
7	12185.00	41.86	54.00	-12.14	27.96	13.90	Average		
8	12185.00	55.21	74.00	-18.79	41.31	13.90	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	HT20	Test Freq. (MHz)	2437
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Ū	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
	11112	ubuv/iii	ubuv/iii	ub	abav	ub		CIII	ueg
1	2483.50	41.29	54.00	-12.71	44.59	-3.30	Average		
2	2483.50	57.04	74.00	-16.96	60.34	-3.30	Peak		
3	4874.00	38.72	54.00	-15.28	33.62	5.10	Average		
4	4874.00	51.69	74.00	-22.31	46.59	5.10	Peak		
5	7311.00	44.75	54.00	-9.25	35.42	9.33	Average		
6	7311.00	58.08	74.00	-15.92	48.75	9.33	Peak		
7	12185.00	41.94	54.00	-12.06	28.04	13.90	Average		
8	12185.00	55.12	74.00	-18.88	41.22	13.90	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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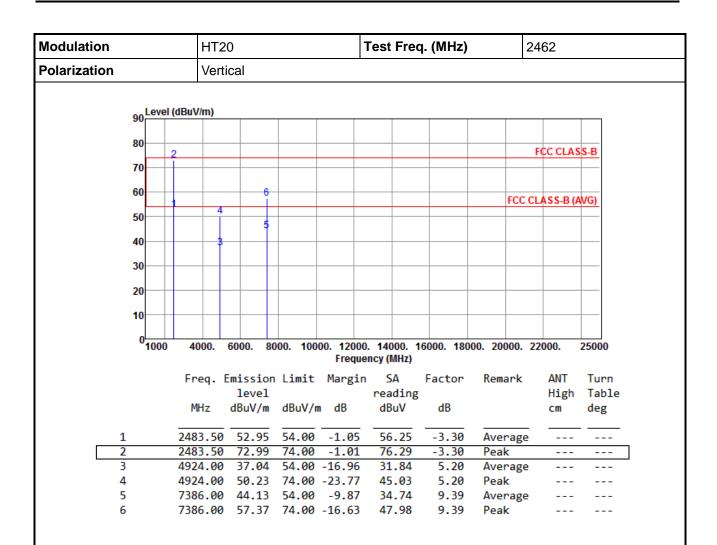
dulation			HT2)				Test	Freq	. (MH	z)	24	62	
larization			Horiz	Horizontal										
			•											
	90 ^{L0}	evel (dBu	V/m)											
	80-													
	-	2										F	CC CLAS	S-B
	70													
	60				6							FCC CL	ASS-B (A	VG)
	50		4											
	40				5									
	30													
	30													
	20													
	10													
	0	100	1000	6000	0000	40000	420	00 44	000 4	2000	10000 1	0000 33	1000	2504
	10	000 4	1000.	6000.	8000.	10000		00. 14 uency (ouuu. 1	18000. 2	20000. 22	2000.	2500

		Emission level		Ū	SA reading		Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		CM	deg
	0400 50			4.26					
1	2483.50	52.64	54.00	-1.36	55.94	-3.30	Average		
2	2483.50	72.59	74.00	-1.41	75.89	-3.30	Peak		
3	4924.00	35.37	54.00	-18.63	30.17	5.20	Average		
4	4924.00	50.06	74.00	-23.94	44.86	5.20	Peak		
5	7386.00	42.51	54.00	-11.49	33.12	9.39	Average		
6	7386.00	56.44	74.00	-17.56	47.05	9.39	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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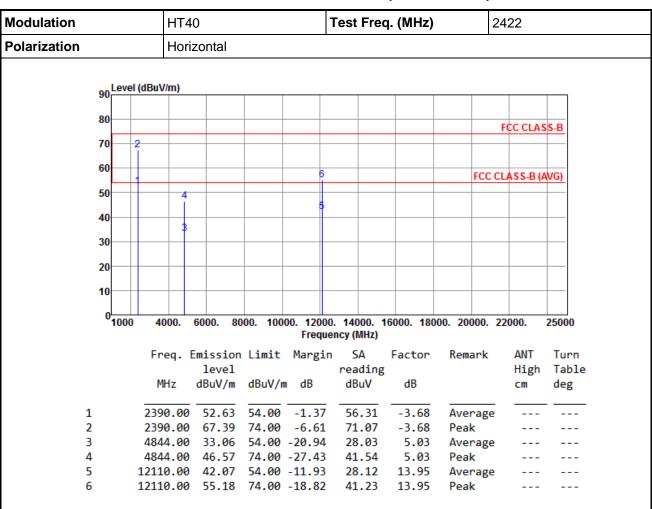
*Factor includes antenna factor, cable loss and amplifier gain

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

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



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

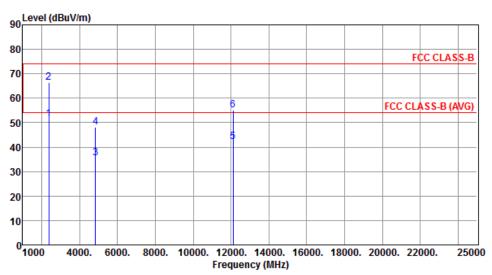
*Factor includes antenna factor, cable loss and amplifier gain

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

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Modulation	HT40	Test Freq. (MHz)	2422
Polarization	Vertical		



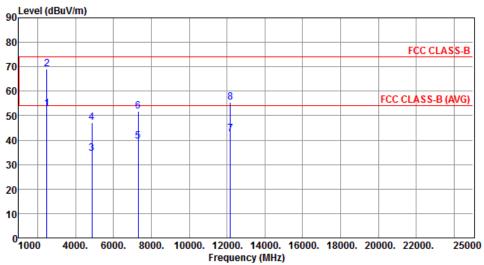
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Ū	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	51.50	54.00	-2.50	55.18	-3.68	Average		
_									
2	2390.00	66.42	74.00	-7.58	70.10	-3.68	Peak		
3	4844.00	35.60	54.00	-18.40	30.57	5.03	Average		
4	4844.00	48.02	74.00	-25.98	42.99	5.03	Peak		
5	12110.00	42.21	54.00	-11.79	28.26	13.95	Average		
6	12110.00	55.29	74.00	-18.71	41.34	13.95	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		
90 Level (dBu\	//m)		



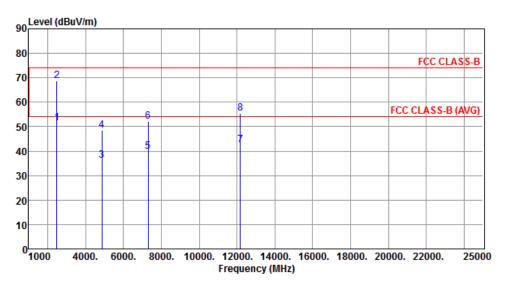
	Freq. i	Emission level dBuV/m	Limit dBuV/m	Ū	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	52.71	54.00	-1.29	56.01	-3.30	Average		
2	2483.50	69.09	74.00	-4.91	72.39	-3.30	Peak		
3	4874.00	34.38	54.00	-19.62	29.28	5.10	Average		
4	4874.00	47.11	74.00	-26.89	42.01	5.10	Peak		
5	7311.00	39.51	54.00	-14.49	30.18	9.33	Average		
6	7311.00	51.84	74.00	-22.16	42.51	9.33	Peak		
7	12185.00	42.42	54.00	-11.58	28.52	13.90	Average		
8	12185.00	55.46	74.00	-18.54	41.56	13.90	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	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	51.63	54.00	-2.37	54.93	-3.30	Average		
2	2483.50	68.82	74.00	-5.18	72.12	-3.30	Peak		
3	4874.00	36.27	54.00	-17.73	31.17	5.10	Average		
4	4874.00	48.46	74.00	-25.54	43.36	5.10	Peak		
5	7311.00	39.99	54.00	-14.01	30.66	9.33	Average		
6	7311.00	52.25	74.00	-21.75	42.92	9.33	Peak		
7	12185.00	42.45	54.00	-11.55	28.55	13.90	Average		
8	12185.00	55.54	74.00	-18.46	41.64	13.90	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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l lodulation		HT40					Т	Test Freq. (MHz)					452		
Polarization		Horizontal													
90 <mark>Le</mark>	vel (dBu	V/m)													
80—															
00														FCC CLAS	SS-B
70	2						+				-		-		+-1
60															\perp
-	4			6									FCC C	LASS-B (AVG)
50		4					+								+
40				5											
		3													
30—															+-1
20															
10															
0 <mark></mark>	00 4	4000.	6000.	8000	. 100		2000. equer			6000.	180	00. 20	0000. 2	22000.	2500
	Е	noa F	missi	on I	imi+		-		-	Fact	ton	Ron	ıark	ANT	Tur
		req. i	leve		111111	riai	8111		ding		COI	IXCII	iui K	High	
	ı	MHz	dBuV/	m d	BuV/	m dB		dBı		dl	В			cm	deg
1	24	83.50	52.5	2 5	1 00	-1.	48	55	.82		.30	Δνε	erage		
2		83.50				-5.			.51		.30	Pea	_		
3	49	04.00	32.8			-21.			.66		.16		erage		
4	49	04.00	46.5	5 7	4.00	-27.	45	41	.39	5.	.16	Pea	ak _		
5			39.0						.66		.36		erage		
6	73	56.00	51.6	4 7	4.00	-22.	36	42	. 28	9.	.36	Pea	k		

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

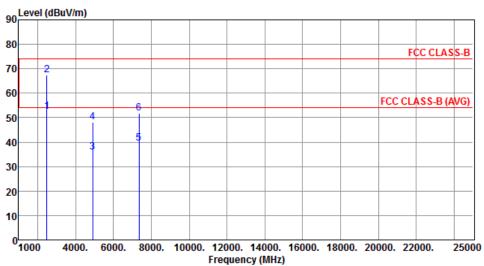
*Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

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Modulation	HT40	Test Freq. (MHz)	2452
Polarization	Vertical		
oo 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	2483.50	52.44	54.00	-1.56	55.74	-3.30	Average		
2	2483.50			-6.57	70.73	-3.30	Peak		
3	4904.00	35.78	54.00	-18.22	30.62	5.16	Average		
4	4904.00	48.03	74.00	-25.97	42.87	5.16	Peak		
5	7356.00	39.55	54.00	-14.45	30.19	9.36	Average		
6	7356.00	51.80	74.00	-22.20	42.44	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

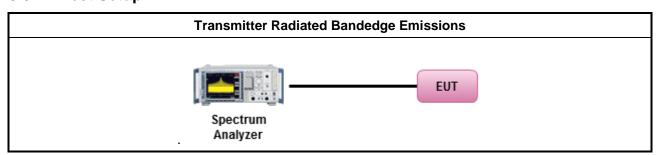
Reference level measurement

- 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

- 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

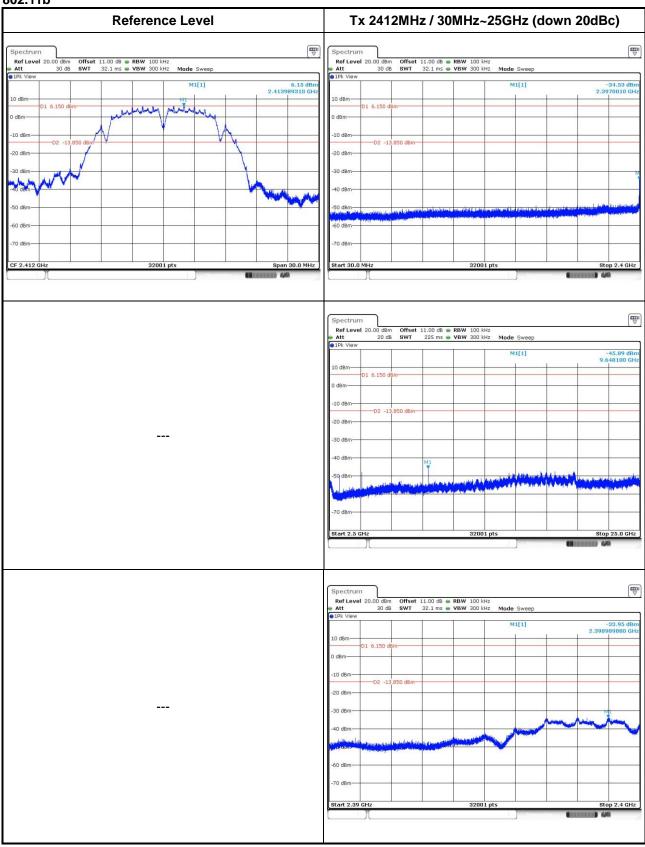
This test item is performed on each TX output individually without summing or adding 10 $log(N_{ANT})$ since measurements are made relative to the in-band emissions on the individual outputs. Only worst test result of each operating mode is presented.

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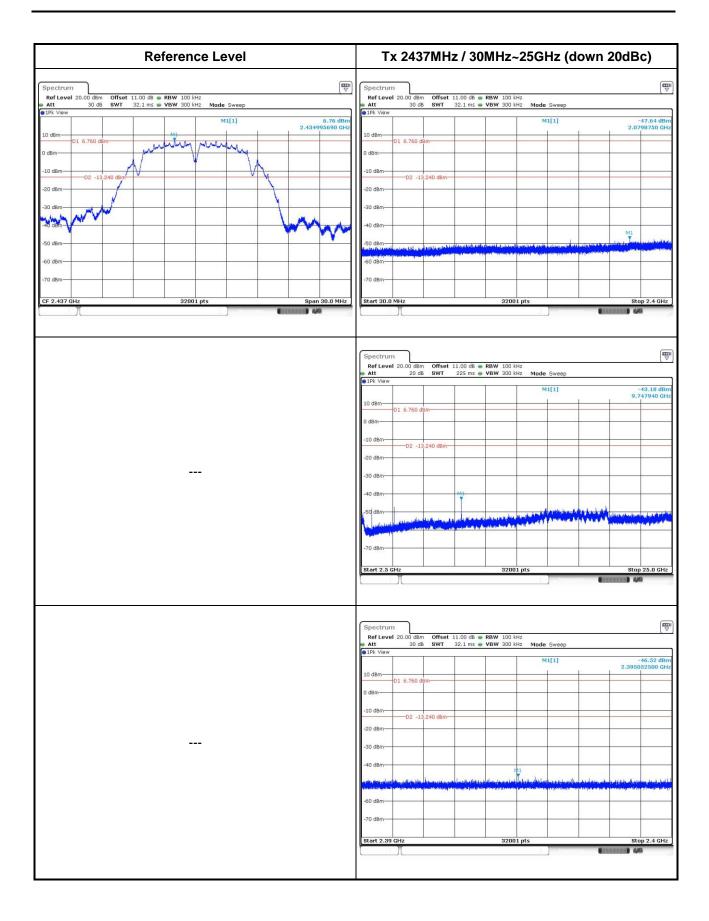
3.6.6 Unwanted Emissions into Non-Restricted Frequency Bands

802.11b



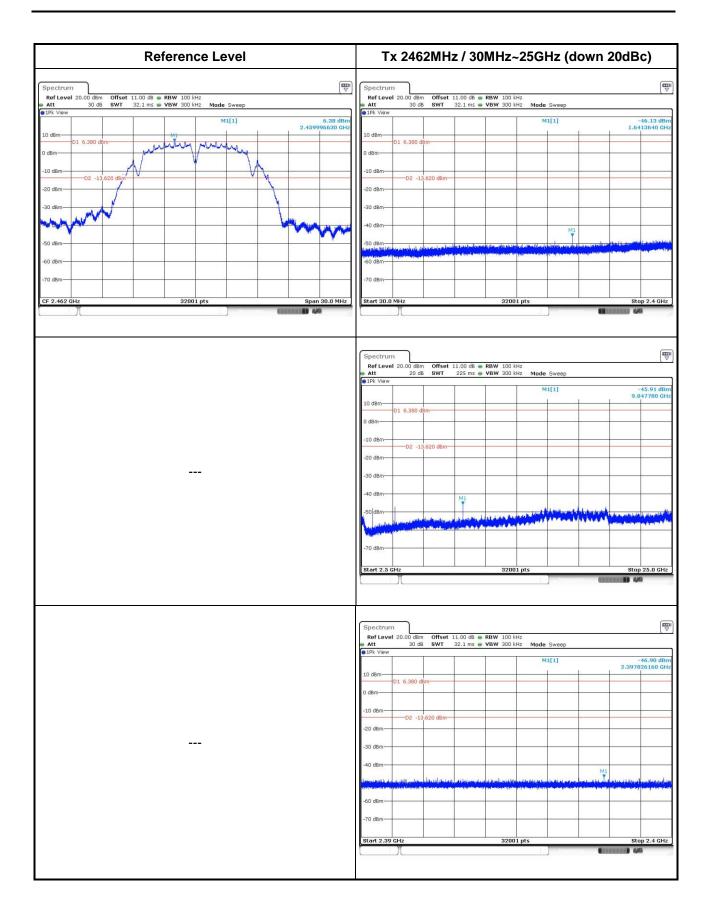
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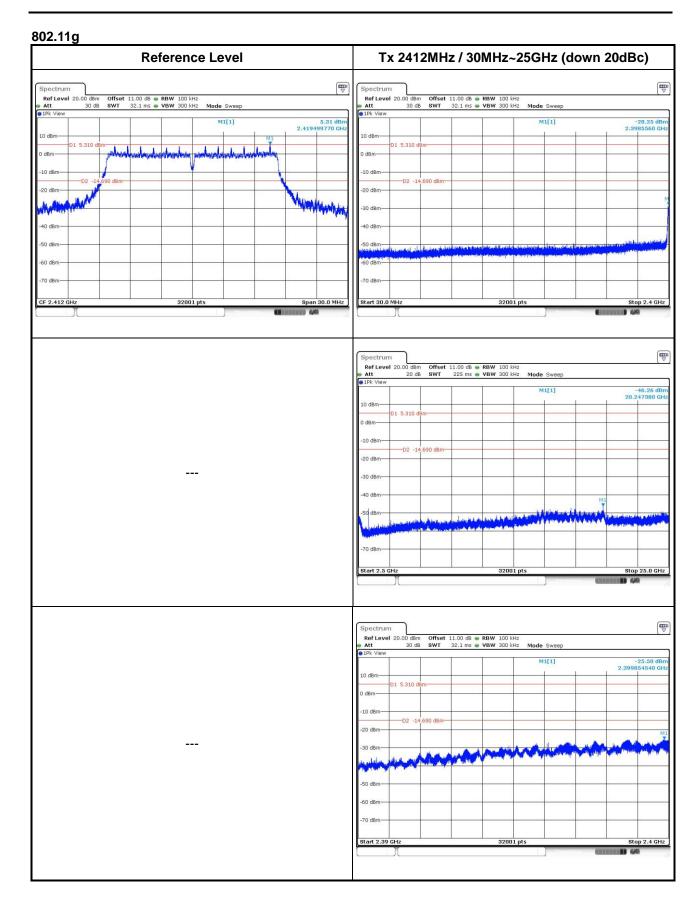
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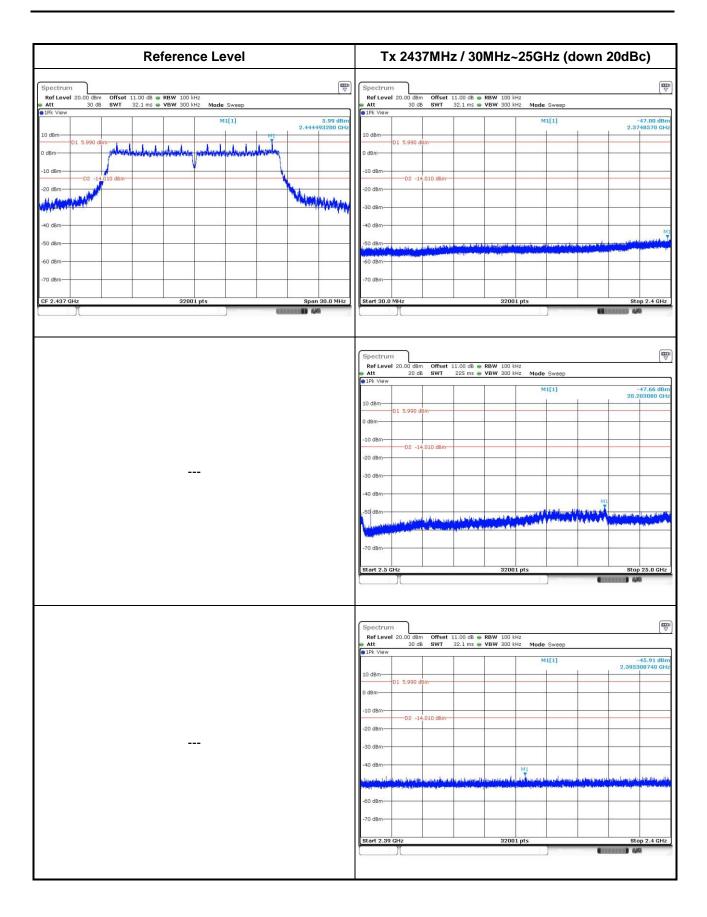
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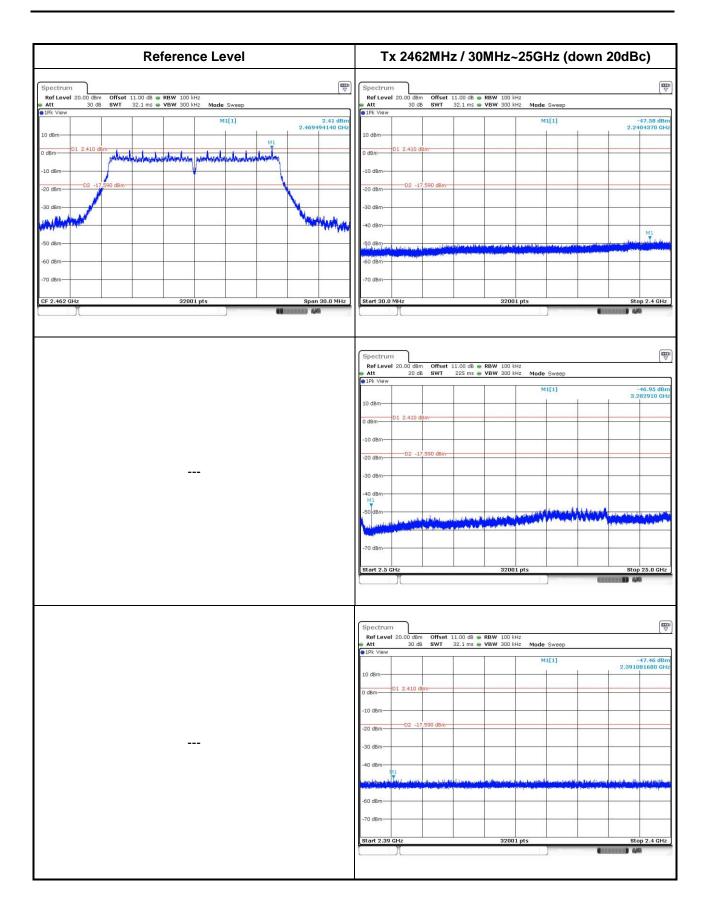
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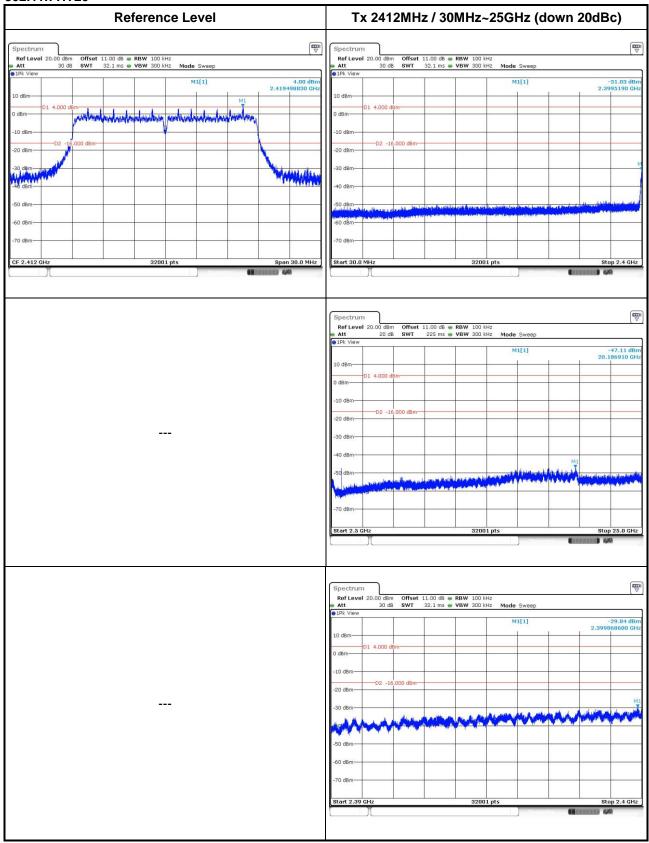




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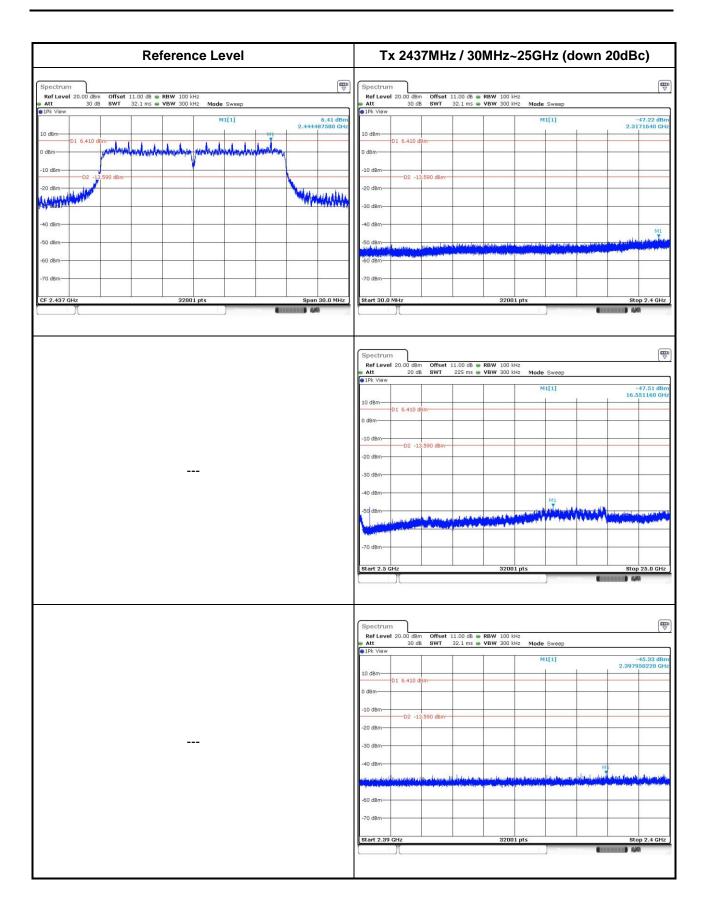


802.11n HT20



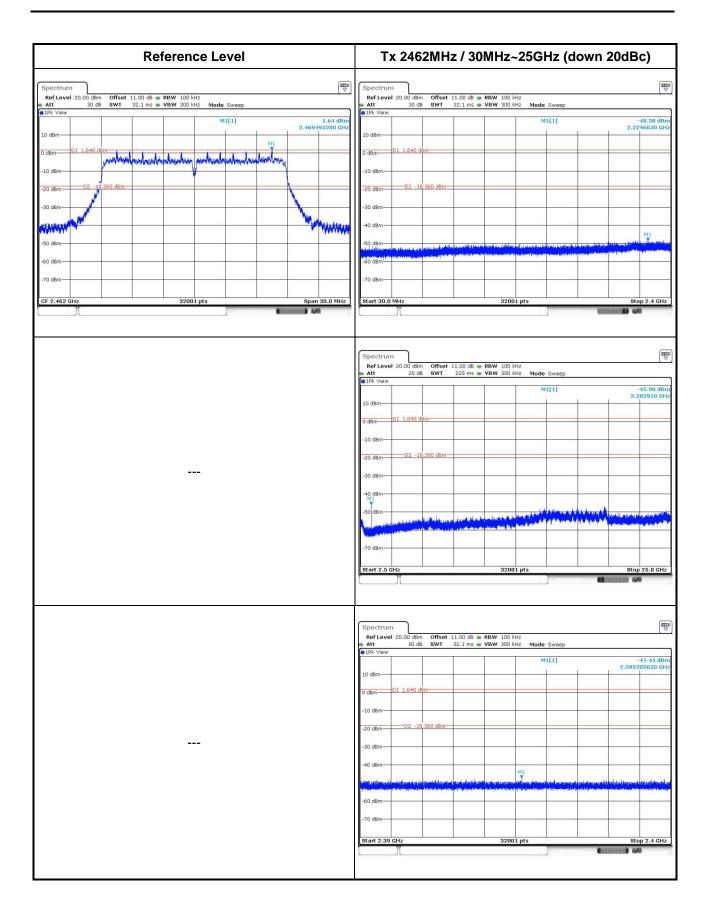
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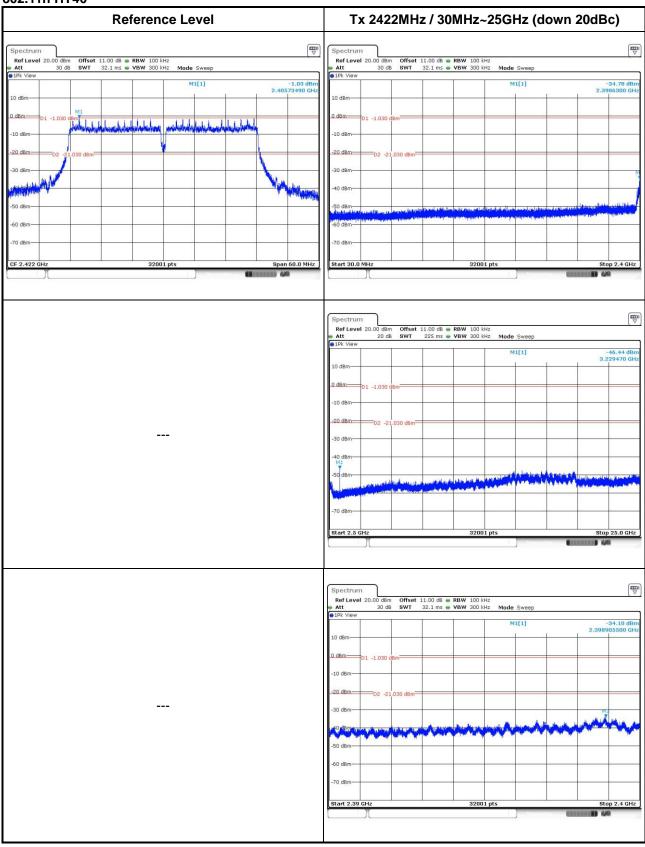




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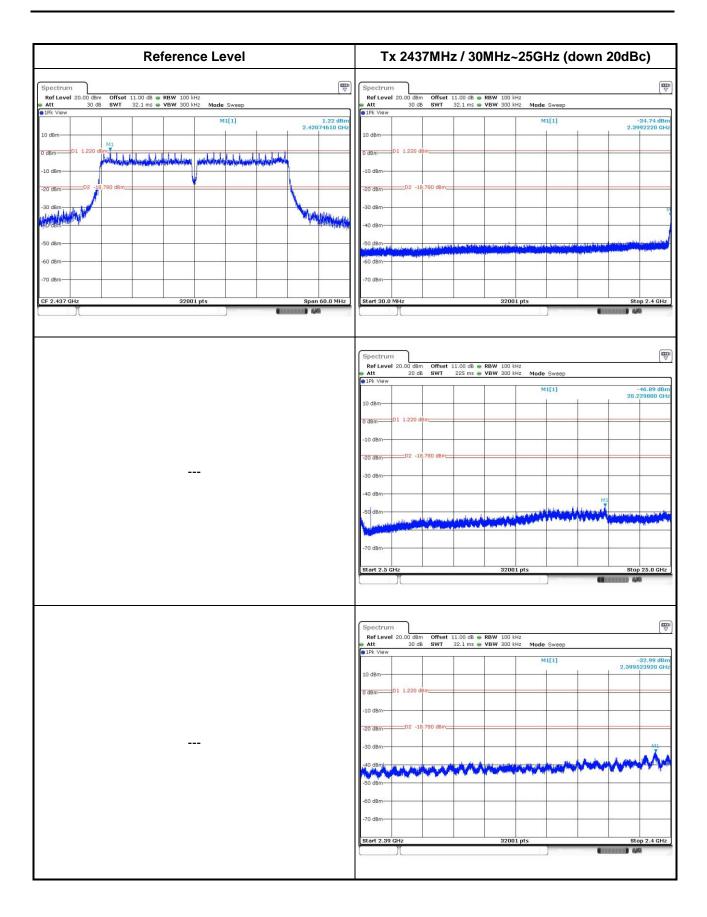


802.11n HT40



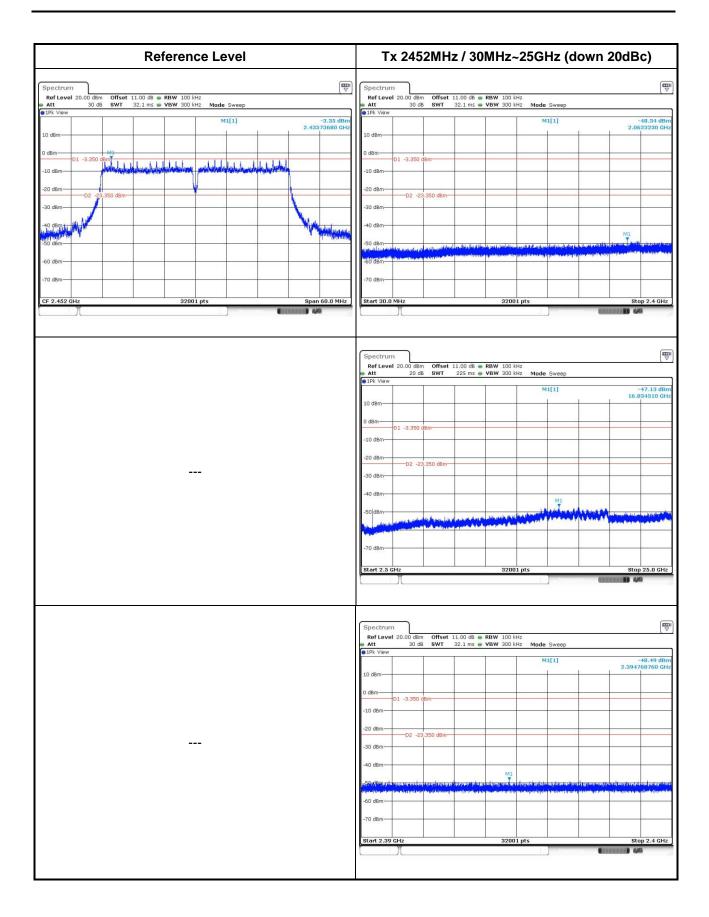
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4 Test laboratory information

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 http://www.icertifi.com.tw.

Linkou

Tel: 886-2-2601-1640

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

R.O.C.

Kwei Shan

Tel: 886-3-271-8666 No. 3-1, Lane 6, Wen San 3rd St., Kwei Shan 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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