

FCC Test Report

FCC ID : 188WRE6505V2

Equipment : Wireless AC750 Range Extender

Model No. : WRE6505 v2

Brand Name : ZYXEL

Applicant: Zyxel Communications Corporation

Address : No.2 Industry East RD. IX, Hsinchu Science

Park, Hsinchu 30075, Taiwan, R.O.C

Standard : 47 CFR FCC Part 15.247

Received Date : May 04, 2016

Tested Date : Aug. 02 ~ Aug. 12, 2016

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

Reviewed by: Approved by:

Along Cher // Assistant Manager Gary Chang / Manager

Testing Laboratory 2732

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Release Record

Report No.	Version	Description	Issued Date
FR650401AC	Rev. 01	Initial issue	Oct. 21, 2016

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Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	Conducted Emissions	[dBuV]: 0.554MHz 37.78 (Margin -8.22dB) - AV	Pass
15.247(d) 15.209	Radiated Emissions	[dBuV/m at 3m]: 2390.00MHz 53.83 (Margin -0.17dB) - AV	Pass
15.247(b)(3)	Maximum Output Power	Max Power [dBm]: Non-beamforming mode 23.61 Beamforming mode 22.17	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

The following versions are provided to this EUT.

sample version	Internal DDR Size	Working voltage of DDR
VE3	32M	DDR1 voltage: 2.5V
VE4	64M	DDR2 voltabe:1.8V

1.1.1 Specification of the Equipment under Test (EUT)

RF General Information							
Frequency Range (MHz)	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 Conducted (Average) Output Power.

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

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

Note 4: 802.11n supports beamforming function.

1.1.2 Antenna Details

Model	Turno	Connector	Operating Frequencies (MHz) / Antenna Gain (dB		
Model Type		Connector	2400~2483.5	5150~5250	5725~5850
ALA110-052026	PIFA	N/A	4.70836		
ALA160-222034	PIFA	N/A	2.82	3.43	3.43

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	100-240V, 0.15A, 50/60Hz
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1.1.4 Accessories

	Accessories					
No.	No. Equipment Description					
1	RJ45 cable	0.94m non-shielded w/o core				

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1.1.5 Channel List

Frequency	band (MHz)	2400~	2483.5	
802.11 b /	g / n HT20	802.11n 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			

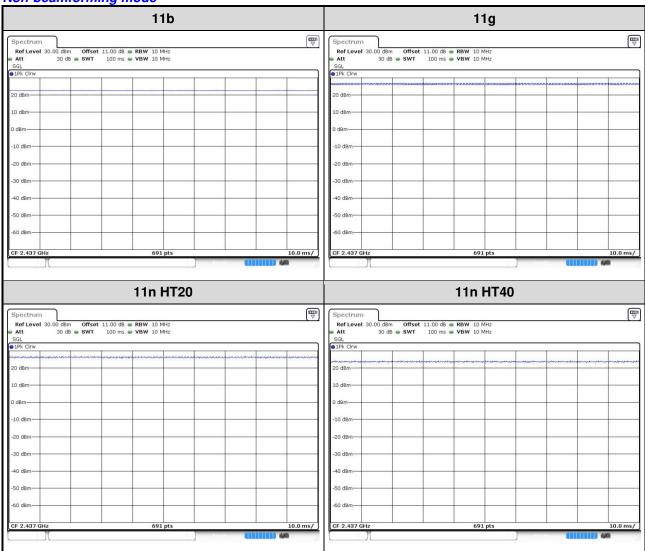
1.1.6 Test Tool and Duty Cycle

Test Tool	Non-beamforming: MP_TEST, Version: 1.3.8.0 Beamforming: LanTest20, Version: 2.0.0.2					
	Mode	Non-beamforming		Beamforming		
	Mode	Duty cycle (%)	Duty factor (dB)	Duty cycle (%) Duty t	Duty factor (dB)	
Duty Cycle and Duty Footor	11b	100.00%	0.00			
Duty Cycle and Duty Factor	11g	100.00%	0.00			
	HT20	100.00%	0.00	99.66%	0.01	
	HT40	100.00%	0.00	99.59%	0.02	

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Beamforming mode



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1.1.7 Power Setting

Modulation Mada	Took Everyoney (MILIP)	Powe	r Set
Modulation Mode	Test Frequency (MHz)	Non-beamforming	Beamforming 2D/2A 3B/36 33/30
11b	2412	48/45	
11b	2437	48/46	
11b	2462	48/46	
11g	2412	48/43	
11g	2437	57/51	
11g	2462	53/49	
HT20	2412	48/43	2D/2A
HT20	2437	57/51	3B/36
HT20	2462	52/48	33/30
HT40	2422	46/40	30/2A
HT40	2437	57/53	3A/37
HT40	2452	49/44	33/2D

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1.2 Local Support Equipment List

Non-beamforming mode

	Support Equipment List							
No.	Equipment	Brand	Model	S/N	Signal cable / Length (m)			
1	Notebook	DELL	Latitude E6430	C0GB4X1	RJ45, 10m non-shielded.			

Beamforming mode

	Support Equipment List										
No.	lo. Equipment Brand Model S/N Signal cable / Len										
1	Notebook	DELL	Latitude E6430	C0GB4X1	RJ45, 10m non-shielded.						
2	Notebook	DELL	Latitude E6430	9ZFB4X1							
3	USB dongle	Edimax	EW-7612UAn								

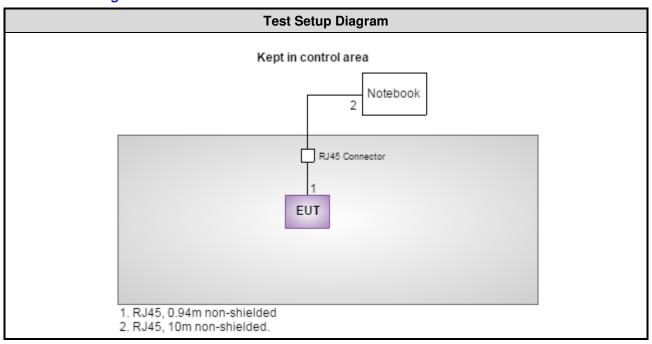
Note: No. 3 is provided by applicant.

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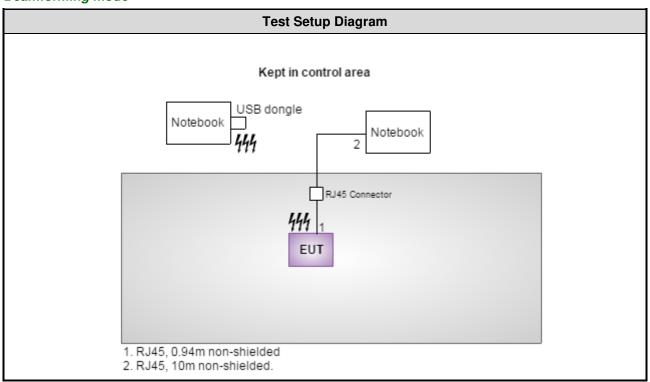


1.3 Test Setup Chart

Non-beamforming mode



Beamforming mode



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1.4 The Equipment List

Test Item	Conducted Emission	Conducted Emission								
Test Site	Conduction room 1 /	Conduction room 1 / (CO01-WS)								
Instrument	Manufacturer	Manufacturer Model No. Serial No. Calibration Date Calibration Until								
EMC Receiver	R&S	ESCS 30	100169	Oct. 21, 2015	Oct. 20, 2016					
LISN	R&S	ENV216	101579	Jan. 11, 2016	Jan. 10, 2017					
RF Cable-CON	EMC	EMCCFD300-BM-BM-6000	50821	Dec. 21, 2015	Dec. 20, 2016					
Measurement Software	AUDIX	e3	6.120210k	NA	NA					
Note: Calibration Int	Note: Calibration Interval of instruments listed above is one year.									

Test Item	Radiated Emission									
Test Site	966 chamber 3 / (030	CH03-WS)								
Instrument	Manufacturer Model No. Serial No.		Calibration Date	Calibration Until						
Spectrum Analyzer	Agilent	N9010A	MY53400091	Sep. 14, 2015	Sep. 13, 2016					
Receiver	Agilent	N9038A	MY53290044	Oct. 14, 2015	Oct. 13, 2016					
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-563	Dec. 29, 2015	Dec. 28, 2016					
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1206	Feb. 24, 2016	Feb. 23, 2017					
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 04, 2015	Nov. 03, 2016					
Preamplifier	EMC	EMC02325	980187	Sep. 21, 2015	Sep. 20, 2016					
Preamplifier	Agilent	83017A	MY53270014	Sep. 07, 2015	Sep. 06, 2016					
Preamplifier	EMC	EMC184045B	980192	Sep. 01, 2015	Aug. 31, 2016					
RF cable-3M	HUBER+SUHNER	SUCOFLEX104	MY22620/4	Feb. 05, 2016	Feb. 04, 2017					
RF cable-8M	HUBER+SUHNER	SUCOFLEX104	MY22600/4	Feb. 05, 2016	Feb. 04, 2017					
RF cable-1M	HUBER+SUHNER	SUCOFLEX104	MY22624/4	Feb. 05, 2016	Feb. 04, 2017					
LF cable-0.8M	EMC	EMC8D-NM-NM-800	EMC8D-NM-NM-800-001	Feb. 05, 2016	Feb. 04, 2017					
LF cable-3M	EMC	EMC8D-NM-NM-3000	131103	Feb. 05, 2016	Feb. 04, 2017					
LF cable-13M	EMC	EMC8D-NM-NM-13000	131104	Feb. 05, 2016	Feb. 04, 2017					
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 16, 2015	Nov. 15, 2016					
Measurement Software	AUDIX	e3	6.120210g	NA	NA					
Note: Calibration Inte	erval of instruments lis	ted above is one year.								

Test Item	RF Conducted	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, 2016	Feb. 16, 2017					
Power Meter	Anritsu	ML2495A	1241002	Sep. 21, 2015	Sep. 20, 2016					
Power Sensor	Anritsu	MA2411B	1207366	Sep. 21, 2015	Sep. 20, 2016					
AC POWER SOURCE	APC	AFC-500W	F312060012	Oct. 26, 2015	Oct. 25, 2016					
Measurement Software	Sporton	Sporton_1	1.3.30	NA	NA					
Note: Calibration Interval of instruments listed above is one year.										

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1.5 Test Standards

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

47 CFR FCC Part 15.247 ANSI C63.10-2013

FCC KDB 558074 D01 DTS Meas Guidance v03r05

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

1.6 Measurement Uncertainty

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

Measurement Uncertainty						
Parameters	Uncertainty					
Bandwidth	±34.134 Hz					
Conducted power	±0.808 dB					
Power density	±0.463 dB					
Conducted emission	±2.670 dB					
AC conducted emission	±2.90 dB					
Radiated emission ≤ 1GHz	±3.66 dB					
Radiated emission > 1GHz	±5.37 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%	Howard Huang
Radiated Emissions	03CH03-WS	20-25°C / 60-63%	Warren Lee Brad Wu
RF Conducted	TH01-WS	22°C / 65%	Brad Wu

FCC site registration No.: 207696IC site registration No.: 10807C-1

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2.2 The Worst Test Modes and Channel Details

Non-beamforming mode

Test item	Modulation Mode	,		Test Configuration
Conducted Emissions	11b	2437	1 Mbps	1, 2
Radiated Emissions ≤1GHz	11b	2437	1 Mbps	1, 2
Radiated Emissions >1GHz Maximum Output Power 6dB bandwidth Power spectral density	11b 11g HT20 HT40	2412 / 2437 / 2462 2412 / 2437 / 2462 2412 / 2437 / 2462 2412 / 2437 / 2452 2422 / 2437 / 2452	1 Mbps 6 Mbps MCS 0 MCS 0	1

NOTE:

- 1) The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement X, Y, and Z-plane. The **X-plane** results were found as the worst case and were shown in this report.
- 2) The EUT has two versions for different Internal DDR Size and Working voltage of DDR (Sample 1: VE3; Sample 2: VE4).
- 3) The test configurations are listed as follows:

Configuration 1 : Sample 1: VE3 Configuration 2 : Sample 2: VE4

Beamforming mode

Test item	Modulation Test Frequency (MHz)		Data Rate	Test Configuration
Conducted Emissions	HT20	2437	MCS 0	1, 2
Radiated Emissions ≤1GHz	HT20	2437	MCS 0	1, 2
Radiated Emissions >1GHz Maximum Output Power 6dB bandwidth Power spectral density	HT20 HT40	2412 / 2437 / 2462 2422 / 2437 / 2452	MCS 0 MCS 0	1

NOTE:

- 1) The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement X, Y, and Z-plane. The **X-plane** results were found as the worst case and were shown in this report.
- The EUT has two versions for different Internal DDR Size and Working voltage of DDR (Sample 1: VE3; Sample 2: VE4).
- 3) The test configurations are listed as follows:

Configuration 1 : Sample 1: VE3 Configuration 2 : Sample 2: VE4

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3 Transmitter Test Results

3.1 Conducted Emissions

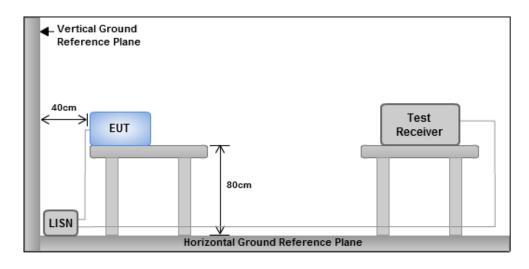
3.1.1 Limit of Conducted Emissions

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.

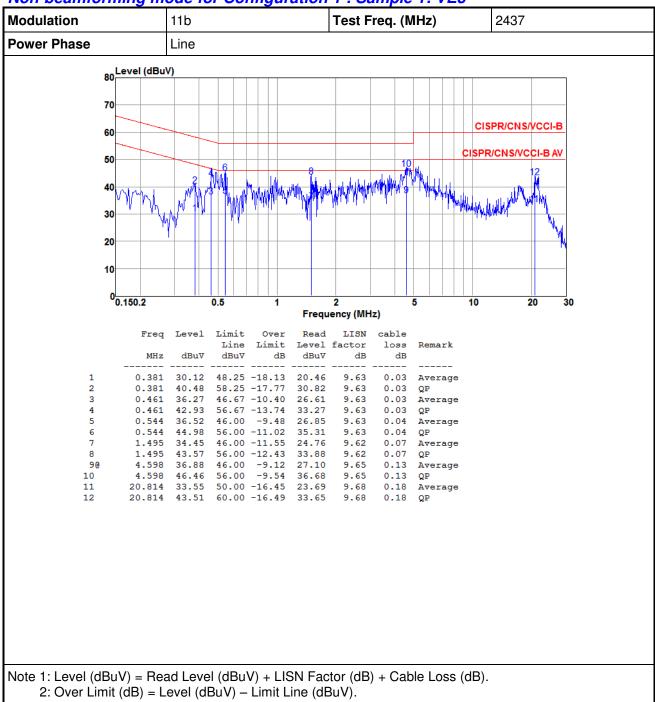
Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

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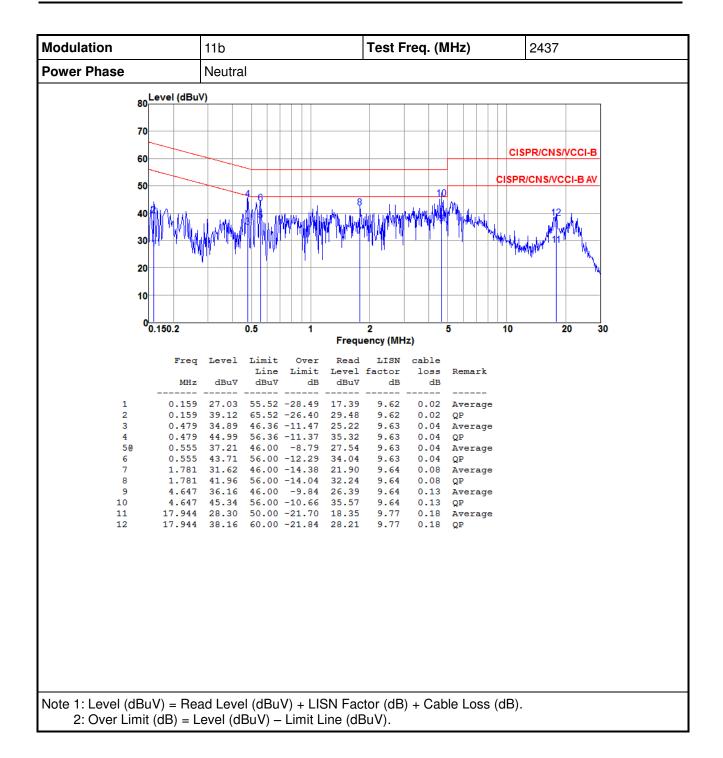
3.1.4 Test Result of Conducted Emissions

Non-beamforming mode for Configuration 1 : Sample 1: VE3



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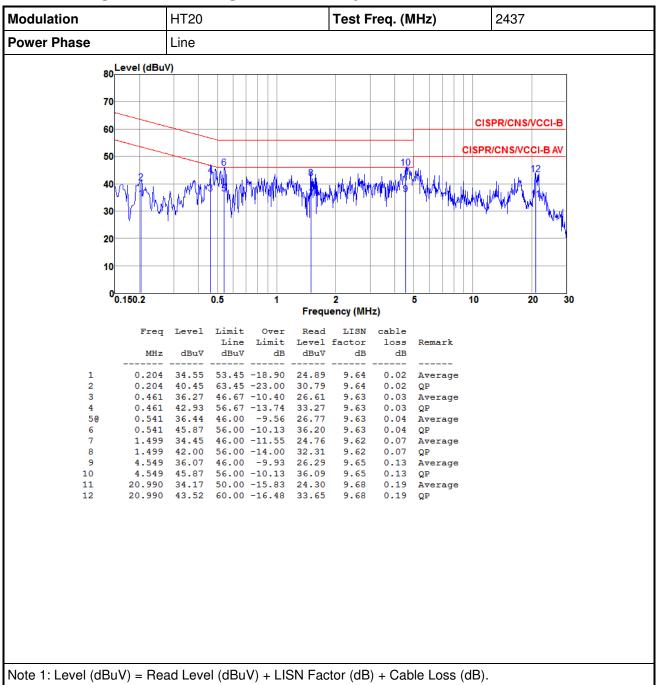




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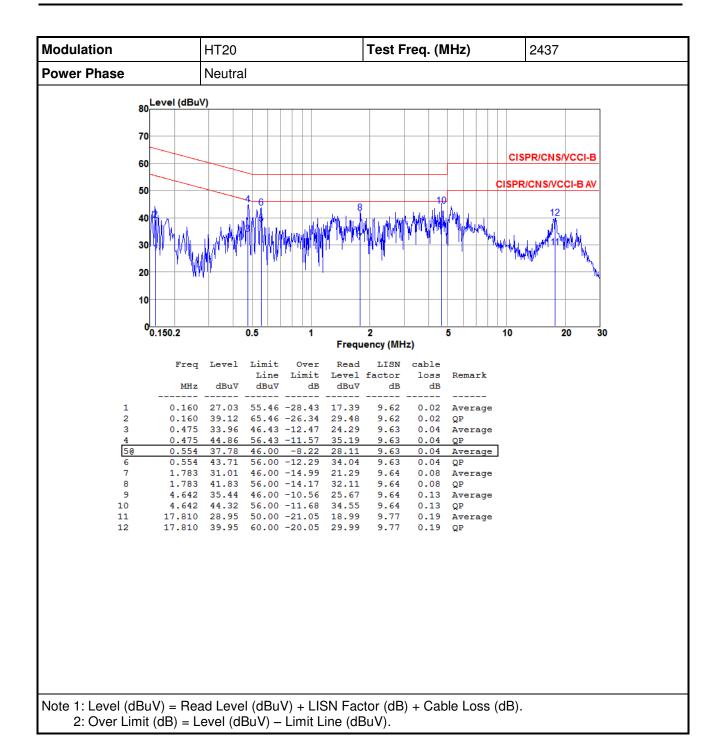
Beamforming mode for Configuration 1 : Sample 1: VE3



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

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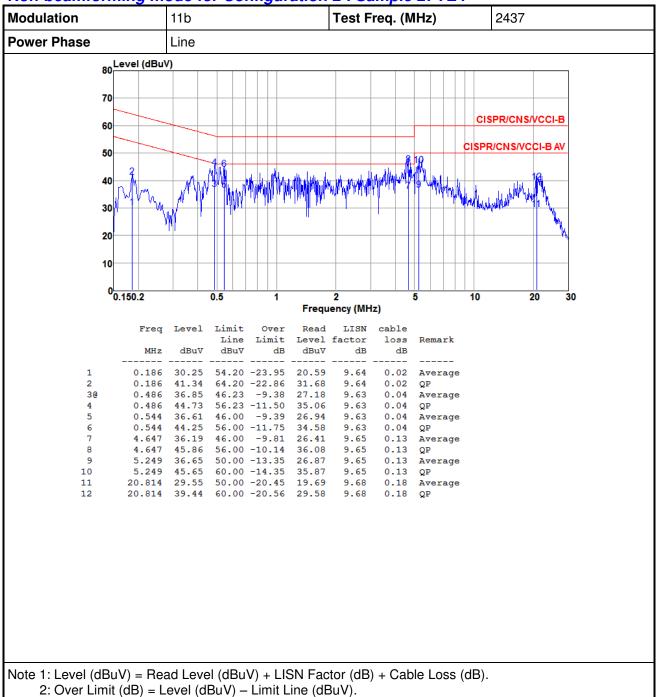




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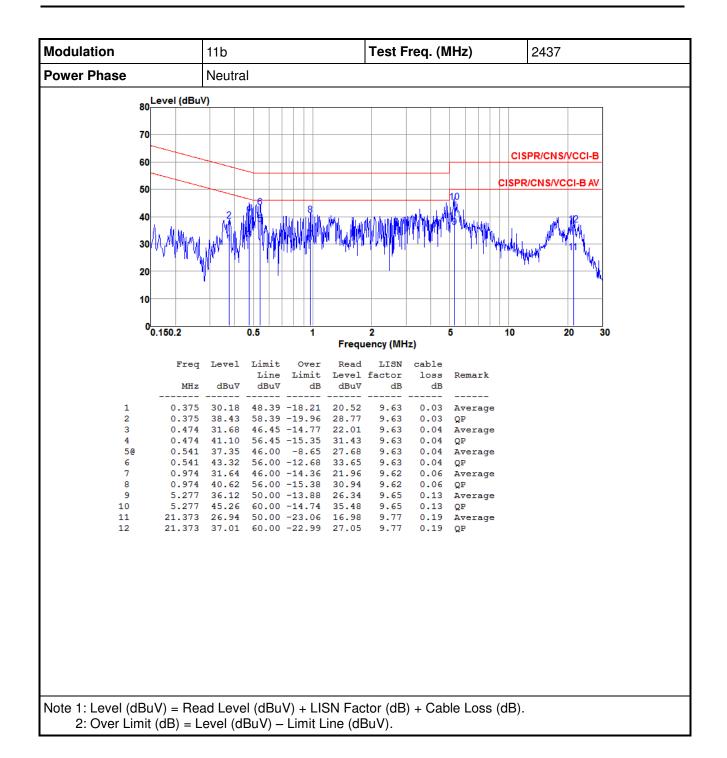


Non-beamforming mode for Configuration 2 : Sample 2: VE4



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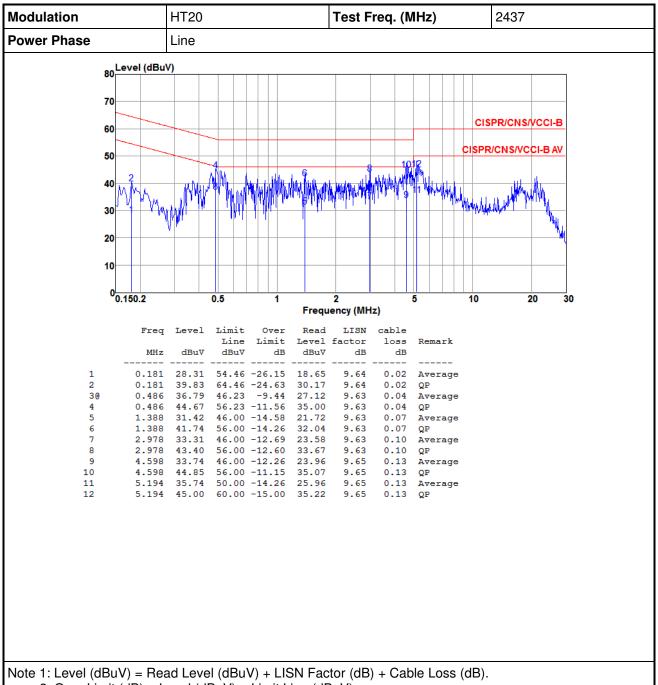




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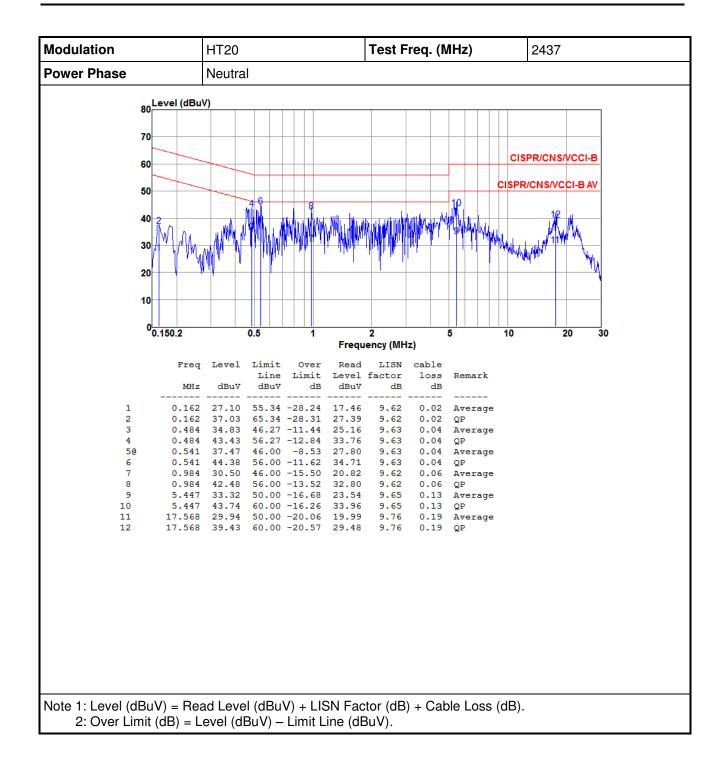
Beamforming mode for Configuration 2: Sample 2: VE4



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

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3.2 6dB and Occupied Bandwidth

3.2.1 Limit of 6dB Bandwidth

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

3.2.2 Test Procedures

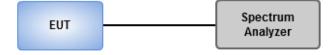
6dB Bandwidth

- 1. Set resolution bandwidth (RBW) = 100 kHz, Video bandwidth = 300 kHz.
- 2. Detector = Peak, Trace mode = max hold.
- 3. Sweep = auto couple, Allow the trace to stabilize.
- 4. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6dB relative to the maximum level measured in the fundamental emission.

Occupied Bandwidth

- 1. Set resolution bandwidth (RBW) = 1 MHz, Video bandwidth = 3 MHz.
- Detector = Sample, Trace mode = max hold.
- 3 Sweep = auto couple, Allow the trace to stabilize.
- 4. Use the OBW measurement function of spectrum analyzer to measure the occupied bandwidth.

3.2.3 Test Setup



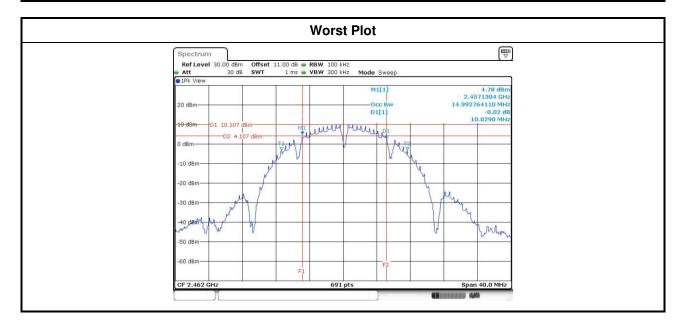
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3.2.4 Test Result of 6dB and Occupied Bandwidth

Non-beamforming mode

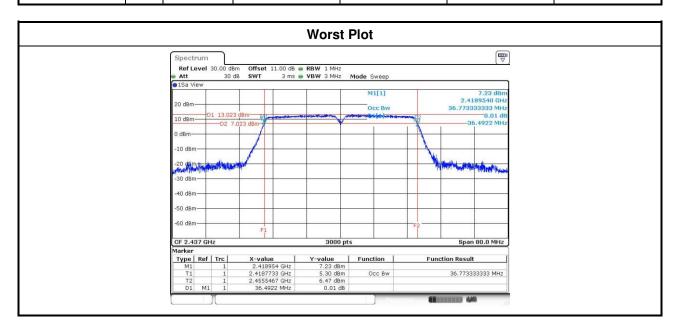
Modulation N		Eros (MU=)		Limit (LUz)			
Mode	N _{TX}	Freq. (MHz)	Chain 0	Chain 1	Chain 2	Chain 3	Limit (kHz)
11b	2	2412	10.09	10.09			500
11b	2	2437	10.09	10.09			500
11b	2	2462	10.03	10.03			500
11g	2	2412	16.58	16.52			500
11g	2	2437	16.58	16.64			500
11g	2	2462	16.58	16.58			500
HT20	2	2412	17.80	17.80			500
HT20	2	2437	17.80	17.80			500
HT20	2	2462	17.80	17.86			500
HT40	2	2422	36.41	36.41			500
HT40	2	2437	36.41	36.41			500
HT40	2	2452	36.41	36.41			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	15.07	15.04			
11b	2	2437	15.07	15.05			
11b	2	2462	15.03	15.04			
11g	2	2412	17.01	16.91			
11g	2	2437	17.05	16.93			
11g	2	2462	16.93	17.05			
HT20	2	2412	18.05	18.05			
HT20	2	2437	18.09	18.09			
HT20	2	2462	18.07	18.08			
HT40	2	2422	36.64	36.67			
HT40	2	2437	36.77	36.69			
HT40	2	2452	36.67	36.69			

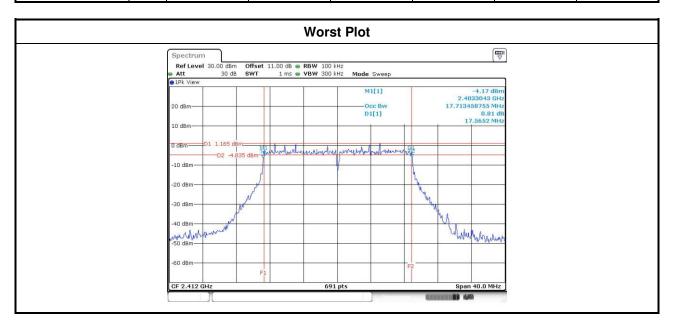


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Beamforming mode

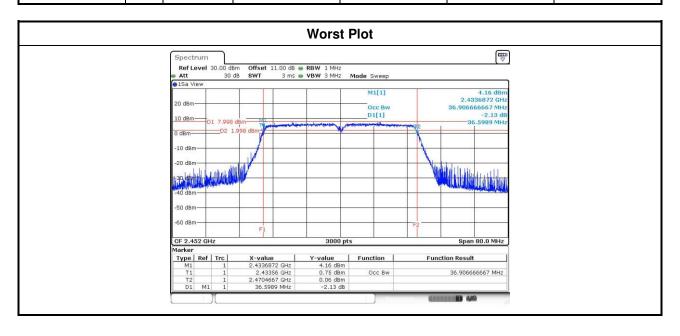
Modulation N		Eros (MU=)		Limit /Idla			
Mode	N _{TX}	Freq. (MHz)	Chain 0	Chain 1	Chain 2	Chain 3	Limit (kHz)
HT20	2	2412	17.57	17.57			500
HT20	2	2437	17.57	17.57			500
HT20	2	2462	17.62	17.62			500
HT40	2	2422	35.01	35.01			500
HT40	2	2437	35.25	36.64			500
HT40	2	2452	35.25	36.52			500



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Modulation	N	Freq.		99% Occupied E	Bandwidth (MHz)	
Mode	N _{TX}	(MHz)	Chain 0	Chain 1	Chain 2	Chain 3
HT20	2	2412	18.01	18.01		
HT20	2	2437	18.11	18.07		
HT20	2	2462	18.05	18.04		
HT40	2	2422	36.85	36.43		
HT40	2	2437	36.61	36.69		
HT40	2	2452	36.91	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

П	Maximum	Poak	Conducted	Output	DOWOR
	IVIAXIIIIIIII	ı can		CHILLIAN	1 () () ()

□ Spectrum analyzer

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

Power 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

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

Non-beamforming mode

				Conducted (Average) Output Power (dBm)								EIRP
Modulation Mode	N _{TX}	Freq. (MHz)	Chain 0	Chain 1	Chain 2	Chain 3	Total Power (mW)	Total Power (dBm)	Limit (dBm)	Ant. Gain (dBi)	EIRP (dBm)	Limit (dBm)
11b	2	2412	20.38	20.52			221.864	23.46	30.00	4.71	28.17	36.00
11b	2	2437	20.41	20.79			229.851	23.61	30.00	4.71	28.32	36.00
11b	2	2462	20.25	20.75			224.776	23.52	30.00	4.71	28.23	36.00
11g	2	2412	15.24	15.11			65.853	18.19	30.00	4.71	22.90	36.00
11g	2	2437	19.31	19.02			165.109	22.18	30.00	4.71	26.89	36.00
11g	2	2462	17.78	17.86			121.073	20.83	30.00	4.71	25.54	36.00
HT20	2	2412	15.12	15.03			64.351	18.09	30.00	4.71	22.80	36.00
HT20	2	2437	19.01	19.32			165.123	22.18	30.00	4.71	26.89	36.00
HT20	2	2462	17.11	17.38			106.106	20.26	30.00	4.71	24.97	36.00
HT40	2	2422	13.35	13.14			42.233	16.26	30.00	4.71	20.97	36.00
HT40	2	2437	19.12	18.56			153.438	21.86	30.00	4.71	26.57	36.00
HT40	2	2452	15.12	14.85			63.058	18.00	30.00	4.71	22.71	36.00

Beamforming mode

				Conduc	ted (Aver	rage) Out	put Powe	er (dBm)		Ant.		EIRP Limit (dBm)
Modulation Mode	N _{TX}	Freq. (MHz)	Chain 0	Chain 1	Chain 2	Chain 3	Total Power (mW)	Total Power (dBm)	Limit (dBm)	Gain (dBi)	EIRP (dBm)	
HT20	2	2412	15.12	15.01			64.204	18.08	29.17	6.83	24.91	36.00
HT20	2	2437	19.28	19.03			164.706	22.17	29.17	6.83	29.00	36.00
HT20	2	2462	16.14	16.96			90.774	19.58	29.17	6.83	26.41	36.00
HT40	2	2422	13.16	13.02			40.746	16.10	29.17	6.83	22.93	36.00
HT40	2	2437	18.16	18.48			135.933	21.33	29.17	6.83	28.16	36.00
HT40	2	2452	14.68	14.33			56.478	17.52	29.17	6.83	24.35	36.00

Note:

Directional gain = $10 * log((10^{4.70836/20} + 10^{2.82/20})^2/2) = 6.83 dBi > 6 dBi$ Limit shall be reduced to 30 dBm - (6.83 dBi - 6 dBi) = 29.17 dBm

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3.4 Power Spectral Density

3.4.1 Limit of Power Spectral Density

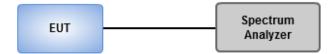
Power spectral density shall not be greater than 8 dBm in any 3 kHz band.

3.4.2 Test Procedures

Method AVGPSD-1

- 1. Set the RBW = 30kHz, VBW = 100kHz.
- 2. Detector = RMS, Sweep time = auto couple.
- 3. Employ trace averaging (RMS) mode over a minimum of 100 traces.
- 4. Use the peak marker function to determine the maximum amplitude level.
- Method AVGPSD-2 Alternative
 - 1. Set the RBW = 30kHz, VBW = 100 kHz, Detector = RMS
 - 2. Manually set the sweep time to: ≥ 10 x (number of measurement points in sweep) x (total on/off period of the transmitted signal).
 - 3. Perform the measurement over a single sweep.
 - 4. Use the peak marker function to determine the maximum amplitude level.
 - 5. Add 10 log (1/x), where x is the duty cycle

3.4.3 Test Setup



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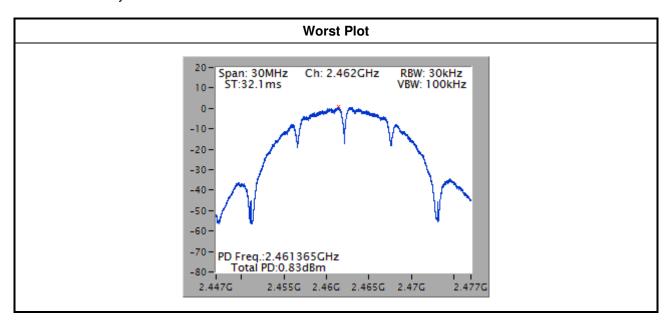
3.4.4 Test Result of Power Spectral Density

Non-beamforming mode

Modulation Mode	N _{TX}	Freq. (MHz)	PPSD w/o D.F (dBm/30kHz)	Duty Factor (dB)	PPSD with D.F (dBm/30kHz)	Limit (dBm/3kHz)
11b	2	2412	0.15	0.00	0.15	8.00
11b	2	2437	0.63	0.00	0.63	8.00
11b	2	2462	0.83	0.00	0.83	8.00
11g	2	2412	-7.73	0.00	-7.73	8.00
11g	2	2437	-3.11	0.00	-3.11	8.00
11g	2	2462	-4.40	0.00	-4.40	8.00
HT20	2	2412	-8.18	0.00	-8.18	8.00
HT20	2	2437	-3.58	0.00	-3.58	8.00
HT20	2	2462	-5.27	0.00	-5.27	8.00
HT40	2	2422	-12.62	0.00	-12.62	8.00
HT40	2	2437	-6.99	0.00	-6.99	8.00
HT40	2	2452	-10.85	0.00	-10.85	8.00

Note 1: Test result is bin-by-bin summing measured value of each TX port.

Note 2: D.F is duty factor



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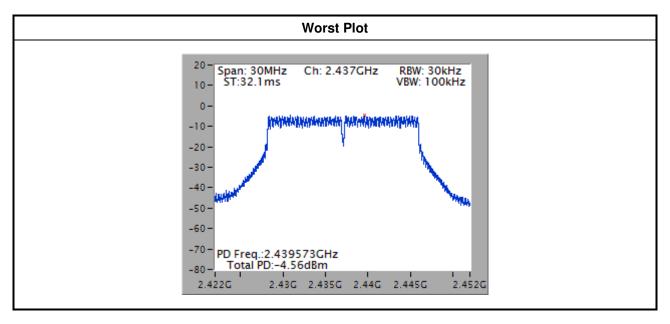


Beamforming mode

Modulation Mode	N _{TX}	Freq. (MHz)	PPSD w/o D.F (dBm/30kHz)	Duty Factor (dB)	PPSD with D.F (dBm/30kHz)	Limit (dBm/3kHz)
HT20	2	2412	-8.12	0.00	-8.12	8.00
HT20	2	2437	-4.56	0.00	-4.56	8.00
HT20	2	2462	-6.99	0.00	-6.99	8.00
HT40	2	2422	-11.98	0.00	-11.98	8.00
HT40	2	2437	-7.88	0.00	-7.88	8.00
HT40	2	2452	-12.13	0.00	-12.13	8.00

Note 1: Test result is bin-by-bin summing measured value of each TX port.

Note 2: D.F is duty factor



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3.5 Unwanted Emissions into Restricted Frequency Bands

3.5.1 Limit of Unwanted Emissions into Restricted Frequency Bands

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

Note 1:

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

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

3.5.2 Test Procedures

- 1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at test table. For emissions testing at or below 1 GHz, the table height is 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height is 1.5 m
- 2. Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m ~ 4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3 m.
- 3. This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

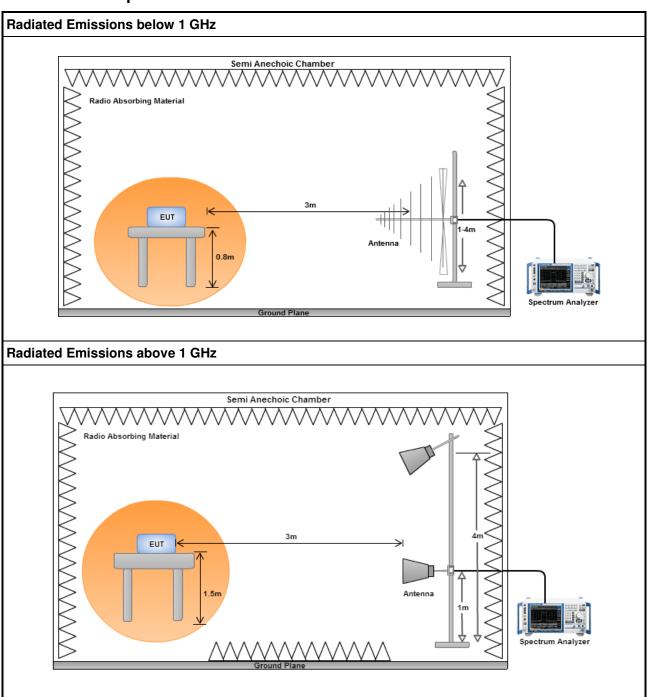
Note:

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

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3.5.3 Test Setup

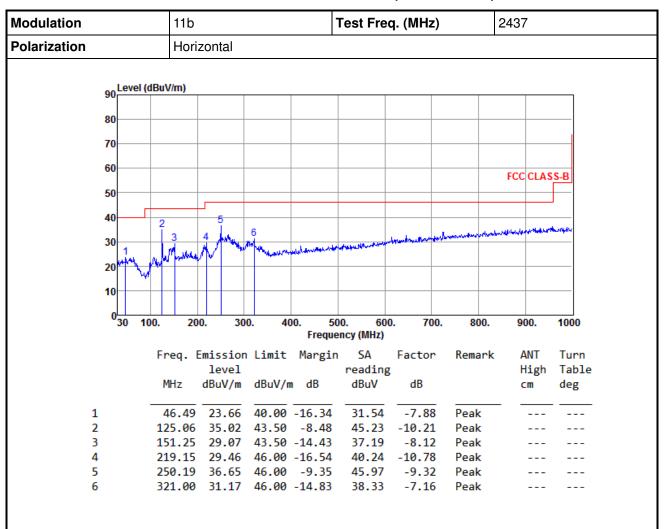


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Non-beamforming mode for Configuration 1 : Sample 1: VE3

3.5.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)



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

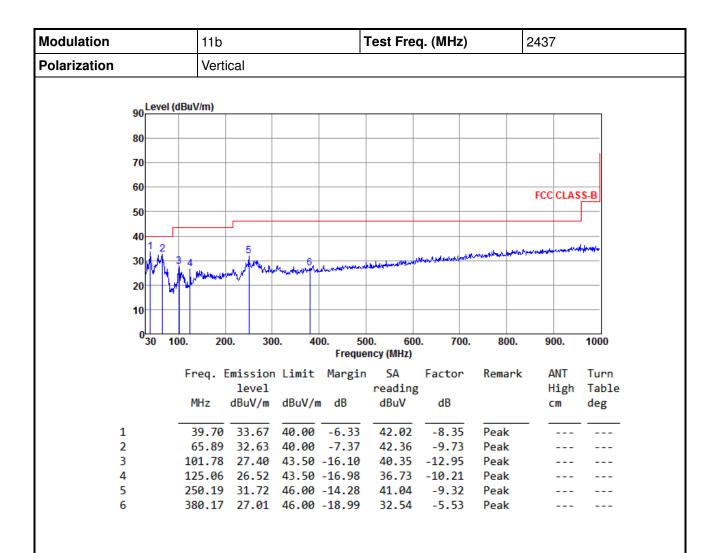
*Factor includes antenna factor, cable loss and amplifier gain

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

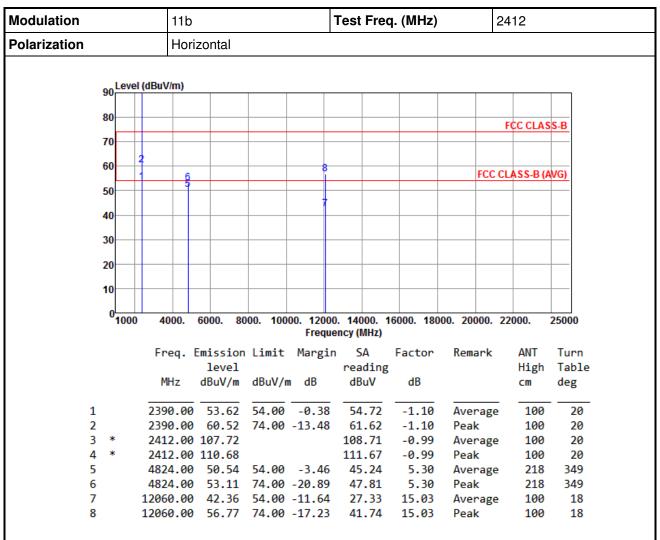
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

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

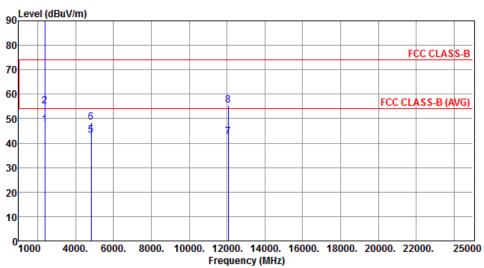
Note 2: Margin (dB) = Emission level (dBuV/m) - Limit (dBuV/m).

Note 3:"*" is Peak / Average value of fundamental frequency

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Modulation	11b	Test Freq. (MHz)	2412
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	47.45	54.00	-6.55	48.55	-1.10	Average	352	188
2		2390.00	55.12	74.00	-18.88	56.22	-1.10	Peak	352	188
3	*	2412.00	104.65			105.64	-0.99	Average	352	188
4	*	2412.00	107.22			108.21	-0.99	Peak	352	188
5		4824.00	43.13	54.00	-10.87	37.83	5.30	Average	315	273
6		4824.00	48.54	74.00	-25.46	43.24	5.30	Peak	315	273
7		12060.00	42.61	54.00	-11.39	27.58	15.03	Average	100	20
8		12060.00	55.33	74.00	-18.67	40.30	15.03	Peak	100	20

Factor includes antenna factor, cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m). Note 3:"" is Peak / Average value of fundamental frequency

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Modulation			11b				Test Fred	q. (MHz)	2	2437	
Polarization			Hori	zontal		'			•		
			<u>'</u>								
	90	Level	(dBuV/m)								
	80									FCC CLAS	S-B
	70										
		.									
	60		9 8	10					FCC (CLASS-B (A	WG)
	50										
	40		5								
	40	1									
	30										
	20										
	10										
	0	1000	4000.	6000.	B000. 100	00. 12000). 14000. 1	16000. 180	00. 20000.	22000.	25000
							ency (MHz)				
			Freq. I	Emissio	n Limit	Margin	s SA	Factor	Remark	ANT	Turn
				level			reading			High	Table
			MHz	dBuV/m	ı dBuV/ı	n dB	dBuV	dB		cm	deg
:	1		2390.00	42.23	54.00	-11.77	43.33	-1.10	Average	346	97
	2		2390.00			-16.74	58.36	-1.10	Peak	346	97
	3 *		2437.00				108.53	-0.86	Average		97
	•	k	2437.00			44.30	111.66	-0.86	Peak	346	97
	5		2483.50				43.22	-0.61	Average		97
	6 7		2483.50			-16.09	58.52	-0.61	Peak	346	97
	/ 8		4874.00 4874.00			-1.32	47.26 50.23	5.42 5.42	Average Peak	222 222	351 351
•	0		40/4.00	55.65	74.00	-10.33	30.23	5.42	reak	222	221

10.26

10.26

Average

Peak

387

387

113

113

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

7311.00 44.80 54.00 -9.20 34.54

7311.00 52.64 74.00 -21.36 42.38

*Factor includes antenna factor, cable loss and amplifier gain

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

Note 3:"*" is Peak / Average value of fundamental frequency

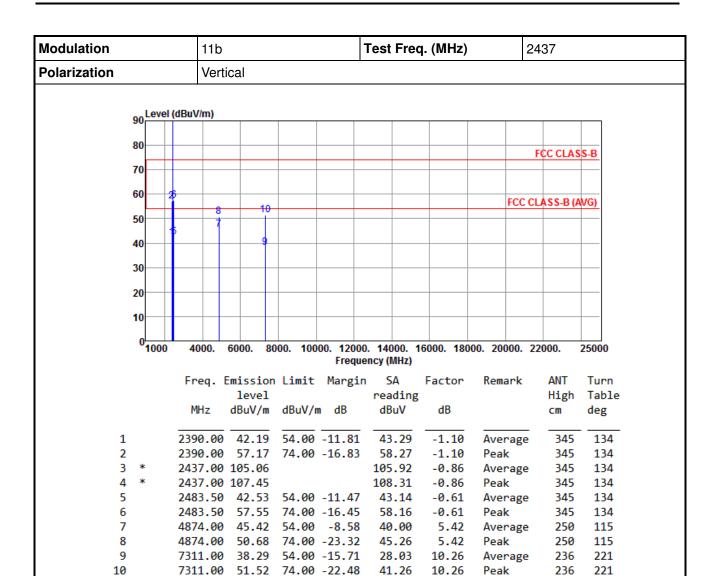
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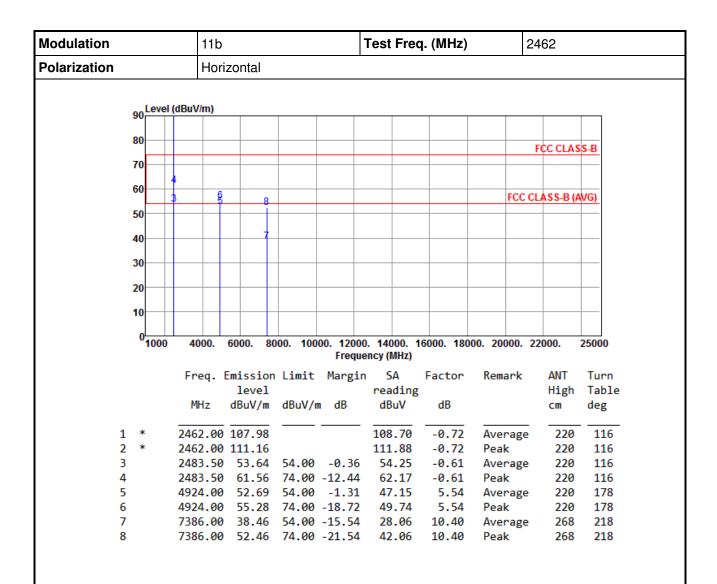
*Factor includes antenna factor, cable loss and amplifier gain

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

Note 3:"*" is Peak / Average value of fundamental frequency

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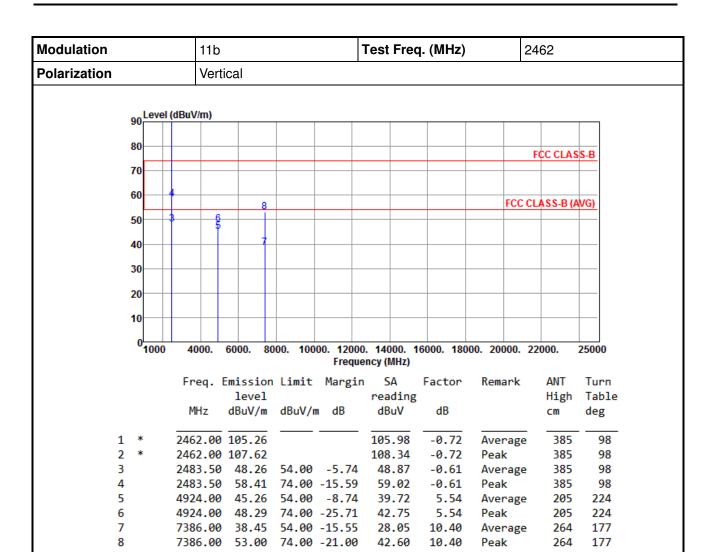
*Factor includes antenna factor, cable loss and amplifier gain

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

Note 3:"*" is Peak / Average value of fundamental frequency

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*Factor includes antenna factor, cable loss and amplifier gain

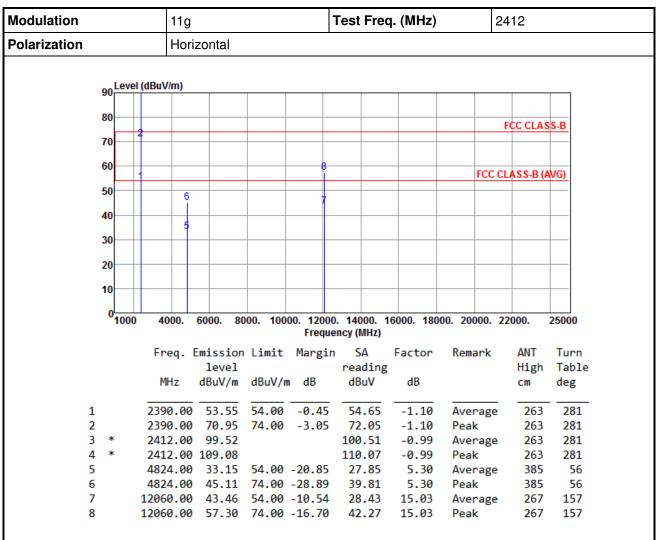
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3:"*" is Peak / Average value of fundamental frequency

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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

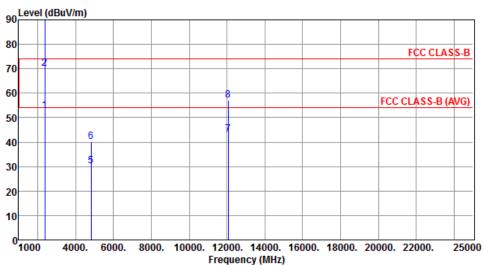
Note 2: Margin (dB) = Emission level (dBuV/m) - Limit (dBuV/m).

Note 3:"*" is Peak / Average value of fundamental frequency

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

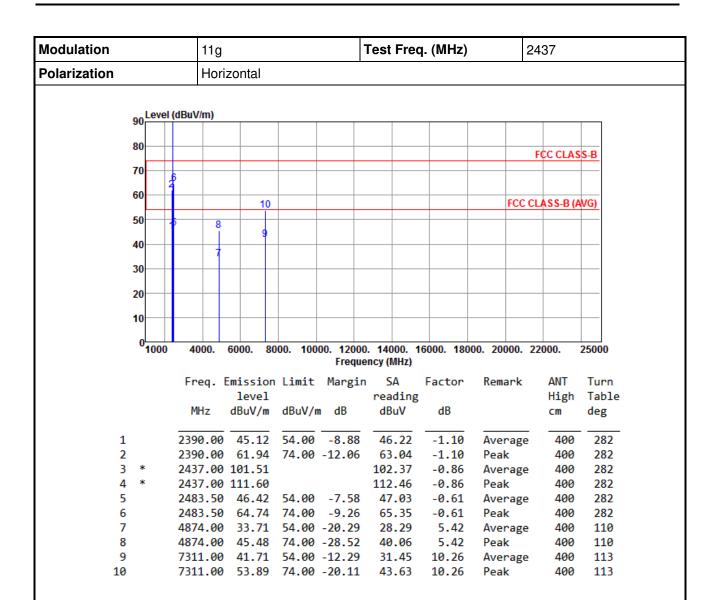


		Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
		MHz	dBuV/m	dBuV/m	dB	dBuV	dB		CM	deg
1		2390.00	52.65	54.00	-1.35	53.75	-1.10	Average	390	138
2		2390.00	70.16	74.00	-3.84	71.26	-1.10	Peak	390	138
3	*	2412.00	97.81			98.80	-0.99	Average	390	138
4	*	2412.00	107.46			108.45	-0.99	Peak	390	138
5		4824.00	30.29	54.00	-23.71	24.99	5.30	Average	391	110
6		4824.00	40.29	74.00	-33.71	34.99	5.30	Peak	391	110
7		12060.00	43.07	54.00	-10.93	28.04	15.03	Average	261	113
8		12060.00	57.14	74.00	-16.86	42.11	15.03	Peak	261	113

Factor includes antenna factor, cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m). Note 3:"" is Peak / Average value of fundamental frequency

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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:"*" is Peak / Average value of fundamental frequency

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Modulation			11g				Test Free	q. (MHz)		2437	
Polarization			Vert	ical		Į.			1		
			•								
	90	Level	(dBuV/m)								
	80										
	00									FCC CLAS	S-B
	70										-
	60	2	6								
	00			10					FCC	CLASS-B (A	WG)
	50	-									
	40		8	9							
			1								
	30										
	20										
	10										
	0										
		1000	4000.	6000. 80	000. 100		0. 14000. 1 ency (MHz)	16000. 180	00. 20000.	22000.	25000
			Freq.	Emission	Limit	Margi	n SA	Factor	Remark	ANT	Turn
				level			reading	5		High	Table
			MHz	dBuV/m	dBuV/ı	m dB	dBuV	dB		cm	deg
	1		2390.00	43.61	54.00	-10.39	44.71	-1.10	Average	400	49
	2		2390.00			-13.16	61.94	-1.10	Peak	400	49
	3 *		2437.00	98.09			98.95	-0.86	Average	400	49
	4 *	:	2437.00				108.55	-0.86	Peak	400	49
	5		2483.50					-0.61	Average		49
	6		2483.50					-0.61	Peak	400	49
	7		4874.00					5.42	Average		55
	8 9		4874.00 7311.00					5.42	Peak	393	55 215
	9			40.35		-13.05	30.09	10.26	Average	396	215

10.26

Peak

396

215

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

7311.00 53.86 74.00 -20.14 43.60

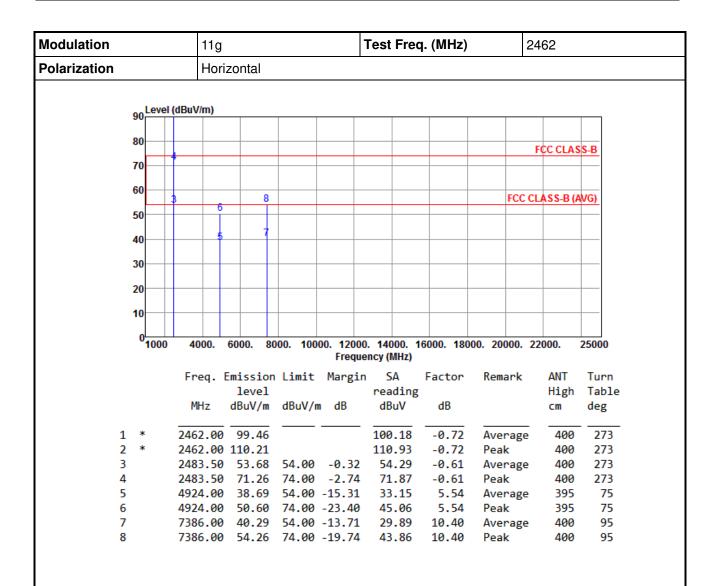
Factor includes antenna factor, cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m). Note 3:"" is Peak / Average value of fundamental frequency

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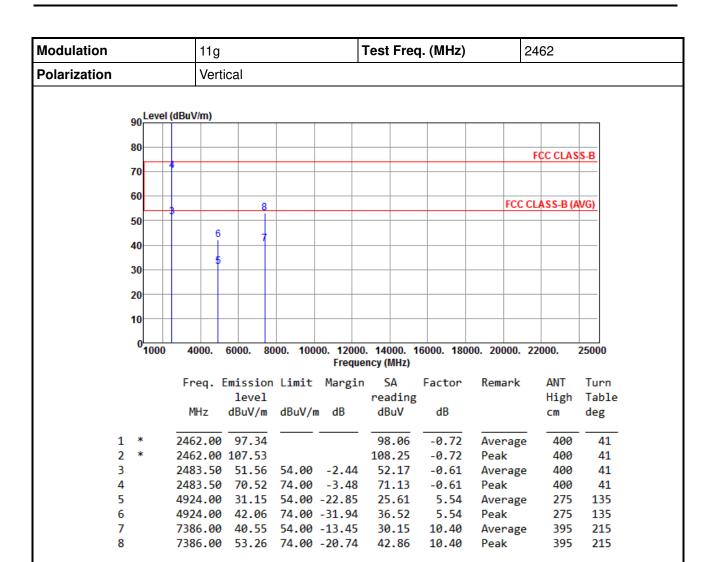
*Factor includes antenna factor, cable loss and amplifier gain

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

Note 3:"*" is Peak / Average value of fundamental frequency

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*Factor includes antenna factor, cable loss and amplifier gain

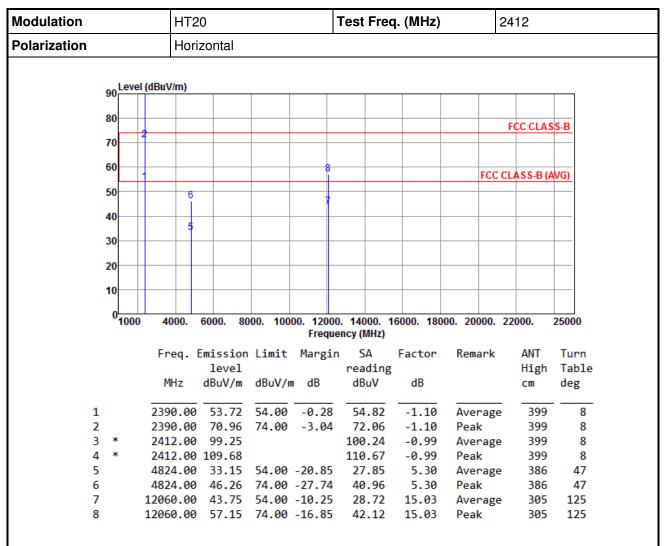
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3:"*" is Peak / Average value of fundamental frequency

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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

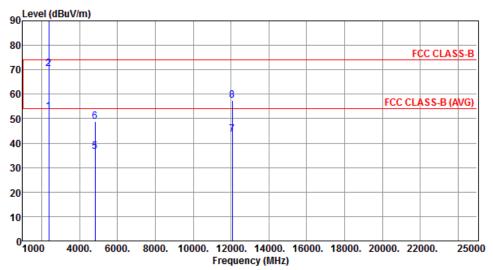
Note 2: Margin (dB) = Emission level (dBuV/m) - Limit (dBuV/m).

Note 3:"*" is Peak / Average value of fundamental frequency

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Modulation	HT20	Test Freq. (MHz)	2412
Polarization	Vertical		



		Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
		MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1		2390.00	52.71	54.00	-1.29	53.81	-1.10	Average	391	35
2		2390.00	70.57	74.00	-3.43	71.67	-1.10	Peak	391	35
3	*	2412.00	97.58			98.57	-0.99	Average	391	35
4	*	2412.00	107.88			108.87	-0.99	Peak	391	35
5		4824.00	36.41	54.00	-17.59	31.11	5.30	Average	395	326
6		4824.00	48.90	74.00	-25.10	43.60	5.30	Peak	395	326
7		12060.00	43.40	54.00	-10.60	28.37	15.03	Average	235	55
8		12060.00	57.30	74.00	-16.70	42.27	15.03	Peak	235	55

Factor includes antenna factor, cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m). Note 3:"" is Peak / Average value of fundamental frequency

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Modulation			HT2	0			Test Free	q. (MHz)	2	2437		
Polarization			Hori	Horizontal								
	90	Level	(dBuV/m)									
	80									FCC CLAS	S-B	
	70											
		2	6									
	60			10					FCC	CLASS-B (A	VG)	
	50		. 8	10							,	
	-	1	ľ									
	40		+	9								
	30											
	30											
	20											
	40											
	10											
	0	1000	4000.	6000. 80	000. 100	00 1200	14000 1	16000 100	00. 20000.	22000	25000	
		1000	4000.	0000. 00	,00. 100		ency (MHz)	10000. 100	00. 20000.	22000.	23000	
			Fred	Emission	limit	Margir	n SA	Factor	Remark	ANT	Turn	
				level		, Id. 811	reading		Acida K	High	Table	
			MHz	dBuV/m	dBuV/ı	m dB	dBuV	dB		cm	deg	
	1		2390.00	45.05	54.00	-8.95	46.15	-1.10	Average	384	19	
	2		2390.00		74.00	-11.27	63.83	-1.10	Peak	384	19	
	3 *		2437.00				102.48	-0.86	Average		19	
	4 *		2437.00				112.39	-0.86	Peak	384	19	
	5		2483.50						Average		19	
	6		2483.50				63.14	-0.61	Peak	384	19	
	7		4874.00				28.56	5.42	Average		160	
	8		4874.00	46.17	/4.00	-27.83	40.75	5.42	Peak	295	160	

10.26

10.26

Average

Peak

251

251

359

359

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

7311.00 39.15 54.00 -14.85 28.89

7311.00 52.86 74.00 -21.14 42.60

*Factor includes antenna factor, cable loss and amplifier gain

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

Note 3:"*" is Peak / Average value of fundamental frequency

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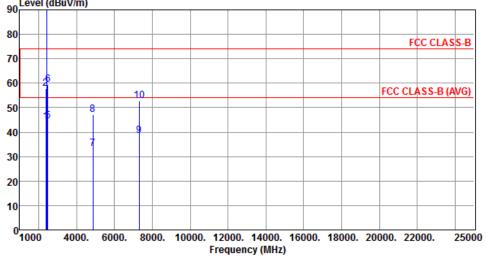
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Modulation	HT20	HT20			Test Freq. (MHz)				2437				
Polarization		Vertical											
00	Level (dBu	V/m)											
80									F	CC CLAS	S-B		

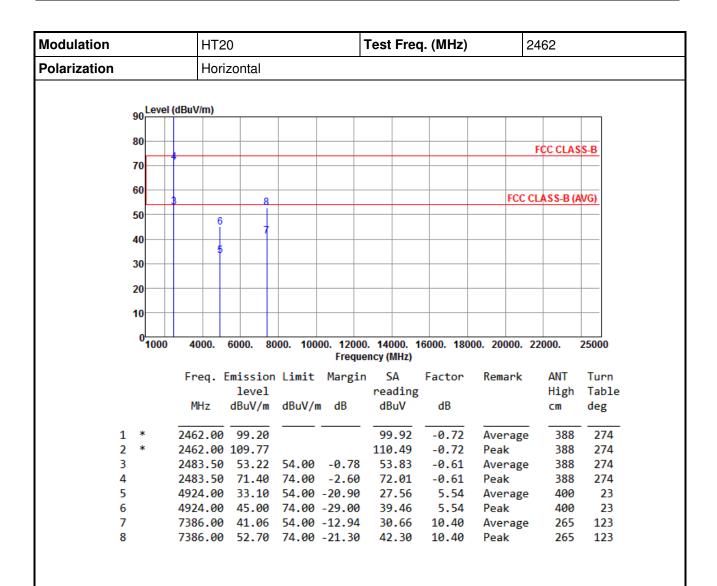


		Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
		MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1		2390.00	44.16	54.00	-9.84	45.26	-1.10	Average	384	115
2		2390.00	57.62	74.00	-16.38	58.72	-1.10	Peak	384	115
3	*	2437.00	99.62			100.48	-0.86	Average	384	115
4	*	2437.00	109.53			110.39	-0.86	Peak	384	115
5		2483.50	44.53	54.00	-9.47	45.14	-0.61	Average	384	115
6		2483.50	59.43	74.00	-14.57	60.04	-0.61	Peak	384	115
7		4874.00	33.07	54.00	-20.93	27.65	5.42	Average	261	188
8		4874.00	47.17	74.00	-26.83	41.75	5.42	Peak	261	188
9		7311.00	38.66	54.00	-15.34	28.40	10.26	Average	292	51
10		7311.00	52.66	74.00	-21.34	42.40	10.26	Peak	292	51

Factor includes antenna factor, cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m). Note 3:"" is Peak / Average value of fundamental frequency

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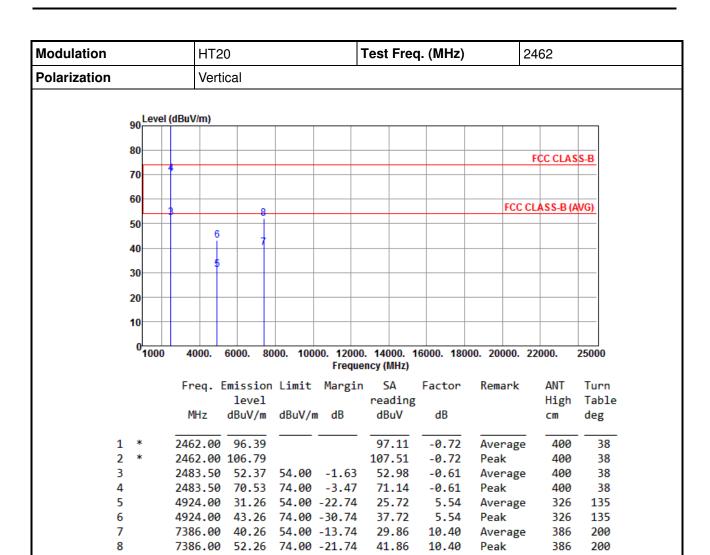
*Factor includes antenna factor, cable loss and amplifier gain

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

Note 3:"*" is Peak / Average value of fundamental frequency

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*Factor includes antenna factor, cable loss and amplifier gain

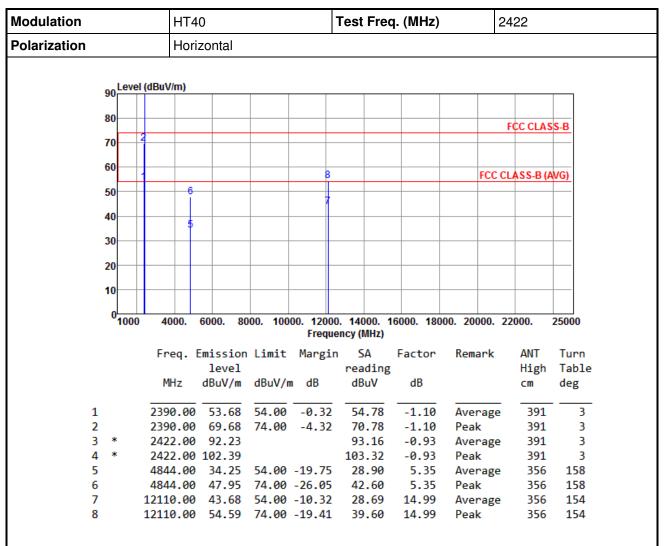
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3:"*" is Peak / Average value of fundamental frequency

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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

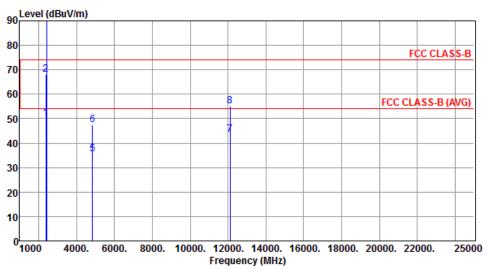
Note 2: Margin (dB) = Emission level (dBuV/m) - Limit (dBuV/m).

Note 3:"*" is Peak / Average value of fundamental frequency

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Modulation	HT40	Test Freq. (MHz)	2422
Polarization	Vertical		



		Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
		MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1		2390.00	50.29	54.00	-3.71	51.39	-1.10	Average	389	314
2		2390.00		74.00	-5.84	69.26	-1.10	Peak	389	314
3	*	2422.00	90.71			91.64	-0.93	Average	389	314
4	*	2422.00	100.09			101.02	-0.93	Peak	389	314
5		4844.00	35.61	54.00	-18.39	30.26	5.35	Average	359	22
6		4844.00	47.61	74.00	-26.39	42.26	5.35	Peak	359	22
7		12110.00	43.40	54.00	-10.60	28.41	14.99	Average	247	195
8		12110.00	55.26	74.00	-18.74	40.27	14.99	Peak	247	195

Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m). Note 3:"" is Peak / Average value of fundamental frequency

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Modulation			HT4	0			Test Free	q. (MHz)	2	437	
Polarization			Hori	zontal					•		
			<u>.</u>								
	90	Level	(dBuV/m)								
	80									FCC CLAS	S-B
	70	- 2									
	60										
	00	1		10					FCC C	LASS-B (A	WG)
	50		8								-
	40			9							
	40		7								
	30										
	20										
	20										
	10										-
	0										
		1000	4000.	6000. 80	00. 100		0. 14000. 1 ency (MHz)	16000. 180	00. 20000. 2	22000.	25000
			Freq. E	mission	Limit	Margi	n SA	Factor	Remark	ANT	Turn
				level			reading			High	Table
			MHz	dBuV/m	dBuV/r	n dB	dBuV	dB		cm	deg
	1		2390.00	53.83	54.00	-0.17	54.93	-1.10	Average	400	271
	2		2390.00	68.44	74.00	-5.56	69.54	-1.10	Peak	400	271
	3 *		2437.00	96.96			97.82	-0.86	Average	400	279
	4 *	:	2437.00				108.14	-0.86	Peak	400	279
	5		2483.50		54.00			-0.61	Average	400	271
	6		2483.50		74.00		65.30	-0.61	Peak	400	271
	7 8		4874.00 4874.00	35.68 47.71		-18.32		5.42 5.42	Average Peak	215 215	326 326
	o 9		7311.00			-26.29 -14.99	42.29 28.75	10.26	Average	215	326
_	_		, 511.00	55.01	34.00	-14.99	20.73	10.20	Average	250	320

10.26

Peak

298

326

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

7311.00 52.52 74.00 -21.48 42.26

Factor includes antenna factor, cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m). Note 3:"" is Peak / Average value of fundamental frequency

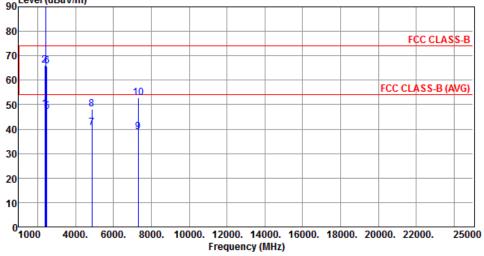
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Modulation	HT40	Test Freq.	(MHz)	2437						
Polarization	Vertical	Vertical								
90 Leve	l (dBuV/m)									
80				F¢C CLASS-B						
70				TCC CEASS-B						

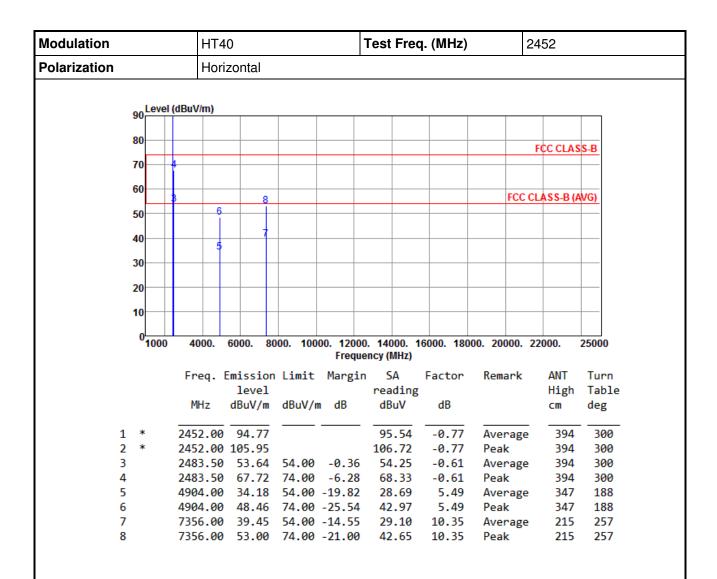


		Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
		MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1		2390.00	48.22	54.00	-5.78	49.32	-1.10	Average	391	39
2		2390.00	65.98	74.00	-8.02	67.08	-1.10	Peak	391	39
3	*	2437.00	93.38			94.24	-0.86	Average	391	329
4	*	2437.00	103.26			104.12	-0.86	Peak	391	329
5		2483.50	47.31	54.00	-6.69	47.92	-0.61	Average	391	39
6		2483.50	65.82	74.00	-8.18	66.43	-0.61	Peak	391	39
7		4874.00	40.68	54.00	-13.32	35.26	5.42	Average	367	195
8		4874.00	48.08	74.00	-25.92	42.66	5.42	Peak	367	195
9		7311.00	38.95	54.00	-15.05	28.69	10.26	Average	305	255
10		7311.00	52.66	74.00	-21.34	42.40	10.26	Peak	305	255

Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m). Note 3:"" is Peak / Average value of fundamental frequency

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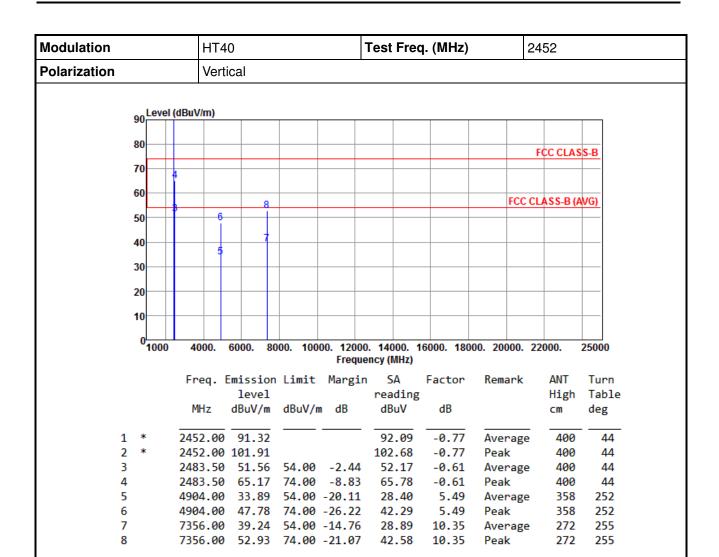
*Factor includes antenna factor, cable loss and amplifier gain

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

Note 3:"*" is Peak / Average value of fundamental frequency

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*Factor includes antenna factor, cable loss and amplifier gain

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

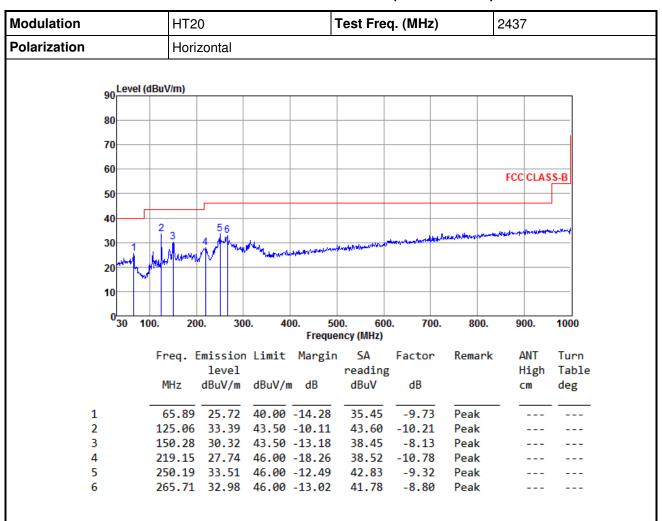
Note 3:"*" is Peak / Average value of fundamental frequency

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Beamforming mode for Configuration 1 : Sample 1: VE3

3.5.9 Transmitter Radiated Unwanted Emissions (Below 1GHz)



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

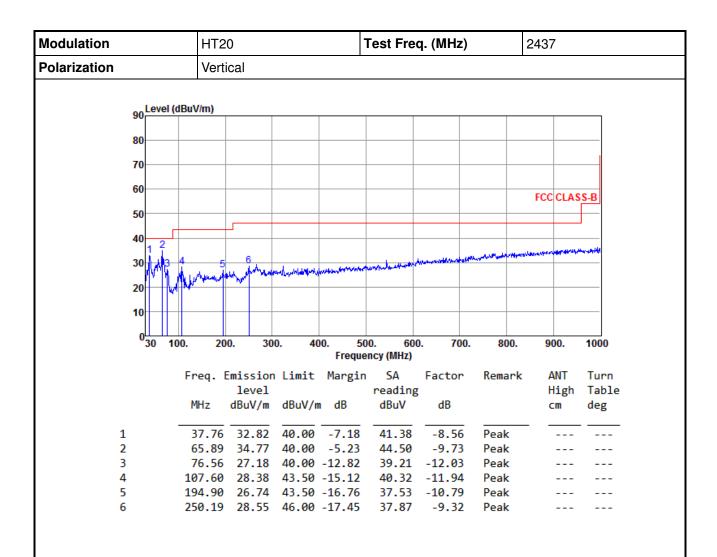
*Factor includes antenna factor, cable loss and amplifier gain

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

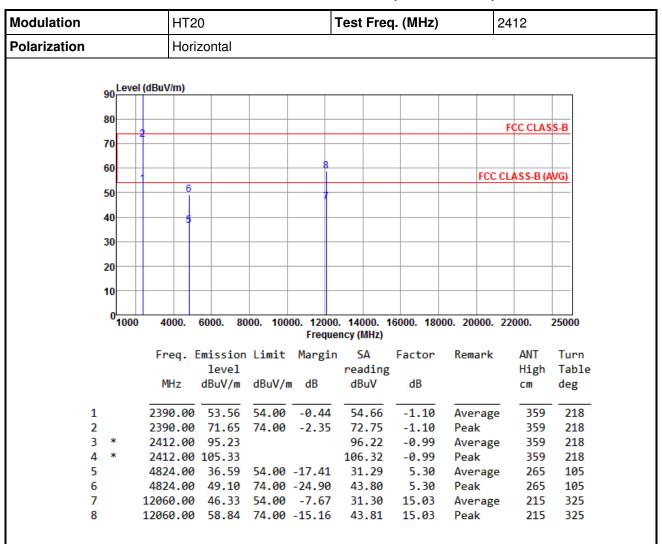
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

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

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3.5.10 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

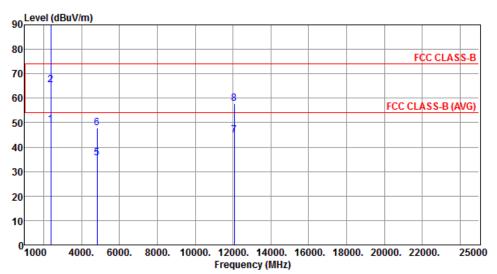
Note 2: Margin (dB) = Emission level (dBuV/m) - Limit (dBuV/m).

Note 3:"*" is Peak / Average value of fundamental frequency

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Modulation	HT20	Test Freq. (MHz)	2412
Polarization	Vertical		



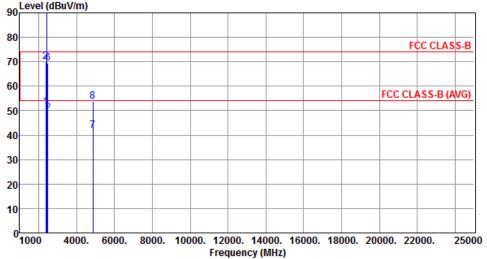
		Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
		MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1		2390.00	49.16	54.00	-4.84	50.26	-1.10	Average	359	203
2		2390.00	65.49	74.00	-8.51	66.59	-1.10	Peak	359	203
3	*	2412.00	94.31			95.30	-0.99	Average	356	338
4	*	2412.00	104.20			105.19	-0.99	Peak	356	338
5		4824.00	35.56	54.00	-18.44	30.26	5.30	Average	274	169
6		4824.00	47.85	74.00	-26.15	42.55	5.30	Peak	274	169
7		12060.00	44.93	54.00	-9.07	29.90	15.03	Average	125	242
8		12060.00	57.63	74.00	-16.37	42.60	15.03	Peak	125	242

Factor includes antenna factor, cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m). Note 3:"" is Peak / Average value of fundamental frequency

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Modulation	HT20	Test Freq. (MHz)	2437
Polarization	Horizontal		
90 Level (dBu\	//m)		
90			



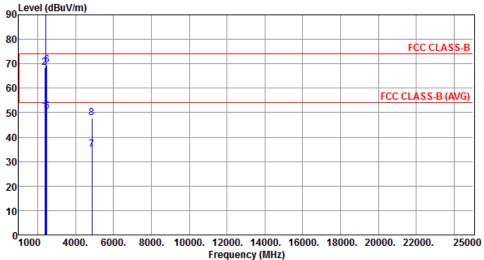
		Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Ū	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1		2390.00	51.42	54.00	-2.58	52.52	-1.10	Average	318	332
2		2390.00	70.16	74.00	-3.84	71.26	-1.10	Peak	318	332
3	*	2437.00	102.75			103.61	-0.86	Average	338	332
4	*	2437.00	111.40			112.26	-0.86	Peak	338	332
5		2483.50	50.25	54.00	-3.75	50.86	-0.61	Average	325	101
6		2483.50	69.51	74.00	-4.49	70.12	-0.61	Peak	325	101
7		4874.00	41.68	54.00	-12.32	36.26	5.42	Average	340	295
8		4874.00	53.67	74.00	-20.33	48.25	5.42	Peak	340	295

Factor includes antenna factor, cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m). Note 3:"" is Peak / Average value of fundamental frequency

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Modulation	HT20	Test Freq. (MHz)	2437
Polarization	Vertical		
90 Level (dBu\	//m)		

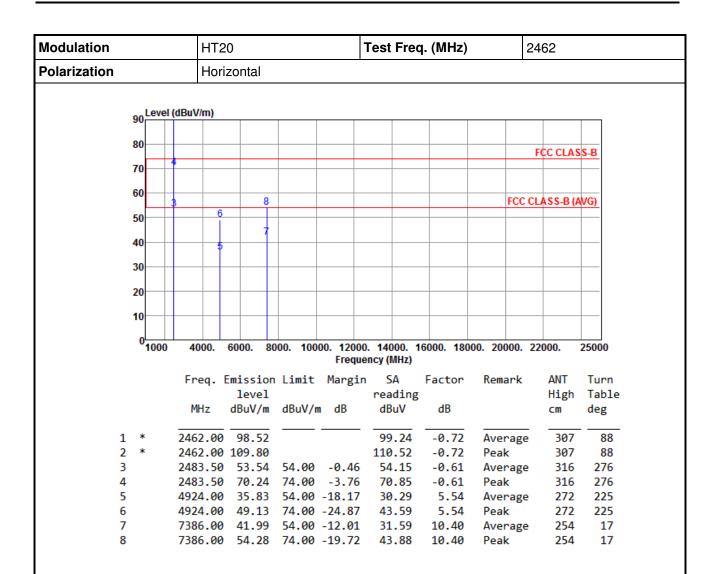


		•	Emission level		Ü	SA reading	Factor	Remark	ANT High	Turn Table
		MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1		2390.00	50.49	54.00	-3.51	51.59	-1.10	Average	320	302
2		2390.00	68.49	74.00	-5.51	69.59	-1.10	Peak	320	302
3	*	2437.00	102.42			103.28	-0.86	Average	358	326
4	*	2437.00	112.13			112.99	-0.86	Peak	358	326
5		2483.50	50.64	54.00	-3.36	51.25	-0.61	Average	358	303
6		2483.50	69.56	74.00	-4.44	70.17	-0.61	Peak	358	303
7		4874.00	34.90	54.00	-19.10	29.48	5.42	Average	386	387
8		4874.00	47.71	74.00	-26.29	42.29	5.42	Peak	386	387

Factor includes antenna factor, cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m). Note 3:"" is Peak / Average value of fundamental frequency

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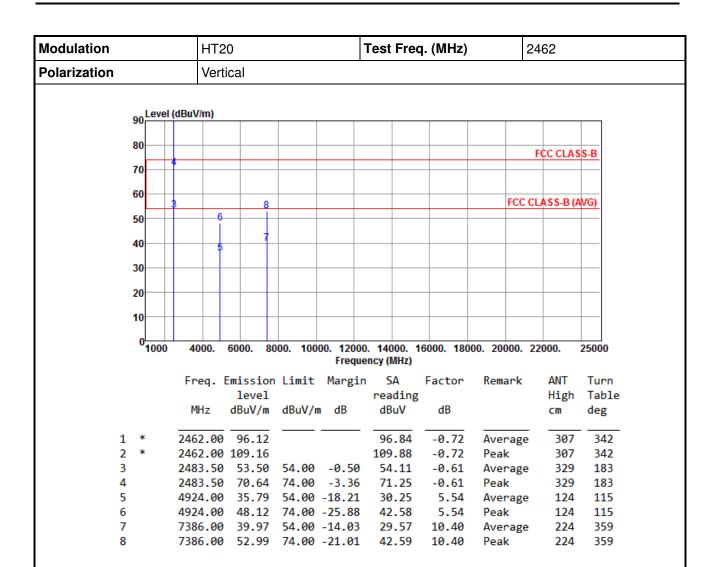
*Factor includes antenna factor, cable loss and amplifier gain

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

Note 3:"*" is Peak / Average value of fundamental frequency

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*Factor includes antenna factor, cable loss and amplifier gain

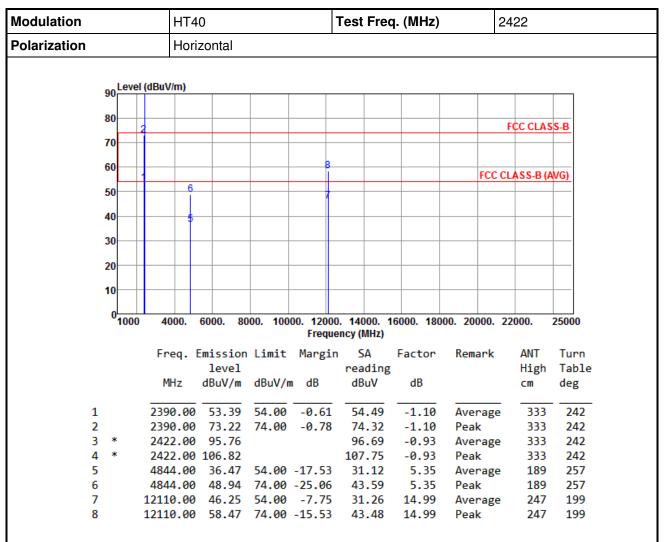
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3:"*" is Peak / Average value of fundamental frequency

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3.5.11 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

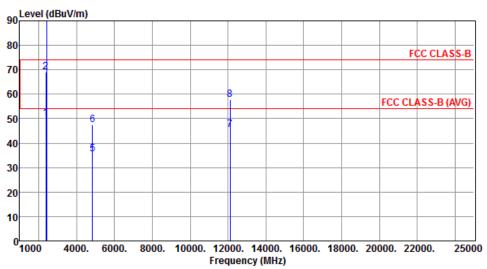
Note 2: Margin (dB) = Emission level (dBuV/m) - Limit (dBuV/m).

Note 3:"*" is Peak / Average value of fundamental frequency

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Modulation	HT40	Test Freq. (MHz)	2422
Polarization	Vertical		



			Emission level		Ū	SA reading	Factor	Remark	ANT High	Turn Table
		MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1		2390.00	50.16	54.00	-3.84	51.26	-1.10	Average	333	316
2		2390.00	69.19	74.00	-4.81	70.29	-1.10	Peak	333	316
3	*	2422.00	95.39			96.32	-0.93	Average	334	187
4	*	2422.00	106.32			107.25	-0.93	Peak	334	187
5		4844.00	35.64	54.00	-18.36	30.29	5.35	Average	265	288
6		4844.00	47.49	74.00	-26.51	42.14	5.35	Peak	265	288
7		12110.00	45.44	54.00	-8.56	30.45	14.99	Average	217	290
8		12110.00	57.88	74.00	-16.12	42.89	14.99	Peak	217	290

Factor includes antenna factor, cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m). Note 3:"" is Peak / Average value of fundamental frequency

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Modulation	odulation		HT40				Test Freq. (MHz)				2437		
Polarization	Horizo	Horizontal											
		•											
90 Le	vel (dBu	ıV/m)	I I										
80													
	4									F	CC CLAS	S-B	
70—													
60		8								FCC CL	ASS-B (A	VG)	
50													
40													
30													
20-													
10													
0 <mark>10</mark>	00 4	4000. 60	00. 800	00. 10		00. 140 uency (N		000. 18	3000. 2	0000. 22	000.	2500	

		Freq. MHz	Emission level		Ū	SA reading dBuV	Factor dB	Remark	ANT High	Turn Table
		MUZ	dBuV/m	dBuV/m	ub	abuv	ub		cm	deg
1		2390.00	53.68	54.00	-0.32	54.78	-1.10	Average	299	242
2		2390.00	72.41	74.00	-1.59	73.51	-1.10	Peak	299	242
3	*	2437.00	97.11			97.97	-0.86	Average	299	242
4	*	2437.00	108.56			109.42	-0.86	Peak	299	242
5		2483.50	49.67	54.00	-4.33	50.28	-0.61	Average	299	85
6		2483.50	72.64	74.00	-1.36	73.25	-0.61	Peak	299	85
7		4874.00	41.54	54.00	-12.46	36.12	5.42	Average	247	246
8		4874.00	54.26	74.00	-19.74	48.84	5.42	Peak	247	246

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

*Factor includes antenna factor, cable loss and amplifier gain

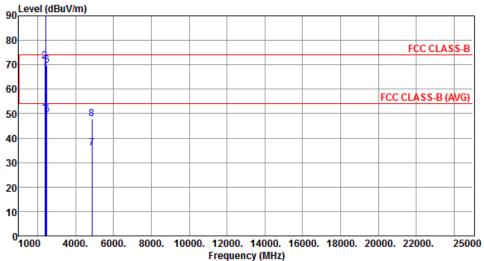
Note 2: Margin (dB) = Emission level (dBuV/m) - Limit (dBuV/m).

Note 3:"*" is Peak / Average value of fundamental frequency

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Modulation	HT40	Test	Freq. (MHz)	24	37		
Polarization	Vertical						
90 Level (dBu	V/m)						



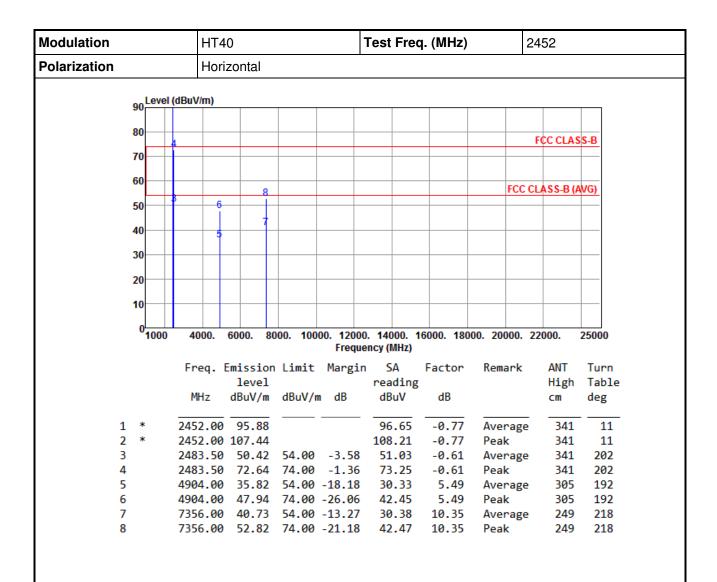
		Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Ū	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1		2390.00	50.25	54.00	-3.75	51.35	-1.10	Average	361	334
2		2390.00	71.24	74.00	-2.76	72.34	-1.10	Peak	361	334
3	*	2437.00	97.68			98.54	-0.86	Average	360	41
4	*	2437.00	108.14			109.00	-0.86	Peak	360	41
5		2483.50	49.62	54.00	-4.38	50.23	-0.61	Average	360	41
6		2483.50	69.81	74.00	-4.19	70.42	-0.61	Peak	360	41
7		4874.00	35.74	54.00	-18.26	30.32	5.42	Average	226	277
8		4874.00	47.96	74.00	-26.04	42.54	5.42	Peak	226	277

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:"" is Peak / Average value of fundamental frequency

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

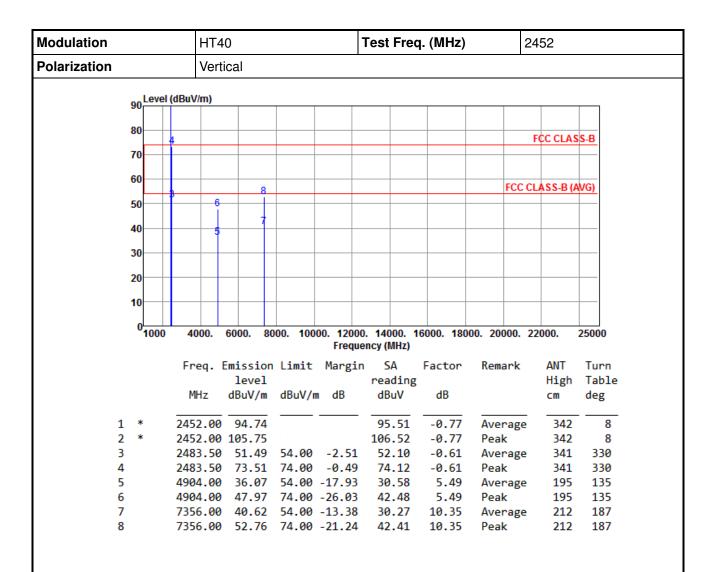
*Factor includes antenna factor, cable loss and amplifier gain

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

Note 3:"*" is Peak / Average value of fundamental frequency

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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).

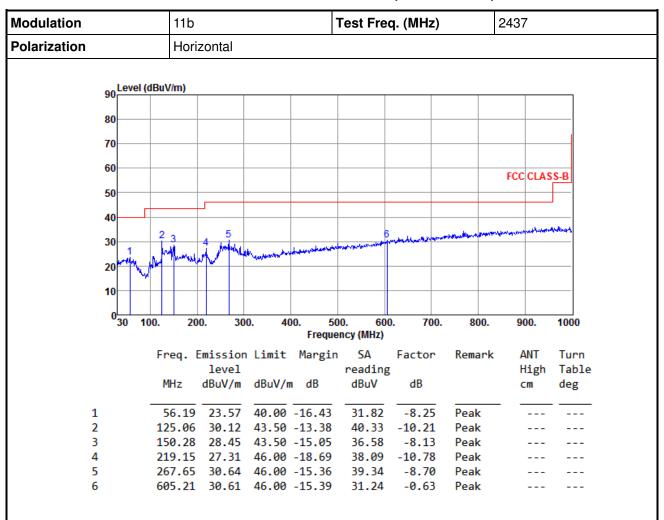
Note 3:"*" is Peak / Average value of fundamental frequency

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Non-beamforming mode for Configuration 2: Sample 2: VE4

3.5.12 Transmitter Radiated Unwanted Emissions (Below 1GHz)



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

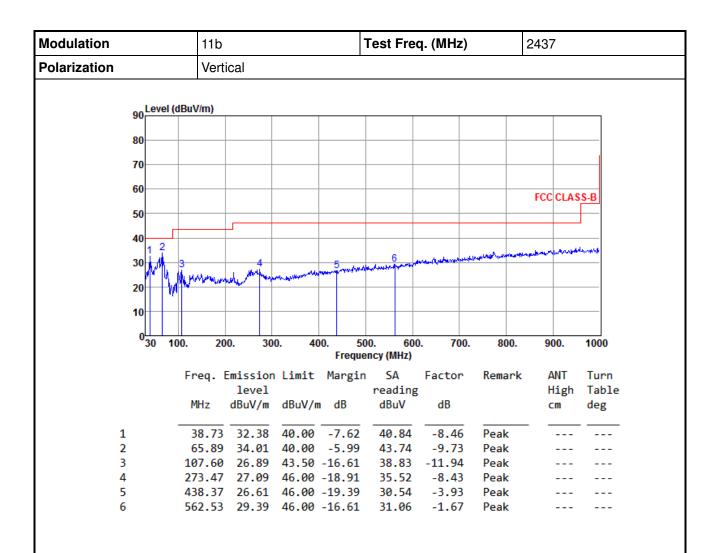
*Factor includes antenna factor, cable loss and amplifier gain

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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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).

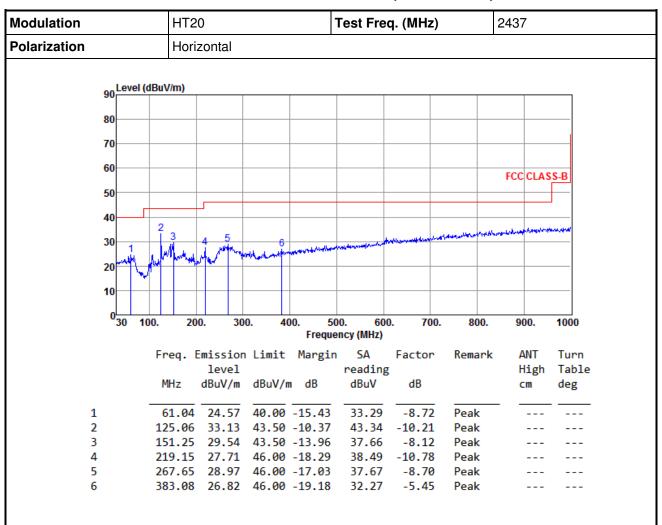
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

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Beamforming mode for Configuration 2: Sample 2: VE4

3.5.13 Transmitter Radiated Unwanted Emissions (Below 1GHz)



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

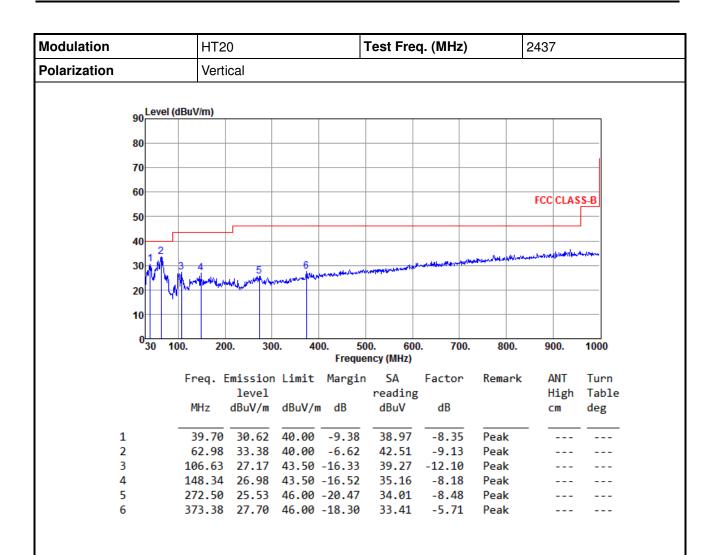
*Factor includes antenna factor , cable loss and amplifier gain

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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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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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 30 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

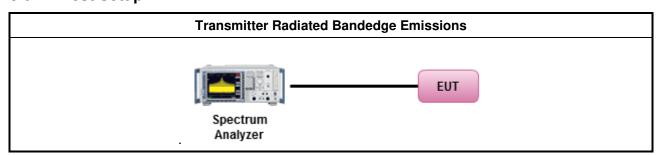
Reference level measurement

- 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.

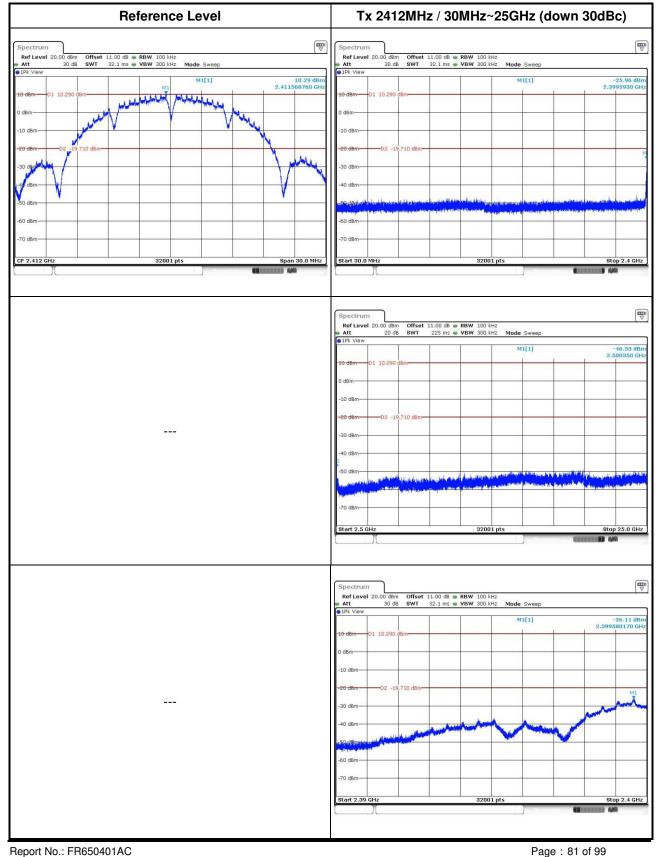
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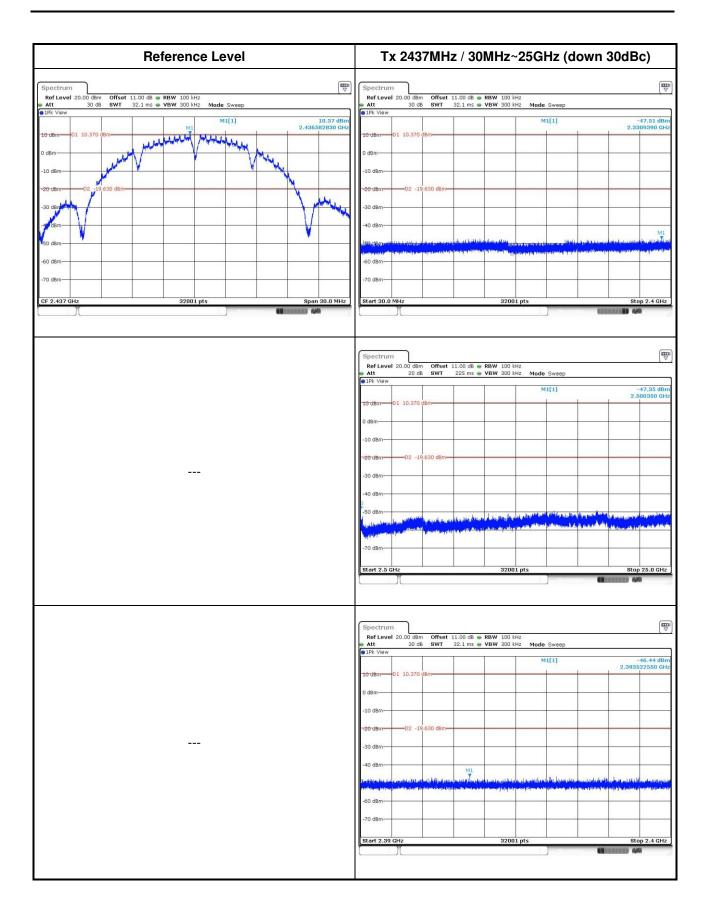
Non-beamforming mode

3.6.6 Unwanted Emissions into Non-Restricted Frequency Bands

802.11b

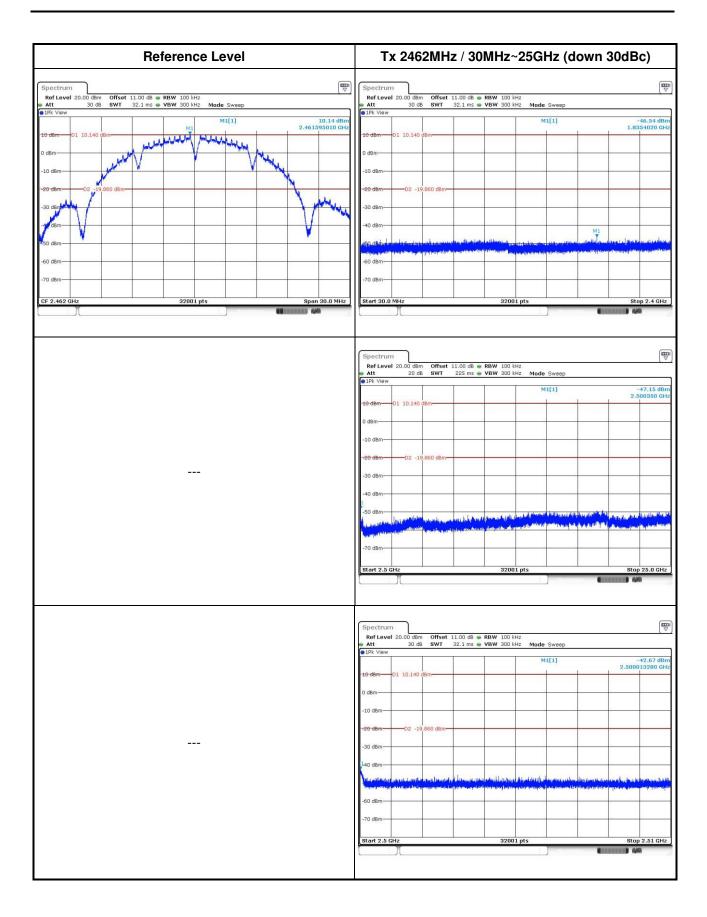






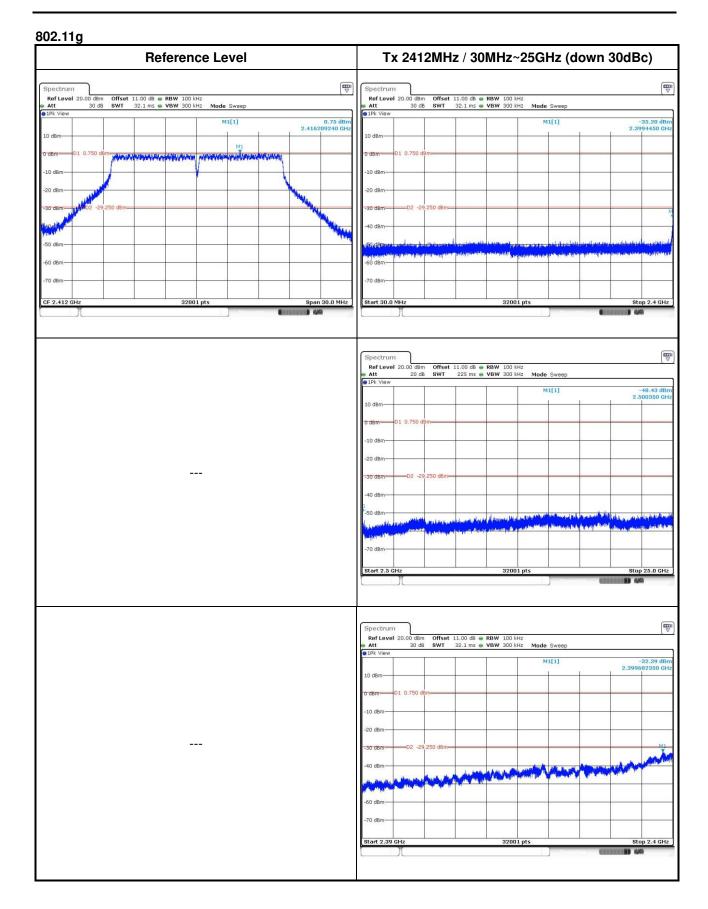
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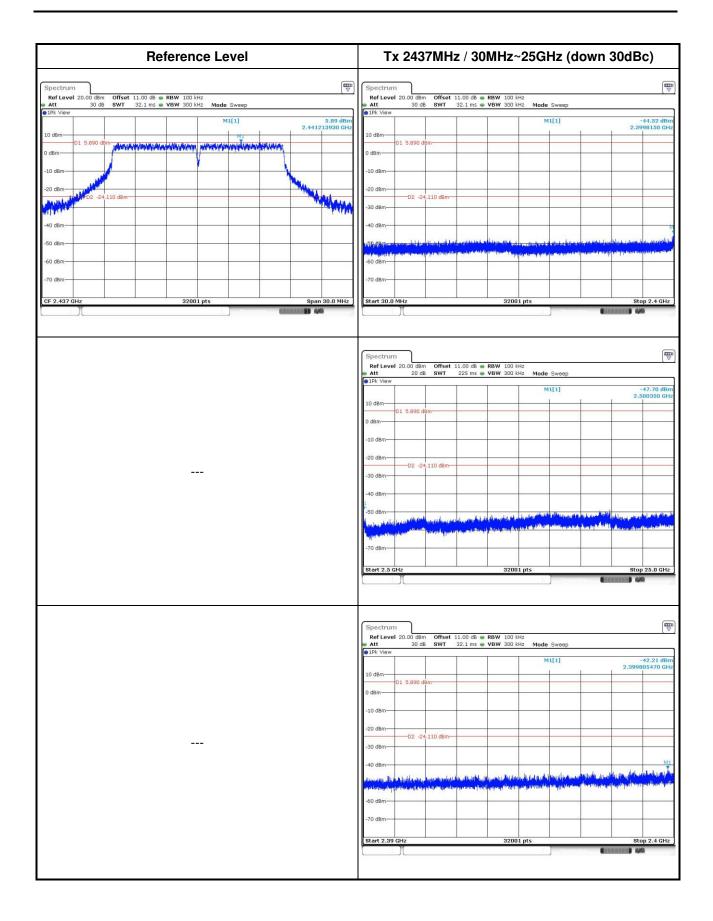
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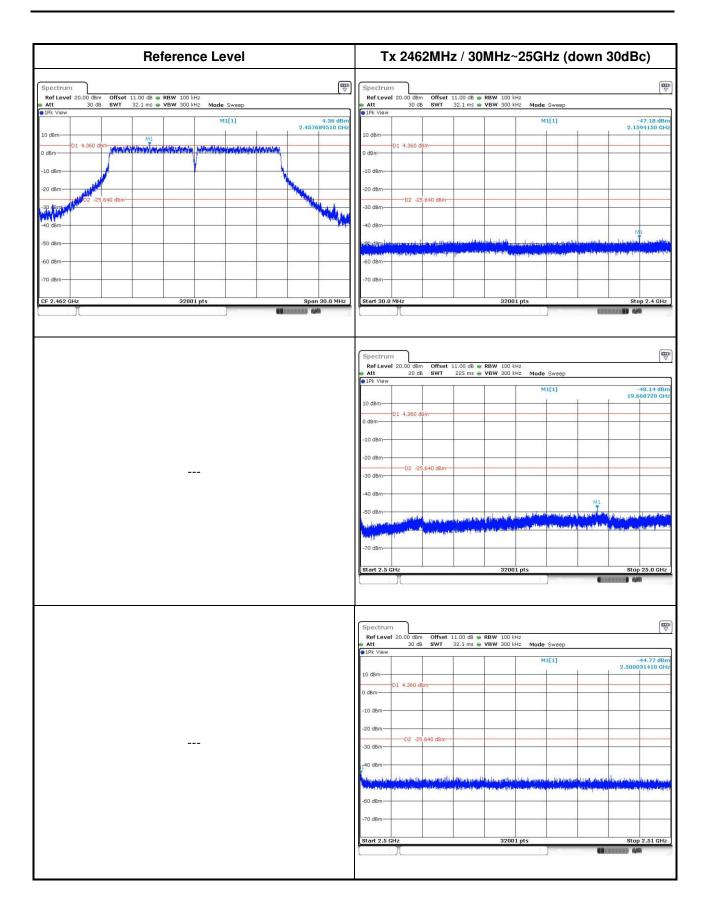
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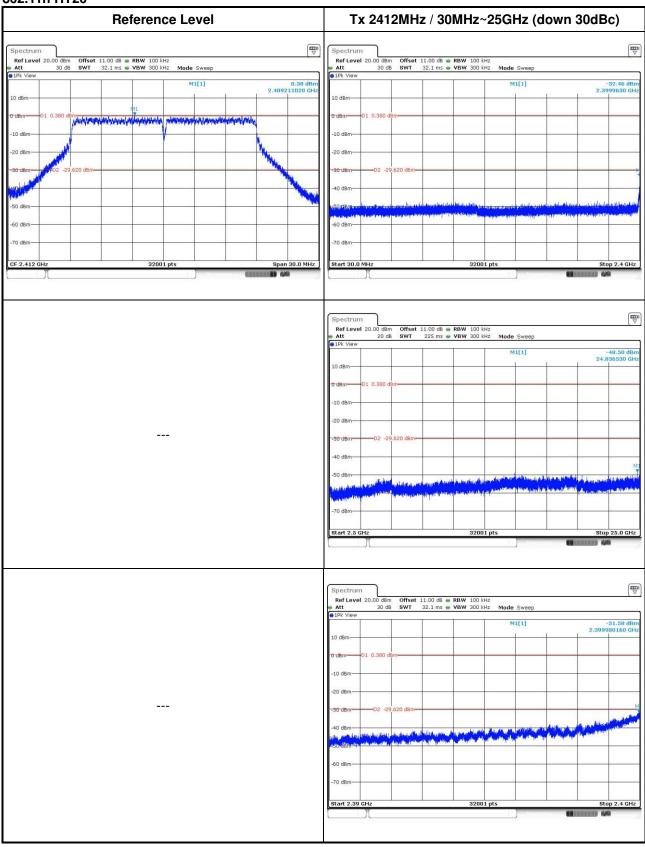




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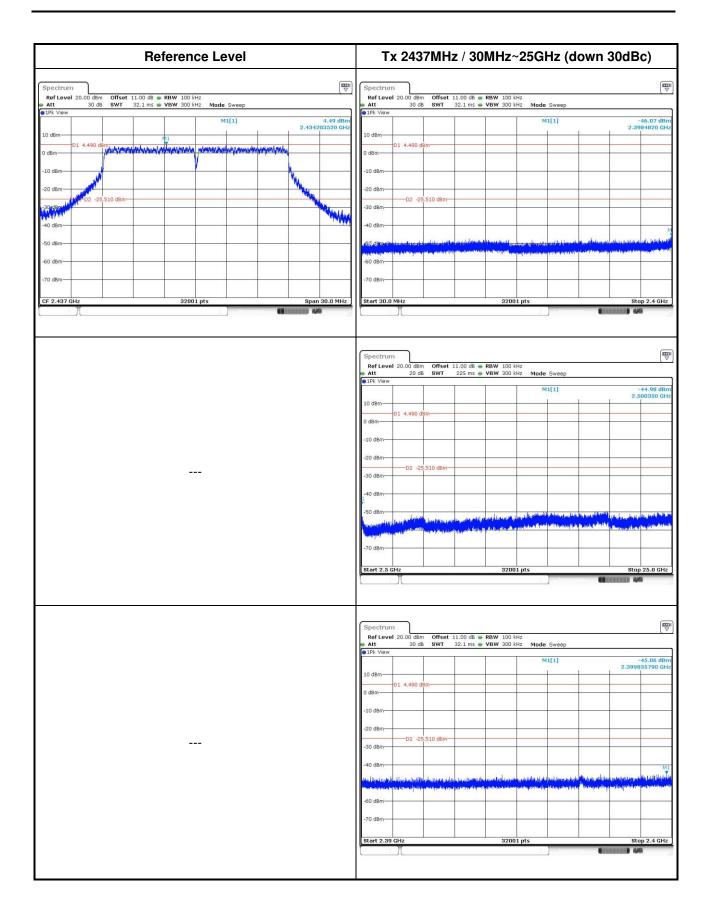


802.11n HT20



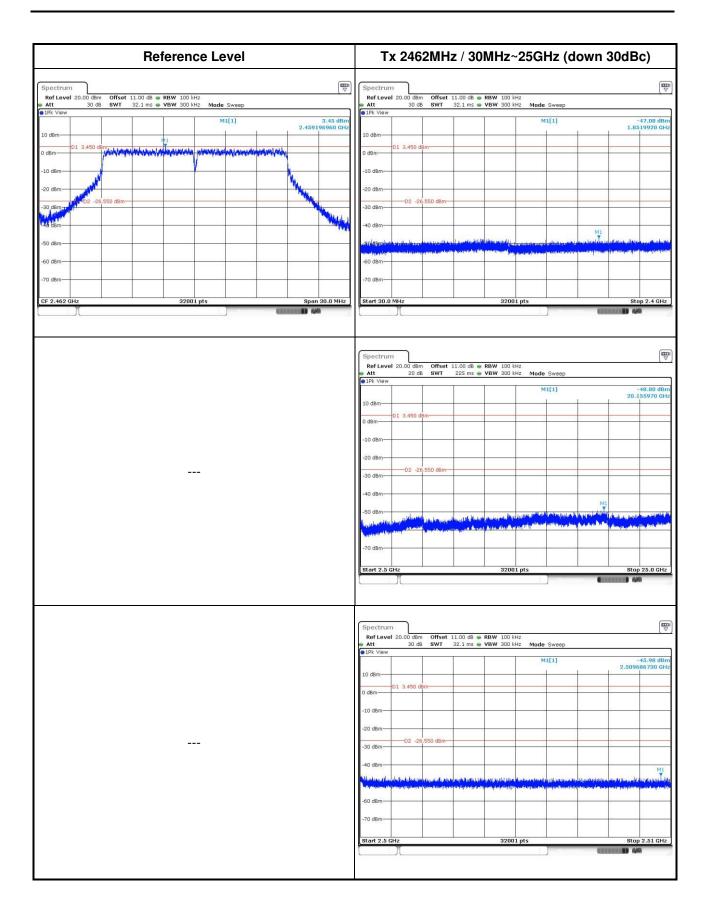
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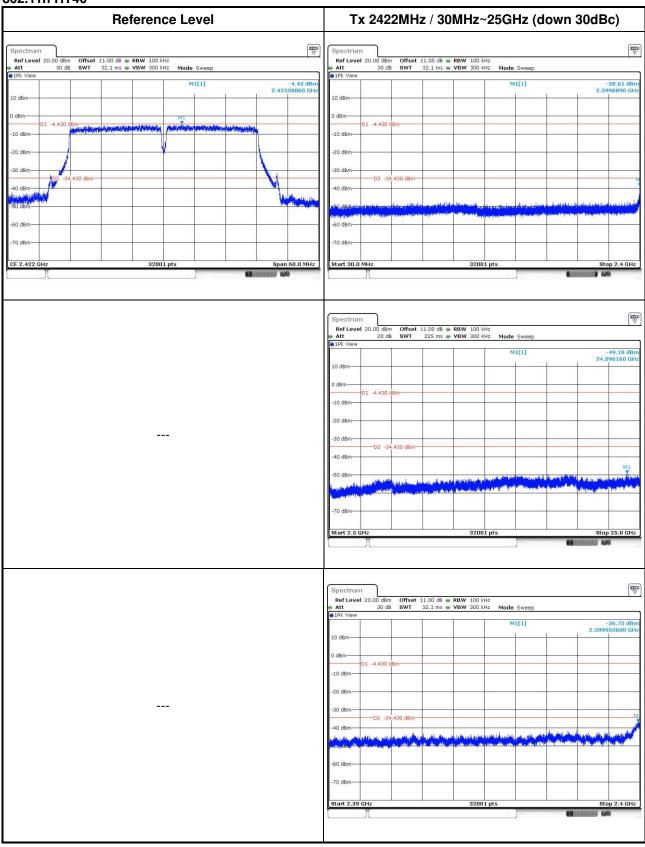




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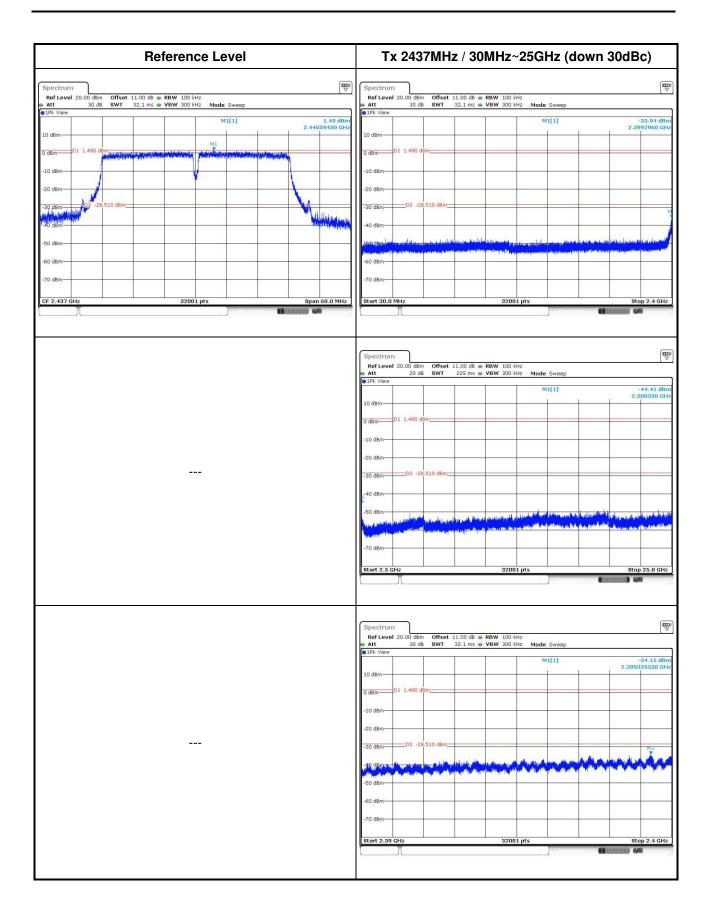


802.11n HT40



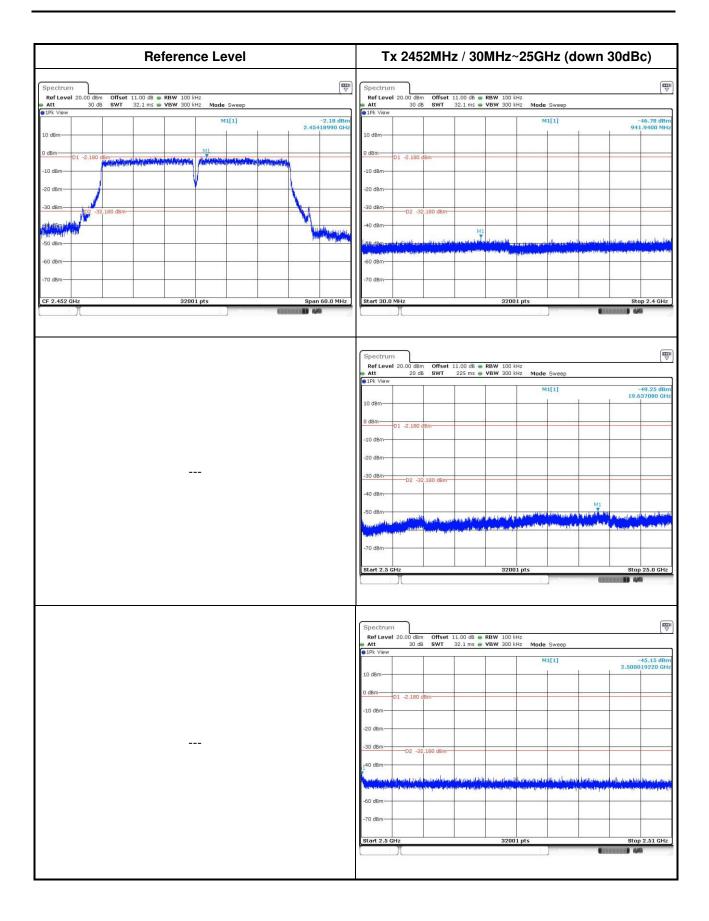
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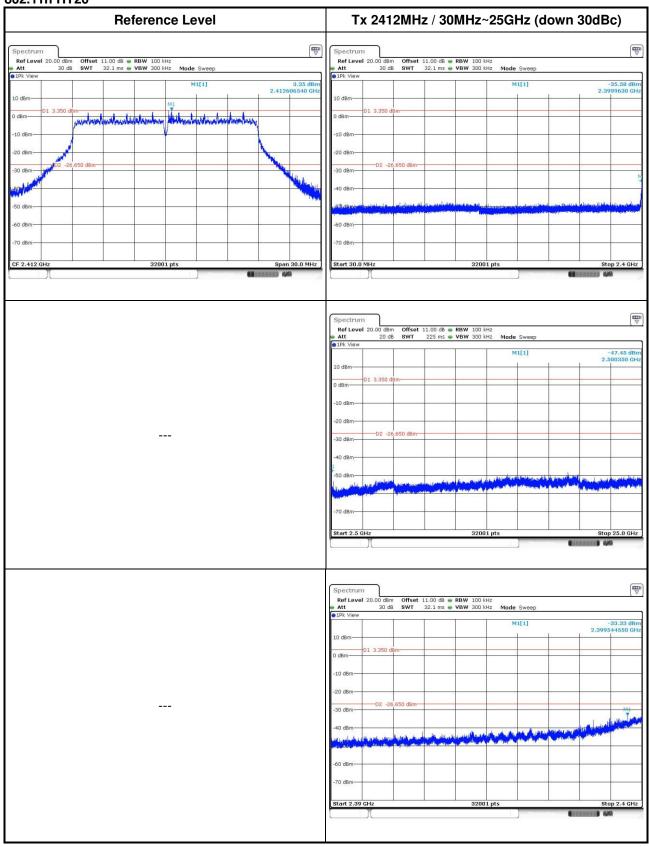
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Beamforming mode

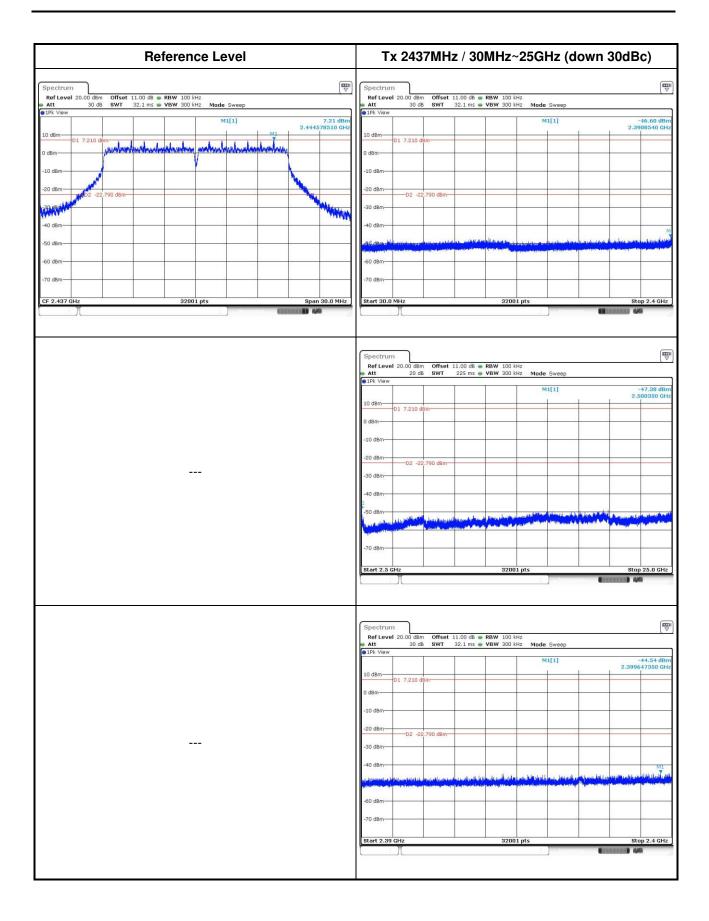
3.6.7 Unwanted Emissions into Non-Restricted Frequency Bands

802.11n HT20



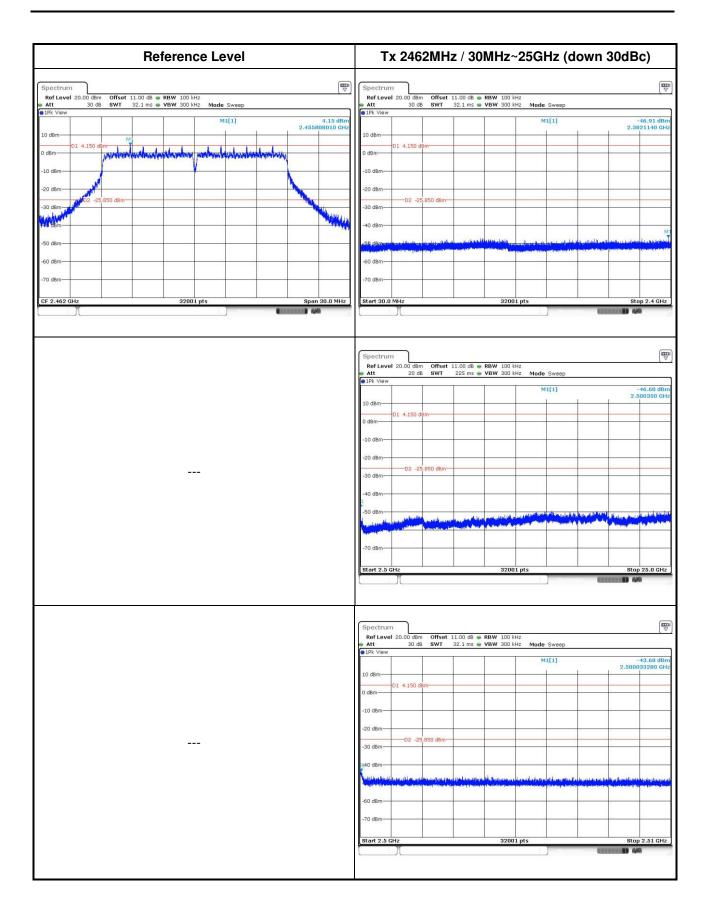
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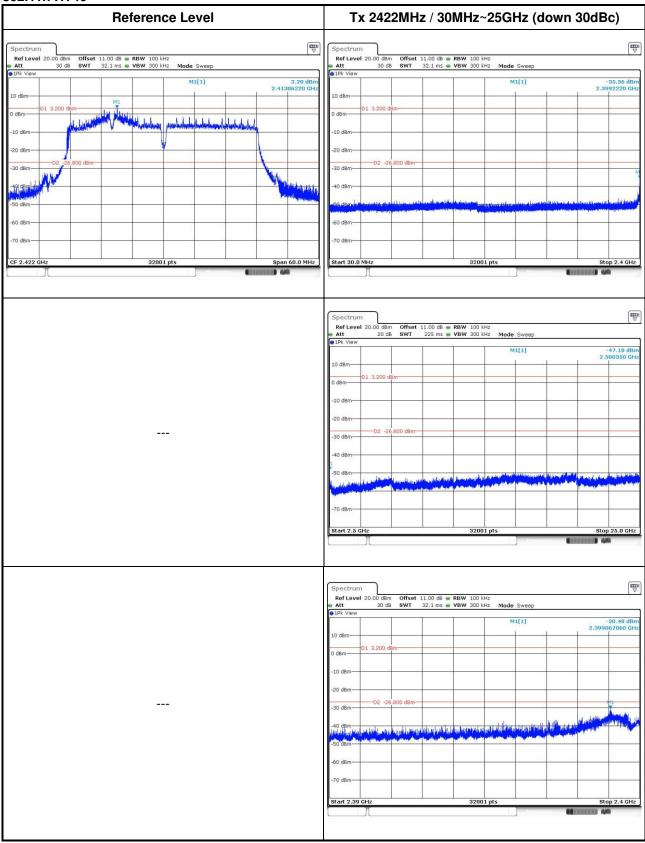




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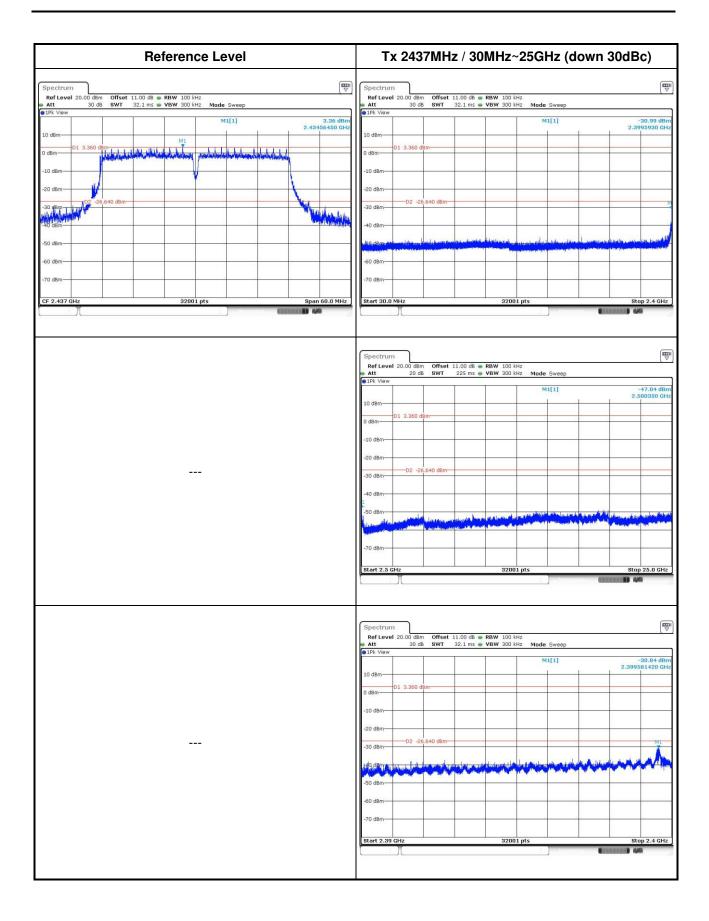


802.11n HT40



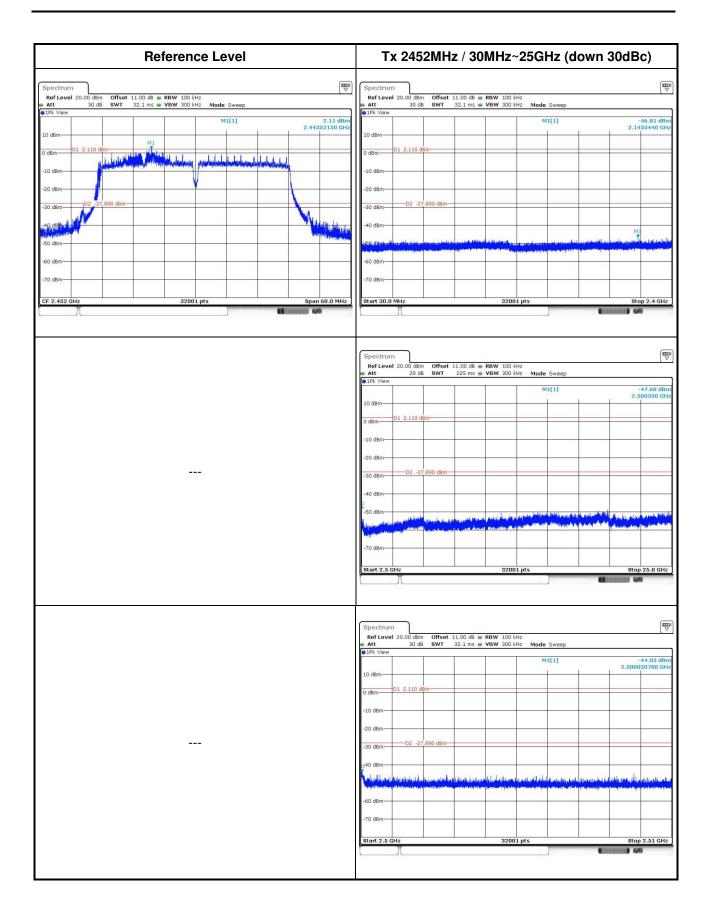
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4 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

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

Our Test sites are located at Linkou District and Kwei Shan District. Location map can be found on our website http://www.icertifi.com.tw.

Linkou

Tel: 886-2-2601-1640 No. 30-2, Ding Fwu Tsuen, Lin Kou District, New Taipei City,

Taiwan, R.O.C.

Kwei Shan

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

Kwei Shan Site II

Tel: 886-3-271-8640

No. 14-1, Lane 19, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C.

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

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

Email: ICC_Service@icertifi.com.tw

==END==

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