

# **FCC Test Report**

FCC ID : VQK-F03H

**Equipment**: Mobile Phone

Model No. : F-03H

Brand Name : FUJITSU

Applicant : FUJITSU LIMITED

Address : 1-1, Kamikodanaka 4-chome, Nakahara-ku,

Kawasaki 211-8588, Japan

Standard : 47 CFR FCC Part 15.247

Received Date : Feb. 26, 2016

Tested Date : Apr. 18 ~ Apr. 28, 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.

Approved & Reviewed by:

Gary Chang / Manager

Iac-MRA



Report No.: FR622602AC Report Version: Rev. 01 Page: 1 of 53



## **Table of Contents**

1	GENERAL DESCRIPTION	5
1.1	Information	5
1.2	Local Support Equipment List	
1.3	Test Setup Chart	
1.4	The Equipment List	
1.5	Test Standards	9
1.6	Measurement Uncertainty	9
2	TEST CONFIGURATION	10
2.1	Testing Condition	10
2.2	The Worst Test Modes and Channel Details	10
3	TRANSMITTER TEST RESULTS	11
3.1	Conducted Emissions	11
3.2	6dB and Occupied Bandwidth	
3.3	RF Output Power	
3.4	Power Spectral Density	19
3.5	Unwanted Emissions into Restricted Frequency Bands	21
3.6	Emissions in Non-Restricted Frequency Bands	43
4	TEST LABORATORY INFORMATION	53



## **Release Record**

Report No.	Version	Description	Issued Date
FR622602AC	Rev. 01	Initial issue	May 10, 2016

Report No.: FR622602AC Page: 3 of 53



# **Summary of Test Results**

FCC Rules	Test Items	Measured	Result
15.207	Conducted Emissions	[dBuV]: 4.430MHz 48.35 (Margin -7.65dB) - QP	Pass
15.247(d)	Radiated Emissions	[dBuV/m at 3m]: 2390.00MHz	Pass
15.209	Natiated Effissions	52.21 (Margin -1.79dB) - AV	rass
15.247(b)(3)	Maximum Output Power	Max Power [dBm]: 20.63	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

Report No.: FR622602AC Page: 4 of 53



## 1 General Description

### 1.1 Information

#### 1.1.1 Product Details

Product Name	Mobile Phone
Brand Name	FUJITSU
Model Name	F-03H
IMEI Code	356398070028368 / 356398070028426
H/W Version	V2.1.0
S/W Version	R012.2

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

	RF General Information						
Frequency Range (MHz)	IEEE Std. 802.11	Ch. Freq. (MHz)	Channel Number	Transmit Chains (N <sub>TX</sub> )	Data Rate / MCS		
2400-2483.5	b	2412-2462	1-11 [11]	1	1-11 Mbps		
2400-2483.5	g	2412-2462	1-11 [11]	1	6-54 Mbps		
2400-2483.5	n (HT20)	2412-2462	1-11 [11]	1	MCS 0-7		

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.

#### 1.1.3 Antenna Details

Ant. No.	Type	Connector	Operating Frequencies (MHz) / Antenna Gain (dBi)		
Ant. No.	Туре		2400~2483.5	5150~5350	5470~5725
1	λ/4 Monopole	N/A	-8.0	-6.1	-6.1

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

Power Supply Type	5.0Vdc from AC adapter 3.8Vdc from Battery
-------------------	---

#### 1.1.5 Accessories

No.	Equipment	Description
1	Battery	Brand Name: FUJITSU CONNECTED TECHNOLOGIES LIMITED Model Name: CA54310-0067 Power Rating: 3.8Vdc, 2,580mAh, 9.9Wh

Report No.: FR622602AC Page: 5 of 53



### 1.1.6 Channel List

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

## 1.1.7 Test Tool and Duty Cycle

Test Tool	QRCT, Version: 3.0.54.0			
	Mode	Duty cycle (%)	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	

## 1.1.8 Power Setting

Modulation Mode	Test Frequency (MHz)	Power Set
11b	2412	14
11b	2437	14
11b	2462	14
11g	2412	14
11g	2437	14
11g	2462	14
HT20	2412	14
HT20	2437	14
HT20	2462	14

Report No.: FR622602AC Page: 6 of 53

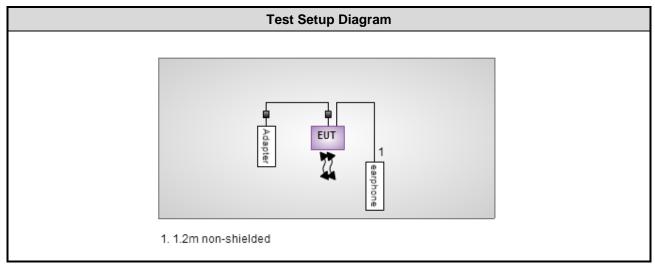


## 1.2 Local Support Equipment List

	Support Equipment List							
No.	Equipment	Brand	Model	S/N	FCC ID	Signal cable / Length (m)		
1	Earphone	APPLE	MD827FE/A	6		1.2m non-shielded w/o core		
2	Adapter	NTT docomo	AC Adapter 04					
3	Notebook	DELL	Latitude E6440	JMXMD12	DoC			

Note: Adapter is provided by applicant.

## 1.3 Test Setup Chart



Note: Notebook is disconnected from EUT and removed from test table when EUT is set to transmit continuously.

Report No.: FR622602AC Page: 7 of 53



## 1.4 The Equipment List

Test Item	Conducted Emission									
Test Site	Conduction room 1 / (CO01-WS)									
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until					
EMC Receiver	R&S	ESCS 30	100169	Oct. 21, 2015	Oct. 20, 2016					
LISN	SCHWARZBECK	Schwarzbeck 8127	8127-667	Nov. 13, 2015	Nov. 12, 2016					
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 Interval of instruments listed above is one year.										

Test Item	Radiated Emission									
Test Site	966 chamber 3 / (03	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	VULB9168-562	Nov. 16, 2015	Nov. 15, 2016					
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1206	Feb. 24, 2016	Feb. 23, 2017					
Horn Antenna 18G-40G	SCHWARZBECK	SCHWARZBECK BBHA 9170 BBHA 9170517		Nov. 04, 2015	Nov. 03, 2016					
Preamplifier	EMC	EMC EMC02325 980187		Sep. 21, 2015	Sep. 20, 2016					
Preamplifier	Agilent	Agilent 83017A MY53270014		Sep. 07, 2015	Sep. 06, 2016					
Preamplifier	EMC	EMC184045B	EMC184045B 980192		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					
Measurement Software AUDIX		e3 6.120210g		NA	NA					
Note: Calibration I	nterval of instruments	listed above is one year.								

Test Item	RF Conducted									
Test Site	(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					
Measurement Software	Sporton	Sporton_1	1.3.30	NA	NA					
Note: Calibration Interval of instruments listed above is one year.										

Report No.: FR622602AC Page: 8 of 53



### 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

## 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							

Report No.: FR622602AC Page: 9 of 53



## 2 Test Configuration

## 2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
AC Conduction	CO01-WS	20°C / 60%	Howard Huang
Radiated Emissions	03CH03-WS	20-21°C / 60%	Felix Sung Warren Lee Allen Yu
RF Conducted	TH01-WS	21°C / 68%	Anderson Hung

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

### 2.2 The Worst Test Modes and Channel Details

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

#### NOTE:

Report No.: FR622602AC Page: 10 of 53

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



## 3 Transmitter Test Results

#### 3.1 Conducted Emissions

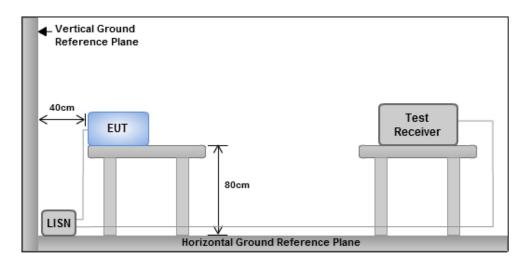
#### 3.1.1 Limit of Conducted Emissions

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

#### 3.1.2 Test Procedures

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

#### 3.1.3 Test Setup



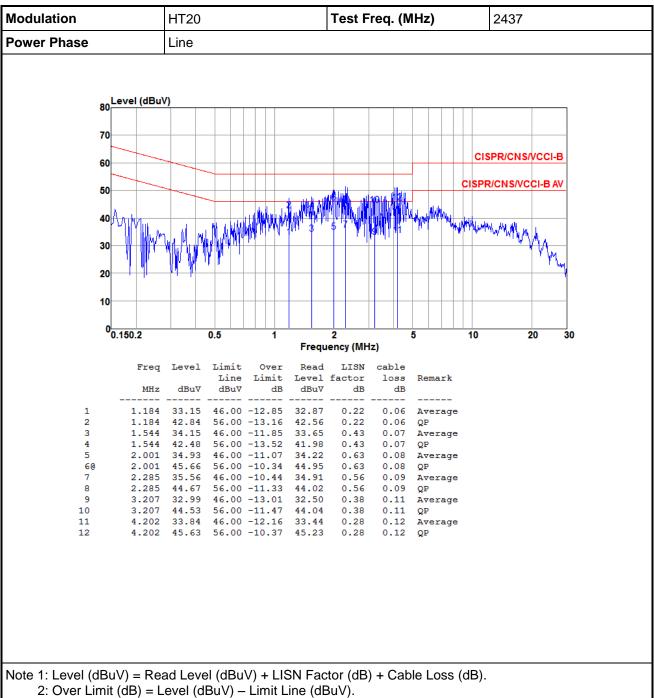
Note: 1. Support units were connected to second LISN.

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

Report No.: FR622602AC Page: 11 of 53

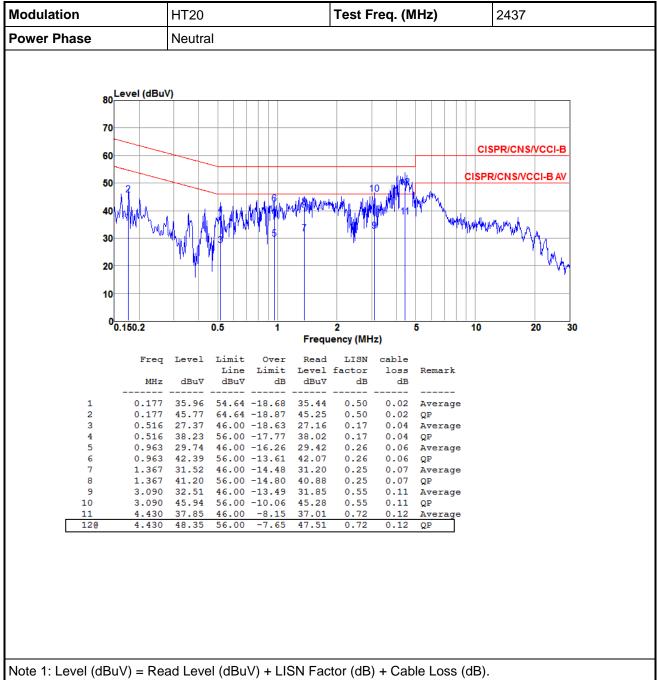


#### **Test Result of Conducted Emissions** 3.1.4



Report No.: FR622602AC Page: 12 of 53





Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB). 2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).

Report No.: FR622602AC Page: 13 of 53



## 3.2 6dB and Occupied Bandwidth

#### 3.2.1 Limit of 6dB Bandwidth

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

#### 3.2.2 Test Procedures

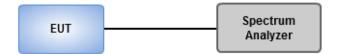
#### 6dB Bandwidth

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

### **Occupied Bandwidth**

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

#### 3.2.3 Test Setup

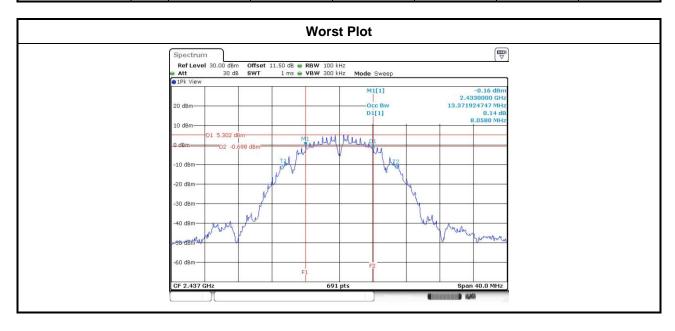


Report No.: FR622602AC Page: 14 of 53



## 3.2.4 Test Result of 6dB and Occupied Bandwidth

Modulation	N	Erog (MUz)		6dB Bandv	vidth (MHz)		Limit (kU=)
Mode	N <sub>TX</sub>	Freq. (MHz)	Chain 0	Chain 1	Chain 2	Chain 3	Limit (kHz)
11b	1	2412	8.06				500
11b	1	2437	8.06				500
11b	1	2462	8.06				500
11g	1	2412	16.29				500
11g	1	2437	16.35				500
11g	1	2462	16.35				500
HT20	1	2412	17.57				500
HT20	1	2437	17.57				500
HT20	1	2462	17.57				500



Report No.: FR622602AC Page: 15 of 53



Modulation	N	Freq.		99% Occupied E	Bandwidth (MHz)	
Mode	N <sub>TX</sub>	(MHz)	Chain 0	Chain 1	Chain 2	Chain 3
11b	1	2412	13.75			
11b	1	2437	13.39			
11b	1	2462	13.19			
11g	1	2412	17.93			
11g	1	2437	17.53			
11g	1	2462	17.15			
HT20	1	2412	18.73			
HT20	1	2437	18.37			
HT20	1	2462	18.15			



Report No.: FR622602AC Page: 16 of 53



## 3.3 RF Output Power

### 3.3.1 Limit of RF Output Power

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

#### 3.3.2 Test Procedures

Maximum Peak Conducted Output Power

#### □ Spectrum analyzer

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

#### Nower meter

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

#### Nower meter

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

#### 3.3.3 Test Setup



Report No.: FR622602AC Page: 17 of 53



## 3.3.4 Test Result of Maximum Output Power

	N <sub>TX</sub>	N <sub>TX</sub> Freq. (MHz)		Peak conducted Output Power (dBm)								FIDD
Modulation Mode			Chain 0	Chain 1	Chain 2	Chain 3	Total Power (mW)	Total Power (dBm)	Limit (dBm)	Ant. Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)
11b	1	2412	17.25				53.088	17.25	30.00	-8.00	9.25	36.00
11b	1	2437	17.43				55.335	17.43	30.00	-8.00	9.43	36.00
11b	1	2462	17.12				51.523	17.12	30.00	-8.00	9.12	36.00
11g	1	2412	20.41				109.901	20.41	30.00	-8.00	12.41	36.00
11g	1	2437	20.46				111.173	20.46	30.00	-8.00	12.46	36.00
11g	1	2462	20.05				101.158	20.05	30.00	-8.00	12.05	36.00
HT20	1	2412	20.58				114.288	20.58	30.00	-8.00	12.58	36.00
HT20	1	2437	20.63				115.611	20.63	30.00	-8.00	12.63	36.00
HT20	1	2462	20.12				102.802	20.12	30.00	-8.00	12.12	36.00

Modulation	Modulation N		Conducted (Average) Output Power (dBm)					Total	Limit
Mode	N <sub>TX</sub>	NTX (MHz) Chain 0 Chain 1 Chain 2		Chain 2	Chain 3	Power (mW)	Power (dBm)	(dBm)	
11b	1	2412	14.31				26.977	14.31	
11b	1	2437	14.56				28.576	14.56	
11b	1	2462	14.22				26.424	14.22	
11g	1	2412	13.49				22.336	13.49	
11g	1	2437	13.53				22.542	13.53	
11g	1	2462	13.12				20.512	13.12	
HT20	1	2412	13.64				23.121	13.64	
HT20	1	2437	13.67				23.281	13.67	
HT20	1	2462	13.25				21.135	13.25	

Note: Conducted average output power is for reference only.

Report No.: FR622602AC Page: 18 of 53



## 3.4 Power Spectral Density

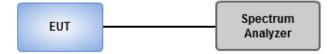
### 3.4.1 Limit of Power Spectral Density

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

#### 3.4.2 Test Procedures

- Maximum peak conducted output power was used to demonstrate compliance to the fundamental output power limit.
  - Set the RBW = 3kHz, VBW = 10kHz.
  - 2. Detector = Peak, Sweep time = auto couple.
  - 3. Trace mode = max hold, allow trace to fully stabilize.
  - 4. Use the peak marker function to determine the maximum amplitude level.
- Maximum (average) conducted output power was used to demonstrate compliance to the fundamental output power limit.
  - Set the RBW = 100kHz, VBW = 300 kHz.
  - 2. Detector = RMS, Sweep time = auto couple.
  - 3. Perform the measurement over a single sweep.
  - 4. Use the peak marker function to determine the maximum amplitude level.

#### 3.4.3 Test Setup

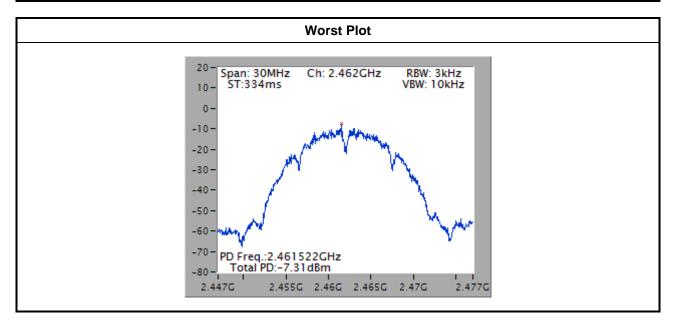


Report No.: FR622602AC Page: 19 of 53



## 3.4.4 Test Result of Power Spectral Density

Modulation Mode	N <sub>TX</sub>	Freq. (MHz)	Total Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
11b	1	2412	-9.53	8.00
11b	1	2437	-8.91	8.00
11b	1	2462	-7.31	8.00
11g	1	2412	-12.35	8.00
11g	1	2437	-11.98	8.00
11g	1	2462	-12.85	8.00
HT20	1	2412	-12.86	8.00
HT20	1	2437	-13.32	8.00
HT20	1	2462	-13.76	8.00



Report No.: FR622602AC Page: 20 of 53



## 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.

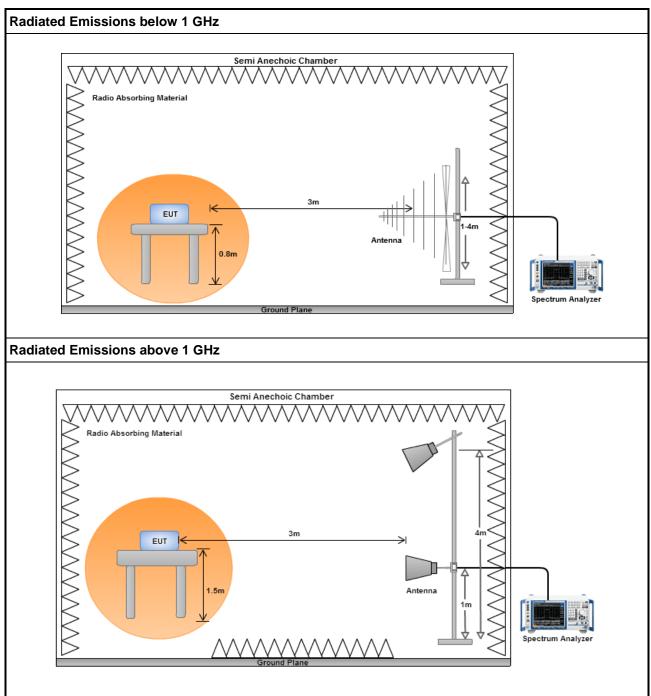
#### Note:

- 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.

Report No.: FR622602AC Page: 21 of 53



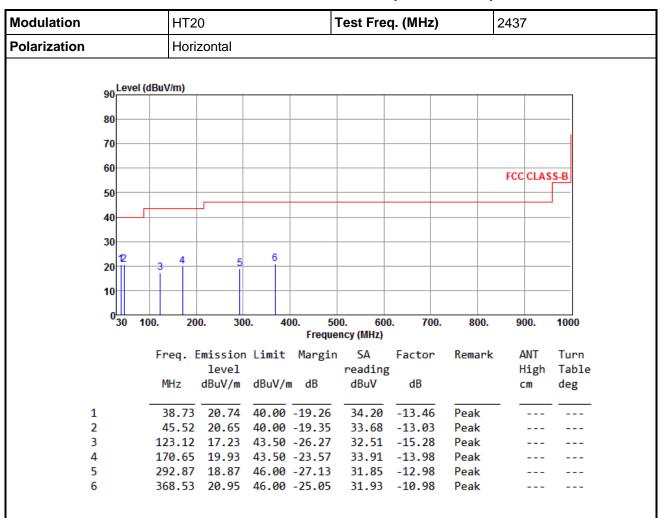
## 3.5.3 Test Setup



Report No.: FR622602AC Page: 22 of 53



### 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.

Report No.: FR622602AC Page: 23 of 53



Modulation				HT2	0					Test Fre	eq. (M	Hz)		2437	7	
Polarization				Vert	ical											
	90	Level	(dBuV	/m)				_								
	80							7								
	70		-					+								
	60															
	60													FCC	CLAS	S-B
	50		-			-		+					-		-	
	40															
	40															
	30	1	-					+	6							
	20	<u>i</u> —	2	3		4		5	<del>-</del>							
	10							Ħ								
	0	30 1	00.	20	n	30	0	40	0 5	00. 60	00.	700.	800	) 0	00.	1000
	,	JU 1	00.	20	0.	30	0.	40		ency (MHz)		700.	000	, 3	ου.	1000
			Fre	eq. I	Emiss	ion	Limi	t	Margi	n SA	Fac	tor	Remar	rk /	ANT	Turn
					lev	el			_	readin	g			H	ligh	Table
			M	Ηz	dBuV	/m	dBuV,	/m	dB	dBuV	d	В		(	m	deg
1	ı		4	3.58	23.	23	40.0	 a	-16.77	36.34	-13	.11	Peak			
2			-	5.03	18.				-24.76	33.70			Peak			
3				5.13	20.				-23.22	33.64			Peak			
4	1		268	8.62	18.	05	46.0	0	-27.95	31.80	-13	.75	Peak			
-				4.05					-25.19				Peak			
6	5		41	7.03	22.	87	46.0	9	-23.13	32.58	-9	.71	Peak			

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

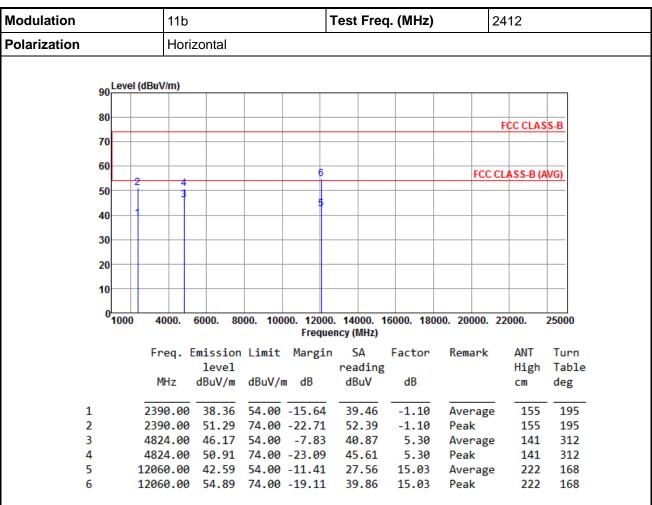
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

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

Report No.: FR622602AC Page: 24 of 53



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



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

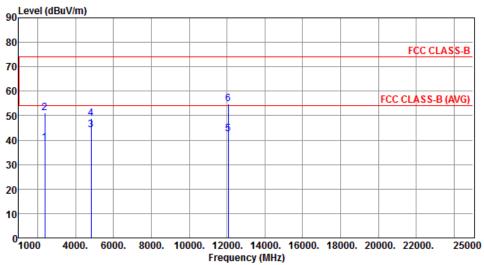
\*Factor includes antenna factor, cable loss and amplifier gain

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

Report No.: FR622602AC Page: 25 of 53



Modulation	11b	Test Freq. (MHz)	2412
Polarization	Vertical		
Lovel (dRu)	(Inn.)		



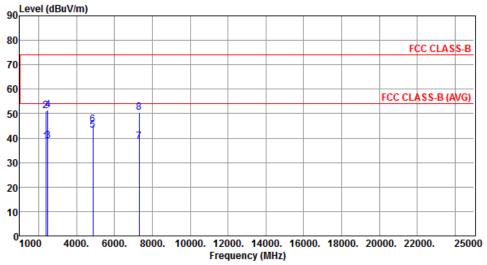
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Ū	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
_									
1	2390.00	38.76	54.00	-15.24	39.86	-1.10	Average	188	109
2	2390.00	51.22	74.00	-22.78	52.32	-1.10	Peak	188	109
3	4824.00	44.18	54.00	-9.82	38.88	5.30	Average	265	256
4	4824.00	48.89	74.00	-25.11	43.59	5.30	Peak	265	256
5	12060.00	42.62	54.00	-11.38	27.59	15.03	Average	222	134
6	12060.00	54.66	74.00	-19.34	39.63	15.03	Peak	222	134

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

Report No.: FR622602AC Page: 26 of 53



Modulation		11b	11b			Freq.	(MHz)	)	24	2437			
Polarization	Horizoi	ntal											
	ovol (dPu	(V/m)											
90	Level (dBu												
80													



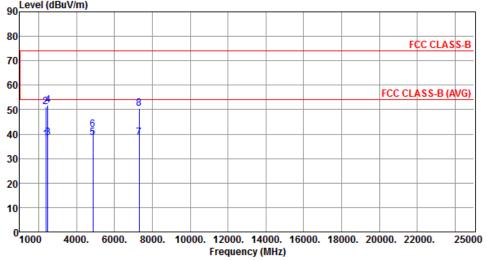
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Ū	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	38.45	54.00	-15.55	39.55	-1.10	Average	189	216
2	2390.00	51.25	74.00	-22.75	52.35	-1.10	Peak	189	216
3	2483.50	38.71	54.00	-15.29	39.32	-0.61	Average	189	216
4	2483.50	51.49	74.00	-22.51	52.10	-0.61	Peak	189	216
5	4874.00	43.33	54.00	-10.67	37.91	5.42	Average	132	138
6	4874.00	45.54	74.00	-28.46	40.12	5.42	Peak	132	138
7	7311.00	38.45	54.00	-15.55	28.19	10.26	Average	222	116
8	7311.00	50.47	74.00	-23.53	40.21	10.26	Peak	222	116

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

Report No.: FR622602AC Page: 27 of 53



Modulation	11b	Test Freq. (MHz)	2437			
Polarization	Vertical					
90 Level (dBi	ıV/m)					
00						



	Freq. E	mission level dBuV/m	Limit dBuV/m	Ü	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	37.96	54.00	-16.04	39.06	-1.10	Average	203	109
2	2390.00	51.21	74.00	-22.79	52.31	-1.10	Peak	203	109
3	2483.50	38.60	54.00	-15.40	39.21	-0.61	Average	203	109
4	2483.50	51.87	74.00	-22.13	52.48	-0.61	Peak	203	109
5	4874.00	38.54	54.00	-15.46	33.12	5.42	Average	138	245
6	4874.00	41.68	74.00	-32.32	36.26	5.42	Peak	138	245
7	7311.00	38.37	54.00	-15.63	28.11	10.26	Average	222	165
8	7311.00	50.58	74.00	-23.42	40.32	10.26	Peak	222	165

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

Report No.: FR622602AC Page: 28 of 53



Modulation			11b			-	Test Fred	q. (MHz)	:	2462		
Polarization			Hori	zontal		1						
		evel	(dBuV/m)									
	90		(4547),,,,									
	80									500 01 40		
	70									FCC CLAS	92-B	
	70											
	60								FCC	CLASS-B (A	WG)	
	50		2 4	6						, 2 , 20, 20		
			.   1									
	40											
	30											
	20											
	10											
	0	1000	4000.	6000. 80	000. 100	00 12000	14000 1	6000 100	00. 20000.	22000	25000	
		1000	4000.	0000. 60	100. 100		ncy (MHz)	0000. 100	00. 20000.	22000.	23000	
			Freq. I	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn	
			•	level		Ü	reading			High	Table	
			MHz	dBuV/m	dBuV/ı	n dB	dBuV	dB		cm	deg	
1			2483.50	38 48	54 00	-15.52	39.09	-0.61	Average	153	196	
2			2483.50			-22.33	52.28	-0.61	Peak	153	196	
3			4924.00				40.66	5.54	Average		322	

45.32

28.03

40.65

5.54

10.40

10.40

Peak

Peak

Average

143

188

188

322

221

221

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).

4924.00

5

50.86 74.00 -23.14

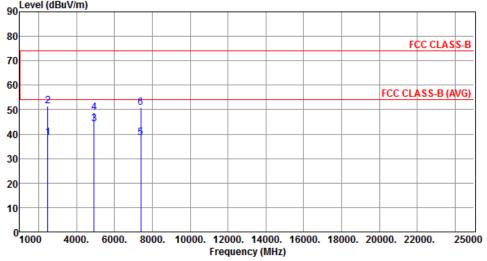
7386.00 38.43 54.00 -15.57

7386.00 51.05 74.00 -22.95

Report No.: FR622602AC Page: 29 of 53



Modulation		11b	11b				Test Freq. (MHz)				2462		
Polarization		Vertical											
مما	_evel (dBu\	//m)											
80-													
00									F	CC CLAS	S_R		



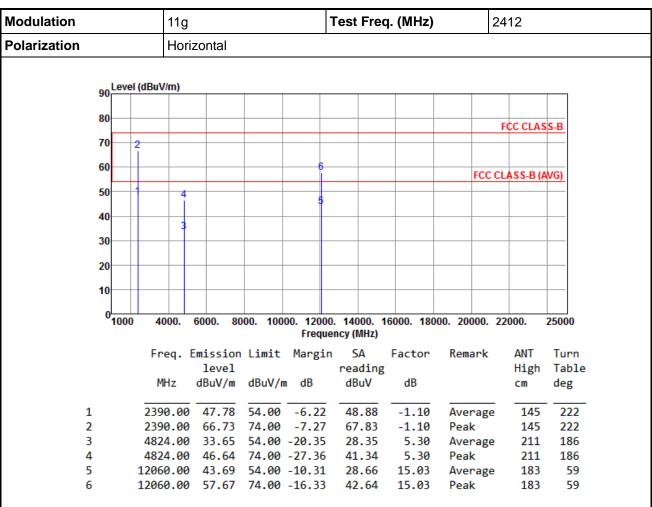
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2483.50	38.46	54.00	-15.54	39.07	-0.61	Average	157	105
2	2483.50	51.48	74.00	-22.52	52.09	-0.61	Peak	157	105
3	4924.00	44.33	54.00	-9.67	38.79	5.54	Average	253	249
4	4924.00	48.75	74.00	-25.25	43.21	5.54	Peak	253	249
5	7386.00	38.61	54.00	-15.39	28.21	10.40	Average	222	169
6	7386.00	50.71	74.00	-23.29	40.31	10.40	Peak	222	169

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

Report No.: FR622602AC Page: 30 of 53



## 3.5.6 Transmitter Radiated Unwanted Emissions (Above 1GHz) for 11g



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

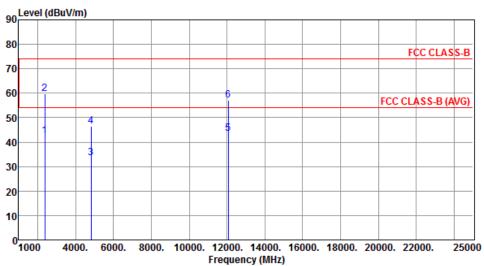
\*Factor includes antenna factor, cable loss and amplifier gain

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

Report No.: FR622602AC Page: 31 of 53



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	42.59	54.00	-11.41	43.69	-1.10	Average	147	107
2	2390.00	59.69	74.00	-14.31	60.79	-1.10	Peak	147	107
3	4824.00	33.39	54.00	-20.61	28.09	5.30	Average	215	88
4	4824.00	46.49	74.00	-27.51	41.19	5.30	Peak	215	88
5	12060.00	43.39	54.00	-10.61	28.36	15.03	Average	183	248
6	12060.00	57.22	74.00	-16.78	42.19	15.03	Peak	183	248

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

Report No.: FR622602AC Page: 32 of 53



Modulation		110	J				Tes	t Freq	. (MHz	)	24	37	
Polarization		Но	rizonta	ıl			•				•		
90	Level (d	BuV/m)											
80													
											F	CC CLAS	S-B
70													
60	H.										FCC CL	ASS-B (A	VG)
50	2			8							10000	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	-
40	- 8			1									
30													
20													
10													
0													
	1000	4000.	6000.	800	00. 10		000. 14 quency		5000. 18	000. 20	0000. 22	2000.	2500
		Frea.	Emiss	ion	Limit	Marg	_		Factor	Ren	nark	ANT	Tu
			100			8						High	

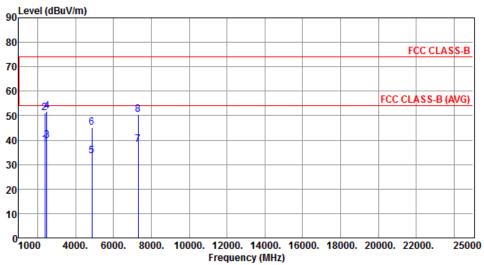
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2390.00	38.43	54.00	-15.57	39.53	-1.10	Average	144	226
2	2390.00	51.53	74.00	-22.47	52.63	-1.10	Peak	144	226
3	2483.50	39.73	54.00	-14.27	40.34	-0.61	Average	144	226
4	2483.50	52.40	74.00	-21.60	53.01	-0.61	Peak	144	226
5	4874.00	33.77	54.00	-20.23	28.35	5.42	Average	188	116
6	4874.00	46.45	74.00	-27.55	41.03	5.42	Peak	188	116
7	7311.00	38.60	54.00	-15.40	28.34	10.26	Average	211	183
8	7311.00	51.69	74.00	-22.31	41.43	10.26	Peak	211	183

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).

Report No.: FR622602AC Page: 33 of 53



Modulation	11g	Test Freq. (MHz)	2437				
Polarization	Vertical						
90 Level (dBuV/m)							
90							

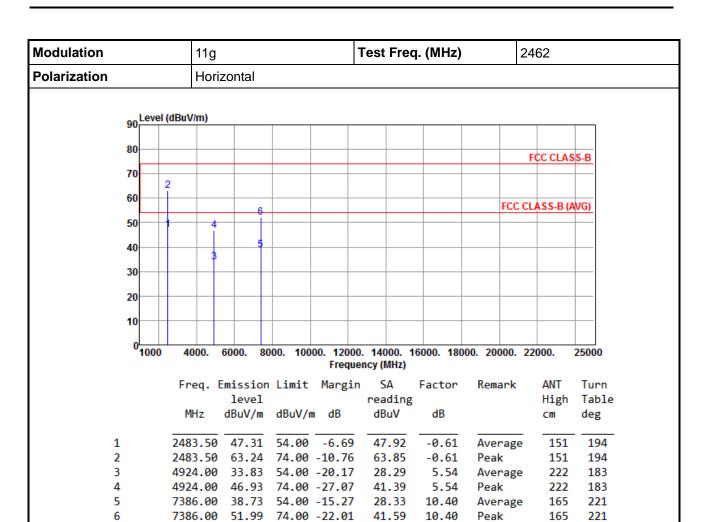


	Freq.   MHz	Emission level dBuV/m	Limit dBuV/m	Ū	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	38.31	54.00	-15.69	39.41	-1.10	Average	147	109
2	2390.00	51.23	74.00	-22.77	52.33	-1.10	Peak	147	109
3	2483.50	39.70	54.00	-14.30	40.31	-0.61	Average	147	109
4	2483.50	51.87	74.00	-22.13	52.48	-0.61	Peak	147	109
5	4874.00	33.64	54.00	-20.36	28.22	5.42	Average	166	211
6	4874.00	45.25	74.00	-28.75	39.83	5.42	Peak	166	211
7	7311.00	38.29	54.00	-15.71	28.03	10.26	Average	221	135
8	7311.00	50.58	74.00	-23.42	40.32	10.26	Peak	221	135

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

Report No.: FR622602AC Page: 34 of 53





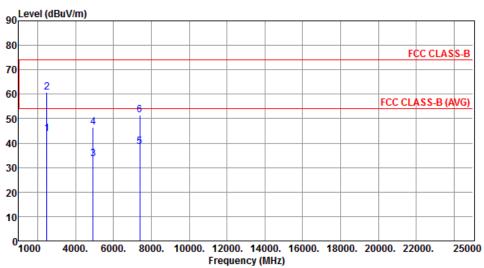
\*Factor includes antenna factor, cable loss and amplifier gain

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

Report No.: FR622602AC Page: 35 of 53



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



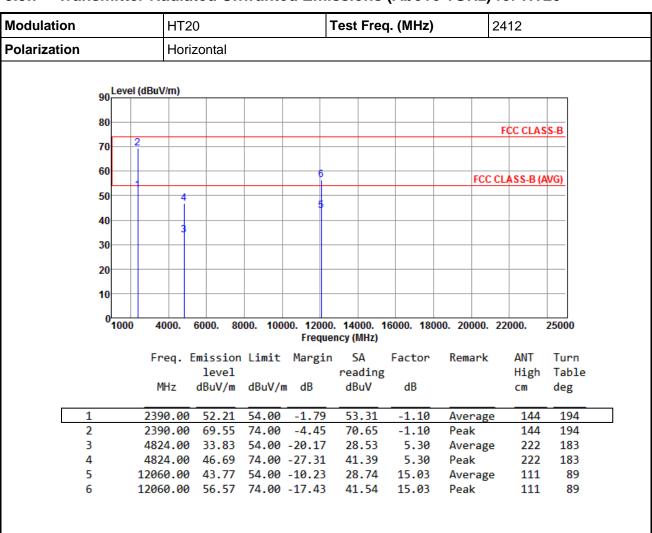
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Ū	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
	2402 50	42.77		40.03					400
1	2483.50	43.77	54.00	-10.23	44.38	-0.61	Average	146	109
2	2483.50	60.73	74.00	-13.27	61.34	-0.61	Peak	146	109
3	4924.00	33.65	54.00	-20.35	28.11	5.54	Average	222	153
4	4924.00	46.40	74.00	-27.60	40.86	5.54	Peak	222	153
5	7386.00	38.64	54.00	-15.36	28.24	10.40	Average	188	69
6	7386.00	51.60	74.00	-22.40	41.20	10.40	Peak	188	69

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

Report No.: FR622602AC Page: 36 of 53



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



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

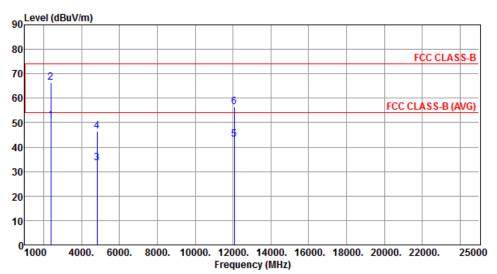
\*Factor includes antenna factor, cable loss and amplifier gain

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

Report No.: FR622602AC Page: 37 of 53



Modulation	HT20	Test Freq. (MHz)	2412
Polarization	Vertical		



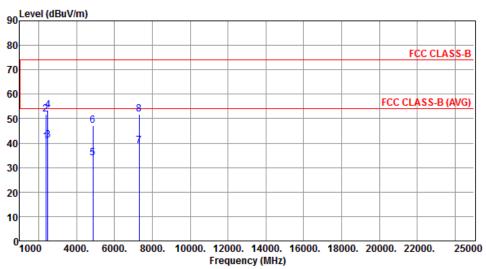
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2390.00	50.76	54.00	-3.24	51.86	-1.10	Average	149	108
2	2390.00	66.28	74.00	-7.72	67.38	-1.10	Peak	149	108
3	4824.00	33.54	54.00	-20.46	28.24	5.30	Average	166	189
4	4824.00	46.39	74.00	-27.61	41.09	5.30	Peak	166	189
5	12060.00	43.13	54.00	-10.87	28.10	15.03	Average	211	237
6	12060.00	56.39	74.00	-17.61	41.36	15.03	Peak	211	237

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

Report No.: FR622602AC Page: 38 of 53



Modulation	HT20	Test Freq. (MHz)	2437
Polarization	Horizontal		



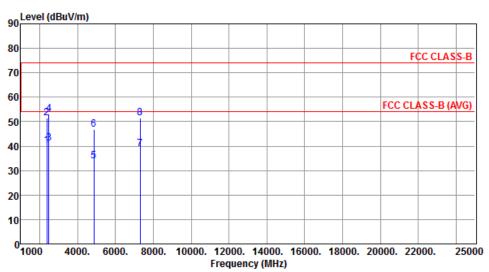
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Ū	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	40.43	54.00	-13.57	41.53	-1.10	Average	143	204
2	2390.00	51.73	74.00	-22.27	52.83	-1.10	Peak	143	204
3	2483.50	41.24	54.00	-12.76	41.85	-0.61	Average	143	204
4	2483.50	53.49	74.00	-20.51	54.10	-0.61	Peak	143	204
5	4874.00	33.88	54.00	-20.12	28.46	5.42	Average	222	183
6	4874.00	47.20	74.00	-26.80	41.78	5.42	Peak	222	183
7	7311.00	38.87	54.00	-15.13	28.61	10.26	Average	166	321
8	7311.00	51.79	74.00	-22.21	41.53	10.26	Peak	166	321

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

Report No.: FR622602AC Page: 39 of 53



Modulation	HT20	Test Freq. (MHz)	2437
Polarization	Vertical		

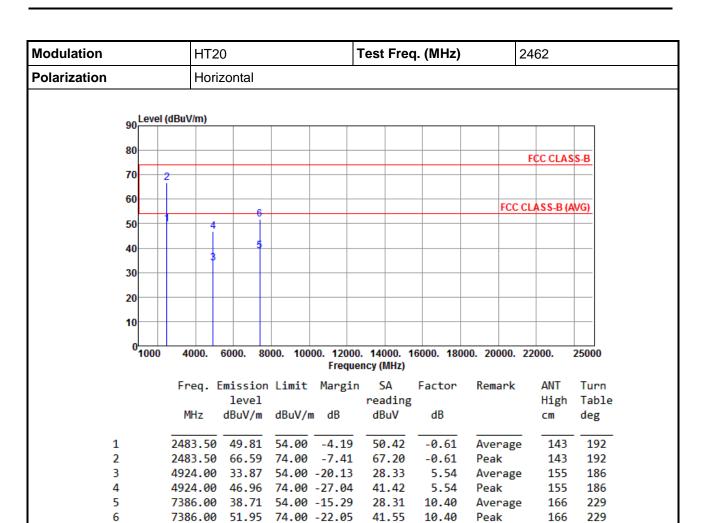


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m		SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	40.29	54.00	-13.71	41.39	-1.10	Average	139	109
2	2390.00	51.56	74.00	-22.44	52.66	-1.10	Peak	139	109
3	2483.50	41.16	54.00	-12.84	41.77	-0.61	Average	139	109
4	2483.50	53.20	74.00	-20.80	53.81	-0.61	Peak	139	109
5	4874.00	33.75	54.00	-20.25	28.33	5.42	Average	168	21
6	4874.00	46.85	74.00	-27.15	41.43	5.42	Peak	168	21
7	7311.00	38.70	54.00	-15.30	28.44	10.26	Average	283	224
8	7311.00	51.55	74.00	-22.45	41.29	10.26	Peak	283	224

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

Report No.: FR622602AC Page: 40 of 53





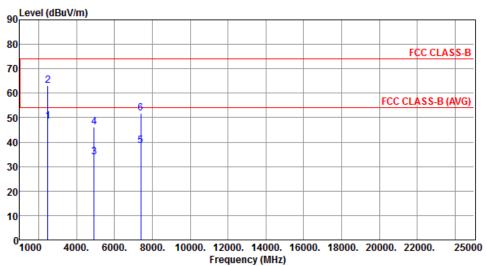
\*Factor includes antenna factor, cable loss and amplifier gain

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

Report No.: FR622602AC Page: 41 of 53



Modulation	HT20	Test Freq. (MHz)	2462
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Ū	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
4	2402 50	40. 33		- C7	40.04			-4.47	
1	2483.50	48.33	54.00	-5.6/	48.94	-0.61	Average	147	111
2	2483.50	62.95	74.00	-11.05	63.56	-0.61	Peak	147	111
3	4924.00	33.75	54.00	-20.25	28.21	5.54	Average	221	183
4	4924.00	46.29	74.00	-27.71	40.75	5.54	Peak	221	183
5	7386.00	38.59	54.00	-15.41	28.19	10.40	Average	193	53
6	7386.00	51.75	74.00	-22.25	41.35	10.40	Peak	193	53

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

Report No.: FR622602AC Page: 42 of 53



# 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

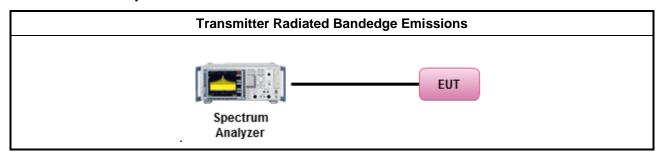
#### Reference level measurement

- 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

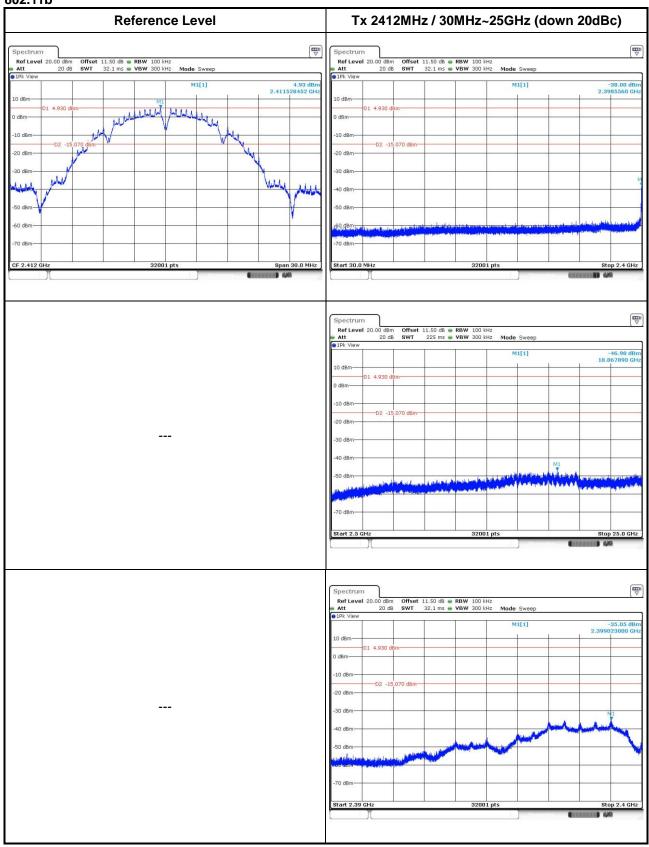


Report No.: FR622602AC Page: 43 of 53



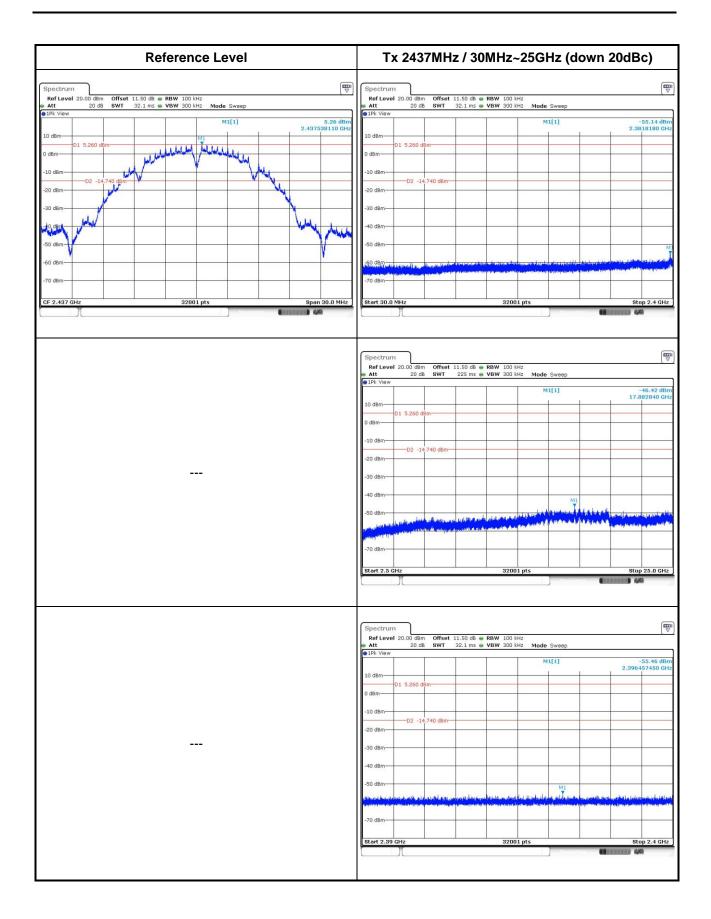
# 3.6.5 Unwanted Emissions into Non-Restricted Frequency Bands

## 802.11b



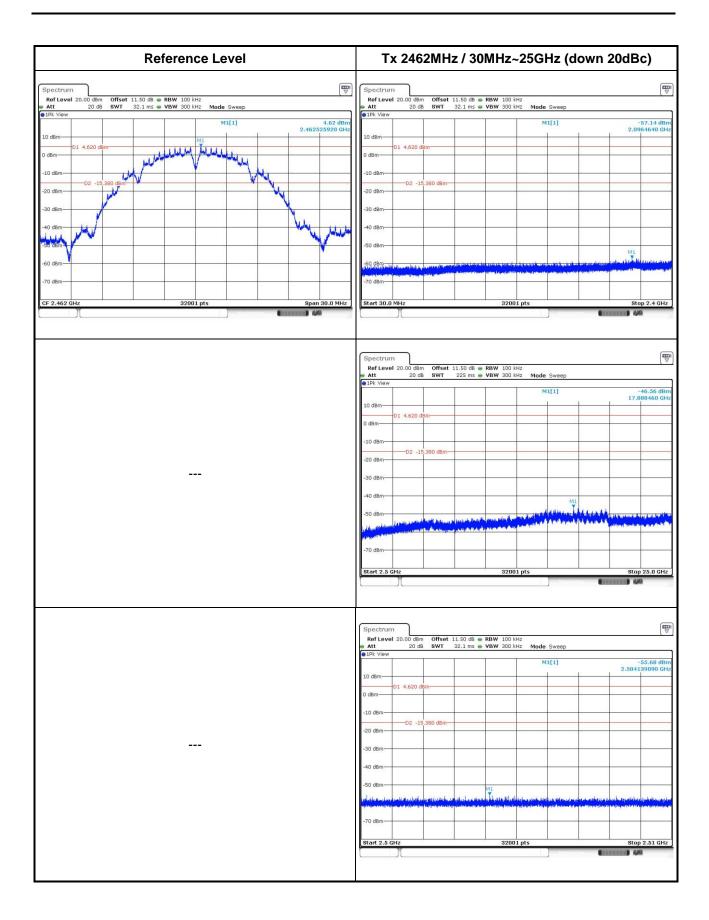
Report No.: FR622602AC Report Version: Rev. 01





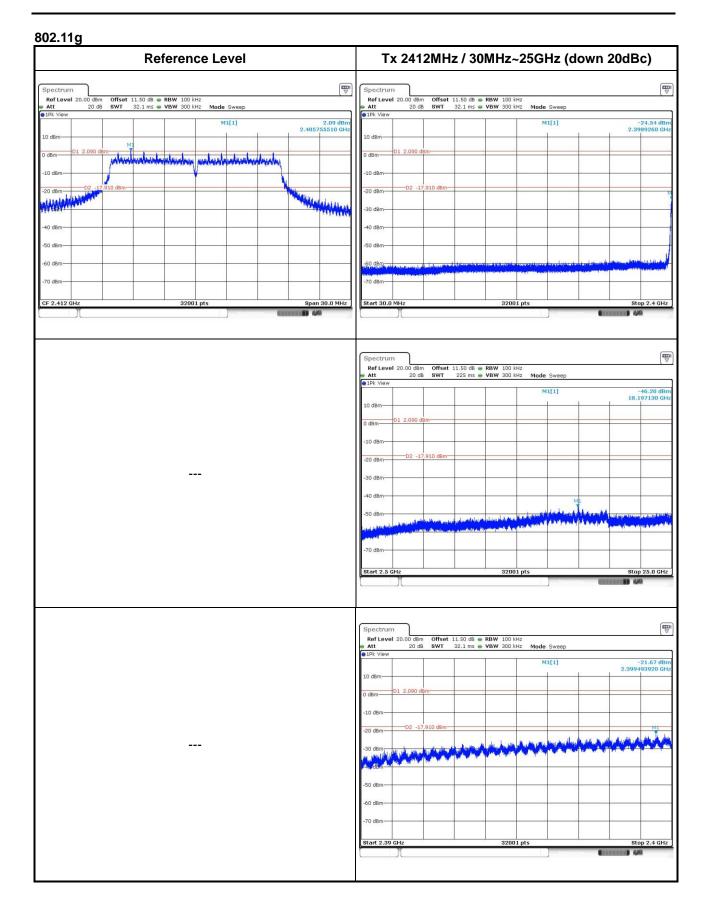
Report No.: FR622602AC Page: 45 of 53





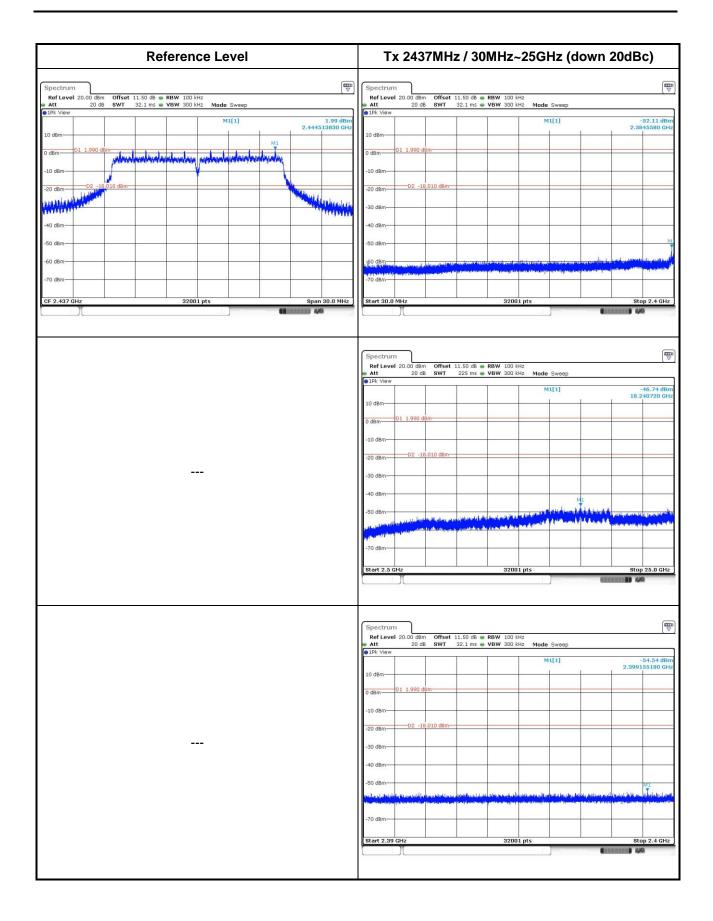
Report No.: FR622602AC Page: 46 of 53





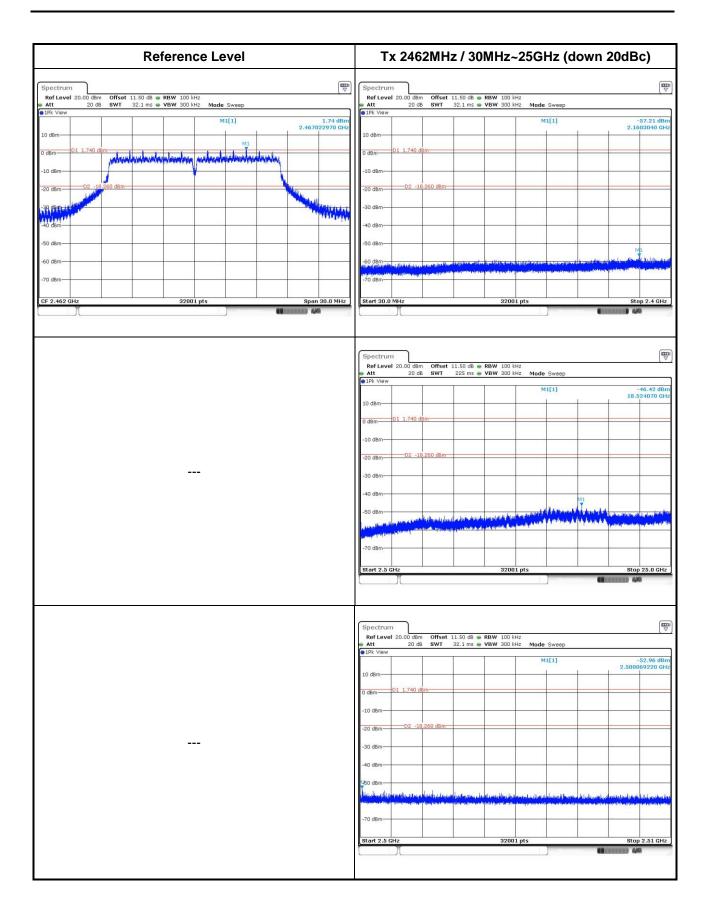
Report No.: FR622602AC Page: 47 of 53





Report No.: FR622602AC Page: 48 of 53

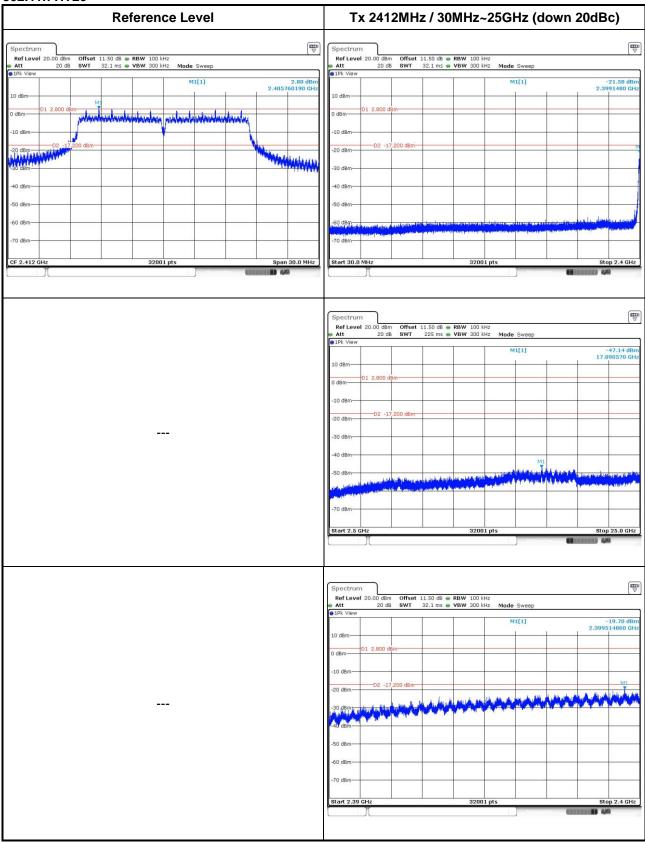




Report No.: FR622602AC Page: 49 of 53

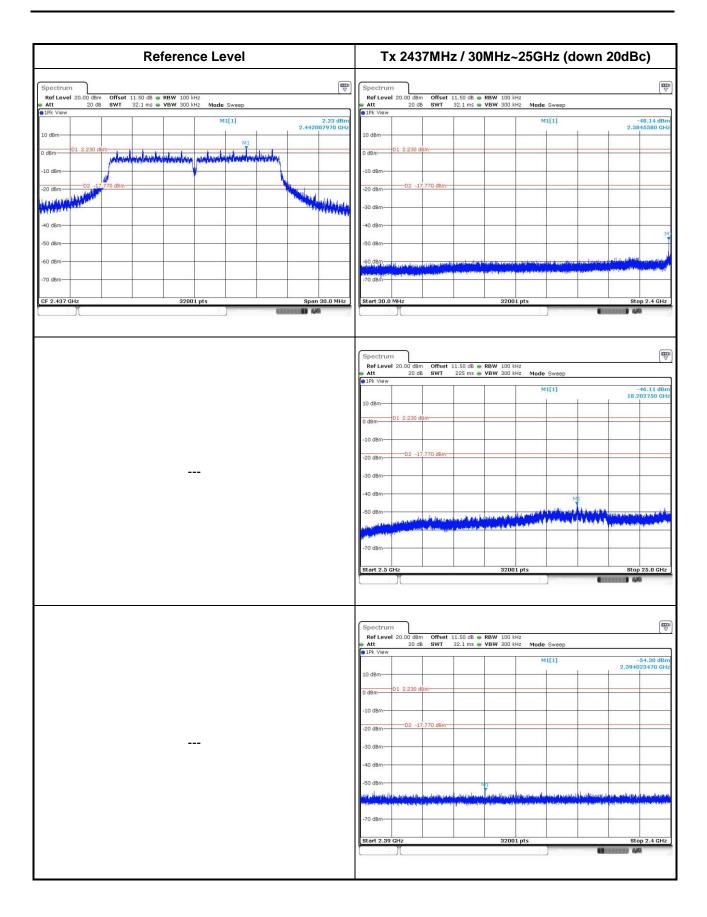


### 802.11n HT20



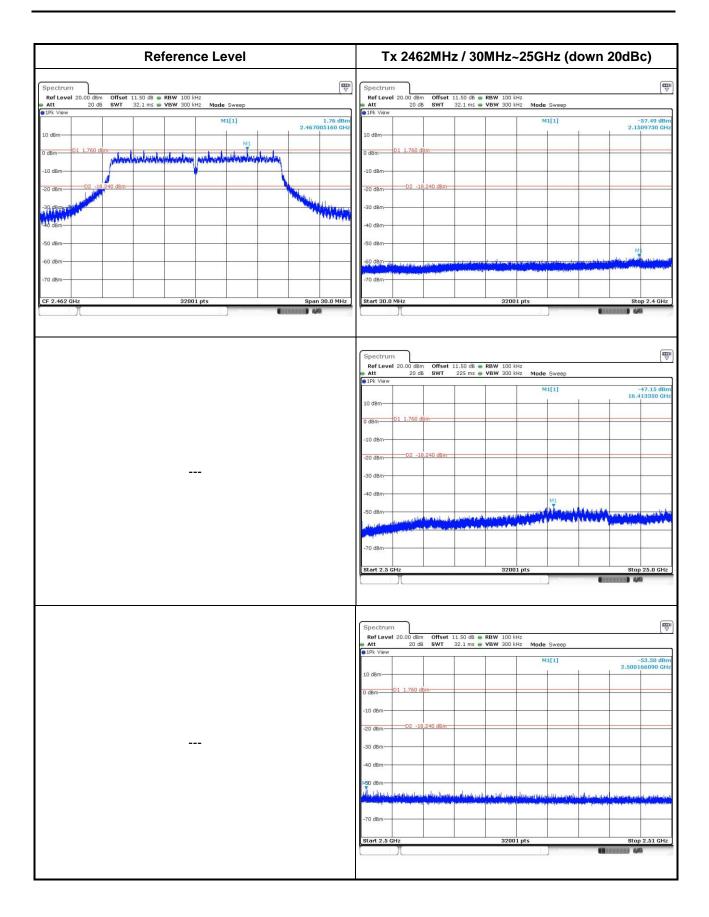
Report No.: FR622602AC Page: 50 of 53





Report No.: FR622602AC Page: 51 of 53





Report No.: FR622602AC Page: 52 of 53



# 4 Test laboratory information

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

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

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

Linkou

Tel: 886-2-2601-1640

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

R.O.C.

Kwei Shan

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

Tel: 886-3-271-8640

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

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

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

Email: ICC\_Service@icertifi.com.tw

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

Report No.: FR622602AC Page: 53 of 53