

## **ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT**

## INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

	OF
Applicant:	Quanta Computer Inc.
	No. 188, Wenhua 2nd Road, Guishan District, Taoyuan City
	33377, Taiwan
Product Name:	7 inch POS Terminal
Brand Name:	Quanta, CASTLES
Model No.:	KI1, SATURN7000
Model Difference:	Marketing Purpose
FCC ID:	HFS-KI1
Report Number:	E2/2018/70098
FCC Rule Part:	§15.247, Cat: DTS
Issue Date:	Oct. 24, 2018
Date of Test:	Aug. 08, 2018 ~ Oct. 19, 2018
Date of EUT Received:	Aug. 08, 2018

#### We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10:2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits.

The test results of this report relate only to the tested sample identified in this report.

Tested By:

Approved By:

Vit. Pei

Vito Pei / Sr. Engineer

tim thang

Jim Chang / Manager





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# **Revision History**

Report Number	Revision	Description	Effected Page	Issue Date	Revised By
E2/2018/70098	Rev.00	Initial creation of docu- ment	All	Oct. 24, 2018	Elle Chang

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#### **GENERAL INFORMATION** 1

#### **1.1 Product description**

General:

Product Name:	7 inch PO	S Terminal			
Brand Name:	Quanta, C	ASTLES			
Model No.:	KI1, SATL	IRN7000			
Model Difference:	Marketing	Marketing Purpose			
Software version:	01.000				
Hardware version:	B2				
	3.8V from Rechargeable Li-ion Battery or 5V from AC/DC Adapter				
Power Supply:	Battery: Model no.: KI1 Supplier: Ningbo Veken Battery Co., Ltd.				
	Adapter: Model No.: CYSF12G-050200U, Supplier: JIANGSU CHENYANG ELECTRON Co., LTD				

#### WLAN 2.4GHz:

Wi-Fi	Frequency Range	Channels	Rated Power	Modulation Technology
11b/g	2412-2462	11	b: 19.64dBm g: 23.94dBm	DSSS, OFDM
11n	HT20 2412-2462	11	HT20:24.00dBm	OFDM
Modulation type: CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM				
Transitio	n Rate:	802.11 g:	1/2/5.5/11 Mbps 6/9/12/18/24/36/48/54 Mbps _20MHz: 6.5 – 72.2Mbps	

#### **Antenna Designation**

An	tenna Type	Part Number	Supplier	Peak Gain (dBi)
	PIFA	L64RF019-CS-H	Luxshare-ICT	2.10

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#### 1.2 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247 FCC KDB 558074 D01 DTS Meas. Guidance v04 ANSI C63.10:2013 Note: All test items have been performed and record as per the above standards.

#### 1.3 Test Facility

SGS Taiwan Ltd. Electronics & Communication Laboratory No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333 (TAF code 0513)

FCC Registration Number and Designation are: 735305 / TW0002

#### **1.4 Special Accessories**

There are no special accessories used while test was conducted.

#### **1.5 Equipment Modifications**

There was no modification incorporated into the EUT.

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## 2 SYSTEM TEST CONFIGURATION

#### 2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

#### 2.2 EUT Exercise

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

#### 2.3 Test Procedure

#### 2.3.1 Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz,. The CISPR Quasi-Peak and Average detector mode is employed according to §15.207. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

#### 2.3.2 Radiated Emissions

The EUT is a placed on as turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.

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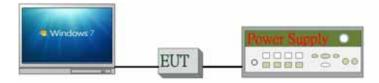
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### 2.4 Configuration of Tested System

## Fig. 2-1 Conducted Emission Configuration



### Fig. 2-2 Radiated Emission Configuration



#### Table 2-1 Equipment Used in Tested System

ltem	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1	Notebook	DELL	E5400	3704625136	Shielded	Unshielded
2	Bluetooth Test Software	N/A	N/A	N/A	N/A	N/A
3.	DC Power Supply	Agilent	E3640A	MY53140006	N/A	Un-Shielded

## **3 SUMMARY OF TEST RESULTS**

FCC Rules	Description Of Test	Result
§15.207(a)	AC Power Line Conducted Emission	Compliant
§15.247(b) (3)	Peak Output Power	Compliant
§15.247(a)(2)	6dB & 99% Emission Bandwidth	Compliant
§15.247(d)	Conducted Band Edge and Spurious Emission	Compliant
§15.247(d)	Radiated Band Edge and Spurious Emission	Compliant
§15.247(e)	Power Spectral Density	Compliant
§15.203 §15.247(b)	Antenna Requirement	Compliant

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## 4 DESCRIPTION OF TEST MODES

#### 4.1 Operated in 2400 ~ 2483.5MHz Band

11 channels are provided for 802.11b, 802.11g and 802.11n\_HT20

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
1	2412 MHz	7	2442 MHz
2	2417 MHz	8	2447 MHz
3	2422 MHz	9	2452 MHz
4	2427 MHz	10	2457 MHz
5	2432 MHz	11	2462 MHz
6	2437 MHz		

#### 4.2 The Worst Test Modes and Channel Details

- 1. The EUT has been tested under operating condition.
- 2. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.
- 3. Investigation has been done on all the possible configurations for searching the worst case.

	RADIATED EMISSION TEST: RADIATED EMISSION TEST (BELOW 1 GHz)							
MODE AVAILABLE TESTED MODULATION DATA RATE (Modulation (Mbps)								
802.11g	1 to 11	1,6,11	OFDM	6				

#### **RADIATED EMISSION TEST:**

RADIATED EMISSION TEST (ABOVE 1 GHz)								
MODE AVAILABLE TESTED MODULATION DATA RATE (Mbps)								
802.11b	1 to 11	1, 6, 11	DSSS	1				
802.11g	1 to 11	1, 6, 11	OFDM	6				
802.11n (HT20)	1 to 11	1, 6, 11	OFDM	MCS 0				

#### Note:

The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for 802.11b/g/n WLAN Transmitter for channel Low, Mid and High, the worst case H position was reported.

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#### ANTENNA PORT CONDUCTED MEASUREMENT:

CONDUCTED TEST							
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)			
802.11b	1 to 11	1, 6, 11	DSSS	1			
802.11g	1 to 11	1, 6, 11	OFDM	6			
802.11n (HT20)	1 to 11	1, 6, 11	OFDM	MCS 0			

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#### MEASUREMENT UNCERTAINTY 5

Test Items	Uncertainty				
AC Power Line Conducted Emission	+/- 2.586 dB				
Peak Output Power	+/- 0.84 dB				
6dB Bandwidth	+/- 51.33 Hz				
100 KHz Bandwidth Of Frequency Band Edges	+/- 0.84 dB				
Peak Power Density	+/- 1.3 dB				
Temperature	+/- 0.65 °C				
Humidity	+/- 4.6 %				
DC / AC Power Source	DC= +/- 0.13%, AC= +/- 0.2%				

Radiated Spurious Emission:

	9kHz – 30MHz: +/- 2.87 dB						
	30MHz - 180MHz: +/- 3.37dB						
Measurement uncertainty	180MHz -417MHz: +/- 3.19dB						
(Polarization : Vertical)	0.417GHz-1GHz: +/- 3.19dB						
	1GHz - 18GHz: +/- 4.04dB						
	18GHz - 40GHz: +/- 4.04dB						

	9kHz – 30MHz: +/- 2.87 dB
	30MHz - 167MHz: +/- 4.22dB
Measurement uncertainty	167MHz -500MHz: +/- 3.44dB
(Polarization : Horizontal)	0.5GHz-1GHz: +/- 3.39dB
	1GHz - 18GHz: +/- 4.08dB
	18GHz - 40GHz: +/- 4.08dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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#### CONDUCTED EMISSION TEST 6

#### 6.1 Standard Applicable

Frequency range within 150kHz to 30MHz shall not exceed the Limit table as below.

Frequency range	Limits dB(uV)						
MHz	Quasi-peak	Average					
0.15 to 0.50	66 to 56	56 to 46					
0.50 to 5	56	46					
5 to 30	60	50					
Note							
1. The lower limit shall apply at th	e transition frequencies						
2. The limit decreases linearly wit	h the logarithm of the frequency in	the range 0.15 MHz to 0.50					
MHz.							

#### 6.2 Measurement Equipment Used

	Conducted Emission Test Site											
EQUIPMENT MFR MODEL SERIAL LAST CAL D												
TYPE		NUMBER	NUMBER	CAL.								
LISN	TESEQ	NNB 51	36076	2018/02/14	2019/2/13							
EMI Test Receiver	R&S	ESCI	101300	2017/11/02	2018/11/1							

#### 6.3 EUT Setup

- 1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI 63.10:2013.
- 2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
- The LISN was connected with 120Vac/60Hz power source.

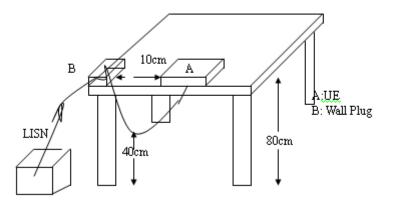
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### 6.4 Test SET-UP (Block Diagram of Configuration)



#### **6.5 Measurement Procedure**

- 1. The EUT was placed on a table which is 0.8m above ground plane.
- 2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 3. Repeat above procedures until all phases of power being supplied by given UE are completed

#### 6.6 Measurement Result

Note: Refer to next page for measurement data and plots.

Note2: The \* reveals the worst-case results that closet to the limit.

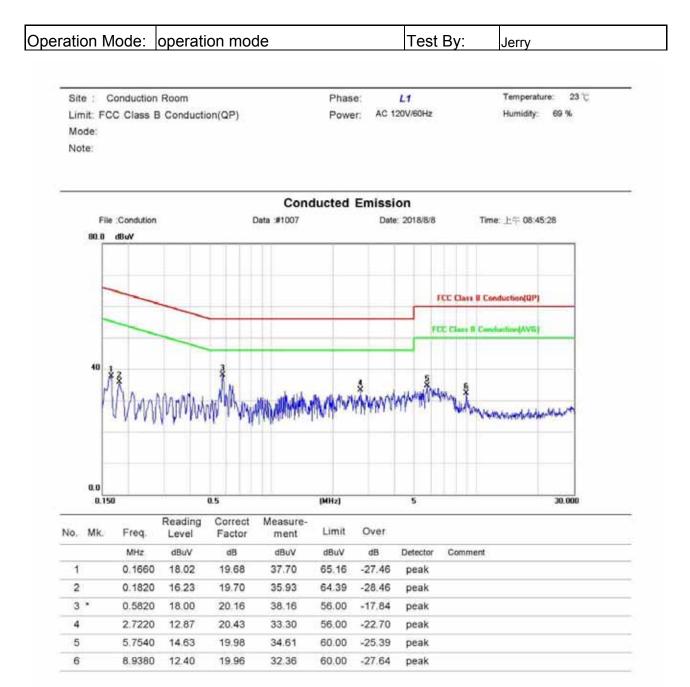
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## AC POWER LINE CONDUCTED EMISSION TEST DATA



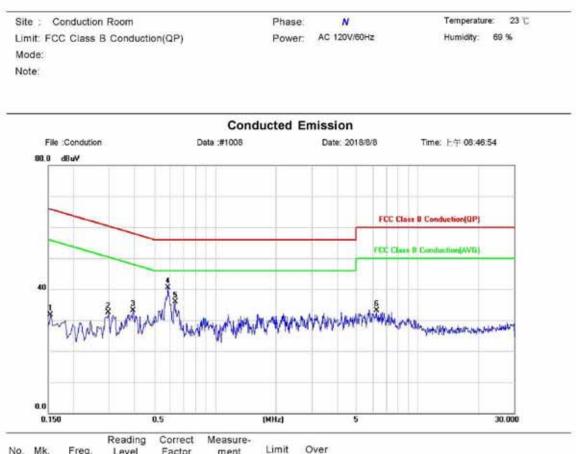
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NO. MK.	Freq.	Level	Factor	ment	Lunit	Over		
	MHz	dBu∀	dB	dBuV	dBuV	dB	Detector	Comment
1	0.1540	12.09	19.65	31.74	65.78	-34.04	peak	
2	0 2980	12.54	19.88	32.42	60.30	-27.88	peak	
3	0.3940	13.02	20.04	33.06	57.98	-24.92	peak	
4 •	0.5860	20.42	20.15	40.57	56.00	-15.43	peak	
5	0.6340	15.71	20.11	35.82	56.00	-20.18	peak	
6	6.2820	13.15	19.96	33.11	60.00	-26.89	peak	

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## 7 DUTY CYCLE OF TEST SIGNAL

Pre-analysis Check: While conducting average power measurement, duty cycle of each mode shall be checked to ensure its duty cycle in order to compensate for the loss due to insufficient ratio of duty cycle.

All duty cycle is pre-scanned, and result as obtained below shows only the most representative ones where duty cycle is conducted as the given transmission with given virtual operation that expresses the percentage.

#### Formula:

Duty Cycle = Ton / (Ton+Toff)

#### Measurement Procedure:

- 1. Set span = Zero
- 2. RBW = 8MHz
- 3. VBW = 8MHz,
- 4. Detector = Peak

### **Duty Cycle:**

	Duty Cycle (%)	Duty Factor (dB)	1/T (kHz)	VBW setting (kHz)
802.11b	98.81	0.05	1.01	2.00
802.11g	92.91	0.32	1.08	2.00
802.11n_20	92.32	0.35	1.08	2.00

Duty Cycle Factor: 10 \* log(1/0.9881) = 0.05 Duty Cycle Factor: 10 \* log(1/0.9291) = 0.32 Duty Cycle Factor: 10 \* log(1/0.9232) = 0.35

 $b = 98.81\%, g = 92.91\%, n_ht_20 = 92.32\%$ 

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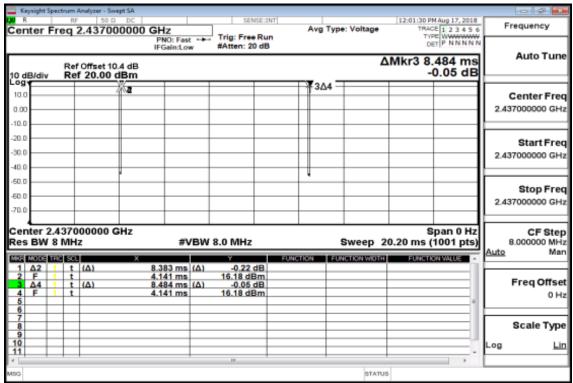
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#### 7.1 DUTY CYCLE TEST SIGNAL Measurement Result

#### 802.11 b



#### 802.11 g

Keysight Sp	ectrum Analyzer -	Swept SA											
R Center F	req 2.437	000000			SENS		Avg Type	: Vol	tage	TRAC	M Aug 17, 2018 CE 1 2 3 4 5 6 PE WWWWWW	Fr	equency
			PNO: Fast IFGain:Lov		Trig: Free F #Atten: 20 (					D	ETPNNNNN		Auto Tur
0 dB/div	Ref Offset Ref 20.0	0 dBm								-	.501 ms 0.55 dB		
<b>.09 წო</b> კსკა 10.0	and the second second	No the second	(Analatic description	-active a	-linet-se	yh <b>il</b> aide <sup>an</sup> the	in stranged and	¥\)1∆	3∆4	and the second			Center Fr
0.00				_									7000000 G
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0.0		utin		+				Brillion	<del> </del>				
0.0				-									Stop F
0.0												2.43	7000000 0
enter 2. es BW 3	437000000 8 MHz	) GHz	#V	BW 8	.0 MHz		,	Swe	ep 2		pan 0 Hz (1001 pts)	8	CF S1 0000000 N
KR MODE T	RC SCL	x			Y	FUNC	TION FUR	ICTION	WOTH	FUNCTO	ON VALUE	Auto	
1 Δ2 2 F	t (Δ) t		1.394 ms 693.6 µs		-5.39 dl								
3 Δ4 4 F	t (Δ) t		1.501 ms 593.6 µs	( <u>A</u> )	-0.55 dl 15.94 dBr							I '	Freq Off
5						-							
7 8													Scale Ty
9												Log	
1													
0									STATUS	1			

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#### 802.11 n\_20 MHz

		Spect		knalyzer - Sw															
Cen		Fre	n d	2.4370						NSE: IN		A	vg Ty	pe: Volt	age	TRA	CE 1 2 3 4 5	6	Frequency
10 di	B/div		Ref	Offset 10	dBm	IFG	O: Fast ain:Lov	w	#Atten: 2	0 dB						Mkr3 1	.422 ms 1.27 dB		Auto Tune
10.0 10.0 0.00	una))	a	-149	17-144-149A	enilleruni	1. All, Argod	***+{*}	r#51	unitation	febyer.	<del>K 14</del> 2	344	101204	4.4.	hin	<b>1.1.1.1</b>	listenise Nikeland	11	Center Freq 437000000 GHz
-20.0 -30.0 -40.0																		2	Start Freq 437000000 GHz
-50.0 -60.0 -70.0		- 										iteria I						2	Stop Freq 437000000 GHz
Cen Res	BW	81	MH		GHz		#\	/BW	8.0 MHz		FUNC	100	FI	Swee	<u> </u>	.600 ms	Span 0 Hz (1001 pts)		CF Step 8.000000 MHz 20 Man
2 3 4	Δ2 F Δ4 F		t	(Δ) (Δ)		98.0	3 ms 80 µs 12 ms 80 µs		0.79 16.00 di 1.27 16.00 di	Bm dB							≡.		Freq Offset 0 Hz
5 6 7 8 9 10 11																		Log	Scale Type
MBG									11						STATU	5	,		

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## 8 PEAK OUTPUT POWER MEASUREMENT

#### 8.1 Standard Applicable

For systems using digital modulation in the 2400-2483.5 MHz bands, the limit for peak output power is 1Watt.

If the transmitting antenna of directional gain greater than 6dBi are used the peak output power form the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the Antenna exceeds 6dBi.

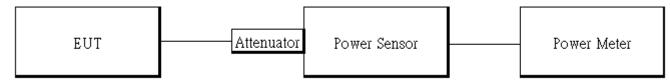
In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of Antenna exceeds 6dBi.

#### 8.2 Measurement Equipment Used

	Conducted Emission Test Site												
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.								
TYPE		NUMBER	NUMBER	CAL.									
Power Meter	Anritsu	ML2496A	1326001	2018/08/09	2019/08/02								
Power Sensor	Anritsu	MA2411B	1315048	2018/08/09	2019/08/02								
Power Sensor	Anritsu	MA2411B	1315049	2018/08/09	2019/08/02								
Notebook	Lenovo	L420	S0011721	N/A	N/A								
DC Power Supply	Agilent	E3640A	MY53140006	2018/05/30	2019/05/29								
Attenuator	Marvelous	MVE2213-10	RF30	2017/12/26	2018/12/25								

#### 8.3 Test Set-up

Power Meter:



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#### 8.4 Measurement Procedure

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
- 3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter.

#### **Power Meter:**

It is used as the auxiliary test equipment to conduct the output power measurement.

4. Record the max. Reading as observed from Spectrum or Power Meter.

#### 8.5 Measurement Result

802.1	802.11b Main										
СН	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit RESU							
1	2412	1	17.73	1 Watt =	30.00	dBm	PASS				
6	2437	1	19.64	1 Watt =	30.00	dBm	PASS				
11	2462	1	17.92	1 Watt =	30.00	dBm	PASS				
802.1	1b Main		-								
СН	Freq. (MHz)	Data Rate	Max. Avg. Output include tune up tolerance Power (dBm)		RESULT						
1	2412	1	15.62	1 Watt =	30.00	dBm	PASS				
6	2437	1	17.67	1 Watt =	30.00	dBm	PASS				
11	2462	1	15.74	1 Watt =	30.00	dBm	PASS				

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802.1	1g Main										
СН	Freq. (MHz)	Data Rate	Peak Output Power (dBm)		RESULT						
1	2412	6	23.49	1 Watt =	30.00	dBm	PASS				
6	2437	6	23.94	1 Watt =	30.00	dBm	PASS				
11	2462	6	23.39	1 Watt =	30.00	dBm	PASS				
802.11g Main											
СН	Freq. (MHz)	Data Rate	Max. Avg. Output include tune up tolerance Power (dBm)	Limit RESUI							
1	2412	6	14.63	1 Watt =	30.00	dBm	PASS				
6	2437	6	16.66	1 Watt =	30.00	dBm	PASS				
11	2462	6	14.77	1 Watt =	30.00	dBm	PASS				
802.11n_HT20M Main											
СН	Freq.	Data	Peak Output Power		RESULT						

СН	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit			RESULT			
1	2412	MCS0	23.35	1 Watt =	30.00	dBm	PASS			
6	2437	MCS0	24.00	1 Watt =	30.00	dBm	PASS			
11	2462	MCS0	23.37	1 Watt =	30.00	dBm	PASS			
802.1	802.11n_HT20M Main									
СН	Freq. (MHz)	Data Rate	Max. Avg. Output include tune up tolerance Power (dBm)		Limit		RESULT			
CH 1			include tune up tolerance Power	1 Watt =	Limit 30.00	dBm	<b>RESULT</b> PASS			
	(MHz)	Rate	include tune up tolerance Power (dBm)		-	dBm dBm				

offset 10.40 dB for SISO mode

\* Note: The duty cycle factor is compensated to obtain the maximum value of measurement in average.

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## 9 6DB BANDWIDTH MEASUREMENT

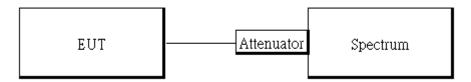
#### 9.1 Standard Applicable

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

#### 9.2 Measurement Equipment Used

	Conducted Emission Test Site											
EQUIPMENT MFR MODEL SERIAL LAST CAI												
ТҮРЕ		NUMBER	NUMBER	CAL.								
Spectrum Analyzer	Agilent	N9010A	MY51440113	2018/06/20	2019/06/19							
DC Block	PASTERNACK	PE8210	RF29	2017/12/26	2018/12/25							
Notebook	Lenovo	L420	S0011721	N/A	N/A							
DC Power Supply	Agilent	E3640A	MY53140006	2018/05/30	2019/05/29							
Attenuator	Marvelous	MVE2213-10	RF30	2017/12/26	2018/12/25							
Power Meter	Anritsu	ML2496A	1326001	2018/08/09	2019/08/02							
Power Sensor	Anritsu	MA2411B	1315048	2018/08/09	2019/08/02							
Power Sensor	Anritsu	MA2411B	1315049	2018/08/09	2019/08/02							

#### 9.3 Test Set-up



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#### 9.4 Measurement Procedure

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
- 3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 4. For 6dB Bandwidth:

Set the spectrum analyzer as RBW = 100 kHz, VBW = 3\*RBW, Span = 30M/50MHz, Detector=peak, Sweep=auto.

- 5. Mark the peak frequency and –6dB (upper and lower) frequency.
- 6. For 99% Bandwidth:

Set the spectrum analyzer as RBW=1%, VBW = 3\*RBW, Span = 30M/50MHz, Detector=Sample, Sweep=auto.

- 7. Turn on the 99% bandwidth function, max reading.
- 8. Repeat above procedures until all frequency of interest measured was complete.

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#### 9.5 Measurement Result

#### 6dB Bandwidth

#### 802.11b Main

Freq.	6dB BW	Limit	Result	Freq.	6dE
(MHz)	(kHz)	(kHz)	Result	(MHz)	(k
2412	8084.50	> 500	PASS	2412	1262
2437	8116.30	> 500	PASS	2437	1574
2462	7123.10	> 500	PASS	2462	1154

		802.11g				
t		Freq.	6dB BW	Limit	Result	
•		(MHz)	(kHz)	(kHz)	nooun	
		2412	12626.00	> 500	PASS	
		2437	15743.00	> 500	PASS	
		2462	11545.00	> 500	PASS	

#### 802.11\_n\_HT20 Main

Freq.	6dB BW	Limit	Result
(MHz)	(kHz)	(kHz)	Result
2412	12907.00	> 500	PASS
2437	16379.00	> 500	PASS
2462	11364.00	> 500	PASS

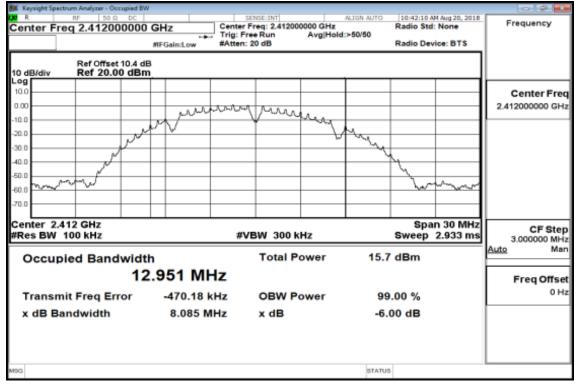
\*Refer to next page for plots

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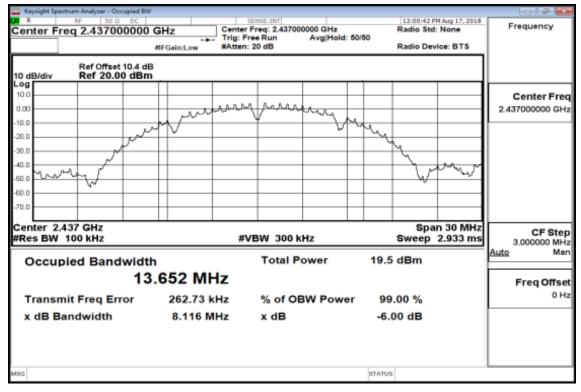
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## 802.11b 6dB Band Width Test Data CH-Low



## 6dB Band Width Test Data CH-Mid

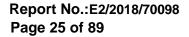


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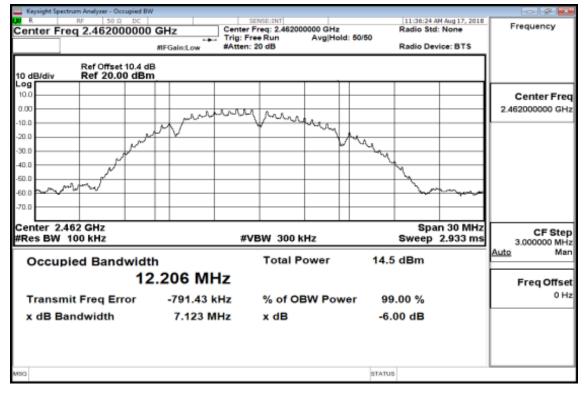
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## 6dB Band Width Test Data CH-High



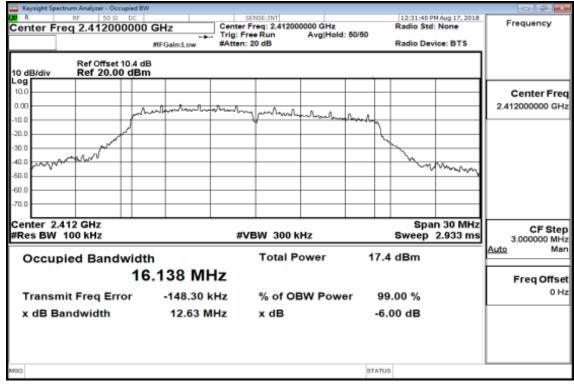
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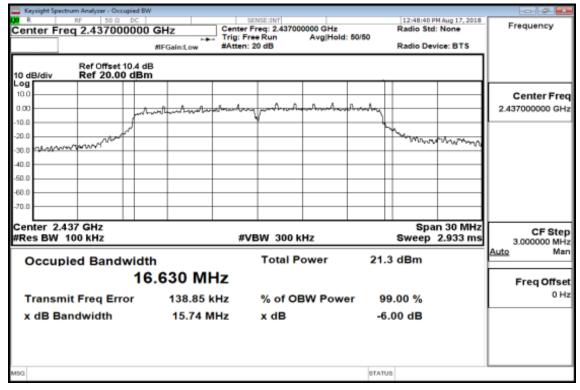
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## 802.11g 6dB Band Width Test Data CH-Low



## 6dB Band Width Test Data CH-Mid



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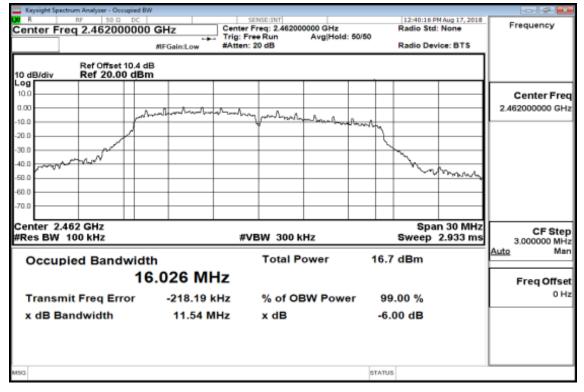
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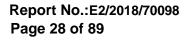
## 6dB Band Width Test Data CH-High



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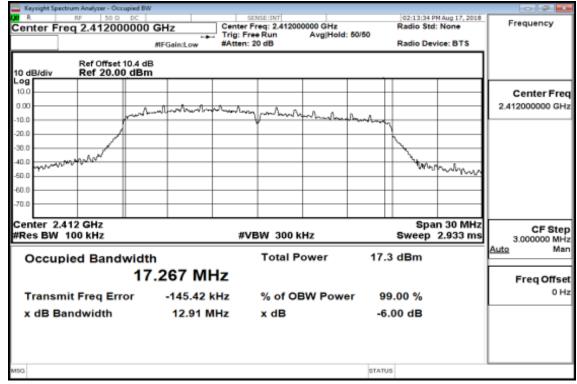
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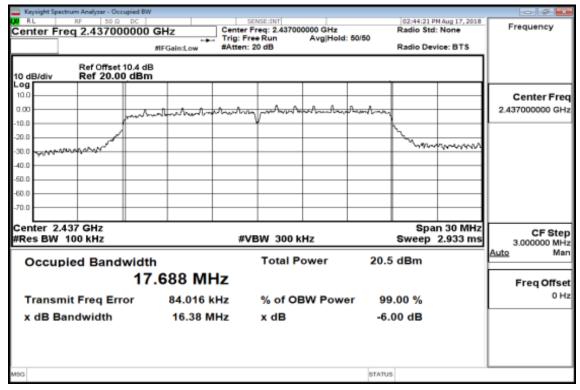




## 802.11n\_HT20M 6dB Band Width Test Data CH-Low



## 6dB Band Width Test Data CH-Mid



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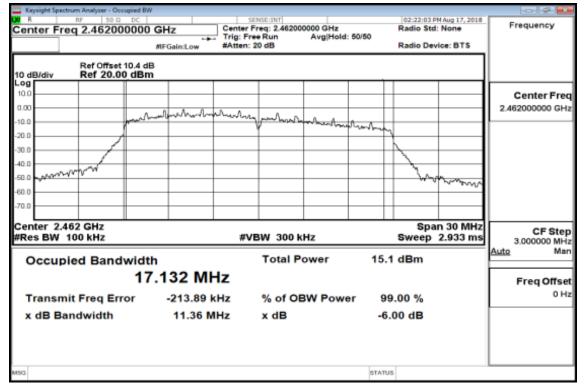
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## 6dB Band Width Test Data CH-High



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### **10 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT**

#### **10.1 Standard Applicable**

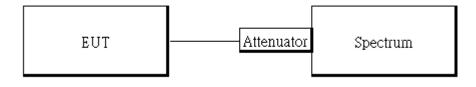
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

Conducted Emission Test Site											
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.						
ТҮРЕ		NUMBER	NUMBER	CAL.							
Spectrum Analyzer	Agilent	N9010A	MY51440113	2018/06/20	2019/06/19						
DC Block	PASTERNACK	PE8210	RF29	2017/12/26	2018/12/25						
Notebook	Lenovo	L420	S0011721	N/A	N/A						
DC Power Supply	Agilent	E3640A	MY53140006	2018/05/30	2019/05/29						
Attenuator	Marvelous	MVE2213-10	RF30	2017/12/26	2018/12/25						
Power Meter	Anritsu	ML2496A	1326001	2018/08/09	2019/08/02						
Power Sensor	Anritsu	MA2411B	1315048	2018/08/09	2019/08/02						
Power Sensor	Anritsu	MA2411B	1315049	2018/08/09	2019/08/02						

#### **10.2 Measurement Equipment Used**

#### 10.3 Test SET-UP



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#### **10.4 Measurement Procedure**

#### **Reference Level of Emission Limit:**

- 1. Set analyzer center frequency to DTS channel center frequency.
- 2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
- 3. Set the span to 1.5 times the DTS channel bandwidth.
- 4. Set the RBW = 100kHz & VBW = 300 kHz.
- 5. Detector = peak.
- 6. Sweep time = auto couple.
- 7. Trace mode = max hold.
- 8. Allow trace to fully stabilize.
- 9. Use the peak marker function to determine the maximum amplitude level.

### Conducted Band Edge:

- 1. To connect Antenna Port of EUT to Spectrum.
- 2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
- 3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 4. Set start to edge frequency, and stop frequency of spectrum analyzer so as to encompass the spectrum to be examined.
- 5. Set the spectrum analyzer as RBW=100 kHz, VBW=300 kHz, Detector = Peak, Sweep = auto
- 6. Mark the highest reading of the emission as the reference level measurement.
- 7. Set DL as the limit = reading on marker 1 20dBm
- 8. Marker on frequency, 2.3999GHz and 2.4836GHz, and examine shall 100 kHz immediately outside the authorized (2400~2483.5) be attenuated by 20dB at least relative to the maximum emission of power.
- 9. Repeat above procedures until all default test channel (low, middle, and high) was complete.

#### **Conducted Spurious Emission:**

- 1. To connect Antenna Port of EUT to Spectrum
- 2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
- 3. Set RBW = 100 kHz & VBW= 300 kHz, Detector =Peak, Sweep = Auto.
- 4. Allow trace to fully stabilize.
- 5. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.
- 6. Repeat above procedures until all default test channel measured were complete.

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#### **10.5 Measurement Result**

Re	eferer	nce Leve	of Limit 802.11b mode	Reference Level of Limit 802.11g mode			
F	req.	PSD	Reference Level of Limit	Freq.	PSD	Reference Level of Limit	
(N	/Hz)	(dBm)	(dBm)	(MHz)	(dBm)	(dBm)	
2	412	0.01	-19.99	2412	1.10	-18.90	
2	437	4.19	-15.81	2437	3.34	-16.66	
2	462	-0.25	-20.25	2462	0.53	-19.47	

#### Reference Level of Limit 802.11n20 mode

Freq.	PSD	Reference Level of Limit
(MHz)	(dBm)	(dBm)
2412	1.04	-18.96
2437	2.40	-17.60
2462	-0.86	-20.86

10.40 dB for SISO mode offset

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Added solution of the solut	0				1.500000 MHz	-40.0 marging and a first of the second seco		handhan	<b>CF Ste</b> 3.000000 MH <u>Auto</u> Ma
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Net To a starting       Ne	2.11b Reference	e Level of En	nission Lir	mit(CH-M	id)	802.11g Refere	nce Level of Er	nission Limit(CH-N	lid)
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Comparison     Avg Type: Log-Por     Mag Type: Log-Por     Prequency       Prequency     Prequency     Prequency     Prequency	25 BW 100 KH2	FVBW 300 kHz	#Sweep 1.	533 ms (1001 pts)		PRes BW 100 kHz	FVBW 300 kHz	#Sweep 2.933 ms (1001 pb	**
Arg Type: Log-Pwr     Arg Type: Log-Pwr     Precuminy       POUNdia     Trig: Free Run Predintow     Arg Type: Log-Pwr     Precuminy       Ref Offset 10.4 dB     Mkr1 2.460 500 GHz -0.25 dBm     Auto Tune       Bioldiv     Ref Offset 10.4 dB     Mkr1 2.460 500 GHz -0.25 dBm     Auto Tune       Center Freq 2.462000000 GHz Bioldiv     Trig: Free Run Precuminy     Mkr1 2.458 25 GHz 0.53 dBm     Auto Tune       Center Freq 2.462000000 GHz Bioldiv     Trig: Free Run Precuminy     Mkr1 2.458 25 GHz 0.53 dBm     Auto Tune       Center Freq 2.462000000 GHz Bioldiv     Trig: Free Run Precuminy     Mkr1 2.458 25 GHz 0.53 dBm     Auto Tune       Center Freq 2.462000000 GHz Bioldiv     Trig: Free Run Precuminy     Mkr1 2.458 25 GHz 0.53 dBm     Auto Tune       Center Freq 2.462000000 GHz Bioldiv     Trig: Free Run Precuminy     Mkr1 2.458 25 GHz 0.53 dBm     Auto Tune       Center Freq 2.462000000 GHz Bioldiv     Trig: Free Run Precuminy     Mkr1 2.458 25 GHz 0.00     Center Freq 2.462000000 GHz Display     Trig: Free Run Precuminy     Mkr1 2.458 25 GHz 0.00     Center Freq 2.462000000 GHz Display     Trig: Free Run Precuminy     Mkr1 2.458 25 GHz 0.00     Trig: Free Run Precuminy     Trig: Free Run Precuminy     Trig: Free Run Precuminy     Mkr1 2.458 25 GHz 0.00     Trig: Free Run Precuminy     Trig: Free Run Precumi	2.11b Reference	e Level of En	nission Lir	mit(CH-Hi	gh)	802.11g Referen	nce Level of Er	nission Limit(CH-H	ligh)
Ref Offset 10.4 dB BD/div     Mkr1 2.460 500 GHz 0.25 dBm     Auto Tune 0.25 dBm     Ref Offset 10.4 dB 0.25 dBm     Mkr1 2.458 25 GHz 0.53 dBm     Auto Tune 0.53 dBm       0     1     0 <td>RF 50 0 DC nter Freq 2.462000000 GH</td> <td>Z D: Wide Co</td> <td>Avg Type: Log-Pwr</td> <td>11:36:40 AM Aug 17, 2018 TRACE 1 2 3 4 5 6 TYPE MWWWWW</td> <td>Frequency</td> <td>Register Spectrum Analyzer - Swept SA R R SO C DC Center Freq 2.462000000 (</td> <td>GHZ PN0: East Co Trig: Free Run</td> <td>12:40:29 PM Aug 17, 201 Avg Type: Log-Pwr TR4CE 1 2 3 4 5 TYPE MWWWW</td> <td>Frequency</td>	RF 50 0 DC nter Freq 2.462000000 GH	Z D: Wide Co	Avg Type: Log-Pwr	11:36:40 AM Aug 17, 2018 TRACE 1 2 3 4 5 6 TYPE MWWWWW	Frequency	Register Spectrum Analyzer - Swept SA R R SO C DC Center Freq 2.462000000 (	GHZ PN0: East Co Trig: Free Run	12:40:29 PM Aug 17, 201 Avg Type: Log-Pwr TR4CE 1 2 3 4 5 TYPE MWWWW	Frequency
Center Freq 2.46200000 GHz         Conter Freq 2.46200000 GHz         Center Freq 100         Center Freq 100         Center Freq 2.46200000 GHz         Center Freq 2.4620000 GHz         Center Freq 100         Center Freq 100         Center Freq 2.46200000 GHz         Center Freq 2.4620000 GHz         Center Freq 100         Center Freq 100         Center Freq 100         Center Freq 2.46200000 GHz         Center Freq 100         C	Ref Offset 10.4 dB	ain:Low #Atten: 20 dB	Mkr1	2.460 500 GHz		Ref Offset 10.4 dB	IFGain:Low #Atten: 20 dB	Mkr1 2.458 25 GH	z Auto Tu
M         M         Stop Freq 2.46960000 GHz         300         Stop Freq 300						10.0			Center Fr 2.462000000 G
M         M         Stop Freq 2.46960000 GHz         300         Stop Freq 300	mm	min m				فسألسم	when her have prober	han have have the	Start Fr 2.447000000 G
Auto         Man         Auto         Man         Auto         Freq Offset         Auto         Freq offset         Auto         Freq offset         Freq Offset <td></td> <td></td> <td></td> <td>- V-C</td> <td></td> <td>-20.0 -30.0</td> <td></td> <td></td> <td>Stop Fr 2.477000000 0</td>				- V-C		-20.0 -30.0			Stop Fr 2.477000000 0
					CE Sten	-40.0 200 Mar 100 M			CF S 3.000000 M
					1.500000 MHz			- Marson	Auto
					1.500000 MHz Auto Man Freq Offset	-50.0			Freq Off:

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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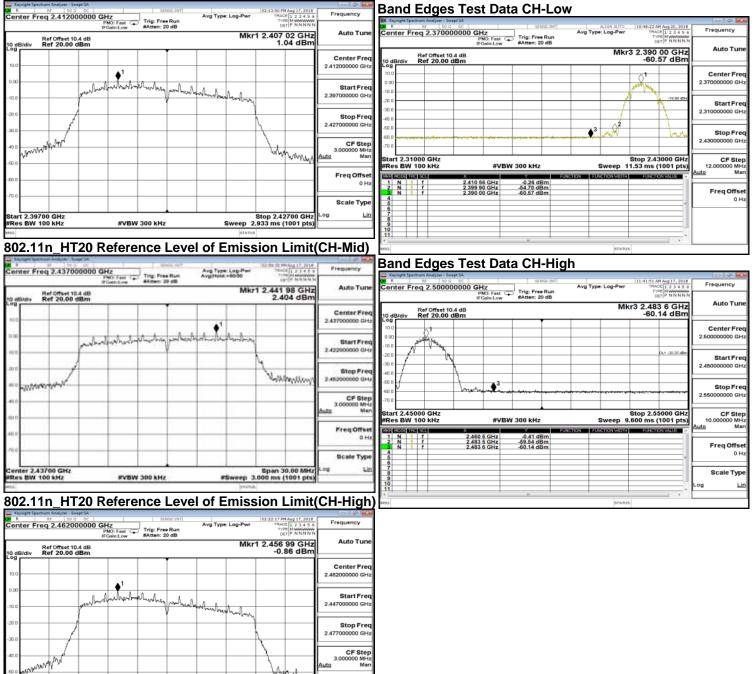
台灣檢驗科技股份有限公司

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#### 802.11n\_HT20 Reference Level of Emission Limit(CH-Low) 802.11b



Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

Stop 2.47700 GHz Sweep 2.933 ms (1001 pts)

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台灣檢驗科技股份有限公司

#VBW 300 kHz

2.44700 GH

Res BW 100 kHz

When

Freq Offse 0 H Scale Typ

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f (886-2) 2298-0488
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#### 802.11g Band Edges Test Data CH-Low

#### 802.11n\_HT20 Band Edges Test Data CH-Low

R R SO Q					R R 50		SENSE:INT				
Center Freq 2.37000	00000 GHz	Avg Type: Log-Pwr	12:38:00 PM Aug 17, 2018 TRACE 1 2 3 4 5 6 TYPE M WWWWW	Frequency	Center Freq 2.370	000000 GHz	Avg	Type: Log-Pwr	02:19:18 PM Aug 17, 2018 TRACE 1 2 3 4 5 6 TYPE M WWWWWW	Frequency	
	PNO: Fast Trig: Free Ri IFGain:Low #Atten: 20 d	B	DET P NNNN			PNO: Fast Trig: F IFGain:Low #Atten	ree Run : 20 dB		DET P N N N N	Ň	
Ref Offset 10		Mk	r3 2.390 00 GHz	Auto Tune	Ref Offset			Mkr	3 2.390 00 GHz	Auto Tune	
10 dB/div Ref 20.00 d	dBm		-57.88 dBm		10 dB/div Ref 20.00	0.4 dB			-56.61 dBm		
10.0			-1	Center Freq	Log 10.0				.1	Center Freq	
0.00			Ω	2.370000000 GHz	0.00				Ω	2.37000000 GHz	
-10.0		1	they have	2.570000000000	10.0			لقم	the way	2.57000000 0112	
-20.0			CL -18.90 (Br)		20.0				01.1-18.96 (Bri		
-30.0				Start Freq	-30.0					Start Freq	
-40.0		SAL SAL		2.310000000 GHz	-40.0			f		2.31000000 GHz	
-40.0		.3.	YA WANT		-40.0			A.3 (MARCAN	here and a second		
		3		Stop Freq			and the second has	<b>3</b> ~~		Stop Freq	
-60.0 manager and a second sec	annere	Booldford and a second se		2.430000000 GHz	70.0	had all a contractive and a contraction of the second second second second second second second second second s	and of the second second			2.430000000 GHz	
-70.0					-76.6						
Center 2.37000 GHz			Span 120.0 MHz	CF Step	Start 2.31000 GHz				Stop 2.43000 GHz		
#Res BW 100 kHz	#VBW 300 kHz		11.53 ms (1001 pts)	12.000000 MHz Auto Man	#Res BW 100 kHz	#VBW 300 ki			1.53 ms (1001 pts)	12.000000 MHz Auto Man	
MRR MODE TRC SCL 1 N 1 f (Δ)	2 405 95 GHz (A) 0 99 dBm	FUNCTION FUNCTION WIDTH	FUNCTION VALUE A		MRE MODE TRC SOL 1 N 1 f (Δ)	2 405 96 GHz (A) 0 95	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE		
2 N 1 f	2.406 96 GHz (Δ) 0.99 dBm 2.399 90 GHz -37.28 dBm			Freq Offset	2 N 1 f	2,406 96 GHz (Δ) 0.95 2,399 90 GHz -39,72 2,390 00 GHz (Δ) -56,61	dBm			Freq Offset	
3 N 1 f (Δ) 4	2.390 00 GHz (Δ) -57.88 dBm			0 Hz	3 N 1 f (Δ) 4	2.390 00 GHZ (Δ) -56.61	dBm			0 Hz	
6			1		6				1		
7				Scale Type	7					Scale Type	
9					9						
11				Log <u>Lin</u>	10					Log <u>Lin</u>	
•	H.	· · · · ·			<	19			•		
MSG		STAT	15		MSG			STATUS	5		
Dand Edaa	- Teet Dete CII										
Dallu Euges	S Test Data CH-	Hiah			Band Edge	s Test Data C	H-Hiah				
	s Test Data CH-	High			Band Edge	s Test Data C	H-High				
Keysight Spectrum Analyzer - Sv R RF 50 C	Vept SA 2 DC SENSE	E:SNT	12:45:28 PM Aug 17, 2018	-	Keysight Spectrum Analyzer - 1	Swept SA	SENSE:2NT	Type: Log-Pwr	02:29:11 PM Aug 17, 2018		
Keynight Spectrum Analyzer - Siv R R IV 500 Center Freq 2.5000	Vept SA 2 DC SENSE 00000 GHz PNO: Fast CD Trig: Free R	EINT Avg Type: Log-Pwr Run	TRACE 1 2 3 4 5 6	Frequency	Regright Spectrum Analyzer - 1 R R IV So Center Freq 2.5000	Swept SA	SENSE:INT Avg	Type: Log-Pwr	TRACE 1 2 3 4 5 6	Frequency	
Reysight Spectrum Analyzer - Sv R R So Center Freq 2.5000	Vept SA 2 DC SENSE 00000 GHz Trig: Free R PN0: Fast G #Atten: 20 c	E:INT Avg Type: Log-Pwr Run dB	TRACE 1 2 3 4 5 6 TYPE NWWWWW DET P NNNN	Frequency	Keynight Spectrum Analyzer - 1 R R 107 50 Center Freq 2.5000	Swept SA IG DC DOOOOO GHZ PND: Fast IFGain:Low #Atter	SENSE:INT AVg		TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P NNNN	Frequency	
Center Freq 2.5000	A process of the service of the serv	E:INT Avg Type: Log-Pwr Run dB	TRACE 1 2 3 4 5 6	Frequency	Exploit Spectrum Analyzer - 3 R RF 35 Center Freq 2.5000 Ref Offset	Swept SA R DC D000000 GHz PN0: Fest IFGein:Low 10.4 dB	SENSE:INT Avg		TRACE 1 2 3 4 5 6	Frequency	
Center Freq 2.5000	A process of the service of the serv	E:INT Avg Type: Log-Pwr Run dB	TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P NNNNN	Frequency Auto Tune	Keynight Spectrum Analyzer - 1 Center Freq 2.5000 Ref Offset 10 dB/div Ref 20.00 Log	Swept SA R DC D000000 GHz PN0: Fest IFGein:Low 10.4 dB	SENSE:INT Avg		TYPE MUMUU DET P NNNN (r3 2.483 6 GHz	Auto Tune	
Regulati Spectrum Analyzer - So           R         100         50 c           Center Freq 2.5000         50 c           Ref Offset 10         10 dEl/div         Ref 20.00           Log         10.0         11.0	2 DC Sthot 00000 GHz PN0: Feat IFGain:Low dB dB 100000 GHz Trig: Free R Atten: 20 C 4 B 100000 GHZ 100000 GHZ 1000000 GHZ 1000000 GHZ 1000000 GHZ 1000000 GHZ 1000000 GHZ 1000000 GHZ 1000000 GHZ 1000000 GHZ 1000000000 GHZ 100000000 GHZ 1000000000000000000000000000000000000	E:INT Avg Type: Log-Pwr Run dB	TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P NNNNN	Auto Tune	Keynight Spectrum Analyzer - Keynight Spectrum Analyzer - So Center Freq 2.500 Center Freq 2.500 Ref Offiset 10 dB/div Ref 20.00 10.0 ↓ 1	10.4 dB 0 dBm	SENSE:INT Avg		TYPE MUMUU DET P NNNN (r3 2.483 6 GHz	Auto Tune	
Regulati Spectrum Analyzer - So           R         100         50 c           Center Freq 2.5000         50 c           Ref Offset 10         10 dEl/div         Ref 20.00           Log         10.0         11.0	2 DC Sthot 00000 GHz PN0: Feat IFGain:Low dB dB 100000 GHz Trig: Free R Atten: 20 C 4 B 100000 GHZ 100000 GHZ 1000000 GHZ 1000000 GHZ 1000000 GHZ 1000000 GHZ 1000000 GHZ 1000000 GHZ 1000000 GHZ 1000000 GHZ 1000000000 GHZ 100000000 GHZ 1000000000000000000000000000000000000	E:INT Avg Type: Log-Pwr Run dB	TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P NNNNN	Frequency Auto Tune	Keynight Spectrum Analyzer - Keynight Spectrum Analyzer - So Center Freq 2.500 Center Freq 2.500 Ref Offiset 10 dB/div Ref 20.00 10.0 ↓ 1	10.4 dB 0 dBm	SENSE:INT Avg		TYPE MUMUU DET P NNNN (r3 2.483 6 GHz	Auto Tune	
Report         Report <th report<<="" td=""><td>2 DC Sthot 00000 GHz PN0: Feat IFGain:Low dB dB 100000 GHz Trig: Free R Atten: 20 C 4 B 100000 GHZ 100000 GHZ 1000000 GHZ 1000000 GHZ 1000000 GHZ 1000000 GHZ 1000000 GHZ 1000000 GHZ 1000000 GHZ 1000000 GHZ 1000000000 GHZ 100000000 GHZ 1000000000000000000000000000000000000</td><td>E:INT Avg Type: Log-Pwr Run dB</td><td>TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P NNNNN</td><td>Auto Tune</td><td>Center Freq 2.5000</td><td>10.4 dB 0 dBm</td><td>SENSE:INT Avg</td><td></td><td>17400E [1 2 3 4 5 6 TOPE MWWWWW DET P NNNN 073 2.483 6 GHz -55.87 dBm</td><td>Auto Tune Center Freq 2.50000000 GHz</td></th>	<td>2 DC Sthot 00000 GHz PN0: Feat IFGain:Low dB dB 100000 GHz Trig: Free R Atten: 20 C 4 B 100000 GHZ 100000 GHZ 1000000 GHZ 1000000 GHZ 1000000 GHZ 1000000 GHZ 1000000 GHZ 1000000 GHZ 1000000 GHZ 1000000 GHZ 1000000000 GHZ 100000000 GHZ 1000000000000000000000000000000000000</td> <td>E:INT Avg Type: Log-Pwr Run dB</td> <td>TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P NNNNN</td> <td>Auto Tune</td> <td>Center Freq 2.5000</td> <td>10.4 dB 0 dBm</td> <td>SENSE:INT Avg</td> <td></td> <td>17400E [1 2 3 4 5 6 TOPE MWWWWW DET P NNNN 073 2.483 6 GHz -55.87 dBm</td> <td>Auto Tune Center Freq 2.50000000 GHz</td>	2 DC Sthot 00000 GHz PN0: Feat IFGain:Low dB dB 100000 GHz Trig: Free R Atten: 20 C 4 B 100000 GHZ 100000 GHZ 1000000 GHZ 1000000 GHZ 1000000 GHZ 1000000 GHZ 1000000 GHZ 1000000 GHZ 1000000 GHZ 1000000 GHZ 1000000000 GHZ 100000000 GHZ 1000000000000000000000000000000000000	E:INT Avg Type: Log-Pwr Run dB	TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P NNNNN	Auto Tune	Center Freq 2.5000	10.4 dB 0 dBm	SENSE:INT Avg		17400E [1 2 3 4 5 6 TOPE MWWWWW DET P NNNN 073 2.483 6 GHz -55.87 dBm	Auto Tune Center Freq 2.50000000 GHz
Center Freq 2.5000	2 DC Sthot 000000 GHz PNO: Feat IFGain:Low dBm	E:INT Avg Type: Log-Pwr Run dB	kr3 2.483 6 GHz -53.99 dBm	Auto Tune Center Freq 2.50000000 GHz	Center Freq 2.5000	10.4 dB 0 dBm	SENSE:INT Avg		TYPE MUMUU DET P NNNN (r3 2.483 6 GHz	Auto Tune Center Freq 2.50000000 GHz Start Freq	
Center Freq 2.5000     R	2 DC Sthot 000000 GHz PNO: Feat IFGain:Low dBm	E:INT Avg Type: Log-Pwr Run dB	kr3 2.483 6 GHz -53.99 dBm	Auto Tune	Ref Offset           10 dB/div         Ref Offset           10 dB/div         Ref Offset           10 dB/div         Ref Offset           10 d0/div         Ref Offset           0.00         1           .000	10.4 dB 0 dBm	SENSE:INT Avg		17400E [1 2 3 4 5 6 TOPE MWWWWW DET P NNNN 073 2.483 6 GHz -55.87 dBm	Auto Tune Center Freq 2.50000000 GHz	
Center Freq 2.5000	A BOOL SPACE	E:INT Avg Type: Log-Pwr Run dB	kr3 2.483 6 GHz -53.99 dBm	Auto Tune Center Freq 2.50000000 GHz	Center Freq 2.5000	10.4 dB 0 dBm	SENSE:INT Avg		17400E [1 2 3 4 5 6 TOPE MWWWWW DET P NNNN 073 2.483 6 GHz -55.87 dBm	Auto Tune Center Freq 2.50000000 GHz Start Freq	
Center Freq 2.5000	D00000 GHZ POD Fast PODI Fast PODI Fast PGainLow Atten: 20 r dBm	E:INT Avg Type: Log-Pwr Run dB	kr3 2.483 6 GHz -53.99 dBm	Auto Tune Center Freq 2.50000000 GHz	Compared Spectrum Analyse - Revealed Spectrum Analyse - Center Freq 2.5000     Compared Spectrum Analyse - Compared Sp	10.4 dB 0 dBm	SENSE:INT Avg		17400E [1 2 3 4 5 6 TOPE MWWWWW DET P NNNN 073 2.483 6 GHz -55.87 dBm	Auto Tune Center Freq 2.50000000 GHz Start Freq	
Center Freq 2.5000     Ref Offset 11     Offset 11     Offset 12     Offset 14	A BOOL SPACE	E:INT Avg Type: Log-Pwr Run dB	kr3 2.483 6 GHz -53.99 dBm	Auto Tune Center Freq 2.50000000 GHz Start Freq 2.450000000 GHz	Center Freq 2.5000	10.4 dB 0 dBm	SENSE:INT Avg		17400E [1 2 3 4 5 6 TOPE MWWWWW DET P NNNN 073 2.483 6 GHz -55.87 dBm	Auto Tune Center Freq 2.50000000 GHz Cater Freq 2.45000000 GHz	
Center Freq 2.5000	A BOOL SPACE	E:INT Avg Type: Log-Pwr Run dB	kr3 2.483 6 GHz -53.99 dBm	Center Freq 2.50000000 GHz 2.450000000 GHz 2.450000000 GHz Stop Freq	Compared Spectrum Analyse - Revealed Spectrum Analyse - Center Freq 2.5000     Compared Spectrum Analyse - Compared Sp	10.4 dB 0 dBm	SENSE:INT Avg		17400E [1 2 3 4 5 6 TOPE MWWWWW DET P NNNN 073 2.483 6 GHz -55.87 dBm	Auto Tune Center Freq 2.50000000 GHz Start Freq 2.45000000 GHz Stop Freq	
Center Freq 2.5000 R 10 500 Center Freq 2.5000 Ref Offset 1 0 dB/div Ref 20.00 100 0000 000 000	000000 GHZ PROI Fast PROI Fast PROINLow Atten: 20 C 0 4 B dBm	Avg Type: Log-Pwr ab Type: Log-Pwr B M Avg Type: Log-Pwr B Cog Cog Cog Cog Cog Cog Cog Cog	THACE [12,23,45,6]           THACE [12,23,45,6]           Marxie [1	Center Freq 2.50000000 GHz 2.45000000 GHz 2.45000000 GHz 2.55000000 GHz 2.55000000 GHz CF Step	Center Freq 2.5000	Sovert SA DODODOO CHZ PRO: Feas PRO: Feas	SENSE INT		Prace [12:3:4:5:4 Tree [12:3:4:5:4 Cer ] & NUMMARY (73:2:483:6 G Hz -55:87 d Bm 	Frequency       Auto Tune       2.50000000 GHz       Start Freq       2.45000000 GHz       Stop Freq       2.55000000 GHz	
Center Freq 2.5000 R m 2000 Center Freq 2.5000 Center Freq 2.5000 Ref Offset 11 0 dB/div Ref 20.00 100 100 100 100 100 100 100	A BOOL SPACE	Avg Type: Log-Pwr Run db M M M M M M M M M M M M M M M M M M	Interest 12.2.3.4.5 Trace [12.2.4.4.5 Certify HINNIN Certify HINNIN Certif	Frequency     Auto Tune     Center Freq     2.50000000 GHz     Start Freq     2.45000000 GHz     Stop Freq     2.55000000 GHz     CF Step     10.00000 MHz2	Center Freq 2.5000	10.4 dB 0 dBm	SENGE INT Avg	Mk	12.3.3.5. 021/01/01/01 021/01/01 021/01	Frequency           Auto Tune           2.50000000 GHz           2.45000000 GHz           Start Freq           2.5000000 GHz           Stop Freq           0.5000000 GHz           CF Step           10.000000 MHz	
Center Freq 2.5000 R 0 050 Center Freq 2.5000 Ref Offset 1 0 dB/div Ref 20.00 00 00 00 00 00 00 00	#VBW 300 kHz	Avg Type: Log-Pwr ab The second seco	Interest 12.2.3.4.5 Trace [12.2.4.4.5 Certify HINNIN Certify HINNIN Certif	Center Freq 2.50000000 GHz 2.45000000 GHz 2.45000000 GHz 2.55000000 GHz 2.55000000 GHz CF Step	Center Freq 2.5000	Borget SA DODODOO CHZ PRO: Feat PRO: Feat PRO: Feat PRO: Feat PRO: Feat PRO: Feat PRO: Feat Trig: P Sature Sature #VBW 300 kk	SENECTION	Mk	Prace [12:3:4:5:4 Tree [12:3:4:5:4 Cer ] & NUMMARY (73:2:483:6 G Hz -55:87 d Bm 	Frequency       Auto Tune       2.50000000 GHz       Start Freq       2.45000000 GHz       Stop Freq       2.55000000 GHz       CF Step	
Center Freq 2.5000 R 10 500 Center Freq 2.5000 Ref Offset 1 0 dB/div Ref 20.00 100 000 100 000 100 000 1	# 20         5000000 GHz         500000 GHz         Trig: Free B           PROD: Fast         Trig: Free B         Atten: 20           00.000 GHz         #VEW 300 kHz         3           #VEW 300 kHz         24870 GHz         0.0 21 dB           2485 0 GHz         0.0 21 dB         0.0 24 dB	Avg Type: Log-Pwr ab Type: Log-Pwr M M M Sweep F5/Reform F5/Reform F5/Reform F5/Reform	Interest 12.2.3.4.5 Trace [12.2.4.4.5 Certify HINNIN Certify HINNIN Certif	Frequency           Auto Tune           Center Freq           2.50000000 GHz           Start Freq           2.450000000 GHz           Stop Freq           2.550000000 GHz           0.00000 GHz           CF Step           0.000000 MHz           Auto	Center Freq 2.5000	Borget SA           0000000 GHz           PHO: Feat           PHO: Feat           Trig: F           AdBm           ddBm           ddBm           #VBW 300 kl           #VBW 300 kl           2,487 0 Hz (a)           6 Hz	SENSE INT AVG	Mk	12.3.3.5. 021/01/01/01 021/01/01 021/01	Frequency           Auto Tune           2.50000000 GHz           Start Freq           2.450000000 GHz           Stop Freq           2.550000000 GHz           0.00000 GHz           CF Step           0.00000 MHz <u>Auto</u>	
Center Freq 2.5000 R 0 050 Center Freq 2.5000 Ref Offset 1 0 dB/div Ref 20.00 00 00 00 00 00 00 00	#VBW 300 kHz	Avg Type: Log-Pwr ab Type: Log-Pwr M M M Sweep F5/Reform F5/Reform F5/Reform F5/Reform	Interest 12.2.3.4.5 Trace [12.2.4.4.5 Certify HINNIN Certify HINNIN Certif	Frequency       Auto Tune       Center Freq       2.50000000 GHz       Start Freq       2.45000000 GHz       Stop Freq       2.550000000 GHz       CF Step       10.00000 MHz       Auto       Man	Center Freq 2.5000	Borget SA DODODOO CHZ PRO: Feat PRO: Feat PRO: Feat PRO: Feat PRO: Feat PRO: Feat PRO: Feat Trig: P Sature Sature #VBW 300 kk	SENSE INT AVG	Mk	12.3.3.5. 021/01/01/01 021/01/01 021/01	Frequency       Auto Tune       2.50000000 GHz       2.45000000 GHz       2.45000000 GHz       Stop Freq       2.55000000 GHz       CF Step       10.00000 MHz       Auto       Man       Freq Offset	
Center Freq 2.5000 R 10 500 Center Freq 2.5000 Ref Offset 1 0 dB/div Ref 20.00 100 000 100 000 100 000 1	# 20         5000000 GHz         500000 GHz         Trig: Free B           PROD: Fast         Trig: Free B         Atten: 20           00.000 GHz         #VEW 300 kHz         3           #VEW 300 kHz         24870 GHz         0.0 21 dB           2485 0 GHz         0.0 21 dB         0.0 24 dB	Avg Type: Log-Pwr ab Type: Log-Pwr M M M Sweep F5/Reform F5/Reform F5/Reform F5/Reform	Interest 12.2.3.4.5 Trace [12.2.4.4.5 Certify HINNIN Certify HINNIN Certif	Frequency           Auto Tune           Center Freq           2.50000000 GHz           Start Freq           2.450000000 GHz           Stop Freq           2.550000000 GHz           0.00000 GHz           CF Step           0.000000 MHz           Auto	Center Freq 2.5000	Borget SA           0000000 GHz           PHO: Feat           PHO: Feat           Trig: F           AdBm   #VBW 300 kt  2.4457 0 CHz (ch1 - 07 2)  2.445 0 CH2 (ch1 - 07 2)  3.445 0	SENSE INT AVG	Mk	12.3.3.5. 021/01/01/01 021/01/01 021/01	Frequency           Auto Tune           2.50000000 GHz           Start Freq           2.450000000 GHz           2.50000000 GHz           Stop Freq           2.50000000 GHz           0.00000 GHz           GF Step           10.000000 MHz           Man	
Center Freq 2.5000 R 10 500 Center Freq 2.5000 Ref Offset 1 0 dB/div Ref 20.00 100 000 100 000 100 000 1	# 20         5000000 GHz         500000 GHz         Trig: Free B           PROD: Fast         Trig: Free B         Atten: 20           00.000 GHz         #VEW 300 kHz         3           #VEW 300 kHz         24870 GHz         0.0 21 dB           2485 0 GHz         0.0 21 dB         0.0 24 dB	Avg Type: Log-Pwr ab Type: Log-Pwr M M M Sweep F5/Reform F5/Reform F5/Reform F5/Reform	Interest 12.2.3.4.5 Trace [12.2.4.4.5 Certify HINNIN Certify HINNIN Certif	Frequency           Auto Tune           Center Freq           2.50000000 GHz           Start Freq           2.450000000 GHz           Stop Freq           2.550000000 GHz           0.00000 MHz           0.00000 MHz           Auto           Man           Freq Offset           0 Hz	Center Freq 2.5000	Borget SA           0000000 GHz           PHO: Feat           PHO: Feat           Trig: F           AdBm   #VBW 300 kt  2.4457 0 CHz (ch1 - 07 2)  2.445 0 CH2 (ch1 - 07 2)  3.445 0	SENSE INT AVG	Mk	12.3.3.5. 021/01/01/01 021/01/01 021/01	Frequency           Auto Tune           2.50000000 GHz           Start Freq           2.450000000 GHz           2.50000000 GHz           2.50000000 GHz           10.00000 GHz           Gr Stop Freq           10.00000 GHz           Man           Freq Offset           0 Hz	
Center Freq 2.5000 R m 2000 Center Freq 2.5000 Center Freq 2.5000 Ref Offset 11 0 dB/div Ref 20.00 100 100 100 100 100 100 100	# 20         5000000 GHz         500000 GHz         Trig: Free B           PROD: Fast         Trig: Free B         Atten: 20           00.000 GHz         #VEW 300 kHz         3           #VEW 300 kHz         24870 GHz         0.0 21 dB           2485 0 GHz         0.0 21 dB         0.0 24 dB	Avg Type: Log-Pwr ab Type: Log-Pwr M M M Sweep F5/Reform F5/Reform F5/Reform F5/Reform	Interest 12.2.3.4.5 Trace [12.2.4.4.5 Certify HINNIN Certify HINNIN Certif	Frequency       Auto Tune       Center Freq       2.50000000 GHz       Start Freq       2.45000000 GHz       Stop Freq       2.550000000 GHz       CF Step       10.00000 MHz       Auto       Man	Center Freq 2.5000	Borget SA           0000000 GHz           PHO: Feat           PHO: Feat           Trig: F           AdBm   #VBW 300 kt  2.4457 0 CHz (ch1 - 07 2)  2.445 0 CH2 (ch1 - 07 2)  3.445 0	SENSE INT AVG	Mk	12.3.3.5. 021/01/01/01 021/01/01 021/01	Frequency       Auto Tune       2.50000000 GHz       2.45000000 GHz       2.45000000 GHz       Stop Freq       2.55000000 GHz       CF Step       10.00000 MHz       Auto       Man       Freq Offset	
Center Freq 2.5000 R 10 500 Center Freq 2.5000 Ref Offset 1 0 dB/div Ref 20.00 100 000 100 000 100 000 1	# 20         5000000 GHz         500000 GHz         Trig: Free B           PROD: Fast         Trig: Free B         Atten: 20           00.000 GHz         #VEW 300 kHz         3           #VEW 300 kHz         24870 GHz         0.0 21 dB           2485 0 GHz         0.0 21 dB         0.0 24 dB	Avg Type: Log-Pwr ab Type: Log-Pwr M M M Sweep F5/Reform F5/Reform F5/Reform F5/Reform	Interest 12.2.3.4.5 Trace [12.2.4.4.5 Certify HINNIN Certify HINNIN Certif	Frequency           Auto Tune           Center Freq           2.50000000 GHz           Start Freq           2.450000000 GHz           Stop Freq           2.550000000 GHz           0.00000 MHz           0.00000 MHz           Auto           Man           Freq Offset           0 Hz	Center Freq 2.5000	Borget SA           0000000 GHz           PHO: Feat           PHO: Feat           Trig: F           AdBm   #VBW 300 kt  2.4457 0 CHz (ch1 - 07 2)  2.445 0 CH2 (ch1 - 07 2)  3.445 0	SENSE INT AVG	Mk	12.3.3.5. 021/01/01/01 021/01/01 021/01	Frequency           Auto Tune           2.50000000 GHz           Start Freq           2.450000000 GHz           2.50000000 GHz           2.50000000 GHz           10.00000 GHz           Gr Stop Freq           10.00000 GHz           Man           Freq Offset           0 Hz	

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#### 802.11b

#### **Spurious Emission Test Data CH-Low**

R         PF         SO 0         DC           enter Freq 1.515000000         Ref 00%         Ref 00%<	PNO: East ( )	sense:int ig: Free Run itten: 20 dB	ALIGN AUTO Avg Type: Log-Pwr		Auto Tune
Odd/div         Ref 20.00 dBm           00			M	kr1 2.411 9 GH	z Auto Tun
0.0				• <sup>1</sup>	Center Free 1.515000000 GH
				-19.92 d9	Start Free 30.000000 MH
0.0			والمستعمد المروقين والمستعملين	a hulosister and a surface surface	Stop Free 3.000000000 GH
enter 1.515 GHz Res BW 100 kHz	#VBW 30		Sweep	Span 2.970 GH 283.9 ms (1001 pts	Iz CF Ste 297.000000 MH Auto Ma
N         1         f         2.4           2	11 9 GHz -	0.03 dBm			Freq Offse
8 9 0 0 1					

#### **Spurious Emission Test Data CH-Mid**

Keysight Sp	ectrum Analyzer - Sv							
Center F	req 1.5150	00000 GHz	SENSE:	Avg T	ype: Log-Pwr	TRACE	Aug 17, 2018	Frequency
10 dB/div	Ref Offset 1 Ref 20.00				Mk	r1 2.435	PNNNNN	Auto Tur
10.0 0.00						<b>♦</b> <sup>1</sup>		Center Fr 1.51500000 G
20.0 30.0 40.0							4.1 -15.00 dBm	Start Fre 30.000000 M
50.0 50.0 70.0	ugh yay an farlan a shaa			Cardena and a cardina and a star of the star		l'hours	anna ann an ann an an an an an an an an	Stop Fr 3.000000000 G
Res BW		X	/BW 300 kHz		Sweep 2			CF St 297.000000 M Auto M
1 N 2 3 4 5 6	f (Δ)	2.435 7 GHz	(Δ) 2.29 dBm				≡.	Freq Off
7 8 9								Scale Ty
11			19					
53					STATUS			

					_				Analyzer - Sv		ysight:	Ke
	E 1 2 3 4 5 6	TRAC	: Log-Pwr	Avg Typ	Run	Trig: Free		00000 G		R Freq	nter	Cer
	IP INTERNAL           Ref Offset 10.4 dB         Mkr1 4.880 0 GHz           10 dB/div         Ref 20.00 dBm         -47.06 dBm											
Center Fre 14.750000000 GF												10.0 0.00
Start Fr 3.000000000 G	01.1 -15.00 dBin									1		-20.0 -30.0 -40.0
Stop Fr 26.50000000 G	lan, nadionali	- (بالارسان المار المولي. - (بالارسان المار المولي.	<b>4</b>				ر بر او مردر. ا		ait Ayura	ľ-	~~~	-50.0 -60.0 -70.0
CF St 2.350000000 G Auto M	Center 14.75 GHz Span 23.50 GHz #Res BW 100 kHz Sweep 2.246 s (1001 pts) org/bold the Sol x Y Parterow Faterory Reserved August											
Freq Offs 0	≣.				m	-47.06 dE	GHz (Δ)	4.880 (	(Δ)	1 1	N	1 2 3 4 5 6
Scale Typ	_											6 7 8 9 10 11
	•		STATUS			10						4

🛤 Keysi	ight Spect		inalyzer - Swept										<b>-</b>
Cente	er Fre	۳ بال	4.75000	DC 0000 G	Hz		NSE:INT	Avg		LIGN AUTO	TRAC	M Aug 20, 2018	Frequency
	Ref Offset 10.4 dB Mkr1 25.959 5 GHz											Auto Tune	
10 dB/ Log	fdiv	Ref	20.00 de	3m							-50.	13 dBm	Center Freq
-10.00 -20.0												-19.99 d5m	Start Freg
-30.0 -40.0 -50.0		+						-				•	3.00000000 GHz
-60.0	<u>م</u> مر م		م مرد اور <sub>م</sub> اهدی	-usyh-mijni	\$ <u>1.</u> 1	بهيد مريد عامه	w	1944 Barrow, By	****	والمحرور المطرق مرمر	all and a second second		Stop Freq 26.50000000 GHz
#Res	enter 14.75 GHz Span 23.50 GHz Res BW 100 kHz #VBW 300 kHz Sweep 2.246 s (1001 pts)										CF Step 2.35000000 GHz Auto Man		
1 1 2 3 4	ODE NTRO N 1	1		× 25.959 6	GHZ	-50.13 di		UNCTION	FUNC	TION WOTH	FUNCTI	ON VALUE A	Freq Offset
5 6 7 8 9	+						+					=1	
10 11 <						17				STATU			
MI543										STATUS	>		

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#### Report No.:E2/2018/70098 Page 37 of 89

#### **Spurious Emission Test Data CH-High**

#### 802.11g Spurious Emission Test Data CH-Low

🔤 Key	sight Spec		nalyzer - Sw								-					— К	rysight Spect	um Anal											
Cent	er Fr	eq 1	.51500	00000	) GH2	2	Tria	SENSE Free R		Avg Type	: Log-Pwr	11:42:32 A	M Aug 17, 2018 CE 1 2 3 4 5 6 PE NWWWWW ET P NNNN	Frequ	lency	Cer	nter Fre	ı¤ q 1.5	50 Q	0000 GH	łz		NSE:INT	Avg T	/pe: Log-Pwr	TRA	CE 1 2 3 4 5 6		Frequency
_					IFG	D:Fast G ain:Low		n: 20 d			Mk		et P NNNN		ito Tune	-				IF	NO: Fast C Gain:Low	#Atten:			M		6 0 GHz		Auto Tune
10 dE	Vdiv		20.00									-1.	89 dBm			10 4	lB/div	Ref Of Ref 2	fset 10.	4 dB Brn						0	.60 dBm		
10.0								-				• <sup>1</sup>			oter Freq	10.0										1			Center Freq 15000000 GHz
-20.0 -30.0													DL1 -20.25 dBn		tart Freq 0000 MHz	-20.0											0L1 -18.90 #Bri		Start Freq 30.000000 MHz
-50.0 -60.0 -70.0	, the second	21-de-34	y in the second s		~~~	يە <b>نە</b> رىرل	a kilmiyi wa	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	مەربەرەرەرەي مەربەرەرەرەرىيى		فعنصم سيبلد	al handan	aina an		top Freq 0000 GHz	-60.0 -60.0 -70.0	valuerature		, inger , emiliari	<del>م</del> ەلبىلامىر	*54:444/7-46	and a state of the	lines - product	-	an one would	Versioner	n antrodonikha	3.0	Stop Freq
#Res	er 1.5 BW	100 k	Hz			#VBV	W 300 H	Hz				83.9 ms (	2.970 GHz (1001 pts)		CF Step 0000 MHz Man	#Re	es BW 1	00 kH	iz iz		#VB	V 300 kH;				83.9 ms	2.970 GHz (1001 pts)	25 Auto	CF Step 97.000000 MHz Man
	N 1			2	.459 5	GHz	-1.8	9 dBn		TION	ICTION WIDTH	FUNCT	ON VALUE	Fre	e <b>q Offset</b> 0 Hz		NODE TRO		7)	2.406	0 GHz (Δ	0.60 d		NCTION	FUNCTION WIDTH	FUNC			Freq Offset 0 Hz
7 8 9														Sca	ale Type Lin	7 8 9 10											=	Log	Scale Type
11		1 1				-		_	-					2.08		11		-											<u></u>
MSG											STATUS					MBG									STATU	5			

Keysight S	Spectrum Analyzer - Sw							Keysight Spectrum Analyzer - Swept SA	0		
Center	Freq 14.7500		Trig: Free P	Avg	Type: Log-Pwr	11:43:00 AM Aug 17, 2018 TRACE 1 2 3 4 5 6 TYPE M WWWWW DET P NNNNN	Frequency	Center Freq 14.750000000 GHz Avg Type: Log-Pwr TR4CE 1 2 3 4 5 6 Frequen	ncy		
		IFGain:Low	#Atten: 20 (	dB			Auto Tura	IFGainLow Writen, 20 up	o Tune		
10 dB/div	Ref Offset 10 Ref 20.00	0.4 dB dBm			MKr1	26.265 0 GHz -51.30 dBm		Ref Offset 10.4 dB WIKT 25.630 5 GHZ 10 dB/div Ref 20.00 dBm -50.88 dBm			
10.0 0.00							Center Freq 14.750000000 GHz		er Freq 000 GHz		
-20.0 -30.0 -40.0						0.1 -20.25 dBn	Start Freq 3.000000000 GHz	20.0 01.1890.000 Star	n <b>t Freq</b> 000 GHz		
-50.0 -60.0	warn bound about		an-16.30 Mariana	-realized and the second	ومۇر مەرو <sup>م</sup> ەر مەرسلامەر	an tana an tana an tana tana tana tana	Stop Freq 26.50000000 GHz		op Freq 000 GHz		
#Res BV		X	300 kHz		Sweep	Span 23.50 GHz 2.246 s (1001 pts)	CF Step 2.35000000 GHz <u>Auto</u> Man	#Res BW 100 kHz         #VBW 300 kHz         Sweep         2.246 s (1001 pts)         2.35000000           Mate         x         y         Eventorial E	F Step 000 GHz Man		
1 N 2 3 4 5	1 1	26.265 0 GHz	-51,30 dBn	n			Freq Offset 0 Hz		Offset 0 Hz		
7 8 9 10							Scale Type	9 10 10	le Type Lin		
*											

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#### **Spurious Emission Test Data CH-Mid**

👝 Kej	ysigt	ht Spe																								8		Key	ysight Sp																					×
Cen	tei	r Fi			51			GH	:		],	Trig: F		E:INT		Avg	Туре	Log-F	wr	12:55	TRAC	Aug 17, 2 1 2 3 4 MWWA	15.6		Frequ	Jency	c	en	ter F	req		50 G		0 GH	łz		Trie	: Free	SE:INT		Avg Ty	pe: Lo	g-Pwr	12:4	TRACE	E 1 2 3	456		Frequency	
10 di	B/d	liv			iffse 20.0		3	IFG	Ji Har sin:Lo	st ⊂, ow		#Atten							Mk	r1 2.	444	6 G 6 d	Hz		Au	uto Tun	1		B/div	Re Re	foffs f20.	et 10.	.4 dB	IF	NU: Ha Gain:L	ist ⊂∎ .ow		ten: 20					Mk		.459	9 5 G 71 de	Hz		Auto Tu	ine
10.0 0.00																				<b>∳</b> 1—				1		nter Fre	q z	.og 10.0 0.00														+		• <sup>1</sup>				1.5	Center Fr 15000000 G	
-10.0 -20.0 -30.0 -40.0																	_		_			X.1 -16.66	dBri			tart Fre 0000 MH	9 .	10.0 20.0 30.0 40.0														+				04,1 -19.47	7 dBm		Start Fr 30.000000 M	
-50.0 -60.0 -70.0	~0	laury e-	<b>1</b> 41			y	 web	-70-1-	- ل م	d-with		il voyedjes	~~~		****		,,.	معطيليهم	e de la	4	Am	رجدده	<b>9.3</b> 4	з		top Fre	9 .	50.0 60.0 70.0	6.1M-67	****		r douro		ماصلتهم		مريسي	****	E.1	castas	942.009	y galf to a function			ul ha	e anticia de la companya de la comp	en incla	144.754	з.0	<b>Stop Fr</b> 000000000 G	
Cen #Re	s E	BW	10	0 k	Hz		×					00 kł			FUNC	TON	_	_	_	83.9 n	<b>15 (</b> 1	970 G 1001 p	ots)		297.00	CF Ste 0000 MH Ma	z #	Re	s BW	100	kHz		×	_		#VBW		-		FUNCTO	NF	_	eep 2	83.9 1	ms (1		pts)		CF St 97.000000 M	
1 2 3 4 5	N	1		1 (	Δ)		2.4	44 6	GH	ε (Δ)		2.30	dBr	m											Fre	e <b>q Offse</b> 0 H		1 2 3 4 5	N 1	1	(Δ)			2.459	5 GH	z (Δ)	-0	.71 dB	im						_		Ξ.		Freq Offs 0	
7 8 9 10																								Log		ale Typ ⊔	HE.	7 8 9 10														_			_	_		Log	Scale Ty	pe Li
			1	+								17					•														'							17			+						+			_
MBG																		8	TATUS								M	83															STATUS	5						_

#### **Spurious Emission Test Data CH-High**

Frequency Auto Tune Center Freq 4.750000000 GHz
Auto Tune Center Freq
Center Freq
Center Freq
4.750000000 GHz
Start Freq
3.000000000 GHz
Stop Freq
6.500000000 GHz
CF Step
2.350000000 GHz
to Man
Freq Offset
0 Hz
Scale Type
g <u>Lin</u>
26

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#### 802.11n\_HT20 Spurious Emission Test Data CH-Low

									Analyzer - Sw			
Frequency	Aug 17, 2018	TRAC	Log-Pwr	Avg Typ	SE:INT	Trig: Free		00000 GH		Freq	· .	Cer
Auto Tune	0 GHz 2 dBm	r1 2.409	Mk			#Atten: 2	0: Fast 😱 in:Low	IFC	f Offset 10		1B/div	
Center Free 1.515000000 GH		1										.09 10.0 0.00
Start Free 30.000000 MH	4,1 -18.96 aBn										-	20.0 30.0
Stop Fre 3.000000000 GH	notexania	honer		ن	71.000-000	ىلەر يەر 10 مەرى	alasala Janua		يحور ورجع والمراجع	an a		50.0 50.0
CF Ste 297.000000 MH Auto Ma			Sweep 2		FUN	300 kHz		×	kHz	1.515 W 100	es Bl	Re
Freq Offse 0 H	_				3m	-2.62 dE	GHz (Δ)	2.409	(Δ)	1 1	N	123456
Scale Typ												7 8 9 10
Log <u>Li</u> r	- •				-	17	-					11
			STATUS									

Keysight Sp	ectrum Analyzer - Swe							
<b>N</b>	req 14.7500		Trig: Free	Run	vg Type: Log-Pwr	02:21:06 PM Aug 1 TRACE 1 2 TYPE MWA DET P N	3456	Frequency
10 dB/div	Ref Offset 10 Ref 20.00 d	IFGain:Lov		) dB	Mk	r1 26.406 0 0 -50.86 d	GHz	Auto Tune
10.0 0.00 -10.0								Center Freq 14.750000000 GHz
-20.0 -30.0 -40.0						DL1 -18	<u></u>	Start Freq 3.000000000 GHz
-50.0 -60.0	and the second		*****	apand-1934, ang frank	ى <sub>يە</sub> مجىلەر <sub>ت</sub> ەكتىرىي	and a family of the standard		Stop Freq 26.50000000 GHz
Center 14 #Res BW	100 kHz	×	BW 300 kHz	FUNCTION	Sweep	Span 23.50 2.246 s (1001	pts)	CF Step 2.350000000 GHz <u>Auto</u> Man
1 N 2 3 4 5 6 7	1 f (Δ)	26.406 0 GHz	(Δ) -50.86 dE	Im				Freq Offset 0 Hz
7 8 9 10 11								Scale Type
A MSG			17		STATU	15	-	

#### **Spurious Emission Test Data CH-Mid**

							Analyzer - Swej		night Spec	
Frequency	03:11:04 PM Aug 17, 2018 TRACE 1 2 3 4 5 6	g Type: Log-Pwr		Trig: Free R	z	0000 GH		req	ter Fr	Cen
Auto Tune	r1 2.441 6 GHz 1.35 dBm	Mki		#Atten: 20 d	NO:Fast G Sain:Low	4 dB	Offset 10.		3/div	10 di
Center Fred 1.515000000 GHz	<b>♦</b> <sup>1</sup>									10.0 0.00
Start Free 30.000000 MHz	DL1 -17.60 (Bn									-20.0 -30.0 -40.0
Stop Free 3.000000000 GH	Veryen of the color of the color	mage, man and	de le secrit de	يندون وروي وروي وروي وروي وروي وروي وروي ور	nug Militiane La	م <sub>ور ع</sub> ام المراجع	hand and particulation of		ووروند	-50.0 -60.0 -70.0
CF Step 297.000000 MH <u>Auto</u> Mar	Span 2.970 GHz 33.9 ms (1001 pts)	Sweep 28	EUNOTIO	300 kHz		×	kHz	100	ter 1.5 s BW	#Re
Freq Offse 0 H				1.35 dBm	6 GHz (Δ)	2.441	(Δ)	1	N 1	1 2 3 4 5 6
Scale Type										7 8 9 10
							,	'		-
		STATUS								M5G

Keysight Sp	ectrum Analyzer -										
enter F		0000000 G	Hz	1	Run	Avg Type	: Log-Pwr	TRA	MAug 17, 2018 DE 1 2 3 4 5 6 PE MWWWWW FT P NNNNN	Fre	equency
10 dB/div	Ref Offset Ref 20.0	10.4 dB	Gain:Low	#Atten: 20			МК	r1 4.88	0 0 GHz 64 dBm		Auto Tun
og 10.0 0.00											enter Fre
20.0									DL1 -17.60 dBn	3.000	Start Fre
0.0 0.0 0.0	-	the water and	, where we have a second		hey, nam	لەدەم ورو ۋېز گېرىم	e tak kunstriden	a dalla in pakadan	and a second	26.500	<b>Stop Fr</b> 0000000 G
	4.75 GHz 100 kHz	×	#VBV	/ 300 kHz	FUN		Sweep	2.246 s (	3.50 GHz 1001 pts)	2.350 <u>Auto</u>	CF St 0000000 G M
1 N 2 3 4 5	1 f (Δ)	4.880	0 GHz (Δ)	-49.64 dB	Im					·	Freq Offs 0
4 5 7 8 9 0										Log	Scale Ty
				10						<u> </u>	

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#### **Spurious Emission Test Data CH-High**

🔤 Keysight Sp												
Center F	Freq 1	.5150	00000 GI			NSE:INT	Avg Type	: Log-Pwr	TRA	MAug 17, 2018 CE 1 2 3 4 5 6 PE MWWWWW		requency
10 dB/div		Offset 10 20.00	1F	NO: Fast G Gain:Low	#Atten: 2			MK	r1 2.45	6 5 GHz 63 dBm		Auto Tune
10.0 0.00									<b>∳</b> <sup>1</sup>			Center Free 5000000 GH
20.0 -30.0 -40.0										DL1 -20.06 dBm	з	Start Free
60.0 60.0 70.0	****	, waran kan	www.	بالار والمعاولة	a a sub-state of the second				hunn	-	3.00	Stop Fre
Center 1 Res BW	100	Hz	×		W 300 kHz	EUN	CTION FUN		83.9 ms	2.970 GHz (1001 pts)	29 Auto	CF Stej 7.000000 MH Ma
1 N 2 3 4 5 6	1 1	(Δ)	2.456	5 GHz Δ	-2.63 di	Bm						Freq Offse 0 H
7 8 9 10											Log	Scale Type
11						-						<u></u>
190								STATUS	в			

Center Fre	RF 50 Ω	DC							
	eq 14.7500	00000 GHz		NSE:INT	Avg Type	Log-Pwr	TRAC	Aug 17, 2018 E 1 2 3 4 5 6	Frequency
10 dB/div	Ref Offset 10. Ref 20.00 d					Mkr	1 26.241	5 GHz 79 dBm	Auto Tu
10.0 0.00									Center Fr 14.750000000 G
30.0								01.1 -20.06 dBm	Start Fr 3.000000000 G
50.0 60.0	an a	and the second		and the second second	4.2,1940-85-4-78			مىرىمەلىيەتىيە مەرىيەتىيەتىيەت	Stop Fr 26.50000000 G
enter 14. Res BW 1	100 kHz	×	/BW 300 kHz	FUNC	TION FUN		Span 2 2.246 s (1		CF Ste 2.350000000 G Auto M
1 N 1 2 3 4 5	f (Δ)	26.241 5 GHz	(Δ) -50.79 di	Bm					Freq Offs
2 3 4 5 7 8 9 10								=	Scale Typ
11 <						STATUS		•	Log L

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# 11 RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT

## **11.1 Standard Applicable**

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands must also comply with the §15.209 limit as below.

And according to §15.33(a) (1), for an intentional radiator operates below 10GHz, the frequency range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.

Frequency (MHz)	Field strength (microvolts/meter)	Distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

### Note:

- 1. The lower limit shall apply at the transition frequencies.
- 2. Emission level ( $dB\mu V/m$ ) = 20 log Emission level ( $dB\mu V/m$ )

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## **11.2 Measurement Equipment Used:**

		966 Chamber			
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.
ТҮРЕ		NUMBER	NUMBER	CAL.	
Broadband Antenna	TESEQ	CBL 6112D	35243	2017/11/10	2018/11/09
Horn Antenna	Schwarzbeck	BBHA9120D	1187	2018/01/04	2019/01/03
Horn Antenna	SCHWAZBECK	BBHA9170	184	2017/12/12	2018/12/11
Loop Antenna	ETS.LINDGREN	6502	148045	2017/09/26	2018/09/25
EMI Test Receiver	R&S	ESU 40	100363	2018/04/11	2019/04/10
Pre-Amplifier	EMC Instruments	EMC330	980096	2017/12/26	2018/12/25
Pre-Amplifier	EMC Instruments	EMC0011830	980199	2017/12/26	2018/12/25
Pre-Amplifier	EMC Instruments	EMC184045B	980135	2017/10/27	2018/10/26
Attenuator	Marvelous	WATT-218FS-10	RF246	2017/12/26	2018/12/25
Highpass Filter	Micro Tronics	BRM50701-01	G008	2017/12/26	2018/12/25
Coaxial Cable	Huber+Suhner	RG 214/U	W21.01	2017/12/26	2018/12/25
Coaxial Cable	Huber Suhner	EMC106-SM-SM-7 200	150703	2017/12/26	2018/12/25
Coaxial Cable	Huber Suhner	SUCOFLEX 104	MY17388/4	2017/12/26	2018/12/25
Coaxial Cable	Huber Suhner	RG 214/U	W22.03	2017/12/26	2018/12/25
Notebook	Lenovo	T470	P0001293	N/A	N/A

NOTE: N.C.R refers to Not Calibrated Required.

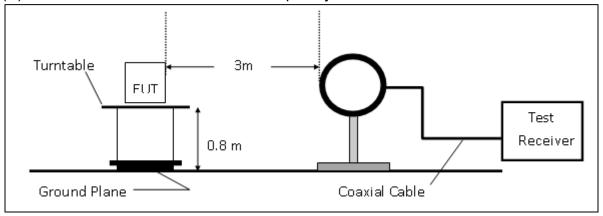
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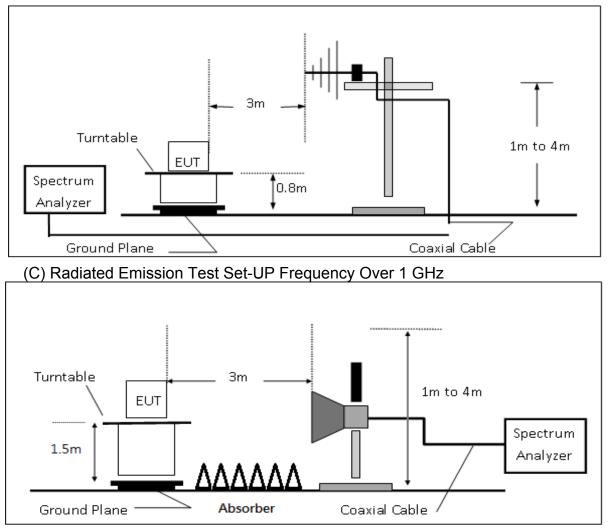


## 11.3 Test SET-UP

(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



# (B) Radiated Emission Test Set-Up, Frequency form 30MHz to 1000MHz



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## **11.4 Measurement Procedure**

- 1. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
- 2. The EUT was placed on a turn table with 0.8m for frequency< 1GHz and 1.5m for frequency> 1GHz above ground plane.
- 3. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
- 4. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
- 5. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.
- 6. Set the spectrum analyzer as RBW=120 kHz and VBW=300 kHz for Peak Detector (PK) and Quasi-peak (QP) at frequency below 1 GHz.
- 7. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz for Peak Detector at frequency above 1 GHz.
- 8. Set the spectrum analyzer as RBW=1 MHz, VBW=10 Hz (Duty cycle > 98%) or VBW ≥ 1/T (Duty cycle < 98%) for Average Detector at frequency above 1 GHz.
- 9. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- 10. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 11. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. On spectrum, change spectrum mode in linear display mode, and reduce VBW = 10Hz if average reading is measured.
- 12. Repeat above procedures until all default test channel measured were complete.

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## 11.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

## FS = RA + AF + CL - AG

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) – Pre\_Amplifier Gain(dB)

## 11.6 Test Results of Radiated Spurious Emissions form 9 kHz to 30 MHz

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit per 15.31(o) was not reported.

## **11.7 Measurement Result**

Note: Refer to next page spectrum analyzer data chart and tabular data sheets.

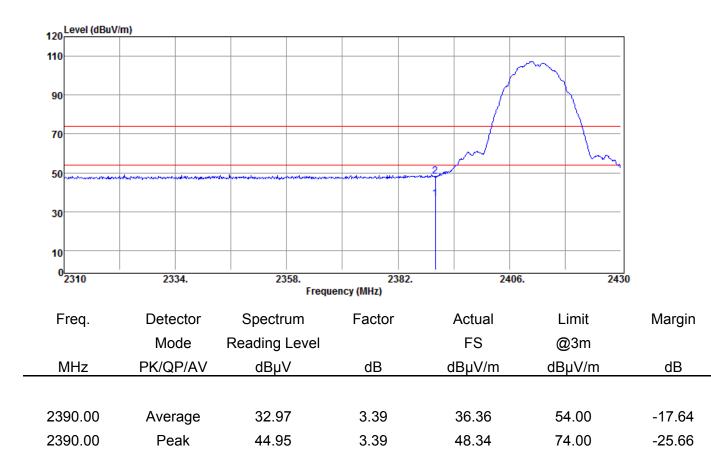
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## Radiated Band Edge Measurement Result (802.11b)

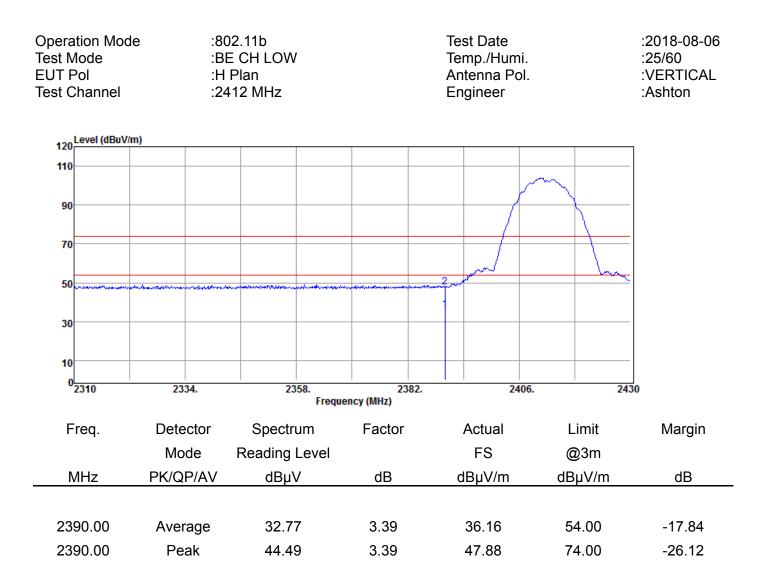
Operation Mode Test Mode EUT Pol Test Channel :802.11b :BE CH LOW :H Plan :2412 MHz Test Date Temp./Humi. Antenna Pol. Engineer :2018-08-06 :25/60 :HORIZONTAL :Ashton



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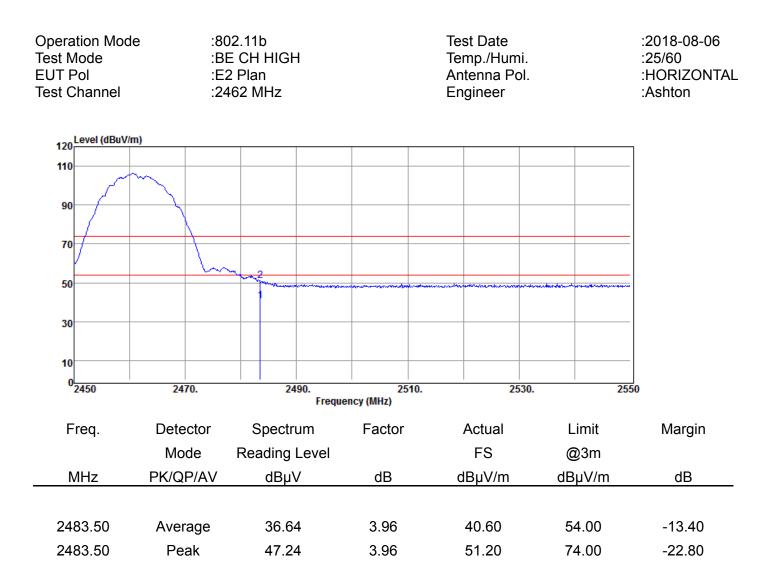
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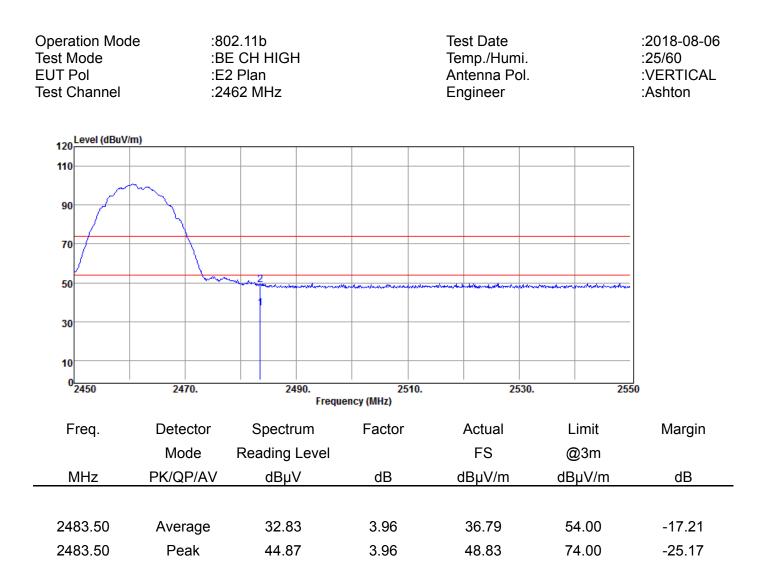
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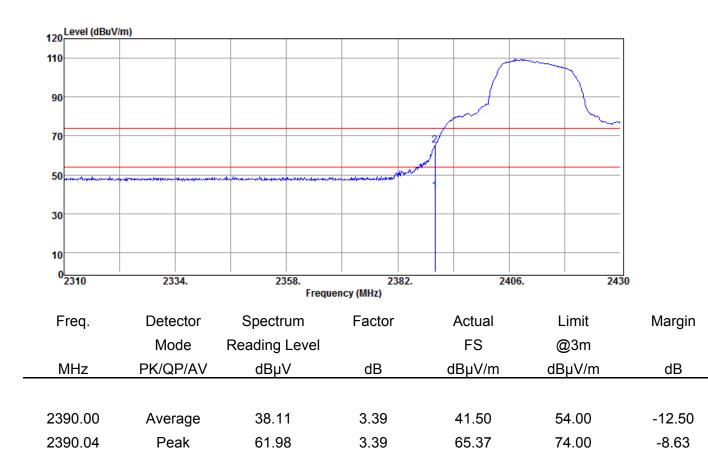


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## Radiated Band Edge Measurement Result (802.11g)

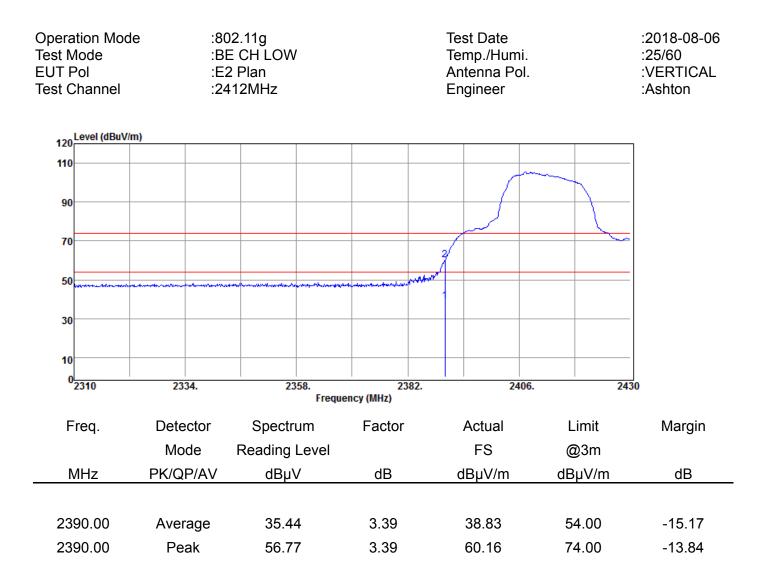
Operation Mode Test Mode EUT Pol Test Channel :802.11g :BE CH LOW :E2 Plan :2412MHz Test Date Temp./Humi. Antenna Pol. Engineer :2018-08-06 :25/60 :HORIZONTAL :Ashton



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Operation Mod Test Mode EUT Pol Test Channel	:BE :E2	02.11g E CH HIGH 2 Plan 662 MHz		Test Date Temp./Humi. Antenna Pol. Engineer		:2018-08-06 :25/60 :HORIZONTAL :Ashton
120 Level (dBuV/r	n)					_
110						
	man 1					
90	1					
70	and the second s	The loss				:
50				- and the second s		- -
30						-
10						
0 <mark></mark> 2450	2470.	2490.	2510.	2530.	25	50
		Freque	ency (MHz)			
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	Average	42.49	3.96	46.45	54.00	-7.55
2483.50	Peak	66.31	3.96	70.27	74.00	-3.73



Test M EUT P		:	802.11g BE CH HIGH E2 Plan 2462 MHz		Test Date Temp./Hu Antenna I Engineer	mi.	:2018-08-06 :25/60 :VERTICAL :Ashton
120	.evel (dBuV/m)						
120							
90-							
70			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~				
50			B	Manager - Antonio - Manager and - Manager	e		man and a second se
30							
10							—
0 <u></u> 2	2450	2470.	249	90. Frequency (MHz)	2510.	2530.	2550
_			<b>a</b> <i>i</i>				
Fr	req.	Detector	Spectru			Limit	Margin
		Mode	Reading L	_evel	FS	@3m	
M	1Hz	PK/QP/AV	′ dBµV	′ dB	dBµV/m	dBµV/m	dB
248	33.50	Average	36.64	3.96	40.60	54.00	-13.40
248	33.50	Peak	57.31	3.96	61.27	74.00	-12.73
248	33.80	Average	36.41	3.96	40.37	54.00	-13.63
248	33.80	Peak	57.64	3.96	61.60	74.00	-12.40



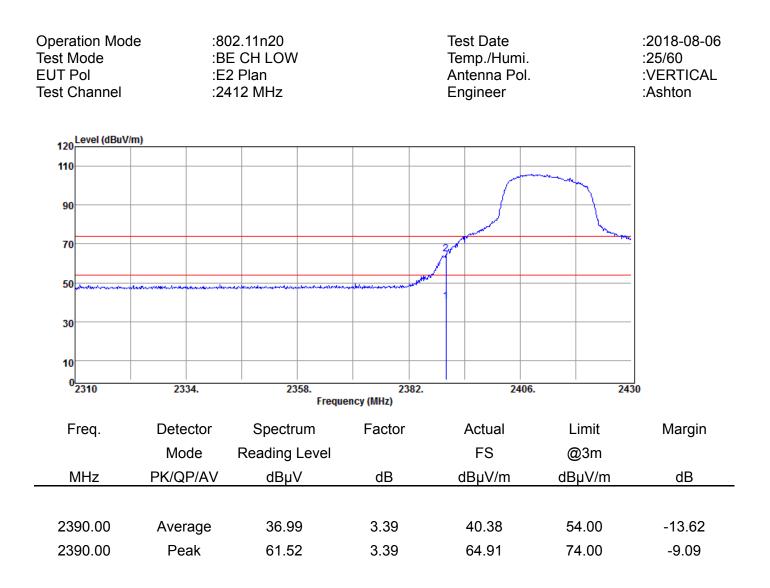
### Radiated Band Edge Measurement Result (802.11 HT20)

Opera Test M EUT P	tion Mode lode	-	:80 :Bl :E:	D2.11n20 E CH LOW 2 Plan 412 MHz	Test Date Temp./Humi. Antenna Pol. Engineer			:2018-08-06 :25/60 :HORIZONTAL :Ashton			
120	Level (dBuV/n	n)									_
110											
90								ſ			
								- American and a second		June Prove	
70							21				
50		hadiga ng sang sang sang sang sang sang sang	and the second	mber and a second s	mentenentration	and an and a state of the second	1 WWW				
30											
10											
	2310	23	24		58.		82.		406.	243	]
	2310	23	54.	23		zə ncy (MHz)	82.	2	400.	24.	00
F	req.	Dete	ctor	Spectr	um	Factor		Actual	L	_imit	Margin
		Мо	de	Reading	Level			FS	(	2)3m	
. N	/Hz	PK/Q	P/AV	dBµ∖	/	dB	(	dBµV/m	dE	8µV/m	dB
239	90.00	Aver	age	40.0	6	3.39		43.45	5	4.00	-10.55
239	90.00	Pe	ak	66.62	2	3.39		70.01	7	4.00	-3.99

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Operation Mo Test Mode EUT Pol Test Channel	:BI :E2	02.11n20 E CH HIGH 2 Plan 462 MHz		Test Date Temp./Humi. Antenna Pol. Engineer		:2018-08-06 :25/60 :HORIZONTAL :Ashton
120 Level (dBu	V/m)					7
110						
$\int$						
90						-
70		Mar and a state of the state of				
50			enternanteration and and a second	water water and the second second	useninturen turenetaringunsidariha	
30						
10						-
0 <mark>2450</mark>	2470.	2490.	2510. ency (MHz)	2530.	25	50
_						
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	Average	42.16	3.96	46.12	54.00	-7.88
2483.50	Peak	67.21	3.96	71.17	74.00	-2.83



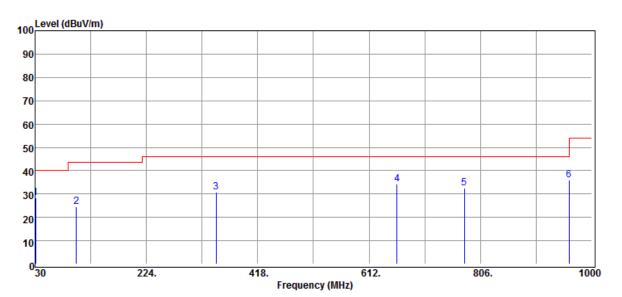
Operation Mod Test Mode EUT Pol Test Channel	:B :E:	02.11n20 E CH HIGH 2 Plan 462 MHz		Test Date Temp./Humi. Antenna Pol. Engineer			
120 Level (dBuV/	m)					7	
110							
	maran and						
90							
70	- have	nHinh manuel					
50		1 march March	and the second	heter for a stand and the stand of the stand and the st	Balankating-Albankangkangtang-palitikatif		
30							
10							
0 2450	2470.	2490. Freque	2510. ency (MHz)	2530.	25	50	
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin	
	Mode	Reading Level		FS	@3m		
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	
2483.50	Average	36.65	3.96	40.61	54.00	-13.39	
2483.50	Peak	59.58	3.96	63.54	74.00	-10.46	



## Below 1GHz Worst-Case Data:

## Radiated Spurious Emission Measurement Result (802.11 g)

Operation Mode	:802.11g	Test Date	:2018-08-07
Test Mode	:TX CH LOW	Temp./Humi.	:24/64
EUT Pol	:H Plan	Antenna Pol.	:VERTICAL
Test Channel	:2412 MHz	Engineer	:Ashton



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
30.97	Peak	32.71	-4.16	28.55	40.00	-11.45
101.78	Peak	39.22	-14.49	24.73	43.50	-18.77
345.25	Peak	38.99	-8.13	30.86	46.00	-15.14
660.50	Peak	36.49	-2.19	34.30	46.00	-11.70
777.87	Peak	33.15	-0.78	32.37	46.00	-13.63
960.23	Peak	33.82	2.32	36.14	54.00	-17.86

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Operation Mod Test Mode EUT Pol Test Channel	:T) :H	02.11g X CH LOW Plan 412 MHz		Test Date Temp./Humi. Antenna Pol. Engineer		:2018-08-07 :24/64 :HORIZONTAL :Ashton
100 Level (dBuV/	m)		1			7
90						
80						
70						
60						
50						
40	J		5	•	6	
30	2 3	4				
20						
10						
0 <mark>30</mark>	224.	418.	612.	806.	10	 00
		Freque	ency (MHz)			
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
46.49	Peak	50.19	-13.55	36.64	40.00	-3.36
231.76	Peak	42.09	-12.32	29.77	46.00	-16.23
285.11	Peak	39.94	-10.16	29.78	46.00	-16.22
440.31	Peak	36.56	-5.73	30.83	46.00	-15.17
652.74	Peak	37.64	-2.30	35.34	46.00	-10.66
960.23	Peak	37.30	2.32	39.62	54.00	-14.38



Operation Mode Test Mode EUT Pol Test Channel	:T) :H	02.11g X CH MID Plan 137 MHz		:2018-08-07 :24/64 :VERTICAL :Ashton		
100 Level (dBuV/n	n)					_
90						
80						
70						
60						
50						
40				5	6	
30		3 4				
20						
10						
0 <mark>10 30</mark>	224.	418. Freque	612. ency (MHz)	806.	10	DO
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
rieq.	Mode	Reading Level	T actor	FS	@3m	Wargin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
				- <b>I</b>		-
33.88	Peak	34.01	-5.73	28.28	40.00	-11.72
101.78	Peak	38.91	-14.49	24.42	43.50	-19.08
345.25	Peak	37.33	-8.13	29.20	46.00	-16.80
421.88	Peak	36.54	-5.85	30.69	46.00	-15.31
660.50	Peak	36.37	-2.19	34.18	46.00	-11.82
961.20	Peak	32.73	2.34	35.07	54.00	-18.93



Operation Mod Test Mode EUT Pol Test Channel	:T) :H	02.11g X CH MID Plan 437 MHz		Test Date Temp./Humi. Antenna Pol. Engineer		:2018-08-07 :24/64 :HORIZONTAL :Ashton
100 Level (dBuV/ 90	m)					
80						
70						
60						
50					6	
40	2	3		4 5		
30 20						
10						
030	224.	418.	612.	806.	100	
50	224.		ency (MHz)	800.	100	0
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
30.97	Peak	32.37	-4.16	28.21	40.00	-11.79
287.05	Peak	40.33	-10.15	30.18	46.00	-15.82
440.31	Peak	36.66	-5.73	30.93	46.00	-15.07
660.50	Peak	33.98	-2.19	31.79	46.00	-14.21
776.90	Peak	33.70	-0.80	32.90	46.00	-13.10
960.23	Peak	37.09	2.32	39.41	54.00	-14.59



Operation Mode Test Mode EUT Pol Test Channel	:T) :H	02.11g X CH HIGH Plan 462 MHz		Test Date Temp./Humi. Antenna Pol. Engineer					
100 Level (dBuV/r	n)					1			
90									
80									
70									
60									
50									
40				4 5	6				
30 2		3							
20									
10									
0 <mark>30</mark>	224.	418. Freque	612. ency (MHz)	806.	100	0			
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin			
	Mode	Reading Level		FS	@3m				
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB			
31.94	Peak	33.64	-4.71	28.93	40.00	-11.07			
96.93	Peak	38.36	-15.26	23.10	43.50	-20.40			
345.25	Peak	36.61	-8.13	28.48	46.00	-17.52			
660.50	Peak	36.13	-2.19	33.94	46.00	-12.06			
729.37	Peak	34.66	-1.45	33.21	46.00	-12.79			
960.23	Peak	33.31	2.32	35.63	54.00	-18.37			



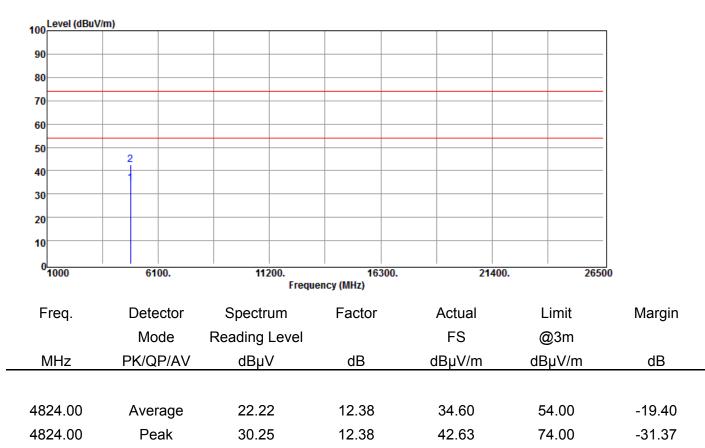
Operation Mod Test Mode EUT Pol Test Channel	:TX :H	02.11g K CH HIGH Plan 462 MHz		Test Date Temp./Humi. Antenna Pol. Engineer					
100 Level (dBuV/	m)					7			
90									
80									
70									
60									
50									
40				4	5				
30	2								
20									
10									
0 <mark>30</mark>	224.	418.	612.	806.	10	 00			
			ency (MHz)						
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin			
	Mode	Reading Level		FS	@3m				
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB			
30.97	Peak	32.70	-4.16	28.54	40.00	-11.46			
165.80	Peak	38.54	-13.67	24.87	43.50	-18.63			
231.76	Peak	42.83	-12.32	30.51	46.00	-15.49			
776.90	Peak	34.59	-0.80	33.79	46.00	-12.21			
934.04	Peak	33.35	1.78	35.13	46.00	-10.87			
960.23	Peak	38.67	2.32	40.99	54.00	-13.01			



## Above 1GHz Data:

### Radiated Spurious Emission Measurement Result (802.11 b)

Operation Mode	:802.11b	Test Date	:2018-08-06
Test Mode	:TX CH LOW	Temp./Humi.	:23/66
EUT Pol	:H Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:2412 MHz	Engineer	:Enzo
		-	



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Operatic Test Mod EUT Pol Test Cha	de I		:TX :H	)2.11b ( CH LOW Plan 12 MHz	,		:2018-08-06 :23/66 :VERTICAL :Enzo				
100 Lev	vel (dBuV/m)										
90											_
80											_
70											_
60											_
50											_
40		2									_
30											_
20											_
10											-
0 <mark>0</mark>	00	61	00.	112	200.	163	00.	21	400.	26	500
					Freque	ency (MHz)					
Fre	eq.	Dete	ector	Spectr	um	Factor		Actual		Limit	Margin
		Мо	de	Reading	Level			FS	(	@3m	
MH	lz	PK/Q	P/AV	dBµ\	/	dB		dBµV/m	dE	3µV/m	dB
4824	.00	Aver	age	22.24	4	12.38		34.62	Ę	54.00	-19.38
4824	.00	Pe	ak	30.30	6	12.38		42.74	7	4.00	-31.26



Operation M Test Mode EUT Pol Test Channe		:802.11b :TX CH MID :H Plan :2437 MHz		Test Date Temp./Hui Antenna F Engineer	:2018-08-06 :23/66 :HORIZONTAL :Enzo	
100 Level (dE	BuV/m)					
90						
80						
70						_
60						
50	2					_
40						—
30						—
20						—
10						
0 1000	6100.	112	00. 163 Frequency (MHz)	300. 2	1400. 2	6500
Freq.	Detect	or Spectru	um Factor	Actual	Limit	Margin
	Mode	e Reading L	_evel	FS	@3m	
MHz	PK/QP/	AV dBµV	′ dB	dBµV/m	dBµV/m	dB
4874.00	Averaç	ge 34.33	3 12.58	46.91	54.00	-7.09
4874.00	Peak	37.32	2 12.58	49.90	74.00	-24.10



Operation Mode Test Mode EUT Pol Test Channel	:TX CH MIDTemp./Humi.:H PlanAntenna Pol.:2437 MHzEngineer					
100 Level (dBuV/m)						
90						
80						
70						
60						
50 2						
40						
30						
20						
10						
0 <sup>L</sup> 1000	6100. 112	200. 163 Frequency (MHz)	600. 2140	00. 2650	0	
Freq. D	Detector Spectr	um Factor	Actual	Limit	Margin	
	Mode Reading	Level	FS	@3m	-	
MHz Pł	K/QP/AV dBµ\	√ dB	dBµV/m	dBµV/m	dB	
4874.00 A	Average 37.63	3 12.58	50.21	54.00	-3.79	
4874.00	Peak 39.7	5 12.58	52.33	74.00	-21.67	



Operat Test M EUT P Test Cl	ol	e	:802.11bTest Date:TX CH HIGHTemp./Hun:H PlanAntenna Pois:2462 MHzEngineer								:2018-08-06 :23/66 :HORIZONTAL :Enzo
100 <sup>L</sup>	.evel (dBuV/n	n)									
90											_
30 80-											_
70											_
60-											_
50											_
40		2									_
30											_
20											_
10											-
0	000	61	00.	11:	200.	163	00.	214	400.	265	500
						ency (MHz)					
Fr	req.	Dete	ector	Spectr	um	Factor		Actual	L	_imit	Margin
		Мо	de	Reading	Level			FS	(	⊉3m	
M	lHz	PK/Q	P/AV	dBµʻ	V	dB		dBµV/m	dE	βµV/m	dB
492	24.00	Aver	rage	23.9	0	12.78		36.68	5	4.00	-17.32
492	24.00	Pe	ak	30.9	2	12.78		43.70	7	4.00	-30.30



Operation Test Mode EUT Pol Test Chan	9	e :802.11b :TX CH HIGH :H Plan :2462 MHz					Te A	est Date emp./Hum ntenna Po ngineer	:2018-08-06 :23/66 :VERTICAL :Enzo		
100 Level	(dBuV/m)										_
90											
80											-
70											-
60											_
50		-									
40		2									
30											-
20											-
10											-
0					000	163	00		400	265	
1000		61(	J <b>U</b> .	112	200. Freque	ncy (MHz)	00.	21	400.	205	00
Freq.		Dete	ctor	Spectr	um	Factor		Actual	L	.imit	Margin
		Мо	de	Reading	Level			FS	C	)3m	
MHz	F	PK/Q	P/AV	dBµ∖	/	dB		dBµV/m	dB	μV/m	dB
4924.0	00	Aver	age	27.3	C	12.78		40.08	5	4.00	-13.92
4924.0	00	Pe	ak	32.6	7	12.78		45.45	7	4.00	-28.55

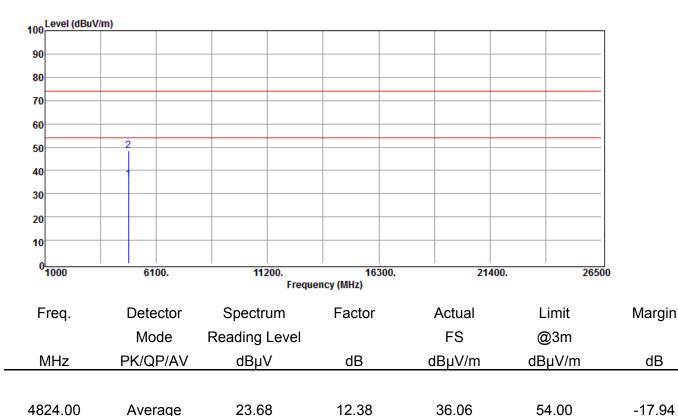


4824.00

Peak

### Radiated Spurious Emission Measurement Result (802.11 g)

Operation Mode	:802.11g	Test Date	:2018-08-06
Test Mode	:TX CH LOW	Temp./Humi.	:23/66
EUT Pol	:H Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:2412 MHz	Engineer	:Enzo
		-	



12.38

48.30

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35.92

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74.00

-25.70



Operation N Test Mode EUT Pol Test Chann		:TX CH LOWTemp./Humi.:H PlanAntenna Pol.:2412 MHzEngineer						:2018-08-06 :23/66 :VERTICAL :Enzo		
100 Level (d	BuV/m)									_
90										
80										
70										-
60										-
50	2									-
40										-
30										-
20										
10										-
0 <mark></mark>	6	100.	11:	200.	163	300.	21	400.	265	
	-				ncy (MHz)					
Freq.	Det	ector	Spectr	um	Factor		Actual	L	_imit	Margin
	М	ode	Reading	Level			FS	(	2)3m	
MHz	PK/0	QP/AV	dBµ\	/	dB		dBµV/m	dE	βµV/m	dB
4824.00	Ave	erage	24.4	5	12.38		36.83	5	4.00	-17.17
4824.00	P	eak	36.6	9	12.38		49.07	7	4.00	-24.93



Operati Test Mo EUT Po Test Ch	ol	e	:T: :H	02.11g X CH MID Plan 437 MHz			۲ ۲ ۴ E	:2018-08-06 :23/66 :HORIZONTAL :Enzo			
100	evel (dBuV/m	n)									_
90											_
80-											-
70											-
60											_
50		2									-
40											_
30											-
20											-
10											-
0	000	61	<b>00.</b>	11:	200. Freque	163 ncy (MHz)	00.	21	400.	265	00
Fre	eq.	Dete	ector	Spectr	um	Factor		Actual	L	_imit	Margin
		Мо	de	Reading	Level			FS	(	2)3m	
Μ	Hz	PK/Q	P/AV	dBµ	V	dB		dBµV/m	dE	βµV/m	dB
487	4.00	Aver	rage	28.7	0	12.58		41.28	5	4.00	-12.72
487	4.00	Pe	ak	40.2	3	12.58		52.81	7	4.00	-21.19



Operation Mod Test Mode EUT Pol Test Channel	:T :H	02.11g X CH MID I Plan 437 MHz		Test Date Temp./Humi. Antenna Pol. Engineer		:2018-08-06 :23/66 :VERTICAL :Enzo
100 Level (dBuV	//m)					-
90						-
80						_
70						-
60	2					-
50	1					-
40						-
30						-
20						-
10						-
0 <sup>L</sup> 1000	6100.	11200. Freque	16300. ency (MHz)	. 21400.	265	 00
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4874.00	Average	31.03	12.58	43.61	54.00	-10.39
4874.00	Peak	43.41	12.58	55.99	74.00	-18.01



Operation Test Mode EUT Pol Test Char	9		:802.11g :TX CH HI :H Plan :2462 MH:	-		Te A	est Date emp./Hun ntenna Po ngineer			:2018-08-06 :23/66 :HORIZONTAL :Enzo
100	(dBuV/m)									-
90										_
80										_
70										-
60										_
50										-
40		2								_
30										_
20										
10										-
0 <sup>L</sup> 1000		6100.		11200. Frequ	163 ency (MHz)	00.	21	400.	265	00
Freq.		Detecto	or Spe	ctrum	Factor		Actual	L	imit	Margin
		Mode	Readii	ng Level			FS	(	2)3m	
MHz	F	PK/QP/A	AV de	βμV	dB		dBµV/m	dB	βµV/m	dB
4924.0	00	Average	e 20	).77	12.78		33.55	5	4.00	-20.45
4924.0	00	Peak	33	8.40	12.78		46.18	7	4.00	-27.82

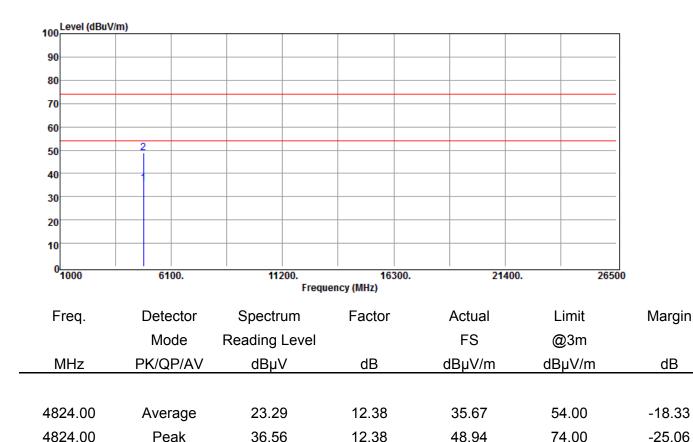


Operation Mode Test Mode EUT Pol Test Channel	:802.11g :TX CH HIGH :H Plan :2462 MHz		Test Date Temp./Humi. Antenna Pol. Engineer		:2018-08-06 :23/66 :VERTICAL :Enzo
100 Level (dBuV/m)					
90					
80					
70					
60					
50					
40					
30					
20					
10					
0 <mark>1000</mark>	6100. 11200. Fr	16300. requency (MHz)	21400.	2650	0
Freq. De	etector Spectrum	Factor	Actual	Limit	Margin
Ν	Node Reading Leve	el	FS	@3m	-
MHz PK/	/QP/AV dBµV	dB	dBµV/m	dBµV/m	dB
4924.00 Av	verage 22.79	12.78	35.57	54.00	-18.43
	<sup>D</sup> eak 35.77	12.78	48.55	74.00	-25.45



#### Radiated Spurious Emission Measurement Result (802.11 HT20)

Operation Mode	:802.11n20	Test Date	:2018-08-06
Test Mode	:TX CH LOW	Temp./Humi.	:23/66
EUT Pol	:H Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:2412 MHz	Engineer	:Enzo
		Ũ	



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Operation N Test Mode EUT Pol Test Chann	el	:T) :H	02.11n20 X CH LOW Plan 412 MHz			T A	ēst Date ēmp./Hum antenna Po Engineer			:2018-08-06 :23/66 :VERTICAL :Enzo
100 Level (d	BuV/m)				1 1				1	7
90										_
80										_
70										-
60										
	2									-
50	Ī									_
40										-
30										_
20										-
10										-
0 <mark>1000</mark>	6'	100.	112		163 ency (MHz)	00.	21	<b>400.</b>	265	 600
				Treque	incy (mriz)					
Freq.	Dete	ector	Spectru	JM	Factor		Actual	L	imit	Margin
	Мо	ode	Reading I	Level			FS	(	2)3m	
MHz	PK/G	P/AV	dBµ∖	/	dB		dBµV/m	dB	βµV/m	dB
4824.00	Ave	rage	24.29	9	12.38		36.67	5	4.00	-17.33
4824.00	Pe	eak	36.04	1	12.38		48.42	7	4.00	-25.58



Operat Test Mo EUT Po Test Ch	ol	e	:T: :H	02.11n20 X CH MID Plan 137 MHz				Fest Date Femp./Hum Antenna Po Engineer			:2018-08-06 :23/66 :HORIZONTAL :Enzo
100	evel (dBuV/m	1)									_
90											_
80											_
70											_
60											_
50		2									_
40		1									-
30											_
20											_
10											-
0	000	61	00.	11	200.	163	00.	21/	400.	265	500
					Frequ	ency (MHz)					
Fr	eq.	Dete	ector	Spectr	um	Factor		Actual	L	.imit	Margin
		Мо	de	Reading	Level			FS	(	@3m	
M	Hz	PK/Q	P/AV	dBµ'	V	dB		dBµV/m	dB	µV/m	dB
487	4.00	Aver	rage	27.3	7	12.58		39.95	5	4.00	-14.05
487	4.00	Pe	ak	39.9	6	12.58		52.54	7	4.00	-21.46



Operation Mode Test Mode EUT Pol Test Channel	:	802.11n20 TX CH MID H Plan 2437 MHz		Test Date Temp./Humi. Antenna Pol Engineer		:2018-08-06 :23/66 :VERTICAL :Enzo
100 Level (dBuV	/m)					_
90						
80						
70						
60	2					
50						
40						
30						
20						
10						
0 <mark>1000</mark>	6100.	11200. Frequ	16300. ency (MHz)	2140	00. 265	_ 00
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	′ dBµV	dB	dBµV/m	dBµV/m	dB
4874.00	Average	29.47	12.58	42.05	54.00	-11.95
4874.00	Peak	41.78	12.58	54.36	74.00	-19.64



Operati Test Mo EUT Po Test Ch	ol	9	:T: :H	)2.11n20 X CH HIGH Plan 462 MHz	ł		•	Test Date Temp./Hum Antenna Po Engineer			:2018-08-06 :23/66 :HORIZONTAL :Enzo
100	evel (dBuV/m	1)									_
90											_
80											_
70											_
60											_
50		2									-
40		—Ī—									-
30											-
20											-
10											-
0	000	61	<b>00.</b>	11:	200. Freque	163 ency (MHz)	00.	21	<b>400.</b>	265	500
Fr	eq.	Dete	ector	Spectr	um	Factor		Actual	L	imit	Margin
		Мо	de	Reading	Level			FS	(	@3m	
Μ	Hz	PK/Q	P/AV	dBµ'	V	dB		dBµV/m	dB	8µV/m	dB
492	4.00	Ave	rage	19.2	8	12.78		32.06	5	4.00	-21.94
492	4.00	Pe	ak	31.3	0	12.78		44.08	7	4.00	-29.92



Operation Mode Test Mode EUT Pol Test Channel	:802.11n20 :TX CH HIGH :H Plan :2462 MHz	-	Test Date Temp./Humi. Antenna Pol. Engineer		:2018-08-06 :23/66 :VERTICAL :Enzo
100 Level (dBuV/m)					
90					
80					
70					
60					
50 2					
40 1					
30					
20					
10					
0 1000 6100		16300. ncy (MHz)	21400.	26500	)
Freq. Detect	tor Spectrum	Factor	Actual	Limit	Margin
Mode	e Reading Level		FS	@3m	
MHz PK/QP/	/AV dBµV	dB	dBµV/m	dBµV/m	dB
4924.00 Avera	ge 21.17	12.78	33.95	54.00	-20.05
4924.00 Peal	-	12.78	46.46	74.00	-27.54



# 12 PEAK POWER SPECTRAL DENSITY

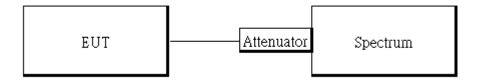
#### **12.1 Standard Applicable**

The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

#### 12.2 Measurement Equipment Used

	Conducted Emission Test Site									
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.					
ТҮРЕ		NUMBER	NUMBER	CAL.						
Spectrum Analyzer	Agilent	N9010A	MY51440113	2018/06/20	2019/06/19					
DC Block	PASTERNACK	PE8210	RF29	2017/12/26	2018/12/25					
Notebook	Lenovo	L420	S0011721	N/A	N/A					
DC Power Supply	Agilent	E3640A	MY53140006	2018/05/30	2019/05/29					
Attenuator	Marvelous	MVE2213-10	RF30	2017/12/26	2018/12/25					
Power Meter	Anritsu	ML2496A	1326001	2018/08/09	2019/08/02					
Power Sensor	Anritsu	MA2411B	1315048	2018/08/09	2019/08/02					
Power Sensor	Anritsu	MA2411B	1315049	2018/08/09	2019/08/02					

#### 12.3 Test Set-up



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#### **12.4 Measurement Procedure**

- 1. Set analyzer center frequency to DTS channel center frequency.
- 2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
- 3. Set the span to 1.5 times the DTS channel bandwidth.
- 4. Set the RBW = 3 kHz & VBW = 10 kHz.
- For defining Restricted Band Edge Limit: Set the RBW = 100kHz & VBW = 300 kHz
- 6. Detector = peak.
- 7. Sweep time = auto couple.
- 8. Trace mode = max hold.
- 9. Allow trace to fully stabilize.
- 10. Use the peak marker function to determine the maximum amplitude level.

#### **12.5 Measurement Result**

	POWER DENSITY 80	)2.11b		POWER DENSITY 802.11g					
Freq.	PPSD	Limit	Result	Freq.	PPSD	Limit	Result		
(MHz)	(dBm)	(dBm)	Result	(MHz)	(dBm)	(dBm)	Result		
2412	-5.97	8.00	PASS	2412	-15.40	8.00	PASS		
2437	-4.07	8.00	PASS	2437	-12.50	8.00	PASS		
2462	-5.77	8.00	PASS	2462	-15.37	8.00	PASS		

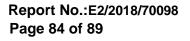
POWER DENSITY 802.11n HT20									
Freq.	PPSD	Limit	Result						
(MHz)	(dBm)	(dBm)	Result						
2412	-14.57	8.00	PASS						
2437	-12.45	8.00	PASS						
2462	-17.78	8.00	PASS						

offset 10.40 dB for SISO mode

\*Refer to next page for plots

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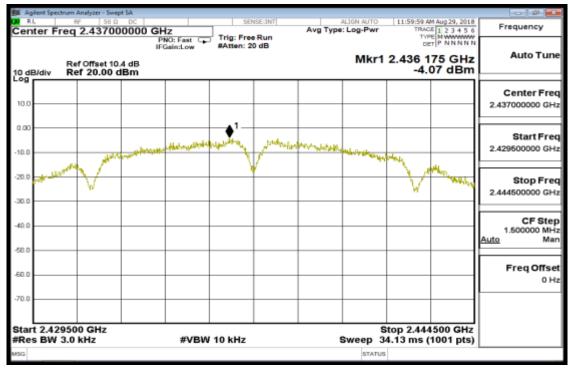




## 802.11b Power Spectral Density Test Plot (CH-Low)



## Power Spectral Density Test Plot (CH-Mid)



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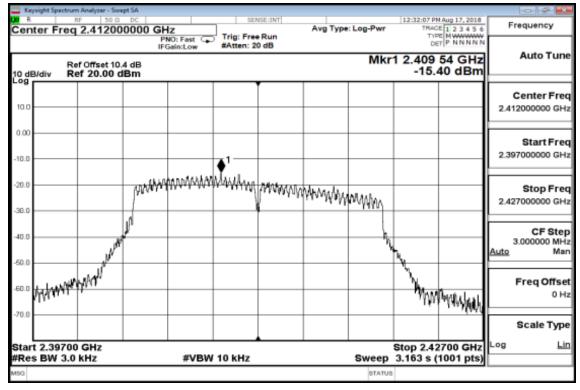


## Power Spectral Density Test Plot (CH-High)



#### 802.11g

## Power Spectral Density Test Plot (CH-Low)

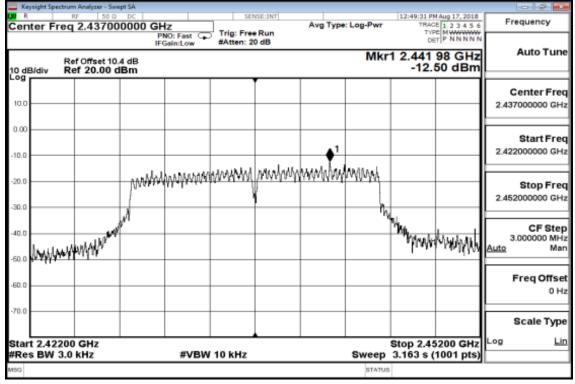


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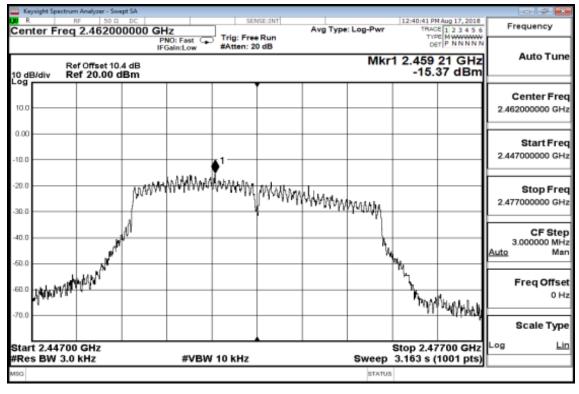
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### **Power Spectral Density Test Plot (CH-Mid)**



#### **Power Spectral Density Test Plot (CH-High)**

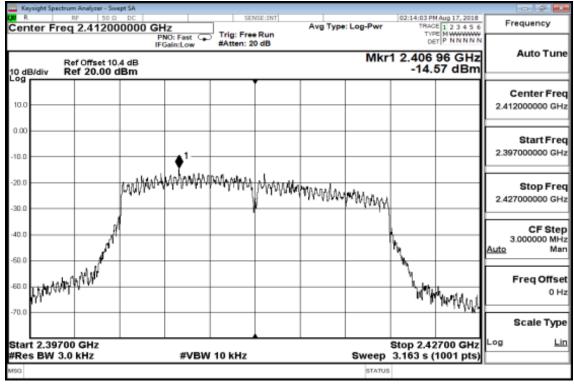


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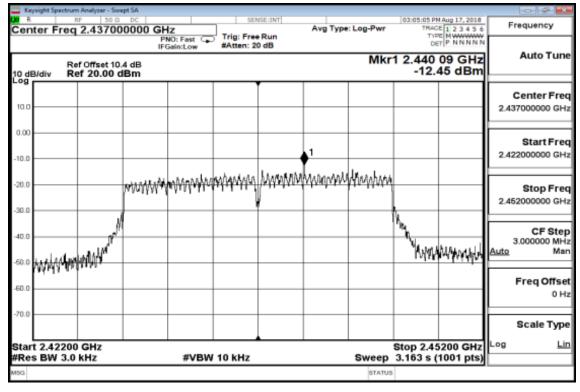
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## 802.11n\_HT20 Power Spectral Density Test Plot (CH-Low)



### Power Spectral Density Test Plot (CH-Mid)

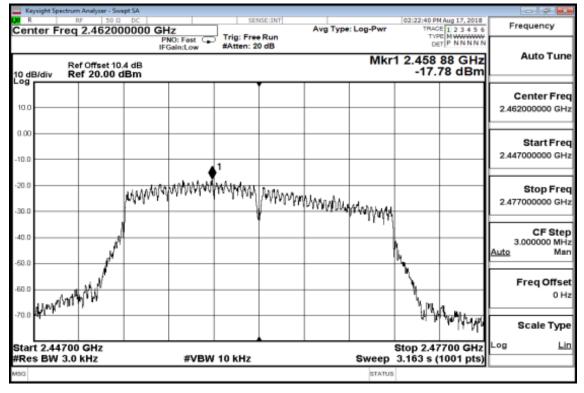


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### **Power Spectral Density Test Plot (CH-High)**



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## **13 ANTENNA REQUIREMENT**

#### **13.1 Standard Applicable**

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by the responsible party shall be used with the device. If the transmitting antenna is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi.

### **13.2 Antenna Connected Construction**

The antenna is designed with unique RF connector and no consideration of replacement. Please see EUT photo for details.

~ End of Report ~

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