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# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

Quanta Computer Inc. Applicant:

No. 188, Wenhua 2nd Road, Guishan District, Taoyuan City

33377, Taiwan

Clover Station Solo **Product Name:** 

**Brand Name:** clover Model No.: C501 **Model Difference:** N/A

**Report Number:** E2/2021/10023

FCC ID HFS-C501

**FCC Rule Part:** §15.247, Cat: DTS

**Issue Date:** February 24, 2021

January 12, 2021 - February 8, 2021 Date of Test:

Date of EUT Received: January 12, 2021

# We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Central RF Lab 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.

Approved By:

Jim Chang / Manager





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Revision History						
Report Number Revision Description Issue Date Revised By						
E2/2021/10023	Rev.00	Original.	February 24, 2021	Susan Lin		

### Note:

1 · Disclaimer

Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.

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# **GENERAL INFORMATION**

## 1.1 Product description

Product Name:	Clover Station Solo
Brand Name:	clover
Model No.:	C501
Model Difference:	N/A
Hardware Version:	N/A
Software Version:	N/A
EUT Series No.:	C051UQ04920067
Power Supply:	24Vdc from AC/DC Adapter

Wi-Fi 802.11	Frequency Range	Channels	Rated Power (dBm)		Modulation Technology	
b			18.70		DSSS	
g	2412-2462	11				
n_HT20			HT:	22.59 (MIMO)	OFDM	
n_HT40	2422-2452	7	HT:	23.57 (MIMO)		
Modulation	type:	type: CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM				
Transistion Rate: 802.17 802.17		802.11 b: 1/2/5.5/11 Mbps 802.11 g: 6/9/12/18/24/36/48/54 Mbps 802.11 n_20MHz: 6.5 – 144.4Mbps 802.11 n_40MHz: 13.5 – 300.0Mbps				

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# 1.2 Antenna Designation

Antenna Type	Supplier	Antenna Part No.	Freq. (MHz)	Peak Antenna Gain (dBi)	Worst Antenna Gain
PCB	Quanta	WIFI-1 antenna	2.4GHz	-1.04	
1 00	Quanta	WIFI-2 antenna	2.4GHz	1.27	V

**Note:** Investigation has been done to determine the worst case scenario for the above antennas demonstrated with measurements in this report.

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# 1.3 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247

FCC KDB 558074 D01 15.247 Meas Guidance v05r02

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

ANSI C63.10:2013

## 1.4 Test Facility

Laboratory	Test Site Address	FCC Designa- tion number
	No.134, Wu Kung Road, New Taipei In-	
SGS Taiwan Ltd.	dustrial Park, Wuku District, New Taipei	TW0027
Central RF Lab.	City, Taiwan.	
(TAF code 3702)	No.2, Keji 1st Rd., Guishan District,	T\\\(\O\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\
	Taoyuan City, Taiwan 333	TW0028

## 1.5 Special Accessories

There are no special accessories used while test was conducted.

# 1.6 Equipment Modifications

There was no modification incorporated into the EUT.

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### 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 a 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. The two LISNs provide 50uH/50 ohm 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 Conducted Test (RF)

The active antenna port of the unlicensed wireless device is connected to the spectrum analyzer with attenuator to protect the instrumentation. If a second antenna port is available, it is tested at one operating frequency, with other port(s) appropriately terminated, to verify it has similar output characteristics as the fully tested port.

#### 2.3.3 Radiated Emissions

The EUT is a placed on a 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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# 2.4 Measurement Results Explanation Example

### 2.4.1 Radiated Emission Test Sites For Measurements From 9 kHz To 30 MHz

Radiated emission below 30MHz is measured in a 9m\*9m\*6m semi-anechoic chamber, the measurements correspond to those obtained at an open-field test site.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

#### 2.4.2 For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.



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# 2.5 Configuration of Tested System

Fig. 2-1 Radiated Emission configuration



Fig. 2-2 Conducted (Antenna Port) Configuration Emission

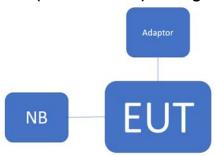


Fig. 2-3 Conducted (AC Power line) Configuration Emission



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

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	WLAN Test Software	N/A	N/A	N/A	N/A	N/A
2.	Notebook	Lenovo	T470	P0001293	N/A	N/A

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# 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)	Emission Bandwidth	Compliant
§15.205 §15.209 §15.247(d)	Radiated & Conducted 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/g/n 20M.

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

7 channels are provided for 802.11n 40M

CHANNEL	FREQUENCY (MHz)
3	2422
4	2427
5	2432
6	2437
7	2442
8	2447
9	2452

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#### 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.

The given UE is pre-scanned among below modes.

Modulation	Transmission Chain	Single Transmission Spatial	Multiple Transmission Spatial
⊠ 802.11 b	☑ Ch0 ☑ Ch1 ☐ Ch2 ☐ Ch3	□ 1TX	⊠ 2TX
⊠ 802.11 g	☑ Ch0 ☑ Ch1 ☐ Ch2 ☐ Ch3	□ 1TX	⊠ 2TX
⊠ 802.11 n	☑ Ch0 ☑ Ch1 ☐ Ch2 ☐ Ch3	□ SISO	⊠ MIMO
□ 802.11 ax	☐ Ch0 ☐ Ch1 ☐ Ch2 ☐ Ch3	□ SISO	☐ MIMO

<sup>4.</sup> Therefore, below summary is the modes of test configuration that yield the highest reading and generate the highest emission chosen to carry out the relevantly mandatory test items.

5. 802.11 b and 802.11 g mode only limit single transmit.

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### 4.3 Radiated Emission Test:

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT		
RADIATED EMISSION TEST (BELOW 1 GHz)							
802.11g	1 to 11	6	OFDM	6	2TX		
802.11n 40M	3 to 9	6	OFDM	MCS 8	MIMO		
	RADIAT	ED EMISSIC	N TEST (ABOVE	1 GHz)			
802.11b	1 to 11	1, 6, 11	DSSS	1	2TX		
802.11g	1 to 11	1, 6, 11	OFDM	6	2TX		
802.11n 20M	1 to 11	1, 6, 11	OFDM	MCS 8	MIMO		
802.11n 40M	3 to 9	3, 6, 9	OFDM	MCS 8	MIMO		

## 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.

### 4.4 Antenna Port Conducted Mesurement:

	CONDUCTED TEST								
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT				
802.11b	1 to 11	1, 6, 11	DSSS	1	2TX				
802.11g	1 to 11	1, 6, 11	OFDM	6	2TX				
802.11n 20M	1 to 11	1, 6, 11	OFDM	MCS 8	MIMO				
802.11n 40M	3 to 9	3, 6, 9	OFDM	MCS 8	MIMO				

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## **MEASUREMENT UNCERTAINTY**

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.34 dB
Peak Output Power	+/- 1 dB
6dB Bandwidth	+/- 1.54 Hz
100 KHz Bandwidth Of Frequency Band Edges	+/- 1.69 dB
Peak Power Density	+/- 1.54 dB
Temperature	+/- 0.4 °C
Humidity	+/- 3.5 %
DC / AC Power Source	DC= +/- 1%, AC= +/- 1%

Radiated Spurious Emission Measurement Uncertainty							
	+/-	2.64	dB	9kHz~30MHz: +-2.3dB			
Polarization: Vertical	+/-	4.93	dB	30MHz - 1000MHz: +/- 3.37dB			
Polarization. Vertical	+/-	4.81	dB	1GHz - 18GHz: +/- 4.04dB			
	+/-	4.52	dB	18GHz - 40GHz: +/- 4.04dB			
	+/-	2.64	dB	9kHz~30MHz: +-2.3dB			
Polarization: Horizontal	+/-	4.45	dB	30MHz - 1000MHz: +/- 4.22dB			
Polarization: Horizontal	+/-	4.81	dB	1GHz - 18GHz: +/- 4.08dB			
	+/-	4.52	dB	18GHz - 40GHz: +/- 4.08dB			

#### Note:

- 1. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
- 2. The conformity assessment statement in this report is based solely on the test results, measurement uncertainty is excluded.

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### **CONDUCTED EMISSION TEST**

## 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 the transition frequencies
- 2. The limit decreases linearly with 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 TYPE	MFR	MFR MODEL NUMBER		LAST CAL.	CAL DUE.				
Test Software	audix	e3	Ver. 6.11- 20180419c	N.C.R	N.C.R				
LISN	SCHWARZBECK Mess-Elektronik	NSLK8127	974	03/25/2020	03/24/2021				
EMI Test Receiver	R&S	ESCI	101342	04/28/2020	04/27/2021				
Coaxial Cable	EC Lab	RF-HY-CAB-250	RF-HY-CAB- 250-01	03/27/2020	03/26/2021				
Pulse Limiter	EC Lab	VTSD 9561F-N	485	03/27/2020	03/26/2021				

### 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.
- 3. The LISN was connected with 120Vac/60Hz power source.

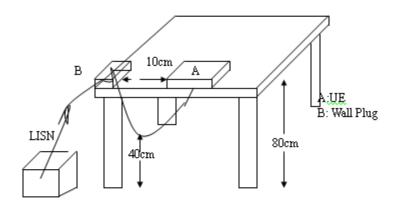
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# 6.4 Test SET-UP (Block Diagram of Configuration)



#### 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

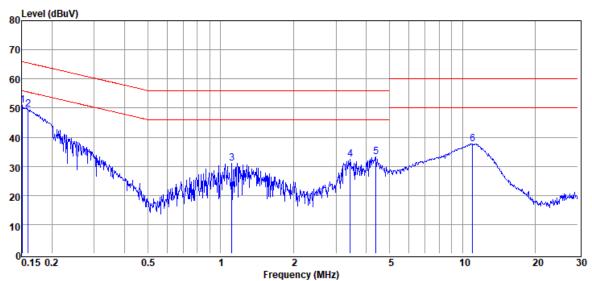
Report Number :E2/2020/10023 Test Site :Conduction Room C

Test Mode :WLAN 2.4G **Test Date** :2021-01-28

Power :120V/60Hz Temp./Humi. :21.2/62

Probe :L1 Engineer :Ashton Chiu

: Adapter:FSP120-AABN3 Note:



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit	Margin
MHz	PK/QP/AV	dΒμV	dB	dΒμV	dΒμV	dB
0.15	Peak	40.58	10.22	50.80	65.91	-15.11
0.16	Peak	39.24	10.22	49.46	65.47	-16.01
1.11	Peak	20.65	10.44	31.09	56.00	-24.91
3.44	Peak	21.90	10.47	32.37	56.00	-23.63
4.38	Peak	22.67	10.49	33.16	56.00	-22.84
11.02	Peak	27.04	10.72	37.76	60.00	-22.24

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MRF分月就好 \* L報告的未開き別規定人株の目長 \* 「同時以後の理味留的人 \* 本程子を発生の主といき、 This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <a href="http://www.sgs.com.tw/Terms-and-Conditions">http://www.sgs.com.tw/Terms-and-Conditions</a>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.



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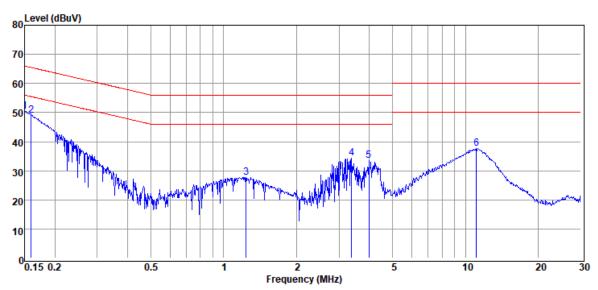
Report Number :E2/2020/10023 **Test Site** :Conduction Room C

Test Mode :WLAN 2.4G **Test Date** :2021-01-28

Power :120V/60Hz Temp./Humi. :21.2/62

Probe :N Engineer :Ashton Chiu

Note: : Adapter:FSP120-AABN3



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit	Margin
MHz	PK/QP/AV	dΒμV	dB	dΒμV	dΒμV	dB
0.15	Peak	40.27	10.21	50.48	66.00	-15.52
0.16	Peak	38.89	10.21	49.10	65.47	-16.37
1.24	Peak	17.29	10.44	27.73	56.00	-28.27
3.38	Peak	23.87	10.48	34.35	56.00	-21.65
3.99	Peak	22.92	10.49	33.41	56.00	-22.59
11.08	Peak	27.03	10.73	37.76	60.00	-22.24

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### **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.

### 7.1 Measurement Procedure:

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

### 7.2 Duty Cycle:

	Duty Cycle (%) = Ton / (Ton+Toff)	Duty Factor (dB) =10*log ( 1/Duty Cycle )	1/T (kHz)	VBW setting (kHz)
802.11b	99.04	0.04	0.08	0.01
802.11g	94.94	0.23	0.48	1.00
802.11n_20	94.58	0.24	0.52	1.00
802.11n_40	90.20	0.45	1.05	2.00

b = 99.043062%, g = 94.942529%,  $n_ht_20 = 94.581281\%$   $n_ht_40 = 90.201729\%$ 

Duty Cycle Factor:  $10 * \log(1/0.99043062) = 0.04$ Duty Cycle Factor:  $10 * \log(1/0.94942529) = 0.23$ Duty Cycle Factor:  $10 * \log(1/0.94581281) = 0.24$ Duty Cycle Factor:  $10 * \log(1/0.90201729) = 0.45$ 

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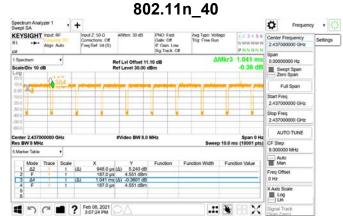
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# 7.3 Duty Cycle test plots







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### 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.

### Note:

As per section F. 2). e). (ii) of FCC KDB 662911 D01

If antenna gains are not equal and each transmit antenna is driven by only one spatial stream, directional gain may be calculated by either of the following formulas.

• Directional Gain = 
$$10 \cdot \log \left[ \frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^{2}}{N_{ANT}} \right]$$

#### where

Each antenna is driven by no more than one spatial stream;

NSS = the number of independent spatial streams of data;

NANT = the total number of antennas

 $g_{j,k} = /20$  10Gk if the kth antenna is being fed by spatial stream j, or zero if it is not;

G<sub>k</sub> is the gain in dBi of the kth antenna.

The antenna gain is not grater than 6 dBi. Therefore, reduction of power is not required.

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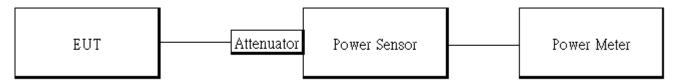
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## 8.2 Measurement Equipment Used

	Conducted Emission Test Site								
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.				
Spectrum Analyzer	KEYSIGHT	N9010B	MY59071573	06/26/2020	06/25/2021				
Power Meter	Anritsu	ML2496A	1512003	07/23/2020	07/22/2021				
Power Sensor	Anritsu	MA2411B	1339378	07/23/2020	07/22/2021				
Power Sensor	Anritsu	MA2411B	1339379	07/23/2020	07/22/2021				
Attenuator	Marvelous	MVE2213-10	RF06	11/19/2020	11/18/2021				
Attenuator	Marvelous	WATT-218FS- 10	RF18	11/19/2020	11/18/2021				
DC Block	PASTERNACK	PE8210	RF153	11/19/2020	11/18/2021				

### 8.3 Test Set-up

Power Meter:



#### **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.

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

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## 8.5 Measurement Result

802.1	1b Ch0					
СН	Freq. (MHz)	Data Rate	Power set	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	1	16	18.70	30.00	PASS
6	2437	1	16	18.52	30.00	PASS
11	2462	1	16	18.30	30.00	PASS
802.1	1b Ch0					
СН	Freq. (MHz)	Data Rate	Power set	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
1	2412	1	16	15.85	30.00	PASS
6	2437	1	16	15.89	30.00	PASS
11	2462	1	16	15.82	30.00	PASS

802.11b Ch1							
СН	Freq. (MHz)	Data Rate	Power set	Peak Output Power (dBm)	Limit (dBm)	RESULT	
1	2412	1	16	18.55	30.00	PASS	
6	2437	1	16	18.43	30.00	PASS	
11	2462	1	16	18.47	30.00	PASS	
802.1	1b Ch1						
СН	Freq. (MHz)	Data Rate	Power set	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT	
1	2412	1	16	15.81	30.00	PASS	
6	2437	1	16	15.62	30.00	PASS	
11	2462	1	16	15.67	30.00	PASS	

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802.1	1g Ch0					
СН	Freq. (MHz)	Data Rate	Power set	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	6	14	18.43	30.00	PASS
6	2437	6	15	18.87	30.00	PASS
11	2462	6	15	18.75	30.00	PASS
802.1	1g Ch0					
СН	Freq. (MHz)	Data Rate	Power set	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
1	2412	6	14	13.41	30.00	PASS
6	2437	6	15	13.38	30.00	PASS
11	2462	6	15	14.30	30.00	PASS

СН	_			802.11g Ch1								
	Freq. (MHz)	Data Rate	Power set	Peak Output Power (dBm)	Limit (dBm)	RESULT						
1	2412	6	14	18.26	30.00	PASS						
6	2437	6	15	18.95	30.00	PASS						
11	2462	6	15	18.64	30.00	PASS						
802.11g	g Ch1											
СН	Freq. (MHz)	Data Rate	Power set	Max. Avg. Output include tune up tolerance Power (dBm) (dBm)		RESULT						
1	2412	6	14	13.26	30.00	PASS						
6	2437	6	15	14.34	30.00	PASS						
11	2462	6	15	14.21	30.00	PASS						

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802.11n_HT20M Ch0								
СН	Freq. (MHz)	Data Rate	Power set	Peak Output Power (dBm)  Limit (dBm)		RESULT		
1	2412	MCS0	13.5	16.75	30.00	PASS		
6	2437	MCS0	15.5	19.62	30.00	PASS		
11	2462	MCS0	15.5	19.45	30.00	PASS		
802.1	1n_HT20 <b>/</b>	√l Ch0						
СН	Freq. (MHz)	Data Rate	Power set	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT		
1	2412	MCS0	13.5	12.54	30.00	PASS		
6	2437	MCS0	15.5	14.84	30.00	PASS		
11	2462	MCS0	15.5	14.67	30.00	PASS		

802.1	1n_HT20l	M Ch1				
СН	Freq. (MHz)	Data Rate	Power set	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	MCS0	13.5	16.62	30.00	PASS
6	2437	MCS0	15.5	19.58	30.00	PASS
11	2462	MCS0	15.5	19.37	30.00	PASS
802.1	1n_HT20I	M Ch1				
СН	Freq. (MHz)	Data Rate	Power set	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
1	2412	MCS0	13.5	13.26	30.00	PASS
6	2437	MCS0	15.5	14.73	30.00	PASS
11	2462	MCS0	15.5	14.60	30.00	PASS

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802.1	1n_HT20l	M MIMO						
СН	Freq.	Data	Power		Output	Total Peak Output Power	Limit	RESULT
СП	(MHz)	Rate	set	Power CH 0 CH 1		(dBm)	(dBm)	RESULT
1	2412	MCS8	13.5	16.21	15.72	18.98	30.00	PASS
6	2437	MCS8	15.5	19.66	19.49	22.59	30.00	PASS
11	2462	MCS8	15.5	19.18	18.80	22.00	30.00	PASS
802.1	1n_HT20l	OMIM N						
				Avg. C	Output	Max. Avg. Output		
СН	Freq.	Data	Power	Po	wer	include tune up	Limit	RESULT
CII	(MHz)	Rate	set	(dE	Bm)	tolerance Power	(dBm)	KLJULI
				CH 0	CH 1	(dBm)		
1	2412	MCS8	13.5	12.46	11.35	15.19	30.00	PASS
6	2437	MCS8	15.5	14.42	14.28	17.60	30.00	PASS
11	2462	MCS8	15.5	13.72	13.68	16.95	30.00	PASS

802.1	1n_HT40/	/I Ch0				
СН	Freq. (MHz)	Data Rate	Power set	Peak Output Power (dBm)	dBm)	
3	2422	MCS0	11.5	16.84	30.00	PASS
6	2437	MCS0	14.5	20.94	30.00	PASS
9	2452	MCS0	11.5	20.14	30.00	PASS
802.1	1n_HT40N	√l Ch0				
СН	Freq. (MHz)	Data Rate	Power set	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
3	2422	MCS0	11.5	10.34	30.00	PASS
6	2437	MCS0	14.5	14.50	30.00	PASS
9	2452	MCS0	11.5	13.74	30.00	PASS

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802.1	802.11n_HT40M Ch1								
СН	Freq. (MHz)	Data Rate	Power set	Peak Output Power (dBm)	Limit (dBm)	RESULT			
3	2422	MCS0	11.5	16.84	30.00	PASS			
6	2437	MCS0	14.5	20.85	30.00	PASS			
9	2452	MCS0	11.5	19.82	30.00	PASS			
802.1°	1n_HT40I	VI Ch1							
СН	Freq. (MHz)	Data Rate	Power set	Max. Avg. Output include tune up tolerance Power (dBm)		RESULT			
3	2422	MCS0	11.5	10.19	30.00	PASS			
6	2437	MCS0	14.5	14.32	30.00	PASS			
9	2452	MCS0	11.5	13.56	30.00	PASS			

802.1	1n_HT40l	OMIM N						
СН	H Freq. Data Power (MHz) Rate set			Po	Output wer	Total Peak Output Power	Limit (dBm)	RESULT
	, ,			CH 0	CH 1	(dBm)	( )	
3	2422	MCS8	11.5	17.15	17.04	20.11	30.00	PASS
6	2437	MCS8	14.5	20.77	20.34	23.57	30.00	PASS
9	2452	MCS8	14	19.54	19.72	22.64	30.00	PASS
802.1	1n_HT40l	OMIM N						
				Avg. C	Output	Max. Avg. Output		
СН	Freq.	Data	Power	Po	wer	include tune up	Limit	RESULT
	(MHz)	Rate	set	(dE	Bm)	tolerance Power	(dBm)	KLJULI
				CH 0	CH 1	(dBm)		
3	2422	MCS8	11.5	10.64	9.98	13.78	30.00	PASS
6	2437	MCS8	14.5	13.63	13.45	17.00	30.00	PASS
9	2452	MCS8	14	13.22	13.08	16.61	30.00	PASS

<sup>\*</sup> Note: The duty cycle factor is compensated toobtain the maximum value of measurement in average.

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### **EMISSION BANDWIDTH MEASUREMENT**

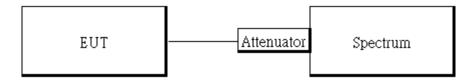
# 9.1 Standard Applicable

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

# 9.2 Measurement Equipment Used

Conducted Emission Test Site									
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.				
Spectrum Analyzer	KEYSIGHT	N9010B	MY59071573	06/26/2020	06/25/2021				
Attenuator	Marvelous	MVE2213-10	RF06	11/19/2020	11/18/2021				
Attenuator	Marvelous	WATT-218FS- 10	RF18	11/19/2020	11/18/2021				
DC Block	PASTERNACK	PE8210	RF153	11/19/2020	11/18/2021				

### 9.3 Test Set-up



### 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. Set the spectrum analyzer as

RBW= 100kHz.

VBW = 3 X RBW

Span= 2 to 5 times of the OBW,

Sweep=auto,

Detector = Peak, and Max hold for -6dB Bandwidth test.

5. Repeat above procedures until all test default channel is completed

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### 9.5 6dB Bandwidth

802.11b Ch0

802.11g Ch0

Freq.	6dB BW	Limit	Result	Freq.	6dB BW	Limit	Result
(MHz)	(kHz)	(kHz)	Nesuit	(MHz)	(kHz)	(kHz)	Nesuit
2412	8070.00	> 500	PASS	2412	15370.00	> 500	PASS
2437	8074.00	> 500	PASS	2437	15180.00	> 500	PASS
2462	7114.00	> 500	PASS	2462	15510.00	> 500	PASS

802.11 n HT20 Ch0

802.11 n HT20 Ch1

Freq.	6dB BW	Limit	Result	Freq.	6dB BW	Limit	Result
(MHz)	(kHz)	(kHz)	Kesuit	(MHz)	(kHz)	(kHz)	Result
2412	15180.00	> 500	PASS	2412	15480.00	> 500	PASS
2437	15470.00	> 500	PASS	2437	15350.00	> 500	PASS
2462	16130.00	> 500	PASS	2462	16930.00	> 500	PASS

802.11\_n\_HT40 Ch0

802.11\_n\_HT40 Ch1

Freq.	6dB BW	Limit	Result	Freq.	6dB BW	Limit	Result
(MHz)	(kHz)	(kHz)	Result	(MHz)	(kHz)	(kHz)	Resuit
2422	35200.00	> 500	PASS	2422	35190.00	> 500	PASS
2437	35190.00	> 500	PASS	2437	35190.00	> 500	PASS
2452	35710.00	> 500	PASS	2452	35310.00	> 500	PASS

<sup>\*</sup>Refer to next page for plots

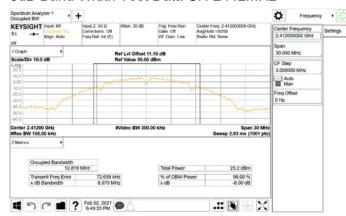
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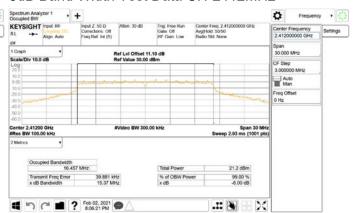


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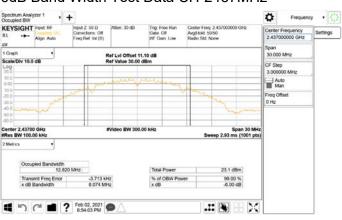
# 802.11b (CH0) 6dB Band Width Test Data CH-2412MHz



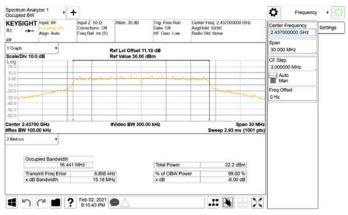
# 802.11g (CH0) 6dB Band Width Test Data CH-2412MHz



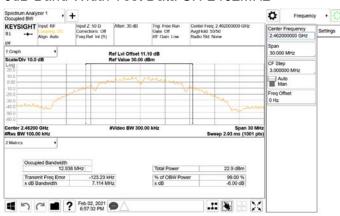
#### 6dB Band Width Test Data CH-2437MHz



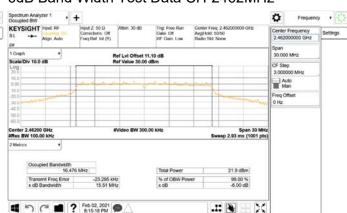
#### 6dB Band Width Test Data CH-2437MHz



#### 6dB Band Width Test Data CH-2462MHz



6dB Band Width Test Data CH-2462MHz



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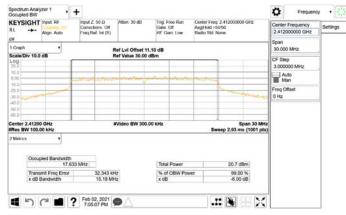
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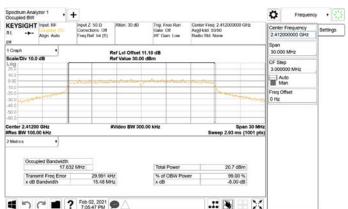
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# 802.11n 20M (CH0)

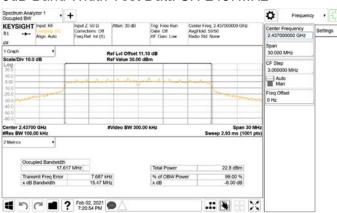
### 6dB Band Width Test Data CH-2412MHz



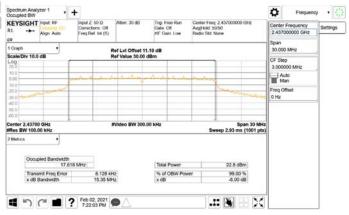
# 802.11n 20M (CH1) 6dB Band Width Test Data CH-2412MHz



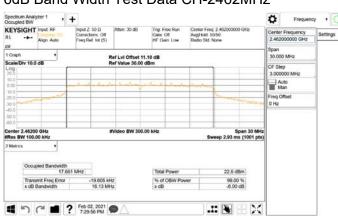
#### 6dB Band Width Test Data CH-2437MHz



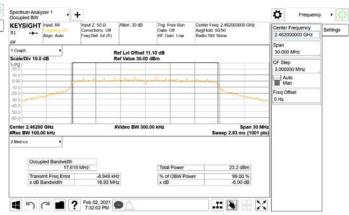
#### 6dB Band Width Test Data CH-2437MHz



#### 6dB Band Width Test Data CH-2462MHz



#### 6dB Band Width Test Data CH-2462MHz



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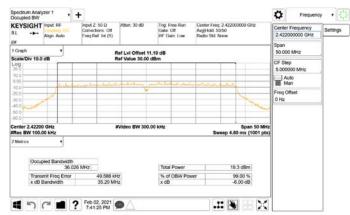
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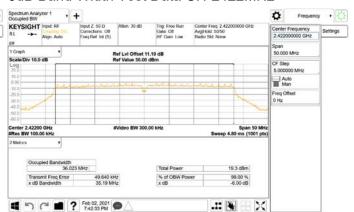
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## 802.11n 40M (CH0)

#### 6dB Band Width Test Data CH-2422MHz



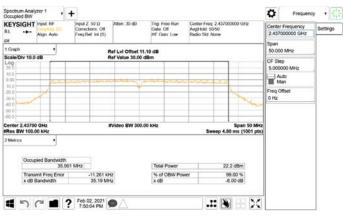
# 802.11n 40M (CH1) 6dB Band Width Test Data CH-2422MHz



#### 6dB Band Width Test Data CH-2437MHz



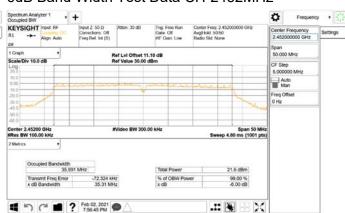
#### 6dB Band Width Test Data CH-2437MHz



#### 6dB Band Width Test Data CH-2452MHz



#### 6dB Band Width Test Data CH-2452MHz



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### 10 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

# 10.1 Standard Applicable

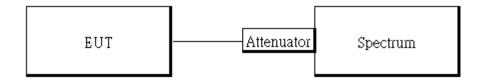
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the 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).

### 10.2 Measurement Equipment Used

Conducted Emission Test Site									
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.				
Spectrum Analyzer	KEYSIGHT	N9010B	MY59071573	06/26/2020	06/25/2021				
Attenuator	Marvelous	MVE2213-10	RF06	11/19/2020	11/18/2021				
Attenuator	Marvelous	WATT-218FS- 10	RF18	11/19/2020	11/18/2021				
DC Block	PASTERNACK	PE8210	RF153	11/19/2020	11/18/2021				

#### 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.
- 10. MIMO mode: offset is set following "measure and add 10 Log (N)" on spectrum to measure for MIMO mode. Offset = cable loss + 10 log (N), where N is number of transmitting antenna.

# **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 of reference level measurement 20dBm
- 8. Mark the highest readings of the emissions outside of 2400MHz~2483.5MHz.
- 9. Repeat above procedures until all default test channel (low, middle, and high) was complete.
- 10. MIMO mode: offset is set following "measure and add 10 Log (N)" on spectrum to measure for MIMO mode. Offset = cable loss + 10 log (N), where N is number of transmitting antenna.

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### **Conducted Spurious Emission:**

- 1. To connect Antenna Port of EUT to Spectrum
- The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
- 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.
- 7. MIMO mode: offset is set following "measure and add 10 Log (N)" on spectrum to measure for MIMO mode. Offset = cable loss +  $10 \log (N)$ , where N is number of transmitting antenna.

#### Note:

For test of MIMO mode, the highest emission of worst case employing Measure and add 10 log (N) technical is reported on this report after the comparison between Main Antenna at single transmitting mode and Aux that yields the higher value. The MIMO transmitting mode produces higher value of outcome.

#### 10.5 Measurement Result

Reference Level of Limit 802.11b mode			Reference Level of Limit 802.11g mode		
Freq.	PSD	Reference Level of Limit	Freq.	PSD	Reference Level of Limit
(MHz)	(dBm)	(dBm)	(MHz)	(dBm)	(dBm)
2412	8.33	-11.67	2412	4.60	-15.40
2437	8.26	-11.74	2437	5.48	-14.52
2462	8.11	-11.89	2462	5.09	-14.91

Reference Level of Limit 802.11n20 mode			Reference Level of Limit 802.11n40 MODE		
Freq.	PSD	Reference Level of Limit	Freq.	PSD	Reference Level of Limit
(MHz)	(dBm)	(dBm)	(MHz)	(dBm)	(dBm)
2412	7.04	-12.96	2422	2.03	-17.97
2437	9.09	-10.91	2437	4.80	-15.20
2462	8.62	-11.38	2452	4.55	-15.45

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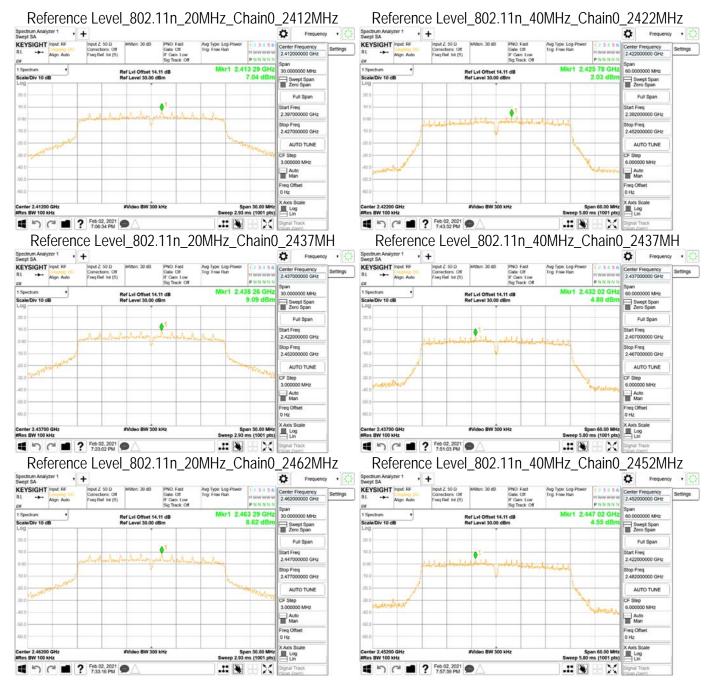
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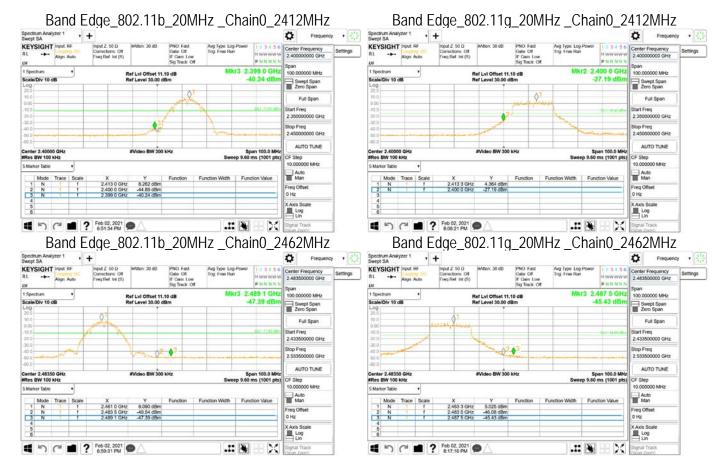
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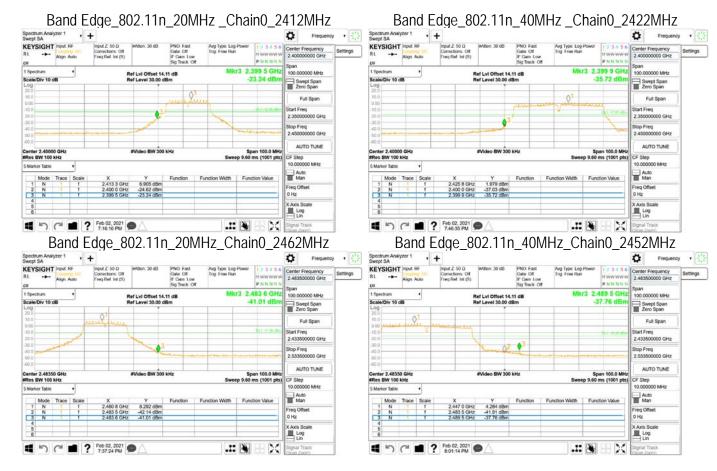
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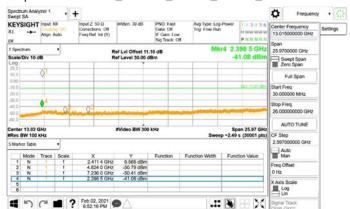
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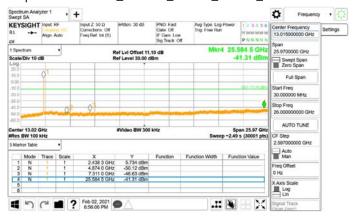


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## Spurious Emission\_802.11b\_20MHz\_Chain0\_2412MHz



# Spurious Emission\_802.11b\_20MHz\_Chain0\_2437MHz



Spurious Emission\_802.11b\_20MHz\_Chain0\_2462MHz



### Spurious Emission 802.11g 20MHz Chain0 2412MHz



Spurious Emission\_802.11g\_20MHz\_Chain0\_2437MHz



Spurious Emission\_802.11g\_20MHz\_Chain0\_2462MHz



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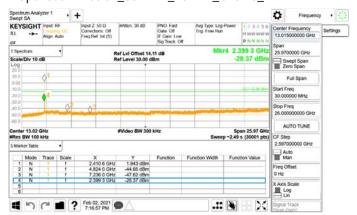
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## Spurious Emission 802.11n 20MHz Chain0 2412MHz



Spurious Emission\_802.11n\_20MHz\_Chain0\_2437MHz



Spurious Emission\_802.11n\_20MHz\_Chain0\_2462MHz



Spurious Emission 802.11n 40MHz ChainO 2422MHz



Spurious Emission\_802.11n\_40MHz\_Chain0\_2437MHz



Spurious Emission\_802.11n\_40MHz\_Chain0\_2452MHz



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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 ( $\mu$ V/m)

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# 11.2 Measurement Equipment Used:

	966 Chamber								
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.				
Broadband Antenna	TESEQ	CBL 6112D	35240	09/08/2020	09/07/2021				
Horn Antenna	Schwarzbeck	BBHA9170	185	07/30/2020	07/29/2021				
Horn Antenna	Schwarzbeck	BBHA9120D	1187	01/11/2021	01/10/2022				
Loop Antenna	ETS.LINDGREN	6502	143303	04/28/2020	04/27/2021				
EMI Test Receiver	R&S	ESU 40	100363	04/29/2020	04/28/2021				
Pre-Amplifier	<b>EMC Instruments</b>	EMC330	980096	11/19/2020	11/18/2021				
Pre-Amplifier	<b>EMC Instruments</b>	EMC0011830	980199	11/19/2020	11/18/2021				
Pre-Amplifier	<b>EMC Instruments</b>	EMC184045B	980135	10/27/2020	10/26/2021				
Attenuator	Marvelous	WATT-218FS- 10	RF20	11/19/2020	11/18/2021				
Band Rejection Filter	Micro-Tronics	BRM50701-01	RF201	11/19/2020	11/18/2021				
Coaxial Cable	Huber Suhner	SUCOFLEX 104	MY17388/4	11/19/2020	11/18/2021				
Coaxial Cable	Huber Suhner	RG 214/U	W22.03	11/19/2020	11/18/2021				
Test Software	audix	e3	20923 sgs Ver.9	N.C.R	N.C.R				
Notebook	Lenovo	L440	P0000367	N/A	N/A				

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

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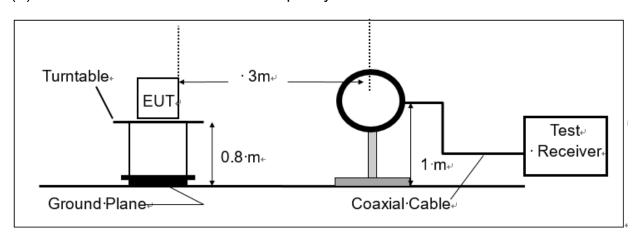
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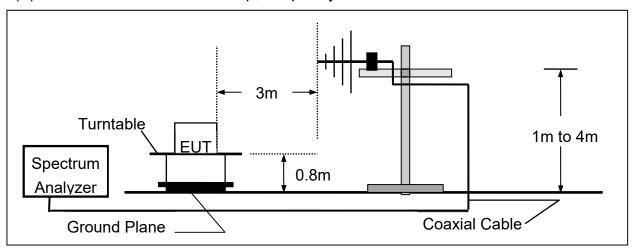
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## 11.3 Test SET-UP

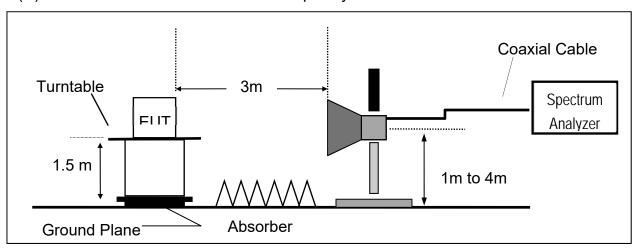
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



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



# (C) Radiated Emission Test Set-UP Frequency Over 1 GHz



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#### 11.4 Measurement Procedure

- 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.

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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# 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

The limit of the emission level is expressed in dBuV/m, which converts 20\*log(uV/m)

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.
- Measurements are completed at peak and average level, the mark of average is the highest emission in restricted bands

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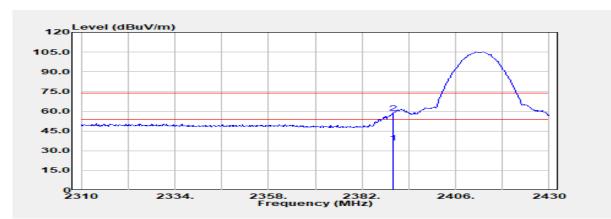
# 11.7.1 Radiated Band Edge Measurement Result

Report Number :E2/2021/10023 **Test Site** :966 Chamber C

**Operation Mode Test Date** :2021-01-26 :802.11b

**Test Frequency** :2412 MHz Temp./Humi. :23.5/58 Test Mode :BE CH LOW Antenna Pol. :Vertical

**EUT Pol** :H Plan Engineer :Enzo Chang



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμ̈V	dB	dBµV/m	dΒμV/m	dB
2390.000	Average	31.23	4.84	36.07	54.00	-17.93
2390.000	Peak	54.07	4.84	58.91	74.00	-15.09

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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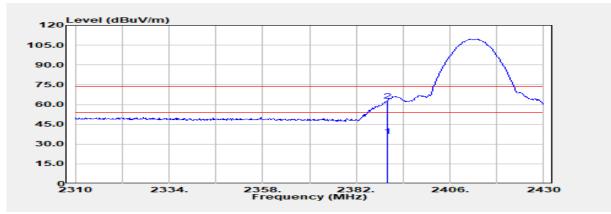
Report Number :E2/2021/10023 **Test Site** :966 Chamber C

**Operation Mode** :802.11b **Test Date** :2021-01-21

Test Frequency :23.8/60 :2412 MHz Temp./Humi.

Test Mode :BE CH LOW Antenna Pol. :Horizontal

**EUT Pol** :H Plan Engineer :Enzo Chang



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBμV/m	dB
2390.000	Average	31.23	4.84	36.07	54.00	-17.93
2390.000	Peak	58.22	4.84	63.06	74.00	-10.94

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.



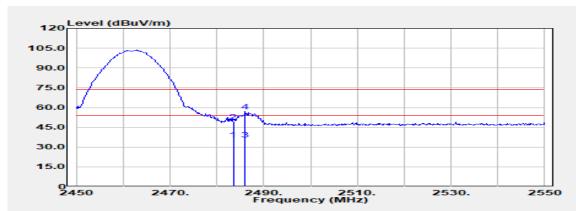
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Report Number :E2/2021/10023 Test Site :966 Chamber C

**Operation Mode** :802.11b **Test Date** :2021-01-21

**Test Frequency** :2462 MHz Temp./Humi. :23.8/60 Test Mode :BE CH HIGH Antenna Pol. :Vertical

**EUT Pol** :H Plan :Enzo Chang Engineer



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBμV/m	dB
2483.500	Average	31.86	3.90	35.76	54.00	-18.24
2483.500	Peak	45.37	3.90	49.27	74.00	-24.73
2486.058	Average	32.08	3.88	35.96	54.00	-18.04
2486.058	Peak	53.03	3.88	56.92	74.00	-17.08

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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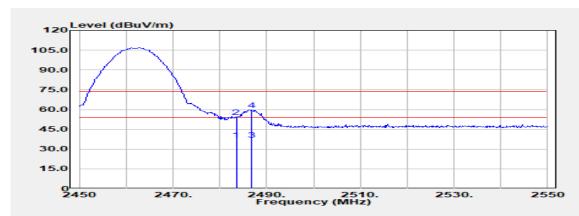
Report Number :E2/2021/10023 Test Site :966 Chamber C

**Operation Mode** :802.11b **Test Date** :2021-01-21

**Test Frequency** :2462 MHz Temp./Humi. :23.8/60

Test Mode :BE CH HIGH Antenna Pol. :Horizontal

**EUT Pol** :H Plan :Enzo Chang Engineer



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBμV/m	dB
2483.500	Average	33.09	3.90	36.99	54.00	-17.01
2483.500	Peak	50.26	3.90	54.17	74.00	-19.83
2486.859	Average	33.34	3.88	37.22	54.00	-16.78
2486.859	Peak	55.78	3.88	59.66	74.00	-14.34

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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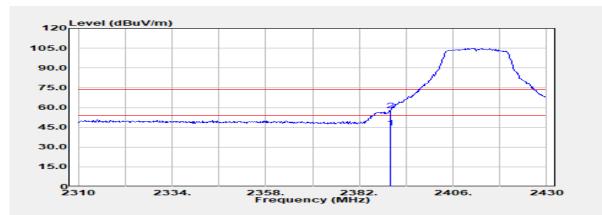
Report Number :E2/2021/10023 Test Site :966 Chamber C

:802.11g **Operation Mode Test Date** :2021-01-26

Test Frequency :2412 MHz Temp./Humi. :21.9/64

Test Mode :BE CH LOW Antenna Pol. :Vertical

**EUT Pol** :H Plan :Enzo Chang Engineer



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
2390.000	Average	40.09	4.84	44.93	54.00	-9.07
2390.000	Peak	53.34	4.84	58.18	74.00	-15.82

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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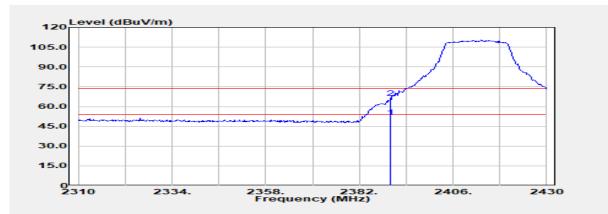
Report Number :E2/2021/10023 Test Site :966 Chamber C

:802.11g **Operation Mode Test Date** :2021-01-25

Test Frequency :2412 MHz Temp./Humi. :21.8/61

Test Mode :BE CH LOW Antenna Pol. :Horizontal

**EUT Pol** :H Plan :Enzo Chang Engineer



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
2390.000	Average	47.21	4.84	52.05	54.00	-1.95
2390.000	Peak	61.68	4.84	66.52	74.00	-7.48

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.



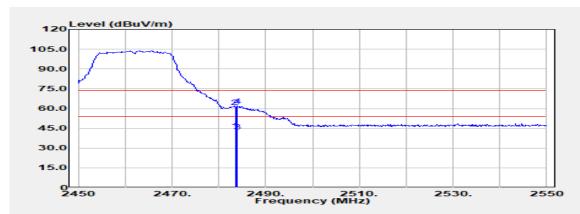
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Report Number :E2/2021/10023 Test Site :966 Chamber C

**Operation Mode** :802.11g **Test Date** :2021-01-21

**Test Frequency** :2462 MHz Temp./Humi. :23.8/60 Test Mode :BE CH HIGH Antenna Pol. :Vertical

**EUT Pol** :H Plan :Enzo Chang Engineer



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBμV/m	dB
2483.500	Average	39.51	3.90	43.41	54.00	-10.59
2483.500	Peak	57.26	3.90	61.16	74.00	-12.84
2483.974	Average	38.59	3.90	42.49	54.00	-11.51
2483.974	Peak	58.12	3.90	62.02	74.00	-11.98

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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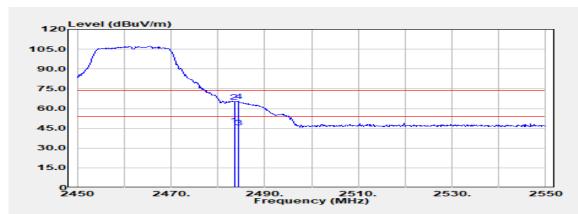
Report Number :E2/2021/10023 Test Site :966 Chamber C

**Operation Mode** :802.11g **Test Date** :2021-01-21

**Test Frequency** :2462 MHz Temp./Humi. :23.8/60

Test Mode :BE CH HIGH Antenna Pol. :Horizontal

**EUT Pol** :H Plan Engineer :Enzo Chang



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
•	Mode	Reading Level		FS	@3m	3
		•			_	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
		•		•	•	
2483.500	Average	43.50	3.90	47.40	54.00	-6.60
2483.500	Peak	61.32	3.90	65.22	74.00	-8.78
	i cak			05.22		-0.70
2484.295	Average	42.03	3.90	45.93	54.00	-8.07
2484.295	Peak	61.61	3.90	65.51	74.00	-8.49
2707.200	i can	01.01	0.00	00.01	77.00	-U. <del>-</del> U

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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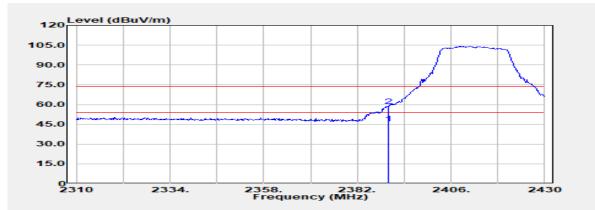
Report Number :E2/2021/10023 Test Site :966 Chamber C

**Operation Mode** :802.11n20 **Test Date** :2021-01-26

**Test Frequency** :2412 MHz Temp./Humi. :21.9/64

Test Mode :BE CH LOW Antenna Pol. :Vertical

**EUT Pol** :H Plan :Enzo Chang Engineer



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBμV/m	dB
2390.000	Average	40.74	4.84	45.58	54.00	-8.42
2390.000	Peak	54.01	4.84	58.85	74.00	-15.15

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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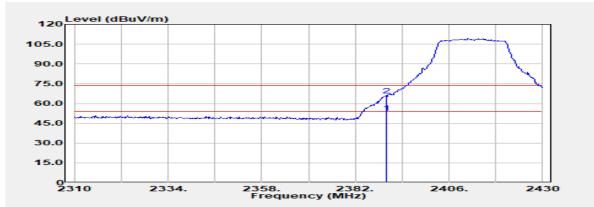
Report Number :E2/2021/10023 Test Site :966 Chamber C

**Operation Mode** :802.11n20 **Test Date** :2021-01-26

Test Frequency :2412 MHz Temp./Humi. :21.9/64

Test Mode :BE CH LOW Antenna Pol. :Horizontal

**EUT Pol** :H Plan :Enzo Chang Engineer



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBμV/m	dB
2390.000	Average	48.08	4.84	52.92	54.00	-1.08
2390.000	Peak	61.31	4.84	66.15	74.00	-7.85

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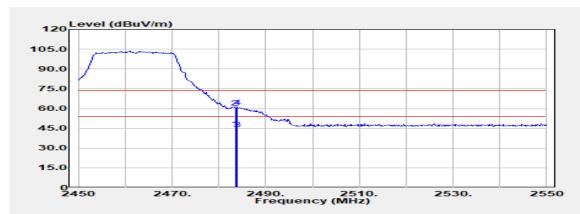
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Report Number :E2/2021/10023 Test Site :966 Chamber C

**Operation Mode** :802.11n20 **Test Date** :2021-01-26

**Test Frequency** :2462 MHz Temp./Humi. :21.9/64 Test Mode :BE CH HIGH Antenna Pol. :Vertical

**EUT Pol** :H Plan :Enzo Chang Engineer



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
•	Mode	Reading Level		FS	@3m	J
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
	11001710	чън т	<u> </u>	аврутт	аБр үүн	<u> </u>
2483.500	Average	40.86	3.90	44.76	54.00	-9.24
2483.500	Peak	56.62	3.90	60.52	74.00	-13.48
2483.974	Average	40.37	3.90	44.27	54.00	-9.73
2400.014	Average	40.57	5.50	44.21	J <del>4</del> .00	-3.13
2483.974	Peak	57.30	3.90	61.20	74.00	-12.80

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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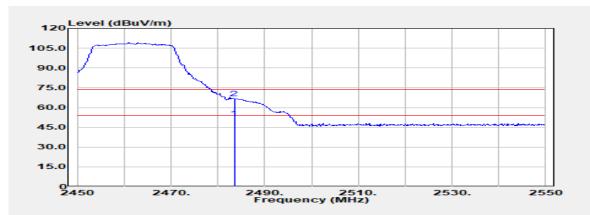
Report Number :E2/2021/10023 Test Site :966 Chamber C

**Operation Mode** :802.11n20 **Test Date** :2021-01-26

**Test Frequency** :2462 MHz Temp./Humi. :21.9/64

Test Mode :BE CH HIGH Antenna Pol. :Horizontal

**EUT Pol** :H Plan Engineer :Enzo Chang



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
2483.500	Average	47.98	3.90	51.88	54.00	-2.12
2483.500	Peak	62.92	3.90	66.82	74.00	-7.18

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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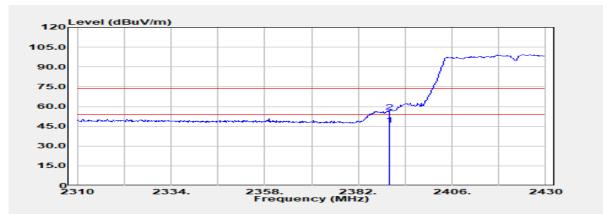
Report Number :E2/2021/10023 Test Site :966 Chamber C

**Operation Mode** :802.11n40 **Test Date** :2021-01-26

**Test Frequency** :2422 MHz Temp./Humi. :21.9/64

Test Mode :BE CH LOW Antenna Pol. :Vertical

**EUT Pol** :H Plan :Enzo Chang Engineer



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dΒμV/m	dB
2390.000	Average	41.55	4.84	46.39	54.00	-7.61
2390.000	Peak	51.48	4.84	56.32	74.00	-17.68

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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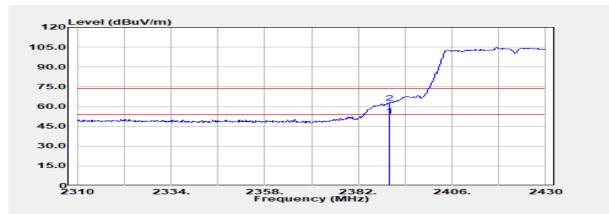
Report Number :E2/2021/10023 Test Site :966 Chamber C

**Operation Mode** :802.11n40 **Test Date** :2021-01-26

**Test Frequency** :2422 MHz Temp./Humi. :21.9/64

Test Mode :BE CH LOW Antenna Pol. :Horizontal

**EUT Pol** :H Plan :Enzo Chang Engineer



	Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
	MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
23	390.000	Average	48.15	4.84	52.99	54.00	-1.01
23	390.000	Peak	58.14	4.84	62.98	74.00	-11.02

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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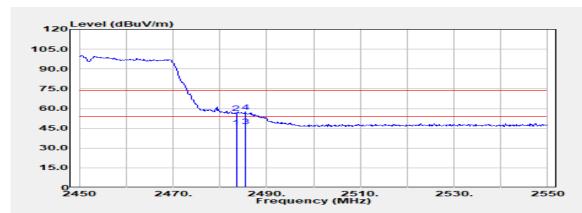
Report Number :E2/2021/10023 Test Site :966 Chamber C

**Operation Mode** :802.11n40 **Test Date** :2021-01-26

**Test Frequency** :2452 MHz Temp./Humi. :21.9/64

Test Mode :BE CH HIGH Antenna Pol. :Vertical

**EUT Pol** :H Plan :Enzo Chang Engineer



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
		•		•	•	
0.400 =00		40.00		4= 00		
2483.500	Average	42.02	3.90	45.92	54.00	-8.08
2483.500	Peak	52.48	3.90	56.38	74.00	-17.62
2485.417	Average	42.56	3.89	46.45	54.00	-7.55
2485.417	Peak	53.56	3.89	57.45	74.00	-16.55

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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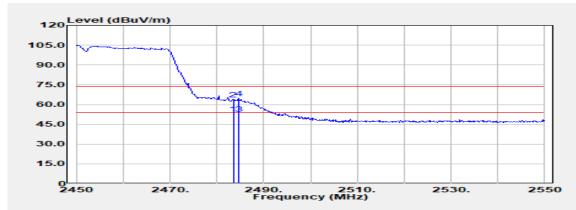
Report Number :E2/2021/10023 Test Site :966 Chamber C

**Operation Mode** :802.11n40 **Test Date** :2021-01-26

**Test Frequency** :2452 MHz Temp./Humi. :21.9/64

Test Mode :BE CH HIGH Antenna Pol. :Horizontal

**EUT Pol** :H Plan Engineer :Enzo Chang



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
•	Mode	Reading Level		FS	@3m	Ü
MHz	PK/QP/AV	•	dB	dBµV/m	dBµV/m	dB
IVITIZ	PN/QP/AV	dΒμV	ub	ибиулл	ασμν/π	uБ
2483.500	Average	49.09	3.90	52.99	54.00	-1.01
2483.500	Peak	59.87	3.90	63.77	74.00	-10.23
2484.615	Average	48.99	3.89	52.88	54.00	-1.12
2484.615	Peak	60.65	3.89	64.54	74.00	-9.46

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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## 11.7.2 Below 1GHz Worst-Case Emission:

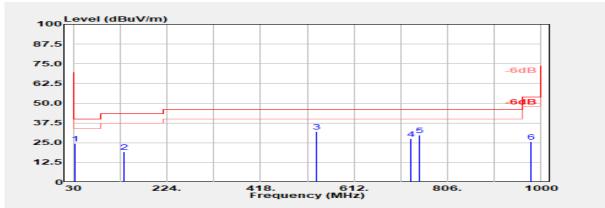
Report Number :E2/2021/10023 **Test Site** :966 Chamber C

:2021-01-20 **Operation Mode Test Date** :802.11g

**Test Frequency** :2437 MHz Temp./Humi. :21.7/62

Test Mode :TX CH MID Antenna Pol. :Vertical

**EUT Pol** :H Plan Engineer :Ashton Chiu



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμ̈V	dB	dBµV/m	dΒμV/m	dB
34.663	Peak	33.55	-8.86	24.69	40.00	-15.31
134.151	Peak	36.18	-16.99	19.20	43.50	-24.30
535.208	Peak	41.24	-9.17	32.07	46.00	-13.93
729.519	Peak	35.69	-7.96	27.73	46.00	-18.27
748.173	Peak	37.25	-7.54	29.71	46.00	-16.29
979.792	Peak	30.57	-4.79	25.78	54.00	-28.22

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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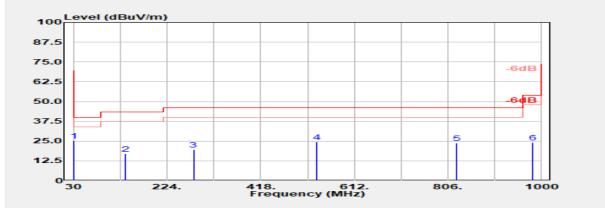
Report Number :E2/2021/10023 **Test Site** :966 Chamber C

**Operation Mode** :802.11g **Test Date** :2021-01-20

Test Frequency :2437 MHz Temp./Humi. :21.7/62

Test Mode :TX CH MID Antenna Pol. :Horizontal

**EUT Pol** :H Plan Engineer :Ashton Chiu



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dΒμV/m	dB
31.554	Peak	32.51	-7.29	25.22	40.00	-14.78
138.814	Peak	34.11	-17.16	16.95	43.50	-26.55
278.718	Peak	35.39	-15.69	19.70	46.00	-26.30
533.654	Peak	34.00	-9.58	24.42	46.00	-21.58
822.789	Peak	30.74	-7.10	23.64	46.00	-22.36
981.346	Peak	29.01	-4.87	24.14	54.00	-29.86

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.



:TX CH MID

Test Mode

Report No.: E2/2021/10023

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:Vertical

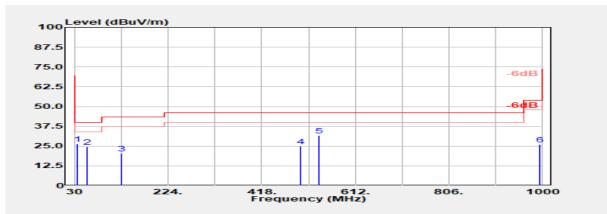
Antenna Pol.

Report Number :E2/2021/10023 **Test Site** :966 Chamber C

**Operation Mode** :802.11n40 **Test Date** :2021-01-20

Test Frequency :2437 MHz Temp./Humi. :21.8/63

**EUT Pol** :H Plan Engineer :Ashton Chiu



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dΒμV/m	dB
36.218	Peak	36.35	-10.03	26.32	40.00	-13.68
56.426	Peak	48.25	-23.67	24.57	40.00	-15.43
127.933	Peak	37.16	-16.91	20.25	43.50	-23.25
499.455	Peak	35.69	-10.63	25.07	46.00	-20.93
536.763	Peak	40.96	-9.27	31.69	46.00	-14.31
993.782	Peak	30.74	-4.86	25.88	54.00	-28.12

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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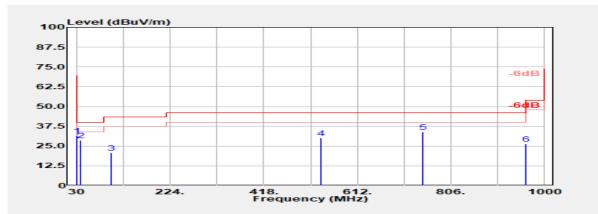
Report Number :E2/2021/10023 **Test Site** :966 Chamber C

**Operation Mode** :802.11n40 **Test Date** :2021-01-20

Test Frequency :2437 MHz Temp./Humi. :21.8/63

Test Mode :TX CH MID Antenna Pol. :Horizontal

**EUT Pol** :H Plan Engineer :Ashton Chiu



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
30.000	Peak	38.31	-6.45	31.86	40.00	-8.14
39.327	Peak	40.40	-11.58	28.82	40.00	-11.18
103.061	Peak	40.06	-19.37	20.69	43.50	-22.81
536.763	Peak	39.37	-9.27	30.10	46.00	-15.90
746.619	Peak	41.82	-7.79	34.03	46.00	-11.97
961.138	Peak	32.21	-5.96	26.26	54.00	-27.74

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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## 11.7.3 Above 1GHz Emission:

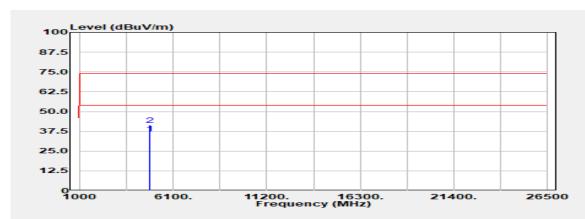
Report Number :E2/2021/10023 Test Site :966 Chamber C

**Operation Mode Test Date** :2021-01-21 :802.11b

Test Frequency :2412 MHz Temp./Humi. :22.4/58

Test Mode :TX CH LOW Antenna Pol. :Vertical

**EUT Pol** :H Plan :Enzo Chang Engineer



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4824.000	Average	25.52	10.56	36.08	54.00	-17.92
4824.000	Peak	31.09	10.56	41.65	74.00	-32.35

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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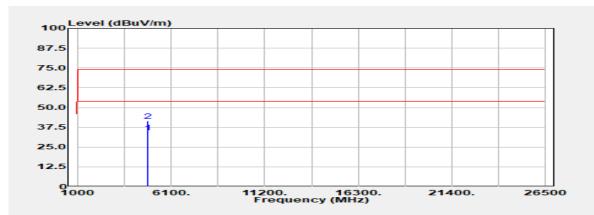
Report Number :E2/2021/10023 Test Site :966 Chamber C

**Operation Mode** :802.11b **Test Date** :2021-01-21

**Test Frequency** :2412 MHz Temp./Humi. :22.4/58

Test Mode :TX CH LOW Antenna Pol. :Horizontal

**EUT Pol** :H Plan Engineer :Enzo Chang



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBμV/m	dB
4824.000	Average	23.83	10.56	34.39	54.00	-19.61
4824.000	Peak	31.01	10.56	41.57	74.00	-32.43

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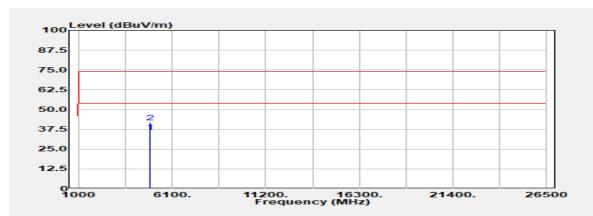
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Report Number :E2/2021/10023 Test Site :966 Chamber C

**Operation Mode** :802.11b **Test Date** :2021-01-21

**Test Frequency** :2437 MHz Temp./Humi. :22.4/58 Test Mode :TX CH MID Antenna Pol. :Vertical

**EUT Pol** :H Plan :Enzo Chang Engineer



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4874.000	Average	25.43	10.33	35.76	54.00	-18.24
4874.000	Peak	31.66	10.33	41.99	74.00	-32.01

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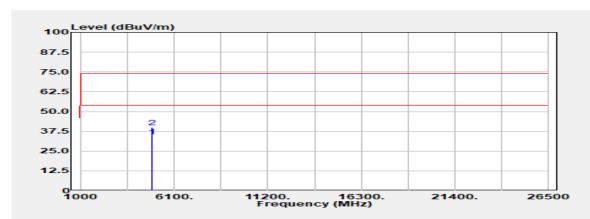
Report Number :E2/2021/10023 Test Site :966 Chamber C

**Operation Mode** :802.11b **Test Date** :2021-01-21

**Test Frequency** :2437 MHz Temp./Humi. :22.4/58

Test Mode :TX CH MID Antenna Pol. :Horizontal

**EUT Pol** :H Plan :Enzo Chang Engineer



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBμV/m	dB
4874.000	Average	23.95	10.33	34.28	54.00	-19.72
4874.000	Peak	29.54	10.33	39.87	74.00	-34.13

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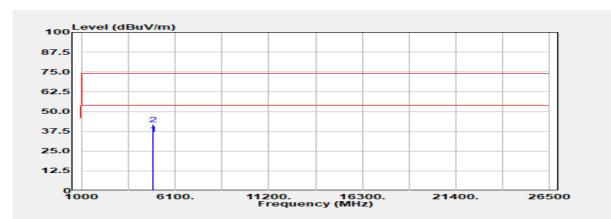
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Report Number :E2/2021/10023 Test Site :966 Chamber C

**Operation Mode** :802.11b **Test Date** :2021-01-21

**Test Frequency** :2462 MHz Temp./Humi. :22.4/58 Test Mode :TX CH HIGH Antenna Pol. :Vertical

**EUT Pol** :H Plan :Enzo Chang Engineer



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dΒμV/m	dB
4924.000	Average	25.89	10.12	36.01	54.00	-17.99
4924.000	Peak	31.81	10.12	41.93	74.00	-32.07

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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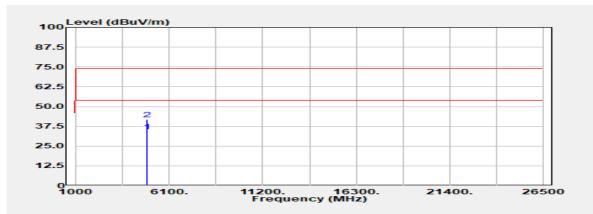
Report Number :E2/2021/10023 Test Site :966 Chamber C

**Operation Mode** :802.11b **Test Date** :2021-01-21

**Test Frequency** :2462 MHz Temp./Humi. :22.4/58

Test Mode :TX CH HIGH Antenna Pol. :Horizontal

**EUT Pol** :H Plan Engineer :Enzo Chang



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dΒμV/m	dB
4924.000	Average	24.08	10.12	34.20	54.00	-19.80
4924.000	Peak	31.89	10.12	42.01	74.00	-31.99

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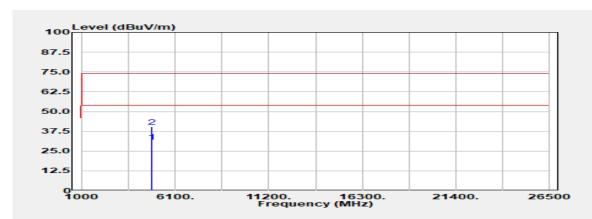
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Report Number :E2/2021/10023 Test Site :966 Chamber C

:802.11g **Operation Mode Test Date** :2021-01-21

**Test Frequency** :2412 MHz Temp./Humi. :22.5/57 Test Mode :TX CH LOW Antenna Pol. :Vertical

**EUT Pol** :H Plan :Enzo Chang Engineer



	Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
_	MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
	4824.000	Average	20.51	10.56	31.07	54.00	-22.93
	4824.000	Peak	29.82	10.56	40.37	74.00	-33.63

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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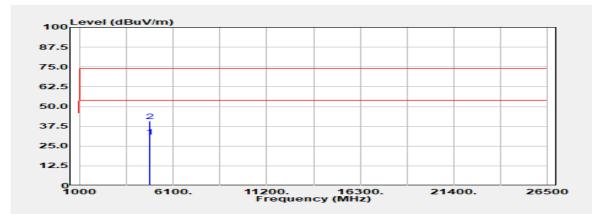
Report Number :E2/2021/10023 Test Site :966 Chamber C

:802.11g **Operation Mode Test Date** :2021-01-21

**Test Frequency** :2412 MHz Temp./Humi. :22.5/57

Test Mode :TX CH LOW Antenna Pol. :Horizontal

**EUT Pol** :H Plan Engineer :Enzo Chang



F	Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
	MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dΒμV/m	dB
48	24.000	Average	20.42	10.56	30.98	54.00	-23.02
48	24.000	Peak	30.15	10.56	40.70	74.00	-33.30

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.



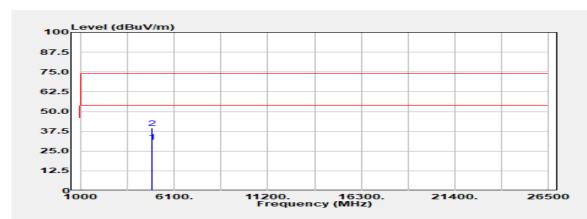
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Report Number :E2/2021/10023 Test Site :966 Chamber C

**Operation Mode** :802.11g **Test Date** :2021-01-21

**Test Frequency** :2437 MHz Temp./Humi. :22.5/57 Test Mode :TX CH MID Antenna Pol. :Vertical

**EUT Pol** :H Plan :Enzo Chang Engineer



	Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
_	MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
	4874.000	Average	20.58	10.33	30.91	54.00	-23.09
	4874.000	Peak	29.46	10.33	39.79	74.00	-34.21

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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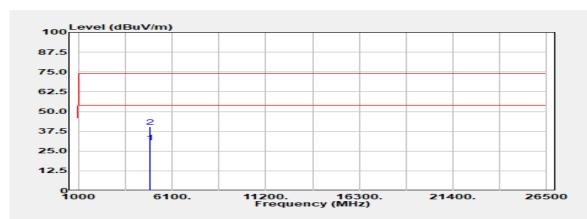
Report Number :E2/2021/10023 Test Site :966 Chamber C

**Operation Mode** :802.11g **Test Date** :2021-01-21

**Test Frequency** :2437 MHz Temp./Humi. :22.5/57

Test Mode :TX CH MID Antenna Pol. :Horizontal

**EUT Pol** :H Plan Engineer :Enzo Chang



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBμV/m	dB
4874.000	Average	20.21	10.33	30.54	54.00	-23.46
4874.000	Peak	29.87	10.33	40.20	74.00	-33.80

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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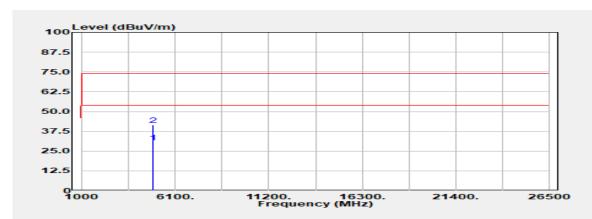
Report Number :E2/2021/10023 Test Site :966 Chamber C

**Operation Mode** :802.11g **Test Date** :2021-01-21

**Test Frequency** :2462 MHz Temp./Humi. :22.5/57

Test Mode :TX CH HIGH Antenna Pol. :Vertical

**EUT Pol** :H Plan :Enzo Chang Engineer



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4924.000	Average	20.63	10.12	30.75	54.00	-23.25
4924.000	Peak	31.33	10.12	41.45	74.00	-32.55

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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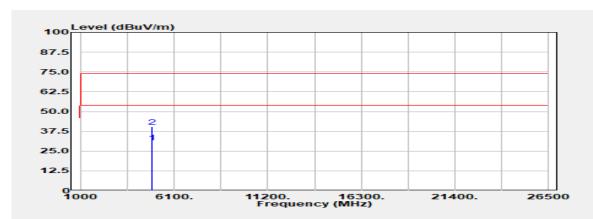
Report Number :E2/2021/10023 Test Site :966 Chamber C

**Operation Mode** :802.11g **Test Date** :2021-01-21

**Test Frequency** :2462 MHz Temp./Humi. :22.5/57

Test Mode :TX CH HIGH Antenna Pol. :Horizontal

**EUT Pol** :H Plan Engineer :Enzo Chang



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBμV/m	dB
4924.000	Average	20.38	10.12	30.50	54.00	-23.50
4924.000	Peak	30.32	10.12	40.44	74.00	-33.56

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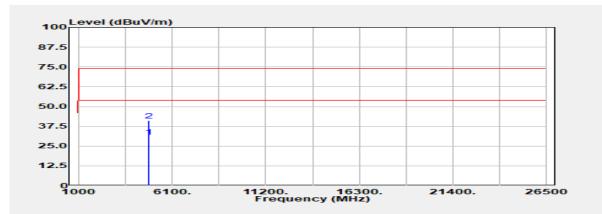
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Report Number :E2/2021/10023 Test Site :966 Chamber C

**Operation Mode** :802.11n20 **Test Date** :2021-01-22

**Test Frequency** :2412 MHz Temp./Humi. :22.5/52 Test Mode :TX CH LOW Antenna Pol. :Vertical

**EUT Pol** :H Plan :Enzo Chang Engineer



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dΒμV/m	dB
4824.000	Average	20.52	10.56	31.08	54.00	-22.92
4824.000	Peak	30.60	10.56	41.15	74.00	-32.85

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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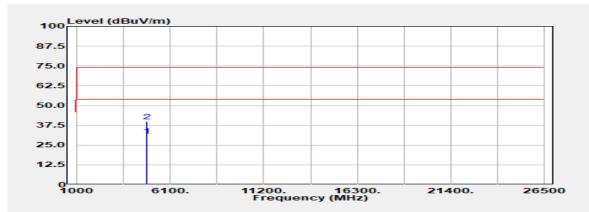
Report Number :E2/2021/10023 Test Site :966 Chamber C

**Operation Mode** :802.11n20 **Test Date** :2021-01-22

**Test Frequency** :2412 MHz Temp./Humi. :22.5/52

Test Mode :TX CH LOW Antenna Pol. :Horizontal

**EUT Pol** :H Plan Engineer :Enzo Chang



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
4824.000	Average	20.21	10.56	30.77	54.00	-23.23
4824.000	Peak	29.35	10.56	39.91	74.00	-34.09

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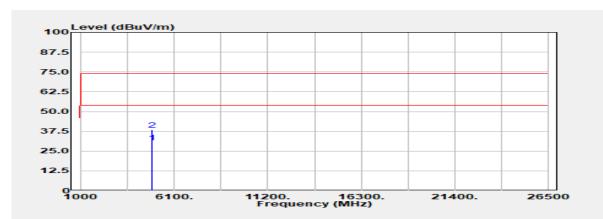
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Report Number :E2/2021/10023 Test Site :966 Chamber C

**Operation Mode** :802.11n20 **Test Date** :2021-01-22

**Test Frequency** :2437 MHz Temp./Humi. :22.5/52 Test Mode :TX CH MID Antenna Pol. :Vertical

**EUT Pol** :H Plan :Enzo Chang Engineer



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4874.000	Average	20.23	10.33	30.56	54.00	-23.44
4874.000	Peak	28.29	10.33	38.61	74.00	-35.39

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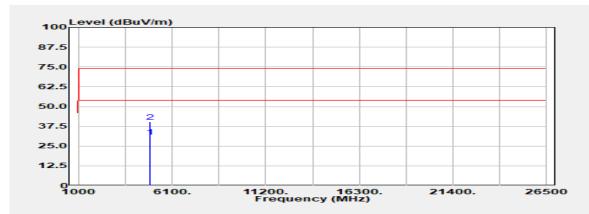
Report Number :E2/2021/10023 Test Site :966 Chamber C

**Operation Mode** :802.11n20 **Test Date** :2021-01-22

**Test Frequency** :2437 MHz Temp./Humi. :22.5/52

Test Mode :TX CH MID Antenna Pol. :Horizontal

**EUT Pol** :H Plan Engineer :Enzo Chang



	Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
_	MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBμV/m	dB
	4874.000	Average	20.45	10.33	30.78	54.00	-23.22
	4874.000	Peak	30.23	10.33	40.56	74.00	-33.44

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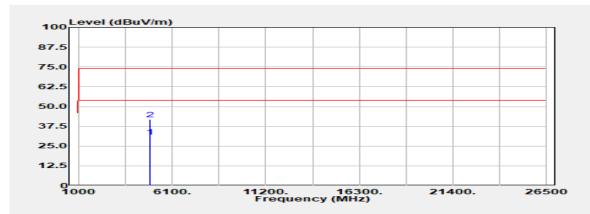
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Report Number :E2/2021/10023 Test Site :966 Chamber C

**Operation Mode** :802.11n20 **Test Date** :2021-01-22

**Test Frequency** :2462 MHz Temp./Humi. :22.5/52 Test Mode :TX CH HIGH Antenna Pol. :Vertical

**EUT Pol** :H Plan :Enzo Chang Engineer



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dΒμV/m	dB
4924.000	Average	20.69	10.12	30.81	54.00	-23.19
4924.000	Peak	31.92	10.12	42.04	74.00	-31.96

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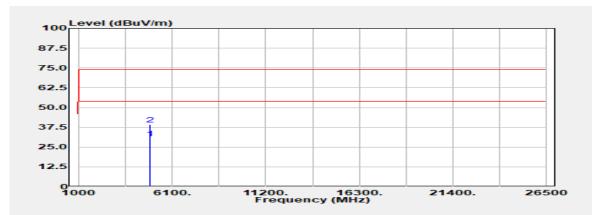
Report Number :E2/2021/10023 Test Site :966 Chamber C

**Operation Mode** :802.11n20 **Test Date** :2021-01-22

**Test Frequency** :2462 MHz Temp./Humi. :22.5/52

Test Mode :TX CH HIGH Antenna Pol. :Horizontal

**EUT Pol** :H Plan Engineer :Enzo Chang



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4924.000	Average	20.34	10.12	30.46	54.00	-23.54
4924.000	Peak	29.23	10.12	39.35	74.00	-34.65

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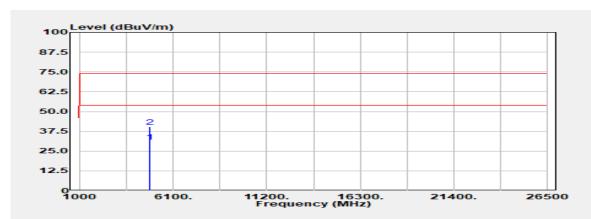
Report Number :E2/2021/10023 Test Site :966 Chamber C

**Operation Mode** :802.11n40 **Test Date** :2021-01-22

**Test Frequency** :2422 MHz Temp./Humi. :22.7/54

Test Mode :TX CH LOW Antenna Pol. :Vertical

**EUT Pol** :H Plan :Enzo Chang Engineer



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4844.000	Average	20.28	10.69	30.97	54.00	-23.03
4844.000	Peak	29.56	10.69	40.24	74.00	-33.76

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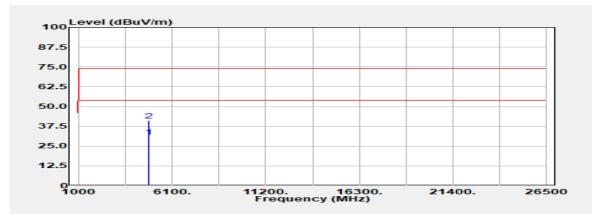
Report Number :E2/2021/10023 Test Site :966 Chamber C

:2021-01-22 **Operation Mode** :802.11n40 **Test Date** 

**Test Frequency** :2422 MHz Temp./Humi. :22.7/54

Test Mode :TX CH LOW Antenna Pol. :Horizontal

**EUT Pol** :H Plan Engineer :Enzo Chang



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dΒμV/m	dB
4844.000	Average	20.33	10.69	31.02	54.00	-22.98
4844.000	Peak	30.44	10.69	41.13	74.00	-32.87

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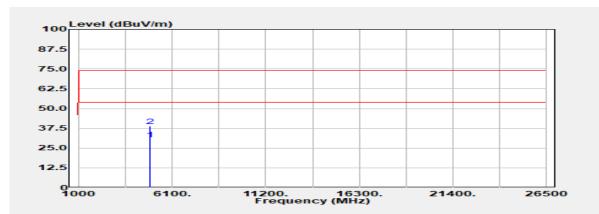
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Report Number :E2/2021/10023 Test Site :966 Chamber C

:2021-01-22 **Operation Mode** :802.11n40 **Test Date** 

**Test Frequency** :2437 MHz Temp./Humi. :22.7/54 Test Mode :TX CH MID Antenna Pol. :Vertical

**EUT Pol** :H Plan :Enzo Chang Engineer



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4874.000	Average	20.18	10.33	30.51	54.00	-23.49
4874.000	Peak	28.69	10.33	39.01	74.00	-34.99

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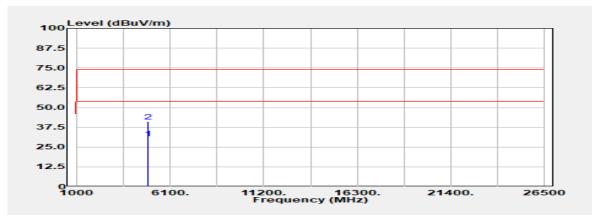
Report Number :E2/2021/10023 Test Site :966 Chamber C

:2021-01-22 **Operation Mode** :802.11n40 **Test Date** 

**Test Frequency** :2437 MHz Temp./Humi. :22.7/54

Test Mode :TX CH MID Antenna Pol. :Horizontal

**EUT Pol** :H Plan Engineer :Enzo Chang



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBμV/m	dB
4874.000	Average	20.38	10.33	30.71	54.00	-23.29
4874.000	Peak	30.77	10.33	41.09	74.00	-32.91

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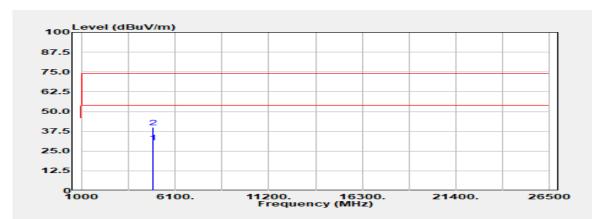
Report Number :E2/2021/10023 Test Site :966 Chamber C

**Operation Mode** :802.11n40 **Test Date** :2021-01-22

**Test Frequency** :2452 MHz Temp./Humi. :22.7/54

Test Mode :TX CH HIGH Antenna Pol. :Vertical

**EUT Pol** :H Plan :Enzo Chang Engineer



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4904.000	Average	20.27	10.20	30.47	54.00	-23.53
4904.000	Peak	29.72	10.20	39.92	74.00	-34.08

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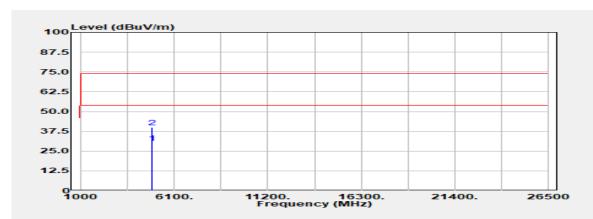
Report Number :E2/2021/10023 Test Site :966 Chamber C

:2021-01-22 **Operation Mode** :802.11n40 **Test Date** 

**Test Frequency** :2452 MHz Temp./Humi. :22.7/54

Test Mode :TX CH HIGH Antenna Pol. :Horizontal

**EUT Pol** :H Plan Engineer :Enzo Chang



	Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
_	MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBμV/m	dB
	4904.000	Average	20.12	10.20	30.32	54.00	-23.68
	4904.000	Peak	29.78	10.20	39.98	74.00	-34.02

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### 12 POWER SPECTRAL DENSITY

### 12.1 Standard Applicable

Per Part 15.247 (e)

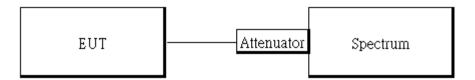
The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

## 12.2 Measurement Equipment Used

	Conducted Emission Test Site								
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.				
Spectrum Analyzer	KEYSIGHT	N9010B	MY59071573	06/26/2020	06/25/2021				
Attenuator	Marvelous	MVE2213-10	RF06	11/19/2020	11/18/2021				
Attenuator	Marvelous	WATT-218FS- 10	RF18	11/19/2020	11/18/2021				
DC Block	PASTERNACK	PE8210	RF153	11/19/2020	11/18/2021				

#### 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.
- 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.
- 10. MIMO mode: offset is set following "measure and add 10 Log (N)" on spectrum to measure the PSD for MIMO mode. Offset = cable loss + 10 log (N), where N is number of transmitting antenna.

#### Note:

For the test of MIMO mode, the highest emission of worst case employing Measure and add 10 log (N) technical is reported on this report after the comparison between Main Antenna at single transmitting mode and Aux that yields the higher value. The MIMO transmitting mode produces higher value of outcome.

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# 12.5 As per FCC KDB 662911 D01

As per section F. 2). e). (ii) of FCC KDB 662911 D01

If antenna gains are not equal and each transmit antenna is driven by only one spatial stream, directional gain may be calculated by either of the following formulas.

• Directional Gain = 
$$10 \cdot \log \left[ \frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^{2}}{N_{ANT}} \right]$$

#### where

Each antenna is driven by no more than one spatial stream;

NSS = the number of independent spatial streams of data;

NANT = the total number of antennas

 $g_{i,k} = /20$  10Gk if the kth antenna is being fed by spatial stream j, or zero if it is not;

G<sub>k</sub> is the gain in dBi of the kth antenna.

The antenna gain is not grater than 6 dBi. Therefore, reduction of power is not required.

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# 12.6 Power spectral density

		ļ	POWER DENSITY 802.11b		
Freq.	Ch0	Ch1	PSD	Limit	Result
(MHz)	PSD	PSD	(dBm/3kHz)	(dBm/3kHz)	Resuit
2412	7.92		7.92	8.00	PASS
2437	7.98		7.98	8.00	PASS
2462	4.71		4.71	8.00	PASS

	POWER DENSITY 802.11g								
Freq.	Ch0	Ch1	PSD	Limit	Result				
(MHz)	PSD	PSD	(dBm/3kHz)	(dBm/3kHz)	Result				
2412	-13.1		-13.10	8.00	PASS				
2437	-12.27		-12.27	8.00	PASS				
2462	-12.78		-12.78	8.00	PASS				

	POWER DENSITY 802.11n HT20								
Freq.	Ch0	Ch1	PSD	Limit	Result				
(MHz)	PSD	PSD	(dBm/3kHz)	(dBm/3kHz)	Result				
2412	-13.69	-13.4	-10.29	8.00	PASS				
2437	-11.71	-11.08	-8.13	8.00	PASS				
2462	-11.82	-10.94	-8.11	8.00	PASS				

	POWER DENSITY 802.11n HT40								
Freq.	Ch0	Ch1	PSD	Limit	Result				
(MHz)	PSD	PSD	(dBm/3kHz)	(dBm/3kHz)	Result				
2422	-17.13	-17.88	-14.03	8.00	PASS				
2437	-13.97	-15.24	-11.10	8.00	PASS				
2452	-14.85	-14.12	-11.01	8.00	PASS				

\*Refer to next page for plots

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802.11b

### Power Spectral Density Test Plot-2412MHz



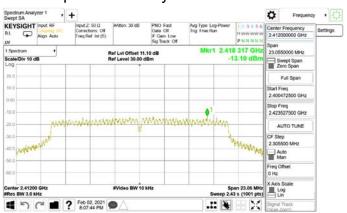
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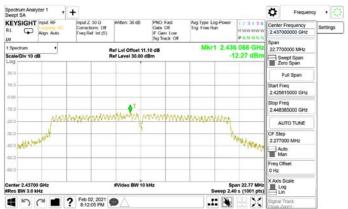
### Power Spectral Density Test Plot-2462MHz



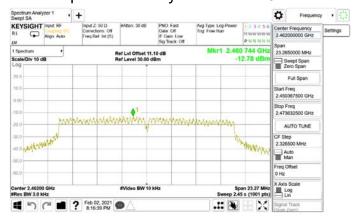
# 802.11g Power Spectral Density Test Plot-2412MHz



## Power Spectral Density Test Plot-2437MHz



#### Power Spectral Density Test Plot-2462MHz



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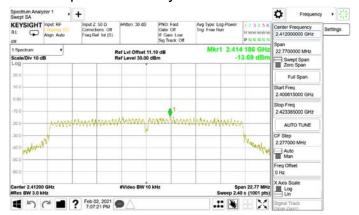
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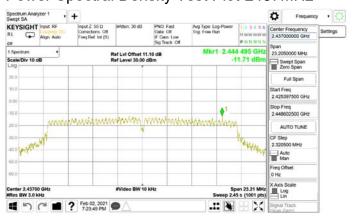
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## 802.11n HT20 (CH0)

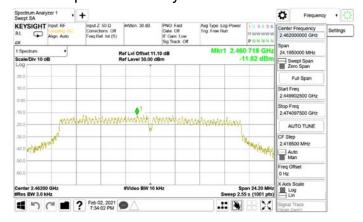
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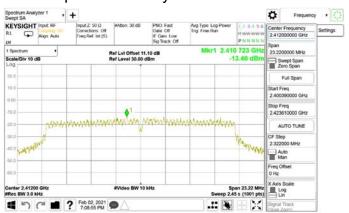
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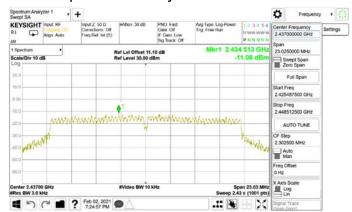
## Power Spectral Density Test Plot-2462MHz



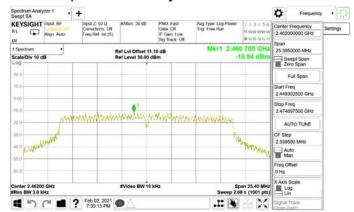
# 802.11n HT20 (CH1) Power Spectral Density Test Plot-2412MHz



### Power Spectral Density Test Plot-2437MHz



#### Power Spectral Density Test Plot-2462MHz



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.

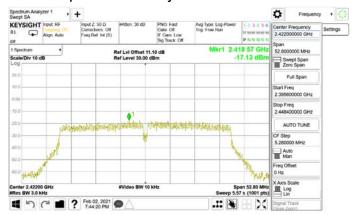
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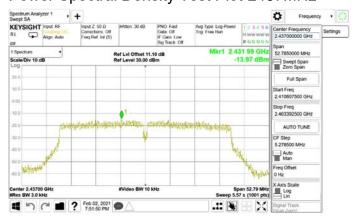
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## 802.11n HT40 (CH0)

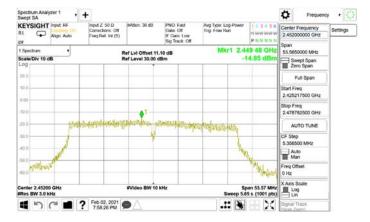
### Power Spectral Density Test Plot-2422MHz



# Power Spectral Density Test Plot-2437MHz

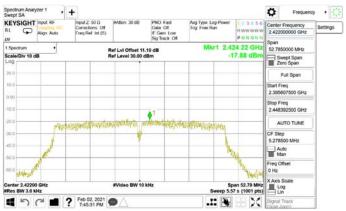


## Power Spectral Density Test Plot-2452MHz

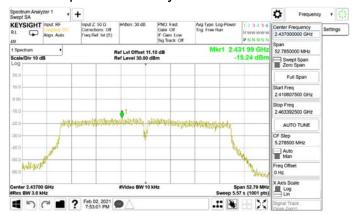


## 802.11n HT40 (CH1)

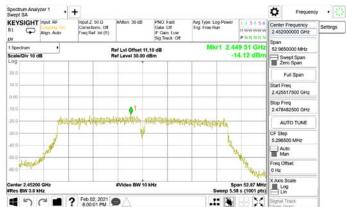
# Power Spectral Density Test Plot-2422MHz



#### Power Spectral Density Test Plot-2437MHz



## Power Spectral Density Test Plot-2452MHz



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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 as permanently attached and no consideration of replacement. Please see EUT photo for details.

~ End of Report ~

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