ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

Testing Laboratory 3702

Applicant:	Murata Manufacturing Co., Ltd. 1-10-1, Higashikotari, Nagaokakyo-shi, Kyoto 617-8555 Japan
Product Name:	Communication Module
Brand Name:	muRata
FCC Model No.:	LBEE5CJ1XK, LBEE5CJ2XK
IC Model No.:	LBEE5CJ1XK, LBEE5CJ2XK
Model Difference:	Different Antenna type
Report Number:	E2/2021/30018
FCC ID:	VPYLB1XK
IC:	772C-LB1XK
Issue Date:	Sep.10,2021
Date of Test:	Mar.11,2021～Aug.12,2021
Date of EUT Received:	Mar.11,2021

Approved By Jay. Lin.

Jay Lin

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 comply with FCC rule part §15.247, ISED RSS-247.

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

Revision History

Report Number	Revision	Description	Issue Date	Revised By
E2/2021/30018	Rev.00	Original	Sep.10,2021	Viola Su

Note:

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

Table of Contents

1 GENERAL INFORMATION

1.1 Product Description

Product Name:	Communication Module
Brand Name:	muRata
FCC Model No.:	LBEE5CJ1XK, LBEE5CJ2XK
IC Model No.:	LBEE5CJ1XK, LBEE5CJ2XK
Model Difference:	Different Antenna type
Hardware Version:	1.0
Firmware Version:	1.0
EUT Series No.:	Conducted：EVB NO.13，Radiated dipole:EVB NO.13 Radiated momopole: EVB NO.03
Power Supply:	3.3Vdc

1.2 RF Specification

WLAN 2.4GHz

Wi-Fi	Frequency Range	Channels	Rated Power in dBm (Peak)	Modulation Technology
802.11b	2412~2462	11	23.14	DSSS
802.11g	2412~2462	11	24.46	OFDM
802.11n20	2412~2462	11	24.50	OFDM
Modulation type:		CCK, DQPSK, DBPSK for DSSS		
		64QAM, 16QAM, QPSK, BPSK for OFDM		
Data Rate:		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 - 72.2Mbps		

WLAN 2.4GHz for IC

Wi-Fi	Frequency Range	Channels	Rated Power in dBm (Peak)	Rated Power in dBm (EIRP)	Modulation Technology
802.11b	2412~2462	11	23.14	22.59	DSSS
802.11g	2412~2462	11	24.46	22.25	OFDM
802.11n20	2412~2462	11	24.50	21.49	OFDM
Modulation type:		CCK, DQPSK, DBPSK for DSSS			
		64QAM, 16QAM, QPSK, BPSK for OFDM			
Data Rate:		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 - 72.2Mbps			

1.3 Antenna Designation

Antenna Type	Supplier	Antenna Part No.	Freq. (MHz)	Peak Antenna Gain (dBi)	Worst Antenna Gain
Monopole	Murata	LBEE5CJ1XK-Antenna	2412~2462	3.6	V
Dipole	Molex	146187	2412~2462	3.4	V
Dipole	Molex	146153	2412~2462	3.2	

Note:
1. Pre-scanned was done on the above antennas, measurements were demonstrated by using the antenna with the highest gain as the worst case scenarios.
2. Antenna information is provided by the applicant.

1.4 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247
FCC KDB 558074 D01 15.247 Meas Guidance v05r02
RSS-247 issue 2 Feb. 2017
RSS-Gen Issue 5, Amendment 2, February 2021
ANSI C63.10:2013

1.5 Test Facility

Laboratory	Test Site Address	Test Site Name	FCC Designation number	IC CAB identifier
SGS Taiwan Ltd. Central RF Lab. (TAF code 3702)	No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan.	SAC 1	TW0027	TW3702
		SAC 3		
		Conduction 1		
		Conducted 1		
		Conducted 2		
		Conducted 3		
		Conducted 4		
		Conducted 5		
		Conducted 6		
	No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333	Conduction A	TW0028	
		SAC C		
		SAC D		
		SAC G		
		Conducted A		
		Conducted B		
		Conducted C		
		Conducted D		
		Conducted E		
		Conducted F		
		Conducted G		
Note: Test site name is remarked on the equipment list in each section of this report as an indication where measurements occurred in specific test site and address.				

1.6 Special Accessories

There are no special accessories used while test was conducted.

1.7 Equipment Modifications

There was no modification incorporated into the EUT.

2 SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

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

2.2 EUT Exercise

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

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is a placed on 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.

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.

2.5 Configuration of Tested System

Fig. 2-1 Conducted Setup&Radiated Setup

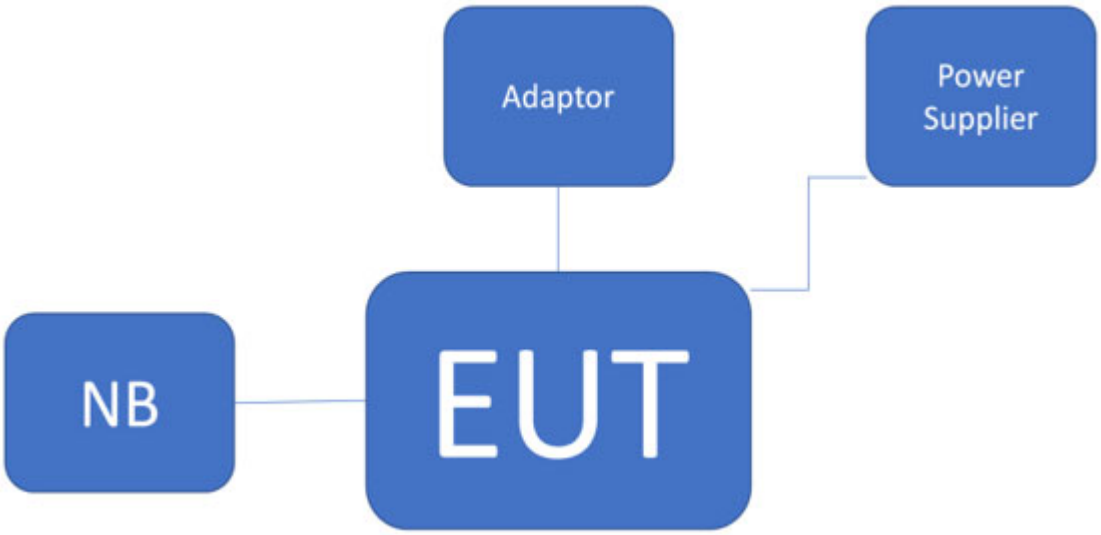


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	Notebook	Lenovo	L440	P0000367	N/A	N/A
2.	DC Power Supply	DHA	DPS-3003	9411005787	N/A	N/A
3.	DutApiSisoBt	N/A	N/A	N/A	N/A	

3 SUMMARY OF TEST RESULTS

FCC Rules	IC Rules	Description Of Test	Result
§15.207(a)	RSS-Gen §8.8	AC Power Line Conducted Emission	N/A
§15.247(b) (3)	RSS-247 §5.4 d	Peak Output Power	Compliant
§15.247(a)(2)	RSS-247 §5.2 a RSS-Gen §6.7	Emission Bandwidth	Compliant
§15.205 §15.209 §15.247(d)	RSS-247 §5.5 RSS-Gen §8.9 RSS-Gen §8.10 RSS-Gen §6.13	Radiated & Conducted Band Edge and Spurious Emission	Compliant
§15.247(e)	RSS-247 §5.2 b	Power Spectral Density	Compliant
§15.203 §15.247(b)	N/A	Antenna Requirement	Compliant

4 DESCRIPTION OF TEST MODES

4.1 Operating Frequencies

802.11 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

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 gevin 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

4. 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.

4.3 Radiated Emission Test:

RADIATED EMISSION TEST (BELOW 1 GHz)					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11g	1 to 11	6	OFDM	6	ch0

RADIATED EMISSION TEST (ABOVE 1 GHz)					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11b	1 to 11	1,6,11	DSSS	1	ch0
802.11g	1 to 11	1,3,4,6,8,9,11	OFDM	6	ch0
802.11n (HT20)	1 to 11	1,3,4,6,8,9,11	OFDM	MCS0	ch0

Note: The field strength of radiation emission was measured as EUT three orthogonal plans, E1 / E2 / H, are positioned to pre-scan the emission generating the highest one. The worst **E1 plane & E2 plane** position is tested, and recorded.

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	ch0
802.11g	1 to 11	1,3,4,6,8,9,11	OFDM	6	ch0
802.11n (HT20)	1 to 11	1,3,4,6,8,9,11	OFDM	MCS0	ch0

5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty		
AC Power Line Conducted Emission	+/-	2.34	dB
Peak Output Power	+/-	1	dB
6dB Bandwidth & 99% Bandwidth	+/-	1.53	Hz
100 KHz Bandwidth Of Frequency Band Edges	+/-	1.69	dB
Peak Power Density	+/-	1.53	dB
Temperature	+/-	0.4	°C
Humidity	+/-	3.5	%
DC / AC Power Source	+/-	1	%

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

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.

6 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.		

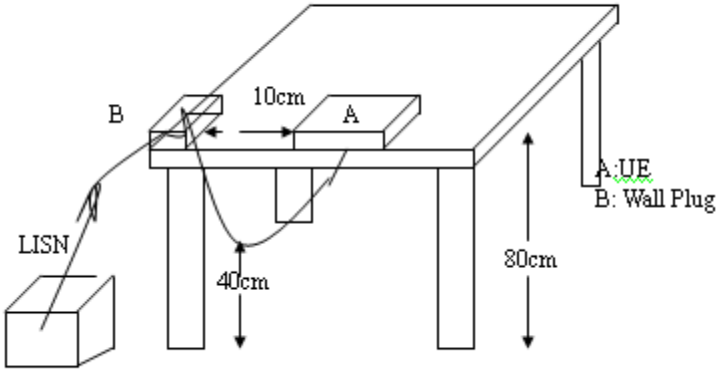
6.2 Measurement Equipment Used

N/A

6.3 EUT Setup

1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.10:2013.
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.

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

N/A; Powered from power supply.

7 DUTY CYCLE OF TEST SIGNAL

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

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

7.1 Measurement Procedure:

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

7.2 Duty Cycle:

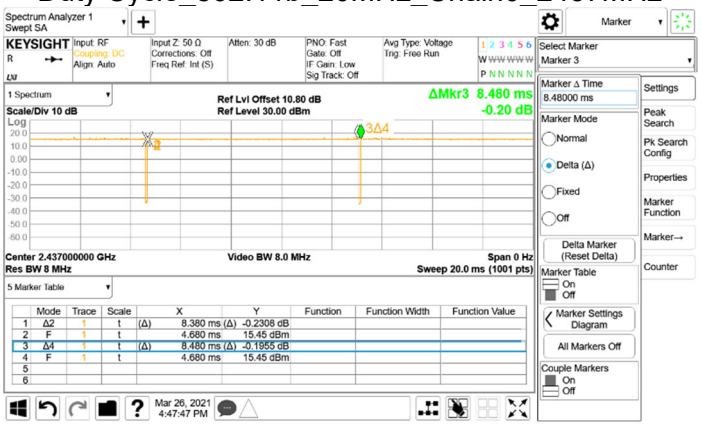
Duty Cycle

	Duty Cycle (%) = Ton / (Ton+Toff)	Duty Factor (dB) =10*log (1/Duty Cycle)	1/T (kHz)	VBW setting (kHz)
802.11b	98.82	0.00	0.00	0.01
802.11g	94.44	0.25	0.58	1.00
802.11n_20	94.18	0.26	0.62	1.00

b = 98.82%, g = 94.44%,n_ht_20 = 94.18%n_ht_40 = 88.88%
Duty Cycle Factor: 10 * log(1/0.9882) = 0.05
Duty Cycle Factor: 10 * log(1/0.9444) = 0.25
Duty Cycle Factor: 10 * log(1/0.9418) = 0.26

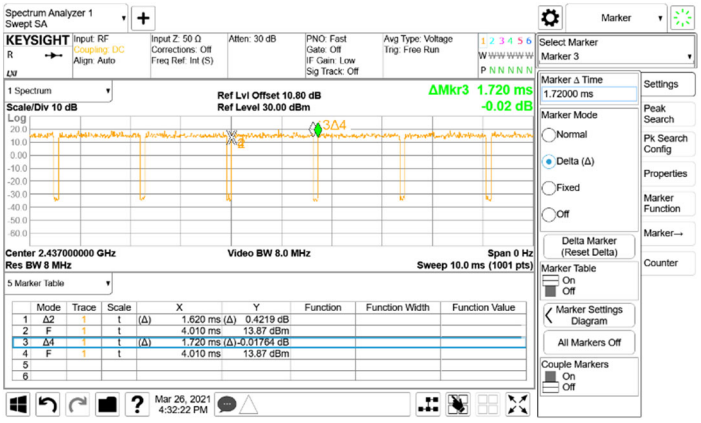
7.3 Duty Cycle test plots

Duty Cycle_802.11b_20MHz_Chain0_2437MHz



Duty Cycle_802.11g_20MHz_Chain0_2437MHz

Duty Cycle_802.11n_20MHz_Chain0_2437MHz



8 PEAK OUTPUT POWER MEASUREMENT

8.1 Standard Applicable

For systems using digital modulation in the 2400-2483.5 MHz bands, the limit for peak output power is 1Watt and the e.i.r.p. shall not exceed 4 W.

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.

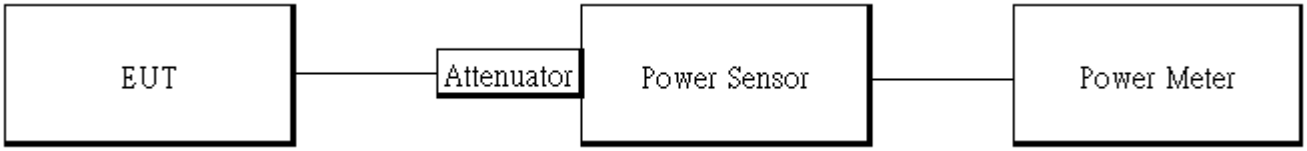
Note:
The antenna gain is not grater than 6 dBi. Therefore, reduction of power is not required.

8.2 Measurement Equipment Used

Conducted Emission Test Site: Conducted A					
EQUIPMENT TYPE	**MFR/BRAND**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
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
DC Power Supply	Agilent	E3640A	MY53130054	09/07/2020	09/06/2021
Attenuator	Marvelous	MVE2213-10	RF09	11/19/2020	11/18/2021
Attenuator	Marvelous	MVE2213-10	RF10	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.***

8.5 Measurement Result

802.11b Ch0						
CH	Freq. (MHz)	Data Rate	Power set	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	1	19	**23.14**	30.00	PASS
6	2437	1	19	23.11	30.00	PASS
11	2462	1	19	23.08	30.00	PASS
802.11b Ch0						
CH	Freq. (MHz)	Data Rate	Power set	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
1	2412	1	19	**18.99**	30.00	PASS
6	2437	1	19	18.95	30.00	PASS
11	2462	1	19	18.90	30.00	PASS

802.11g Ch0						
CH	Freq. (MHz)	Data Rate	Power set	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	6	16.5	24.41	30.00	PASS
3	2422	6	16.5	24.35	30.00	PASS
4	2427	6	19	24.40	30.00	PASS
6	2437	6	19	24.42	30.00	PASS
8	2447	6	19	**24.46**	30.00	PASS
9	2452	6	16.5	24.34	30.00	PASS
11	2462	6	16.5	24.33	30.00	PASS
802.11g Ch0						
CH	Freq. (MHz)	Data Rate	Power set	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
1	2412	6	16.5	15.81	30.00	PASS
3	2422	6	16.5	15.87	30.00	PASS
4	2427	6	19	18.54	30.00	PASS
6	2437	6	19	18.62	30.00	PASS
8	2447	6	19	**18.65**	30.00	PASS
9	2452	6	16.5	15.83	30.00	PASS
11	2462	6	16.5	15.75	30.00	PASS

802.11n_HT20M Ch0						
CH	Freq. (MHz)	Data Rate	Power set	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	MCS0	15	**24.50**	30.00	PASS
3	2422	MCS0	15	24.40	30.00	PASS
4	2427	MCS0	18	24.42	30.00	PASS
6	2437	MCS0	18	24.45	30.00	PASS
8	2447	MCS0	18	24.40	30.00	PASS
9	2452	MCS0	15	24.38	30.00	PASS
11	2462	MCS0	15	24.05	30.00	PASS
802.11n_HT20M Ch0						
CH	Freq. (MHz)	Data Rate	Power set	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
1	2412	MCS0	15	14.97	30.00	PASS
3	2422	MCS0	15	14.95	30.00	PASS
4	2427	MCS0	18	17.82	30.00	PASS
6	2437	MCS0	18	**17.89**	30.00	PASS
8	2447	MCS0	18	17.81	30.00	PASS
9	2452	MCS0	15	14.96	30.00	PASS
11	2462	MCS0	15	14.95	30.00	PASS

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

EIRP

802.11b Ch0							
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	RESULT
1	2412	1	18.99	3.60	**22.59**	36	PASS
6	2437	1	18.95	3.60	22.55	36	PASS
11	2462	1	18.90	3.60	22.50	36	PASS

802.11g Ch0							
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	RESULT
1	2412	6	15.81	3.60	19.41	36	PASS
3	2422	6	15.87	3.60	19.47	36	PASS
4	2427	6	18.54	3.60	22.14	36	PASS
6	2437	6	18.62	3.60	22.22	36	PASS
8	2447	6	18.65	3.60	**22.25**	36	PASS
9	2452	6	15.83	3.60	19.43	36	PASS
11	2462	6	15.75	3.60	19.35	36	PASS

802.11n_HT20M Ch0							
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	RESULT
1	2412	MCS0	14.97	3.60	18.57	36	PASS
3	2422	MCS0	14.95	3.60	18.55	36	PASS
4	2427	MCS0	17.82	3.60	21.42	36	PASS
6	2437	MCS0	17.89	3.60	**21.49**	36	PASS
8	2447	MCS0	17.81	3.60	21.41	36	PASS
9	2452	MCS0	14.96	3.60	18.56	36	PASS
11	2462	MCS0	14.95	3.60	18.55	36	PASS

9 EMISSION BANDWIDTH MEASUREMENT

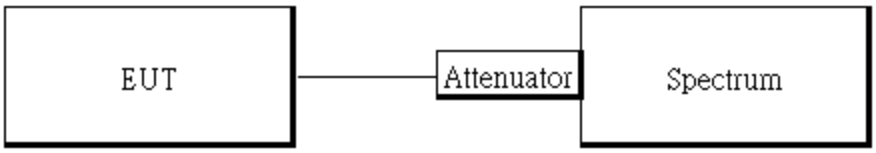
9.1 Standard Applicable

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

9.2 Measurement Equipment Used

Conducted Emission Test Site: Conducted A					
EQUIPMENT TYPE	MFR/BRAND	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010B	MY59071573	06/26/2020	06/25/2021
DC Power Supply	Agilent	E3640A	MY53130054	09/07/2020	09/06/2021
Attenuator	Marvelous	MVE2213-10	RF09	11/19/2020	11/18/2021
DC Block	PASTERNACK	PE8210	RF151	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. Set the spectrum analyzer as
   RBW= 1 % to 5% of 99% Bandwidth ,
   VBW ≥ 3 X RBW,
   Span= large enough to capture all products of the modulation process,
   Sweep=auto,
   Detector = Peak, and Max hold for 99% Bandwidth test.
6. Turn on the 99% bandwidth function, max reading.
7. Repeat above procedures until all test default channel is completed

9.5 6dB Bandwidth

802.11b Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	**9168.00**	> 500	PASS
2437	9130.00	> 500	PASS
2462	9159.00	> 500	PASS

802.11g Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	**16400.00**	> 500	PASS
2427	**16400.00**	> 500	PASS
2437	**16400.00**	> 500	PASS
2447	**16400.00**	> 500	PASS
2462	**16400.00**	> 500	PASS

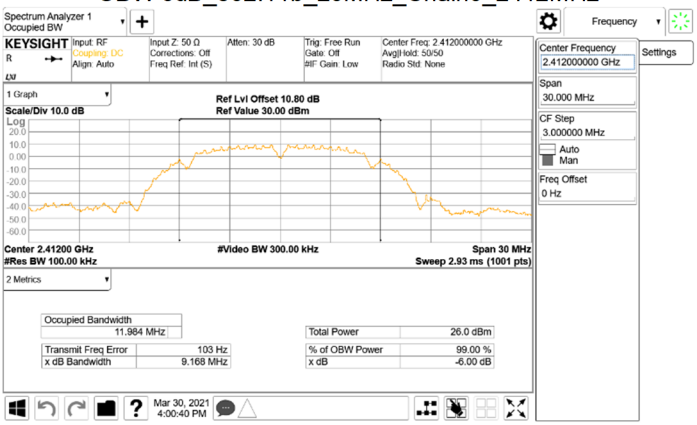
802.11_n_HT20 Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	17590.00	> 500	PASS
2427	17600.00	> 500	PASS
2437	17590.00	> 500	PASS
2447	**17780.00**	> 500	PASS
2462	17590.00	> 500	PASS

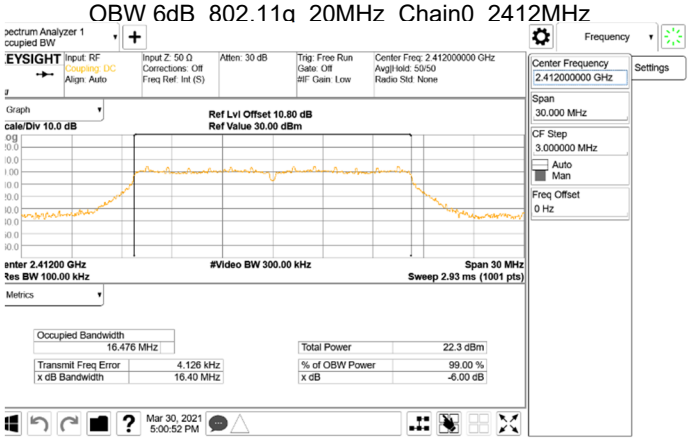
** Note: Offset 10.8dB for 2.4G 802.11b/g/n_20*

**Refer to next page for plots*

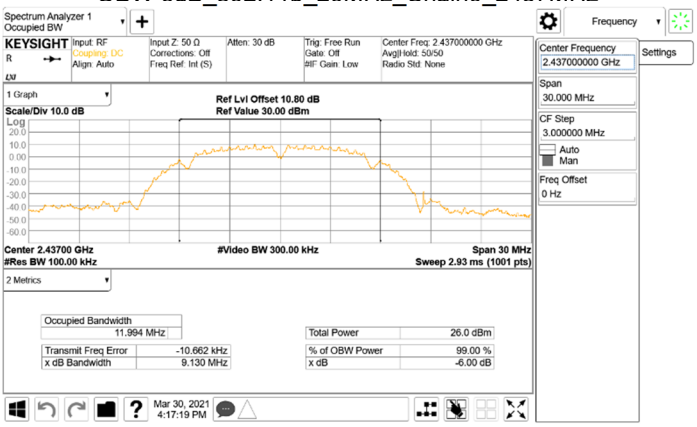
OBW 6dB_802.11b_20MHz_Chain0_2412MHz



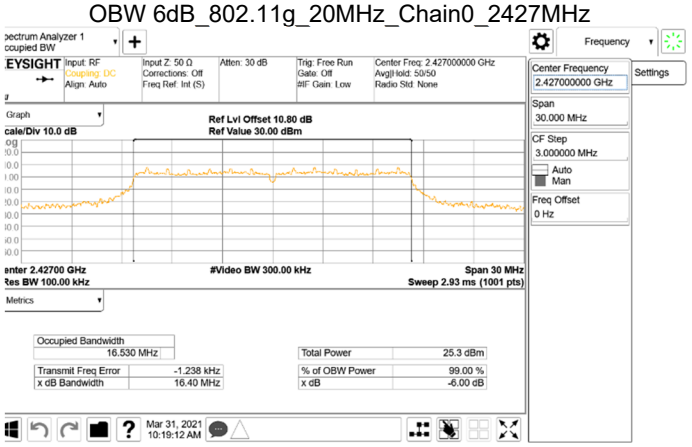
OBW 6dB_802.11g_20MHz_Chain0_2412MHz



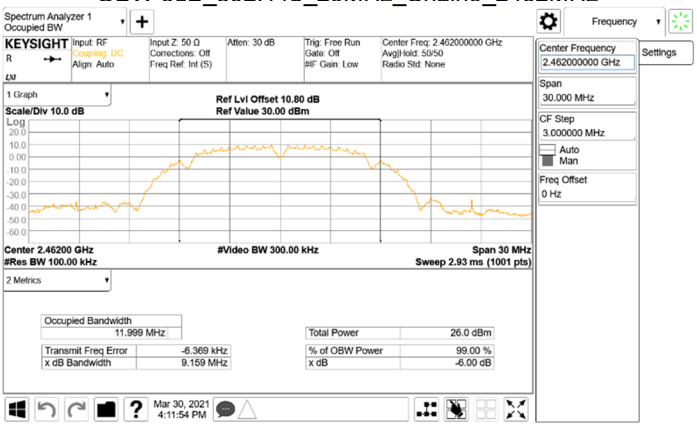
OBW 6dB_802.11b_20MHz_Chain0_2437MHz



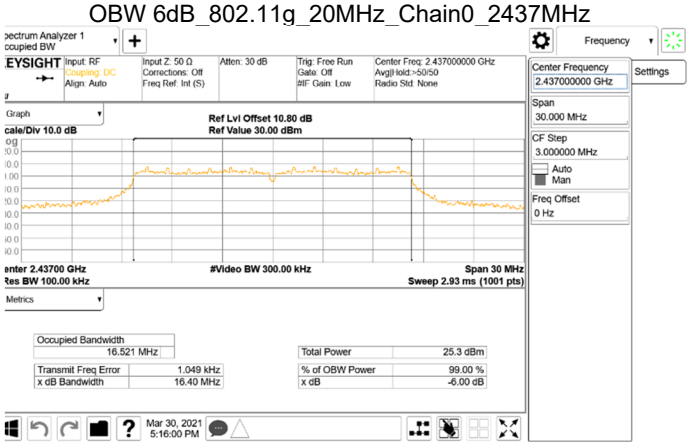
OBW 6dB_802.11g_20MHz_Chain0_2427MHz



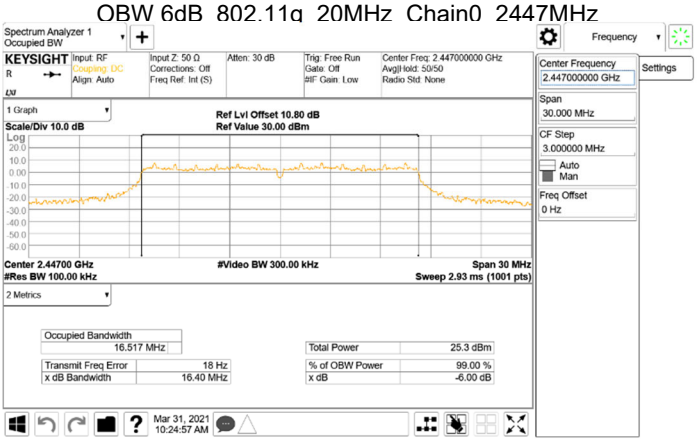
OBW 6dB_802.11b_20MHz_Chain0_2462MHz



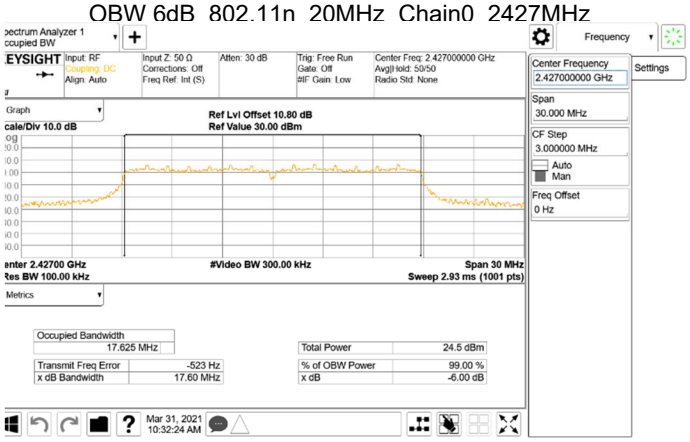
OBW 6dB_802.11g_20MHz_Chain0_2437MHz



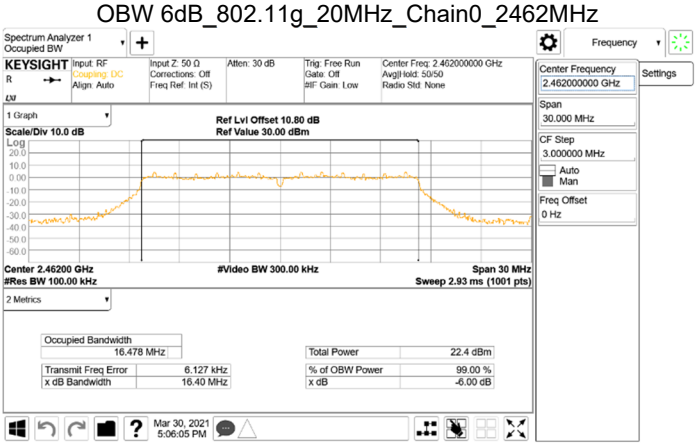
OBW 6dB 802.11g 20MHz Chain0 2447MHz



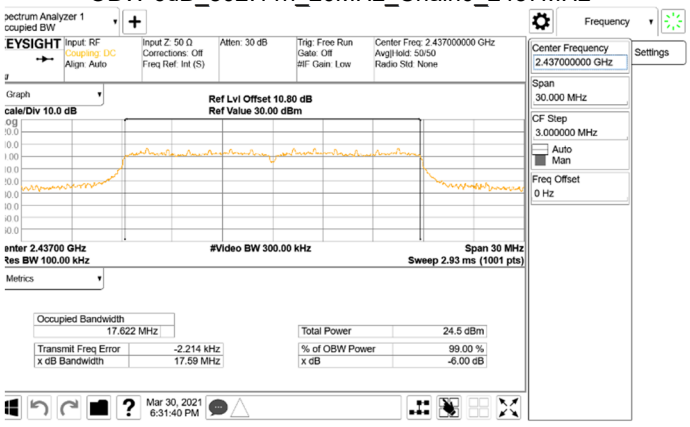
OBW 6dB 802.11n 20MHz Chain0 2427MHz



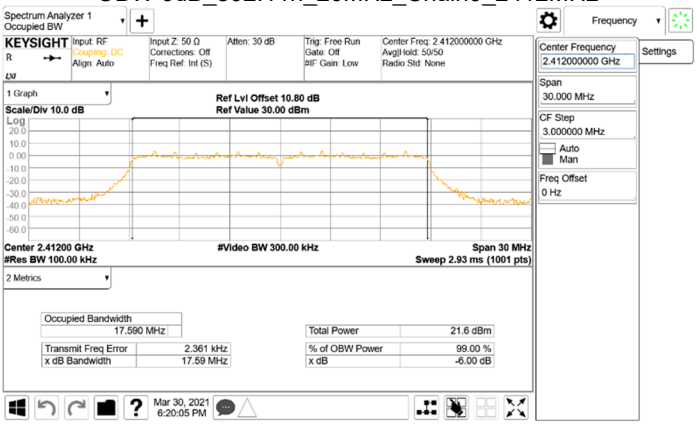
OBW 6dB_802.11g_20MHz_Chain0_2462MHz



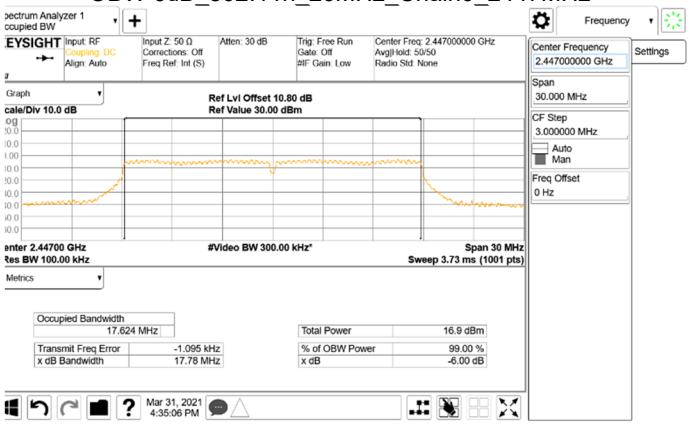
OBW 6dB_802.11n_20MHz_Chain0_2437MHz



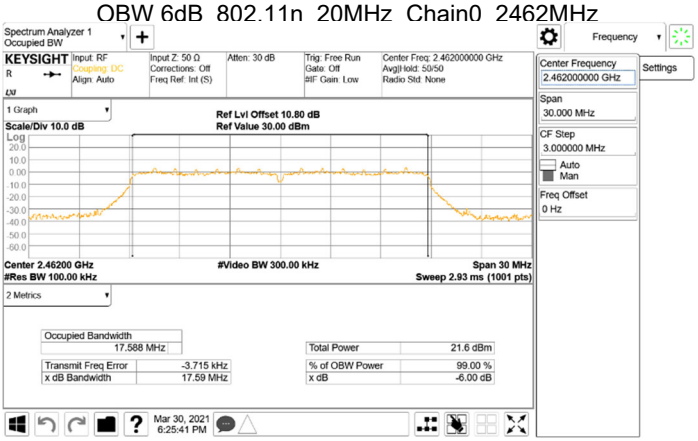
OBW 6dB_802.11n_20MHz_Chain0_2412MHz



OBW 6dB_802.11n_20MHz_Chain0_2447MHz



OBW 6dB 802.11n 20MHz Chain0 2462MHz



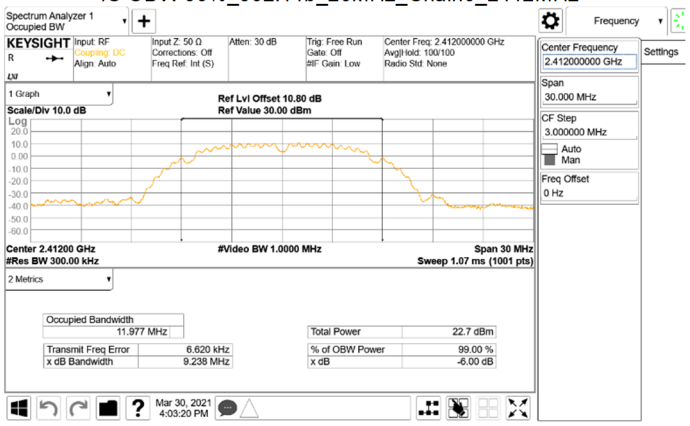
9.6 99% Bandwidth

802.11b Ch0	
Freq. (MHz)	99% BW (MHz)
2412	11.977
2437	11.979
2462	**11.987**

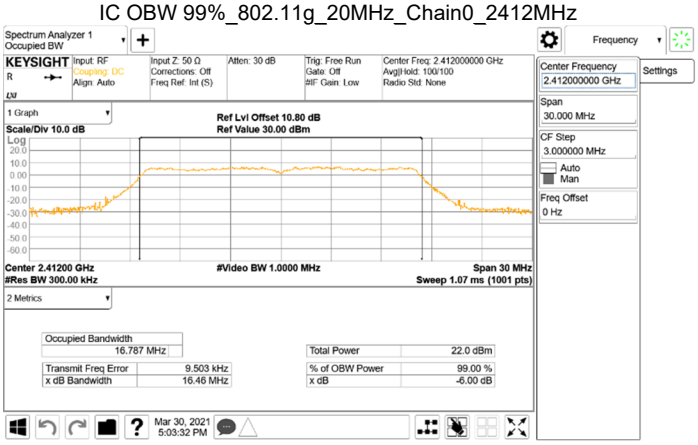
802.11g Ch0	
Freq. (MHz)	99% BW (MHz)
2412	16.787
2427	16.919
2437	16.917
2447	**16.923**
2462	16.801

802.11n_HT20M Ch0	
Freq. (MHz)	99% BW (MHz)
2412	17.712
2427	17.799
2437	**17.817**
2447	17.688
2462	**17.706**

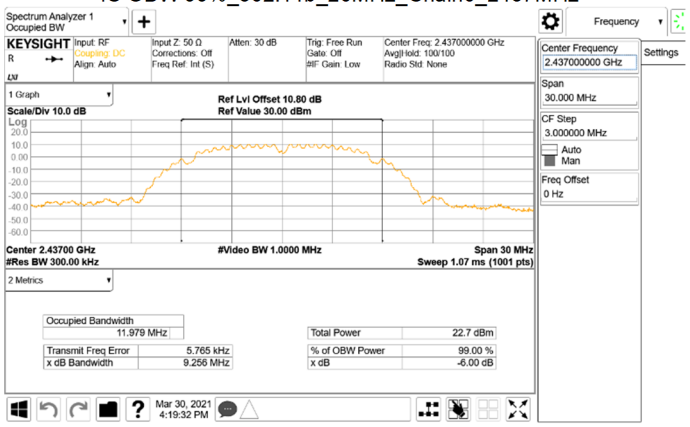
IC OBW 99%_802.11b_20MHz_Chain0_2412MHz



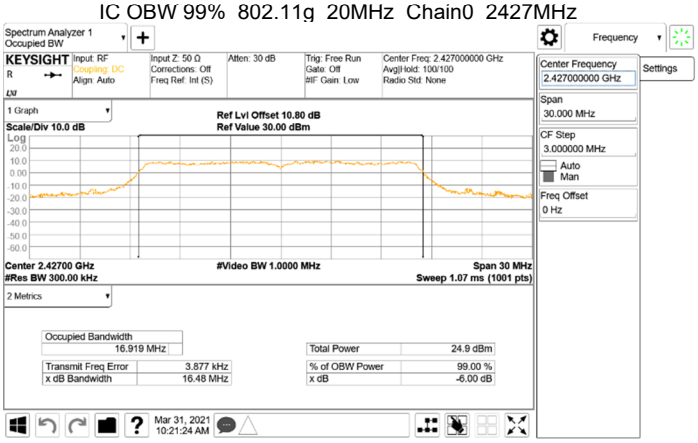
IC OBW 99%_802.11g_20MHz_Chain0_2412MHz



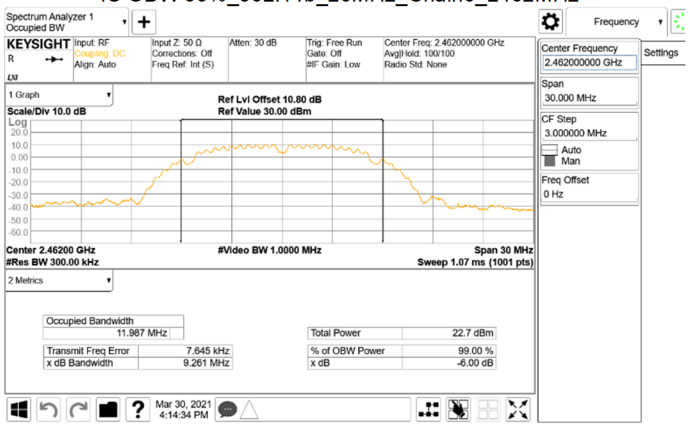
IC OBW 99%_802.11b_20MHz_Chain0_2437MHz



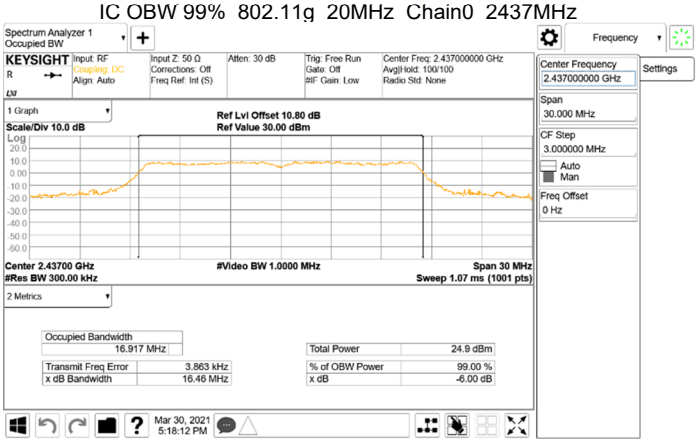
IC OBW 99% 802.11g 20MHz Chain0 2427MHz



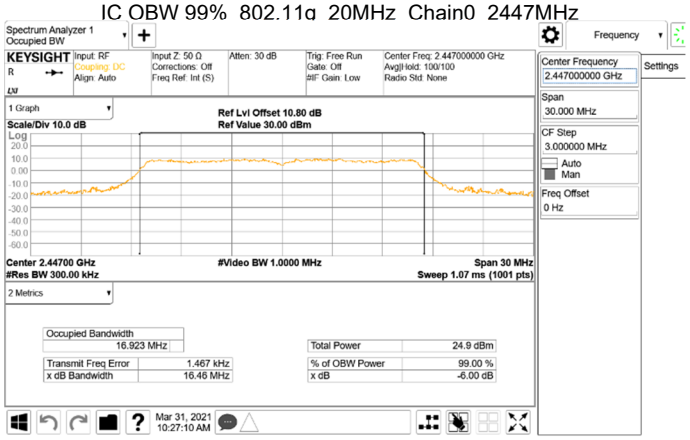
IC OBW 99%_802.11b_20MHz_Chain0_2462MHz



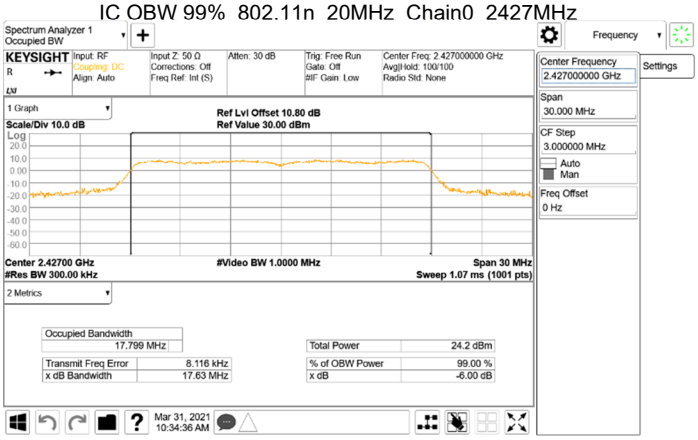
IC OBW 99% 802.11g 20MHz Chain0 2437MHz



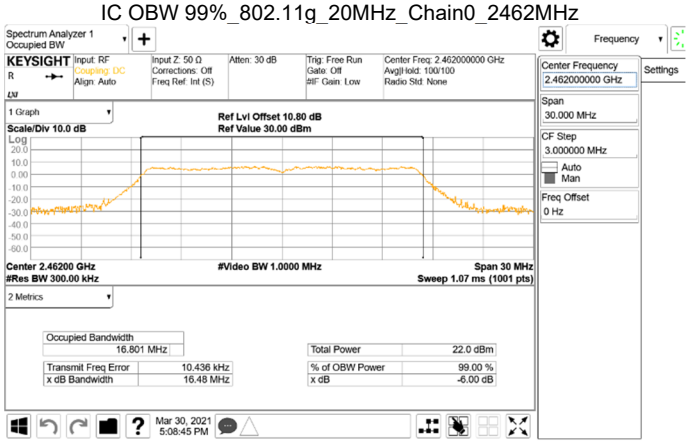
IC OBW 99% 802.11g 20MHz Chain0 2447MHz



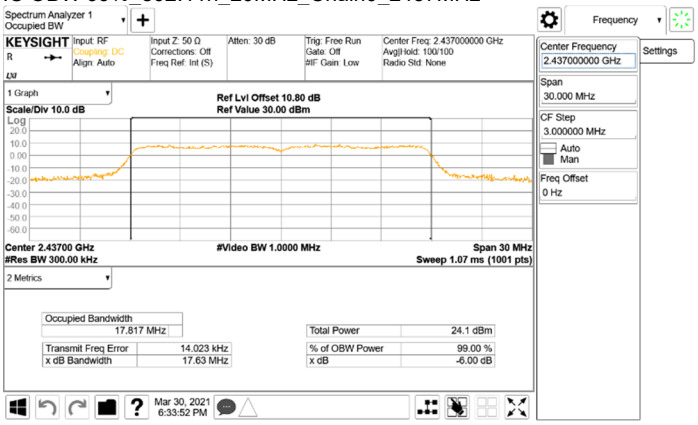
IC OBW 99% 802.11n 20MHz Chain0 2427MHz



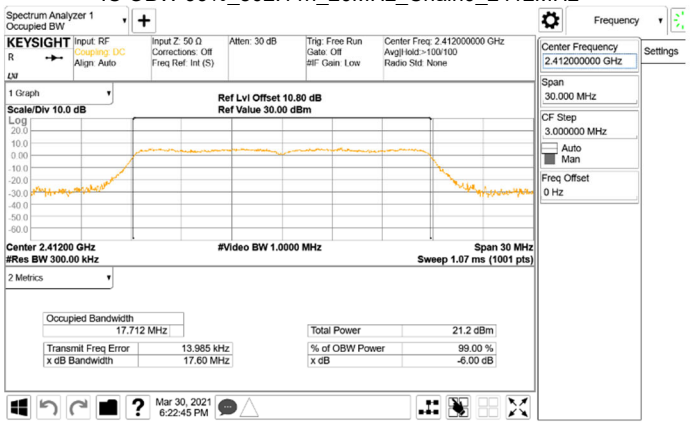
IC OBW 99%_802.11g_20MHz_Chain0_2462MHz



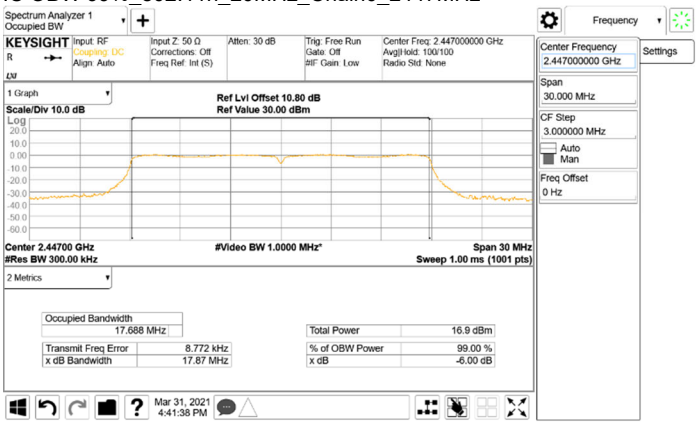
IC OBW 99%_802.11n_20MHz_Chain0_2437MHz



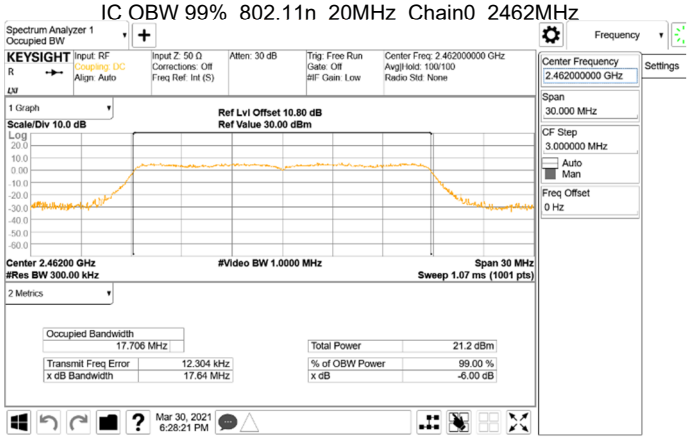
IC OBW 99%_802.11n_20MHz_Chain0_2412MHz



IC OBW 99%_802.11n_20MHz_Chain0_2447MHz



IC OBW 99% 802.11n 20MHz Chain0 2462MHz



10 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

10.1 Standard Applicable

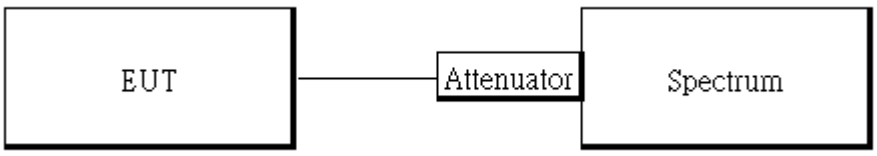
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the 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) & RSS-Gen §8.10, must also comply with the radiated emission limits specified in §15.209(a) & RSS-Gen §8.9.

10.2 Measurement Equipment Used

Conducted Emission Test Site: Conducted A					
EQUIPMENT TYPE	MFR/BRAND	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010B	MY59071573	06/26/2020	06/25/2021
DC Power Supply	Agilent	E3640A	MY53130054	09/07/2020	09/06/2021
Attenuator	Marvelous	MVE2213-10	RF09	11/19/2020	11/18/2021
DC Block	PASTERNACK	PE8210	RF151	11/19/2020	11/18/2021

10.3 Test SET-UP



10.4 Measurement Procedure

Reference Level of Emission Limit:

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

Conducted Band Edge:

1. To connect Antenna Port of EUT to Spectrum.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
4. Set start to edge frequency, and stop frequency of spectrum analyzer so as to encompass the spectrum to be examined.
5. Set the spectrum analyzer as RBW=100 kHz, VBW=300 kHz, Detector = Peak, Sweep = auto
6. Mark the highest reading of the emission as the reference level measurement.
7. Set DL as the limit = reading on marker 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.

Conducted Spurious Emission:

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

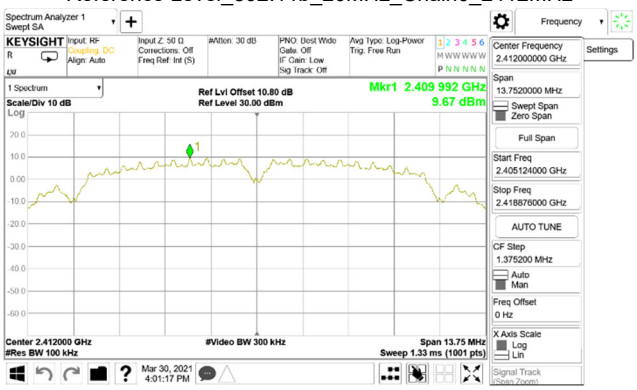
10.5 Measurement Result

Reference Level of Limit 802.11b mode		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2412	9.67	-10.33
2437	9.41	-10.59
2462	9.41	-10.59

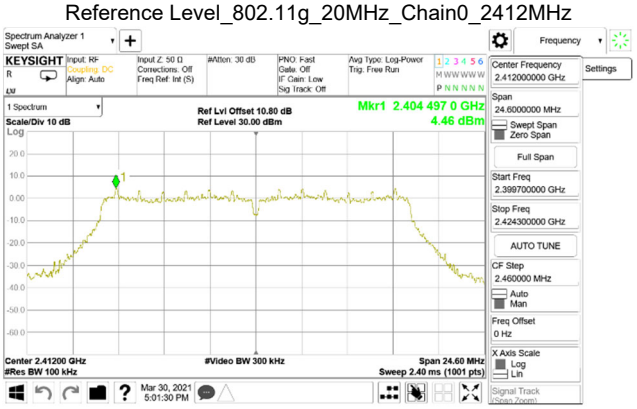
Reference Level of Limit 802.11g mode		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2412	4.46	-15.54
2427	7.37	-12.63
2437	7.44	-12.56
2447	7.41	-12.59
2462	4.41	-15.59

Reference Level of Limit 802.11n20 mode		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2412	3.48	-16.52
2427	6.44	-13.56
2437	6.48	-13.52
2447	6.45	-13.55
2462	3.42	-16.58

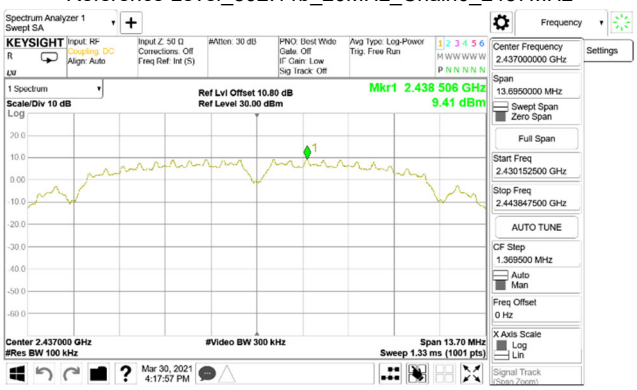
Reference Level_802.11b_20MHz_Chain0_2412MHz



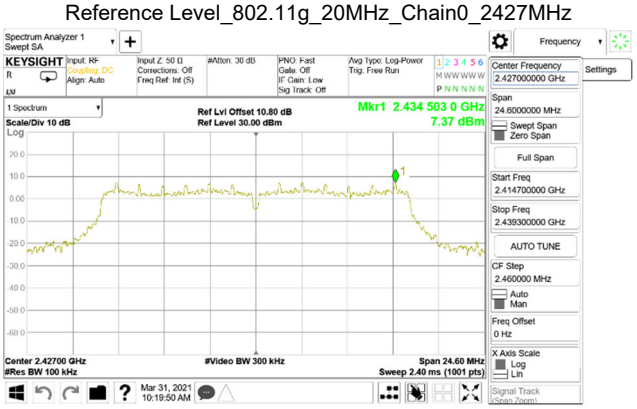
Reference Level_802.11g_20MHz_Chain0_2412MHz



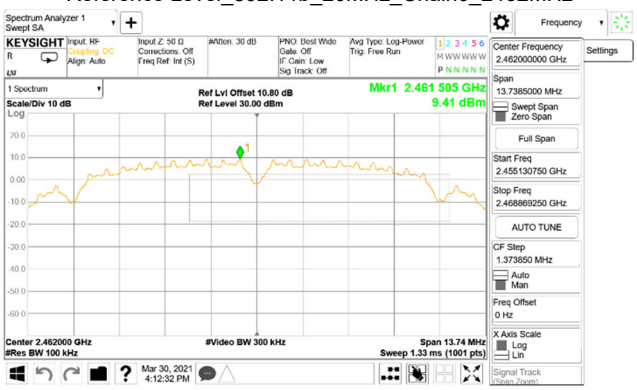
Reference Level_802.11b_20MHz_Chain0_2437MHz



Reference Level_802.11g_20MHz_Chain0_2427MHz



Reference Level_802.11b_20MHz_Chain0_2462MHz



Reference Level_802.11g_20MHz_Chain0_2437MHz