RF TEST REPORT

SIEMIC
A Bureau Veritas Group Company

Report No.: NCC_SL18121801-KLA-021-DTS Rev2.0
Supersede Report No.: NCC_SL18121801-KLA-021-DTS Rev1.0

Applicant	:	KLA Corporation
Product Name	:	SensArray® AM Wafer
Model No.	:	AMW120
Test Standard	:	LP0002: 2018
Test Method	:	LP0002: 2018 ANSI C63.10: 2013 558074 D01 DTS Meas Guidance v04
Dates of test	:	03/01/2019 – 03/10/2019
Issue Date	:	03/28/2019
Test Result	:	☒ Pass ☐ Fail
Equipment complied with the specification [X] Equipment did not comply with the specification [ ]		

This Test Report is Issued Under the Authority of:	
Cipher	**Chen Ge**
Test Engineer	Engineer Reviewer

Issued By:
SIEMIC Laboratories
775 Montague Expressway, Milpitas, 95035 CA

ilac-MRA
ACCREDITED
TESTING CERT # 2742-01

Laboratory Introduction

SIEMIC, headquartered in the heart of Silicon Valley, with superior facilities in US and Asia, is one of the leading independent testing and certification facilities providing customers with one-stop shop services for Compliance Testing and Global Certifications.

In addition to testing and certification, SIEMIC provides initial design reviews and compliance management throughout a project. Our extensive experience with China, Asia Pacific, North America, European, and International compliance requirements, assures the fastest, most cost effective way to attain regulatory compliance for the global markets.

Accreditations for Conformity Assessment

Country/Region	Accreditation Body	Scope
USA	FCC, A2LA	EMC, RF/Wireless, Telecom
Canada	IC, A2LA, NIST	EMC, RF/Wireless, Telecom
Taiwan	BSMI, NCC, NIST	EMC, RF, Telecom, Safety
Hong Kong	OFTA, NIST	RF/Wireless, Telecom
Australia	NATA, NIST	EMC, RF, Telecom, Safety
Korea	KCC/RRA, NIST	EMI, EMS, RF, Telecom, Safety
Japan	VCCI, JATE, TELEC, RFT	EMI, RF/Wireless, Telecom
Mexico	NOM, COFETEL, Caniety	Safety, EMC, RF/Wireless, Telecom
Europe	A2LA, NIST	EMC, RF, Telecom, Safety
Israel	MOC, NIST	EMC, RF, Telecom, Safety

Accreditations for Product Certifications

Country	Accreditation Body	Scope
USA	FCC TCB, NIST	EMC, RF, Telecom
Canada	IC FCB, NIST	EMC, RF, Telecom
Singapore	iDA, NIST	EMC, RF, Telecom
EU	NB	EMC & R&TTE Directive
Japan	MIC (RCB 208)	RF, Telecom
Hong Kong	OFTA (US002)	RF, Telecom

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1 Report Revision History

Report No.	Report Version	Description	Issue Date
NCC_SL18121801-KLA-021-DTS	None	Original	03/28/2019
NCC_SL18121801-KLA-021-DTS_Rev1.0	Rev1.0	Add Product Name,Model no.	04/18/2019
NCC_SL18121801-KLA-021-DTS_Rev2.0	Rev2.0	Update Product Information	05/27/2020

2 Executive Summary

The purpose of this test program was to demonstrate compliance of following product

Company:	KLA Corporation
Product:	SensArray® AM Wafer
Model:	AMW120

against the current Stipulated Standards. The specified model product stated above has demonstrated compliance with the Stipulated Standard listed on 1st page.

3 Customer information

Applicant Name	:	KLA Corporation
Applicant Address	:	1 Technology Dr, Milpitas, CA 95035, USA
Manufacturer Name	:	KLA Corporation
Manufacturer Address	:	1 Technology Dr, Milpitas, CA 95035, USA

4 Test site information

Lab performing tests	SIEMIC Laboratories
Lab Address	775 Montague Expressway, Milpitas, CA 95035
FCC Test Site No.	540430
IC Test Site No.	4842D-2
VCCI Test Site No.	A0133

5 Modification

Index	Item	Description	Note
-	-	-	-

6 EUT Information

6.1 EUT Description

Product Name	SensArray® AM Wafer
Model No.	AMW120
Trade Name	KLA Corporation
Serial No.	0219005
Input Power	5 VDC
Date of EUT received	03/18/2019
Equipment Class/ Category	DTS
Port/Connectors	I/O

6.2 Radio Description

Radio Type	802.11b/g/n
Operating Frequency	2412-2462MHz
Modulation	DSSS (CCK, DQPSK, DBPSK)
Channel Spacing	5MHz
Number of Channels	11
Antenna Type	Chip Antenna
Antenna Gain (Peak)	1.9 dBi
Antenna Connector Type	PCB
Note	-

7 Supporting Equipment/Software and cabling Description

7.1 Supporting Equipment

Item	Supporting Equipment Description	Model	Serial Number	Manufacturer	Note
1	Laptop	ThinkPad T420s	N/A	Lenovo	-

7.2 Cabling Description

Name	Connection Start		Connection Stop		Length / shielding Info		Note
	From	I/O Port	To	I/O Port	Length (m)	Shielding	
USB	EUT	Micro-USB Port	Laptop	USB	1	Unshielded	-

7.3 Test Software Description

Test Item	Software	Description
RF Testing	Tera Term	Set the EUT to transmit continuously in different test modes.

8 Test Summary

Test Item	Test standard		Test Method/Procedure	Pass / Fail
Antenna Requirement	NCC	LP0002, 2.2	LP0002: 2018 Appendix III 558074 D01 DTS Meas Guidance v04	☒ Pass ☐ N/A
AC Conducted Emissions Voltage	NCC	LP0002, 2.3	LP0002: 2018 Appendix III	☒ Pass ☐ N/A
Restricted Band of Operation	NCC	LP0002, 2.7	LP0002: 2018 Appendix III 558074 D01 DTS Meas Guidance v04	☒ Pass ☐ N/A

DTS Band Requirement

Test Item	Test standard		Test Method/Procedure	Pass / Fail
6 dB Bandwidth	NCC	LP0002, 3.10.1.6	LP0002: 2018 Appendix II 558074 D01 DTS Meas Guidance v04	☒ Pass ☐ N/A
Band Edge and Radiated Spurious Emissions	NCC	LP0002, 3.10.1.5	LP0002: 2018 Appendix II 558074 D01 DTS Meas Guidance v04	☒ Pass ☐ N/A
Output Power	NCC	LP0002, 3.10.1.2	LP0002: 2018 Appendix II 558074 D01 DTS Meas Guidance v04	☒ Pass ☐ N/A
Antenna Gain > 6 dBi	NCC	LP0002, 3.10.1.3	-	☐ Pass ☒ N/A
Power Spectral Density	NCC	LP0002, 3.10.1.6	LP0002: 2018 Appendix II 558074 D01 DTS Meas Guidance v04	☒ Pass ☐ N/A
Remark	1. All measurement uncertainties do not take into consideration for all presented test results. 2. The applicant shall ensure frequency stability by showing that an emission is maintained within the band of operation under all normal operating conditions as specified in the user's manual. 3. The device is operating at near 98% duty cycle.			

9 Measurement Uncertainty

9.1 Emissions (30MHz to 1GHz)

The test is to measure the radiated emissions of the EUT.

Some error sources that can contribute to the total uncertainty:
- Uncertainty of the receiver
- Uncertainty of the antenna
- Uncertainty of cables
- Uncertainty due to the mismatches
- NSA Calibration
- Etc., details see the below table

Source of Uncertainty	Value (dB)	Probability Distribution	Division	Sensitivity Coefficient	Expanded Uncertainty
Receiver Reading	0.12	Rectangular	1.732	1	0.069284
Cable Insertion Loss	0.21	Normal	2	1	0.105
Filter Insertion Loss	0.25	Normal	2	1	0.125
Antenna Factor	0.65	Normal	2	1	0.325
Receiver CW accuracy	0.5	Rectangular	1.732	1	0.2886836
Pulse Amplitude Response	1.5	Rectangular	1.732	1	0.86605081
PRF Response	1.5	Rectangular	1.732	1	0.86605081
Mismatch Filter - Receiver	0.25	U-Shape	1.414	1	0.1768033
NSA Calibration	4.0	U-Shape	1.414	1	2.8288543
Combined Standard Uncertainty					3.0059131
Expanded Uncertainty (K=2)					**6.0118262**

The total derived measurement uncertainty is +/- 6.00 dB.

9.2 Radiated Emissions (1GHz to 40GHz)

The test is to measure the radiated emissions of the EUT.

Some error sources that can contribute to the total uncertainty:
- Uncertainty of the receiver
- Uncertainty of the antenna
- Uncertainty of cables
- Uncertainty due to the mismatches
- VSWR Calibration
- Etc., details see the below table

Source of Uncertainty	Value (dB)	Probability Distribution	Division	Sensitivity Coefficient	Expanded Uncertainty
Receiver Reading	0.12	Rectangular	1.732	1	0.0692840
Cable Insertion Loss	0.21	Normal	2	1	0.1050000
Filter Insertion Loss	0.25	Normal	2	1	0.1250000
Antenna Factor	0.65	Normal	2	1	0.3250000
Receiver CW accuracy	0.5	Rectangular	1.732	1	0.2886836
Pulse Amplitude Response	1.5	Rectangular	1.732	1	0.8660508
PRF Response	1.5	Rectangular	1.732	1	0.8660508
Mismatch Filter - Receiver	0.25	U-Shape	1.414	1	0.1768033
VSWR Calibration	2.0	U-Shape	1.414	1	1.4144272
Combined Standard Uncertainty					4.2363
Expanded Uncertainty (K=2)					**8.4726**

The total derived measurement uncertainty is +/- 8.47 dB.

9.3 RF conducted measurement

The test is to measure the RF output power from the EUT.

Some error sources that can contribute to the total uncertainty:

- Uncertainty of the Reference Level Uncertainty
- Uncertainty of variable attenuators
- Uncertainty of cables
- Uncertainty due to the mismatches

Source of Uncertainty	Value (dB)	Probability Distribution	Division	Sensitivity Coefficient	Expanded Uncertainty
Reference Level	0.12	Rectangular	1.732	1	0.069284
Cable Insertion Loss	0.21	Normal	2	1	0.105
Attenuator	0.25	Normal	2	1	0.125
Mismatch	0.25	U-Shape	1.414	1	0.1768033
Combined Standard Uncertainty					0.476087
Expanded Uncertainty (K=2)					**0.952174**

The total derived measurement uncertainty is +/- 0.95 dB.

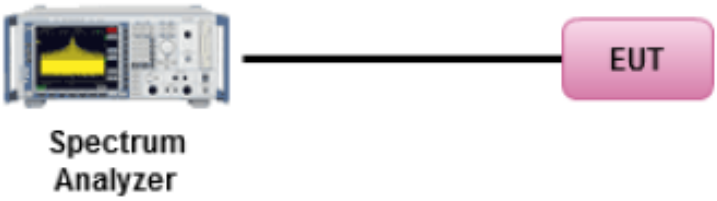
10 Measurements, Examination and Derived Results

10.1 Antenna Requirement

Spec	Requirement	Applicable
LP0002, 2.2	An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. Antenna requirement must meet at least one of the following: a) Antenna must be permanently attached to the device. b) The antenna must use a unique type of connector to attach to the device. c) Device must be professionally installed. The installer shall be responsible for ensuring that the correct antenna is employed by the device.	☒
Remark	The EUT uses PCB for antenna connection which meet the requirement.	
Result	☒ PASS ☐ FAIL	

10.1 6dB Bandwidth

Requirement(s):

Spec	Requirement	Applicable
LP0002-2018	6dB BW≥500KHz;	☒
Test Setup		
Test Procedure	558074 D01 DTS Meas Guidance v04, 8.1 DTS bandwidth 6dB Emission bandwidth measurement procedure - Set RBW = 100 kHz. - Set the video bandwidth (VBW) ⩾ 3 x RBW. - Detector = Peak. - Trace mode = max hold. - Sweep = auto couple. - Allow the trace to stabilize. - Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.	

Test Date	03/01/2019 – 03/10/2019	Environmental condition	Temperature 23ºC Relative Humidity 42% Atmospheric Pressure 1021mbar
Remark	N/A		
Result	☒ Pass ☐ Fail		

Test Data ☒ Yes ☐ N/A
Test Plot ☒ Yes ☐ N/A

Test was done by Cipher at RF test site.

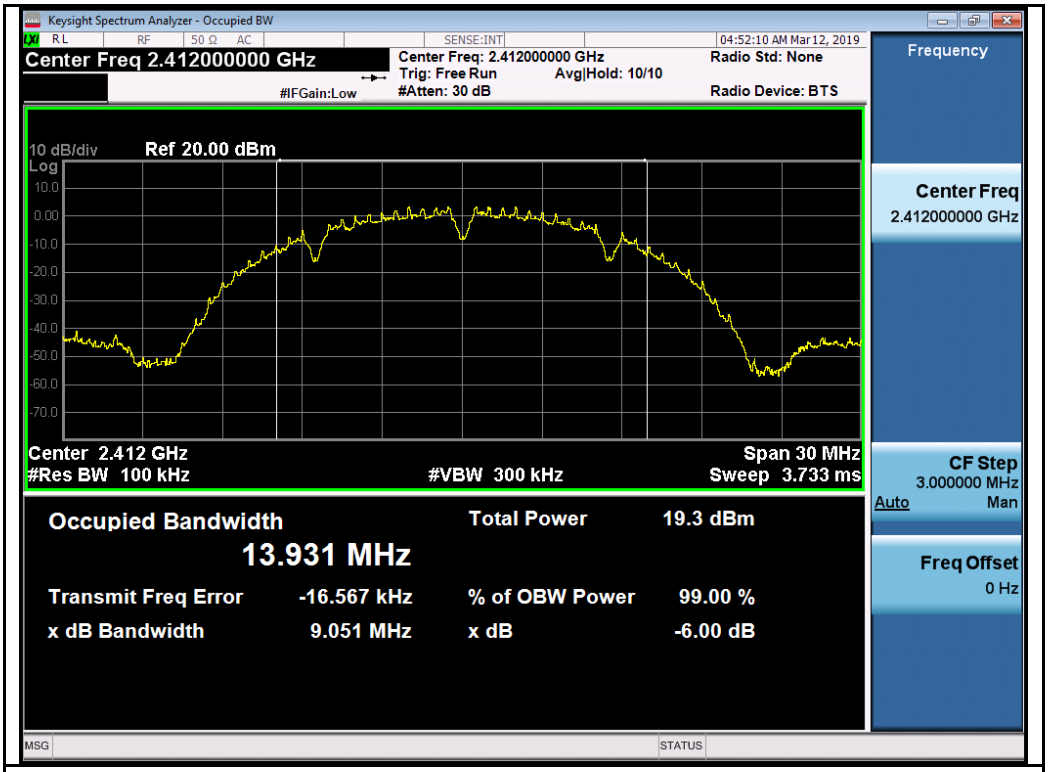
6dB Bandwidth measurement result for 2.4GHz

Type	Test mode	Freq (MHz)	CH	Result (MHz)	Limit (MHz)	Result
6dB BW	802.11b	2412	Low	9.051	≥0.5	Pass
		2437	Mid	9.553	≥0.5	Pass
		2462	High	9.071	≥0.5	Pass
	802.11g	2412	Low	15.041	≥0.5	Pass
		2437	Mid	15.083	≥0.5	Pass
		2462	High	15.042	≥0.5	Pass
	802.11n20	2412	Low	15.025	≥0.5	Pass
		2437	Mid	13.184	≥0.5	Pass
		2462	High	15.106	≥0.5	Pass

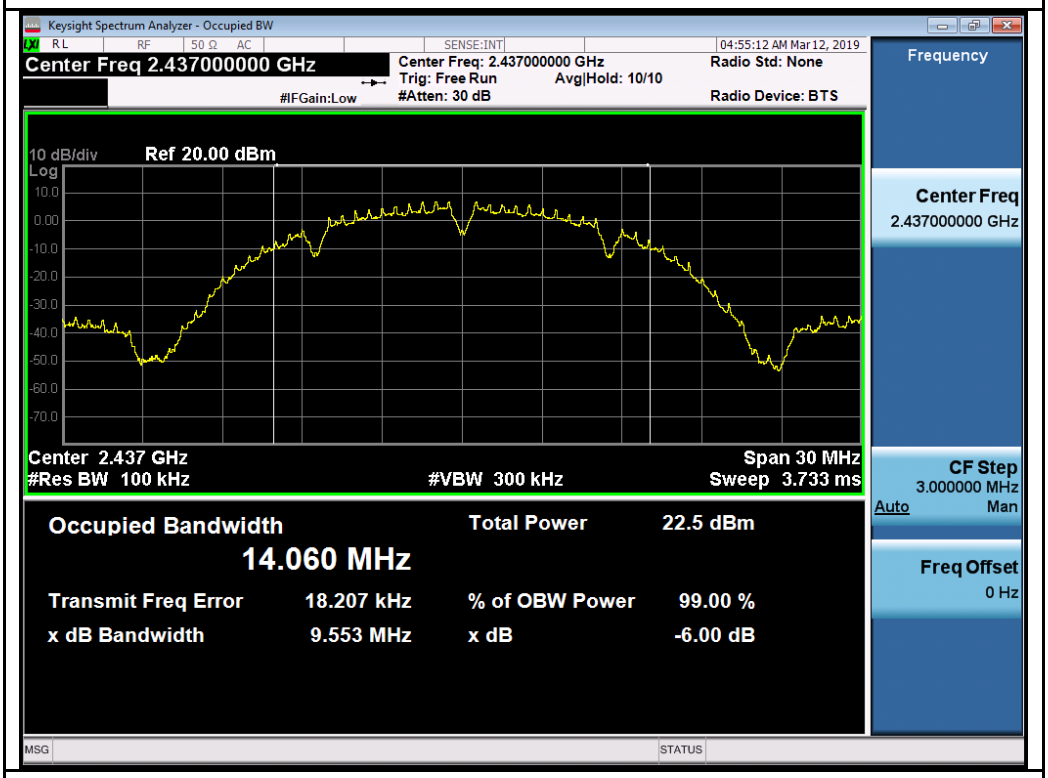
99% OBW measurement result for 2.4GHz

Type	Test mode	Freq (MHz)	CH	Result (MHz)
99% OBW	802.11b	2412	Low	13.931
		2437	Mid	14.060
		2462	High	14.019
	802.11g	2412	Low	16.291
		2437	Mid	16.654
		2462	High	16.324
	802.11n20	2412	Low	17.470
		2437	Mid	17.673
		2462	High	17.474

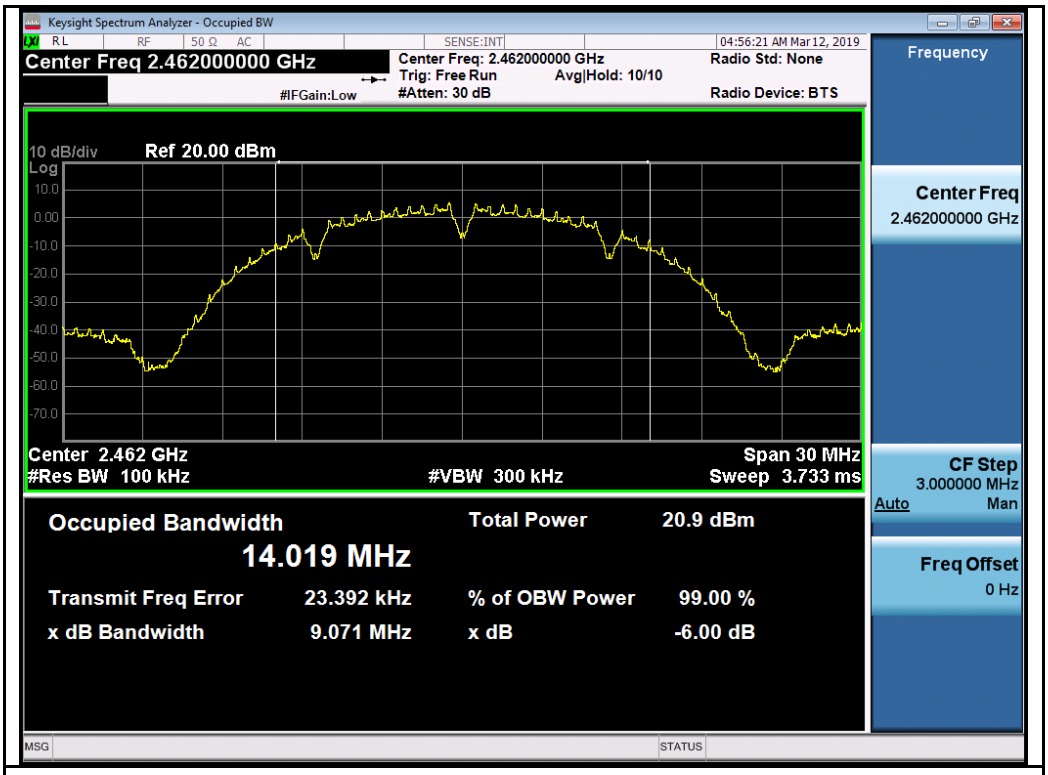
6dB & 99% Bandwidth Test Plots



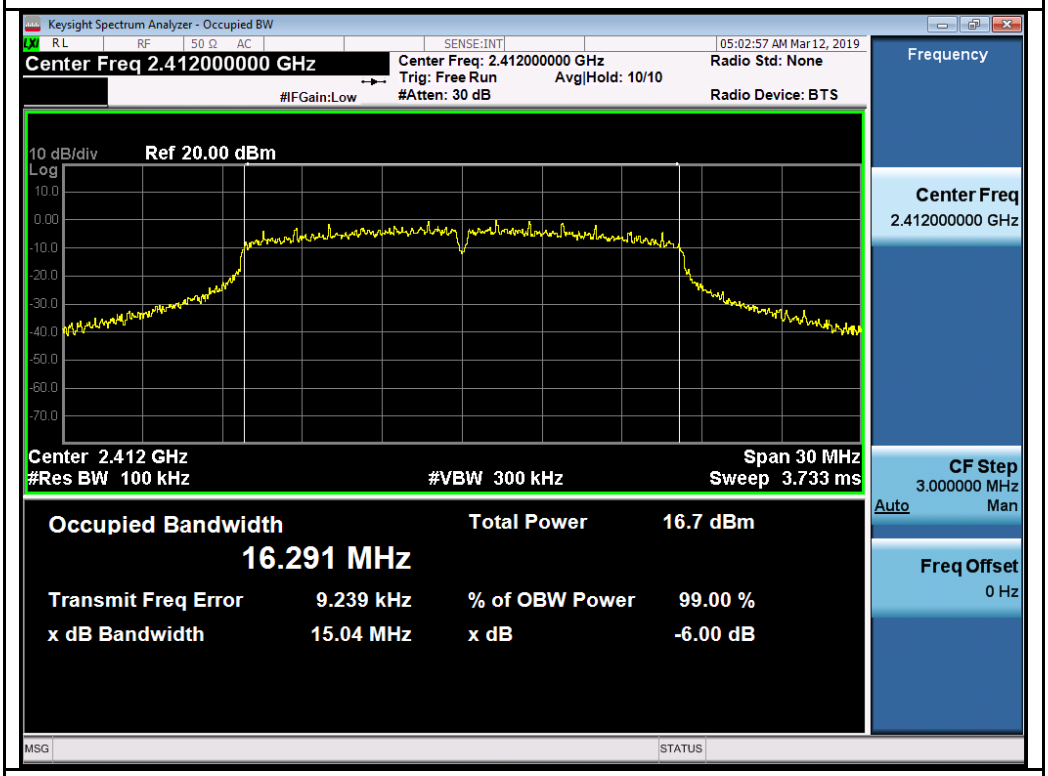
802.11b-2412MHz



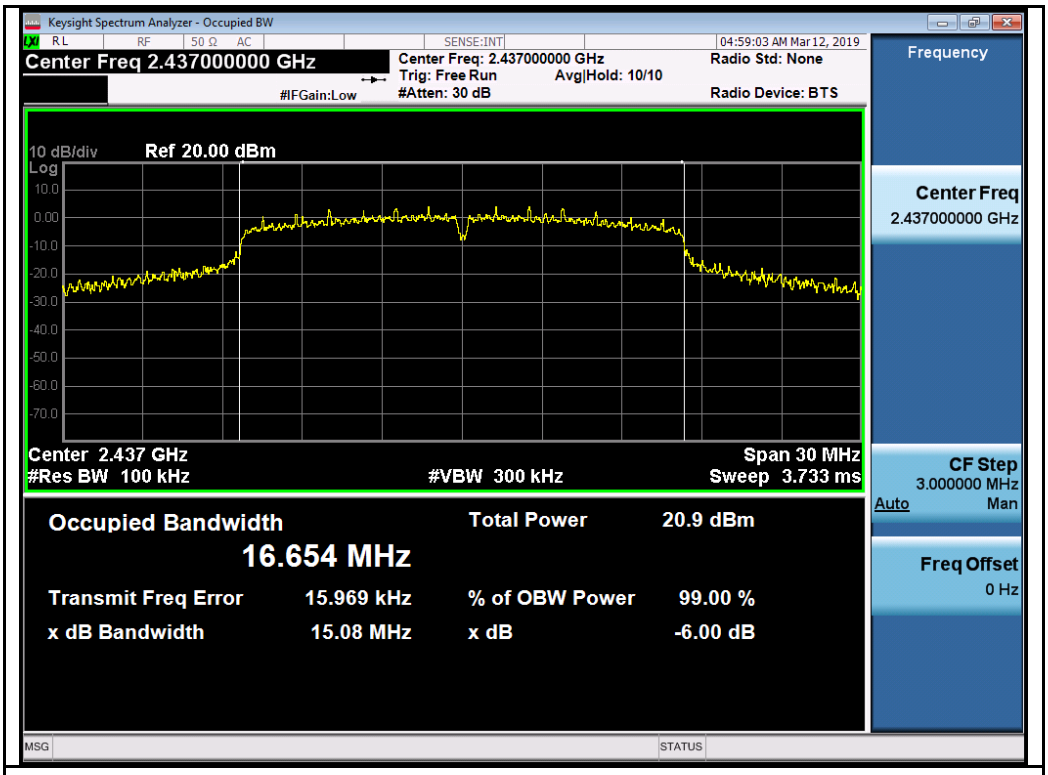
802.11b-2437MHz



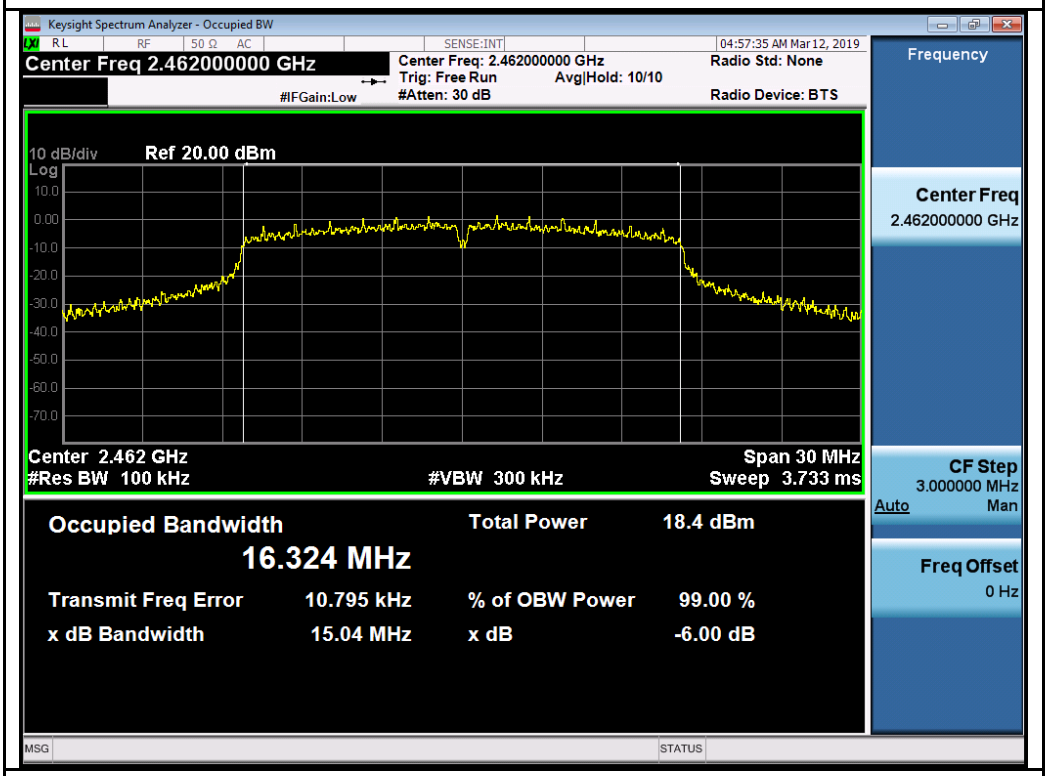
802.11b-2462MHz



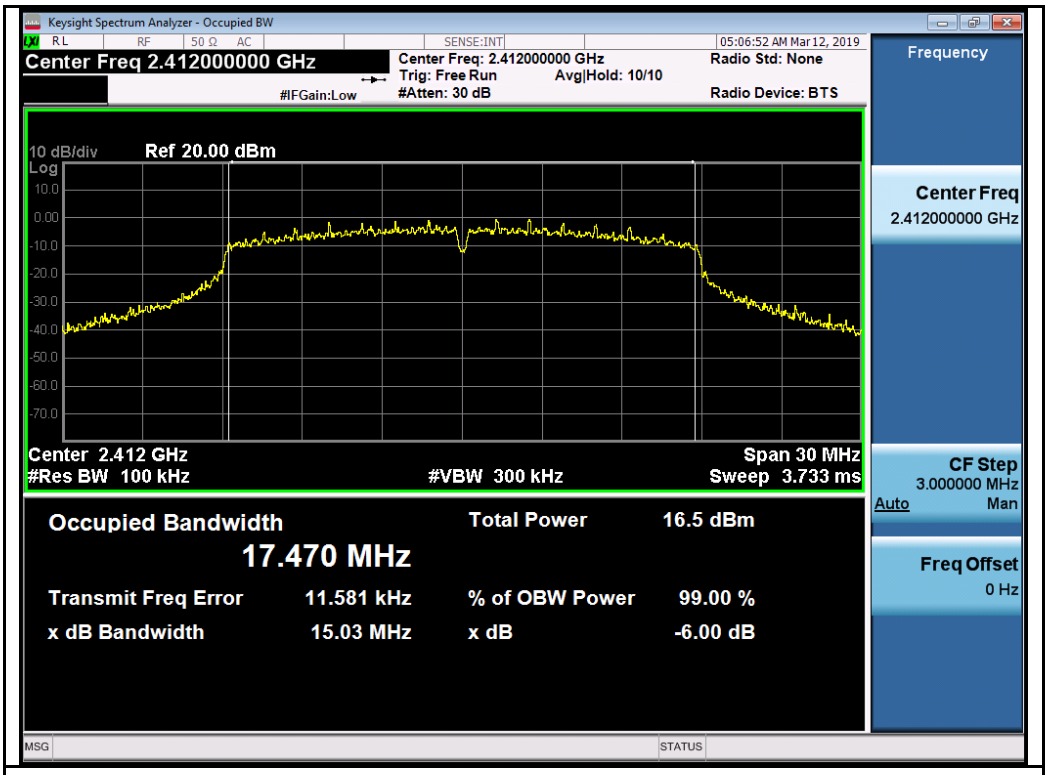
802.11g-2412MHz



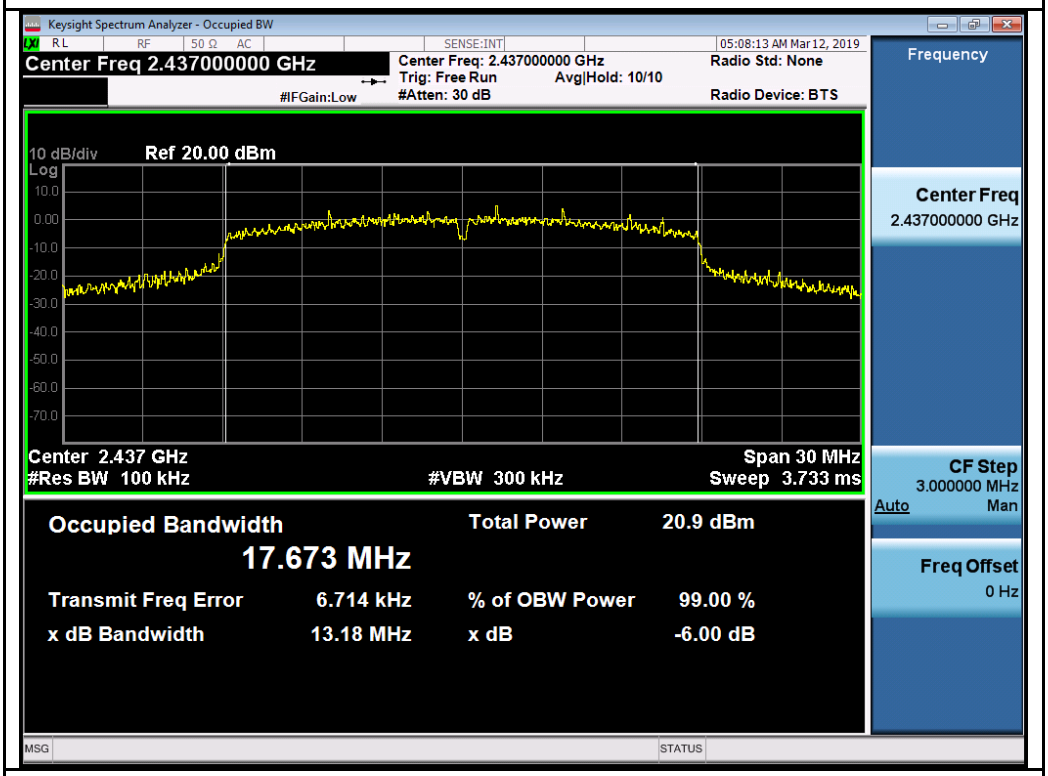
802.11g-2437MHz



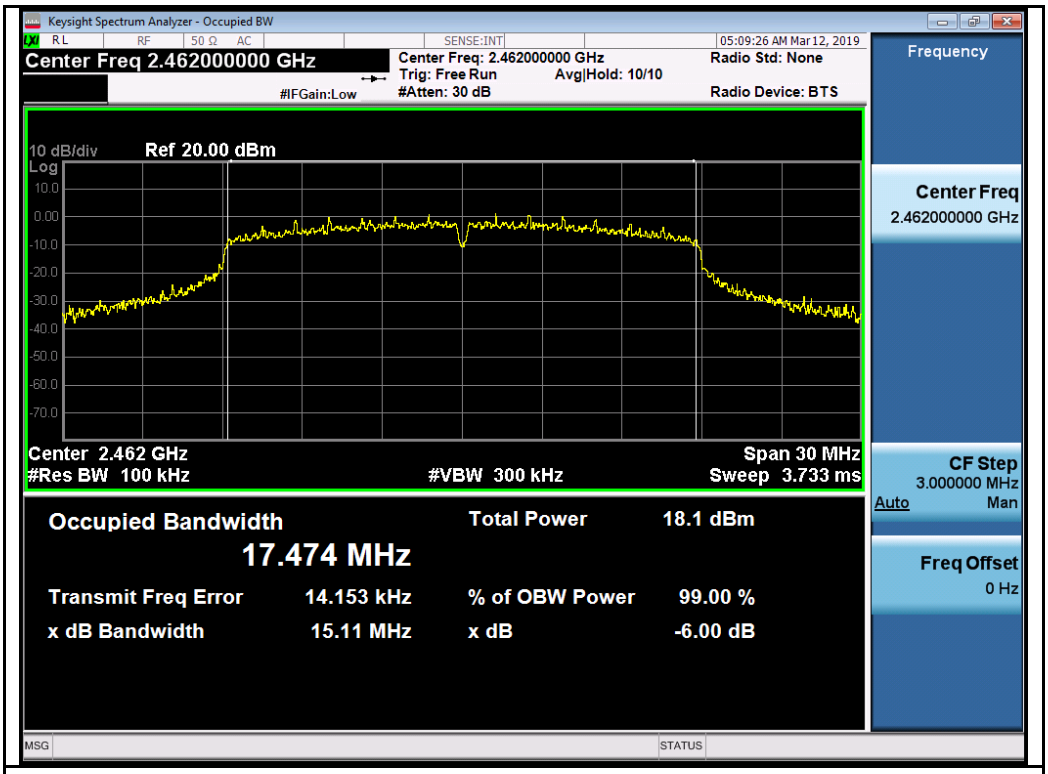
802.11g-2462MHz



802.11n20-2412MHz



802.11n20-2437MHz

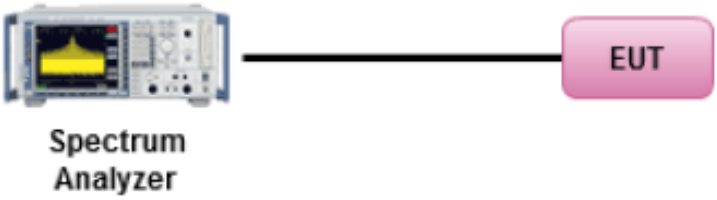


802.11n20-2462MHz

10.1 Maximum Conducted Output Power

Requirement(s):

Spec	Item	Requirement	Applicable
LP0002: 2018	1	DSSS in 2400-2483.5MHz: ≤1 Watt	☒

Test Setup	
Test Procedure	558074 D01 DTS Meas Guidance v04, 9.2.2.2 Measurement using a Spectrum Analyzer (SA) (a) Set span to at least 1.5 times the OBW (b) Set RBW = 1-5% of the OBW, not to exceed 1 MHz. (c) Set VBW ≥ 3 x RBW. (d) Number of points in sweep ≥ 2 × span / RBW. (This gives bin-to-bin spacing ≤ RBW/2, so that narrowband signals are not lost between frequency bins.) (e) Sweep time = auto. (f) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode. (g) If transmit duty cycle < 98 %, use a sweep trigger with the level set to enable triggering only on full power pulses. The transmitter shall operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle ≥ 98 %, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to "free run". (h) Trace average at least 100 traces in power averaging (i.e., RMS) mode (i) Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function, with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.

Test Date	03/01/2019 – 03/10/2019	Environmental condition	Temperature Relative Humidity Atmospheric Pressure	23ºC 44% 1021mbar
Remark	N/A			
Result	☒ Pass ☐ Fail			

Test Data ☒ Yes ☐ N/A

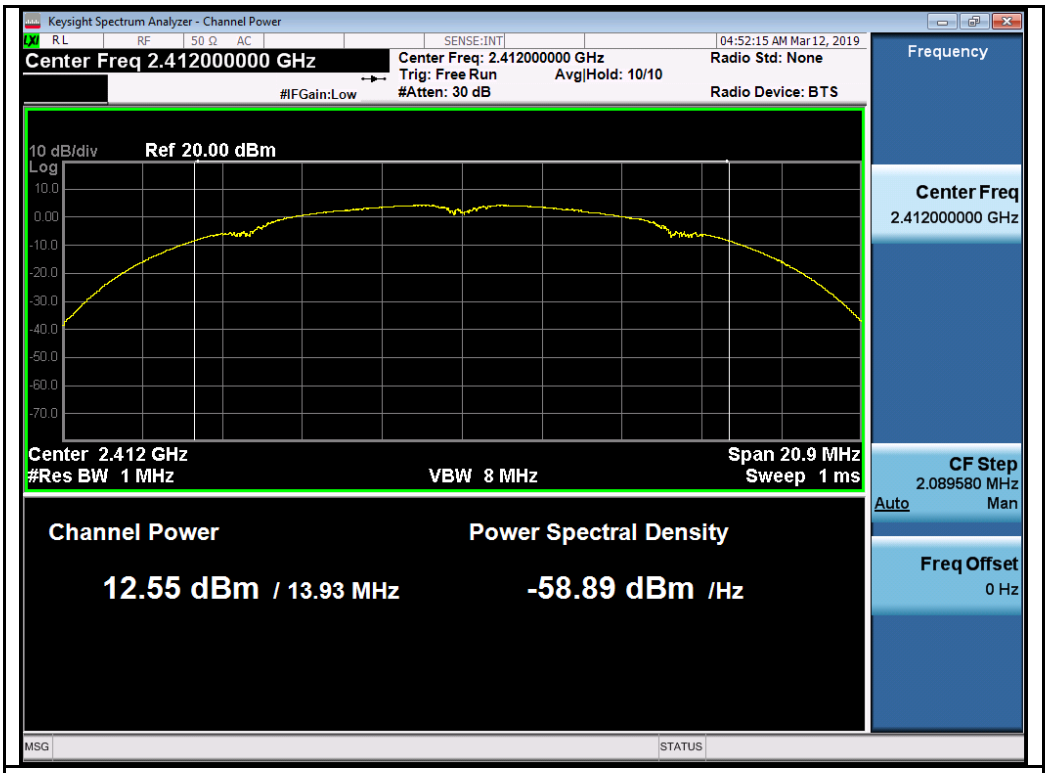
Test Plot ☒Yes (See below) ☐ N/A

Test was done by Cipher at RF test site.

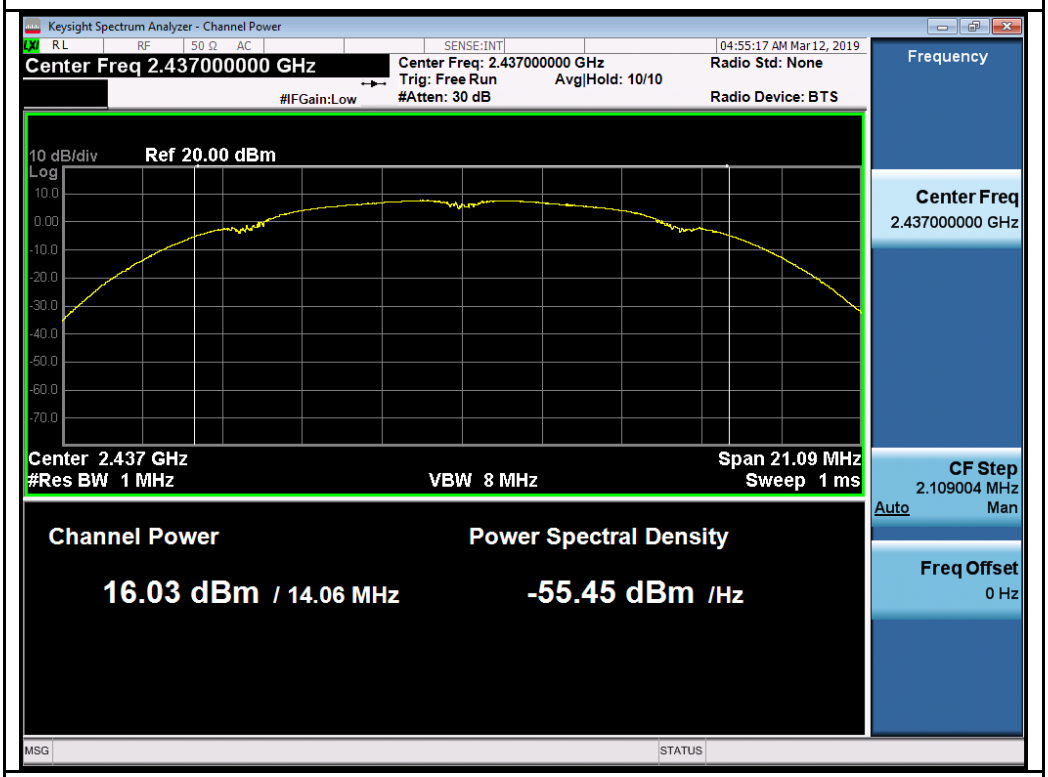
Output Power measurement result

Type	Test mode	Freq (MHz)	CH	Conducted Power (dBm)	Limit (dBm)	Result
Output Power	802.11b	2412	Low	12.555	30	Pass
		2437	Mid	16.025	30	Pass
		2462	High	14.265	30	Pass
	802.11g	2412	Low	9.793	30	Pass
		2437	Mid	14.156	30	Pass
		2462	High	12.186	30	Pass
	802.11n20	2412	Low	10.349	30	Pass
		2437	Mid	14.919	30	Pass
		2462	High	11.667	30	Pass

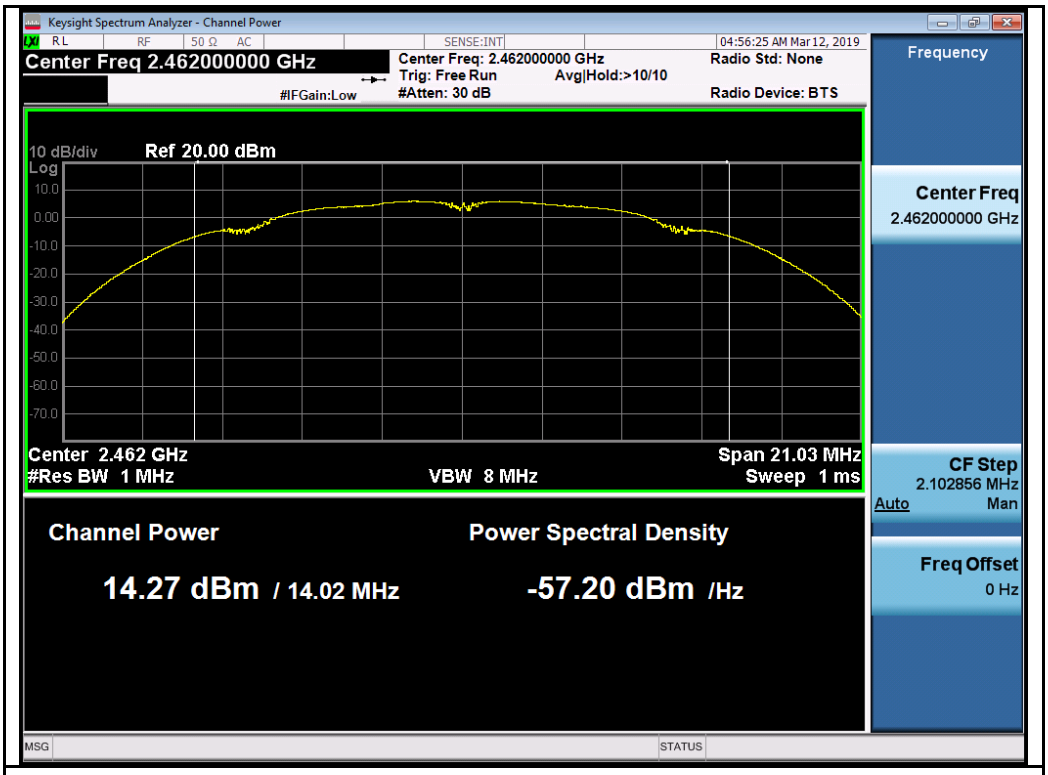
Test Plots:



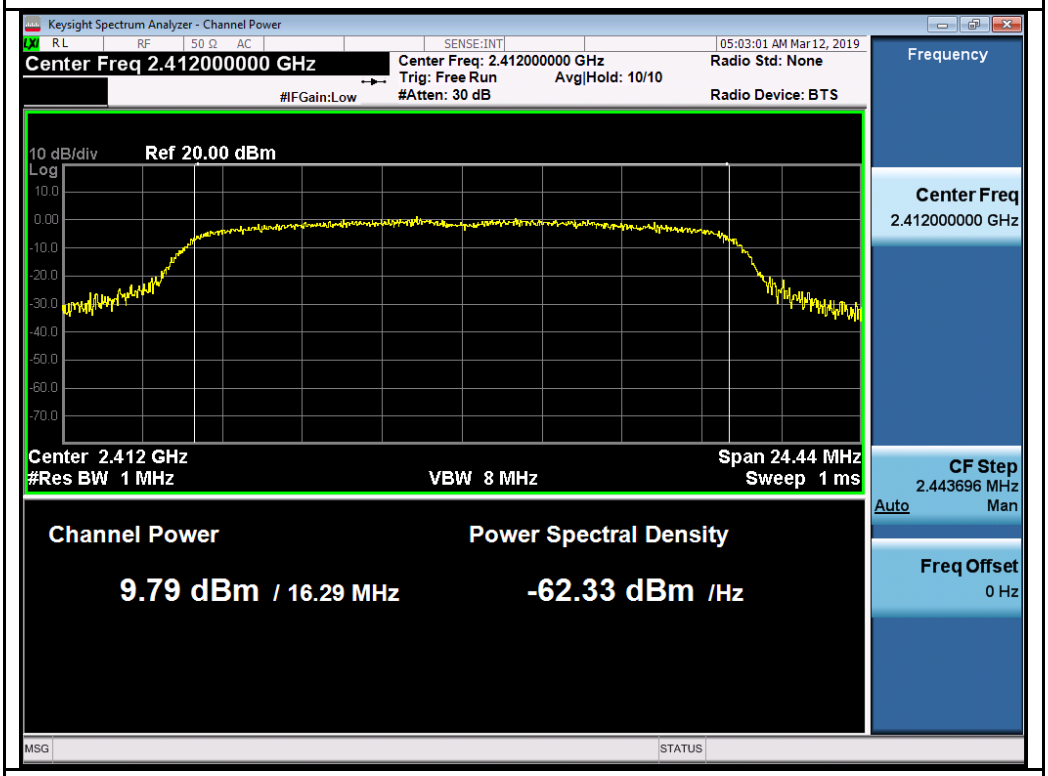
802.11b-2412MHz



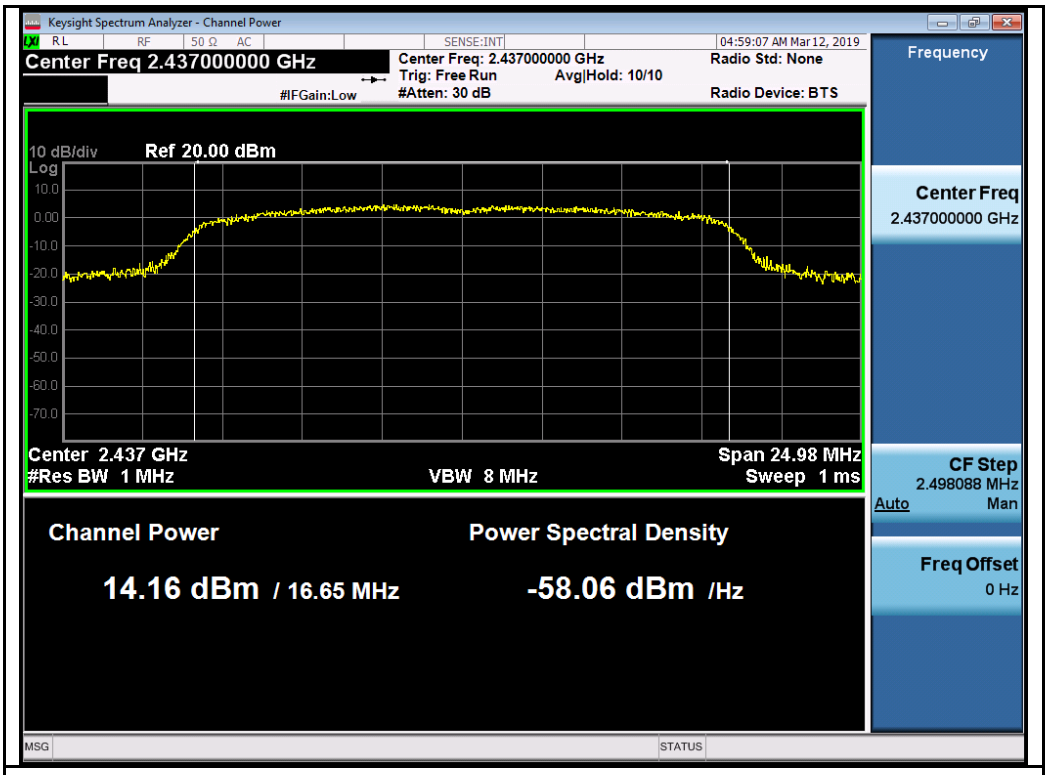
802.11b-2437MHz



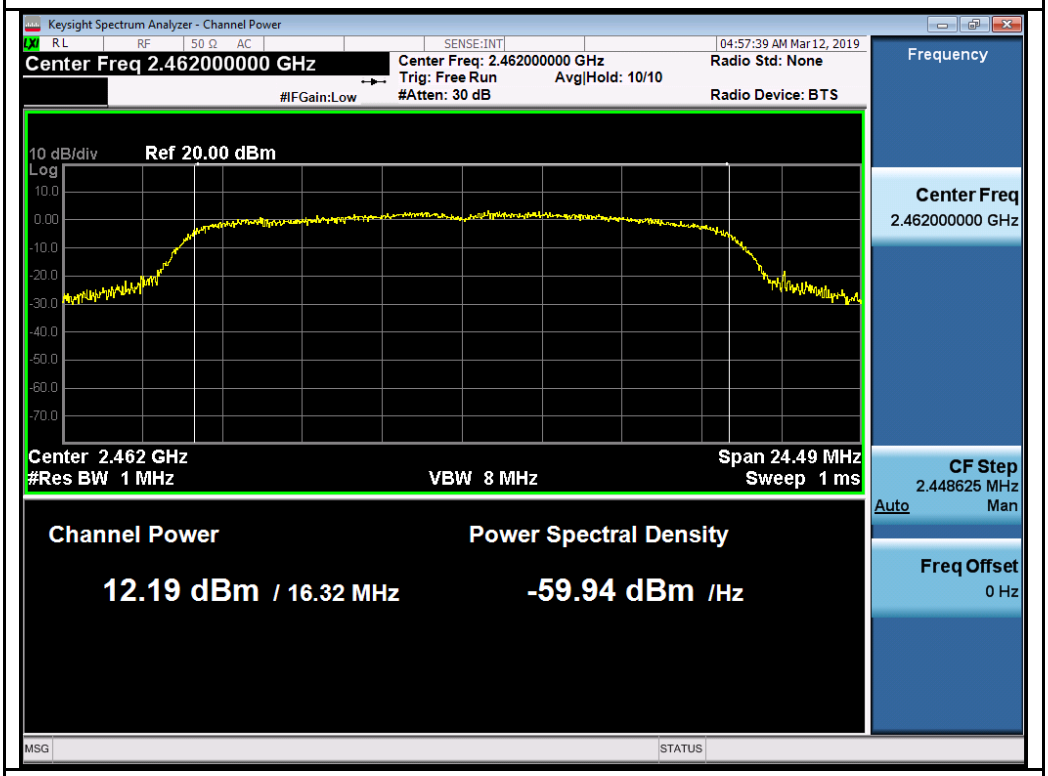
802.11b-2462MHz



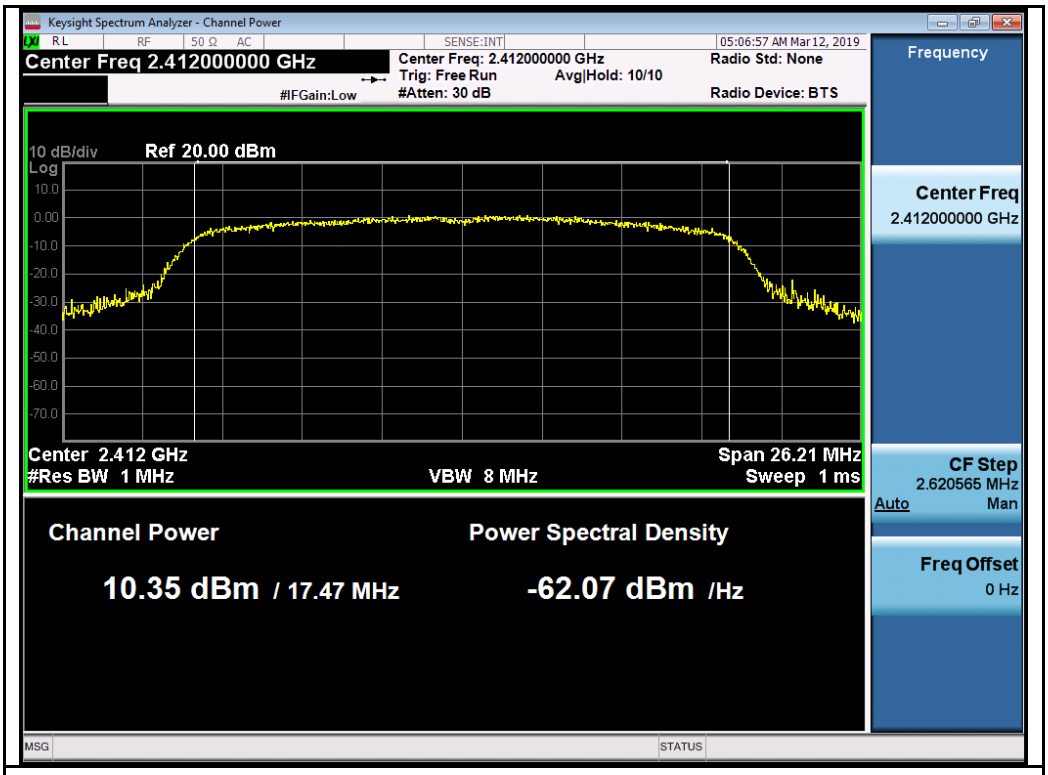
802.11g-2412MHz



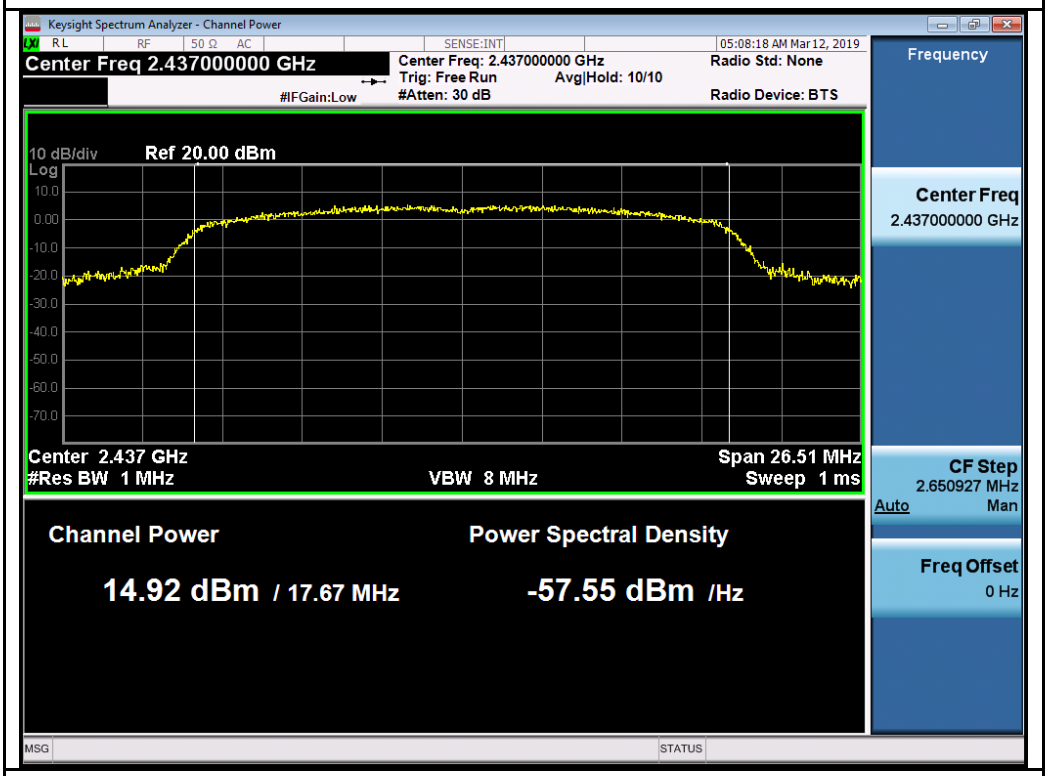
802.11g-2437MHz



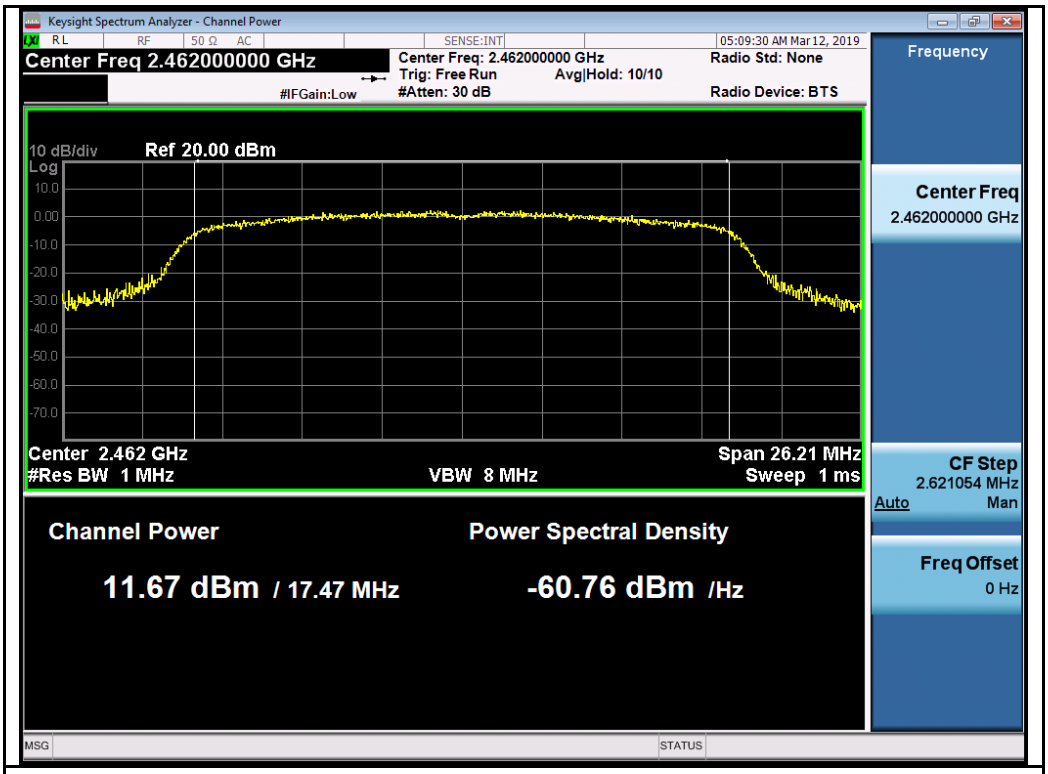
802.11g-2462MHz



802.11n20-2412MHz



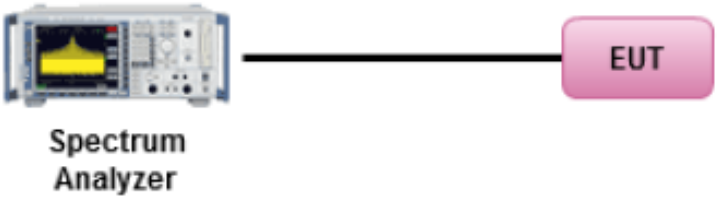
802.11n20-2437MHz



802.11n20-2462MHz

10.2 Band Edge

Requirement(s):

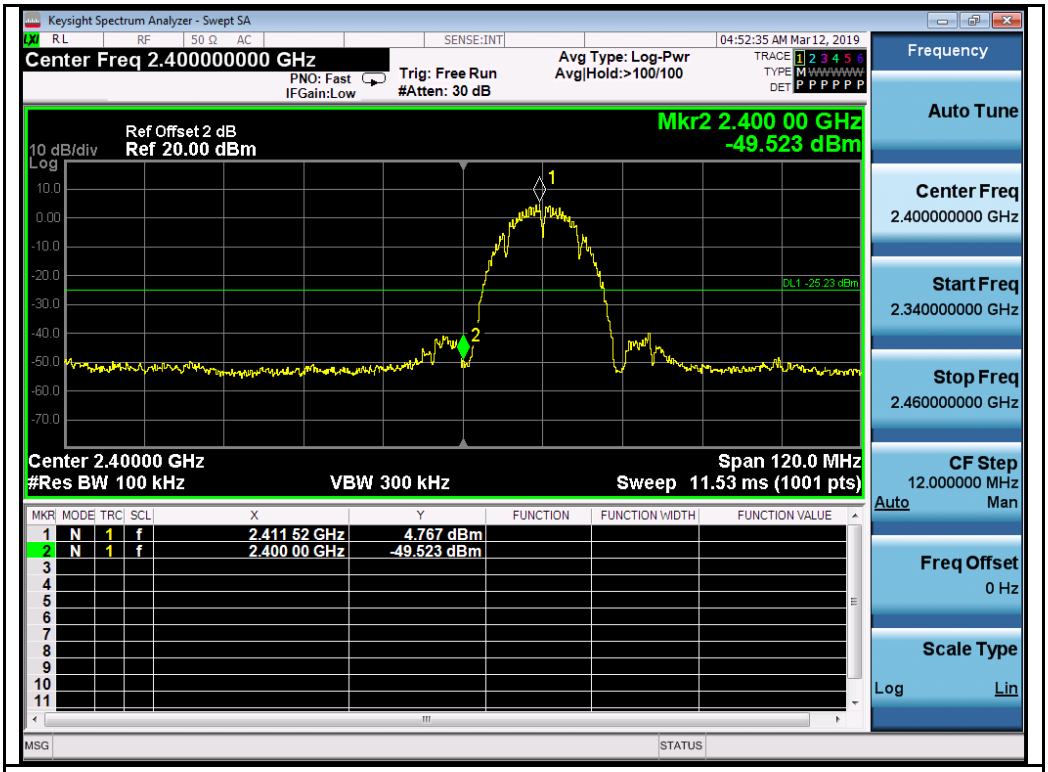
Spec	Item	Requirement	Applicable
LP0002-2018	1	For non-restricted band, In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB or 30dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, determined by the measurement method on output power to be used. Attenuation below the general limits specified in section 2.8 is not required ☐ 20 dB down ☒ 30 dB down	☒
Test Setup			
Test Procedure	558074 D01 DTS Meas Guidance v04 Band Edge measurement procedure 1. Set the EUT to maximum power setting and enable the EUT transmit continuously. 2. Band edge emissions must be at least 30 dB down from the highest emission level within the authorized band as a measured. The attunation shall be be 30 dB instead of 20 dB when Peak conducted output power procedure is used. 3. Change modulation and channel bandwidth then repeat step 1 to 2. 4. Measured and record the results in the test report.		
Test Date	03/01/2019 – 03/10/2019	Environmental condition	Temperature 22°C Relative Humidity 46% Atmospheric Pressure 1020mbar
Remark	N/A		
Result	☒ Pass ☐ Fail		

Test Data ☐ Yes ☒ N/A

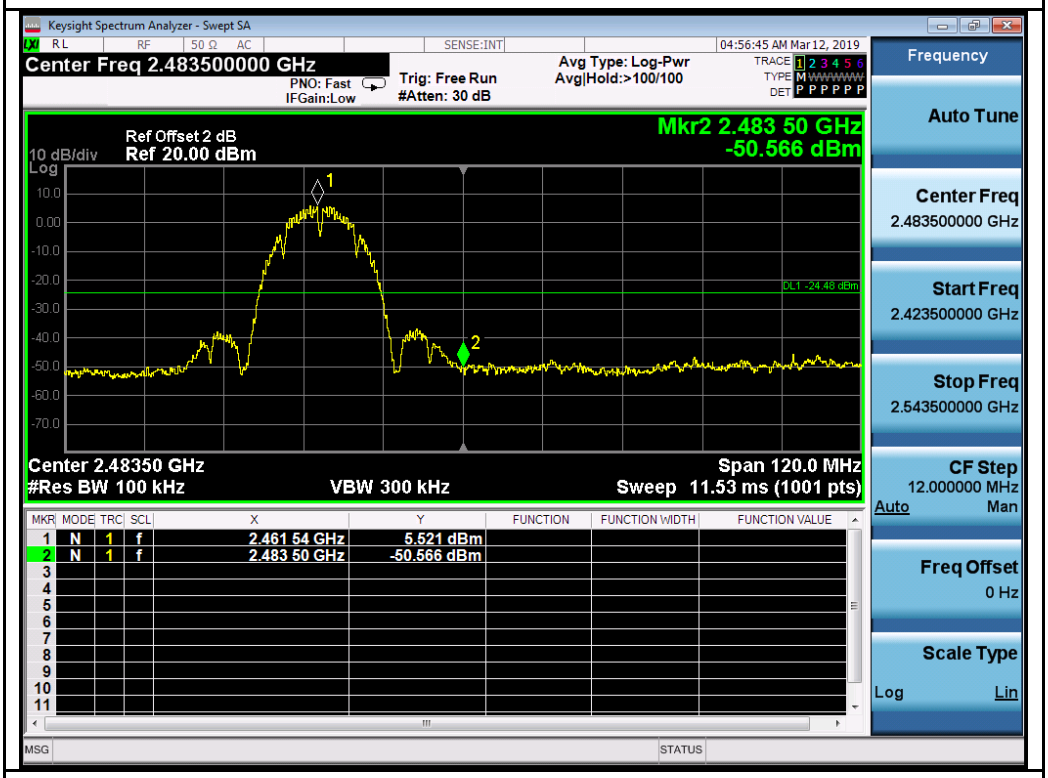
Test Plot ☒ Yes (See below) ☐ N/A

Test was done by Cipher at RF test site.

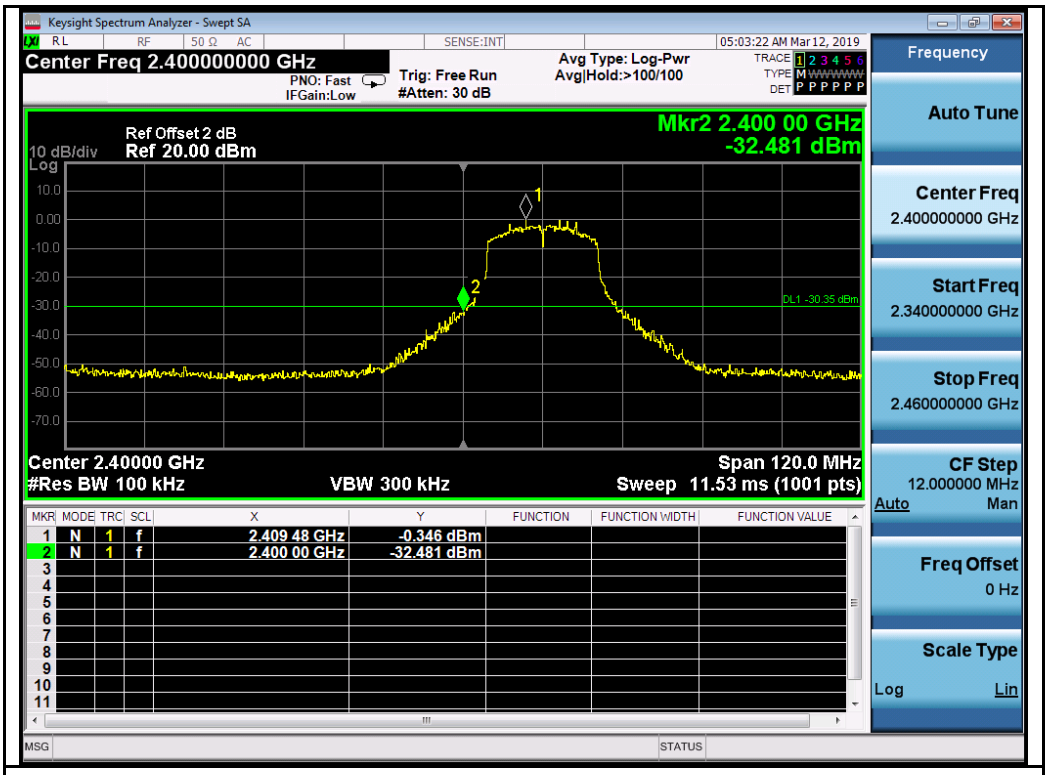
Test Plots



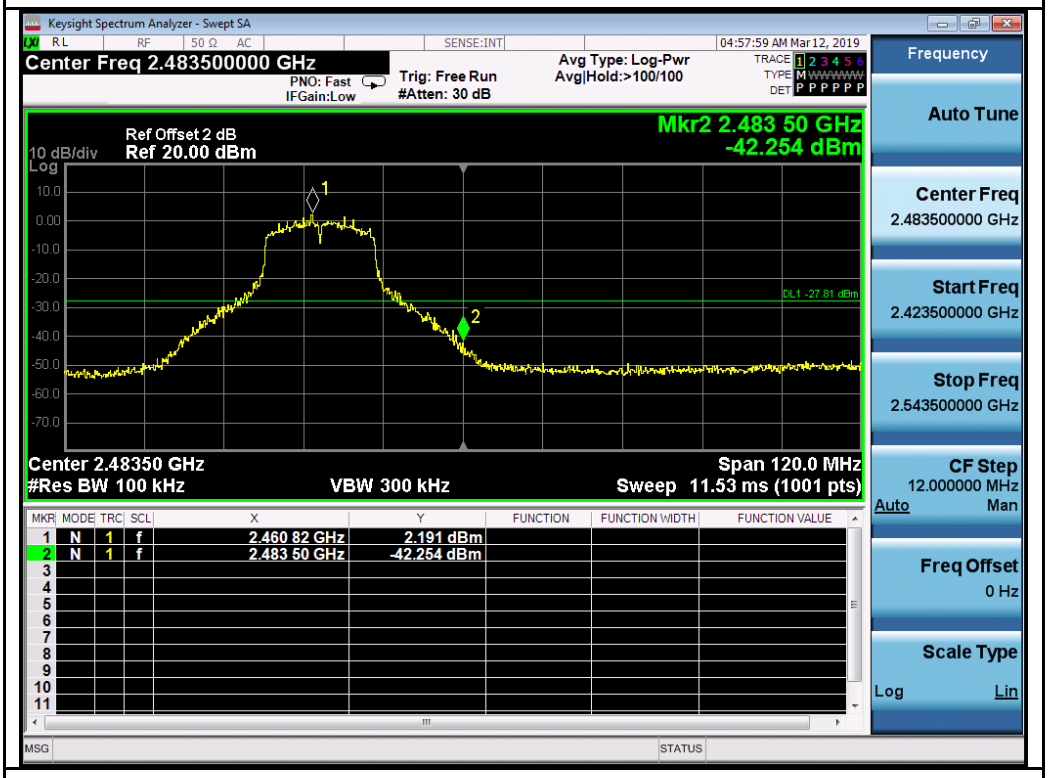
802.11b-2412MHz



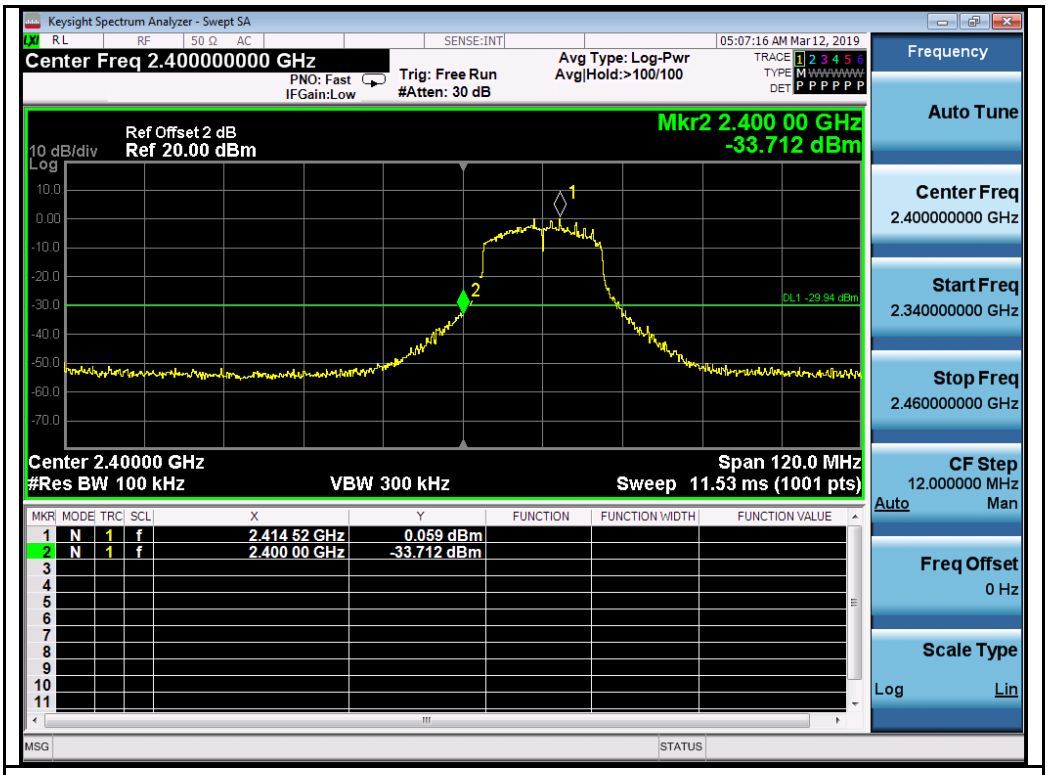
802.11b-2462MHz



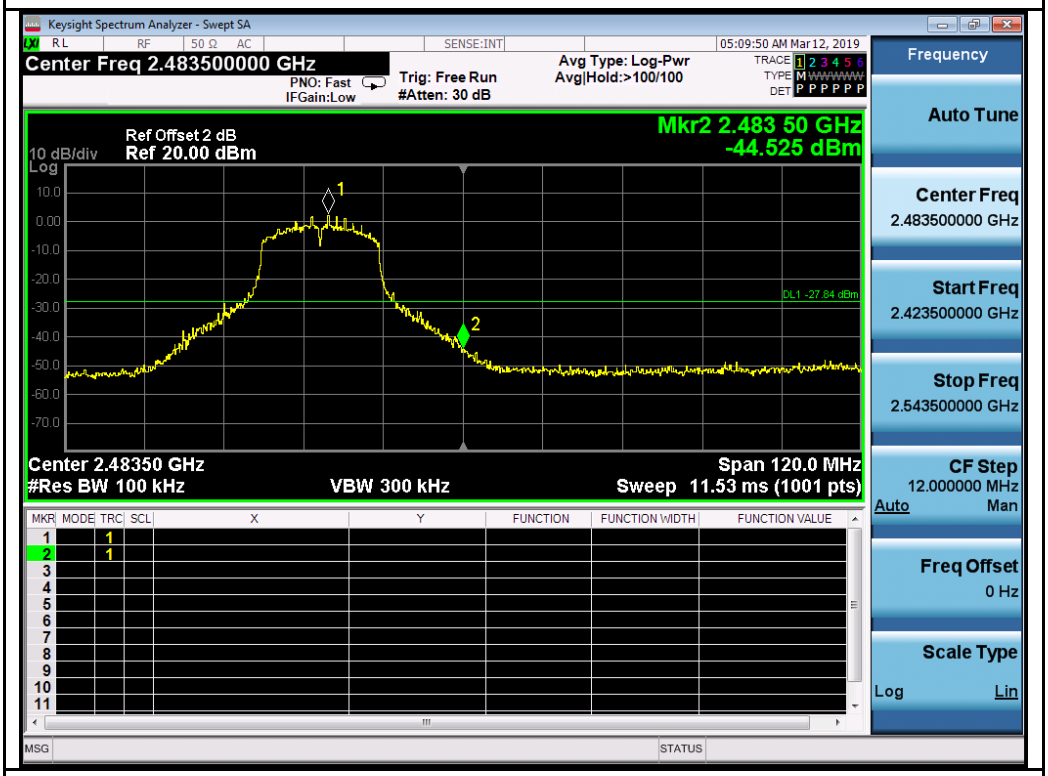
802.11g-2412MHz



802.11g-2462MHz



802.11n20-2412MHz

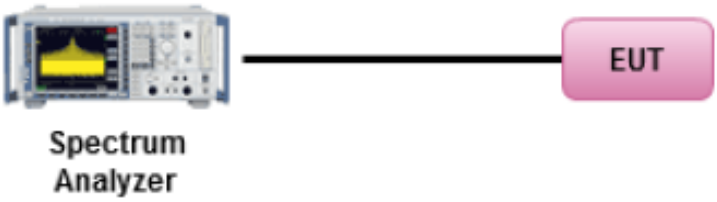


802.11n20-2462MHz

10.3 Peak Power Spectral Density

Requirement(s):

Spec	Item	Requirement	Applicable
LP0002 - 2018	1	DSSS: ≤8dBm/3KHz	☒
	2	DSSS in hybrid sys with FH turned off: ≤8dBm/3KHz	☐

Test Setup				
Test Procedure	558074 D01 DTS Meas Guidance v04, 10.2 Method PKPSD (peak PSD) Peak spectral density measurement procedure - Set analyzer center frequency to DTS channel center frequency. - Set the span to 1.5 times the DTS bandwidth. - Set the RBW to: 3 kHz ⩽ RBW ⩽ 100 kHz. - Set the VBW ⩾ 3 x RBW. - Detector = Peak - Sweep time = auto couple. - Trace mode = Max Hold - Allow trace to fully stabilize. - Use the peak marker function to determine the maximum amplitude level within the RBW. - If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.			
Test Date	03/01/2019 – 03/10/2019	Environmental condition	Temperature Relative Humidity Atmospheric Pressure	22°C 46% 1020mbar
Remark	N/A			
Result	☒ Pass ☐ Fail			

Test Data ☒ Yes ☐ N/A

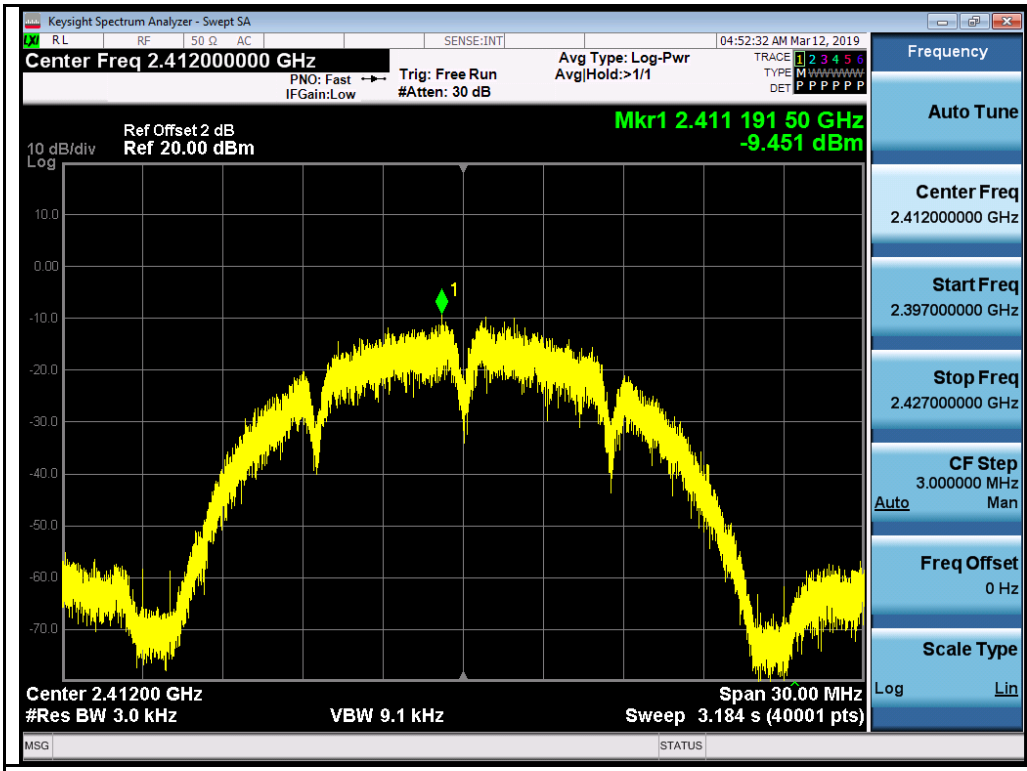
Test Plot ☒ Yes (See below) ☐ N/A

Test was done by Cipher at RF test site.

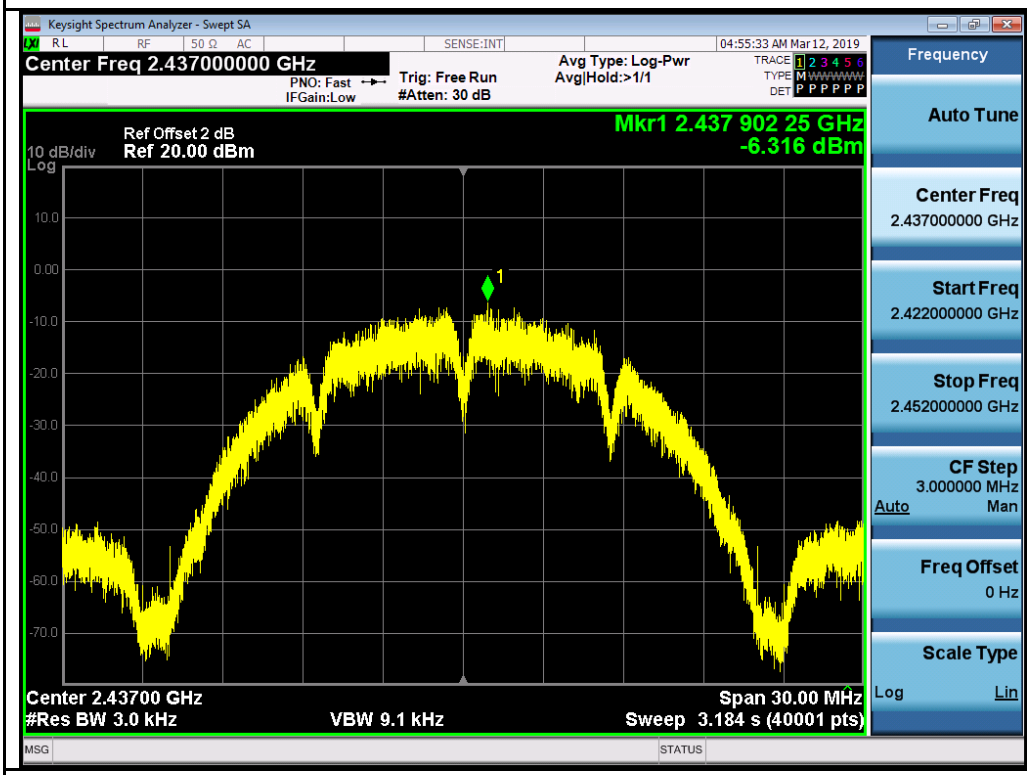
PSD measurement results

Type	Test mode	Freq (MHz)	CH	Conducted PSD (dBm/3KHz)	Limit (dBm/3KHz)	Result
PSD	802.11b	2412	Low	-9.451	≤8	Pass
		2437	Mid	-6.316	≤8	Pass
		2462	High	-9.011	≤8	Pass
	802.11g	2412	Low	-12.767	≤8	Pass
		2437	Mid	-9.243	≤8	Pass
		2462	High	-12.080	≤8	Pass
	802.11n20	2412	Low	-14.298	≤8	Pass
		2437	Mid	-8.841	≤8	Pass
		2462	High	-11.905	≤8	Pass

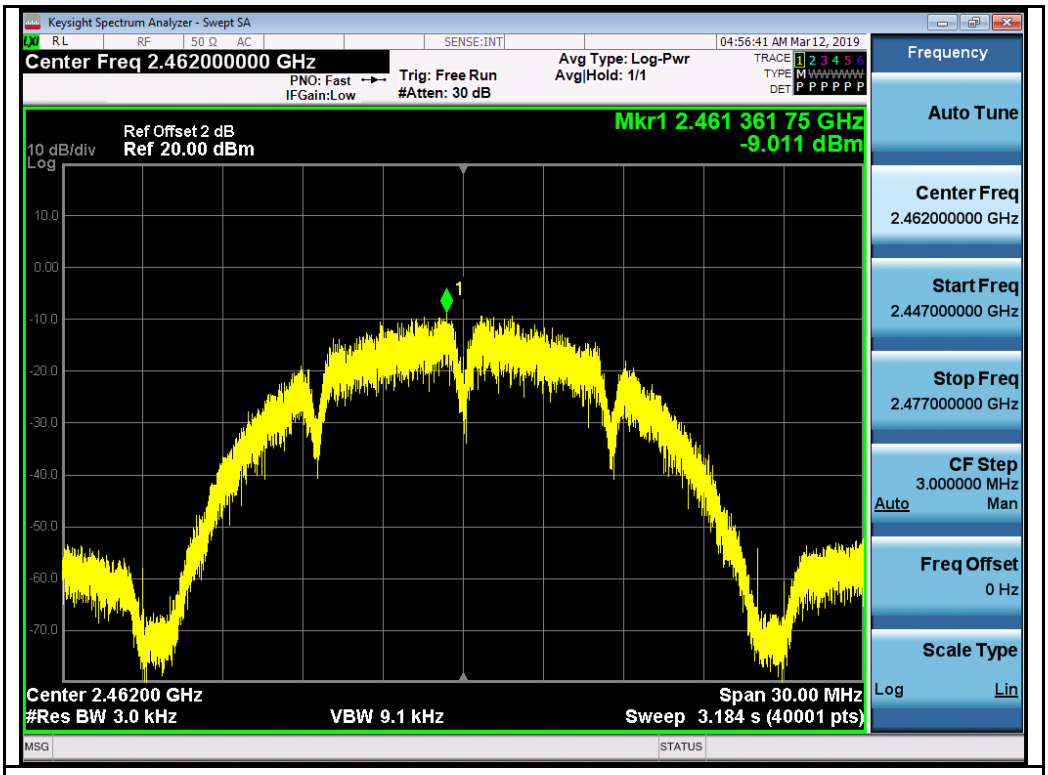
Test Plots:



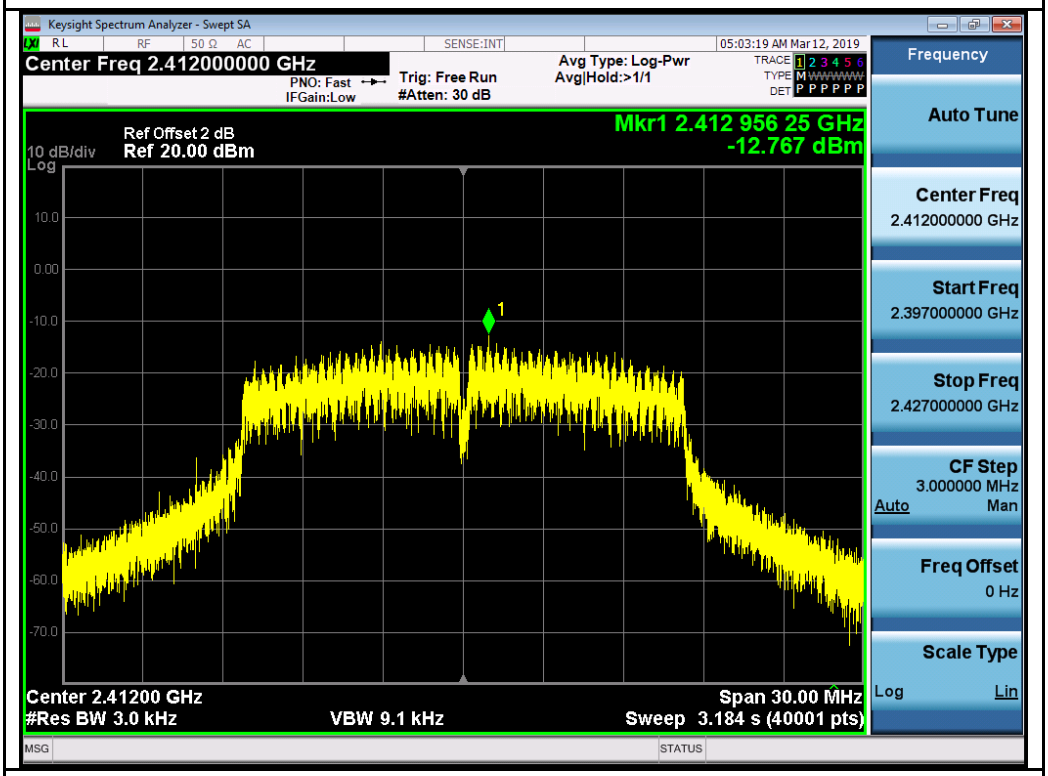
802.11b-2412MHz



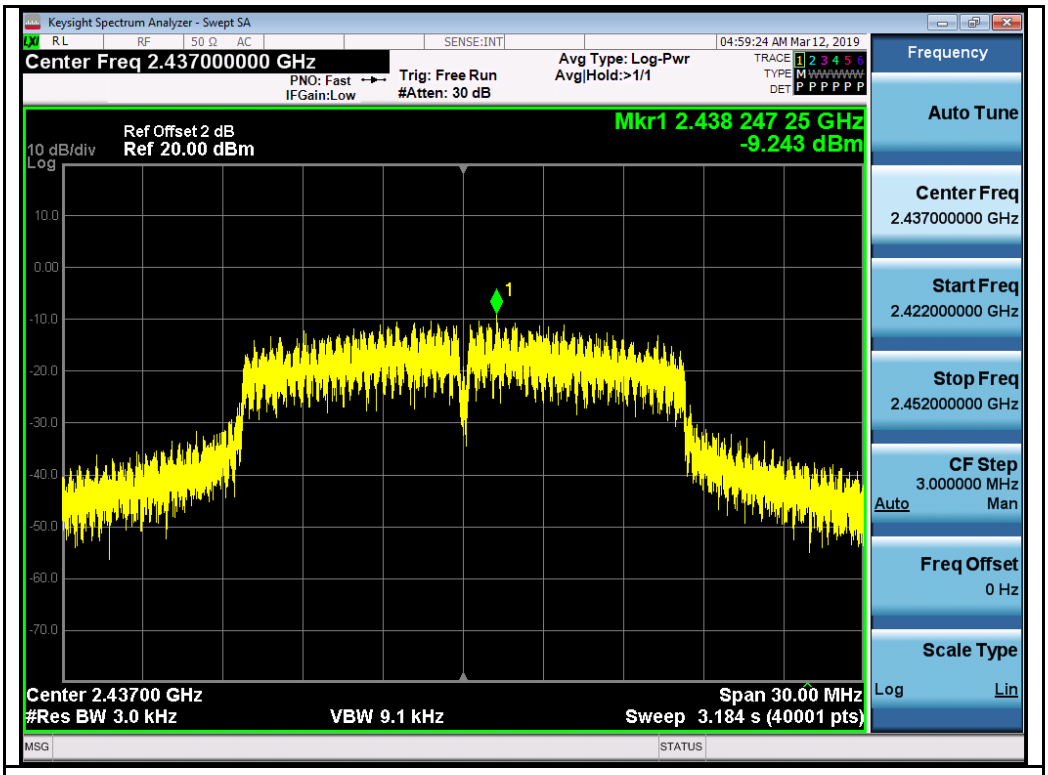
802.11b-2437MHz



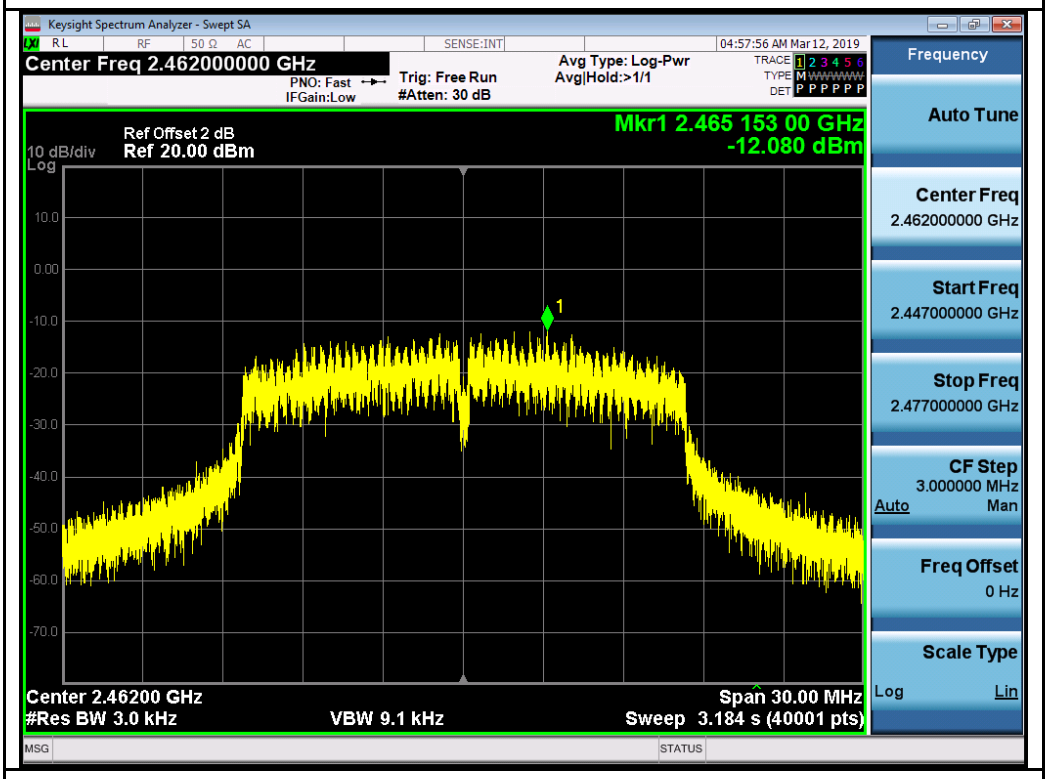
802.11b-2462MHz



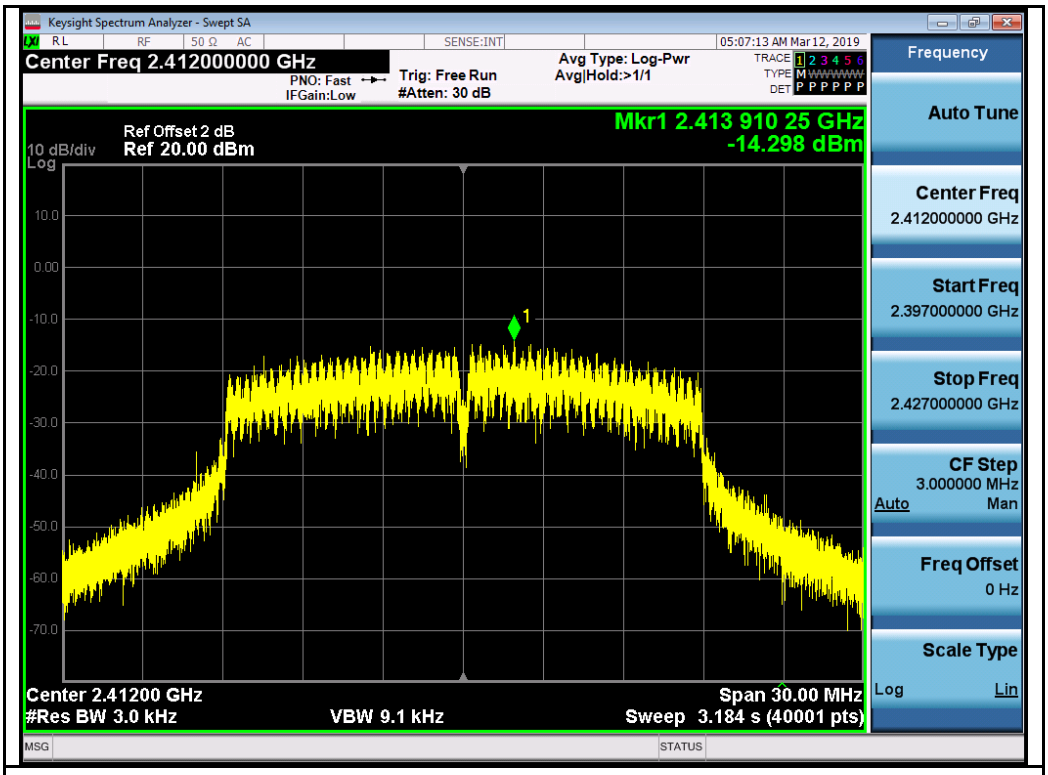
802.11g-2412MHz



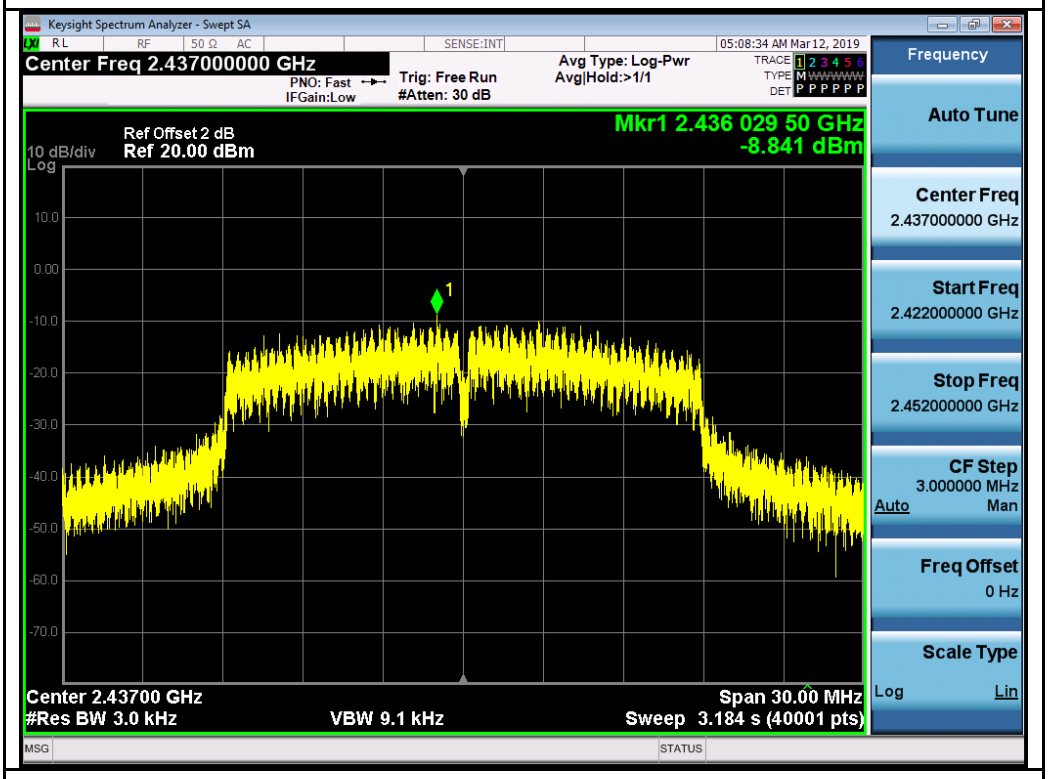
802.11g-2437MHz



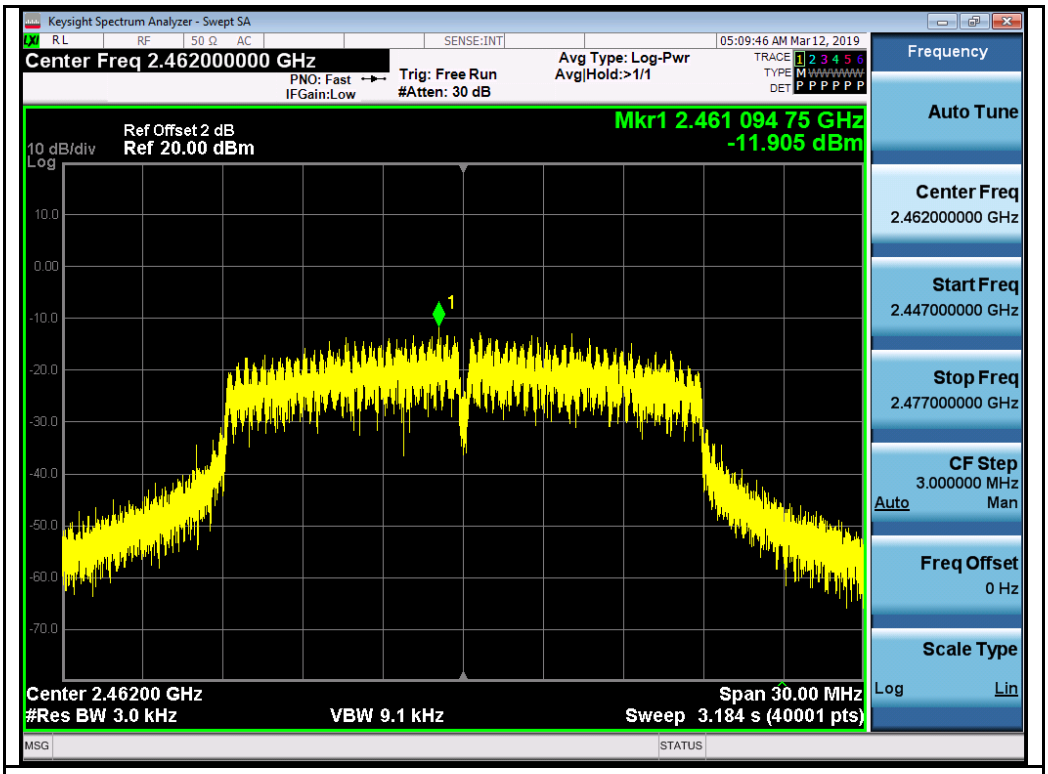
802.11g-2462MHz



802.11n20-2412MHz



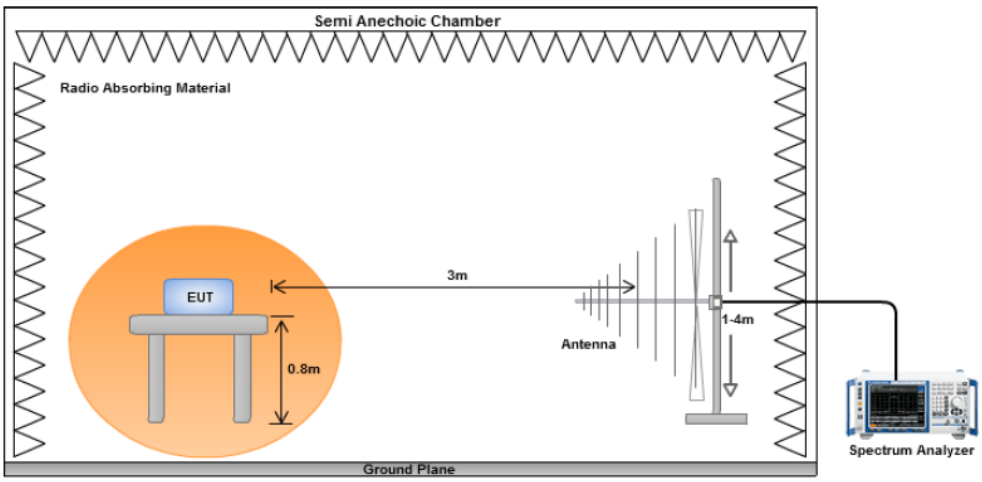
802.11n20-2437MHz



802.11n20-2462MHz

10.4 Radiated Spurious Emissions below 1GHz

Requirement(s):

<table>
<tr><th>Spec</th><th>Requirement</th><th>Applicable</th></tr>
<tr><td>LP0002 : 2018)</td><td>Except higher limit as specified elsewhere in other section, the emissions from the low-power radio-frequency devices shall not exceed the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges
<table>
<tr><th>Frequency range (MHz)</th><th>Field Strength (uV/m)</th></tr>
<tr><td>30 – 88</td><td>100</td></tr>
<tr><td>88 – 216</td><td>150</td></tr>
<tr><td>216 960</td><td>200</td></tr>
<tr><td>Above 960</td><td>500</td></tr>
</table></td><td>☒</td></tr>
<tr><td>Test Setup</td><td> 
</td><td></td></tr>
<tr><td>Procedure</td><td>1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. The test was carried out at the selected frequency points obtained from the EUT characterisation. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:
a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen.
b. The EUT was then rotated to the direction that gave the maximum emission.
c. Finally, the antenna height was adjusted to the height that gave the maximum emission.
3. A Quasi-peak measurement was then made for that frequency point.
4. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.</td><td></td></tr>
<tr><td>Remark</td><td>The EUT was scanned up to 1GHz. Both horizontal and vertical polarities were investigated. The results show only the worst case.</td><td></td></tr>
<tr><td>Result</td><td>☒ Pass ☐ Fail</td><td></td></tr>
</table>

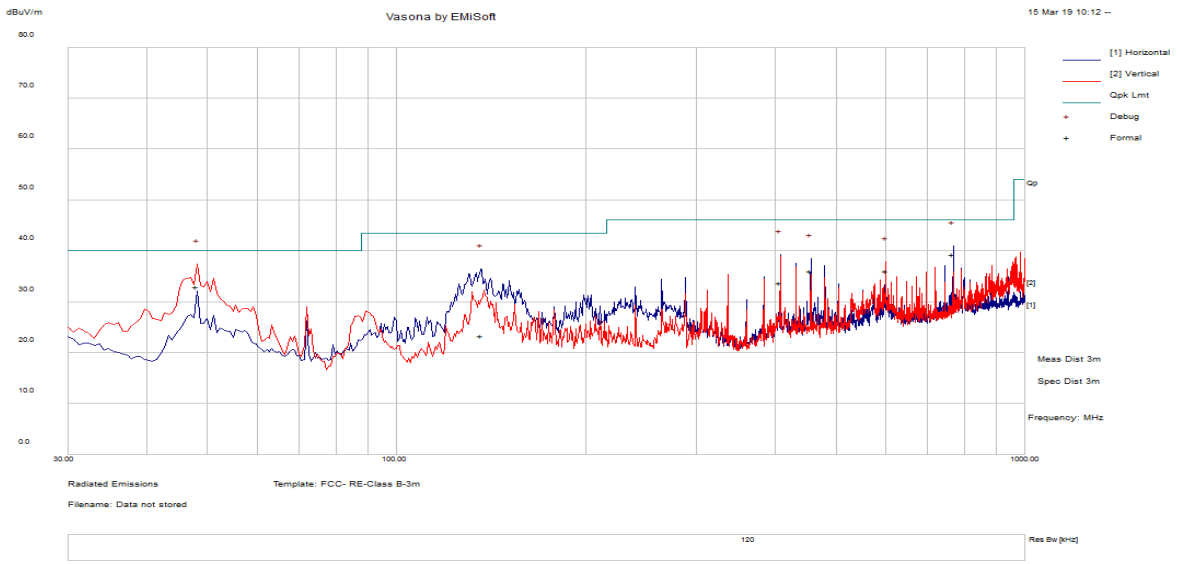
Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test was done by Cipher at 10m chamber.

Radiated Emission Test Results (Below 1GHz)

Test specification	below 1GHz			
Environmental Conditions:	Temp (°C):	26	Result	Pass
	Humidity (%)	47		
	Atmospheric (mbar):	1020		
Mains Power:	5 VDC			
Tested by:	Cipher			
Test Date:	03/01/2019 – 03/10/2019			
Remarks:	802.11b mid channel			

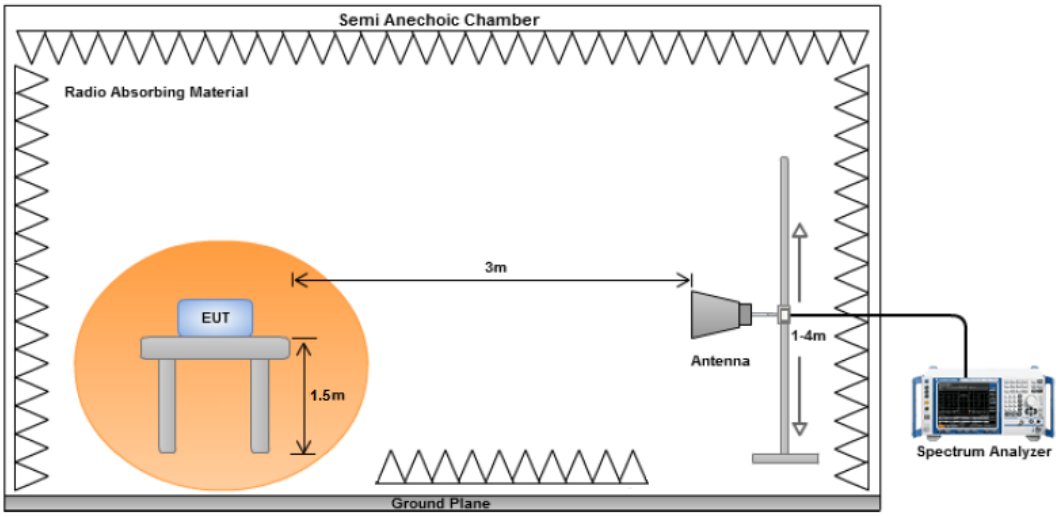


Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
47.99	46.98	11.43	-25.41	33	Quasi Max	V	118	330	40	-7	Pass
768.00	38.32	15.43	-14.42	39.32	Quasi Max	H	106	137	46	-6.68	Pass
407.94	40.14	13.85	-20.15	33.84	Quasi Max	H	122	311	46	-12.16	Pass
136.34	34.26	12.19	-23.12	23.32	Quasi Max	H	126	332	43.5	-20.18	Pass
455.99	40.98	14.08	-18.98	36.08	Quasi Max	H	107	337	46	-9.92	Pass
599.98	38.03	14.69	-16.53	36.19	Quasi Max	V	103	90	46	-9.81	Pass

Note: Both horizontal and vertical polarities were investigated. The results above show only the worst case.

10.1 Radiated Spurious Emissions above 1GHz and Restricted Band Measurement

Requirement(s):

Spec	Item	Requirement	Applicable
LP0002 : 2018	a)	For non-restricted band, 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 or 30dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, determined by the measurement method on output power to be used. Attenuation below the general limits specified in § 15.209(a) is not required ☐ 20 dB down ☒ 30 dB down	☒
	b)	or restricted band, emission must also comply with the radiated emission limits specified in 15.209	☒
Test Setup			
Procedure	1. The EUT was switched on and allowed to warm up to its normal operating condition. 2. The test was carried out at the selected frequency points obtained from the EUT characterisation. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner: a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen. b. The EUT was then rotated to the direction that gave the maximum emission. c. Finally, the antenna height was adjusted to the height that gave the maximum emission. 3. An average measurement was then made for that frequency point. 4. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.		
Remark	The EUT was scanned up to 40GHz. Both horizontal and vertical polarities were investigated. The results show only the worst case. There isn't outstanding emission found at the edge of restricted frequency.		
Result	☒ Pass ☐ Fail		

Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☐ Yes (See below) ☒ N/A

Test was done by Cipher at 10m chamber.

Radiated Emission Test Results (Above 1GHz)

Above 1GHz-25GHz – 802.11b – 2412MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
3024.81	49.87	3.29	-14.09	39.07	Peak Max	V	266	304	74	-34.93	Pass
4824.35	60.66	4.12	-10.92	53.86	Peak Max	H	227	47	74	-20.14	Pass
8494.46	41.14	5.53	-6.86	39.81	Peak Max	V	168	159	74	-34.19	Pass
3024.81	40.01	3.29	-14.09	29.21	Average Max	H	266	304	54	-24.79	Pass
4824.35	51.58	4.12	-10.92	44.78	Average Max	V	227	47	54	-9.22	Pass
8494.46	32.03	5.53	-6.86	30.7	Average Max	V	168	159	54	-23.3	Pass

Above 1GHz-25GHz- 802.11b - 2437MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
3821.31	49.8	3.65	-12.93	40.52	Peak Max	H	268	304	74	-33.48	Pass
4873.36	60.36	4.17	-11.01	53.52	Peak Max	H	232	49	74	-20.48	Pass
8096.01	42.32	5.4	-7.07	40.65	Peak Max	H	164	160	74	-33.35	Pass
3821.31	40.67	3.65	-12.93	31.39	Average Max	V	268	304	54	-22.61	Pass
4873.36	51.33	4.17	-11.01	44.49	Average Max	V	232	49	54	-9.51	Pass
8096.01	32.41	5.4	-7.07	30.74	Average Max	H	164	160	54	-23.26	Pass

Above 1GHz-25GHz – 802.11b – 2462MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
3040.75	49.39	3.3	-14.02	38.67	Peak Max	H	269	304	74	-35.33	Pass
4924.33	60.24	4.22	-11.11	53.35	Peak Max	V	234	45	74	-20.65	Pass
8338.02	42.01	5.41	-7.03	40.39	Peak Max	H	169	153	74	-33.61	Pass
3040.75	39.45	3.3	-14.02	28.73	Average Max	V	269	304	54	-25.27	Pass
4924.33	51.11	4.22	-11.11	44.22	Average Max	V	234	45	54	-9.78	Pass
8338.02	32.03	5.41	-7.03	30.41	Average Max	V	169	153	54	-23.59	Pass

Above 1GHz-25GHz- 802.11g - 2412MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
3154.74	49.74	3.39	-13.81	39.32	Peak Max	V	265	295	74	-34.68	Pass
4825.00	48.6	4.12	-10.92	41.8	Peak Max	H	225	49	74	-32.2	Pass
8617.57	43.32	5.58	-6.67	42.23	Peak Max	H	169	159	74	-31.77	Pass
3154.74	39.85	3.39	-13.81	29.43	Average Max	V	265	295	54	-24.57	Pass
4825.00	39.52	4.12	-10.92	32.72	Average Max	H	225	49	54	-21.28	Pass
8617.57	33.97	5.58	-6.67	32.88	Average Max	V	169	159	54	-21.12	Pass

Above 1GHz-25GHz – 802.11g – 2437MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
3735.19	50.66	3.57	-13.13	41.1	Peak Max	H	271	304	74	-32.9	Pass
4873.76	48.35	4.17	-11.01	41.51	Peak Max	H	226	47	74	-32.49	Pass
8011.44	42.3	5.43	-7.03	40.7	Peak Max	V	167	158	74	-33.3	Pass
3735.19	40.86	3.57	-13.13	31.3	Average Max	V	271	304	54	-22.7	Pass
4873.76	39.08	4.17	-11.01	32.24	Average Max	H	226	47	54	-21.76	Pass
8011.44	32.64	5.43	-7.03	31.04	Average Max	V	167	158	54	-22.96	Pass

Above 1GHz-25GHz- 802.11g - 2462MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
3091.64	49.8	3.34	-13.87	39.27	Peak Max	H	269	302	74	-34.73	Pass
4924.08	48.27	4.22	-11.11	41.38	Peak Max	H	233	43	74	-32.62	Pass
8371.97	42.28	5.44	-6.99	40.73	Peak Max	H	168	160	74	-33.27	Pass
3091.64	40.61	3.34	-13.87	30.08	Average Max	H	269	302	54	-23.92	Pass
4924.08	38.71	4.22	-11.11	31.82	Average Max	H	233	43	54	-22.18	Pass
8371.97	32.88	5.44	-6.99	31.33	Average Max	V	168	160	54	-22.67	Pass

Above 1GHz-25GHz- 802.11n20 - 2412MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
3876.64	49.23	3.71	-12.8	40.14	Peak Max	V	266	296	74	-33.86	Pass
4824.86	60.61	4.12	-10.92	53.81	Peak Max	V	230	45	74	-20.19	Pass
8872.45	41.81	5.63	-6.18	41.26	Peak Max	V	163	155	74	-32.74	Pass
3876.64	39.98	3.71	-12.8	30.89	Average Max	H	266	296	54	-23.11	Pass
4824.86	50.7	4.12	-10.92	43.9	Average Max	V	230	45	54	-10.1	Pass
8872.45	32.76	5.63	-6.18	32.21	Average Max	V	163	155	54	-21.79	Pass

Above 1GHz-25GHz – 802.11n20 – 2437MHz

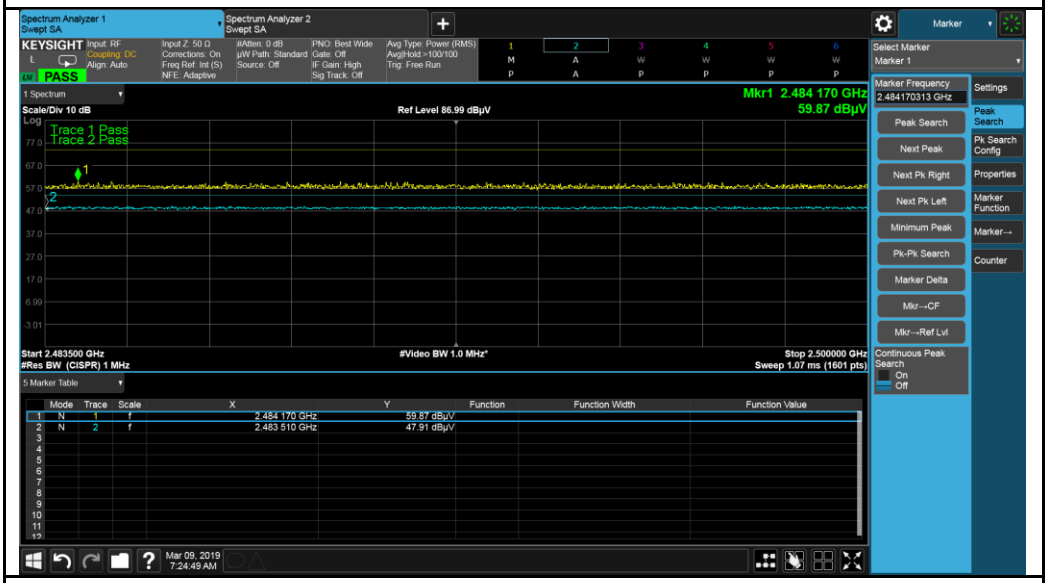
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
3423.88	49.58	3.55	-13.73	39.4	Peak Max	H	269	297	74	-34.6	Pass
4873.81	60.35	4.17	-11.01	53.51	Peak Max	V	230	43	74	-20.49	Pass
8918.49	41.4	5.62	-6.11	40.91	Peak Max	H	168	160	74	-33.09	Pass
3423.88	39.99	3.55	-13.73	29.81	Average Max	V	269	297	54	-24.19	Pass
4873.81	50.67	4.17	-11.01	43.83	Average Max	H	230	43	54	-10.17	Pass
8918.49	31.52	5.62	-6.11	31.03	Average Max	H	168	160	54	-22.97	Pass

Above 1GHz-25GHz- 802.11n20 - 2462MHz

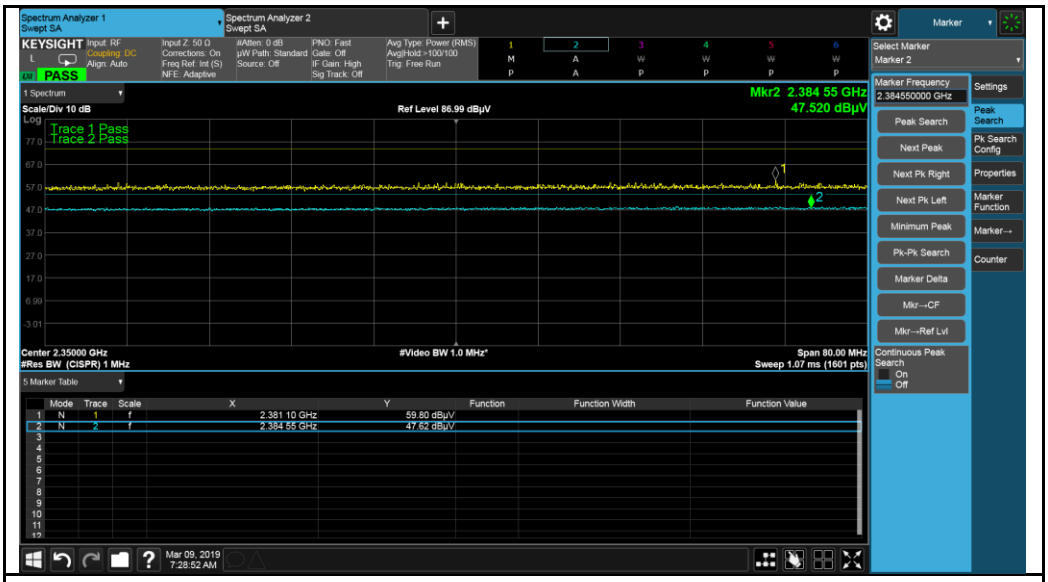
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
3894.65	49.24	3.73	-12.76	40.21	Peak Max	H	264	296	74	-33.79	Pass
4924.39	60.24	4.22	-11.11	53.35	Peak Max	V	225	45	74	-20.65	Pass
8938.38	42.06	5.62	-6.07	41.61	Peak Max	H	161	159	74	-32.39	Pass
3894.65	40.24	3.73	-12.76	31.21	Average Max	H	264	296	54	-22.79	Pass
4924.39	50.3	4.22	-11.11	43.41	Average Max	H	225	45	54	-10.59	Pass
8938.38	32.84	5.62	-6.07	32.39	Average Max	H	161	159	54	-21.61	Pass

Restricted Band Measurement Plots:

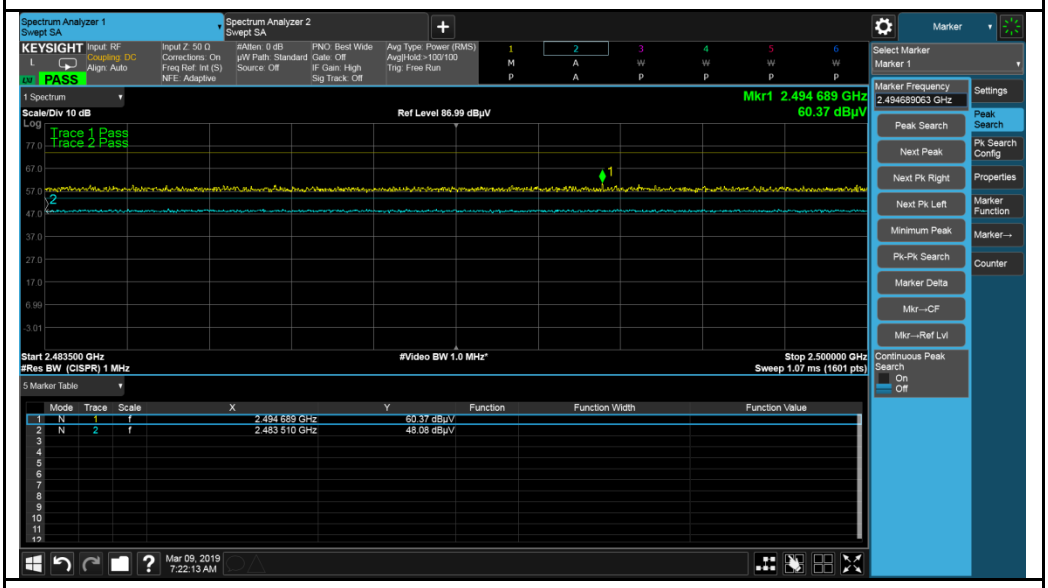
802.11b-2412MHz



802.11b-2462MHz

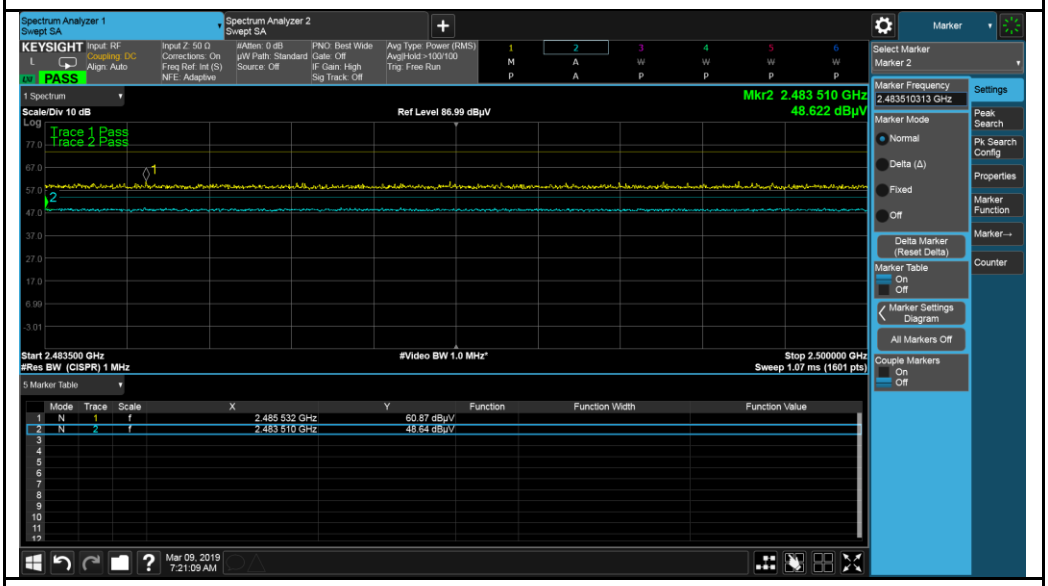


802.11g-2412MHz



802.11g-2462MHz

802.11n20-2412MHz



802.11n20-2462MHz

Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Cycle	Cal Due	In use
Radiated Emissions						
Keysight EXA 44GHz Spectrum Analyzer	N9030B(PXA)	MY57140374	08/20/2018	1 Year	08/20/2019	☑
Bi-Log antenna (30MHz~6GHz)	JB6	A111717	08/12/2018	1 Year	08/12/2019	☑
Horn Antenna (1GHz~26GHz)	3115	100059	01/26/2019	1 Year	01/26/2020	☑
Horn Antenna (26GHz~40GHz)	AH-840	101013	08/28/2018	1 Year	08/28/2019	☑
Pre-Amplifier(0.3MHz-6.5GHz)	LPA-6-30	11170602	02/06/2019	1 Year	02/06/2020	☑
Pre-Amplifier (1-26.5GHz)	8449B	3008A00715	08/16/2018	1 Year	08/16/2019	☑
Pre-Amp (10MHz~50GHz)	RAMP00M50GA	17032300047	02/10/2019	1 Year	02/10/2020	☑
Conducted Measurement						
Spectrum Analyzer	N9010A	10SL0180	11/16/2018	1 Year	11/16/2019	☑
Keysight Signal Generator	E8257D	MY57280548	02/09/2018	2 Year	02/09/2020	☑

Annex B. SIEMIC Accreditation

Accreditations	Document	Scope / Remark
ISO 17025 (A2LA)		Please see the documents for the detailed scope
ISO Guide 65 (A2LA)		Please see the documents for the detailed scope
TCB Designation		A1, A2, A3, A4, B1, B2, B3, B4, C
FCC DoC Accreditation		FCC Declaration of Conformity Accreditation
FCC Site Registration		3 meter site
FCC Site Registration		10 meter site
IC Site Registration		3 meter site
IC Site Registration		10 meter site
EU NB		**Radio & Telecommunications Terminal Equipment:** EN45001 – EN ISO/IEC 17025
		Electromagnetic Compatibility: EN45001 – EN ISO/IEC 17025
Singapore iDA CB(Certification Body)		Phase I, Phase II
Vietnam MIC CAB Accreditation		Please see the document for the detailed scope
Hong Kong OFCA		**(Phase II)** OFCA Foreign Certification Body for Radio and Telecom
		(Phase I) Conformity Assessment Body for Radio and Telecom
Industry Canada CAB		**Radio:** Scope A – All Radio Standard Specification in Category I
		Telecom: CS-03 Part I, II, V, VI, VII, VIII

Japan Recognized Certification Body Designation		**Radio**: A1. Terminal equipment for purpose of calling **Telecom**: B1. Specified radio equipment specified in Article 38-2, Paragraph 1, Item 1 of the Radio Law
Korea CAB Accreditation		**EMI:** KCC Notice 2008-39, RRL Notice 2008-3: CA Procedures for EMI KN22: Test Method for EMI **EMS:** KCC Notice 2008-38, RRL Notice 2008-4: CA Procedures for EMS KN24, KN61000-4-2, -4-3, -4-4, -4-5, -4-6, -4-8, -4-11: Test Method for EMS
		Radio: RRL Notice 2008-26, RRL Notice 2008-2, RRL Notice 2008-10, RRL Notice 2007-49, RRL Notice 2007-20, RRL Notice 2007-21, RRL Notice 2007-80, RRL Notice 2004-68
		Telecom: President Notice 20664, RRL Notice 2007-30, RRL Notice 2008-7 with attachments 1, 3, 5, 6; President Notice 20664, RRL Notice 2008-7 with attachment 4
Taiwan NCC CAB Recognition		LP0002, PSTN01, ADSL01, ID0002, IS6100, CNS14336, PLMN07, PLMN01, PLMN08
Taiwan BSMI CAB Recognition		CNS 13438
Japan VCCI		R-3083: Radiation 3 meter site C-3421: Main Ports Conducted Interference Measurement T-1597: Telecommunication Ports Conducted Interference Measurement
Australia CAB Recognition		**EMC:** AS/NZS CISPR 11, AS/NZS CISPR 14.1, AS/NZS CISPR22, AS/NZS 61000.6.3, AS/NZS 61000.6.4
		Radio communications: AS/NZS 4281, AS/NZS 4268, AS/NZS 4280.1, AS/NZS 4280.2, AS/NZS 4295, AS/NZS 4582, AS/NZS 4583, AS/NZS 4769.1, AS/NZS 4769.2, AS/NZS 4770, AS/NZS 4771
		Telecommunications: AS/ACIF S002:05, AS/ACIF S003:06, AS/ACIF S004:06 AS/ACIF S006:01, AS/ACIF S016:01, AS/ACIF S031:01, AS/ACIF S038:01, AS/ACIF S040:01, AS/ACIF S041:05, AS/ACIF S043.2:06, AS/ACIF S60950.1
Australia NATA Recognition		AS/ACIF S002, AS/ACIF S003, AS/ACIF S004, AS/ACIF S006, AS/ACIF S016,AS/ACIF S031, AS/ACIF S038, AS/ACIF S040, AS/ACIF S041, AS/ACIF S043.2