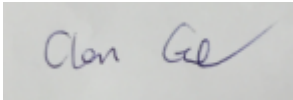


RF TEST REPORT



Report No.: FCC_IC_RF_SL15122401-BTF-003_DTS_WLAN_Rev1.0

Supersede Report No.: None

Applicant	Butterfleye, Inc.
Product Name	Butterfleye Smart Camera
Model No.	WCAM100WH
Test Standard	47 CFR 15.247 RSS 247 Iss.1 : May 2015
Test Method	ANSI C63.10: 2013 RSS Gen Iss 4: Nov 2014 558074 D01 DTS Meas Guidance v03r04
FCC ID	2AG9N-BFLY1
IC ID	21091-BFLY1
Date of test	01/07/2016 – 01/14/2016
Issue Date	01/21/2016
Test Result	<u>Pass</u> Fail
Equipment complied with the specification	[x]
Equipment did not comply with the specification	[]
	
Rachana Khanduri	Chen Ge
Test Engineer	Engineer Reviewer
This test report may be reproduced in full only Test result presented in this test report is applicable to the tested sample only	

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



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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	EMC, RF/Wireless, Telecom, Safety
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
FCC_IC_RF_SL15122401-BTF-003_DTS_WLAN	None	Original	01/21/2016
FCC_IC_RF_SL15122401-BTF-003_DTS_WLAN_Rev1.0	Rev1.0	Updated Antenna Gain	02/10/2016

2 Executive Summary

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

Company: Butterfleye, Inc.
Product: Butterfleye Smart Camera
Model: WCAM100WH

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	Butterfleye Inc.
Applicant Address	2191-B, South El Camino Real, San Mateo, CA 94403, USA
Manufacturer Name	Appro Photoelectron, Inc.
Manufacturer Address	3F, No.23 Siyuan Rd., Xinzhuang Dist., New Taipei, 24251 Taiwan, (R.O.C)

4 Test site information

Lab performing tests	SIEMIC Laboratories
Lab Address	775 Montague Expressway, Milpitas, CA 95035
FCC Test Site No.	881796
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	:	Butterfleye Smart Camera
Model No.	:	WCAM100WH
Trade Name	:	Butterfleye
Serial No.	:	N/A
Host Model No.	:	N/A
Input Power	:	100-240V, 50/60Hz
Power Adapter Manu/Model	:	N/A
Power Adapter SN	:	N/A
Product Hardware version	:	DVT4
Product Software version	:	0.4.14
Radio Hardware version	:	DVT4
Radio Software version	:	0.4.14
Date of EUT received	:	01/07/2016
Equipment Class/ Category	:	DTS
Port/Connectors	:	USB

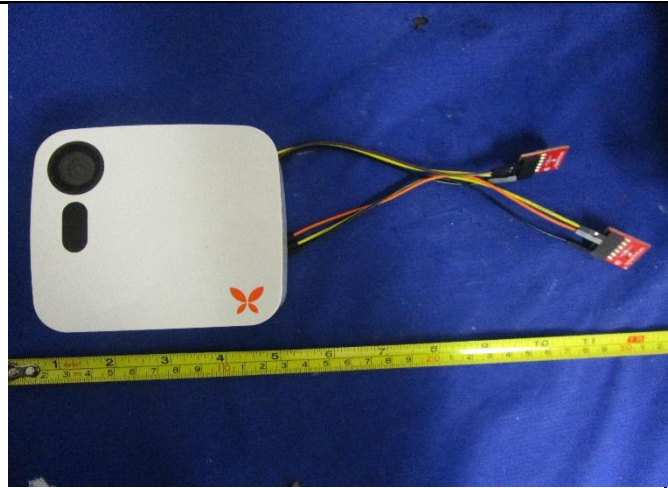
6.2 Radio Description

Radio Type	802.11b	802.11g	802.11n-20M
Operating Frequency	2412-2462MHz	2412-2462MHz	2412-2462MHz
Modulation	DSSS (CCK, DQPSK, DBPSK)	OFDM-CCK (BPSK, QPSK, 16QAM,64QAM)	OFDM (BPSK, QPSK, 16QAM, 64QAM)
Channel Spacing	5MHz	5MHz	5MHz(2.4GHz)
Number of Channels	11	11	11(2.4GHz)
Antenna Type	Dipole		
Antenna Gain (Peak)	3.8 dBi (Wifi)		
Antenna Connector Type	U.FL connector		

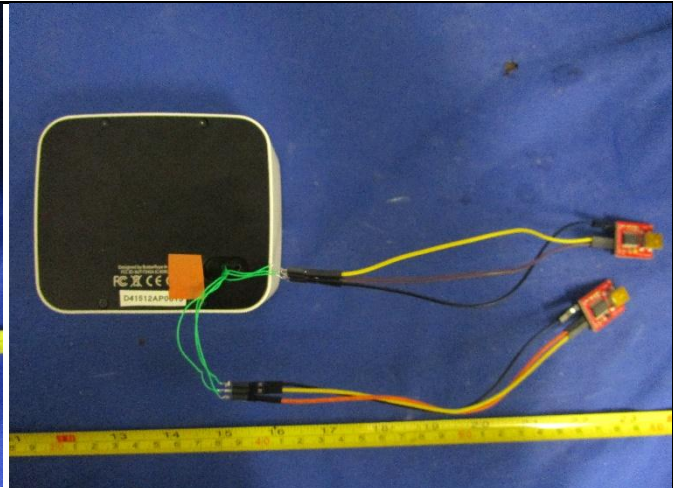
EUT Power level setting

Mode	Frequency (MHz)	Power setting
802.11-b	2412	Default
802.11-b	2437	Default
802.11-b	2462	Default
802.11-g	2412	Default
802.11-g	2437	Default
802.11-g	2462	Default
802.11-n-20	2412	Default
802.11-n-20	2437	Default
802.11-n-20	2462	Default

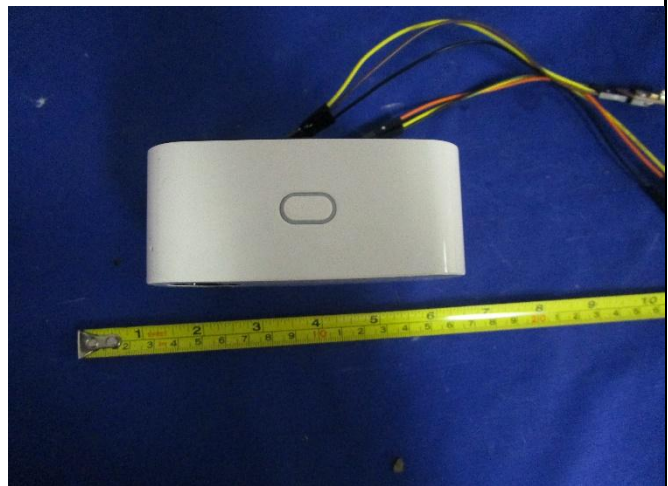
6.3 EUT Photos-External



EUT - Front View



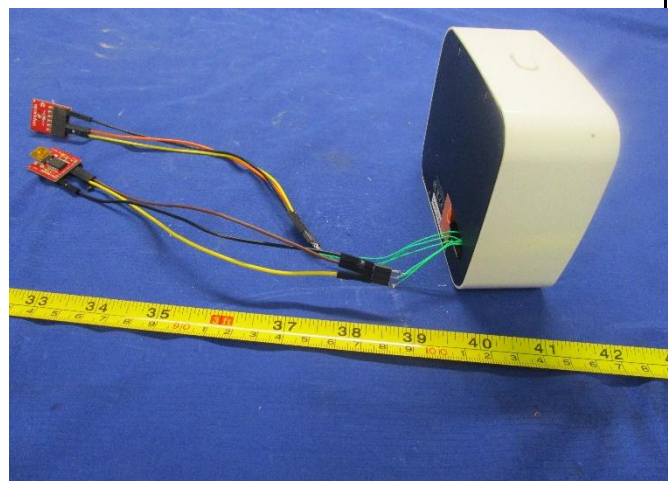
EUT - Rear View



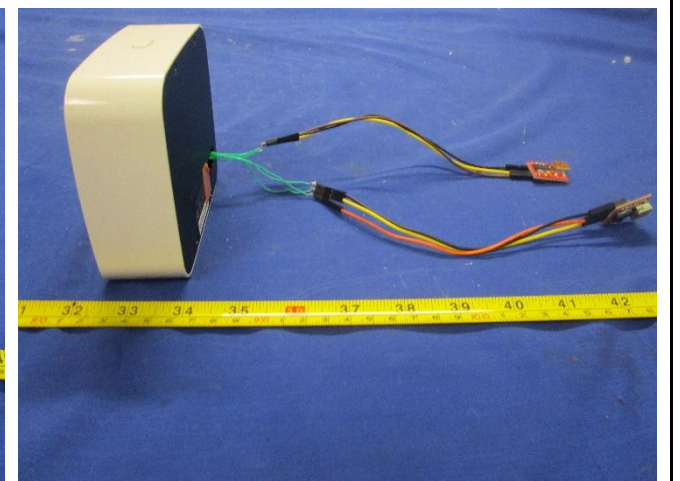
EUT - Top View



EUT - Bottom View

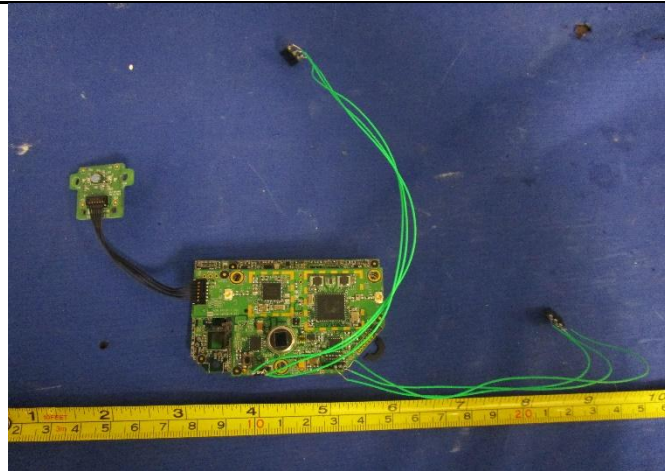


EUT - Left Side View

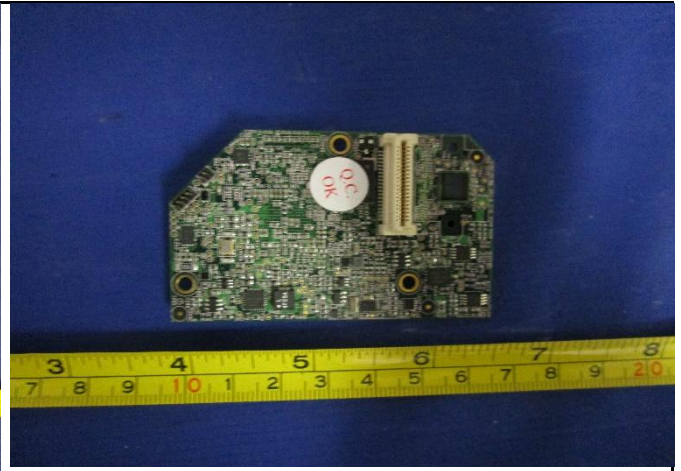


EUT - Right Side View

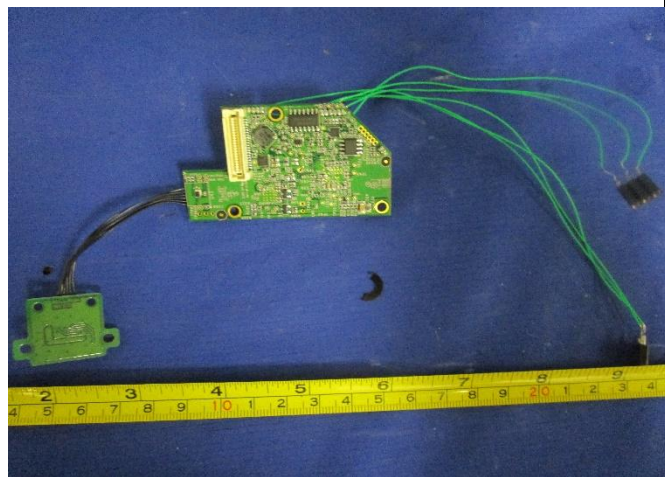
6.4 EUT Photos (Internal)



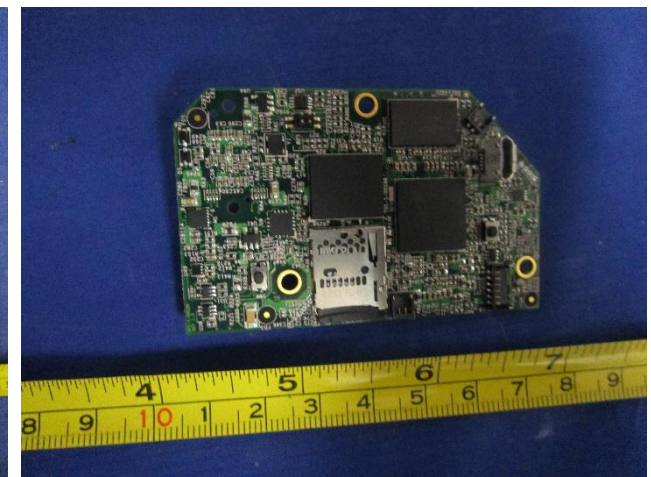
Cover off View 1



Cover off View 2



PCBA 1 Top View



PCBA 1 RearView



Support Equipment Power Supply Top View



Support Equipment Power Supply Bottom View

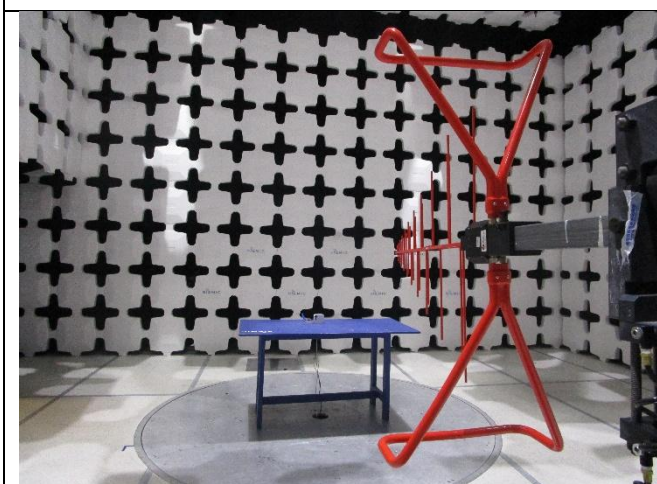
6.5 EUT Test Setup Photos



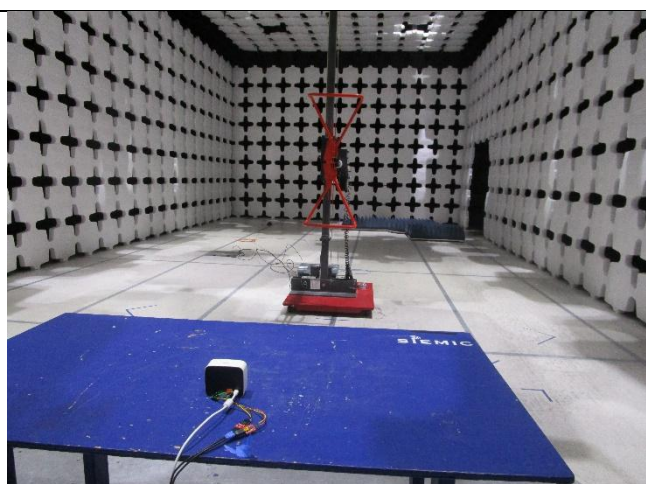
AC Line Conducted Emissions – Front View



AC Line Conducted Emissions – Rear View



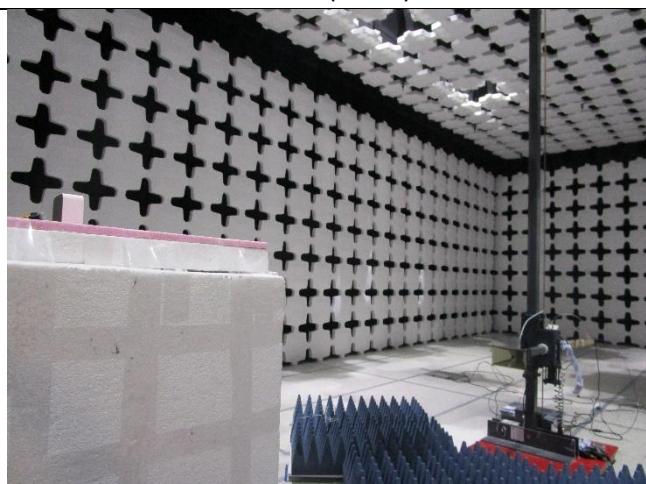
Radiated Emissions (<1GHz) – Front View



Radiated Emissions (<1GHz) – Rear View



Radiated Emissions (>1GHz) – Front View



Radiated Emissions (>1GHz) – Rear View

7 Supporting Equipment/Software and cabling Description

7.1 Supporting Equipment

Item	Supporting Equipment Description	Model	Serial Number	Manufacturer	Note
1.	Laptop	Latitude 3550	-	Dell	-

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	I/O Port	Laptop	USB	2	Unshielded	-

7.3 Test Software Description

Test Item	Software	Description
RF Testing	RadioToolGUI.exe	Set the EUT to different modulation and channel

8 Test Summary

Test Item	Test standard		Test Method/Procedure		Pass / Fail
Restricted Band of Operation	FCC	15.205	FCC	ANSI C63.10:2013	☒ Pass
	IC	RSS Gen 8.10	IC	558074 D01 DTS Meas Guidance v03r04	☐ N/A
AC Conducted Emissions	FCC	15.207(a)	FCC	ANSI C63.10:2013	☐ Pass
	IC	RSS Gen 8.8	IC	RSS Gen Issue 4: 2014	☒ N/A

Test Item	Test standard		Test Method/Procedure		Pass / Fail
99% Occupied Bandwidth	-	-	-	-	☐ Pass
	IC	RSS Gen 6.6	IC	RSS Gen Issue 4: 2014 -	☒ N/A
6dB Bandwidth	FCC	15.247(a)(2)	FCC	558074 D01 DTS Meas Guidance v03r04	☐ Pass
	IC	RSS247 (5.2.1)	IC		☒ N/A
Band Edge and Radiated Spurious Emissions	FCC	15.247(d)	FCC	ANSI C63.10:2013 558074 D01 DTS Meas Guidance v03r04	☒ Pass
	IC	RSS247 (5.5)	IC		☐ N/A
Output Power	FCC	15.247(b)	FCC	558074 D01 DTS Meas Guidance v03r04	☐ Pass
	IC	RSS247 (5.4.4)	IC		☒ N/A
Receiver Spurious Emissions	IC	RSS Gen (4.8)	IC	RSS Gen Issue 4: 2014	☐ Pass ☒ N/A
Antenna Gain > 6 dBi	FCC	15.247(e)	FCC	-	☐ Pass
	IC	-	IC	-	☒ N/A
Power Spectral Density	FCC	15.247(e)	FCC	558074 D01 DTS Meas Guidance v03r04	☐ Pass
	IC	RSS247 (5.2.2)	IC		☒ N/A
RF Exposure requirement	FCC	15.247(i)	FCC	-	☐ Pass
	IC	RSS Gen(5.5)	IC	RSS Gen Issue 4: 2014	☒ 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.				
Note	Only Radiated Spurious Emission was tested for AP1130 with sector antenna. Please refer to the report FR472301AA (Sporton Lab) for rest of the items.				

9 Measurement Uncertainty

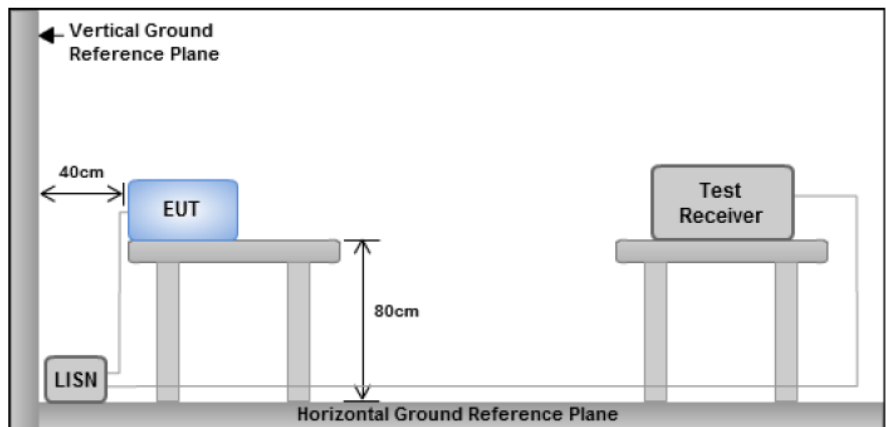
Emissions			
Test Item	Frequency Range	Description	Uncertainty
Band Edge and Radiated Spurious Emissions	30MHz – 1GHz	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	+5.6dB/-4.5dB
Band Edge and Radiated Spurious Emissions	1GHz – 40GHz	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	+4.3dB/-4.1dB

10 Measurements, Examination and Derived Results

10.1 Conducted Emissions

Conducted Emission Limit

Frequency ranges (MHz)	Limit (dBuV)	
	QP	Average
0.15 ~ 0.5	66 – 56	56 – 46
0.5 ~ 5	56	46
5 ~ 30	60	50

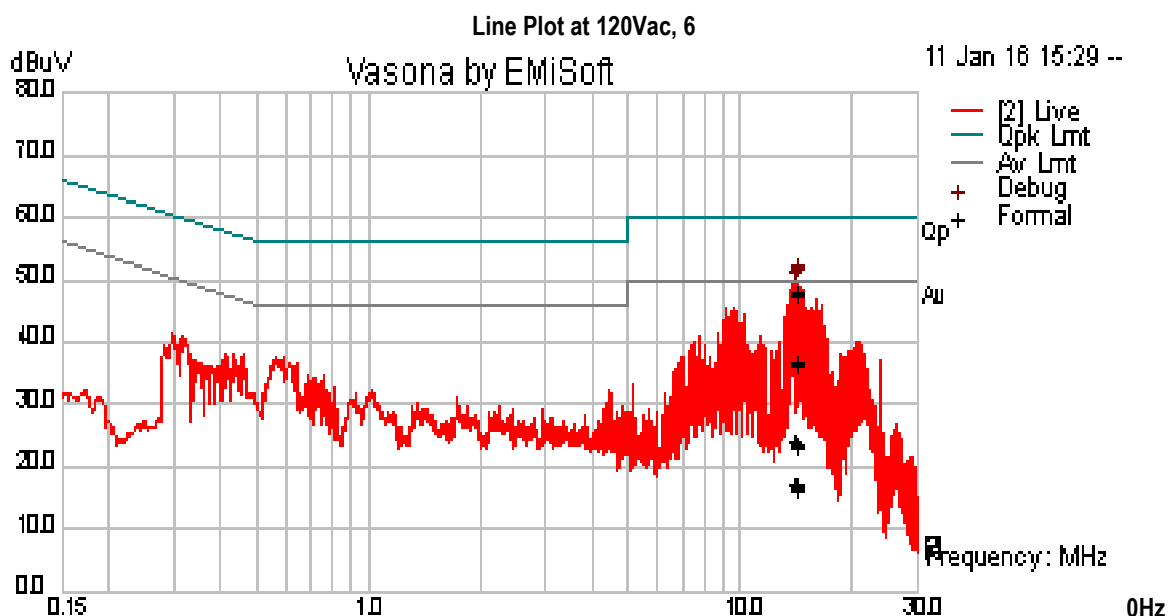
Spec	Item	Requirement	Applicable
§ 15.205 RSS Gen Issue 4: 2014 (8.8)	a)	For Low-power radio-frequency devices that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). The lower limit applies at the boundary between the frequency ranges.	☒
Test Setup	 Note: 1. Support units were connected to second LISN. 2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes		
Procedure	- The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table, as shown in Annex B. - The power supply for the EUT was fed through a 50Ω/50μH EUT LISN, connected to filtered mains. - The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable. - All other supporting equipment was powered separately from another main supply.		
Remark	EUT tested with AC 120V 60Hz		
Result	☒ Pass ☐ Fail		

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Conducted Emission Test Results

Test specification:	Conducted Emissions			
Environmental Conditions:	Temp(°C):	21	Result:	☒ Pass ☐ Fail
	Humidity (%):	42		
	Atmospheric(mbar):	1021		
Mains Power:	120Vac, 60Hz			
Tested by:	Rachana Khanduri			
Test Date:	01/11/2016			
Remarks	AC Line @ Line			

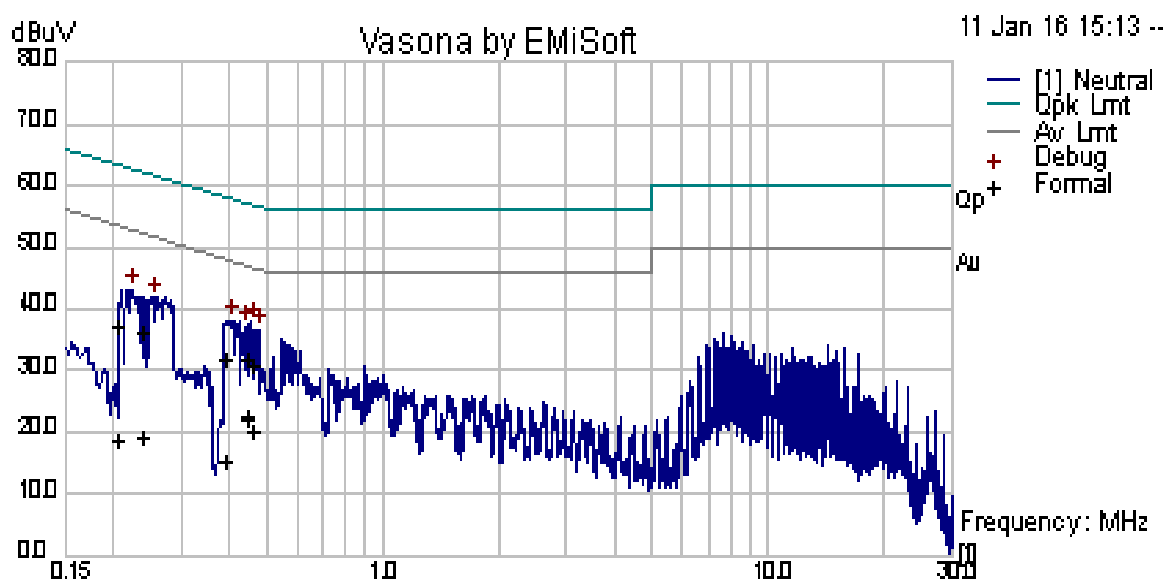


Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV)	Measurement Type	Line	Limit (dBuV)	Margin (dB)	Pass /Fail
14.15	36.97	10.06	0.59	47.62	Quasi Peak	Live	60	-12.38	Pass
14.31	37.62	10.06	0.59	48.27	Quasi Peak	Live	60	-11.73	Pass
14.35	37.28	10.06	0.59	47.93	Quasi Peak	Live	60	-12.07	Pass
14.20	12.49	10.06	0.59	23.14	Quasi Peak	Live	60	-36.86	Pass
14.24	12.85	10.06	0.59	23.50	Quasi Peak	Live	60	-36.50	Pass
14.12	13.16	10.06	0.59	23.81	Quasi Peak	Live	60	-36.19	Pass
14.15	25.80	10.06	0.59	36.45	Average	Live	50	-13.55	Pass
14.31	25.95	10.06	0.59	36.60	Average	Live	50	-13.40	Pass
14.35	6.45	10.06	0.59	17.10	Average	Live	50	-32.90	Pass
14.20	6.00	10.06	0.59	16.65	Average	Live	50	-33.35	Pass
14.24	5.48	10.06	0.59	16.13	Average	Live	50	-33.87	Pass
14.12	6.43	10.06	0.59	17.08	Average	Live	50	-32.92	Pass

Note: The results above show only the worst case.

Conducted Emission Test Results

Test specification:	Conducted Emissions			
Environmental Conditions:	Temp(°C):	21	Result:	☒ Pass ☐ Fail
	Humidity (%):	42		
	Atmospheric(mbar):	1021		
Mains Power:	120Vac, 60Hz			
Tested by:	Rachana Khanduri			
Test Date:	01/11/2016			
Remarks	AC Line @ Neutral			



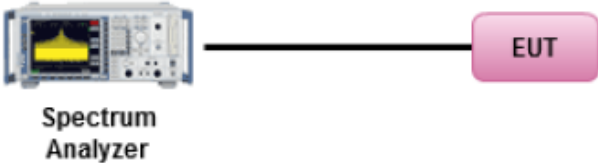
Neutral Plot at 120Vac, 60Hz

Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV)	Measurement Type	Line	Limit (dBuV)	Margin (dB)	Pass /Fail
0.448354	21.03	10.01	0.71	31.76	Quasi Peak	Neutral	56.91	-25.15	Pass
0.236899	25.30	10.00	1.12	36.43	Quasi Peak	Neutral	62.20	-25.78	Pass
0.205163	26.13	10.00	1.28	37.42	Quasi Peak	Neutral	63.40	-25.98	Pass
0.392989	20.98	10.01	0.76	31.74	Quasi Peak	Neutral	58.00	-26.26	Pass
0.463504	20.06	10.01	0.70	30.78	Quasi Peak	Neutral	56.63	-25.85	Pass
0.448763	21.05	10.01	0.71	31.77	Quasi Peak	Neutral	56.90	-25.13	Pass
0.448354	11.54	10.01	0.71	22.26	Average	Neutral	46.91	-24.65	Pass
0.236899	7.99	10.00	1.12	19.11	Average	Neutral	52.20	-33.09	Pass
0.205163	7.51	10.00	1.28	18.80	Average	Neutral	53.40	-34.60	Pass
0.392989	4.70	10.01	0.76	15.46	Average	Neutral	48.00	-32.54	Pass
0.463504	9.23	10.01	0.70	19.94	Average	Neutral	46.63	-26.69	Pass
0.448763	11.64	10.01	0.71	22.36	Average	Neutral	46.90	-24.54	Pass

Note: The results above show only the worst case.

10.2 6dB Bandwidth

Requirement(s):

Spec	Item	Requirement	Applicable
§ 15.247 RSS247 (5.2.1)	a)(2)	6dB BW≥500KHz;	☒
Test Setup			
Test Procedure	558074 D01 DTS Meas Guidance v03r04, 8.1 DTS bandwidth <u>6dB Emission bandwidth measurement procedure</u> - Set RBW = 100 kHz. - Set the video bandwidth (VBW) $\geq 3 \times$ 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	01/11/2016	Environmental condition	Temperature 23°C Relative Humidity 42% Atmospheric Pressure 1021mbar
Remark	N/A		
Result	☒ Pass ☐ Fail		

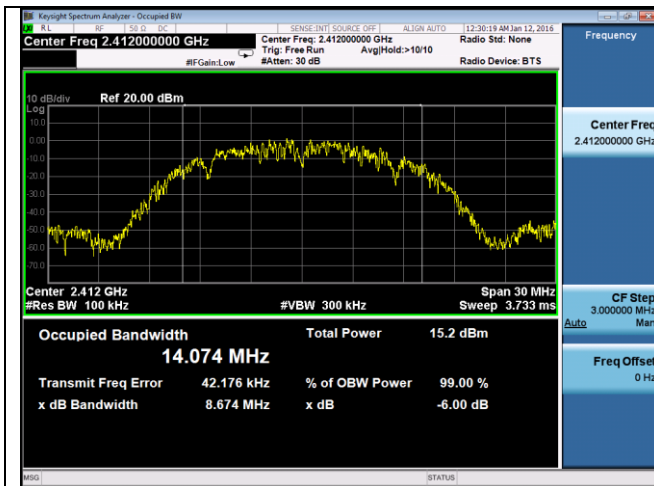
Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes ☐ N/A

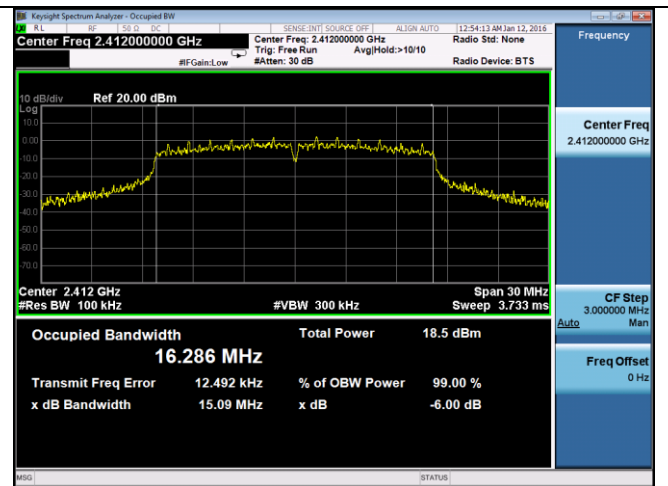
6dB Bandwidth measurement result for 2.4GHz

Type	Test mode	Freq (MHz)	CH	Result (MHz)	Limit (MHz)	Result
6dB BW	802.11b	2412	Low	8.67	≥0.5	Pass
6dB BW	802.11b	2437	Mid	9.69	≥0.5	Pass
6dB BW	802.11b	2462	High	9.09	≥0.5	Pass
6dB BW	802.11g	2412	Low	15.09	≥0.5	Pass
6dB BW	802.11g	2437	Mid	15.10	≥0.5	Pass
6dB BW	802.11g	2462	High	15.09	≥0.5	Pass
6dB BW	802.11n-20M	2412	Low	15.08	≥0.5	Pass
6dB BW	802.11n-20M	2437	Mid	15.10	≥0.5	Pass
6dB BW	802.11n-20M	2462	High	15.09	≥0.5	Pass

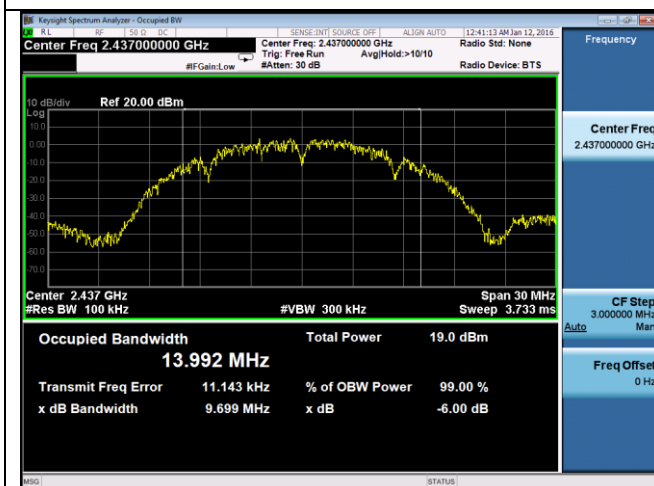
Test Plots



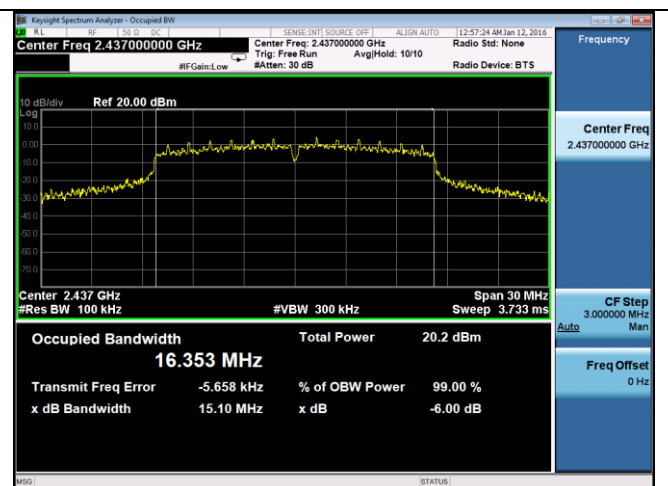
6dB BW -2.4G 802.11b 2412MHz



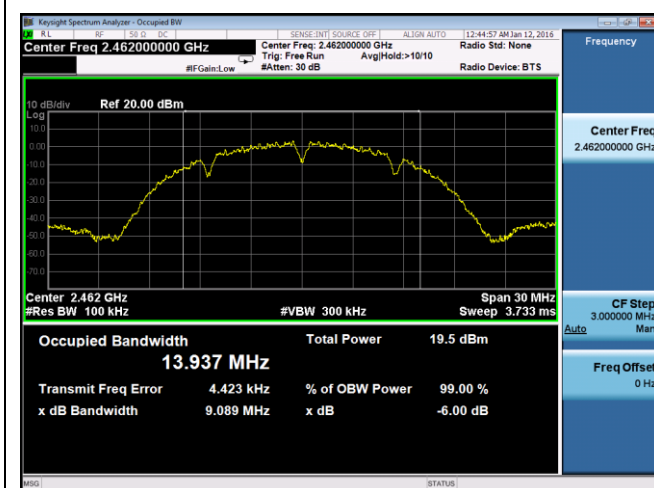
6dB BW -2.4G 802.11g 2412MHz



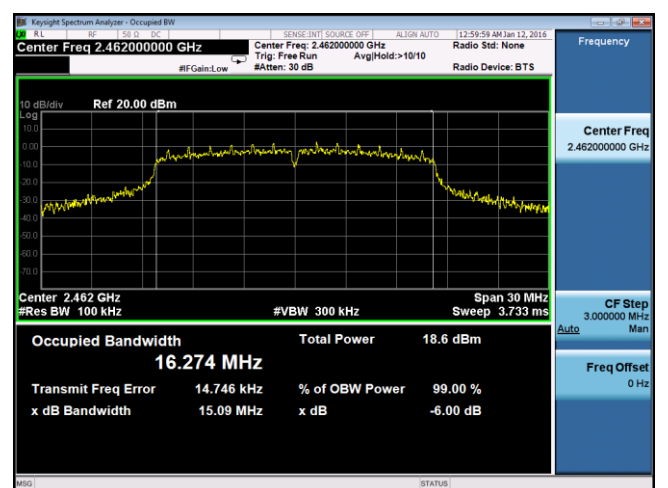
6dB BW -2.4G 802.11b 2437MHz



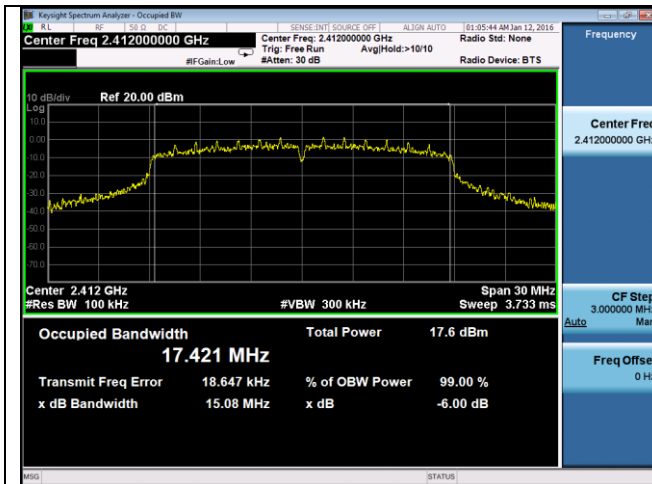
6dB BW -2.4G 802.11g 2437MHz



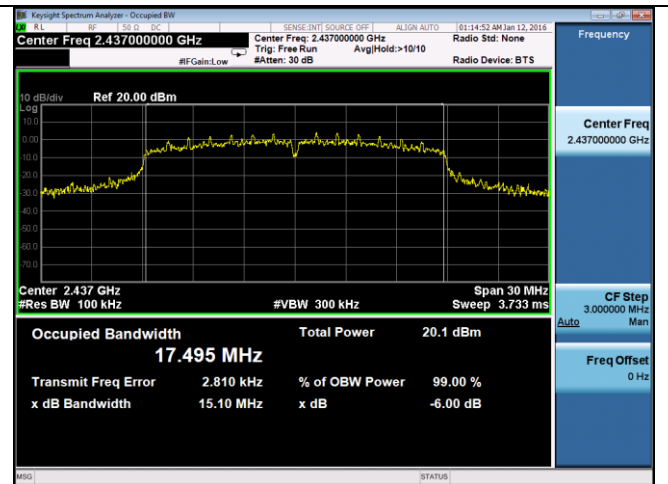
6dB BW -2.4G 802.11b 2462MHz



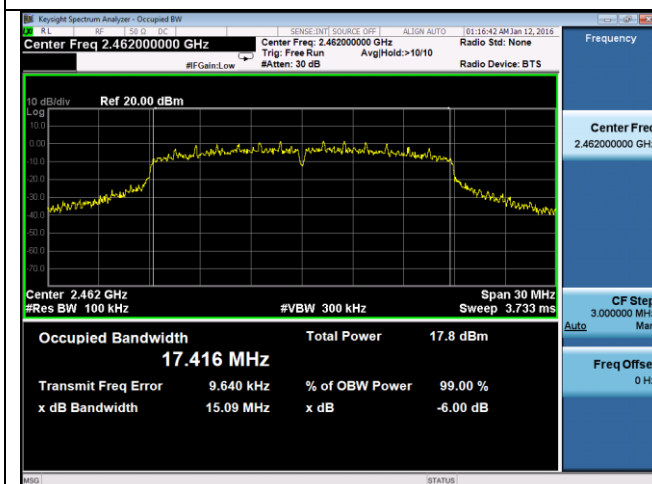
6dB BW -2.4G 802.11g 2462MHz



6dB BW -2.4G 802.11n-20M 2412MHz



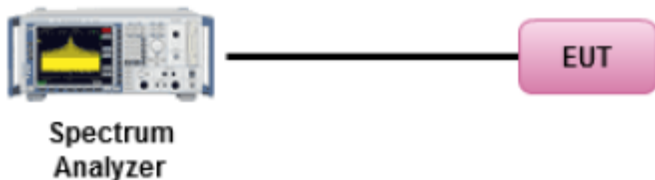
6dB BW -2.4G 802.11n-20M 2437MHz



6dB BW -2.4G 802.11n-20M 2462MHz

10.3 99% Occupied Bandwidth

Requirements:

Spec	Requirement	Applicable
RSS Gen 4.6.1	The transmitter shall be operated at its maximum carrier power measured under normal test conditions. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used given that a peak or peak hold may produce a wider bandwidth than actual. The trace data points are recovered and directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded. The span between the two recorded frequencies is the occupied bandwidth	☒
Test Setup		
Procedure	- EUT was set for low, mid, high channel with modulated mode and highest RF output power. - The spectrum analyzer was connected to the antenna terminal.	
Test Date	01/11/2016	Environmental condition Temperature 23oC Relative Humidity 47% Atmospheric Pressure 1019mbar
Remark	-	
Result	☒ Pass ☐ Fail	

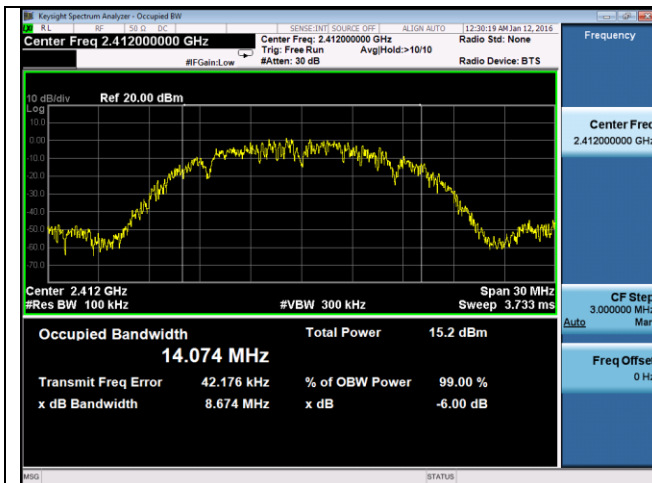
Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

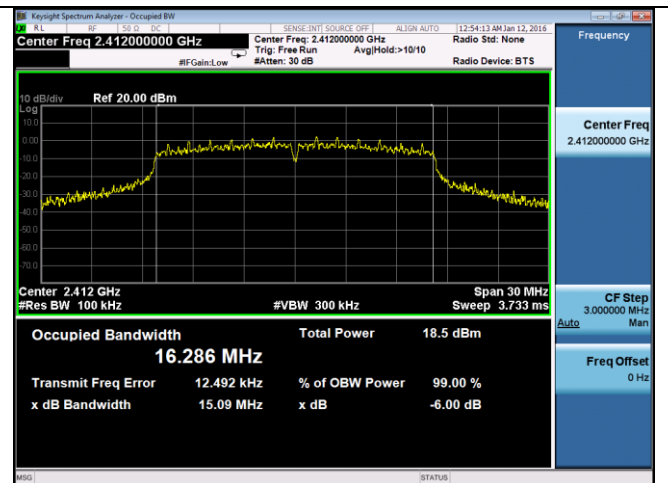
99% OBW measurement result for 2.4GHz

Type	Test mode	Freq (MHz)	CH	Result (MHz)
99% OBW	802.11b	2412	Low	14.074
99% OBW	802.11b	2437	Mid	13.992
99% OBW	802.11b	2462	High	13.937
99% OBW	802.11g	2412	Low	16.286
99% OBW	802.11g	2437	Mid	16.353
99% OBW	802.11g	2462	High	16.274
99% OBW	802.11n-20M	2412	Low	17.421
99% OBW	802.11n-20M	2437	Mid	17.495
99% OBW	802.11n-20M	2462	High	17.416

Test Plots



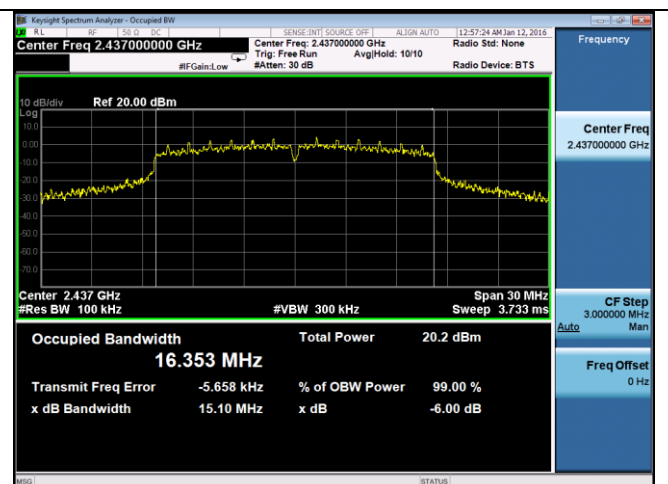
99% OBW -2.4G 802.11b 2412MHz



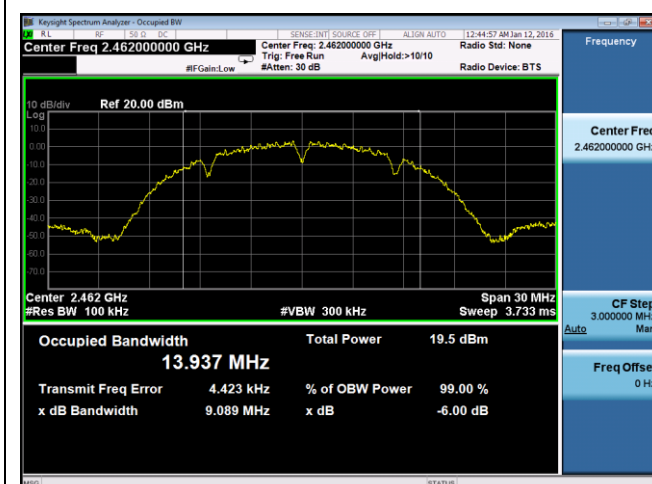
99% OBW -2.4G 802.11g 2412MHz



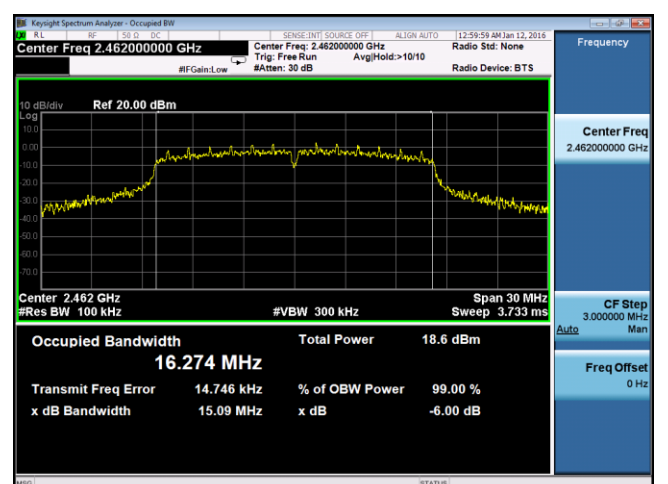
99% OBW -2.4G 802.11b 2437MHz



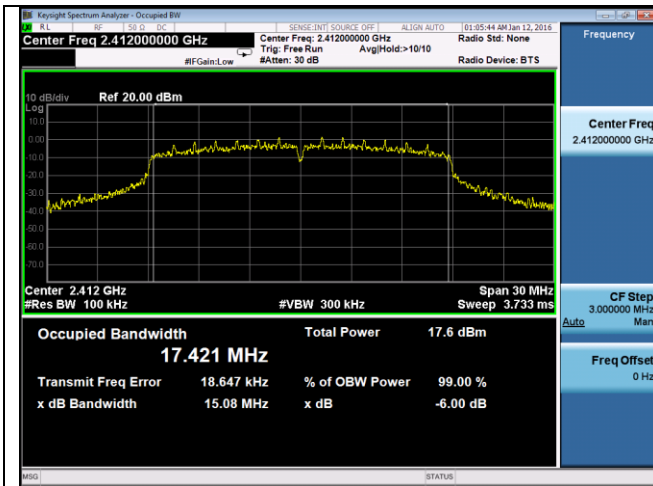
99% OBW -2.4G 802.11g 2437MHz



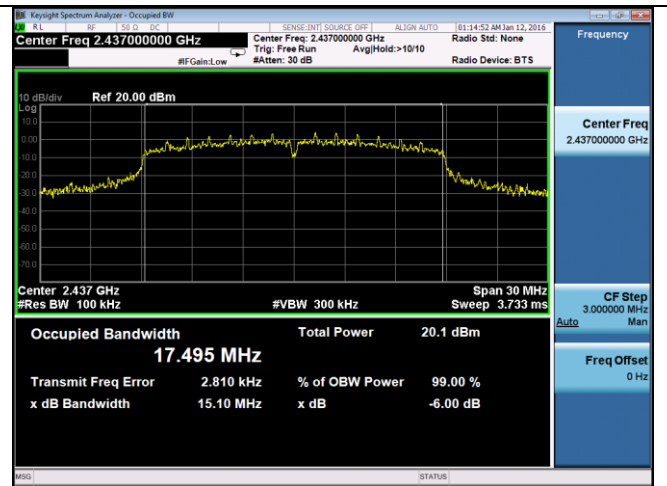
99% OBW -2.4G 802.11b 2462MHz



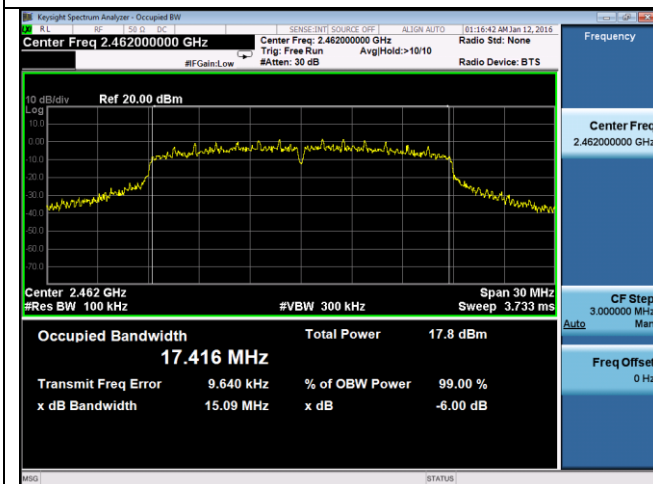
99% OBW -2.4G 802.11g 2462MHz



99% OBW -2.4G 802.11n-20M 2412MHz



99% OBW -2.4G 802.11n-20M 2437MHz



99% OBW -2.4G 802.11n-20M 2462MHz

10.4 Peak Output Power

Requirement(s):

Spec	Item	Requirement	Applicable
§ 15.247 RSS247 (5.4.4)	a)	FHSS in 2400-2483.5MHz with ≥ 75 channels: ≤ 1 Watt	☐
	b)	FHSS in 5725-5850MHz: ≤ 1 Watt	☐
	c)	For all other FHSS in the 2400-2483.5MHz band: ≤ 0.125 Watt.	☐
	d)	FHSS in 902-928MHz with ≥ 50 channels: ≤ 1 Watt	☐
	e)	FHSS in 902-928MHz with ≥ 25 & < 50 channels: ≤ 0.25 Watt	☐
	f)	DSSS in 902-928MHz, 2400-2483.5MHz, 5725-5850MHz: ≤ 1 Watt	☒
Test Setup	 Power Meter		
Test Procedure	558074 D01 DTS Meas Guidance v03r04, 9.2.3.1 <u>Measurement using a Power Meter (PM)</u> Measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required. - Connect EUT's RF output power to power meter - Set EUT to be continuous transmission mode - Measurement the average output power using power meter and record the result - Repeat above steps for different test channel and other modulation type.		
Test Date	01/11/2016	Environmental condition	Temperature 23°C Relative Humidity 44% Atmospheric Pressure 1021mbar
Remark	None		
Result	☒ Pass ☐ Fail		

Test Data ☒ Yes ☐ N/A

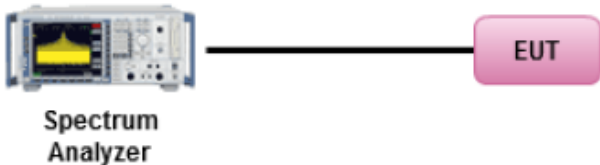
Test Plot ☐ Yes (See below) ☒ N/A

Output Power measurement result

Type	Test mode	Freq (MHz)	CH	Output Power (dBm)	Limit (dBm)	Result
Output power	802.11b	2412	Low	11.75	30	Pass
Output power	802.11b	2437	Mid	13.79	30	Pass
Output power	802.11b	2462	High	12.20	30	Pass
Output power	802.11g	2412	Low	8.57	30	Pass
Output power	802.11g	2437	Mid	9.64	30	Pass
Output power	802.11g	2462	High	8.33	30	Pass
Output power	802.11n-20M	2412	Low	7.35	30	Pass
Output power	802.11n-20M	2437	Mid	9.70	30	Pass
Output power	802.11n-20M	2462	High	7.67	30	Pass

10.5 Band Edge

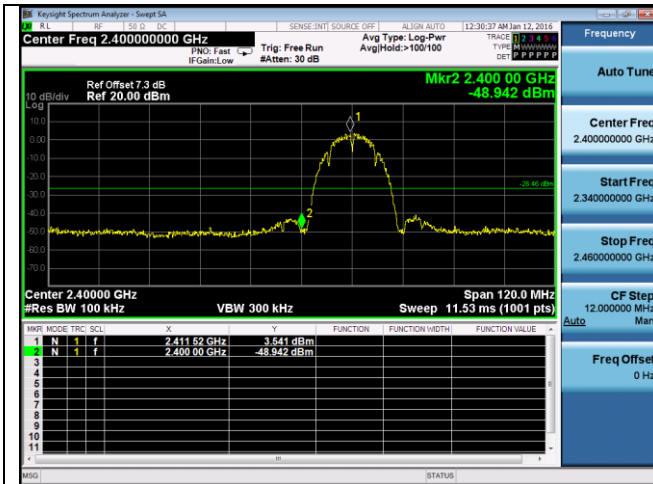
Requirement(s):

Spec	Item	Requirement	Applicable
§ 15.247 RSS247(5.5)	d)	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	☒
Test Setup			
Test Procedure	558074 D01 DTS Meas Guidance v03r04 <u>Band Edge measurement procedure</u> 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 attenuation shall 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	01/11/2016	Environmental condition	Temperature 22°C Relative Humidity 46% Atmospheric Pressure 1020mbar
Remark	-		
Result	☒ Pass ☐ Fail		

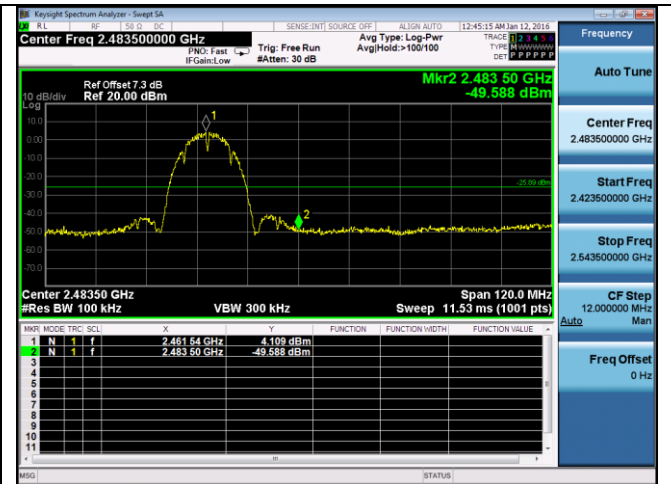
Test Data ☐ Yes ☒ N/A

Test Plot ☒ Yes (See below) ☐ N/A

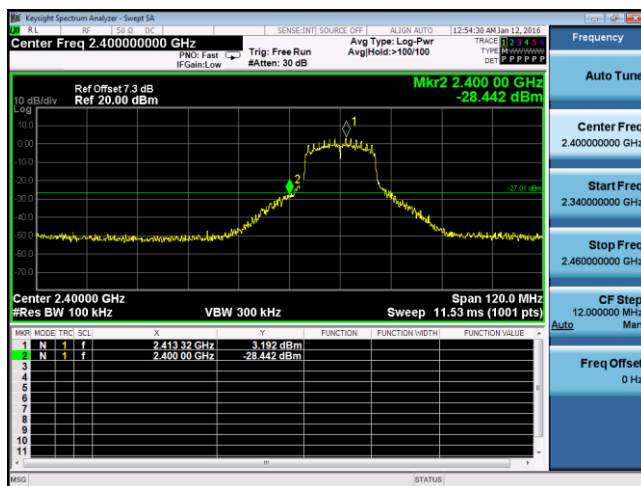
Test Plots



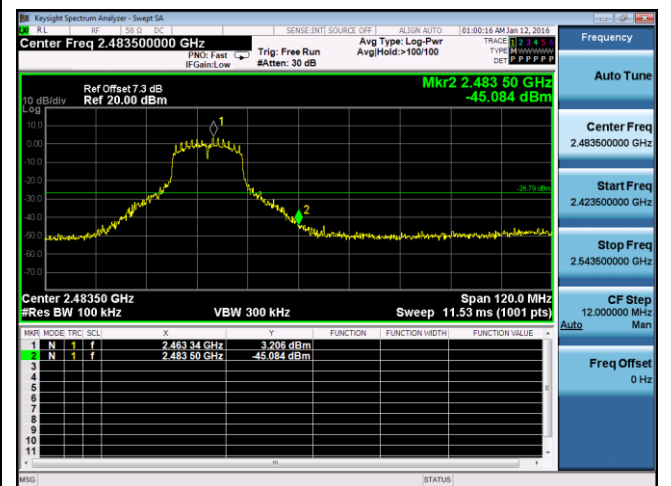
Lower Band Edge-2.4G-802.11b 2412MHz



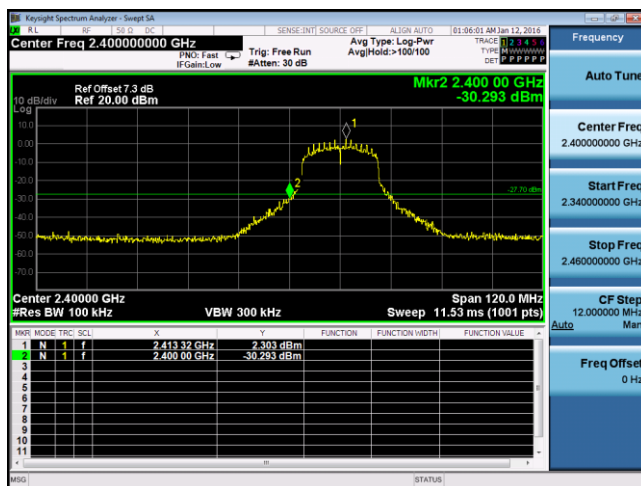
Higher Band Edge-2.4G-802.11b 2462MHz



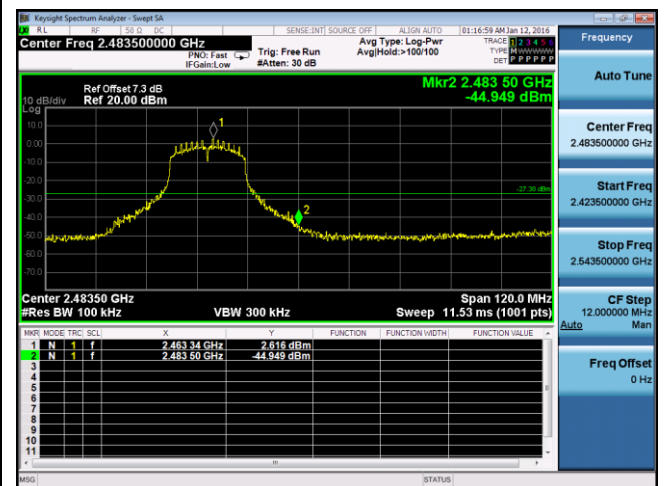
Lower Band Edge-2.4G-802.11g 2412MHz



Higher Band Edge-2.4G-802.11g 2462MHz



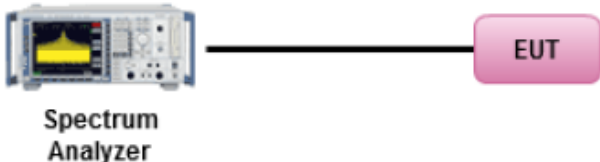
Lower Band Edge-2.4G-802.11n-20M 2412MHz



Higher Band Edge-2.4G-802.11n-20M 2462MHz

10.6 Peak Spectral Density

Requirement(s):

Spec	Item	Requirement	Applicable
§ 15.247(e) RSS247 (5.2.2)	e)	DSSS: $\leq 8\text{dBm}/3\text{KHz}$	☒
	f)	DSSS in hybrid sys with FH turned off: $\leq 8\text{dBm}/3\text{KHz}$	☐
Test Setup			
Test Procedure	558074 D01 DTS Meas Guidance v03r04, 10.2 Method PKPSD (peak PSD) <u>Peak spectral density measurement procedure</u> - Set analyzer center frequency to DTS channel center frequency. - Set the span to 1.5 times the DTS bandwidth. - Set the RBW to: $3\text{ kHz} \leq \text{RBW} \leq 100\text{ kHz}$. - Set the VBW $\geq 3 \times \text{RBW}$. - 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	01/11/2016	Environmental condition	Temperature 22°C Relative Humidity 46% Atmospheric Pressure 1020mbar
Remark	-		
Result	☒ Pass ☐ Fail		

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

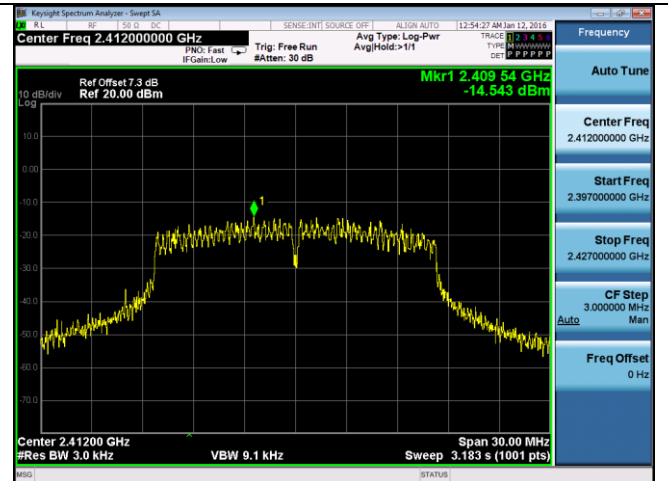
PSD measurement result

Type	Test mode	Freq (MHz)	CH	Conducted PSD (dBm/3KHz)	Limit (dBm/3KHz)	Result
PSD	802.11b	2412	Low	-10.379	≤8	Pass
PSD	802.11b	2437	Mid	-7.814	≤8	Pass
PSD	802.11b	2462	High	-9.396	≤8	Pass
PSD	802.11g	2412	Low	-14.543	≤8	Pass
PSD	802.11g	2437	Mid	-12.060	≤8	Pass
PSD	802.11g	2462	High	-13.566	≤8	Pass
PSD	802.11n-20M	2412	Low	-14.292	≤8	Pass
PSD	802.11n-20M	2437	Mid	-10.806	≤8	Pass
PSD	802.11n-20M	2462	High	-14.244	≤8	Pass

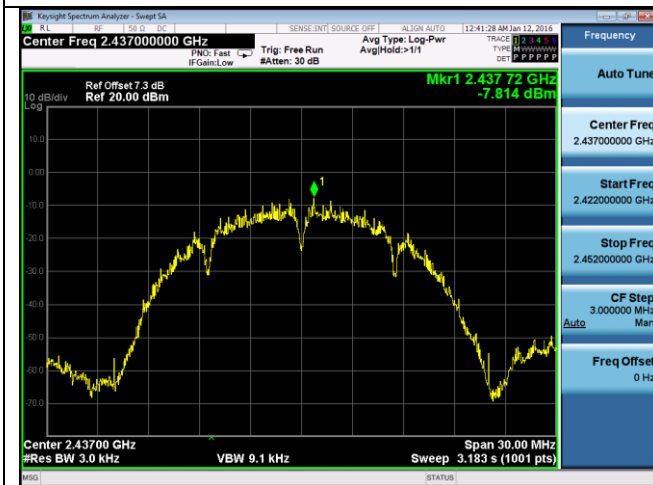
Test Plots



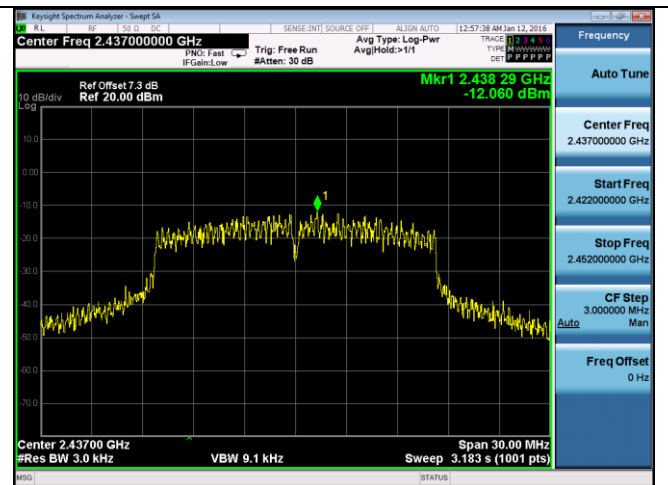
PSD-2.4G-802.11b 2412MHz



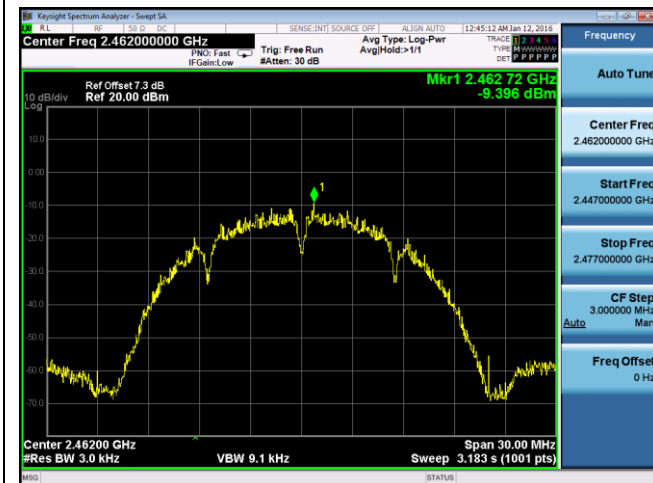
PSD-2.4G-802.11g 2412MHz



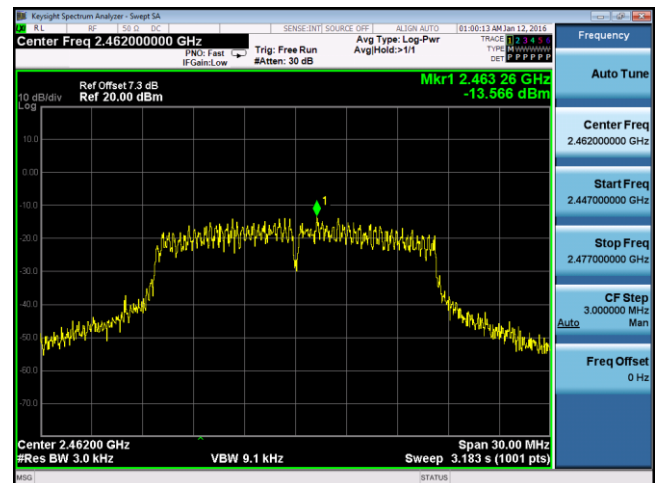
PSD-2.4G-802.11b 2437MHz



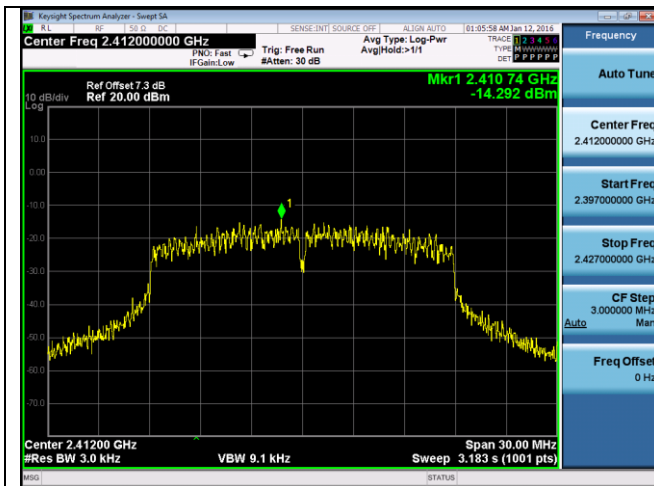
PSD-2.4G-802.11g 2437MHz



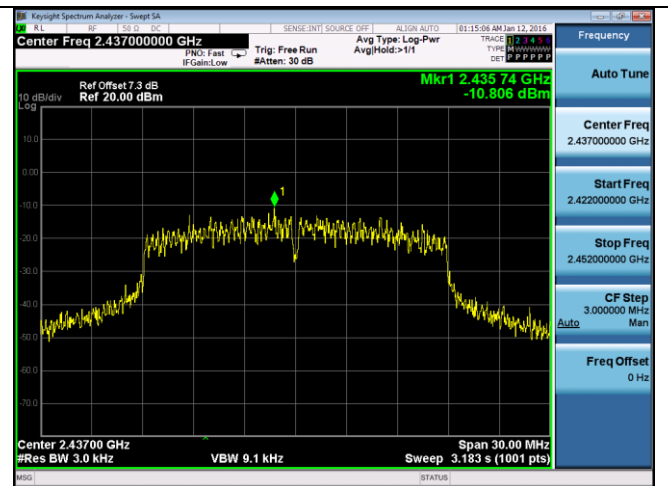
PSD-2.4G-802.11b 2462MHz



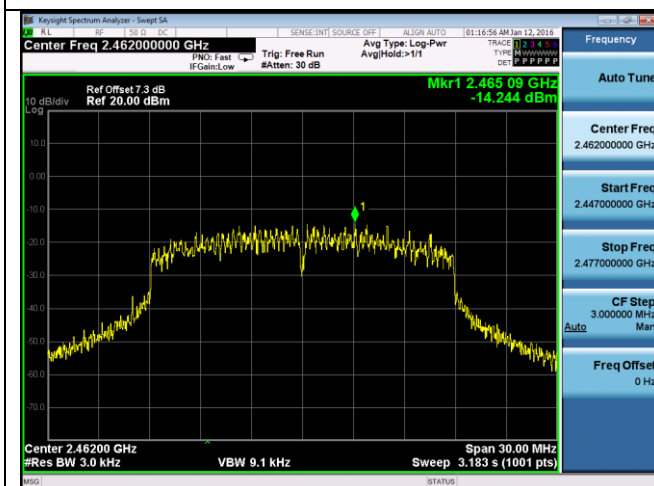
PSD-2.4G-802.11g 2462MHz



PSD-2.4G-802.11n-20M 2412MHz



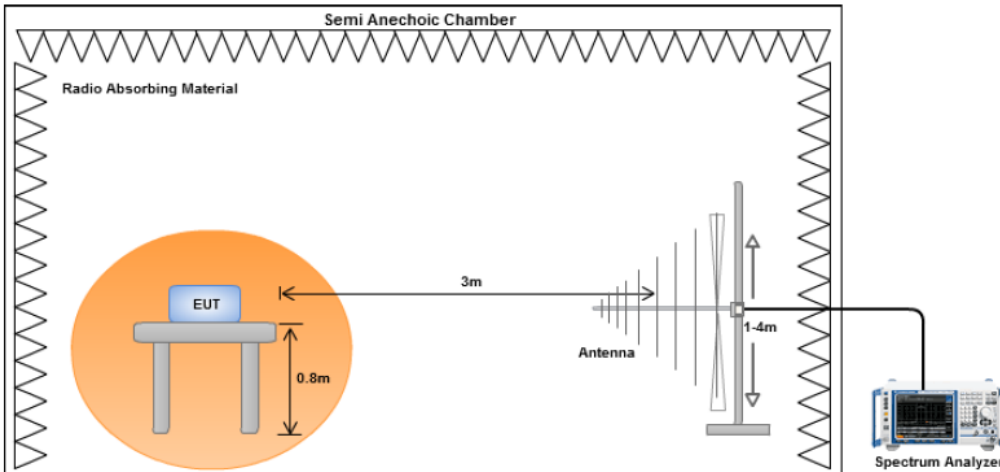
PSD-2.4G-802.11n-20M 2437MHz



PSD-2.4G-802.11n-20M 2462MHz

10.7 Radiated Emissions below 1GHz

Requirement(s):

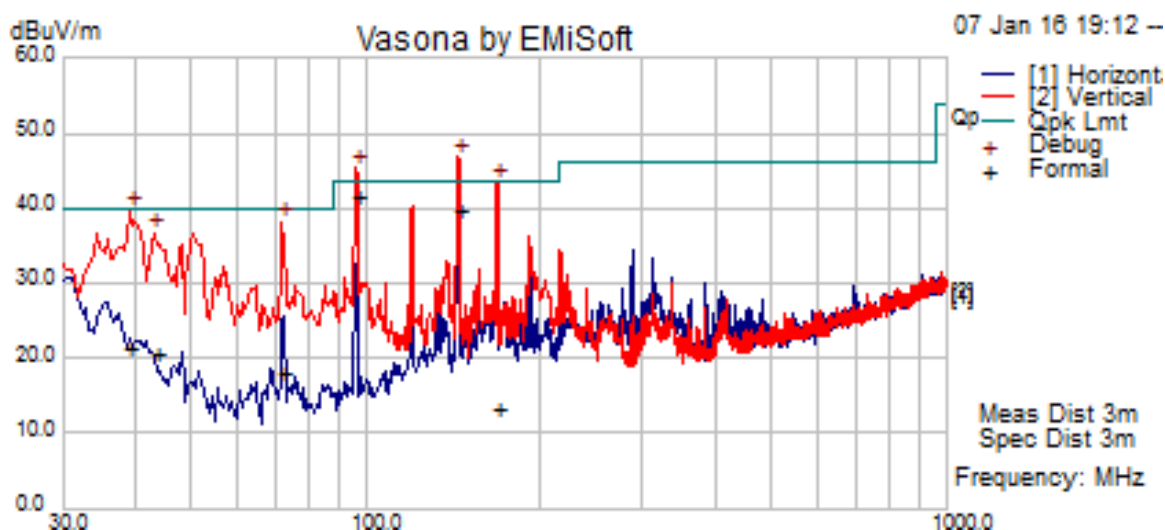
Spec	Item	Requirement	Applicable										
47CFR§15.247(d)	a)	Except higher limit as specified elsewhere in other section, the emissions from the low-power radio-frequency devices shall not exceed the field strength levels specified in the following table and the level of any unwanted emissions shall 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>	Frequency range (MHz)	Field Strength (uV/m)	30 – 88	100	88 – 216	150	216 960	200	Above 960	500	☒
Frequency range (MHz)	Field Strength (uV/m)												
30 – 88	100												
88 – 216	150												
216 960	200												
Above 960	500												
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. 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.												
Remark	The EUT was scanned up to 1GHz. Both horizontal and vertical polarities were investigated. The results show only the worst case.												
Result	☒ Pass ☐ Fail												

Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Radiated Emission Test Results (Below 1GHz)

Test specification	Below 1GHz				
Environmental Conditions:	Temp (°C):	25.7	Result		
	Humidity (%)	29			
	Atmospheric (mPa):				
Mains Power:	110VAC, 60Hz				
Tested by:	Rachana Khanduri				
Test Date:	01/07/2016				
Remarks:	2.4GHz 11n20 2437MHz				



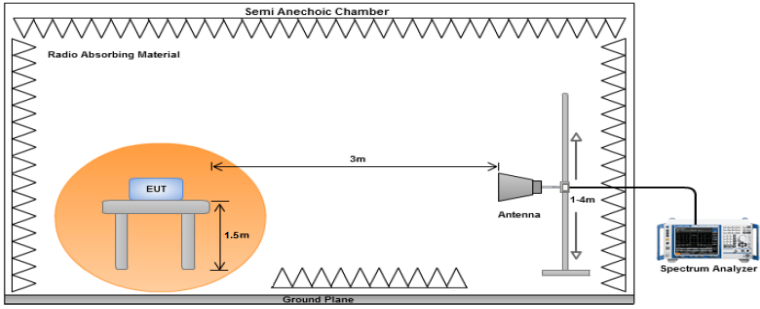
Quasi Max Measurement

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
143.96	63.13	1.96	-25.53	39.56	Quasi Max	V	121	181	43.52	-3.96	Pass
96.151	69.12	1.59	-29.31	41.4	Quasi Max	V	135	129	43.52	-2.12	Pass
168.27	38.09	2.15	-27.04	13.2	Quasi Max	V	224	39	43.52	-30.32	Pass
39.03	42.41	0.9	-21.9	21.41	Quasi Max	V	114	125	40	-18.59	Pass
71.874	46.9	1.37	-30.16	18.11	Quasi Max	V	159	204	40	-21.89	Pass
43.336	44.64	1.02	-24.94	20.72	Quasi Max	V	138	185	40	-19.28	Pass

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

10.8 Radiated Spurious Emissions above 1GHz

Requirement(s):

Spec	Item	Requirement	Applicable
47CFR§15.247(d) RSS247 (5.5)	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	- The EUT was switched on and allowed to warm up to its normal operating condition. - 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: - Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen. - The EUT was then rotated to the direction that gave the maximum emission. - Finally, the antenna height was adjusted to the height that gave the maximum emission. - An average measurement was then made for that frequency point. - Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.		
Test Date	01/14/2016	Environmental condition	Temperature 23°C Relative Humidity 42% Atmospheric Pressure 1021mbar
Remark	The EUT was scanned up to 25GHz. Both horizontal and vertical polarities were investigated. The results show only the worst case. For spurious emission measurement, if the peak emission is below 54 dBuV/m average limit, the average value is not be measured. Both horizontal and vertical polarization have been verified.		
Result	☒ Pass ☐ Fail		

Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Radiated Spurious Emission Test Results (Above 1GHz)

Above 1GHz – 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
2093.95	40.25	4.36	11.18	55.79	Peak Max	V	146	38	74	-18.21	Pass
6058.78	36.53	10.55	10.92	58.01	Peak Max	H	203	243	74	-15.99	Pass
10754.34	36.14	12.19	8.38	56.71	Peak Max	H	163	75	74	-17.29	Pass
2093.95	28.57	4.36	11.18	44.12	Average Max	V	146	38	54	-9.88	Pass
6058.78	24.44	10.55	10.92	45.92	Average Max	H	203	243	54	-8.08	Pass
10754.34	23.98	12.19	8.38	44.55	Average Max	H	163	75	54	-9.45	Pass

Above 1GHz – 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
17650.18	34.95	16.53	10.55	62.04	Peak Max	V	187	346	74	-11.97	Pass
6088.10	36.07	10.59	10.85	57.52	Peak Max	V	217	125	74	-16.48	Pass
2115.05	39.92	4.38	11.11	55.41	Peak Max	V	202	205	74	-18.59	Pass
17650.18	22.76	16.53	10.55	49.84	Average Max	V	187	346	54	-4.16	Pass
6088.10	24.57	10.59	10.85	46.02	Average Max	V	217	125	54	-7.98	Pass
2115.05	28.34	4.38	11.11	43.84	Average Max	V	202	205	54	-10.16	Pass

Above 1GHz – 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
17371.91	33.96	16.77	10.01	60.75	Peak Max	H	178	119	74	-13.25	Pass
5994.91	35.64	10.46	11.06	57.17	Peak Max	H	190	215	74	-16.84	Pass
2032.52	40.27	4.31	11.37	55.96	Peak Max	H	242	124	74	-18.04	Pass
17371.91	22.83	16.77	10.01	49.62	Average Max	H	178	119	54	-4.38	Pass
5994.91	24.30	10.46	11.06	45.82	Average Max	H	190	215	54	-8.18	Pass
2032.52	28.37	4.31	11.37	44.05	Average Max	H	242	124	54	-9.95	Pass

Above 1GHz – 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
17414.07	34.32	16.78	10.14	61.24	Peak Max	H	221	39	74	-12.76	Pass
6027.58	35.88	10.51	11.00	57.40	Peak Max	H	118	354	74	-16.6	Pass
4208.41	37.50	9.02	11.32	57.85	Peak Max	V	136	277	74	-16.16	Pass
17414.07	22.75	16.78	10.14	49.67	Average Max	H	221	39	54	-4.33	Pass
6027.58	24.34	10.51	11.00	45.86	Average Max	H	118	354	54	-8.14	Pass
4208.41	25.46	9.02	11.32	45.80	Average Max	V	136	277	54	-8.20	Pass

Above 1GHz – 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
4187.89	36.82	8.97	11.41	57.20	Peak Max	H	132	110	74	-16.80	Pass
17466.97	34.49	16.79	10.3	61.58	Peak Max	V	126	296	74	-12.42	Pass
6013.99	36.36	10.50	11.03	57.89	Peak Max	V	226	143	74	-16.11	Pass
4187.89	25.58	8.97	11.41	45.96	Average Max	H	132	110	54	-8.04	Pass
17466.97	22.85	16.79	10.30	49.94	Average Max	V	126	296	54	-4.06	Pass
6013.99	24.46	10.50	11.03	45.99	Average Max	V	226	143	54	-8.01	Pass

Above 1GHz – 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
4122.56	36.73	8.81	11.69	57.23	Peak Max	V	194	162	74	-16.77	Pass
6098.76	36.60	10.6	10.83	58.04	Peak Max	V	217	182	74	-15.96	Pass
17799.88	34.72	16.27	10.71	61.69	Peak Max	H	220	9	74	-12.31	Pass
4122.56	25.50	8.81	11.69	46	Average Max	V	194	162	54	-8.00	Pass
6098.76	24.39	10.6	10.83	45.82	Average Max	V	217	182	54	-8.18	Pass
17799.88	22.88	16.27	10.71	49.85	Average Max	H	220	9	54	-4.15	Pass

Above 1GHz – 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
17701.18	34.75	16.44	10.60	61.79	Peak Max	H	134	73	74	-12.21	Pass
4154.31	37.16	8.89	11.55	57.60	Peak Max	V	217	147	74	-16.40	Pass
6152.18	36.19	10.67	10.70	57.56	Peak Max	H	232	223	74	-16.44	Pass
17701.18	22.88	16.44	10.60	49.93	Average Max	H	134	73	54	-4.07	Pass
4154.31	25.67	8.89	11.55	46.12	Average Max	V	217	147	54	-7.88	Pass
6152.18	24.54	10.67	10.70	45.91	Average Max	H	232	223	54	-8.09	Pass

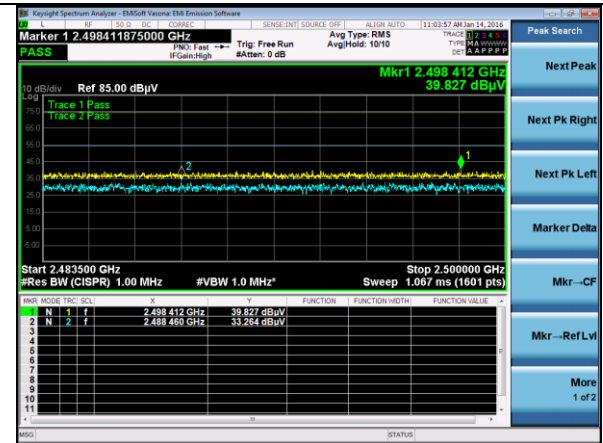
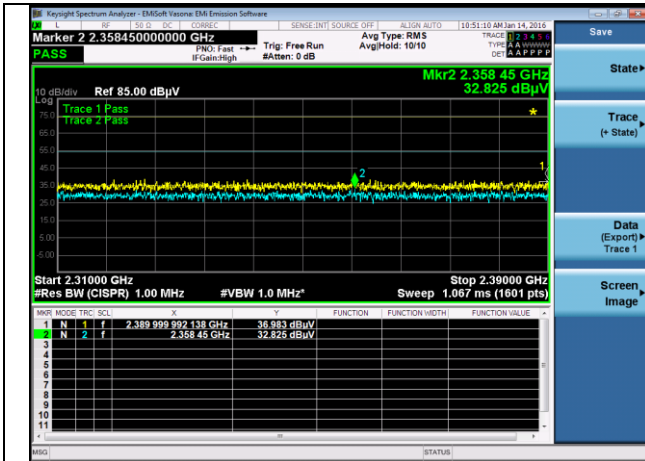
Above 1GHz – 802.11n20 – 2437MHz

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
4092.71	36.96	8.74	11.82	57.52	Peak Max	V	156	133	74	-16.48	Pass
17488.70	35.71	16.79	10.36	62.86	Peak Max	V	170	298	74	-11.14	Pass
6079.12	35.99	10.58	10.88	57.45	Peak Max	V	155	233	74	-16.55	Pass
4092.71	25.38	8.74	11.82	45.93	Average Max	V	156	133	54	-8.07	Pass
17488.70	23.04	16.79	10.36	50.20	Average Max	V	170	298	54	-3.80	Pass
6079.12	24.53	10.58	10.88	45.98	Average Max	V	155	233	54	-8.02	Pass

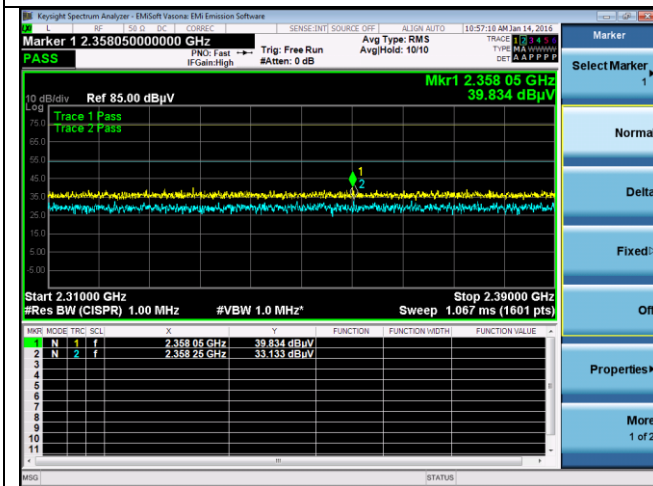
Above 1GHz – 802.11n20 – 2462MHz

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
4291.98	36.68	9.22	10.97	56.88	Peak Max	V	111	150	74	-17.12	Pass
17434.95	34.88	16.78	10.20	61.87	Peak Max	V	227	38	74	-12.13	Pass
6280.82	35.53	10.83	10.40	56.75	Peak Max	V	185	355	74	-17.25	Pass
4291.98	24.98	9.22	10.97	45.18	Average Max	V	111	150	54	-8.82	Pass
17434.95	22.84	16.78	10.20	49.83	Average Max	V	227	38	54	-4.17	Pass
6280.82	24.14	10.83	10.40	45.36	Average Max	V	185	355	54	-8.64	Pass

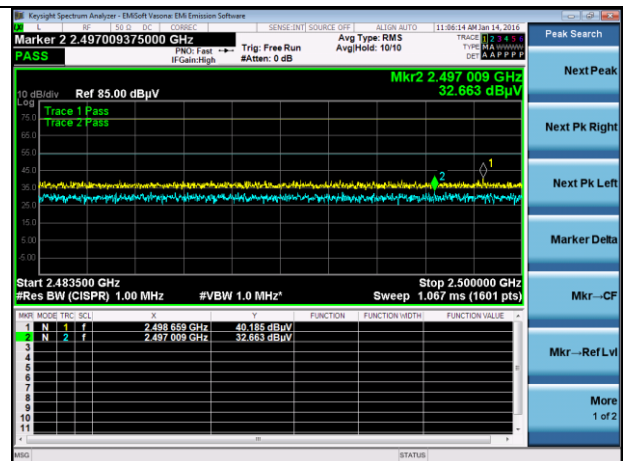
Radiated Restricted Band Test Results (Above 1GHz)



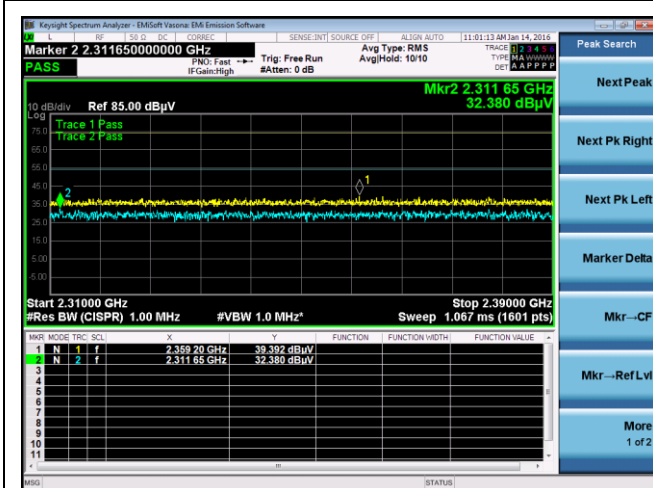
Lower Band (802.11b-2412MHz)



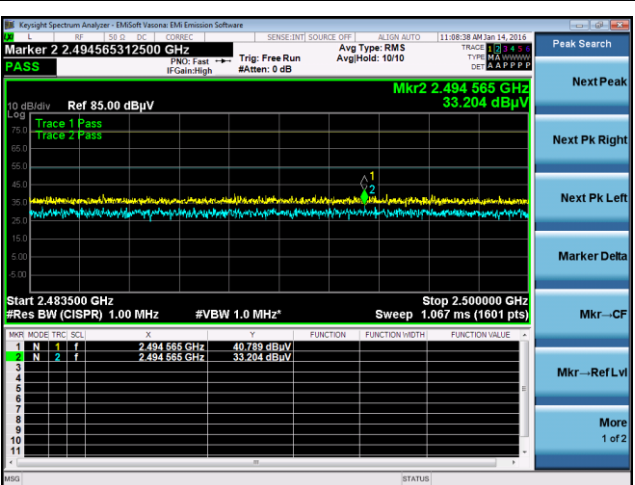
Higher Band (802.11b-2462MHz)



Lower Band (802.11g-2412MHz)



Higher Band (802.11g-2462MHz)



Lower Band (802.11n20-2412MHz)

Higher Band (802.11n20-2462MHz)

Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Cycle	Cal Due	In use
Conducted Emissions						
R & S Receiver	ESIB 40	100179	05/23/2015	1 Year	05/23/2016	☒
CHASE LISN	MN2050B	1018	08/07/2015	1 Year	08/07/2016	☒
Radiated Emissions						
R & S Receiver	ESL6	100178	05/27/2015	1 Year	05/27/2016	☒
R & S Receiver	ESIB 40	100179	05/23/2015	1 Year	05/23/2016	☒
ETS-Lingren Loop Antenna	6512	00049120	05/12/2015	1 Year	05/12/2016	☐
Bi-Log antenna (30MHz~2GHz)	JB1	A030702	08/12/2015	1 Year	08/12/2016	☒
Horn Antenna (1-26.5GHz)	3115	10SL0059	08/11/2015	1 Year	08/11/2016	☒
Horn Antenna (18-40 GHz)	AH-840	101013	08/11/2015	1 Year	08/11/2016	☒
3 Meters SAC	3M	N/A	08/08/2015	1 Year	08/08/2016	☒
10 Meters SAC	10M	N/A	09/05/2015	1 Year	09/05/2016	☒
RF Conducted Measurement						
Spectrum Analyzer	N9010A	10SL0219	08/20/2015	1 Year	08/20/2016	☒
R & S Receiver	ESIB 40	100179	05/23/2015	1 Year	05/23/2016	☒
Test Equity Environment Chamber	1007H	61201	07/31/2015	1 Year	07/31/2016	☒
USB RF Power Sensor	7002-006	10SL0190	09/03/2015	1 Year	09/03/2016	☒

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