



RF TEST REPORT



Report No.: FCC_IC_SL17031601-RUC-009-DTS
Supersede Report No.:

Applicant	:	Ruckus Wireless, Inc.
Product Name	:	T811-CM Access Point
Model No.	:	T811-CM
Test Standard	:	47 CFR 15.247 RSS-247 Issue 2, February 2017
Test Method	:	ANSI C63.10: 2013 RSS Gen Iss 4: Nov 2014 558074 D01 DTS Meas Guidance v04
FCC ID	:	S9GT811CM
IC ID	:	5912A-T811CM
Dates of test	:	08/10/2017 – 08/25/2017
Issue Date	:	09/20/2017
Test Result	:	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail
Equipment complied with the specification [X] Equipment did not comply with the specification []		

This Test Report is Issued Under the Authority of:

	
Rachana Khanduri	Chen Ge
Test Engineer	Engineer Reviewer

Issued By:
SIEMIC Laboratories
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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	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 & Radio Equipment Directive (RED)
Japan	MIC (RCB 208)	RF, Telecom
Hong Kong	OFTA (US002)	RF, Telecom

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ANNEX B. SIEMIC ACCREDITATION		ERROR! BOOKMARK NOT DEFINED.

1 Report Revision History

Report No.	Report Version	Description	Issue Date
FCC_IC_SL17031601-RUC-009-DTS	None	Original	09/20/2017

2 Executive Summary

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

Company: Ruckus Wireless, Inc.
Product: T811-CM Access Point
Model: T811-CM

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	:	Ruckus Wireless, Inc.
Applicant Address	:	350 West Java Drive, Sunnyvale, California 94089 U.S.A
Manufacturer Name	:	Ruckus Wireless, Inc.
Manufacturer Address	:	350 West Java Drive, Sunnyvale, California 94089 U.S.A

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	T811-CM Access Point
Model No.	T811-CM
Trade Name	Ruckus
Serial No.	291706000007
Host Model No.	N/A
Input Power	100-240VAC 50/60Hz
Power Adapter Manu/Model	HK-AD-120A100-US
Power Adapter SN	N/A
Date of EUT received	08/10/2017
Equipment Class/ Category	DTS, UNII
Port/Connectors	-

6.2 Radio Description

Radio Type	802.11b	802.11g	802.11n-20M	802.11n-40M
Operating Frequency	2412-2462MHz	2412-2462MHz	2412-2462MHz	2422-2452MHz
Modulation	DSSS (CCK, DQPSK, DBPSK)	OFDM-CCK (BPSK, QPSK, 16QAM, 64QAM)	OFDM (BPSK, QPSK, 16QAM, 64QAM)	OFDM (BPSK, QPSK, 16QAM, 64QAM)
Channel Spacing	5MHz	5MHz	5MHz	5MHz
Number of Channels	11	11	11	7
Antenna Type	Internal Omni PCB Antenna			
Antenna Gain (Peak)	2.4GHz: 3 dBi			
Antenna Connector Type	U.FL			
Note	2.4GHz and 5GHz Radio can transmit simultaneously			

Note: The AP supports Beamforming mode and the power setting for Beamforming and Non-Beamforming modes are the same.

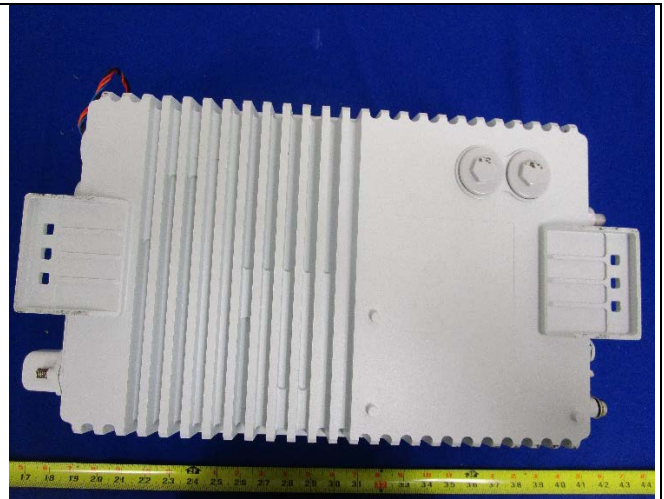
EUT Power level setting

Mode	Frequency (MHz)	Power setting
802.11-b	2412	45
802.11-b	2437	46
802.11-b	2462	46
802.11-g	2412	43
802.11-g	2437	46
802.11-g	2462	40
802.11-n-20	2412	44
802.11-n-20	2437	46
802.11-n-20	2462	40
802.11-n-40	2422	37
802.11-n-40	2437	42
802.11-n-40	2452	39

6.3 EUT Photos - External



EUT Top View



EUT Bottom View



EUT Front View



EUT Rear View

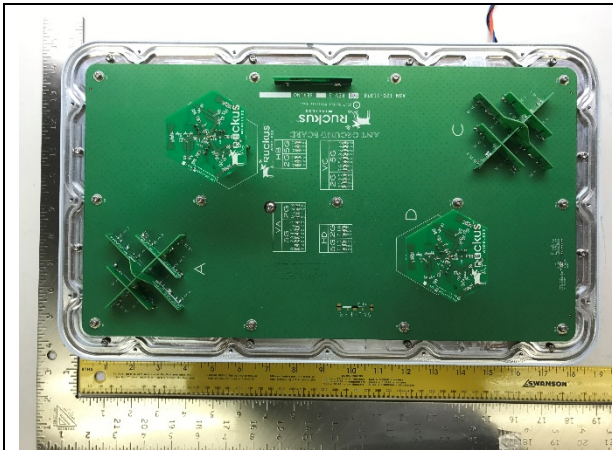


EUT Left Side View

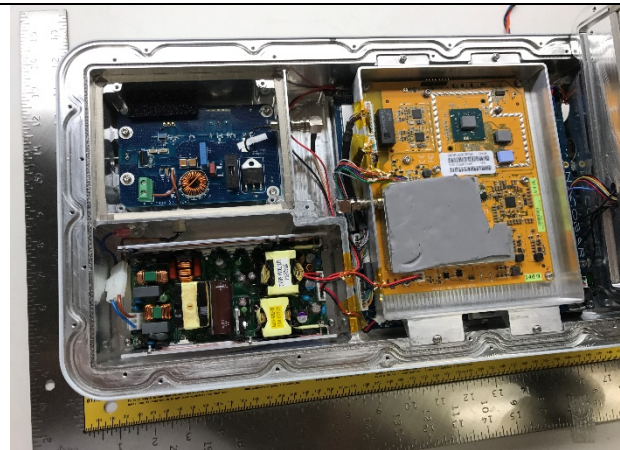


EUT Right Side View

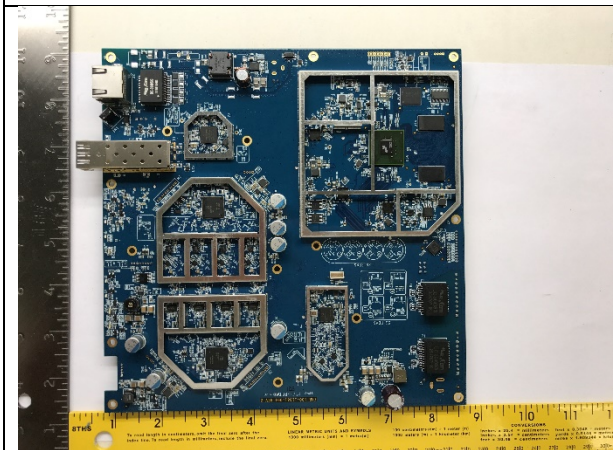
6.4 EUT Photos - Internal



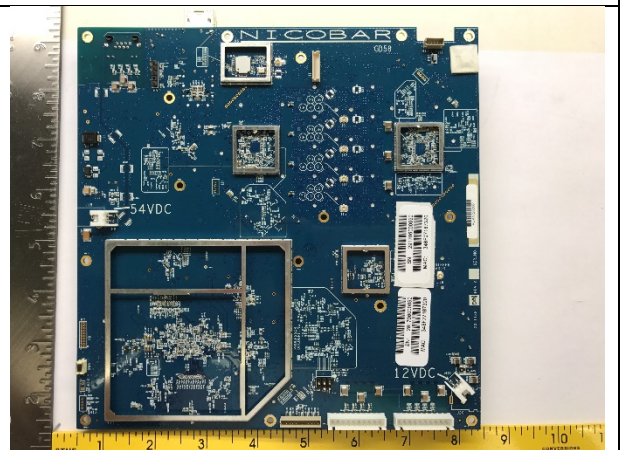
Antenna- Top View



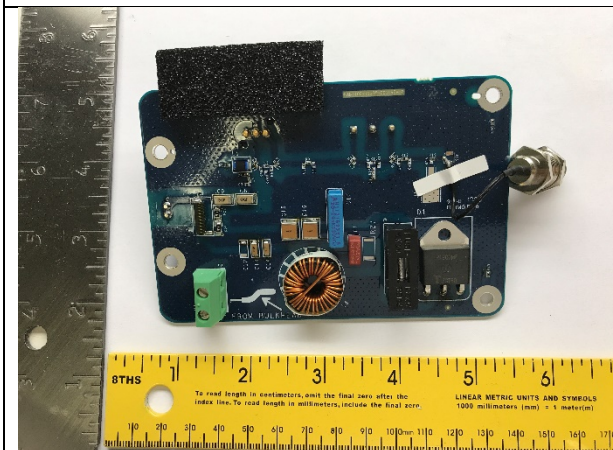
EUT Antenna-Borad Off View



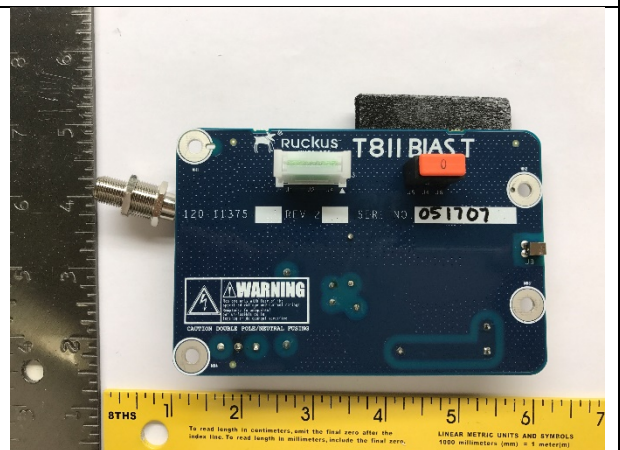
AP Board - Top View



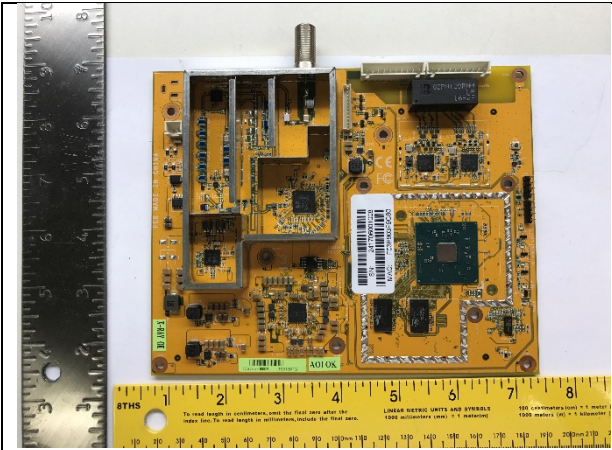
AP Board - Bottom View



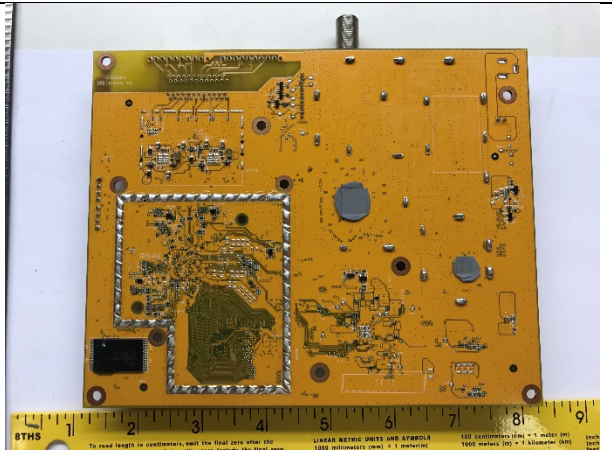
Bias-T Top View



Bias-T Bottom View



Cable Modem - Top View



Cable Modem - Bottom View

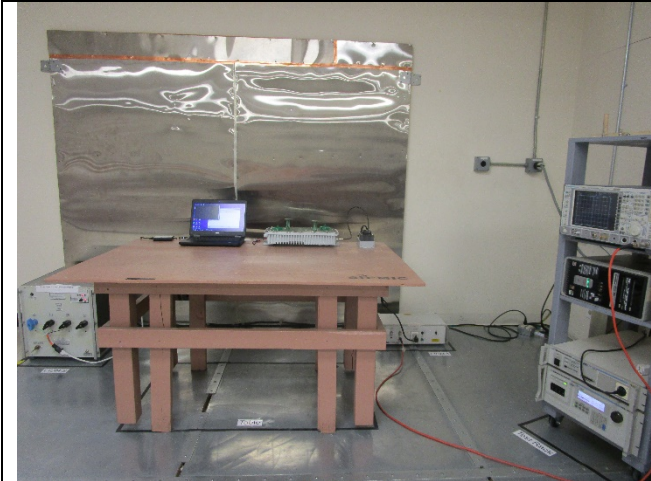


Power Supply - Side View



Power Supply - Top View

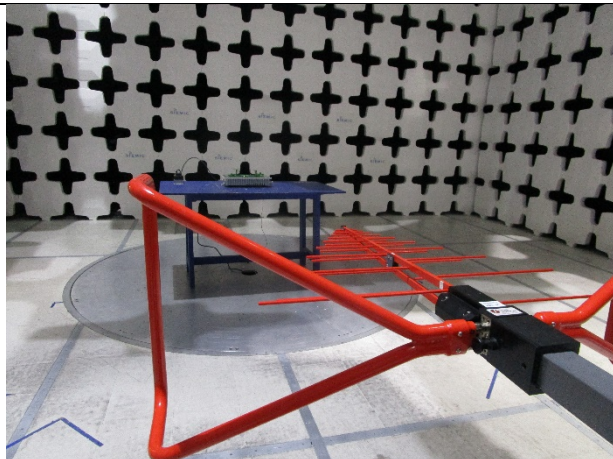
6.5 EUT Test Setup Photos



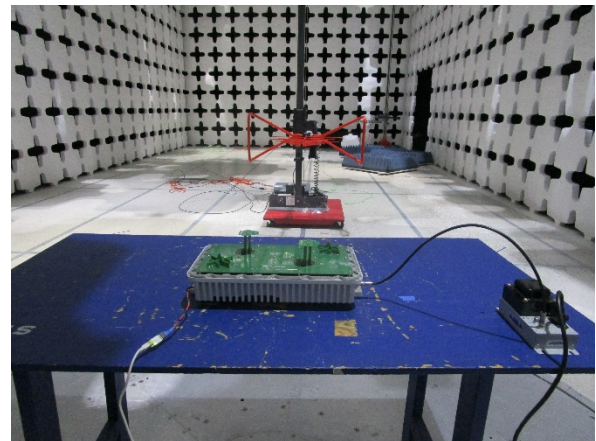
AC Line Conducted Emissions – Front View



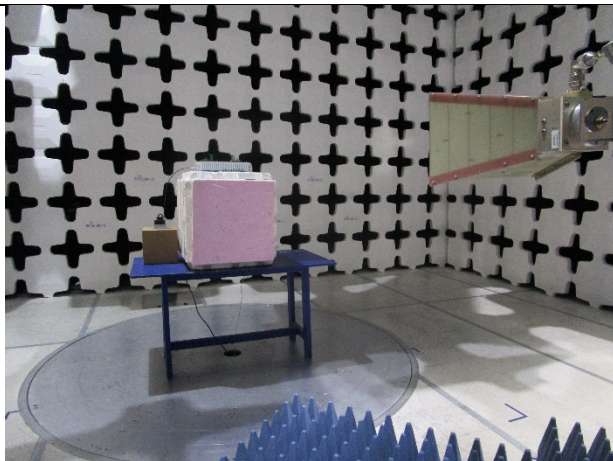
AC Line Conducted Emissions – Rear View



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	PP01L Latitude E5440	F1WPF12	Dell	-
2	Power Supply	DL 7000SSX	61688175	Electroline Equipment Inc.	-

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	USB	Laptop	USB	2	N/A	-

7.3 Test Software Description

Test Item	Software	Description
RF Testing	Putty	Set the EUT to transmit continuously in diferent test mode

8 Test Summary

Test Item	Test standard		Test Method/Procedure		Pass / Fail
Restricted Band of Operation	FCC	15.205	FCC	ANSI C63.10:2013 558074 D01 DTS Meas Guidance v04	<input checked="" type="checkbox"/> Pass
	IC	RSS Gen 8.10	IC		<input type="checkbox"/> N/A
AC Conducted Emissions	FCC	15.207(a)	FCC	ANSI C63.10:2013	<input checked="" type="checkbox"/> Pass
	IC	RSS Gen 8.8	IC	RSS Gen Issue 4: 2014	<input type="checkbox"/> N/A

DTS Band Requirement

Test Item	Test standard		Test Method/Procedure		Pass / Fail
99% Occupied Bandwidth	-	-	-	-	<input checked="" type="checkbox"/> Pass
	IC	RSS Gen 6.6	IC	RSS Gen Issue 4: 2014 -	<input type="checkbox"/> N/A
6dB Bandwidth	FCC	15.247(a)(2)	FCC	558074 D01 DTS Meas Guidance v04	<input checked="" type="checkbox"/> Pass
	IC	RSS247 (5.2.1)	IC		<input type="checkbox"/> N/A
Band Edge and Radiated Spurious Emissions	FCC	15.247(d)	FCC	ANSI C63.10:2013 558074 D01 DTS Meas Guidance v04	<input checked="" type="checkbox"/> Pass
	IC	RSS247 (5.5)	IC		<input type="checkbox"/> N/A
Output Power	FCC	15.247(b)	FCC	558074 D01 DTS Meas Guidance v04	<input checked="" type="checkbox"/> Pass
	IC	RSS247 (5.4.4)	IC		<input type="checkbox"/> N/A
Receiver Spurious Emissions	IC	RSS Gen (4.8)	IC	RSS Gen Issue 4: 2014	<input type="checkbox"/> Pass <input checked="" type="checkbox"/> N/A
Antenna Gain > 6 dBi	FCC	15.247(e)	FCC	-	<input type="checkbox"/> Pass
	IC	-	IC	-	<input checked="" type="checkbox"/> N/A
Power Spectral Density	FCC	15.247(e)	FCC	558074 D01 DTS Meas Guidance v04	<input checked="" type="checkbox"/> Pass
	IC	RSS247 (5.2.2)	IC		<input type="checkbox"/> N/A
RF Exposure requirement	FCC	15.247(i)	FCC	-	<input type="checkbox"/> Pass
	IC	RSS Gen(5.5)	IC	RSS Gen Issue 4: 2014	<input checked="" type="checkbox"/> N/A
Remark	<ol style="list-style-type: none"> All measurement uncertainties do not take into consideration for all presented test results. 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. 				

9 Measurement Uncertainty

9.1 Conducted Emissions

The test is to measure the conducted emissions to the mains port of the EUT.

Some error sources that can contribute to the total uncertainty:

- Uncertainty of the receiver
- Uncertainty of the LISN
- Uncertainty of cables
- Uncertainty due to the mismatches
- Etc, see the below table for details

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
LISN Insertion Loss	0.40	Normal	2	1	0.20
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 LISN - Receiver	0.25	U-Shape	1.414	1	0.1768033
LISN Impedance	2.5	Triangular	2.449	1	1.0208248
Combined Standard Uncertainty					1.928133
Expanded Uncertainty (K=2)					3.856266

The total derived measurement uncertainty is +/- 3.86 dB.

9.2 Radiated 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.

9.3 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.

9.4 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

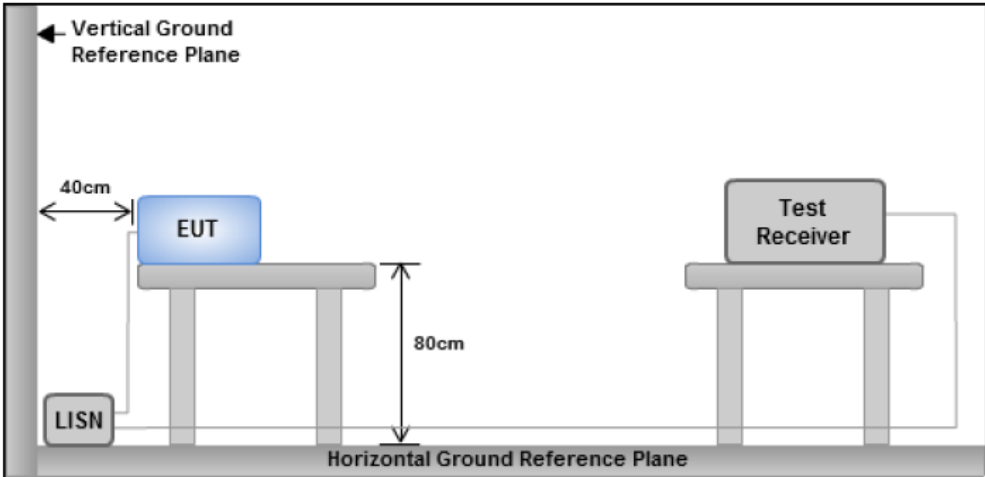
The total derived measurement uncertainty is +/- 0.95 dB.

10 Measurements, Examination and Derived Results

10.1 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
RSS247(A8.1)	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.	<input checked="" type="checkbox"/>
Test Setup	 <p>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</p>		
Procedure	<ul style="list-style-type: none"> - 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 was tested at 120VAC, 60Hz		
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

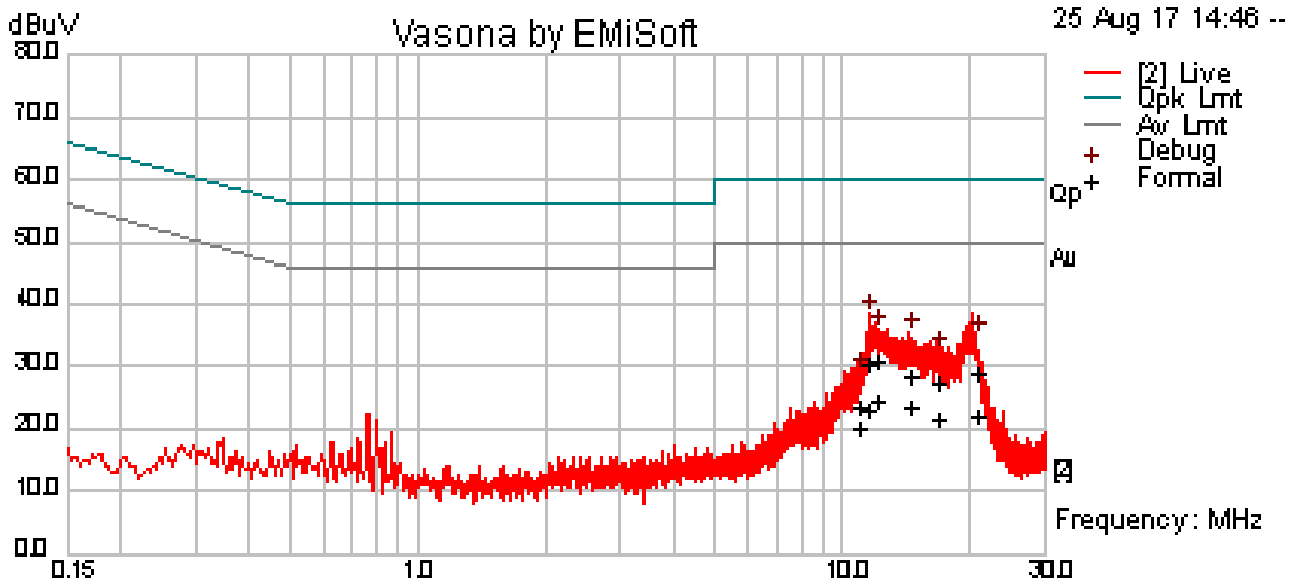
Test Data Yes N/A

Test Plot Yes (See below) N/A

Test was done by Rachana Khanduri at Conducted Emission test site.

Conducted Emission Test Results

Test specification:	Conducted Emissions			Result:	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail
Environmental Conditions:	Temp(°C):	21			
	Humidity (%):	42			
	Atmospheric(mbar):	1021			
Mains Power:	120Vac, 60Hz				
Tested by:	Rachana Khanduri				
Test Date:	08/25/2017				
Remarks	Conducted @ Live				

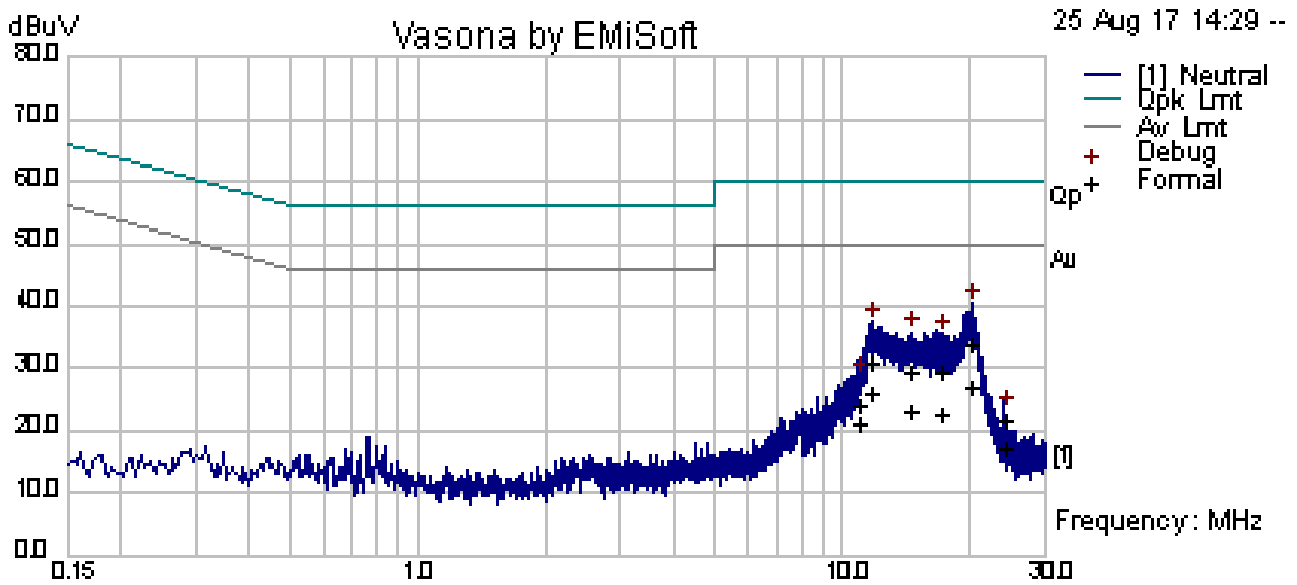


Live Plot at 120Vac, 60Hz

Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV)	Measurement Type	Line / Neutral	Limit (dBuV)	Margin (dB)	Pass /Fail
11.53	19.61	10.05	0.53	30.19	Quasi Peak	Live	60.00	-29.81	Pass
12.17	20.25	10.05	0.53	30.84	Quasi Peak	Live	60.00	-29.16	Pass
14.39	18.00	10.06	0.55	28.61	Quasi Peak	Live	60.00	-31.39	Pass
20.75	18.16	10.07	0.67	28.90	Quasi Peak	Live	60.00	-31.10	Pass
16.70	16.68	10.06	0.60	27.34	Quasi Peak	Live	60.00	-32.66	Pass
10.87	13.05	10.05	0.52	23.62	Quasi Peak	Live	60.00	-36.38	Pass
11.53	12.41	10.05	0.53	22.99	Average	Live	50.00	-27.01	Pass
12.17	13.72	10.05	0.53	24.31	Average	Live	50.00	-25.69	Pass
14.39	12.91	10.06	0.55	23.52	Average	Live	50.00	-26.48	Pass
20.75	11.31	10.07	0.67	22.05	Average	Live	50.00	-27.95	Pass
16.70	10.80	10.06	0.60	21.46	Average	Live	50.00	-28.54	Pass
10.87	9.43	10.05	0.52	20.00	Average	Live	50.00	-30.00	Pass

Conducted Emission Test Results

Test specification:	Conducted Emissions			Result:	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail
Environmental Conditions:	Temp(°C):	21			
	Humidity (%):	42			
	Atmospheric(mbar):	1021			
Mains Power:	120Vac, 60Hz				
Tested by:	Rachana Khanduri				
Test Date:	08/25/1017				
Remarks	Conducted @ Neutral				

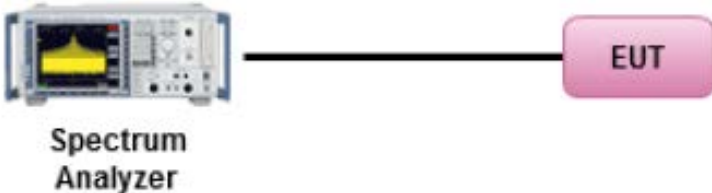


Neutral Plot at 120Vac, 60Hz

Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV)	Measurement Type	Line / Neutral	Limit (dBuV)	Margin (dB)	Pass /Fail
20.24	23.07	10.07	0.66	33.80	Quasi Peak	Neutral	60.00	-26.20	Pass
11.67	20.43	10.05	0.53	31.01	Quasi Peak	Neutral	60.00	-28.99	Pass
14.49	18.67	10.06	0.56	29.28	Quasi Peak	Neutral	60.00	-30.72	Pass
16.96	18.70	10.06	0.60	29.37	Quasi Peak	Neutral	60.00	-30.63	Pass
10.98	13.45	10.05	0.52	24.02	Quasi Peak	Neutral	60.00	-35.98	Pass
24.00	10.82	10.08	0.72	21.61	Quasi Peak	Neutral	60.00	-38.39	Pass
20.24	16.06	10.07	0.66	26.80	Average	Neutral	50.00	-23.20	Pass
11.67	15.36	10.05	0.53	25.94	Average	Neutral	50.00	-24.06	Pass
14.49	12.59	10.06	0.56	23.20	Average	Neutral	50.00	-26.80	Pass
16.96	11.79	10.06	0.60	22.46	Average	Neutral	50.00	-27.54	Pass
10.98	10.72	10.05	0.52	21.29	Average	Neutral	50.00	-28.71	Pass
24.00	6.47	10.08	0.72	17.27	Average	Neutral	50.00	-32.73	Pass

10.2 6dB & 99% Bandwidth

Requirement(s):

Spec	Requirement	Applicable
§ 15.247 RSS247 (5.2.1)	6dB BW≥500KHz;	<input checked="" type="checkbox"/>
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	<input checked="" type="checkbox"/>
Test Setup	 <p style="text-align: center;">Spectrum Analyzer EUT</p>	
Test Procedure	558074 D01 DTS Meas Guidance v04, 8.1 DTS bandwidth <u>6dB Emission bandwidth measurement procedure</u> <ul style="list-style-type: none"> - 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	08/10/2017	Environmental condition Temperature 23°C Relative Humidity 42% Atmospheric Pressure 1021mbar
Remark	N/A	
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail	

Test Data Yes N/A

Test Plot Yes N/A

Test was done by Rachana Khanduri at RF test site.

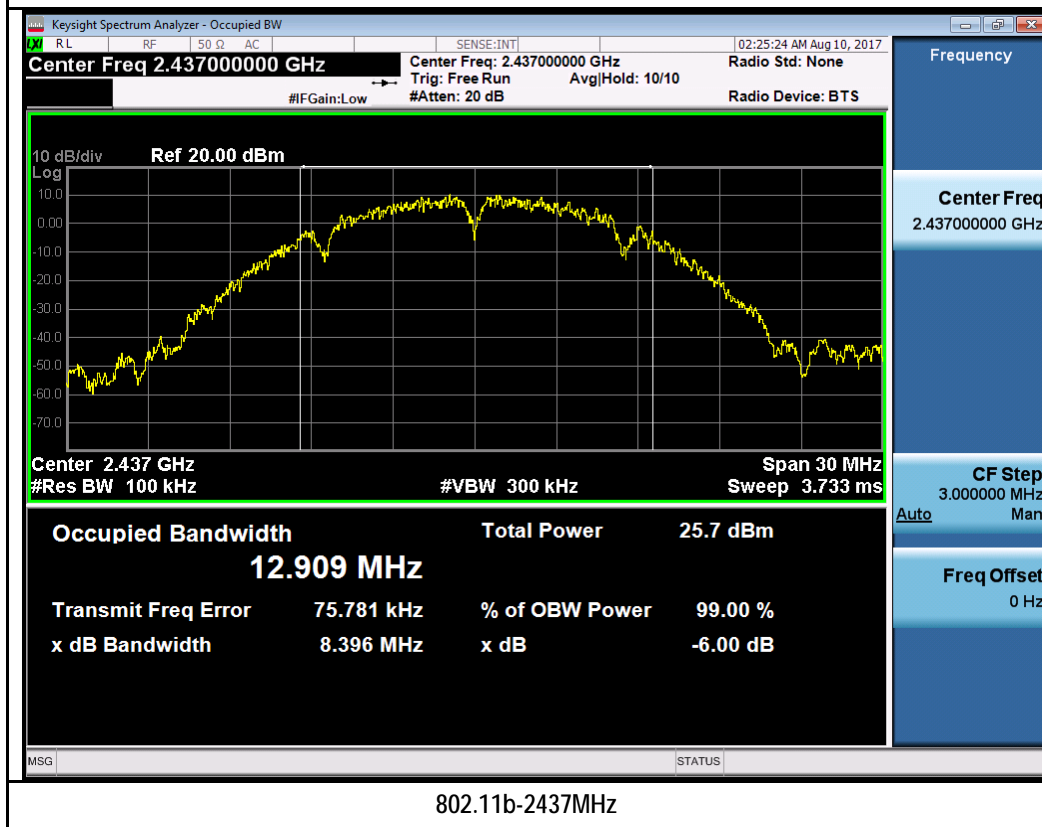
6dB Bandwidth measurement result for 2.4GHz

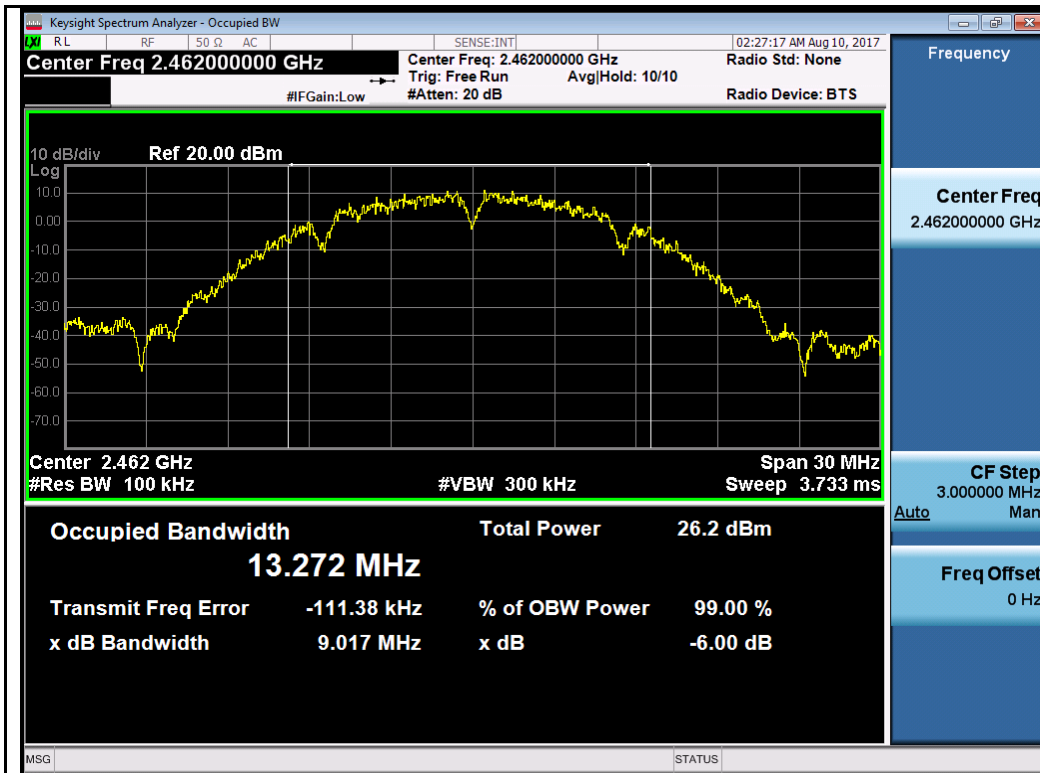
Type	Test mode	Freq (MHz)	CH	Result (MHz)	Limit (MHz)	Result
6dB BW	802.11b	2412	Low	7.97	≥0.5	Pass
		2437	Mid	8.40	≥0.5	Pass
		2462	High	9.02	≥0.5	Pass
	802.11g	2412	Low	16.34	≥0.5	Pass
		2437	Mid	15.69	≥0.5	Pass
		2462	High	16.38	≥0.5	Pass
	802.11n-20M	2412	Low	17.61	≥0.5	Pass
		2437	Mid	17.61	≥0.5	Pass
		2462	High	17.69	≥0.5	Pass
	802.11n-40M	2422	Low	35.93	≥0.5	Pass
		2437	Mid	35.90	≥0.5	Pass
		2452	High	25.72	≥0.5	Pass

99% OBW measurement result for 2.4GHz

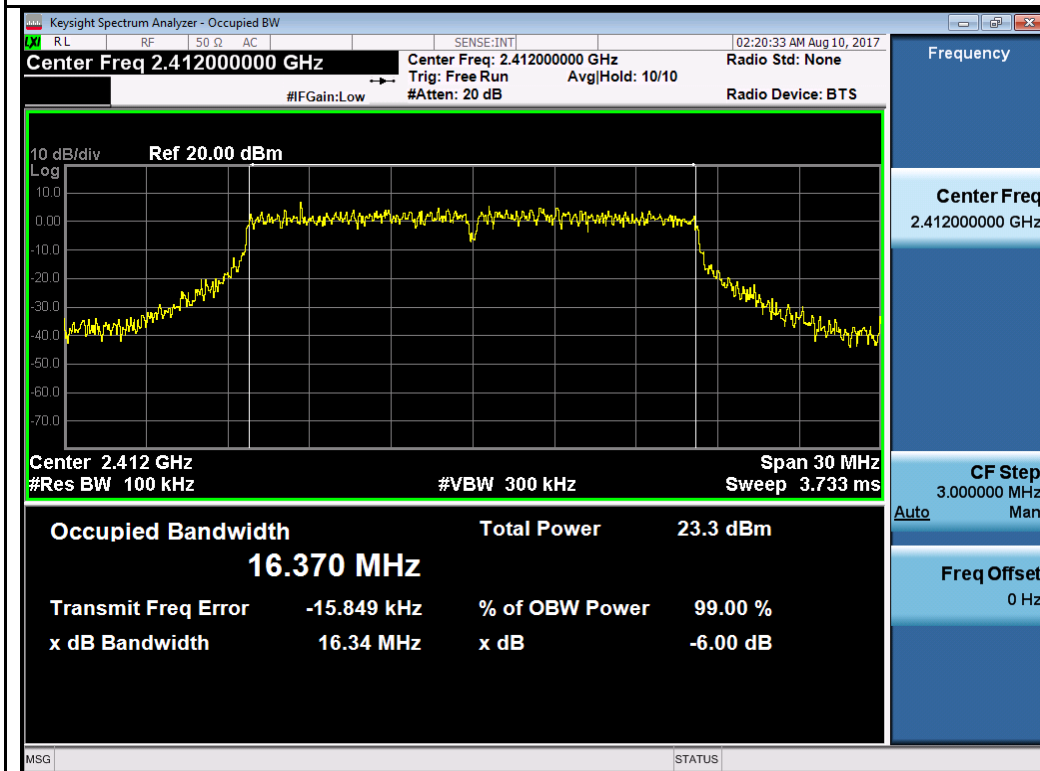
Type	Test mode	Freq (MHz)	CH	Result (MHz)
99% OBW	802.11b	2412	Low	12.95
		2437	Mid	12.86
		2462	High	13.09
	802.11g	2412	Low	16.38
		2437	Mid	16.35
		2462	High	16.39
	802.11n-20M	2412	Low	17.60
		2437	Mid	17.62
		2462	High	17.61
	802.11n-40M	2422	Low	36.05
		2437	Mid	35.91
		2452	High	35.93

6dB & 99% Bandwidth Test Plots

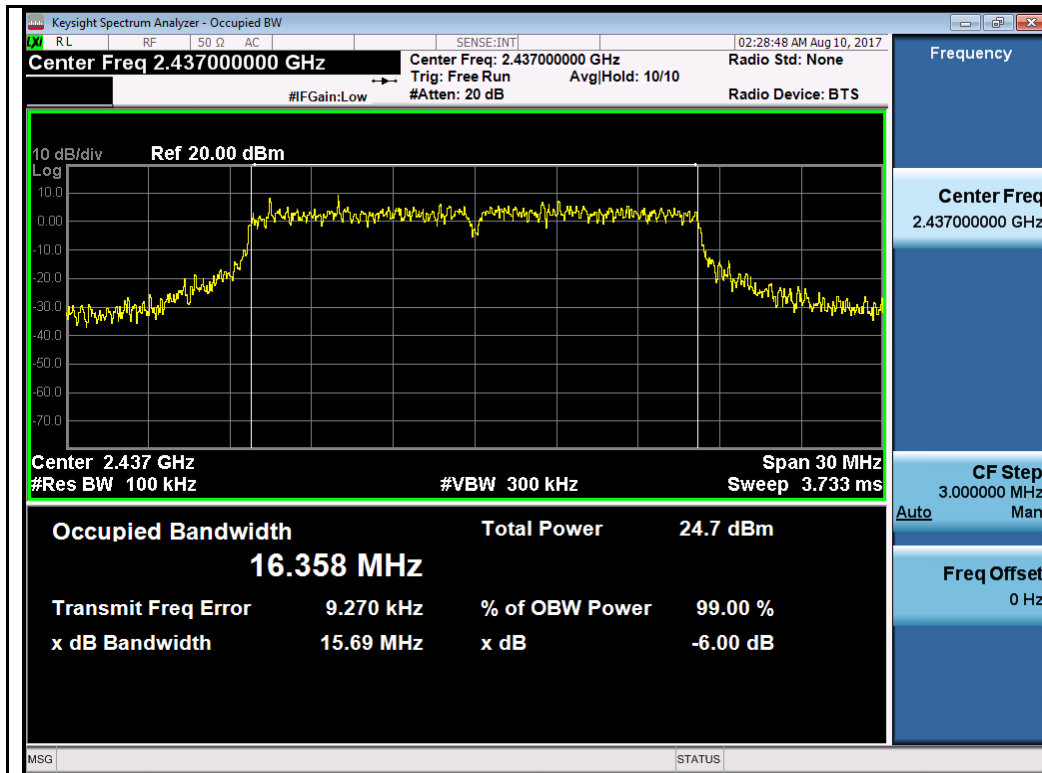




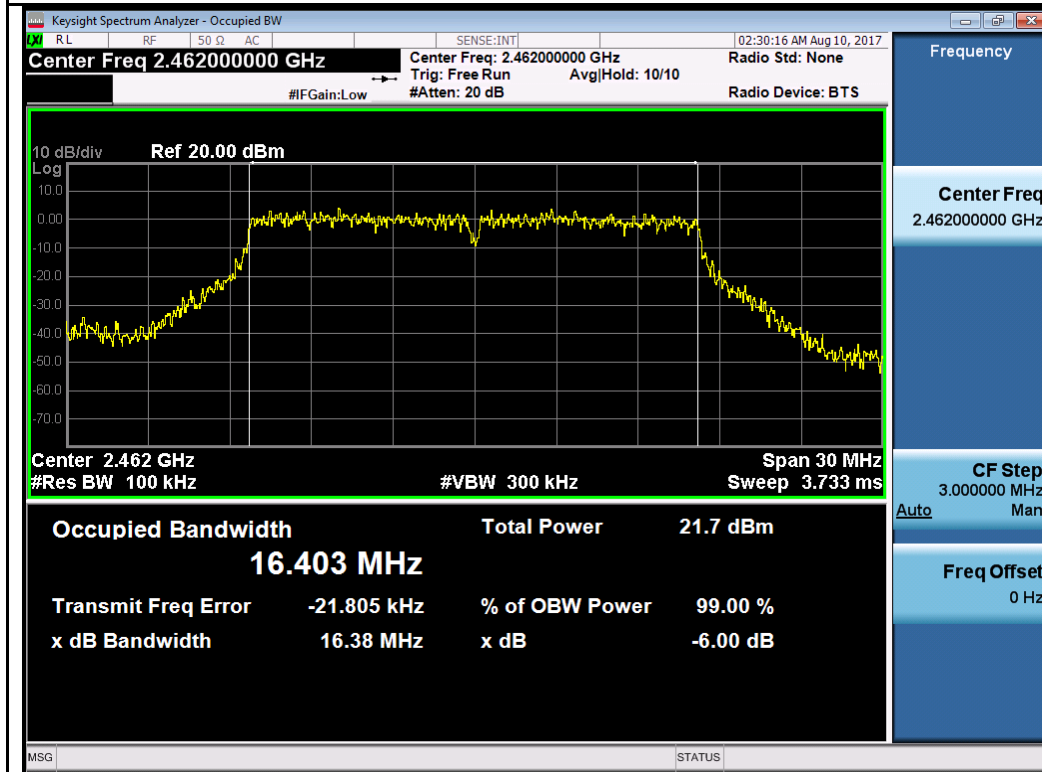
802.11b-2462MHz



802.11g-2412MHz



802.11g-2437MHz



802.11g-2462MHz