RF TEST REPORT

SIEMIC
A Bureau Veritas Group Company

Report No.: FCC_IC_SL17063001-RUC-018A2_DTS
Supersede Report No.:

Applicant	:	Ruckus Wireless, Inc.
Product Name	:	T310 (N/S) Access Point
Model No.	:	T310
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 v03r05
FCC ID	:	S9GT310NS
IC ID	:	5912A-T310NS
Dates of test	:	11/11/2017-11/21/2017
Issue Date	:	11/27/2017
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
A2LA 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.

21

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

CONTENTS

1 Report Revision History

Report No.	Report Version	Description	Issue Date
FCC_IC_SL17063001-RUC-018A2_DTS	None	Original	11/27/2017

2 Executive Summary

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

Company: Ruckus Wireless, Inc.
Product: T310 (N/S) Access Point
Model: T310

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	T310 (N/S) Access Point
Model No.	T310
Trade Name	Ruckus
Serial No.	431706000021
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	11/10/2017
Equipment Class/ Category	DTS, UNII
Port/Connectors	PoE, Ethernet

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, 256QAM)	OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)	OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)
Channel Spacing	5MHz	5MHz	5MHz	5MHz
Number of Channels	11	11	11	7
Antenna Type	T310S: Internal dipole array T310N: Internal patch array			
Antenna Gain (Peak)	T310S: 2.4G: Highest Gain 6dBi T310N: 2.4G: 8.7dBi for Vertical 7.6dBi for Horizontal			
Antenna Connector Type	U.FL			
Note	T310S: Tow chains for 2.4G, both can be Vertical and Horizontal T310N: Tow chains for 2.4G, one for Vertical and one for Horizontal			

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

EUT Power level setting

T310N

Mode	Frequency (MHz)	Power setting
802.11-b	2412	42
802.11-b	2437	44
802.11-b	2462	42
802.11-g	2412	32
802.11-g	2437	42
802.11-g	2462	38
802.11-n-20	2412	32
802.11-n-20	2437	40
802.11-n-20	2462	36
802.11-n-40	2422	32
802.11-n-40	2437	40
802.11-n-40	2452	34

T310S

Mode	Frequency (MHz)	Power setting
802.11-b	2412	42
802.11-b	2437	44
802.11-b	2462	42
802.11-g	2412	32
802.11-g	2437	42
802.11-g	2462	36
802.11-n-20	2412	34
802.11-n-20	2437	40
802.11-n-20	2462	38
802.11-n-40	2422	34
802.11-n-40	2437	40
802.11-n-40	2452	30

7 Supporting Equipment/Software and cabling Description

7.1 Supporting Equipment

Item	Supporting Equipment Description	Model	Serial Number	Manufacturer	Note
1	Laptop	VOSTRO 1520	26543939185	Dell	-

7.2 Cabling Description

Item	Connection Start		Connection Stop		Length / shielding Info		Note
	From	I/O Port	To	I/O Port	Length (m)	Shielding	
1	EUT	RJ45	Power Over Ethernet Injector	RJ45	>3m	N/A	-
2	Laptop	RJ45	Power Over Ethernet Injector	RJ45	>3m	N/A	-

7.3 Test Software Description

Test Item	Software	Description
RF Testing	Command prompt	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 v03r05	☒ Pass ☐ N/A
	IC	RSS Gen 8.10	IC		
AC Conducted Emissions	FCC	15.207(a)	FCC	ANSI C63.10:2013	☒ Pass ☐ N/A
	IC	RSS Gen 8.8	IC	RSS Gen Issue 4: 2014	
Antenna requirement	FCC	15.203	FCC	15.203	☒ Pass ☐ N/A

DTS Band Requirement

Test Item	Test standard		Test Method/Procedure		Pass / Fail
99% Occupied Bandwidth	-	-	-	-	☒ Pass ☐ N/A
	IC	RSS Gen 6.6	IC	RSS Gen Issue 4: 2014 -	
6dB Bandwidth	FCC	15.247(a)(2)	FCC	558074 D01 DTS Meas Guidance v03r05	☒ Pass ☐ N/A
	IC	RSS247 (5.2.1)	IC		
Band Edge and Radiated Spurious Emissions	FCC	15.247(d)	FCC	ANSI C63.10:2013 558074 D01 DTS Meas Guidance v03r05	☒ Pass ☐ N/A
	IC	RSS247 (5.5)	IC		
Output Power	FCC	15.247(b)	FCC	558074 D01 DTS Meas Guidance v03r05	☒ Pass ☐ N/A
	IC	RSS247 (5.4.4)	IC		
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 ☒ N/A
	IC	-	IC	-	
Power Spectral Density	FCC	15.247(e)	FCC	558074 D01 DTS Meas Guidance v03r05	☒ Pass ☐ N/A
	IC	RSS247 (5.2.2)	IC		
RF Exposure requirement	FCC	15.247(i)	FCC	-	☐ Pass ☒ N/A
	IC	RSS Gen(5.5)	IC	RSS Gen Issue 4: 2014	
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.				

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 Antenna Requirement

Spec	Requirement	Applicable
15.203	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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of § § 15.211, 15.213, 15.217, 15.219, 15.221, or § 15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.	☒
Remark	N/A	
Result	☒ Pass ☐ Fail	

Test Data ☐ Yes ☒ N/A
Test Plot ☐ Yes (See below) ☒ N/A

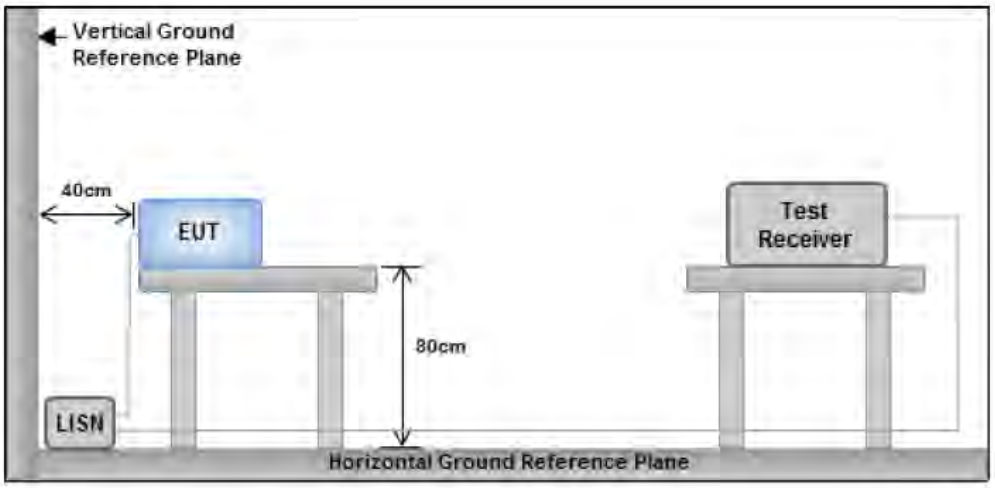
Antenna Connector Construction

Antenna Type	T310S: Internal dipole array T310N: Internal patch array
Antenna Gain (Peak)	T310S: 2.4G: Highest Gain 6dBi T310N: 2.4G: 8.7dBi for Vertical 7.6dBi for Horizontal
Antenna Connector Type	U.FL
Note	The antenna used U.FL antenna connectors which is a unique type which meet the requirement.

10.2 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
FCC 15.207 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 50μH/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 was tested in two modes of operations: (1) P.O.E Mode; (2) Power Supply Mode		
Result	☒ Pass ☐ Fail		

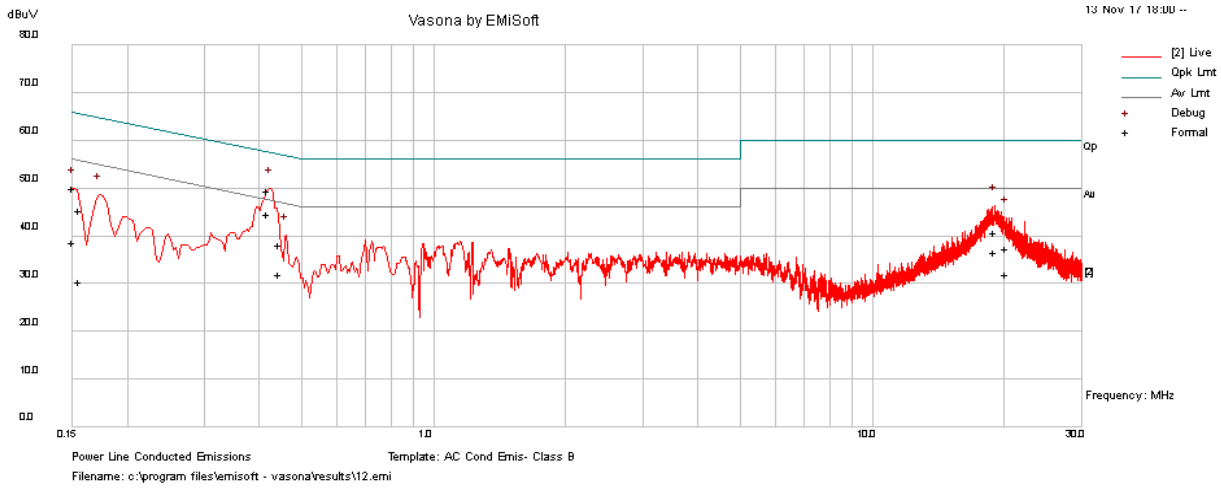
Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test was done by Shuo Zhang at Conducted Emission test site.

Conducted Emission Test Results

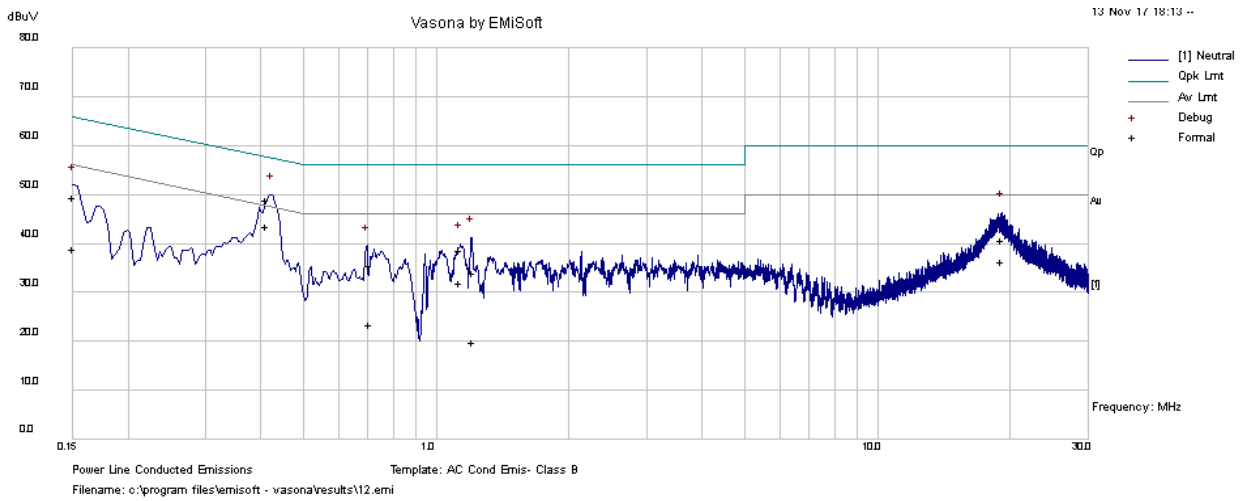
Test specification:	Conducted Emissions			
Environmental Conditions:	Temp(° C):	21	Result:	☒ Pass ☐ Fail
	Humidity (%):	42		
	Atmospheric(mbar):	1021		
Mains Power:	120Vac, 60Hz			
Tested by:	Shuo Zhang			
Test Date:	11/13/2017			
Remarks	Conducted @ Live – P.O.E Mode			



Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV)	Measurement Type	Line / Neutral	Limit (dBuV)	Margin (dB)	Pass /Fail
0.41	39.36	9.33	0.69	49.37	Quasi Peak	Live	57.48	-8.11	Pass
19.08	30.78	9.38	0.64	40.81	Quasi Peak	Live	60	-19.19	Pass
0.15	38.78	9.33	1.74	49.84	Quasi Peak	Live	65.99	-16.15	Pass
0.15	34.22	9.33	1.67	45.22	Quasi Peak	Live	65.69	-20.47	Pass
20.23	27.4	9.39	0.66	37.45	Quasi Peak	Live	60	-22.55	Pass
0.44	28.08	9.33	0.67	38.08	Quasi Peak	Live	56.98	-18.91	Pass
0.41	34.58	9.33	0.69	44.59	Average	Live	47.48	-2.9	Pass
19.08	26.58	9.38	0.64	36.61	Average	Live	50	-13.39	Pass
0.15	27.59	9.33	1.74	38.65	Average	Live	55.99	-17.34	Pass
0.15	19.31	9.33	1.67	30.3	Average	Live	55.69	-25.39	Pass
20.23	21.81	9.39	0.66	31.86	Average	Live	50	-18.14	Pass
0.44	21.9	9.33	0.67	31.89	Average	Live	46.98	-15.09	Pass

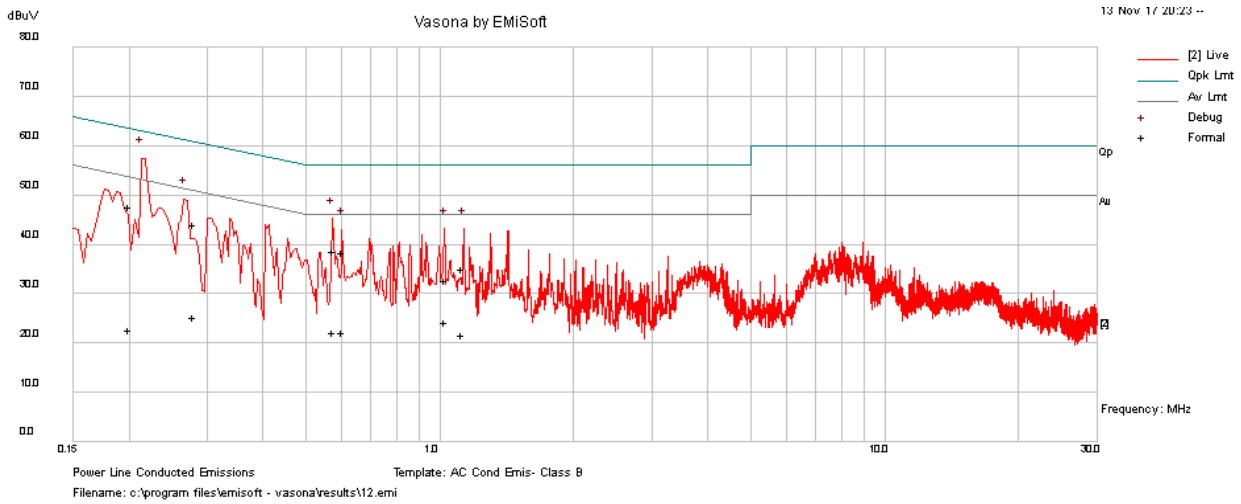
Conducted Emission Test Results

Test specification:	Conducted Emissions			
Environmental Conditions:	Temp(° C):	21	Result:	☒ Pass ☐ Fail
	Humidity (%):	42		
	Atmospheric(mbar):	1021		
Mains Power:	120Vac, 60Hz			
Tested by:	Shuo Zhang			
Test Date:	11/13/2017			
Remarks	Conducted @ Neutral - P.O.E Mode			



Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV)	Measurement Type	Line / Neutral	Limit (dBuV)	Margin (dB)	Pass /Fail
0.41	38.91	9.33	0.69	48.93	Quasi Peak	Neutral	57.61	-8.68	Pass
19.11	30.7	9.38	0.64	40.73	Quasi Peak	Neutral	60	-19.27	Pass
0.15	38.48	9.33	1.74	49.55	Quasi Peak	Neutral	66	-16.45	Pass
1.20	24.11	9.33	0.52	33.96	Quasi Peak	Neutral	56	-22.04	Pass
1.13	28.92	9.33	0.52	38.77	Quasi Peak	Neutral	56	-17.23	Pass
0.70	25.6	9.33	0.56	35.48	Quasi Peak	Neutral	56	-20.52	Pass
0.41	33.48	9.33	0.69	43.5	Average	Neutral	47.61	-4.11	Pass
19.11	26.41	9.38	0.64	36.44	Average	Neutral	50	-13.56	Pass
0.15	27.8	9.33	1.74	38.87	Average	Neutral	56	-17.13	Pass
1.20	10.04	9.33	0.52	19.9	Average	Neutral	46	-26.1	Pass
1.13	22.05	9.33	0.52	31.9	Average	Neutral	46	-14.1	Pass
0.70	13.63	9.33	0.56	23.52	Average	Neutral	46	-22.48	Pass

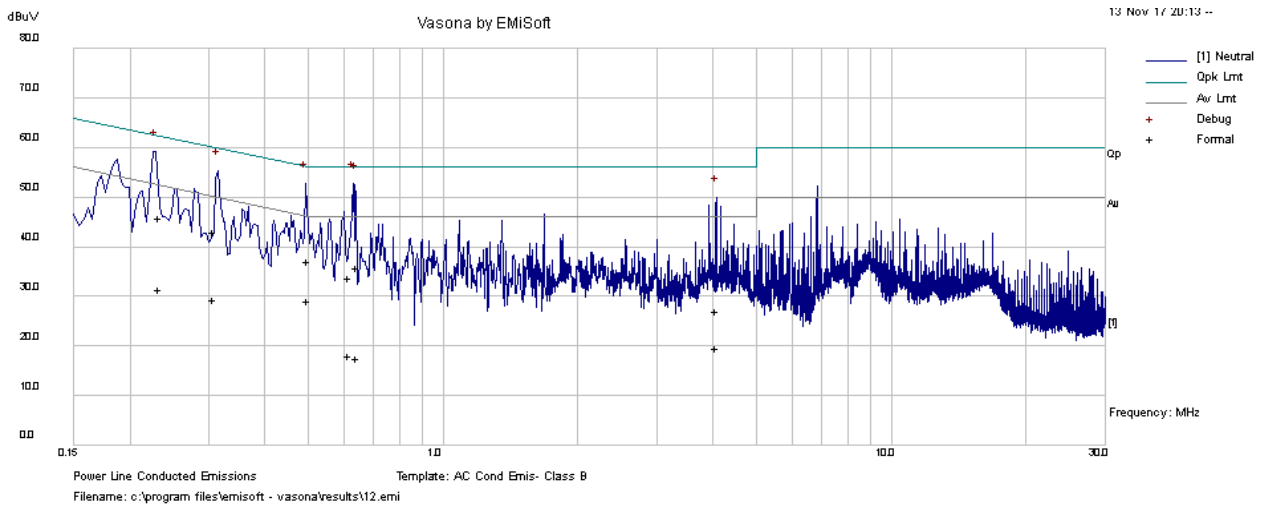
Test specification:	Conducted Emissions			
Environmental Conditions:	Temp(° C):	21	Result:	☒ Pass ☐ Fail
	Humidity (%):	42		
	Atmospheric(mbar):	1021		
Mains Power:	120Vac, 60Hz			
Tested by:	Shuo Zhang			
Test Date:	11/13/2017			
Remarks	Conducted @ Live – Power Supply Mode			



Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV)	Measurement Type	Line / Neutral	Limit (dBuV)	Margin (dB)	Pass /Fail
0.20	37.07	9.32	1.25	47.64	Quasi Peak	Live	63.61	-15.97	Pass
0.57	28.71	9.33	0.6	38.64	Quasi Peak	Live	56	-17.36	Pass
0.27	33.7	9.32	0.91	43.93	Quasi Peak	Live	60.84	-16.9	Pass
1.02	22.74	9.33	0.53	32.6	Quasi Peak	Live	56	-23.4	Pass
1.12	25.31	9.33	0.52	35.17	Quasi Peak	Live	56	-20.83	Pass
0.60	28.34	9.33	0.59	38.26	Quasi Peak	Live	56	-17.74	Pass
0.20	12.19	9.32	1.25	22.76	Average	Live	53.61	-30.84	Pass
0.57	12.15	9.33	0.6	22.08	Average	Live	46	-23.92	Pass
0.27	14.95	9.32	0.91	25.18	Average	Live	50.84	-25.66	Pass
1.02	14.39	9.33	0.53	24.25	Average	Live	46	-21.75	Pass
1.12	11.75	9.33	0.52	21.6	Average	Live	46	-24.4	Pass
0.60	12.15	9.33	0.59	22.06	Average	Live	46	-23.94	Pass

Conducted Emission Test Results

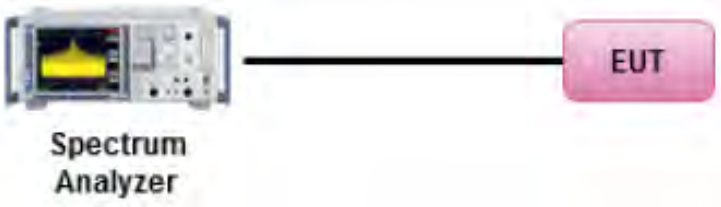
Test specification:	Conducted Emissions			
Environmental Conditions:	Temp(° C):	21	Result:	☒ Pass ☐ Fail
	Humidity (%):	42		
	Atmospheric(mbar):	1021		
Mains Power:	120Vac, 60Hz			
Tested by:	Shuo Zhang			
Test Date:	11/13/2017			
Remarks	Conducted @ Neutral - Power Supply Mode			



Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV)	Measurement Type	Line / Neutral	Limit (dBuV)	Margin (dB)	Pass /Fail
0.23	35.39	9.32	1.08	45.79	Quasi Peak	Neutral	62.34	-16.54	Pass
0.49	27.17	9.33	0.63	37.12	Quasi Peak	Neutral	56.02	-18.9	Pass
0.61	23.9	9.33	0.58	33.82	Quasi Peak	Neutral	56	-22.18	Pass
0.64	25.91	9.33	0.58	35.82	Quasi Peak	Neutral	56	-20.18	Pass
0.30	32.81	9.32	0.84	42.97	Quasi Peak	Neutral	60.05	-17.08	Pass
4.06	17.26	9.34	0.5	27.1	Quasi Peak	Neutral	56	-28.9	Pass
0.23	20.99	9.32	1.08	31.39	Average	Neutral	52.34	-20.94	Pass
0.49	19.29	9.33	0.63	29.25	Average	Neutral	46.02	-16.77	Pass
0.61	8.22	9.33	0.58	18.14	Average	Neutral	46	-27.86	Pass
0.64	7.68	9.33	0.58	17.59	Average	Neutral	46	-28.41	Pass
0.30	19.22	9.32	0.84	29.38	Average	Neutral	50.05	-20.67	Pass
4.06	9.81	9.34	0.5	19.66	Average	Neutral	46	-26.34	Pass

10.3 6dB & 99% Bandwidth

Requirement(s):

Spec	Requirement	Applicable
§ 15.247 RSS247 (5.2.1)	6dB BW≥500KHz;	☒
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		
Test Procedure	558074 D01 DTS Meas Guidance v03r05, 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	11/11/2017-11/21/2017	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

Test was done by Cipher at RF test site.

6dB Bandwidth measurement result for 2.4GHz

T310N

Type	Test mode	Freq (MHz)	CH	Result (MHz)	Limit (MHz)	Result
6dB BW	802.11b	2412	Low	10.03	≥0.5	Pass
		2437	Mid	10.03	≥0.5	Pass
		2462	High	8.09	≥0.5	Pass
	802.11g	2412	Low	16.38	≥0.5	Pass
		2437	Mid	16.32	≥0.5	Pass
		2462	High	16.33	≥0.5	Pass
	802.11n-20M	2412	Low	17.60	≥0.5	Pass
		2437	Mid	17.58	≥0.5	Pass
		2462	High	17.57	≥0.5	Pass
	802.11n-40M	2422	Low	35.60	≥0.5	Pass
		2437	Mid	35.05	≥0.5	Pass
		2452	High	35.31	≥0.5	Pass

T310S

Type	Test mode	Freq (MHz)	CH	Result (MHz)	Limit (MHz)	Result
6dB BW	802.11b	2412	Low	10.03	≥0.5	Pass
		2437	Mid	10.03	≥0.5	Pass
		2462	High	8.09	≥0.5	Pass
	802.11g	2412	Low	16.36	≥0.5	Pass
		2437	Mid	16.34	≥0.5	Pass
		2462	High	16.36	≥0.5	Pass
	802.11n-20M	2412	Low	17.60	≥0.5	Pass
		2437	Mid	17.57	≥0.5	Pass
		2462	High	17.56	≥0.5	Pass
	802.11n-40M	2422	Low	35.94	≥0.5	Pass
		2437	Mid	35.08	≥0.5	Pass
		2452	High	35.94	≥0.5	Pass

99% OBW measurement result for 2.4GHz

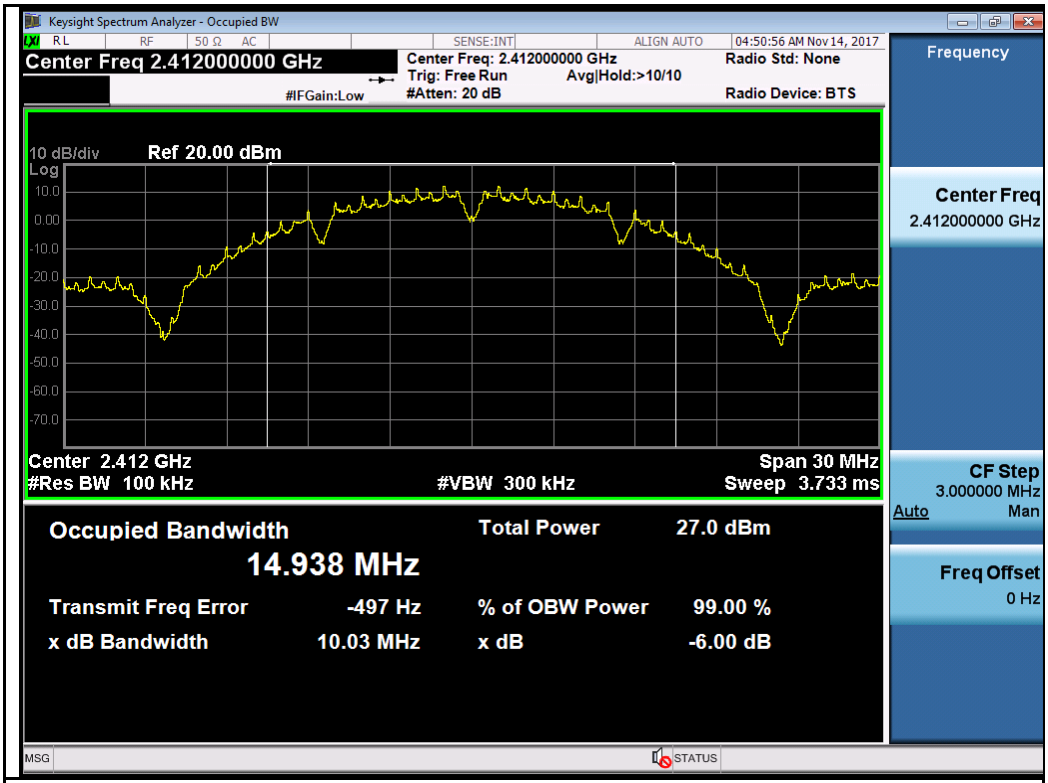
T310N

Type	Test mode	Freq (MHz)	CH	Result (MHz)
99% OBW	802.11b	2412	Low	14.938
		2437	Mid	14.958
		2462	High	14.248
	802.11g	2412	Low	16.366
		2437	Mid	18.486
		2462	High	16.443
	802.11n-20M	2412	Low	17.573
		2437	Mid	17.762
		2462	High	17.595
	802.11n-40M	2422	Low	35.978
		2437	Mid	36.393
		2452	High	35.947

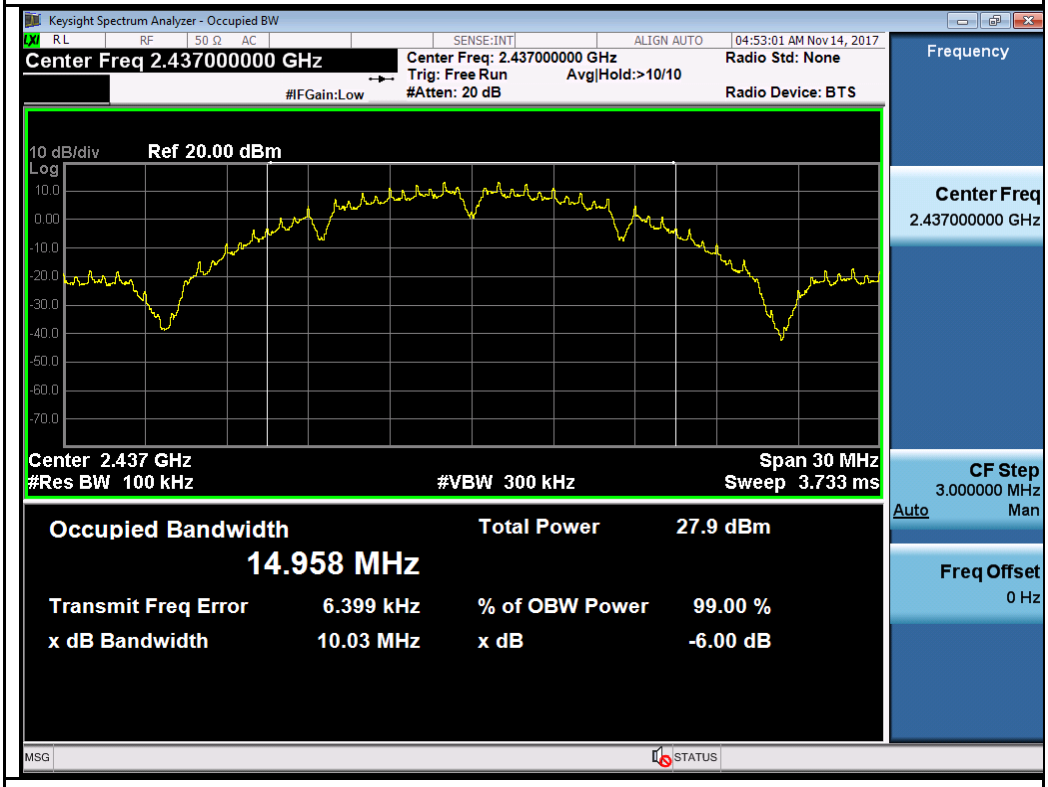
T310S

Type	Test mode	Freq (MHz)	CH	Result (MHz)
99% OBW	802.11b	2412	Low	14.944
		2437	Mid	14.993
		2462	High	14.264
	802.11g	2412	Low	16.365
		2437	Mid	18.371
		2462	High	16.391
	802.11n-20M	2412	Low	17.576
		2437	Mid	17.763
		2462	High	17.652
	802.11n-40M	2422	Low	35.980
		2437	Mid	36.409
		2452	High	35.908

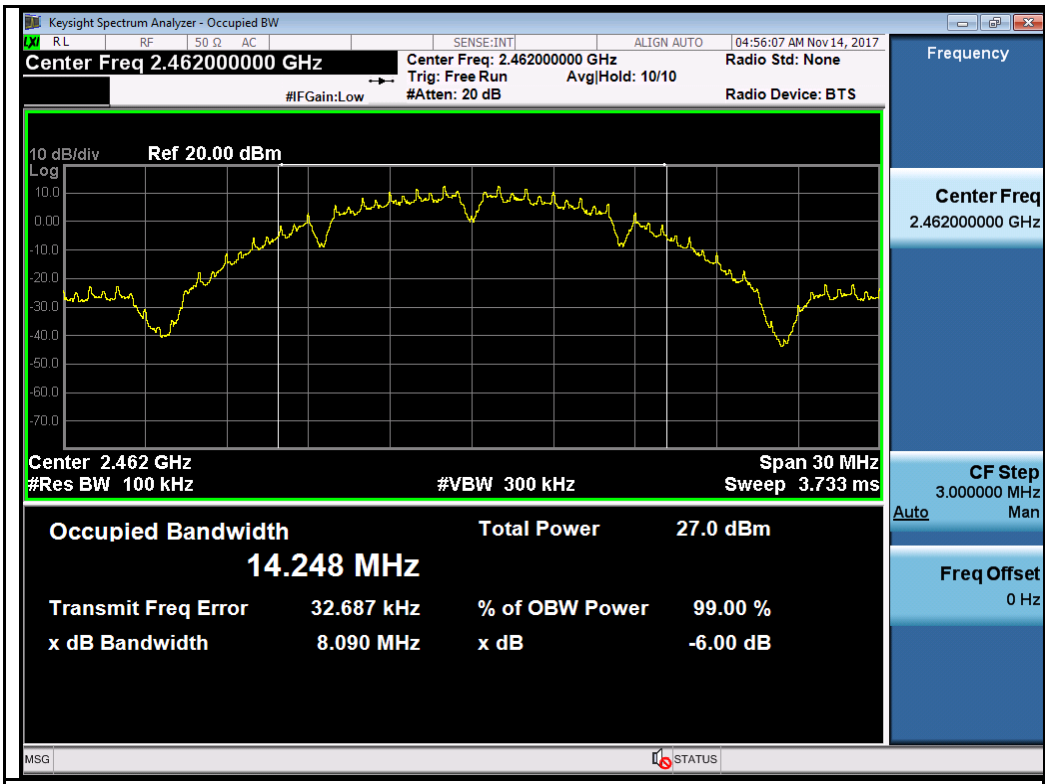
6dB & 99% Bandwidth Test Plots
T310N



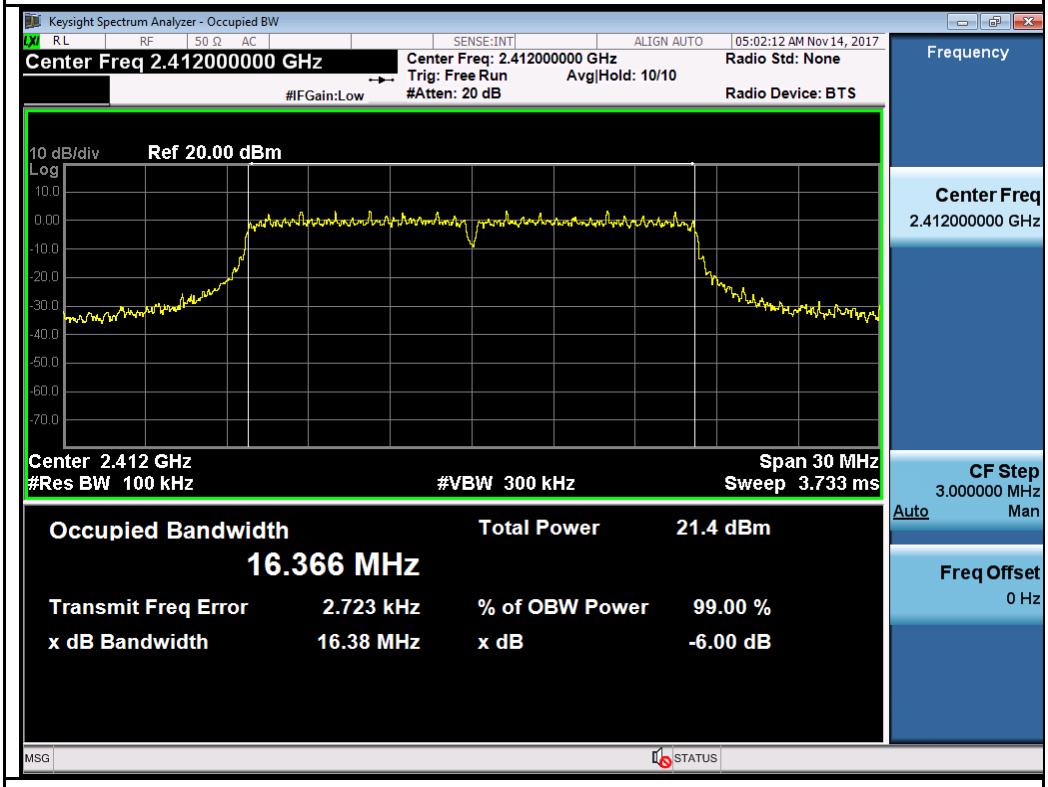
802.11b-2412MHz



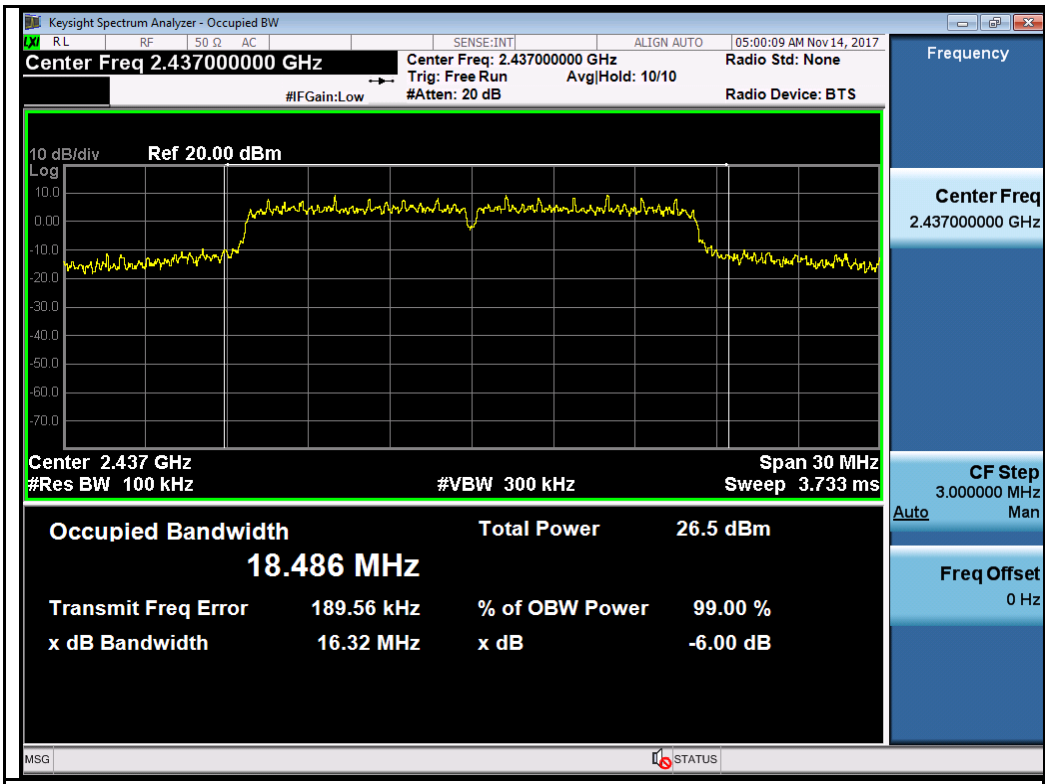
802.11b-2437MHz



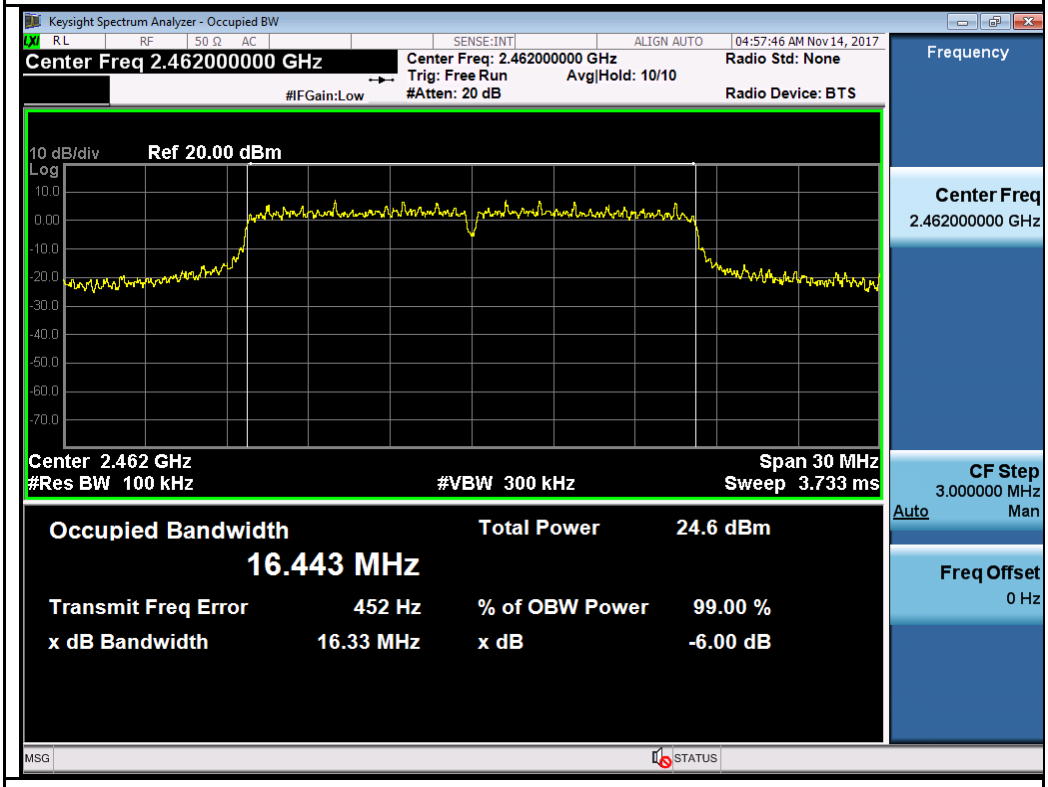
802.11b-2462MHz



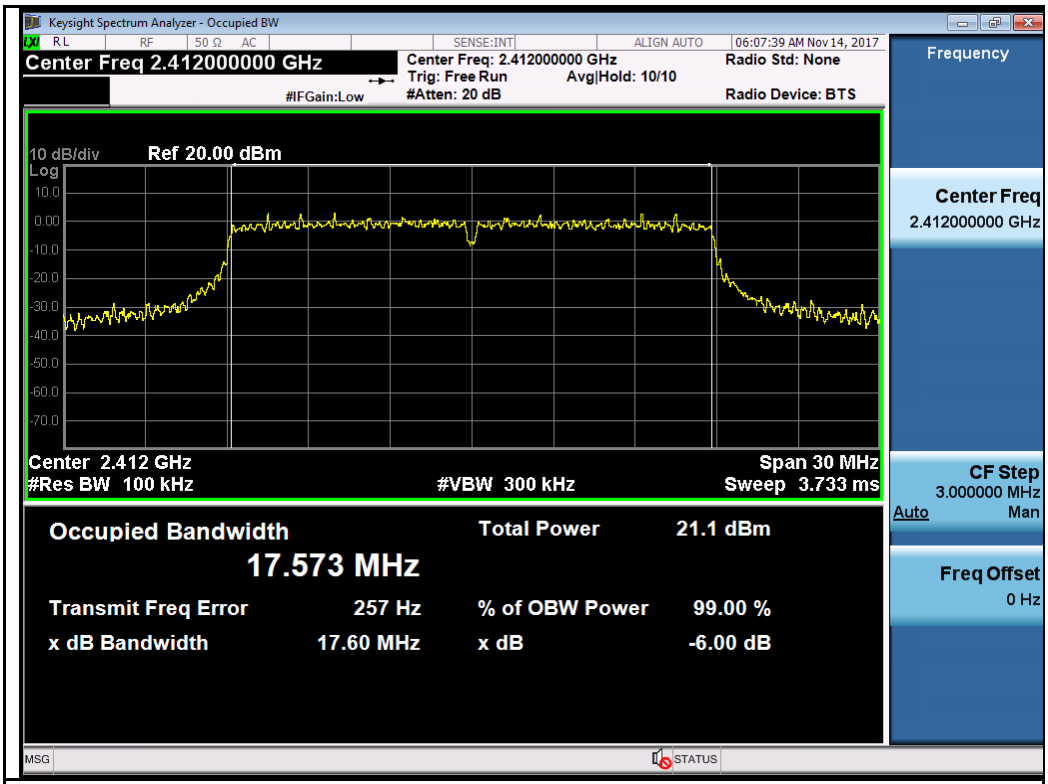
802.11g-2412MHz



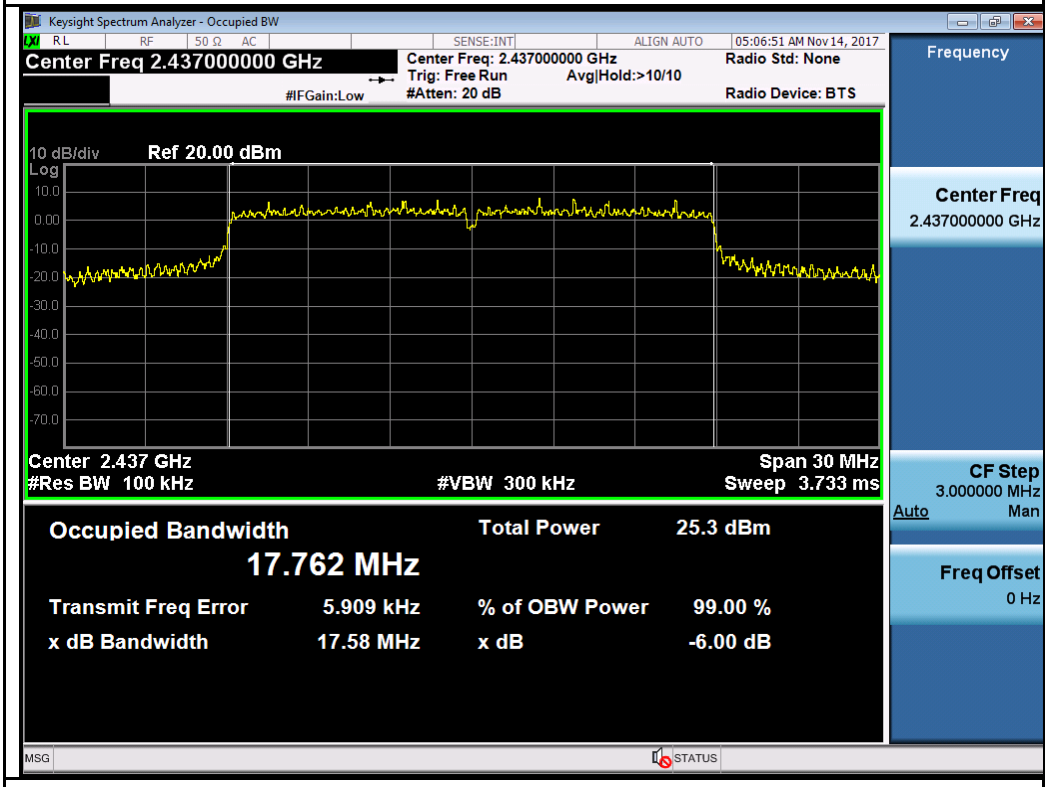
802.11g-2437MHz



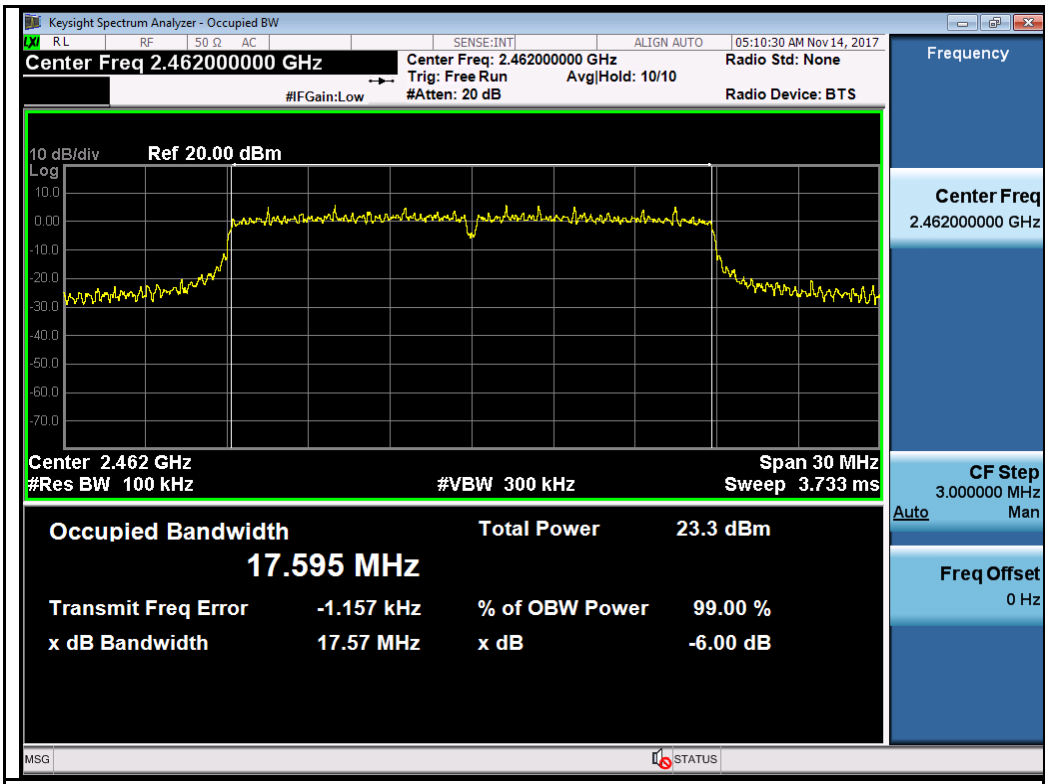
802.11g-2462MHz



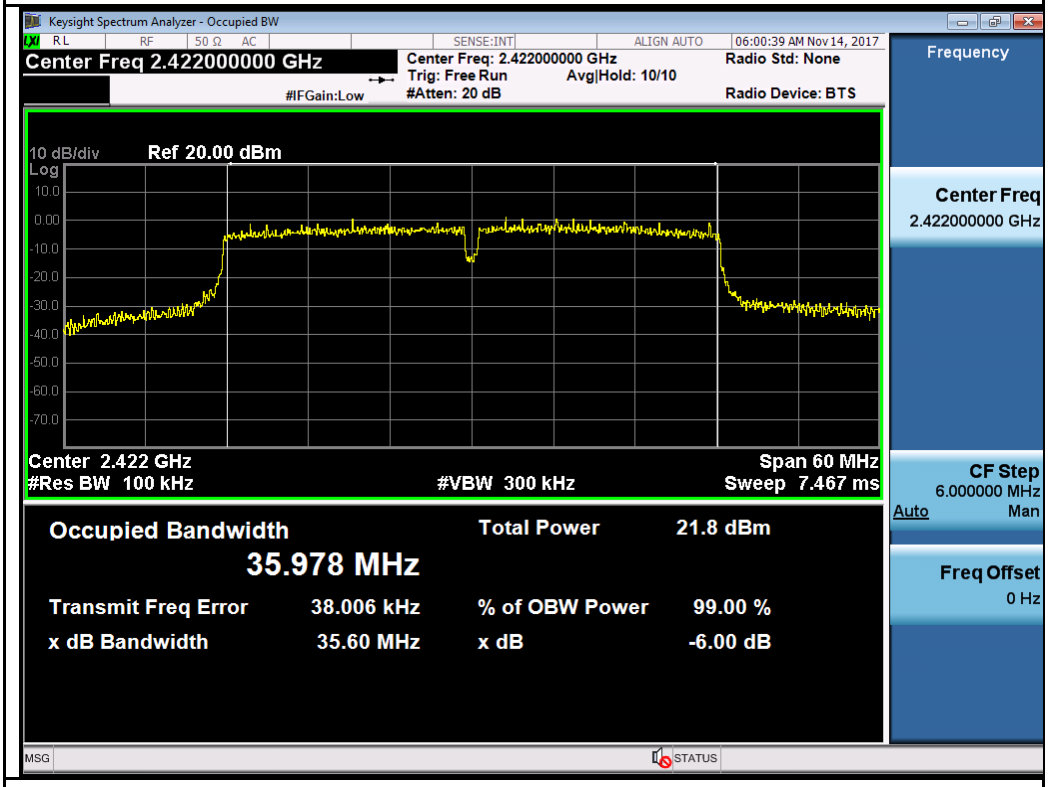
802.11n-HT20-2412MHz



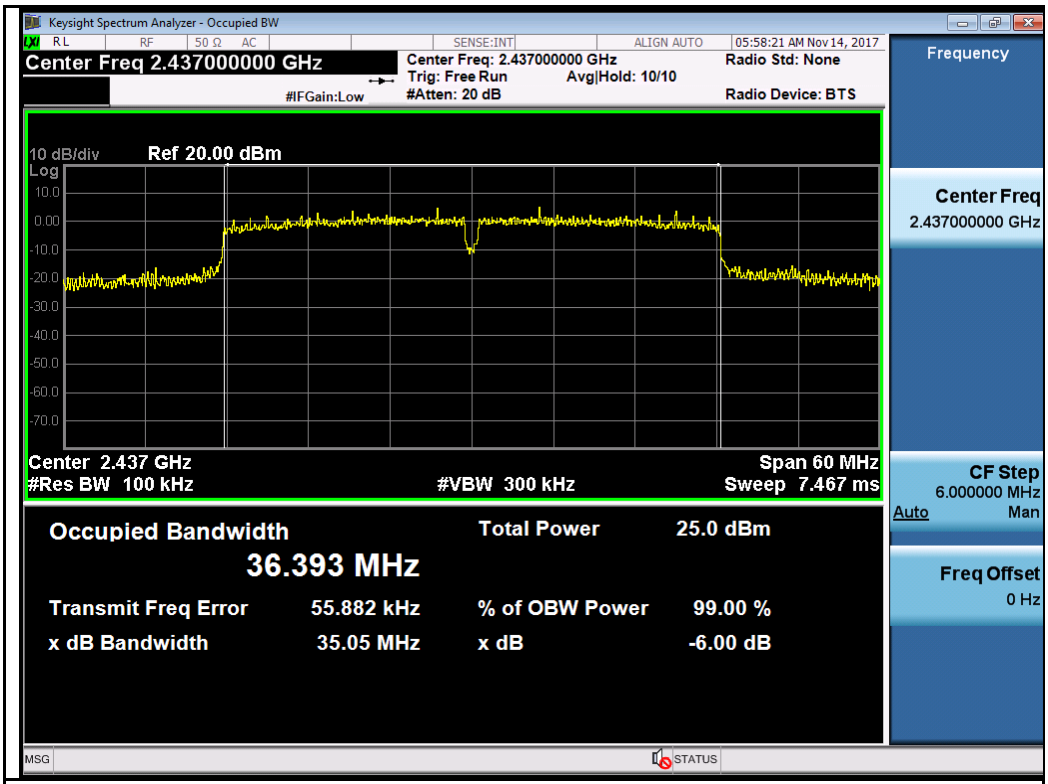
802.11n-HT20-2437MHz



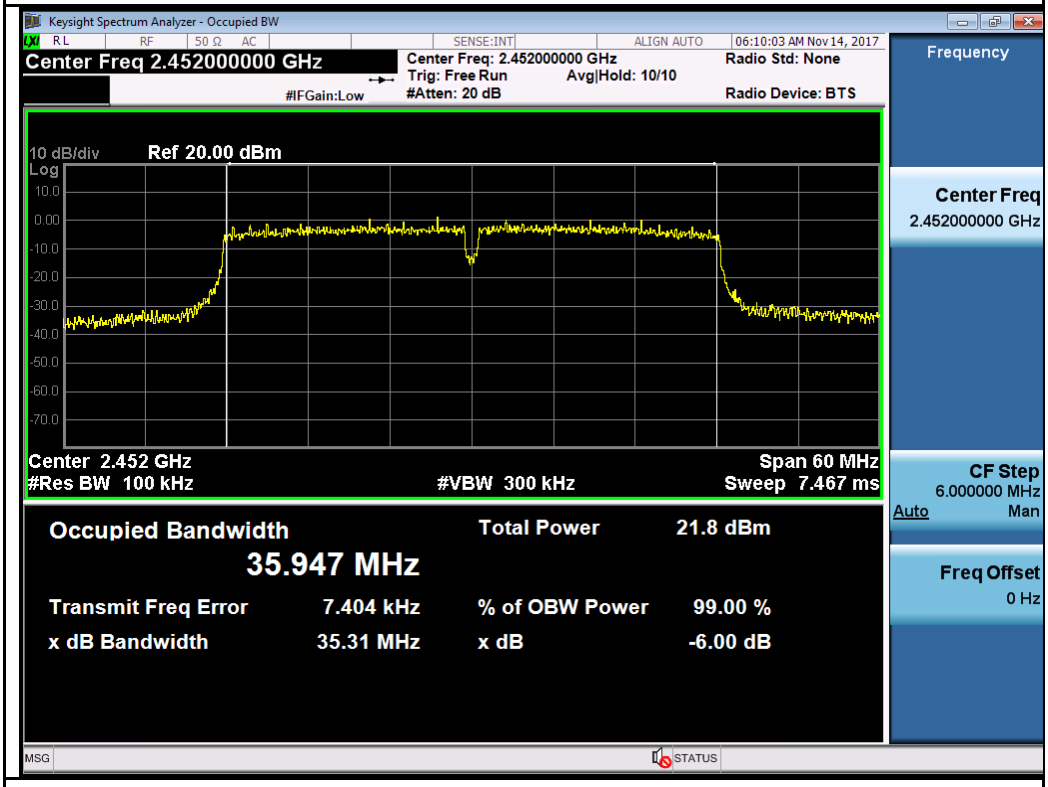
802.11n-HT20-2462MHz



802.11n-HT40-2422MHz

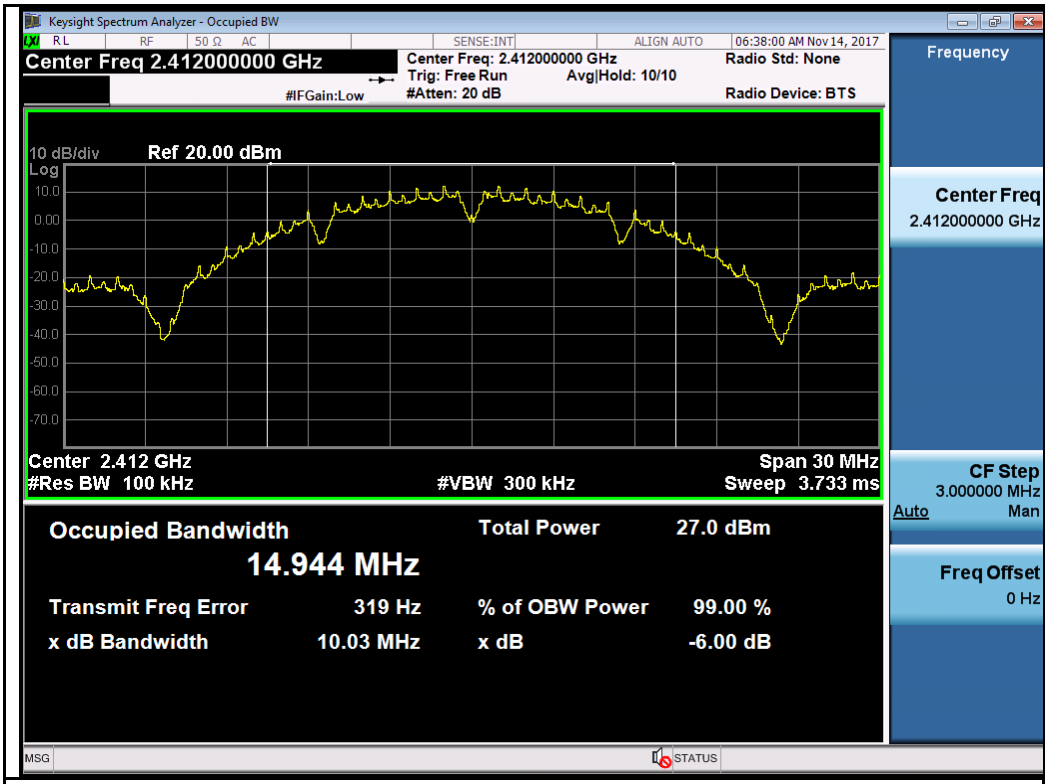


802.11n-HT40-2437MHz

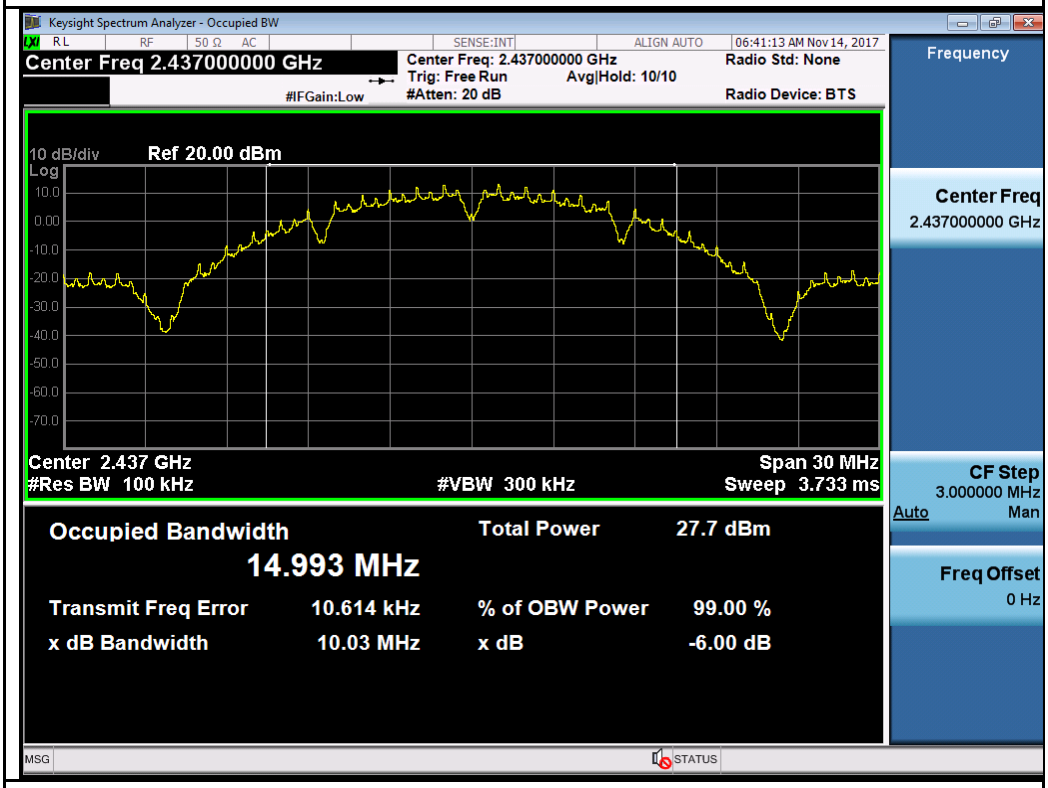


802.11n-HT40-2452MHz

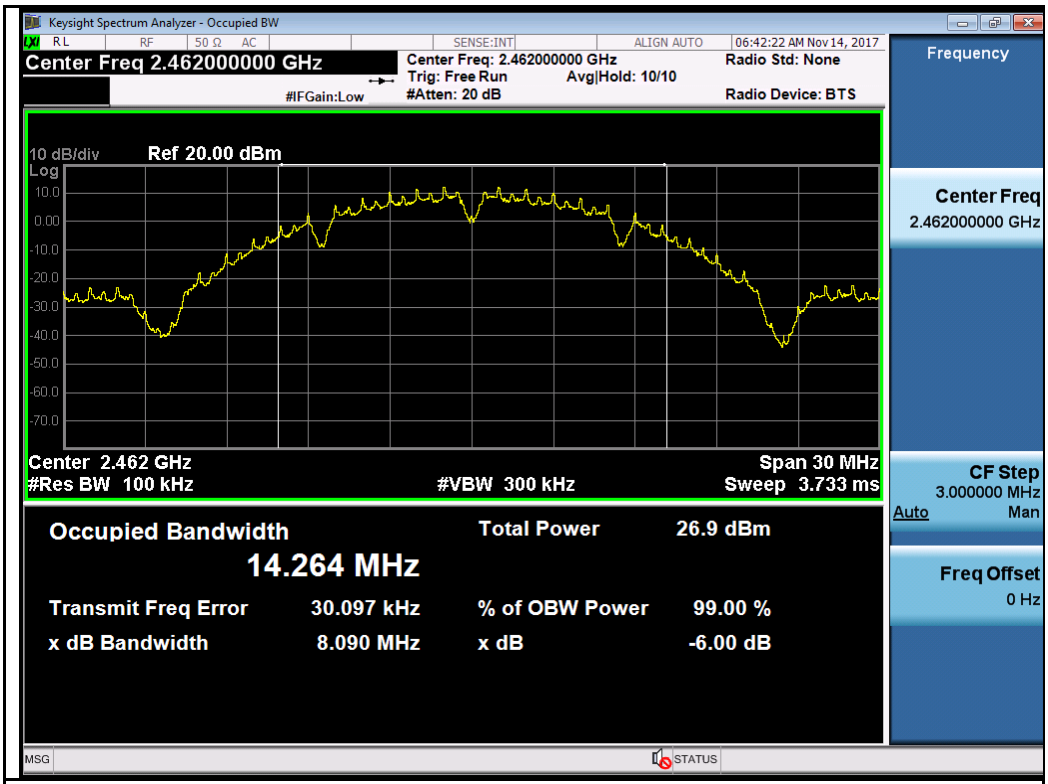
T310S



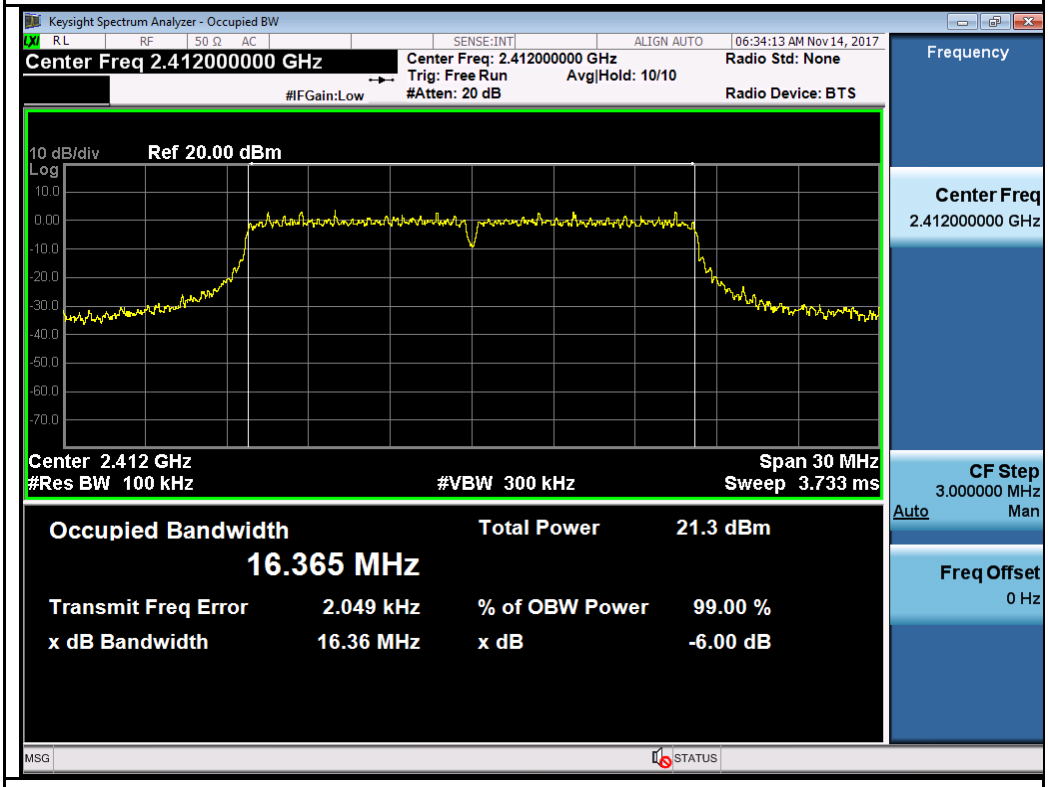
802.11b-2412MHz



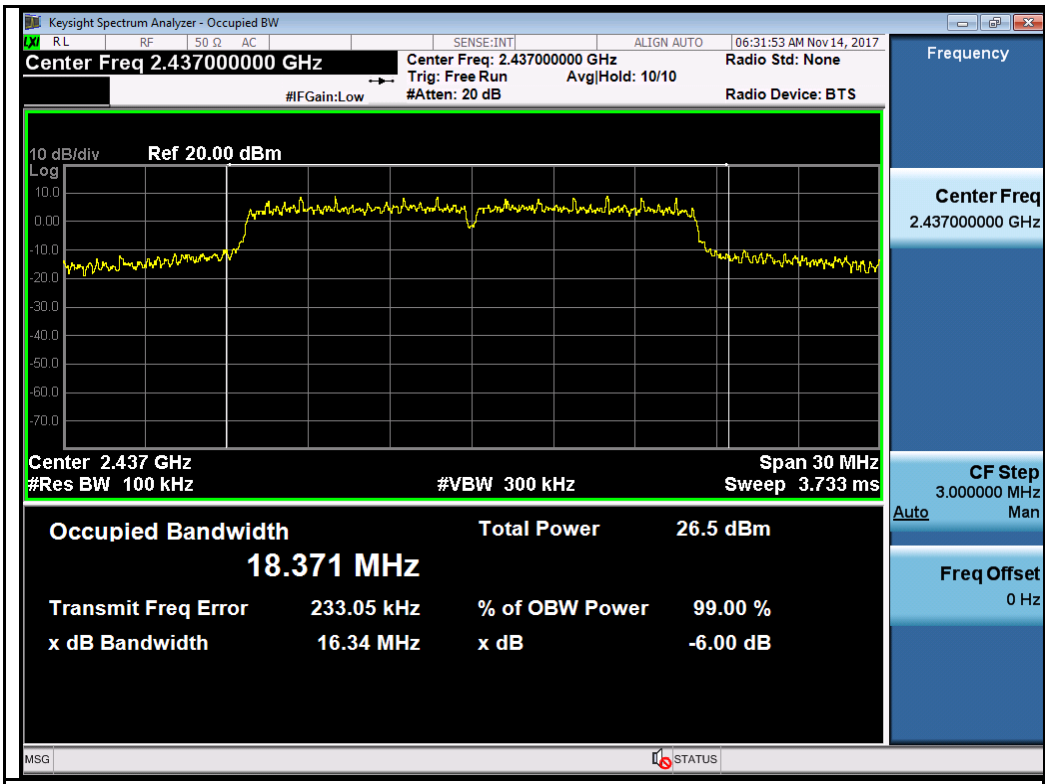
802.11b-2437MHz



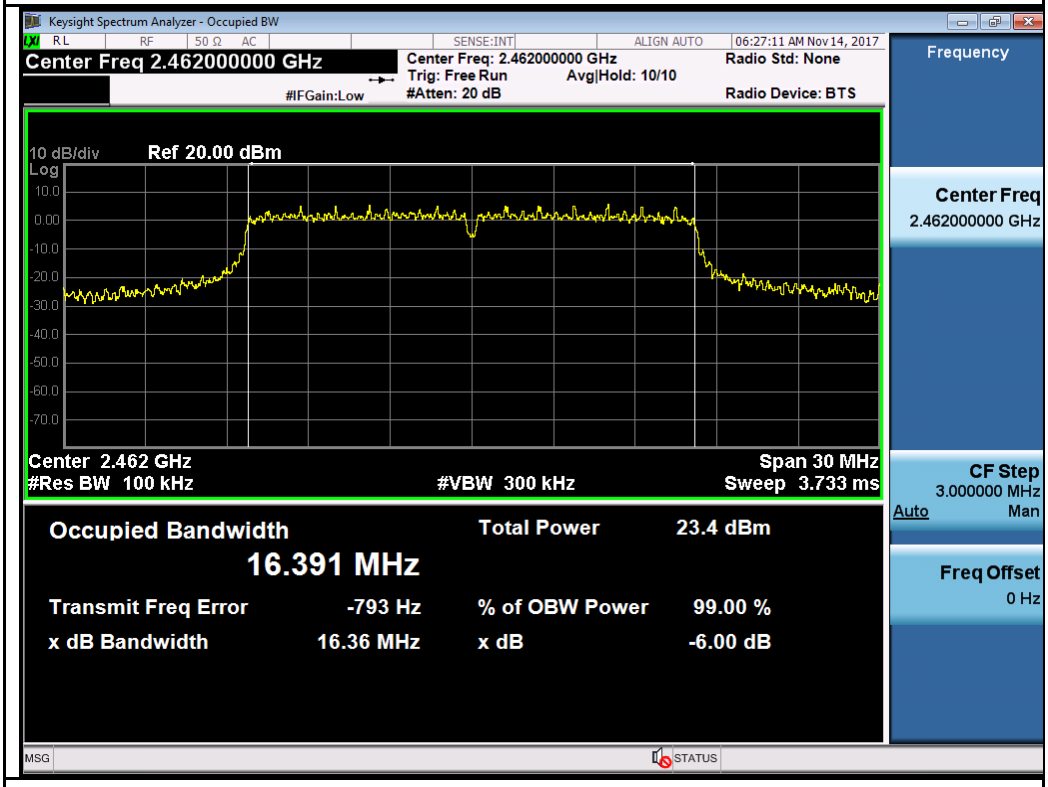
802.11b-2462MHz



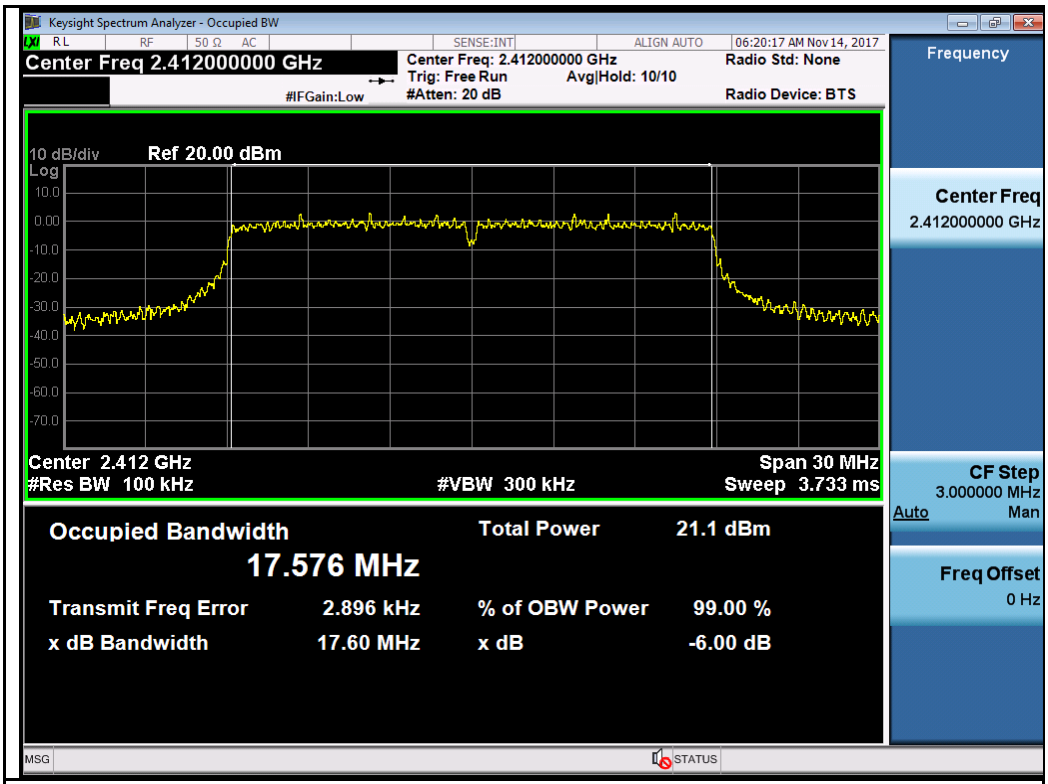
802.11g-2412MHz



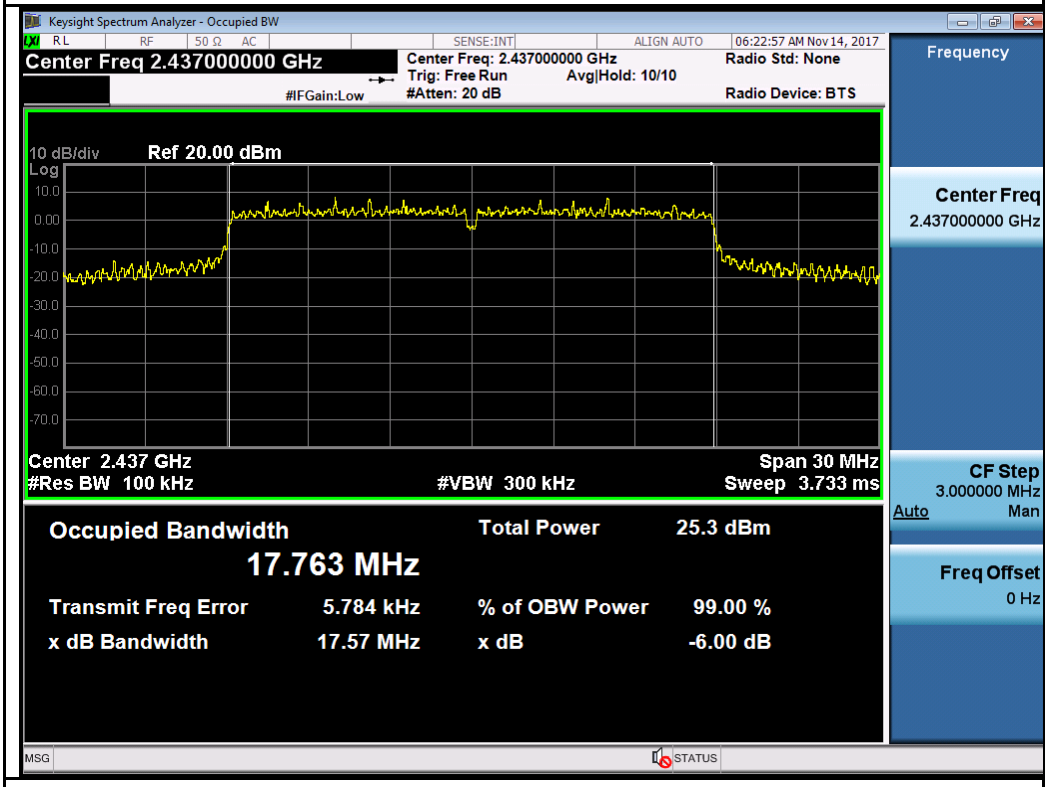
802.11g-2437MHz



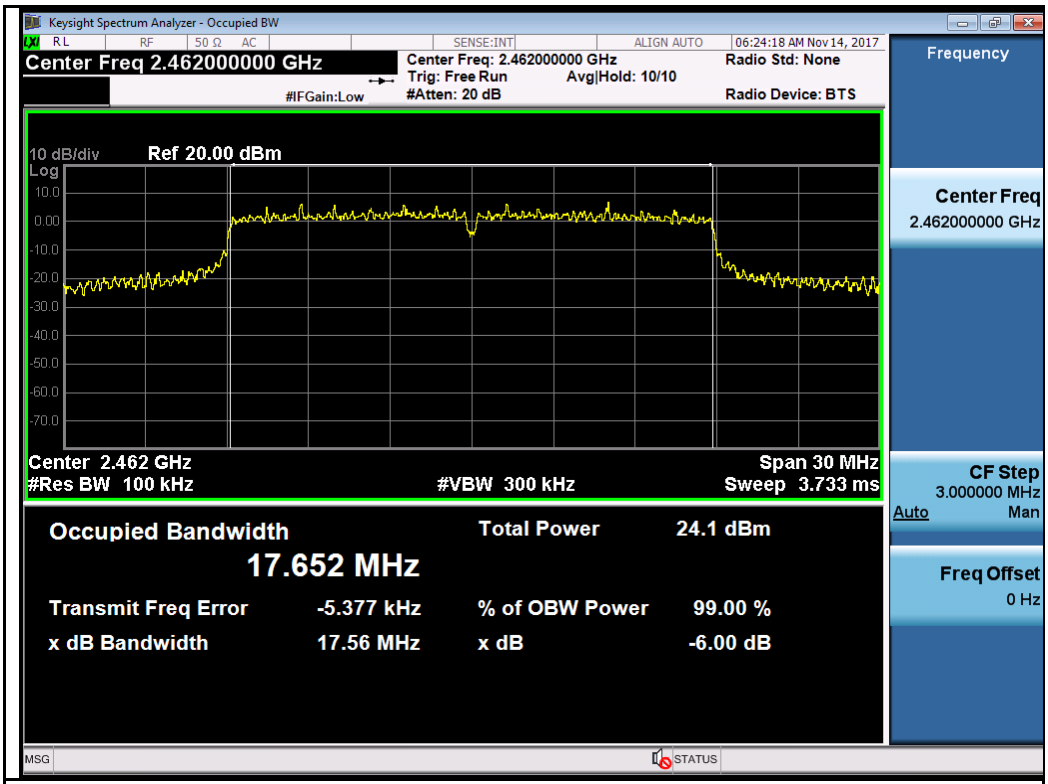
802.11g-2462MHz



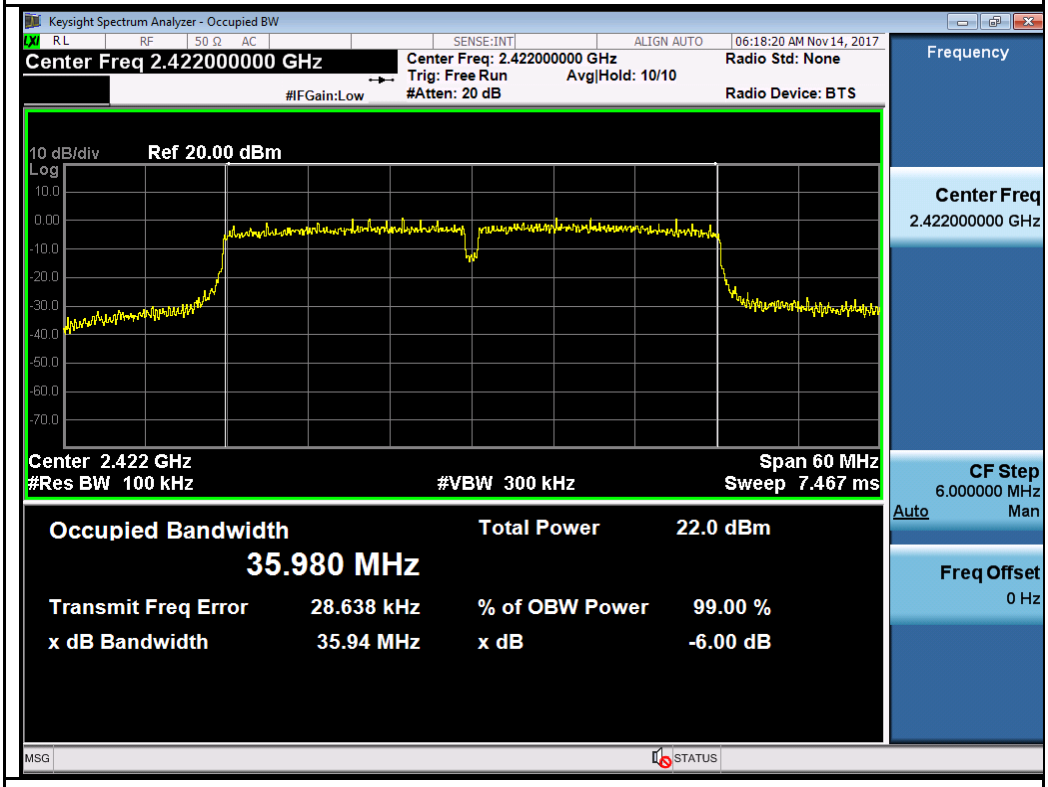
802.11n-HT20-2412MHz



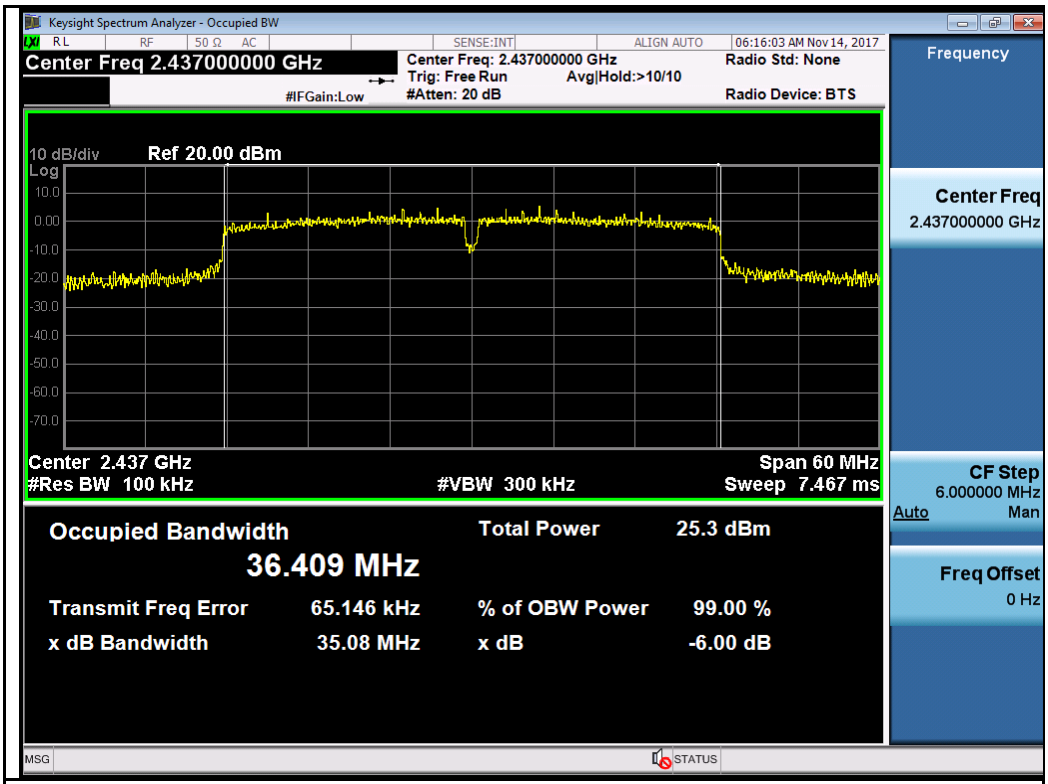
802.11n-HT20-2437MHz



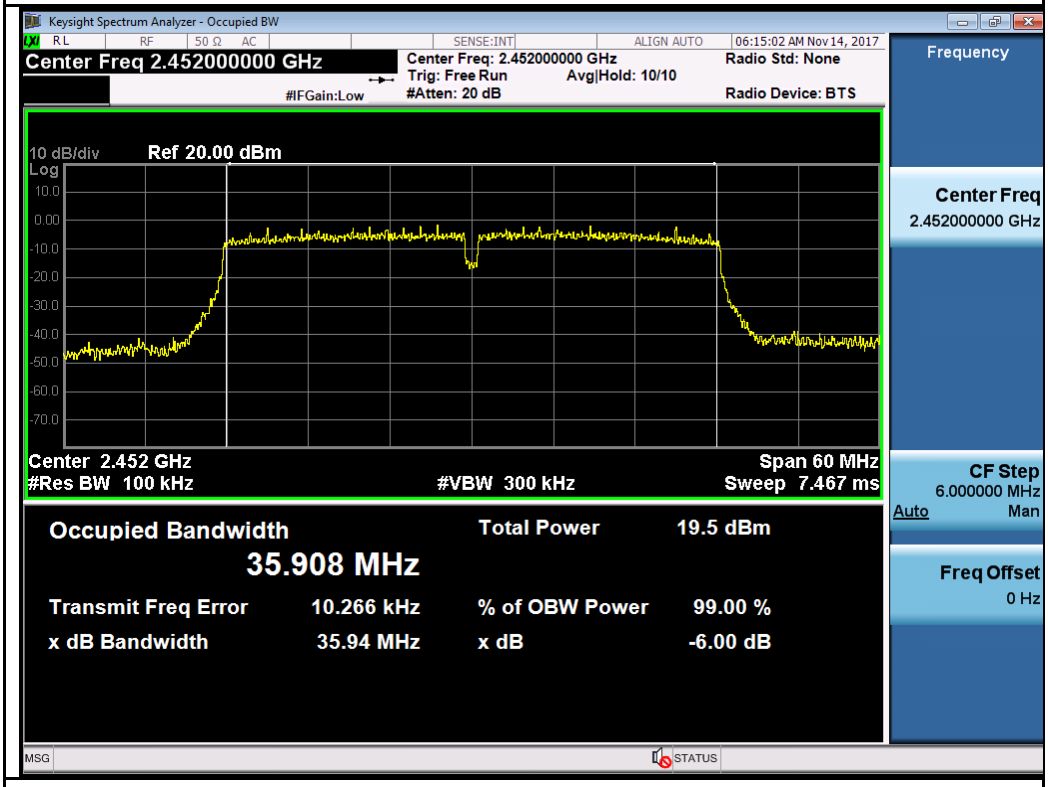
802.11n-HT20-2462MHz



802.11n-HT40-2422MHz



802.11n-HT40-2437MHz



802.11n-HT40-2452MHz

10.4 Output Power

Requirement(s):

Spec	Item	Requirement	Applicable
§ 15.247 RSS247 (5.4.4)	f)	DSSS in 902-928MHz, 2400-2483.5MHz, 5725-5850MHz: ≤1 Watt	☒

Test Setup	
Test Procedure	558074 D01 DTS Meas Guidance v03r05, 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	11/11/2017-11/21/2017	Environmental condition	Temperature Relative Humidity Atmospheric Pressure	23°C 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

T310N

Type	Test mode	Freq (MHz)	CH	Conducted Power (dBm)			Limit (dBm)	Result
				Chain 0	Chain 1	Combined Power		
Output Power	802.11b	2412	Low	20.04	20.14	23.10	27.3	Pass
		2437	Mid	20.23	20.21	23.23	27.3	Pass
		2462	High	19.94	19.99	22.98	27.3	Pass
	802.11g	2412	Low	15.12	15.59	18.37	27.3	Pass
		2437	Mid	19.83	19.86	22.85	27.3	Pass
		2462	High	18.33	18.34	21.35	27.3	Pass
	802.11n-20M	2412	Low	15.50	15.62	18.57	27.3	Pass
		2437	Mid	19.12	19.01	22.08	27.3	Pass
		2462	High	17.39	17.54	20.48	27.3	Pass
	802.11n-40M	2422	Low	16.29	16.56	19.44	27.3	Pass
		2437	Mid	19.73	19.69	22.72	27.3	Pass
		2452	High	16.58	16.46	19.53	27.3	Pass
Note	Two chains are cross-polarized, the directional gain = individual antenna gain = 8.7dBi. 8.7-6 = 2.7 dB limit adjustment is needed. All the mode transmission is MIMO.							

T310S

Type	Test mode	Freq (MHz)	CH	Conducted Power (dBm)			Limit (dBm)	Result
				Chain 0	Chain 1	Combined Power		
Output Power	802.11b	2412	Low	19.84	19.74	22.80	30	Pass
		2437	Mid	20.26	20.25	23.26	30	Pass
		2462	High	19.71	19.62	22.68	30	Pass
	802.11g	2412	Low	15.46	15.51	18.50	30	Pass
		2437	Mid	19.79	19.67	22.74	30	Pass
		2462	High	17.30	17.38	20.35	30	Pass
	802.11n-20M	2412	Low	15.46	15.55	18.51	30	Pass
		2437	Mid	19.22	19.20	22.22	30	Pass
		2462	High	18.13	18.22	21.18	30	Pass
	802.11n-40M	2422	Low	16.68	16.81	19.76	30	Pass
		2437	Mid	19.83	19.91	22.88	30	Pass
		2452	High	14.05	14.24	17.16	30	Pass
Note	Highest Two antennas are cross polarized, the directional gain = individual antenna gain = 6dBi. No limit adjustment is needed. All the mode transmission is MIMO.							

Beamforming

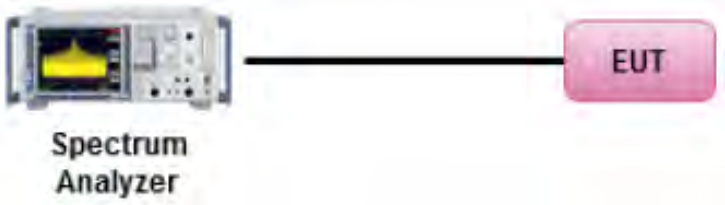
T310S

Type	Test mode	Freq (MHz)	CH	Conducted Power (dBm)			Limit (dBm)	Result
				Chain 0	Chain 1	Combined Power		
Output Power	802.11b	2412	Low	19.84	19.74	22.80	27	Pass
		2437	Mid	20.26	20.25	23.26	27	Pass
		2462	High	19.71	19.62	22.68	27	Pass
	802.11g	2412	Low	15.46	15.51	18.50	27	Pass
		2437	Mid	19.79	19.67	22.74	27	Pass
		2462	High	17.30	17.38	20.35	27	Pass
	802.11n-20M	2412	Low	15.46	15.55	18.51	27	Pass
		2437	Mid	19.22	19.20	22.22	27	Pass
		2462	High	18.13	18.22	21.18	27	Pass
	802.11n-40M	2422	Low	16.68	16.81	19.76	27	Pass
		2437	Mid	19.83	19.91	22.88	27	Pass
		2452	High	14.05	14.24	17.16	27	Pass
Note	Array gain is 10 log10(N_{ANT})=3dB, N_{ANT} = 2, highest individual gain is 6dBi, so max directional gain of the EUT is 9dBi. 9-6 = 3 dB limit adjustment is needed. All the mode transmission is MIMO.							

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	☒

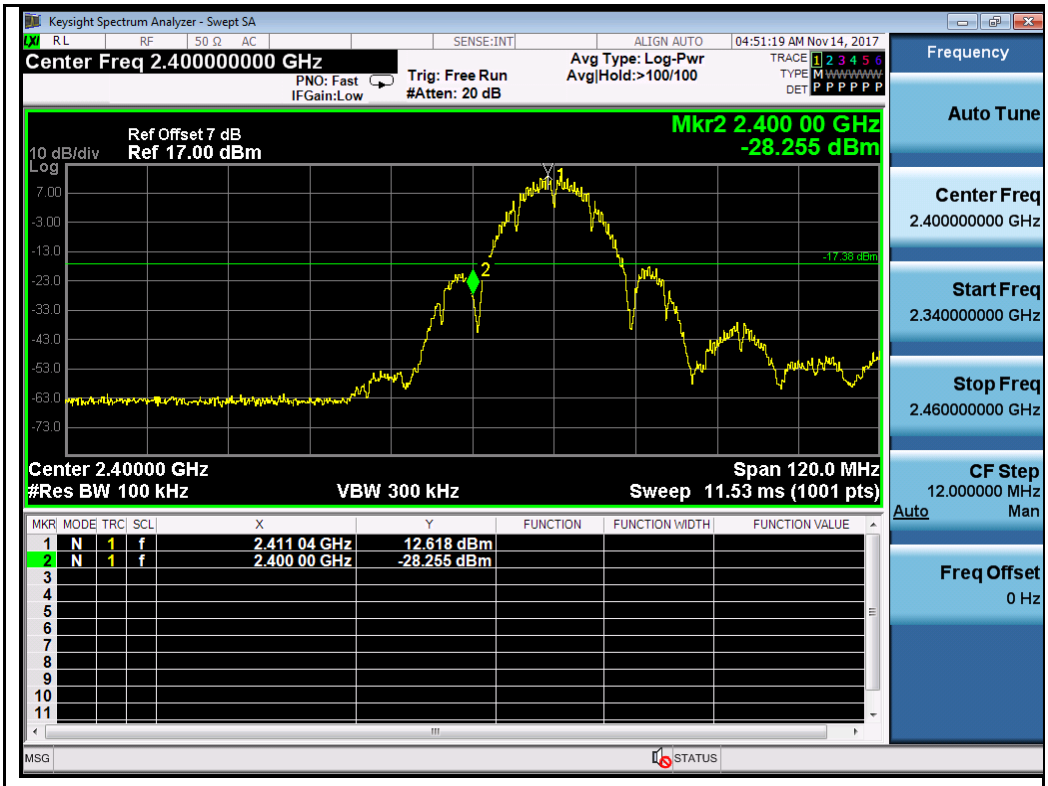
Test Setup				
Test Procedure	558074 D01 DTS Meas Guidance v03r05 Band Edge measurement procedure 1. Set the EUT to maximum power setting and enable the EUT transmit continuously. 2. Band edge emissions must be at least 30 dB down from the highest emission level within the authorized band as a measured. 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	11/11/2017-11/21/2017	Environmental condition	Temperature Relative Humidity Atmospheric Pressure	22°C 46% 1020mbar
Remark	-			
Result	☒ Pass ☐ Fail			

Test Data ☐ Yes ☒ N/A

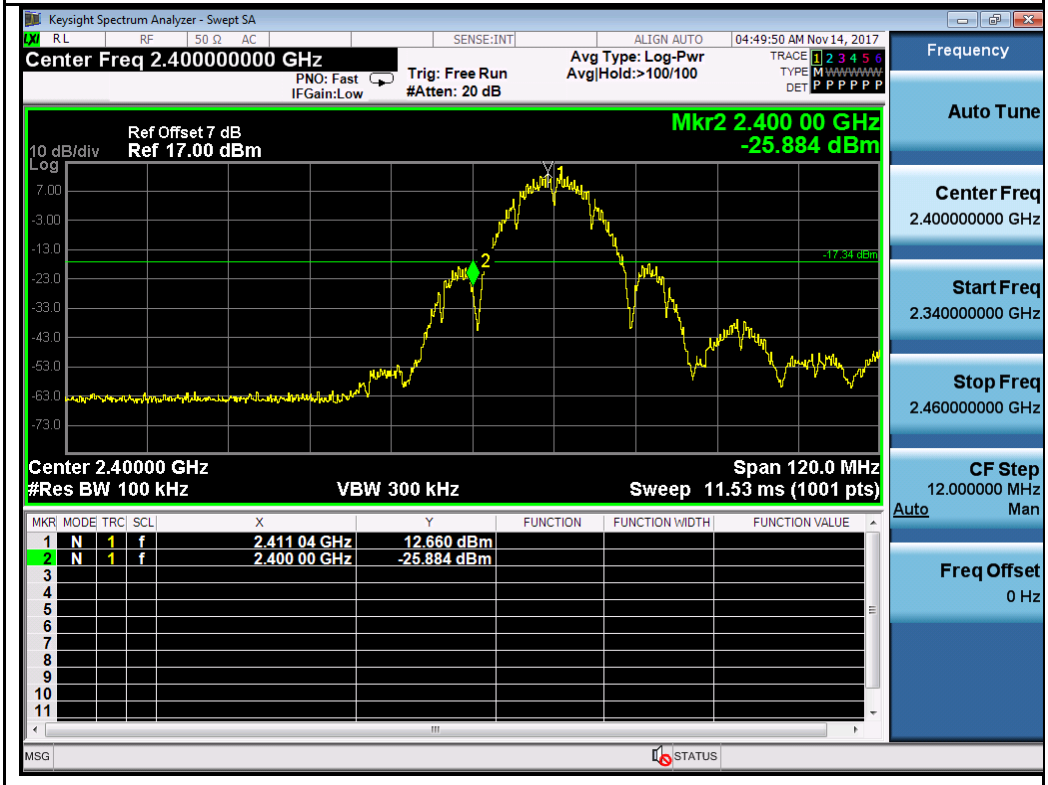
Test Plot ☒ Yes (See below) ☐ N/A

Test was done by Cipher at RF test site.

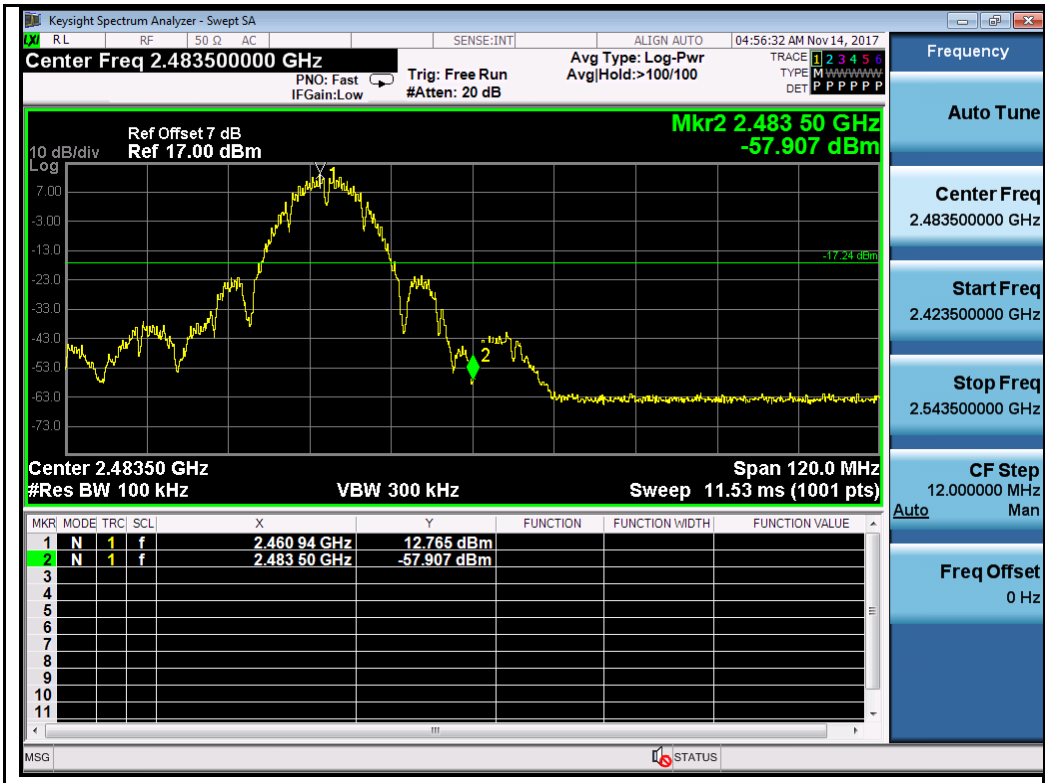
Test Plots
T310N



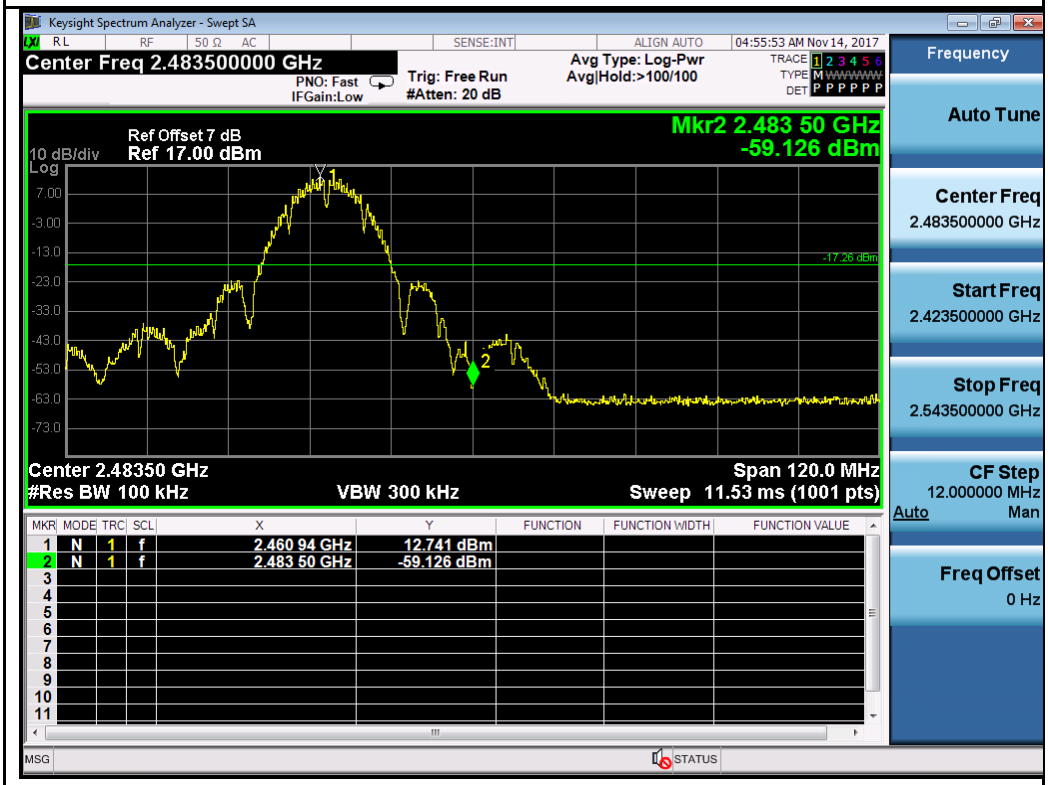
802.11b-2412MHz Chain 0



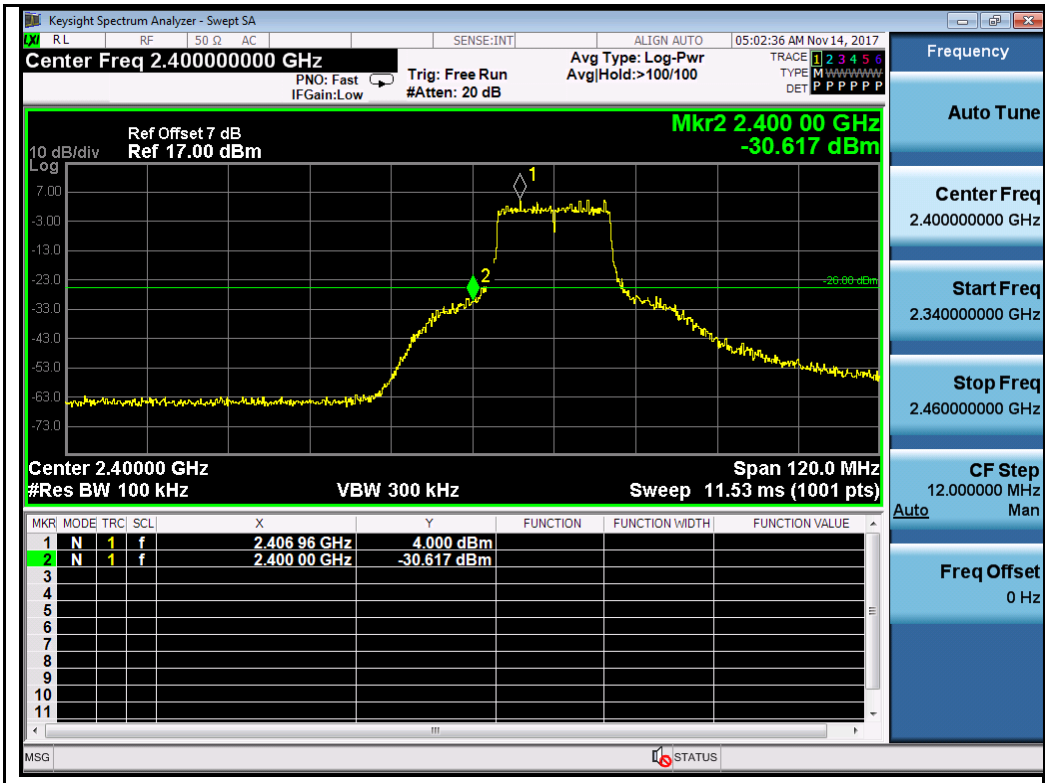
802.11b-2412MHz Chain 1



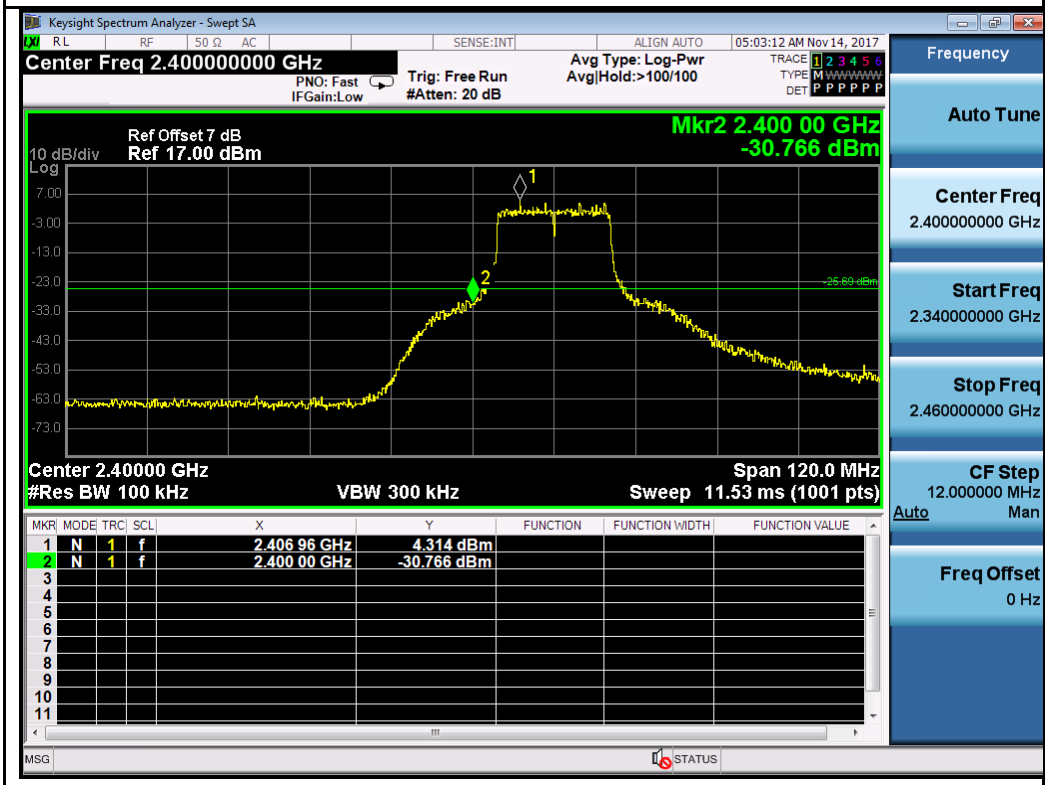
802.11b-2462MHz Chain 0



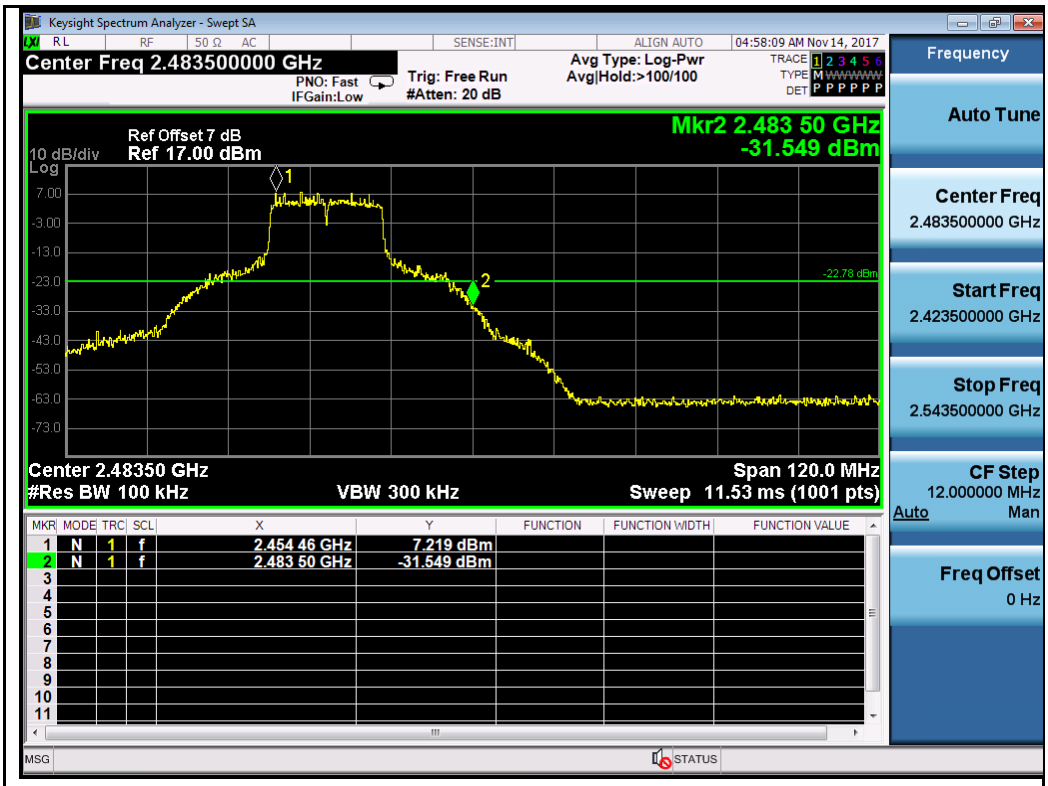
802.11b-2462MHz Chain 1



802.11g-2412MHz Chain 0



802.11g-2412MHz Chain 1



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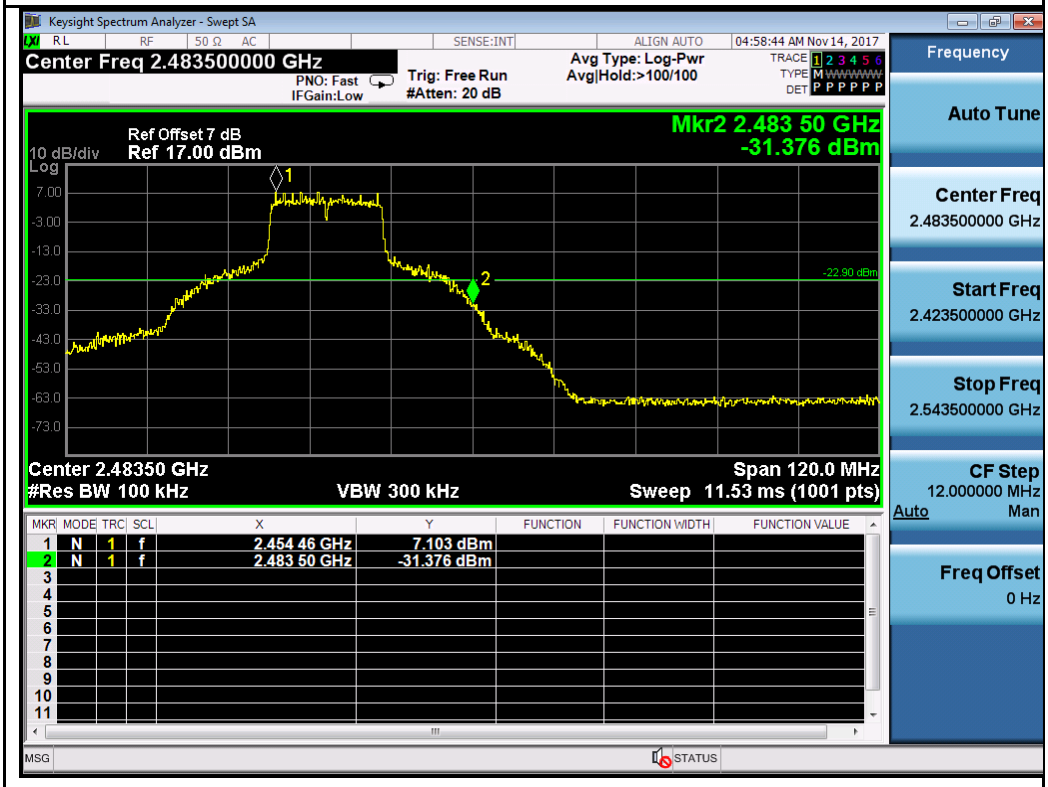
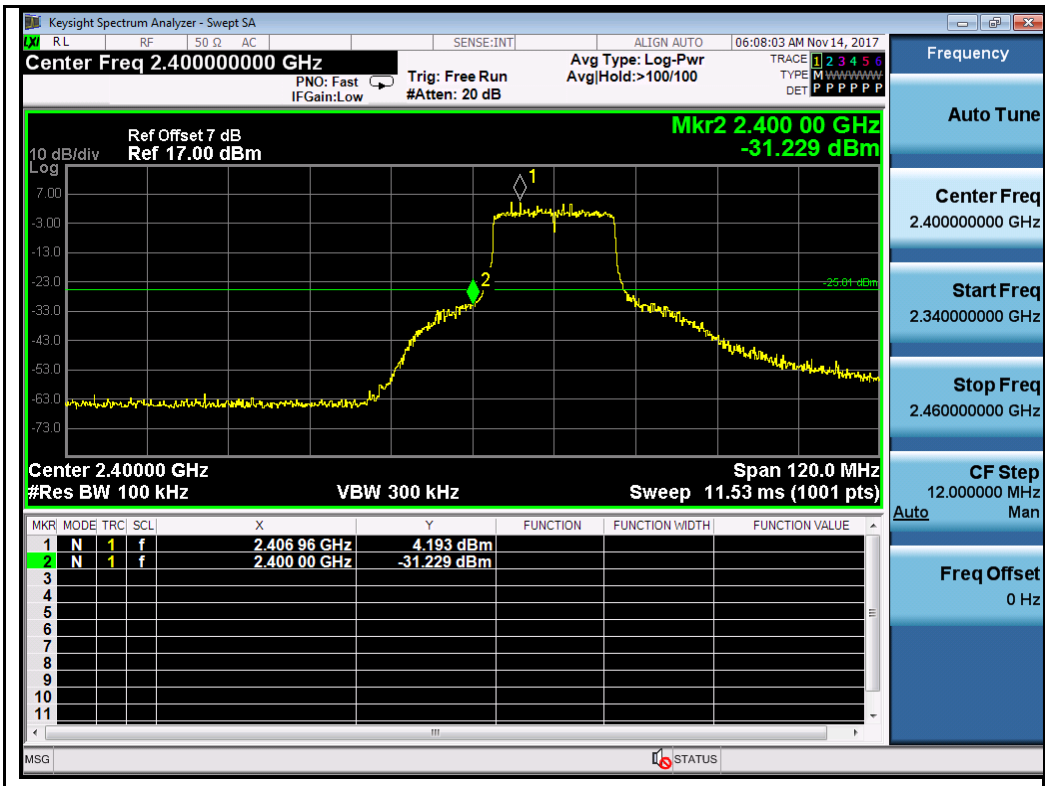
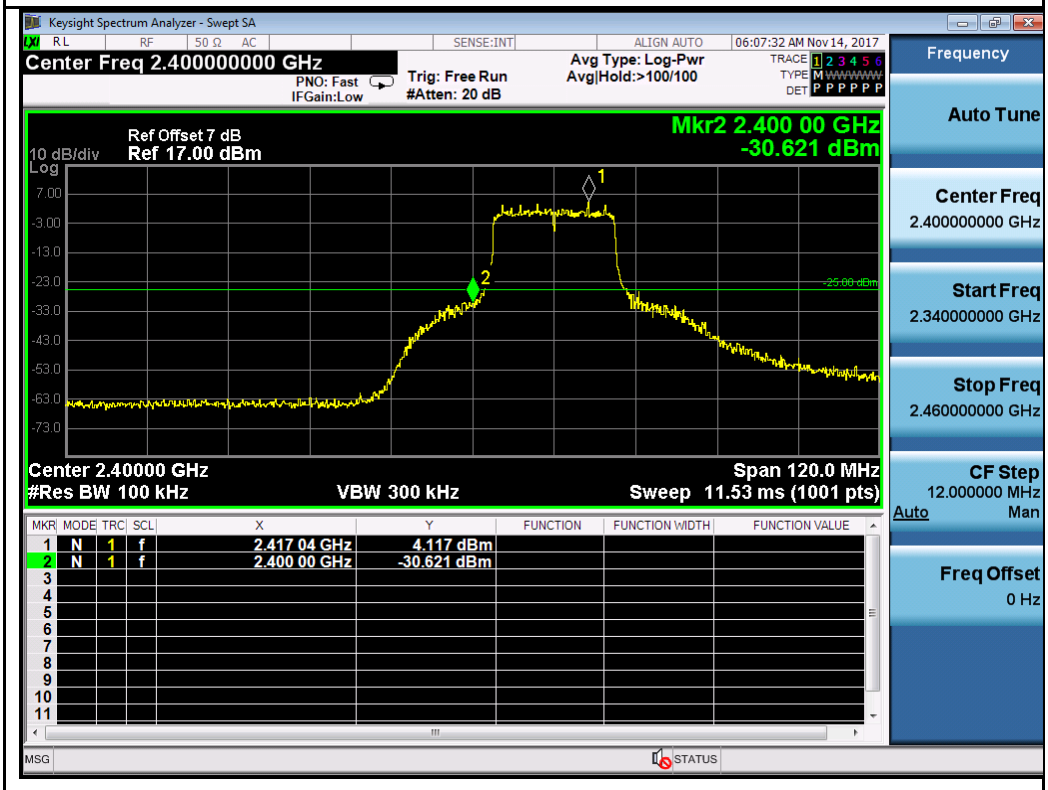


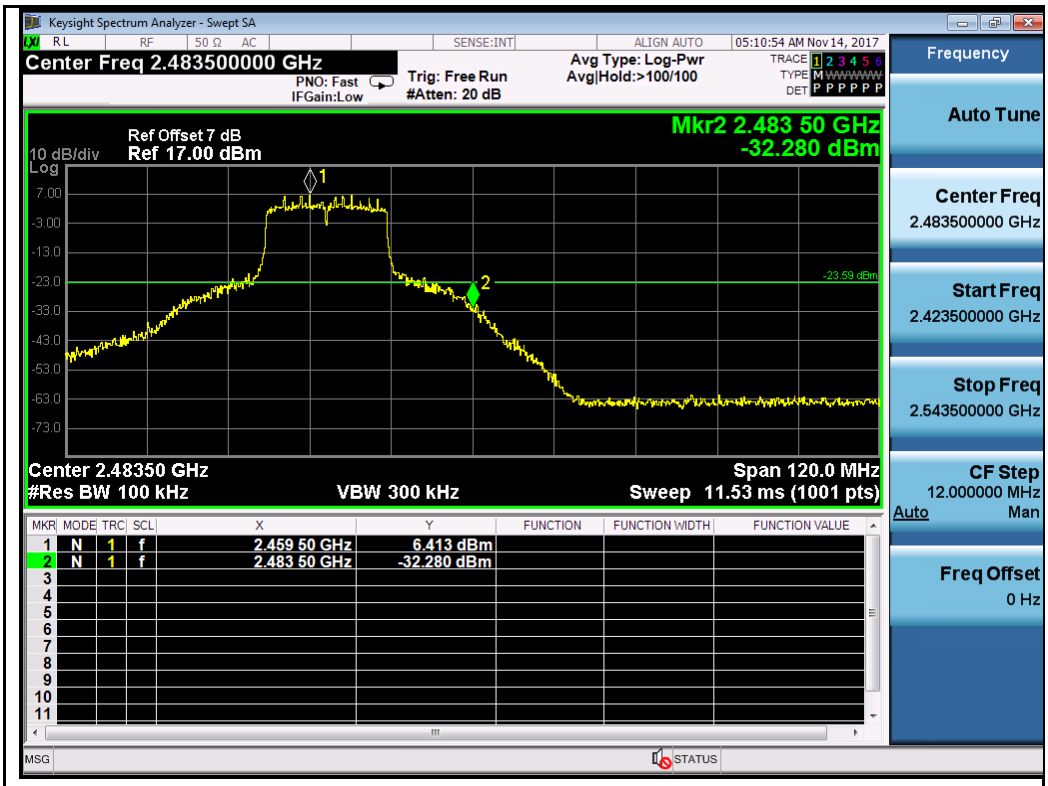
802.11g-2462MHz Chain 1



802.11n-HT20-2412MHz Chain 0



802.11n-HT20-2412MHz Chain 1



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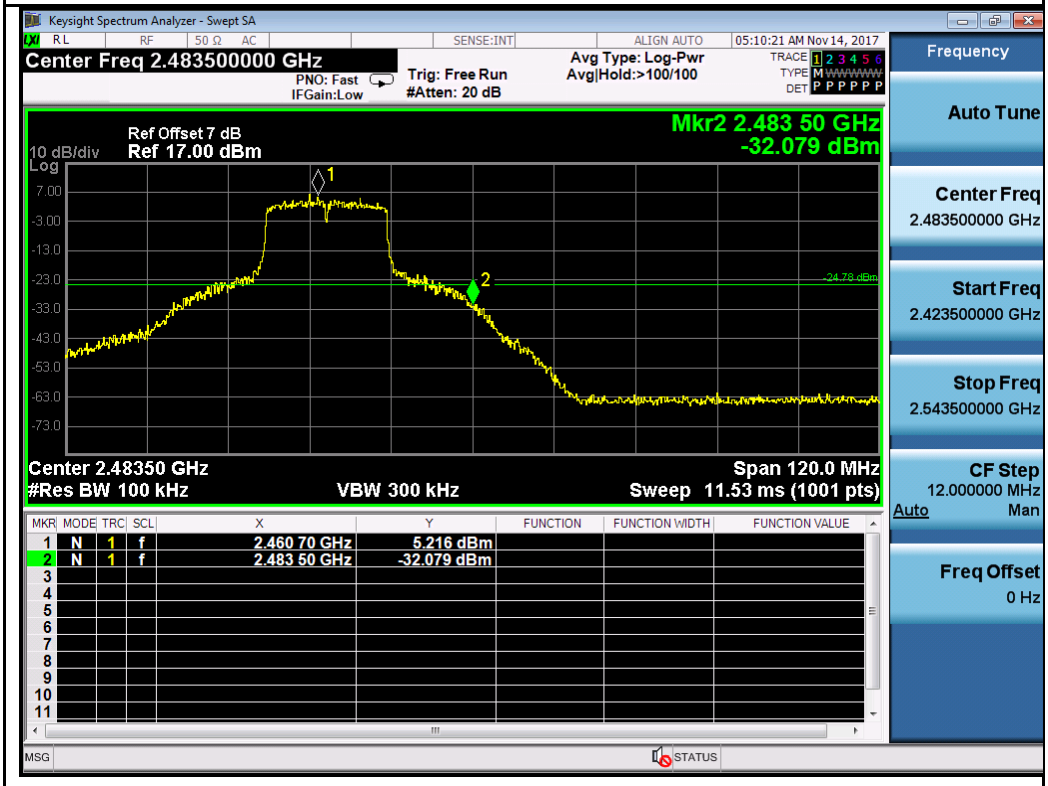
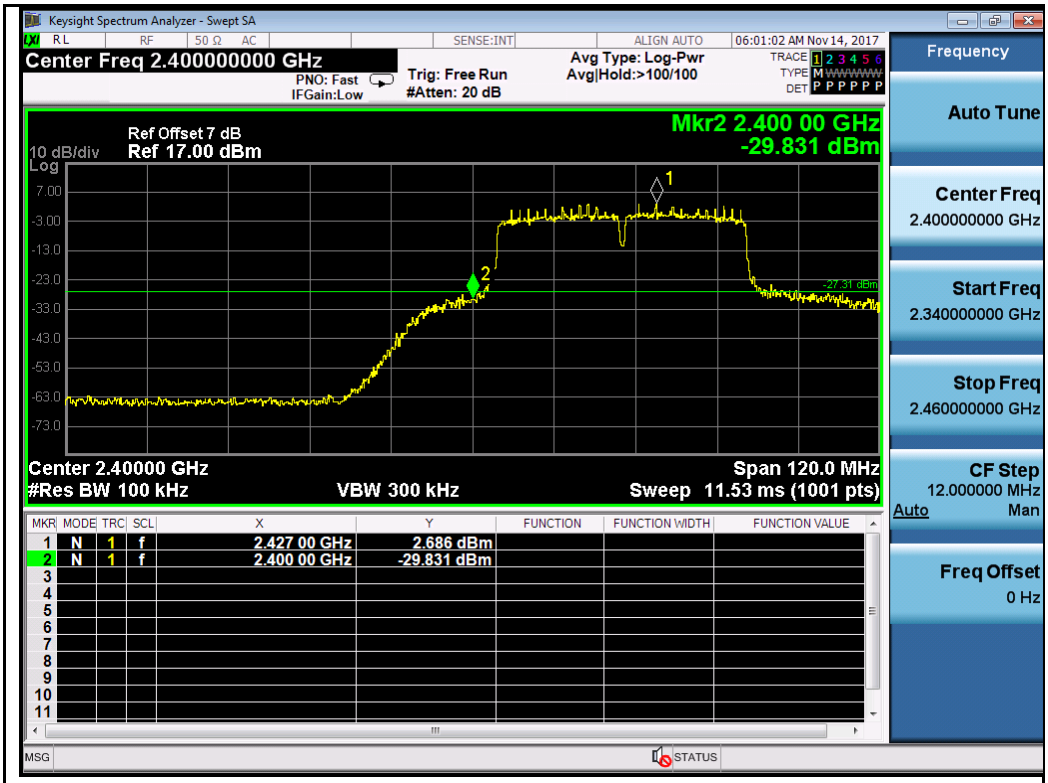
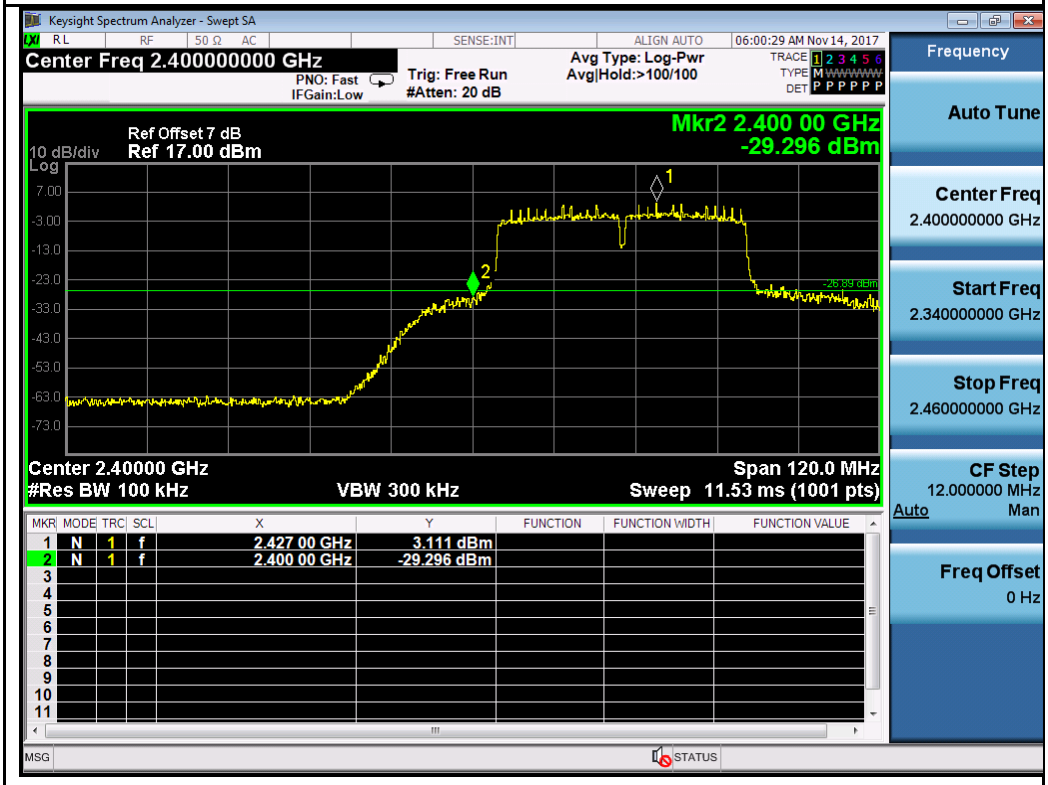


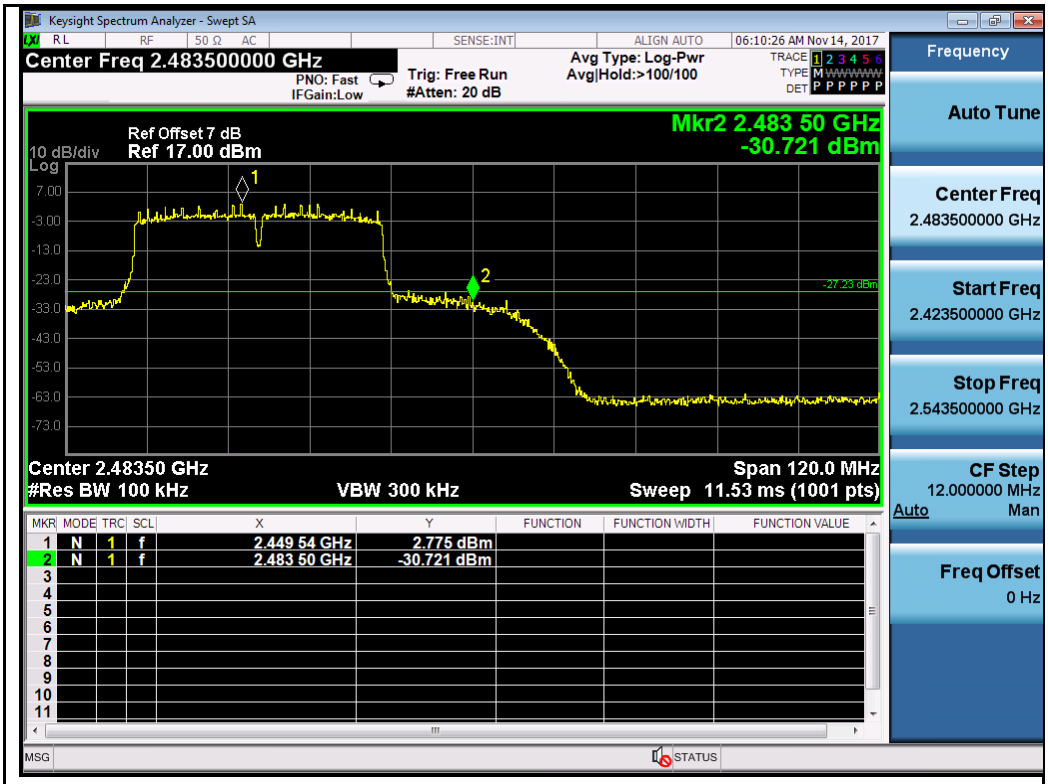
802.11n-HT20-2462MHz Chain 1



802.11n-HT40-2422MHz Chain 0



802.11n-HT40-2422MHz Chain 1

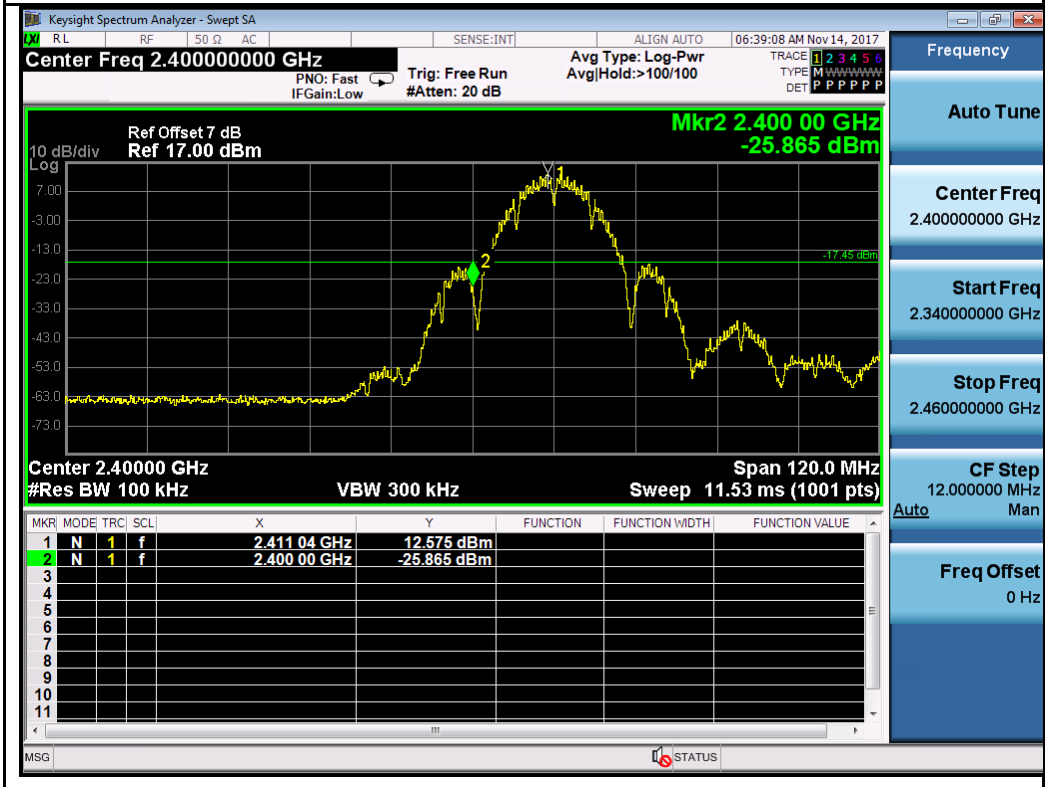


802.11n-HT40-2452MHz Chain 0

802.11n-HT40-2452MHz Chain 1

T310S

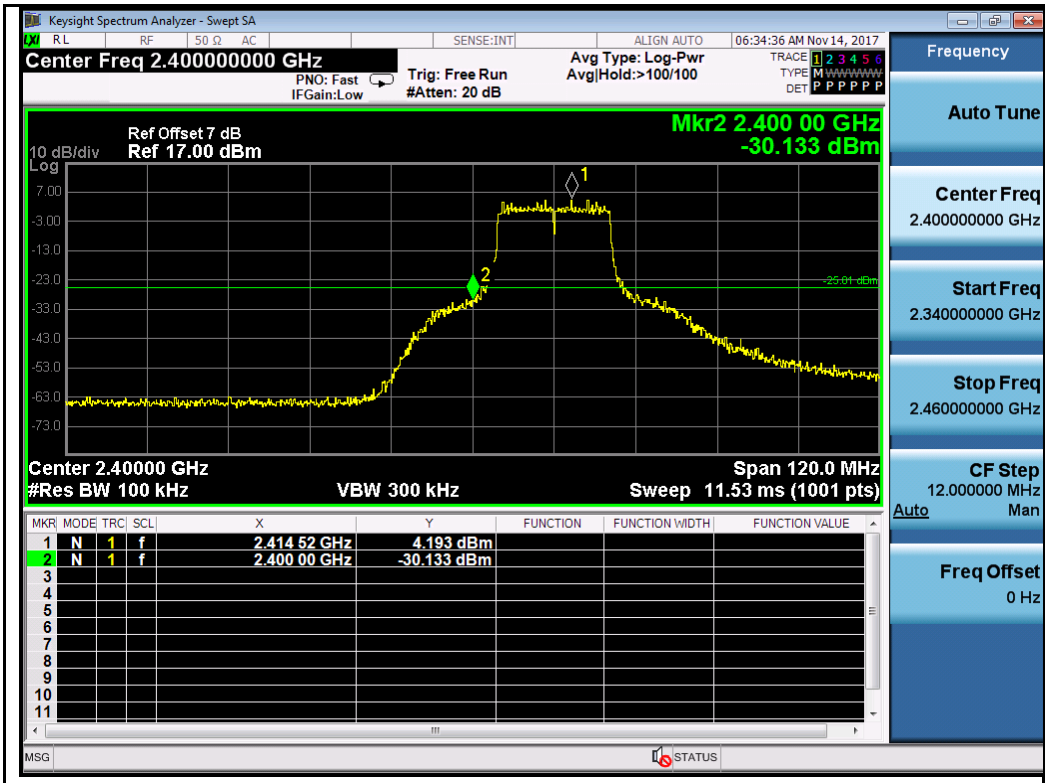
802.11b-2412MHz Chain 0



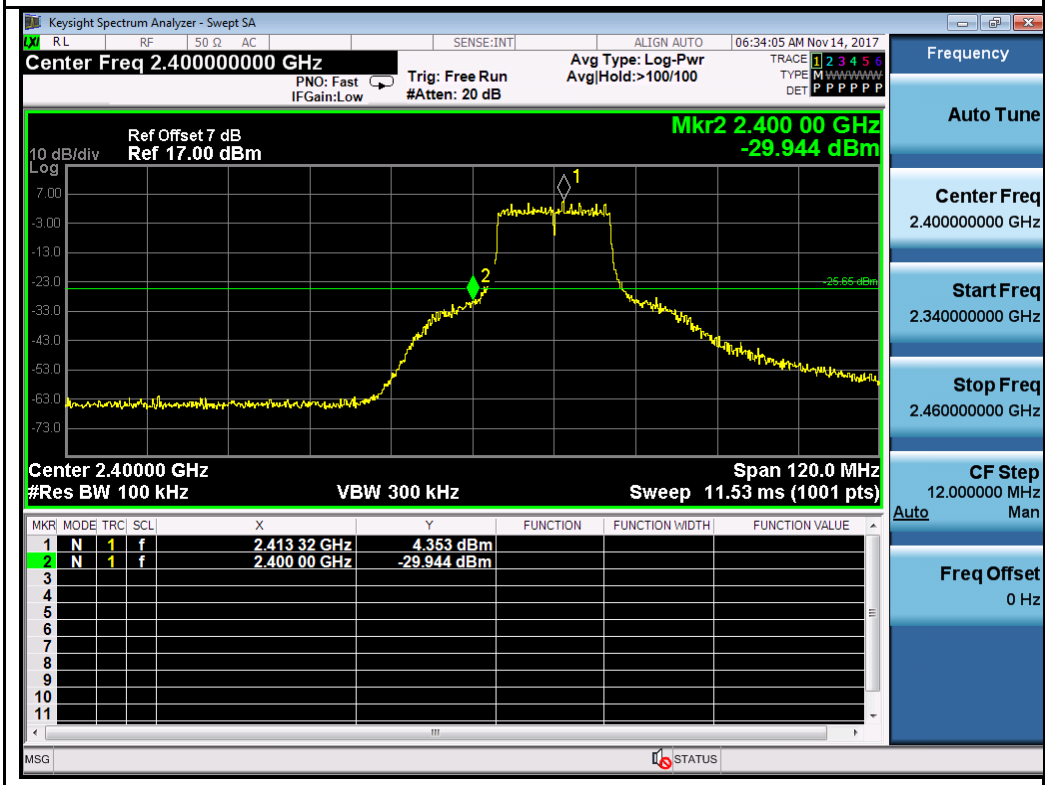
802.11b-2412MHz Chain 1

802.11b-2462MHz Chain 0

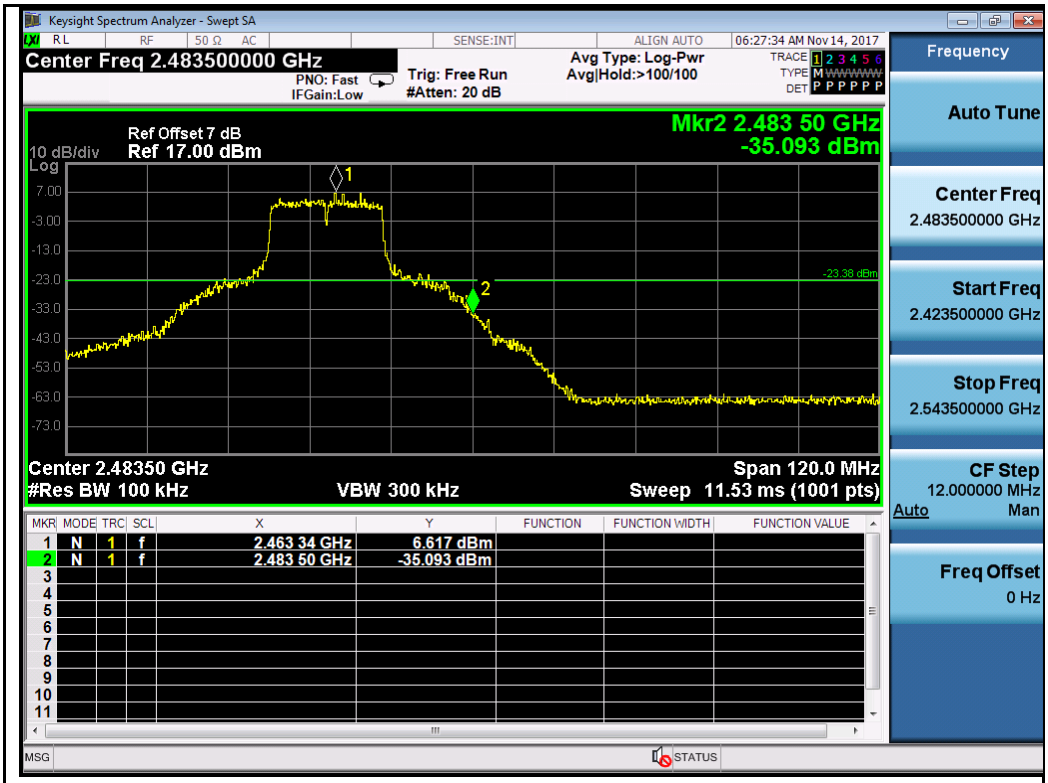
802.11b-2462MHz Chain 1



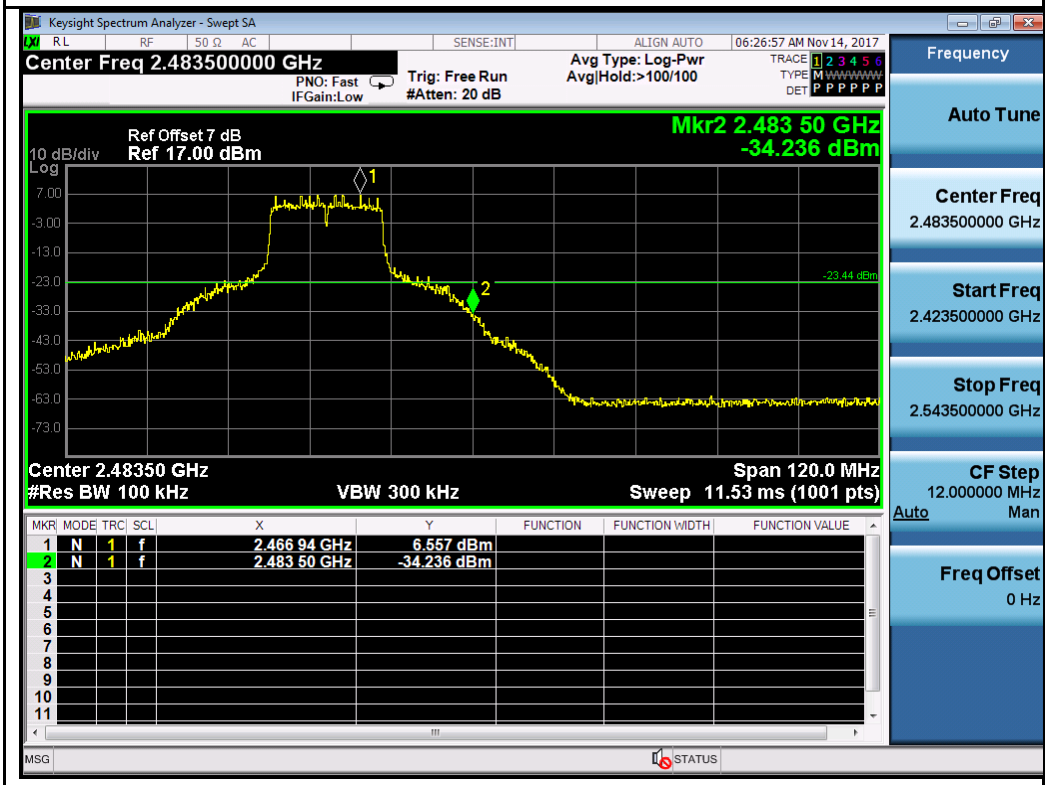
802.11g-2412MHz Chain 0



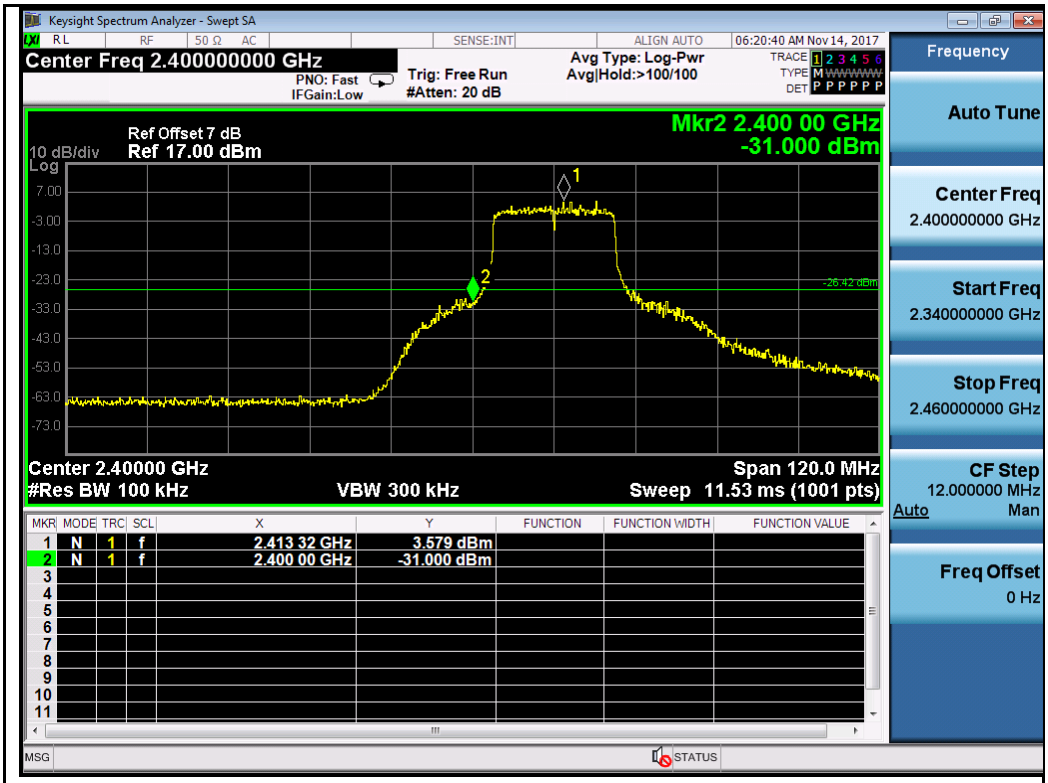
802.11g-2412MHz Chain 1



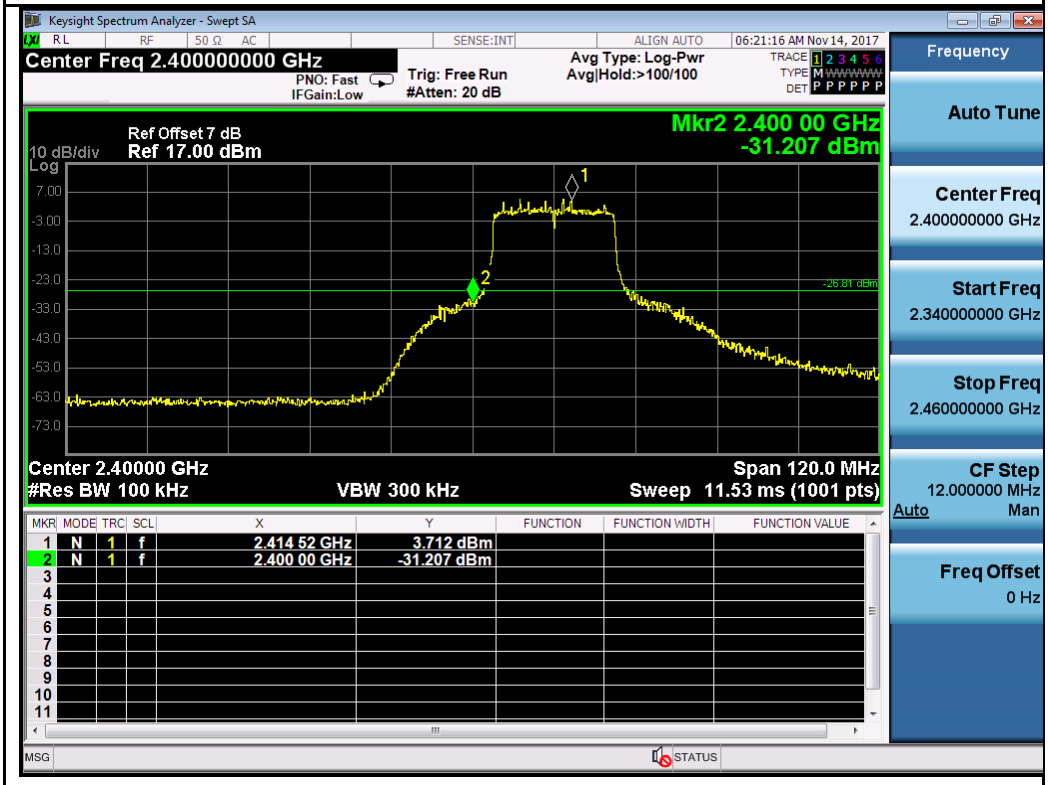
802.11g-2462MHz Chain 0



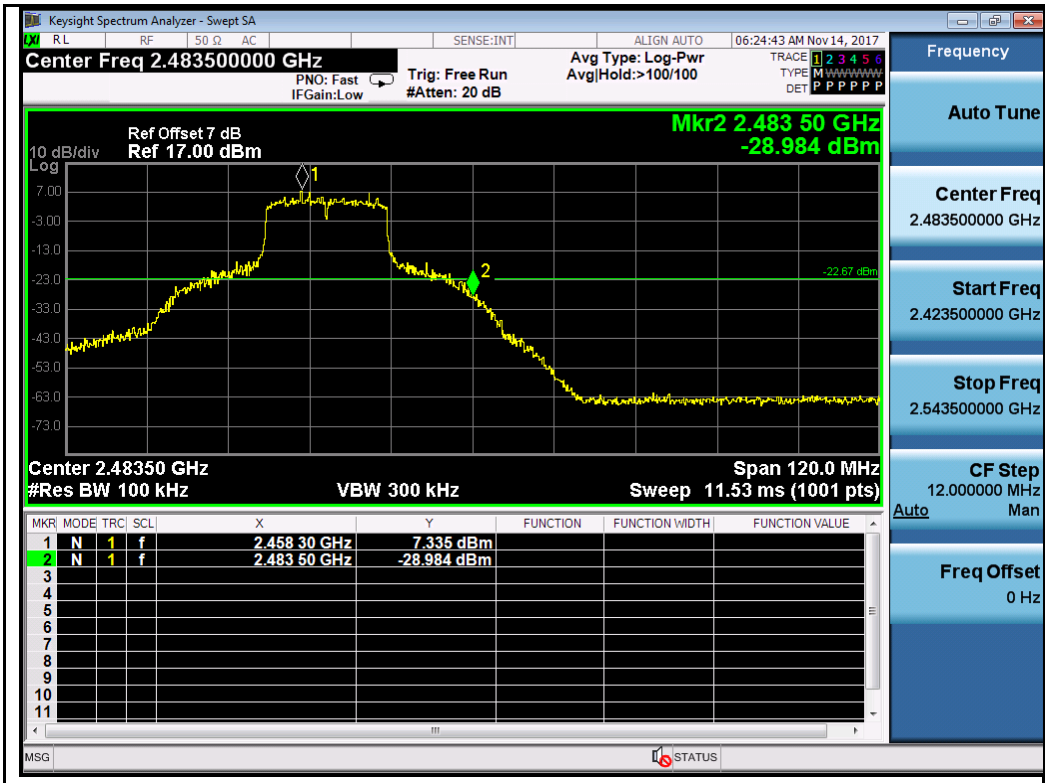
802.11g-2462MHz Chain 1



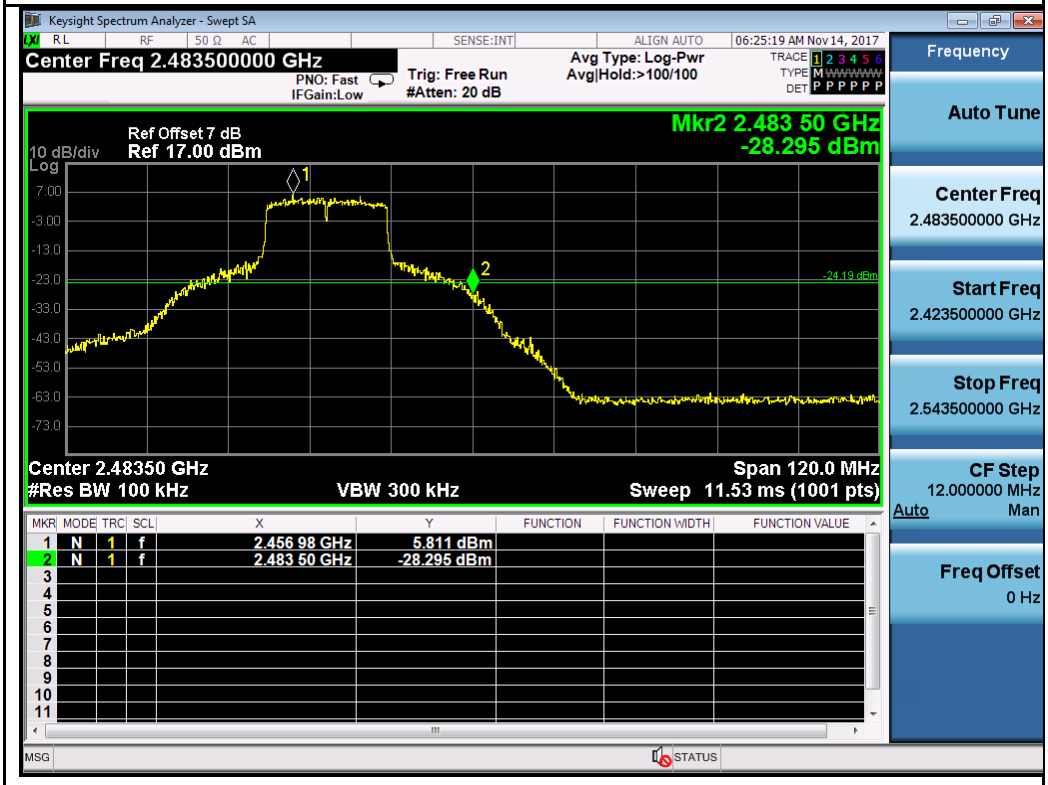
802.11n-HT20-2412MHz Chain 0



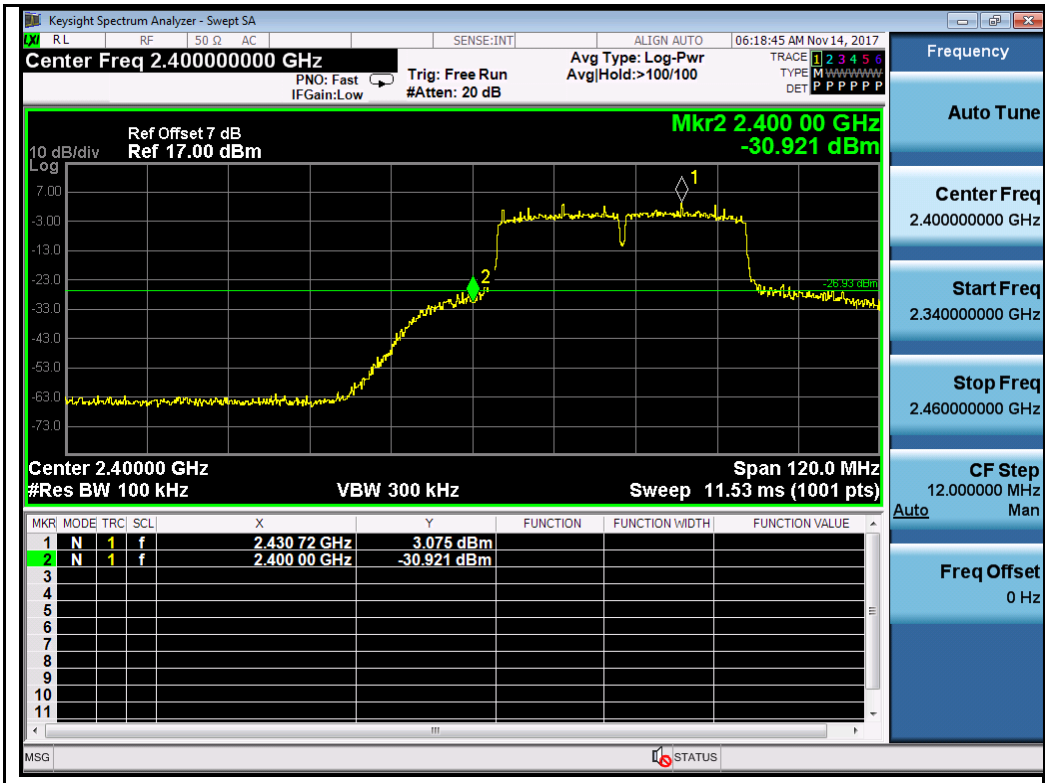
802.11n-HT20-2412MHz Chain 1



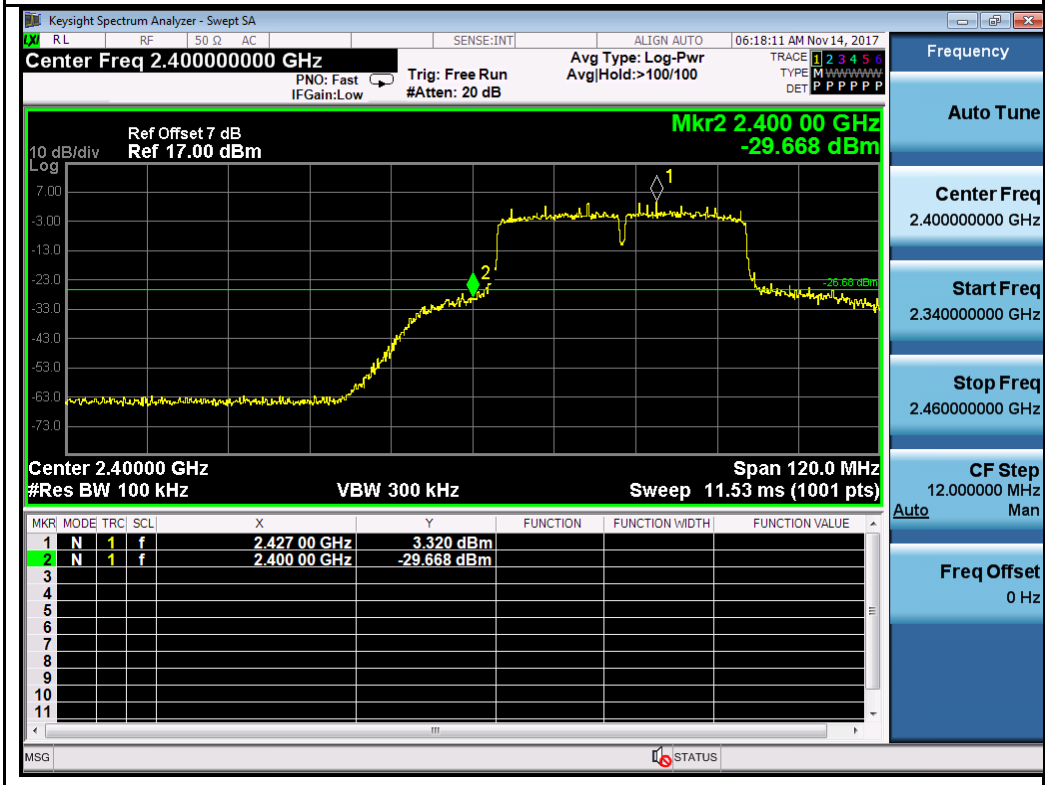
802.11n-HT20-2462MHz Chain 0



802.11n-HT20-2462MHz Chain 1

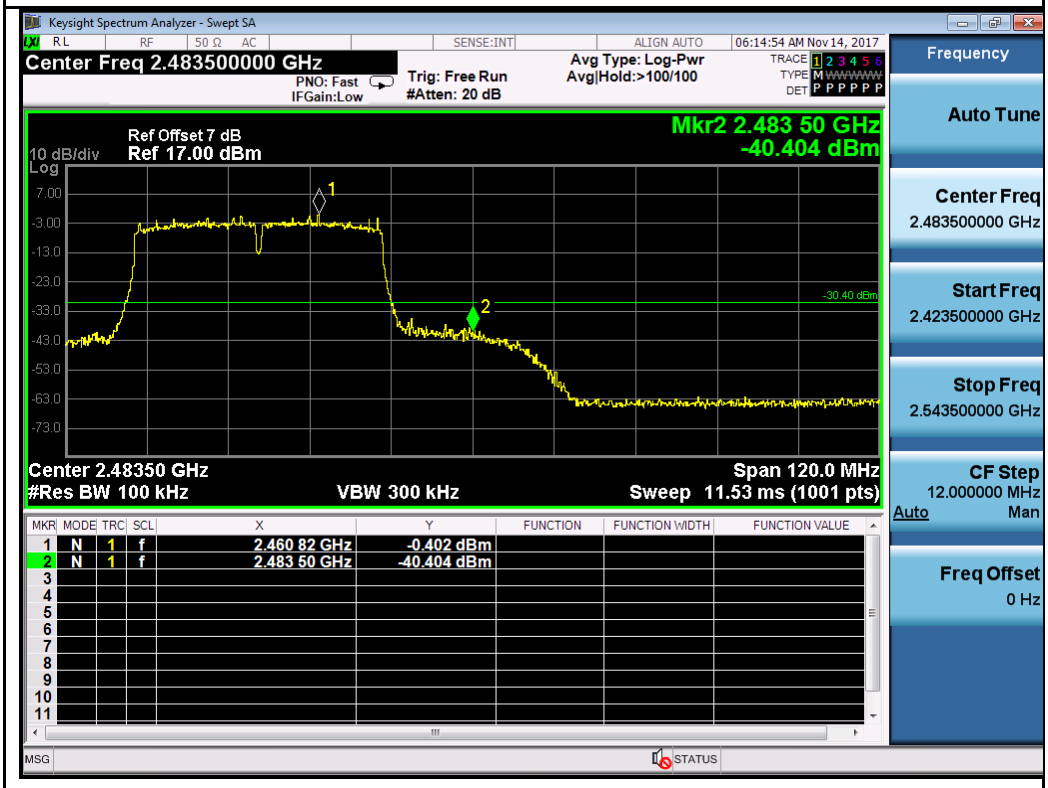


802.11n-HT40-2422MHz Chain 0



802.11n-HT40-2422MHz Chain 1

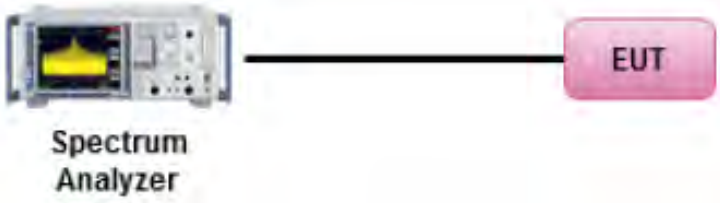
802.11n-HT40-2452MHz Chain 0



802.11n-HT40-2452MHz Chain 1

10.6 Peak Spectral Density

Requirement(s):

Spec	Item	Requirement	Applicable
§ 15.247(e) RSS247 (5.2.2)	e)	DSSS: ≤8dBm/3KHz	☒
	f)	DSSS in hybrid sys with FH turned off: ≤8dBm/3KHz	☐
Test Setup			
Test Procedure	558074 D01 DTS Meas Guidance v03r05, 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	11/11/2017-11/21/2017	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.

PSD measurement results

T310N

Type	Test mode	Freq (MHz)	CH	Conducted PSD (dBm/3KHz)			Limit (dBm/3KHz)	Result
				Chain0	Chain1	Combine		
PSD	802.11b	2412	Low	-3.225	-3.483	-0.342	≤5.3	Pass
		2437	Mid	-3.381	-3.004	-0.178	≤5.3	Pass
		2462	High	-0.996	-3.049	1.108	≤5.3	Pass
	802.11g	2412	Low	-11.310	-12.139	-8.694	≤5.3	Pass
		2437	Mid	-7.645	-6.259	-3.887	≤5.3	Pass
		2462	High	-8.799	-8.953	-5.865	≤5.3	Pass
	802.11n-20M	2412	Low	-11.906	-11.413	-8.642	≤5.3	Pass
		2437	Mid	-7.991	-7.579	-4.770	≤5.3	Pass
		2462	High	-8.676	-9.236	-5.937	≤5.3	Pass
	802.11n-40M	2422	Low	-12.017	-12.445	-9.215	≤5.3	Pass
		2437	Mid	-9.188	-8.774	-5.966	≤5.3	Pass
		2452	High	-12.318	-11.791	-9.036	≤5.3	Pass
Note	Two chains are cross-polarized, the directional gain = individual antenna gain = 8.7dBi. 8.7-6 = 2.7 dB limit adjustment is needed. All the mode transmission is MIMO.							

T310S

Type	Test mode	Freq (MHz)	CH	Conducted PSD (dBm/3KHz)			Limit (dBm/3KHz)	Result
				Chain0	Chain1	Combine		
PSD	802.11b	2412	Low	-3.209	4.045	4.794	≤8	Pass
		2437	Mid	-3.558	-3.584	-0.561	≤8	Pass
		2462	High	-4.548	-4.071	-1.293	≤8	Pass
	802.11g	2412	Low	-12.459	-11.936	-9.179	≤8	Pass
		2437	Mid	-7.438	-6.813	-4.104	≤8	Pass
		2462	High	-9.576	-9.732	-6.643	≤8	Pass
	802.11n-20M	2412	Low	-11.810	-11.905	-8.847	≤8	Pass
		2437	Mid	-7.513	-6.623	-4.035	≤8	Pass
		2462	High	-8.723	-8.732	-5.717	≤8	Pass
	802.11n-40M	2422	Low	-11.460	-13.624	-9.398	≤8	Pass
		2437	Mid	-9.443	-8.561	-5.969	≤8	Pass
		2452	High	-15.159	-14.628	-11.875	≤8	Pass
Note	Highest Two antennas are cross polarized, the directional gain = individual antenna gain = 6dBi. No limit adjustment is needed. All the mode transmission is MIMO.							

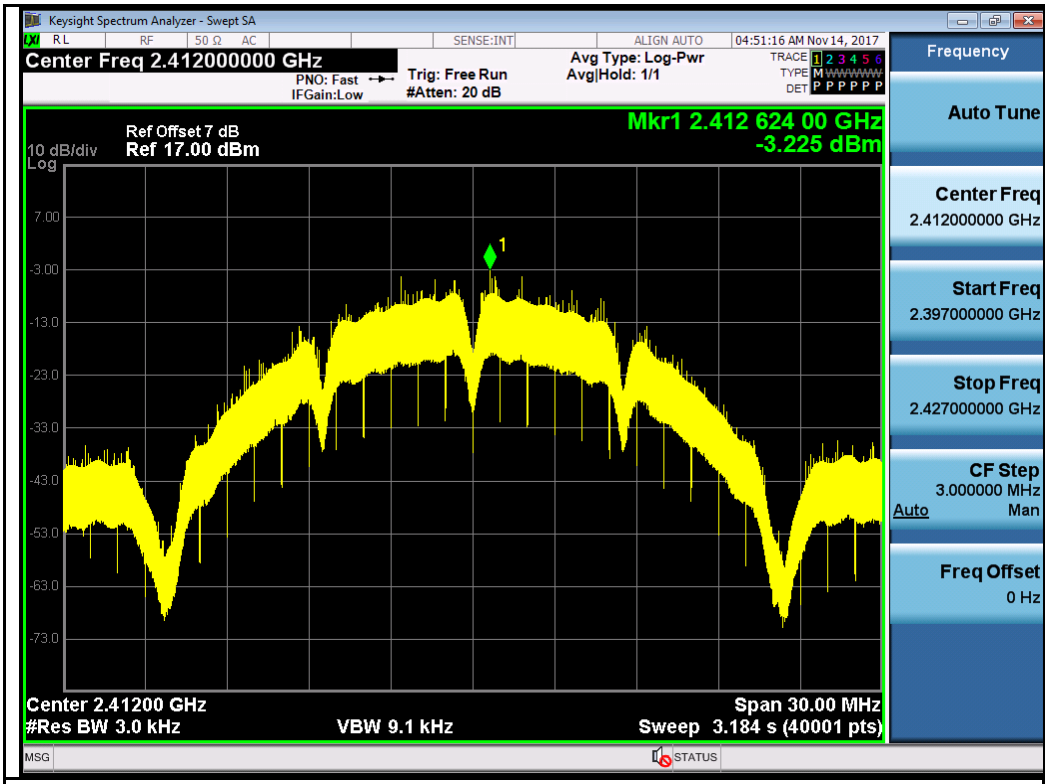
Beamforming

T310S

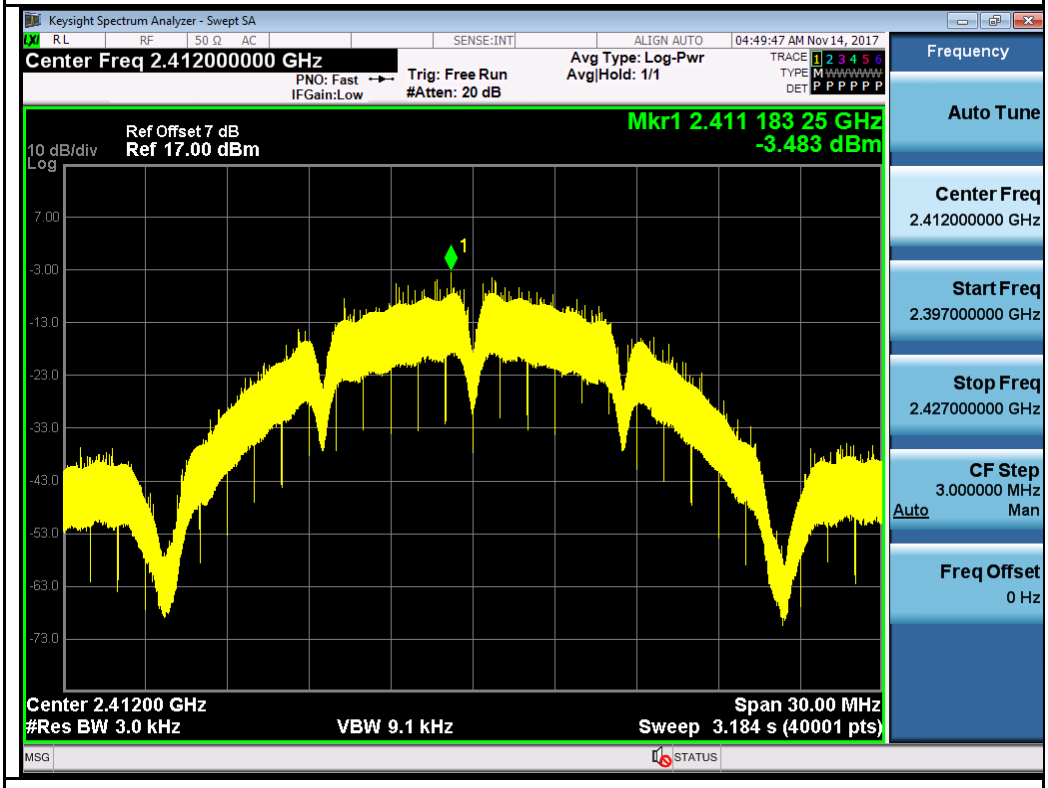
Type	Test mode	Freq (MHz)	CH	Conducted PSD (dBm/3KHz)			Limit (dBm/3KHz)	Result
				Chain0	Chain1	Combine		
PSD	802.11b	2412	Low	-3.209	4.045	4.794	≤5	Pass
		2437	Mid	-3.558	-3.584	-0.561	≤5	Pass
		2462	High	-4.548	-4.071	-1.293	≤5	Pass
	802.11g	2412	Low	-12.459	-11.936	-9.179	≤5	Pass
		2437	Mid	-7.438	-6.813	-4.104	≤5	Pass
		2462	High	-9.576	-9.732	-6.643	≤5	Pass
	802.11n-20M	2412	Low	-11.810	-11.905	-8.847	≤5	Pass
		2437	Mid	-7.513	-6.623	-4.035	≤5	Pass
		2462	High	-8.723	-8.732	-5.717	≤5	Pass
	802.11n-40M	2422	Low	-11.460	-13.624	-9.398	≤5	Pass
		2437	Mid	-9.443	-8.561	-5.969	≤5	Pass
		2452	High	-15.159	-14.628	-11.875	≤5	Pass
Note	Array gain is 10 log10(N_{ANT})=3dB, N_{ANT} = 2, highest individual gain is 6dBi, so max directional gain of the EUT is 9dBi. 9-6 = 3 dB limit adjustment is needed. All the mode transmission is MIMO.							

Test Plots:

T310N



802.11b-2412MHz Chain 0



802.11b-2412MHz Chain 1