HCT CO.,LTD.

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FCC DTS REPORT

FCC Certification

Applicant Name:
SAMSUNG Electronics Co., Ltd.

Address:
129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea

Date of Issue:
January 04, 2019

Test Site/Location:
HCT CO., LTD., 74,Seoicheon-ro 578beon-gil,Majang-myeo,Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA

Report No.: HCT-RF-1901-FC009

FCC ID : A3LSOL230-48D

APPLICANT : SAMSUNG Electronics Co., Ltd.

Model(s): SOL230-48D

EUT Type: Small cell (SOL230)

Average Output Power:

Omni Antenna

Mode	Ant.0 (SISO)	Ant.1 (SISO)	Ant.2 (SISO)	Ant.3 (SISO)	MIMO
802.11b	19.65 dBm	19.48 dBm	19.57 dBm	19.70 dBm	25.60 dBm
802.11g	19.90 dBm	19.77 dBm	19.92 dBm	19.90 dBm	25.89 dBm
802.11n_HT20	20.07 dBm	19.82 dBm	20.06 dBm	19.98 dBm	26.00 dBm
802.11n_HT40	20.03 dBm	19.71 dBm	19.84 dBm	20.01 dBm	25.92 dBm

Directional Antenna

Mode	Ant.0 (SISO)	Ant.1 (SISO)	Ant.2 (SISO)	Ant.3 (SISO)	MIMO
802.11b	14.83 dBm	15.05 dBm	15.19 dBm	15.08 dBm	21.01 dBm
802.11g	15.29 dBm	15.40 dBm	15.66 dBm	15.50 dBm	21.48 dBm
802.11n_HT20	15.00 dBm	15.03 dBm	15.36 dBm	15.15 dBm	21.16 dBm
802.11n_HT40	15.20 dBm	15.24 dBm	15.52 dBm	15.35 dBm	21.35 dBm

Frequency Range: 2412 MHz - 2462 MHz (2.4 GHz Band)

Modulation type: CCK/DSSS/OFDM

FCC Classification: Digital Transmission System(DTS)

FCC Rule Part(s): Part 15.247

Engineering Statement:

The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.
HCT CO., LTD. Certifies that no party to this application has subject to a denial of Federal benefits that includes FCC benefits pursuant to section 5301 of the Anti-Drug Abuse Act of 1998,21 U.S. C.853(a)

Report prepared by : Se Wook Park
Engineer of Telecommunication testing center

Approved by : Jong Seok Lee
Manager of Telecommunication testing center

Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-1901-FC009	January 04, 2019	- Revised the original report. (Original Report No.: HCT-R-1710-F005) - Revised the Omni average power table on page 4

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1. GENERAL INFORMATION

Applicant:	SAMSUNG Electronics Co.,Ltd.
Address:	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
FCC ID:	A3LSOL230-48D
EUT Type:	Small cell (SOL230)
Model:	SOL230-48D
Date(s) of Tests:	July 20, 2017 ~ October 25, 2017
Place of Tests:	HCT Co., Ltd. 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea

2. EUT DESCRIPTION

Model	SOL230-48D		
EUT Type	Small cell (SOL230)		
Power Supply	DC 48 V		
Frequency Range	TX: 2412 MHz ~ 2462 MHz RX: 2412 MHz ~ 2462 MHz		
Max. RF Output Power	Average (Omni)	Ant. 0 (SISO)	Wi-Fi 802.11b(19.65 dBm) / Wi-Fi 802.11g (19.90 dBm) / Wi-Fi 802.11n_HT20 (20.07 dBm) Wi-Fi 802.11n_HT40 (20.03 dBm)
		Ant.1 (SISO)	Wi-Fi 802.11b(19.48 dBm) / Wi-Fi 802.11g (19.77 dBm) / Wi-Fi 802.11n_HT20 (19.82 dBm) Wi-Fi 802.11n_HT40 (19.71 dBm)
		Ant.2 (SISO)	Wi-Fi 802.11b(19.57 dBm) / Wi-Fi 802.11g (19.92 dBm) / Wi-Fi 802.11n_HT20 (20.06 dBm) Wi-Fi 802.11n_HT40 (19.84 dBm)
		Ant.3 (SISO)	Wi-Fi 802.11b(19.70 dBm) / Wi-Fi 802.11g (19.90 dBm) / Wi-Fi 802.11n_HT20 (19.98 dBm) Wi-Fi 802.11n_HT40 (20.01 dBm)
		MIMO	Wi-Fi 802.11b(25.60 dBm) / Wi-Fi 802.11g (25.87 dBm) / Wi-Fi 802.11n_HT20 (26.00 dBm) Wi-Fi 802.11n_HT40 (25.92 dBm)
	Average (Directional)	Ant. 0 (SISO)	Wi-Fi 802.11b(14.83 dBm) / Wi-Fi 802.11g (15.29 dBm) / Wi-Fi 802.11n_HT20 (15.00 dBm) Wi-Fi 802.11n_HT40 (15.20 dBm)
		Ant.1 (SISO)	Wi-Fi 802.11b(15.05 dBm) / Wi-Fi 802.11g (15.40 dBm) / Wi-Fi 802.11n_HT20 (15.03 dBm) Wi-Fi 802.11n_HT40 (15.24 dBm)
		Ant.2 (SISO)	Wi-Fi 802.11b(15.19 dBm) / Wi-Fi 802.11g (15.66 dBm) / Wi-Fi 802.11n_HT20 (15.36 dBm) Wi-Fi 802.11n_HT40 (15.52 dBm)
		Ant.3 (SISO)	Wi-Fi 802.11b(15.08 dBm) / Wi-Fi 802.11g (15.50 dBm) / Wi-Fi 802.11n_HT20 (15.15 dBm) Wi-Fi 802.11n_HT40 (15.35 dBm)
		MIMO	Wi-Fi 802.11b(21.01 dBm) / Wi-Fi 802.11g (21.48 dBm) / Wi-Fi 802.11n_HT20 (21.16 dBm) Wi-Fi 802.11n_HT40 (21.35 dBm)
Modulation Type	DSSS/CCK(802.11b), OFDM(802.11g, 802.11n)		
Antenna Specification	Manufacturer: Ace Technology Antenna type: OMNI Antenna, Directional Antenna Peak Gain : cf. Section 6		

2.1 EUT OPERATING MODE

▣ Operating mode

Mode	Operating Mode	Operating Ant.
802.11b/g/n	SISO	Ant. 0
		Ant. 1
		Ant. 2
		Ant. 3
802.11b/g/n	MIMO	Ant. 0 & 1 & 2 & 3

Note : We have done all test case. Worst case is MIMO(CDD) for 802.11b/g/n_HT20, HT40 mode. So, we attached the result of MIMO for 802.11b/g/n mode.

3. TEST METHODOLOGY

FCC KDB 558074 D01 DTS Meas Guidance v04 dated April 05, 2017 entitled “Guidance for Performing Compliance Measurements on Digital Transmission Systems(DTS) and the measurement procedure described in ANSI C63.10(Version : 2013) ‘the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices’.

3.1 EUT CONFIGURATION

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

3.2 EUT EXERCISE

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

3.3 GENERAL TEST PROCEDURES

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2 of ANSI C63.10. (Version :2013) Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane below 1GHz. Above 1GHz with 1.5m using absorbers between the EUT and receive antenna. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 8 of ANSI C63.10. (Version: 2013)

Conducted Antenna Terminal

See Section from 9.1 to 9.2.(KDB 558074 v04)

3.4 DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

Channel low, mid and high with highest data rate (worst case) is chosen for full testing.

4. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipments, which is traceable to recognized national standards.
All equipments(spectrum, antenna, accessory, etc.) for measurement is calibrated in accordance with the requirements of C63.5 (Version: 2006).

5. FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

The SAC(Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at the 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea. The site is constructed in conformance with the requirements of ANSI C63.4. (Version :2014) and CISPR Publication 22. Detailed description of test facility was submitted to the Commission and accepted dated July 07, 2015 (Registration Number: 90661)

5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements. Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.
All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

6. ANTENNA REQUIREMENTS

According to FCC 47 CFR §15.203:

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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 antennas of this E.U.T are permanently attached.
*The E.U.T Complies with the requirement of §15.203

▣ Directional Gain Calculations

▪ **If any transmit signals are correlated with each other(802.11g/n_HT20, 40),**

Directional gain = $10*\log[(10^{G1/20} + 10^{G2/20}+\ldots+10^{GN/20})^2/N]$ dBi

▣ Antenna Gain

2.4 GHz Band (OMNI)

			Omni	Directional
Antenna Gain(SISO)	802.11b/g/n	Ant 0	dBi	3.3 dBi
		Ant 1	dBi	2.3 dBi
		Ant 2	dBi	3.7 dBi
		Ant 3	dBi	4.1 dBi
Antenna Gain(MIMO)	802.11b/g/n	Ant 0 & 1 & 2 & 3	dBi	9.4 dBi

2.4 GHz Band (Directional)

			Omni	Directional
Antenna Gain(SISO)	802.11b/g/n	Ant 0	dBi	3.6 dBi
		Ant 1	dBi	4.5 dBi
		Ant 2	dBi	3.5 dBi
		Ant 3	dBi	4.7 dBi
Antenna Gain(MIMO)	802.11b/g/n	Ant 0 & 1 & 2 & 3	dBi	10.11 dBi

7. MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4:2014.

All measurement uncertainty values are shown with a coverage factor of k = 2 to indicate a 95 % level of confidence.

Parameter	Expanded Uncertainty (±dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.82
Radiated Disturbance (9 kHz ~ 30 MHz)	3.40
Radiated Disturbance (30 MHz ~ 1 GHz)	4.80
Radiated Disturbance (1 GHz ~ 18 GHz)	5.70

8. SUMMARY TEST OF RESULTS

Test Description	FCC Part Section(s)	Test Limit	Test Condition	Test Result
6 dB Bandwidth	§15.247(a)(2)	> 500 kHz	CONDUCTED	PASS
Conducted Maximum Peak Output Power	§15.247(b)(3)	< 1 Watt		PASS
Power Spectral Density	§15.247(e)	< 8 dBm / 3 kHz Band		PASS
Band Edge(Out of Band Emissions)	§15.247(d)	Conducted > 30 dBc		PASS
AC Power line Conducted Emissions	§15.207	cf. Section 9.7		N/A
Radiated Spurious Emissions	§15.205, 15.209	cf. Section 9.6.1	RADIATED	PASS
Radiated Restricted Band Edge	§15.247(d), 15.205, 15.209	cf. Section 9.6.2		PASS

*N/A = Not Tested.

9. TEST RESULT

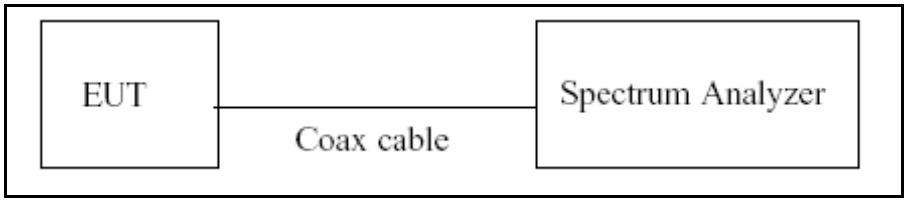
9.1 DUTY CYCLE

▣ TEST PROCEDURE

According to Section 6.0)b) in KDB 558074 v04

The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on and off times of the transmitted signal. Set the center frequency of the instrument to the center frequency of the transmission. Set RBW ≥ OBW if possible; otherwise, set RBW to the largest available value. Set VBW ≥ RBW. Set detector = peak or average. The zero-span measurement method shall not be used unless both RBW and VBW are > 50/T and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if T ≤ 16.7 microseconds.)

▣ TEST CONFIGURATION



▣ TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer. We tested accroding to the zero-span measurement method, 6.0)b) in KDB 558074 v04

The largest availble value of RBW is 8 MHz and VBW is 50 MHz. The zero-span method of measuring duty cycle shall not be used if T ≤ 6.25 microseconds. (50/6.25 = 8)

The zero-span method was used because all measured T data are > 6.25 microseconds and both RBW and VBW are > 50/*T*.

1. RBW = 8 MHz (the largest availble value)
2. VBW = 8 MHz (≥ RBW)
3. SPAN = 0 Hz
4. Detector = Peak
5. Number of points in sweep > 100
6. Trace mode = Clear write
7. Measure T_{total} and T_{on}
8. Calculate Duty Cycle = T_{on}/ T_{total} and Duty Cycle Factor = 10*log(1/Duty Cycle)

▣ Duty Cycle Factor_Ant 0_Omni

Mode	Data Rate	T_{on} (ms)	T_{total} (ms)	Duty Cycle	Duty Cycle Factor (dB)
b	1 Mbps	12.418	12.508	0.99278844	0.031
	2 Mbps	6.311	6.371	0.99053083	0.041
	5.5 Mbps	2.414	2.477	0.97446238	0.112
	11 Mbps	1.305	1.369	0.95315559	0.208
g	6 Mbps	2.067	2.132	0.96951220	0.134
	9 Mbps	1.385	1.451	0.95454765	0.202
	12 Mbps	1.044	1.114	0.93750000	0.280
	18 Mbps	0.704	0.769	0.91457203	0.388
	24 Mbps	0.532	0.596	0.89244080	0.494
	36 Mbps	0.364	0.432	0.84168272	0.749
	48 Mbps	0.276	0.340	0.81364424	0.896
	54 Mbps	0.249	0.315	0.78994569	1.024
n_HT20	MCS 0	5.003	5.064	0.98807156	0.052
	MCS 1	4.983	5.043	0.98802395	0.052
	MCS 2	4.158	4.218	0.98568018	0.063
	MCS 3	4.973	5.033	0.98799999	0.052
	MCS 4	3.333	3.400	0.98019898	0.087
	MCS 5	2.498	2.572	0.97120674	0.127
	MCS 6	2.229	2.296	0.97081716	0.129
	MCS 7	2.010	2.079	0.96681097	0.147
n_HT40	MCS 0	2.427	2.492	0.97378411	0.115
	MCS 1	2.422	2.487	0.97373489	0.116
	MCS 2	2.021	2.091	0.96651791	0.148
	MCS 3	2.413	2.483	0.97180455	0.124
	MCS 4	1.624	1.689	0.96132786	0.171
	MCS 5	1.222	1.288	0.94890511	0.228
	MCS 6	1.094	1.156	0.94579657	0.242
	MCS 7	0.990	1.053	0.94047587	0.267

Note : Duty Cycle Factor = 10*log(1/Duty Cycle). where, Duty Cycle = T_{on} / T_{total}

▣ Duty Cycle Factor_Ant 1_Omni

Mode	Data Rate	T_{on} (ms)	T_{total} (ms)	Duty Cycle	Duty Cycle Factor (dB)
b	1 Mbps	12.418	12.508	0.99278844	0.031
	2 Mbps	6.311	6.371	0.99053083	0.041
	5.5 Mbps	2.419	2.482	0.97450846	0.112
	11 Mbps	1.305	1.369	0.95315559	0.208
g	6 Mbps	2.062	2.131	0.96755877	0.143
	9 Mbps	1.383	1.449	0.95471709	0.201
	12 Mbps	1.044	1.114	0.93699515	0.283
	18 Mbps	0.704	0.770	0.91355140	0.393
	24 Mbps	0.533	0.595	0.89516129	0.481
	36 Mbps	0.365	0.433	0.84210526	0.746
	48 Mbps	0.276	0.340	0.81425664	0.892
	54 Mbps	0.248	0.314	0.78971985	1.025
n_HT20	MCS 0	5.003	5.074	0.98611045	0.061
	MCS 1	4.983	5.043	0.98802395	0.052
	MCS 2	4.158	4.228	0.98333254	0.073
	MCS 3	4.963	5.033	0.98600132	0.061
	MCS 4	3.326	3.400	0.97821976	0.096
	MCS 5	2.505	2.572	0.97382325	0.115
	MCS 6	2.229	2.303	0.96783481	0.142
	MCS 7	2.014	2.081	0.96781121	0.142
n_HT40	MCS 0	2.427	2.493	0.97357590	0.116
	MCS 1	2.417	2.483	0.97346808	0.117
	MCS 2	2.020	2.088	0.96742671	0.144
	MCS 3	2.414	2.482	0.97260274	0.121
	MCS 4	1.622	1.690	0.95975855	0.178
	MCS 5	1.224	1.287	0.95070176	0.220
	MCS 6	1.093	1.158	0.94324294	0.254
	MCS 7	0.988	1.059	0.93362210	0.298

Note : Duty Cycle Factor = 10*log(1/Duty Cycle). where, Duty Cycle = T_{on} / T_{total}

▣ Duty Cycle Factor_Ant 2_Omni

Mode	Data Rate	T_{on} (ms)	T_{total} (ms)	Duty Cycle	Duty Cycle Factor (dB)
b	1 Mbps	12.448	12.508	0.99519496	0.021
	2 Mbps	6.311	6.371	0.99053083	0.041
	5.5 Mbps	2.414	2.477	0.97446238	0.112
	11 Mbps	1.305	1.369	0.95315559	0.208
g	6 Mbps	2.062	2.127	0.96940575	0.135
	9 Mbps	1.383	1.451	0.95292132	0.209
	12 Mbps	1.044	1.114	0.93699515	0.283
	18 Mbps	0.704	0.770	0.91355140	0.393
	24 Mbps	0.533	0.595	0.89516129	0.481
	36 Mbps	0.364	0.444	0.81891892	0.868
	48 Mbps	0.276	0.344	0.80232558	0.956
	54 Mbps	0.248	0.315	0.78762555	1.037
n_HT20	MCS 0	5.003	5.074	0.98611045	0.061
	MCS 1	4.983	5.043	0.98802395	0.052
	MCS 2	4.147	4.218	0.98329512	0.073
	MCS 3	4.973	5.033	0.98799999	0.052
	MCS 4	3.322	3.392	0.97922752	0.091
	MCS 5	2.503	2.574	0.97243839	0.121
	MCS 6	2.230	2.298	0.97041420	0.130
	MCS 7	2.013	2.081	0.96732026	0.144
n_HT40	MCS 0	2.427	2.493	0.97357590	0.116
	MCS 1	2.422	2.488	0.97352607	0.117
	MCS 2	2.022	2.087	0.96844506	0.139
	MCS 3	2.412	2.483	0.97142592	0.126
	MCS 4	1.622	1.686	0.96169355	0.170
	MCS 5	1.224	1.285	0.95238095	0.212
	MCS 6	1.090	1.156	0.94314014	0.254
	MCS 7	0.988	1.059	0.93362210	0.298

Note : Duty Cycle Factor = 10*log(1/Duty Cycle). where, Duty Cycle = T_{on} / T_{total}

▣ Duty Cycle Factor_Ant 3_Omni

Mode	Data Rate	T_{on} (ms)	T_{total} (ms)	Duty Cycle	Duty Cycle Factor (dB)
b	1 Mbps	12.448	12.508	0.99519496	0.021
	2 Mbps	6.311	6.371	0.99053083	0.041
	5.5 Mbps	2.419	2.482	0.97450846	0.112
	11 Mbps	1.307	1.369	0.95465870	0.202
g	6 Mbps	2.063	2.132	0.96748124	0.144
	9 Mbps	1.382	1.448	0.95445095	0.202
	12 Mbps	1.043	1.112	0.93814452	0.277
	18 Mbps	0.704	0.769	0.91457203	0.388
	24 Mbps	0.532	0.596	0.89261745	0.493
	36 Mbps	0.364	0.432	0.84337349	0.740
	48 Mbps	0.276	0.339	0.81329843	0.898
	54 Mbps	0.249	0.315	0.79063255	1.020
n_HT20	MCS 0	5.003	5.074	0.98611045	0.061
	MCS 1	4.983	5.053	0.98605513	0.061
	MCS 2	4.147	4.218	0.98329512	0.073
	MCS 3	4.973	5.033	0.98799999	0.052
	MCS 4	3.326	3.400	0.97821976	0.096
	MCS 5	2.505	2.572	0.97382325	0.115
	MCS 6	2.229	2.296	0.97081716	0.129
	MCS 7	2.010	2.079	0.96681097	0.147
n_HT40	MCS 0	2.427	2.493	0.97357590	0.116
	MCS 1	2.422	2.488	0.97352607	0.117
	MCS 2	2.022	2.087	0.96844506	0.139
	MCS 3	2.412	2.483	0.97142592	0.126
	MCS 4	1.618	1.686	0.95967742	0.179
	MCS 5	1.224	1.287	0.95070176	0.220
	MCS 6	1.093	1.158	0.94324294	0.254
	MCS 7	0.988	1.059	0.93362210	0.298

Note : Duty Cycle Factor = 10*log(1/Duty Cycle). where, Duty Cycle = T_{on} / T_{total}

▣ Duty Cycle Factor_Ant 0_Directional

Mode	Data Rate	T_{on} (ms)	T_{total} (ms)	Duty Cycle	Duty Cycle Factor (dB)
b	1 Mbps	12.418	12.508	0.99278844	0.031
	2 Mbps	6.311	6.371	0.99053083	0.041
	5.5 Mbps	2.414	2.477	0.97446238	0.112
	11 Mbps	1.305	1.369	0.95315559	0.208
g	6 Mbps	2.067	2.132	0.96951220	0.134
	9 Mbps	1.385	1.451	0.95454765	0.202
	12 Mbps	1.044	1.114	0.93750000	0.280
	18 Mbps	0.704	0.769	0.91457203	0.388
	24 Mbps	0.532	0.596	0.89244080	0.494
	36 Mbps	0.364	0.432	0.84168272	0.749
	48 Mbps	0.276	0.340	0.81364424	0.896
	54 Mbps	0.249	0.315	0.78994569	1.024
n_HT20	MCS 0	5.003	5.064	0.98807156	0.052
	MCS 1	4.983	5.043	0.98802395	0.052
	MCS 2	4.158	4.218	0.98568018	0.063
	MCS 3	4.973	5.033	0.98799999	0.052
	MCS 4	3.333	3.400	0.98019898	0.087
	MCS 5	2.498	2.572	0.97120674	0.127
	MCS 6	2.229	2.296	0.97081716	0.129
	MCS 7	2.010	2.079	0.96681097	0.147
n_HT40	MCS 0	2.427	2.492	0.97378411	0.115
	MCS 1	2.422	2.487	0.97373489	0.116
	MCS 2	2.021	2.091	0.96651791	0.148
	MCS 3	2.413	2.483	0.97180455	0.124
	MCS 4	1.624	1.689	0.96132786	0.171
	MCS 5	1.222	1.288	0.94890511	0.228
	MCS 6	1.094	1.156	0.94579657	0.242
	MCS 7	0.990	1.053	0.94047587	0.267

Note : Duty Cycle Factor = 10*log(1/Duty Cycle). where, Duty Cycle = T_{on} / T_{total}

▣ Duty Cycle Factor_Ant 1_Directional

Mode	Data Rate	T_{on} (ms)	T_{total} (ms)	Duty Cycle	Duty Cycle Factor (dB)
b	1 Mbps	12.418	12.508	0.99278844	0.031
	2 Mbps	6.311	6.371	0.99053083	0.041
	5.5 Mbps	2.414	2.477	0.97446238	0.112
	11 Mbps	1.305	1.369	0.95315559	0.208
g	6 Mbps	2.067	2.132	0.96951220	0.134
	9 Mbps	1.385	1.451	0.95454765	0.202
	12 Mbps	1.044	1.114	0.93750000	0.280
	18 Mbps	0.704	0.769	0.91457203	0.388
	24 Mbps	0.532	0.596	0.89244080	0.494
	36 Mbps	0.364	0.432	0.84168272	0.749
	48 Mbps	0.276	0.340	0.81364424	0.896
	54 Mbps	0.249	0.315	0.78994569	1.024
n_HT20	MCS 0	5.003	5.064	0.98807156	0.052
	MCS 1	4.983	5.043	0.98802395	0.052
	MCS 2	4.158	4.218	0.98568018	0.063
	MCS 3	4.973	5.033	0.98799999	0.052
	MCS 4	3.333	3.400	0.98019898	0.087
	MCS 5	2.498	2.572	0.97120674	0.127
	MCS 6	2.229	2.296	0.97081716	0.129
	MCS 7	2.010	2.079	0.96681097	0.147
n_HT40	MCS 0	2.427	2.492	0.97378411	0.115
	MCS 1	2.422	2.487	0.97373489	0.116
	MCS 2	2.021	2.091	0.96651791	0.148
	MCS 3	2.413	2.483	0.97180455	0.124
	MCS 4	1.624	1.689	0.96132786	0.171
	MCS 5	1.222	1.288	0.94890511	0.228
	MCS 6	1.094	1.156	0.94579657	0.242
	MCS 7	0.990	1.053	0.94047587	0.267

Note : Duty Cycle Factor = 10*log(1/Duty Cycle). where, Duty Cycle = T_{on} / T_{total}

▣ Duty Cycle Factor_Ant 2_Directional

Mode	Data Rate	T_{on} (ms)	T_{total} (ms)	Duty Cycle	Duty Cycle Factor (dB)
b	1 Mbps	12.418	12.508	0.99278844	0.031
	2 Mbps	6.311	6.371	0.99053083	0.041
	5.5 Mbps	2.414	2.477	0.97446238	0.112
	11 Mbps	1.305	1.369	0.95315559	0.208
g	6 Mbps	2.067	2.132	0.96951220	0.134
	9 Mbps	1.385	1.451	0.95454765	0.202
	12 Mbps	1.044	1.114	0.93750000	0.280
	18 Mbps	0.704	0.769	0.91457203	0.388
	24 Mbps	0.532	0.596	0.89244080	0.494
	36 Mbps	0.364	0.432	0.84168272	0.749
	48 Mbps	0.276	0.340	0.81364424	0.896
	54 Mbps	0.249	0.315	0.78994569	1.024
n_HT20	MCS 0	5.003	5.064	0.98807156	0.052
	MCS 1	4.983	5.043	0.98802395	0.052
	MCS 2	4.158	4.218	0.98568018	0.063
	MCS 3	4.973	5.033	0.98799999	0.052
	MCS 4	3.333	3.400	0.98019898	0.087
	MCS 5	2.498	2.572	0.97120674	0.127
	MCS 6	2.229	2.296	0.97081716	0.129
	MCS 7	2.010	2.079	0.96681097	0.147
n_HT40	MCS 0	2.427	2.492	0.97378411	0.115
	MCS 1	2.422	2.487	0.97373489	0.116
	MCS 2	2.021	2.091	0.96651791	0.148
	MCS 3	2.413	2.483	0.97180455	0.124
	MCS 4	1.624	1.689	0.96132786	0.171
	MCS 5	1.222	1.288	0.94890511	0.228
	MCS 6	1.094	1.156	0.94579657	0.242
	MCS 7	0.990	1.053	0.94047587	0.267

Note : Duty Cycle Factor = 10*log(1/Duty Cycle). where, Duty Cycle = T_{on} / T_{total}

▣ Duty Cycle Factor_Ant 3_Directional

Mode	Data Rate	T_{on} (ms)	T_{total} (ms)	Duty Cycle	Duty Cycle Factor (dB)
b	1 Mbps	12.418	12.508	0.99278844	0.031
	2 Mbps	6.311	6.371	0.99053083	0.041
	5.5 Mbps	2.414	2.477	0.97446238	0.112
	11 Mbps	1.305	1.369	0.95315559	0.208
g	6 Mbps	2.067	2.132	0.96951220	0.134
	9 Mbps	1.385	1.451	0.95454765	0.202
	12 Mbps	1.044	1.114	0.93750000	0.280
	18 Mbps	0.704	0.769	0.91457203	0.388
	24 Mbps	0.532	0.596	0.89244080	0.494
	36 Mbps	0.364	0.432	0.84168272	0.749
	48 Mbps	0.276	0.340	0.81364424	0.896
	54 Mbps	0.249	0.315	0.78994569	1.024
n_HT20	MCS 0	5.003	5.064	0.98807156	0.052
	MCS 1	4.983	5.043	0.98802395	0.052
	MCS 2	4.158	4.218	0.98568018	0.063
	MCS 3	4.973	5.033	0.98799999	0.052
	MCS 4	3.333	3.400	0.98019898	0.087
	MCS 5	2.498	2.572	0.97120674	0.127
	MCS 6	2.229	2.296	0.97081716	0.129
	MCS 7	2.010	2.079	0.96681097	0.147
n_HT40	MCS 0	2.427	2.492	0.97378411	0.115
	MCS 1	2.422	2.487	0.97373489	0.116
	MCS 2	2.021	2.091	0.96651791	0.148
	MCS 3	2.413	2.483	0.97180455	0.124
	MCS 4	1.624	1.689	0.96132786	0.171
	MCS 5	1.222	1.288	0.94890511	0.228
	MCS 6	1.094	1.156	0.94579657	0.242
	MCS 7	0.990	1.053	0.94047587	0.267

Note : Duty Cycle Factor = 10*log(1/Duty Cycle). where, Duty Cycle = T_{on} / T_{total}

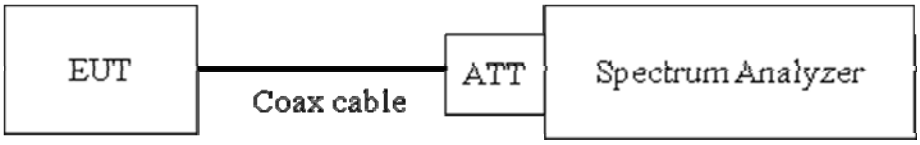
9.2 6dB BANDWIDTH

Test Requirements and limit, §15.247(a)(2)

The bandwidth at 6dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the receive antenna while the EUT is operating in transmission mode at the appropriate frequencies.

The minimum permissible 6dB bandwidth is 500 kHz.

▣ TEST CONFIGURATION



▣ TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer.

The Spectrum Analyzer is set to (Procedure 8.1 in KDB 558074 v04)

RBW = 100 kHz

VBW ≥ 3 x RBW

Detector = Peak

Trace mode = max hold

Sweep = auto couple

Allow the trace to stabilize

Note : We tested 6 dB bandwidth using the automatic bandwidth measurement capability of a spectrum analyzer. X dB is set 6 dB.

▣ TEST RESULTS_Ant.0_Omni

Conducted 6dB Bandwidth Measurements for 802.11b

802.11b Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2412	1	8.102	0.500	Pass
2437	6	8.099	0.500	Pass
2462	11	8.098	0.500	Pass

Conducted 6dB Bandwidth Measurements for 802.11g

802.11g Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2412	1	16.06	0.500	Pass
2437	6	16.32	0.500	Pass
2462	11	16.08	0.500	Pass

Conducted 6dB Bandwidth Measurements for 802.11n_HT20

802.11n Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2412	1	16.93	0.500	Pass
2437	6	17.59	0.500	Pass
2462	11	16.97	0.500	Pass

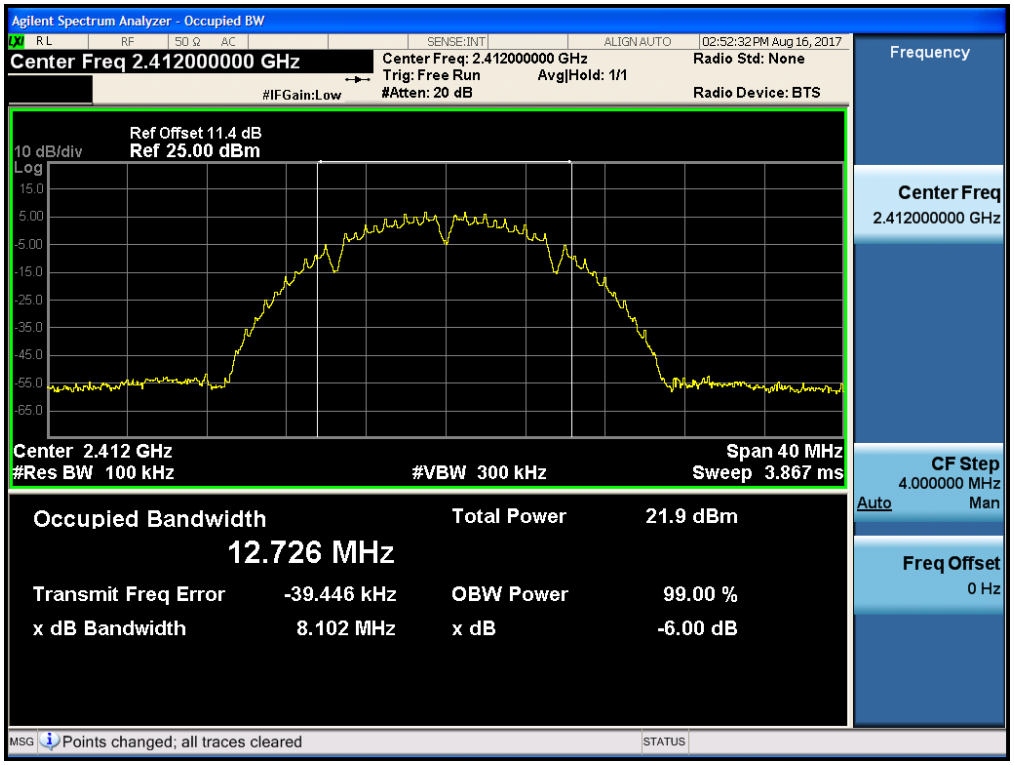
Conducted 6dB Bandwidth Measurements for 802.11n_HT40

802.11n Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2422	3	33.92	0.500	Pass
2437	6	35.35	0.500	Pass
2452	9	35.76	0.500	Pass

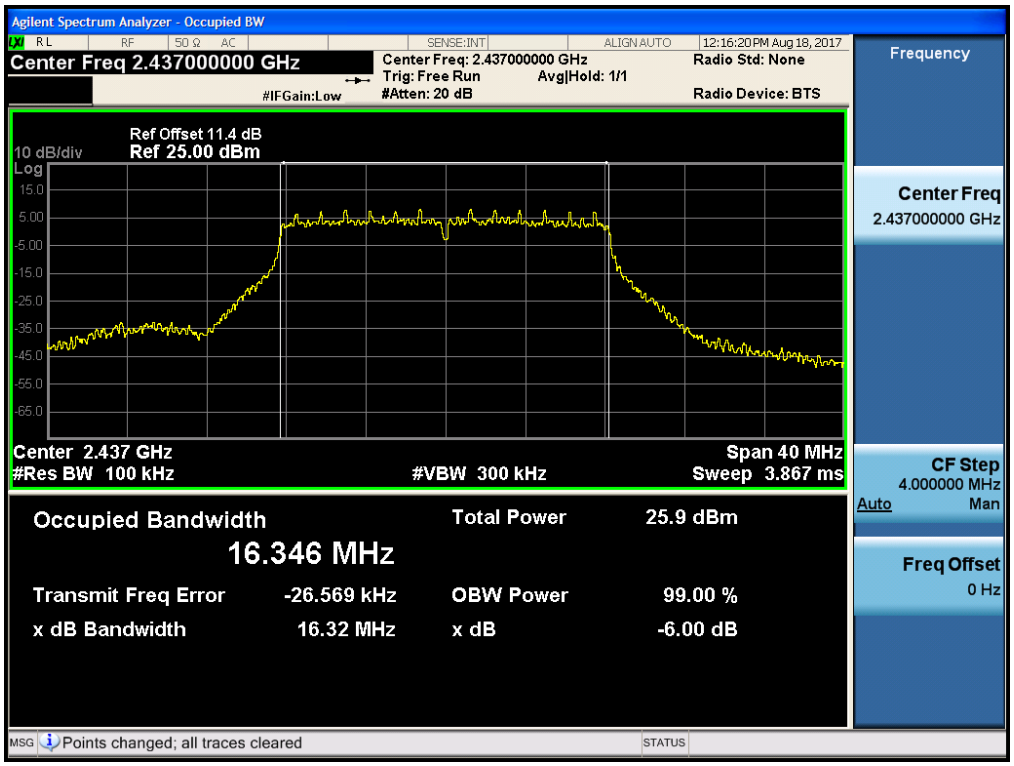
Note : In order to simplify the report, attached plots were only the most wide 6 dB BW channel.

▣ RESULT PLOTS

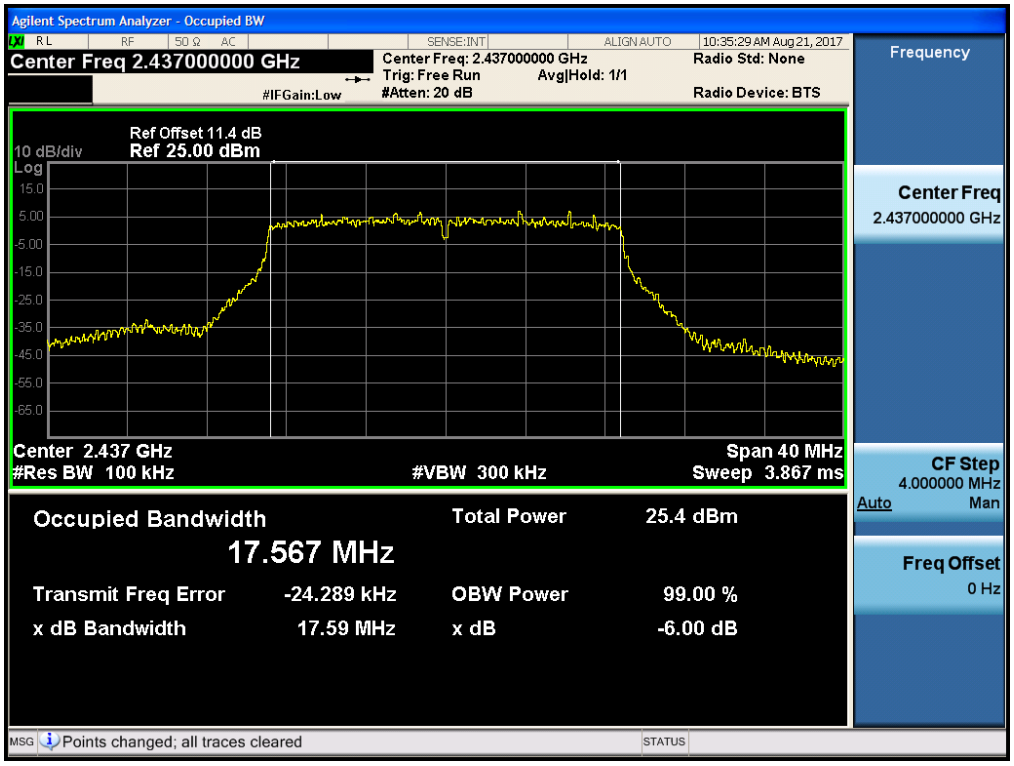
6dB Bandwidth plot (802.11b-CH 1)



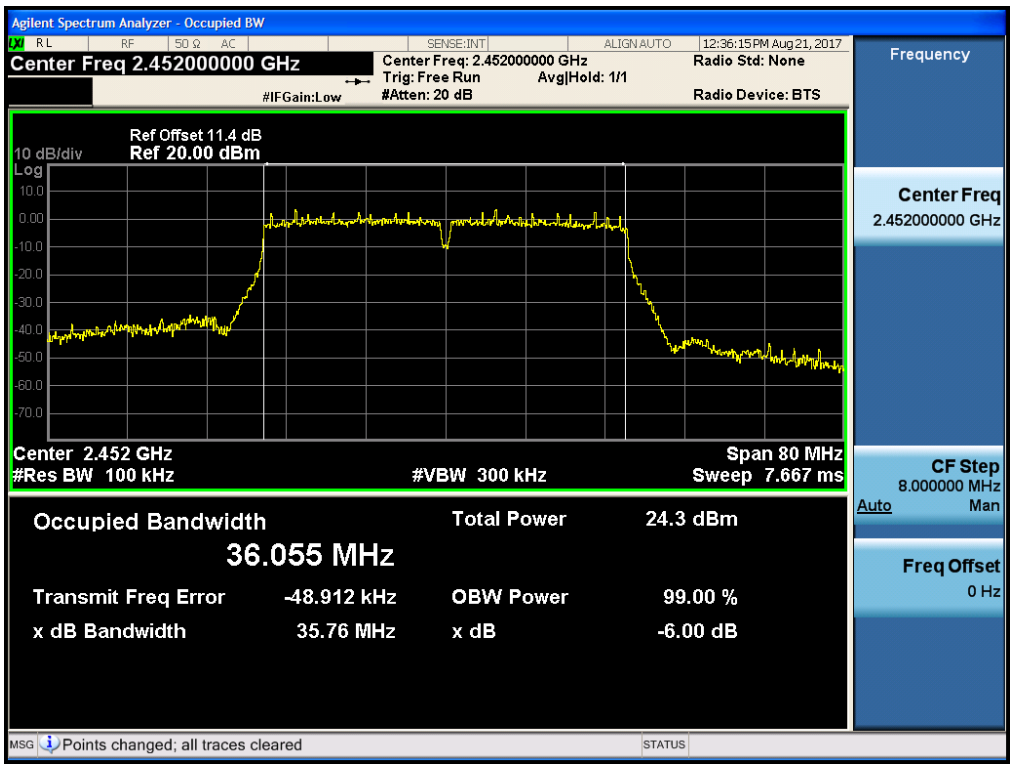
6dB Bandwidth plot (802.11g-CH 6)



6dB Bandwidth plot (802.11n_HT20-CH 6)



6dB Bandwidth plot (802.11n_HT40-CH 9)



▣ TEST RESULTS_Ant.1_Omni

Conducted 6dB Bandwidth Measurements for 802.11b

802.11b Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2412	1	8.102	0.500	Pass
2437	6	8.100	0.500	Pass
2462	11	8.102	0.500	Pass

Conducted 6dB Bandwidth Measurements for 802.11g

802.11g Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2412	1	16.29	0.500	Pass
2437	6	15.95	0.500	Pass
2462	11	16.32	0.500	Pass

Conducted 6dB Bandwidth Measurements for 802.11n_HT20

802.11n Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2412	1	16.02	0.500	Pass
2437	6	16.81	0.500	Pass
2462	11	16.62	0.500	Pass

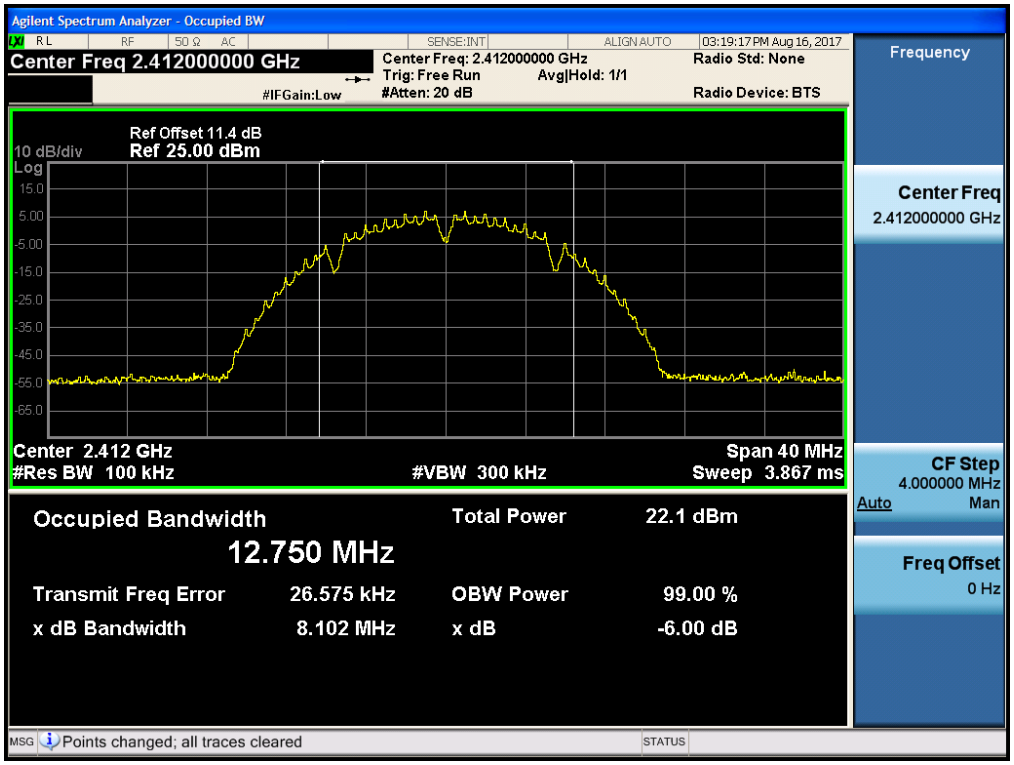
Conducted 6dB Bandwidth Measurements for 802.11n_HT40

802.11n Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2422	3	35.20	0.500	Pass
2437	6	35.22	0.500	Pass
2452	9	35.20	0.500	Pass

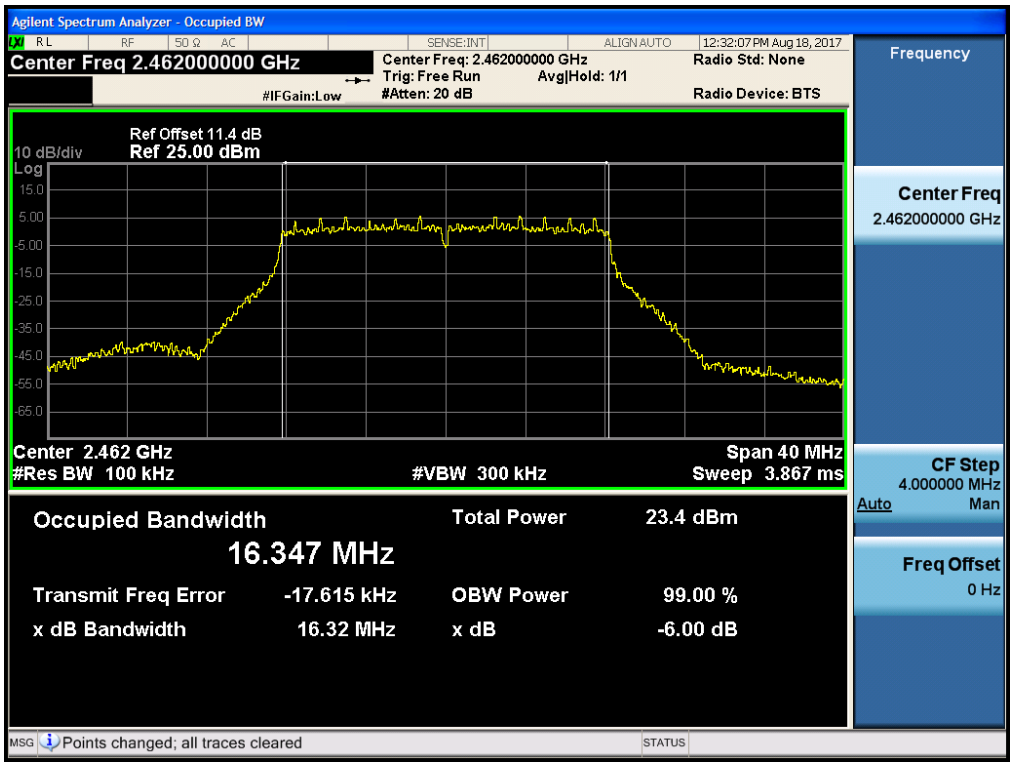
Note : In order to simplify the report, attached plots were only the most wide 6 dB BW channel.

▣ RESULT PLOTS

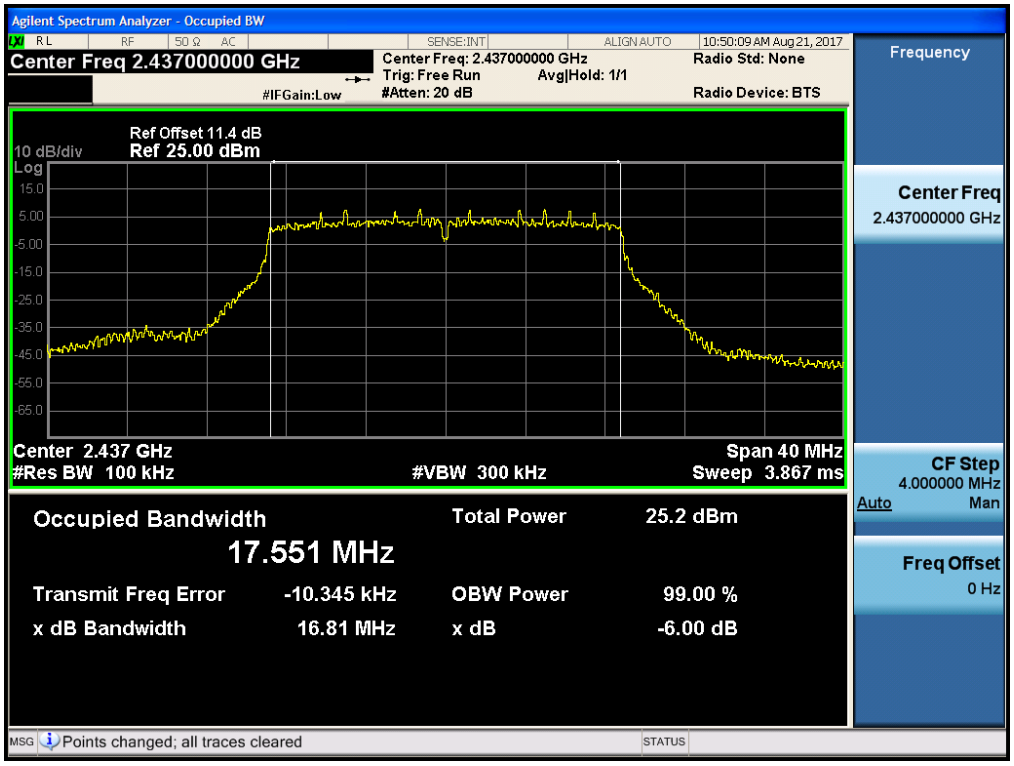
6dB Bandwidth plot (802.11b-CH 1)



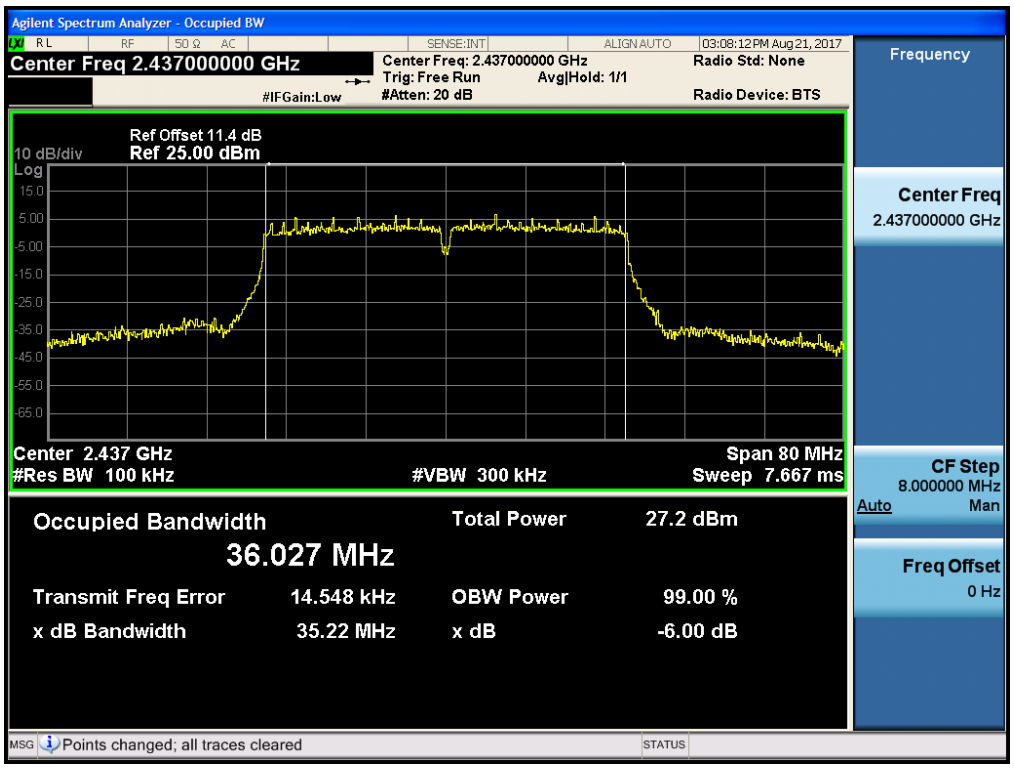
6dB Bandwidth plot (802.11g-CH 11)



6dB Bandwidth plot (802.11n_HT20-CH 6)



6dB Bandwidth plot (802.11n_HT40-CH 6)



▣ TEST RESULTS_Ant.2_Omni

Conducted 6dB Bandwidth Measurements for 802.11b

802.11b Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2412	1	8.100	0.500	Pass
2437	6	8.102	0.500	Pass
2462	11	8.100	0.500	Pass

Conducted 6dB Bandwidth Measurements for 802.11g

802.11g Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2412	1	16.30	0.500	Pass
2437	6	16.07	0.500	Pass
2462	11	16.07	0.500	Pass

Conducted 6dB Bandwidth Measurements for 802.11n_HT20

802.11n Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2412	1	16.37	0.500	Pass
2437	6	16.94	0.500	Pass
2462	11	16.86	0.500	Pass

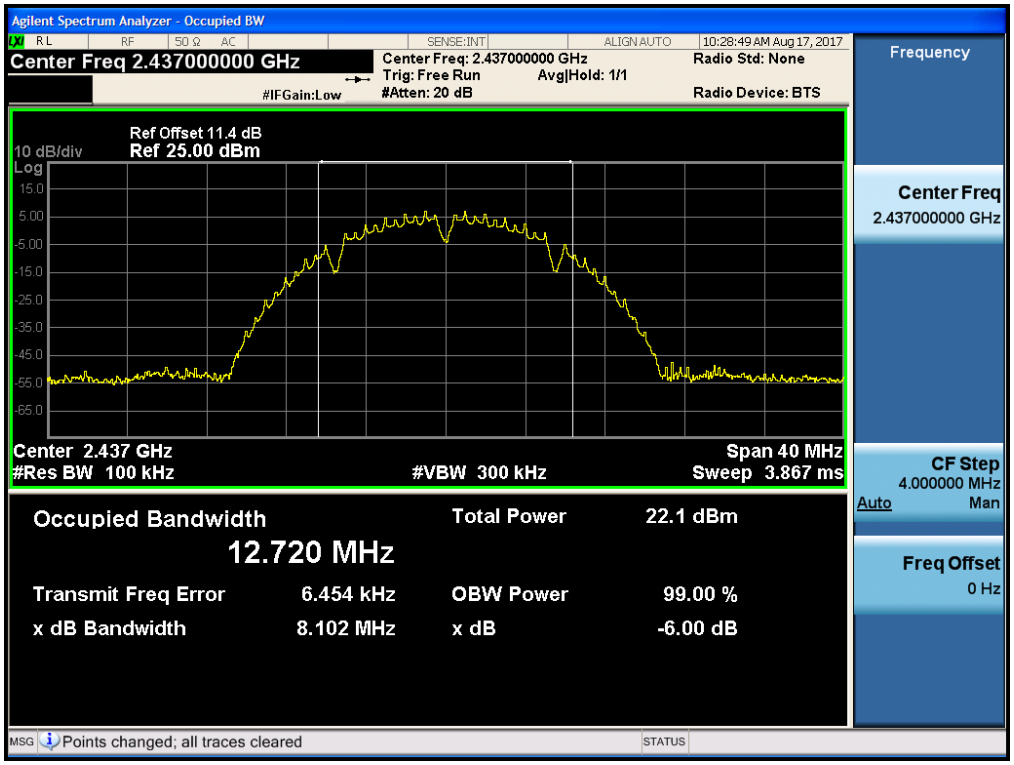
Conducted 6dB Bandwidth Measurements for 802.11n_HT40

802.11n Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2422	3	35.24	0.500	Pass
2437	6	35.23	0.500	Pass
2452	9	34.28	0.500	Pass

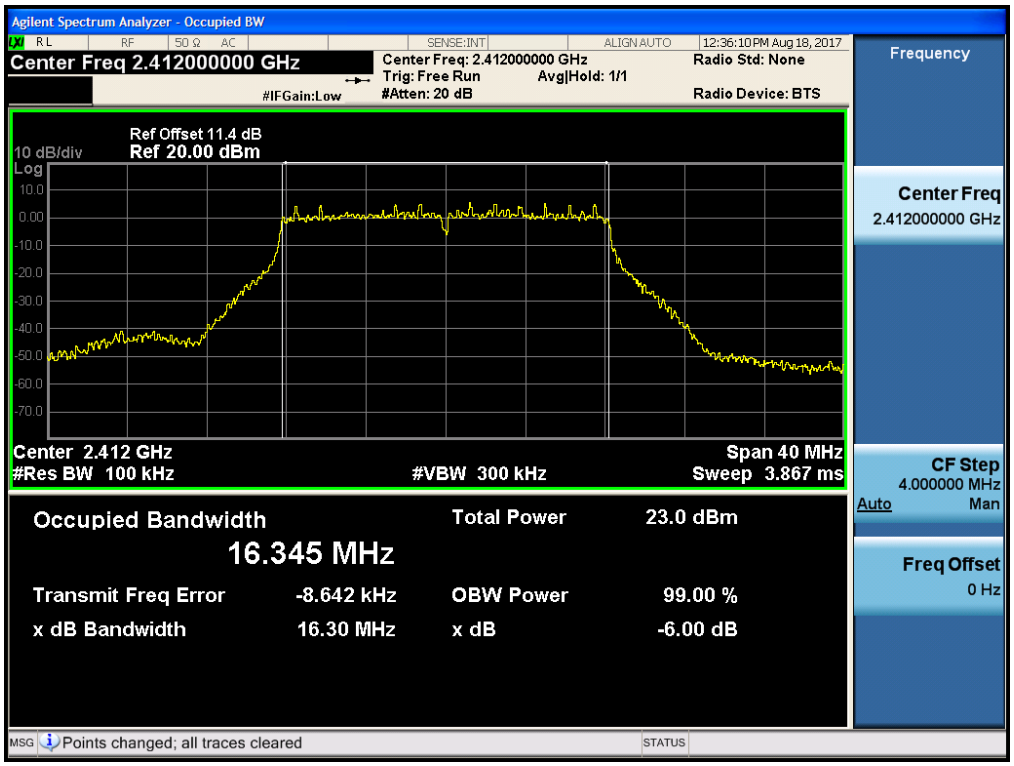
Note : In order to simplify the report, attached plots were only the most wide 6 dB BW channel.

▣ RESULT PLOTS

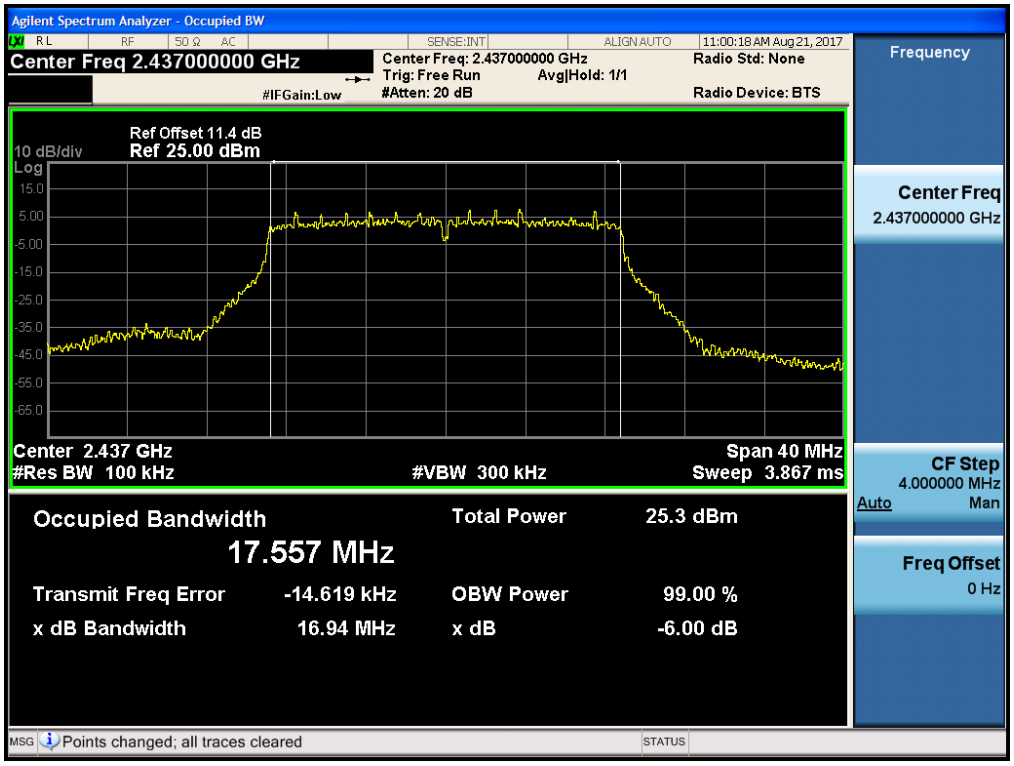
6dB Bandwidth plot (802.11b-CH 6)



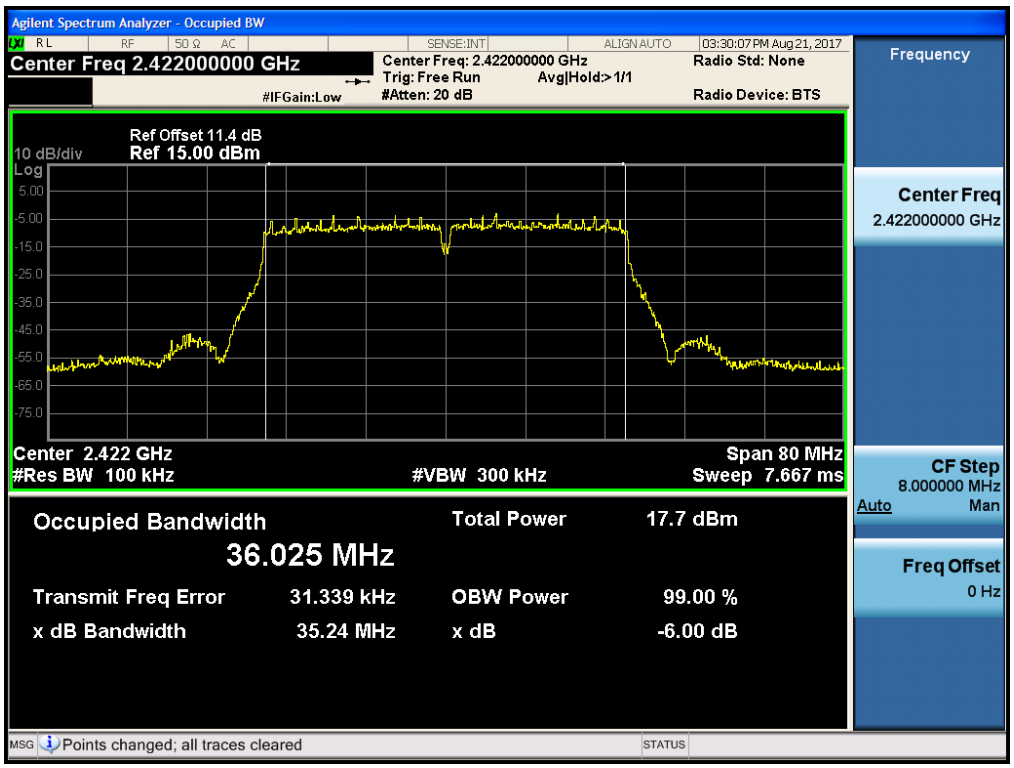
6dB Bandwidth plot (802.11g-CH 1)



6dB Bandwidth plot (802.11n_HT20-CH 6)



6dB Bandwidth plot (802.11n_HT40-CH 3)



▣ TEST RESULTS_Ant.3_Omni

Conducted 6dB Bandwidth Measurements for 802.11b

802.11b Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2412	1	8.101	0.500	Pass
2437	6	8.100	0.500	Pass
2462	11	8.102	0.500	Pass

Conducted 6dB Bandwidth Measurements for 802.11g

802.11g Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2412	1	16.07	0.500	Pass
2437	6	16.27	0.500	Pass
2462	11	16.05	0.500	Pass

Conducted 6dB Bandwidth Measurements for 802.11n_HT20

802.11n Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2412	1	15.71	0.500	Pass
2437	6	16.32	0.500	Pass
2462	11	16.95	0.500	Pass

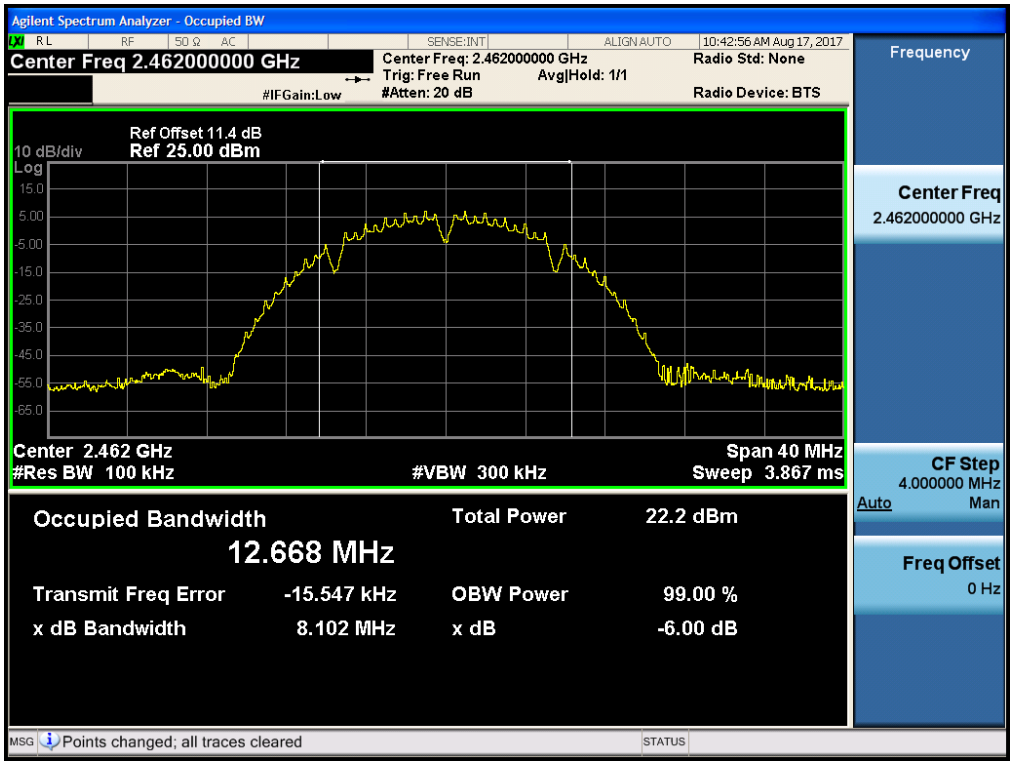
Conducted 6dB Bandwidth Measurements for 802.11n_HT40

802.11n Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2422	3	35.93	0.500	Pass
2437	6	35.17	0.500	Pass
2452	9	35.18	0.500	Pass

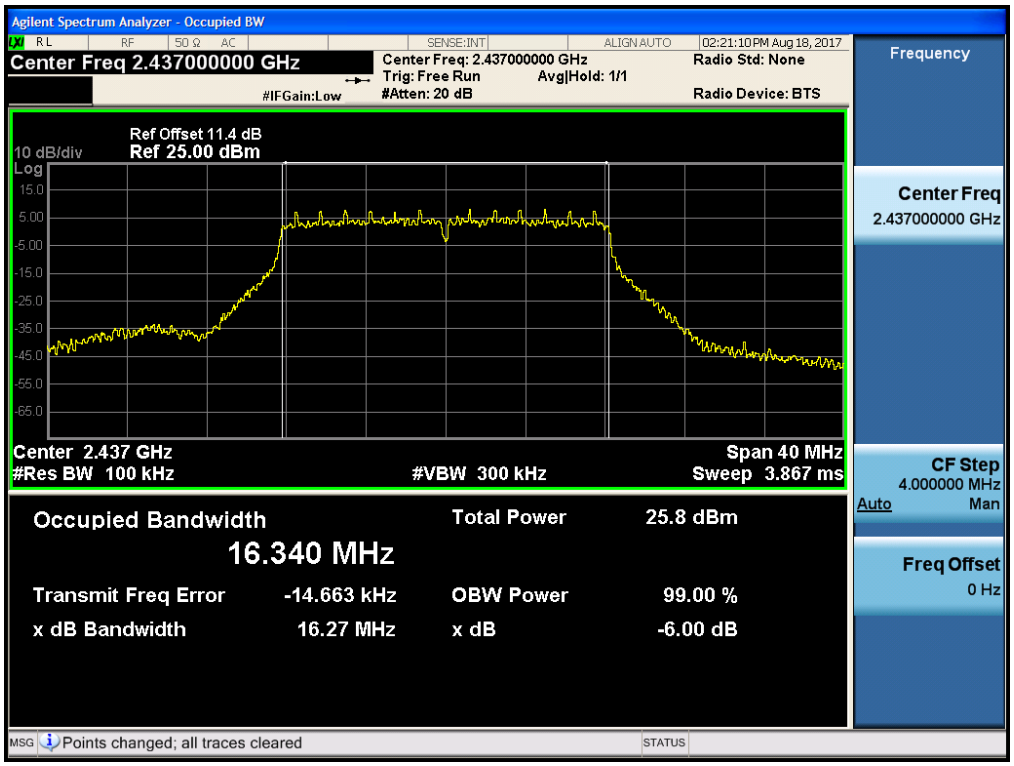
Note : In order to simplify the report, attached plots were only the most wide 6 dB BW channel.

▣ RESULT PLOTS

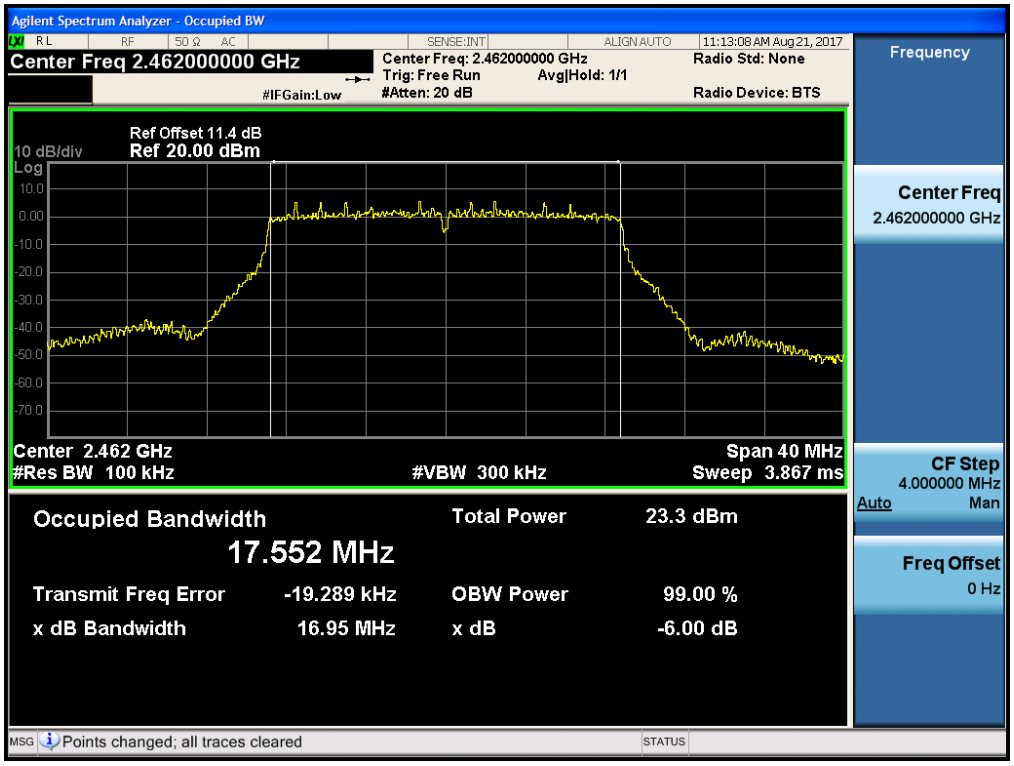
6dB Bandwidth plot (802.11b-CH 11)



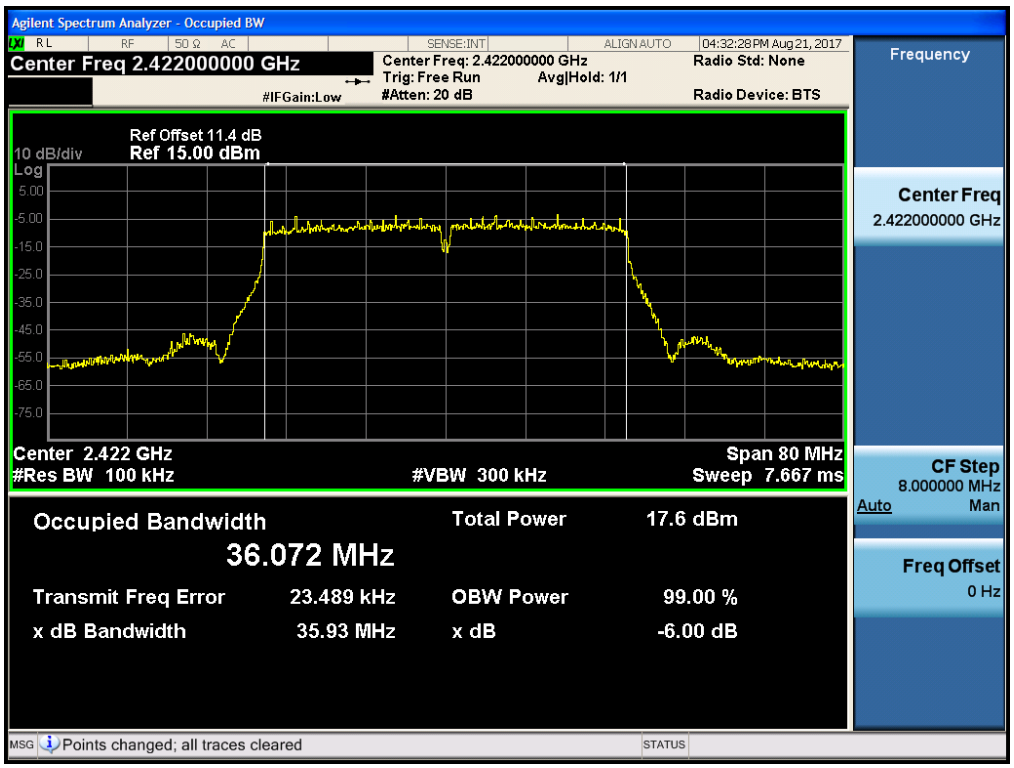
6dB Bandwidth plot (802.11g-CH 6)



6dB Bandwidth plot (802.11n_HT20-CH 11)



6dB Bandwidth plot (802.11n_HT40-CH 3)



▣ TEST RESULTS_Ant.0_Directional

Conducted 6dB Bandwidth Measurements for 802.11b

802.11b Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2412	1	8.106	0.500	Pass
2437	6	8.106	0.500	Pass
2462	11	8.105	0.500	Pass

Conducted 6dB Bandwidth Measurements for 802.11g

802.11g Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2412	1	16.06	0.500	Pass
2437	6	16.07	0.500	Pass
2462	11	16.07	0.500	Pass

Conducted 6dB Bandwidth Measurements for 802.11n_HT20

802.11n Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2412	1	16.66	0.500	Pass
2437	6	16.58	0.500	Pass
2462	11	16.58	0.500	Pass

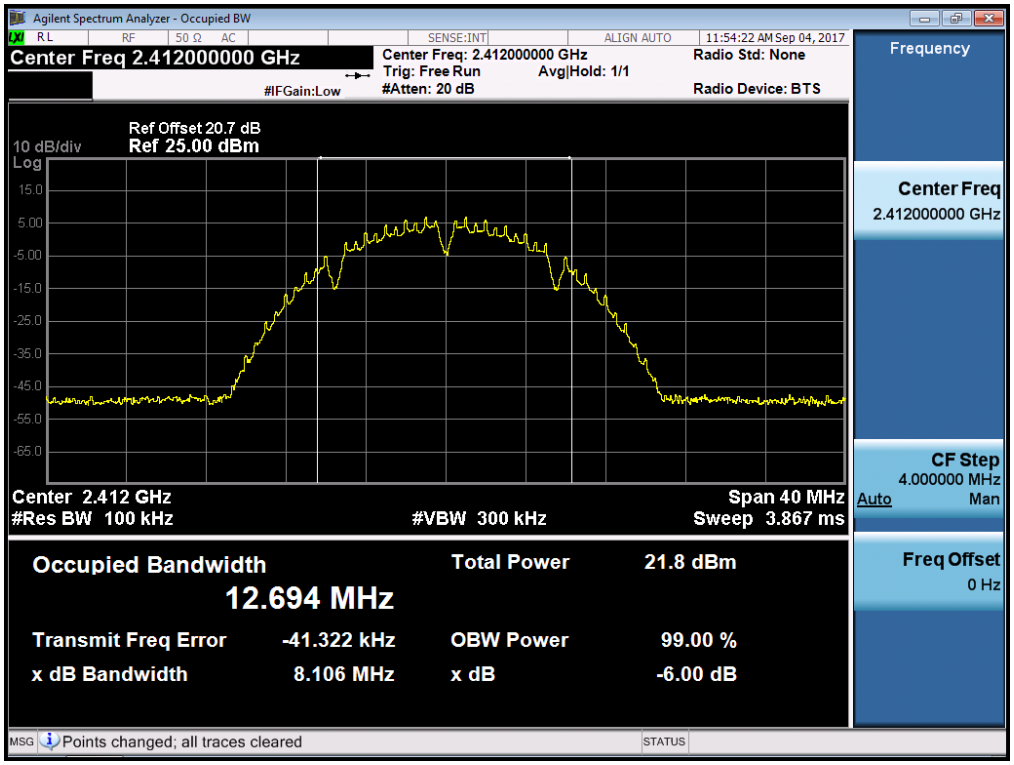
Conducted 6dB Bandwidth Measurements for 802.11n_HT40

802.11n Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2422	3	35.14	0.500	Pass
2437	6	35.08	0.500	Pass
2452	9	35.11	0.500	Pass

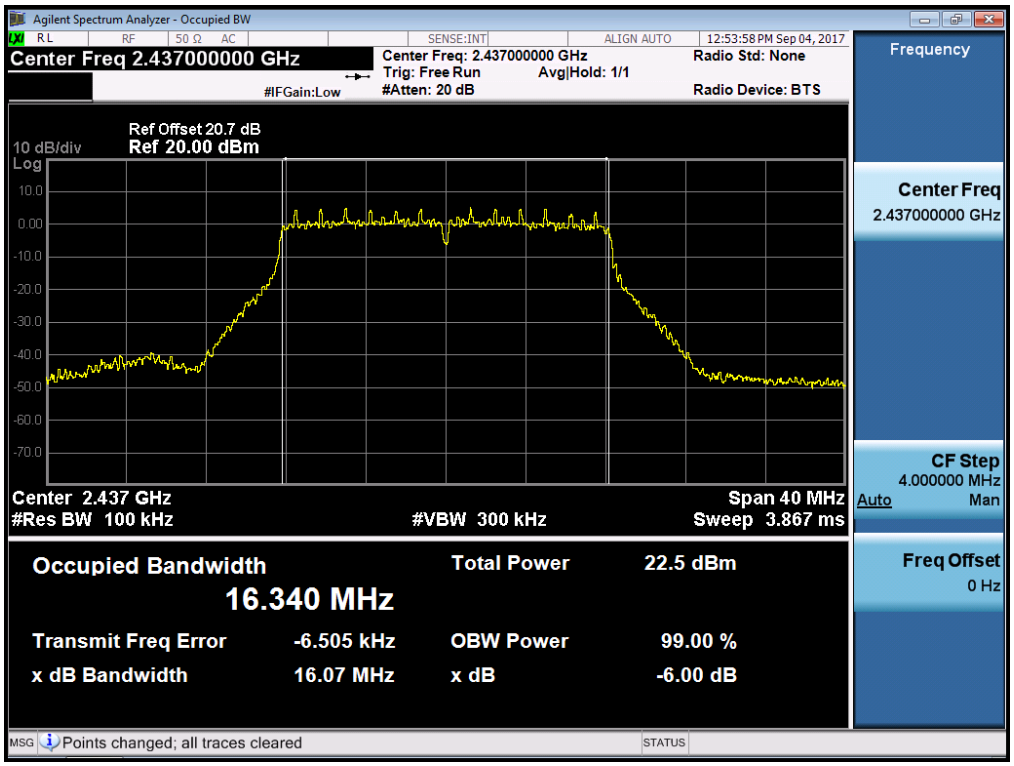
Note : In order to simplify the report, attached plots were only the most wide 6 dB BW channel.

▣ RESULT PLOTS

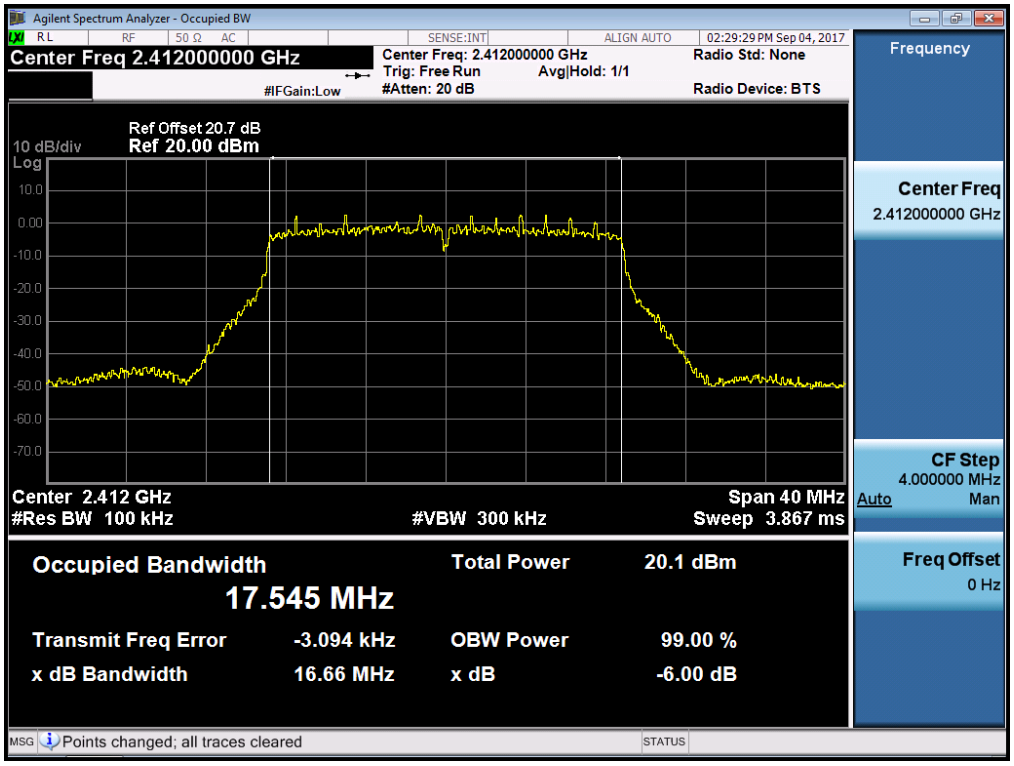
6dB Bandwidth plot (802.11b-CH 1)



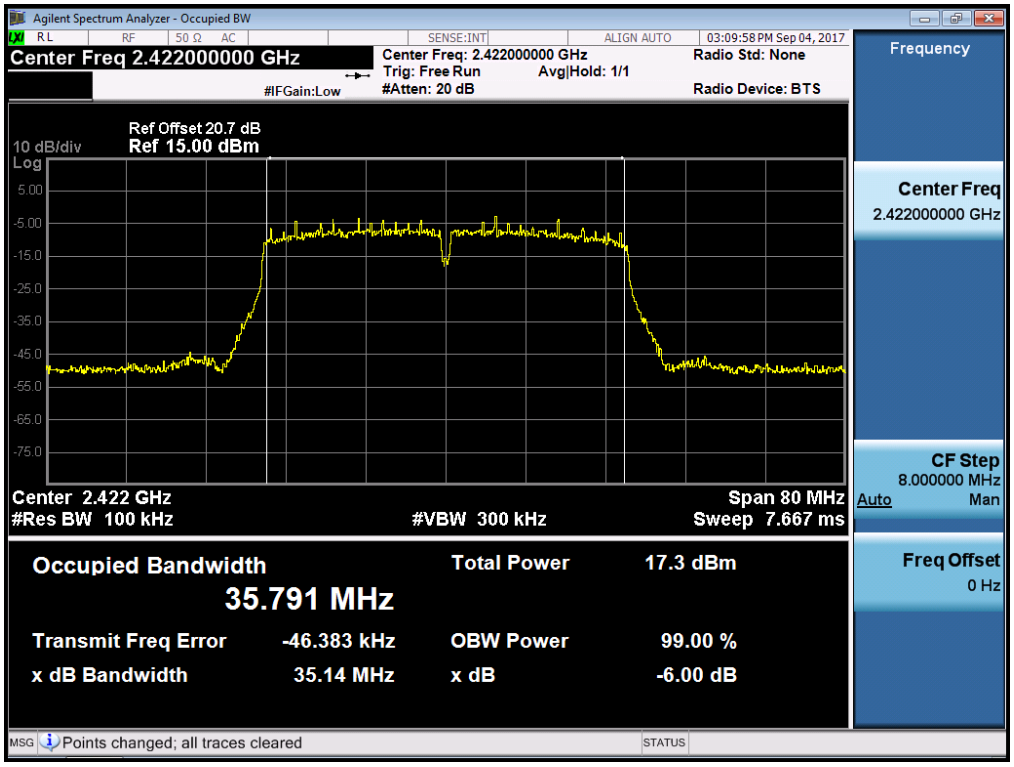
6dB Bandwidth plot (802.11g-CH 6)



6dB Bandwidth plot (802.11n_HT20-CH 1)



6dB Bandwidth plot (802.11n_HT40-CH 3)



▣ TEST RESULTS_Ant.1_Directional

Conducted 6dB Bandwidth Measurements for 802.11b

802.11b Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2412	1	8.105	0.500	Pass
2437	6	8.106	0.500	Pass
2462	11	8.106	0.500	Pass

Conducted 6dB Bandwidth Measurements for 802.11g

802.11g Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2412	1	15.97	0.500	Pass
2437	6	15.73	0.500	Pass
2462	11	16.06	0.500	Pass

Conducted 6dB Bandwidth Measurements for 802.11n_HT20

802.11n Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2412	1	16.32	0.500	Pass
2437	6	16.61	0.500	Pass
2462	11	16.33	0.500	Pass

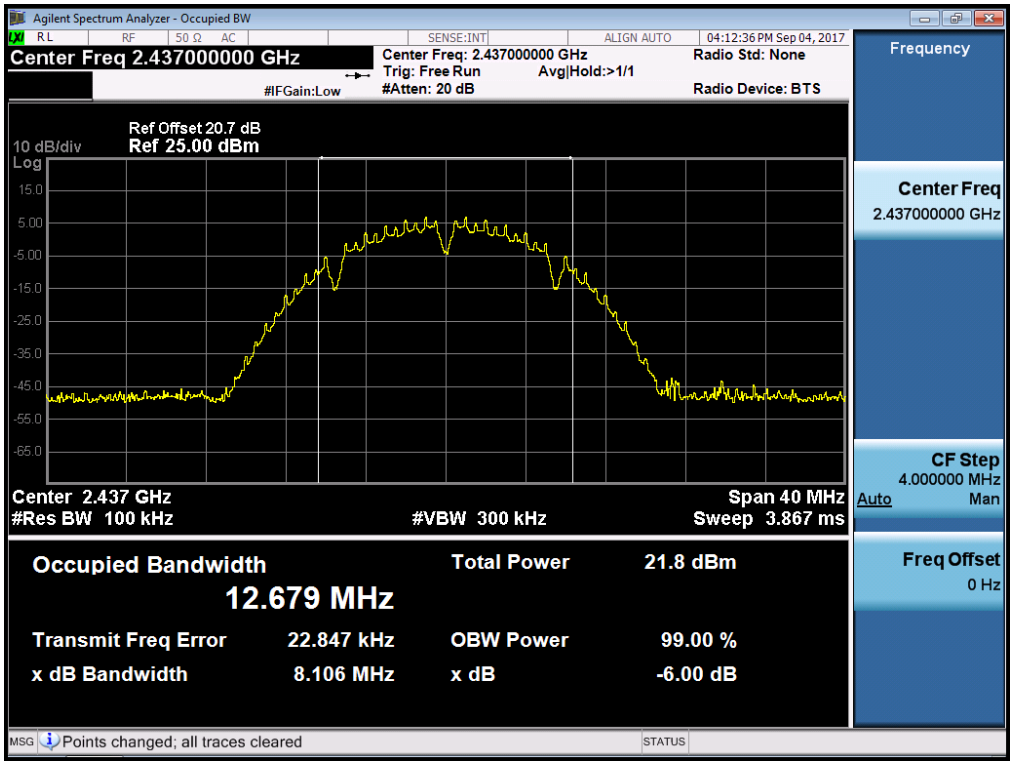
Conducted 6dB Bandwidth Measurements for 802.11n_HT40

802.11n Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2422	3	35.14	0.500	Pass
2437	6	35.10	0.500	Pass
2452	9	35.14	0.500	Pass

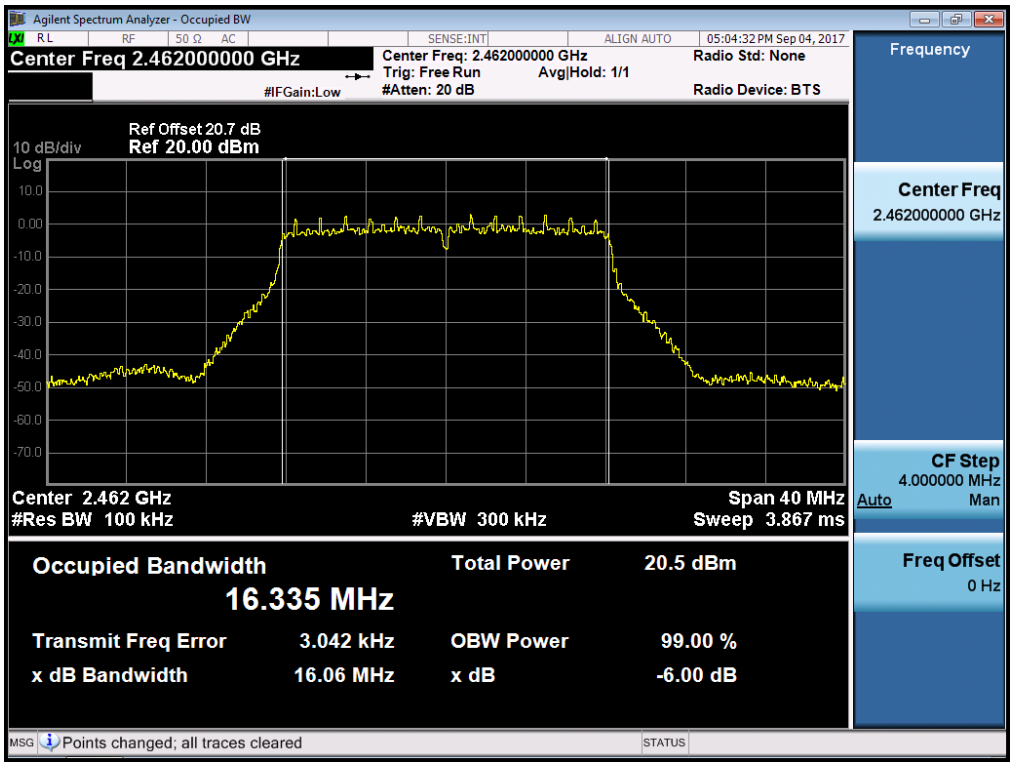
Note : In order to simplify the report, attached plots were only the most wide 6 dB BW channel.

▣ RESULT PLOTS

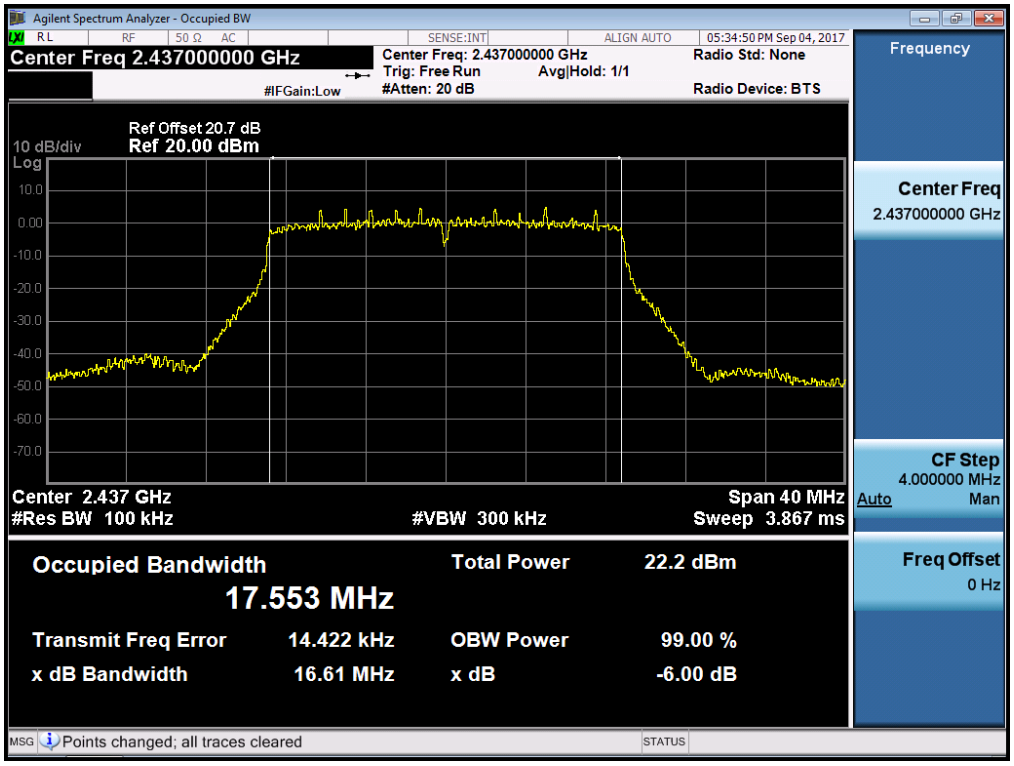
6dB Bandwidth plot (802.11b-CH 6)



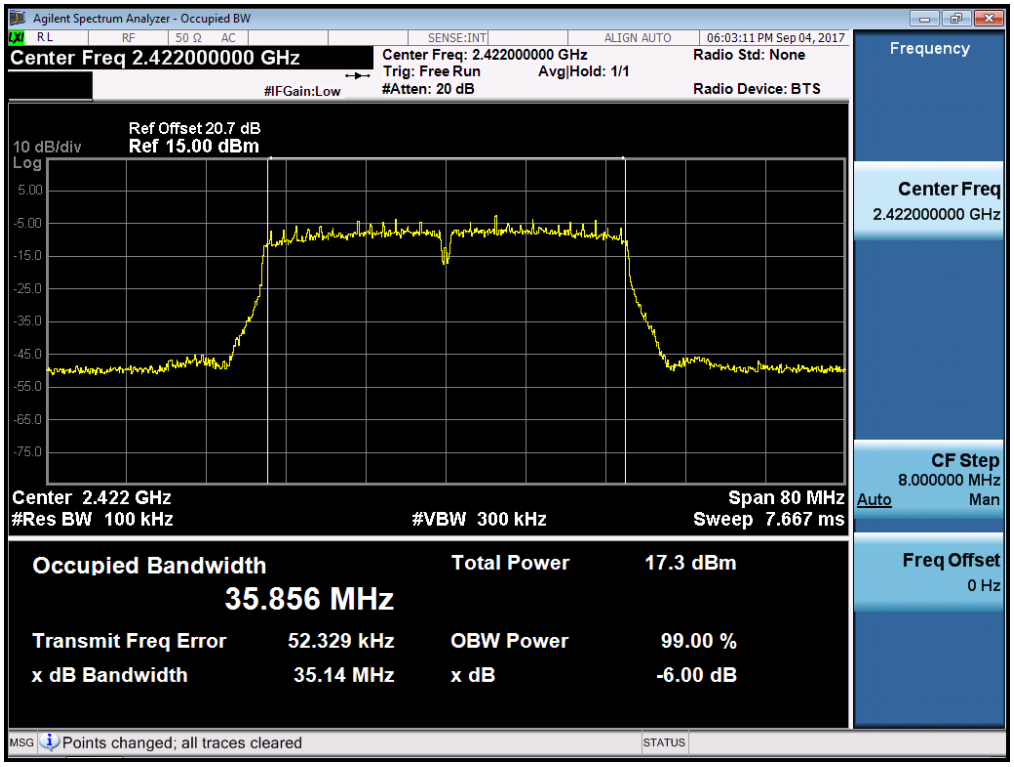
6dB Bandwidth plot (802.11g-CH 11)



6dB Bandwidth plot (802.11n_HT20-CH 6)



6dB Bandwidth plot (802.11n_HT40-CH 3)



▣ TEST RESULTS_Ant.2_Directional

Conducted 6dB Bandwidth Measurements for 802.11b

802.11b Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2412	1	8.106	0.500	Pass
2437	6	8.106	0.500	Pass
2462	11	8.106	0.500	Pass

Conducted 6dB Bandwidth Measurements for 802.11g

802.11g Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2412	1	15.83	0.500	Pass
2437	6	15.70	0.500	Pass
2462	11	16.04	0.500	Pass

Conducted 6dB Bandwidth Measurements for 802.11n_HT20

802.11n Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2412	1	16.31	0.500	Pass
2437	6	16.97	0.500	Pass
2462	11	16.07	0.500	Pass

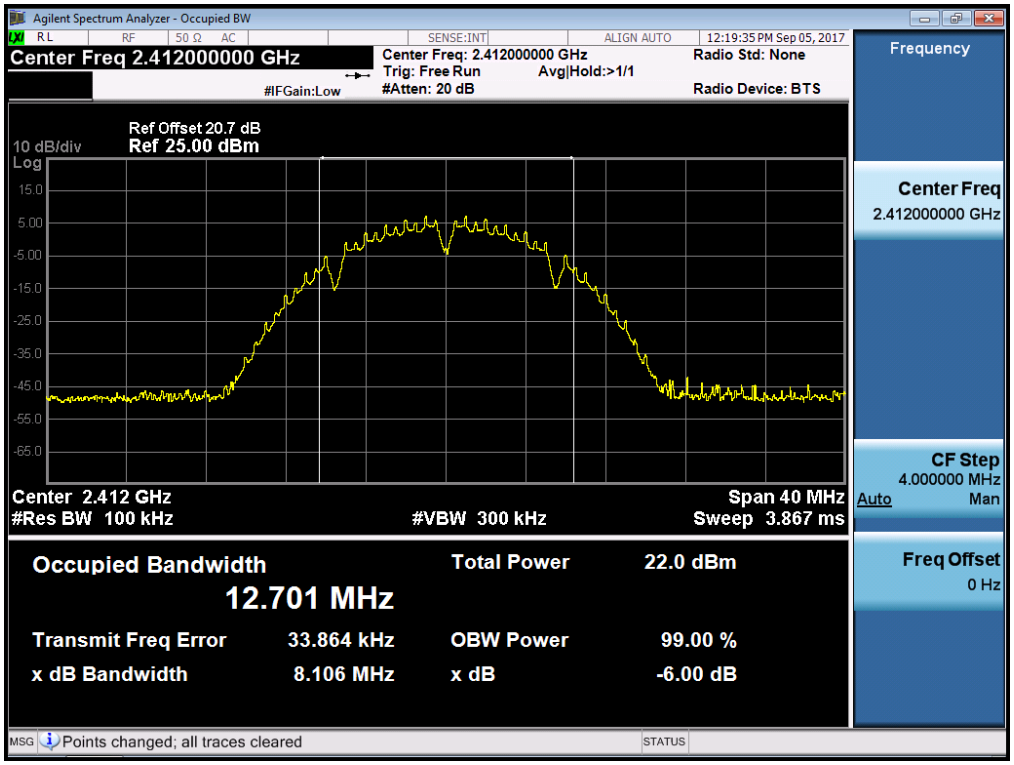
Conducted 6dB Bandwidth Measurements for 802.11n_HT40

802.11n Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2422	3	35.15	0.500	Pass
2437	6	35.13	0.500	Pass
2452	9	35.16	0.500	Pass

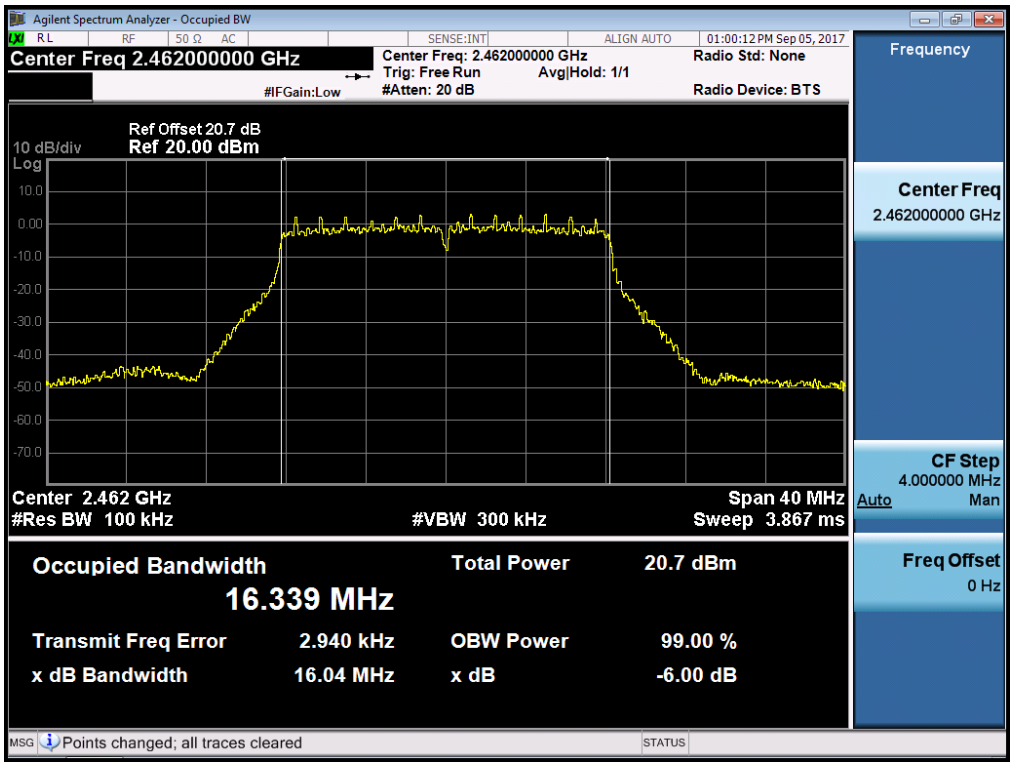
Note : In order to simplify the report, attached plots were only the most wide 6 dB BW channel.

▣ RESULT PLOTS

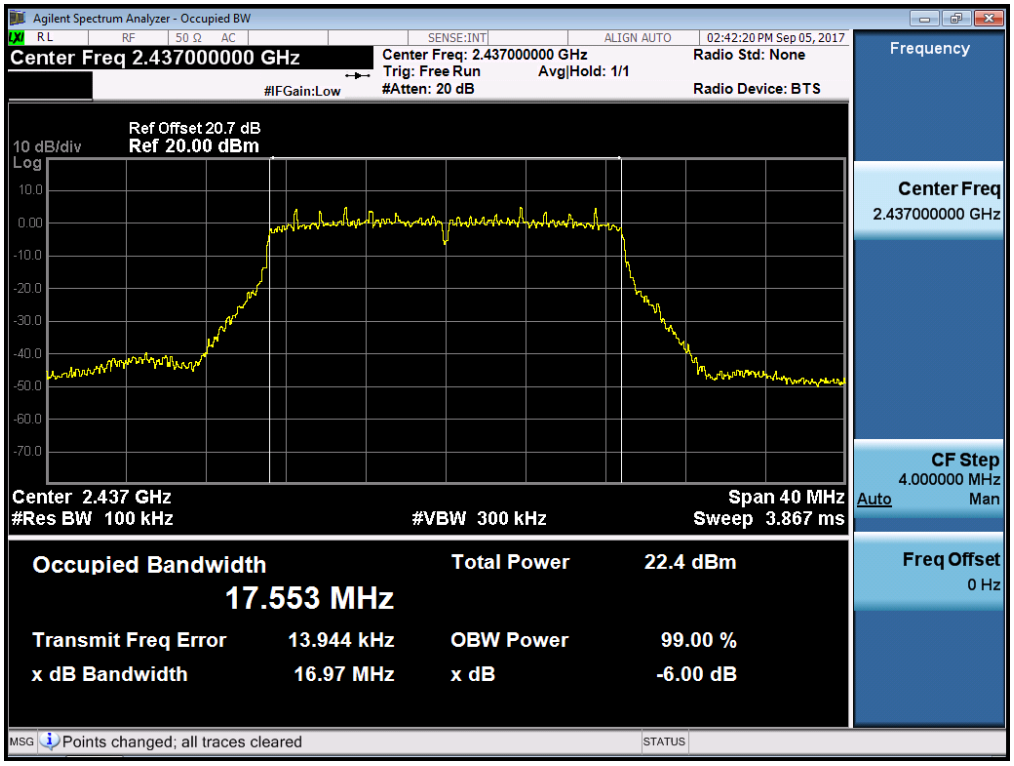
6dB Bandwidth plot (802.11b-CH 1)



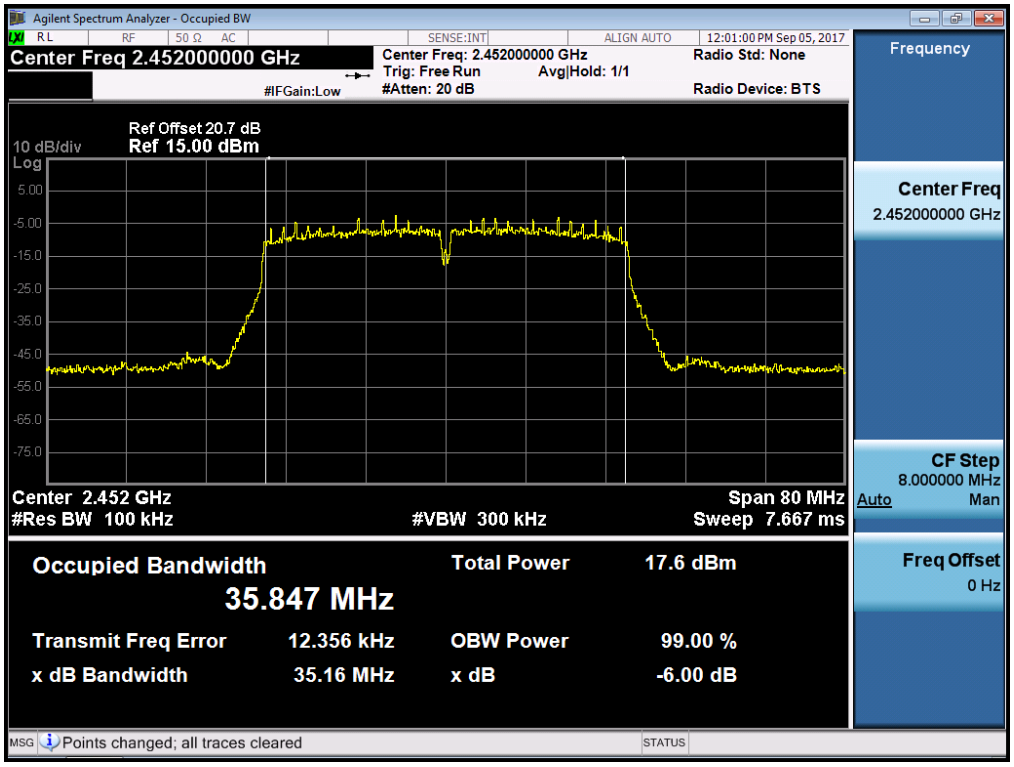
6dB Bandwidth plot (802.11g-CH 11)



6dB Bandwidth plot (802.11n_HT20-CH 6)



6dB Bandwidth plot (802.11n_HT40-CH 9)



▣ TEST RESULTS_Ant.3_Directional

Conducted 6dB Bandwidth Measurements for 802.11b

802.11b Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2412	1	8.105	0.500	Pass
2437	6	8.106	0.500	Pass
2462	11	8.106	0.500	Pass

Conducted 6dB Bandwidth Measurements for 802.11g

802.11g Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2412	1	15.69	0.500	Pass
2437	6	15.89	0.500	Pass
2462	11	16.06	0.500	Pass

Conducted 6dB Bandwidth Measurements for 802.11n_HT20

802.11n Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2412	1	16.37	0.500	Pass
2437	6	16.06	0.500	Pass
2462	11	16.92	0.500	Pass

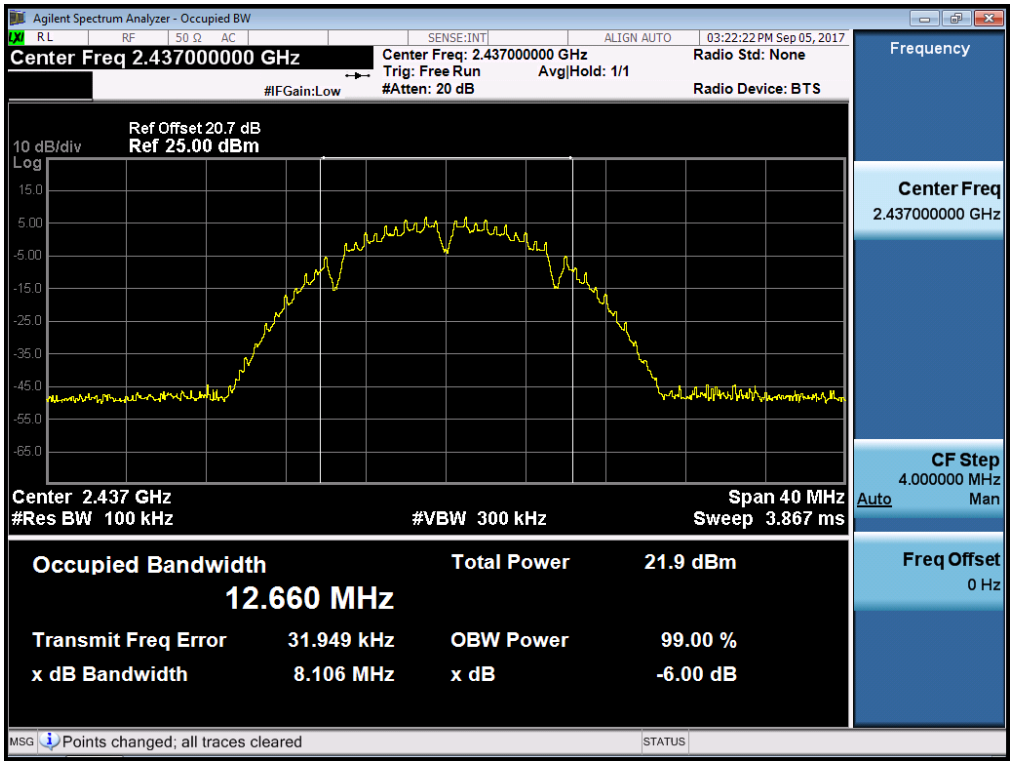
Conducted 6dB Bandwidth Measurements for 802.11n_HT40

802.11n Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2422	3	35.13	0.500	Pass
2437	6	35.11	0.500	Pass
2452	9	35.13	0.500	Pass

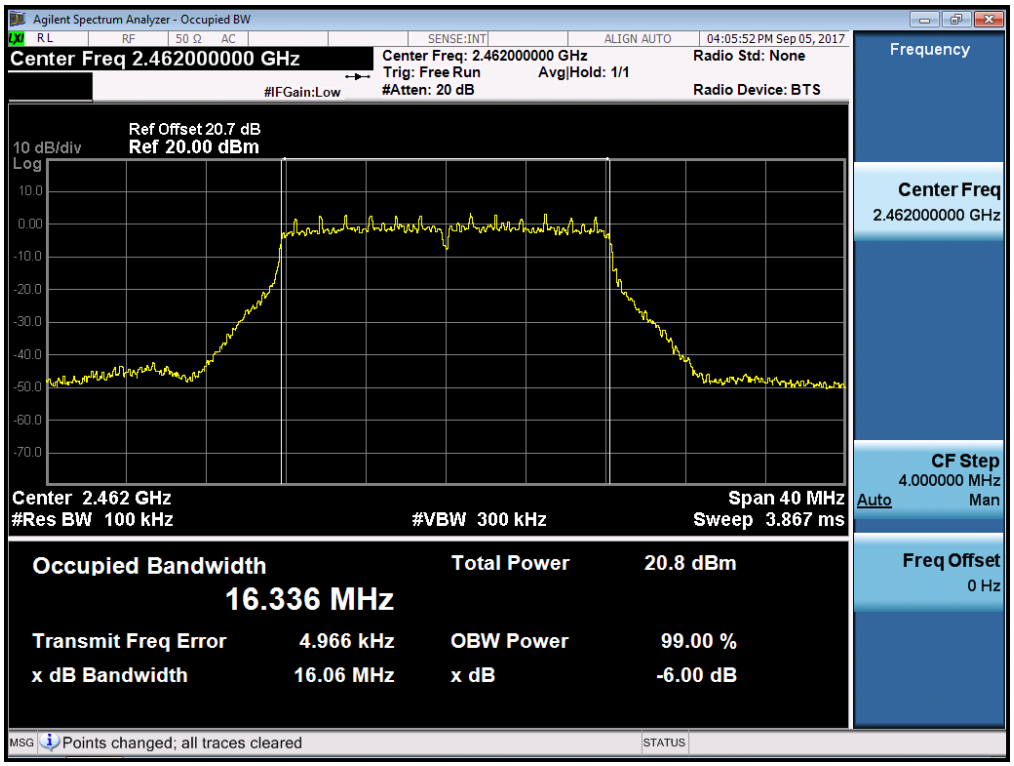
Note : In order to simplify the report, attached plots were only the most wide 6 dB BW channel.

▣ RESULT PLOTS

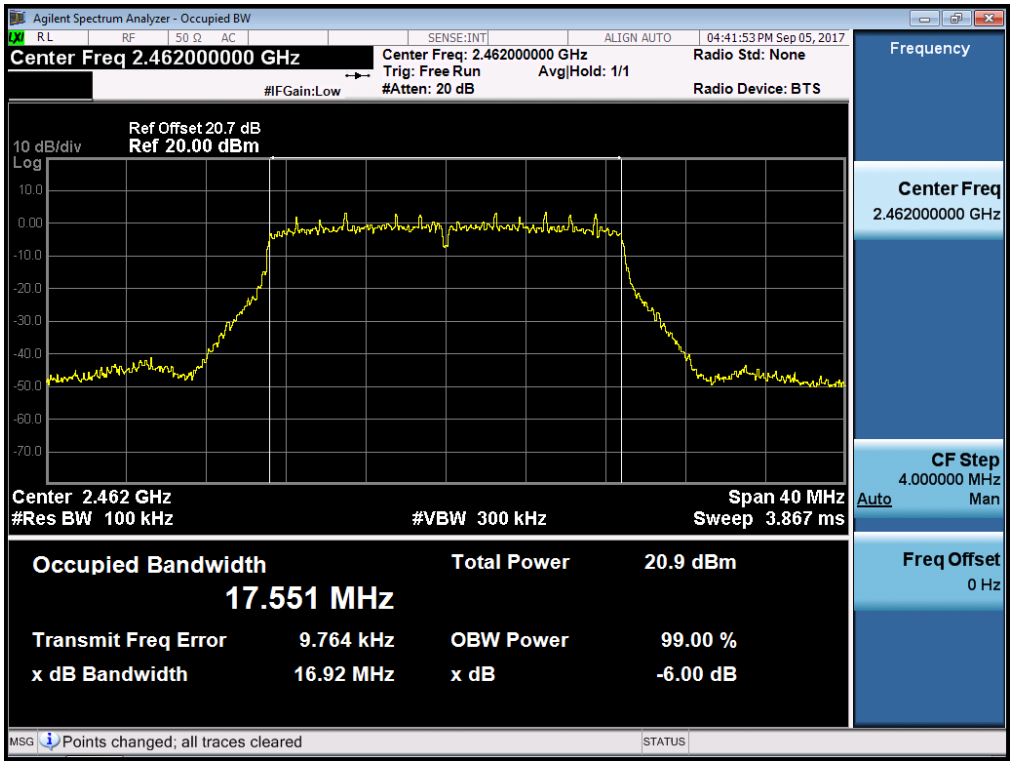
6dB Bandwidth plot (802.11b-CH 6)



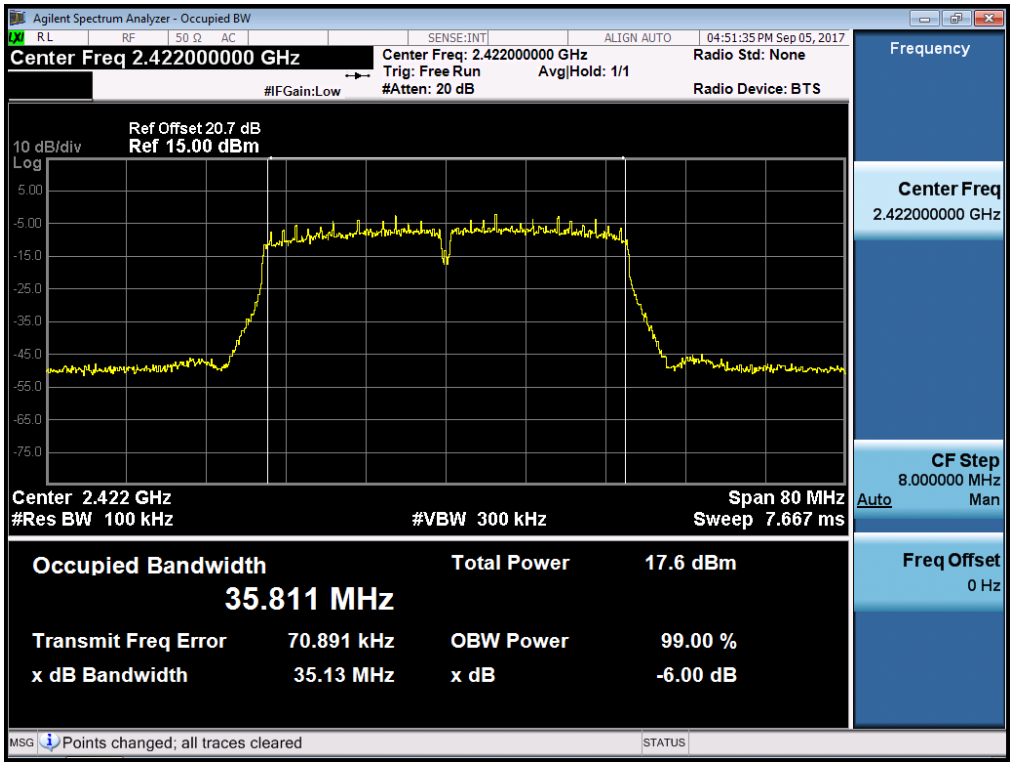
6dB Bandwidth plot (802.11g-CH 11)



6dB Bandwidth plot (802.11n_HT20-CH 11)



6dB Bandwidth plot (802.11n_HT40-CH 3)



9.3 OUTPUT POWER (802.11b/g/n)

Test Requirements and limit, §15.247(b)(3)

The transmitter output is connected to the input of an RF power sensor. Measurement is made using a broadband power meter capable of making peak and average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

The maximum permissible conducted output power is 1 Watt.

▣ Limit(CDD)

Maximum Conducted Output Power

- Omni

Operating Mode	Band	Mode	Ant. Port	Ant. Gain (dBi)	Limit (dBm)
SISO	2.4 GHz	802.11b/g/n	0	3.3	30.0
			1	2.3	30.0
			2	3.7	30.0
			3	4.1	30.0
MIMO(4 TX)		802.11g/n	0 & 1 & 2 & 3	9.40	26.6

- Directional

Operating Mode	Band	Mode	Ant. Port	Ant. Gain (dBi)	Limit (dBm)
SISO	2.4 GHz	802.11b/g/n	0	3.6	30.0
			1	4.5	30.0
			2	3.5	30.0
			3	4.7	30.0
MIMO(4 TX)		802.11g/n	0 & 1 & 2 & 3	10.11	25.89

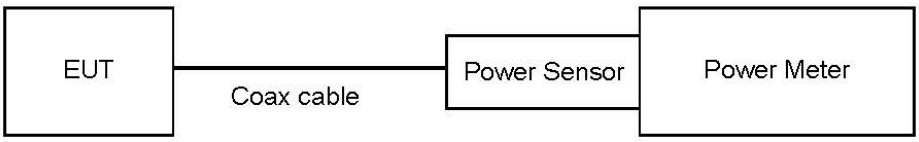
Note : 1. If antenna gains are not equal,

Directional gain = $10*\log[(10^{G1/20} + 10^{G2/20}+\ldots+10^{GN/20})^2/N]$ dBi (802.11g/n)

(according to KDB662911 D01 v02r01)

2. Limit is calculated by antenna gain.

▣ TEST CONFIGURATION(20 MHz BW)



▣ TEST PROCEDURE(20 MHz BW)

▪ Average Power (Procedure 9.2.3.1 in KDB 558074 v04)

1. Measure the duty cycle.
2. Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
3. Add 10 log (1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times.

Note :

1. We apply to the offset in the 2.4 GHz range that was rounded off to the closest 10dB or 20 dB.
2. We apply the offset of Omni and Directional respectively.
   The offset of the 2.4 GHz band on Omni is 11.4 dB.
   The offset of the 2.4 GHz band on Directional is 20.7 dB.
   Actual value of loss for the attenuator and cable combination is below table.

ANT	Band	Loss(dB)
Omni	2.4 GHz	11.4
Directional		20.7

(Actual value of loss for the attenuator and cable combination)

3. MIMO output power results are calculated by each antenna output power on MIMO operating mode.
   So, in case of MIMO output power, we attached only MIMO output power except each antenna power result.

▣ Sample Calculation

ANT.0

Output Power = Reading Value + ATT loss + Cable loss(1 ea) + Duty Cycle Factor

Ex) Output Power = 10 dBm + 20 dB + 0.61 dB + 0.2 dB = 31.0 dBm

ANT.1

Output Power = Reading Value + ATT loss + Cable loss(2 ea) + Duty Cycle Factor

Ex) Output Power = 10 dBm + 20 dB + 1.28 dB + 0.2 dB = 31.7 dBm

☑ **TEST RESULTS-Average_Omni**

☑ **TEST RESULTS_Ant.0**

Conducted Output Power Measurements (802.11b Mode)

802.11b Mode		Rate (Mbps)	Measured Power(dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
2412	1	1 Mbps	19.56	0.031	19.60	30
		2 Mbps	19.53	0.041	19.57	30
		5.5 Mbps	19.44	0.112	19.56	30
		11 Mbps	19.37	0.208	19.58	30
2437	6	1 Mbps	19.62	0.031	19.65	30
		2 Mbps	19.57	0.041	19.61	30
		5.5 Mbps	19.47	0.112	19.58	30
		11 Mbps	19.40	0.208	19.61	30
2462	11	1 Mbps	18.02	0.031	18.05	30
		2 Mbps	17.95	0.041	17.99	30
		5.5 Mbps	17.87	0.112	17.98	30
		11 Mbps	17.80	0.208	18.01	30

▣ TEST RESULTS_Ant.1

Conducted Output Power Measurements (802.11b Mode)

802.11b Mode		Rate (Mbps)	Measured Power(dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
2412	1	1 Mbps	19.45	0.031	19.48	30
		2 Mbps	19.42	0.041	19.46	30
		5.5 Mbps	19.37	0.112	19.48	30
		11 Mbps	19.27	0.208	19.48	30
2437	6	1 Mbps	19.35	0.031	19.38	30
		2 Mbps	19.34	0.041	19.38	30
		5.5 Mbps	19.26	0.112	19.37	30
		11 Mbps	19.17	0.208	19.38	30
2462	11	1 Mbps	17.82	0.031	17.85	30
		2 Mbps	17.79	0.041	17.84	30
		5.5 Mbps	17.70	0.112	17.82	30
		11 Mbps	17.62	0.208	17.83	30

▣ TEST RESULTS_Ant.2

Conducted Output Power Measurements (802.11b Mode)

802.11b Mode		Rate (Mbps)	Measured Power(dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
2412	1	1 Mbps	19.51	0.021	19.53	30
		2 Mbps	19.48	0.041	19.53	30
		5.5 Mbps	19.36	0.112	19.47	30
		11 Mbps	19.28	0.208	19.49	30
2437	6	1 Mbps	19.54	0.021	19.57	30
		2 Mbps	19.43	0.041	19.47	30
		5.5 Mbps	19.35	0.112	19.46	30
		11 Mbps	19.27	0.208	19.48	30
2462	11	1 Mbps	18.14	0.021	18.16	30
		2 Mbps	18.11	0.041	18.16	30
		5.5 Mbps	18.01	0.112	18.12	30
		11 Mbps	17.94	0.208	18.15	30

▣ TEST RESULTS_Ant.3

Conducted Output Power Measurements (802.11b Mode)

802.11b Mode		Rate (Mbps)	Measured Power(dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
2412	1	1 Mbps	19.68	0.021	19.70	30
		2 Mbps	19.65	0.041	19.69	30
		5.5 Mbps	19.57	0.112	19.68	30
		11 Mbps	19.49	0.202	19.69	30
2437	6	1 Mbps	19.63	0.021	19.65	30
		2 Mbps	19.61	0.041	19.65	30
		5.5 Mbps	19.52	0.112	19.63	30
		11 Mbps	19.45	0.202	19.65	30
2462	11	1 Mbps	18.13	0.021	18.15	30
		2 Mbps	18.10	0.041	18.14	30
		5.5 Mbps	18.01	0.112	18.12	30
		11 Mbps	17.89	0.202	18.09	30

▣ **TEST RESULTS_Sum Data of Ant.0, 1, 2, 3**

Conducted Output Power Measurements (802.11b MIMO Mode)

802.11g Mode		Rate (Mbps)	Sum Power of Ant.0 & 1 & 2 & 3 (dBm)	Limit (dBm)
Frequency[MHz]	Channel No.			
2412	1	1 Mbps	25.60	26.6
		2 Mbps	25.58	26.6
		5.5 Mbps	25.57	26.6
		11 Mbps	25.58	26.6
2437	6	1 Mbps	25.58	26.6
		2 Mbps	25.55	26.6
		5.5 Mbps	25.53	26.6
		11 Mbps	25.55	26.6
2462	11	1 Mbps	24.07	26.6
		2 Mbps	24.05	26.6
		5.5 Mbps	24.03	26.6
		11 Mbps	24.04	26.6

▣ TEST RESULTS_Ant.0

Conducted Output Power Measurements (802.11g SISO Mode)

802.11g Mode		Rate (Mbps)	Measured Power(dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
2412	1	6 Mbps	15.69	0.134	15.82	30
		9 Mbps	15.62	0.202	15.82	30
		12 Mbps	15.03	0.280	15.31	30
		18 Mbps	15.38	0.388	15.77	30
		24 Mbps	15.03	0.494	15.53	30
		36 Mbps	14.77	0.749	15.52	30
		48 Mbps	14.58	0.896	15.48	30
		54 Mbps	14.45	1.024	15.47	30
2437	6	6 Mbps	19.77	0.134	19.90	30
		9 Mbps	19.69	0.202	19.89	30
		12 Mbps	19.14	0.280	19.42	30
		18 Mbps	19.48	0.388	19.87	30
		24 Mbps	19.16	0.494	19.65	30
		36 Mbps	18.92	0.749	19.67	30
		48 Mbps	18.76	0.896	19.65	30
		54 Mbps	18.60	1.024	19.62	30
2462	11	6 Mbps	16.39	0.134	16.52	30
		9 Mbps	16.12	0.202	16.33	30
		12 Mbps	15.79	0.280	16.07	30
		18 Mbps	16.13	0.388	16.52	30
		24 Mbps	15.85	0.494	16.35	30
		36 Mbps	15.58	0.749	16.33	30
		48 Mbps	15.42	0.896	16.31	30
		54 Mbps	15.27	1.024	16.29	30

▣ TEST RESULTS_Ant.1

Conducted Output Power Measurements (802.11g SISO Mode)

802.11g Mode		Rate (Mbps)	Measured Power(dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
2412	1	6 Mbps	15.58	0.143	15.72	30
		9 Mbps	15.48	0.201	15.68	30
		12 Mbps	14.97	0.283	15.26	30
		18 Mbps	15.32	0.393	15.71	30
		24 Mbps	15.18	0.481	15.66	30
		36 Mbps	14.93	0.746	15.67	30
		48 Mbps	14.76	0.892	15.65	30
		54 Mbps	14.61	1.025	15.64	30
2437	6	6 Mbps	19.63	0.143	19.77	30
		9 Mbps	19.57	0.201	19.77	30
		12 Mbps	18.98	0.283	19.27	30
		18 Mbps	19.31	0.393	19.71	30
		24 Mbps	18.80	0.481	19.28	30
		36 Mbps	18.60	0.746	19.34	30
		48 Mbps	18.43	0.892	19.32	30
		54 Mbps	18.28	1.025	19.30	30
2462	11	6 Mbps	16.14	0.143	16.28	30
		9 Mbps	15.94	0.201	16.14	30
		12 Mbps	15.63	0.283	15.91	30
		18 Mbps	15.88	0.393	16.28	30
		24 Mbps	15.61	0.481	16.09	30
		36 Mbps	15.37	0.746	16.11	30
		48 Mbps	15.18	0.892	16.08	30
		54 Mbps	15.05	1.025	16.07	30

▣ TEST RESULTS_Ant.2

Conducted Output Power Measurements (802.11g SISO Mode)

802.11g Mode		Rate (Mbps)	Measured Power(dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
2412	1	6 Mbps	15.64	0.135	15.77	30
		9 Mbps	15.55	0.209	15.76	30
		12 Mbps	15.01	0.283	15.29	30
		18 Mbps	15.36	0.393	15.76	30
		24 Mbps	15.22	0.481	15.70	30
		36 Mbps	14.86	0.868	15.73	30
		48 Mbps	14.76	0.956	15.72	30
		54 Mbps	14.63	1.037	15.67	30
2437	6	6 Mbps	19.79	0.135	19.92	30
		9 Mbps	19.71	0.209	19.92	30
		12 Mbps	19.13	0.283	19.41	30
		18 Mbps	19.49	0.393	19.88	30
		24 Mbps	18.97	0.481	19.45	30
		36 Mbps	18.74	0.868	19.61	30
		48 Mbps	18.57	0.956	19.53	30
		54 Mbps	18.43	1.037	19.46	30
2462	11	6 Mbps	16.61	0.135	16.75	30
		9 Mbps	16.20	0.209	16.41	30
		12 Mbps	15.83	0.283	16.11	30
		18 Mbps	16.10	0.393	16.49	30
		24 Mbps	15.89	0.481	16.37	30
		36 Mbps	15.62	0.868	16.49	30
		48 Mbps	15.44	0.956	16.40	30
		54 Mbps	15.30	1.037	16.34	30

▣ TEST RESULTS_Ant.3

Conducted Output Power Measurements (802.11g SISO Mode)

802.11g Mode		Rate (Mbps)	Measured Power(dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
2412	1	6 Mbps	15.90	0.144	16.04	30
		9 Mbps	15.82	0.202	16.03	30
		12 Mbps	15.23	0.277	15.51	30
		18 Mbps	15.58	0.388	15.97	30
		24 Mbps	15.27	0.493	15.76	30
		36 Mbps	15.00	0.740	15.74	30
		48 Mbps	14.82	0.898	15.72	30
		54 Mbps	14.65	1.020	15.67	30
2437	6	6 Mbps	19.75	0.144	19.90	30
		9 Mbps	19.69	0.202	19.89	30
		12 Mbps	19.15	0.277	19.43	30
		18 Mbps	19.45	0.388	19.84	30
		24 Mbps	19.13	0.493	19.62	30
		36 Mbps	18.93	0.740	19.67	30
		48 Mbps	18.76	0.898	19.66	30
		54 Mbps	18.62	1.020	19.64	30
2462	11	6 Mbps	16.35	0.144	16.49	30
		9 Mbps	16.15	0.202	16.35	30
		12 Mbps	15.80	0.277	16.08	30
		18 Mbps	16.11	0.388	16.49	30
		24 Mbps	15.86	0.493	16.35	30
		36 Mbps	15.59	0.740	16.33	30
		48 Mbps	15.41	0.898	16.31	30
		54 Mbps	15.28	1.020	16.30	30

▣ TEST RESULTS_Sum Data of Ant.0, 1, 2, 3

Conducted Output Power Measurements (802.11g MIMO Mode)

802.11g Mode		Rate	Sum Power of Ant.0 & 1	Limit
Frequency[MHz]	Channel No.	(Mbps)	(dBm)	(dBm)
2412	1	6 Mbps	21.86	26.6
		9 Mbps	21.84	26.6
		12 Mbps	21.36	26.6
		18 Mbps	21.82	26.6
		24 Mbps	21.68	26.6
		36 Mbps	21.69	26.6
		48 Mbps	21.66	26.6
		54 Mbps	21.63	26.6
2437	6	6 Mbps	25.89	26.6
		9 Mbps	25.89	26.6
		12 Mbps	25.40	26.6
		18 Mbps	25.85	26.6
		24 Mbps	25.52	26.6
		36 Mbps	25.59	26.6
		48 Mbps	25.56	26.6
		54 Mbps	25.53	26.6
2462	11	6 Mbps	22.53	26.6
		9 Mbps	22.33	26.6
		12 Mbps	22.06	26.6
		18 Mbps	22.47	26.6
		24 Mbps	22.31	26.6
		36 Mbps	22.34	26.6
		48 Mbps	22.30	26.6
		54 Mbps	22.27	26.6

▣ **TEST RESULTS_Ant.0**

Conducted Output Power Measurements (802.11n_HT20 SISO Mode)

802.11n Mode		MCS Index	Measured Power(dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
2412	1	0	14.45	0.052	14.50	30
		1	14.29	0.052	14.34	30
		2	14.36	0.063	14.42	30
		3	14.89	0.052	14.94	30
		4	14.56	0.087	14.65	30
		5	14.51	0.127	14.64	30
		6	14.57	0.129	14.70	30
		7	14.45	0.147	14.59	30
2437	6	0	19.59	0.052	19.64	30
		1	19.43	0.052	19.48	30
		2	19.55	0.063	19.61	30
		3	20.02	0.052	20.07	30
		4	19.55	0.087	19.64	30
		5	19.50	0.127	19.63	30
		6	19.55	0.129	19.67	30
		7	19.46	0.147	19.60	30
2462	11	0	15.97	0.052	16.02	30
		1	15.82	0.052	15.87	30
		2	16.15	0.063	16.21	30
		3	16.72	0.052	16.77	30
		4	16.18	0.087	16.26	30
		5	16.12	0.127	16.25	30
		6	16.19	0.129	16.31	30
		7	16.08	0.147	16.23	30

▣ **TEST RESULTS_Ant.1**

Conducted Output Power Measurements (802.11n_HT20 SISO Mode)

802.11n Mode		MCS Index	Measured Power(dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
2412	1	0	14.55	0.061	14.61	30
		1	14.39	0.052	14.44	30
		2	14.57	0.073	14.64	30
		3	15.07	0.061	15.13	30
		4	14.45	0.096	14.54	30
		5	14.41	0.115	14.52	30
		6	14.46	0.142	14.60	30
		7	14.36	0.142	14.50	30
2437	6	0	19.44	0.061	19.51	30
		1	19.29	0.052	19.34	30
		2	19.35	0.073	19.43	30
		3	19.76	0.061	19.82	30
		4	19.22	0.096	19.31	30
		5	19.17	0.115	19.29	30
		6	19.20	0.142	19.34	30
		7	19.13	0.142	19.27	30
2462	11	0	15.79	0.061	15.85	30
		1	15.62	0.052	15.68	30
		2	15.97	0.073	16.04	30
		3	16.52	0.061	16.58	30
		4	15.94	0.096	16.03	30
		5	15.90	0.115	16.01	30
		6	15.96	0.142	16.10	30
		7	15.85	0.142	15.99	30

▣ TEST RESULTS_Ant.2

Conducted Output Power Measurements (802.11n_HT20 SISO Mode)

802.11n Mode		MCS Index	Measured Power(dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
2412	1	0	14.57	0.061	14.63	30
		1	14.41	0.052	14.46	30
		2	14.47	0.073	14.55	30
		3	15.02	0.052	15.07	30
		4	14.47	0.091	14.56	30
		5	14.42	0.121	14.54	30
		6	14.49	0.130	14.62	30
		7	14.38	0.144	14.52	30
2437	6	0	19.55	0.061	19.61	30
		1	19.41	0.052	19.46	30
		2	19.52	0.073	19.60	30
		3	20.00	0.052	20.06	30
		4	19.38	0.091	19.47	30
		5	19.34	0.121	19.46	30
		6	19.37	0.130	19.50	30
		7	19.27	0.144	19.42	30
2462	11	0	16.07	0.061	16.13	30
		1	15.90	0.052	15.95	30
		2	16.22	0.073	16.29	30
		3	16.77	0.052	16.82	30
		4	16.21	0.091	16.30	30
		5	16.18	0.121	16.30	30
		6	16.25	0.130	16.38	30
		7	16.14	0.144	16.28	30

▣ TEST RESULTS_Ant.3

Conducted Output Power Measurements (802.11n_HT20 SISO Mode)

802.11n Mode		MCS Index	Measured Power(dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
2412	1	0	14.61	0.061	14.67	30
		1	14.45	0.061	14.51	30
		2	14.53	0.073	14.60	30
		3	15.06	0.052	15.11	30
		4	14.62	0.096	14.71	30
		5	14.57	0.115	14.69	30
		6	14.63	0.129	14.76	30
		7	14.53	0.147	14.68	30
2437	6	0	19.54	0.061	19.60	30
		1	19.39	0.061	19.45	30
		2	19.50	0.073	19.57	30
		3	19.93	0.052	19.98	30
		4	19.50	0.096	19.60	30
		5	19.47	0.115	19.58	30
		6	19.50	0.129	19.63	30
		7	19.42	0.147	19.56	30
2462	11	0	16.05	0.061	16.11	30
		1	15.88	0.061	15.94	30
		2	16.26	0.073	16.33	30
		3	16.74	0.052	16.79	30
		4	16.22	0.096	16.32	30
		5	16.17	0.115	16.28	30
		6	16.23	0.129	16.36	30
		7	16.13	0.147	16.27	30

▣ **TEST RESULTS_Sum Data of Ant.0, 1, 2, 3**

Conducted Output Power Measurements (802.11n_HT20 MIMO Mode)

802.11n Mode		MCS	Sum Power of Ant.0 & 1 (dBm)	Limit (dBm)
Frequency[MHz]	Channel No.	Index		
2412	1	0	20.62	26.6
		1	20.46	26.6
		2	20.57	26.6
		3	21.08	26.6
		4	20.64	26.6
		5	20.62	26.6
		6	20.69	26.6
		7	20.59	26.6
2437	6	0	25.61	26.6
		1	25.45	26.6
		2	25.57	26.6
		3	26.00	26.6
		4	25.53	26.6
		5	25.51	26.6
		6	25.56	26.6
		7	25.48	26.6
2462	11	0	22.05	26.6
		1	21.88	26.6
		2	22.24	26.6
		3	22.76	26.6
		4	22.25	26.6
		5	22.23	26.6
		6	22.31	26.6
		7	22.21	26.6

▣ **TEST RESULTS_Ant.0**

Conducted Output Power Measurements (802.11n_HT40 SISO Mode)

802.11n Mode		MCS Index	Measured Power(dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
2422	3	0	10.17	0.115	10.29	30
		1	10.20	0.116	10.32	30
		2	10.18	0.148	10.33	30
		3	10.18	0.124	10.30	30
		4	10.14	0.171	10.31	30
		5	10.15	0.228	10.38	30
		6	10.09	0.242	10.34	30
		7	10.00	0.267	10.26	30
2437	6	0	19.89	0.115	20.01	30
		1	19.90	0.116	20.01	30
		2	19.88	0.148	20.03	30
		3	19.85	0.124	19.98	30
		4	19.84	0.171	20.01	30
		5	19.81	0.228	20.03	30
		6	19.79	0.242	20.03	30
		7	19.72	0.267	19.98	30
2452	9	0	16.78	0.115	16.90	30
		1	16.78	0.116	16.89	30
		2	16.73	0.148	16.88	30
		3	16.83	0.124	16.96	30
		4	16.84	0.171	17.01	30
		5	16.80	0.228	17.02	30
		6	16.71	0.242	16.95	30
		7	16.66	0.267	16.92	30

▣ **TEST RESULTS_Ant.1**

Conducted Output Power Measurements (802.11n_HT40 SISO Mode)

802.11n Mode		MCS Index	Measured Power(dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
2422	3	0	9.91	0.116	10.03	30
		1	9.94	0.117	10.06	30
		2	9.88	0.144	10.03	30
		3	9.95	0.121	10.07	30
		4	9.89	0.178	10.07	30
		5	9.86	0.220	10.07	30
		6	9.79	0.254	10.05	30
		7	9.74	0.298	10.04	30
2437	6	0	19.52	0.116	19.63	30
		1	19.55	0.117	19.67	30
		2	19.56	0.144	19.70	30
		3	19.48	0.121	19.60	30
		4	19.47	0.178	19.64	30
		5	19.49	0.220	19.71	30
		6	19.36	0.254	19.62	30
		7	19.38	0.298	19.68	30
2452	9	0	16.58	0.116	16.70	30
		1	16.66	0.117	16.78	30
		2	16.54	0.144	16.69	30
		3	16.58	0.121	16.70	30
		4	16.60	0.178	16.78	30
		5	16.56	0.220	16.78	30
		6	16.51	0.254	16.77	30
		7	16.48	0.298	16.77	30

▣ TEST RESULTS_Ant.2

Conducted Output Power Measurements (802.11n_HT40 SISO Mode)

802.11n Mode		MCS Index	Measured Power(dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
2422	3	0	10.10	0.116	10.21	30
		1	10.14	0.117	10.25	30
		2	10.09	0.139	10.23	30
		3	10.11	0.126	10.23	30
		4	10.12	0.170	10.29	30
		5	10.09	0.212	10.30	30
		6	10.01	0.254	10.27	30
		7	9.90	0.298	10.20	30
2437	6	0	19.66	0.116	19.78	30
		1	19.67	0.117	19.79	30
		2	19.64	0.139	19.78	30
		3	19.59	0.126	19.71	30
		4	19.61	0.170	19.78	30
		5	19.63	0.212	19.84	30
		6	19.57	0.254	19.83	30
		7	19.46	0.298	19.76	30
2452	9	0	16.76	0.116	16.88	30
		1	16.77	0.117	16.89	30
		2	16.74	0.139	16.87	30
		3	16.84	0.126	16.97	30
		4	16.83	0.170	17.00	30
		5	16.82	0.212	17.03	30
		6	16.77	0.254	17.02	30
		7	16.68	0.298	16.98	30

▣ TEST RESULTS_Ant.3

Conducted Output Power Measurements (802.11n_HT40 SISO Mode)

802.11n Mode		MCS Index	Measured Power(dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
2422	3	0	10.10	0.116	10.22	30
		1	10.18	0.117	10.30	30
		2	10.08	0.139	10.22	30
		3	10.16	0.126	10.28	30
		4	10.12	0.179	10.30	30
		5	10.12	0.220	10.34	30
		6	10.07	0.254	10.33	30
		7	9.98	0.298	10.27	30
2437	6	0	19.87	0.116	19.99	30
		1	19.88	0.117	20.00	30
		2	19.86	0.139	19.99	30
		3	19.82	0.126	19.95	30
		4	19.79	0.179	19.97	30
		5	19.79	0.220	20.01	30
		6	19.72	0.254	19.97	30
		7	19.58	0.298	19.88	30
2452	9	0	16.83	0.116	16.95	30
		1	16.84	0.117	16.96	30
		2	16.83	0.139	16.97	30
		3	16.89	0.126	17.02	30
		4	16.87	0.179	17.05	30
		5	16.84	0.220	17.06	30
		6	16.80	0.254	17.05	30
		7	16.73	0.298	17.03	30

▣ **TEST RESULTS_Sum Data of Ant.0, 1, 2, 3**

Conducted Output Power Measurements (802.11n_HT40 MIMO Mode)

802.11n Mode		MCS	Sum Power of Ant.0 & 1 (dBm)	Limit (dBm)
Frequency[MHz]	Channel No.	Index		
2422	3	0	16.21	26.6
		1	16.25	26.6
		2	16.22	26.6
		3	16.24	26.6
		4	16.26	26.6
		5	16.29	26.6
		6	16.27	26.6
		7	16.21	26.6
2437	6	0	25.87	26.6
		1	25.89	26.6
		2	25.90	26.6
		3	25.83	26.6
		4	25.87	26.6
		5	25.92	26.6
		6	25.88	26.6
		7	25.85	26.6
2452	9	0	22.88	26.6
		1	22.90	26.6
		2	22.87	26.6
		3	22.93	26.6
		4	22.98	26.6
		5	22.99	26.6
		6	22.97	26.6
		7	22.95	26.6

▣ **TEST RESULTS-Average_Directional**

▣ **TEST RESULTS_Ant.0**

Conducted Output Power Measurements (802.11b Mode)

802.11b Mode		Rate (Mbps)	Measured Power(dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
2412	1	1 Mbps	14.78	0.031	14.81	30
		2 Mbps	14.73	0.041	14.78	30
		5.5 Mbps	14.66	0.112	14.77	30
		11 Mbps	14.56	0.208	14.76	30
2437	6	1 Mbps	14.80	0.031	14.83	30
		2 Mbps	14.75	0.041	14.80	30
		5.5 Mbps	14.68	0.112	14.80	30
		11 Mbps	14.60	0.208	14.81	30
2462	11	1 Mbps	14.78	0.031	14.81	30
		2 Mbps	14.75	0.041	14.79	30
		5.5 Mbps	14.66	0.112	14.78	30
		11 Mbps	14.58	0.208	14.79	30

▣ TEST RESULTS_Ant.1

Conducted Output Power Measurements (802.11b Mode)

802.11b Mode		Rate (Mbps)	Measured Power(dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
2412	1	1 Mbps	15.01	0.031	15.05	30
		2 Mbps	14.91	0.041	14.95	30
		5.5 Mbps	14.83	0.112	14.95	30
		11 Mbps	14.75	0.208	14.96	30
2437	6	1 Mbps	14.87	0.031	14.90	30
		2 Mbps	14.85	0.041	14.89	30
		5.5 Mbps	14.77	0.112	14.89	30
		11 Mbps	14.69	0.208	14.90	30
2462	11	1 Mbps	14.91	0.031	14.94	30
		2 Mbps	14.89	0.041	14.93	30
		5.5 Mbps	14.80	0.112	14.91	30
		11 Mbps	14.73	0.208	14.93	30

▣ TEST RESULTS_Ant.2

Conducted Output Power Measurements (802.11b Mode)

802.11b Mode		Rate (Mbps)	Measured Power(dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
2412	1	1 Mbps	15.04	0.031	15.07	30
		2 Mbps	15.01	0.041	15.05	30
		5.5 Mbps	14.95	0.112	15.06	30
		11 Mbps	14.85	0.208	15.06	30
2437	6	1 Mbps	15.16	0.031	15.19	30
		2 Mbps	15.10	0.041	15.14	30
		5.5 Mbps	15.04	0.112	15.15	30
		11 Mbps	14.92	0.208	15.13	30
2462	11	1 Mbps	15.11	0.031	15.14	30
		2 Mbps	15.07	0.041	15.11	30
		5.5 Mbps	14.99	0.112	15.10	30
		11 Mbps	14.90	0.208	15.11	30

▣ TEST RESULTS_Ant.3

Conducted Output Power Measurements (802.11b Mode)

802.11b Mode		Rate (Mbps)	Measured Power(dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
2412	1	1 Mbps	14.96	0.031	14.99	30
		2 Mbps	14.95	0.041	14.99	30
		5.5 Mbps	14.88	0.112	14.99	30
		11 Mbps	14.78	0.208	14.99	30
2437	6	1 Mbps	14.96	0.031	14.99	30
		2 Mbps	14.94	0.041	14.98	30
		5.5 Mbps	14.86	0.112	14.97	30
		11 Mbps	14.78	0.208	14.99	30
2462	11	1 Mbps	15.05	0.031	15.08	30
		2 Mbps	15.02	0.041	15.07	30
		5.5 Mbps	14.94	0.112	15.06	30
		11 Mbps	14.86	0.208	15.07	30

▣ **TEST RESULTS_Sum Data of Ant.0, 1, 2, 3**

Conducted Output Power Measurements (802.11b MIMO Mode)

802.11g Mode		Rate	Sum Power of Ant.0 & 1	Limit
Frequency[MHz]	Channel No.	(Mbps)	(dBm)	(dBm)
2412	1	1 Mbps	21.00	25.89
		2 Mbps	20.96	25.89
		5.5 Mbps	20.96	25.89
		11 Mbps	20.96	25.89
2437	6	1 Mbps	21.00	25.89
		2 Mbps	20.97	25.89
		5.5 Mbps	20.97	25.89
		11 Mbps	20.98	25.89
2462	11	1 Mbps	21.01	25.89
		2 Mbps	21.00	25.89
		5.5 Mbps	20.98	25.89
		11 Mbps	21.00	25.89

▣ TEST RESULTS_Ant.0

Conducted Output Power Measurements (802.11g SISO Mode)

802.11g Mode		Rate (Mbps)	Measured Power(dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
2412	1	6 Mbps	13.48	0.134	13.62	30
		9 Mbps	13.41	0.202	13.61	30
		12 Mbps	12.86	0.280	13.14	30
		18 Mbps	13.22	0.388	13.61	30
		24 Mbps	12.41	0.494	12.90	30
		36 Mbps	12.63	0.749	13.38	30
		48 Mbps	12.45	0.896	13.34	30
		54 Mbps	12.31	1.024	13.33	30
2437	6	6 Mbps	15.15	0.134	15.29	30
		9 Mbps	14.99	0.202	15.19	30
		12 Mbps	14.36	0.280	14.64	30
		18 Mbps	14.70	0.388	15.09	30
		24 Mbps	13.89	0.494	14.39	30
		36 Mbps	14.16	0.749	14.91	30
		48 Mbps	13.98	0.896	14.88	30
		54 Mbps	13.83	1.024	14.85	30
2462	11	6 Mbps	13.12	0.134	13.25	30
		9 Mbps	12.96	0.202	13.16	30
		12 Mbps	12.40	0.280	12.68	30
		18 Mbps	12.75	0.388	13.14	30
		24 Mbps	11.92	0.494	12.41	30
		36 Mbps	12.15	0.749	12.90	30
		48 Mbps	11.97	0.896	12.86	30
		54 Mbps	11.81	1.024	12.83	30

▣ **TEST RESULTS_Ant.1**

Conducted Output Power Measurements (802.11g SISO Mode)

802.11g Mode		Rate (Mbps)	Measured Power(dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
2412	1	6 Mbps	13.79	0.134	13.92	30
		9 Mbps	13.64	0.202	13.85	30
		12 Mbps	13.07	0.280	13.35	30
		18 Mbps	13.43	0.388	13.82	30
		24 Mbps	12.59	0.494	13.09	30
		36 Mbps	12.83	0.749	13.58	30
		48 Mbps	12.67	0.896	13.57	30
		54 Mbps	12.52	1.024	13.54	30
2437	6	6 Mbps	15.27	0.134	15.40	30
		9 Mbps	15.11	0.202	15.32	30
		12 Mbps	14.48	0.280	14.76	30
		18 Mbps	14.82	0.388	15.21	30
		24 Mbps	14.04	0.494	14.53	30
		36 Mbps	14.31	0.749	15.06	30
		48 Mbps	14.13	0.896	15.03	30
		54 Mbps	13.99	1.024	15.01	30
2462	11	6 Mbps	13.11	0.134	13.24	30
		9 Mbps	13.04	0.202	13.24	30
		12 Mbps	12.46	0.280	12.74	30
		18 Mbps	12.82	0.388	13.21	30
		24 Mbps	11.99	0.494	12.48	30
		36 Mbps	12.22	0.749	12.97	30
		48 Mbps	12.04	0.896	12.94	30
		54 Mbps	11.90	1.024	12.92	30

▣ TEST RESULTS_Ant.2

Conducted Output Power Measurements (802.11g SISO Mode)

802.11g Mode		Rate (Mbps)	Measured Power(dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
2412	1	6 Mbps	13.78	0.134	13.92	30
		9 Mbps	13.72	0.202	13.92	30
		12 Mbps	13.15	0.280	13.43	30
		18 Mbps	13.52	0.388	13.91	30
		24 Mbps	12.63	0.494	13.12	30
		36 Mbps	12.86	0.749	13.61	30
		48 Mbps	12.68	0.896	13.57	30
		54 Mbps	12.53	1.024	13.56	30
2437	6	6 Mbps	15.52	0.134	15.66	30
		9 Mbps	15.36	0.202	15.56	30
		12 Mbps	14.72	0.280	15.00	30
		18 Mbps	15.09	0.388	15.47	30
		24 Mbps	14.24	0.494	14.74	30
		36 Mbps	14.46	0.749	15.20	30
		48 Mbps	14.28	0.896	15.18	30
		54 Mbps	14.14	1.024	15.17	30
2462	11	6 Mbps	13.35	0.134	13.48	30
		9 Mbps	13.20	0.202	13.40	30
		12 Mbps	12.61	0.280	12.89	30
		18 Mbps	13.02	0.388	13.41	30
		24 Mbps	12.22	0.494	12.71	30
		36 Mbps	12.44	0.749	13.19	30
		48 Mbps	12.26	0.896	13.16	30
		54 Mbps	12.11	1.024	13.14	30

▣ TEST RESULTS_Ant.3

Conducted Output Power Measurements (802.11g SISO Mode)

802.11g Mode		Rate (Mbps)	Measured Power(dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
2412	1	6 Mbps	13.80	0.134	13.93	30
		9 Mbps	13.66	0.202	13.86	30
		12 Mbps	13.10	0.280	13.38	30
		18 Mbps	13.42	0.388	13.81	30
		24 Mbps	12.65	0.494	13.15	30
		36 Mbps	12.89	0.749	13.64	30
		48 Mbps	12.71	0.896	13.60	30
		54 Mbps	12.56	1.024	13.58	30
2437	6	6 Mbps	15.37	0.134	15.50	30
		9 Mbps	15.20	0.202	15.41	30
		12 Mbps	14.55	0.280	14.83	30
		18 Mbps	14.90	0.388	15.29	30
		24 Mbps	14.12	0.494	14.62	30
		36 Mbps	14.35	0.749	15.10	30
		48 Mbps	14.18	0.896	15.07	30
		54 Mbps	14.04	1.024	15.06	30
2462	11	6 Mbps	13.33	0.134	13.46	30
		9 Mbps	13.25	0.202	13.45	30
		12 Mbps	12.68	0.280	12.96	30
		18 Mbps	13.02	0.388	13.41	30
		24 Mbps	12.20	0.494	12.69	30
		36 Mbps	12.42	0.749	13.17	30
		48 Mbps	12.25	0.896	13.15	30
		54 Mbps	12.11	1.024	13.13	30

▣ **TEST RESULTS_Sum Data of Ant.0, 1, 2, 3**

Conducted Output Power Measurements (802.11g MIMO Mode)

802.11g Mode		Rate	Sum Power of Ant.0 & 1	Limit
Frequency[MHz]	Channel No.	(Mbps)	(dBm)	(dBm)
2412	1	6 Mbps	19.87	25.89
		9 Mbps	19.83	25.89
		12 Mbps	19.35	25.89
		18 Mbps	19.81	25.89
		24 Mbps	19.09	25.89
		36 Mbps	19.57	25.89
		48 Mbps	19.54	25.89
		54 Mbps	19.52	25.89
2437	6	6 Mbps	21.48	25.89
		9 Mbps	21.39	25.89
		12 Mbps	20.83	25.89
		18 Mbps	21.29	25.89
		24 Mbps	20.59	25.89
		36 Mbps	21.09	25.89
		48 Mbps	21.06	25.89
		54 Mbps	21.04	25.89
2462	11	6 Mbps	19.38	25.89
		9 Mbps	19.33	25.89
		12 Mbps	18.84	25.89
		18 Mbps	19.31	25.89
		24 Mbps	18.59	25.89
		36 Mbps	19.08	25.89
		48 Mbps	19.05	25.89
		54 Mbps	19.03	25.89

▣ **TEST RESULTS_Ant.0**

Conducted Output Power Measurements (802.11n_HT20 SISO Mode)

802.11n Mode		MCS Index	Measured Power(dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
2412	1	0	12.89	0.052	12.94	30
		1	12.63	0.052	12.68	30
		2	12.73	0.063	12.80	30
		3	12.70	0.052	12.75	30
		4	12.72	0.087	12.80	30
		5	12.67	0.127	12.80	30
		6	12.73	0.129	12.86	30
		7	12.62	0.147	12.77	30
2437	6	0	14.95	0.052	15.00	30
		1	14.70	0.052	14.75	30
		2	14.71	0.063	14.78	30
		3	14.68	0.052	14.73	30
		4	14.78	0.087	14.87	30
		5	14.73	0.127	14.86	30
		6	14.80	0.129	14.93	30
		7	14.70	0.147	14.84	30
2462	11	0	13.41	0.052	13.46	30
		1	13.14	0.052	13.19	30
		2	13.25	0.063	13.32	30
		3	13.22	0.052	13.28	30
		4	13.30	0.087	13.39	30
		5	13.25	0.127	13.38	30
		6	13.32	0.129	13.45	30
		7	13.21	0.147	13.36	30

▣ TEST RESULTS_Ant.1

Conducted Output Power Measurements (802.11n_HT20 SISO Mode)

802.11n Mode		MCS Index	Measured Power(dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
2412	1	0	13.08	0.052	13.13	30
		1	12.82	0.052	12.87	30
		2	12.94	0.063	13.00	30
		3	12.91	0.052	12.96	30
		4	12.96	0.087	13.05	30
		5	12.91	0.127	13.04	30
		6	12.98	0.129	13.11	30
		7	12.87	0.147	13.02	30
2437	6	0	14.97	0.052	15.03	30
		1	14.81	0.052	14.87	30
		2	14.84	0.063	14.91	30
		3	14.79	0.052	14.85	30
		4	14.88	0.087	14.97	30
		5	14.83	0.127	14.96	30
		6	14.89	0.129	15.02	30
		7	14.79	0.147	14.93	30
2462	11	0	13.55	0.052	13.60	30
		1	13.29	0.052	13.34	30
		2	13.37	0.063	13.43	30
		3	13.34	0.052	13.39	30
		4	13.38	0.087	13.46	30
		5	13.33	0.127	13.46	30
		6	13.40	0.129	13.52	30
		7	13.26	0.147	13.41	30

▣ TEST RESULTS_Ant.2

Conducted Output Power Measurements (802.11n_HT20 SISO Mode)

802.11n Mode		MCS Index	Measured Power(dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
2412	1	0	13.17	0.052	13.22	30
		1	12.92	0.052	12.97	30
		2	12.99	0.063	13.05	30
		3	12.95	0.052	13.00	30
		4	13.05	0.087	13.14	30
		5	13.01	0.127	13.14	30
		6	13.07	0.129	13.20	30
		7	12.96	0.147	13.11	30
2437	6	0	15.31	0.052	15.36	30
		1	15.04	0.052	15.09	30
		2	15.12	0.063	15.18	30
		3	15.09	0.052	15.14	30
		4	15.13	0.087	15.22	30
		5	15.06	0.127	15.19	30
		6	15.14	0.129	15.27	30
		7	15.03	0.147	15.17	30
2462	11	0	13.69	0.052	13.74	30
		1	13.37	0.052	13.42	30
		2	13.55	0.063	13.62	30
		3	13.52	0.052	13.57	30
		4	13.56	0.087	13.64	30
		5	13.51	0.127	13.63	30
		6	13.57	0.129	13.70	30
		7	13.46	0.147	13.61	30

▣ TEST RESULTS_Ant.3

Conducted Output Power Measurements (802.11n_HT20 SISO Mode)

802.11n Mode		MCS Index	Measured Power(dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
2412	1	0	13.06	0.052	13.11	30
		1	12.79	0.052	12.84	30
		2	12.95	0.063	13.01	30
		3	12.92	0.052	12.97	30
		4	12.91	0.087	12.99	30
		5	12.86	0.127	12.99	30
		6	12.92	0.129	13.05	30
		7	12.81	0.147	12.95	30
2437	6	0	15.10	0.052	15.15	30
		1	14.84	0.052	14.89	30
		2	14.88	0.063	14.94	30
		3	14.84	0.052	14.89	30
		4	14.92	0.087	15.00	30
		5	14.88	0.127	15.00	30
		6	14.93	0.129	15.06	30
		7	14.83	0.147	14.98	30
2462	11	0	13.63	0.052	13.68	30
		1	13.35	0.052	13.40	30
		2	13.52	0.063	13.58	30
		3	13.49	0.052	13.55	30
		4	13.52	0.087	13.61	30
		5	13.47	0.127	13.60	30
		6	13.54	0.129	13.67	30
		7	13.44	0.147	13.58	30

▣ **TEST RESULTS_Sum Data of Ant.0, 1, 2, 3**

Conducted Output Power Measurements (802.11n_HT20 MIMO Mode)

802.11n Mode		MCS	Sum Power of Ant.0 & 1 (dBm)	Limit (dBm)
Frequency[MHz]	Channel No.	Index		
2412	1	0	19.12	25.89
		1	18.86	25.89
		2	18.99	25.89
		3	18.94	25.89
		4	19.02	25.89
		5	19.01	25.89
		6	19.08	25.89
		7	18.98	25.89
2437	6	0	21.16	25.89
		1	20.92	25.89
		2	20.97	25.89
		3	20.92	25.89
		4	21.04	25.89
		5	21.02	25.89
		6	21.09	25.89
		7	21.00	25.89
2462	11	0	19.64	25.89
		1	19.36	25.89
		2	19.51	25.89
		3	19.47	25.89
		4	19.55	25.89
		5	19.54	25.89
		6	19.61	25.89
		7	19.51	25.89

▣ TEST RESULTS_Ant.0

Conducted Output Power Measurements (802.11n_HT40 SISO Mode)

802.11n Mode		MCS Index	Measured Power(dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
2422	3	0	9.96	0.115	10.08	30
		1	9.89	0.116	10.01	30
		2	9.78	0.148	9.93	30
		3	9.72	0.124	9.85	30
		4	9.81	0.171	9.98	30
		5	9.76	0.228	9.98	30
		6	9.74	0.242	9.98	30
		7	9.66	0.267	9.93	30
2437	6	0	15.08	0.115	15.20	30
		1	15.00	0.116	15.12	30
		2	14.91	0.148	15.06	30
		3	14.85	0.124	14.97	30
		4	14.97	0.171	15.14	30
		5	14.91	0.228	15.14	30
		6	14.89	0.242	15.13	30
		7	14.83	0.267	15.10	30
2452	9	0	10.10	0.115	10.22	30
		1	10.02	0.116	10.14	30
		2	9.91	0.148	10.06	30
		3	9.86	0.124	9.98	30
		4	9.94	0.171	10.12	30
		5	9.89	0.228	10.11	30
		6	9.86	0.242	10.10	30
		7	9.77	0.267	10.04	30

▣ **TEST RESULTS_Ant.1**

Conducted Output Power Measurements (802.11n_HT40 SISO Mode)

802.11n Mode		MCS Index	Measured Power(dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
2422	3	0	10.07	0.115	10.19	30
		1	10.00	0.116	10.11	30
		2	9.88	0.148	10.02	30
		3	9.84	0.124	9.96	30
		4	9.92	0.171	10.10	30
		5	9.87	0.228	10.10	30
		6	9.84	0.242	10.08	30
		7	9.76	0.267	10.03	30
2437	6	0	15.13	0.115	15.24	30
		1	15.05	0.116	15.17	30
		2	14.97	0.148	15.11	30
		3	14.90	0.124	15.03	30
		4	15.05	0.171	15.22	30
		5	14.99	0.228	15.21	30
		6	14.95	0.242	15.19	30
		7	14.87	0.267	15.14	30
2452	9	0	10.11	0.115	10.22	30
		1	10.03	0.116	10.14	30
		2	9.93	0.148	10.08	30
		3	9.87	0.124	9.99	30
		4	9.95	0.171	10.12	30
		5	9.90	0.228	10.13	30
		6	9.86	0.242	10.10	30
		7	9.79	0.267	10.06	30

▣ TEST RESULTS_Ant.2

Conducted Output Power Measurements (802.11n_HT40 SISO Mode)

802.11n Mode		MCS Index	Measured Power(dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
2422	3	0	10.29	0.115	10.41	30
		1	10.15	0.116	10.26	30
		2	10.11	0.148	10.26	30
		3	10.06	0.124	10.19	30
		4	10.15	0.171	10.32	30
		5	10.09	0.228	10.32	30
		6	10.07	0.242	10.31	30
		7	9.98	0.267	10.25	30
2437	6	0	15.41	0.115	15.52	30
		1	15.33	0.116	15.44	30
		2	15.28	0.148	15.43	30
		3	15.22	0.124	15.34	30
		4	15.32	0.171	15.49	30
		5	15.27	0.228	15.49	30
		6	15.22	0.242	15.47	30
		7	15.15	0.267	15.41	30
2452	9	0	10.31	0.115	10.42	30
		1	10.21	0.116	10.33	30
		2	10.14	0.148	10.29	30
		3	10.06	0.124	10.19	30
		4	10.15	0.171	10.33	30
		5	10.13	0.228	10.35	30
		6	10.07	0.242	10.31	30
		7	10.01	0.267	10.27	30

▣ TEST RESULTS_Ant.3

Conducted Output Power Measurements (802.11n_HT40 SISO Mode)

802.11n Mode		MCS Index	Measured Power(dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
2422	3	0	10.29	0.115	10.40	30
		1	10.22	0.116	10.33	30
		2	10.11	0.148	10.25	30
		3	10.05	0.124	10.17	30
		4	10.13	0.171	10.30	30
		5	10.08	0.228	10.30	30
		6	10.04	0.242	10.28	30
		7	9.96	0.267	10.23	30
2437	6	0	15.24	0.115	15.35	30
		1	15.16	0.116	15.28	30
		2	15.07	0.148	15.22	30
		3	15.00	0.124	15.13	30
		4	15.11	0.171	15.28	30
		5	15.04	0.228	15.27	30
		6	15.01	0.242	15.26	30
		7	14.94	0.267	15.21	30
2452	9	0	10.14	0.115	10.26	30
		1	10.08	0.116	10.19	30
		2	9.96	0.148	10.11	30
		3	9.90	0.124	10.02	30
		4	9.99	0.171	10.17	30
		5	9.93	0.228	10.16	30
		6	9.91	0.242	10.15	30
		7	9.83	0.267	10.09	30

▣ **TEST RESULTS_Sum Data of Ant.0, 1, 2, 3**

Conducted Output Power Measurements (802.11n_HT40 MIMO Mode)

802.11n Mode		MCS	Sum Power of Ant.0 & 1 (dBm)	Limit (dBm)
Frequency[MHz]	Channel No.	Index		
2422	3	0	16.29	25.89
		1	16.20	25.89
		2	16.14	25.89
		3	16.06	25.89
		4	16.20	25.89
		5	16.20	25.89
		6	16.18	25.89
		7	16.13	25.89
2437	6	0	21.35	25.89
		1	21.27	25.89
		2	21.23	25.89
		3	21.14	25.89
		4	21.30	25.89
		5	21.30	25.89
		6	21.28	25.89
		7	21.24	25.89
2452	9	0	16.30	25.89
		1	16.22	25.89
		2	16.16	25.89
		3	16.07	25.89
		4	16.21	25.89
		5	16.21	25.89
		6	16.19	25.89
		7	16.14	25.89

9.4 POWER SPECTRAL DENSITY (802.11b/g/n)

Test Requirements and limit, §15.247(e)

The peak power spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies.

Minimum Standard – the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

▣ Limit

- Omni

Operating Mode	Band	Mode	Ant. Port	Ant. Gain (dBi)	Limit (dBm)
SISO	2.4 GHz	802.11b/g/n	0	3.3	8.0
			1	2.3	8.0
			2	3.7	8.0
			3	4.1	8.0
MIMO(4 TX)		802.11b/g/n	0 & 1 & 2 & 3	9.40	4.6

- Directional

Operating Mode	Band	Mode	Ant. Port	Ant. Gain (dBi)	Limit (dBm)
SISO	2.4 GHz	802.11b/g/n	0	3.6	8.0
			1	4.5	8.0
			2	3.5	8.0
			3	4.7	8.0
MIMO(4 TX)		802.11b/g/n	0 & 1 & 2 & 3	10.11	3.89

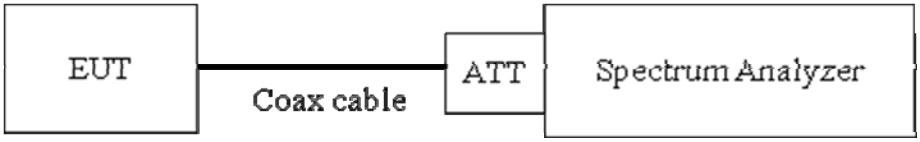
Note : 1. If antenna gains are not equal,

Directional gain = $10*\log[(10^{G1/20} + 10^{G2/20}+\ldots+10^{GN/20})^2/N]$ dBi (802.11g/n)

(according to KDB662911 D01 v02r01)

2. Limit is calculated by antenna gain.

▣ TEST CONFIGURATION



▣ TEST PROCEDURE

We tested according to Procedure 10.3 in KDB 558074 v04

The spectrum analyzer is set to :

Set analyzer center frequency to DTS channel center frequency.

Span = 1.5 times the DTS channel bandwidth.

RBW = 3 kHz ≤ RBW ≤ 100 kHz.

VBW ≥ 3 x RBW.

Sweep = auto couple

Detector = power averaging (RMS) or sample detector (when RMS not available).

Ensure that the number of measurement points in the sweep ≥ 2 × span/RBW.

Employ trace averaging (RMS) mode over a minimum of 100 traces.

Use the peak marker function to determine the maximum amplitude level.

If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

▣ Sample Calculation

PSD = Reading Value + ATT loss + Cable loss(1 ea)

Note :

1. Spectrum reading values are not plot data. The PSD results in plot is already including the actual values of loss for the attenuator and cable combination.
2. Spectrum offset = Attenuator loss + Cable loss
2. We apply the offset of Omni and Directional respectively.
   The offset of the 2.4 GHz band on Omni is 11.4 dB.
   The offset of the 2.4 GHz band on Directional is 20.7 dB.
   Actual value of loss for the attenuator and cable combination is below table.

ANT	Band	Loss(dB)
Omni	2.4 GHz	11.4
Directional		20.7

(Actual value of loss for the attenuator and cable combination)

4. MIMO output power results are calculated by each antenna output power on MIMO operating mode.
So, in case of MIMO output power, we attached only MIMO output power except each antenna power result.

▣ TEST RESULTS_Ant.0_Omni

Conducted Power Density Measurements

Frequency (MHz)	Channel No.	Mode	Test Result		
			PSD (dBm)	Limit (dBm)	Pass/Fail
2412	1	802.11b (SISO)	-6.017	8	Pass
2437	6		-6.955	8	Pass
2462	11		-7.712	8	Pass
2412	1	802.11g (SISO)	-16.580	8	Pass
2437	6		-12.375	8	Pass
2462	11		-16.128	8	Pass
2412	1	802.11n HT20 (SISO)	-15.716	8	Pass
2437	6		-10.794	8	Pass
2462	11		-13.887	8	Pass
2422	3	802.11n HT40 (SISO)	-22.377	8	Pass
2437	6		-12.595	8	Pass
2452	9		-15.482	8	Pass

▣ TEST RESULTS_Ant.1_Omni

Conducted Power Density Measurements

Frequency (MHz)	Channel No.	Mode	Test Result		
			PSD (dBm)	Limit (dBm)	Pass/Fail
2412	1	802.11b (SISO)	-7.580	8	Pass
2437	6		-6.912	8	Pass
2462	11		-7.755	8	Pass
2412	1	802.11g (SISO)	-16.607	8	Pass
2437	6		-12.652	8	Pass
2462	11		-16.270	8	Pass
2412	1	802.11n HT20 (SISO)	-15.599	8	Pass
2437	6		-10.693	8	Pass
2462	11		-14.348	8	Pass
2422	3	802.11n HT40 (SISO)	-22.572	8	Pass
2437	6		-13.288	8	Pass
2452	9		-15.562	8	Pass

▣ TEST RESULTS_Ant.2_Omni

Conducted Power Density Measurements

Frequency (MHz)	Channel No.	Mode	Test Result		
			PSD (dBm)	Limit (dBm)	Pass/Fail
2412	1	802.11b (SISO)	-6.316	8	Pass
2437	6		-7.430	8	Pass
2462	11		-8.451	8	Pass
2412	1	802.11g (SISO)	-16.657	8	Pass
2437	6		-12.429	8	Pass
2462	11		-15.979	8	Pass
2412	1	802.11n HT20 (SISO)	-15.467	8	Pass
2437	6		-10.514	8	Pass
2462	11		-13.820	8	Pass
2422	3	802.11n HT40 (SISO)	-21.819	8	Pass
2437	6		-12.479	8	Pass
2452	9		-15.509	8	Pass

▣ TEST RESULTS_Ant.3_Omni

Conducted Power Density Measurements

Frequency (MHz)	Channel No.	Mode	Test Result		
			PSD (dBm)	Limit (dBm)	Pass/Fail
2412	1	802.11b (SISO)	-8.870	8	Pass
2437	6		-6.064	8	Pass
2462	11		-7.827	8	Pass
2412	1	802.11g (SISO)	-16.410	8	Pass
2437	6		-12.524	8	Pass
2462	11		-16.173	8	Pass
2412	1	802.11n HT20 (SISO)	-15.661	8	Pass
2437	6		-10.637	8	Pass
2462	11		-13.864	8	Pass
2422	3	802.11n HT40 (SISO)	-22.236	8	Pass
2437	6		-13.044	8	Pass
2452	9		-15.534	8	Pass

▣ TEST RESULTS_Sum Data of Ant.0, 1, 2, 3_Omni

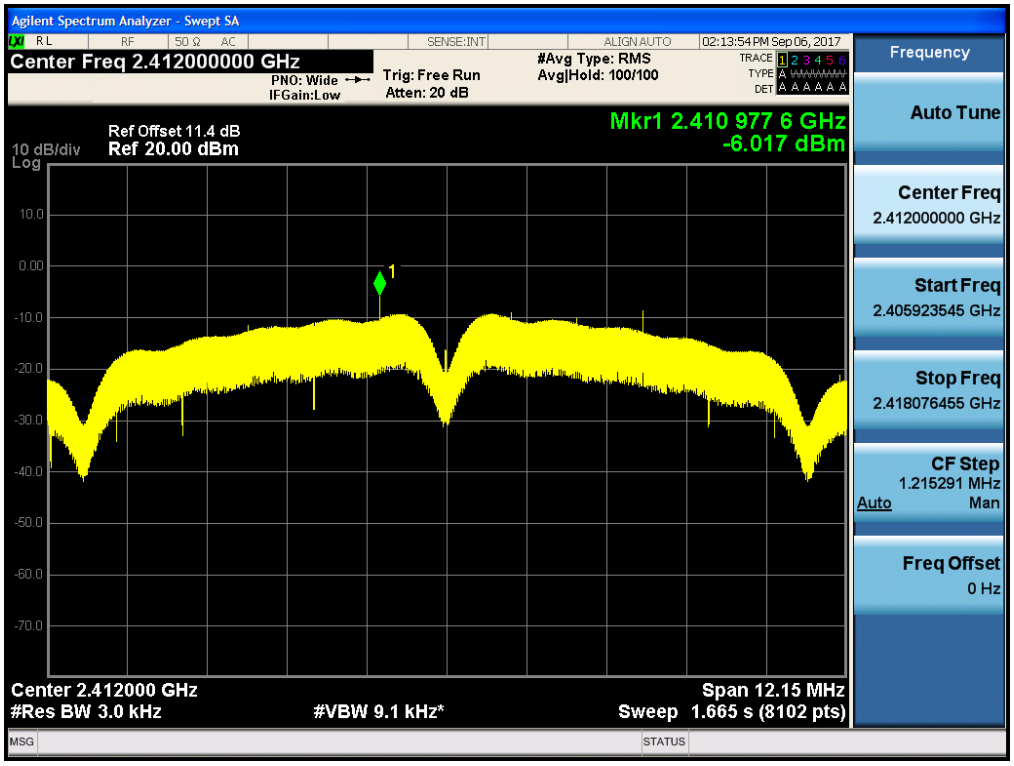
Conducted Power Density Measurements

Frequency (MHz)	Channel No.	Mode	Test Result		
			PSD (dBm)	Limit (dBm)	Pass/Fail
2412	1	802.11b (MIMO)	-1.10	4.6	Pass
2437	6		-0.81		Pass
2462	11		-1.91		Pass
2412	1	802.11g (MIMO)	-10.54	4.6	Pass
2437	6		-6.47		Pass
2462	11		-10.12		Pass
2412	1	802.11n HT20 (MIMO)	-9.59	4.6	Pass
2437	6		-4.64		Pass
2462	11		-7.96		Pass
2422	3	802.11n HT40 (MIMO)	-16.23	4.6	Pass
2437	6		-6.82		Pass
2452	9		-9.50		Pass

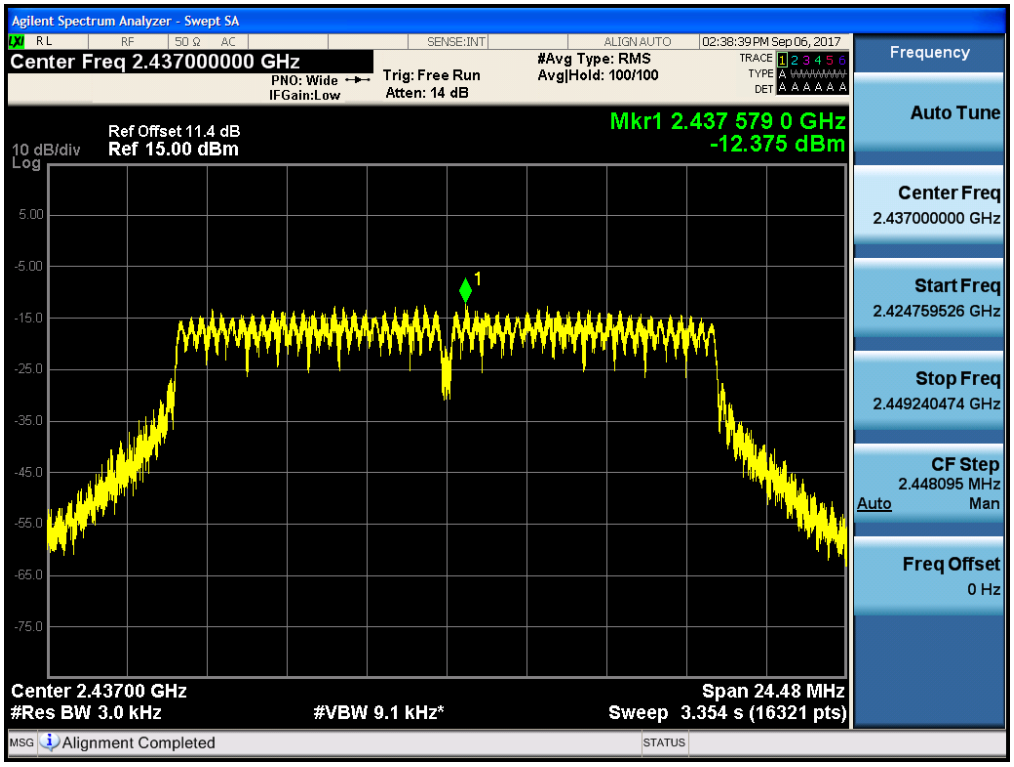
Note : In order to simplify the report, attached plots were only the highest PSD channel.

▣ RESULT PLOTS_Ant.0

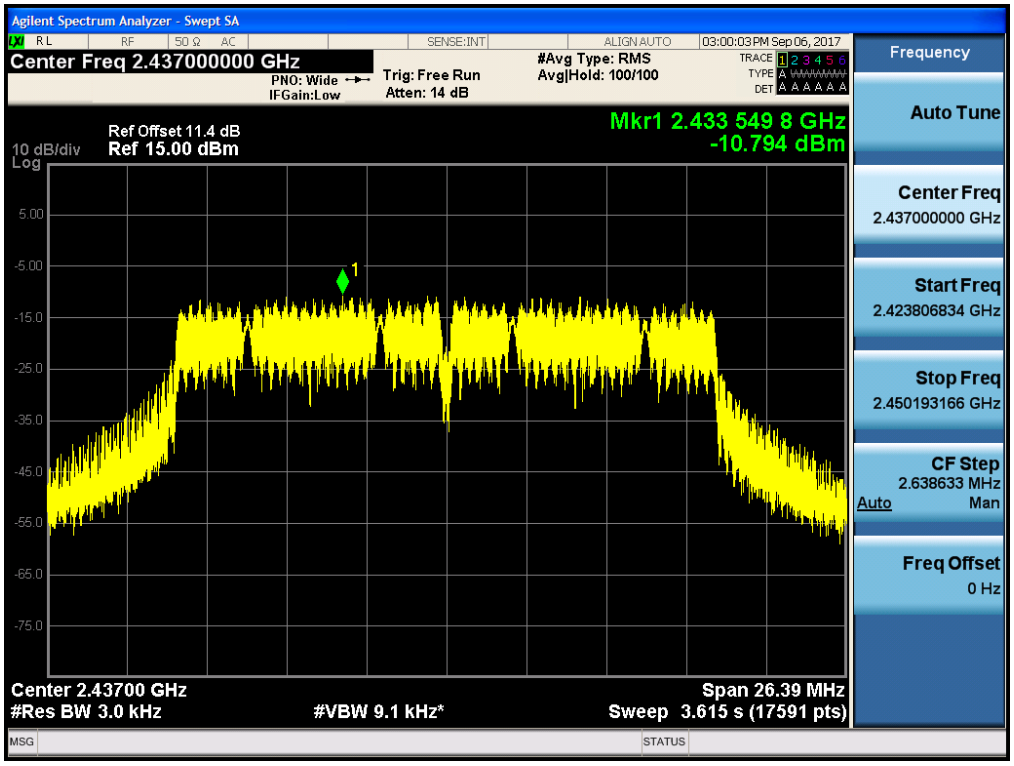
Power Spectral Density (802.11b-CH 1)



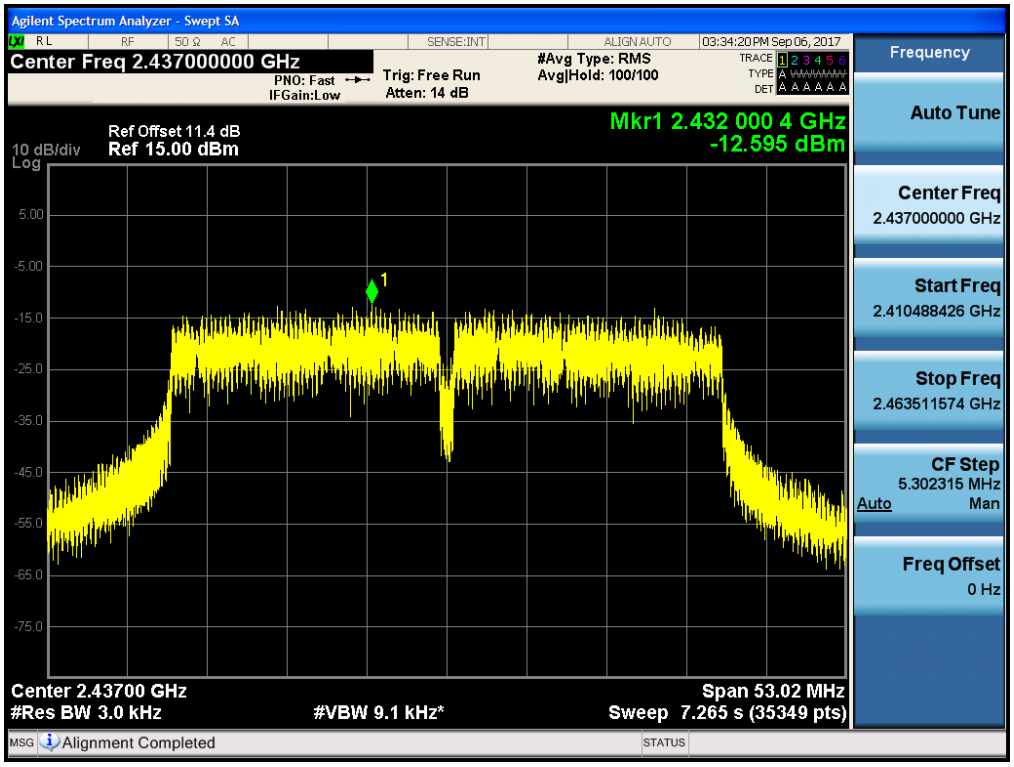
Power Spectral Density (802.11g-CH 6)



Power Spectral Density (802.11n_HT20 -CH 6)

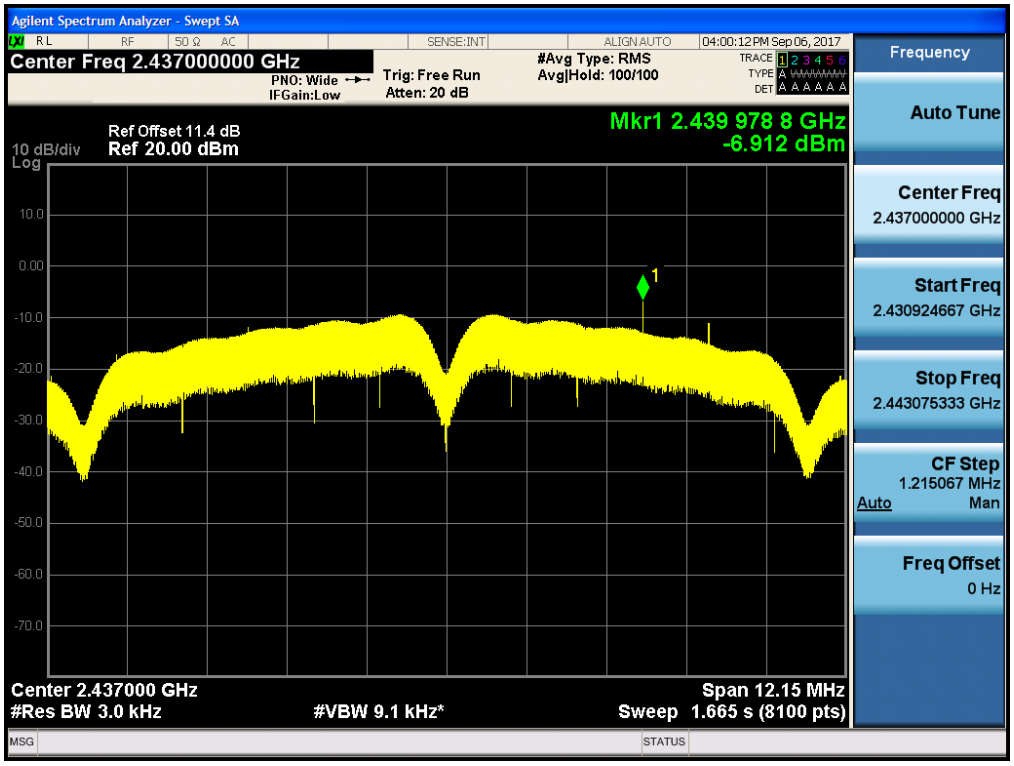


Power Spectral Density (802.11n_HT40 -CH 6)

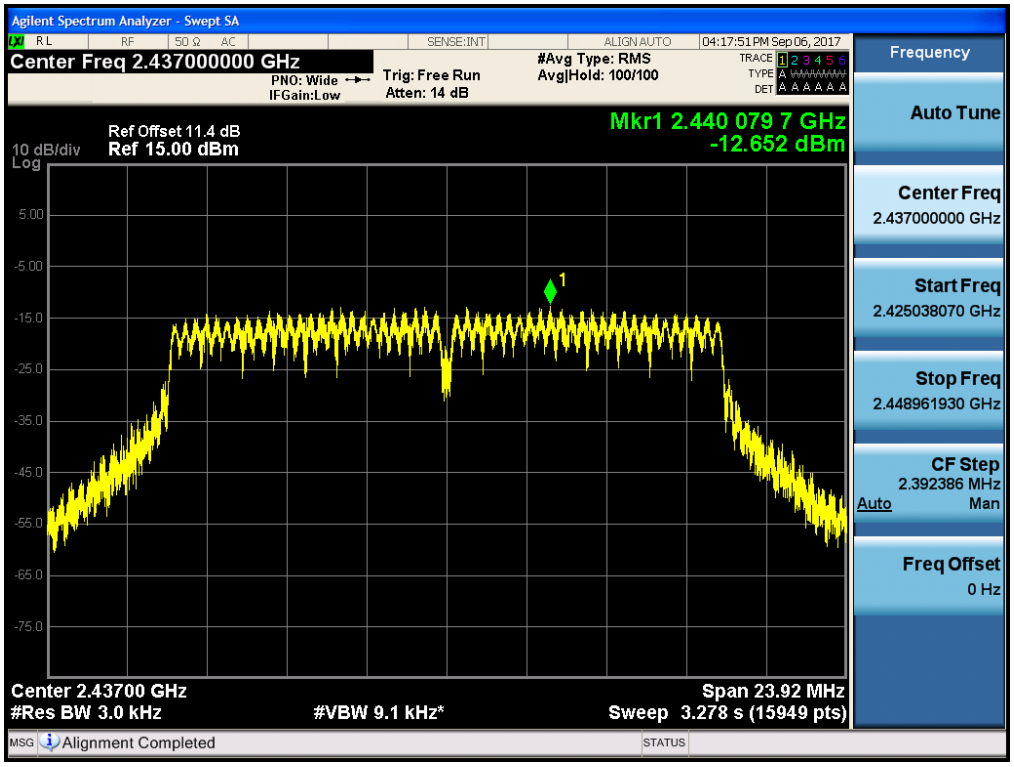


▣ RESULT PLOTS_Ant.1

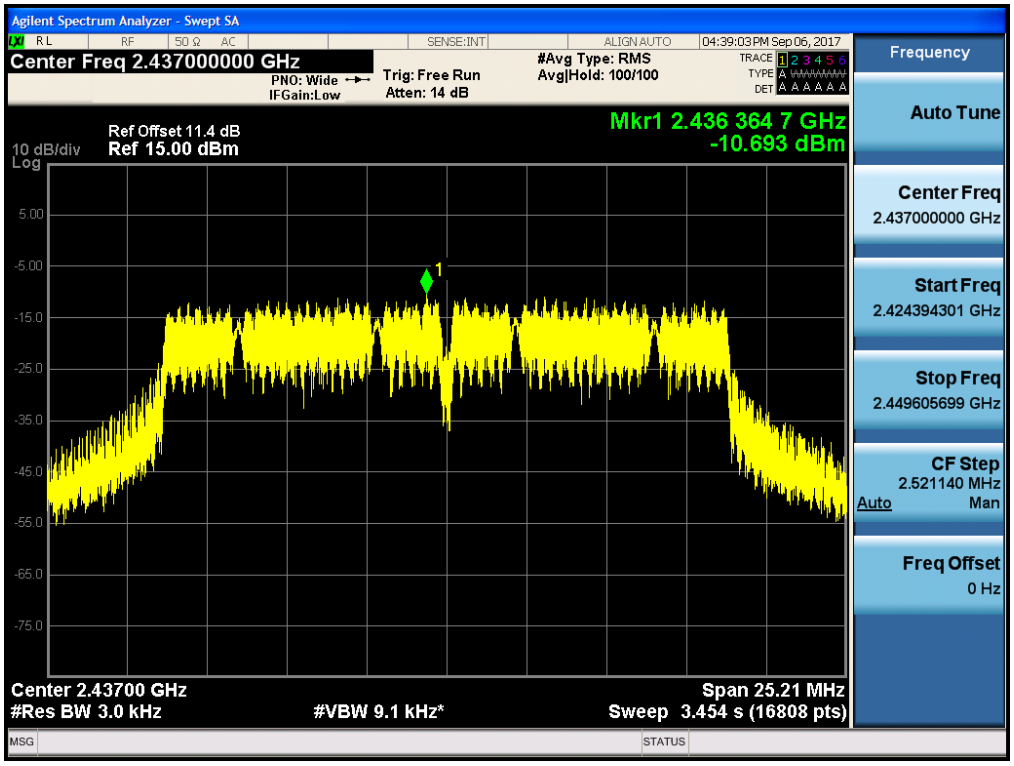
Power Spectral Density (802.11b-CH 6)



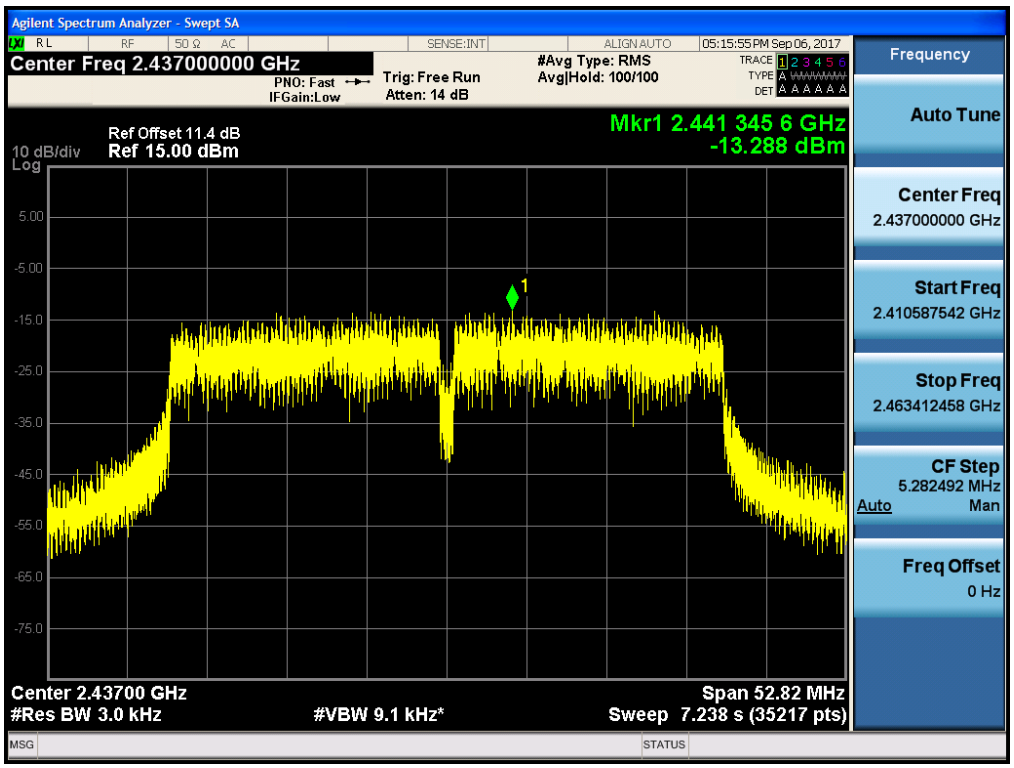
Power Spectral Density (802.11g-CH 6)



Power Spectral Density (802.11n_HT20 -CH 6)

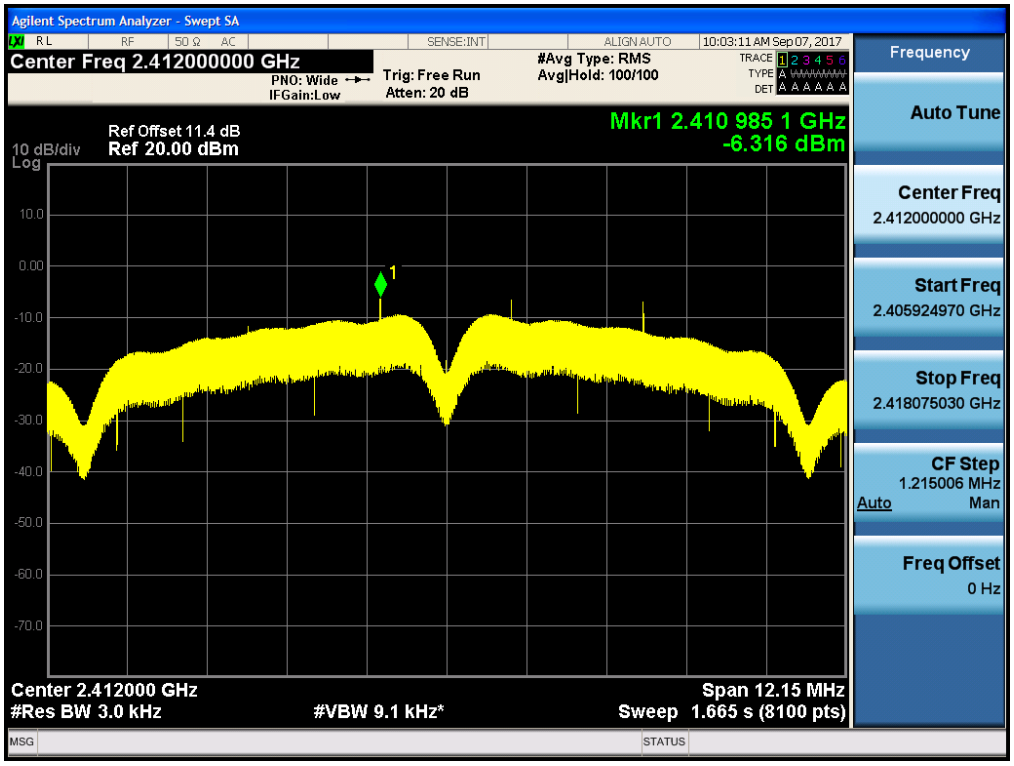


Power Spectral Density (802.11n_HT40 -CH 6)

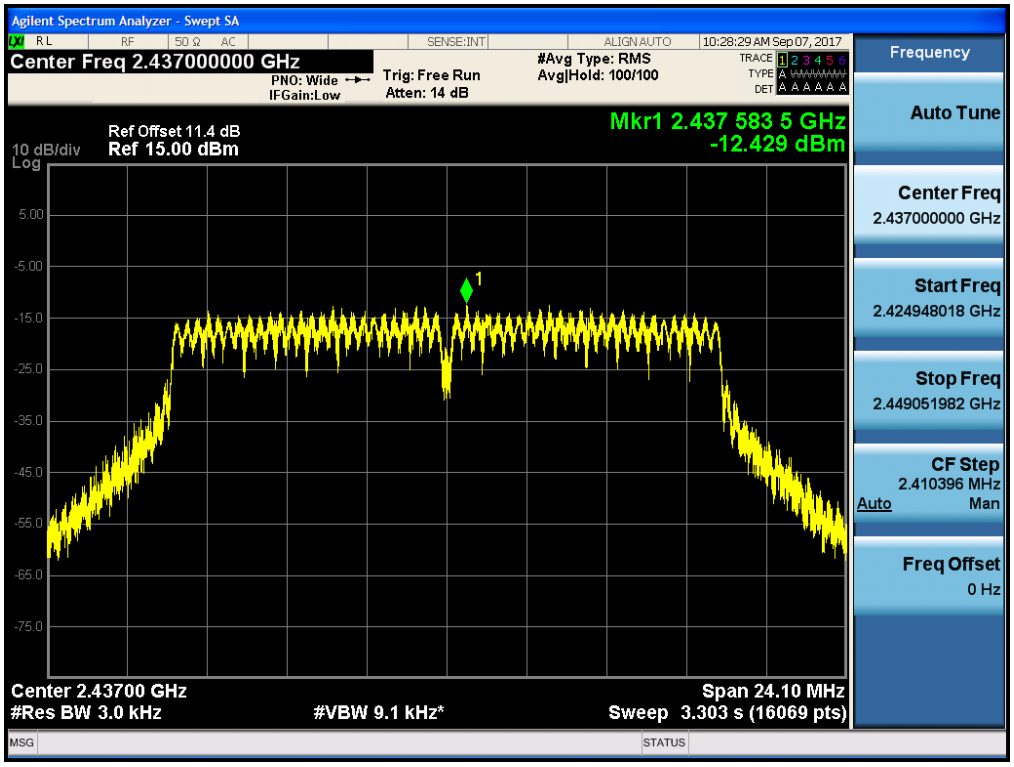


▣ RESULT PLOTS_Ant.2

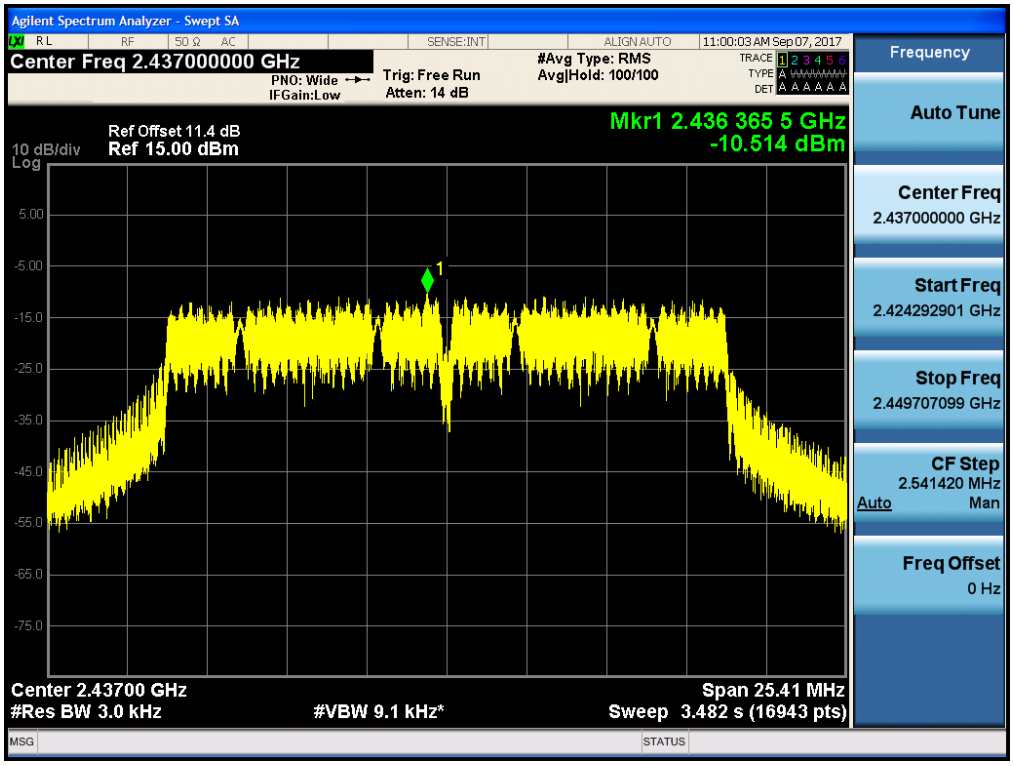
Power Spectral Density (802.11b-CH 1)



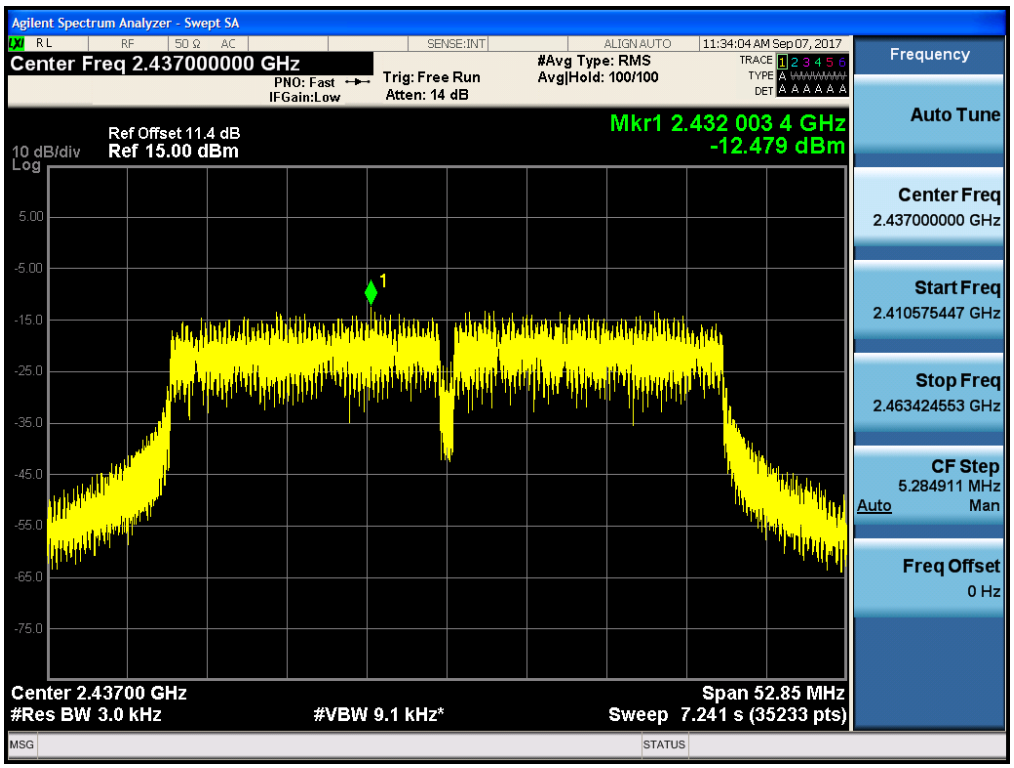
Power Spectral Density (802.11g-CH 6)



Power Spectral Density (802.11n_HT20 -CH 6)

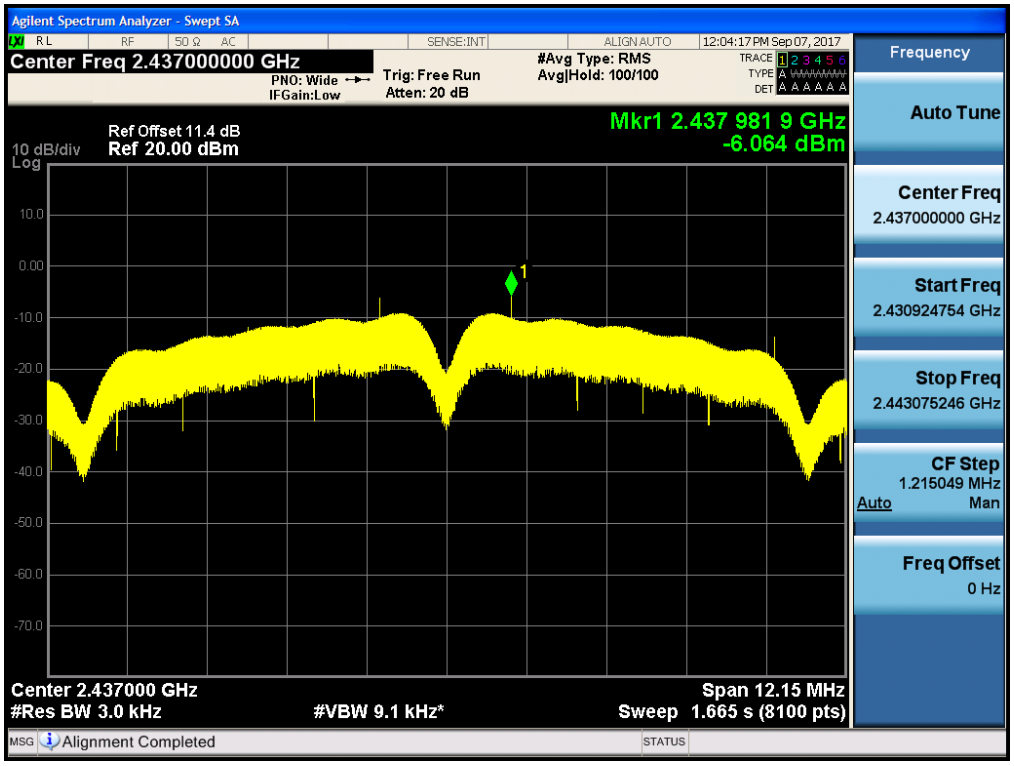


Power Spectral Density (802.11n_HT40 -CH 6)

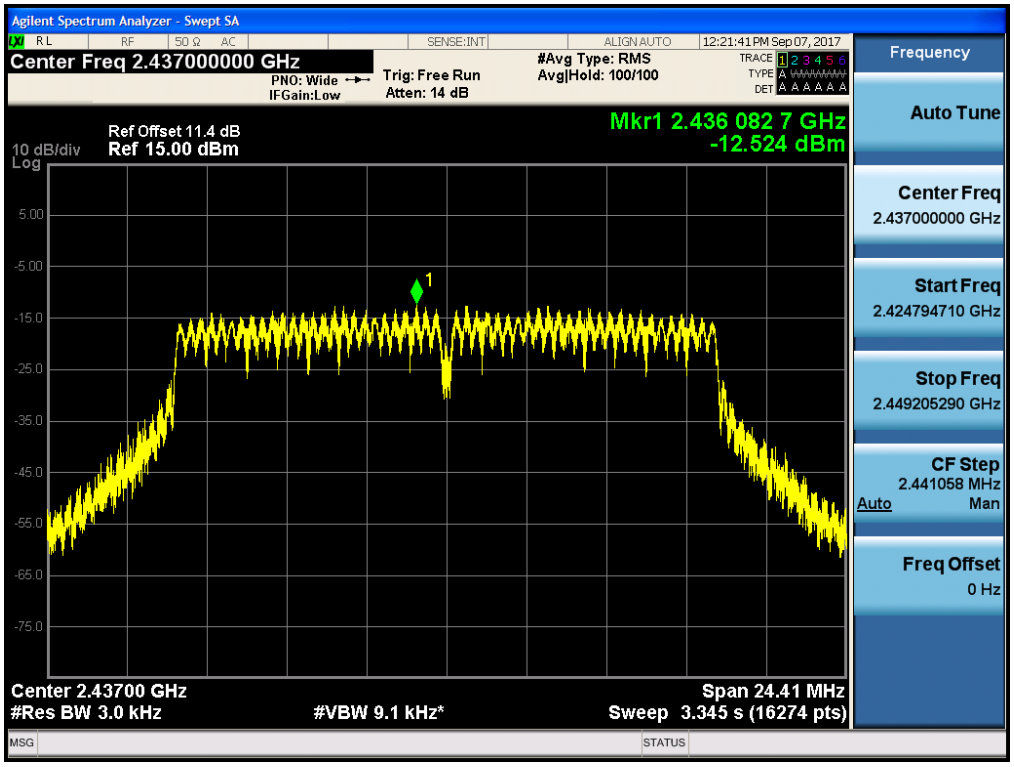


▣ RESULT PLOTS_Ant.3

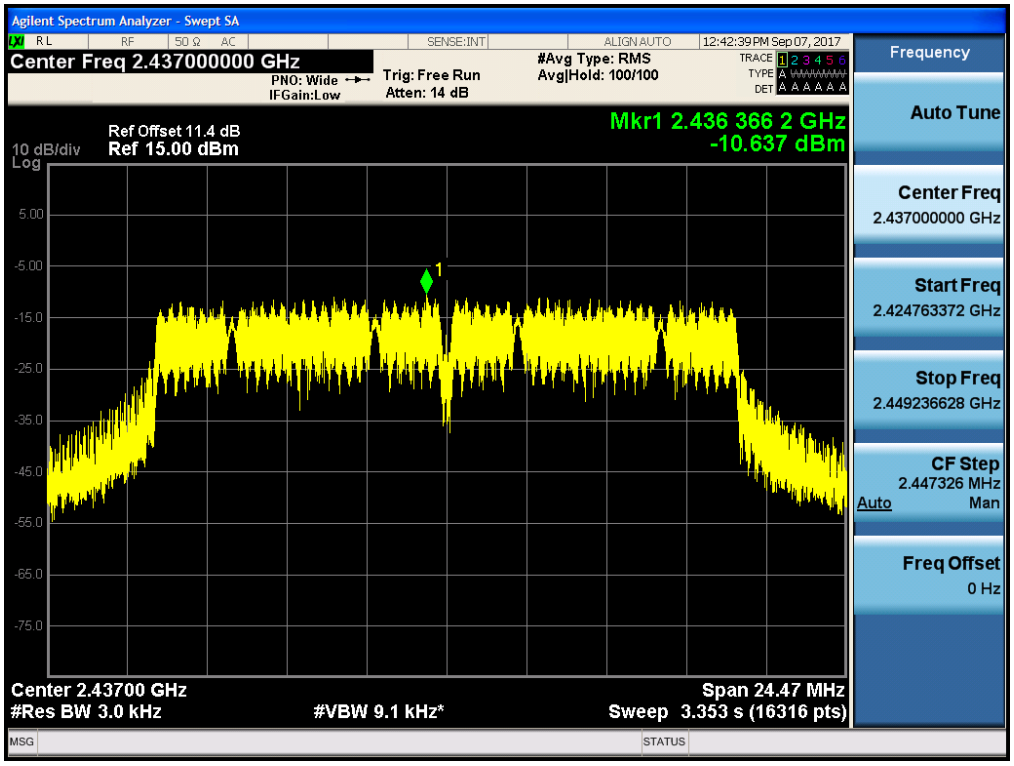
Power Spectral Density (802.11b-CH 6)



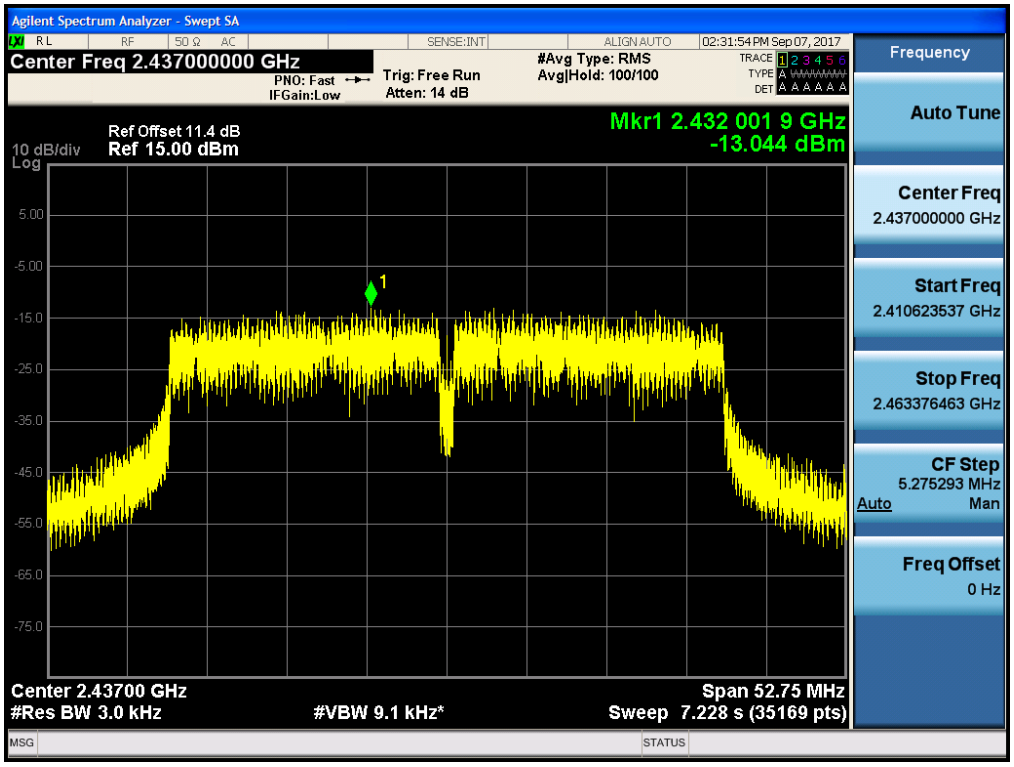
Power Spectral Density (802.11g-CH 6)



Power Spectral Density (802.11n_HT20 -CH 6)



Power Spectral Density (802.11n_HT40 -CH 6)



▣ TEST RESULTS_Ant.0_Directional

Conducted Power Density Measurements

Frequency (MHz)	Channel No.	Mode	Test Result		
			PSD (dBm)	Limit (dBm)	Pass/Fail
2412	1	802.11b (SISO)	-11.411	8	Pass
2437	6		-11.408	8	Pass
2462	11		-13.733	8	Pass
2412	1	802.11g (SISO)	-18.668	8	Pass
2437	6		-17.369	8	Pass
2462	11		-19.249	8	Pass
2412	1	802.11n HT20 (SISO)	-19.540	8	Pass
2437	6		-17.519	8	Pass
2462	11		-18.927	8	Pass
2422	3	802.11n HT40 (SISO)	-24.367	8	Pass
2437	6		-19.642	8	Pass
2452	9		-24.649	8	Pass

▣ TEST RESULTS_Ant.1_Directional

Conducted Power Density Measurements

Frequency (MHz)	Channel No.	Mode	Test Result		
			PSD (dBm)	Limit (dBm)	Pass/Fail
2412	1	802.11b (SISO)	-14.041	8	Pass
2437	6		-14.121	8	Pass
2462	11		-13.774	8	Pass
2412	1	802.11g (SISO)	-18.679	8	Pass
2437	6		-17.275	8	Pass
2462	11		-19.393	8	Pass
2412	1	802.11n HT20 (SISO)	-19.440	8	Pass
2437	6		-17.292	8	Pass
2462	11		-19.069	8	Pass
2422	3	802.11n HT40 (SISO)	-19.919	8	Pass
2437	6		-19.962	8	Pass
2452	9		-19.531	8	Pass

▣ TEST RESULTS_Ant.2_Directional

Conducted Power Density Measurements

Frequency (MHz)	Channel No.	Mode	Test Result		
			PSD (dBm)	Limit (dBm)	Pass/Fail
2412	1	802.11b (SISO)	-13.260	8	Pass
2437	6		-11.057	8	Pass
2462	11		-10.945	8	Pass
2412	1	802.11g (SISO)	-18.474	8	Pass
2437	6		-17.047	8	Pass
2462	11		-18.906	8	Pass
2412	1	802.11n HT20 (SISO)	-19.020	8	Pass
2437	6		-16.991	8	Pass
2462	11		-18.550	8	Pass
2422	3	802.11n HT40 (SISO)	-22.092	8	Pass
2437	6		-19.500	8	Pass
2452	9		-21.027	8	Pass

▣ TEST RESULTS_Ant.3_Directional

Conducted Power Density Measurements

Frequency (MHz)	Channel No.	Mode	Test Result		
			PSD (dBm)	Limit (dBm)	Pass/Fail
2412	1	802.11b (SISO)	-13.984	8	Pass
2437	6		-9.087	8	Pass
2462	11		-9.259	8	Pass
2412	1	802.11g (SISO)	-18.848	8	Pass
2437	6		-16.962	8	Pass
2462	11		-19.062	8	Pass
2412	1	802.11n HT20 (SISO)	-19.198	8	Pass
2437	6		-17.521	8	Pass
2462	11		-18.952	8	Pass
2422	3	802.11n HT40 (SISO)	-23.446	8	Pass
2437	6		-19.438	8	Pass
2452	9		-14.779	8	Pass

▣ TEST RESULTS_Sum Data of Ant.0, 1, 2, 3_Directional

Conducted Power Density Measurements

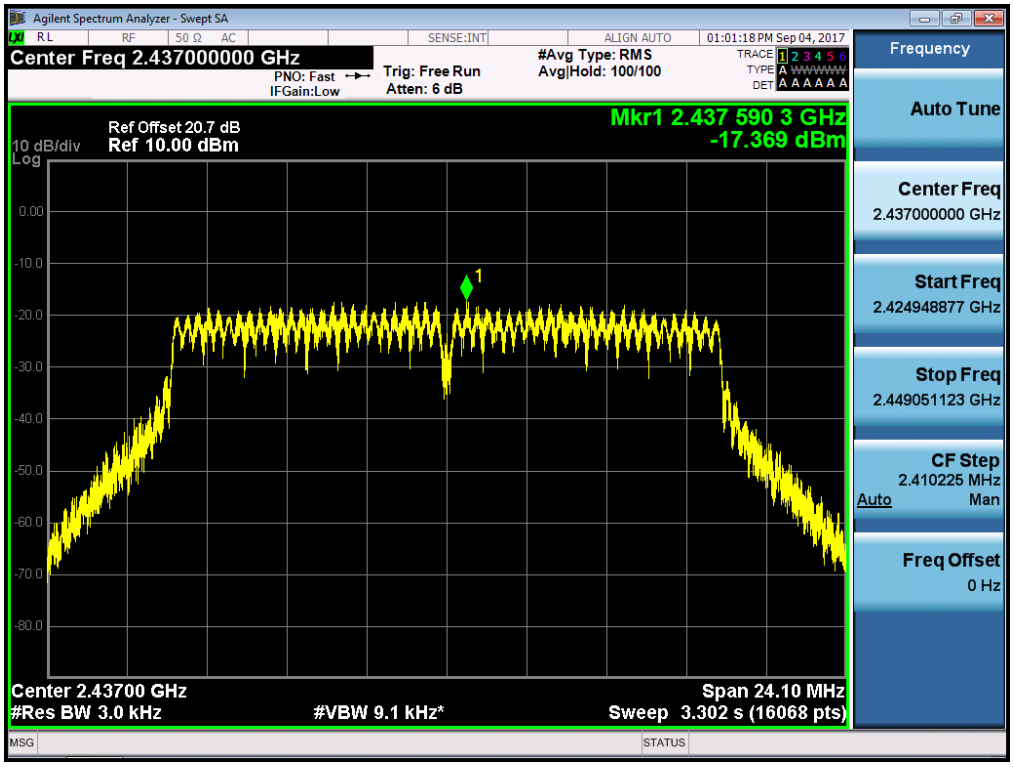
Frequency (MHz)	Channel No.	Mode	Test Result		
			PSD (dBm)	Limit (dBm)	Pass/Fail
2412	1	802.11b (MIMO)	-7.09	3.89	Pass
2437	6		-5.22		Pass
2462	11		-5.69		Pass
2412	1	802.11g (MIMO)	-12.65	3.89	Pass
2437	6		-11.14		Pass
2462	11		-13.13		Pass
2412	1	802.11n HT20 (MIMO)	-13.28	3.89	Pass
2437	6		-11.31		Pass
2462	11		-12.85		Pass
2422	3	802.11n HT40 (MIMO)	-16.27	3.89	Pass
2437	6		-13.61		Pass
2452	9		-13.24		Pass

Note : In order to simplify the report, attached plots were only the highest PSD channel.

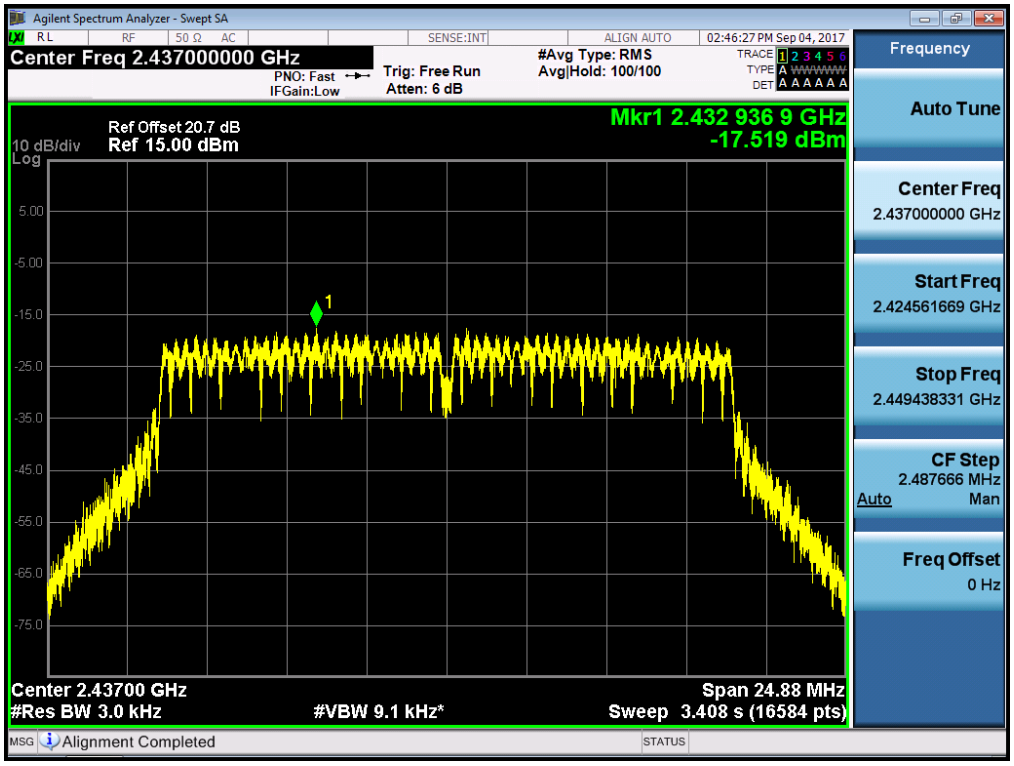
▣ RESULT PLOTS_Ant.0

Power Spectral Density (802.11b-CH 6)

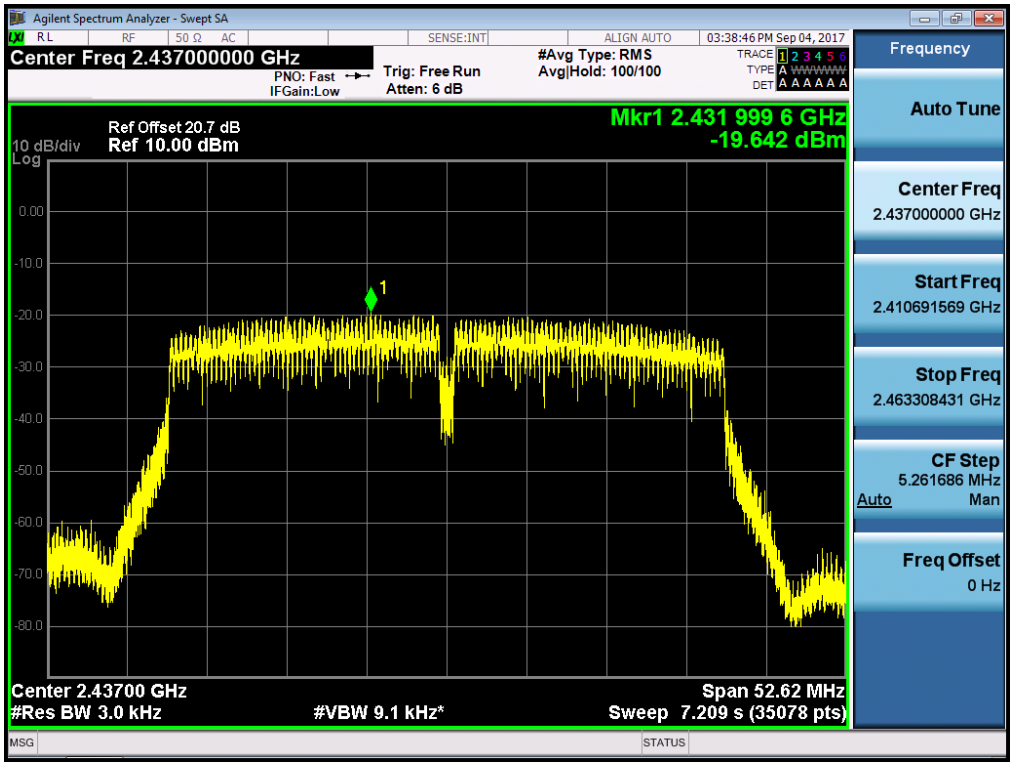
Power Spectral Density (802.11g-CH 6)



Power Spectral Density (802.11n_HT20 -CH 6)



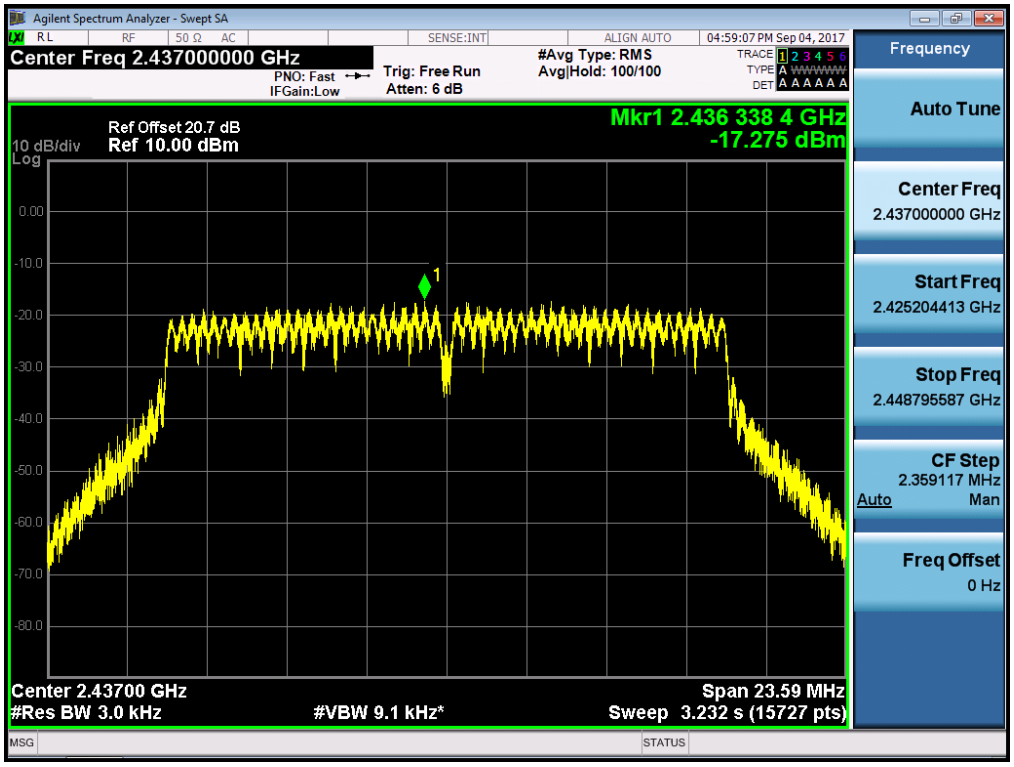
Power Spectral Density (802.11n_HT40 -CH 6)



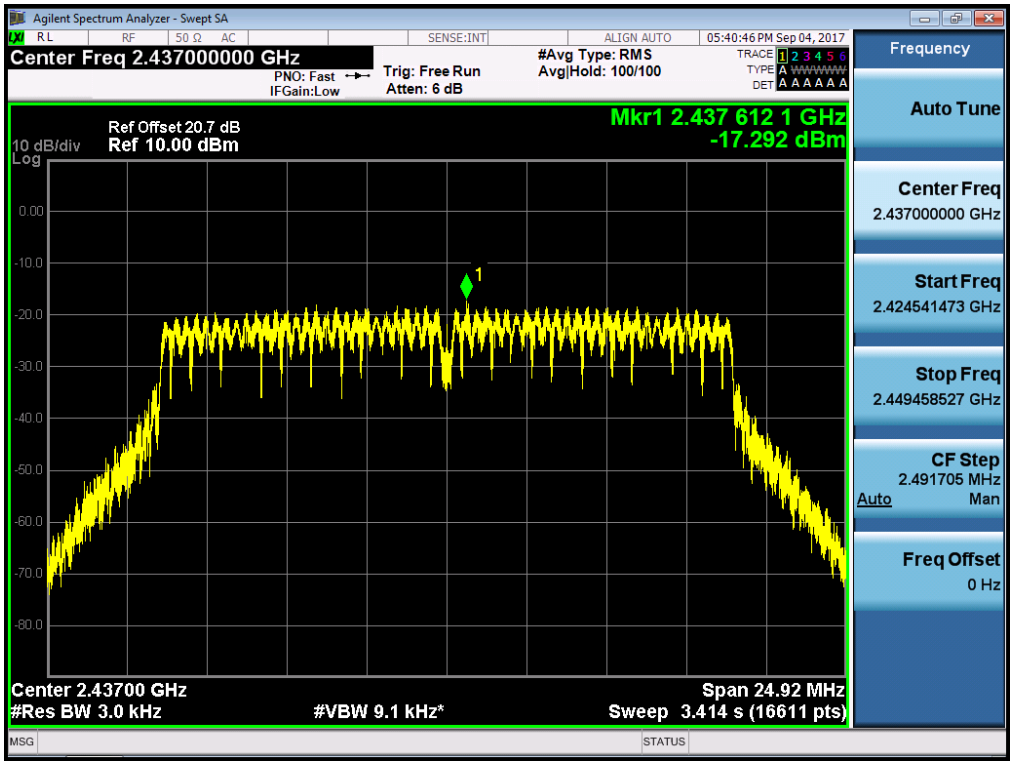
▣ RESULT PLOTS_Ant.1

Power Spectral Density (802.11b-CH 11)

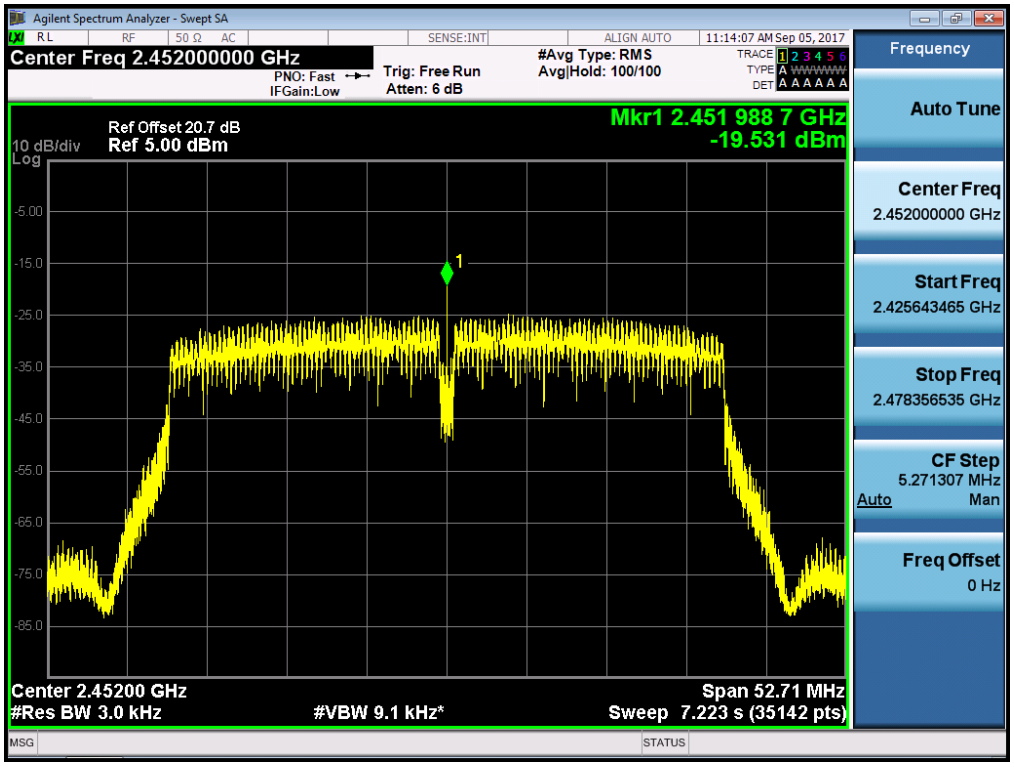
Power Spectral Density (802.11g-CH 6)



Power Spectral Density (802.11n_HT20 -CH 6)



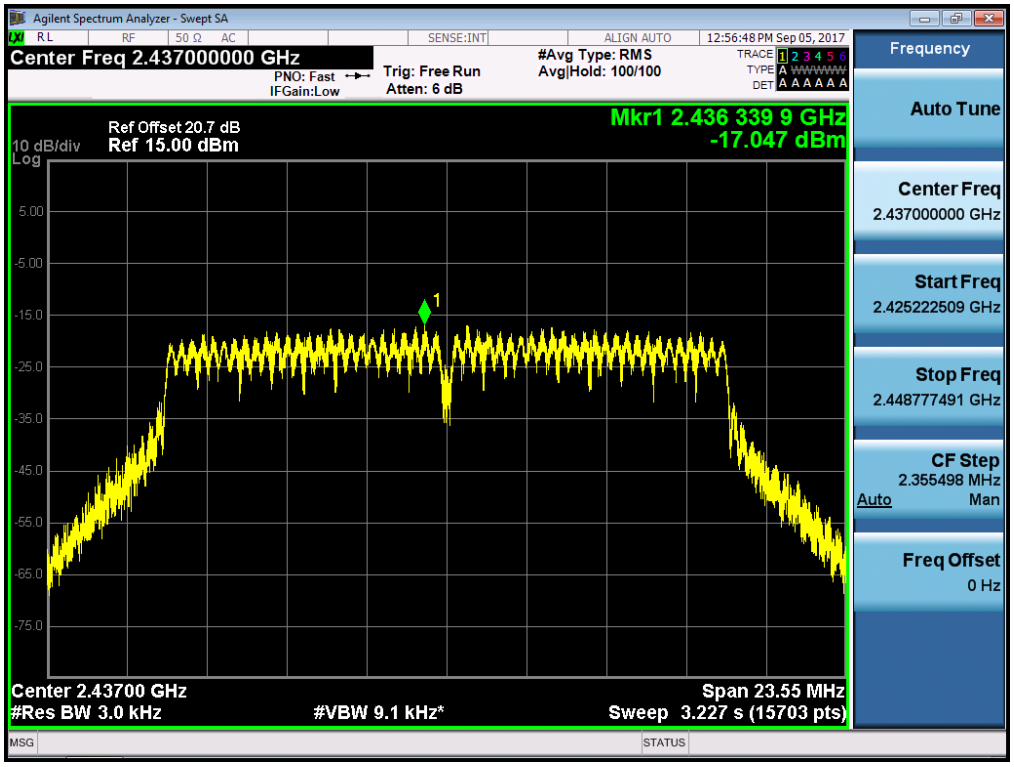
Power Spectral Density (802.11n_HT40 -CH 9)



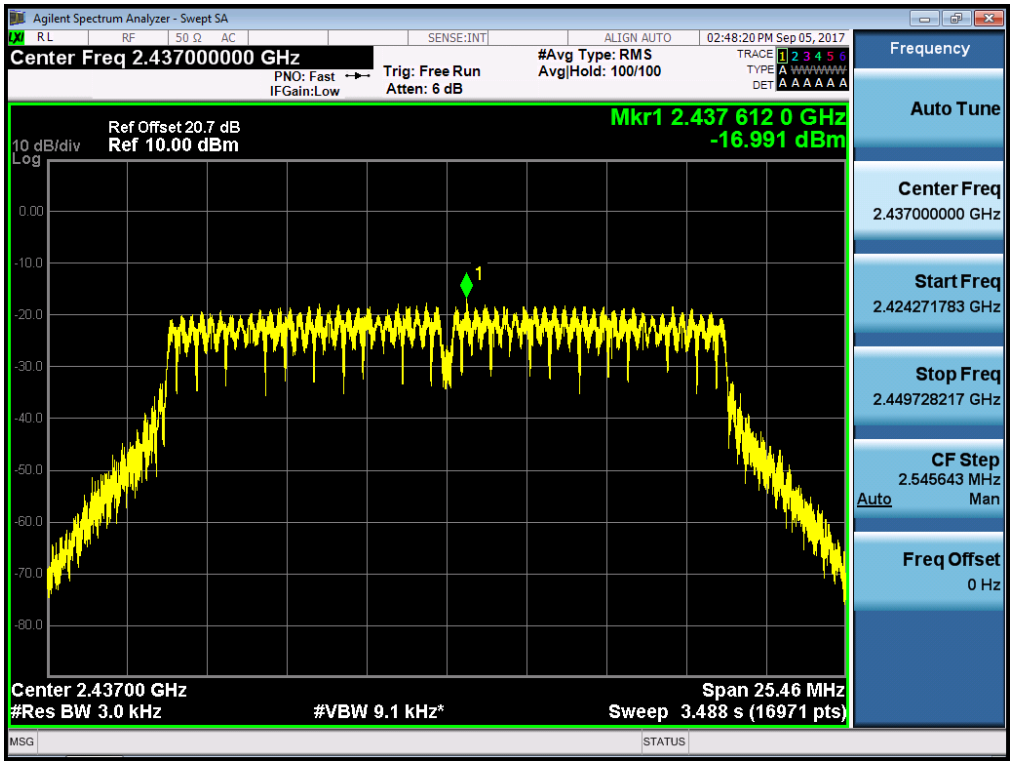
▣ RESULT PLOTS_Ant.2

Power Spectral Density (802.11b-CH 11)

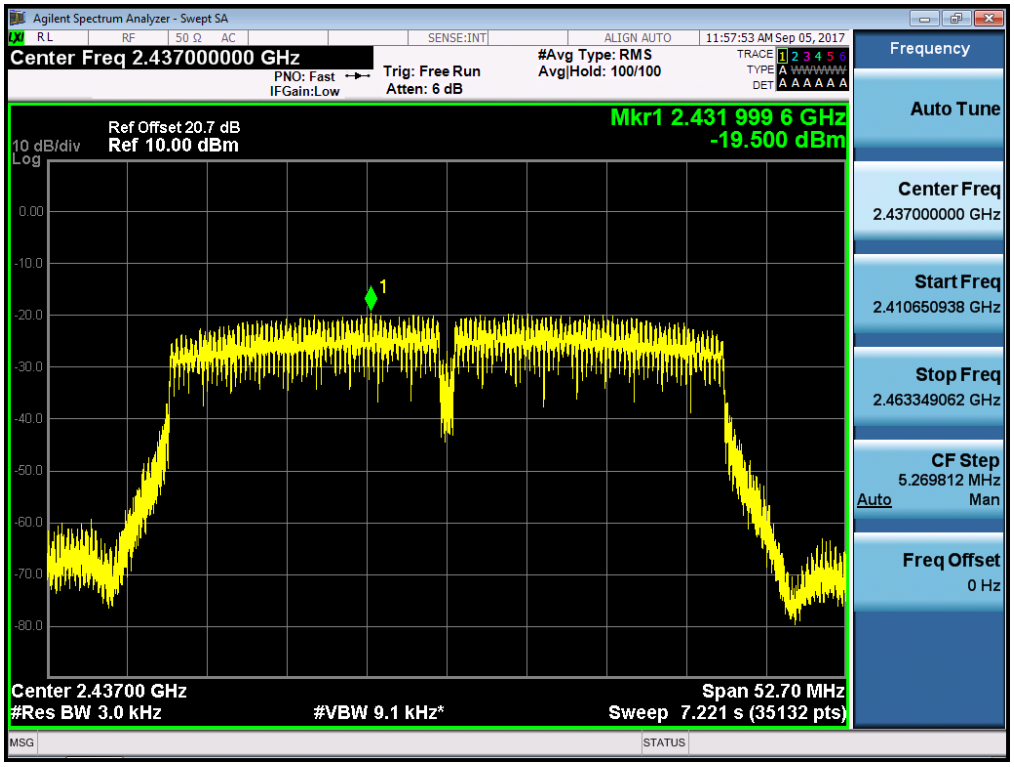
Power Spectral Density (802.11g-CH 6)



Power Spectral Density (802.11n_HT20 -CH 6)



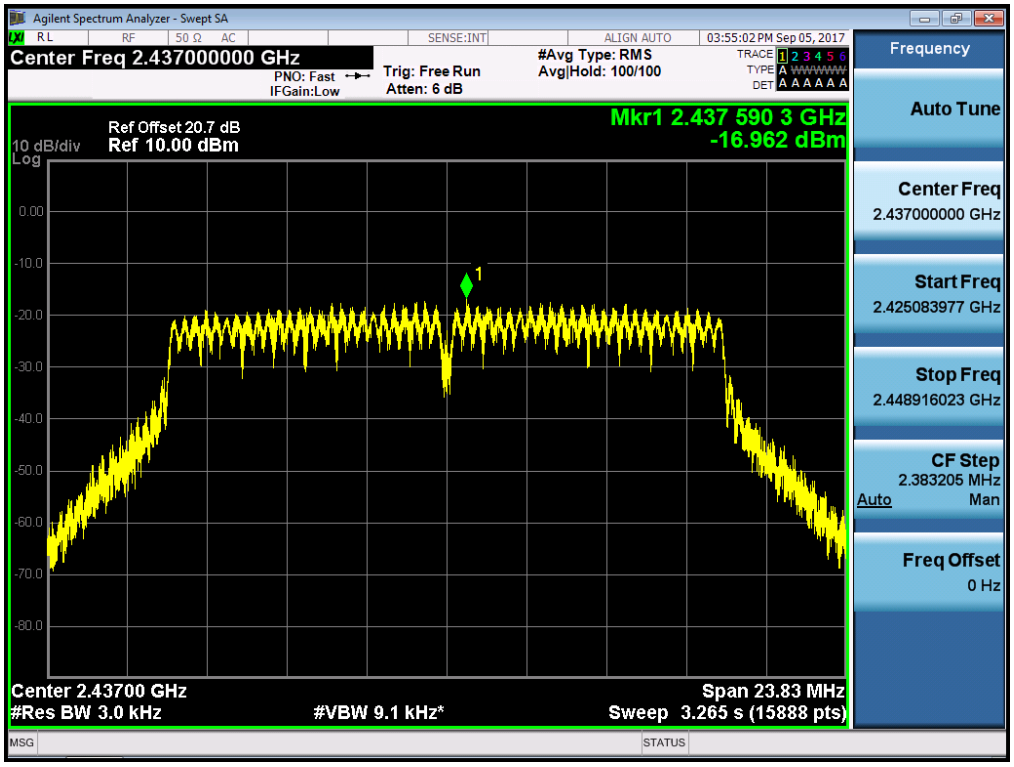
Power Spectral Density (802.11n_HT40 -CH 6)



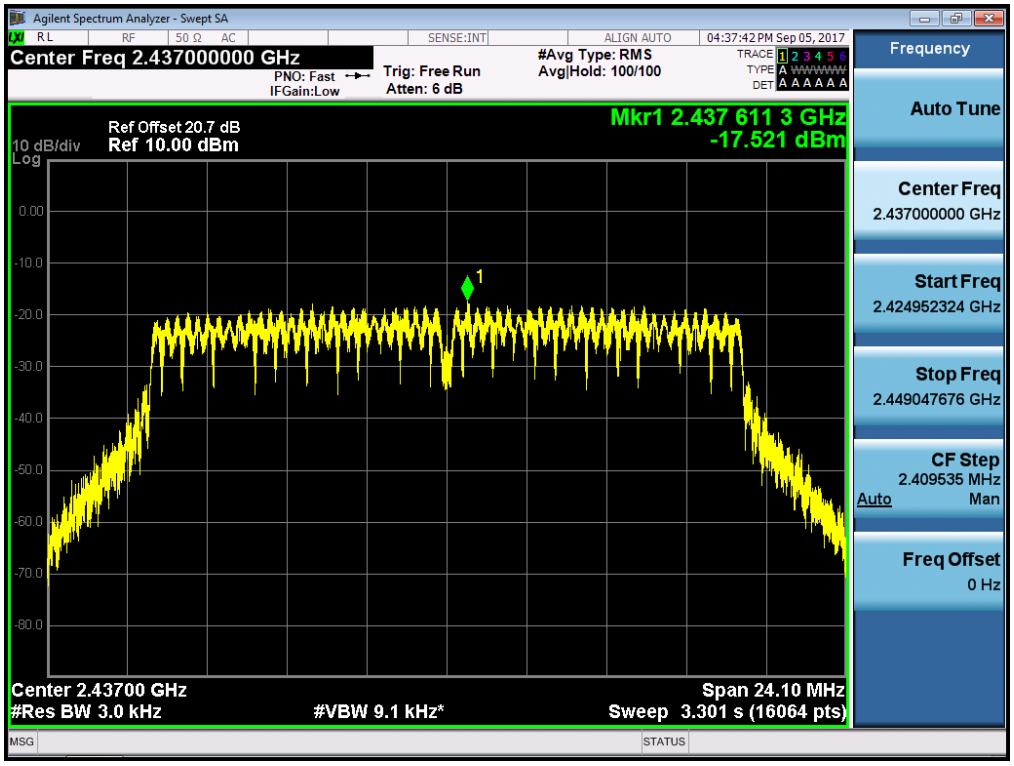
▣ RESULT PLOTS_Ant.3

Power Spectral Density (802.11b-CH 6)

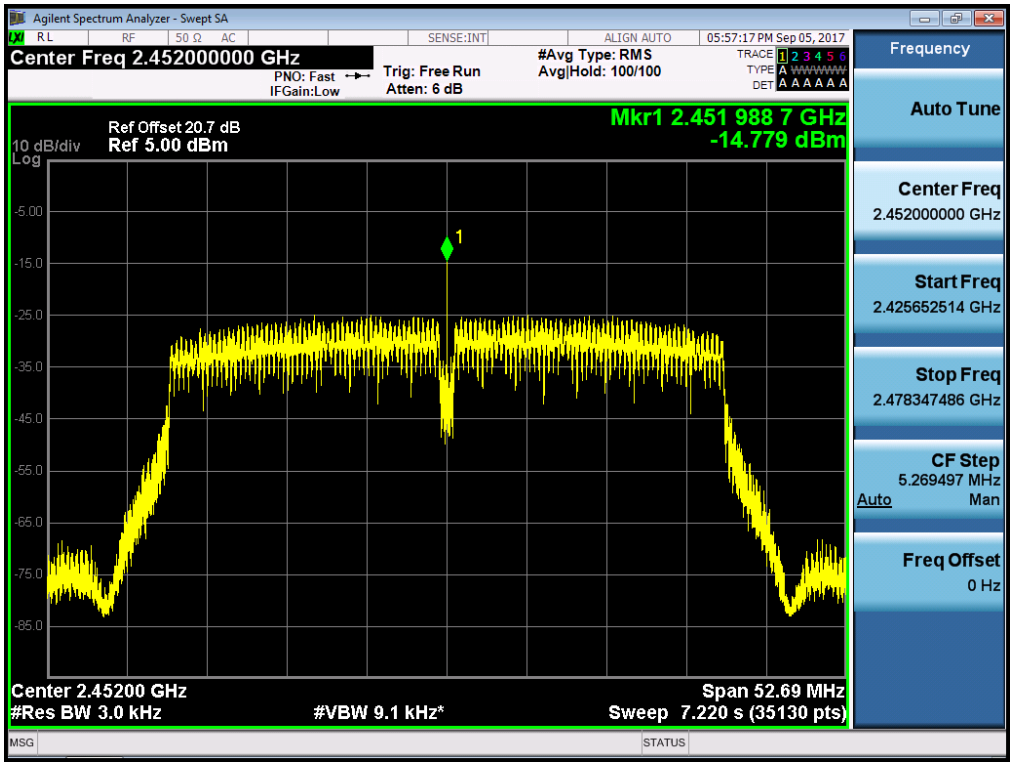
Power Spectral Density (802.11g-CH 6)



Power Spectral Density (802.11n_HT20 -CH 6)



Power Spectral Density (802.11n_HT40 -CH 9)



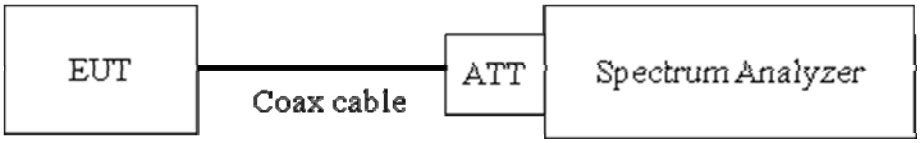
9.5 OUT OF BAND EMISSIONS AT THE BAND EDGE/ CONDUCTED SPURIOUS EMISSIONS

Test Requirements and limit, §15.247(d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

Limit : 20 dBc

▣ TEST CONFIGURATION



▣ TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. (Procedure 11.3 in KDB 558074 v04)

RBW = 100 kHz

VBW ≥ 3 x RBW

Set the center frequency and span to encompass frequency range to be measured.

Detector = Peak

Trace Mode = max hold

Sweep time = auto couple

Allow trace to fully stabilize.

Use peak marker function to determine the maximum amplitude level.

Measurements are made over the 30 MHz to 10th harmonic range with the transmitter set to the lowest, middle, and highest channels.

Note :

1. The band edge results in plot is already including the actual values of loss for the attenuator and cable combination.
2. Spectrum offset = Attenuator loss + Cable loss
2. We apply the offset of Omni and Directional respectively.

The offset of the 2.4 GHz band on Omni is 11.4 dB.

The offset of the 2.4 GHz band on Directional is 20.7 dB.

Actual value of loss for the attenuator and cable combination is below table.

ANT	Band	Loss(dB)
Omni	2.4 GHz	11.4
Directional		20.7

(Actual value of loss for the attenuator and cable combination)

4. In case of conducted spurious emissions test(not band edge), please check factors blow table.

5. In order to simplify the report, attached plots were only the worst case. (where, worst case is SISO mode and highest power channel)

▣ FACTORS FOR FREQUENCY

Directional	
Freq(MHz)	Factor(dB)
30	20.56
100	20.57
200	20.58
300	20.58
400	20.58
500	20.58
600	20.59
700	20.59
800	20.59
900	20.59
1000	20.59
2000	20.61
2400*	20.70
2500*	20.72
3000	20.84
4000	20.93
5000	22.10
6000	21.22
7000	21.42
8000	21.61
9000	21.63
10000	21.74
11000	21.90
12000	22.21
13000	22.38

Omni	
Freq(MHz)	Factor(dB)
30	10.83
100	10.67
200	10.75
300	10.74
400	10.79
500	10.83
600	10.87
700	10.89
800	10.91
900	10.93
1000	10.95
2000	11.18
2400*	11.40
2500*	11.42
3000	11.58
4000	11.66
5000	11.76
6000	11.80
7000	11.86
8000	11.80
9000	11.93
10000	11.96
11000	11.99
12000	12.13
13000	12.07

14000	22.51	14000	12.19
15000	22.61	15000	12.42
16000	22.66	16000	12.45
17000	22.71	17000	12.68
18000	22.72	18000	12.61
19000	22.76	19000	12.82
20000	22.72	20000	12.75
21000	22.70	21000	12.67
22000	22.74	22000	12.87
23000	22.59	23000	12.65
24000	22.66	24000	12.96
25000	22.27	25000	12.60

Note : 1. '*' is fundamental frequency range.

2. Factor

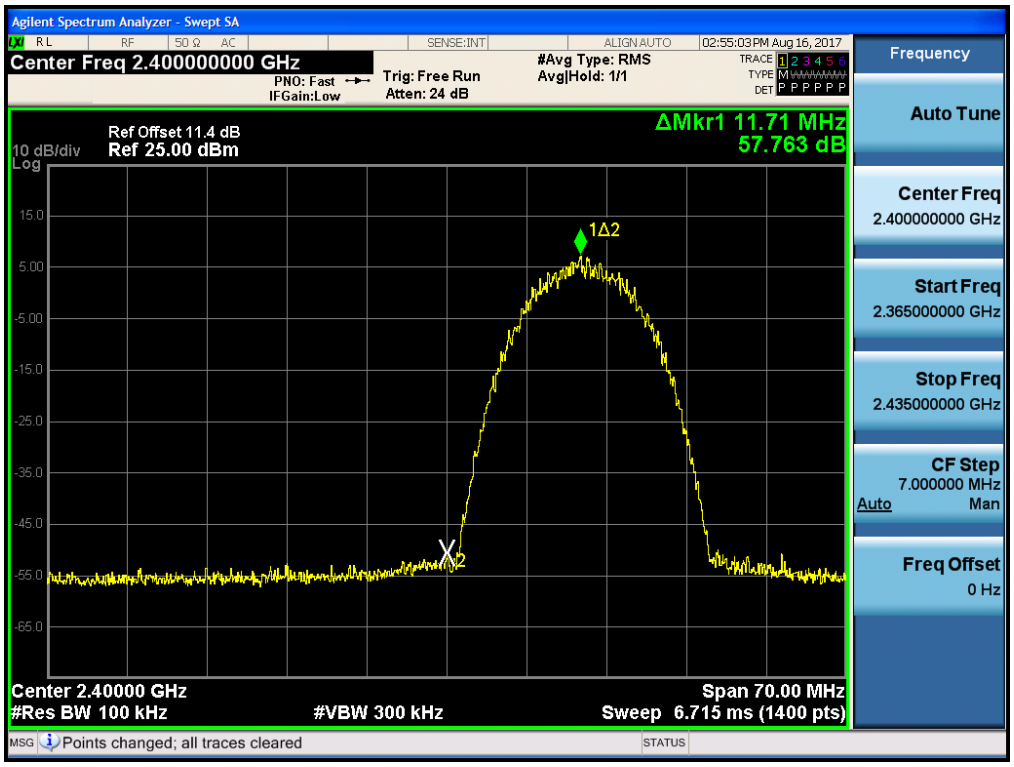
ANT.0 = ATT loss + Cable loss(1 ea)

ANT.1 = ATT loss + Cable loss(2 ea)

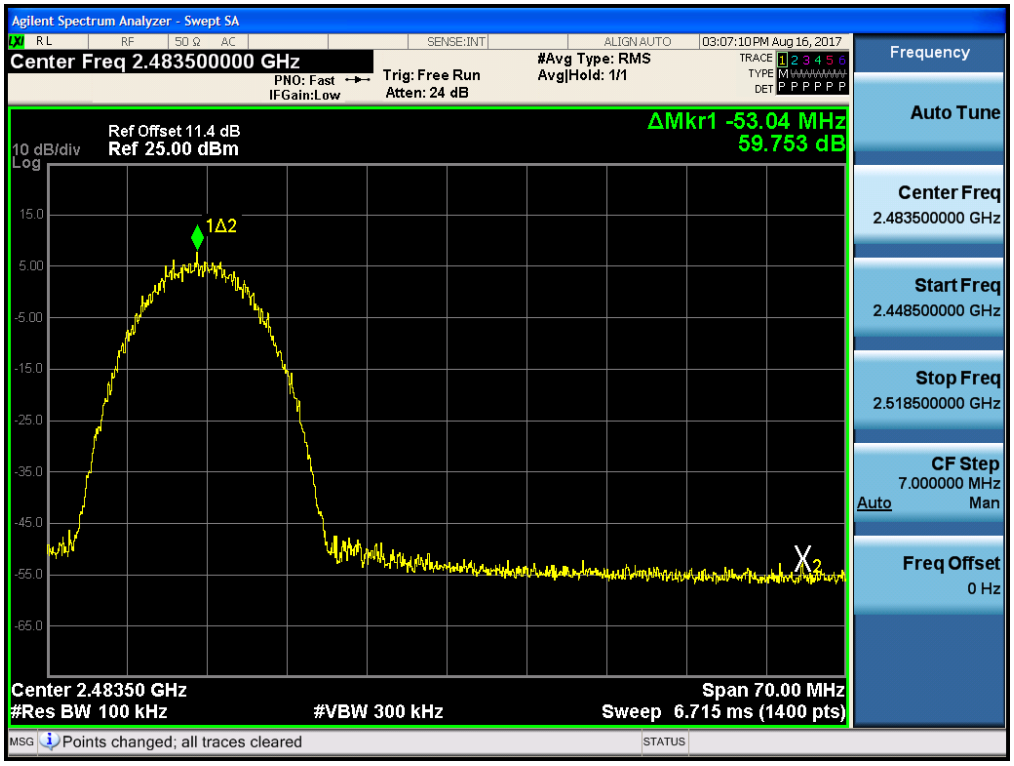
[Omni]

▣ RESULT PLOTS_Ant.0

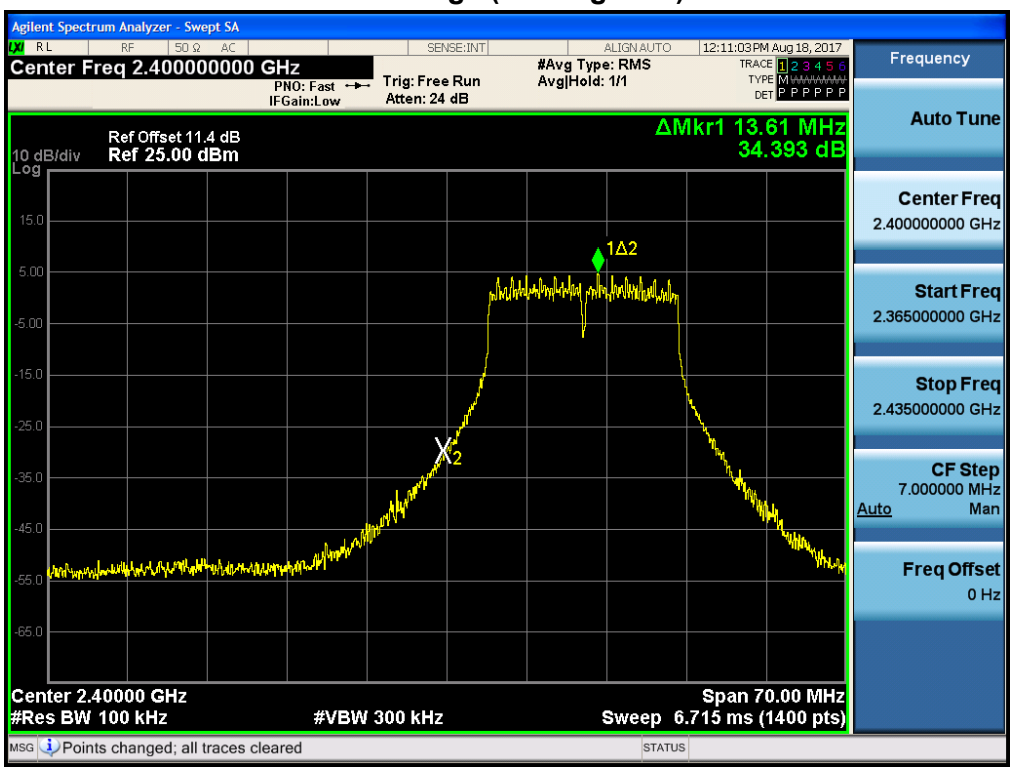
Band Edge (802.11b-CH1)



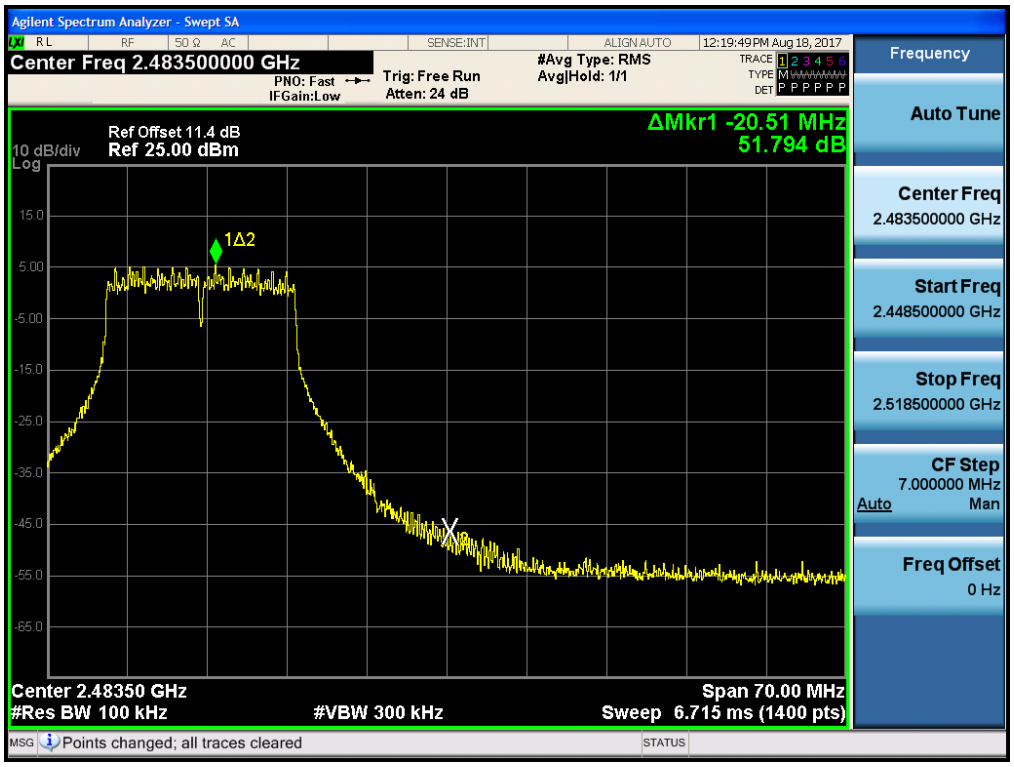
Band Edge (802.11b-CH11)



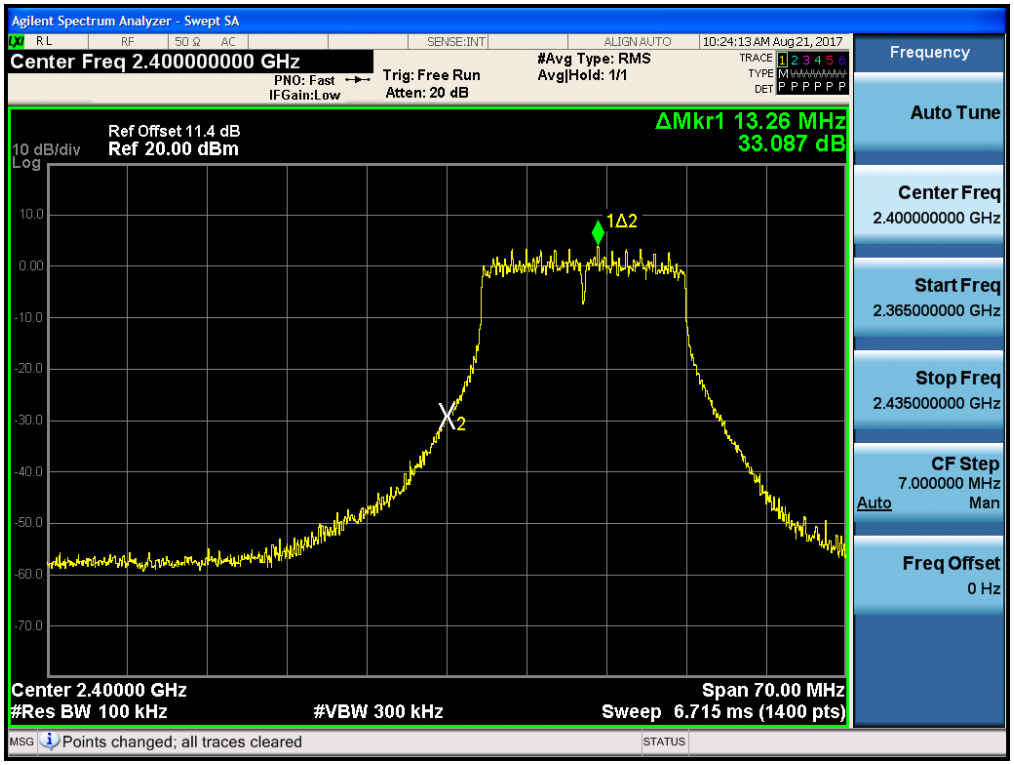
Band Edge (802.11g-CH1)



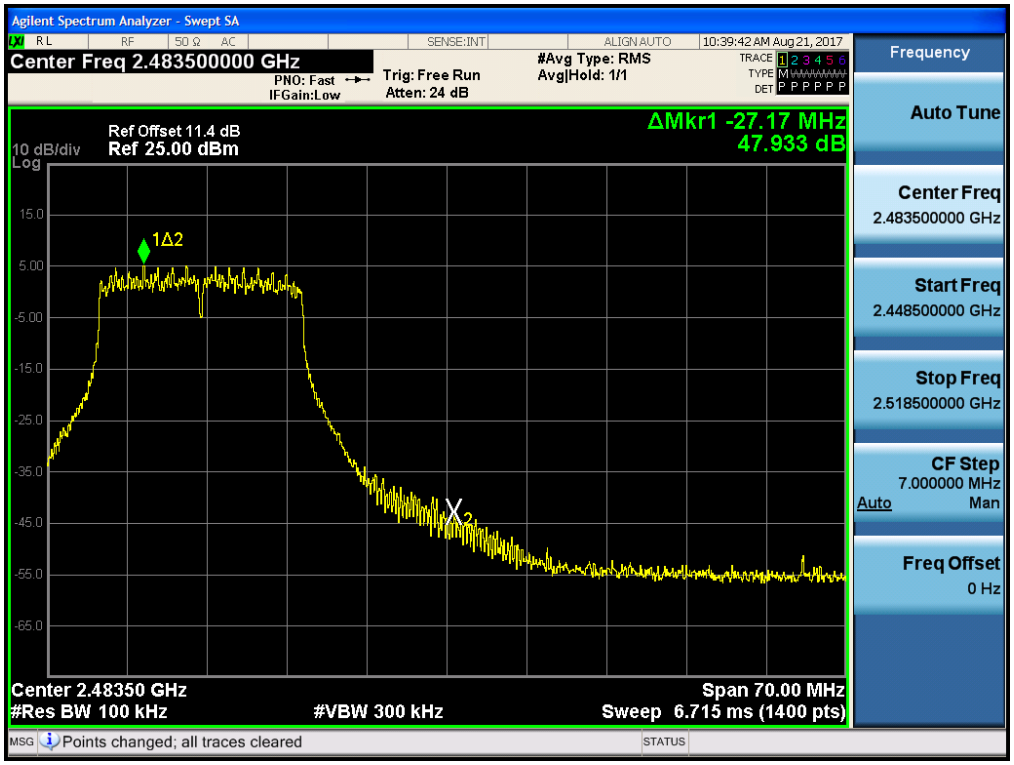
Band Edge (802.11g-CH11)



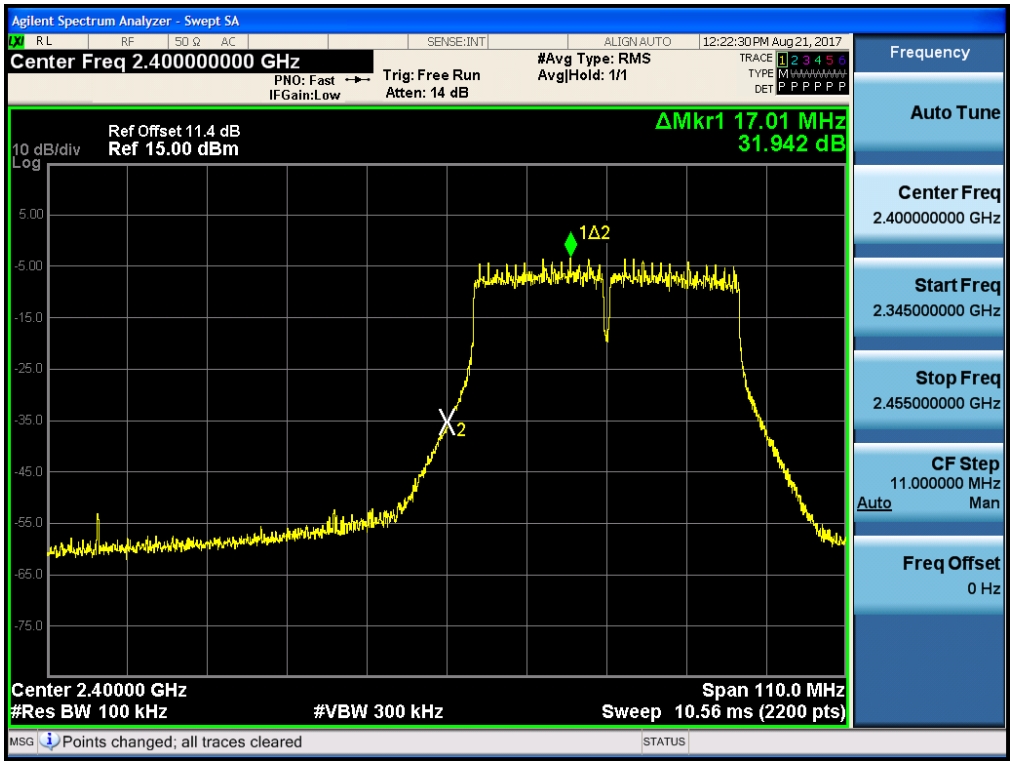
Band Edge (802.11n_HT20-CH1)



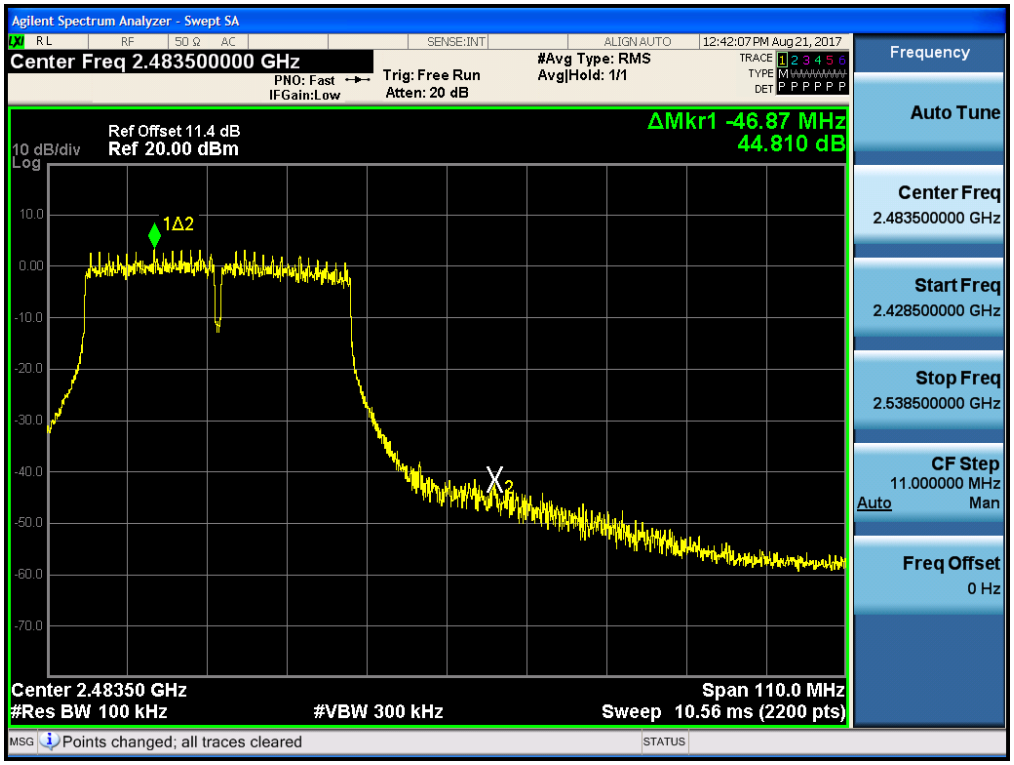
Band Edge (802.11n_HT20-CH11)



Band Edge (802.11n_HT40-CH3)

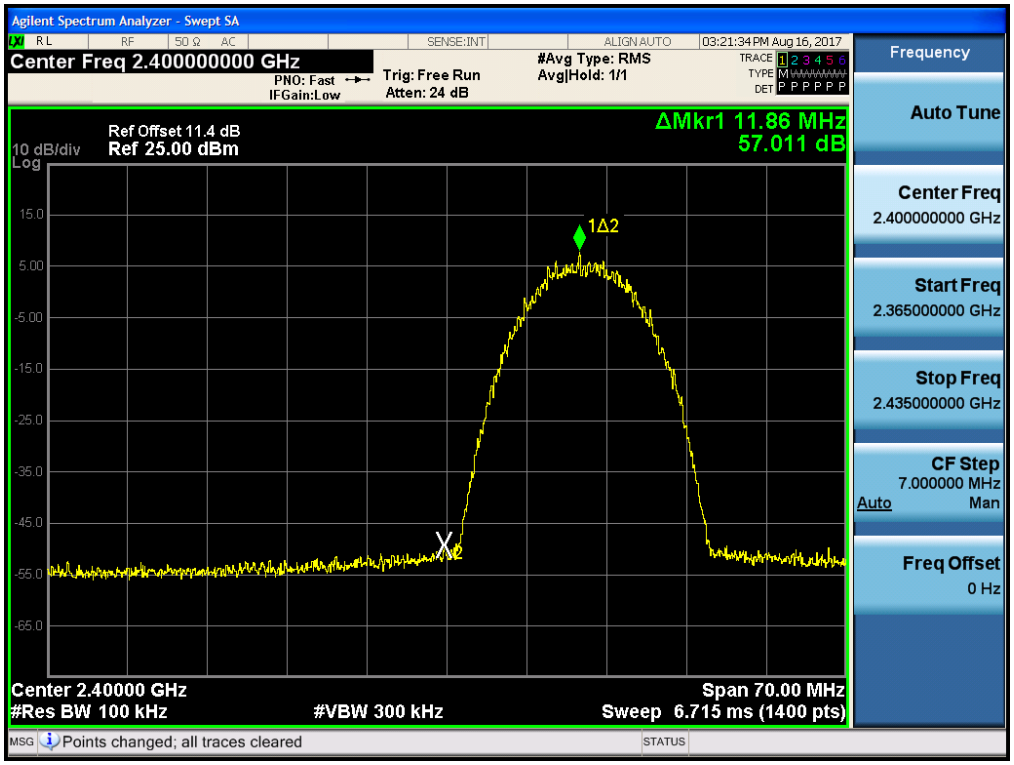


Band Edge (802.11n_HT40-CH9)

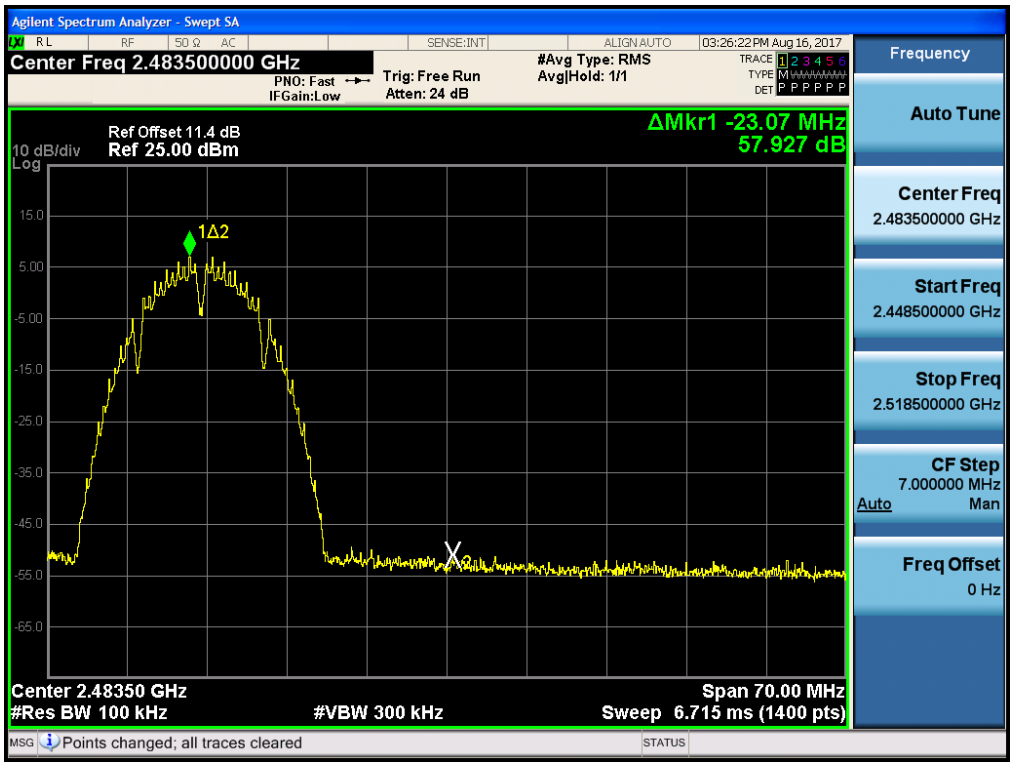


▣ RESULT PLOTS_Ant.1

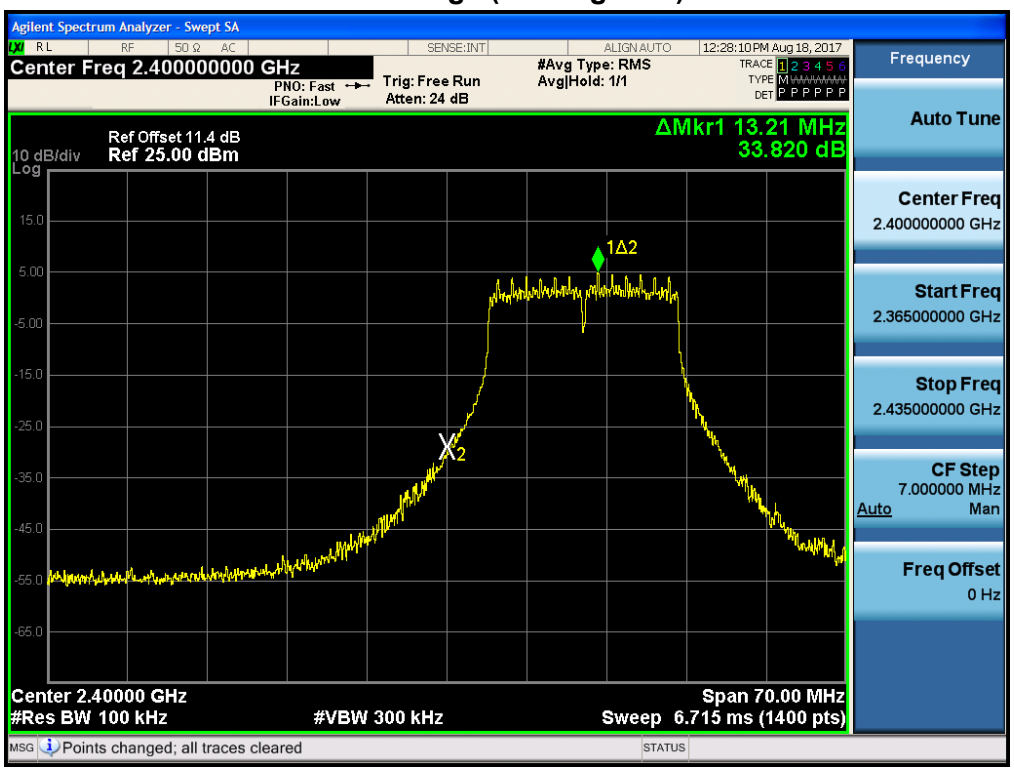
Band Edge (802.11b-CH1)



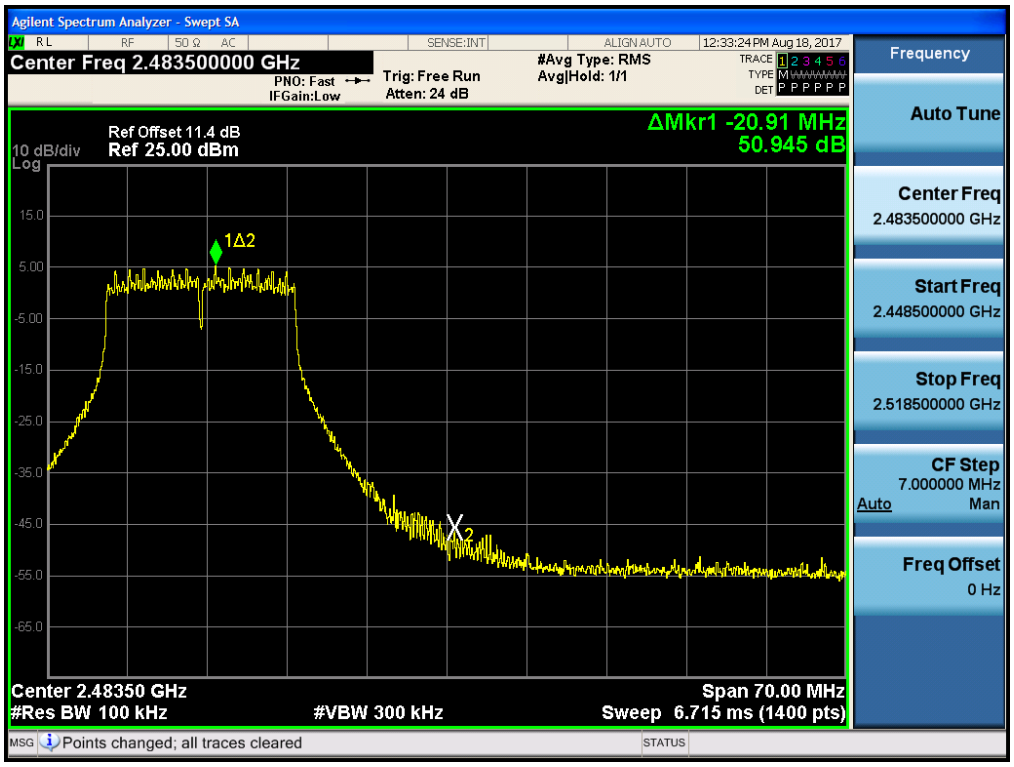
Band Edge (802.11b-CH11)



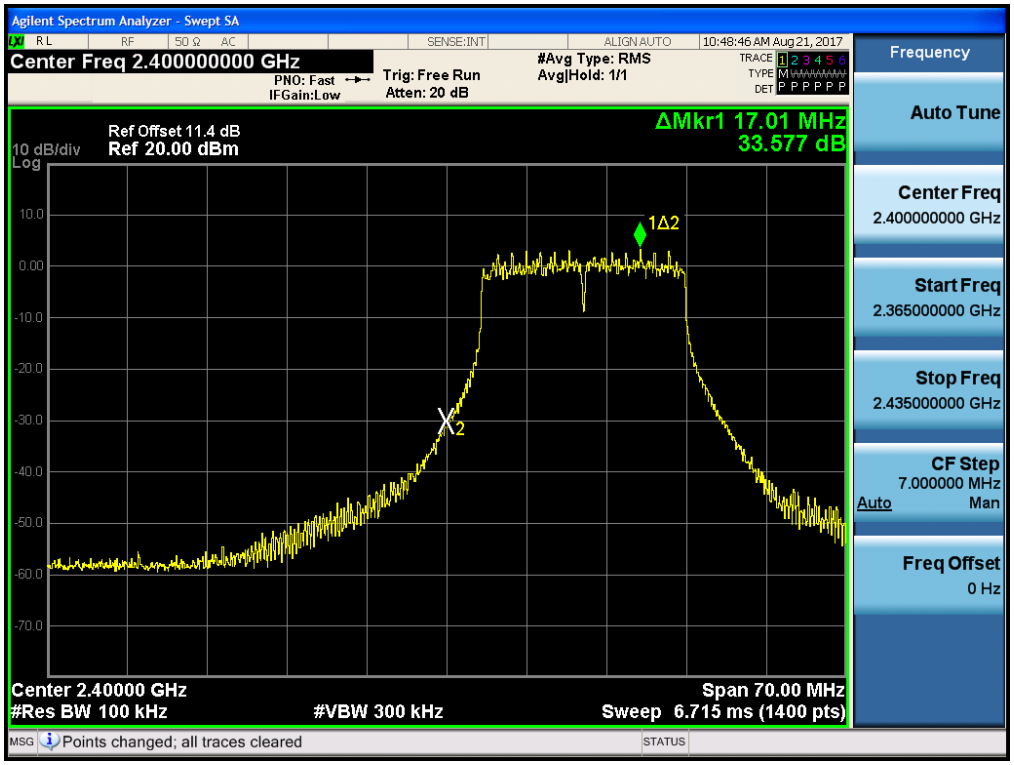
Band Edge (802.11g-CH1)



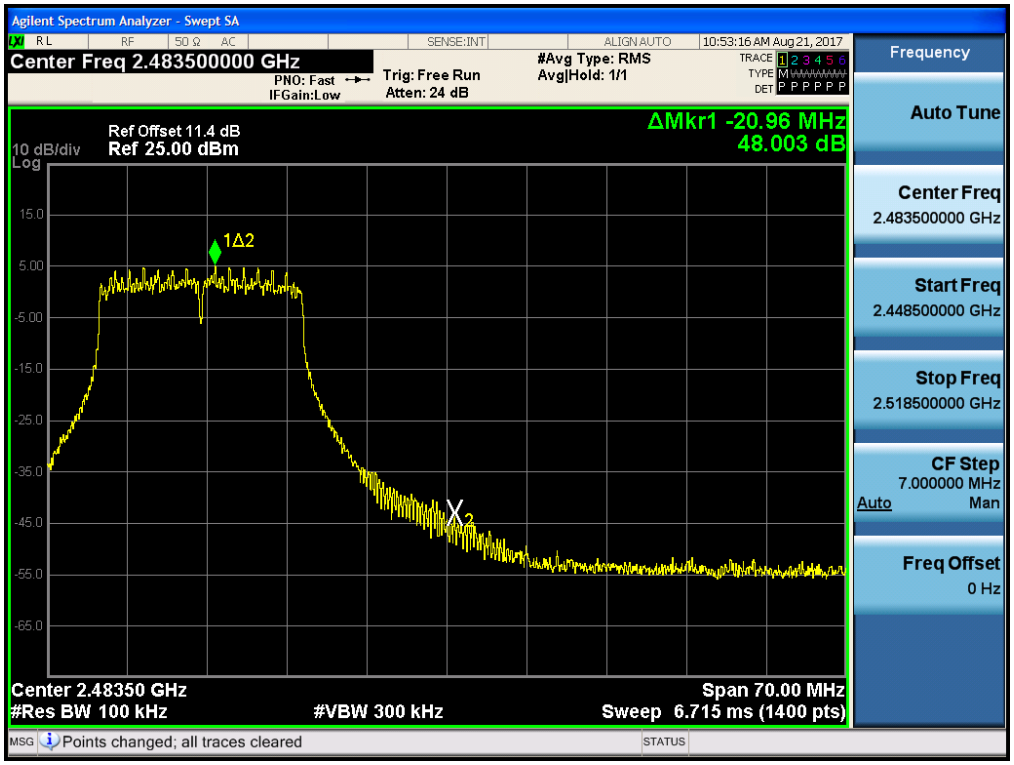
Band Edge (802.11g-CH11)



Band Edge (802.11n_HT20-CH1)

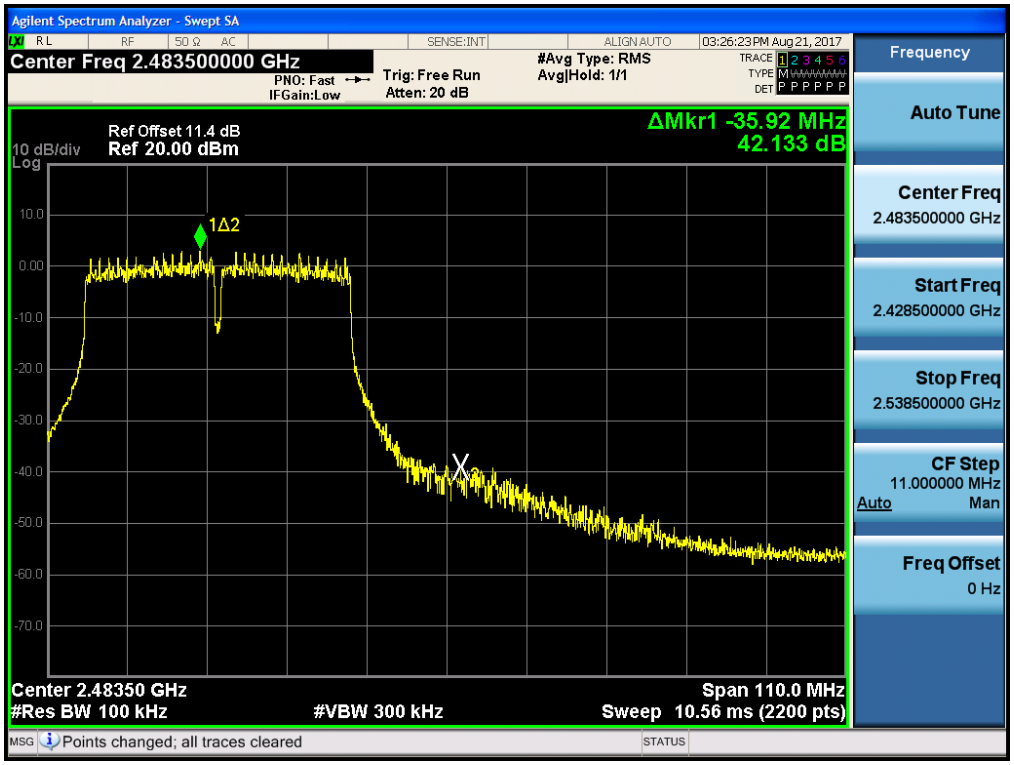


Band Edge (802.11n_HT20-CH11)



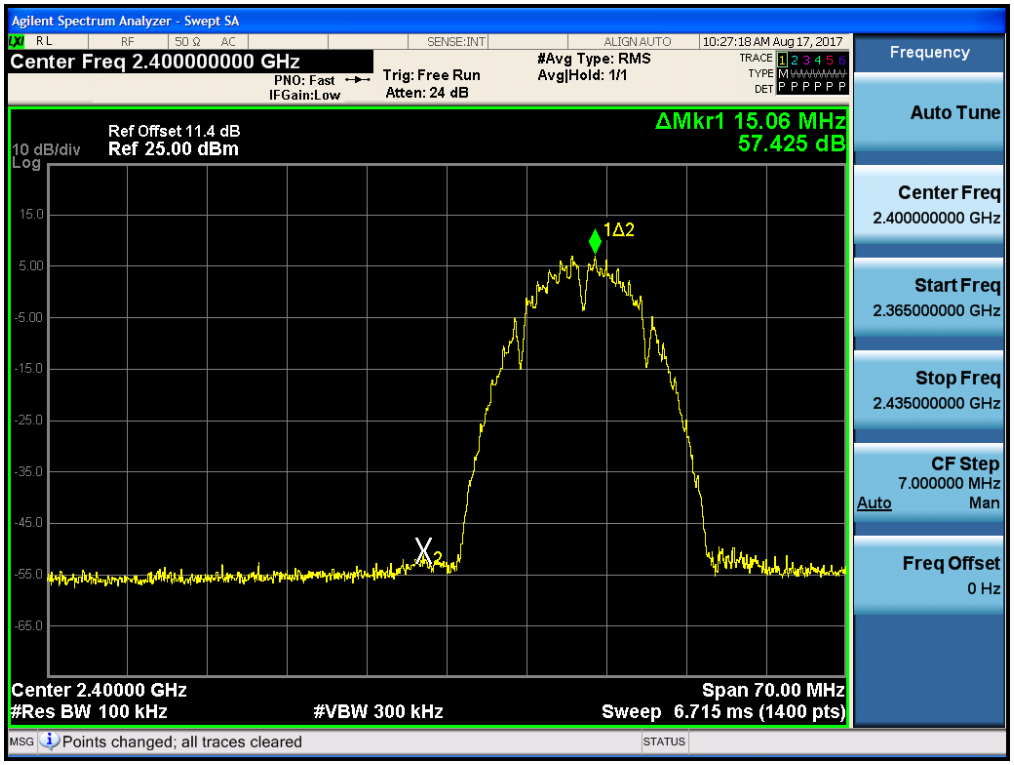
Band Edge (802.11n_HT40-CH3)

Band Edge (802.11n_HT40-CH9)



▣ RESULT PLOTS_Ant.2

Band Edge (802.11b-CH1)



Band Edge (802.11b-CH11)