



**FCC CFR47 PART 15 SUBPART C
INDUSTRY CANADA RSS-247 ISSUE 1**

DTS Wireless LAN

C2PC CERTIFICATION TEST REPORT

FOR

Bluetooth/BLE, DTS b/g/n WATCH

MODEL NUMBER : SM-R732

FCC ID: A3LSMR732

IC ID: 649E-SMR732

REPORT NUMBER: 16K23312-E1V2

ISSUE DATE: JUN 02, 2016

Prepared for
SAMSUNG ELECTRONICS CO., LTD.
129 SAMSUNG-RO, YEONGTONG-GU, SUWON-SI,
GYEONGGI-DO, 16677, KOREA

Prepared by
UL Korea, Ltd. Suwon Laboratory
218 Maeyeong-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16675, Korea
TEL: (031) 337-9902
FAX: (031) 213-5433



Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
V1	05/31/16	Initial issue	SungGil Park
V1	06/02/16	KDB version revised	SungGil Park

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS	5
2. TEST METHODOLOGY	6
3. FACILITIES AND ACCREDITATION	6
4. CALIBRATION AND UNCERTAINTY	6
4.1. <i>MEASURING INSTRUMENT CALIBRATION</i>	6
4.2. <i>SAMPLE CALCULATION</i>	6
4.3. <i>MEASUREMENT UNCERTAINTY</i>	7
5. EQUIPMENT UNDER TEST	8
5.1. <i>DESCRIPTION OF EUT</i>	8
5.2. <i>MAXIMUM OUTPUT POWER</i>	8
5.3. <i>DESCRIPTION OF AVAILABLE ANTENNAS</i>	8
5.4. <i>WORST-CASE CONFIGURATION AND MODE</i>	8
5.5. <i>DESCRIPTION OF TEST SETUP</i>	9
6. TEST AND MEASUREMENT EQUIPMENT	11
7. MEASUREMENT METHODS	12
8. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS	12
8.1. <i>ON TIME AND DUTY CYCLE RESULTS</i>	12
9. SUMMARY TABLE	13
10. ANTENNA PORT TEST RESULTS	14
10.1. <i>6 dB BANDWIDTH</i>	14
10.1.1. 802.11b MODE IN THE 2.4 GHz BAND.....	14
10.1.2. 802.11g MODE IN THE 2.4 GHz BAND.....	14
10.1.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND.....	15
10.1.4. 6 dB BANDWIDTH PLOTS.....	16
10.2. <i>99% BANDWIDTH</i>	22
10.2.1. 802.11b MODE IN THE 2.4 GHz BAND.....	22
10.2.2. 802.11g MODE IN THE 2.4 GHz BAND.....	22
10.2.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND.....	22
10.2.4. 99% BANDWIDTH PLOTS.....	23
10.3. <i>OUTPUT POWER</i>	29
10.3.1. 802.11b MODE IN THE 2.4 GHz BAND.....	30
10.3.2. 802.11g MODE IN THE 2.4 GHz BAND.....	31
10.3.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND.....	32
10.4. <i>PSD</i>	33

10.4.1.	802.11b MODE IN THE 2.4 GHz BAND	34
10.4.2.	802.11g MODE IN THE 2.4 GHz BAND	34
10.4.3.	802.11n HT20 MODE IN THE 2.4 GHz BAND	34
10.4.4.	PSD PLOTS	35
10.5.	<i>OUT-OF-BAND EMISSIONS</i>	41
10.5.1.	802.11b MODE IN THE 2.4 GHz BAND	42
10.5.2.	802.11g MODE IN THE 2.4 GHz BAND	44
10.5.3.	802.11n HT20 MODE IN THE 2.4 GHz BAND	46
11.	RADIATED TEST RESULTS	48
11.1.	<i>LIMITS AND PROCEDURE</i>	48
11.2.	<i>TRANSMITTER ABOVE 1 GHz</i>	49
11.2.1.	TX ABOVE 1 GHz 802.11b MODE IN THE 2.4 GHz BAND	49
11.2.2.	TX ABOVE 1 GHz 802.11g MODE IN THE 2.4 GHz BAND	67
11.2.3.	TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 2.4 GHz BAND	85
11.3.	<i>WORST-CASE BELOW 1 GHz</i>	103
12.	AC POWER LINE CONDUCTED EMISSIONS	105
13.	SETUP PHOTOS	108

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.
EUT DESCRIPTION: Bluetooth/BLE and DTS b/g/n WATCH
MODEL NUMBER: SM-R732
SERIAL NUMBER: RFAH30LRNFA, RFAH30LRNNV (RADIATED);
R732XXE2CPD1 (CONDUCTED)
DATE TESTED: AUG 07, 2015 - AUG 26, 2015 (Original test)
MAY 19, 2016 - MAY 31, 2016 (C2PC test)

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-247 Issue 1	Pass
INDUSTRY CANADA RSS-GEN Issue 4	Pass

UL Korea, Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Korea, Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Korea, Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Korea, Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by IAS, any agency of the Federal Government, or any agency of any government.

Approved & Released For
UL Korea, Ltd. By:



CY Choi
Suwon Lab Engineer
UL Korea, Ltd.

Tested By:



SungGil Park
Suwon Lab Engineer
UL Korea, Ltd.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, KDB 558074 D01 v03r05, ANSI C63.10-2009 for FCC and ANSI C63.10-2013, RSS-GEN Issue 4, and RSS-247 Issue 1 for IC.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 443-823, Korea. Line conducted emissions are measured only at the 218 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

218 Maeyeong-ro
<input checked="" type="checkbox"/> Chamber 1
<input checked="" type="checkbox"/> Chamber 2

UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637. The full scope of accreditation can be viewed at <http://www.iasonline.org/PDF/TL/TL-637.pdf>.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

$$\text{Field Strength (dBuV/m)} = \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} - \text{Preamp Gain (dB)}$$

$$36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} = 28.9 \text{ dBuV/m}$$

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	2.32 dB
Radiated Disturbance, Below 1GHz	4.14 dB
Radiated Disturbance, Above 1 GHz	5.97 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a Bluetooth/BLE and DTS b/g/n WATCH.

This test report addresses the DTS (WLAN) operational mode.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum total conducted average output power as follows:

Frequency Range [MHz]	Mode	Output Power [dBm]	Output Power [mW]
2412 - 2472	802.11b	17.01	50.23
	802.11g	14.25	26.61
	802.11n HT20	13.15	20.65

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an FPCB antennas, with a antenna's maximum gain of -6.29 dBi.

5.4. WORST-CASE CONFIGURATION AND MODE

Radiated emission and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z it was determined that Z orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Z orientation.

Based on the baseline scan, the worst-case data rates were:

802.11b mode: 1 Mbps
802.11g mode: 6 Mbps
802.11n HT20 mode: MCS0

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Adapter	SAMSUNG	ETA0U60JBE	DK1G725HS/7-E	N/A
Wireless Charger	SAMSUNG	EP-OR720	N/A	N/A
Data Cable	SAMSUNG	ECB-DU6ABE	N/A	N/A

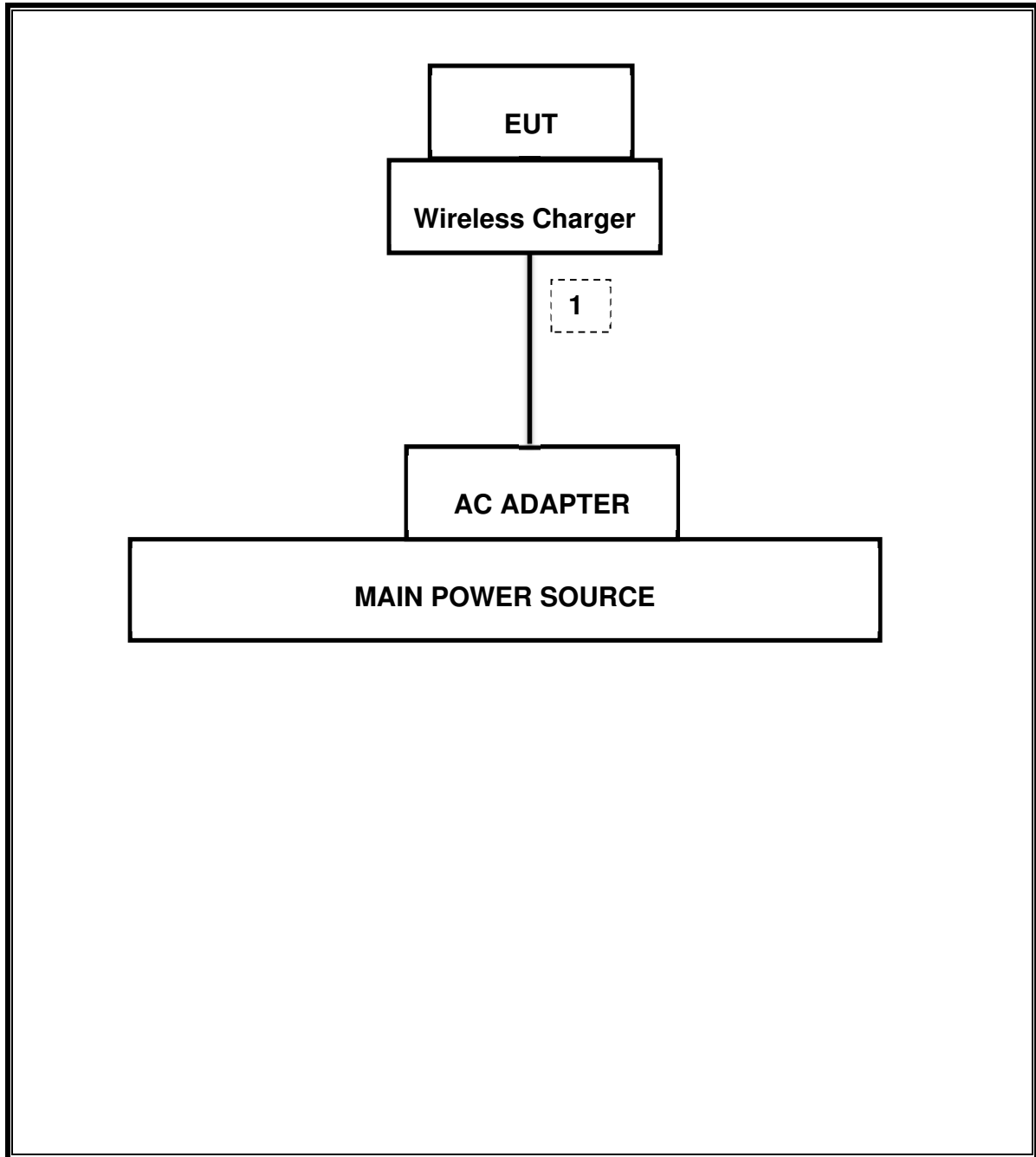
I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	Mini-USB	Shielded	0.8m	N/A

TEST SETUP

The EUT is a stand-alone unit during the tests. Test software exercised the radio card.

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment List				
Description	Manufacturer	Model	S/N	Cal Due
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	750	11-17-16
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	04-25-17
Antenna, Horn, 18 GHz	ETS	3115	00167211	09-20-16
Antenna, Horn, 18 GHz	ETS	3115	00161451	05-17-17
Antenna, Horn, 18 GHz	ETS	3117	00168724	06-17-17
Antenna, Horn, 18 GHz	ETS	3117	00168717	06-17-17
Antenna, Horn, 40 GHz	ETS	3116C	00166155	11-30-17
Antenna, Horn, 40 GHz	ETS	3116C-PA	00168841	12-15-17
Preamplifier, 1000 MHz	Sonoma	310N	341282	08-18-16
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-18-16
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1876511	08-18-16
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	08-18-16
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54170614	08-19-16
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54490312	08-19-16
Bluetooth Tester	TESCOM	TC-3000C	3000C000546	08-18-16
Average Power Sensor	R&S	NRZ-Z91	102681	08-18-16
Average Power Sensor	Agilent / HP	U2000	MY54270007	08-18-16
EMI Test Receive, 40 GHz	R&S	ESU40	100439	08-19-16
EMI Test Receive, 40 GHz	R&S	ESU40	100457	08-19-16
EMI Test Receive, 3 GHz	R&S	ESR3	101832	08-19-16
Attenuator / Switch driver	HP	11713A	3748A04272	N/A
Low Pass Filter 3GHz	Micro-Tronics	LPS17541	009	08-18-16
Low Pass Filter 3GHz	Micro-Tronics	LPS17541	015	08-18-16
High Pass Filter 5GHz	Micro-Tronics	HPS17542	009	08-18-16
High Pass Filter 6GHz	Micro-Tronics	HPM17543	010	08-18-16
High Pass Filter 5GHz	Micro-Tronics	HPS17542	016	08-18-16
High Pass Filter 6GHz	Micro-Tronics	HPM17543	015	08-18-16
LISN	R&S	ENV-216	101836	08-19-16
LISN	R&S	ENV-216	101837	08-19-16
Attenuator	PASTERNAK	PE7087-10	A009	08-19-16

7. MEASUREMENT METHODS

KDB 558074 D01 DTS Meas Guidance v03r05: Measurement Procedure §9.2.3.1 AVGPM is used for average power and §10.5 AVGPS-2 is used for power spectral density.

Unwanted emissions within Restricted Bands are measured using traditional radiated procedures.

Band edge emissions within Restricted Bands are measured using RMS with duty cycle factor offset method.

8. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS

LIMITS

None; for reporting purposes only.

8.1. ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B [msec]	Period [msec]	Duty Cycle x [linear]	Duty Cycle [%]	Duty Cycle Correction Factor [dB]	1/T Minimum VBW [kHz]
2400MHz Bands						
802.11b	8.604	8.704	0.989	98.9%	0.00	0.010
802.11g	1.428	1.528	0.935	93.5%	0.29	0.700
802.11n HT20	1.335	1.436	0.930	93.0%	0.32	0.749



9. SUMMARY TABLE

FCC Part Section	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Worst Case
15.247 (a)(2)	RSS-247 5.2.1	Occupied Band width (6dB)	>500KHz	Conducted	Pass	9.010 MHz
2.1051, 15.247 (d)	RSS-247 5.5	Band Edge / Conducted Spurious Emission	-20dBc		Pass	-29.797 dBm
15.247	RSS-247 5.4.4	TX conducted output power	<30dBm		Pass	17.01 dBm
15.247	RSS-247 5.2.2	PSD	<8dBm		Pass	-14.84 dBm
15.207 (a)	RSS-GEN 8.8	AC Power Line conducted emissions	Section 10	Power Line conducted	Pass	39.22 dBuV (QP)
15.205, 15.209	RSS-GEN 8.9/7	Radiated Spurious Emission	< 74dBuV/m	Radiated	Pass	71.08 dBuV/m (PK)

10. ANTENNA PORT TEST RESULTS

10.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)
 IC RSS-247 5.2.1

The minimum 6 dB bandwidth shall be at least 500 kHz.

TEST PROCEDURE

Reference to KDB 558074 D01 DTS Meas Guidance v03r05: The transmitter output is connected to a spectrum analyzer with the RBW set to 100KHz, the VBW $\geq 3 \times$ RBW, peak detector and max hold.

RESULTS

10.1.1. 802.11b MODE IN THE 2.4 GHz BAND

Channel	Frequency [MHz]	6 dB Bandwidth [MHz]	Minimum Limit [MHz]
Low	2412	10.026	0.5
Mid	2437	9.538	0.5
High	2462	9.516	0.5
12	2467	9.029	0.5
13	2472	9.010	0.5
Worst		9.010	0.5

10.1.2. 802.11g MODE IN THE 2.4 GHz BAND

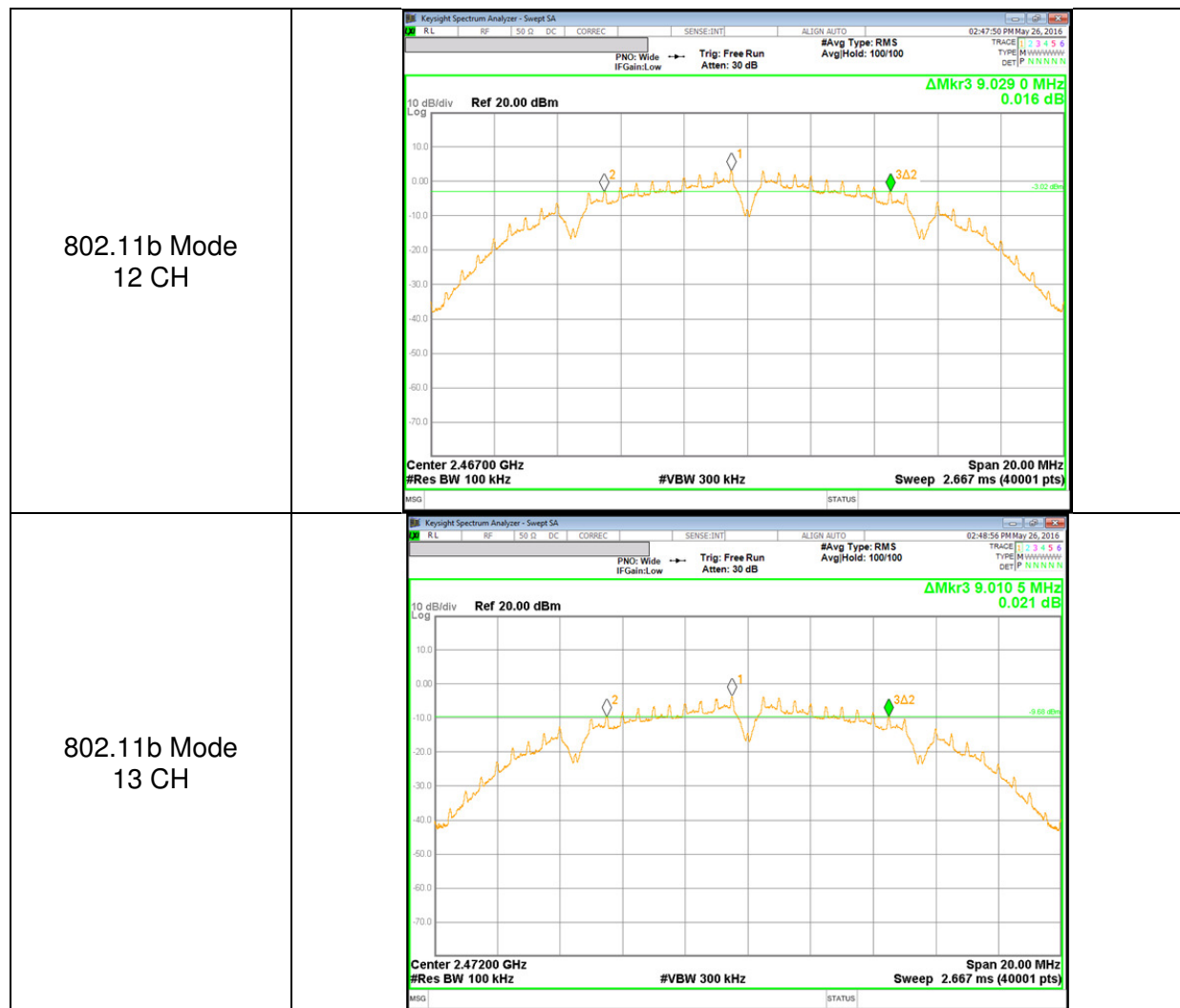
Channel	Frequency [MHz]	6 dB Bandwidth [MHz]	Minimum Limit [MHz]
Low	2412	15.110	0.5
Mid	2437	15.108	0.5
High	2462	15.110	0.5
12	2467	15.108	0.5
13	2472	15.110	0.5
Worst		15.108	0.5

10.1.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

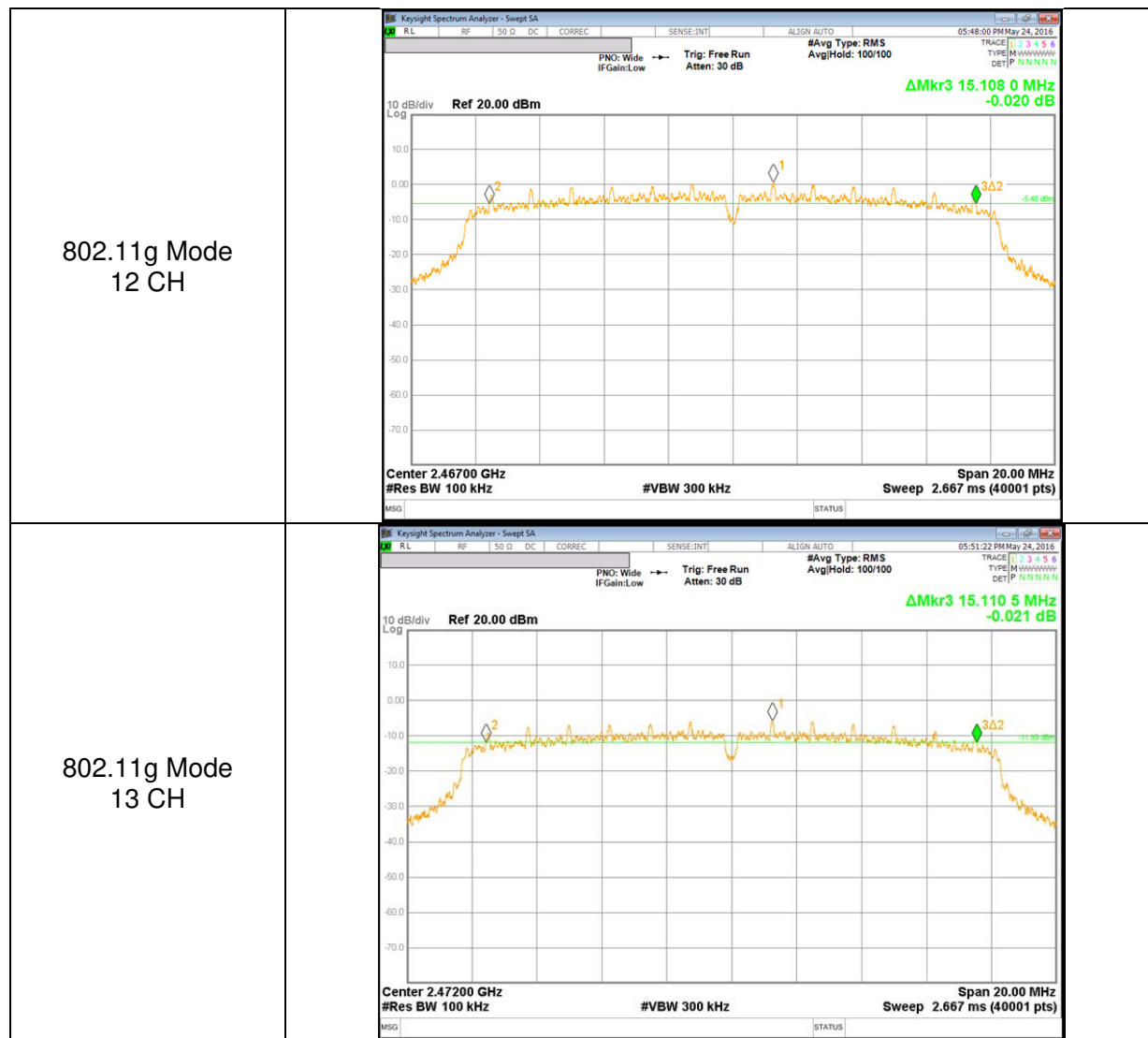
Channel	Frequency [MHz]	6 dB Bandwidth [MHz]	Minimum Limit [MHz]
Low	2412	15.106	0.5
Mid	2437	15.121	0.5
High	2462	15.109	0.5
12	2467	15.106	0.5
13	2472	15.115	0.5
Worst		15.106	0.5

10.1.4. 6 dB BANDWIDTH PLOTS

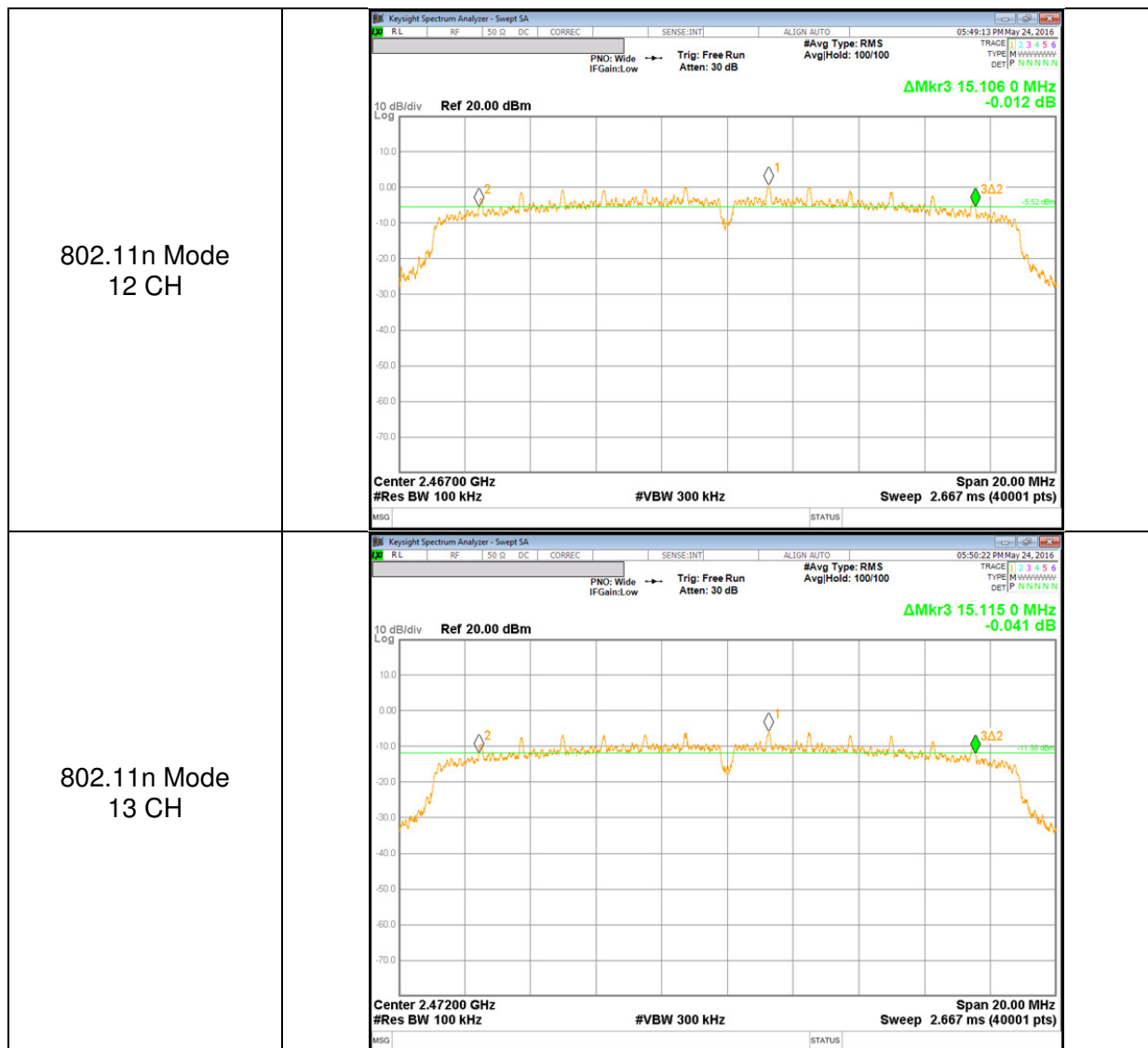
<p>802.11b Mode Low CH</p>	
<p>802.11b Mode Middle CH</p>	
<p>802.11b Mode High CH</p>	



<p>802.11g Mode Low CH</p>	<p>KeySight Spectrum Analyzer - Swept SA 10:28:33 AM Aug 10, 2015 #Avg Type: RMS AvgHold: 100/100 PNO: Wide IFGain: Low Trig: Free Run Atten: 20 dB Ref Offset 10.15 dB Ref 20.00 dBm ΔMkr3 15.110 MHz -0.061 dB 10 dB/div Log Center 2.41200 GHz Span 20.00 MHz #Res BW 100 kHz #VBW 300 kHz Sweep 1.333 ms (20001 pts)</p>
<p>802.11g Mode Middle CH</p>	<p>KeySight Spectrum Analyzer - Swept SA 10:27:24 AM Aug 10, 2015 #Avg Type: RMS AvgHold: 100/100 PNO: Wide IFGain: Low Trig: Free Run Atten: 20 dB Ref Offset 10.15 dB Ref 20.00 dBm ΔMkr3 15.108 MHz -0.067 dB 10 dB/div Log Center 2.43700 GHz Span 20.00 MHz #Res BW 100 kHz #VBW 300 kHz Sweep 1.333 ms (20001 pts)</p>
<p>802.11g Mode High CH</p>	<p>KeySight Spectrum Analyzer - Swept SA 10:26:02 AM Aug 10, 2015 #Avg Type: RMS AvgHold: 100/100 PNO: Wide IFGain: Low Trig: Free Run Atten: 20 dB Ref Offset 10.15 dB Ref 20.00 dBm ΔMkr3 15.110 MHz -0.020 dB 10 dB/div Log Center 2.46200 GHz Span 20.00 MHz #Res BW 100 kHz #VBW 300 kHz Sweep 1.333 ms (20001 pts)</p>



<p>802.11n Mode Low CH</p>	<p>KeySight Spectrum Analyzer - Swept SA 10:30:01 AM Aug 10, 2015 #Avg Type: RMS AvgHold: 100/100 PNO: Wide IFGain: Low Trig: Free Run Atten: 20 dB Ref Offset 10.16 dB Ref 20.00 dBm ΔMkr3 15.106 MHz -0.016 dB Center 2.41200 GHz #Res BW 100 kHz #VBW 300 kHz Span 20.00 MHz Sweep 1.333 ms (20001 pts)</p>
<p>802.11n Mode Middle CH</p>	<p>KeySight Spectrum Analyzer - Swept SA 10:33:27 AM Aug 10, 2015 #Avg Type: RMS AvgHold: 100/100 PNO: Wide IFGain: Low Trig: Free Run Atten: 20 dB Ref Offset 10.16 dB Ref 20.00 dBm ΔMkr3 15.121 MHz 0.012 dB Center 2.43700 GHz #Res BW 100 kHz #VBW 300 kHz Span 20.00 MHz Sweep 1.333 ms (20001 pts) Alignment Completed</p>
<p>802.11n Mode High CH</p>	<p>KeySight Spectrum Analyzer - Swept SA 10:34:31 AM Aug 10, 2015 #Avg Type: RMS AvgHold: 100/100 PNO: Wide IFGain: Low Trig: Free Run Atten: 20 dB Ref Offset 10.16 dB Ref 20.00 dBm ΔMkr3 15.109 MHz 0.088 dB Center 2.46200 GHz #Res BW 100 kHz #VBW 300 kHz Span 20.00 MHz Sweep 1.333 ms (20001 pts)</p>



10.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

10.2.1. 802.11b MODE IN THE 2.4 GHz BAND

Channel	Frequency [MHz]	99% Bandwidth [MHz]
Low	2412	15.149
Mid	2437	15.046
High	2462	15.083
12	2467	14.097
13	2472	14.121
Worst		15.149

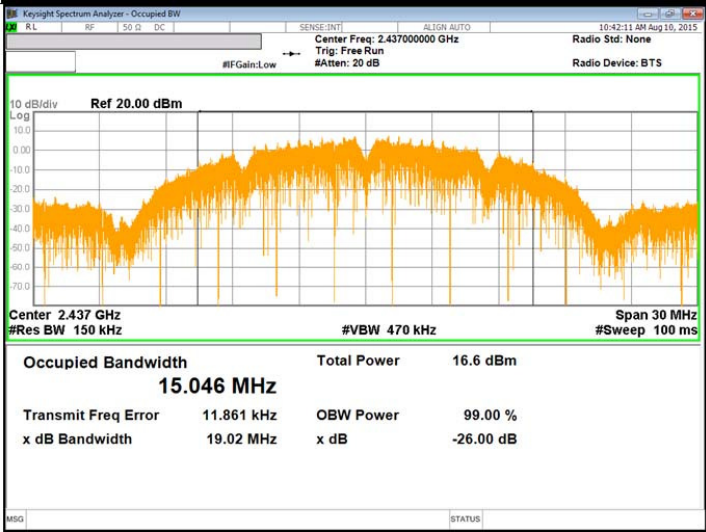
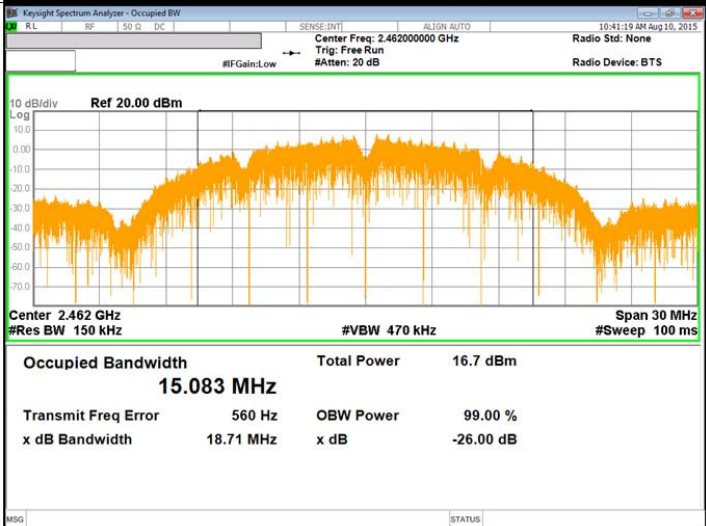
10.2.2. 802.11g MODE IN THE 2.4 GHz BAND

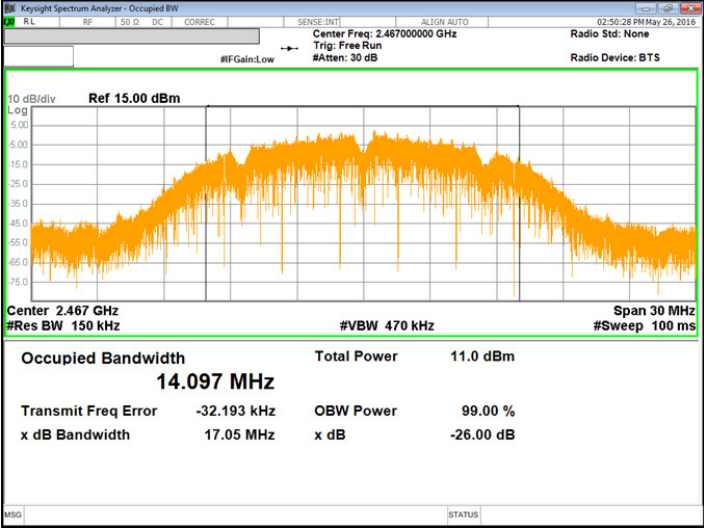
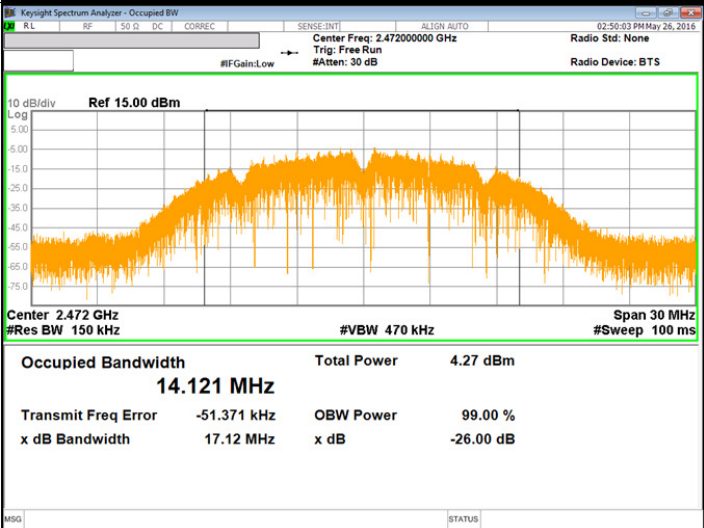
Channel	Frequency [MHz]	99% Bandwidth [MHz]
Low	2412	16.353
Mid	2437	16.360
High	2462	16.312
12	2467	16.285
13	2472	16.271
Worst		16.360

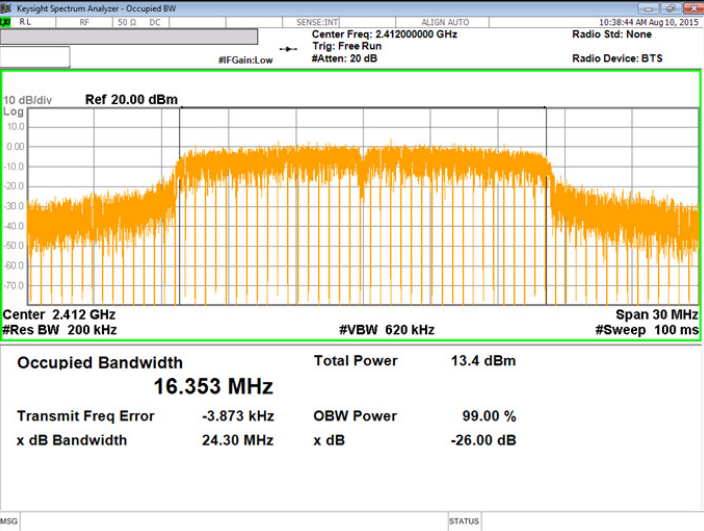


10.2.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

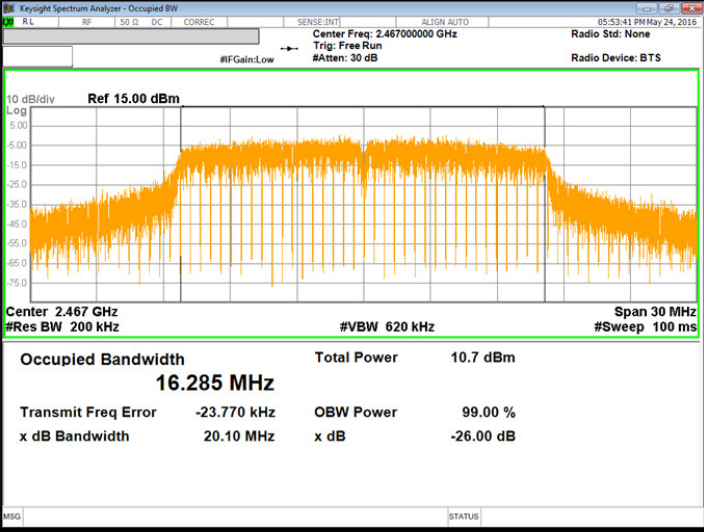
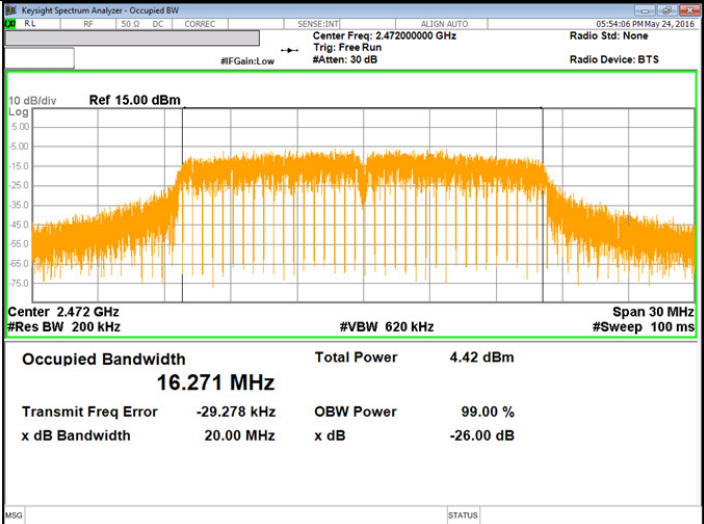
Channel	Frequency [MHz]	99% Bandwidth [MHz]
Low	2412	17.513
Mid	2437	17.517
High	2462	17.461
12	2467	17.471
13	2472	17.448
Worst		17.517

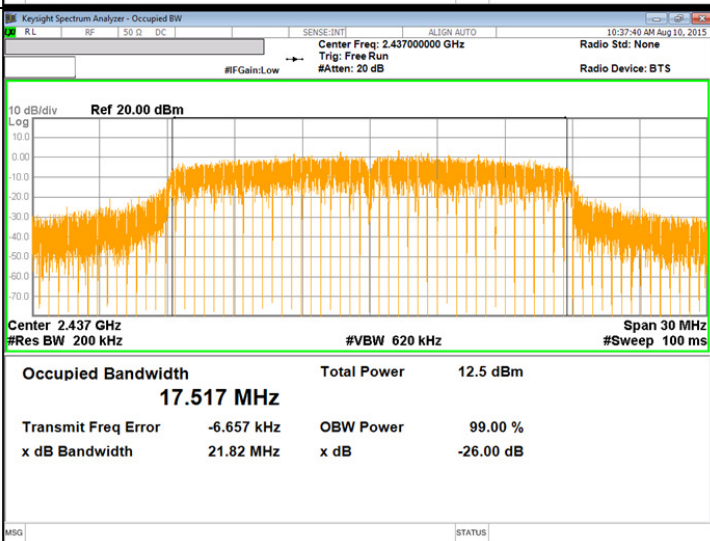
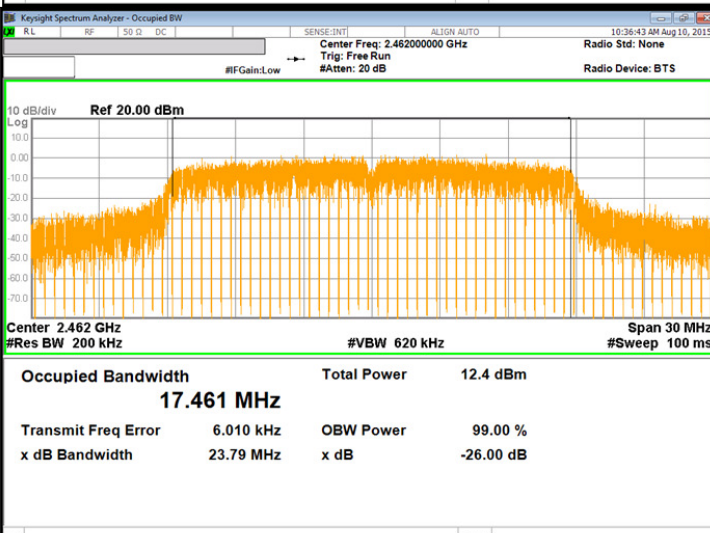
10.2.4. 99% BANDWIDTH PLOTS

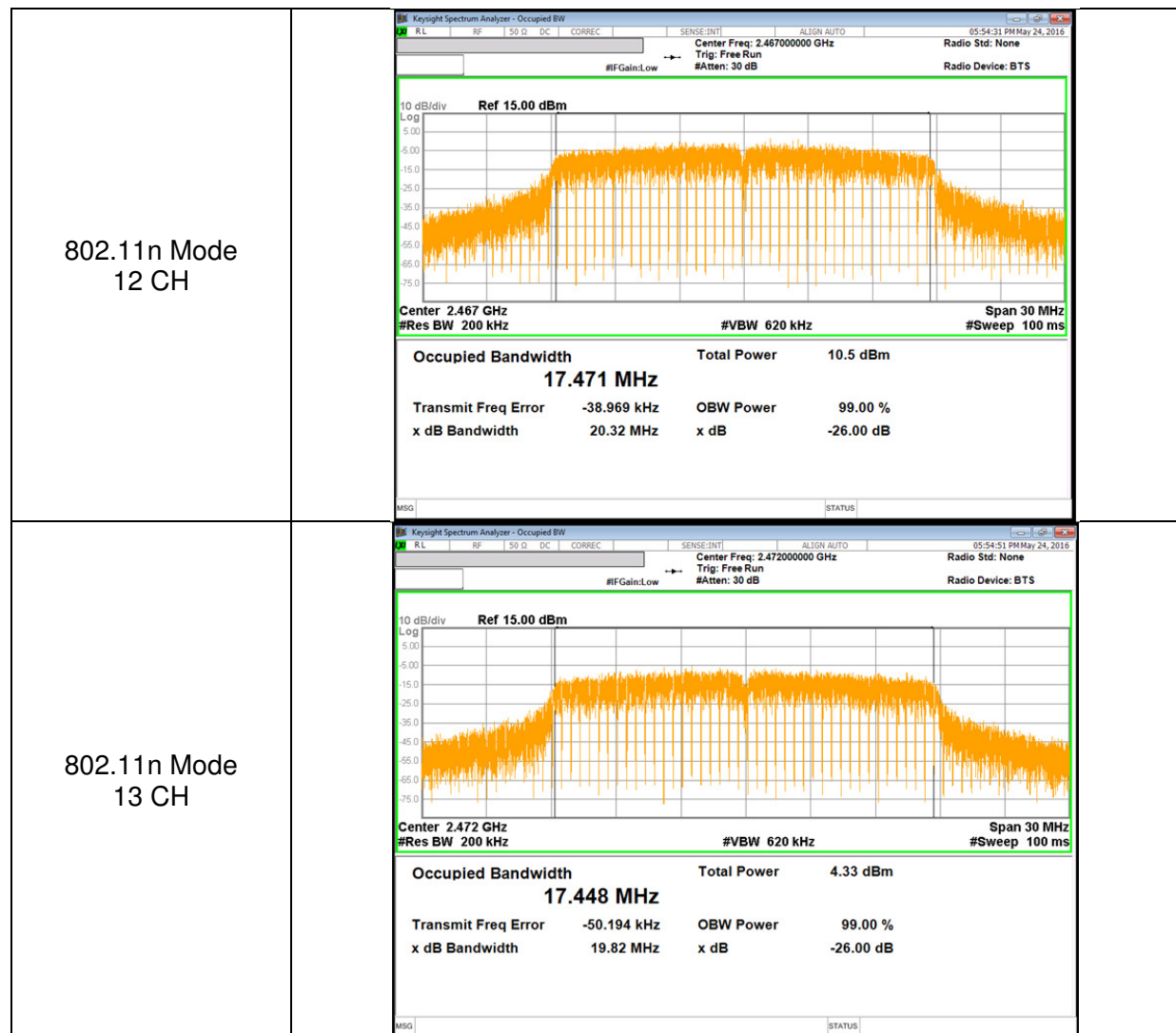
<p>802.11b Mode Low CH</p>	 <p>KeySight Spectrum Analyzer - Occupied BW Center Freq: 2.41200000 GHz Trig: Free Run #Atten: 20 dB Radio Std: None Radio Device: BTS</p> <p>10 dB/div Ref 20.00 dBm</p> <p>Center 2.412 GHz Span 30 MHz #Res BW 150 kHz #VBW 470 kHz #Sweep 100 ms</p> <table border="1"> <tr> <td>Occupied Bandwidth</td> <td>Total Power</td> <td>16.5 dBm</td> </tr> <tr> <td colspan="3" style="text-align: center;">15.149 MHz</td> </tr> <tr> <td>Transmit Freq Error</td> <td>34.073 kHz</td> <td>OBW Power</td> </tr> <tr> <td>x dB Bandwidth</td> <td>18.66 MHz</td> <td>x dB</td> </tr> <tr> <td></td> <td></td> <td>99.00 %</td> </tr> <tr> <td></td> <td></td> <td>-26.00 dB</td> </tr> </table>	Occupied Bandwidth	Total Power	16.5 dBm	15.149 MHz			Transmit Freq Error	34.073 kHz	OBW Power	x dB Bandwidth	18.66 MHz	x dB			99.00 %			-26.00 dB
Occupied Bandwidth	Total Power	16.5 dBm																	
15.149 MHz																			
Transmit Freq Error	34.073 kHz	OBW Power																	
x dB Bandwidth	18.66 MHz	x dB																	
		99.00 %																	
		-26.00 dB																	
<p>802.11b Mode Middle CH</p>	 <p>KeySight Spectrum Analyzer - Occupied BW Center Freq: 2.43700000 GHz Trig: Free Run #Atten: 20 dB Radio Std: None Radio Device: BTS</p> <p>10 dB/div Ref 20.00 dBm</p> <p>Center 2.437 GHz Span 30 MHz #Res BW 150 kHz #VBW 470 kHz #Sweep 100 ms</p> <table border="1"> <tr> <td>Occupied Bandwidth</td> <td>Total Power</td> <td>16.6 dBm</td> </tr> <tr> <td colspan="3" style="text-align: center;">15.046 MHz</td> </tr> <tr> <td>Transmit Freq Error</td> <td>11.861 kHz</td> <td>OBW Power</td> </tr> <tr> <td>x dB Bandwidth</td> <td>19.02 MHz</td> <td>x dB</td> </tr> <tr> <td></td> <td></td> <td>99.00 %</td> </tr> <tr> <td></td> <td></td> <td>-26.00 dB</td> </tr> </table>	Occupied Bandwidth	Total Power	16.6 dBm	15.046 MHz			Transmit Freq Error	11.861 kHz	OBW Power	x dB Bandwidth	19.02 MHz	x dB			99.00 %			-26.00 dB
Occupied Bandwidth	Total Power	16.6 dBm																	
15.046 MHz																			
Transmit Freq Error	11.861 kHz	OBW Power																	
x dB Bandwidth	19.02 MHz	x dB																	
		99.00 %																	
		-26.00 dB																	
<p>802.11b Mode High CH</p>	 <p>KeySight Spectrum Analyzer - Occupied BW Center Freq: 2.46200000 GHz Trig: Free Run #Atten: 20 dB Radio Std: None Radio Device: BTS</p> <p>10 dB/div Ref 20.00 dBm</p> <p>Center 2.462 GHz Span 30 MHz #Res BW 150 kHz #VBW 470 kHz #Sweep 100 ms</p> <table border="1"> <tr> <td>Occupied Bandwidth</td> <td>Total Power</td> <td>16.7 dBm</td> </tr> <tr> <td colspan="3" style="text-align: center;">15.083 MHz</td> </tr> <tr> <td>Transmit Freq Error</td> <td>560 Hz</td> <td>OBW Power</td> </tr> <tr> <td>x dB Bandwidth</td> <td>18.71 MHz</td> <td>x dB</td> </tr> <tr> <td></td> <td></td> <td>99.00 %</td> </tr> <tr> <td></td> <td></td> <td>-26.00 dB</td> </tr> </table>	Occupied Bandwidth	Total Power	16.7 dBm	15.083 MHz			Transmit Freq Error	560 Hz	OBW Power	x dB Bandwidth	18.71 MHz	x dB			99.00 %			-26.00 dB
Occupied Bandwidth	Total Power	16.7 dBm																	
15.083 MHz																			
Transmit Freq Error	560 Hz	OBW Power																	
x dB Bandwidth	18.71 MHz	x dB																	
		99.00 %																	
		-26.00 dB																	

<p>802.11b Mode 12 CH</p>	 <p>Center Freq: 2.46700000 GHz Trig: Free Run #Atten: 30 dB Radio Device: BTS</p> <p>10 dB/div Ref 15.00 dBm</p> <p>Center 2.467 GHz #Res BW 150 kHz #VBW 470 kHz Span 30 MHz #Sweep 100 ms</p> <table border="1"> <tr> <td>Occupied Bandwidth</td> <td>Total Power</td> <td>11.0 dBm</td> </tr> <tr> <td>14.097 MHz</td> <td></td> <td></td> </tr> <tr> <td>Transmit Freq Error</td> <td>OBW Power</td> <td>99.00 %</td> </tr> <tr> <td>-32.193 kHz</td> <td></td> <td></td> </tr> <tr> <td>x dB Bandwidth</td> <td>x dB</td> <td>-26.00 dB</td> </tr> <tr> <td>17.05 MHz</td> <td></td> <td></td> </tr> </table>	Occupied Bandwidth	Total Power	11.0 dBm	14.097 MHz			Transmit Freq Error	OBW Power	99.00 %	-32.193 kHz			x dB Bandwidth	x dB	-26.00 dB	17.05 MHz		
Occupied Bandwidth	Total Power	11.0 dBm																	
14.097 MHz																			
Transmit Freq Error	OBW Power	99.00 %																	
-32.193 kHz																			
x dB Bandwidth	x dB	-26.00 dB																	
17.05 MHz																			
<p>802.11b Mode 13 CH</p>	 <p>Center Freq: 2.47200000 GHz Trig: Free Run #Atten: 30 dB Radio Device: BTS</p> <p>10 dB/div Ref 15.00 dBm</p> <p>Center 2.472 GHz #Res BW 150 kHz #VBW 470 kHz Span 30 MHz #Sweep 100 ms</p> <table border="1"> <tr> <td>Occupied Bandwidth</td> <td>Total Power</td> <td>4.27 dBm</td> </tr> <tr> <td>14.121 MHz</td> <td></td> <td></td> </tr> <tr> <td>Transmit Freq Error</td> <td>OBW Power</td> <td>99.00 %</td> </tr> <tr> <td>-51.371 kHz</td> <td></td> <td></td> </tr> <tr> <td>x dB Bandwidth</td> <td>x dB</td> <td>-26.00 dB</td> </tr> <tr> <td>17.12 MHz</td> <td></td> <td></td> </tr> </table>	Occupied Bandwidth	Total Power	4.27 dBm	14.121 MHz			Transmit Freq Error	OBW Power	99.00 %	-51.371 kHz			x dB Bandwidth	x dB	-26.00 dB	17.12 MHz		
Occupied Bandwidth	Total Power	4.27 dBm																	
14.121 MHz																			
Transmit Freq Error	OBW Power	99.00 %																	
-51.371 kHz																			
x dB Bandwidth	x dB	-26.00 dB																	
17.12 MHz																			

<p>802.11g Mode Low CH</p>	 <p>KeySight Spectrum Analyzer - Occupied BW Center Freq: 2.41200000 GHz Trig: Free Run #Atten: 20 dB Radio Device: BTS</p> <p>10 dB/div Ref 20.00 dBm</p> <p>Center 2.412 GHz Span 30 MHz #Res BW 200 kHz #VBW 620 kHz #Sweep 100 ms</p> <table border="1"> <tr> <td>Occupied Bandwidth</td> <td>Total Power</td> <td>13.4 dBm</td> </tr> <tr> <td>16.353 MHz</td> <td></td> <td></td> </tr> <tr> <td>Transmit Freq Error</td> <td>OBW Power</td> <td>99.00 %</td> </tr> <tr> <td>-3.873 kHz</td> <td>x dB</td> <td>-26.00 dB</td> </tr> <tr> <td>x dB Bandwidth</td> <td></td> <td></td> </tr> <tr> <td>24.30 MHz</td> <td></td> <td></td> </tr> </table>	Occupied Bandwidth	Total Power	13.4 dBm	16.353 MHz			Transmit Freq Error	OBW Power	99.00 %	-3.873 kHz	x dB	-26.00 dB	x dB Bandwidth			24.30 MHz		
Occupied Bandwidth	Total Power	13.4 dBm																	
16.353 MHz																			
Transmit Freq Error	OBW Power	99.00 %																	
-3.873 kHz	x dB	-26.00 dB																	
x dB Bandwidth																			
24.30 MHz																			
<p>802.11g Mode Middle CH</p>	 <p>KeySight Spectrum Analyzer - Occupied BW Center Freq: 2.43700000 GHz Trig: Free Run #Atten: 20 dB Radio Device: BTS</p> <p>10 dB/div Ref 20.00 dBm</p> <p>Center 2.437 GHz Span 30 MHz #Res BW 200 kHz #VBW 620 kHz #Sweep 100 ms</p> <table border="1"> <tr> <td>Occupied Bandwidth</td> <td>Total Power</td> <td>13.5 dBm</td> </tr> <tr> <td>16.360 MHz</td> <td></td> <td></td> </tr> <tr> <td>Transmit Freq Error</td> <td>OBW Power</td> <td>99.00 %</td> </tr> <tr> <td>-12.365 kHz</td> <td>x dB</td> <td>-26.00 dB</td> </tr> <tr> <td>x dB Bandwidth</td> <td></td> <td></td> </tr> <tr> <td>21.58 MHz</td> <td></td> <td></td> </tr> </table>	Occupied Bandwidth	Total Power	13.5 dBm	16.360 MHz			Transmit Freq Error	OBW Power	99.00 %	-12.365 kHz	x dB	-26.00 dB	x dB Bandwidth			21.58 MHz		
Occupied Bandwidth	Total Power	13.5 dBm																	
16.360 MHz																			
Transmit Freq Error	OBW Power	99.00 %																	
-12.365 kHz	x dB	-26.00 dB																	
x dB Bandwidth																			
21.58 MHz																			
<p>802.11g Mode High CH</p>	 <p>KeySight Spectrum Analyzer - Occupied BW Center Freq: 2.46200000 GHz Trig: Free Run #Atten: 20 dB Radio Device: BTS</p> <p>10 dB/div Ref 20.00 dBm</p> <p>Center 2.462 GHz Span 30 MHz #Res BW 200 kHz #VBW 620 kHz #Sweep 100 ms</p> <table border="1"> <tr> <td>Occupied Bandwidth</td> <td>Total Power</td> <td>13.4 dBm</td> </tr> <tr> <td>16.312 MHz</td> <td></td> <td></td> </tr> <tr> <td>Transmit Freq Error</td> <td>OBW Power</td> <td>99.00 %</td> </tr> <tr> <td>3.828 kHz</td> <td>x dB</td> <td>-26.00 dB</td> </tr> <tr> <td>x dB Bandwidth</td> <td></td> <td></td> </tr> <tr> <td>23.04 MHz</td> <td></td> <td></td> </tr> </table>	Occupied Bandwidth	Total Power	13.4 dBm	16.312 MHz			Transmit Freq Error	OBW Power	99.00 %	3.828 kHz	x dB	-26.00 dB	x dB Bandwidth			23.04 MHz		
Occupied Bandwidth	Total Power	13.4 dBm																	
16.312 MHz																			
Transmit Freq Error	OBW Power	99.00 %																	
3.828 kHz	x dB	-26.00 dB																	
x dB Bandwidth																			
23.04 MHz																			

<p>802.11g Mode 12 CH</p>	 <p>Center 2.467 GHz #Res BW 200 kHz #VBW 620 kHz Span 30 MHz #Sweep 100 ms</p> <table border="1"> <tr> <td>Occupied Bandwidth</td> <td>Total Power</td> <td>10.7 dBm</td> </tr> <tr> <td>16.285 MHz</td> <td></td> <td></td> </tr> <tr> <td>Transmit Freq Error</td> <td>OBW Power</td> <td>99.00 %</td> </tr> <tr> <td>-23.770 kHz</td> <td></td> <td></td> </tr> <tr> <td>x dB Bandwidth</td> <td>x dB</td> <td>-26.00 dB</td> </tr> <tr> <td>20.10 MHz</td> <td></td> <td></td> </tr> </table>	Occupied Bandwidth	Total Power	10.7 dBm	16.285 MHz			Transmit Freq Error	OBW Power	99.00 %	-23.770 kHz			x dB Bandwidth	x dB	-26.00 dB	20.10 MHz		
Occupied Bandwidth	Total Power	10.7 dBm																	
16.285 MHz																			
Transmit Freq Error	OBW Power	99.00 %																	
-23.770 kHz																			
x dB Bandwidth	x dB	-26.00 dB																	
20.10 MHz																			
<p>802.11g Mode 13 CH</p>	 <p>Center 2.472 GHz #Res BW 200 kHz #VBW 620 kHz Span 30 MHz #Sweep 100 ms</p> <table border="1"> <tr> <td>Occupied Bandwidth</td> <td>Total Power</td> <td>4.42 dBm</td> </tr> <tr> <td>16.271 MHz</td> <td></td> <td></td> </tr> <tr> <td>Transmit Freq Error</td> <td>OBW Power</td> <td>99.00 %</td> </tr> <tr> <td>-29.278 kHz</td> <td></td> <td></td> </tr> <tr> <td>x dB Bandwidth</td> <td>x dB</td> <td>-26.00 dB</td> </tr> <tr> <td>20.00 MHz</td> <td></td> <td></td> </tr> </table>	Occupied Bandwidth	Total Power	4.42 dBm	16.271 MHz			Transmit Freq Error	OBW Power	99.00 %	-29.278 kHz			x dB Bandwidth	x dB	-26.00 dB	20.00 MHz		
Occupied Bandwidth	Total Power	4.42 dBm																	
16.271 MHz																			
Transmit Freq Error	OBW Power	99.00 %																	
-29.278 kHz																			
x dB Bandwidth	x dB	-26.00 dB																	
20.00 MHz																			

<p>802.11n Mode Low CH</p>	 <p>KeySight Spectrum Analyzer - Occupied BW Center Freq: 2.41200000 GHz Span 30 MHz #Res BW 200 kHz #VBW 620 kHz #Sweep 100 ms</p> <table border="1"> <tr> <td>Occupied Bandwidth</td> <td>Total Power</td> <td>12.5 dBm</td> </tr> <tr> <td>17.513 MHz</td> <td></td> <td></td> </tr> <tr> <td>Transmit Freq Error</td> <td>8.175 kHz</td> <td>OBW Power</td> </tr> <tr> <td>x dB Bandwidth</td> <td>20.15 MHz</td> <td>x dB</td> </tr> <tr> <td></td> <td></td> <td>-26.00 dB</td> </tr> </table>	Occupied Bandwidth	Total Power	12.5 dBm	17.513 MHz			Transmit Freq Error	8.175 kHz	OBW Power	x dB Bandwidth	20.15 MHz	x dB			-26.00 dB
Occupied Bandwidth	Total Power	12.5 dBm														
17.513 MHz																
Transmit Freq Error	8.175 kHz	OBW Power														
x dB Bandwidth	20.15 MHz	x dB														
		-26.00 dB														
<p>802.11n Mode Middle CH</p>	 <p>KeySight Spectrum Analyzer - Occupied BW Center Freq: 2.43700000 GHz Span 30 MHz #Res BW 200 kHz #VBW 620 kHz #Sweep 100 ms</p> <table border="1"> <tr> <td>Occupied Bandwidth</td> <td>Total Power</td> <td>12.5 dBm</td> </tr> <tr> <td>17.517 MHz</td> <td></td> <td></td> </tr> <tr> <td>Transmit Freq Error</td> <td>-6.657 kHz</td> <td>OBW Power</td> </tr> <tr> <td>x dB Bandwidth</td> <td>21.82 MHz</td> <td>x dB</td> </tr> <tr> <td></td> <td></td> <td>-26.00 dB</td> </tr> </table>	Occupied Bandwidth	Total Power	12.5 dBm	17.517 MHz			Transmit Freq Error	-6.657 kHz	OBW Power	x dB Bandwidth	21.82 MHz	x dB			-26.00 dB
Occupied Bandwidth	Total Power	12.5 dBm														
17.517 MHz																
Transmit Freq Error	-6.657 kHz	OBW Power														
x dB Bandwidth	21.82 MHz	x dB														
		-26.00 dB														
<p>802.11n Mode High CH</p>	 <p>KeySight Spectrum Analyzer - Occupied BW Center Freq: 2.46200000 GHz Span 30 MHz #Res BW 200 kHz #VBW 620 kHz #Sweep 100 ms</p> <table border="1"> <tr> <td>Occupied Bandwidth</td> <td>Total Power</td> <td>12.4 dBm</td> </tr> <tr> <td>17.461 MHz</td> <td></td> <td></td> </tr> <tr> <td>Transmit Freq Error</td> <td>6.010 kHz</td> <td>OBW Power</td> </tr> <tr> <td>x dB Bandwidth</td> <td>23.79 MHz</td> <td>x dB</td> </tr> <tr> <td></td> <td></td> <td>-26.00 dB</td> </tr> </table>	Occupied Bandwidth	Total Power	12.4 dBm	17.461 MHz			Transmit Freq Error	6.010 kHz	OBW Power	x dB Bandwidth	23.79 MHz	x dB			-26.00 dB
Occupied Bandwidth	Total Power	12.4 dBm														
17.461 MHz																
Transmit Freq Error	6.010 kHz	OBW Power														
x dB Bandwidth	23.79 MHz	x dB														
		-26.00 dB														



10.3. OUTPUT POWER

LIMITS

FCC §15.247
IC RSS-247 5.4.4

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

DIRECTIONAL ANTENNA GAIN

There is only one transmitter output therefore the directional gain is equal to the antenna gain.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.1 dB (including 10 dB pad and 0.1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Duty cycle correction factor is already added to the average output power results for duty cycle factor < 98%. (802.11g, 802.11n mode)

RESULTS

10.3.1. 802.11b MODE IN THE 2.4 GHz BAND

Limits

Channel	Frequency [MHz]	Directional Gain Primary [dBi]	FCC Power Limit [dBm]	IC Power Limit [dBm]	IC EIRP Limit [dBm]	Max Power [dBm]
Low	2412	-5.78	30.00	30.00	36.00	30.00
Mid	2437	-5.78	30.00	30.00	36.00	30.00
High	2462	-5.78	30.00	30.00	36.00	30.00
12	2467	-5.78	30.00	30.00	36.00	30.00
13	2472	-5.78	30.00	30.00	36.00	30.00

Results

Channel	Frequency [MHz]	Primary Meas Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Margin [dB]
Low	2412	16.98	16.98	36.00	-19.02
Mid	2437	17.01	17.01	36.00	-18.99
High	2462	16.98	16.98	36.00	-19.02
12	2467	10.75	11.02	36.00	-24.98
13	2472	4.22	4.38	36.00	-31.62
Worst			17.01	36.00	-18.99

10.3.2. 802.11g MODE IN THE 2.4 GHz BAND

Limits

Channel	Frequency [MHz]	Directional Gain Primary [dBi]	FCC Power Limit [dBm]	IC Power Limit [dBm]	IC EIRP Limit [dBm]	Max Power [dBm]
Low	2412	-5.78	30.00	30.00	36.00	30.00
Mid	2437	-5.78	30.00	30.00	36.00	30.00
High	2462	-5.78	30.00	30.00	36.00	30.00
12	2467	-5.78	30.00	30.00	36.00	30.00
13	2472	-5.78	30.00	30.00	36.00	30.00
Channel	Frequency [MHz]	Primary Meas Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Margin [dB]	
Low	2412	14.25	14.25	36.00	-21.75	
Mid	2437	14.21	14.21	36.00	-21.79	
High	2462	14.10	14.10	36.00	-21.90	
12	2467	10.78	10.78	36.00	-25.22	
13	2472	4.48	4.48	36.00	-31.52	
Worst			14.25	36.00	-21.75	

10.3.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

Channel	Frequency [MHz]	Directional Gain Primary [dBi]	FCC Power Limit [dBm]	IC Power Limit [dBm]	IC EIRP Limit [dBm]	Max Power [dBm]
Low	2412	-5.78	30.00	30.00	36.00	30.00
Mid	2437	-5.78	30.00	30.00	36.00	30.00
High	2462	-5.78	30.00	30.00	36.00	30.00
12	2467	-5.78	30.00	30.00	36.00	30.00
13	2472	-5.78	30.00	30.00	36.00	30.00

Results

Channel	Frequency [MHz]	Primary Meas Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Margin [dB]
Low	2412	13.14	13.14	36.00	-22.86
Mid	2437	13.15	13.15	36.00	-22.85
High	2462	12.99	12.99	36.00	-23.01
12	2467	10.61	10.61	36.00	-25.39
13	2472	4.42	4.42	36.00	-31.58
Worst			13.15	36.00	-22.85

10.4. PSD

LIMITS

FCC §15.247
IC RSS-247 5.2.2

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST PROCEDURE

Power Spectral Density was performed utilizing the "Method AVGPS-1" under KDB558074 D01 DTS Meas Guidance v03r05

RESULTS

10.4.1. 802.11b MODE IN THE 2.4 GHz BAND

Channel	Frequency [MHz]	PSD Meas [dBm]	Duty Factor [dB]	Final PSD [dBm]	Limit [dBm]	Margin [dB]
Low	2412	-14.842	0.00	-14.84	8.00	-22.84
Mid	2437	-15.044	0.00	-15.04	8.00	-23.04
High	2462	-15.073	0.00	-15.07	8.00	-23.07
12	2467	-20.1	0.00	-20.10	8.00	-28.10
13	2472	-26.793	0.00	-26.79	8.00	-34.79

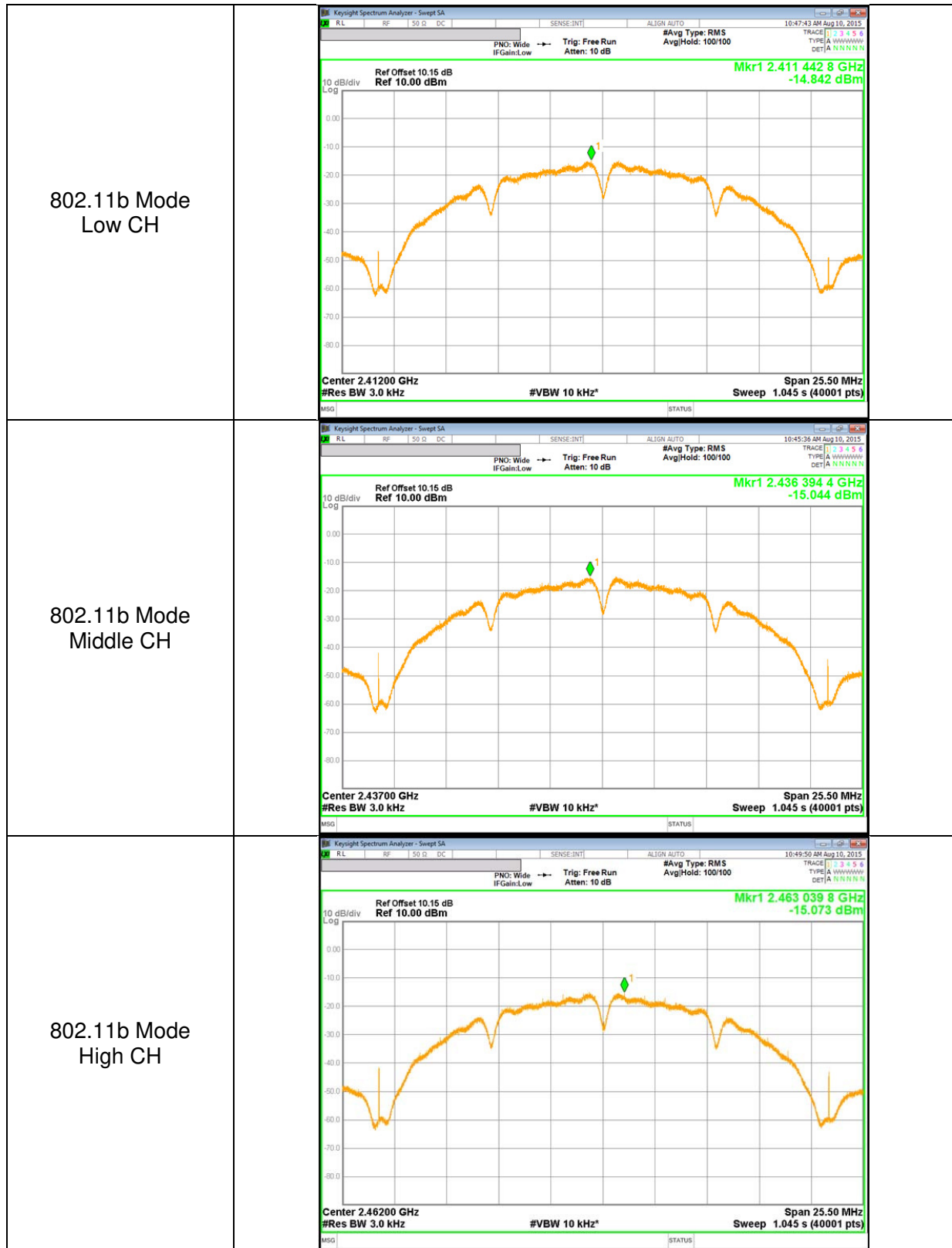
10.4.2. 802.11g MODE IN THE 2.4 GHz BAND

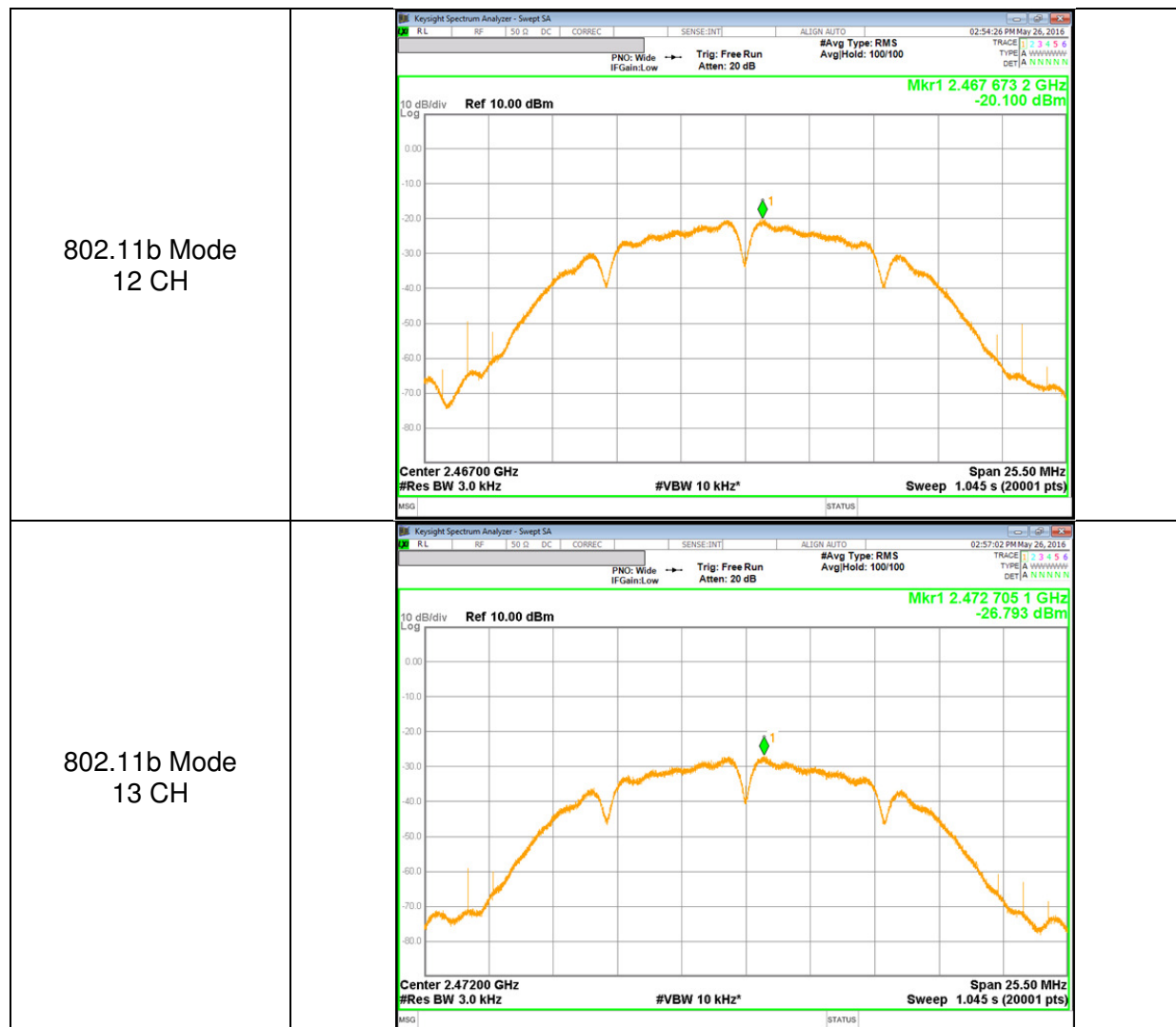
Channel	Frequency [MHz]	PSD Meas [dBm]	Duty Factor [dB]	Final PSD [dBm]	Limit [dBm]	Margin [dB]
Low	2412	-19.525	0.29	-19.24	8.00	-27.53
Mid	2437	-19.716	0.29	-19.43	8.00	-27.72
High	2462	-19.536	0.29	-19.25	8.00	-27.54
12	2467	-22.725	0.00	-22.73	8.00	-30.73
13	2472	-28.831	0.00	-28.83	8.00	-36.83

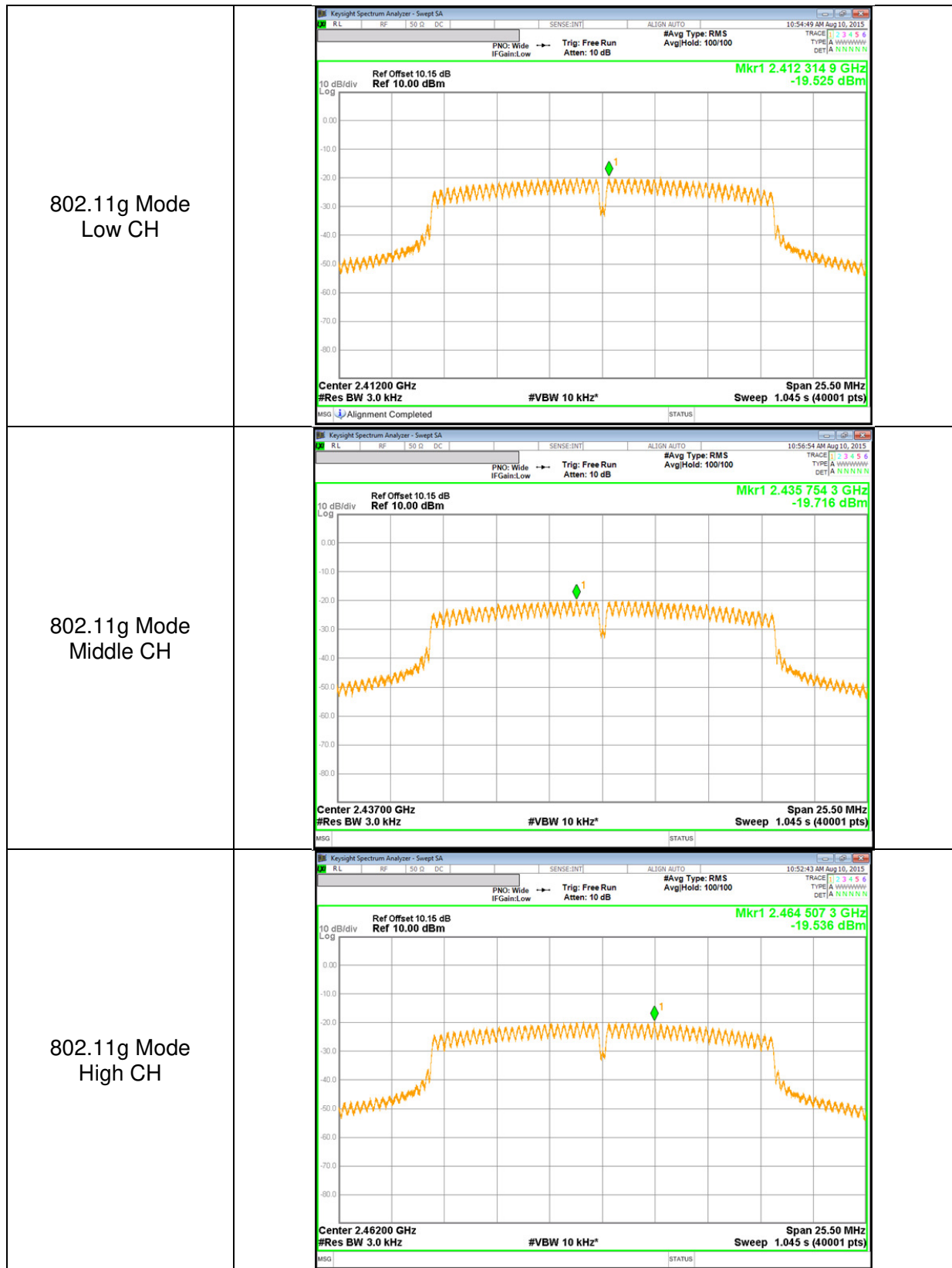
10.4.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

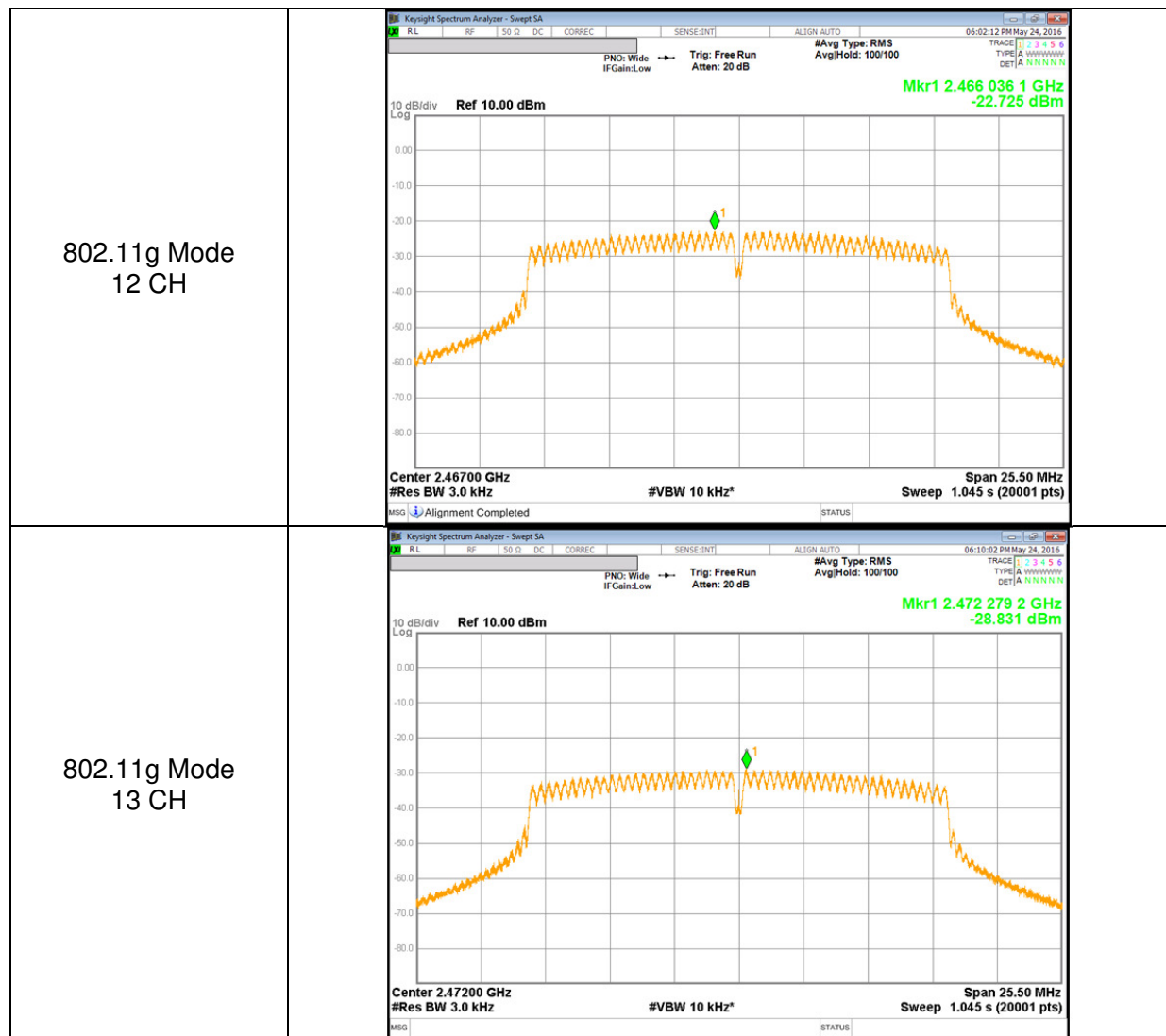
Channel	Frequency [MHz]	PSD Meas [dBm]	Duty Factor [dB]	Final PSD [dBm]	Limit [dBm]	Margin [dB]
Low	2412	-20.361	0.32	-20.04	8.00	-28.36
Mid	2437	-20.665	0.32	-20.35	8.00	-28.67
High	2462	-20.487	0.32	-20.17	8.00	-28.49
12	2467	-22.897	0.00	-22.90	8.00	-30.90
13	2472	-29.326	0.00	-29.33	8.00	-37.33

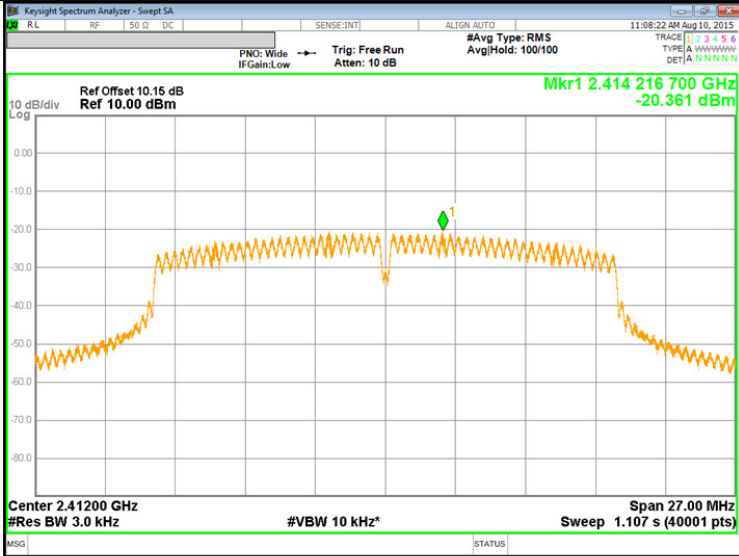
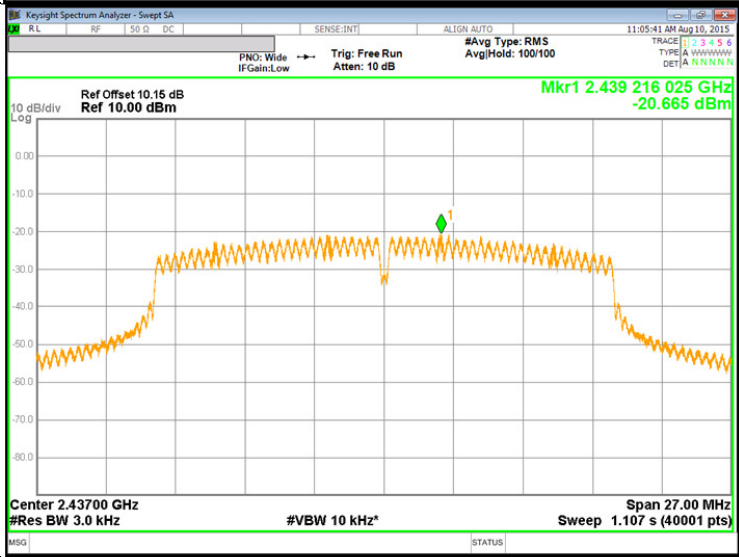
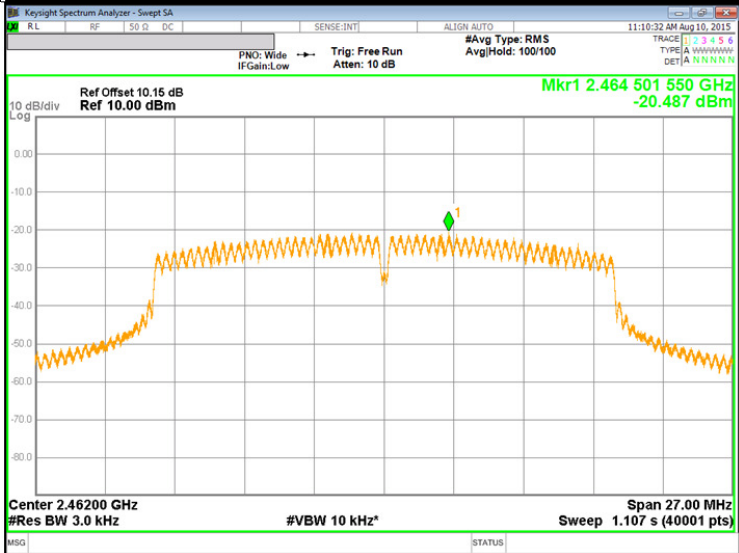
10.4.4. PSD PLOTS

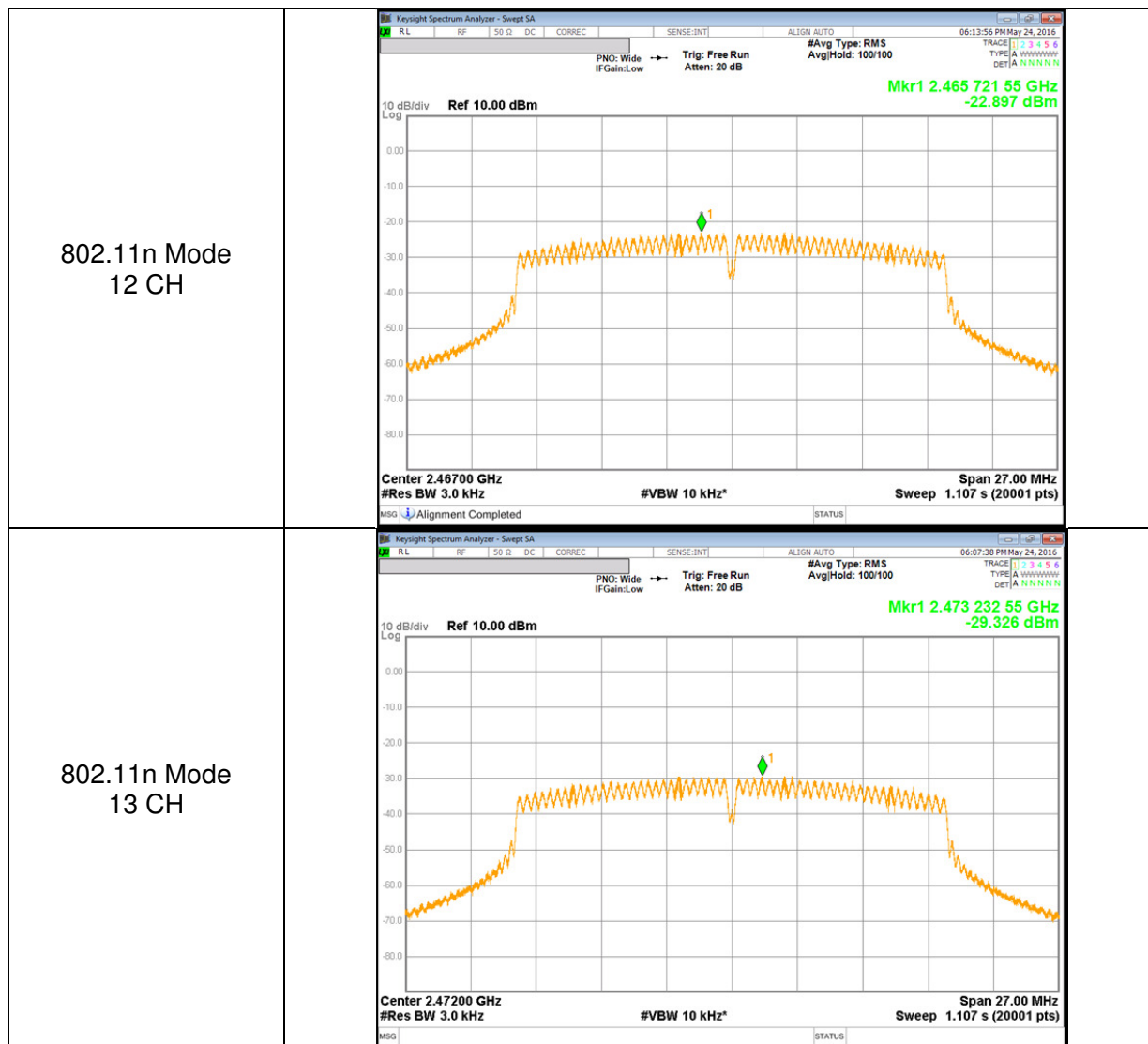








<p>802.11n Mode Low CH</p>	
<p>802.11n Mode Middle CH</p>	
<p>802.11n Mode High CH</p>	



10.5. OUT-OF-BAND EMISSIONS

LIMITS

FCC §15.247 (d)
IC RSS-247 5.5

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.

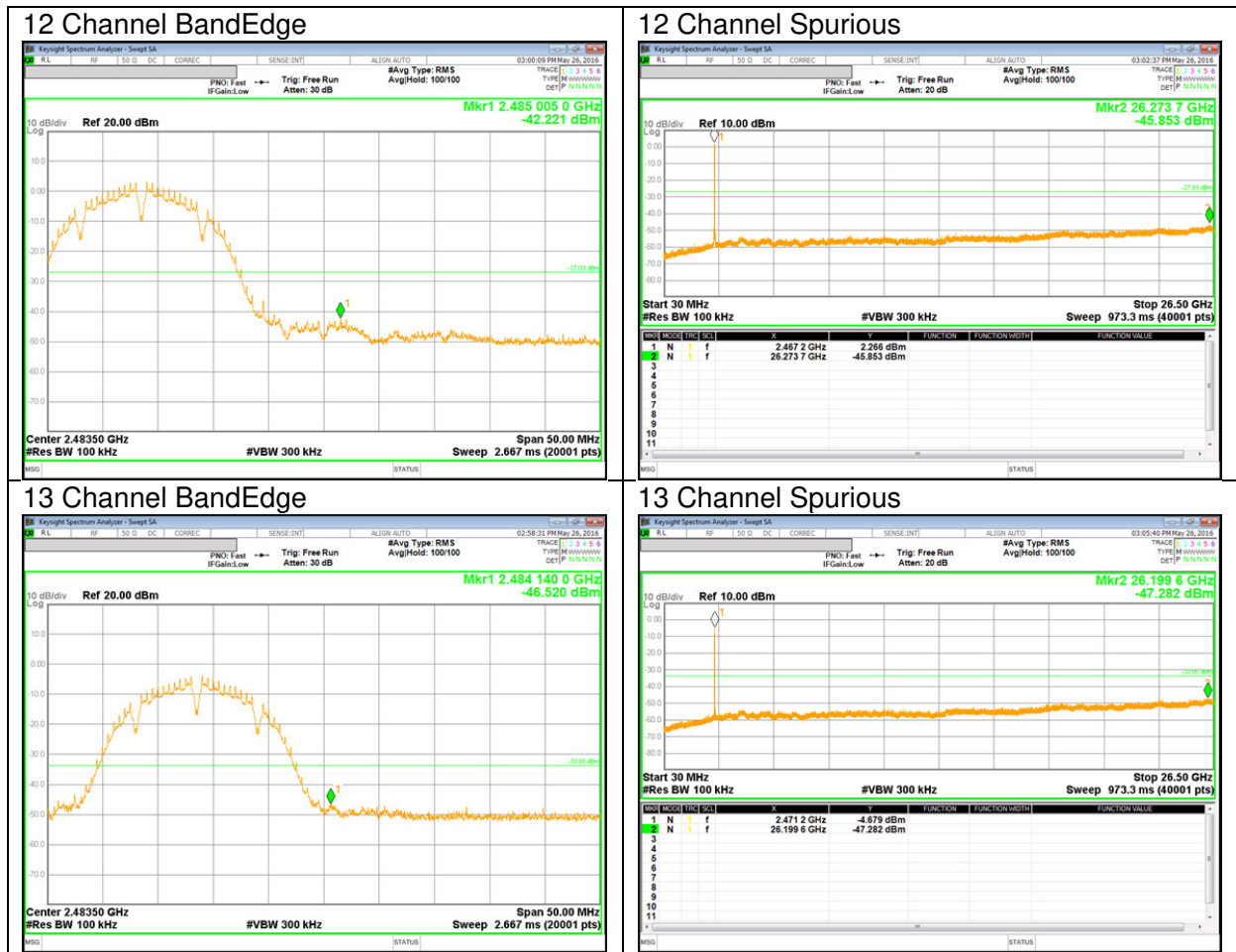
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer with RBW = 100 kHz, VBW = 300 kHz, peak detector, and max hold. Measurements utilizing these settings are made of the in-band reference level, bandedge (where measurements to the general radiated limits will not be made) and out-of-band emissions.

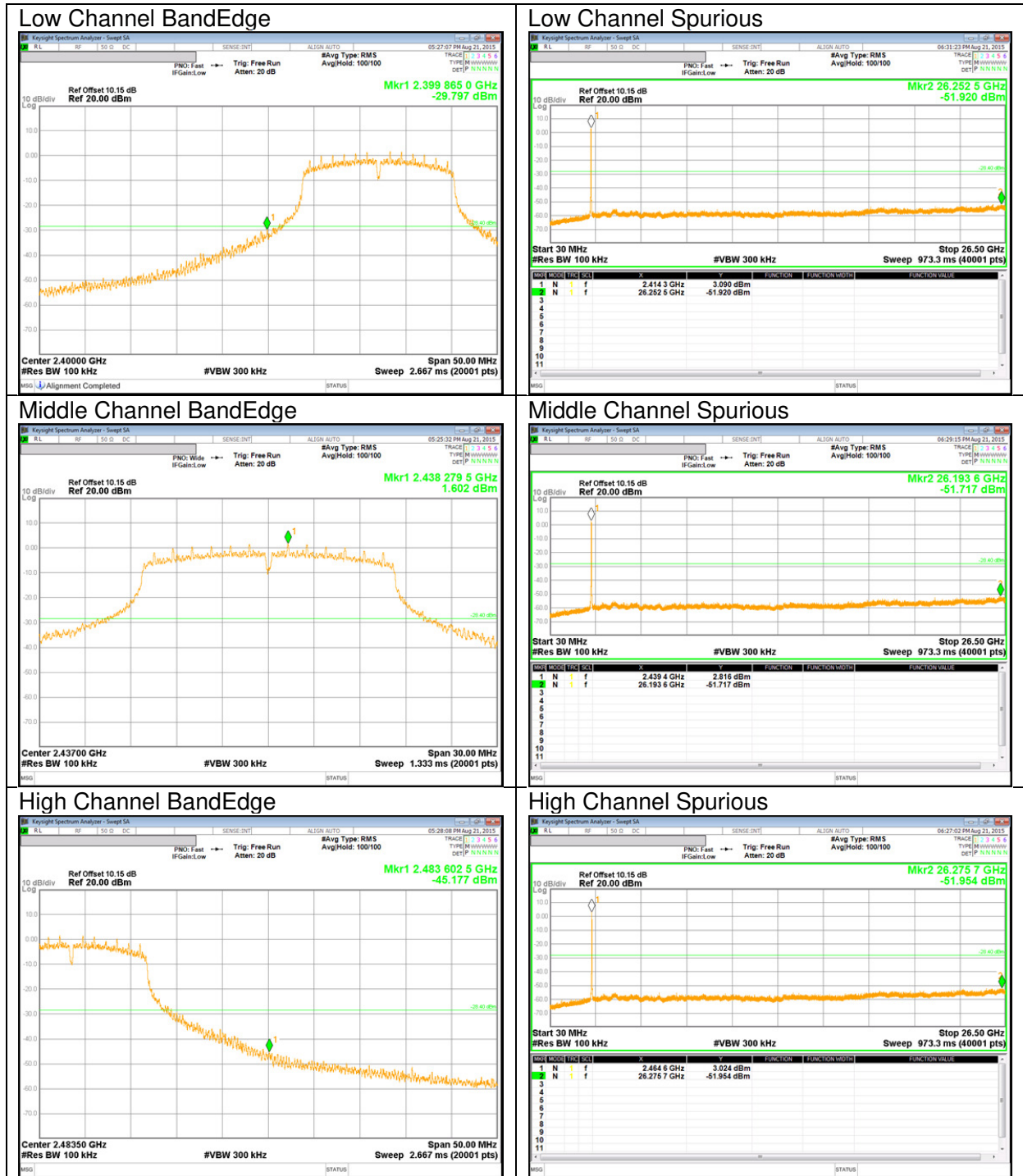
RESULTS

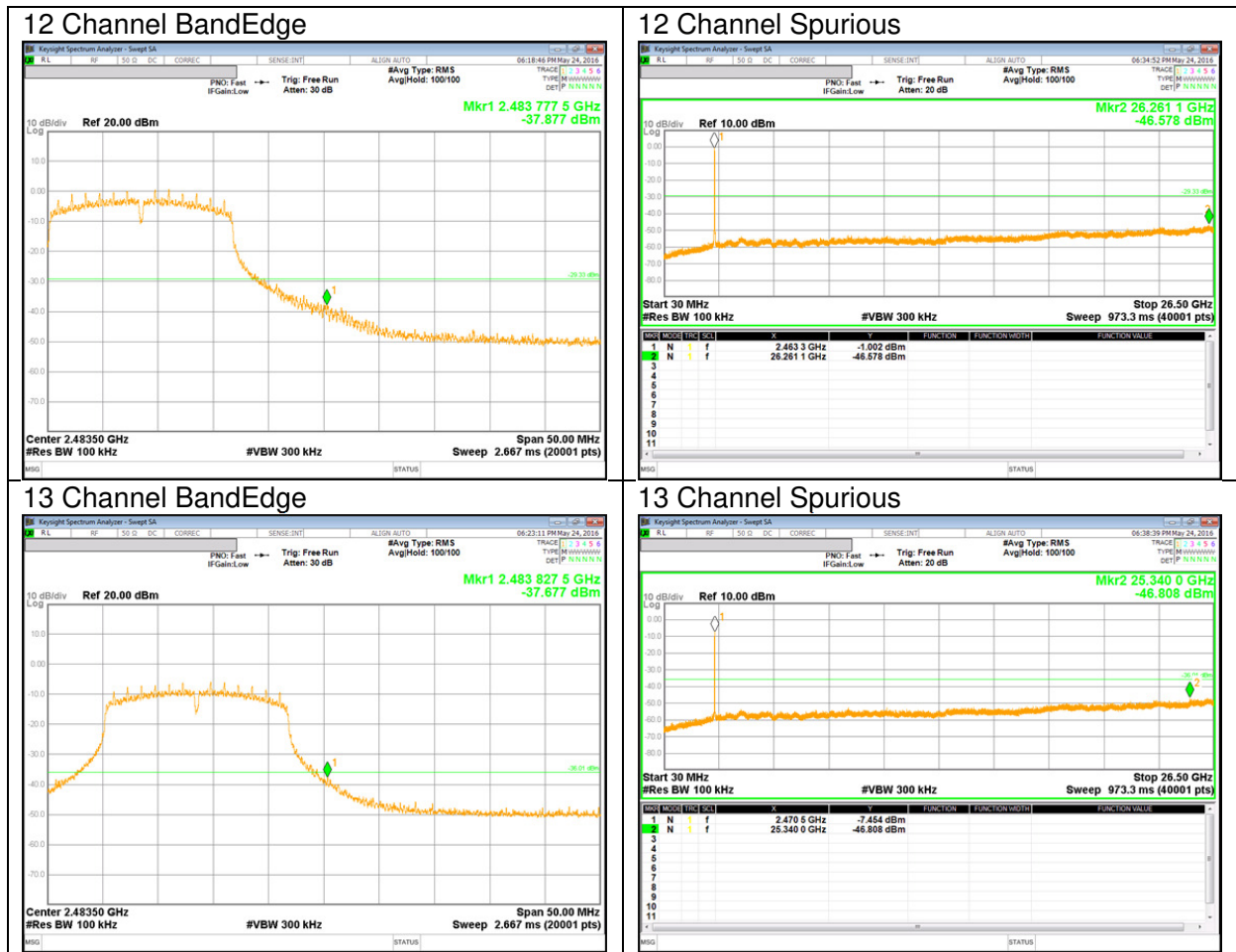
10.5.1. 802.11b MODE IN THE 2.4 GHz BAND





10.5.2. 802.11g MODE IN THE 2.4 GHz BAND





10.5.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

