CERTIFICATION TEST REPORT

Report Number. : 11526345-E3V3

Applicant	:	NVIDIA CORP. 2701 SAN TOMAS EXPY SANTA CLARA, CA 95050
Model	:	P3310
FCC ID	:	VOB-P3310
IC	:	7361A-P3310
EUT Description	:	WLAN 2x2 MIMO 802.11a/b/g/n/ac with Bluetooth
Test Standard(s)	:	FCC 47 CFR PART 15 SUBPART C INDUSTRY CANADA RSS - 247 ISSUE 1 INDUSTRY CANADA RSS-GEN ISSUE 4

Date Of Issue:
January 23, 2017

Prepared by:
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	01/05/17	Initial Issue	D. Coronia
V2	01/14/17	Updates Section 1, 2, 7 & correct antenna port name from Core to Chain	D. Coronia
V3	01/23/17	Updates Section 9 & 13.2	D. Coronia

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: NVIDIA CORP.

EUT DESCRIPTION: WLAN 2x2 MIMO 802.11a/b/g/n/ac with Bluetooth

MODEL: P3310

SERIAL NUMBER: 0334916010248 (for Conducted)
0334916000053 (for Radiated)

DATE TESTED: DECEMBER 13 - 28, 2016

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 Verification Services Inc. 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 Verification Services Inc. 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 Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. 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 NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For
UL Verification Services Inc. By:

DAN CORONIA
WiSE Project Lead
UL VERIFICATION SERVICES INC.

Tested By:

JONATHAN HSU
WiSE Lab Engineer
UL VERIFICATION SERVICES INC.

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, KDB 662911 D01 Multiple Transmitter Output v02r01, ANSI C63.10-2013, RSS-GEN Issue 4, and RSS-247 Issue 1.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, Fremont, California, USA. Line conducted emissions are measured only at the 47173 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.

47173 Benicia Street	47266 Benicia Street
☐ Chamber A (IC:2324B-1)	☐ Chamber D (IC:2324B-4)
☒ Chamber B (IC:2324B-2)	☐ Chamber E (IC:2324B-5)
☒ Chamber C (IC:2324B-3)	☐ Chamber F (IC:2324B-6)
	☐ Chamber G (IC:2324B-7)
	☐ Chamber H (IC:2324B-8)

The above test sites and facilities are covered under FCC Test Firm Registration # 208313.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://ts.nist.gov/standards/scopes/2000650.htm.

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:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

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

Parameter	Uncertainty
Worst Case Conducted Disturbance, 9KHz to 0.15 MHz	3.84 dB
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.65 dB
Worst Case Radiated Disturbance, 9KHz to 30 MHz	3.15 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	5.36 dB
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.32 dB
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.45 dB
Worst Case Radiated Disturbance, 26000 to 40000 MHz	5.24 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a WLAN 2x2 MIMO 802.11a/b/g/n/ac with Bluetooth

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2412 - 2472	802.11b 1TX	18.40	69.18
2412 - 2472	802.11g 1TX	18.44	69.82
2412 - 2472	802.11n HT20 2TX CDD	18.24	66.68

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The EUT utilizes a Dipole antenna with maximum gain of 2.86dBi across operation frequency 2.4GHz band.

5.4. SOFTWARE AND FIRMWARE

The software and firmware in the EUT during testing was C03A10019.0700.

5.5. WORST-CASE CONFIGURATION AND MODE

Radiated bandedge, harmonics, and spurious emissions from 1 GHz to 18GHz were performed. The EUT was set to transmit at the Low/Middle/High channels with designed (target) output powers.

Radiated emission below 1GHz, above 18GHz, and power line conducted emission were performed with the EUT was set to transmit at the channel with highest output power as worst-case scenario.

The fundamental of the EUT was investigated in three transmitting antenna degrees: 0, 45, and 90. It was determined that 90 degrees was the worst case antenna position; therefore all final radiated testing was performed with the antenna position at 90 degrees.

Worst-case data rates as provided by the client were:

802.11b mode: 1 Mbps
802.11g mode: 6 Mbps
802.11n HT20mode: MCS0

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Description	Manufacturer	Model	Serial Number	FCC ID
EUT AC/DC Adapter	Mean Well Enterprises	GST90A19	EB68F90444	NA
Laptop	Lenovo	7659	L3-AL664 08/03	NA
Base Board	NVIDIA	P2597	0334916030630, 0334916030642	DoC

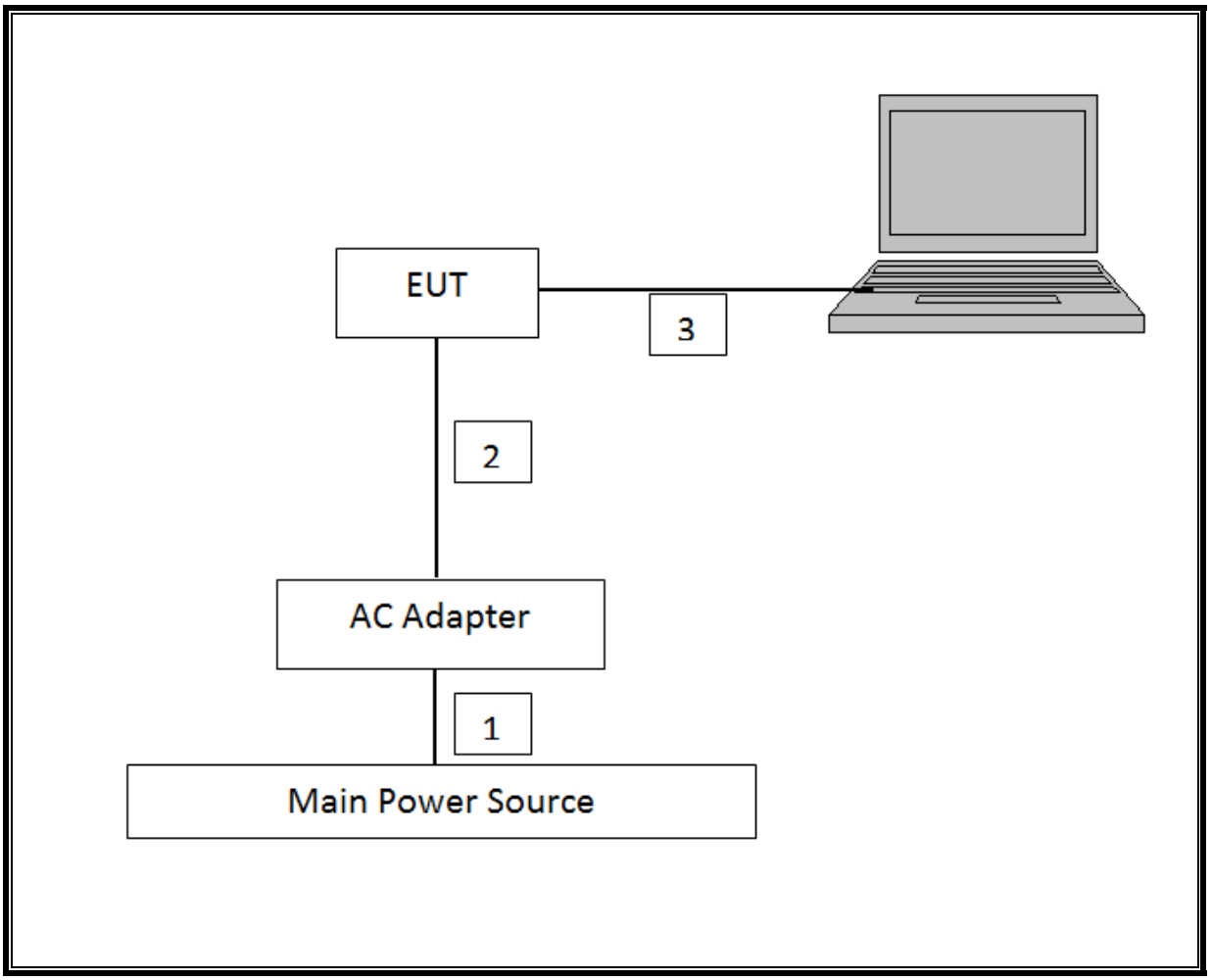
I/O CABLES (CONDUCTED & RADIATED TEST)

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	1	US115V	Unshielded	0.5	For EUT
2	DC	1	19 Vdc	Unshielded	1	For EUT
3	USB	1	USB	Shielded	1.5	

TEST SETUP

The EUT was connected to a host Laptop via USB cable adapter. Test software exercised the EUT.

SETUP DIAGRAM



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**	**T Number**	**Cal Date**	**Cal Due**
PSA Series Spectrum Analyzer, 3Hz - 44GHz	Agilent	E4446A	146	07/13/16	07/13/17
Spectrum Analyzer,	Agilent	8564E	106	09/07/16	09/07/17
Pre-Amp 1-26.5 GHz	Agilent	8449B	404	07/05/16	07/05/17
Amplifier, 1 to 18 GHz	Miteq	AFS43-00101800-25-S-42	493	03/09/16	03/09/17
Amplifier, 1 to 8 GHz	Miteq	AMF-4D-01000800-30-29P	1156	03/09/16	03/09/17
Amplifier, 10KHz to 1GHz, 32dB	Keysight	8447D	10	02/01/16	02/01/17
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB1	477	06/22/16	06/22/17
Antenna, Horn 1-18GHz	ETS Lindgren	3117	345	03/07/16	03/07/17
18 - 26.5 GHz Horn Antenna	Seavey Division	MWH-1826/B	449	05/26/16	5/26/2017
Loop Antenna	EMCO	6502	35	03/24/16	03/24/17
P-Series Power Meter	Agilent	N1911A	229	07/28/16	07/28/17
EMI Receiver	Rohde & Schwarz	ESR-EMI	1436	12/19/16	12/19/17
LISN	FISCHER	FCC-LISN-50/250-25-2-01	1310	06/08/16	06/08/17

NOTE: *testing is completed before equipment calibration expiration date.

7. MEASUREMENT METHODS

On Time and Duty Cycle: KDB 558074 D01 v03r05, Section 6.

6 dB BW: KDB 558074 D01 v03r05, Section 8.1.

99% BW: ANSI C63.10-2013, Section 6.9.3.

Output Power: KDB 558074 D01 v03r05, Section 9.2.3.2.

Power Spectral Density: KDB 558074 D01 v03r05, Section 10.3.

Out-of-band emissions in non-restricted bands: KDB 558074 D01 v03r05, Section 11.0.

Out-of-band emissions in restricted bands: KDB 558074 D01 v03r05, Section 12.1.

Band-edge: KDB 558074 D01 v03r05, Section 12.1.

AC Power Line Conducted Emissions: ANSI C63.10-2013, Section 6.2.

8. SUMMARY TABLE

FCC Part Section	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result
15.247 (a)(2)	RSS-247 5.2.1	Occupied Band width (6dB)	>500KHz	Conducted	Pass
2.1051, 15.247 (d)	RSS-247 5.5	Band Edge / Conducted Spurious Emission	-30dBc		Pass
15.247	RSS-247 5.4.4	TX conducted output power	<30dBm		Pass
15.247	RSS-247 5.2.2	PSD	<8dBm		Pass
15.207 (a)	RSS-GEN 8.8	AC Power Line conducted emissions	Section 10	Radiated	Pass
15.205, 15.209, 15.247(d)	RSS-GEN 8.9/7	Radiated Spurious Emission	< 54dBuV/m		Pass

9. ON TIME AND DUTY CYCLE MEASUREMENT METHODS

LIMITS

None; for reporting purposes only.

PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method.

ON TIME AND DUTY CYCLE RESULTS

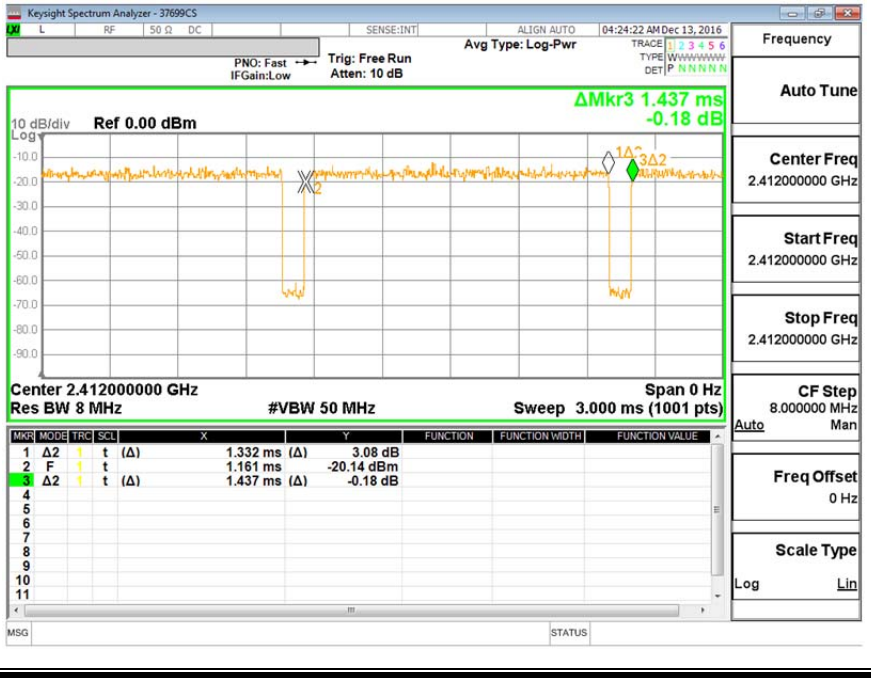
Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (khz)
11b 1TX	8.580	8.685	0.987	98.7	0.00	0.01
11g 1TX	1.425	1.527	0.933	93.3	0.30	0.70
HT20 CDD	1.332	1.437	0.926	92.6	0.33	0.75

DUTY CYCLE PLOTS

DUTY CYCLE 802.11b 1TX MODE

DUTY CYCLE 802.11g 1TX MODE

DUTY CYCLE 802.11n HT20 CDD MODE



11. ANTENNA PORT TEST RESULTS

11.1. 11b Chain 0 SISO MODE IN THE 2.4GHz BAND

11.1.1. 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.

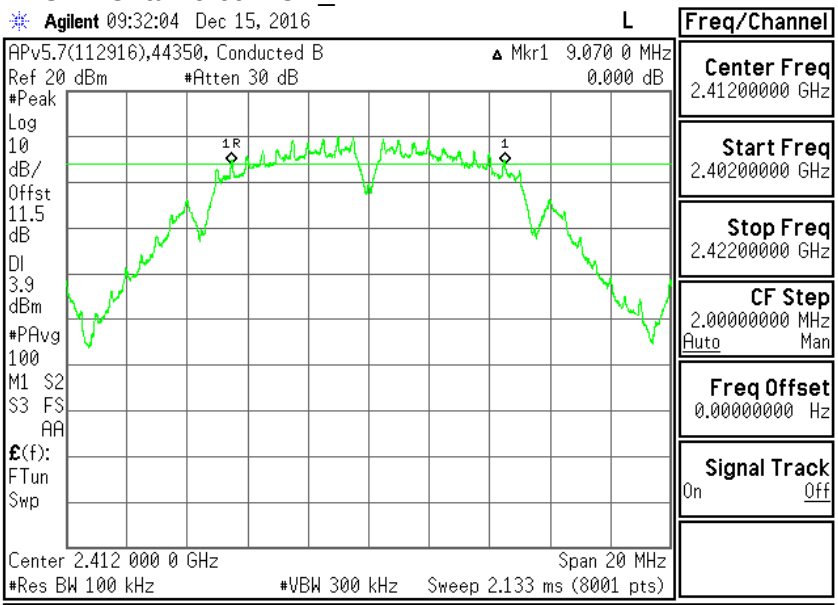
TEST PROCEDURE

KDB 58074 D01 v03r05 Section 8.1

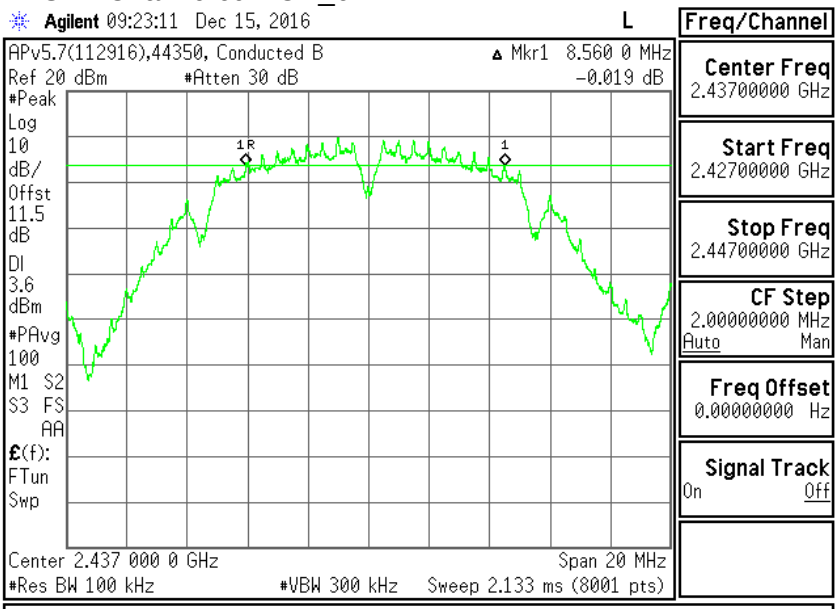
RESULTS

Channel	Frequency (MHz)	6 dB BW Chain 0 (MHz)	Minimum Limit (MHz)
Low_1	2412	9.0700	0.5
Middle_6	2437	8.5600	0.5
High_11	2462	8.5600	0.5
High_12	2467	9.0575	0.5
High_13	2472	7.5750	0.5

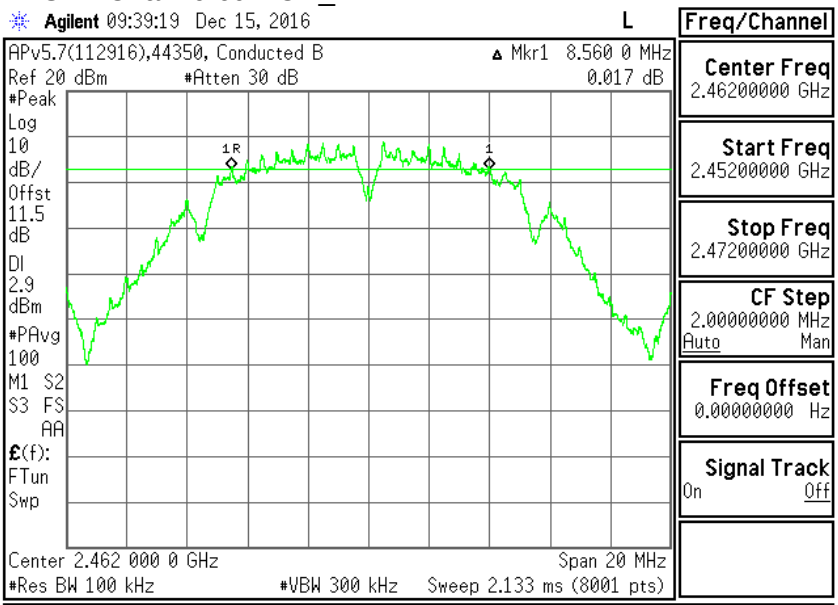
2.4GHz Chain 0 6dB CH_1



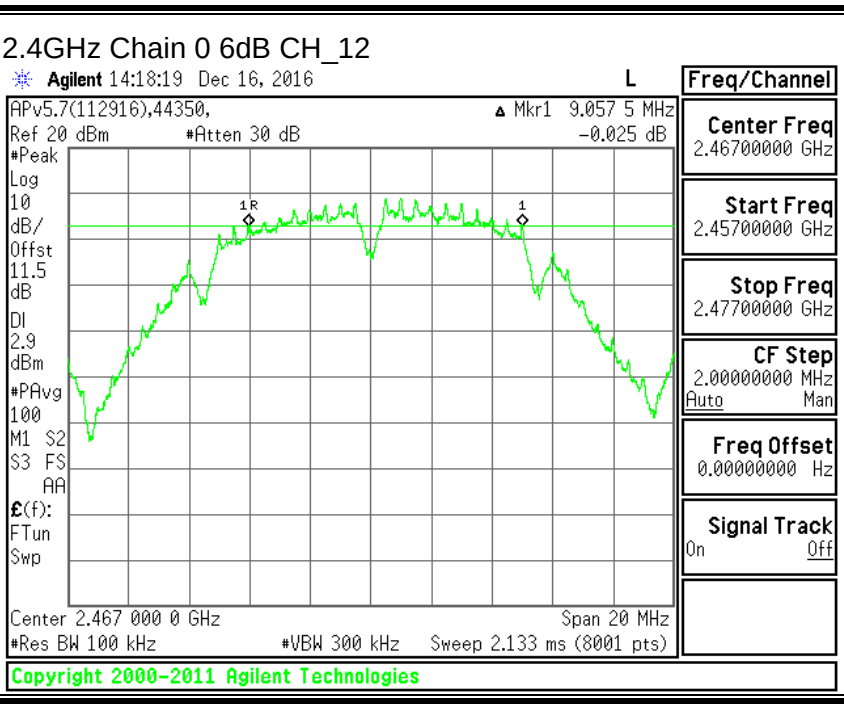
2.4GHz Chain 0 6dB CH_6



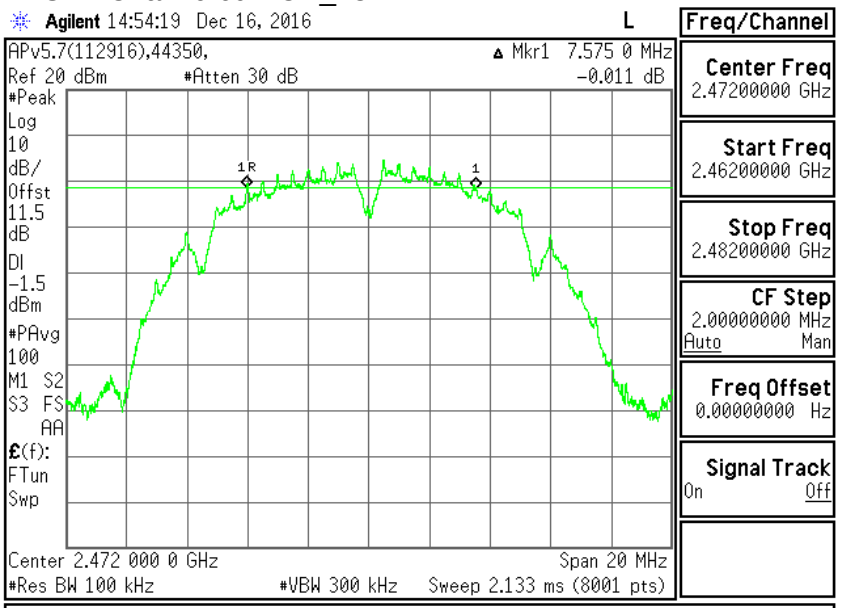
2.4GHz Chain 0 6dB CH_11



2.4GHz Chain 0 6dB CH_12



2.4GHz Chain 0 6dB CH_13



11.1.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

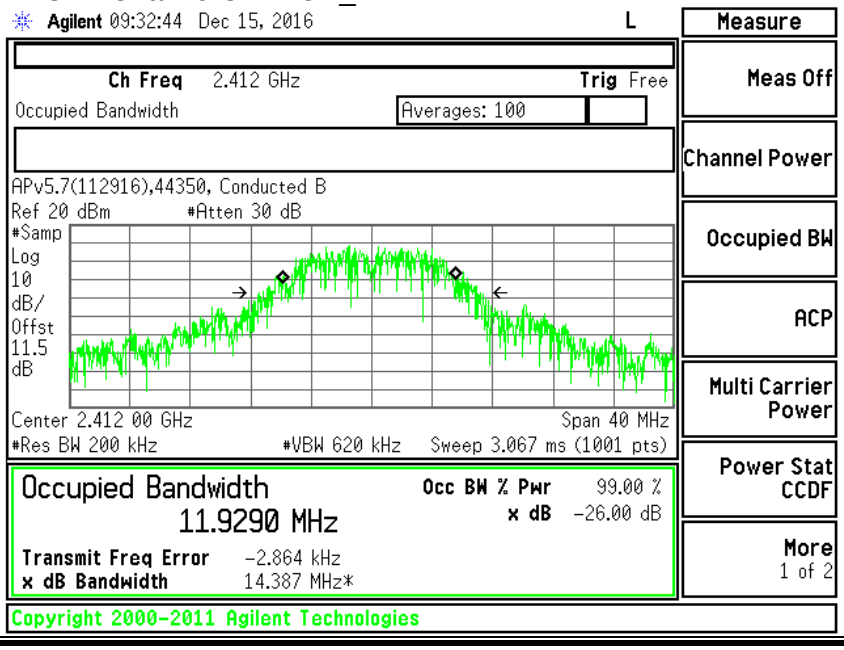
TEST PROCEDURE

ANSI C63.10: 2013 Section 6.9.3

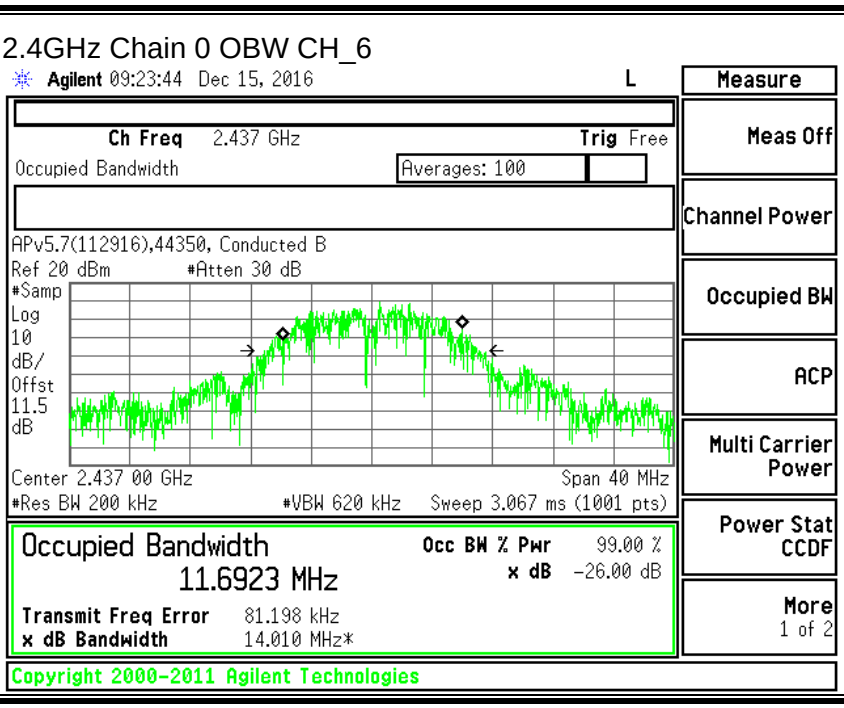
RESULTS

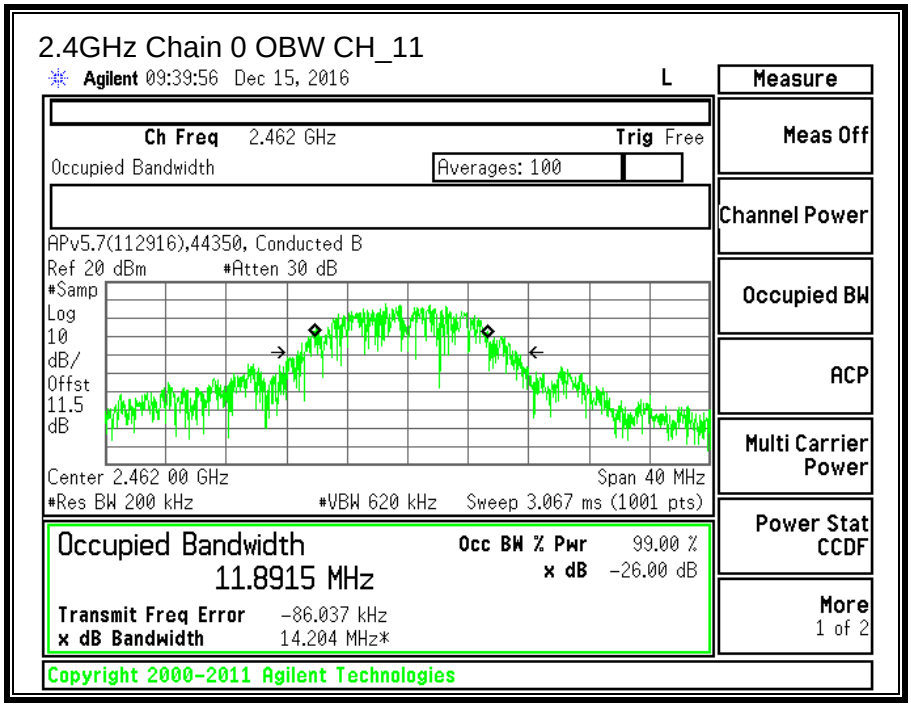
Channel	Frequency (MHz)	99% Bandwidth Chain 0 (MHz)
Low_1	2412	11.9290
Middle_6	2437	11.6923
High_11	2462	11.8915
High_12	2467	11.8141
High_13	2472	10.2808

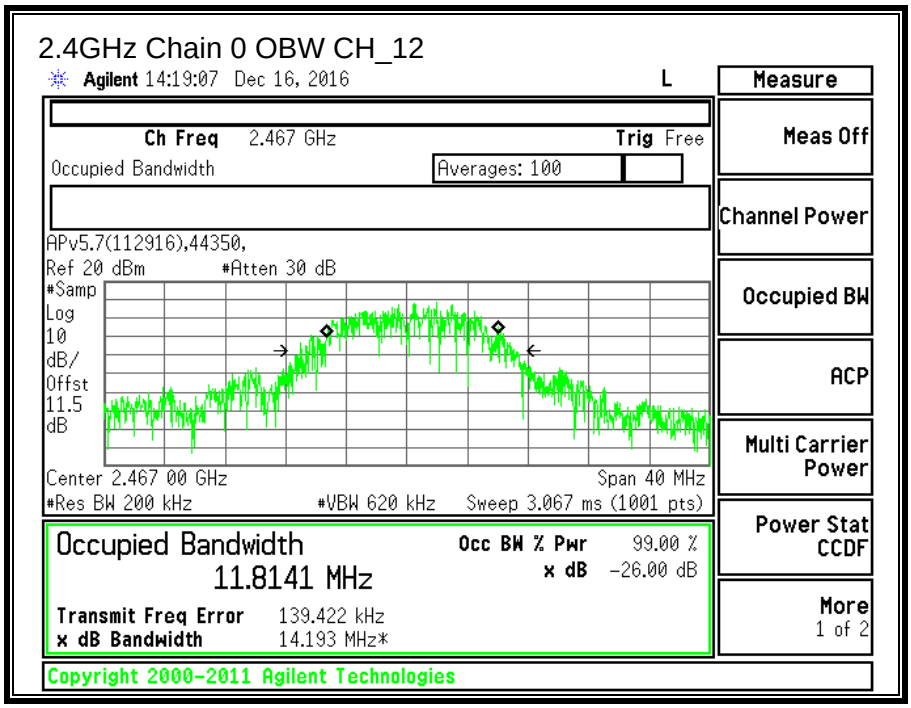
2.4GHz Chain 0 OBW CH_1

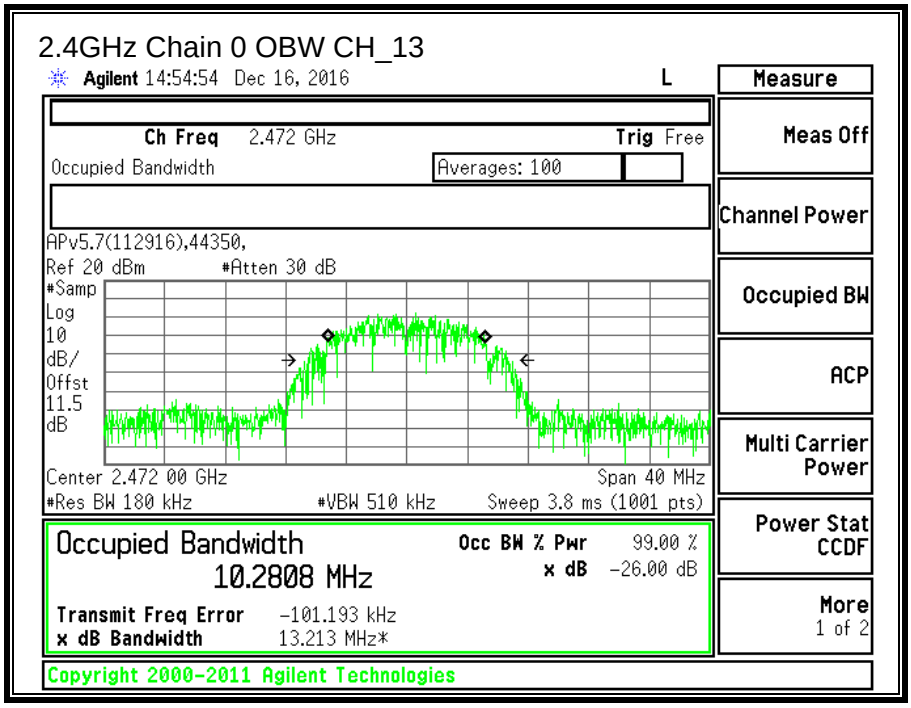


2.4GHz Chain 0 OBW CH_6









11.1.3. OUTPUT POWER

LIMITS

FCC §15.247

IC RSS-247 (5.4) (4)

For systems using digital modulation in the 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

KDB 58074 D01 v03r05 Section 9.2.3.2

RESULTS

ID:	44350	Date:	12/19/2016

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low_1	2412	2.86	30.00	30	36	30.00
Mid_6	2437	2.86	30.00	30	36	30.00
High_11	2462	2.86	30.00	30	36	30.00
High_12	2467	2.86	30.00	30	36	30.00
High_13	2472	2.86	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Core 0 Meas Power (dBm)	Power Limit (dBm)	Margin (dB)
Low_1	2412	18.10	30.00	-11.90
Mid_6	2437	18.10	30.00	-11.90
High_11	2462	18.00	30.00	-12.00
High_12	2467	16.91	30.00	-13.09
High_13	2472	12.16	30.00	-17.84

Note: the power readings above were measured with gated method, and the measurement was taken only during the ON time. No duty cycle correction was necessary.

11.1.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247

IC RSS-247 (5.2) (2)

For digitally modulated systems, the power spectral density conducted form the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 KHz band during any time interval of continuous transmissions.

TEST PROCEDURE

KDB 58074 D01 v03r05 Section 10.3

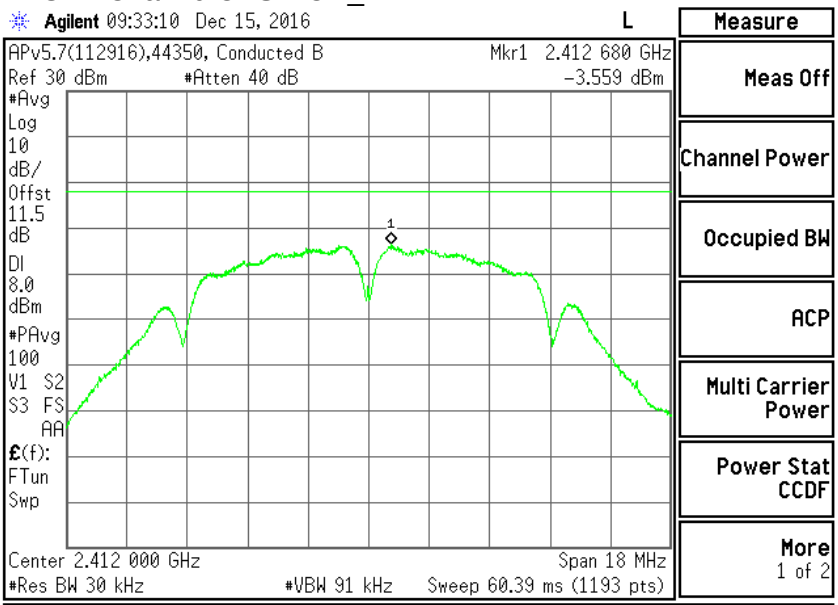
RESULTS

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd PSD

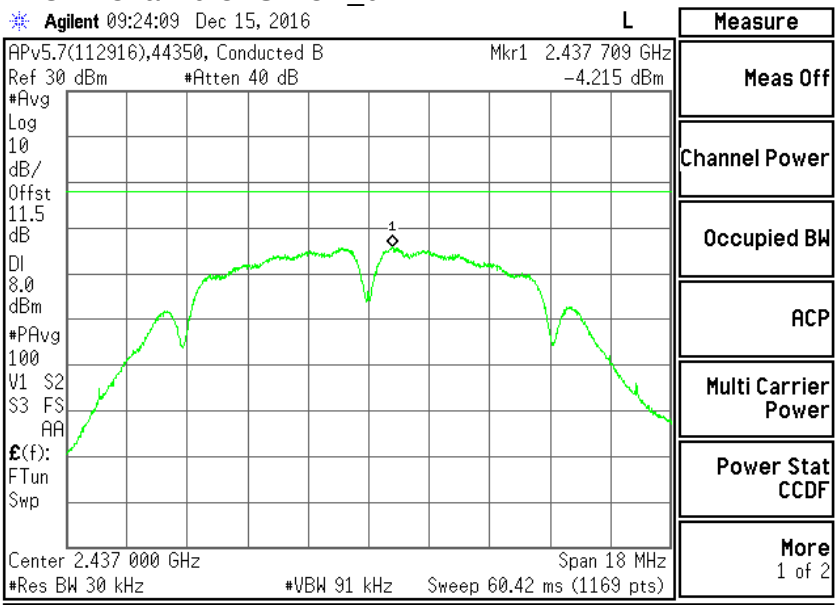
PSD Results

Channel	Frequency (MHz)	Core 0 Meas (dBm)	Limit (dBm)	Margin (dB)
Low_1	2412	-3.559	8.0	-11.6
Mid_6	2437	-4.215	8.0	-12.2
High_11	2462	-4.814	8.0	-12.8
High_12	2467	-5.049	8.0	-13.0
High_13	2472	-9.208	8.0	-17.2

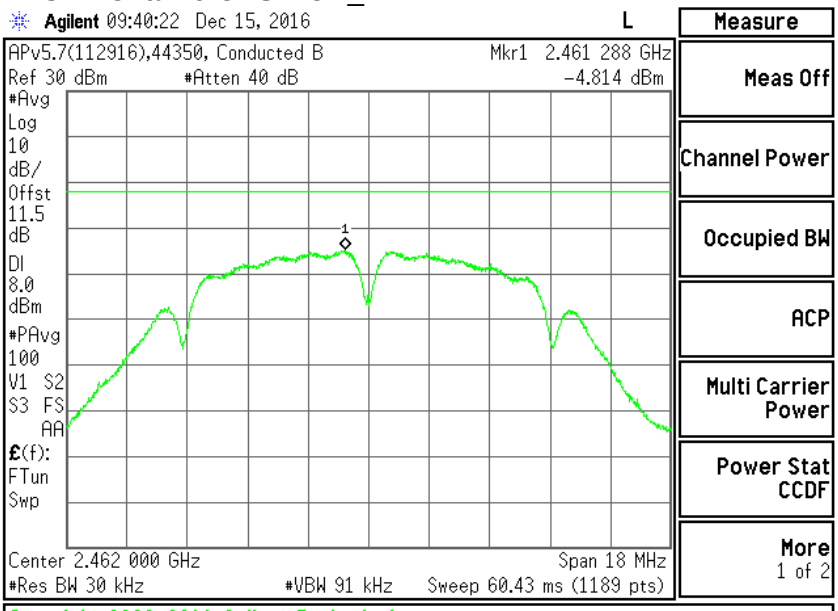
2.4GHz Chain 0 CPSD CH_1



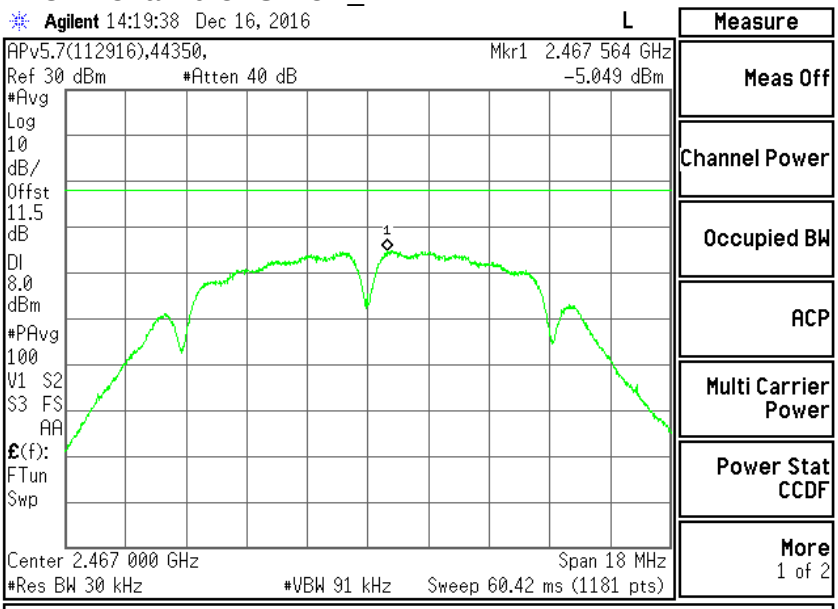
2.4GHz Chain 0 CPSD CH_6



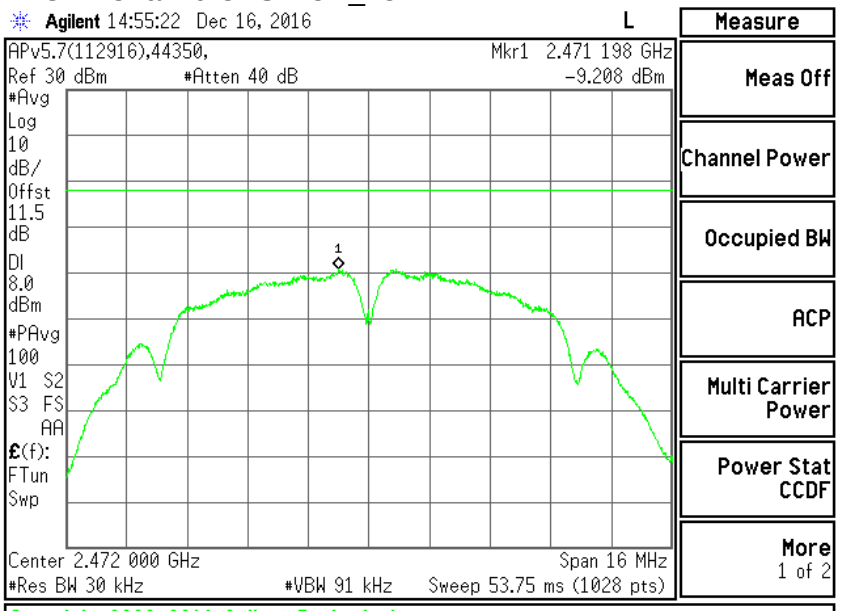
2.4GHz Chain 0 CPSD CH_11



2.4GHz Chain 0 CPSD CH_12

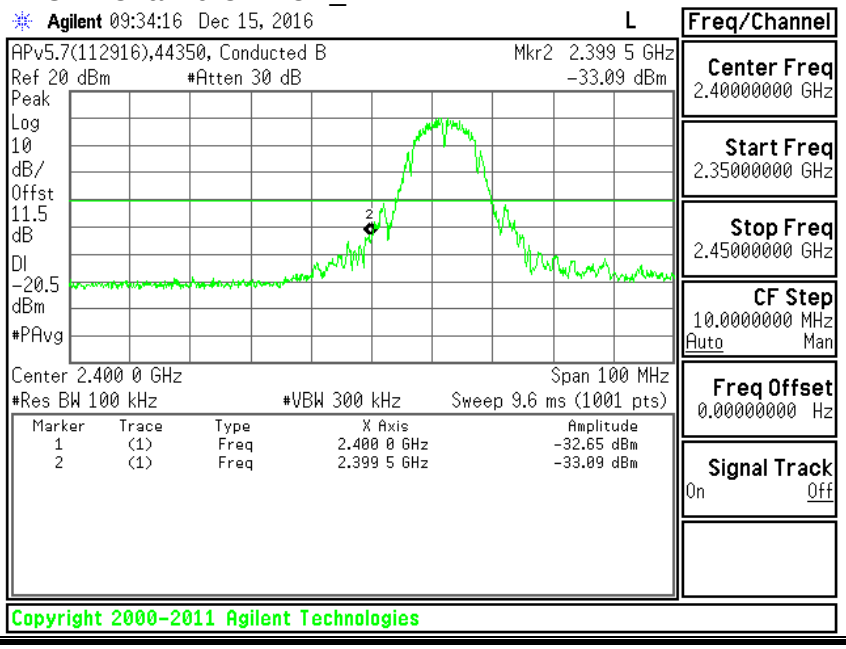


2.4GHz Chain 0 CPSD CH_13

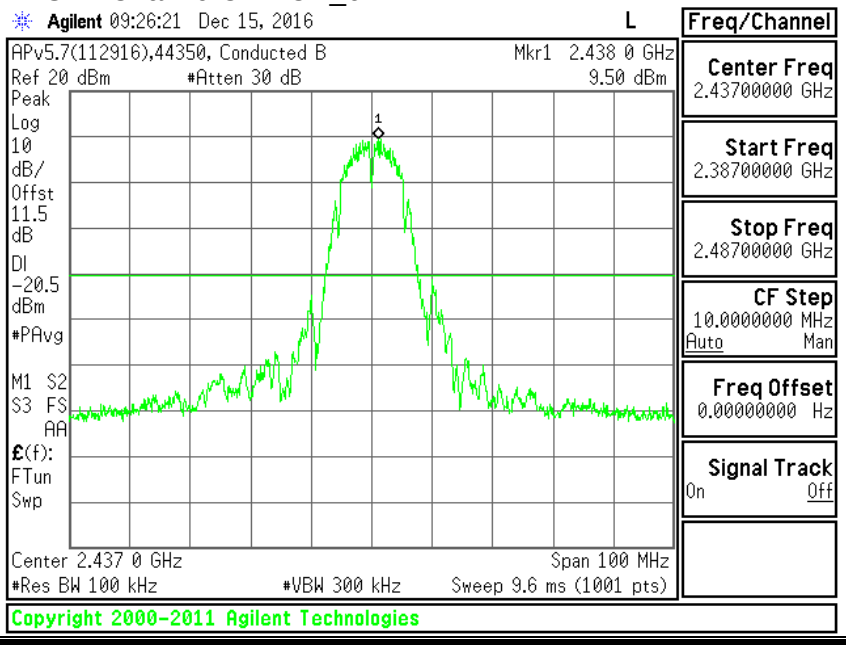


11.1.5. CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS

2.4GHz Chain 0 CBE CH_1



2.4GHz Chain 0 CBE CH_6



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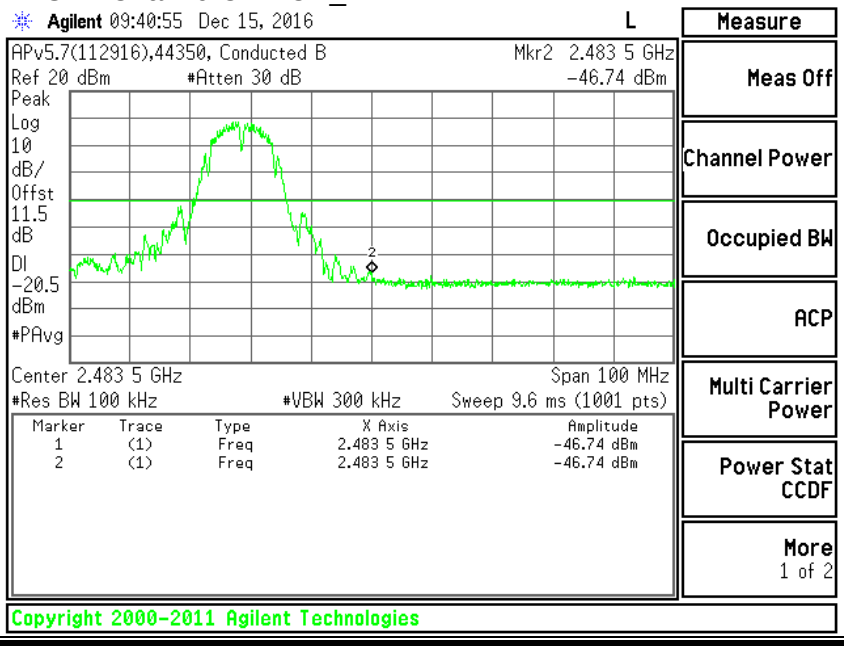

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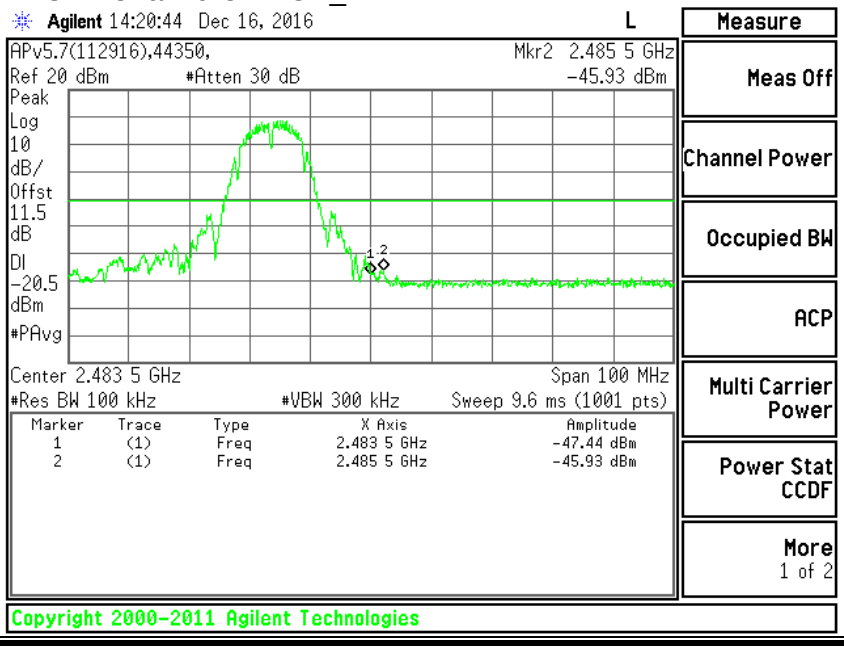
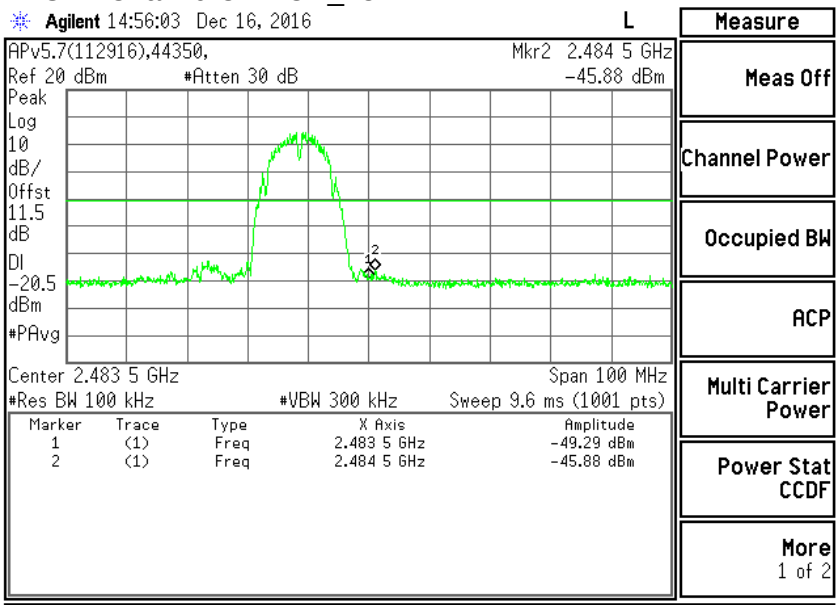
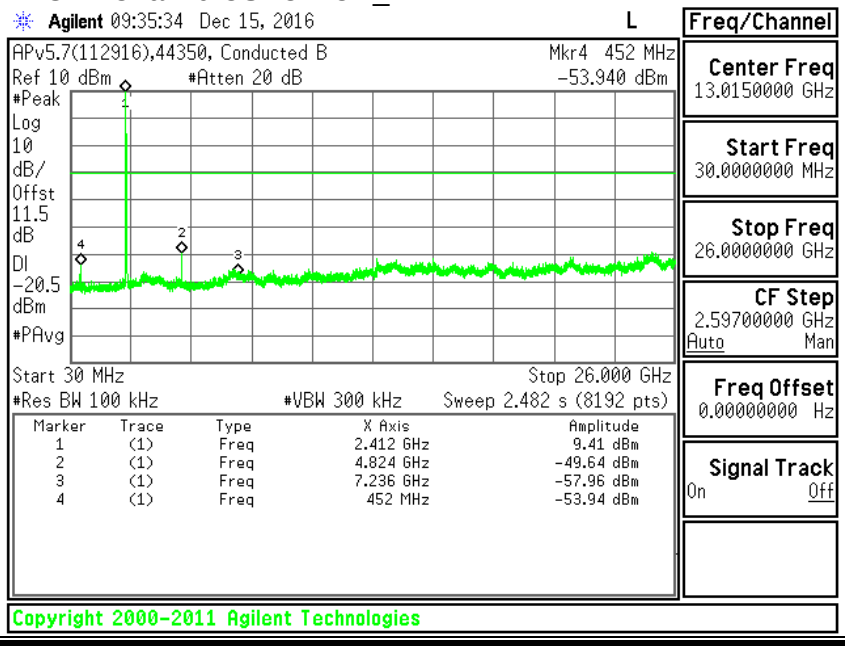


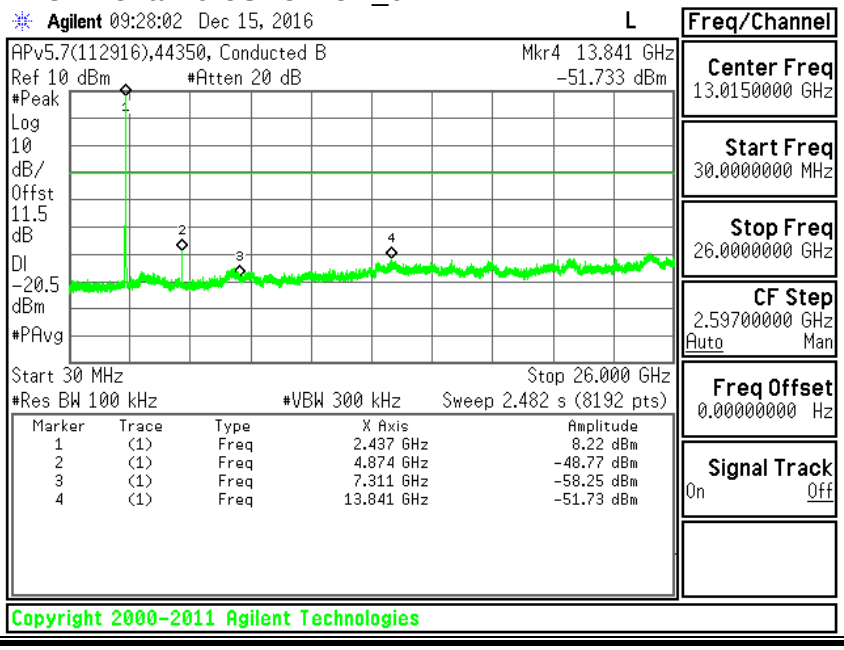
2.4GHz Chain 0 CBE CH_13



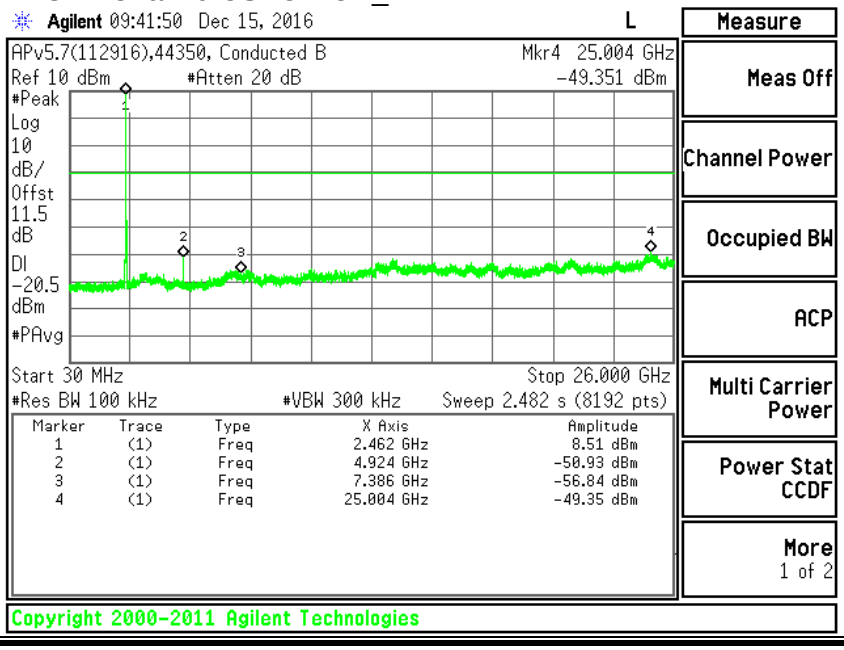
2.4GHz Chain 0 CSPUR CH_1



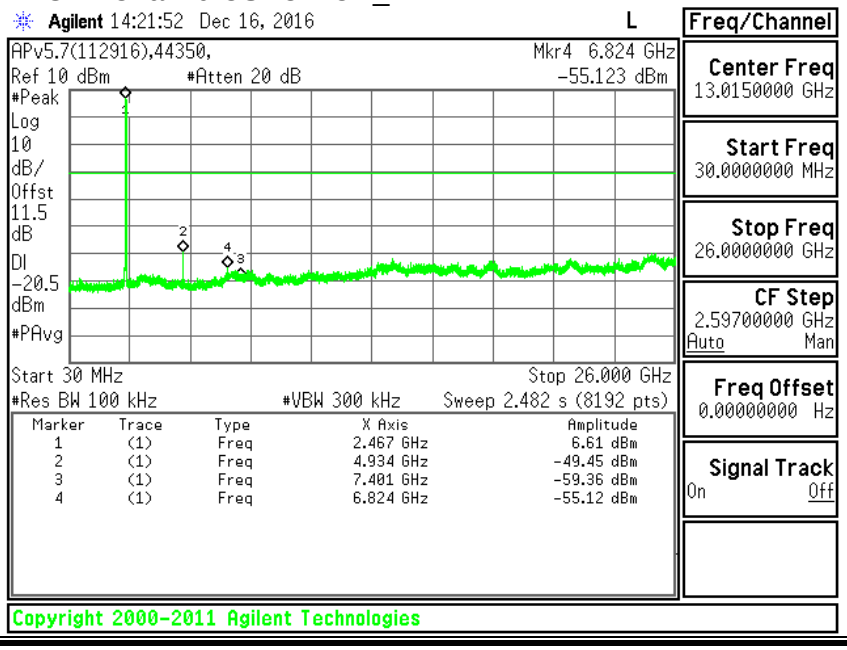
2.4GHz Chain 0 CSPUR CH_6



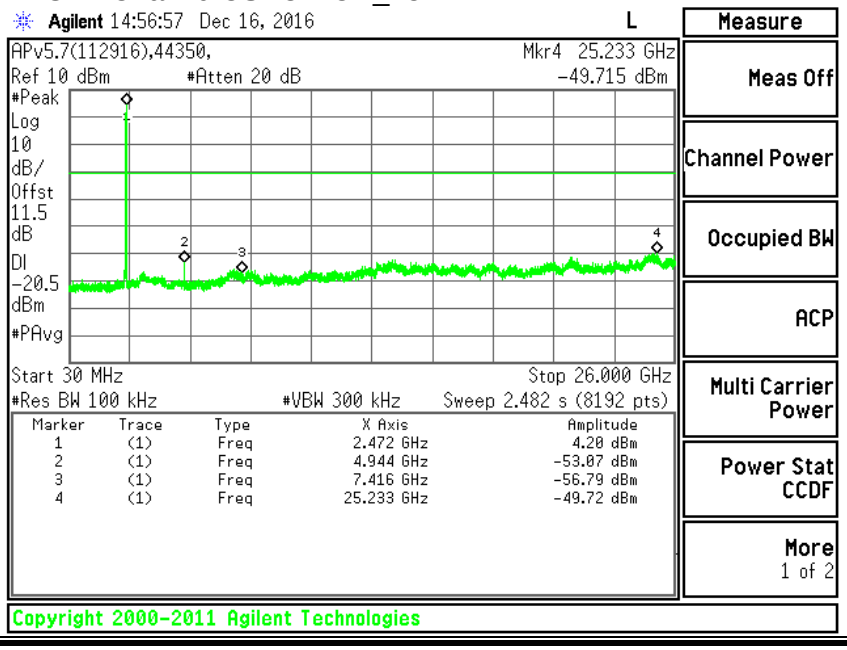
2.4GHz Chain 0 CSPUR CH_11



2.4GHz Chain 0 CSPUR CH_12



2.4GHz Chain 0 CSPUR CH_13



11.2. 11b Chain 1 SISO MODE IN THE 2.4GHz BAND

11.2.1. 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.

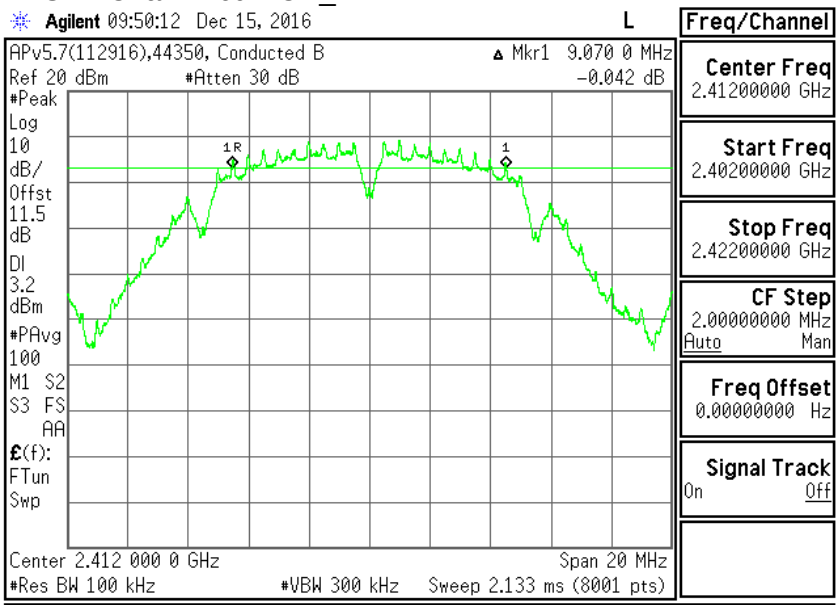
TEST PROCEDURE

KDB 58074 D01 v03r05 Section 8.1

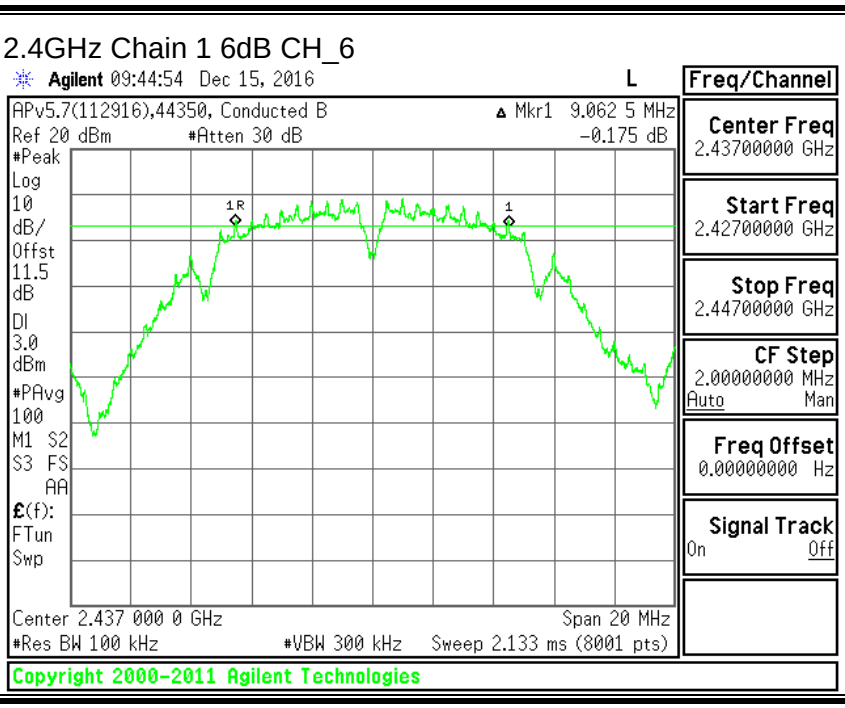
RESULTS

Channel	Frequency (MHz)	6 dB BW Chain 1 (MHz)	Minimum Limit (MHz)
Low_1	2412	9.0700	0.5
Middle_6	2437	9.0625	0.5
High_11	2462	9.0975	0.5
High_12	2467	9.0775	0.5
High_13	2472	7.5725	0.5

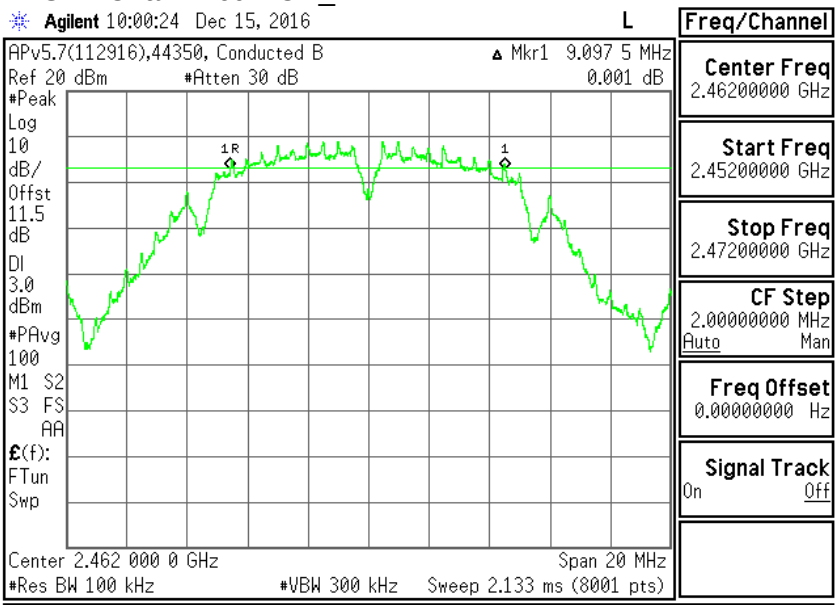
2.4GHz Chain 1 6dB CH_1



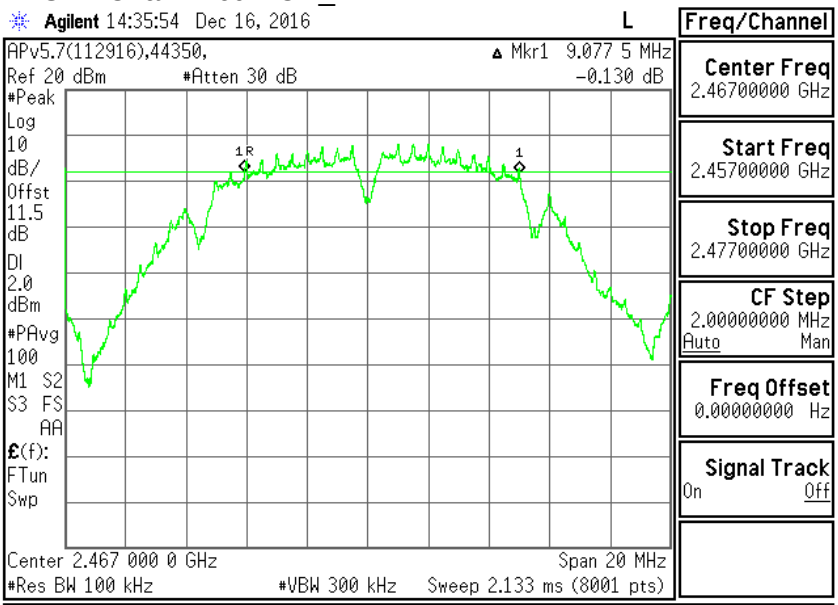
2.4GHz Chain 1 6dB CH_6

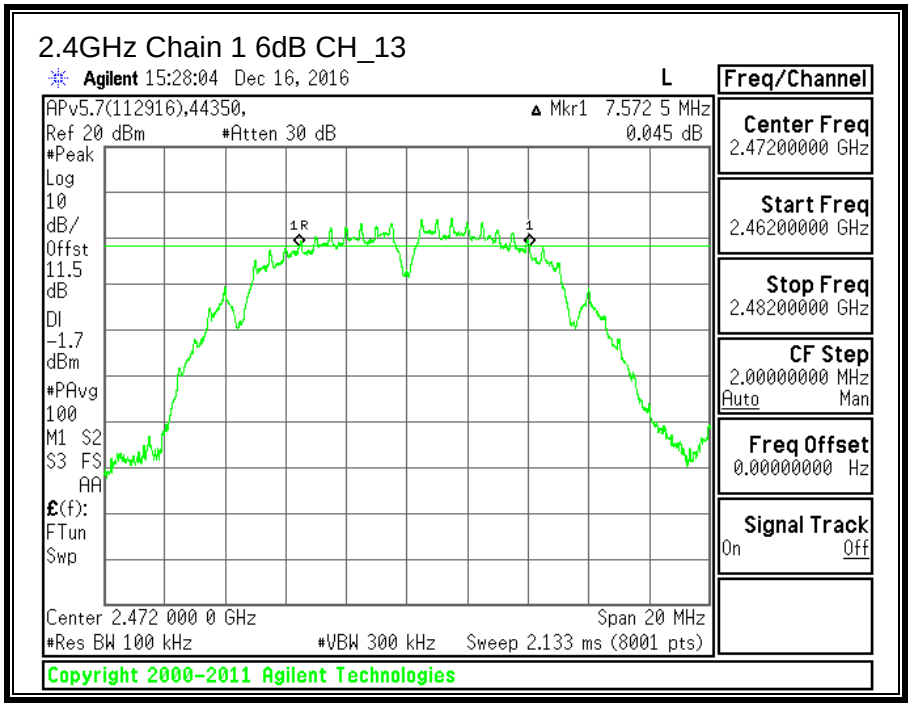


2.4GHz Chain 1 6dB CH_11



2.4GHz Chain 1 6dB CH_12





11.2.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

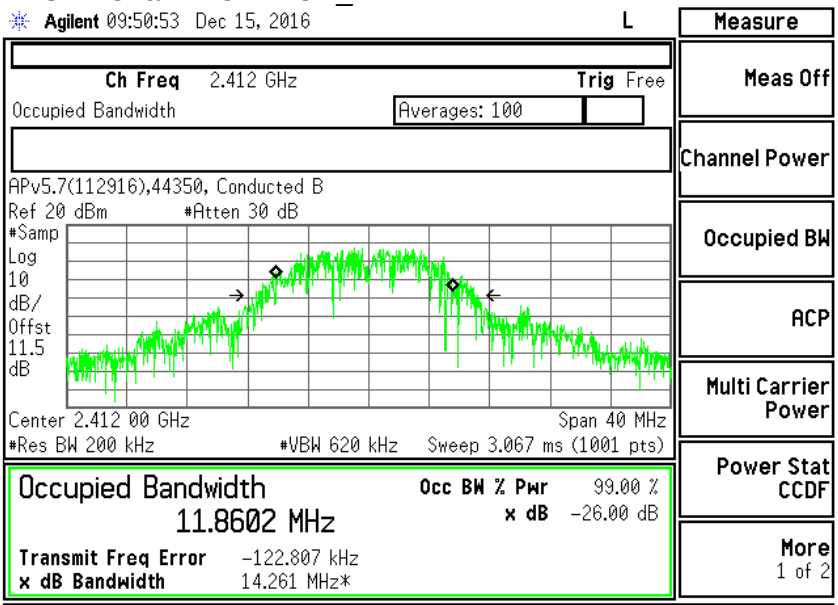
TEST PROCEDURE

ANSI C63.10: 2013 Section 6.9.3

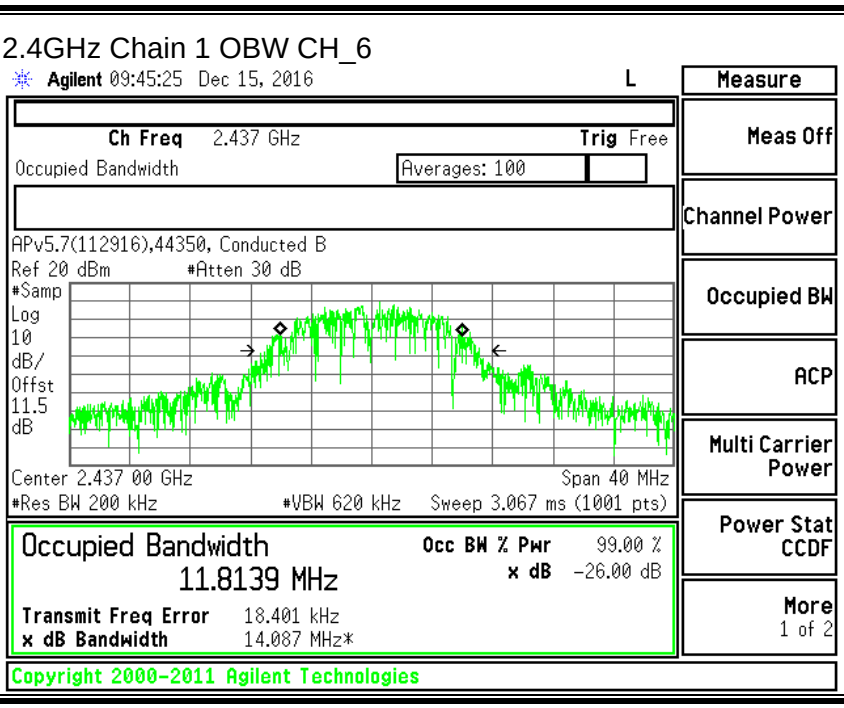
RESULTS

Channel	Frequency (MHz)	99% Bandwidth Chain 1 (MHz)
Low_1	2412	11.8602
Middle_6	2437	11.8139
High_11	2462	11.9165
High_12	2467	11.9487
High_13	2472	10.6639

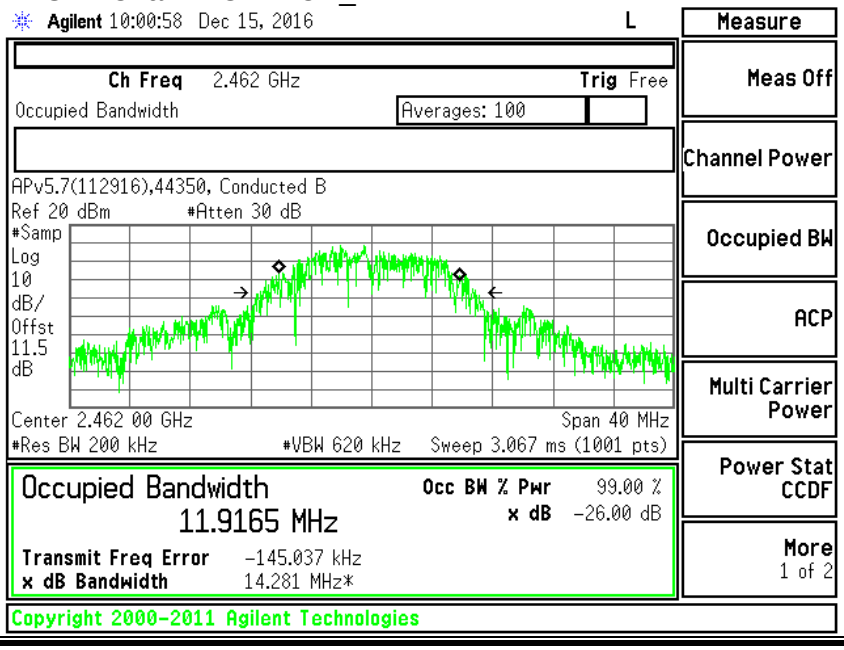
2.4GHz Chain 1 OBW CH_1



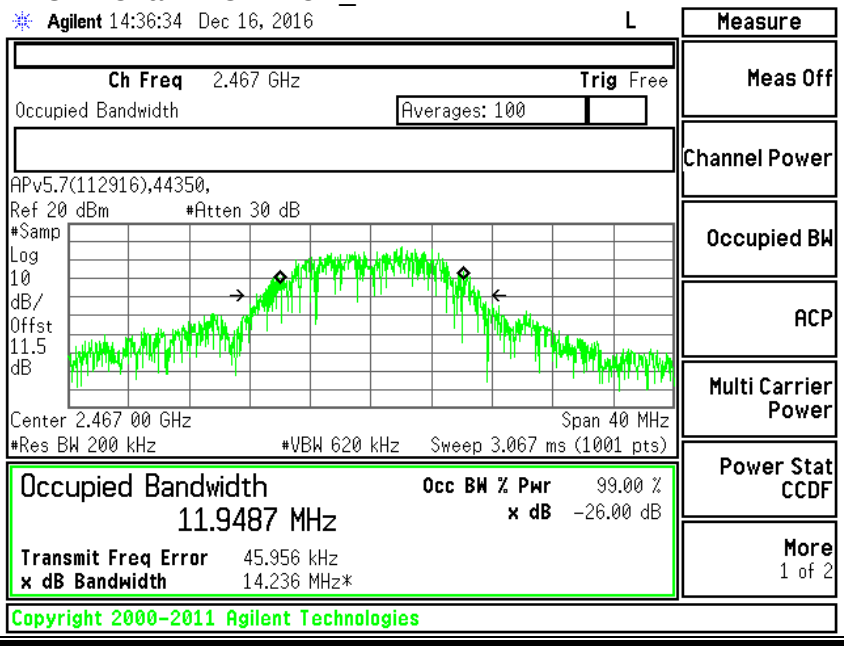
2.4GHz Chain 1 OBW CH_6

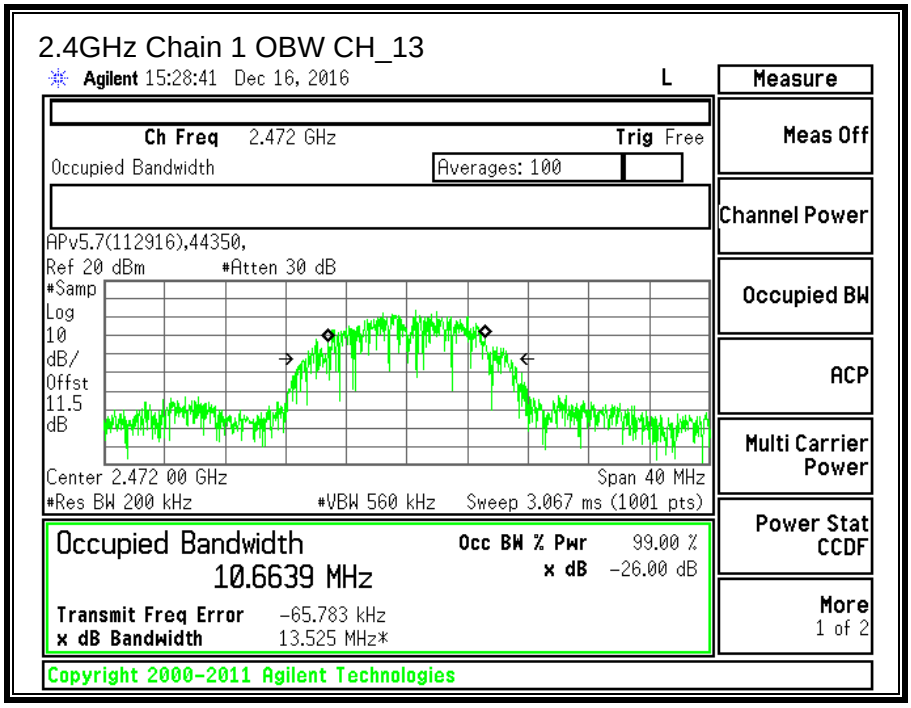


2.4GHz Chain 1 OBW CH_11



2.4GHz Chain 1 OBW CH_12





11.2.3. OUTPUT POWER

LIMITS

FCC §15.247

IC RSS-247 (5.4) (4)

For systems using digital modulation in the 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

KDB 58074 D01 v03r05 Section 9.2.3.2

RESULTS

ID:	44350	Date:	12/19/2016

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low_1	2412	2.86	30.00	30	36	30.00
Mid_6	2437	2.86	30.00	30	36	30.00
High_11	2462	2.86	30.00	30	36	30.00
High_12	2467	2.86	30.00	30	36	30.00
High_13	2472	2.86	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Core 1 Meas Power (dBm)	Power Limit (dBm)	Margin (dB)
Low_1	2412	18.40	30.00	-11.60
Mid_6	2437	18.40	30.00	-11.60
High_11	2462	18.40	30.00	-11.60
High_12	2467	16.92	30.00	-13.08
High_13	2472	12.09	30.00	-17.91

Note: the power readings above were measured with gated method, and the measurement was taken only during the ON time. No duty cycle correction was necessary.

11.2.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247

IC RSS-247 (5.2) (2)

For digitally modulated systems, the power spectral density conducted form the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 KHz band during any time interval of continuous transmissions.

TEST PROCEDURE

KDB 58074 D01 v03r05 Section 10.3

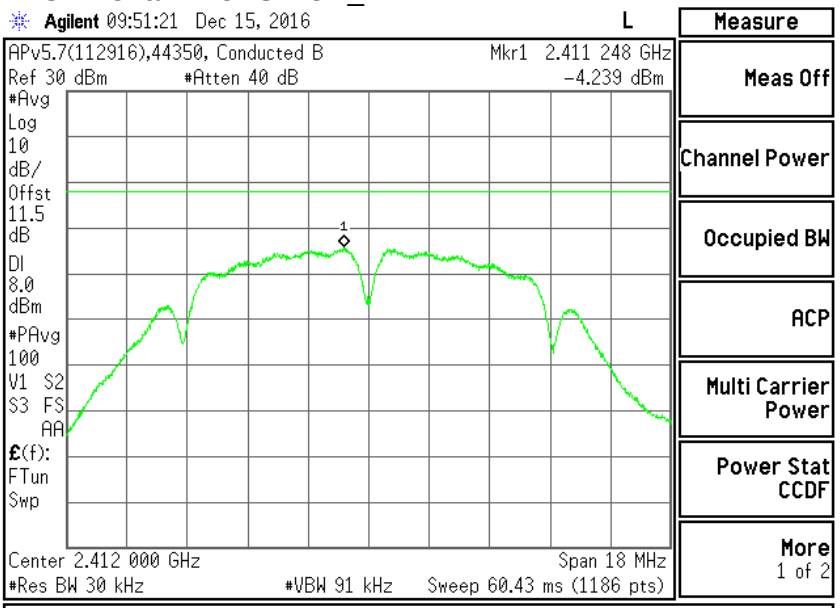
RESULTS

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd PSD

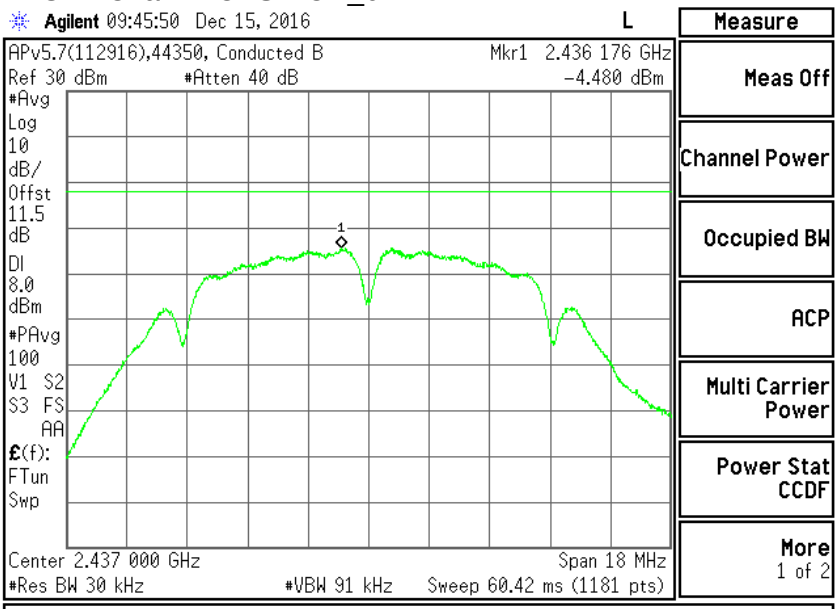
PSD Results

Channel	Frequency (MHz)	Core 1 Meas (dBm)	Limit (dBm)	Margin (dB)
Low_1	2412	-4.239	8.0	-12.2
Mid_6	2437	-4.480	8.0	-12.5
High_11	2462	-4.522	8.0	-12.5
High_12	2467	-5.350	8.0	-13.4
High_13	2472	-9.542	8.0	-17.5

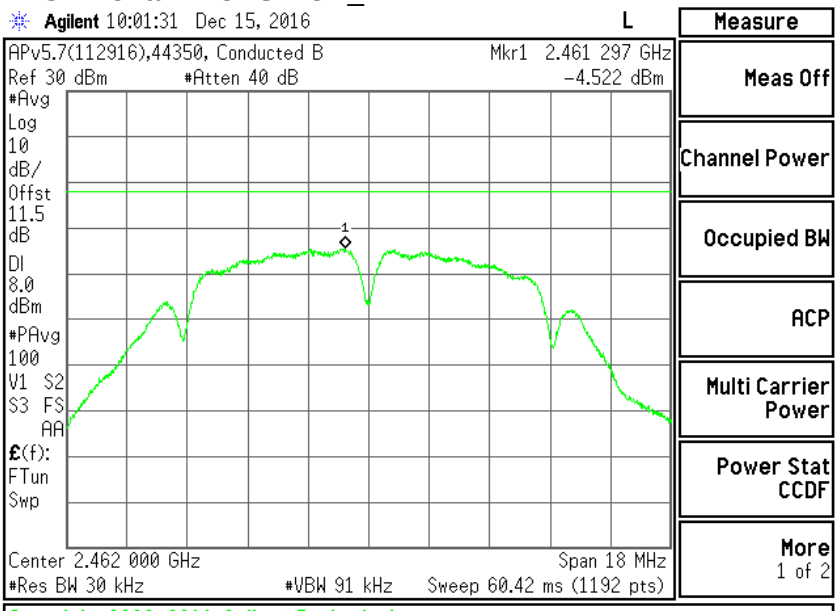
2.4GHz Chain 1 CPSD CH_1



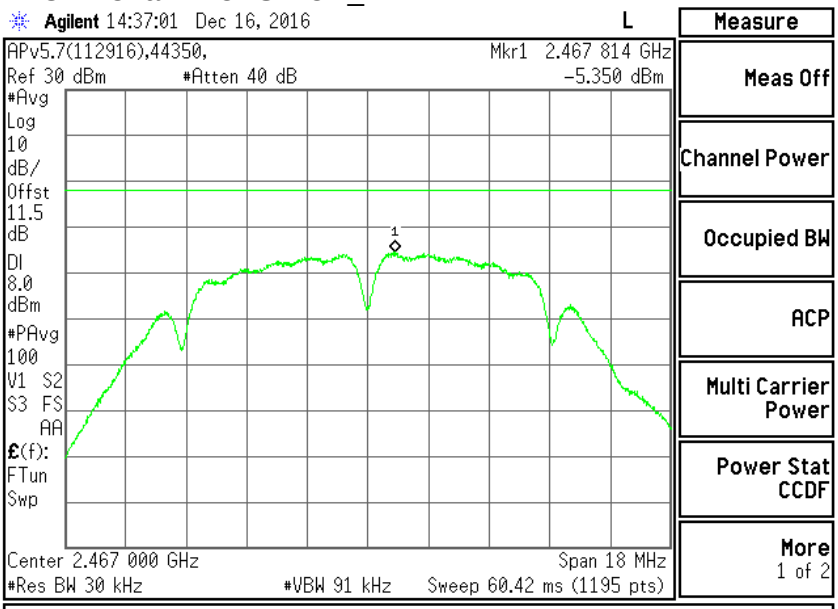
2.4GHz Chain 1 CPSD CH_6



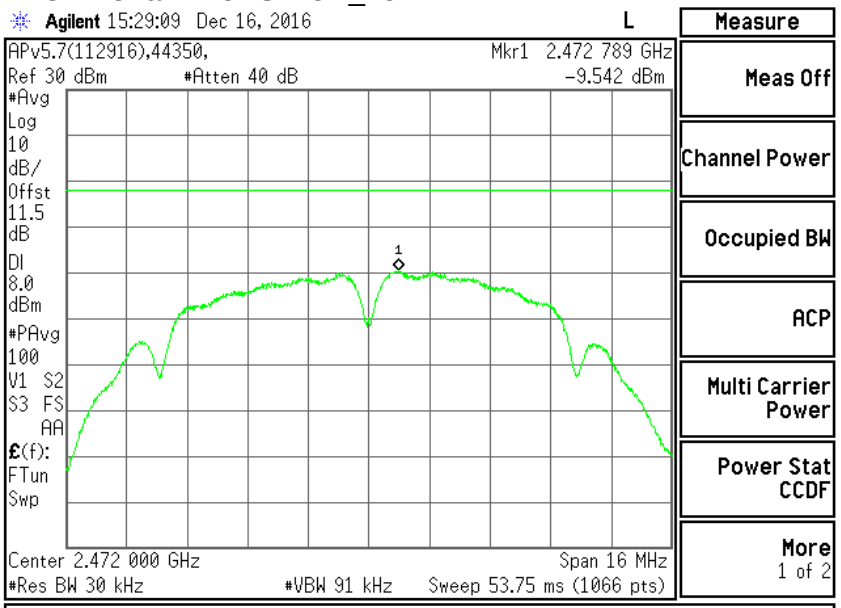
2.4GHz Chain 1 CPSD CH_11



2.4GHz Chain 1 CPSD CH_12

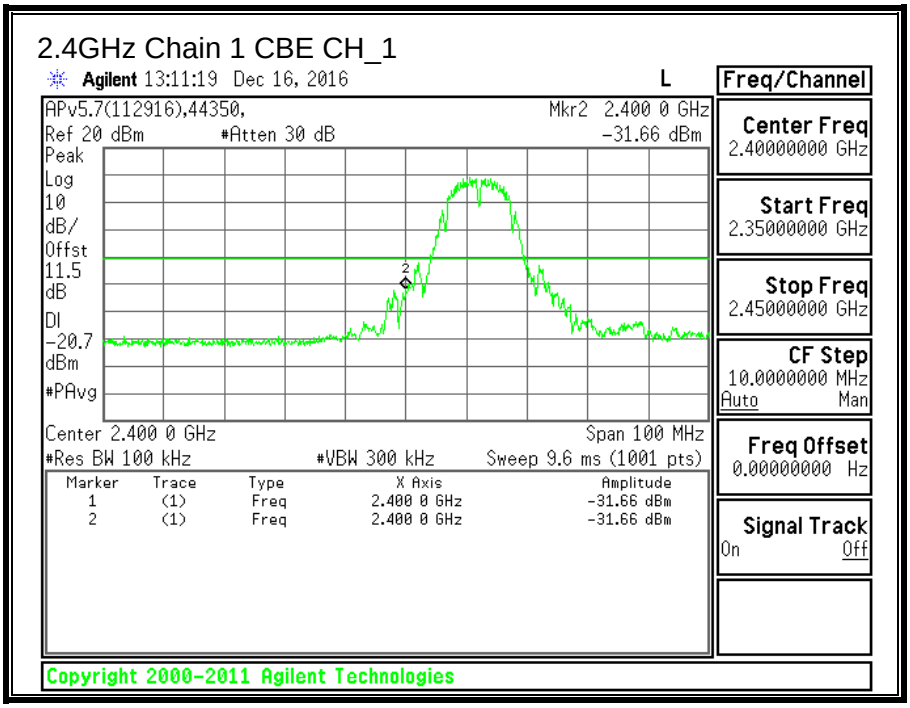


2.4GHz Chain 1 CPSD CH_13

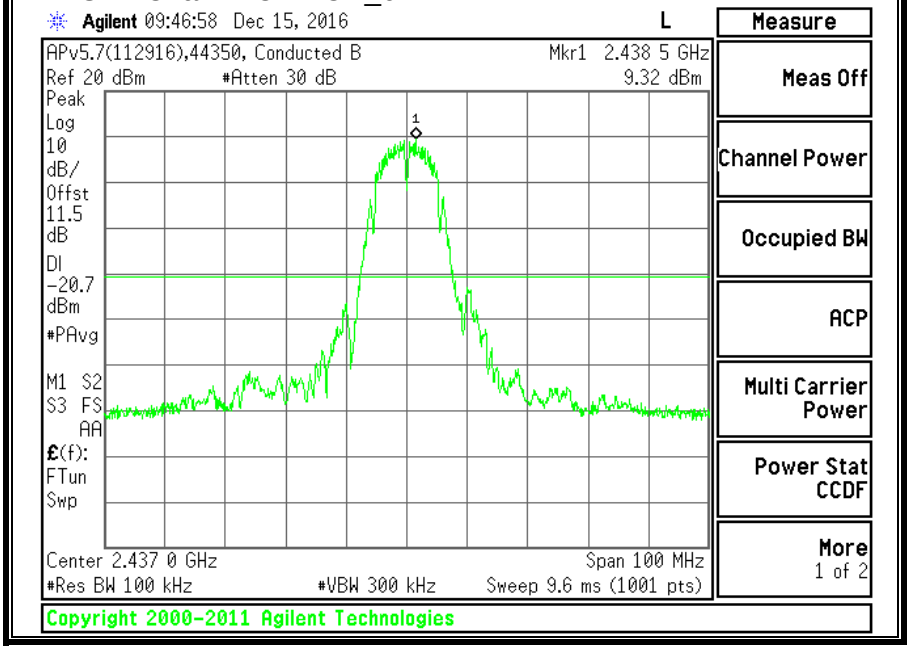


11.2.5. CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS

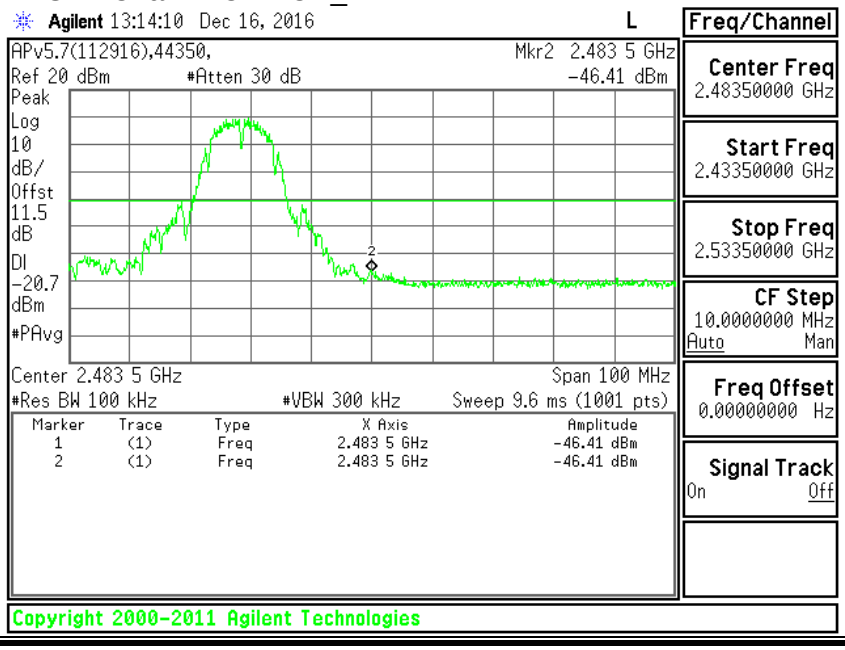
2.4GHz Chain 1 CBE CH_1



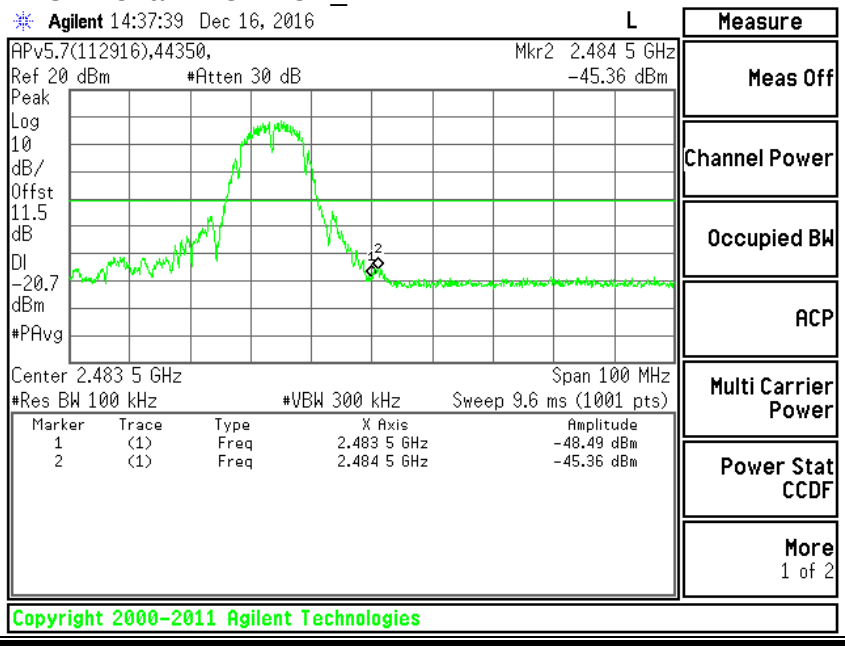
2.4GHz Chain 1 CBE CH_6



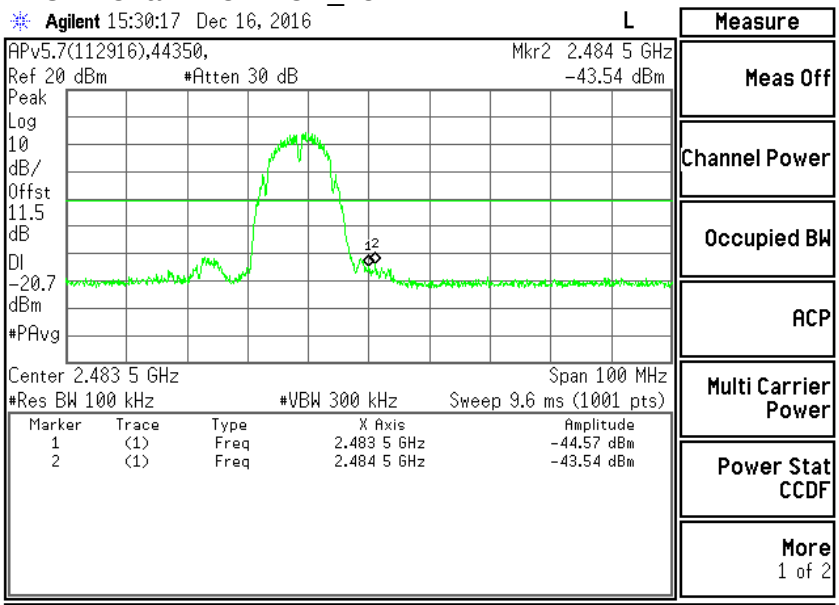
2.4GHz Chain 1 CBE CH_11



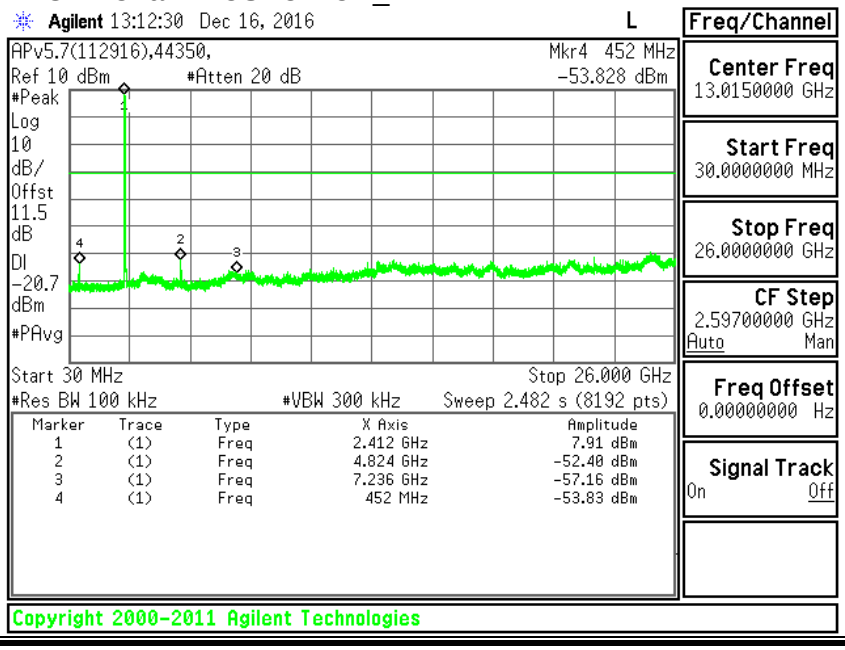
2.4GHz Chain 1 CBE CH_12



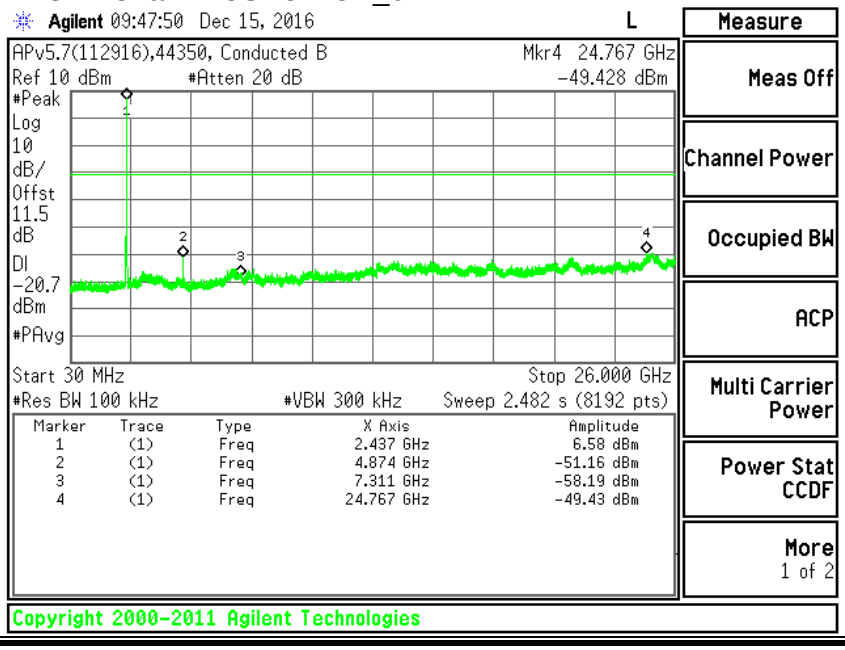
2.4GHz Chain 1 CBE CH_13



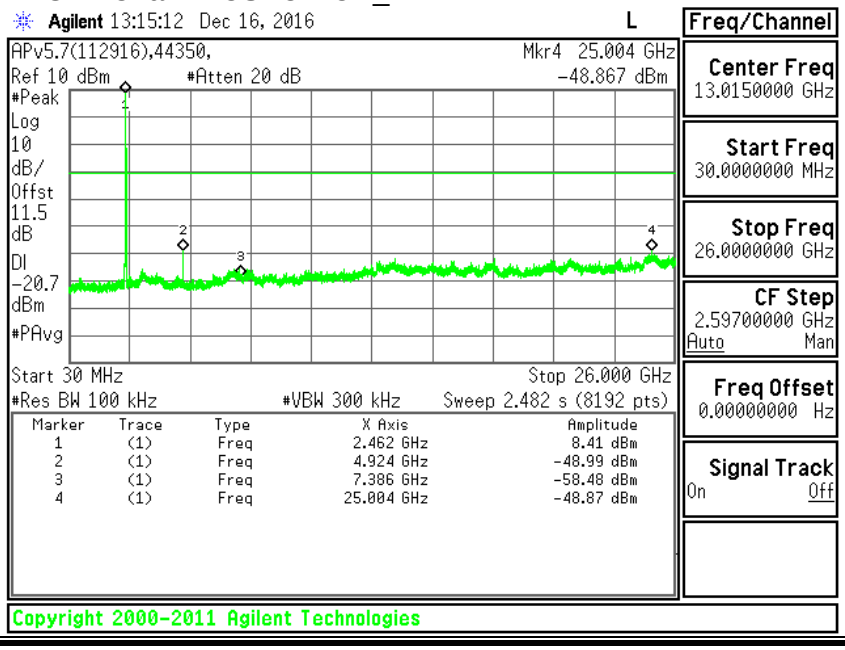
2.4GHz Chain 1 CSPUR CH_1



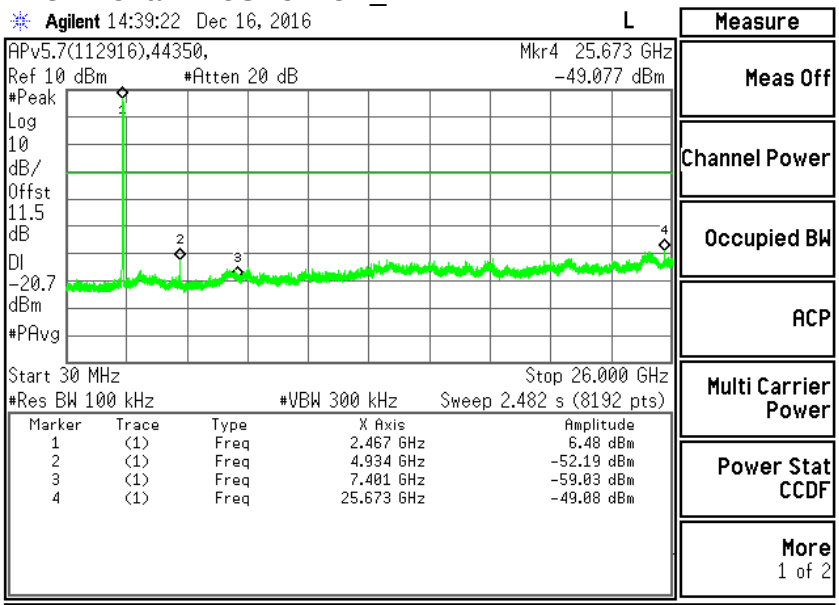
2.4GHz Chain 1 CSPUR CH_6



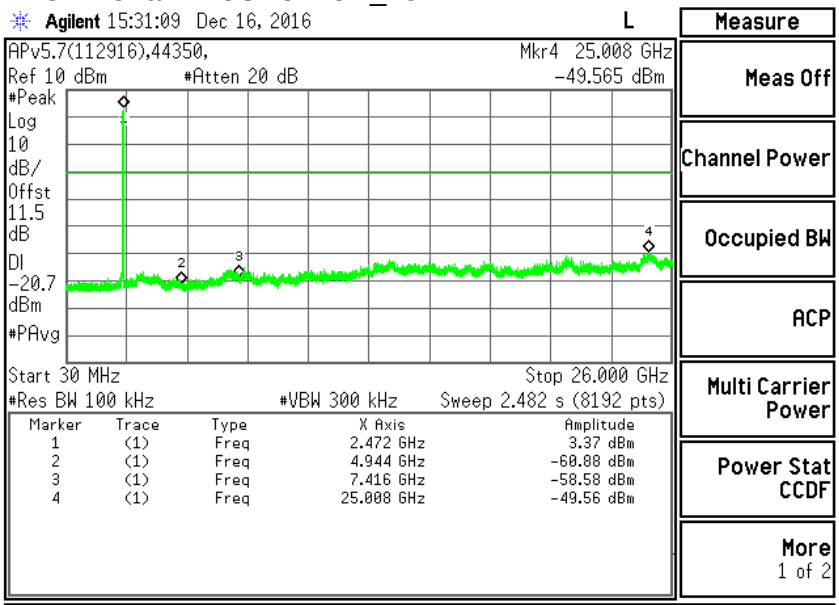
2.4GHz Chain 1 CSPUR CH_11



2.4GHz Chain 1 CSPUR CH_12



2.4GHz Chain 1 CSPUR CH_13



11.3. 11g Chain 0 SISO MODE IN THE 2.4GHz BAND

11.3.1. 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.

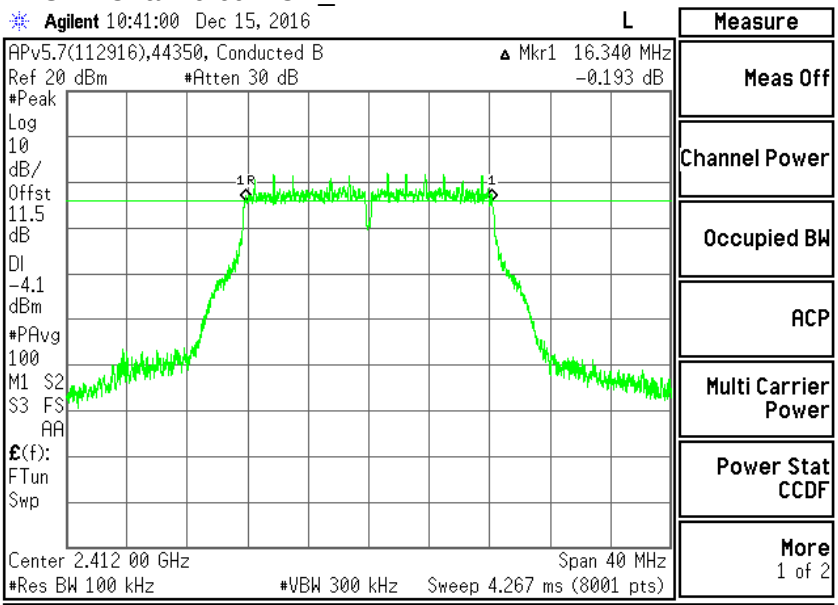
TEST PROCEDURE

KDB 58074 D01 v03r05 Section 8.1

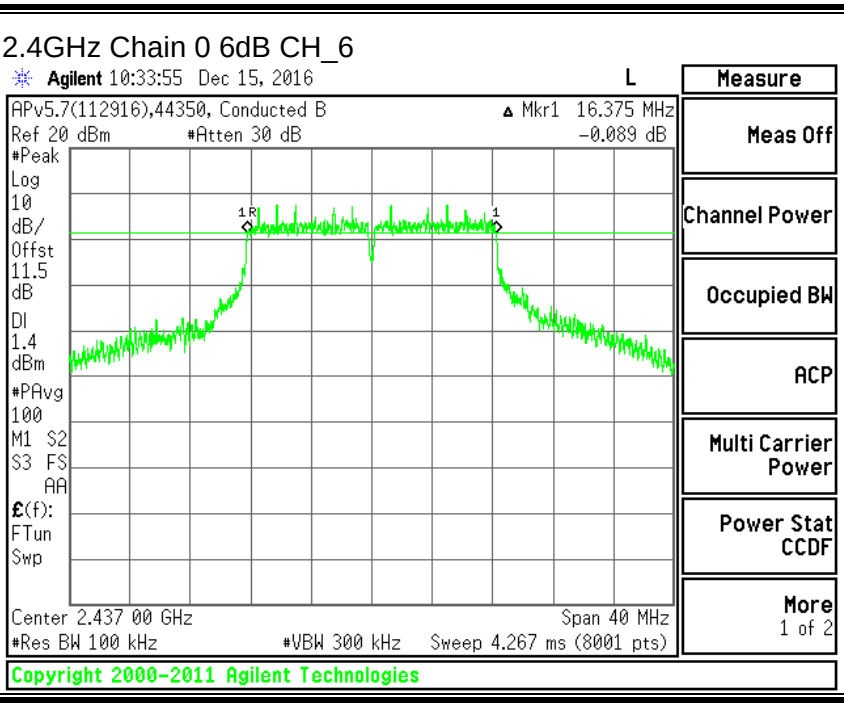
RESULTS

Channel	Frequency (MHz)	6 dB BW Chain 0 (MHz)	Minimum Limit (MHz)
Low_1	2412	16.340	0.5
Middle_6	2437	16.375	0.5
High_11	2462	16.375	0.5
High_12	2467	16.315	0.5
High_13	2472	15.455	0.5

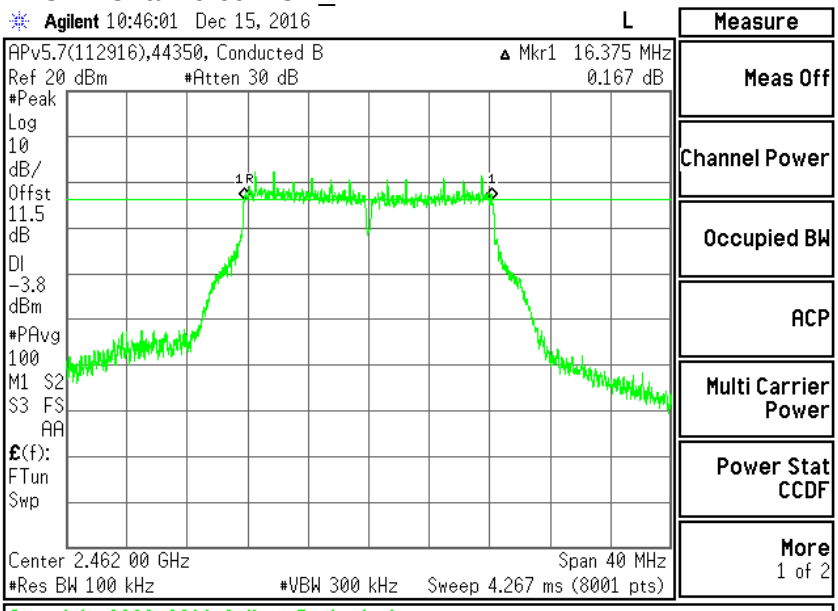
2.4GHz Chain 0 6dB CH_1



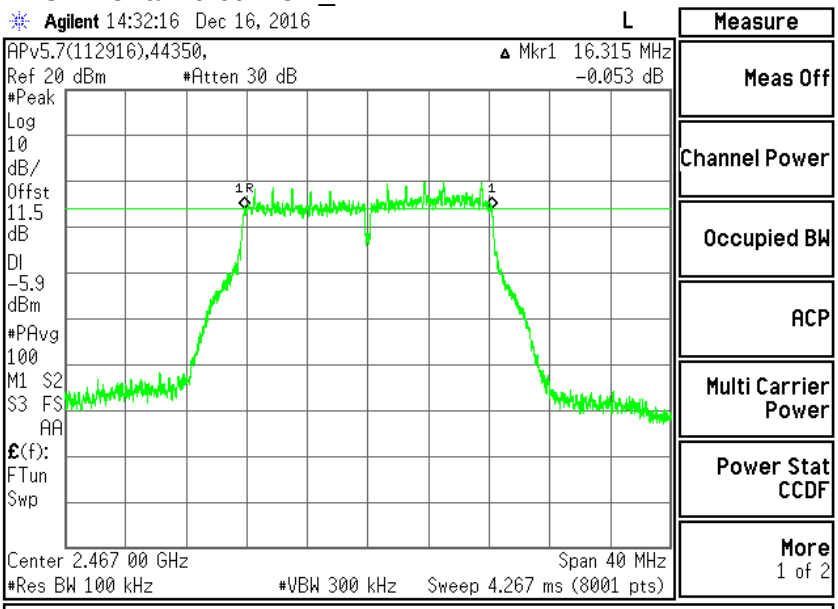
2.4GHz Chain 0 6dB CH_6

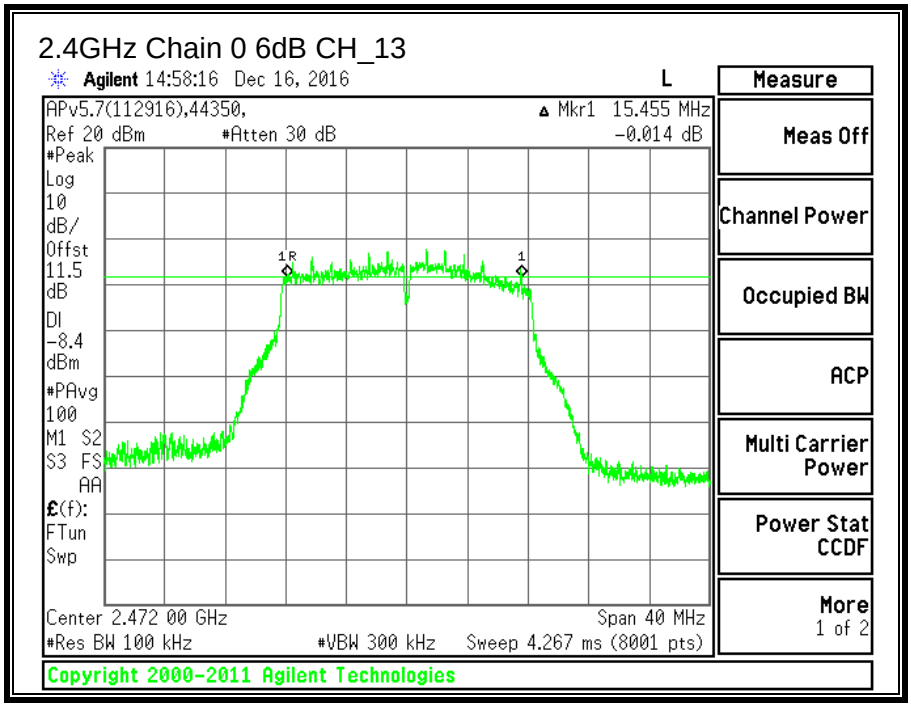


2.4GHz Chain 0 6dB CH_11



2.4GHz Chain 0 6dB CH_12





11.3.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

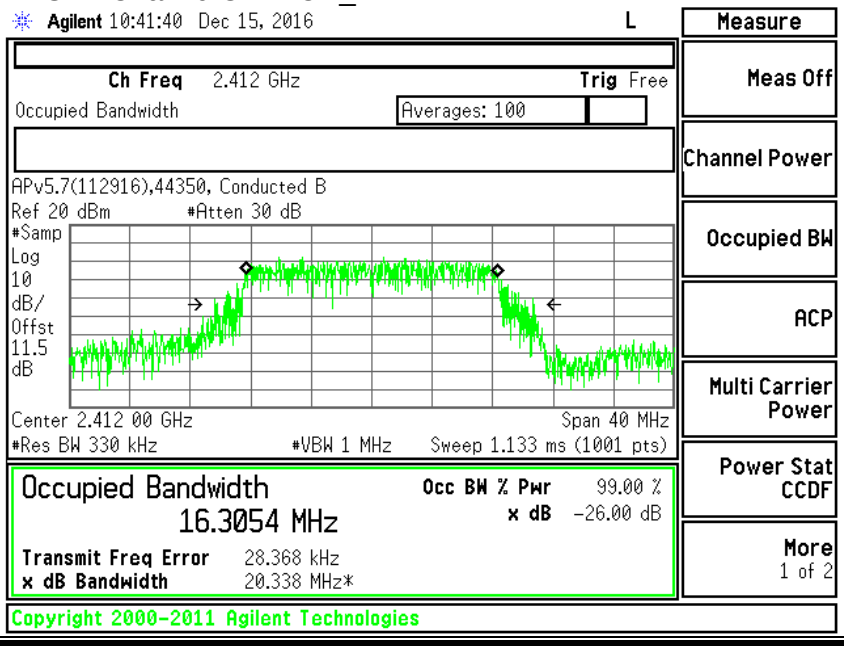
TEST PROCEDURE

ANSI C63.10: 2013 Section 6.9.3

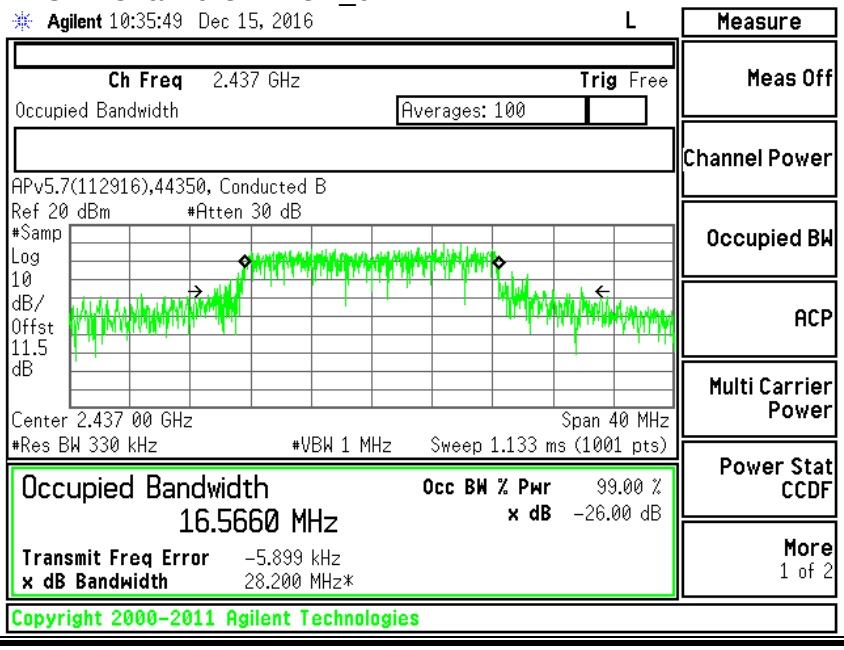
RESULTS

Channel	Frequency (MHz)	99% Bandwidth Chain 0 (MHz)
Low_1	2412	16.3054
Middle_6	2437	16.5660
High_11	2462	16.4113
High_12	2467	16.3662
High_13	2472	16.1576

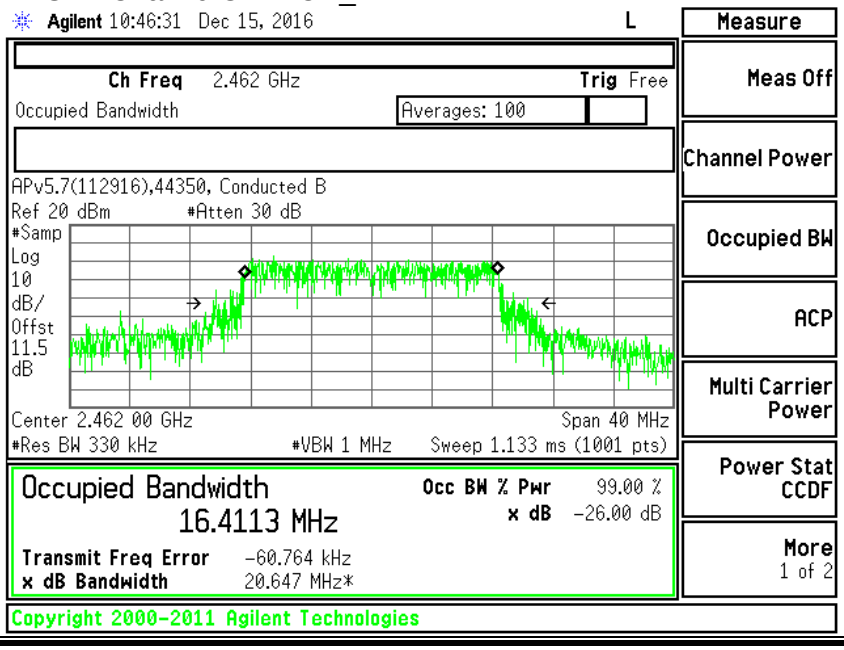
2.4GHz Chain 0 OBW CH_1



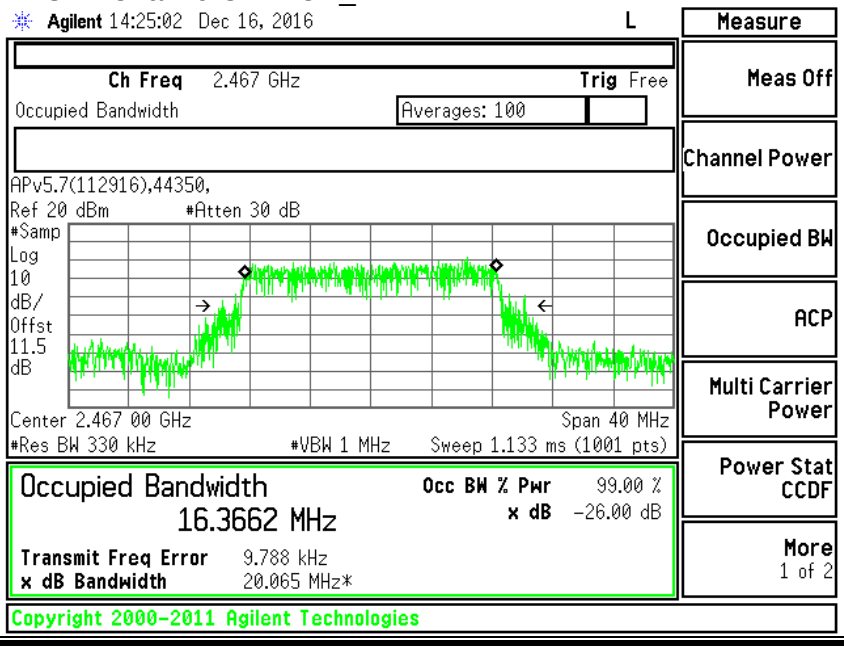
2.4GHz Chain 0 OBW CH_6

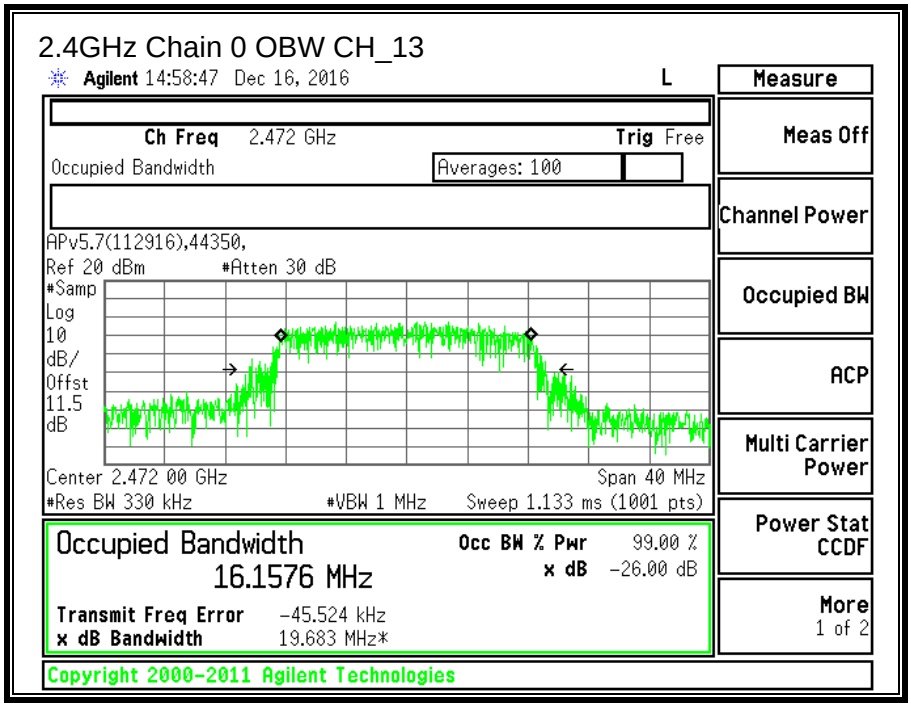


2.4GHz Chain 0 OBW CH_11



2.4GHz Chain 0 OBW CH_12





11.3.3. OUTPUT POWER

LIMITS

FCC §15.247

IC RSS-247 (5.4) (4)

For systems using digital modulation in the 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

KDB 58074 D01 v03r05 Section 9.2.3.2

RESULTS

ID:	44350	Date:	12/19/2016

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low_1	2412	2.86	30.00	30	36	30.00
Mid_6	2437	2.86	30.00	30	36	30.00
High_11	2462	2.86	30.00	30	36	30.00
High_12	2467	2.86	30.00	30	36	30.00
High_13	2472	2.86	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Core 0 Meas Power (dBm)	Power Limit (dBm)	Margin (dB)
Low_1	2412	15.10	30.00	-14.90
Mid_6	2437	18.44	30.00	-11.56
High_11	2462	13.53	30.00	-16.47
High_12	2467	10.66	30.00	-19.34
High_13	2472	8.16	30.00	-21.84

Note: the power readings above were measured with gated method, and the measurement was taken only during the ON time. No duty cycle correction was necessary.

11.3.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247

IC RSS-247 (5.2) (2)

For digitally modulated systems, the power spectral density conducted form the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 KHz band during any time interval of continuous transmissions.

TEST PROCEDURE

KDB 58074 D01 v03r05 Section 10.3

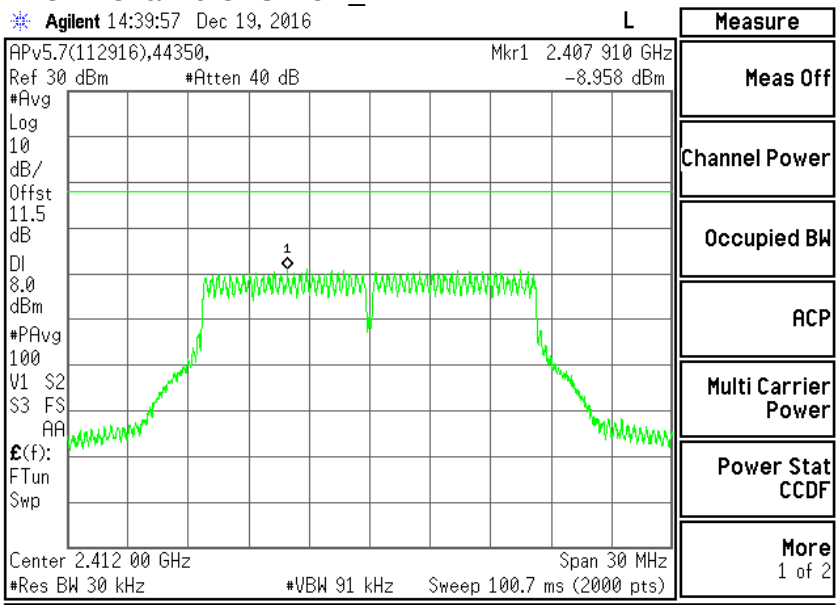
RESULTS

Duty Cycle CF (dB)	0.30	Included in Calculations of Corr'd PSD

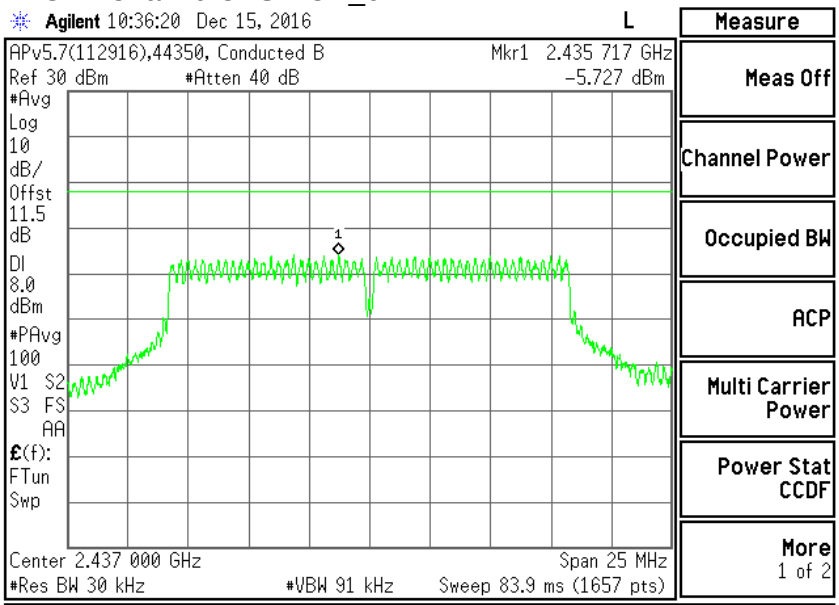
PSD Results

Channel	Frequency (MHz)	Core 0 Meas (dBm)	Limit (dBm)	Margin (dB)
Low_1	2412	-8.958	8.0	-17.0
Mid_6	2437	-5.727	8.0	-13.7
High_11	2462	-10.227	8.0	-18.2
High_12	2467	-12.622	8.0	-20.6
High_13	2472	-15.244	8.0	-23.2

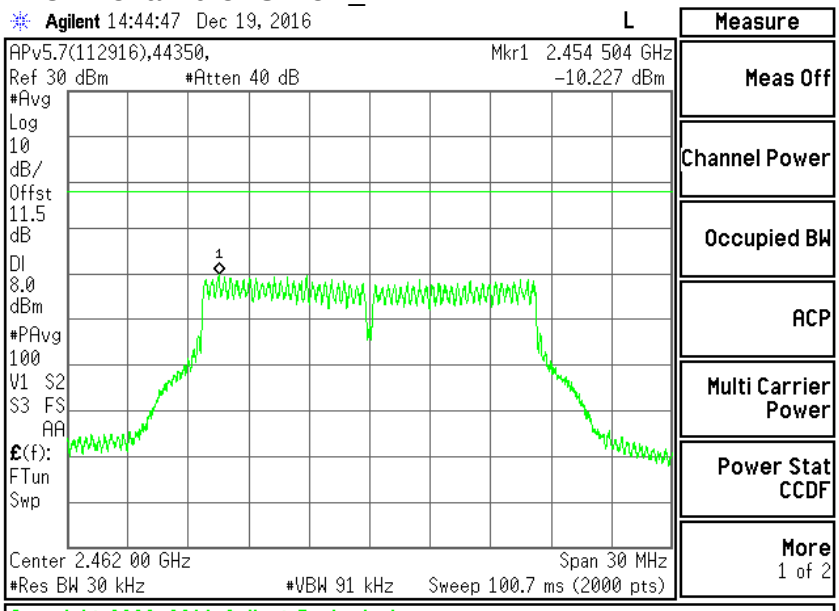
2.4GHz Chain 0 CPSD CH_1



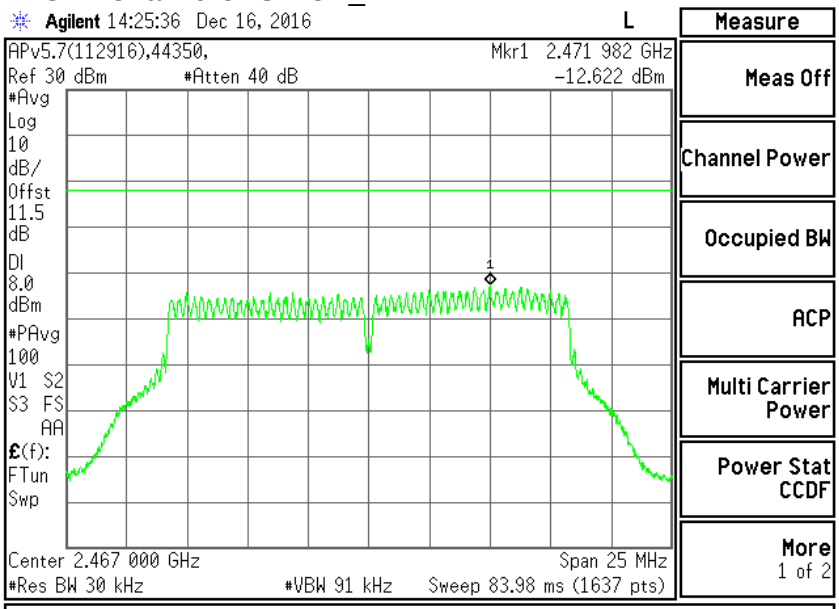
2.4GHz Chain 0 CPSD CH_6



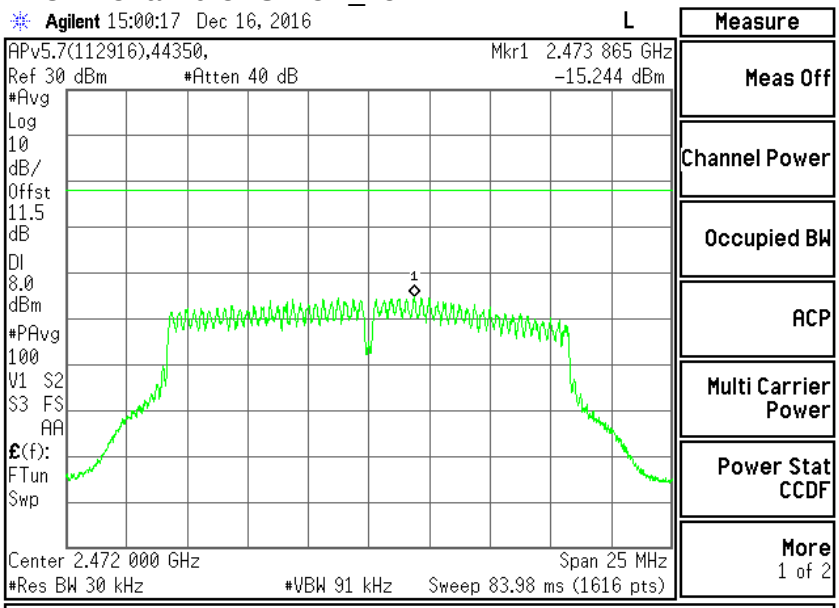
2.4GHz Chain 0 CPSD CH_11



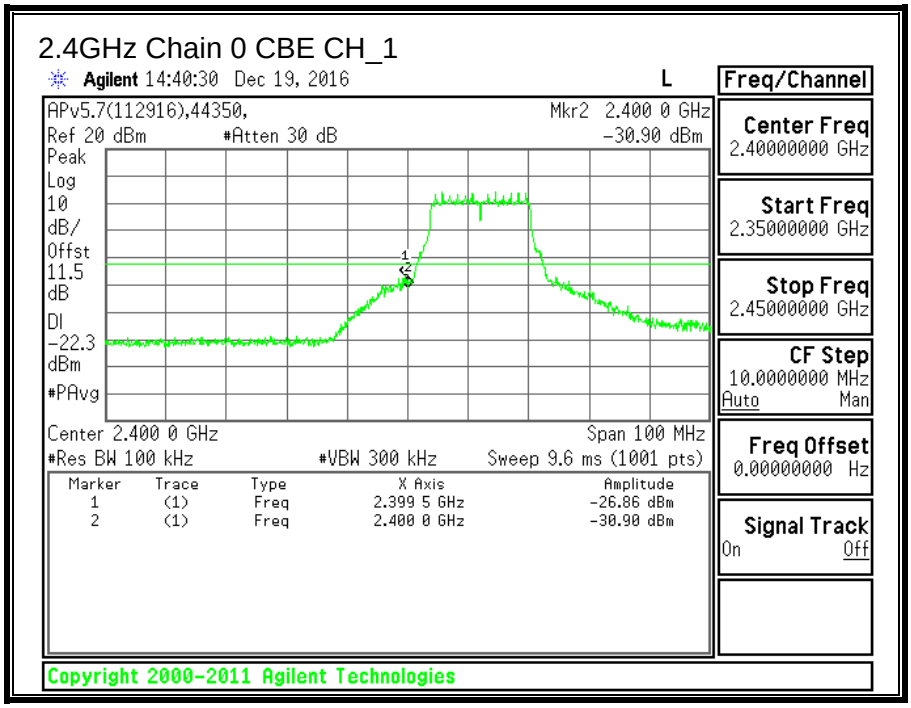
2.4GHz Chain 0 CPSD CH_12

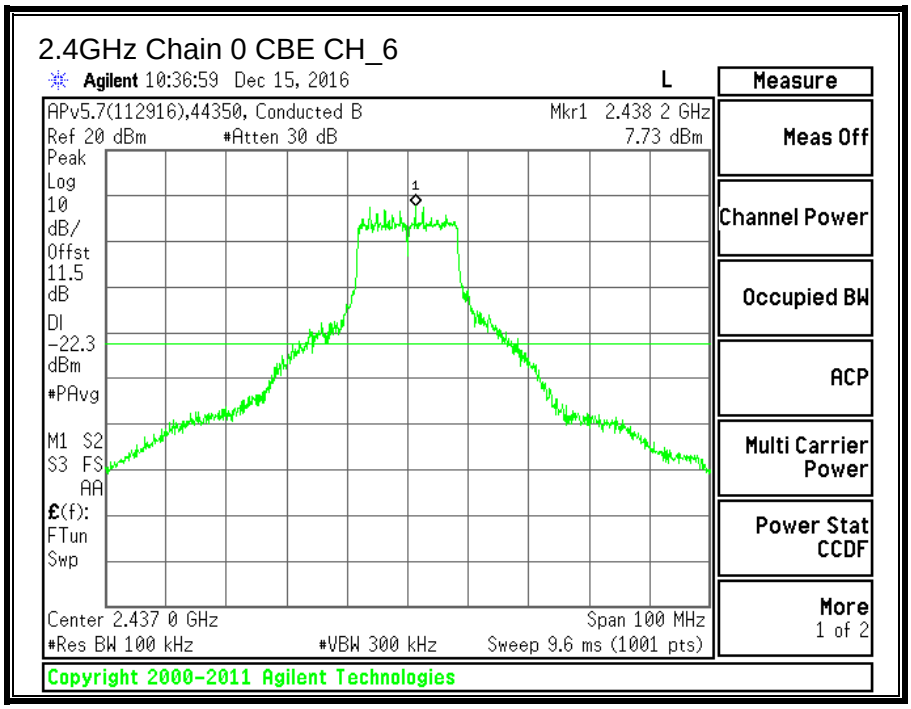


2.4GHz Chain 0 CPSD CH_13

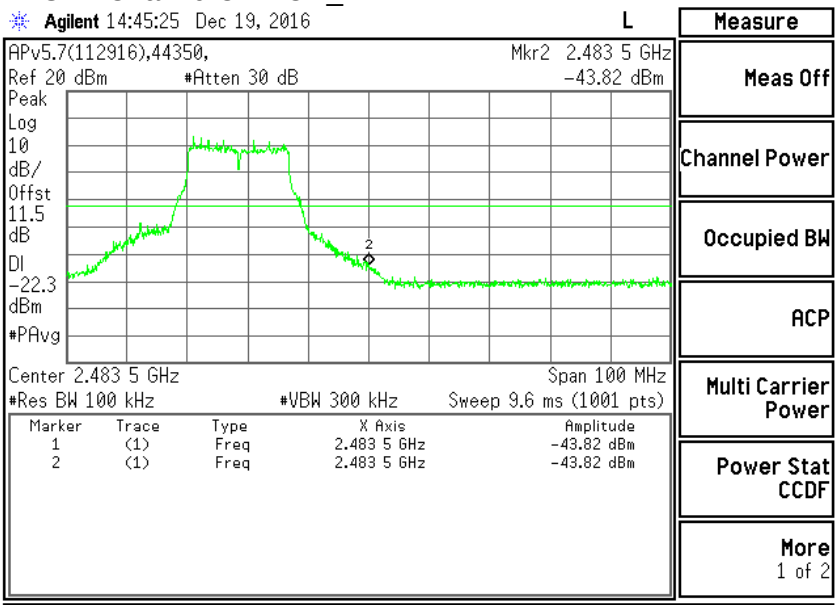


11.3.5. CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS

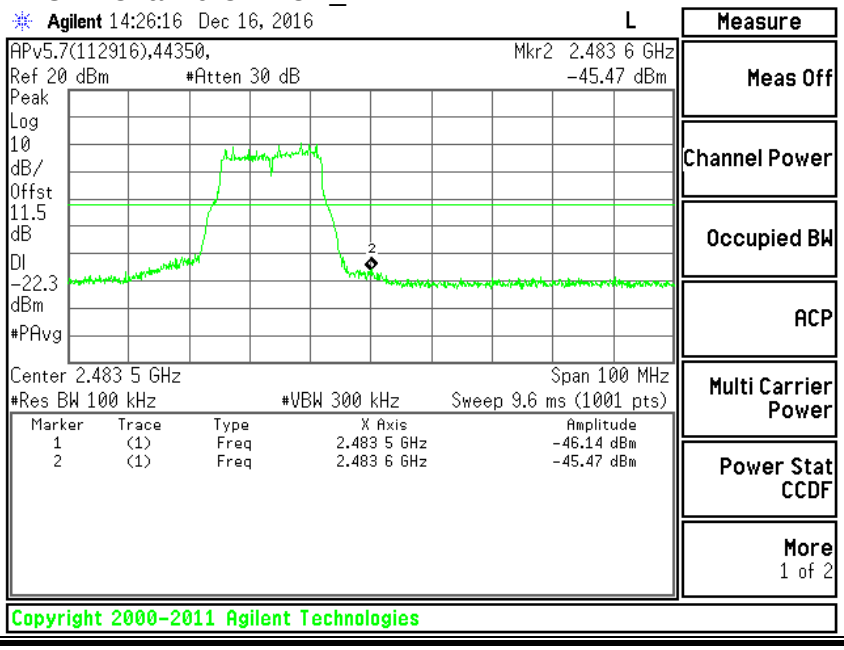




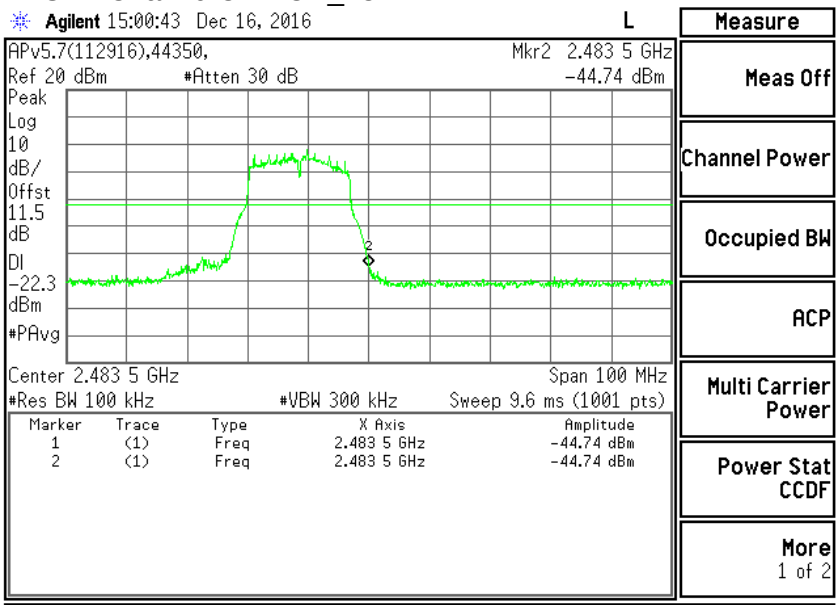
2.4GHz Chain 0 CBE CH_11



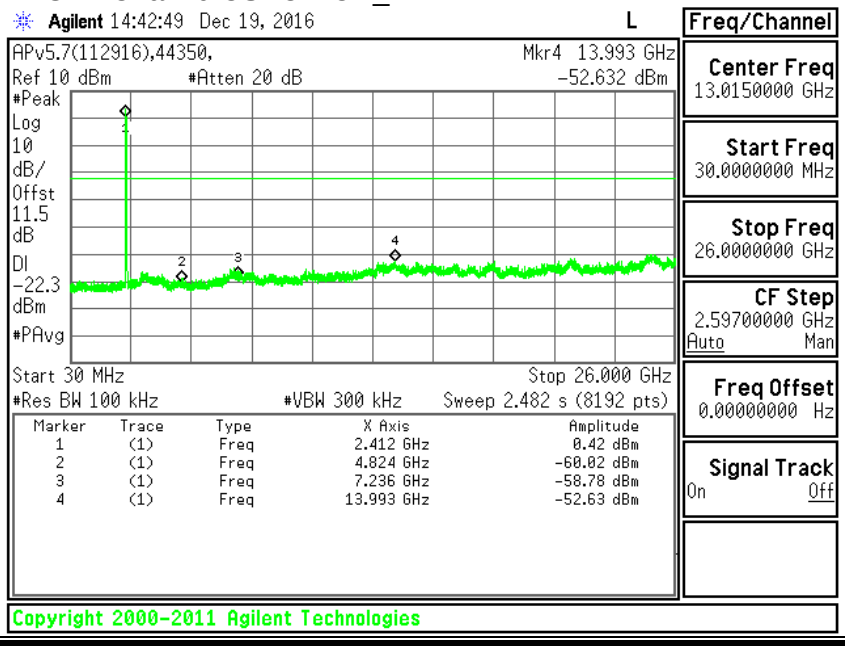
2.4GHz Chain 0 CBE CH_12



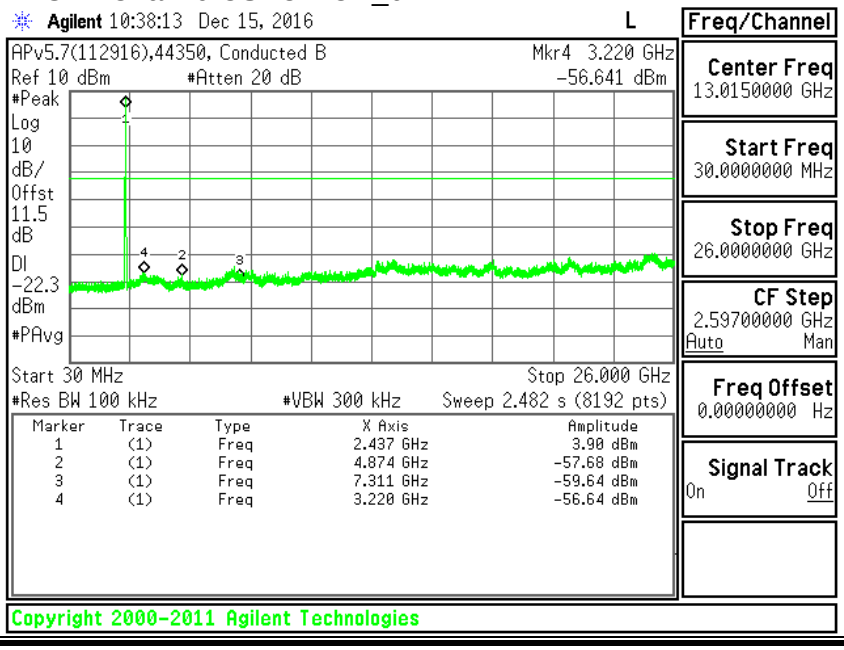
2.4GHz Chain 0 CBE CH_13



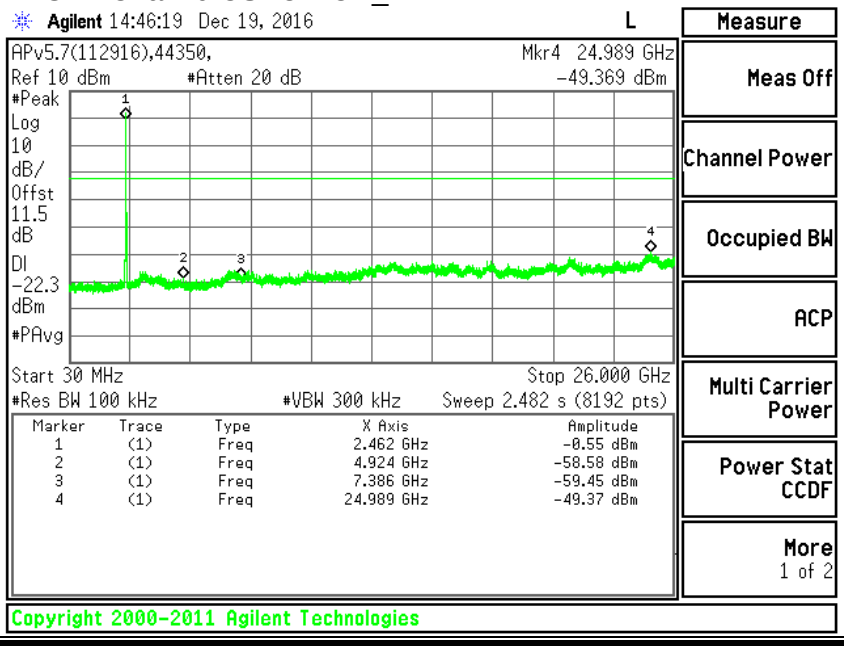
2.4GHz Chain 0 CSPUR CH_1



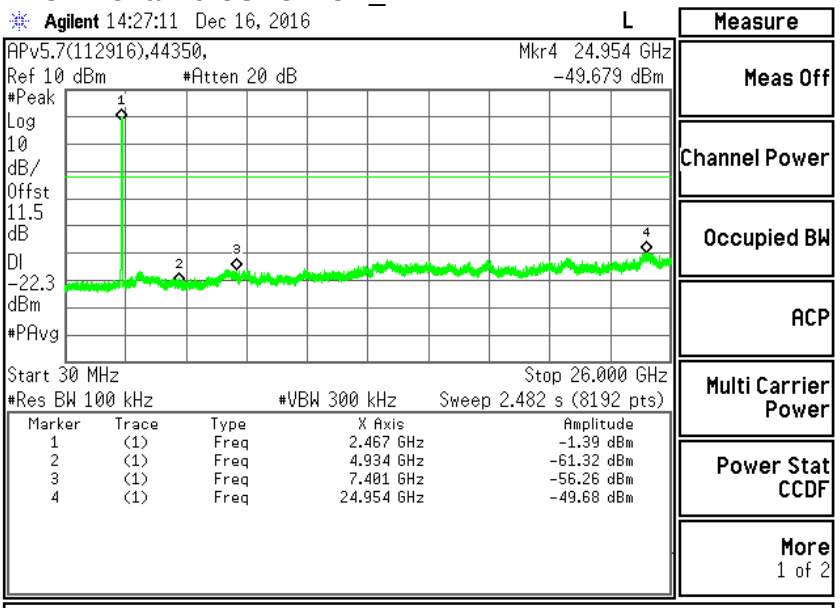
2.4GHz Chain 0 CSPUR CH_6



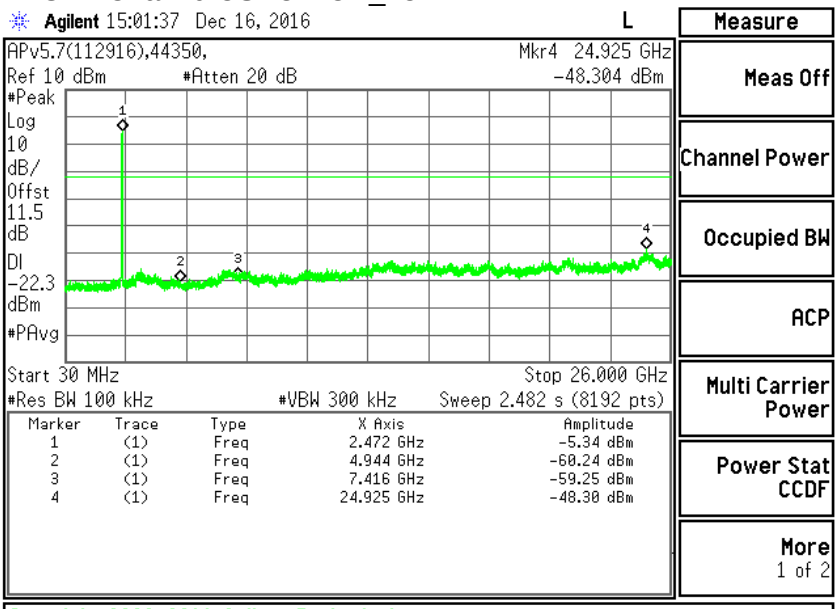
2.4GHz Chain 0 CSPUR CH_11



2.4GHz Chain 0 CSPUR CH_12



2.4GHz Chain 0 CSPUR CH_13



11.4. 11g Chain 1 SISO MODE IN THE 2.4GHz BAND

11.4.1. 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.

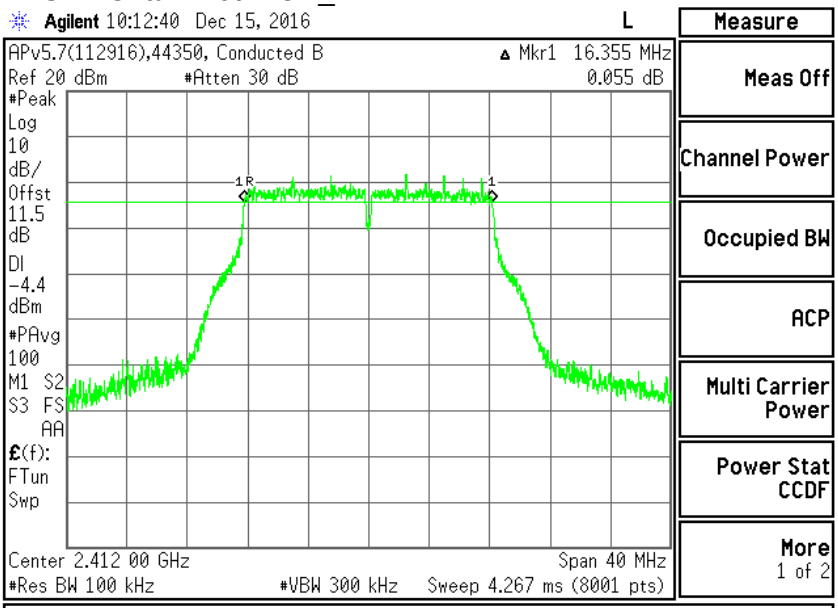
TEST PROCEDURE

KDB 58074 D01 v03r05 Section 8.1

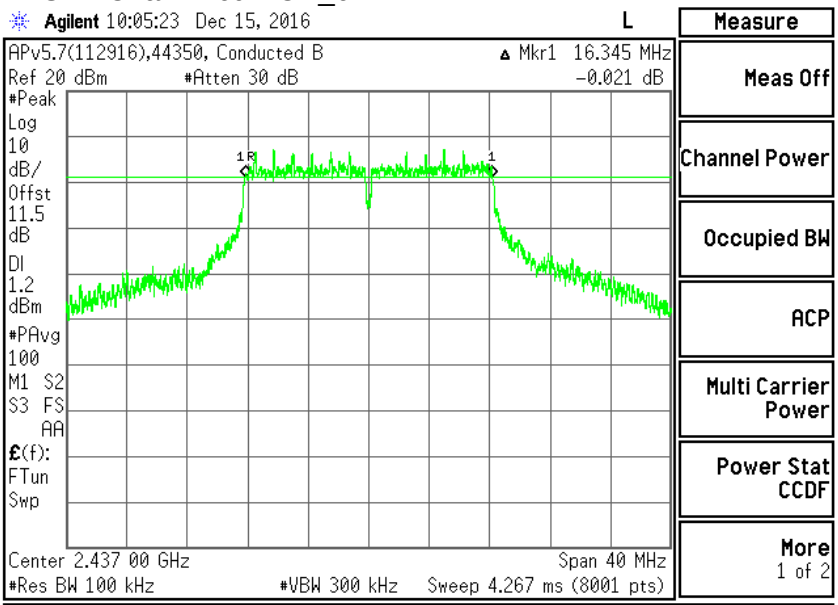
RESULTS

Channel	Frequency (MHz)	6 dB BW Chain 1 (MHz)	Minimum Limit (MHz)
Low_1	2412	16.355	0.5
Middle_6	2437	16.345	0.5
High_11	2462	16.390	0.5
High_12	2467	16.345	0.5
High_13	2472	15.710	0.5

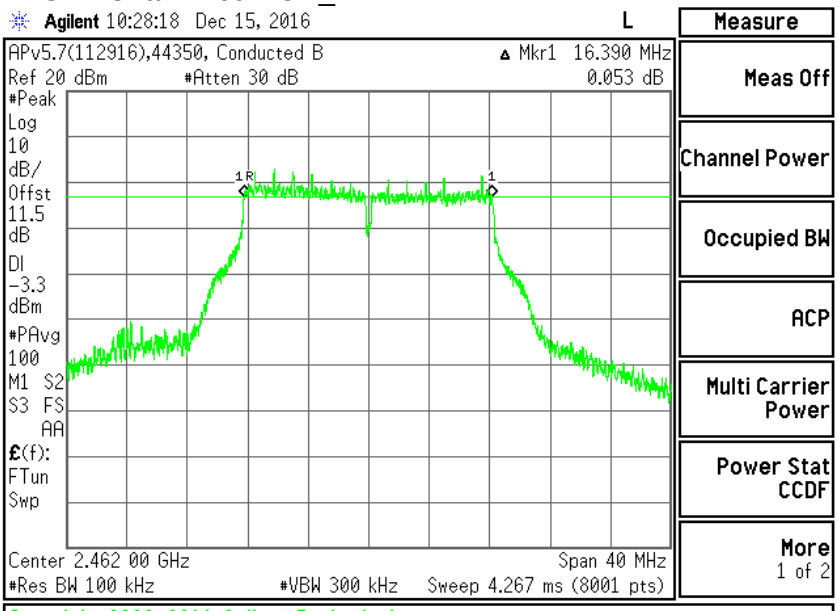
2.4GHz Chain 1 6dB CH_1



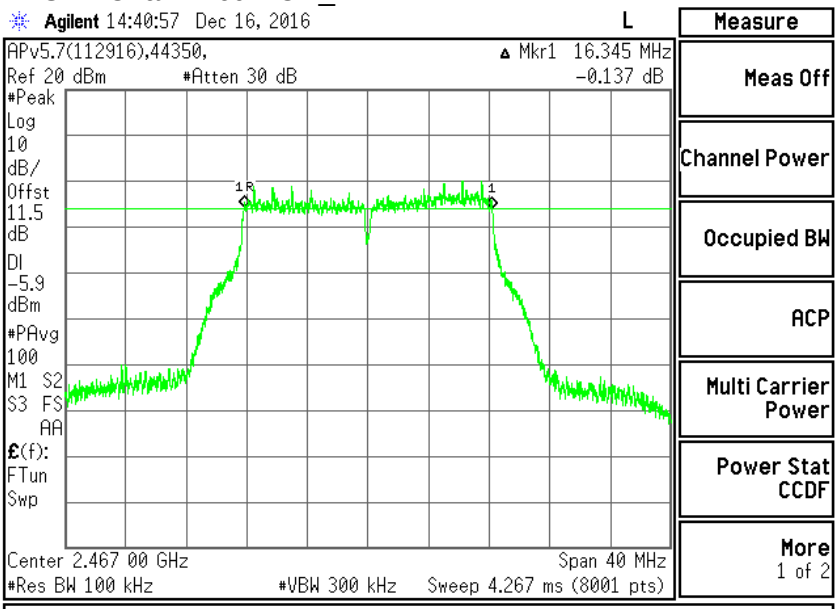
2.4GHz Chain 1 6dB CH_6



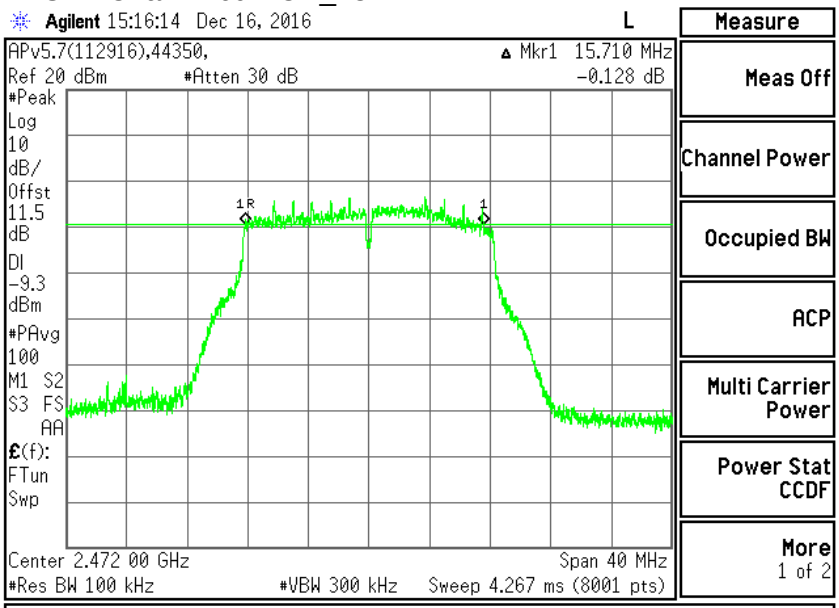
2.4GHz Chain 1 6dB CH_11



2.4GHz Chain 1 6dB CH_12



2.4GHz Chain 1 6dB CH_13



11.4.2. 99% BANDWIDTH

LIMITS

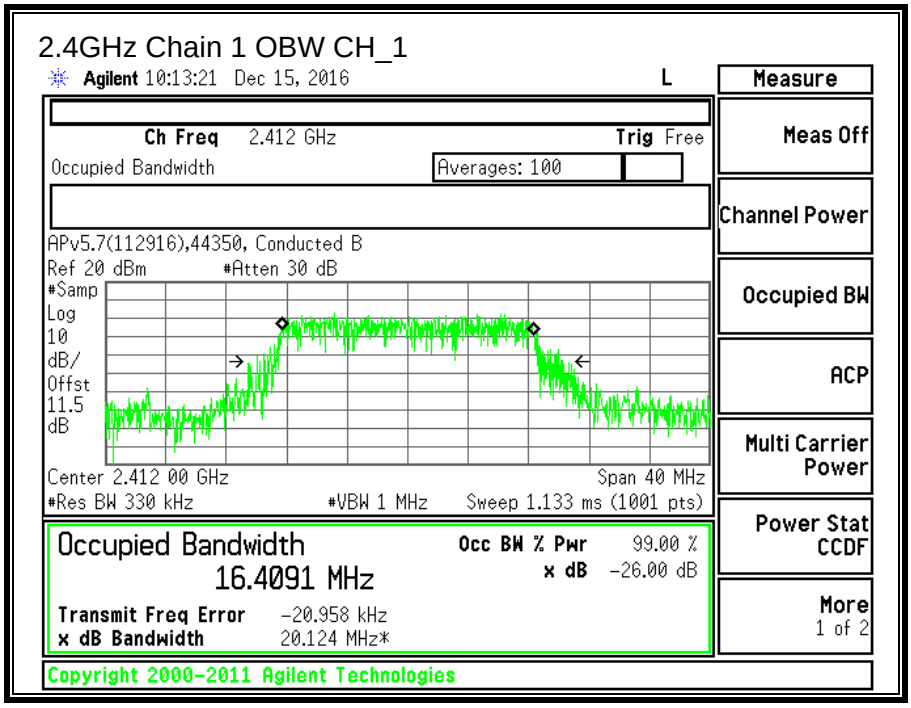
None; for reporting purposes only.

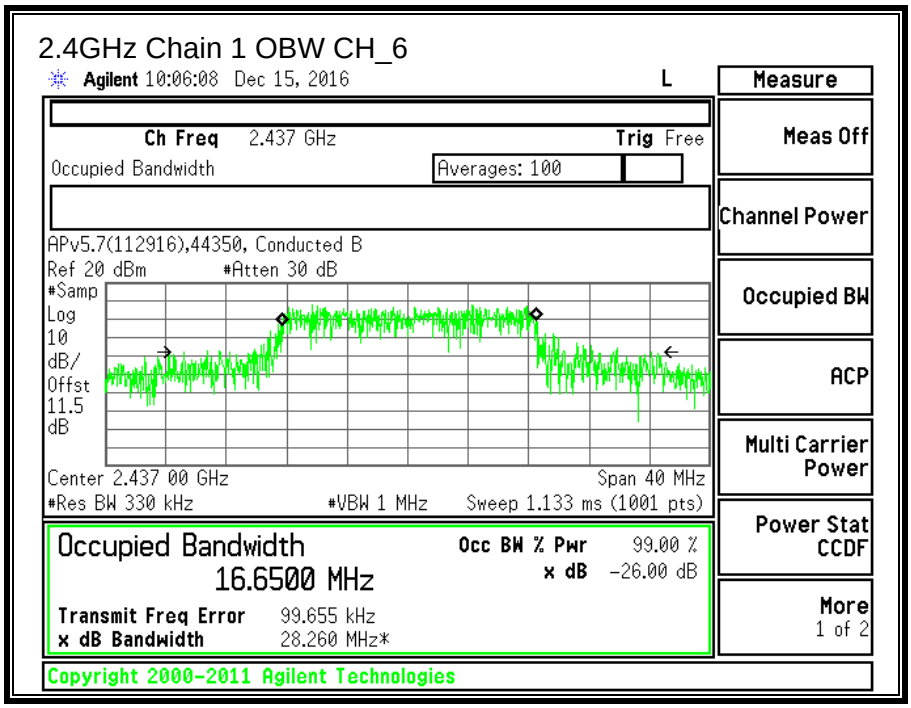
TEST PROCEDURE

ANSI C63.10: 2013 Section 6.9.3

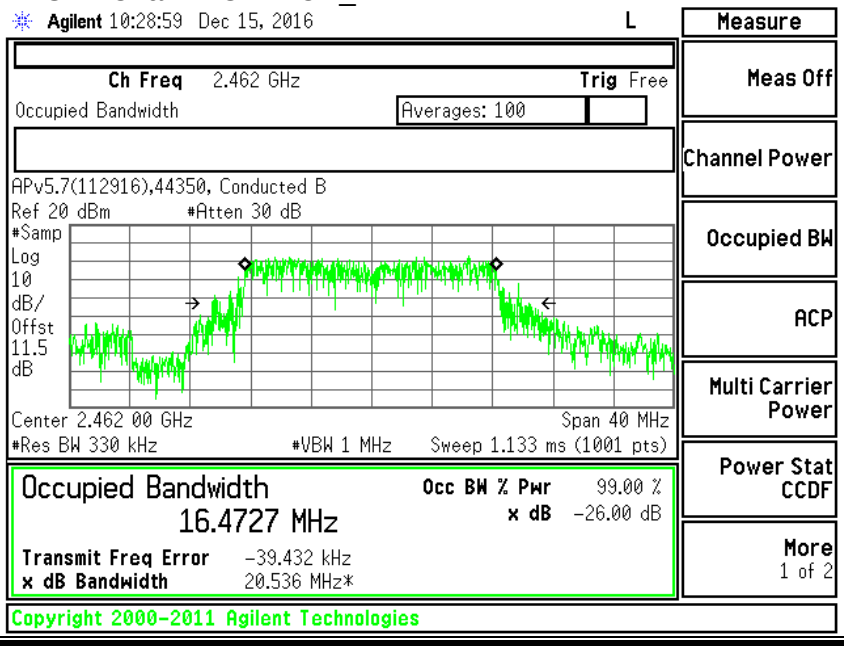
RESULTS

Channel	Frequency (MHz)	99% Bandwidth Chain 1 (MHz)
Low_1	2412	16.4091
Middle_6	2437	16.6500
High_11	2462	16.4727
High_12	2467	16.3440
High_13	2472	16.2457

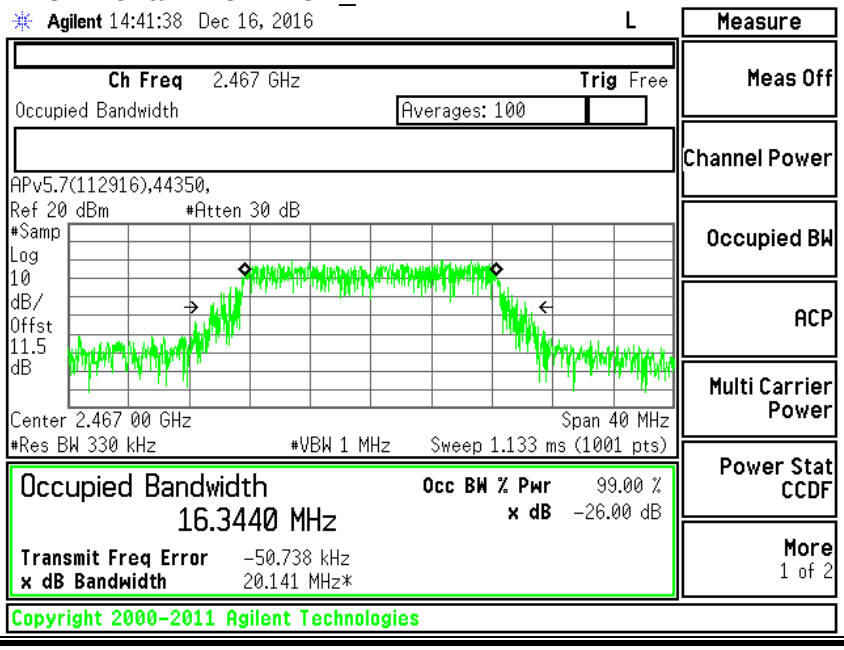


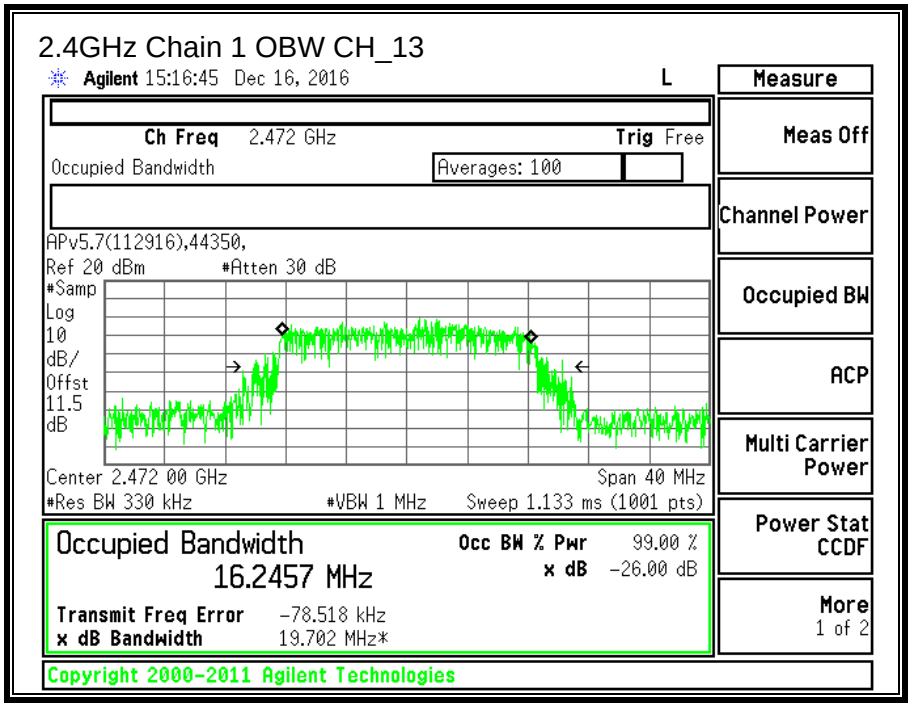


2.4GHz Chain 1 OBW CH_11



2.4GHz Chain 1 OBW CH_12





11.4.3. OUTPUT POWER

LIMITS

FCC §15.247

IC RSS-247 (5.4) (4)

For systems using digital modulation in the 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

KDB 58074 D01 v03r05 Section 9.2.3.2

RESULTS

ID:	44350	Date:	12/19/2016

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low_1	2412	2.86	30.00	30	36	30.00
Mid_6	2437	2.86	30.00	30	36	30.00
High_11	2462	2.86	30.00	30	36	30.00
High_12	2467	2.86	30.00	30	36	30.00
High_13	2472	2.86	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Core 1 Meas Power (dBm)	Power Limit (dBm)	Margin (dB)
Low_1	2412	15.27	30.00	-14.73
Mid_6	2437	18.33	30.00	-11.67
High_11	2462	14.17	30.00	-15.83
High_12	2467	11.02	30.00	-18.98
High_13	2472	8.29	30.00	-21.71

Note: the power readings above were measured with gated method, and the measurement was taken only during the ON time. No duty cycle correction was necessary.

11.4.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247

IC RSS-247 (5.2) (2)

For digitally modulated systems, the power spectral density conducted form the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 KHz band during any time interval of continuous transmissions.

TEST PROCEDURE

KDB 58074 D01 v03r05 Section 10.3

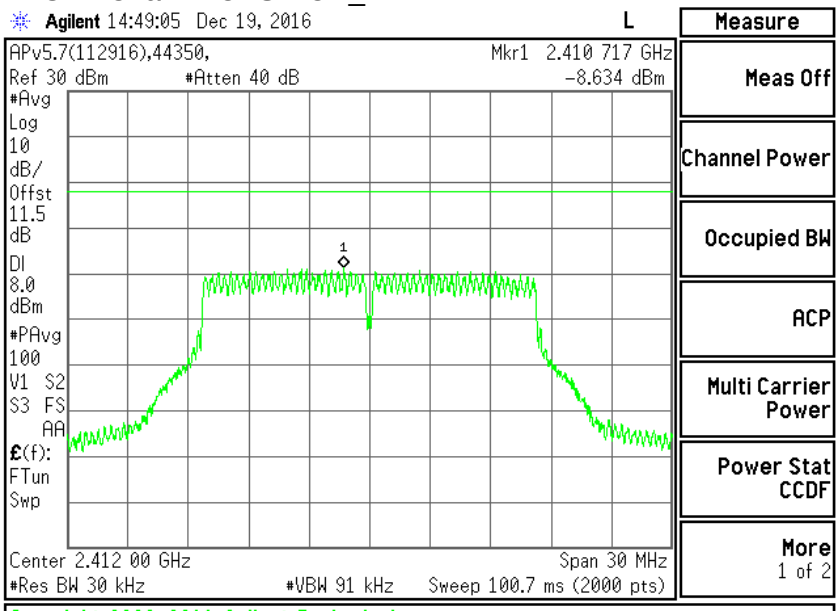
RESULTS

Duty Cycle CF (dB)	0.30	Included in Calculations of Corr'd PSD

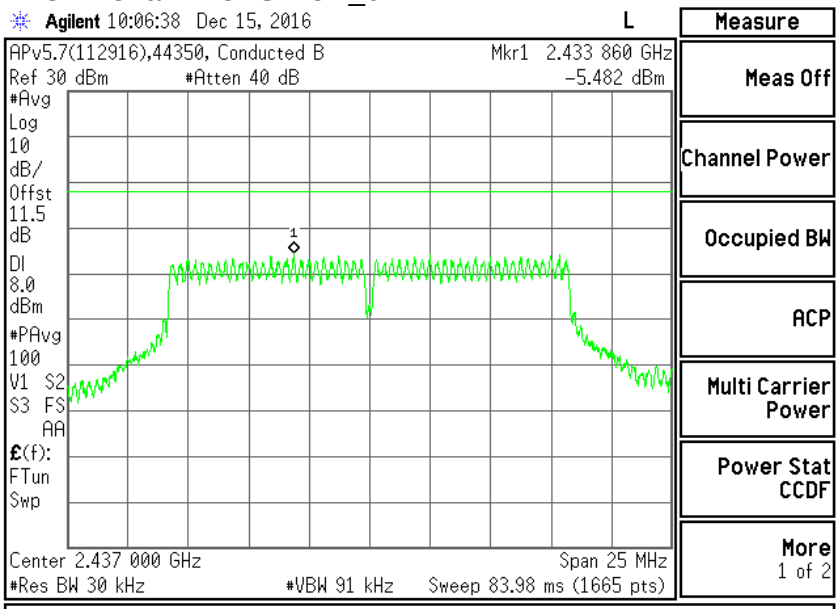
PSD Results

Channel	Frequency (MHz)	Core 1 Meas (dBm)	Limit (dBm)	Margin (dB)
Low_1	2412	-8.634	8.0	-16.6
Mid_6	2437	-5.482	8.0	-13.5
High_11	2462	-9.570	8.0	-17.6
High_12	2467	-12.568	8.0	-20.6
High_13	2472	-15.421	8.0	-23.4

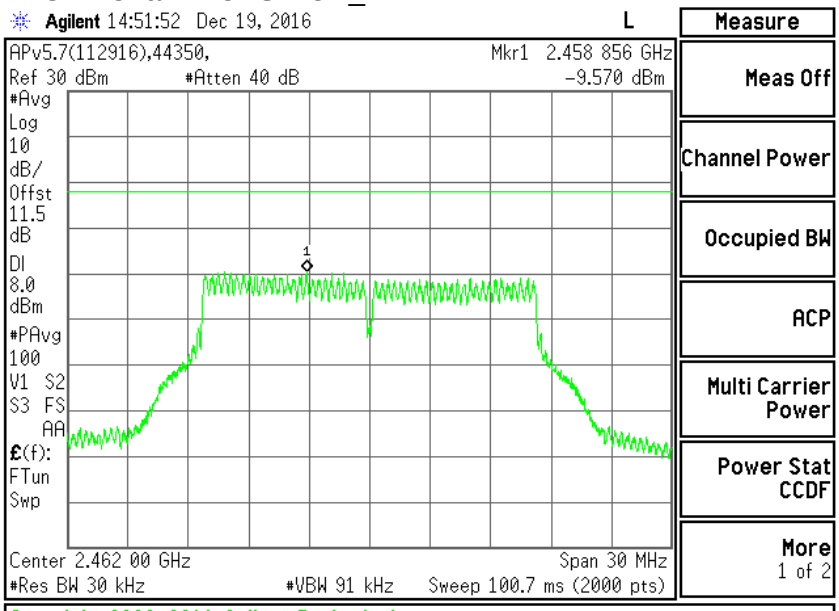
2.4GHz Chain 1 CPSD CH_1



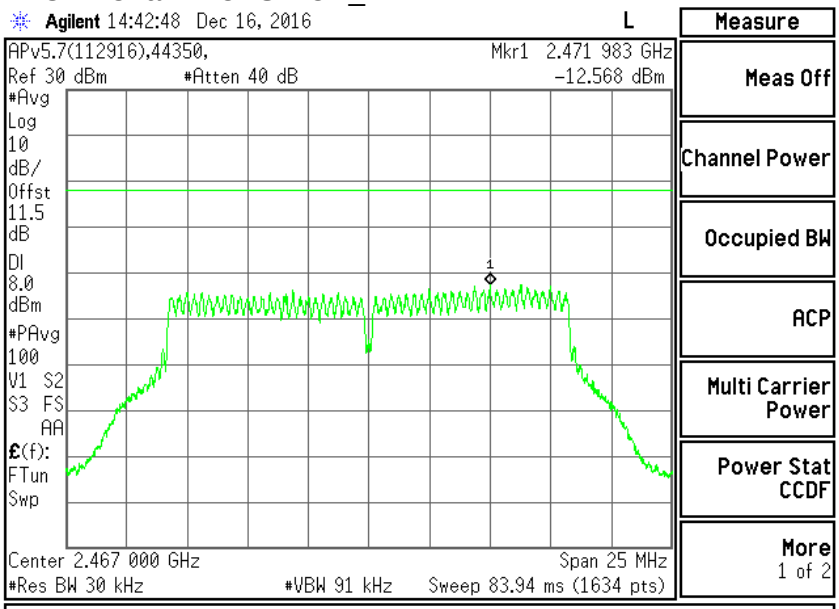
2.4GHz Chain 1 CPSD CH_6



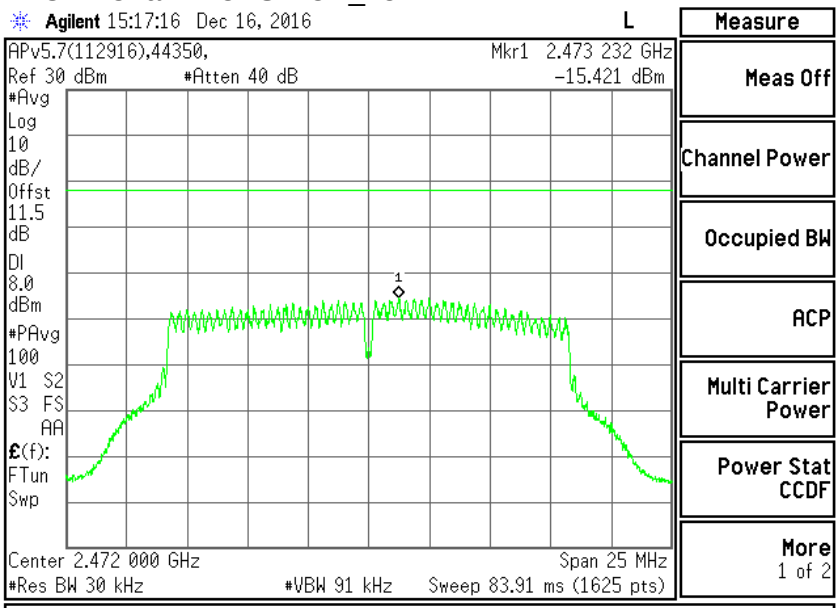
2.4GHz Chain 1 CPSD CH_11



2.4GHz Chain 1 CPSD CH_12

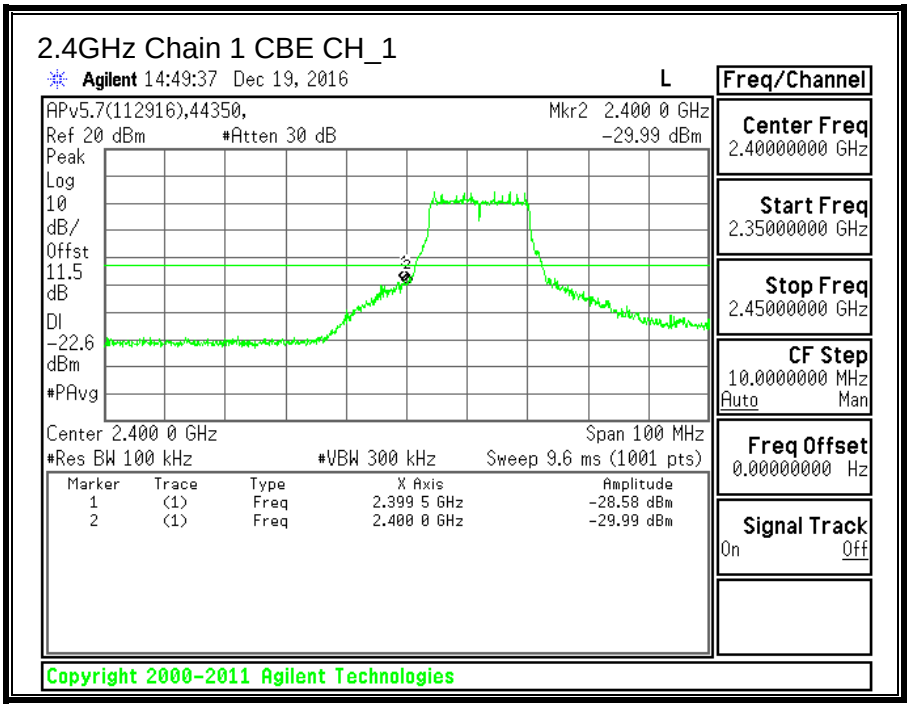


2.4GHz Chain 1 CPSD CH_13

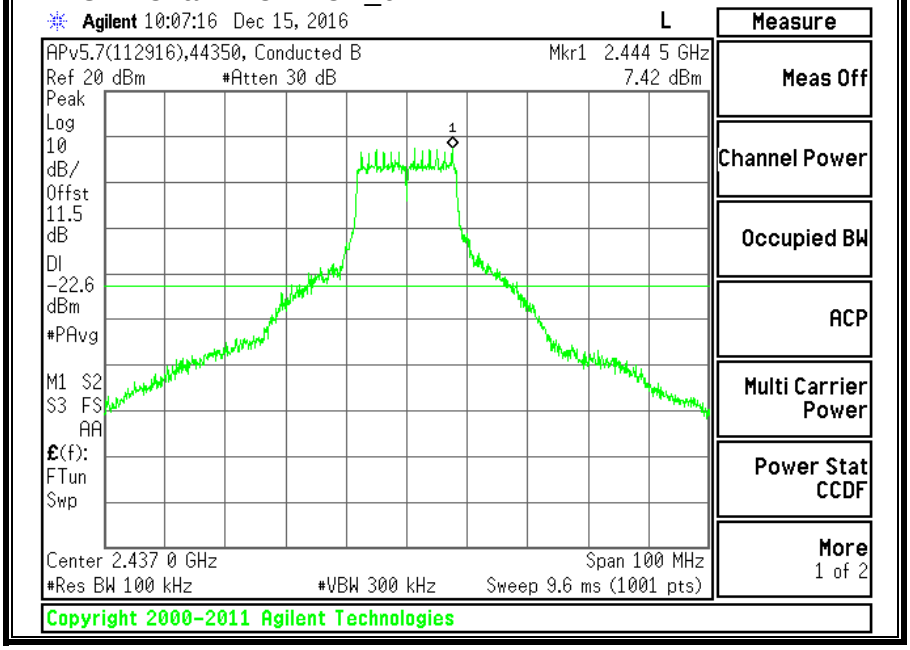


11.4.5. CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS

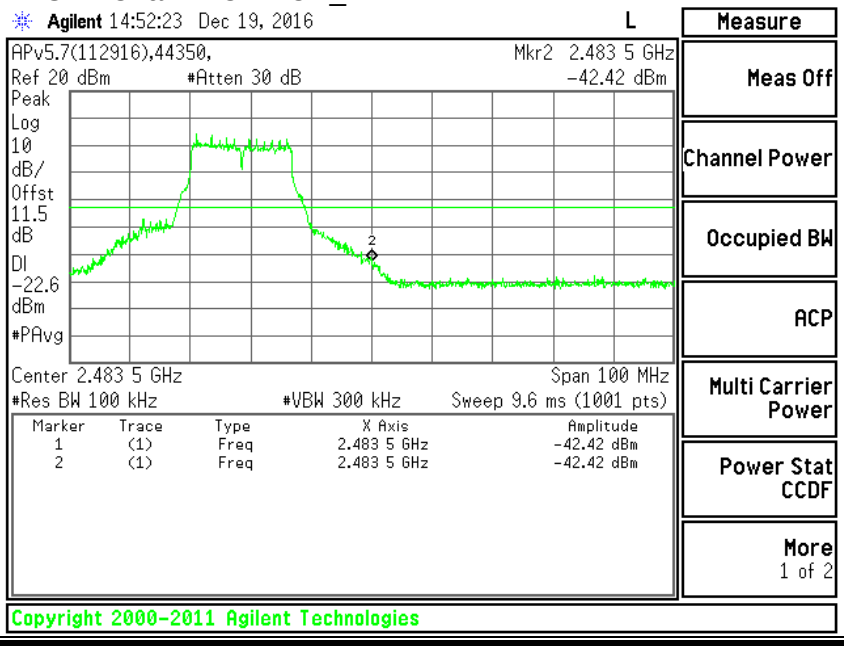
2.4GHz Chain 1 CBE CH_1



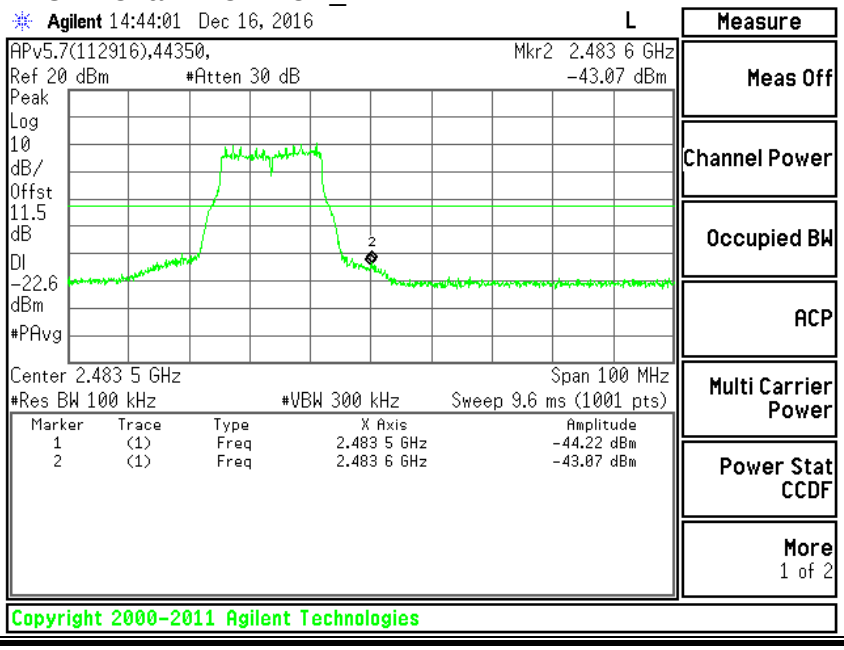
2.4GHz Chain 1 CBE CH_6



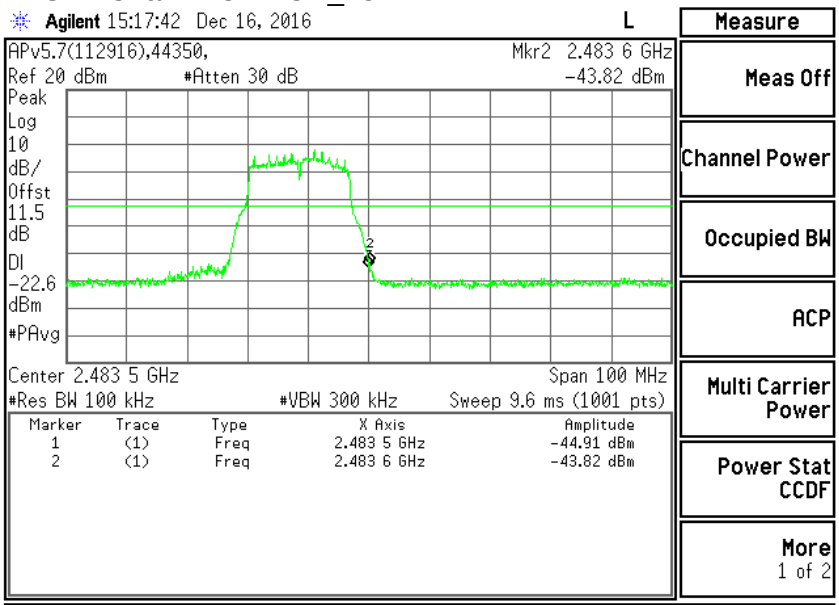
2.4GHz Chain 1 CBE CH_11



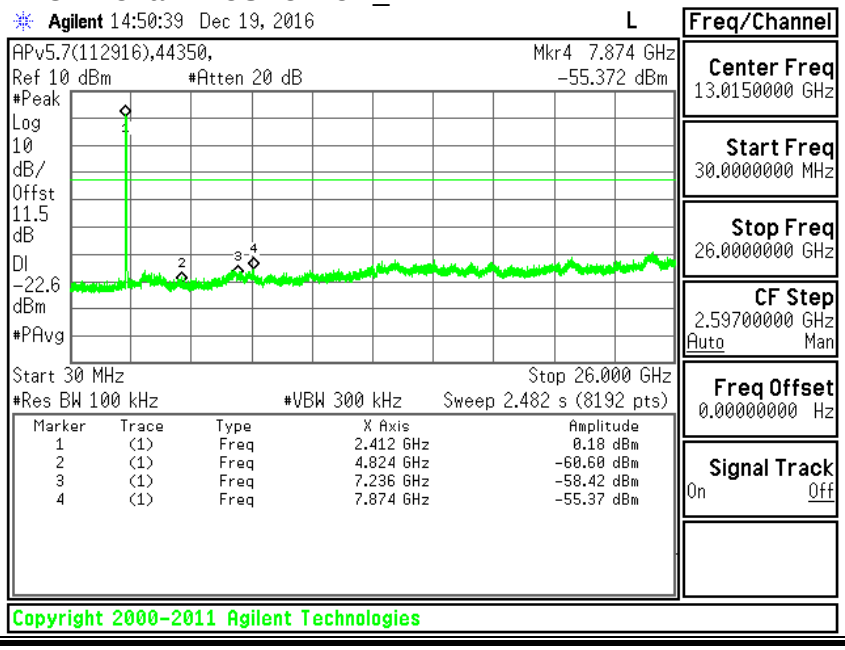
2.4GHz Chain 1 CBE CH_12



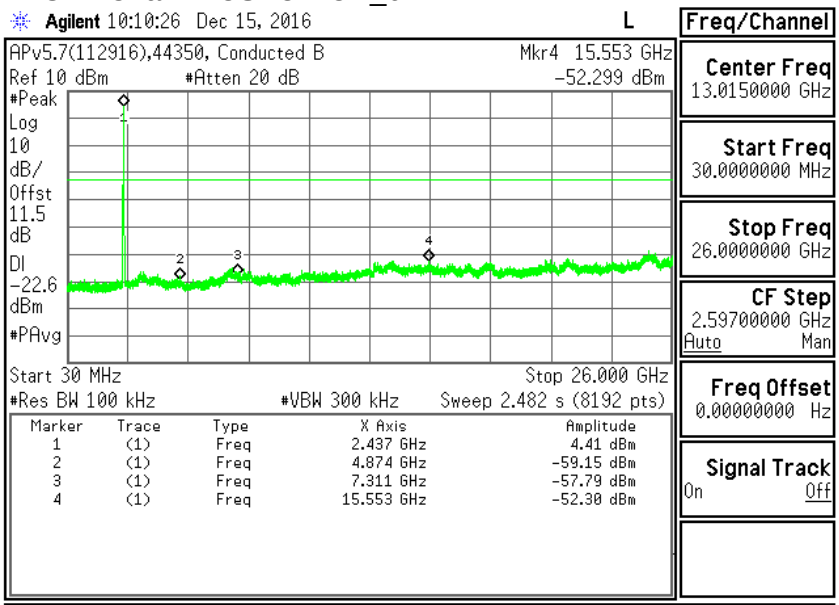
2.4GHz Chain 1 CBE CH_13



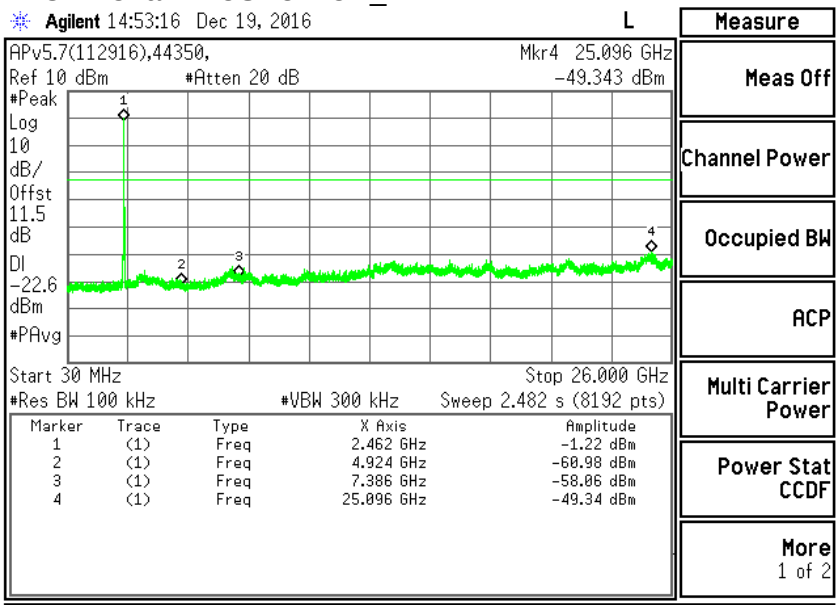
2.4GHz Chain 1 CSPUR CH_1



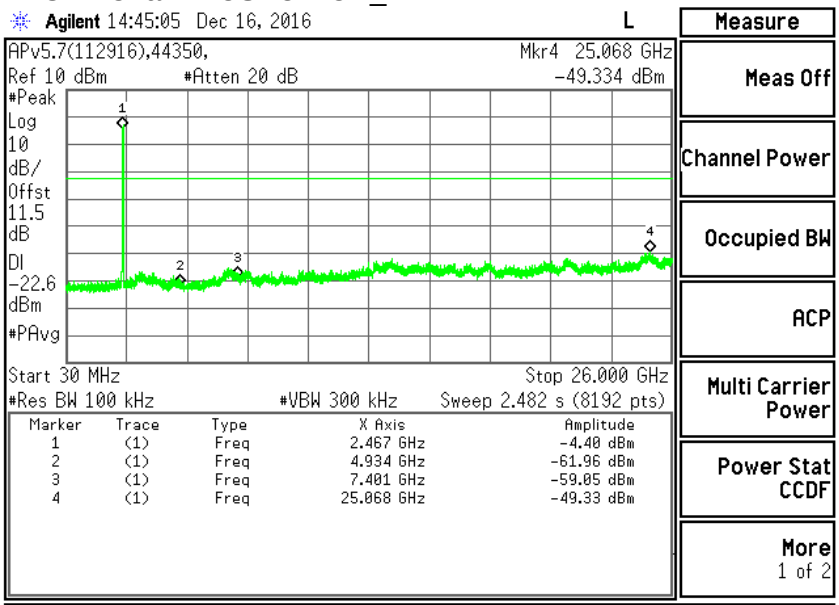
2.4GHz Chain 1 CSPUR CH_6



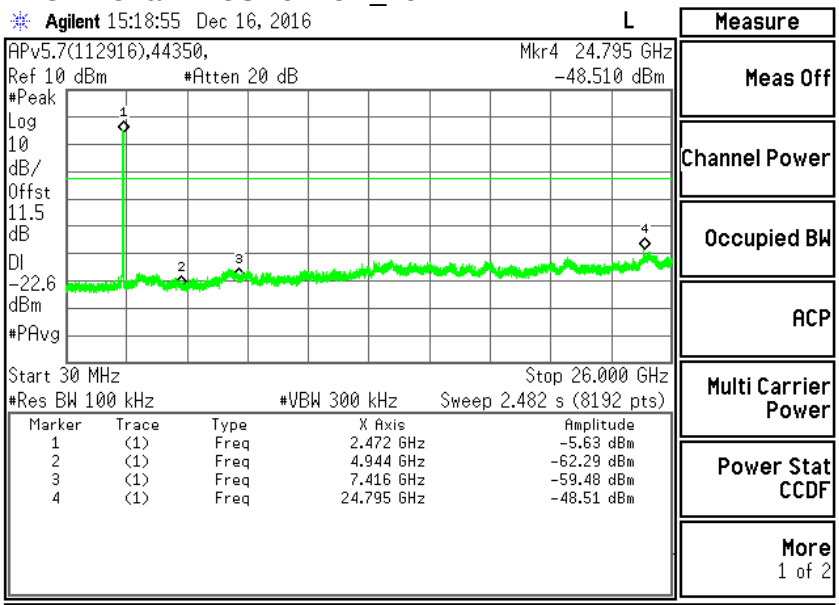
2.4GHz Chain 1 CSPUR CH_11



2.4GHz Chain 1 CSPUR CH_12



2.4GHz Chain 1 CSPUR CH_13



11.5. 11n HT20 2TX CDD MIMO MODE IN THE 2.4GHz BAND

11.5.1. 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.

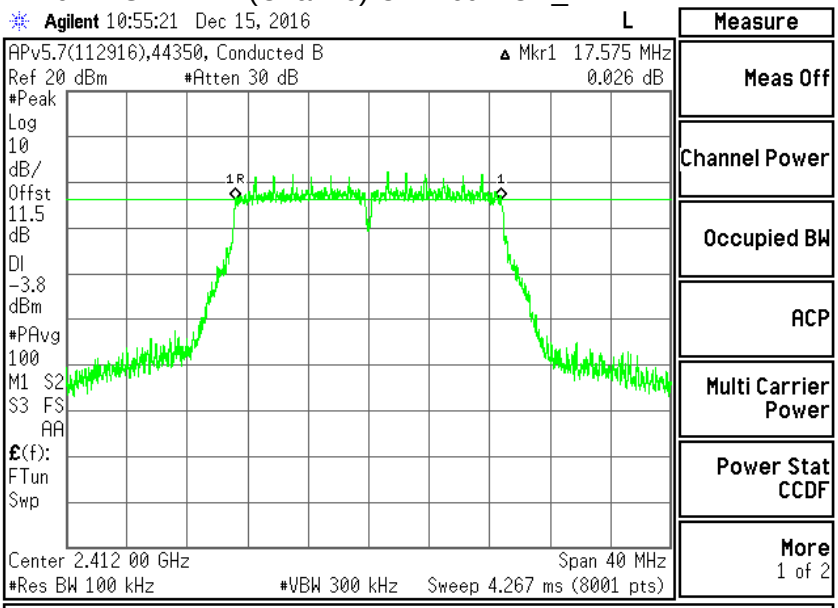
TEST PROCEDURE

KDB 58074 D01 v03r05 Section 8.1

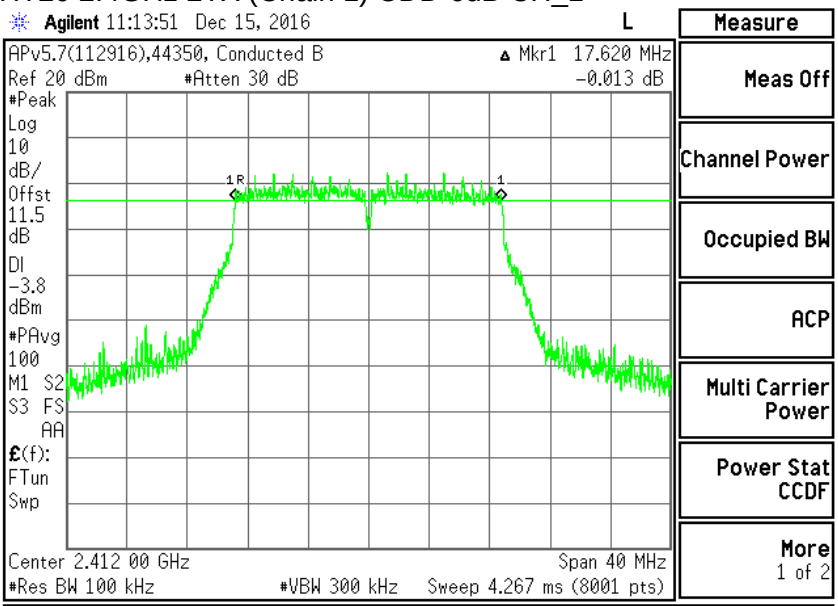
RESULTS

Channel	Frequency	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	Minimum Limit (MHz)
Low_1	2412	17.575	17.620	0.5
Middle_6	2437	17.605	17.605	0.5
High_11	2462	17.625	17.615	0.5
High_12	2467	17.590	17.575	0.5
High_13	2472	15.110	15.685	0.5

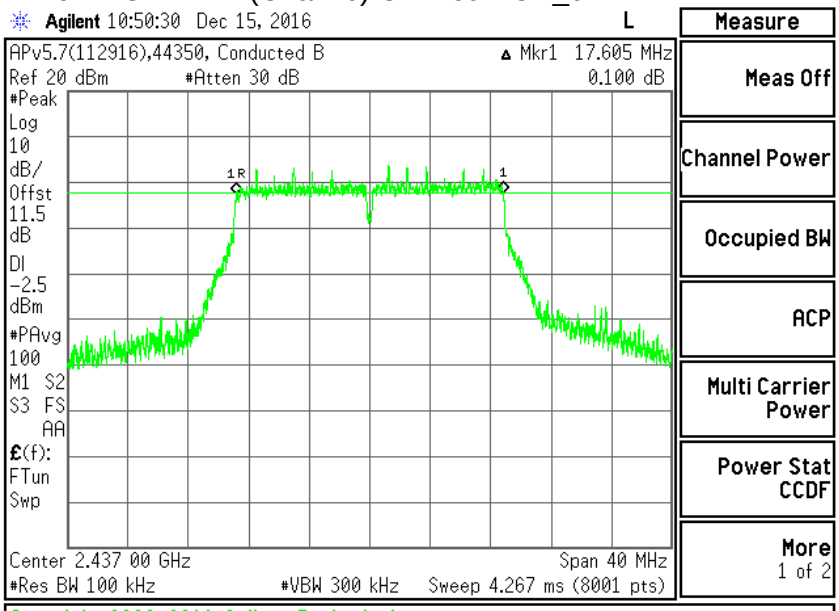
HT20 2.4GHz 2TX (Chain 0) CDD 6dB CH_1



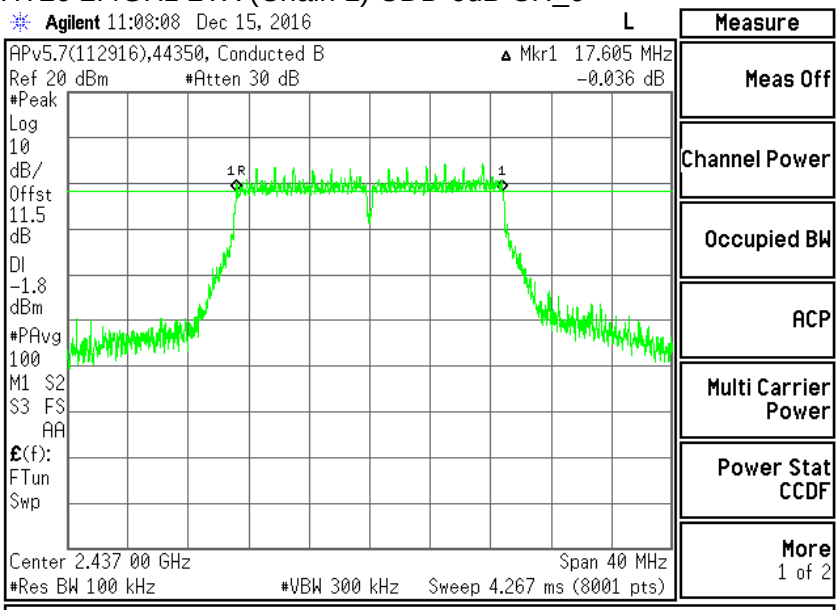
HT20 2.4GHz 2TX (Chain 1) CDD 6dB CH_1



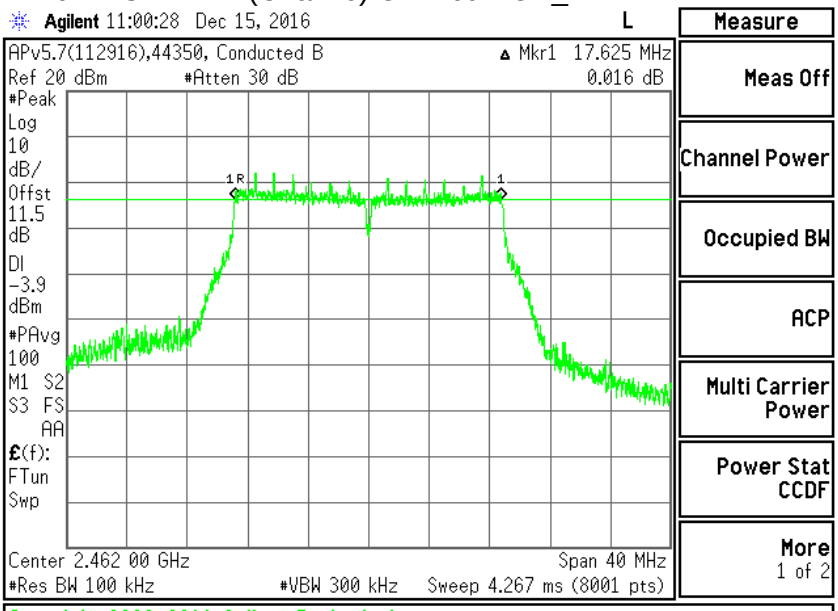
HT20 2.4GHz 2TX (Chain 0) CDD 6dB CH_6



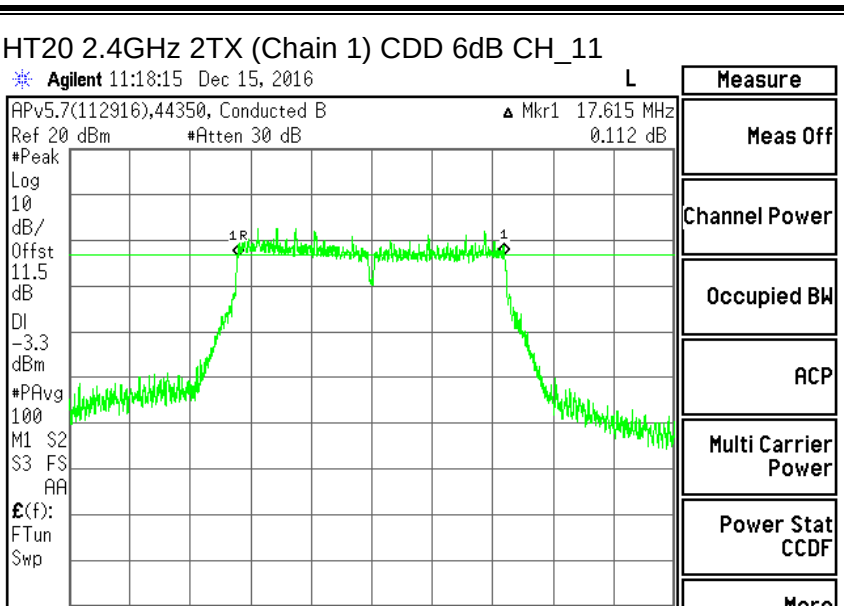
HT20 2.4GHz 2TX (Chain 1) CDD 6dB CH_6



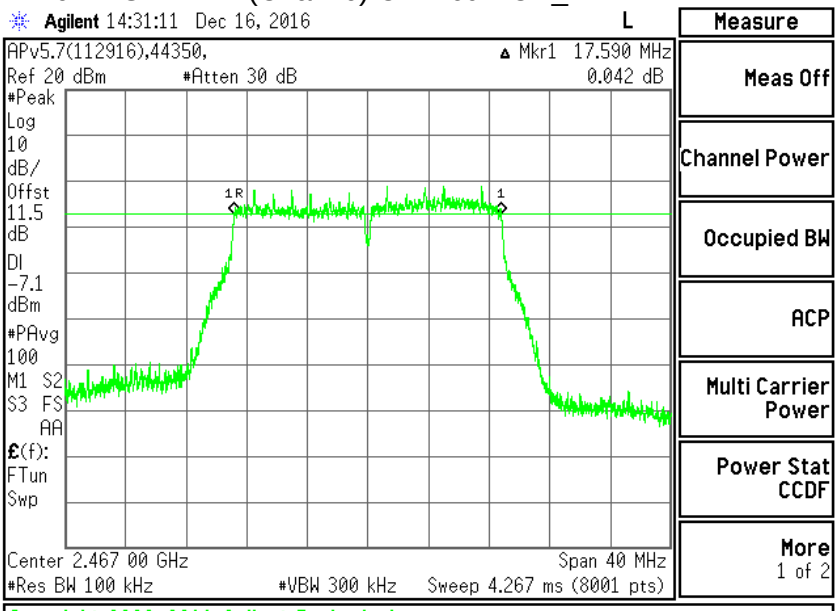
HT20 2.4GHz 2TX (Chain 0) CDD 6dB CH_11



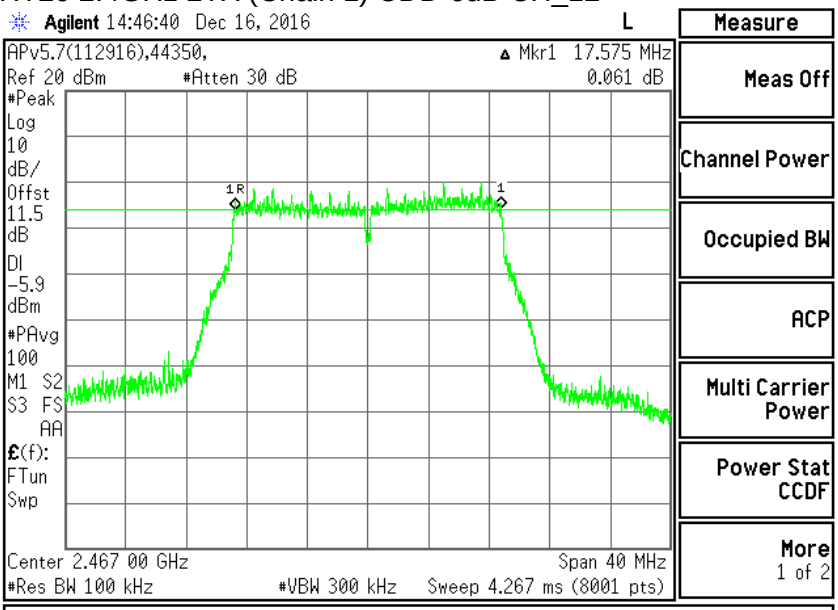
HT20 2.4GHz 2TX (Chain 1) CDD 6dB CH_11



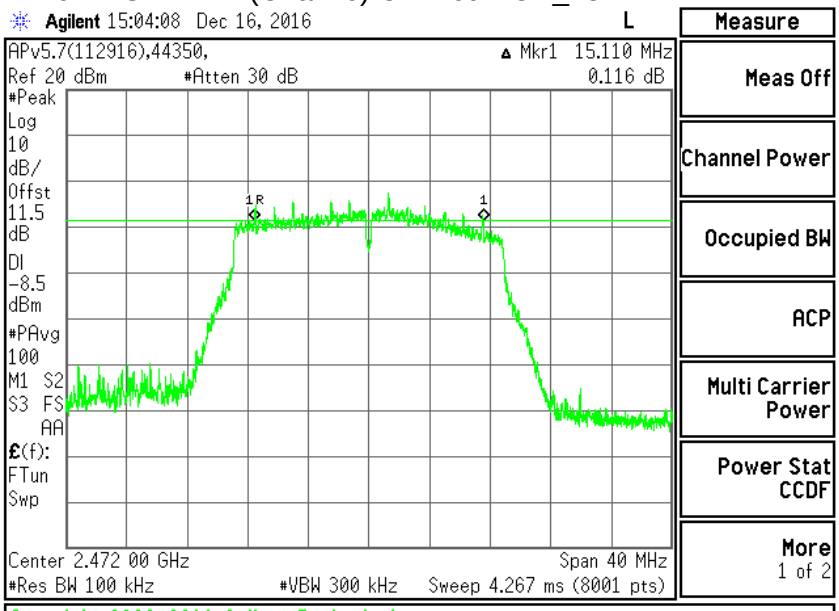
HT20 2.4GHz 2TX (Chain 0) CDD 6dB CH_12



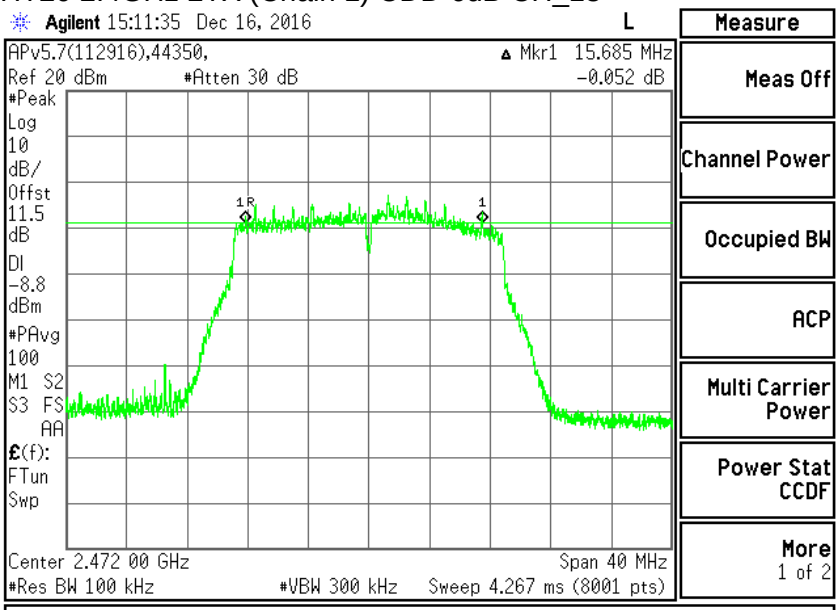
HT20 2.4GHz 2TX (Chain 1) CDD 6dB CH_12



HT20 2.4GHz 2TX (Chain 0) CDD 6dB CH_13



HT20 2.4GHz 2TX (Chain 1) CDD 6dB CH_13



11.5.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

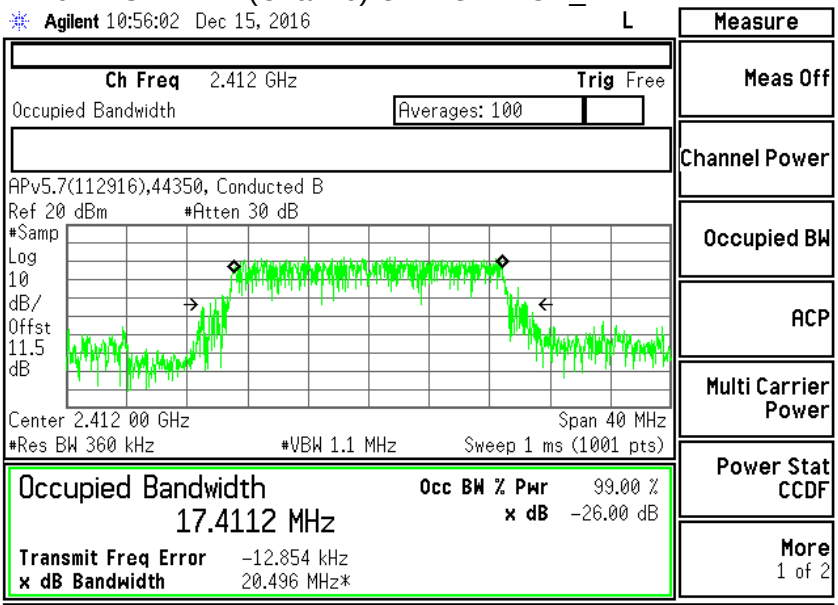
TEST PROCEDURE

ANSI C63.10: 2013 Section 6.9.3

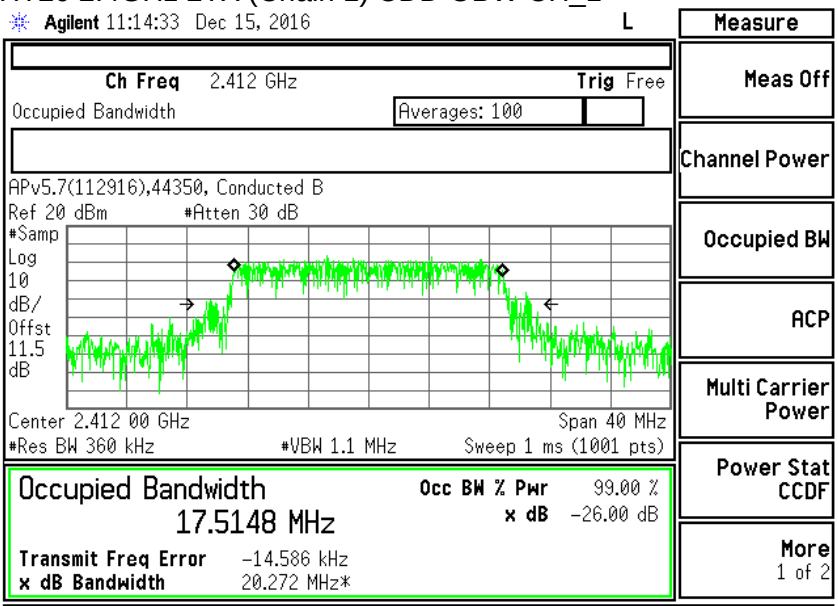
RESULTS

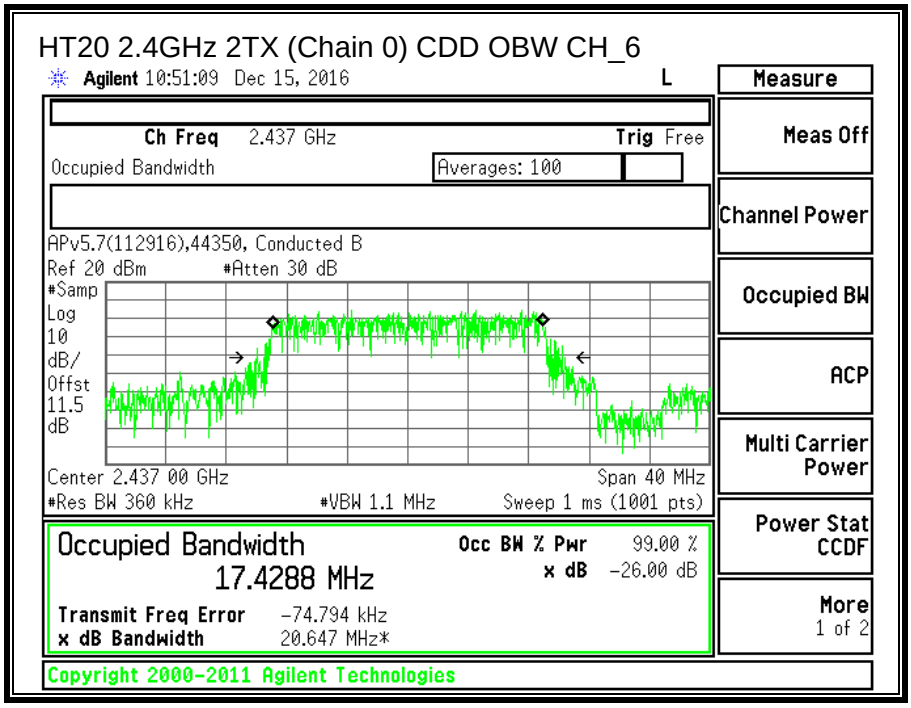
Channel	Frequency (MHz)	99% Bandwidth Chain 0 (MHz)	99% Bandwidth Chain 1 (MHz)
Low_1	2412	17.4112	17.5148
Middle_6	2437	17.4288	17.4933
High_11	2462	17.5817	17.4361
High_12	2467	17.3420	17.3680
High_13	2472	17.1676	17.2285

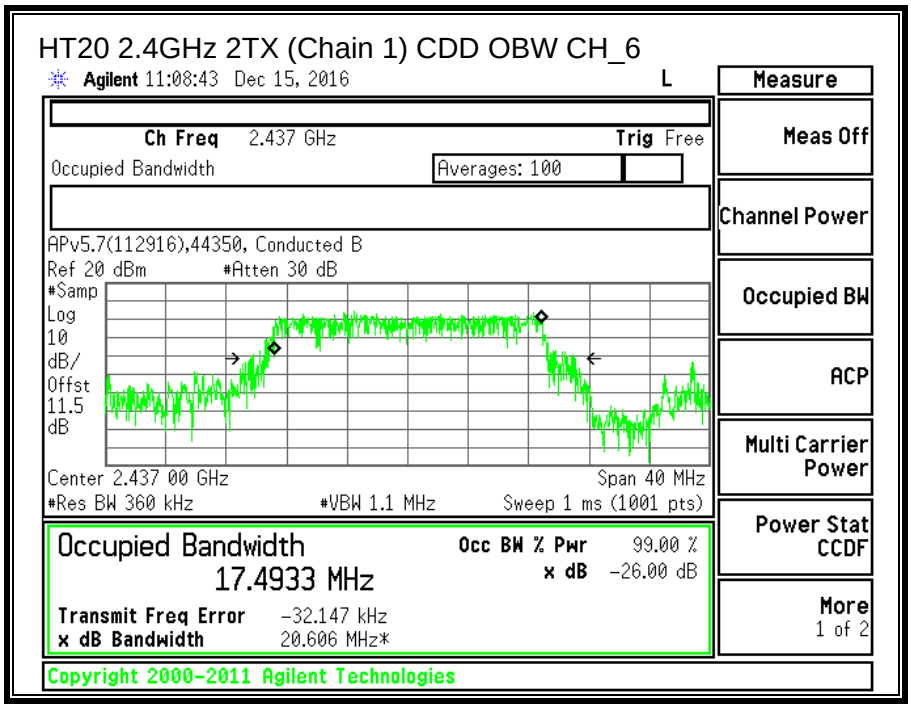
HT20 2.4GHz 2TX (Chain 0) CDD OBW CH_1

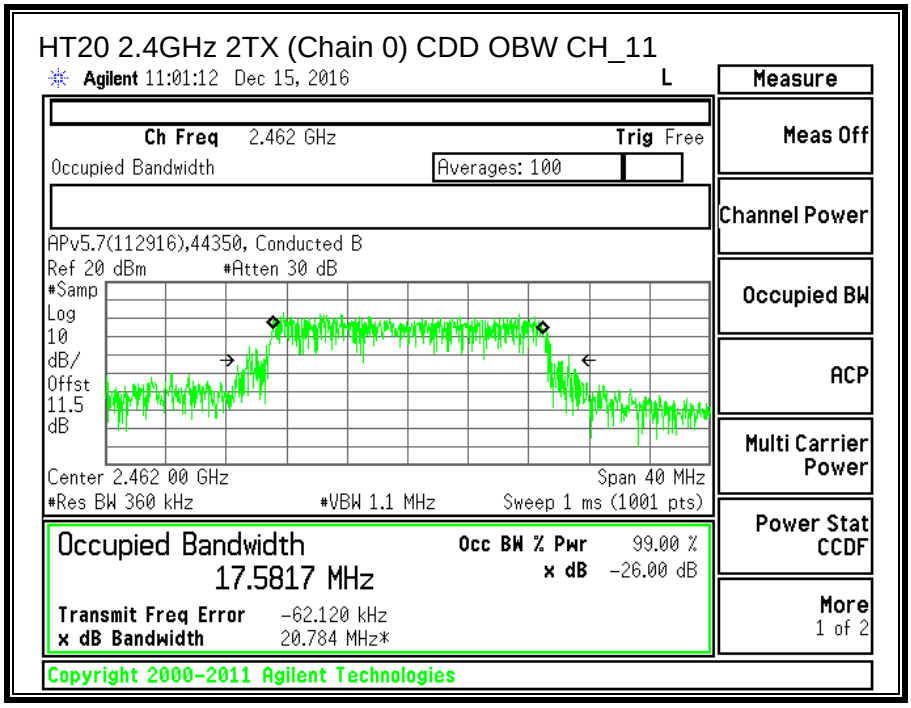


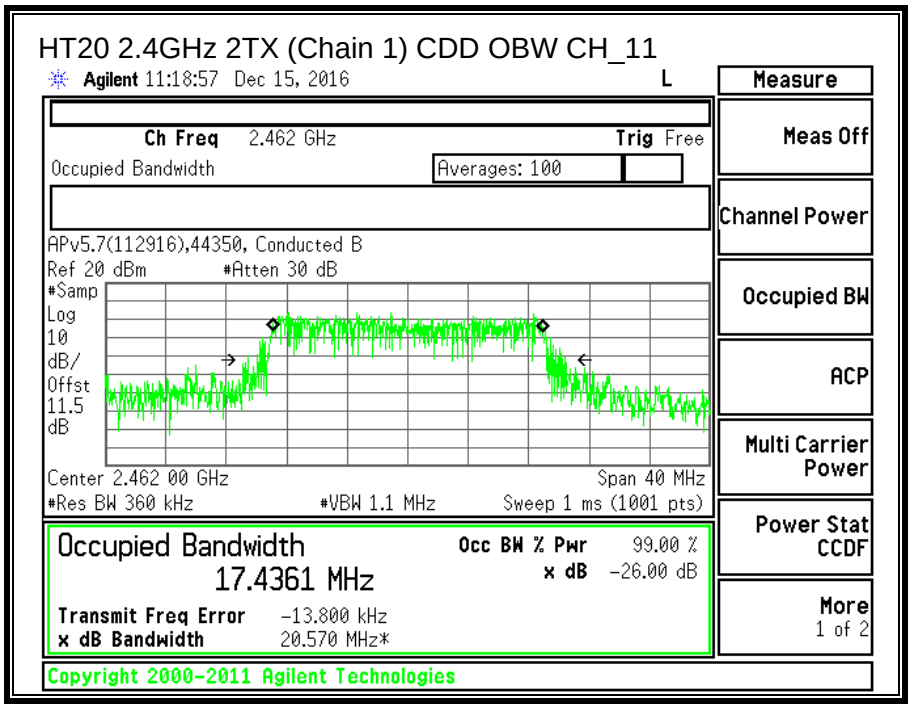
HT20 2.4GHz 2TX (Chain 1) CDD OBW CH_1

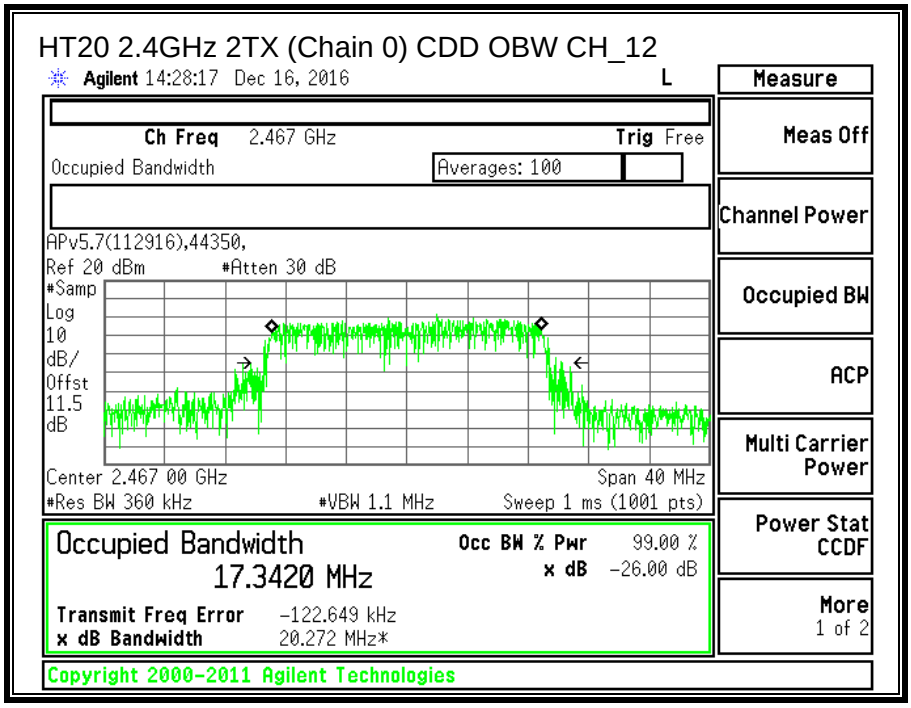


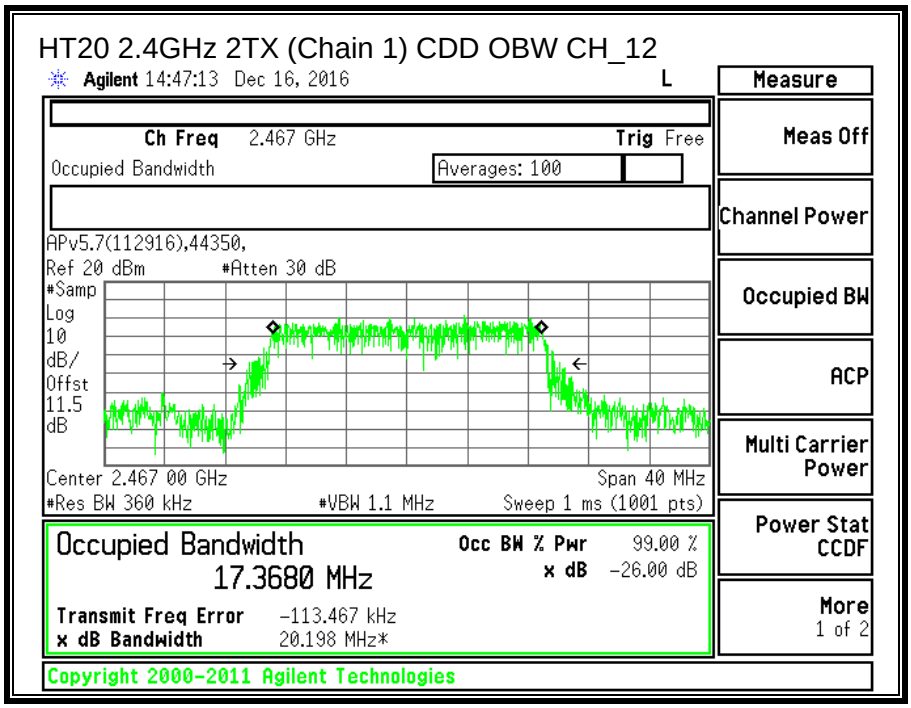


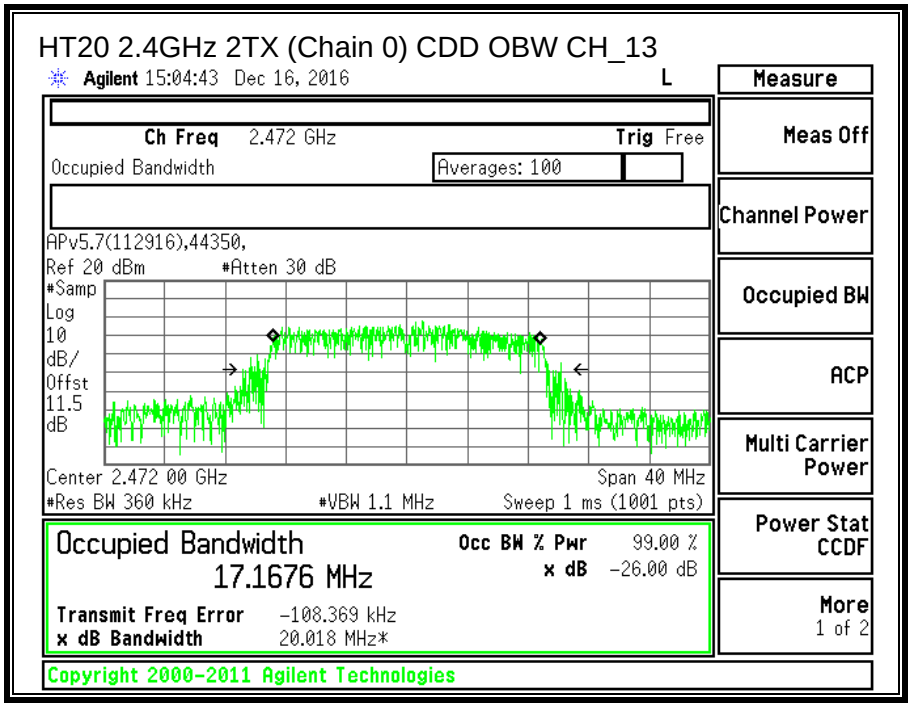


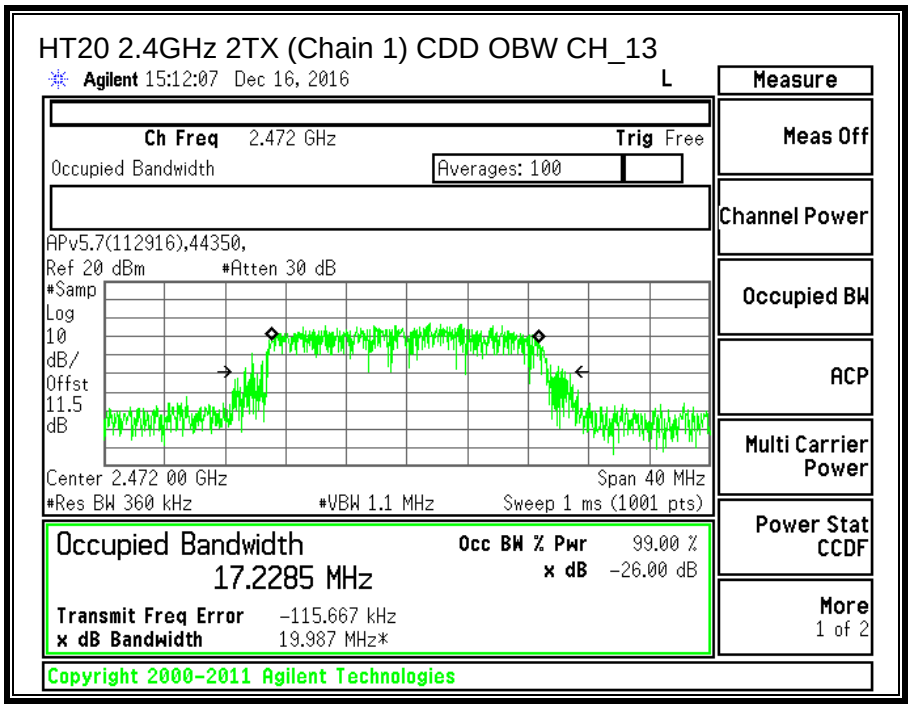












11.5.3. OUTPUT POWER

LIMITS

FCC §15.247

IC RSS-247 (5.4) (4)

For systems using digital modulation in the 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

The TX chains are uncorrelated and the antenna gain is unequal among the chains. The directional gain is:

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)
2.86	2.86	2.86

TEST PROCEDURE

KDB 58074 D01 v03r05 Section 9.2.3.2

RESULTS

ID:	44350	Date:	12/19/2016

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low_1	2412	2.86	30.00	30	36	30.00
Mid_6	2437	2.86	30.00	30	36	30.00
High_11	2462	2.86	30.00	30	36	30.00
High_12	2467	2.86	30.00	30	36	30.00
High_13	2472	2.86	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Core 0 Meas Power (dBm)	Core 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low_1	2412	15.17	15.29	18.24	30.00	-11.76
Mid_6	2437	14.64	15.18	17.93	30.00	-12.07
High_11	2462	12.70	13.40	16.07	30.00	-13.93
High_12	2467	10.28	10.48	13.39	30.00	-16.61
High_13	2472	7.21	7.01	10.12	30.00	-19.88

Note: the power readings above were measured with gated method, and the measurement was taken only during the ON time. No duty cycle correction was necessary.

11.5.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247

IC RSS-247 (5.2) (2)

For digitally modulated systems, the power spectral density conducted form the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 KHz band during any time interval of continuous transmissions.

TEST PROCEDURE

KDB 58074 D01 v03r05 Section 10.3

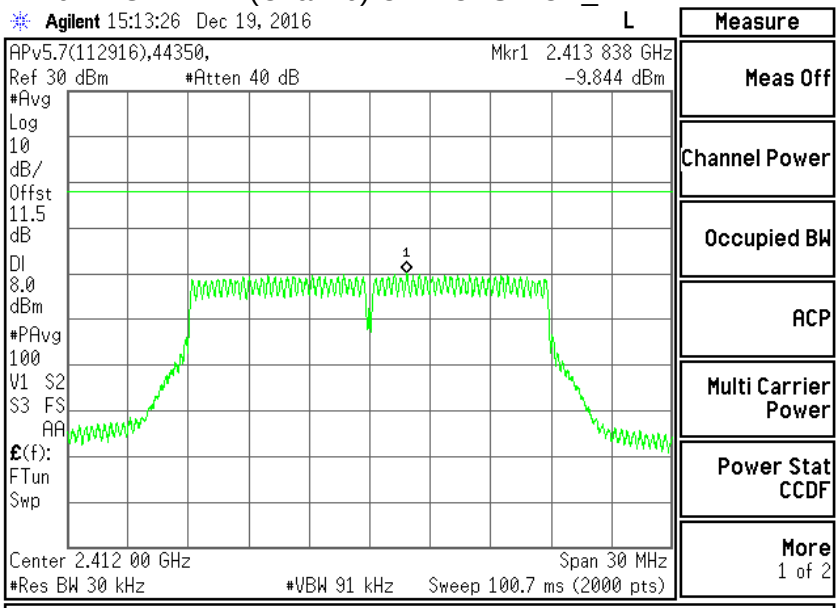
RESULTS

Duty Cycle CF (dB)	0.33	Included in Calculations of Corr'd PSD

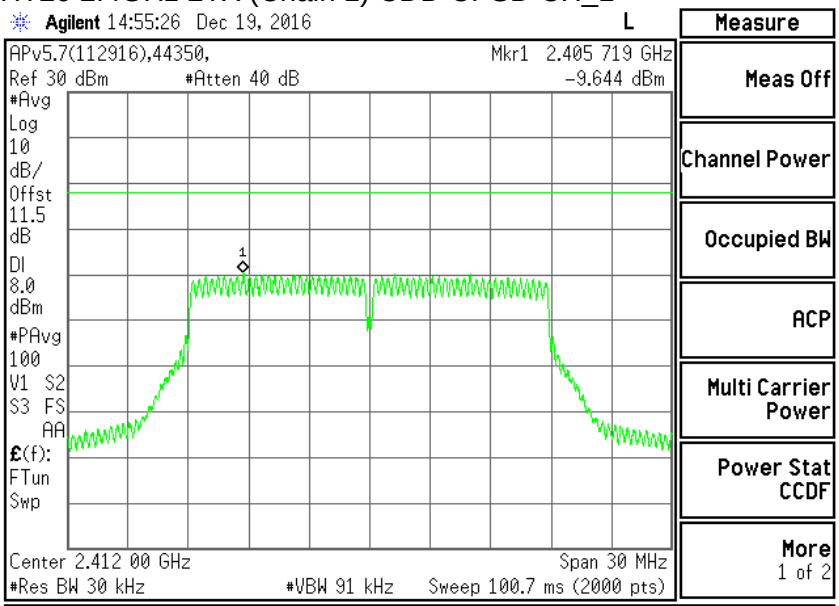
PSD Results

Channel	Frequency (MHz)	Core 0 Meas (dBm)	Core 1 Meas (dBm)	Total Corr'd PSD (dBm)	Limit (dBm)	Margin (dB)
Low_1	2412	-9.844	-9.644	-6.40	8.0	-14.4
Mid_6	2437	-9.959	-9.587	-6.43	8.0	-14.4
High_11	2462	-12.270	-11.446	-8.50	8.0	-16.5
High_12	2467	-14.417	-14.235	-10.98	8.0	-19.0
High_13	2472	-16.779	-16.818	-13.46	8.0	-21.5

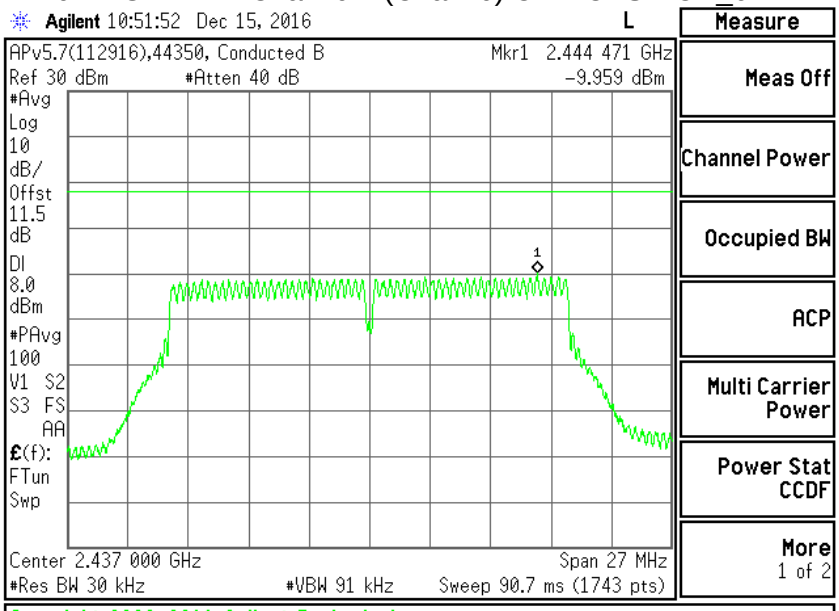
HT20 2.4GHz 2TX (Chain 0) CDD CPSD CH_1



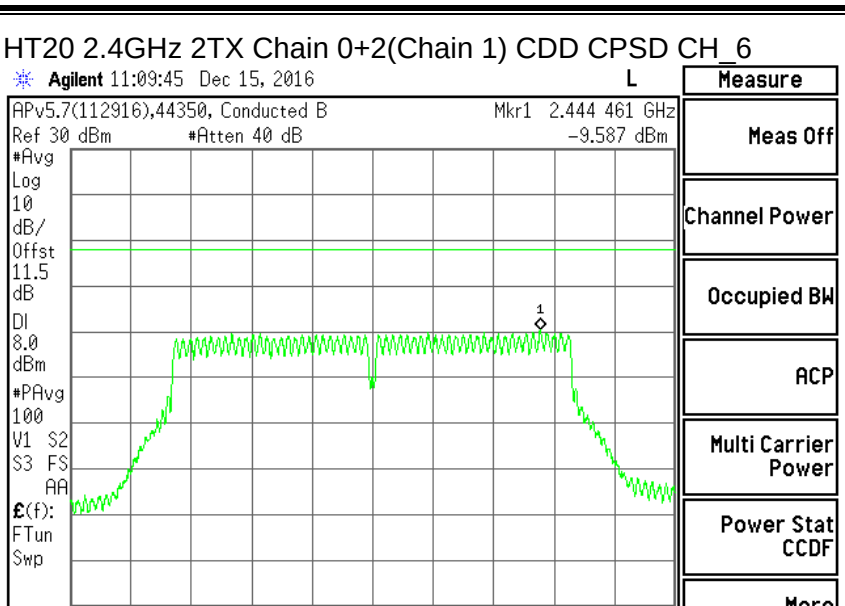
HT20 2.4GHz 2TX (Chain 1) CDD CPSD CH_1



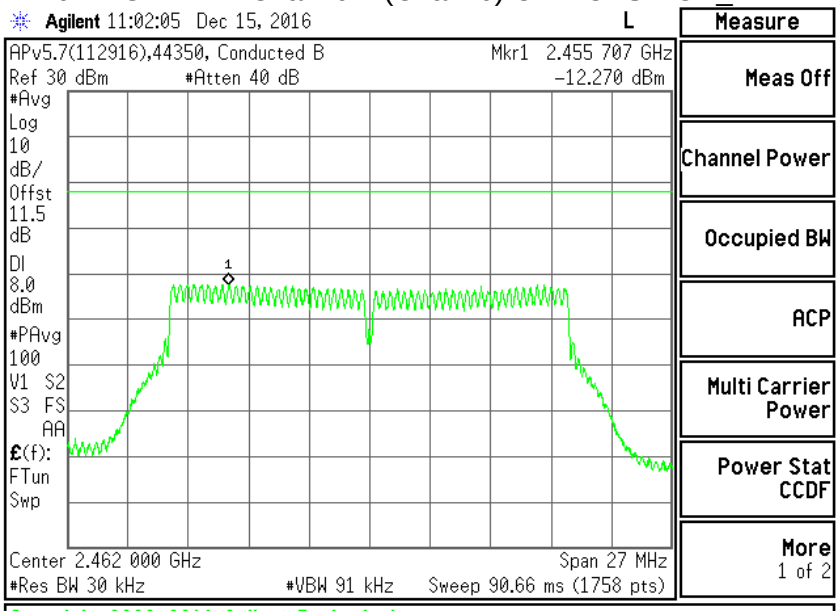
HT20 2.4GHz 2TX Chain 0+2(Chain 0) CDD CPSD CH_6



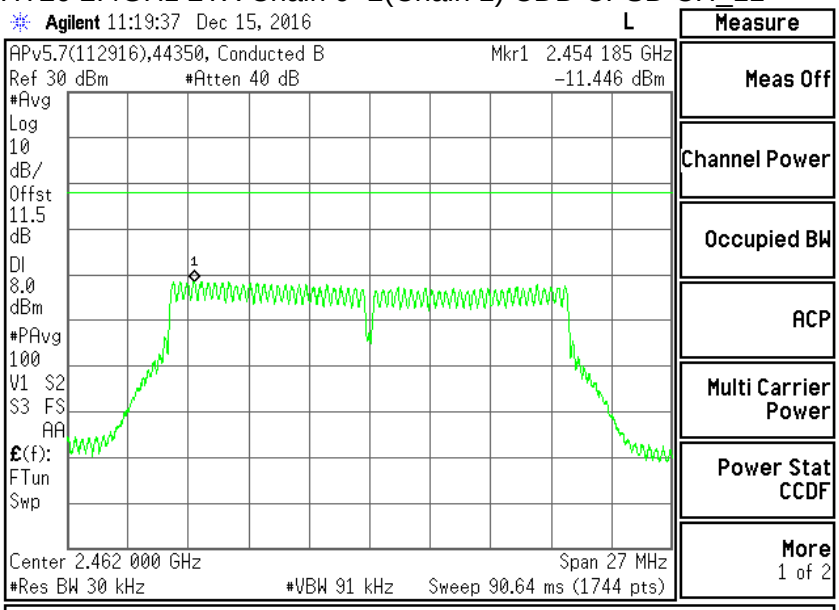
HT20 2.4GHz 2TX Chain 0+2(Chain 1) CDD CPSD CH_6



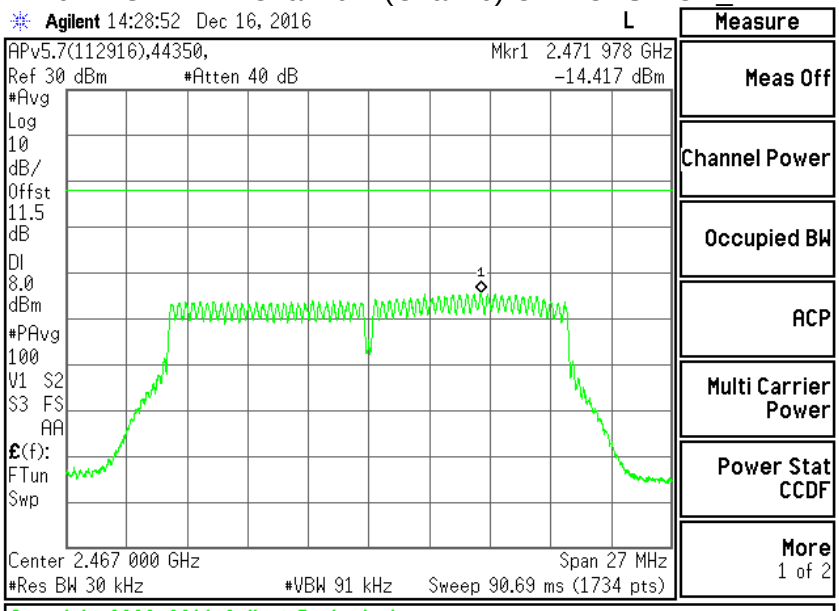
HT20 2.4GHz 2TX Chain 0+2(Chain 0) CDD CPSD CH_11



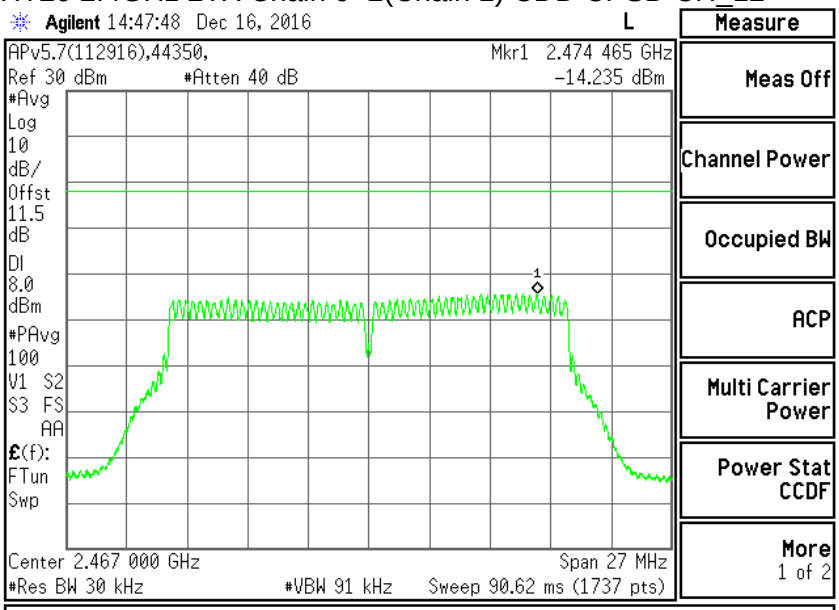
HT20 2.4GHz 2TX Chain 0+2(Chain 1) CDD CPSD CH_11



HT20 2.4GHz 2TX Chain 0+2(Chain 0) CDD CPSD CH_12



HT20 2.4GHz 2TX Chain 0+2(Chain 1) CDD CPSD CH_12



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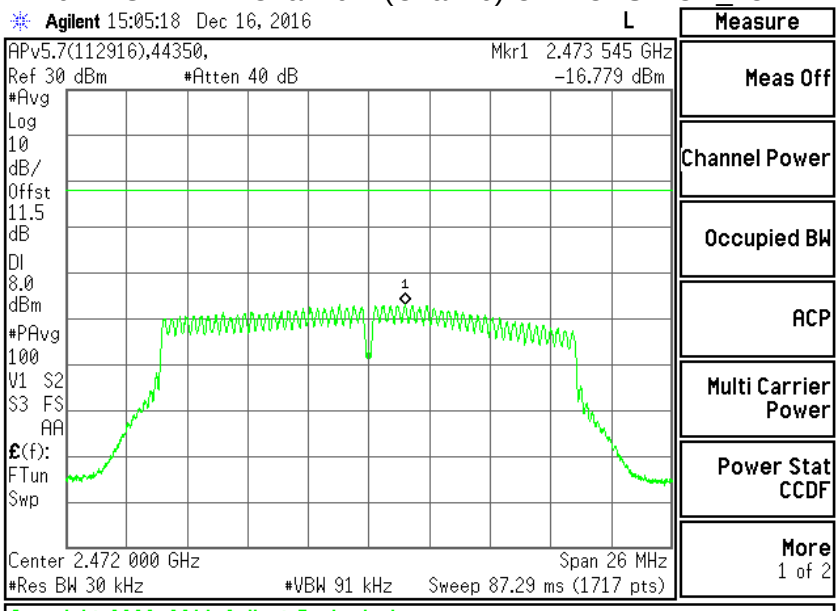
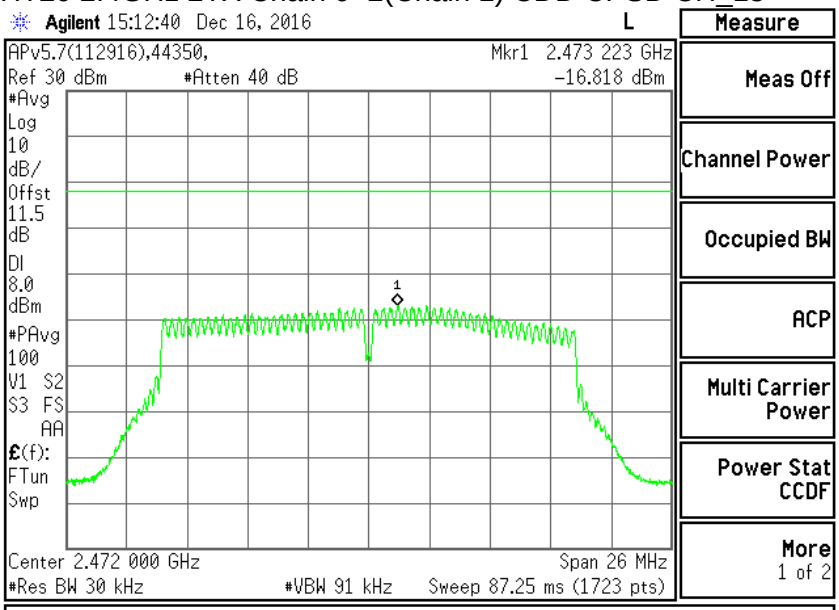
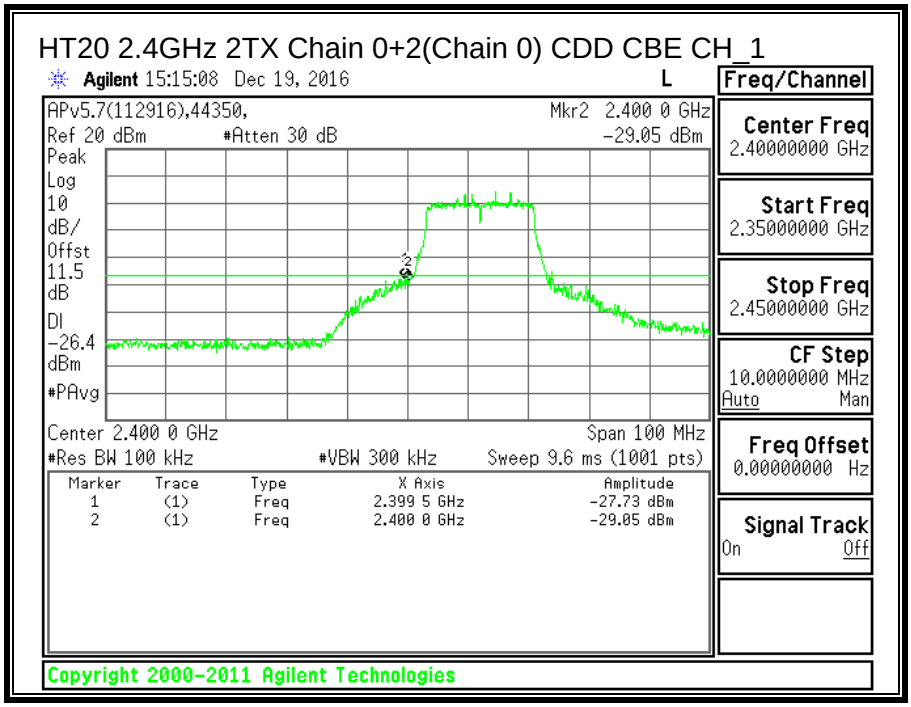


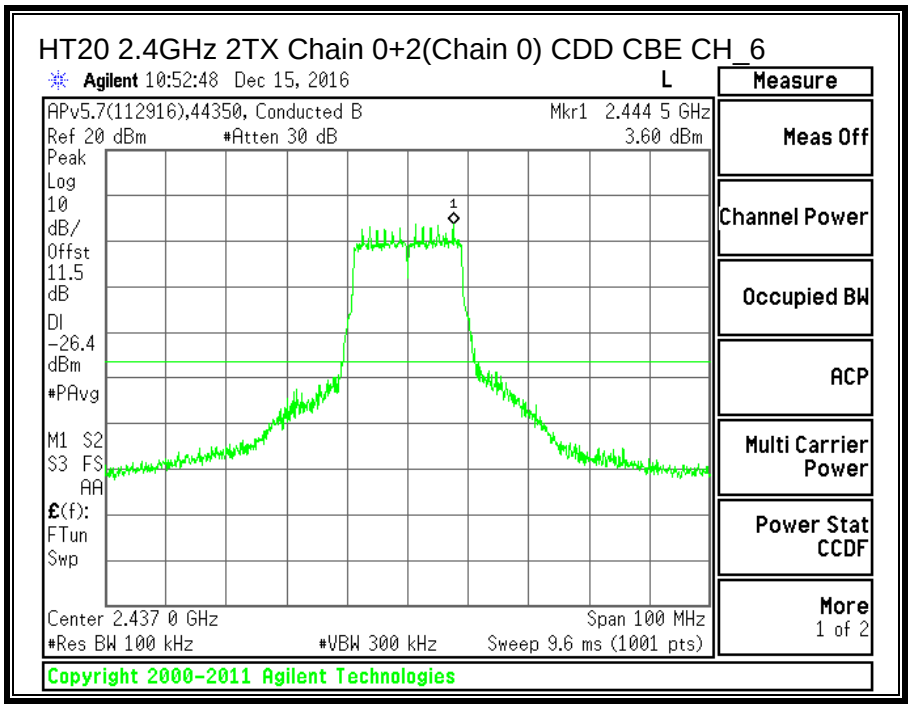
HT20 2.4GHz 2TX Chain 0+2(Chain 1) CDD CPSD CH_13



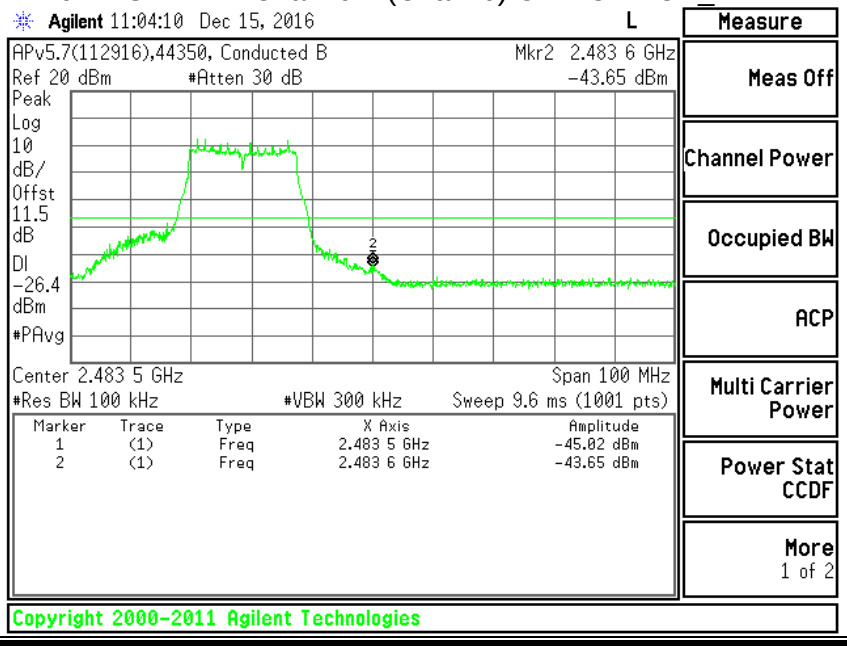
11.5.5. CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS

CHAIN 0

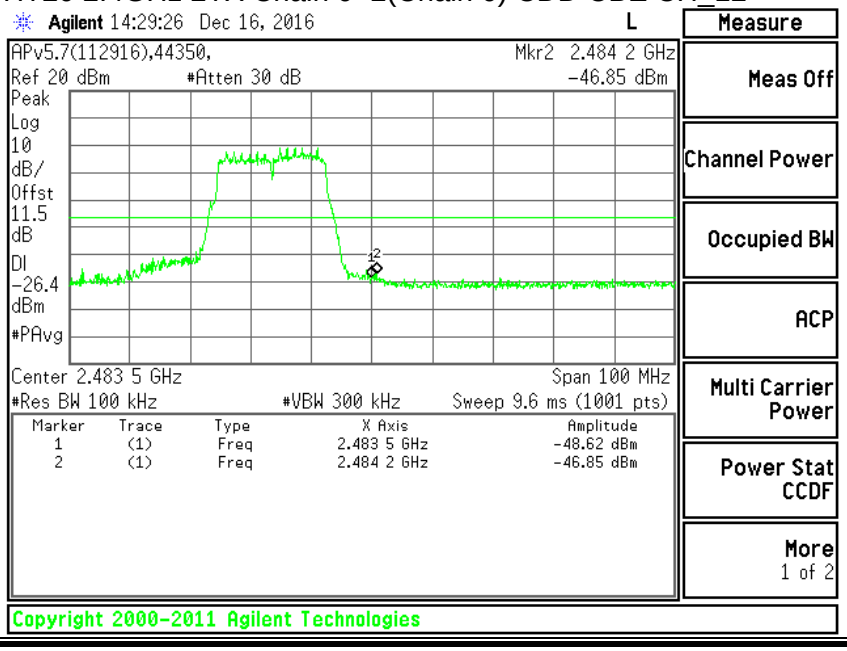




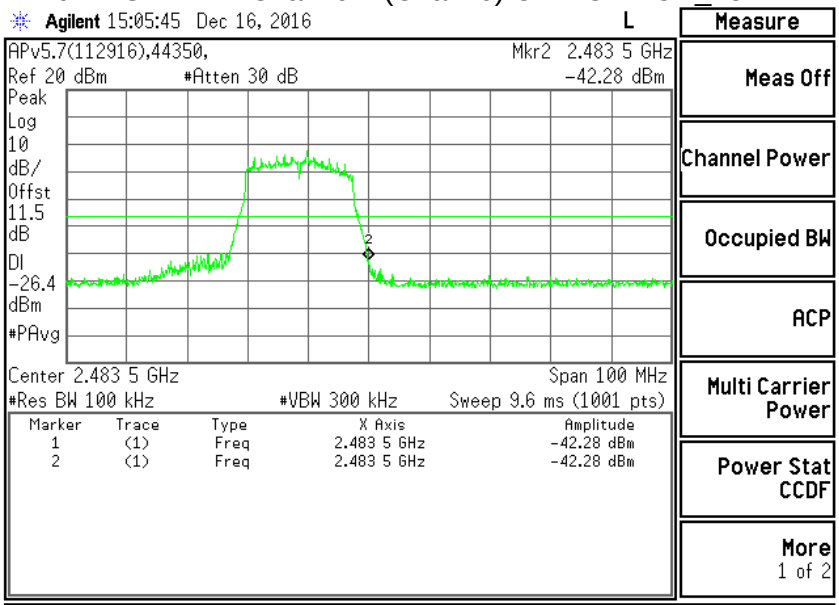
HT20 2.4GHz 2TX Chain 0+2(Chain 0) CDD CBE CH_11



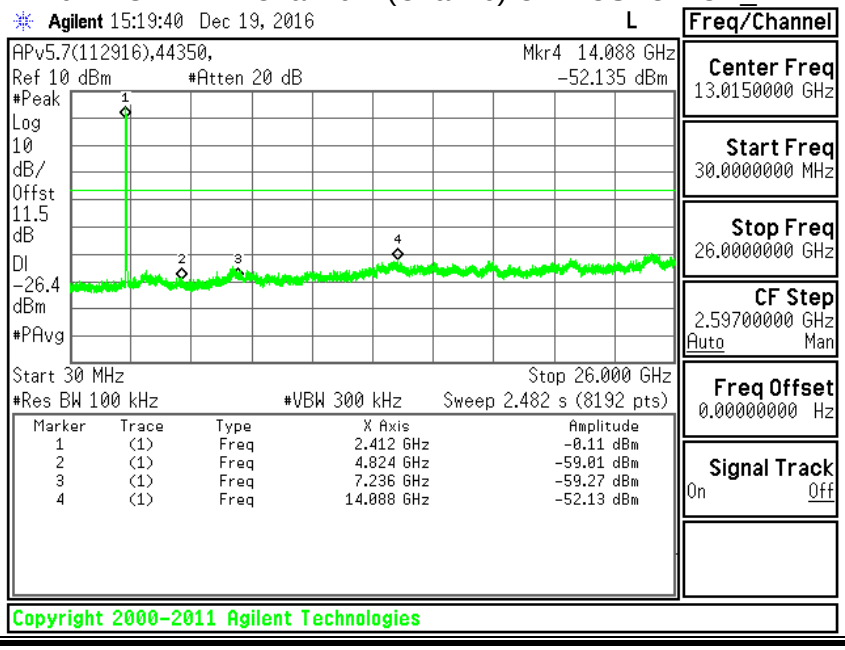
HT20 2.4GHz 2TX Chain 0+2(Chain 0) CDD CBE CH_12



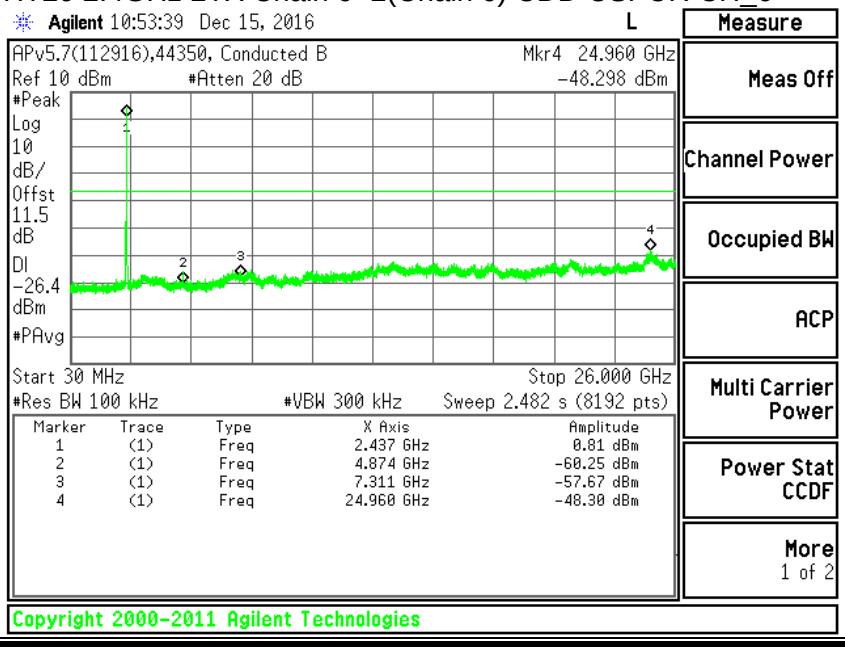
HT20 2.4GHz 2TX Chain 0+2(Chain 0) CDD CBE CH_13



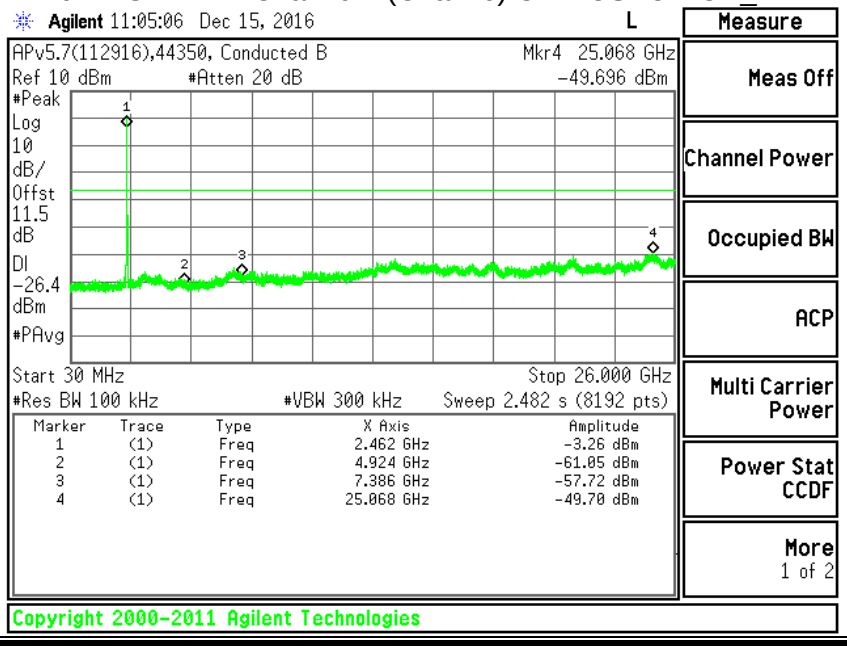
HT20 2.4GHz 2TX Chain 0+2(Chain 0) CDD CSPUR CH_1



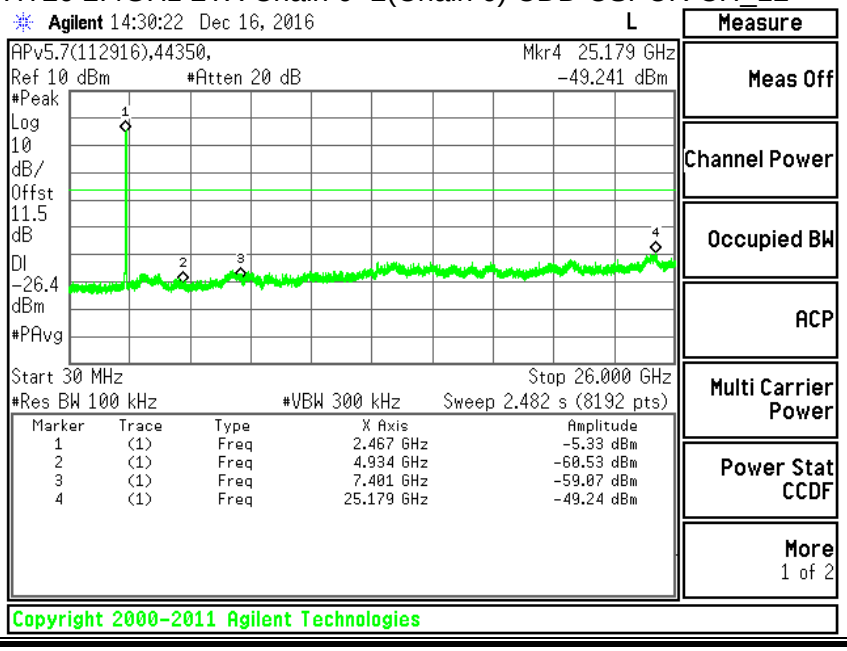
HT20 2.4GHz 2TX Chain 0+2(Chain 0) CDD CSPUR CH_6



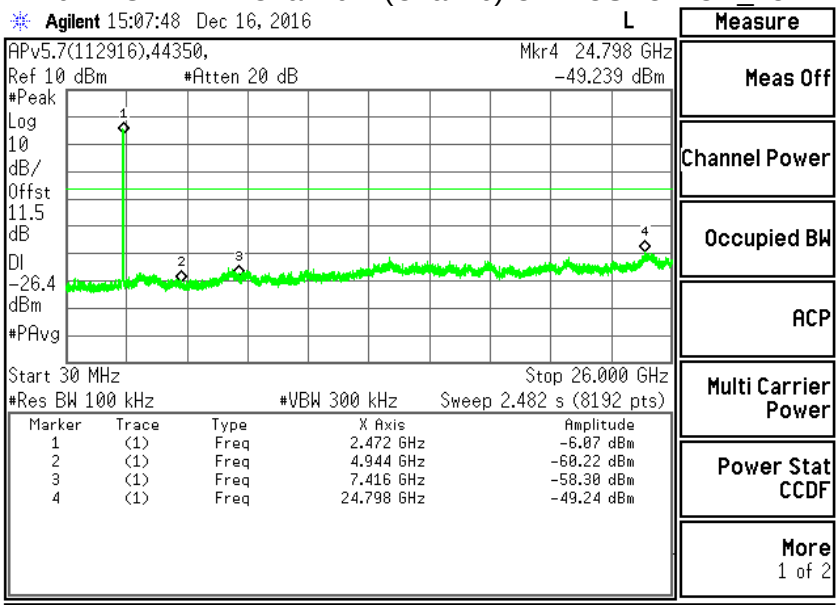
HT20 2.4GHz 2TX Chain 0+2(Chain 0) CDD CSPUR CH_11



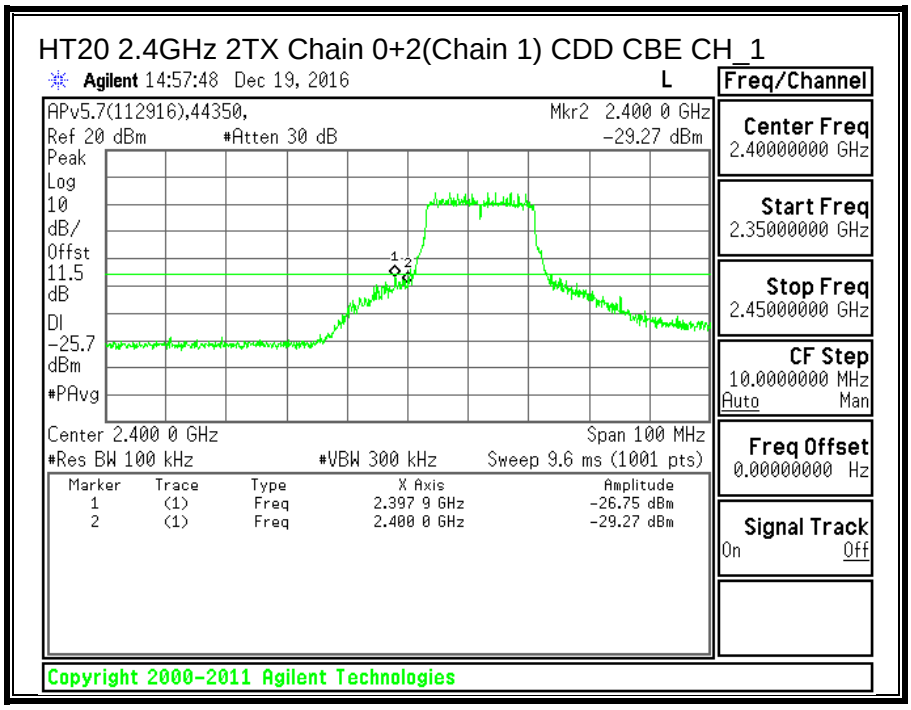
HT20 2.4GHz 2TX Chain 0+2(Chain 0) CDD CSPUR CH_12

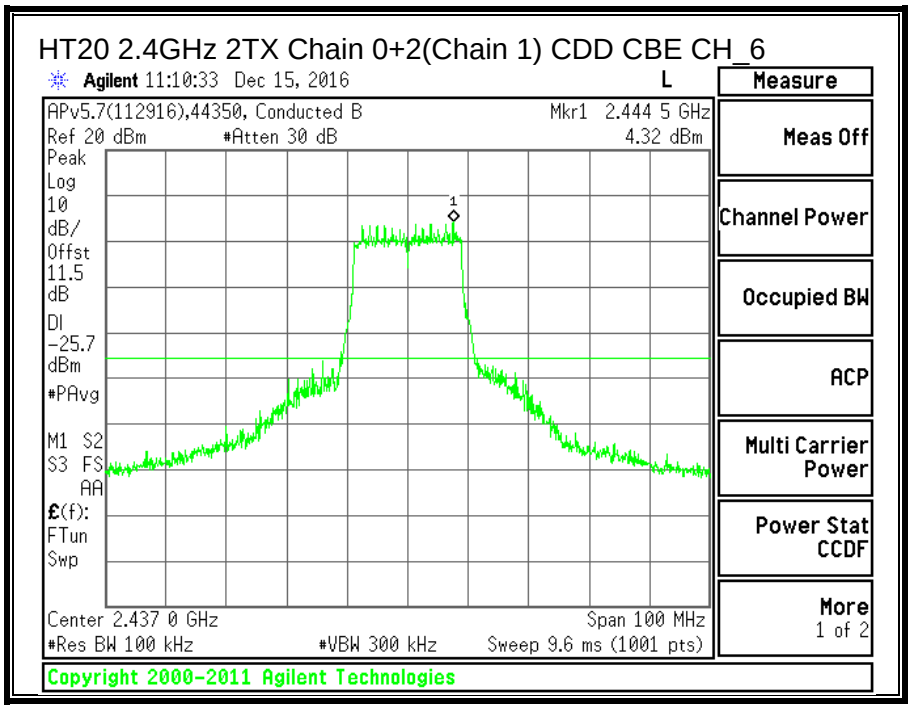


HT20 2.4GHz 2TX Chain 0+2(Chain 0) CDD CSPUR CH_13

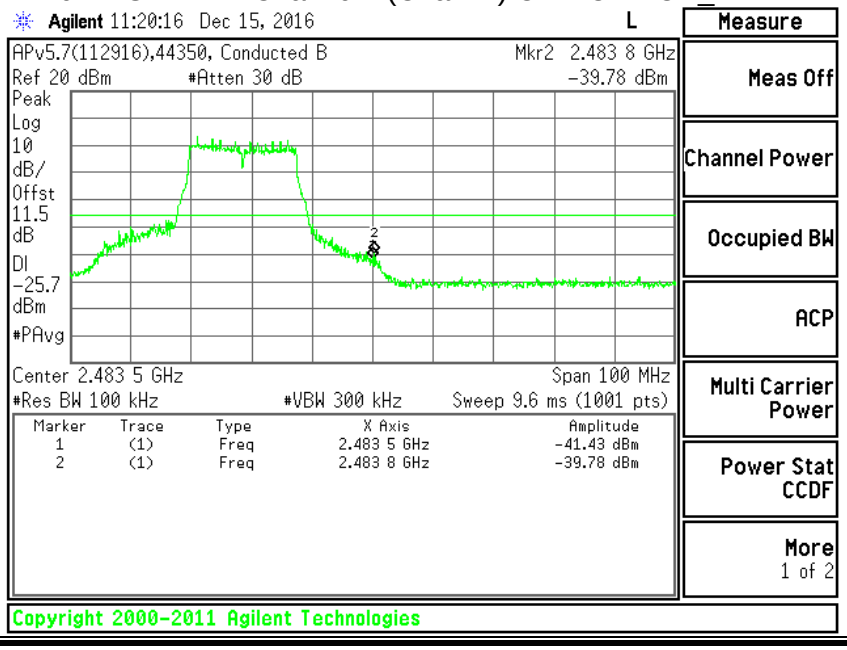


CHAIN 1

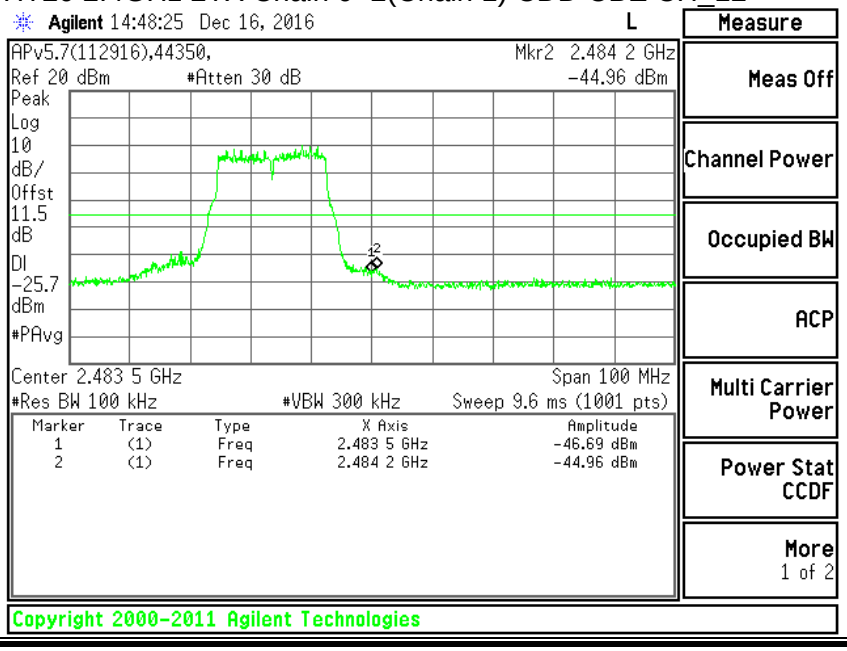




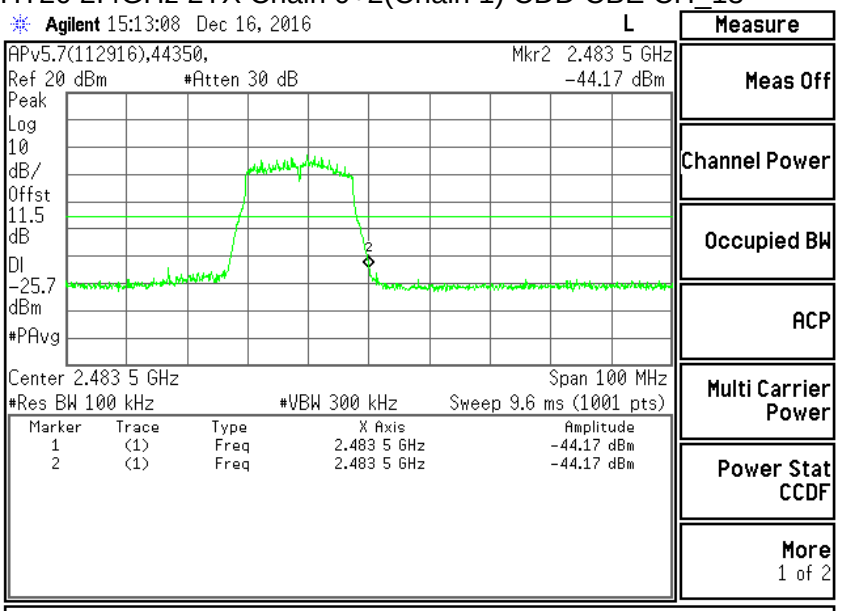
HT20 2.4GHz 2TX Chain 0+2(Chain 1) CDD CBE CH_11



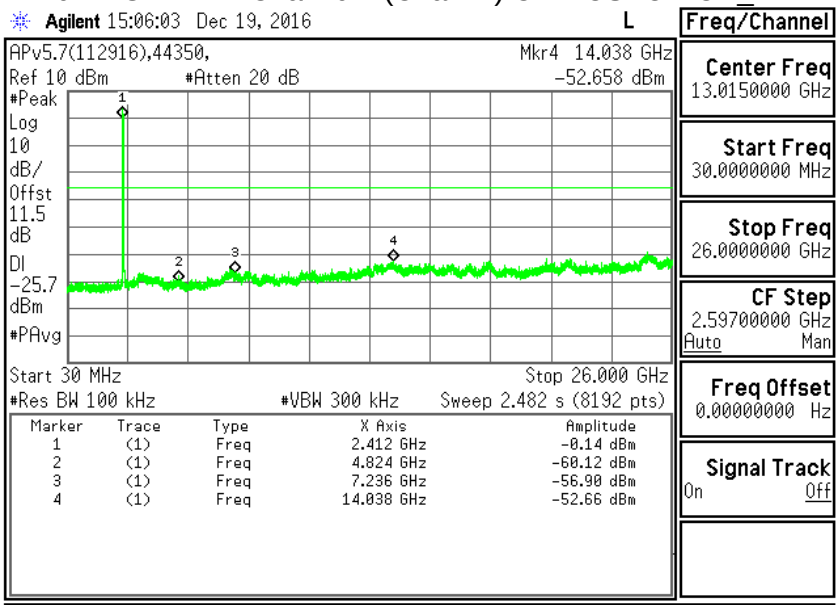
HT20 2.4GHz 2TX Chain 0+2(Chain 1) CDD CBE CH_12



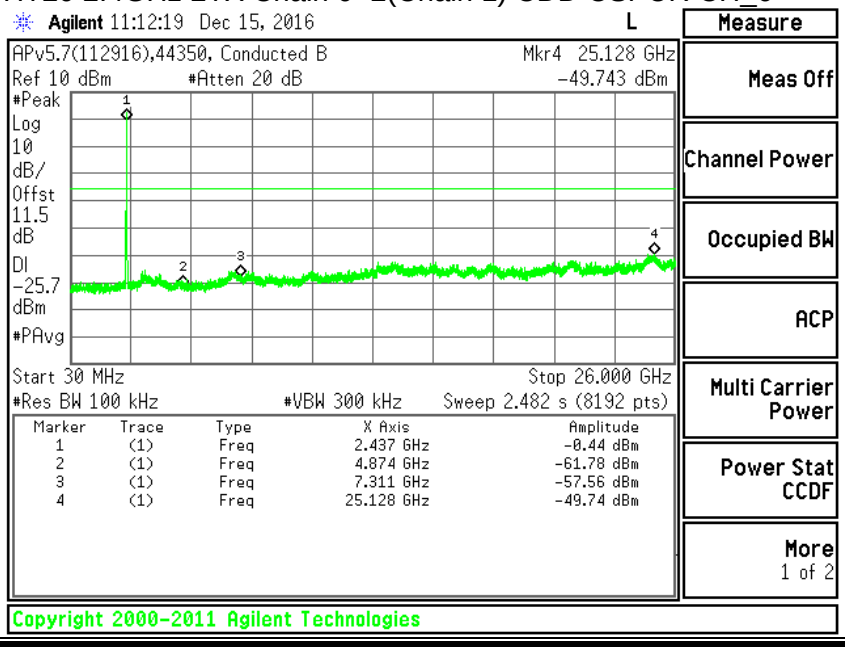
HT20 2.4GHz 2TX Chain 0+2(Chain 1) CDD CBE CH_13



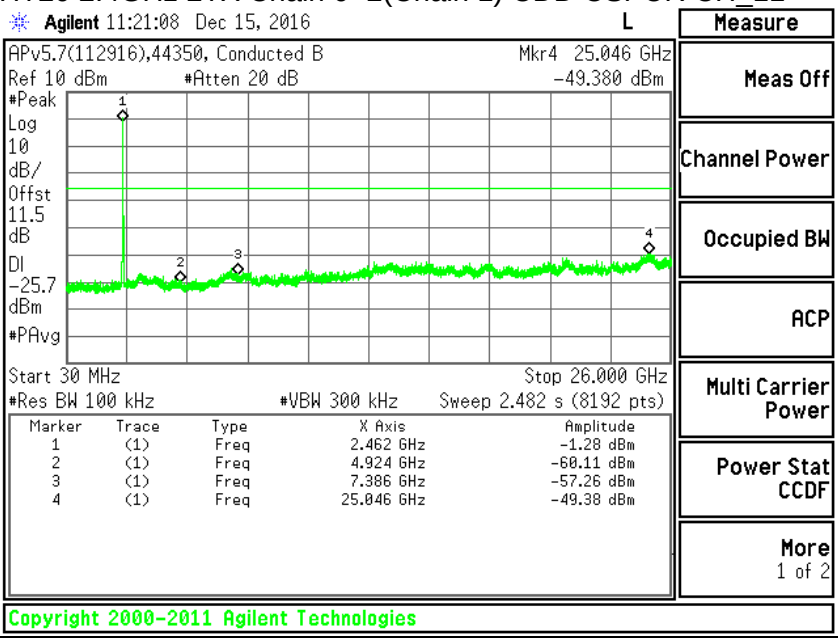
HT20 2.4GHz 2TX Chain 0+2(Chain 1) CDD CSPUR CH_1



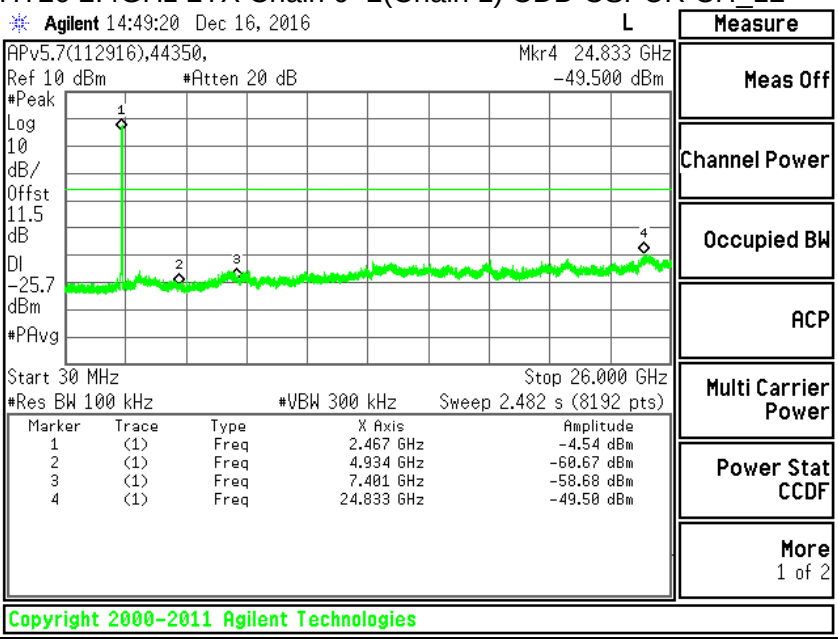
HT20 2.4GHz 2TX Chain 0+2(Chain 1) CDD CSPUR CH_6



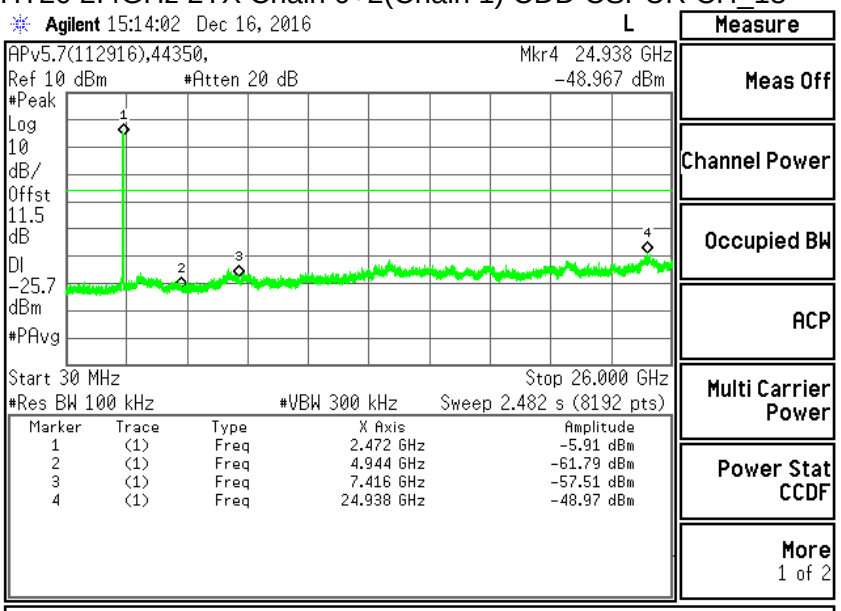
HT20 2.4GHz 2TX Chain 0+2(Chain 1) CDD CSPUR CH_11



HT20 2.4GHz 2TX Chain 0+2(Chain 1) CDD CSPUR CH_12



HT20 2.4GHz 2TX Chain 0+2(Chain 1) CDD CSPUR CH_13



12. RADIATED TEST RESULTS

12.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-GEN, Section 8.9 and 8.10.

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
0.009-0.490	2400/F(kHz) @ 300m	2400/F(kHz) @ 300m
0.490-1.705	24000/F(kHz) @ 30m	24000/F(kHz) @ 30m
1.705-30.0	30 @ 30m	30 @ 30m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

NOTE: KDB 937606 OATS and Chamber Correlation Justification

- Based on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.
- OATs and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane for measurement below 1GHz; 1.5 m above the ground plane for measurement above 1GHz. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, the video bandwidth is set to 3 MHz for peak measurements and as applicable for average measurements.
Note: The pre-scan measurements above 1GHz the VBW is set to 30 kHz.

For 2.4 GHz band, the spectrum from 9 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions