FCC 47 CFR PART 15 SUBPART E

CERTIFICATION TEST REPORT
CLASS II PERMISSIVE CHANGE

FOR

802.11 a/b/g/n 2X2 ACCESS POINT

MODEL NUMBER: A1392

FCC ID: BCGA1392

REPORT NUMBER: 15U21850-E2V2

ISSUE DATE: NOVEMBER 18, 2015

Prepared for
APPLE, INC.
1 INFINITE LOOP
CUPERTINO, CA 95014, U.S.A.

Prepared by
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	11/09/2015	Initial Issue	J. Vang
V2	11/18/2015	Revised report to address TCB's questions	T. Chu

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: APPLE, INC.
1 INFINITE LOOP
CUPERTINO, CA 95014, U.S.A.

EUT DESCRIPTION: 802.11 a/b/g/n 2X2 ACCESS POINT

MODEL: A1392

SERIAL NUMBER: C86HL7XTDV2R (Conducted), C7JKPOD1FLTM (Radiated)

DATE TESTED: SEPTEMBER 25, 2015 TO SEPTEMBER 30, 2015

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart E	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:

CHIN PANG
SENIOR ENGINEER
UL VERIFICATION SERVICES INC.

Tested By:

JOE VANG
EMC 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, FCC 14-30, FCC KDB 662911 D01 v02r01, FCC KDB 905462 D02 v01r02/D03 v01r01/D06 v01, FCC KDB 789033 D02 v01, FCC KDB 644545 D03 v01 ANSI C63.10-2013.

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	☒ Chamber D
☐ Chamber B	☒ Chamber E
☐ Chamber C	☐ Chamber F
	☐ Chamber G
	☐ Chamber H

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers A through H are covered under Industry Canada company address code 2324B with site numbers 2324B -1 through 2324B-8, respectively.

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
Conducted Disturbance, 0.15 to 30 MHz	± 3.52 dB
Radiated Disturbance, 30 to 1000 MHz	± 4.94 dB
Radiated Disturbance, 1 to 6 GHz	± 3.86 dB
Radiated Disturbance, 6 to 18 GHz	± 4.23 dB
Radiated Disturbance, 18 to 26 GHz	± 5.30 dB
Radiated Disturbance, 26 to 40 GHz	± 5.23 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is an 802.11 a/b/g/n transceiver Access Point.

5.2. DESCRIPTION OF CLASS II PERMISSIVE CHANGE

Upgrade EUT to 5.8GHz band new rule per KDB 789033 D02 v01 and upgrade 5.3GHz/5.6GHz band new rule per KDB 905462 D02 v01r02.

5.3. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

5.8GHz Band

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5745 - 5825	802.11a 2TX CDD	21.40	138.04
5745 - 5825	802.11n HT20 CDD 2TX	21.40	138.04
5745 - 5825	802.11n HT20 STBC/SDM 2TX	Covered by 802.11n HT20 CDD 2TX	
5755 - 5795	802.11n HT40 CDD 2TX	19.60	91.20
5755 - 5795	802.11n HT40 STBC/SDM 2TX	Covered by 802.11n HT40 CDD 2TX	

5.4. DESCRIPTION OF AVAILABLE ANTENNAS

	Antenna Gain	
Frequency Band (GHz)	Chain 0	Chain 1
5.8	2.74	3.11

5.5. SOFTWARE AND FIRMWARE

The Utility software installed in the EUT during testing was ART v3.3.

The firmware installed in the EUT during testing was v7.6.2.d1auto20120216T6T0030-T0T

5.6. WORST-CASE CONFIGURATION AND MODE

For Radiated Emissions below 1 GHz and Power line Conducted Emissions, the channel with the highest conducted output power was selected.

Worst-case data rates as provided by the manufacturer are:

For 11a mode: 6Mbps
For 11n HT20: MCS0
For 11n HT40: MCS0

EUT only has one orientation (laid down on the desktop) and it was tested in that orientation.

Since EUT passed radiated with antenna, no conducted spurious was performed.

5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Apple	A1342	W893700JA0Y	N/A
Laptop AC/DC adapter	Apple	A1343	N/A	N/A
Earphone	Apple	NA	N/A	N/A

I/O CABLES (CONDUCTED TEST)

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Antenna	2	SMA	Un-Shielded	0.2	To spectrum Analyzer
2	Ethernet	1	RJ45	Shielded	1.5	N/A
3	AC	1	AC	Un-shielded	3	N/A

I/O CABLES (RADIATED ABOVE 1 GHZ)

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	1	AC	Un-shielded	2	N/A

I/O CABLES (RADAITED BELOW 1 GHZ)

I/O Cable List						
Cable No	Port	# of identical	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Headphone Jack	1	3.5mm Audio	Shielded	0.9	N/A
2	AC	1	AC	Un-shielded	2	N/A

I/O CABLES (AC LINE CONDUCTED: AC/DC ADAPTER)

I/O Cable List						
Cable No	Port	# of identical	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Headphone Jack	1	3.5mm Audio	Shielded	0.9	N/A
2	AC	1	AC	Un-shielded	2	N/A

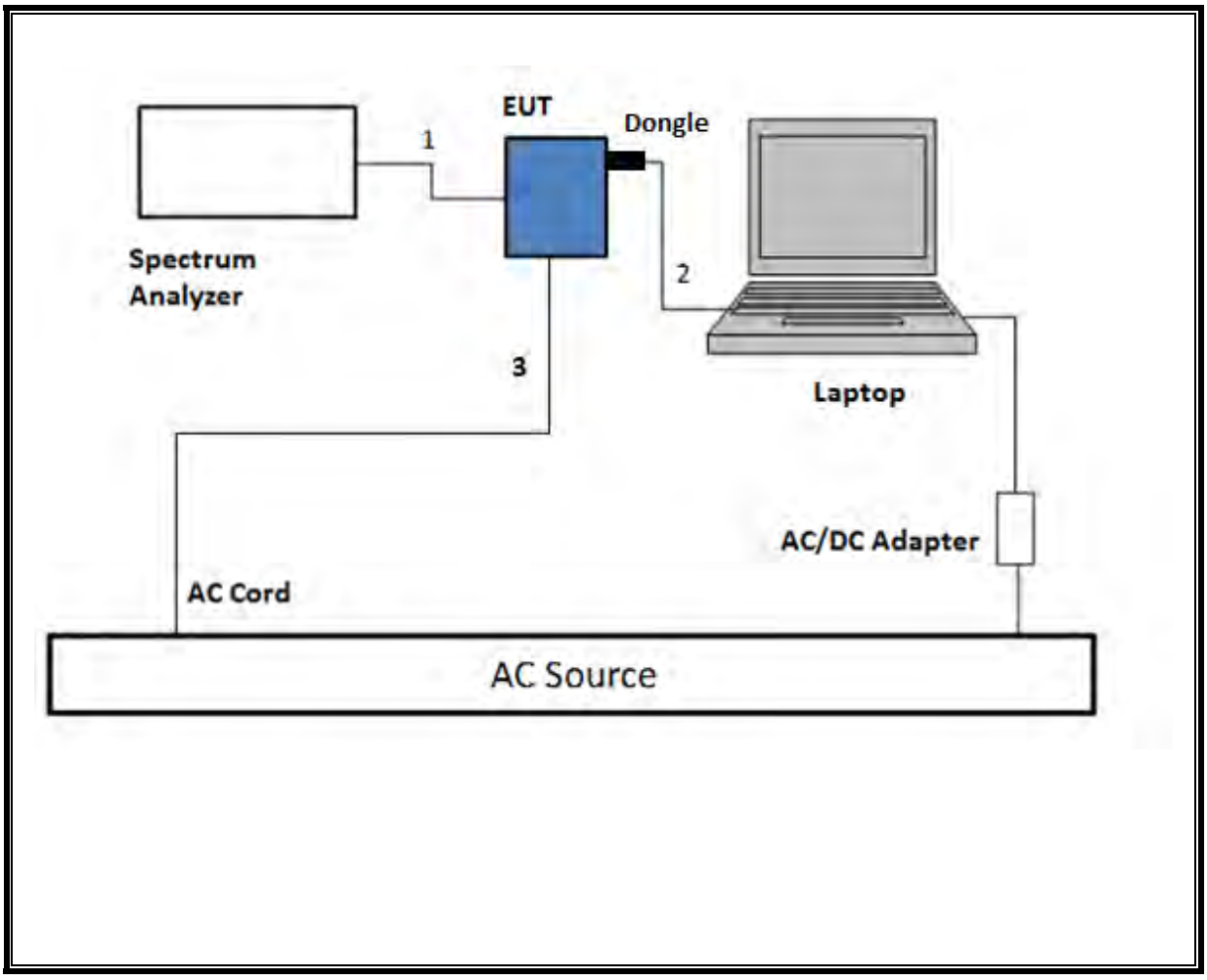
I/O CABLES (AC LINE CONDUCTED: LAPTOP CONFIGUARTION)

I/O Cable List						
Cable No	Port	# of identical	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	1	AC	Unshielded	2m	N/A
2	DC	1	DC	Unshielded	2.5m	N/A
3	AC	1	AC	Unshielded	2m	N/A
4	Ethernet	1	RJ45	Shielded	1.5m	N/A

TEST SETUP - CONDUCTED TESTS

The EUT was tested connected to a host Laptop via USB cable adapter and spectrum analyzer to antenna port. Test software exercised the EUT.

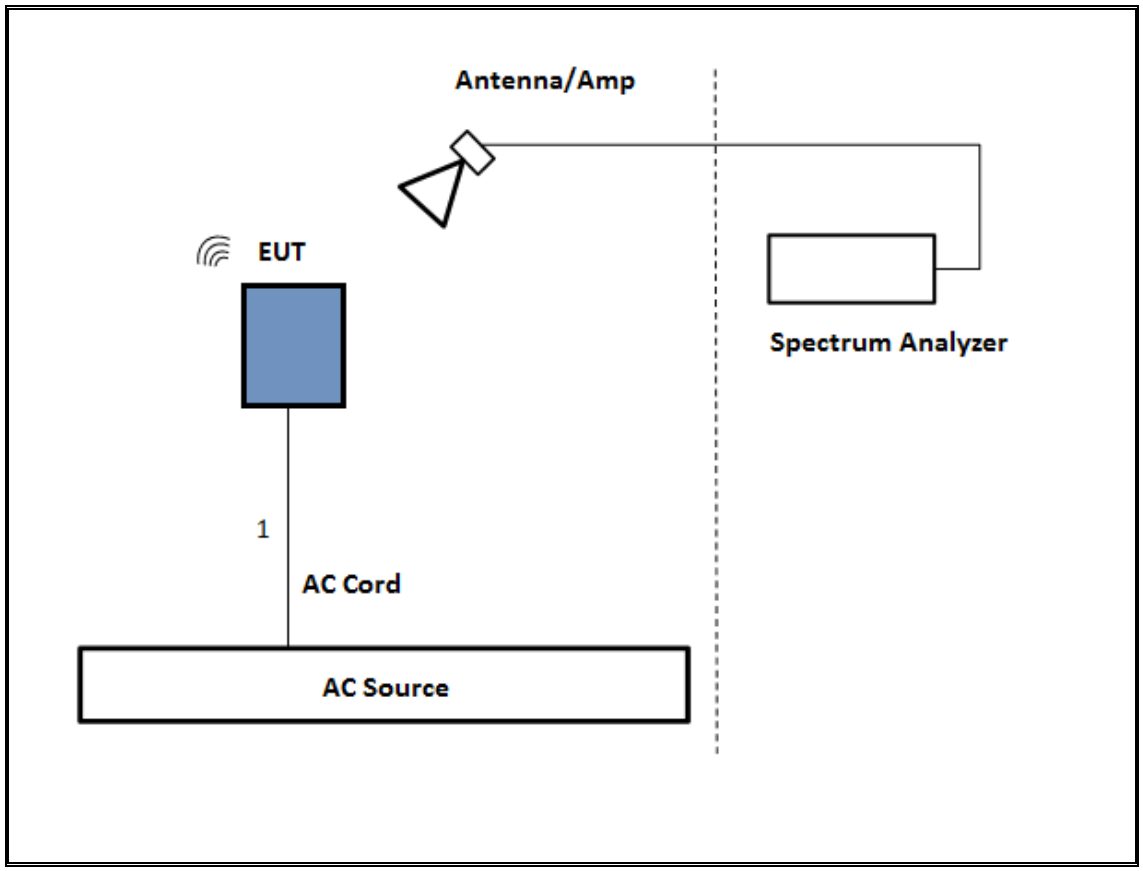
SETUP DIAGRAM



TEST SETUP- RADIATED-ABOVE 1 GHZ

The EUT was tested battery powered. Test software exercised the EUT.

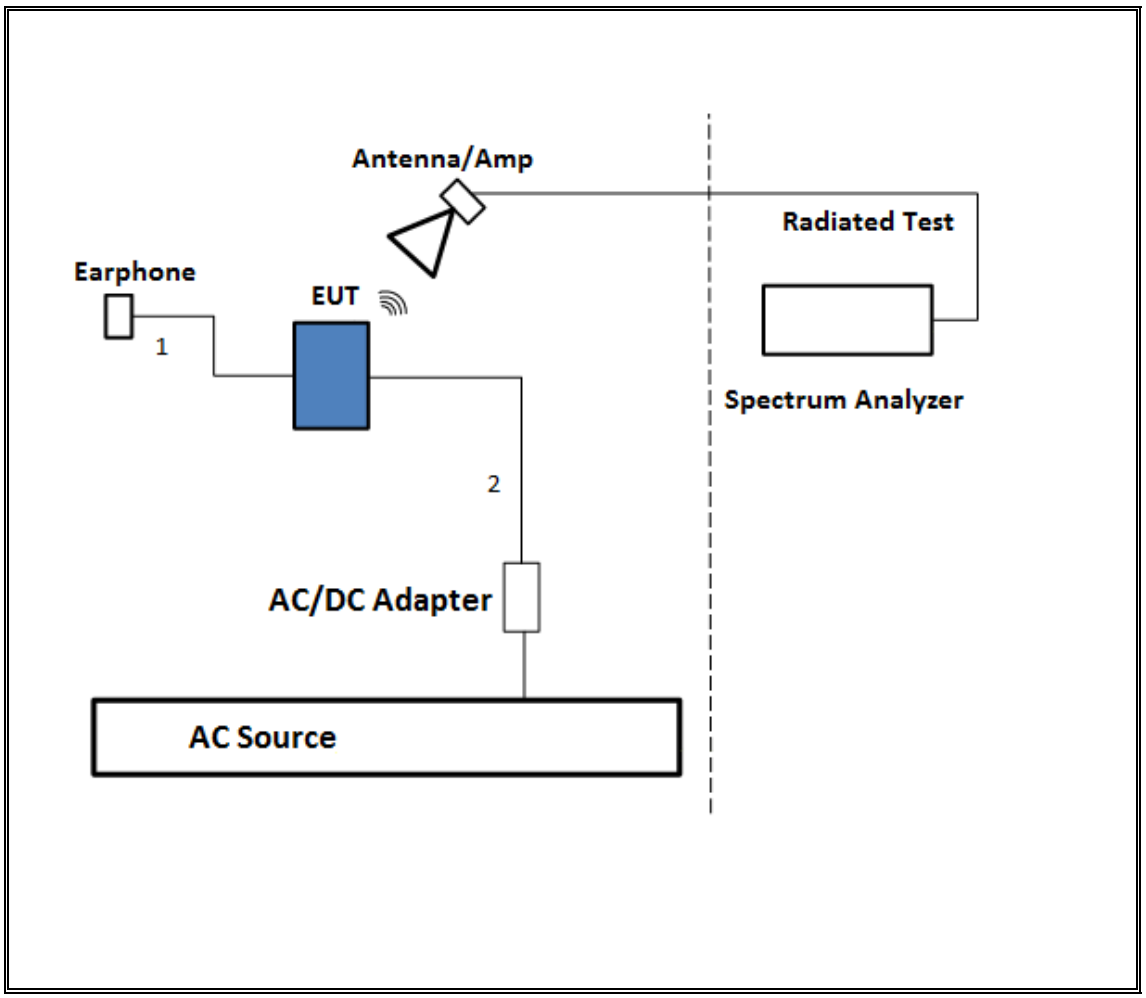
SETUP DIAGRAM



TEST SETUP- BELOW 1GHz

The EUT was tested with earphone connected and powered by AC adapter. Test software exercised the EUT.

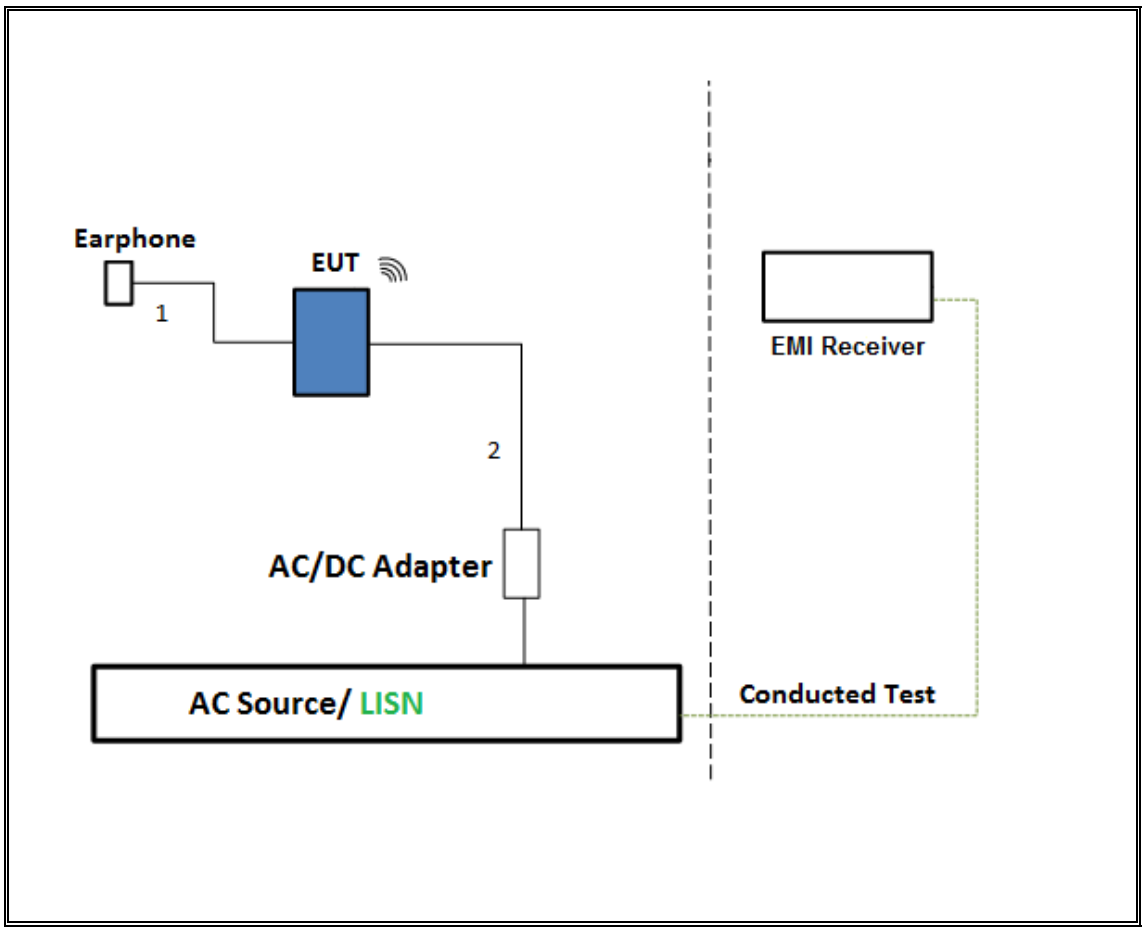
SETUP DIAGRAM



TEST SETUP- AC LINE CONDUCTED: AC/DC ADAPTER

The EUT was tested with earphone connected and powered by AC/DC adapter via USB cable. 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**	**Asset**	**Cal Due**
Antenna, Horn 1-18GHz	ETS Lindgren	3117	00143448	2/10/2016
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	A022813-1	1/14/2016
Amplifier, 1 - 18GHz	Miteq	AFS42-00101800-25-S-42	1782158	1/26/2016
Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	323561	6/8/2016
Spectrum Analyzer, PXA, 3Hz to 50GHz	Agilent	N9030A	MY52350427	9/13/2016
Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	325117	6/9/2016
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent	N9030A-544	US51160264	12/23/2015
Power Meter, P-series single channel	Agilent	N1911A	GB45100212	10/9/2015
Power Sensor, P - series, 50MHz to 18GHz, Wideband	Agilent	N1921A	MY53260010	7/12/2016
Antenna, Horn 18 to 26.5GHz	ARA	MWH-1826	1049	12/17/2015
Horn Antenna, 40GHz	ARA	MWH-2640/B	1029	7/15/2016
Spectrum Analyzer, 40 GHz	Agilent	8564E	3943A01643	8/14/2016
Amplifier, 1 to 26.5GHz, 23.5dB Gain minimum	Agilent	8449B	3008A04710	6/29/2016
Amplifier, 26 to 40GHz	Miteq	NSP4000-SP2	1029	9/3/2016
AC Line Conducted				
EMI Test Receiver 9Khz-7GHz	Rohde & Schwarz	ESCI7	100935	9/16/2016
LISN for Conducted Emissions CISPR-16	FCC	50/250-25-2	114	1/16/2016
Power Cable, Line Conducted Emissions ANSI 63.4	UL	PG1	N/A	7/28/2016
UL SOFTWARE				
*Radiated Software	UL	UL EMC	Ver 9.5, July 22, 2014	
*Conducted Software	UL	UL EMC	Ver 2.2, March 31, 2015	
*AC Line Conducted Software	UL	UL EMC	Ver 9.5, April 3, 2015	

Note: * indicates automation software version used in the compliance certification testing

7. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS

7.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

PROCEDURE

KDB 789033 Zero-Span Spectrum Analyzer Method.

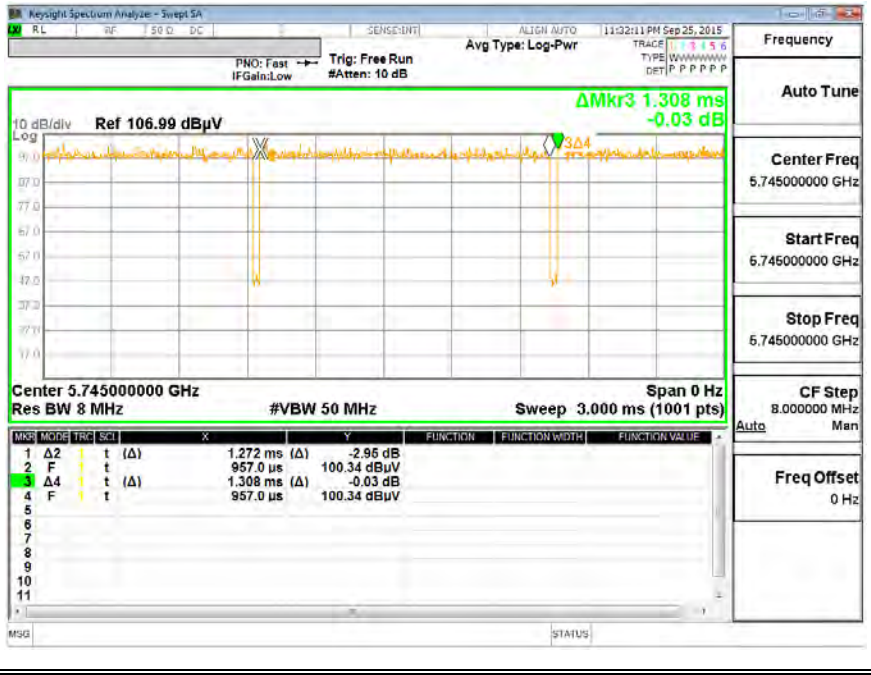
RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
802.11a MODE 2TX	1.359	1.395	0.974	97.42%	0.11	0.736
802.11n HT20 CDD	1.272	1.308	0.972	97.25%	0.12	0.786
802.11n HT40 CDD	0.631	0.655	0.963	96.34%	0.16	1.585

DUTY CYCLE PLOTS

DUTY CYCLE 802.11a MODE 2TX MODE

DUTY CYCLE 802.11n HT20 CDD MODE



DUTY CYCLE 802.11n HT40 CDD MODE

7.2. MEASUREMENT METHODS

26 dB Emission BW & 6 dB Emission BW: KDB 789033 D02 v01, Section C.

99% Occupied BW: KDB 789033 D02 v01, Section D.

Conducted Output Power: KDB 789033 D02 v01, Section E.3.b (Method PM-G).

Power Spectral Density: KDB 789033 D02 v01, Section F.

Unwanted emissions in restricted bands: KDB 789033 D02 v01, Sections G.3, G.4, G.5, and G.6.

Unwanted emissions in non-restricted bands: KDB 789033 D02 v01, Sections G.3, G.4, and G.5.

8. ANTENNA PORT TEST RESULTS

8.1. 802.11a MODE 2Tx CDD MODE IN THE 5.8 GHz BAND

8.1.1. 6 dB BANDWIDTH

LIMITS

FCC §15.407 (e)

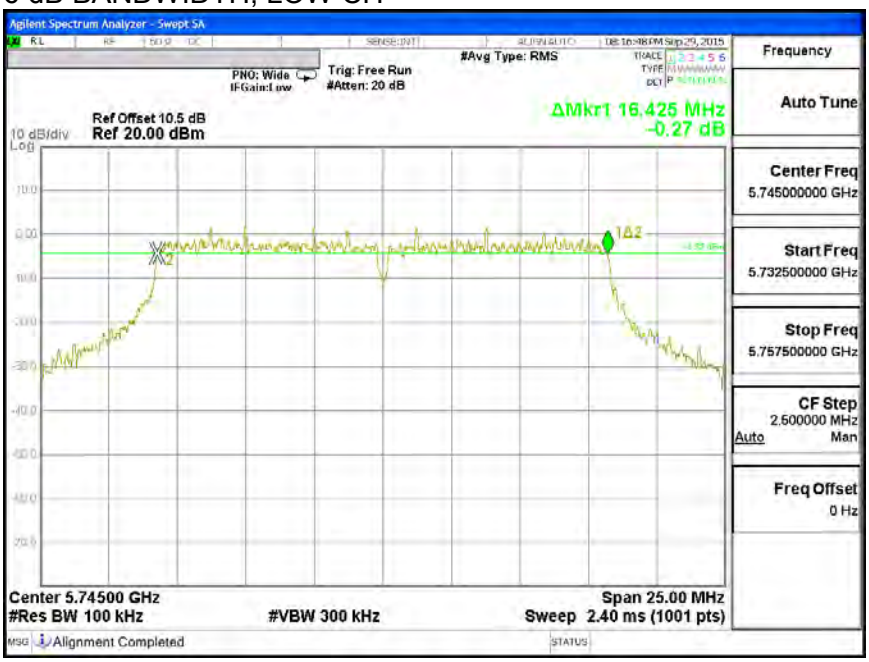
The minimum 6 dB bandwidth shall be at least 500 kHz.

RESULTS

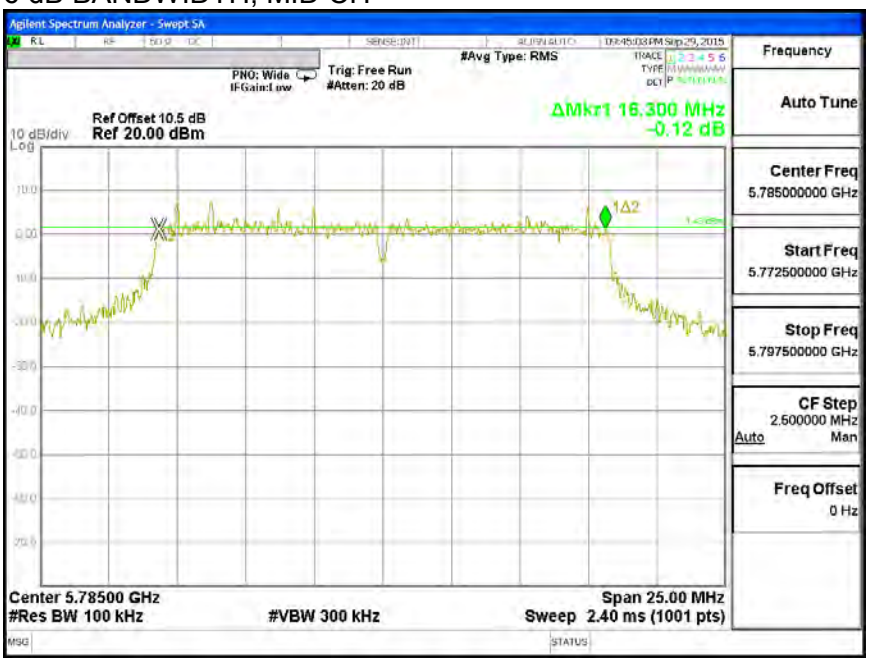
Channel	Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	Minimum Limit (MHz)
Low	5745	16.425	16.350	0.5
Mid	5785	16.300	16.350	0.5
High	5825	16.325	16.325	0.5

6 dB BANDWIDTH, CHAIN 0

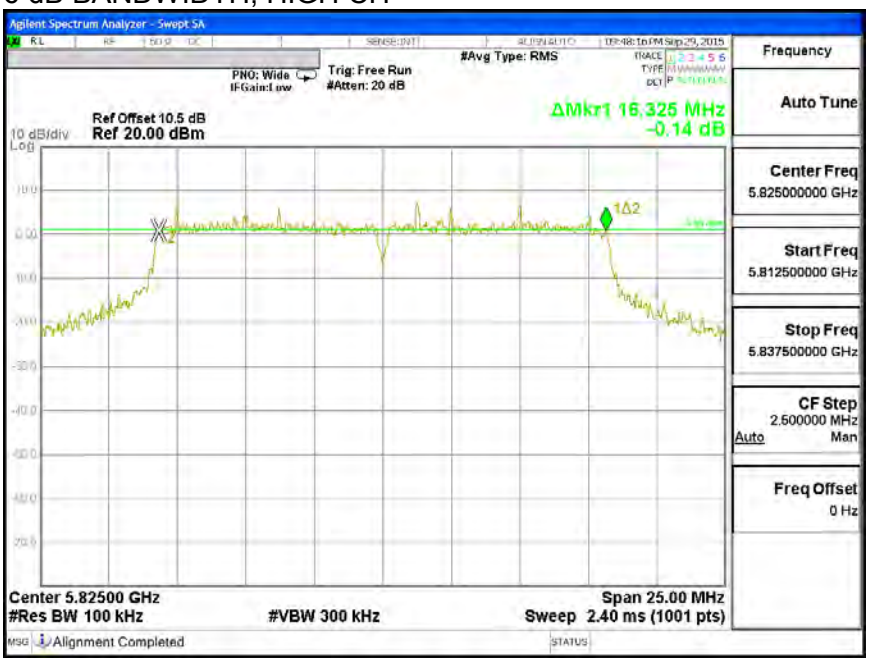
6 dB BANDWIDTH, LOW CH



6 dB BANDWIDTH, MID CH

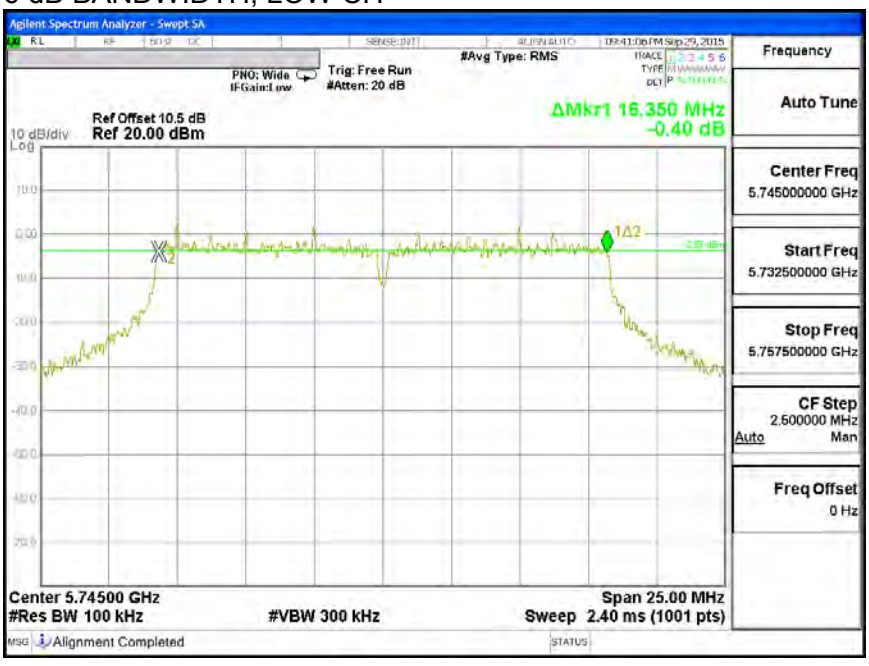


6 dB BANDWIDTH, HIGH CH

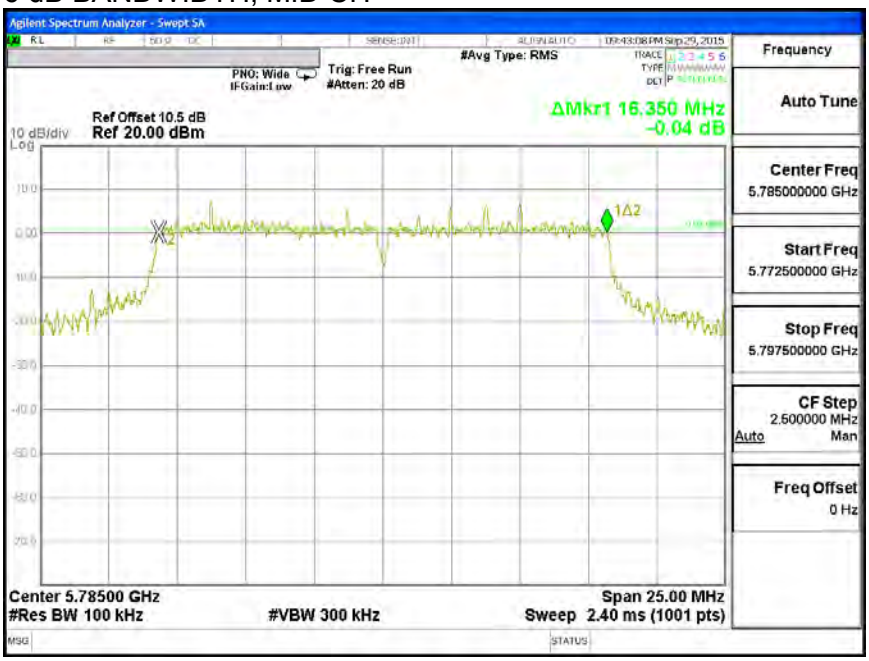


6 dB BANDWIDTH, CHAIN 1

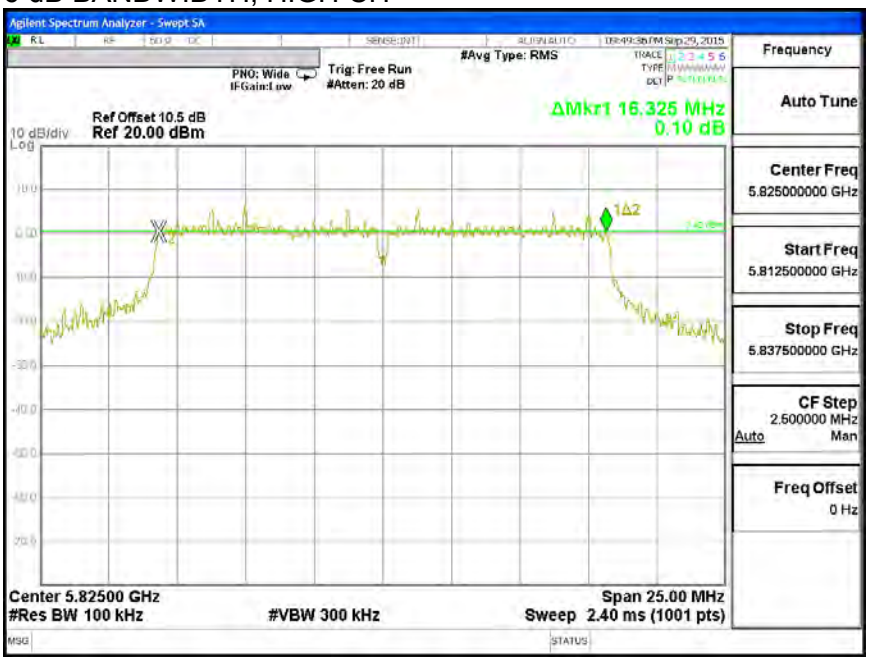
6 dB BANDWIDTH, LOW CH



6 dB BANDWIDTH, MID CH



6 dB BANDWIDTH, HIGH CH



8.1.2. 26 dB BANDWIDTH

LIMITS

None, for reporting purposes only.

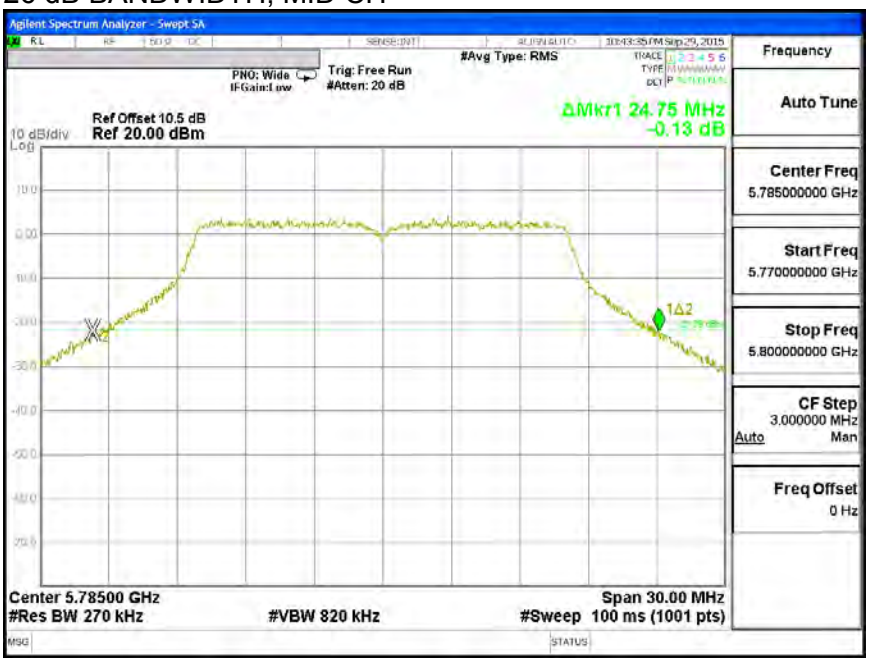
RESULTS

Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)
Low	5745	24.75	24.84
Mid	5785	24.75	24.36
High	5825	24.81	24.60

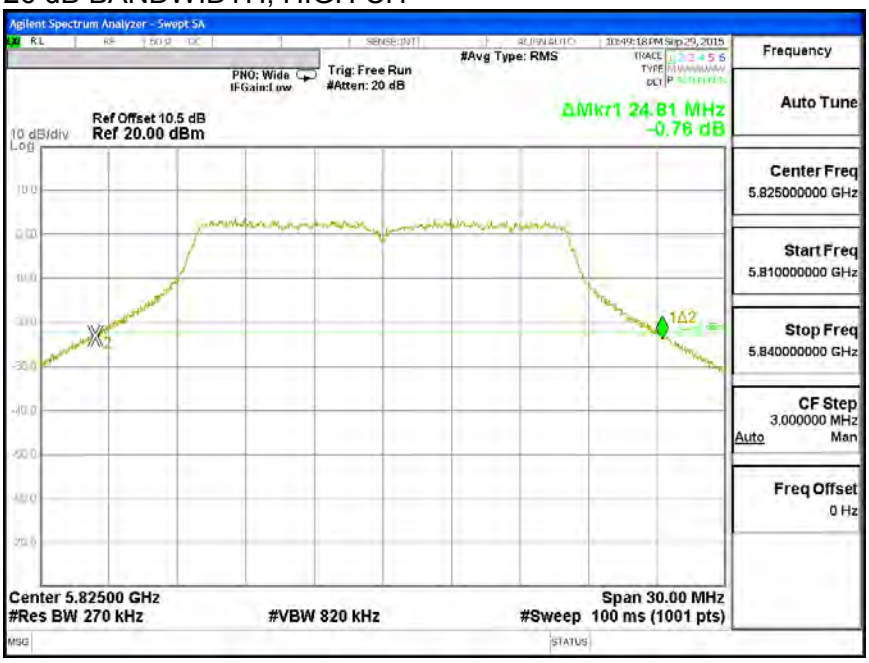
26 dB BANDWIDTH, CHAIN 0

26 dB BANDWIDTH, LOW CH

26 dB BANDWIDTH, MID CH

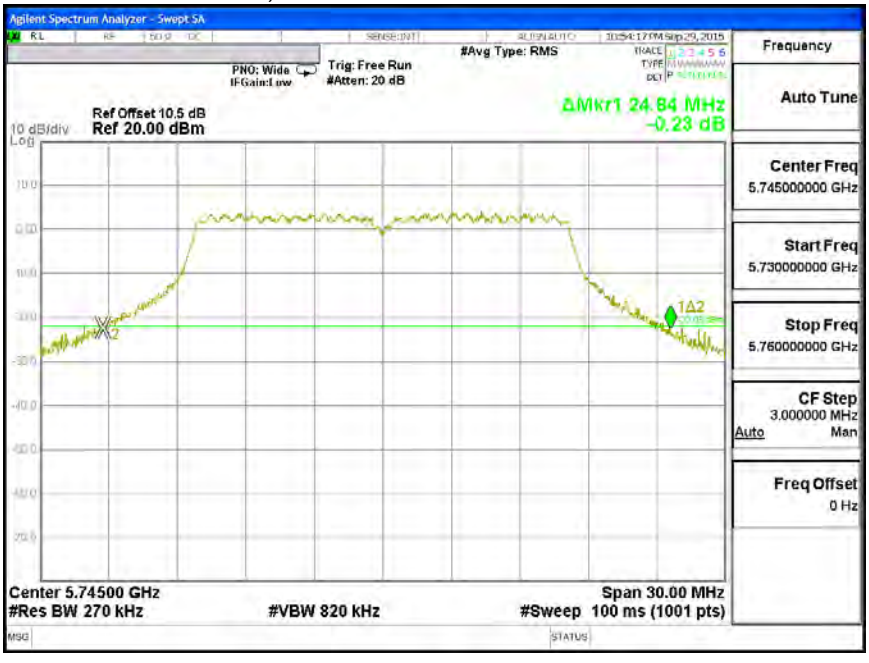


26 dB BANDWIDTH, HIGH CH

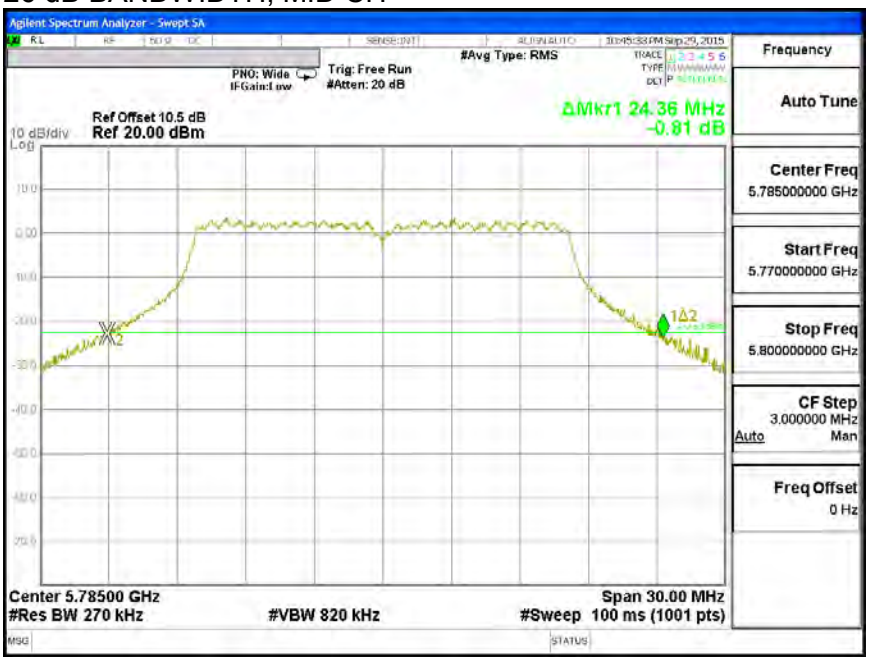


26 dB BANDWIDTH, CHAIN 1

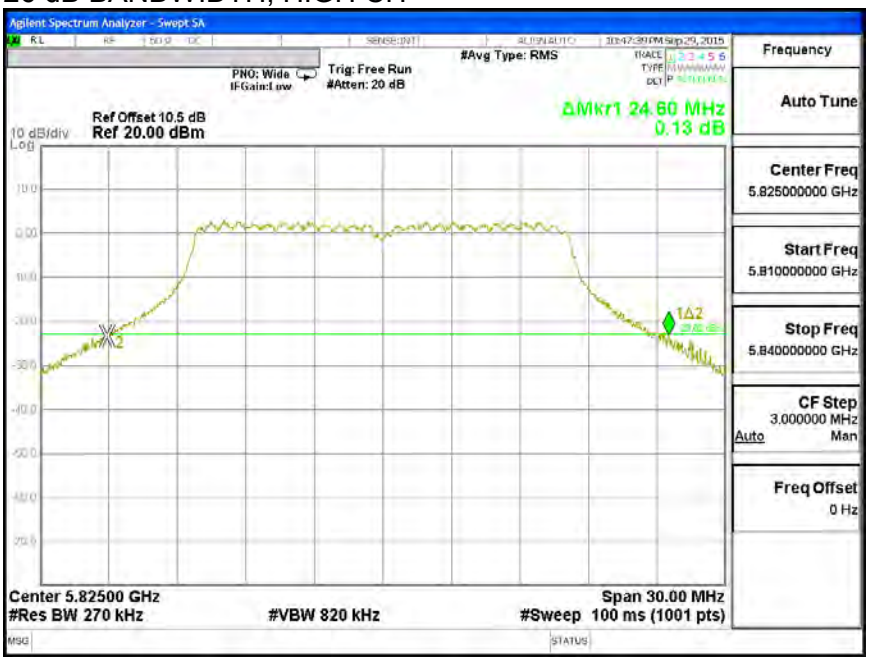
26 dB BANDWIDTH, LOW CH



26 dB BANDWIDTH, MID CH



26 dB BANDWIDTH, HIGH CH



8.1.3. 99% BANDWIDTH

LIMITS

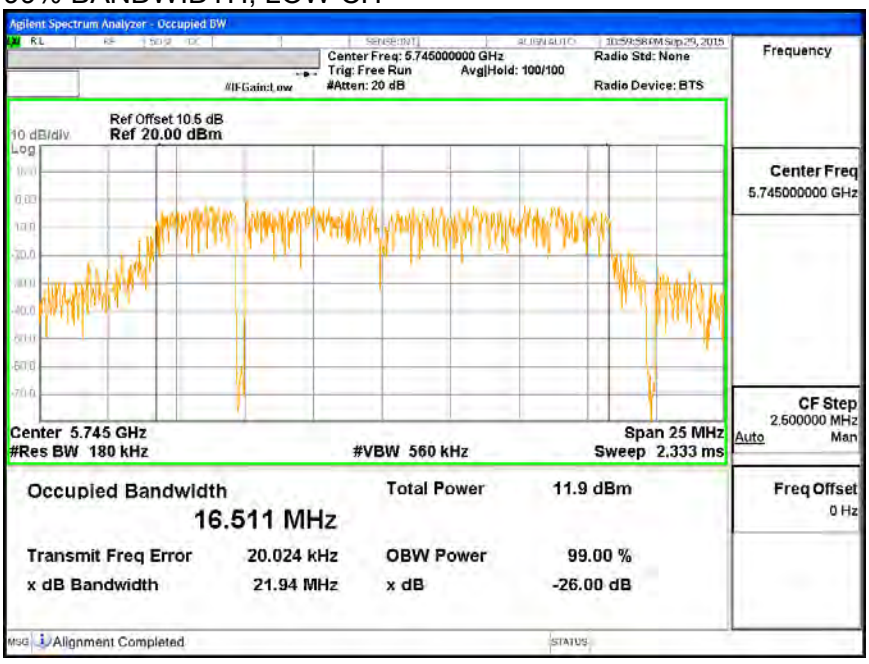
None; for reporting purposes only.

RESULTS

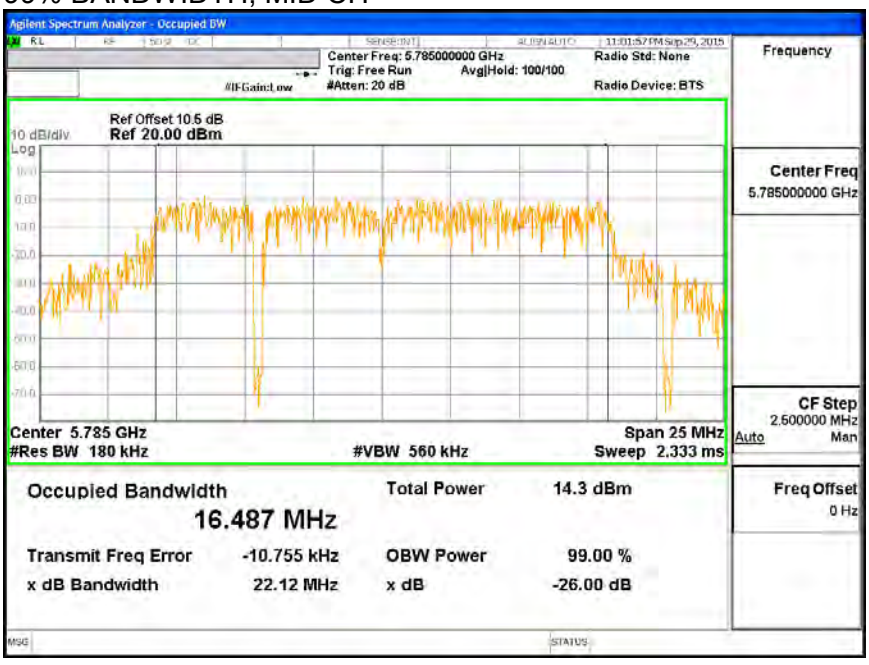
Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	5745	16.511	16.489
Mid	5785	16.487	16.472
High	5825	16.410	16.461

99% BANDWIDTH, CHAIN 0

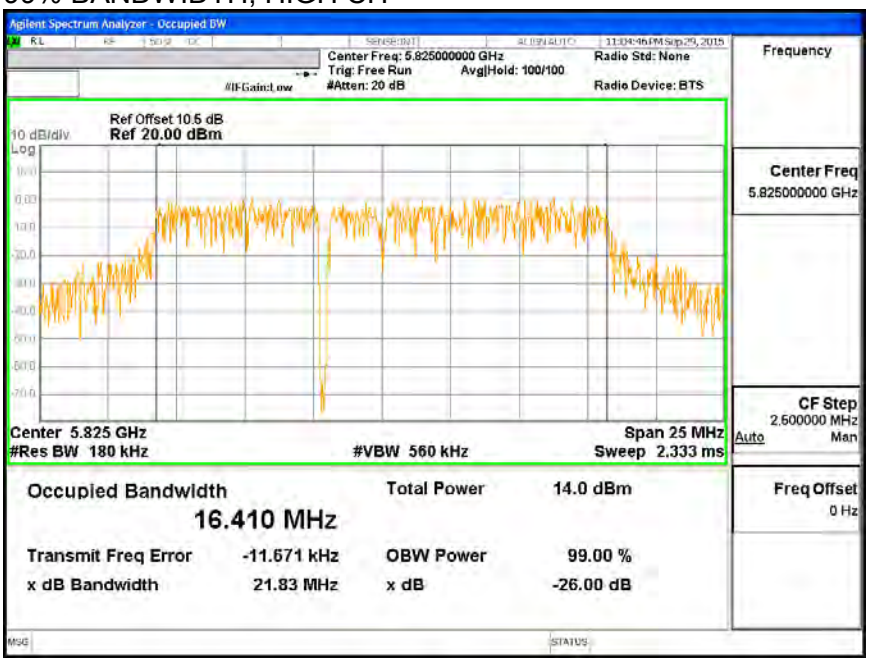
99% BANDWIDTH, LOW CH



99% BANDWIDTH, MID CH

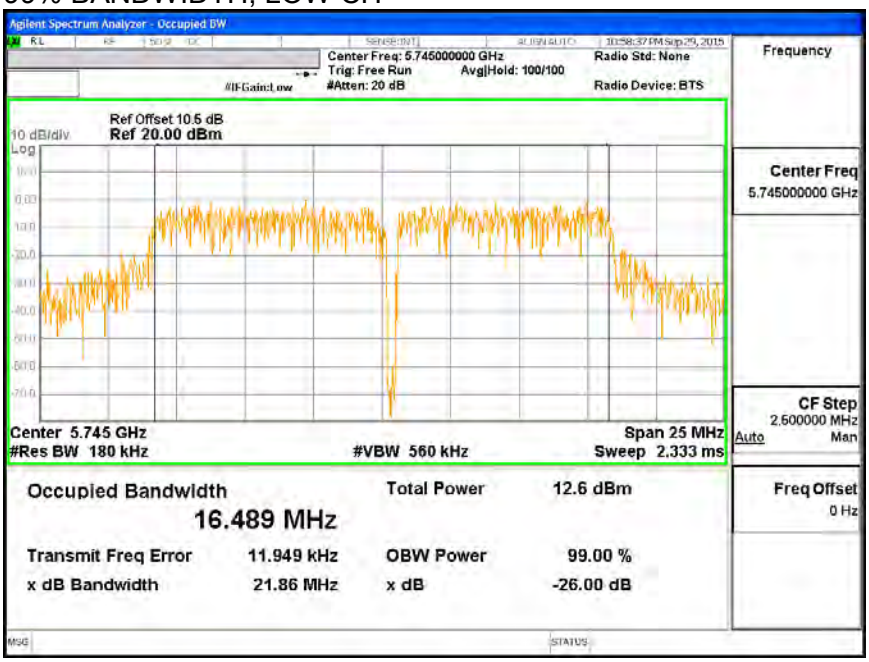


99% BANDWIDTH, HIGH CH

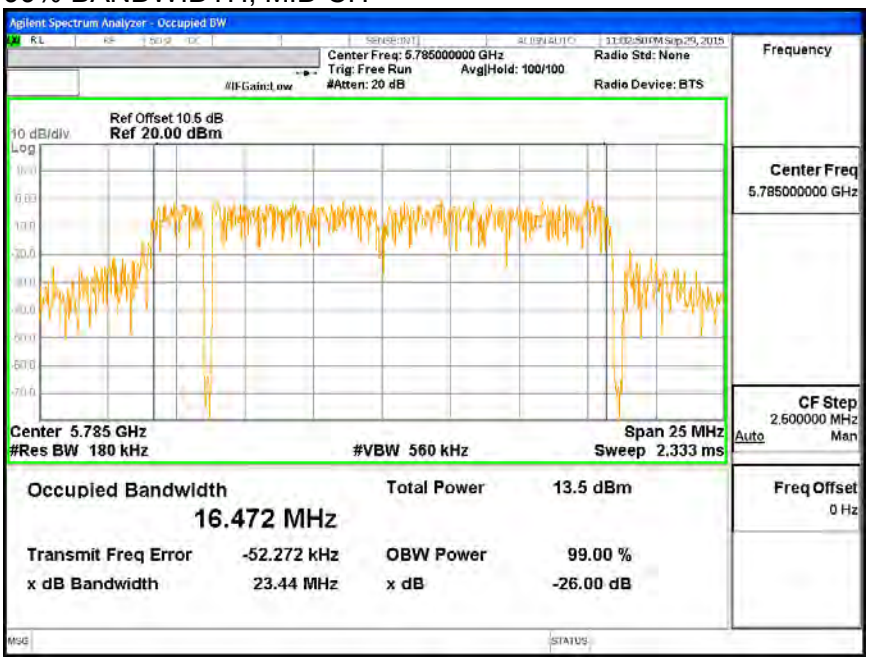


99% BANDWIDTH, CHAIN 1

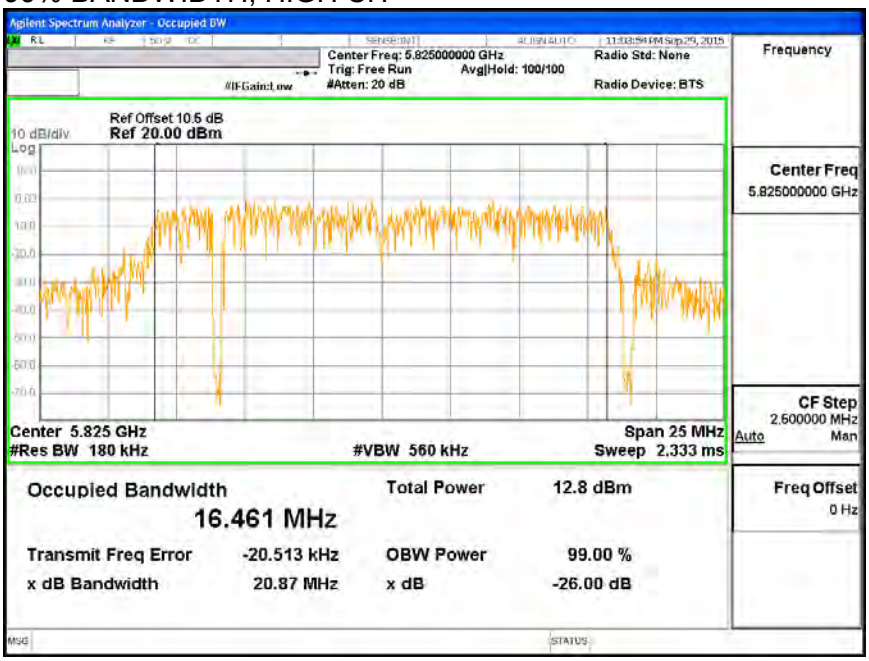
99% BANDWIDTH, LOW CH



99% BANDWIDTH, MID CH



99% BANDWIDTH, HIGH CH



8.1.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter.

RESULTS

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)
Low	5745	13.00	12.73	15.88
Mid	5785	18.70	18.06	21.40
High	5825	18.31	17.40	20.89

8.1.5. OUTPUT POWER

LIMITS

FCC §15.407 (a) (3)

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

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)
2.74	3.11	2.93

RESULTS

Antenna Gain and Limit

Channel	Frequency (MHz)	Directional Gain for Power (dBi)	Power Limit (dBm)
Low	5745	2.93	30.00
Mid	5785	2.93	30.00
High	5825	2.93	30.00

Output Power Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5745	13.00	12.73	15.88	30.00	-14.12
Mid	5785	18.70	18.06	21.40	30.00	-8.60
High	5825	18.31	17.40	20.89	30.00	-9.11

8.1.6. PSD

LIMITS

FCC §15.407 (a) (3)

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density 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 correlated and the antenna gain is unequal among the chains. The directional gain is:

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
2.74	3.11	5.94

RESULTS

Antenna Gain and Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	PSD Limit (dBm)
Low	5745	5.94	30.00
Mid	5785	5.94	30.00
High	5825	5.94	30.00

Duty Cycle CF (dB)	0.11	Included in Calculations of Corr'd PSD

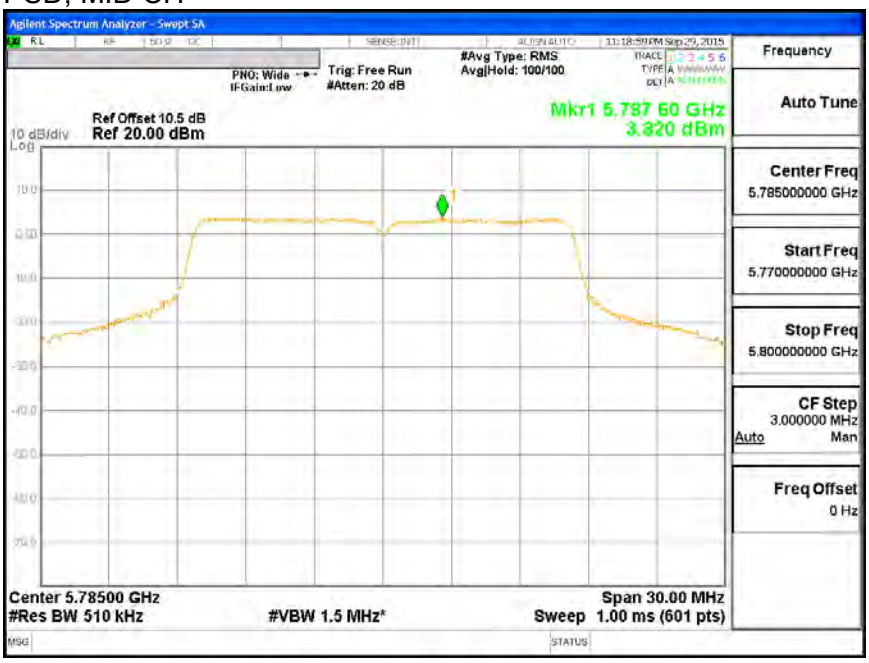
PSD Results

Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm)	Chain 1 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5745	-1.28	-1.46	1.75	30.00	-28.25
Mid	5785	3.82	2.83	6.48	30.00	-23.52
High	5825	3.21	3.10	6.27	30.00	-23.73

PSD, CHAIN 0

PSD, LOW CH

PSD, MID CH

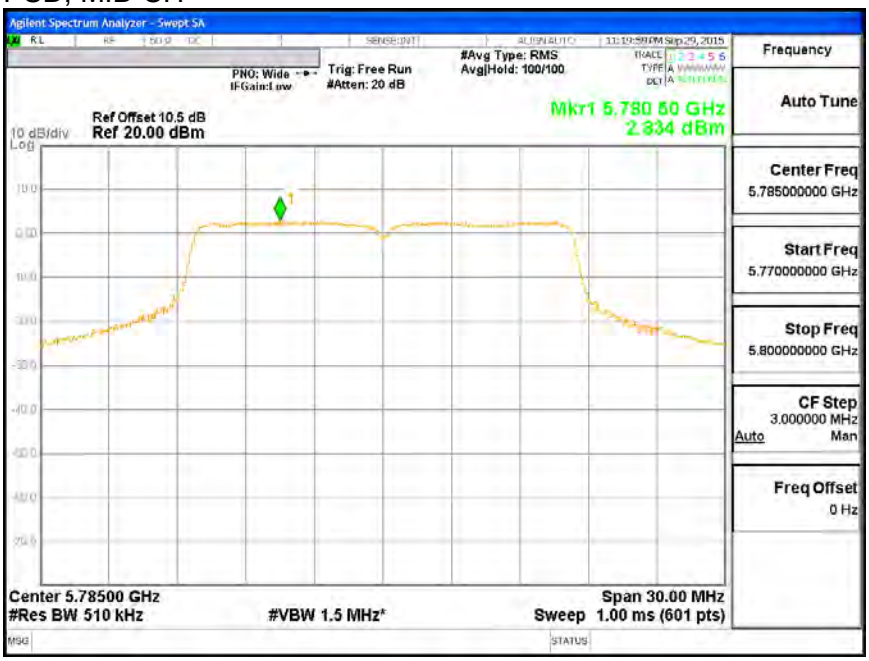


PSD, HIGH CH

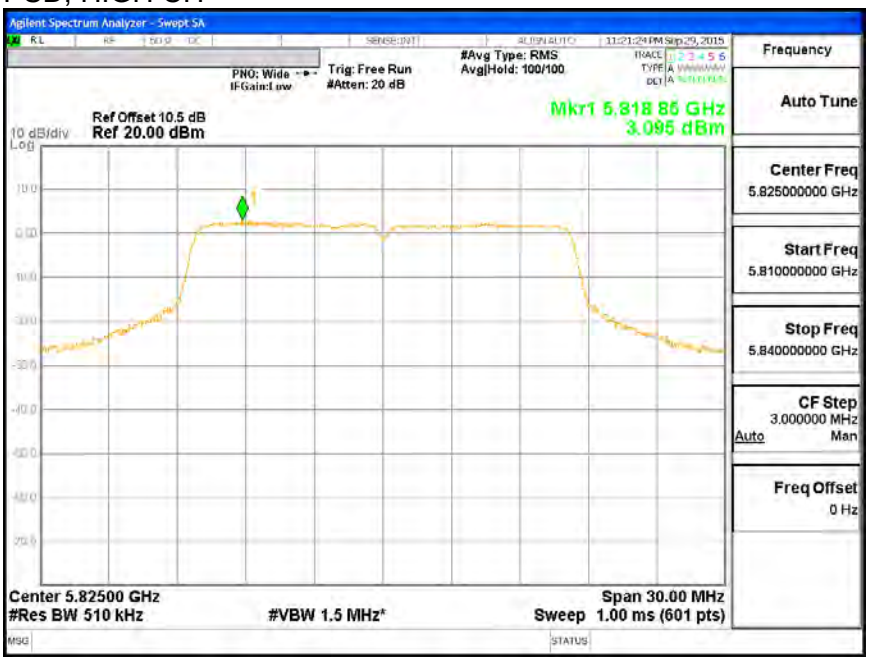
PSD, CHAIN 1

PSD, LOW CH

PSD, MID CH



PSD, HIGH CH



8.2. 802.11n HT20 2Tx CDD MODE IN THE 5.8 GHz BAND

8.2.1. 6 dB BANDWIDTH

LIMITS

FCC §15.407 (e)

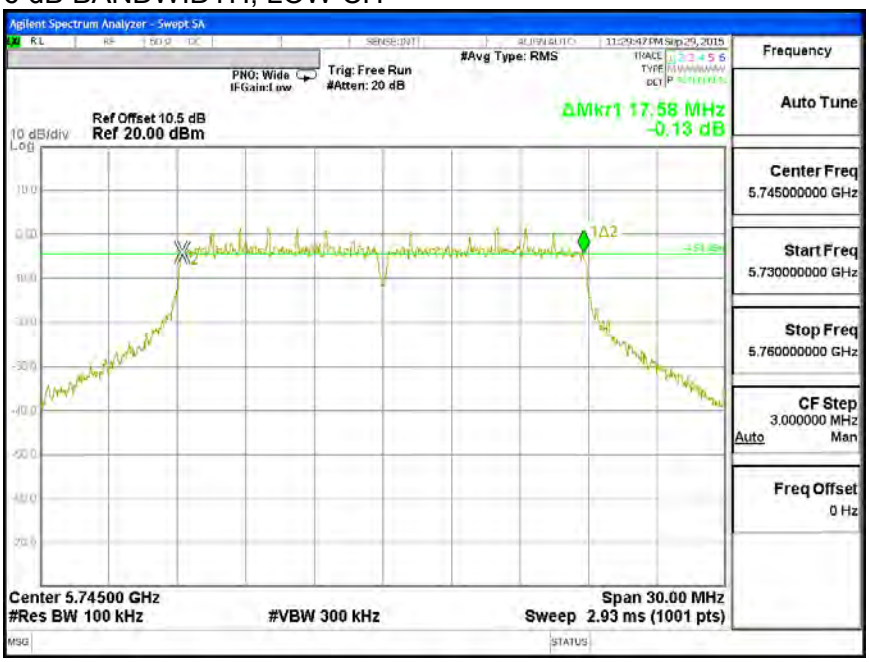
The minimum 6 dB bandwidth shall be at least 500 kHz.

RESULTS

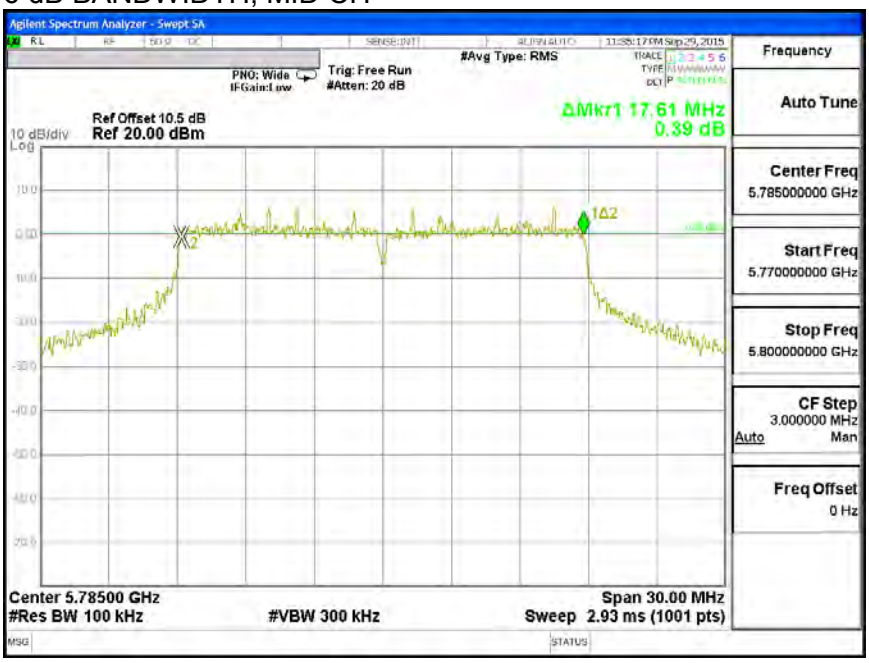
Channel	Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	Minimum Limit (MHz)
Low	5745	17.58	17.58	0.5
Mid	5785	17.61	17.58	0.5
High	5825	17.64	17.58	0.5

6 dB BANDWIDTH, CHAIN 0

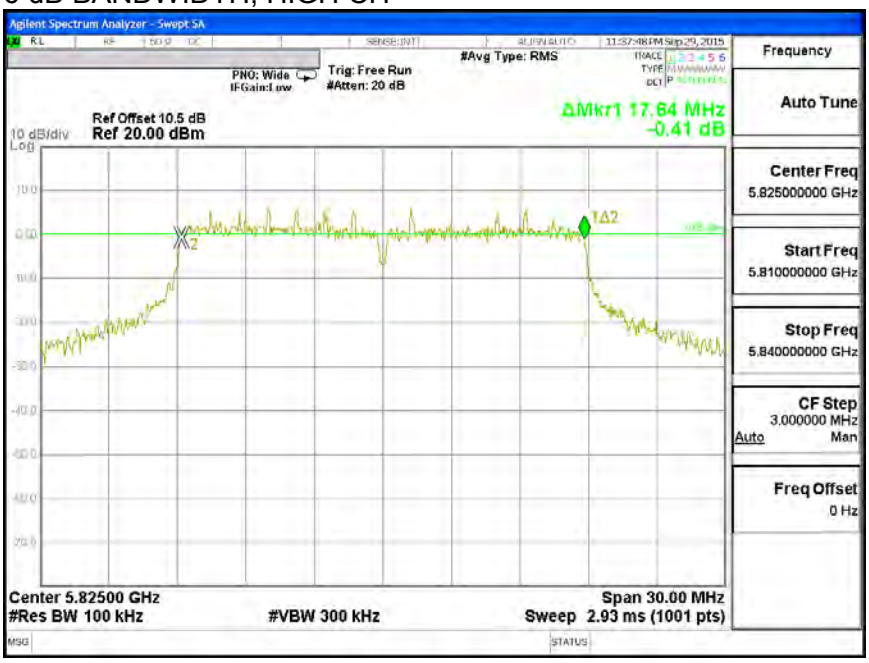
6 dB BANDWIDTH, LOW CH



6 dB BANDWIDTH, MID CH

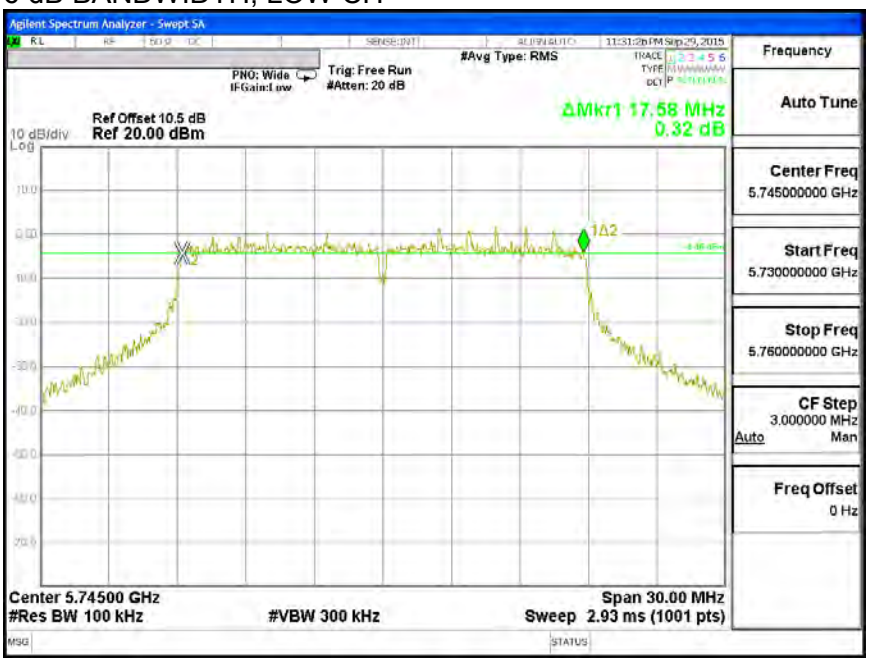


6 dB BANDWIDTH, HIGH CH

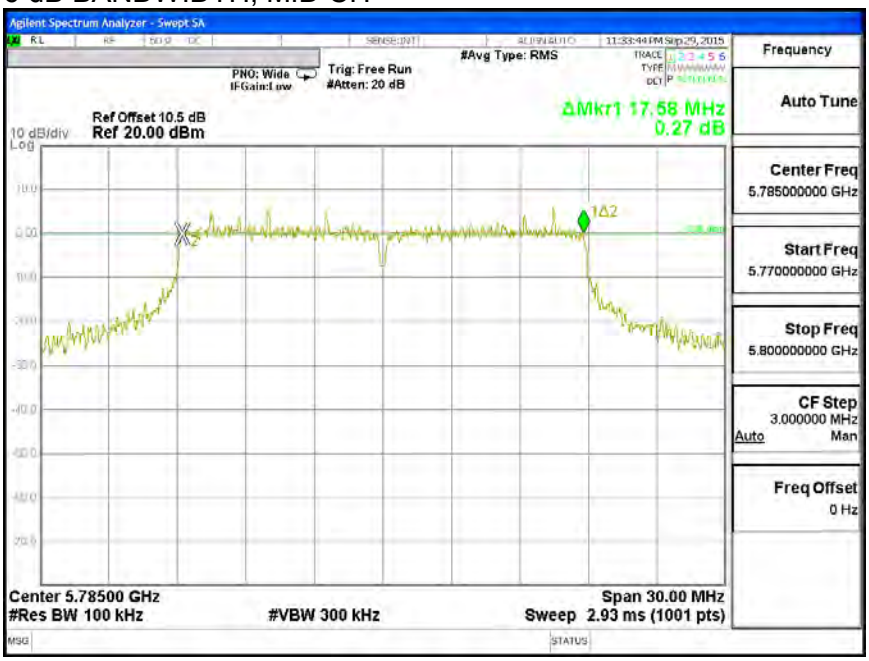


6 dB BANDWIDTH, CHAIN 1

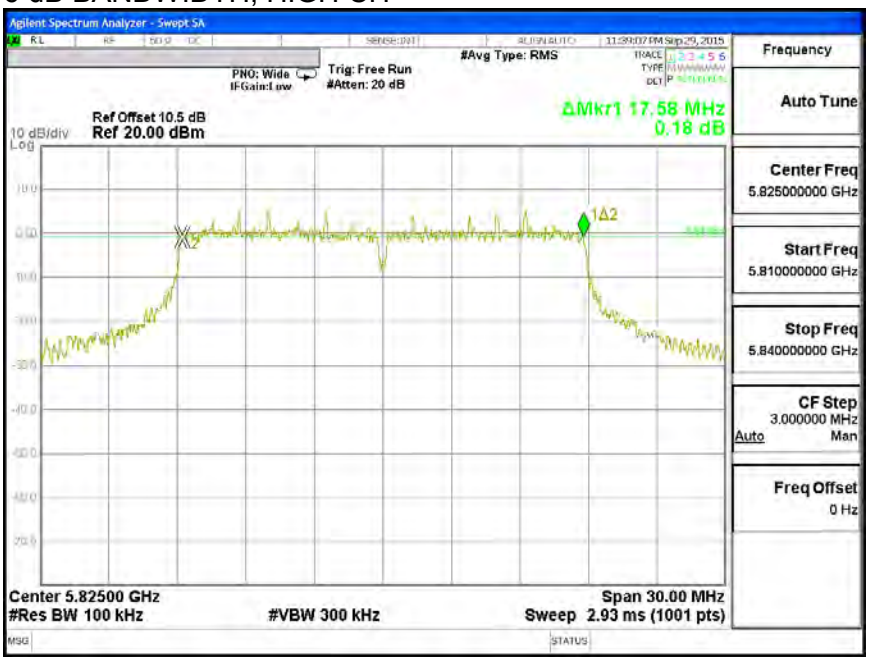
6 dB BANDWIDTH, LOW CH



6 dB BANDWIDTH, MID CH



6 dB BANDWIDTH, HIGH CH



8.2.2. 26 dB BANDWIDTH

LIMITS

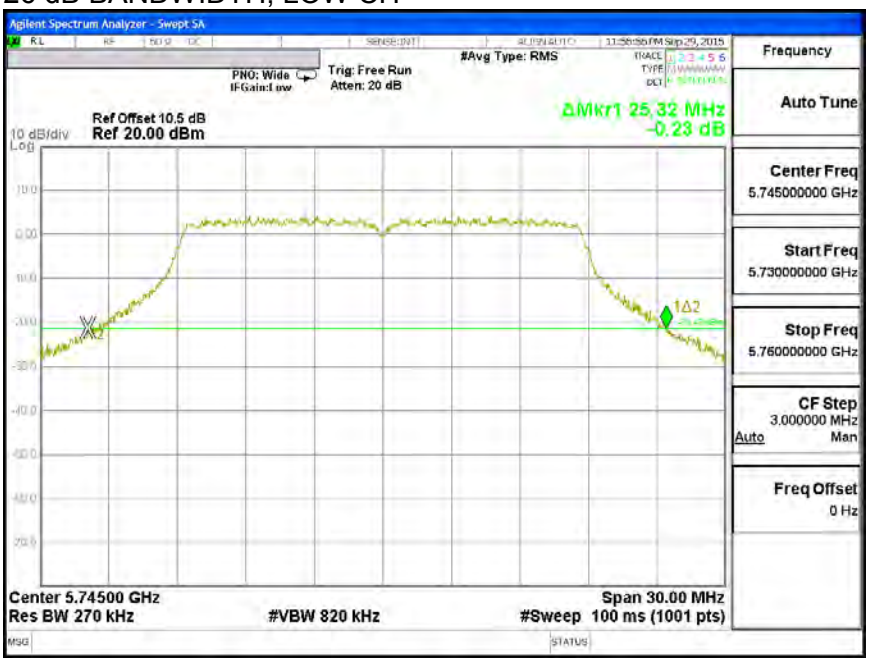
None, for reporting purposes only.

RESULTS

Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)
Low	5745	25.32	25.47
Mid	5785	25.62	25.53
High	5825	25.47	25.59

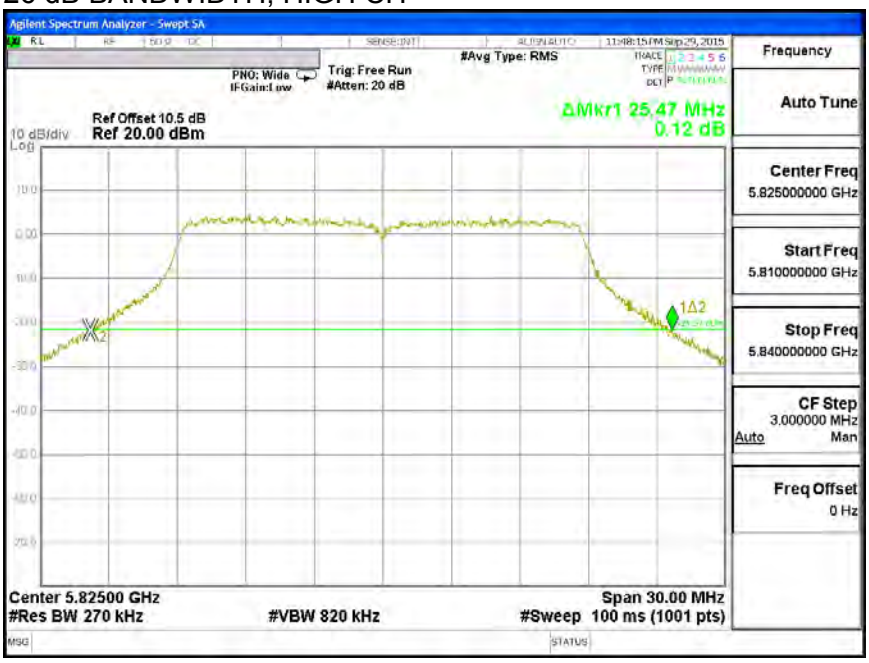
26 dB BANDWIDTH, CHAIN 0

26 dB BANDWIDTH, LOW CH



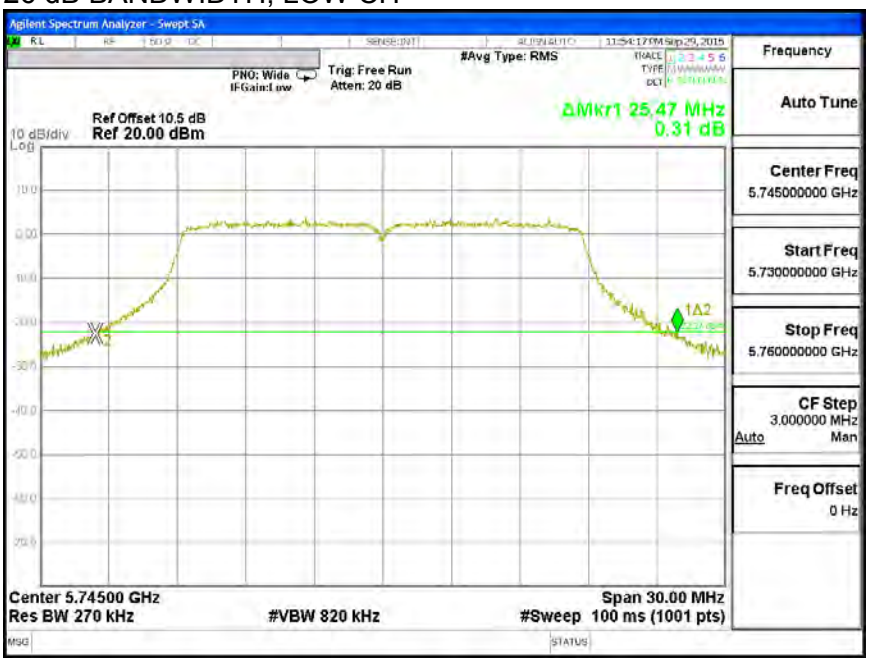
26 dB BANDWIDTH, MID CH

26 dB BANDWIDTH, HIGH CH

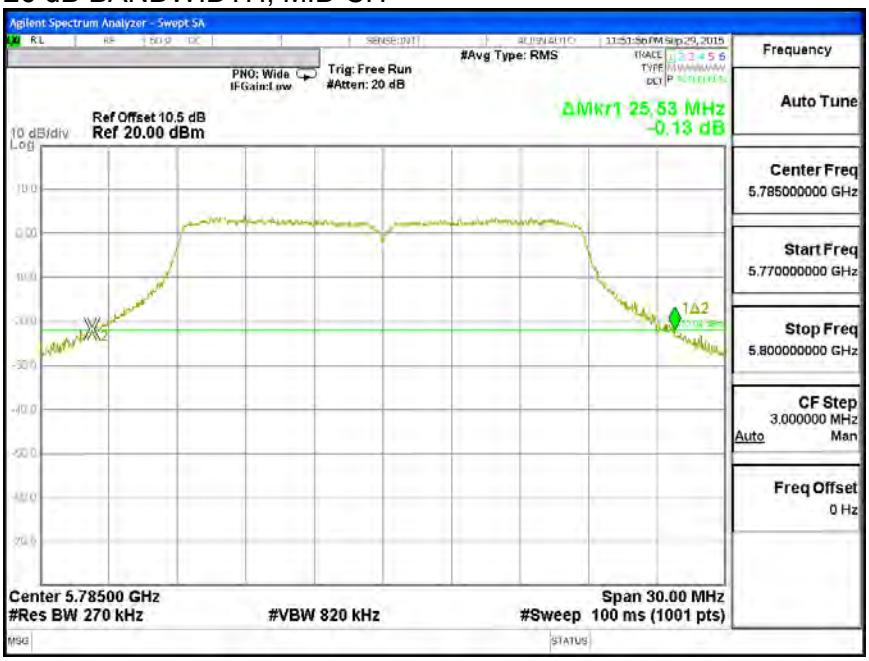


26 dB BANDWIDTH, CHAIN 1

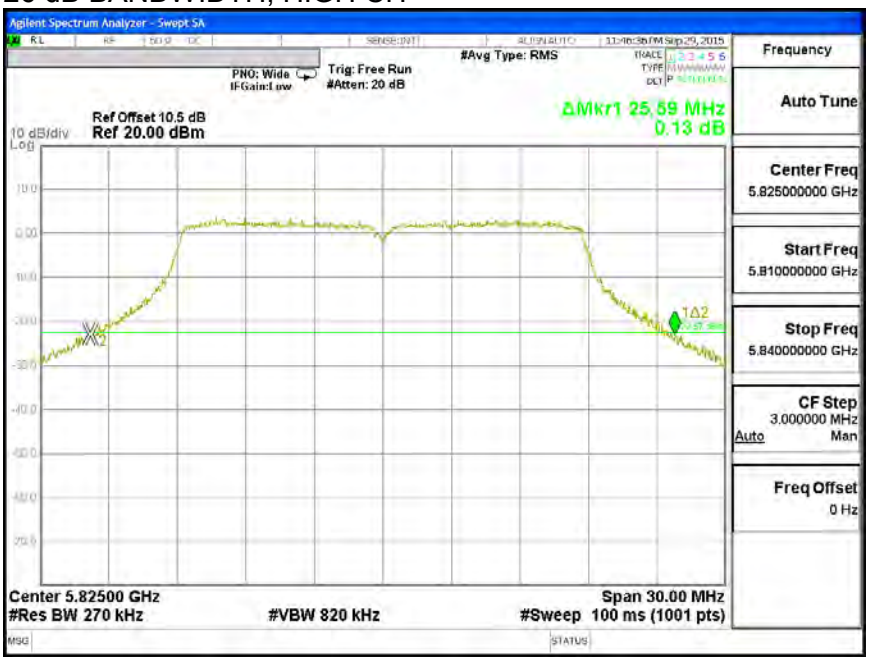
26 dB BANDWIDTH, LOW CH



26 dB BANDWIDTH, MID CH



26 dB BANDWIDTH, HIGH CH



8.2.3. 99% BANDWIDTH

LIMITS

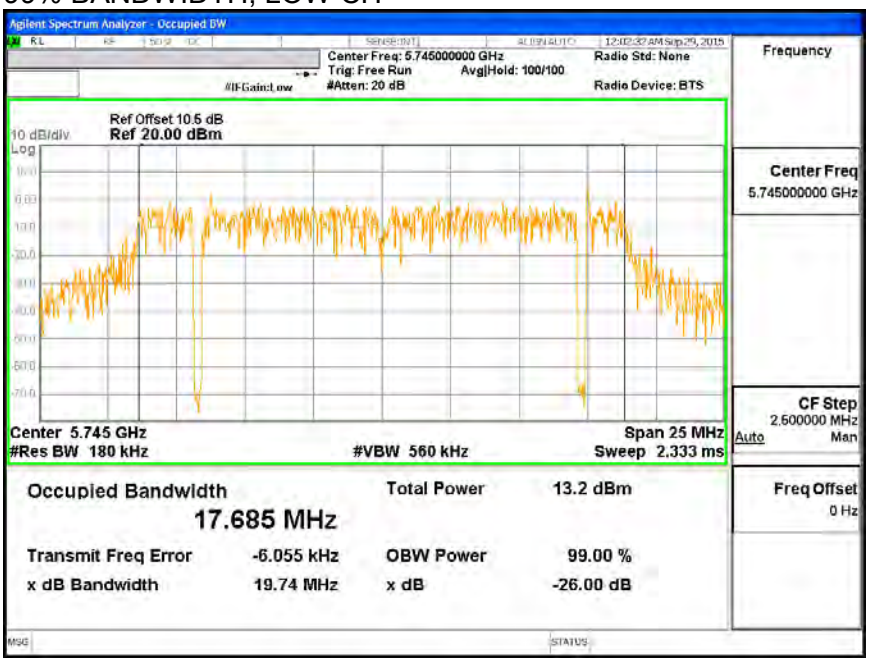
None; for reporting purposes only.

RESULTS

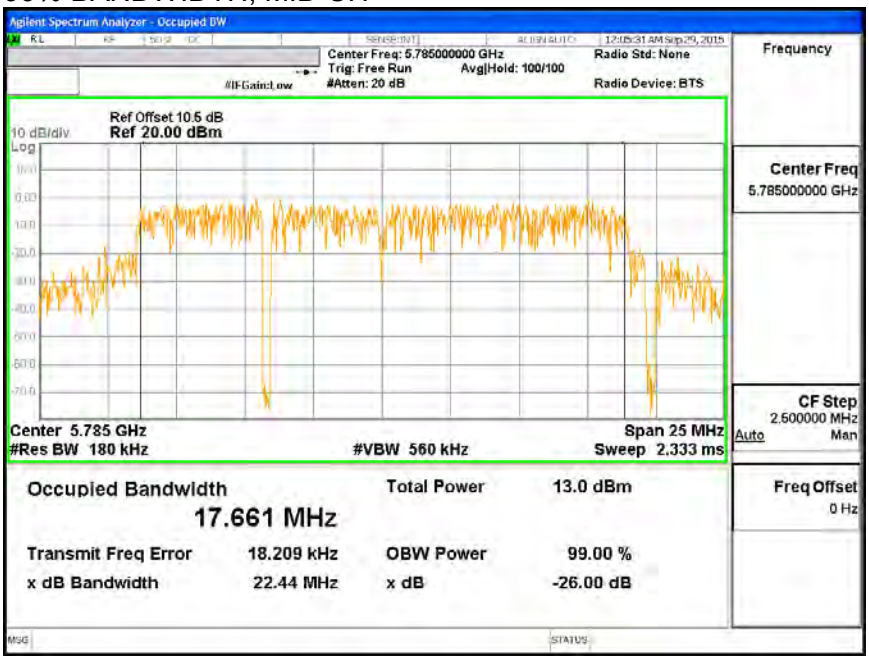
Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	5745	17.685	17.719
Mid	5785	17.661	17.733
High	5825	17.650	17.726

99% BANDWIDTH, CHAIN 0

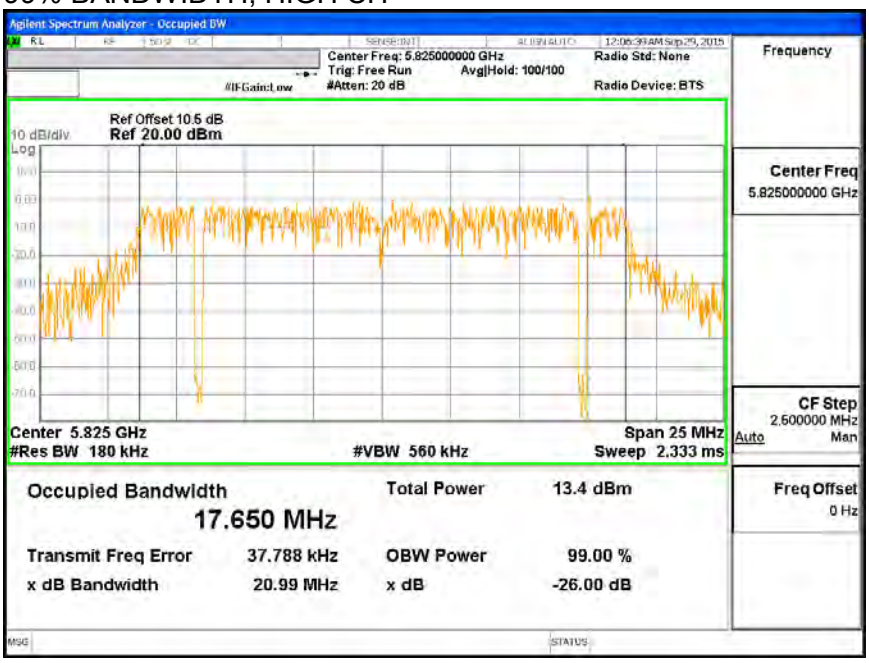
99% BANDWIDTH, LOW CH



99% BANDWIDTH, MID CH

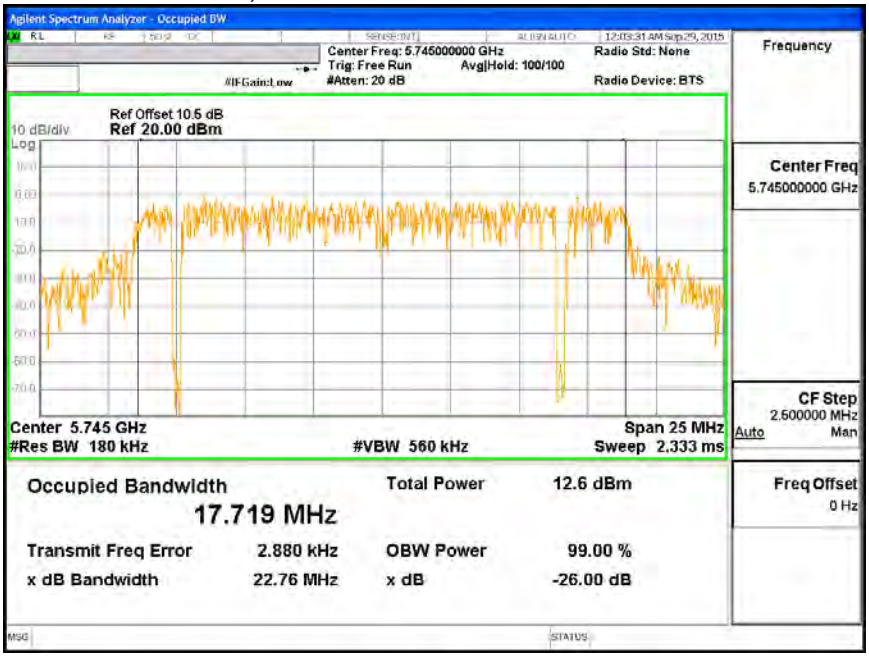


99% BANDWIDTH, HIGH CH

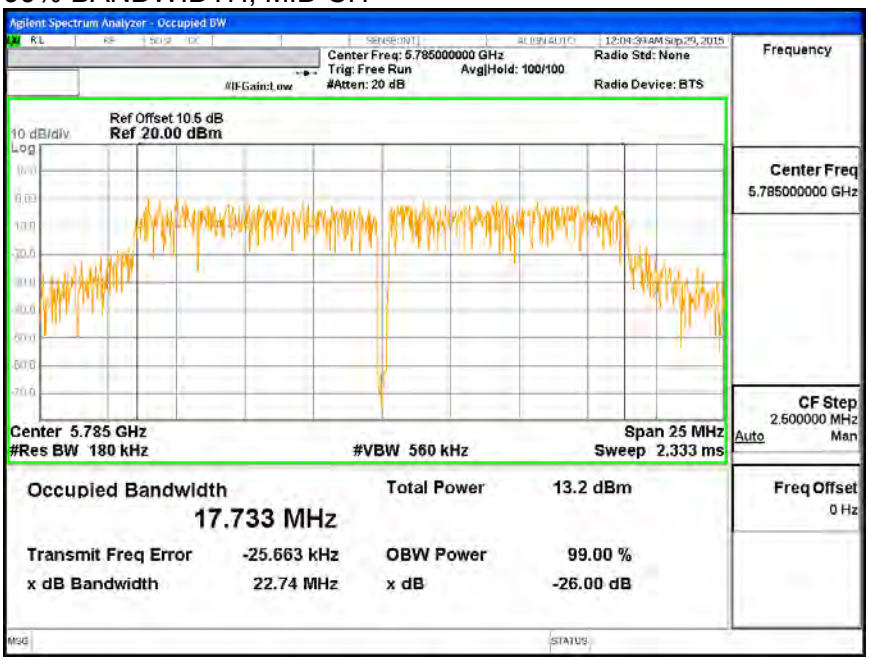


99% BANDWIDTH, CHAIN 1

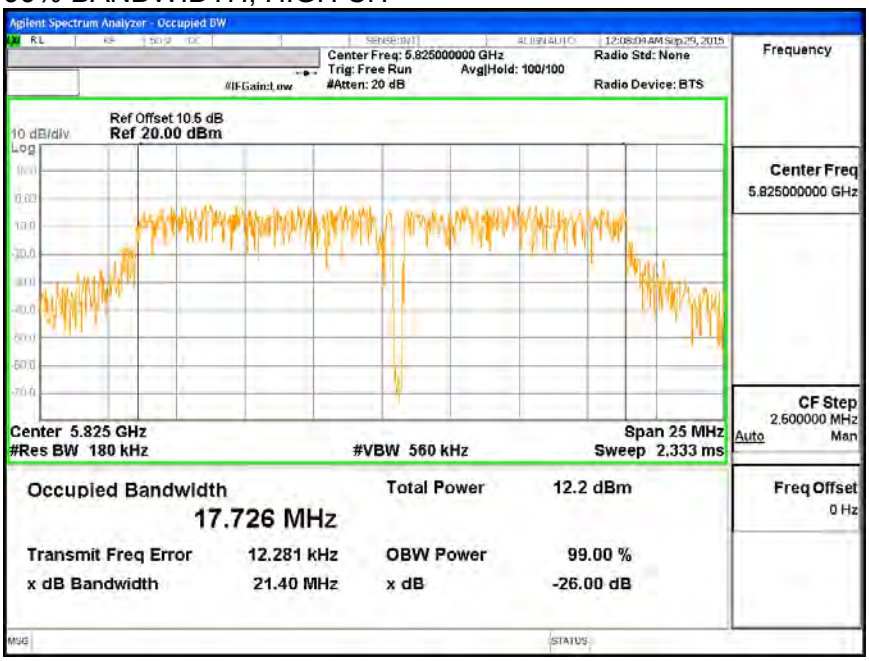
99% BANDWIDTH, LOW CH



99% BANDWIDTH, MID CH



99% BANDWIDTH, HIGH CH



8.2.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter.

RESULTS

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)
Low	5745	12.42	12.79	15.62
Mid	5785	18.66	18.11	21.40
High	5825	17.75	16.91	20.36

8.2.5. OUTPUT POWER

LIMITS

FCC §15.407 (a) (3)

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

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)
2.74	3.11	2.93

RESULTS

Antenna Gain and Limit

Channel	Frequency (MHz)	Directional Gain for Power (dBi)	Power Limit (dBm)
Low	5745	2.93	30.00
Mid	5785	2.93	30.00
High	5825	2.93	30.00

Output Power Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5745	12.42	12.79	15.62	30.00	-14.38
Mid	5785	18.66	18.11	21.40	30.00	-8.60
High	5825	17.75	16.91	20.36	30.00	-9.64

8.2.6. PSD

LIMITS

FCC §15.407 (a) (3)

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density 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 correlated and the antenna gain is unequal among the chains. The directional gain is:

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
2.74	3.11	5.94

RESULTS

Antenna Gain and Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	PSD Limit (dBm)
Low	5745	5.94	30.00
Mid	5785	5.94	30.00
High	5825	5.94	30.00

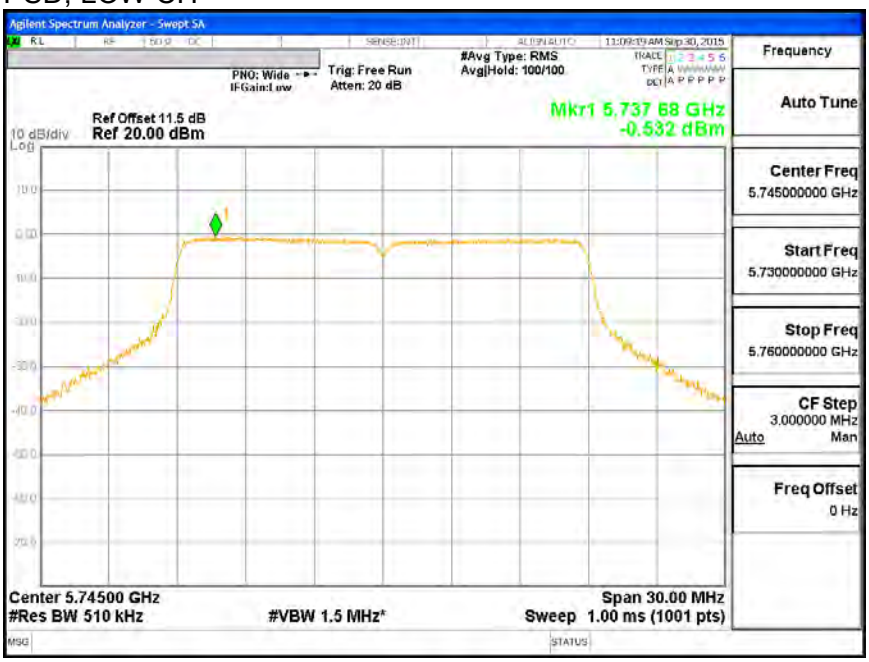
Duty Cycle CF (dB)	0.12	Included in Calculations of Corr'd PSD

PSD Results

Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm)	Chain 1 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5745	-0.53	-0.61	2.56	30.00	-27.44
Mid	5785	3.62	2.93	6.42	30.00	-23.58
High	5825	3.66	2.54	6.27	30.00	-23.73

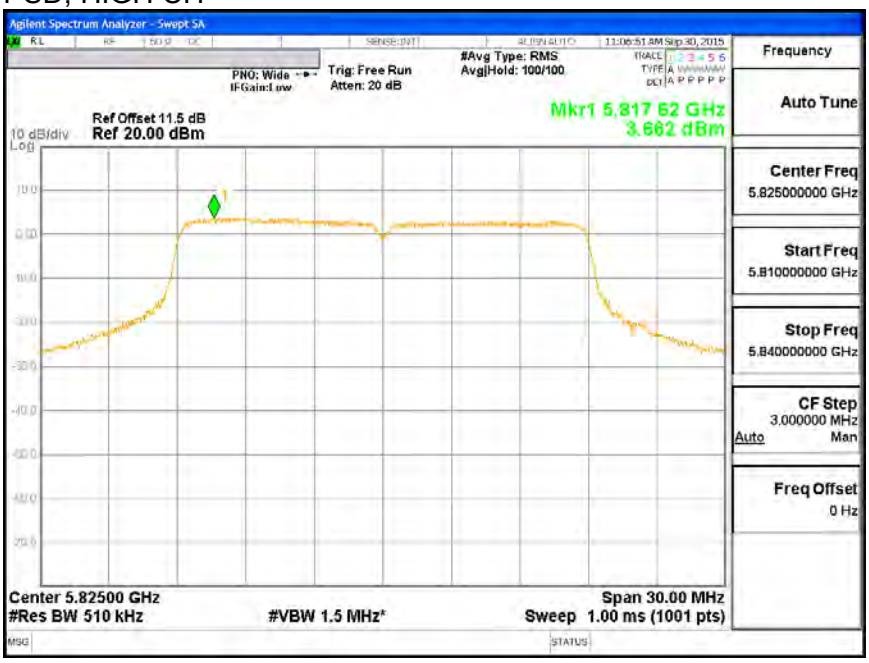
PSD, CHAIN 0

PSD, LOW CH



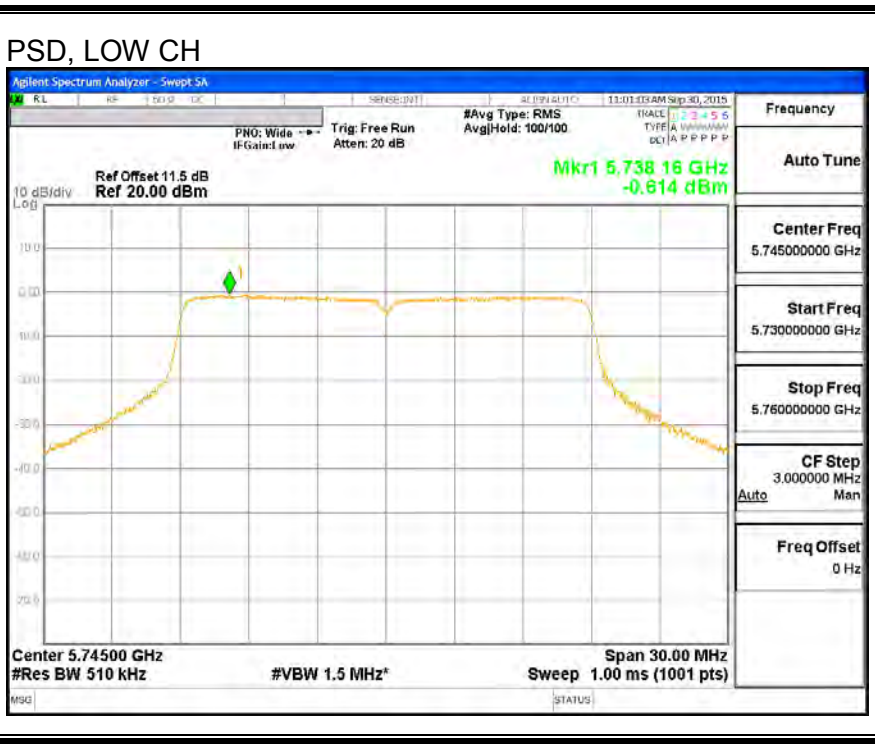
PSD, MID CH

PSD, HIGH CH

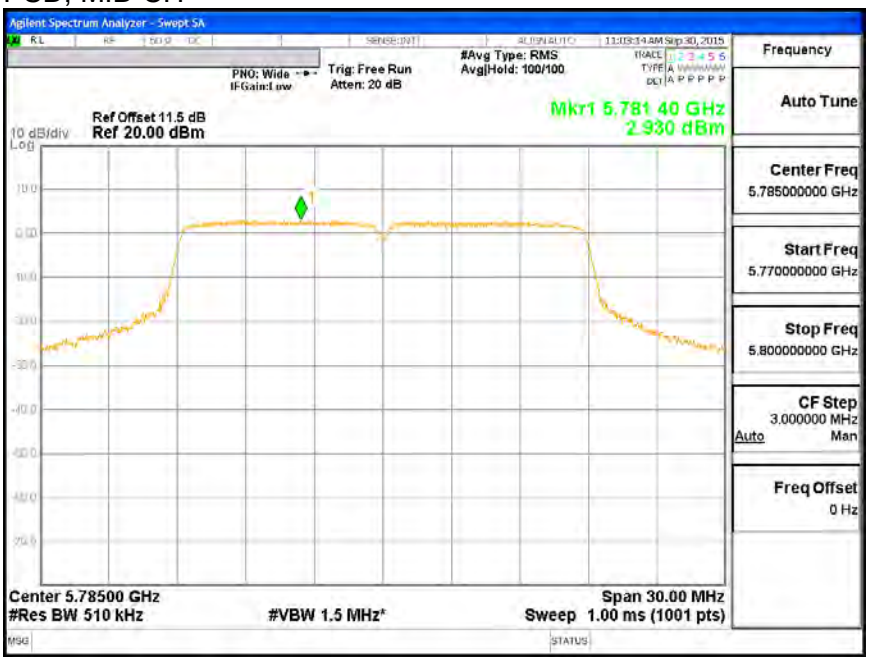


PSD, CHAIN 1

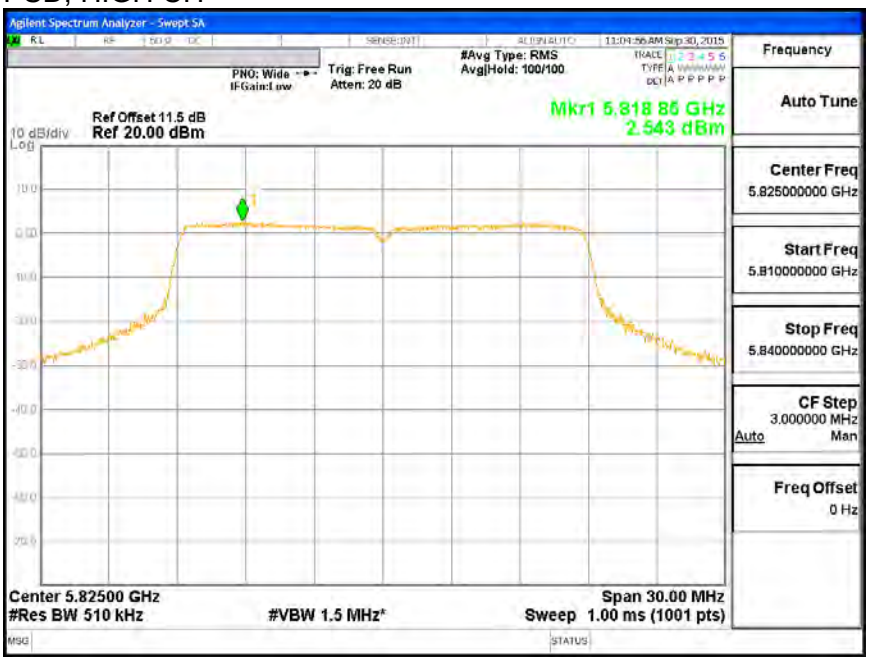
PSD, LOW CH



PSD, MID CH



PSD, HIGH CH



8.3. 802.11n HT40 2Tx CDD MODE IN THE 5.8 GHz BAND

8.3.1. 6 dB BANDWIDTH

LIMITS

FCC §15.407 (e)

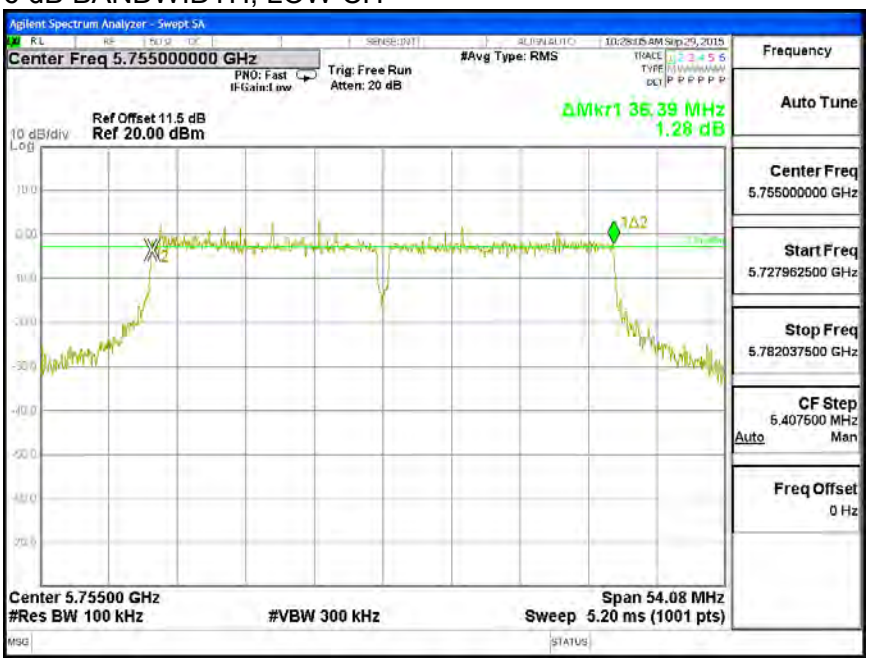
The minimum 6 dB bandwidth shall be at least 500 kHz.

RESULTS

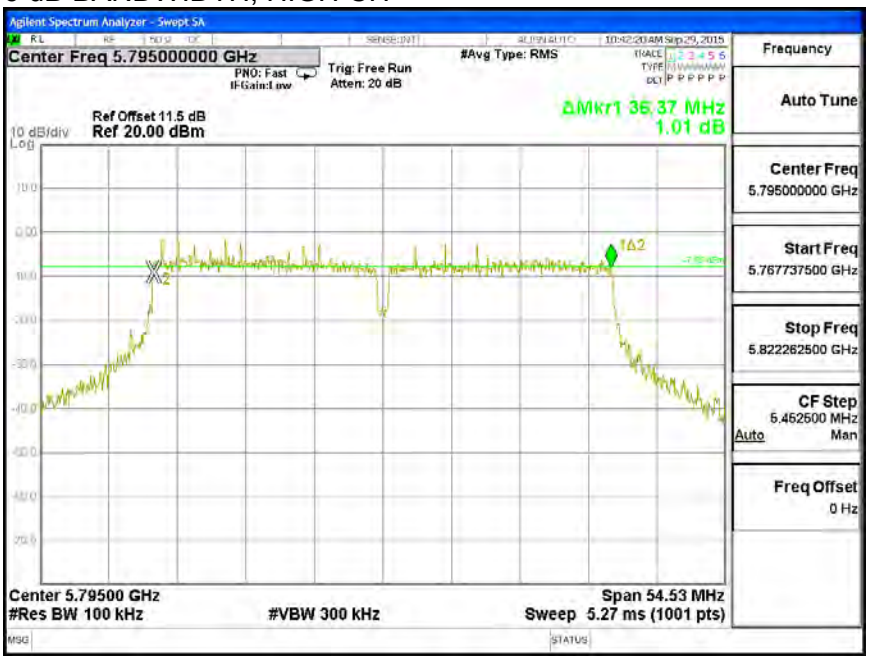
Channel	Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	Minimum Limit (MHz)
Low	5755	36.39	36.37	0.5
High	5795	36.37	36.37	0.5

6 dB BANDWIDTH, CHAIN 0

6 dB BANDWIDTH, LOW CH

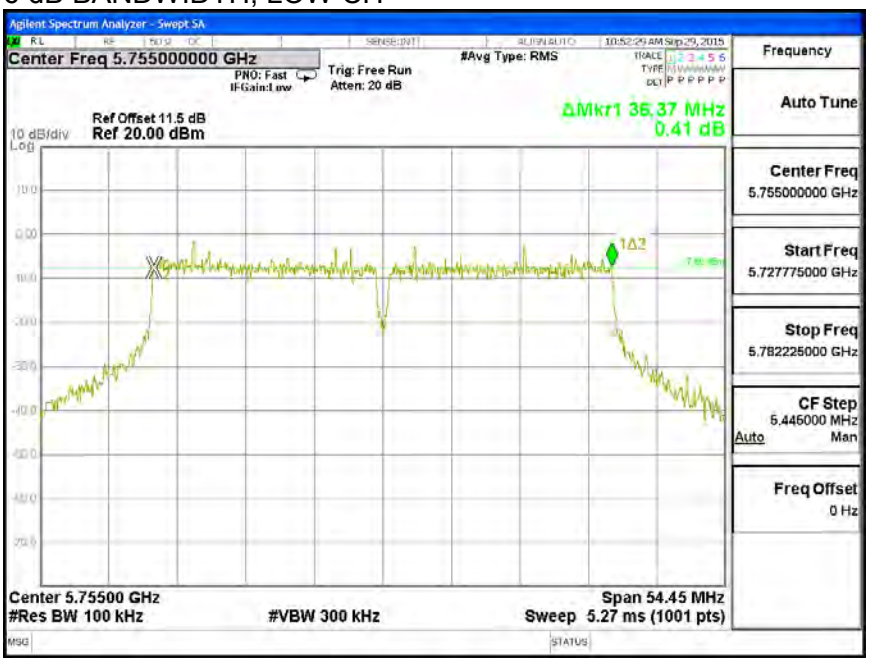


6 dB BANDWIDTH, HIGH CH

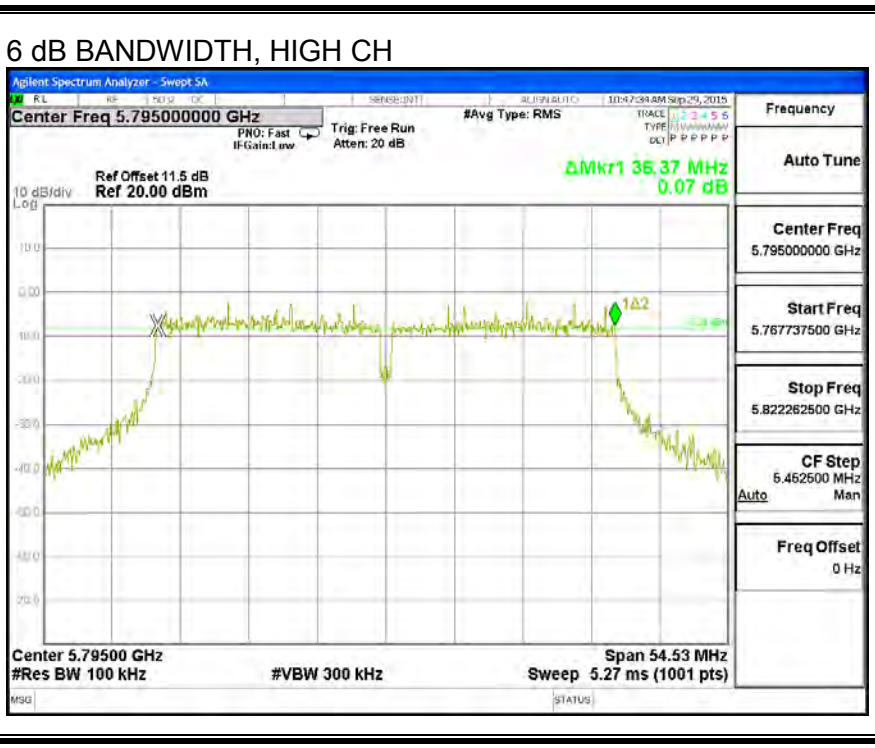


6 dB BANDWIDTH, CHAIN 1

6 dB BANDWIDTH, LOW CH



6 dB BANDWIDTH, HIGH CH



8.3.2. 26 dB BANDWIDTH

LIMITS

None, for reporting purposes only.

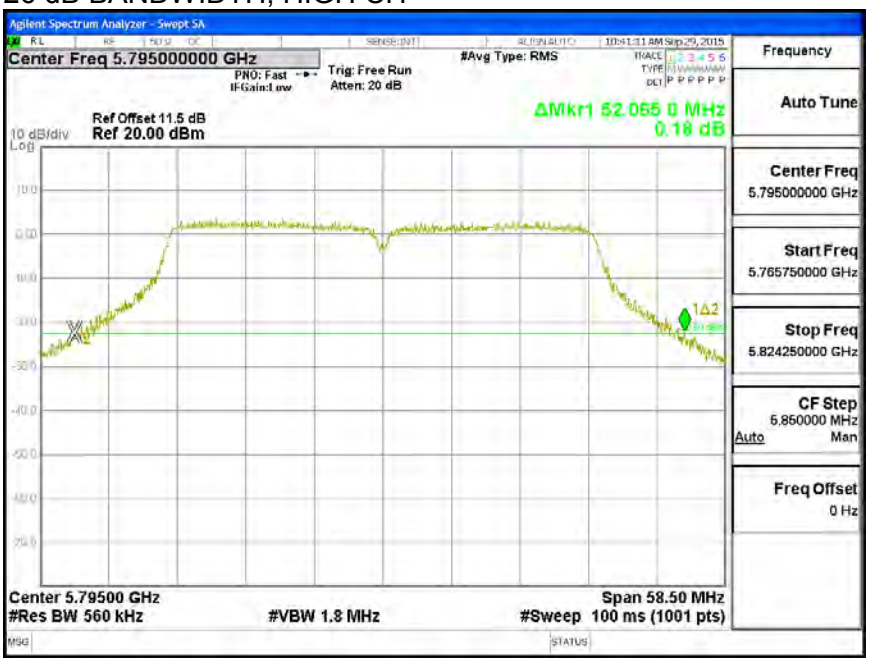
RESULTS

Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)
Low	5755	51.60	51.01
High	5795	52.07	50.54

26 dB BANDWIDTH, CHAIN 0

26 dB BANDWIDTH, LOW CH

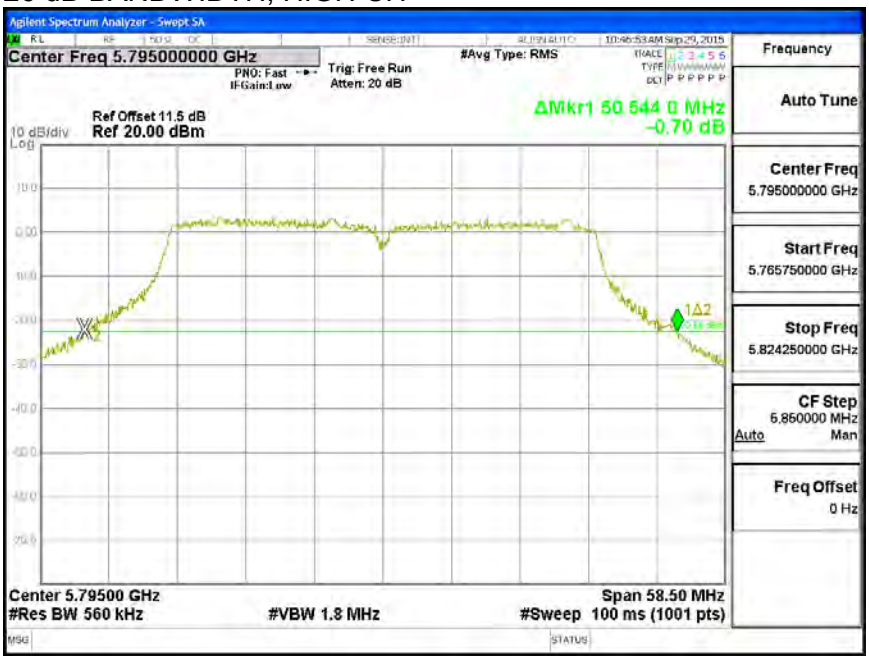
26 dB BANDWIDTH, HIGH CH



26 dB BANDWIDTH, CHAIN 1

26 dB BANDWIDTH, LOW CH

26 dB BANDWIDTH, HIGH CH



8.3.3. 99% BANDWIDTH

LIMITS

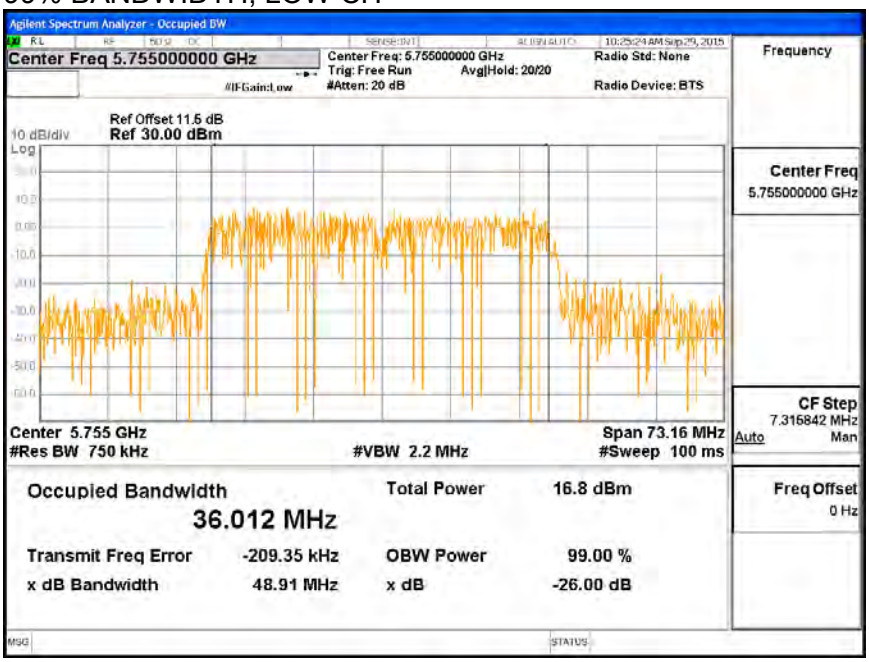
None; for reporting purposes only.

RESULTS

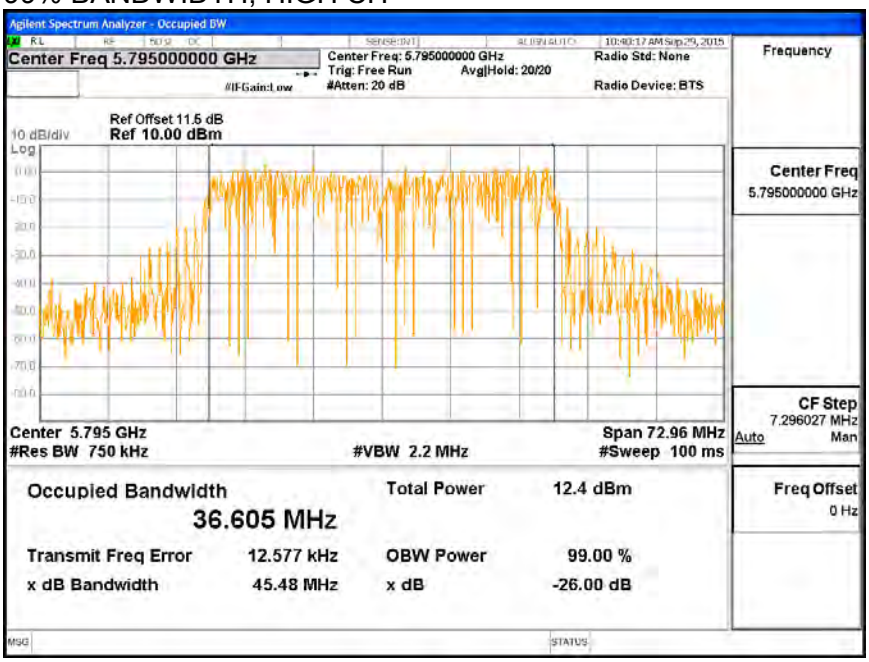
Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	5755	36.012	36.780
High	5795	36.605	36.386

99% BANDWIDTH, CHAIN 0

99% BANDWIDTH, LOW CH

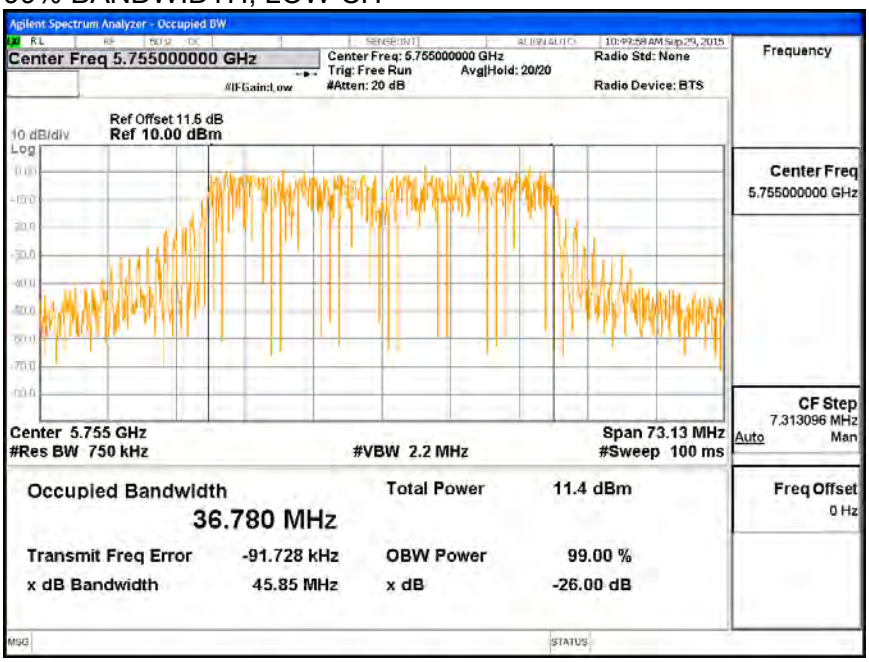


99% BANDWIDTH, HIGH CH

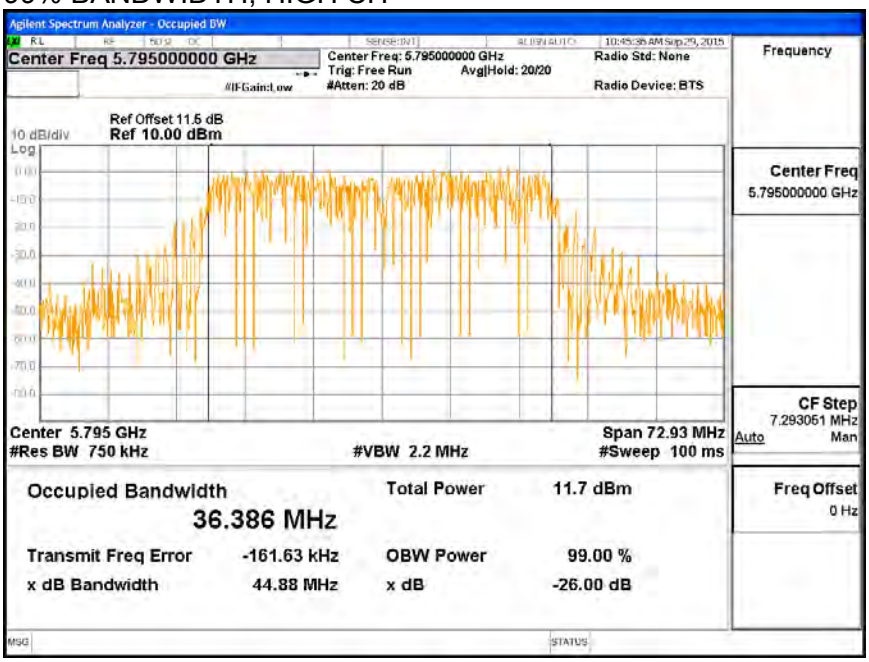


99% BANDWIDTH, CHAIN 1

99% BANDWIDTH, LOW CH



99% BANDWIDTH, HIGH CH



8.3.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter.

RESULTS

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)
Low	5755	10.84	10.37	13.62
High	5795	16.80	16.36	19.60

8.3.5. OUTPUT POWER

LIMITS

FCC §15.407 (a) (3)

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

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)
2.74	3.11	2.93

RESULTS

Antenna Gain and Limit

Channel	Frequency (MHz)	Directional Gain (dBi)	Power Limit (dBm)
Low	5755	2.93	30.00
High	5795	2.93	30.00

Output Power Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5755	10.84	10.37	13.62	30.00	-16.38
High	5795	16.80	16.36	19.60	30.00	-10.40

8.3.6. PSD

LIMITS

FCC §15.407 (a) (3)

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density 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 correlated and the antenna gain is unequal among the chains. The directional gain is:

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
2.74	3.11	5.94

RESULTS

Antenna Gain and Limit

Channel	Frequency (MHz)	Directional Gain (dBi)	PSD Limit (dBm)
Low	5755	5.94	30.00
High	5795	5.94	30.00

Duty Cycle CF (dB)	0.16	Included in Calculations of Corr'd PSD

PSD Results

Channel	Frequency (MHz)	Chain 0 Meas PSD (dBm)	Chain 1 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5755	-4.89	-5.02	-1.78	30.00	-31.78
High	5795	0.03	-0.67	2.86	30.00	-27.14

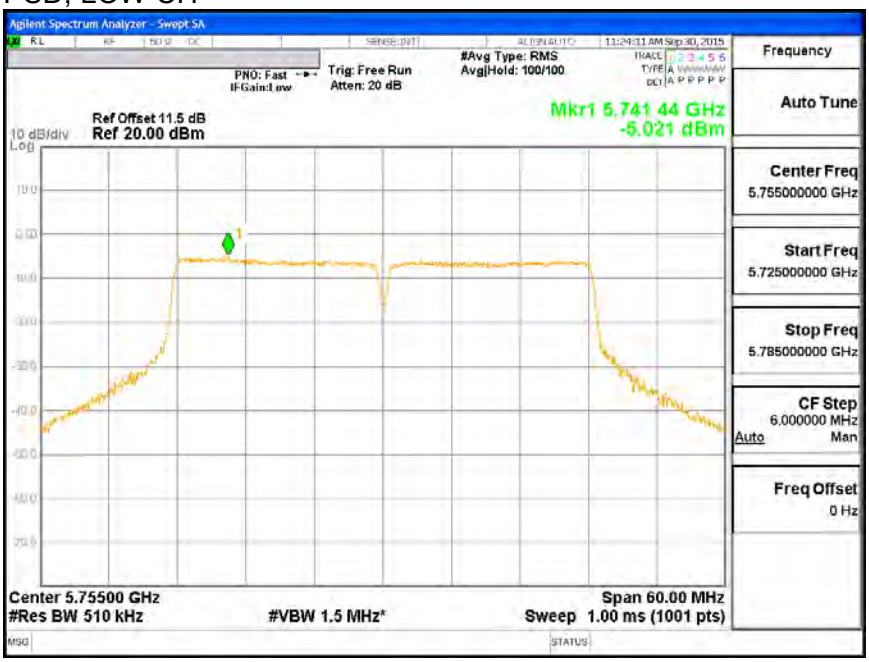
PSD, CHAIN 0

PSD, LOW CH

PSD, HIGH CH

PSD, CHAIN 1

PSD, LOW CH



PSD, HIGH CH

9. RADIATED TEST RESULTS

9.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

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.

The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

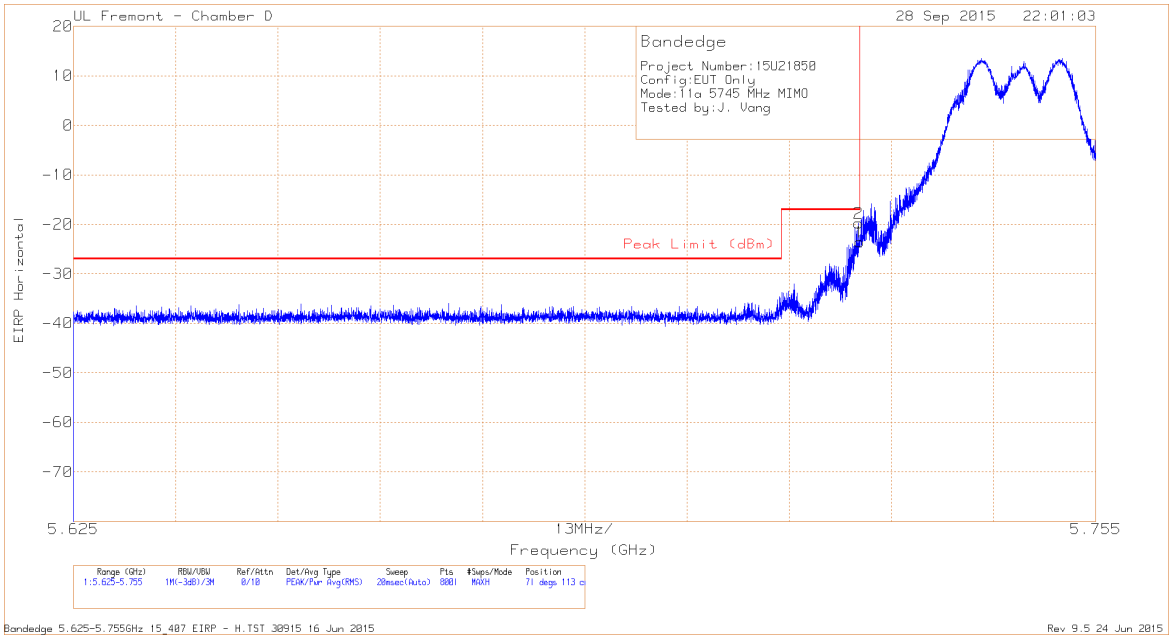
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

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

9.2. 802.11a MODE 2Tx CDD MODE IN THE 5.8 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL)

LOW CHANNEL HORIZONTAL PLOT

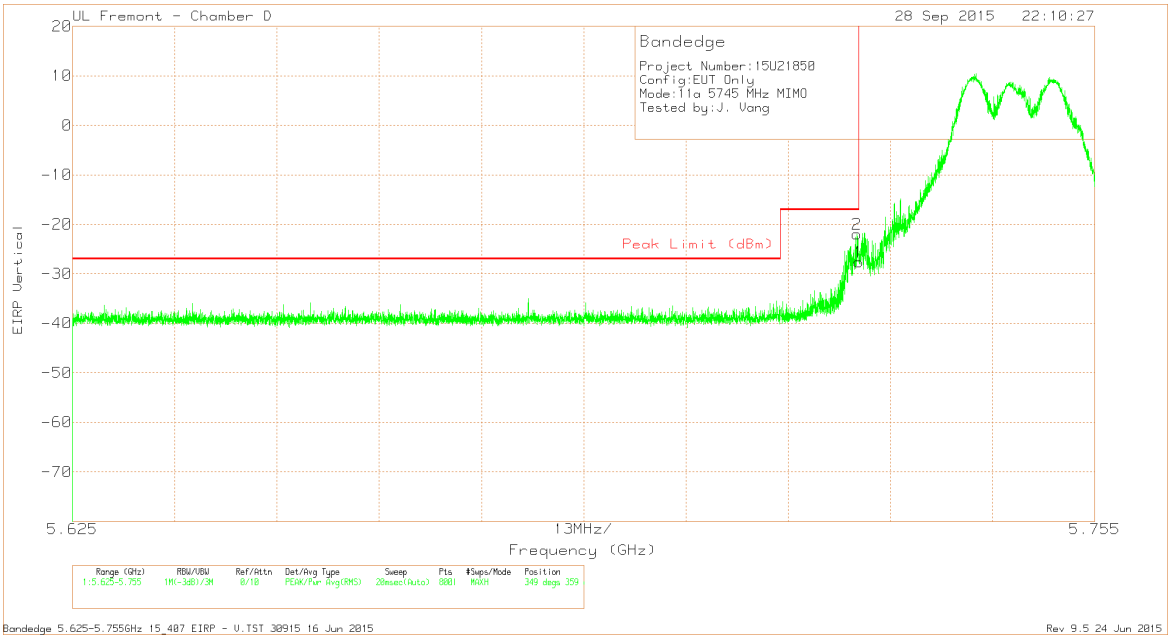


DATA

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T344 (dB/m)	Amp/Cbl /Fltr/Pad (dB)	Conversion Factor (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	5.725	-52.32	Pk	34.6	-17.6	11.8	-23.52	-17	-6.52	71	113	H
2	5.725	-48.51	Pk	34.6	-17.6	11.8	-19.71	-17	-2.71	71	113	H

Pk - Peak detector

LOW CHANNEL VERTICAL PLOT

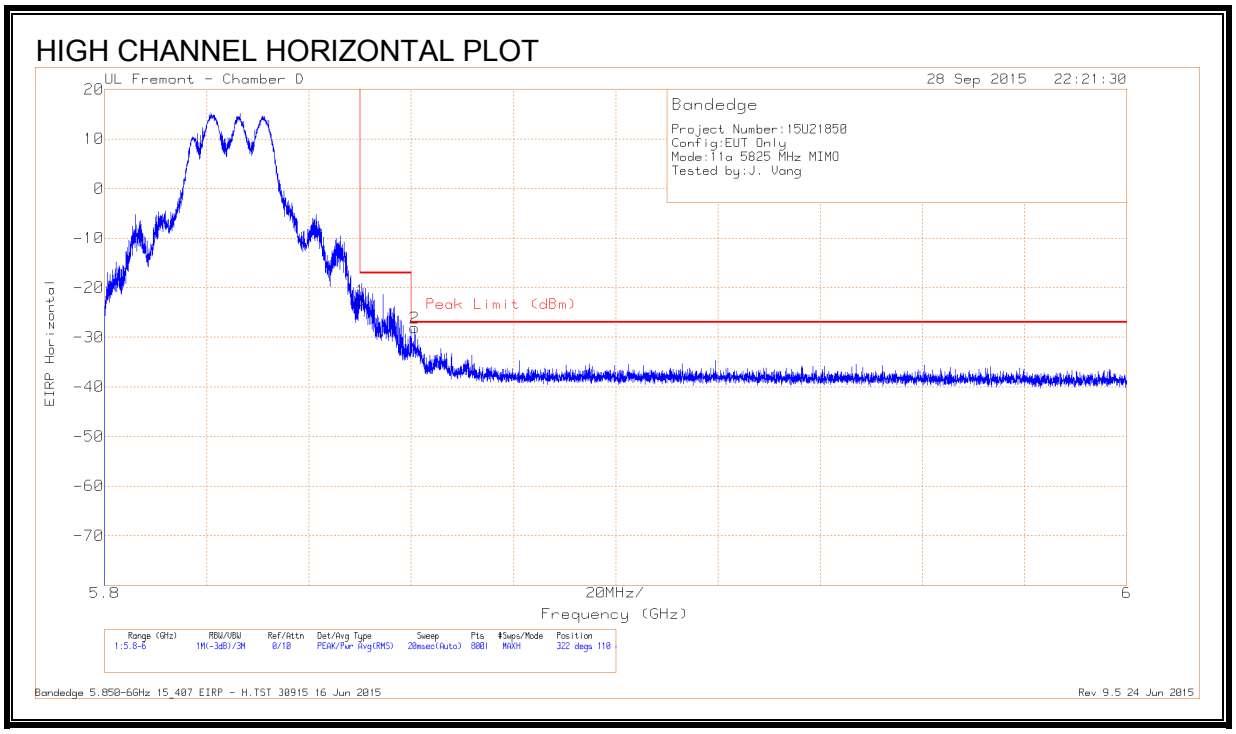


DATA

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T344 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Conversion Factor (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	5.725	-56.38	Pk	34.6	-17.6	11.8	-27.58	-17	-10.58	349	359	V
2	5.725	-50.76	Pk	34.6	-17.6	11.8	-21.96	-17	-4.96	349	359	V

Pk - Peak detector

RESTRICTED BANDEDGE (HIGH CHANNEL)

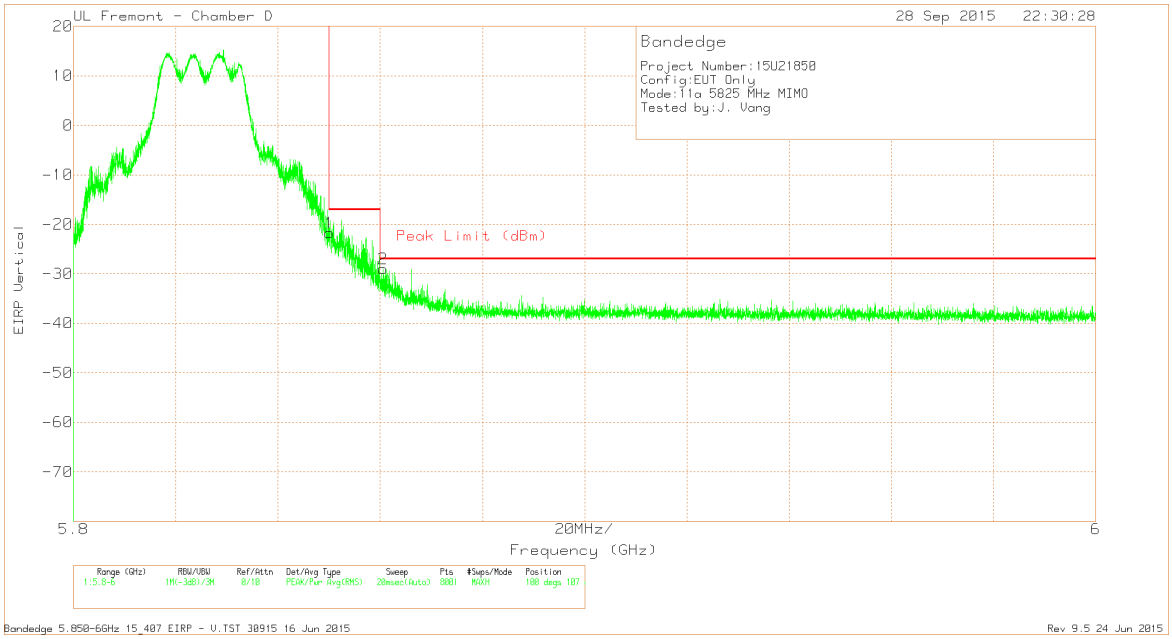


DATA

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T344 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Conversion Factor (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	5.85	-51.61	Pk	34.9	-17.7	11.8	-22.61	-17	-5.61	322	110	H
2	5.861	-57.26	Pk	35	-17.6	11.8	-28.06	-27	-1.06	322	110	H

Pk - Peak detector

HIGH CHANNEL VERTICAL PLOT



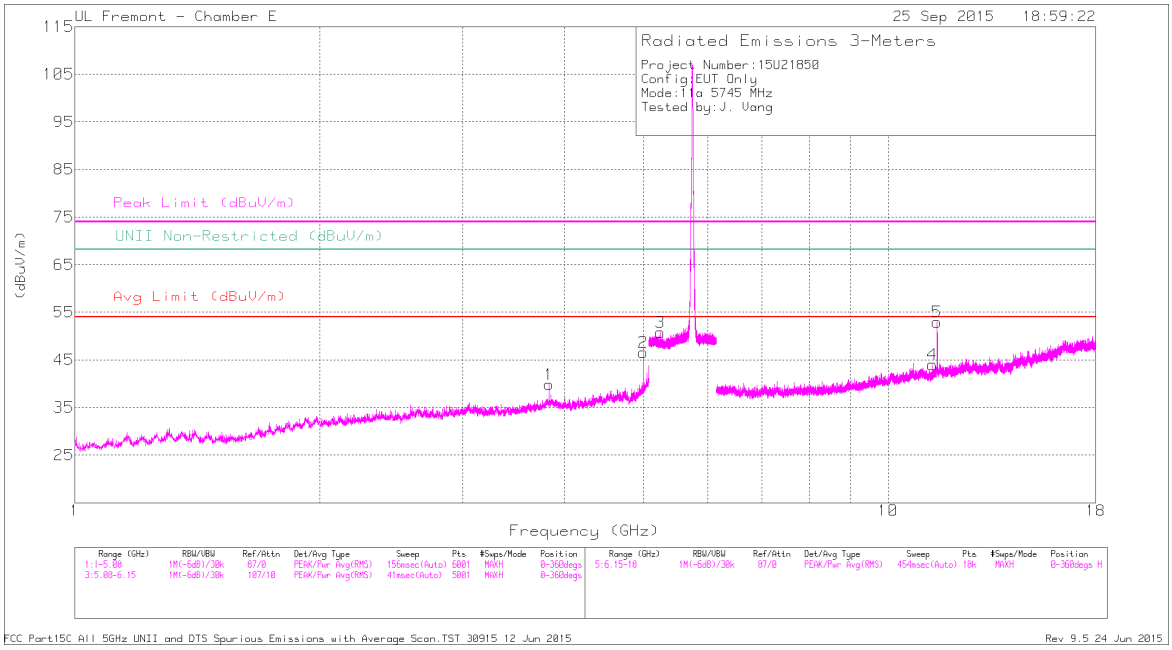
DATA

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T344 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Conversion Factor (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	5.85	-50.7	Pk	34.9	-17.7	11.8	-21.7	-17	-4.7	100	107	V
2	5.861	-58.19	Pk	35	-17.6	11.8	-28.99	-27	-1.99	100	107	V

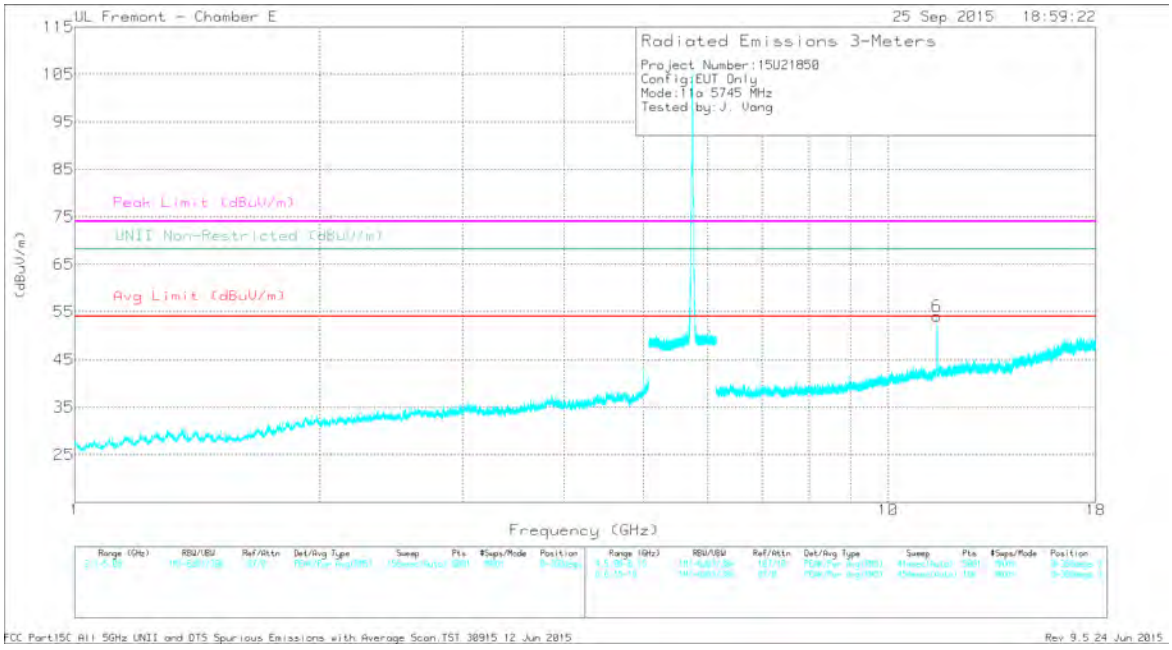
Pk - Peak detector

LOW CHANNEL HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL PLOT



LOW CHANNEL VERTICAL PLOT



DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 3.830	42.11	PK-U	33.5	-29.9	0	45.71	-	-	74	-28.29	-	-	110	259	H
	* 3.830	33.33	ADR	33.5	-29.9	.11	37.04	54	-16.96	-	-	-	-	110	259	H
2	* 5.000	47.46	PK-U	34.2	-28.9	0	52.76	-	-	74	-21.24	-	-	38	384	H
	* 5.000	41.21	ADR	34.2	-28.9	.11	46.62	54	-7.38	-	-	-	-	38	384	H
4	* 11.335	36.59	PK-U	38	-24.5	0	50.09	-	-	74	-23.91	-	-	314	201	H
	* 11.335	25.13	ADR	38	-24.5	.11	38.74	54	-15.26	-	-	-	-	314	201	H
5	* 11.494	46.32	PK-U	38.1	-24.2	0	60.22	-	-	74	-13.78	-	-	0	110	H
	* 11.489	34.38	ADR	38.1	-24.1	.11	48.49	54	-5.51	-	-	-	-	0	110	H
6	* 11.488	48.56	PK-U	38.1	-24.1	0	62.56	-	-	74	-11.44	-	-	344	100	V
	* 11.489	36.42	ADR	38.1	-24.1	.11	50.53	54	-3.47	-	-	-	-	344	100	V
3	5.247	43.28	PK-U	34.5	-20.2	0	57.58	-	-	-	-	68.2	-10.62	256	269	H

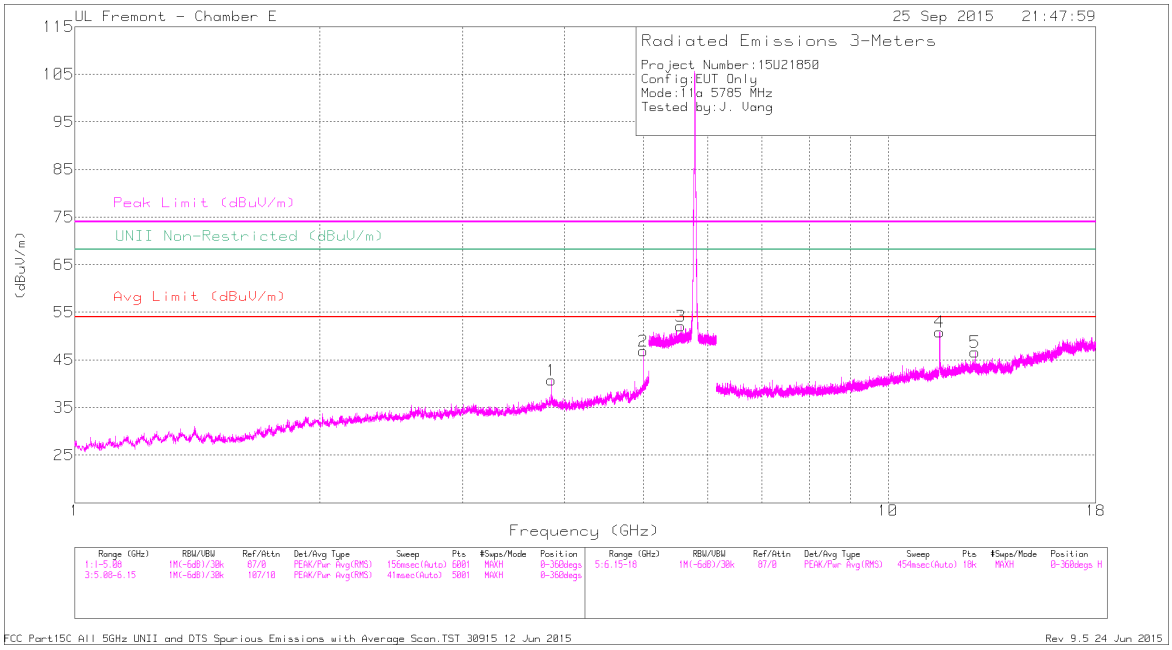
* - indicates frequency in CFR15.205/IC8.10 Restricted Band

PK-U - U-NII: Maximum Peak

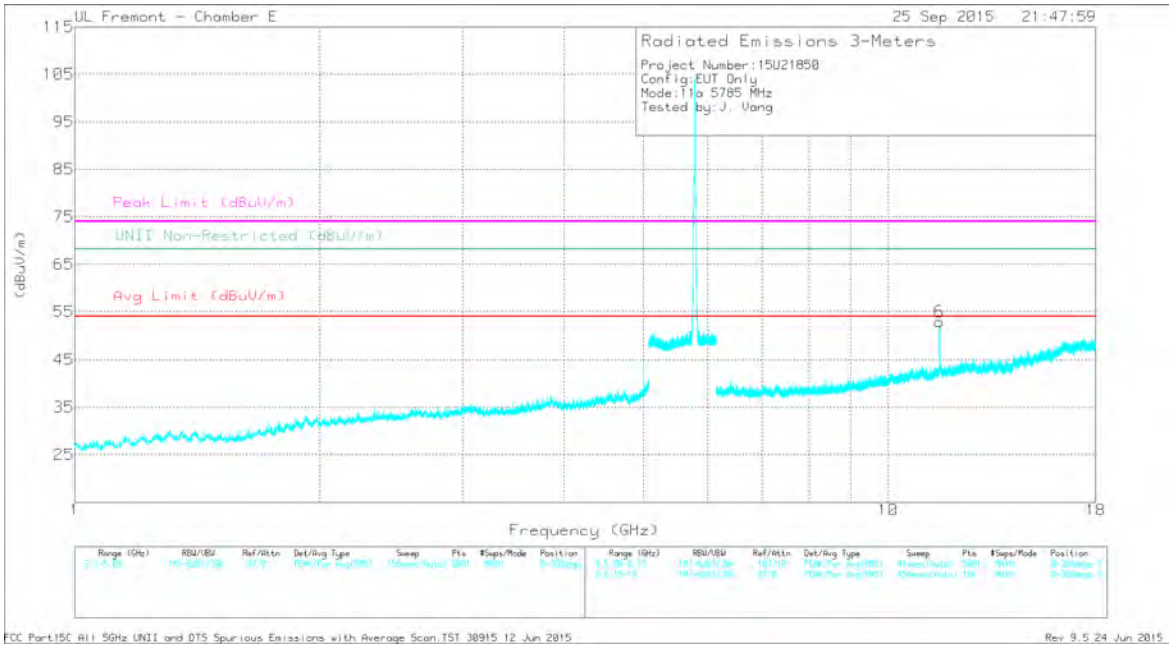
ADR - U-NII AD primary method, RMS average

MID CHANNEL HARMONICS AND SPURIOUS EMISSIONS

MID CHANNEL HORIZONTAL PLOT



MID CHANNEL VERTICAL PLOT



DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 3.857	43.69	PK-U	33.5	-29.9	0	47.29	-	-	74	-26.71	-	-	171	232	H
	* 3.857	35.31	ADR	33.5	-29.9	.11	39.02	54	-14.98	-	-	-	-	171	232	H
2	* 5.000	47.57	PK-U	34.2	-28.9	0	52.87	-	-	74	-21.13	-	-	42	219	H
	* 5.000	40.7	ADR	34.2	-28.9	.11	46.11	54	-7.89	-	-	-	-	42	219	H
4	* 11.568	45.62	PK-U	38.1	-22.3	0	61.42	-	-	74	-12.58	-	-	351	106	H
	* 11.568	32.7	ADR	38.1	-22.3	.11	48.61	54	-5.39	-	-	-	-	351	106	H
6	* 11.568	47.54	PK-U	38.1	-22.3	0	63.34	-	-	74	-10.66	-	-	282	101	V
	* 11.568	34.68	ADR	38.1	-22.3	.11	50.59	54	-3.41	-	-	-	-	282	101	V
3	5.562	45.38	PK-U	34.6	-20.4	0	59.58	-	-	-	-	68.2	-8.62	261	105	H
5	12.788	37.28	PK-U	39	-23.7	0	52.58	-	-	-	-	68.2	-15.62	217	200	H

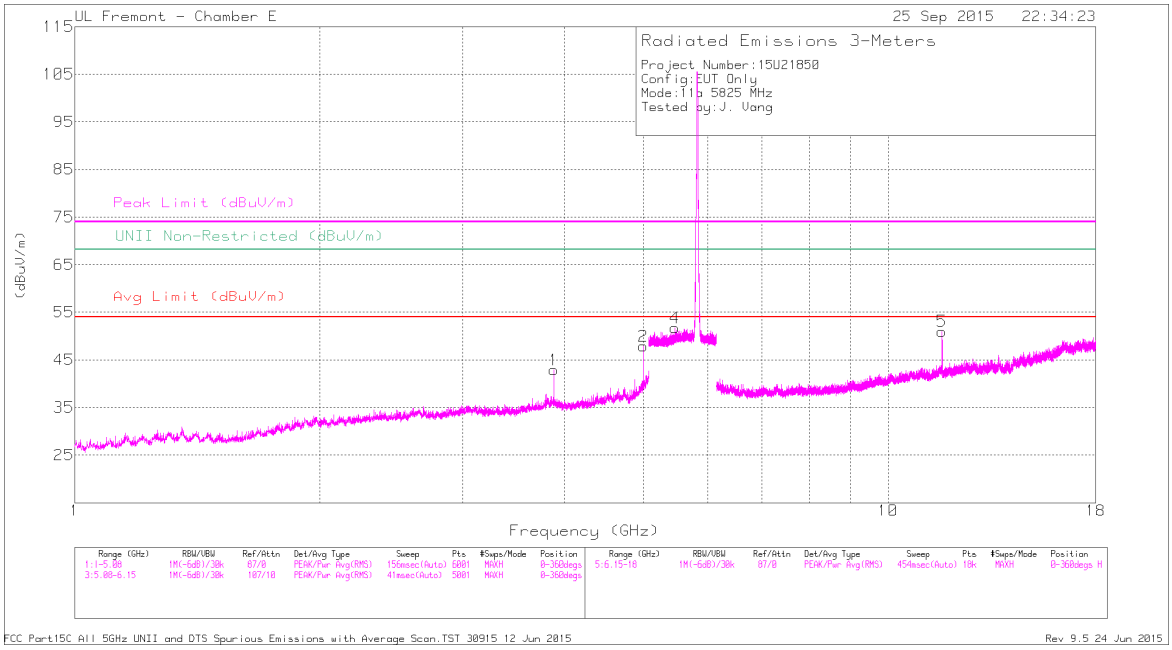
* - indicates frequency in CFR15.205/IC8.10 Restricted Band

PK-U - U-NII: Maximum Peak

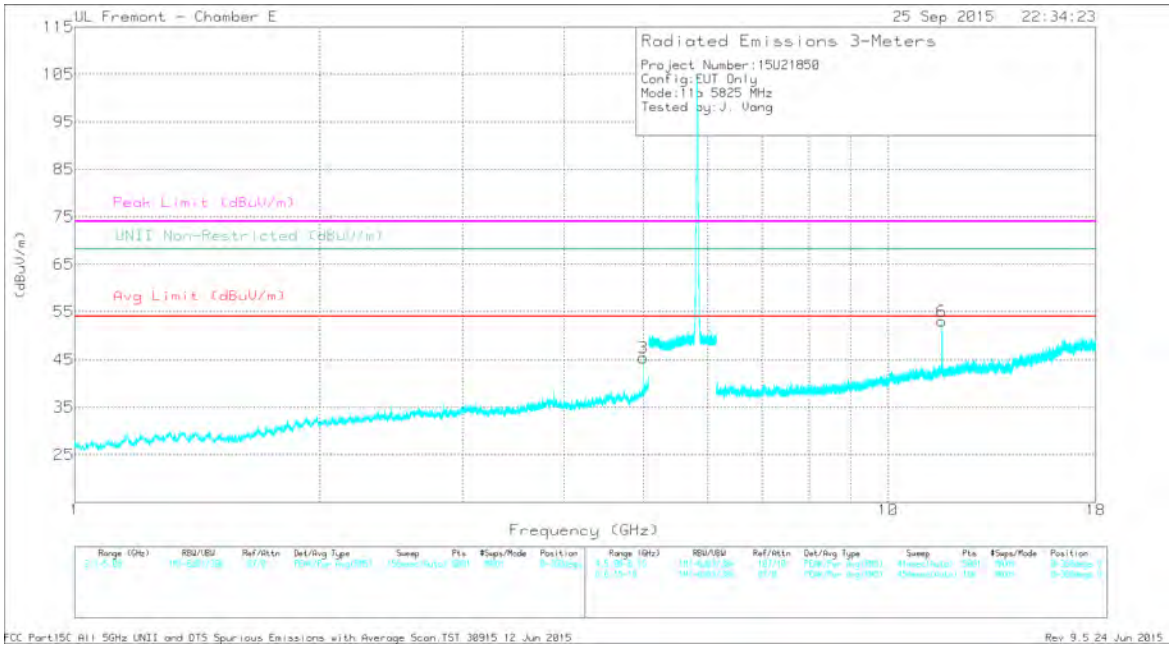
ADR - U-NII AD primary method, RMS average

HIGH CHANNEL HARMONICS AND SPURIOUS EMISSIONS

HIGH CHANNEL HORIZONTAL PLOT



HIGH CHANNEL VERTICAL PLOT



DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 3.883	45.13	PK-U	33.5	-30.2	0	48.43	-	-	74	-25.57	-	-	174	101	H
	* 3.883	38.53	ADR	33.5	-30.2	.11	41.94	54	-12.06	-	-	-	-	174	101	H
2	* 5.000	48.48	PK-U	34.2	-29	0	53.68	-	-	74	-20.32	-	-	42	108	H
	* 5.000	42.17	ADR	34.2	-28.9	.11	47.58	54	-6.42	-	-	-	-	42	108	H
3	* 5.000	47.61	PK-U	34.2	-28.9	0	52.91	-	-	74	-21.09	-	-	157	339	V
	* 5.000	40.8	ADR	34.2	-28.9	.11	46.21	54	-7.79	-	-	-	-	157	339	V
5	* 11.648	46.41	PK-U	38.2	-24	0	60.61	-	-	74	-13.39	-	-	356	136	H
	* 11.648	32.78	ADR	38.2	-24	.11	47.09	54	-6.91	-	-	-	-	356	136	H
6	* 11.653	48.25	PK-U	38.2	-24.2	0	62.25	-	-	74	-11.75	-	-	278	111	V
	* 11.648	35.29	ADR	38.2	-24	.11	49.6	54	-4.4	-	-	-	-	278	111	V
4	5.470	44.79	PK-U	34.6	-20.4	0	58.99	-	-	-	-	68.2	-9.21	166	102	H

* - indicates frequency in CFR15.205/IC8.10 Restricted Band

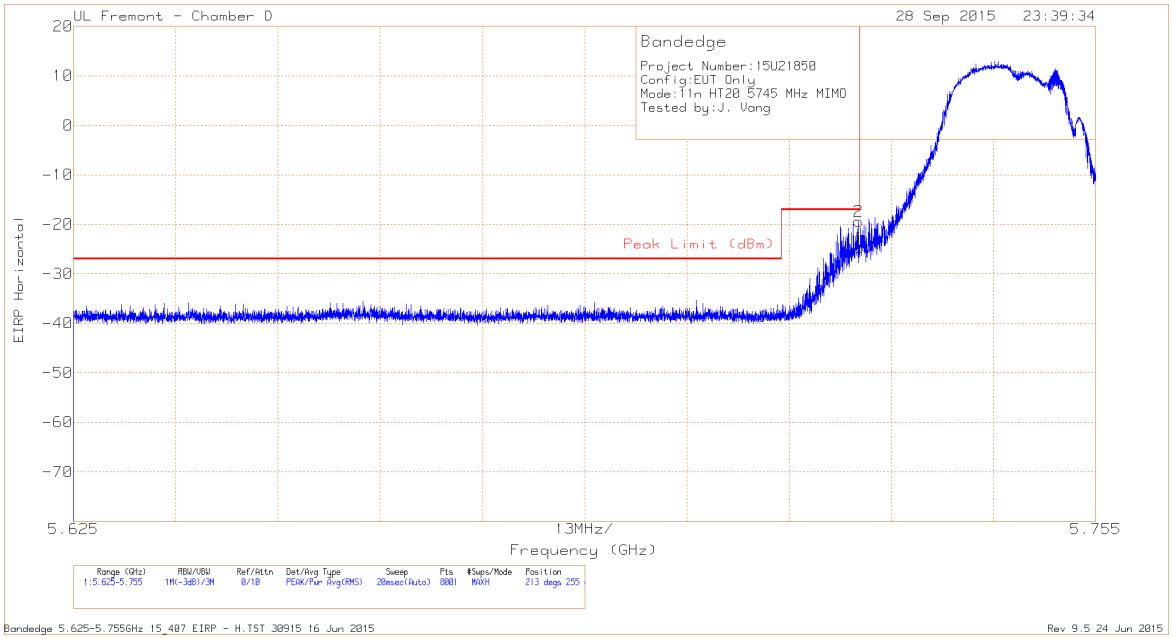
PK-U - U-NII: Maximum Peak

ADR - U-NII AD primary method, RMS average

9.3. 802.11n HT20 2Tx CDD MODE IN THE 5.8 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL)

LOW CHANNEL HORIZONTAL PLOT

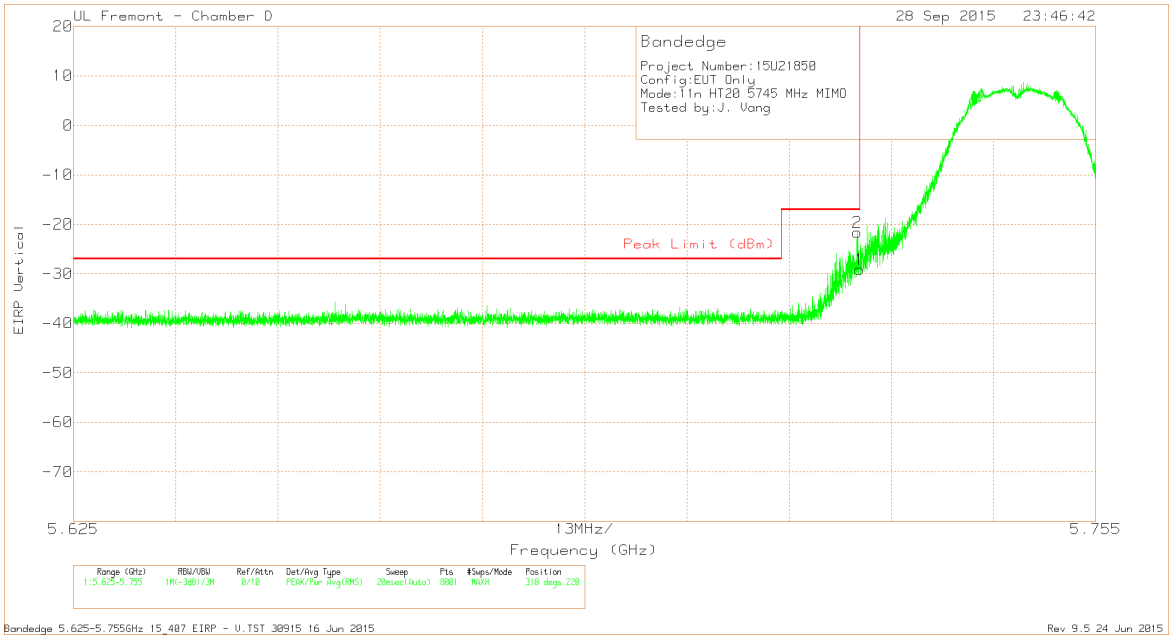


DATA

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T344 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Conversion Factor (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	5.725	-53.42	Pk	34.6	-17.6	11.8	-24.62	-17	-7.62	213	255	H
2	5.725	-48.21	Pk	34.6	-17.6	11.8	-19.41	-17	-2.41	213	255	H

Pk - Peak detector

LOW CHANNEL VERTICAL PLOT

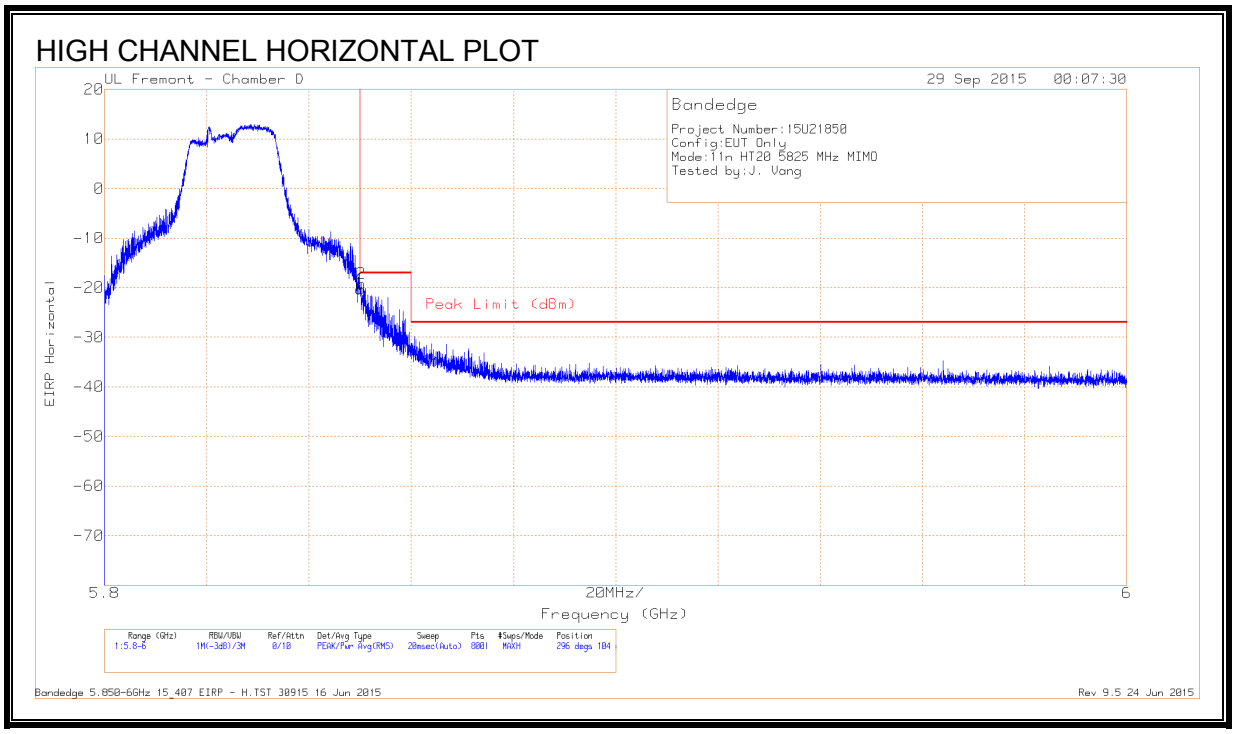


DATA

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T344 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Conversion Factor (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	5.725	-57.89	Pk	34.6	-17.6	11.8	-29.09	-17	-12.09	310	220	V
2	5.725	-50.43	Pk	34.6	-17.6	11.8	-21.63	-17	-4.63	310	220	V

Pk - Peak detector

RESTRICTED BANDEDGE (HIGH CHANNEL)

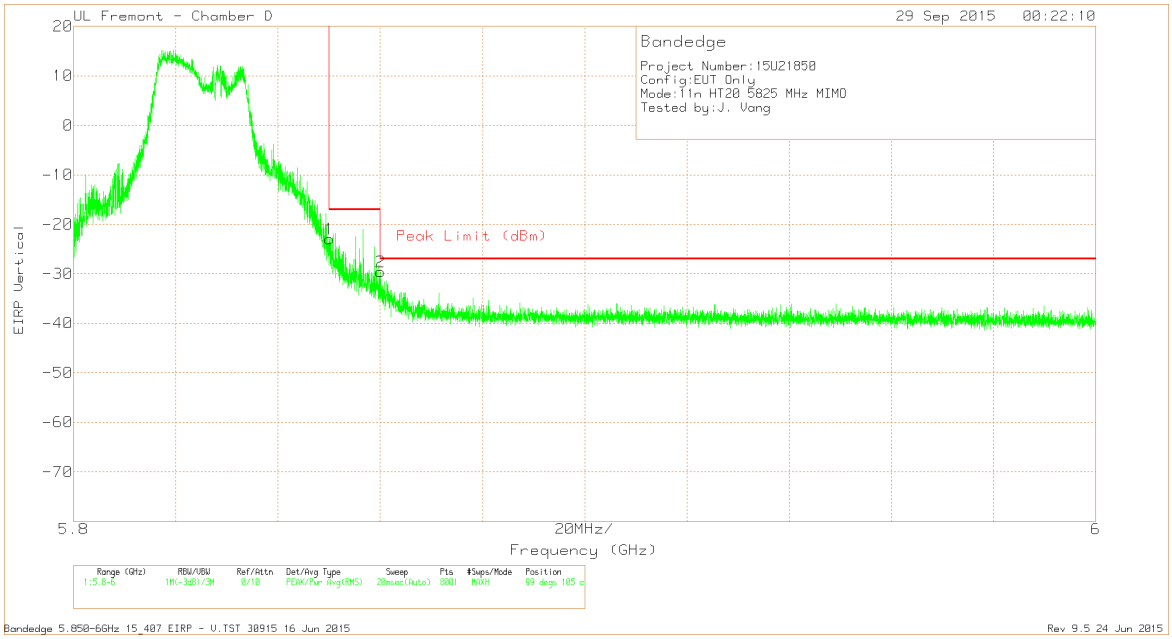


DATA

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T344 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Conversion Factor (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	5.85	-49.22	Pk	34.9	-17.7	11.8	-20.22	-17	-3.22	296	104	H
2	5.85	-48.2	Pk	34.9	-17.7	11.8	-19.2	-17	-2.2	296	104	H

Pk - Peak detector

HIGH CHANNEL VERTICAL PLOT



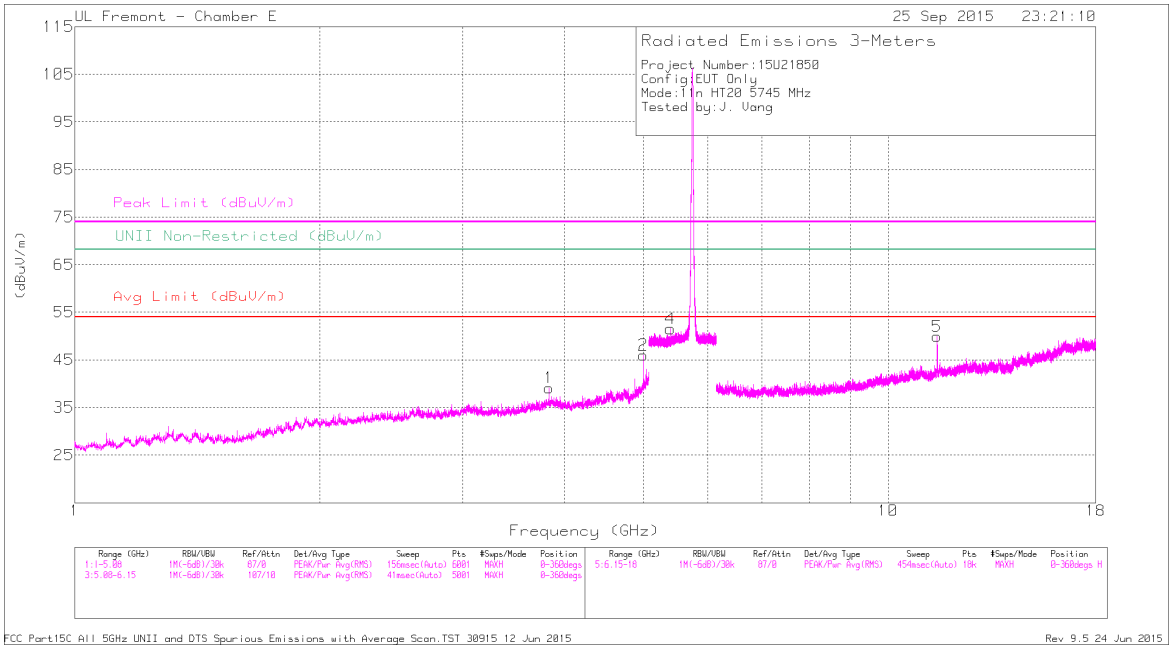
DATA

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T344 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Conversion Factor (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	5.85	-51.91	Pk	34.9	-17.7	11.8	-22.91	-17	-5.91	99	105	V
2	5.86	-58.77	Pk	35.0	-17.6	11.8	-29.57	-27	-2.57	99	105	V

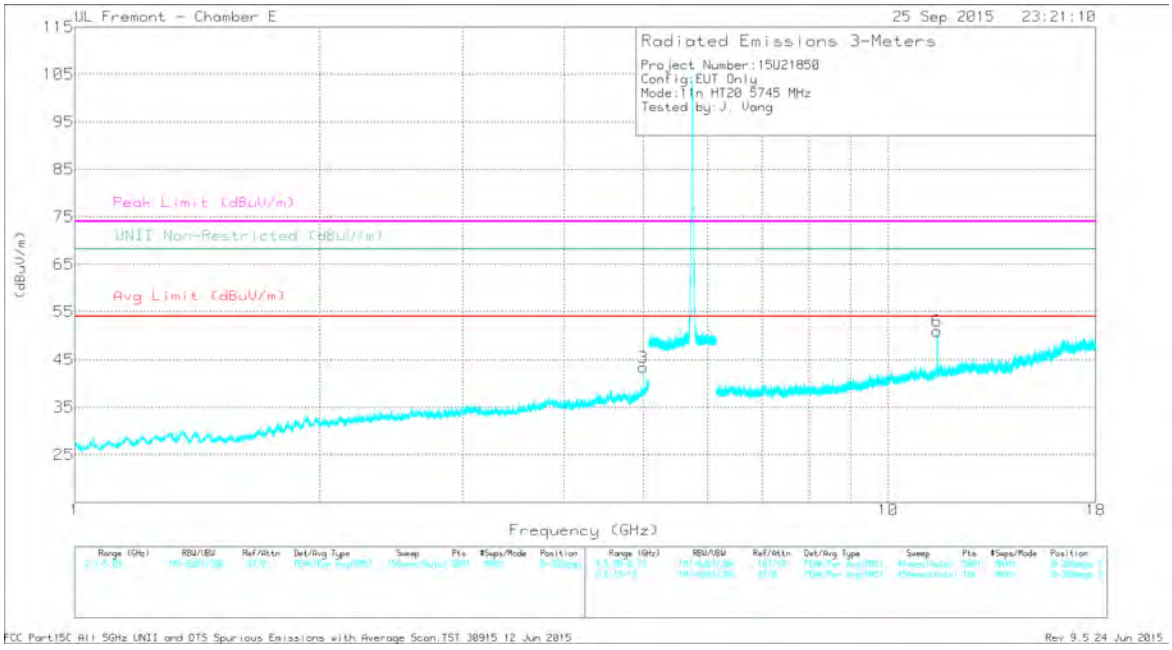
Pk - Peak detector

LOW CHANNEL HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL PLOT



LOW CHANNEL VERTICAL PLOT



DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 3.830	43.29	PK-U	33.5	-29.9	0	46.89	-	-	74	-27.11	-	-	99	116	H
	* 3.830	34.1	ADR	33.5	-29.9	.12	37.82	54	-16.18	-	-	-	-	99	116	H
2	* 5.000	47.33	PK-U	34.2	-29	0	52.53	-	-	74	-21.47	-	-	42	247	H
	* 5.000	41.08	ADR	34.2	-28.9	.12	46.5	54	-7.5	-	-	-	-	42	247	H
3	* 5.000	46.61	PK-U	34.2	-28.9	0	51.91	-	-	74	-22.09	-	-	156	300	V
	* 5.000	39.29	ADR	34.2	-28.9	.12	44.71	54	-9.29	-	-	-	-	156	300	V
4	* 5.400	44.18	PK-U	34.6	-20.5	0	58.28	-	-	74	-15.72	-	-	262	200	H
	* 5.400	33.72	ADR	34.6	-20.5	.12	47.94	54	-6.06	-	-	-	-	262	200	H
5	* 11.487	45.99	PK-U	38.1	-24.1	0	59.99	-	-	74	-14.01	-	-	0	102	H
	* 11.486	32.94	ADR	38.1	-24.1	.12	47.06	54	-6.94	-	-	-	-	0	102	H
6	* 11.501	47.19	PK-U	38.1	-24.2	0	61.09	-	-	74	-12.91	-	-	334	101	V
	* 11.483	32.91	ADR	38.1	-24.1	.12	47.03	54	-6.97	-	-	-	-	334	101	V

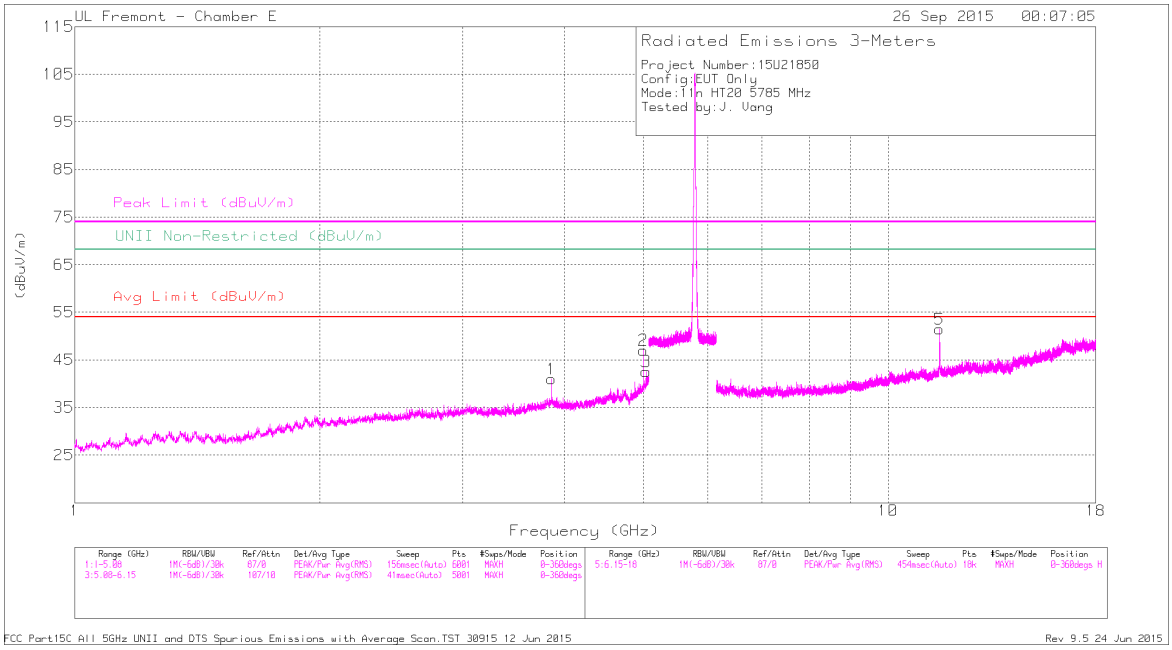
* - indicates frequency in CFR15.205/IC8.10 Restricted Band

PK-U - U-NII: Maximum Peak

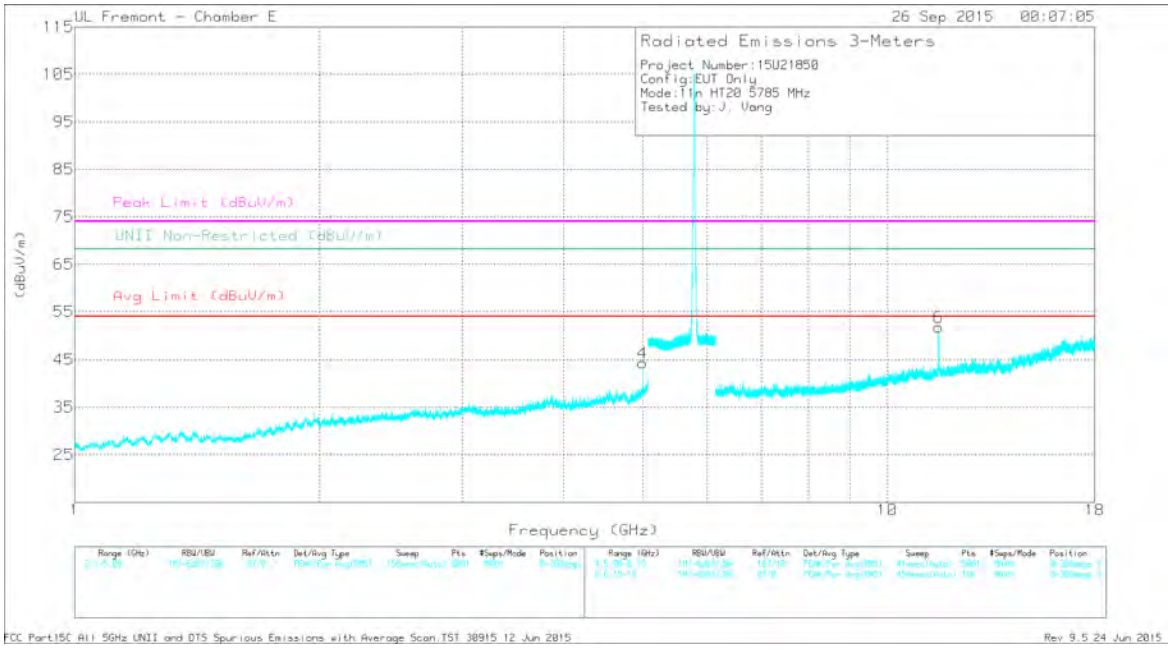
ADR - U-NII AD primary method, RMS average

MID CHANNEL HARMONICS AND SPURIOUS EMISSIONS

MID CHANNEL HORIZONTAL PLOT



MID CHANNEL VERTICAL PLOT



DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 3.857	43.88	PK-U	33.5	-29.9	0	47.48	-	-	74	-26.52	-	-	98	111	H
	* 3.857	36.08	ADR	33.5	-29.9	.12	39.8	54	-14.2	-	-	-	-	98	111	H
2	* 5.000	47.46	PK-U	34.2	-28.9	0	52.76	-	-	74	-21.24	-	-	42	249	H
	* 5.000	41.21	ADR	34.2	-28.9	.12	46.63	54	-7.37	-	-	-	-	42	249	H
3	* 5.042	44.11	PK-U	34.2	-28.4	0	49.91	-	-	74	-24.09	-	-	277	305	H
	* 5.040	33.16	ADR	34.2	-28.4	.12	39.08	54	-14.92	-	-	-	-	277	305	H
4	* 5.000	46.44	PK-U	34.2	-28.9	0	51.74	-	-	74	-22.26	-	-	152	267	V
	* 5.000	38.87	ADR	34.2	-28.9	.12	44.29	54	-9.71	-	-	-	-	152	267	V
5	* 11.569	43.52	PK-U	38.1	-22.3	0	59.32	-	-	74	-14.68	-	-	302	108	H
	* 11.571	30.92	ADR	38.1	-22.2	.12	46.94	54	-7.06	-	-	-	-	302	108	H
6	* 11.564	47.03	PK-U	38.1	-22.3	0	62.83	-	-	74	-11.17	-	-	281	106	V
	* 11.564	33.52	ADR	38.1	-22.3	.12	49.44	54	-4.56	-	-	-	-	281	106	V

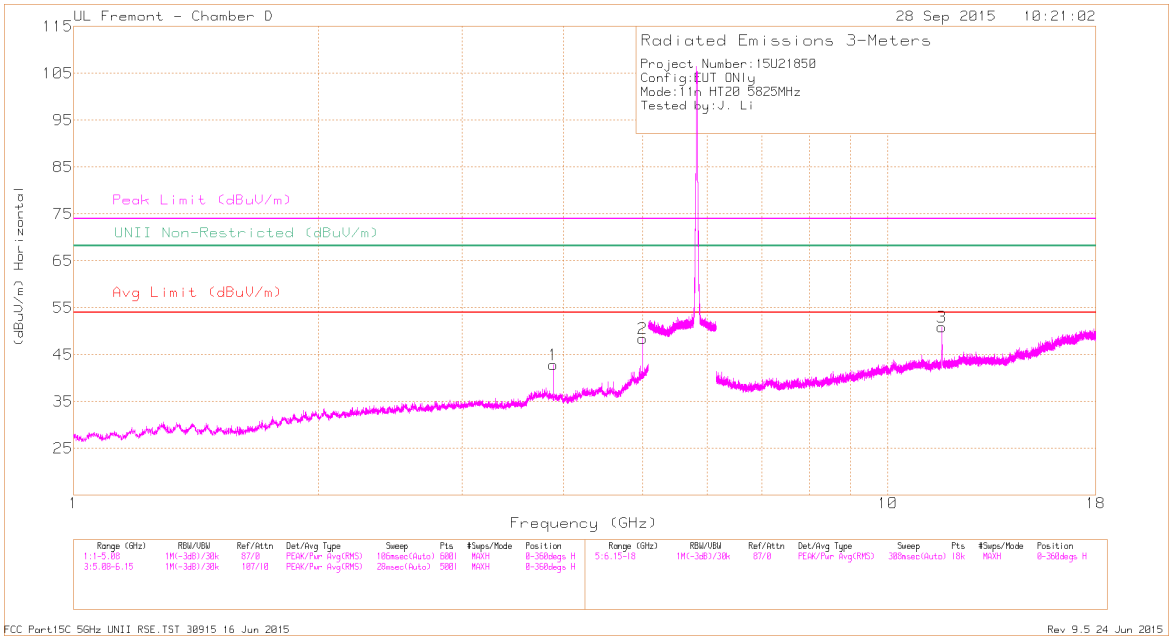
* - indicates frequency in CFR15.205/IC8.10 Restricted Band

PK-U - U-NII: Maximum Peak

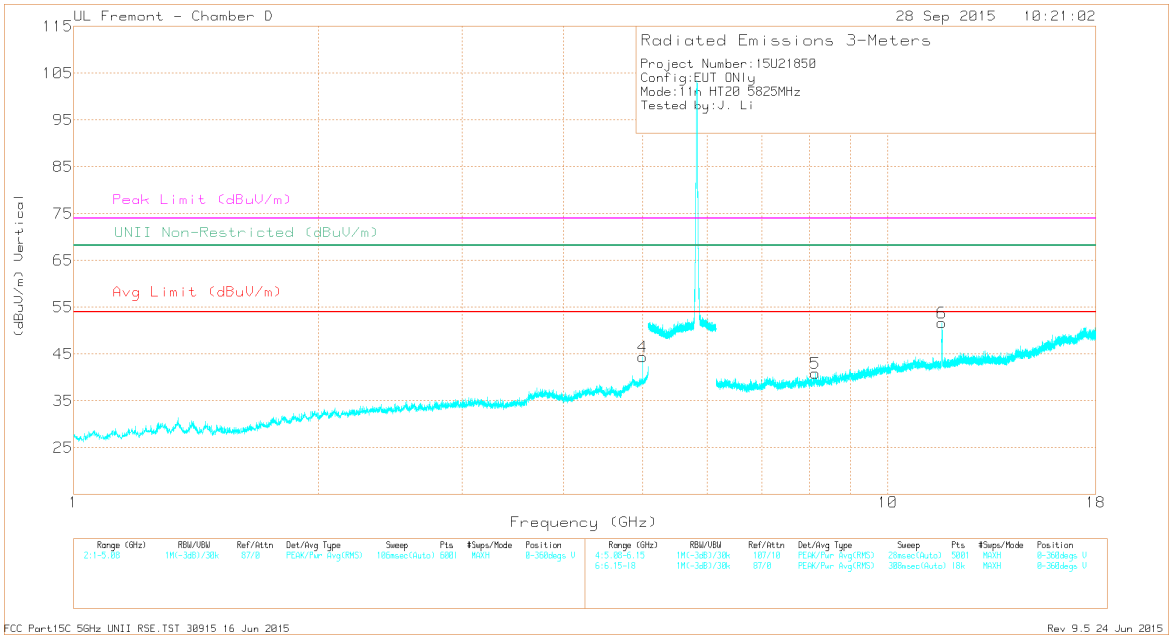
ADR - U-NII AD primary method, RMS average

HIGH CHANNEL HARMONICS AND SPURIOUS EMISSIONS

HIGH CHANNEL HORIZONTAL PLOT



HIGH CHANNEL VERTICAL PLOT



DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 3.883	43	PK-U	33.4	-29.1	0	47.3	-	-	74	-26.7	-	-	257	126	H
	* 3.883	37.31	ADR	33.4	-29.1	.12	41.73	54	-12.27	-	-	-	-	257	126	H
2	* 5.000	45.74	PK-U	34.3	-26.7	0	53.34	-	-	74	-20.66	-	-	4	106	H
	* 5.000	39.56	ADR	34.3	-26.7	.12	47.28	54	-6.72	-	-	-	-	4	106	H
4	* 5.000	42.91	PK-U	34.3	-26.7	0	50.51	-	-	74	-23.49	-	-	243	369	V
	* 5.000	35.63	ADR	34.3	-26.7	.12	43.35	54	-10.65	-	-	-	-	243	369	V
3	* 11.648	43.39	PK-U	38.1	-21.5	0	59.99	-	-	74	-14.01	-	-	36	101	H
	* 11.649	29.94	ADR	38.1	-21.4	.12	46.76	54	-7.24	-	-	-	-	36	101	H
5	* 8.151	35.1	PK-U	35.6	-23.8	0	46.9	-	-	74	-27.1	-	-	254	201	V
	* 8.153	24.48	ADR	35.6	-23.9	.12	36.3	54	-17.7	-	-	-	-	254	201	V
6	* 11.648	43.84	PK-U	38.1	-21.5	0	60.44	-	-	74	-13.56	-	-	106	114	V
	* 11.647	30.64	ADR	38.1	-21.5	.12	47.36	54	-6.64	-	-	-	-	106	114	V

* - indicates frequency in CFR15.205/IC8.10 Restricted Band

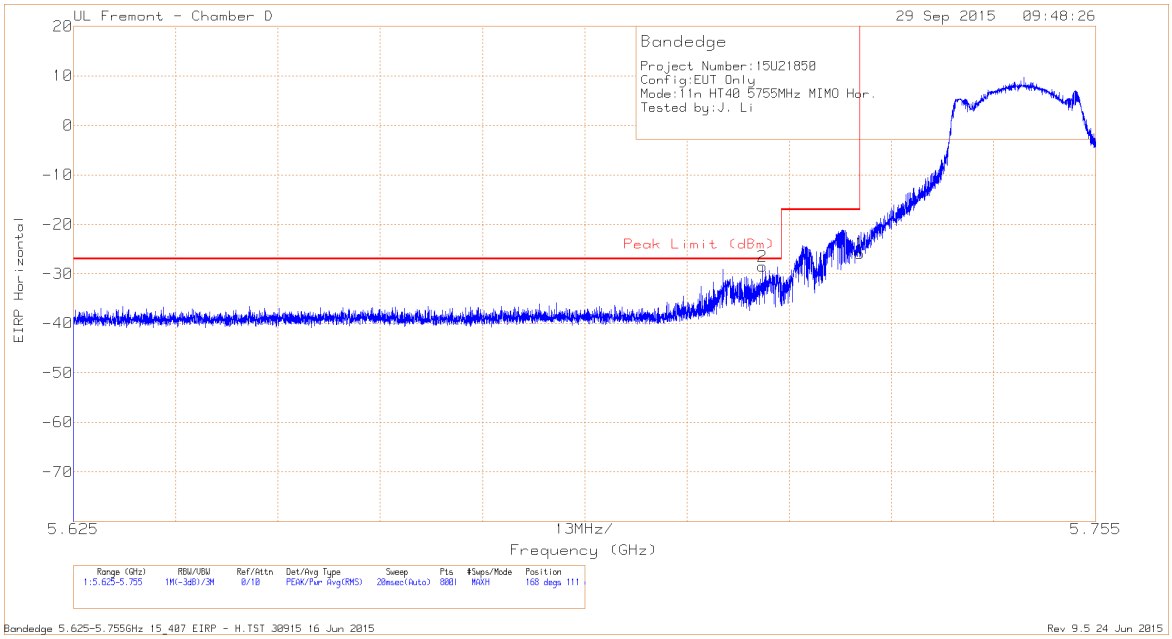
PK-U - U-NII: Maximum Peak

ADR - U-NII AD primary method, RMS average

9.4. 802.11n HT40 2Tx CDD MODE IN THE 5.8 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL)

LOW CHANNEL HORIZONTAL PLOT

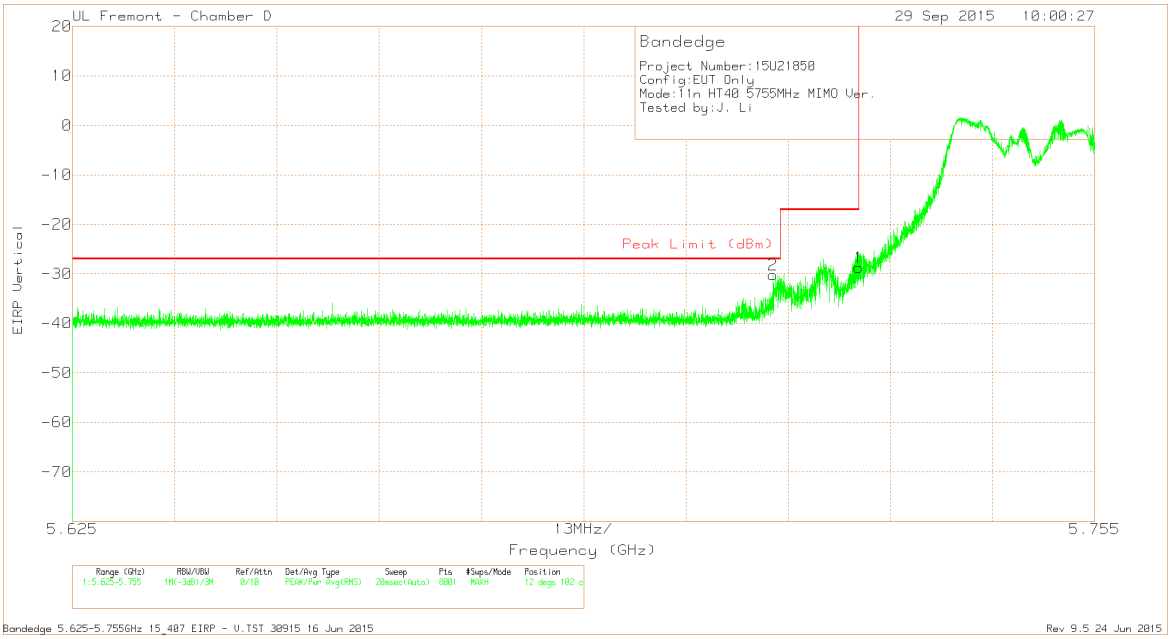


DATA

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T344 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Conversion Factor (dB)	DC Corr (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	5.713	-57.42	Pk	34.6	-17.5	11.8	0	-28.52	-27	-1.52	168	111	H
1	5.725	-54.67	Pk	34.6	-17.6	11.8	0	-25.87	-17	-8.87	168	111	H

Pk - Peak detector

LOW CHANNEL VERTICAL PLOT

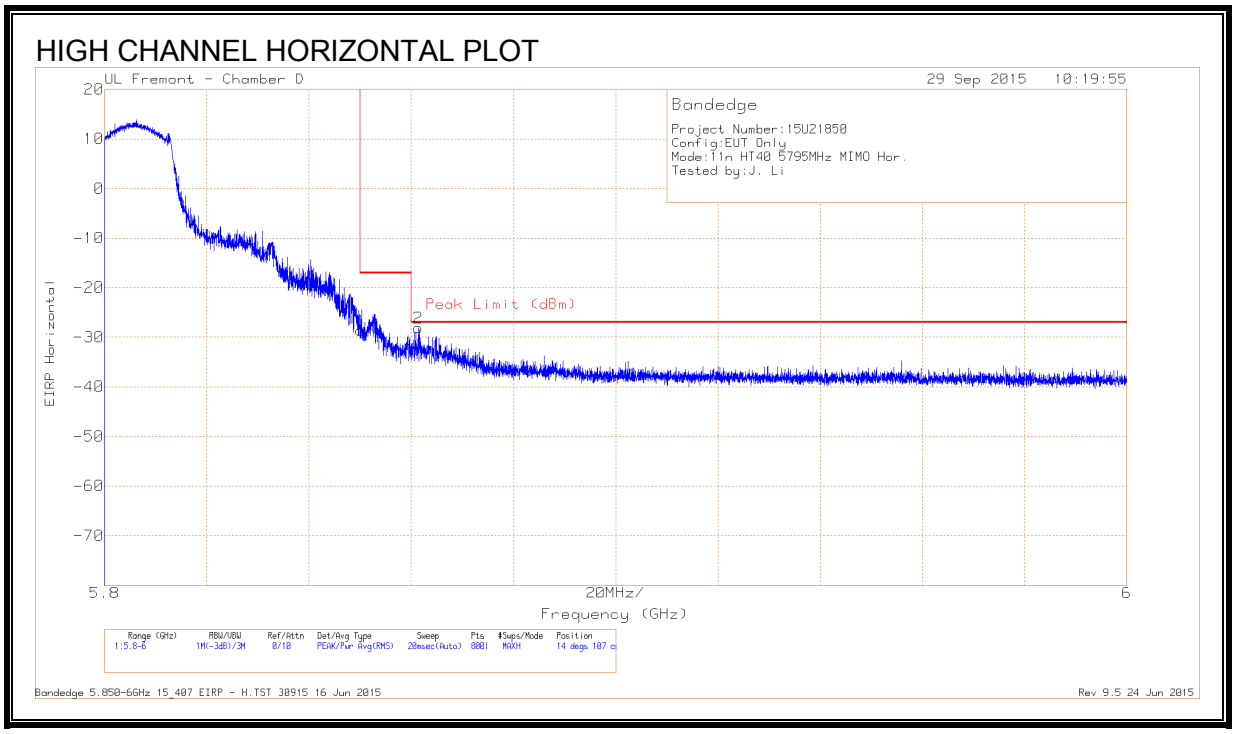


DATA

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T344 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Conversion Factor (dB)	DC Corr (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	5.714	-59.05	Pk	34.6	-17.5	11.8	0	-30.15	-27	-3.15	12	102	V
1	5.725	-57.52	Pk	34.6	-17.6	11.8	0	-28.72	-17	-11.72	12	102	V

Pk - Peak detector

RESTRICTED BANDEDGE (HIGH CHANNEL)

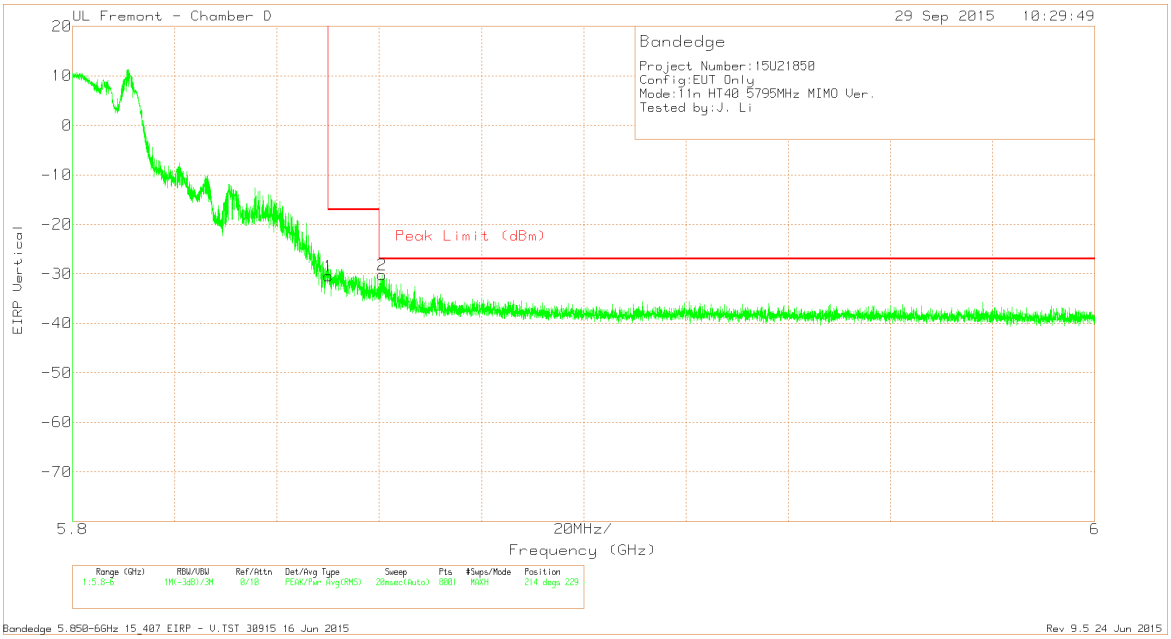


DATA

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T344 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Conversion Factor (dB)	DC Corr (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	5.85	-57.6	Pk	34.9	-17.7	11.8	0	-28.6	-17	-11.6	14	107	H
2	5.861	-57.27	Pk	35.0	-17.6	11.8	0	-28.07	-27	-1.07	14	107	H

Pk - Peak detector

HIGH CHANNEL VERTICAL PLOT



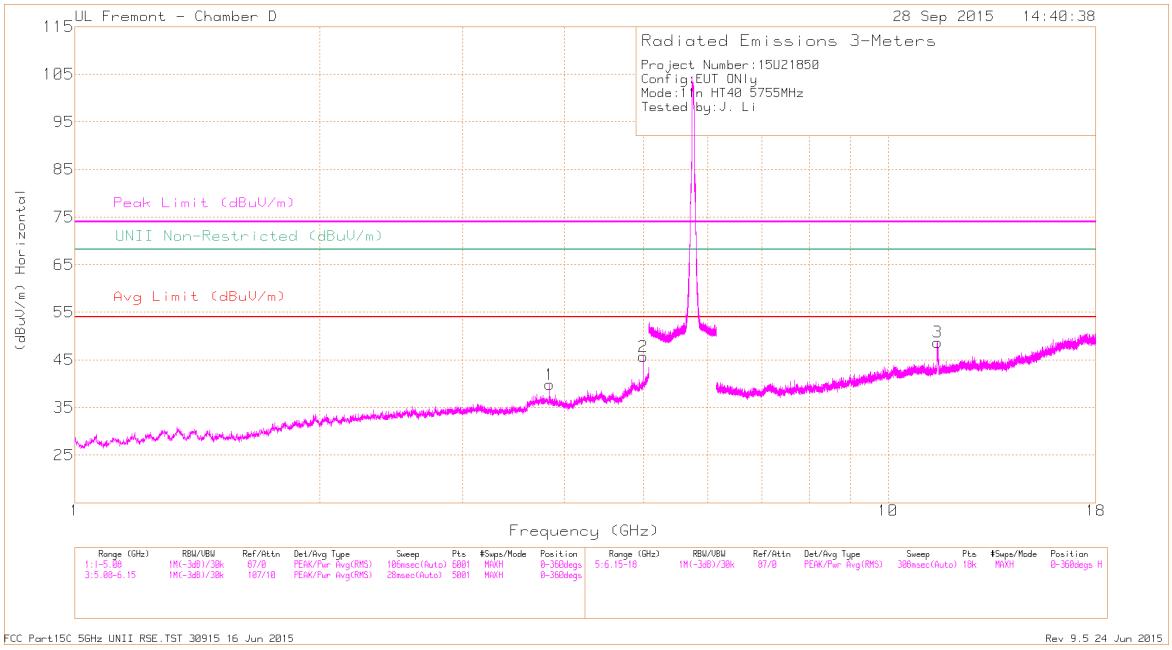
DATA

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T344 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Conversion Factor (dB)	DC Corr (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	5.85	-59.47	Pk	34.9	-17.7	11.8	0	-30.47	-17	-13.47	214	229	V
2	5.861	-59.38	Pk	35.0	-17.6	11.8	0	-30.18	-27	-3.18	214	229	V

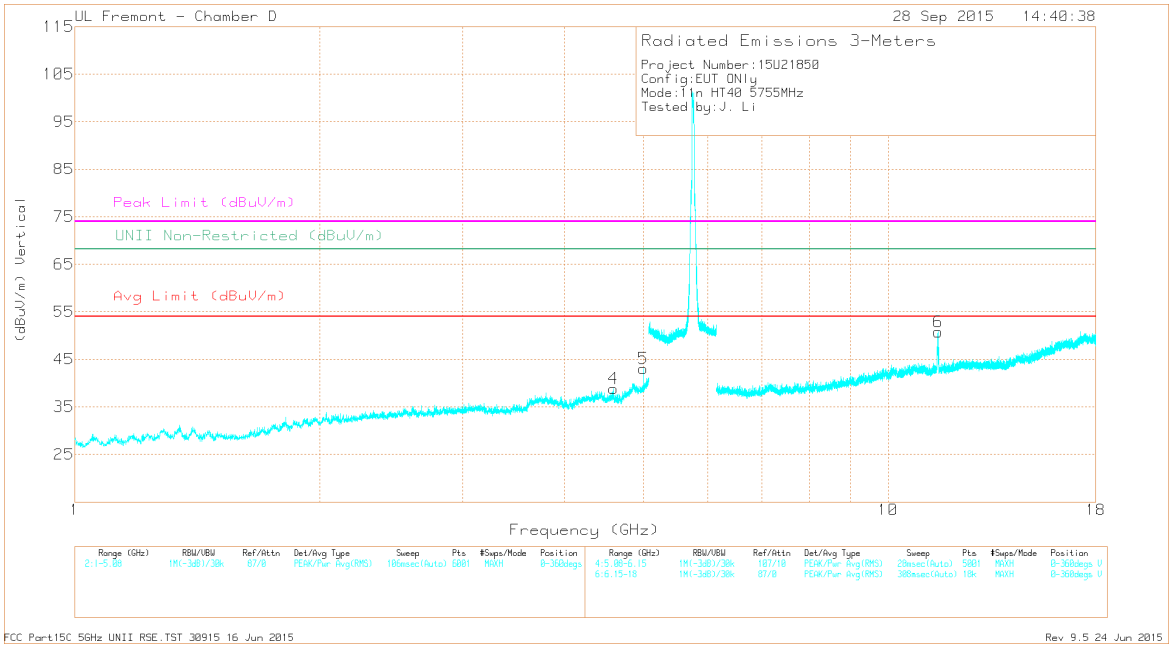
Pk - Peak detector

LOW CHANNEL HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL PLOT



LOW CHANNEL VERTICAL PLOT



DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 3.836	41.19	PK-U	33.4	-28.8	0	45.79	-	-	74	-28.21	-	-	272	124	H
	* 3.837	32.95	ADR	33.4	-28.8	.16	37.71	54	-16.29	-	-	-	-	272	124	H
2	* 5.000	44.38	PK-U	34.3	-26.7	0	51.98	-	-	74	-22.02	-	-	72	109	H
	* 5.000	37.83	ADR	34.3	-26.7	.16	45.59	54	-8.41	-	-	-	-	72	109	H
4	* 4.596	37.36	PK-U	34.1	-27	0	44.46	-	-	74	-29.54	-	-	133	201	V
	* 4.596	26.34	ADR	34.1	-27	.16	33.6	54	-20.4	-	-	-	-	133	201	V
5	* 5.000	41.73	PK-U	34.3	-26.7	0	49.33	-	-	74	-24.67	-	-	341	101	V
	* 5.000	33.51	ADR	34.3	-26.7	.16	41.27	54	-12.73	-	-	-	-	341	101	V
3	* 11.503	42.59	PK-U	38.1	-21.9	0	58.79	-	-	74	-15.21	-	-	179	194	H
	* 11.504	29.01	ADR	38.1	-21.9	.16	45.37	54	-8.63	-	-	-	-	179	194	H
6	* 11.503	43.72	PK-U	38.1	-21.9	0	59.92	-	-	74	-14.08	-	-	201	109	V
	* 11.504	30.2	ADR	38.1	-21.9	.16	46.56	54	-7.44	-	-	-	-	201	109	V

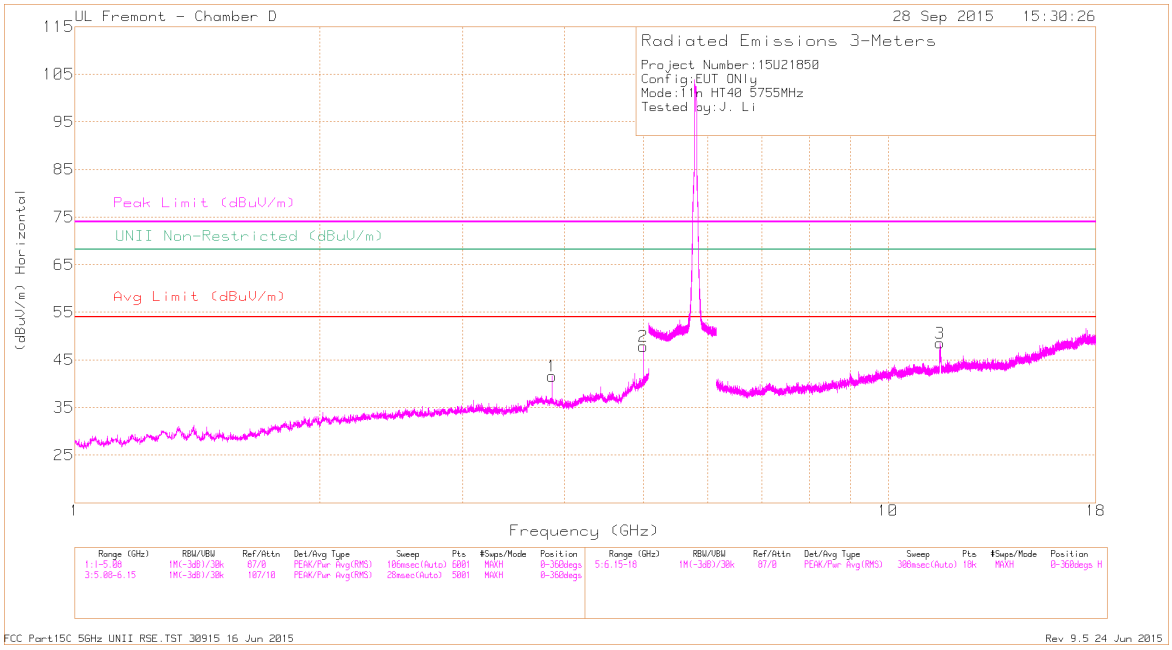
* - indicates frequency in CFR15.205/IC8.10 Restricted Band

PK-U - U-NII: Maximum Peak

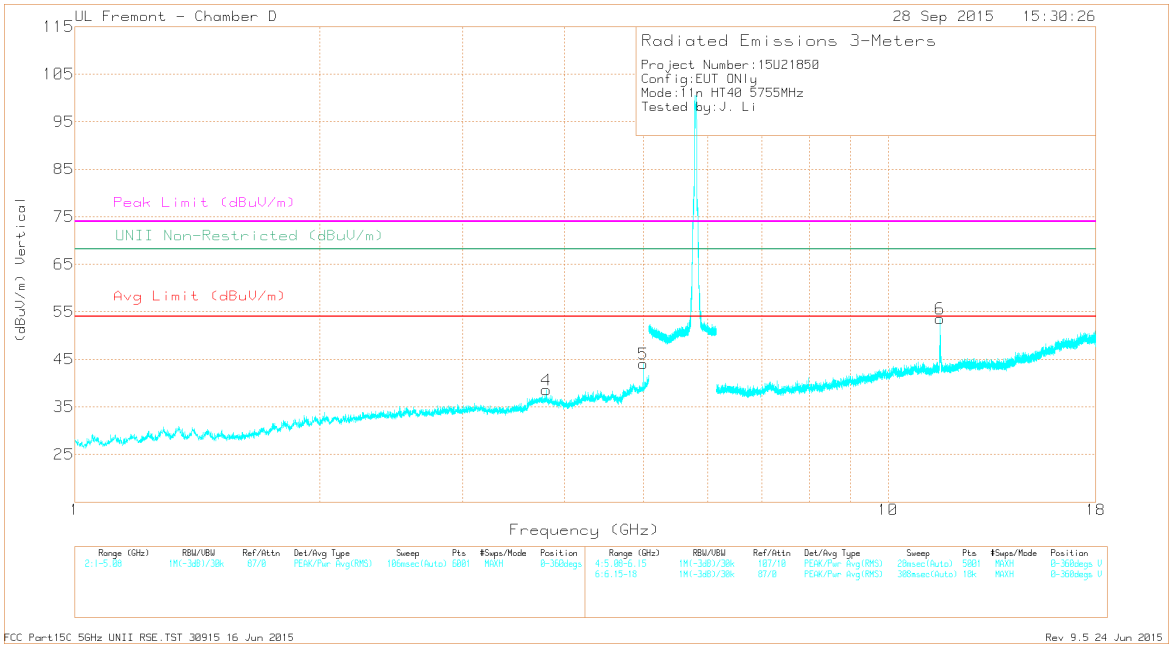
ADR - U-NII AD primary method, RMS average

HIGH CHANNEL HARMONICS AND SPURIOUS EMISSIONS

HIGH CHANNEL HORIZONTAL PLOT



HIGH CHANNEL VERTICAL PLOT



DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 3.863	42.07	PK-U	33.4	-29	0	46.47	-	-	74	-27.53	-	-	271	104	H
	* 3.863	35.3	ADR	33.4	-29	.16	39.86	54	-14.14	-	-	-	-	271	104	H
2	* 5.000	45.94	PK-U	34.3	-26.7	0	53.54	-	-	74	-20.46	-	-	87	106	H
	* 5.000	39.53	ADR	34.3	-26.7	.16	47.29	54	-6.71	-	-	-	-	87	106	H
4	* 3.800	38.55	PK-U	33.3	-28.7	0	43.15	-	-	74	-30.85	-	-	269	102	V
	* 3.802	27.04	ADR	33.3	-28.6	.16	31.9	54	-22.1	-	-	-	-	269	102	V
5	* 5.000	42.43	PK-U	34.3	-26.7	0	50.03	-	-	74	-23.97	-	-	192	194	V
	* 5.000	35.09	ADR	34.3	-26.7	.16	42.85	54	-11.15	-	-	-	-	192	194	V
3	* 11.583	41.14	PK-U	38.1	-22.1	0	57.14	-	-	74	-16.86	-	-	128	107	H
	* 11.589	28.4	ADR	38.1	-22	.16	44.66	54	-9.34	-	-	-	-	128	107	H
6	* 11.583	44.95	PK-U	38.1	-22.1	0	60.95	-	-	74	-13.05	-	-	200	102	V
	* 11.584	31.11	ADR	38.1	-22	.16	47.37	54	-6.63	-	-	-	-	200	102	V

* - indicates frequency in CFR15.205/IC8.10 Restricted Band

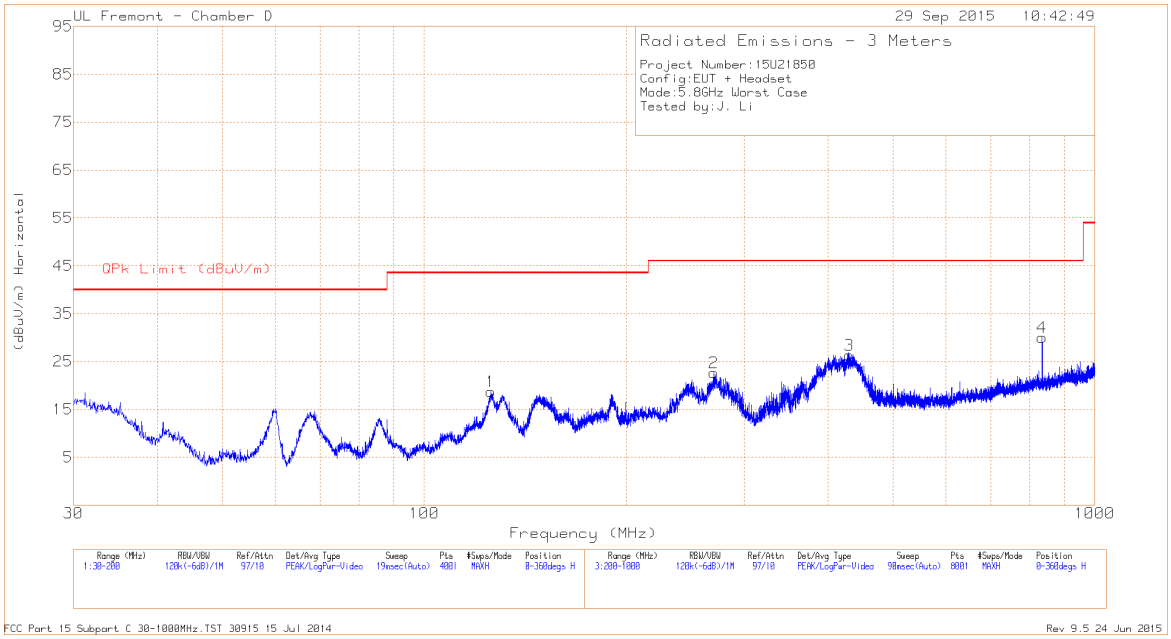
PK-U - U-NII: Maximum Peak

ADR - U-NII AD primary method, RMS average

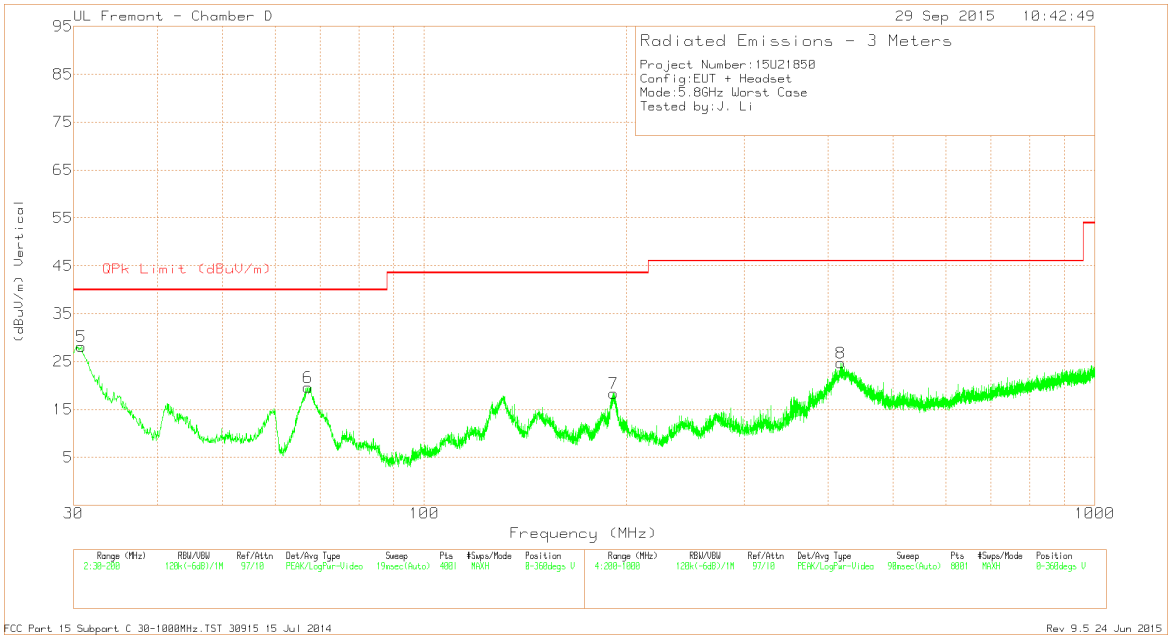
9.5. WORST-CASE BELOW 1 GHz

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL & VERTICAL)

HORIZONTAL PLOT



VERTICAL PLOT



HORIZONTAL AND VERTICAL DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T407 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 125.7525	36.15	Pk	13.8	-31.2	18.75	43.52	-24.77	0-360	201	H
2	* 270.400	39.97	Pk	13.2	-30.5	22.67	46.02	-23.35	0-360	100	H
5	30.8075	39.15	Pk	20.9	-31.9	28.15	40	-11.85	0-360	100	V
6	67.145	43.17	Pk	8.1	-31.6	19.67	40	-20.33	0-360	100	V
7	191.7763	37.96	Pk	11.3	-30.9	18.36	43.52	-25.16	0-360	100	V
8	417.600	39.06	Pk	15.7	-30	24.76	46.02	-21.26	0-360	96	V
3	430.000	40.02	Pk	16.3	-29.9	26.42	46.02	-19.6	0-360	100	H
4	834.600	37.59	Pk	21.2	-28.8	29.99	46.02	-16.03	0-360	201	H

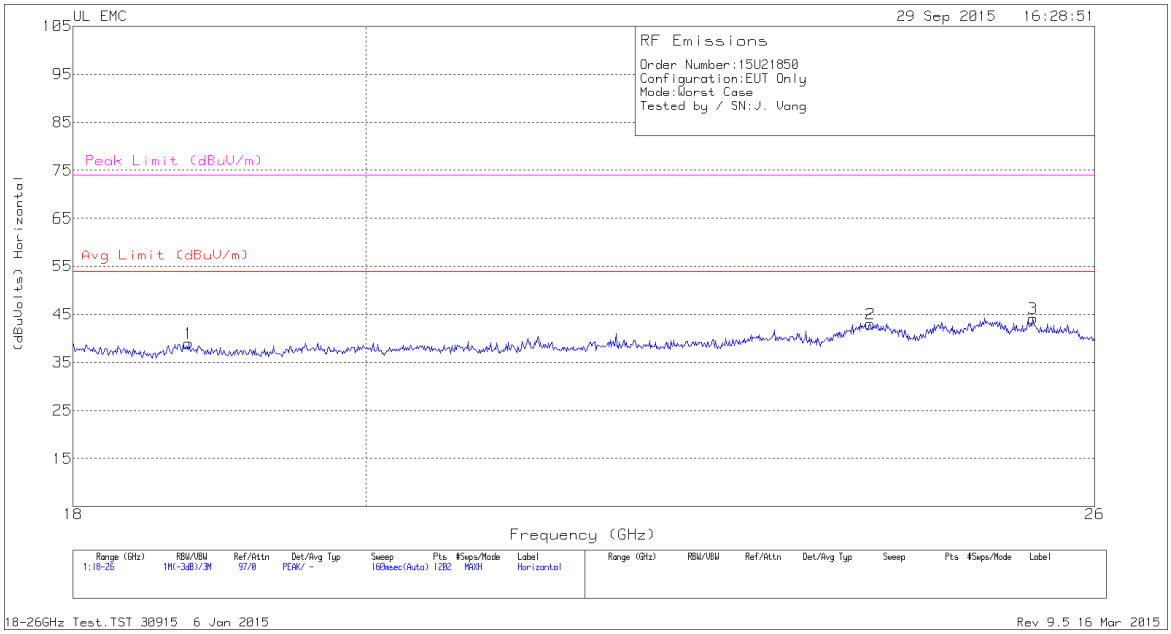
* - indicates frequency in CFR15.205/IC8.10 Restricted Band

Pk - Peak detector

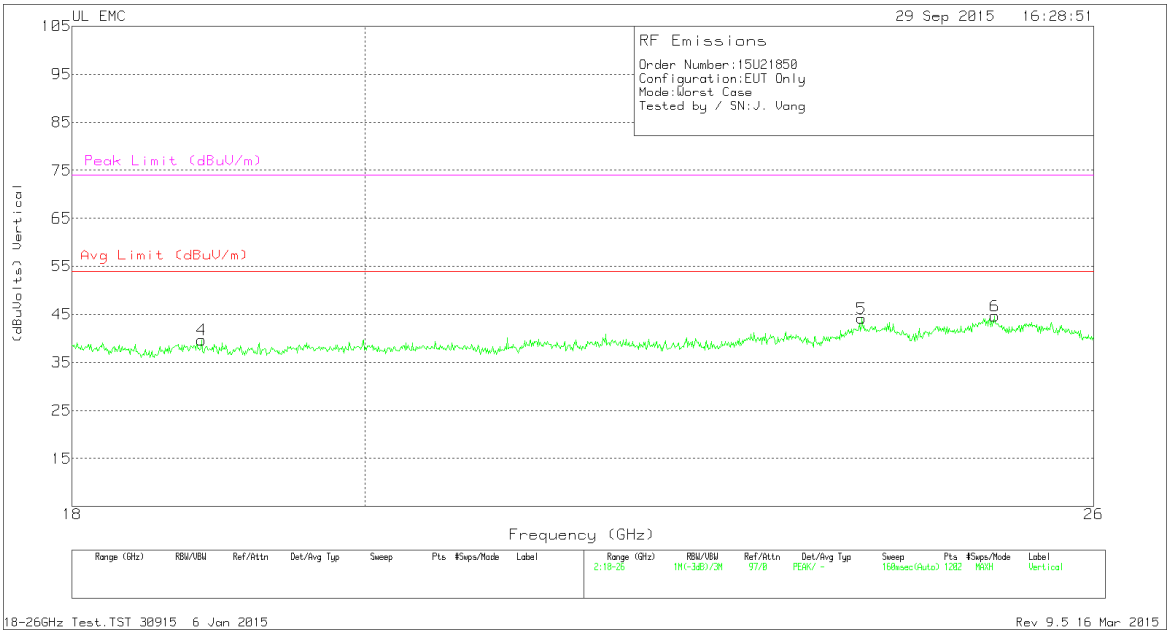
9.6. WORST-CASE ABOVE 18 GHz

SPURIOUS EMISSIONS 18000 TO 26000 MHz (WORST-CASE CONFIGURATION)

HORIZONTAL PLOT



VERTICAL PLOT



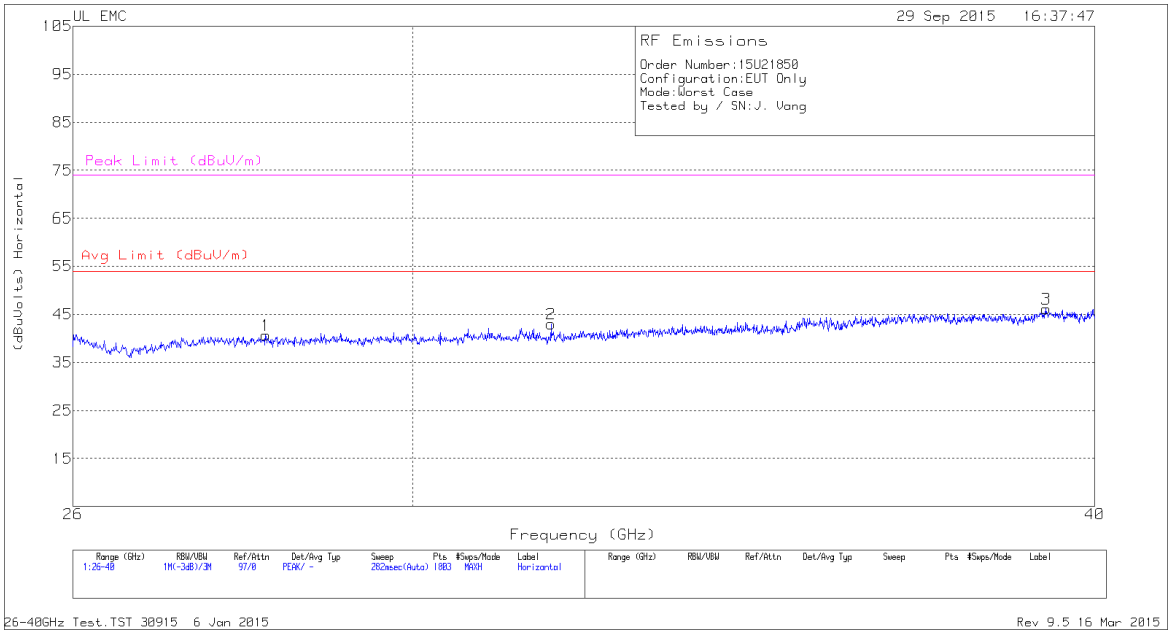
HORIZONTAL AND VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T89 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Corrected Reading (dBuVolts)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)
1	18.766	40.9	Pk	32.5	-24.9	-9.5	39	54	-15	74	-35
2	23.982	43.5	Pk	33.3	-24.3	-9.5	43	54	-11	74	-31
3	25.427	44.17	Pk	33.8	-24.3	-9.5	44.16	54	-9.83	74	-29.83
4	18.859	41.87	Pk	32.4	-25.1	-9.5	39.66	54	-14.33	74	-34.33
5	23.915	44.17	Pk	33.4	-23.9	-9.5	44.16	54	-9.83	74	-29.83
6	25.087	44.67	Pk	34	-24.5	-9.5	44.66	54	-9.33	74	-29.33

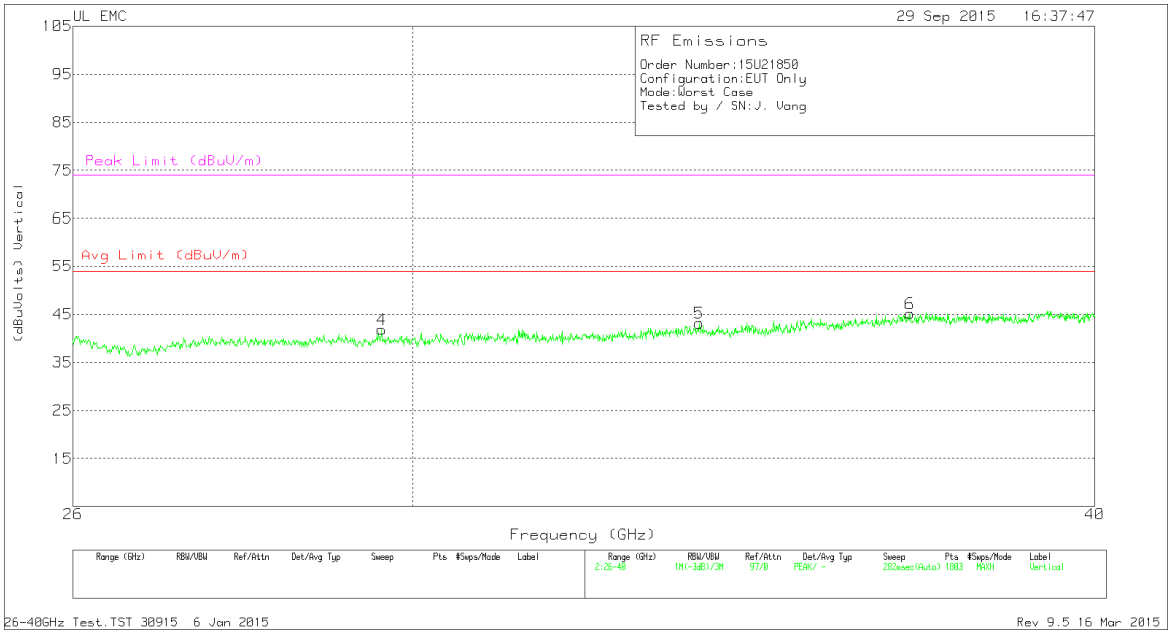
Pk - Peak detector

SPURIOUS EMISSIONS 26000 TO 40000 MHz (WORST-CASE CONFIGURATION)

HORIZONTAL PLOT



VERTICAL PLOT



HORIZONTAL AND VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T90 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Corrected Reading (dBuVolts)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)
1	28.199	45.97	Pk	35.9	-31.7	-9.5	40.66	54	-13.33	74	-33.33
2	31.804	49	Pk	36.3	-32.8	-9.5	43	54	-11	74	-31
3	39.184	49.47	Pk	38.2	-32	-9.5	46.16	54	-7.83	74	-27.83
4	29.613	47.53	Pk	36	-32.2	-9.5	41.83	54	-12.16	74	-32.16
5	33.855	48.77	Pk	36.9	-33	-9.5	43.16	54	-10.83	74	-30.83
6	37.001	50.77	Pk	37.2	-33.3	-9.5	45.16	54	-8.83	74	-28.83

Pk - Peak detector

10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

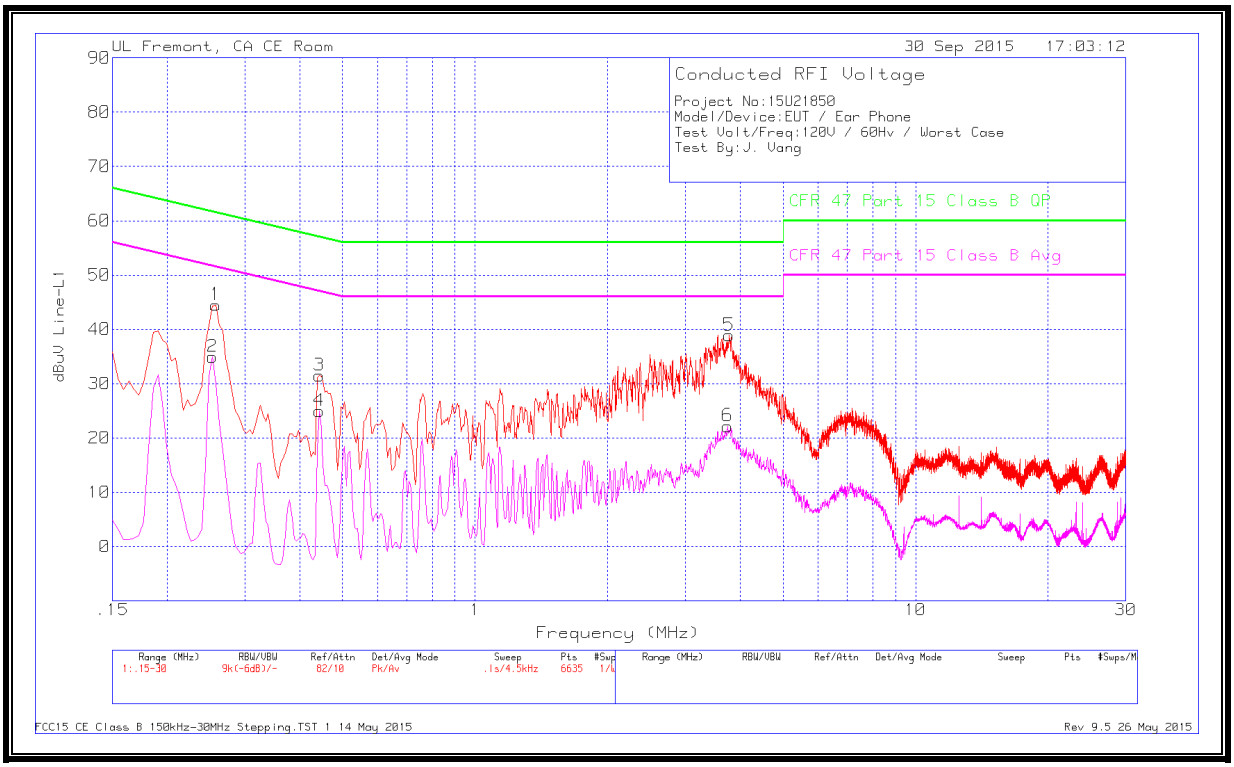
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

RESULTS

10.1. EUT POWERED BY AC ADAPTER

LINE 1 RESULTS



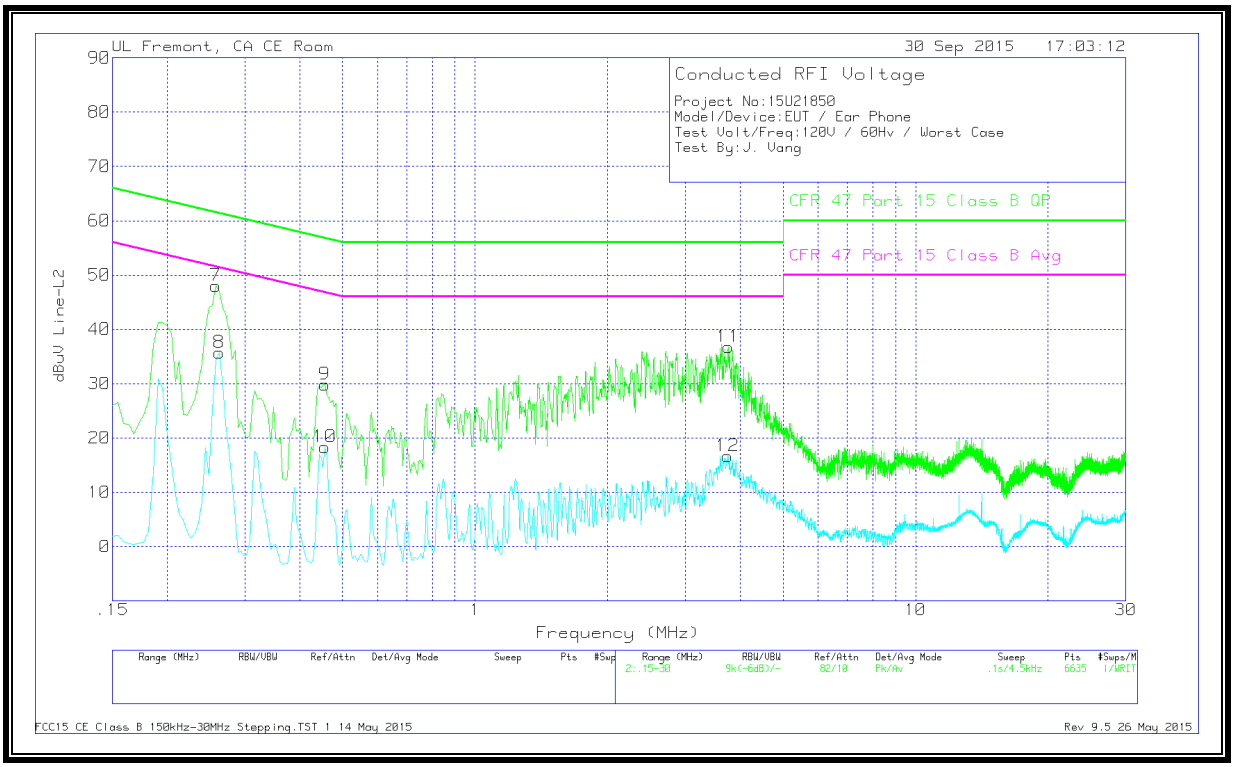
WORST EMISSIONS

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1	LC Cables 1&3	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	Margin (dB)	CFR 47 Part 15 Class B Avg	Margin (dB)
1	.258	43.78	Pk	.7	0	44.48	61.5	-17.02	-	-
2	.2535	34.23	Av	.7	0	34.93	-	-	51.64	-16.71
3	.4425	31.11	Pk	.4	0	31.51	57.01	-25.5	-	-
4	.4425	24.6	Av	.4	0	25	-	-	47.01	-22.01
5	3.7725	38.58	Pk	.2	.1	38.88	56	-17.12	-	-
6	3.7455	21.89	Av	.2	.1	22.19	-	-	46	-23.81

Pk - Peak detector

Av - Average detection

LINE 2 RESULTS



WORST EMISSIONS

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2	LC Cables 2&3	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	Margin (dB)	CFR 47 Part 15 Class B Avg	Margin (dB)
7	.258	47.35	Pk	.7	0	48.05	61.5	-13.45	-	-
8	.2625	34.98	Av	.7	0	35.68	-	-	51.35	-15.67
9	.456	29.44	Pk	.4	0	29.84	56.77	-26.93	-	-
10	.456	17.89	Av	.4	0	18.29	-	-	46.77	-28.48
11	3.7545	36.44	Pk	.2	.1	36.74	56	-19.26	-	-
12	3.7455	16.33	Av	.2	.1	16.63	-	-	46	-29.37

Pk - Peak detector

Av - Average detection

11. DYNAMIC FREQUENCY SELECTION

11.1. OVERVIEW

11.1.1. LIMITS

INDUSTRY CANADA

IC RSS-247 is closely harmonized with FCC Part 15 DFS rules. The deviations are as follows:

RSS-247 Issue 1

Note: For the band 5600–5650 MHz, no operation is permitted.

Until further notice, devices subject to this annex shall not be capable of transmitting in the band 5600–5650 MHz. This restriction is for the protection of Environment Canada weather radars operating in this band.

FCC

§15.407 (h), FCC KDB 905462 D02 “COMPLIANCE MEASUREMENT PROCEDURES FOR UNLICENSED-NATIONAL INFORMATION INFRASTRUCTURE DEVICES OPERATING IN THE 5250-5350 MHz AND 5470-5725 MHz BANDS INCORPORATING DYNAMIC FREQUENCY SELECTION” and KDB 905462 D03 “U-NII CLIENT DEVICES WITHOUT RADAR DETECTION CAPABILITY”.

Table 1: Applicability of DFS requirements prior to use of a channel

Requirement	Operational Mode		
	Master	Client (without radar detection)	Client (with radar detection)
Non-Occupancy Period	Yes	Not required	Yes
DFS Detection Threshold	Yes	Not required	Yes
Channel Availability Check Time	Yes	Not required	Not required
U-NII Detection Bandwidth	Yes	Not required	Yes

Table 2: Applicability of DFS requirements during normal operation

Requirement	Operational Mode		
	Master	Client **(without DFS)**	Client **(with DFS)**
DFS Detection Threshold	Yes	Not required	Yes
Channel Closing Transmission Time	Yes	Yes	Yes
Channel Move Time	Yes	Yes	Yes
U-NII Detection Bandwidth	Yes	Not required	Yes

Additional requirements for devices with multiple bandwidth modes	Master Device or Client with Radar DFS	Client (without DFS)
U-NII Detection Bandwidth and Statistical Performance Check	All BW modes must be tested	Not required
Channel Move Time and Channel Closing Transmission Time	Test using widest BW mode available	Test using the widest BW mode available for the link
All other tests	Any single BW mode	Not required
Note: Frequencies selected for statistical performance check (Section 7.8.4) should include several frequencies within the radar detection bandwidth and frequencies near the edge of the radar detection bandwidth. For 802.11 devices it is suggested to select frequencies in all 20 MHz channel blocks and a null frequency between the bonded 20 MHz channel blocks.		

Table 3: Interference Threshold values, Master or Client incorporating In-Service Monitoring

Maximum Transmit Power	Value (see notes)
E.I.R.P. ≥ 200 mill watt	-64 dBm
E.I.R.P. < 200 mill watt and power spectral density < 10 dBm/MHz	-62 dBm
E.I.R.P. < 200 mill watt that do not meet power spectral density requirement	-64 dBm

Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna
Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response.
Note 3: E.I.R.P. is based on the highest antenna gain. For MIMO devices refer to KDB publication 662911 D01.

Table 4: DFS Response requirement values

Parameter	Value
Non-occupancy period	30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds (See Note 1)
Channel Closing Transmission Time	200 milliseconds + approx. 60 milliseconds over remaining 10 second period. (See Notes 1 and 2)
U-NII Detection Bandwidth	Minimum 100% of the U-NII 99% transmission power bandwidth. (See Note 3)

Note 1: *Channel Move Time* and the *Channel Closing Transmission Time* should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst.
Note 2: The *Channel Closing Transmission Time* is comprised of 200 milliseconds starting at the beginning of the *Channel Move Time* plus any additional intermittent control signals required to facilitate a *Channel* move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.
Note 3: During the *U-NII Detection Bandwidth* detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.

Table 5 – Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (usec)	PRI (usec)	Pulses	Minimum Percentage of Successful Detection	Minimum Trials
0	1	1428	18	See Note 1	See Note 1
1	1	Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in table 5a	Roundup: {(1/360) x (19 x 10^6 PRI_{usec})}	60%	30
		Test B: 15 unique PRI values randomly selected within the range of 518-3066 usec. With a minimum increment of 1 usec, excluding PRI values selected in Test A			
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Radar Types 1-4)				80%	120

Note 1: Short Pulse Radar Type 0 should be used for the *Detection Bandwidth* test, *Channel Move Time*, and *Channel Closing Time* tests.

Table 6 – Long Pulse Radar Test Signal

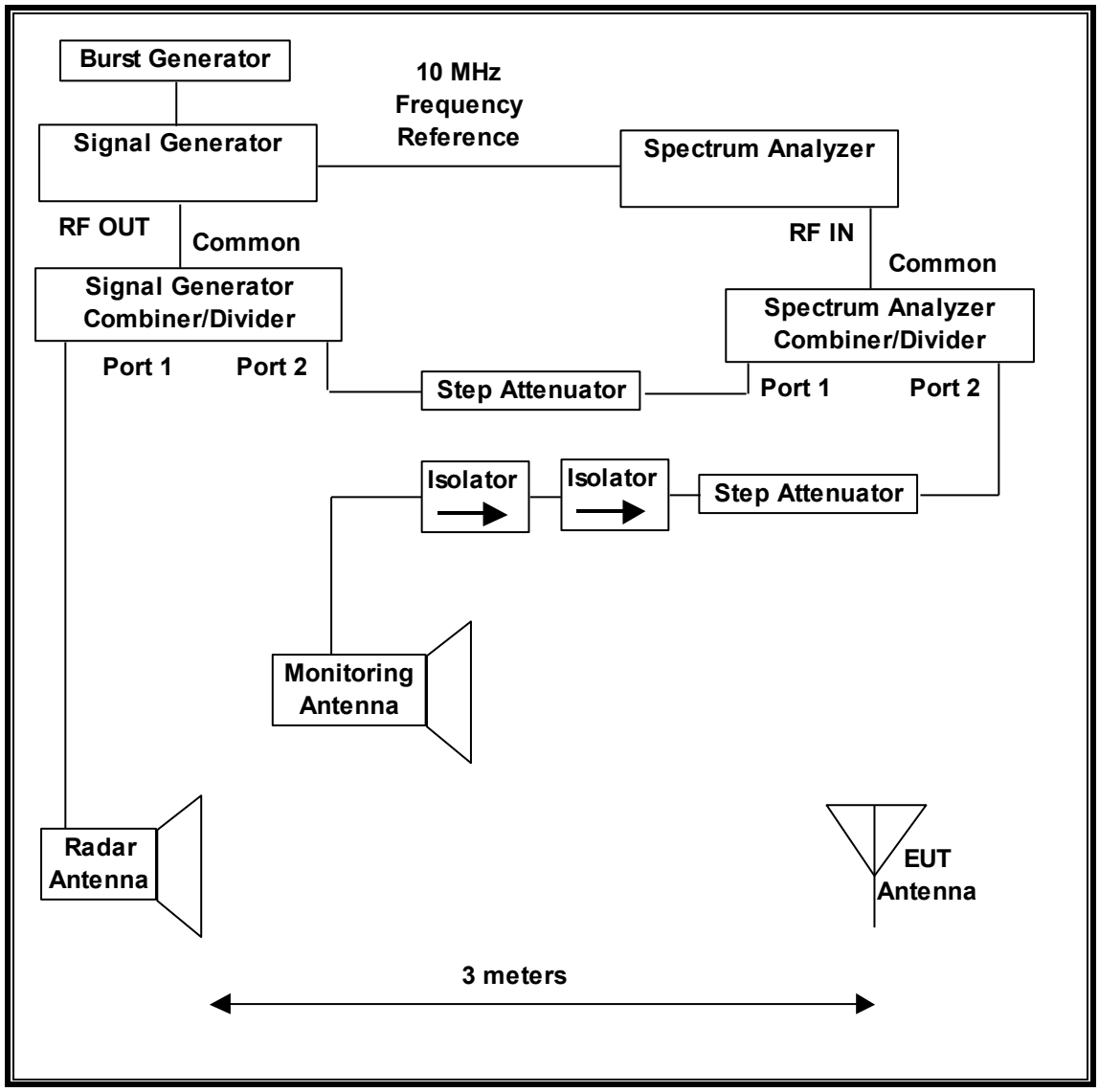
Radar Waveform Type	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Pulses per Burst	Number of Bursts	Minimum Percentage of Successful Detection	Minimum Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

Table 7 – Frequency Hopping Radar Test Signal

Radar Waveform Type	Pulse Width (µsec)	PRI (µsec)	Pulses per Hop	Hopping Rate (kHz)	Hopping Sequence Length (msec)	Minimum Percentage of Successful Detection	Minimum Trials
6	1	333	9	0.333	300	70%	30

11.1.2. TEST AND MEASUREMENT SYSTEM

RADIATED METHOD SYSTEM BLOCK DIAGRAM



SYSTEM OVERVIEW

The short pulse and long pulse signal generating system utilizes the NTIA software. The Vector Signal Generator has been validated by the NTIA. The hopping signal generating system utilizes the CCS simulated hopping method and system, which has been validated by the DoD, FCC and NTIA. The software selects waveform parameters from within the bounds of the signal type on a random basis using uniform distribution.

The short pulse types 1, 2, 3 and 4, and the long pulse type 5 parameters are randomized at run-time.

The hopping type 6 pulse parameters are fixed while the hopping sequence is based on the August 2005 NTIA Hopping Frequency List. The initial starting point randomized at run-time and each subsequent starting point is incremented by 475. Each frequency in the 100-length segment is compared to the boundaries of the EUT Detection Bandwidth and the software creates a hopping burst pattern in accordance with Section 7.4.1.3 Method #2 Simulated Frequency Hopping Radar Waveform Generating Subsystem of KDB 905462 D02. The frequency of the signal generator is incremented in 1 MHz steps from F_L to F_H for each successive trial. This incremental sequence is repeated as required to generate a minimum of 30 total trials and to maintain a uniform frequency distribution over the entire Detection Bandwidth.

The signal monitoring equipment consists of a spectrum analyzer. The aggregate ON time is calculated by multiplying the number of bins above a threshold during a particular observation period by the dwell time per bin, with the analyzer set to peak detection and max hold.

SYSTEM CALIBRATION

A 50-ohm load is connected in place of the spectrum analyzer, and the spectrum analyzer is connected to a horn antenna via a coaxial cable, with the reference level offset set to (horn antenna gain – coaxial cable loss). The signal generator is set to CW mode. The amplitude of the signal generator is adjusted to yield a level of –64 dBm as measured on the spectrum analyzer.

Without changing any of the instrument settings, the spectrum analyzer is reconnected to the Common port of the Spectrum Analyzer Combiner/Divider. The Reference Level Offset of the spectrum analyzer is adjusted so that the displayed amplitude of the signal is –64 dBm.

The spectrum analyzer displays the level of the signal generator as received at the antenna ports of the Master Device. The interference detection threshold may be varied from the calibrated value of –64 dBm and the spectrum analyzer will still indicate the level as received by the Master Device.

ADJUSTMENT OF DISPLAYED TRAFFIC LEVEL

A link is established between the Master and Slave and the distance between the units is adjusted as needed to provide a suitable received level at the Master and Slave devices. The video test file is streamed to generate WLAN traffic. The monitoring antenna is adjusted so that the WLAN traffic level, as displayed on the spectrum analyzer, is at lower amplitude than the radar detection threshold.

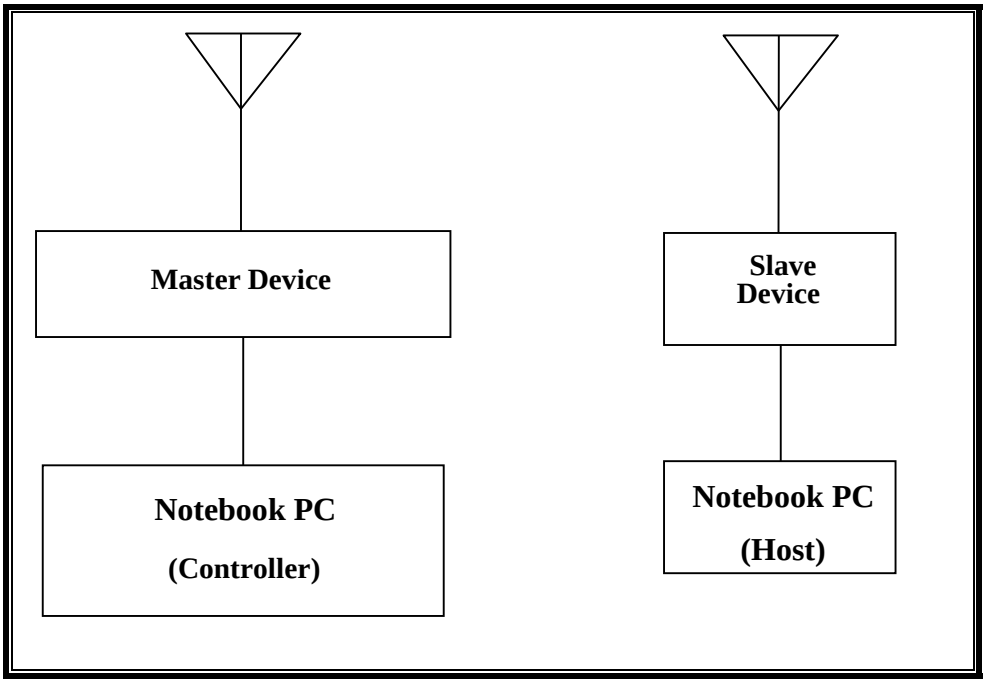
TEST AND MEASUREMENT EQUIPMENT

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

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Notebook PC (Controller)	Apple	A1278	C02HJ0A7DTY4	DoC
AC Adapter (Controller PC)	Apple	A1172	MV7211FJAX4XA	DoC
iPhone 6S(Slave Device)	Apple	A1633	C7JPH035GL2T	BCG-E2946A
Notebook PC (Host)	Apple	A1502	C02LRLKYFH00	DoC
AC Adapter (Host PC)	Apple	A1435	D39346606VMF2YAJ	DoC

11.1.3. SETUP OF EUT

RADIATED METHOD EUT TEST SETUP



SUPPORT EQUIPMENT

The following support equipment was utilized for the DFS tests documented in this report:

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Notebook PC (Controller)	Apple	A1278	C02HJ0A7DTY4	DoC
AC Adapter (Controller PC)	Apple	A1172	MV7211FJAX4XA	DoC
iPhone 6S(Slave Device)	Apple	A1633	C7JPH035GL2T	BCG-E2946A
Notebook PC (Host)	Apple	A1502	C02LRLKYFH00	DoC
AC Adapter (Host PC)	Apple	A1435	D39346606VMF2YAJ	DoC

11.1.4. DESCRIPTION OF EUT

For FCC the EUT operates over the 5250-5350 MHz and 5470-5725 MHz ranges.

For IC the EUT operates over the 5250-5350 MHz and 5470-5725 MHz ranges, excluding the 5600-5650 MHz range.

The EUT is a Master Device.

The highest power level within these bands is 24.28 dBm EIRP in the 5250-5350 MHz band and 25.36 dBm EIRP in the 5470-5725 MHz band.

The highest gain antenna assembly utilized with the EUT has a gain of 2.07 dBi in the 5250-5350 MHz band and 3.28 dBi in the 5470-5725 MHz band. The lowest gain antenna assembly utilized with the EUT has a gain of 1.54 dBi in the 5250-5350 MHz band and 3.09 dBi in the 5470-5725 MHz band.

Two antennas are utilized to meet the diversity and MIMO operational requirements.

The rated output power of the Master unit is > 23dBm (EIRP). Therefore the required interference threshold level is –64 dBm. After correction for procedural adjustments, the required radiated threshold at the antenna port is –64 + 1 = -63 dBm.

The calibrated radiated DFS Detection Threshold level is set to –64 dBm. The tested level is lower than the required level hence it provides a margin to the limit.

The EUT uses two transmitter/receiver chains, each connected to an antenna to perform radiated tests.

The Slave device associated with the EUT during these tests does not have radar detection capability.

WLAN traffic that meets or exceeds the minimum required loading was generated by transferring a data stream from the EUT through the Slave Device to the Host PC using iPerf version 2.0.5 software package.

TPC is not required since the maximum EIRP is less than 500 mW (27 dBm).

The EUT utilizes the 802.11a/n architecture. Two nominal channel bandwidths are implemented: 20 MHz and 40 MHz.

The software installed in the access point is revision 7.6.5f0 dev.

UNIFORM CHANNEL SPREADING

This function is not required per KDB 905462.

11.2. RESULTS FOR 20 MHz BANDWIDTH

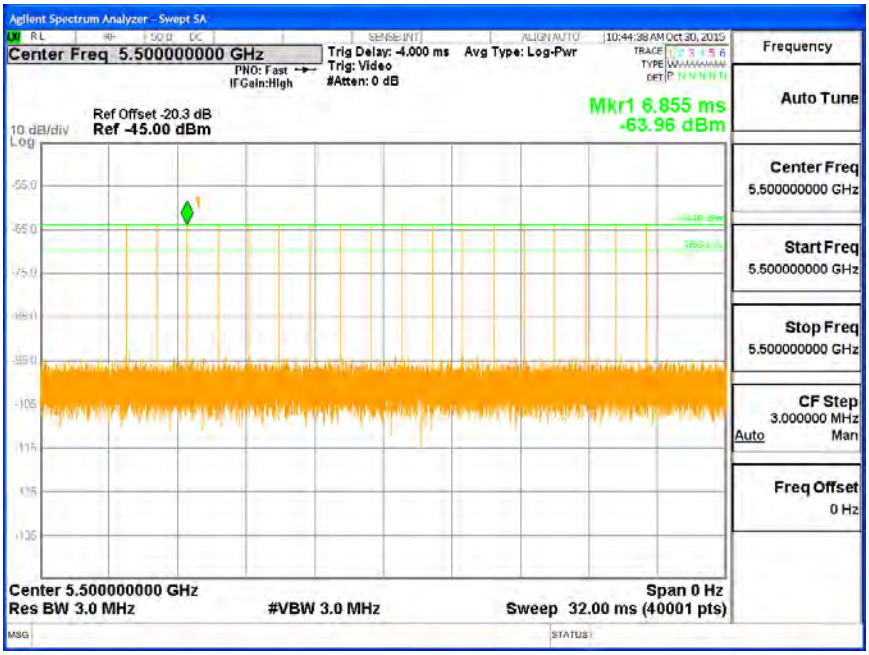
11.2.1. TEST CHANNEL

All tests were performed at a channel center frequency of 5500 MHz.

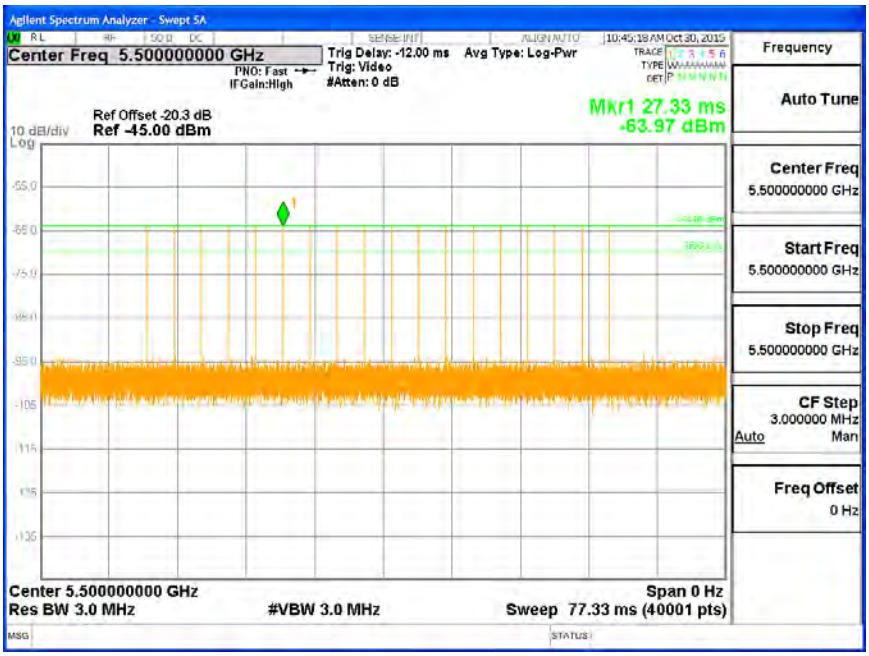
11.2.2. RADAR WAVEFORMS AND TRAFFIC

RADAR WAVEFORMS

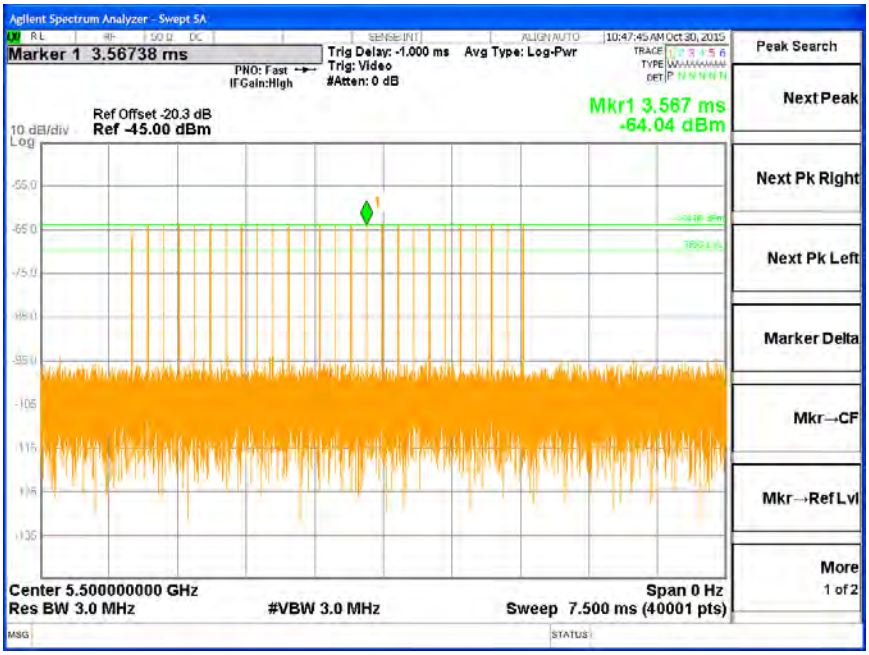
SHORT PULSE RADAR TYPE 0



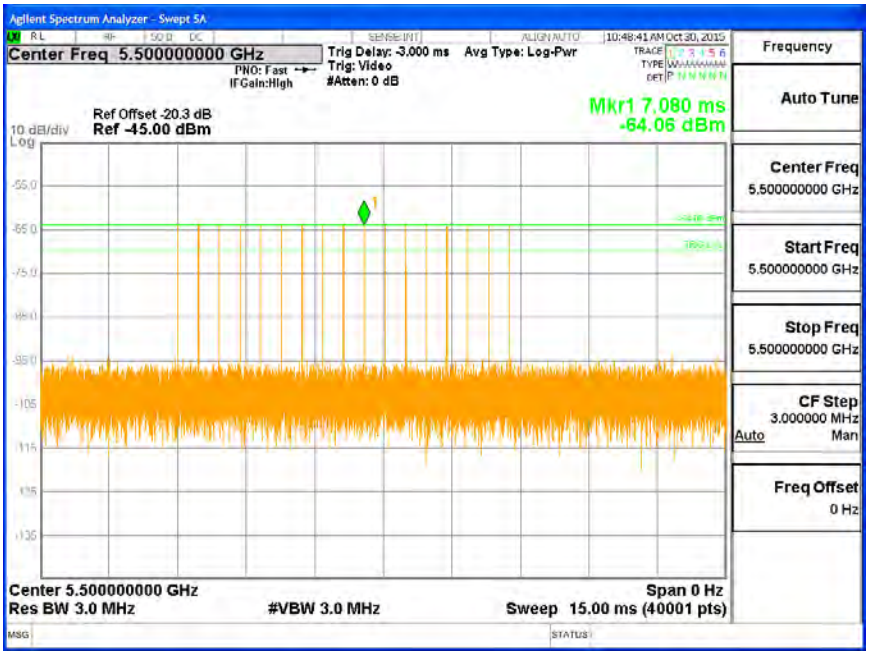
SAMPLE OF RADAR TYPE 1



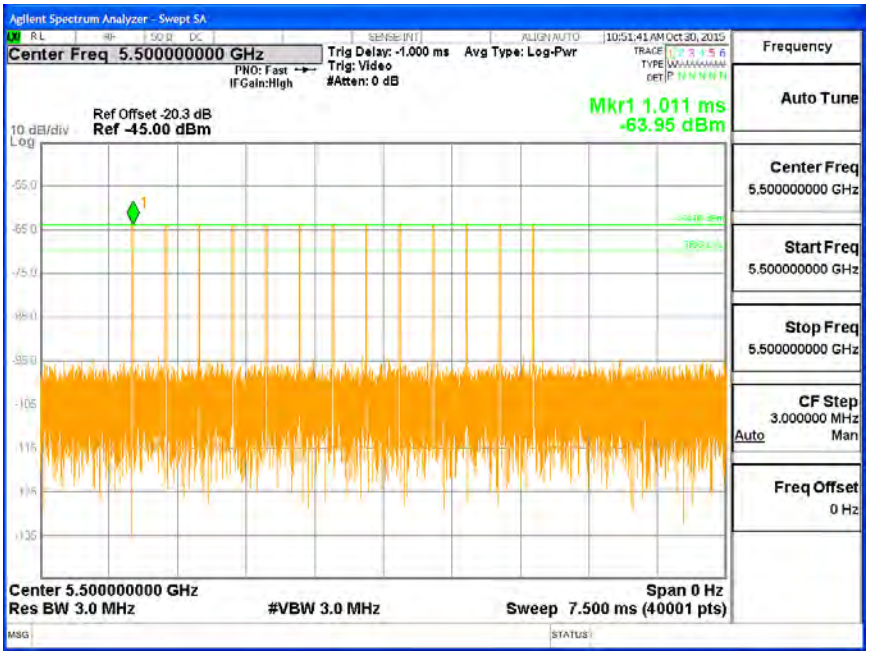
SAMPLE OF RADAR TYPE 2



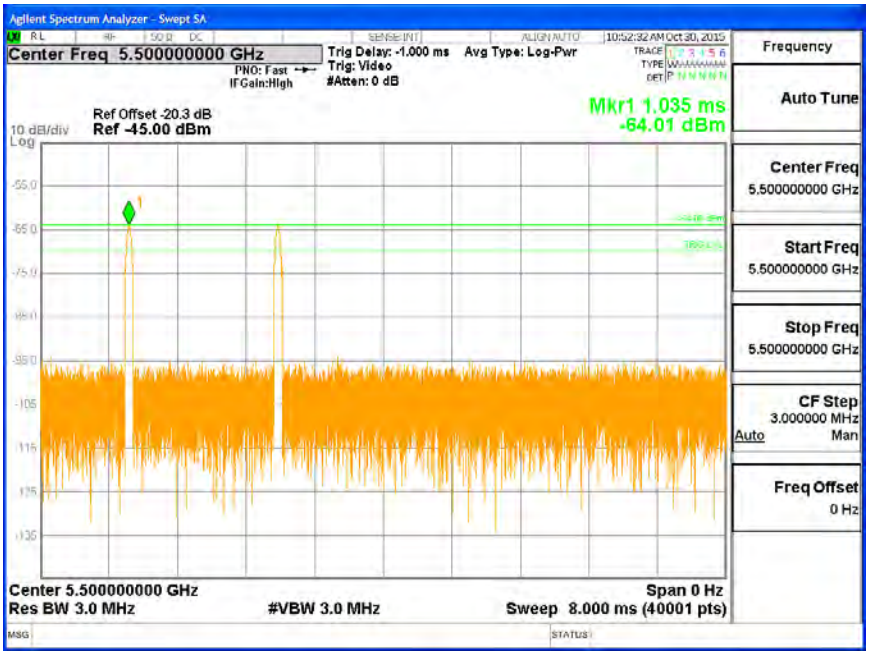
SAMPLE OF RADAR TYPE 3



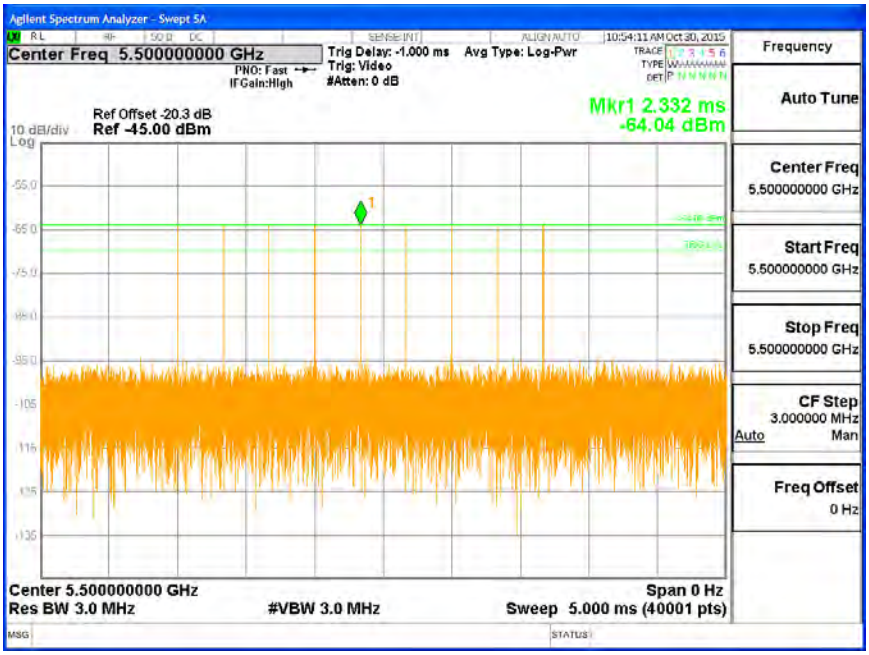
SAMPLE OF RADAR TYPE 4



SAMPLE OF SINGLE BURST OF RADAR TYPE 5

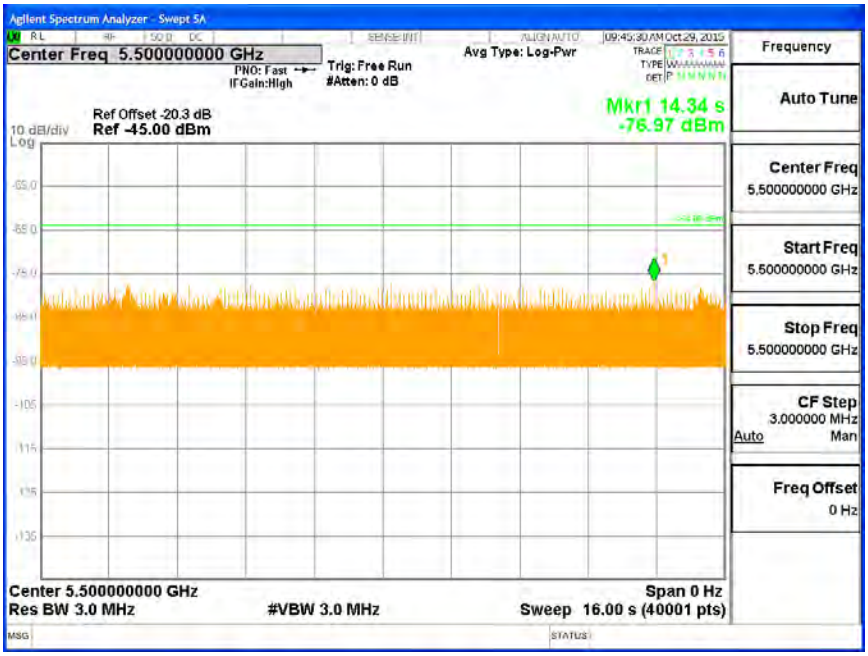


SINGLE BURST OF RADAR TYPE 6

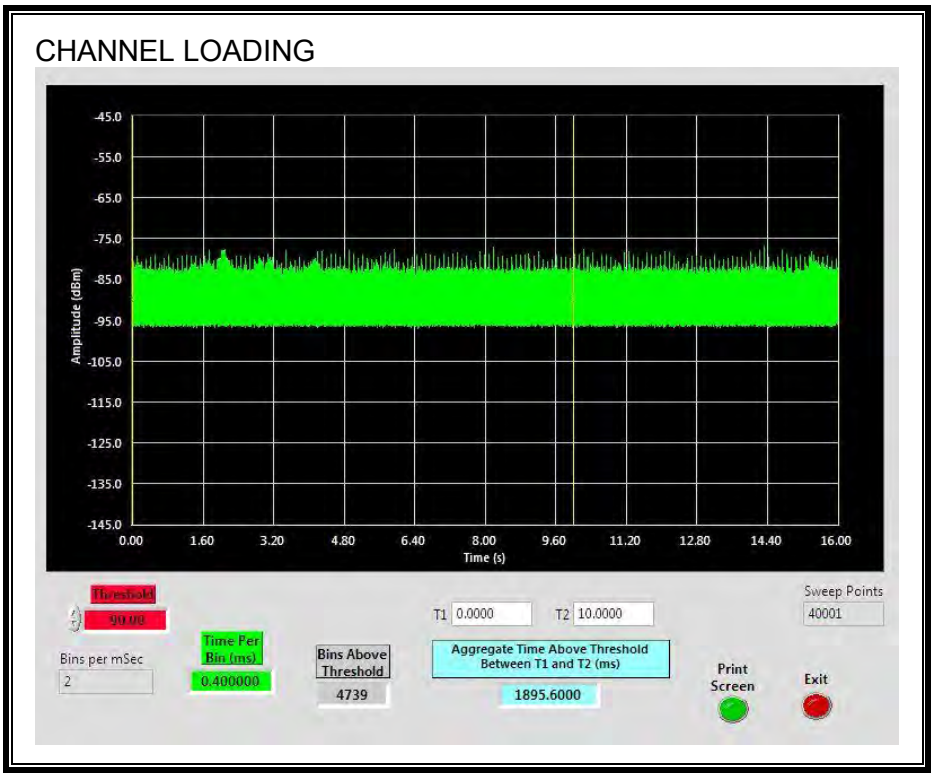


TRAFFIC

TRAFFIC



CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 18.95%

11.2.3. CHANNEL AVAILABILITY CHECK TIME

PROCEDURE TO DETERMINE INITIAL POWER-UP CYCLE TIME

A link was established on channel then the EUT was rebooted. The time from the cessation of traffic to the re-initialization of traffic was measured as the time required for the EUT to complete the total power-up cycle. The time to complete the initial power-up period is 60 seconds less than this total power-up time.

PROCEDURE FOR TIMING OF RADAR BURST

With a link established on channel, the EUT was rebooted. A radar signal was triggered within 0 to 6 seconds after the initial power-up period, and transmissions on the channel were monitored on the spectrum analyzer.

The Non-Occupancy list was cleared. With a link established on channel, the EUT was rebooted. A radar signal was triggered within 54 to 60 seconds after the initial power-up period, and transmissions on the channel were monitored on the spectrum analyzer.

QUANTITATIVE RESULTS

No Radar Triggered

Timing of Reboot (sec)	Timing of Start of Traffic (sec)	Total Power-up Cycle Time (sec)	Initial Power-up Cycle Time (sec)
31.32	135.2	103.9	43.9

Radar Near Beginning of CAC

Timing of Reboot (sec)	Timing of Radar Burst (sec)	Radar Relative to Reboot (sec)	Radar Relative to Start of CAC (sec)
30.29	75.5	45.2	1.3

Radar Near End of CAC

Timing of Reboot (sec)	Timing of Radar Burst (sec)	Radar Relative to Reboot (sec)	Radar Relative to Start of CAC (sec)
30.43	132.7	102.3	58.4

QUALITATIVE RESULTS

Timing of Radar Burst	Display on Control Computer	Spectrum Analyzer Display
No Radar Triggered	EUT marks Channel as active	Transmissions begin on channel after completion of the initial power-up cycle and the CAC
Within 0 to 6 second window	EUT indicates radar detected	No transmissions on channel
Within 54 to 60 second window	EUT indicates radar detected	No transmissions on channel

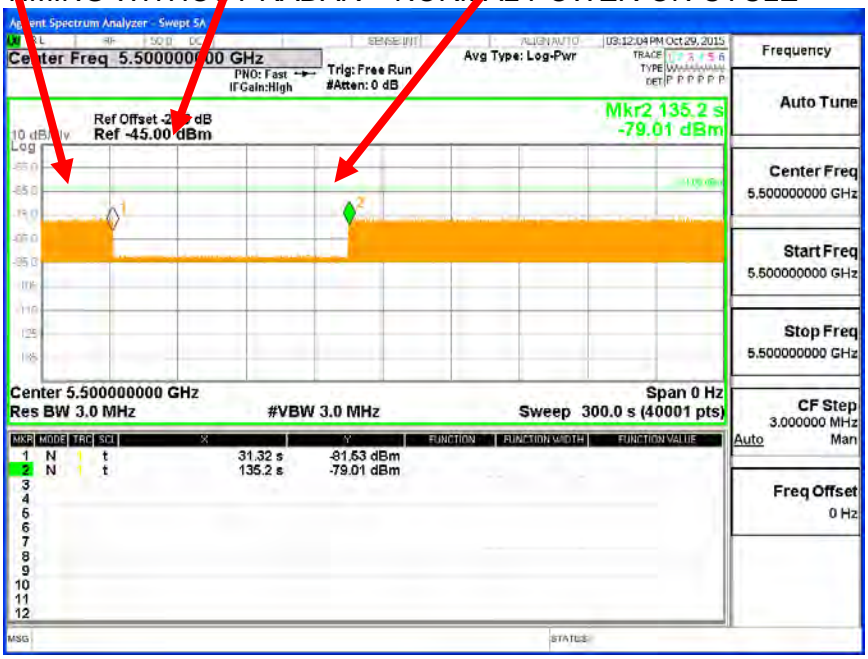
TIMING WITHOUT RADAR DURING CAC

AP is rebooted
Traffic ceases
Start of Initial Power-up cycle

End of Initial Power-up cycle
Start of CAC

End of CAC
Traffic is Initiated

TIMING WITHOUT RADAR – NORMAL POWER-ON CYCLE



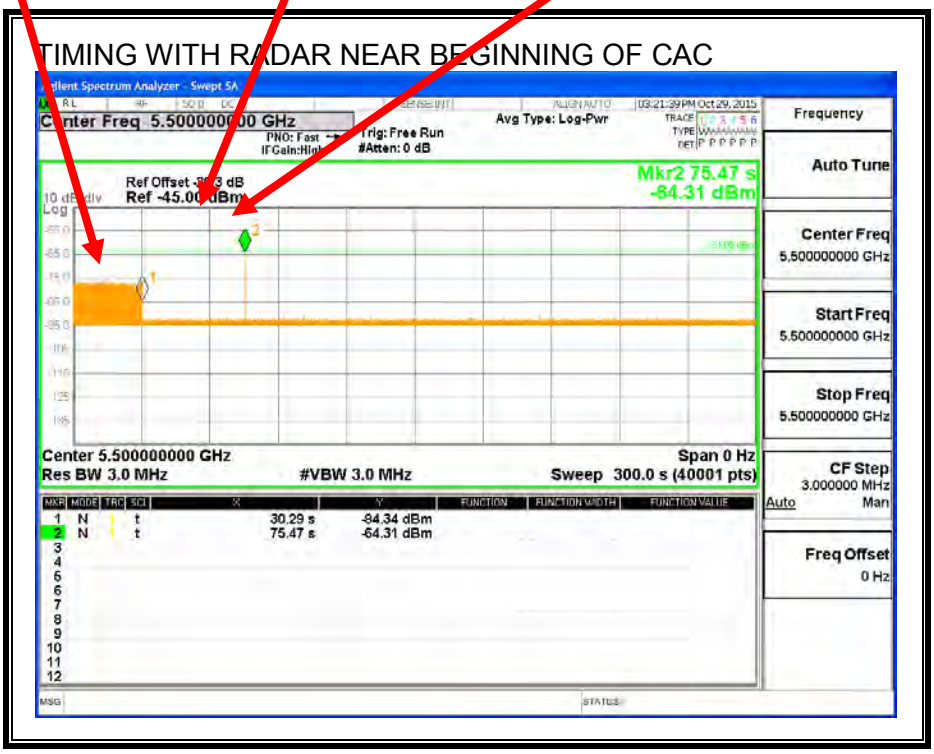
Transmissions begin on channel after completion of the initial power-up cycle and the CAC.

TIMING WITH RADAR NEAR BEGINNING OF CAC

AP is rebooted
Traffic ceases
Start of Initial Power-up cycle

End of Initial Power-up cycle
Start of CAC

Radar Signal Applied



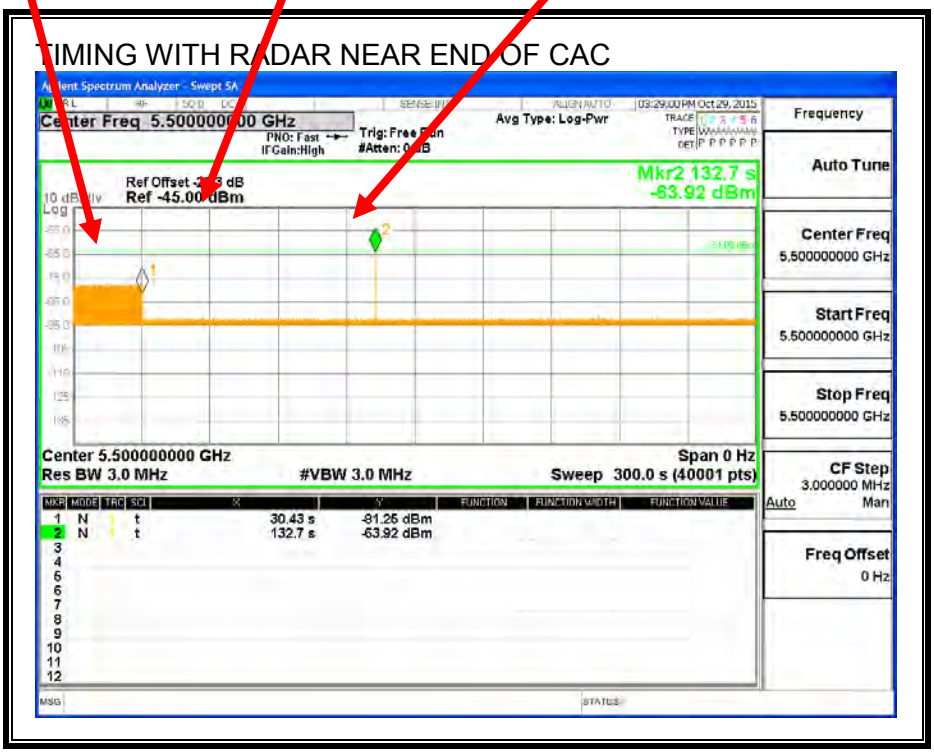
No EUT transmissions were observed after the radar signal.

TIMING WITH RADAR NEAR END OF CAC

AP is rebooted
Traffic ceases
Start of Initial Power-up cycle

End of Initial Power-up cycle
Start of CAC

Radar Signal Applied



No EUT transmissions were observed after the radar signal.

11.2.4. OVERLAPPING CHANNEL TESTS

RESULTS

The channel spacing is not less than the channel bandwidth therefore the EUT does not have an overlapping channel plan.

11.2.5. MOVE AND CLOSING TIME

REPORTING NOTES

The reference marker is set at the end of last radar pulse.

The delta marker is set at the end of the last WLAN transmission following the radar pulse. This delta is the channel move time.

The aggregate channel closing transmission time is calculated as follows:

Aggregate Transmission Time =
(Number of analyzer bins showing transmission) * (dwell time per bin)

The observation period over which the aggregate time is calculated begins at (Reference Marker + 200 msec) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

Channel Move Time (sec)	Limit (sec)
0.4372	10

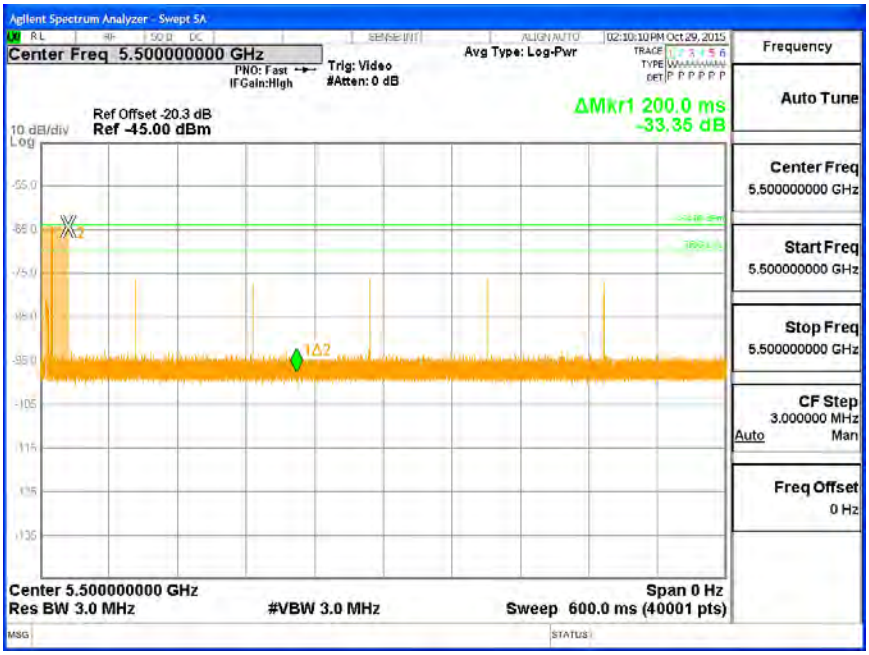
Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
2.4	60

MOVE TIME

MOVE TIME

CHANNEL CLOSING TIME

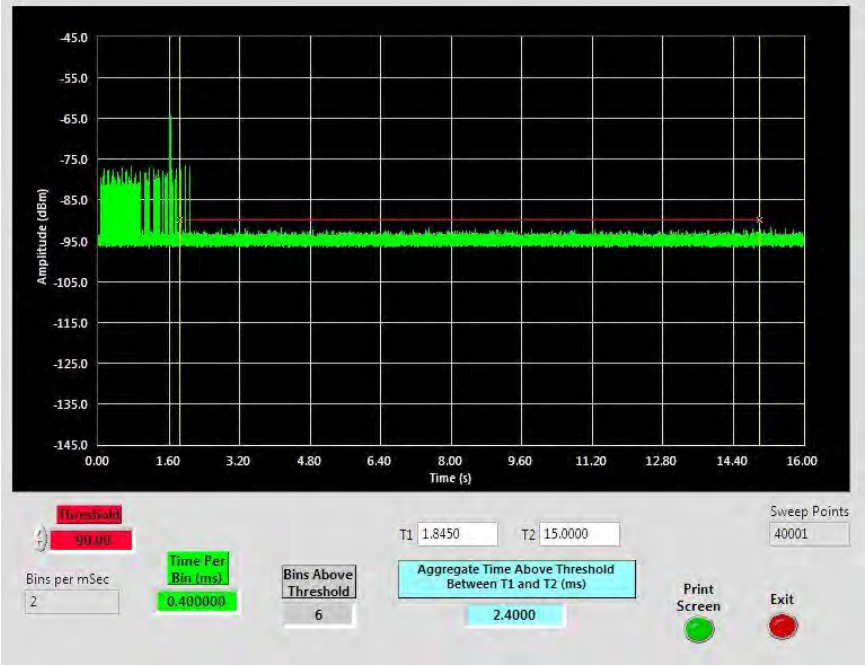
CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

Only intermittent transmissions are observed during the aggregate monitoring period.

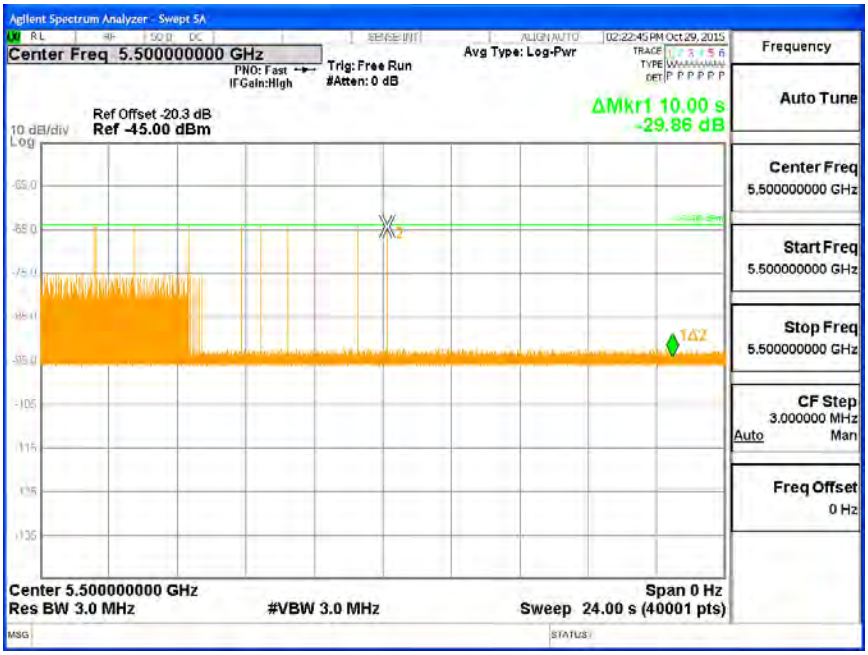
AGGREGATE CLOSING TIME



LONG PULSE CHANNEL MOVE TIME

The traffic ceases prior to 10 seconds after the end of the radar waveform.

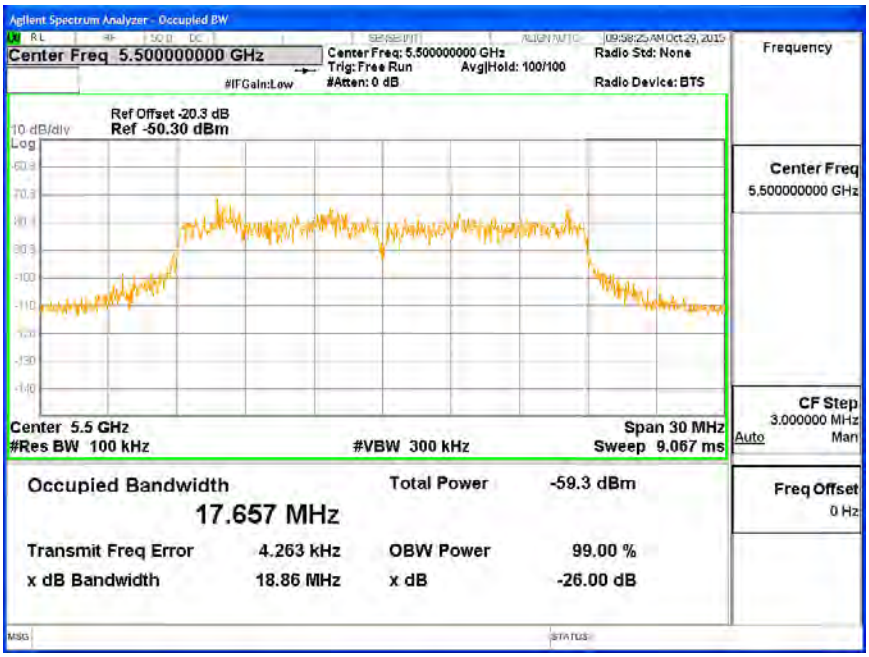
MOVE TIME FOR LONG PULSE RADAR



11.2.6. DETECTION BANDWIDTH

REFERENCE PLOT OF 99% POWER BANDWIDTH

99% BANDWIDTH



RESULTS

FL (MHz)	FH (MHz)	Detection Bandwidth (MHz)	99% Power Bandwidth (MHz)	Ratio of Detection BW to 99% Power BW (%)	Minimum Limit (%)
5490	5510	20	17.657	113.3	100

DETECTION BANDWIDTH PROBABILITY

DETECTION BANDWIDTH PROBABILITY RESULTS

Detection Bandwidth Test Results				
FCC Type 0 Waveform: 1 us Pulse Width, 1428 us PRI, 18 Pulses per Burst				
Frequency (MHz)	Number of Trials	Number Detected	Detection (%)	Mark
5490	10	9	90	FL
5495	10	10	100	
5500	10	10	100	
5505	10	10	100	
5510	30	27	90	FH

11.2.7. IN-SERVICE MONITORING

RESULTS

FCC Radar Test Summary

Signal Type	Number of Trials	Detection (%)	Limit (%)	Pass/Fail	Detection Bandwidth		80% of Det BW	
					FL	FH	FL5	FH5
FCC Short Pulse Type 1	30	100.00	60	Pass	5490	5510		
FCC Short Pulse Type 2	30	96.67	60	Pass	5490	5510		
FCC Short Pulse Type 3	30	86.67	60	Pass	5490	5510		
FCC Short Pulse Type 4	30	70.00	60	Pass	5490	5510		
Aggregate		88.33	80	Pass				
FCC Long Pulse Type 5	30	96.67	80	Pass	5490	5510	5492	5508
FCC Hopping Type 6	42	100.00	70	Pass	5490	5510		

TYPE 1 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 1

Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Test (A/B)	Frequency (MHz)	Successful Detection (Yes/No)
1001	1	3066	18	A	5500	Yes
1002	1	838	63	A	5500	Yes
1003	1	798	67	A	5500	Yes
1004	1	938	57	A	5500	Yes
1005	1	738	72	A	5500	Yes
1006	1	898	59	A	5500	Yes
1007	1	698	76	A	5500	Yes
1008	1	678	78	A	5500	Yes
1009	1	518	102	A	5500	Yes
1010	1	818	65	A	5500	Yes
1011	1	638	83	A	5500	Yes
1012	1	578	92	A	5500	Yes
1013	1	718	74	A	5500	Yes
1014	1	658	81	A	5500	Yes
1015	1	618	86	A	5500	Yes
1016	1	1984	27	B	5500	Yes
1017	1	1940	28	B	5500	Yes
1018	1	1701	32	B	5500	Yes
1019	1	1787	30	B	5500	Yes
1020	1	1678	32	B	5500	Yes
1021	1	719	74	B	5500	Yes
1022	1	1222	44	B	5500	Yes
1023	1	2725	20	B	5500	Yes
1024	1	2004	27	B	5500	Yes
1025	1	1089	49	B	5500	Yes
1026	1	1851	29	B	5500	Yes
1027	1	2419	22	B	5500	Yes
1028	1	763	70	B	5500	Yes
1029	1	1460	37	B	5500	Yes
1030	1	1286	42	B	5500	Yes

TYPE 2 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 2

Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Frequency (MHz)	Successful Detection (Yes/No)
2001	4.7	171	26	5500	Yes
2002	2.9	214	28	5500	Yes
2003	3.8	208	27	5500	Yes
2004	2.1	217	26	5500	Yes
2005	1.3	215	29	5500	Yes
2006	2.1	228	28	5500	Yes
2007	3.4	192	28	5500	Yes
2008	2.4	209	25	5500	Yes
2009	2	220	29	5500	Yes
2010	3.2	161	25	5500	Yes
2011	1.1	176	23	5500	Yes
2012	4.6	163	23	5500	Yes
2013	2.7	183	25	5500	Yes
2014	2.4	174	29	5500	Yes
2015	4.8	160	28	5500	Yes
2016	2.7	156	25	5500	Yes
2017	3.4	226	24	5500	Yes
2018	1.6	188	26	5500	Yes
2019	2.5	225	29	5500	Yes
2020	4.9	191	24	5500	Yes
2021	4.1	151	27	5500	Yes
2022	4.9	202	26	5500	Yes
2023	4.2	166	23	5500	Yes
2024	1.1	183	29	5500	Yes
2025	4.8	194	26	5500	Yes
2026	4.1	216	23	5500	Yes
2027	3.9	150	24	5500	No
2028	3.3	219	28	5500	Yes
2029	1.4	157	30	5500	Yes
2030	1.1	230	27	5500	Yes

TYPE 3 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 3					
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Frequency (MHz)	Successful Detection (Yes/No)
3001	5.7	453	17	5500	Yes
3002	5.6	440	16	5500	Yes
3003	6.4	408	18	5500	Yes
3004	9.2	290	18	5500	Yes
3005	5.2	404	17	5500	Yes
3006	5.9	299	18	5500	Yes
3007	7.3	425	17	5500	No
3008	8.2	333	16	5500	No
3009	7.4	472	18	5500	Yes
3010	8.7	408	17	5500	Yes
3011	8.1	309	16	5500	Yes
3012	7.2	376	18	5500	Yes
3013	7	423	18	5500	Yes
3014	6.3	385	17	5500	Yes
3015	9	445	18	5500	Yes
3016	8.6	419	16	5500	Yes
3017	9.2	374	16	5500	Yes
3018	9	494	16	5500	Yes
3019	9.9	462	17	5500	Yes
3020	7.6	462	17	5500	Yes
3021	8.7	325	16	5500	Yes
3022	9.4	470	17	5500	Yes
3023	5.6	346	16	5500	Yes
3024	6.6	254	18	5500	Yes
3025	5.8	275	17	5500	Yes
3026	7	329	17	5500	Yes
3027	6.5	481	18	5500	Yes
3028	5.6	430	17	5500	Yes
3029	5.3	344	17	5500	No
3030	9.8	305	16	5500	No

TYPE 4 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 4					
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Frequency (MHz)	Successful Detection (Yes/No)
4001	14.8	365	13	5500	Yes
4002	19.4	473	16	5500	Yes
4003	15.1	294	15	5500	No
4004	10.1	415	16	5500	No
4005	16.5	383	16	5500	Yes
4006	12	265	12	5500	No
4007	14.2	496	16	5500	Yes
4008	15.6	391	15	5500	Yes
4009	18.2	267	15	5500	No
4010	10	307	14	5500	No
4011	18.6	447	12	5500	Yes
4012	10.9	500	12	5500	Yes
4013	20	402	12	5500	No
4014	18.1	350	12	5500	Yes
4015	17.6	264	13	5500	No
4016	16.3	477	16	5500	Yes
4017	11.6	419	12	5500	Yes
4018	16.2	393	12	5500	Yes
4019	11.9	466	14	5500	Yes
4020	17	335	15	5500	Yes
4021	13.3	303	14	5500	Yes
4022	18.9	436	15	5500	Yes
4023	16.3	417	15	5500	Yes
4024	12.4	312	14	5500	Yes
4025	15	438	13	5500	Yes
4026	16.9	479	13	5500	Yes
4027	15.4	367	15	5500	No
4028	17.8	421	15	5500	Yes
4029	16.8	322	16	5500	Yes
4030	15	271	16	5500	No

TYPE 5 DETECTION PROBABILITY

Data Sheet for FCC Long Pulse Radar Type 5		
Trial	Frequency (MHz)	Successful Detection (Yes/No)
1	5494	Yes
2	5504	Yes
3	5497	Yes
4	5503	Yes
5	5494	Yes
6	5496	Yes
7	5494	Yes
8	5504	Yes
9	5502	Yes
10	5504	Yes
11	5497	Yes
12	5501	Yes
13	5507	Yes
14	5493	No
15	5506	Yes
16	5493	Yes
17	5500	Yes
18	5506	Yes
19	5504	Yes
20	5497	Yes
21	5499	Yes
22	5500	Yes
23	5507	Yes
24	5508	Yes
25	5499	Yes
26	5493	Yes
27	5506	Yes
28	5499	Yes
29	5497	Yes
30	5502	Yes

Note: The Type 5 randomized parameters tested are shown in a separate document.

TYPE 6 DETECTION PROBABILITY

Data Sheet for FCC Hopping Radar Type 6

1 us Pulse Width, 333 us PRI, 9 Pulses per Burst, 1 Burst per Hop

NTIA August 2005 Hopping Sequence

Trial	Starting Index Within Sequence	Signal Generator Frequency (MHz)	Hops within Detection BW	Successful Detection (Yes/No)
1	140	5490	2	Yes
2	615	5491	7	Yes
3	1090	5492	3	Yes
4	1565	5493	2	Yes
5	2040	5494	4	Yes
6	2515	5495	4	Yes
7	2990	5496	3	Yes
8	3465	5497	3	Yes
9	3940	5498	5	Yes
10	4415	5499	3	Yes
11	4890	5500	9	Yes
12	5365	5501	4	Yes
13	5840	5502	7	Yes
14	6315	5503	4	Yes
15	6790	5504	4	Yes
16	7265	5505	6	Yes
17	7740	5506	5	Yes
18	8215	5507	5	Yes
19	8690	5508	5	Yes
20	9165	5509	6	Yes
21	9640	5510	5	Yes
22	10115	5490	1	Yes
23	10590	5491	4	Yes
24	11065	5492	4	Yes
25	11540	5493	5	Yes
26	12015	5494	7	Yes
27	12490	5495	5	Yes
28	12965	5496	8	Yes
29	13440	5497	6	Yes
30	13915	5498	3	Yes
31	14390	5499	2	Yes
32	14865	5500	3	Yes
33	15340	5501	5	Yes
34	15815	5502	4	Yes
35	16290	5503	2	Yes
36	16765	5504	5	Yes
37	17240	5505	4	Yes
38	17715	5506	6	Yes
39	18190	5507	7	Yes
40	18665	5508	4	Yes
41	19140	5509	7	Yes
42	19615	5510	3	Yes

11.3. RESULTS FOR 40 MHz BANDWIDTH

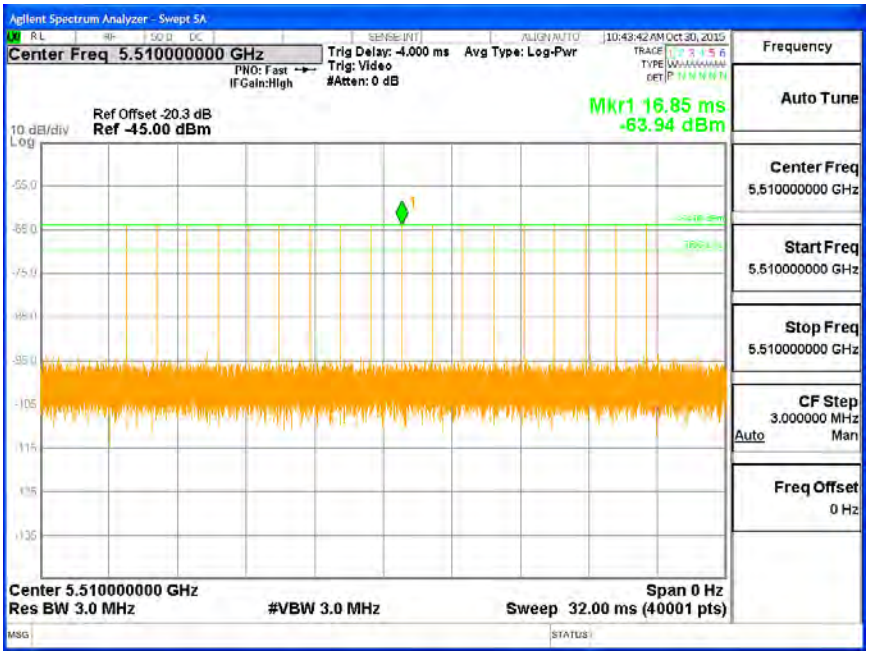
11.3.1. TEST CHANNEL

All tests were performed at a channel center frequency of 5510 MHz.

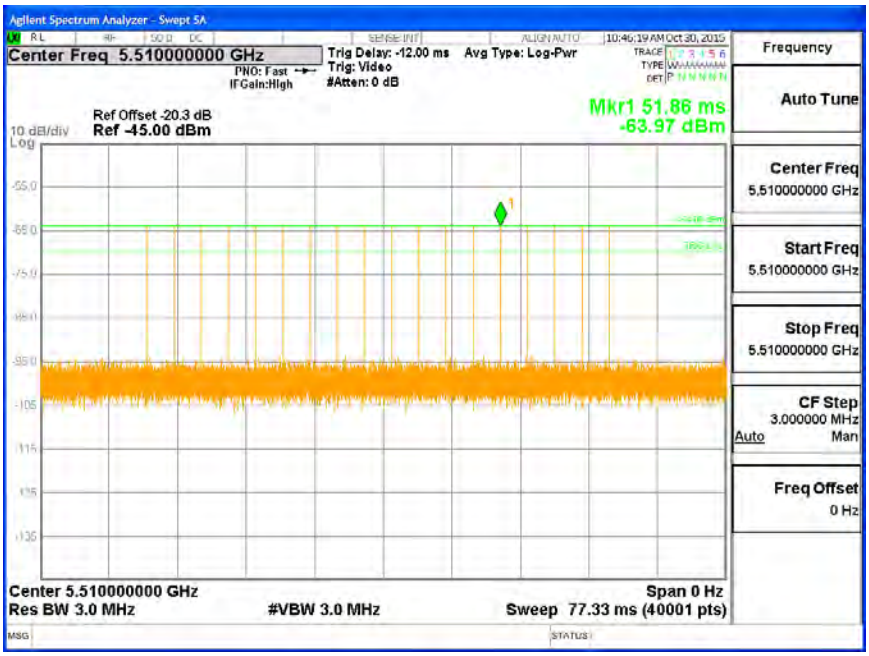
11.3.2. RADAR WAVEFORMS AND TRAFFIC

RADAR WAVEFORMS

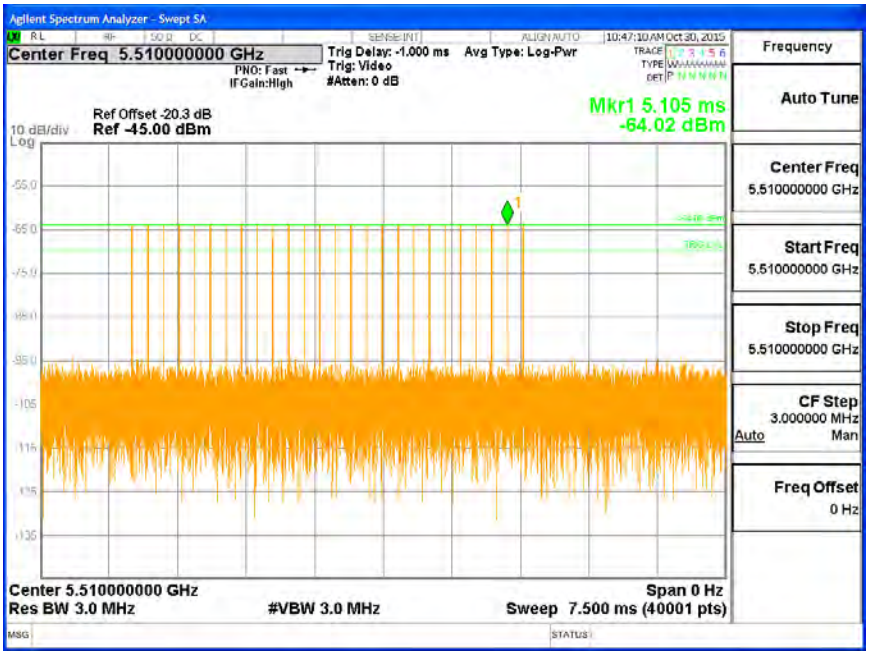
SHORT PULSE RADAR TYPE 0



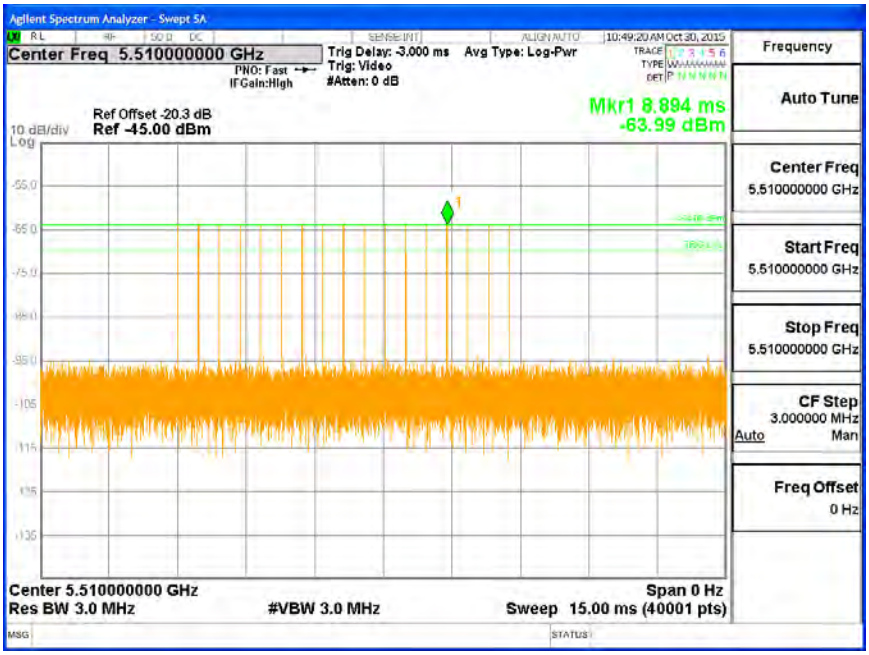
SAMPLE OF RADAR TYPE 1



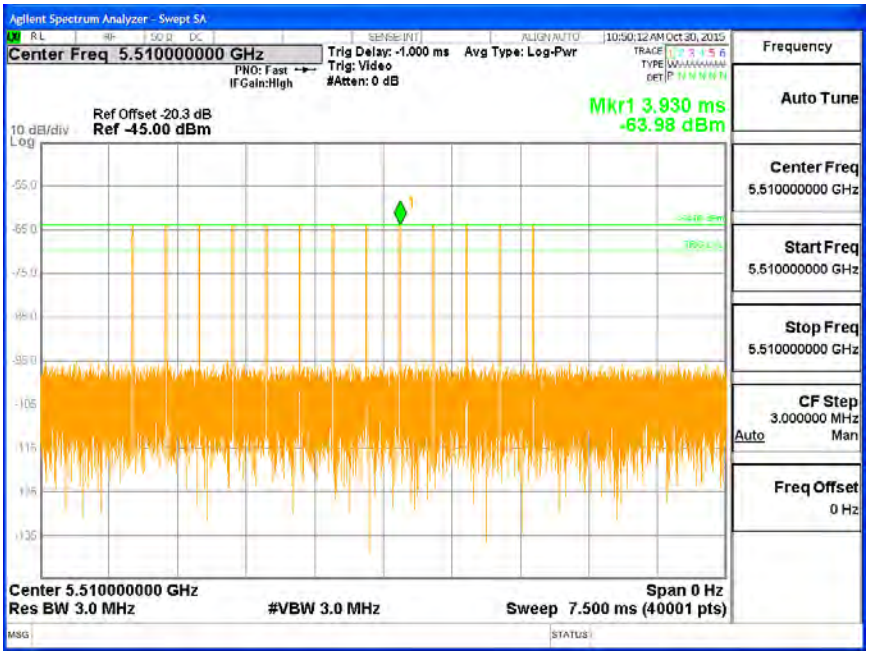
SAMPLE OF RADAR TYPE 2



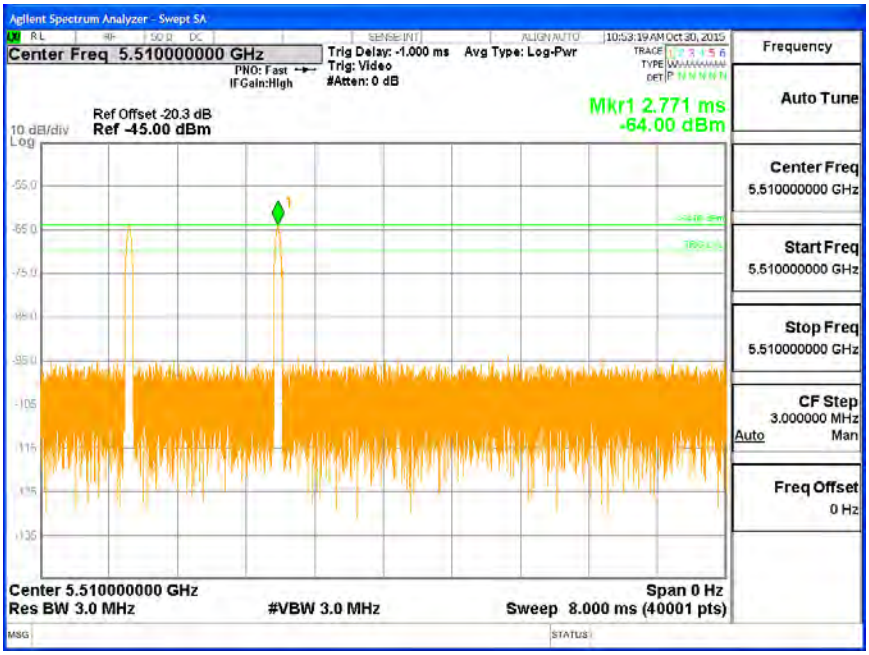
SAMPLE OF RADAR TYPE 3



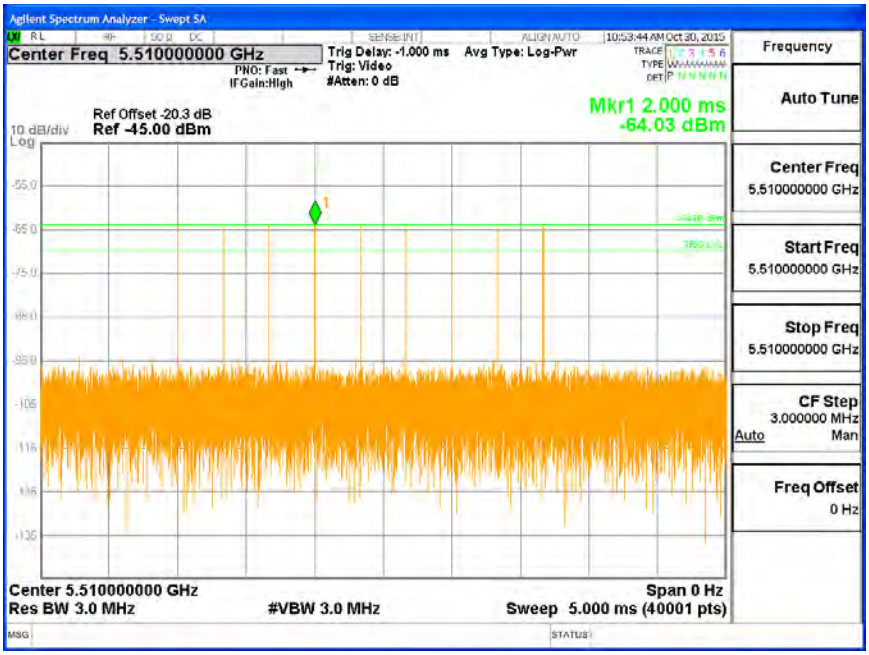
SAMPLE OF RADAR TYPE 4



SAMPLE OF SINGLE BURST OF RADAR TYPE 5

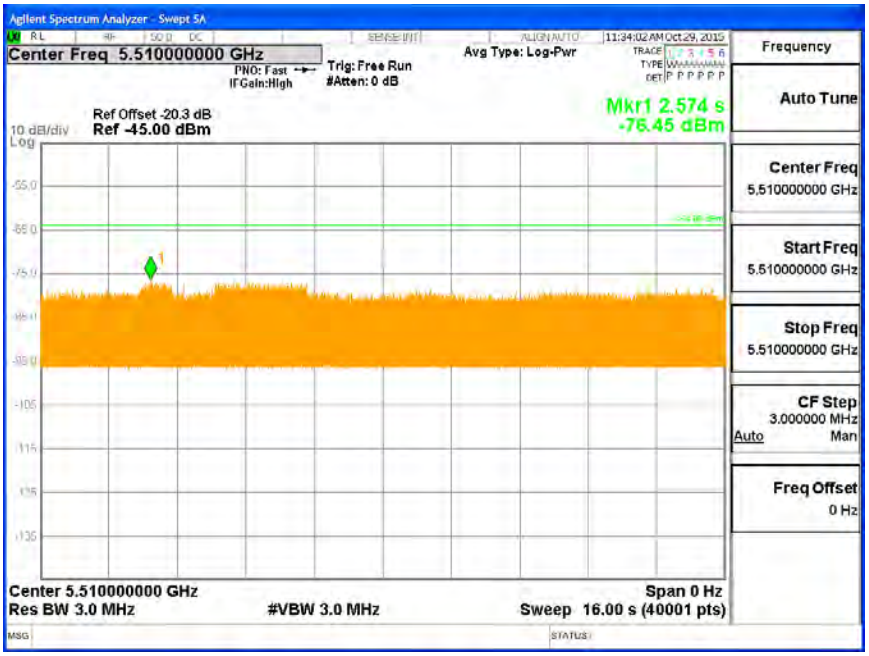


SINGLE BURST OF RADAR TYPE 6

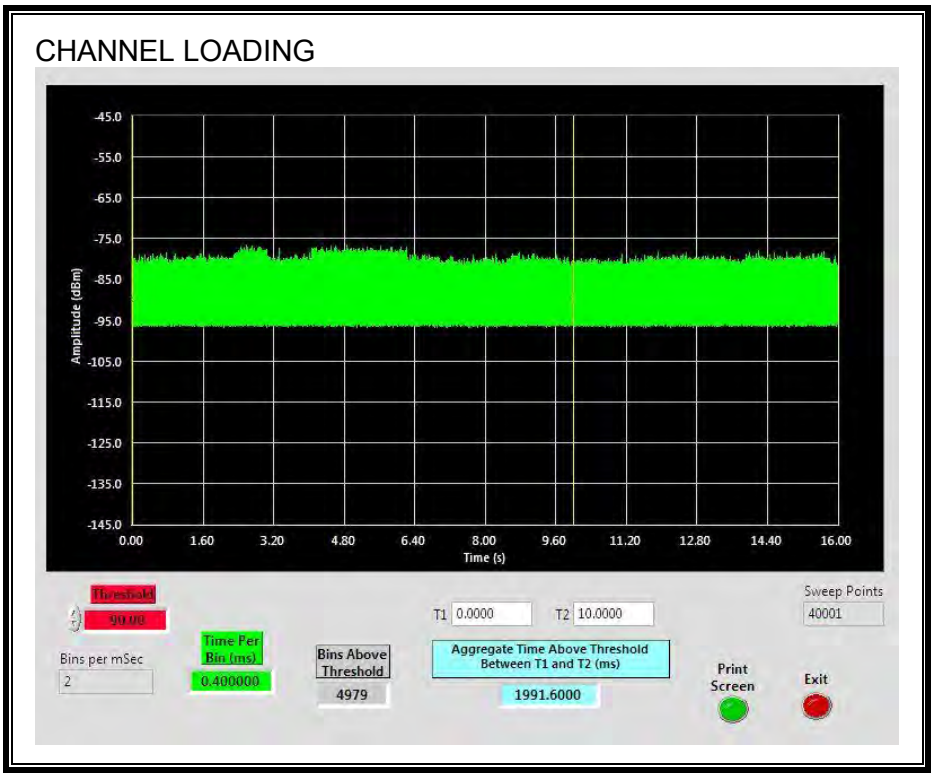


TRAFFIC

TRAFFIC



CHANNEL LOADING



The level of traffic loading on the channel by the EUT is 19.91%

11.3.3. CHANNEL AVAILABILITY CHECK TIME

PROCEDURE TO DETERMINE INITIAL POWER-UP CYCLE TIME

A link was established on channel then the EUT was rebooted. The time from the cessation of traffic to the re-initialization of traffic was measured as the time required for the EUT to complete the total power-up cycle. The time to complete the initial power-up period is 60 seconds less than this total power-up time.

PROCEDURE FOR TIMING OF RADAR BURST

With a link established on channel, the EUT was rebooted. A radar signal was triggered within 0 to 6 seconds after the initial power-up period, and transmissions on the channel were monitored on the spectrum analyzer.

The Non-Occupancy list was cleared. With a link established on channel, the EUT was rebooted. A radar signal was triggered within 54 to 60 seconds after the initial power-up period, and transmissions on the channel were monitored on the spectrum analyzer.

QUANTITATIVE RESULTS

No Radar Triggered

Timing of Reboot (sec)	Timing of Start of Traffic (sec)	Total Power-up Cycle Time (sec)	Initial Power-up Cycle Time (sec)
30.41	134.5	104.1	44.1

Radar Near Beginning of CAC

Timing of Reboot (sec)	Timing of Radar Burst (sec)	Radar Relative to Reboot (sec)	Radar Relative to Start of CAC (sec)
30.46	75.86	45.4	1.3

Radar Near End of CAC

Timing of Reboot (sec)	Timing of Radar Burst (sec)	Radar Relative to Reboot (sec)	Radar Relative to Start of CAC (sec)
30.38	133.7	103.3	59.2

QUALITATIVE RESULTS

Timing of Radar Burst	Display on Control Computer	Spectrum Analyzer Display
No Radar Triggered	EUT marks Channel as active	Transmissions begin on channel after completion of the initial power-up cycle and the CAC
Within 0 to 6 second window	EUT indicates radar detected	No transmissions on channel
Within 54 to 60 second window	EUT indicates radar detected	No transmissions on channel

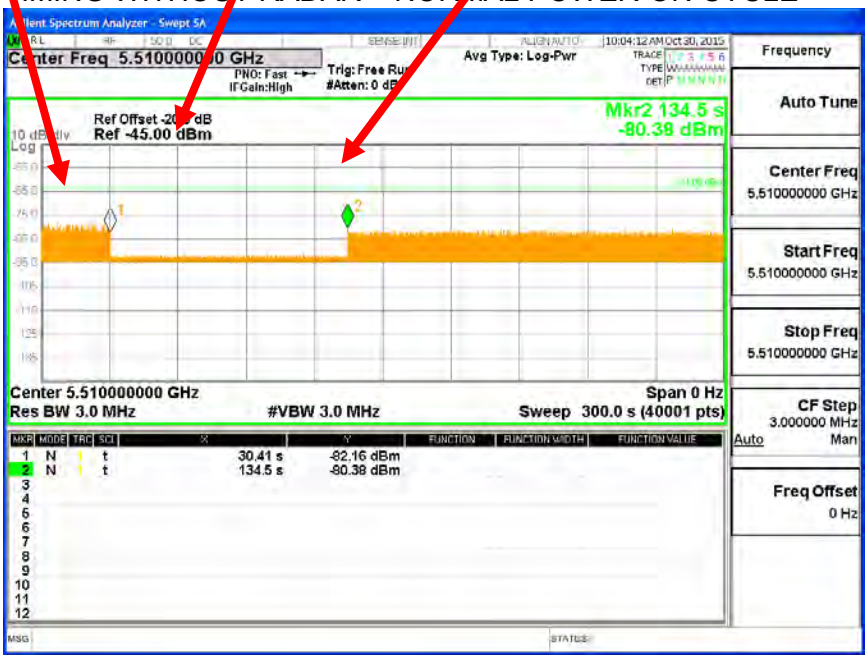
TIMING WITHOUT RADAR DURING CAC

AP is rebooted
Traffic ceases
Start of Initial Power-up cycle

End of Initial Power-up cycle
Start of CAC

End of CAC
Traffic is Initiated

TIMING WITHOUT RADAR – NORMAL POWER-ON CYCLE



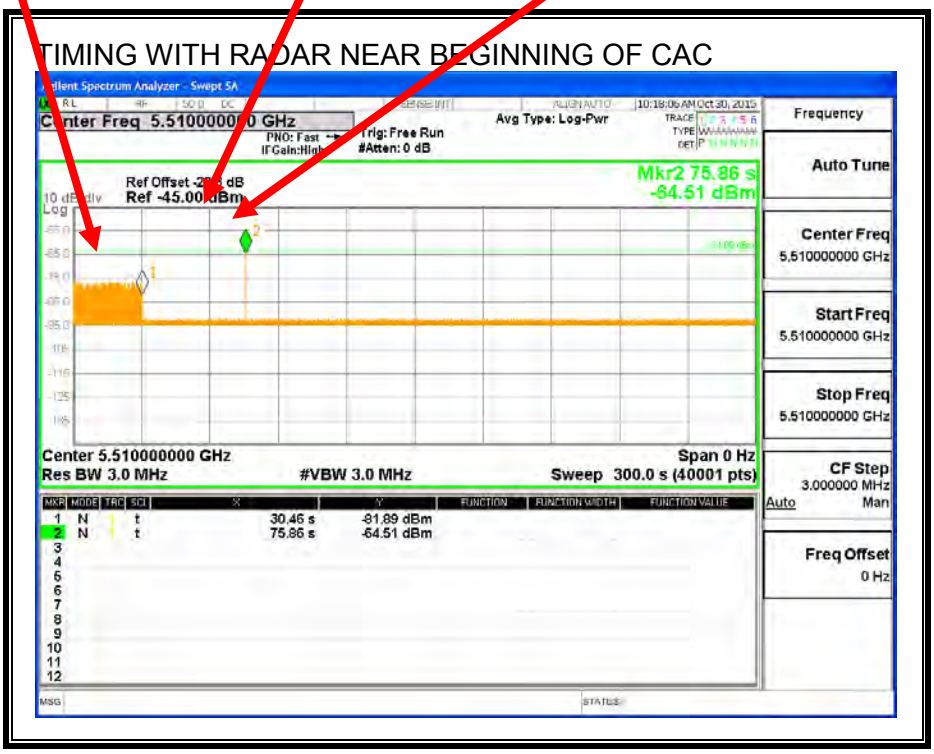
Transmissions begin on channel after completion of the initial power-up cycle and the CAC.

TIMING WITH RADAR NEAR BEGINNING OF CAC

AP is rebooted
Traffic ceases
Start of Initial Power-up cycle

End of Initial Power-up cycle
Start of CAC

Radar Signal Applied



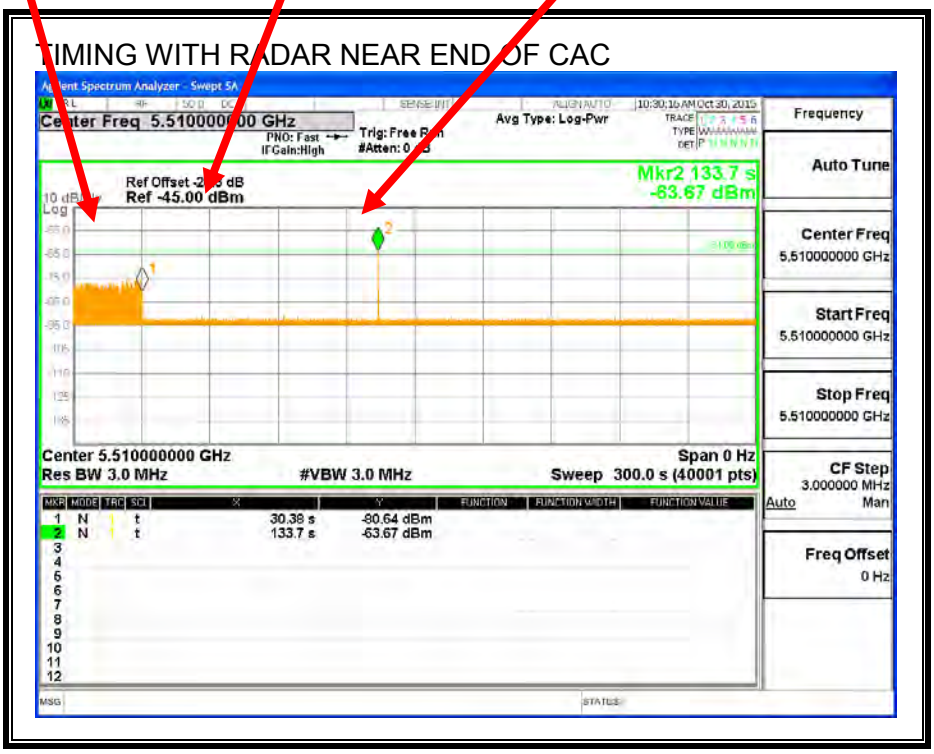
No EUT transmissions were observed after the radar signal.

TIMING WITH RADAR NEAR END OF CAC

AP is rebooted
Traffic ceases
Start of Initial Power-up cycle

End of Initial Power-up cycle
Start of CAC

Radar Signal Applied



No EUT transmissions were observed after the radar signal.

11.3.4. OVERLAPPING CHANNEL TESTS

RESULTS

The channel spacing is not less than the channel bandwidth therefore the EUT does not have an overlapping channel plan.

11.3.5. MOVE AND CLOSING TIME

REPORTING NOTES

The reference marker is set at the end of last radar pulse.

The delta marker is set at the end of the last WLAN transmission following the radar pulse. This delta is the channel move time.

The aggregate channel closing transmission time is calculated as follows:

Aggregate Transmission Time =
(Number of analyzer bins showing transmission) * (dwell time per bin)

The observation period over which the aggregate time is calculated begins at (Reference Marker + 200 msec) and ends no earlier than (Reference Marker + 10 sec).

RESULTS

Channel Move Time (sec)	Limit (sec)
0.534	10

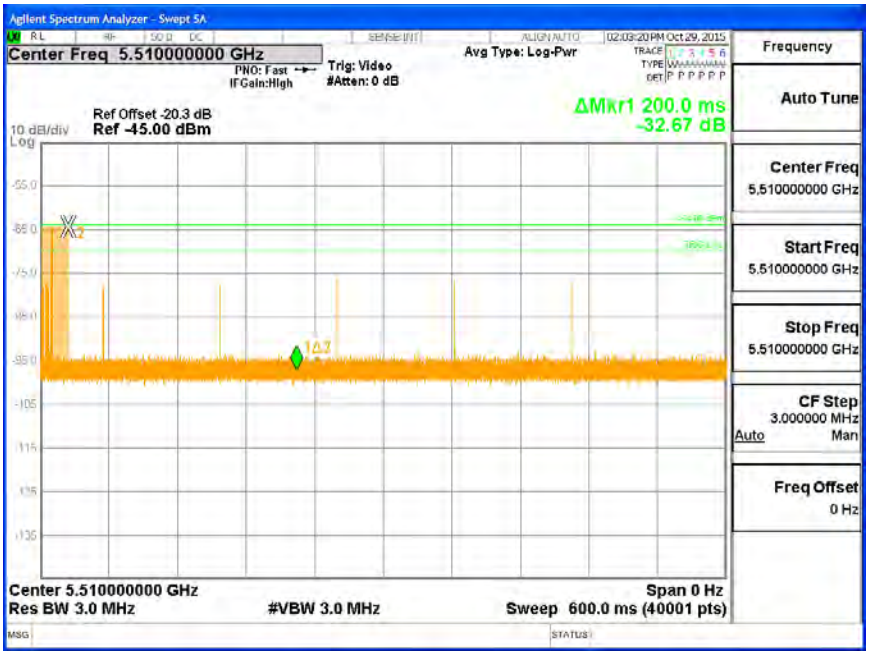
Aggregate Channel Closing Transmission Time (msec)	Limit (msec)
2.0	60

MOVE TIME

MOVE TIME

CHANNEL CLOSING TIME

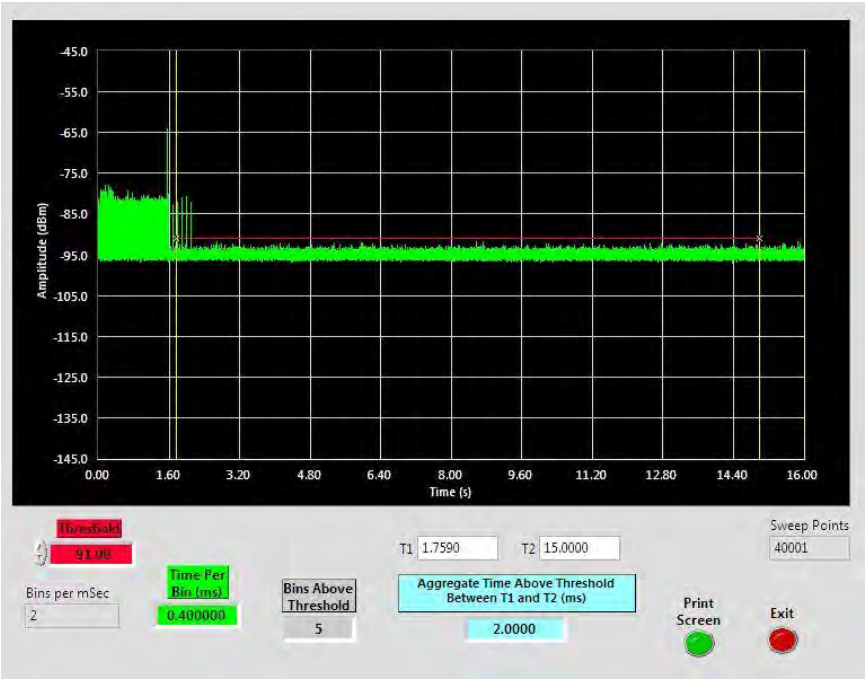
CLOSING TIME



AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

Only intermittent transmissions are observed during the aggregate monitoring period.

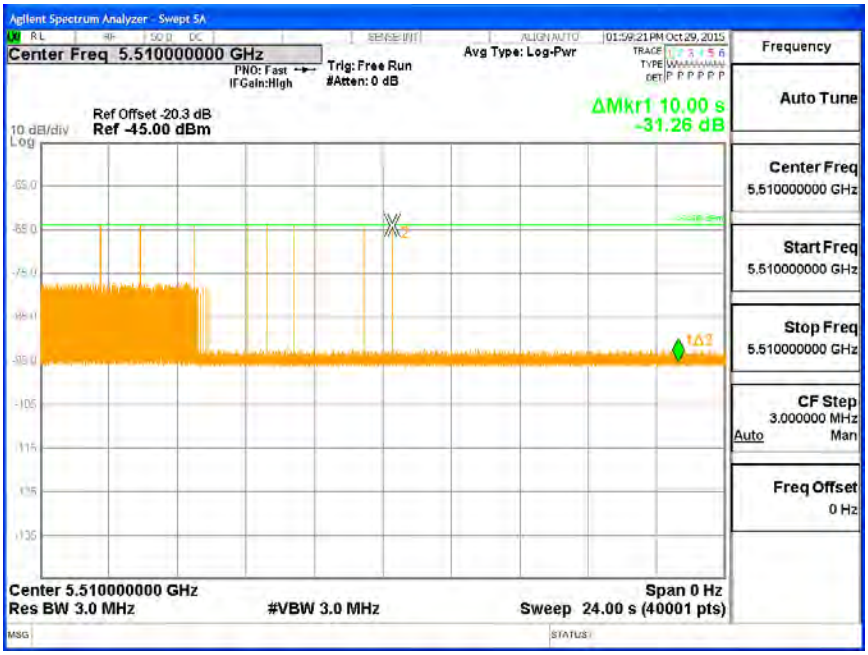
AGGREGATE CLOSING TIME



LONG PULSE CHANNEL MOVE TIME

The traffic ceases prior to 10 seconds after the end of the radar waveform.

MOVE TIME FOR LONG PULSE RADAR

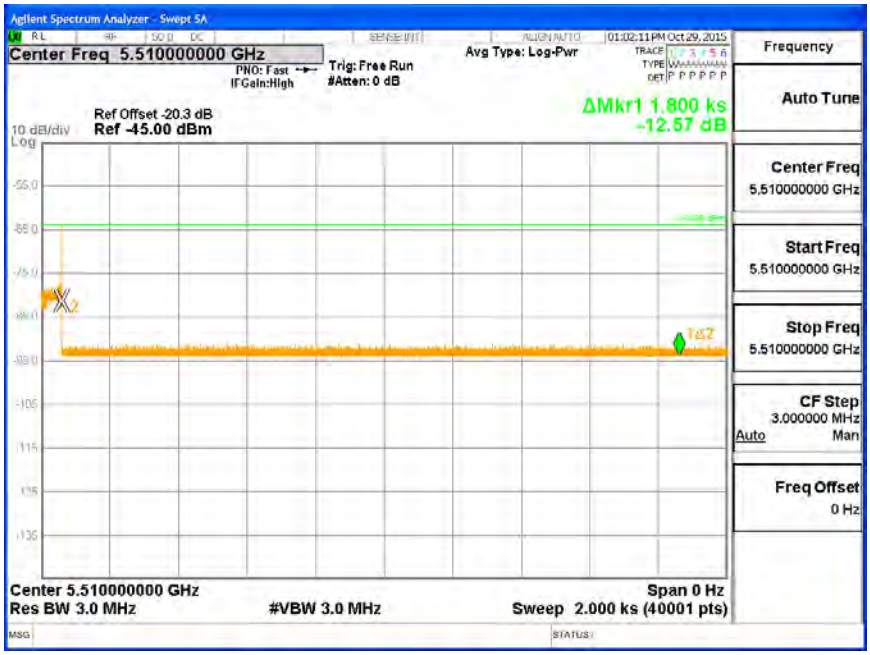


11.3.6. NON-OCCUPANCY PERIOD

RESULTS

No EUT transmissions were observed on the test channel during the 30-minute observation time.

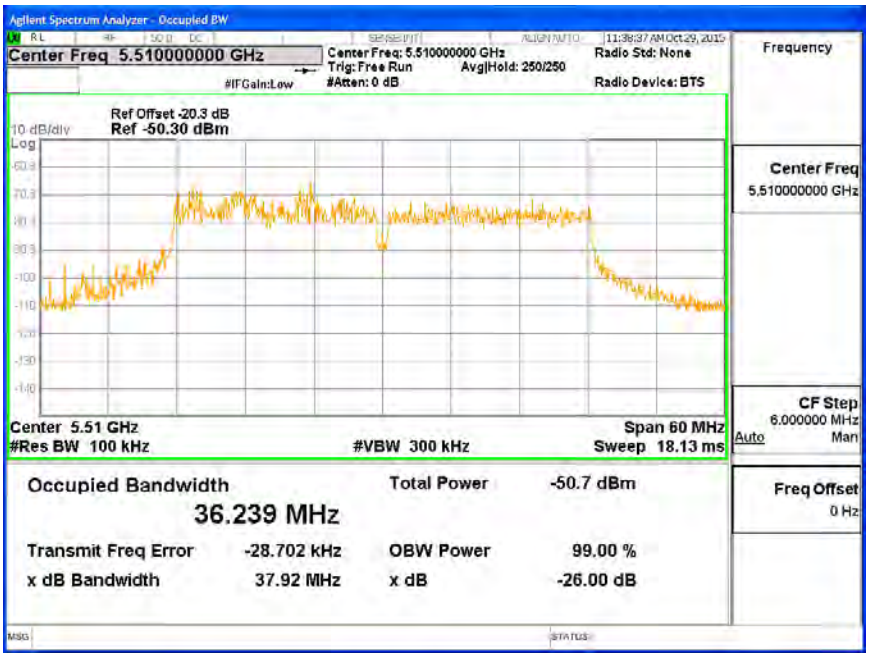
NON-OCCUPANCY PERIOD



11.3.7. DETECTION BANDWIDTH

REFERENCE PLOT OF 99% POWER BANDWIDTH

99% BANDWIDTH



RESULTS

FL (MHz)	FH (MHz)	Detection Bandwidth (MHz)	99% Power Bandwidth (MHz)	Ratio of Detection BW to 99% Power BW (%)	Minimum Limit (%)
5490	5530	40	36.239	110.4	100

DETECTION BANDWIDTH PROBABILITY

DETECTION BANDWIDTH PROBABILITY RESULTS

Detection Bandwidth Test Results				
FCC Type 0 Waveform: 1 us Pulse Width, 1428 us PRI, 18 Pulses per Burst				
Frequency (MHz)	Number of Trials	Number Detected	Detection (%)	Mark
5489	10	0	0	
5490	10	10	100	FL
5495	10	10	100	
5500	10	10	100	
5505	10	10	100	
5510	10	10	100	
5515	10	10	100	
5520	10	10	100	
5525	10	10	100	
5530	10	10	100	FH
5531	10	0	0	

11.3.8. IN-SERVICE MONITORING

RESULTS

FCC Radar Test Summary

Signal Type	Number of Trials	Detection (%)	Limit (%)	Pass/Fail	Detection Bandwidth		80% of Det BW	
					FL	FH	FL5	FH5
FCC Short Pulse Type 1	30	100.00	60	Pass	5490	5530		
FCC Short Pulse Type 2	30	100.00	60	Pass	5490	5530		
FCC Short Pulse Type 3	30	100.00	60	Pass	5490	5530		
FCC Short Pulse Type 4	30	100.00	60	Pass	5490	5530		
Aggregate		100.00	80	Pass				
FCC Long Pulse Type 5	30	100.00	80	Pass	5490	5530	5494	5526
FCC Hopping Type 6	41	100.00	70	Pass	5490	5530		

TYPE 1 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 1						
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Test (A/B)	Frequency (MHz)	Successful Detection (Yes/No)
1001	1	3066	18	A	5510	Yes
1002	1	838	63	A	5510	Yes
1003	1	798	67	A	5510	Yes
1004	1	938	57	A	5510	Yes
1005	1	738	72	A	5510	Yes
1006	1	898	59	A	5510	Yes
1007	1	698	76	A	5510	Yes
1008	1	678	78	A	5510	Yes
1009	1	518	102	A	5510	Yes
1010	1	818	65	A	5510	Yes
1011	1	638	83	A	5510	Yes
1012	1	578	92	A	5510	Yes
1013	1	718	74	A	5510	Yes
1014	1	658	81	A	5510	Yes
1015	1	618	86	A	5510	Yes
1016	1	1984	27	B	5510	Yes
1017	1	1940	28	B	5510	Yes
1018	1	1701	32	B	5510	Yes
1019	1	1787	30	B	5510	Yes
1020	1	1678	32	B	5510	Yes
1021	1	719	74	B	5510	Yes
1022	1	1222	44	B	5510	Yes
1023	1	2725	20	B	5510	Yes
1024	1	2004	27	B	5510	Yes
1025	1	1089	49	B	5510	Yes
1026	1	1851	29	B	5510	Yes
1027	1	2419	22	B	5510	Yes
1028	1	763	70	B	5510	Yes
1029	1	1460	37	B	5510	Yes
1030	1	1286	42	B	5510	Yes

TYPE 2 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 2

Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Frequency (MHz)	Successful Detection (Yes/No)
2001	4.7	171	26	5510	Yes
2002	2.9	214	28	5510	Yes
2003	3.8	208	27	5510	Yes
2004	2.1	217	26	5510	Yes
2005	1.3	215	29	5510	Yes
2006	2.1	228	28	5510	Yes
2007	3.4	192	28	5510	Yes
2008	2.4	209	25	5510	Yes
2009	2	220	29	5510	Yes
2010	3.2	161	25	5510	Yes
2011	1.1	176	23	5510	Yes
2012	4.6	163	23	5510	Yes
2013	2.7	183	25	5510	Yes
2014	2.4	174	29	5510	Yes
2015	4.8	160	28	5510	Yes
2016	2.7	156	25	5510	Yes
2017	3.4	226	24	5510	Yes
2018	1.6	188	26	5510	Yes
2019	2.5	225	29	5510	Yes
2020	4.9	191	24	5510	Yes
2021	4.1	151	27	5510	Yes
2022	4.9	202	26	5510	Yes
2023	4.2	166	23	5510	Yes
2024	1.1	183	29	5510	Yes
2025	4.8	194	26	5510	Yes
2026	4.1	216	23	5510	Yes
2027	3.9	150	24	5510	Yes
2028	3.3	219	28	5510	Yes
2029	1.4	157	30	5510	Yes
2030	1.1	230	27	5510	Yes

TYPE 3 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 3					
Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Frequency (MHz)	Successful Detection (Yes/No)
3001	5.7	453	17	5510	Yes
3002	5.6	440	16	5510	Yes
3003	6.4	408	18	5510	Yes
3004	9.2	290	18	5510	Yes
3005	5.2	404	17	5510	Yes
3006	5.9	299	18	5510	Yes
3007	7.3	425	17	5510	Yes
3008	8.2	333	16	5510	Yes
3009	7.4	472	18	5510	Yes
3010	8.7	408	17	5510	Yes
3011	8.1	309	16	5510	Yes
3012	7.2	376	18	5510	Yes
3013	7	423	18	5510	Yes
3014	6.3	385	17	5510	Yes
3015	9	445	18	5510	Yes
3016	8.6	419	16	5510	Yes
3017	9.2	374	16	5510	Yes
3018	9	494	16	5510	Yes
3019	9.9	462	17	5510	Yes
3020	7.6	462	17	5510	Yes
3021	8.7	325	16	5510	Yes
3022	9.4	470	17	5510	Yes
3023	5.6	346	16	5510	Yes
3024	6.6	254	18	5510	Yes
3025	5.8	275	17	5510	Yes
3026	7	329	17	5510	Yes
3027	6.5	481	18	5510	Yes
3028	5.6	430	17	5510	Yes
3029	5.3	344	17	5510	Yes
3030	9.8	305	16	5510	Yes

TYPE 4 DETECTION PROBABILITY

Data Sheet for FCC Short Pulse Radar Type 4

Waveform	Pulse Width (us)	PRI (us)	Pulses Per Burst	Frequency (MHz)	Successful Detection (Yes/No)
4001	14.8	365	13	5510	Yes
4002	19.4	473	16	5510	Yes
4003	15.1	294	15	5510	Yes
4004	10.1	415	16	5510	Yes
4005	16.5	383	16	5510	Yes
4006	12	265	12	5510	Yes
4007	14.2	496	16	5510	Yes
4008	15.6	391	15	5510	Yes
4009	18.2	267	15	5510	Yes
4010	10	307	14	5510	Yes
4011	18.6	447	12	5510	Yes
4012	10.9	500	12	5510	Yes
4013	20	402	12	5510	Yes
4014	18.1	350	12	5510	Yes
4015	17.6	264	13	5510	Yes
4016	16.3	477	16	5510	Yes
4017	11.6	419	12	5510	Yes
4018	16.2	393	12	5510	Yes
4019	11.9	466	14	5510	Yes
4020	17	335	15	5510	Yes
4021	13.3	303	14	5510	Yes
4022	18.9	436	15	5510	Yes
4023	16.3	417	15	5510	Yes
4024	12.4	312	14	5510	Yes
4025	15	438	13	5510	Yes
4026	16.9	479	13	5510	Yes
4027	15.4	367	15	5510	Yes
4028	17.8	421	15	5510	Yes
4029	16.8	322	16	5510	Yes
4030	15	271	16	5510	Yes

TYPE 5 DETECTION PROBABILITY

Data Sheet for FCC Long Pulse Radar Type 5		
Trial	Frequency (MHz)	Successful Detection (Yes/No)
1	5507	Yes
2	5502	Yes
3	5499	Yes
4	5517	Yes
5	5505	Yes
6	5514	Yes
7	5518	Yes
8	5515	Yes
9	5495	Yes
10	5494	Yes
11	5509	Yes
12	5495	Yes
13	5508	Yes
14	5504	Yes
15	5523	Yes
16	5518	Yes
17	5509	Yes
18	5526	Yes
19	5500	Yes
20	5508	Yes
21	5506	Yes
22	5508	Yes
23	5504	Yes
24	5514	Yes
25	5497	Yes
26	5494	Yes
27	5516	Yes
28	5512	Yes
29	5495	Yes
30	5522	Yes

Note: The Type 5 randomized parameters tested are shown in a separate document.

TYPE 6 DETECTION PROBABILITY

Data Sheet for FCC Hopping Radar Type 6
1 us Pulse Width, 333 us PRI, 9 Pulses per Burst, 1 Burst per Hop
NTIA August 2005 Hopping Sequence

Trial	Starting Index Within Sequence	Signal Generator Frequency (MHz)	Hops within Detection BW	Successful Detection (Yes/No)
1	361	5490	4	Yes
2	836	5491	3	Yes
3	1311	5492	11	Yes
4	1786	5493	9	Yes
5	2261	5494	8	Yes
6	2736	5495	6	Yes
7	3211	5496	6	Yes
8	3686	5497	7	Yes
9	4161	5498	9	Yes
10	4636	5499	6	Yes
11	5111	5500	5	Yes
12	5586	5501	7	Yes
13	6061	5502	8	Yes
14	6536	5503	7	Yes
15	7011	5504	8	Yes
16	7486	5505	5	Yes
17	7961	5506	3	Yes
18	8436	5507	10	Yes
19	8911	5508	11	Yes
20	9386	5509	10	Yes
21	9861	5510	6	Yes
22	10336	5511	6	Yes
23	10811	5512	11	Yes
24	11286	5513	8	Yes
25	11761	5514	5	Yes
26	12236	5515	8	Yes
27	12711	5516	14	Yes
28	13186	5517	7	Yes
29	13661	5518	6	Yes
30	14136	5519	13	Yes
31	14611	5520	9	Yes
32	15086	5521	9	Yes
33	15561	5522	8	Yes
34	16036	5523	10	Yes
35	16511	5524	13	Yes
36	16986	5525	13	Yes
37	17461	5526	8	Yes
38	17936	5527	3	Yes
39	18411	5528	7	Yes
40	18886	5529	9	Yes
41	19361	5530	10	Yes

11.4. BRIDGE MODE RESULTS

Per KDB 905462, Section 5.1 (footnote 1):

Networks Access Points with Bridge and/or MESH modes of operation are permitted to operate in the DFS bands but must employ a DFS function. The functionality of the Bridge mode as specified in §15.403(a) must be validated in the DFS test report. Devices operating as relays must also employ DFS function. The method used to validate the functionality must be documented and validation data must be documented. Bridge mode can be validated by performing a test statistical performance check (Section 7.8.4) on any one of the radar types. This is an abbreviated test to verify DFS functionality. MESH mode operational methodology must be submitted in the application for certification for evaluation by the FCC.

This device does not support Bridge Mode, therefore this test was not performed.