



**FCC CFR47 PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 8**

CERTIFICATION TEST REPORT

FOR

The Apple iPad is a tablet device with iPod functions (music, application support, and video), 802.11a/b/g/n radio, and Bluetooth radio functions

MODEL NUMBER: A1458, A1459, A1460*

FCC ID: BCGA1458

IC: 579C-A1458

REPORT NUMBER: 12U14507-1, Revision A

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*Models differences are detailed within the body of this report



NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	08/15/12	Initial Issue	F. Ibrahim
A	10/04/12	Detailed method was referenced for output power and PSD under test procedure titles	F. Ibrahim

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1. ATTESTATION OF TEST RESULTS

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

EUT DESCRIPTION: Handheld device with 802.11 abgn WLAN and BT radios

MODEL: A1458, A1459, & A1460

SERIAL NUMBER: 20558

DATE TESTED: AUGUST 03-13, 2012

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-210 Issue 8 Annex 8	Pass
INDUSTRY CANADA RSS-GEN Issue 3	Pass

UL CCS 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 CCS 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 CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL CCS 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 CCS By:

Tested By:



FRANK IBRAHIM
EMC SUPERVISOR
UL CCS



TOM CHEN
EMC ENGINEER
UL CCS

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2003, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 3, and RSS-210 Issue 8.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

UL CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://www.ccsemc.com>.

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:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamplifier Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

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

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a iPad tablet device with iPod functions (music, application support, and video), 802.11a/b/g/n radio, and Bluetooth radio functions.

5.2. DESCRIPTION OF MODELS DIFFERENCES

FCC ID: BCGA1458
IC ID: 579C-A1458
Model #: A1458

Model A1458, is a tablet with multimedia functions (music, application support, and video) IEEE 802.11a/b/g/n radio and Bluetooth radio. The rechargeable battery is not user accessible.

FCC ID: BCGA1459
IC ID: 579C-A1459
Model #: A1459

Model A1459, is a tablet with multimedia functions (music, application support, and video), cellular GSM/GPRS/EGPRS/WCDMA/HSPA+/DC-HSDPA/LTE radio, IEEE 802.11a/b/g/n and Bluetooth radio. The rechargeable battery is not user accessible.

FCC ID: BCGA1460
IC ID: 579C-A1460
Model #: A1460

Model A1460, is a tablet with multimedia functions (music, application support, and video), cellular GSM/GPRS/EGPRS/WCDMA/HSPA+/DC-HSDPA/CDMA1xRTT/ EV-DO Rev 0, A, B / LTE radio, IEEE 802.11a/b/g/n radio and Bluetooth radio. The rechargeable battery is not user accessible.

5.3. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2412 - 2462	802.11b	19.03	79.98
2412 - 2462	802.11g	25.20	331.13
2412 - 2462	802.11n HT20	25.05	319.89
5745 - 5825	802.11a	27.58	572.80
5745 - 5825	802.11n HT20	27.27	533.33
5755 - 5795	802.11n HT40	27.61	576.77

5.4. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a PIFA antenna, with a maximum gain as shown below:

Frequency Band (GHz)	Antenna Gain (dBi)
2.4-2.4835	-0.26
5.15-5.25	4.63
5.25-5.35	4.25
5.5-5.7	4.51
5.725-5.85	4.90

5.5. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was 10A378

The EUT driver software installed during testing was Broadcom_Rel_6_10_56_172

The test utility software used during testing was WL_tool.

5.6. WORST-CASE CONFIGURATION AND MODE

For the fundamental investigation, since the EUT is a portable device that has three orientations; X, Y and Z orientations have been investigated, also with AC/DC adapter, and earphone, and the worst case was found to be at Y orientation without AC adapter and earphone for both 2.4GHz and 5GHz band.

For Radiated Emissions below 1 GHz and Power line Conducted Emissions, the channel with the highest conducted output power was selected as a worst-case scenario.

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

For 11b mode: 1Mbps

For 11g mode: 6Mbps

For 11n HT20: MCS0

For 11a mode: 6Mbps

For 11n HT20 (5.8 GHz band): MCS0

For 11n HT40 (5.8 GHz band): MCS0

5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
AC Adapter	Apple	A1401	D060812	DoC
Power Splitter	Krytar	158010	99250	N/A
Dc Power Supply	Agilent	E3610A	KR24104150	N/A
Laptop PC	Apple	MacBook Pro	AOU269116	N/A

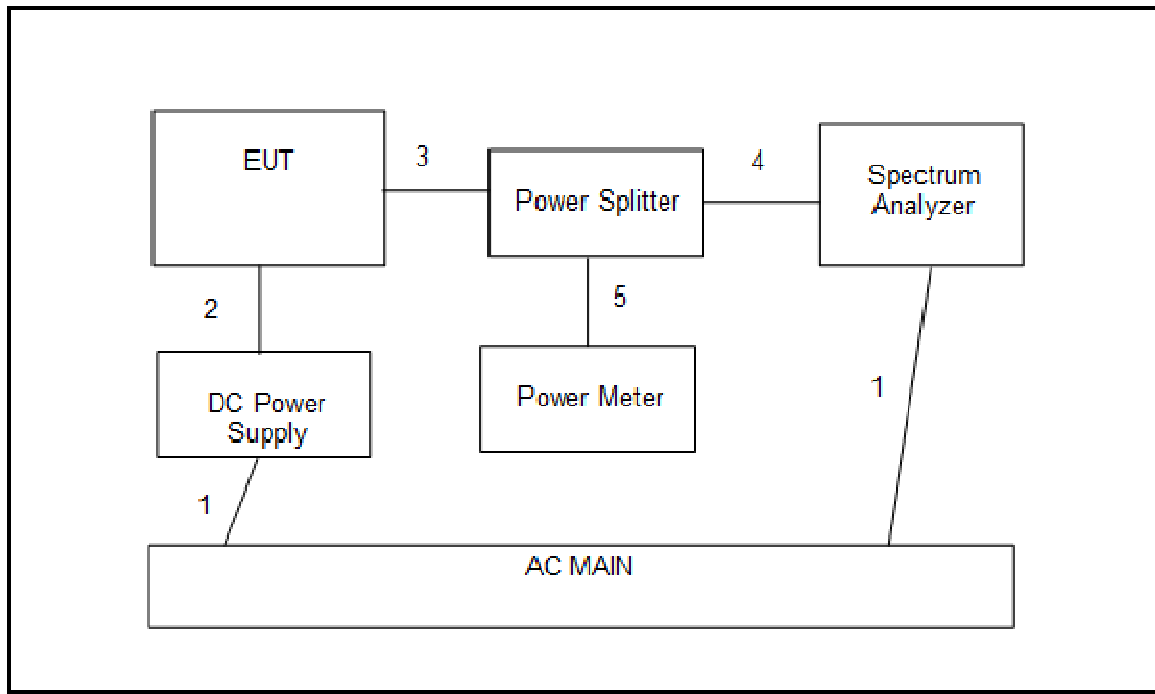
I/O CABLES (CONDUCTED SETUP)

I/O CABLE LIST						
Cable No.	Port	#of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	2	AC	Un-shielded	2.0m	N/A
2	DC	1	DC	Un-shielded	1.0m	N/A
3	Antenna Port	1	Splitter	Un-shielded	0.1m	N/A
4	RF out	1	Spectrum Analyzer	Un-Shielded	None	N/A
5	RF out	1	Power Meter	Shielded	None	NA

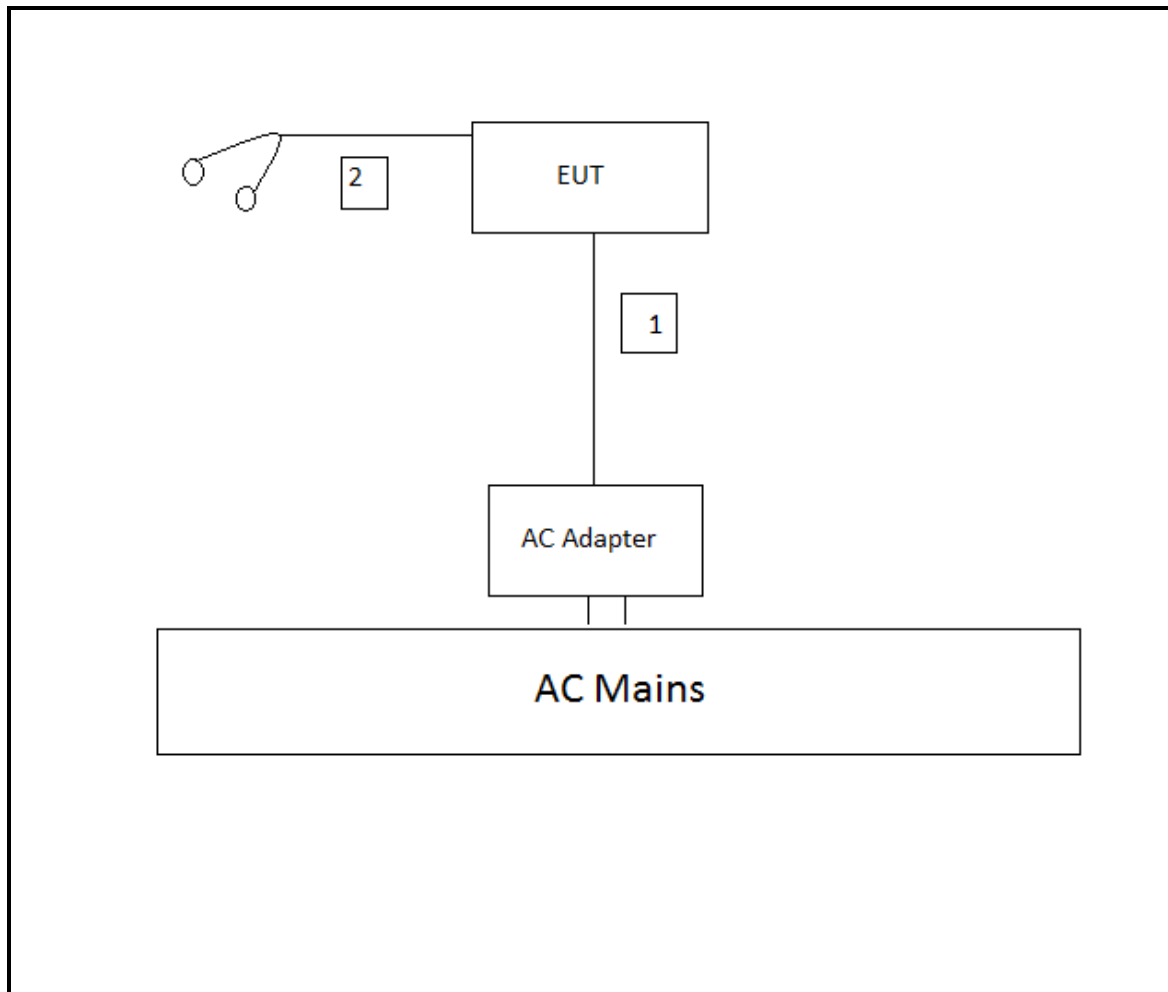
I/O CABLES (RADIATED SETUP)

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC	1	MINI USB	UN-SHELDED	1.0m	N/A
2	AUDIO	1	MINI JACK	UN-SHELDED	1.0m	N/A

SETUP DIAGRAM FOR CONDUCTED TEST



SETUP DIAGRAM FOR RADIATED TEST



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
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	11/11/12
Antenna, Horn, 18 GHz	EMCO	3115	C00945	10/06/12
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00580	11/11/12
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1		02/07/13
Horn Antenna, 26.5 GHz	ARA	MWH-1826/B	C00589	04/23/13
Horn Antenna, 40 GHz	ARA	MWH-2640/B	C00981	06/14/13
Preamplifier, 40 GHz	Miteq	NSP4000-SP2	C00990	03/14/13
Reject Filter, 2.0-2.9 GHz	Micro-Tronics	BRM50702	N02684	CNR
High Pass Filter, 7.6 GHz	Micro-Tronics	HPM13195	N02682	CNR
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01069	12/15/12
E-Series Power Sensor 9 kHz~18 GHz	Agilent	E9304A	1260847C	05/23/13
P-Series single channel Power Meter	Agilent / HP	N1911A		07/27/13
Reject Filter, 5.725-5.825 GHz	Micro-Tronics	BRC13192	N02676	CNR
Reject Filter, 2.4-2.5 GHz	Micro-Tronics	BRM50702	N02685	CNR
Highpass Filter, 7.6 GHz	Micro-Tronics	HPM13195	N02682	CNR
EMI Test Receiver, 30MHz	R & S	ESHS 20	N02396	08/19/13
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	12/13/12

7. ANTENNA PORT TEST RESULTS

7.1. 802.11b MODE IN THE 2.4 GHz BAND

7.1.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

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

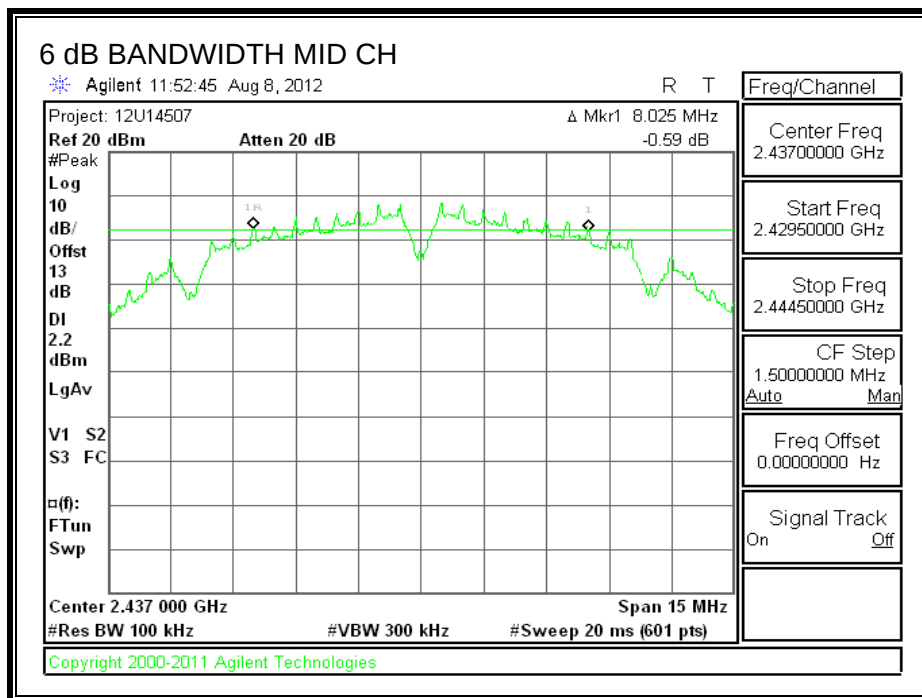
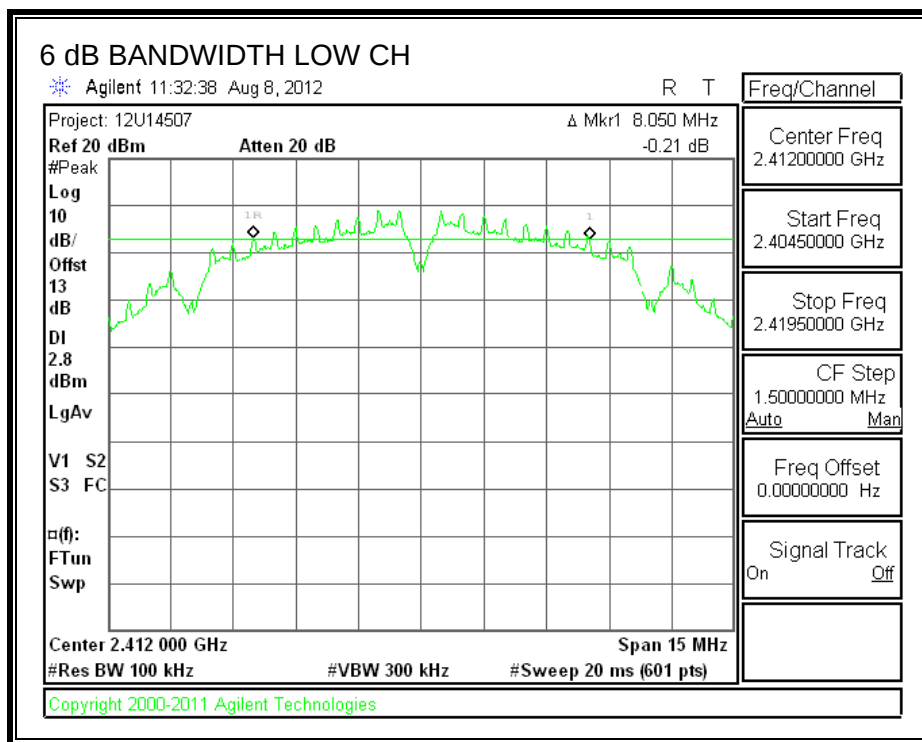
TEST PROCEDURE

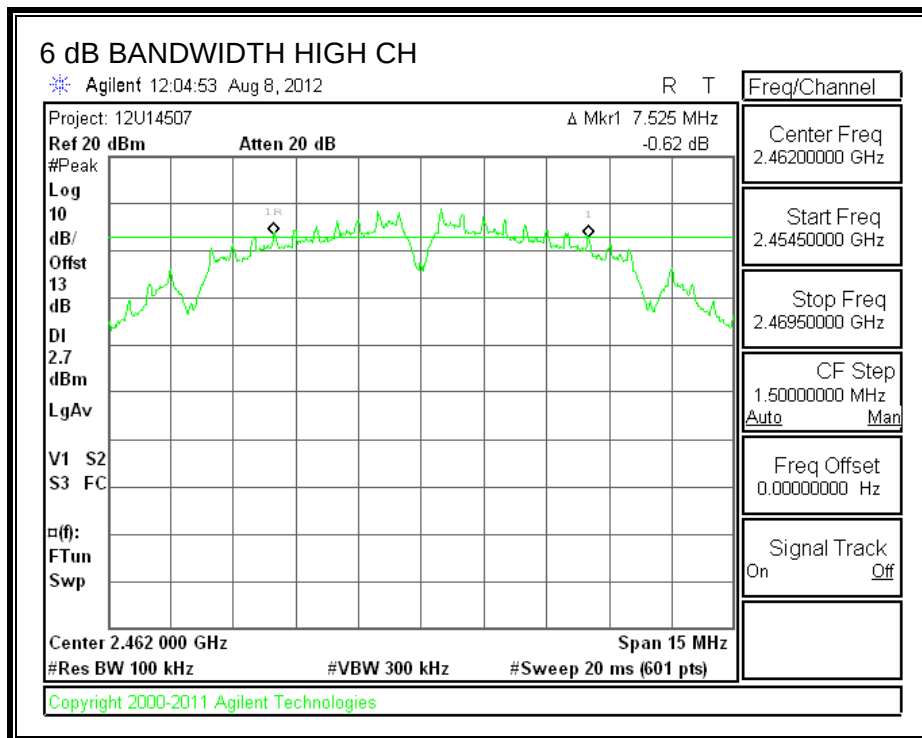
KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	8.050	0.5
Middle	2437	8.025	0.5
High	2462	7.525	0.5

6 dB BANDWIDTH





7.1.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

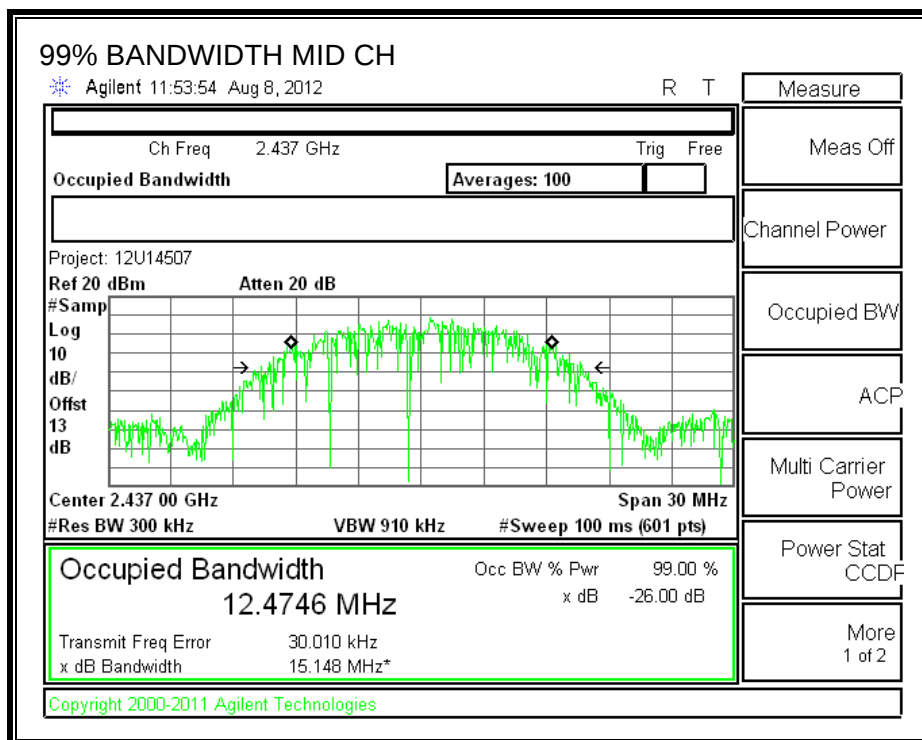
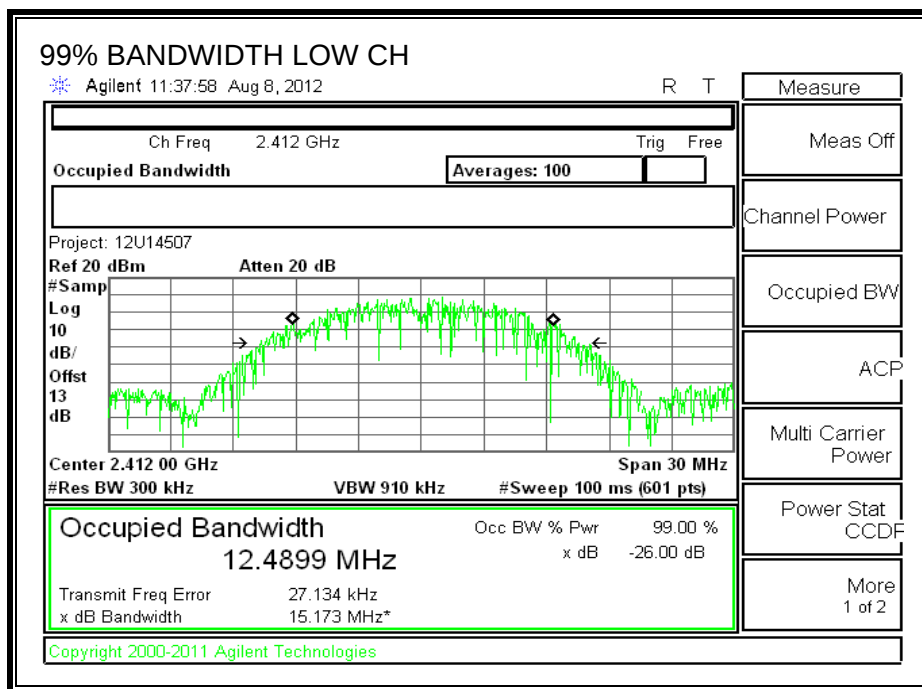
TEST PROCEDURE

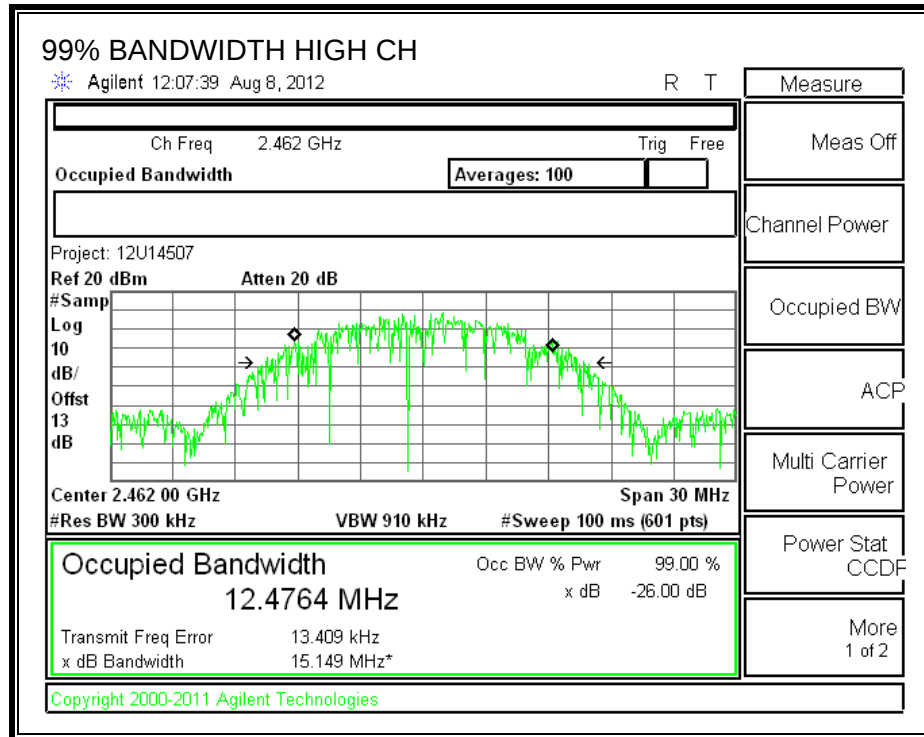
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth and to 1% of the span. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	12.4899
Middle	2437	12.4746
High	2462	12.4764

99% BANDWIDTH





7.1.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

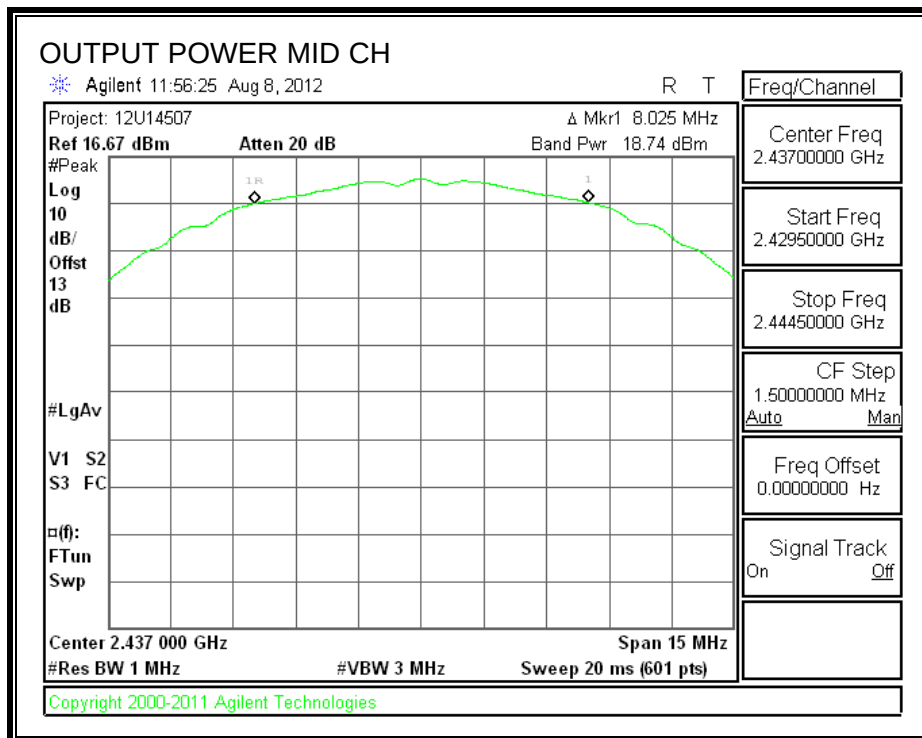
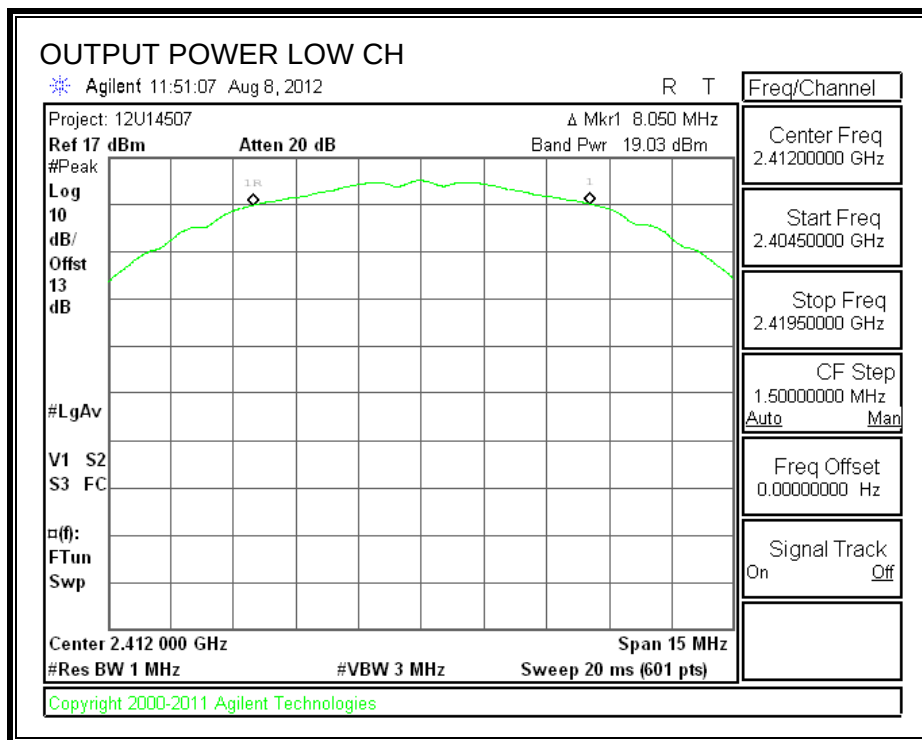
KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

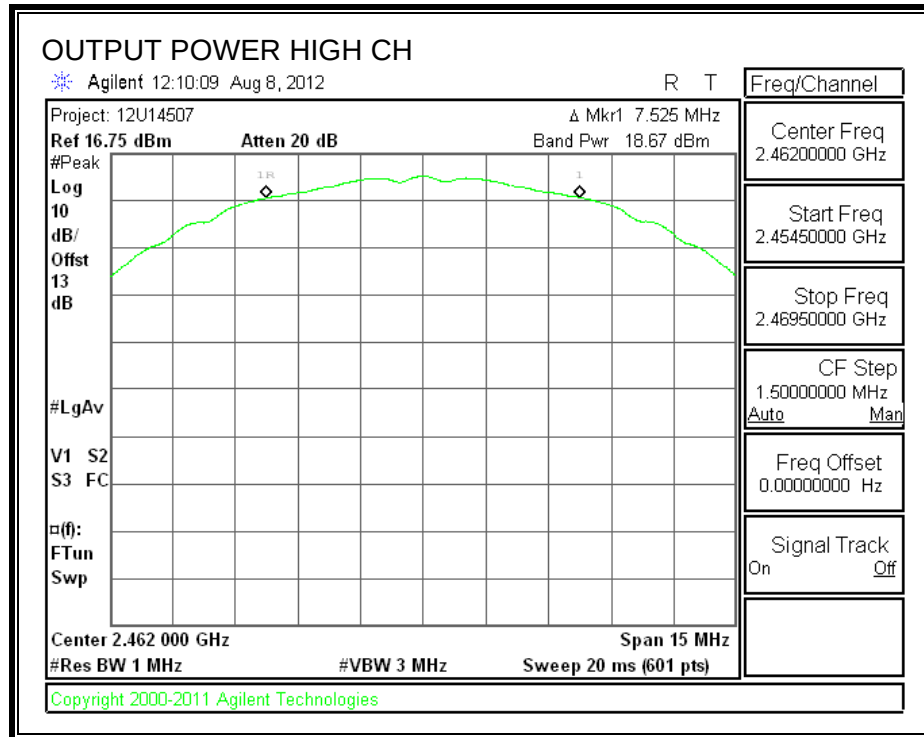
Measurement Procedure PK2 as referenced by section 5.2.1.2 of the KDB mentioned above was used.

RESULTS

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2412	19.03	30	-10.970
Middle	2437	18.74	30	-11.260
High	2462	18.67	30	-11.330

OUTPUT POWER





7.1.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

RESULTS

The cable assembly insertion loss of 13dB (including 12 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	AV power (dBm)
Low	2412	16.48
Middle	2437	16.46
High	2462	16.49

7.1.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

TEST PROCEDURE

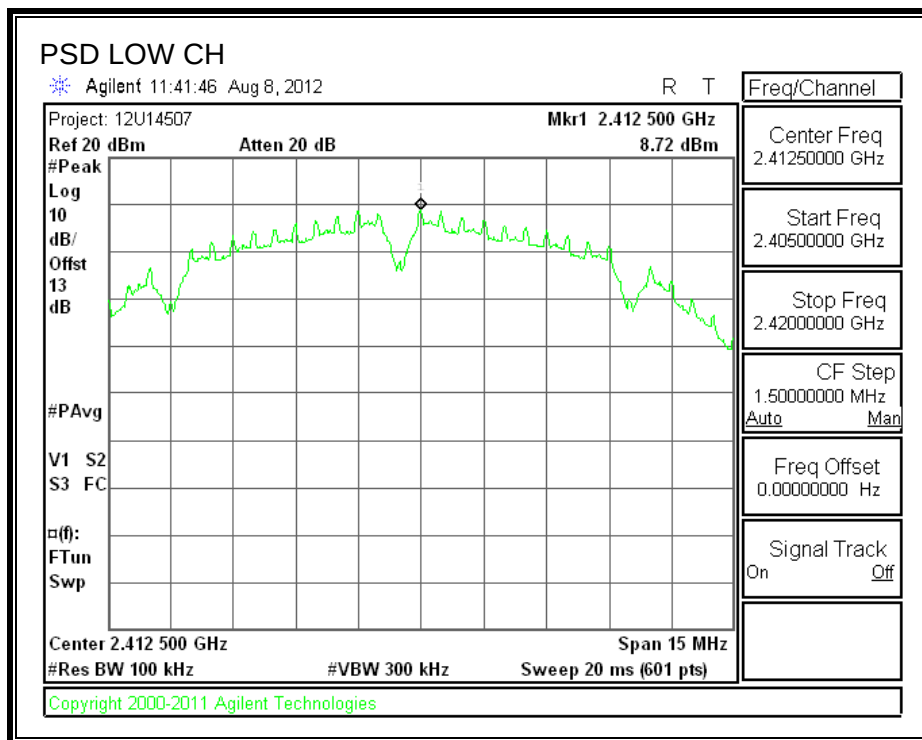
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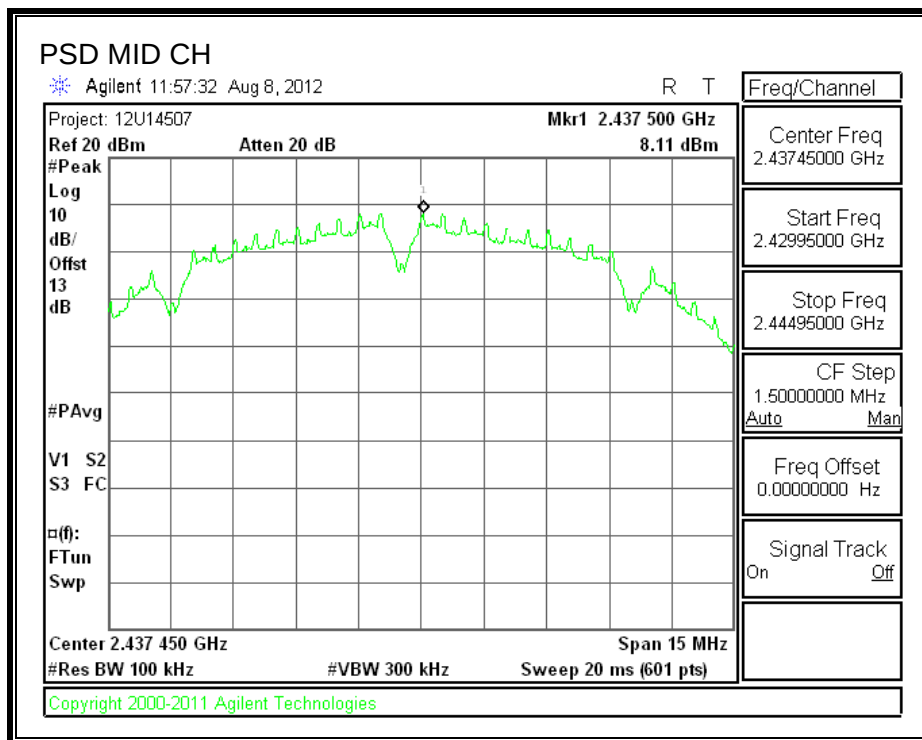
Measurement Procedure PKPSD as referenced by section 5.3.1 of the KDB mentioned above was used.

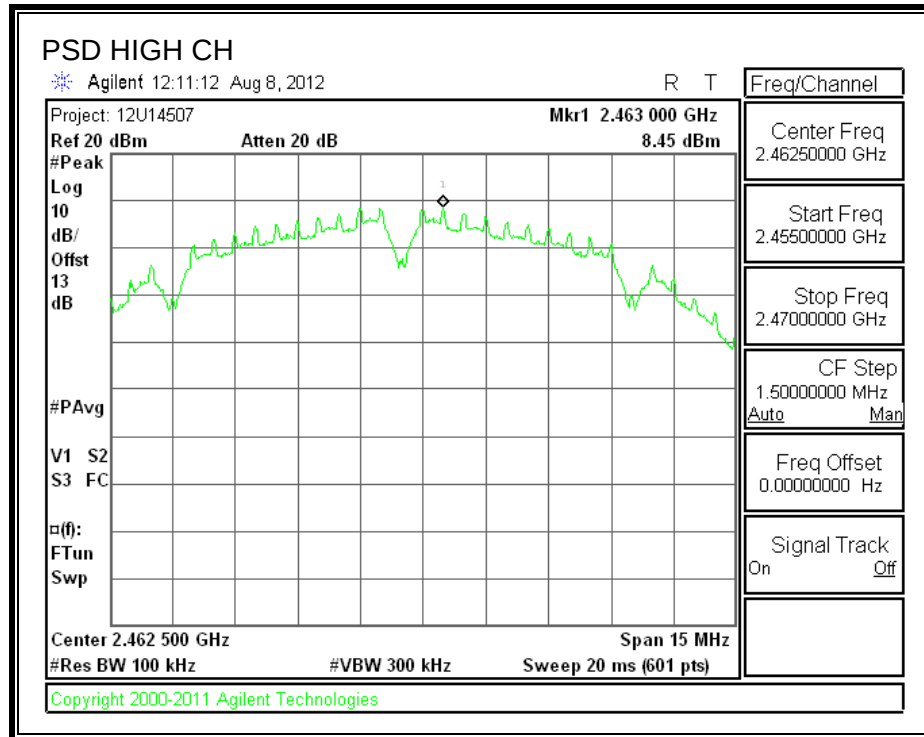
RESULTS

Channel	Frequency (MHz)	Analyzer Reading (dBm)	10log(3kHz/100kHz) (dB)	PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	8.72	-15.2	-6.48	8	-14.48
Middle	2437	8.11	-15.2	-7.09	8	-15.09
High	2462	8.45	-15.2	-6.75	8	-14.75

POWER SPECTRAL DENSITY







7.1.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

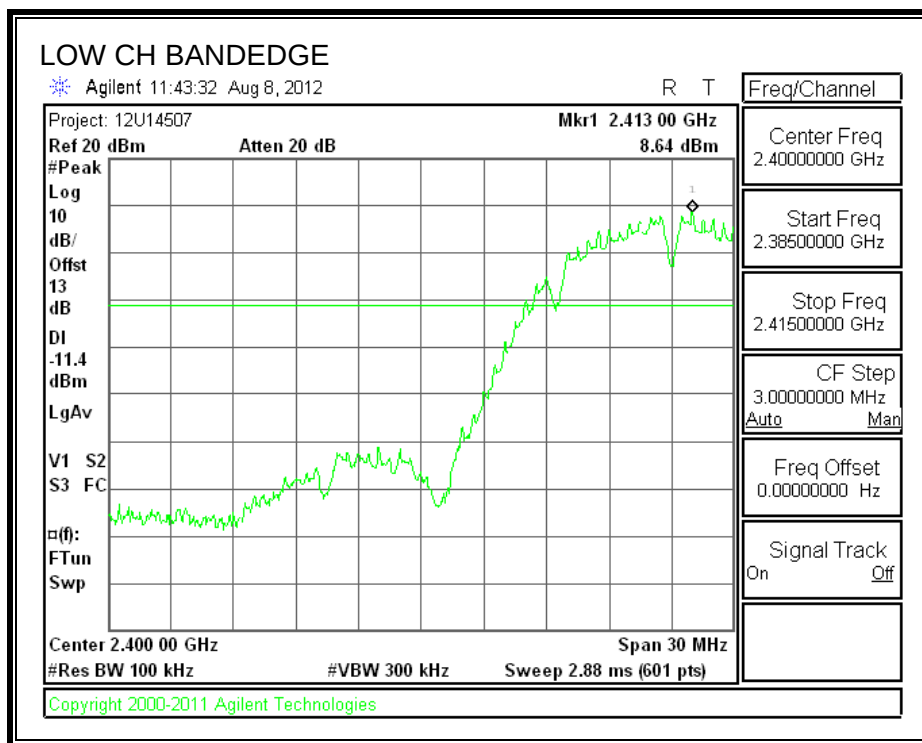
Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

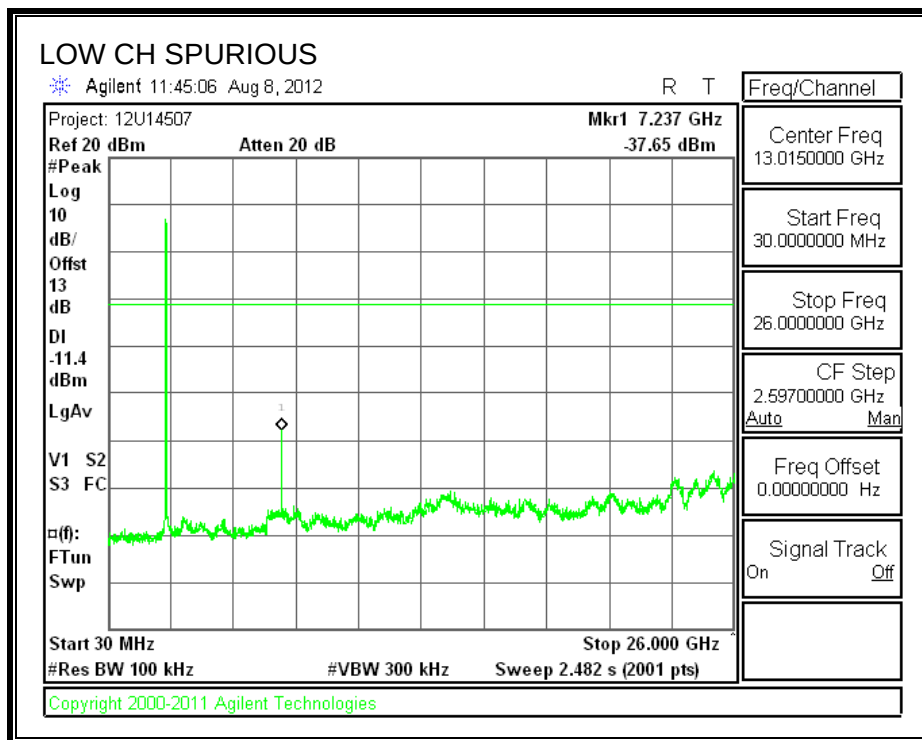
TEST PROCEDURE

KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

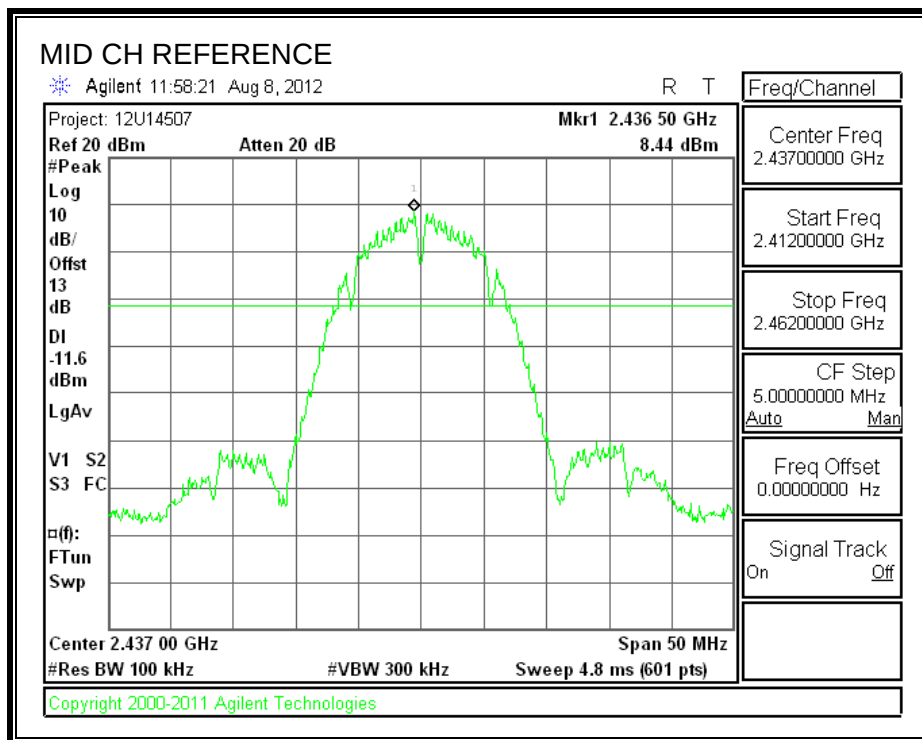
RESULTS

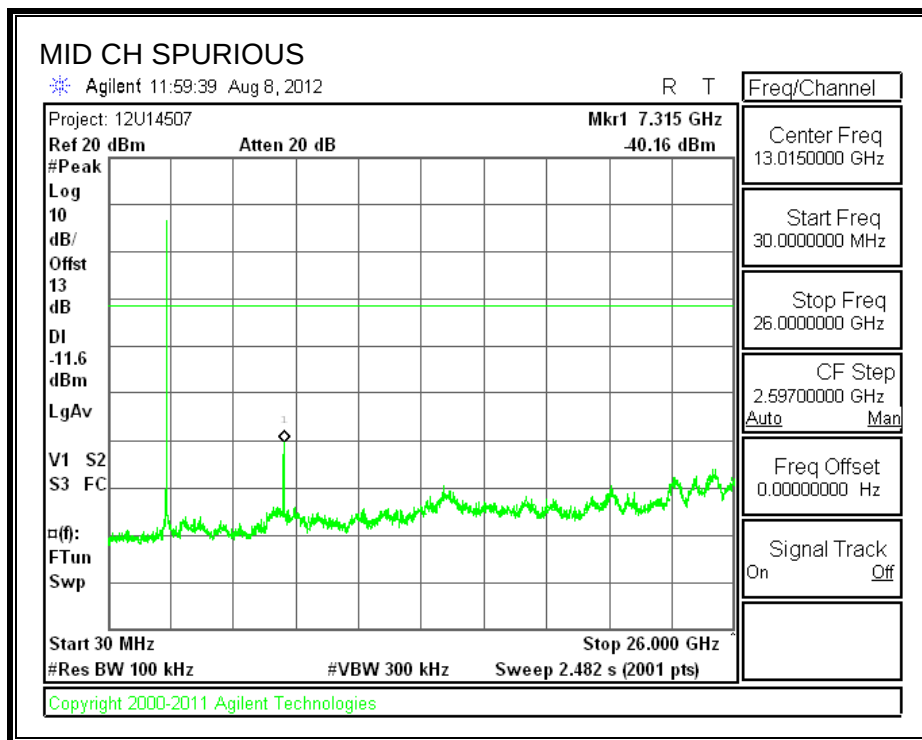
SPURIOUS EMISSIONS, LOW CHANNEL



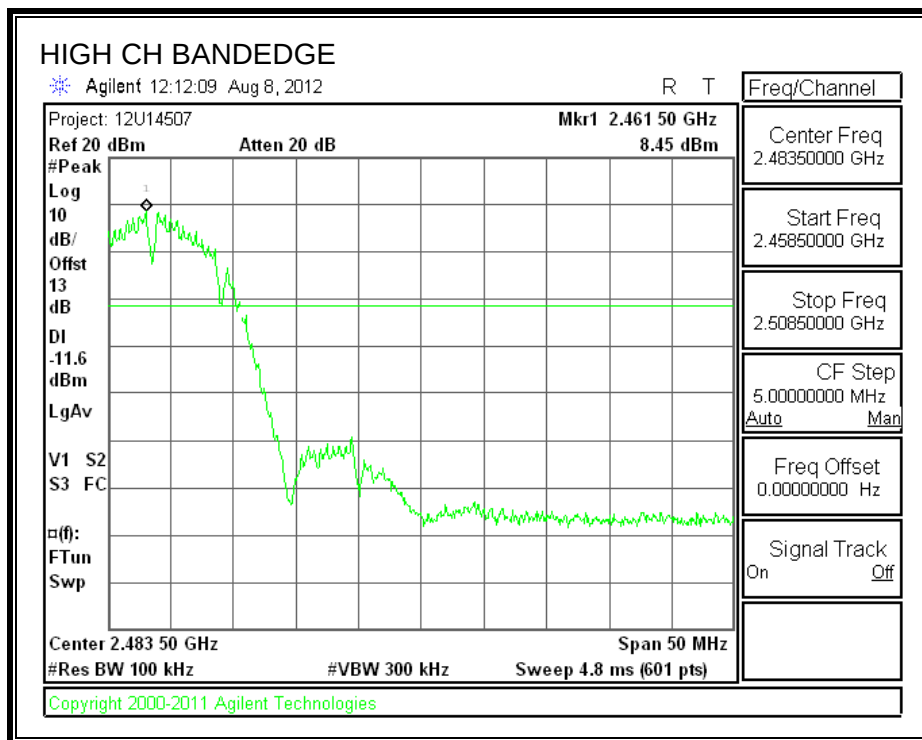


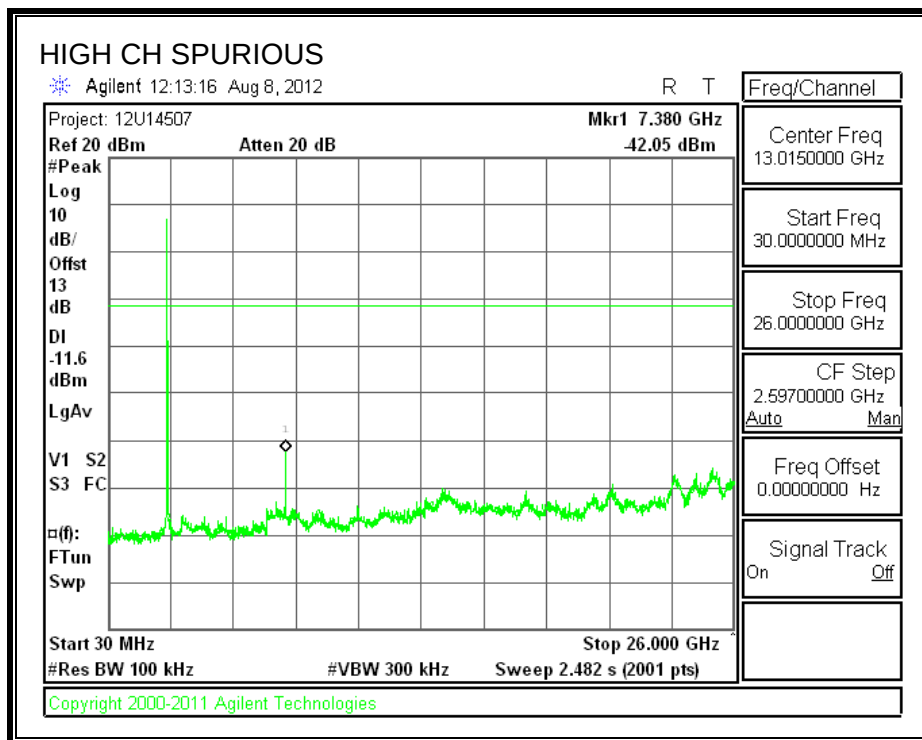
SPURIOUS EMISSIONS, MID CHANNEL





SPURIOUS EMISSIONS, HIGH CHANNEL





7.2. 802.11g MODE IN THE 2.4 GHz BAND

7.2.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

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

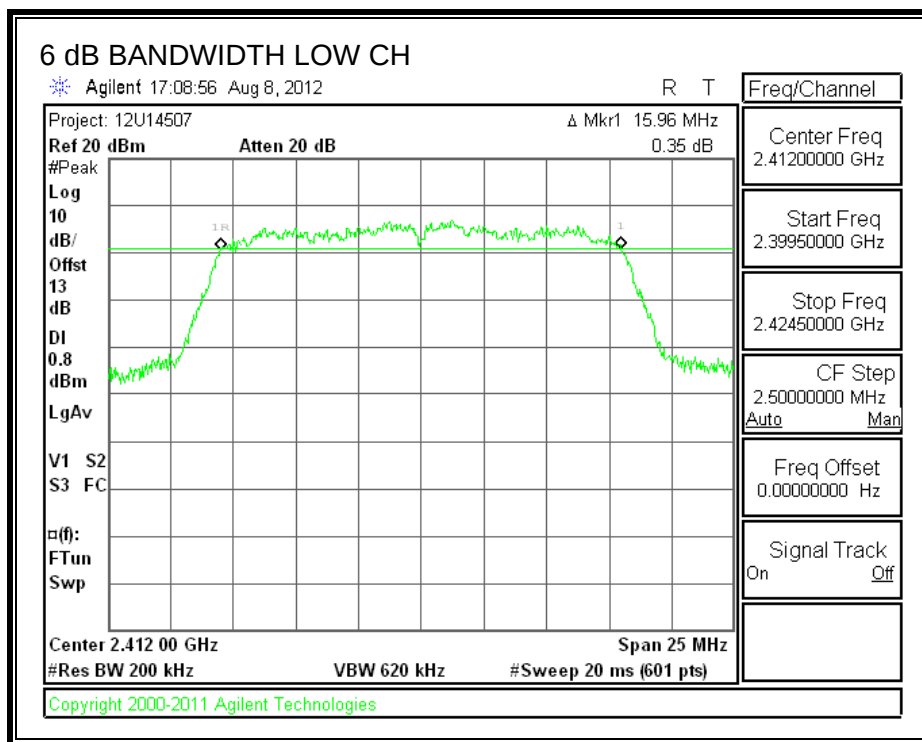
TEST PROCEDURE

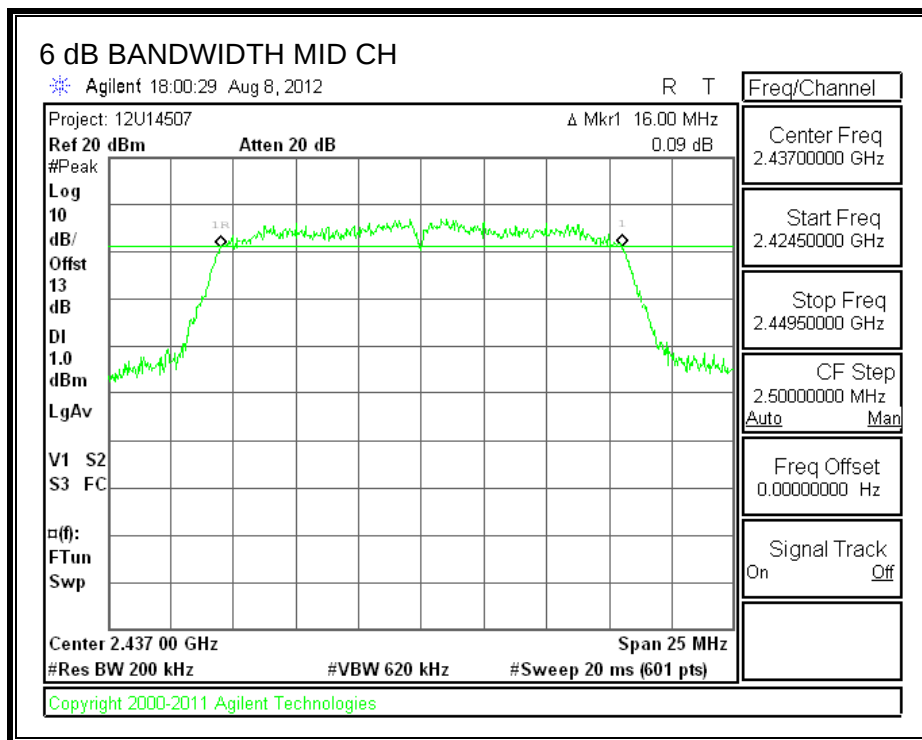
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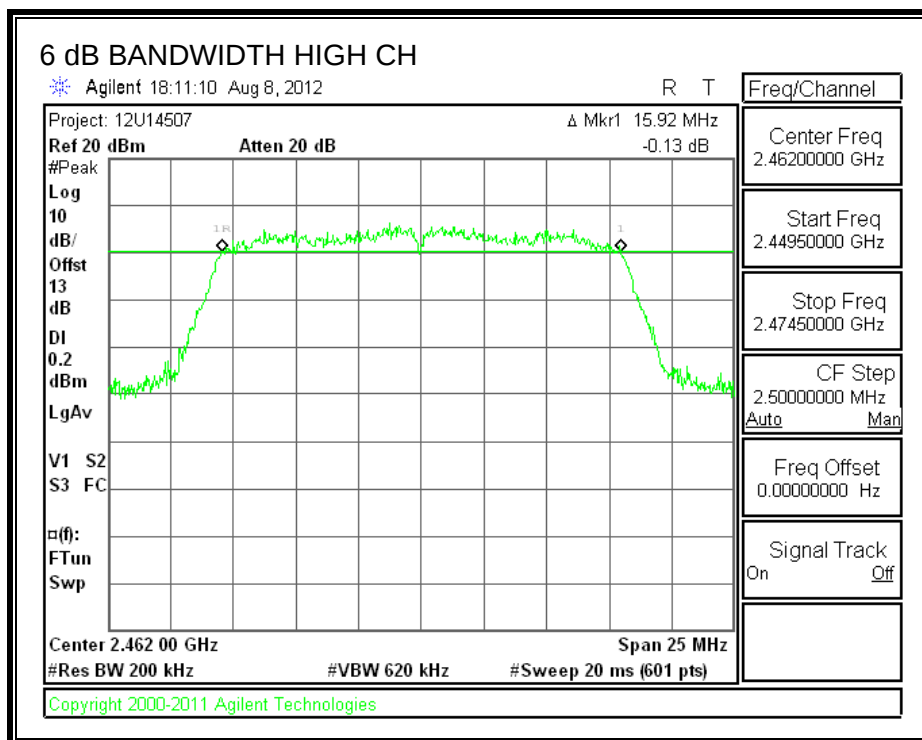
RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	15.96	0.5
Middle	2437	16.00	0.5
High	2462	15.92	0.5

6 dB BANDWIDTH







7.2.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

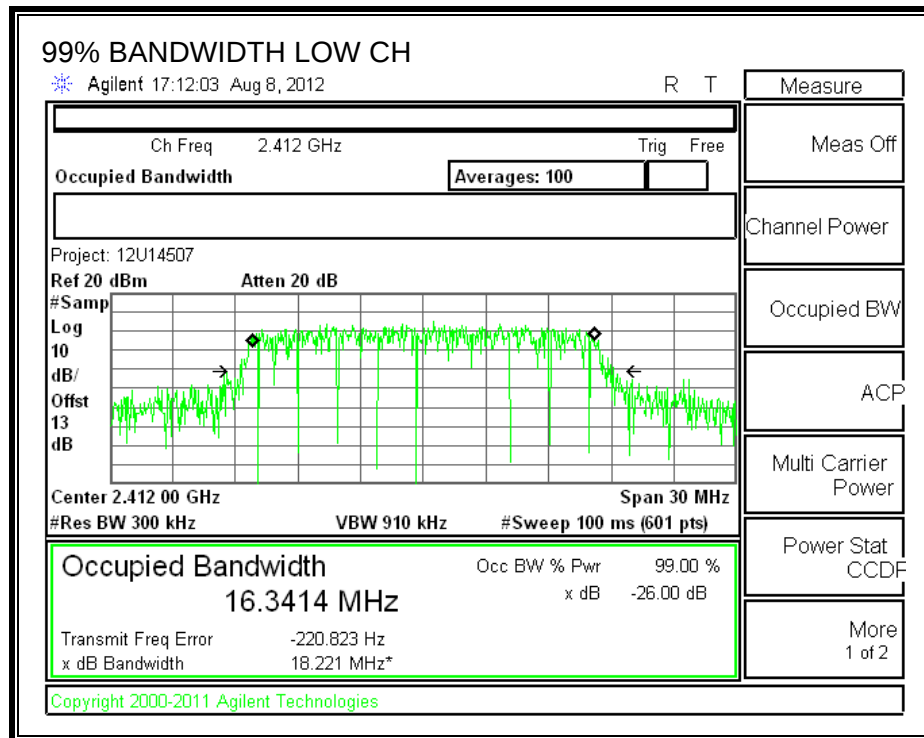
TEST PROCEDURE

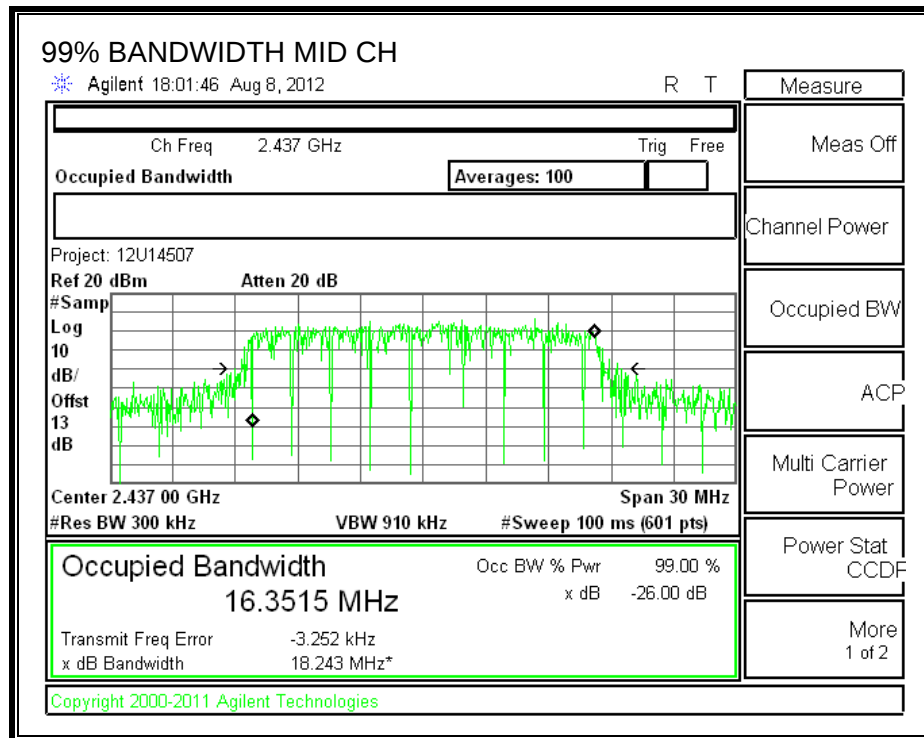
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

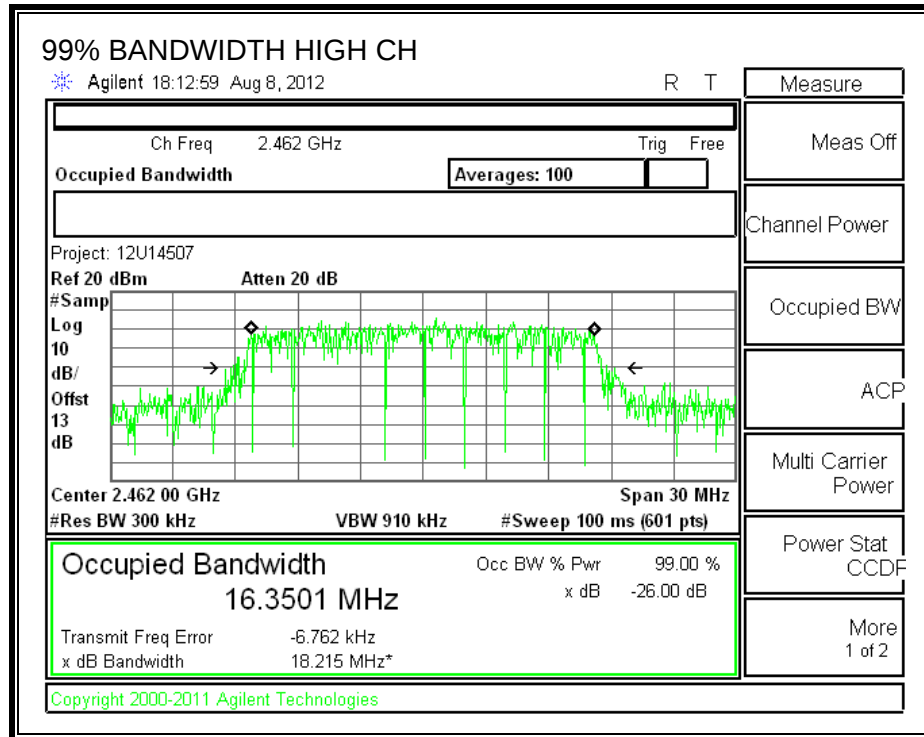
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	16.3414
Middle	2437	16.3515
High	2462	16.3501

99% BANDWIDTH







7.2.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

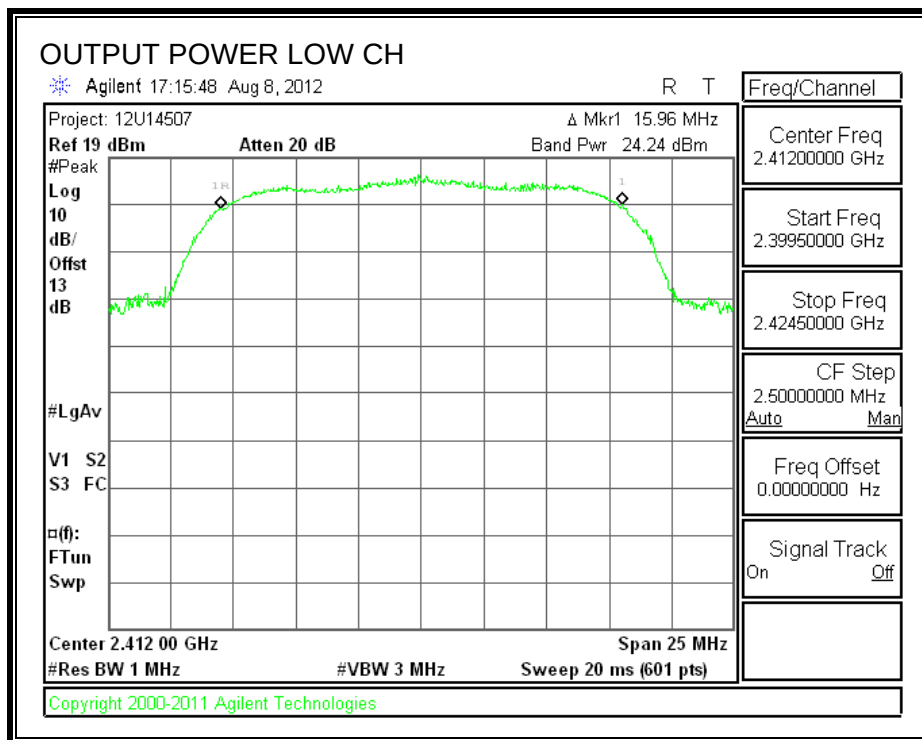
KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

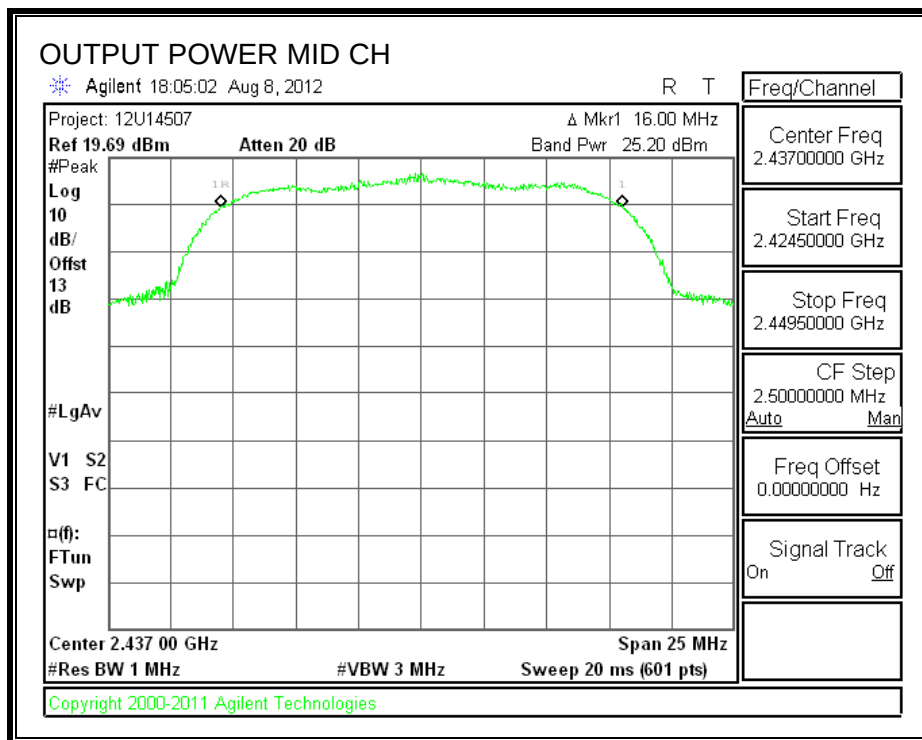
Measurement Procedure PK2 as referenced by section 5.2.1.2 of the KDB mentioned above was used.

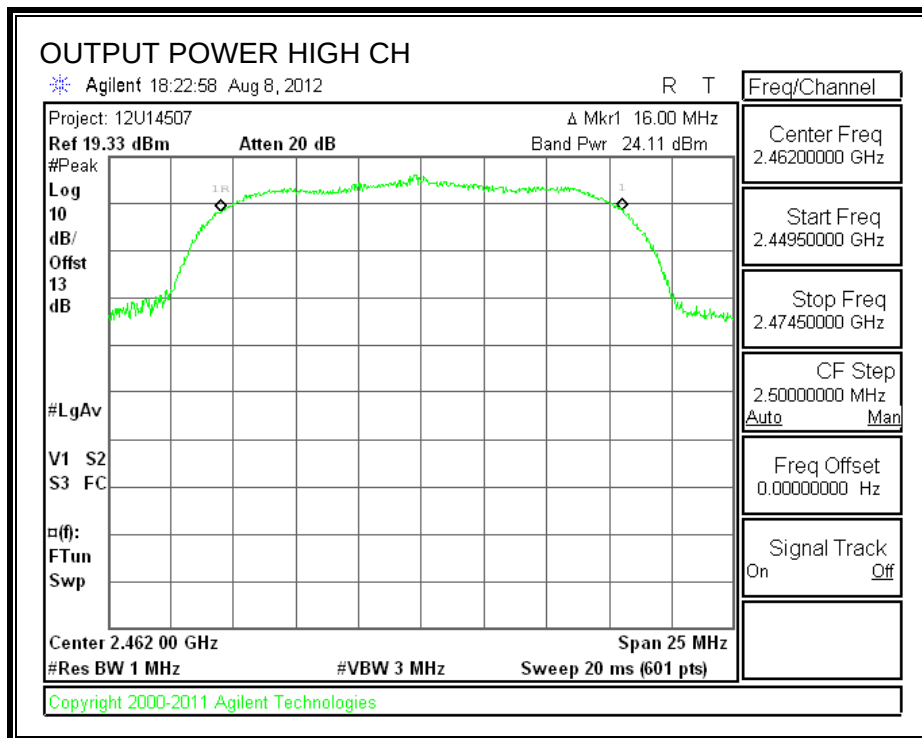
RESULTS

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2412	24.24	30	-5.76
Middle	2437	25.20	30	-4.80
High	2462	24.11	30	-5.89

OUTPUT POWER







7.2.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

RESULTS

The cable assembly insertion loss of 13 dB (including 12 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Power (dBm)
Low	2412	15.97
Middle	2437	16.45
High	2462	15.46

7.2.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

TEST PROCEDURE

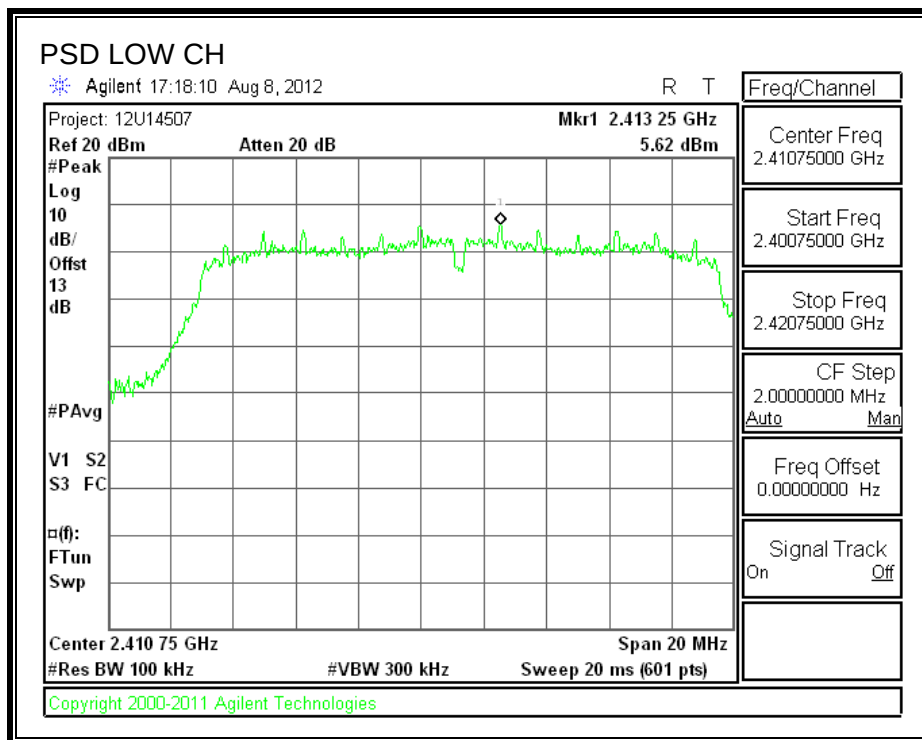
KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

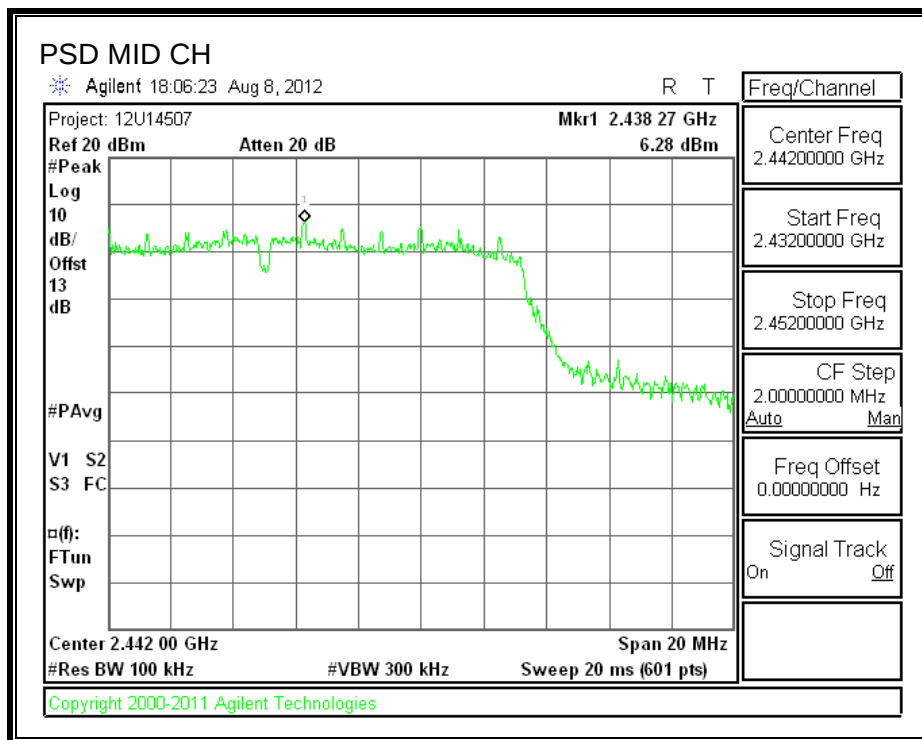
Measurement Procedure PKPSD as referenced by section 5.3.1 of the KDB mentioned above was used.

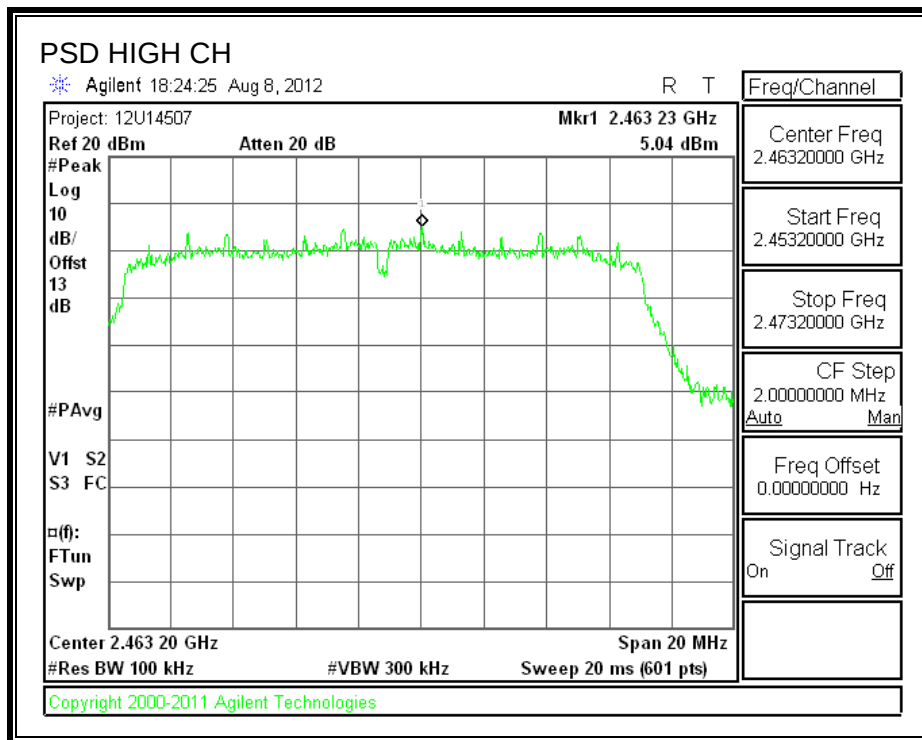
RESULTS

Channel	Frequency (MHz)	Analyzer Reading (dBm)	10log(3kHz/100kHz) (dB)	PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	5.62	-15.2	-9.58	8	-17.58
Middle	2437	6.28	-15.2	-8.92	8	-16.92
High	2462	5.04	-15.2	-10.16	8	-18.16

POWER SPECTRAL DENSITY







7.2.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

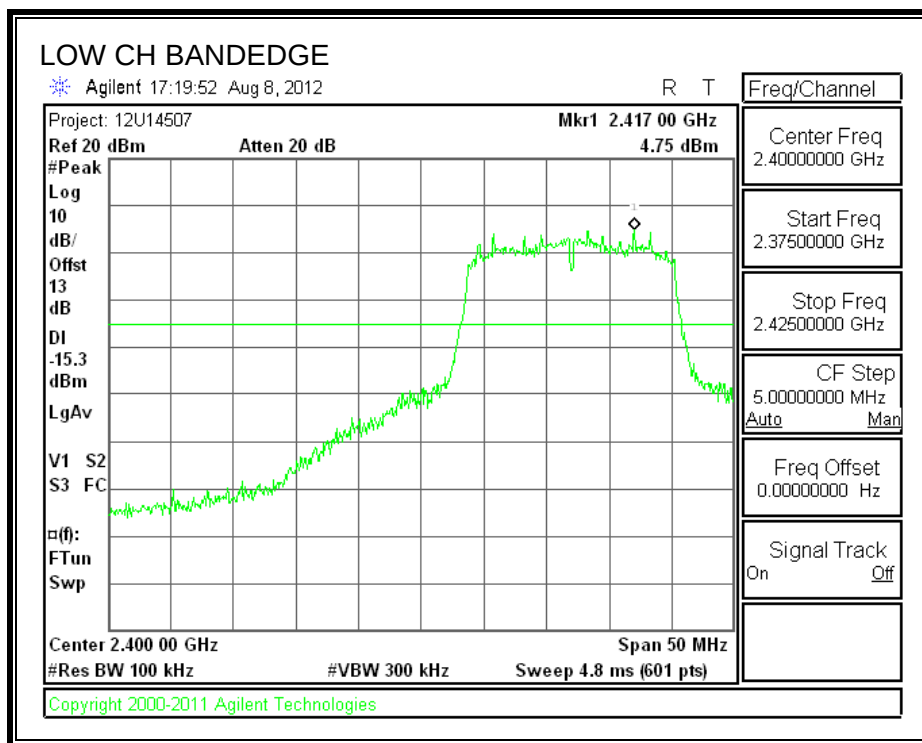
Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

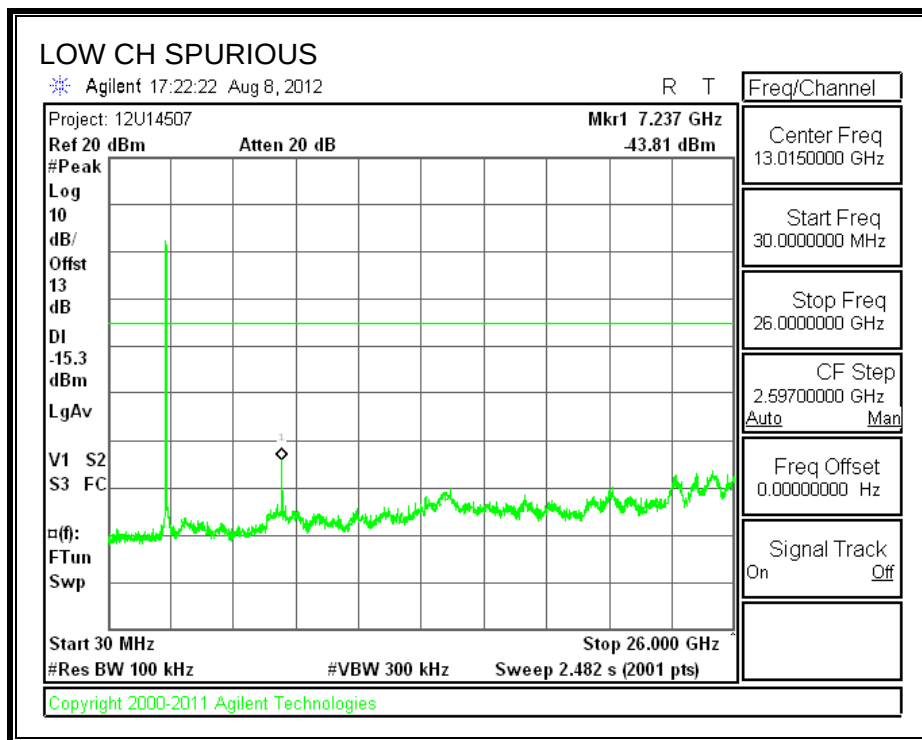
TEST PROCEDURE

KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

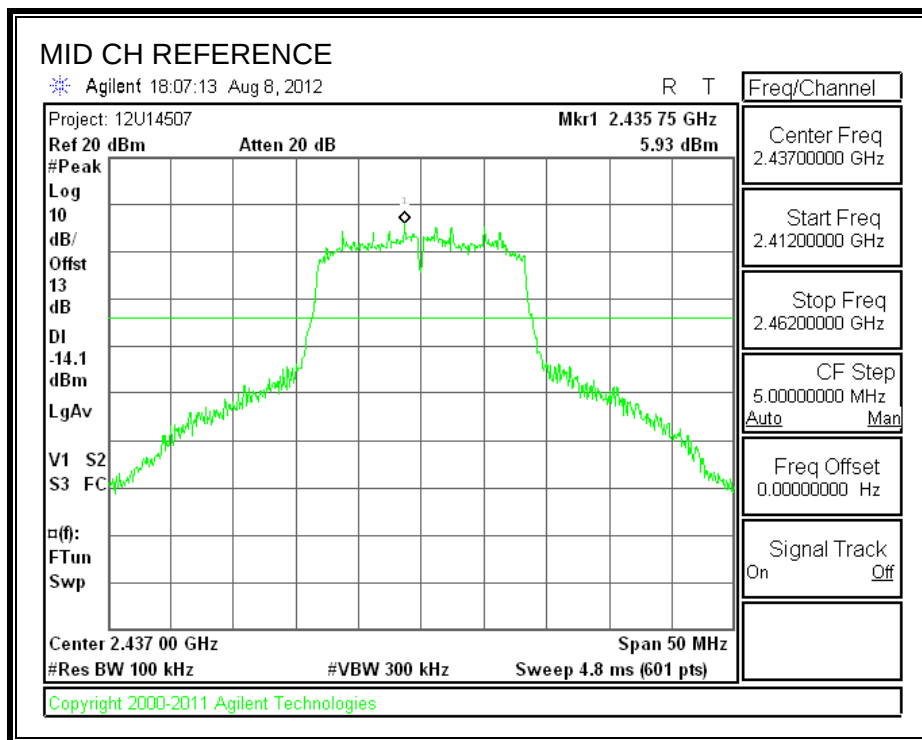
RESULTS

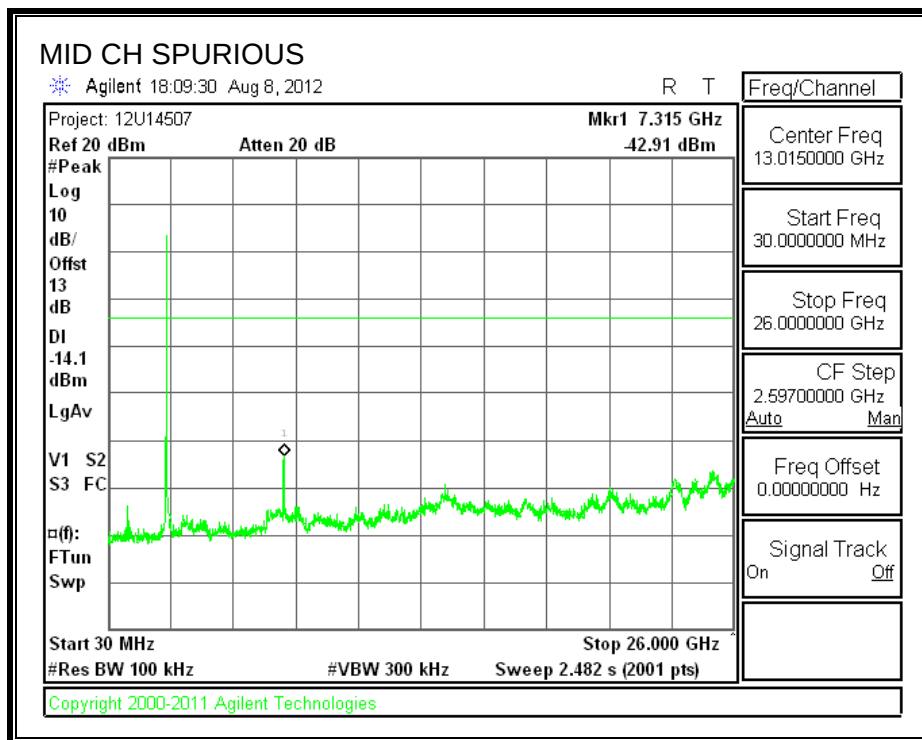
SPURIOUS EMISSIONS, LOW CHANNEL



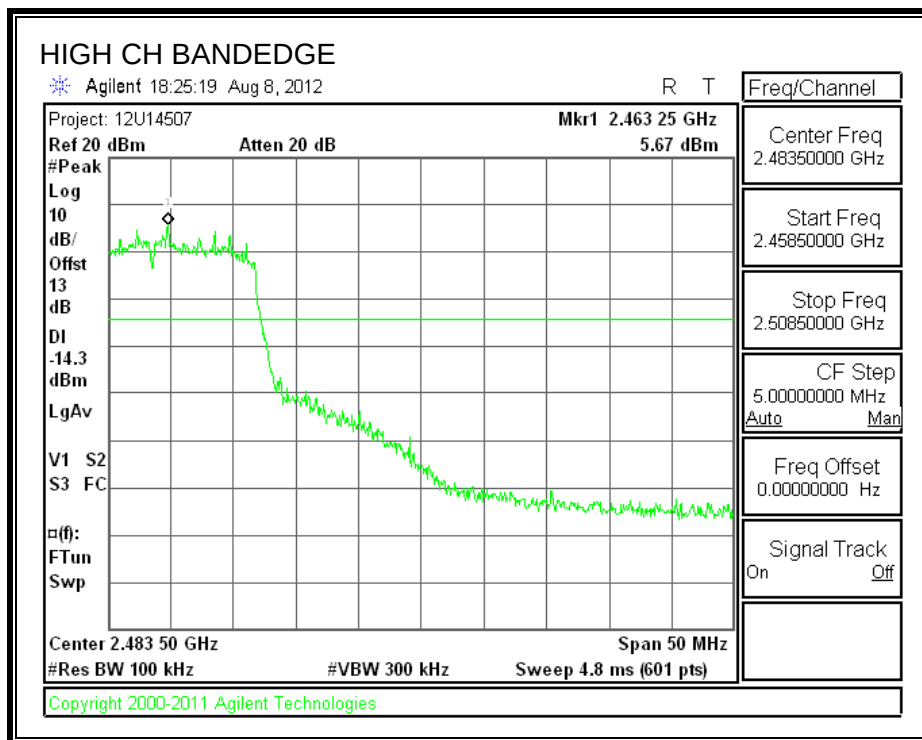


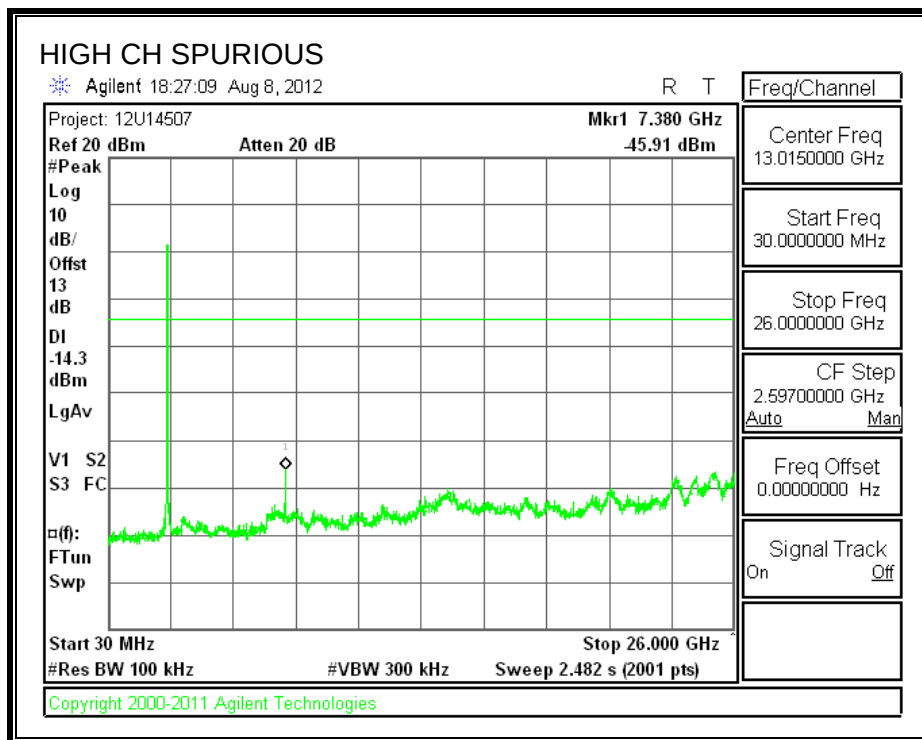
SPURIOUS EMISSIONS, MID CHANNEL





SPURIOUS EMISSIONS, HIGH CHANNEL





7.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

7.3.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

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

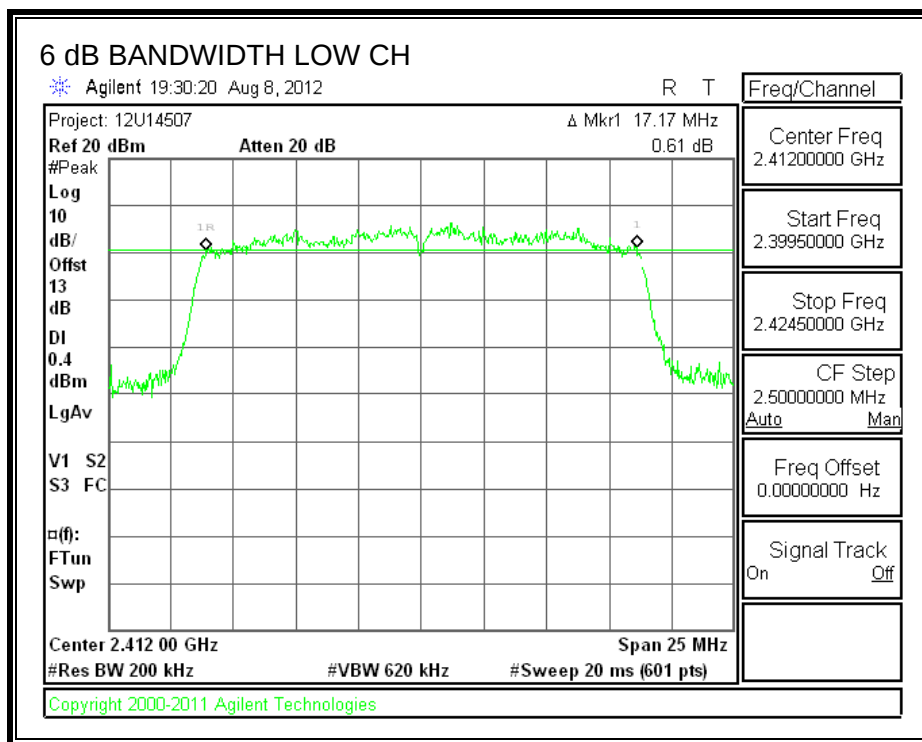
TEST PROCEDURE

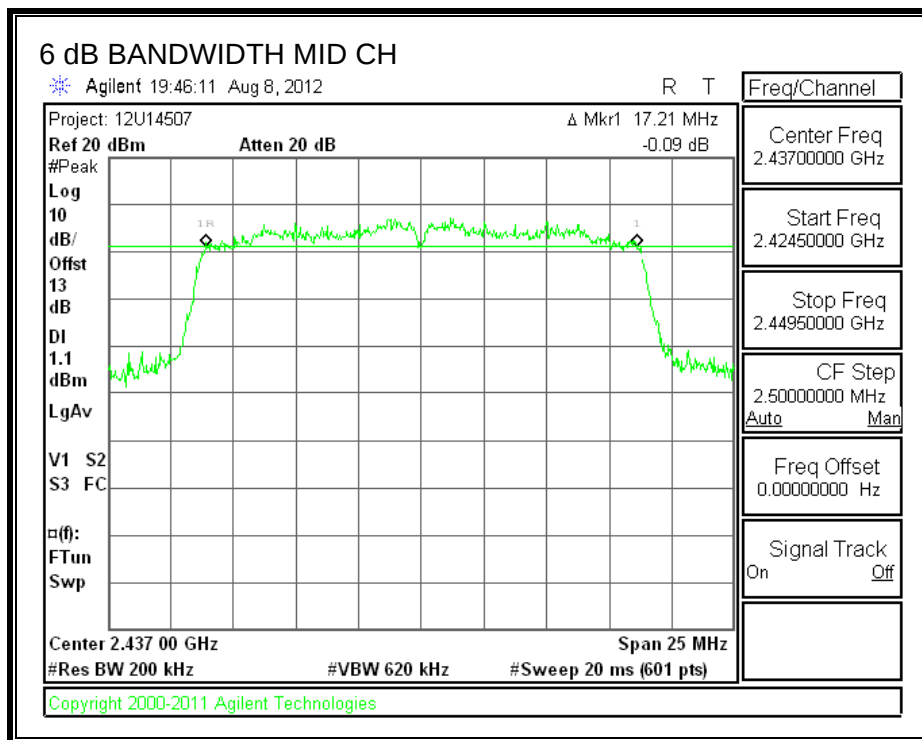
KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

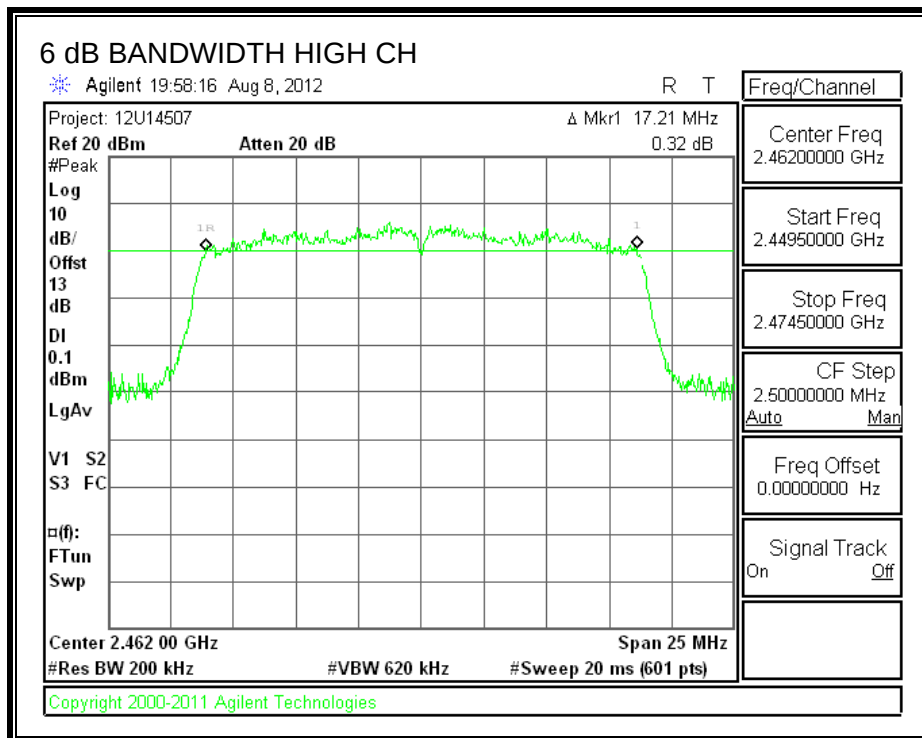
RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	17.17	0.5
Middle	2437	17.21	0.5
High	2462	17.21	0.5

6 dB BANDWIDTH







7.3.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

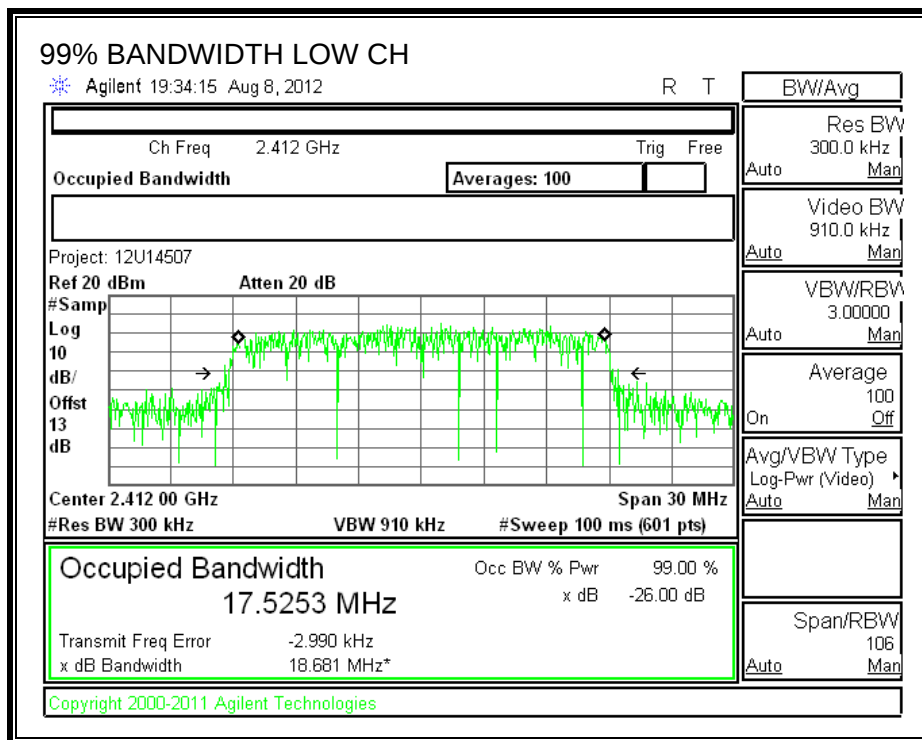
TEST PROCEDURE

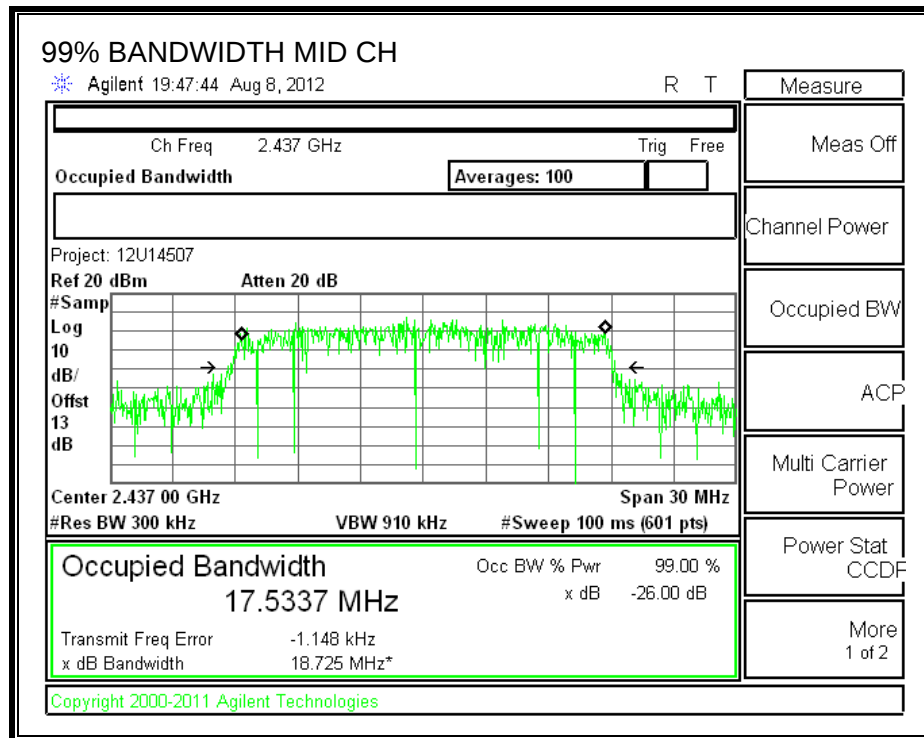
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

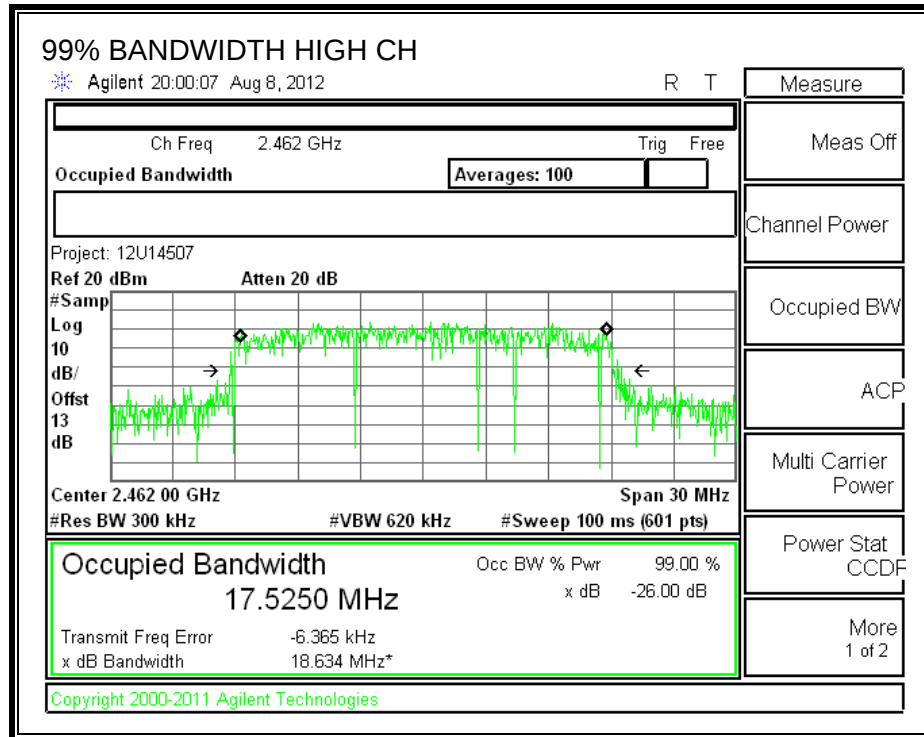
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	17.5253
Middle	2437	17.5337
High	2462	17.5250

99% BANDWIDTH







7.3.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

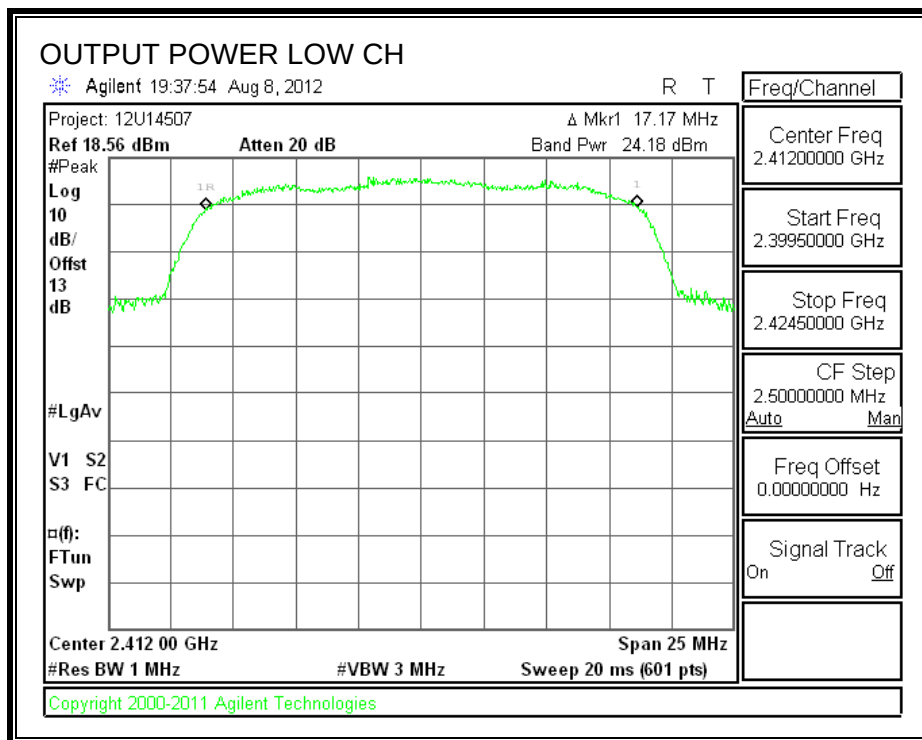
KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

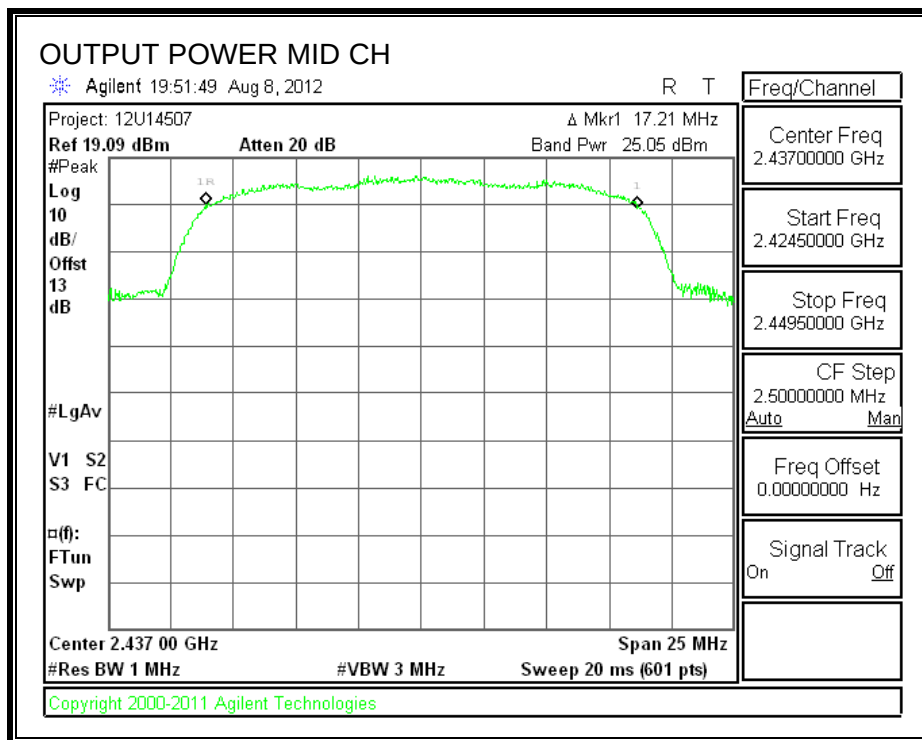
Measurement Procedure PK2 as referenced by section 5.2.1.2 of the KDB mentioned above was used.

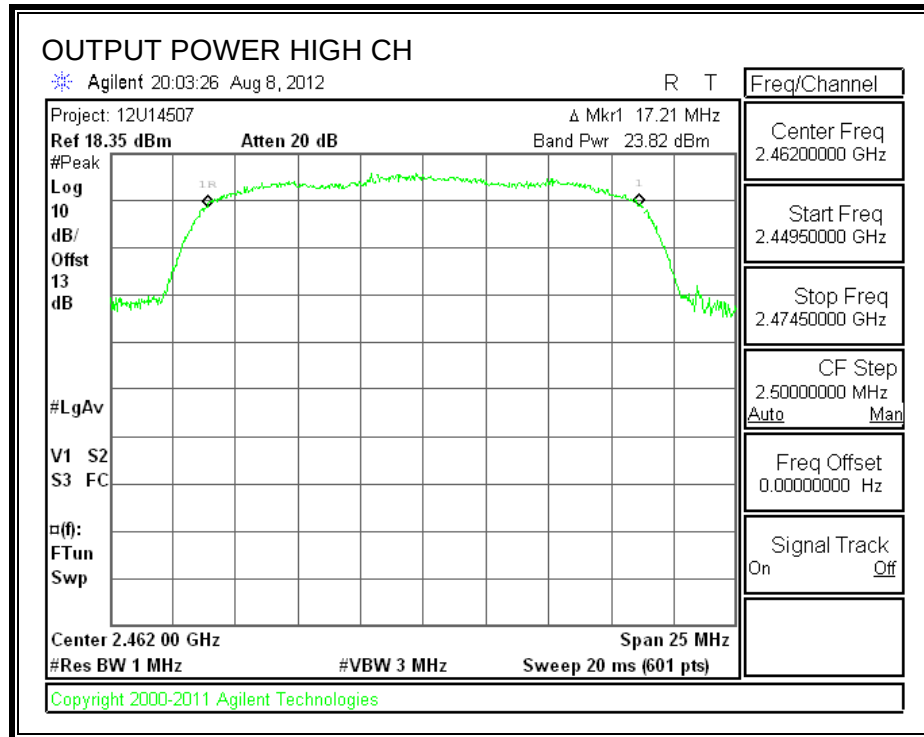
RESULTS

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2412	24.18	30	-5.82
Middle	2437	25.05	30	-4.95
High	2462	23.82	30	-6.18

OUTPUT POWER







7.3.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

RESULTS

The cable assembly insertion loss of 13 dB (including 12 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Power (dBm)
Low	2412	15.48
Middle	2437	16.45
High	2462	14.95

7.3.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

TEST PROCEDURE

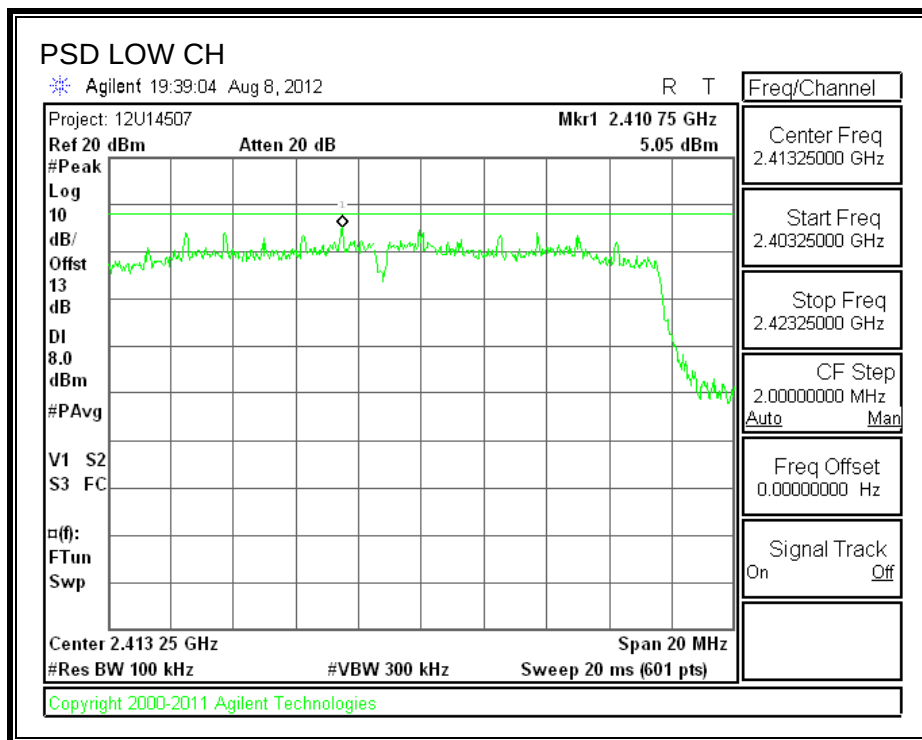
KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

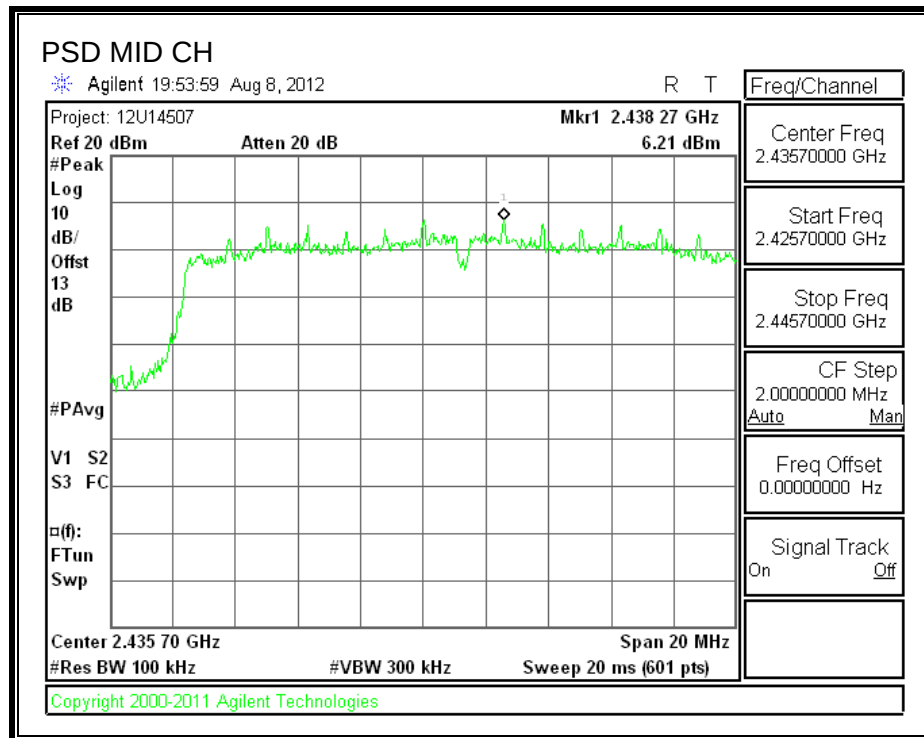
Measurement Procedure PKPSD as referenced by section 5.3.1 of the KDB mentioned above was used.

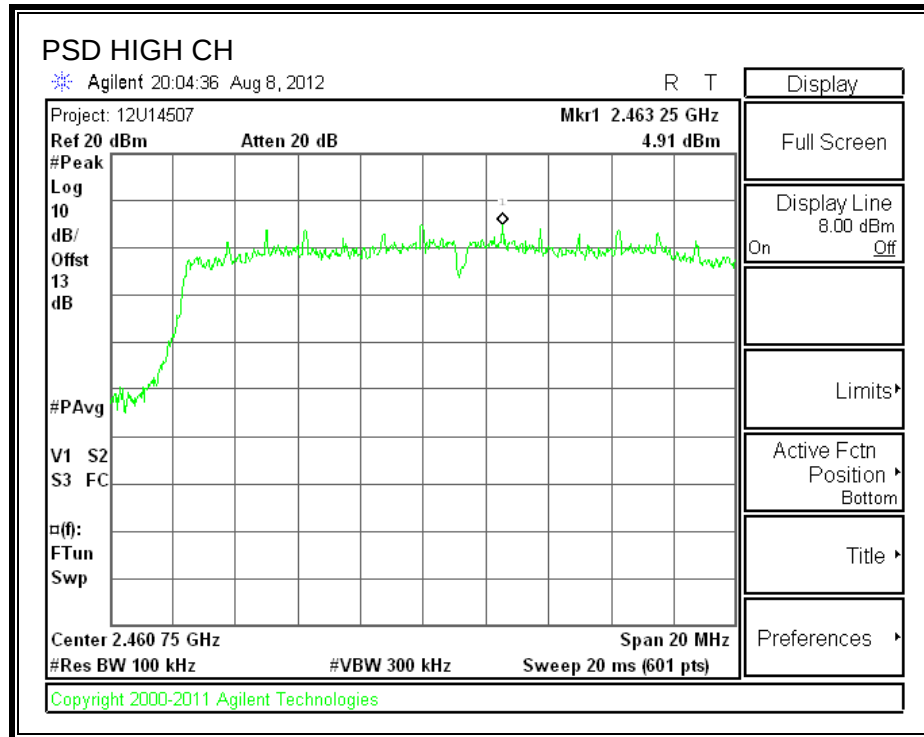
RESULTS

Channel	Frequency (MHz)	Analyzer Reading (dBm)	10log(3kHz/100kHz) (dB)	PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	5.05	-15.2	-10.15	8	-18.15
Middle	2437	6.21	-15.2	-8.99	8	-16.99
High	2462	4.91	-15.2	-10.29	8	-18.29

POWER SPECTRAL DENSITY







7.3.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

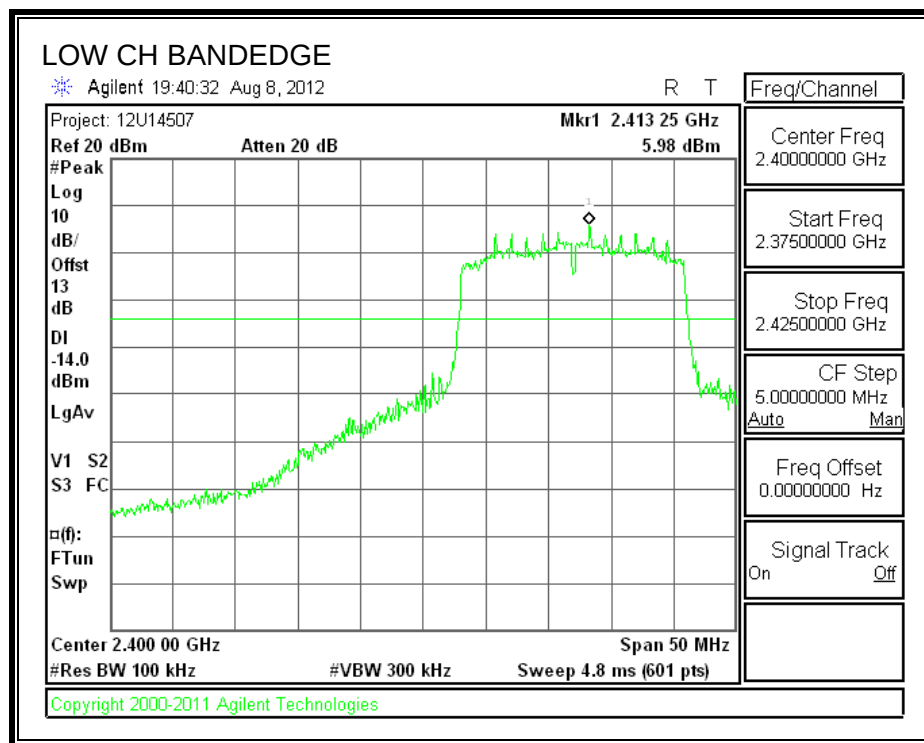
Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

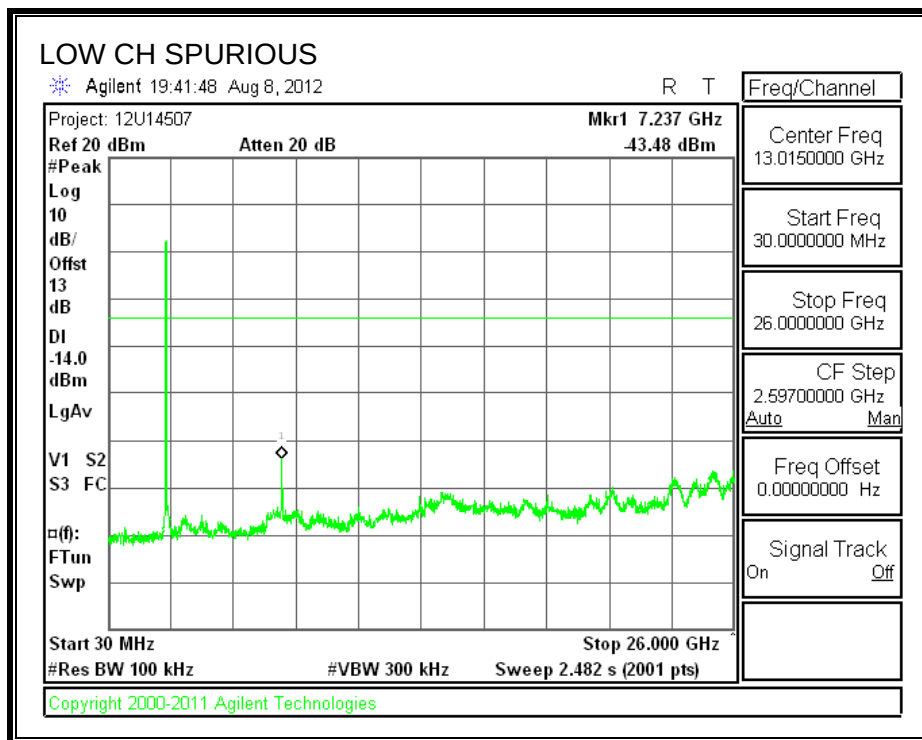
TEST PROCEDURE

KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

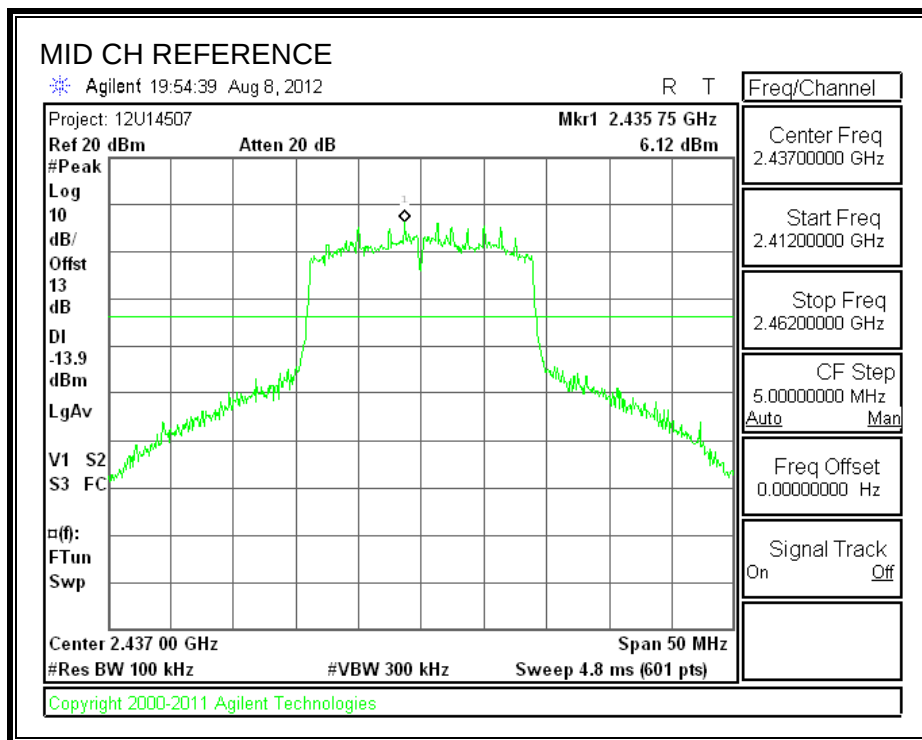
RESULTS

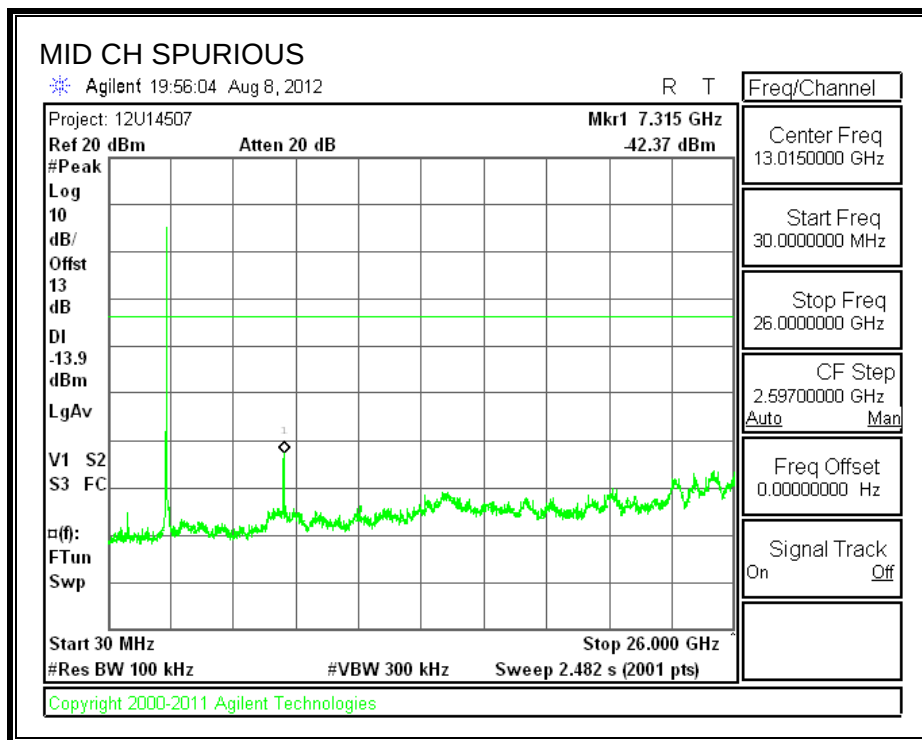
SPURIOUS EMISSIONS, LOW CHANNEL



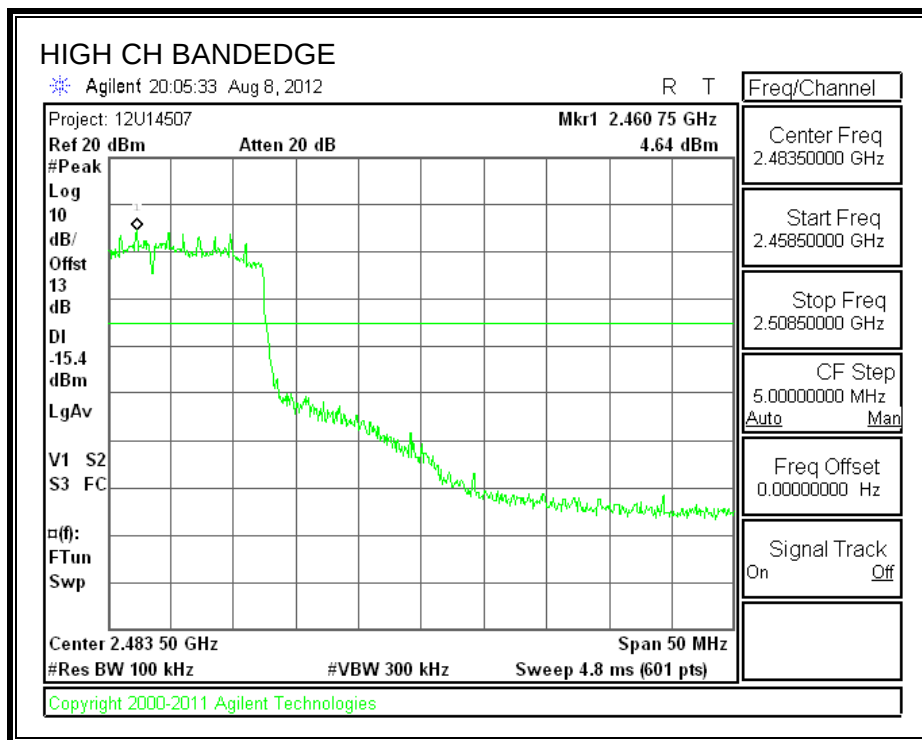


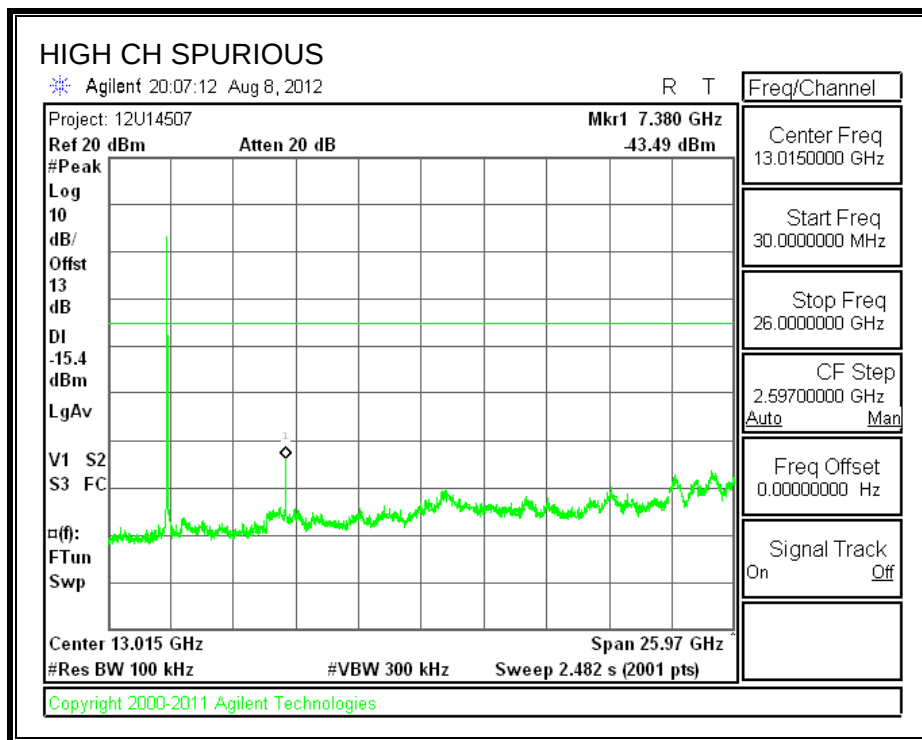
SPURIOUS EMISSIONS, MID CHANNEL





SPURIOUS EMISSIONS, HIGH CHANNEL





7.4. 802.11a MODE IN THE 5.8 GHz BAND

7.4.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

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

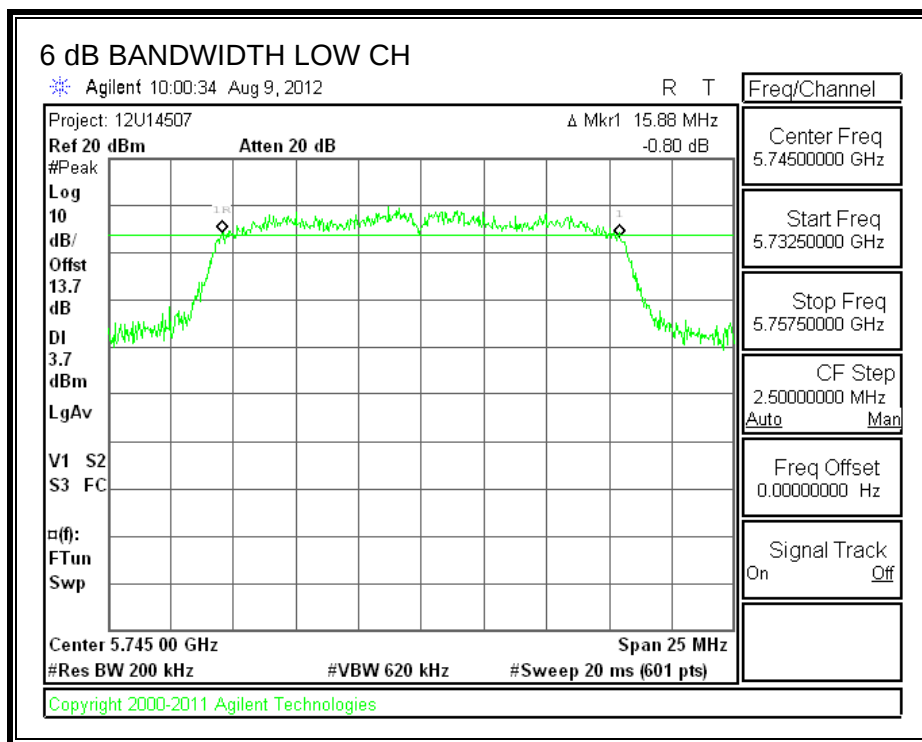
TEST PROCEDURE

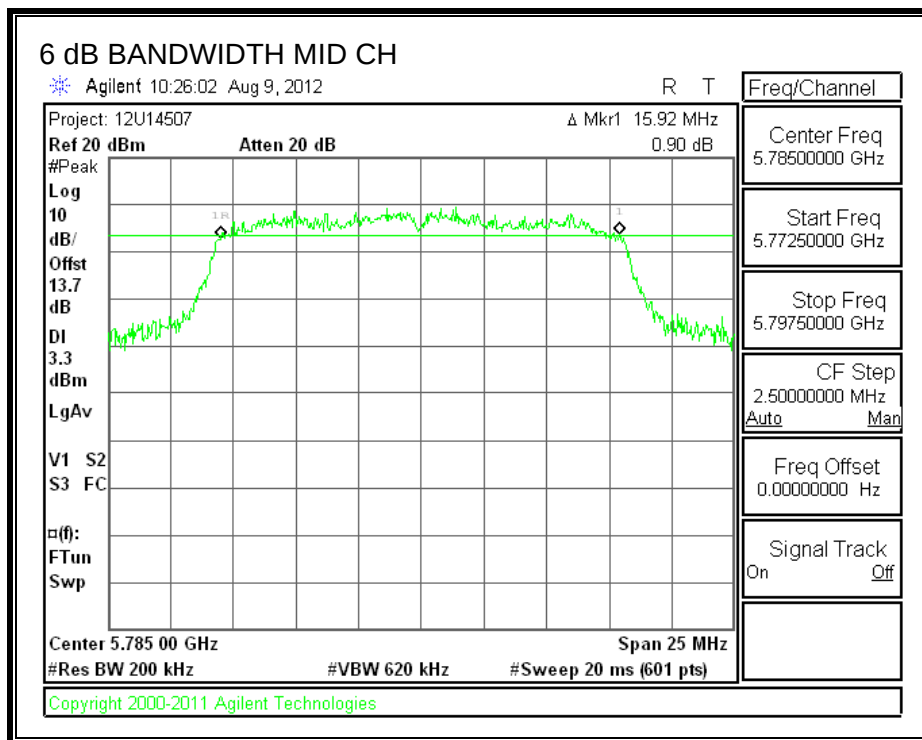
KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

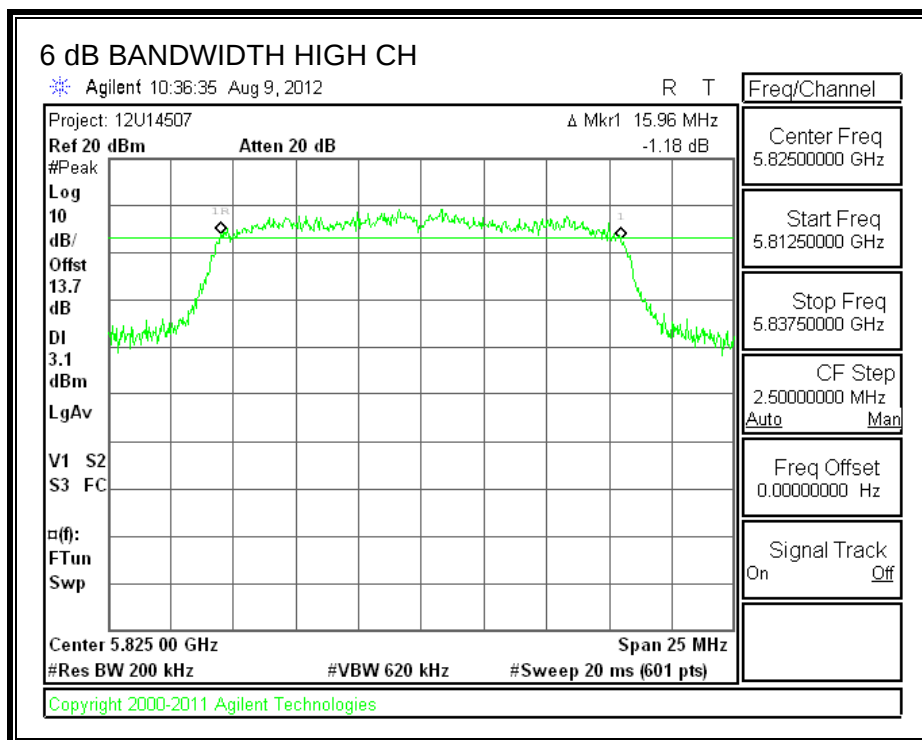
RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	5745	15.88	0.5
Middle	5785	15.92	0.5
High	5825	15.96	0.5

6 dB BANDWIDTH







7.4.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

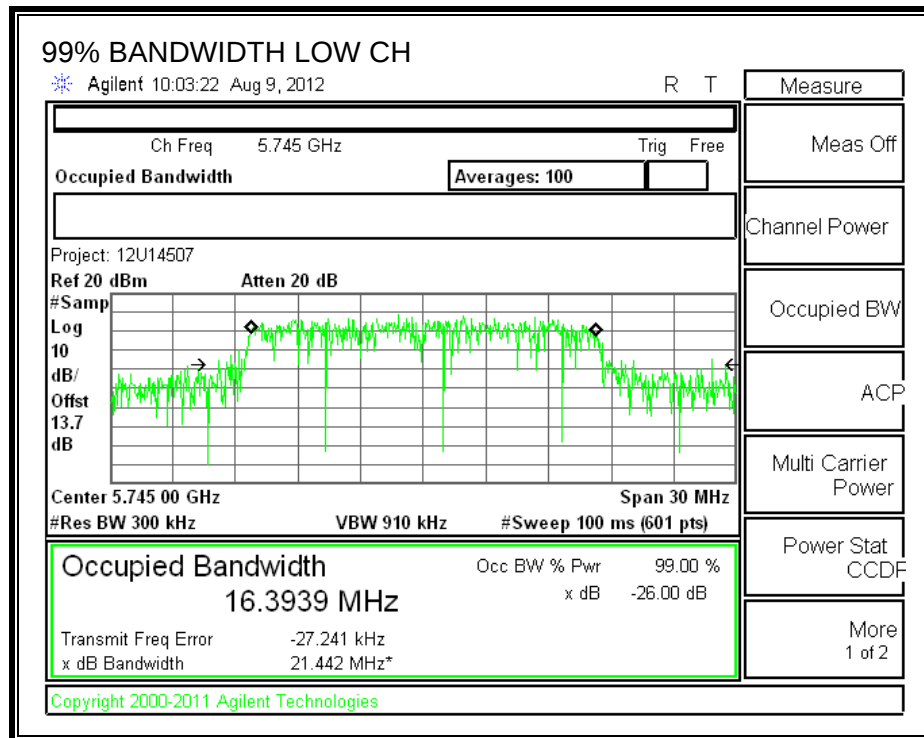
TEST PROCEDURE

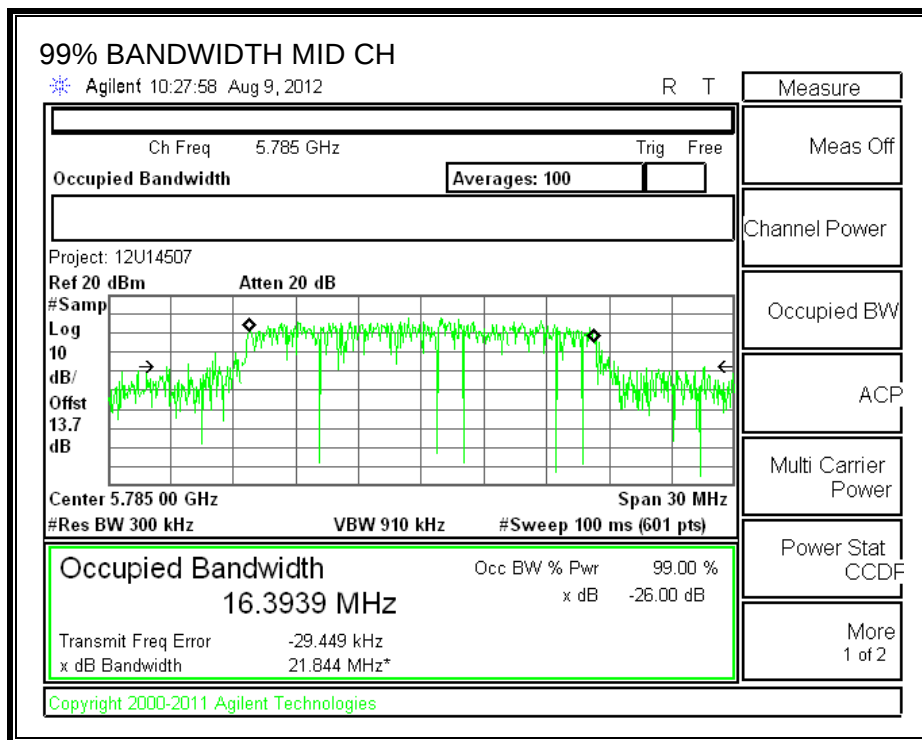
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

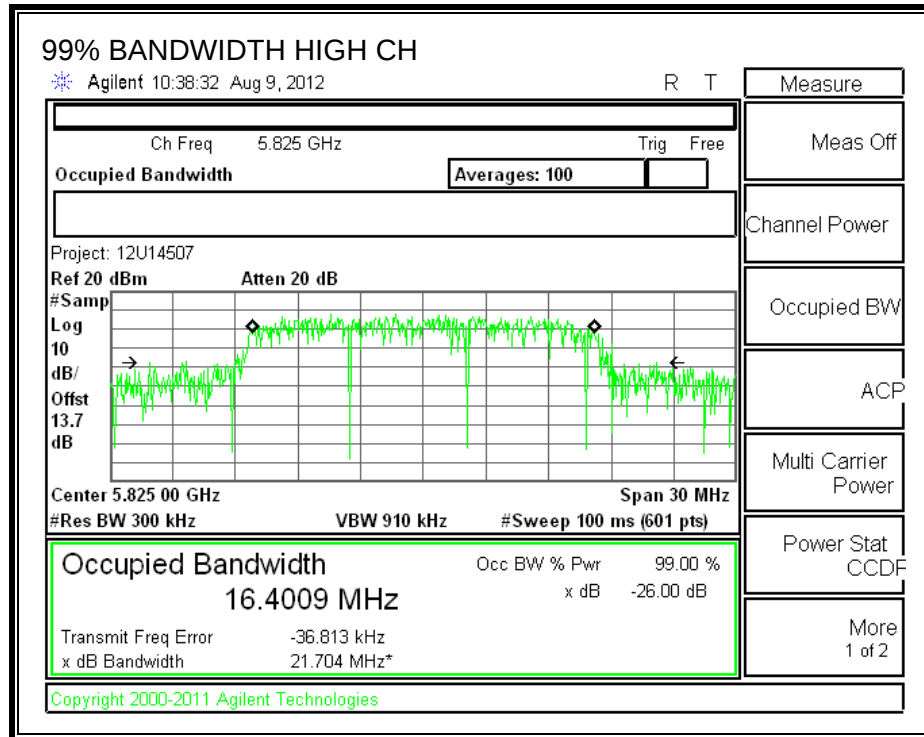
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5745	16.3939
Middle	5785	16.3939
High	5825	16.4009

99% BANDWIDTH







7.4.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

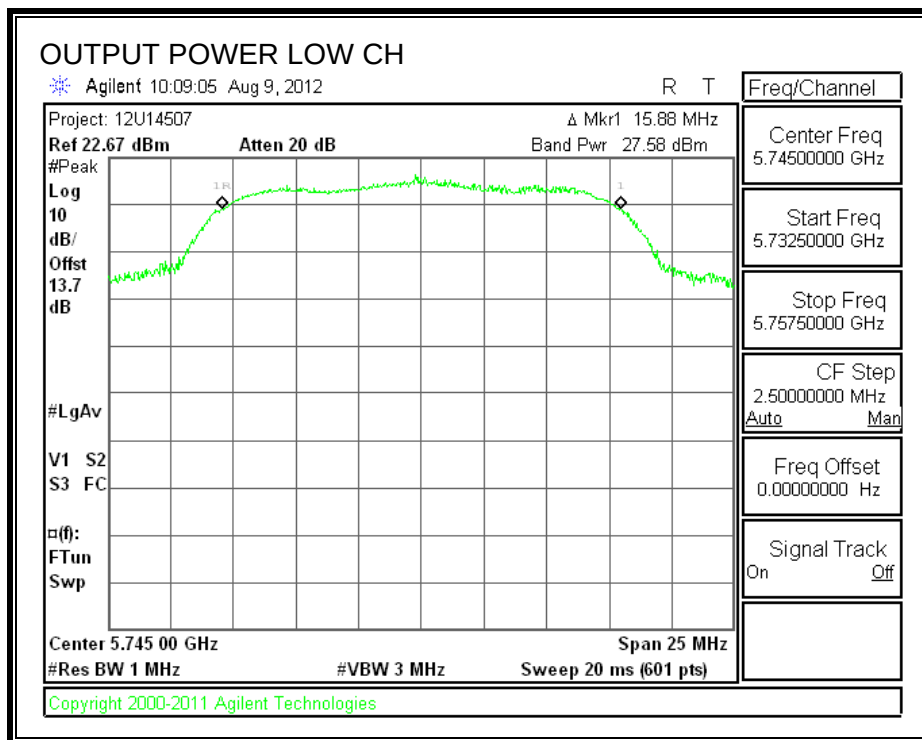
KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

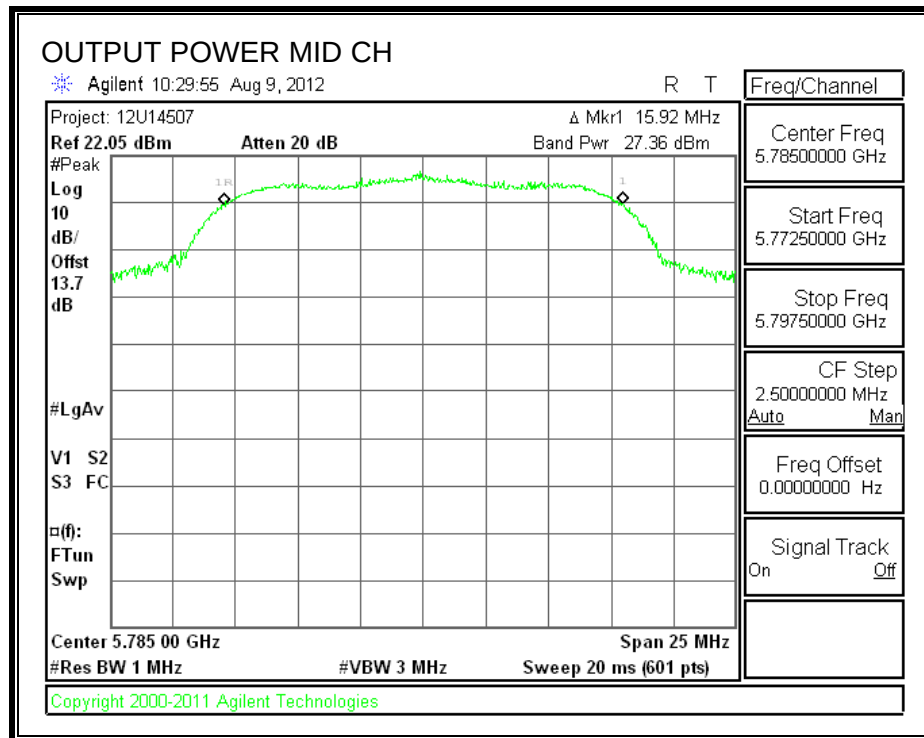
Measurement Procedure PK2 as referenced by section 5.2.1.2 of the KDB mentioned above was used.

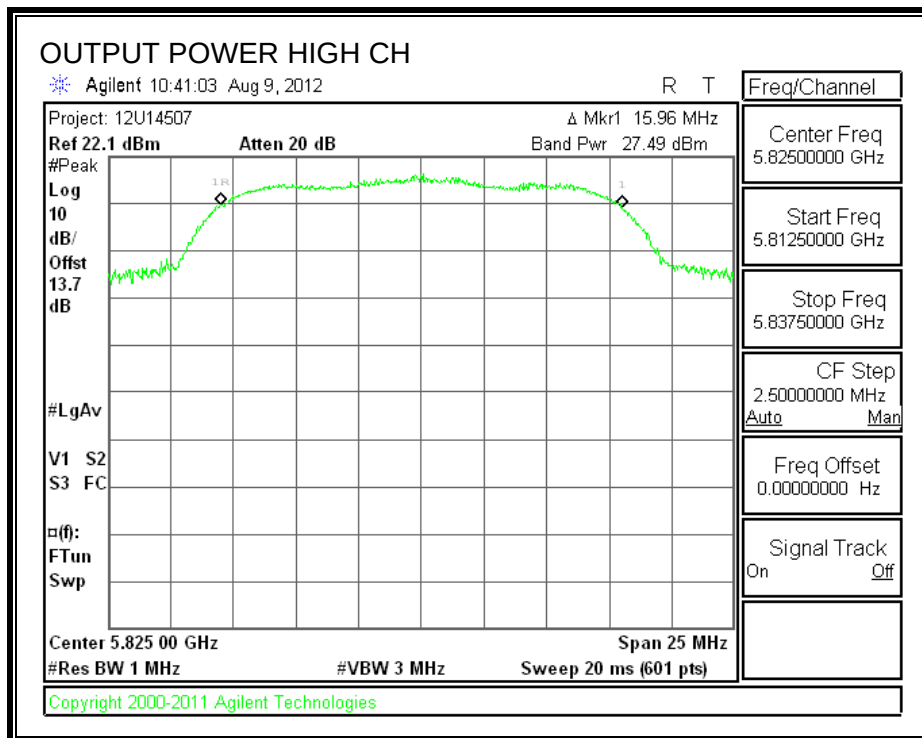
RESULTS

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	5745	27.58	30	-2.42
Middle	5785	27.36	30	-2.64
High	5825	27.49	30	-2.51

OUTPUT POWER







7.4.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

RESULTS

The cable assembly insertion loss of 13.7 dB (including 12. dB pad and 1.7 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Power (dBm)
Low	5745	18.43
Middle	5785	18.43
High	5825	18.47

7.4.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

TEST PROCEDURE

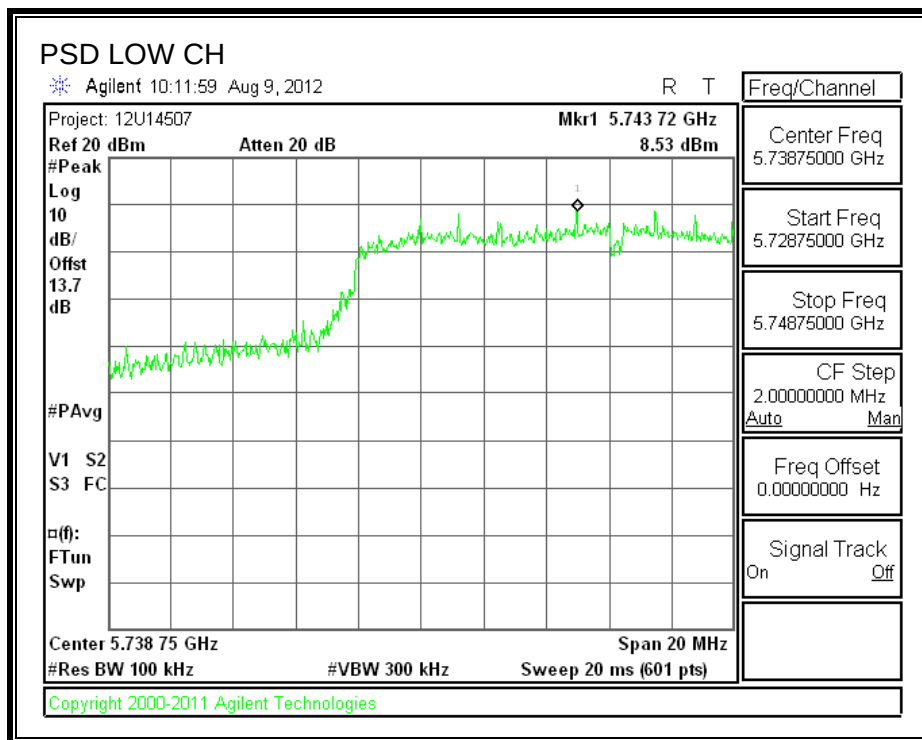
KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

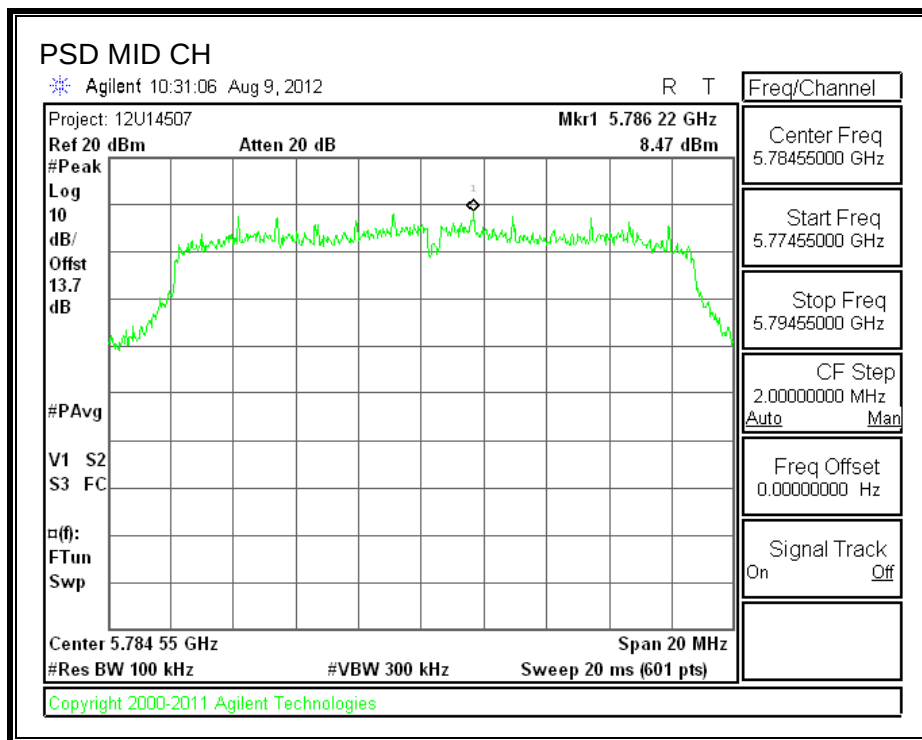
Measurement Procedure PKPSD as referenced by section 5.3.1 of the KDB mentioned above was used.

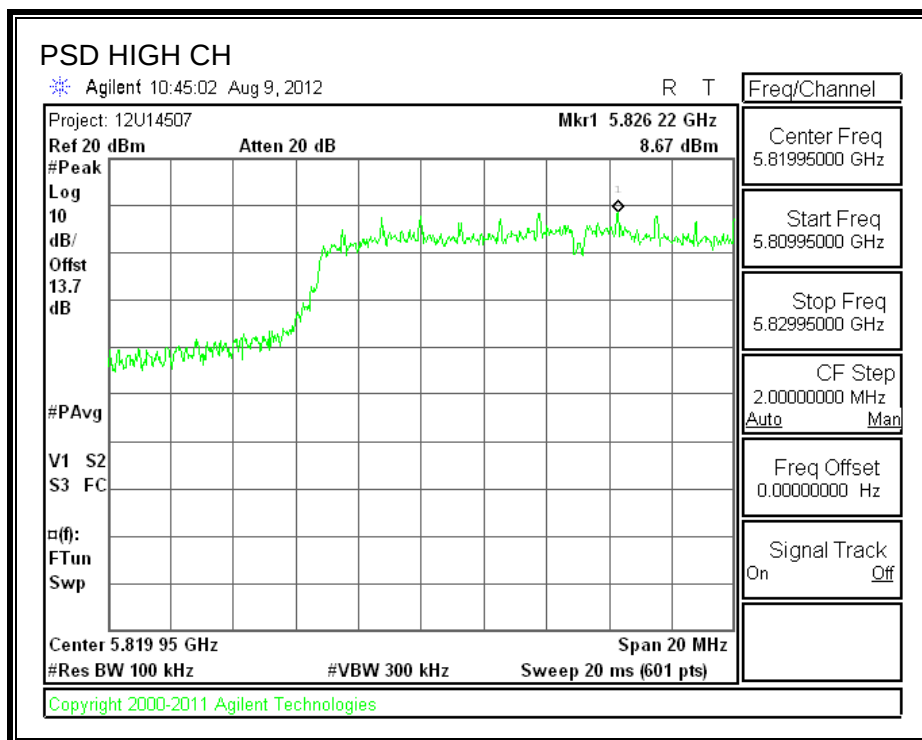
RESULTS

Channel	Frequency (MHz)	Analyzer Reading (dBm)	10log(3kHz/100kHz) (dB)	PSD (dBm)	Limit (dBm)	Margin (dB)
Low	5745	8.53	-15.2	-6.67	8	-14.67
Middle	5785	8.47	-15.2	-6.73	8	-14.73
High	5825	8.67	-15.2	-6.53	8	-14.53

POWER SPECTRAL DENSITY







7.4.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

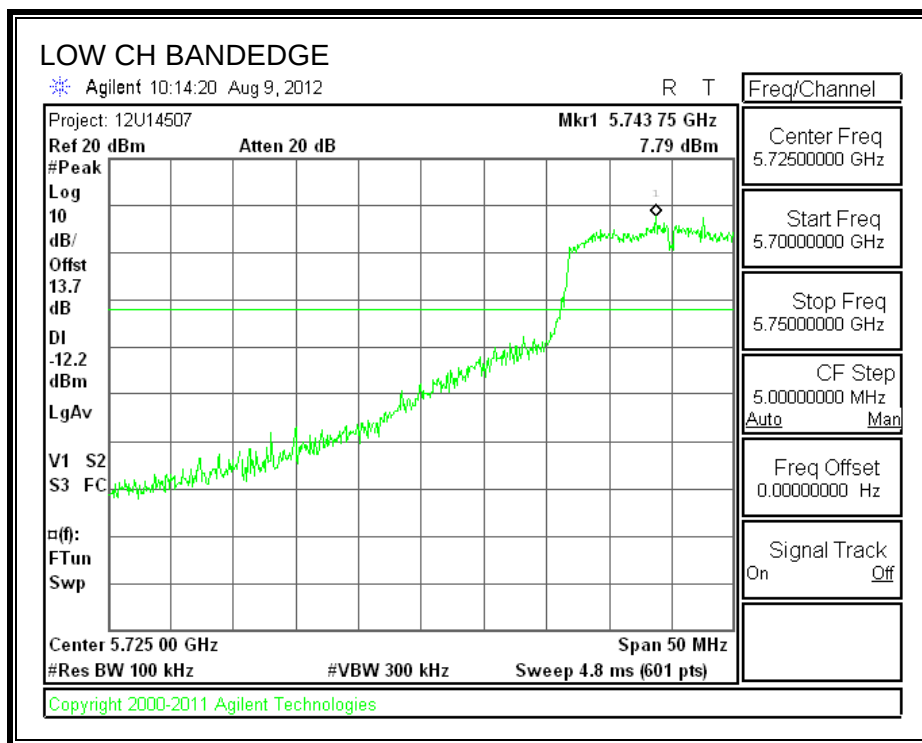
Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

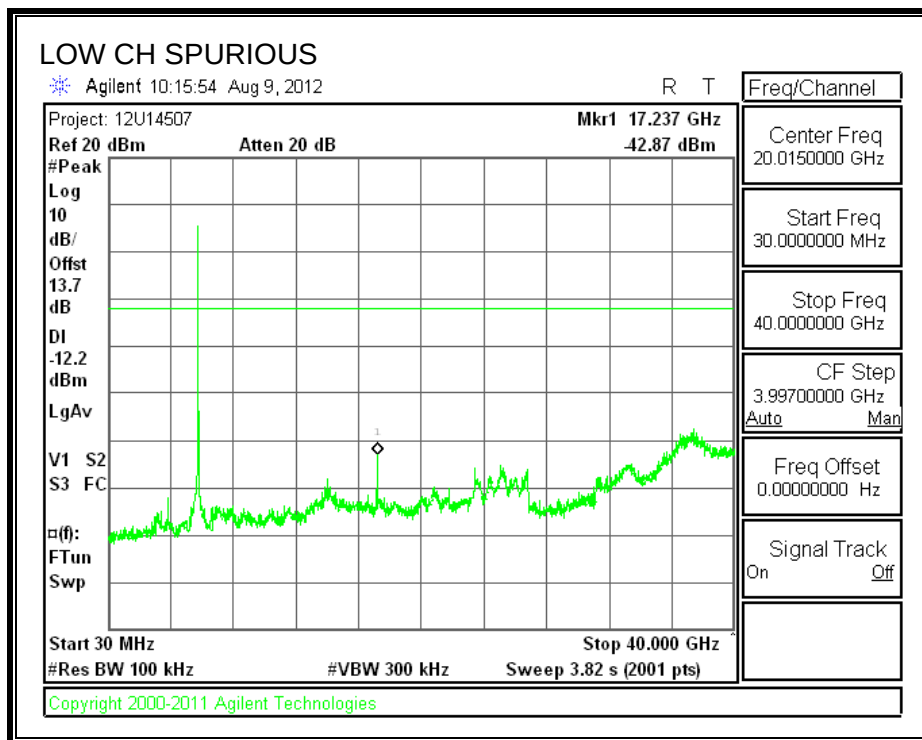
TEST PROCEDURE

KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

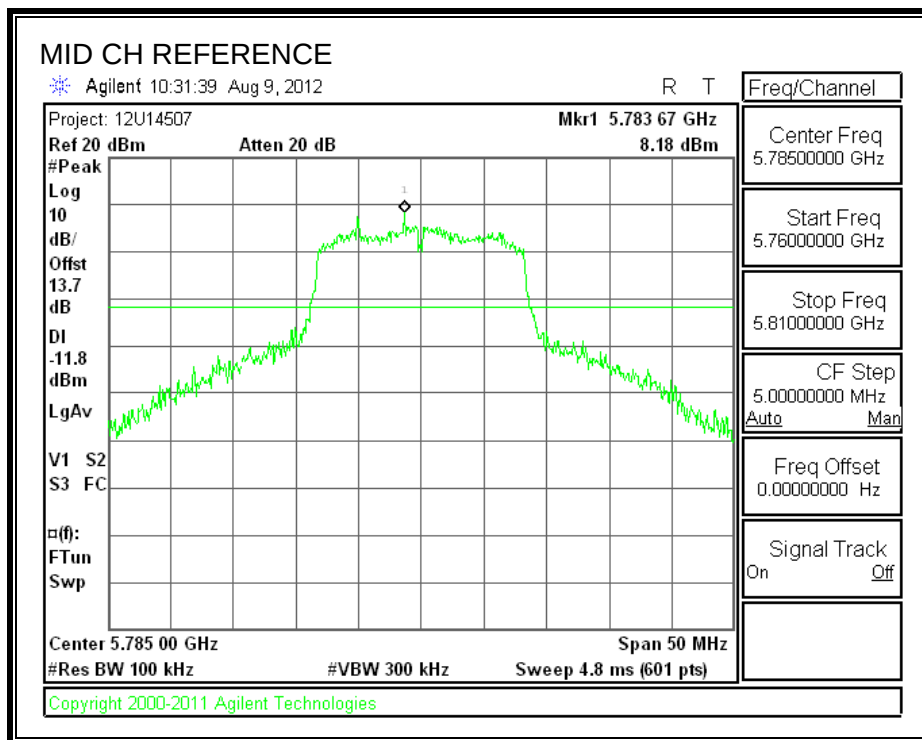
RESULTS

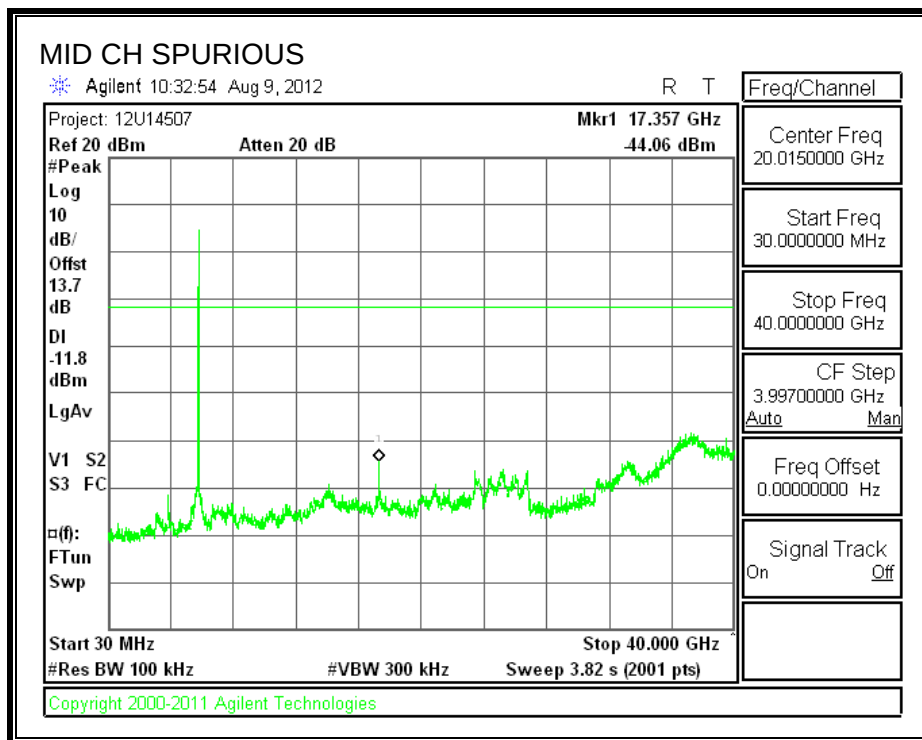
SPURIOUS EMISSIONS, LOW CHANNEL



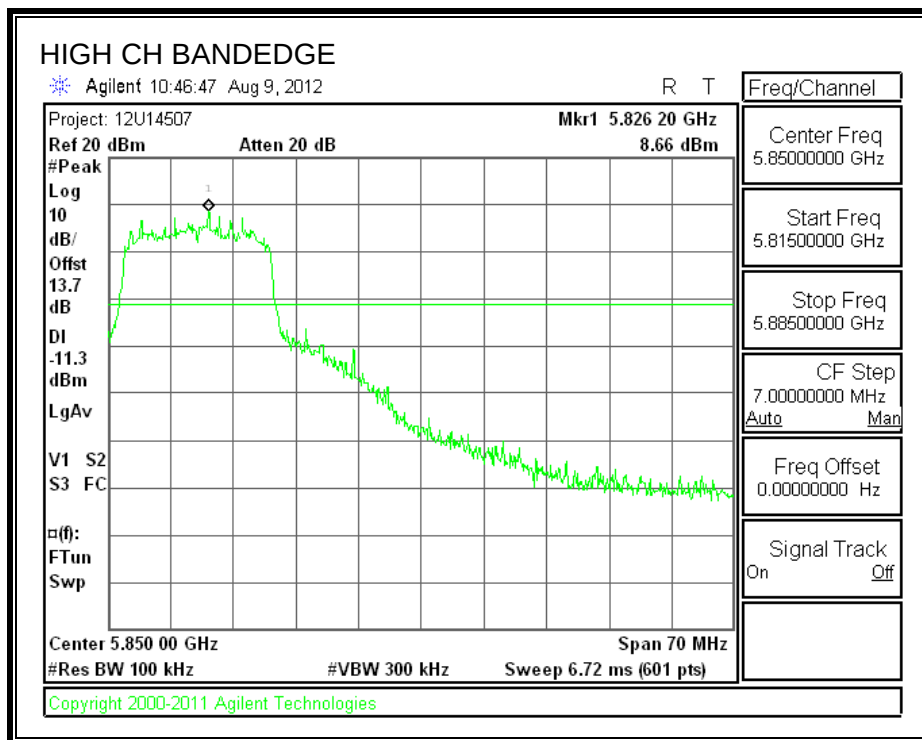


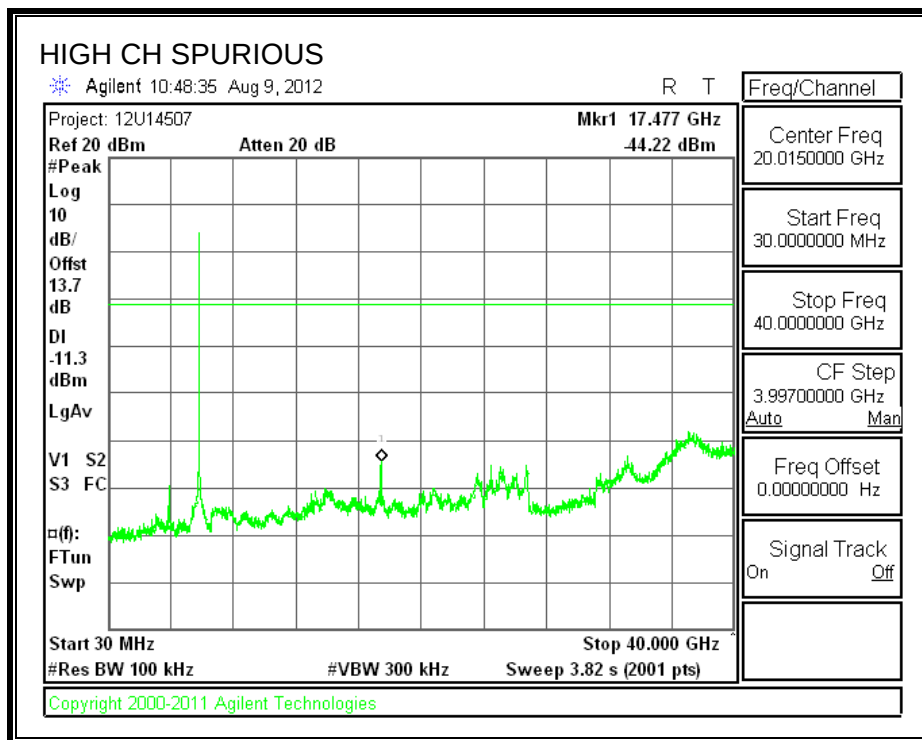
SPURIOUS EMISSIONS, MID CHANNEL





SPURIOUS EMISSIONS, HIGH CHANNEL





7.5. 802.11n HT20 MODE IN THE 5.8 GHz BAND

7.5.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

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

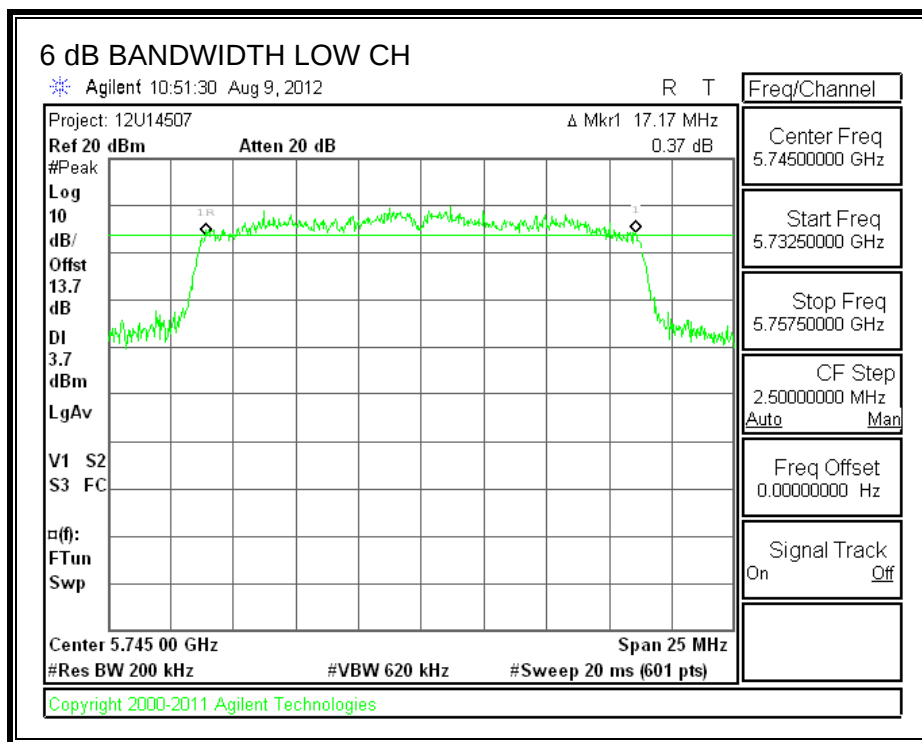
TEST PROCEDURE

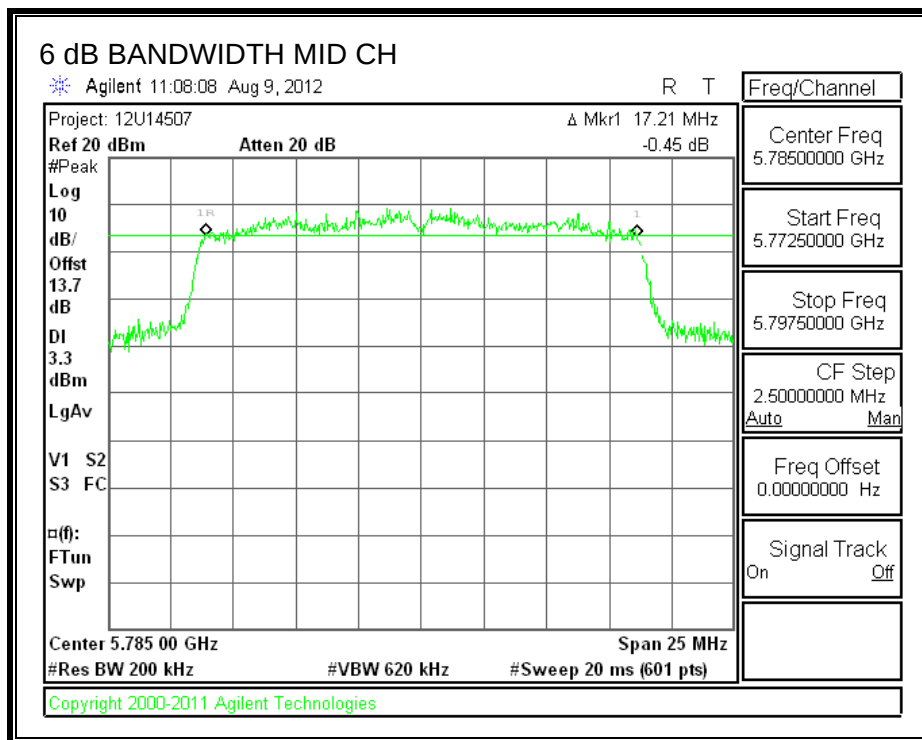
KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

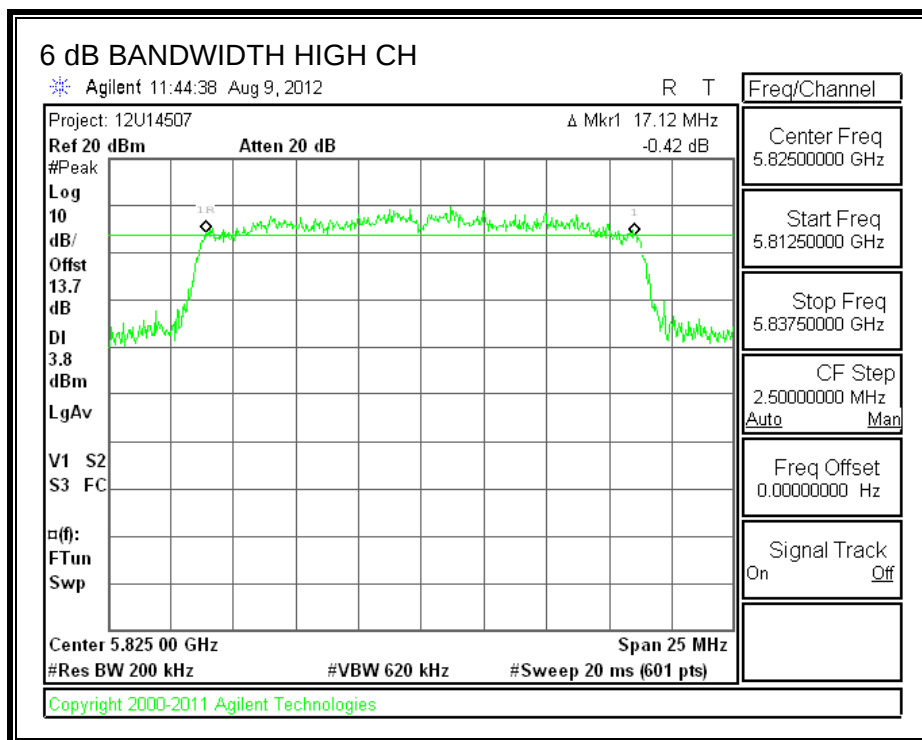
RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	5745	17.17	0.5
Middle	5785	17.21	0.5
High	5825	17.12	0.5

6 dB BANDWIDTH







7.5.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

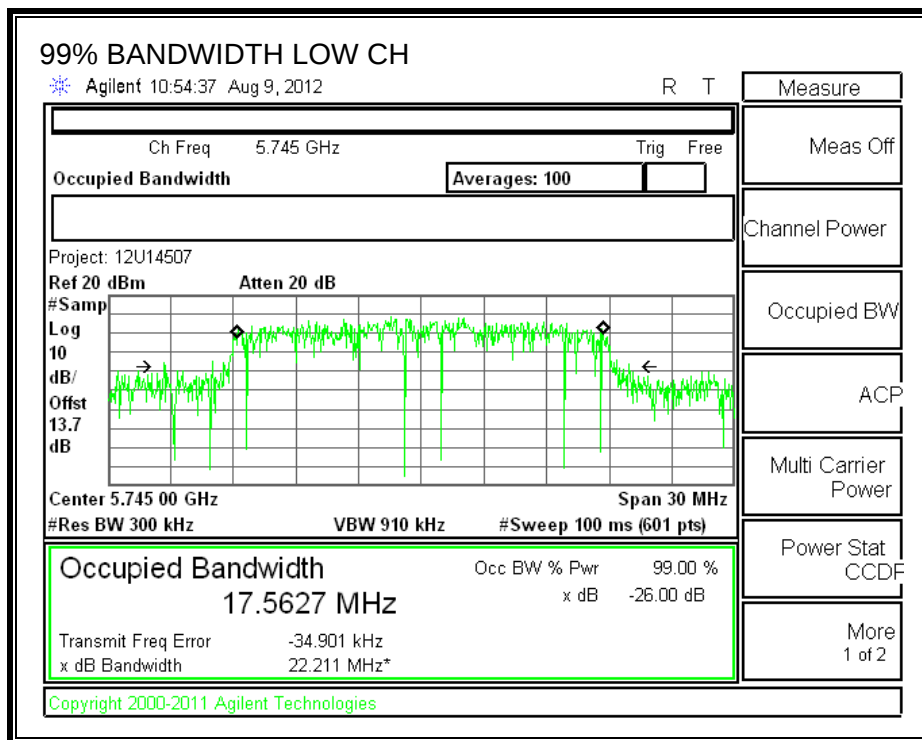
TEST PROCEDURE

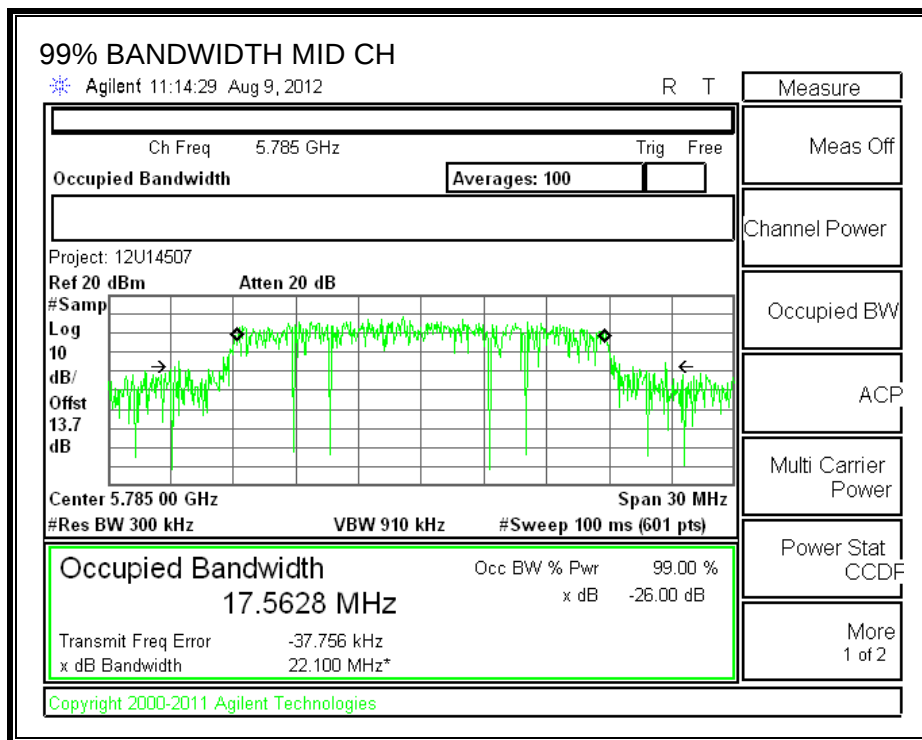
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

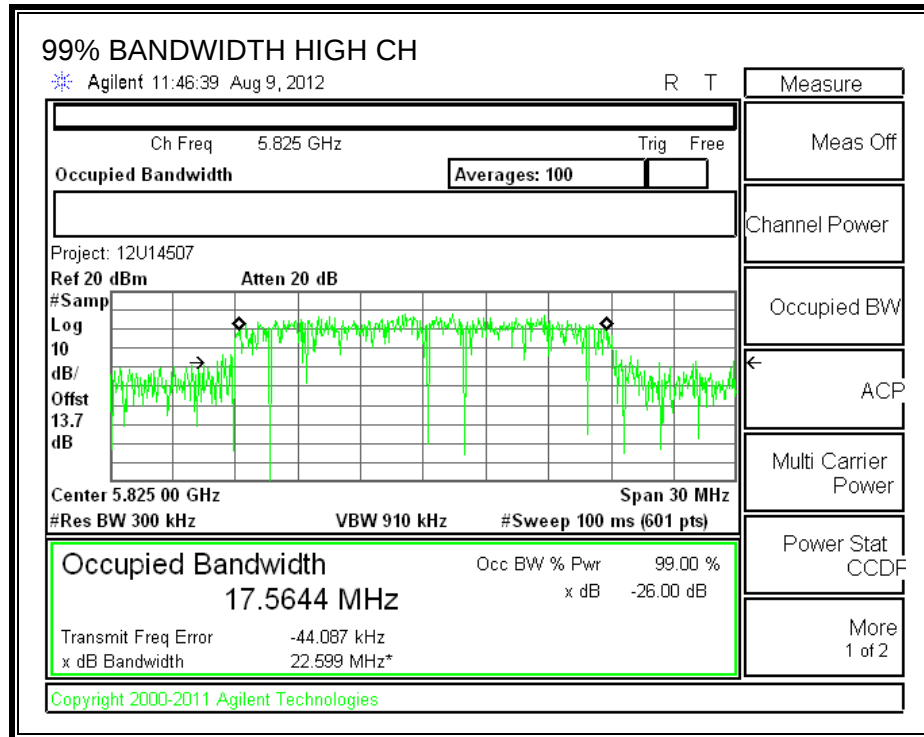
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5745	17.5627
Middle	5785	17.5628
High	5825	17.5644

99% BANDWIDTH







7.5.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

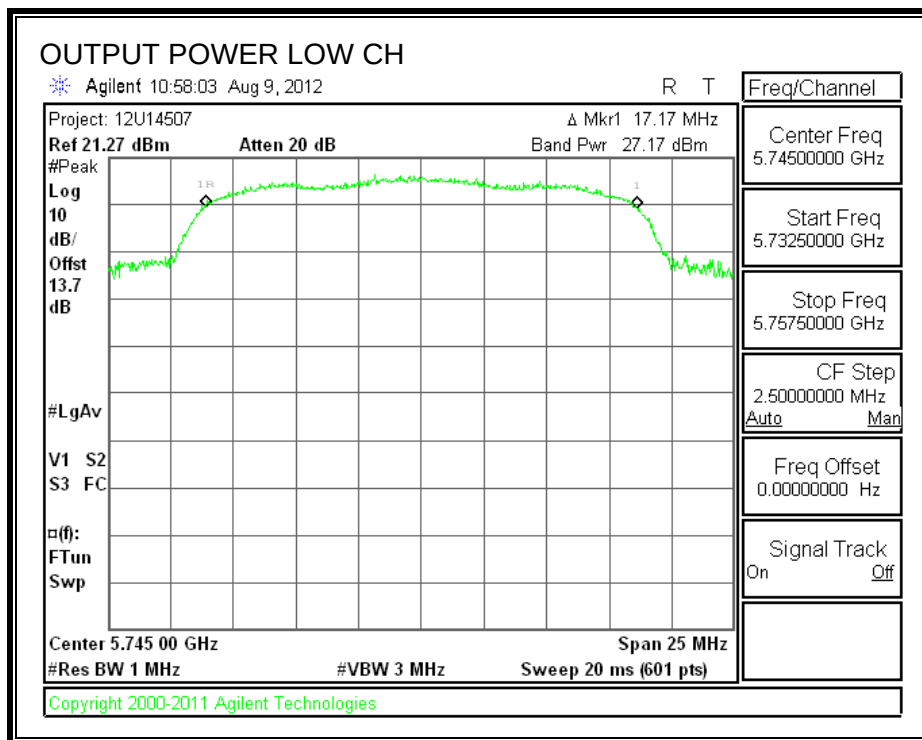
KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

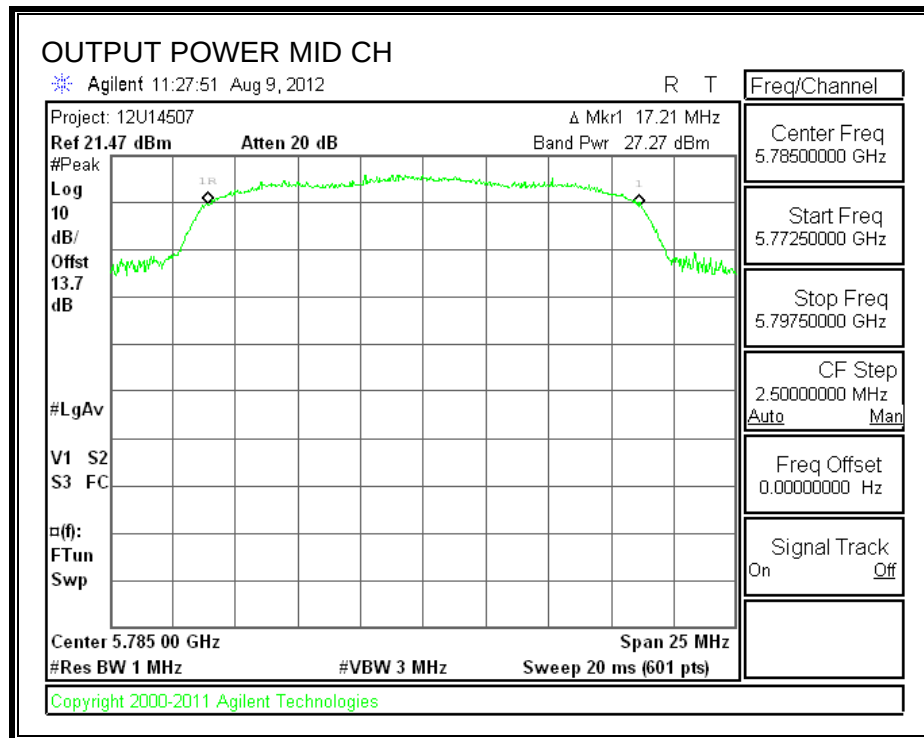
Measurement Procedure PK2 as referenced by section 5.2.1.2 of the KDB mentioned above was used.

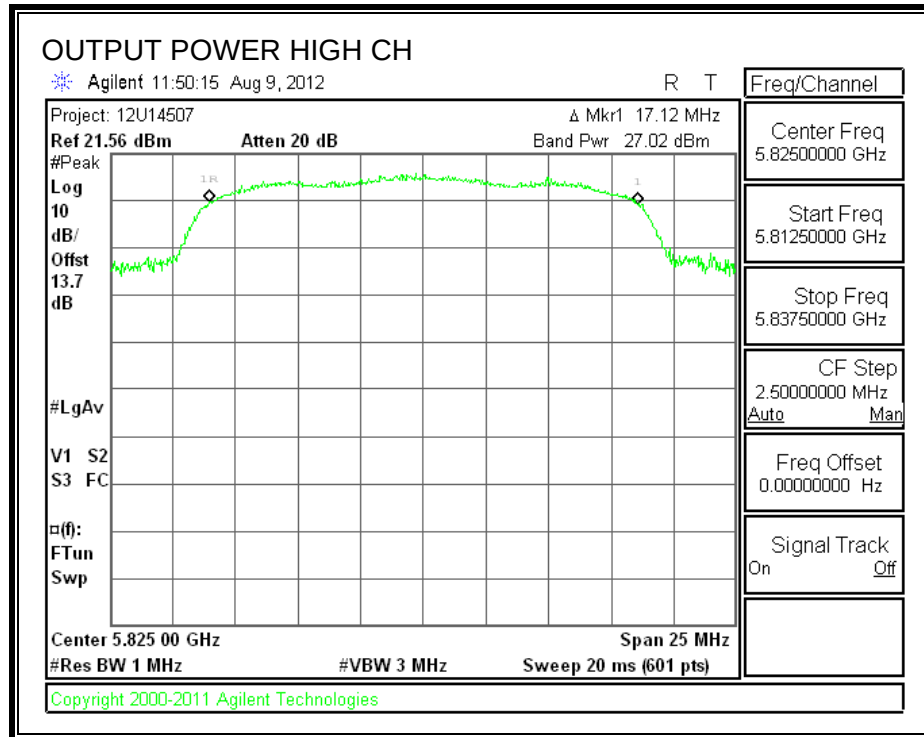
RESULTS

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	5745	27.17	30	-2.83
Middle	5785	27.27	30	-2.73
High	5825	27.02	30	-2.98

OUTPUT POWER







7.5.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

RESULTS

The cable assembly insertion loss of 13.7 dB (including 12 dB pad and 1.7 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Power (dBm)
Low	5745	18.46
Middle	5785	18.45
High	5825	18.48

7.5.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

TEST PROCEDURE

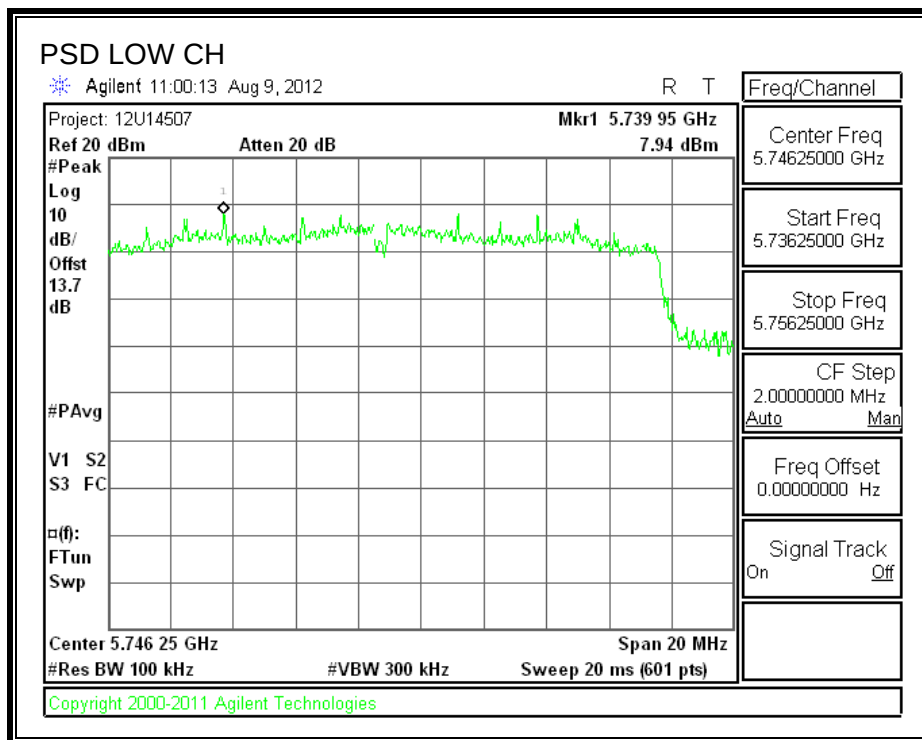
KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

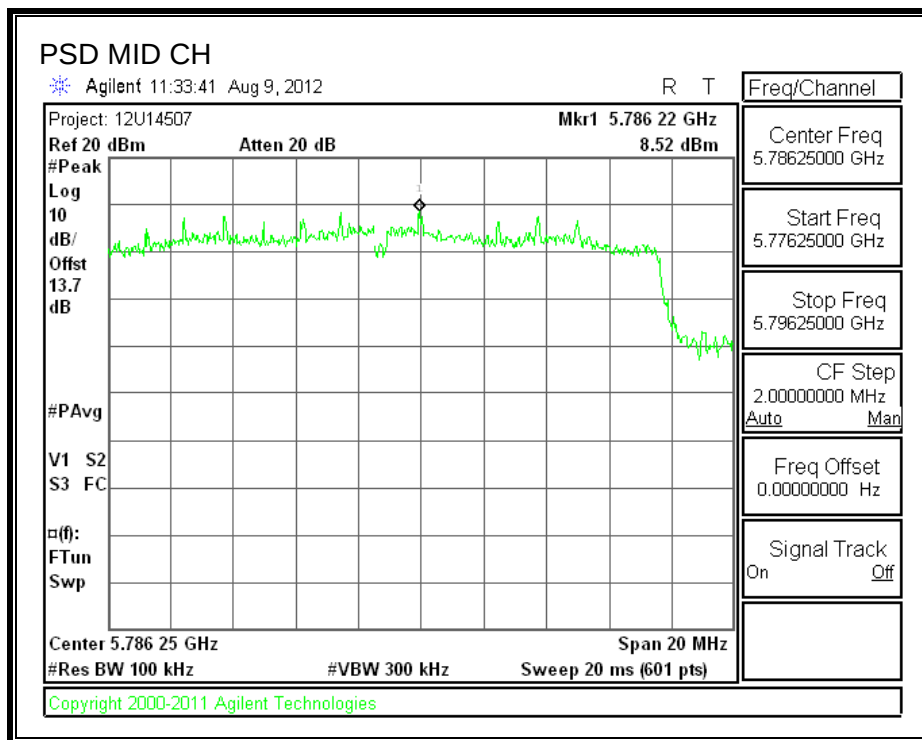
Measurement Procedure PKPSD as referenced by section 5.3.1 of the KDB mentioned above was used.

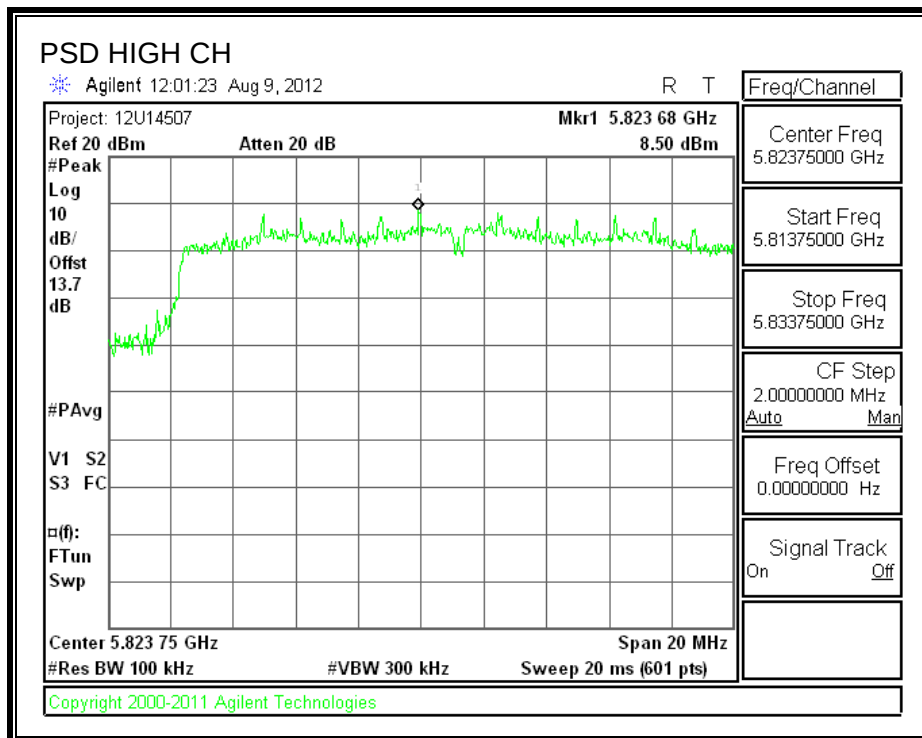
RESULTS

Channel	Frequency (MHz)	Analyzer Reading (dBm)	10log(3kHz/100kHz) (dB)	PSD (dBm)	Limit (dBm)	Margin (dB)
Low	5745	7.94	-15.2	-7.26	8	-15.26
Middle	5785	8.52	-15.2	-6.68	8	-14.68
High	5825	8.50	-15.2	-6.70	8	-14.70

POWER SPECTRAL DENSITY







7.5.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

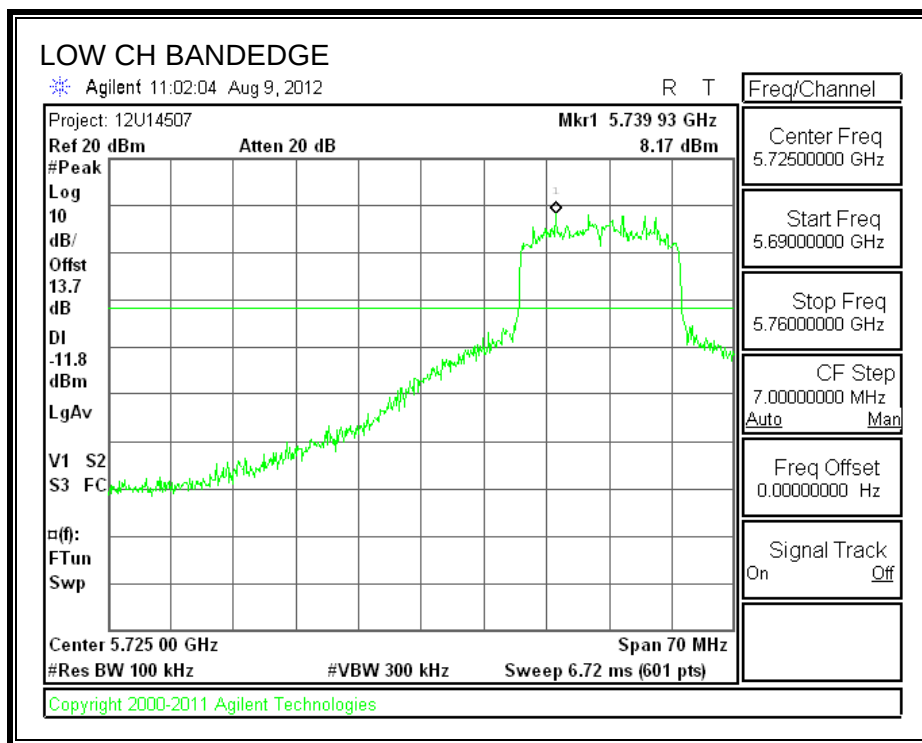
Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

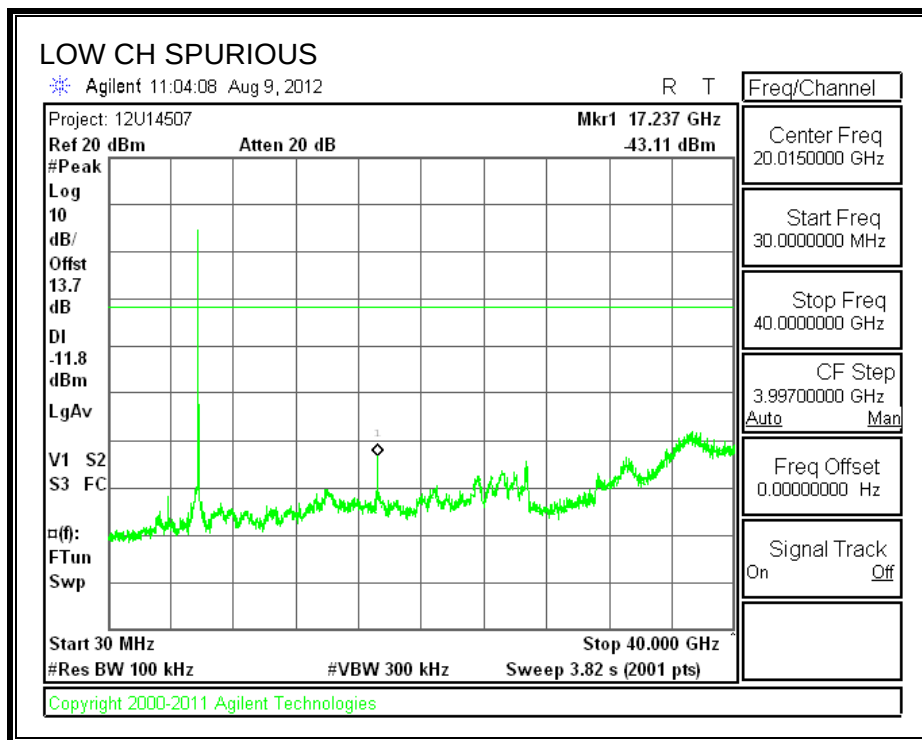
TEST PROCEDURE

KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

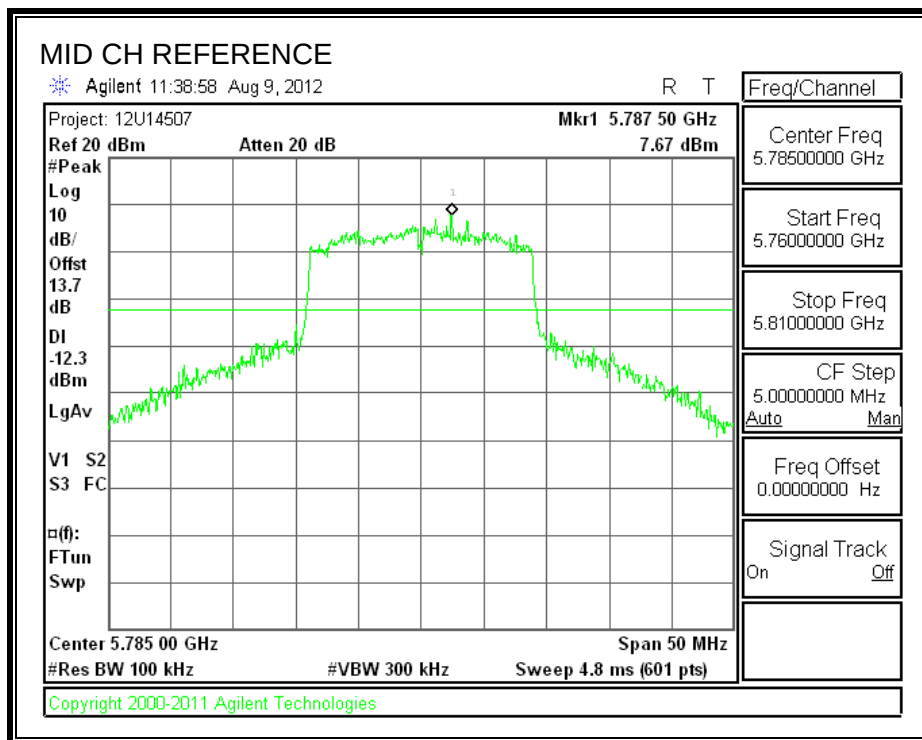
RESULTS

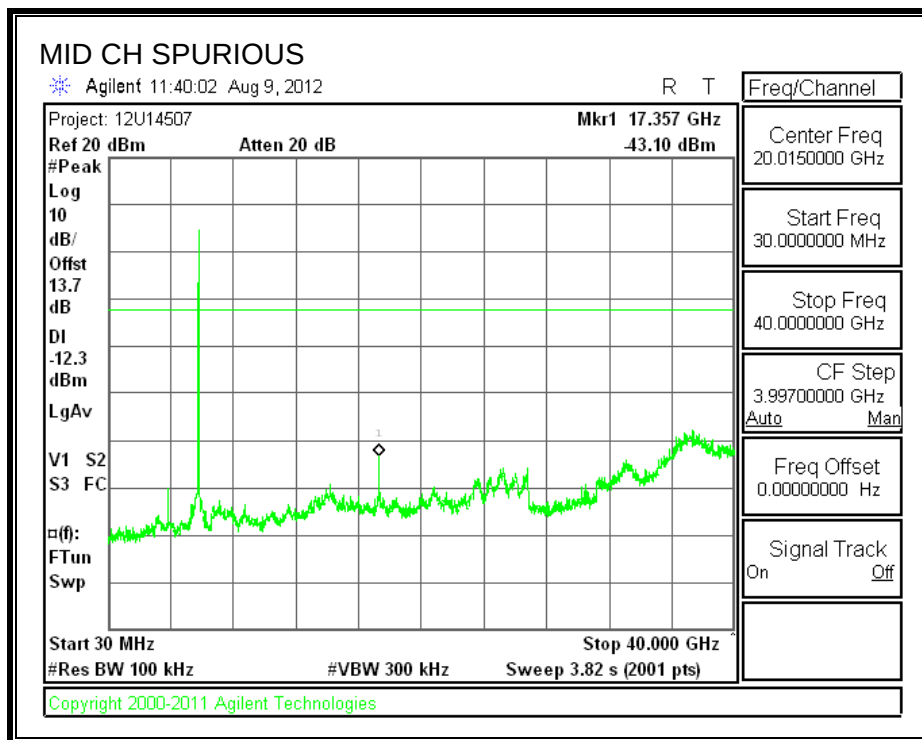
SPURIOUS EMISSIONS, LOW CHANNEL



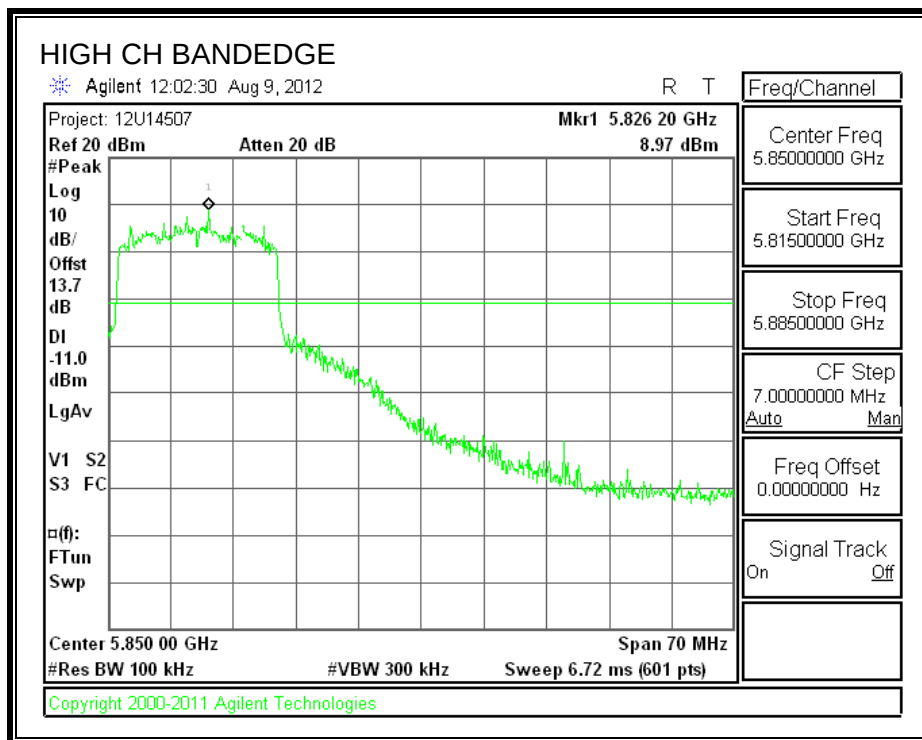


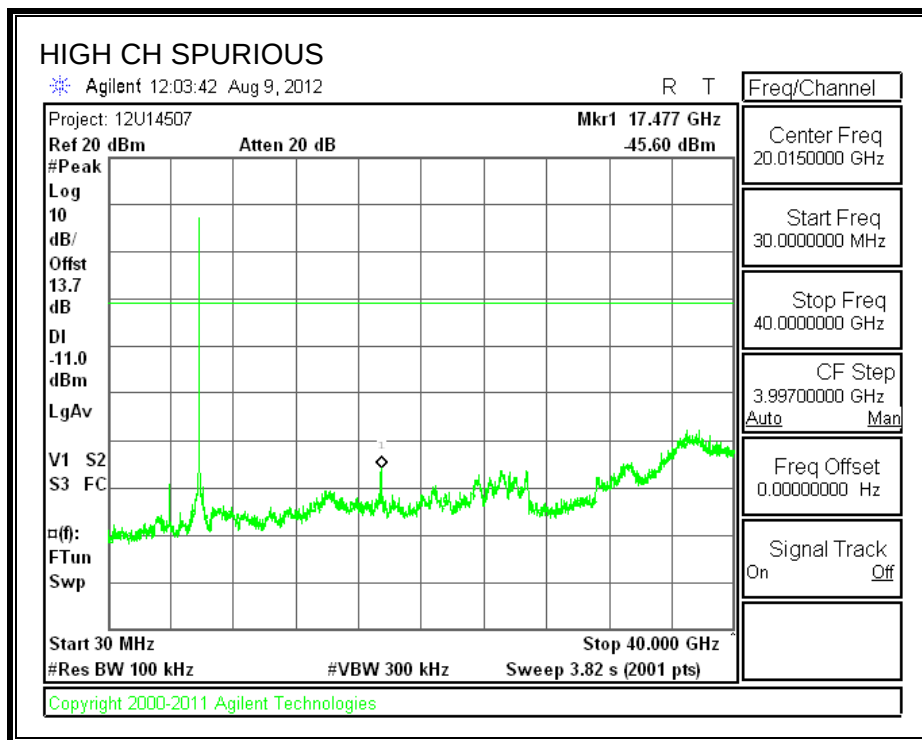
SPURIOUS EMISSIONS, MID CHANNEL





SPURIOUS EMISSIONS, HIGH CHANNEL





7.6. 802.11n HT40 MODE IN THE 5.8 GHz BAND

7.6.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

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

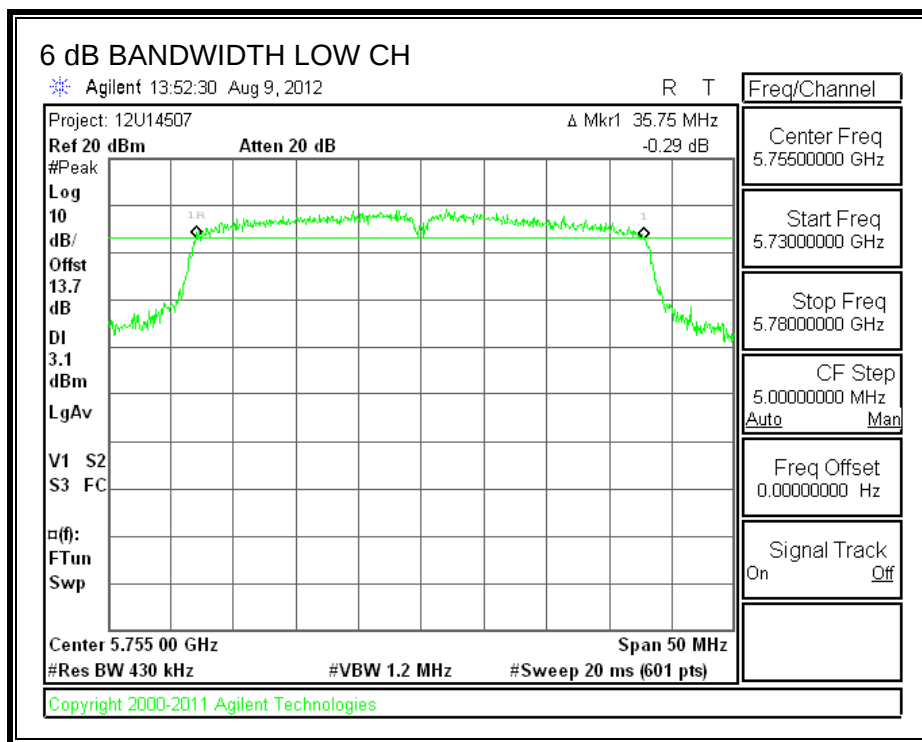
TEST PROCEDURE

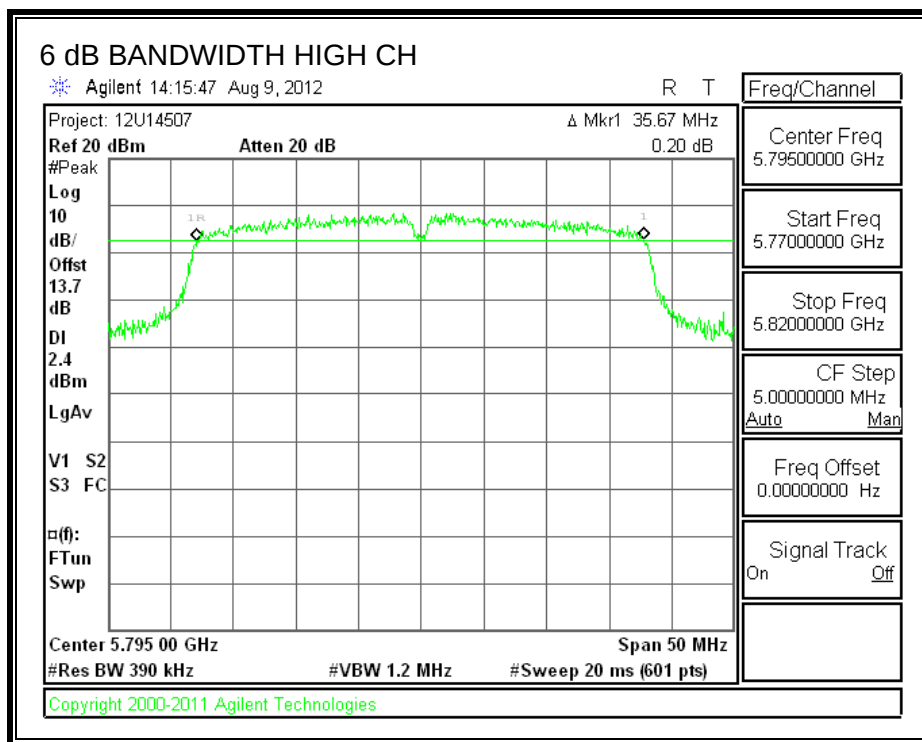
KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	5755	35.75	0.5
High	5795	35.67	0.5

6 dB BANDWIDTH





7.6.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

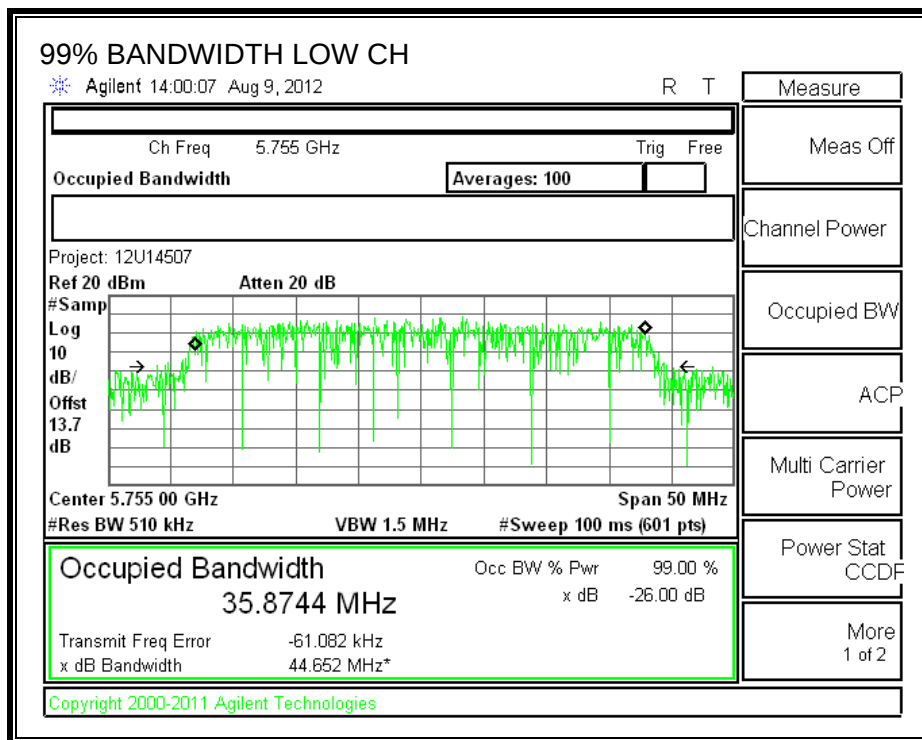
TEST PROCEDURE

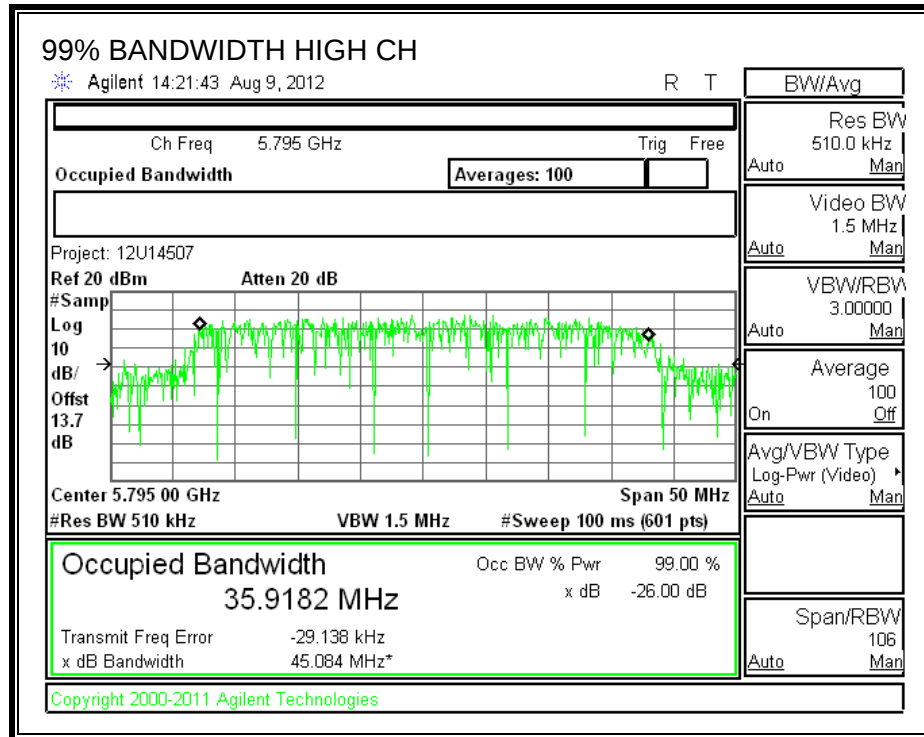
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5755	35.8744
High	5795	35.9182

99% BANDWIDTH





7.6.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

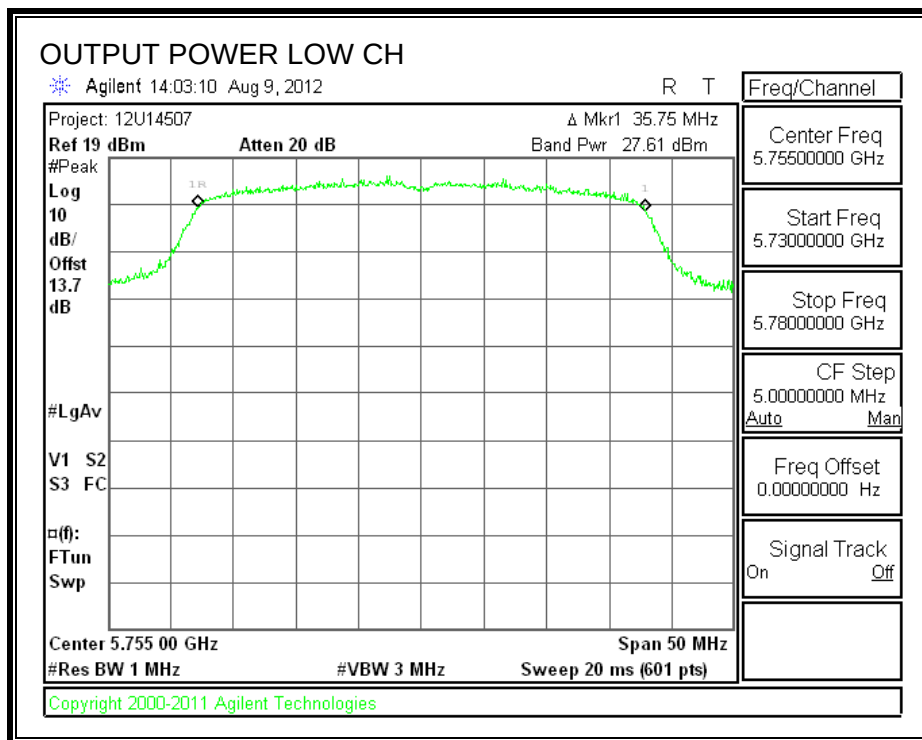
KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

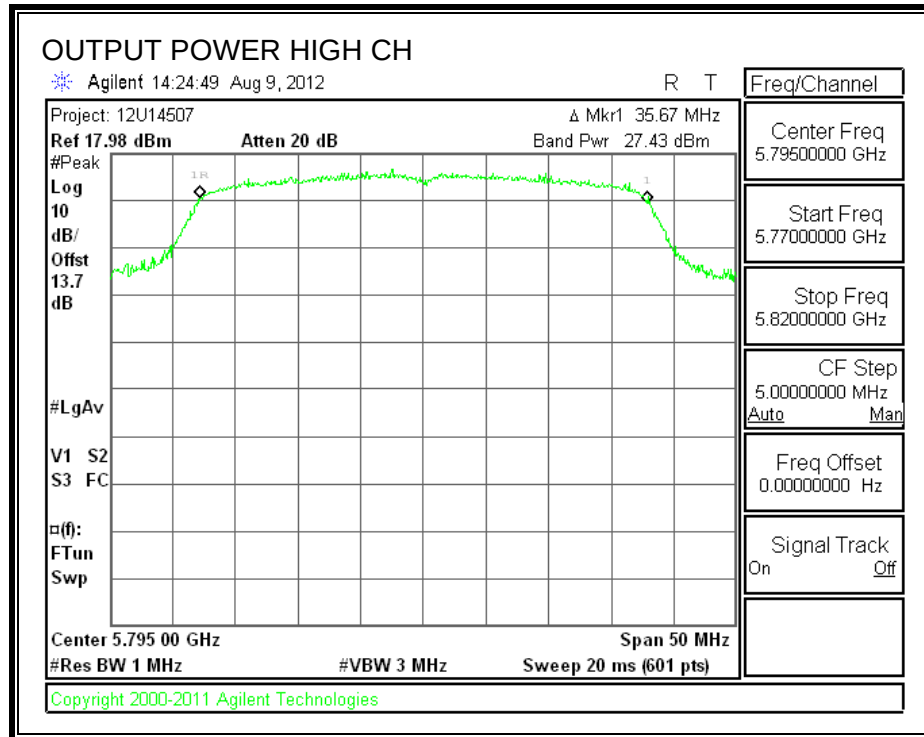
Measurement Procedure PK2 as referenced by section 5.2.1.2 of the KDB mentioned above was used.

RESULTS

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	5755	27.61	30	-2.39
High	5795	27.43	30	-2.57

OUTPUT POWER





7.6.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

RESULTS

The cable assembly insertion loss of 13.7 dB (including 12 dB pad and 1.7 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Power (dBm)
Low	5755	18.43
High	5795	18.45

7.6.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

TEST PROCEDURE

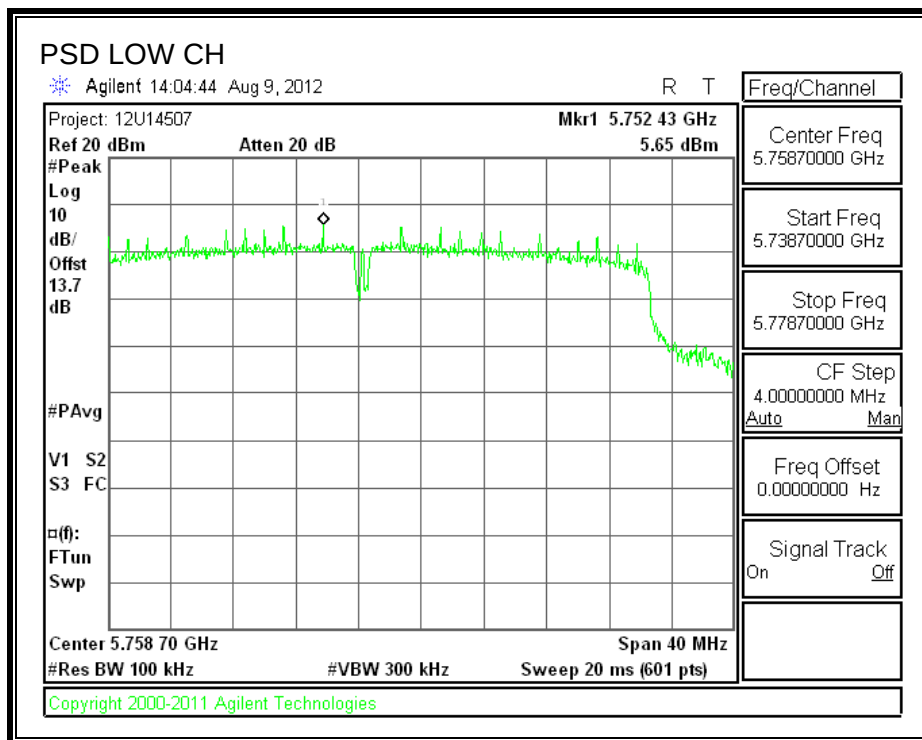
KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

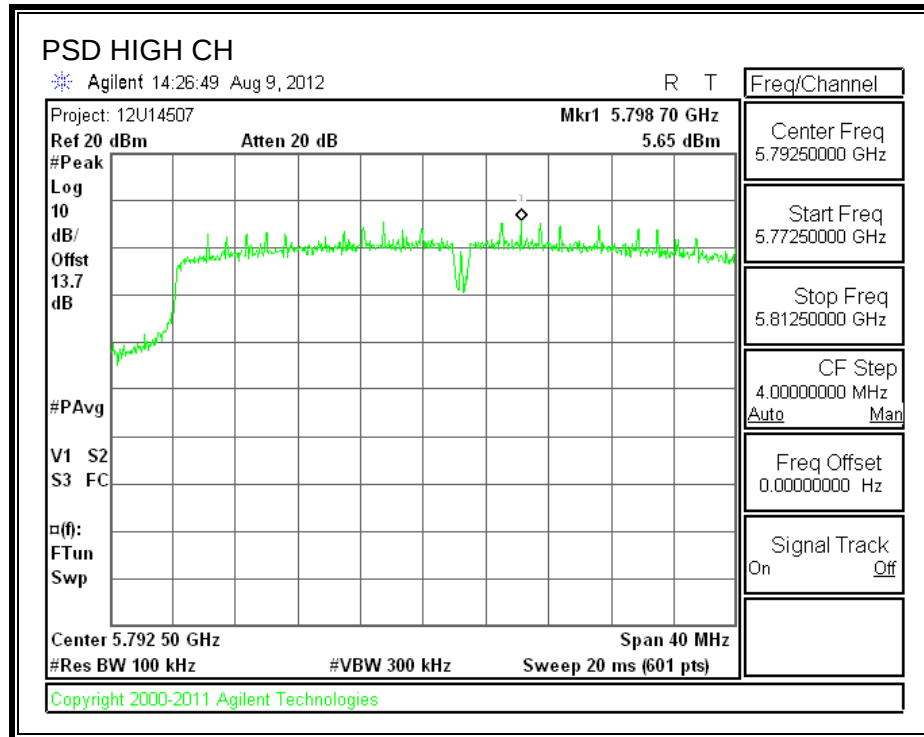
Measurement Procedure PKPSD as referenced by section 5.3.1 of the KDB mentioned above was used.

RESULTS

Channel	Frequency (MHz)	Analyzer Reading (dBm)	10log(3kHz/100kHz) (dB)	PSD (dBm)	Limit (dBm)	Margin (dB)
Low	5755	5.65	-15.2	-9.55	8	-17.55
High	5795	5.65	-15.2	-9.55	8	-17.55

POWER SPECTRAL DENSITY





7.6.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

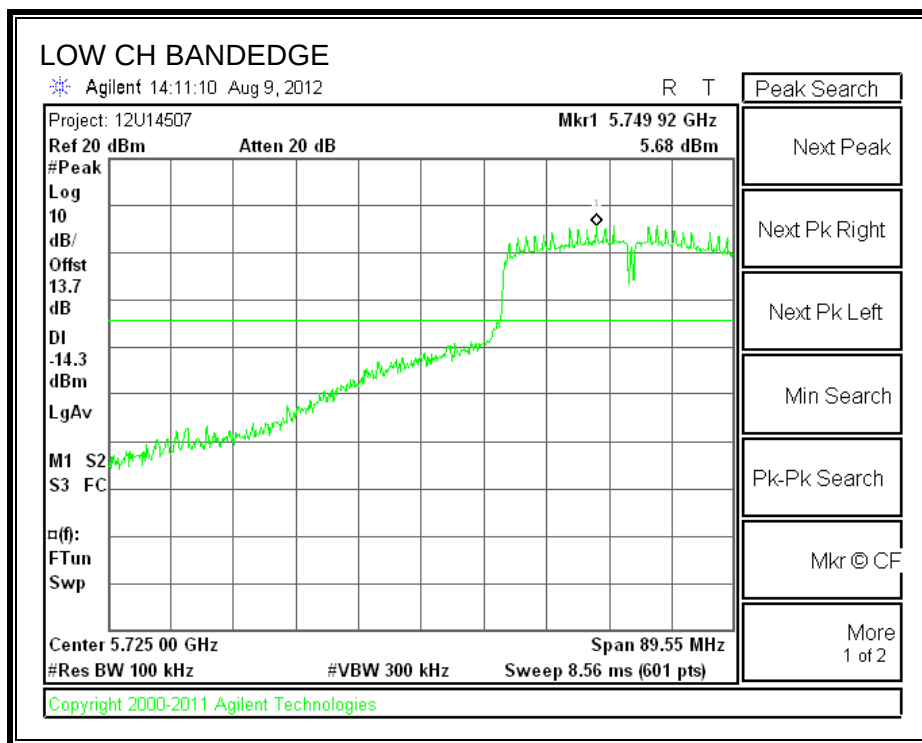
Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

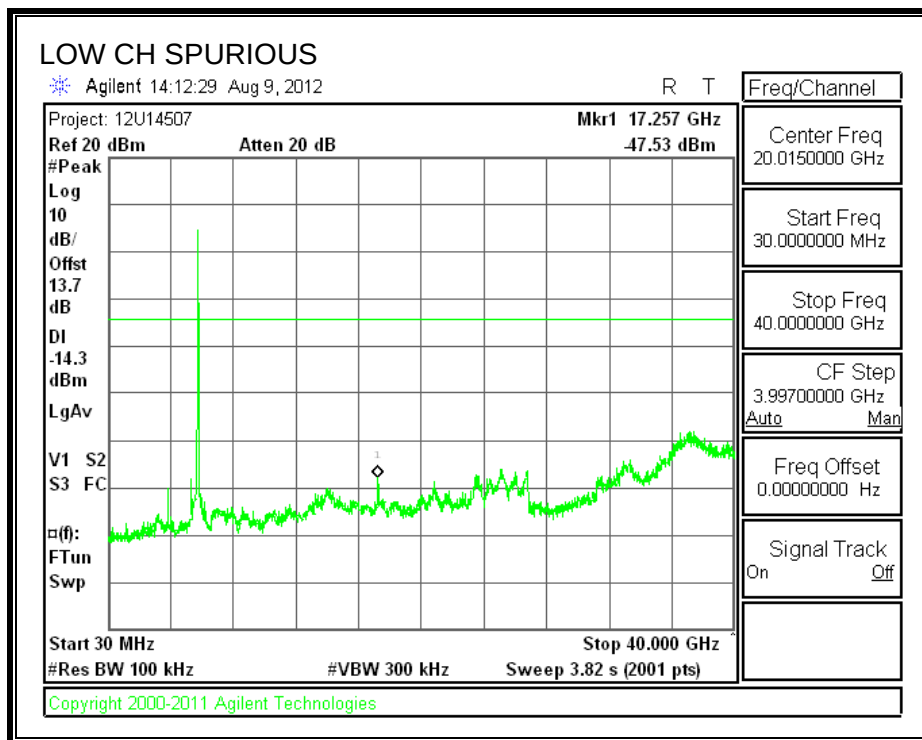
TEST PROCEDURE

KDB 558074 D01 V01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247", dated 01/18/2012.

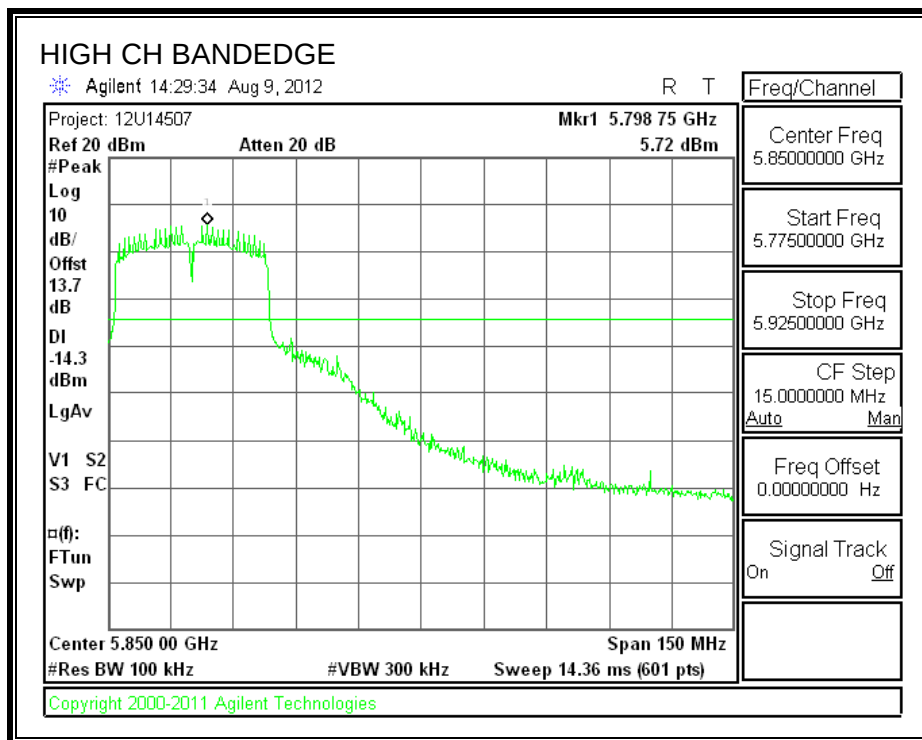
RESULTS

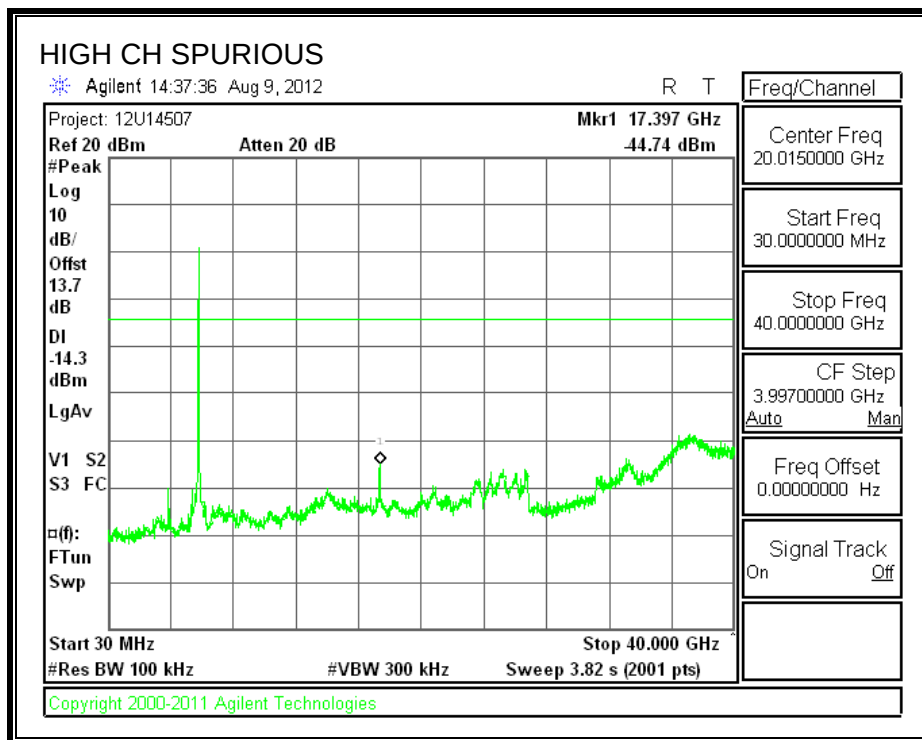
SPURIOUS EMISSIONS, LOW CHANNEL





SPURIOUS EMISSIONS, HIGH CHANNEL





8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

Frequency Range (MHz)	Field Strength Limit ($\mu\text{V/m}$) at 3 m	Field Strength Limit (dB $\mu\text{V/m}$) 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. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. 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, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

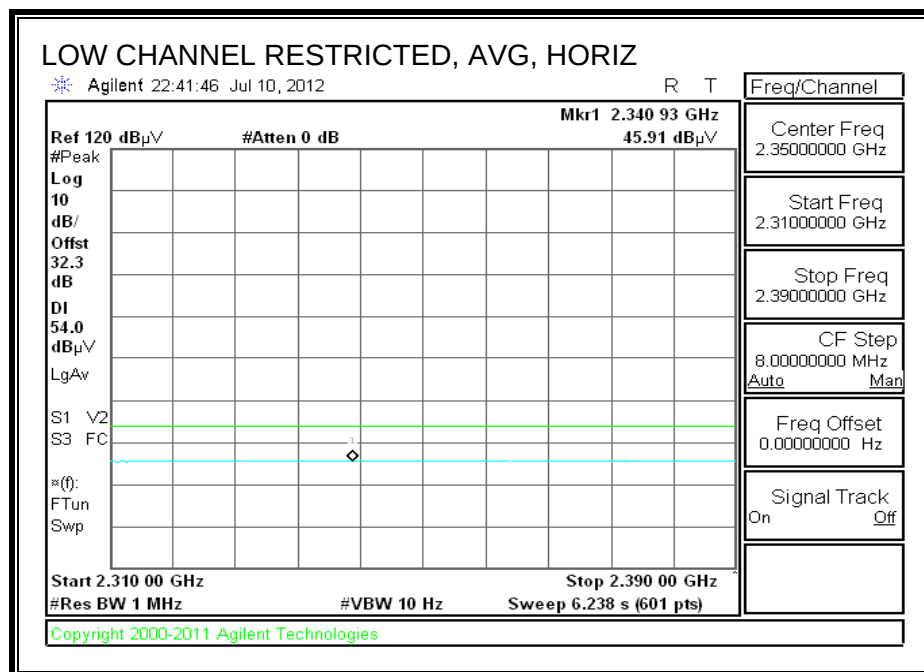
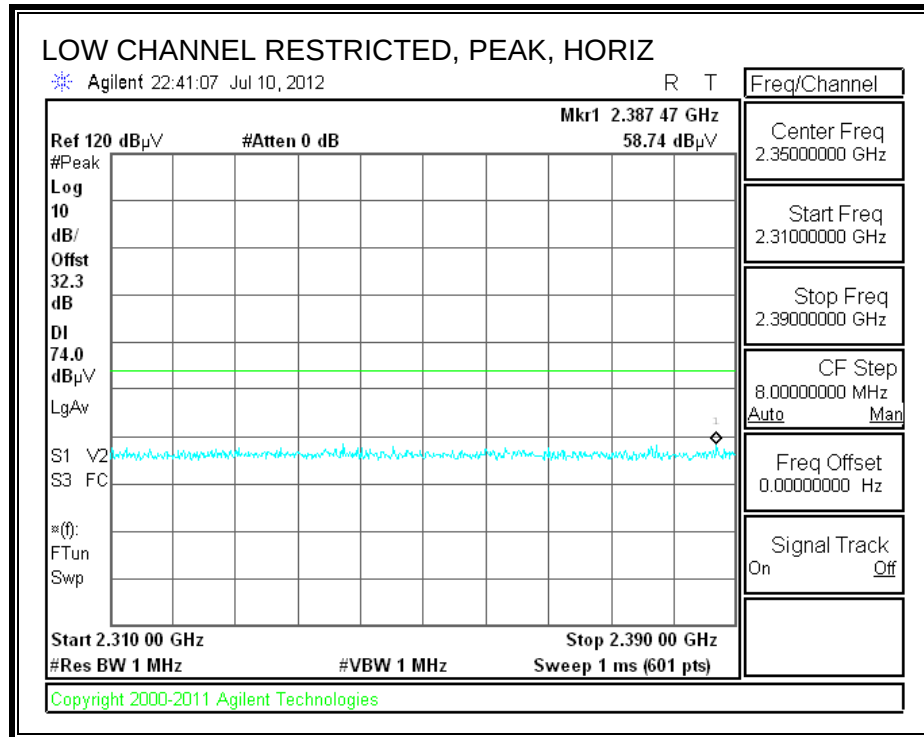
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

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.

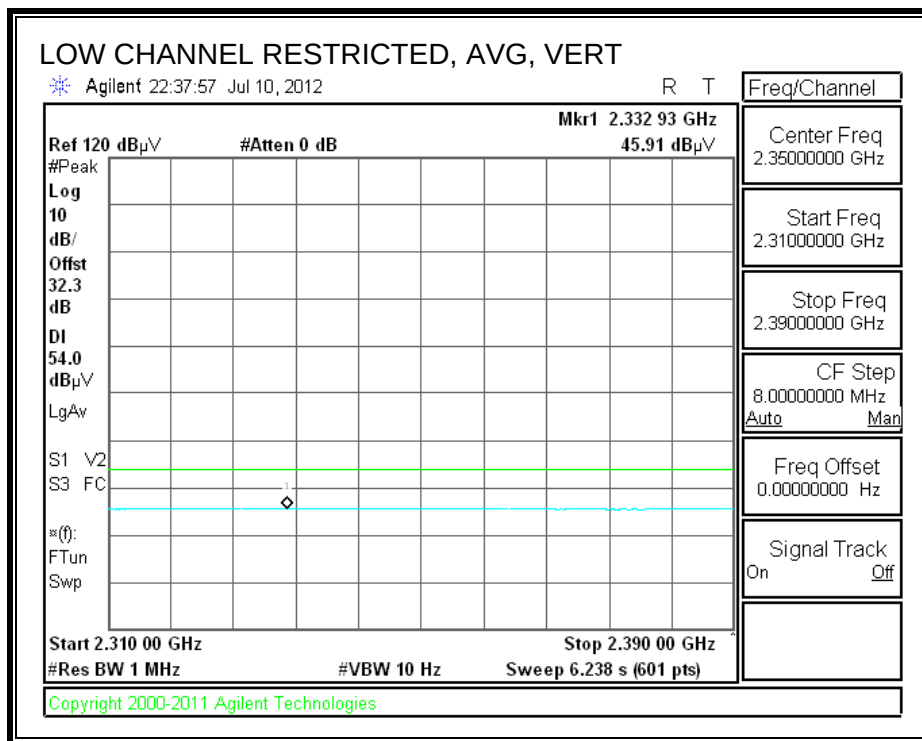
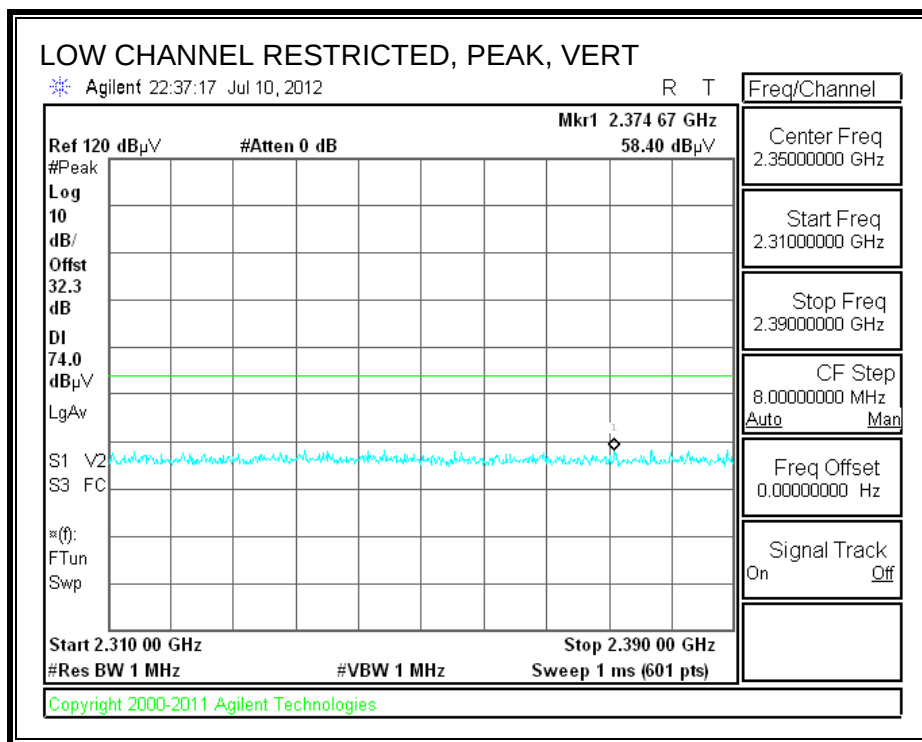
8.2. TRANSMITTER ABOVE 1 GHz

8.2.1. TX ABOVE 1 GHz, 802.11b 1TX MODE, 2.4 GHz BAND

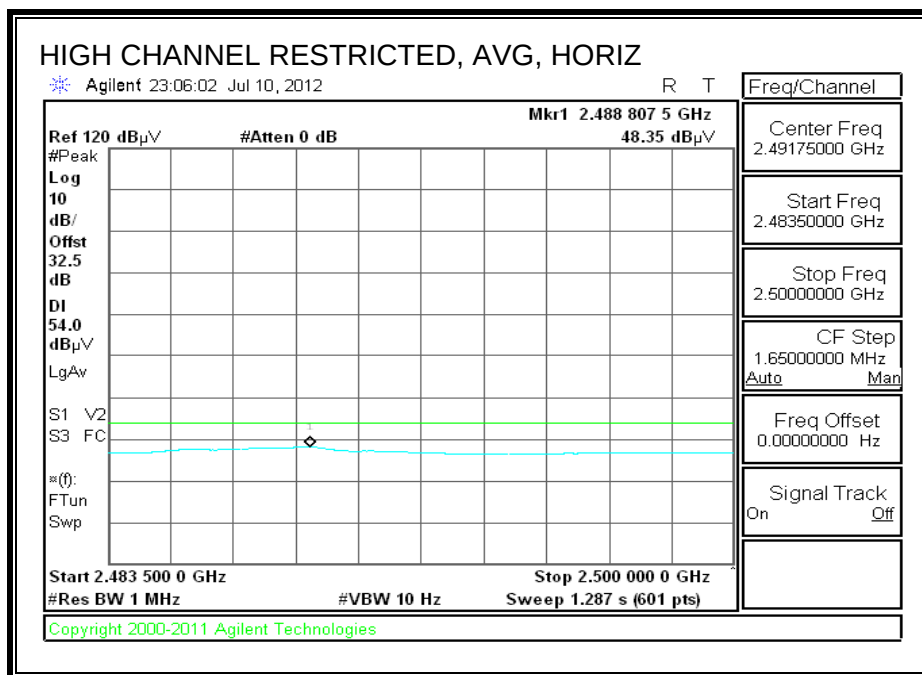
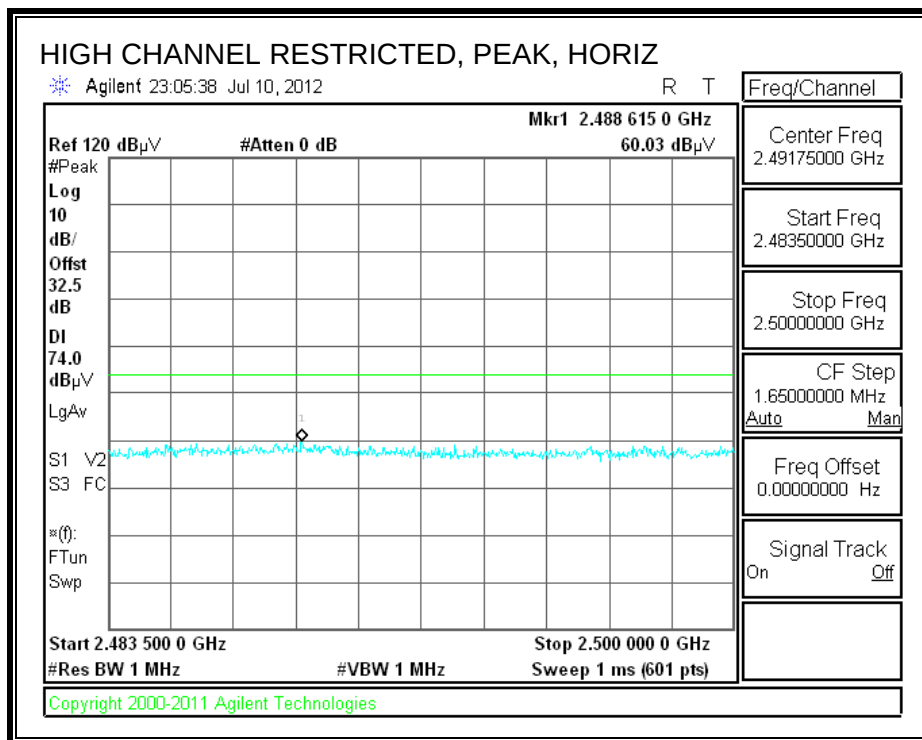
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



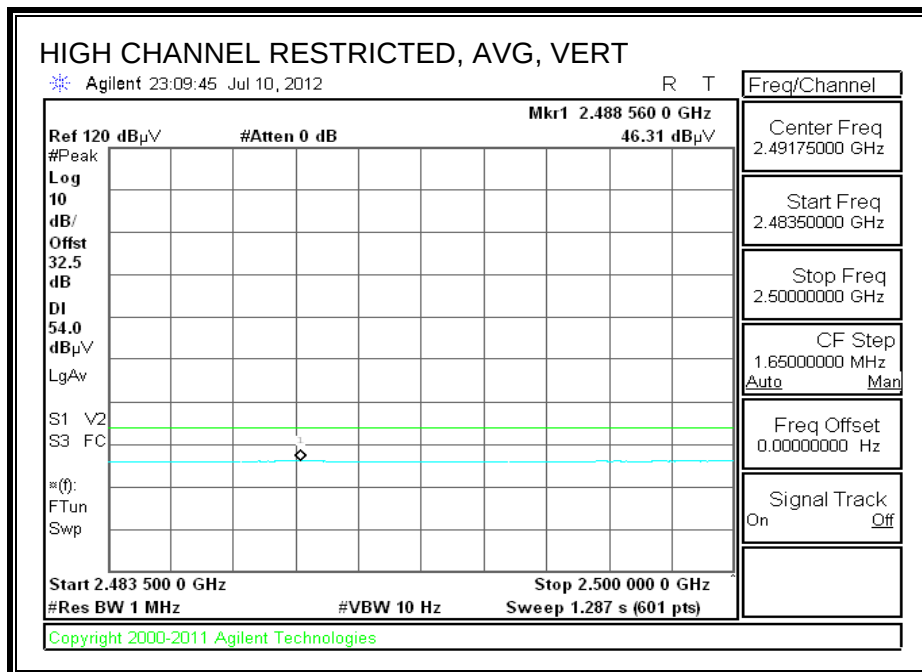
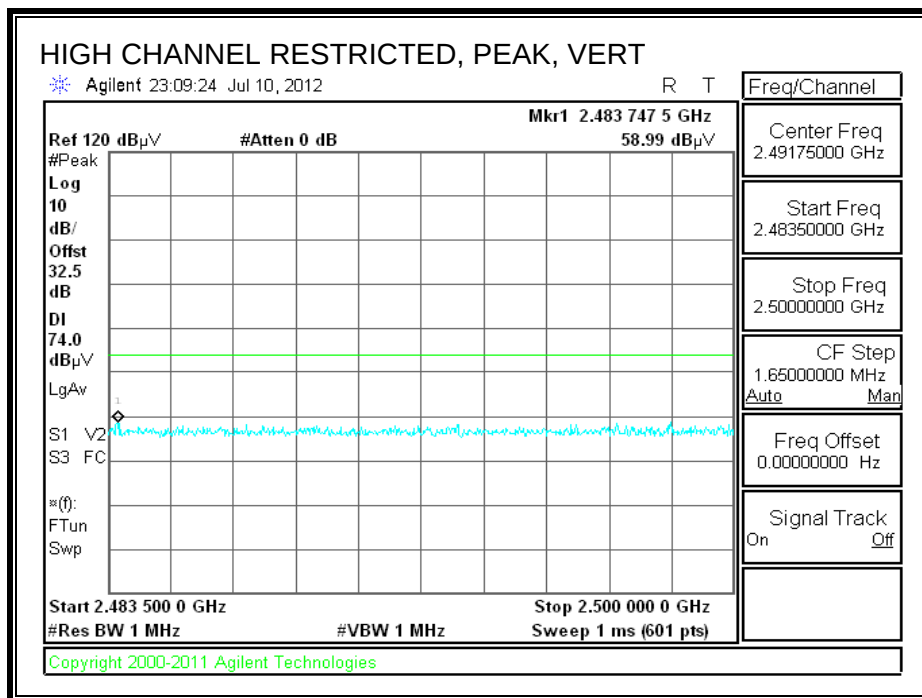
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement **Compliance Certification Services, Fremont 5m Chamber**

Test Engr: Chin Pang
Date: 08/04/12
Project #: 12U14507
Company: Apple
Test Target: FCC 15.247
Mode Oper: b mode, TX

f	Measurement Frequency	Amp	Preamp Gain	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter	

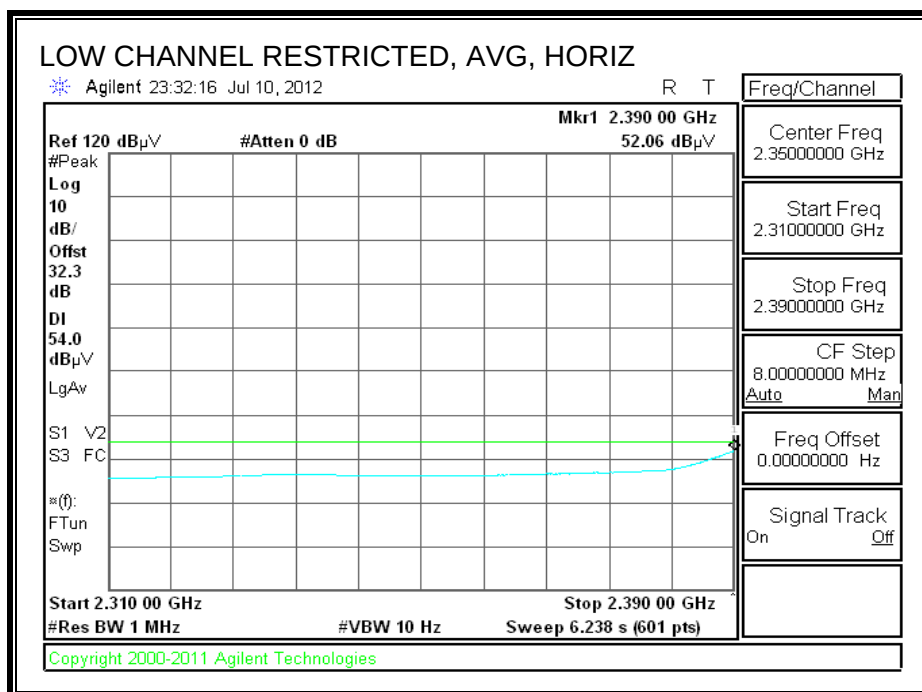
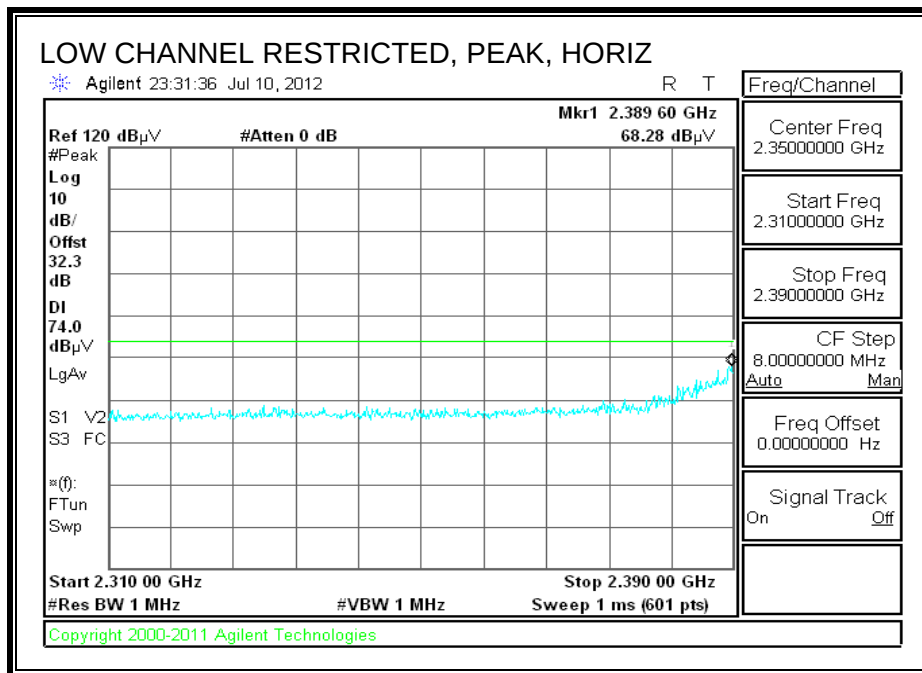
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
Low Ch, 2412MHz													
4.824	3.0	38.5	33.4	6.3	-35.5	0.0	0.0	42.7	74.0	-31.3	H	P	
4.824	3.0	26.2	33.4	6.3	-35.5	0.0	0.0	30.4	54.0	-23.6	H	A	
4.824	3.0	37.8	33.4	6.3	-35.5	0.0	0.0	42.0	74.0	-32.0	V	P	
4.824	3.0	27.0	33.4	6.3	-35.5	0.0	0.0	31.2	54.0	-22.8	V	A	
Mid Ch, 2437MHz													
4.874	3.0	37.1	33.5	6.3	-35.5	0.0	0.0	41.4	74.0	-32.6	H	P	
4.874	3.0	24.9	33.5	6.3	-35.5	0.0	0.0	29.2	54.0	-24.8	H	A	
7.311	3.0	37.0	35.7	8.5	-35.4	0.0	0.0	45.8	74.0	-28.2	H	P	
7.311	3.0	25.0	35.7	8.5	-35.4	0.0	0.0	33.8	54.0	-20.2	H	A	
4.874	3.0	37.3	33.5	6.3	-35.5	0.0	0.0	41.6	74.0	-32.4	V	P	
4.874	3.0	25.2	33.5	6.3	-35.5	0.0	0.0	29.5	54.0	-24.5	V	A	
7.311	3.0	38.0	35.7	8.5	-35.4	0.0	0.0	46.8	74.0	-27.2	V	P	
7.311	3.0	26.0	35.7	8.5	-35.4	0.0	0.0	34.8	54.0	-19.2	V	A	
High Ch, 2462MHz													
4.924	3.0	37.7	33.5	6.3	-35.5	0.0	0.0	42.1	74.0	-31.9	H	P	
4.924	3.0	25.2	33.5	6.3	-35.5	0.0	0.0	29.6	54.0	-24.4	H	A	
7.386	3.0	37.0	35.8	8.5	-35.5	0.0	0.0	45.9	74.0	-28.1	H	P	
7.386	3.0	25.3	35.8	8.5	-35.5	0.0	0.0	34.2	54.0	-19.8	H	A	
4.924	3.0	37.6	33.5	6.3	-35.5	0.0	0.0	42.0	74.0	-32.0	V	P	
4.924	3.0	25.0	33.5	6.3	-35.5	0.0	0.0	29.4	54.0	-24.6	V	A	
7.386	3.0	37.4	35.8	8.5	-35.5	0.0	0.0	46.3	74.0	-27.7	V	P	
7.386	3.0	26.5	35.8	8.5	-35.5	0.0	0.0	35.4	54.0	-18.6	V	A	

Rev. 4.1.2.7

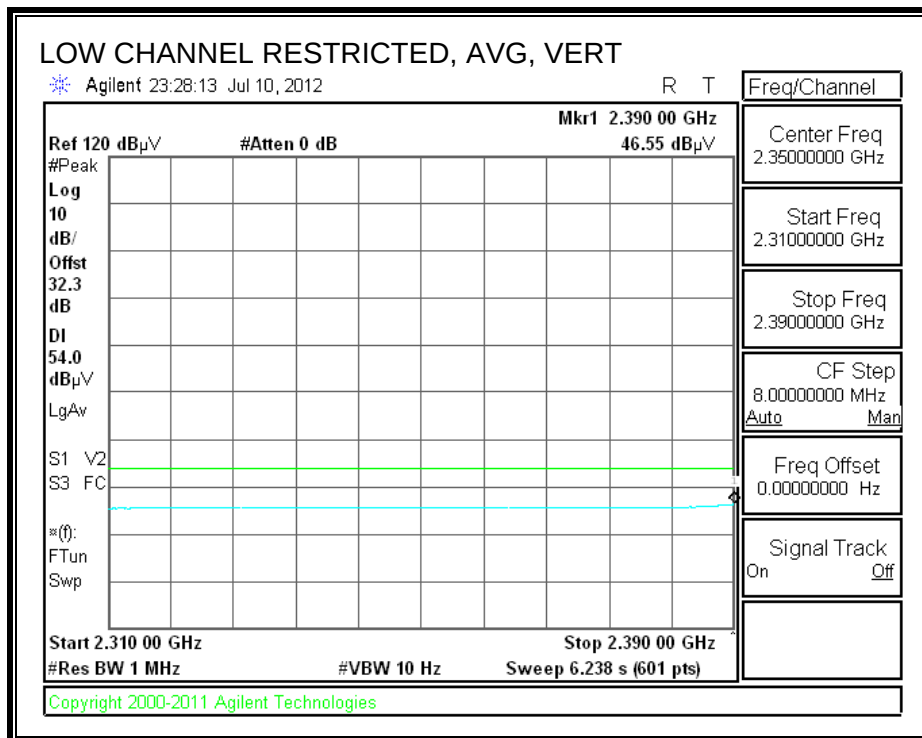
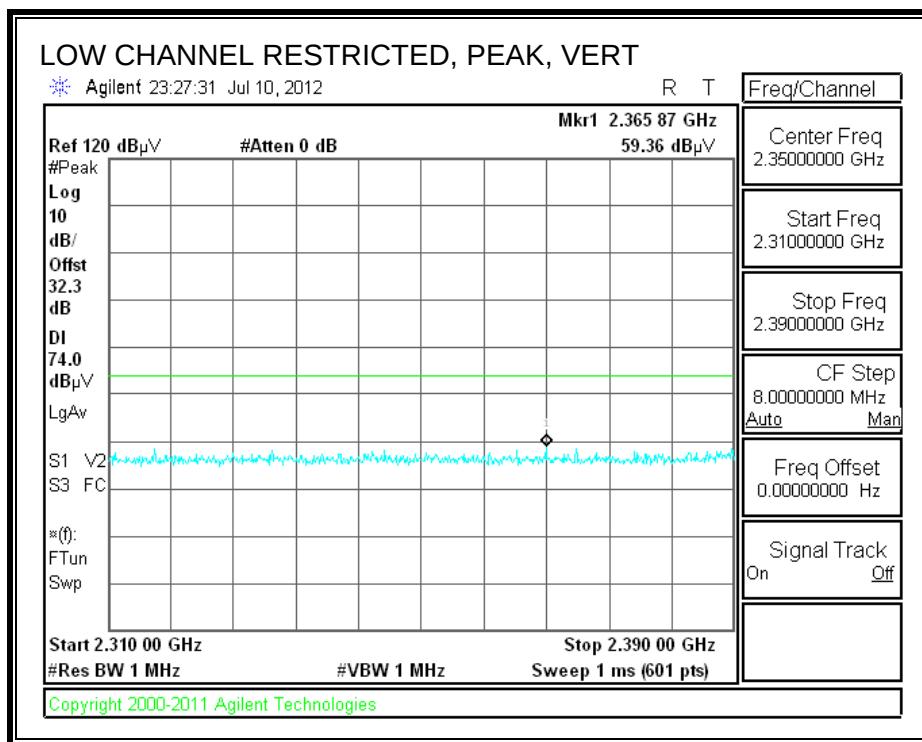
Note: No other emissions were detected above the system noise floor.

8.2.2. TX ABOVE 1 GHz, 802.11g 1TX MODE, 2.4 GHz BAND

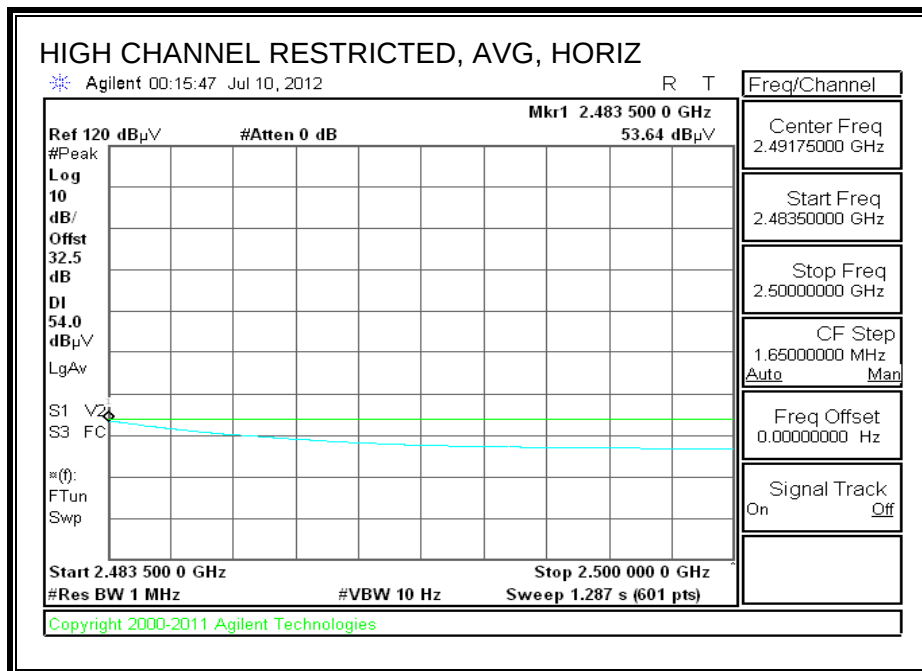
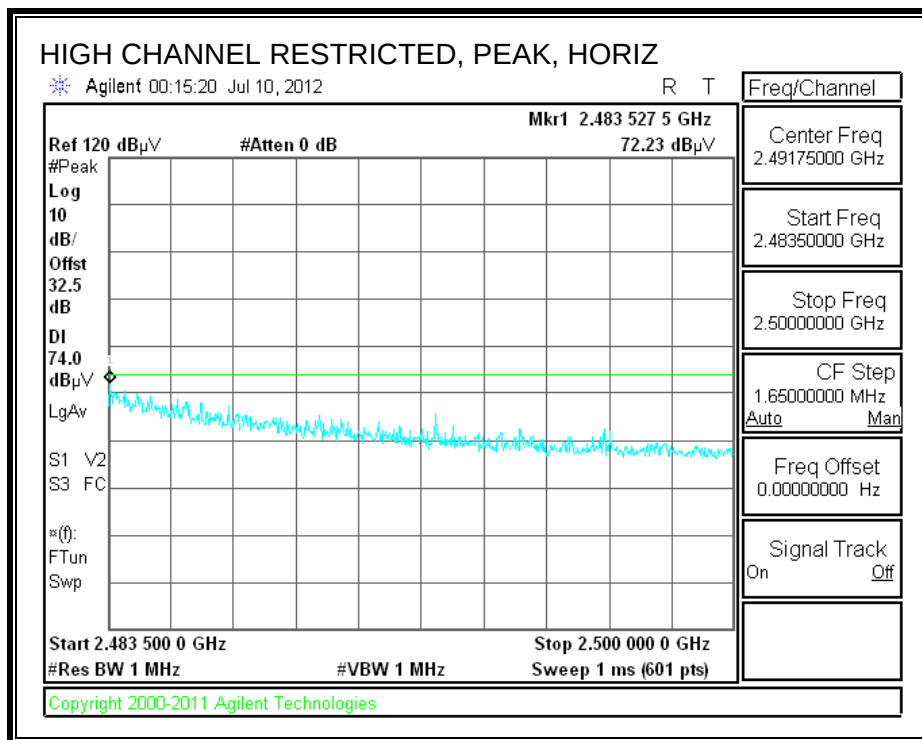
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



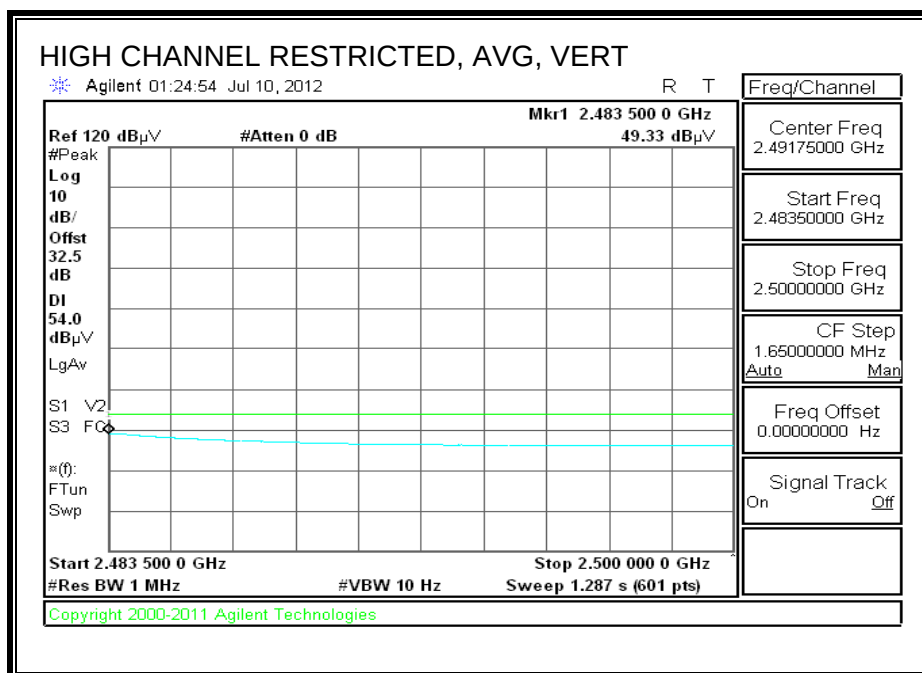
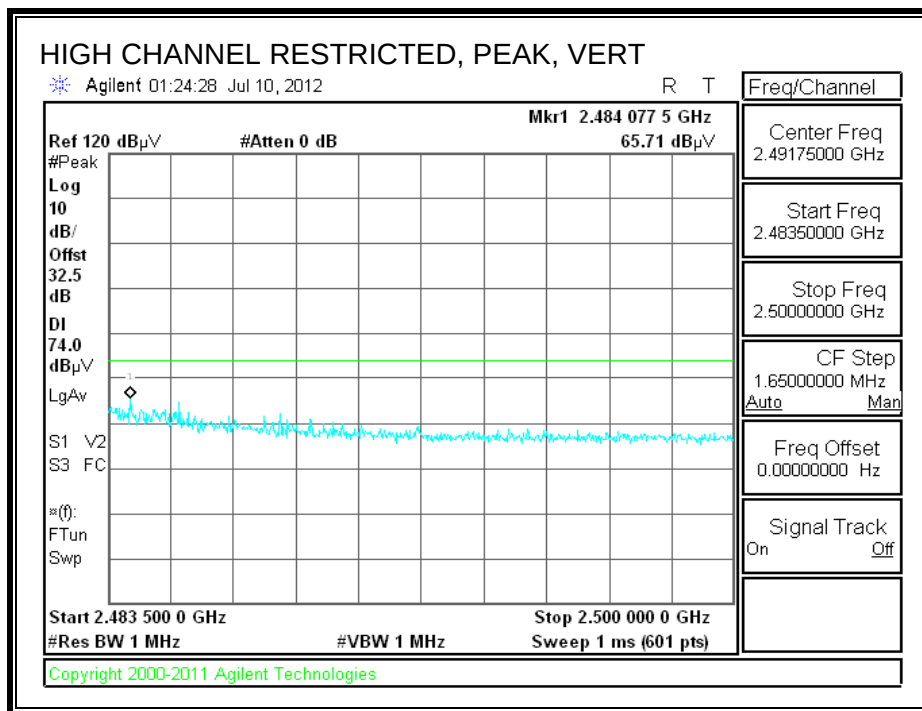
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

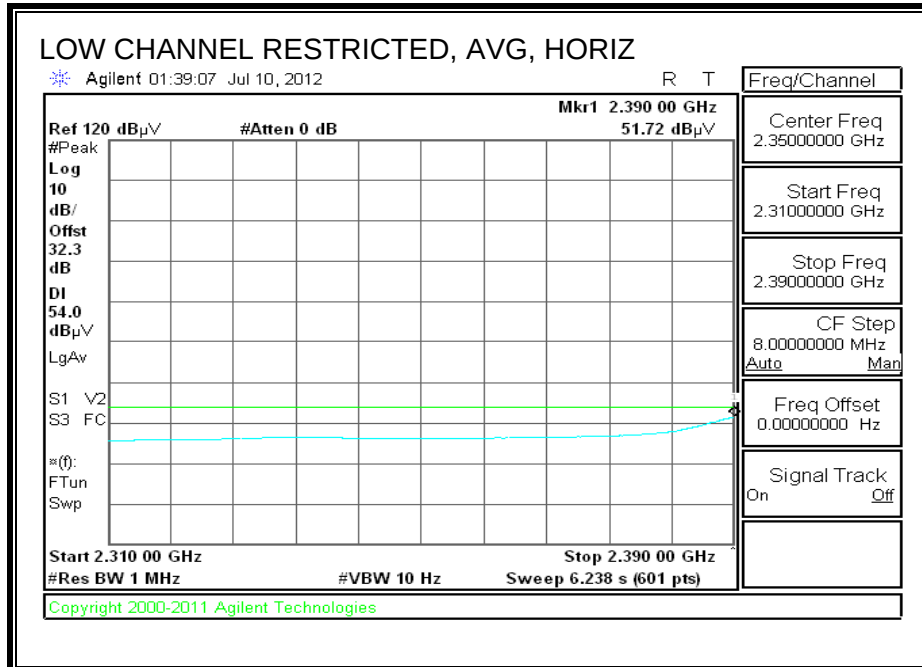
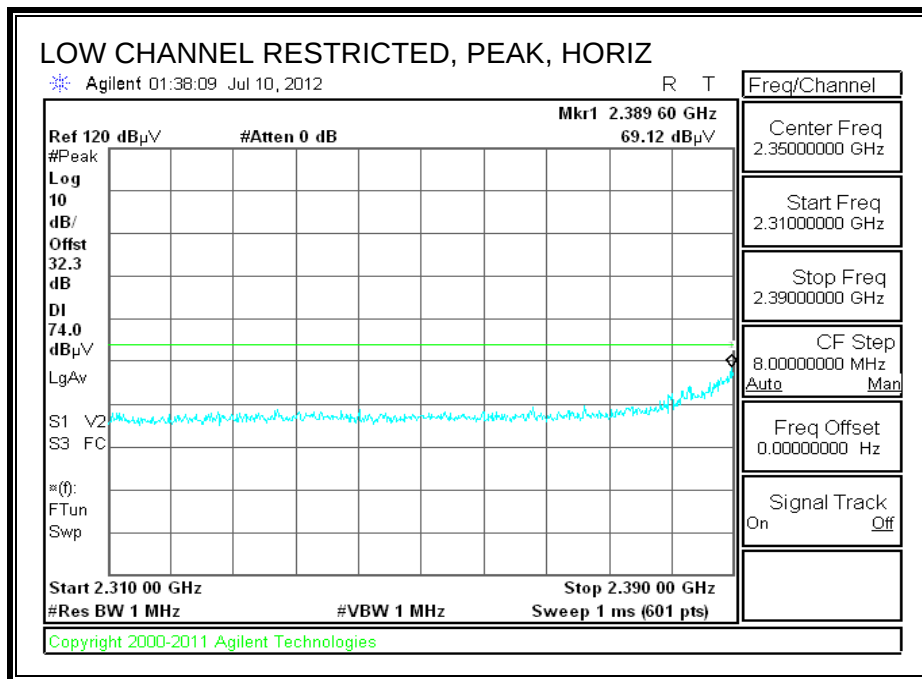


RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

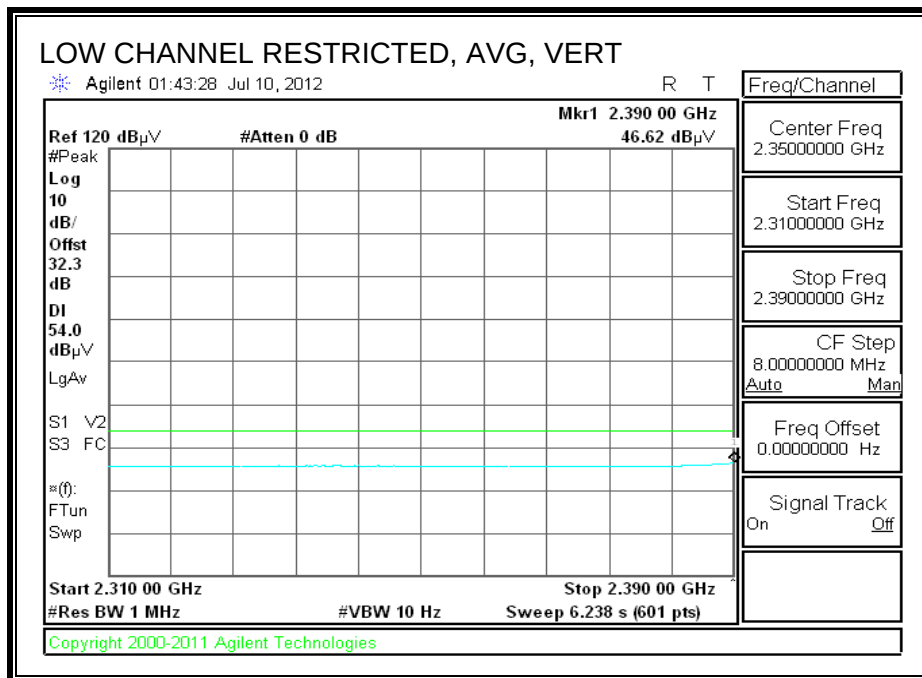
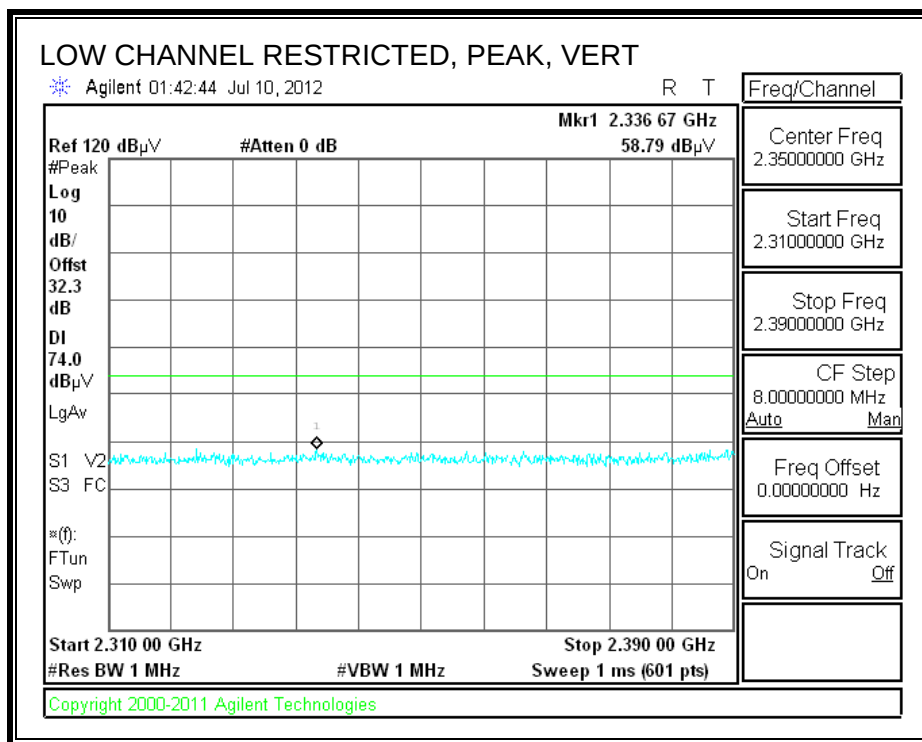


8.2.3. TX ABOVE 1 GHz, 802.11n HT20 1TX MODE, 2.4 GHz BAND

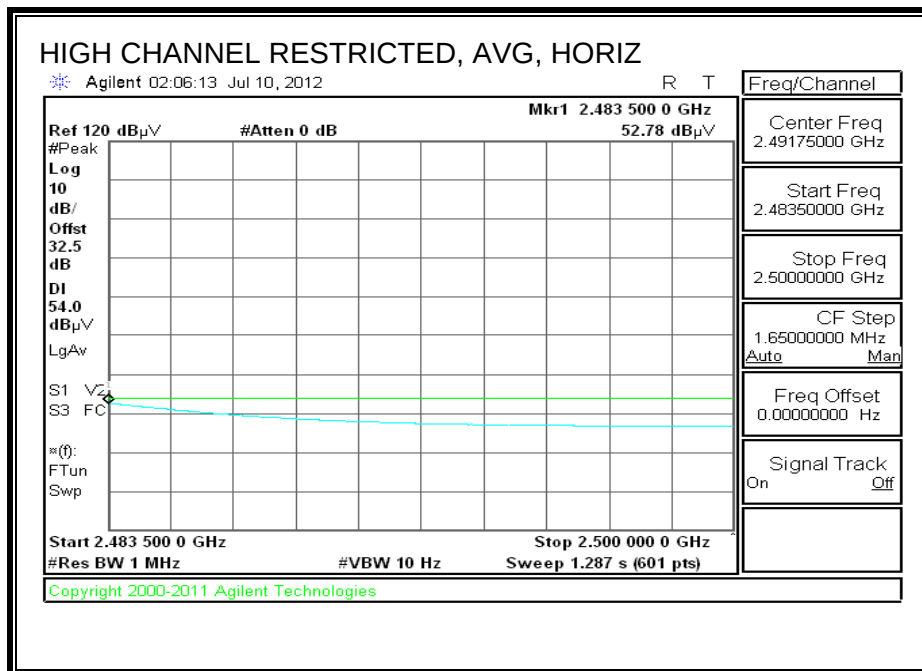
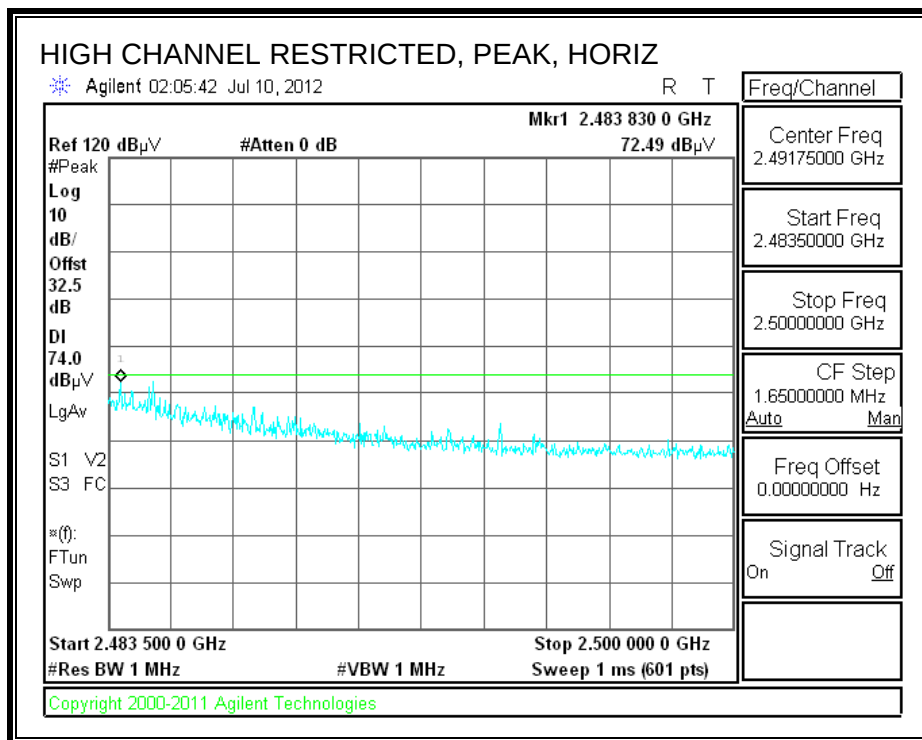
RESTRICTED BANEDGE (LOW CHANNEL, HORIZONTAL)



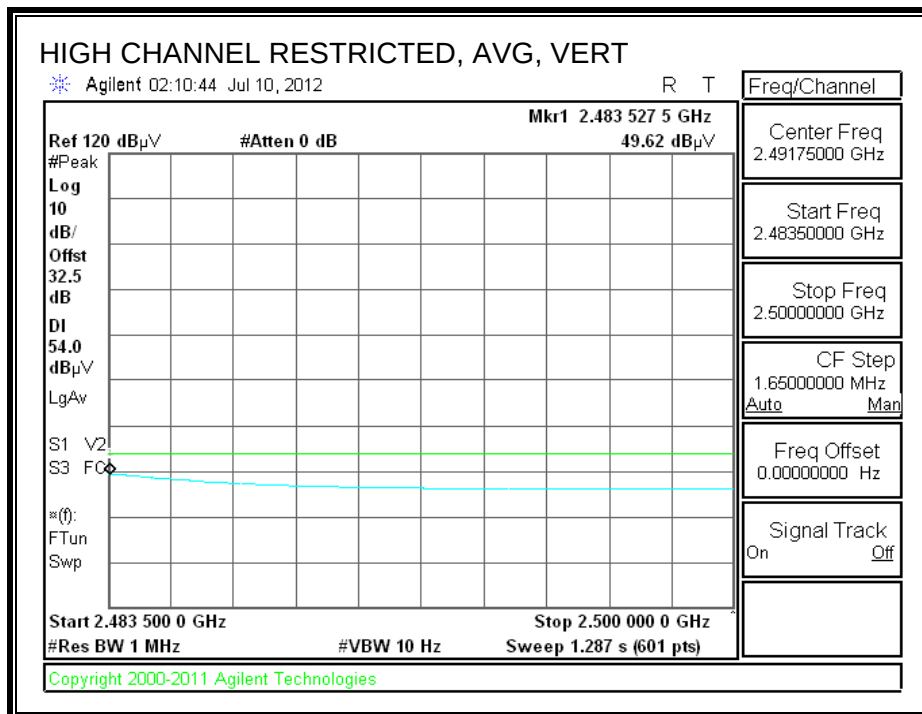
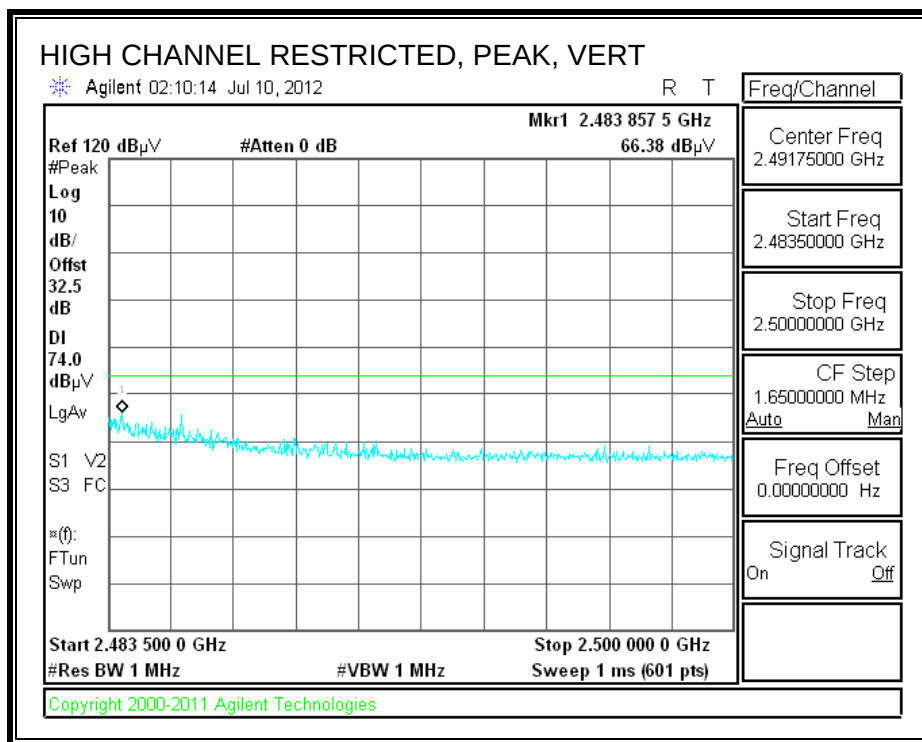
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement

Compliance Certification Services, Fremont 5m Chamber

Test Engr: Chin Pang
Date: 08/04/12
Project #: 12U14507
Company: Apple
Test Target: FCC 15.247
Mode Oper: HT20, TX

f	Measurement Frequency	Amp	Preamplifier Gain	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter	

f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
Low Ch, 2412MHz													
4.824	3.0	42.0	33.4	6.3	-35.5	0.0	0.0	46.2	74.0	-27.8	V	P	
4.824	3.0	27.3	33.4	6.3	-35.5	0.0	0.0	31.5	54.0	-22.5	V	A	
4.824	3.0	43.2	33.4	6.3	-35.5	0.0	0.0	47.4	74.0	-26.6	H	P	
4.824	3.0	28.0	33.4	6.3	-35.5	0.0	0.0	32.2	54.0	-21.8	H	A	
Mid Ch, 2437MHz													
4.874	3.0	42.5	33.5	6.3	-35.5	0.0	0.0	46.8	74.0	-27.2	V	P	
4.874	3.0	27.5	33.5	6.3	-35.5	0.0	0.0	31.8	54.0	-22.2	V	A	
7.311	3.0	41.0	35.7	8.5	-35.4	0.0	0.0	49.8	74.0	-24.2	V	P	
7.311	3.0	25.0	35.7	8.5	-35.4	0.0	0.0	33.8	54.0	-20.2	V	A	
4.874	3.0	43.0	33.5	6.3	-35.5	0.0	0.0	47.3	74.0	-26.7	H	P	
4.874	3.0	28.0	33.5	6.3	-35.5	0.0	0.0	32.3	54.0	-21.7	H	A	
7.311	3.0	42.0	35.7	8.5	-35.4	0.0	0.0	50.8	74.0	-23.2	H	P	
7.311	3.0	24.6	35.7	8.5	-35.4	0.0	0.0	33.4	54.0	-20.6	H	A	
High Ch, 2462MHz													
4.924	3.0	42.0	33.5	6.3	-35.5	0.0	0.0	46.4	74.0	-27.6	V	P	
4.924	3.0	28.0	33.5	6.3	-35.5	0.0	0.0	32.4	54.0	-21.6	V	A	
7.386	3.0	42.0	35.8	8.5	-35.5	0.0	0.0	50.9	74.0	-23.1	V	P	
7.386	3.0	24.5	35.8	8.5	-35.5	0.0	0.0	33.4	54.0	-20.6	V	A	
4.924	3.0	43.5	33.5	6.3	-35.5	0.0	0.0	47.9	74.0	-26.1	H	P	
4.924	3.0	28.4	33.5	6.3	-35.5	0.0	0.0	32.8	54.0	-21.2	H	A	
4.924	3.0	43.0	33.5	6.3	-35.5	0.0	0.0	47.4	74.0	-26.6	H	P	
4.924	3.0	28.5	33.5	6.3	-35.5	0.0	0.0	32.9	54.0	-21.1	H	A	
7.386	3.0	43.2	35.8	8.5	-35.5	0.0	0.0	52.1	74.0	-21.9	H	P	
7.386	3.0	24.2	35.8	8.5	-35.5	0.0	0.0	33.1	54.0	-20.9	H	A	

Rev. 4.1.2.7

Note: No other emissions were detected above the system noise floor.

8.2.4. TX ABOVE 1 GHz, 802.11a 1TX MODE, 5.8 GHz BAND

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement													
Compliance Certification Services, Fremont 5m Chamber													
Test Engr:		Chin Pang											
Date:		08/04/12											
Project #:		12U14507											
Company:		Apple											
Test Target:		FCC 15.247											
Mode Oper:		a mode, 5.8GHz, TX											
f	Measurement Frequency		Amp	Preamp Gain		Average Field Strength Limit							
Dist	Distance to Antenna		D Corr	Distance Correct to 3 meters		Peak Field Strength Limit							
Read	Analyzer Reading		Avg	Average Field Strength @ 3 m		Margin vs. Average Limit							
AF	Antenna Factor		Peak	Calculated Peak Field Strength		Margin vs. Peak Limit							
CL	Cable Loss		HPF	High Pass Filter									
f	Dist	Read	AF	CL	Amp	D Corr	Filtr	Corr.	Limit	Margin	Ant. Pol.	Det.	Notes
GHz	(m)	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dB	V/H	P/A/QP	
Low Ch, 5745MHz													
11.490	3.0	35.2	38.8	10.5	-35.5	0.0	0.7	49.7	74.0	-24.3	V	P	
11.490	3.0	22.3	38.8	10.5	-35.5	0.0	0.7	36.8	54.0	-17.2	V	A	
11.490	3.0	34.2	38.8	10.5	-35.5	0.0	0.7	48.7	74.0	-25.3	H	P	
11.490	3.0	22.3	38.8	10.5	-35.5	0.0	0.7	36.8	54.0	-17.2	H	A	
Mid Ch, 5785MHz													
11.570	3.0	34.9	38.9	10.6	-35.5	0.0	0.7	49.6	74.0	-24.4	V	P	
11.570	3.0	24.5	38.9	10.6	-35.5	0.0	0.7	39.2	54.0	-14.8	V	A	
11.570	3.0	35.0	38.9	10.6	-35.5	0.0	0.7	49.7	74.0	-24.3	H	P	
11.570	3.0	24.5	38.9	10.6	-35.5	0.0	0.7	39.2	54.0	-14.8	H	A	
High Ch, 5825MHz													
11.650	3.0	35.1	39.0	10.7	-35.5	0.0	0.7	50.0	74.0	-24.0	V	P	
11.650	3.0	22.3	39.0	10.7	-35.5	0.0	0.7	37.2	54.0	-16.8	V	A	
11.650	3.0	35.1	39.0	10.7	-35.5	0.0	0.7	50.0	74.0	-24.0	H	P	
11.650	3.0	24.8	39.0	10.7	-35.5	0.0	0.7	39.7	54.0	-14.3	H	A	
Rev. 4.1.2.7													
Note: No other emissions were detected above the system noise floor.													

8.2.5. TX ABOVE 1 GHz, 802.11n HT20 1TX MODE, 5.8 GHz BAND

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement

Compliance Certification Services, Fremont 5m Chamber

Test Engr: Chin Pang
Date: 08/04/12
Project #: 12U14507
Company: Apple
Test Target: FCC 15.247
Mode Oper: HT20, 5.8GHz, TX

f	Measurement Frequency	Amp	Preamp Gain	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter	

f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
Low Ch, 5745MHz													
11.490	3.0	37.0	38.8	10.5	-35.5	0.0	0.7	51.5	74.0	-22.5	H	P	
11.490	3.0	24.0	38.8	10.5	-35.5	0.0	0.7	38.5	54.0	-15.5	H	A	
11.490	3.0	36.0	38.8	10.5	-35.5	0.0	0.7	50.5	74.0	-23.5	V	P	
11.490	3.0	23.0	38.8	10.5	-35.5	0.0	0.7	37.5	54.0	-16.5	V	A	
Mid Ch, 5785MHz													
11.570	3.0	37.4	38.9	10.6	-35.5	0.0	0.7	52.1	74.0	-21.9	H	P	
11.570	3.0	25.0	38.9	10.6	-35.5	0.0	0.7	39.7	54.0	-14.3	H	A	
11.570	3.0	36.0	38.9	10.6	-35.5	0.0	0.7	50.7	74.0	-23.3	V	P	
11.570	3.0	24.0	38.9	10.6	-35.5	0.0	0.7	38.7	54.0	-15.3	V	A	
High Ch, 5825MHz													
11.650	3.0	34.9	39.0	10.7	-32.7	0.0	0.7	52.6	74.0	-21.4	H	P	
11.650	3.0	21.9	39.0	10.7	-32.7	0.0	0.7	39.6	54.0	-14.4	H	A	
11.650	3.0	35.0	39.0	10.7	-32.7	0.0	0.7	52.7	74.0	-21.3	V	P	
11.650	3.0	21.9	39.0	10.7	-32.7	0.0	0.7	39.6	54.0	-14.4	V	A	

Rev. 4.1.2.7

Note: No other emissions were detected above the system noise floor.

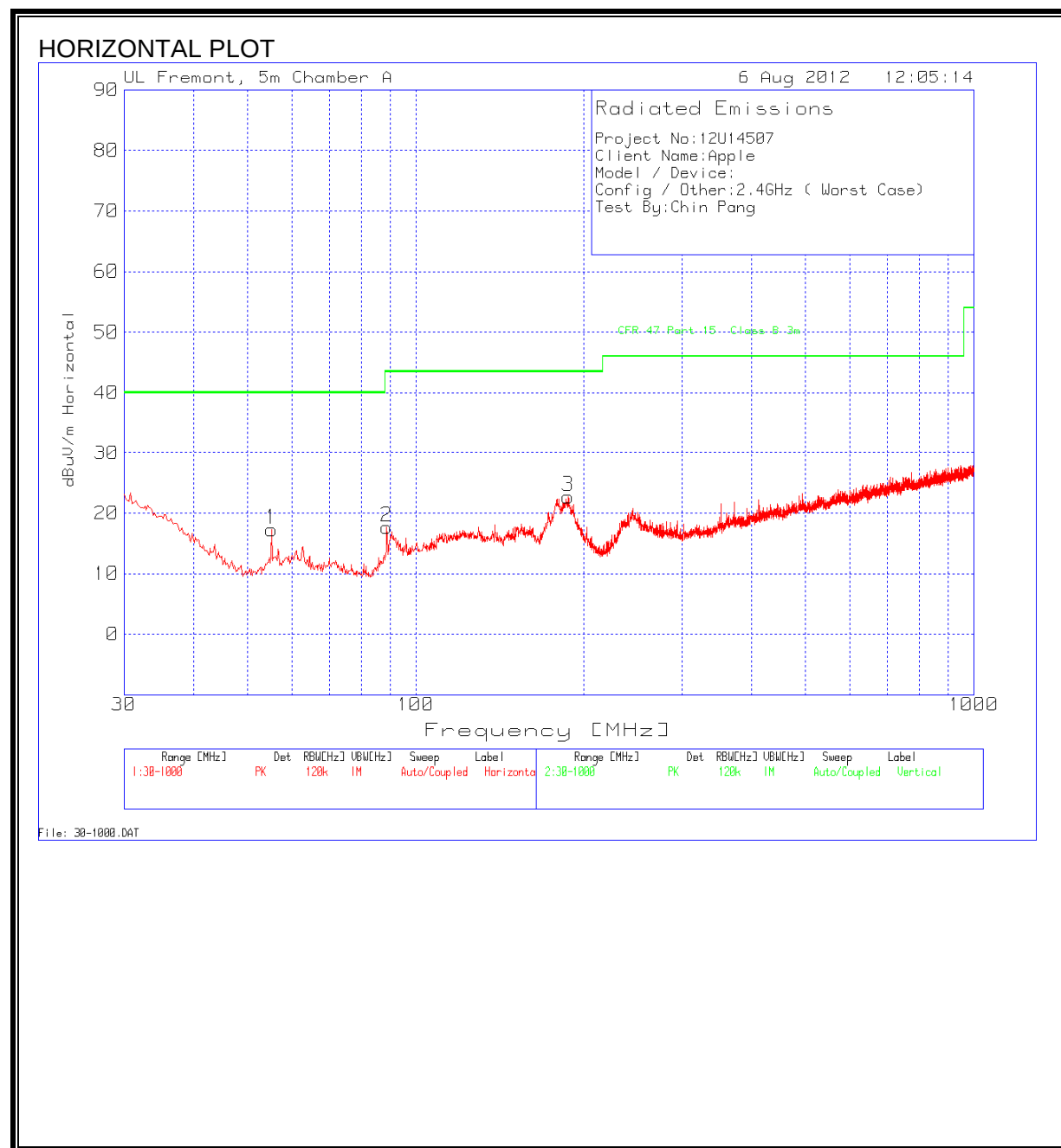
8.2.6. TX ABOVE 1 GHz, 802.11n HT40 1TX MODE, 5.8 GHz BAND

HARMONICS AND SPURIOUS EMISSIONS

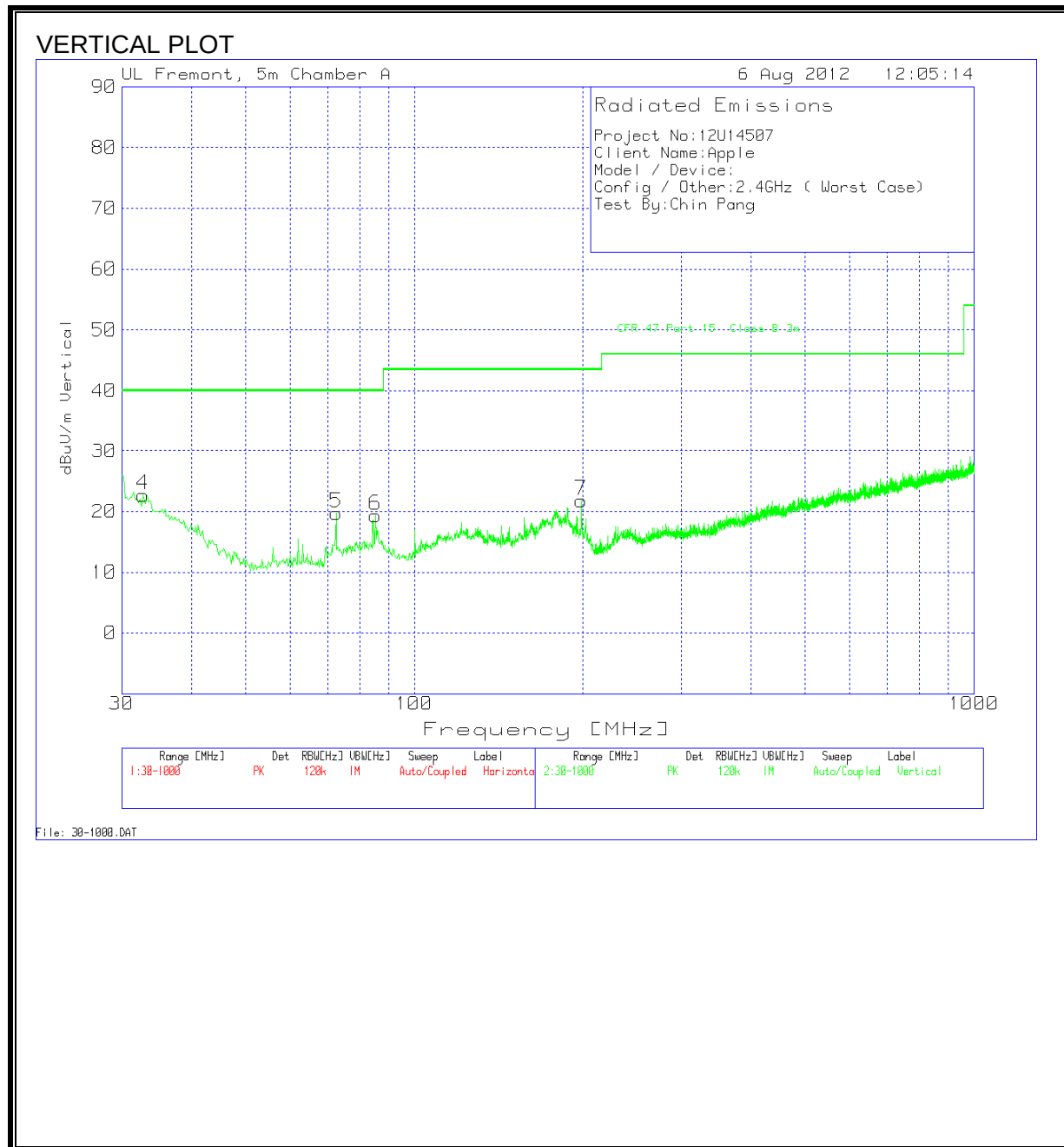
High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber													
Test Engr:		Chin Pang											
Date:		08/06/12											
Project #:		12U14507											
Company:		Apple											
Test Target:		FCC 15.247											
Mode Oper:		TX, 5.8GHz HT40											
f	Measurement Frequency		Amp	Preamp Gain		Average Field Strength Limit							
Dist	Distance to Antenna		D Corr	Distance Correct to 3 meters		Peak Field Strength Limit							
Read	Analyzer Reading		Avg	Average Field Strength @ 3 m		Margin vs. Average Limit							
AF	Antenna Factor		Peak	Calculated Peak Field Strength		Margin vs. Peak Limit							
CL	Cable Loss		HPF	High Pass Filter									
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
Low Ch, 5755MHz													
11.510	3.0	34.4	38.8	10.6	-32.8	0.0	0.7	51.7	74.0	-22.3	V	P	
11.510	3.0	21.9	38.8	10.6	-32.8	0.0	0.7	39.1	54.0	-14.9	V	A	
11.510	3.0	34.2	38.8	10.6	-32.8	0.0	0.7	51.4	74.0	-22.6	H	P	
11.510	3.0	21.9	38.8	10.6	-32.8	0.0	0.7	39.1	54.0	-14.9	H	A	
High Ch, 5795MHz													
11.590	3.0	35.0	38.9	10.6	-32.7	0.0	0.7	52.5	74.0	-21.5	V	P	
11.590	3.0	21.7	38.9	10.6	-32.7	0.0	0.7	39.2	54.0	-14.8	V	A	
11.590	3.0	35.0	38.9	10.6	-32.7	0.0	0.7	52.5	74.0	-21.5	H	P	
11.590	3.0	21.8	38.9	10.6	-32.7	0.0	0.7	39.3	54.0	-14.7	H	A	
Rev. 4.1.2.7													
Note: No other emissions were detected above the system noise floor.													

8.3. WORST-CASE BELOW 1 GHz

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



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



DATA

Project No:12U14507								
Client Name:Apple								
Model / Device:								
Config / Other:2.4GHz (Worst Case)								
Test By:Chin Pang								
Horizontal 30 - 1000MHz								
Frequency	Reading	Detector	25MHz-1GHz	T243 Sunol	dBuV/m	CFR 47 Part 15B	Margin	Polarity
55.1998	37.52	PK	-27.3	7.1	17.32	40	-22.68	Horz
88.735	37.16	PK	-27	7.5	17.66	43.5	-25.84	Horz
187.7898	37.65	PK	-26.3	11.3	22.65	43.5	-20.85	Horz
Vertical 30 - 1000MHz								
Frequency	Reading	Detector	25MHz-1GHz	T243 Sunol	dBuV/m	CFR 47 Part 15B	Margin	Polarity
32.7138	31.12	PK	-27.6	19.2	22.72	40	-17.28	Vert
72.452	38.7	PK	-27.1	8.1	19.7	40	-20.3	Vert
85.2458	39	PK	-27	7.3	19.3	40	-20.7	Vert
198.8389	35.76	PK	-26.2	12.2	21.76	43.5	-21.74	Vert

9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	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

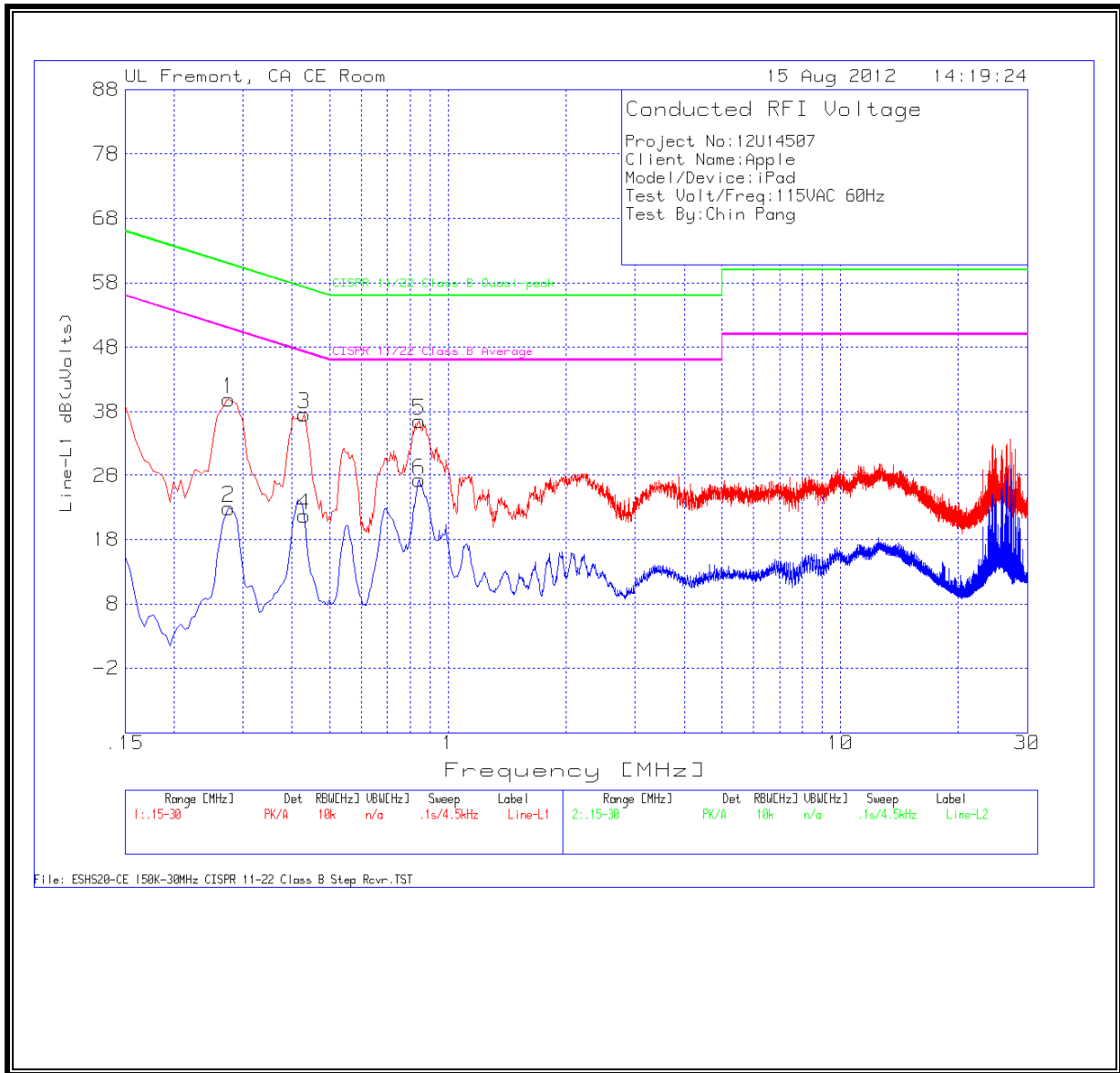
ANSI C63.4

RESULTS

6 WORST EMISSIONS

Project No:12U14507									
Client Name:Apple									
Model/Device:iPad									
Test Volt/Freq:115VAC 60Hz									
Test By:Chin Pang									
Line-L1 .15 - 30MHz									
Frequency	Reading	Detector	T24 IL L1	LC Cables	dB(uVolts	CISPR Class B Q-peak	Margin	CISPR Class B Avg	Margin
0.276	39.77	PK	0.1	0	39.87	60.9	-21.03	-	-
0.276	22.74	Av	0.1	0	22.84	-	-	50.9	-28.06
0.429	37.44	PK	0.1	0	37.54	57.3	-19.76	-	-
0.429	21.62	Av	0.1	0	21.72	-	-	47.3	-25.58
0.843	36.46	PK	0.1	0	36.56	56	-19.44	-	-
0.843	27.17	Av	0.1	0	27.27	-	-	46	-18.73
Line-L2 .15 - 30MHz									
Frequency	Reading	Detector	T24 IL L1	LC Cables	dB(uVolts	CISPR Class B Q-peak	Margin	CISPR Class B Avg	Margin
0.2715	39.87	PK	0.1	0	39.97	61.1	-21.13	-	-
0.2715	19.94	Av	0.1	0	20.04	-	-	51.1	-31.06
0.4065	38.22	PK	0.1	0	38.32	57.7	-19.38	-	-
0.4065	21.22	Av	0.1	0	21.32	-	-	47.7	-26.38
0.87	33.72	PK	0.1	0	33.82	56	-22.18	-	-
0.87	22.15	Av	0.1	0	22.25	-	-	46	-23.75

LINE 1 RESULTS



LINE 2 RESULTS

