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

CERTIFICATION TEST REPORT

FOR

GSM/GPRS/EGPRS/WCDMA/HSPA+/DC-HSDPA/LTE radio, IEEE 802.11a/b/g/n and Bluetooth radio

MODEL NUMBER: A1428 and A1429

FCC ID: BCG-E2599A
IC: 579C-E2599A
IC: 579C-E2610A

REPORT NUMBER: 11U14136-3, Revision B

ISSUE DATE: AUGUST 9, 2012

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

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	07/26/2012	Initial Issue	T. LEE
A	08/07/2012	Added Model A1429	T. LEE
B	08/09/2012	Corrected Average Power	T. LEE

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1. ATTESTATION OF TEST RESULTS

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

EUT DESCRIPTION: cellular GSM/GPRS/EGPRS/WCDMA/HSPA+/DC-HSDPA/LTE radio, IEEE 802.11a/b/g/n and Bluetooth radio.

MODEL: A1428 and A1429

SERIAL NUMBER: C39HV0HPF5P5

DATE TESTED: JULY 10~23, 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:

TIM LEE
STAFF ENGINEER
UL CCS

Tested By:

TOM CHEN
EMC ENGINEER
UL CCS

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, 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:

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

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

Model A1428, is a mobile phone with multimedia functions (music, application support, and video), cellular GSM/GPRS/EGPRS/WCDMA/HSPA+/DC-HSDPA/CDMA1xRTT/ EV-DO Rev 0, A, B /1xAdvanced/ LTE radio, IEEE 802.11a/b/g/n radio and Bluetooth radio. The rechargeable battery is not user accessible.

5.2. 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	21.22	132.43
2412 - 2462	802.11g	26.03	400.87
2412 - 2462	802.11n HT20	26.05	402.72
5745 - 5825	802.11a	23.90	245.47
5746 - 5825	802.11n HT20	23.75	237.14
5747 - 5825	802.11n HT40	24.99	315.50

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a PiFA antenna, with a maximum gain as below table.

Frequency (GHz)	Gain (dBi) Type: Pifa
2.400-2.480	-1.4
5.150-5.250	0.14
5.250-5.350	-1.66
5.47-5.725	-0.83
5725-5850	-2.85

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was WL Tool FW 6.10.56.166

5.5. MODEL DIFFERNECE

Model A1428 is identical to Model A1429 except in the license bands. Model A1429 encompasses CDMA technology. Testing conducted on Model A1428 is considered representative for Model A1429.

5.6. WORST-CASE CONFIGURATION AND MODE

The worst-case channel for RF radiated emissions below 1GHz tests is channel with highest RF output power.

Based on the investigation results, the highest peak power and enhanced data rate is the worst-case scenario for all measurements.

For the fundamental investigation, the EUT is investigated for vertical and horizontal antenna orientations and the worst case was determined to be at X-position.

Based on the manufacturer's attestation that the nominal output power is reduced as the data rate increases, the data rates tested represent the highest power and worst-case with respect to EMC performance.

Worst-case data rates were used:

802.11b mode: 1 Mbps
802.11g mode: 6 Mbps
802.11a mode: 6 Mbps
802.11n HT20mode: MCS0
802.11n HT40mode: MCS0

5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST			
Description	**Manufacturer**	**Model**	**Serial Number**
AC adapter	Apple	A1344	NA
Earphone	Apple	NA	NA

I/O CABLES (Conducted Setup)

I/O Cable List						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	Antenna	1	SMA	Shielded	0.1m	To Spectrum Analyzer

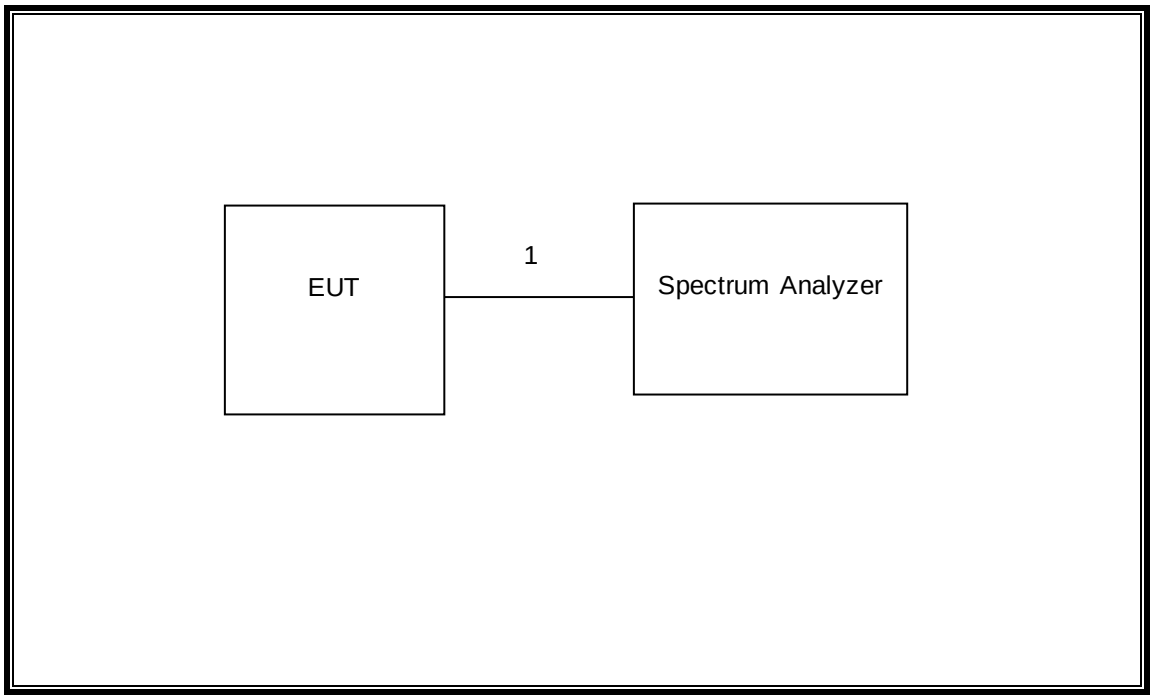
I/O CABLES(Radiated Setup)

I/O CABLE LIST						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	Jack	1	Earphone	Unshielded	0.5m	N/A

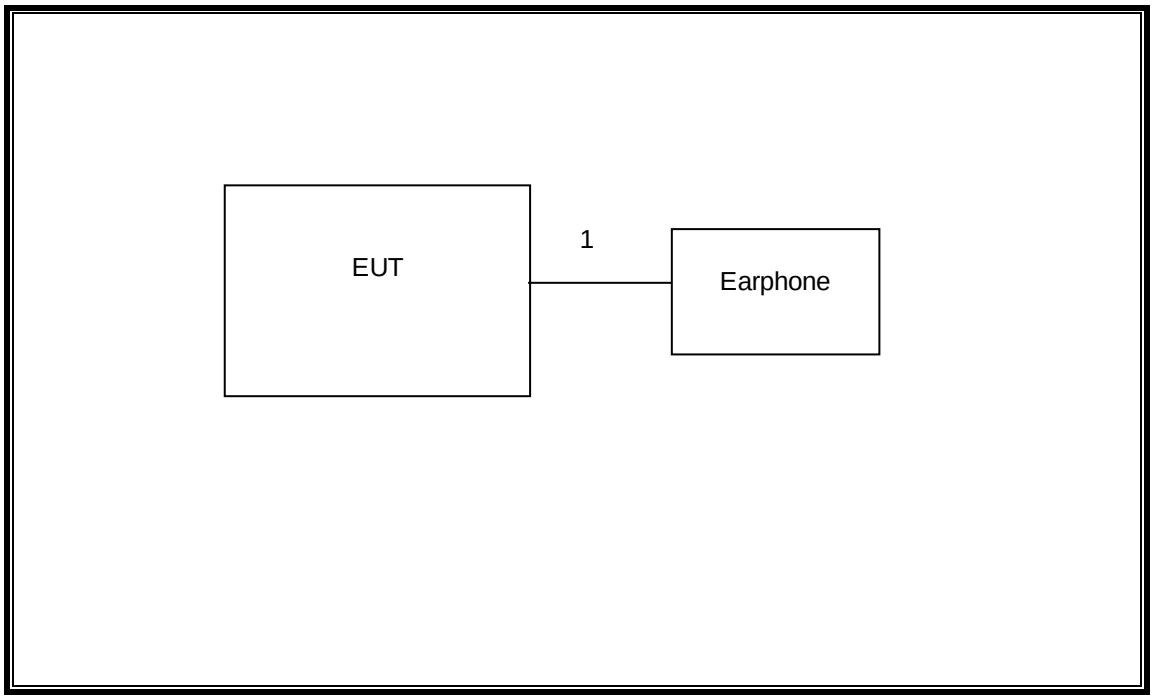
TEST SETUP

The EUT is a stand-alone device.

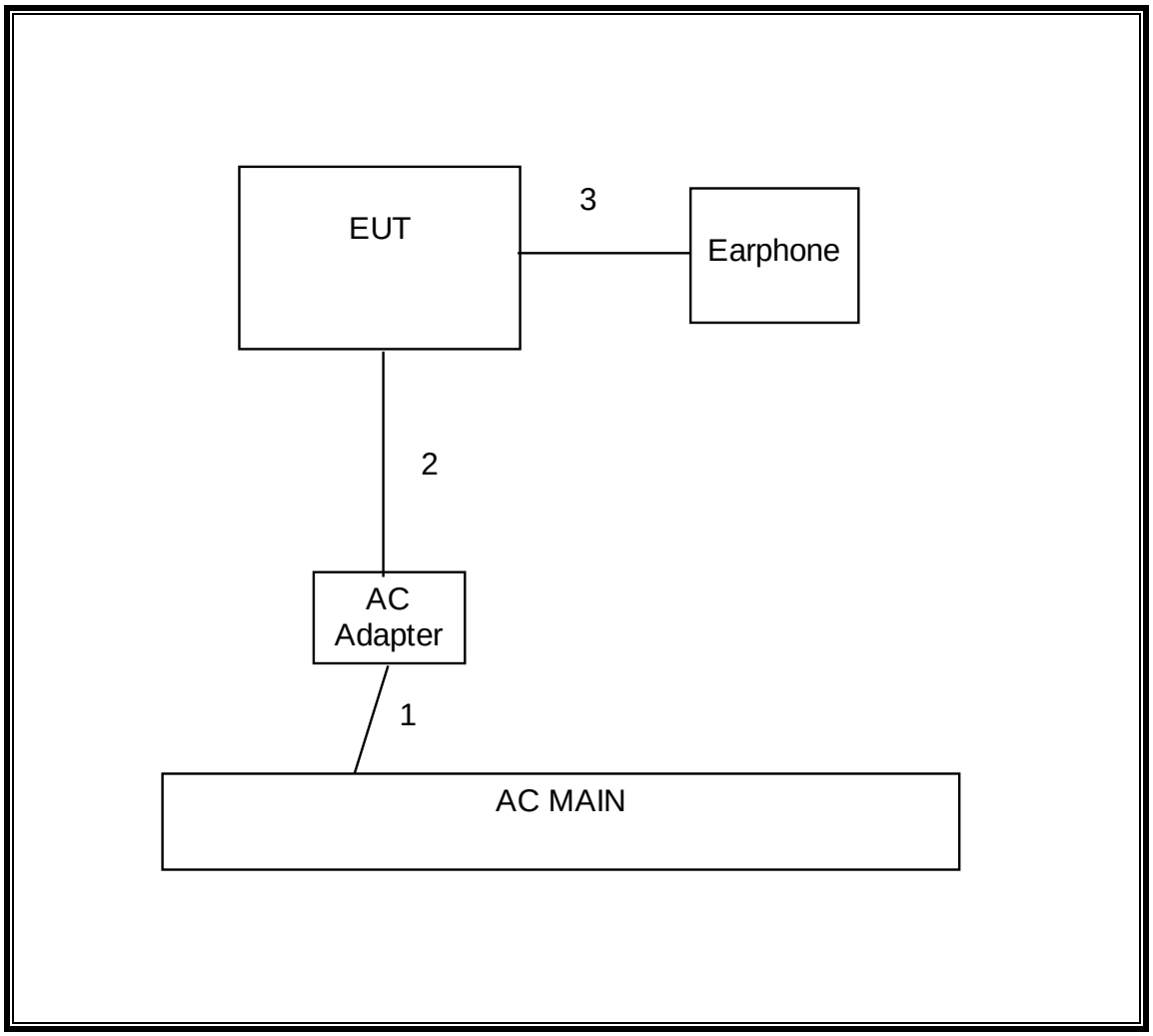
SETUP DIAGRAM FOR CONDUCTED TESTS



SETUP DIAGRAM FOR RADIATED TESTS



SETUP DIAGRAM FOR AC POWER CONDUCTED TESTS



6. TEST AND MEASUREMENT EQUIPMENT

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

TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Asset**	**Cal Due**
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	07/14/13
Antenna, Horn, 18 GHz	EMCO	3115	C00945	06/29/13
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00580	11/11/12
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01016	07/12/13
Horn Antenna, 26.5 GHz	ARA	MWH-1826/B	C00589	07/28/13
Horn Antenna, 40 GHz	ARA	MWH-2640/B	C00981	05/10/13
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	C01159	04/09/13
Peak Power Meter	Agilent	N1911A	1260847C	08/04/12
Peak Power Sensor	Agilent	E9323A	1244073F	08/04/12
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.

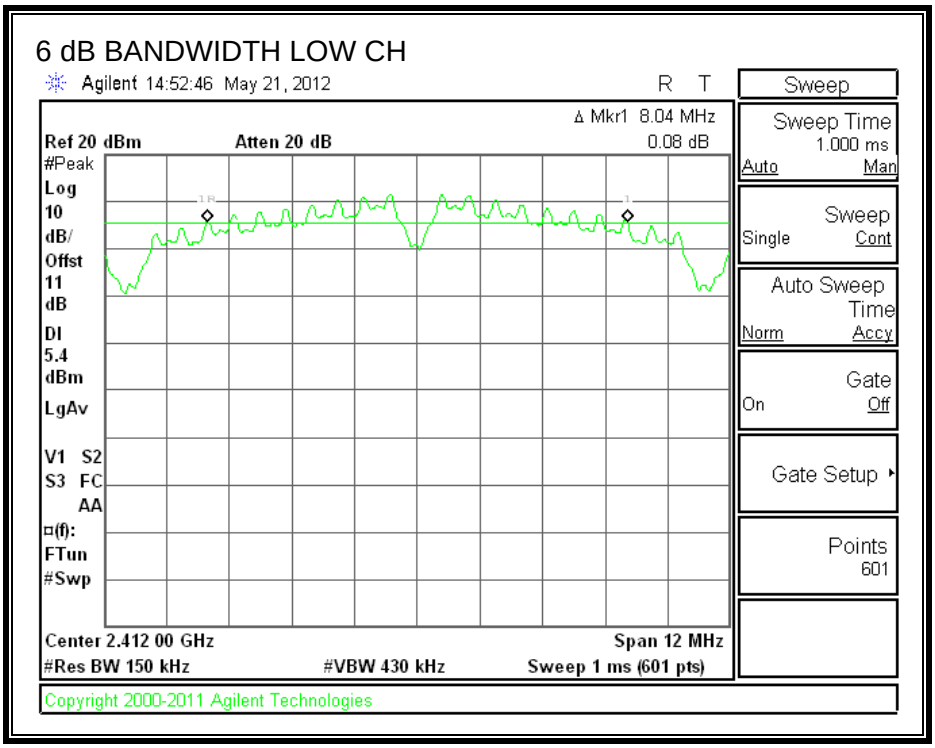
TEST PROCEDURE

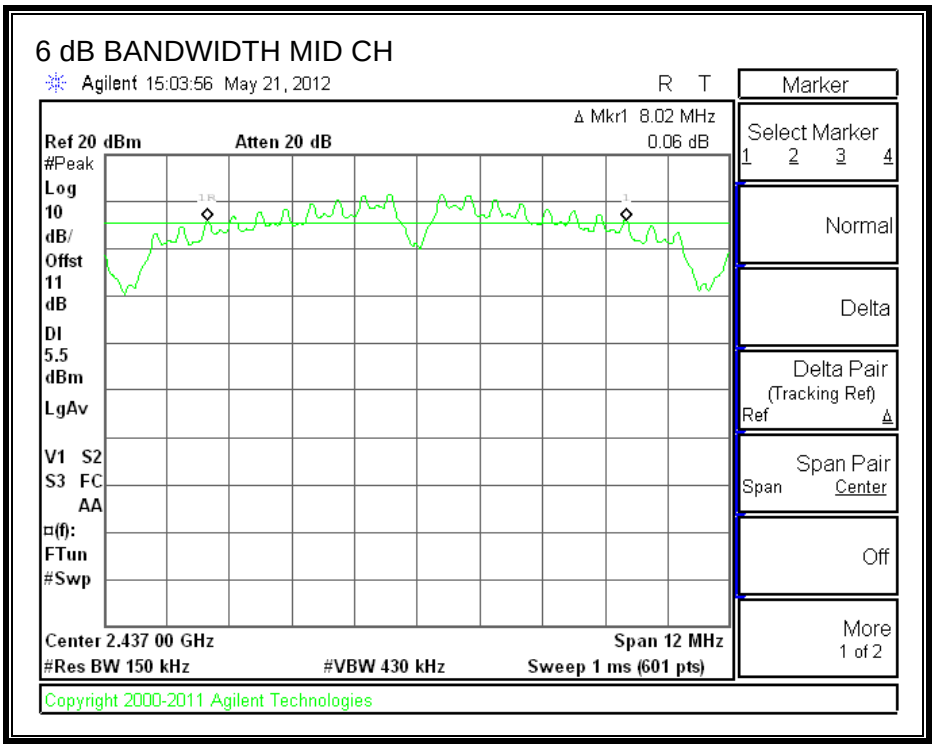
KDB 558074 D01 v01 “Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247”.

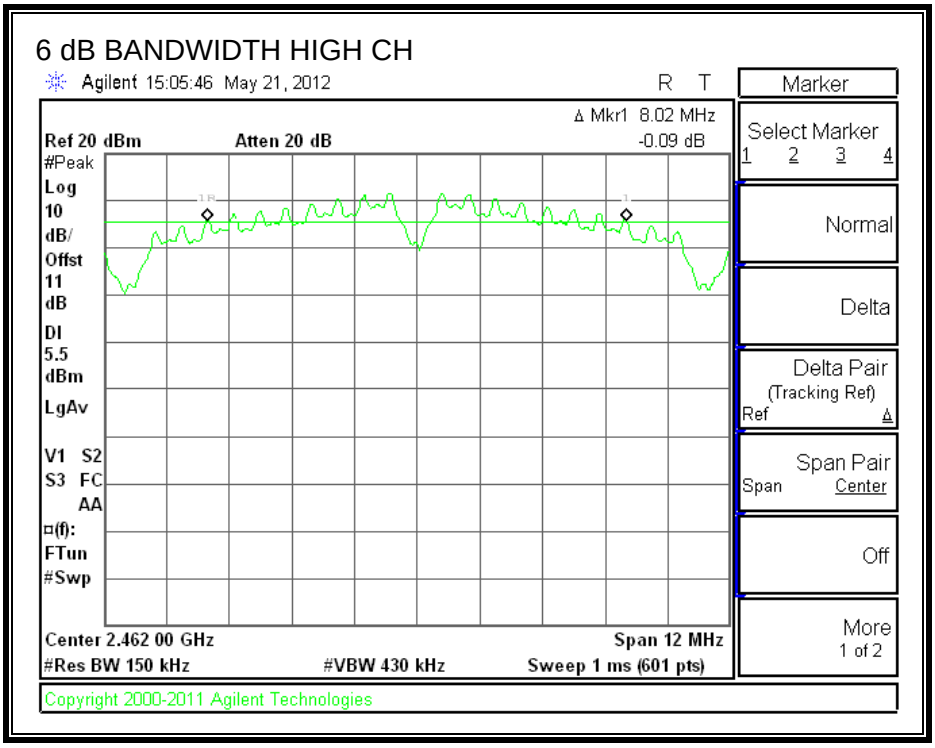
RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	8.0400	0.5
Middle	2437	8.0200	0.5
High	2462	8.0200	0.5

6 dB BANDWIDTH







7.1.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

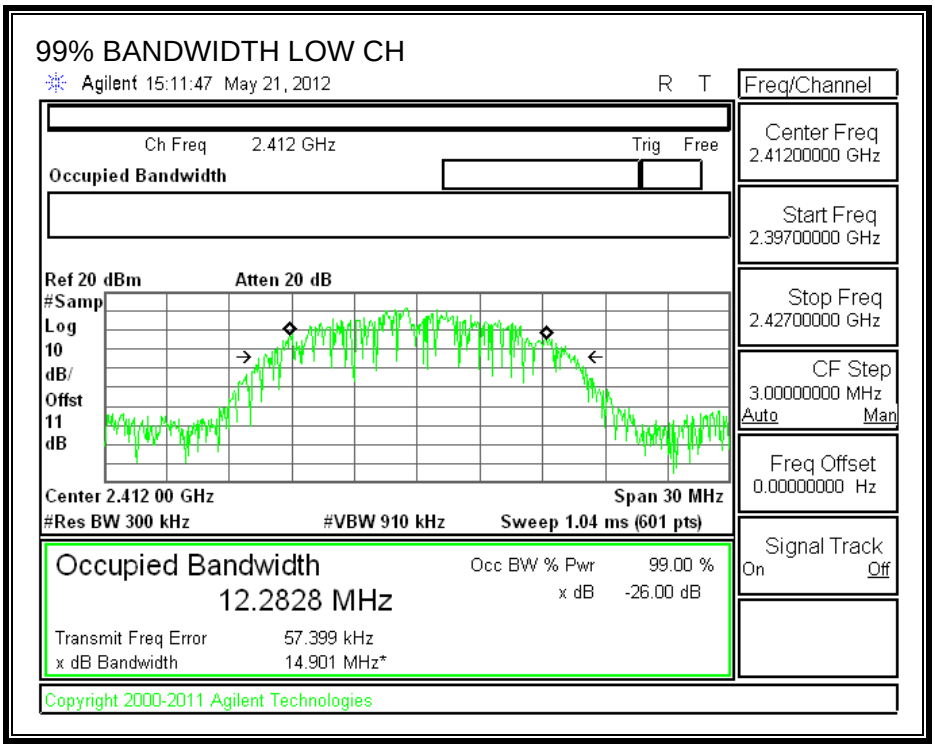
TEST PROCEDURE

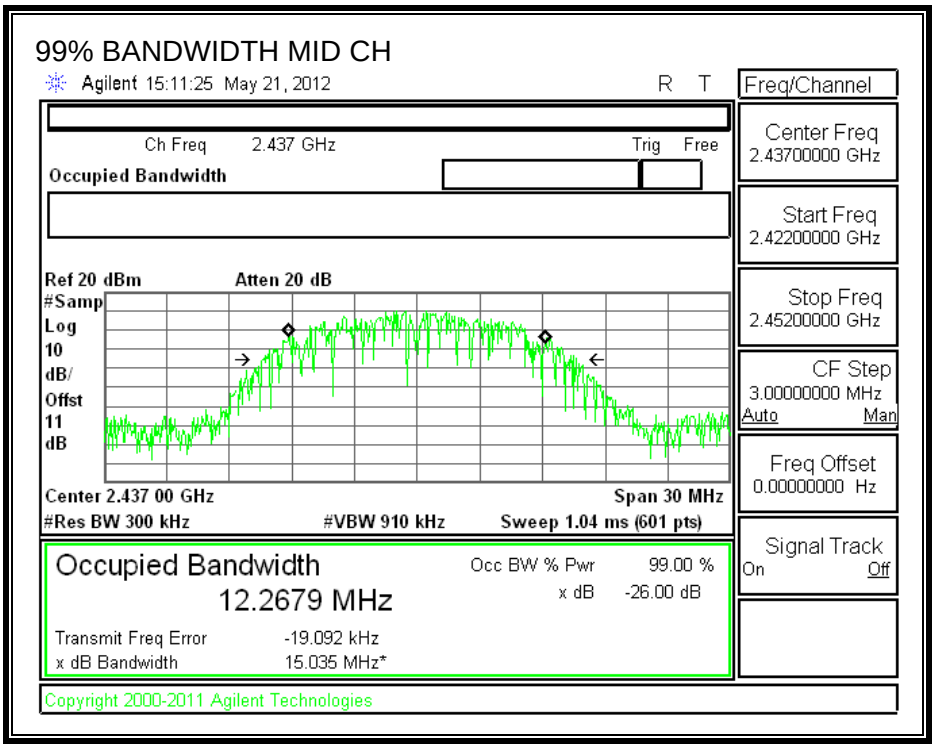
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth and to 1% of the span. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

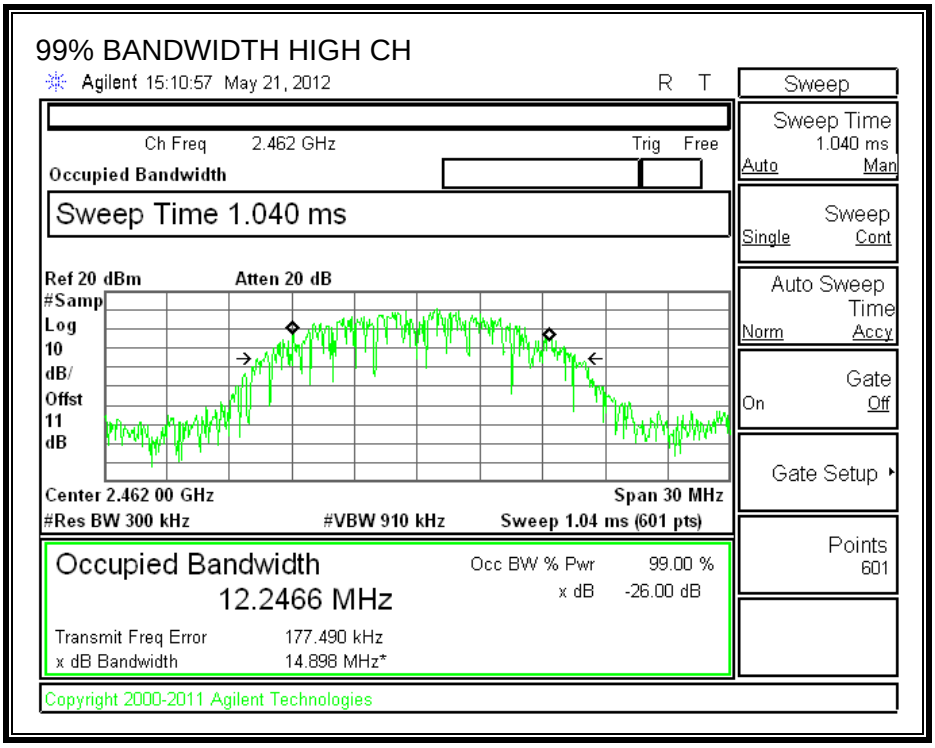
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	12.2828
Middle	2437	12.2679
High	2462	12.2466

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.

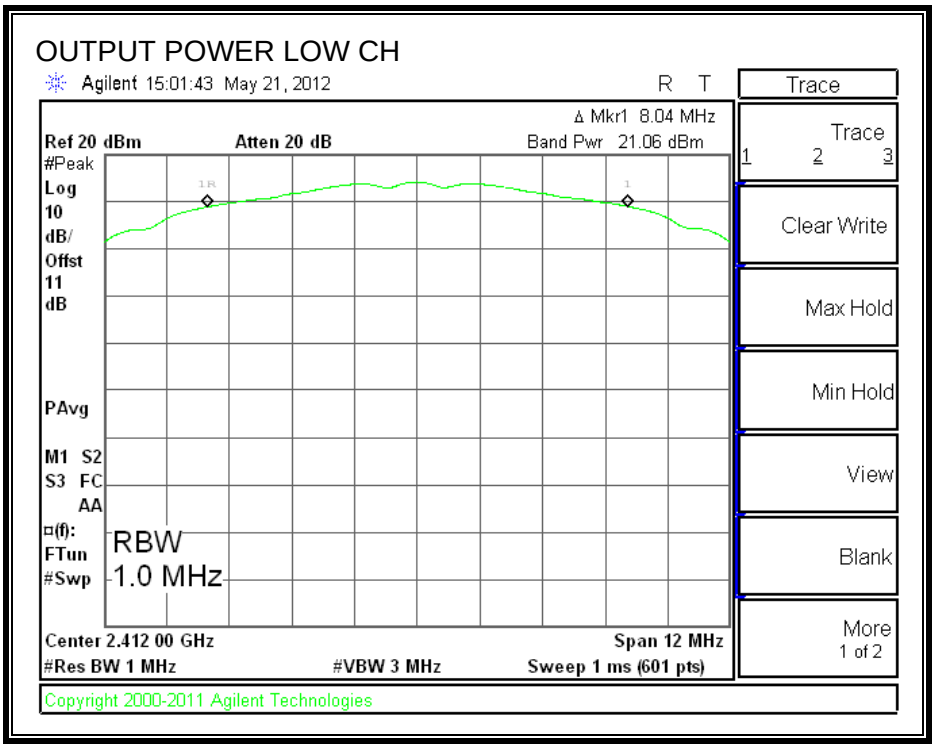
TEST PROCEDURE

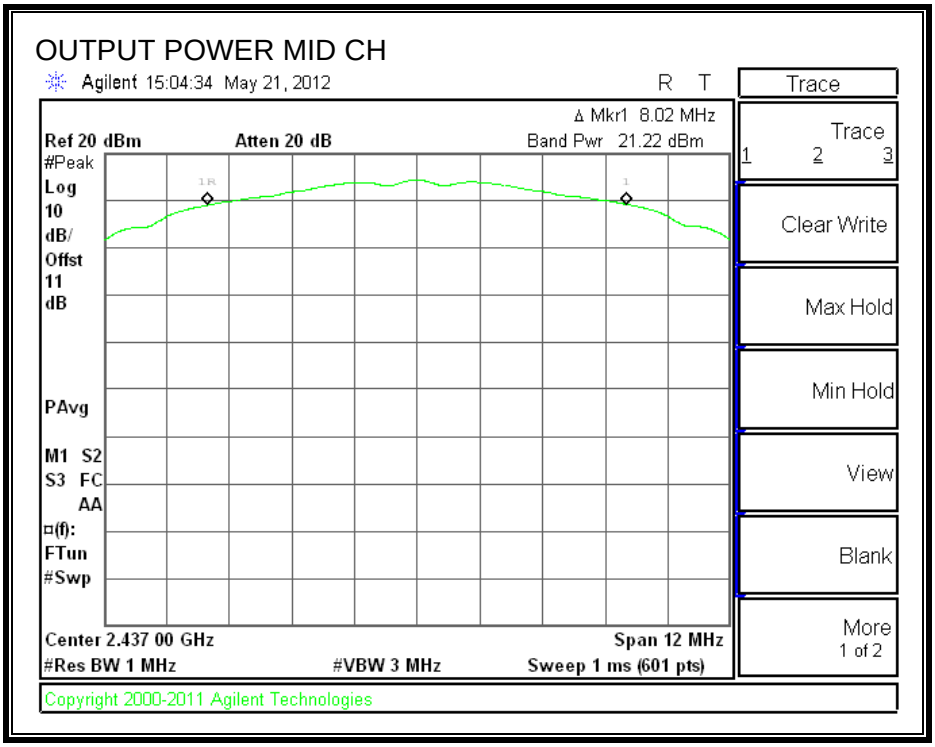
KDB 558074 D01 v01 “Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247”.

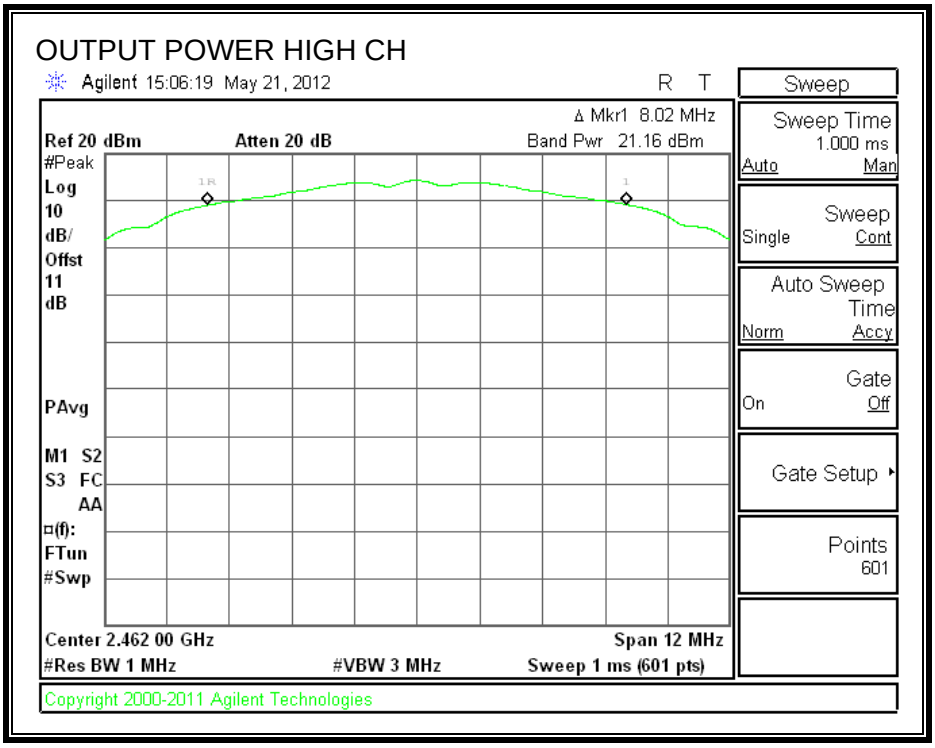
RESULTS

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2412	21.060	30	-8.940
Middle	2437	21.220	30	-8.780
High	2462	21.160	30	-8.840

OUTPUT POWER







7.1.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11 dB (including 10 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	15.85
Middle	2437	15.94
High	2462	15.95

7.1.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

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

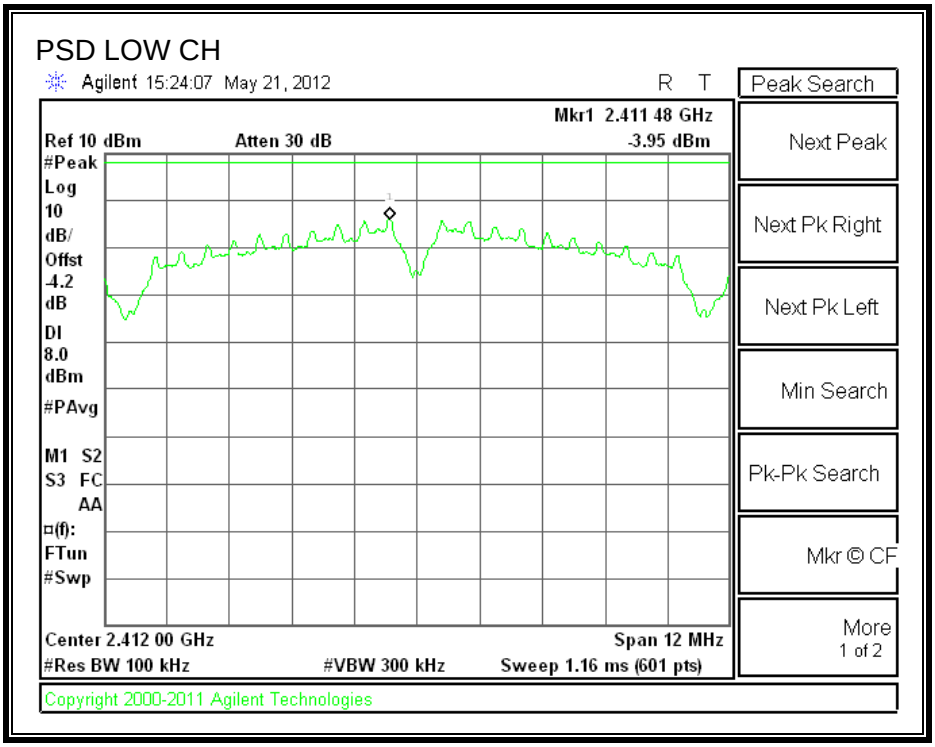
TEST PROCEDURE

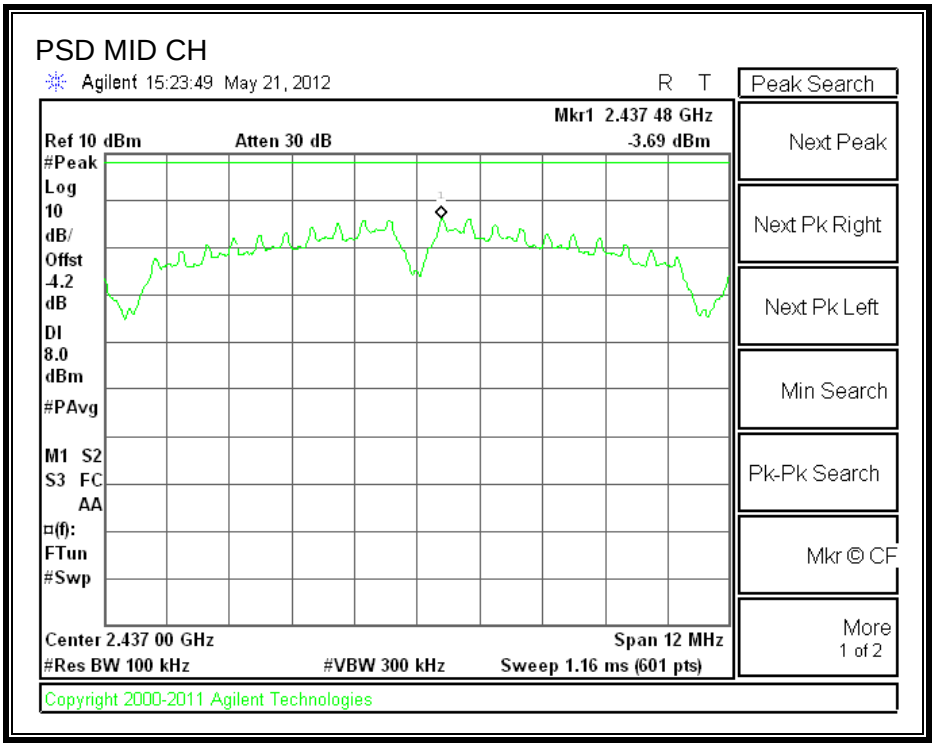
KDB 558074 D01 v01 “Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247”.

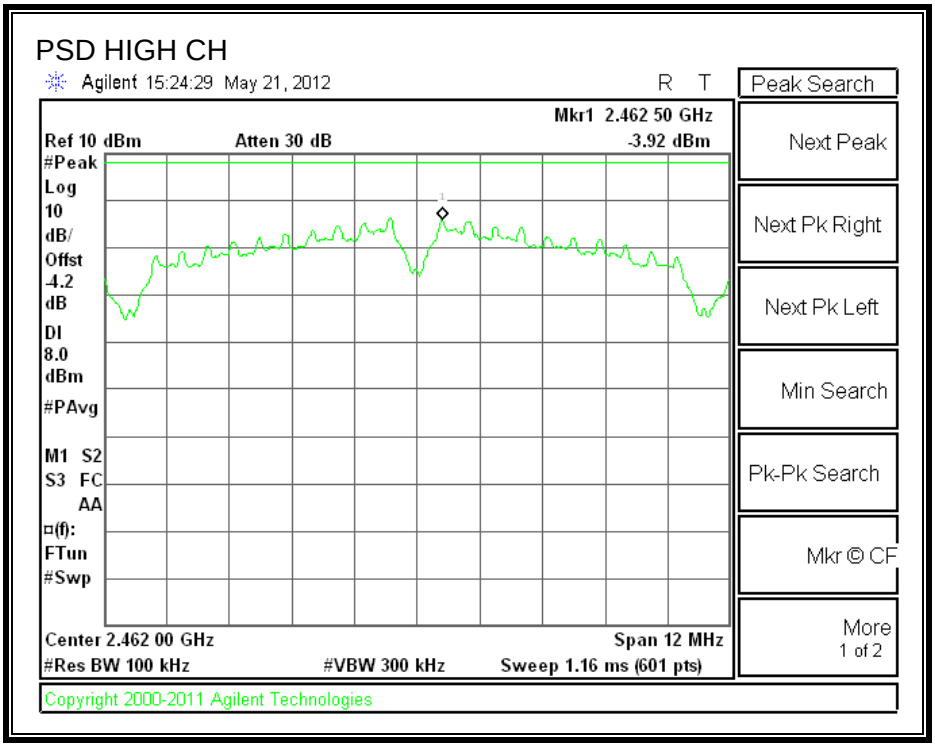
RESULTS

Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-3.95	8	-11.95
Middle	2437	-3.69	8	-11.69
High	2462	-3.92	8	-11.92

POWER SPECTRAL DENSITY







7.1.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

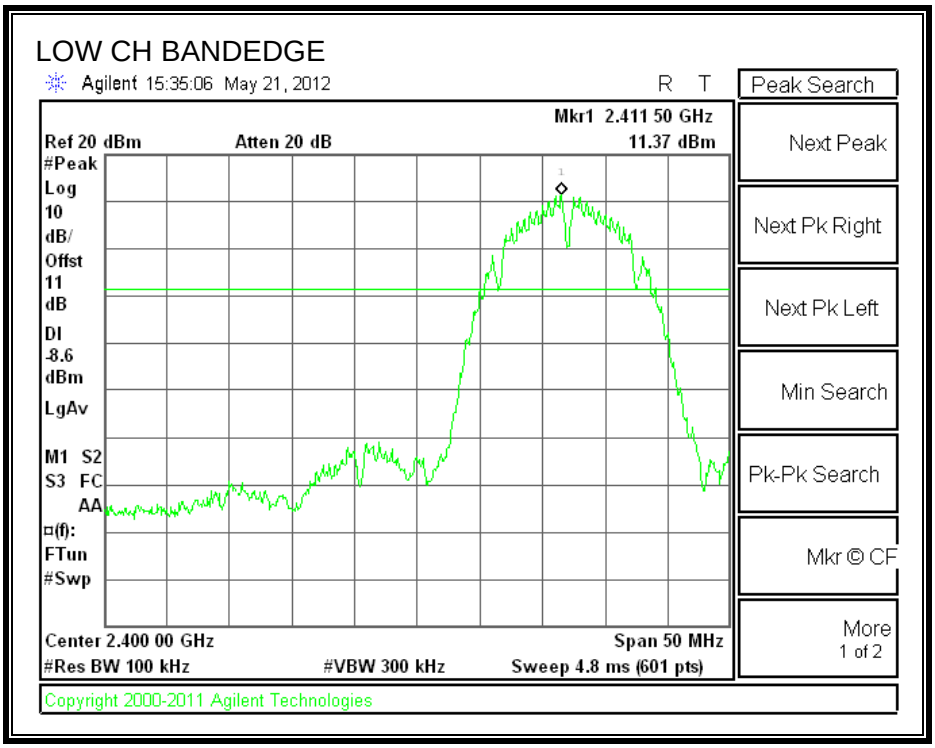
Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

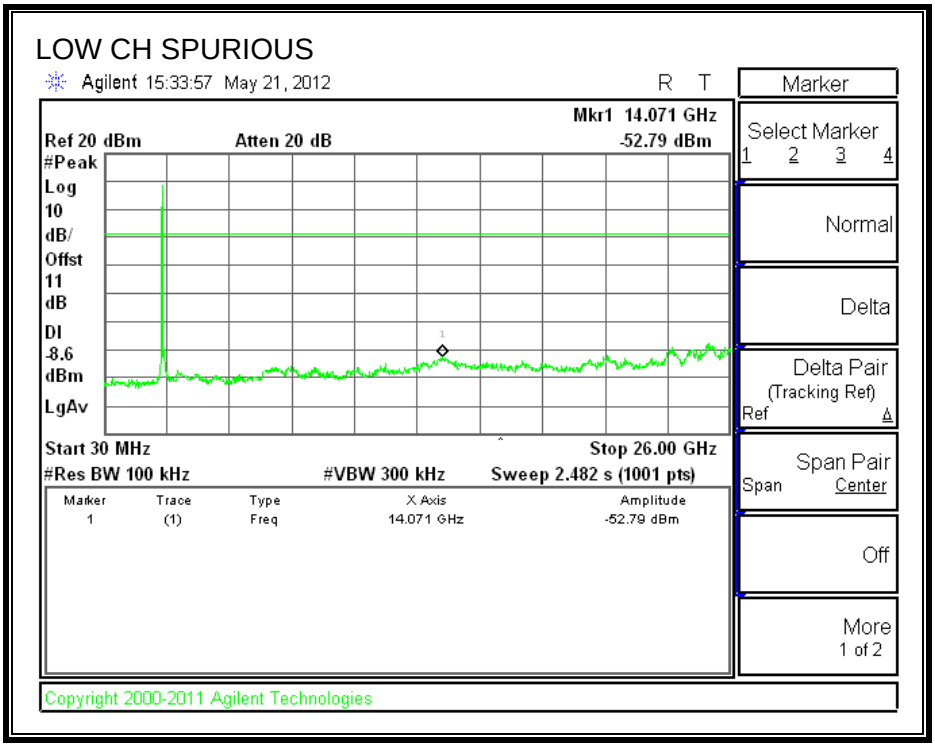
TEST PROCEDURE

KDB 558074 D01 v01 “Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247”.

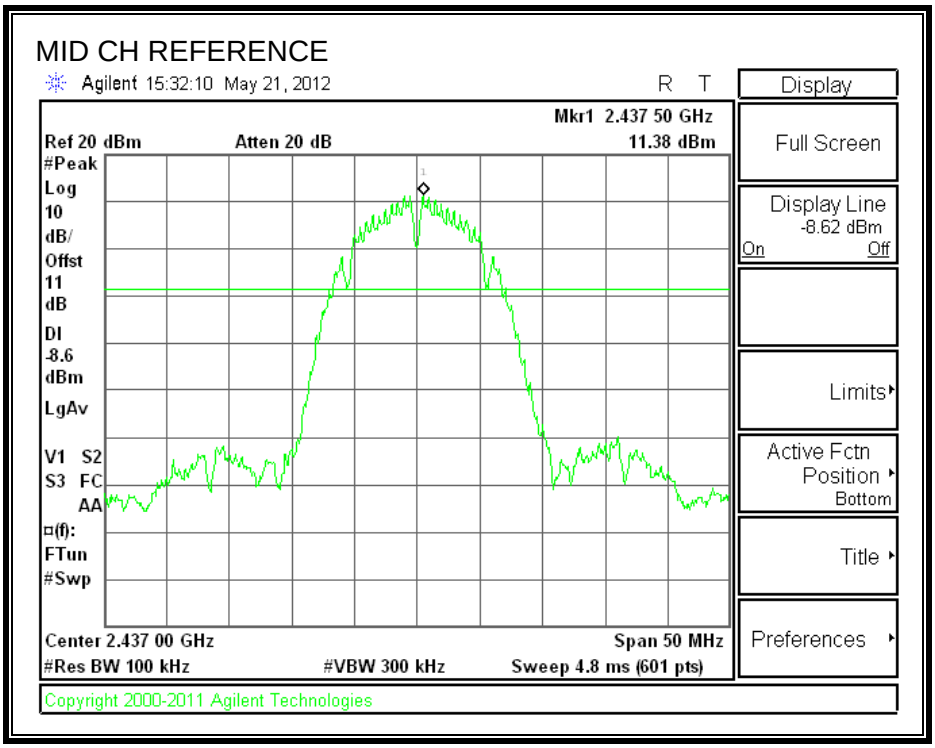
RESULTS

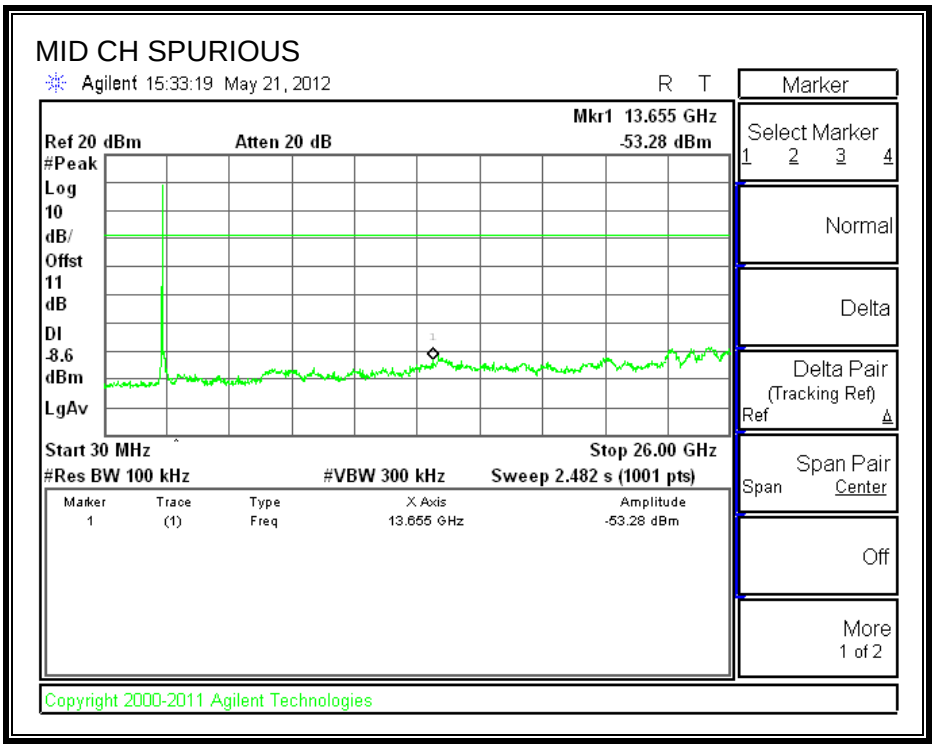
SPURIOUS EMISSIONS, LOW CHANNEL



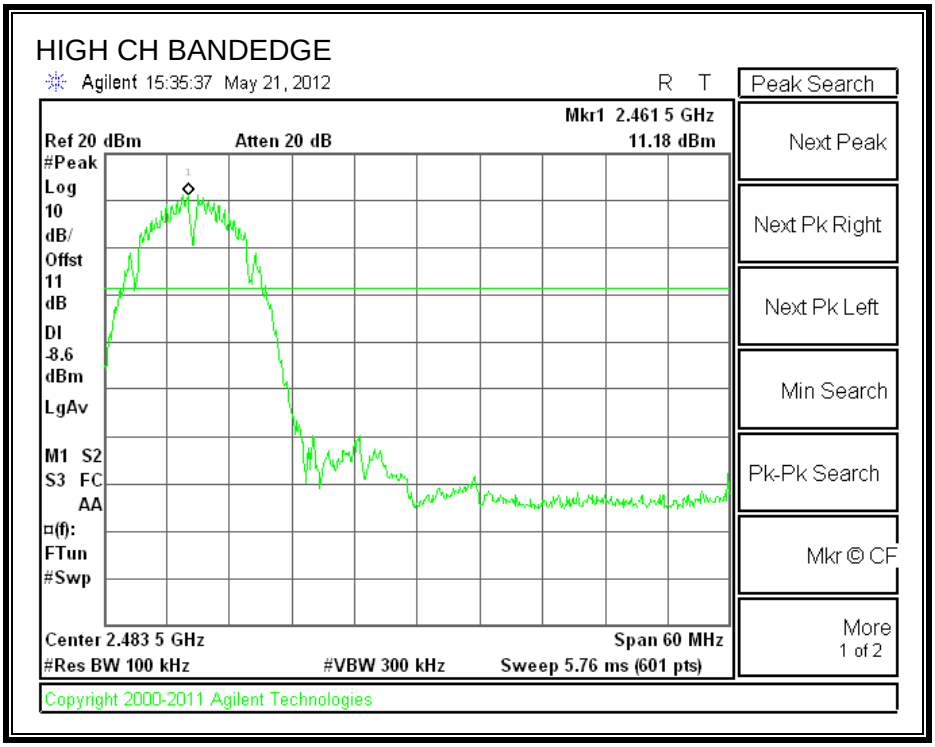


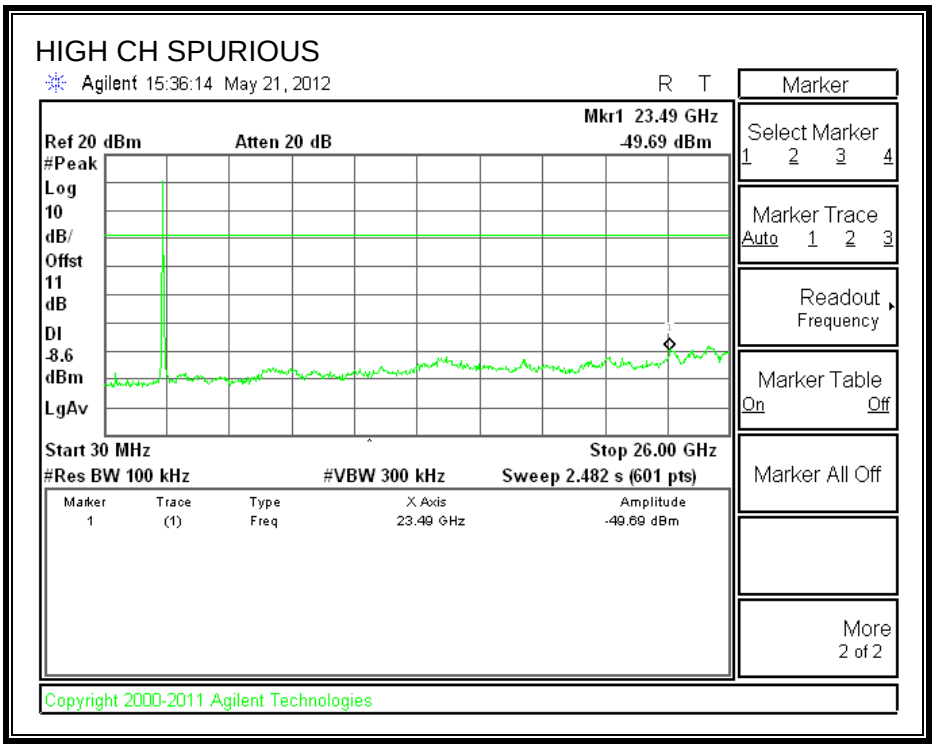
SPURIOUS EMISSIONS, MID CHANNEL





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.

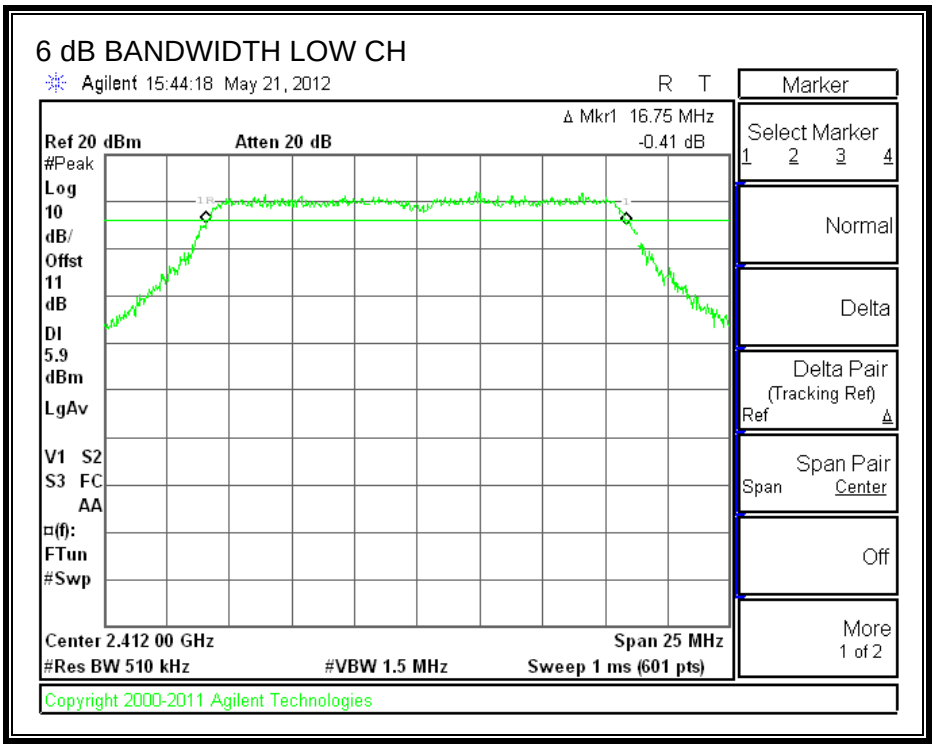
TEST PROCEDURE

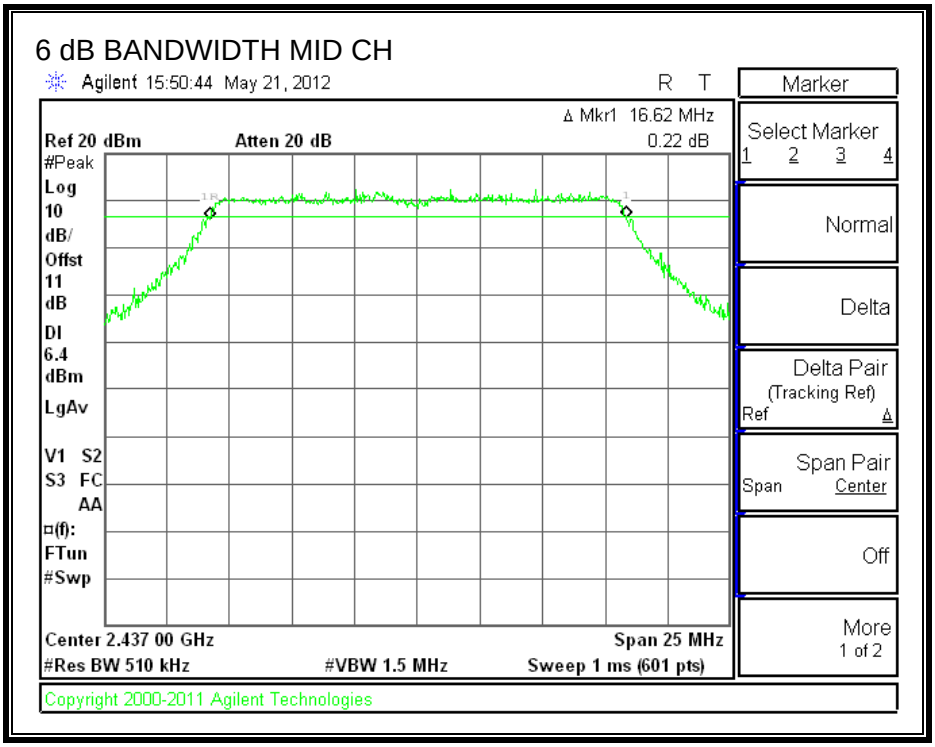
KDB 558074 D01 v01 “Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247”.

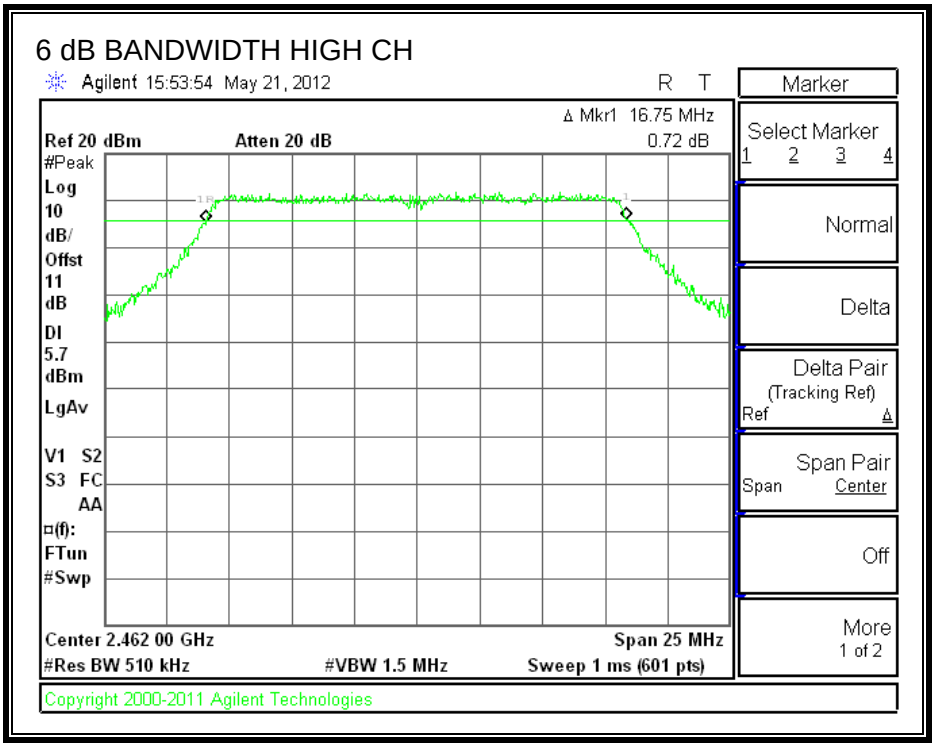
RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	16.7500	0.5
Middle	2437	16.6200	0.5
High	2462	16.7500	0.5

6 dB BANDWIDTH







7.2.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

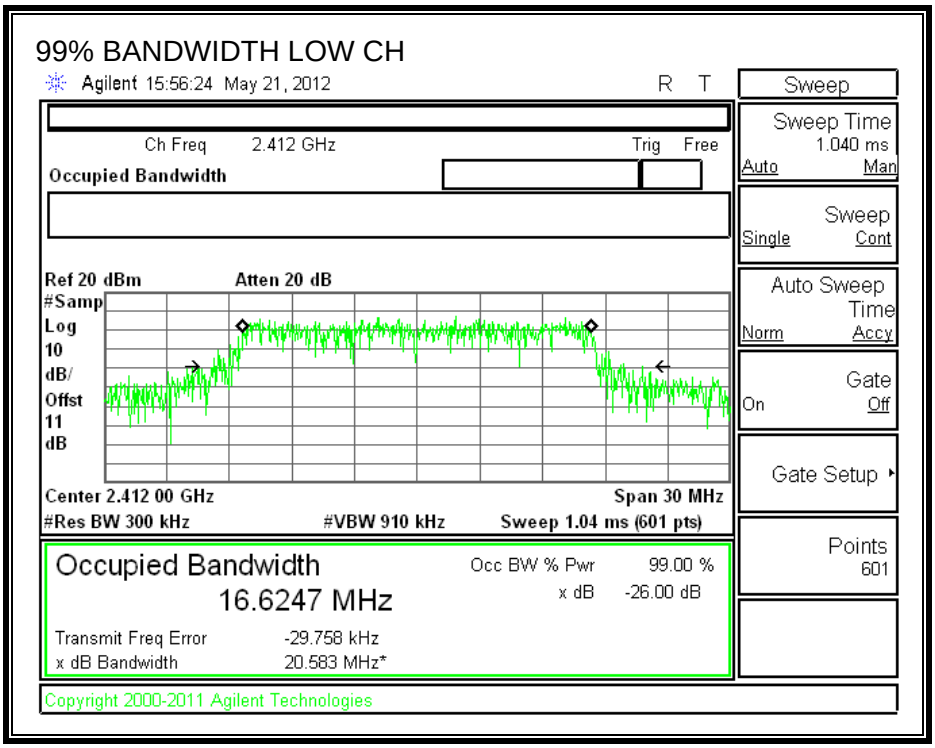
TEST PROCEDURE

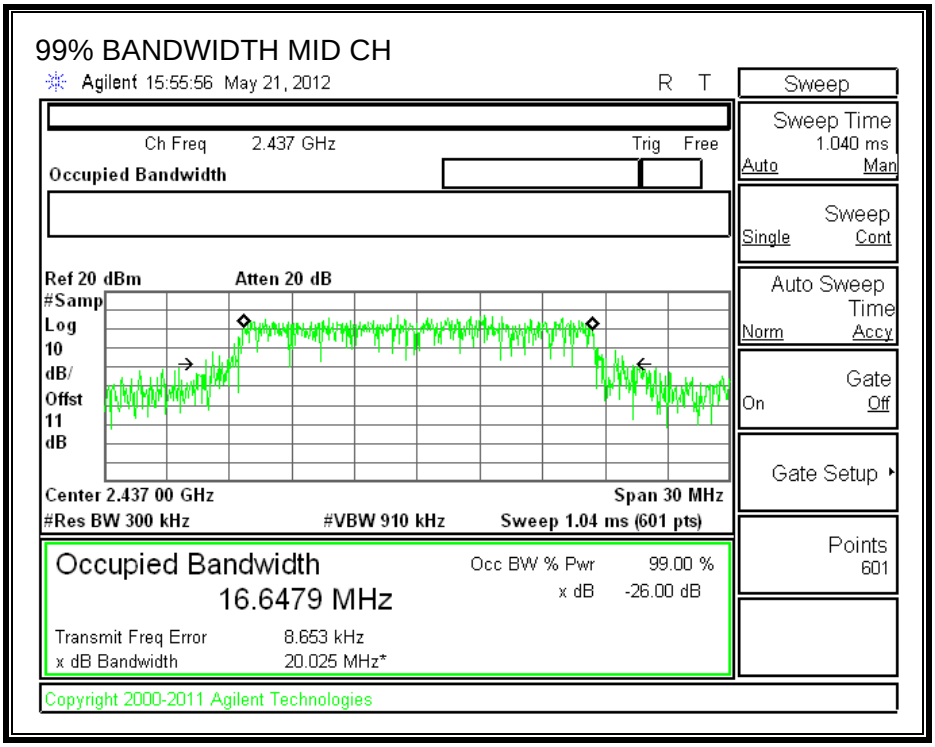
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth and to 1% of the span. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

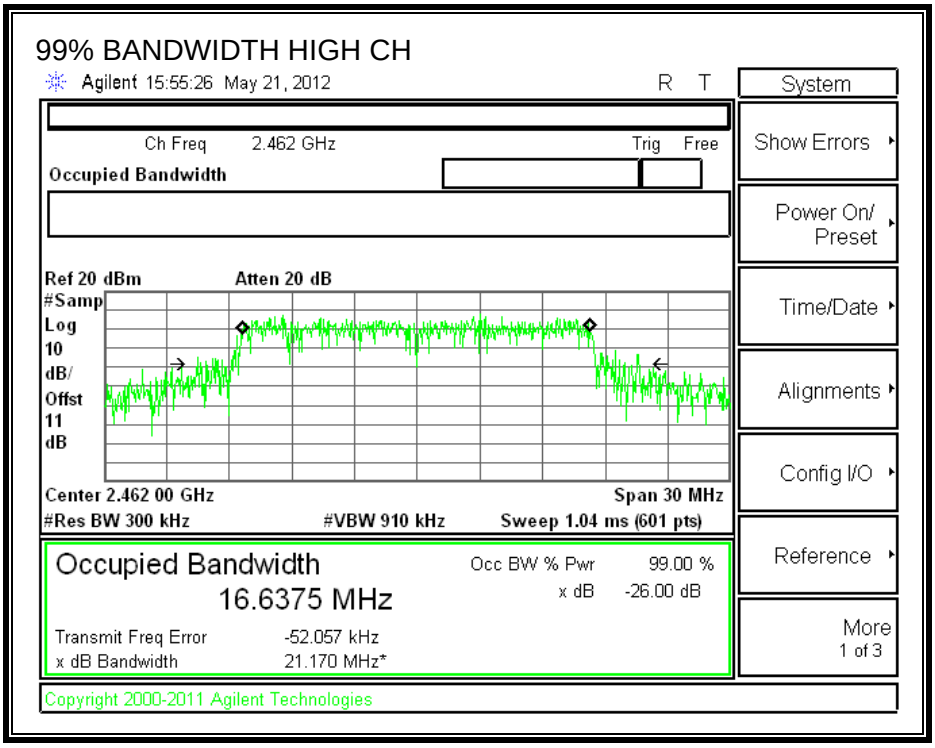
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	16.6247
Middle	2437	16.6479
High	2462	16.6375

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

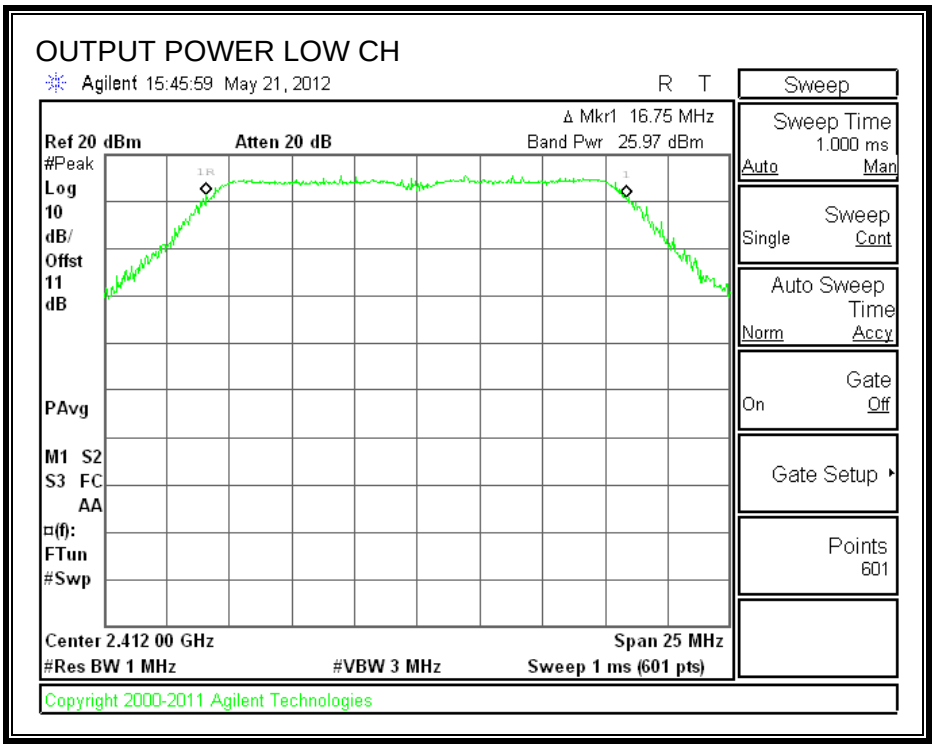
KDB 558074 D01 v01 “Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247”.

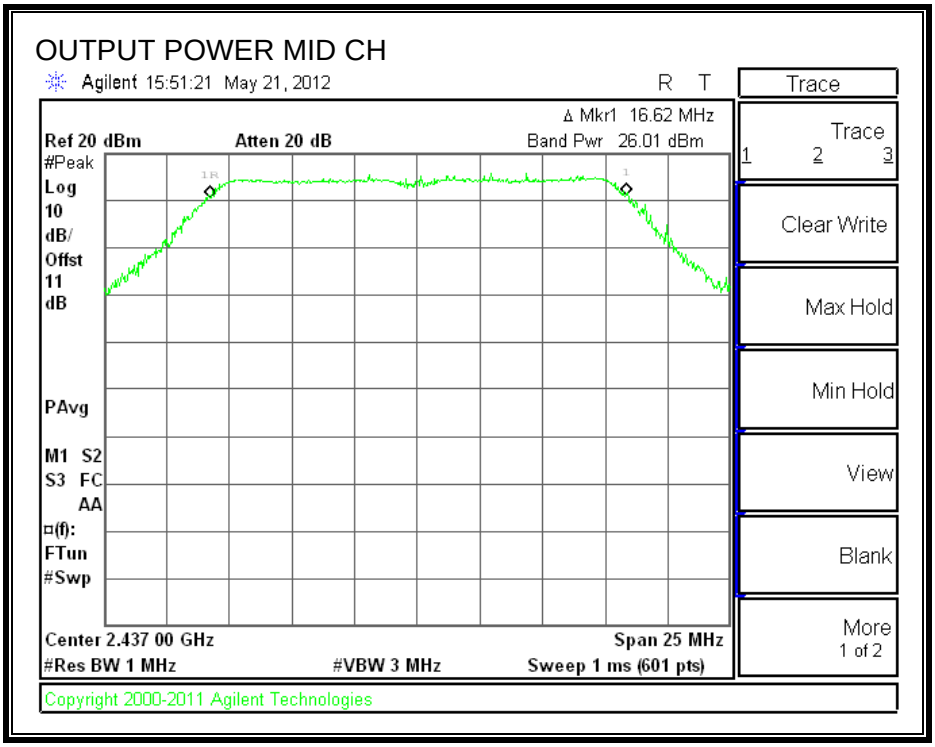
RESULTS

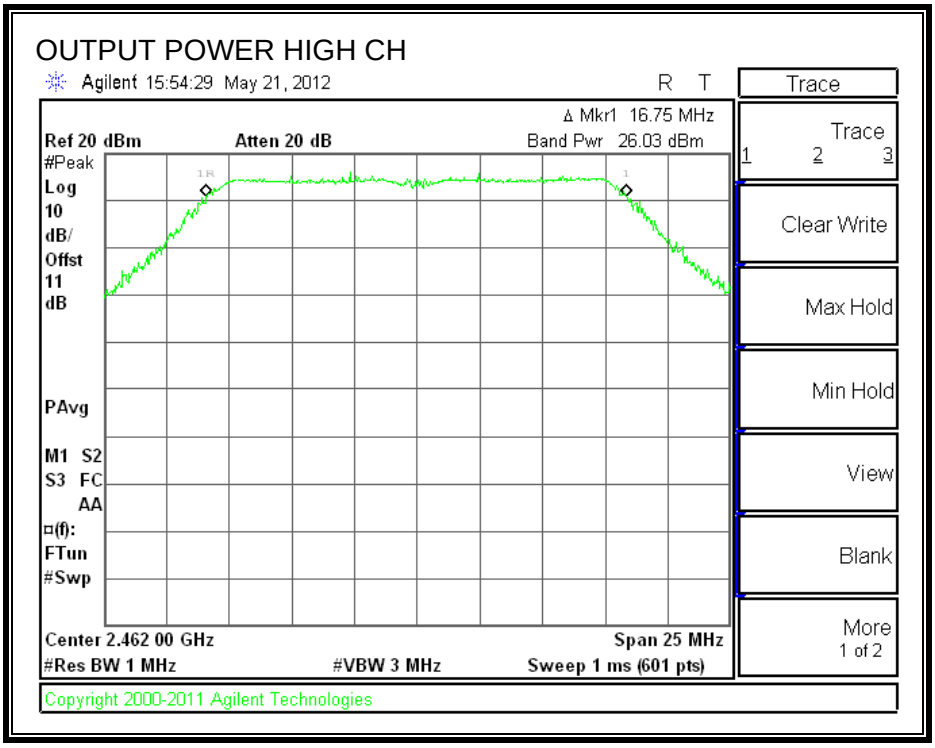
The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	25.97	25.97	30	-4.03
Middle	2437	26.01	26.01	30	-3.99
High	2462	26.03	26.03	30	-3.97

OUTPUT POWER







7.2.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11 dB (including 10 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	15.95
Middle	2437	15.91
High	2462	15.45

7.2.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

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

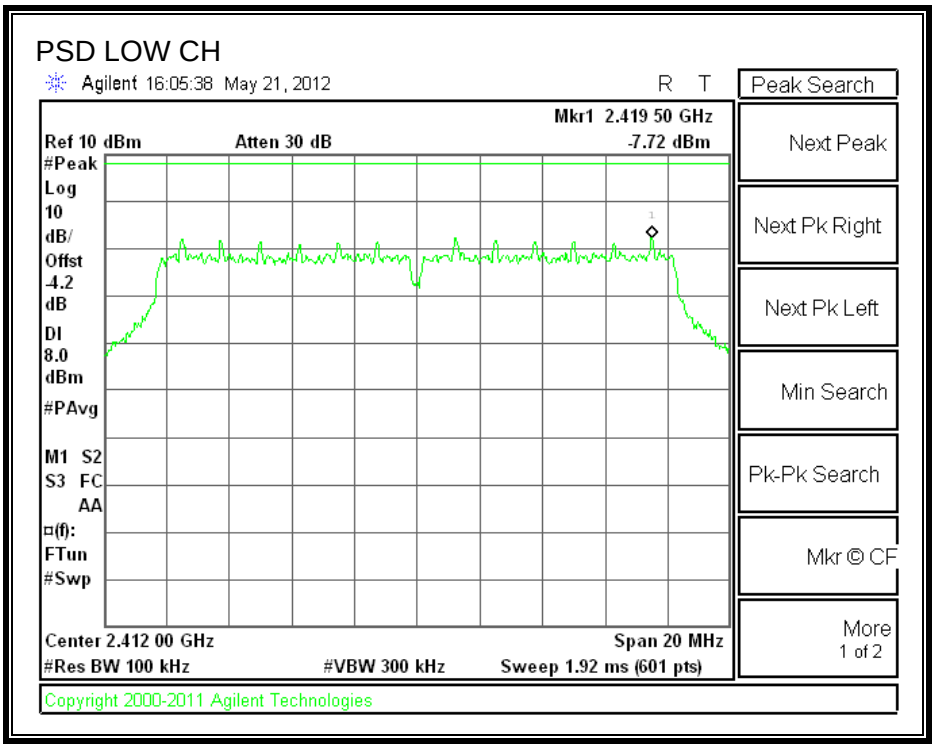
TEST PROCEDURE

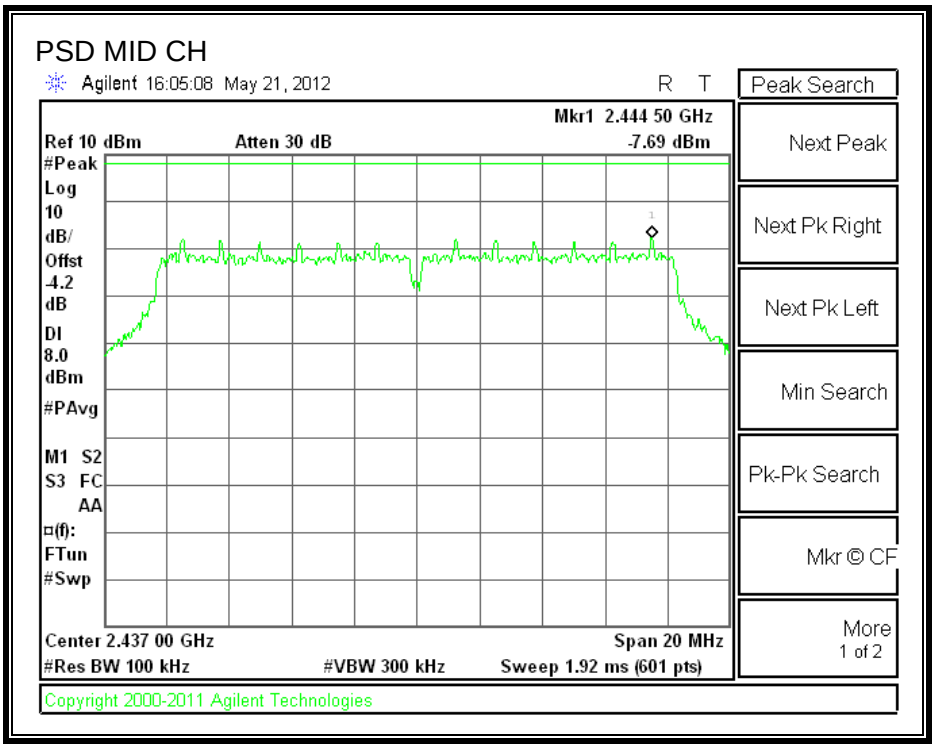
KDB 558074 D01 v01 “Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247”.

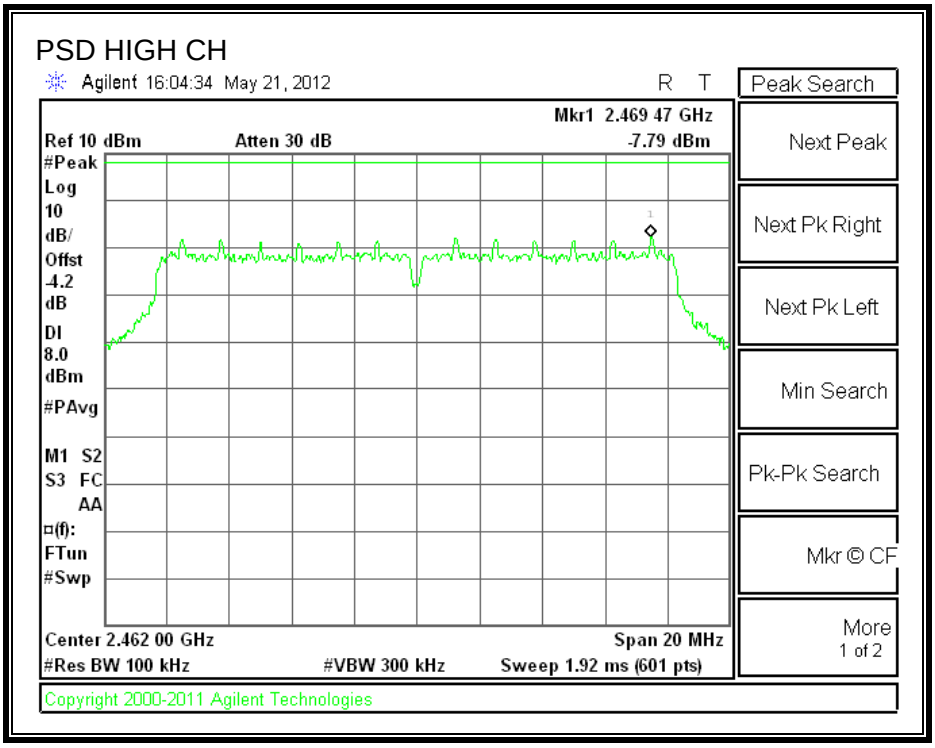
RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-7.72	8	-15.72
Middle	2437	-7.69	8	-15.69
High	2462	-7.79	8	-15.79

POWER SPECTRAL DENSITY







7.2.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

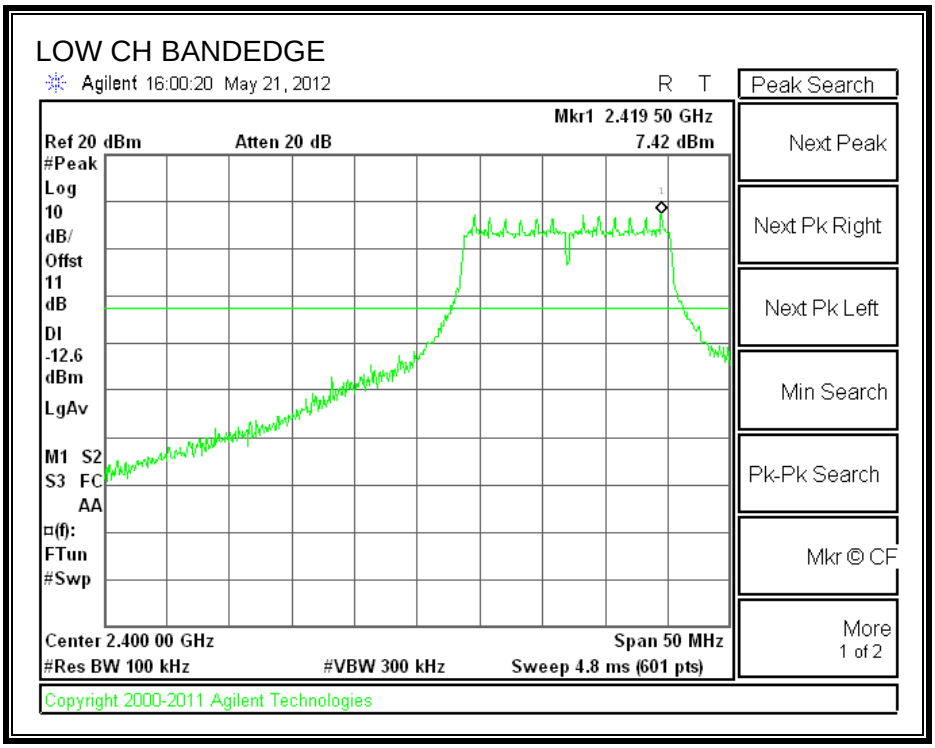
Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

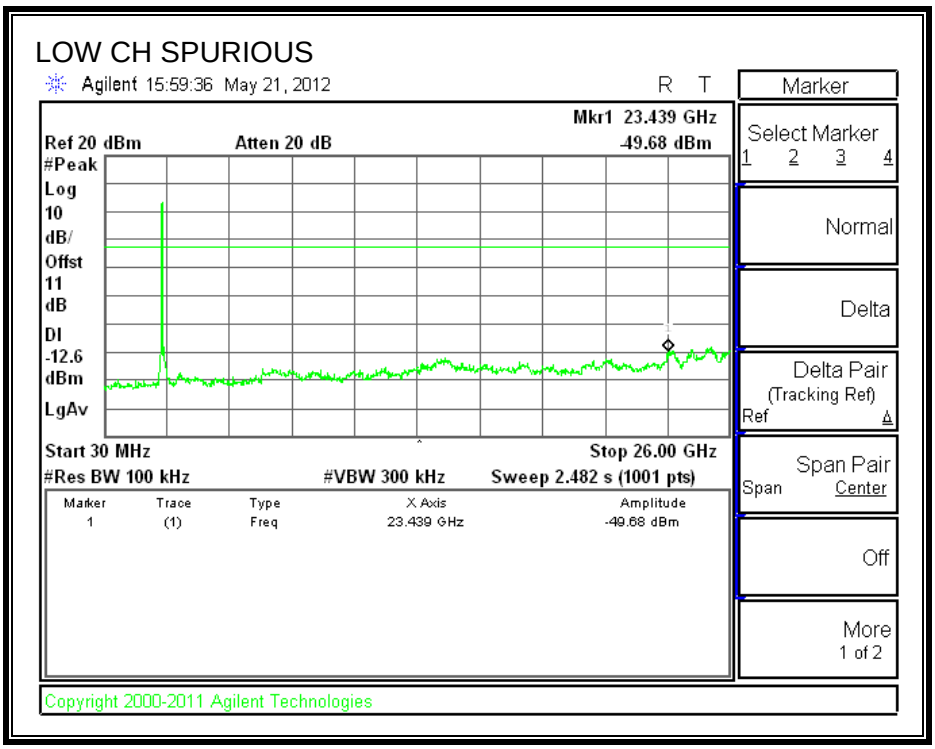
TEST PROCEDURE

KDB 558074 D01 v01 “Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247”.

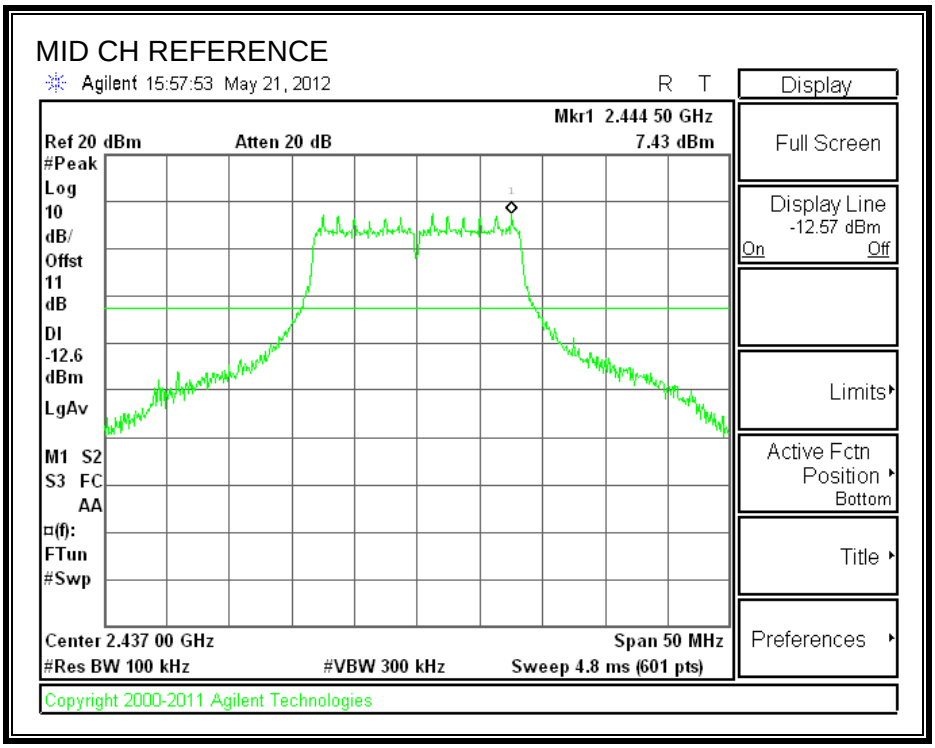
RESULTS

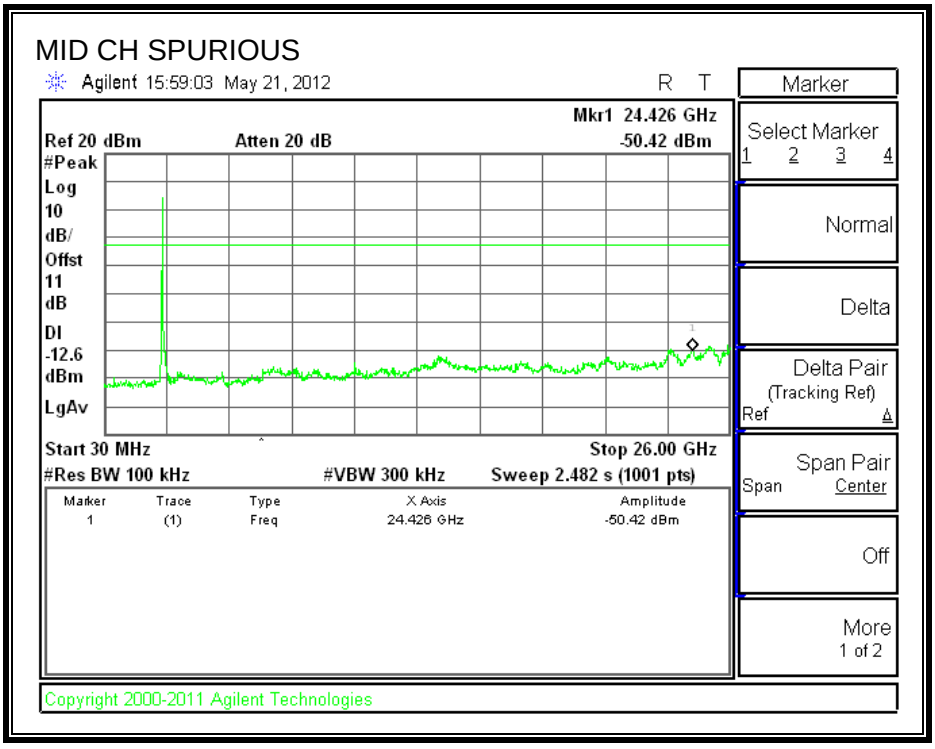
SPURIOUS EMISSIONS, LOW CHANNEL



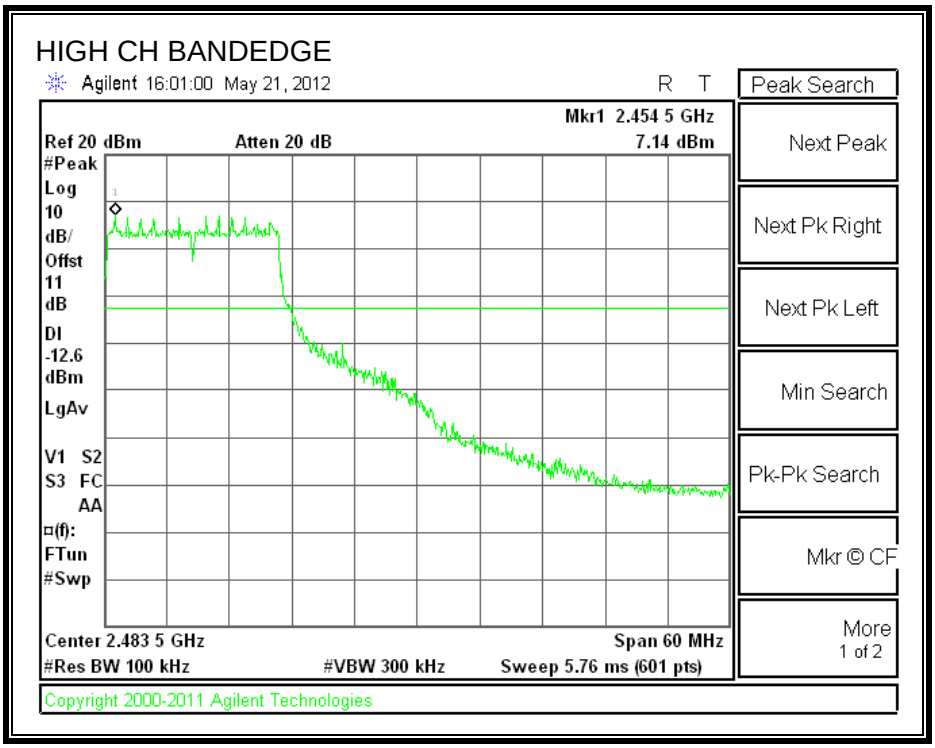


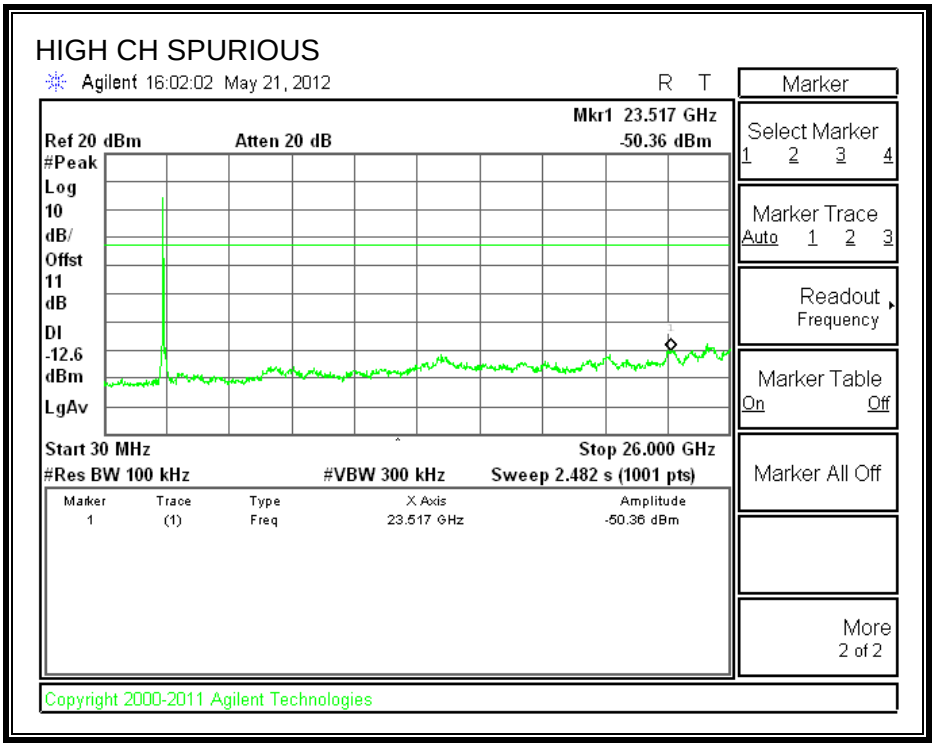
SPURIOUS EMISSIONS, MID CHANNEL





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.

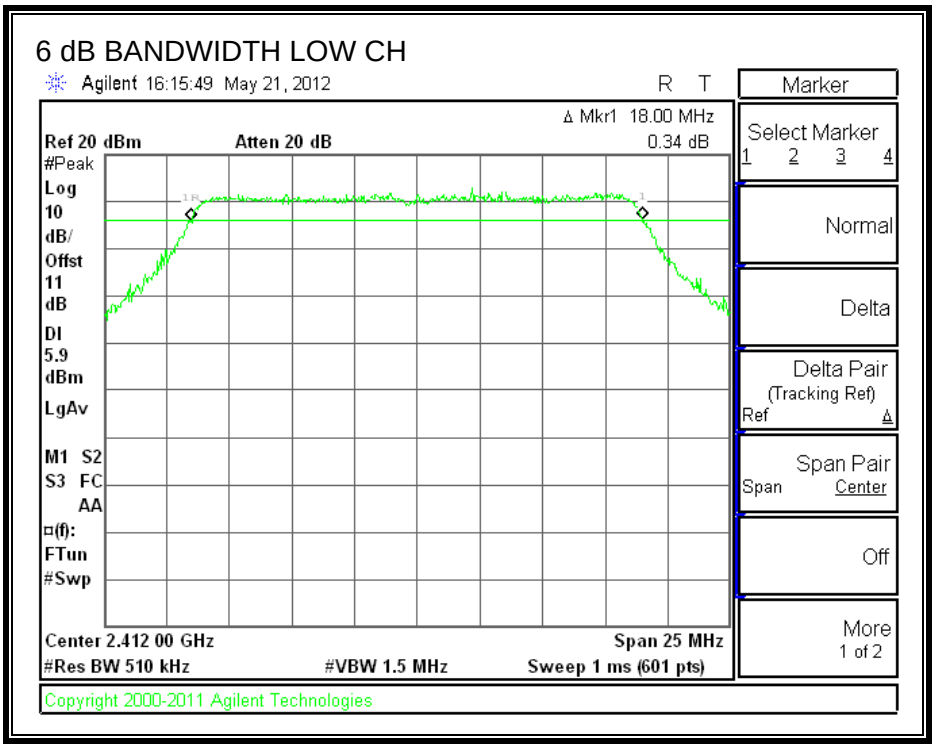
TEST PROCEDURE

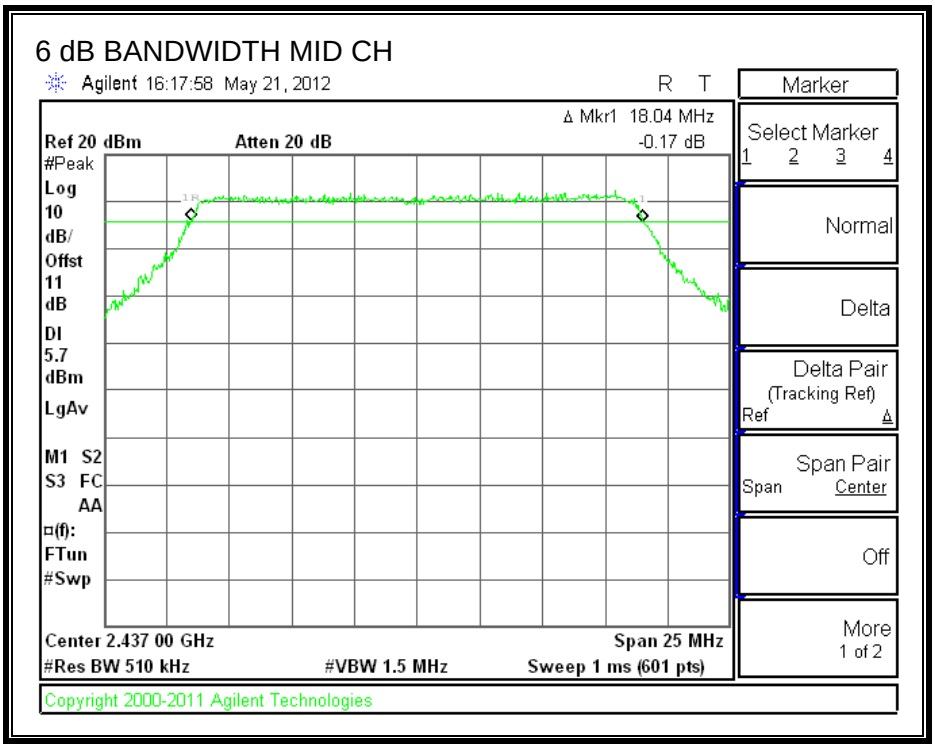
KDB 558074 D01 v01 “Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247”.

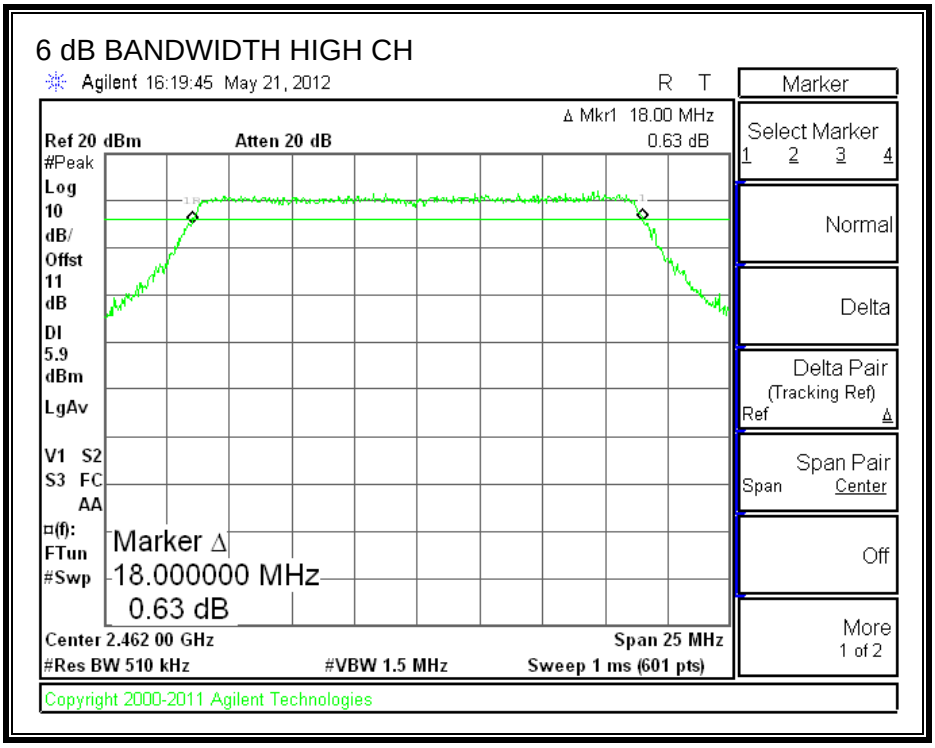
RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	18.0000	0.5
Middle	2437	18.0400	0.5
High	2462	18.0000	0.5

6 dB BANDWIDTH







7.3.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

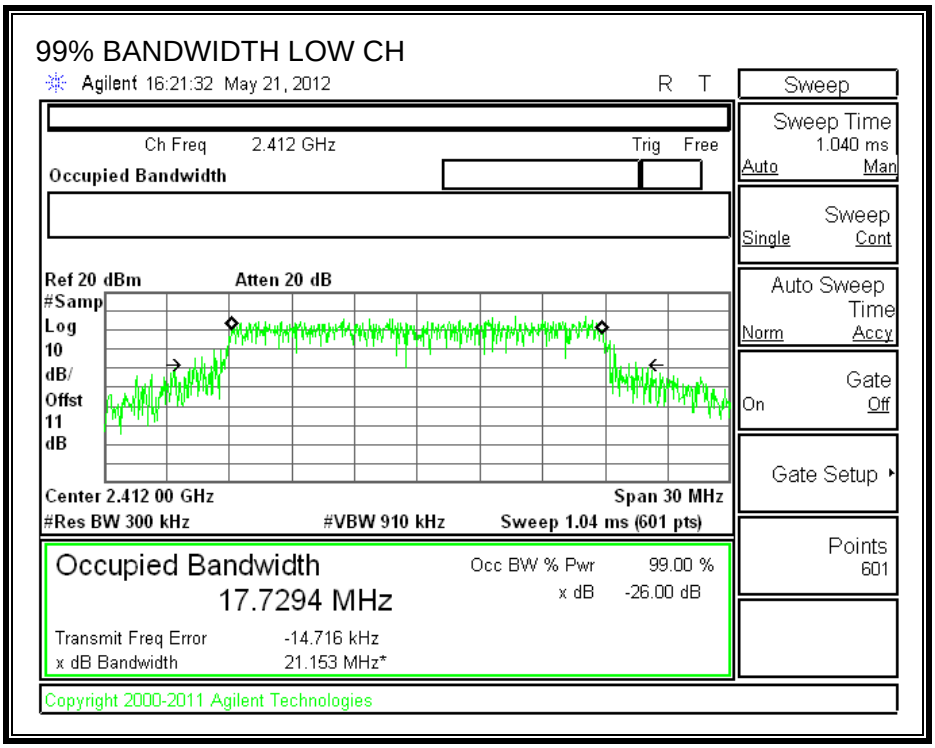
TEST PROCEDURE

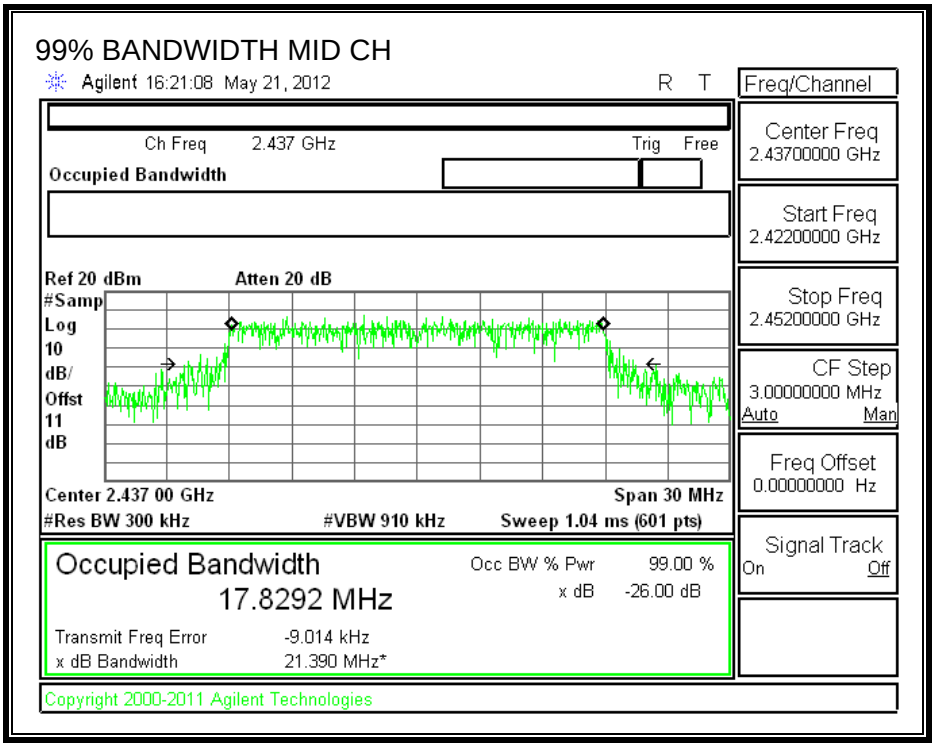
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth and to 1% of the span. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

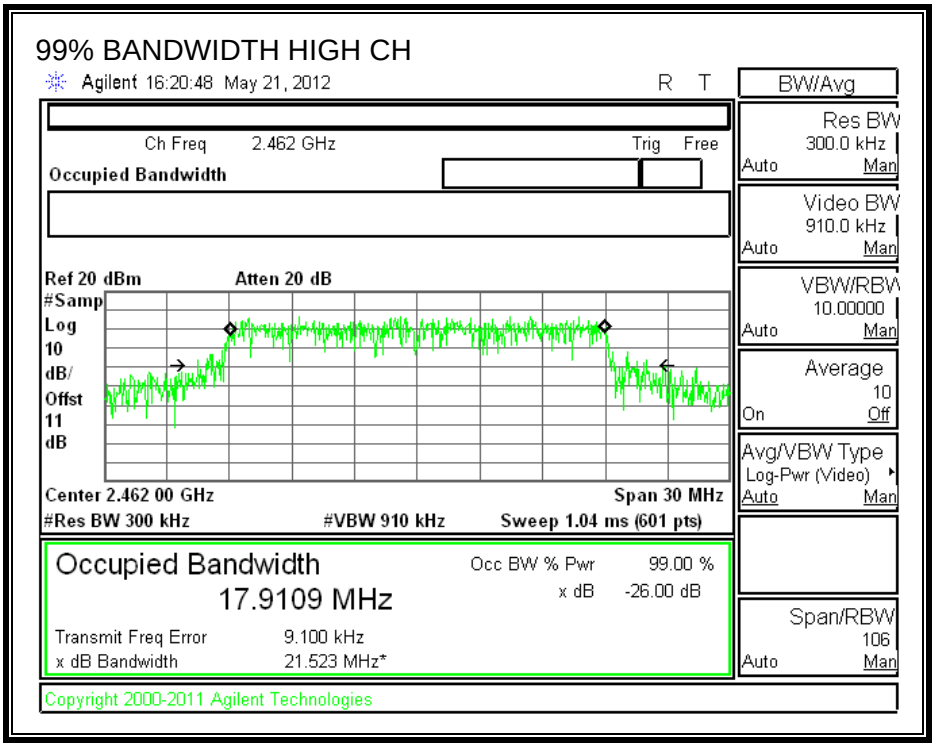
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	17.7294
Middle	2437	17.8292
High	2462	17.9109

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

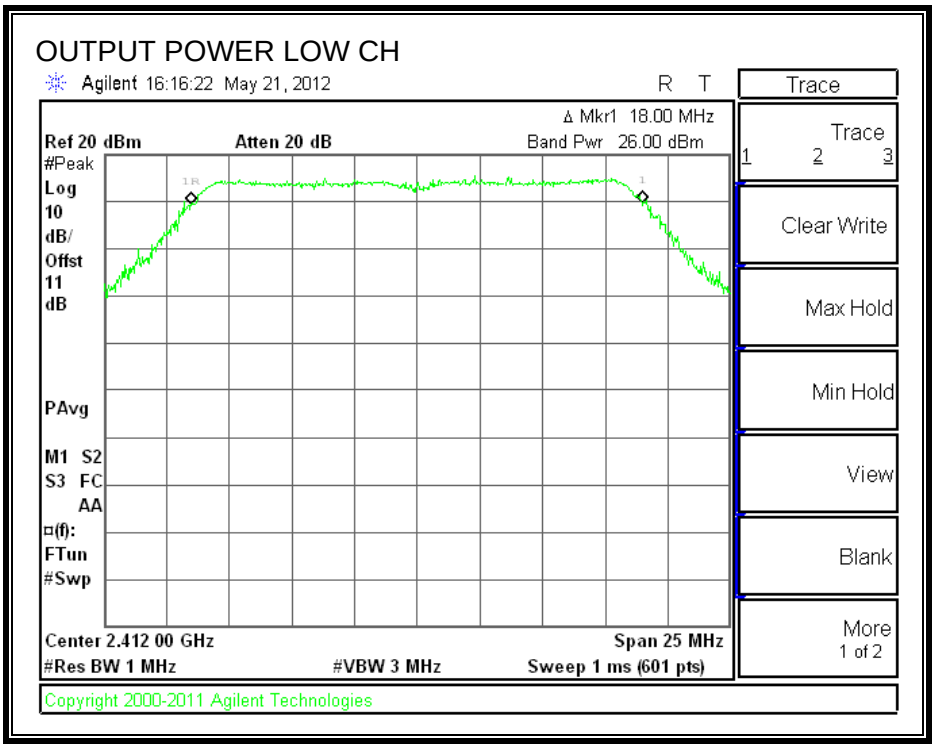
KDB 558074 D01 v01 “Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247”.

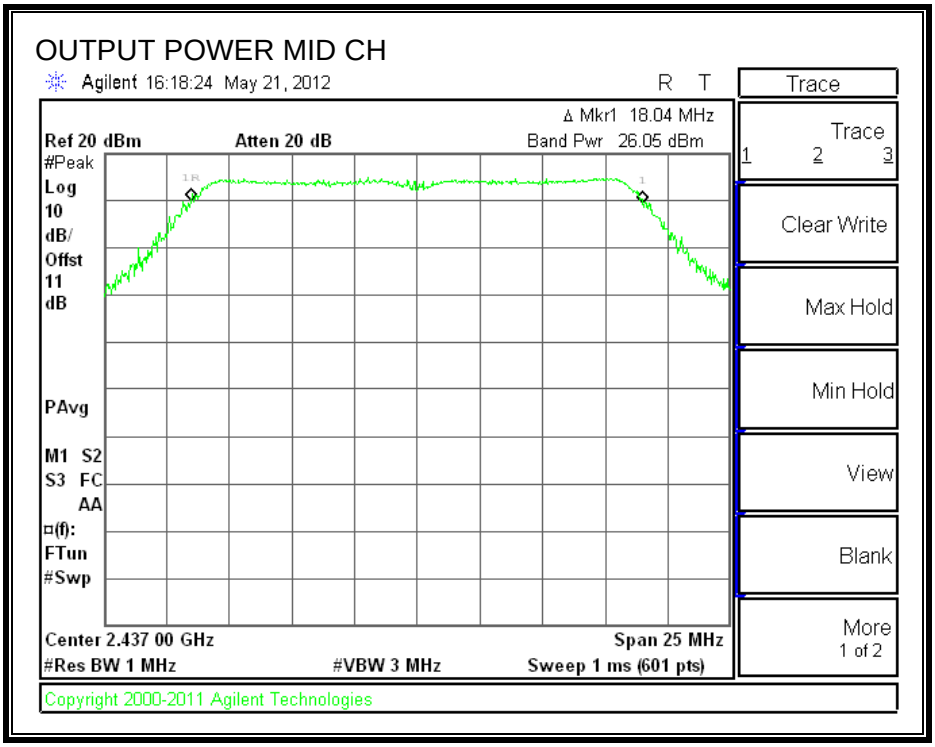
RESULTS

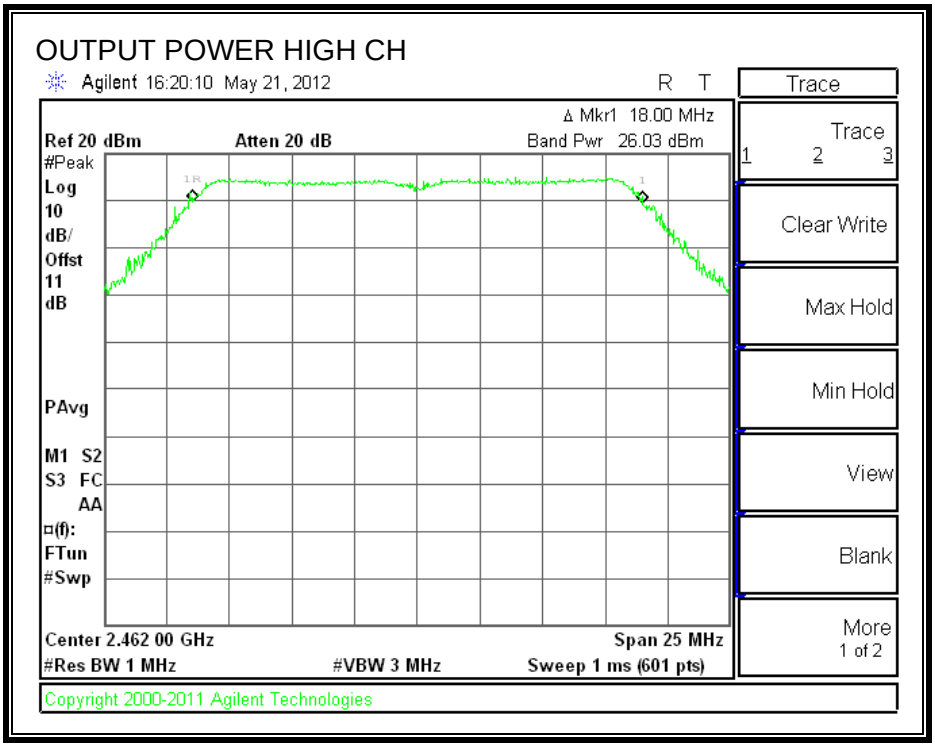
The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	26.00	26.00	30	-4.00
Middle	2437	26.05	26.05	30	-3.95
High	2462	26.03	26.03	30	-3.97

OUTPUT POWER







7.3.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11 dB (including 10 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	16.00
Middle	2437	15.97
High	2462	15.07

7.3.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

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

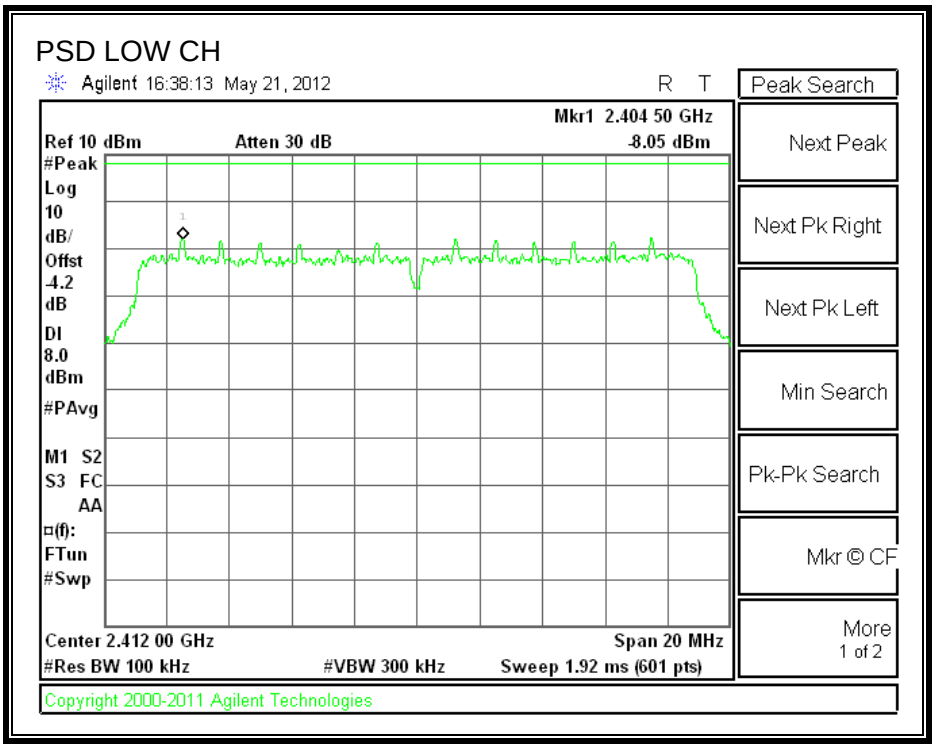
TEST PROCEDURE

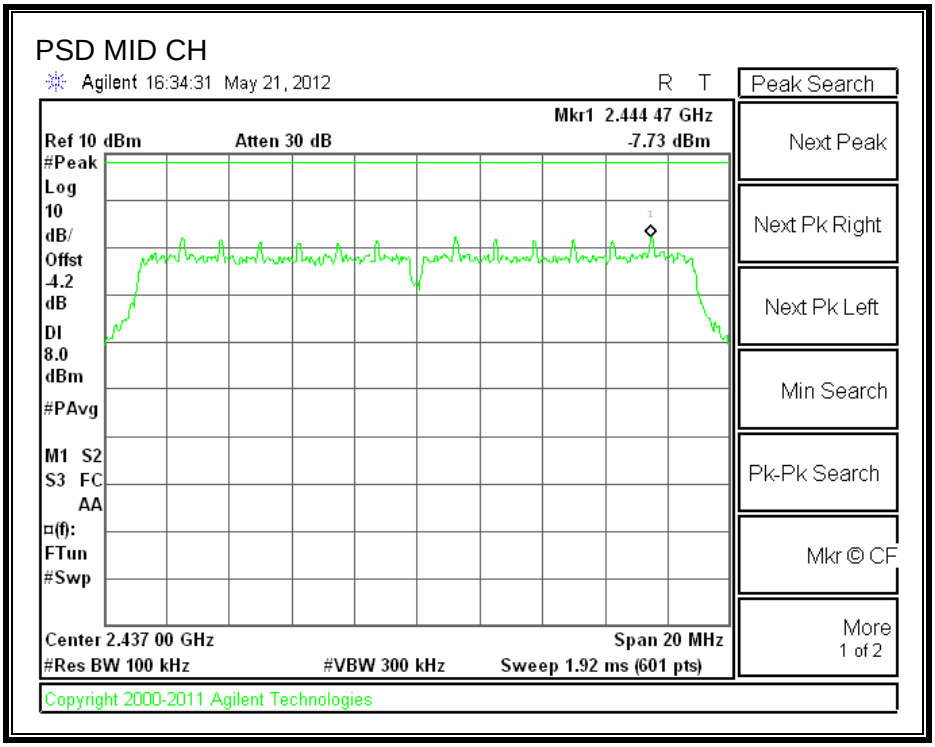
KDB 558074 D01 v01 “Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247”.

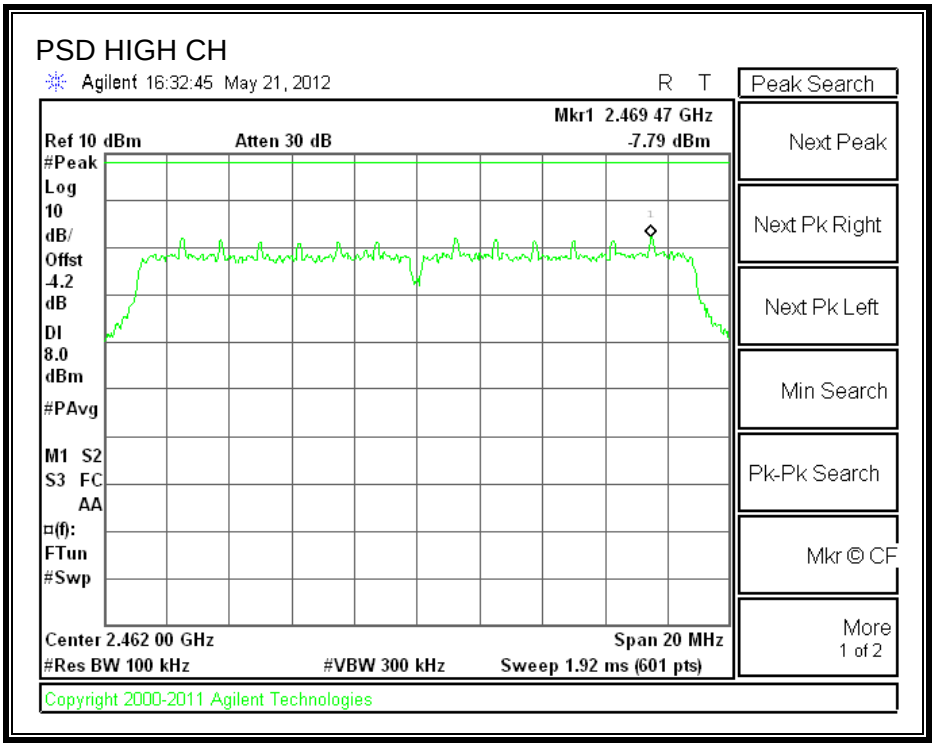
RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-8.05	8	-16.05
Middle	2437	-7.73	8	-15.73
High	2462	-7.79	8	-15.79

POWER SPECTRAL DENSITY







7.3.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

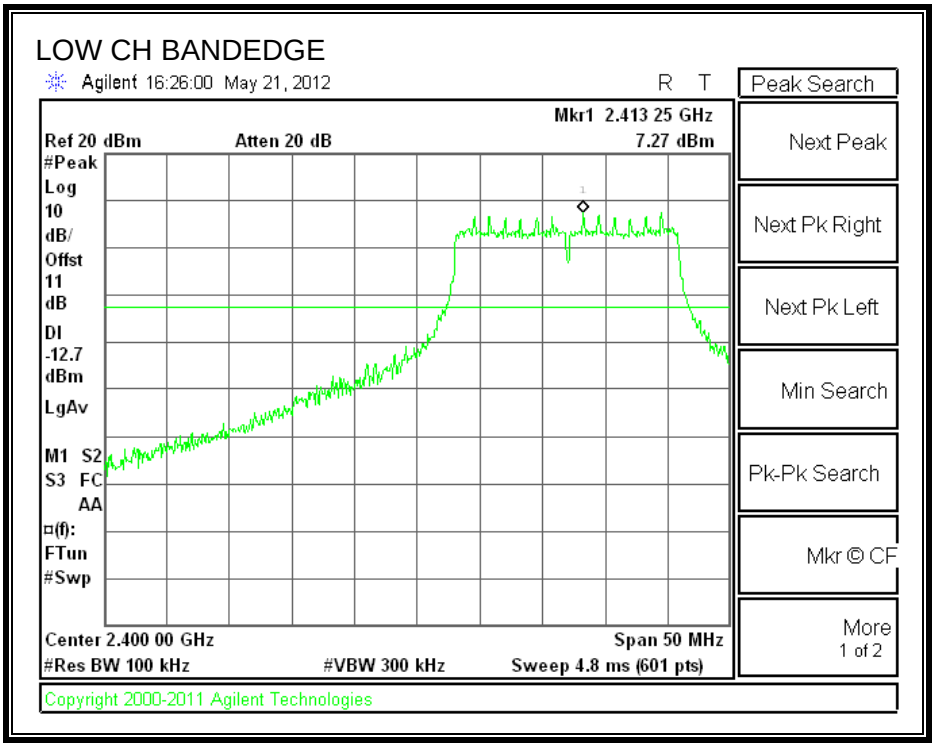
Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

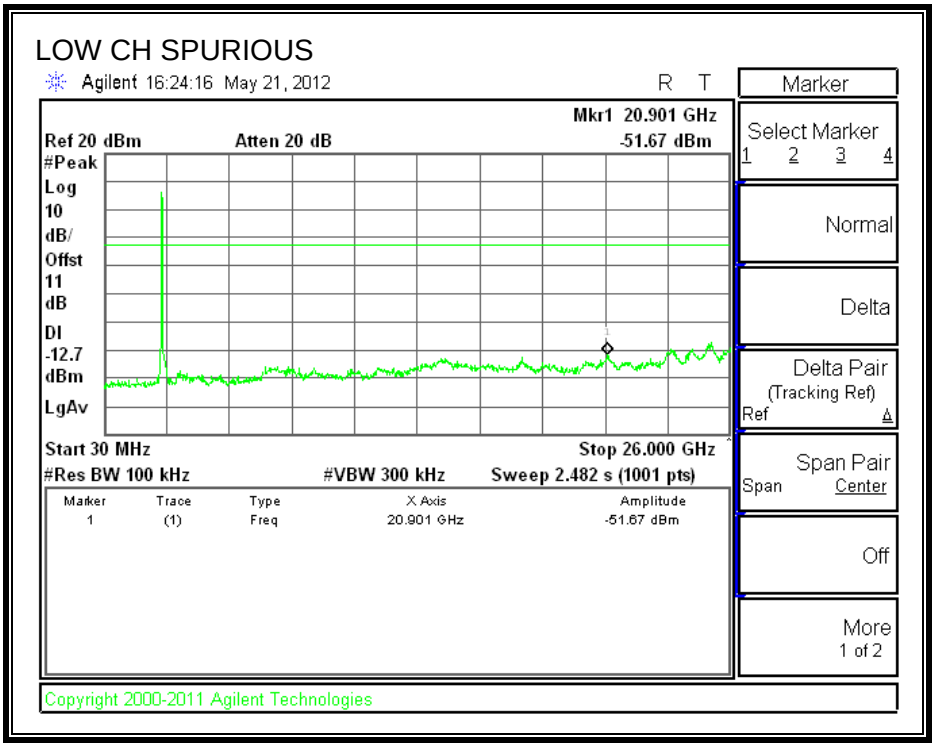
TEST PROCEDURE

KDB 558074 D01 v01 “Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247”.

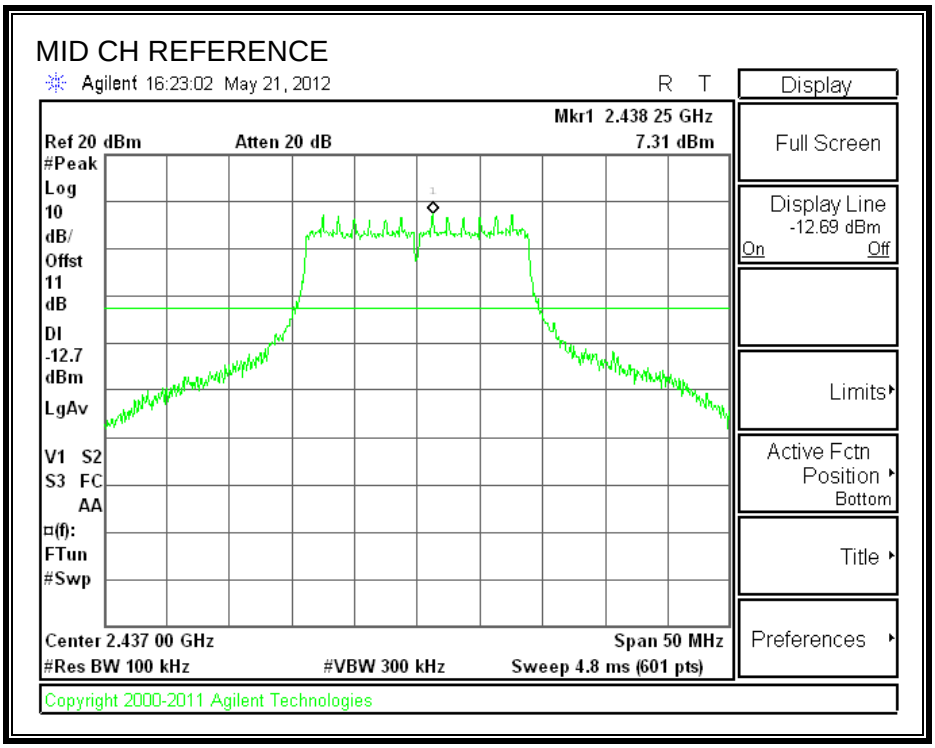
RESULTS

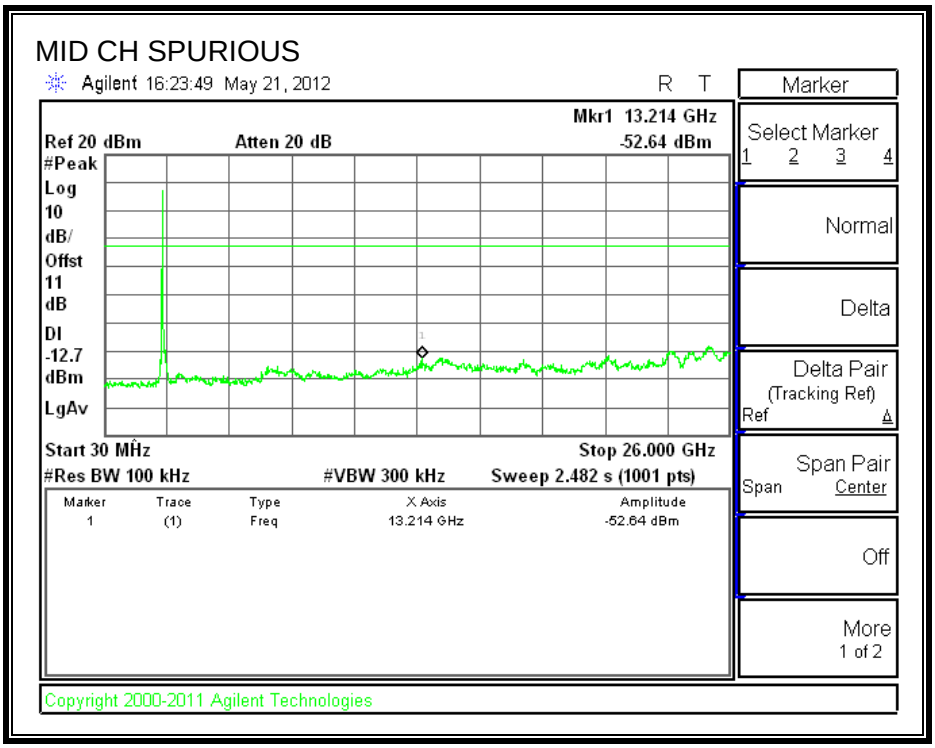
SPURIOUS EMISSIONS, LOW CHANNEL



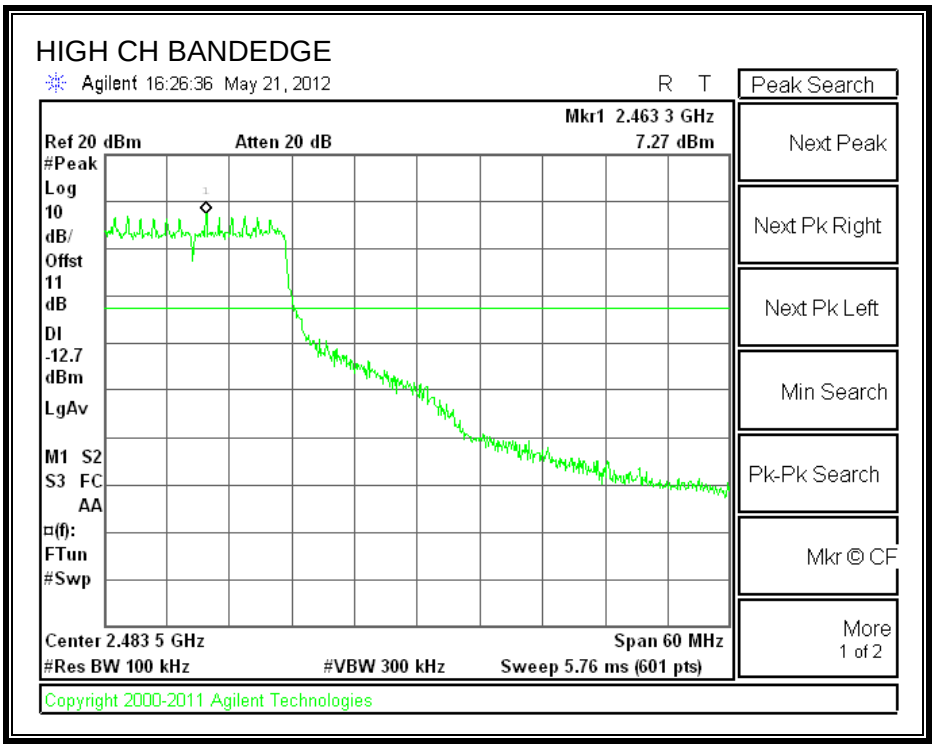


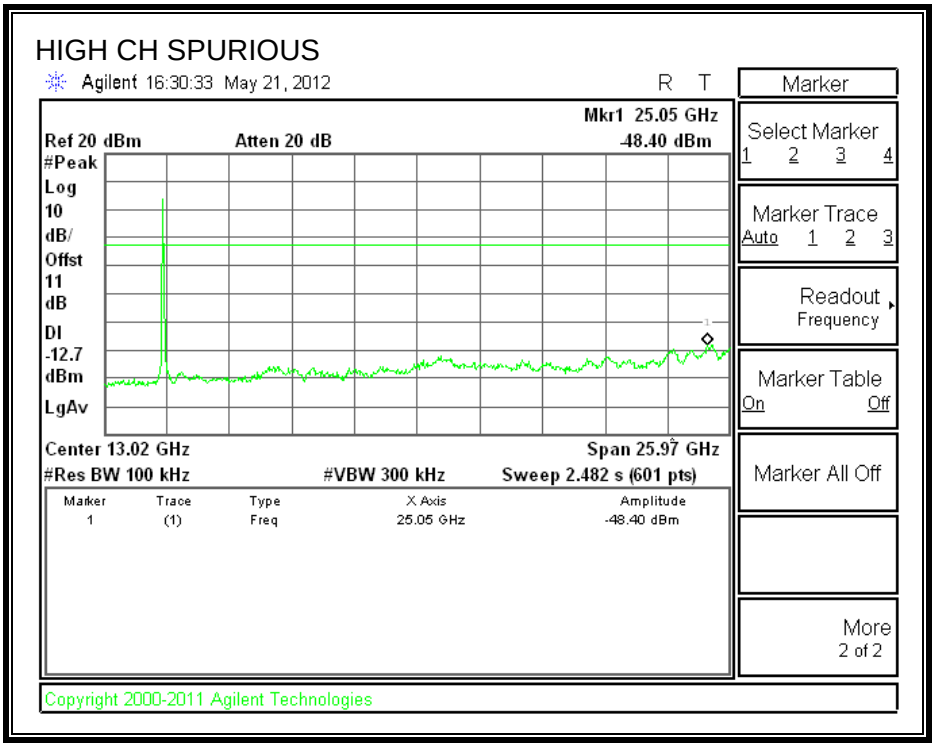
SPURIOUS EMISSIONS, MID CHANNEL





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.

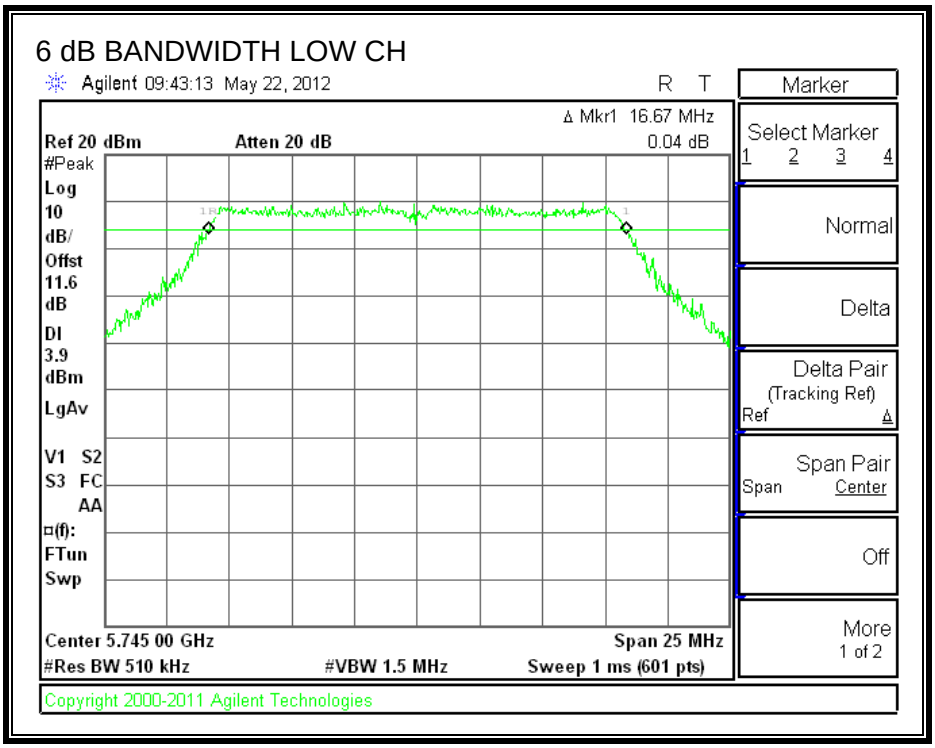
TEST PROCEDURE

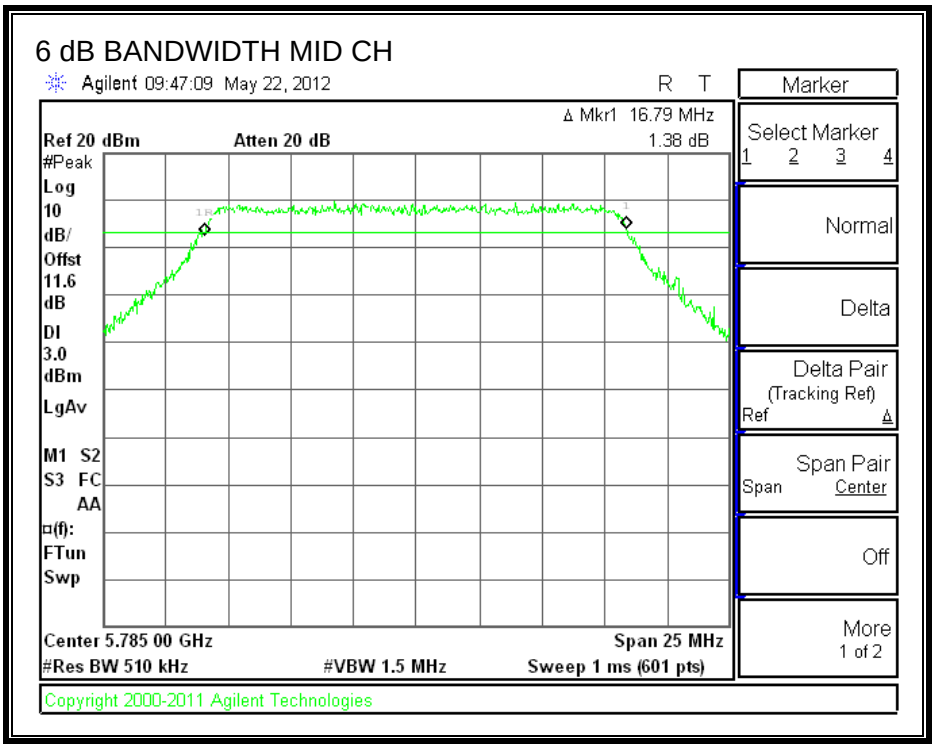
KDB 558074 D01 v01 “Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247”.

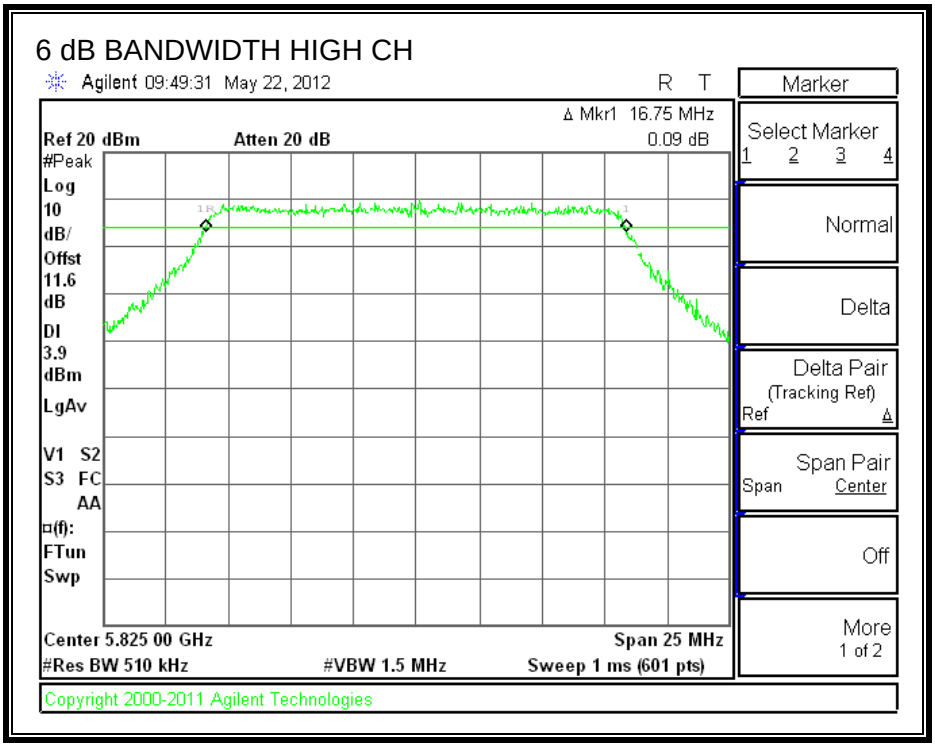
RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	5745	16.67	0.5
Middle	5785	16.79	0.5
High	5825	16.75	0.5

6 dB BANDWIDTH







7.4.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

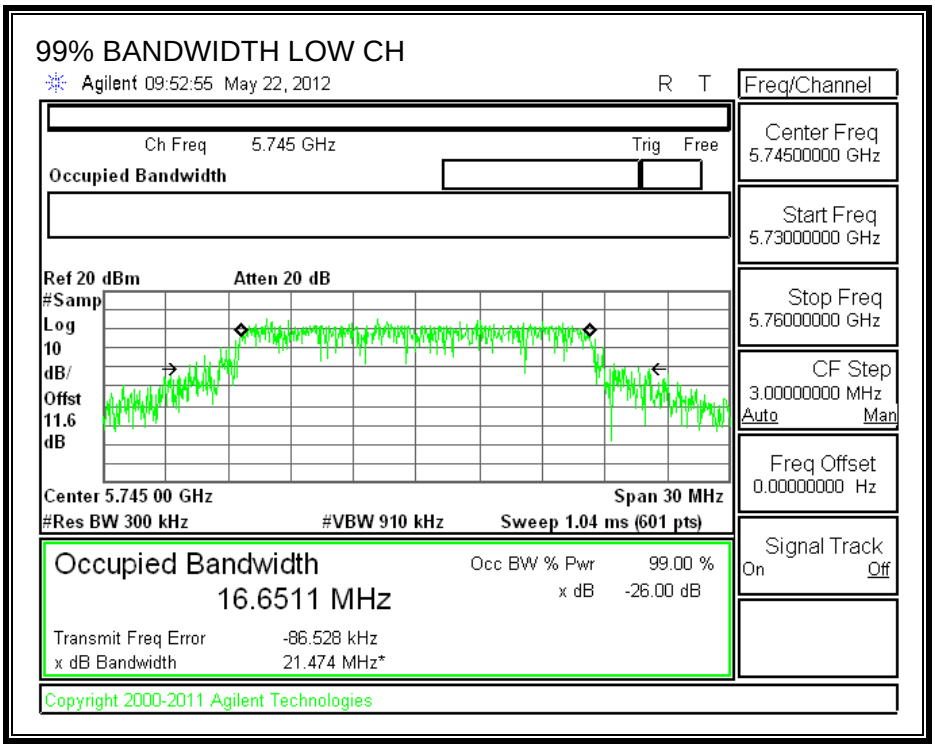
TEST PROCEDURE

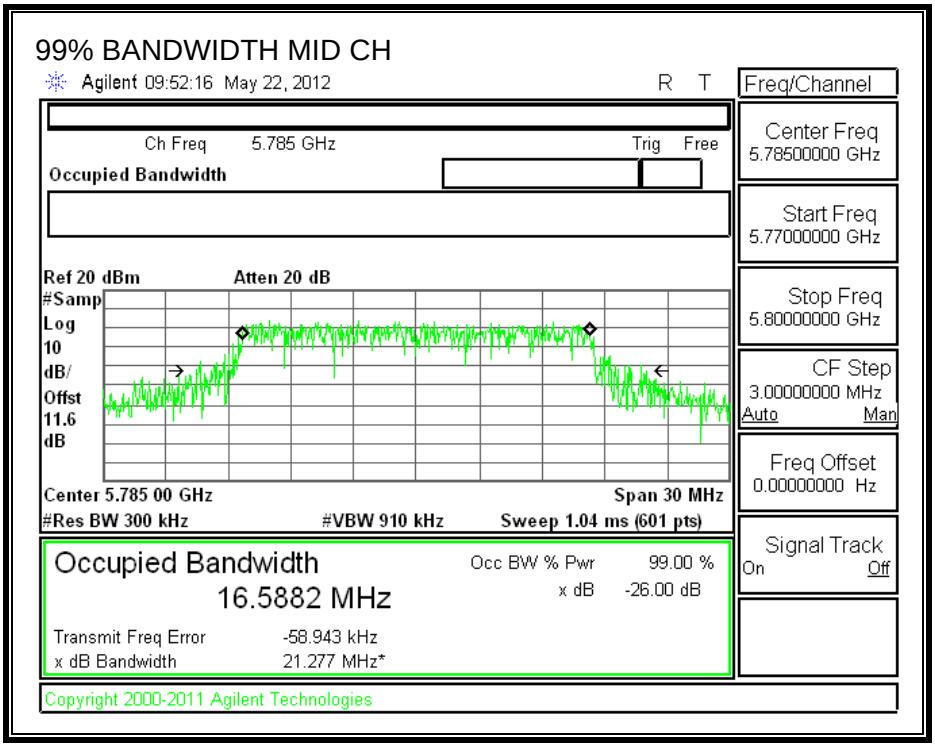
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth and to 1% of the span. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

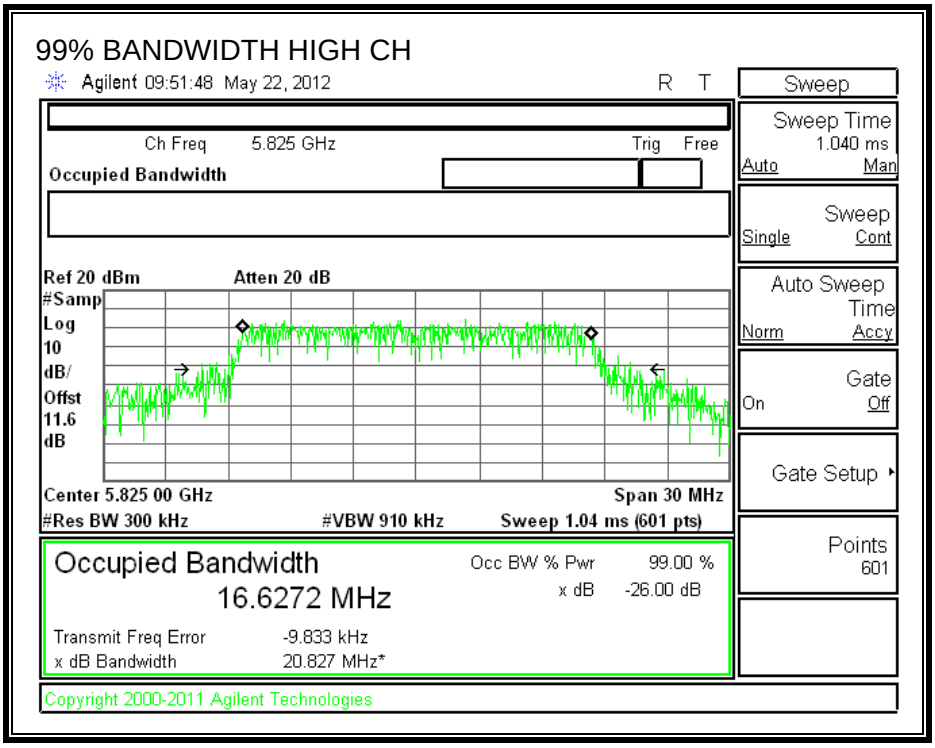
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5745	16.6511
Middle	5785	16.5882
High	5825	16.6272

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

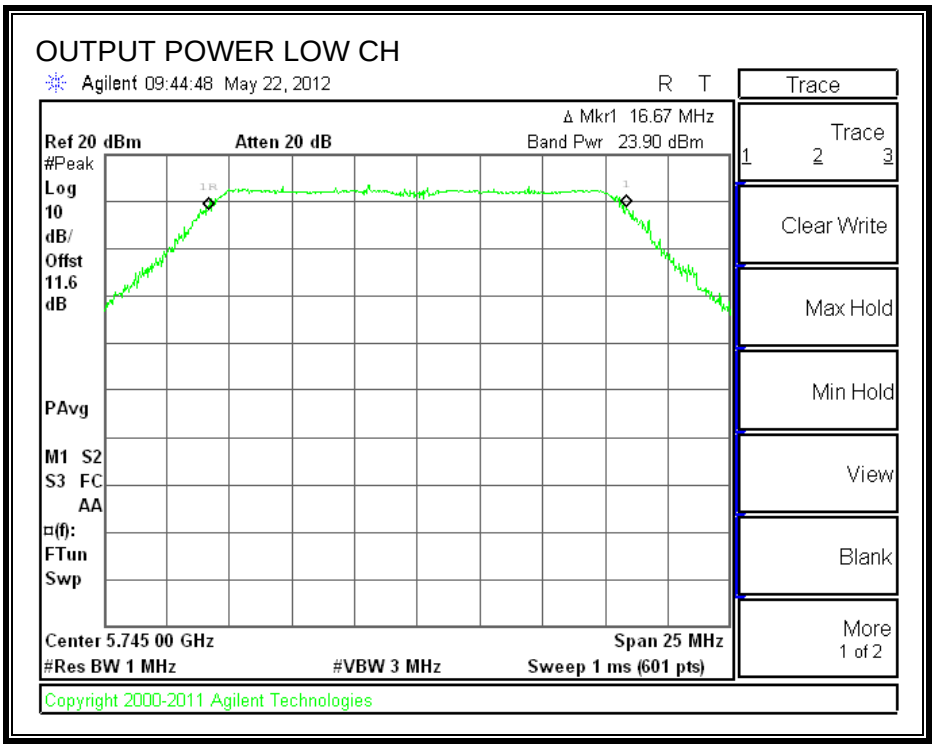
KDB 558074 D01 v01 “Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247”.

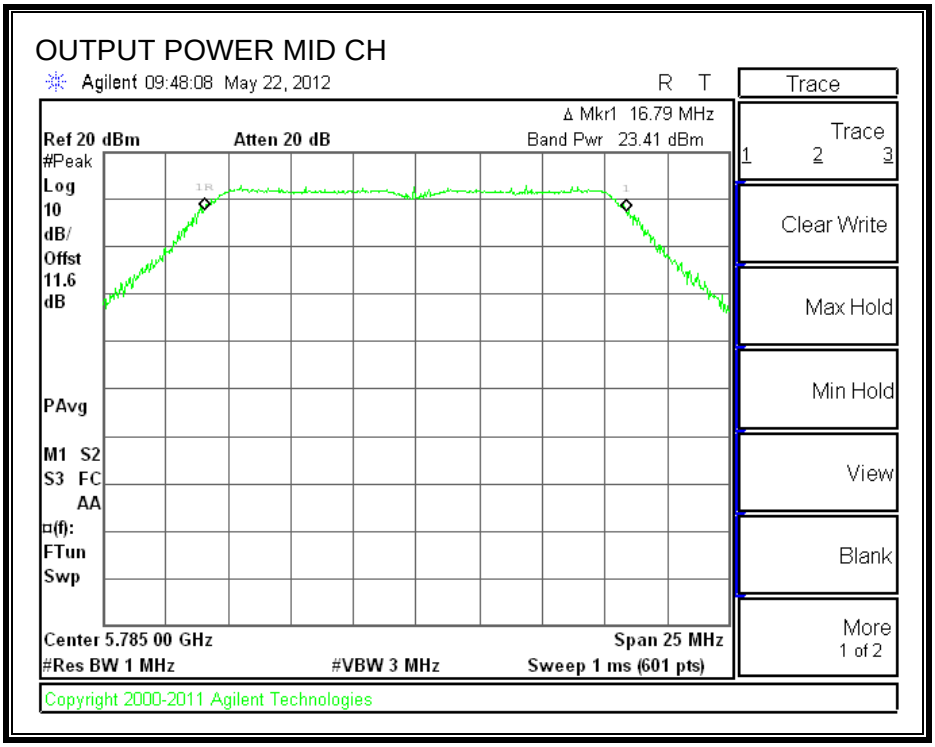
RESULTS

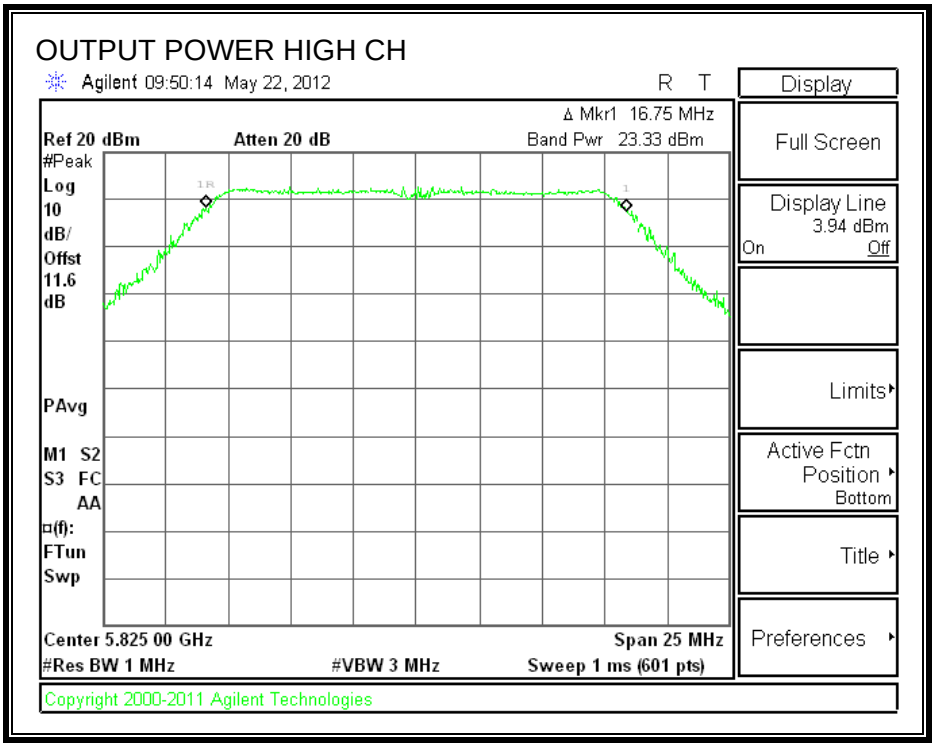
The cable assembly insertion loss of 11.6dB (including 10 dB pad and 1.6 dB cable) was entered as an offset in the power meter to allow for direct reading of power

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	5745	23.9	23.90	30	-6.10
Middle	5785	23.41	23.41	30	-6.59
High	5825	23.33	23.33	30	-6.67

OUTPUT POWER







7.4.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11.6 dB (including 10 dB pad and 1.6 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	13.00
Middle	5785	12.96
High	5825	12.98

7.4.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

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

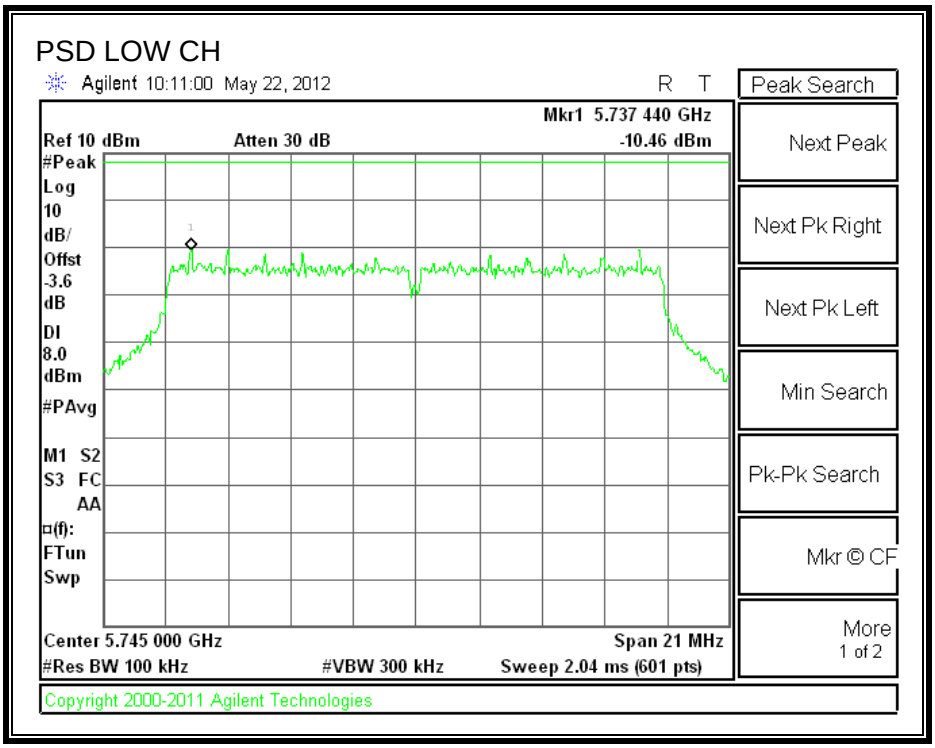
TEST PROCEDURE

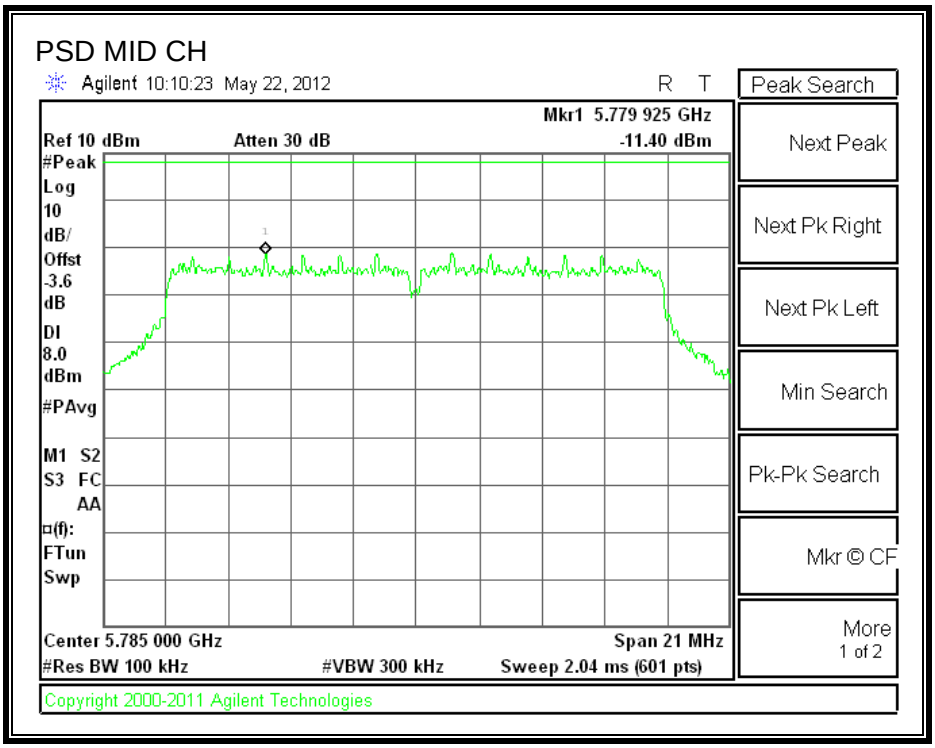
KDB 558074 D01 v01 “Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247”.

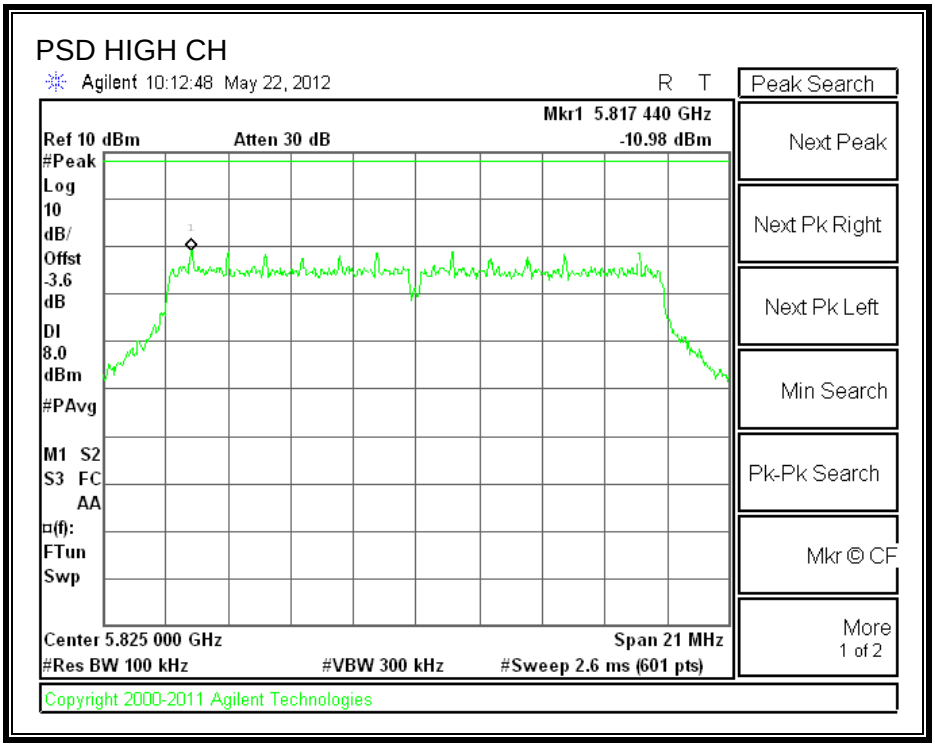
RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5745	-10.46	8	-18.46
Middle	5785	-11.40	8	-19.40
High	5825	-10.98	8	-18.98

POWER SPECTRAL DENSITY







7.4.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

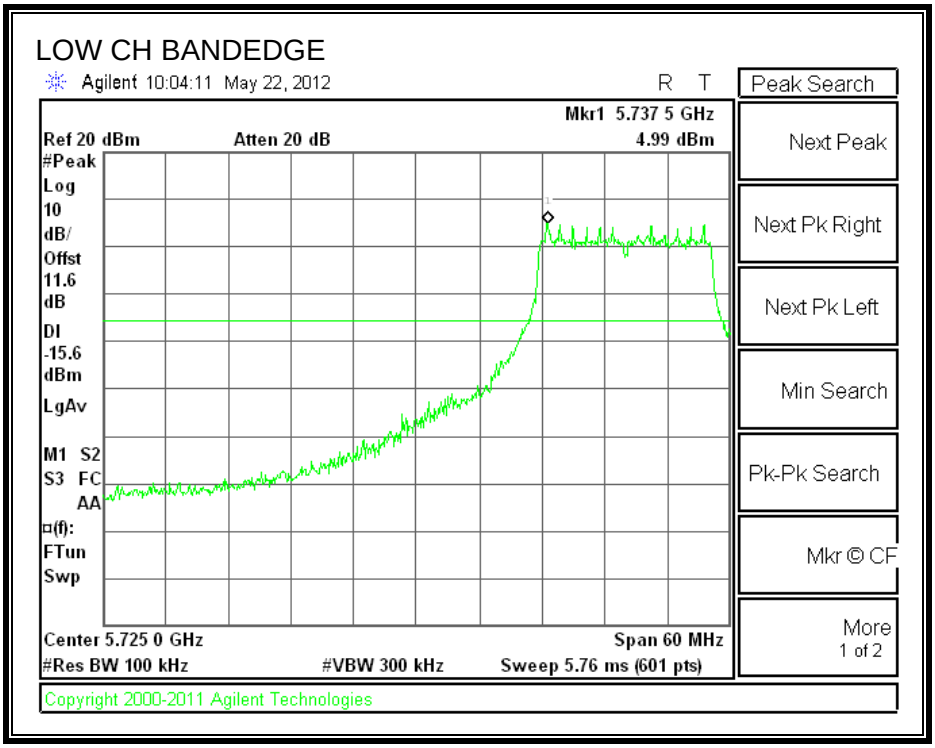
Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

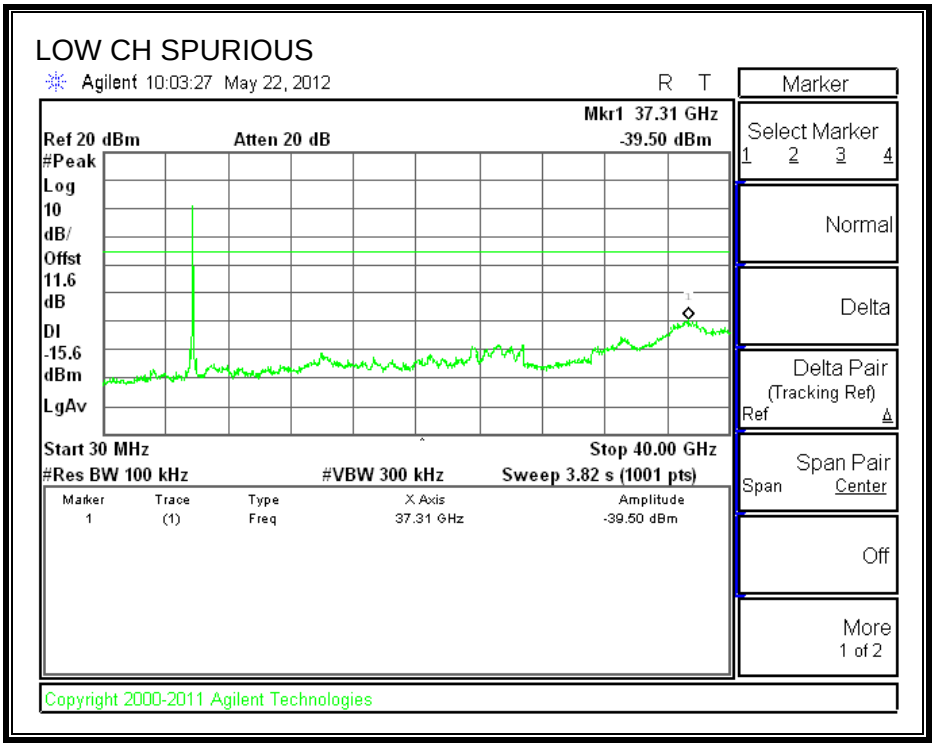
TEST PROCEDURE

KDB 558074 D01 v01 “Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247”.

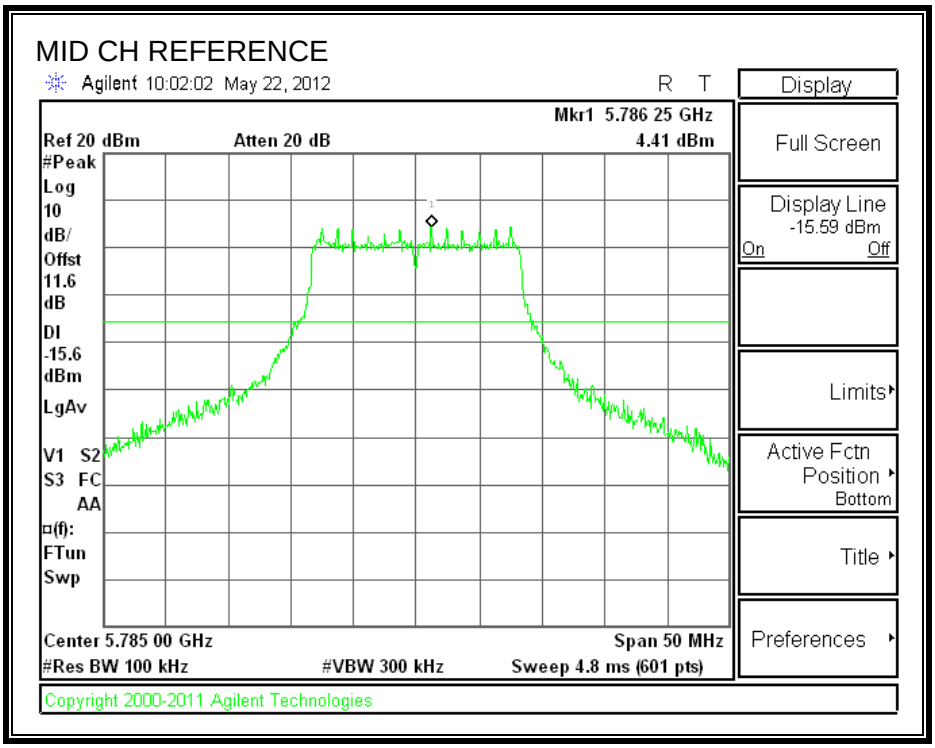
RESULTS

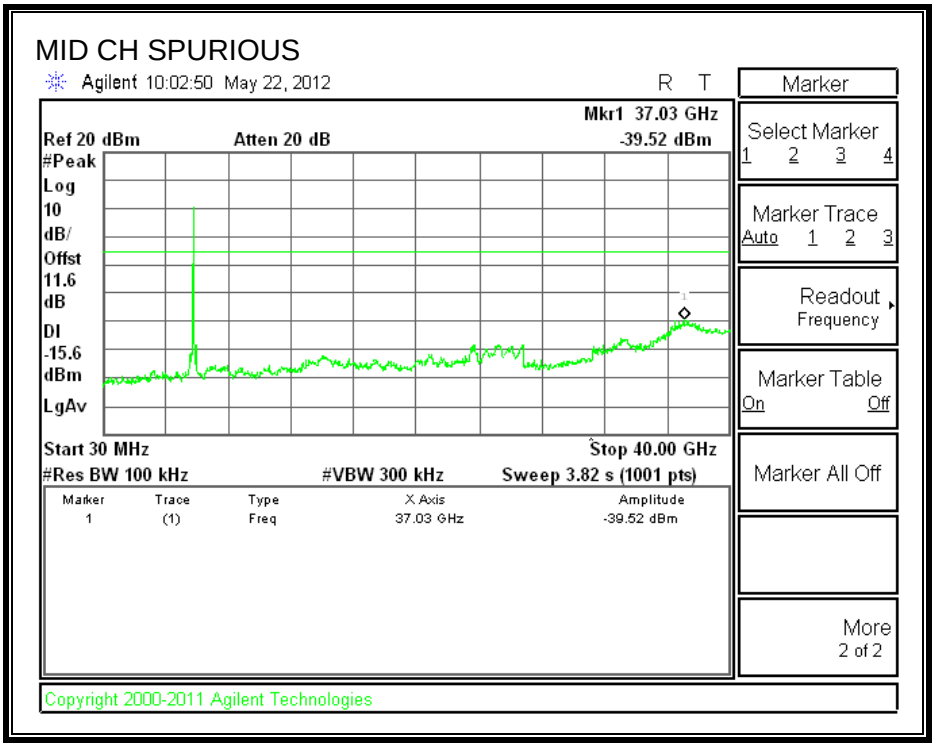
SPURIOUS EMISSIONS, LOW CHANNEL



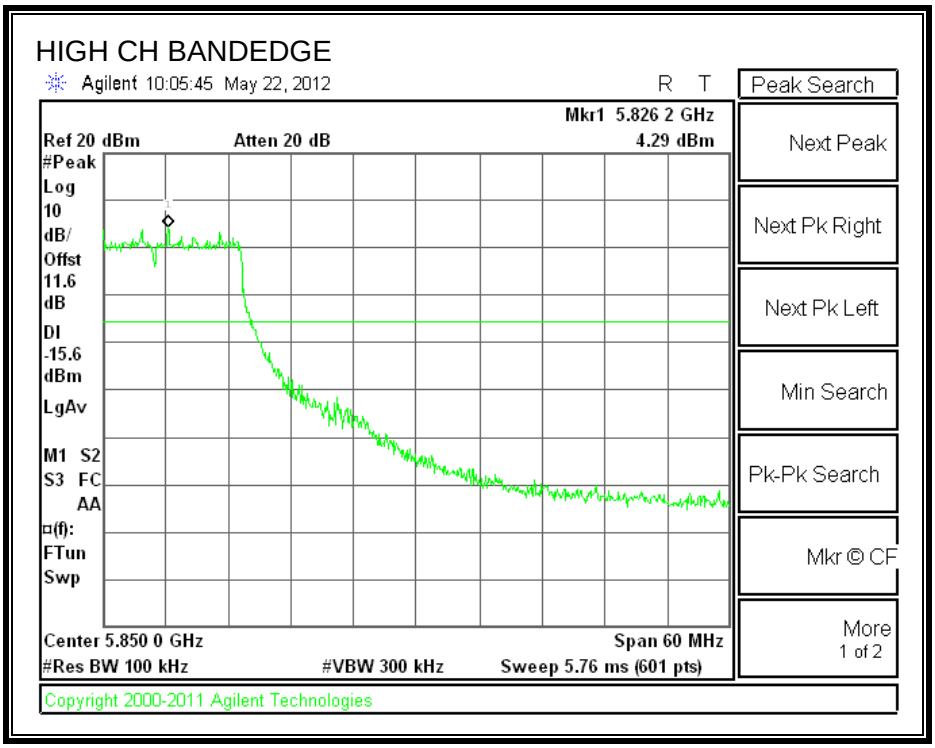


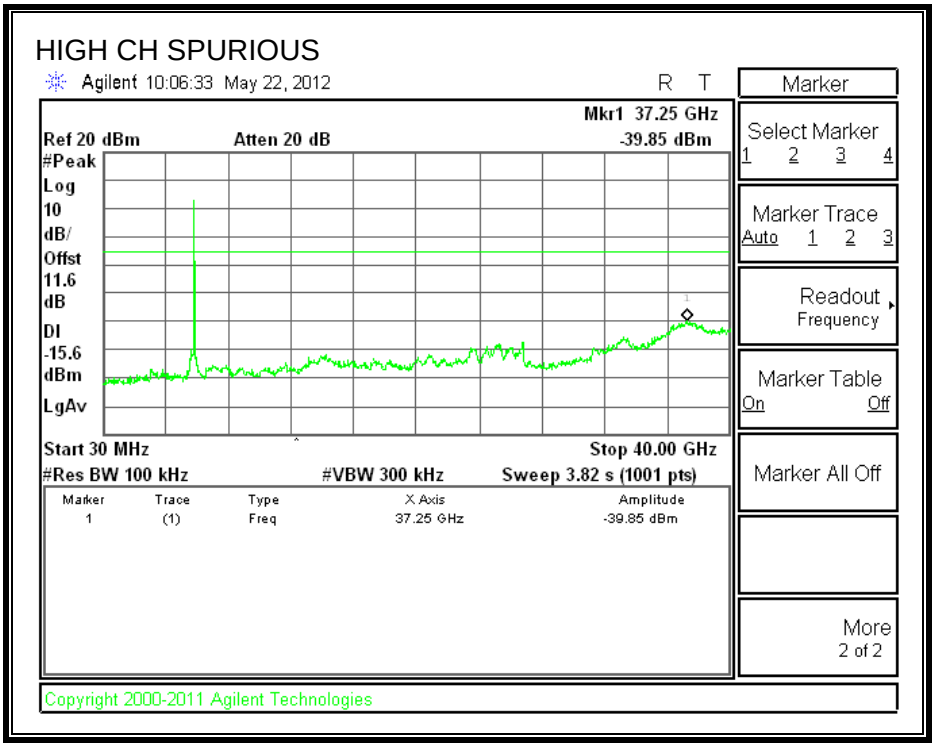
SPURIOUS EMISSIONS, MID CHANNEL





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.

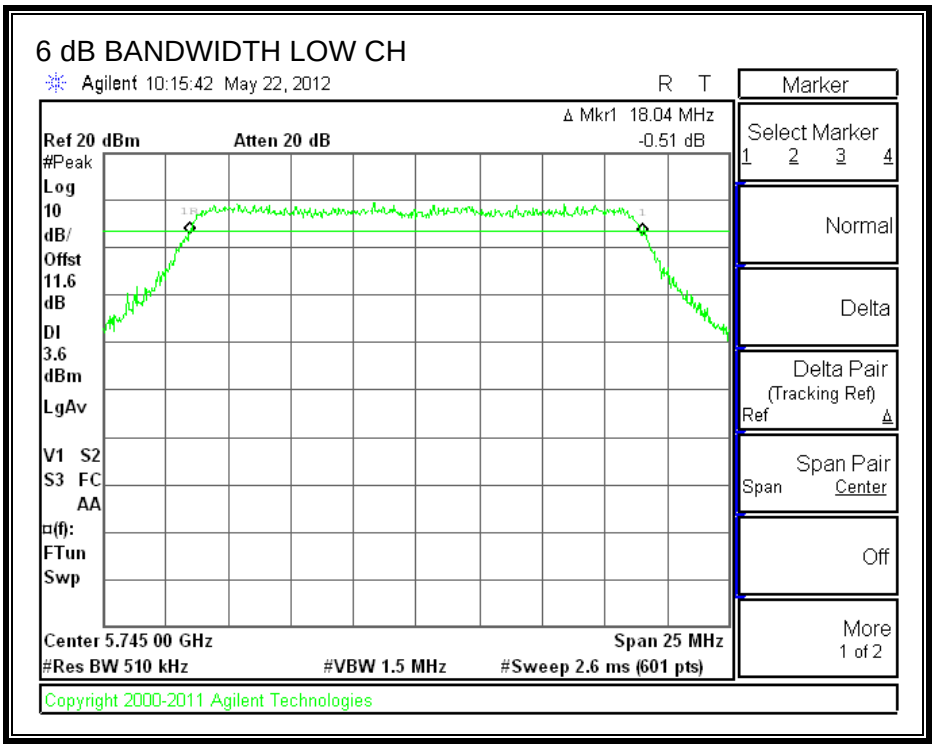
TEST PROCEDURE

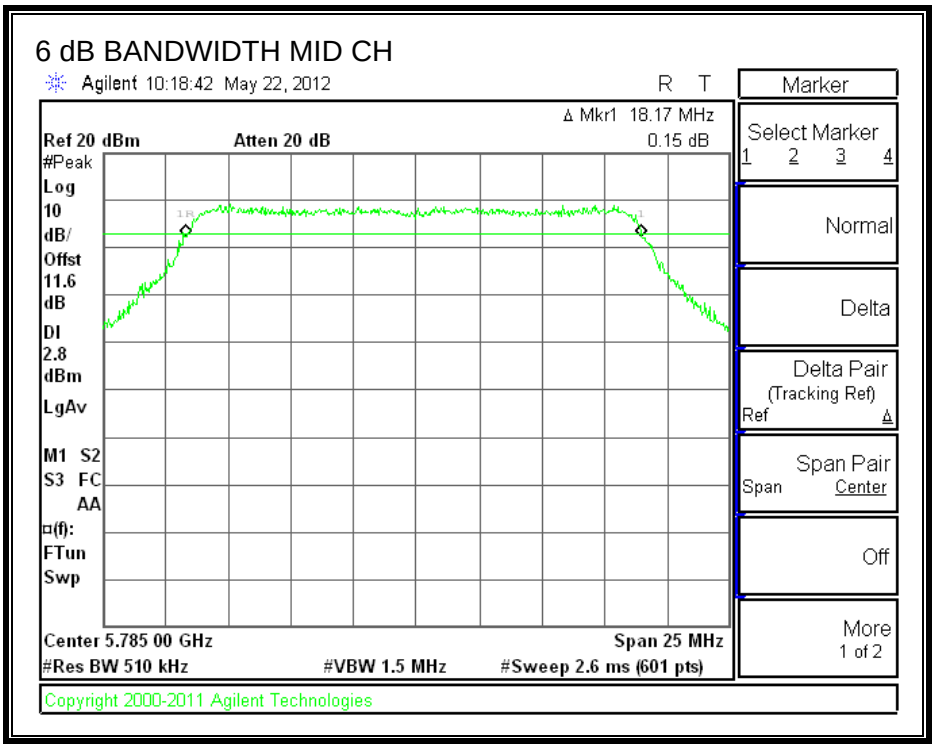
KDB 558074 D01 v01 “Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247”.

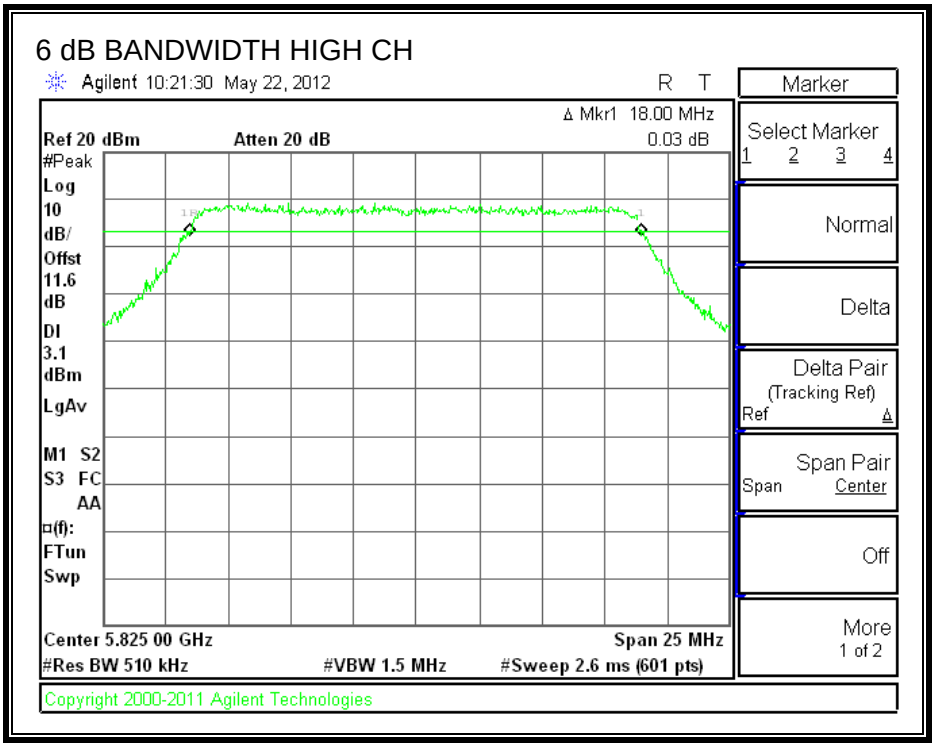
RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	5745	18.04	0.5
Middle	5785	18.17	0.5
High	5825	18.00	0.5

6 dB BANDWIDTH







7.5.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

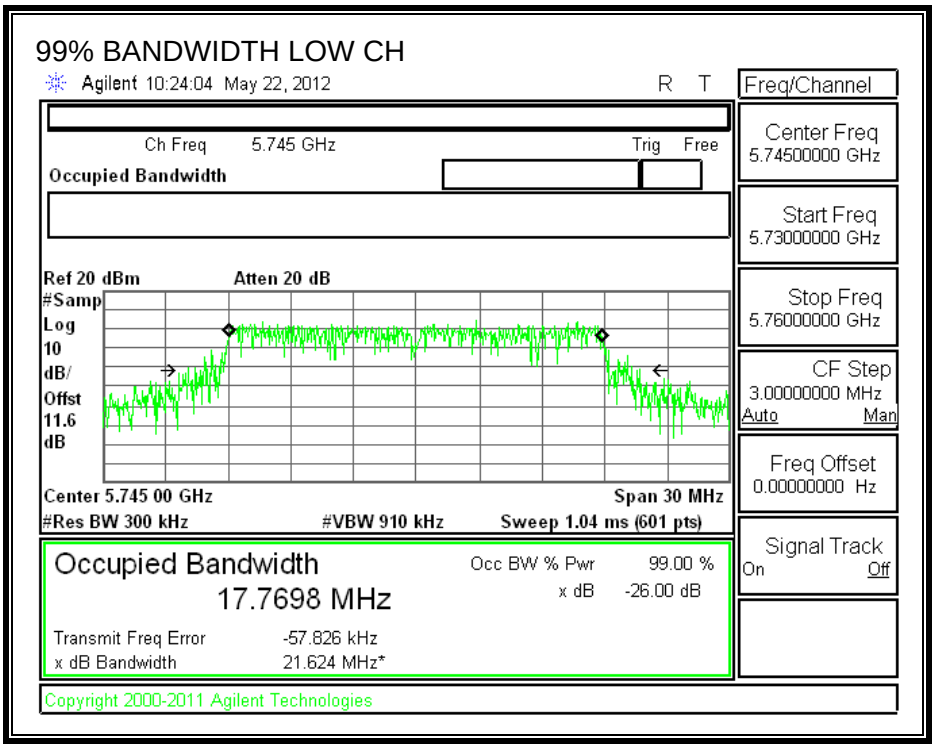
TEST PROCEDURE

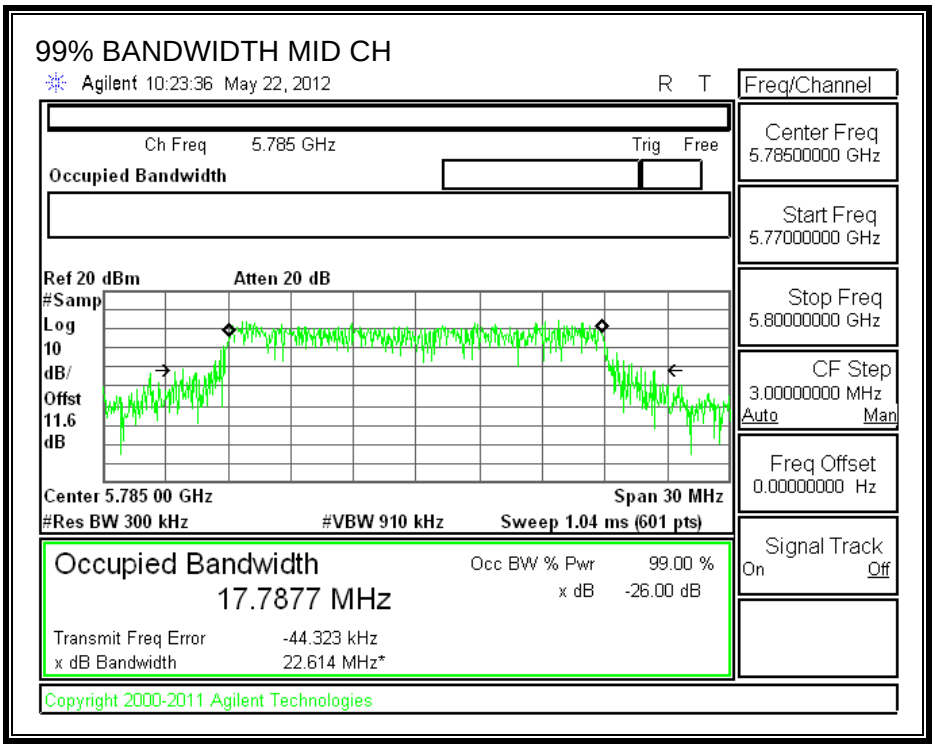
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth and to 1% of the span. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

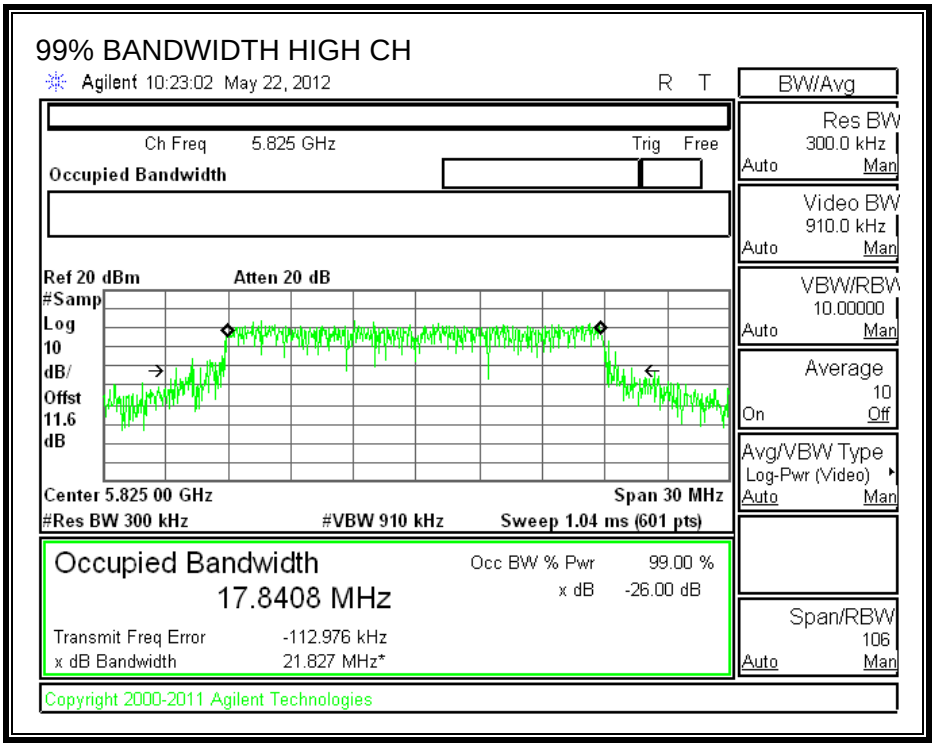
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5745	17.7698
Middle	5785	17.7877
High	5825	17.8408

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

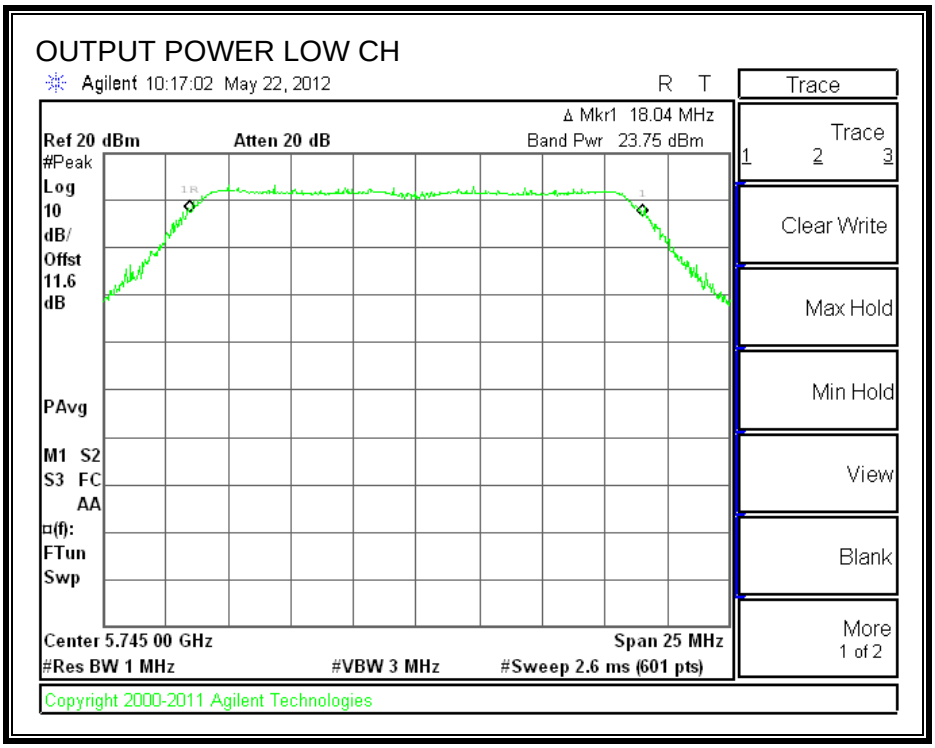
KDB 558074 D01 v01 “Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247”.

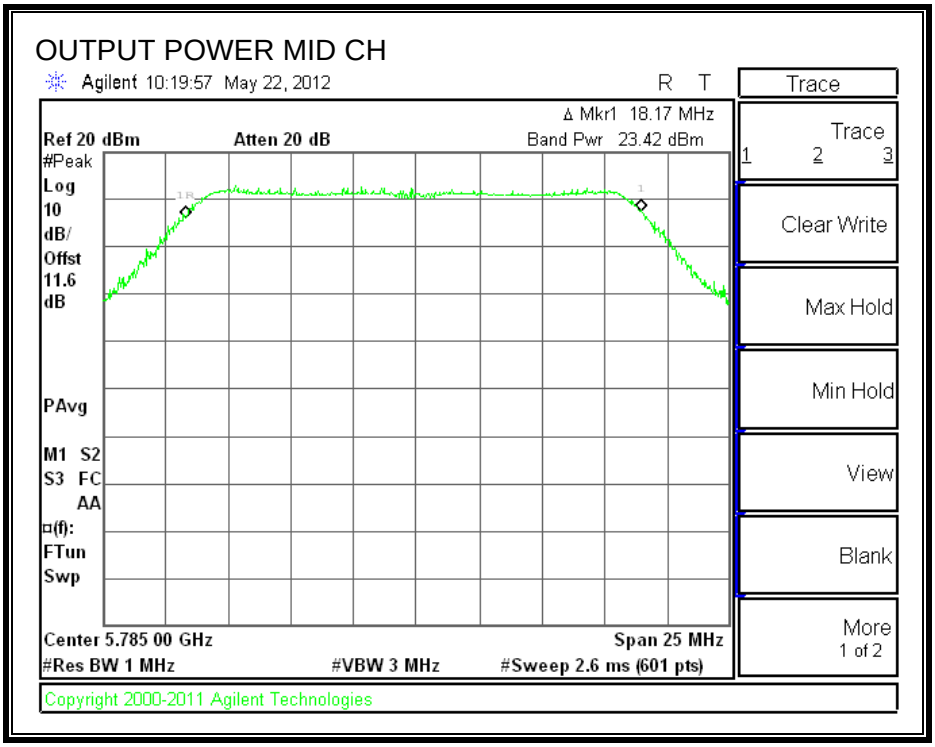
RESULTS

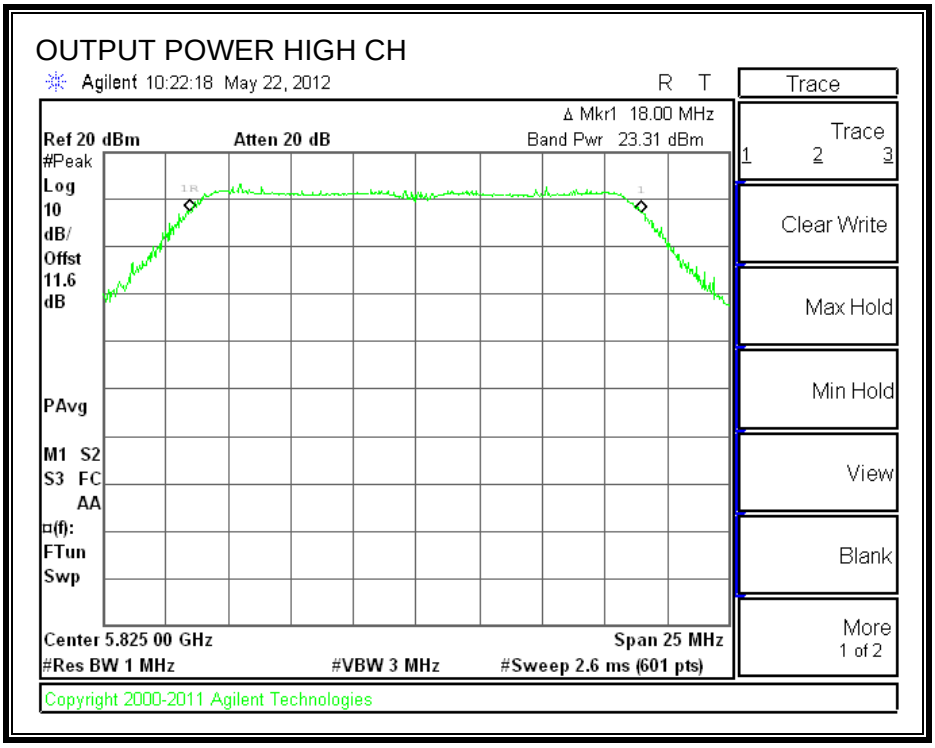
The cable assembly insertion loss of 11.6 dB (including 10 dB pad and 1.6 dB cable) was entered as an offset in the power meter to allow for direct reading of power

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	5745	23.75	23.75	30	-6.25
Middle	5785	23.42	23.42	30	-6.58
High	5825	23.31	23.31	30	-6.69

OUTPUT POWER







7.5.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11.6 dB (including 10 dB pad and 1.6 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	13.00
Middle	5785	13.00
High	5825	12.98

7.5.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

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

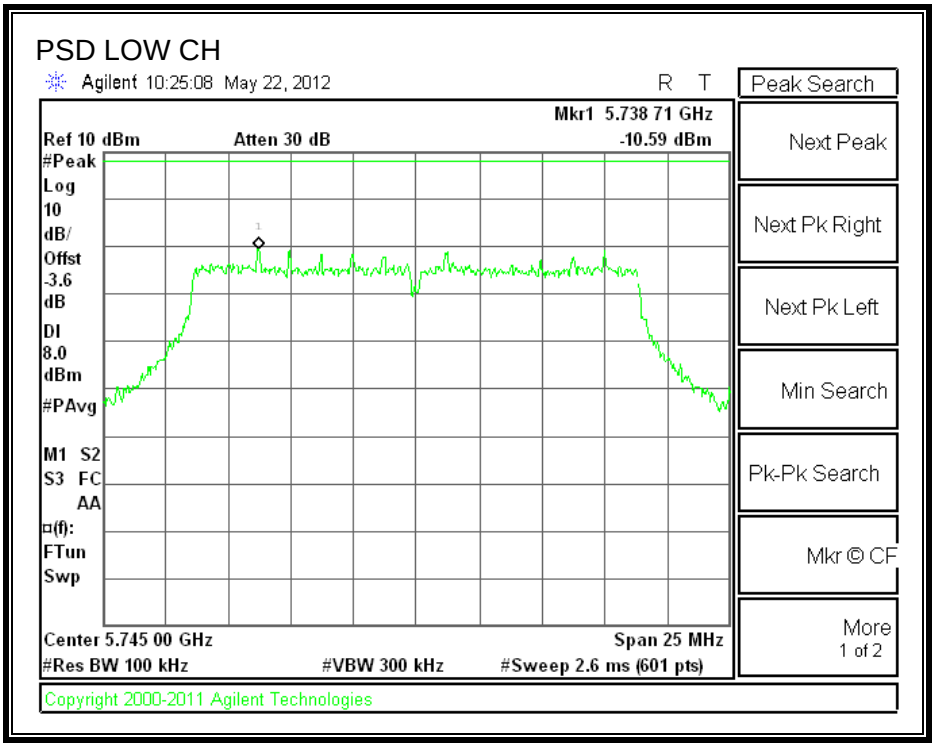
TEST PROCEDURE

KDB 558074 D01 v01 “Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247”.

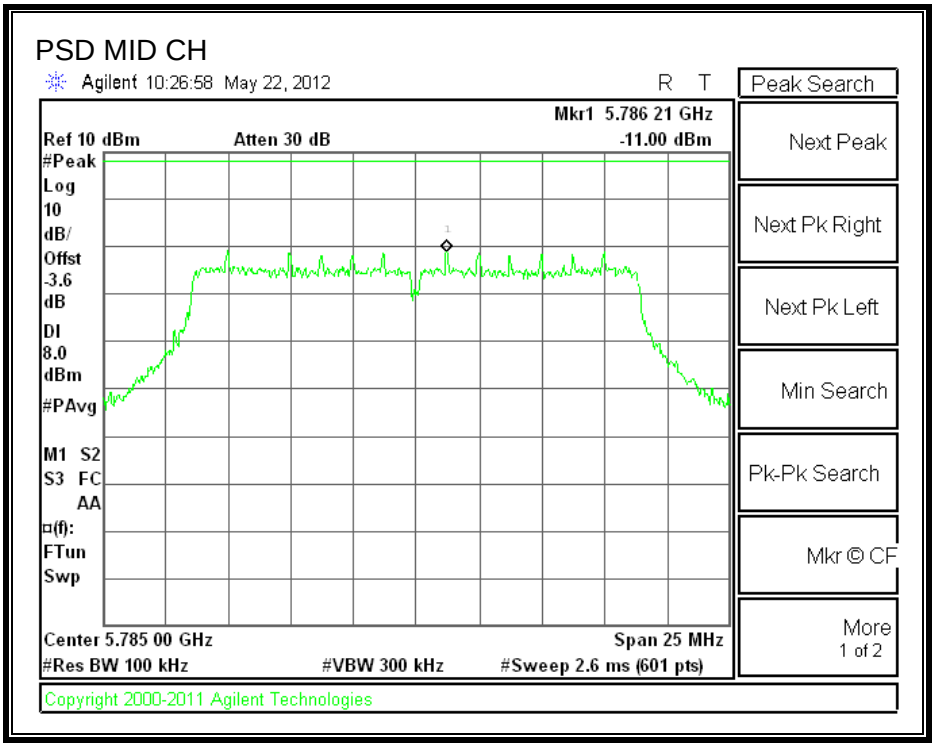
RESULTS

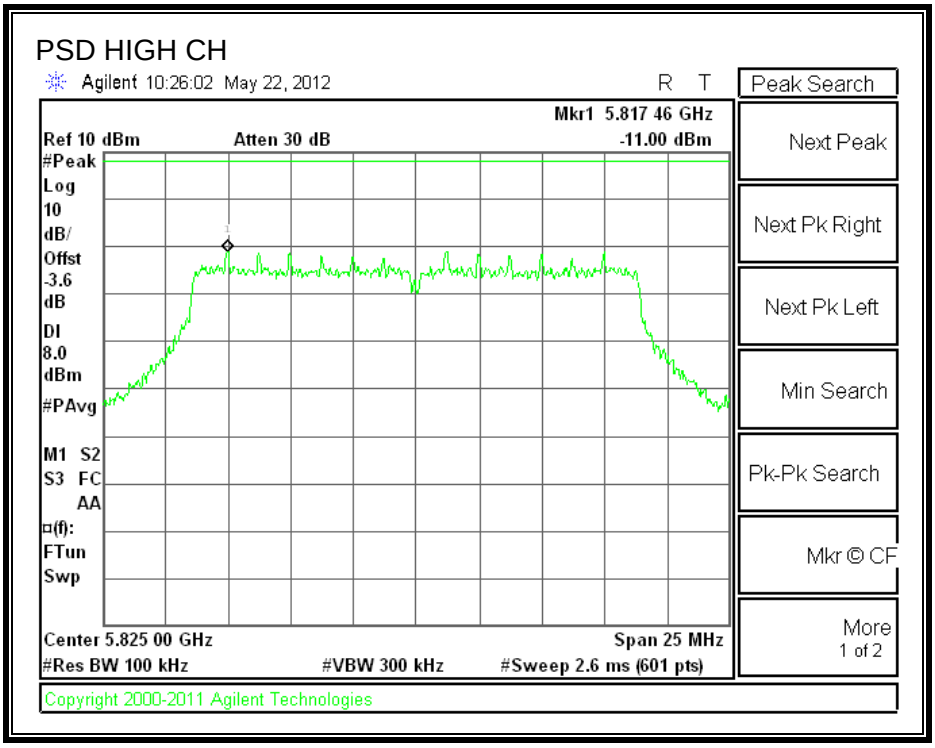
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5745	-10.59	8	-18.59
Middle	5785	-11.00	8	-19.00
High	5825	-11.00	8	-19.00

POWER SPECTRAL DENSITY



PSD MID CH





7.5.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

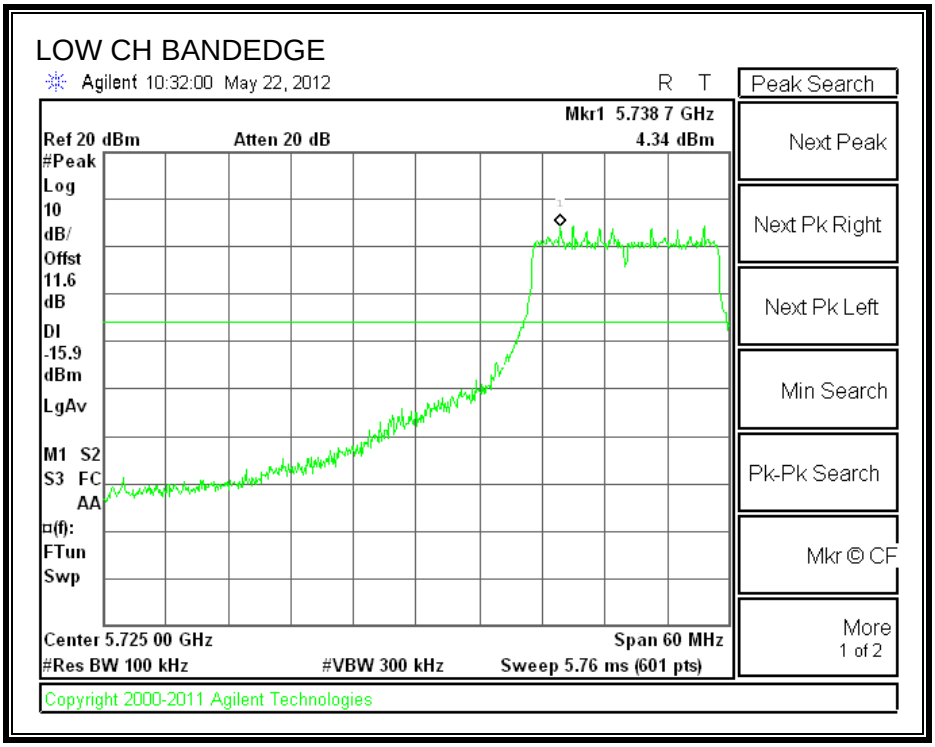
Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

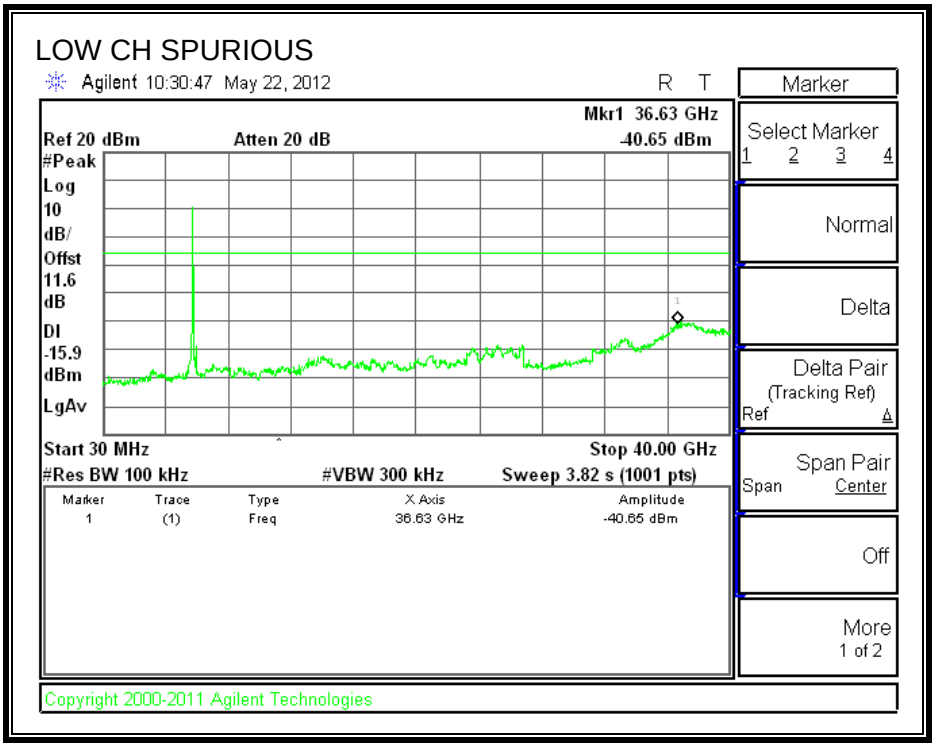
TEST PROCEDURE

KDB 558074 D01 v01 “Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247”.

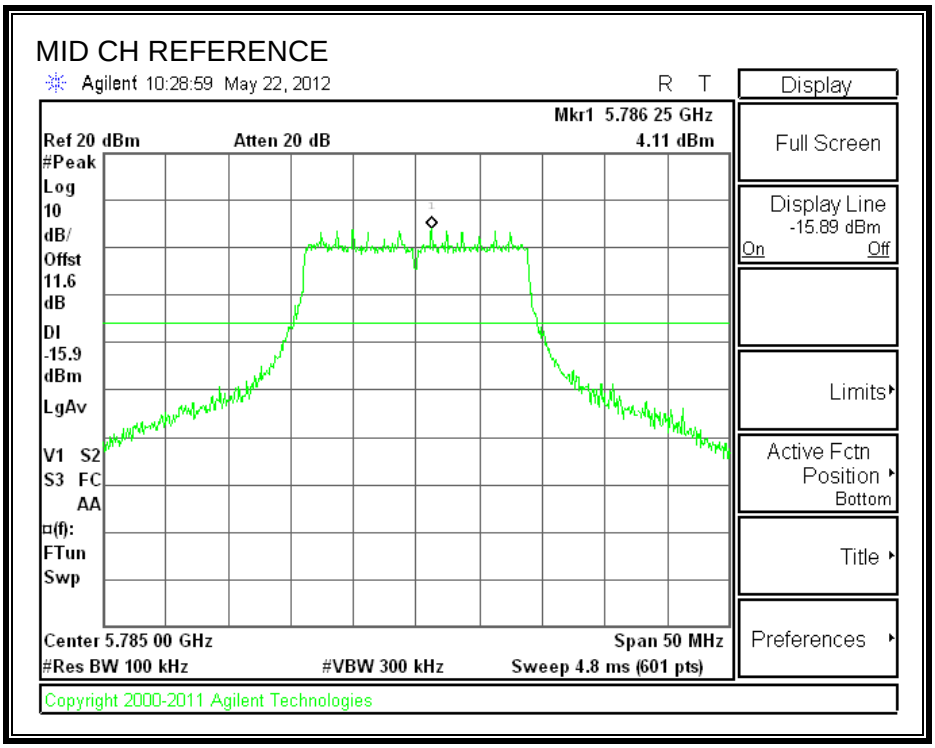
RESULTS

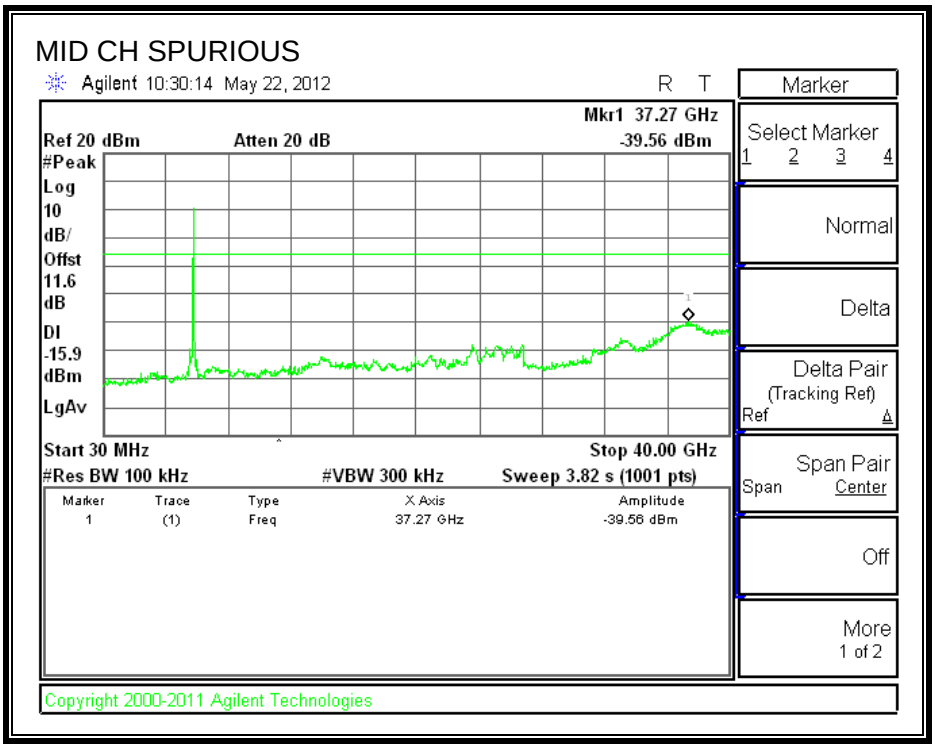
SPURIOUS EMISSIONS, LOW CHANNEL



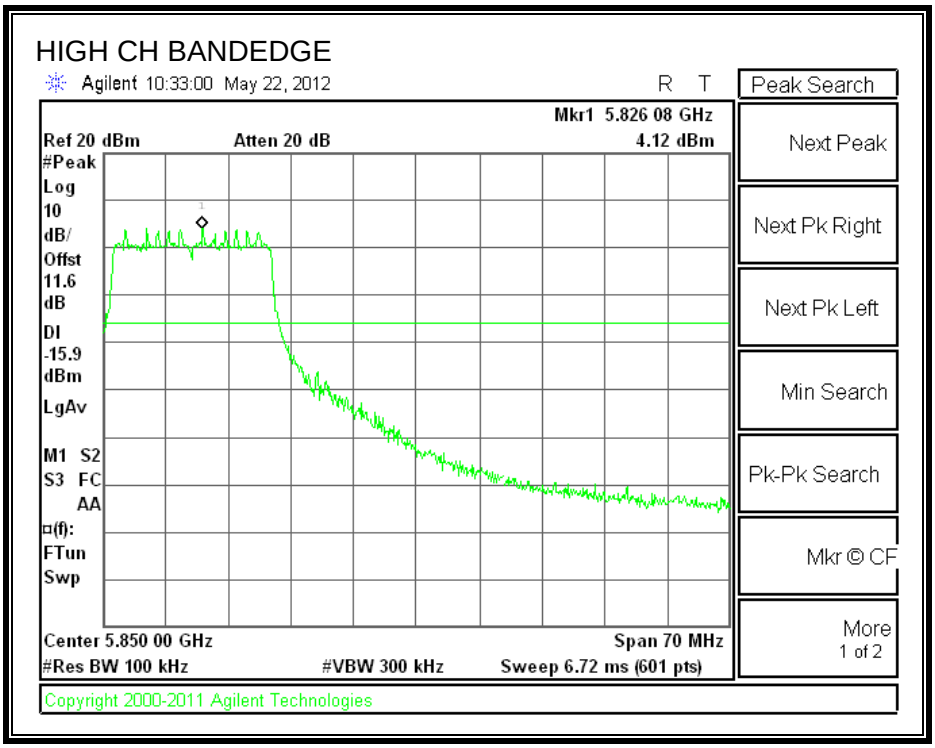


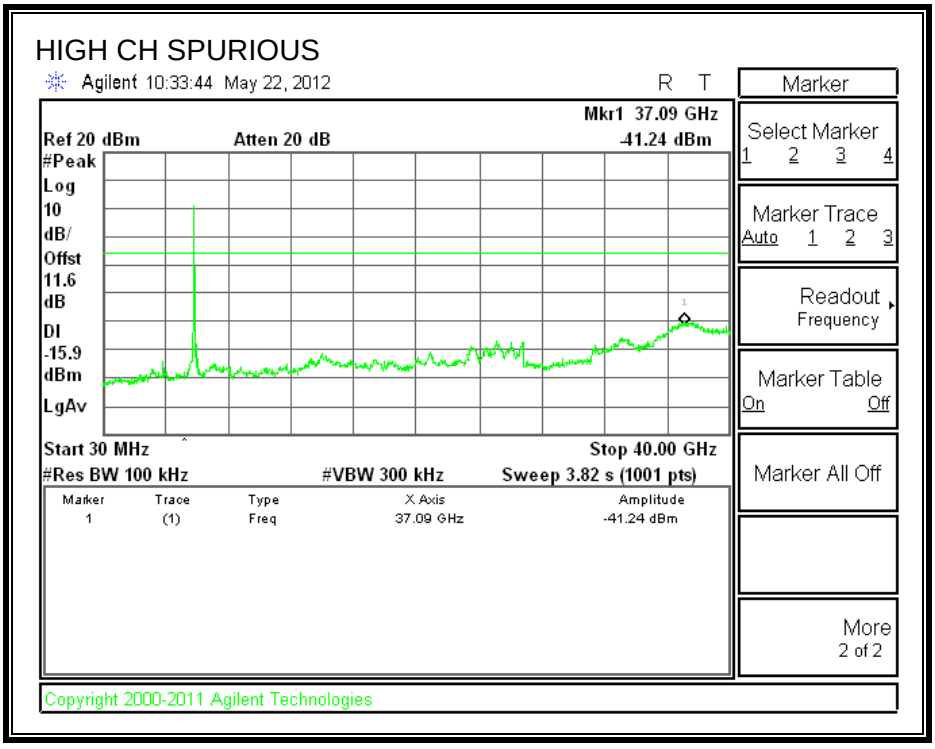
SPURIOUS EMISSIONS, MID CHANNEL





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.

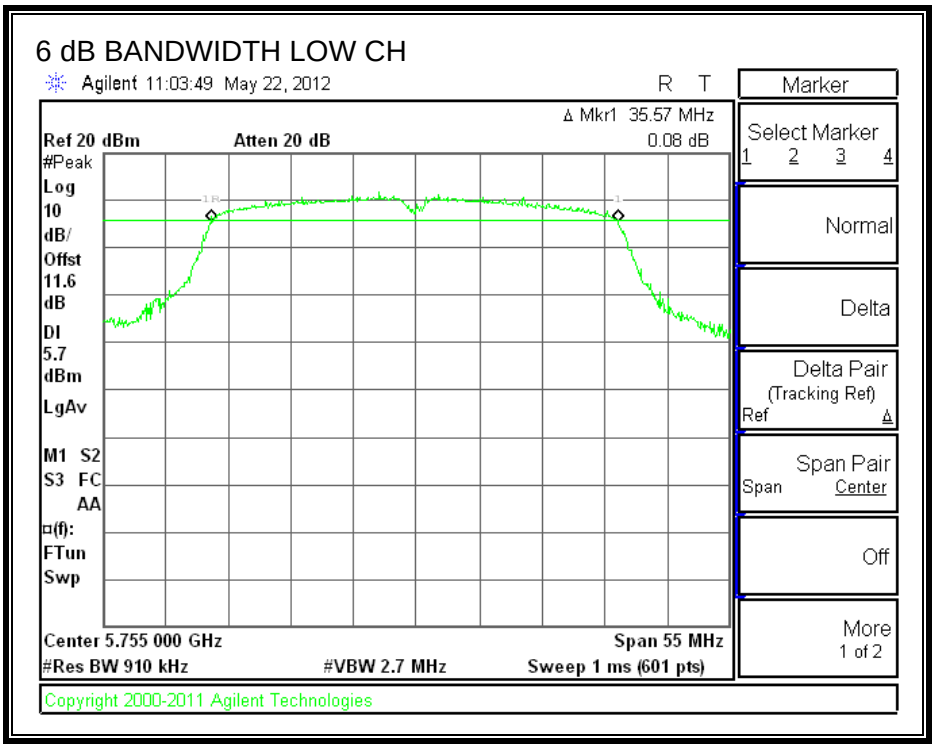
TEST PROCEDURE

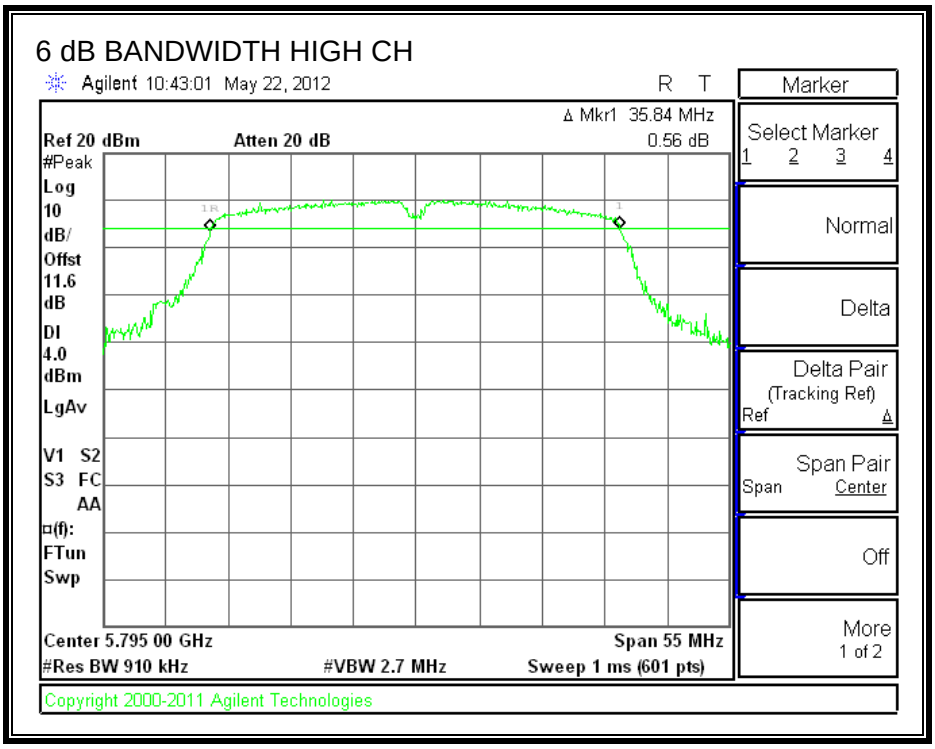
KDB 558074 D01 v01 “Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247”.

RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	5755	35.57	0.5
High	5795	35.84	0.5

6 dB BANDWIDTH





7.6.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

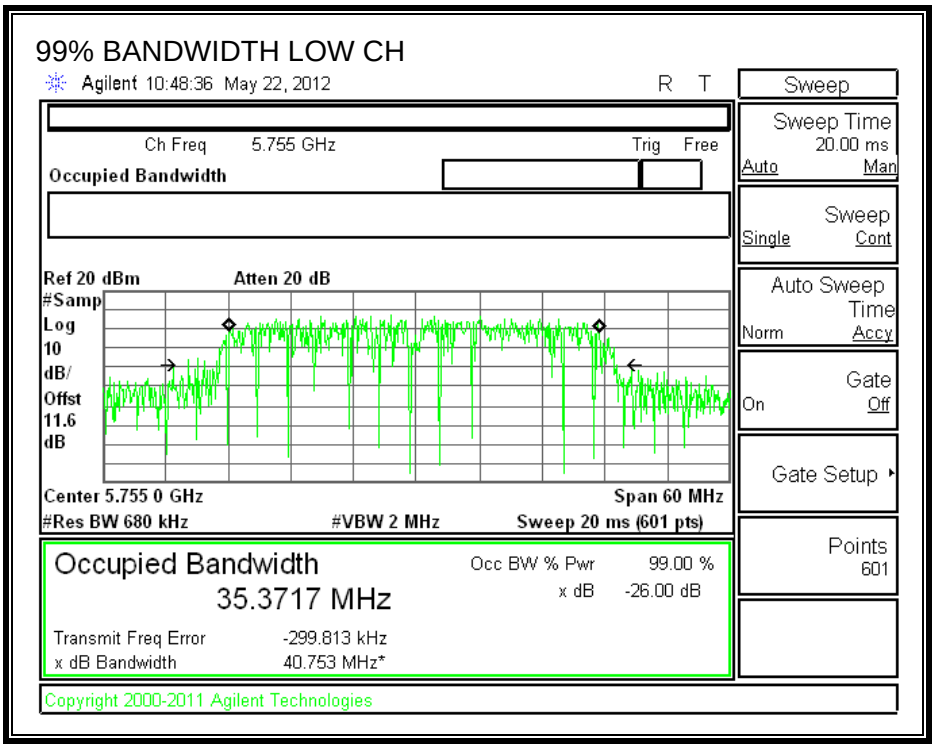
TEST PROCEDURE

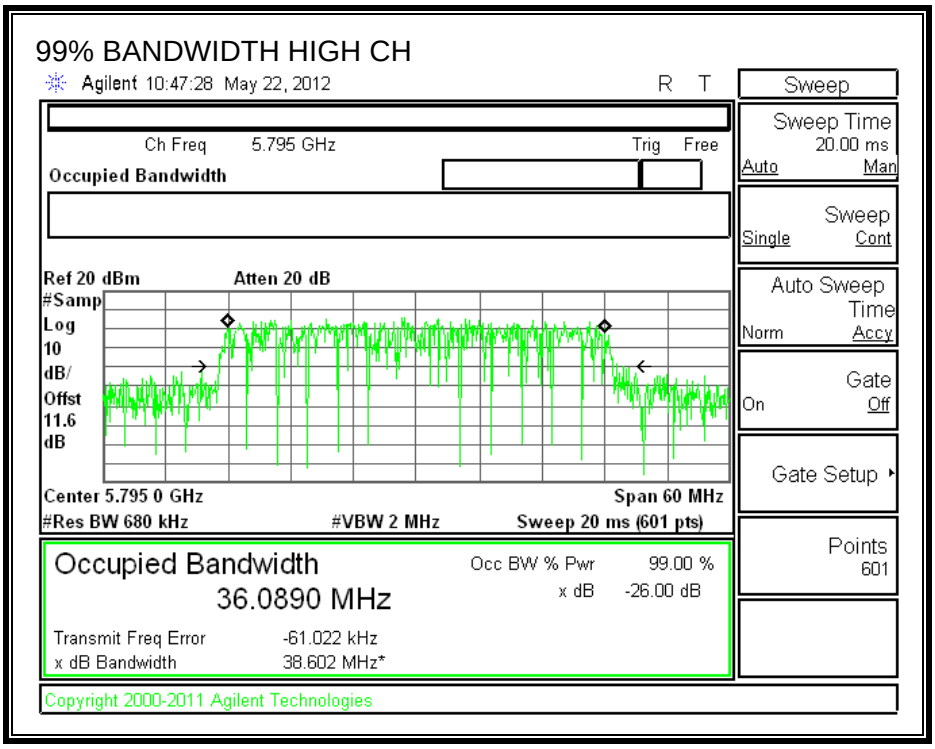
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth and to 1% of the span. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5755	35.372
High	5795	36.089

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

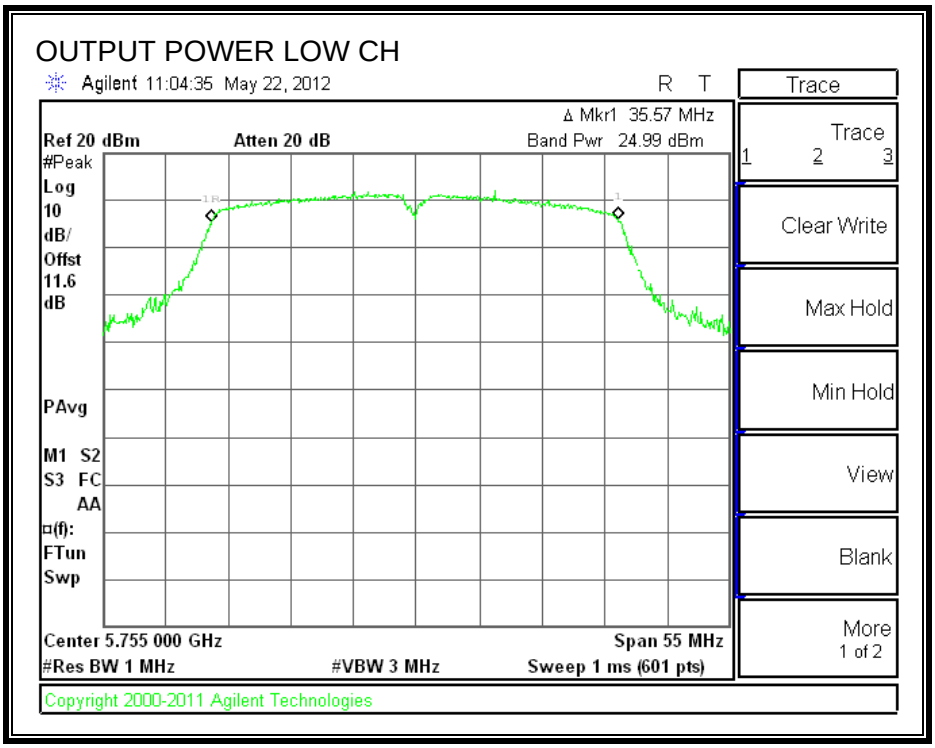
KDB 558074 D01 v01 “Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247”.

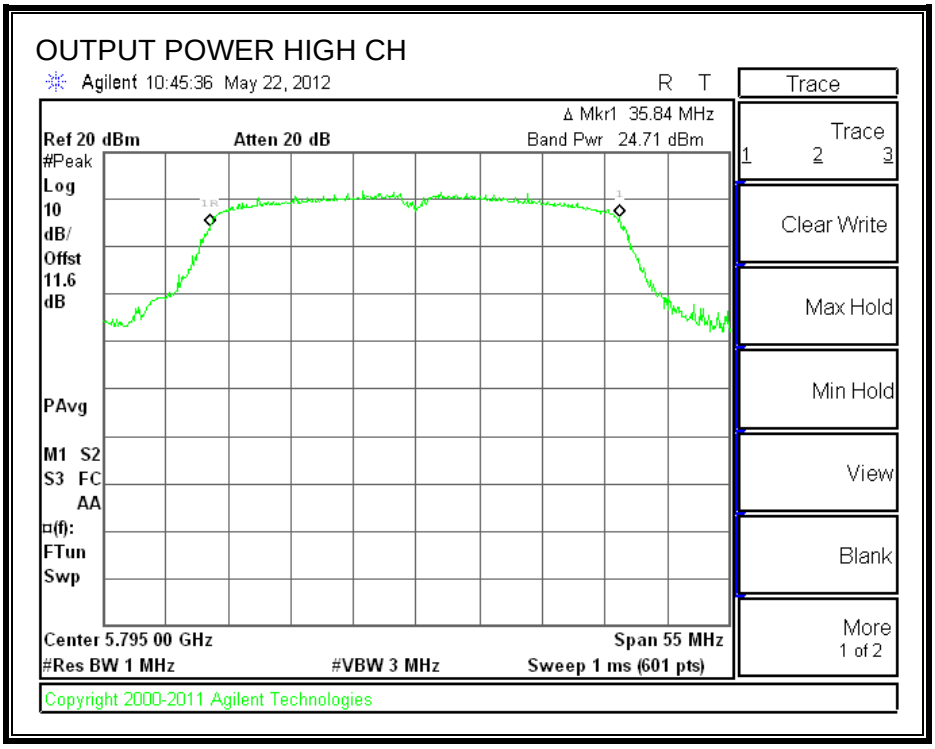
RESULTS

The cable assembly insertion loss of 11.6 dB (including 10 dB pad and 1.6 dB cable) was entered as an offset in the power meter to allow for direct reading of power

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	5755	24.99	24.99	30	-5.01
High	5795	24.71	24.71	30	-5.29

OUTPUT POWER





7.6.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11.6 dB (including 10 dB pad and 1.6 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	13.00
High	5795	12.95

7.6.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

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

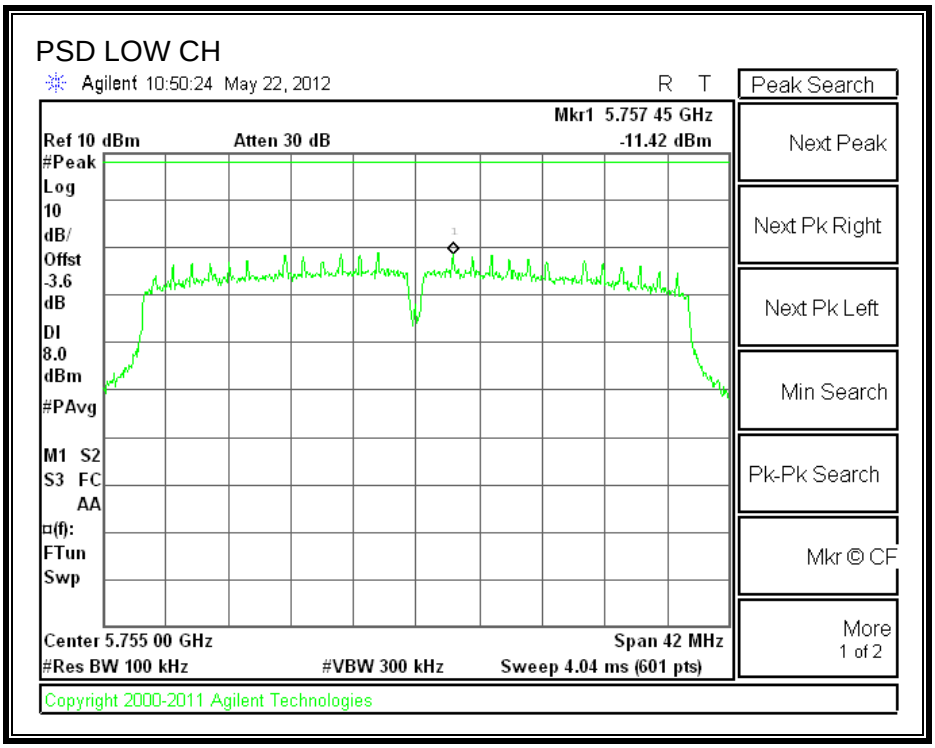
TEST PROCEDURE

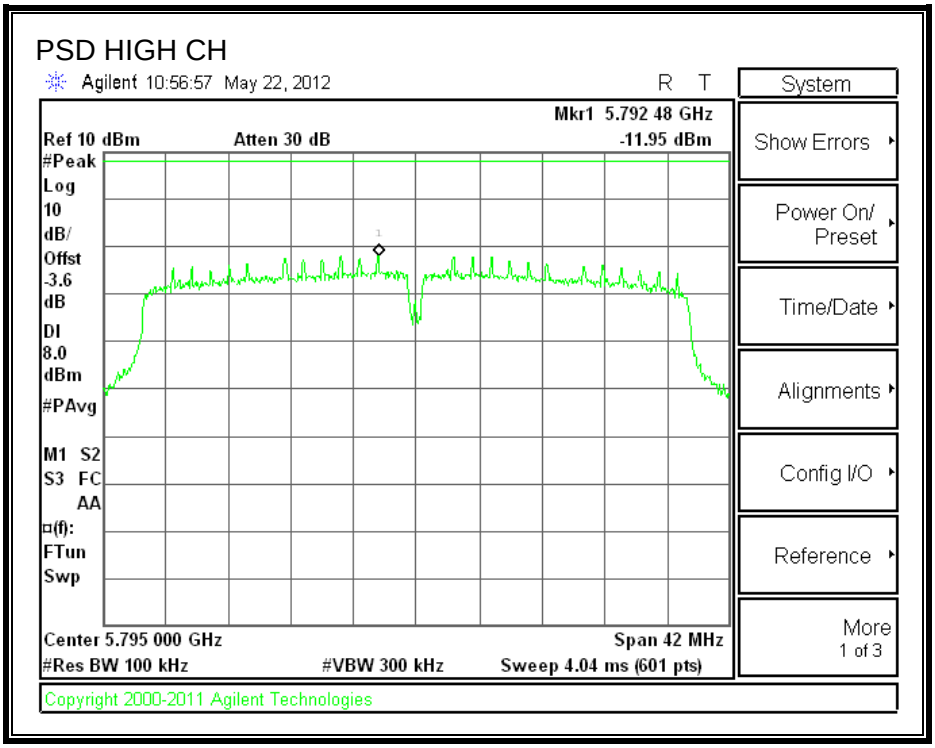
KDB 558074 D01 v01 “Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247”.

RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5755	-11.42	8	-19.42
High	5795	-11.95	8	-19.95

POWER SPECTRAL DENSITY





7.6.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

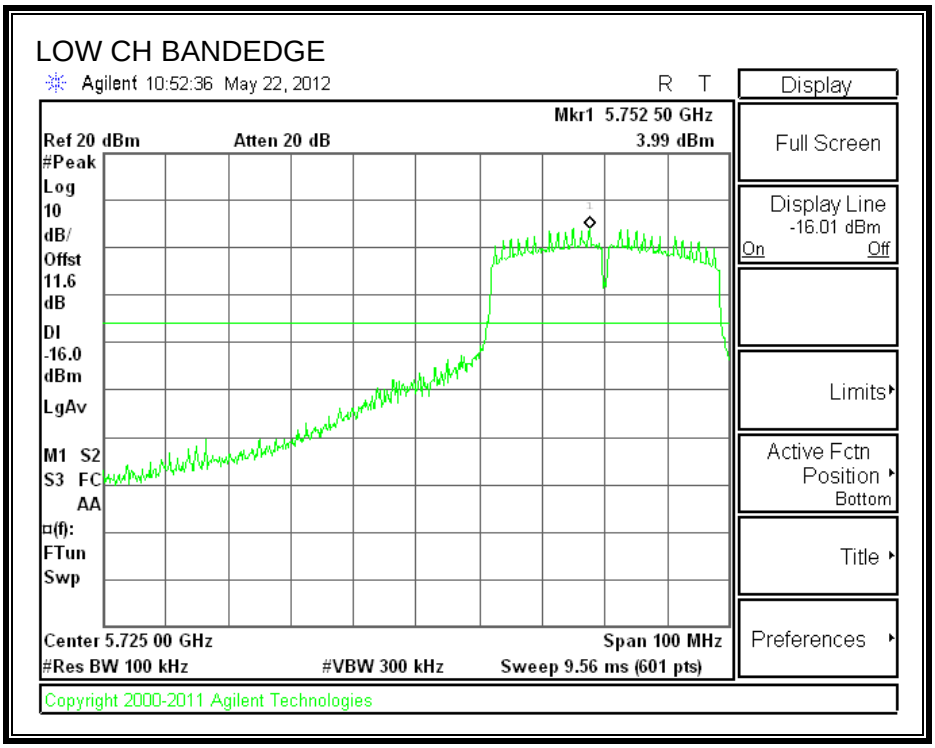
Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

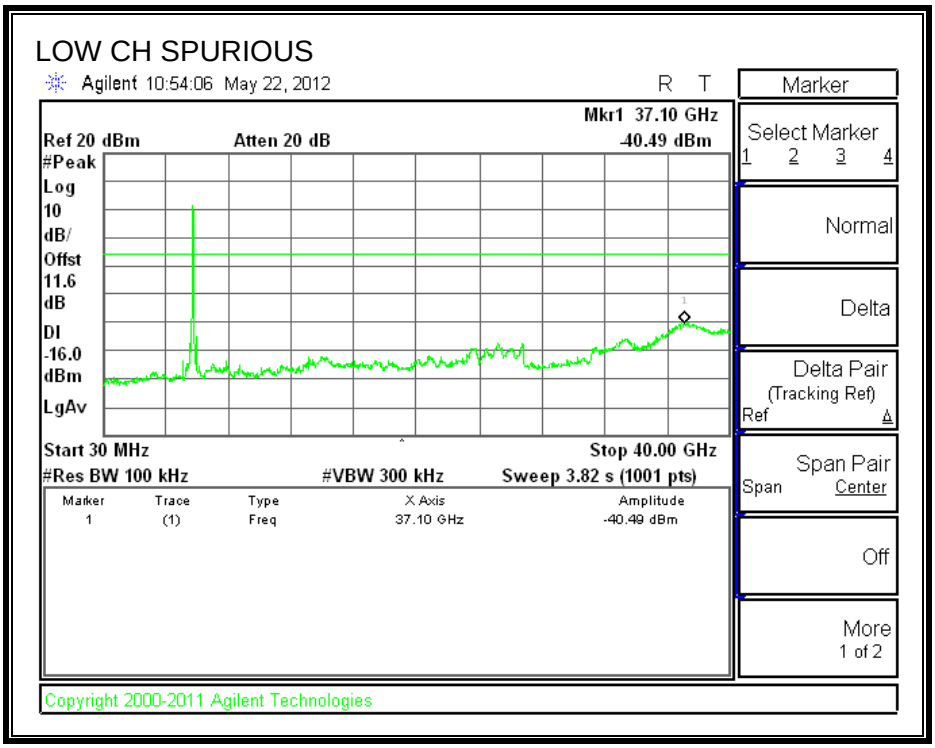
TEST PROCEDURE

KDB 558074 D01 v01 “Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247”.

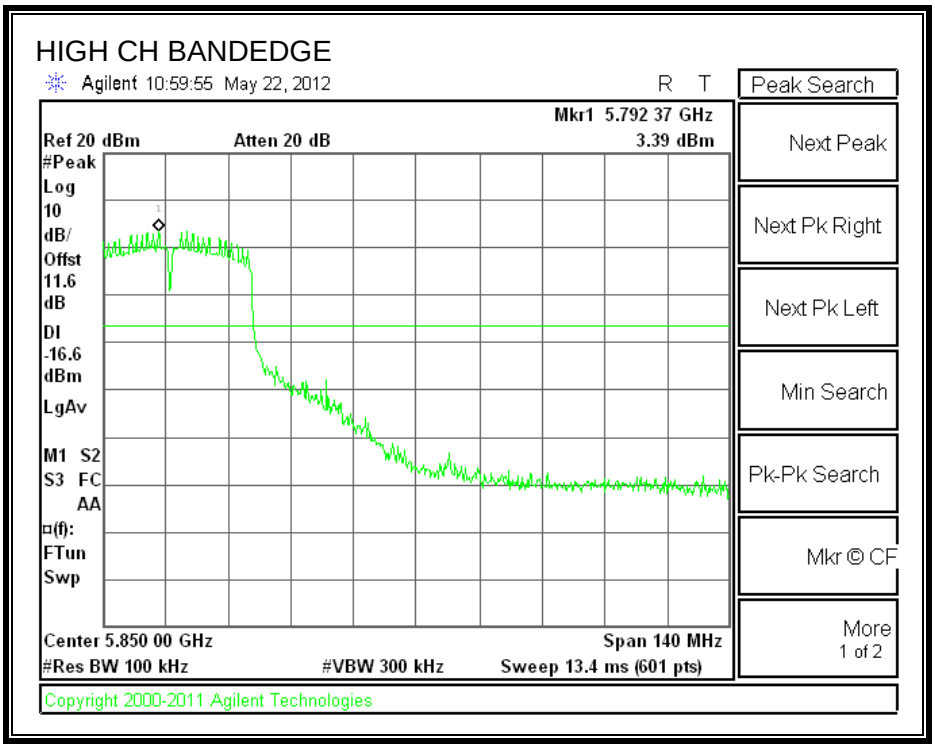
RESULTS

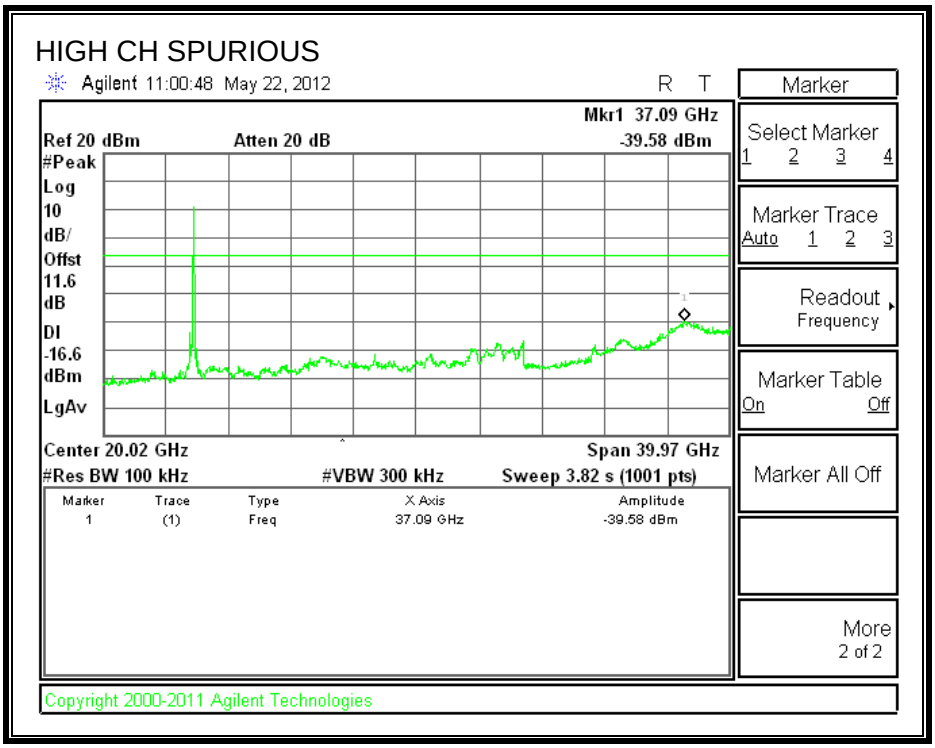
SPURIOUS EMISSIONS, LOW CHANNEL





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 (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. 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.

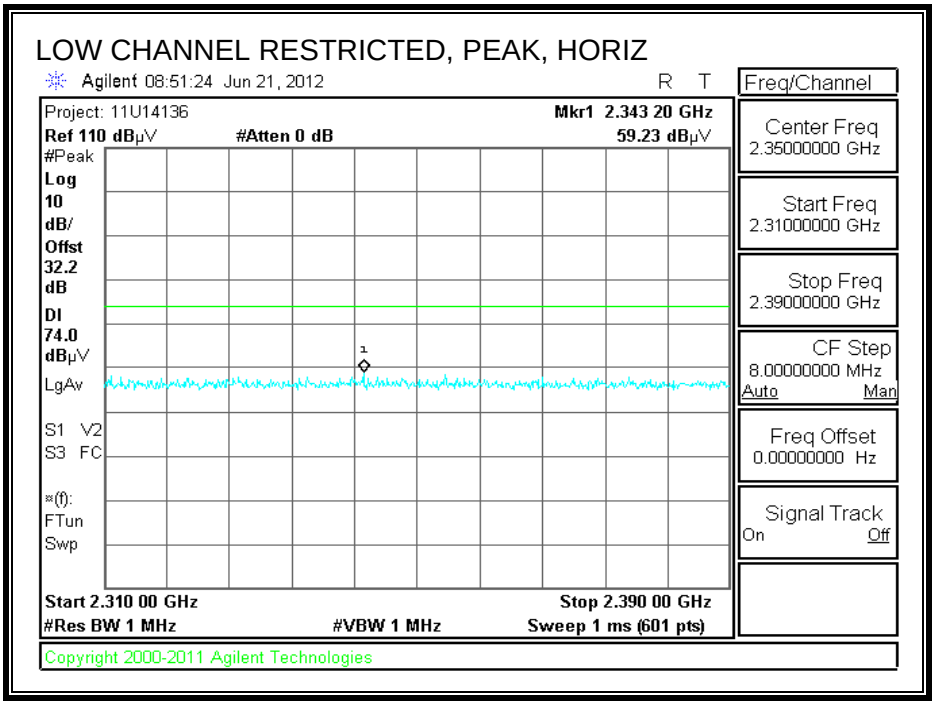
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

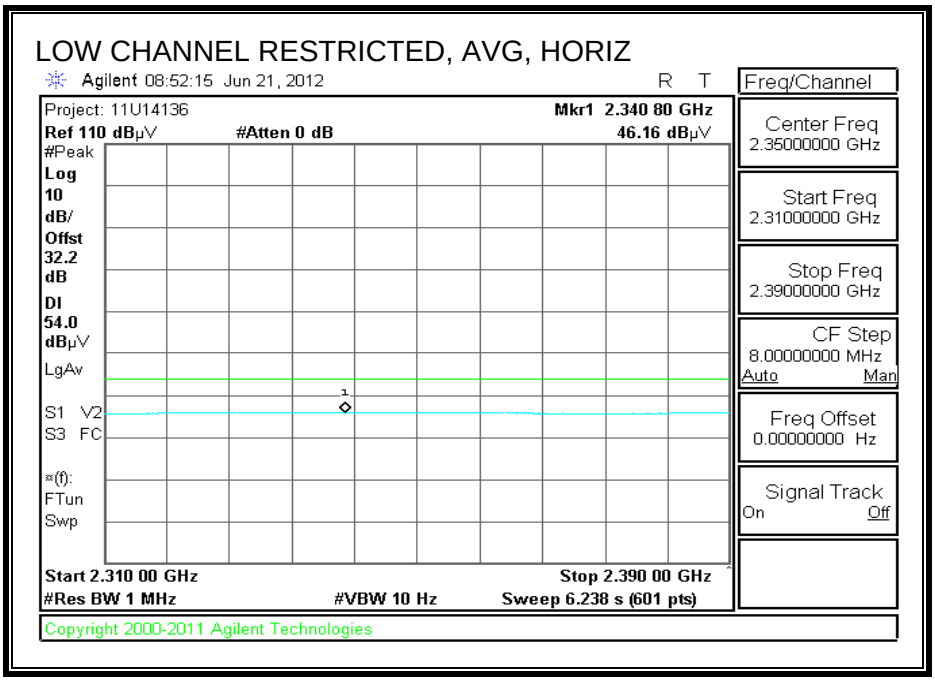
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

8.2. TRANSMITTER ABOVE 1 GHz

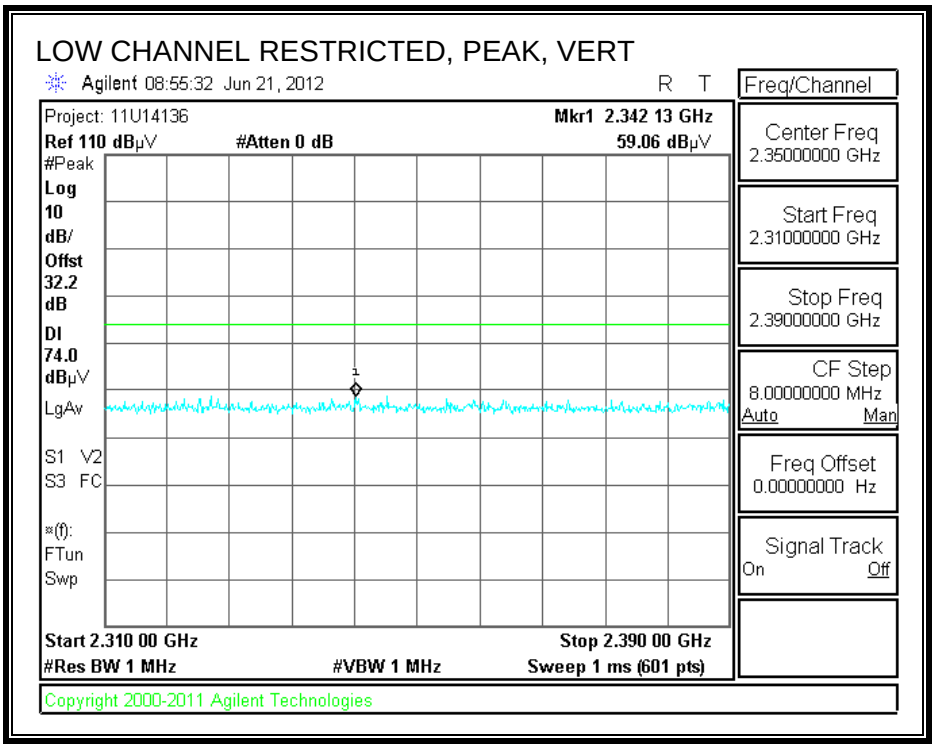
8.2.1. TX ABOVE 1 GHz FOR 802.11b 1TX MODE IN THE 2.4 GHz BAND

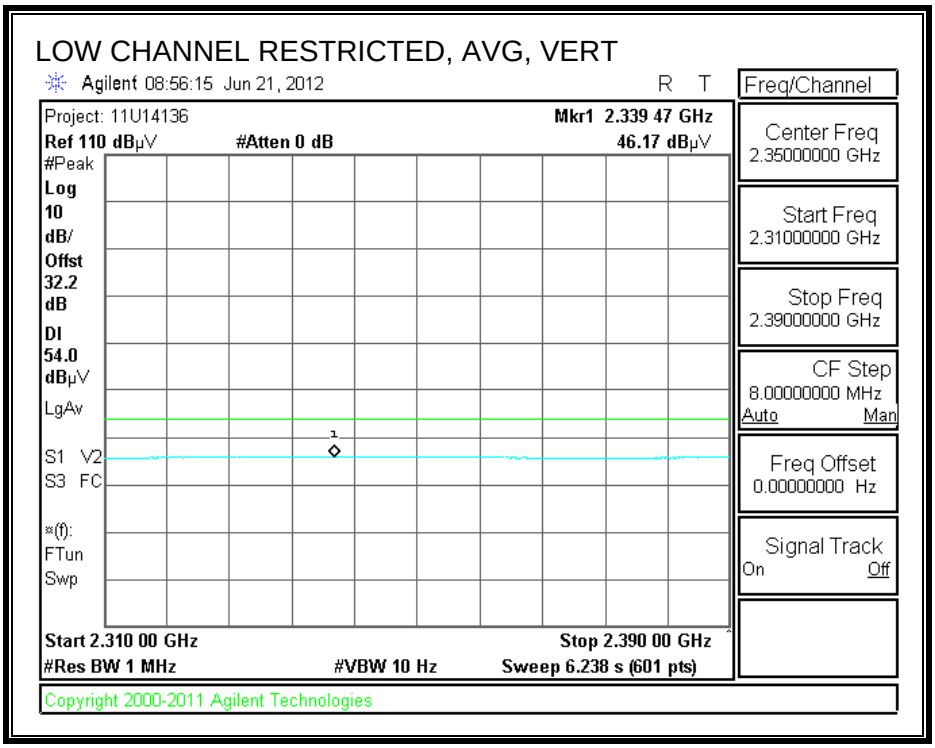
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



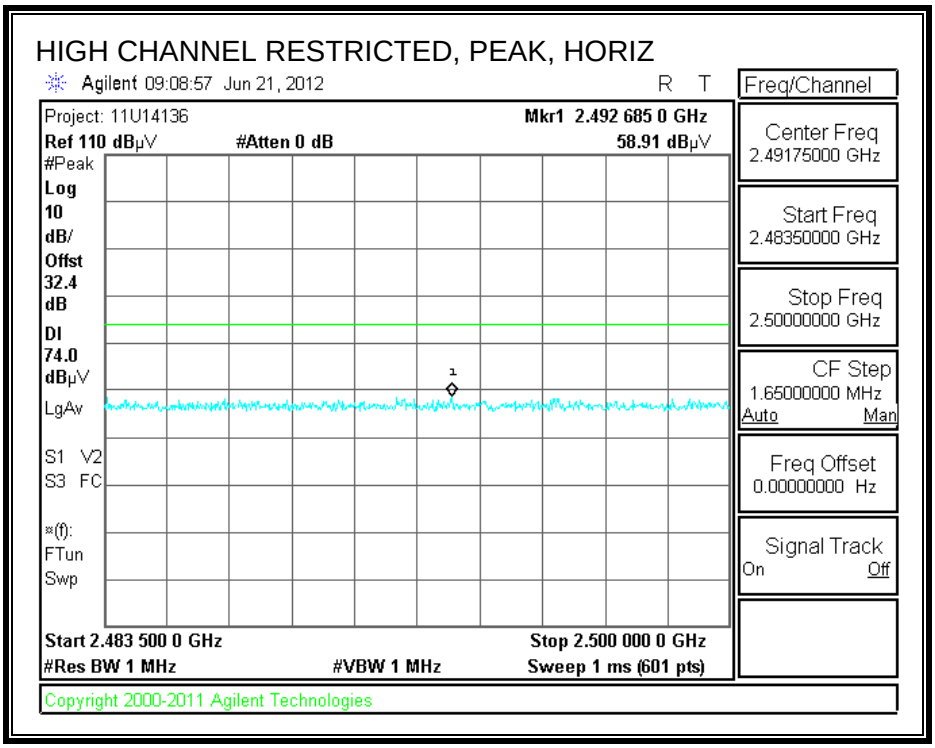


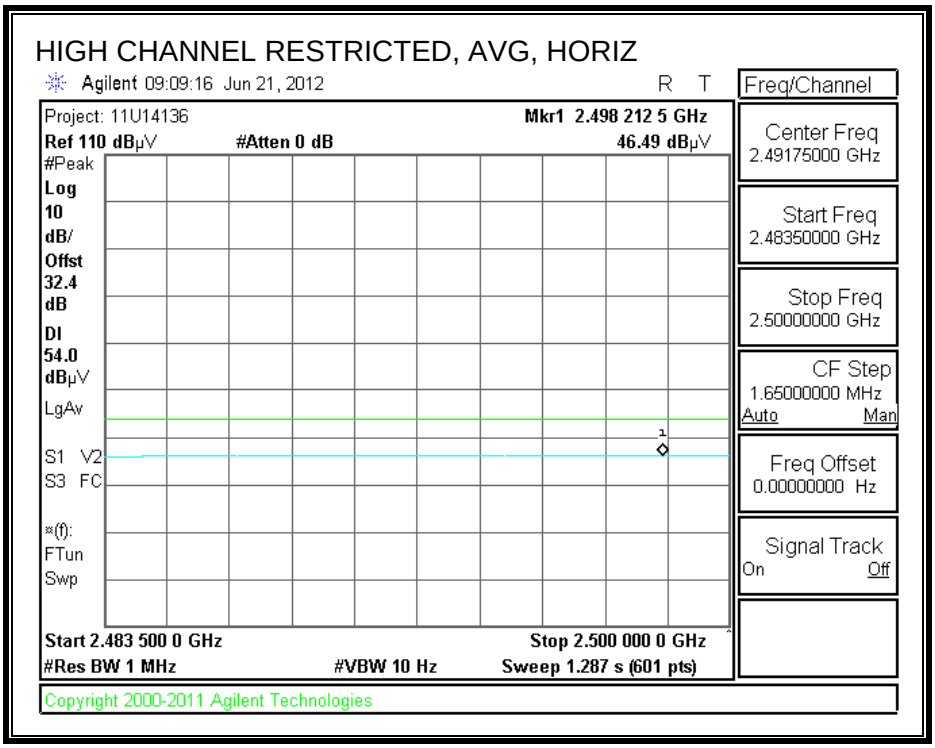
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



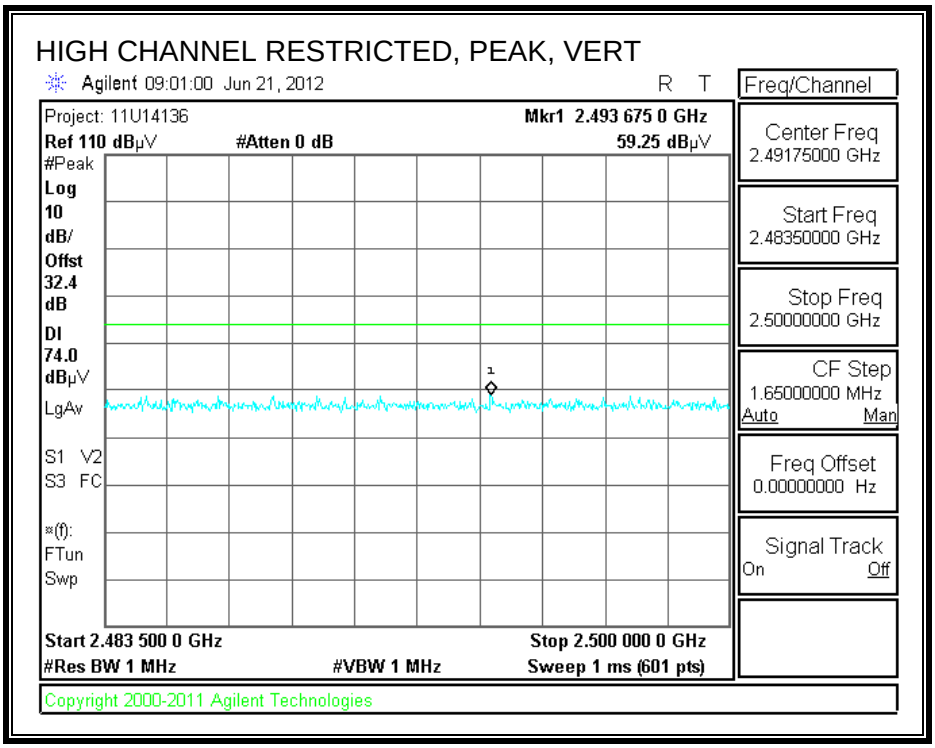


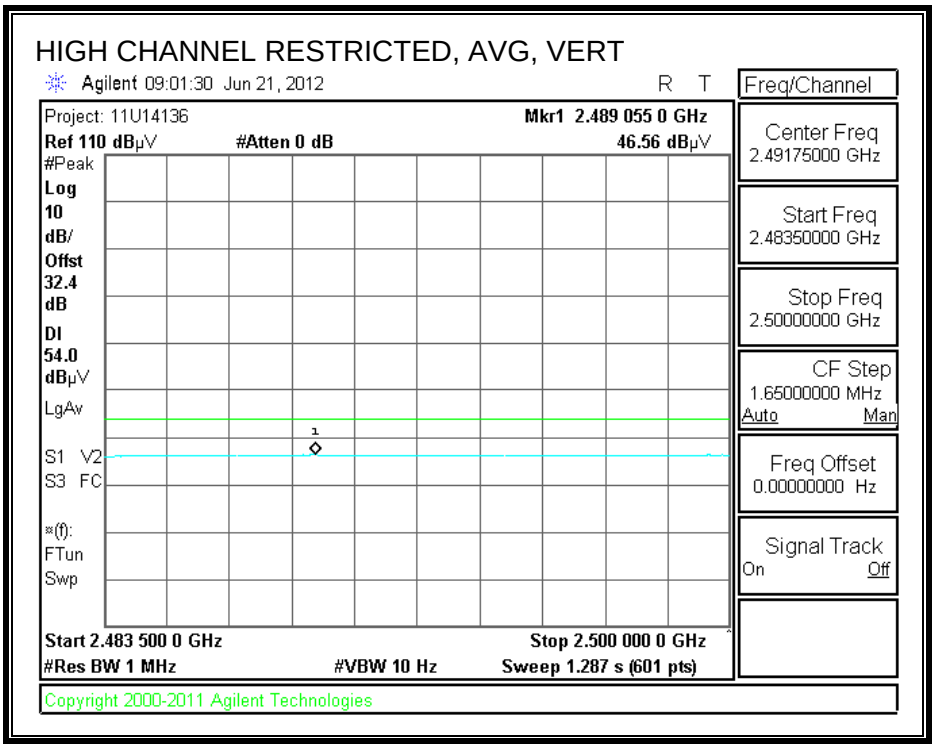
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen
Date: 07/21/12
Project #: 11U14136
Company: Apple Inc.
Test Target: FCC Class B
Mode Oper: 802.11b, TX mode

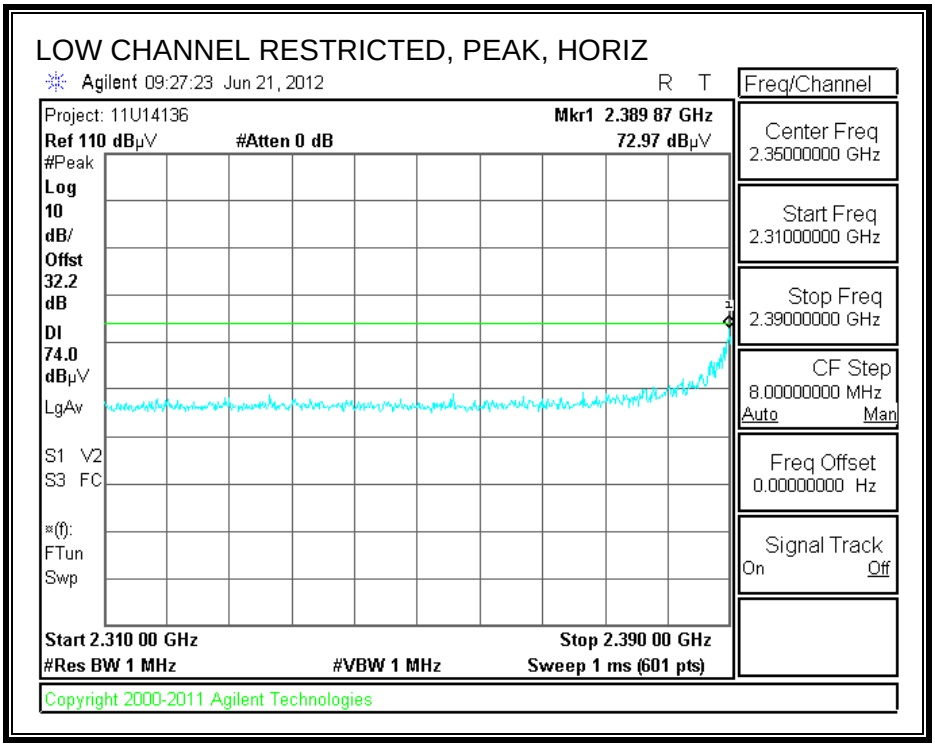
f	Measurement Frequency	Amp	Preamp Gain	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Margin vs.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

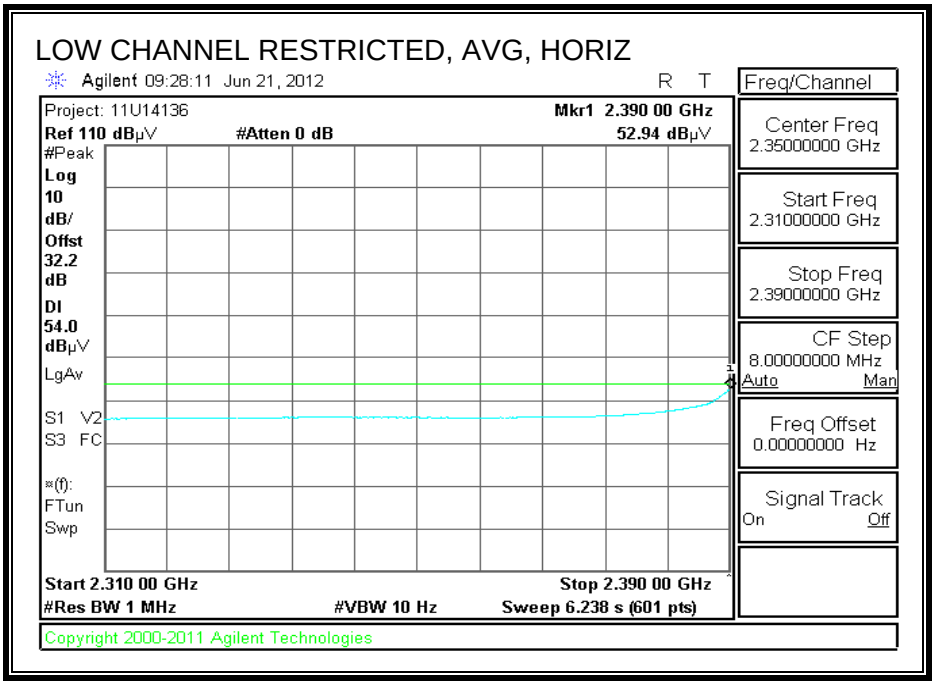
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
2412MHz 11b													
4.824	3.0	37.3	33.1	6.3	-34.8	0.0	0.0	41.8	74.0	-32.2	V	P	
4.824	3.0	24.8	33.1	6.3	-34.8	0.0	0.0	29.3	54.0	-24.7	V	A	
4.824	3.0	37.5	33.1	6.3	-34.8	0.0	0.0	42.1	74.0	-31.9	H	P	
4.824	3.0	24.9	33.1	6.3	-34.8	0.0	0.0	29.4	54.0	-24.6	H	A	
24372MHz 11b													
4.874	3.0	36.3	33.1	6.3	-34.8	0.0	0.0	40.9	74.0	-33.1	V	P	
4.874	3.0	24.5	33.1	6.3	-34.8	0.0	0.0	29.1	54.0	-24.9	V	A	
4.874	3.0	36.8	33.1	6.3	-34.8	0.0	0.0	41.4	74.0	-32.6	H	P	
4.874	3.0	24.5	33.1	6.3	-34.8	0.0	0.0	29.2	54.0	-24.8	H	A	
2462MHz 11b													
4.924	3.0	37.0	33.2	6.3	-34.8	0.0	0.0	41.8	74.0	-32.2	V	P	
4.924	3.0	24.8	33.2	6.3	-34.8	0.0	0.0	29.5	54.0	-24.5	V	A	
4.924	3.0	37.2	33.2	6.3	-34.8	0.0	0.0	42.0	74.0	-32.0	H	P	
4.924	3.0	24.7	33.2	6.3	-34.8	0.0	0.0	29.4	54.0	-24.6	H	A	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

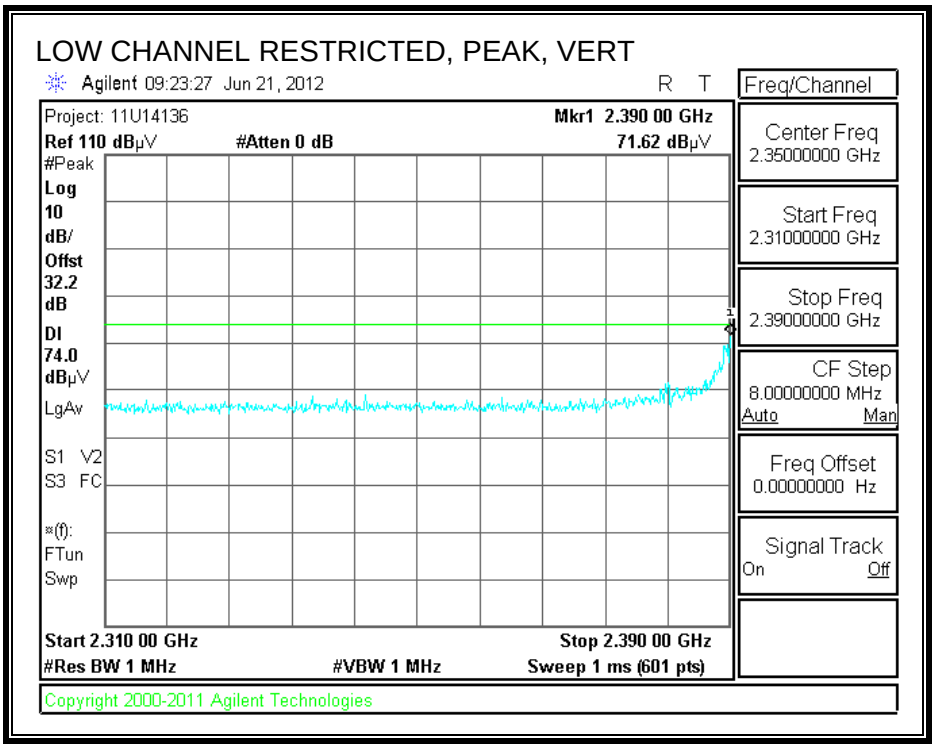
8.2.2. TX ABOVE 1 GHz FOR 802.11g 1TX MODE IN THE 2.4 GHz BAND

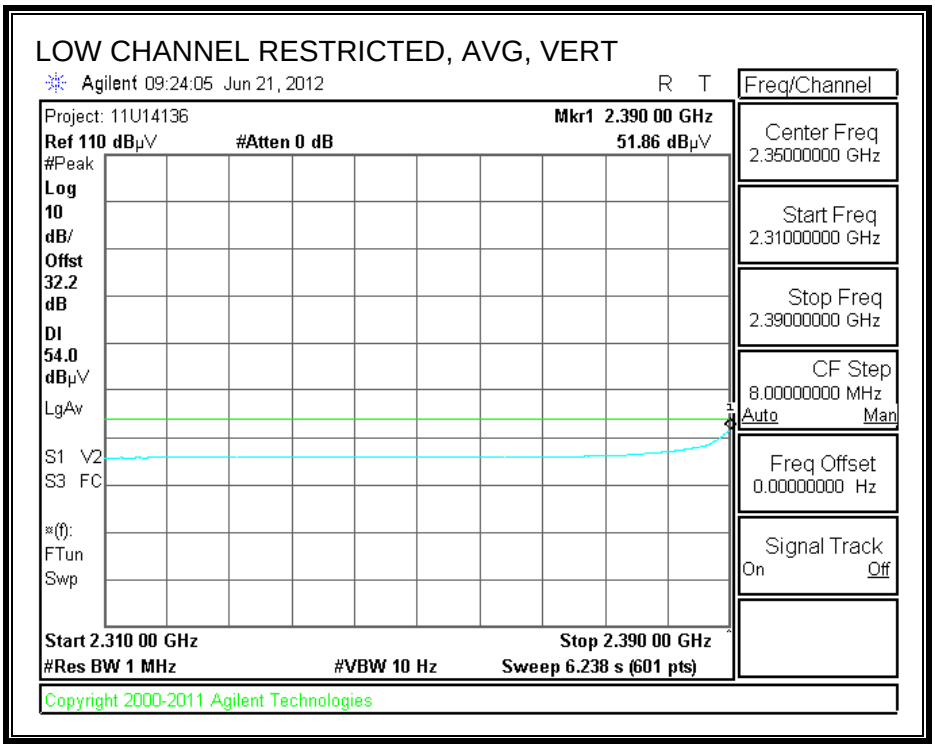
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



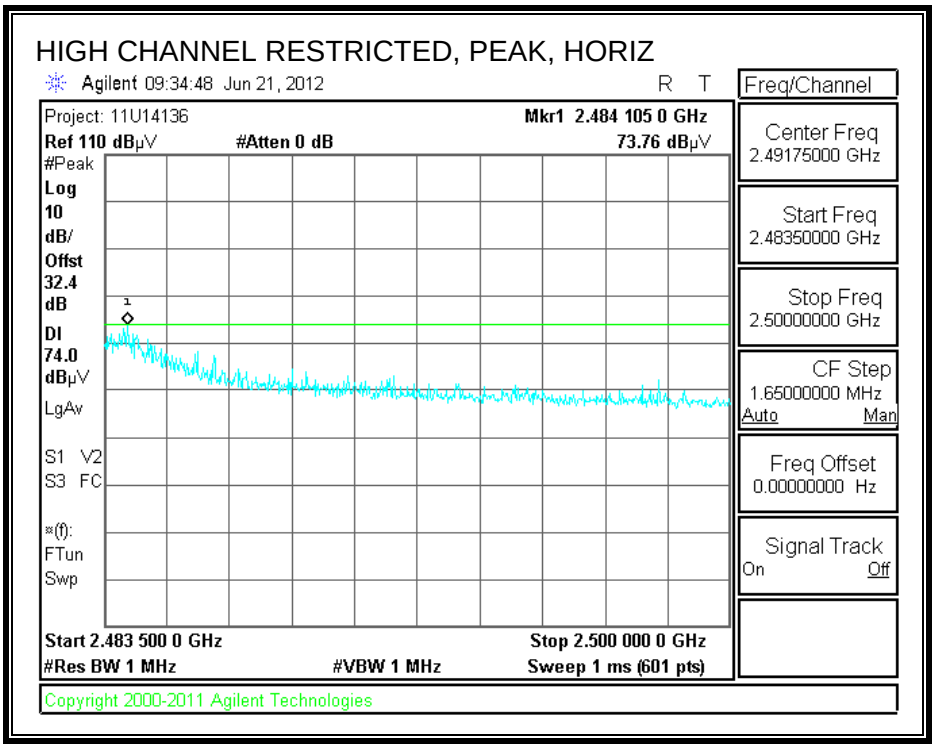


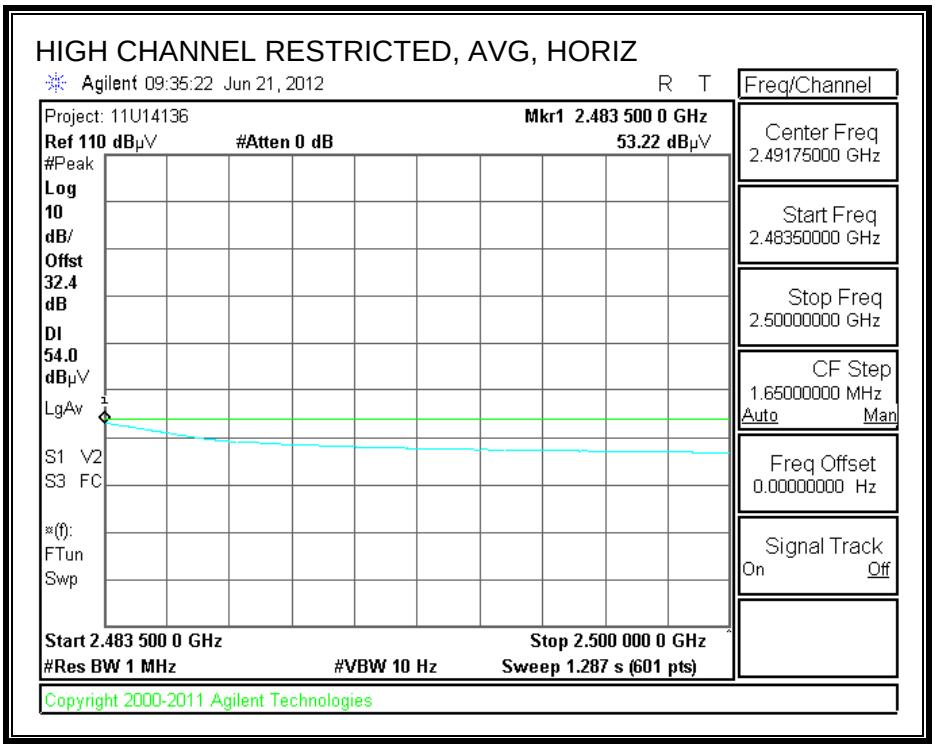
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



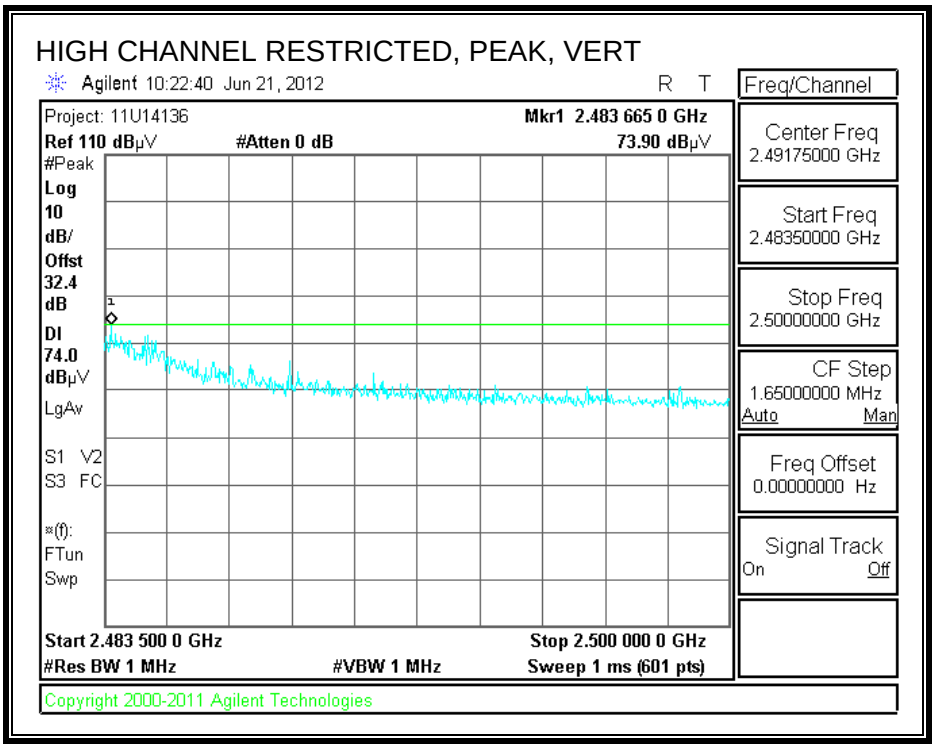


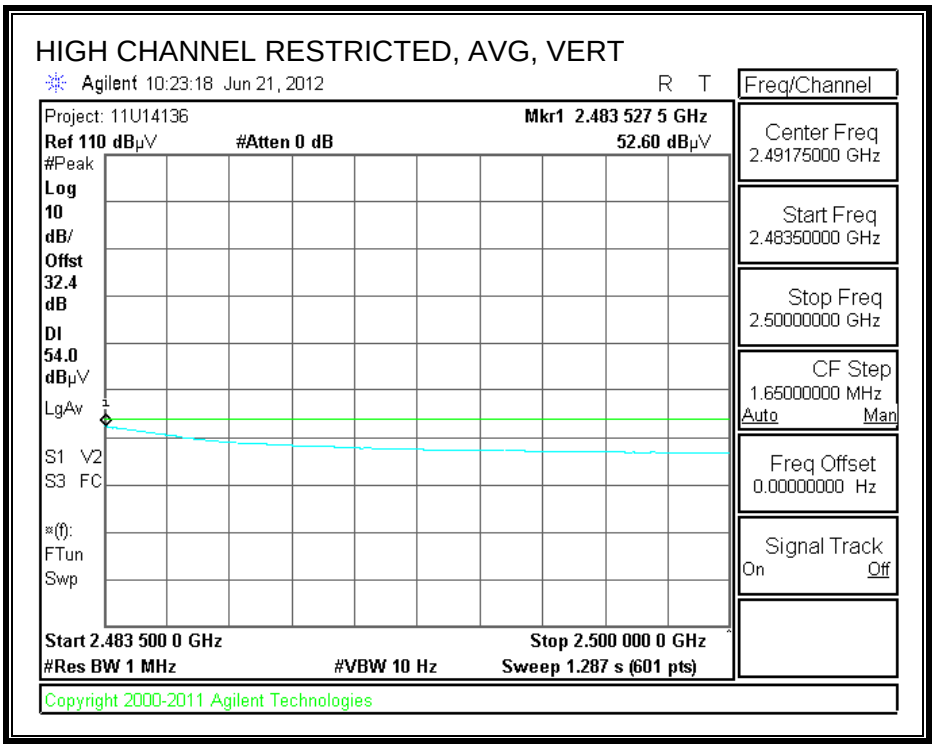
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen
Date: 07/21/12
Project #: 11U14136
Company: Apple Inc.
Test Target: FCC Class B
Mode Oper: 802.11g, TX mode

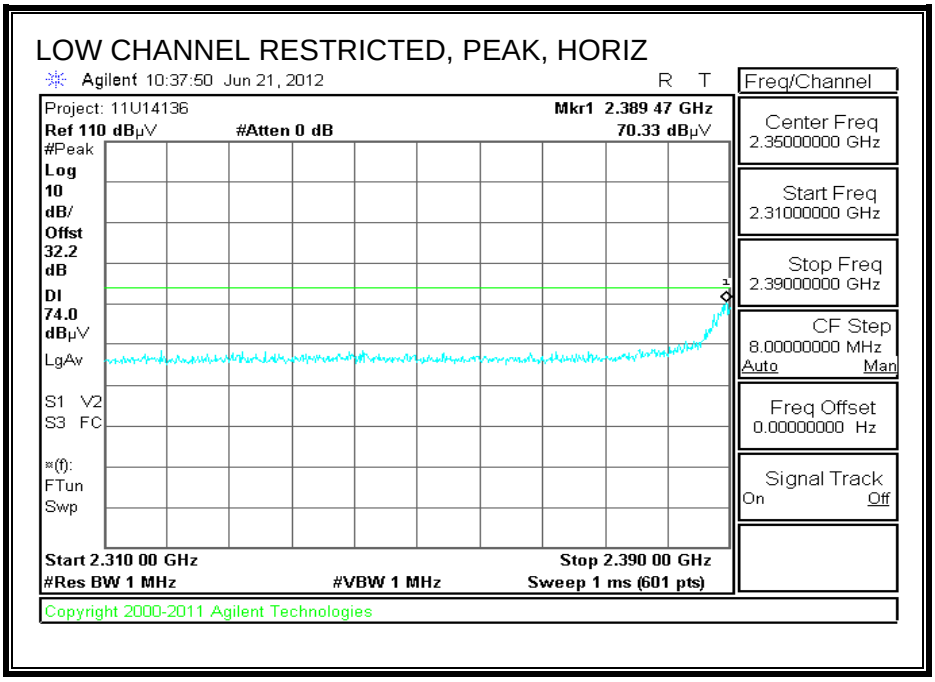
f	Measurement Frequency	Amp	Preamp Gain	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Margin vs.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

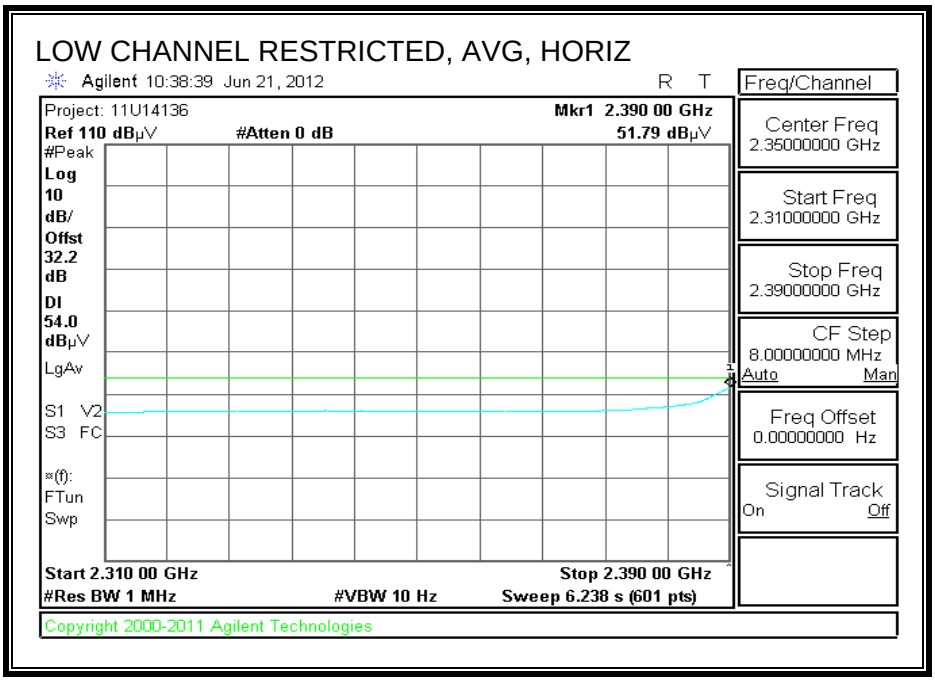
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
2412MHz 11g													
4.824	3.0	37.3	33.1	6.3	-34.8	0.0	0.0	41.8	74.0	-32.2	H	P	
4.824	3.0	24.9	33.1	6.3	-34.8	0.0	0.0	29.4	54.0	-24.6	H	A	
4.824	3.0	37.1	33.1	6.3	-34.8	0.0	0.0	41.6	74.0	-32.4	V	P	
4.824	3.0	24.8	33.1	6.3	-34.8	0.0	0.0	29.3	54.0	-24.7	V	A	
2437MHz 11g													
4.874	3.0	37.0	33.1	6.3	-34.8	0.0	0.0	41.7	74.0	-32.3	V	P	
4.874	3.0	24.3	33.1	6.3	-34.8	0.0	0.0	29.0	54.0	-25.0	V	A	
4.874	3.0	37.0	33.1	6.3	-34.8	0.0	0.0	41.6	74.0	-32.4	H	P	
4.874	3.0	24.4	33.1	6.3	-34.8	0.0	0.0	29.1	54.0	-24.9	H	A	
2462MHz 11g													
4.924	3.0	37.0	33.2	6.3	-34.8	0.0	0.0	41.7	74.0	-32.3	V	P	
4.924	3.0	24.7	33.2	6.3	-34.8	0.0	0.0	29.4	54.0	-24.6	V	A	
4.924	3.0	37.0	33.2	6.3	-34.8	0.0	0.0	41.7	74.0	-32.3	H	P	
4.924	3.0	24.7	33.2	6.3	-34.8	0.0	0.0	29.4	54.0	-24.6	H	A	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

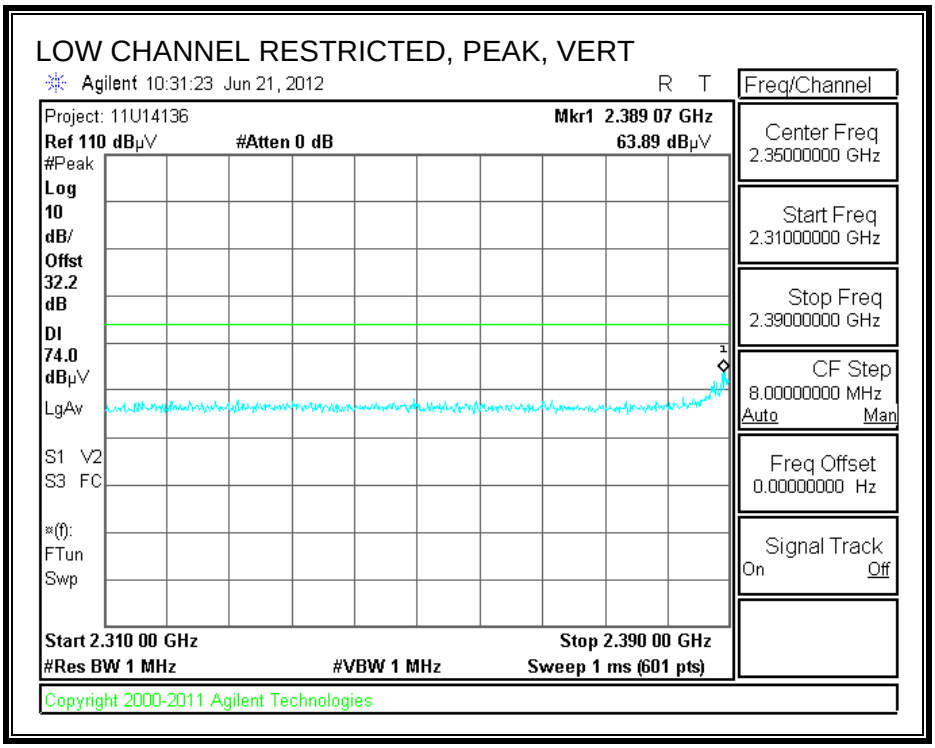
8.2.3. TX ABOVE 1 GHz FOR 802.11n HT20 1TX MODE IN THE 2.4 GHz BAND

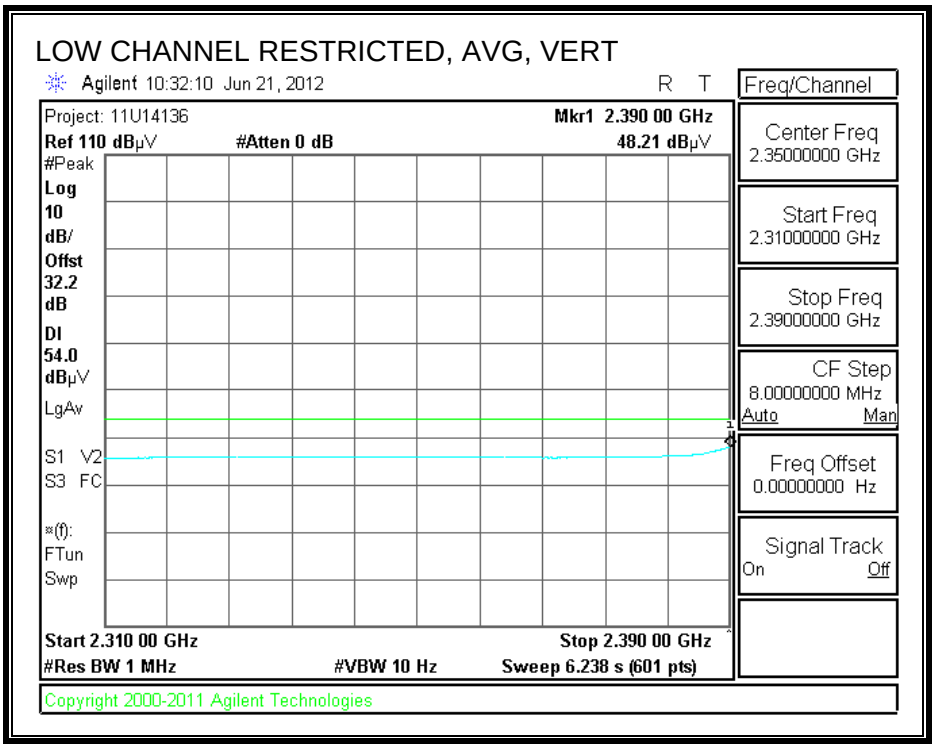
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



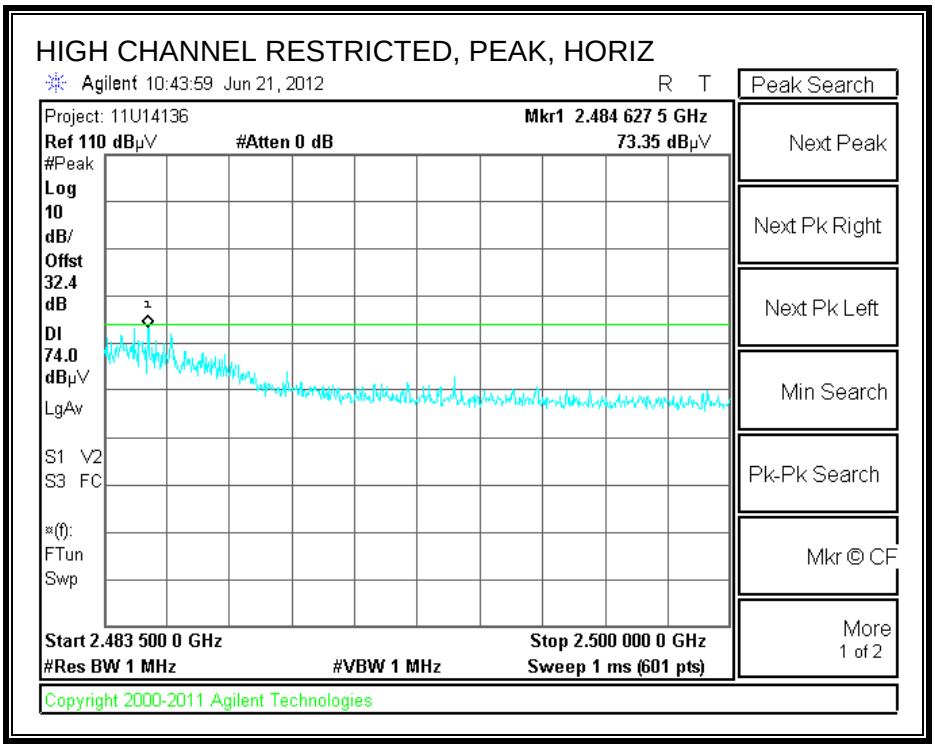


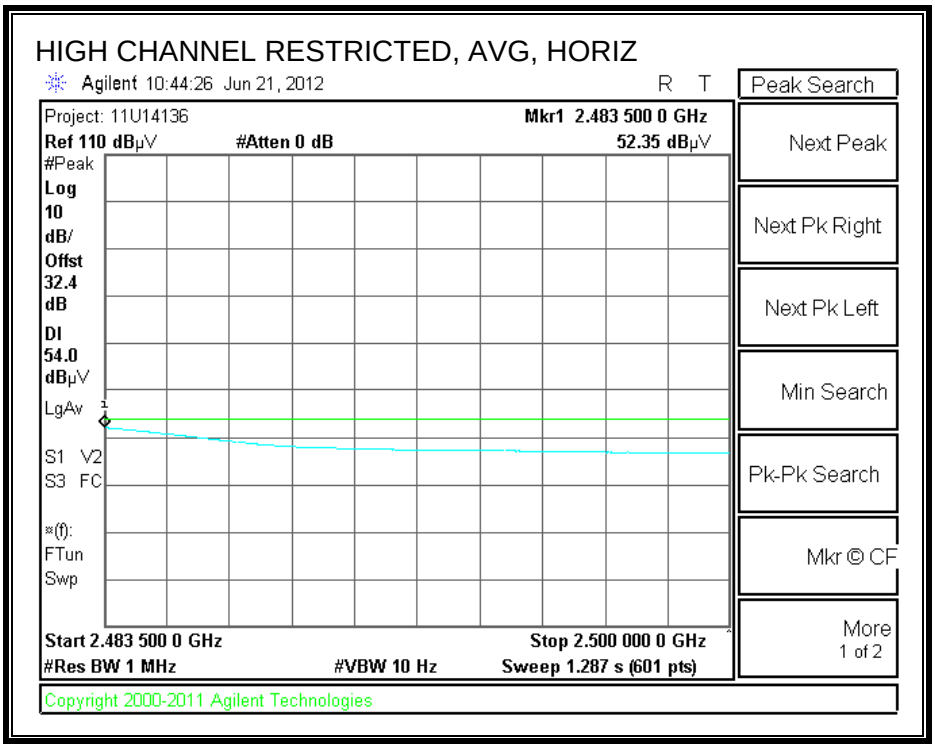
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



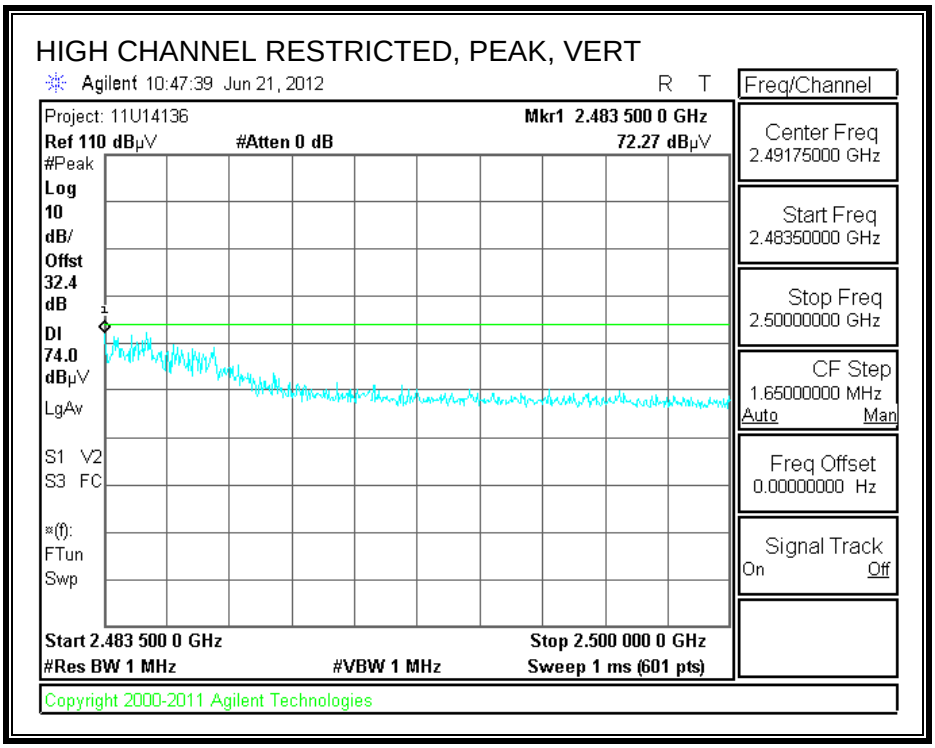


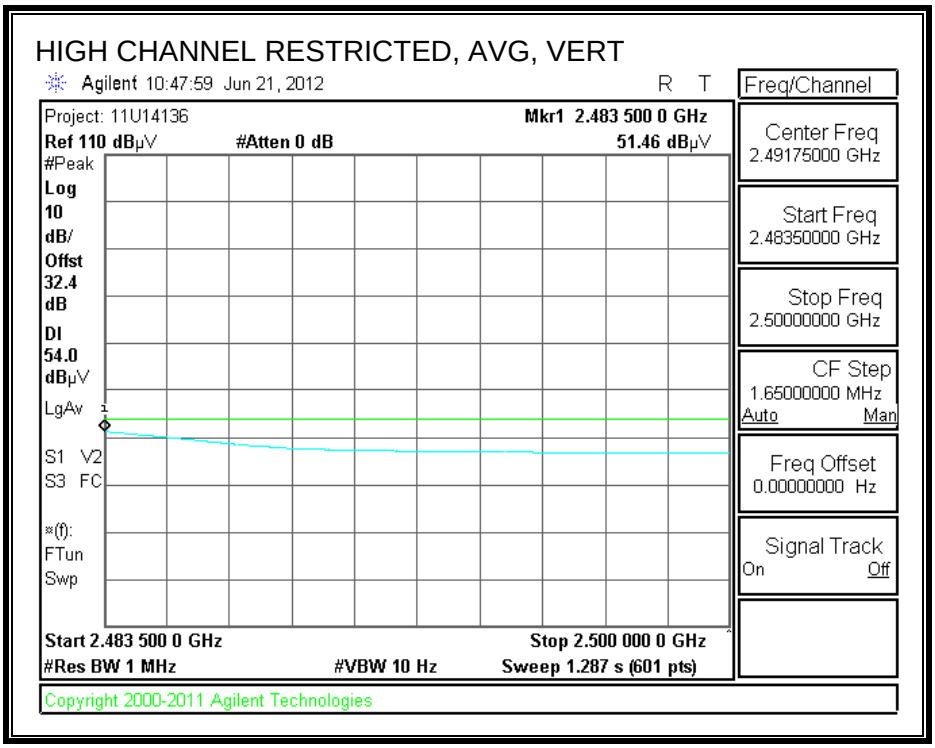
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen
Date: 07/21/12
Project #: 11U14136
Company: Apple Inc.
Test Target: FCC Class B
Mode Oper: 802.11n HT20, TX mode

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
2412MHz 11n													
4.824	3.0	37.2	33.1	6.3	-34.8	0.0	0.0	41.7	74.0	-32.3	V	P	
4.824	3.0	24.9	33.1	6.3	-34.8	0.0	0.0	29.4	54.0	-24.6	V	A	
4.824	3.0	37.7	33.1	6.3	-34.8	0.0	0.0	42.2	74.0	-31.8	H	P	
4.824	3.0	24.9	33.1	6.3	-34.8	0.0	0.0	29.4	54.0	-24.6	H	A	
2437MHz 11n													
4.874	3.0	37.3	33.1	6.3	-34.8	0.0	0.0	42.0	74.0	-32.0	V	P	
4.874	3.0	24.6	33.1	6.3	-34.8	0.0	0.0	29.2	54.0	-24.8	V	A	
4.874	3.0	36.5	33.1	6.3	-34.8	0.0	0.0	41.1	74.0	-32.9	H	P	
4.874	3.0	24.6	33.1	6.3	-34.8	0.0	0.0	29.3	54.0	-24.7	H	A	
2462MHz 11n													
4.924	3.0	37.1	33.2	6.3	-34.8	0.0	0.0	41.9	74.0	-32.1	V	P	
4.924	3.0	24.7	33.2	6.3	-34.8	0.0	0.0	29.5	54.0	-24.5	V	A	
4.924	3.0	37.5	33.2	6.3	-34.8	0.0	0.0	42.2	74.0	-31.8	H	P	
4.924	3.0	24.7	33.2	6.3	-34.8	0.0	0.0	29.4	54.0	-24.6	H	A	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

8.2.4. FOR 802.11a MODE IN THE 5.8 GHz BAND

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen
Date: 07/19/12
Project #: 11U14136
Company: Apple Inc.
Test Target: FCC Class B
Mode Oper: 802.11a, TX mode

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
5745MHz 11a													
11.490	3.0	34.6	38.8	10.7	-32.9	0.0	0.7	51.9	74.0	-22.1	H	P	
11.490	3.0	24.5	38.8	10.7	-32.9	0.0	0.7	41.9	54.0	-12.1	H	A	
11.490	3.0	34.6	38.8	10.7	-32.9	0.0	0.7	52.0	74.0	-22.0	V	P	
11.490	3.0	24.6	38.8	10.7	-32.9	0.0	0.7	41.9	54.0	-12.1	V	A	
5785MHz 11a													
11.570	3.0	35.3	38.9	10.8	-32.8	0.0	0.7	52.9	74.0	-21.1	V	P	
11.570	3.0	24.6	38.9	10.8	-32.8	0.0	0.7	42.2	54.0	-11.8	V	A	
11.570	3.0	34.9	38.9	10.8	-32.8	0.0	0.7	52.5	74.0	-21.5	H	P	
11.570	3.0	24.4	38.9	10.8	-32.8	0.0	0.7	42.0	54.0	-12.0	H	A	
5825MHz 11a													
11.650	3.0	35.7	39.0	10.9	-32.7	0.0	0.7	53.6	74.0	-20.4	H	P	
11.650	3.0	24.9	39.0	10.9	-32.7	0.0	0.7	42.7	54.0	-11.3	H	A	
11.650	3.0	35.8	39.0	10.9	-32.7	0.0	0.7	53.6	74.0	-20.4	V	P	
11.650	3.0	24.9	39.0	10.9	-32.7	0.0	0.7	42.8	54.0	-11.2	V	A	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

8.2.5. FOR 802.11n HT20 MODE IN THE 5.8 GHz BAND

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen
Date: 07/19/12
Project #: 11U14136
Company: Apple Inc.
Test Target: FCC Class B
Mode Oper: 802.11n HT20, TX mode

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
5745MHz HT20													
11.490	3.0	34.3	38.8	10.7	-32.9	0.0	0.7	51.7	74.0	-22.3	V	P	
11.490	3.0	24.3	38.8	10.7	-32.9	0.0	0.7	41.7	54.0	-12.3	V	A	
11.490	3.0	34.4	38.8	10.7	-32.9	0.0	0.7	51.8	74.0	-22.2	H	P	
11.490	3.0	24.4	38.8	10.7	-32.9	0.0	0.7	41.7	54.0	-12.3	H	A	
5785 MHz HT20													
11.570	3.0	35.0	38.9	10.8	-32.8	0.0	0.7	52.6	74.0	-21.4	V	P	
11.570	3.0	24.5	38.9	10.8	-32.8	0.0	0.7	42.1	54.0	-11.9	V	A	
11.570	3.0	34.9	38.9	10.8	-32.8	0.0	0.7	52.6	74.0	-21.4	H	P	
11.570	3.0	24.5	38.9	10.8	-32.8	0.0	0.7	42.1	54.0	-11.9	H	A	
5825 MHz HT20													
11.650	3.0	35.8	39.0	10.9	-32.7	0.0	0.7	53.7	74.0	-20.3	H	P	
11.650	3.0	24.7	39.0	10.9	-32.7	0.0	0.7	42.6	54.0	-11.4	H	A	
11.650	3.0	35.1	39.0	10.9	-32.7	0.0	0.7	53.0	74.0	-21.0	V	P	
11.650	3.0	24.8	39.0	10.9	-32.7	0.0	0.7	42.7	54.0	-11.3	V	A	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

8.2.6. FOR 802.11n HT40 MODE IN THE 5.8 GHz BAND

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen
Date: 07/20/12
Project #: 11U14136
Company: Apple Inc.
Test Target: FCC Class B
Mode Oper: 802.11n HT40, TX mode

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		

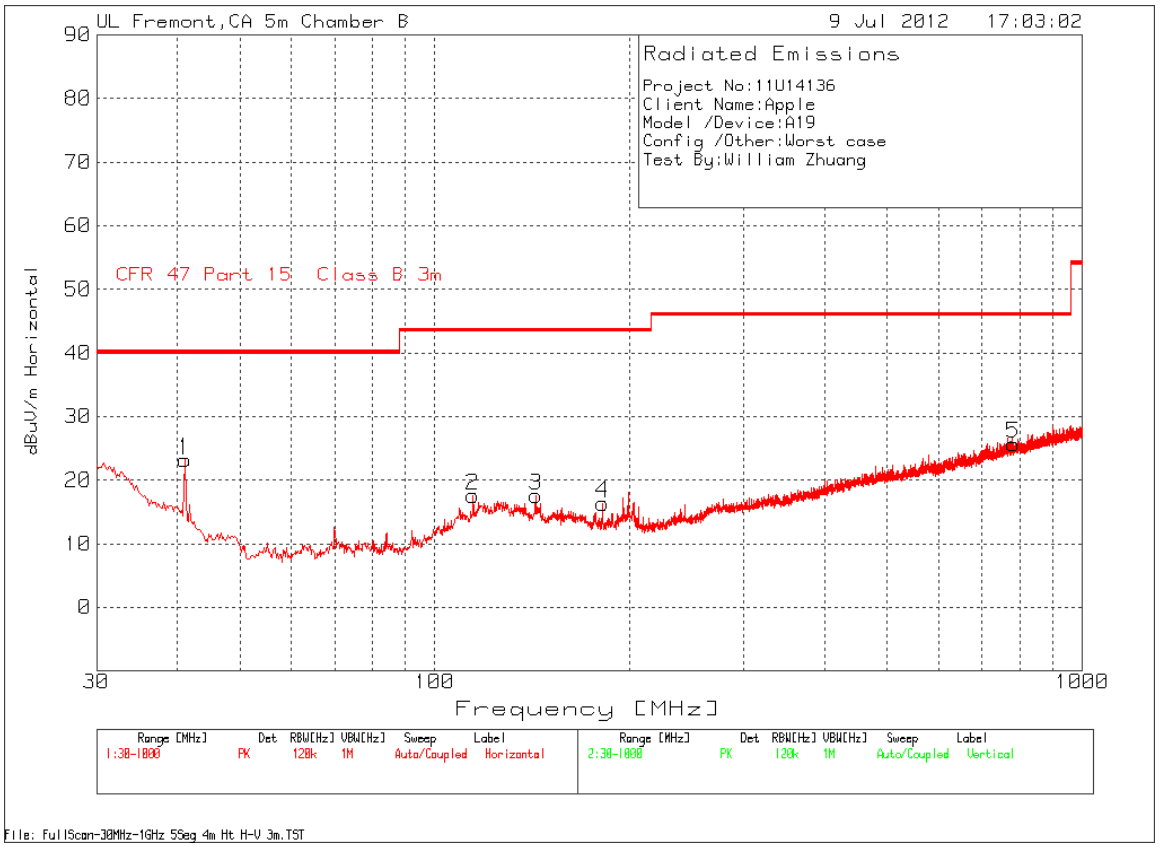
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
5755 MHz HT40													
11.510	3.0	34.7	38.8	10.7	-32.8	0.0	0.7	52.1	74.0	-21.9	V	P	
11.510	3.0	24.2	38.8	10.7	-32.8	0.0	0.7	41.6	54.0	-12.4	V	A	
11.510	3.0	34.3	38.8	10.7	-32.8	0.0	0.7	51.8	74.0	-22.2	H	P	
11.510	3.0	24.2	38.8	10.7	-32.8	0.0	0.7	41.6	54.0	-12.4	H	A	
5795 MHz HT40													
11.590	3.0	34.9	38.9	10.8	-32.7	0.0	0.7	52.6	74.0	-21.4	H	P	
11.590	3.0	24.4	38.9	10.8	-32.7	0.0	0.7	42.1	54.0	-11.9	H	A	
11.590	3.0	34.9	38.9	10.8	-32.7	0.0	0.7	52.6	74.0	-21.4	V	P	
11.590	3.0	24.4	38.9	10.8	-32.7	0.0	0.7	42.1	54.0	-11.9	V	A	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

8.3. WORST-CASE BELOW 1 GHz

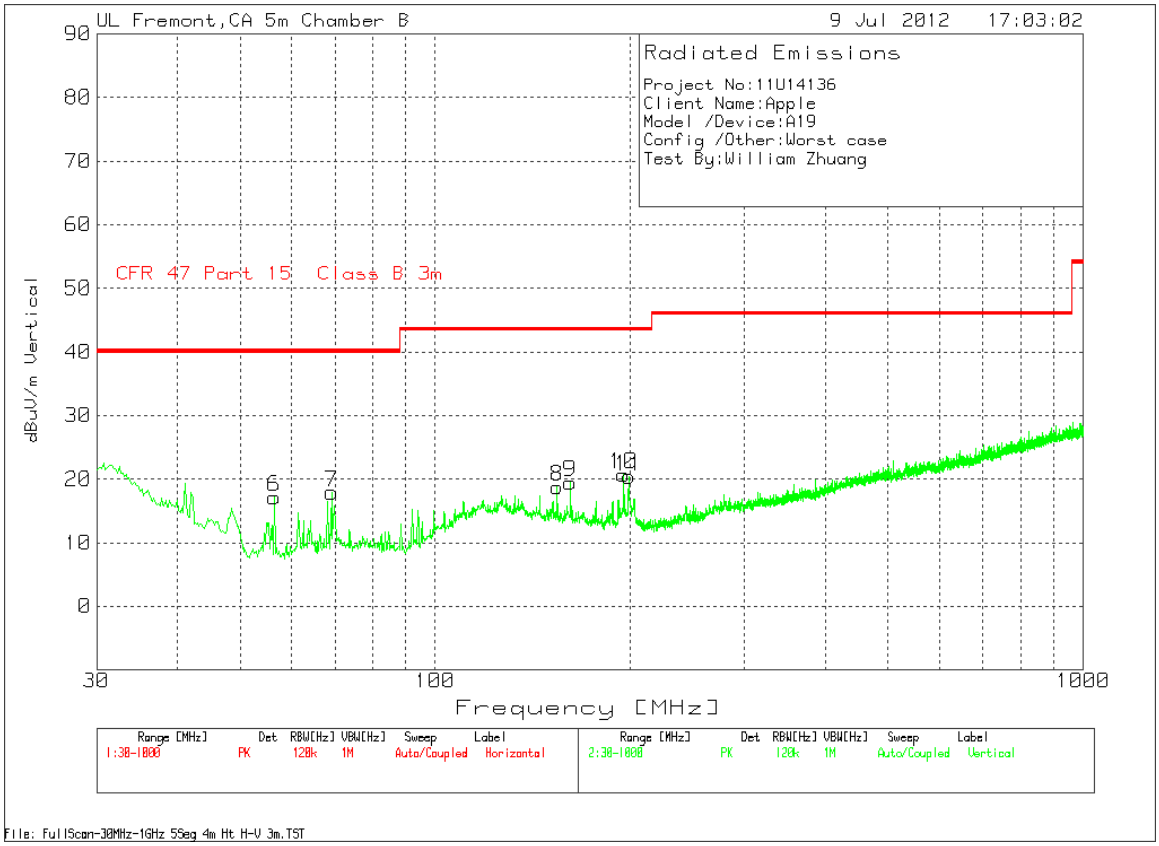
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL PLOT



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

VERTICAL PLOT



HORIZONTAL AND VERTICAL DATA

Project No:11U14136
Client Name:Apple
Model /Device:A19
Config /Other:Worst case
Test By:William Zhuang

Horizontal 30 - 1000MHz

Test Frequency	Meter Reading	Detector	T122 Sunol Bilog.TXT (dB)	5mB Amp Path 30-1000MHz (dB)	dBuV/m	CFR 47 Part 15 Class B 3m	Margin	Polarity
41.0492	39.36	PK	13	-29.2	23.16	40	-16.84	Horz
114.5164	32.49	PK	13.5	-28.4	17.59	43.5	-25.91	Horz
143.2054	32.78	PK	12.9	-28.1	17.58	43.5	-25.92	Horz
181.5867	32.98	PK	11.1	-27.7	16.38	43.5	-27.12	Horz
783.2814	29.99	PK	21.2	-25.5	25.69	46	-20.31	Horz

Vertical 30 - 1000MHz

Test Frequency	Meter Reading	Detector	T122 Sunol Bilog.TXT (dB)	5mB Amp Path 30-1000MHz (dB)	dBuV/m	CFR 47 Part 15 Class B 3m	Margin	Polarity
56.3629	38.93	PK	7.2	-29	17.13	40	-22.87	Vert
69.1567	38.74	PK	8.1	-28.9	17.94	40	-22.06	Vert
154.2546	34.3	PK	12.5	-28	18.8	43.5	-24.7	Vert
161.4269	35	PK	12.4	-27.9	19.5	43.5	-24	Vert
195.1559	36.44	PK	11.9	-27.6	20.74	43.5	-22.76	Vert
199.0328	35.32	PK	12.7	-27.6	20.42	43.5	-23.08	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

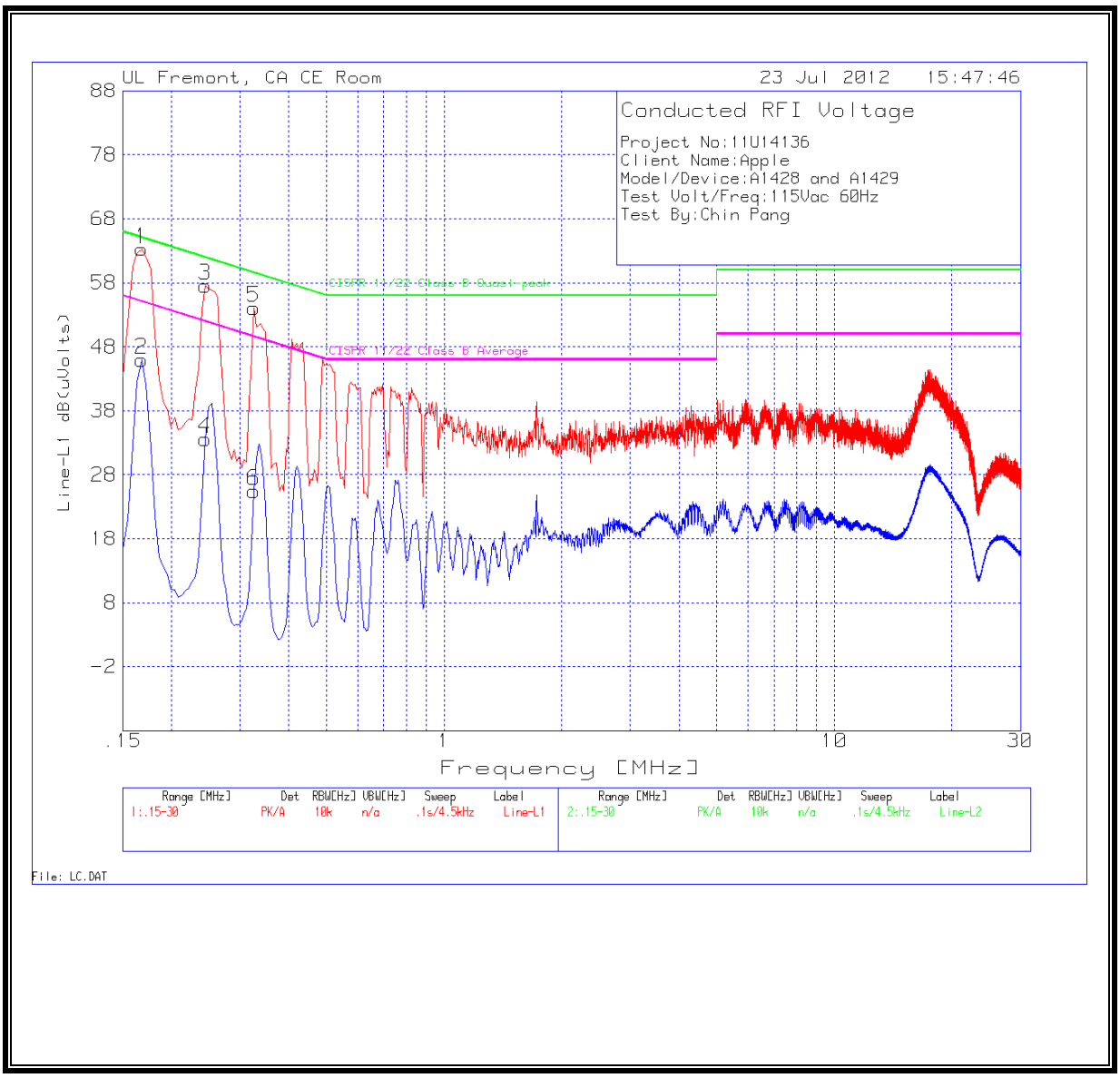
ANSI C63.4

RESULTS

6 WORST EMISSIONS

Project No:11U14136									
Client Name:Apple									
Model/Device:A1428 and A1429									
Test Volt/Freq:115Vac 60Hz									
Test By:Chin Pang									
Line-L1 .15 - 30MHz									
Test Frequ	Meter Rea	Detector	T24 IL L1.T	LC Cables	dB(uVolts	CISPR 11/2	Margin	CISPR 11/2	Margin
0.168	63.2	PK	0.1	0	63.3	65.1	-1.8	-	-
0.168	45.89	Av	0.1	0	45.99	-	-	55.1	-9.11
0.2445	57.43	PK	0.1	0	57.53	61.9	-4.37	-	-
0.2445	33.52	Av	0.1	0	33.62	-	-	51.9	-18.28
0.3255	54.03	PK	0.1	0	54.13	59.6	-5.47	-	-
0.3255	25.37	Av	0.1	0	25.47	-	-	49.6	-24.13
Line-L2 .15 - 30MHz									
Test Frequ	Meter Rea	Detector	T24 IL L2.T	LC Cables	dB(uVolts	CISPR 11/2	Margin	CISPR 11/2	Margin
0.1635	53.72	PK	0.1	0	53.82	65.3	-11.48	-	-
0.1635	32.37	Av	0.1	0	32.47	-	-	55.3	-22.83
0.2445	50.33	PK	0.1	0	50.43	61.9	-11.47	-	-
0.2445	29.13	Av	0.1	0	29.23	-	-	51.9	-22.67
0.321	46.08	PK	0.1	0	46.18	59.7	-13.52	-	-
0.321	21.42	Av	0.1	0	21.52	-	-	49.7	-28.18

LINE 1 RESULTS



LINE 2 RESULTS