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

BLUETOOTH LOW ENERGY
CERTIFICATION TEST REPORT

FOR

MOBILE, BTLE PROXIMITY ENABLING DEVICE

MODEL NUMBER: FYX Beacon

FCC ID: R6CFYX1
IC: 10756A-FYX1

REPORT NUMBER: 12U14557-2

ISSUE DATE: DECEMBER 21, 2012

Prepared for
QUALCOMM LABS, INC.
5775 MOREHOUSE DRIVE
SAN DIEGO, CA 92121, U.S.A.

Prepared by
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	12/21/12	Initial Issue	F. Ibrahim

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: QUALCOMM LABS, INC
5775 MOREHOUSE DRIVE
SAN DIEGO, CA 92121, U.S.A.

EUT DESCRIPTION: MOBILE, BTLE PROXIMITY ENABLING DEVICE

MODEL: FYX Beacon

SERIAL NUMBER: Radiated Emission Samples: 3QTW-YEB88, C3NH-WQPAV, JPUZ-WHRVW. Conducted Samples: N10GMGF2N, N10GMGG7D, N10GMGFXV, N10GMGG0M.

DATE TESTED: NOVEMBER 19 - DECEMBER 19, 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:

FRANK IBRAHIM
WiSE PROJECT LEAD
UL CCS

Tested By:

OLIVER SU
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

The EUT is a Bluetooth LE (low energy) transceiver powered by a battery coin cell.

The radio module is manufactured by QUALCOMM TECHNOLOGIES, INC.

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)
2402 - 2480	BLE	-0.44	0.90

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an internal integral antenna with a maximum gain of 1 dBi.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was CHRP, rev. REV_1.0.

5.5. WORST-CASE CONFIGURATION AND MODE

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

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

The EUT only operates in GFSK modulation at a data rate of 200 kb/s.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
DC Power Supply	Lambda	LA-300	T205	None

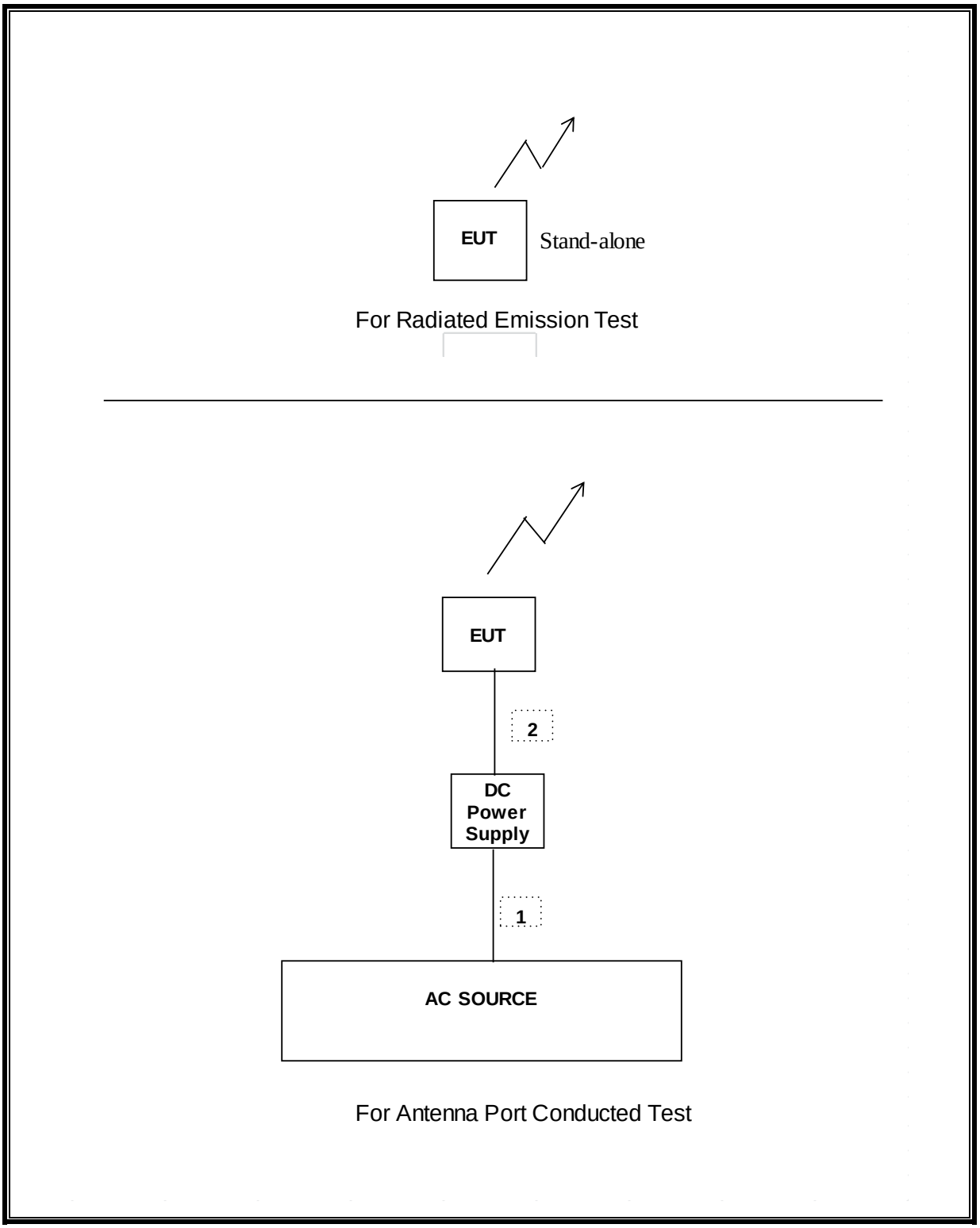
I/O CABLES

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	AC	1	US	Non-shielded	1.8	
2	DC	1	Pos / Neg Clips	Non-shielded	1	

TEST SETUP

The EUT is powered by a cell battery (3 Vdc) for Radiated Emission test, and powered by DC Power Supply during Antenna Port conducted test. Test software exercised the radio card.

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment List				
Description	**Manufacturer**	**Model**	**Asset**	**Cal Due**
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01063	10/22/13
Antenna, Horn, 18 GHz	EMCO	3115	C00783	10/25/13
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00580	12/30/12
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	03/23/13
Horn Antenna, 26.5 GHz	ARA	SWH-28	C01015	04/23/13
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C00986	03/22/13
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01179	02/16/13
Power Sensor	Agilent	8481A	T233	09/23/13
Power Meter	Agilent / HP	437B	N02785	09/24/13
Reject Filter, 2.4-2.5 GHz	Micro-Tronics	BRM50702	N02684	CNR
DC Power Supply	Lambda	LA-300	T205	CNR

7. ANTENNA PORT TEST RESULTS

7.1. 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.

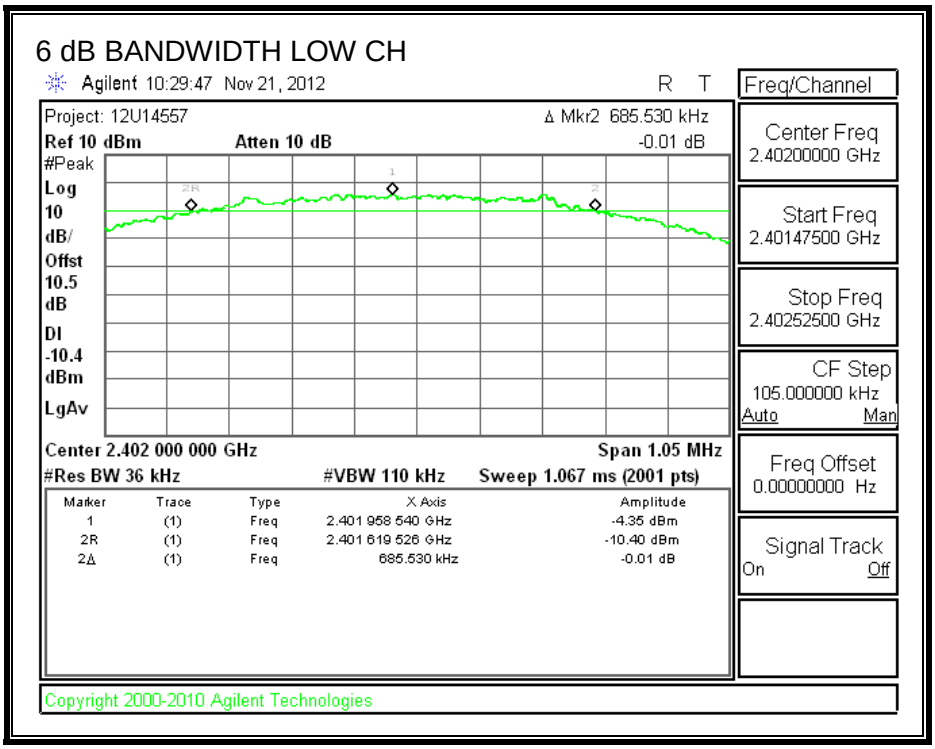
TEST PROCEDURE

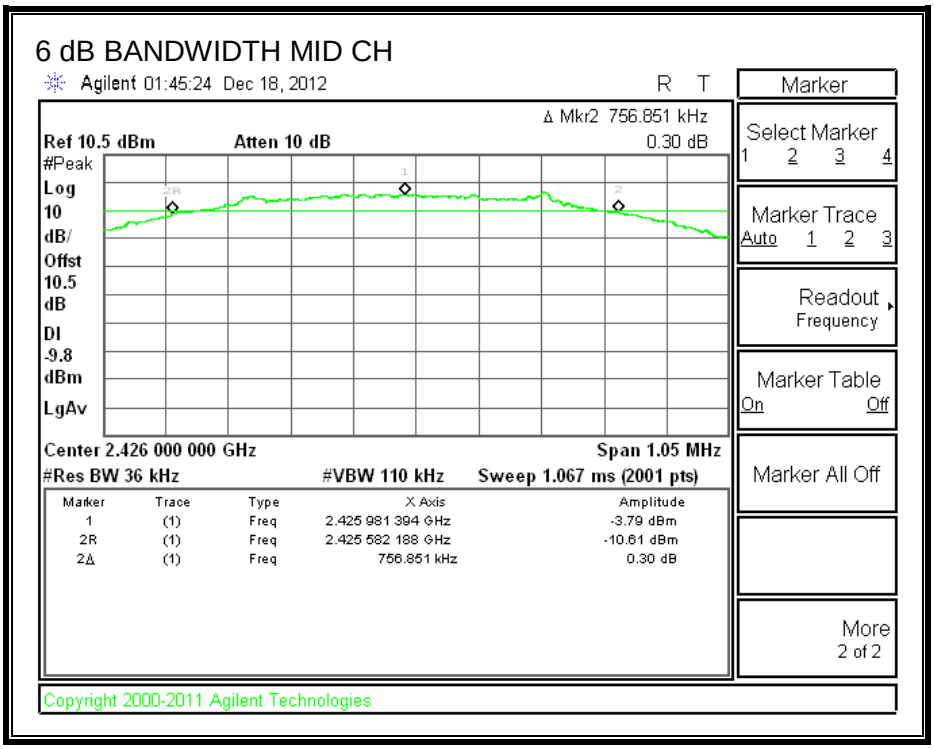
KDB 558074 D01 DTS Meas Guidance v02 “Guidance for Performing Compliance Measurements on Digital Transmission System (DTS) Operating Under 15.247”.

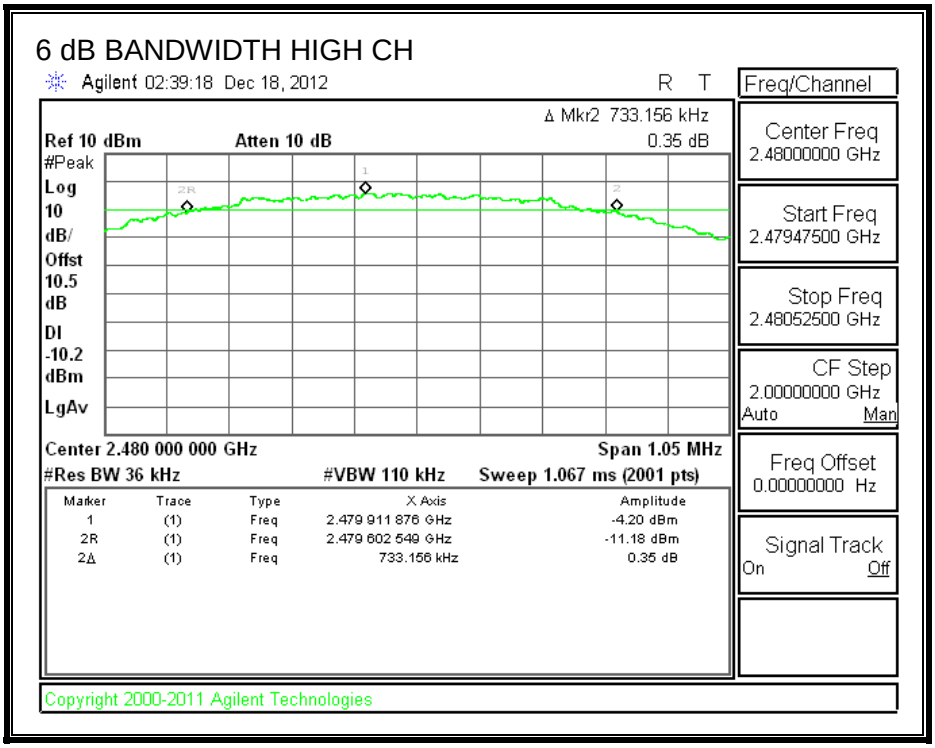
RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.685530	0.5
Middle	2426	0.756851	0.5
High	2480	0.733156	0.5

6 dB BANDWIDTH







7.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

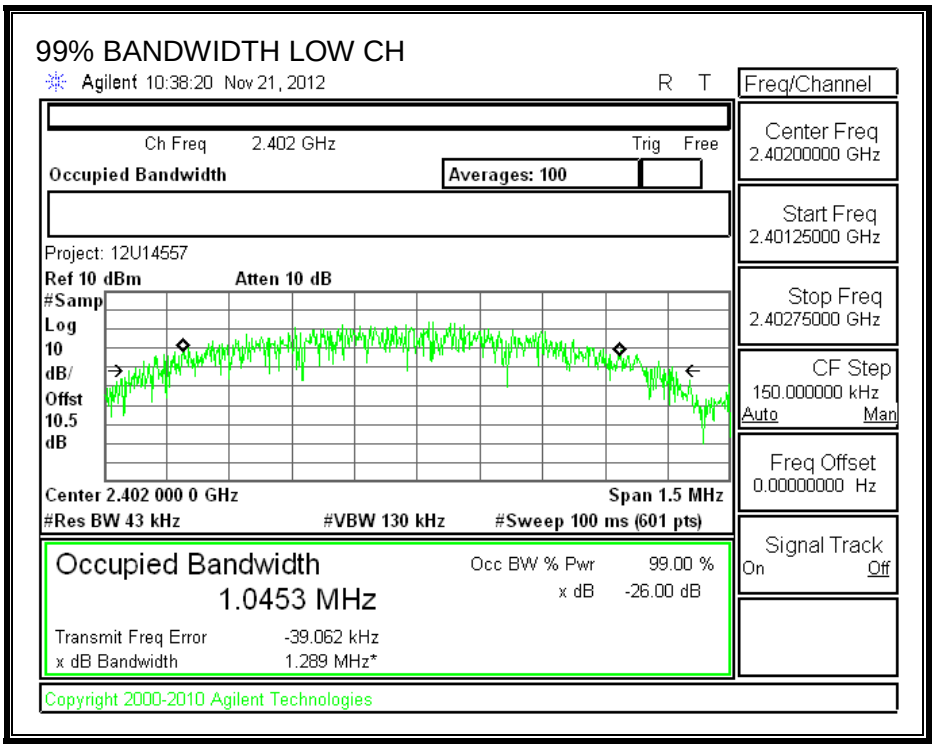
TEST PROCEDURE

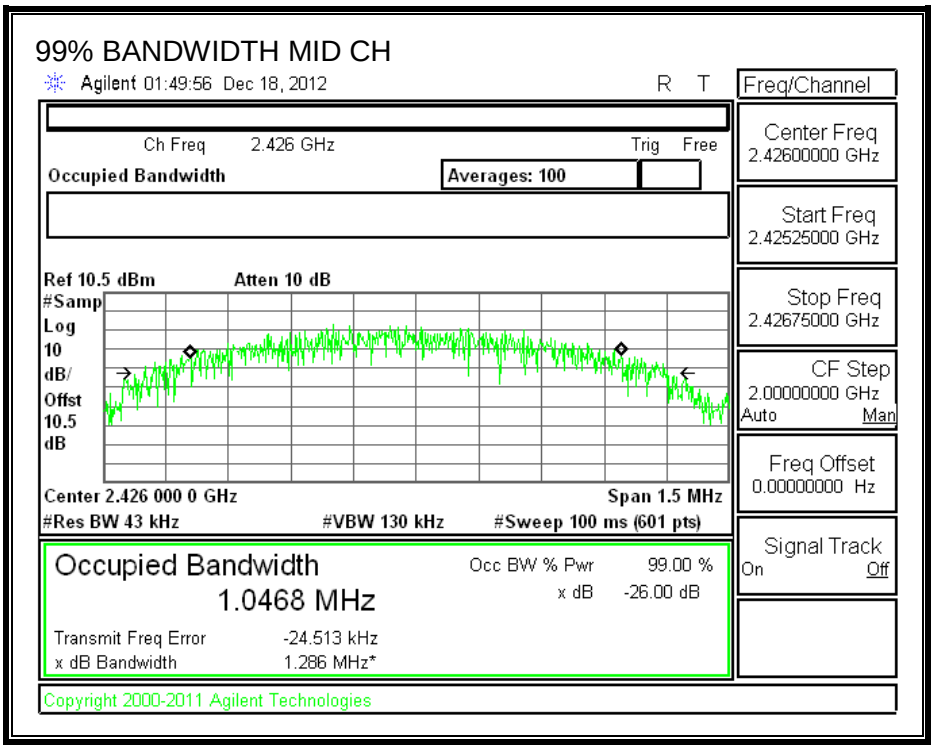
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth and to 1% of the span. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

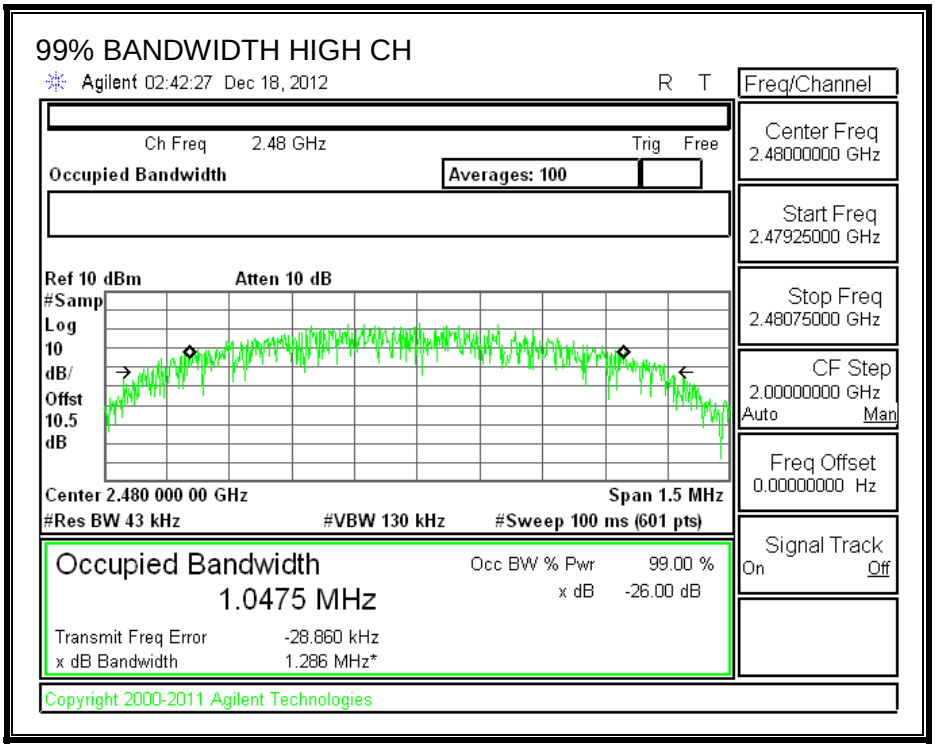
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.0453
Middle	2426	1.0468
High	2480	1.0475

99% BANDWIDTH







7.3. 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.

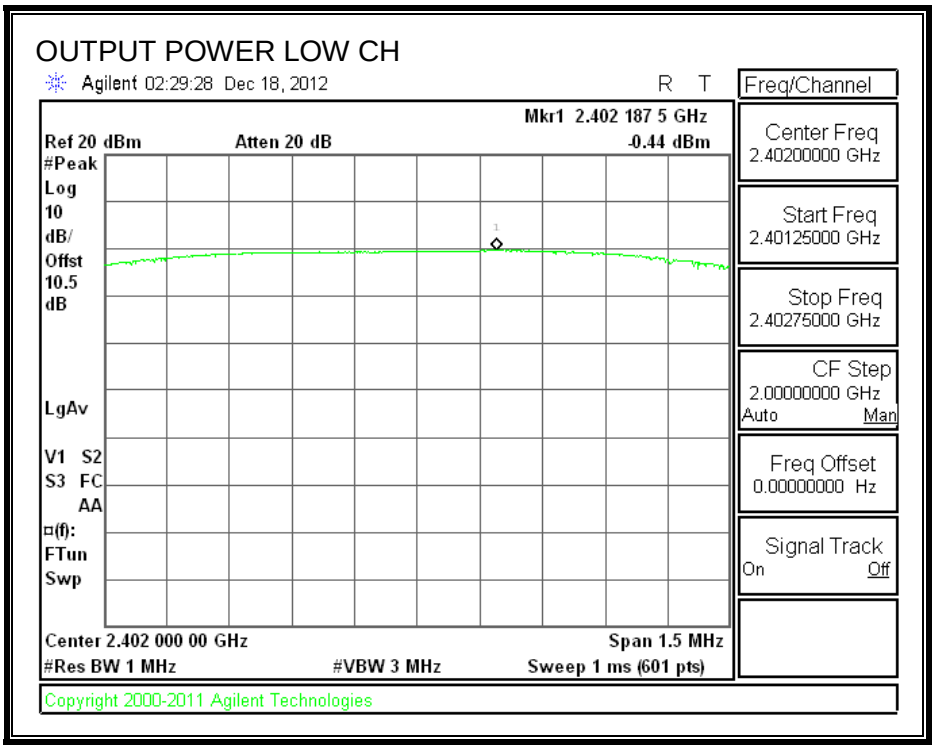
TEST PROCEDURE

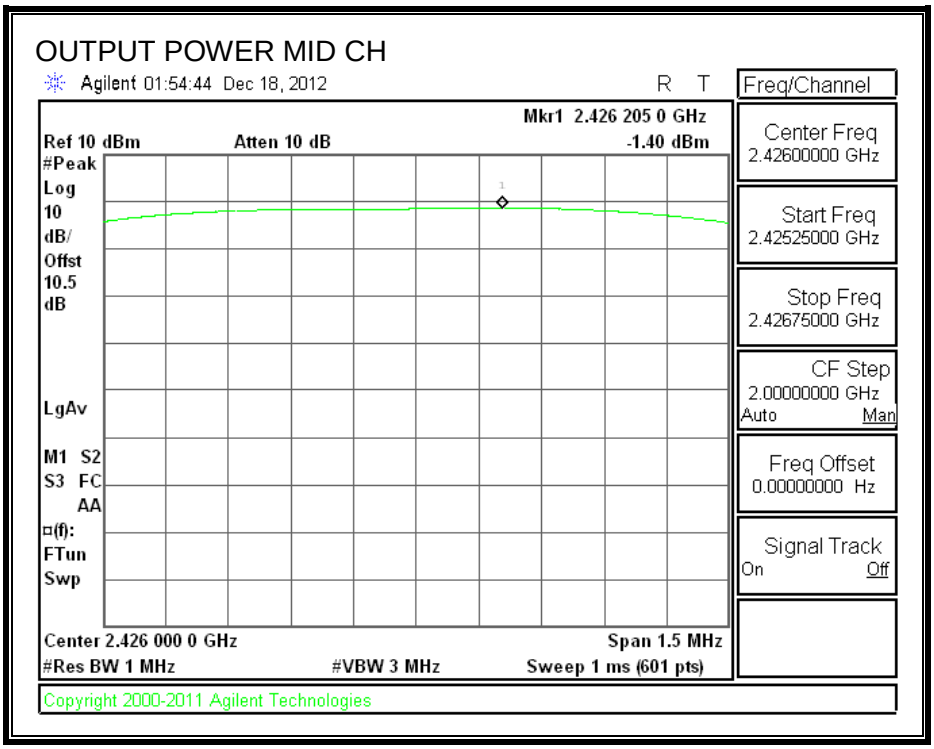
KDB 558074 D01 DTS Meas Guidance v02 “Guidance for Performing Compliance Measurements on Digital Transmission System (DTS) Operating Under 15.247”.

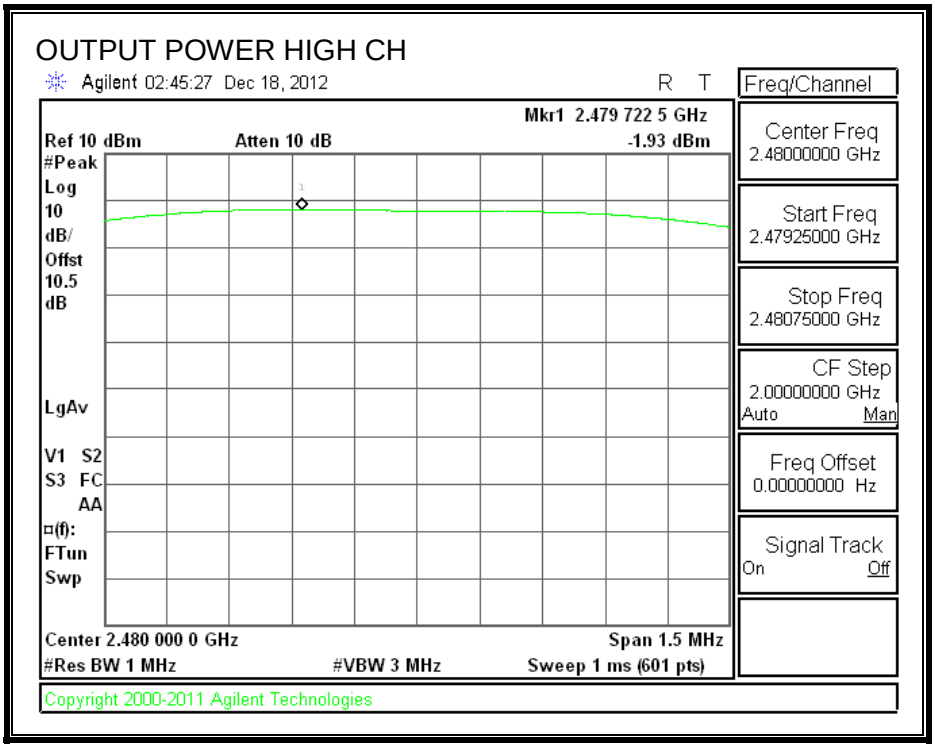
RESULTS

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	-0.440	30	-30.440
Middle	2426	-1.400	30	-31.400
High	2480	-1.930	30	-31.930

OUTPUT POWER







7.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

KDB 558074 D01 DTS Meas Guidance v02 “Guidance for Performing Compliance Measurements on Digital Transmission System (DTS) Operating Under 15.247”.

RESULTS

The cable assembly insertion loss of 10.54 dB (including 10 dB pad and 0.54 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	2402	-0.67
Middle	2426	-1.79
High	2480	-2.06

7.5. 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.

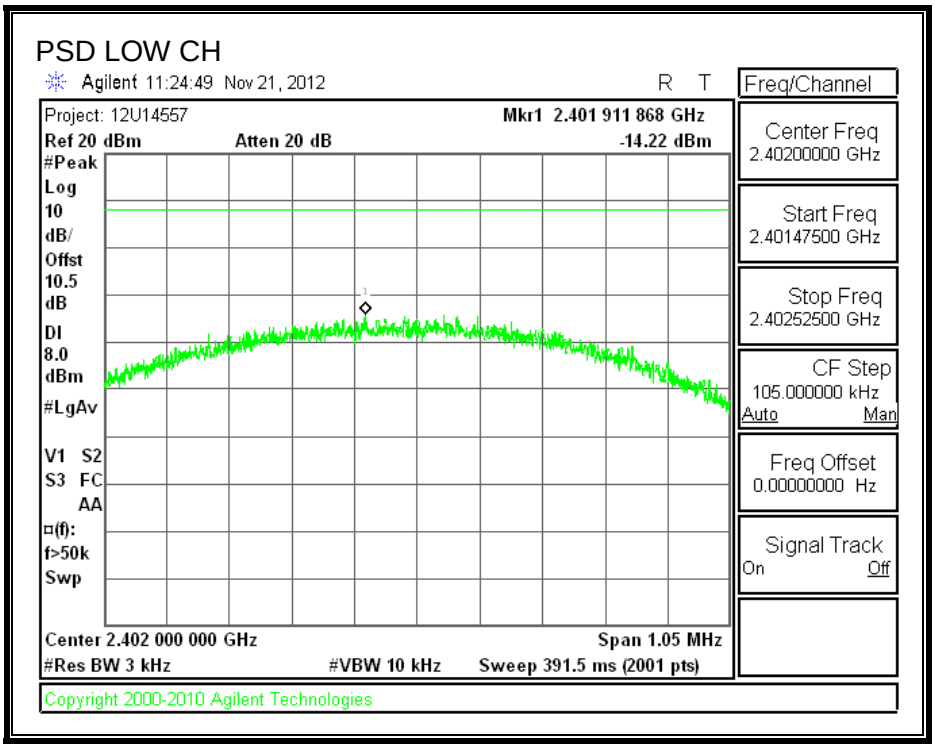
TEST PROCEDURE

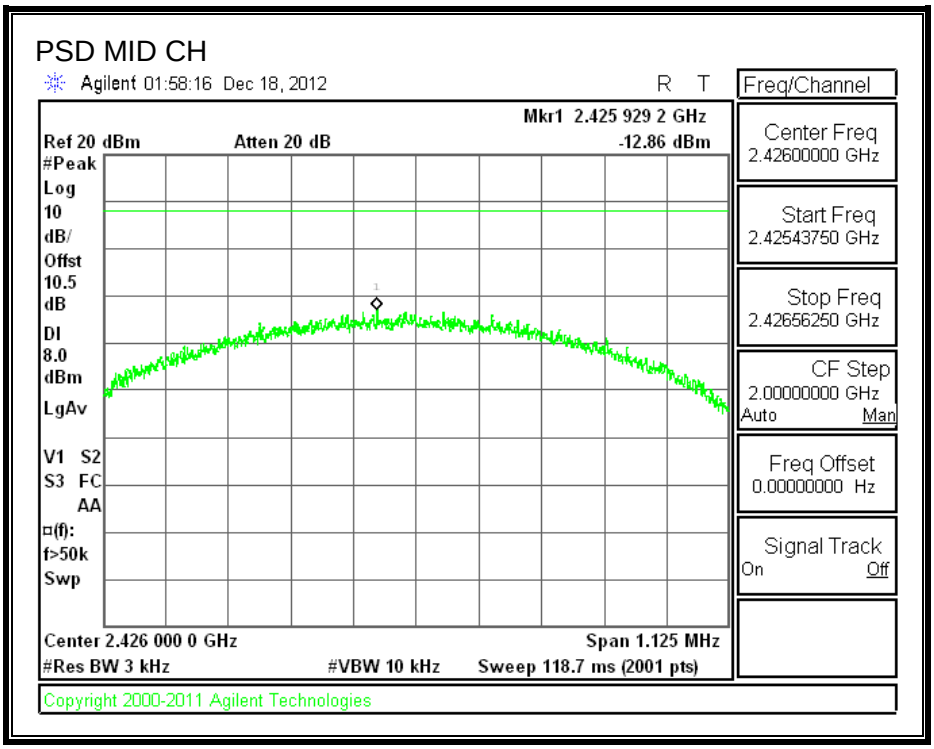
KDB 558074 D01 DTS Meas Guidance v02 “Guidance for Performing Compliance Measurements on Digital Transmission System (DTS) Operating Under 15.247”.

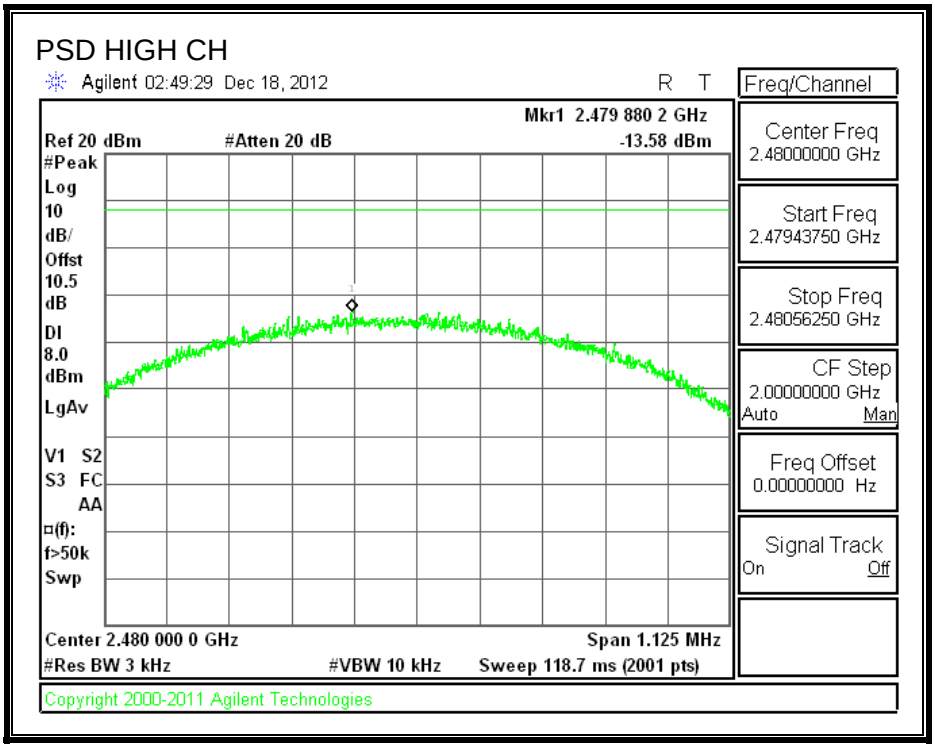
RESULTS

Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2402	-14.22	8	-22.22
Middle	2426	-12.86	8	-20.86
High	2480	-13.58	8	-21.58

POWER SPECTRAL DENSITY







7.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

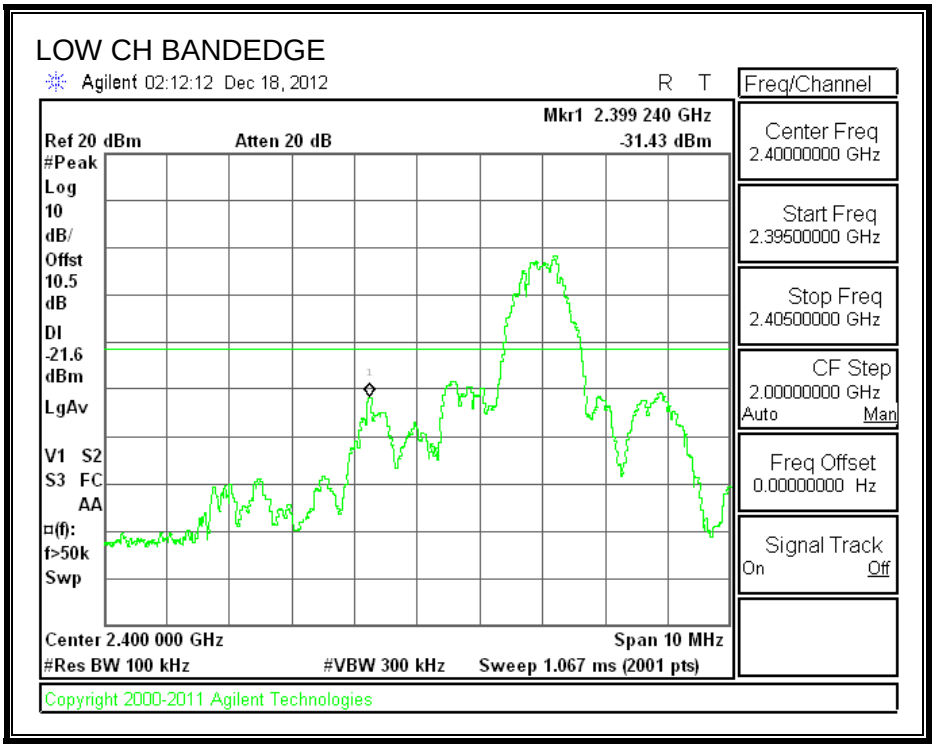
Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

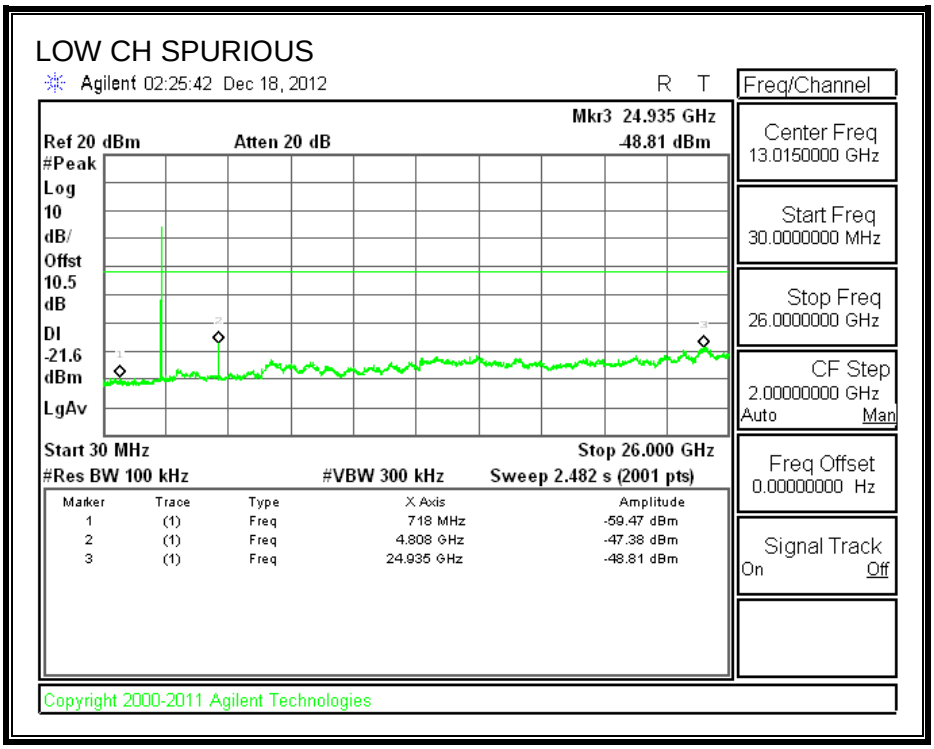
TEST PROCEDURE

KDB 558074 D01 DTS Meas Guidance v02 “Guidance for Performing Compliance Measurements on Digital Transmission System (DTS) Operating Under 15.247”.

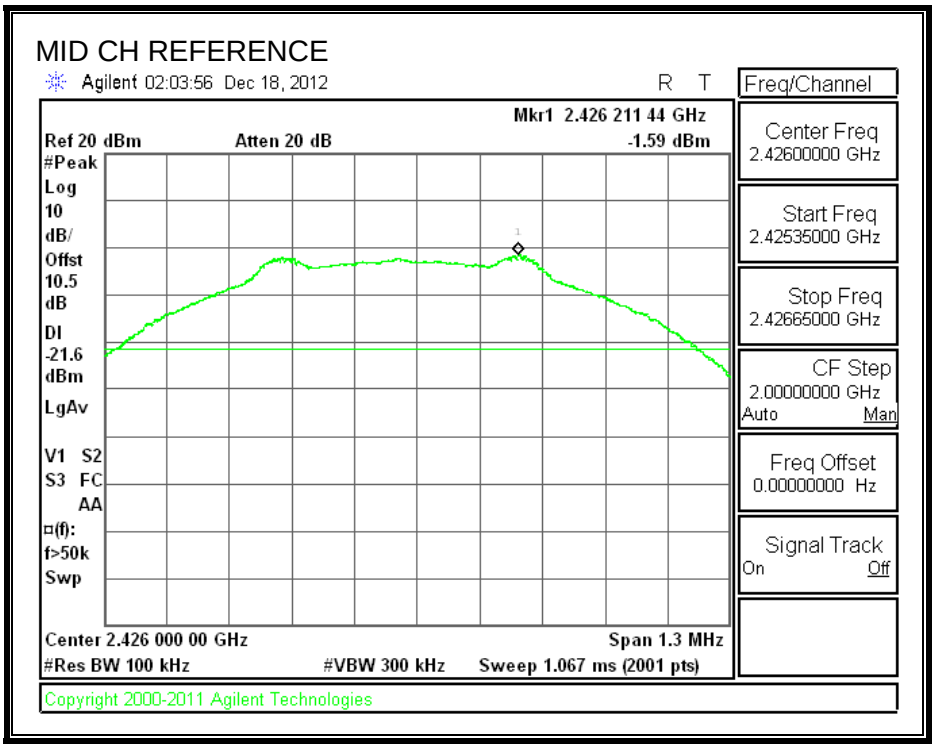
RESULTS

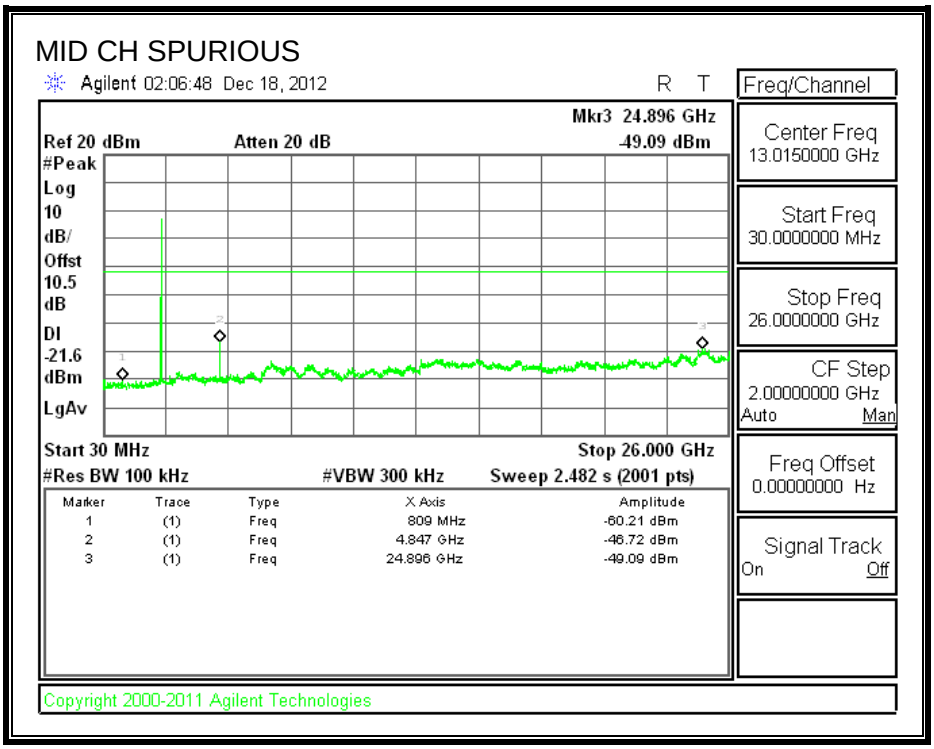
SPURIOUS EMISSIONS, LOW CHANNEL



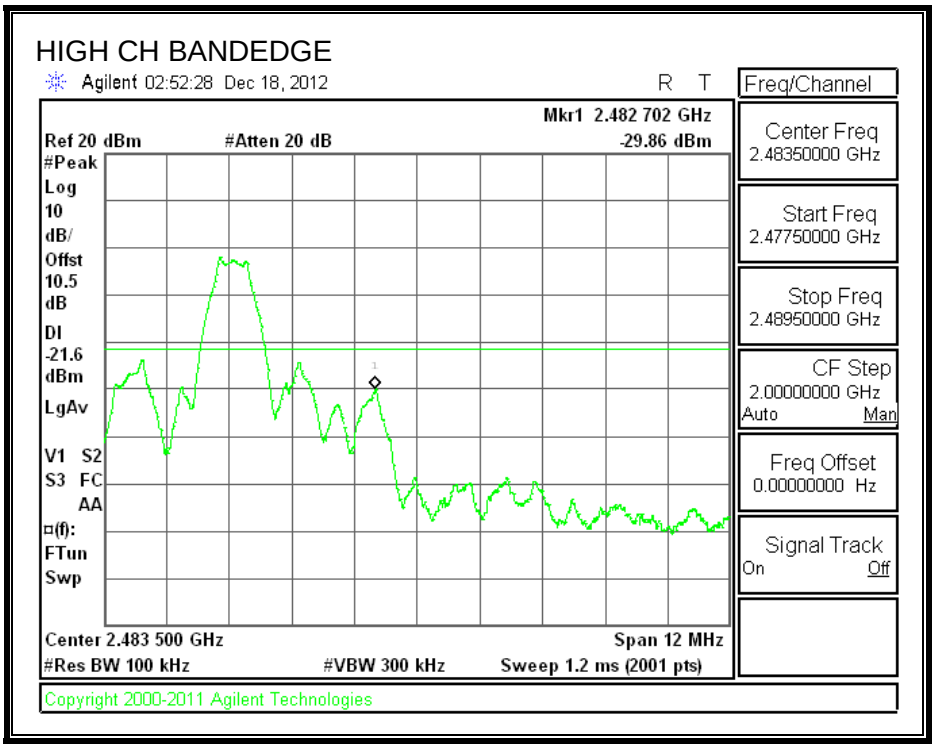


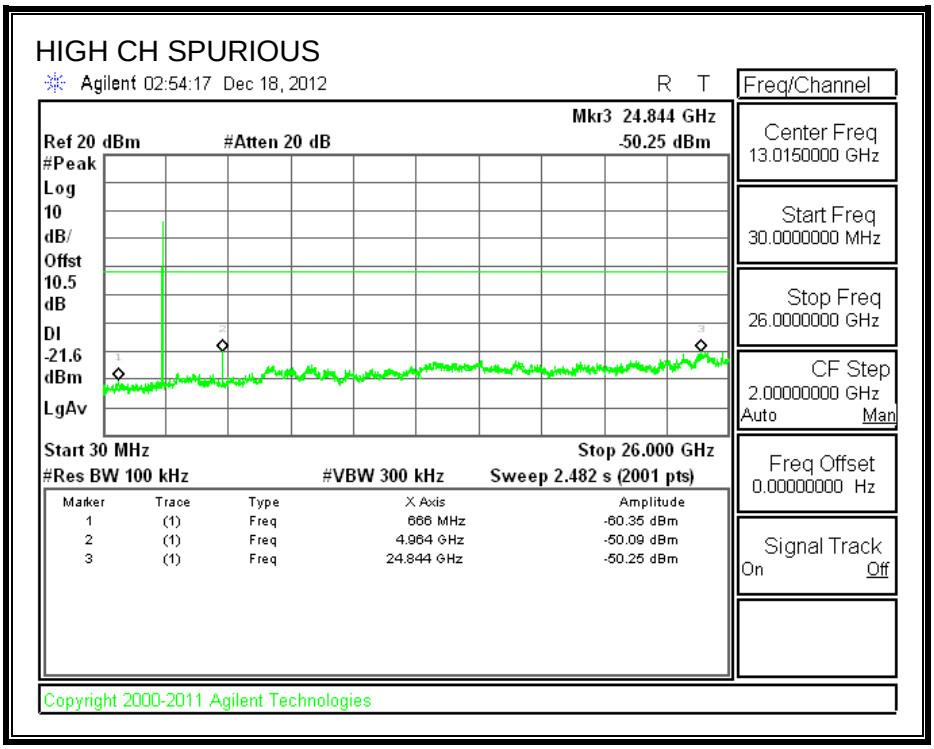
SPURIOUS EMISSIONS, MID CHANNEL





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.

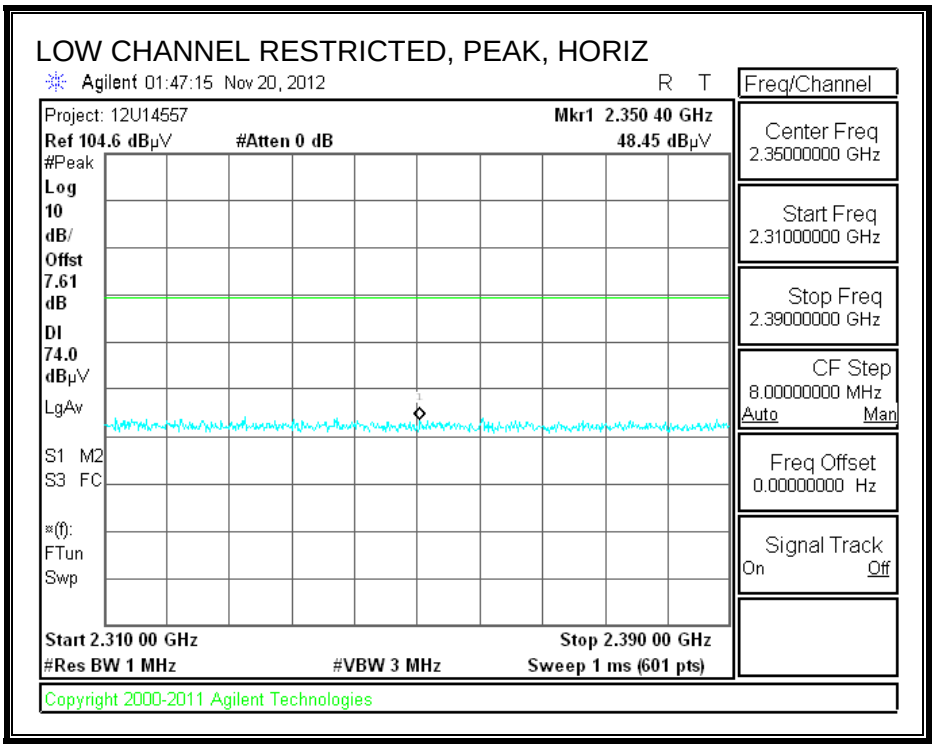
For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

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.

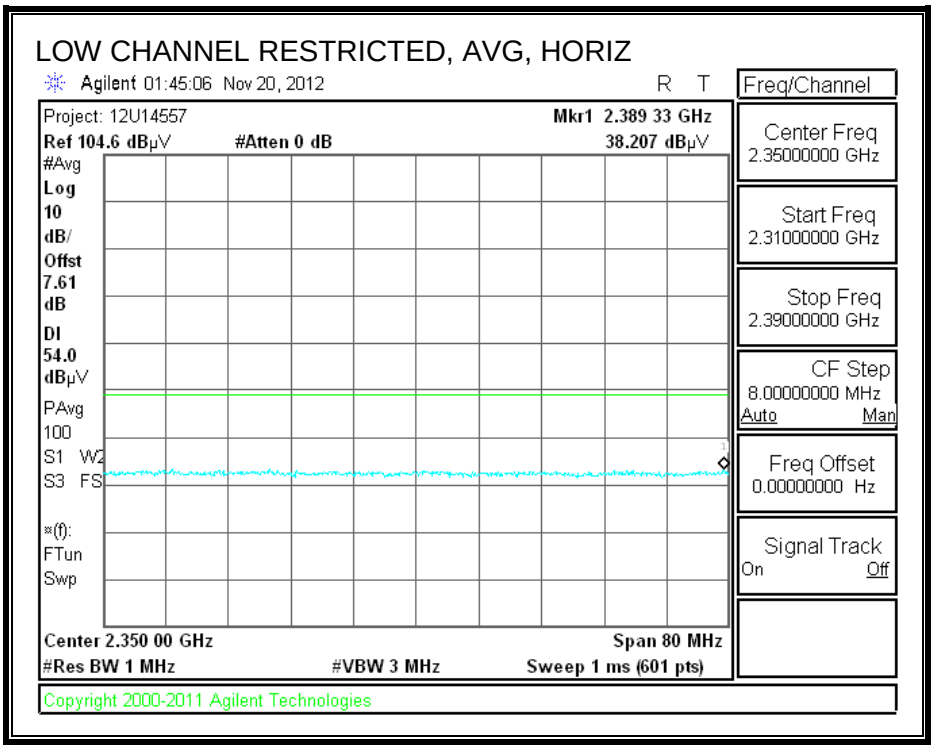
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

8.2. TRANSMITTER ABOVE 1 GHz

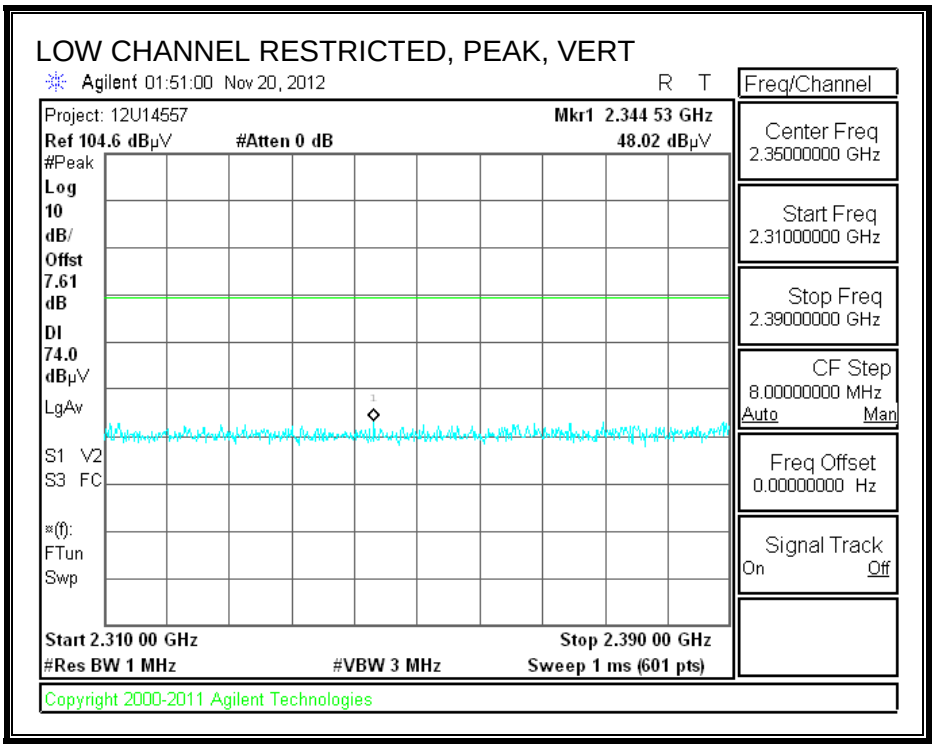
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



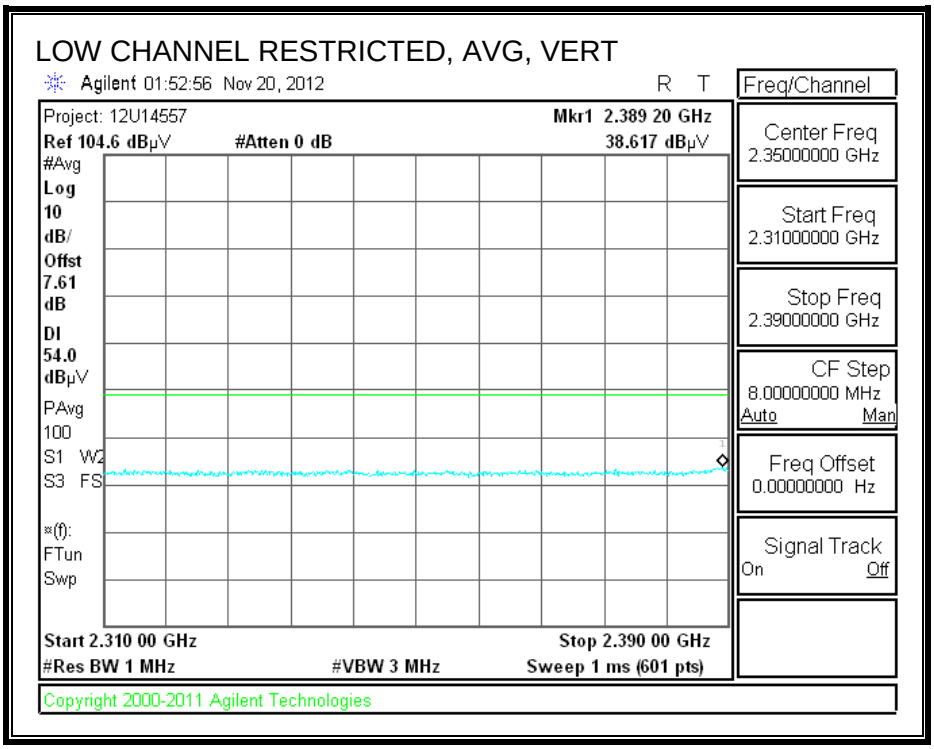
LOW CHANNEL RESTRICTED, AVG, HORIZ



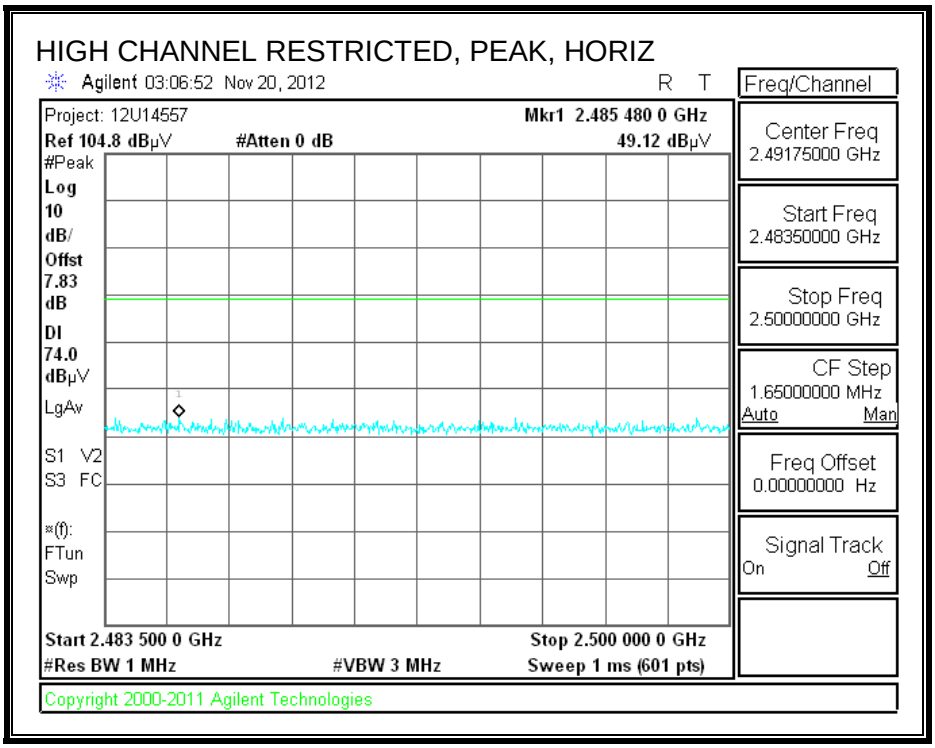
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

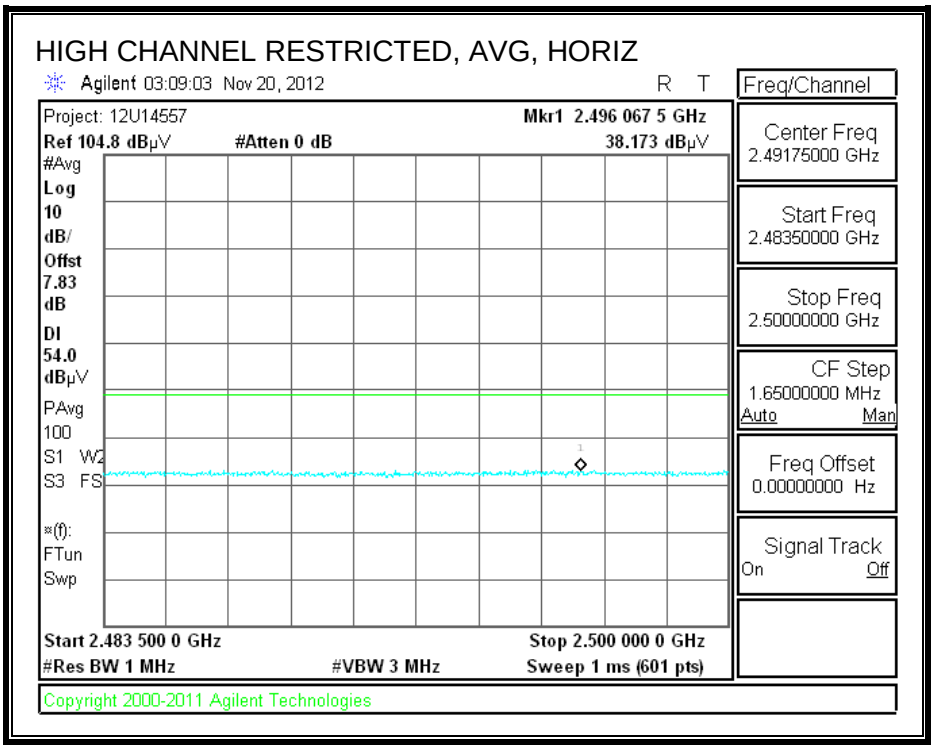


LOW CHANNEL RESTRICTED, AVG, VERT

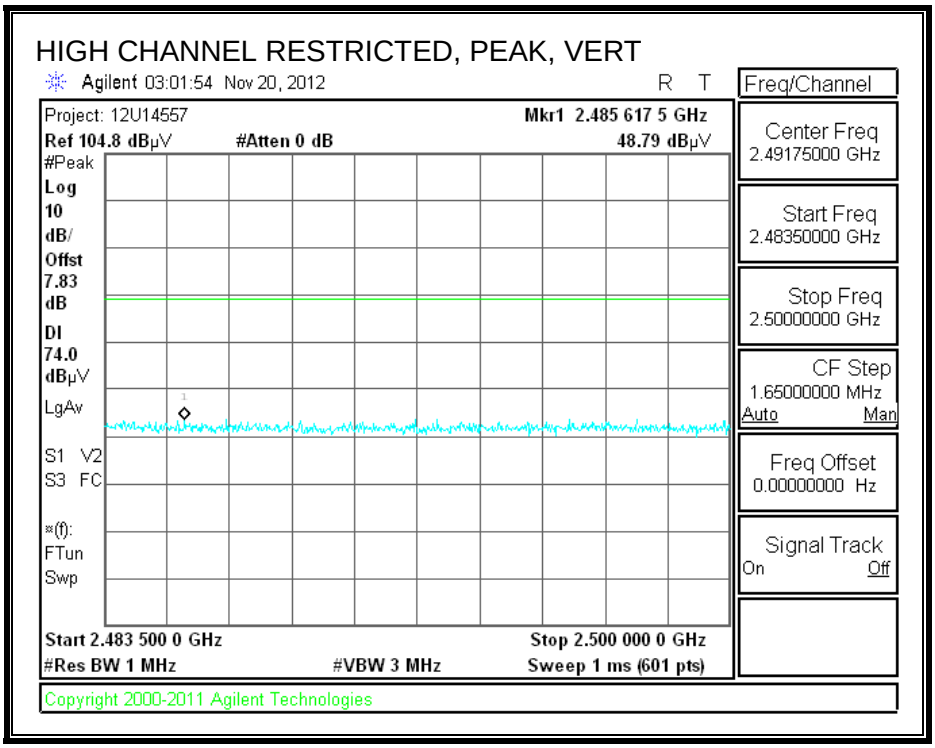


RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

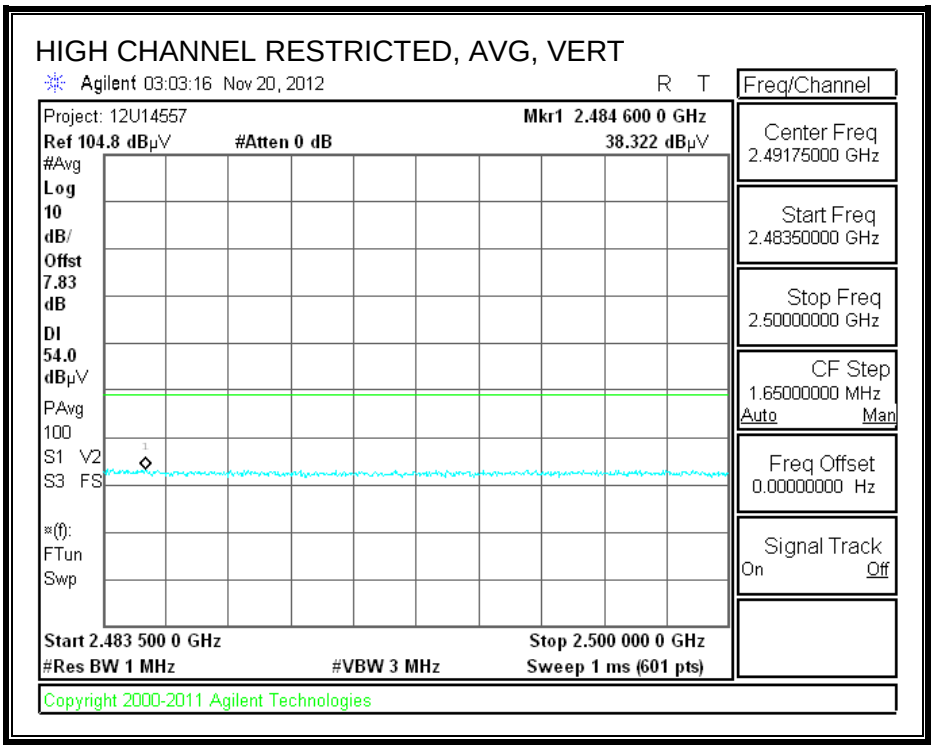




RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



HIGH CHANNEL RESTRICTED, AVG, VERT



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber-B

Company: Qualcomm
Project #: 12U14557
Date: 11/20/2012
Test Engineer: Oliver Su
Configuration: EUT stand-alone
Mode: Tx continuously

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T59; S/N: 3245 @3m	T145 Agilent 3008A0056	T88 Miteq 26-40GHz	T125; ARA 18-26GHz; S/N:1007	FCC 15.205

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500		R_001

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Ch (2402MHz)															
4.804	3.0	52.0	45.7	33.1	6.3	-34.8	0.0	0.0	56.5	50.3	74	54	-17.5	-3.7	V
4.804	3.0	51.7	45.7	33.1	6.3	-34.8	0.0	0.0	56.2	50.3	74	54	-17.8	-3.7	H
Mid Ch (2426MHz)															
4.852	3.0	49.4	43.6	33.1	6.3	-34.8	0.0	0.0	54.0	48.2	74	54	-20.0	-5.8	V
4.852	3.0	49.3	42.0	33.1	6.3	-34.8	0.0	0.0	53.9	46.6	74	54	-20.1	-7.4	H
7.278	3.0	42.2	39.5	35.8	8.5	-34.9	0.0	0.0	51.6	48.8	74	54	-22.4	-5.2	V
7.278	3.0	41.8	38.8	35.8	8.5	-34.9	0.0	0.0	51.2	48.2	74	54	-22.8	-5.8	H
High Ch (2480MHz)															
4.960	3.0	47.0	40.6	33.2	6.4	-34.8	0.0	0.0	51.7	45.4	74	54	-22.3	-8.6	V
4.960	3.0	50.7	44.7	33.2	6.4	-34.8	0.0	0.0	55.5	49.5	74	54	-18.5	-4.5	H
7.440	3.0	41.6	38.6	36.0	8.5	-34.9	0.0	0.0	51.3	48.3	74	54	-22.7	-5.7	V
7.440	3.0	41.5	38.1	36.0	8.5	-34.9	0.0	0.0	51.1	47.7	74	54	-22.9	-6.3	H

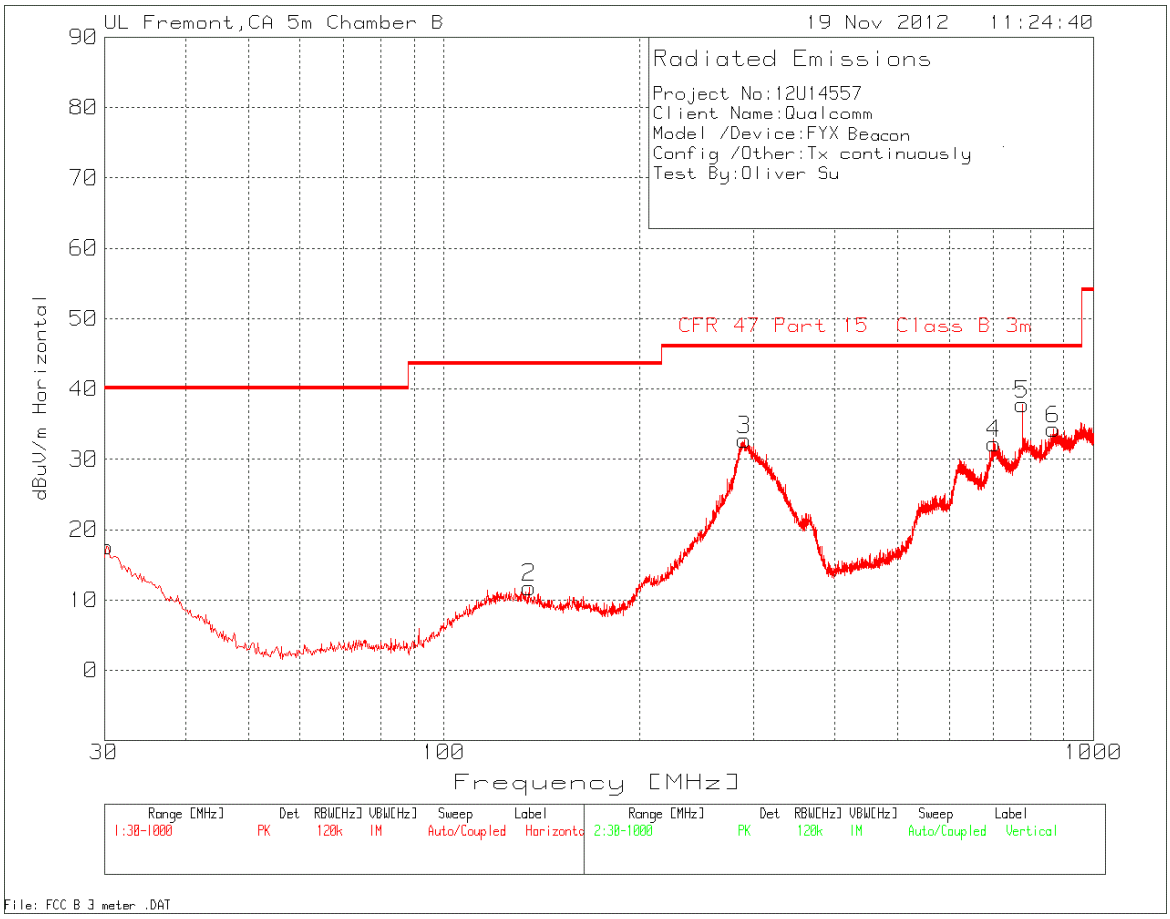
Rev. 11.10.11

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

8.3. WORST-CASE BELOW 1 GHz

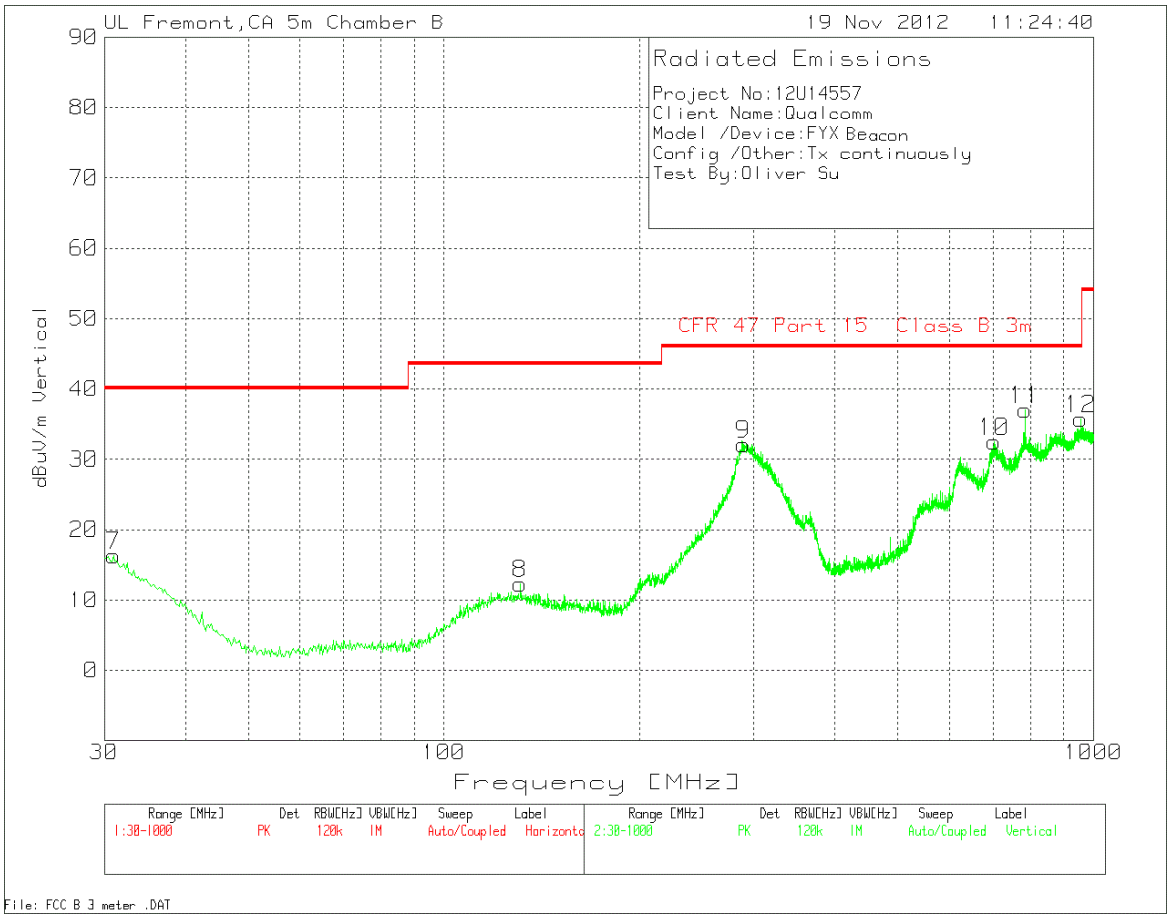
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL PLOT



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

VERTICAL PLOT



HORIZONTAL DATA AND VERTICAL DATA

Project No:12U14557
Client Name:Qualcomm
Model /Device:FYX Beacon
Config /Other:Tx continuously
Test By:Oliver Su

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	Height [cm]	Polarity
30.1938	25.59	PK	21.3	-29.3	17.59	40	-22.41	400	Horz
135.2578	26.32	PK	13.7	-28.2	11.82	43.5	-31.68	300	Horz
290.1399	46.38	PK	13.3	-26.9	32.78	46	-13.22	100	Horz
703.0296	38	PK	20.3	-26.1	32.2	46	-13.8	100	Horz
777.8537	42.17	PK	21.2	-25.6	37.77	46	-8.23	400	Horz
868.1855	37.16	PK	22	-24.9	34.26	46	-11.74	300	Horz
Vertical 30 - 1000MHz									
30.9692	24.9	PK	20.7	-29.3	16.3	40	-23.7	200	Vert
131.1871	26.54	PK	14	-28.2	12.34	43.5	-31.16	300	Vert
289.1707	45.68	PK	13.3	-26.9	32.08	46	-13.92	300	Vert
704.1926	38.33	PK	20.3	-26.1	32.53	46	-13.47	400	Vert
785.8014	41.34	PK	21.2	-25.5	37.04	46	-8.96	100	Vert
955.2218	37.34	PK	22.8	-24.4	35.74	46	-10.26	200	Vert

PK - Peak detector
QP - Quasi-Peak detector
Av - Average detector