



CERTIFICATION TEST REPORT

Report Number. : 11686683-E1V3

Applicant : DIGI INTERNATIONAL INC.
11001 BREN RD. E
MINNETONKA, MN 55343, USA

Model : SMARTGATEWAY

FCC ID : MCQ-SMARTGTW01

IC : 1846A-SMARTGTW01

EUT : DIGI SMART GATEWAY (AT&T)
Description

Test : FCC 47 CFR PART 15 SUBPART C
Standard(s) INDUSTRY CANADA RSS - 247 ISSUE 2

Date Of Issue:

May 17, 2017

Prepared by:

UL Verification Services Inc.
47173 Benicia Street
Fremont, CA 94538, U.S.A.
TEL: (510) 771-1000
FAX: (510) 661-0888



NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	04/28/17	Initial Issue	D. Corona
V2	05/05/17	Updated KDB reference number	D. Corona
V3	05/17/17	Updated Section 3 and EUT Description	D. Corona

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: DIGI WIRELESS DESIGN SERVICES INC.
11001 BREN RD. E
MINNETONKA, MN 55343, USA

EUT DESCRIPTION: DIGI SMART GATEWAY (AT&T)

MODEL: SMARTGATEWAY

SERIAL NUMBER: F000023 (RADIATED), F000027 (CONDUCTED)

DATE TESTED: MARCH 23, 2017 – APRIL 14, 2017

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-247 Issue 2	Pass
INDUSTRY CANADA RSS-GEN Issue 4	Pass

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of the U.S. government.

Approved & Released For
UL Verification Services Inc. By:



DAN CORONIA
CONSUMER TECHNOLOGY DIVISION
WISE PPROJECT LEAD
UL VERIFICATION SERVICES INC.

Prepared By:



KIYA KEDIDA
CONSUMER TECHNOLOGY DIVISION
WISE ENGINEER
UL VERIFICATION SERVICES INC.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.10-2013, RSS-GEN Issue 4, and RSS-247 Issue 2.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, Fremont, California, USA. Line conducted emissions are measured only at the 47173 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

47173 Benicia Street		47266 Benicia Street	
☐	Chamber A (IC:2324B-1)	☐	Chamber D (IC:22541-1)
☒	Chamber B (IC:2324B-2)	☐	Chamber E (IC:22541-2)
☐	Chamber C (IC:2324B-3)	☐	Chamber F (IC:22541-3)
		☐	Chamber G (IC:22541-4)
		☐	Chamber H (IC:22541-5)

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

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

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

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

4.3. MEASUREMENT UNCERTAINTY

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

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

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

5. EQUIPMENT UNDER TEST

5.1. BRIEF DESCRIPTION OF EUT

The EUT (HCGateway) is a connected product that pairs with various sensors over BLE and WLAN, as part of Digi's Cold Chain Solutions. The sensor data and gateway position is transmitted to the cloud over the cellular network.

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	4.03	2.53

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a PCB inverted-F, with a maximum gain of -1.50 dBi.

5.4. SOFTWARE AND FIRMWARE

The test utility software used during testing was Qualcomm Atheros Radio Tool 2 for Internet of Everything (ART2_IoE).

5.5. WORST-CASE CONFIGURATION AND MODE

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

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

The fundamental of the EUT was investigated in three orthogonal orientations X/Y/Z, it was determined that Y orientation was worst-case orientation. Therefore, all final radiated testing was performed with the EUT in Y orientation.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Description	Manufacturer	Model	Serial Number	FCC ID
Laptop AC/DC adapter	HP	HSTNN-DA25	WCNVH0AAR2Z641	N/A
Laptop	HP	EliteBook 8570p	N/A	N/A
AC/DC Power Supply	Sorensen	XHR 60-18	1308A01936	N/A
J-TAG PCB	J-TAG	JTAG-0004	N/A	N/A

I/O CABLES (CONDUCTED TEST)

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Antenna	1	SMA RF	Shielded	0.2	Antenna to SA
2	Serial	1	9-Pin Serial	Shielded	3	Laptop to J-TAG PCB
3	DC	1	DC	Un-Shielded	0.1	DC Power Supply to EUT
4	DC	1	DC	Shielded	1	AC Adapter to Laptop
5	AC	1	AC	Shielded	1	AC Mains to DC PS
6	AC	1	AC	Shielded	1	AC Mains to AC Adapter
7	Serial	1	Ribbon	Shielded	0.2	J-TAG PCB to EUT

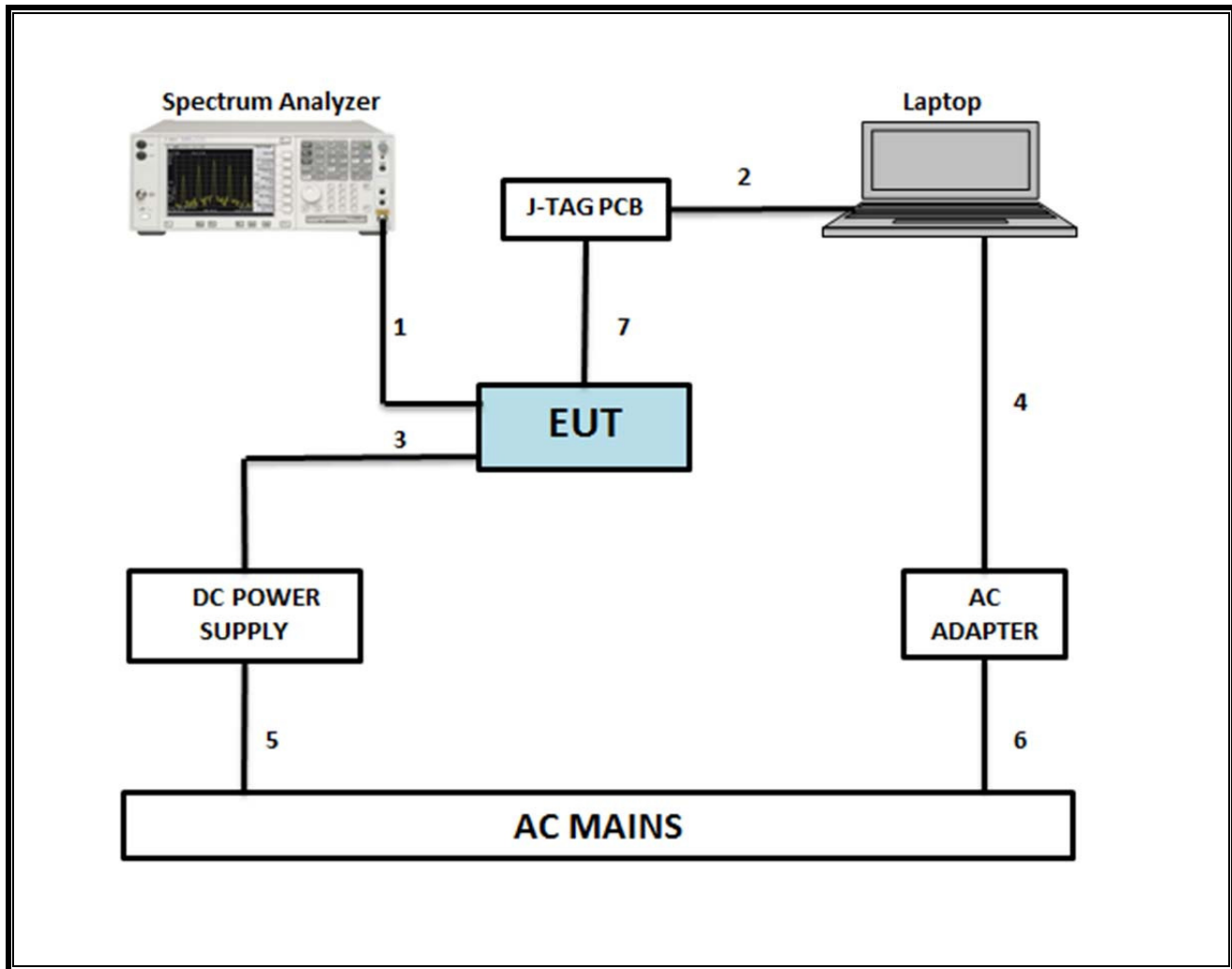
I/O CABLES (RADIATED AND CONDUCTED EMISSIONS)

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC	1	DC	Un-Shielded	0.1	DC Power SupplyTo EUT
2	AC	1	AC	Shielded	1	AC Mains To DC Power Supply

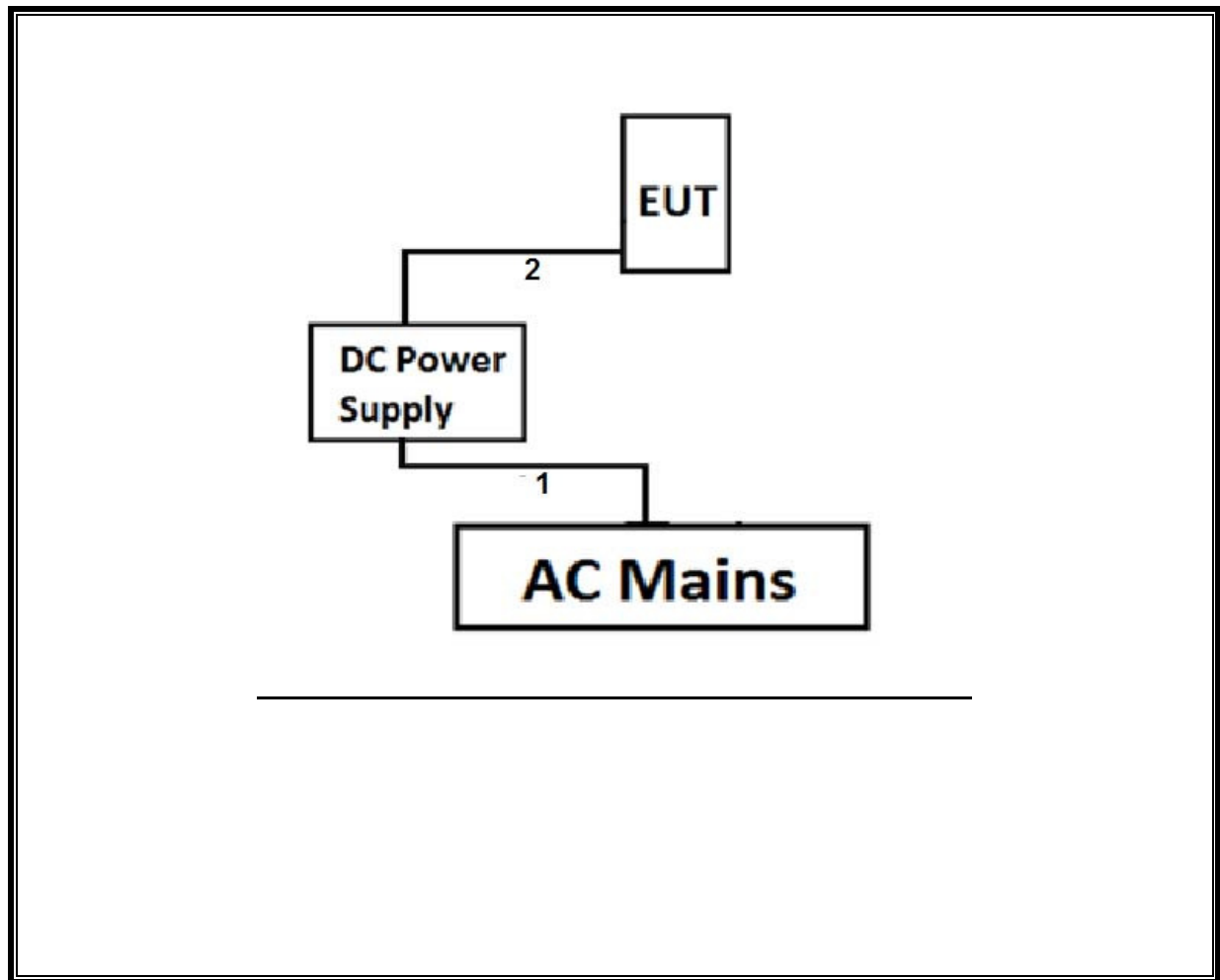
TEST SETUP

The EUT was tested connected to a host Laptop via J-TAG PCB & cable for Antenna Port and AC tests. Radiated tests were performed with EUT connected to AC adapter and remote laptop. Test software exercised the radio card.

SETUP DIAGRAM FOR ANTENNA PORT CONDUCTED TESTS



SETUP DIAGRAM FOR RADIATED TESTS AND AC LINE CONDUCTED EMISSIONS



6. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment List					
Description	Manufacturer	Model	T Number	Cal Date	Cal Due
Amplifier, 1 to 18 GHz	Miteq	AFS43-00101800-25-S-42	493	02/15/17	02/15/18
Amplifier, 1 to 8 GHz	Miteq	AMF-4D-01000800-30-29P	1156	02/15/17	02/15/18
Pre-Amp 1-26.5GHz	Agilent	8449B	404	07/05/16	07/05/17
Amplifier, 10KHz to 1GHz, 32dB	Keysight	8447D	10	02/15/17	02/15/18
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB1	130	09/23/16	09/23/17
Antenna, Horn 1-18GHz	ETS Lindgren	3117	346	03/23/17	03/23/18
18 - 26.5 GHz Horn Antenna	Seavey Division	MWH-1826/B	449	05/26/16	05/26/17
Spectrum Analyzer, PXA 3Hz to 44GHz	Keysight	N9030A	907	01/23/17	01/23/18
PSA Series Spectrum Analyzer, 3Hz - 44GHz	Agilent	E4446A	146	07/13/16	07/13/17
Power Meter	Keysight	N1911A	T229	07/28/16	07/28/17
Power Sensor	Keysight	N1921A	T413	06/20/16	06/20/17
EMI Receiver	Rohde & Schwarz	ESR-EMI	1436	12/19/16	12/19/17
LISN	FISCHER	FCC-LISN-50/250-25-2-01	1310	06/08/16	06/08/17

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

Test Software List			
Description	Manufacturer	Model	Version
Radiated Software	UL	UL EMC	Ver 9.5, Dec 01, 2016
Antenna Port Software	UL	UL RF	Ver 6.5, Apr 21, 2017

7. MEASUREMENT METHODS

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

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

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

Output Power: KDB 558074 D01 v03r05, Section 9.1.2.

Power Spectral Density: KDB 558074 D01 v03r05, Section 10.2.

Out-of-band emissions in non-restricted bands: KDB 558074 D01 v03r05, Section 11.1 (a).

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

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

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

8. SUMMARY TABLE

FCC Part Section	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result
15.247 (a)(2)	RSS-247 5.2.1	Occupied Band width (6dB)	>500KHz	Conducted	Pass
2.1051, 15.247 (d)	RSS-247 5.5	Band Edge / Conducted Spurious Emission	-30dBc		Pass
15.247 (b) (3)	RSS-247 5.4.4	TX conducted output power	<30dBm		Pass
15.247 (e)	RSS-247 5.2.2	PSD	<8dBm		Pass
15.207 (a)	RSS-GEN 8.8	AC Power Line conducted emissions	Section 10	Radiated	Pass
15.205, 15.209, 15.247(d)	RSS-GEN 8.9/7	Radiated Spurious Emission	< 54dBuV/m		Pass

9. ANTENNA PORT TEST RESULTS

9.1. ON TIME, DUTY CYCLE

LIMITS

None; for reporting purposes only.

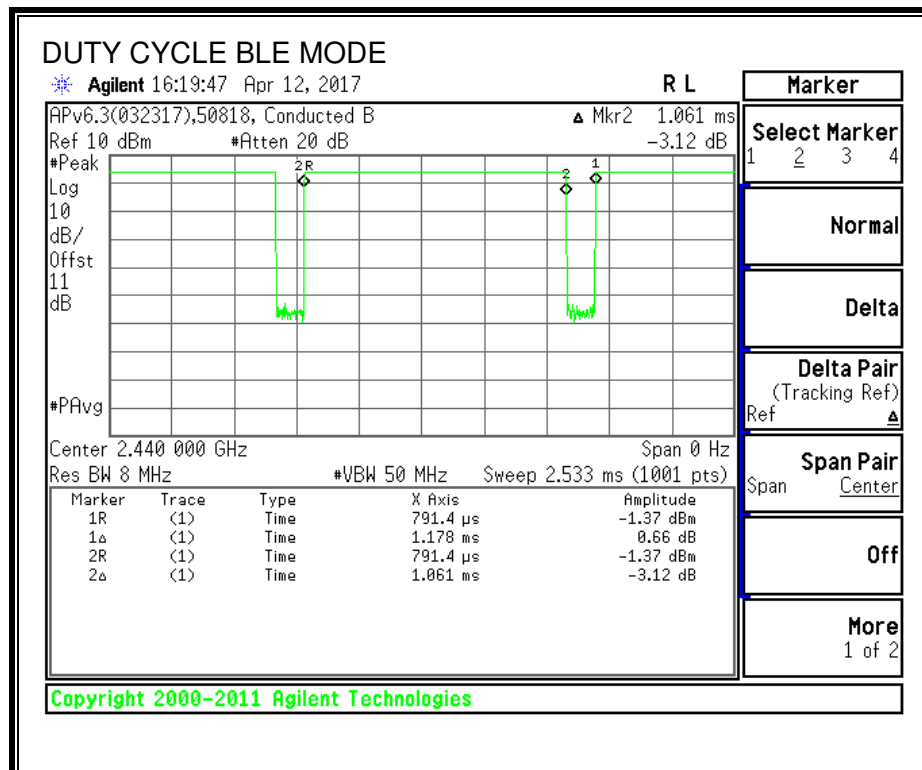
PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method.

ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/T Minimum VBW (khz)
BLE	1.061	1.178	0.9007	90.07	0.454	0.9425

DUTY CYCLE PLOTS



9.3. BLE

9.3.1. 6 dB BANDWIDTH

LIMITS

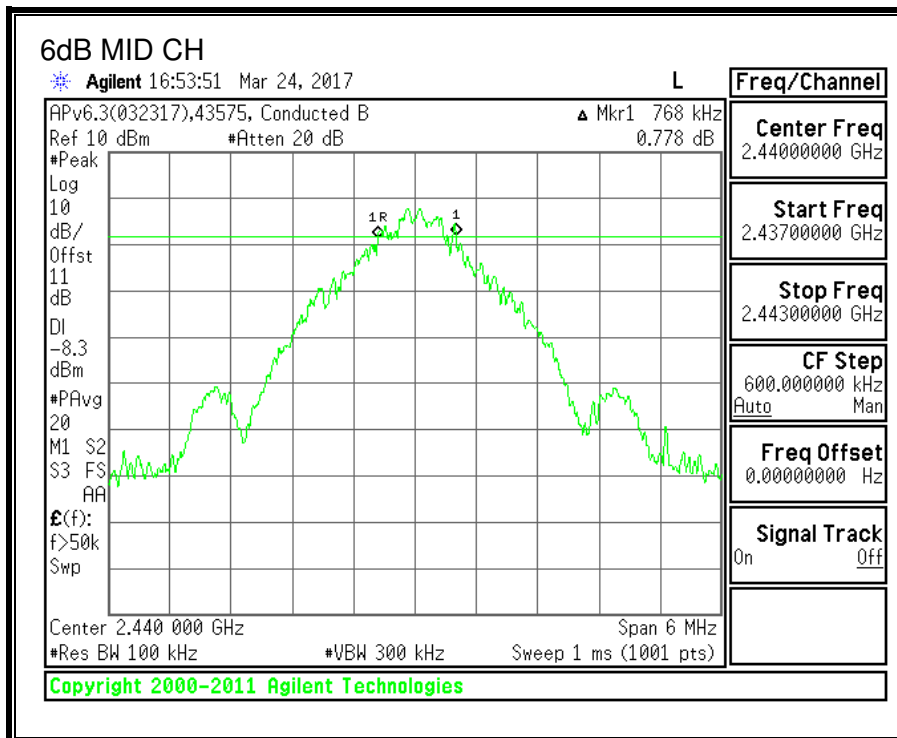
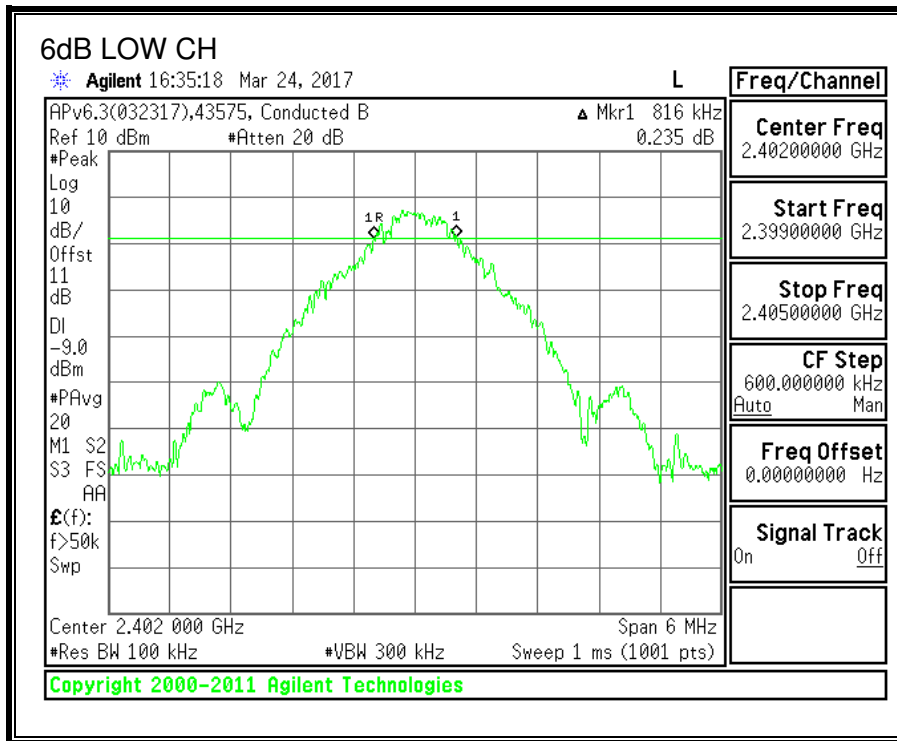
FCC §15.247 (a) (2)

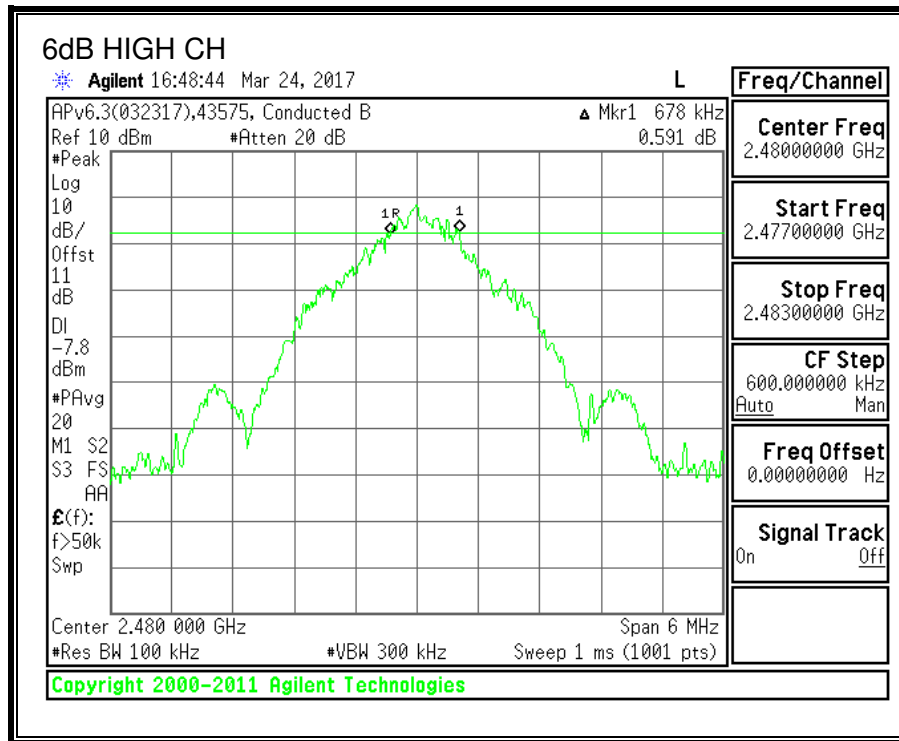
IC RSS-247 (5.2) (1)

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

RESULTS

Channel	Frequency	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.816	0.5
Middle	2440	0.768	0.5
High	2480	0.678	0.5





9.3.2. 99% BANDWIDTH

LIMITS

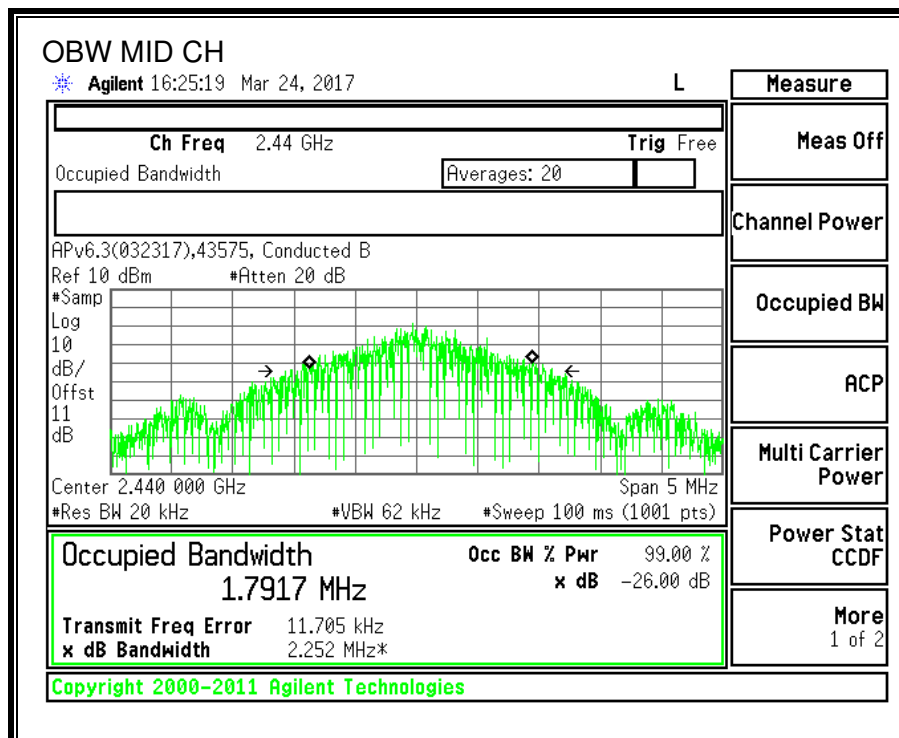
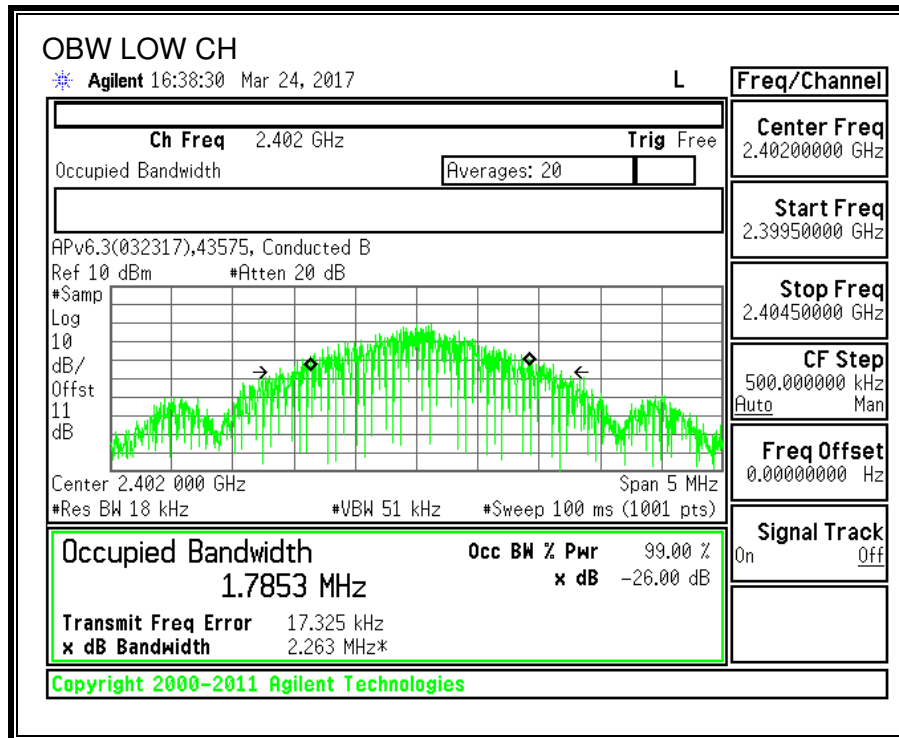
None; for reporting purposes only.

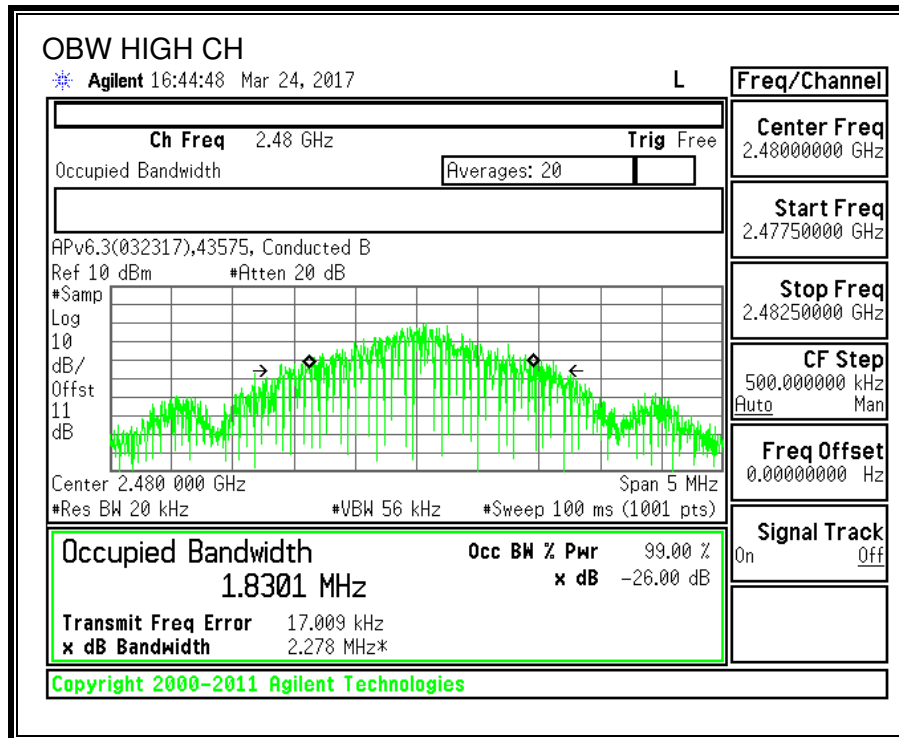
Test Procedure

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	2402	1.7853
Middle	2440	1.7917
High	2480	1.8301





9.3.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

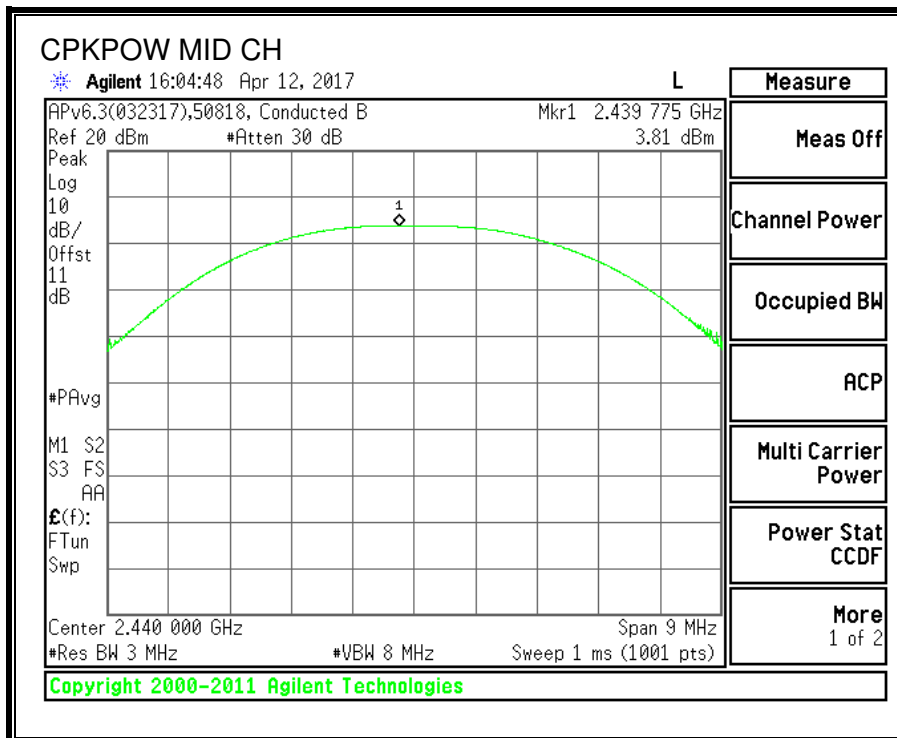
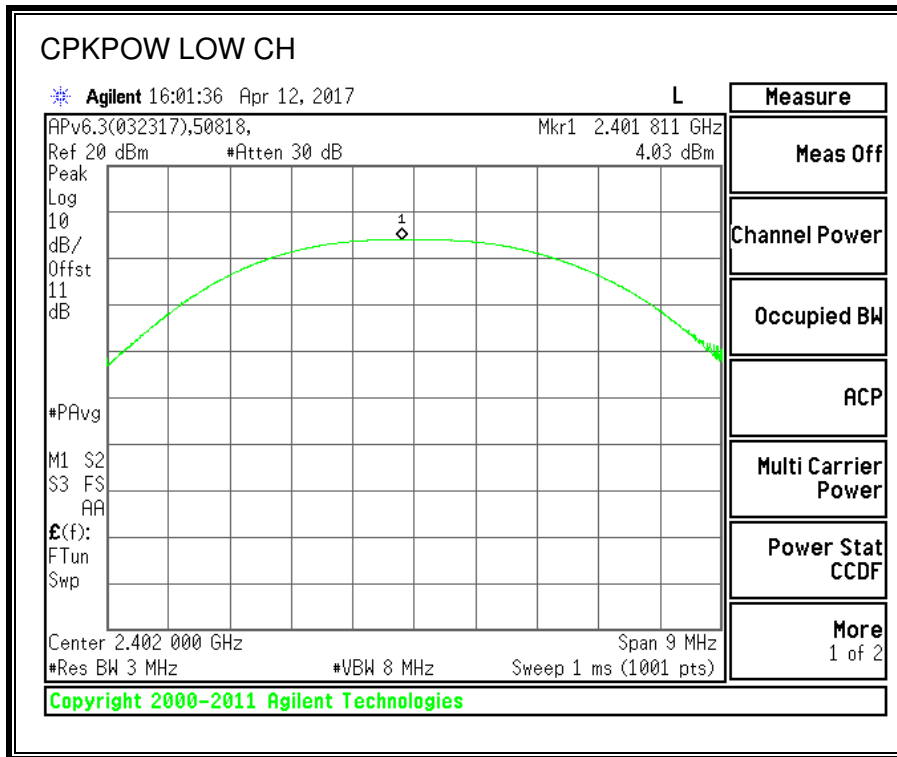
IC RSS-247 (5.4) (4)

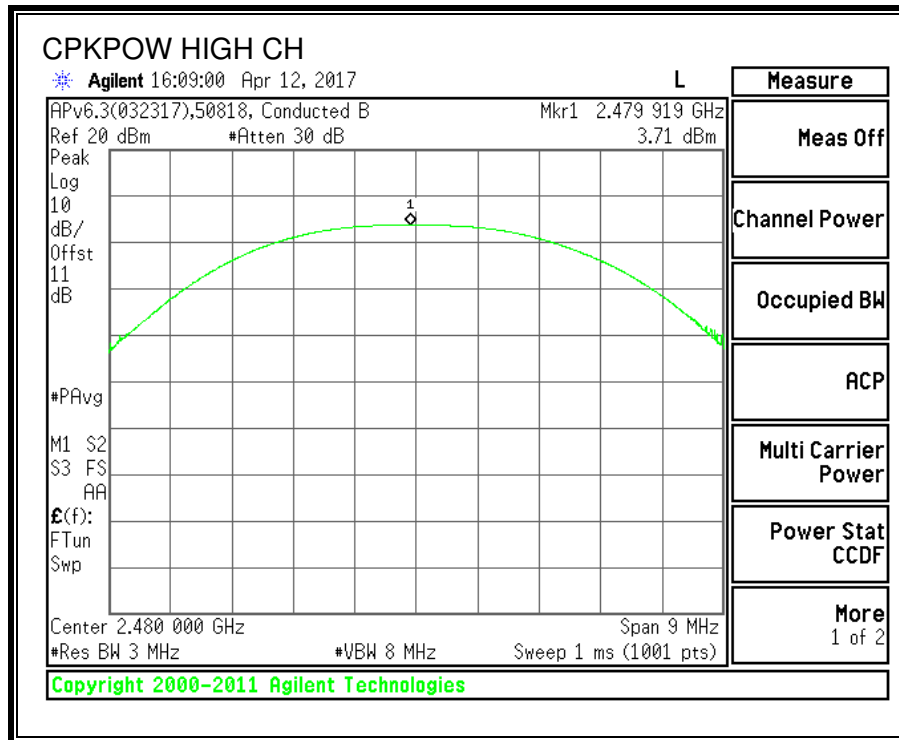
The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

RESULTS

Tested By:	43575 OS
Date:	3/24/2017

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	4.03	30	-25.97
Middle	2440	3.81	30	-26.19
High	2480	3.71	30	-26.29





9.3.4. POWER SPECTRAL DENSITY

LIMITS

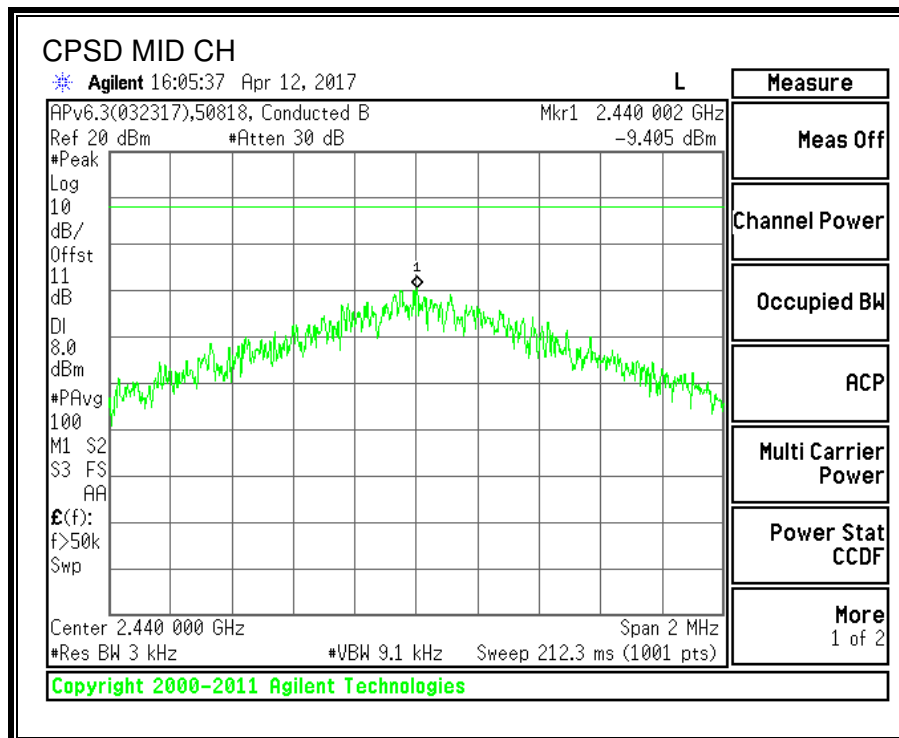
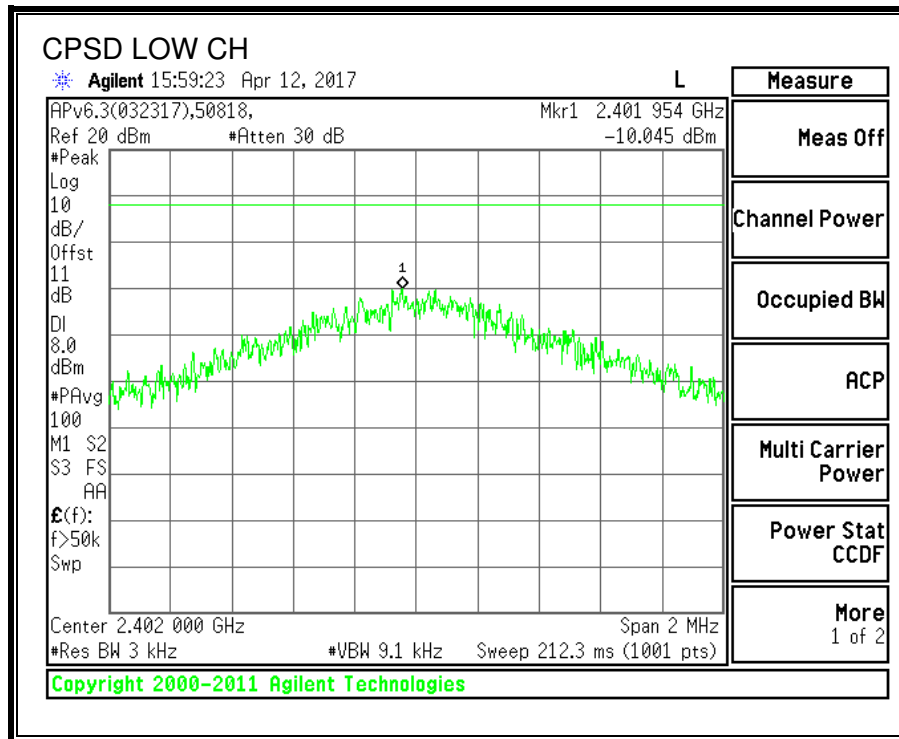
FCC §15.247 (e)

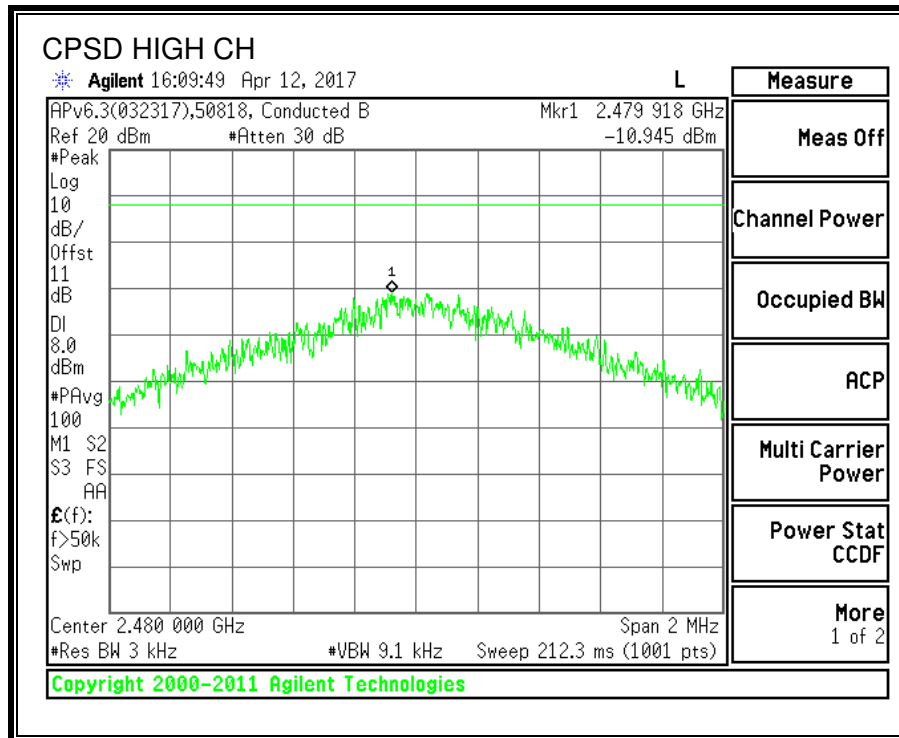
IC RSS-247 (5.2) (2)

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.

RESULTS

Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2402	-10.05	8	-18.05
Middle	2440	-9.41	8	-17.41
High	2480	-10.95	8	-18.95





9.3.5. CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS

LIMITS

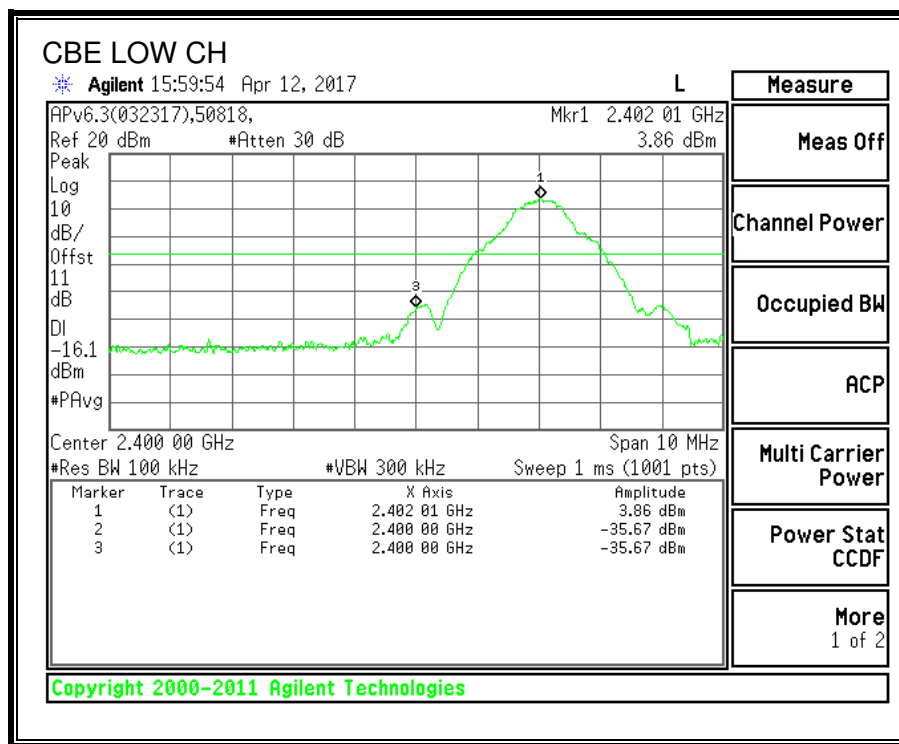
FCC §15.247 (d)

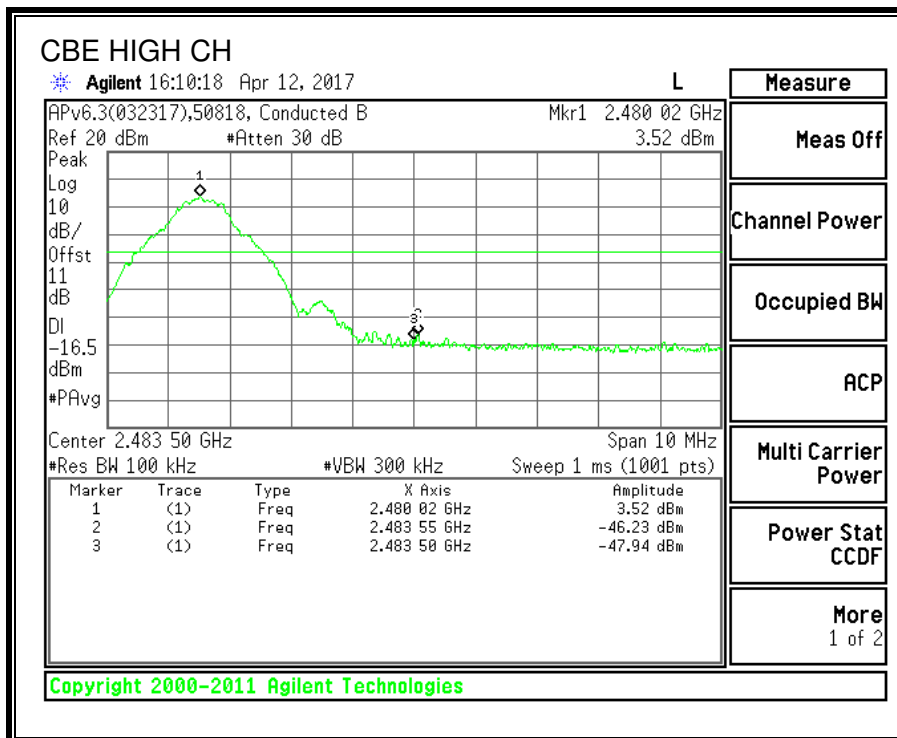
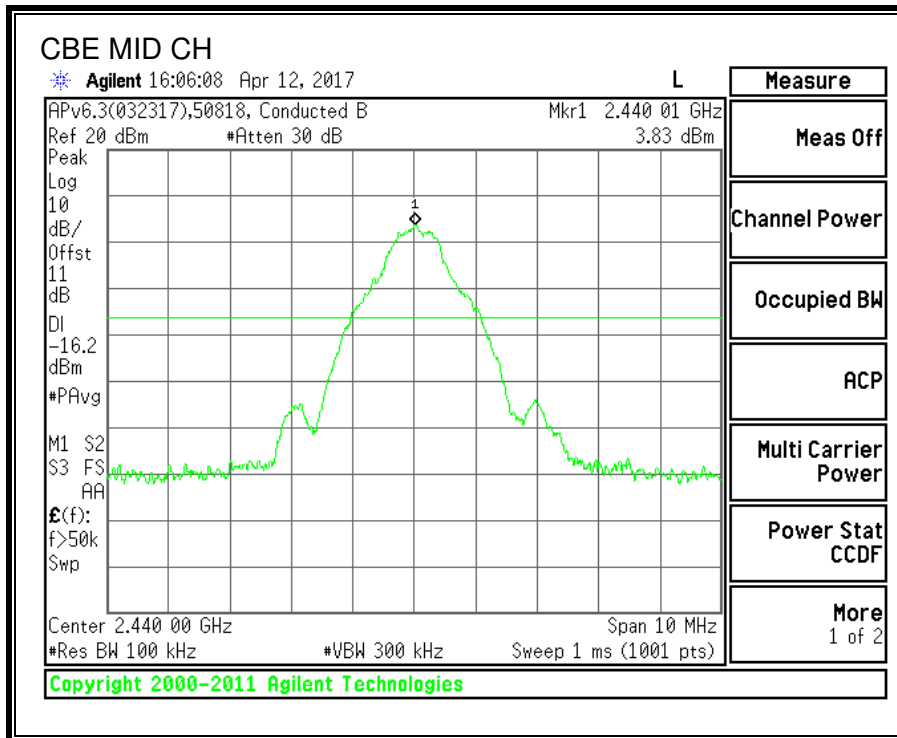
IC RSS-247 (5.5)

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

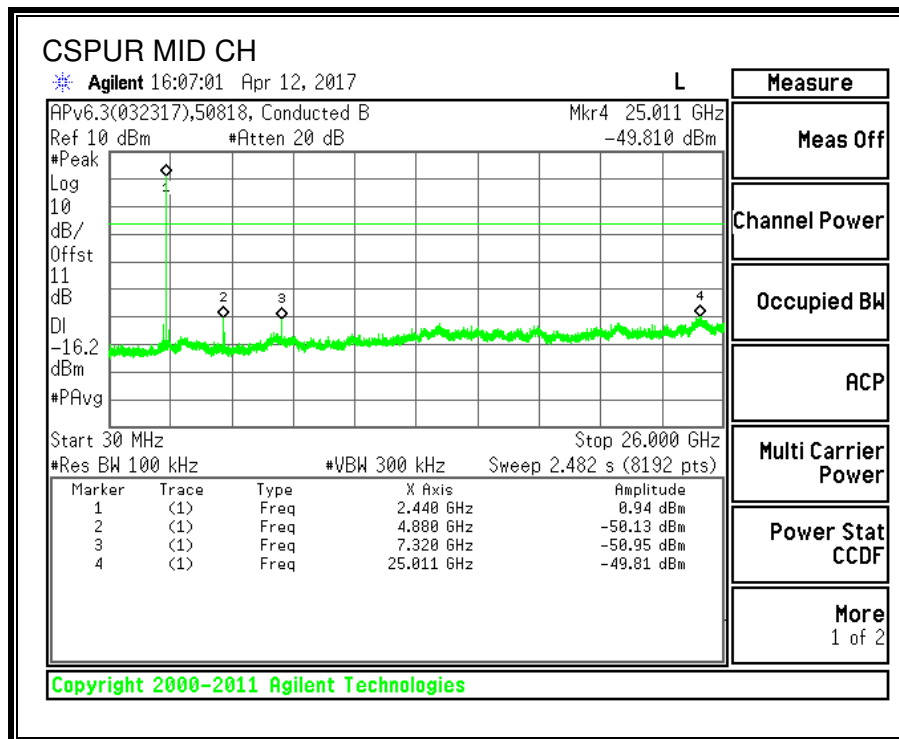
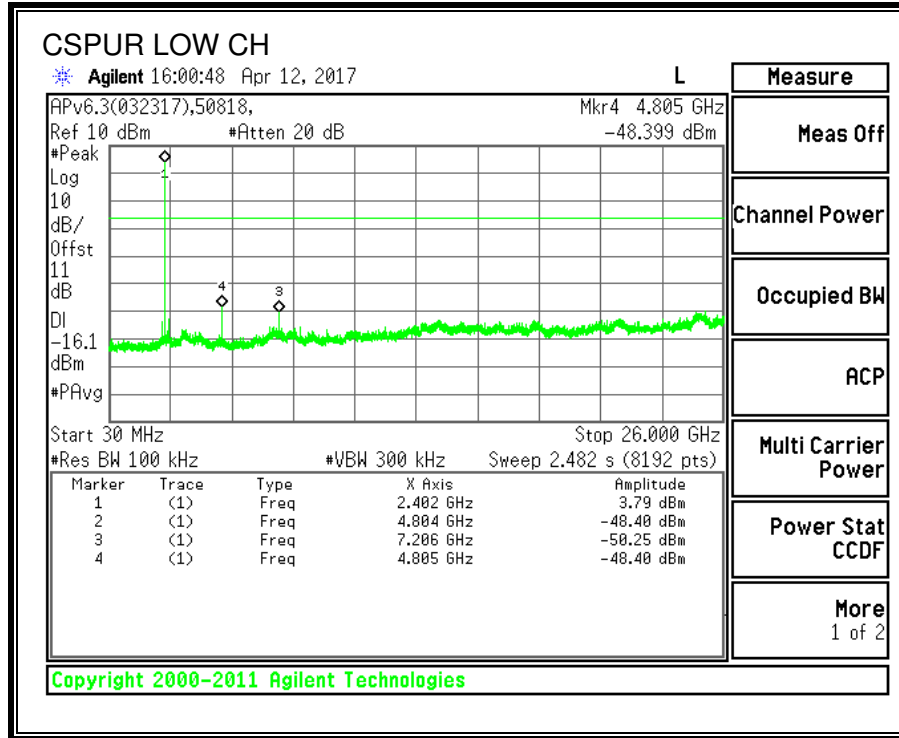
RESULTS

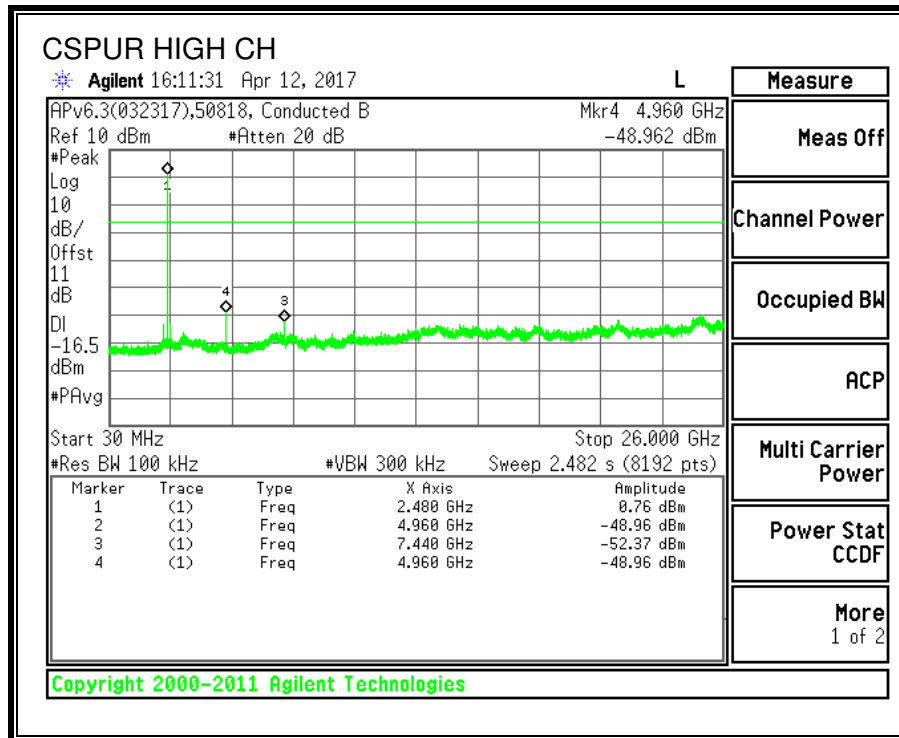
CONDUCTED BANDEDGE:





CONDUCTED SPURIOUS EMISSIONS:





10. RADIATED TEST RESULTS

10.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-GEN, Section 8.9 and 8.10.

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

NOTE: KDB 414788 D01 OATS and Chamber Correlation Justification

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

TEST PROCEDURE

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

For measurements below 1 GHz the resolution bandwidth is set to 120 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements for the 30-1000 MHz range, 9 kHz for peak detection measurements or 9 kHz for quasi-peak detection measurements for the 0.15-30 MHz range and 200 Hz for peak detection measurements or 200 Hz for quasi-peak detection measurements for the 9 to 150 kHz range. Peak detection is used unless otherwise noted as quasi-peak.

For pre-scans above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 30 KHz for peak measurements.

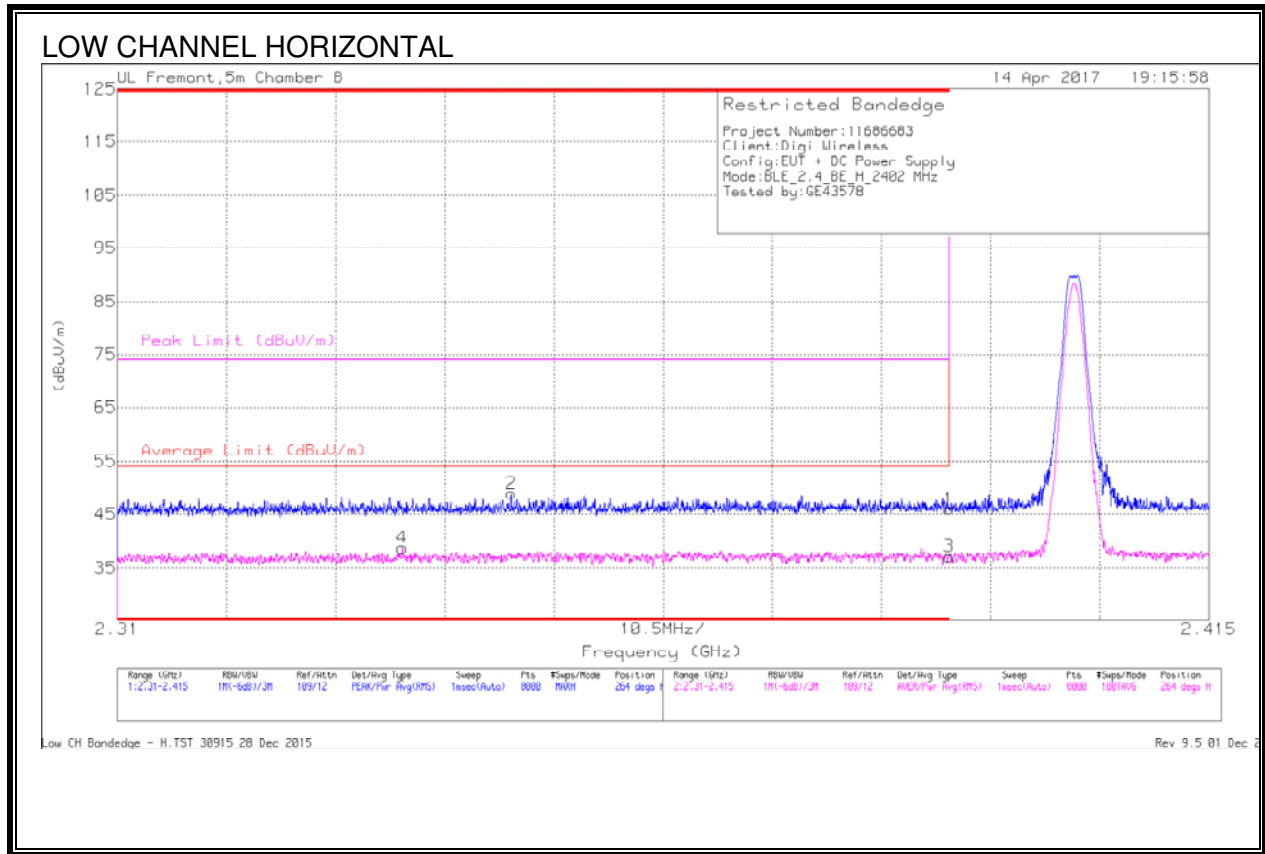
For final measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements and as applicable for average measurements.

For 2.4 GHz band, the spectrum from 9 kHz to 26 GHz is investigated with the EUT was set to transmit on the channel with higher output power as worst-case scenario.

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.

10.2. BLE

10.2.1. RESTRICTED BANDEDGE (LOW CHANNEL)

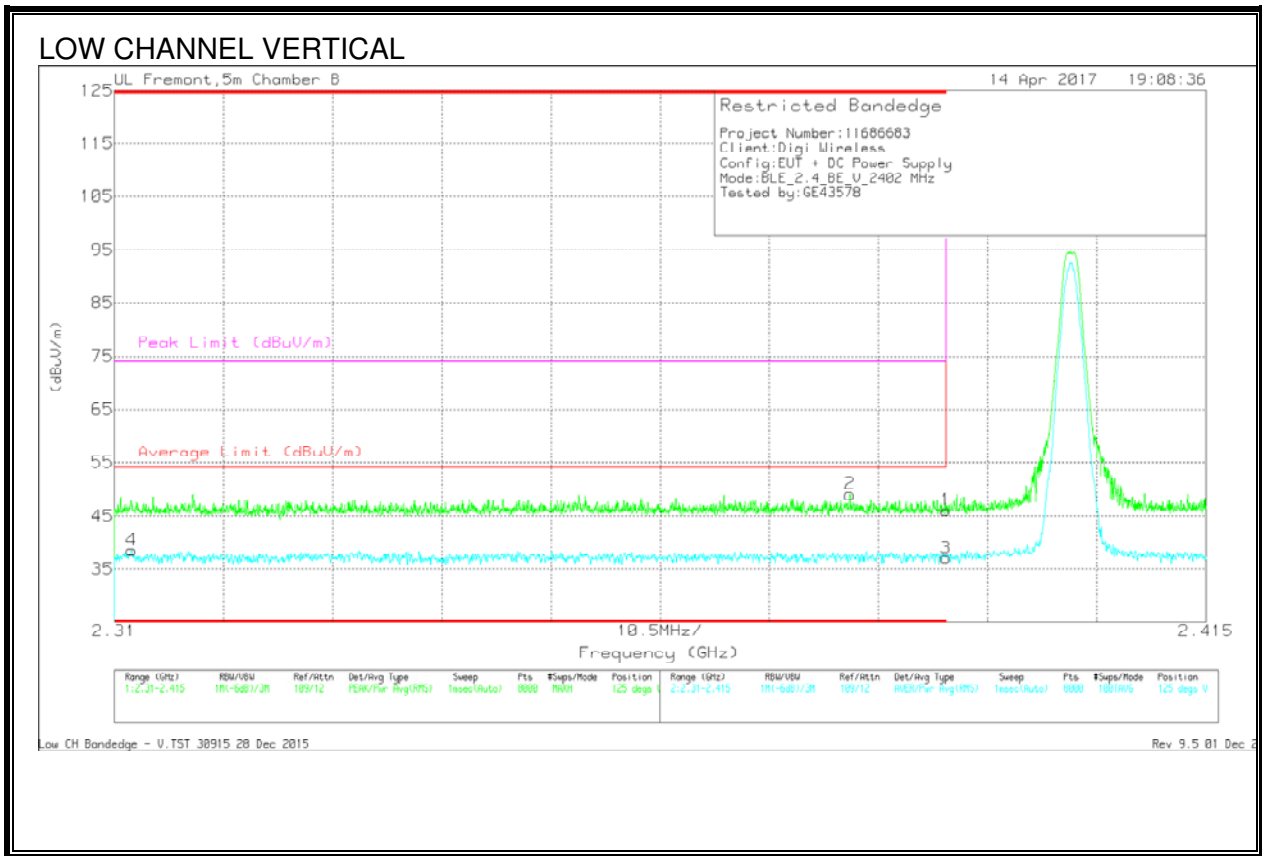


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/Fitr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	* 2.337	27.72	RMS	31.8	-21.3	.45	38.67	54	-15.33	-	-	264	202	H
2	* 2.348	38.29	Pk	31.8	-21.2	0	48.89	-	-	74	-25.11	264	202	H
1	* 2.39	35.21	Pk	32	-21.3	0	45.91	-	-	74	-28.09	264	202	H
3	* 2.39	26	RMS	32	-21.3	.45	37.15	54	-16.85	-	-	264	202	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

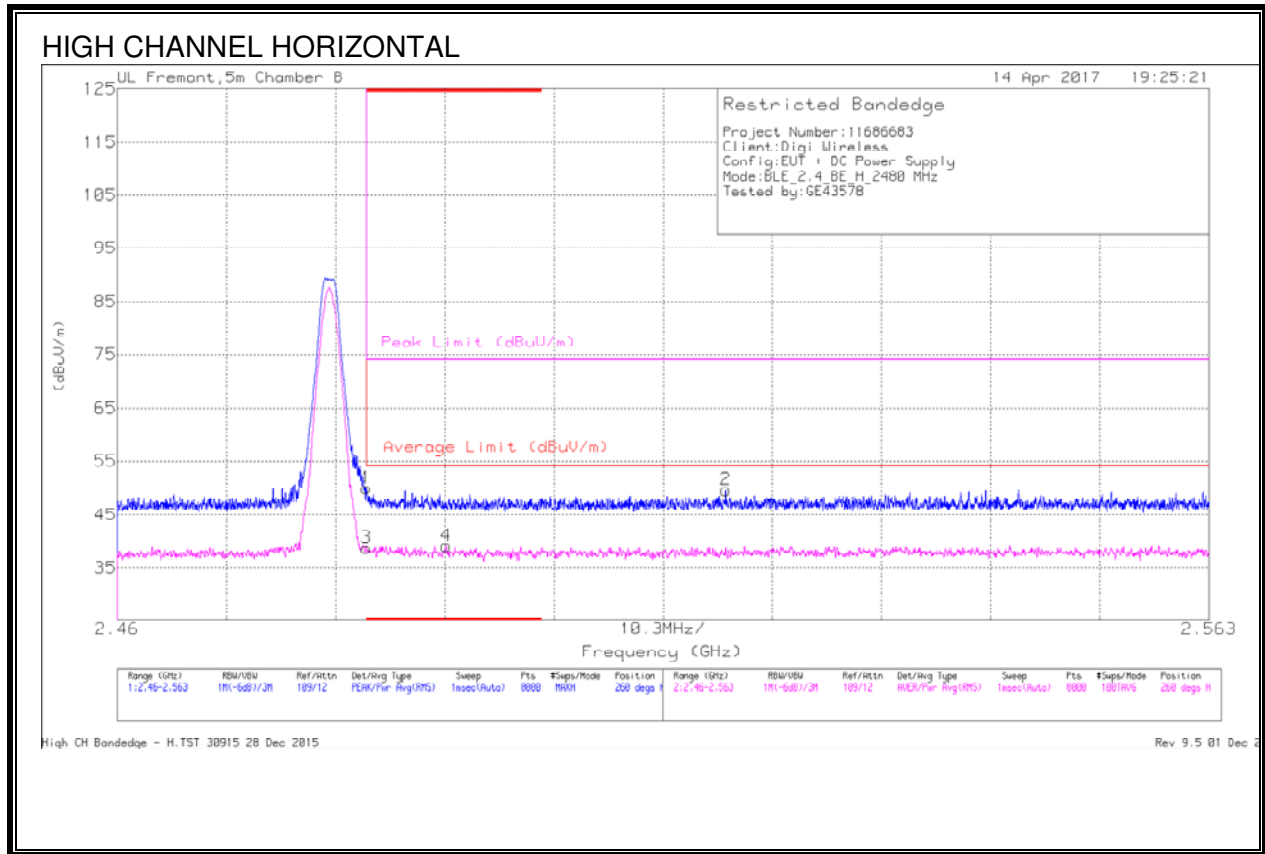
RMS - RMS detection



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dBm)	Amp/Cbl/Ftr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	35.36	Pk	32	-21.3	0	46.06	-	-	74	-27.94	125	123	V
2	* 2.381	38.35	Pk	31.9	-21.2	0	49.05	-	-	74	-24.95	125	123	V
3	* 2.39	25.95	RMS	32	-21.3	.45	37.1	54	-16.9	-	-	125	123	V
4	* 2.312	27.68	RMS	31.7	-21.3	.45	38.53	54	-15.47	-	-	125	123	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
RMS - RMS detection

10.2.2. AUTHORIZED BANDEDGE (HIGH CHANNEL)

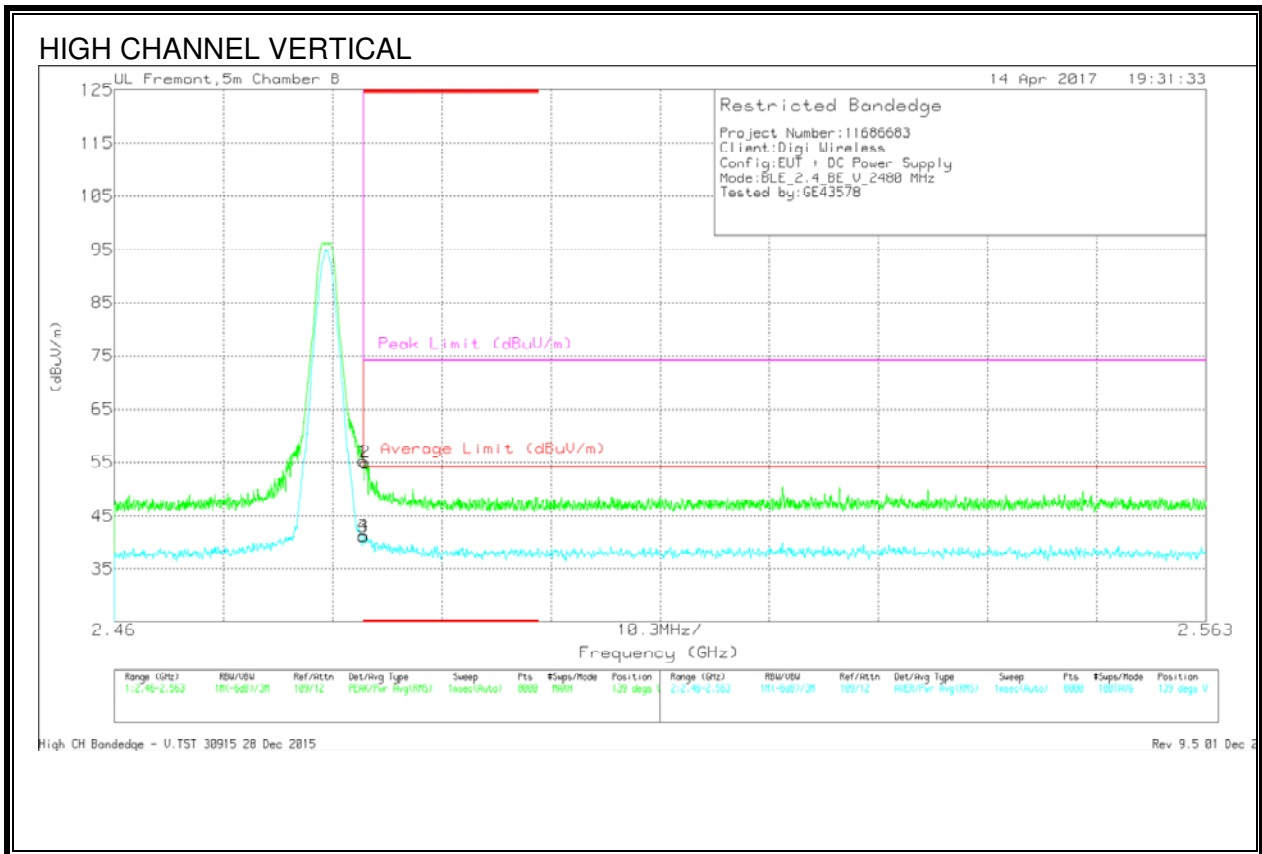


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dBm)	Amp/Cbl/Fitr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Altitude (Degs)	Height (cm)	Polarity
1	* 2.484	39.04	Pk	32.1	-21.2	0	49.94	-	-	74	-24.06	260	167	H
3	* 2.484	27.3	RMS	32.1	-21.2	.45	38.65	54	-15.35	-	-	260	167	H
4	* 2.491	27.7	RMS	32.1	-21.2	.45	39.05	54	-14.95	-	-	260	167	H
2	2.517	38.66	Pk	32.1	-21.1	0	49.66	-	-	74	-24.34	260	167	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection



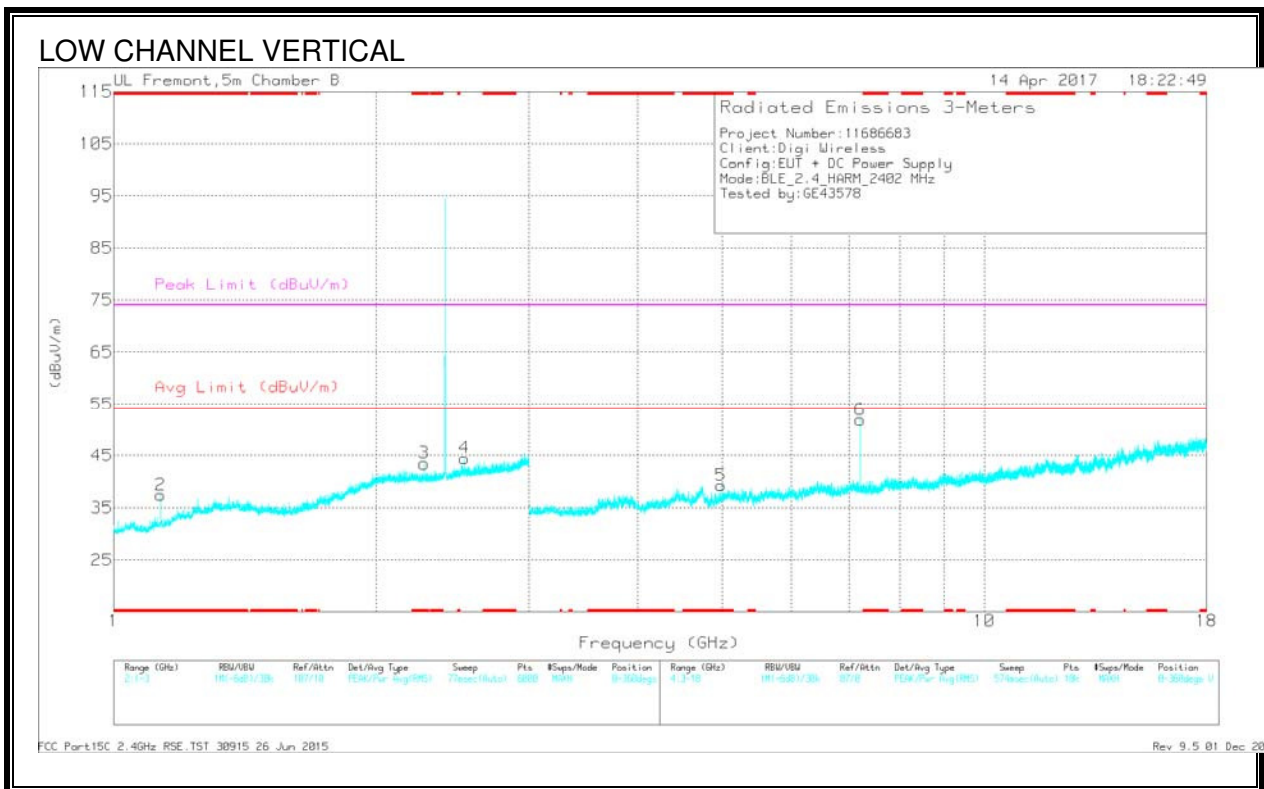
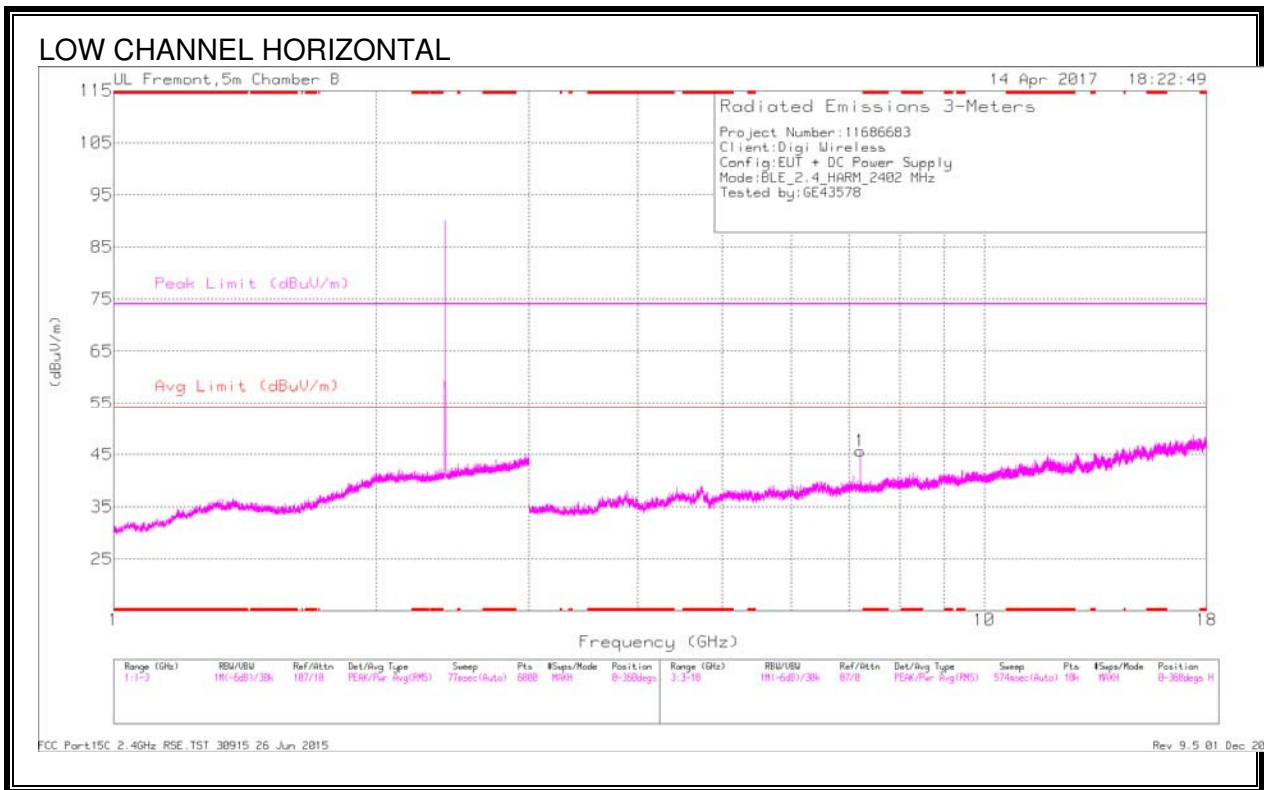
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dBm)	Amp/CBI/Filt/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Altitude (Degs)	Height (cm)	Polarity
1	* 2.484	44.28	Pk	32.1	-21.2	0	55.18	-	-	74	-18.82	139	136	V
2	* 2.484	44	Pk	32.1	-21.2	0	54.9	-	-	74	-19.1	139	136	V
3	* 2.484	29.76	RMS	32.1	-21.2	.45	41.11	54	-12.89	-	-	139	136	V
4	* 2.484	29.93	RMS	32.1	-21.2	.45	41.28	54	-12.72	-	-	139	136	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

10.2.3. HARMONICS AND SPURIOUS EMISSIONS



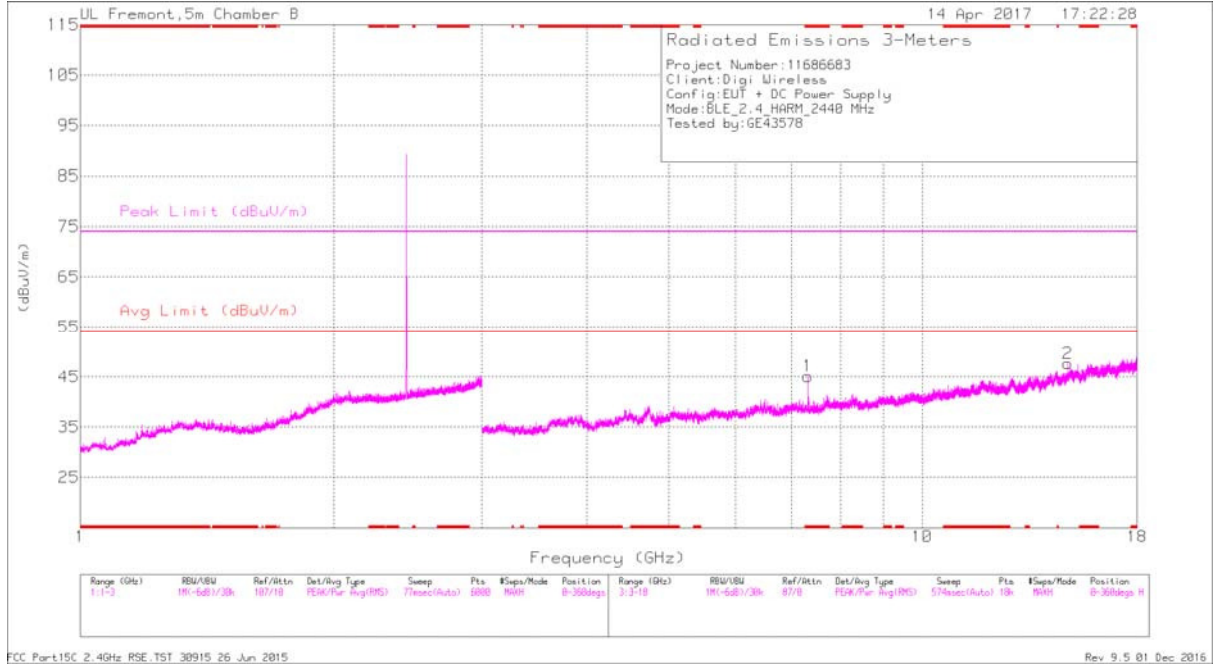
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 1.133	34.41	PK2	26.9	-22.6	0	38.71	-	-	74	-35.29	126	162	V
* 1.131	22.85	MAv1	26.8	-22.7	.45	27.4	54	-26.6	-	-	126	162	V
* 2.274	38.79	PK2	31.8	-21.2	0	49.39	-	-	74	-24.61	238	233	V
* 2.274	28.76	MAv1	31.8	-21.2	.45	39.81	54	-14.19	-	-	238	233	V
* 4.983	38.61	PK2	34.5	-29.4	0	43.71	-	-	74	-30.29	311	119	V
* 4.98	27.22	MAv1	34.5	-29.3	.45	32.87	54	-21.13	-	-	311	119	V
2.53	39.73	PK2	32.1	-21.1	0	50.73	-	-	74	-23.27	129	231	V
7.205	42.45	PK2	36.1	-27.3	0	51.25	-	-	74	-22.75	192	118	H
7.207	46.56	PK2	36.1	-27.3	0	55.36	-	-	74	-18.64	236	148	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

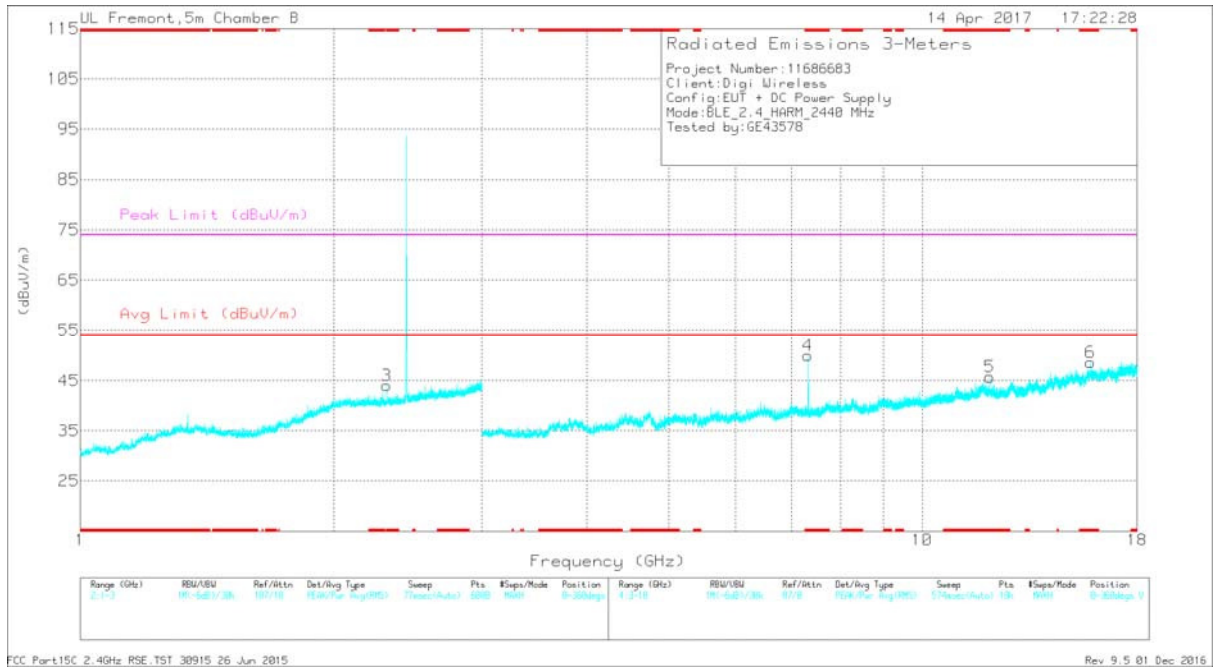
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

MID CHANNEL HORIZONTAL



MID CHANNEL VERTICAL



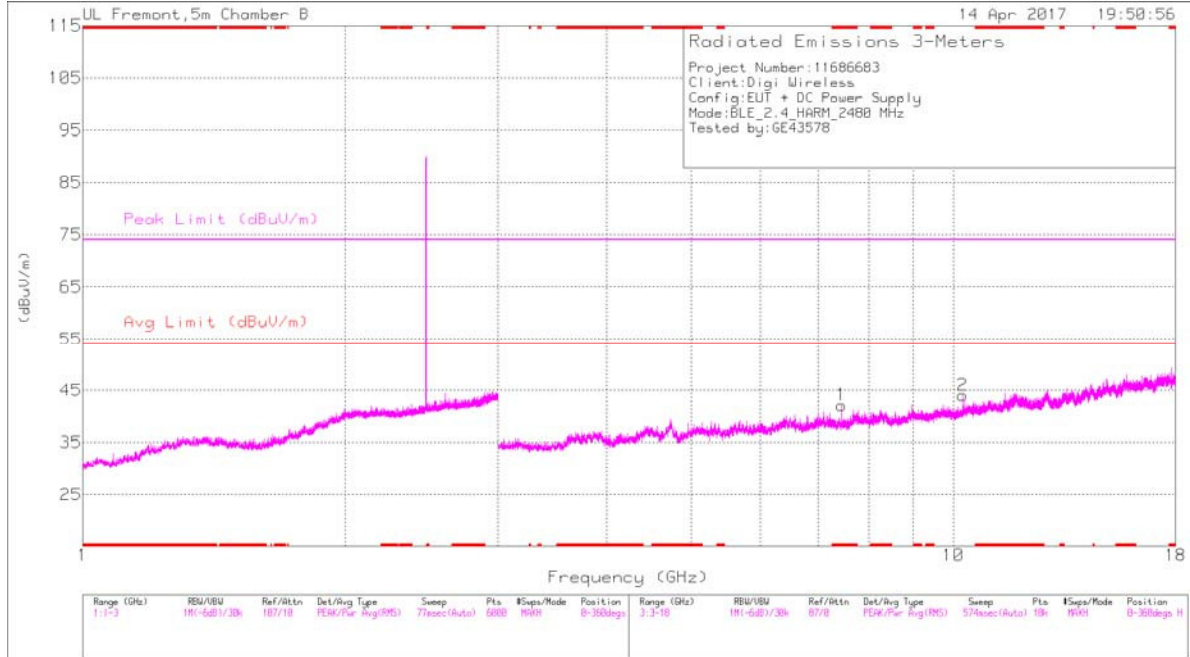
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/Filtr/ Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 2.312	38.36	PK2	31.7	-21.2	0	48.86	-	-	74	-25.14	144	158	V
* 2.312	29.28	MAv1	31.7	-21.2	.45	40.23	54	-13.77	-	-	144	158	V
* 7.319	42.5	PK2	36	-27.9	0	50.6	-	-	74	-23.4	190	102	H
* 7.319	33.42	MAv1	36	-27.9	.45	41.97	54	-12.03	-	-	190	102	H
* 7.321	45.47	PK2	36	-27.8	0	53.67	-	-	74	-20.33	182	107	V
* 7.319	37.78	MAv1	36	-27.9	.45	46.33	54	-7.67	-	-	182	107	V
* 12.033	33.24	PK2	39.6	-23.1	0	49.74	-	-	74	-24.26	0	317	V
* 12.03	21.8	MAv1	39.6	-23.2	.45	38.65	54	-15.35	-	-	0	317	V
* 15.848	32.74	PK2	41.6	-20	0	54.34	-	-	74	-19.66	339	150	V
* 15.848	20.23	MAv1	41.6	-20	.45	42.28	54	-11.72	-	-	339	150	V
14.892	33.29	PK2	40.7	-21.7	0	52.29	-	-	74	- 21.71	134	218	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

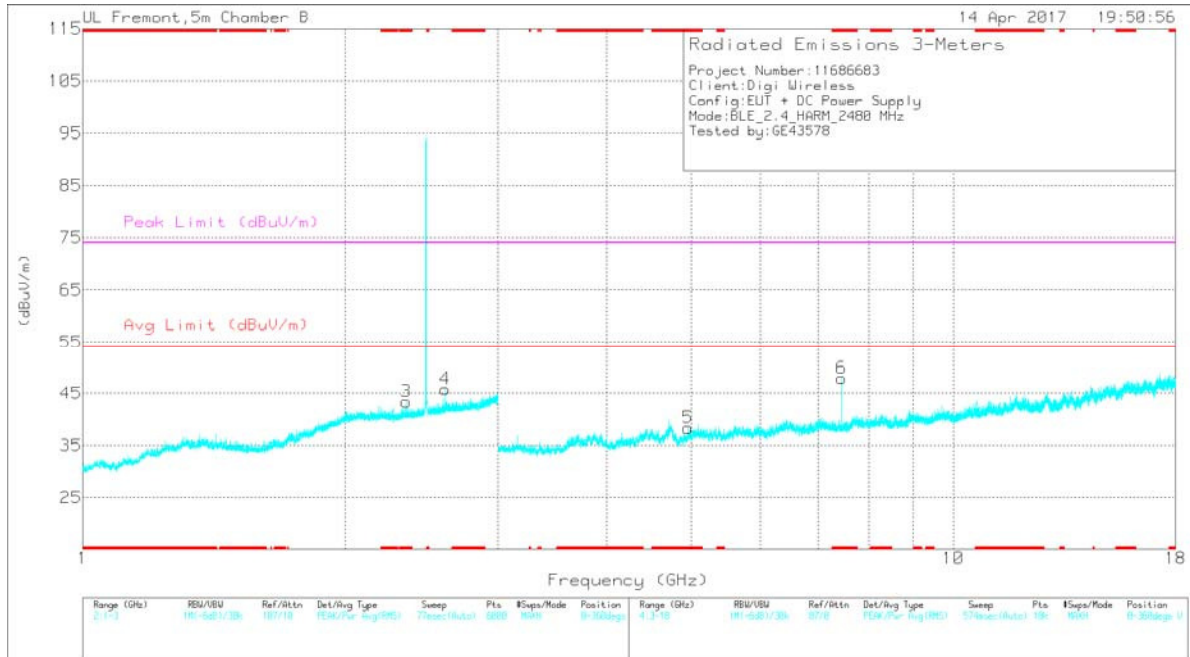
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

HIGH CHANNEL HORIZONTAL



HIGH CHANNEL VERTICAL



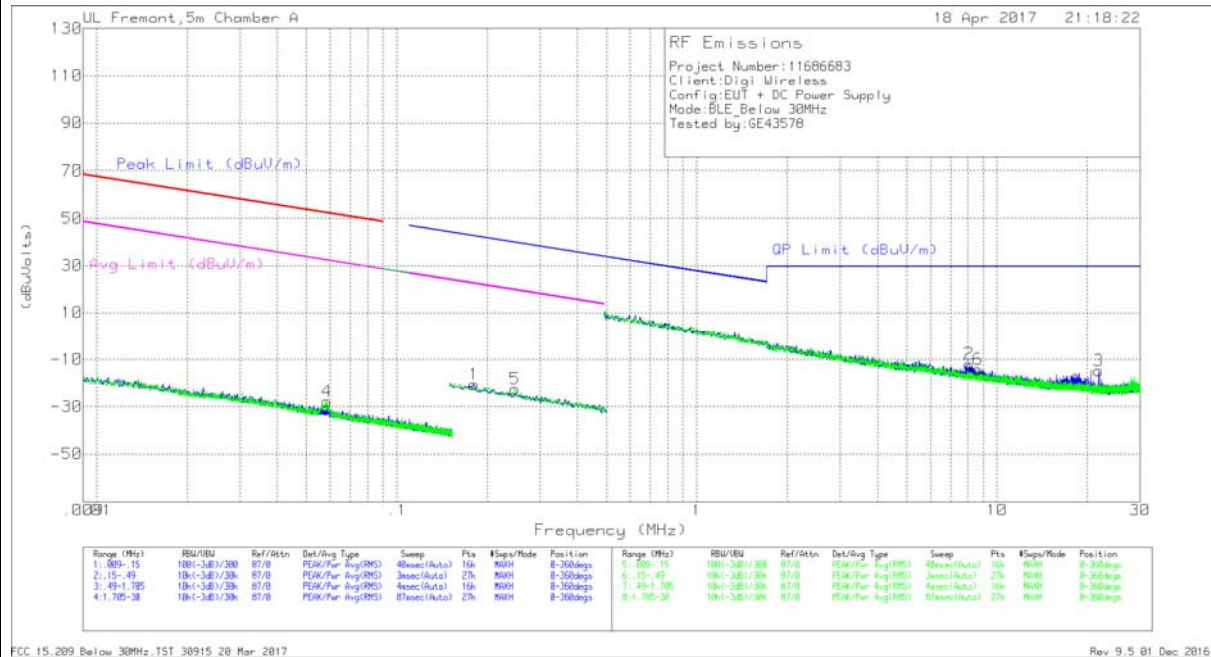
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 2.353	37.97	PK2	31.8	-21.3	0	48.47	-	-	74	-25.53	129	194	V
* 2.352	28.84	MAv1	31.8	-21.3	.45	39.79	54	-14.21	-	-	129	194	V
* 7.441	39.99	PK2	36.1	-26.9	0	49.19	-	-	74	-24.81	90	166	H
* 7.441	29.61	MAv1	36.1	-26.9	.45	39.26	54	-14.74	-	-	90	166	H
* 4.96	40.69	PK2	34.5	-29.7	0	45.49	-	-	74	-28.51	221	102	V
* 4.96	29.49	MAv1	34.5	-29.7	.45	34.74	54	-19.26	-	-	221	102	V
* 7.441	43.96	PK2	36.1	-26.9	0	53.16	-	-	74	-20.84	243	161	V
* 7.441	36.16	MAv1	36.1	-26.9	.45	45.81	54	-8.19	-	-	243	161	V
2.608	39.7	PK2	32.2	-20.9	0	51	-	-	74	-23	305	204	V
10.252	34.62	PK2	37.5	-23.9	0	48.22	-	-	74	-25.78	229	103	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PK2 - KDB558074 Method: Maximum Peak
MAv1 - KDB558074 Option 1 Maximum RMS Average

10.3. WORST-CASE BELOW 30 MHz

SPURIOUS EMISSIONS BELOW 30 MHz (WORST-CASE CONFIGURATION)

HORIZONTAL AND VERTICAL PLOTS



Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dBm)	Cbl (dB)	Dist Corr 300m	Corrected Reading (dBuVolts)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	QP Limit (dBuV/m)	Margin (dB)	QP Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
4	.05857	39.92	Pk	12.2	.1	-80	-27.78	52.23	-80.01	32.23	-60.01	-	-	-	-	-	-	-	-	0-360
1	.18088	47.6	Pk	11.6	.1	-80	-20.7	-	-	-	-	-	-	-	-	42.47	-63.17	22.47	-43.17	0-360
5	.24749	45.81	Pk	11.5	.1	-80	-22.59	-	-	-	-	-	-	-	-	39.74	-62.33	19.74	-42.33	0-360

Pk - Peak detector

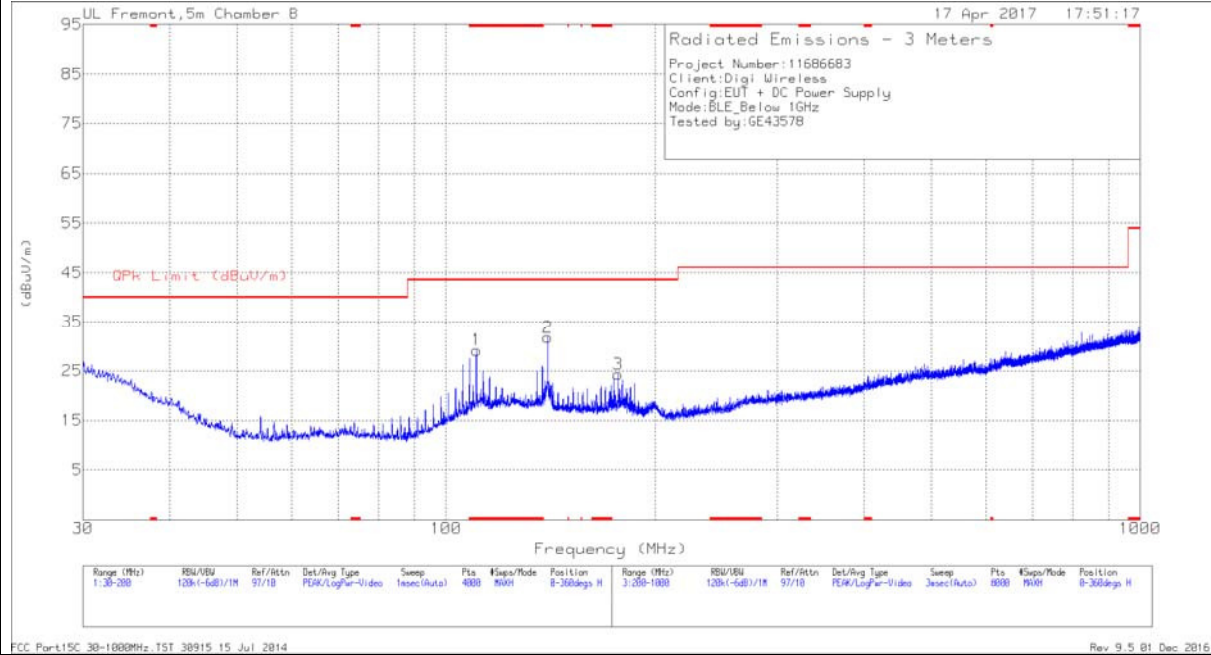
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dBm)	Cbl (dB)	Dist Corr 300m	Corrected Reading (dBuVolts)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	QP Limit (dBuV/m)	Margin (dB)	QP Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
2	8.07579	16.52	Pk	11.1	.4	-40	-11.98	-	-	-	-	-	-	29.5	-41.48	-	-	-	-	0-360
6	8.62023	14.32	Pk	11	.4	-40	-14.28	-	-	-	-	-	-	29.5	-43.78	-	-	-	-	0-360
3	21.84861	15.19	Pk	9.4	.7	-40	-14.71	-	-	-	-	-	-	29.5	-44.21	-	-	-	-	0-360

Pk - Peak detector

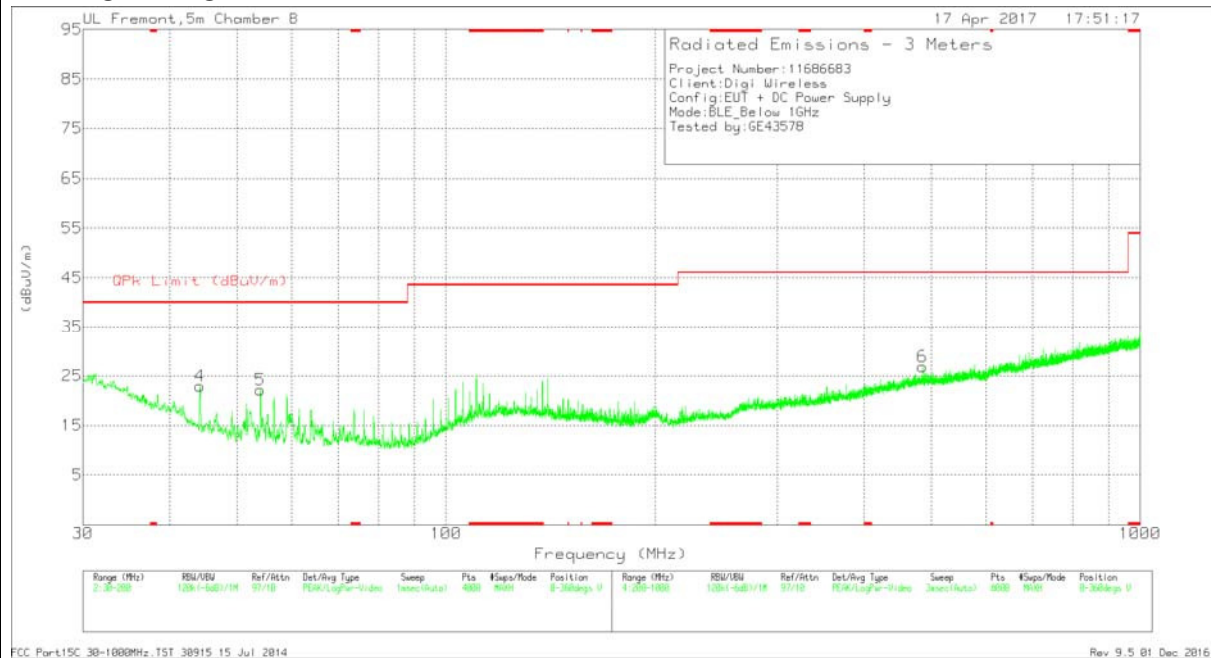
10.4. WORST-CASE BELOW 1 GHz

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

HORIZONTAL PLOT



VERTICAL PLOT



DATA

Trace Markers

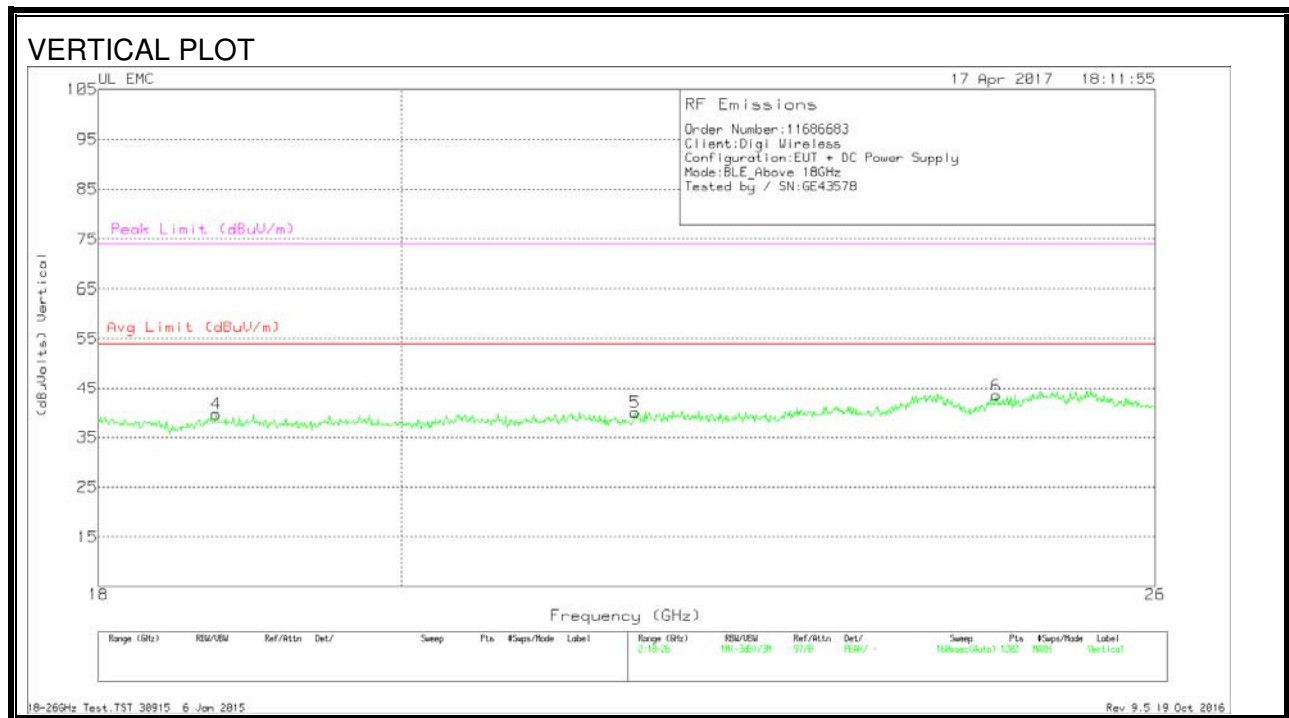
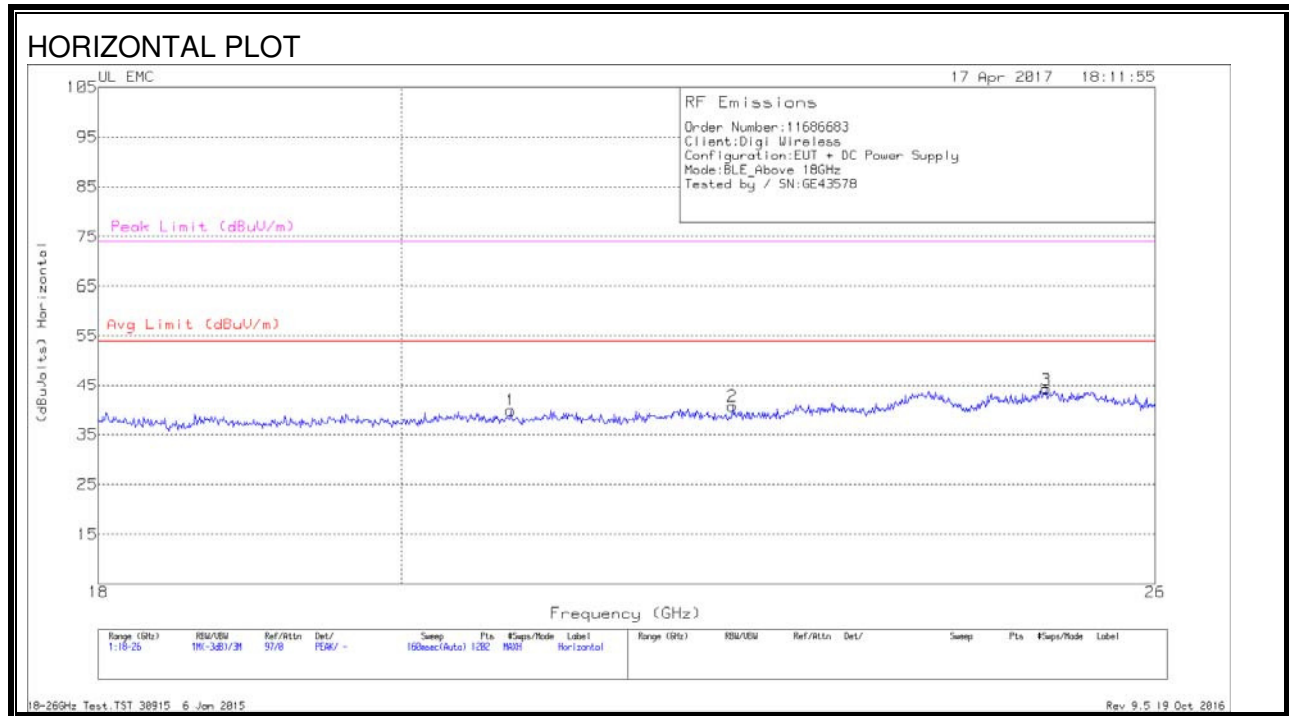
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T477 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 110.6009	40.42	Pk	16.6	-27.8	29.22	43.52	-14.3	0-360	300	H
4	44.2412	36.69	Pk	14.9	-28.6	22.99	40	-17.01	0-360	100	V
5	54.0612	39.34	Pk	11.2	-28.4	22.14	40	-17.86	0-360	100	V
2	140.1035	42.44	Pk	16.9	-27.5	31.84	43.52	-11.68	0-360	200	H
3	176.9605	36.13	Pk	15.3	-27.1	24.33	43.52	-19.19	0-360	200	H
6	485.4871	31.15	Pk	21.6	-25.9	26.85	46.02	-19.17	0-360	300	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

10.5. WORST-CASE ABOVE 18 GHz

SPURIOUS EMISSIONS 18 TO 26 GHz (WORST-CASE CONFIGURATION)



Data

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T449 (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Corrected Reading (dBuVolts)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)
1	20.778	41.23	Pk	33	-24.9	-9.5	39.83	54	-14.17	74	-34.17
2	22.443	41.37	Pk	33.5	-24.7	-9.5	40.67	54	-13.33	74	-33.33
3	25.034	44.27	Pk	34.2	-24.8	-9.5	44.17	54	-9.83	74	-29.83
4	18.753	41.37	Pk	32.4	-24.6	-9.5	39.67	54	-14.33	74	-34.33
5	21.697	40.9	Pk	33.2	-24.6	-9.5	40	54	-14	74	-34
6	24.601	43.1	Pk	34.1	-24.2	-9.5	43.5	54	-10.5	74	-30.5

Pk - Peak detector

10.6. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 8.8

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

*Decreases with the logarithm of the frequency.

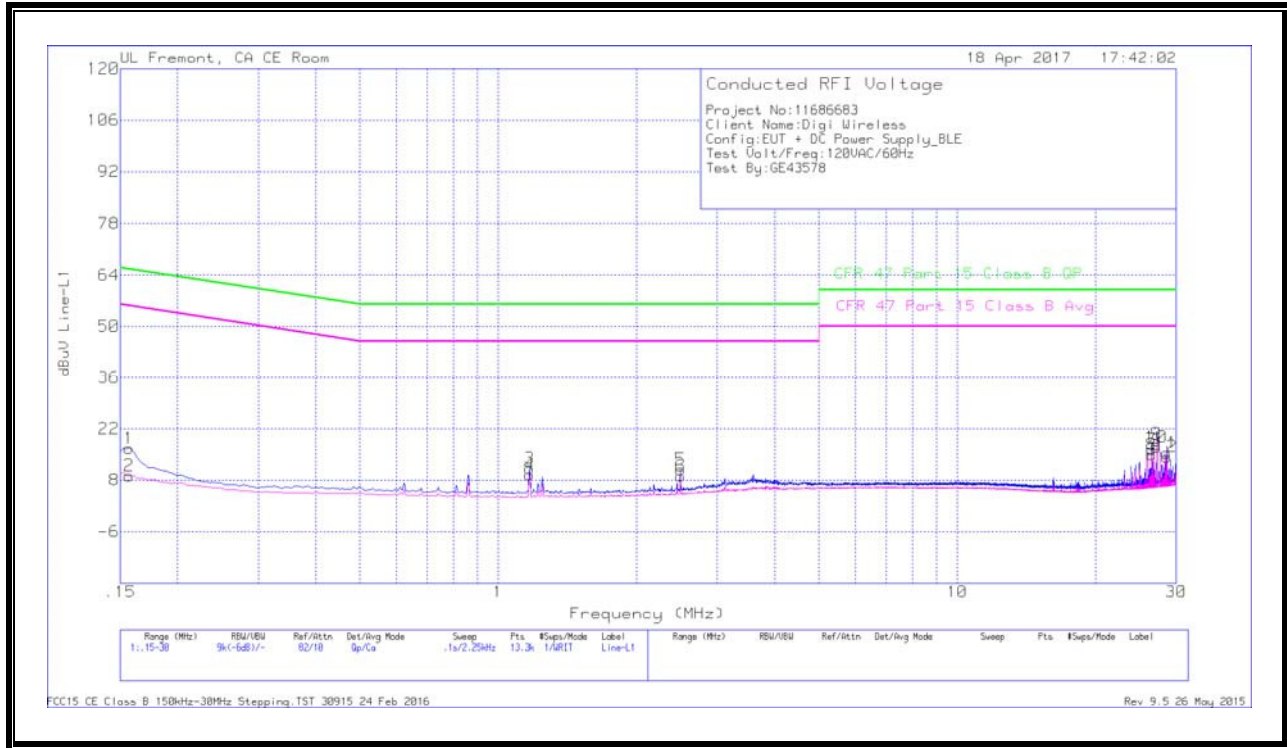
TEST PROCEDURE

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

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

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

LINE 1 RESULTS



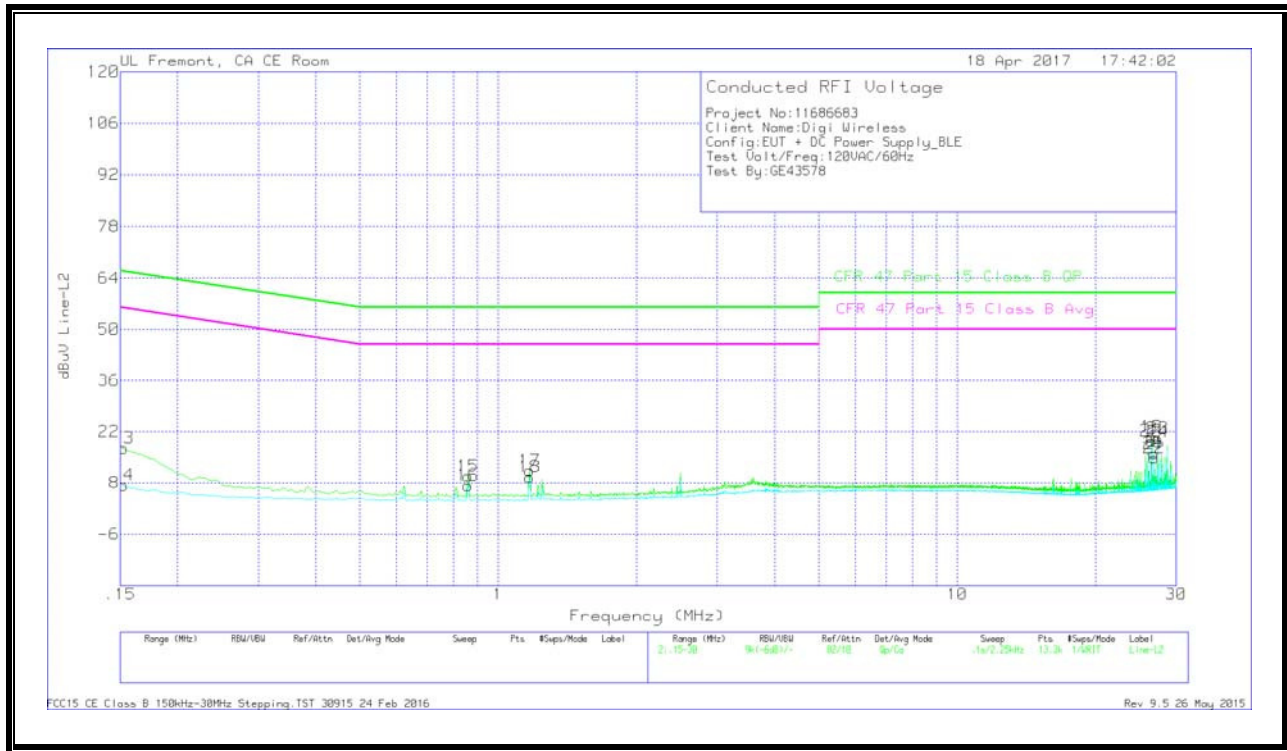
Trace Markers

Range 1: Line-L1 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L1	LC Cables C1&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR) Margin (dB)
1	.15675	6.45	Qp	0	.1	10.1	16.65	65.63	-48.98	-	-
2	.15675	-1.04	Ca	0	.1	10.1	9.16	-	-	55.63	-46.47
3	1.1715	.97	Qp	0	.1	10.1	11.17	56	-44.83	-	-
4	1.1715	-.77	Ca	0	.1	10.1	9.43	-	-	46	-36.57
5	2.4945	.66	Qp	0	.1	10.1	10.86	56	-45.14	-	-
6	2.4945	-1.12	Ca	0	.1	10.1	9.08	-	-	46	-36.92
7	26.493	5.43	Qp	.1	.3	10.5	16.33	60	-43.67	-	-
8	26.493	4.04	Ca	.1	.3	10.5	14.94	-	-	50	-35.06
9	27.16575	6.83	Qp	.1	.3	10.5	17.73	60	-42.27	-	-
10	27.16575	6.09	Ca	.1	.3	10.5	16.99	-	-	50	-33.01
11	28.56975	4.5	Qp	.1	.3	10.5	15.4	60	-44.6	-	-
12	28.56975	3.44	Ca	.1	.3	10.5	14.34	-	-	50	-35.66

Qp - Quasi-Peak detector

Ca - CISPR average detection

LINE 2 RESULTS



Trace Markers

Range 2: Line-L2 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L2	LC Cables C2&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR) Margin (dB)
13	.15225	7.35	Qp	0	0	10.1	17.45	65.88	-48.43	-	-
14	.15225	-2.76	Ca	0	0	10.1	7.34	-	-	55.88	-48.54
15	.85875	-.41	Qp	0	.1	10.1	9.79	56	-46.21	-	-
16	.85875	-2.92	Ca	0	.1	10.1	7.28	-	-	46	-38.72
17	1.1715	1.13	Qp	0	.1	10.1	11.33	56	-44.67	-	-
18	1.1715	-.64	Ca	0	.1	10.1	9.56	-	-	46	-36.44
19	26.49075	9.69	Qp	.1	.3	10.5	20.59	60	-39.41	-	-
20	26.49075	8.55	Ca	.1	.3	10.5	19.45	-	-	50	-30.55
21	26.8575	5.13	Qp	.1	.3	10.5	16.03	60	-43.97	-	-
22	26.8575	3.86	Ca	.1	.3	10.5	14.76	-	-	50	-35.24
23	27.34575	9.24	Qp	.1	.3	10.5	20.14	60	-39.86	-	-
24	27.34575	8.28	Ca	.1	.3	10.5	19.18	-	-	50	-30.82

Qp - Quasi-Peak detector

Ca - CISPR average detection