



**FCC 47 CFR PART 15 SUBPART C
INDUSTRY CANADA RSS-247 ISSUE 1**

CERTIFICATION TEST REPORT

FOR

BT, BLE and 802.11 a/b/g/n RADIO MODULE

MODEL NUMBER: CONAPPWM

FCC ID: MHI-CONAPPWM

IC ID: 3681C-CONAPPWM

REPORT NUMBER: 16U22930-E2V2

ISSUE DATE: 9/1/2016

Prepared for
**CARD ACCESS, INC.
11778 SOUTH ELECTION RD. #260
DRAPER UT 84020, U.S.A.**

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NVLAP LAB CODE 200065-0

REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	04/5/16	Initial Issue	C. Vergonio
V2	09/1/16	Updated Section 3.5, Section 5.2 and Section 6.	C. Vergonio

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: CARD ACCESS INC.
11778 SOUTH ELECTION RD. #260
DRAPER, UT 84020, USA

EUT DESCRIPTION: BT, BLE and 802.11 a/b/g/n RADIO MODULE

MODEL: CONAPPWM

SERIAL NUMBER: 427258, 427299, 427300

DATE TESTED: March 1 – August 31, 2016

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-247 Issue 1	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 any government.

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2. SUMMARY OF TESTING

2.1. 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: 2324B-4)
☐ Chamber B(IC: 2324B-2)	☐ Chamber E(IC: 2324B-5)
☒ Chamber C(IC: 2324B-3)	☐ Chamber F(IC: 2324B-6)
	☐ Chamber G(IC: 2324B-7)
	☐ Chamber H(IC: 2324B-8)

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.

Chambers A through H are covered under Industry Canada company address code 2324B with site numbers 2324B -1 through 2324B-8, respectively.

2.2. 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	-20dBc		Pass
15.247	RSS-247 5.4.4	TX conducted output power	<30dBm		Pass
15.247	RSS-247 5.2.2	PSD	<8dBm		Pass
15.207 (a)	RSS-GEN 8.8	AC Power Line conducted emissions	Section 10		Pass
15.205, 15.209	RSS-GEN 8.9/7	Radiated Spurious Emission	< 54dBuV/m	Radiated	Pass

2.3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 4, and RSS-247 Issue 1.

2.4. CALIBRATION AND UNCERTAINTY

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.

SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

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

MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 9KHz to 0.15 MHz	3.84 dB
Conducted Disturbance, 0.15 to 30 MHz	3.65 dB
Radiated Disturbance, 9KHz to 30 MHz	3.15 dB
Radiated Disturbance, 30 to 1000 MHz	5.36 dB
Radiated Disturbance, 1000 to 18000 MHz	4.32 dB
Radiated Disturbance, 18000 to 26000 MHz	4.45 dB
Radiated Disturbance, 26000 to 40000 MHz	5.24 dB

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

2.5. MEASUREMENT METHOD

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

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

Conducted Output Power: KDB 558074 D01 v03r05, Section 9.1.1.

Power Spectral Density: KDB 558074 D01 v03r05, Section 10.2 (Method PKPSD).

Unwanted emissions in restricted bands: KDB 558074 D01 v03r05, Section 12.1, 12.2.

Unwanted emissions in non-restricted bands: KDB 558074 D01 v03r05, Section 11.0.

Band-edge: KDB 558074 D01 v03r05, Section 13.2.

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

2.6. 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 Due
Amplifier, 1-18GHz	Miteq	AFS42-00101800-25-S-42	1165	07/20/16
Amplifier, 1-8GHz, 35 dB	Miteq	AMF-4D-01000800-30-29P	1172	07/20/16
Antenna, Biconolog, 30MHz-1 GHz	Sunol Sciences	JB1	122	01/29/17
Antenna, Horn, 18GHz	ETS Lindgren	3117	345	02/22/17
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	447	05/12/16
ESR7 EMI Test Receiver 7GHz	Rohde & Schwarz	ESR	1436	12/19/16
High Pass Filter 3GHz	Micro-Tronics	HPS17543	486	07/20/16
High Pass Filter 6GHz	Micro-Tronics	HPS17542	484	07/20/16
LISN, 30 MHz	FCC	FCC-LISN-50/250-25-2	1310	09/16/17
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	481	07/20/16
Peak / Average Power Sensor	Keysight	N1921A	750	09/17/16
Peak Power Meter	Agilent / HP	N1911A	1268	07/06/17
RF Preamplifier, 1GHz - 18GHz	Miteq	NSP4000-SP2	88	04/07/16
RF Preamplifier, 1GHz - 26.5GHz	HP	8449B	404	06/29/16
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	99	06/10/16
Spectrum Analyzer, PXA, 3 Hz to 44 GHz	Keysight	N9030A	PRE0126777	12/21/16

Test Software List			
Description	Manufacturer	Model	Version
Radiated Software	UL	UL EMC	Ver 9.5, June 24, 2015
Conducted Software	UL	UL EMC	Ver 9.5, May 26, 2015
Antenna Port Software	UL	UL RF	Ver 4.2, Feb 2, 2016

3. EQUIPMENT UNDER TEST

3.1. DESCRIPTION OF EUT

The EUT is a BT, BLE and 802.11 a/b/g/n RADIO MODULE.

3.2. 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	1.69	1.48

3.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an PIFA antenna, with a maximum gain of -0.5dBi.

3.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was BusyBox, rev.1.19.4 <2016-02-18 14:39:10 MST> built-In Shell (ash).

The test utility software used during testing was Tera Term, rev 4.8.3(SVN#5602)

3.5. WORST-CASE CONFIGURATION AND MODE

Below 1GHz Radiated emission and power line conducted emission were performed with the EUT set to transmit on the channel with higher output power as worst-case scenario.

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

3.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

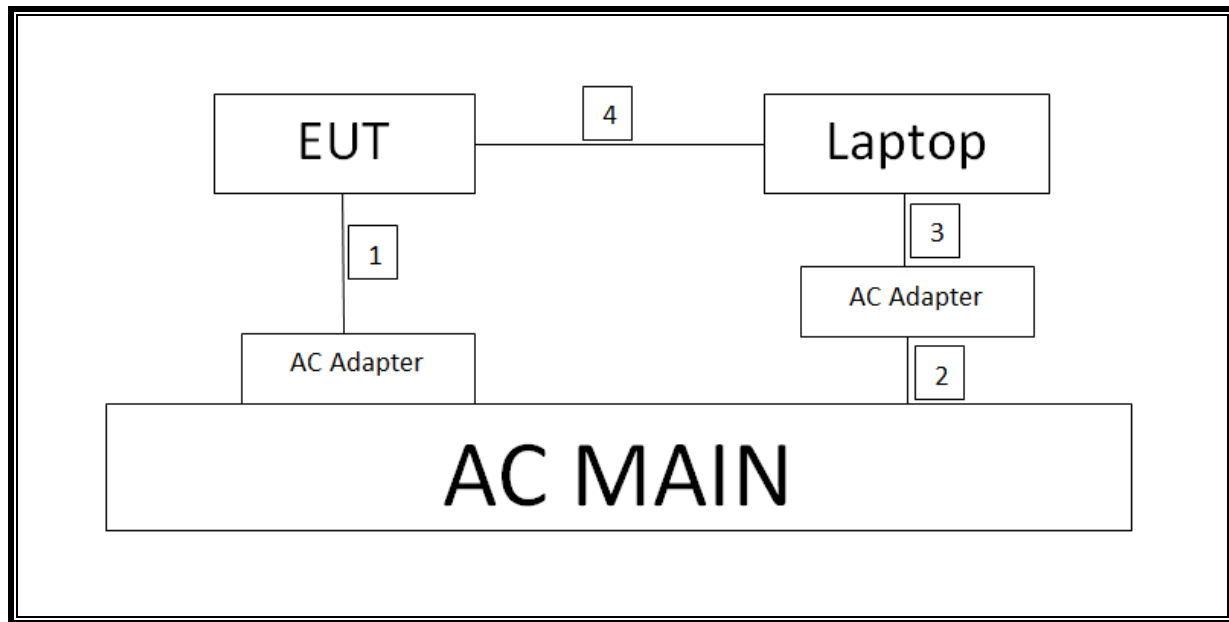
Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
AC Adapter	TRIAD	WSU120-0700	N/A	N/A
Laptop	Lenovo	T430	PB-05HPL	N/A
Laptop AC Adapter	Lenovo	ADLX90NLT2A	11S45N0707Z1ZL7436RDM2	N/A

I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC/DC	1	US115V/12V	Unshielded	1	
2	AC	1	US115V	Unshielded	1	
3	DC	1	20Vdc	Unshielded	1.5	Ferrite on Laptop end
4	Com	1	USB/Serial	Unshielded	1.5	

TEST SETUP

The EUT is stand-alone unit during the tests; test software exercised the radio card via USB-Serial cable.



Note: For radiated testing, the unit was test stand alone with AC adapter

4. ANTENNA PORT TEST RESULTS

4.1. ON TIME, DUTY CYCLE

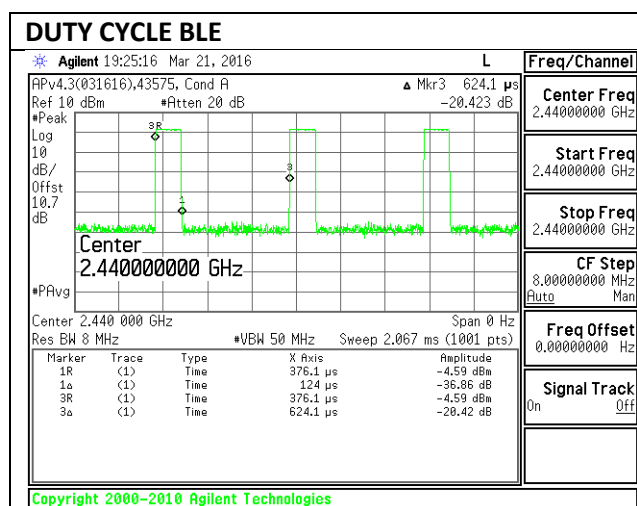
LIMITS

None; for reporting purposes only.

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/B Minimum VBW (kHz)
2.4GHz Band						
BLE	0.124	0.624	0.199	19.87%	7.02	8.065

DUTY CYCLE PLOTS



4.2. 6 dB BANDWIDTH

LIMITS

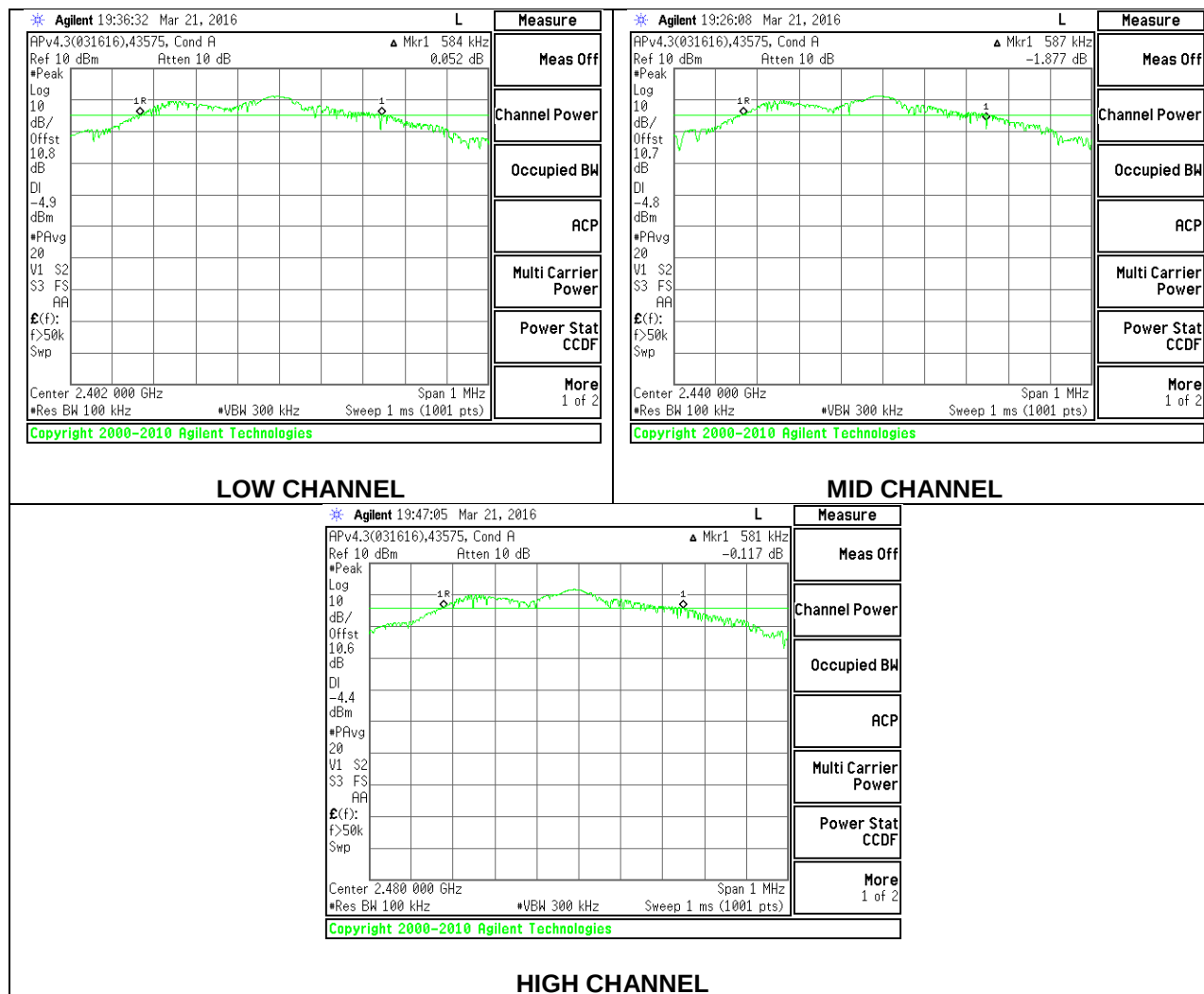
FCC §15.247 (a) (2)

IC RSS-247 5.2.1

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

RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.5840	0.5
Middle	2440	0.5870	0.5
High	2480	0.5810	0.5



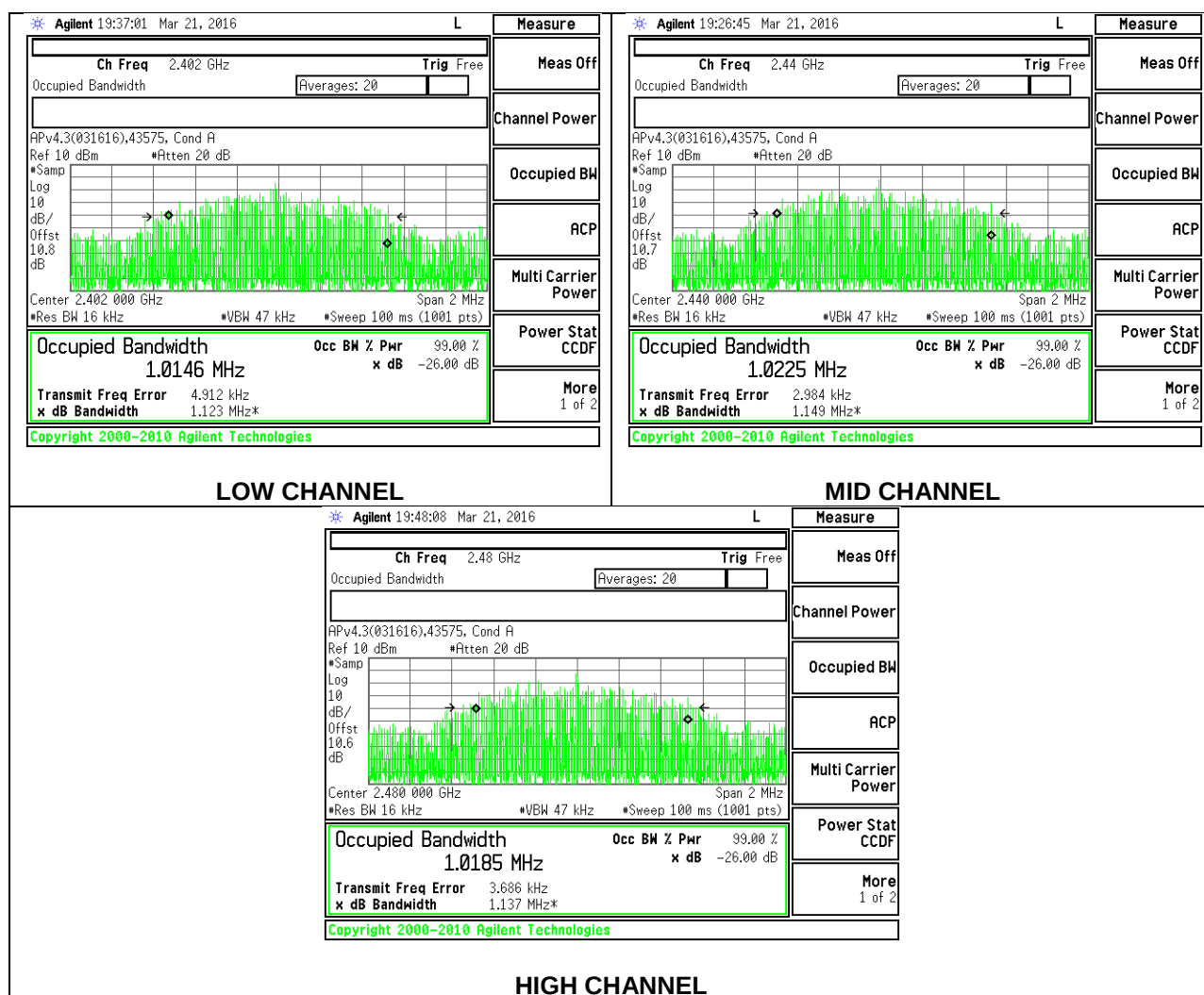
4.3. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.0146
Middle	2440	1.0225
High	2480	1.0185



4.4. OUTPUT POWER

LIMITS

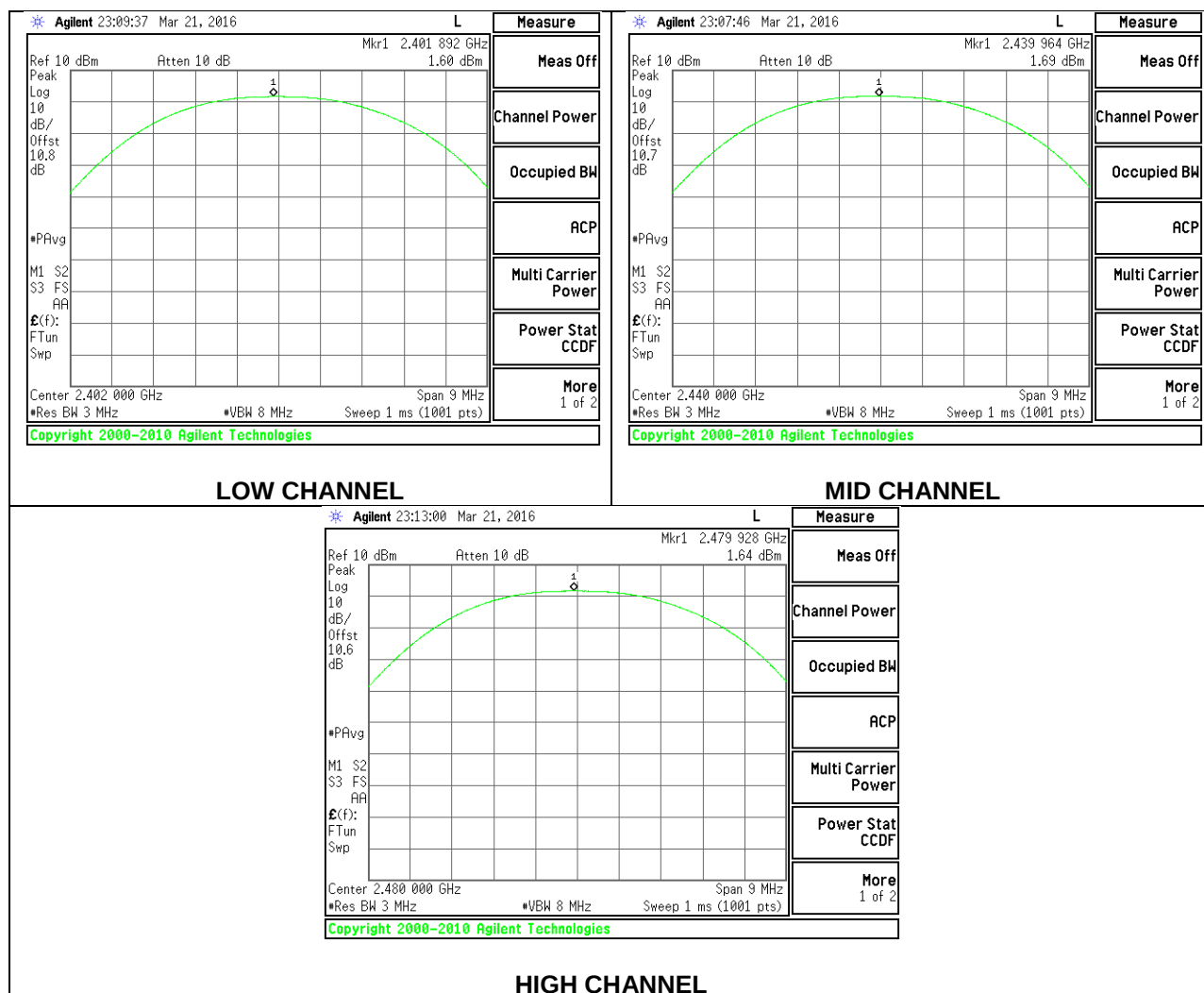
FCC §15.247 (b)

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

Channel	Frequency	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	1.600	30	-28.400
Middle	2440	1.690	30	-28.310
High	2480	1.640	30	-28.360



4.5. POWER SPECTRAL DENSITY

LIMITS

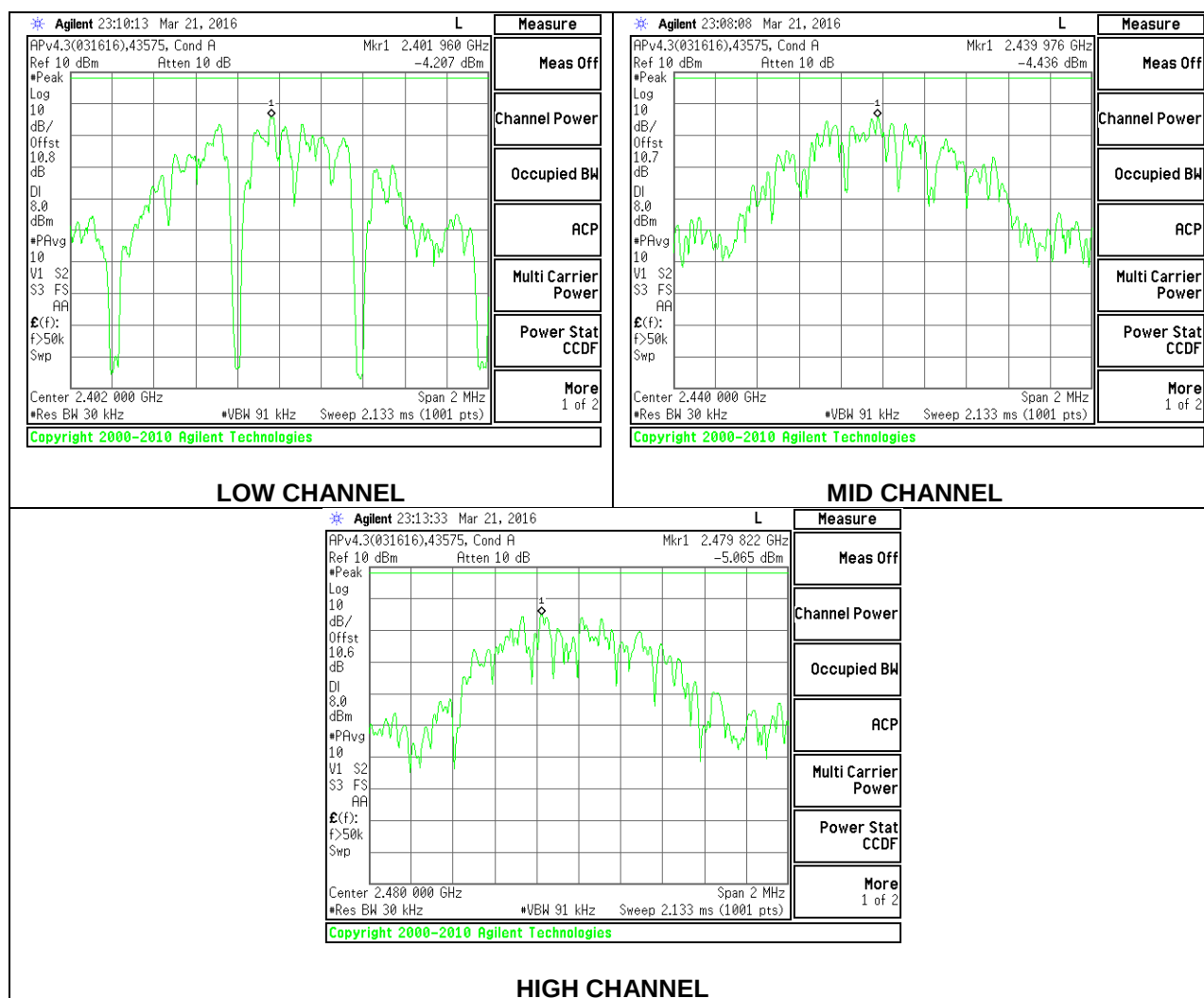
FCC §15.247 (e)

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	-4.207	8	-12.21
Middle	2440	-4.436	8	-12.44
High	2480	-5.065	8	-13.07



4.6. CONDUCTED SPURIOUS EMISSIONS

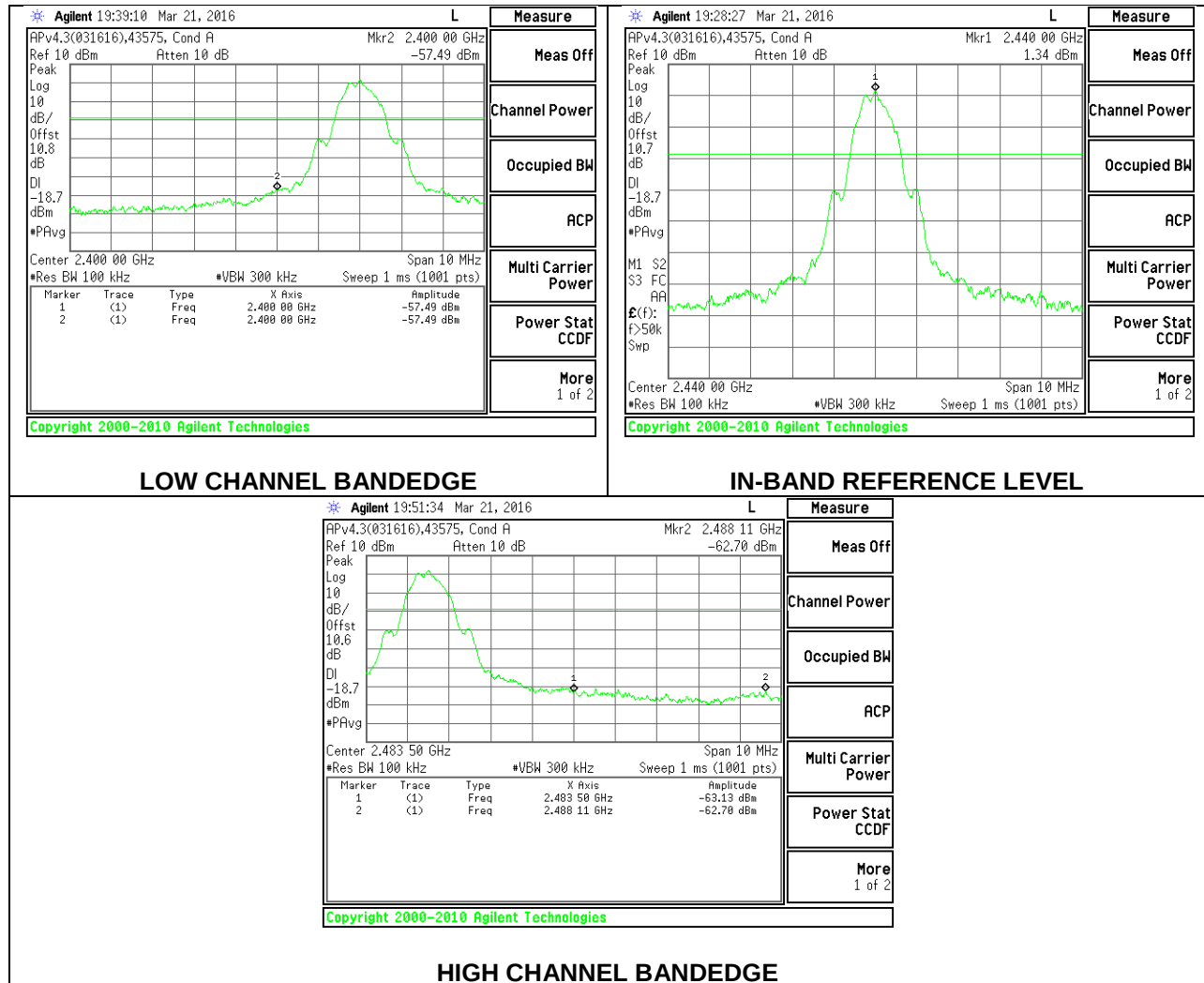
LIMITS

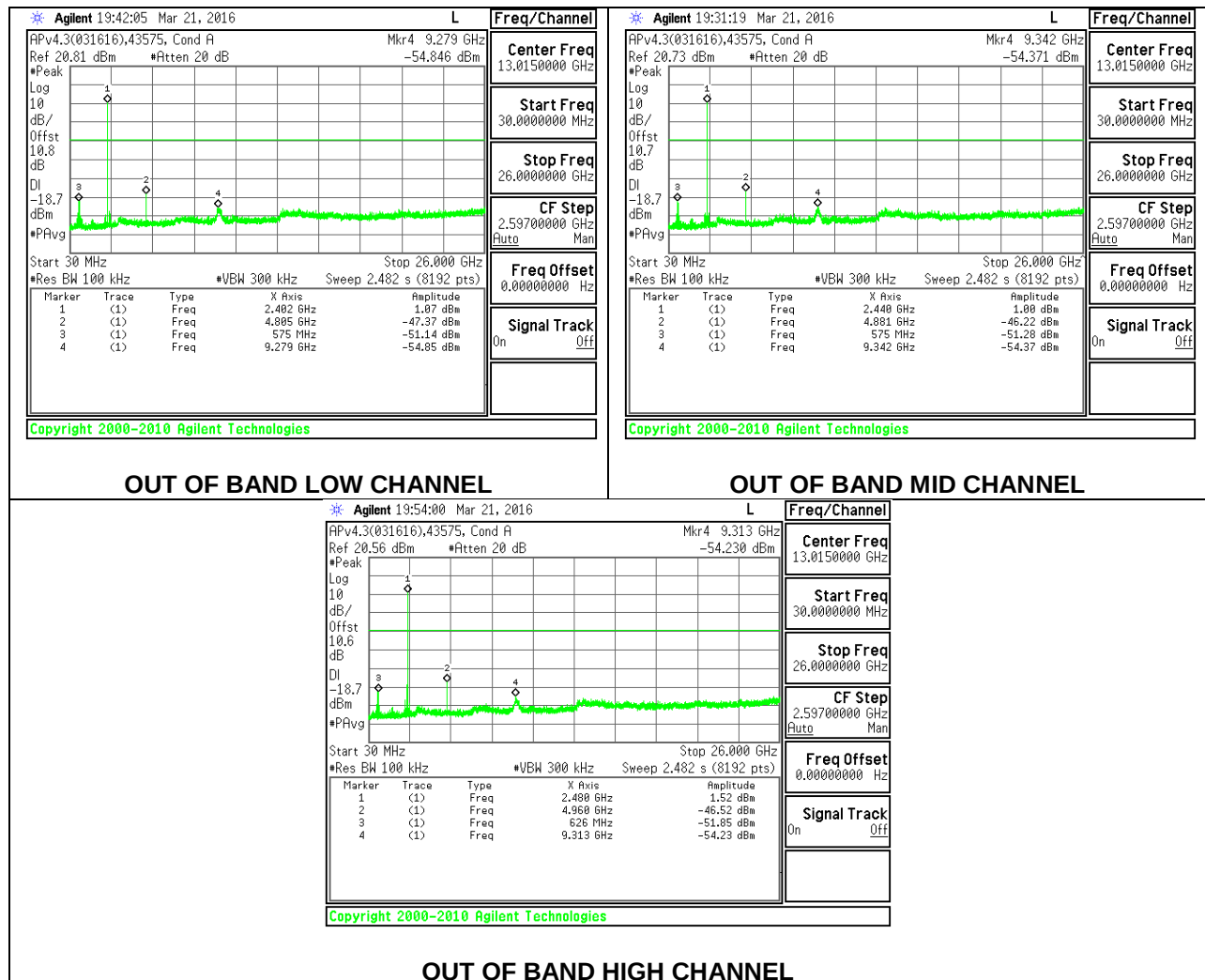
FCC §15.247 (d)

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





5. RADIATED TEST RESULTS

5.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-GEN Clause 8.9 (Transmitter)

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

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane for below 1GHz and 150cm for above 1GHz. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and add duty cycle factor for average measurements. Duty cycle factor = $10 \log(1/x)$. For this sample: $DCF = 10\log(1/0.199)=7.02\text{dB}$.

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.

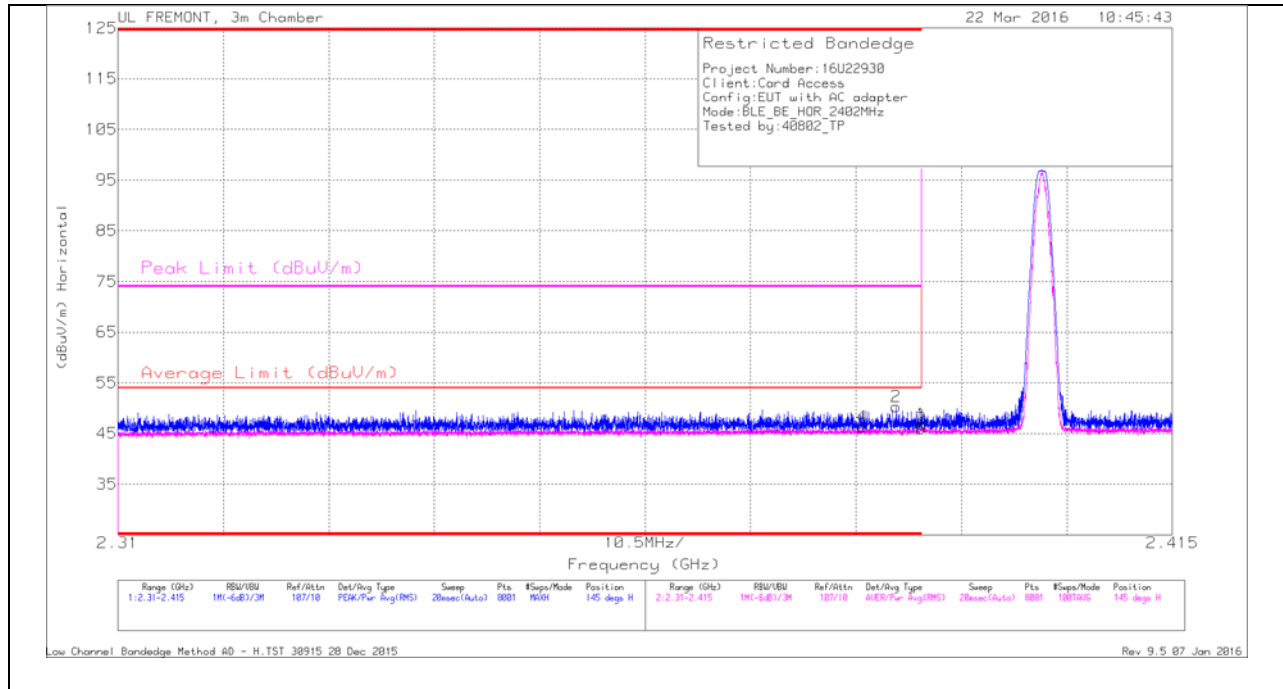
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

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.

5.2. TRANSMITTER ABOVE 1 GHz

RESTRICTED BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULTS



Trace Markers

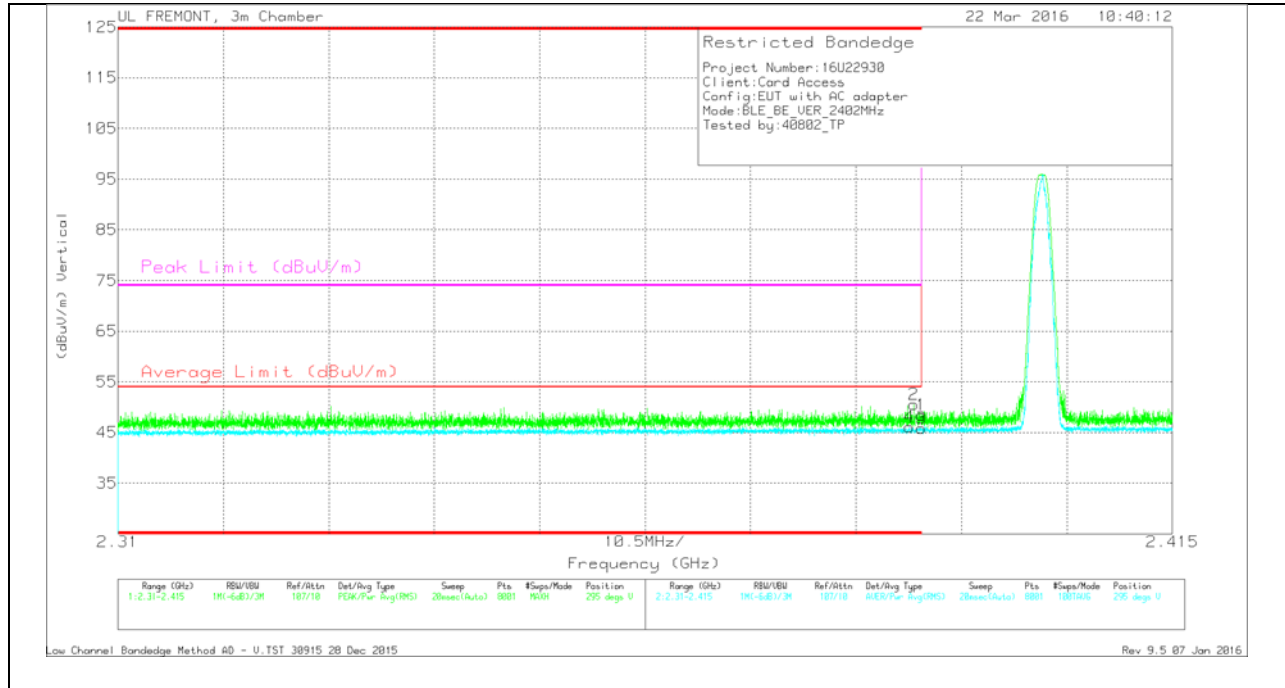
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AFT119 (dB/m)	Amp/Cb/Ftr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Asimuth (Degs)	Height (cm)	Polarity
1	* 2.39	36.92	Pk	32.1	-22.2	0	46.82	-	-	74	-27.18	145	326	H
2	* 2.388	40.5	Pk	32	-22.2	0	50.3	-	-	74	-23.7	145	326	H
3	* 2.39	29.05	RMS	32.1	-22.2	7.02	45.97	54	-8.03	-	-	145	326	H
4	* 2.384	29.47	RMS	32	-22.2	7.02	46.29	54	-7.71	-	-	145	326	H

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

Pk - Peak detector

RMS - RMS detection

VERTICAL RESULTS



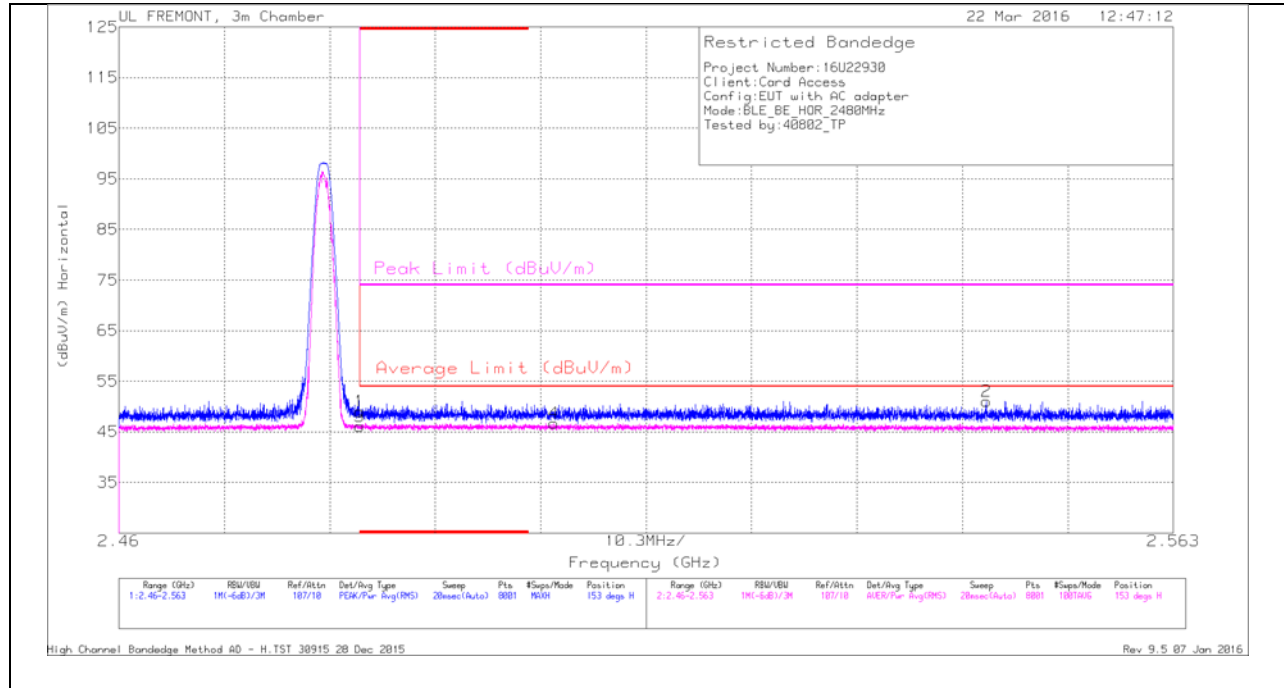
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Ch/Filt/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Asimuth (Degs)	Height (cm)	Polarity
1	* 2.39	38.56	Pk	32.1	-22.2	0	48.46	-	-	74	-25.54	295	368	V
2	* 2.389	40.66	Pk	32.1	-22.2	0	50.56	-	-	74	-23.44	295	368	V
3	* 2.39	28.92	RMS	32.1	-22.2	7.02	45.84	54	-8.16	-	-	295	368	V
4	* 2.389	29.2	RMS	32.1	-22.2	7.02	46.12	54	-7.88	-	-	295	368	V

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

Pk - Peak detector

RMS - RMS detection

AUTHORIZED BANDEGE (HIGH CHANNEL)**HORIZONTAL RESULTS****Trace Markers**

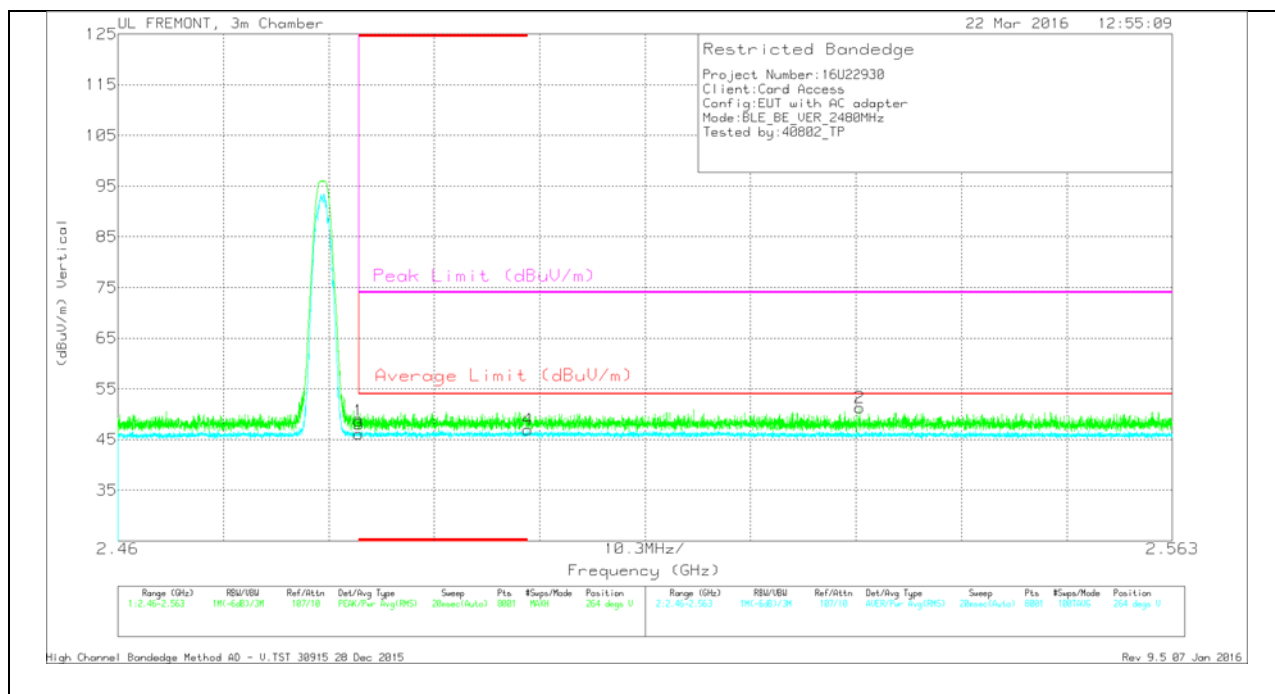
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Ch/Filt/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Altitude (Degs)	Height (cm)	Polarity
1	* 2.484	38.59	PK	32.4	-22	0	48.99	-	-	74	-25.01	153	387	H
3	* 2.484	28.62	RMS	32.4	-22	7.02	46.04	54	-7.96	-	-	153	387	H
4	2.502	29.2	RMS	32.4	-21.9	7.02	46.72	54	-7.28	-	-	153	387	H
2	2.545	40.58	PK	32.4	-21.9	0	51.08	-	-	74	-22.92	153	387	H

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

PK - Peak detector

RMS - RMS detection

VERTICAL RESULTS



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AFT119 (dB/m)	Amp/Cb/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	* 2.484	38.27	Pk	32.4	-22	0	48.67	-	-	74	-25.33	264	356	V
3	* 2.484	28.66	RMS	32.4	-22	7.02	46.08	54	-7.92	-	-	264	356	V
4	2.5	29.37	RMS	32.4	-21.9	7.02	46.89	54	-7.11	-	-	264	356	V
2	2.532	40.73	Pk	32.4	-21.9	0	51.23	-	-	74	-22.77	264	356	V

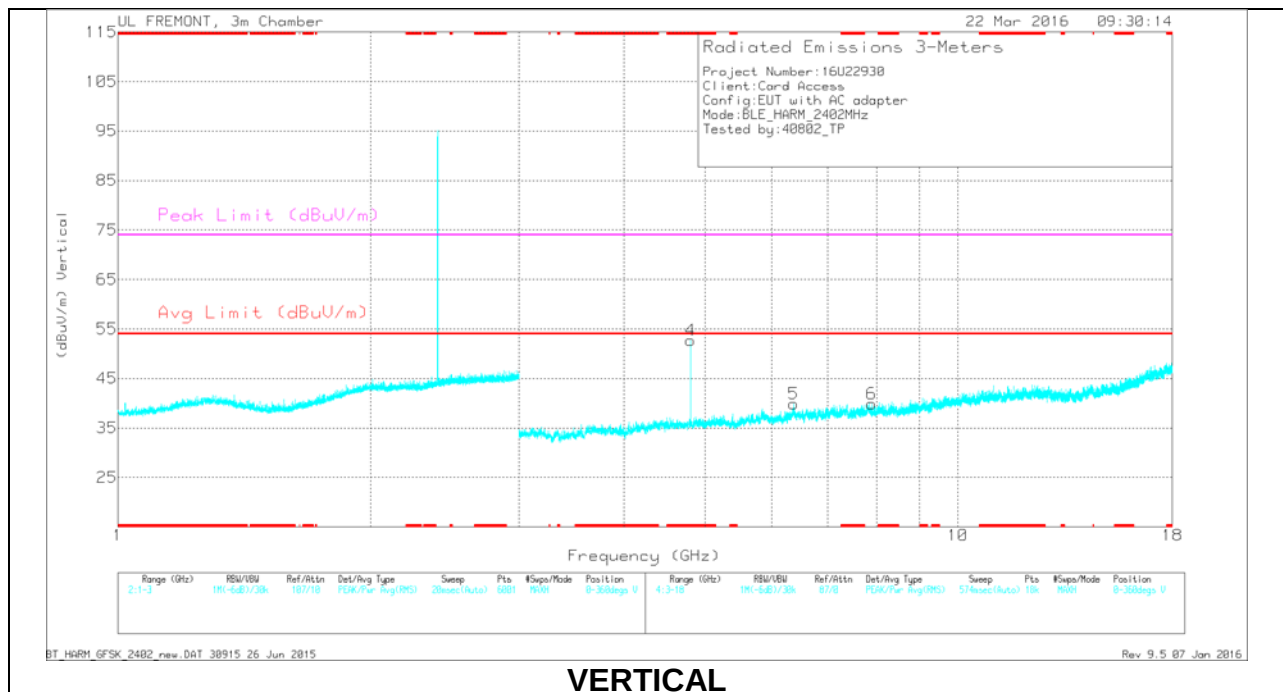
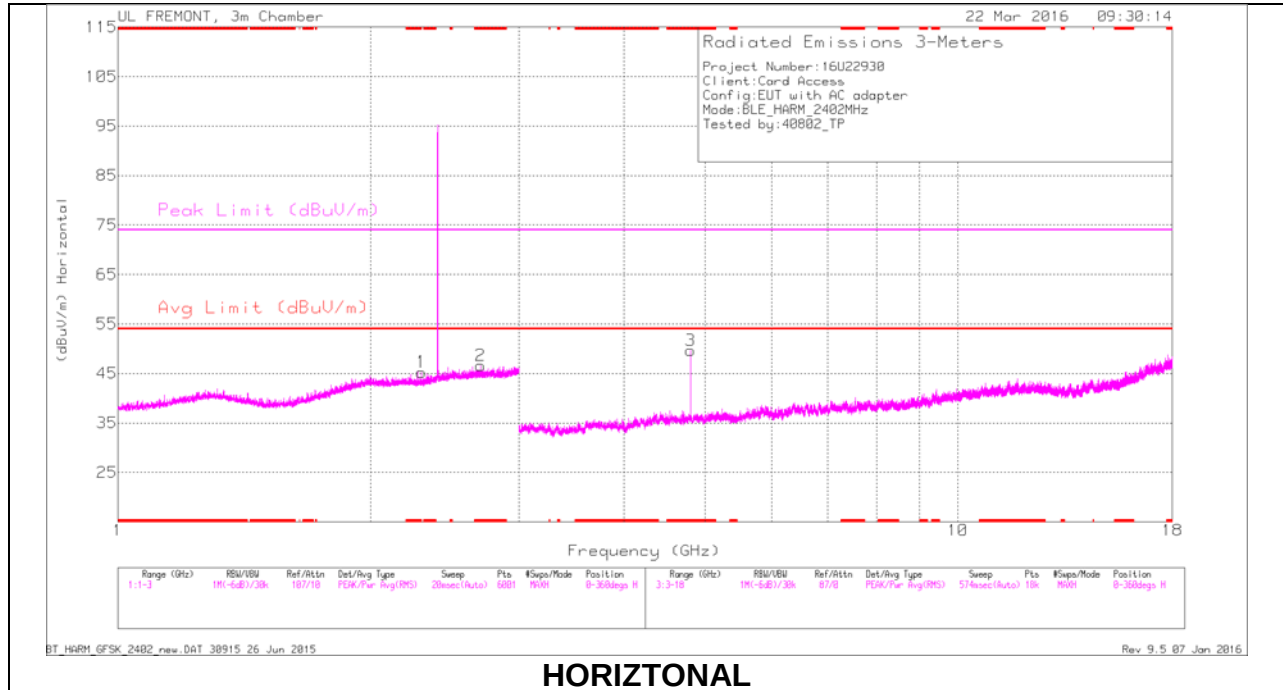
* - indicates frequency in CFR15.205/IC8.10 Restricted Band

Pk - Peak detector

RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

LOW CHANNEL DATA

TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Chl/Fitr/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	* 2.298	35.98	Pk	31.6	-22.3	0	45.28	-	-	74	-28.72	0-360	100	H
2	* 2.701	35.96	Pk	32.6	-21.9	0	46.66	-	-	74	-27.34	0-360	100	H
3	* 4.803	44.59	Pk	34.2	-29.1	0	49.69	-	-	74	-24.31	0-360	200	H
4	* 4.803	47.58	Pk	34.2	-29.1	0	52.68	-	-	74	-21.32	0-360	100	V
5	6.377	31.36	Pk	35.6	-27.1	0	39.86	-	-	-	-	0-360	200	V
6	7.886	30.07	Pk	35.8	-26	0	39.87	-	-	-	-	0-360	200	V

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

Pk - Peak detector

RADIATED EMISSIONS

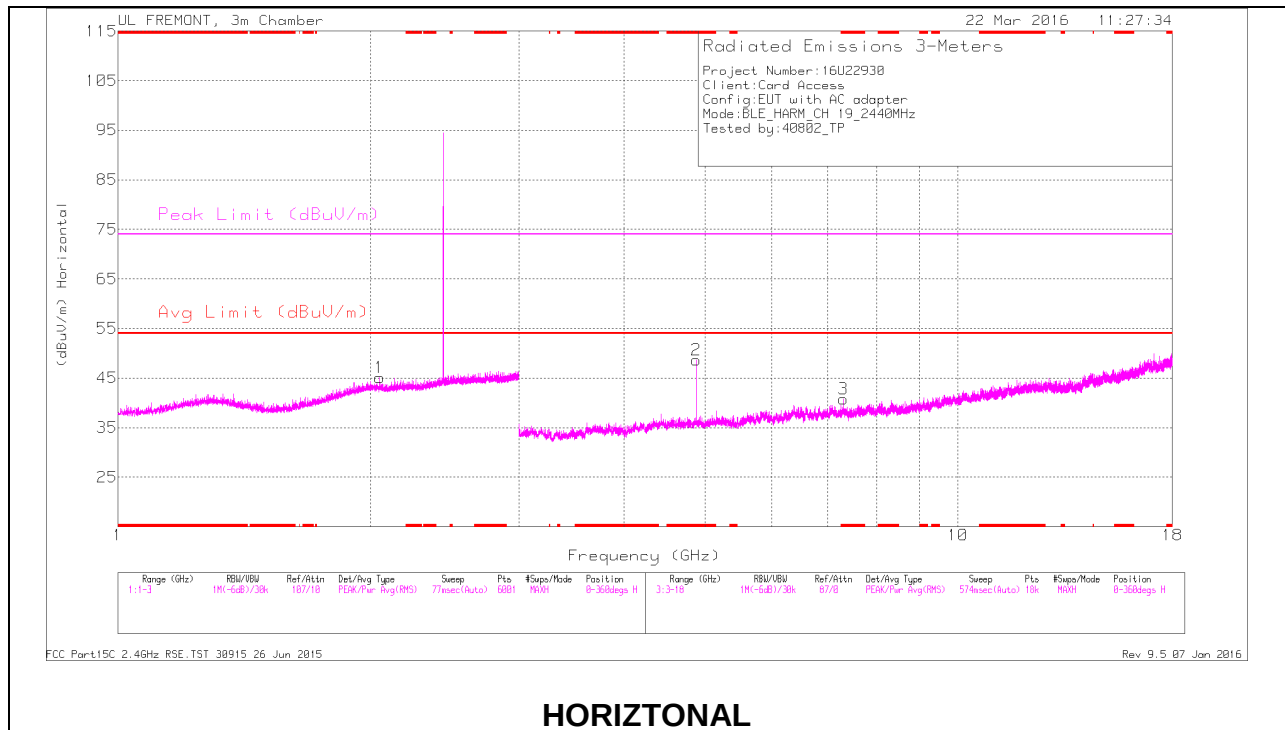
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Chl/Fitr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 2.3	40.78	PK2	31.6	-22.3	0	50.08	-	-	74	-23.92	20	378	H
* 2.299	28.89	MAv1	31.6	-22.3	7.02	45.21	54	-8.79	-	-	20	378	H
* 2.703	40.87	PK2	32.6	-21.9	0	51.57	-	-	74	-22.43	301	212	H
* 2.701	28.89	MAv1	32.6	-21.9	7.02	46.61	54	-7.39	-	-	301	212	H
* 4.804	50.63	PK2	34.2	-29.1	0	55.73	-	-	74	-18.27	20	276	H
* 4.804	41.24	MAv1	34.2	-29.1	7.02	53.36	54	-64	-	-	20	276	H
* 4.804	51.38	PK2	34.2	-29.1	0	56.48	-	-	74	-17.52	188	103	V
* 4.804	41.47	MAv1	34.2	-29.1	7.02	53.59	54	-.41	-	-	188	103	V
6.377	36.69	PK2	35.6	-27.1	0	45.19	-	-	74	-28.81	304	166	V
7.887	34.69	PK2	35.8	-26	0	44.49	-	-	74	-29.51	120	366	V

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

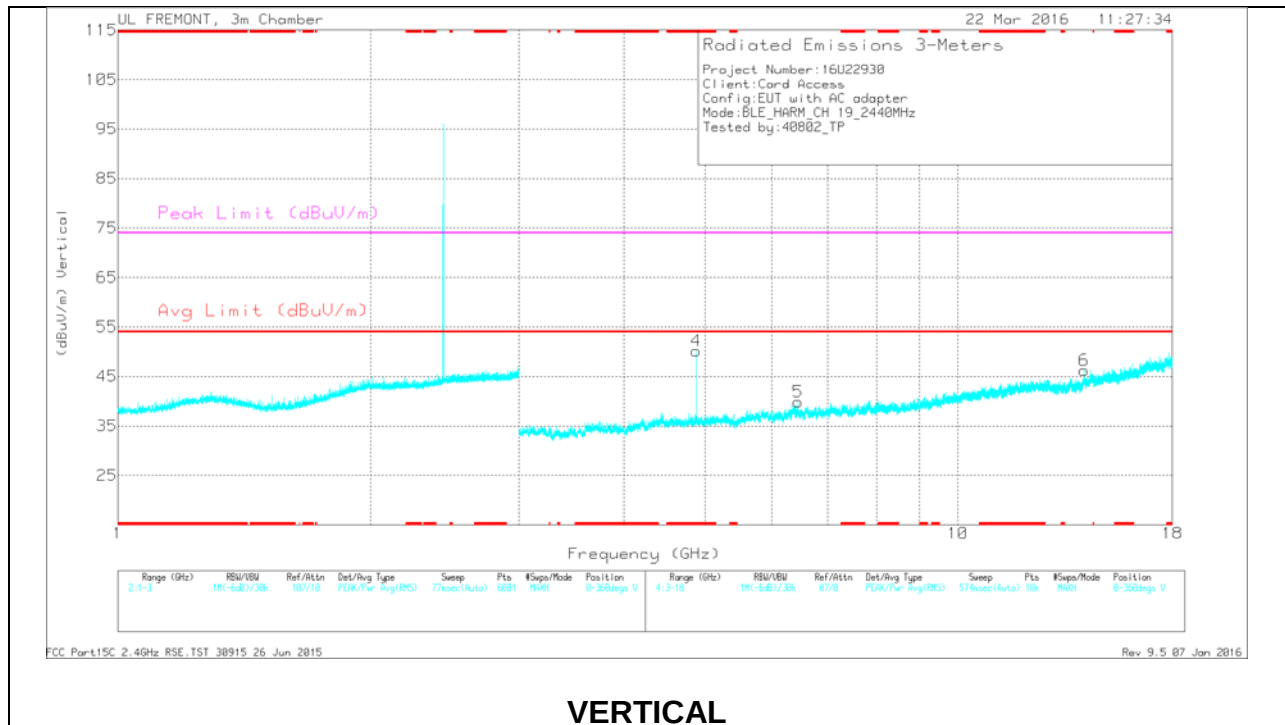
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

MID CHANNEL RESULTS



HORIZONTAL



VERTICAL

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

MID CHANNEL DATA

TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fitr/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	* 4.88	43.2	Pk	34.2	-28.8	0	48.6	-	-	74	-25.4	0-360	100	H
3	* 7.307	31.88	Pk	35.7	-26.8	0	40.78	-	-	74	-33.22	0-360	100	H
4	* 4.88	44.77	Pk	34.2	-28.8	0	50.17	-	-	74	-23.83	0-360	100	V
1	2.049	35.82	Pk	31.7	-22.4	0	45.12	-	-	-	-	0-360	100	H
5	6.45	33	Pk	35.6	-28.7	0	39.9	-	-	-	-	0-360	200	V
6	14.133	30.78	Pk	39.2	-23.8	0	46.18	-	-	-	-	0-360	100	V

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

Pk - Peak detector

RADIATED EMISSIONS

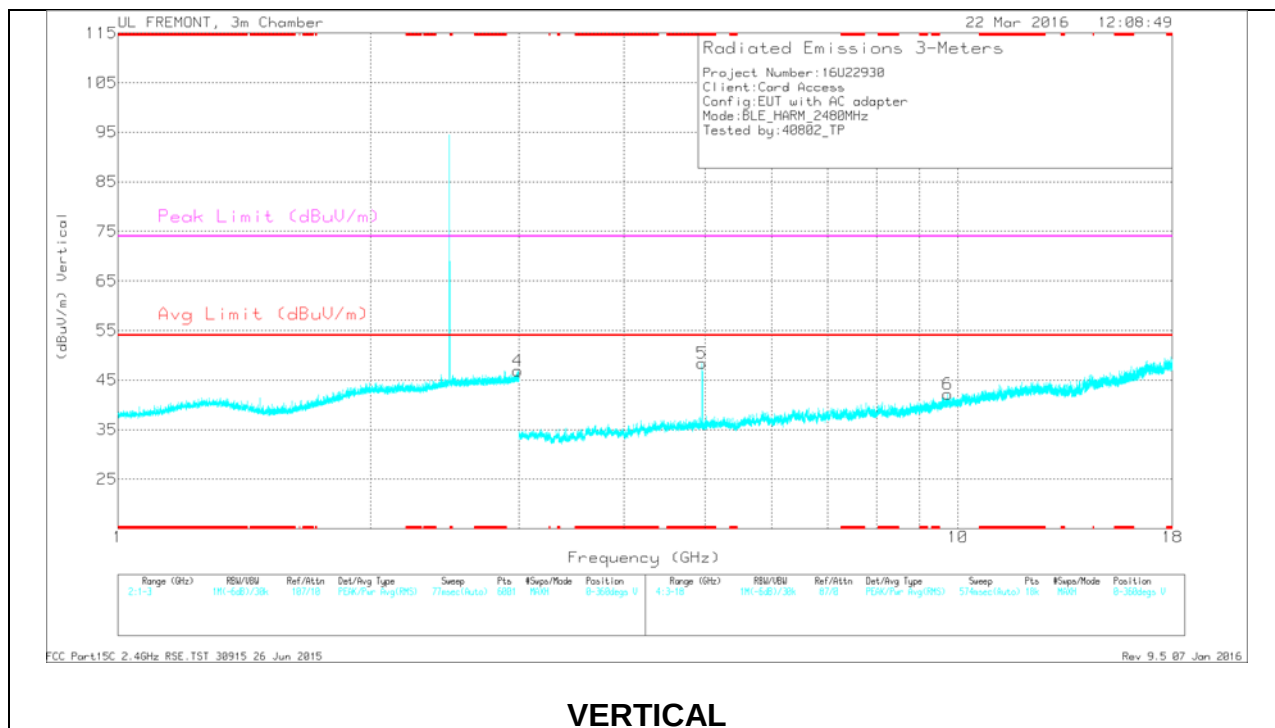
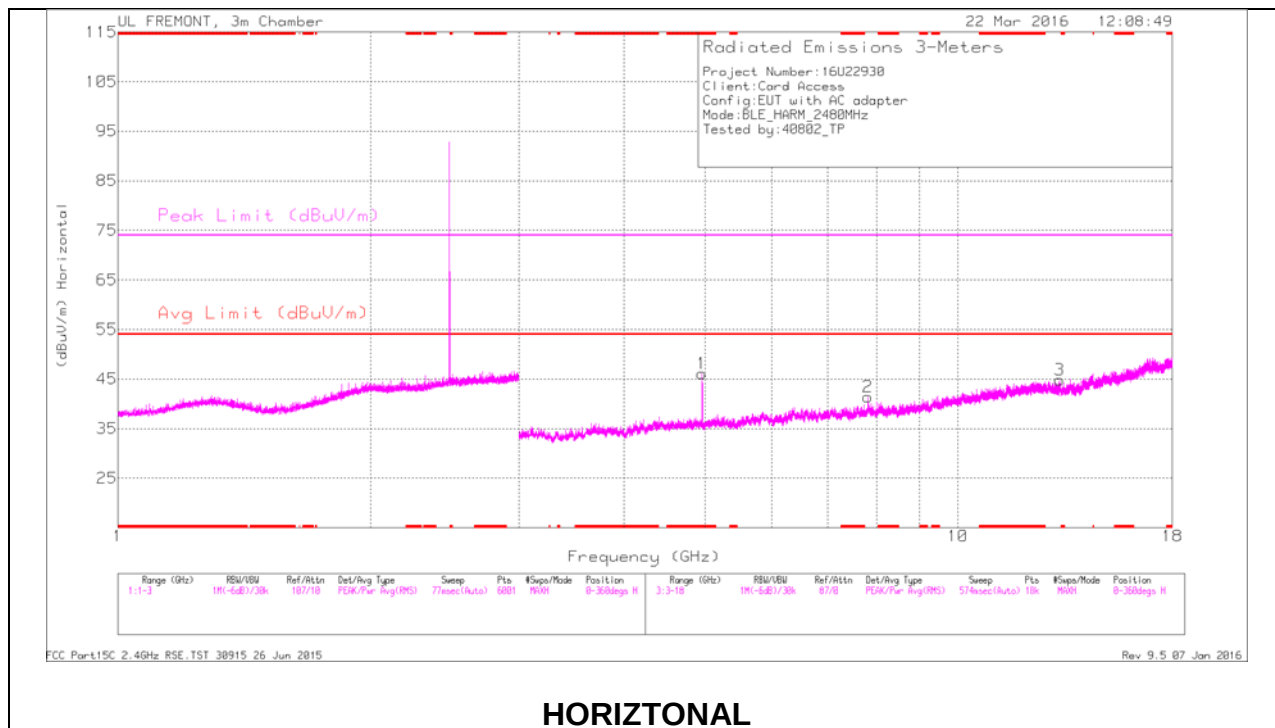
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fitr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.88	46.17	PK2	34.2	-28.8	0	51.57	-	-	74	-22.43	36	148	H
* 4.88	36.8	MAV1	34.2	-28.8	7.02	49.22	54	-4.78	-	-	36	148	H
* 7.306	36.81	PK2	35.7	-26.8	0	45.71	-	-	74	-28.29	70	346	H
* 7.307	24.66	MAV1	35.7	-26.8	7.02	40.58	54	-13.42	-	-	70	346	H
* 4.88	48.21	PK2	34.2	-28.8	0	53.61	-	-	74	-20.39	278	386	V
* 4.88	38.25	MAV1	34.2	-28.8	7.02	50.67	54	-3.33	-	-	278	386	V
2.048	40.91	PK2	31.7	-22.4	0	50.21	-	-	74	-23.79	219	129	H
6.452	37.82	PK2	35.6	-28.7	0	44.72	-	-	74	-29.28	261	107	V
14.132	36.18	PK2	39.2	-23.8	0	51.58	-	-	74	-22.42	234	107	V

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

PK2 - KDB558074 Method: Maximum Peak

MAV1 - KDB558074 Option 1 Maximum RMS Average

HIGH CHANNEL RESULTS



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

HIGH CHANNEL DATA

TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fitr/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	* 4.96	41.34	Pk	34.2	-29.4	0	46.14	-	-	74	-27.86	0-360	100	H
5	* 4.96	43.62	Pk	34.2	-29.4	0	48.42	-	-	74	-25.58	0-360	100	V
4	2.99	35.78	Pk	32.8	-21.7	0	46.88	-	-	-	-	0-360	100	V
2	7.818	31.62	Pk	35.8	-26	0	41.42	-	-	-	-	0-360	100	H
6	9.73	29.07	Pk	36.8	-23.7	0	42.17	-	-	-	-	0-360	200	V
3	13.214	29.57	Pk	39.1	-23.8	0	44.87	-	-	-	-	0-360	100	H

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

Pk - Peak detector

RADIATED EMISSIONS

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fitr/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
* 4.959	45.46	PK2	34.2	-29.4	0	50.26	-	-	74	-23.74	144	100	H
* 4.96	34.52	MAv1	34.2	-29.4	7.02	46.34	54	-7.66	-	-	144	100	H
* 4.96	46.91	PK2	34.2	-29.5	0	51.61	-	-	74	-22.39	263	332	V
* 4.96	36.71	MAv1	34.2	-29.4	7.02	48.53	54	-5.47	-	-	263	332	V
2.992	40.65	PK2	32.8	-21.6	0	51.85	-	-	74	-22.15	42	366	V
7.82	36.13	PK2	35.8	-25.9	0	46.03	-	-	74	-27.97	31	400	H
9.731	33.77	PK2	36.8	-23.7	0	46.87	-	-	74	-27.13	290	325	V
13.215	35.69	PK2	39.1	-23.8	0	50.99	-	-	74	-23.01	359	152	H

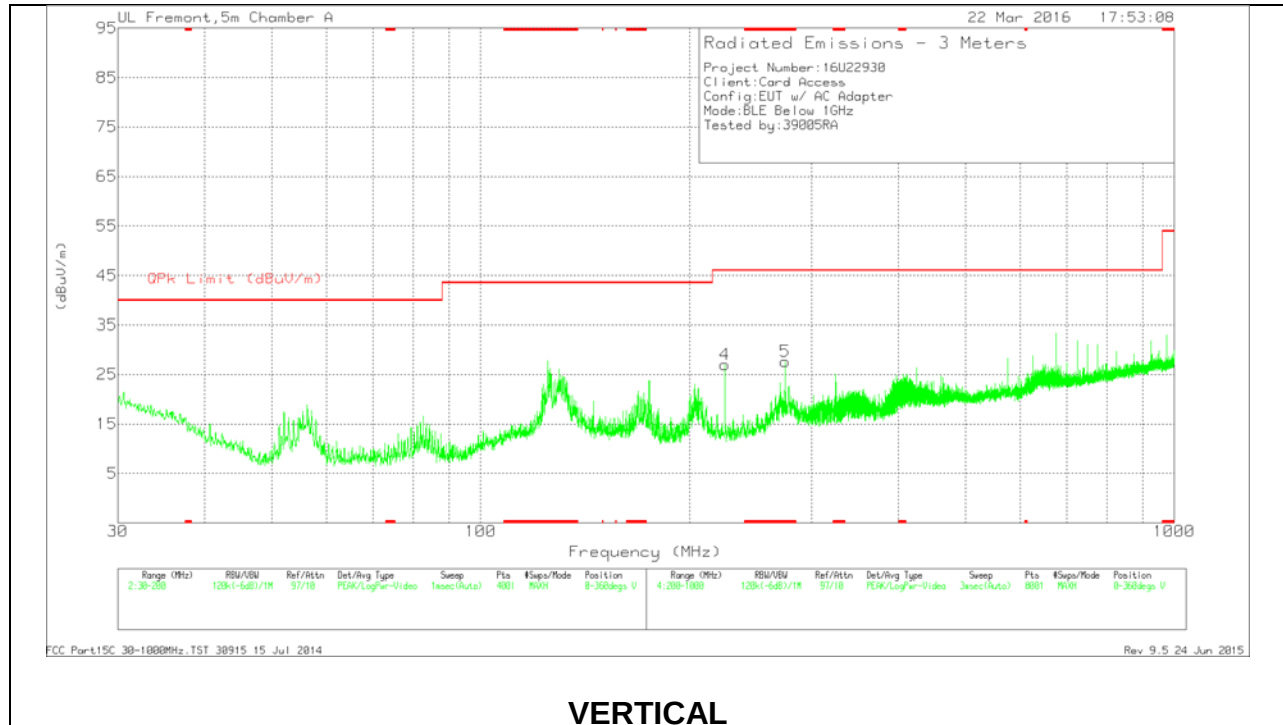
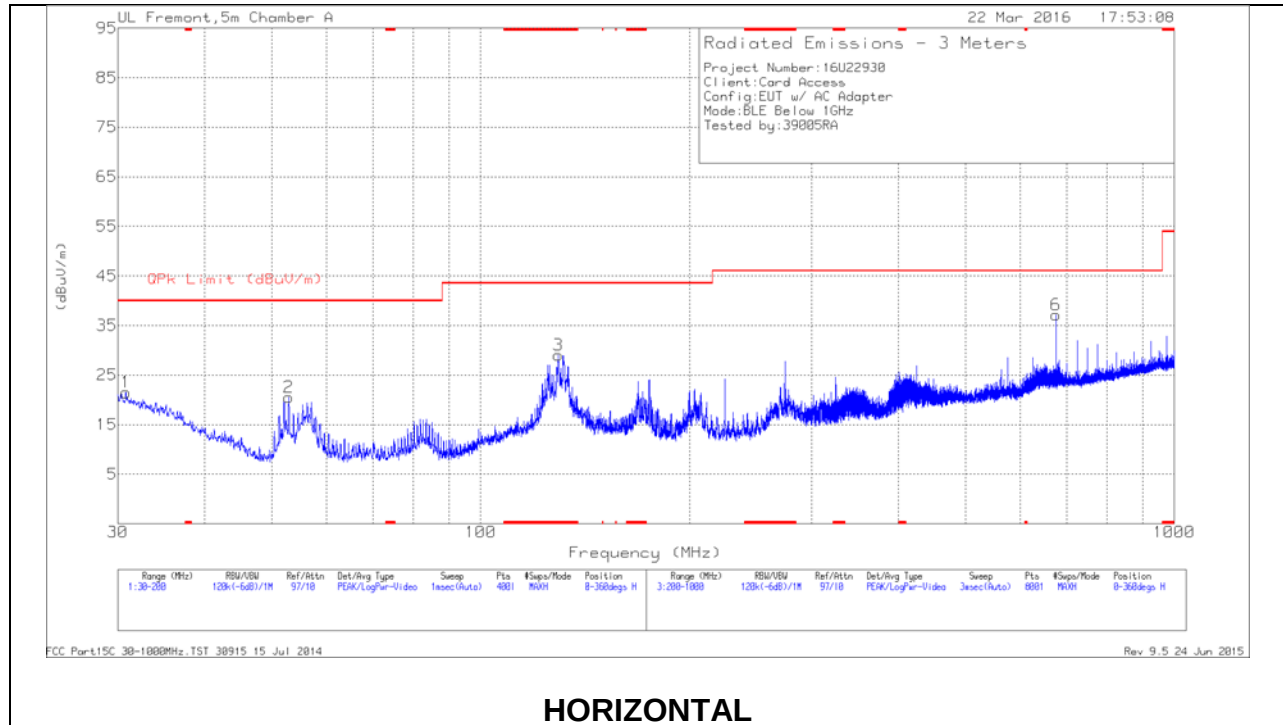
* - indicates frequency in CFR15.205/IC8.10 Restricted Band

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

5.1. WORST-CASE BELOW 1 GHz

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



Data

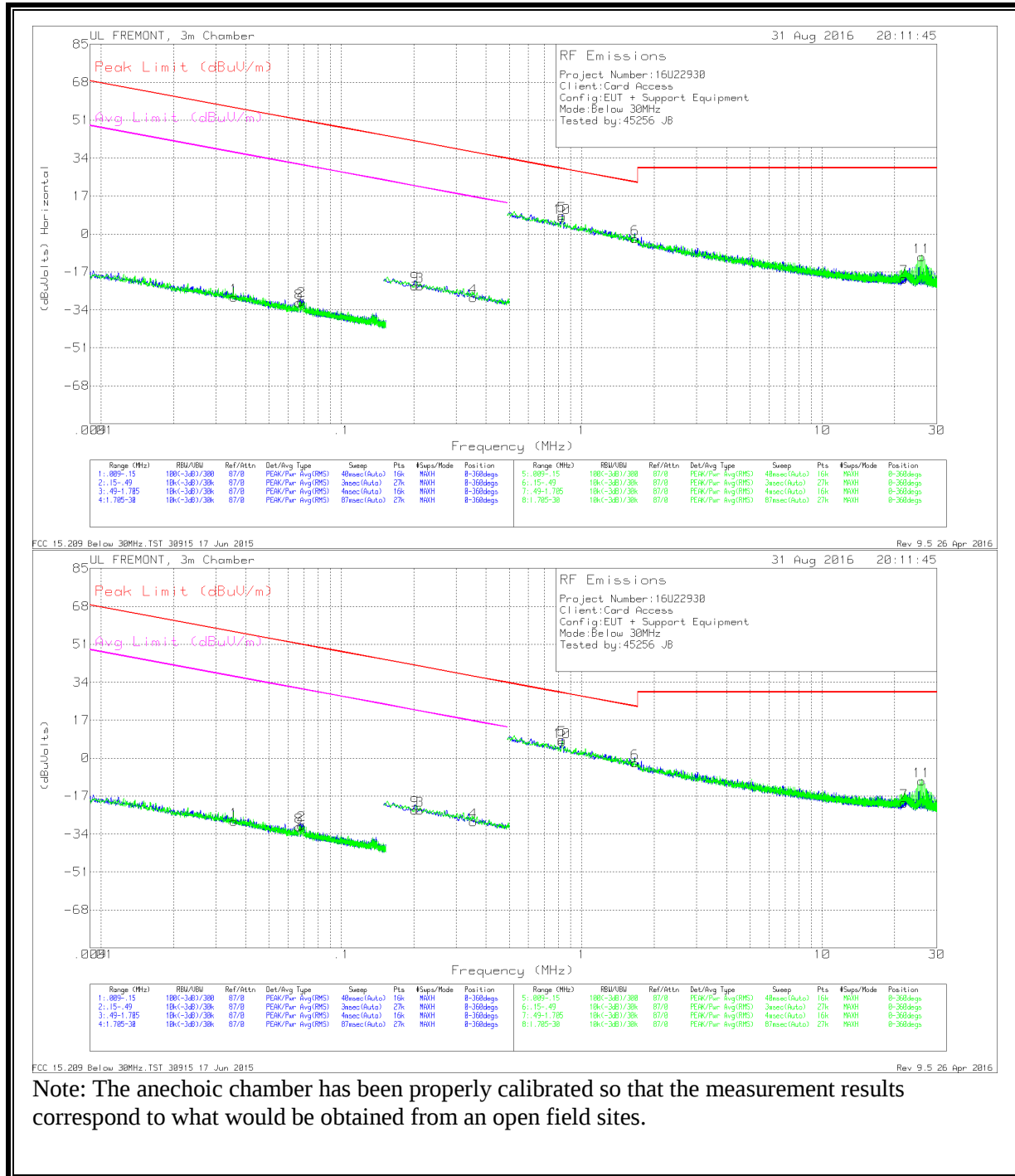
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T477 (dB/m)	Amp/Cbl (dB/m)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
3	* 129.3863	41.76	Pk	17.7	-30.4	29.06	43.52	-14.46	0-360
5	* 275	39.89	Pk	17.3	-29.5	27.69	46.02	-18.33	0-360
1	30.8075	28.08	Pk	24.6	-31.2	21.48	40	-18.52	0-360
2	52.9075	40.35	Pk	11.2	-31	20.55	40	-19.45	0-360
4	225	41.96	Pk	14.8	-29.8	26.96	46.02	-19.06	0-360
6	675	41.63	Pk	23.7	-28.2	37.13	46.02	-8.89	0-360

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

5.2. WORST-CASE BELOW 30 MHz

SPURIOUS EMISSIONS BELOW 30 MHz



BELOW 30 MHz TABLE

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cbl (dB)	Dist Corr 300m	Corrected Reading (dBuVolts)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	.03572	37.74	Pk	12.5	1.4	-80	-28.36	56.55	-84.91	36.55	-64.91	0-360
8	.06665	36.7	Pk	11	1.4	-80	-30.9	51.13	-82.03	31.13	-62.03	0-360
2	.06831	37.57	Pk	11	1.4	-80	-30.03	50.91	-80.94	30.91	-60.94	0-360
9	.20214	44.44	Pk	10.8	1.5	-80	-23.26	41.49	-64.75	21.49	-44.75	0-360
3	.21212	44.38	Pk	10.8	1.5	-80	-23.32	41.07	-64.39	21.07	-44.39	0-360
4	.35393	39.25	Pk	10.7	1.5	-80	-28.55	36.63	-65.18	16.63	-45.18	0-360

Pk - Peak detector

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cbl (dB)	Dist Corr 30m	Corrected Reading (dBuVolts)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
5	.82767	36.23	Pk	10.6	1.5	-40	8.33	29.25	-20.92	-	-	0-360
10	.82767	35.17	Pk	10.6	1.5	-40	7.27	29.25	-21.98	-	-	0-360
6	1.66504	25.52	Pk	10.8	1.5	-40	-2.18	23.18	-25.36	-	-	0-360
7	21.90992	8.41	Pk	9.8	1.7	-40	-20.09	29.54	-49.63	-	-	0-360
11	25.93371	19.12	Pk	9	1.7	-40	-10.18	29.54	-39.72	-	-	0-360

Pk - Peak detector

5.3. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 8.8

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

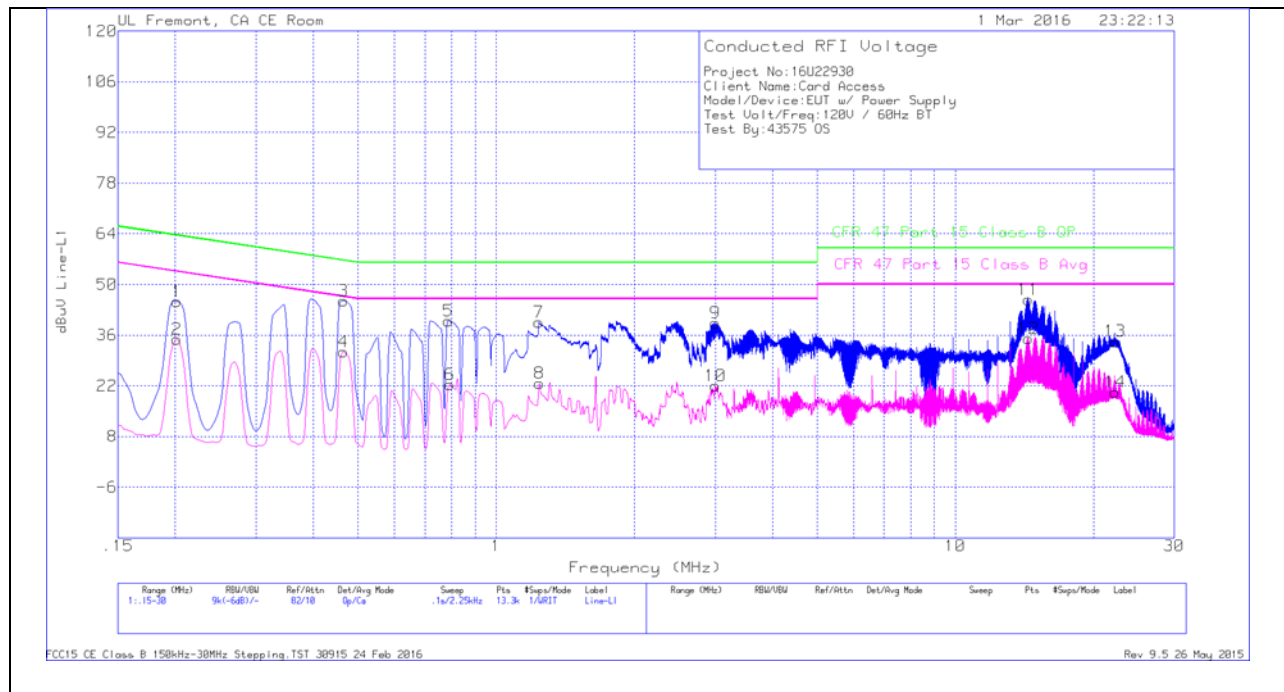
The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

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

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

RESULTS

LINE 1 RESULTS



Trace Markers

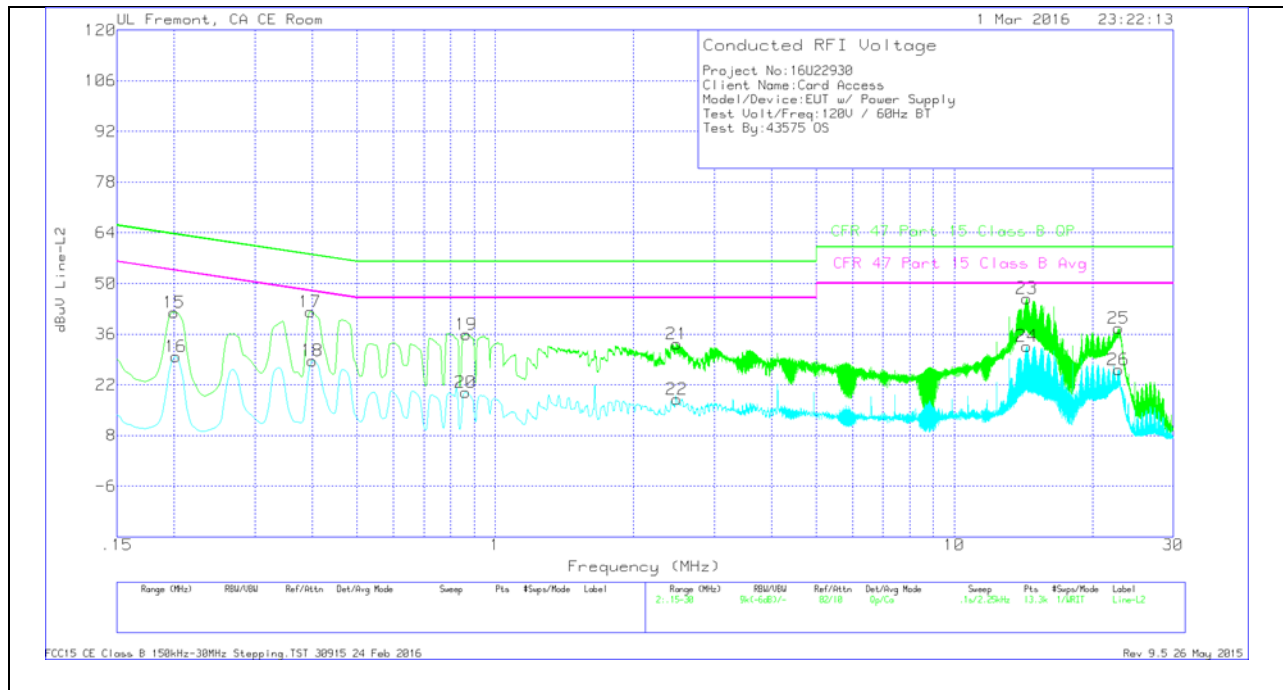
Range 1: Line-L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T1310 IL L1	LC Cables 1&3	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	.20175	35.24	Qp	0	0	10.1	45.34	63.54	-18.2	-	-
2	.20175	24.83	Ca	0	0	10.1	34.93	-	-	53.54	-18.61
3	.465	35.43	Qp	0	0	10.1	45.53	56.6	-11.07	-	-
4	.465	21.3	Ca	0	0	10.1	31.4	-	-	46.6	-15.2
5	.78675	29.82	Qp	0	0	10.1	39.92	56	-16.08	-	-
6	.79125	12.2	Ca	0	0	10.1	22.3	-	-	46	-23.7
7	1.239	29.42	Qp	0	0	10.1	39.52	56	-16.48	-	-
8	1.24125	12.55	Ca	0	0	10.1	22.65	-	-	46	-23.35
9	3.00075	29.14	Qp	0	.1	10.1	39.34	56	-16.66	-	-
10	3.00075	11.74	Ca	0	.1	10.1	21.94	-	-	46	-24.06
11	14.43975	35.42	Qp	0	.2	10.2	45.82	60	-14.18	-	-
12	14.43975	24.63	Ca	0	.2	10.2	35.03	-	-	50	-14.97
13	22.30575	23.57	Qp	0	.3	10.4	34.27	60	-25.73	-	-
14	22.2855	9.54	Ca	0	.3	10.4	20.24	-	-	50	-29.76

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	T1310 IL L2	LC Cables 2&3	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)
15	.1995	31.94	Qp	0	0	10.1	42.04	63.63	-21.59	-	-
16	.20175	19.74	Ca	0	0	10.1	29.84	-	-	53.54	-23.7
17	.39525	32.05	Qp	0	0	10.1	42.15	57.95	-15.8	-	-
18	.39975	18.6	Ca	0	0	10.1	28.7	-	-	47.86	-19.16
19	.8655	25.78	Qp	0	0	10.1	35.88	56	-20.12	-	-
20	.86325	9.85	Ca	0	0	10.1	19.95	-	-	46	-26.05
21	2.48775	23.05	Qp	0	.1	10.1	33.25	56	-22.75	-	-
22	2.48775	7.85	Ca	0	.1	10.1	18.05	-	-	46	-27.95
23	14.39925	35.41	Qp	.1	.2	10.2	45.91	60	-14.09	-	-
24	14.39925	22.2	Ca	.1	.2	10.2	32.7	-	-	50	-17.3
25	22.80075	26.92	Qp	0	.3	10.4	37.62	60	-22.38	-	-
26	22.76025	15.5	Ca	0	.3	10.4	26.2	-	-	50	-23.8

Qp - Quasi-Peak detector

Ca - CISPR average detection