CERTIFICATION TEST REPORT

Report Number. : 12150954-E1V2

Applicant	:	ENERGOUS CORPORATION 3590 NORTH FIRST STREET SAN JOSE, CA 95134 U.S.A.
Model	:	NF-230
FCC ID	:	2ADNG-NF230
EUT Description	:	WIRELESS CHARGER
Test Standard(s)	:	FCC 47 CFR PART 15 SUBPART C

Date Of Issue:
March 12, 2018

Prepared by:
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	3/6/2018	Initial Issue	--
V2	3/12/2018	Updated Section 9.1 to address TCB's question	Tina Chu

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: ENERGOUS CORPORATION
3590 NORTH FIRST STREET
SAN JOSE, CA 95134 U.S.A.

EUT DESCRIPTION: WIRELESS CHARGER

MODEL NUMBER: NF-230

SERIAL NUMBER: DD017211400D

DATE TESTED: FEBRUARY 28, 2018 – MARCH 06, 2018

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Complies

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 U.S. government.

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TEST 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, KDB 558074 D01 v04, ANSI C63.10-2013.

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:

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, 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
Occupied Channel Bandwidth	±0.39 %

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a single client RF near-field, contact charger that operates when a receiving device is placed on the charger pad's surface. The charger pad uses BLE to pair with the receiving device, and transmits a continuous carrier wave signal at 918 MHz frequency.

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	-0.65	0.86

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

Frequency Band (GHz)	Antenna Peak Gain (dBi)
2.4	0.53

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was 3.0.1.64.
The software installed in the EUT during testing was Direct Test Mode 1.23.0.0

5.5. WORST-CASE CONFIGURATION AND MODE

Radiated band edge, harmonics, and spurious emissions from 1 GHz to 18GHz were performed with the EUT was set to transmit at the Low/Middle/High channels.

Radiated emission below 30MHz, 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 EUT is a tabletop device. Therefore, all final radiated testing was performed with the EUT in tabletop orientation.

Worst-case data rate as provided by the client was:

BLE: 1 Mbps.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop AC/DC Adapter	Dell	LA130PM121	CN-0VJCH5-72438-66L-0D19-A03	NA
Laptop	Dell	M4800	3074	NA
AC/DC Adapter	CUI INC	SMI10-S	3517HB	NA

I/O CABLES (CONDUCTED TEST)

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	1	AC	Unshielded	1	AC Mains to AC/DC Adapter
2	DC	1	DC	Unshielded	1.5	AC/DC Adapter to Laptop
3	USB	1	UART	Unshielded	2	EUT to Laptop
4	Antenna	1	SMA	Unshielded	0.05	To spectrum analyzer
5	USB	1	micro USB	Unshielded	1	EUT to AC/DC adapter

I/O CABLES (RADIATED TEST)

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	1	AC	Unshielded	1	AC Mains to AC/DC Adapter
2	DC	1	DC	Unshielded	1.5	AC/DC Adapter to Laptop
3	USB	1	UART	Unshielded	2	EUT to Laptop
4	USB	1	micro USB	Unshielded	1	EUT to AC/DC adapter

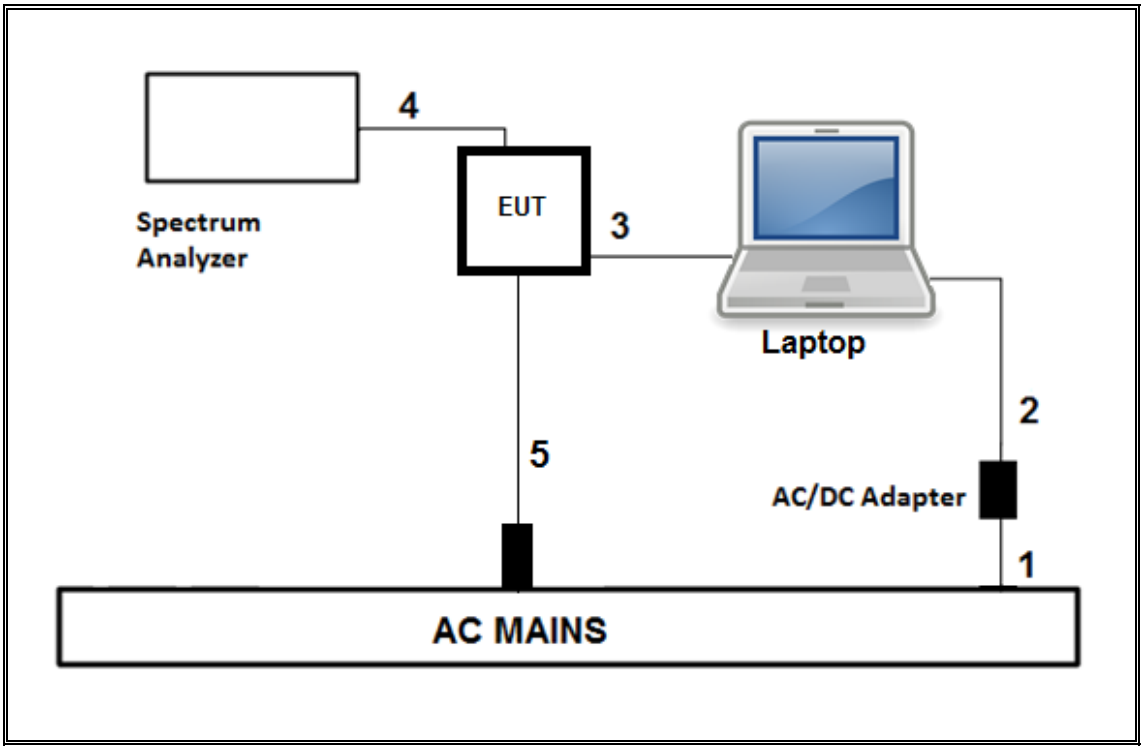
I/O CABLES (AC POWER CONDUCTED TEST)

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	USB	1	micro USB	Unshielded	1	EUT to AC/DC adapter

TEST SETUP-CONDUCTED TEST

The EUT was connected to the test laptop via USB cable. Test software exercised the EUT.

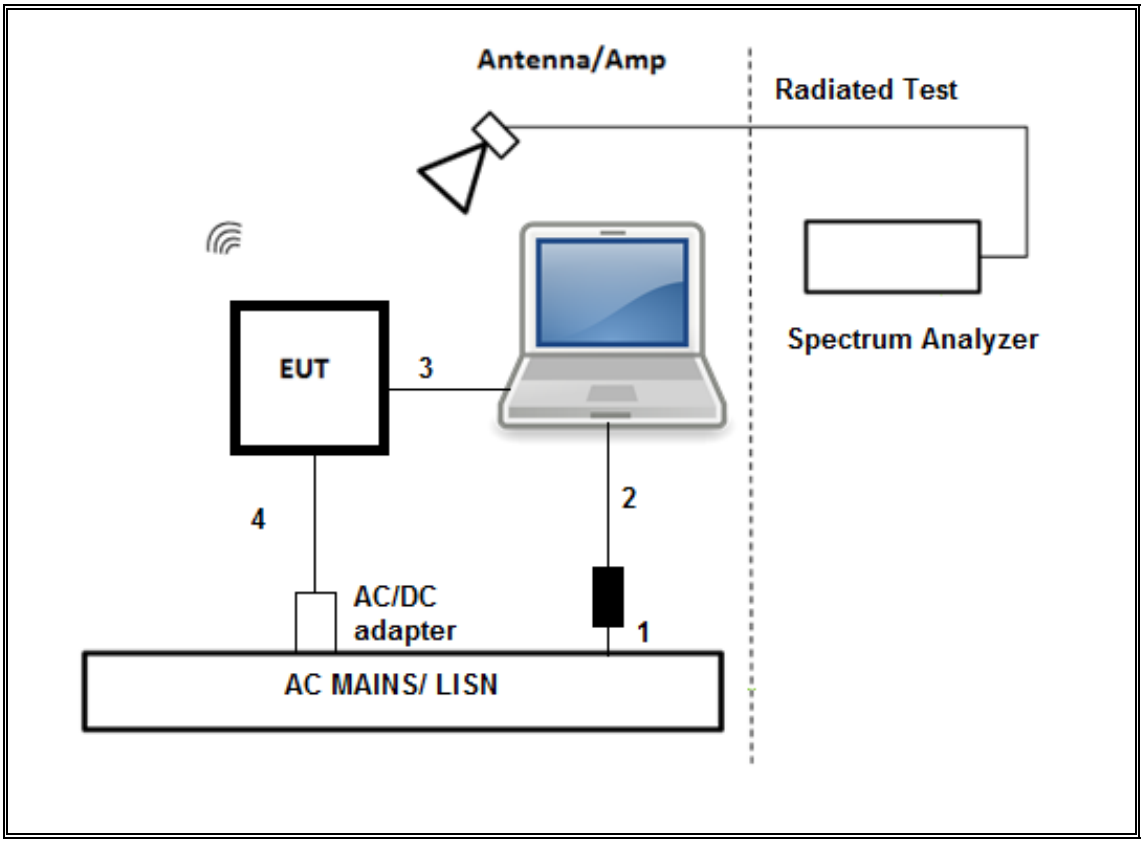
SETUP DIAGRAM



TEST SETUP- RADIATED TEST

The EUT was powered by an AC/DC adapter via USB cable. Test software exercised the EUT.

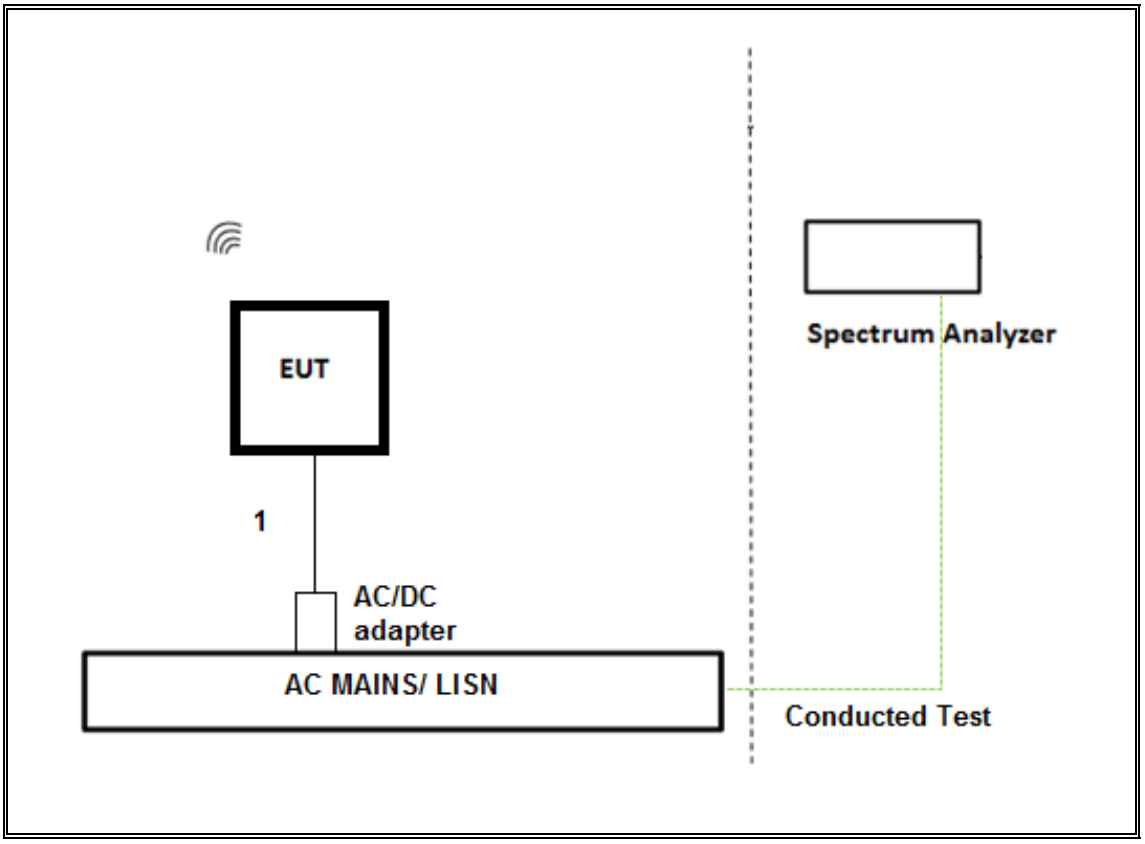
SETUP DIAGRAM



TEST SETUP- AC LINE CONDUCTED TEST

The EUT was powered by an AC/DC adapter via USB cable. Test software exercised the EUT.

SETUP DIAGRAM



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**
Antenna, Active Loop 9KHz to 30MHz	COM-POWER	AL-130R	PRE0165308	12/18/2018
Amplifier, 10KHz to 1GHz, 32dB	SONOMA INSTRUMENT	310N	T300	12/11/2018
Spectrum Analyzer, PXA 3Hz to 44GHz	Keysight	N9030A	T1466	04/11/2018
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T863	06/09/2018
Amplifier, 1 to 18GHz	Miteq	AFS42-00101800-25-S-42	T493	12/16/2018
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	T899	06/15/2018
Amplifier, 10KHz to 1GHz, 32dB	SONOMA INSTRUMENT	8447D	T10	02/14/2019
Spectrum Analyzer, PXA 3Hz to 44GHz	Keysight	N9030A	T1454	01/08/2019
Antenna Horn, 18 to 26GHz	ARA	MWH-1826/B	T449	06/12/2019
Amplifier, 1 to 26.5GHz 23.5dB gain Minimum	Keysight	8449B	T404	07/23/2018
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight	N9030A-544	T1113	12/21/2018
Power Meter, P-series single channel	Keysight	N1912A	T1245	05/12/2018
Power Sensor	Keysight	N1921A	T413	06/22/2018
AC Line Conducted				
EMI TEST RECEIVER 10Hz-26.5GHz	Rohde & Schwarz	ESCI7	PRE0176493	02/21/2019
LISN for Conducted Emissions CISPR-16	Fischer	50/250-25-2-01	T1310	06/15/2018
Power Cable, Line Conducted Emissions	UL	PG1	T861	08/31/2018
UL AUTOMATION SOFTWARE				
Radiated Software	UL	UL EMC	Ver 9.5, Dec 01, 2016	
Conducted Software	UL	UL EMC	Ver 8.0, Feb 15, 2018	
AC Line Conducted Software	UL	UL EMC	Ver 9.5, May 26, 2015	

NOTES:

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

7. MEASUREMENT METHODS

On Time and Duty Cycle: KDB 558074 D01 v04, Section 6.

6 dB BW: KDB 558074 D01 v04, Section 8.1.

Occupied BW (99%): ANSI C63.10-2013 Section 6.9.3

Output Power: KDB 558074 D01 v04, Section 9.1.3.

Power Spectral Density: KDB 558074 D01 v04, Section 10.2.

Out-of-band emissions in non-restricted bands: KDB 558074 D01 v04, Section 11.0.

Out-of-band emissions in restricted bands: KDB 558074 D01 v04, Section 12.1.

Band-edge: KDB 558074 D01 v04, Section 12.1.

AC Power-line conducted emissions: ANSI C63.10-2013, Section 6.2.

8. ANTENNA PORT TEST RESULTS

8.1. 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/B Minimum VBW (kHz)
BLE	0.182	0.625	0.291	29.10%	5.36	5.504

DUTY CYCLE PLOTS

DUTY CYCLE BLE

8.2. BLE

8.2.1. 6 dB BANDWIDTH

LIMITS

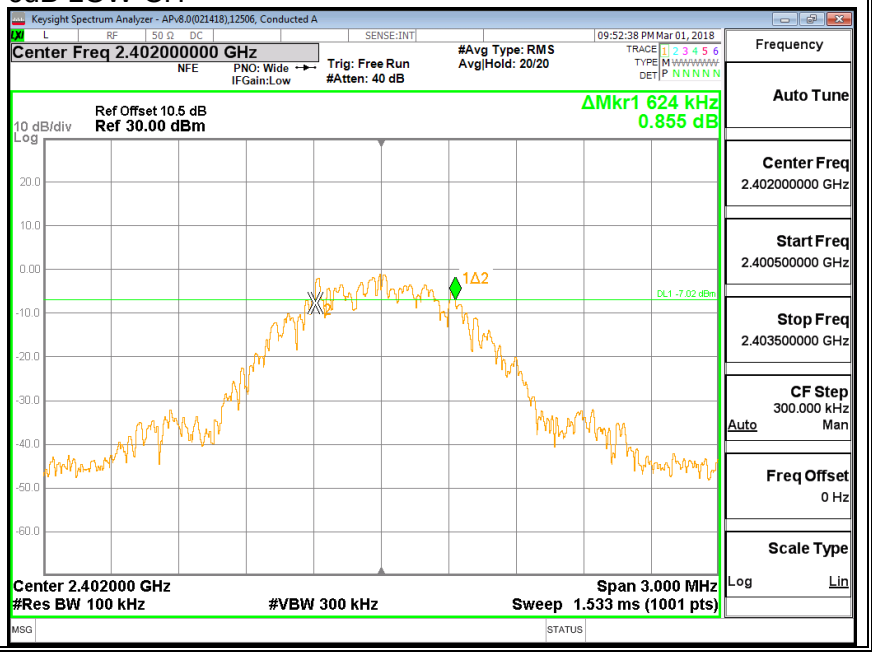
FCC §15.247 (a) (2)

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

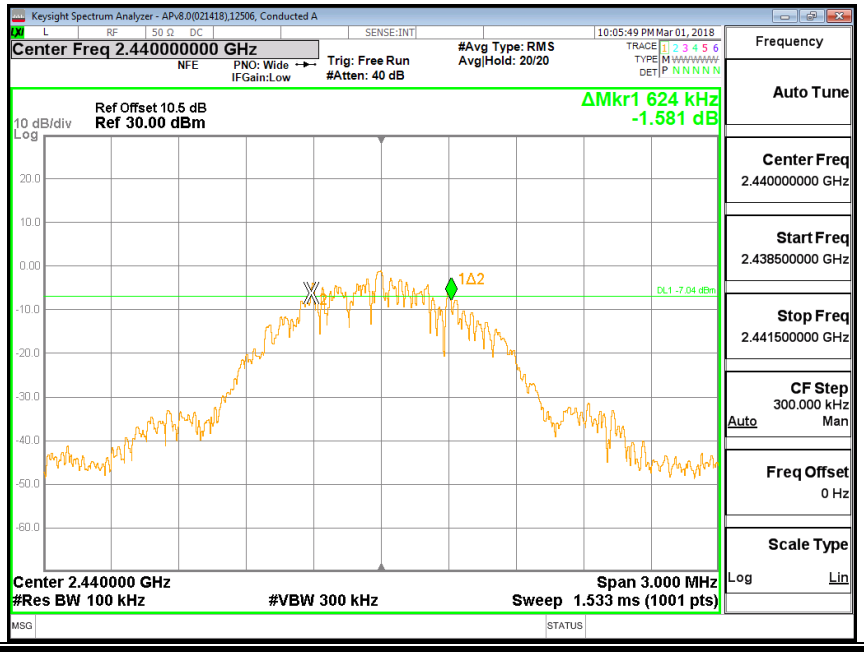
RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.6240	0.5
Middle	2440	0.6240	0.5
High	2480	0.6540	0.5

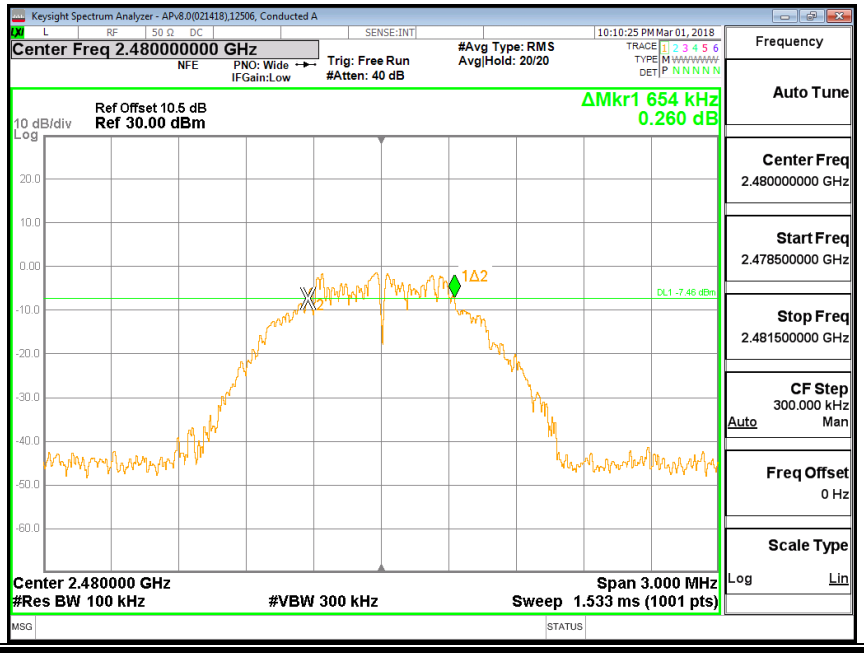
6dB LOW CH



6dB MID CH



6dB HIGH CH



8.2.2. 99% BANDWIDTH

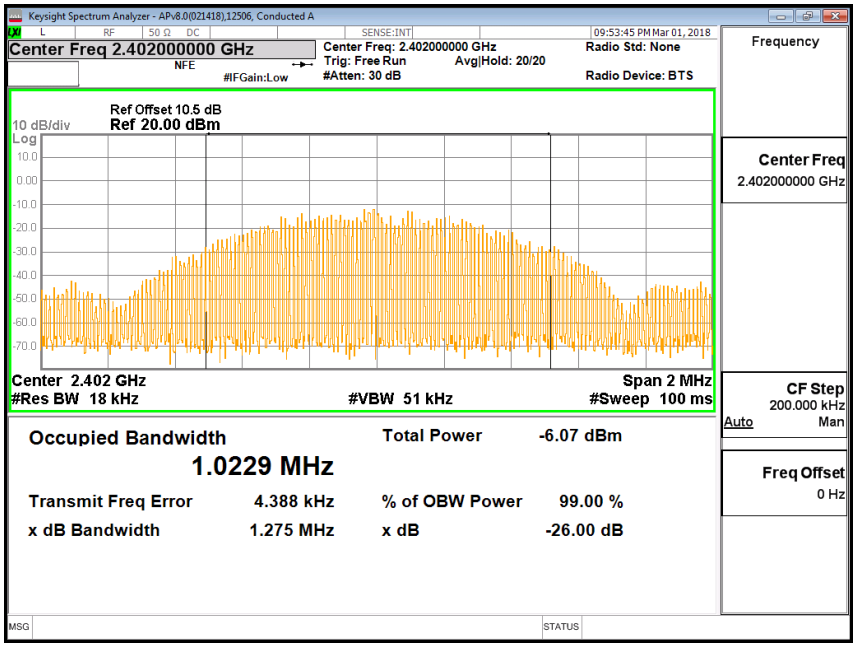
LIMITS

None; for reporting purposes only.

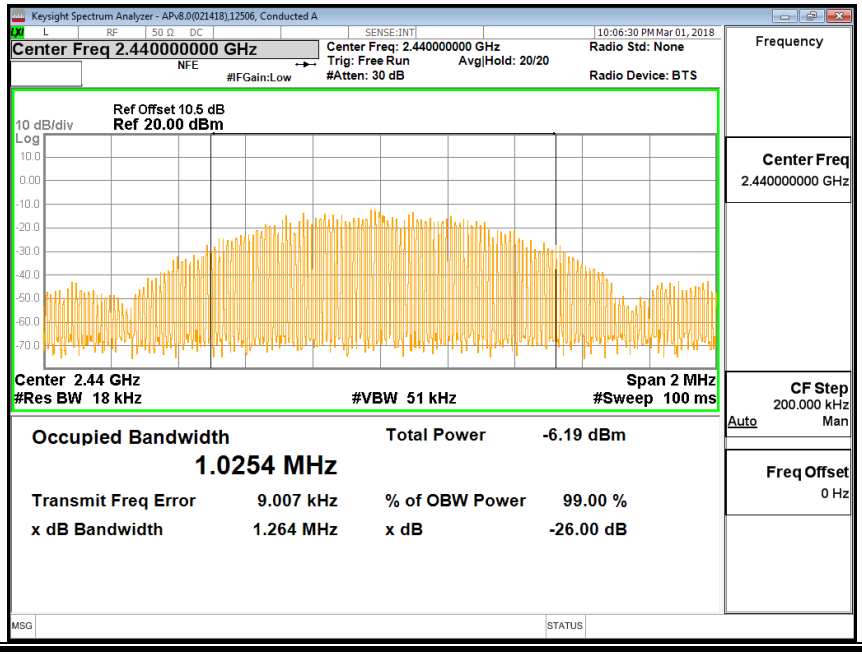
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.0229
Middle	2440	1.0254
High	2480	1.0248

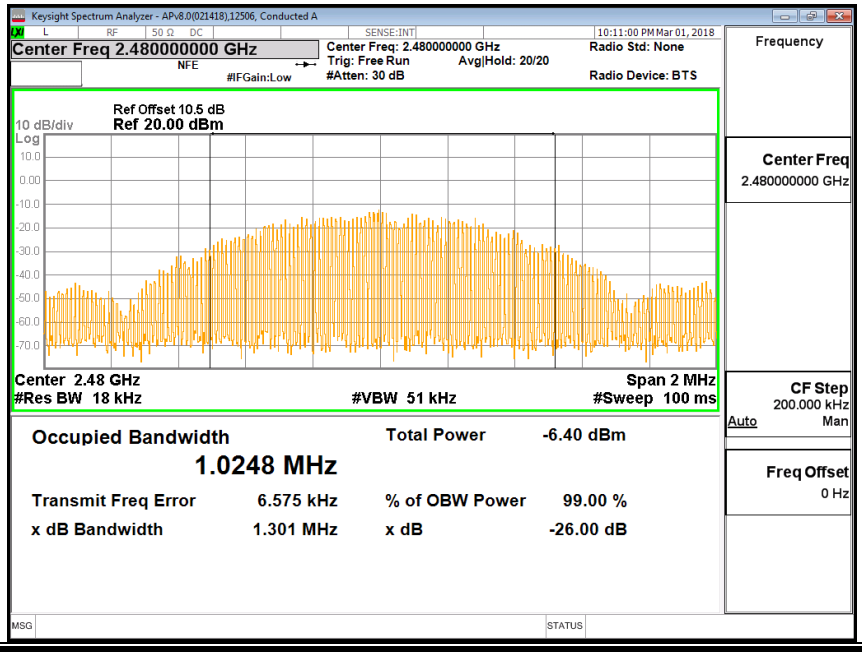
OBW LOW CH



OBW MID CH



OBW HIGH CH



8.2.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

The cable assembly insertion loss of 10.3 dB (including 10 dB pad and 0.3 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

ID:	12506	Date:	3/1/2018

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	-0.8
Middle	2440	-0.93
High	2480	-1.07

8.2.4. OUTPUT POWER

LIMITS

FCC §15.247 (b)

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

RESULTS

ID:	12506	Date:	3/1/2018

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	-0.65	30	-30.65
Middle	2440	-0.72	30	-30.72
High	2480	-0.92	30	-30.92

8.2.5. POWER SPECTRAL DENSITY

LIMITS

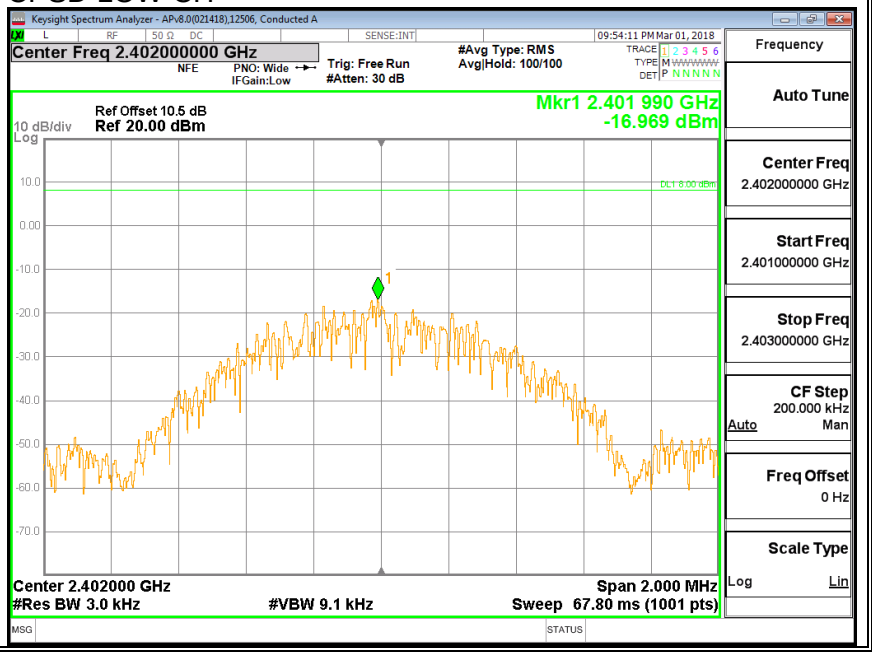
FCC §15.247 (e)

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.

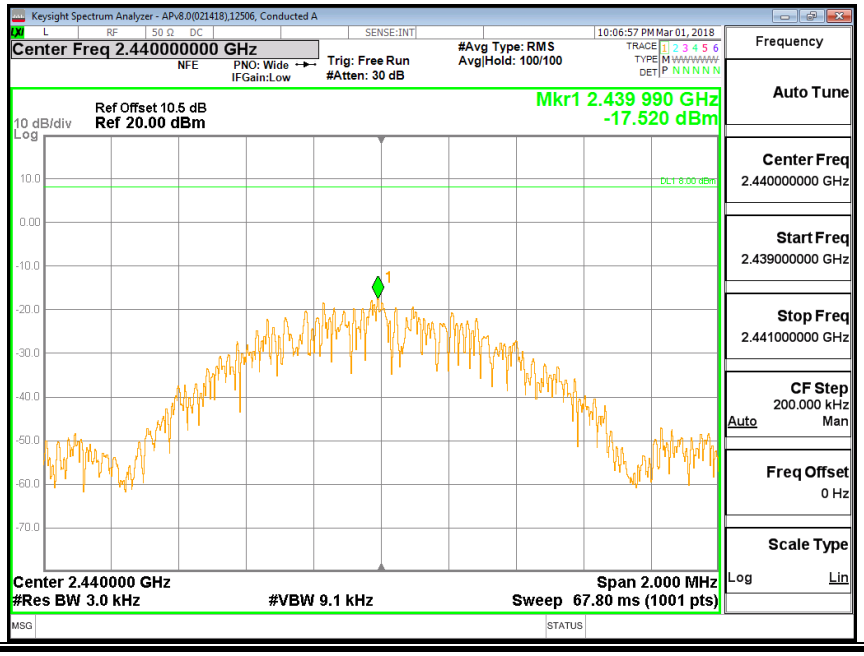
RESULTS

Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2402	-16.97	8	-24.97
Middle	2440	-17.52	8	-25.52
High	2480	-18.13	8	-26.13

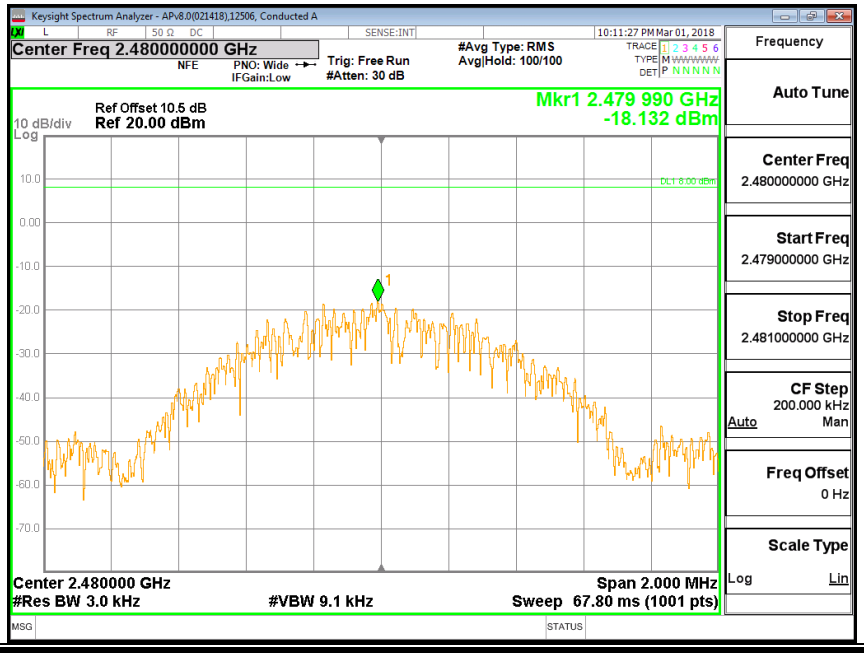
CPSD LOW CH



CPSD MID CH



CPSD HIGH CH



8.2.6. CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS

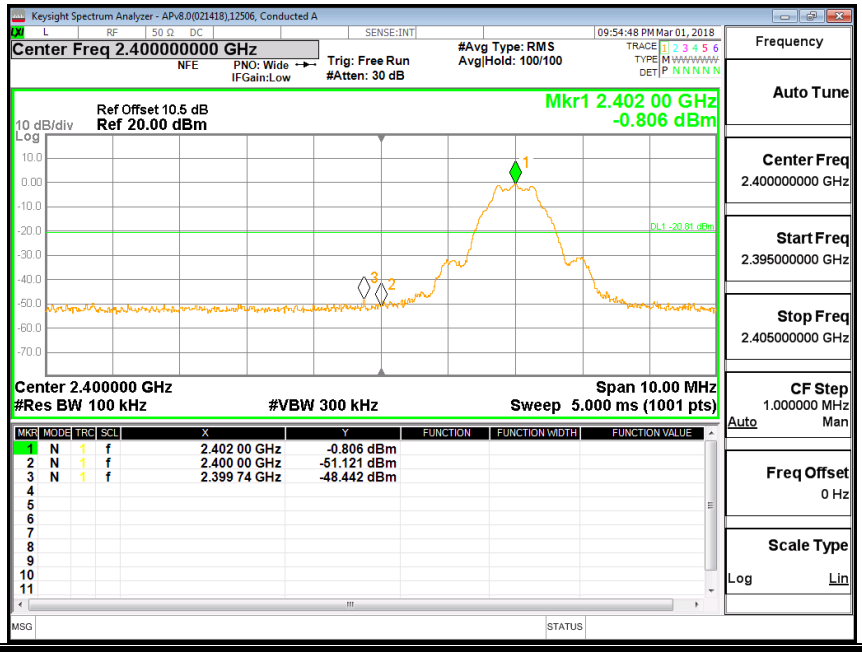
LIMITS

FCC §15.247 (d)

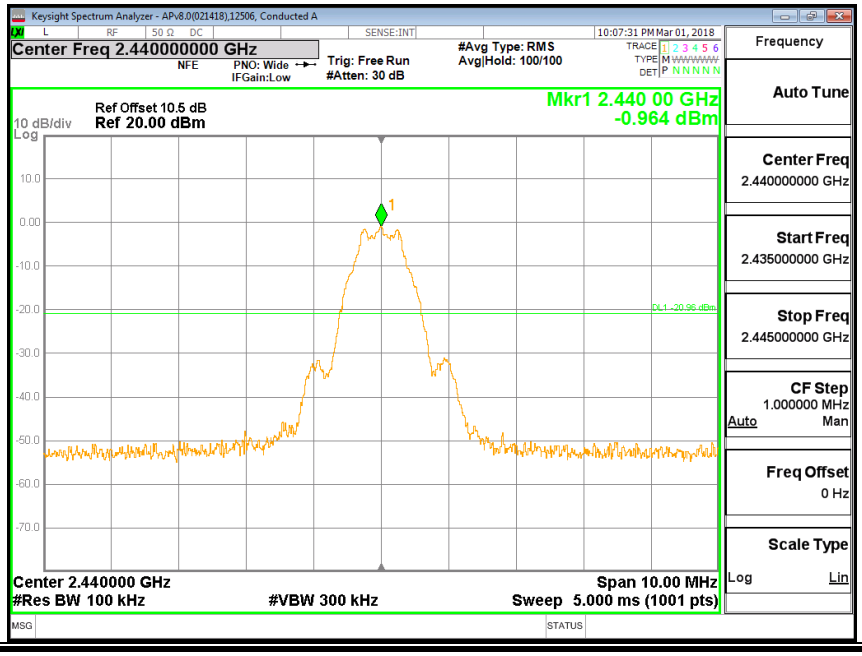
Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

RESULTS

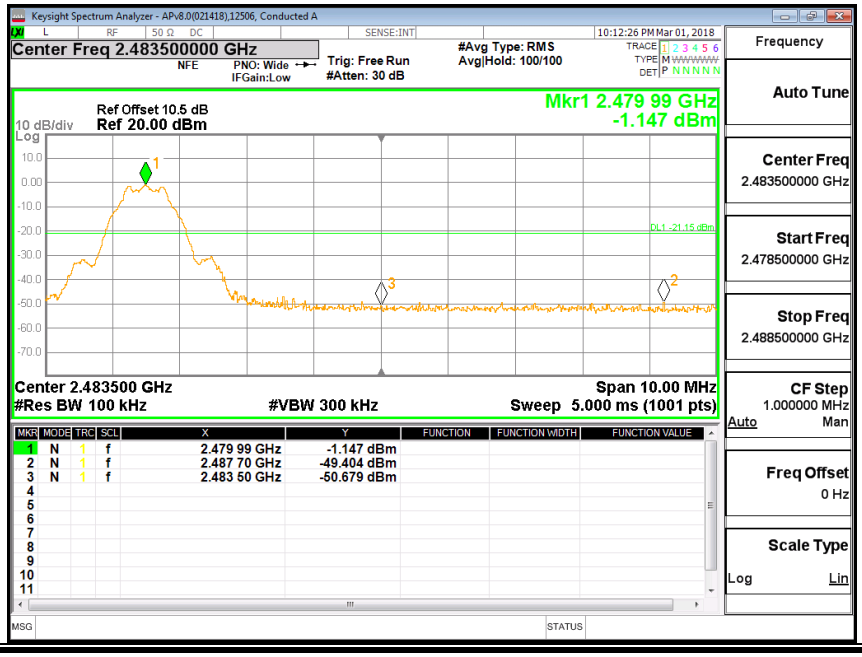
CBE LOW CH



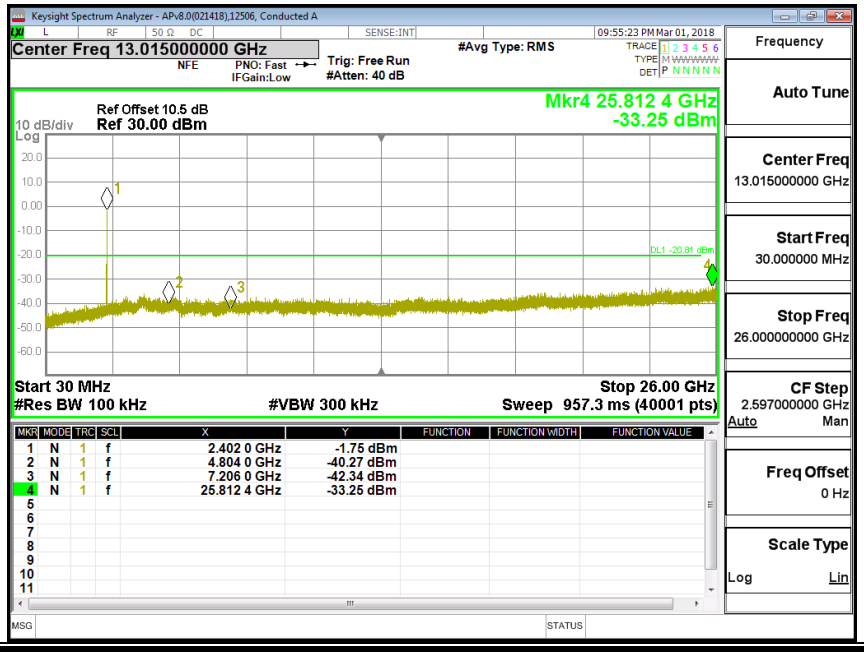
CBE MID CH



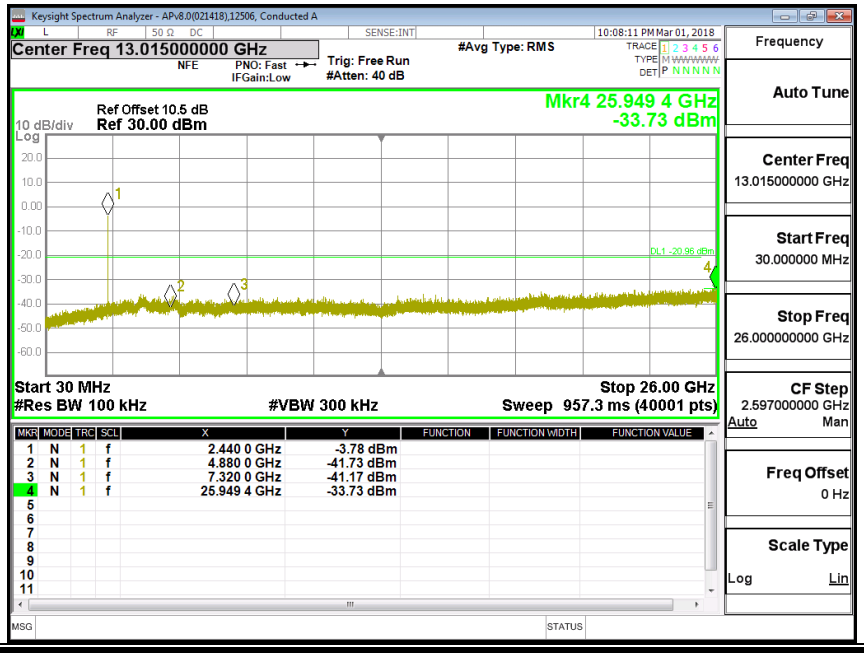
CBE HIGH CH



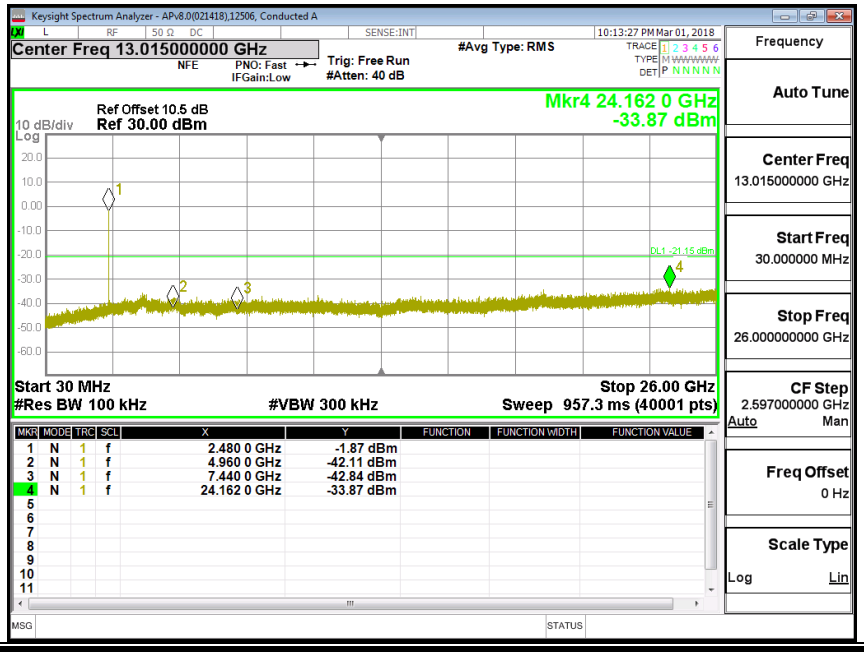
CSPUR LOW CH



CSPUR MID CH



CSPUR HIGH CH



9. RADIATED TEST RESULTS

9.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

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 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 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 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.

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.

KDB 414788 OATS and Chamber Correlation Justification

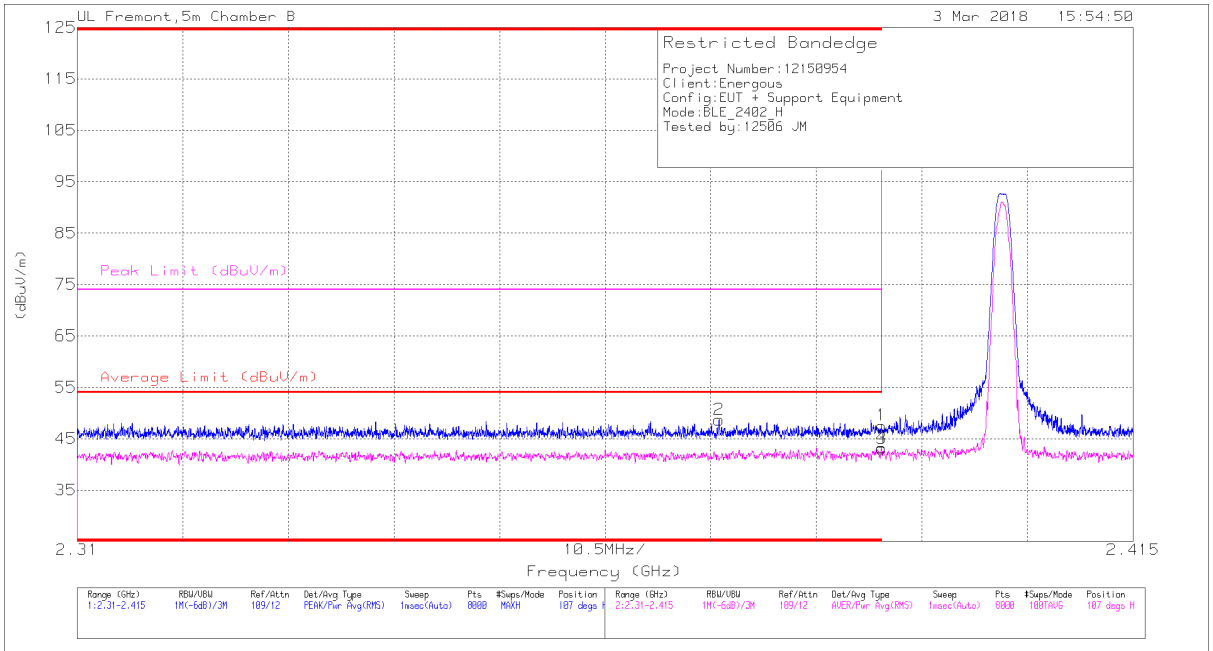
Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.

OATs and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

9.2. TRANSMITTER ABOVE 1GHZ

9.2.1. RESTRICTED BANDEDGE (LOW CHANNEL)

LOW CHANNEL HORIZONTAL

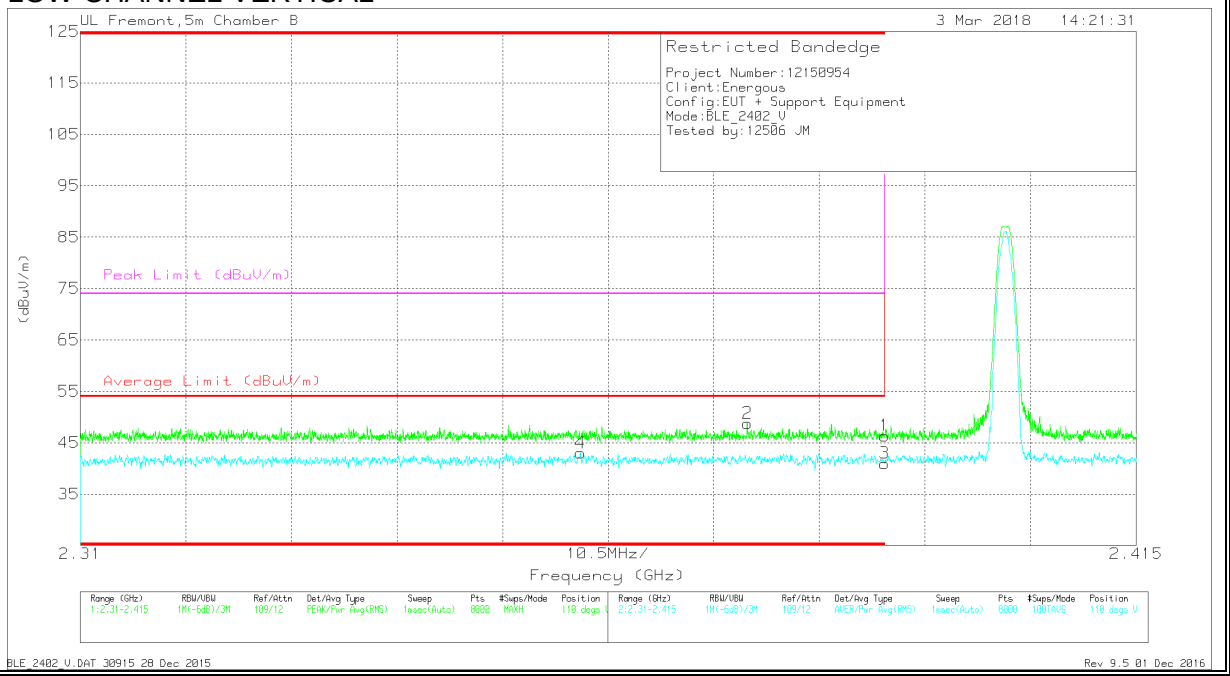


DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Fltr/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
2	* 2.374	38.09	Pk	31.9	-21.3	0	48.69	-	-	74	-25.31	107	380	H
1	* 2.39	36.87	Pk	32	-21.3	0	47.57	-	-	74	-26.43	107	380	H
3	* 2.39	27.02	RMS	32	-21.3	5.36	43.08	54	-10.92	-	-	107	380	H
4	* 2.39	27.18	RMS	32	-21.3	5.36	43.24	54	-10.76	-	-	107	380	H

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

LOW CHANNEL VERTICAL



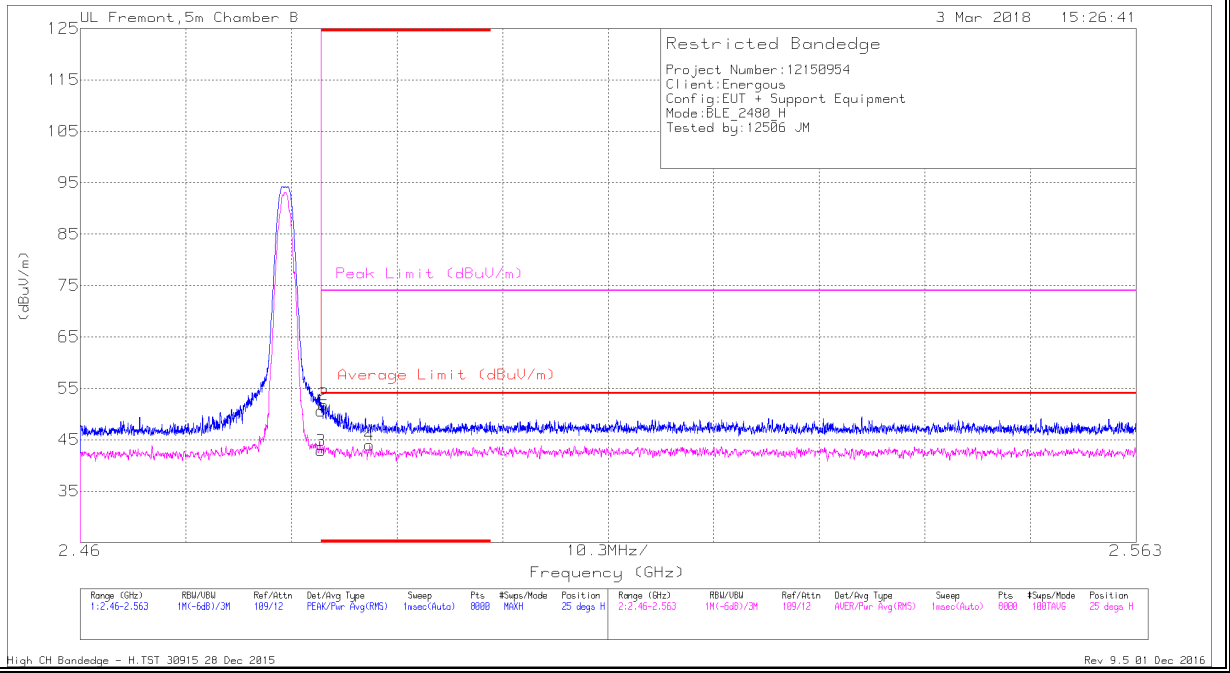
DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Fltr/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	* 2.36	27.05	RMS	31.9	-21.3	5.36	43.01	54	-10.99	-	-	110	129	V
2	* 2.376	38.16	Pk	31.9	-21.3	0	48.76	-	-	74	-25.24	110	129	V
1	* 2.39	35.65	Pk	32	-21.3	0	46.35	-	-	74	-27.65	110	129	V
3	* 2.39	24.92	RMS	32	-21.3	5.36	40.98	54	-13.02	-	-	110	129	V

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

9.2.2. AUTHORIZED BANDEDGE (HIGH CHANNEL)

HIGH CHANNEL HORIZONTAL

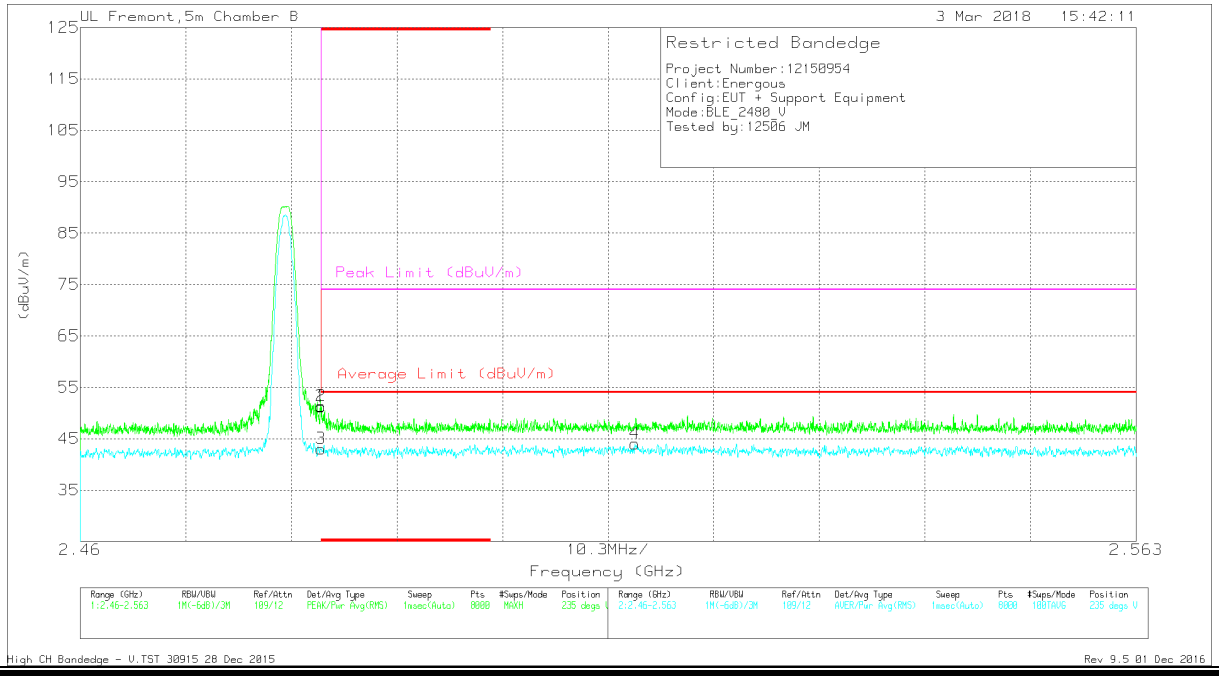


DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Fltr/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	39.44	Pk	32.5	-21.3	0	50.64	-	-	74	-23.36	25	266	H
2	* 2.484	40.62	Pk	32.5	-21.3	0	51.82	-	-	74	-22.18	25	266	H
3	* 2.484	26.31	RMS	32.5	-21.3	5.36	42.87	54	-11.13	-	-	25	266	H
4	* 2.488	27.39	RMS	32.5	-21.3	5.36	43.95	54	-10.05	-	-	25	266	H

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

HIGH CHANNEL VERTICAL



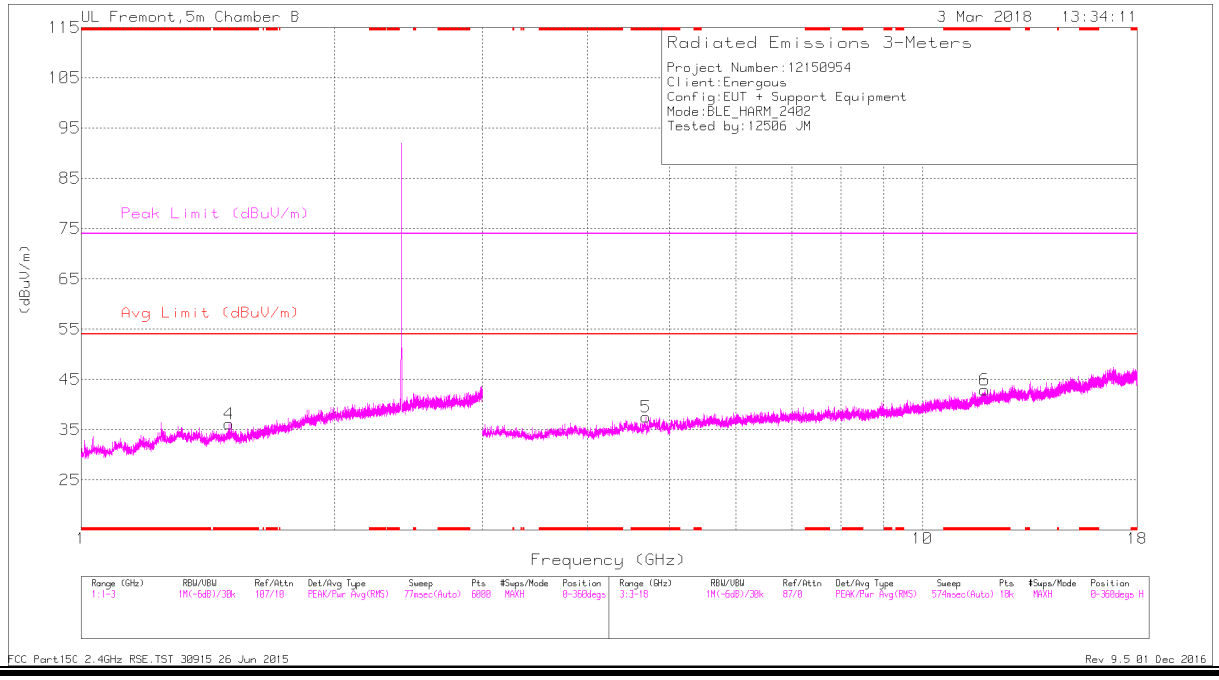
DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Fltr/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	40.02	Pk	32.5	-21.3	0	51.22	-	-	74	-22.78	235	382	V
2	* 2.484	40.17	Pk	32.5	-21.3	0	51.37	-	-	74	-22.63	235	382	V
3	* 2.484	26.49	RMS	32.5	-21.3	5.36	43.05	54	-10.95	-	-	235	382	V
4	2.514	27.18	RMS	32.6	-21.1	5.36	44.04	54	-9.96	-	-	235	382	V

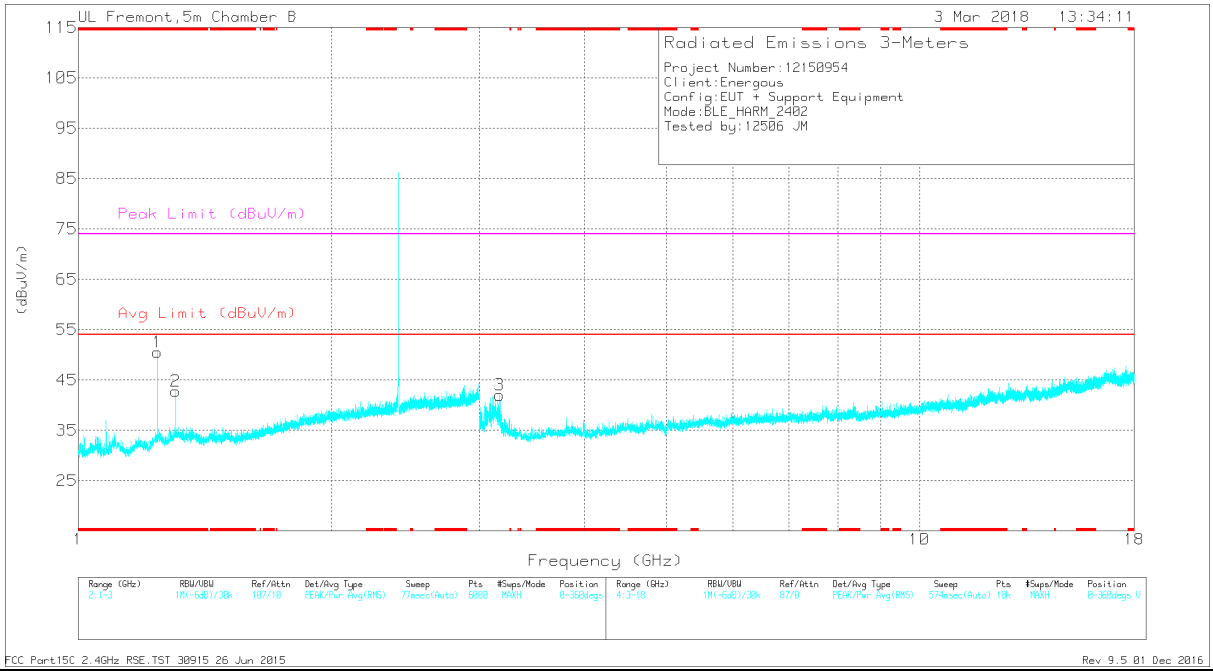
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
RMS - RMS detection

9.2.3. HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



LOW CHANNEL VERTICAL

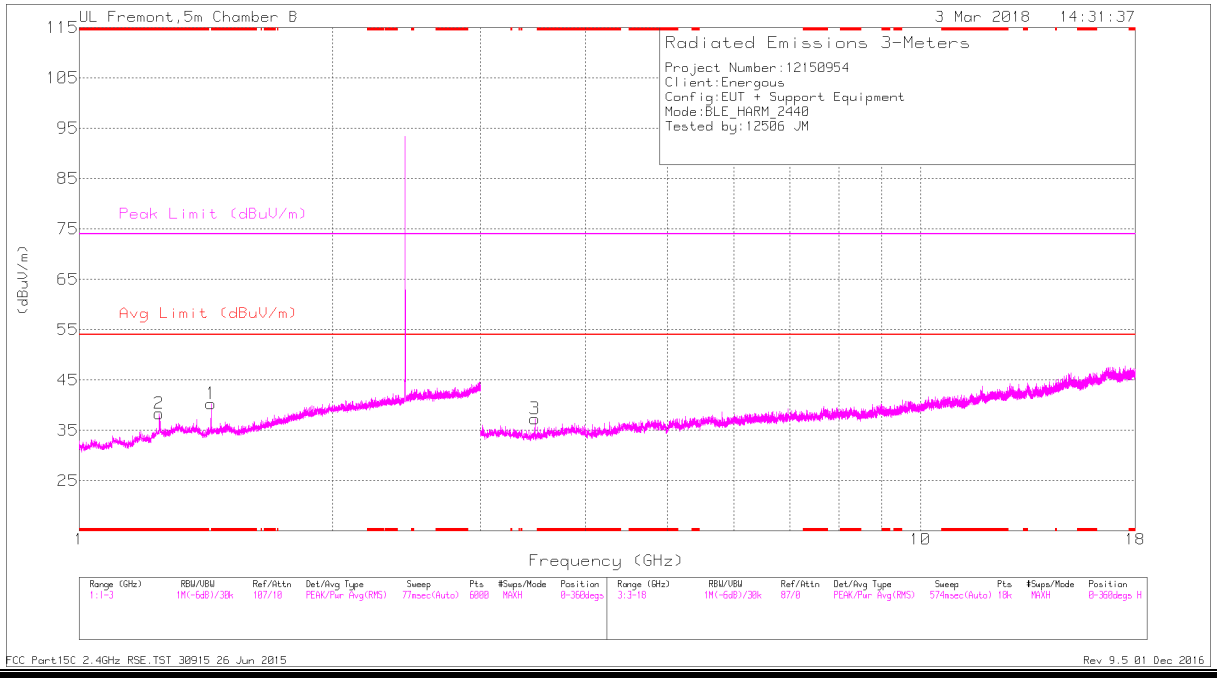


DATA

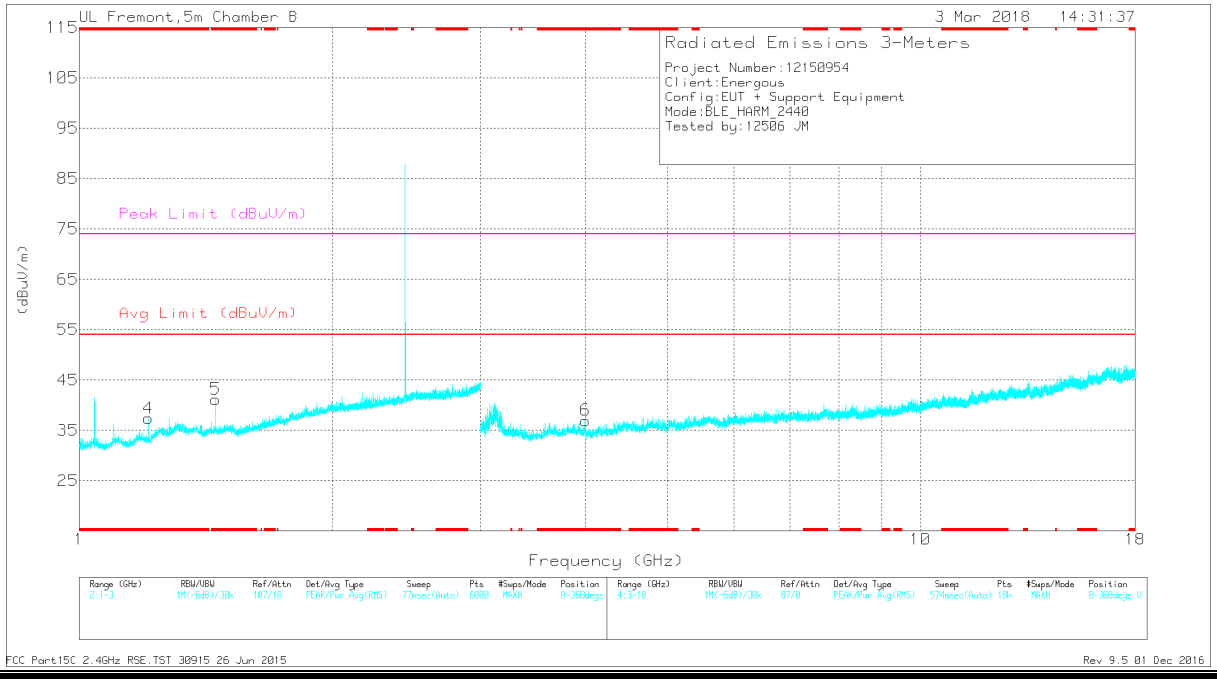
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Fltr/ Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	* 1.501	34.13	PK2	28.2	-21.2	0	41.13	-	-	74	-32.87	274	234	H
	* 1.5	18.19	MAv1	28.2	-21.2	5.36	30.55	54	-23.45	-	-	274	234	H
1	* 1.243	34.83	PK2	28.7	-22.3	0	41.23	-	-	74	-32.77	280	226	V
	* 1.242	23.77	MAv1	28.7	-22.3	5.36	35.53	54	-18.47	-	-	280	226	V
2	* 1.308	35.31	PK2	28.9	-21.9	0	42.31	-	-	74	-31.69	270	219	V
	* 1.308	23.81	MAv1	28.9	-21.9	5.36	36.17	54	-17.83	-	-	270	219	V
5	* 4.694	38.93	PK2	34.2	-30.4	0	42.73	-	-	74	-31.27	259	123	H
	* 4.692	28.16	MAv1	34.2	-30.5	5.36	37.22	54	-16.78	-	-	259	123	H
6	* 11.855	33.6	PK2	38.6	-24	0	48.2	-	-	74	-25.8	247	116	H
	* 11.854	22.97	MAv1	38.6	-23.9	5.36	43.03	54	-10.97	-	-	247	116	H
3	3.167	40.01	PK2	33	-30.7	0	42.31	-	-	-	-	247	110	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

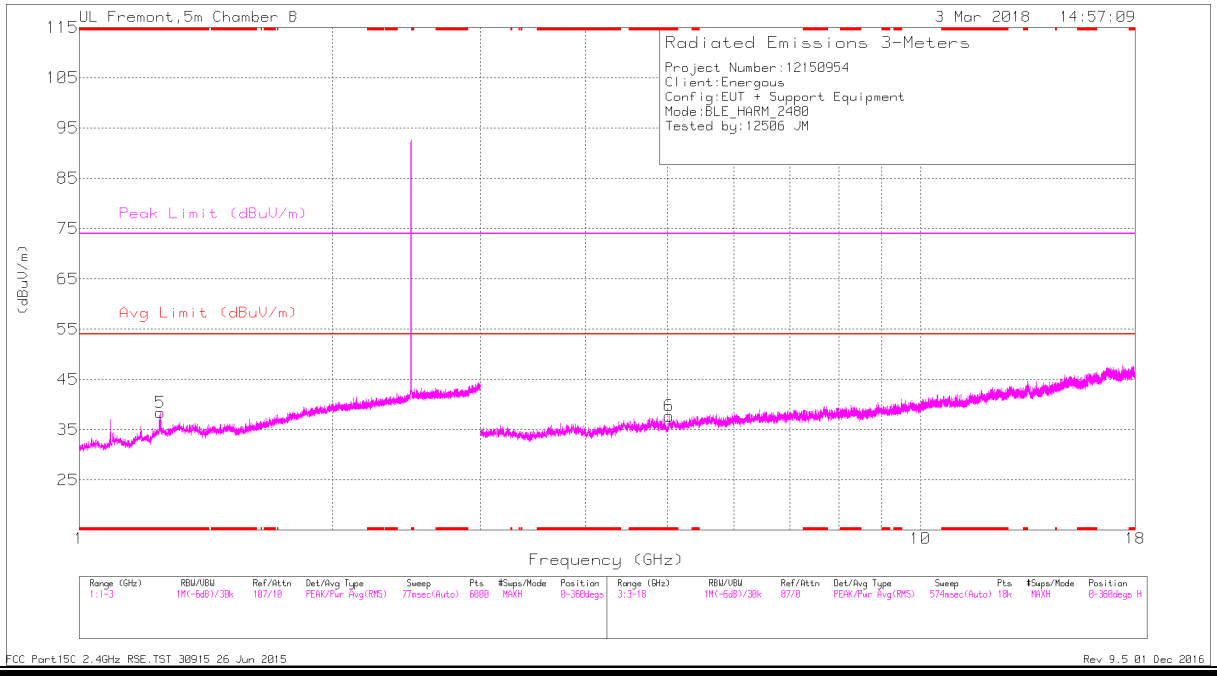


DATA

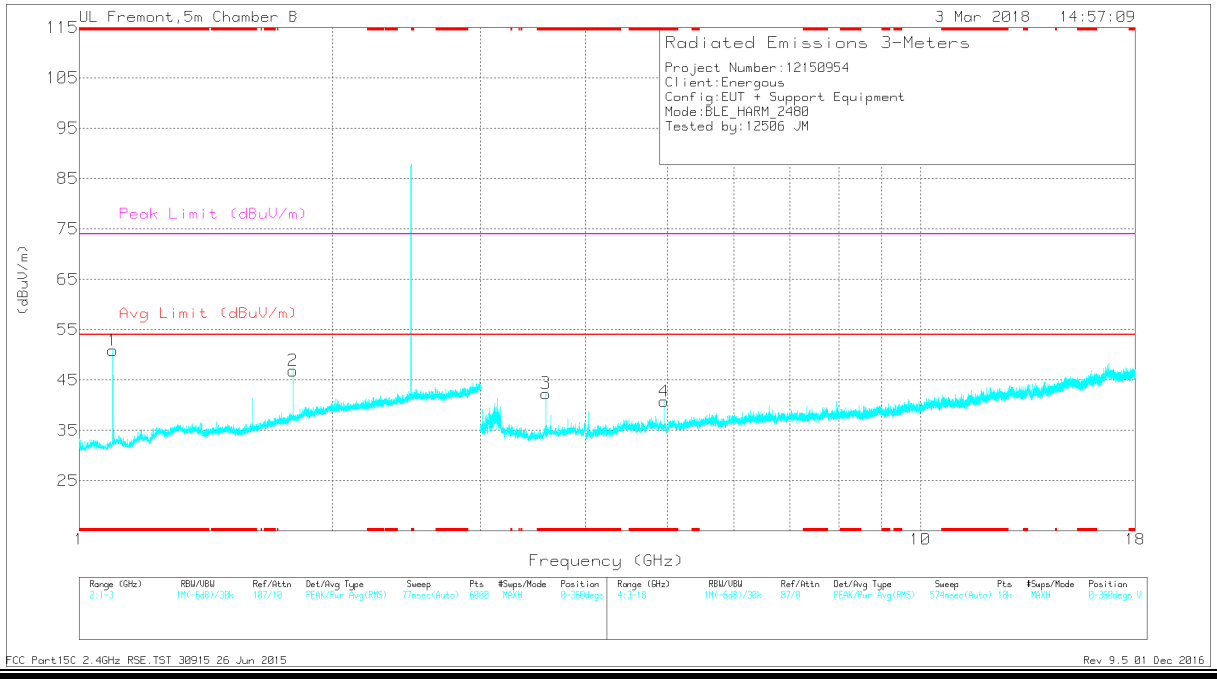
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Fltr/ Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.435	33.63	Pk	28.3	-21.6	0	40.33	-	-	-	-	0-360	103	H
2	* 1.245	35.52	PK2	28.7	-22.3	0	41.92	-	-	74	-32.08	35	121	H
	* 1.245	23.69	MAv1	28.7	-22.3	5.36	35.45	54	-18.55	-	-	35	121	H
4	* 1.209	34.86	PK2	28.1	-22.6	0	40.36	-	-	74	-33.64	41	151	V
	* 1.211	23.02	MAv1	28.2	-22.8	5.36	33.78	54	-20.22	-	-	41	151	V
5	* 1.452	35.07	PK2	28.3	-21.6	0	41.77	-	-	74	-32.23	50	169	V
	* 1.452	23.5	MAv1	28.3	-21.6	5.36	35.56	54	-18.44	-	-	50	169	V
6	* 3.998	39.45	PK2	33.5	-31.5	0	41.45	-	-	74	-32.55	80	146	V
	* 3.997	28.75	MAv1	33.5	-31.5	5.36	36.11	54	-17.89	-	-	80	146	V
3	3.482	40.06	PK2	32.7	-31.5	0	41.26	-	-	-	-	53	117	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



DATA

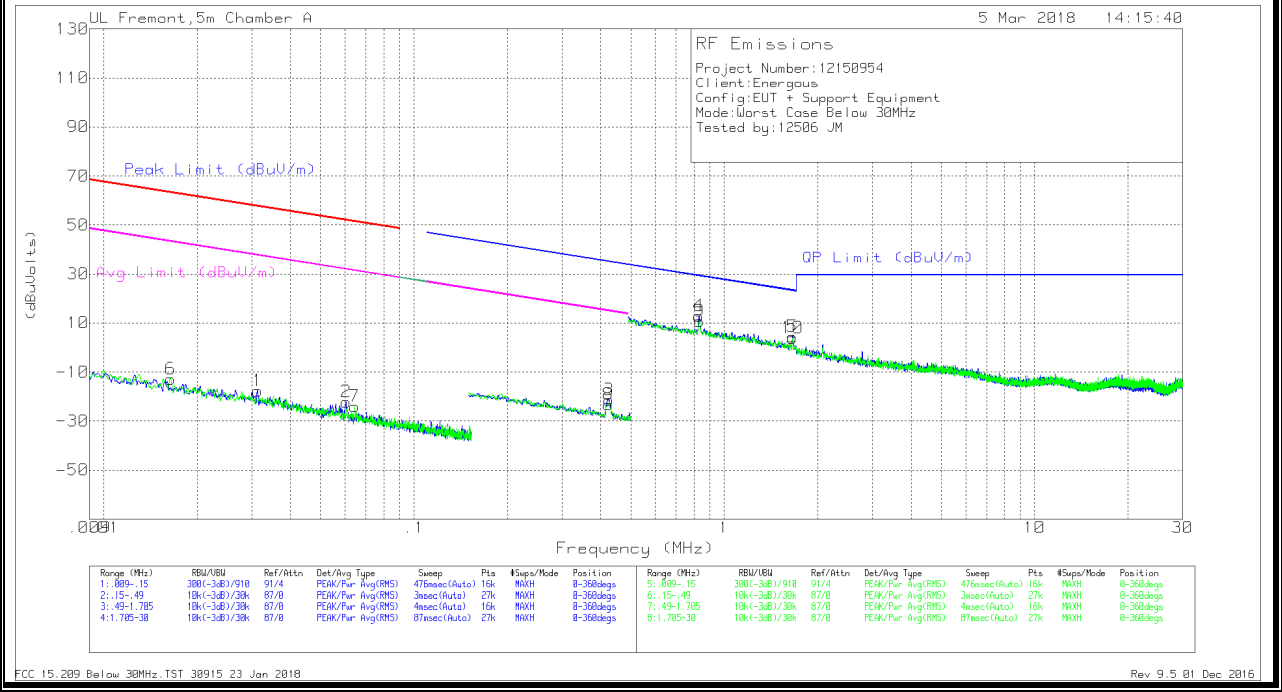
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Fltr/ Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
5	* 1.248	47.89	PK2	28.7	-22.1	0	54.49	-	-	74	-19.51	45	400	H
	* 1.249	23.6	MAv1	28.8	-22.3	5.36	35.46	54	-18.54	-	-	45	400	H
1	* 1.097	35.88	PK2	27.6	-23	0	40.48	-	-	74	-33.52	57	276	V
	* 1.098	23.84	MAv1	27.6	-23	5.36	33.8	54	-20.2	-	-	57	276	V
6	* 5.026	37.76	PK2	34.4	-29.4	0	42.76	-	-	74	-31.24	52	247	H
	* 5.027	26.94	MAv1	34.4	-29.3	5.36	37.4	54	-16.6	-	-	52	247	H
3	* 3.588	39.85	PK2	33.1	-31.7	0	41.25	-	-	74	-32.75	70	228	V
	* 3.588	28.71	MAv1	33.1	-31.7	5.36	35.47	54	-18.53	-	-	70	228	V
4	* 4.955	39.31	PK2	34.4	-30.9	0	42.81	-	-	74	-31.19	76	205	V
	* 4.954	28.51	MAv1	34.4	-30.9	5.36	37.37	54	-16.63	-	-	76	205	V
1	1.796	36.23	PK2	30.2	-21.2	0	45.23	-	-	-	-	62	270	V

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

9.3. WORST-CASE BELOW 30MHz

SPURIOUS EMISSIONS BELOW 30 MHz (WORST-CASE CONFIGURATION)

ANTENNA LOOP FACE ON AND FACE OFF



DATA

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)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
6	.01643	52.37	Pk	14.7	.1	-80	-12.83	63.27	-76.1	43.27	-56.1	-	-	-	-	0-360
1	.03133	46.97	Pk	15.2	.1	-80	-17.73	57.67	-75.4	37.67	-55.4	-	-	-	-	0-360
2	.0604	43.4	Pk	14.3	.1	-80	-22.2	51.96	-74.16	31.96	-54.16	-	-	-	-	0-360
7	.0644	41.75	Pk	14.2	.1	-80	-23.95	51.41	-75.36	31.41	-55.36	-	-	-	-	0-360
8	.42387	43.02	Pk	13.7	.1	-80	-23.18	-	-	-	-	35.06	-58.24	15.06	-38.24	0-360
3	.42537	44.65	Pk	13.8	.1	-80	-21.45	-	-	-	-	35.03	-56.48	15.03	-36.48	0-360

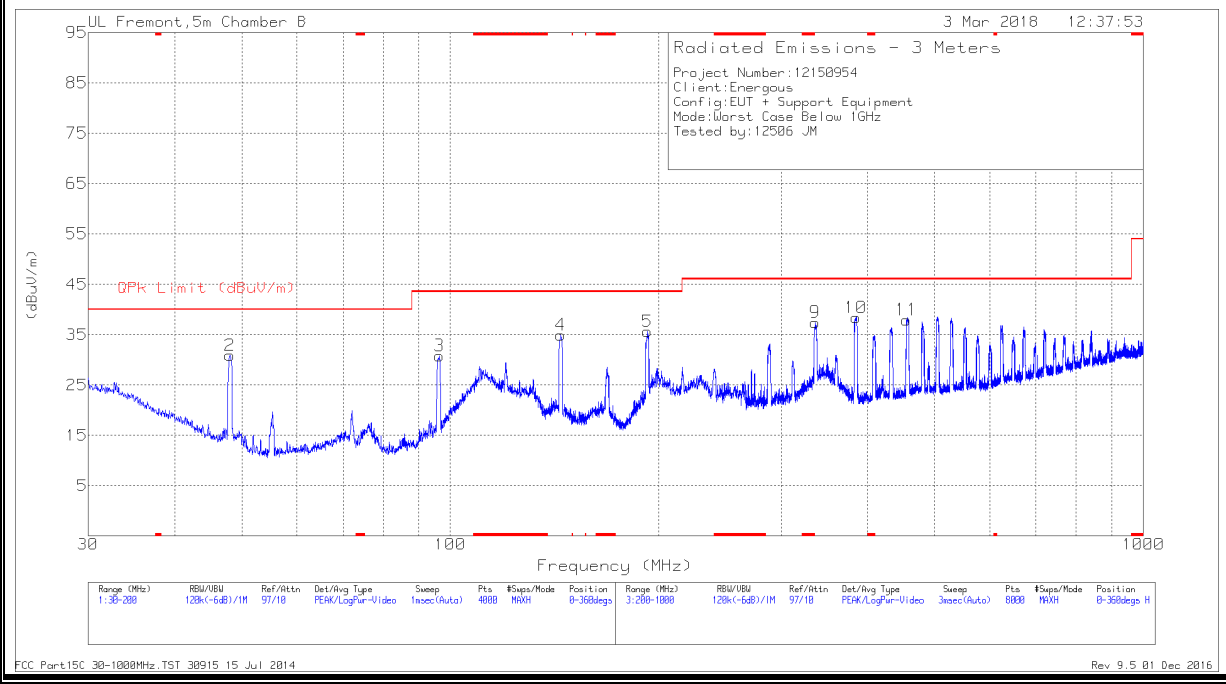
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cbl (dB)	Dist Corr 30m	Corrected Reading (dBuVolts)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
4	.82907	38.93	Pk	13.9	.1	-40	12.93	29.24	-16.31	0-360
9	.83238	36.63	Pk	13.9	.1	-40	10.63	29.21	-18.58	0-360
10	1.65991	29.5	Pk	14.2	.2	-40	3.9	23.23	-19.33	0-360
5	1.65994	30.07	Pk	14.2	.2	-40	4.47	23.23	-18.76	0-360

Pk - Peak detector

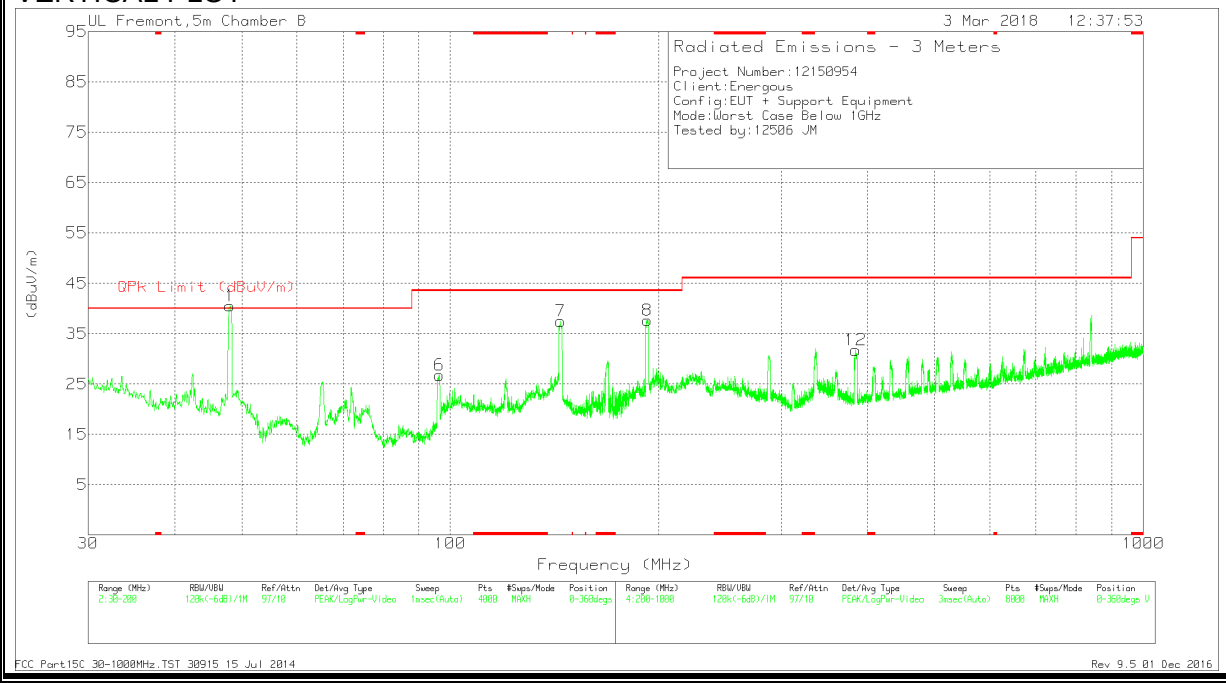
9.4. WORST-CASE 30MHz TO 1GHz

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

HORIZONTAL PLOT



VERTICAL PLOT



DATA

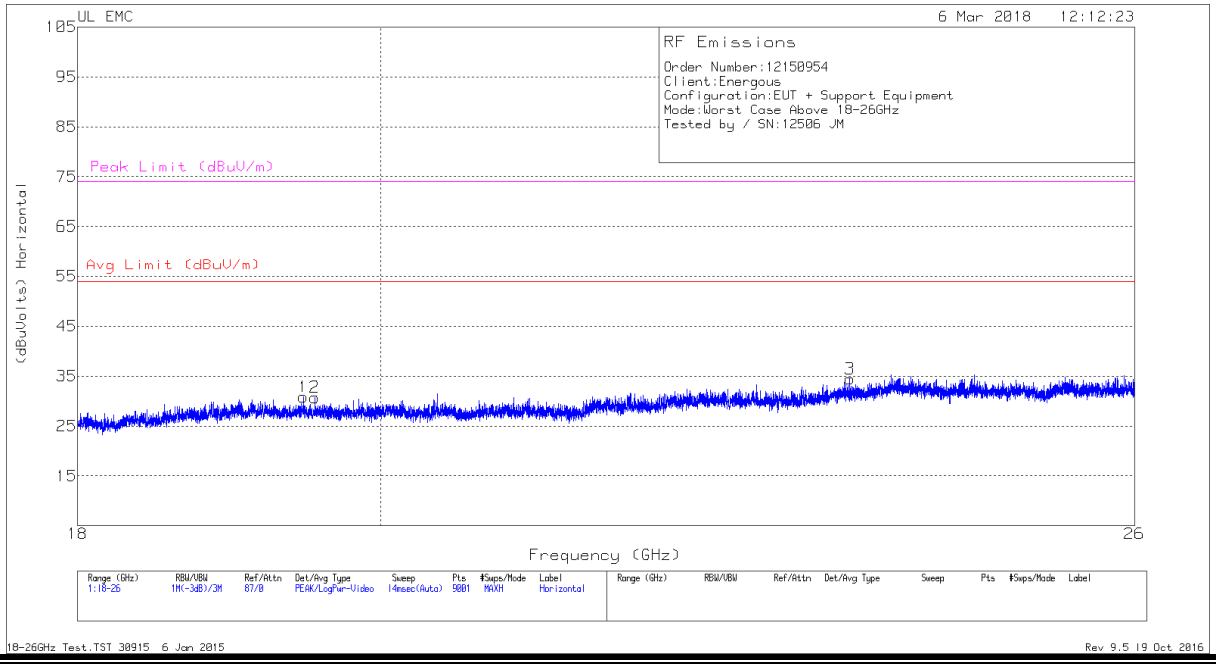
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T899 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	48.0672	47.17	Pk	12.3	-28.6	30.87	40	-9.13	0-360	400	H
1	48.0672	56.83	Pk	12.3	-28.6	40.53	40	.53	0-360	100	V
	48.1032	55.22	Qp	12.2	-28.6	38.82	40	-1.18	219	116	V
6	96.3597	41.54	Pk	13.2	-28	26.74	43.52	-16.78	0-360	100	V
3	96.4022	45.6	Pk	13.2	-28	30.8	43.52	-12.72	0-360	300	H
4	144.2271	45.43	Pk	16.9	-27.4	34.93	43.52	-8.59	0-360	200	H
7	144.2271	47.97	Pk	16.9	-27.4	37.47	43.52	-6.05	0-360	100	V
8	192.392	49.25	Pk	15.3	-26.9	37.65	43.52	-5.87	0-360	100	V
5	192.5621	47.15	Pk	15.4	-26.9	35.65	43.52	-7.87	0-360	200	H
	192.3603	46.42	Qp	15.3	-26.9	34.82	43.52	-8.7	129	106	V
9	336.0177	45.51	Pk	17.8	-25.9	37.41	46.02	-8.61	0-360	100	H
12	384.524	38.63	Pk	19.1	-26	31.73	46.02	-14.29	0-360	100	V
10	384.724	45.26	Pk	19.1	-26	38.36	46.02	-7.66	0-360	100	H
11	455.3332	43.04	Pk	20.9	-26	37.94	46.02	-8.08	0-360	100	H

Pk - Peak detector

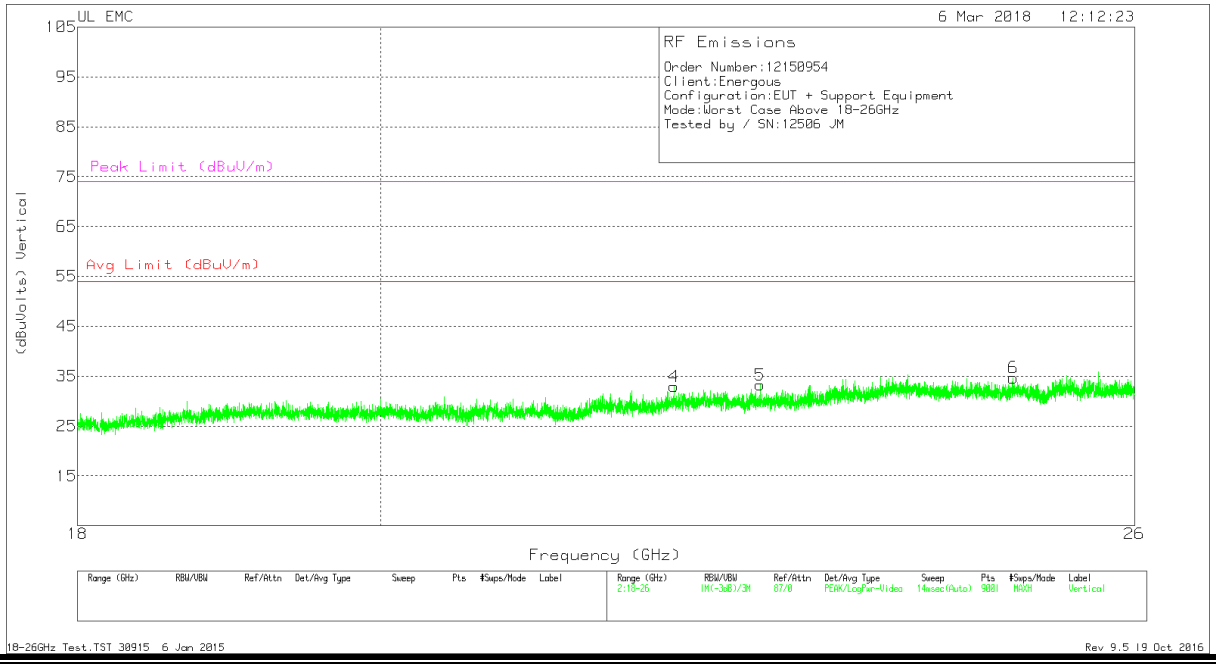
9.5. WORST-CASE ABOVE 18 GHz

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

HORIZONTAL PLOT



VERTICAL PLOT



DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T449 AF (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	19.471	32.45	Pk	32.7	-24.8	-9.5	30.85	54	-23.15	74	-43.15
2	19.549	32.6	Pk	32.7	-25.1	-9.5	30.7	54	-23.3	74	-43.3
3	23.548	34.87	Pk	33.9	-24.8	-9.5	34.47	54	-19.53	74	-39.53
4	22.152	33.74	Pk	33.4	-24.7	-9.5	32.94	54	-21.06	74	-41.06
5	22.825	34.43	Pk	33.5	-25.2	-9.5	33.23	54	-20.77	74	-40.77
6	24.927	34.17	Pk	34.3	-24.3	-9.5	34.67	54	-19.33	74	-39.33

Pk - Peak detector

10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	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

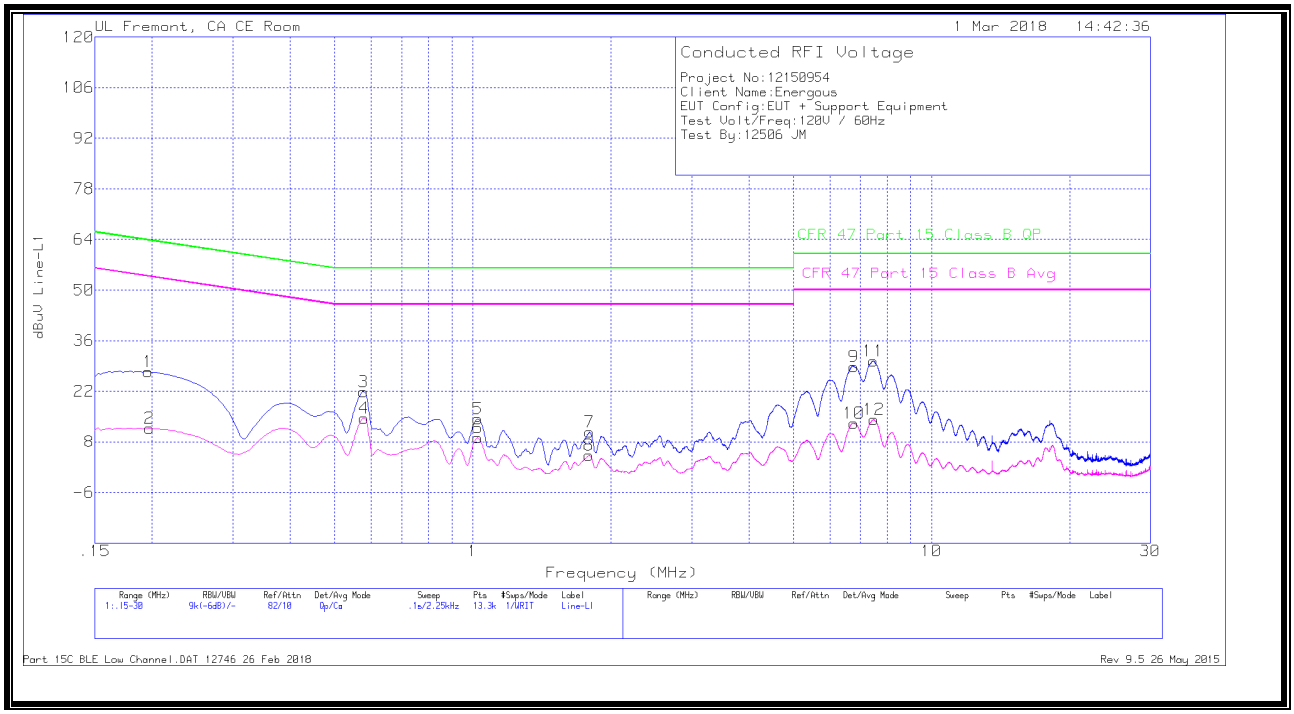
The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

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

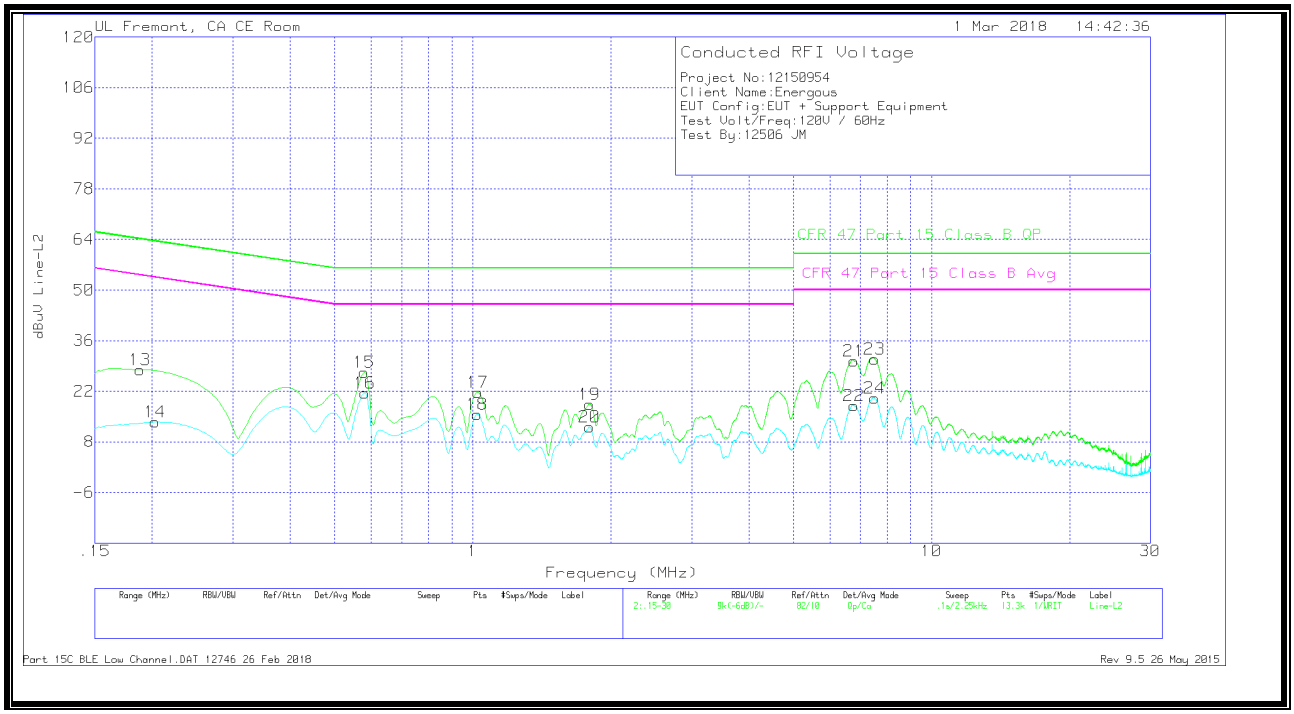


WORST EMISSIONS

Range 1: Line-L1 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L1	LC Cables C1&C3	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	Margin (dB)	CFR 47 Part 15 Class B Avg	Margin (dB)
1	.19613	27.38	Qp	0	0	27.38	63.77	-36.39	-	-
2	.19725	11.71	Ca	0	0	11.71	-	-	53.73	-42.02
3	.5775	21.87	Qp	0	0	21.87	56	-34.13	-	-
4	.57975	14.61	Ca	0	0	14.61	-	-	46	-31.39
5	1.02525	14.21	Qp	0	.1	14.31	56	-41.69	-	-
6	1.02525	9	Ca	0	.1	9.1	-	-	46	-36.9
7	1.797	10.63	Qp	0	.1	10.73	56	-45.27	-	-
8	1.7925	4.14	Ca	0	.1	4.24	-	-	46	-41.76
9	6.77288	28.59	Qp	0	.2	28.79	60	-31.21	-	-
10	6.77288	12.9	Ca	0	.2	13.1	-	-	50	-36.9
11	7.476	30.15	Qp	0	.2	30.35	60	-29.65	-	-
12	7.48388	13.98	Ca	0	.2	14.18	-	-	50	-35.82

Qp - Quasi-Peak detector
Ca - CISPR average detection

LINE 2 RESULTS



WORST EMISSIONS

Range 2: Line-L2 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L2	LC Cables C2&C3	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	Margin (dB)	CFR 47 Part 15 Class B Avg	Margin (dB)
13	.18825	27.98	Qp	0	0	27.98	64.11	-36.13	-	-
14	.20288	13.47	Ca	0	0	13.47	-	-	53.49	-40.02
15	.57975	27.21	Qp	0	0	27.21	56	-28.79	-	-
16	.58087	21.54	Ca	0	0	21.54	-	-	46	-24.46
17	1.02412	21.62	Qp	0	.1	21.72	56	-34.28	-	-
18	1.023	15.52	Ca	0	.1	15.62	-	-	46	-30.38
19	1.797	18.31	Qp	0	.1	18.41	56	-37.59	-	-
20	1.797	11.99	Ca	0	.1	12.09	-	-	46	-33.91
21	6.774	30.19	Qp	0	.2	30.39	60	-29.61	-	-
22	6.77288	17.83	Ca	0	.2	18.03	-	-	50	-31.97
23	7.51875	30.73	Qp	0	.2	30.93	60	-29.07	-	-
24	7.51875	19.92	Ca	0	.2	20.12	-	-	50	-29.88

Qp - Quasi-Peak detector
Ca - CISPR average detection