



FCC 47 CFR PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

2.4 GHz MODULAR TRANSCEIVER

MODEL NUMBER: LEA02109X0001

FCC ID: 2ACQ6-LN4

REPORT NUMBER: R10529365-E1A

ISSUE DATE: 2015-06-10

Prepared for

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NVLAP LAB CODE 200246-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	2015-06-04	Initial Issue	Jeff Moser
1	2015-06-10	Revised test method on page 53 from C63.4 to C63.10.	Jeff Moser

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: CREE INC.
4600 SILICON DR.
DURHAM, NC 27709 USA

EUT DESCRIPTION: 2.4 GHz Modular Transceiver

MODEL: LEA02109X0001

SERIAL NUMBER: Non-serialized

DATE TESTED: 2015-04-02 to 2015-05-20

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass

UL LLC 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 LLC 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 LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released
For UL LLC By:



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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 4, and RSS-247 Issue 1.

- Note – Radiated testing above 1GHz was performed on a 1.5m table height, per ANSI C63.10: 2013. All other testing was performed per ANSI C63.10: 2009.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 12 Laboratory Dr., Research Triangle Park, NC 27709, USA.

12 Laboratory Dr., RTP, NC 27709	
☒	Chamber A
☒	Chamber C

UL LLC (RTP) is accredited by NVLAP, Laboratory Code 200246-0. The full scope of accreditation can be viewed at <http://ts.nist.gov/standards/scopes/2002460.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:

Test	Uncertainty
Conducted Emissions (0.150-30MHz)	+/- 2.37 dB
Total RF power, conducted	+/- 0.45 dB
RF power density, conducted	+/- 1.5 dB
Spurious emissions, conducted	+/- 1.46 dB
Radiated Emissions (30-1000 MHz)	+/- 6.04 dB (3m)
Radiated Emissions (1-6 GHz)	+/- 5.96 dB
Radiated Emissions (6-18 GHz)	+/- 6.10 dB
Radiated Emissions (18-26 GHz)	+/- 6.81 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The 2.4 GHz Modular Transceiver, p/n LEA02109X0001 is a 2.4 GHz DSSS transceiver used with light fixtures. The module uses an O-QPSK modulation and a 250 kbps data rate. The module was tested as a stand-alone device.

The radio module is manufactured by Cree Inc.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2405 - 2480	O-QPSK	5.09	3.23

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a trace antenna, with a maximum gain of 1.7 dBi.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was the following:

128RFR2_MOD_11.hex
128RFR2_MOD_18.hex
128RFR2_MOD_25.hex
128RFR2_MOD_26.hex

5.5. WORST-CASE CONFIGURATION AND MODE

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

The fundamental of the EUT was investigated in 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.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
DC power supply	Electro Industries	DIGI 360	None	NA

I/O CABLES

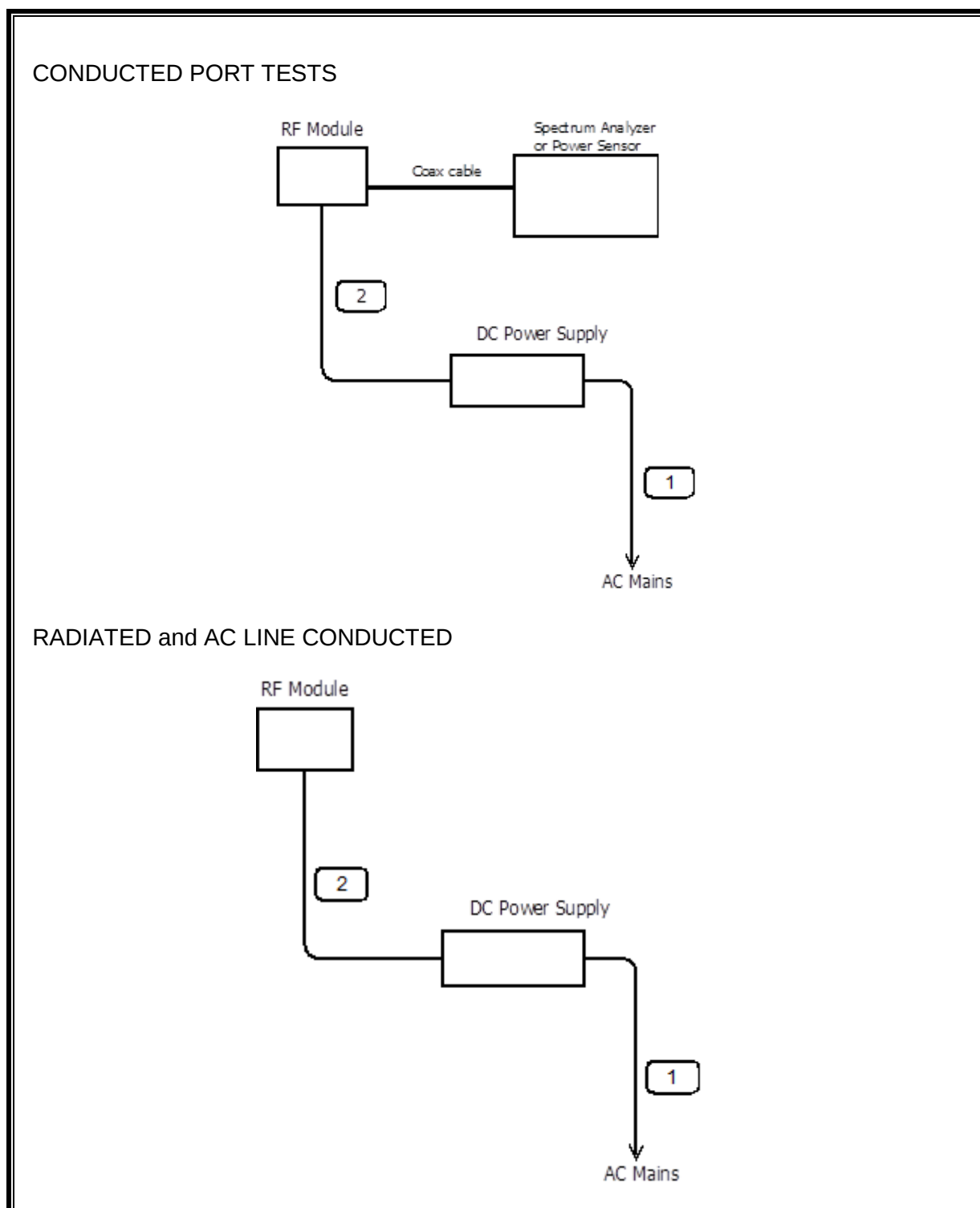
I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	1	AC inlet	Unshielded	1.5	AC input to DC power supply. 3C/18AWG power cord.
2	DC	1	DC	Unshielded	1	2-pin connector at RF-module end, banana leads at power-supply end. Two 22AWG wires.

TEST SETUP

Different Radio Modules were provided. 3 modules were provided for Radiated Emissions testing (Low Channel, Mid Channel and High Channel) and 1 module was provided for Conducted Port tests that was programmed onsite by Cree Engineers. Additionally, one of the Radiated samples was programmed onsite for Channel 25.

Note, the Low and Mid Channel's output power was set for 5 dBm during testing. The High Channel output power was set for 2.5 dBm during testing. It's Cree's intent for all channels, except the high channel to be set for a target of roughly 5 dBm. The high channel will be set for 2.5 dBm

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

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

Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	Common Equipment				
SA0019	Spectrum Analyzer	Agilent Technologies	E4446	2014-06-12	2015-06-30
PAR041 (S/N 100185)	Power Meter, DC to 40GHz	Rohde & Schwarz	NRVD	2015-01-07	2016-01-31
PAR043 (S/N 100042)	Power Sensor, DC to 18GHz	Rohde & Schwarz	NRV-Z51	2015-01-05	2016-01-31
MM0150	Digital Multimeter, 4½ Digit (True RMS AC, AC+DC measurement)	Agilent	U1252A	2014-09-04	2016-09-30
HI0041	Temp/Humid/Pressure Meter	Cole-Parmer	99760-00	2015-03-23	2016-03-31

Radiated Disturbance Emissions (E-field) – Chamber C (Above 1 GHz)

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	1-18 GHz				
AT0062	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2014-07-22	2015-07-31
	18-40 GHz (calibrated as set)				
AT0063	Horn Antenna, 18-26.5GHz	ARA	MWH-1826/B	2014-07-23	2015-07-31
AT0061	Horn Antenna, 25.5-40GHz	ARA	MWH-2640/B	2014-07-23	2015-07-31
	Gain-Loss Chains				
SAC_G (BOM) 1-18GHz	Gain-Loss string for Hybrid antenna at 3m	Various	Various	2015-01-26	2016-01-31
SAC_G (BOM) 18-40GHz	Gain-Loss string for Hybrid antenna at 3m	Various	Various	2015-01-26	2016-01-31
	Receiver & Software				
SA0018	Spectrum Analyzer	Agilent	N9030A	2014-06-24	2015-06-30
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
	Additional Equipment used				
HI0034	Temp/Humid/Pressure Meter	Cole-Parmer	99760-00	2015-03-23	2016-03-31

Radiated Disturbance Emissions (E-field) – Chamber A (Below 1 GHz)

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	30-1000 MHz Range				
AT0025	Biconical Antenna, 30 to 300 MHz	Schaffner-Chase EMC Ltd.	VBA6106A	2014-07-01	2015-07-31
AT0030	Log-periodic Antenna, 200 MHz to 1000 MHz	Schaffner	UPA6109	2014-07-01	2015-07-31
	Gain-Loss Chains				
SAC_C (Biconical 3m location)	Gain-Loss string for biconical antenna at 3m	Various	Various	2014-09-03	2015-09-30
SAC_D (Log-Periodic 3m location)	Gain-Loss string for log-periodic antenna at 3m	Various	Various	2014-07-17	2015-07-31
	Receiver & Software				
SAR003	Spectrum Analyzer / Receiver	Rohde & Schwarz	ESIB40 (1088.7490.40)	2014-07-14	2015-07-31
SA0016	Spectrum Analyzer	Agilent	N9030A	2014-09-03	2015-09-30
SOFTMI	EMI Software	UL	Version 9.5	NA	NA
	Additional Equipment used				
HI0034	Temp/Humid/Pressure Meter	Cole-Parmer	99760-00	2015-03-23	2016-03-31

Conducted Disturbance Emissions - Voltage

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	Equipment – Ground Plane E				
S/N 101793	EMI Test Receiver 9kHz-3.6GHz	Rohde & Schwarz	ESR3	2014-05-26	2015-05-31
ATA509	Coaxial cable, 20 ft., BNC - male to BNC-male	UL	RG-223	2014-09-15	2015-07-31
HI0069	Temp/Humid/Pressure Meter	Cole-Parmer	99760-00	2014-06-27	2015-06-30
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
	Transient Limiter				
ATA508	Transient Limiter, 0.009 to 100 MHz	Electro-Metrics	EM 7600	2014-09-03	2015-09-30
	LISN (FCC & CISPR testing)				
LISN002	LISN, 50-ohm/50-uH, 2-conductor, 25A	Fischer Custom Com.	FCC-LISN-50-25-2-01-550V	2014-09-04	2015-09-30

7. ANTENNA PORT TEST RESULTS

7.1. O-QPSK MODE IN THE 2.4 GHz BAND

7.1.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

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

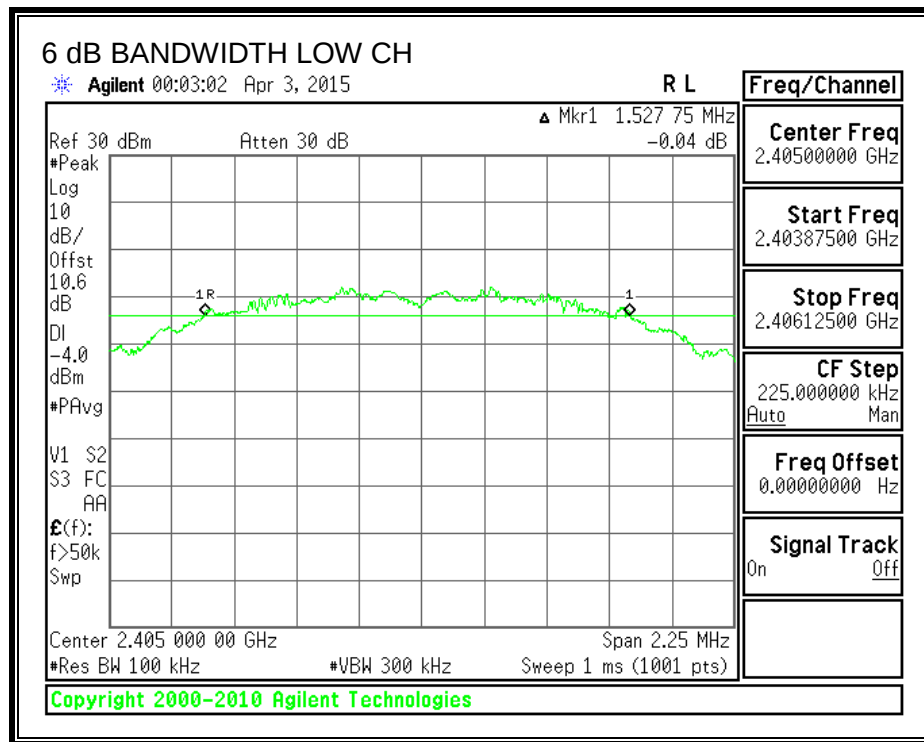
TEST PROCEDURE

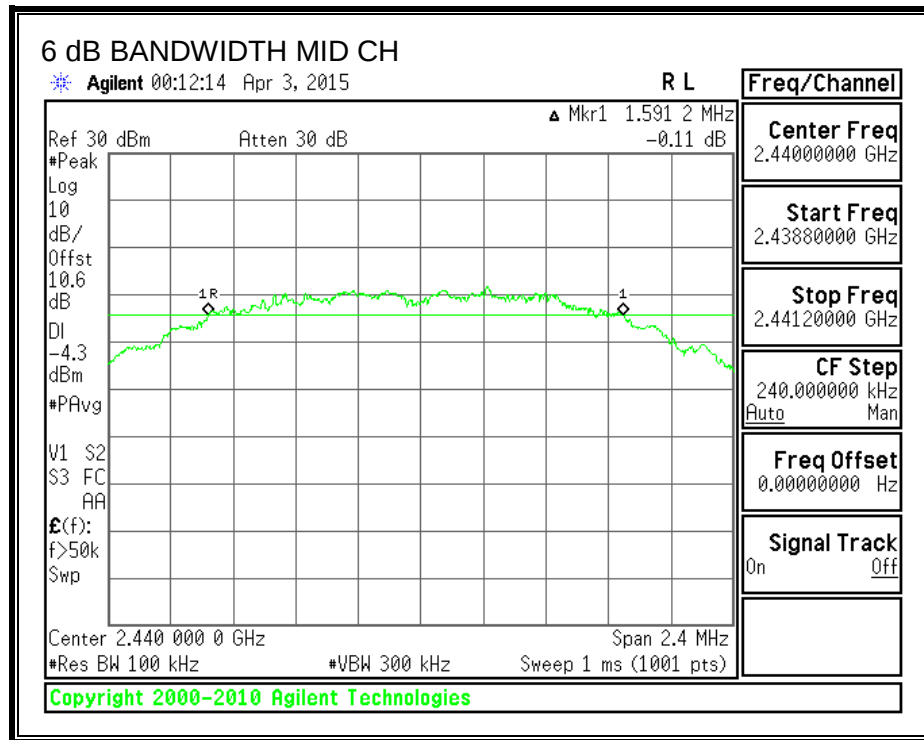
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

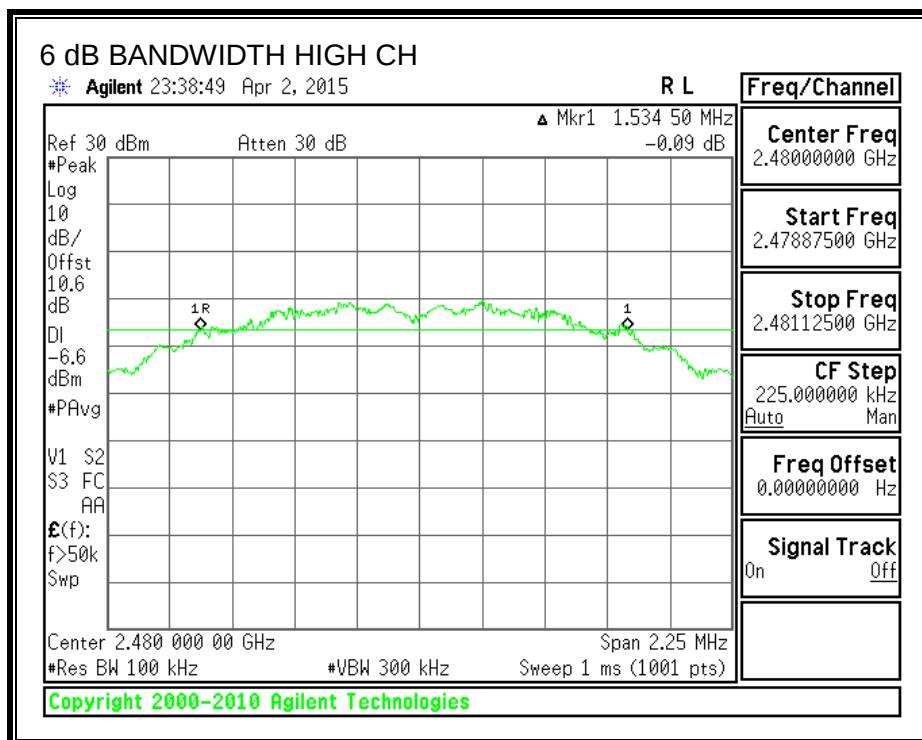
RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2405	1.527	0.5
Middle	2440	1.591	0.5
High	2480	1.534	0.5

6 dB BANDWIDTH







7.1.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

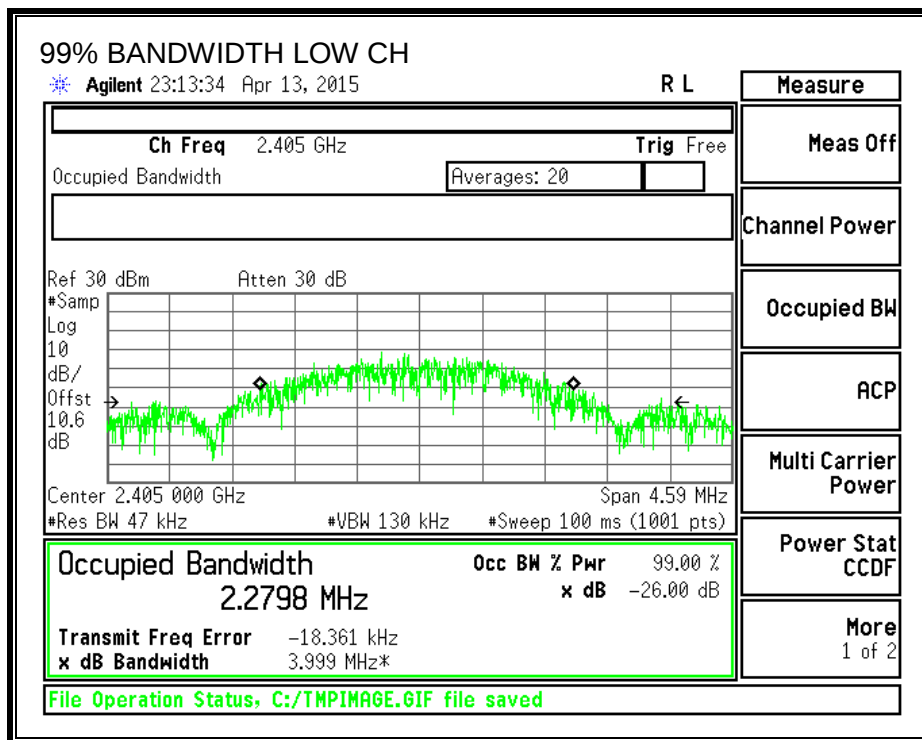
TEST PROCEDURE

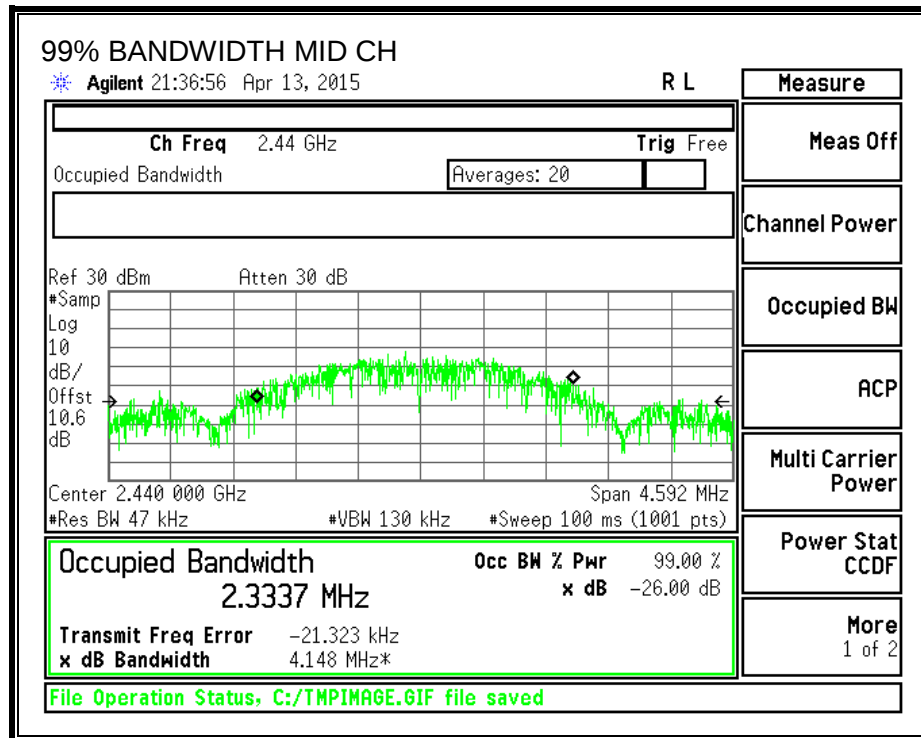
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 5% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

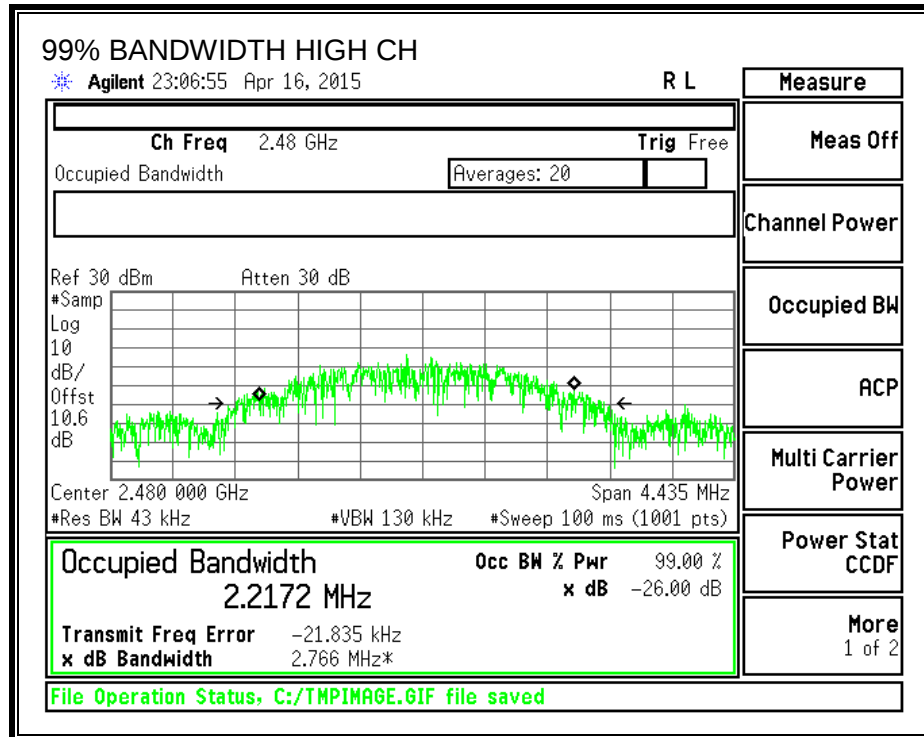
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2405	2.2798
Middle	2440	2.3337
High	2480	2.2172

99% BANDWIDTH







7.1.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

The maximum antenna gain is less than or equal to 6 dBi (0 dBi), therefore the limit is 30 dBm.

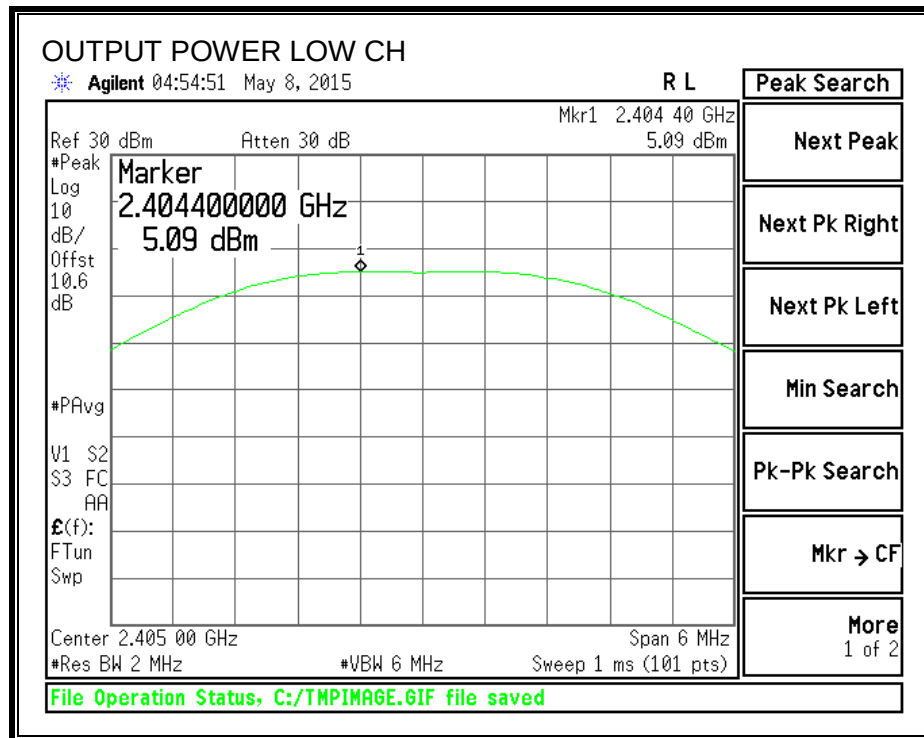
TEST PROCEDURE

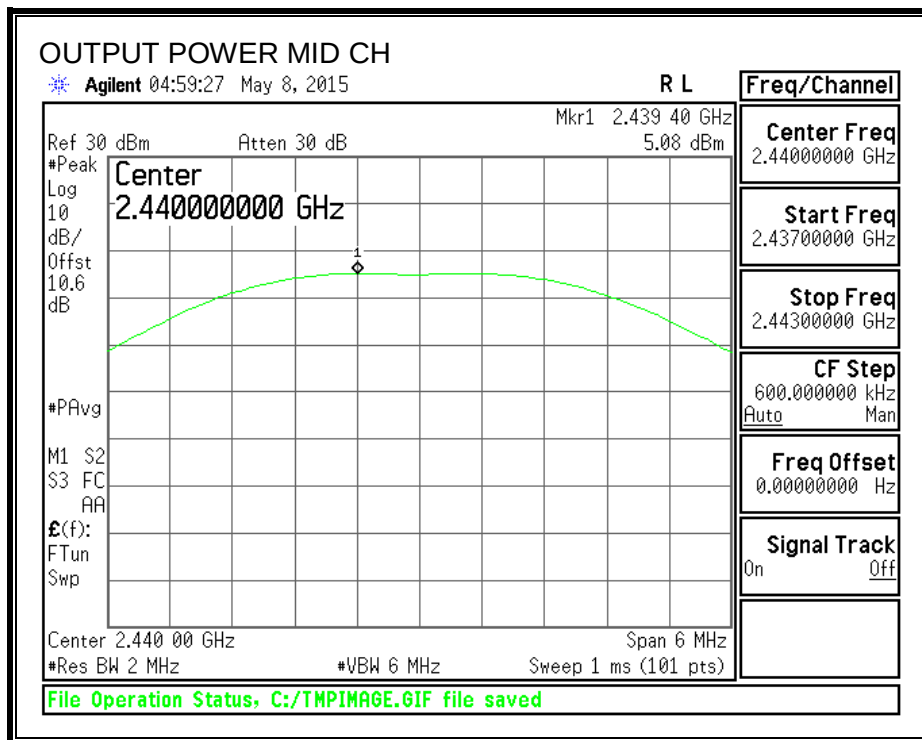
The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 99% bandwidth of the EUT.

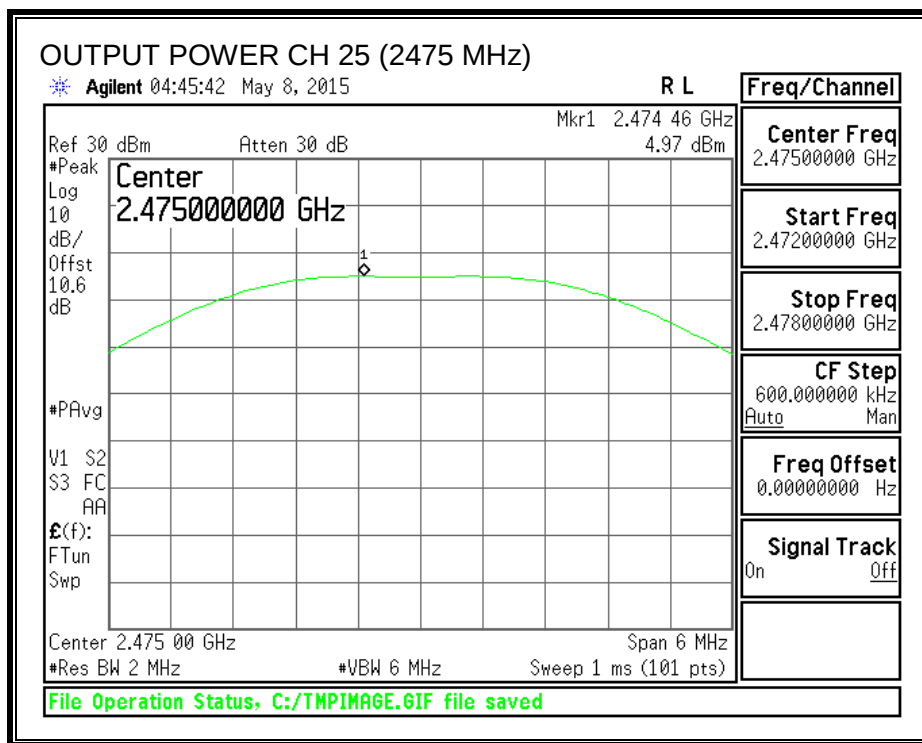
RESULTS

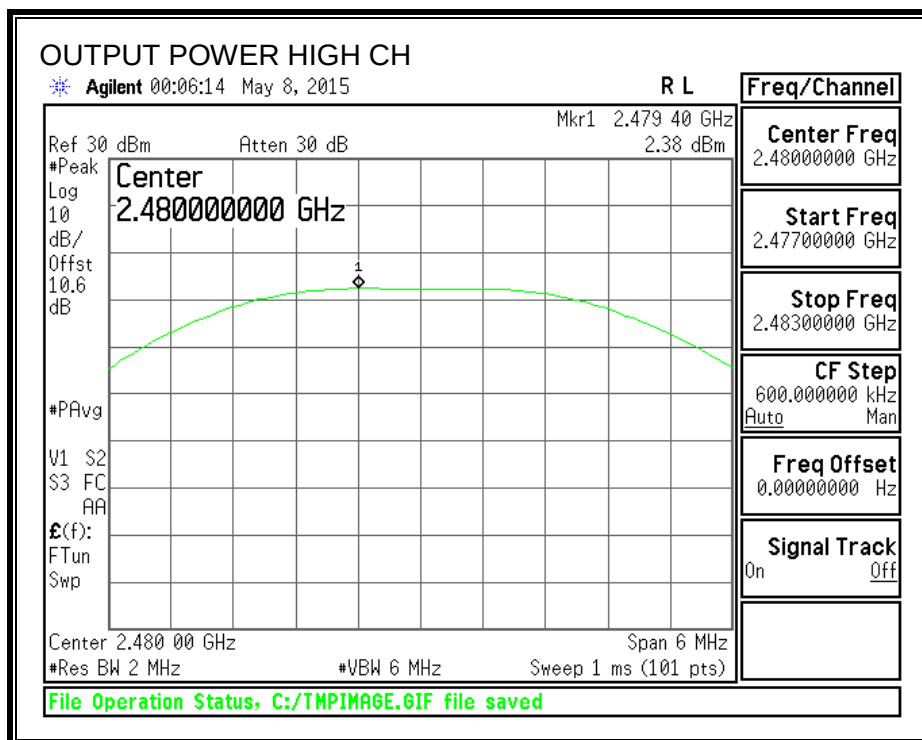
Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2405	5.09	30	-24.91
Middle	2440	5.08	30	-24.92
-	2475	4.97	30	-25.03
High	2480	2.38	30	-27.62

OUTPUT POWER









7.1.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 10.6 dB (including 10 dB pad and 0.6 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Power (dBm)
Low	2405	4.72
Middle	2440	4.77
-	2475	4.74
High	2480	2.05

7.1.5. 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.

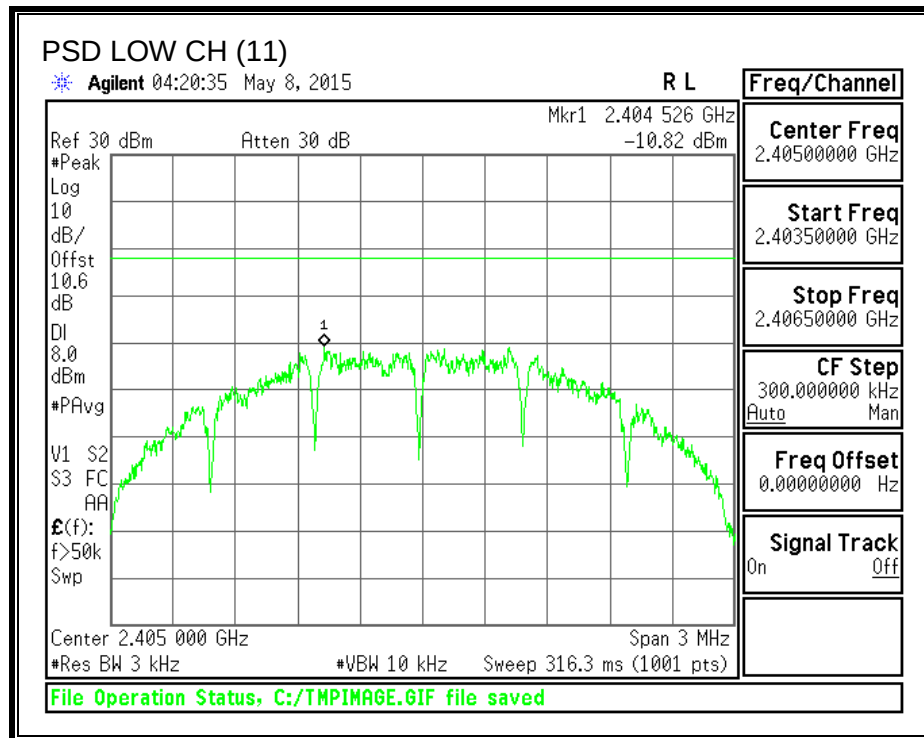
TEST PROCEDURE

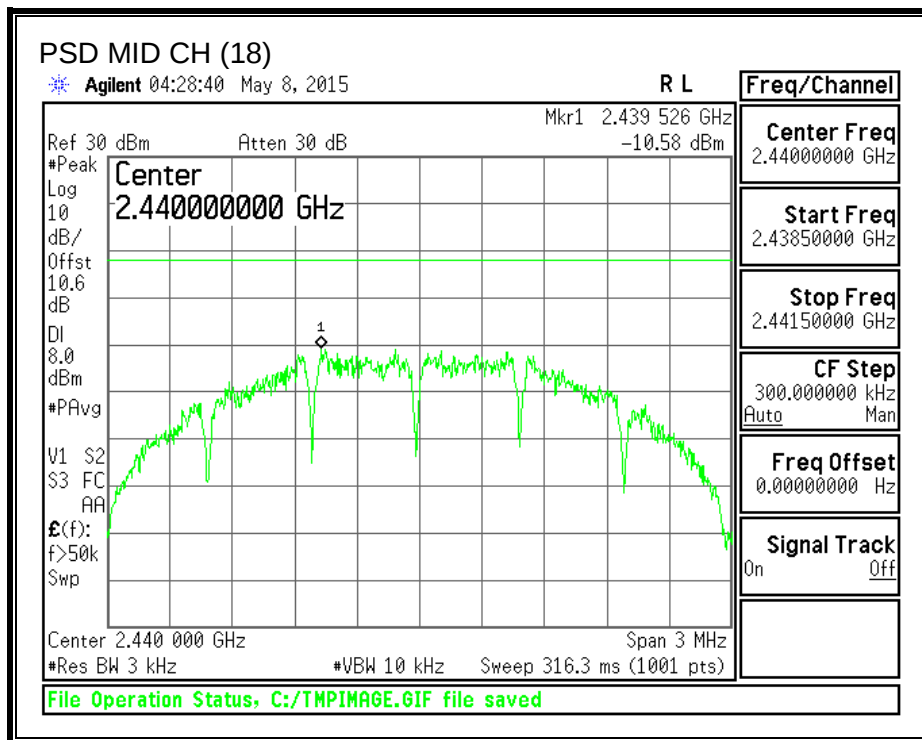
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 10.2.

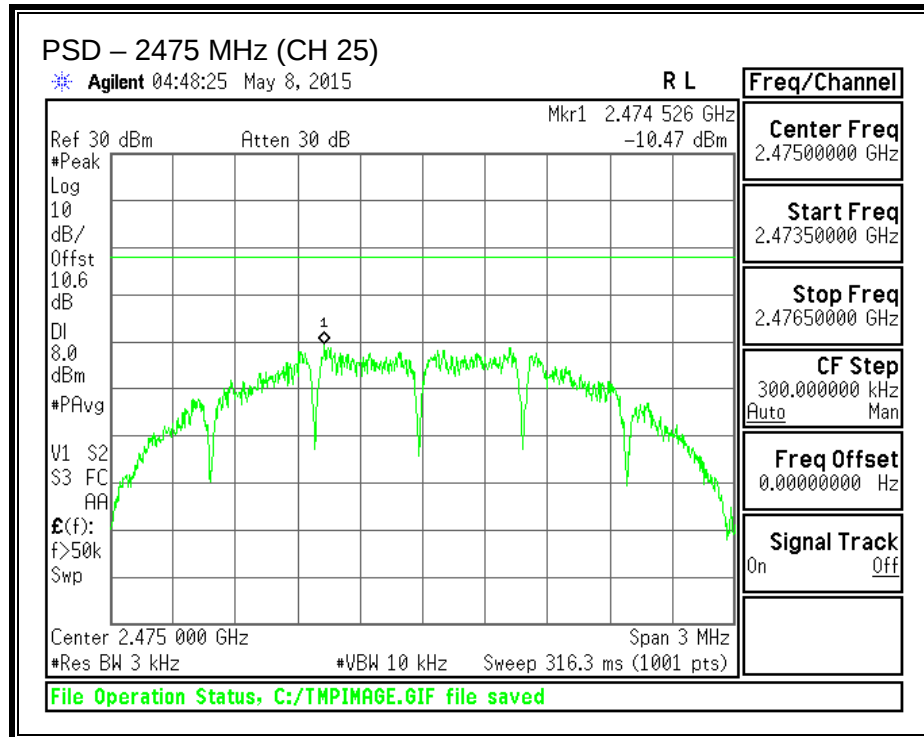
RESULTS

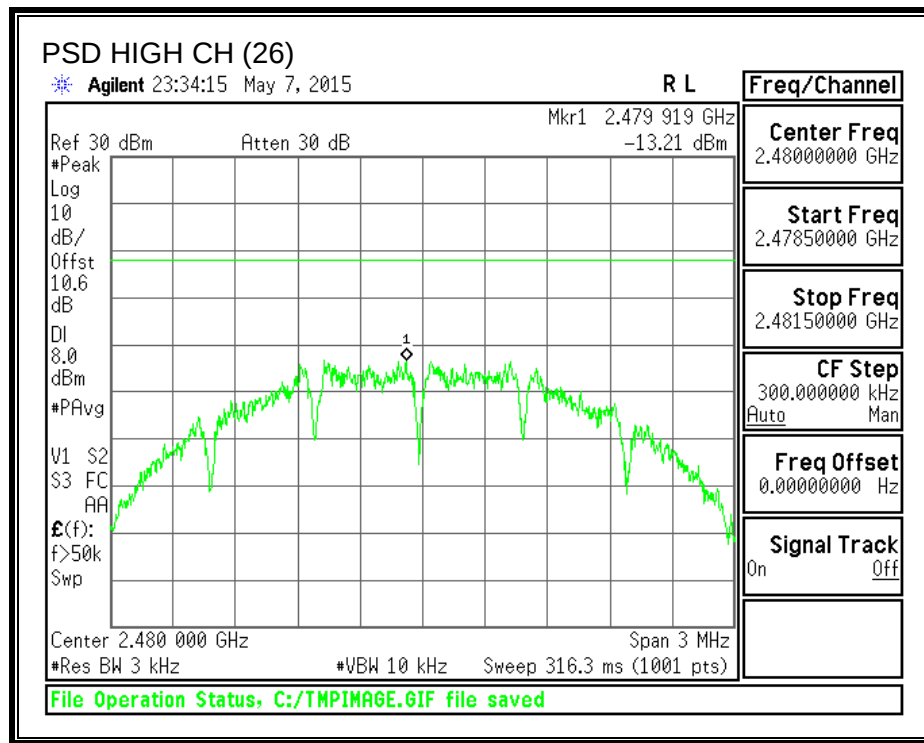
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2405	-10.82	8	-18.82
Middle	2440	-10.58	8	-18.58
-	2475	-10.47	8	-18.47
High	2480	-13.21	8	-21.21

POWER SPECTRAL DENSITY









7.1.6. CONDUCTED 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.

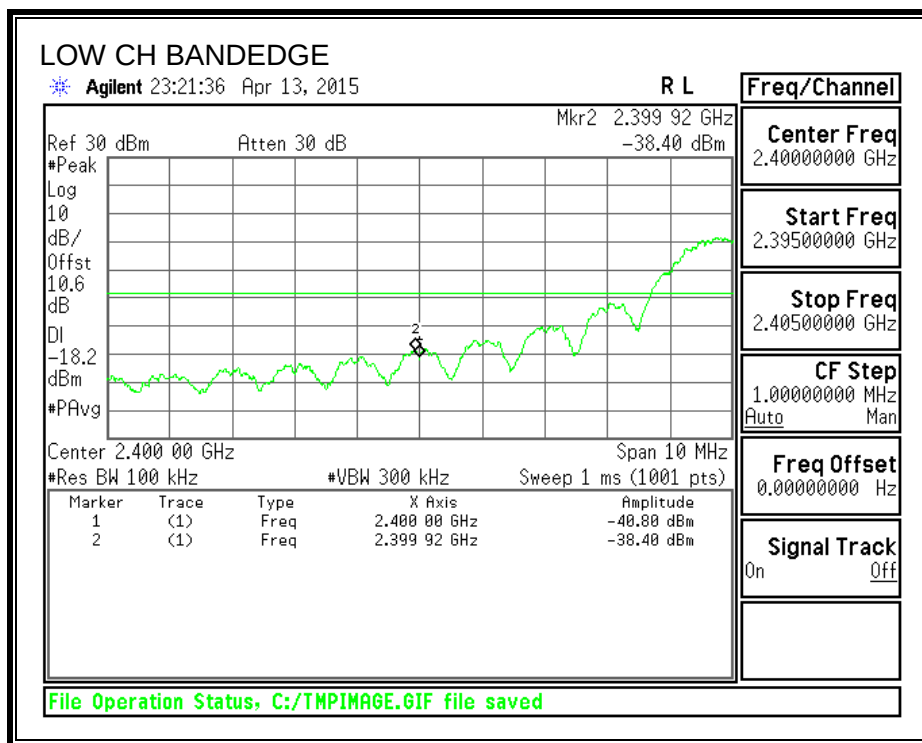
TEST PROCEDURE

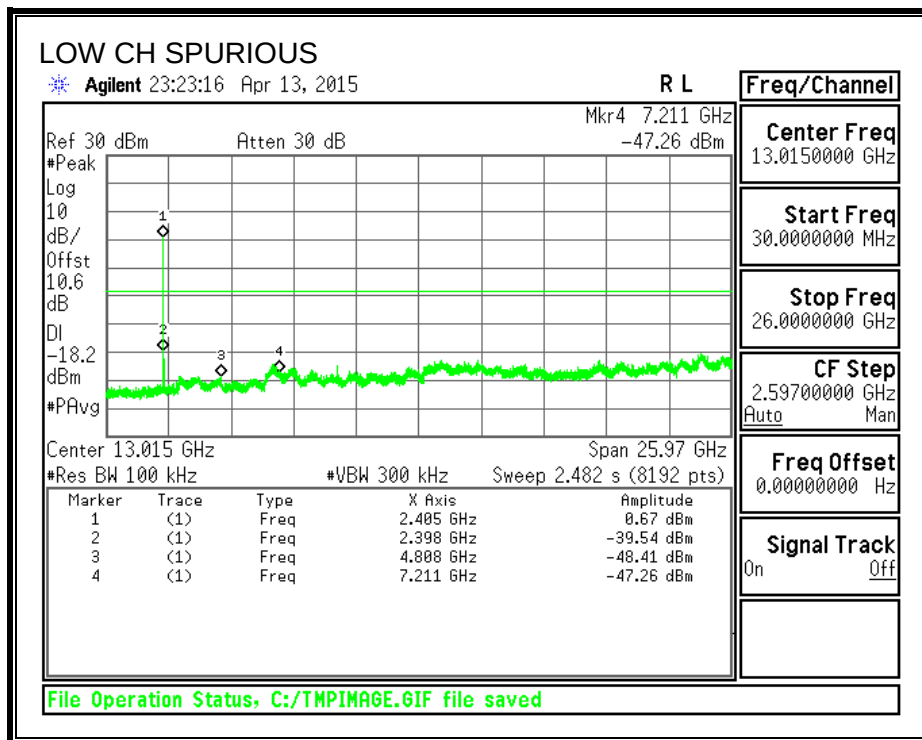
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

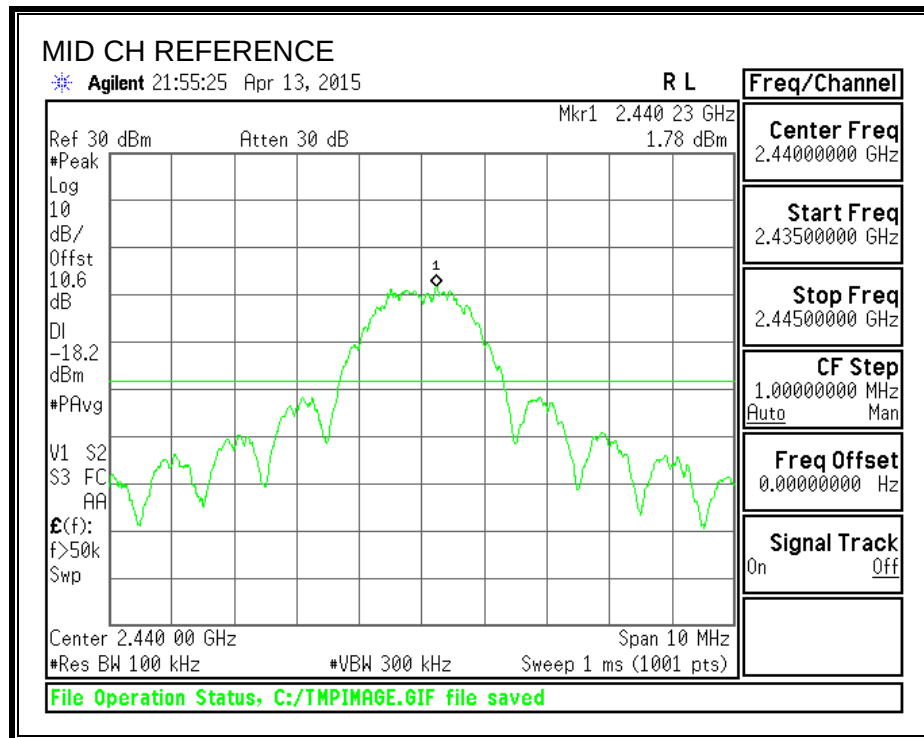
RESULTS

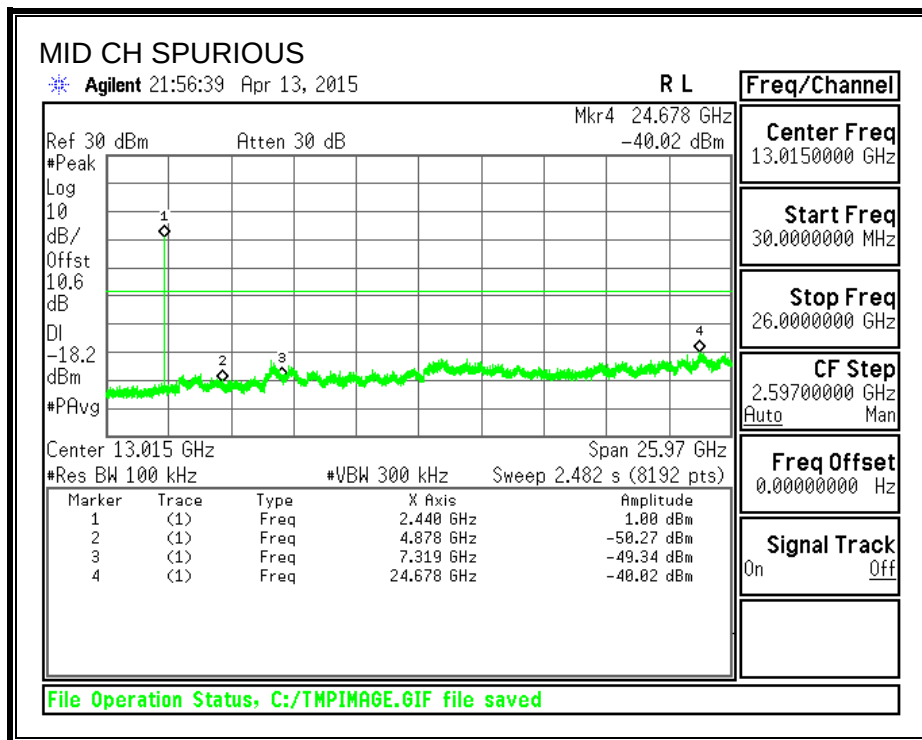
SPURIOUS EMISSIONS, LOW CHANNEL



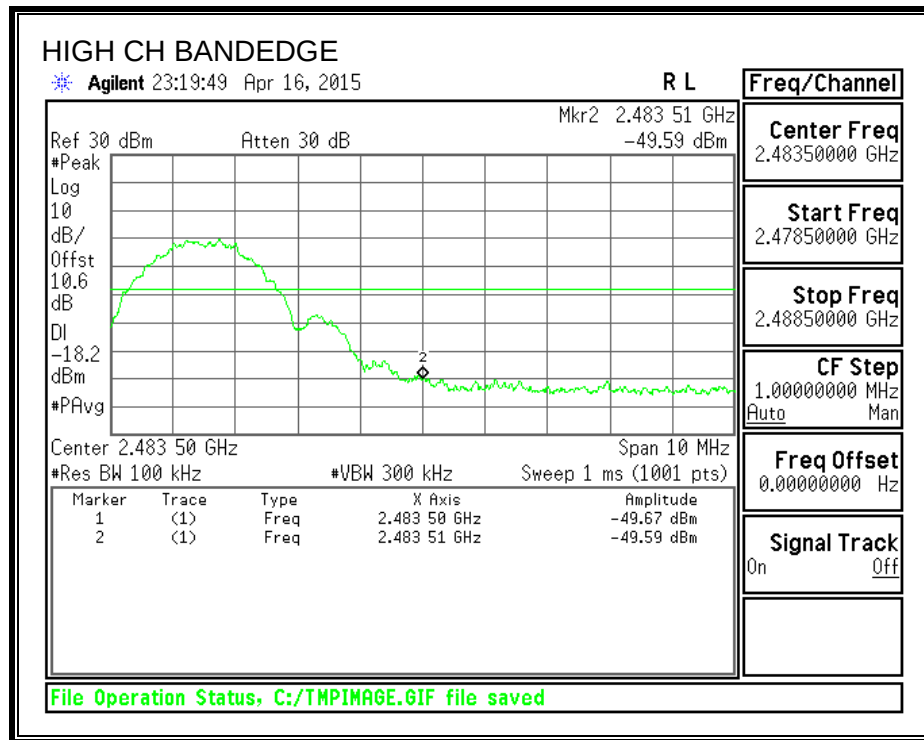


SPURIOUS EMISSIONS, MID CHANNEL

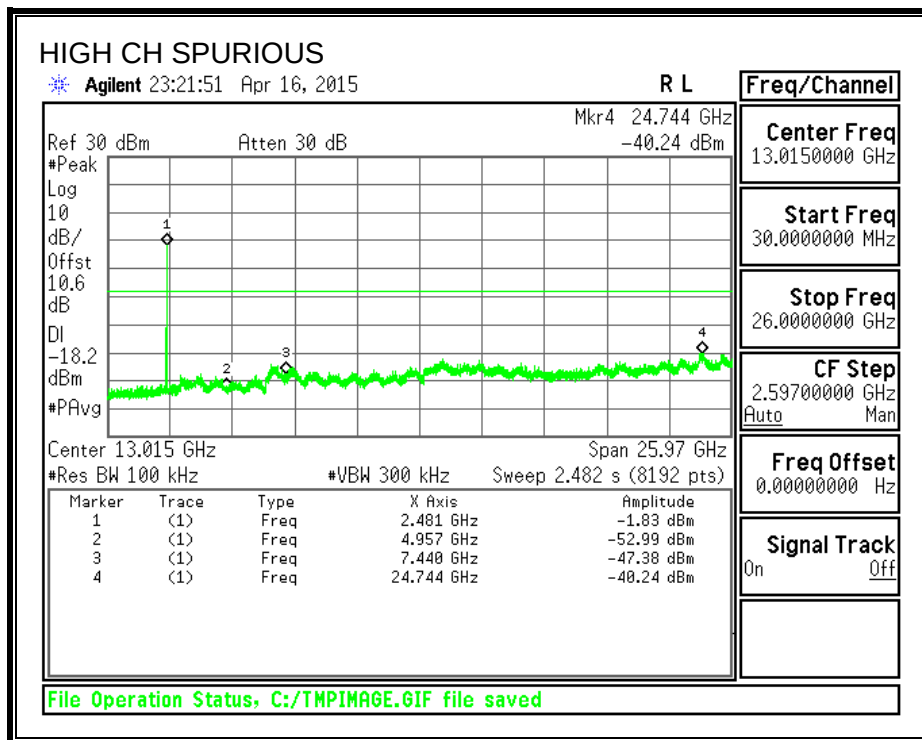




SPURIOUS EMISSIONS, HIGH CHANNEL



High Channel was tested at worst-case mid channel settings.



High Channel was tested at worst-case mid channel settings.

8. RADIATED TEST RESULTS

8.1. 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 below 1GHz measurements and 1.5 m above the ground plane for above 1GHz measurements. The antenna to EUT distance is 3 meters.

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. Peak detection is used unless otherwise noted as quasi-peak.

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

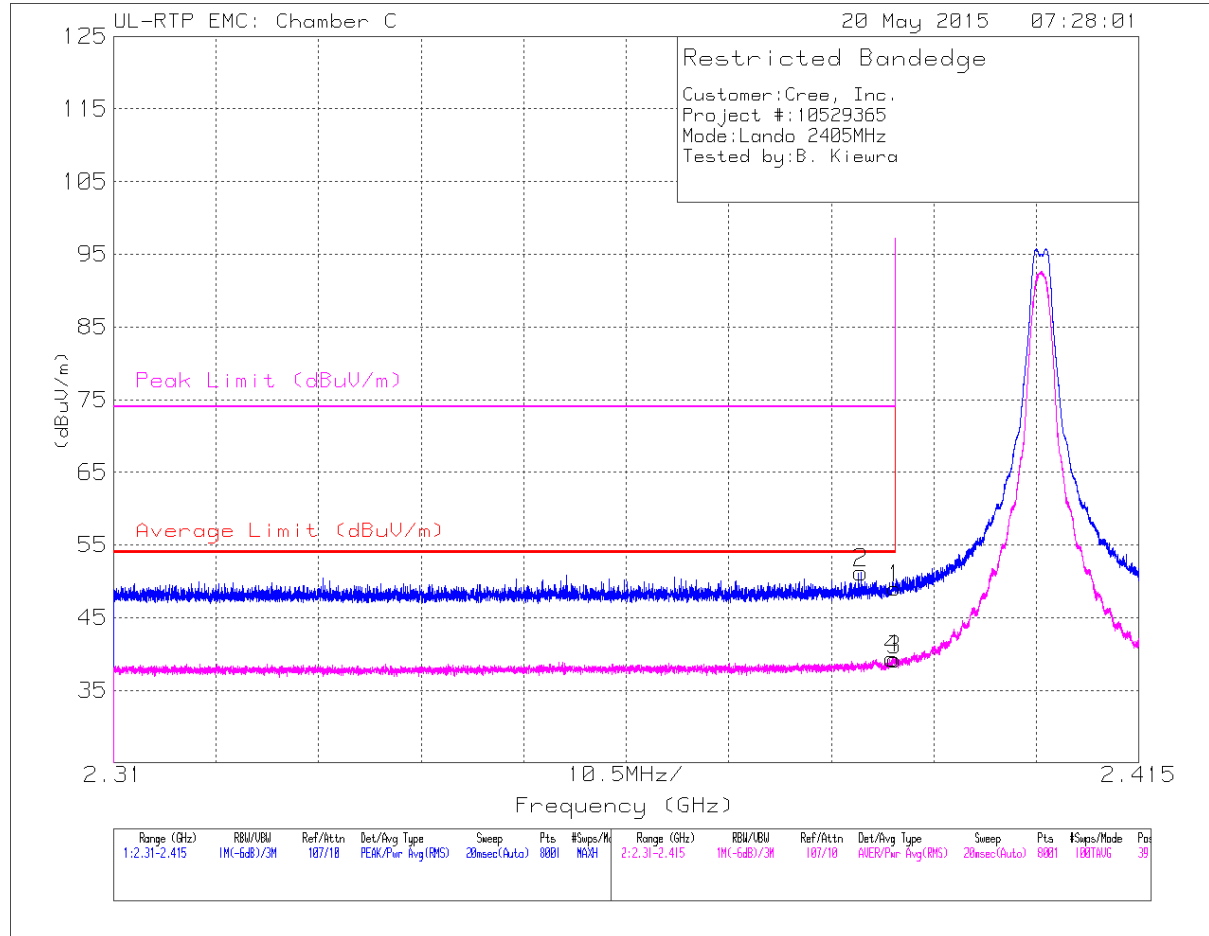
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

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

8.2. TRANSMITTER ABOVE 1 GHz

8.2.1. TX ABOVE 1 GHz FOR O-QPSK MODE IN THE 2.4 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



Trace Markers

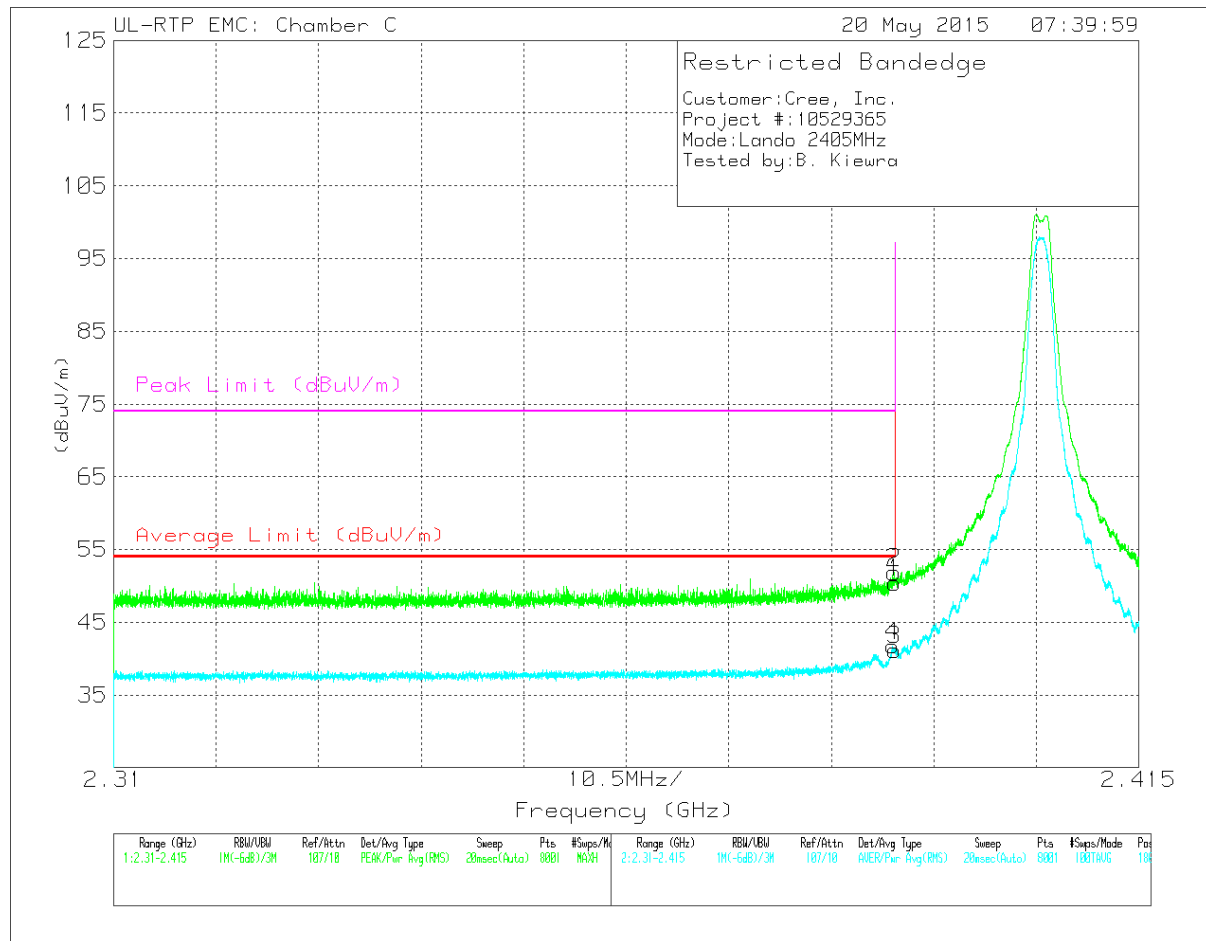
Marker	Frequency (GHz)	Meter Reading (dBUV)	Det	AT0062 (dB/m)	Amp/Cbl/F ltr/Pad	Corrected Reading (dBUV/m)	Average Limit (dBUV/m)	Margin (dB)	Peak Limit (dBUV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	43.68	Pk	32.1	-26.7	49.08	-	-	74	-24.92	39	166	H
2	* 2.387	45.8	Pk	32.1	-26.7	51.2	-	-	74	-22.8	39	166	H
3	* 2.39	33.81	RMS	32.1	-26.7	39.21	54	-14.79	-	-	39	166	H
4	* 2.39	34.01	RMS	32.1	-26.7	39.41	54	-14.59	-	-	39	166	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

RMS - RMS detection

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



Trace Markers

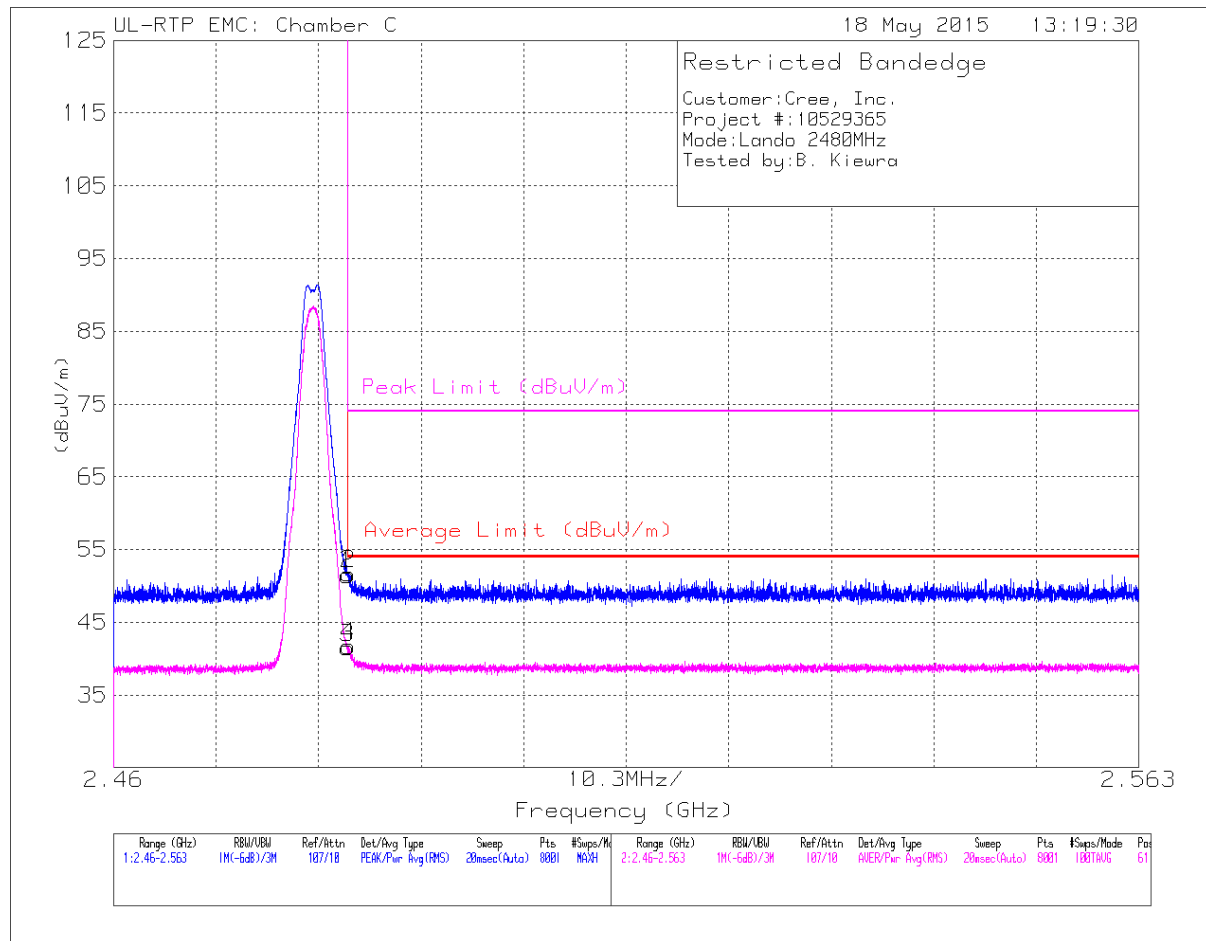
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0062 (dB/m)	Amp/Cbl/ Fltr/Pad	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	45.06	Pk	32.1	-26.7	50.46	-	-	74	-23.54	180	170	V
2	* 2.39	46.47	Pk	32.1	-26.7	51.87	-	-	74	-22.13	180	170	V
3	* 2.39	35.81	RMS	32.1	-26.7	41.21	54	-12.79	-	-	180	170	V
4	* 2.39	36.39	RMS	32.1	-26.7	41.79	54	-12.21	-	-	180	170	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

RMS - RMS detection

RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



Trace Markers

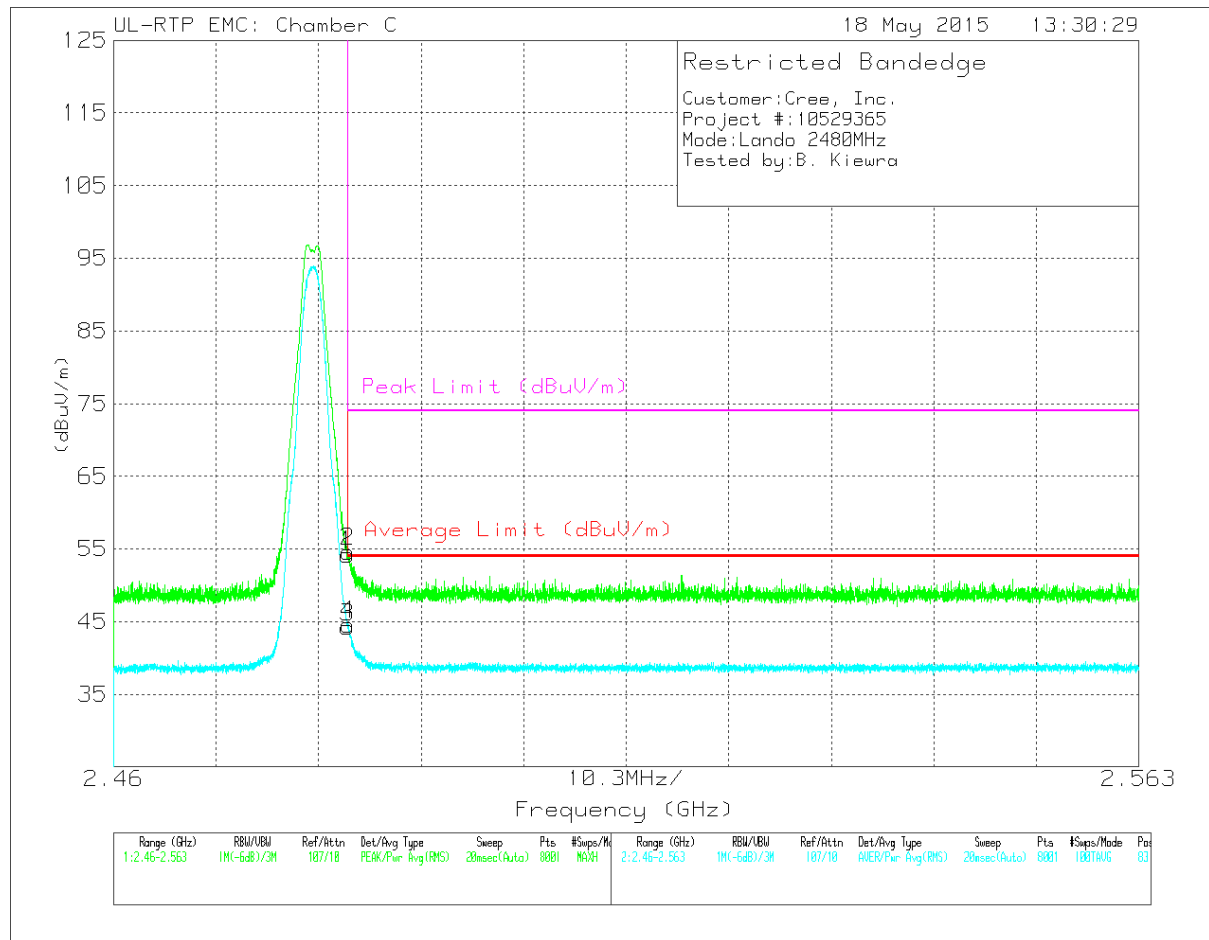
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0062 (dB/m)	Amp/Cbl/ Fltr/Pad	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	45.65	Pk	32.3	-26.5	51.45	-	-	74	-22.55	61	121	H
2	* 2.484	45.86	Pk	32.3	-26.5	51.66	-	-	74	-22.34	61	121	H
3	* 2.484	35.73	RMS	32.3	-26.5	41.53	54	-12.47	-	-	61	121	H
4	* 2.484	35.9	RMS	32.3	-26.5	41.7	54	-12.3	-	-	61	121	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

RMS - RMS detection

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



Trace Markers

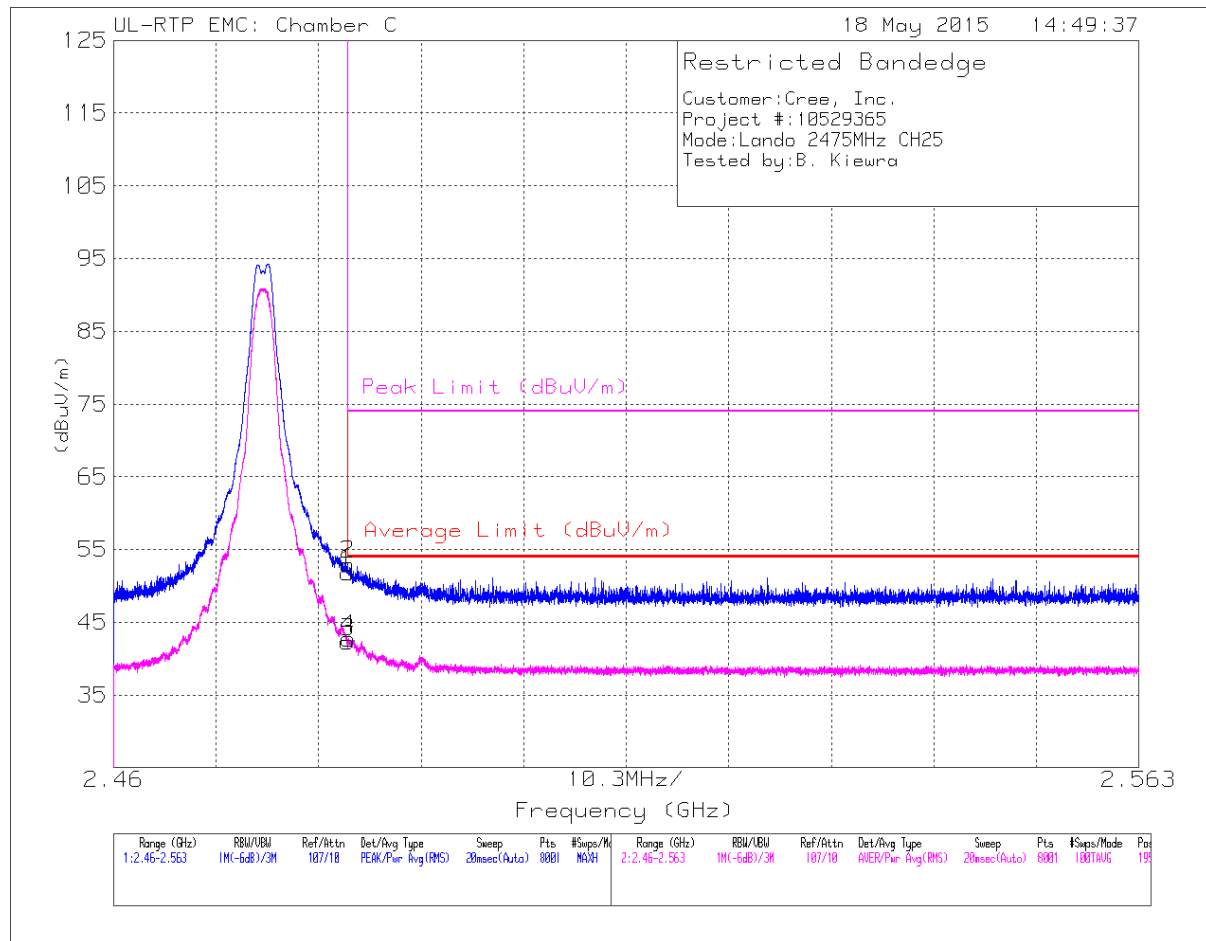
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0062 (dB/m)	Amp/Cbl/ Filt/Pad	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	48.41	Pk	32.3	-26.5	54.21	-	-	74	-19.79	83	101	V
2	* 2.484	48.81	Pk	32.3	-26.5	54.61	-	-	74	-19.39	83	101	V
3	* 2.484	38.46	RMS	32.3	-26.5	44.26	54	-9.74	-	-	83	101	V
4	* 2.484	38.81	RMS	32.3	-26.5	44.61	54	-9.39	-	-	83	101	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

RMS - RMS detection

RESTRICTED BANDEDGE (CH 25 [2475 MHz], HORIZONTAL)



Trace Markers

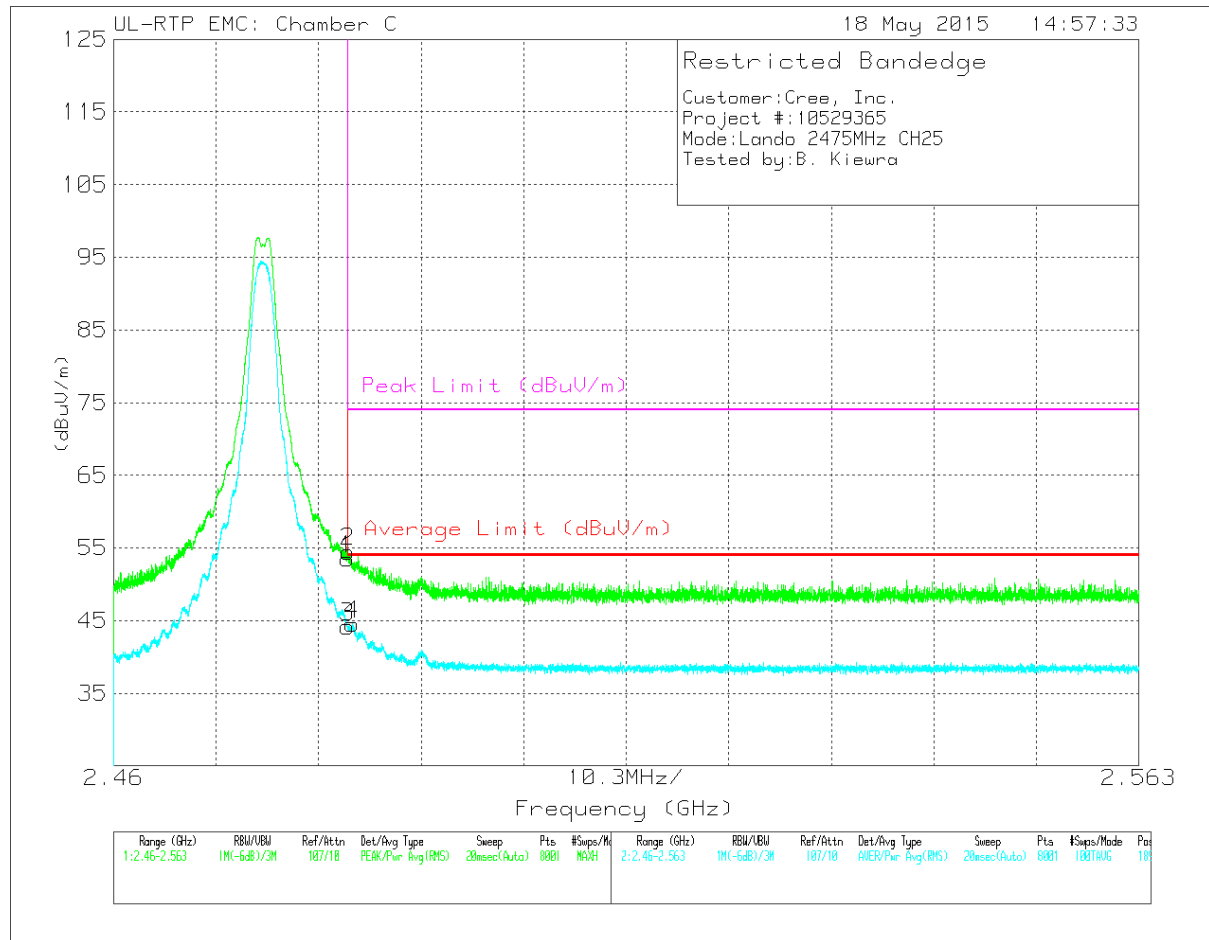
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0062 (dB/m)	Amp/Cbl/Fltr/Pad	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	46.02	Pk	32.3	-26.5	51.82	-	-	74	-22.18	195	229	H
2	* 2.484	47.21	Pk	32.3	-26.5	53.01	-	-	74	-20.99	195	229	H
3	* 2.484	36.53	RMS	32.3	-26.5	42.33	54	-11.67	-	-	195	229	H
4	* 2.484	36.94	RMS	32.3	-26.5	42.74	54	-11.26	-	-	195	229	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

RMS - RMS detection

RESTRICTED BANDEDGE (CH 25 [2475 MHz], VERTICAL)



Trace Markers

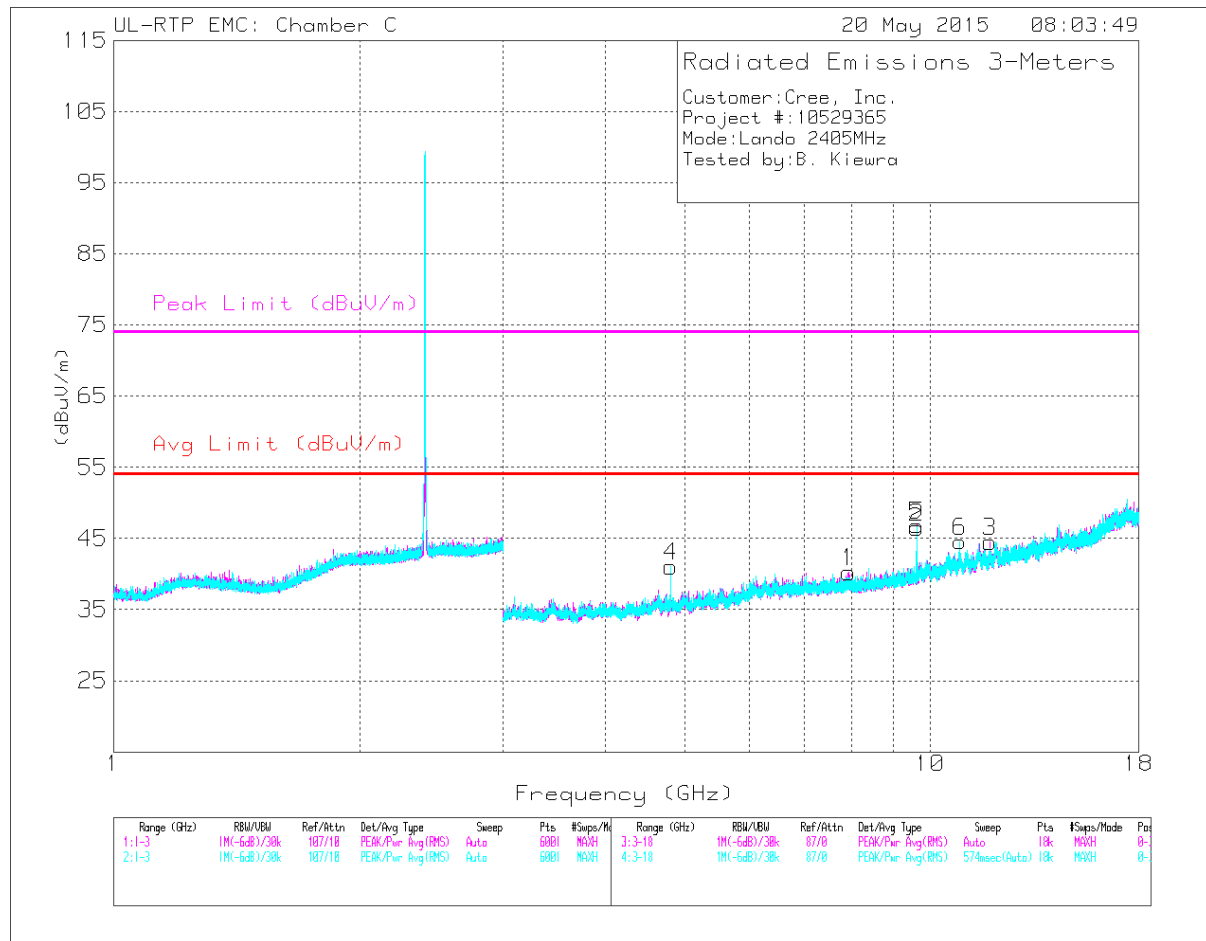
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0062 (dB/m)	Amp/Cbl/ Ftr/Pad	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	47.71	Pk	32.3	-26.5	53.51	-	-	74	-20.49	189	102	V
2	* 2.484	48.68	Pk	32.3	-26.5	54.48	-	-	74	-19.52	189	102	V
3	* 2.484	38.37	RMS	32.3	-26.5	44.17	54	-9.83	-	-	189	102	V
4	* 2.484	38.74	RMS	32.3	-26.5	44.54	54	-9.46	-	-	189	102	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS: 1-18 GHz LOW CHANNEL



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0062 (dB/m)	Amp/Cbl/F ltr/Pad	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	7.944	32.27	Pk	35.8	-27.8	40.27	-	-	74	-33.73	0-360	151	H
2	9.622	43.95	PK2	36.8	-27.8	52.95	-	-	74	-21.05	43	252	H
	9.622	35.62	MAv1	36.8	-27.8	44.62	54	-9.38	-	-	43	252	H
3	* 11.833	37.99	PK2	38.5	-25.2	51.29	-	-	74	-22.71	218	189	H
	* 11.834	26.34	MAv1	38.5	-25.2	39.64	54	-14.36	-	-	218	189	H
4	* 4.811	46.6	PK2	34.1	-32.8	47.9	-	-	74	-26.1	8	305	V
	* 4.811	36.28	MAv1	34.1	-32.8	37.58	54	-16.42	-	-	8	305	V
5	9.622	44.45	PK2	36.8	-27.8	53.45	-	-	74	-20.55	273	105	V
	9.622	36.23	MAv1	36.8	-27.8	45.23	54	-8.77	-	-	273	105	V
6	* 10.87	37.99	PK2	37.8	-24.8	50.99	-	-	74	-23.01	321	260	V
	* 10.866	26.01	MAv1	37.8	-24.8	39.01	54	-14.99	-	-	321	260	V

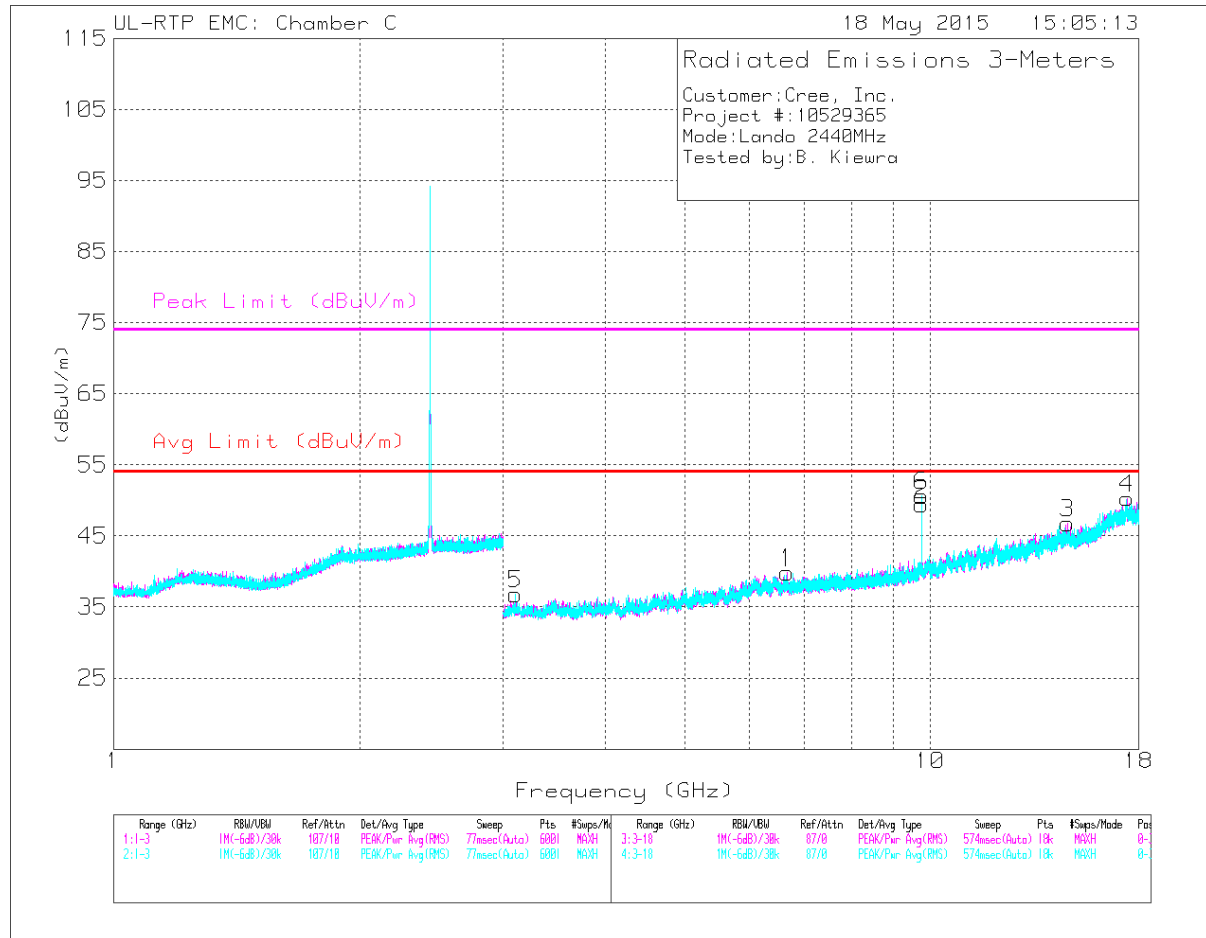
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

HARMONICS AND SPURIOUS EMISSIONS: 1-18 GHz MID CHANNEL



Trace Markers

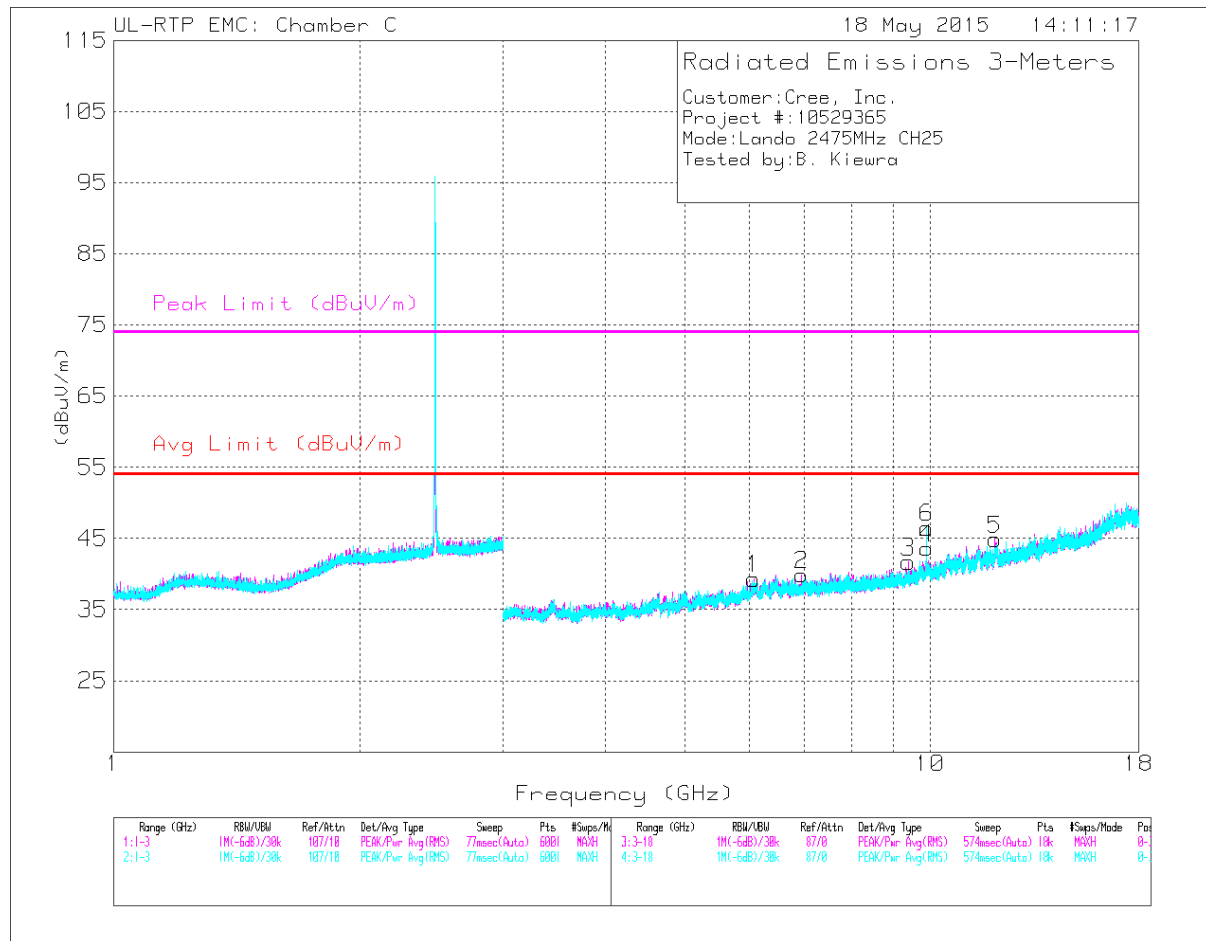
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0062 (dB/m)	Amp/Cbl/F ltr/Pad	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	6.675	32.91	Pk	35.7	-28.8	39.81	-	-	74	-34.19	0-360	151	H
2	9.762	47.16	PK2	37	-26.8	57.36	-	-	74	-16.64	204	102	H
	9.762	39.81	MAv1	37	-26.8	50.01	54	-3.99	-	-	204	102	H
3	14.729	29.69	Pk	39.6	-22.5	46.79	-	-	74	-27.21	0-360	250	H
4	17.419	36.6	PK2	41.6	-20.2	58	-	-	74	-16	166	243	H
	17.423	24.28	MAv1	41.6	-20.3	45.58	54	-8.42	-	-	166	243	H
5	3.105	38.18	Pk	33.3	-34.7	36.78	-	-	74	-37.22	0-360	250	V
6	9.762	46.96	PK2	37	-26.8	57.16	-	-	74	-16.84	260	212	V
	9.762	39.4	MAv1	37	-26.8	49.6	54	-4.4	-	-	260	212	V

Pk - Peak detector

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

HARMONICS AND SPURIOUS EMISSIONS: 1-18 GHz CH 25 (2475 MHz)



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0062 (dB/m)	Amp/Cbl/F ltr/Pad	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	6.076	33.14	PK	35.4	-29.2	39.34	-	-	74	-34.66	0-360	151	H
2	6.956	33.59	PK	35.6	-29.3	39.89	-	-	74	-34.11	0-360	151	H
3	* 9.395	40.19	PK2	36.5	-27.2	49.49	-	-	74	-24.51	254	261	H
	* 9.392	27.39	MAv1	36.5	-27.2	36.69	54	-17.31	-	-	254	261	H
4	9.902	42.36	PK2	37.1	-26.3	53.16	-	-	74	-20.84	6	376	H
	9.902	32.66	MAv1	37.1	-26.3	43.46	54	-10.54	-	-	6	376	H
5	* 11.996	39	PK2	38.7	-25.1	52.6	-	-	74	-21.4	274	362	H
	* 11.999	26.7	MAv1	38.7	-25.1	40.3	54	-13.7	-	-	274	362	H
6	9.902	42.08	PK2	37.1	-26.3	52.88	-	-	74	-21.12	235	108	V
	9.902	32.28	MAv1	37.1	-26.3	43.08	54	-10.92	-	-	235	108	V

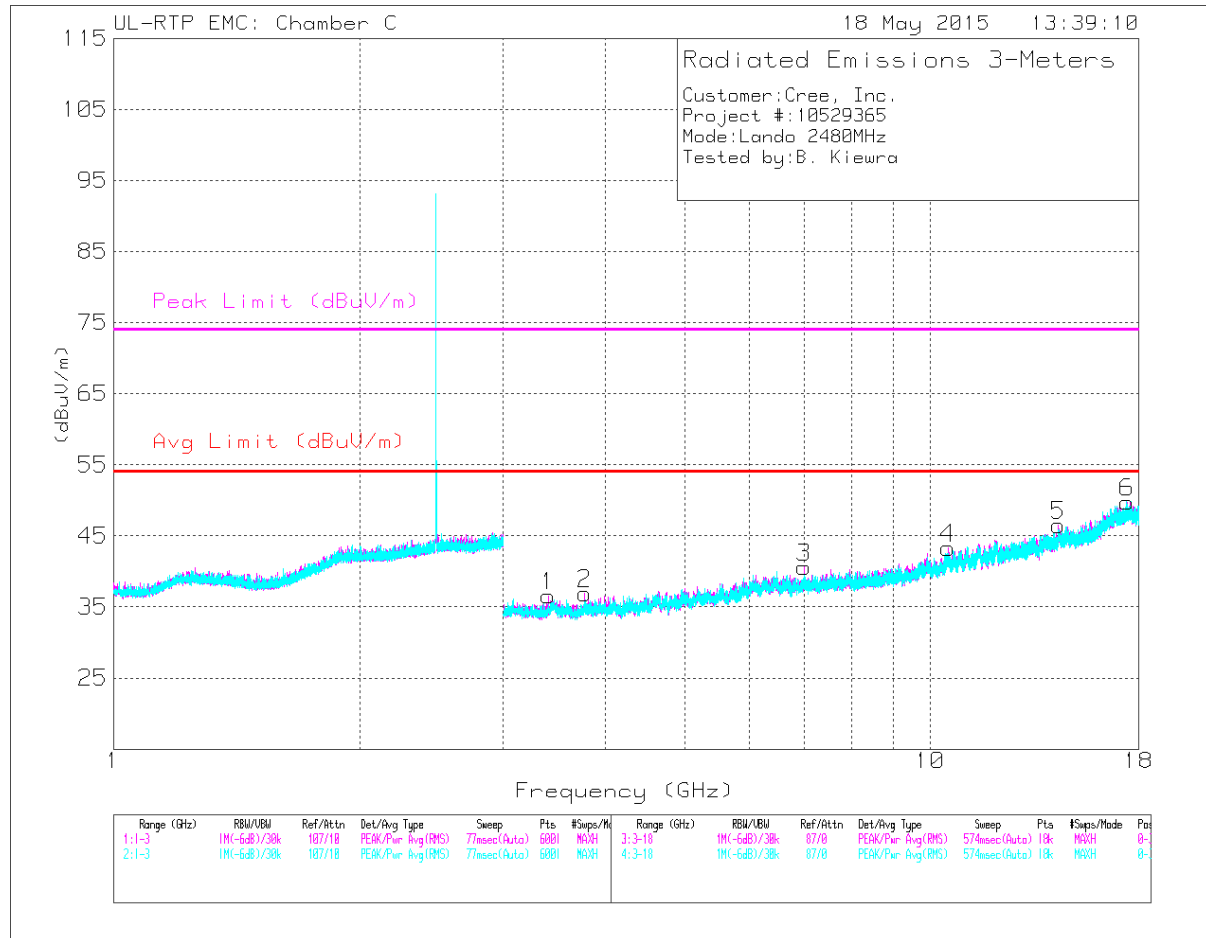
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

HARMONICS AND SPURIOUS EMISSIONS: 1-18 GHz HIGH CHANNEL



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0062 (dB/m)	Amp/Cbl/F ltr/Pad	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	3.407	37.76	Pk	32.8	-34	36.56	-	-	74	-37.44	0-360	151	H
2	* 3.775	44.31	PK2	33.4	-33.6	44.11	-	-	74	-29.89	7	268	H
	* 3.775	32.56	MAv1	33.4	-33.6	32.36	54	-21.64	-	-	7	268	H
3	7.008	33.49	Pk	35.7	-28.6	40.59	-	-	74	-33.41	0-360	151	H
4	10.52	30.19	Pk	37.5	-24.4	43.29	-	-	74	-30.71	0-360	250	H
5	14.349	29.87	Pk	39.1	-22.5	46.47	-	-	74	-27.53	0-360	250	H
6	17.411	35.98	PK2	41.6	-19.9	57.68	-	-	74	-16.32	127	352	H
	17.412	24.03	MAv1	41.6	-19.9	45.73	54	-8.27	-	-	127	352	H

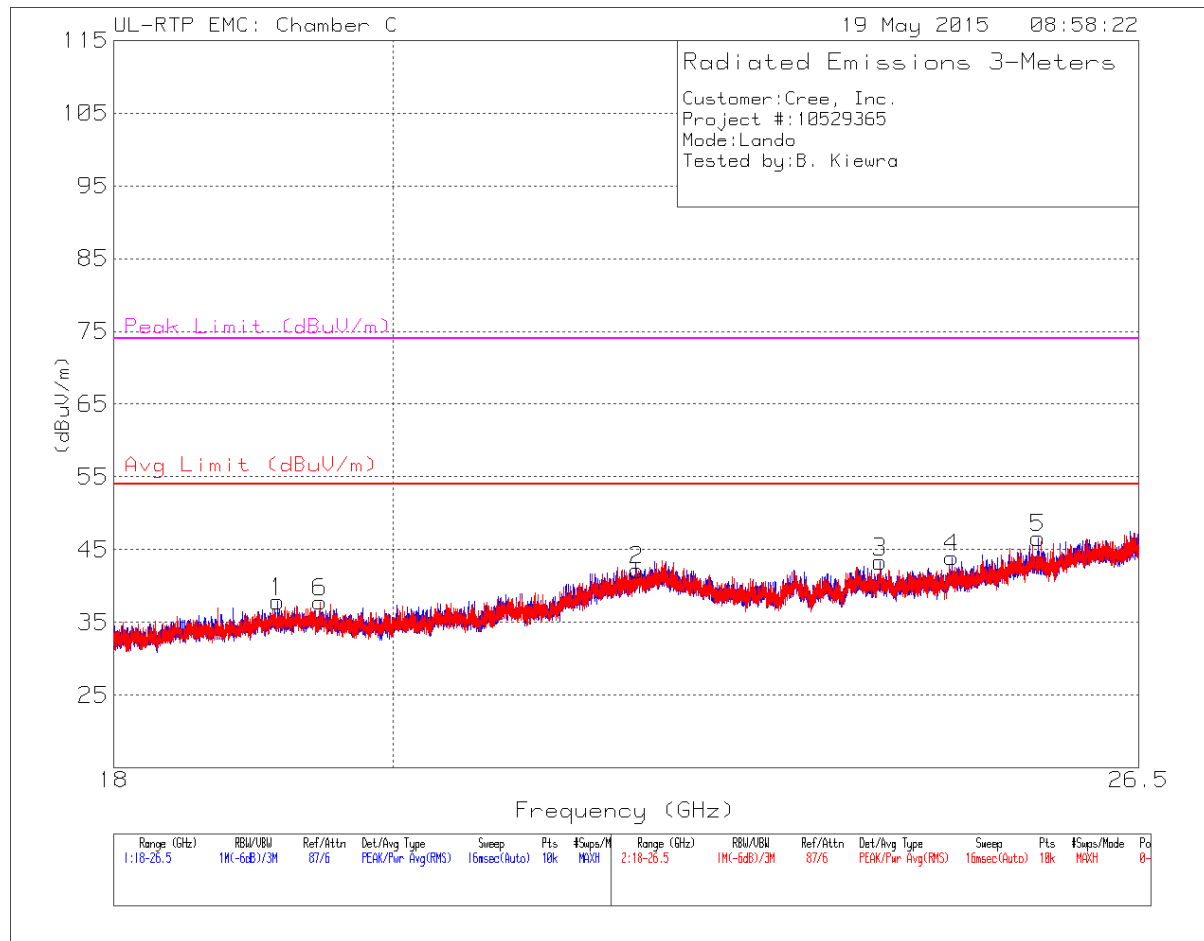
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

HARMONICS AND SPURIOUS EMISSIONS: 18-26GHz (WORST-CASE CHANNEL)



Trace Markers

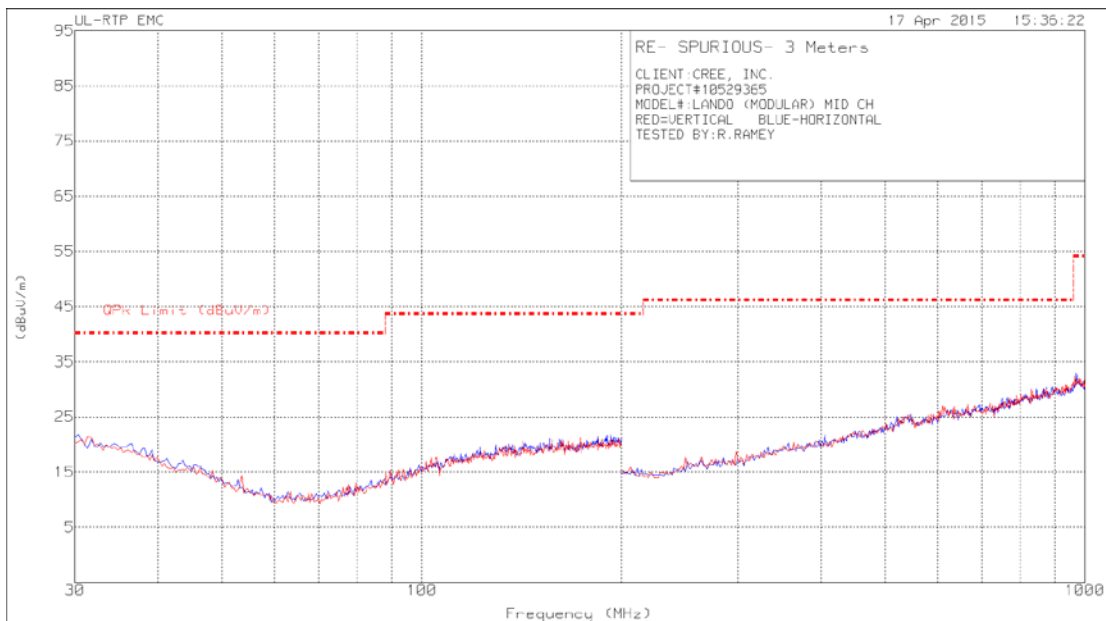
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	Horn AT0063 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 19.148	38.76	Pk	32.6	-33.5	37.86	54	-16.14	74	-36.14	0-360	200	H
6	* 19.455	38.43	Pk	32.6	-33.2	37.83	54	-16.17	74	-36.17	0-360	151	V
2	21.927	37.21	Pk	36.8	-31.8	42.21	-	-	74	-31.79	0-360	200	H
3	24.036	40.03	Pk	33.6	-30.3	43.33	-	-	74	-30.67	0-360	150	H
4	24.697	39.53	Pk	33.8	-29.4	43.93	-	-	74	-30.07	0-360	175	H
5	25.512	41.52	Pk	33.8	-28.7	46.62	-	-	74	-27.38	0-360	200	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

8.3. WORST-CASE BELOW 1 GHz

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



Frequency (GHz)	Meter Reading (dBuV)	Detector	Antenna Factor (dB/m)	Amp/Cbl/ Filter/Pad	Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	QP Margin (dB)	Azimuth (deg)	Height (cm)	Polarity
30.3407	30.23	Pk	17.7	-26.1	21.83	40	-18.17	0-360	98	H
52.8256	30.87	Pk	8.5	-25.7	13.67	40	-26.33	0-360	98	H
105.6312	30.13	Pk	11.8	-25.0	16.93	43.52	-26.59	0-360	200	H
*249.6994	33.80	Pk	12.0	-28.1	17.70	46.02	-28.32	0-360	98	V
*610.4207	33.11	Pk	20.1	-26.2	27.01	46.02	-19.01	0-360	200	V
*964.7293	34.94	Pk	23.9	-26.5	32.34	53.97	-21.63	0-360	98	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 [*]	56 to 46 [*]
0.5-5	56	46
5-30	60	50

^{*} Decreases with the logarithm of the frequency.

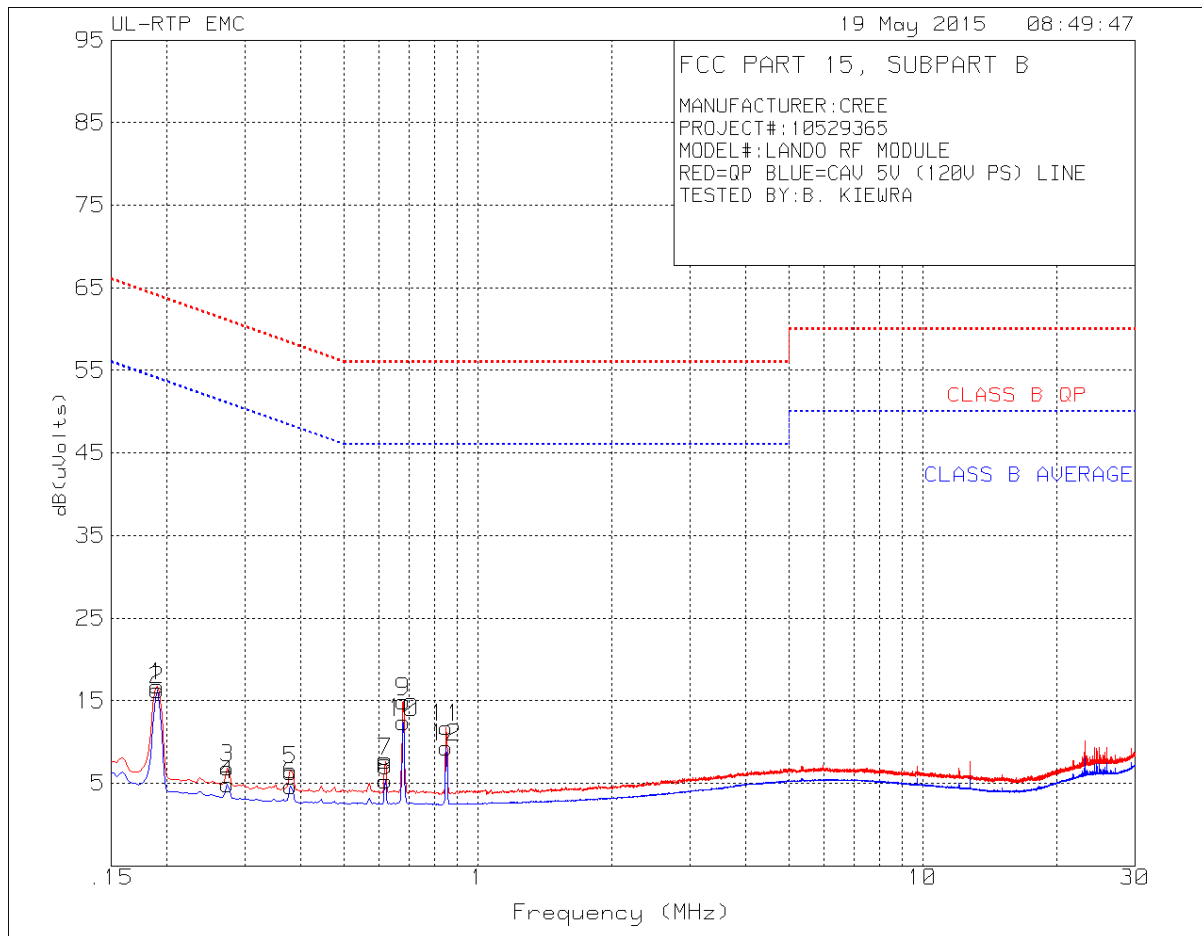
TEST PROCEDURE

ANSI C63.10

RESULTS

6 WORST EMISSIONS

LINE 1 RESULTS



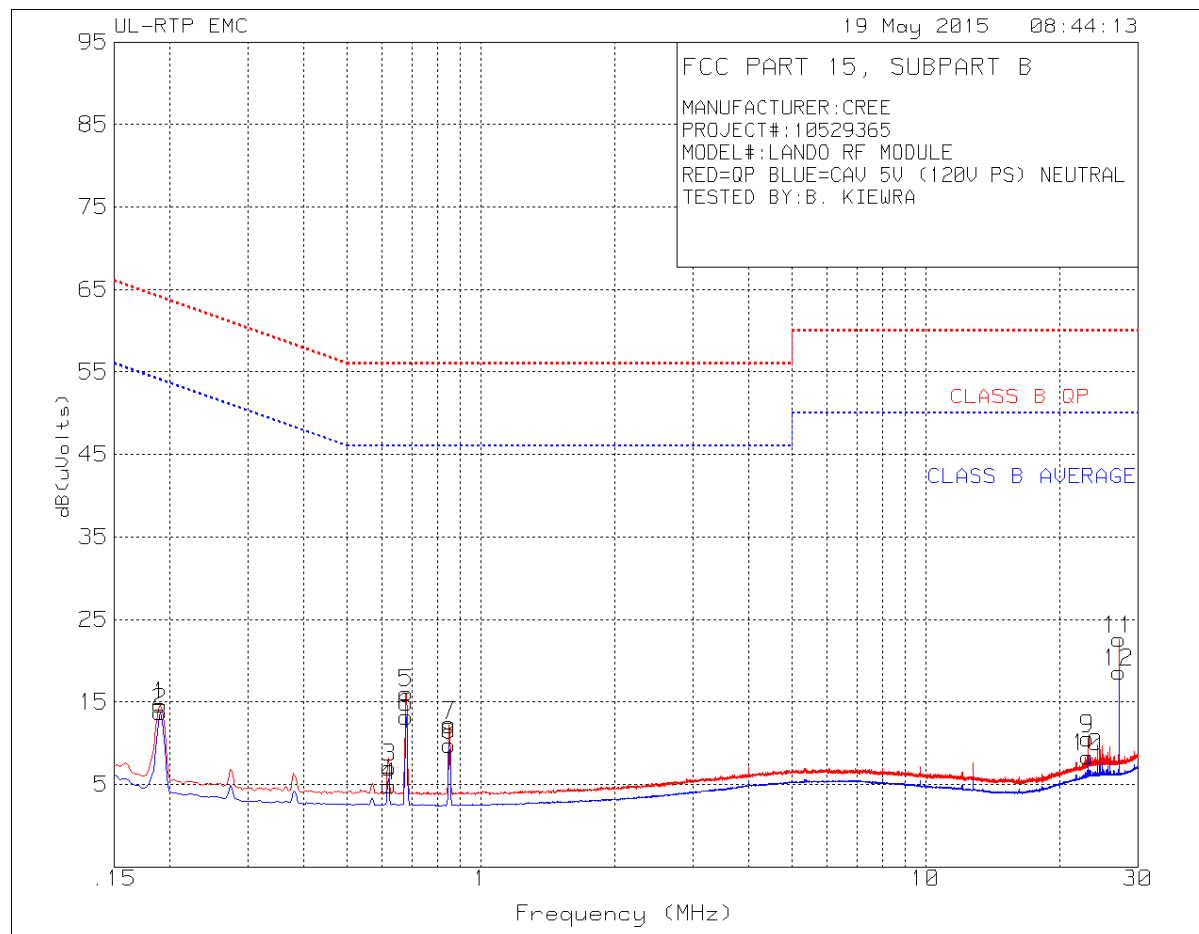
Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN002-003_DUE 2015-09-30	ATA508-ATA509_DUE_2015-07-31	Corrected Reading dB(uVolts)	CLASS B QP	QP Margin (dB)	CLASS B AVERAGE	Av(CISPR)Margin (dB)
1	.1905	7.08	Qp	.3	9.4	16.78	64.01	-47.23	-	-
2	.1905	6.58	Ca	.3	9.4	16.28	-	-	54.01	-37.73
3	.27375	-2.75	Qp	.2	9.4	6.85	61	-54.15	-	-
4	.27375	-4.75	Ca	.2	9.4	4.85	-	-	51	-46.15
5	.3795	-2.9	Qp	.1	9.4	6.6	58.29	-51.69	-	-
6	.3795	-4.88	Ca	.1	9.4	4.62	-	-	48.29	-43.67
7	.62025	-1.95	Qp	.1	9.5	7.65	56	-48.35	-	-
8	.62025	-4.31	Ca	.1	9.5	5.29	-	-	46	-40.71
9	.681	5.3	Qp	.1	9.5	14.9	56	-41.1	-	-
10	.681	2.78	Ca	.1	9.5	12.38	-	-	46	-33.62
11	.84975	2.25	Qp	0	9.5	11.75	56	-44.25	-	-
12	.84975	-.18	Ca	0	9.5	9.32	-	-	46	-36.68

Qp - Quasi-Peak detector

Ca - CISPR average detection

LINE 2 RESULTS



Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN002-003_DUE 2015-09-30	ATA508-ATA509_DUE_2015-07-31	Corrected Reading dB(uVolts)	CLASS B QP	QP Margin (dB)	CLASS B AVERAGE	Av(CISPR)Margin (dB)
1	.1905	4.91	Qp	.3	9.4	14.61	64.01	-49.4	-	-
2	.1905	4.07	Ca	.3	9.4	13.77	-	-	54.01	-40.24
3	.6225	-2.56	Qp	.1	9.5	7.04	56	-48.96	-	-
4	.6225	-4.76	Ca	.1	9.5	4.84	-	-	46	-41.16
5	.681	6.51	Qp	.1	9.5	16.11	56	-39.89	-	-
6	.681	3.59	Ca	.1	9.5	13.19	-	-	46	-32.81
7	.84975	2.65	Qp	0	9.5	12.15	56	-43.85	-	-
8	.84975	.26	Ca	0	9.5	9.76	-	-	46	-36.24
9	23.12925	.85	Qp	.3	9.4	10.55	60	-49.45	-	-
10	23.12925	-1.35	Ca	.3	9.4	8.35	-	-	50	-41.65
11	27.186	12.79	Qp	.3	9.5	22.59	60	-37.41	-	-
12	27.18375	8.8	Ca	.3	9.5	18.6	-	-	50	-31.4

Qp - Quasi-Peak detector

Ca - CISPR average detection

END OF REPORT