FCC 47 CFR PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 8

CERTIFICATION TEST REPORT

FOR

LIGHT BULB WITH 2.4 GHz TRANSCEIVER

MODEL NUMBER: BA19-08027OMF-12CE26-1U100 (US)
BA19-08027OMF-12CE26-1U200 (CANADA)

FCC ID: 2ACQ6-A19
IC: 11481A-A19

REPORT NUMBER: R10455472-RF

ISSUE DATE: 2014-10-06

Prepared for
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NVLAP LAB CODE 200246-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	2014-10-06	Initial Issue	Jeff Moser

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1. ATTESTATION OF TEST RESULTS

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

EUT DESCRIPTION: Lightbulb with 2.4 GHz Transceiver

MODEL: BA19-08027OMF-12CE26-1U100 (US)
BA19-08027OMF-12CE26-1U200 (CANADA)

SERIAL NUMBER: Non-serialized units

DATE TESTED: 2014-09-14 through 2014-09-16; 2014-09-24; 2014-09-29

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-210 Issue 8 Annex 8	Pass
INDUSTRY CANADA RSS-GEN Issue 3	Pass

UL 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:

Mike Antola
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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.4-2003, RSS-GEN Issue 3, and RSS-210 Issue 8.

3. FACILITIES AND ACCREDITATION

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

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:

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:

Test	Uncertainty
Conducted Emissions (0.150-30MHz)	+/- 2.37 dB
Radiated Emissions (30-1000 MHz)	+/- 6.04 dB (3m)

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

Part Number BA19-08027OMF-12CE26 is a Light Bulb that contains a 2.4 GHz DSSS transceiver used with light fixtures. The BA19-08027OMF-12CE26 utilizes an O-QPSK modulation and a 250 kbps data rate. The Light Bulb receives signals from other devices to control the fixture.

The radio module is manufactured by Cree Inc.

Nomenclature explanation:

BA19-08027OMF-12CE26
"B" indicates "Bulb"
"A19" indicates "Bulb shape"
"080" indicates "800" Lumens
"27" indicates the CCT (2700K color temperature)
"OM" indicates "Omni directional" (beam angle)
"F" indicates "Frosted"

The remaining characters are:
12CE26-1U100
12CE26-1U200

"12" indicates 120V
"C" indicates controls, i.e. Zigbee etc….
"E26" indicates the Edison base
"1" indicates the version
"U" indicates U.S. manufactured
The last 3 characters have to do with packaging and marketing (Country specific for US and Canada)

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2405-2480	O-QPSK	5.11	3.24

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a Monopole, chip antenna, with a maximum gain of -2.2 dBi.

5.4. SOFTWARE AND FIRMWARE

The firmware for the bulb was “fcc_test_dut_v133.elf”.

There was no driver firmware.

Lastly, there was no software on laptop and was just used as a terminal window to communicate.

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 the X orientation ((Bulb upright.) was found to be the worst-case orientation; therefore, all final radiated testing was performed with the EUT in X orientation. (Bulb upright.)

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Laptop PC with USB Atmel SAMR21 wireless board used to configure the radio module.	Dell	E6400	399P5M1	NA

I/O CABLES

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
	The following was used during radiated and line-conducted emissions testing.					
1	AC	1	AC inlet	Unshielded	1	2C/18AWG line cord.
	The following was used during antenna-port measurements.					
2	AC	1	AC inlet	Unshielded	1.8	AC input to DC power supply. 3C/18AWG power cord.
3	DC	1	DC	Unshielded	NA	2-wire connection from DC power supply.

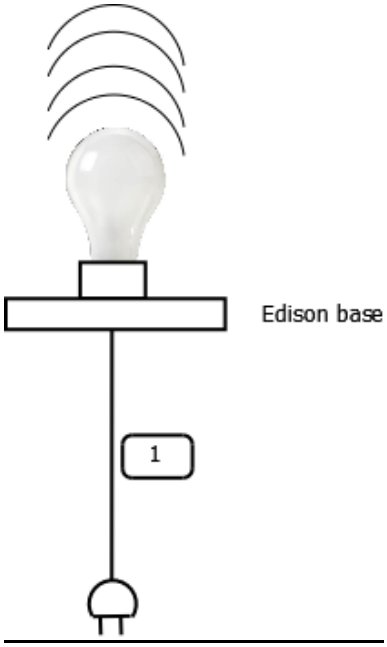
TEST SETUP

Different BA19 Light Bulbs were provided. 1 unit was provided for Radiated Emissions testing (an external control board allowed for channel adjustment) and 1 unit was provided for Conducted Port tests.

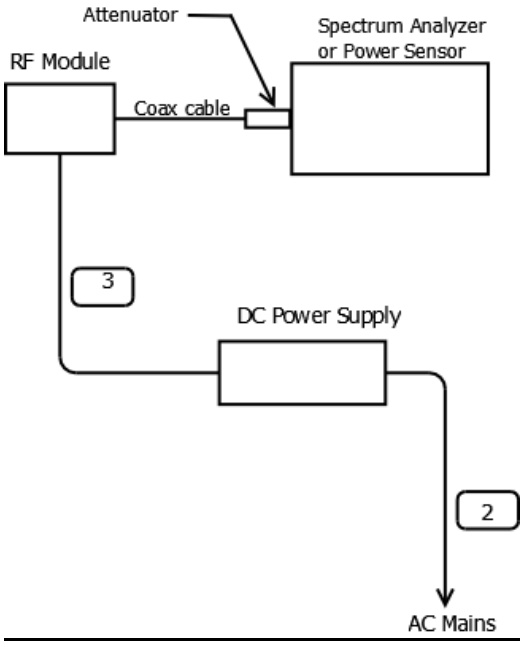
Note, the Low and Mid Channel's output power was set for 4.0 dBm (0x00) during testing. The High Channel output power was set for -6.0 dBm (0x0C) during testing.

SETUP DIAGRAM FOR TESTS

Radiated & Line Conducted Setup



Antenna Port Conducted Setup



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.
SA0016	Spectrum Analyzer	Agilent Technologies	N9030A	2014-09-03	2015-09-30
PSENSOR001	Wideband Power Sensor (30MHz video bandwidth)	Rohde & Schwartz	NRP-Z81 (w/ NRP-Z3 USB adapter)	2014-09-03	2015-09-30
MM0145	Digital Multimeter	Fluke	177	2014-09-04	2016-09-30
HI0041	Temp/Humid/Pressure Meter	Cole-Parmer	99760-00	2014-02-19	2015-02-28

Radiated Disturbance Emissions (E-field)

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
AT0022	Log-periodic Antenna, 200 MHz to 1000 MHz	Chase	UPA6109	2014-02-18	2015-02-28
AT0025	Biconical Antenna, 30 to 300 MHz	Schaffner-Chase EMC Ltd.	VBA6106A	2014-07-01	2015-07-31
AT0062	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2014-07-22	2015-07-31
AT0063	Horn Antenna, 18-26.5GHz	ARA	MWH-1826/B	2014-07-23	2015-07-31
SAC_C (Biconical 3m location)	Gain-Loss string for biconical antenna at 3m	Various	Various	2014-09-15	2015-09-30
SAC_D (Log-Periodic 3m location)	Gain-Loss string for log-periodic antenna at 3m	Various	Various	2014-07-15	2015-07-31
SAR003	Spectrum Analyzer / Receiver	Rohde & Schwarz	ESIB40 (1088.7490.40)	2014-07-14	2015-07-31
SA0015	Spectrum Analyzer / Receiver	Rohde & Schwarz	ESCI7	2014-09-03	2015-09-30
SA0016	Spectrum Analyzer	Agilent	N9030A	2014-09-03	2015-09-30
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
AMP011	RF Amp, 1-20GHz	Miteq	AMF-6D-01002000-22-10P	2014-07-18	2015-07-31
AMP013	RF Amp, 18-40GHz	Miteq	JS44-18004000-33-8P	2014-07-18	2015-07-31

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
BRF003	2.4GHz Band-reject Fileter	Microtronics	BRM50702	2014-09-03	2015-09-30
HI0034	Temp/Humid/Pressure Meter	Cole-Parmer	99760-00	2014-02-19	2015-02-28

Line Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
SA0015	EMI Test Receiver 9kHz-7GHz	Rohde & Schwarz	ESCI 7	2014-09-03	2015-09-30
ATA509	Coaxial cable, 20 ft., BNC -male to BNC-male	UL	RG-223	2014-07-15	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
ATA508	Transient Limiter, 0.009 to 100 MHz	Electro-Metrics	EM 7600	2014-09-03	2015-09-30
LISN003	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. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS

LIMITS

None; for reporting purposes only.

PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method.

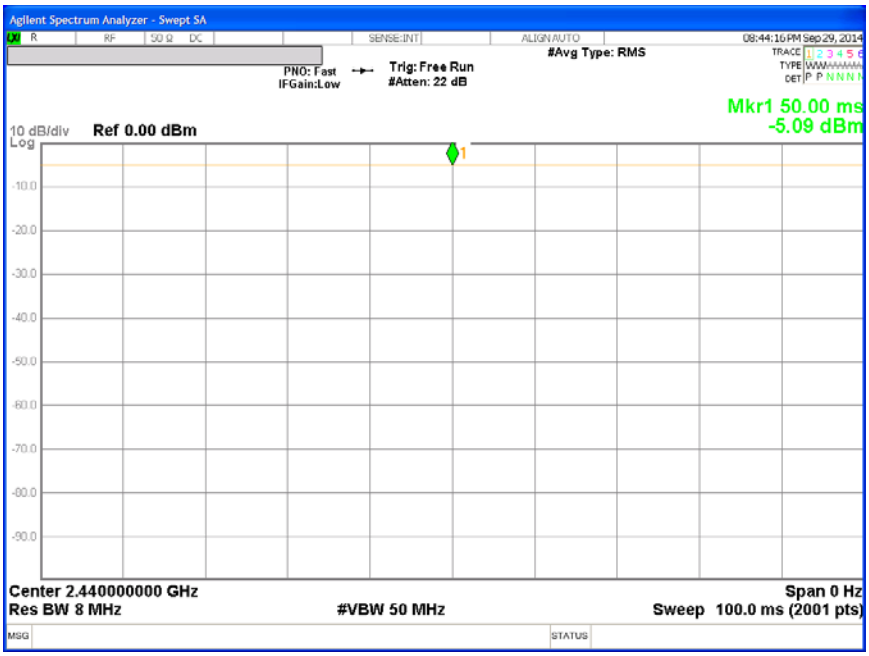
7.1. ON TIME AND DUTY CYCLE RESULTS

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						
O-QPSK Mode	100.000	100.000	1.000	100.00%	0.00	0.010

7.1. DUTY CYCLE PLOTS

2.4 GHz BAND

DUTY CYCLE



7.2. MEASUREMENT METHODS

6 dB BW: KDB 558074 D01 v03r02, Section 8.1.

Output Power: KDB 558074 D01 v03r02, Section 9.1.2.

Power Spectral Density: KDB 558074 D01 v03r02, Section 10.2.

Out-of-band emissions in non-restricted bands: KDB 558074 D01 v03r02, Section 11.0.

Out-of-band emissions in restricted bands: KDB 558074 D01 v03r02, Section 12.1.

8. ANTENNA PORT TEST RESULTS

8.1. O-QPSK (DSSS) MODE IN THE 2.4 GHz BAND

8.1.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

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

RESULTS

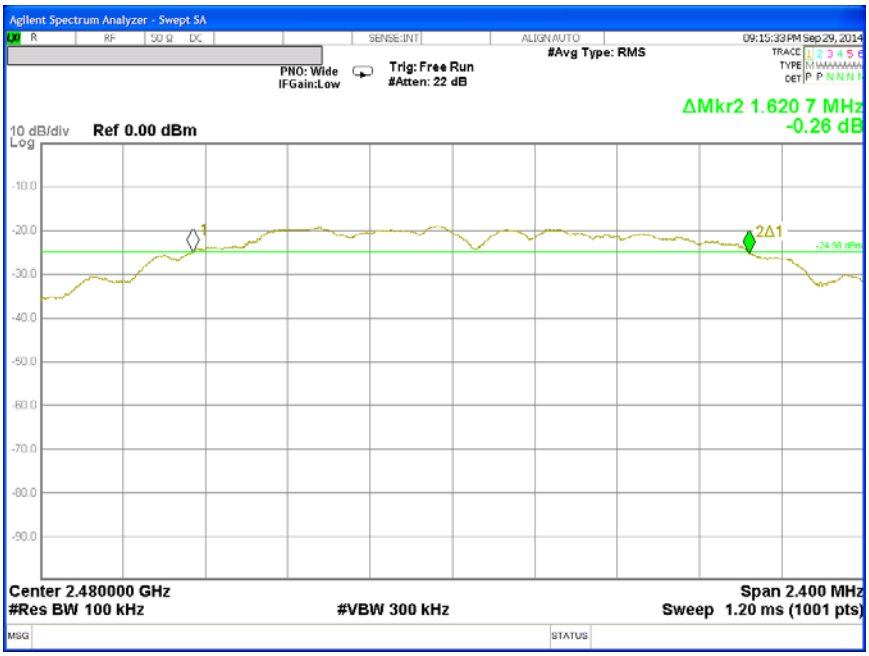
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2405	1.54	0.5
Mid	2440	1.53	0.5
High	2480	1.62	0.5

6 dB BANDWIDTH

6 dB BANDWIDTH LOW CH

6 dB BANDWIDTH MID CH

6 dB BANDWIDTH HIGH CH



8.1.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

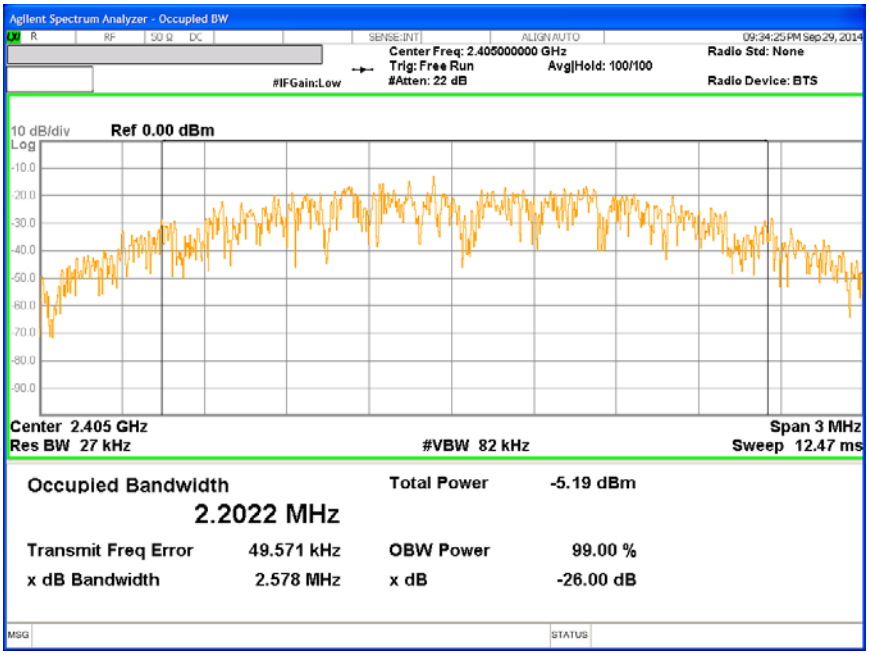
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

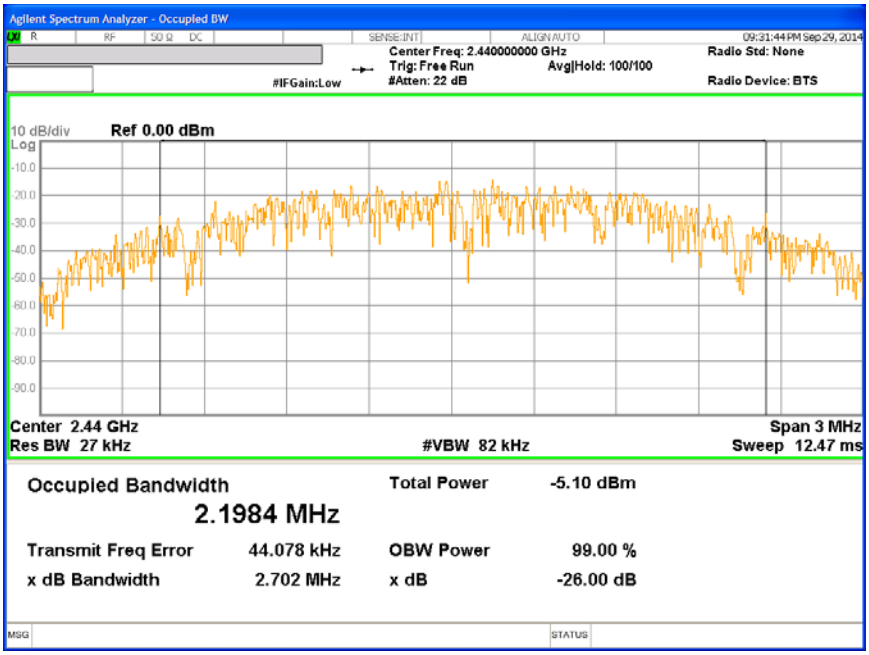
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2405	2.20
Middle	2440	2.20
High	2480	2.24

99% BANDWIDTH

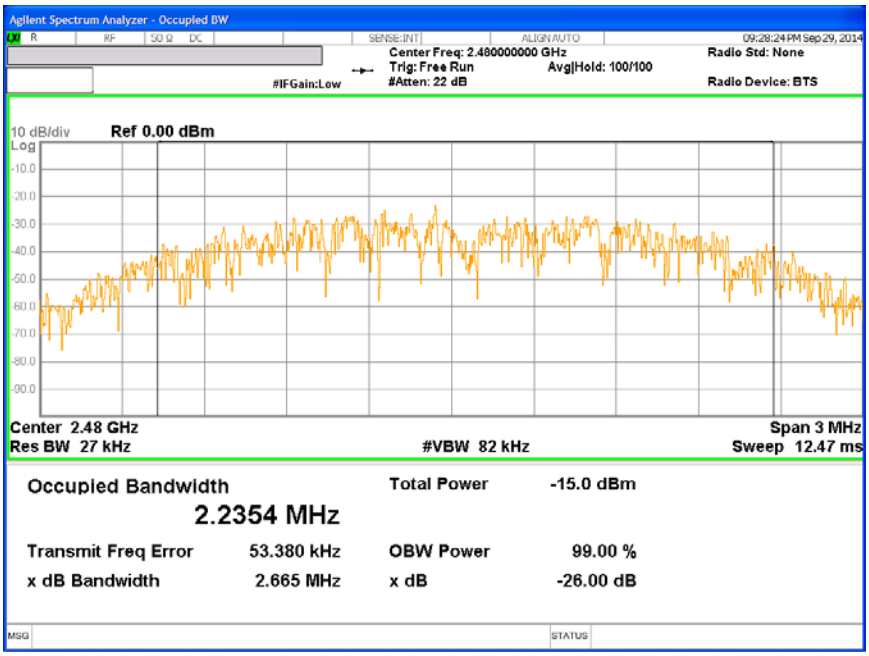
99% BANDWIDTH LOW CH



99% BANDWIDTH MID CH



99% BANDWIDTH HIGH CH



8.1.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter with average-power measurement capability.

The cable assembly insertion loss of 10.15 dB (including 10 dB pad and 0.15 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Channel	Frequency (MHz)	Power (dBm)
Low	2405	4.99
Mid	2440	4.99
High	2480	-4.81

8.1.4. OUTPUT POWER

LIMITS

FCC §15.247

IC RSS-210 A8.4

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

DIRECTIONAL ANTENNA GAIN

There is only one transmitter output therefore the directional gain is equal to the antenna gain.

TEST PROCEDURE

The transmitter output is connected to a power meter with peak-power measurement capability.

The cable assembly insertion loss of 10.15 dB (including 10 dB pad and 0.15 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	2405	-2.20	30.00	30	36	30.00
Mid	2440	-2.20	30.00	30	36	30.00
High	2480	-2.20	30.00	30	36	30.00

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd Power

Results

Channel	Frequency (MHz)	Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low	2405	5.11	5.11	30.00	-24.89
Mid	2440	5.11	5.11	30.00	-24.89
High	2480	-4.14	-4.14	30.00	-34.14

8.1.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247

IC RSS-210 A8.2

RESULTS

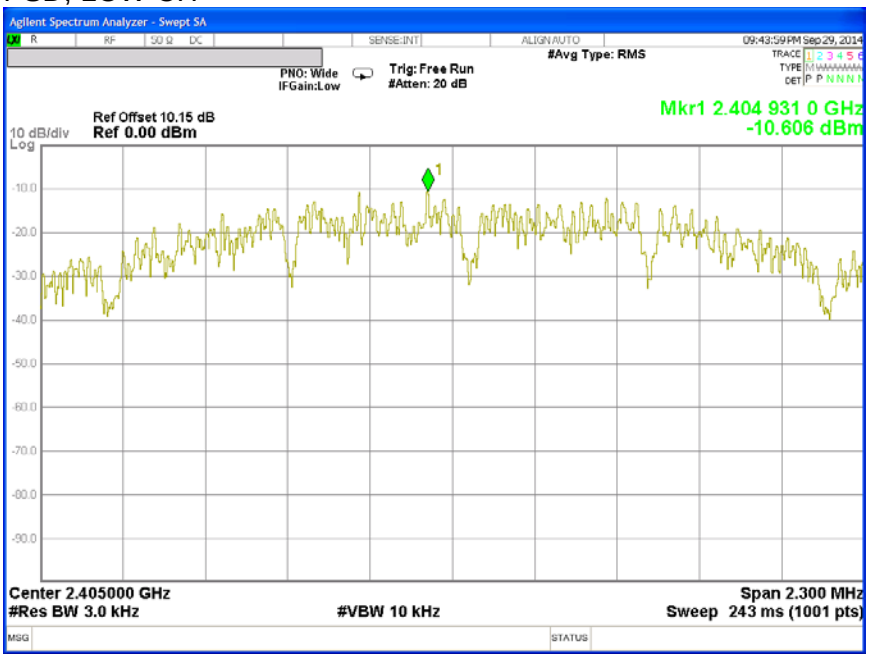
Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd PSD

PSD Results

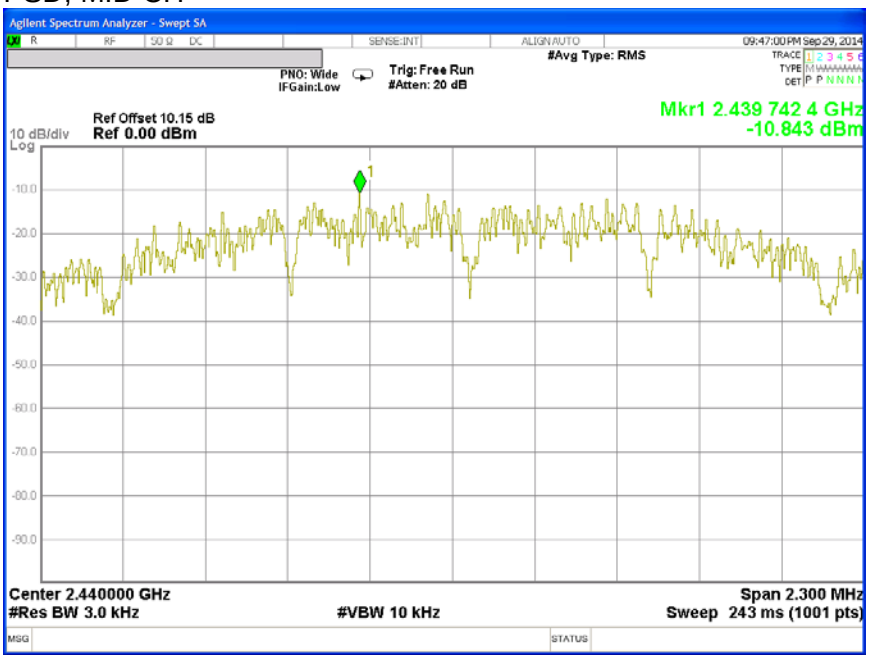
Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Total Corr'd PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2405	-10.61	-10.61	8.0	-18.6
Mid	2440	-10.84	-10.84	8.0	-18.8
High	2480	-21.38	-21.38	8.0	-29.4

POWER SPECTRAL DENSITY

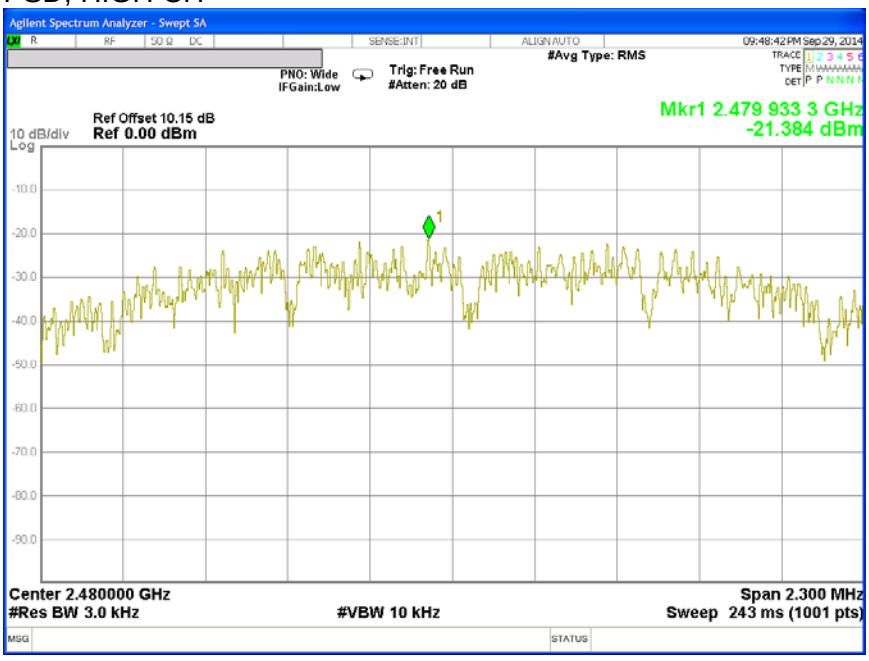
PSD, LOW CH



PSD, MID CH



PSD, HIGH CH



8.1.6. OUT-OF-BAND EMISSIONS

LIMITS

FCC §15.247 (d)

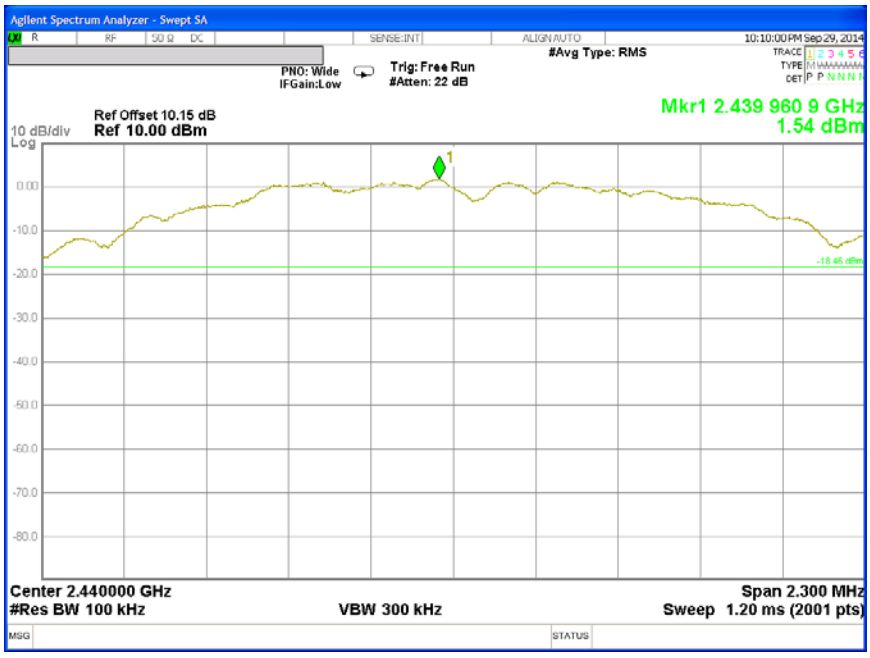
IC RSS-210 A8.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

RESULTS

IN-BAND REFERENCE LEVEL

REFERENCE LEVEL MID CH



LOW CHANNEL BANDEDGE

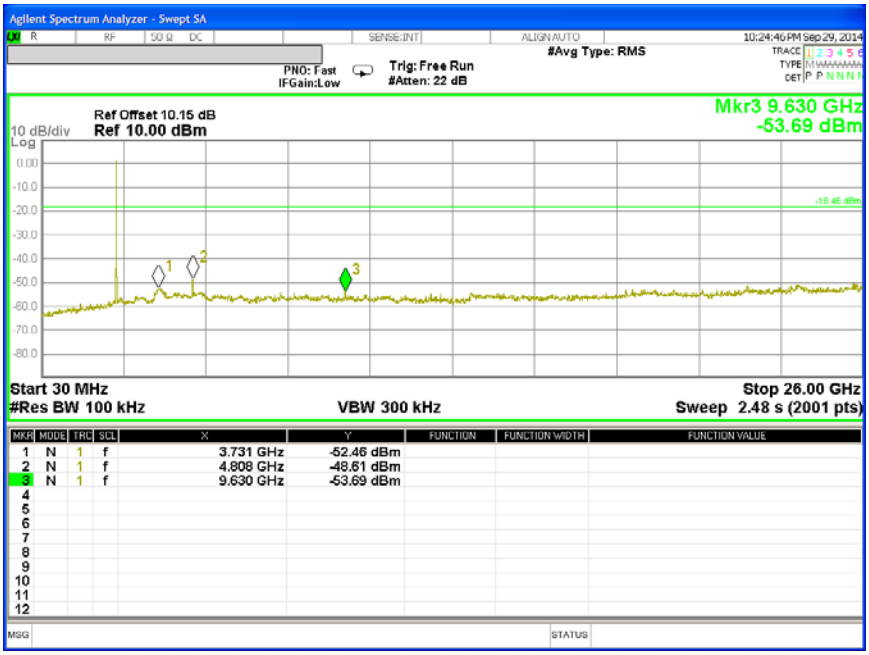
AUTHORIZED BAND EDGE LOW CH

HIGH CHANNEL BANDEDGE

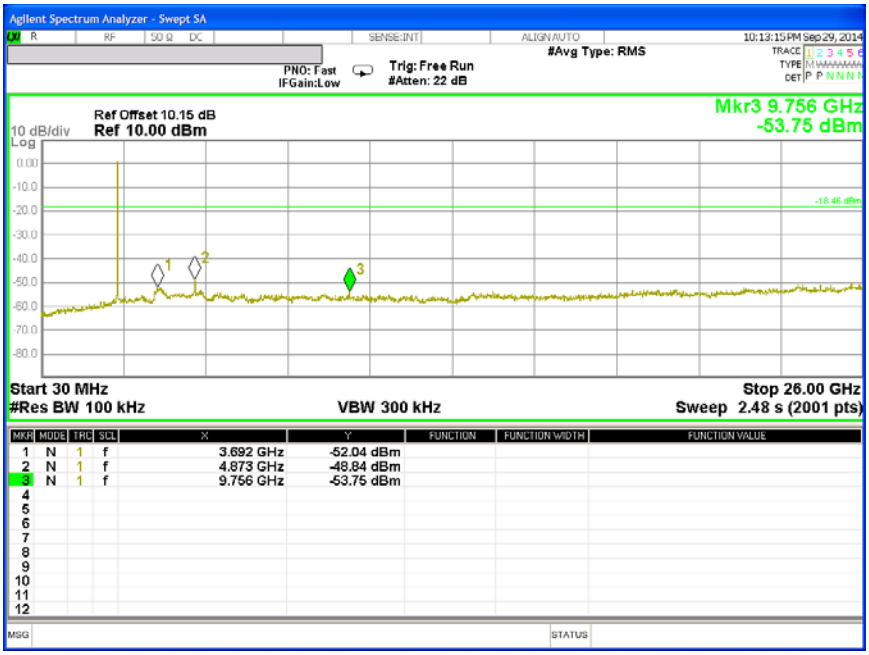
AUTHORIZED BAND EDGE HIGH CH

OUT-OF-BAND EMISSIONS

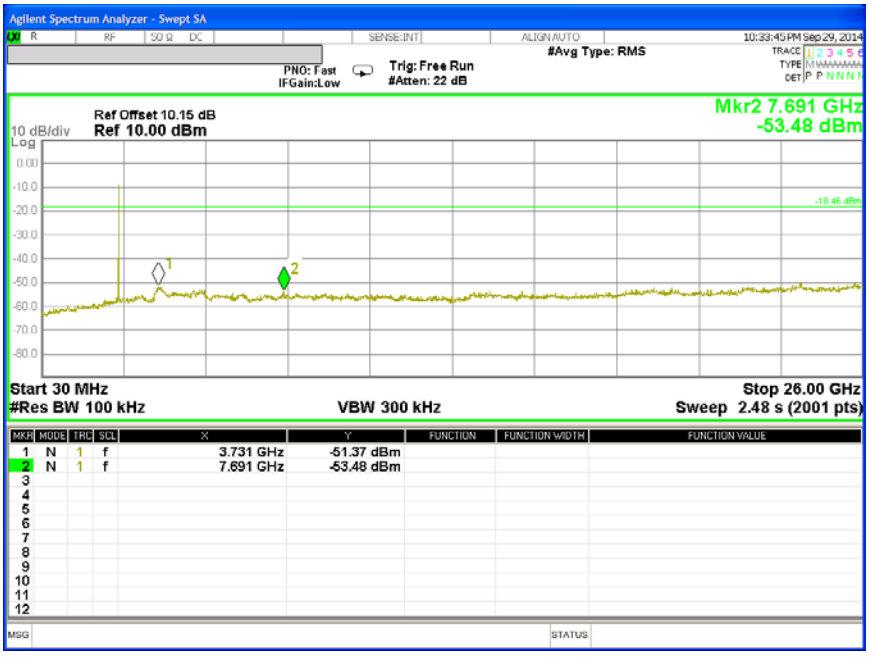
OUT OF BAND LOW CH



OUT OF BAND MID CH



OUT OF BAND HIGH CH



9. RADIATED TEST RESULTS

9.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

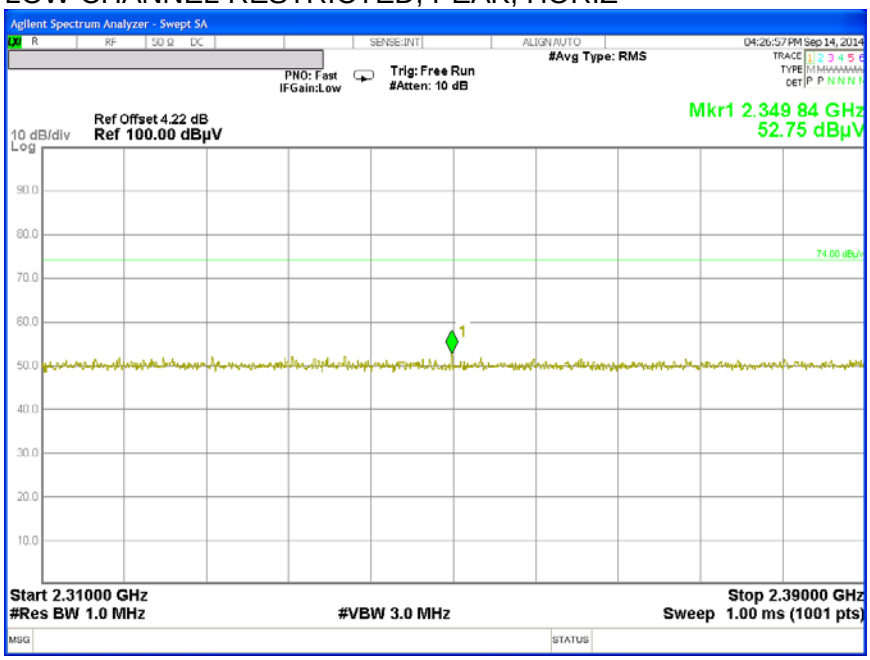
Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

9.2. TRANSMITTER ABOVE 1 GHz

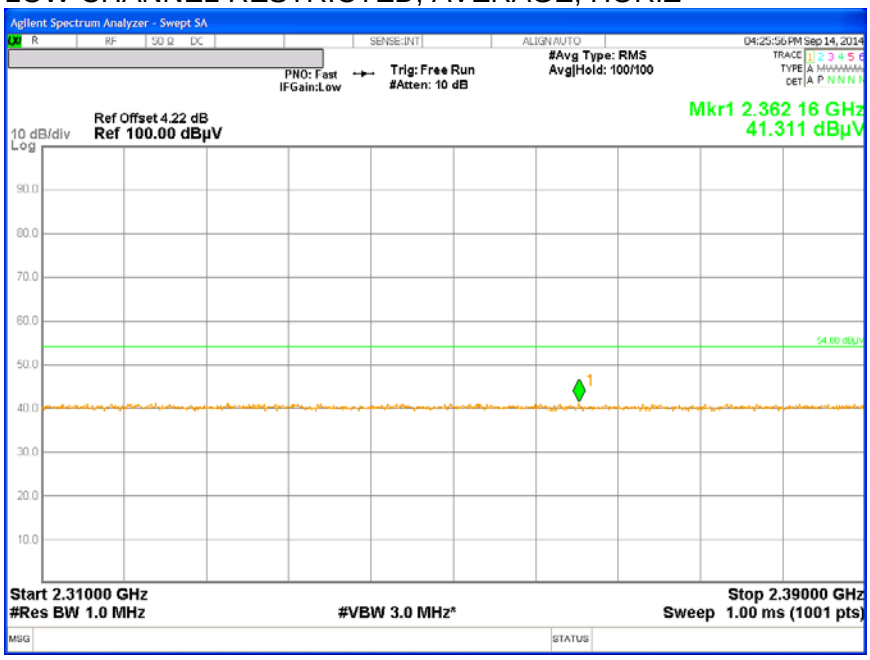
9.3. TX ABOVE 1 GHz O-QPSK (DSSS) IN THE 2.4 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL)

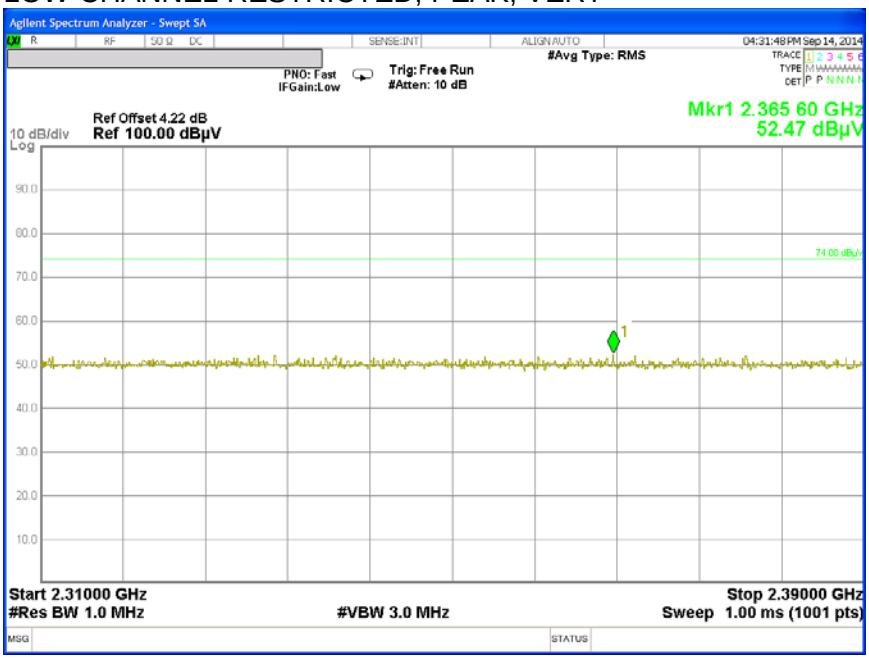
LOW CHANNEL RESTRICTED, PEAK, HORIZ



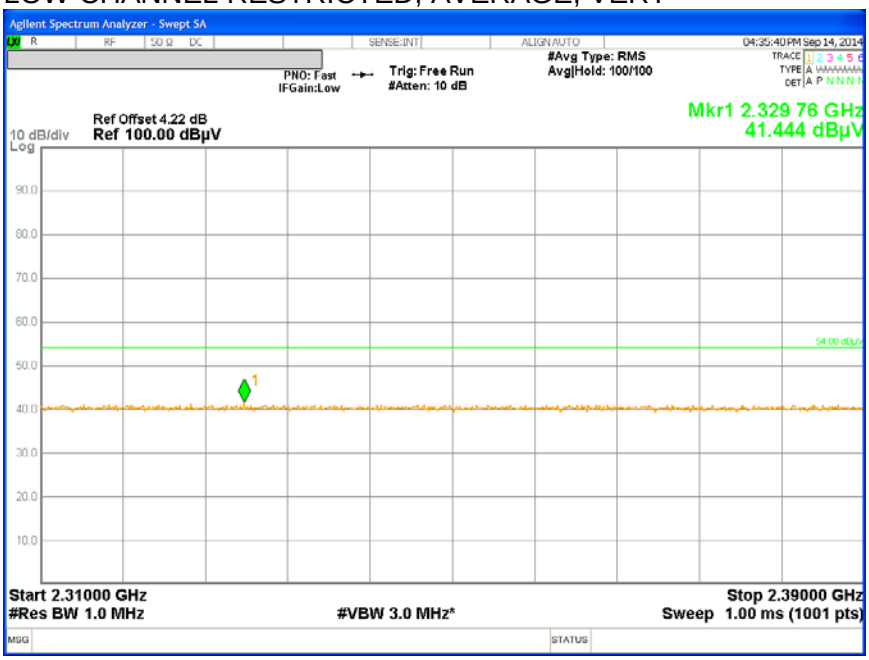
LOW CHANNEL RESTRICTED, AVERAGE, HORIZ



LOW CHANNEL RESTRICTED, PEAK, VERT

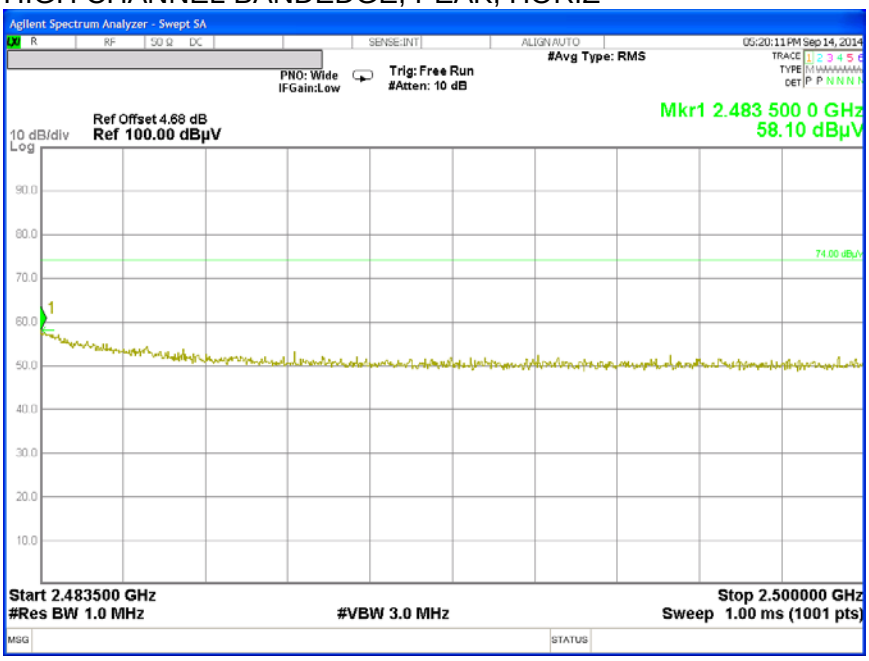


LOW CHANNEL RESTRICTED, AVERAGE, VERT

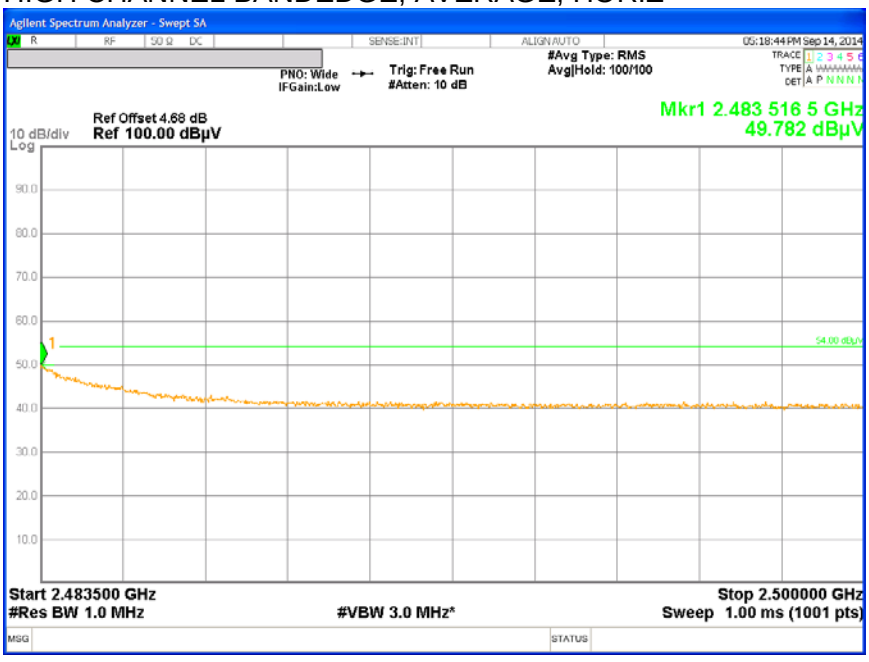


AUTHORIZED BANDEDGE (HIGH CHANNEL)

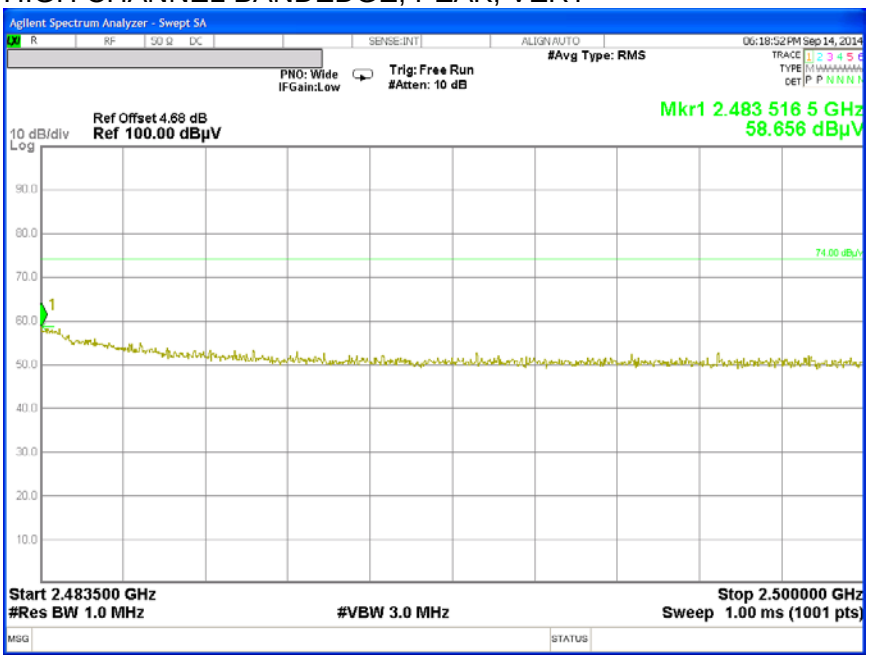
HIGH CHANNEL BANDEDGE, PEAK, HORIZ



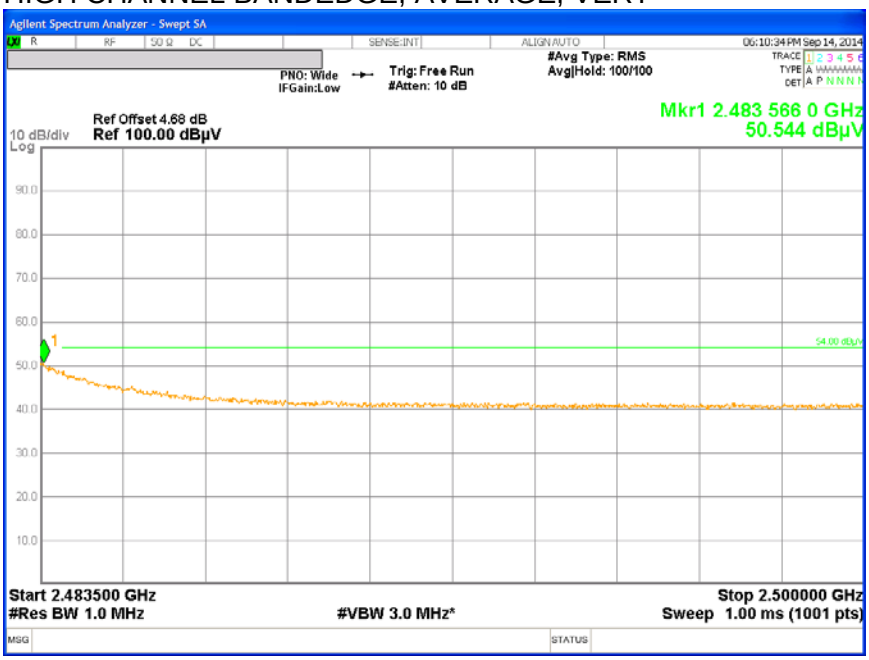
HIGH CHANNEL BANDEDGE, AVERAGE, HORIZ



HIGH CHANNEL BANDEDGE, PEAK, VERT

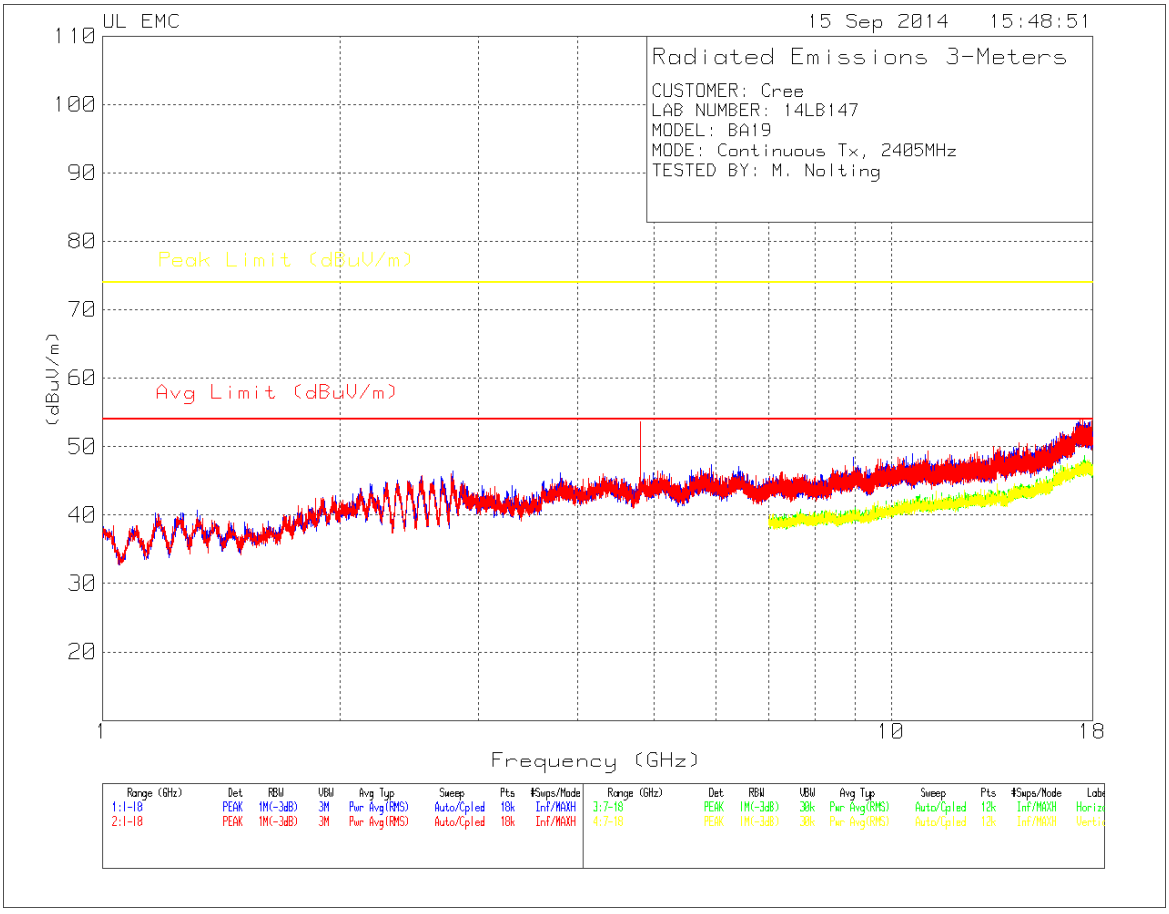


HIGH CHANNEL BANDEDGE, AVERAGE, VERT



HARMONICS AND SPURIOUS EMISSIONS: 1-18GHz

Low Channel: Horizontal/Vertical Plot



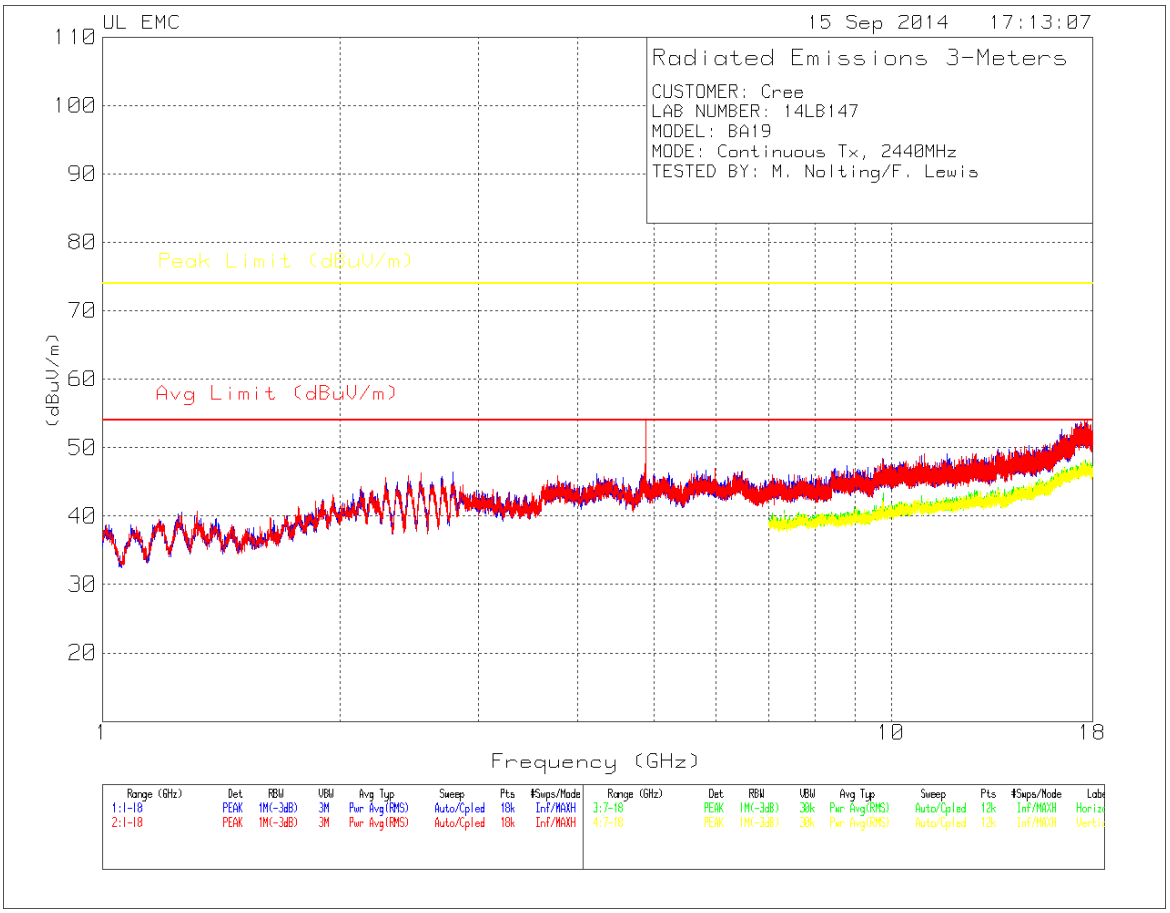
Low Channel: Tabular Data

CUSTOMER: Cree
LAB NUMBER: 14LB147
MODEL: BA19
MODE: Continuous Tx, 2405MHz
TESTED BY: M. Nolting

Freq (GHz)	Meter Reading [dBuV]	Detector	Antenna Factor [dB/m]	Gain/Loss [dB]	Field Strength [dBuV/m]	Average Limit [dBuV/m]	Margin [dB]	Peak Limit [dBuV/m]	Margin [dB]	Antenna Polarity	In Restricted Band?
4.809	55.56	PK2	34.1	-35.4	54.3	-	-	74.0	-19.7	H	Y
4.809	49.09	MAv1	34.1	-35.4	47.8	54.0	-6.2	-	-	H	Y
3.797	47.45	PK2	33.4	-36.1	44.8	-	-	74.0	-29.2	H	Y
3.806	36.52	MAv1	33.5	-36.1	33.9	54.0	-20.1	-	-	H	Y
8.949	43.28	PK	36.2	-31.1	48.4	-	-	-	-	H	N
4.811	57.51	PK2	34.1	-35.4	56.2	-	-	74.0	-17.8	V	Y
4.811	50.95	MAv1	34.1	-35.4	49.7	54.0	-4.3	-	-	V	Y
9.627	42.26	PK	36.8	-30.9	48.2	-	-	-	-	V	N
11.146	40.51	PK2	37.8	-29.5	48.8	-	-	74.0	-25.2	V	Y
11.147	28.84	MAv1	37.8	-29.5	37.1	54.0	-16.8	-	-	V	Y

PK - Peak detector
PK2 - KDB558074 Method: Maximum Peak
MAv1 - KDB558074 Option 1 Maximum RMS Average

Mid Channel: Horizontal/Vertical Plot



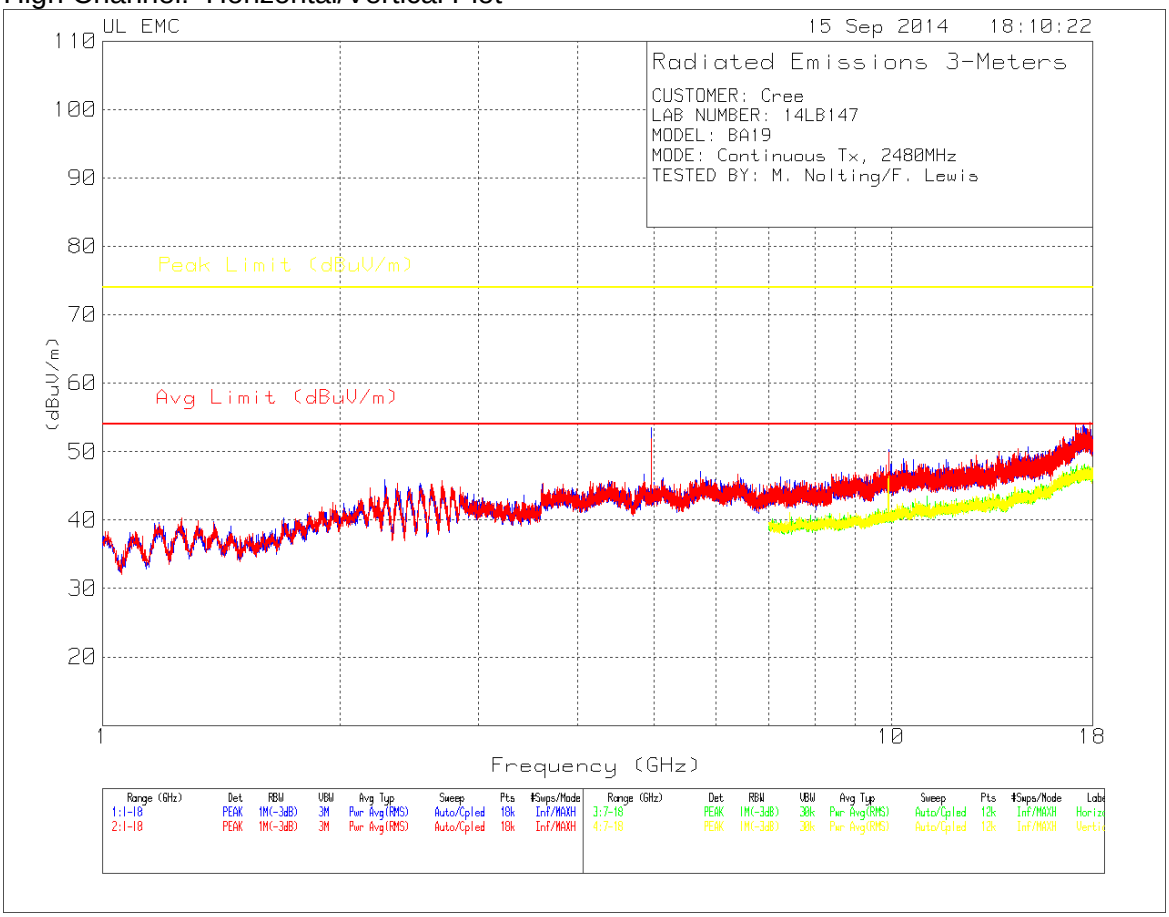
Mid Channel: Tabular Data

CUSTOMER: Cree
LAB NUMBER: 14LB147
MODEL: BA19
MODE: Continuous Tx, 2440MHz
TESTED BY: M. Nolting/F. Lewis

Freq (GHz)	Meter Reading [dBuV]	Detector	Antenna Factor [dB/m]	Gain/Loss [dB]	Field Strength [dBuV/m]	Average Limit [dBuV/m]	Margin [dB]	Peak Limit [dBuV/m]	Margin [dB]	Antenna Polarity	In Restricted Band?
4.879	54.59	PK2	34.1	-35.4	53.3	-	-	74.0	-20.7	H	Y
4.879	48.06	MAv1	34.1	-35.4	46.8	54.0	-7.2	-	-	H	Y
9.764	42.19	PK	37.0	-30.9	48.3	-	-	-	-	H	N
10.927	40.18	PK2	37.7	-29.7	48.2	-	-	74.0	-25.8	H	Y
10.928	29.09	MAv1	37.7	-29.7	37.1	54.0	-16.9	-	-	H	Y
4.879	57.05	PK2	34.1	-35.4	55.8	-	-	74.0	-18.2	V	Y
4.879	51.06	MAv1	34.1	-35.4	49.8	54.0	-4.2	-	-	V	Y
9.759	42.36	PK	37.0	-30.9	48.5	-	-	-	-	V	N
11.020	40.40	PK2	37.7	-29.5	48.6	-	-	74.0	-25.4	V	Y
11.018	29.15	MAv1	37.7	-29.5	37.4	54.0	-16.6	-	-	V	Y

PK - Peak detector
PK2 - KDB558074 Method: Maximum Peak
MAv1 - KDB558074 Option 1 Maximum RMS Average

High Channel: Horizontal/Vertical Plot



High Channel: Tabular Data

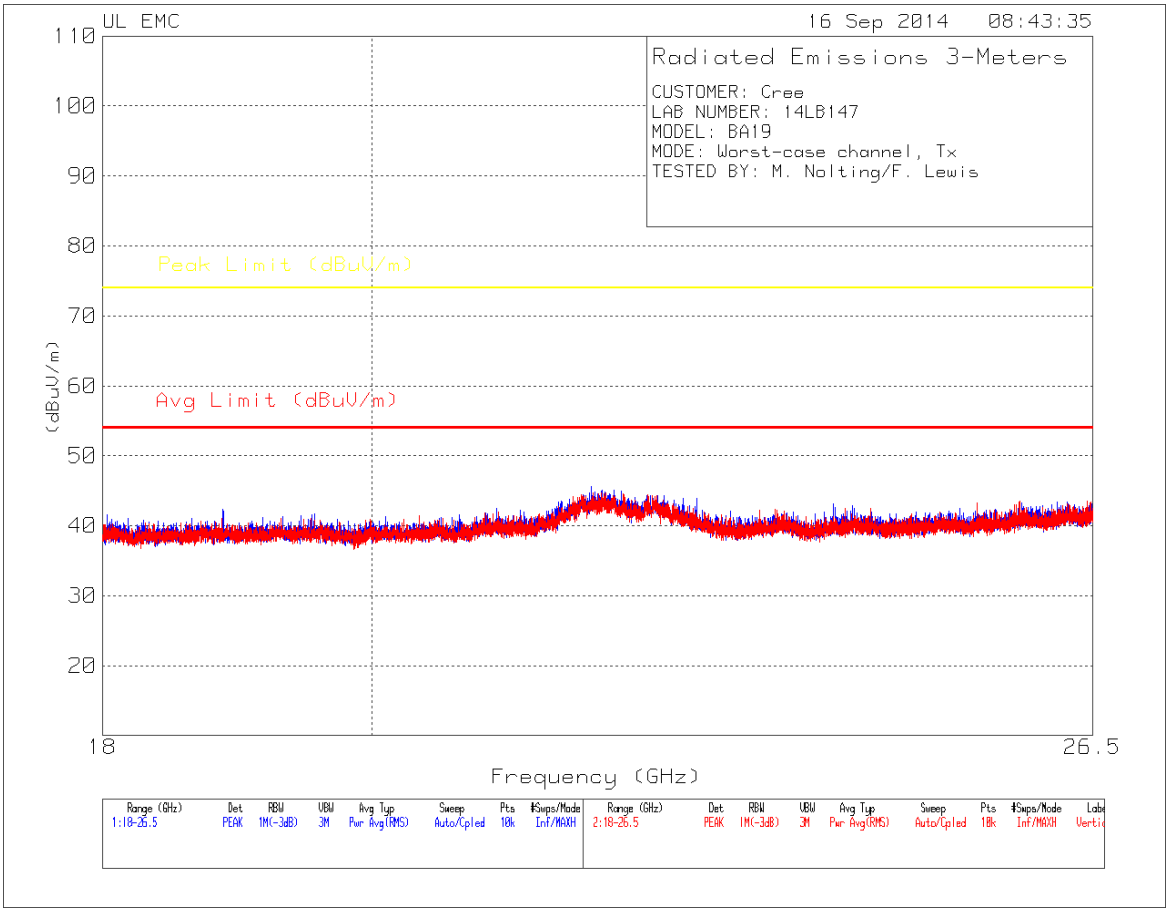
CUSTOMER: Cree
LAB NUMBER: 14LB147
MODEL: BA19
MODE: Continuous Tx, 2480MHz
TESTED BY: M. Nolting/F. Lewis

Freq (GHz)	Meter Reading [dBuV]	Detector	Antenna Factor [dB/m]	Gain/Loss [dB]	Field Strength [dBuV/m]	Average Limit [dBuV/m]	Margin [dB]	Peak Limit [dBuV/m]	Margin [dB]	Antenna Polarity	In Restricted Band?
4.959	54.79	PK2	34.1	-35.2	53.7	-	-	74.0	-20.3	H	Y
4.959	48.39	MAv1	34.1	-35.2	47.3	54.0	-6.7	-	-	H	Y
7.439	44.03	PK2	35.7	-31.4	48.3	-	-	74.0	-25.6	H	Y
7.439	33.46	MAv1	35.7	-31.4	37.8	54.0	-16.2	-	-	H	Y
9.919	43.84	PK	37.1	-30.6	50.3	-	-	-	-	H	N
4.961	53.79	PK2	34.1	-35.2	52.7	-	-	74.0	-21.3	V	Y
4.961	46.93	MAv1	34.1	-35.2	45.8	54.0	-8.1	-	-	V	Y
7.442	43.53	PK2	35.7	-31.4	47.8	-	-	74.0	-26.1	V	Y
7.442	33.19	MAv1	35.7	-31.4	37.5	54.0	-16.5	-	-	V	Y
9.923	43.46	PK	37.1	-30.6	50.0	-	-	-	-	V	N

PK - Peak detector
PK2 - KDB558074 Method: Maximum Peak
MAv1 - KDB558074 Option 1 Maximum RMS Average

HARMONICS AND SPURIOUS EMISSIONS: 18-26GHz

Worst-case Channel: Horizontal/Vertical Plot



Worst-case Channel: Tabular Data

CUSTOMER: Cree
LAB NUMBER: 14LB147
MODEL: BA19
MODE: Worst-case channel, Tx
TESTED BY: M. Nolting/F. Lewis

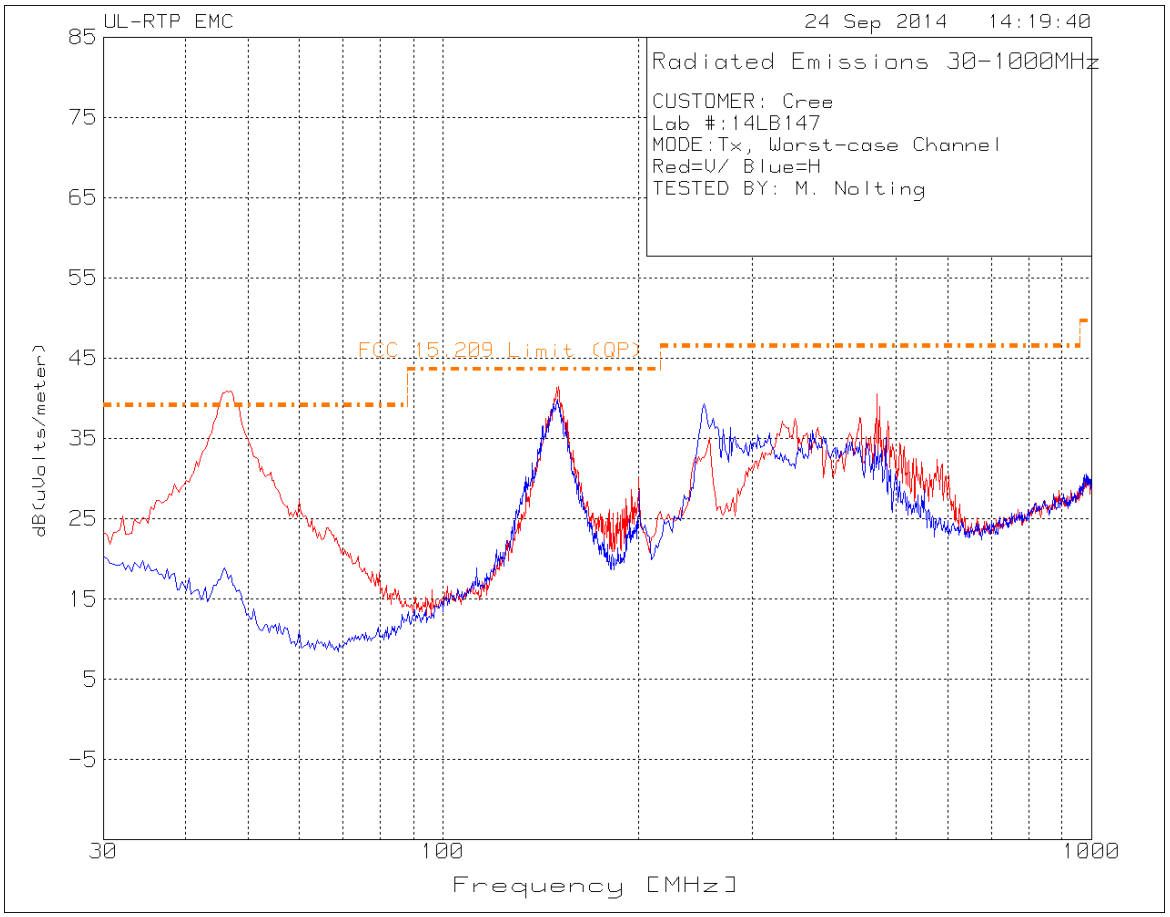
Freq (GHz)	Meter Reading [dBuV]	Detector	Antenna Factor [dB/m]	Gain/Loss [dB]	Field Strength [dBuV/m]	Average Limit [dBuV/m]	Margin [dB]	Peak Limit [dBuV/m]	Margin [dB]	Antenna Polarity	In Restricted Band?
18.869	48.21	PK	32.5	-38.8	41.9	54.0	-12.1	74.0	-32.1	H	Y
21.789	47.38	PK	36.4	-38.2	45.6	-	-	-	-	H	N
23.945	46.56	PK2	33.7	-37.5	42.8	-	-	74.0	-31.2	H	Y
23.948	35.52	MAv1	33.7	-37.5	31.7	54.0	-22.3	-	-	H	Y
18.856	47.40	PK	32.4	-38.8	41.0	54.0	-13.0	74.0	-33.0	V	Y
22.061	46.88	PK2	36.9	-38.3	45.5	-	-	74.0	-28.5	V	Y
22.060	35.89	MAv1	36.9	-38.3	34.5	54.0	-19.5	-	-	V	Y
25.749	45.16	PK	34.0	-35.7	43.5	-	-	-	-	V	N

PK - Peak detector
PK2 - KDB558074 Method: Maximum Peak
MAv1 - KDB558074 Option 1 Maximum RMS Average

9.4. WORST-CASE BELOW 1 GHz

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

VERTICAL/HORIZONTAL PLOT



VERTICAL/HORIZONTAL DATA

CUSTOMER: Cree
Lab #:14LB147
MODE:Tx, Worst-case Channel
Red=V/ Blue=H
TESTED BY: M. Nolting

Freq (MHz)	Meter Reading [dBuV]	Detector	Antenna Factor [dB/m]	Gain/Loss [dB]	Field Strength [dBuV/m]	15.209 QP Limit [dBuV/m]	Margin [dB]	Antenna Polarity	In Restricted Band?
46.633	51.77	QP	11.1	-25.8	37.1	-	-	V	N
149.900	47.15	QP	14.3	-24.6	36.9	43.5	-6.7	V	Y
257.715	50.95	PK	12.2	-28.0	35.2	46.4	-11.3	V	Y
349.098	50.05	PK	14.7	-27.2	37.6	-	-	V	N
438.878	47.80	PK	16.5	-26.7	37.6	-	-	V	N
466.015	37.46	QP	16.8	-26.6	27.7	-	-	V	N
149.808	47.33	QP	14.3	-24.6	37.0	-	-	H	N
149.900	47.31	QP	14.3	-24.6	37.0	43.5	-6.5	H	Y
252.906	50.12	QP	12.1	-28.1	34.1	46.4	-12.3	H	Y
261.217	48.46	QP	12.2	-28.0	32.7	46.4	-13.7	H	Y
371.543	48.19	PK	14.9	-27.0	36.1	-	-	H	N
450.100	43.95	PK	17.0	-26.7	34.3	-	-	H	N

PK - Peak detector
QP - Quasi-peak detector

10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

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 C63.4.

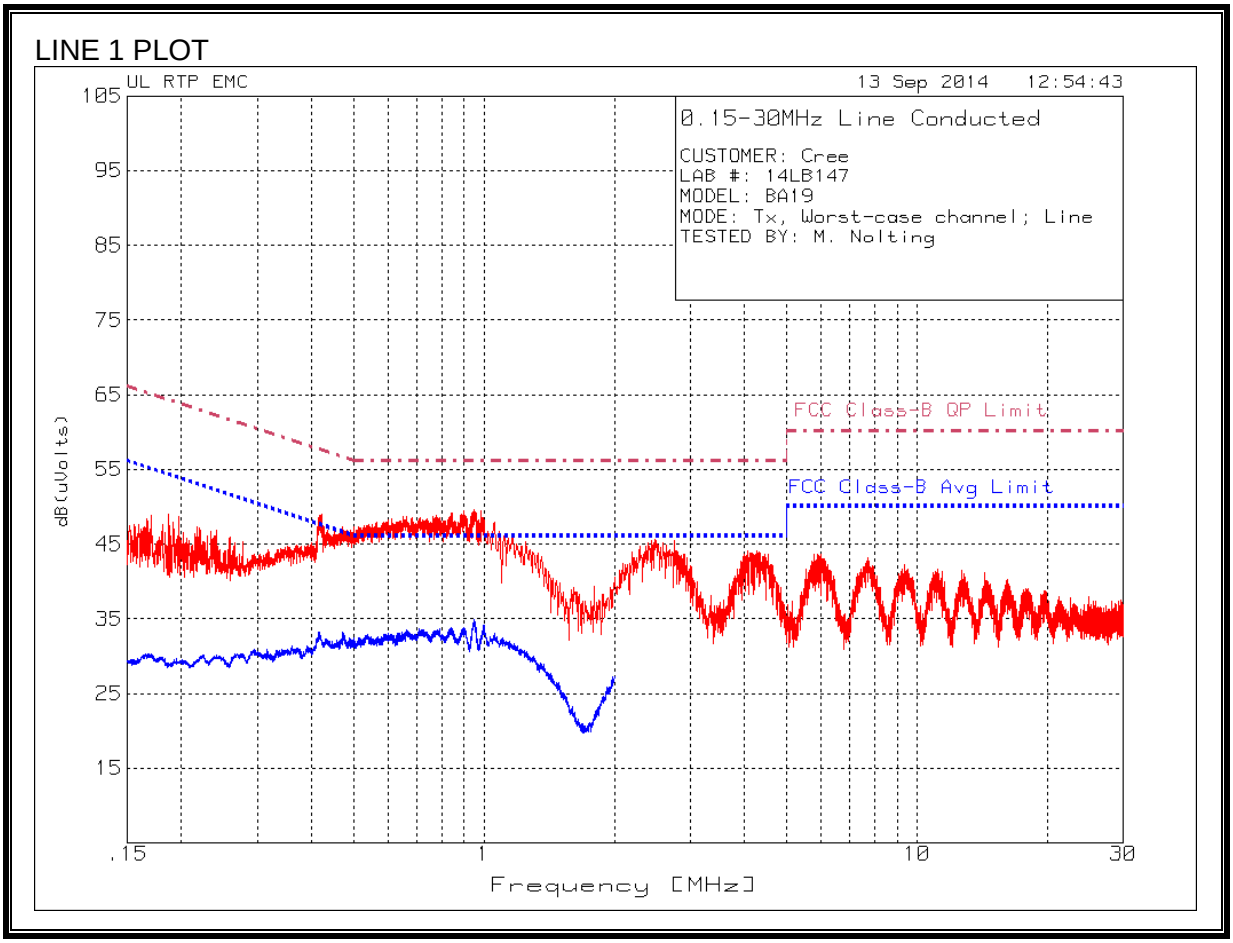
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

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

RESULTS

LINE 1 RESULTS

LINE 1 PLOT



Note: Blue trace is a reduced video-bandwidth scan to determine presence of narrow-band emissions.

LINE 1 TABULAR DATA

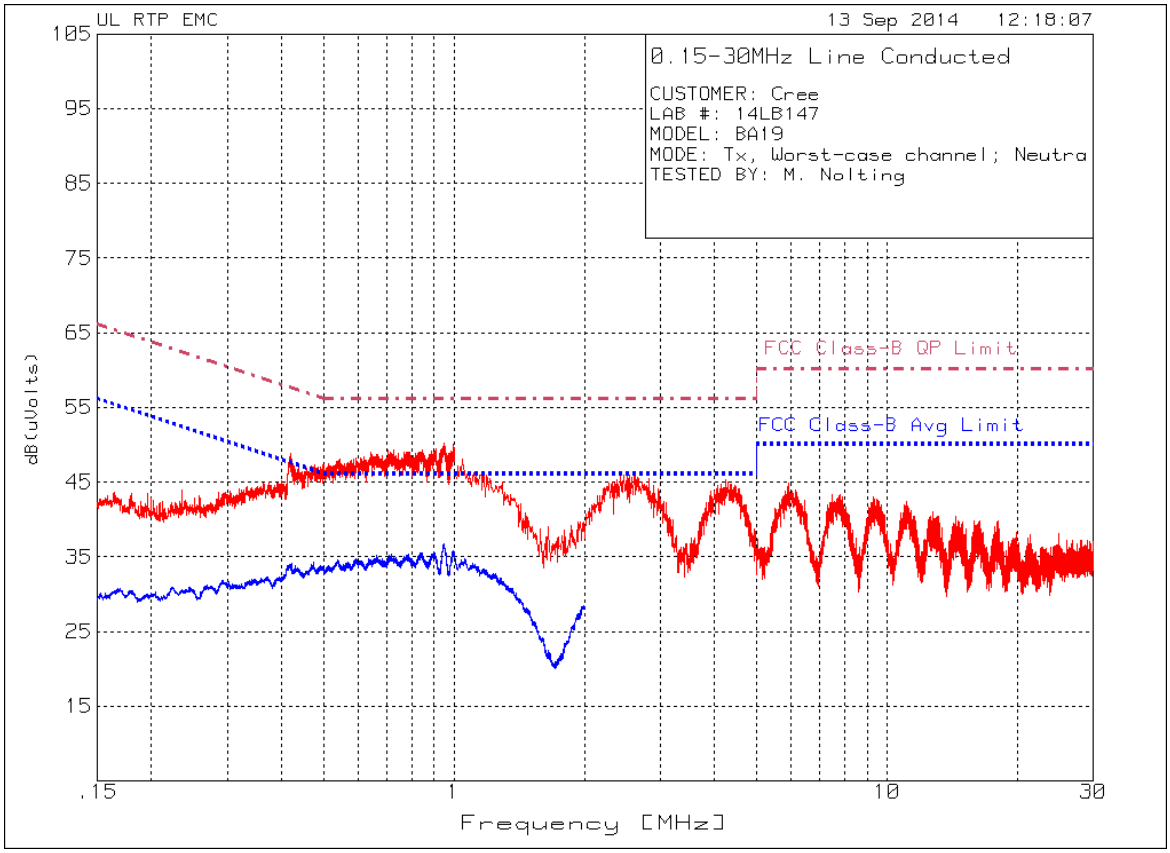
CUSTOMER: Cree
LAB #: 14LB147
MODEL: BA19
MODE: Tx, Worst-case channel; Line
TESTED BY: M. Nolting

Test Frequency [MHz]	Meter Reading [dBuV]	Detector*	LISN [dB]	Cable Loss [dB]	RF Line Voltage [dBuV]	FCC 15.207 (QP) [dBuV]	Margin [dB]	FCC 15.207 (AV) [dBuV]	Margin [dB]
0.1870	26.99	QP	0.3	9.4	36.7	64.2	-27.5	-	-
0.2246	28.07	QP	0.2	9.4	37.7	62.6	-24.9	-	-
0.4160	33.73	QP	0.1	9.5	43.3	57.5	-14.2	-	-
0.9490	34.78	QP	0.0	9.5	44.3	56.0	-11.7	-	-
0.9957	33.45	QP	0.0	9.5	43.0	56.0	-13.1	-	-
2.5490	29.95	QP	0.0	9.5	39.5	56.0	-16.6	-	-
4.3154	28.62	QP	0.0	9.5	38.1	56.0	-17.9	-	-
0.1870	18.36	CAV	0.3	9.4	28.1	-	-	54.2	-26.1
0.2246	19.85	CAV	0.2	9.4	29.5	-	-	52.6	-23.2
0.4160	23.25	CAV	0.1	9.5	32.9	-	-	47.5	-14.7
0.9490	24.69	CAV	0.0	9.5	34.2	-	-	46.0	-11.8
0.9957	23.69	CAV	0.0	9.5	33.2	-	-	46.0	-12.8
2.5490	21.22	CAV	0.0	9.5	30.7	-	-	46.0	-15.3
4.3154	20.13	CAV	0.0	9.5	29.6	-	-	46.0	-16.4

*PK = Peak, QP = Quasi-Peak, CAV = CISPR-compliant average

LINE 2 RESULTS

LINE 2 PLOT



Note: Blue trace is a reduced video-bandwidth scan to determine presence of narrow-band emissions.

LINE 2 TABULAR DATA

CUSTOMER: Cree
LAB #: 14LB147
MODEL: BA19
MODE: Tx, Worst-case channel; Neutral
TESTED BY: M. Nolting

Test Frequency [MHz]	Meter Reading [dBuV]	Detector*	LISN [dB]	Cable Loss [dB]	RF Line Voltage [dBuV]	FCC 15.207 (QP) [dBuV]	Margin [dB]	FCC 15.207 (AV) [dBuV]	Margin [dB]
0.4177	33.21	QP	0.1	9.5	42.8	57.5	-14.7	-	-
0.9480	34.96	QP	0.0	9.5	44.5	56.0	-11.5	-	-
0.9979	33.66	QP	0.0	9.5	43.2	56.0	-12.8	-	-
2.5486	30.99	QP	0.0	9.5	40.5	56.0	-15.5	-	-
4.2499	29.76	QP	0.0	9.5	39.3	56.0	-16.7	-	-
5.9997	29.08	QP	0.1	9.4	38.6	60.0	-21.4	-	-
0.4177	24.00	CAV	0.1	9.5	33.6	-	-	47.5	-13.9
0.9480	26.48	CAV	0.0	9.5	36.0	-	-	46.0	-10.0
0.9979	25.50	CAV	0.0	9.5	35.0	-	-	46.0	-11.0
2.5486	23.26	CAV	0.0	9.5	32.8	-	-	46.0	-13.2
4.2499	22.53	CAV	0.0	9.5	32.0	-	-	46.0	-14.0
5.9997	21.73	CAV	0.1	9.4	31.2	-	-	50.0	-18.8

*PK = Peak, QP = Quasi-Peak, CAV = CISPR-compliant average

END OF REPORT