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

CERTIFICATION TEST REPORT

FOR

2400 – 2483.5 MHZ TRANSCEIVER

MODEL NUMBER: A20737A, A20737C*

FCC ID: X7J-A14070701
IC: 8975A-A14070701

REPORT NUMBER: 14M18350- E1

ISSUE DATE: SEPTEMBER 12, 2014

Prepared for
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6635 KIRKVILLE ROAD
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Prepared by
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*Model differences are explained in the body of this report

NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	09/12/14	Initial Issue	F. Ibrahim

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: ANAREN, INC.
6635 KIRKVILLE ROAD
EAST SYRACUSE, NEW YORK 13057-9600, U.S.A.

EUT DESCRIPTION: 2400 – 2483.5 MHZ TRANSCEIVER

MODEL: A20737A (for radiated testing)
A20737C (for conducted testing and radiated testing)

SERIAL NUMBER: For Conducted: S/N 15
For Radiated: S/N 14 (PCB Antenna), S/N 15 (Monopole Antenna)

DATE TESTED: SEPTEMBER 2 to 3, 2014

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

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

Approved & Released For
UL Verification Services Inc. By:

FRANK IBRAHIM
PROGRAM MANAGER
UL Verification Services Inc.

Tested By:

VICKY NGUYEN
EMC ENGINEER
UL Verification Services Inc.

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 3, and RSS-210 Issue 8.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

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	☐ Chamber D
☐ Chamber B	☐ Chamber E
☐ Chamber C	☐ Chamber F
	☐ Chamber G
	☐ Chamber H

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers A through H are covered under Industry Canada company address code 2324B with site numbers 2324B -1 through 2324B-8, respectively.

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, 0.15 to 30 MHz	± 3.52 dB
Radiated Disturbance, 30 to 1000 MHz	± 4.94 dB
Radiated Disturbance, 1 to 6 GHz	± 3.86 dB
Radiated Disturbance, 6 to 18 GHz	± 4.23 dB
Radiated Disturbance, 18 to 26 GHz	± 5.30 dB
Radiated Disturbance, 26 to 40 GHz	± 5.23 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a 2.4 GHz BLE module.

The transceiver is manufactured by Anaren, Inc.

5.2. MANUFACTURER'S DESCRIPTION OF MODEL DIFFERENCES

The two models are identical except that model A20737A has an integral printed antenna while model A20737C has a U.FL connector.

Based on the above, for antenna port testing, model A20737C was considered representative of model A20737A.

5.3. 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	GFSK 1Mbps 250kHz deviation	3.23	2.10

5.4. DESCRIPTION OF AVAILABLE ANTENNAS

Module A20737A utilizes a PCB antenna, with a maximum gain of 2 dBi.
Module A20737C utilizes an external Monopole antenna, with a maximum gain of 3 dBi.

5.5. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was FTDI 2232H D2xx, Ver. 2.10.0.0.

The test utility software used during testing was A20737x_cert_test.exe, Ver. 1.0.0.0.

5.6. 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 X orientation was worst-case orientation for module A20737A and Y orientation was worst-case orientation for module A20737C. Final radiated testing was performed with EUT laid out in its worst-case orientation.

Data rate is fixed for this device which is 1 Mbps.

Based on feedback from the manufacturer, there is no colocation in the device covered by this report.

5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Laptop	Lenovo	2349CW5	PB05HPL	N/A
AC / DC Adapter	Lenovo	42T4430	11S42T4430Z1ZGWE28	N/A
Test Board	Anaren	WES-12288	N/A	N/A

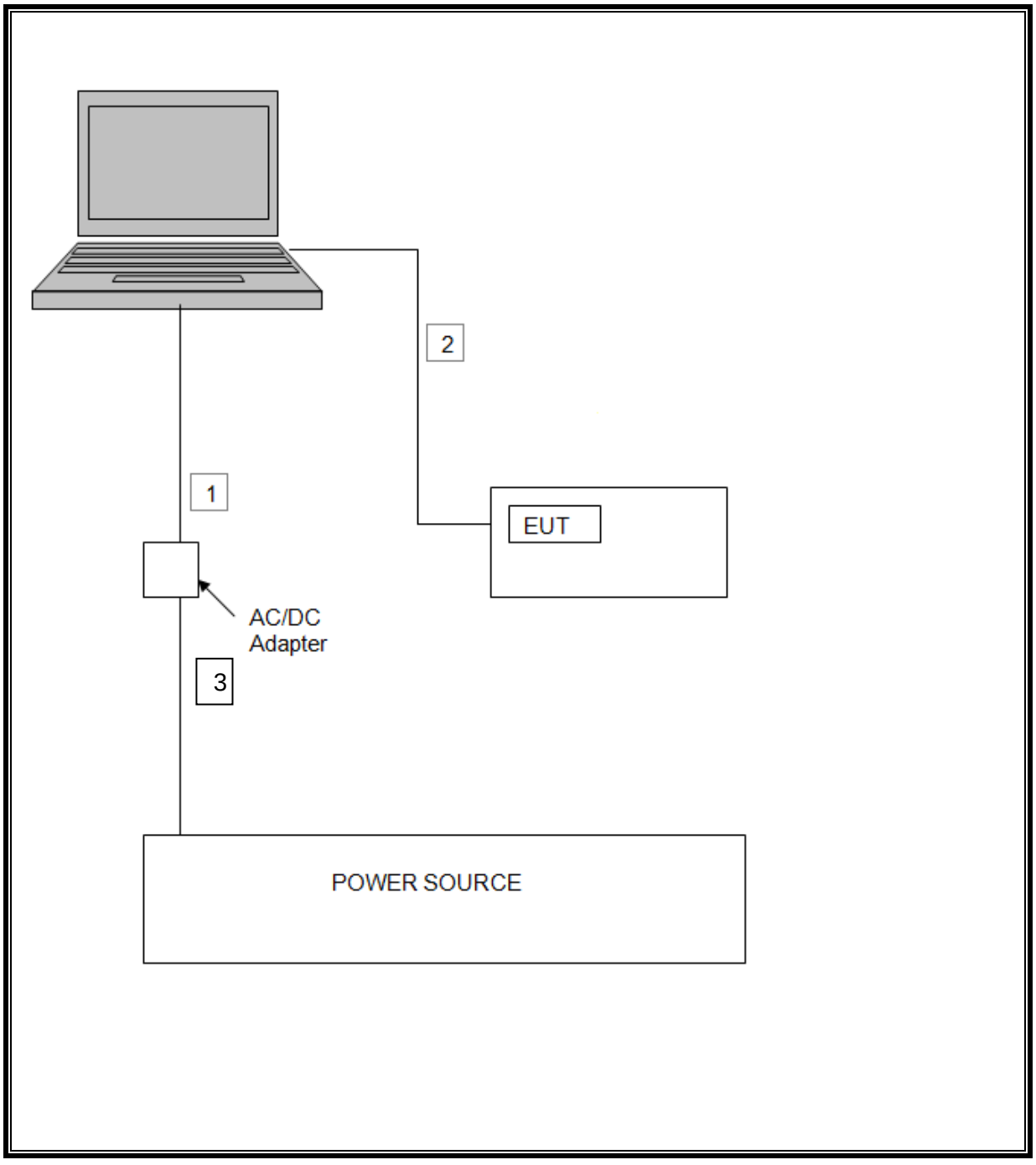
I/O CABLES

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	DC	1	DC	Unshielded	1	DC Output
2	USB	1	USB	Unshielded	0.5	USB to EUT
3	AC	1	AC	Unshielded	1	AC input

TEST SETUP

The EUT is connected to a host laptop computer by USB cable during the tests. Test software exercised the radio module.

SETUP DIAGRAM FOR TESTS



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 Date**	**Cal Due**
Spectrum Analyzer, 3 Hz-44GHz	Agilent	N9030A	F00491	05/09/14	05/09/15
Antenna, Horn 1-18GHz	ETS Lindgren	3117	C01022	02/28/14	02/28/15
Antenna, 30 to 2000MHz	Sunol Sciences	JB3	F00215	05/29/14	05/29/15
Filter, HPF 3.0GHz	Micro-Tronics	HPM17543	T486	01/11/14	01/11/15
Filter, LPF 5.0GHz	Micro-Tronics	LPS17541	T481	01/11/14	01/11/15
Filter, HPF 6.0GHz	Micro-Tronics	HPS17542	T484	01/11/14	01/11/15
Silver Box Amplifier	Miteq	AFS42-0010180	F00002	08/19/14	08/19/15
Amplifier, 10KHz to 1GHz	Agilent	8447D	C00885	04/03/14	04/03/15
Antenna, Horn 18-26.5GHz	ARA	MWH-1826/B	C00980	11/26/13	11/26/14
Amplifier, 1-26.5GHz	Agilent	8449B	F00167	03/25/14	03/25/15
Spectrum Analyzer, 40GHz	Agilent	8564E	C00951	08/06/14	08/06/15
Spectrum Analyzer, 3Hz-26.5GHz	Agilent	E4440A	C01179	07/25/14	07/25/15
Power Meter, P-Series Single	Agilent	N1911A	F00017	06/30/14	06/30/15
Power Sensor, 50MHz-6GHz	Agilent	E9323A	F00162	05/02/14	05/02/15

7. MEASUREMENT METHODS

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

Output Power: KDB 558074 D01 v03r02, Section 9.1.1.

Average Power: KDB 558074 D01 v03r02, Section 9.2.3.1.

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. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

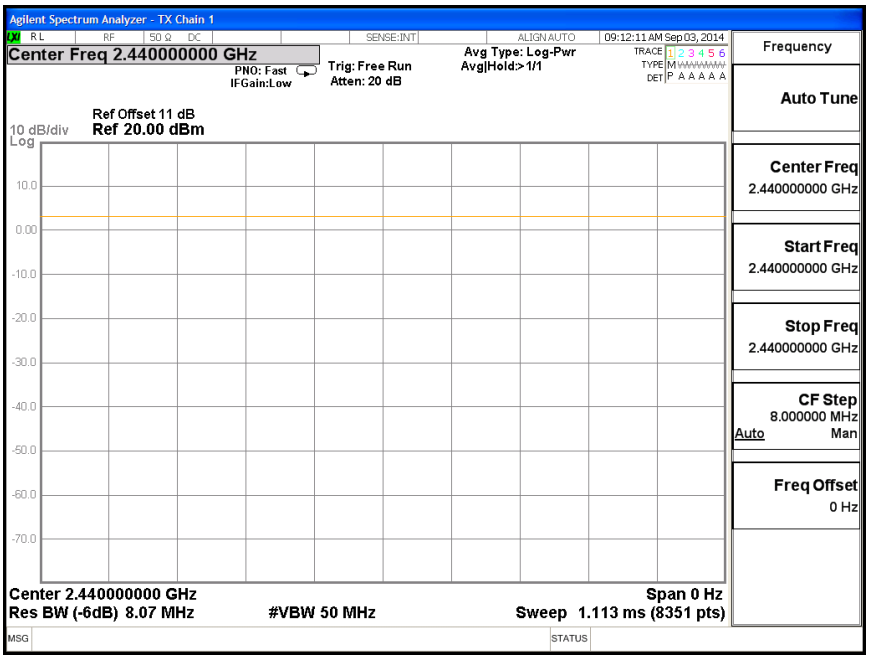
PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method.

RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
GFSK 1Mbps 250kHz deviation	1.000	1.000	1.000	100.00%	0.00	0.010

DUTY CYCLE BLE MODE



8.2. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

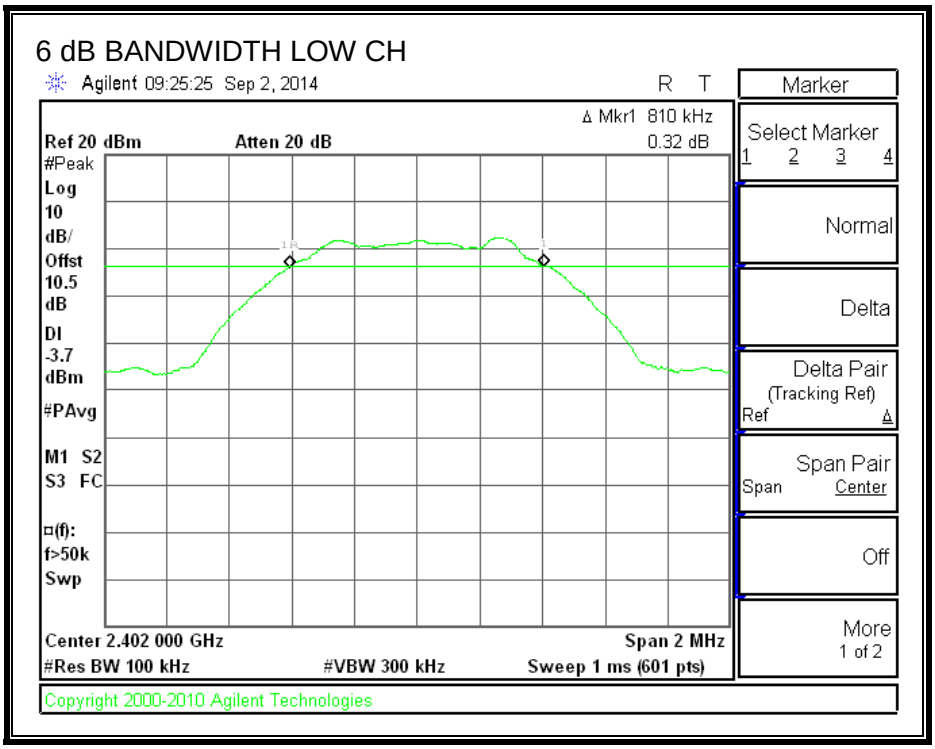
IC RSS-210 A8.2 (a)

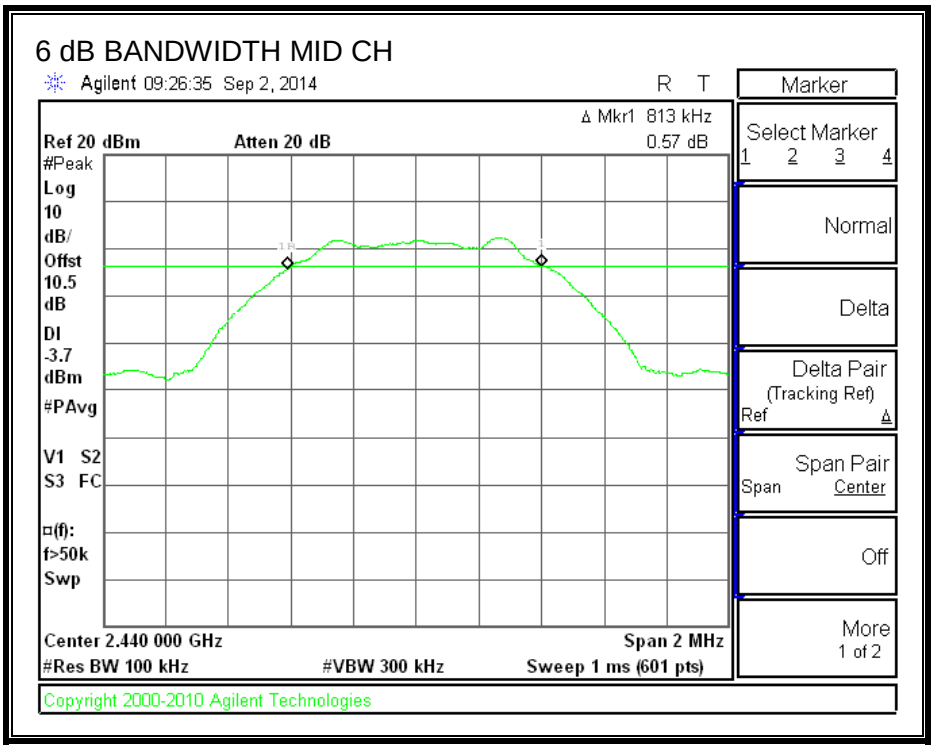
The minimum 6 dB bandwidth shall be at least 500 kHz.

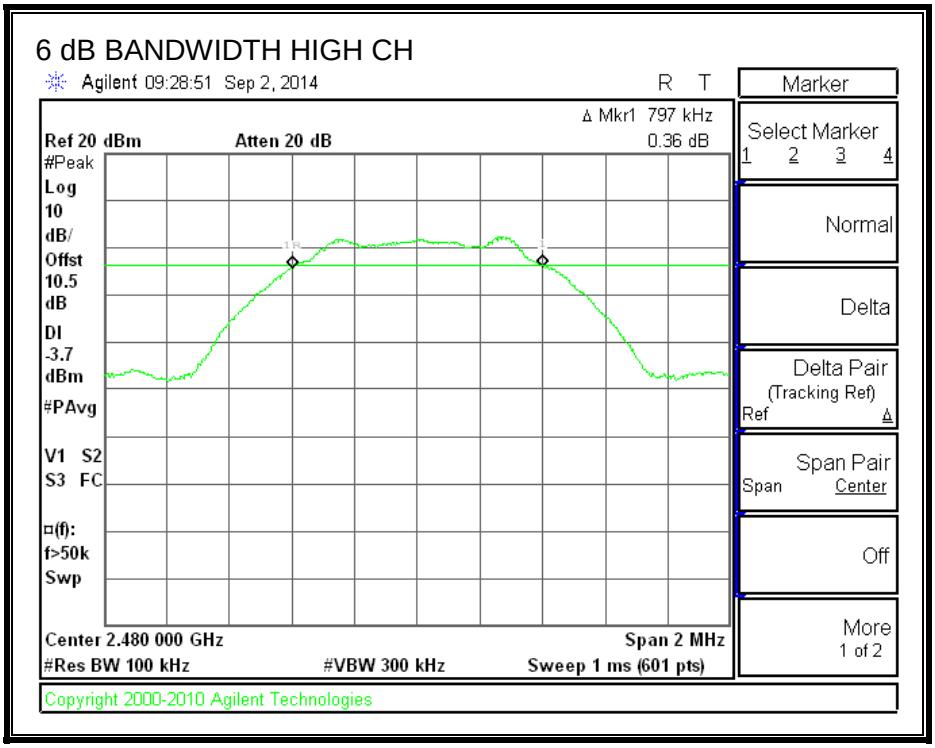
RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.810	0.5
Middle	2440	0.813	0.5
High	2480	0.797	0.5

6 dB BANDWIDTH







8.3. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

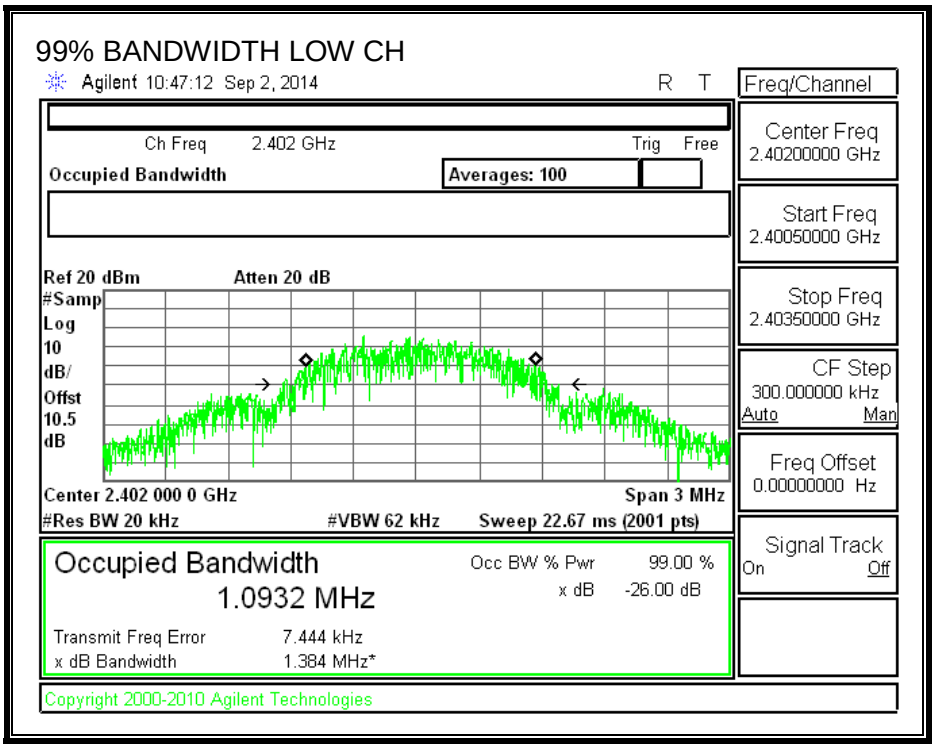
TEST PROCEDURE

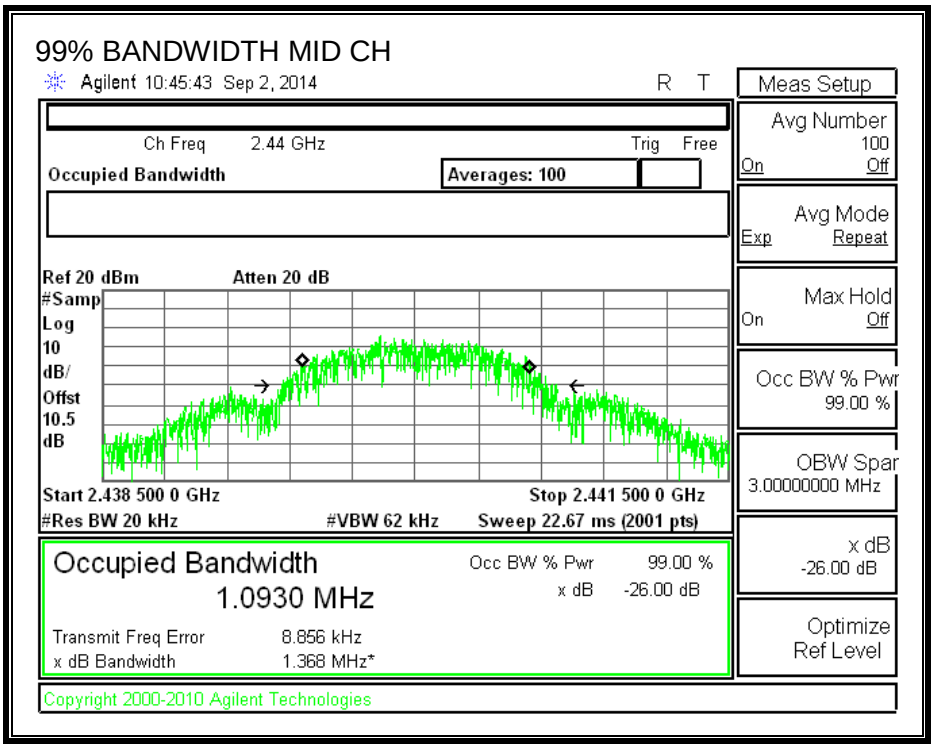
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth and to 1% of the span. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

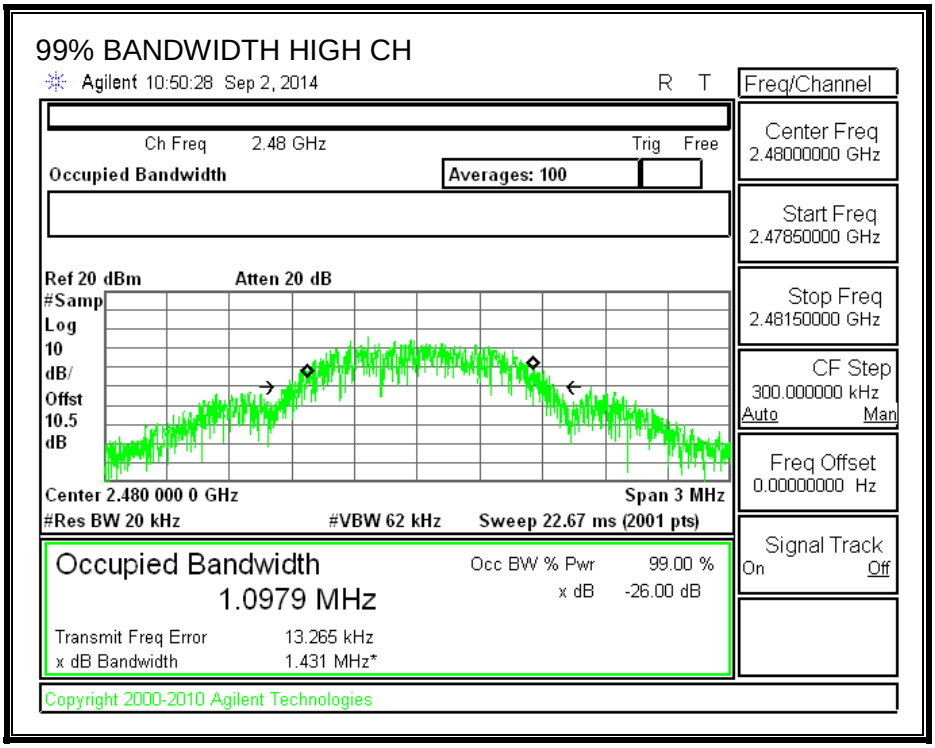
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.0932
Middle	2440	1.0930
High	2480	1.0979

99% BANDWIDTH







8.4. OUTPUT POWER

LIMITS

FCC §15.247 (b)

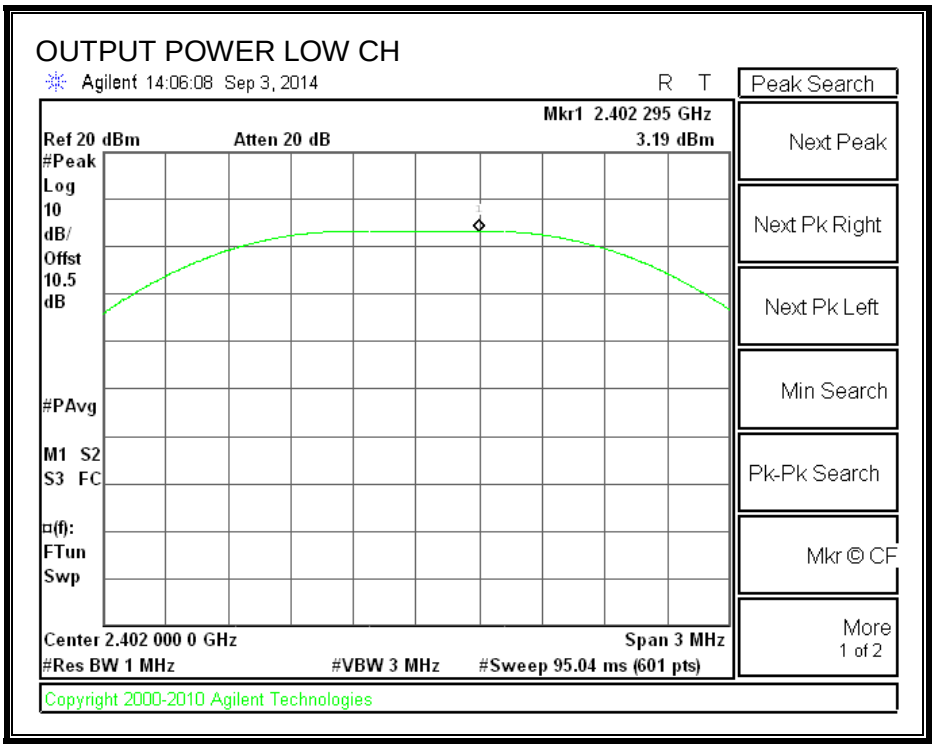
IC RSS-210 A8.4

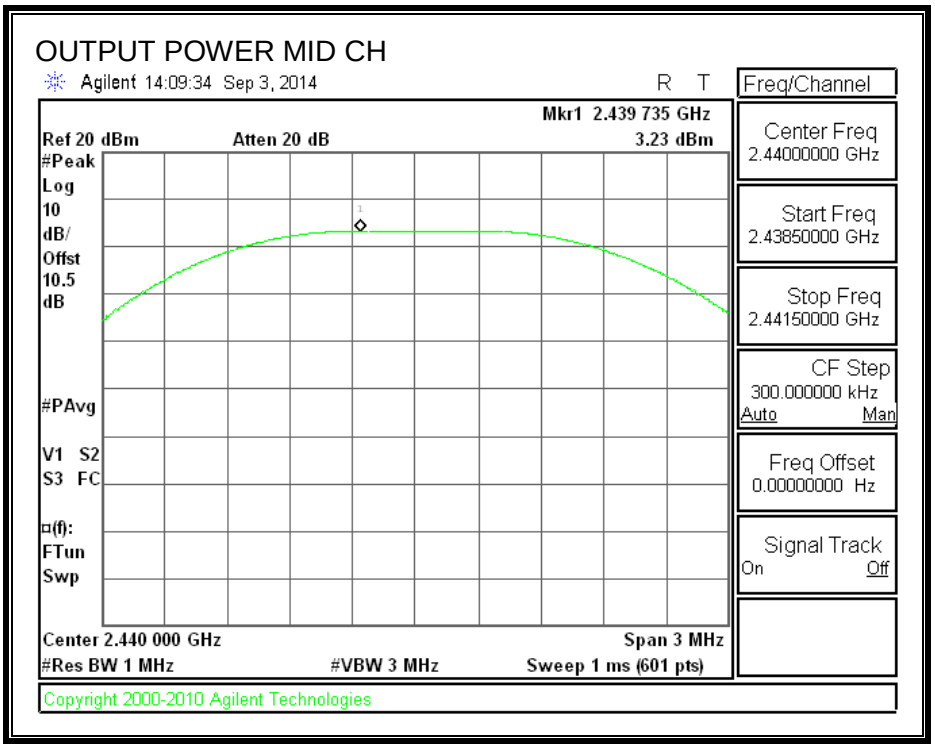
The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

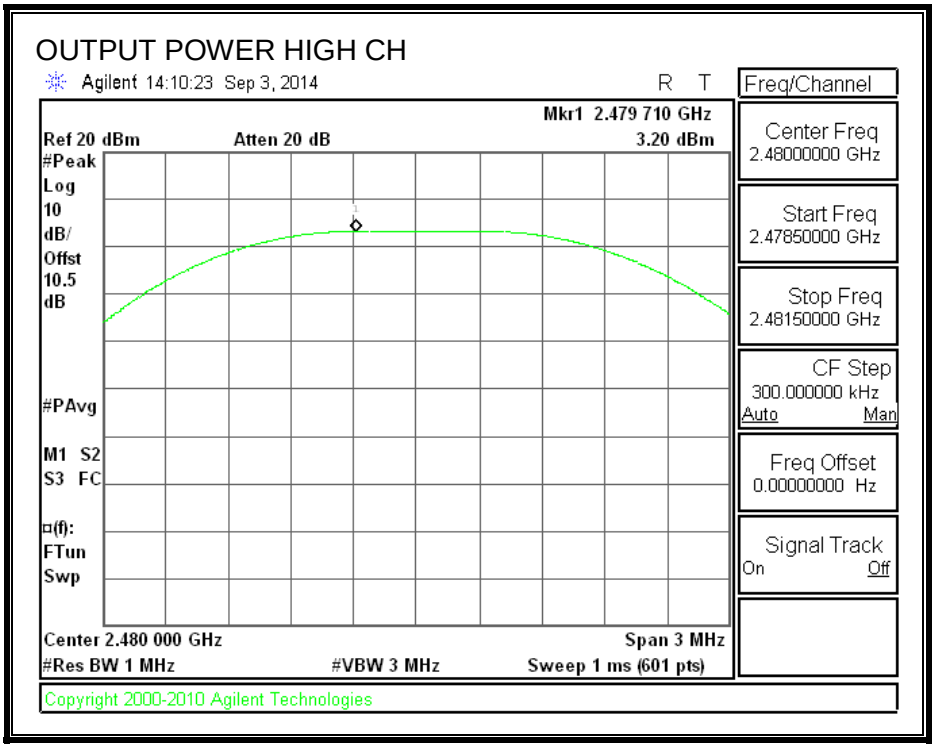
RESULTS

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	3.19	30	-26.81
Middle	2440	3.23	30	-26.77
High	2480	3.20	30	-26.80

OUTPUT POWER







8.5. AVERAGE POWER

LIMITS

None; for reporting purposes only.

RESULTS

The cable assembly insertion loss of 10.5 dB (including 10 dB pad and 0.5 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	3.07
Middle	2440	3.15
High	2480	3.10

8.6. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

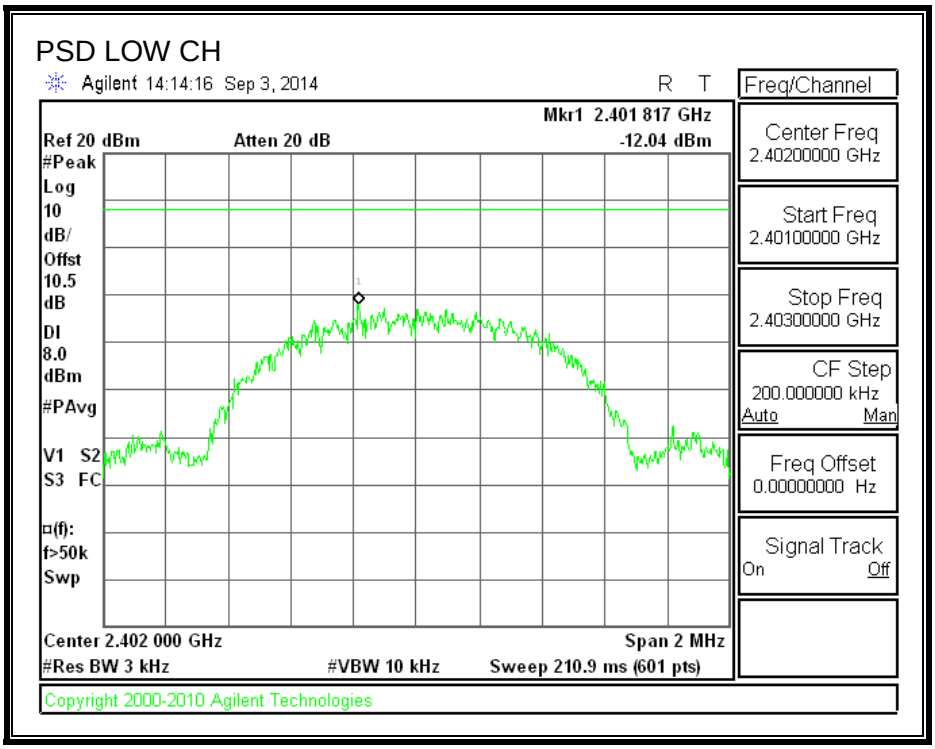
IC RSS-210 A8.2 (b)

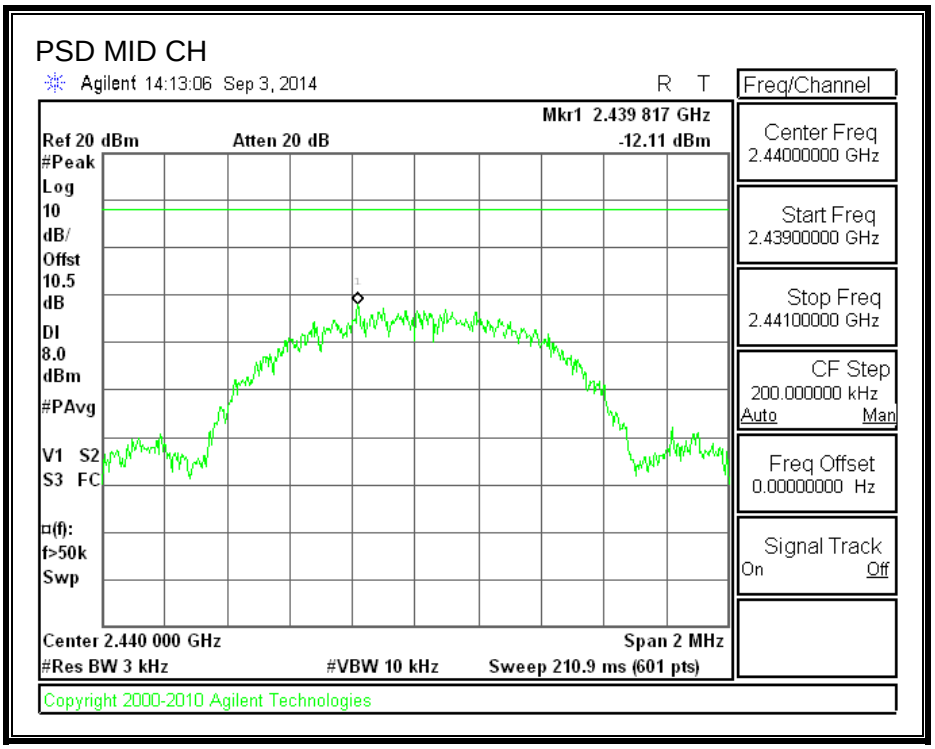
The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

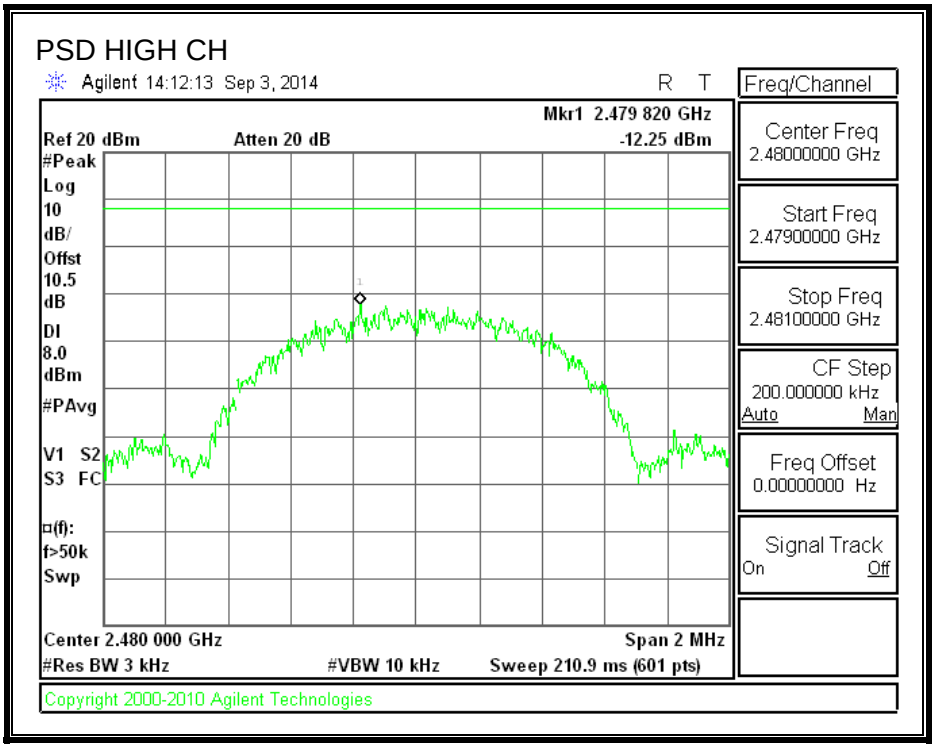
RESULTS

Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2402	-12.04	8	-20.04
Middle	2440	-12.11	8	-20.11
High	2480	-12.25	8	-20.25

POWER SPECTRAL DENSITY







8.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

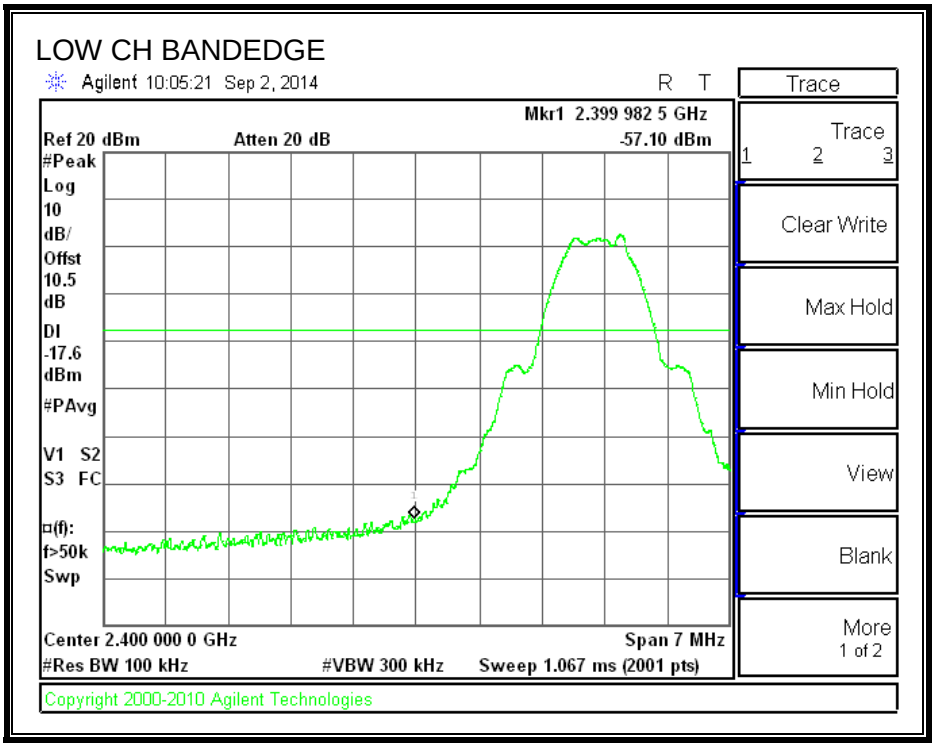
FCC §15.247 (d)

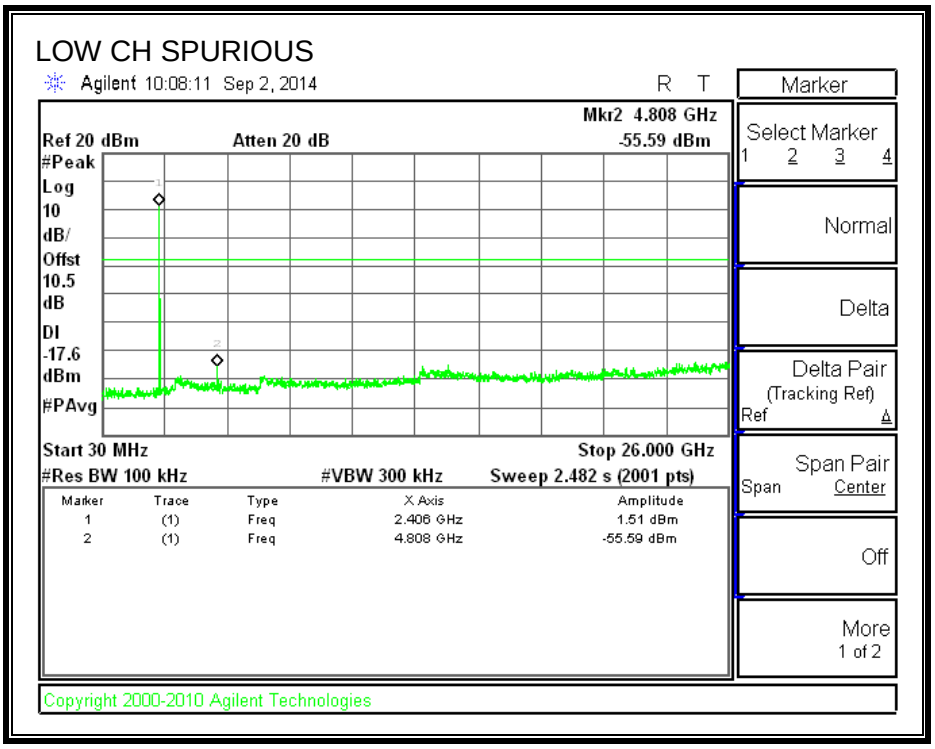
IC RSS-210 A8.5

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

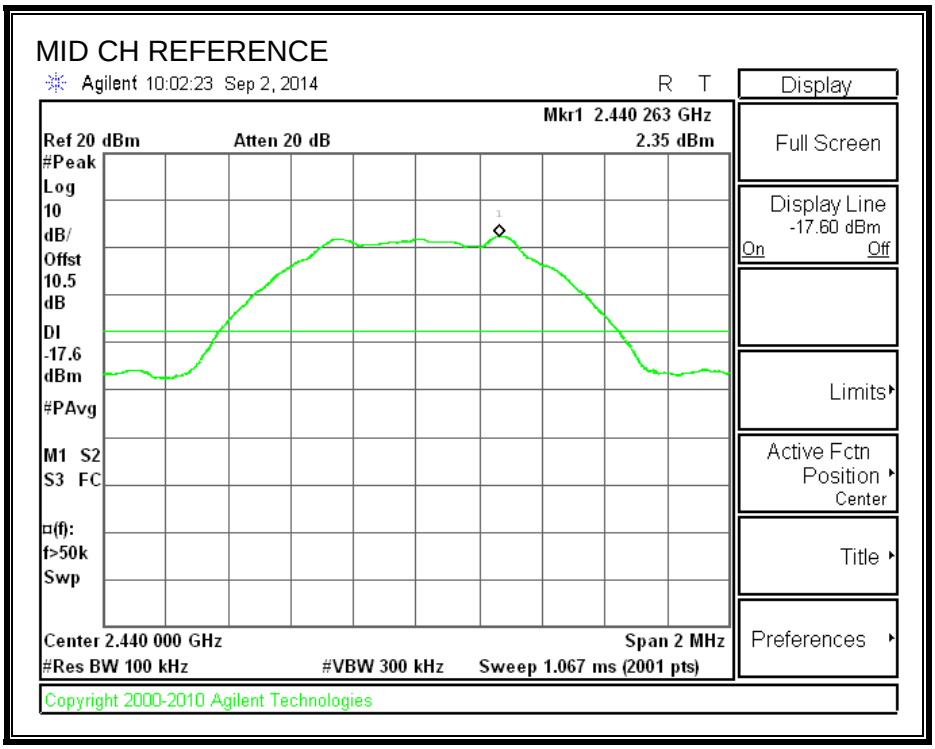
RESULTS

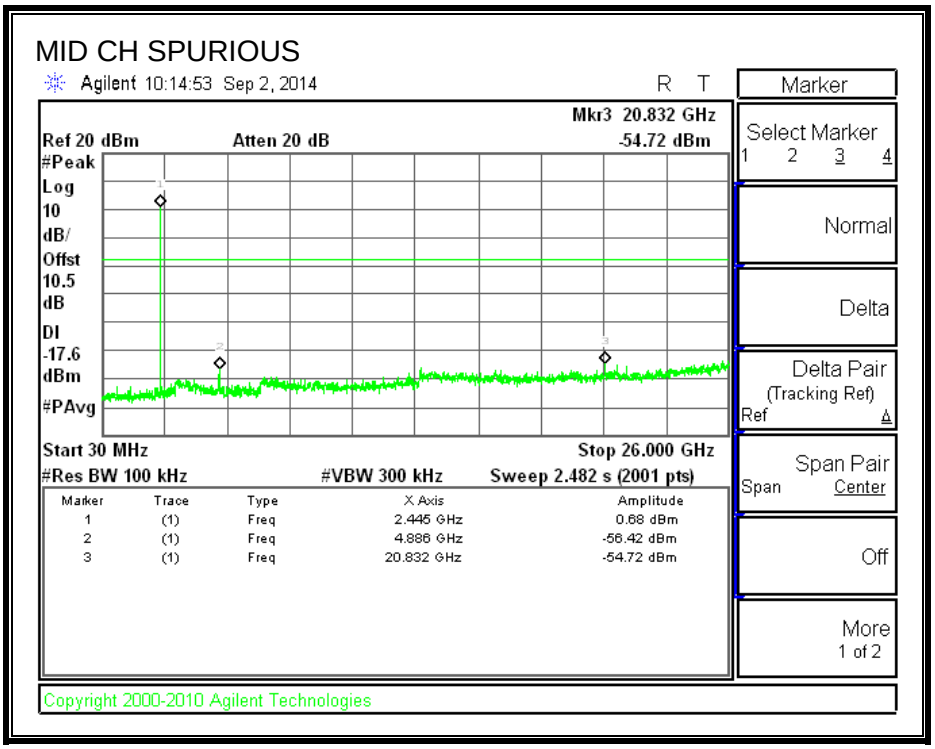
SPURIOUS EMISSIONS, LOW CHANNEL



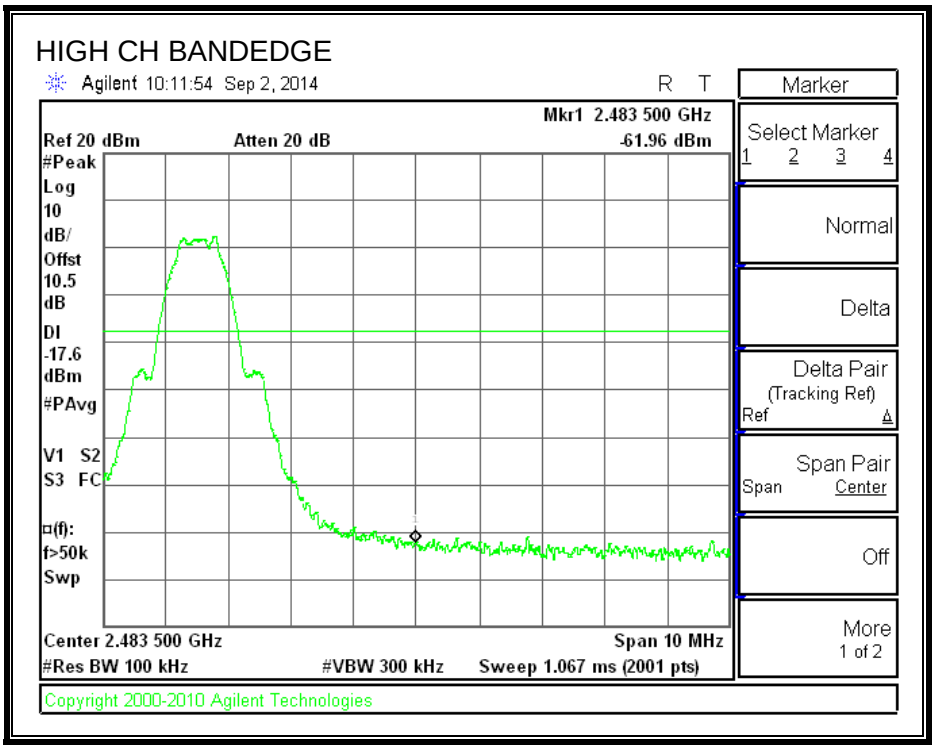


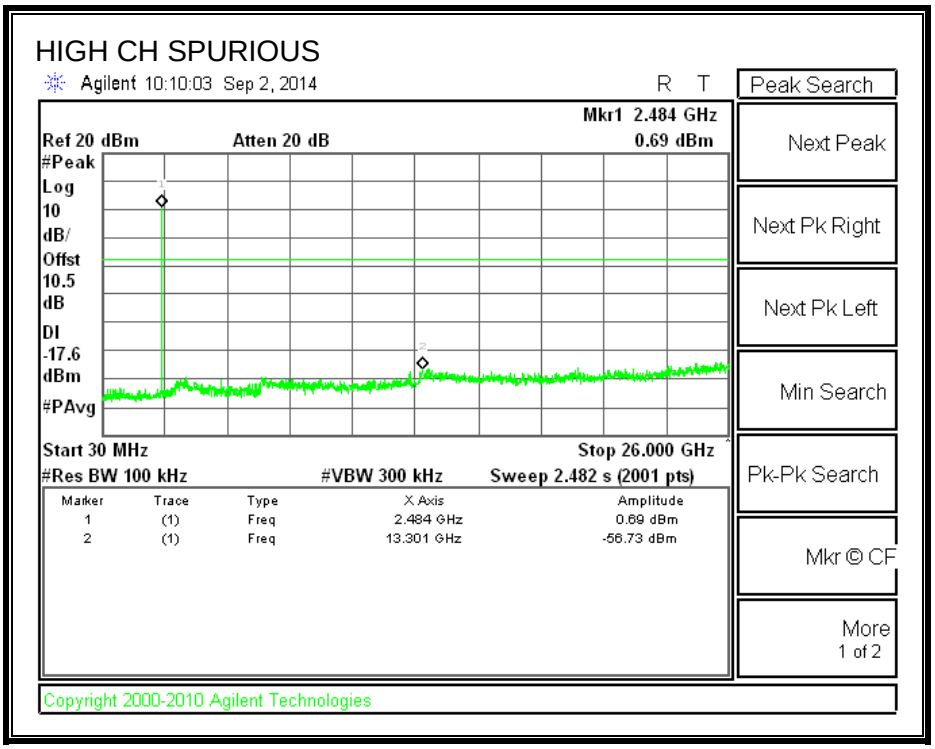
SPURIOUS EMISSIONS, MID CHANNEL





SPURIOUS EMISSIONS, HIGH CHANNEL





9. RADIATED TEST RESULTS

9.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

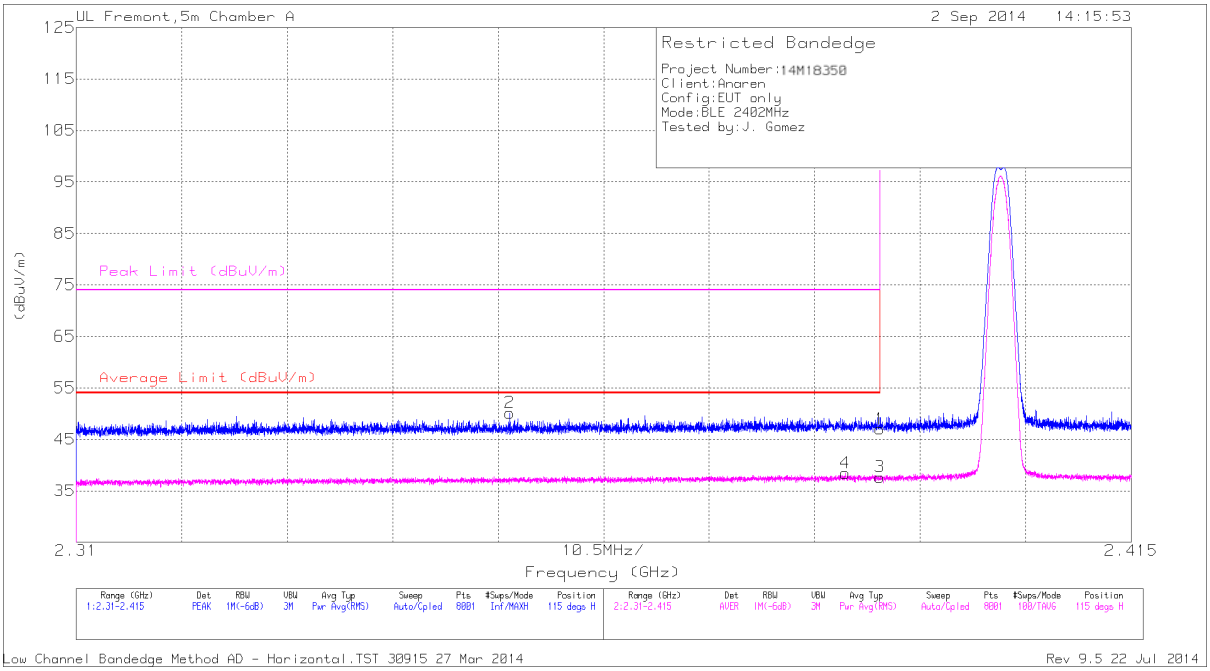
IC RSS-GEN Clause 6 (Receiver)

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. TX ABOVE 1 GHz FOR BLE MODE IN THE 2.4 GHz BAND

9.2.1. A20737A (Module with PCB Antenna)

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



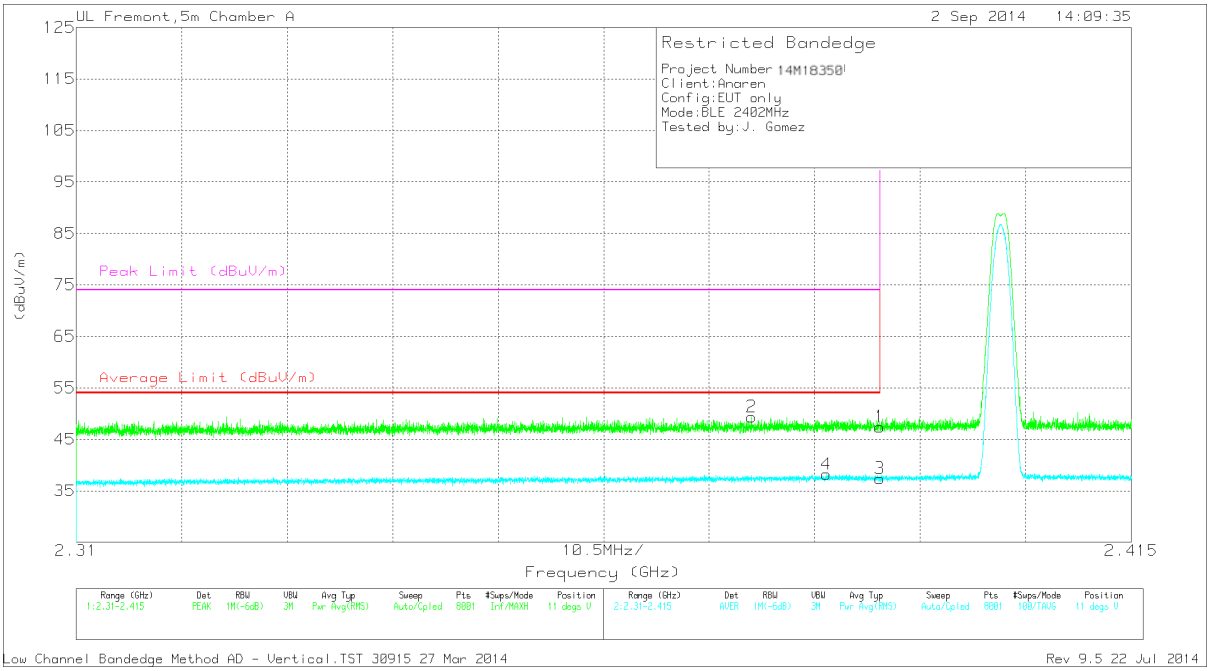
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	*2.353	42.35	PK	31.9	-24.1	50.15	-	-	74	-23.85	115	218	H
4	*2.387	30.23	RMS	32.2	-24	38.43	54	-15.57	-	-	115	218	H
1	*2.39	38.9	PK	32.2	-24.1	47	-	-	74	-27	115	218	H
3	*2.39	29.58	RMS	32.2	-24.1	37.68	54	-16.32	-	-	115	218	H

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

PK - Peak detector

RMS - RMS detection

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



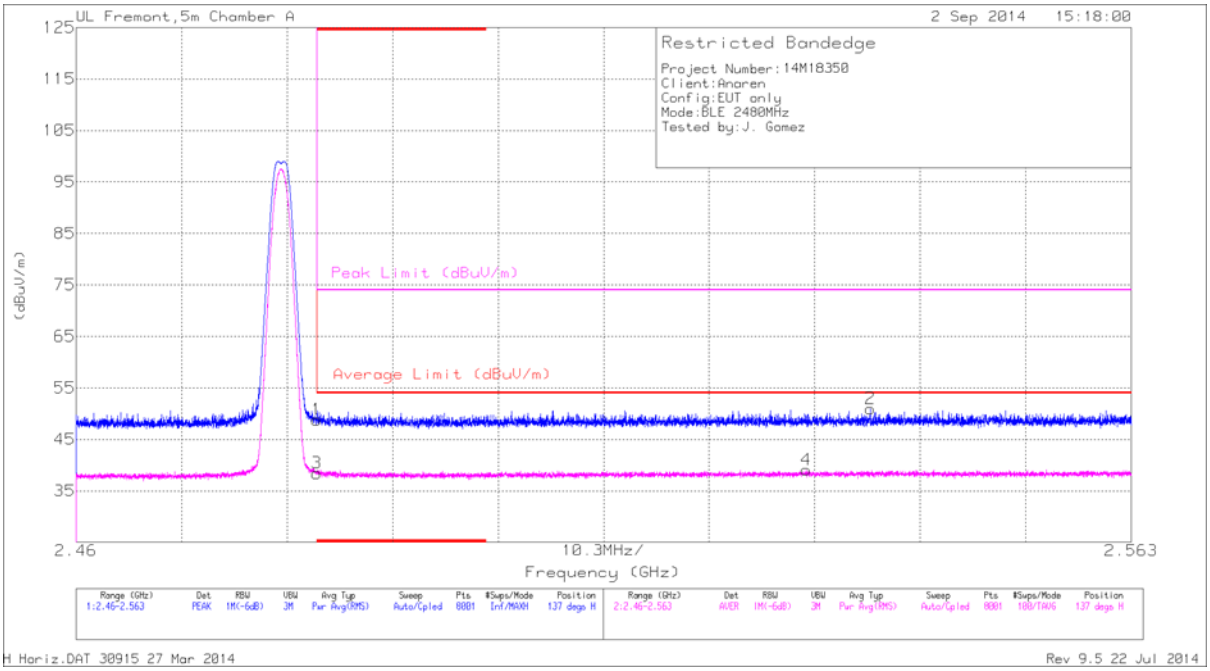
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	*2.377	41.27	PK	32.1	-24	49.37	-	-	74	-24.63	11	318	V
4	*2.385	30.04	RMS	32.2	-24	38.24	54	-15.76	-	-	11	318	V
1	*2.39	39.33	PK	32.2	-24.1	47.43	-	-	74	-26.57	11	318	V
3	*2.39	29.29	RMS	32.2	-24.1	37.39	54	-16.61	-	-	11	318	V

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

PK - Peak detector

RMS - RMS detection

RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



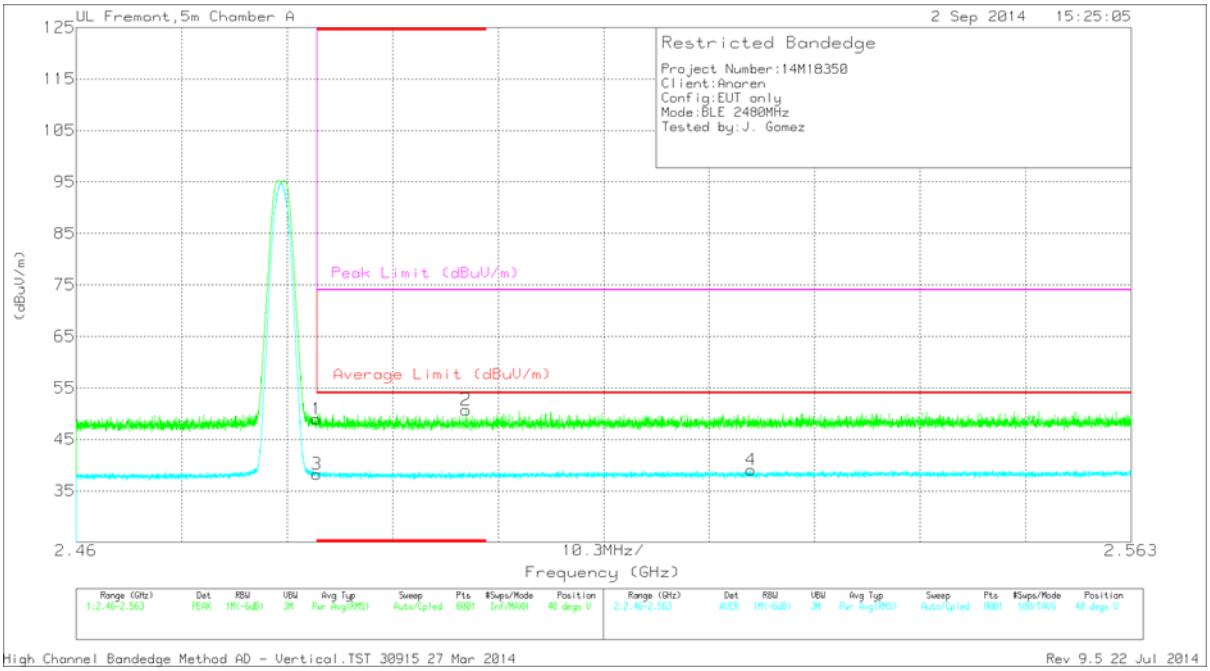
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	40.31	PK	32.7	-24.2	48.81	-	-	74	-25.19	137	348	H
3	* 2.484	29.92	RMS	32.7	-24.2	38.42	54	-15.58	-	-	137	348	H
4	2.531	30.19	RMS	32.9	-24	39.09	54	-14.91	-	-	137	348	H
2	2.538	41.97	PK	32.9	-23.9	50.97	-	-	74	-23.03	137	348	H

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

PK - Peak detector

RMS - RMS detection

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/ Fltr/Pad (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	40.45	PK	32.7	-24.2	48.95	-	-	74	-25.05	48	342	V
2	* 2.498	42.12	PK	32.8	-24.2	50.72	-	-	74	-23.28	48	342	V
3	* 2.484	29.75	RMS	32.7	-24.2	38.25	54	-15.75	-	-	48	342	V
4	2.526	30.28	RMS	32.9	-24.1	39.08	54	-14.92	-	-	48	342	V

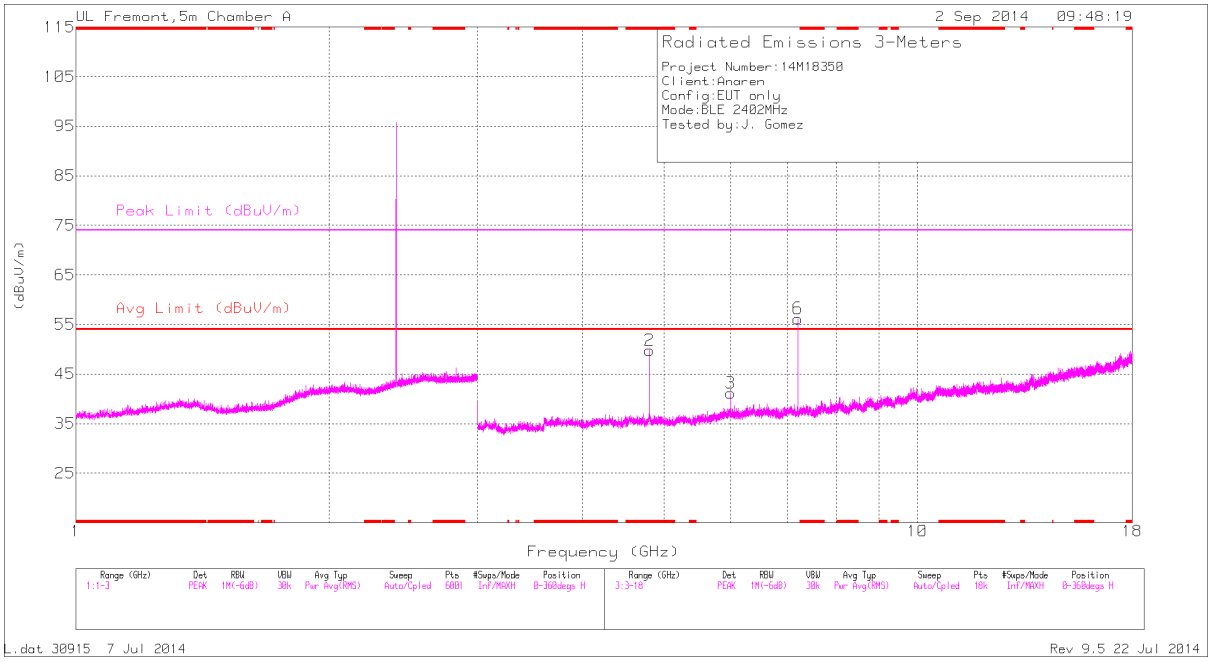
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

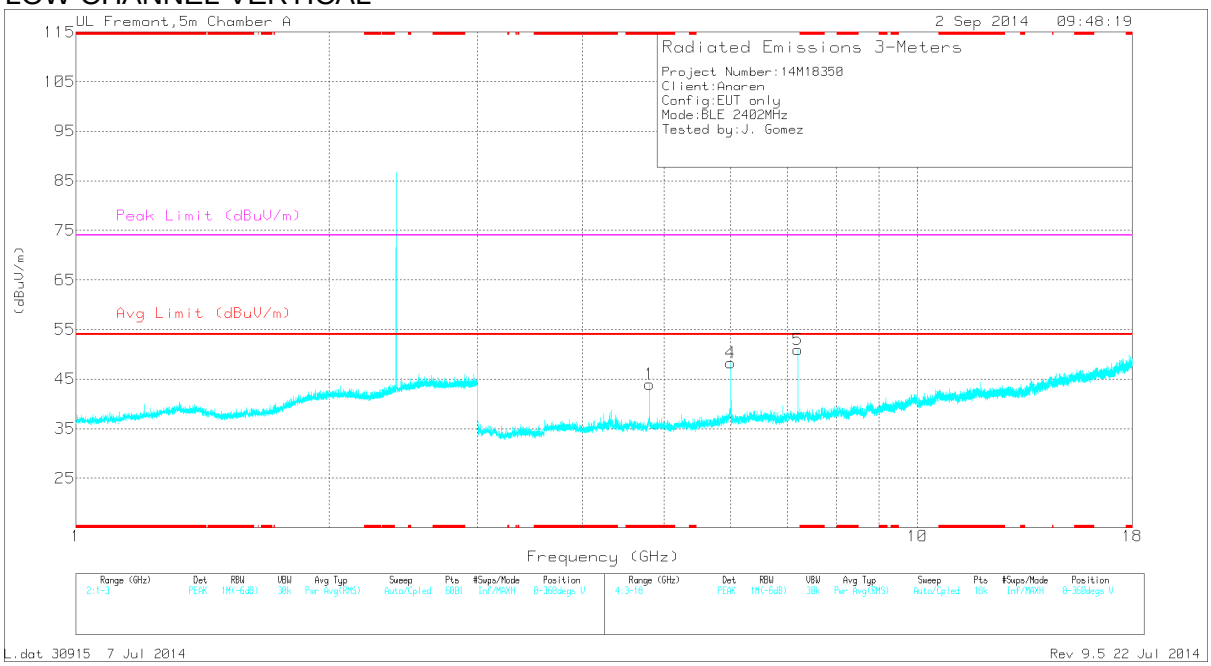
RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



LOW CHANNEL VERTICAL



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 4.803	49.6	PK2	34	-29.2	54.4	-	-	74	-19.6	171	108	H
	* 4.804	44.01	MAv1	34	-29.2	48.81	54	-5.19	-	-	171	108	H
1	* 4.803	44.49	PK2	34	-29.2	49.29	-	-	74	-24.71	156	223	V
	* 4.804	36.69	MAv1	34	-29.2	41.49	54	-12.51	-	-	156	223	V
3	6	34.41	PK	35.3	-28.5	41.21	-	-	-	-	0-360	100	H
4	6	41.51	PK	35.3	-28.5	48.31	-	-	-	-	0-360	100	V
6	7.205	48.1	PK	35.2	-27.1	56.2	-	-	-	-	0-360	100	H
5	7.206	42.86	PK	35.2	-27.1	50.96	-	-	-	-	0-360	201	V

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

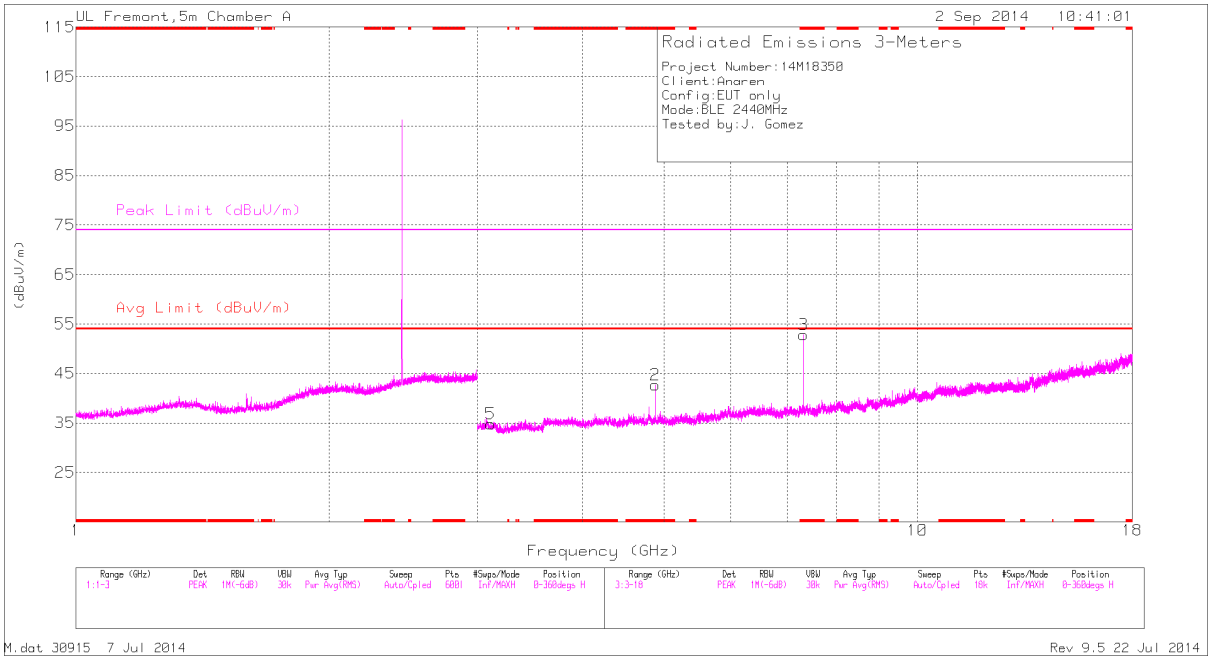
- Compliance for emissions in non-restricted bands is shown in conducted out of band emissions testing

PK - Peak detector

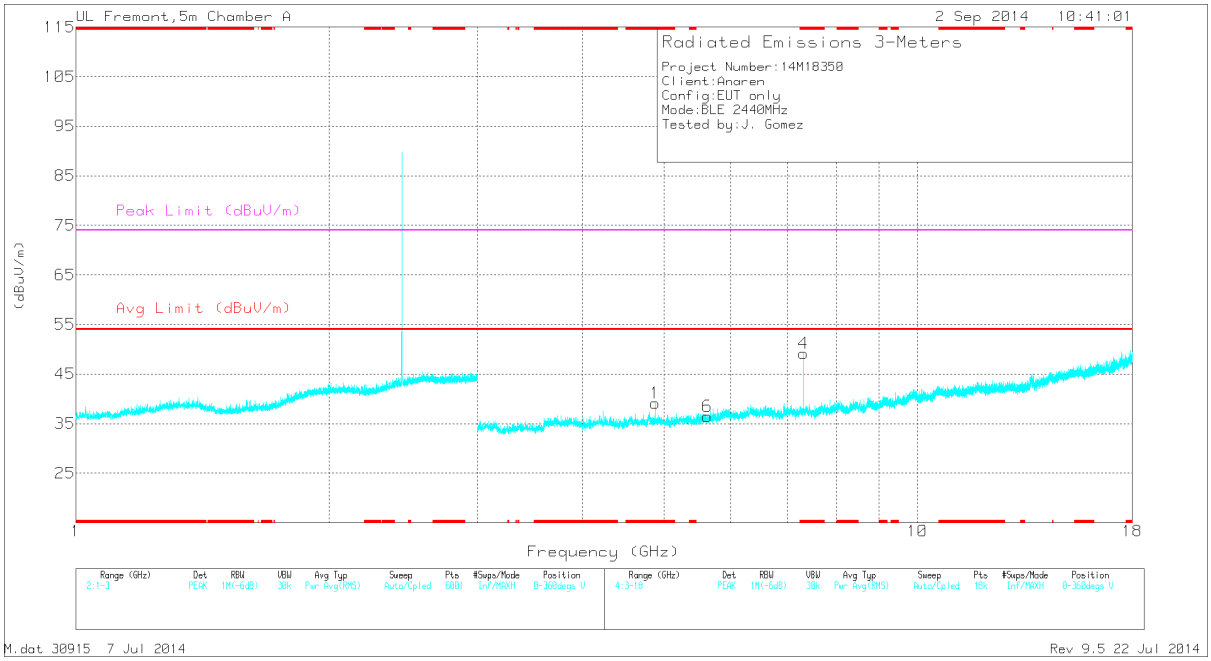
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

MID CHANNEL HORIZONTAL



MID CHANNEL VERTICAL



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 4.879	42.35	PK2	34	-28.7	47.65	-	-	74	-26.35	168	141	H
	* 4.88	33.61	MAv1	34	-28.7	38.91	54	-15.09	-	-	168	141	H
3	* 7.321	47.39	PK2	35.2	-26	56.59	-	-	74	-17.41	285	100	H
	* 7.321	41.72	MAv1	35.2	-26	50.92	54	-3.08	-	-	285	100	H
1	* 4.881	40.19	PK2	34	-28.7	45.49	-	-	74	-28.51	222	130	V
	* 4.88	30.21	MAv1	34	-28.7	35.51	54	-18.49	-	-	222	130	V
4	* 7.319	44.91	PK2	35.2	-26	54.11	-	-	74	-19.89	313	101	V
	* 7.319	38.29	MAv1	35.2	-26	47.49	54	-6.51	-	-	313	101	V
5	3.112	31.99	PK	32.8	-30	34.79	-	-	-	-	0-360	201	H
6	5.632	30.47	PK	34.4	-28.4	36.47	-	-	-	-	0-360	100	V

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

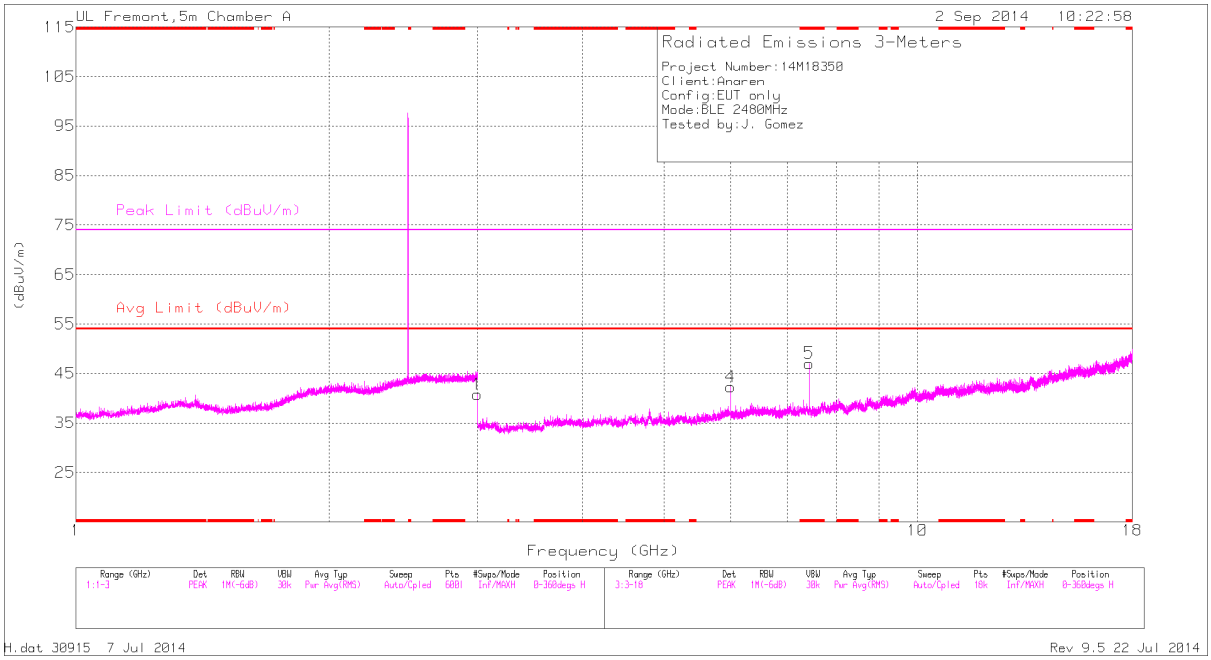
- Compliance for emissions in non-restricted bands is shown in conducted out of band emissions testing

PK - Peak detector

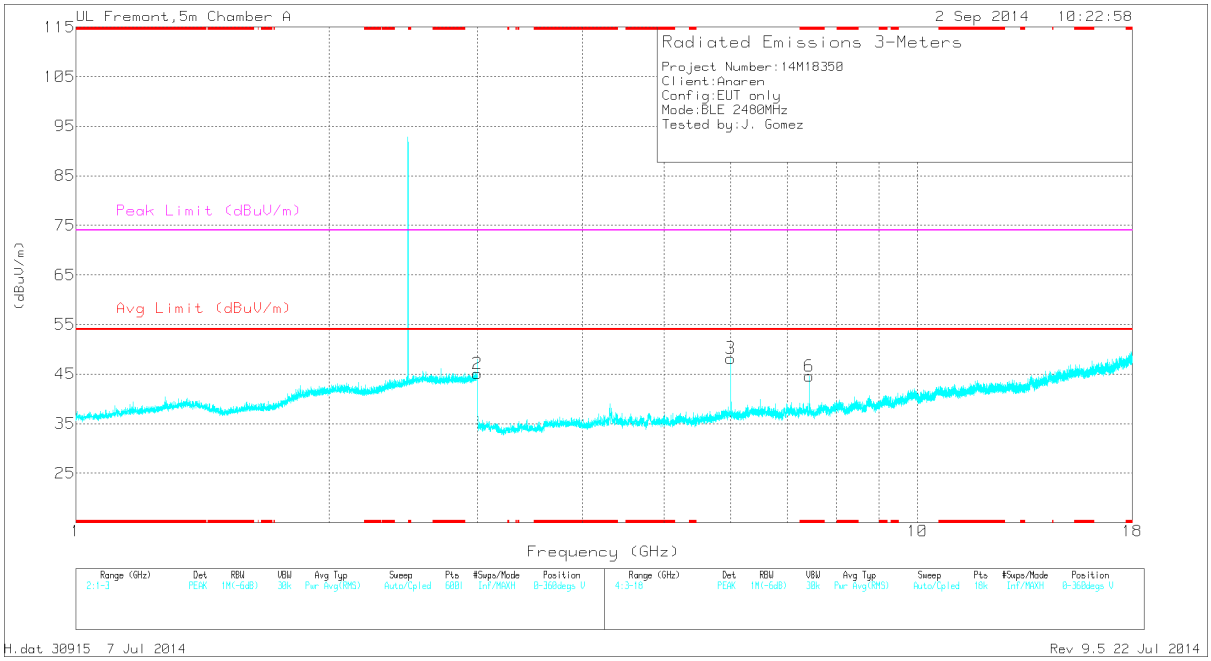
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

HIGH CHANNEL HORIZONTAL



HIGH CHANNEL VERTICAL



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
5	* 7.44	40.25	PK2	35.3	-25.6	49.95	-	-	74	-24.05	356	132	H
	* 7.439	31.25	MAv1	35.3	-25.6	40.95	54	-13.05	-	-	356	132	
6	* 7.439	40.85	PK2	35.3	-25.6	50.55	-	-	74	-23.45	322	100	V
	* 7.44	32.19	MAv1	35.3	-25.6	41.89	54	-12.11	-	-	322	100	
1	3	39.2	PK	32.8	-31.2	40.8	-	-	-	-	0-360	201	H
2	3	43.45	PK	32.8	-31.2	45.05	-	-	-	-	0-360	100	V
4	6	35.55	PK	35.3	-28.5	42.35	-	-	-	-	0-360	100	H
3	6	41.4	PK	35.3	-28.5	48.2	-	-	-	-	0-360	100	V

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

- Compliance for emissions in non-restricted bands is shown in conducted out of band emissions testing

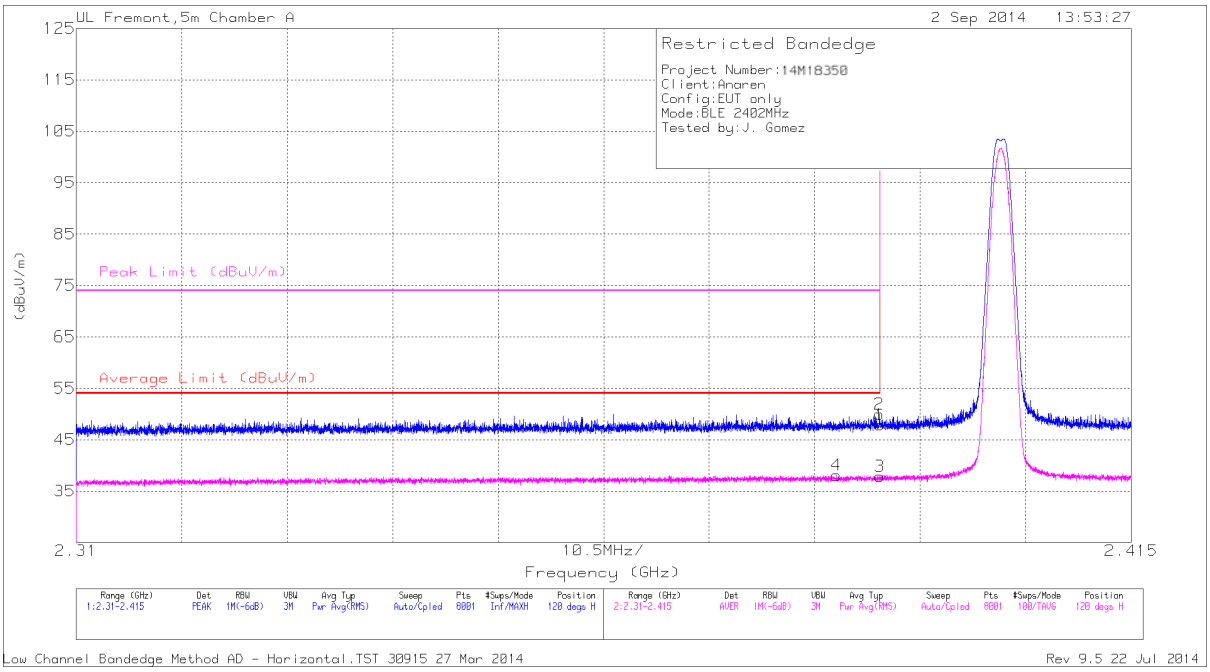
PK - Peak detector

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

9.2.2. A20737C (Connectorized Module with Monopole Antenna)

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

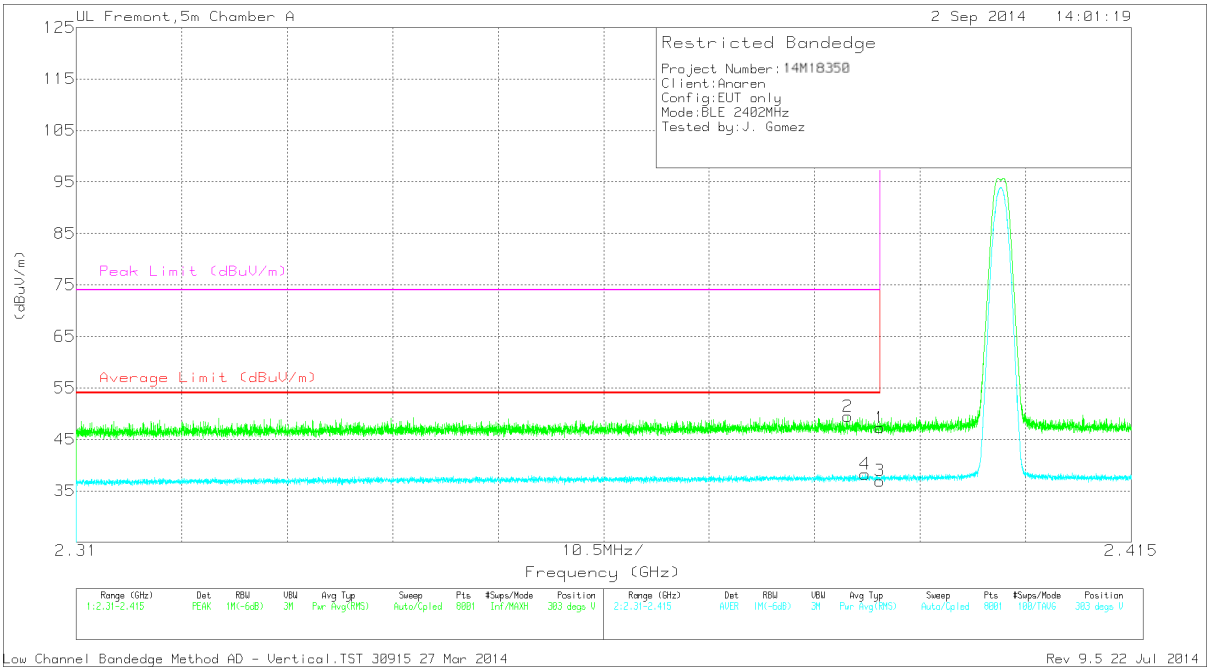


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	*2.386	29.87	RMS	32.2	-24	38.07	54	-15.93	-	-	120	104	H
1	*2.39	39.79	PK	32.2	-24.1	47.89	-	-	74	-26.11	120	104	H
2	*2.39	41.85	PK	32.2	-24.1	49.95	-	-	74	-24.05	120	104	H
3	*2.39	29.77	RMS	32.2	-24.1	37.87	54	-16.13	-	-	120	104	H

PK - Peak detector

RMS - RMS detection

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

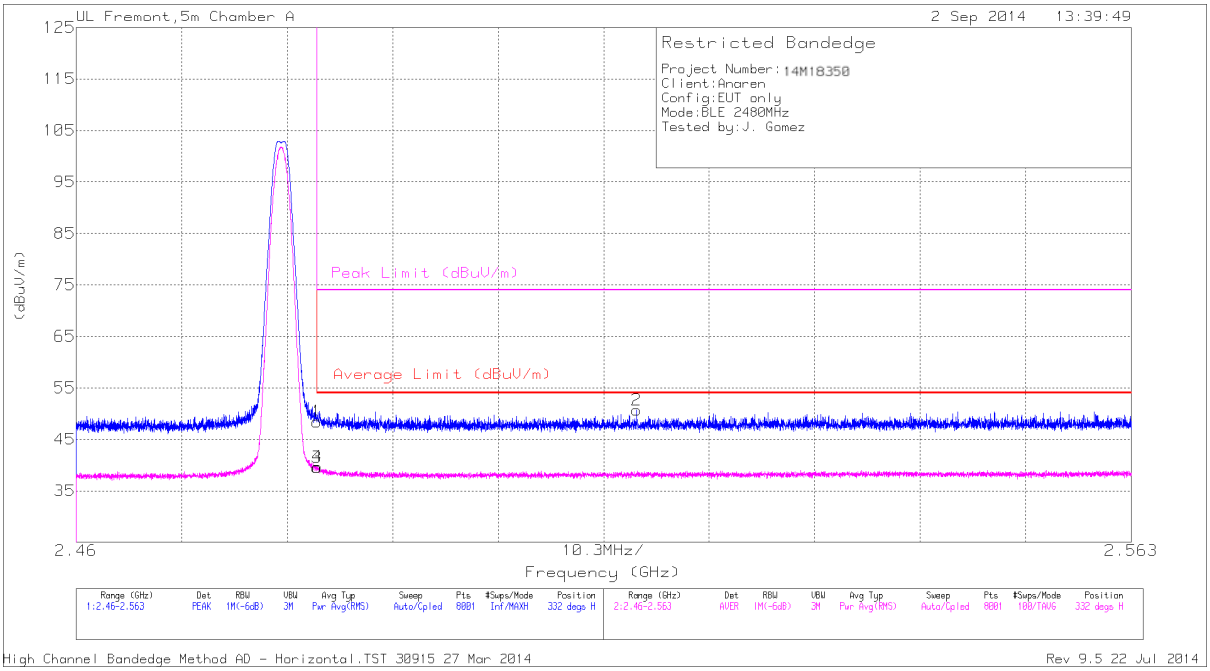


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	*2.387	41.24	PK	32.2	-24	49.44	-	-	74	-24.56	303	107	V
4	*2.389	30.15	RMS	32.2	-24.1	38.25	54	-15.75	-	-	303	107	V
1	*2.39	39.14	PK	32.2	-24.1	47.24	-	-	74	-26.76	303	107	V
3	*2.39	28.85	RMS	32.2	-24.1	36.95	54	-17.05	-	-	303	107	V

PK - Peak detector

RMS - RMS detection

RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



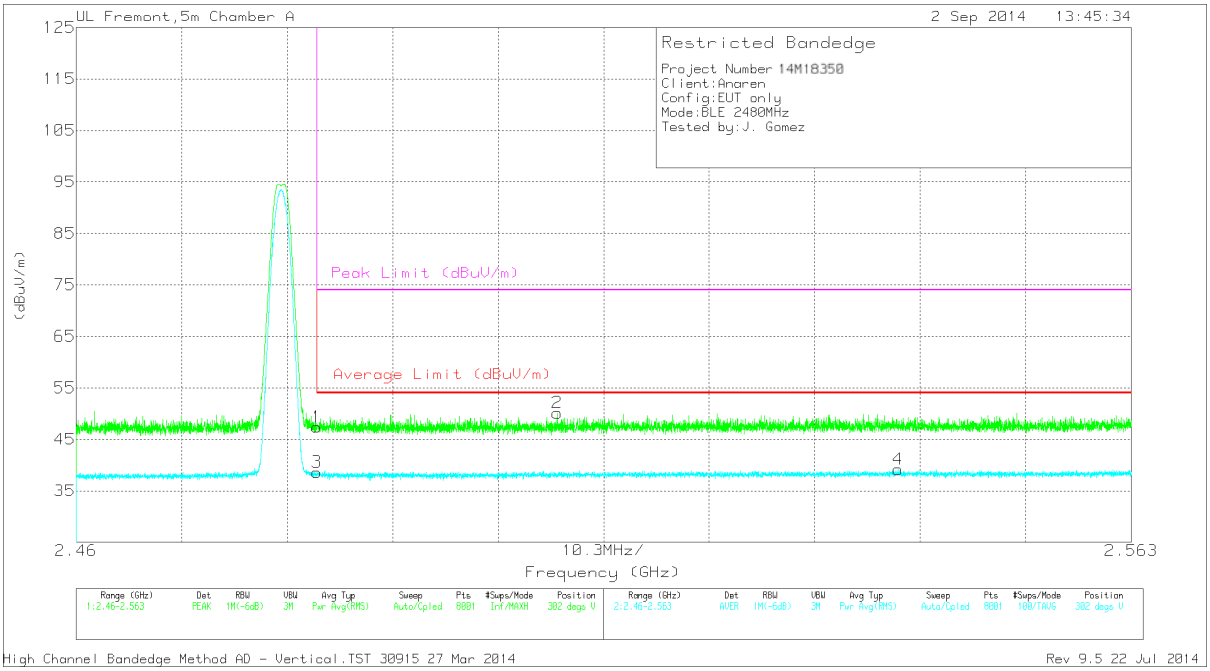
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	*2.484	39.94	PK	32.7	-24.2	48.44	-	-	74	-25.56	332	110	H
3	*2.484	31.08	RMS	32.7	-24.2	39.58	54	-14.42	-	-	332	110	H
4	*2.484	31.15	RMS	32.7	-24.2	39.65	54	-14.35	-	-	332	110	H
2	2.515	41.9	PK	32.8	-24	50.7	-	-	74	-23.3	332	110	H

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

PK - Peak detector

RMS - RMS detection

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	*2.484	38.89	PK	32.7	-24.2	47.39	-	-	74	-26.61	302	104	V
3	*2.484	30.14	RMS	32.7	-24.2	38.64	54	-15.36	-	-	302	104	V
2	2.507	41.45	PK	32.8	-24.1	50.15	-	-	74	-23.85	302	104	V
4	2.54	30.06	RMS	32.9	-23.8	39.16	54	-14.84	-	-	302	104	V

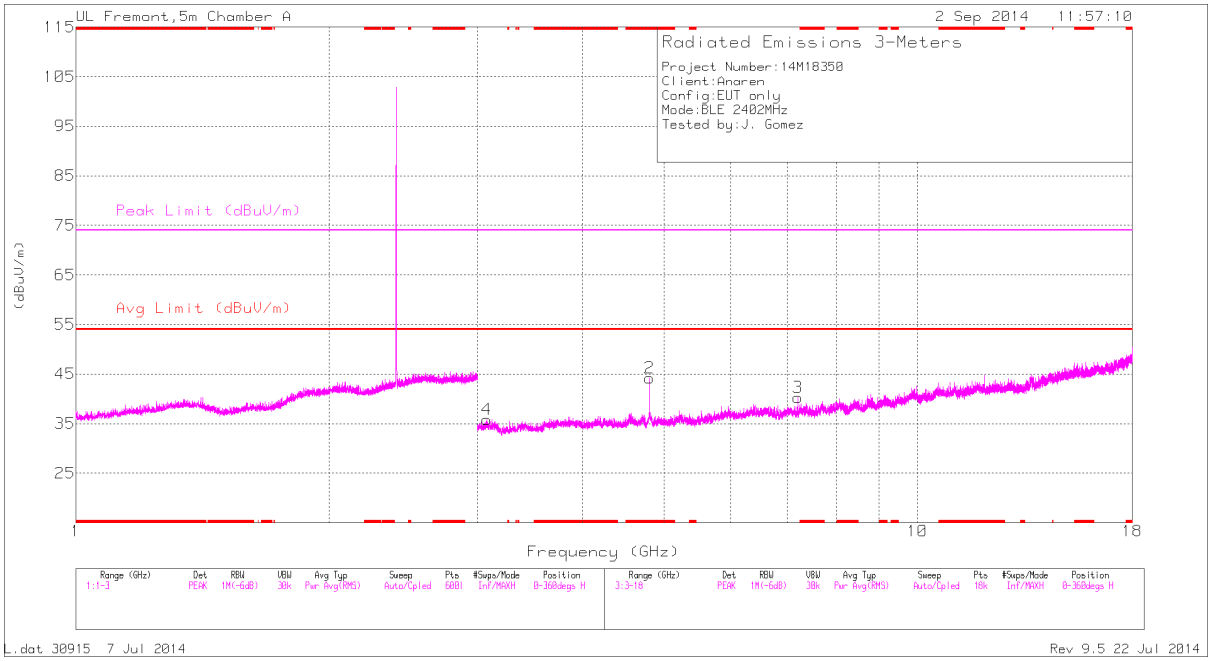
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

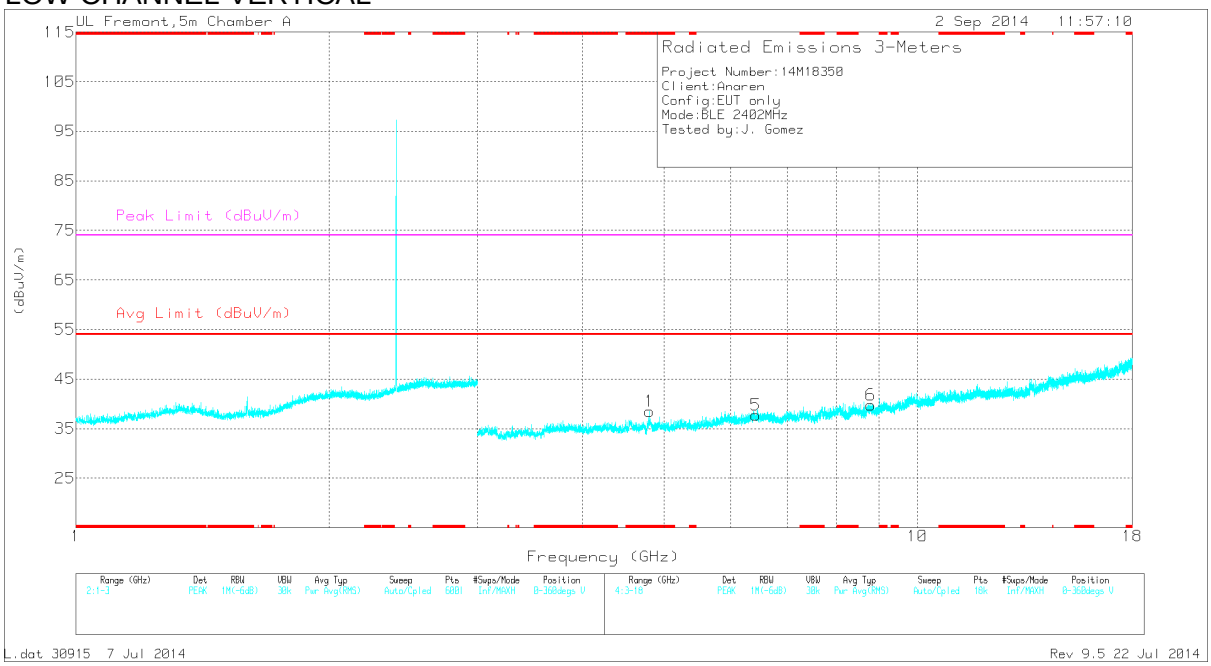
RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



LOW CHANNEL VERTICAL



Trace Markers

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.804	44.38	PK2	34	-29.2	49.18	-	-	74	-24.82	316	103	H
* 4.804	37.23	MAv1	34	-29.2	42.03	54	-11.97	-	-	316	103	H
* 4.804	41.9	PK2	34	-29.2	46.7	-	-	74	-27.3	87	140	V
* 4.804	32.55	MAv1	34	-29.2	37.35	54	-16.65	-	-	87	140	V

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

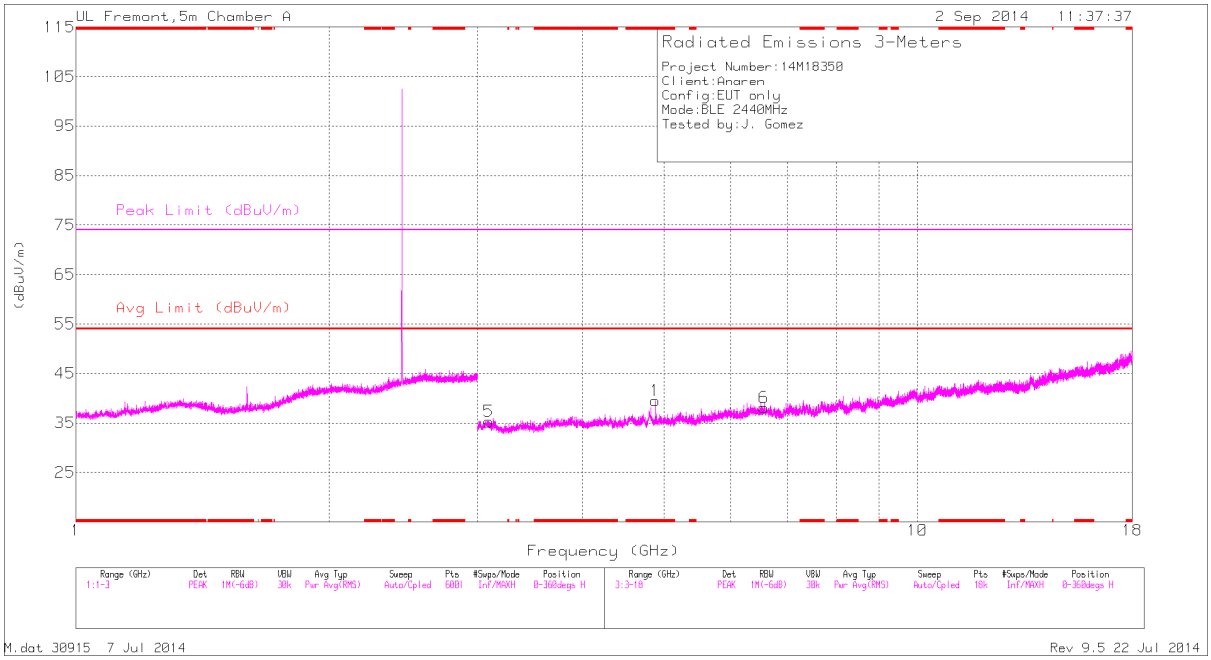
- Compliance for emissions in non-restricted bands is shown in conducted out of band emissions testing

PK - Peak detector

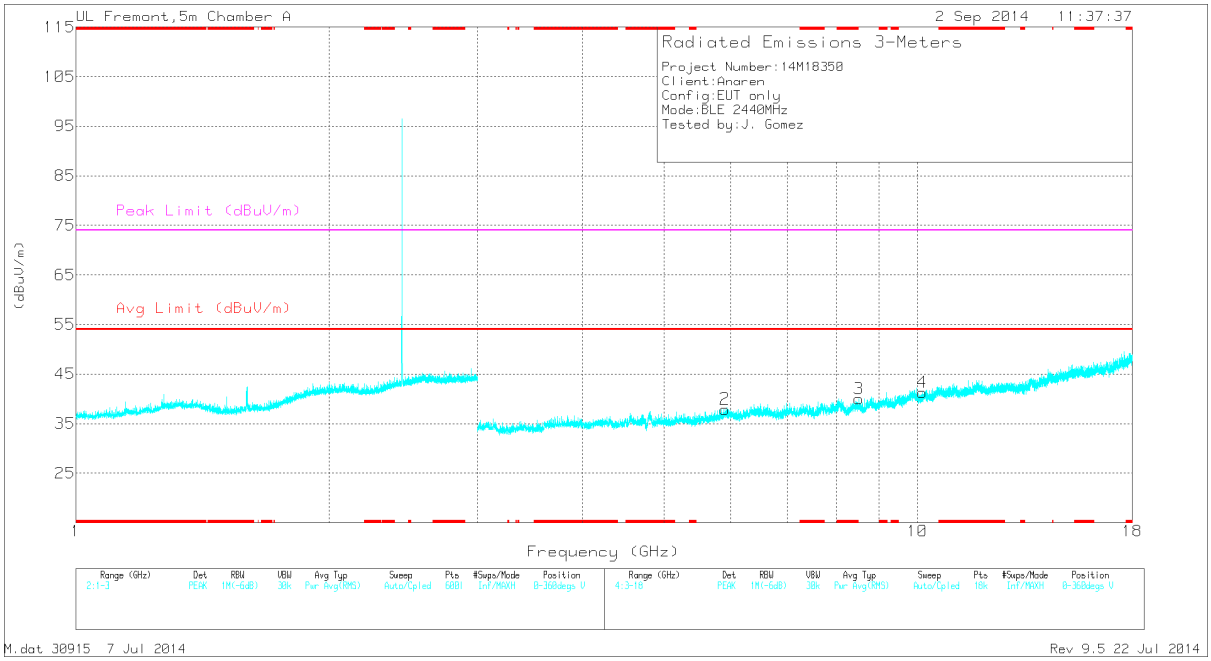
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

MID CHANNEL HORIZONTAL



MID CHANNEL VERTICAL



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.88	40.65	PK2	34	-28.7	45.95	-	-	74	-28.05	170	100	H
	* 4.88	31.96	MAv1	34	-28.7	37.26	54	-16.74	-	-	170	100	H
5	3.092	32.26	PK	32.8	-29.8	35.26	-	-	-	-	0-360	201	H
2	5.902	30.82	PK	35	-27.9	37.92	-	-	-	-	0-360	201	V
6	6.565	29.97	PK	35.5	-27.3	38.17	-	-	-	-	0-360	100	H
3	8.515	29.27	PK	35.7	-25	39.97	-	-	-	-	0-360	201	V
4	10.14	27.11	PK	37.1	-22.9	41.31	-	-	-	-	0-360	201	V

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

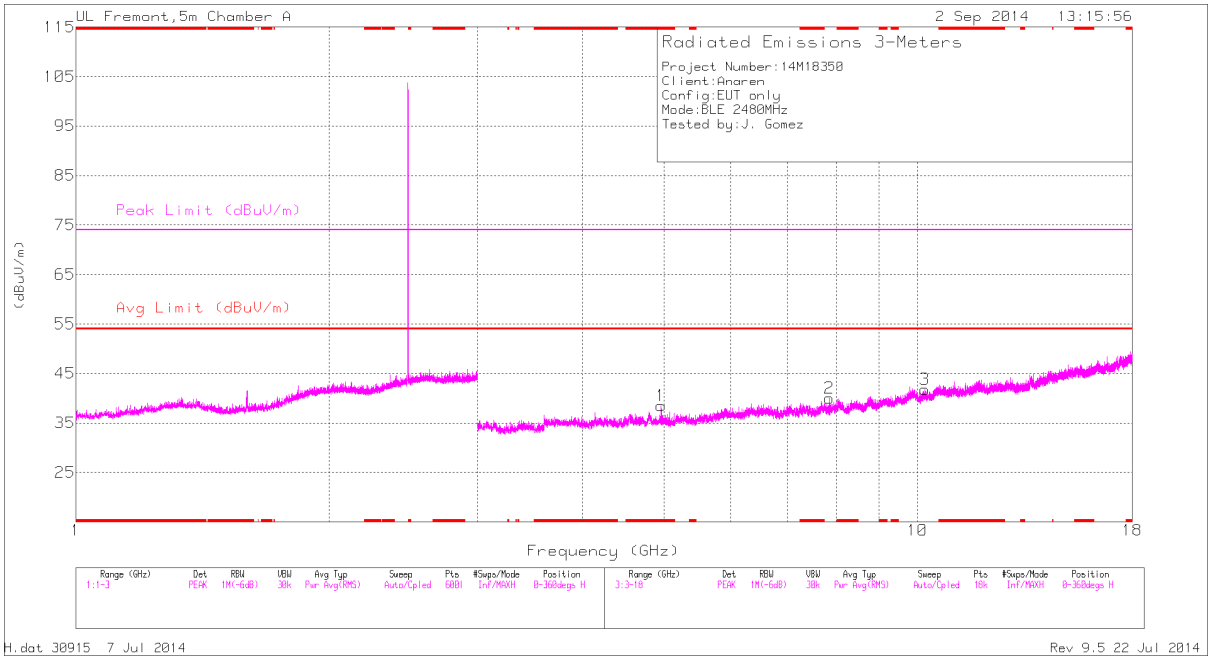
- Compliance for emissions in non-restricted bands is shown in conducted out of band emissions testing

PK - Peak detector

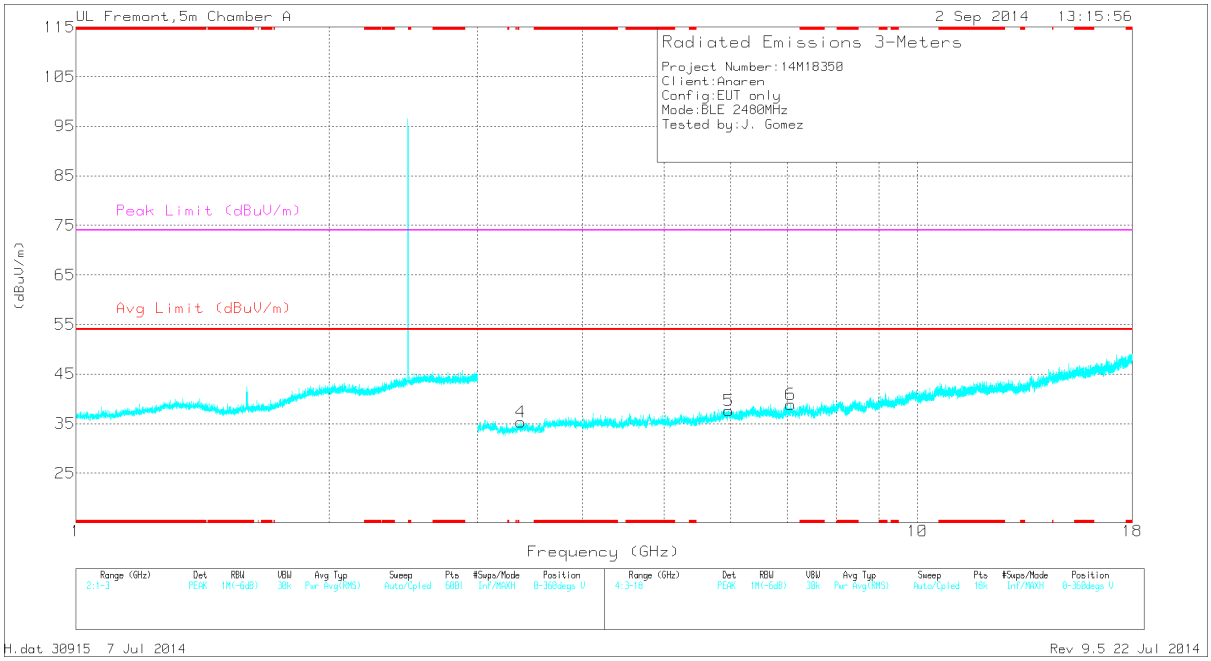
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

HIGH CHANNEL HORIZONTAL



HIGH CHANNEL VERTICAL



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.96	41.88	PK2	33.9	-29	46.78	-	-	74	-27.22	319	118	H
	* 4.96	32.08	MAv1	33.9	-29	36.98	54	-17.02	-	-	319	118	H
4	3.38	32.58	PK	33	-30.3	35.28	-	-	-	-	0-360	201	V
5	5.972	30.26	PK	35.2	-27.9	37.56	-	-	-	-	0-360	100	V
6	7.068	29.9	PK	35.3	-26.3	38.9	-	-	-	-	0-360	201	V
2	7.86	30.88	PK	35.5	-26.4	39.98	-	-	-	-	0-360	100	H
3	10.204	27.45	PK	37.2	-22.8	41.85	-	-	-	-	0-360	100	H

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

- Compliance for emissions in non-restricted bands is shown in conducted out of band emissions testing

PK - Peak detector

PK2 - KDB558074 Method: Maximum Peak

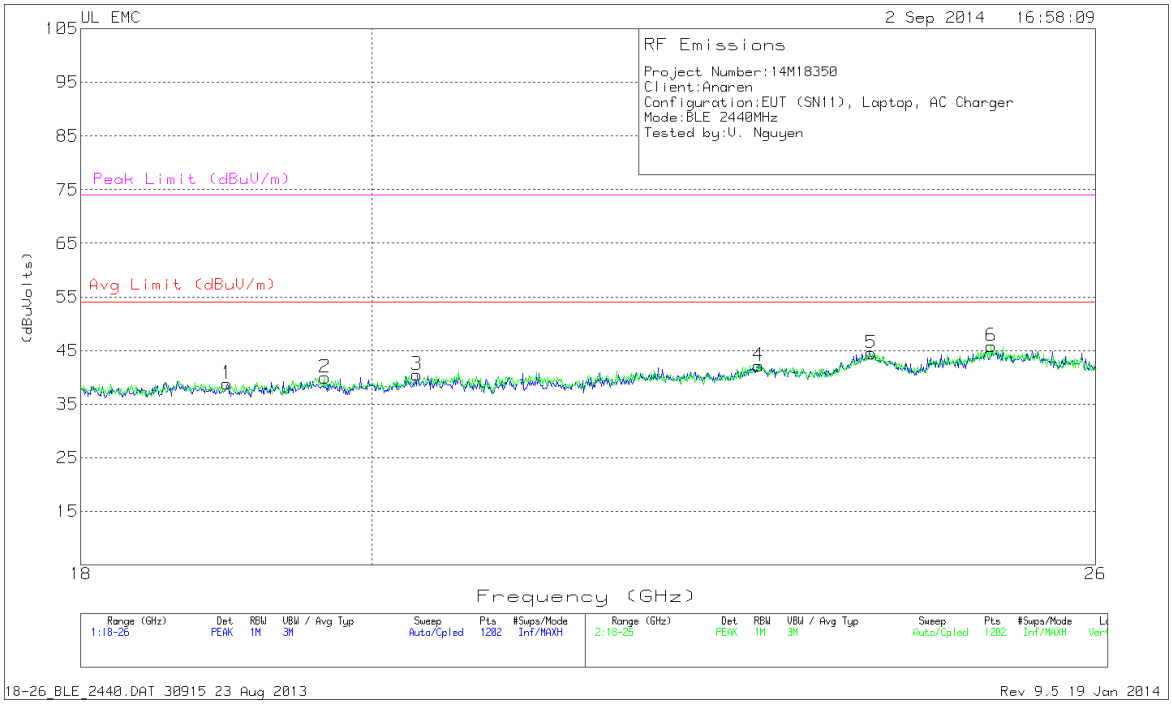
MAv1 - KDB558074 Option 1 Maximum RMS Average

9.3. WORST-CASE ABOVE 18 GHz

9.3.1. A20737A (Module with PCB Antenna)

18GHz to 26 GHz

VERTICAL AND HORIZONTAL PLOT



VERTICAL AND HORIZONTAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T89 (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	18.979	40.23	PK	32.5	-24.4	-9.5	38.83	54	-15.17	74	-35.17
3	20.331	41.2	PK	32.7	-23.9	-9.5	40.5	54	-13.5	74	-33.5
4	23.009	41.37	PK	33.6	-23.3	-9.5	42.17	54	-11.83	74	-31.83
2	19.665	41.2	PK	32.6	-24.3	-9.5	40	54	-14	74	-34
5	23.968	43	PK	33.6	-22.6	-9.5	44.5	54	-9.5	74	-29.5
6	25.034	44.13	PK	34	-22.8	-9.5	45.83	54	-8.17	74	-28.17

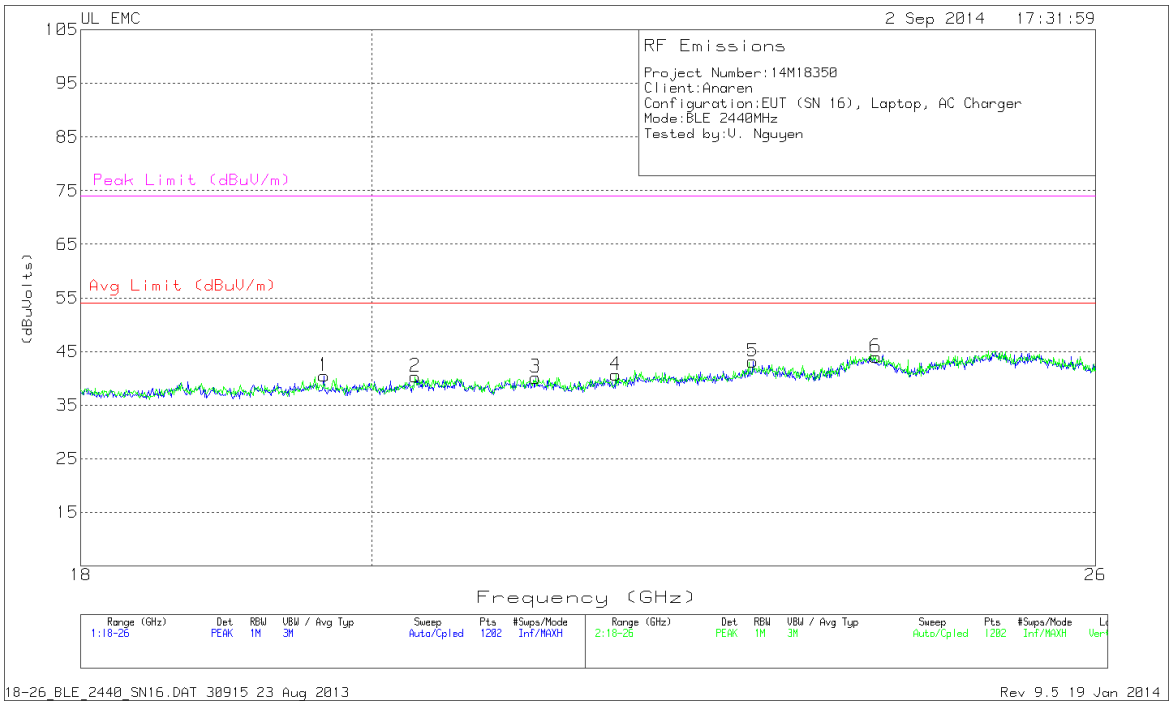
PK - Peak detector

18-26_BLE_2440.DAT 30915 23 Aug 2013 Rev 9.5 19 Jan 2014

9.3.2. A20737C (Connectorized Module with Monopole Antenna)

18GHz to 26 GHz

VERTICAL AND HORIZONTAL PLOT



VERTICAL AND HORIZONTAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T89 (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	19.659	41.6	PK	32.6	-24.2	-9.5	40.5	54	-13.5	74	-33.5
3	21.224	40.47	PK	33	-23.8	-9.5	40.17	54	-13.83	74	-33.83
5	22.963	42.67	PK	33.6	-23.6	-9.5	43.17	54	-10.83	74	-30.83
2	20.318	41.23	PK	32.7	-24.1	-9.5	40.33	54	-13.67	74	-33.67
4	21.85	40.67	PK	33.3	-23.8	-9.5	40.67	54	-13.33	74	-33.33
6	24.008	42.7	PK	33.6	-22.8	-9.5	44	54	-10	74	-30

PK - Peak detector

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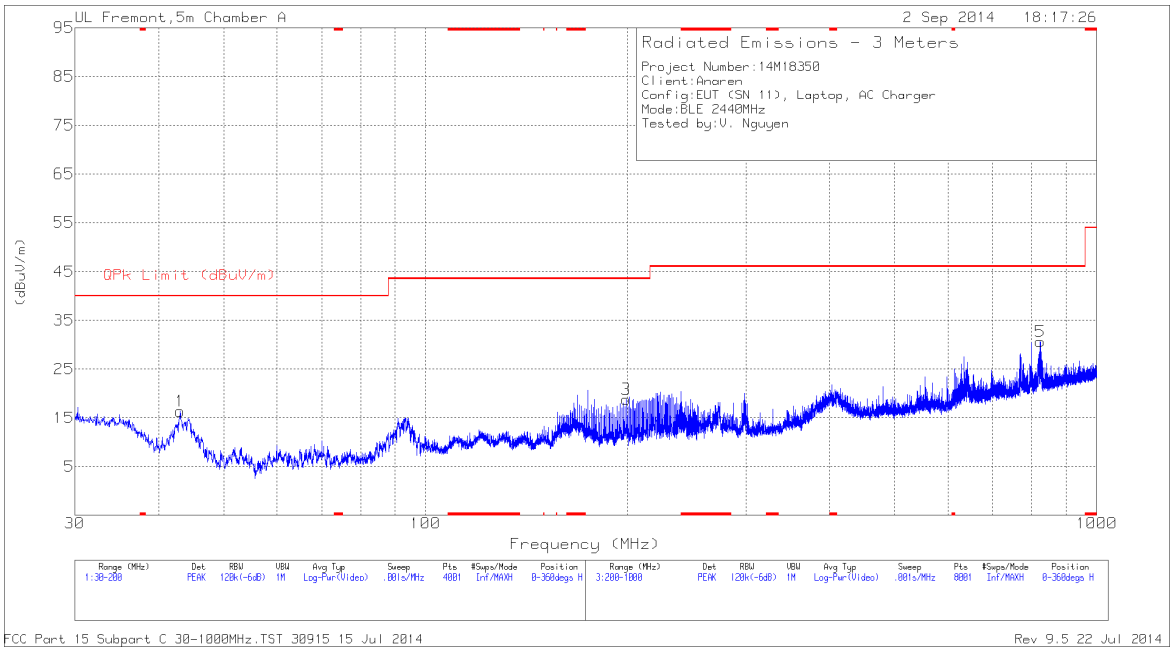
9.4. WORST-CASE BELOW 1 GHz

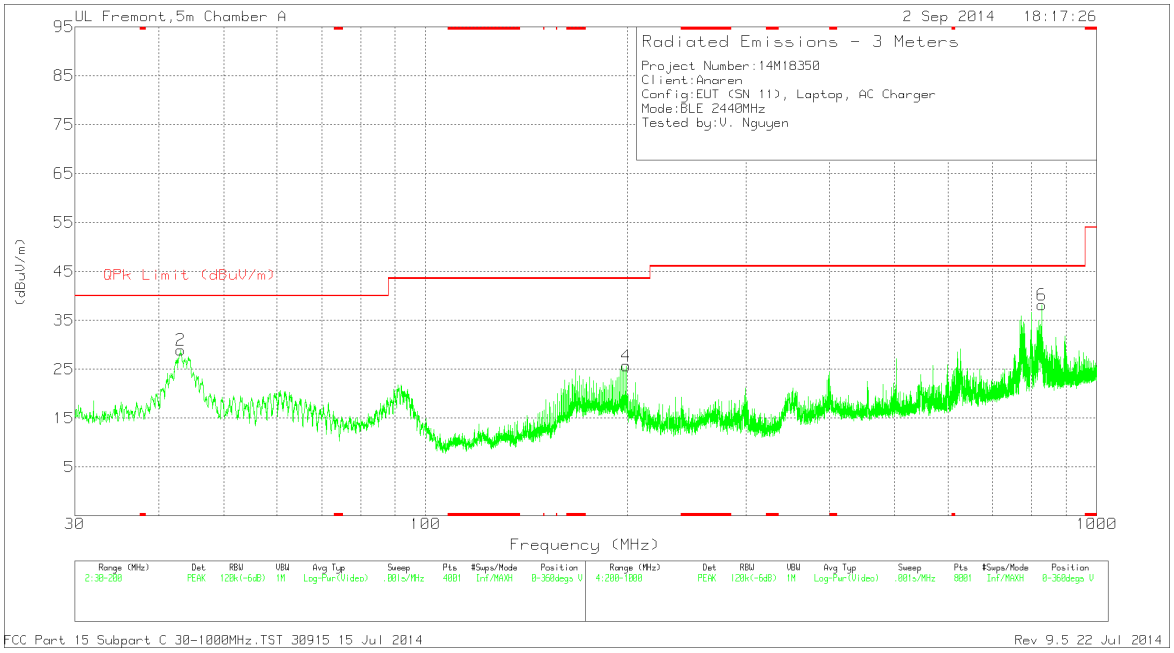
9.4.1. A20737A (Module with PCB Antenna)

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

HORIZONTAL PLOT



VERTICAL PLOT



Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T477 (dB/m)	Amp/Cbl (dB/m)	DC Corr (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	43.09	35.86	PK	11.5	-31	0	16.36	40	-23.64	0-360	300	H
2	43.175	48.45	PK	11.5	-31	0	28.95	40	-11.05	0-360	101	V
4	199.065	43.12	PK	12.5	-29.9	0	25.72	43.52	-17.8	0-360	101	V
3	199.1075	36.21	PK	12.5	-29.9	0	18.81	43.52	-24.71	0-360	101	H
5	824	36.55	PK	21.7	-27.6	0	30.65	46.02	-15.37	0-360	300	H
6	828.1	44.37	PK	21.7	-27.9	0	38.17	46.02	-7.85	0-360	101	V

PK - Peak detector

FCC Part 15 Subpart C 30-1000MHz.TST 30915 15 Jul 2014

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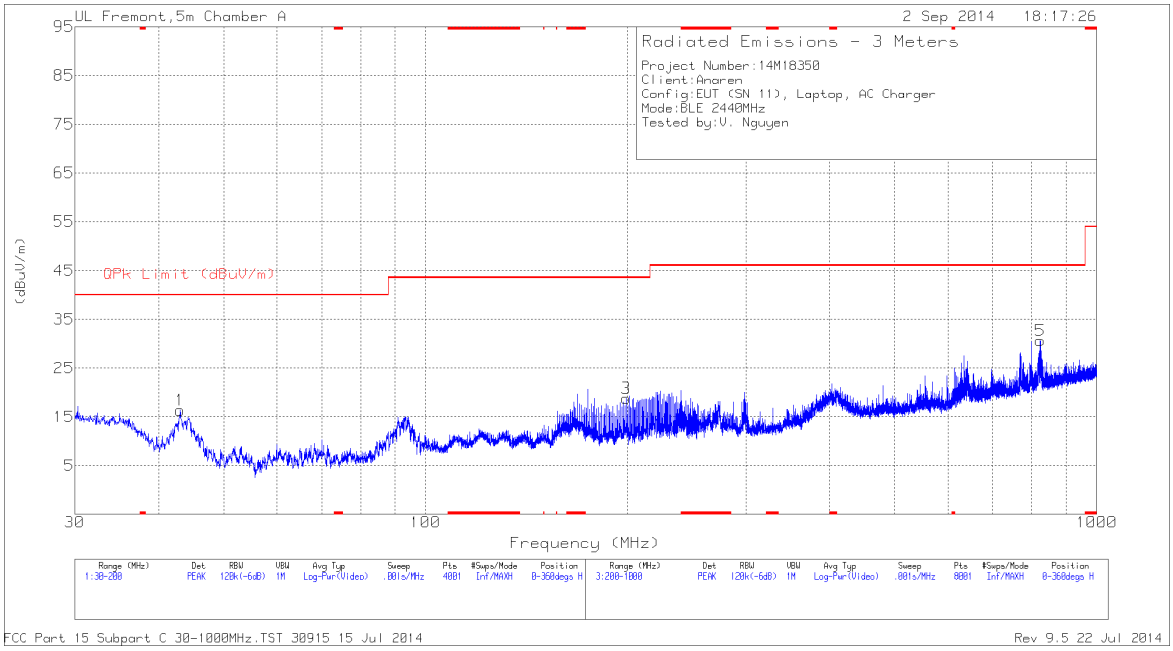
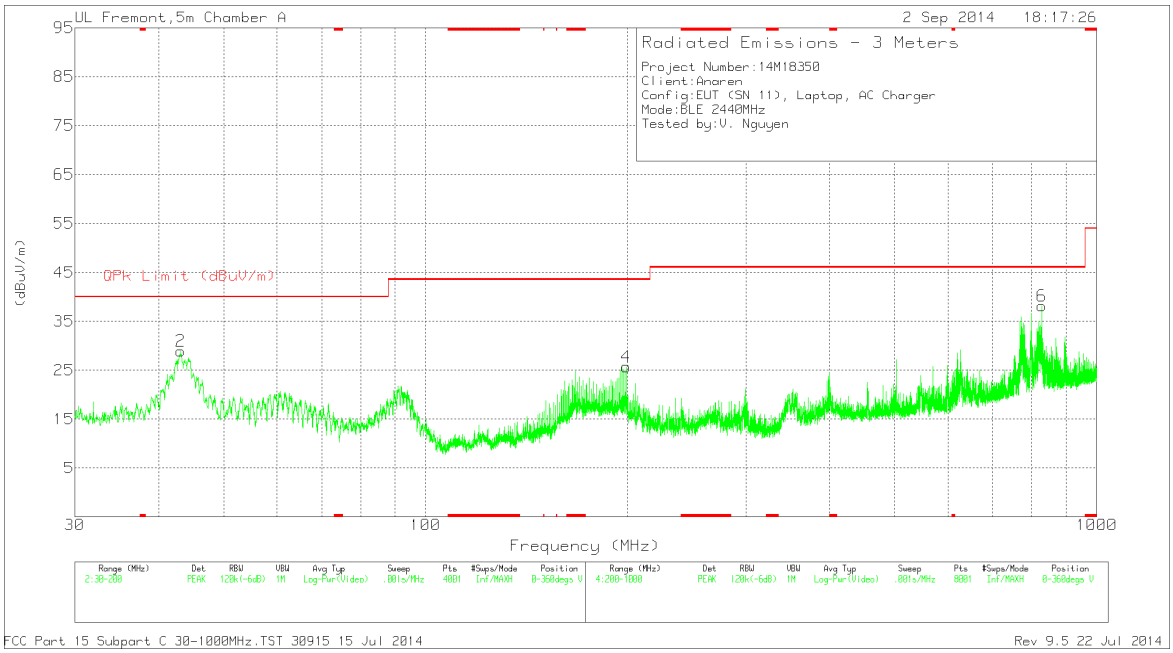
9.4.2. A20737C (Connectorized Module with Monopole Antenna)

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

HORIZONTAL PLOT



VERTICAL PLOT



Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T477 (dB/m)	Amp/Cbl (dB/m)	DC Corr (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	43.09	35.86	PK	11.5	-31	0	16.36	40	-23.64	0-360	300	H
2	43.175	48.45	PK	11.5	-31	0	28.95	40	-11.05	0-360	101	V
4	199.065	43.12	PK	12.5	-29.9	0	25.72	43.52	-17.8	0-360	101	V
3	199.1075	36.21	PK	12.5	-29.9	0	18.81	43.52	-24.71	0-360	101	H
5	824	36.55	PK	21.7	-27.6	0	30.65	46.02	-15.37	0-360	300	H
6	828.1	44.37	PK	21.7	-27.9	0	38.17	46.02	-7.85	0-360	101	V

PK - Peak detector

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10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

Frequency range (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.

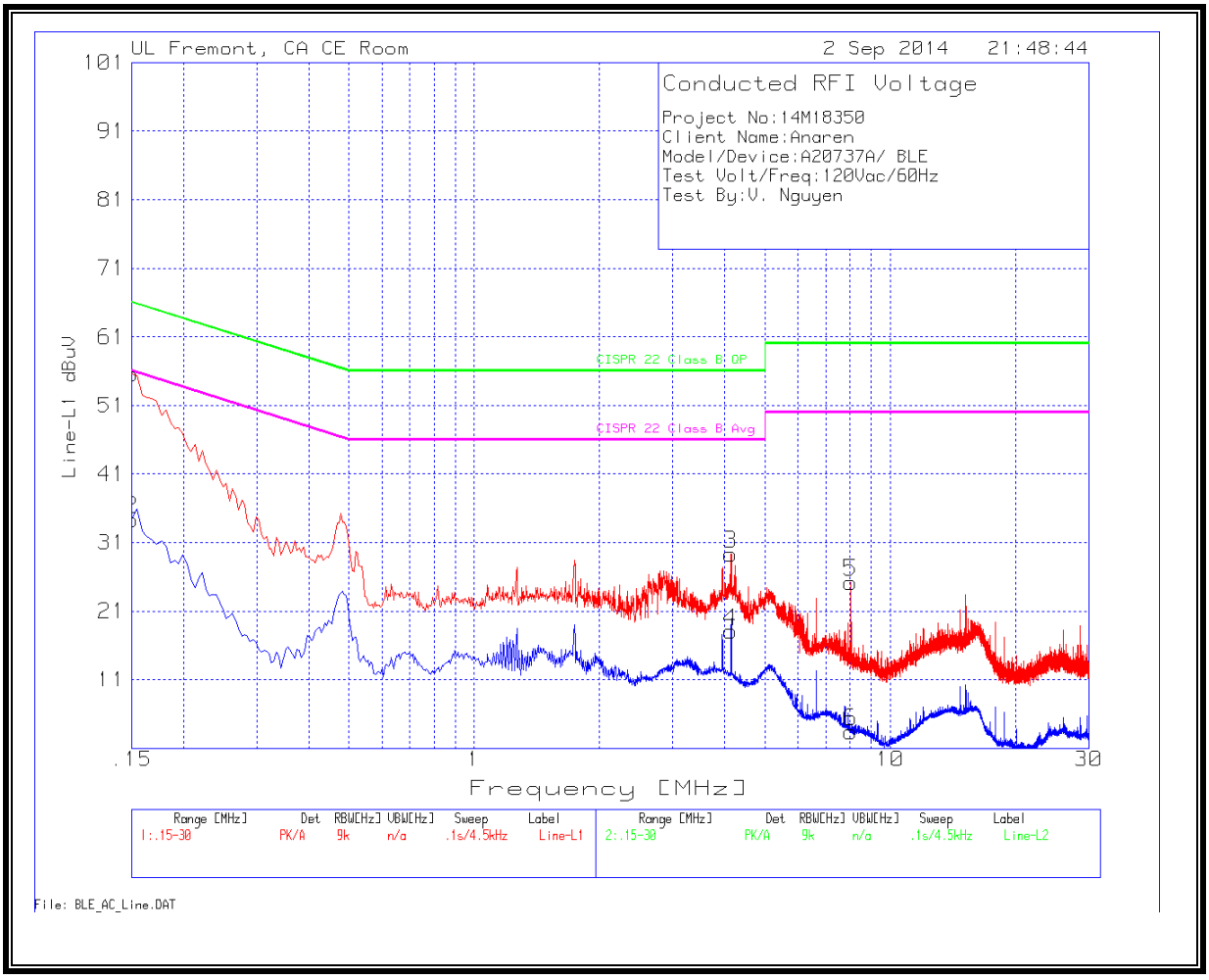
TEST PROCEDURE

ANSI C63.4

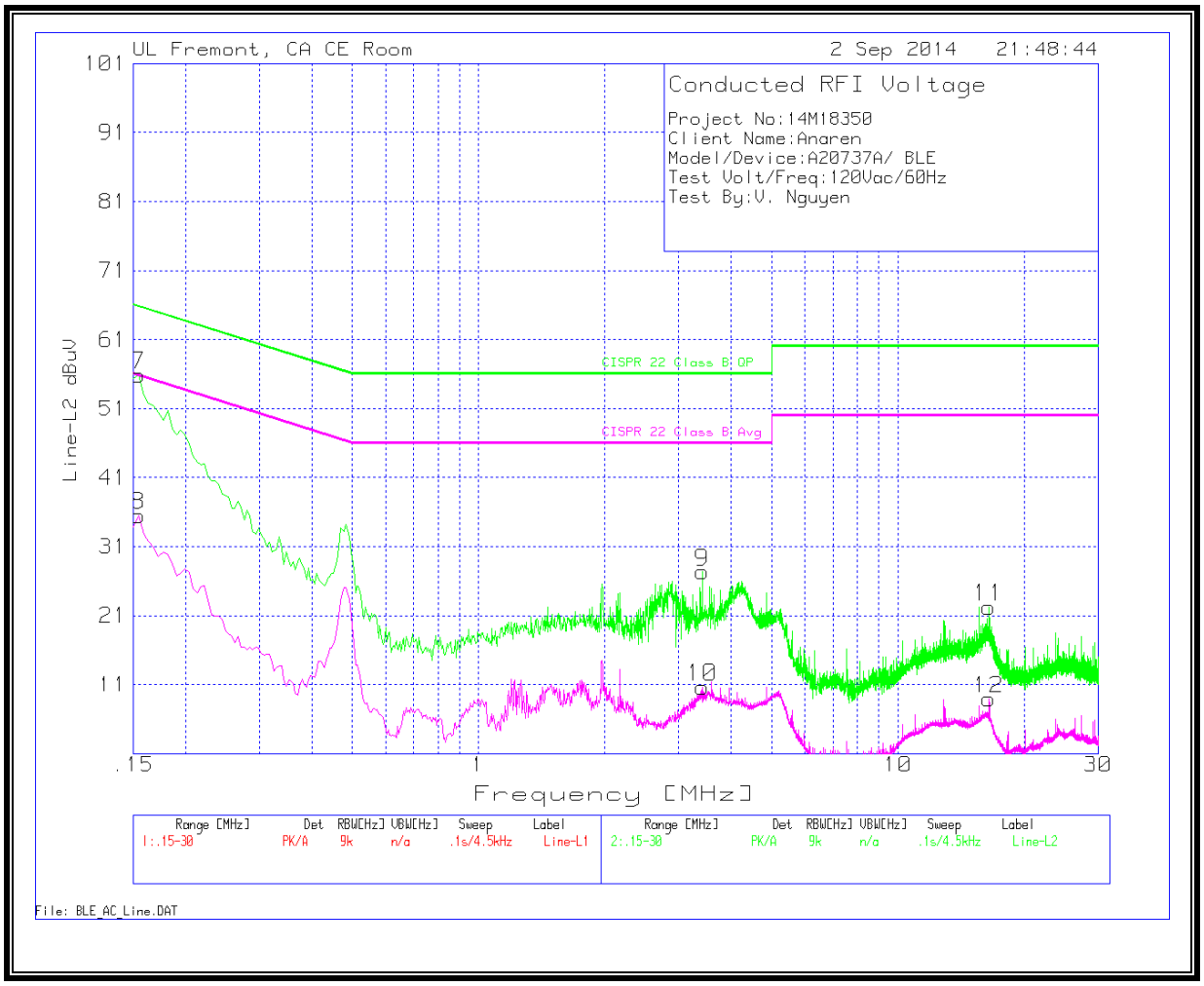
RESULTS

6 WORST EMISSIONS

LINE 1 RESULTS



LINE 2 RESULTS



Line-L1 .15 - 30MHz

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1 (dB)	LC Cables 1&3 (dB)	Corrected Reading dBuV	CISPR 22 Class B QP	Margin to Limit (dB)	CISPR 22 Class B Avg	Margin to Limit (dB)
1	.15	54.23	PK	1.4	0	55.63	66	-10.37	-	-
2	.15	32.92	Av	1.4	0	34.32	-	-	56	-21.68
3	4.1415	29	PK	.2	.1	29.3	56	-26.7	-	-
4	4.1415	17.74	Av	.2	.1	18.04	-	-	46	-27.96
5	8.0475	24.89	PK	.2	.1	25.19	60	-34.81	-	-
6	8.0475	3.15	Av	.2	.1	3.45	-	-	50	-46.55

Line-L2 .15 - 30MHz

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2 (dB)	LC Cables 2&3 (dB)	Corrected Reading dBuV	CISPR 22 Class B QP	Margin to Limit (dB)	CISPR 22 Class B Avg	Margin to Limit (dB)
7	.1545	54.45	PK	1.4	0	55.85	65.8	-9.95	-	-
8	.1545	34.09	Av	1.4	0	35.49	-	-	55.8	-20.31
9	3.417	27.02	PK	.2	.1	27.32	56	-28.68	-	-
10	3.417	10.36	Av	.2	.1	10.66	-	-	46	-35.34
11	16.494	21.71	PK	.3	.2	22.21	60	-37.79	-	-
12	16.494	8.39	Av	.3	.2	8.89	-	-	50	-41.11

PK - Peak detector

Av - average detection