



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

**BLUETOOTH LOW ENERGY
CERTIFICATION TEST REPORT**

FOR

Gimbal Proximty Beacon

MODEL NUMBER: 900-0000-000

**FCC ID: R6CGS21
IC: 10756A-GS21**

REPORT NUMBER: 14U17607-1C

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NVLAP Lab code: 100414-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	08/21/14	Initial Issue	M.Ferrer
A	10/17/14	Updated BW and Power measurements.	M.Ferrer
B	10/21/14	Updated RF exposure	M.Ferrer
C	11/24/14	Updated duty cycle clarification, orientation clarification	M.Ferrer

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Gimbal Inc
12526 High Bluff Dr.
San Diego, CA 92130

EUT DESCRIPTION: Gimbal Proximity Beacon

MODEL: 900-0000-000

SERIAL NUMBER: NA

DATE TESTED: August 1, 2014 – October 17, 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 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 By:



Bart Mucha
Staff ENGINEER
UL LLC

Tested By:



MICHAEL FERRER
Program Manager
UL LLC

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 333 Pfingsten Road, Northbrook, IL 60062 USA.

UL NBK is accredited by NVLAP, Laboratory Code 100414-0. The full scope of accreditation can be viewed at <http://ts.nist.gov/Standards/scopes/1004140.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

Sample Calculations

Radiated Field Strength and Conducted Emissions data contained within this report is calculated on the following basis:

Field Strength (dBuV/m) = Meter Reading (dBuV) + AF (dB/m) - Gain (dB) + Cable Loss (dB)

Conducted Voltage (dBuV) = Meter Reading (dBuV) + Cable Loss (dB) + LISN IL (dB)

Conducted Current (dBuA) = Meter Reading (dBuV) + Cable Loss (dB) - Transducer Factor (dBohms)

4.3. MEASUREMENT UNCERTAINTY

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

Test	Range	Equipment	Uncertainty k=2
Radiated Emissions	30-200MHz	Bicon 10m Horz	4.27dB
Radiated Emissions	30-200MHz	Bicon 10m Vert	4.28dB
Radiated Emissions	200-1000MHz	LogP 10m Horz	3.33dB
Radiated Emissions	200-1000MHz	LogP 10m Vert	3.39dB
Radiated Emissions	30-200MHz	Bicon 3m Horz	3.30dB
Radiated Emissions	30-130MHz	Bicon 3m Vert	4.84dB
Radiated Emissions	130-200MHz	Bicon 3m Vert	4.94dB
Radiated Emissions	200-1000MHz	LogP 3m Horz	3.46dB
Radiated Emissions	200-1000MHz	LogP 3m Vert	4.98dB
Radiated Emissions	1-6GHz	Horn	5.02dB
Radiated Emissions	6-18GHz	Horn	5.34dB
Radiated Emissions	18-26GHz	Horn	6.60dB
Conducted Ant Port	30MHz-26GHz	Spectrum Analyzer	2.94

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is an BTLE device.

The radio module is manufactured by Texas Instruments.

5.2. MAXIMUM OUTPUT POWER

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

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2402 - 2480	BLE	-1.19	0.76

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a Dipole or Patch antenna, with a maximum gain of 2.3 and 2.9 dBi respectively.

5.4. 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 for the Patch antenna the worst-case orientation was X and for the Omni-directional antenna they worst-case orientation was Y. Therefore all final radiated emissions testing was performed with the EUT in these orientations with the noted antenna. For the Omni directional antenna some plots and associated data were incorrectly annotated as the X axis but testing was conducted in the worst-case orientation (Y-Axis).

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
EUT	Gimbal	-	-	-

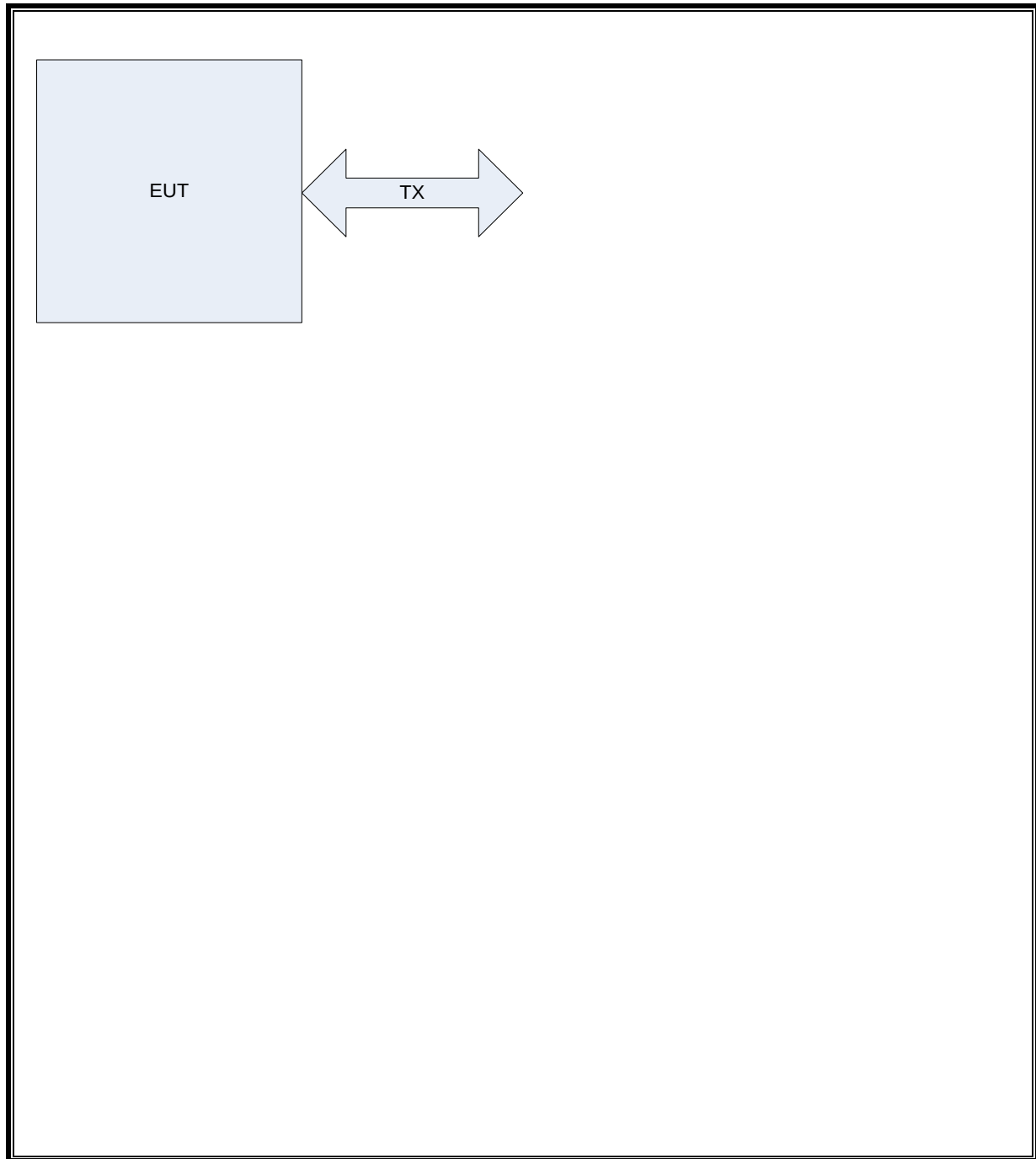
I/O CABLES

None

TEST SETUP

EUT is battery powered and programmed to transmit with 100% Duty cycle during all tests except dwell time testing normal duty cycle timing was used. 3 samples each transmitting one channel. 1 sample programmed used to demonstrated switching between channels.

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	Test
EMI Test Receiver	Rohde & Schwarz	ESU	EMC4323	20131220	20141231	RE
Bicon Antenna	Chase	VBA6106A	EMC4078	20140401	20150401	RE
Log-P Antenna	Chase	UPA6109	EMC4313	20131003	20141031	RE
Spectrum Analyzer	Rohde & Schwarz	FSEK	EMC4182	20131217	20141231	RE
Antenna Array	UL	BOMS	EMC4276	20130913	20140913	RE
EMI Test Receiver	Agilent	N9030A	EMC4360	20131221	20141221	OBW, Dwell
Antenna	EMCO	-	-	N/A	N/A	OBW, Dwell
Power Meter	Agilent	N1912A	EMC4362	20130606	20150606	AP
Power Sensor	Agilent	85481A	EMC4363	20131209	20141209	AP
EMI Test Receiver	Rohde & Schwarz	ESCI	EMC4328	20131217	20141231	CE
LISN	Solar	8602-50-TS-50-N	EMC4052	20140116	20150116	CE
LISN	Solar	8602-50-TS-50-N	EMC4064	20140116	20150116	CE

7. ANTENNA PORT TEST RESULTS

7.1. MEASUREMENT METHODS

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

Output Power: KDB 558074 D01 v03r02, Section 9.1.1.

Output 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.

Band-edge: KDB 558074 D01 v03r02, Section 13.3.3.

7.2. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS

LIMITS

None; for reporting purposes only.

PROCEDURE

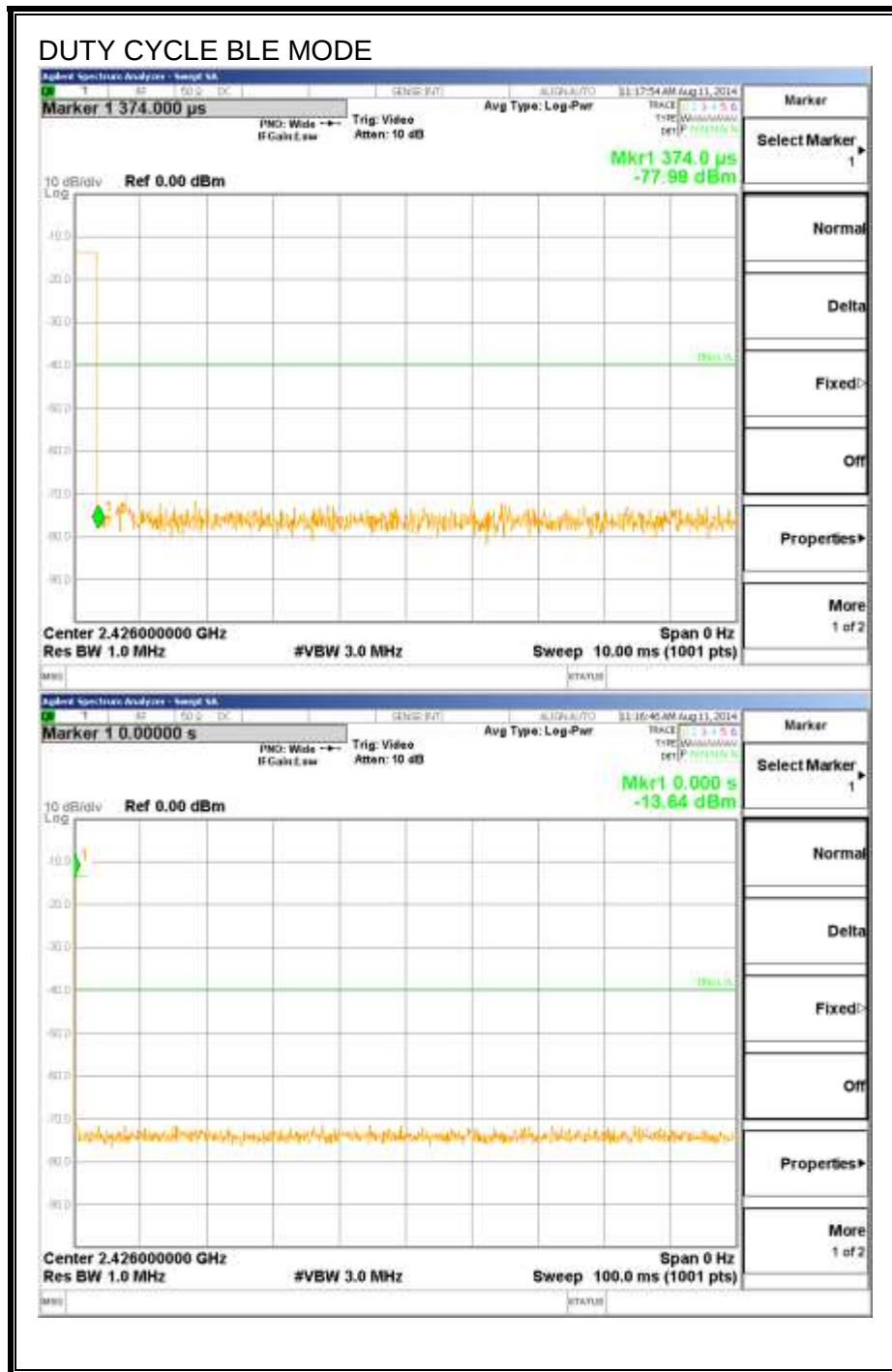
KDB 558074 Zero-Span Spectrum Analyzer Method.

7.2.1. 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)
BLE	0.374	100.000	0.004	0.37%	24.27	2.674

Duty Cycle calculation above was based on power rather than voltage but considered worst case.

7.2.2. DUTY CYCLE PLOTS



7.3. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

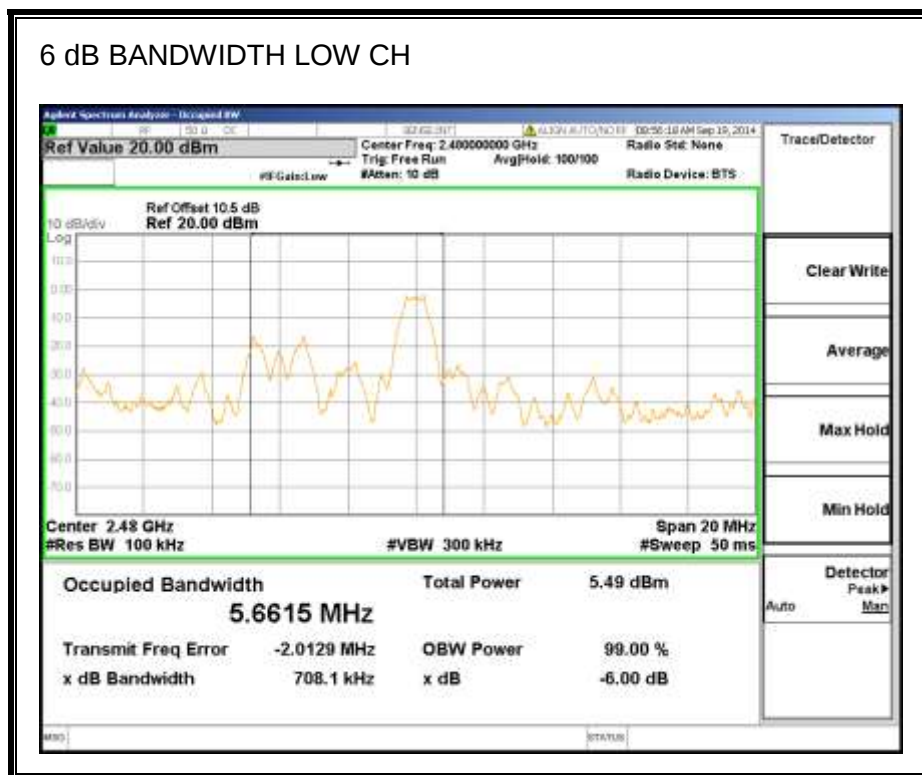
IC RSS-210 A8.2 (a)

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

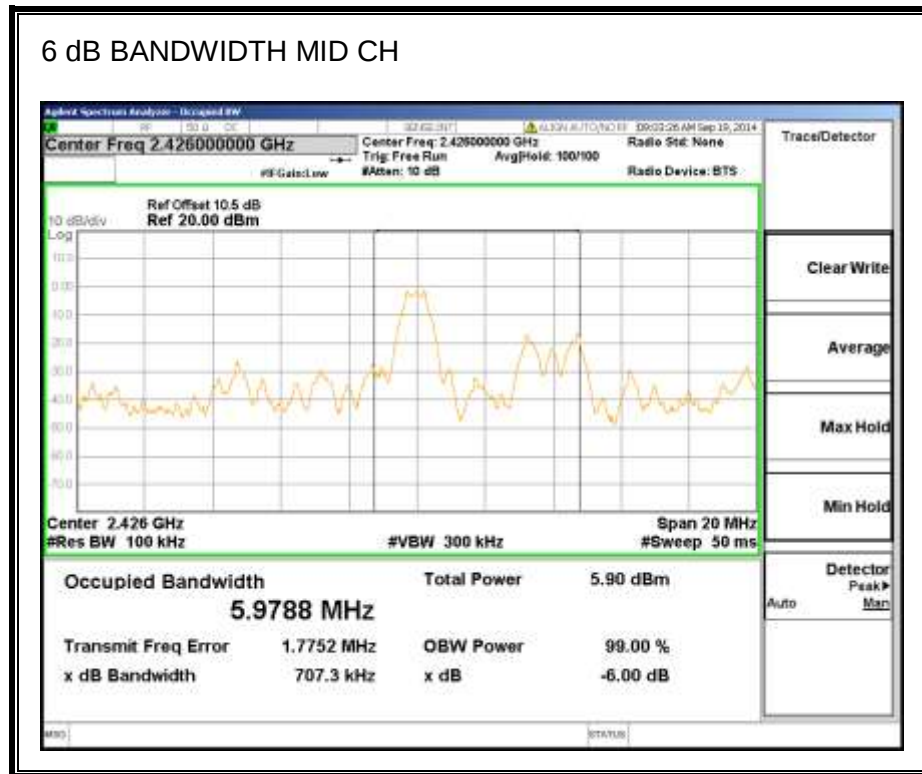
RESULTS

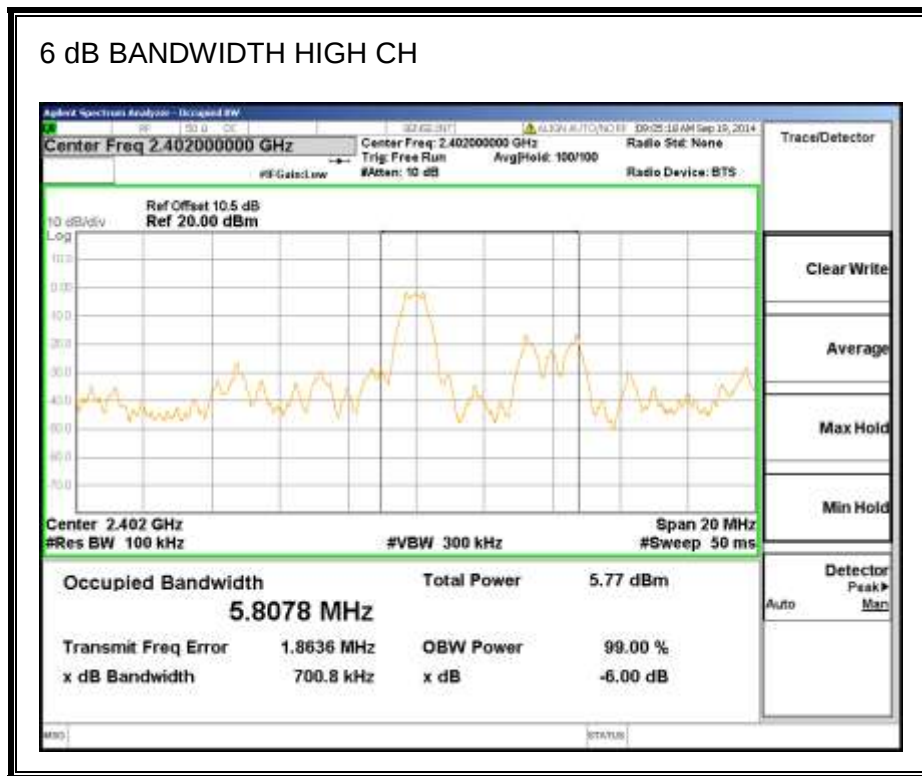
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.7081	0.5
Middle	2426	0.7073	0.5
High	2480	0.7008	0.5

6 dB BANDWIDTH



6 dB BANDWIDTH MID CH





7.4. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

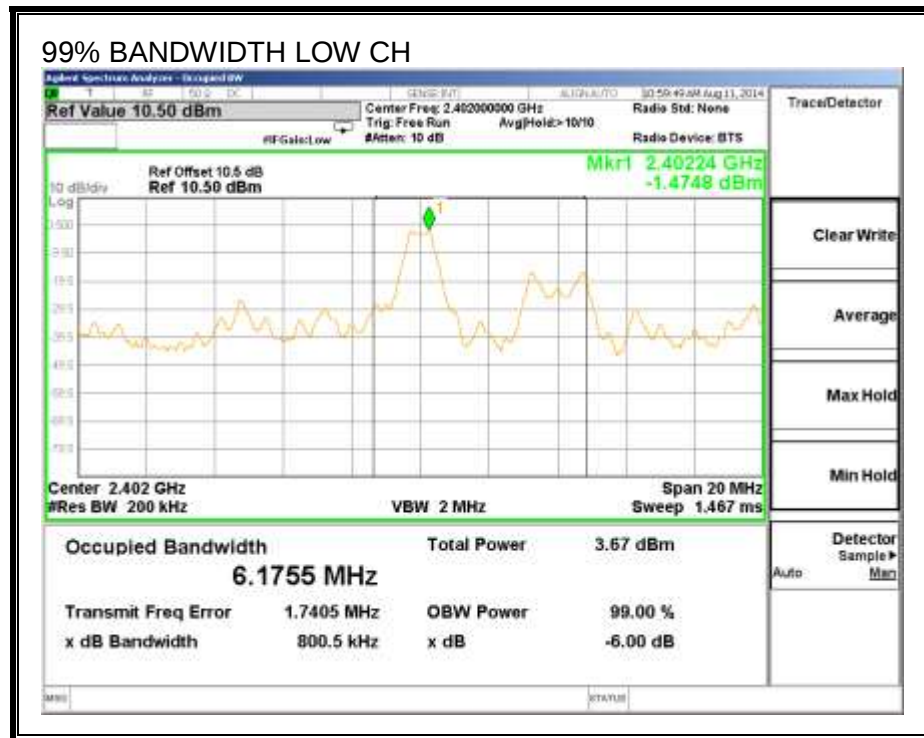
TEST PROCEDURE

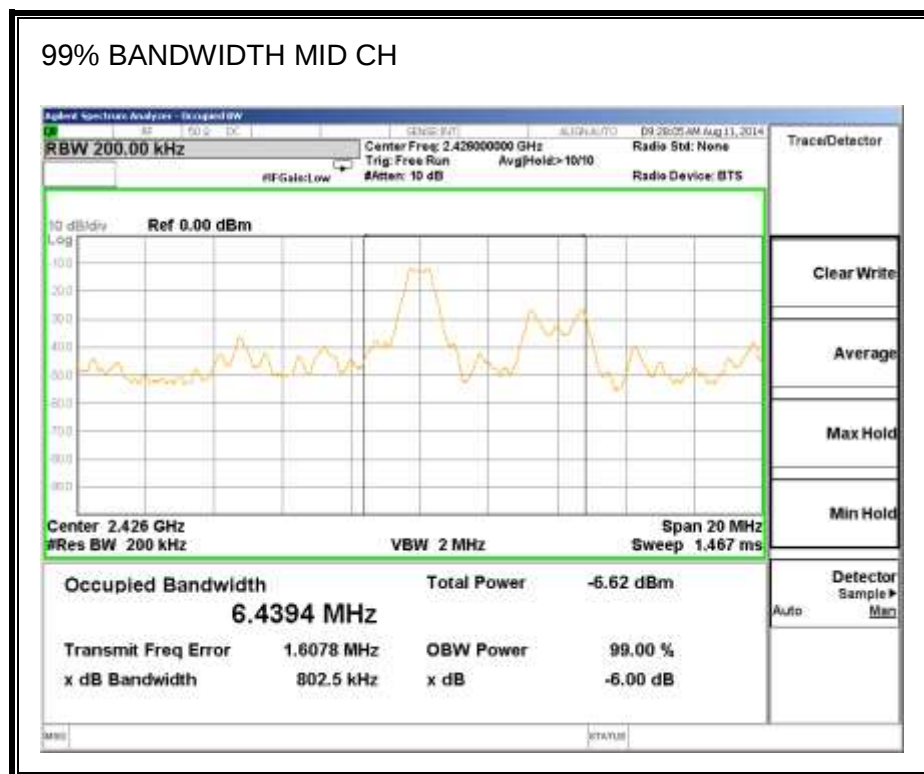
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth and to 1% of the span. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

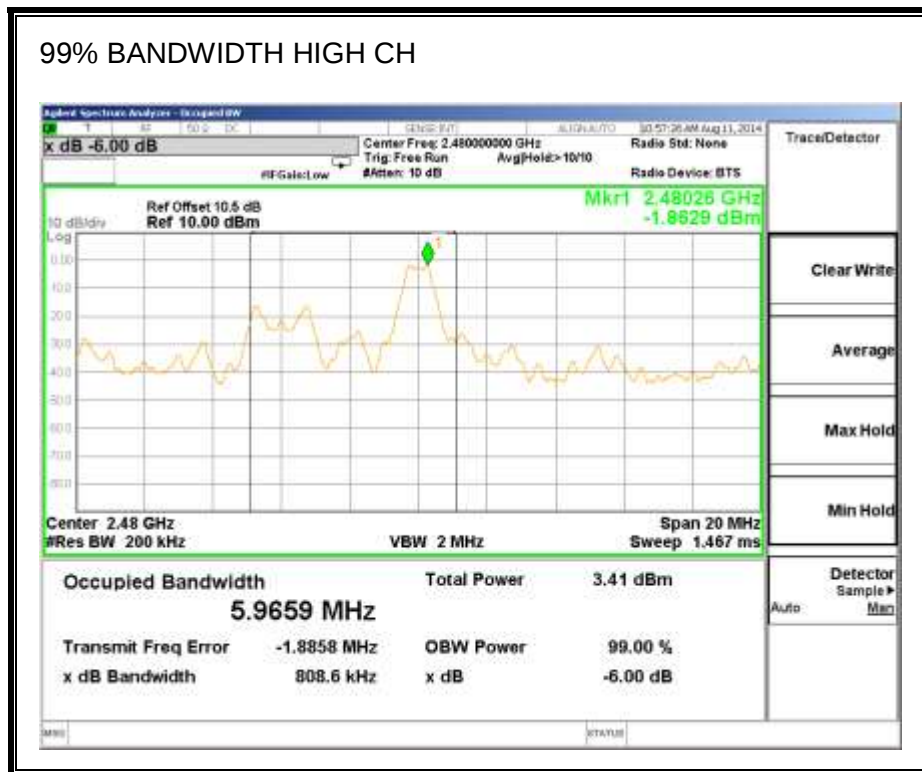
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	6.1755
Middle	2426	6.4394
High	2480	5.9659

99% BANDWIDTH







7.5. OUTPUT POWER

LIMITS

FCC §15.247 (b)

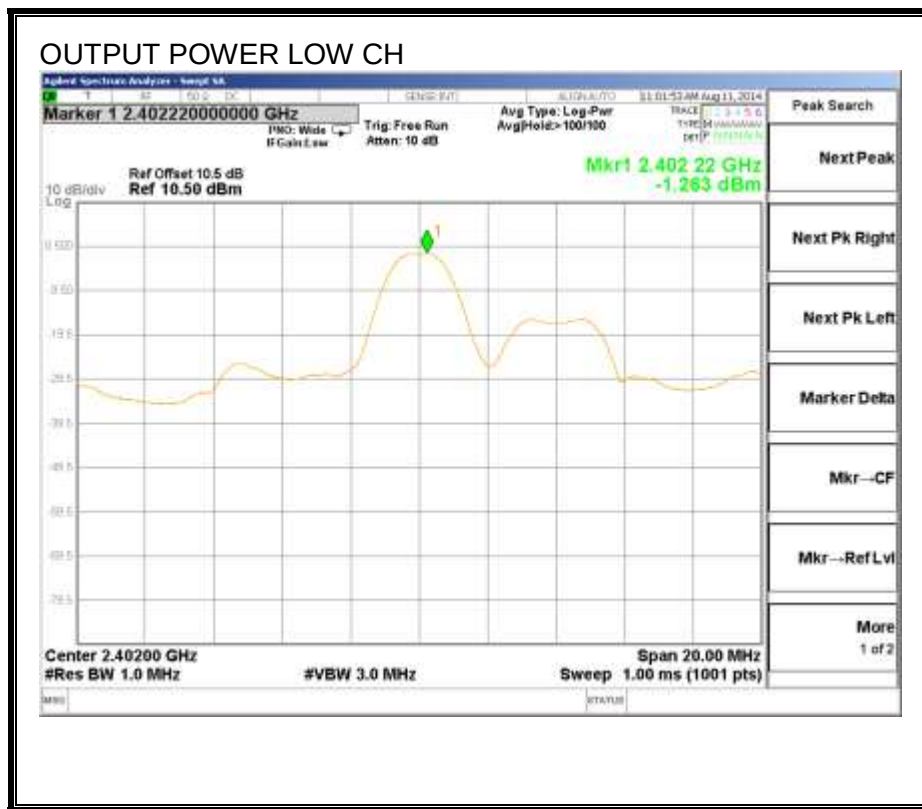
IC RSS-210 A8.4

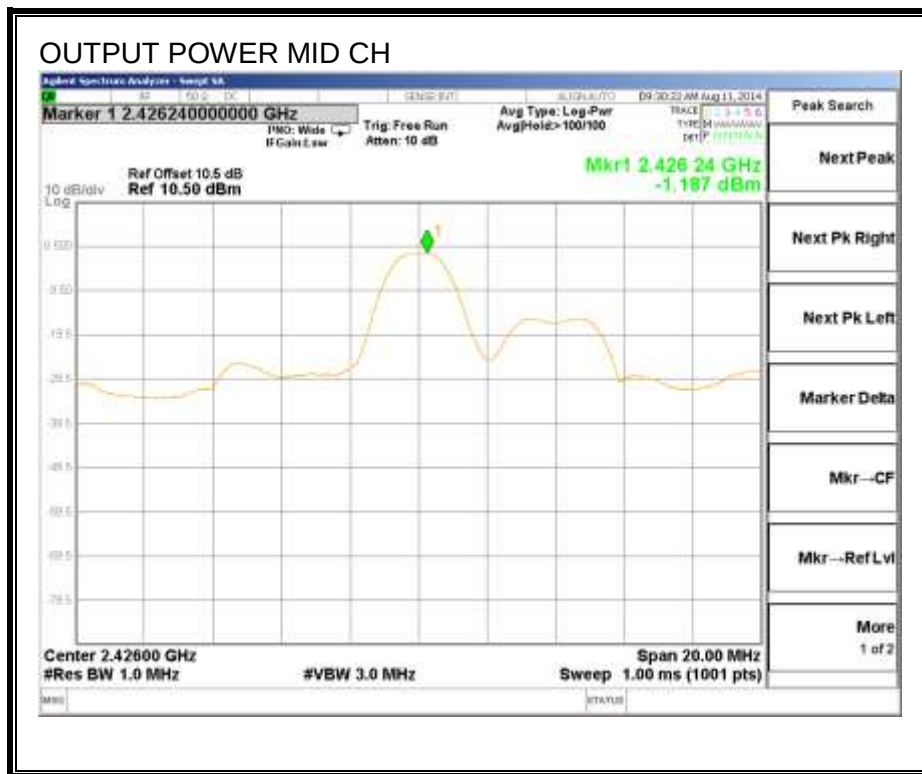
The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

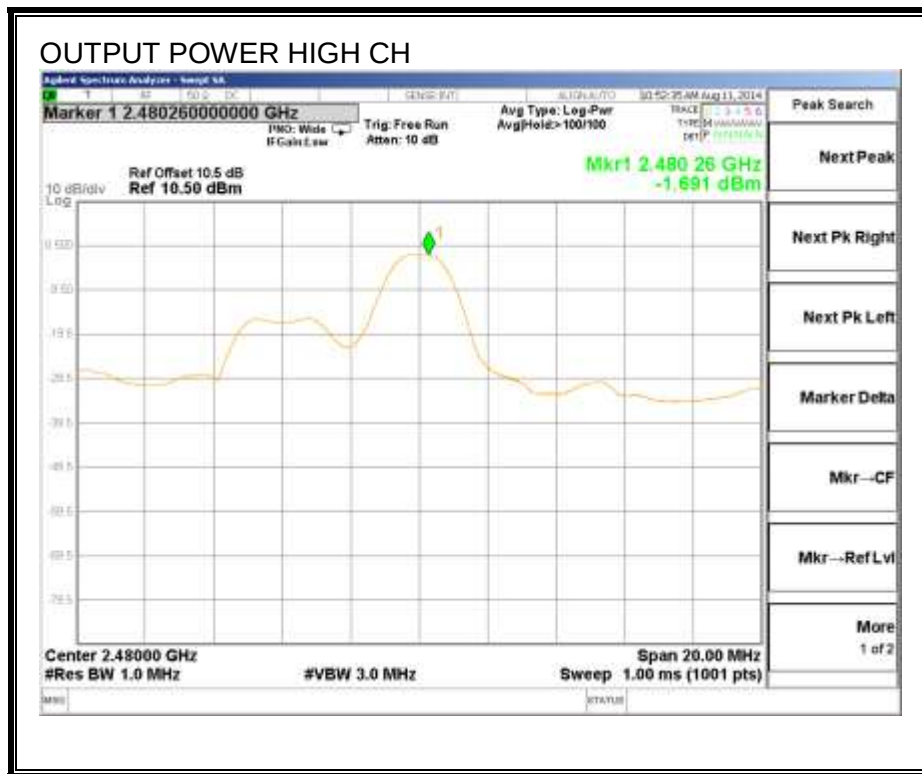
RESULTS

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	-1.263	30	-31.263
Middle	2426	-1.187	30	-31.187
High	2480	-1.691	30	-31.691

OUTPUT POWER







7.6. AVERAGE POWER

LIMITS

None; for reporting purposes only.

RESULTS

The cable assembly insertion loss of 0 dB was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	-1.38
Middle	2440	-1.34
High	2480	-1.73

7.7. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

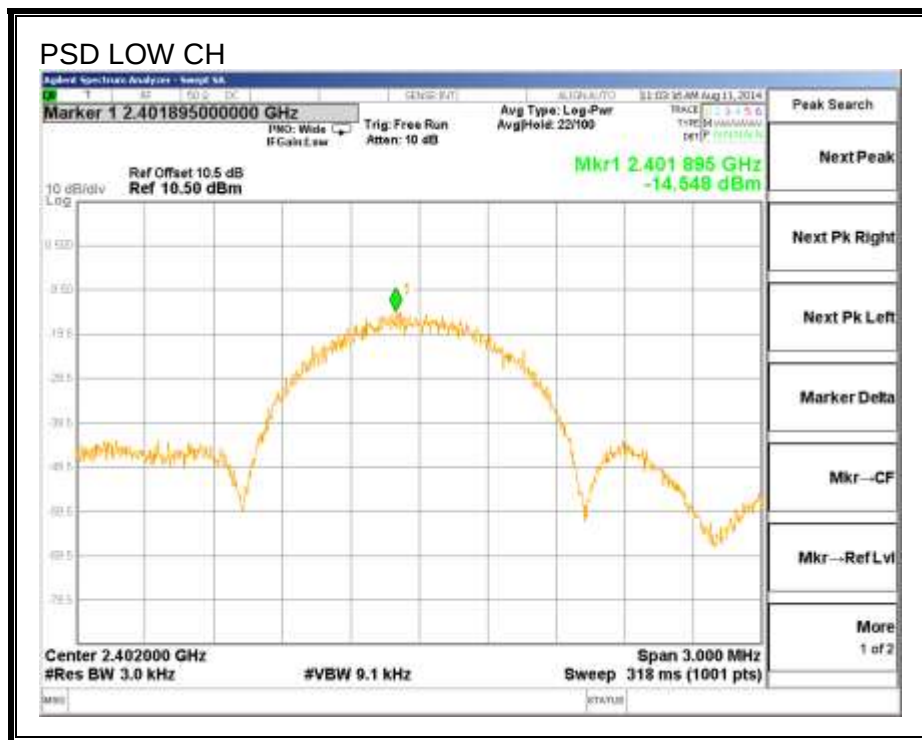
IC RSS-210 A8.2 (b)

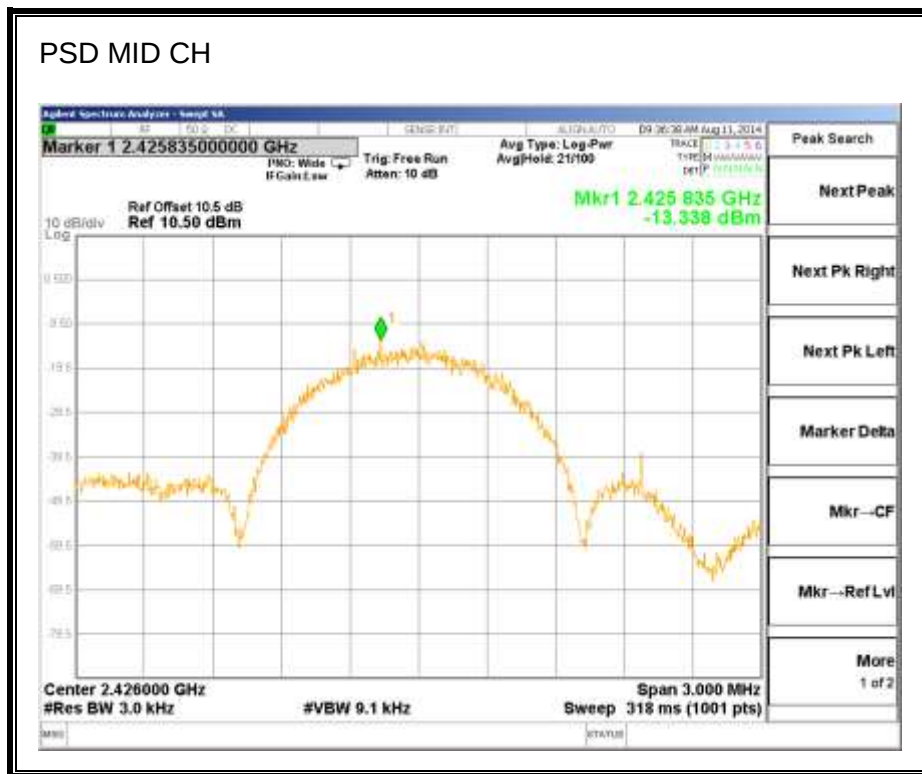
The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

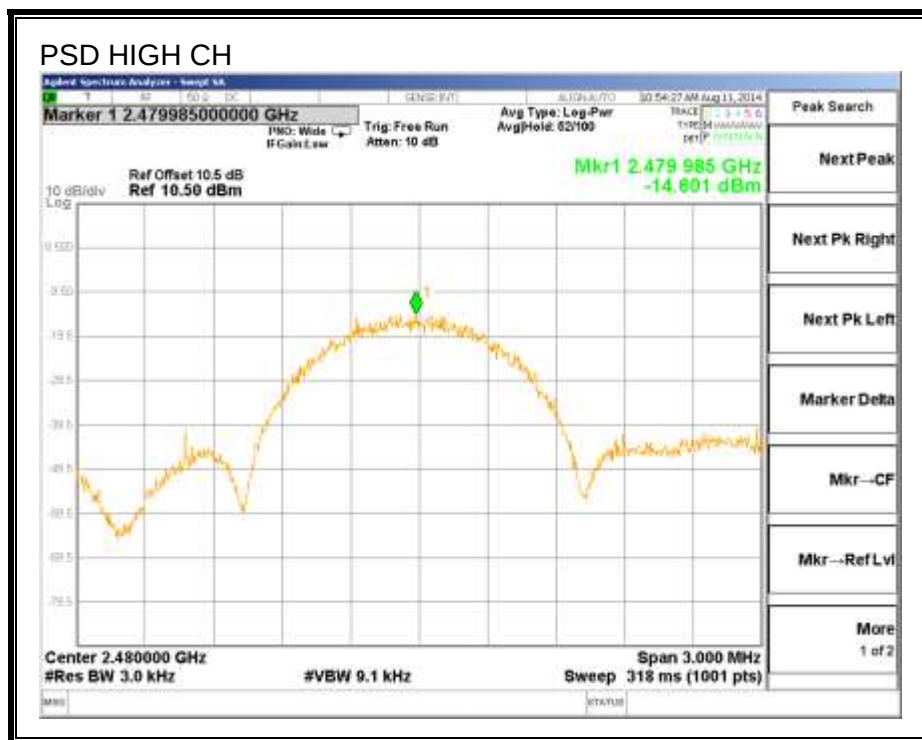
RESULTS

Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2402	-14.55	8	-22.55
Middle	2426	-13.34	8	-21.34
High	2480	-14.60	8	-22.60

POWER SPECTRAL DENSITY







7.8. CONDUCTED SPURIOUS EMISSIONS

LIMITS

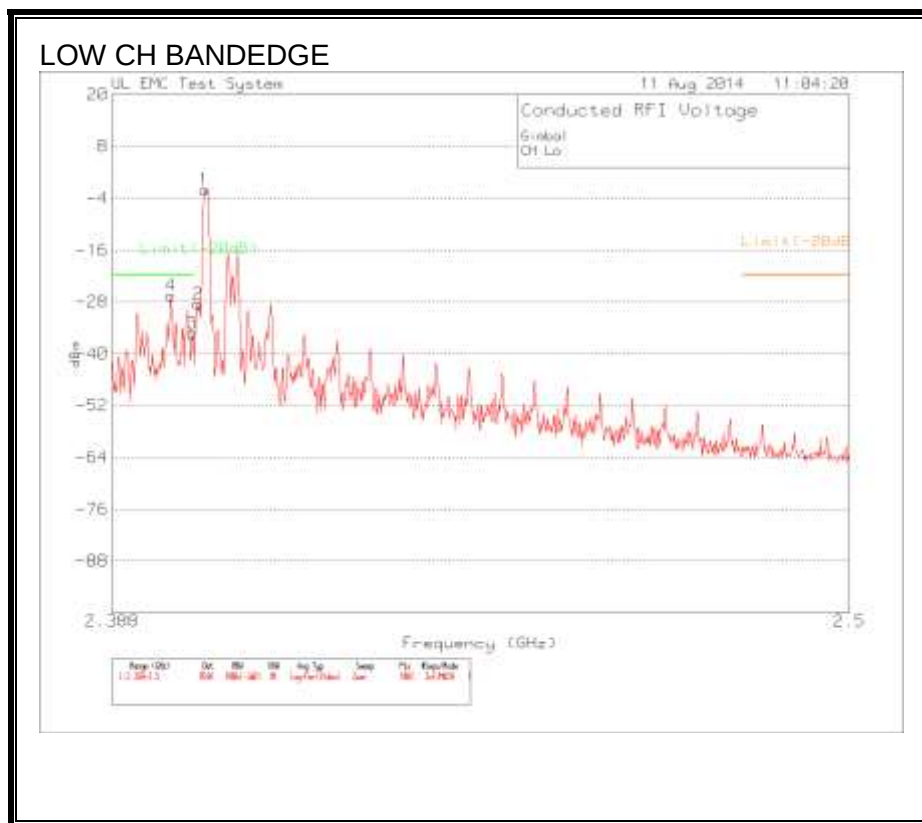
FCC §15.247 (d)

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



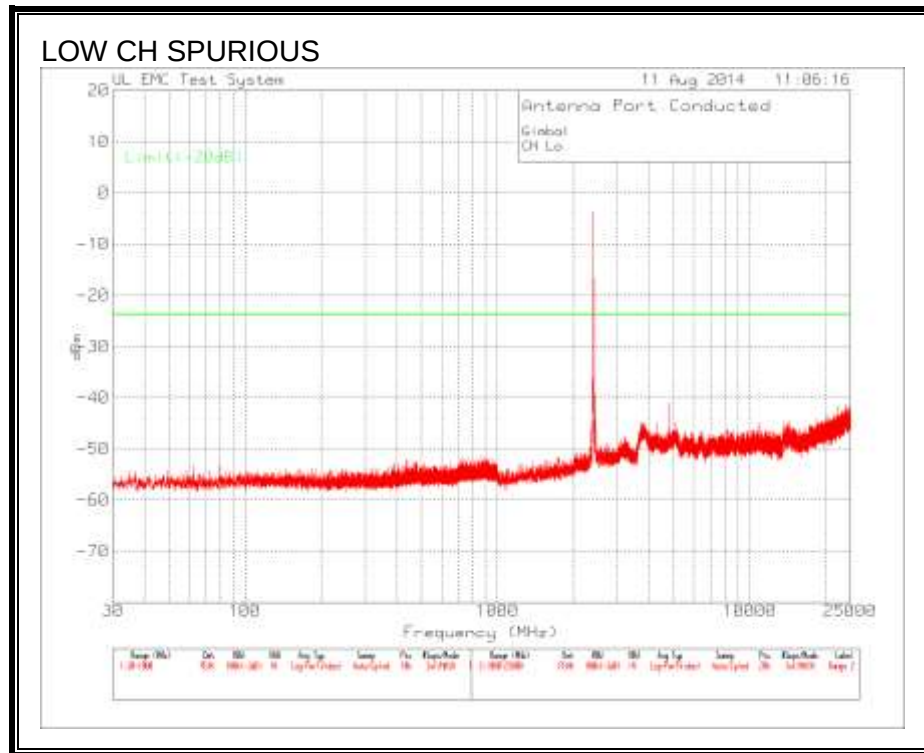
Gimbal
CH Lo

Trace Markers

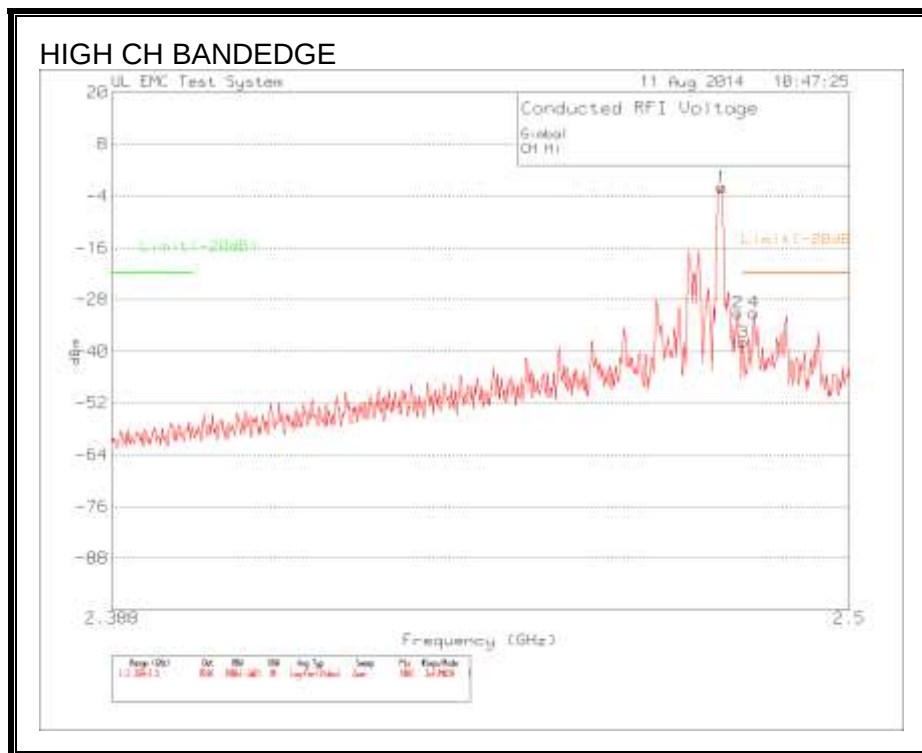
Range 2 2.388 - 2.5MHz

Marker No.	Test Frequency (GHz)	Meter Reading (dBuV)	Detector	dBuV to dBm	Cable Factor dB	Corrected Reading dBm	Limit	Margin (dB)
1	2.4018	94.43	PK	-107	10.5	-2.07	-	-
2	2.4008	67.96	PK	-107	10.5	-28.54	-	-
3	2.4	61.26	PK	-107	10.5	-35.24	-21.78	-13.46
4	2.3967	69.97	PK	-107	10.5	-26.53	-21.78	-4.75

PK - Peak detector



SPURIOUS EMISSIONS, HIGH CHANNEL



Gimbal
CH Hi

Trace Markers

Range 2 2.388 - 2.5MHz

Marker No.	Test Frequency (GHz)	Meter Reading (dBuV) Detector	Meter dBm	Cable Factor dB	Corrected Reading dBm	Limit	Margin (dB)
1	2.4803	94.51 PK	-107	10.5	-1.99	-	-
2	2.4828	65.44 PK	-107	10.5	-31.06	-	-
3 *	2.4835	58.55 PK	-107	10.5	-37.95	-21.89	-16.06
4 *	2.4852	65.42 PK	-107	10.5	-31.08	-21.89	-9.19

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



8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

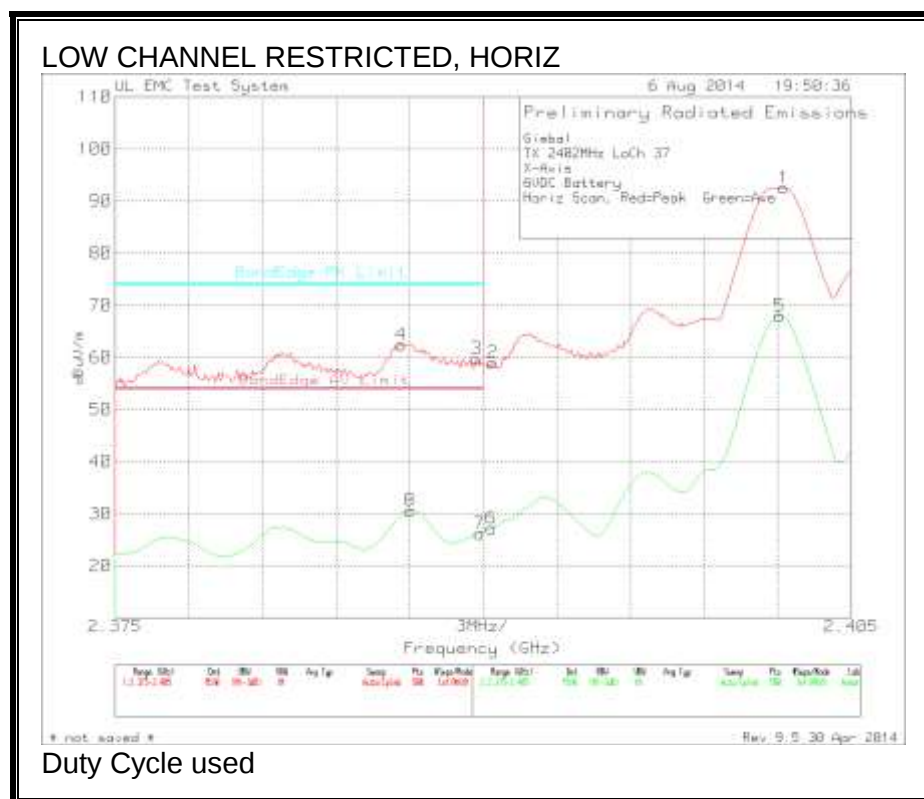
IC RSS-GEN Clause 6 (Receiver)

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

8.2. TRANSMITTER ABOVE 1 GHz

8.2.1. TX ABOVE 1 GHz FOR BLUETOOTH LOW ENERGY MODE IN THE 2.4 GHz BAND Patch Antenna

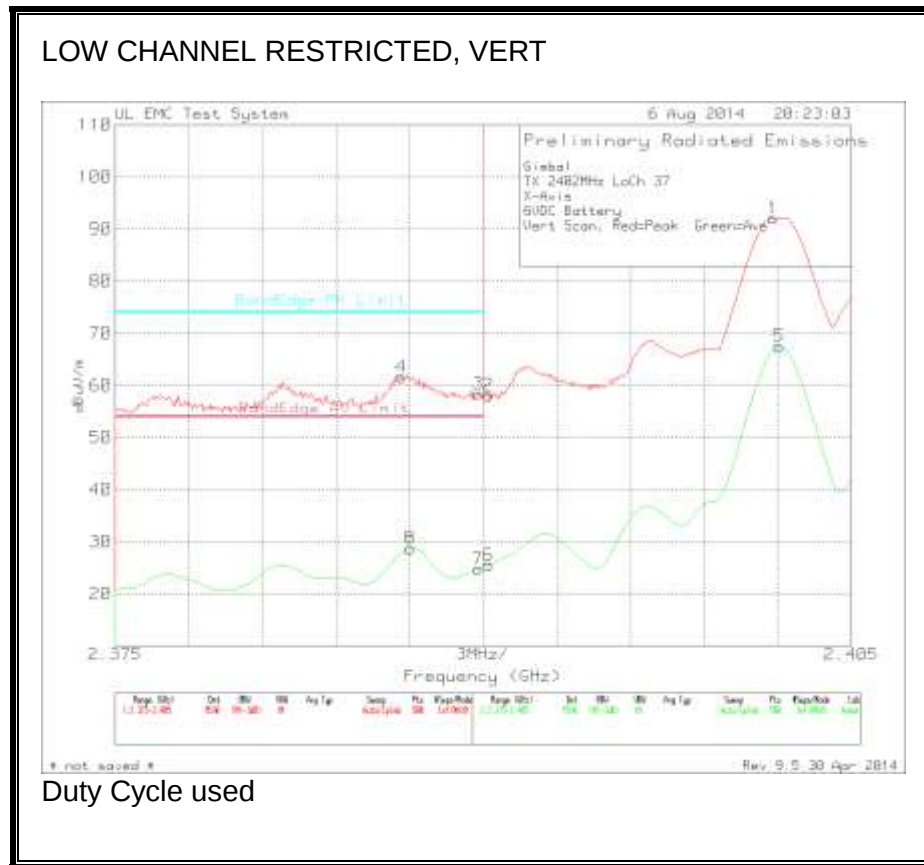
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



Gimbal
TX 2402MHz LoCh 37
X-Axis
6VDC Battery
Horiz Scan, Red=Peak Green=Ave

Marker No.	Test Frequency (GHz)	Meter Reading(dBuV) Detector	Antenna Factor dB/m	Duty Cycle	Corrected		BandEdge PK Limit	Margin (dB)	BandEdge AV Limit	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
					Reading dBuV/m	BandEdge Margin							
1	2.4022	70.76 PK	21.8	-	92.56	-	-	-	-	-	10	101	H
2	2.3904	37.17 PK	21.8	-	58.97	-	-	-	-	-	10	101	H
3	2.3897	37.97 PK	21.8	-	59.77	74	-14.23	54	5.77	-	10	101	H
4	2.3867	40.62 PK	21.8	-	62.42	74	-11.58	54	8.42	-	10	101	H
5	2.4021	70.16 AV	21.8	-24	67.96	-	-	-	-	-	10	101	H
6	2.3903	29.4 AV	21.8	-24	27.2	-	-	-	-	-	10	101	H
7	2.3899	28.36 AV	21.8	-24	26.16	74	-47.84	54	-27.84	-	10	101	H
8	2.387	32.76 AV	21.8	-24	30.56	74	-43.44	54	-23.44	-	10	101	H

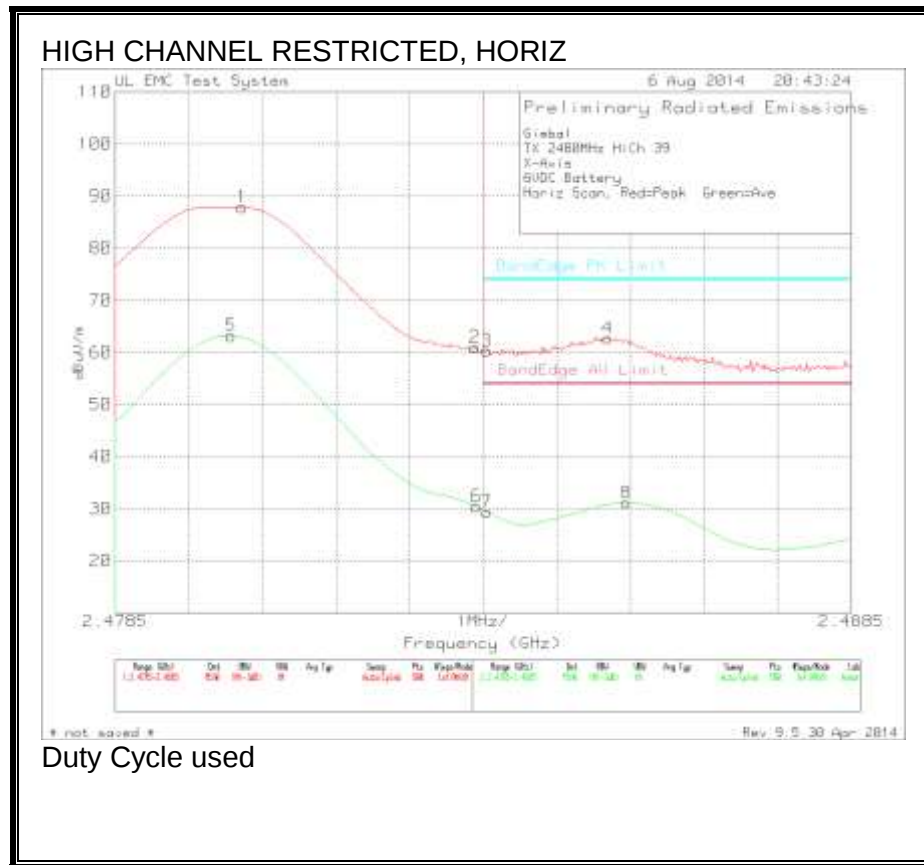
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



Gimbal
TX 2402MHz LoCh 37
X-Axis
6VDC Battery
Vert Scan, Red=Peak Green=Ave

Marker No.	Test Frequency (GHz)	Meter Reading (dBuV)	Antenna Factor (dB/m)	Duty Cycle	Corrected Reading (dBuV/m)	BandEdge PK Limit (dB)	Margin (dB)	BandEdge AV Limit (dB)	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1	2.4018	70.26 PK	21.8	-	92.06	-	-	-	-	3	123	V
2	2.3902	36.27 PK	21.8	-	58.07	-	-	-	-	3	123	V
3	2.3898	36.64 PK	21.8	-	58.44	74	-15.56	54	4.44	3	123	V
4	2.3867	39.77 PK	21.8	-	61.57	74	-12.43	54	7.57	3	123	V
5	2.4021	69.66 AV	21.8	-24	67.46	-	-	-	-	3	123	V
6	2.3902	27.71 AV	21.8	-24	25.51	-	-	-	-	3	123	V
7	2.3898	26.94 AV	21.8	-24	24.74	74	-49.26	54	-29.26	3	123	V
8	2.387	30.96 AV	21.8	-24	28.76	74	-45.24	54	-25.24	3	123	V

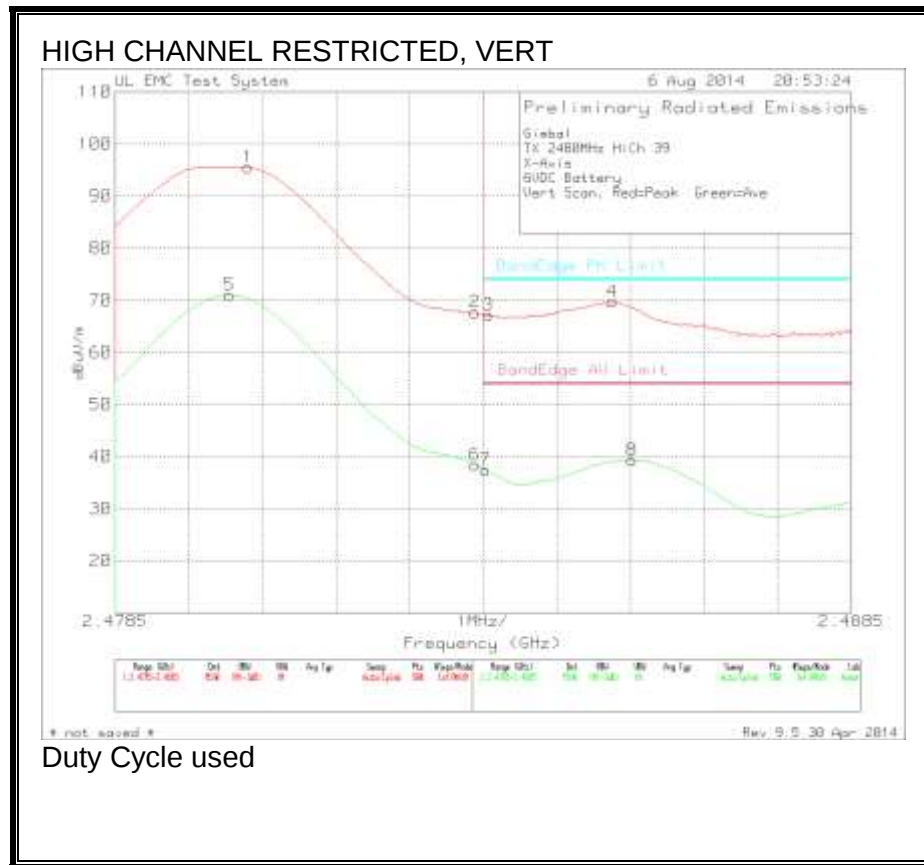
RESTRICTED BANEDGE (HIGH CHANNEL, HORIZONTAL)



Gimbal
TX 2402MHz LoCh 37
X-Axis
6VDC Battery
Horiz Scan, Red=Peak Green=Ave

Marker No.	Test Frequency (GHz)	Meter Reading (dBuV)	Antenna Factor (dB/m)	Duty Cycle	Corrected Reading (dBuV/m)	BandEdge PK Limit (dB)	Margin (dB)	BandEdge AV Limit (dB)	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1	2.4022	70.76 PK	21.8	-	92.56	-	-	-	-	10	101	H
2	2.3904	37.17 PK	21.8	-	58.97	-	-	-	-	10	101	H
3	2.3897	37.97 PK	21.8	-	59.77	74	-14.23	54	5.77	10	101	H
4	2.3867	40.62 PK	21.8	-	62.42	74	-11.58	54	8.42	10	101	H
5	2.4021	70.16 AV	21.8	-24	67.96	-	-	-	-	10	101	H
6	2.3903	29.4 AV	21.8	-24	27.2	-	-	-	-	10	101	H
7	2.3899	28.36 AV	21.8	-24	26.16	74	-47.84	54	-27.84	10	101	H
8	2.387	32.76 AV	21.8	-24	30.56	74	-43.44	54	-23.44	10	101	H

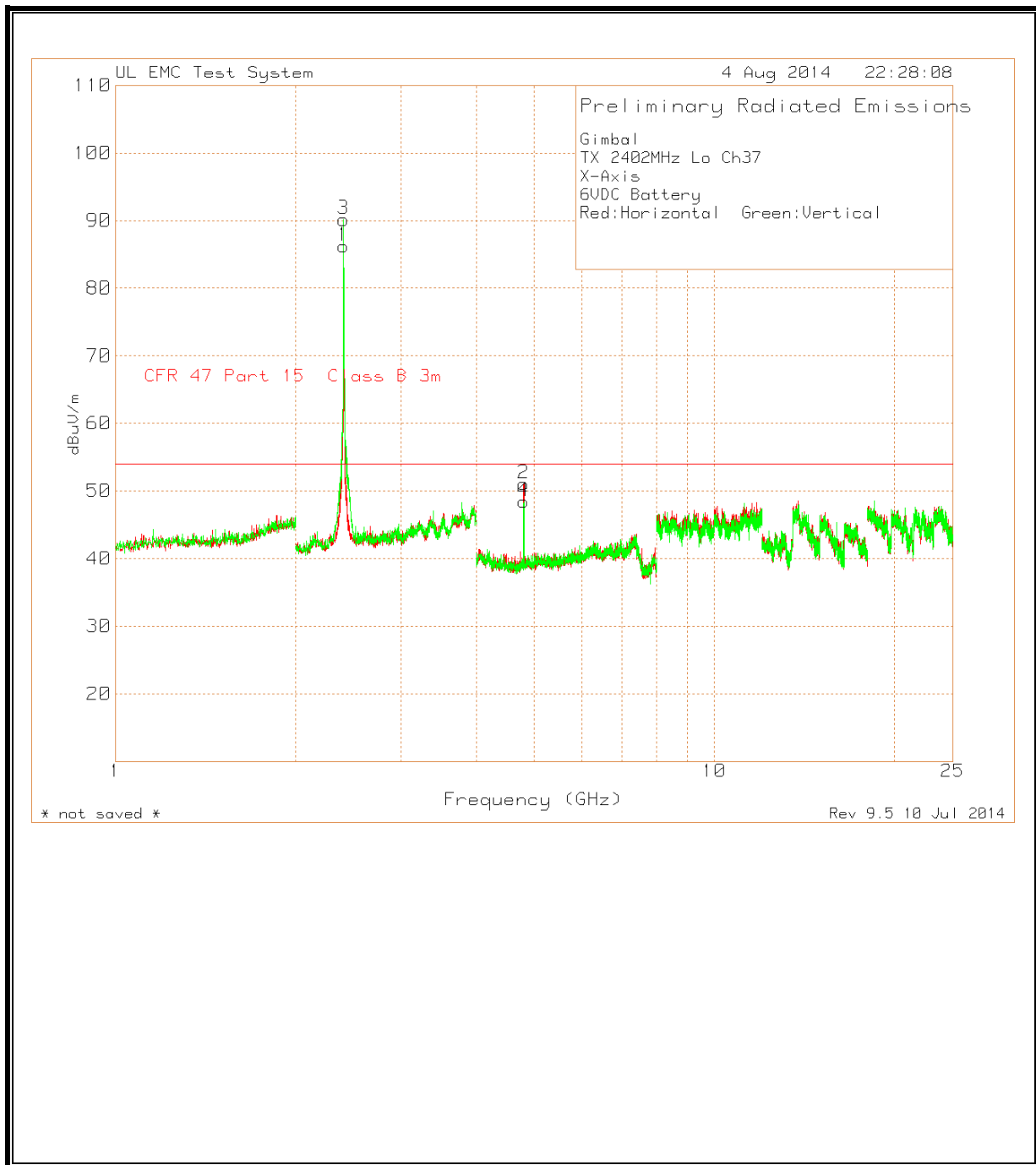
RESTRICTED BANEDGE (HIGH CHANNEL, VERTICAL)



Gimbal
TX 2480MHz HiCh 39
X-Axis
6VDC Battery
Vert Scan, Red=Peak Green=Ave

Marker No.	Test Frequenc y (GHz)	Meter Reading(d BuV) Detector	Antenna Factor dB/m	Duty Cycle	Corrected Reading dBuV/m	BandEdge PK Limit	Margin (dB)	BandEdge AV Limit	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1	2.4803	73.54 PK	22	-	95.54	-	-	-	-	357	120	V
2	2.4834	45.63 PK	22.1	-	67.73	-	-	-	-	357	120	V
3	2.4836	45.11 PK	22.1	-	67.21	74	-6.79	54	13.21	357	120	V
4	2.4853	47.63 PK	22.1	-	69.73	74	-4.27	54	15.73	357	120	V
5	2.4801	72.97 AV	22	-24	70.97	-	-	-	-	357	120	V
6	2.4834	40.32 AV	22.1	-24	38.42	-	-	-	-	357	120	V
7	2.4835	39.35 AV	22.1	-24	37.45	74	-36.55	54	-16.55	357	120	V
8	2.4855	41.21 AV	22.1	-24	39.31	74	-34.69	54	-14.69	357	120	V

HARMONICS AND SPURIOUS EMISSIONS

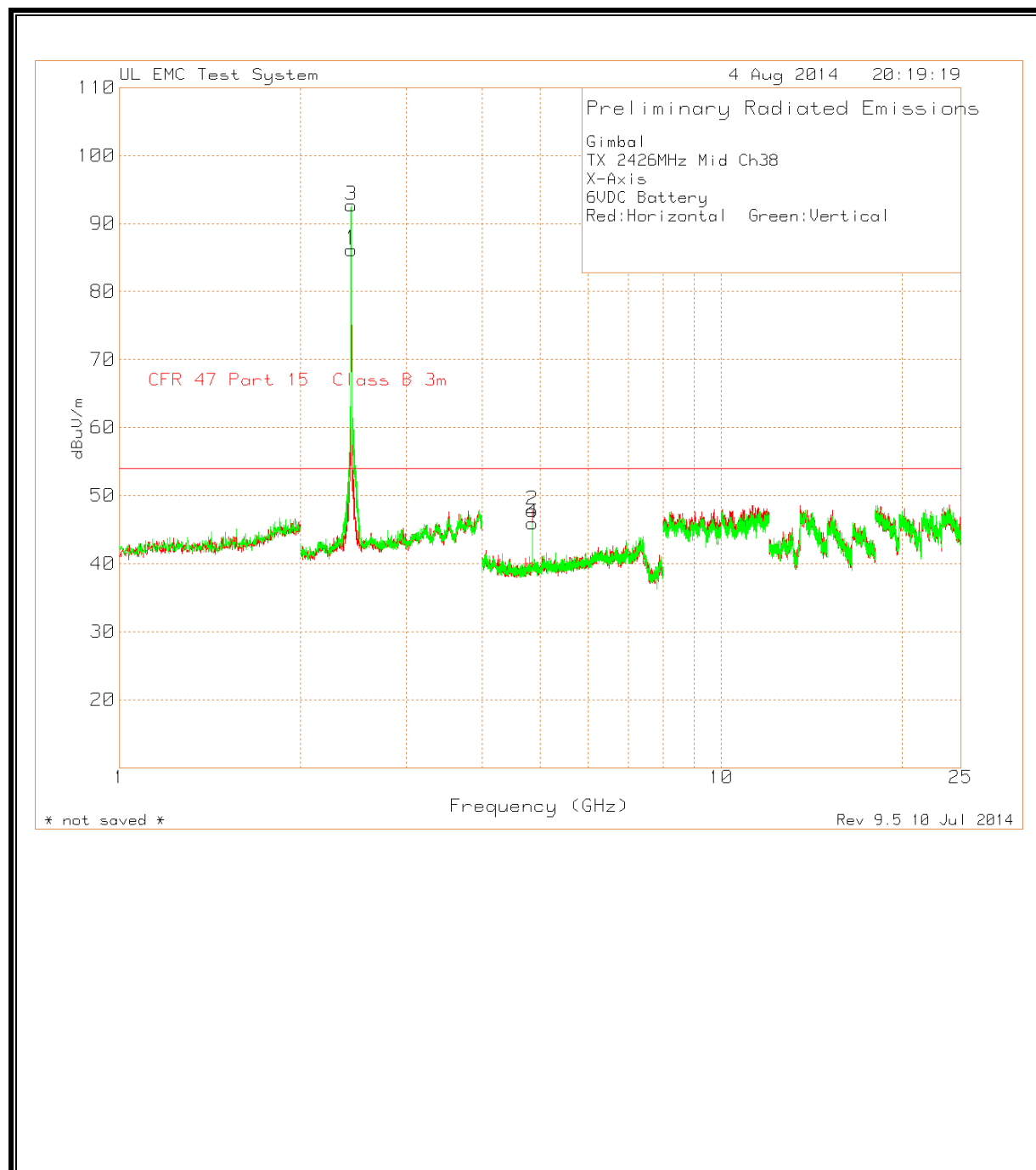


Gimbal
TX 2402MHz Lo Ch37
X-Axis
6VDC Battery
Red:Horizontal Green:Vertical

Test	Meter	Antenna				Corrected CFR 47					
Frequency	Reading		Factor	Gain/Loss	Duty	Reading	Part 15	Margin	Azimuth	Height	
(GHz)	(dBuV)	Detector	dB/m	(dB)	Cycle	dBuV/m	Limit	(dB)	[Degs]	[cm]	Polarity
* 4.8044	80.06	PK	27.7	-50.45		57.31	74	-16.69	227	101	H
* 4.8040	77.17	LnAv	27.7	-50.46	-24	30.41	54	-23.59	227	101	H
* 4.8045	73.24	PK	27.7	-50.45		50.49	74	-23.51	186	142	V
* 4.8040	68.77	LnAv	27.7	-50.46	-24	22.01	54	-31.99	186	142	V

PK - Peak detector

LnAv - Linear (voltage) average detector

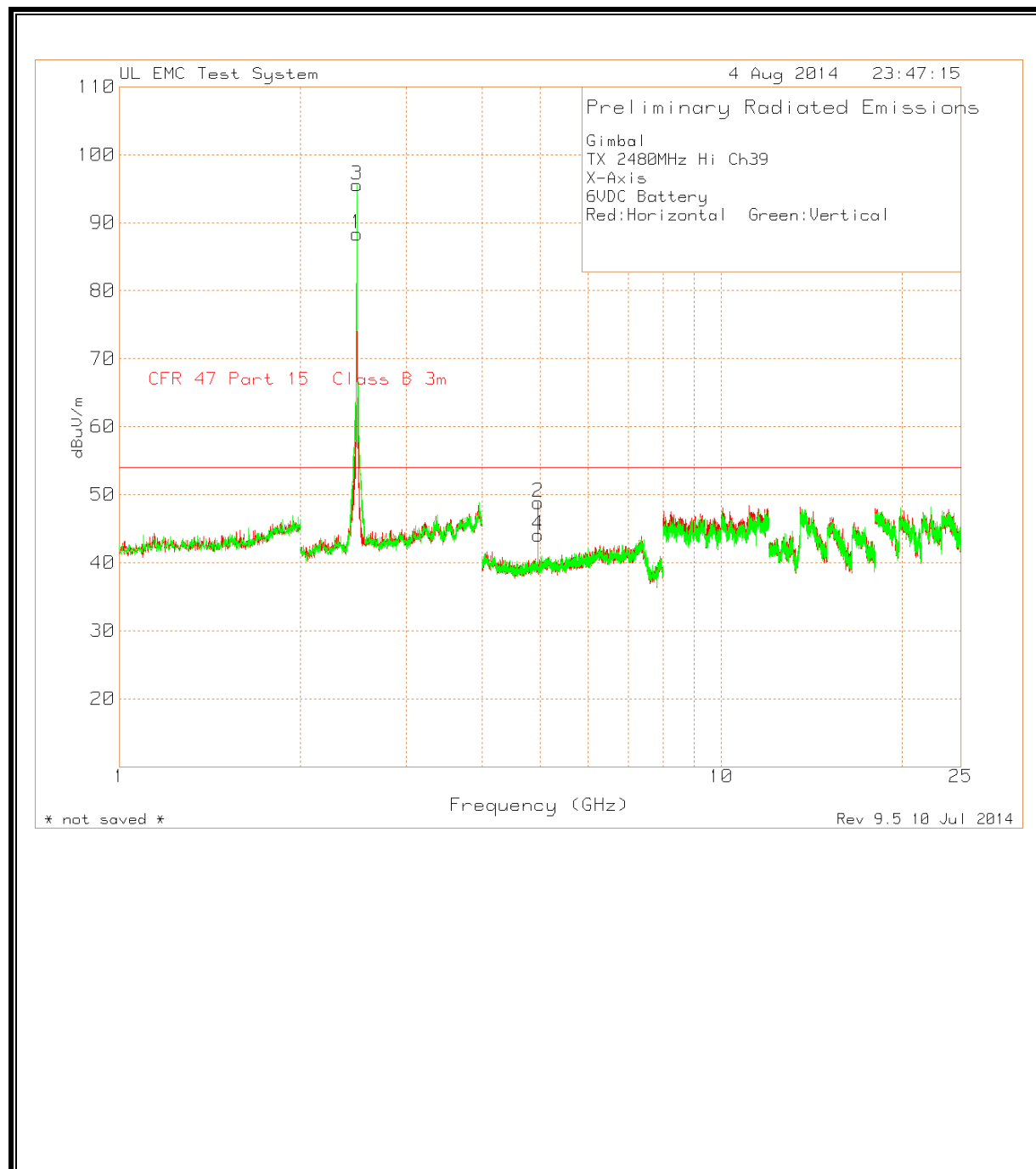


Gimbal
TX 2426MHz Mid Ch38
X-Axis
6VDC Battery
Red:Horizontal Green:Vertical

Test	Meter	Antenna	Corrected CFR 47							
Frequency	Reading	Factor	Gain/Loss	Duty	Reading	Part 15	Margin	Azimuth	Height	
(GHz)	(dBuV)	Detector	dB/m	(dB)	Cycle	dBuV/m	Limit	(dB)	[Degs]	[cm] Polarity
* 4.8524	77.6	PK	27.7	-50.17		55.13	74	-18.87	228	100 H
* 4.8520	74.23	LnAv	27.7	-50.17	-24	27.76	54	-26.24	228	100 H
* 4.8524	70.6	PK	27.7	-50.17		48.13	74	-25.87	182	115 V
* 4.8520	64.61	LnAv	27.7	-50.17	-24	18.14	54	-35.86	182	115 V

PK - Peak detector

LnAv - Linear (voltage) average detector



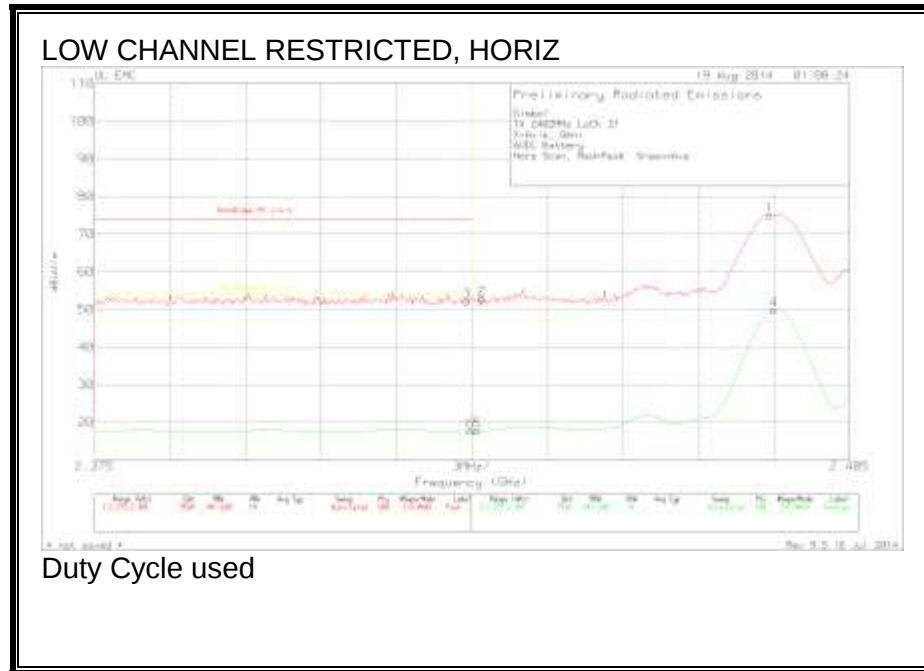
Gimbal
TX 2480MHz Hi Ch39
X-Axis
6VDC Battery
Red:Horizontal Green:Vertical

Test	Meter		Antenna			Corrected CFR 47					
Frequenc	Reading		Factor	Gain/Loss	Duty	Reading	Part 15	Margin	Azimuth	Height	
y (GHz)	(dBuV)	Detector	dB/m	(dB)	Cycle	dBuV/m	Limit	(dB)	[Degs]	[cm]	Polarity
* 4.9604	72.39	PK	27.8	-50.5		49.69	74	-24.31	228	101	H
* 4.9600	67.62	LnAv	27.8	-50.5	-24	20.92	54	-33.08	228	101	H
* 4.9606	68.45	PK	27.8	-50.5		45.75	74	-28.25	188	101	V
* 4.9600	61.73	LnAv	27.8	-50.5	-24	15.03	54	-38.97	188	101	V

PK - Peak detector
LnAv - Linear (voltage) average detector

8.2.1. TX ABOVE 1 GHz FOR BLUETOOTH LOW ENERGY MODE IN THE 2.4 GHz BAND Dipole Antenna

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

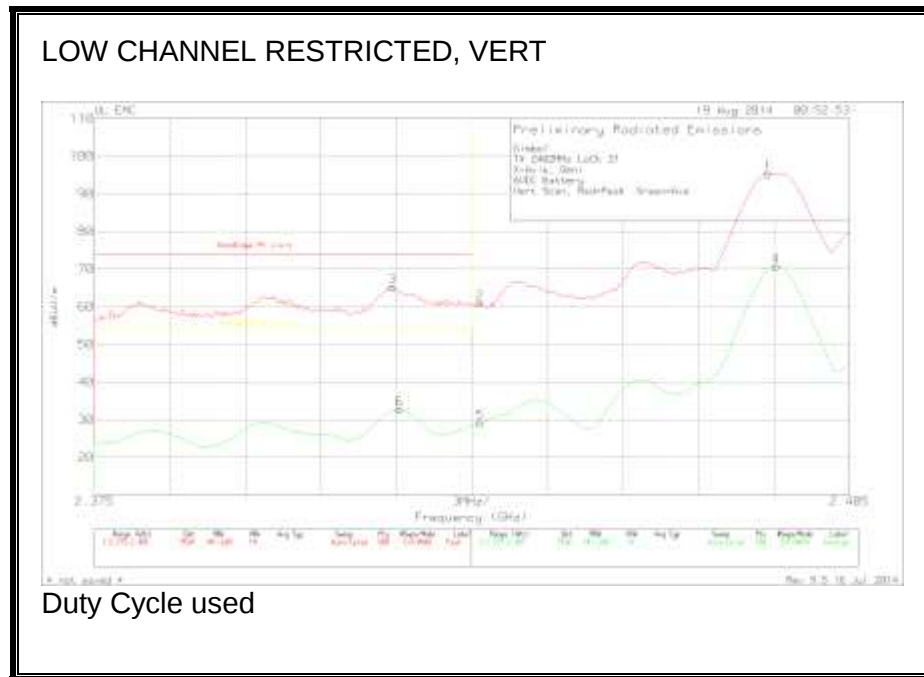


Data should say Y-Axis not X-axis

Gimbal
TX 2402MHz LoCh 37
X-Axis, Omni
6VDC Battery
Horz Scan, Red=Peak Green=Ave

Marker No.	Test Frequenc y (GHz)	Meter Reading(d BuV) Detector	Antenna Factor dB/m	Duty Cycle	Corrected Reading dBuV/m	BandEdge PK Limit	Margin (dB)	BandEdge AV Limit	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1	2.4018	53.27 PK	21.8	-	75.07	-	-	-	-	139	120	H
2	2.3904	31.03 PK	21.8	-	52.83	-	-	-	-	139	120	H
3	2.3898	30.51 PK	21.8	-	52.31	74	-21.69	54	-1.69	139	120	H
4	2.402	52.14 AV	21.8	-24	49.94	-	-	-	-	139	120	H
5	2.3902	20.03 AV	21.8	-24	17.83	-	-	-	-	139	120	H
6	2.3899	20.01 AV	21.8	-24	17.81	74	-56.19	54	-36.19	139	120	H

RESTRICTED BANEDGE (LOW CHANNEL, VERTICAL)

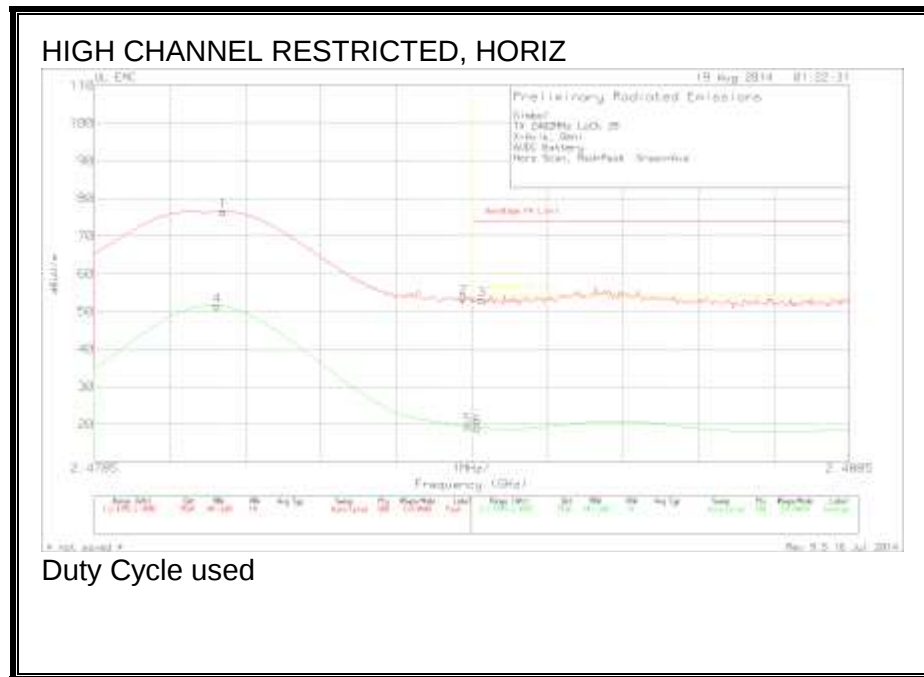


Data should say Y-Axis not X-axis

Gimbal
TX 2402MHz LoCh 37
X-Axis, Omni
6VDC Battery
Vert Scan, Red=Peak Green=Ave

Marker No.	Test Frequenc y (GHz)	Meter Reading(d BuV) Detector	Antenna Factor dB/m	Duty Cycle	Corrected Reading dBuV/m	BandEdge PK Limit	Margin (dB)	BandEdge AV Limit	Margin (dB)	Azimuth [Deps]	Height [cm]	Polarity
1	2.4018	73.52 PK	21.8	-	95.32	-	-	-	-	282	122 V	
2	2.3903	39.14 PK	21.8	-	60.94	-	-	-	-	282	122 V	
3	2.3868	43.6 PK	21.8	-	65.4	74	-8.6	54	11.4	282	122 V	
4	2.4021	72.96 AV	21.8	-24	70.76	-	-	-	-	282	122 V	
5	2.3903	31.43 AV	21.8	-24	29.23	-	-	-	-	282	122 V	
6	2.3871	35.02 AV	21.8	-24	32.82	74	-41.18	54	-21.18	282	122 V	

RESTRICTED BANEDGE (HIGH CHANNEL, HORIZONTAL)

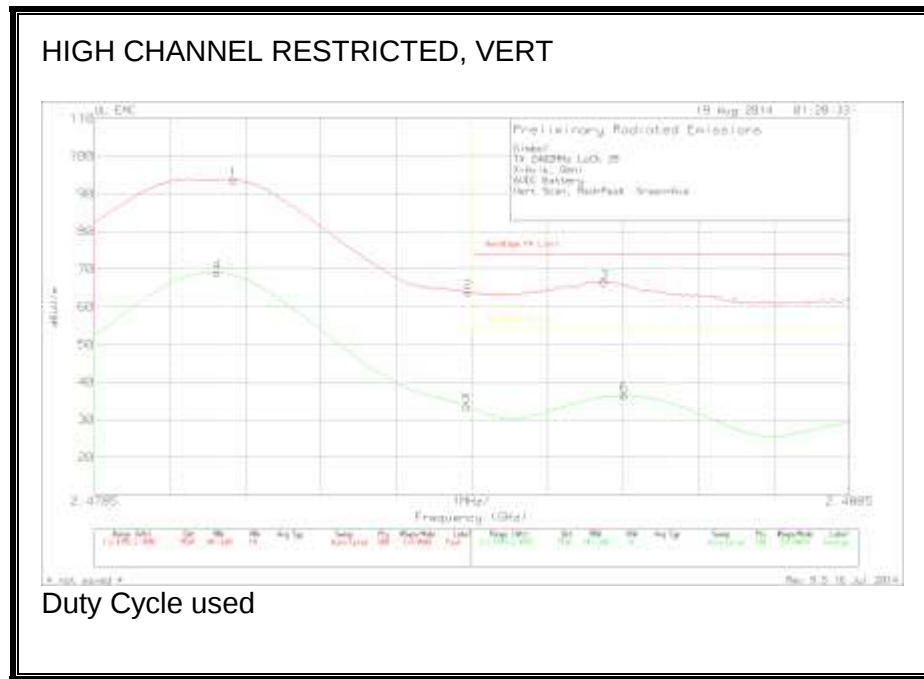


Data should say Y-Axis not X-axis

Gimbal
TX 2402MHz LoCh 39
X-Axis, Omni
6VDC Battery
Horz Scan, Red=Peak Green=Ave

	Test	Meter	Antenna		Corrected								
Marker	Frequenc	Reading(d	Factor	Duty	Reading	BandEdge	Margin	BandEdge	Margin	Azimuth	Height		
No.	y (GHz)	BuV)	Detector	dB/m	Cycle	dBuV/m	PK Limit	(dB)	AV Limit	(dB)	[Degs]	[cm]	Polarity
1	2.4802	54.46	PK	22	-	76.46	-	-	-	-	134	117	H
2	2.4834	31.63	PK	22.1	-	53.73	-	-	-	-	134	117	H
3	2.4836	30.94	PK	22.1	-	53.04	74	-20.96	54	-0.96	134	117	H
4	2.4801	53.51	AV	22	-24	51.51	-	-	-	-	134	117	H
5	2.4835	21.35	AV	22.1	-24	19.45	-	-	-	-	134	117	H
6	2.4836	21.07	AV	22.1	-24	19.17	74	-54.83	54	-34.83	134	117	H

RESTRICTED BANEDGE (HIGH CHANNEL, VERTICAL)

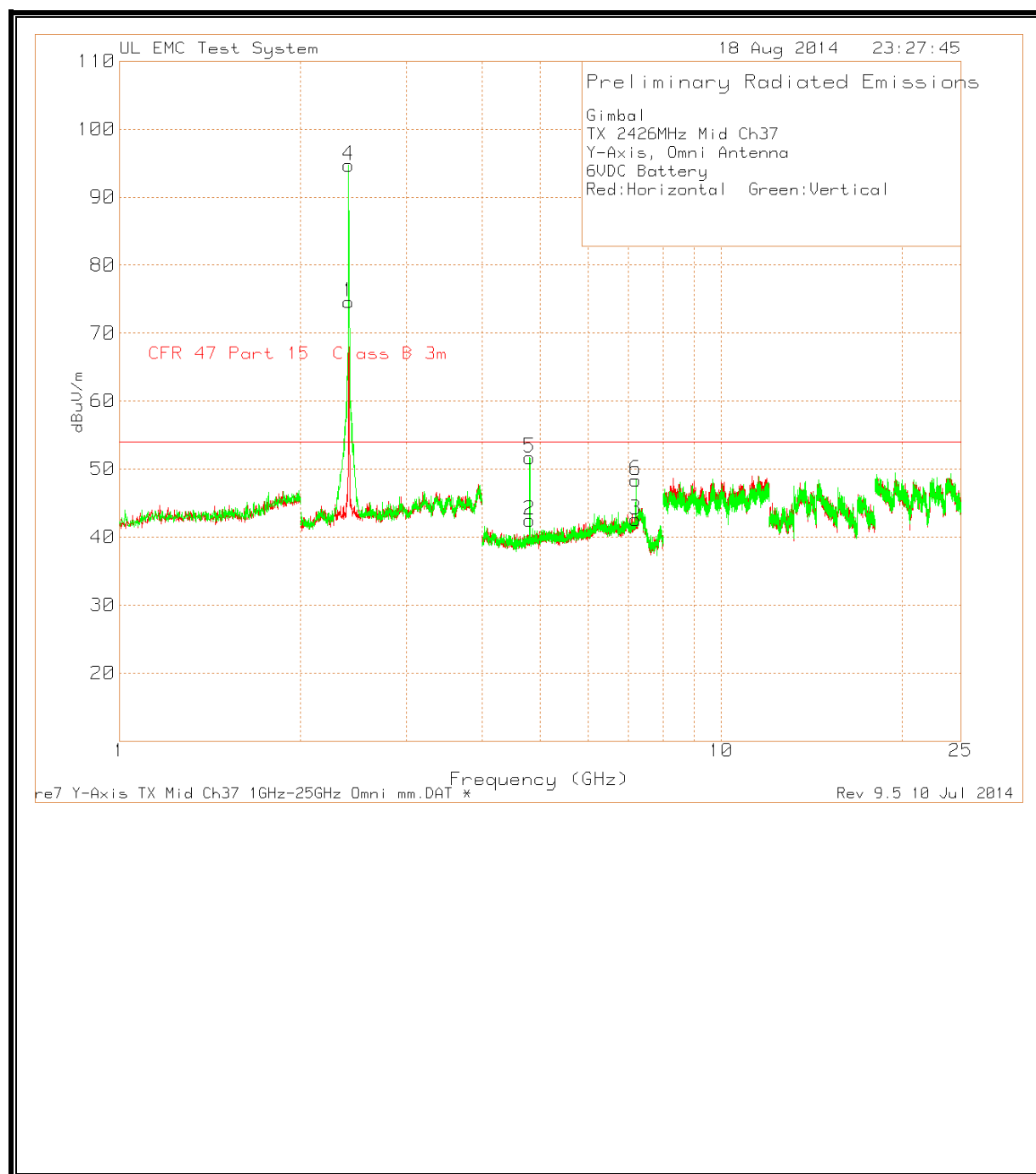


Data should say Y-Axis not X-axis

Gimbal
TX 2402MHz LoCh 39
X-Axis, Omni
6VDC Battery
Vert Scan, Red=Peak Green=Ave

	Test	Meter	Antenna		Corrected								
Marker	Frequenc	Reading(d	Factor	Duty	Reading	BandEdge	Margin	BandEdge	Margin	Azimuth	Height		
No.	y (GHz)	BuV)	Detector	dB/m	Cycle	dBuV/m	PK Limit	(dB)	AV Limit	(dB)	[Degs]	[cm]	Polarity
1	2.4803	71.65 PK	-		22	93.65	-	-	-	-	270	118	V
2	2.4835	41.76 PK	-		22.1	63.86	-	-	-	-	270	118	V
3	2.4853	44.48 PK	-		22.1	66.58	74	-7.42	54	12.58	270	118	V
4	2.4801	71.11 AV		22	-24	69.11	-	-	-	-	270	118	V
5	2.4834	35.48 AV		22.1	-24	33.58	-	-	-	-	270	118	V
6	2.4855	38.32 AV		22.1	-24	36.42	74	-37.58	54	-17.58	270	118	V

HARMONICS AND SPURIOUS EMISSIONS

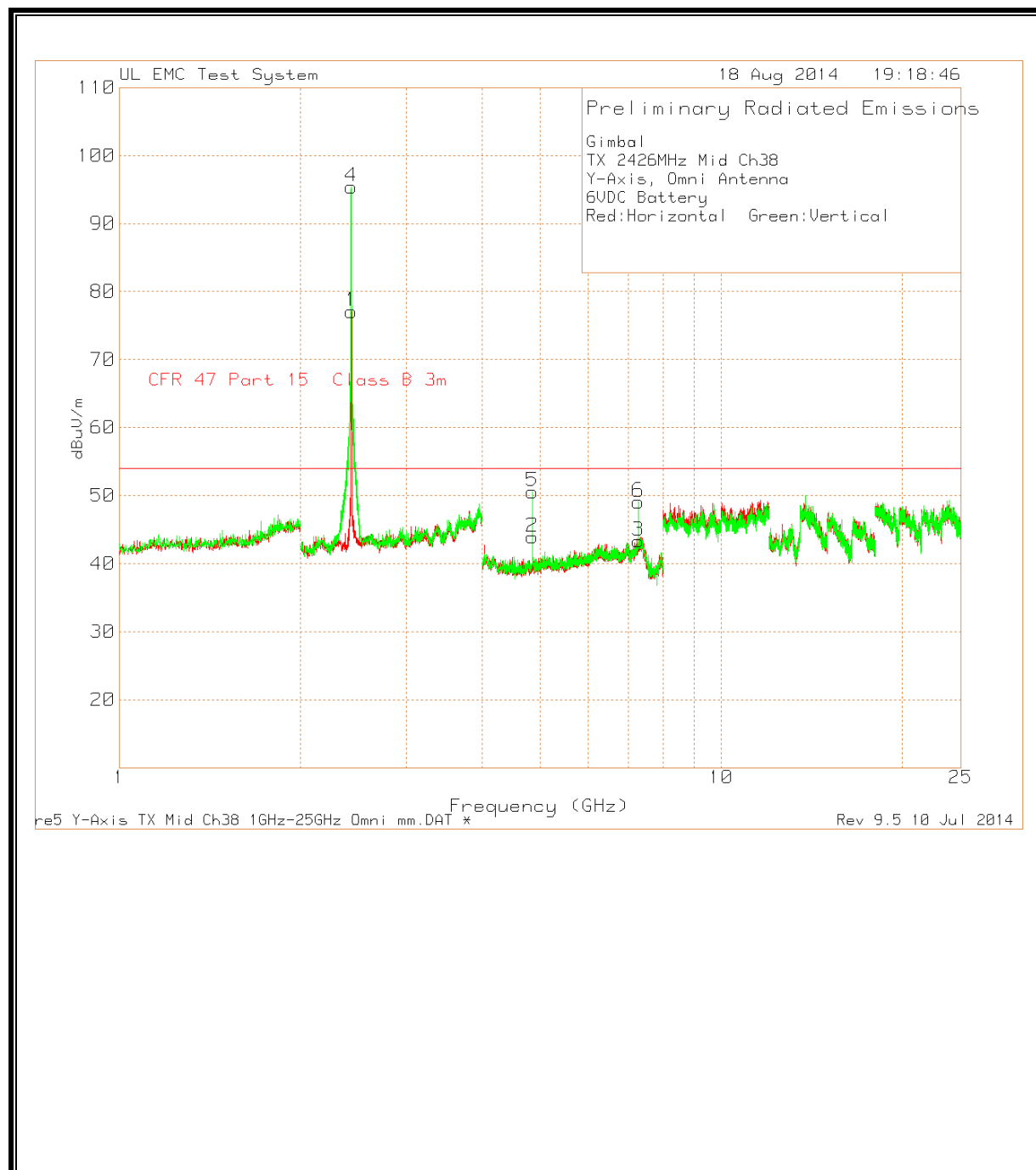


Gimbal
TX 2426MHz Mid Ch37
Y-Axis, Omni Antenna
6VDC Battery
Red:Horizontal Green:Vertical

Test	Meter	Antenna	Corrected	CFR 47					
Frequency	Reading	Factor	Gain/Loss	Reading	Part 15	Margin	Azimuth	Height	
(GHz)	(dBuV) Detector	dB/m	(dB)	dBuV/m	Limit	(dB)	[Degs]	[cm]	Polarity
* 4.8045	75.92 PK	27.7	-50.45	53.17	74	-20.83	219	102	V
* 4.804	72.44 LnAv	27.7	-50.46	49.68	54	-4.32	219	102	V
* 4.8084	66.82 PK	27.7	-50.42	44.1	74	-29.9	224	101	V
* 4.8081	58.15 LnAv	27.7	-50.42	35.43	54	-18.57	224	101	V
* 4.8044	67 PK	27.7	-50.45	44.25	74	-29.75	0	103	H
* 4.804	59.32 LnAv	27.7	-50.46	36.56	54	-17.44	0	103	H
7.2065	65.94 PK	29.7	-46.34	49.3	74	-24.7	202	101	V
7.206	58.9 LnAv	29.7	-46.34	42.26	54	-11.74	202	101	V
7.2101	64.43 PK	29.8	-46.33	47.9	74	-26.1	202	101	V
7.21	58.3 LnAv	29.8	-46.33	41.77	54	-12.23	202	101	V

PK - Peak detector

LnAv - Linear (voltage) average detector

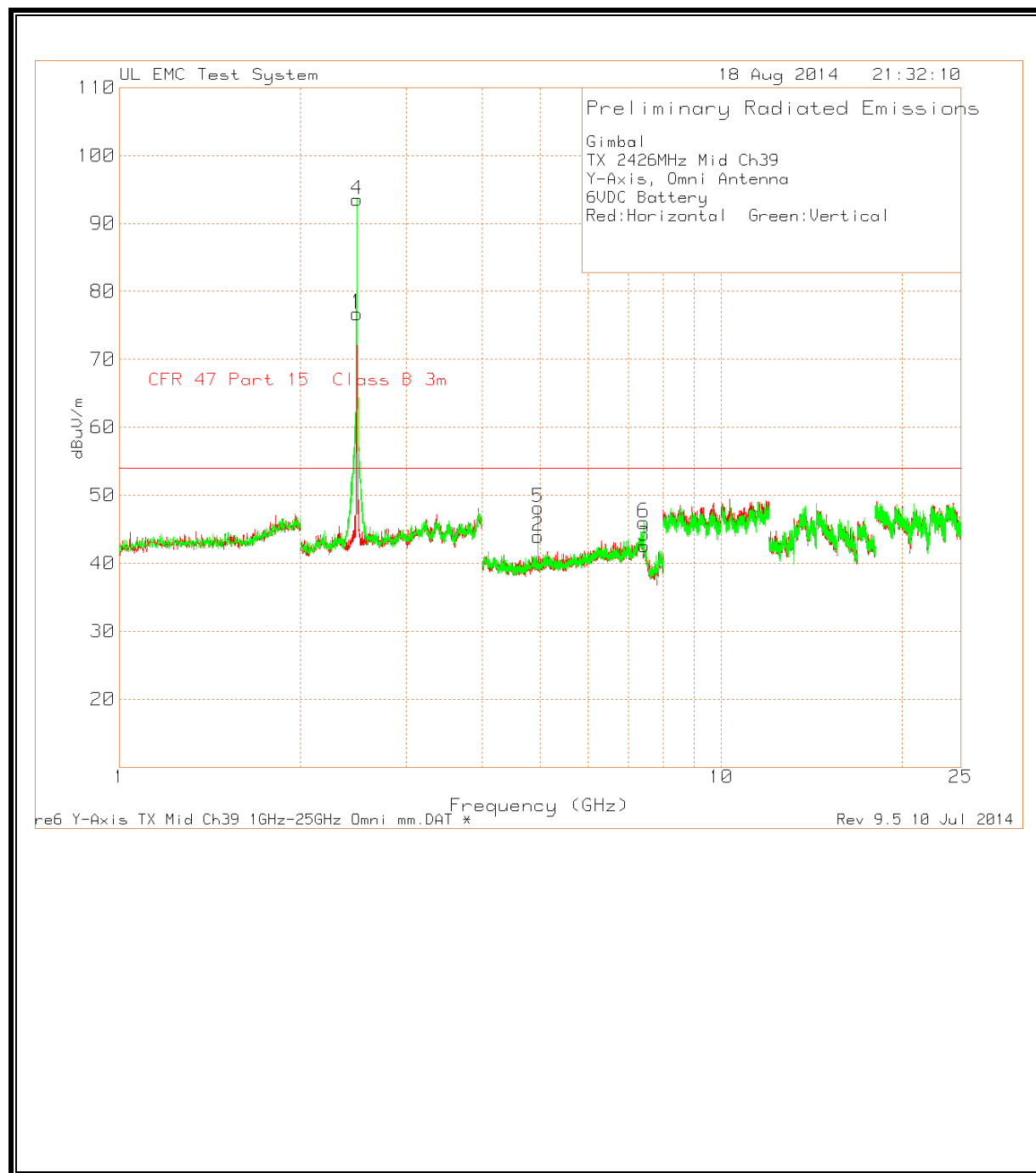


Gimbal
TX 2426MHz Mid Ch38
Y-Axis, Omni Antenna
6VDC Battery
Red:Horizontal Green:Vertical

		EMCO				CFR 47					
		3161-03				Part 15					
Test	Meter	S/N	Corrected	Part 15							
Frequenc	Reading	99051041	Gain/Loss	Reading	Class B	Margin	Azimuth	Height			
y (GHz)	(dBuV)	Detector	UL	(dB)	dBuV/m	3m	(dB)	[Degs]	[cm]	Polarity	Notes
* 4.8524	73.95 PK		27.7	-50.17	51.48	74	-22.52	303	101 V		2
* 4.8520	70.05 LnAv		27.7	-50.17	47.58	54	-6.42	303	101 V		2
* 4.8524	68.08 PK		27.7	-50.17	45.61	74	-28.39	156	101 H		2
* 4.8520	61.25 LnAv		27.7	-50.17	38.78	54	-15.22	156	101 H		2
* 7.2773	66.17 PK		30.3	-45.98	50.49	74	-23.51	202	101 V		2
* 7.2780	59.14 LnAv		30.3	-45.98	43.46	54	-10.54	202	101 V		2
* 7.2785	60.06 PK		30.3	-45.99	44.37	74	-29.63	219	101 H		2
* 7.2786	49.33 LnAv		30.3	-45.99	33.64	54	-20.36	219	101 H		2
* 4.8539	66.39 PK		27.7	-50.17	43.92	74	-30.08	156	101 H		2
* 4.8540	58.84 LnAv		27.7	-50.17	36.37	54	-17.63	156	101 H		2
* 4.8565	65.92 PK		27.7	-50.16	43.46	74	-30.54	303	101 V		2
* 4.8561	56.23 LnAv		27.7	-50.16	33.77	54	-20.23	303	101 V		2
* 7.2824	65.01 PK		30.3	-45.94	49.37	74	-24.63	201	101 V		2
* 7.2820	60.06 LnAv		30.3	-45.95	44.41	54	-9.59	201	101 V		2
* 7.2825	59.85 PK		30.3	-45.94	44.21	74	-29.79	219	101 H		2
* 7.2821	49.39 LnAv		30.3	-45.95	33.74	54	-20.26	219	101 H		2

Notes:
2 - Y-Axis

PK - Peak detector
LnAv - Linear (voltage) average detector



Gimbal
TX 2426MHz Mid Ch39
Y-Axis, Omni Antenna
6VDC Battery
Red:Horizontal Green:Vertical

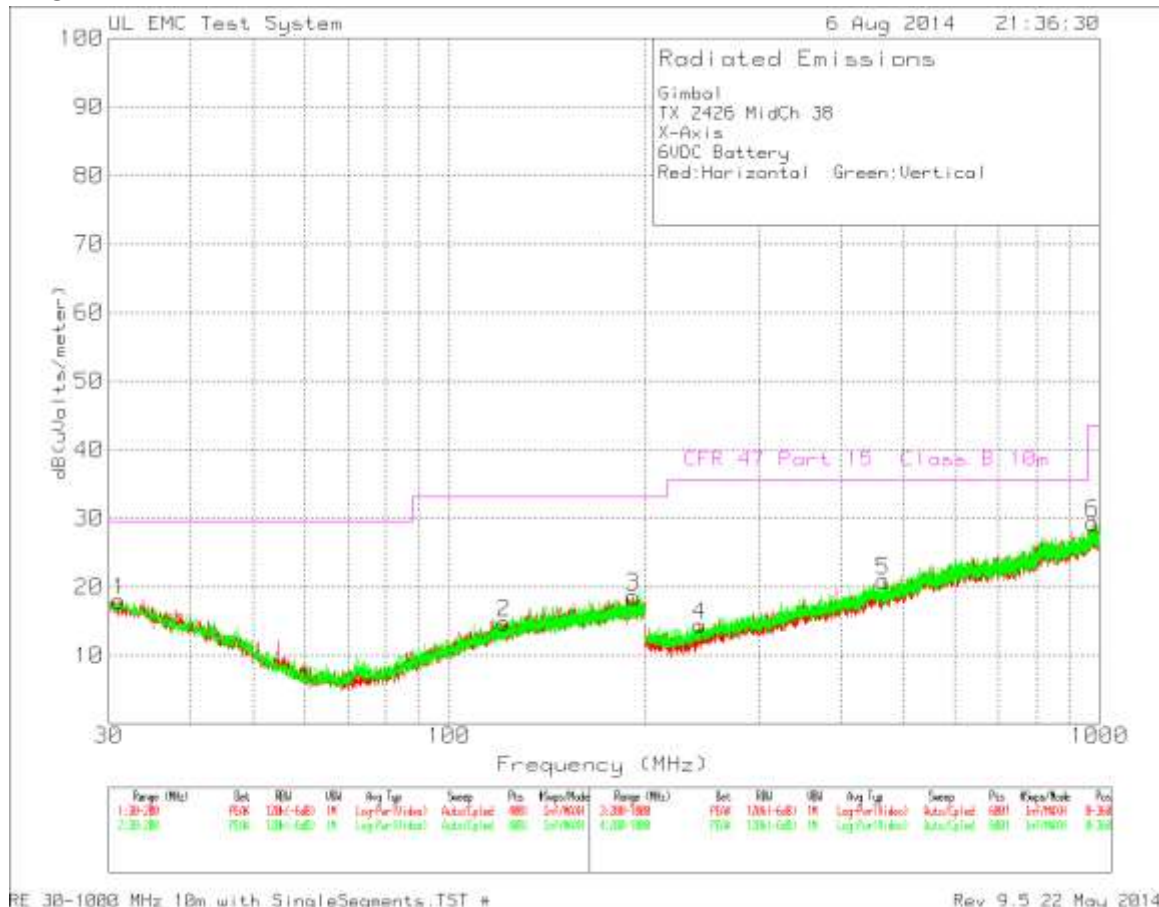
Test	Meter	Antenna	Corrected CFR 47							
Frequency	Reading	Factor	Gain/Loss	Reading	Part 15	Margin	Azimuth	Height		
(GHz)	(dBuV) Detector	dB/m	(dB)	dBuV/m	Limit	(dB)	[Degs]	[cm]	Polarity	
* 4.958	67.53 PK	27.8	-50.49	44.84	74	-29.16	273	101	H	
* 4.958	61.61 LnAv	27.8	-50.49	38.92	54	-15.08	273	101	H	
* 4.96	58.29 LnAv	27.8	-50.5	35.59	54	-18.41	273	101	H	
* 4.9596	67.01 PK	27.8	-50.5	44.31	74	-29.69	273	101	H	
* 4.96	71.09 PK	27.8	-50.5	48.39	74	-25.61	293	101	V	
* 4.9601	66.41 LnAv	27.8	-50.5	43.71	54	-10.29	293	101	V	
* 4.958	62.3 LnAv	27.8	-50.49	39.61	54	-14.39	293	101	V	
* 4.958	68.5 PK	27.8	-50.49	45.81	74	-28.19	293	101	V	
* 4.9594	67.35 PK	27.8	-50.49	44.66	74	-29.34	146	101	H	
* 4.96	59.95 LnAv	27.8	-50.5	37.25	54	-16.75	146	101	H	
* 7.4358	63.8 PK	30.6	-46.66	47.74	74	-26.26	200	101	V	
* 7.436	57.82 LnAv	30.6	-46.67	41.75	54	-12.25	200	101	V	
* 7.4394	63.09 PK	30.6	-46.7	46.99	74	-27.01	191	101	V	
* 7.4396	53.28 LnAv	30.6	-46.7	37.18	54	-16.82	191	101	V	

PK - Peak detector
LnAv - Linear (voltage) average detector

8.3. WORST-CASE BELOW 1 GHz Patch Antenna

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

PLOT

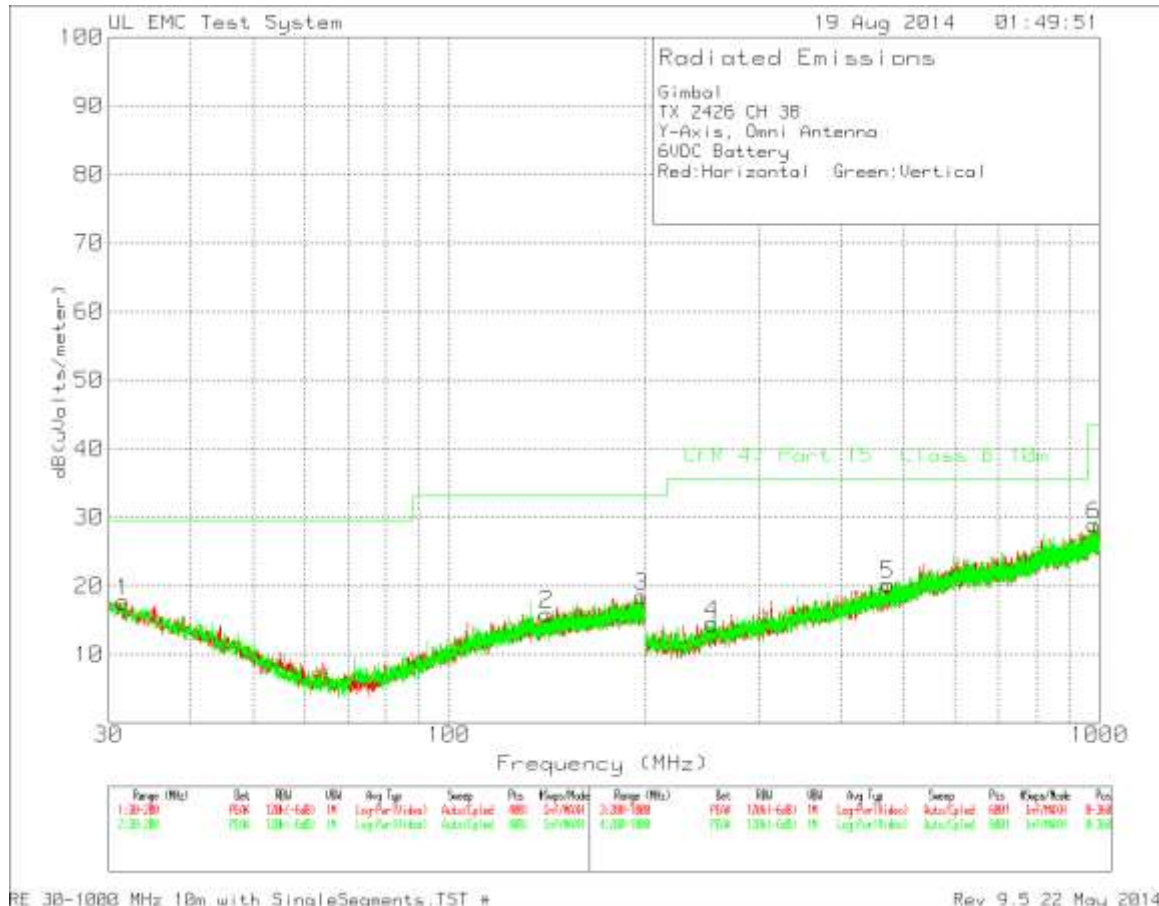


All Emissions at least 6dB below the limit, therefore no further measurement needed.

8.1. WORST-CASE BELOW 1 GHz Dipole Antenna

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

PLOT



All Emissions at least 6dB below the limit, therefore no further measurement needed.

9. RF EXPOSURE

FCC Part 15

Per KDB 447498 section 4.3.1 #(1), exclusion calculation for 2.45GHz at 5mm separation at 1-g SAR.

$$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot [\sqrt{f_{\text{GHz}}}] \leq 3.0 \text{ for 1-g SAR}$$

$$[(1.0\text{mW})/(5\text{mm})] \cdot \sqrt{2.54\text{GHz}} = 0.319 < 3.0 \text{ therefore SAR is excluded}$$