



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

**CERTIFICATION TEST REPORT**

**FOR**

**Dimmer 2**

**MODEL NUMBER: FGD212**

**FCC ID: 2AA9MFGD212  
IC: 20430-FGD212**

**REPORT NUMBER: 10874163**

**ISSUE DATE: December 16, 2015**

*Prepared for*  
**Fibar Group S.A.  
ul. Lotnicza 1  
Poznań, Poland 60-453**

*Prepared by*  
**UL LLC  
333 Pfingsten Rd.  
Northbrook, IL 60062  
TEL: (847) 272-8800**



NVLAP Lab code: 100414-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	December 16, 2015	Initial Issue	V Sabalvaro

## TABLE OF CONTENTS

<b>1. ATTESTATION OF TEST RESULTS.....</b>	<b>4</b>
<b>2. TEST METHODOLOGY .....</b>	<b>5</b>
<b>3. FACILITIES AND ACCREDITATION .....</b>	<b>5</b>
<b>4. CALIBRATION AND UNCERTAINTY .....</b>	<b>5</b>
4.1. MEASURING INSTRUMENT CALIBRATION .....	5
4.2. SAMPLE CALCULATION .....	5
4.3. MEASUREMENT UNCERTAINTY.....	6
5.5. DESCRIPTION OF TEST SETUP .....	8
<b>6. TEST AND MEASUREMENT EQUIPMENT .....</b>	<b>12</b>
<b>7. TEST RESULTS .....</b>	<b>13</b>
7.1. 20 dB AND 99% BANDWIDTH.....	13
7.2. RADIATED EMISSIONS.....	20
7.2.1. FUNDAMENTAL FREQUENCY RADIATED EMISSION .....	22
7.2.2. HARMONICS AND SPURIOUS EMISSIONS ABOVE 1GHz .....	23
7.2.3. WORST-CASE BELOW 1 GHz .....	27
7.2.4. Transmitter RX Radiated Emissions.....	31
7.2.5. Digital Radiated Emissions .....	35
7.3. AC POWER LINE CONDUCTED EMISSIONS .....	38
7.3.1. TRANSMITTER – AC POWER LINE CONDUCTED EMISSIONS .....	39
7.3.2. DIGITAL – AC POWER LINE CONDUCTED EMISSIONS .....	47
<b>8. SETUP PHOTOS .....</b>	<b>59</b>

## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** Fibar Group S.A.  
Ul. Lotnicza 1  
Poznań, Poland 60-453

**EUT DESCRIPTION:** Radio controlled automated light dimmer

**MODEL:** FGD212

**SERIAL NUMBER:** Not Serialized

**DATE TESTED:** September 18 – December 2, 2015

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-210 Issue 8 Annex A2.9	Pass
INDUSTRY CANADA RSS-GEN Issue 4	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:

Tested By:



Bart Mucha  
Staff Engineer

UL LLC



Vincent Sabalvaro  
EMC WISE Engineer  
Consumer Technology  
UL LLC

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 4, 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>

## 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, Dimmer 2, is a 908MHz transceiver. It is AC powered. The transmitter utilizes Z-wave technologies to communicate with other devices for home automation. The EUT can be configured with the Bypass 2 for use with low-powered loads

The radio device is manufactured by Fibar Group S.A..

### 5.2. MAXIMUM OUTPUT E-FIELD STRENGTH

The transmitter has a maximum output peak E-field as follows:

Frequency Range (MHz)	Mode	Configuration	Output PK E-field Strength (dBuV/m)*
908.4 - 916.0	TX	With Bypass 2	93.10
908.4 - 916.0	TX	Without Bypass 2	93.29

\*Note: PK detector measurements shown, but are below the QP Limits

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a quarter-wave monopole copper antenna wire soldered to pcb and lead out of the case.

### 5.4. WORST-CASE CONFIGURATION AND MODE

The EUT, Dimmer 2, was set in worst axis as found in preliminary testing. Z-axis is the worst axis. The EUT can be configured with the Bypass 2 for use with low-powered loads. The worst case configuration is when the Dimmer 2 is configured without the Bypass 2.

## 5.5. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Bypass 2	Fibar	FGS-002	Not Serialized	n/a
Momentary Switch	-	-	-	-

### I/O CABLES

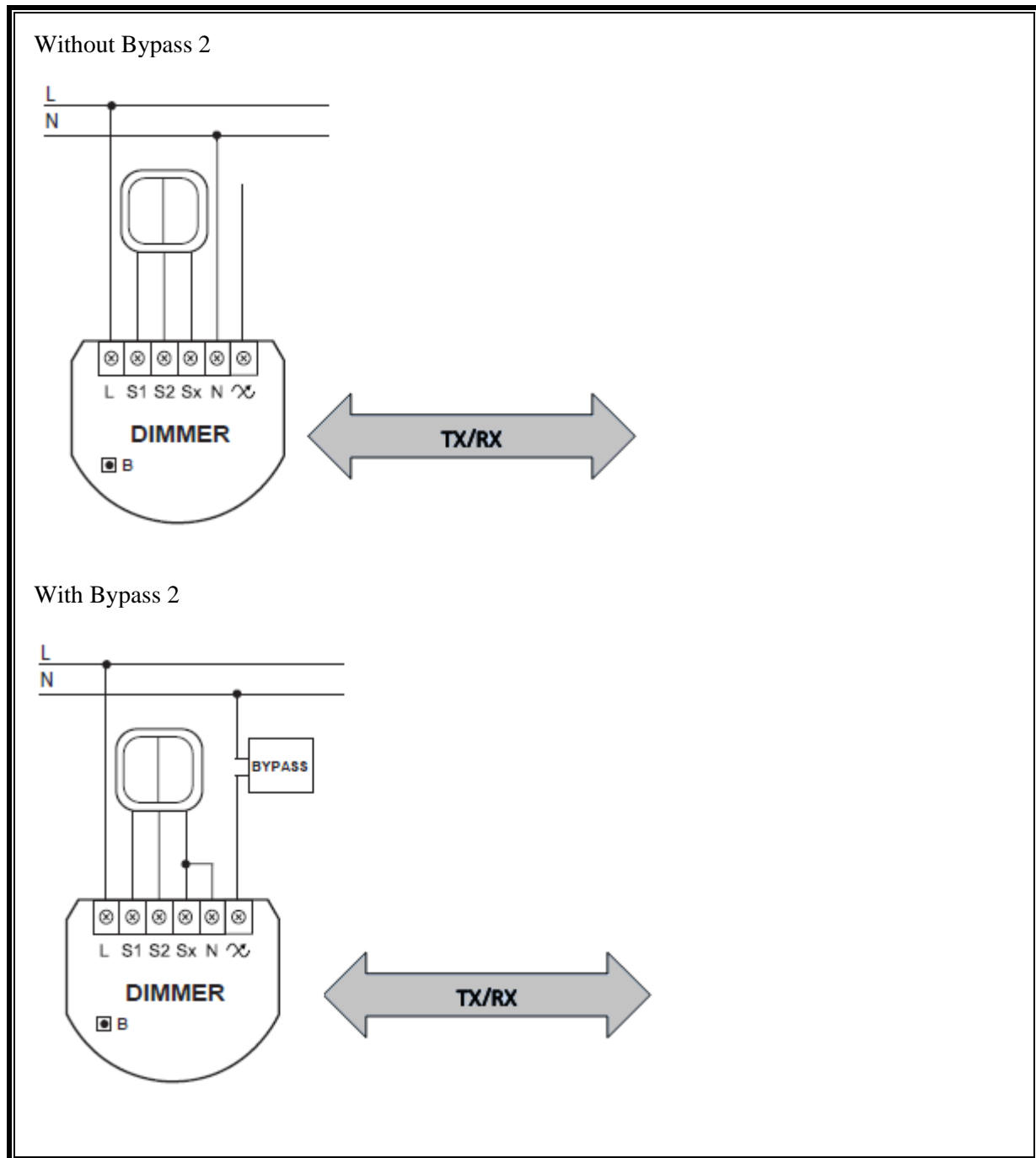
I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
0	Enclosure	-	Non-Electrical	-	-	None
1	AC	2	Wire	AC	>3m	None
2	Load	1	Wire	AC	>3m	None
3	Switch	3	Wire	AC	>3m	None

### TEST SETUP

The EUT is programmed for continuous TX mode



### SETUP DIAGRAM FOR TESTS



## **SETUP FOR DIGITAL DEVICE TESTS**

### **SUPPORT EQUIPMENT**

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Bypass 2	Fibar	FGS-002	Not Serialized	-
Momentary Switch	-	-	-	-
Light Bulb	-	-	-	-

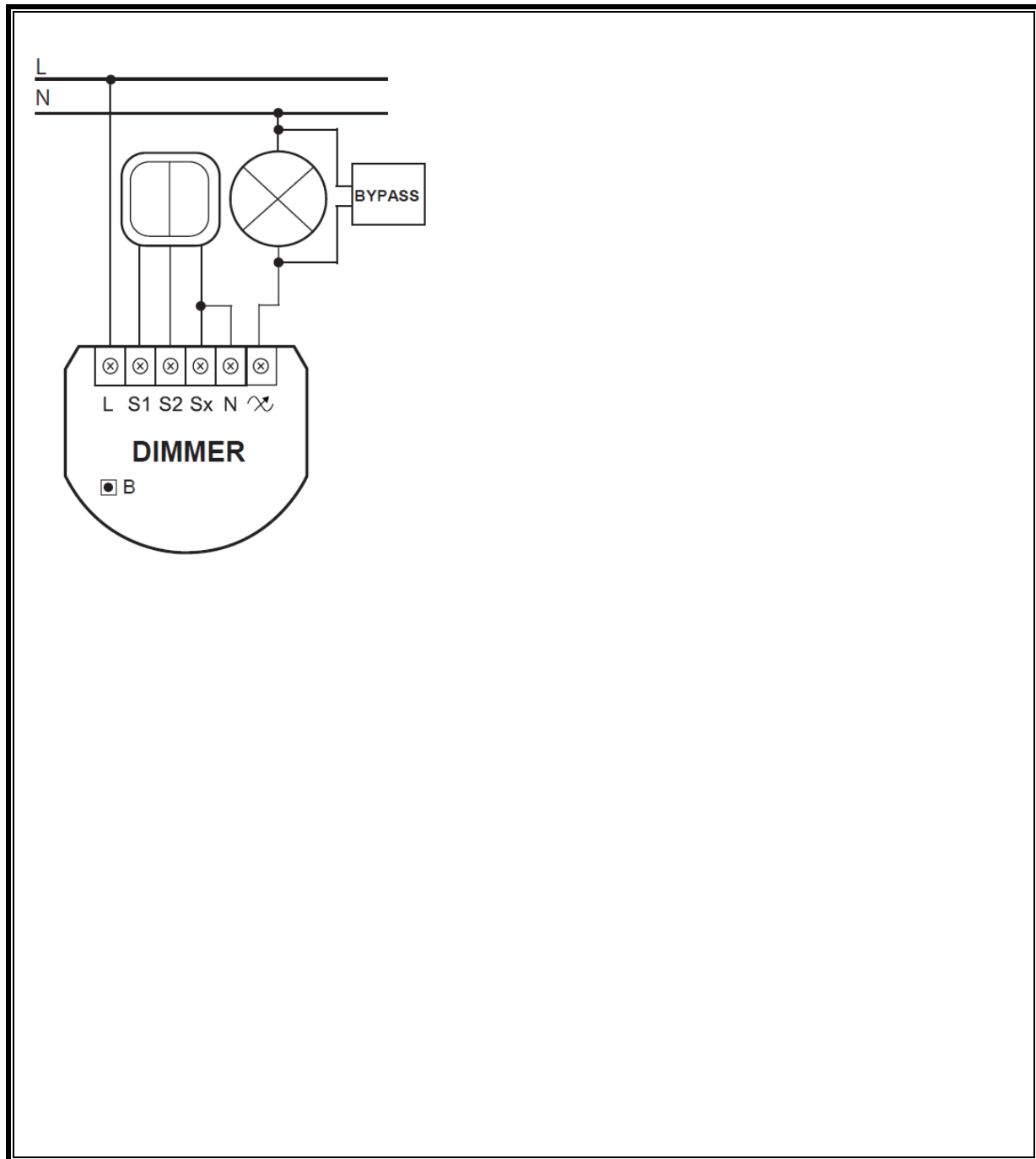
### **I/O CABLES**

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
0	Enclosure	-	Non-Electrical	-	-	None
1	AC	2	Wire	AC	>3m	None
2	Load	1	Wire	AC	>3m	None
3	Switch	3	Wire	AC	>3m	None

### **TEST SETUP**

The EUT is configured with light bulb, where the brightness is set using the momentary switch. The EUT is not set to transmit.

**SETUP DIAGRAM FOR DIGITAL DEVICE 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	T No.	Cal Date	Cal Due
Radiated Software	UL	UL EMC	Ver 9.5, July 22, 2014		
Conducted Software	UL	UL EMC	Ver 9.5, May 17 2012		
EMI Test Receiver	Rohde & Schwarz	ESR	EMC4377	4/20/2015	4/20/2016
Transient Limiter	Electro-Metrics	EM7600-2	EMC4224	N/A	N/A
HighPass Filter	Solar Electronics	2803-150	EMC4327	N/A	N/A
Attenuator	HP	8494B	2831A0083	N/A	N/A
LISN - L1	Solar	8602-50-TS-50-N	EMC4052	1/15/2015	1/15/2016
LISN - L2	Solar	8602-50-TS-50-N	EMC4064	1/9/2015	1/9/2016
Signal Analyzer	Agilent	PXA	EMC4360	12/19/2014	12/19/2015
Near Field Probe	EMCO	7405	1270	N/A	N/A
Test Receiver	Rhode & Schwarz	ESCI	EMC4328	12/18/2014	12/30/2015
Log-P Antenna	Chase	UPA6109	EMC4258	4/27/2015	4/27/2016
Bicon Antenna	Electro-Metrics	VBA6106A	EMC4323	12/18/2014	12/31/2015
Loop Antenna	EMCO	6502/1	EMC4026	3/18/2014	3/18/2015
Antenna Array	UL	BOMS	EMC4276	12/1/2014	12/31/2015
Test Receiver	Rhode & Schwarz	ESU	EMC4323	12/16/2014	12/30/2015

## 7. TEST RESULTS

### 7.1. 20 dB AND 99% BANDWIDTH

#### LIMITS

None; for reporting purposes only.

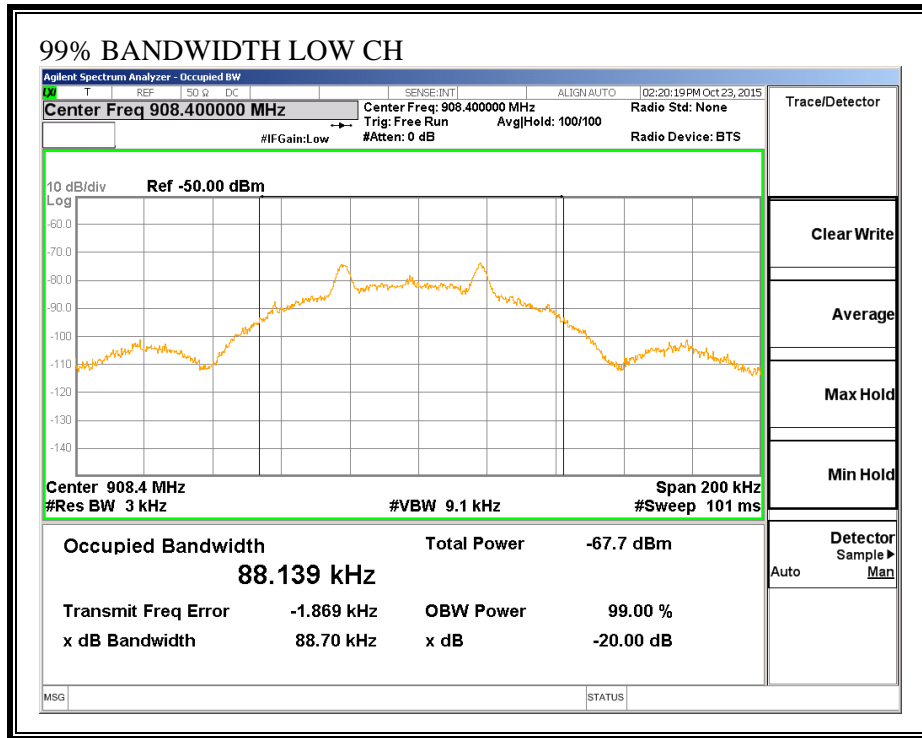
#### TEST PROCEDURE

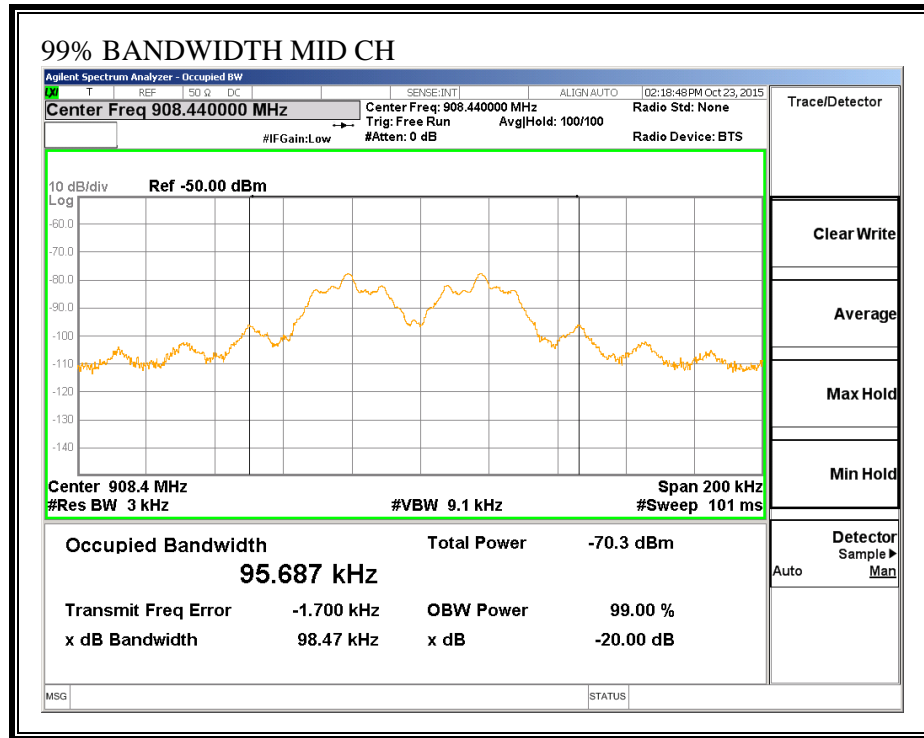
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the Occupied bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

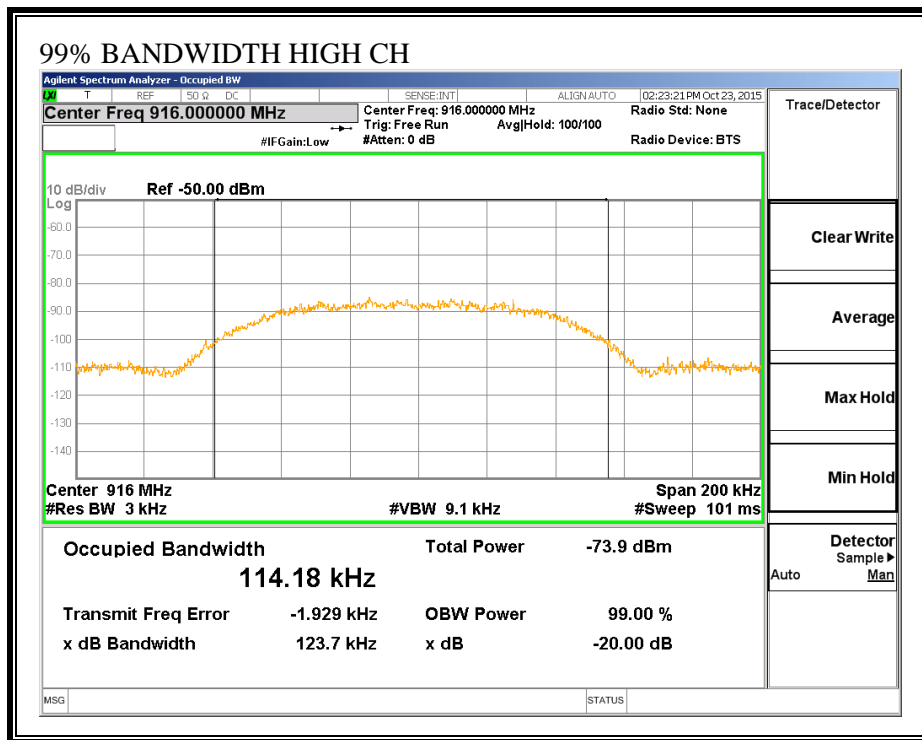
#### RESULTS

Channel	Frequency (MHz)	20 dB Bandwidth (kHz)	99% Bandwidth (kHz)
Low	908.4	87.27	88.139
Middle	908.44	98.02	95.687
High	916	124.6	114.18

## 99% BANDWIDTH

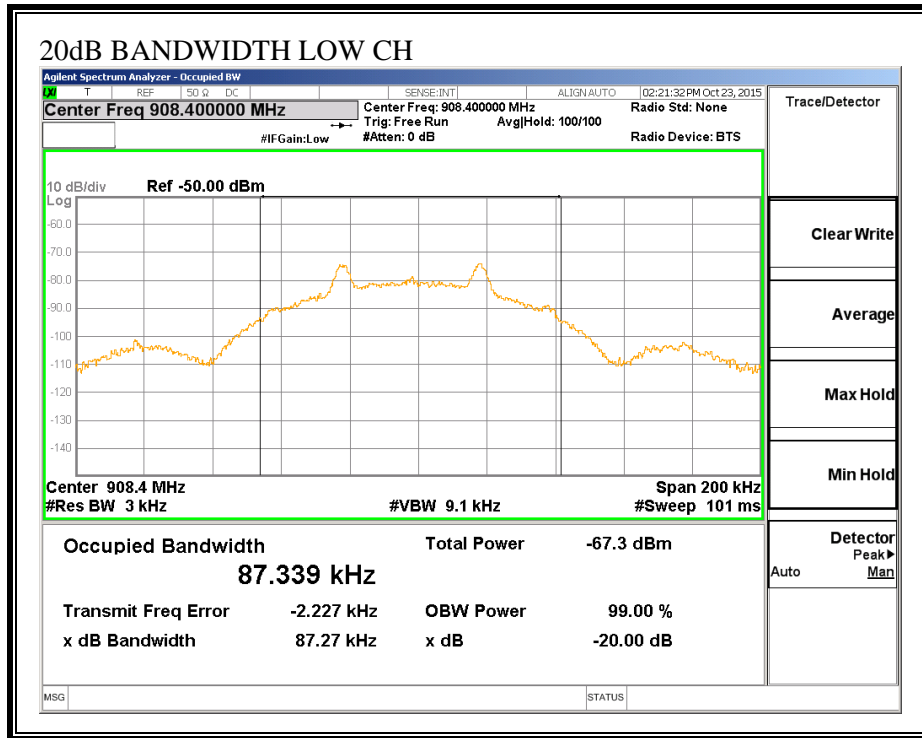


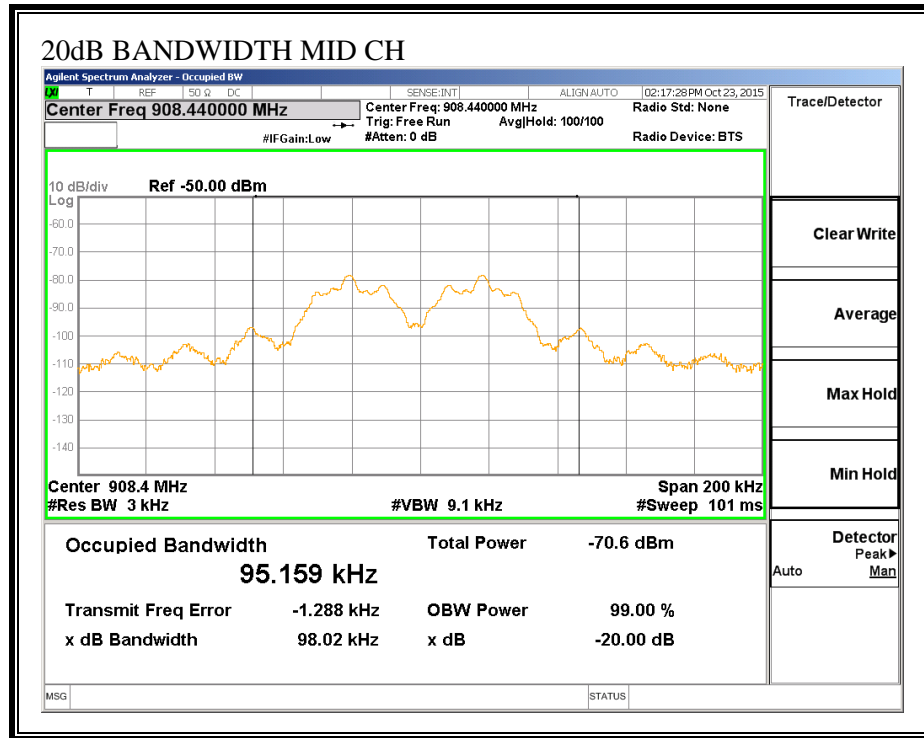


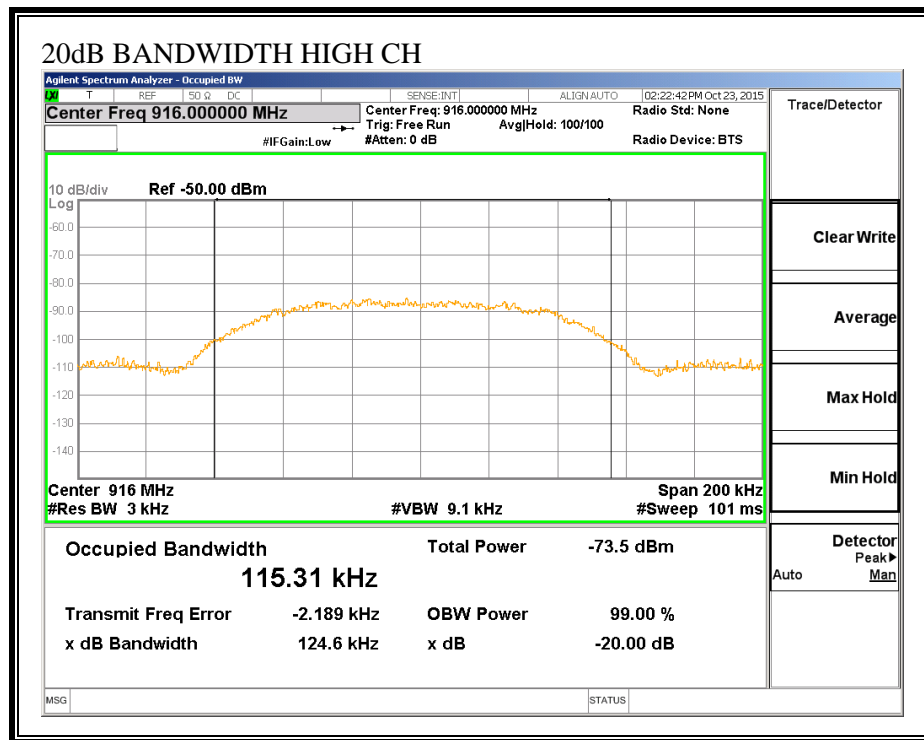




## 20dB BANDWIDTH







## 7.2. RADIATED EMISSIONS

### LIMIT

IC RSS-210, A2.9  
FCC 15.249

Operation within the bands 902–928 MHz, 2400–2483.5 MHz, 5725–5875 MHz, and 24.0–24.25 GHz.

(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz .....	50	500
2400–2483.5 MHz .....	50	500
5725–5875 MHz .....	50	500
24.0–24.25 GHz .....	250	2500

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009–0.490 .....	2400/F(kHz)	300
0.490–1.705 .....	24000/F(kHz)	30
1.705–30.0 .....	30	30
30–88 .....	100 **	3
88–216 .....	150 **	3
216–960 .....	200 **	3
Above 960 .....	500	3

\*\* Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54–72 MHz, 76–88 MHz, 174–216 MHz or 470–806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.

## **RESULTS**

C63.10 sect. 4.1.4.2.3 (e) Average voltage measurements using spectrum analyzer reduced video bandwidth

PK: RBW 1MHz, VBW 1MHz

AV: RBW 1MHz, VBW 10Hz

## 7.2.1. FUNDAMENTAL FREQUENCY RADIATED EMISSION

Fibar  
Dimmer2  
Tx Z-Axis  
120Vac60Hz

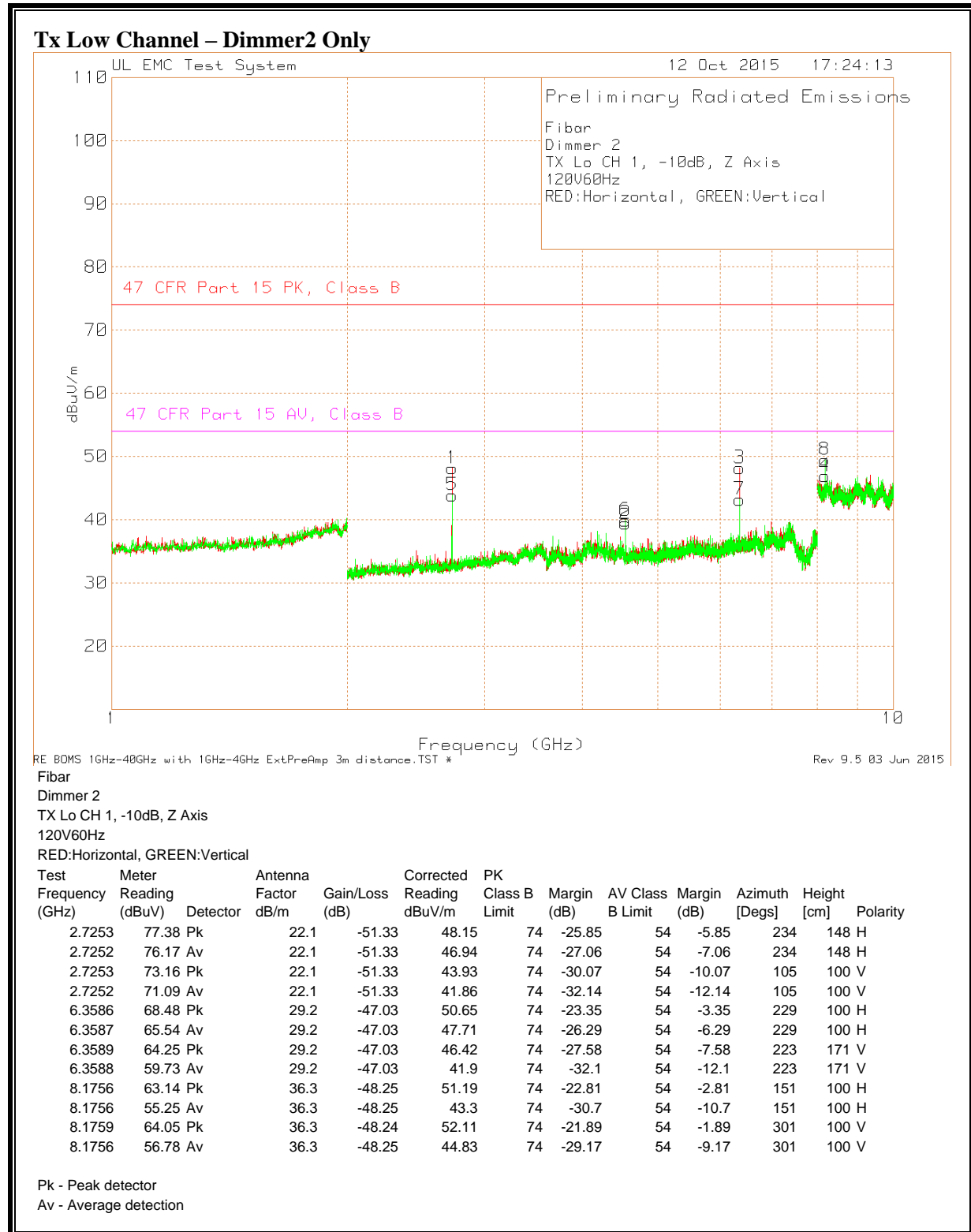
Test	Meter	Antenna	Cable	Corrected								
Frequency	Reading	Factor	Gain/Loss	Reading	PK Limit	Margin	QP Limit	Margin	Azimuth	Height		
(MHz)	(dBuV)	3m	3m	(uVolts/ meter)	3 m	(dB)	3m	(dB)	[Degs]	[cm]	Polarity	
Dimmer2 with Bypass2												
908.458147	58.88 Pk	23.3	10.3	92.48	114	-21.52	94	-1.52	0	100	H	
908.458147	57.21 Av	23.3	10.3	90.81	114	-23.19	94	-3.19	0	100	H	
908.458147	53.81 Pk	23.3	10.3	87.41	114	-26.59	94	-6.59	255	119	V	
908.458147	51.61 Av	23.3	10.3	85.21	114	-28.79	94	-8.79	255	119	V	
908.378019	58.78 Pk	23.3	10.3	92.38	114	-21.62	94	-1.62	0	100	H	
908.378019	57.27 Av	23.3	10.3	90.87	114	-23.13	94	-3.13	0	100	H	
908.378019	53.69 Pk	23.3	10.3	87.29	114	-26.71	94	-6.71	297	125	V	
908.378019	51.58 Av	23.3	10.3	85.18	114	-28.82	94	-8.82	297	125	V	
916.001603	59.4 Pk	23.4	10.3	93.1	114	-20.9	94	-0.9	0	101	H	
916.001603	58.35 Av	23.4	10.3	92.05	114	-21.95	94	-1.95	0	101	H	
916.009615	54.48 Pk	23.4	10.3	88.18	114	-25.82	94	-5.82	288	120	V	
916.001603	52.52 Av	23.4	10.3	86.22	114	-27.78	94	-7.78	288	120	V	
Dimmer2 without Bypass2												
908.45609	58.54 Pk	23.3	10.3	92.14	114	-21.86	94	-1.86	213	100	H	
908.45609	57.24 Av	23.3	10.3	90.84	114	-23.16	94	-3.16	213	100	H	
908.45609	53.54 Pk	23.3	10.3	87.14	114	-26.86	94	-6.86	286	100	V	
908.45609	52.26 Av	23.3	10.3	85.86	114	-28.14	94	-8.14	286	100	V	
908.379167	59.55 Pk	23.3	10.3	93.15	114	-20.85	94	-0.85	358	100	H	
908.379167	58.29 Av	23.3	10.3	91.89	114	-22.11	94	-2.11	358	100	H	
908.379167	53.33 Pk	23.3	10.3	86.93	114	-27.07	94	-7.07	288	100	V	
908.379167	52.1 Av	23.3	10.3	85.7	114	-28.3	94	-8.3	288	100	V	
916.001603	59.59 Pk	23.4	10.3	93.29	114	-20.71	94	-0.71	359	100	H	
916.001603	58.53 Av	23.4	10.3	92.23	114	-21.77	94	-1.77	359	100	H	
916.001603	54.28 Pk	23.4	10.3	87.98	114	-26.02	94	-6.02	286	100	V	
916.001603	53.4 Av	23.4	10.3	87.1	114	-26.9	94	-6.9	286	100	V	

Pk - Peak detector

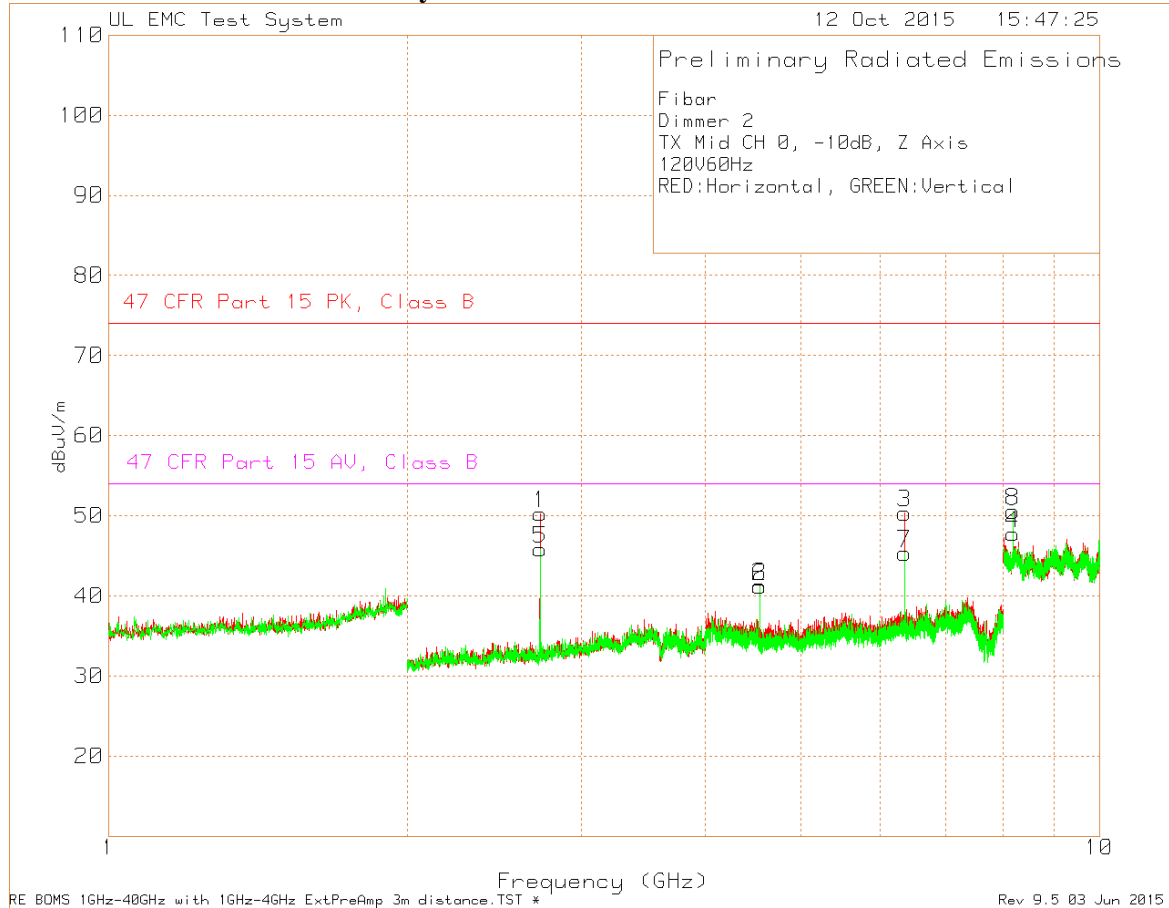
Av - Average detection

\*Note: Correct detector should have used QP detector measurements, although all PK measurements are under the QP limit.

## 7.2.2. HARMONICS AND SPURIOUS EMISSIONS ABOVE 1GHz



### Tx Mid Channel – Dimmer2 Only



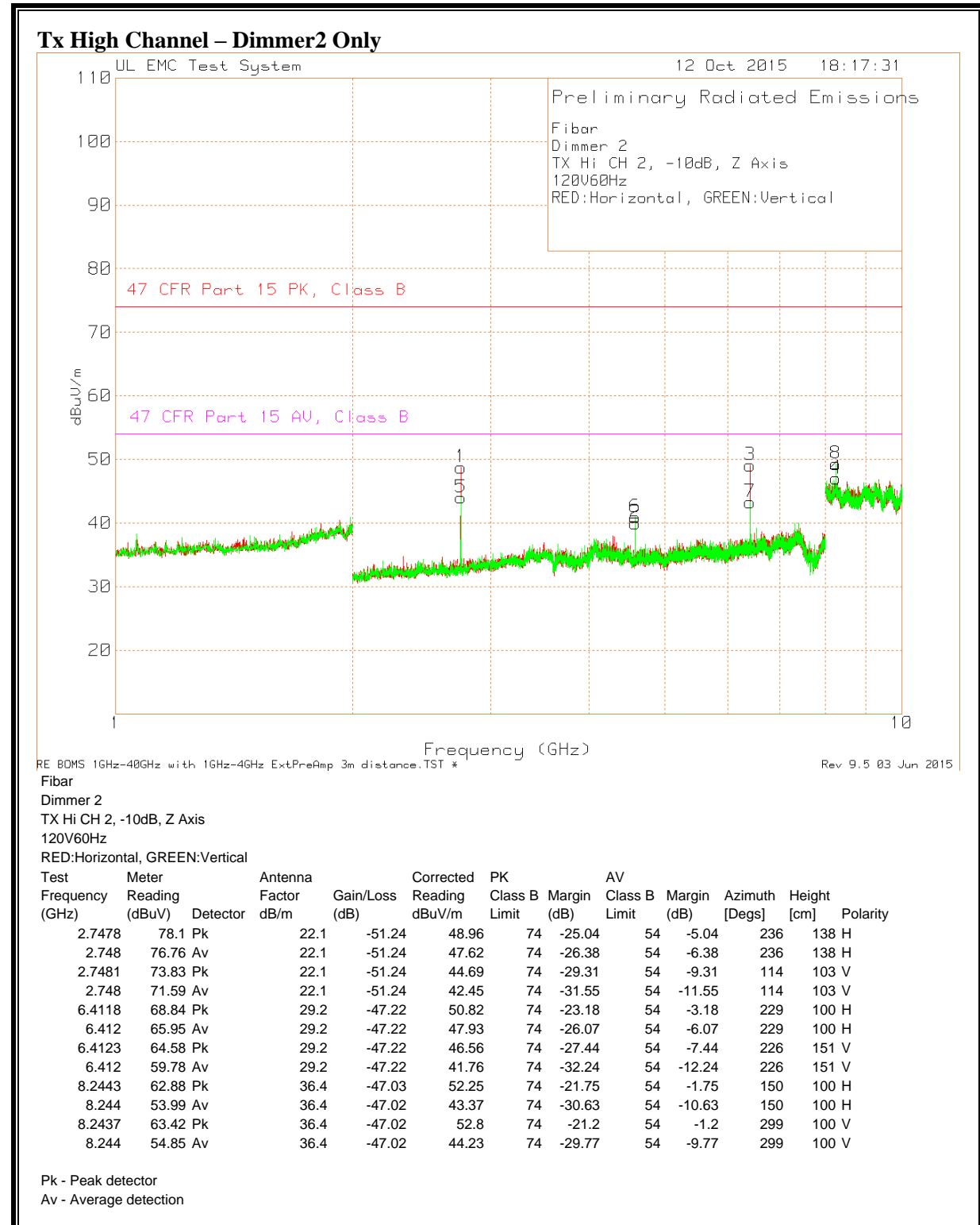
Fibar  
Dimmer 2  
TX Mid CH 0, -10dB, Z Axis  
120V60Hz

RED:Horizontal, GREEN:Vertical

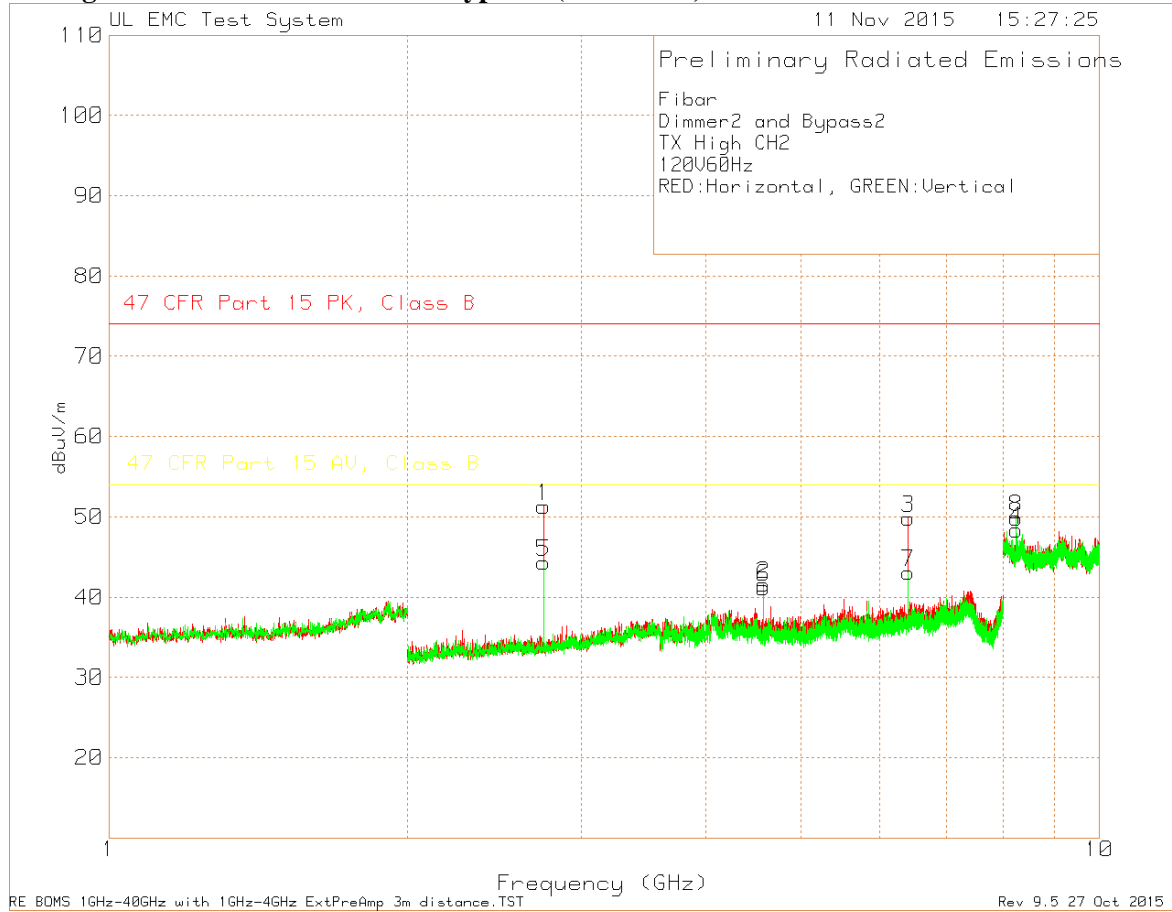
Test Frequency (GHz)	Meter Reading (dBuV)	Antenna Factor (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	PK Class B Limit (dB)	Margin (dB)	AV Class B Limit (dB)	Margin (dB)	Azimuth [Degr]	Height [cm]	Polarity
2.7253	79.34 Pk	22.1	-51.33	50.11	74	-23.89	54	-3.89	238	160	H
2.7253	78.26 Av	22.1	-51.33	49.03	74	-24.97	54	-4.97	238	160	H
2.7253	75.18 Pk	22.1	-51.33	45.95	74	-28.05	54	-8.05	113	104	V
2.7253	73.62 Av	22.1	-51.33	44.39	74	-29.61	54	-9.61	113	104	V
6.359	69.8 Pk	29.2	-47.03	51.97	74	-22.03	54	-2.03	230	100	H
6.3591	67.43 Av	29.2	-47.04	49.59	74	-24.41	54	-4.41	230	100	H
6.3589	65.72 Pk	29.2	-47.03	47.89	74	-26.11	54	-6.11	221	216	V
6.3591	61.94 Av	29.2	-47.04	44.1	74	-29.9	54	-9.9	221	216	V
8.1761	64.89 Pk	36.3	-48.23	52.96	74	-21.04	54	-1.04	156	100	H
8.1759	56.71 Av	36.3	-48.24	44.77	74	-29.23	54	-9.23	156	100	H
8.176	64.79 Pk	36.3	-48.23	52.86	74	-21.14	54	-1.14	305	100	V
8.176	58.26 Av	36.3	-48.23	46.33	74	-27.67	54	-7.67	305	100	V

Pk - Peak detector  
Av - Average detection





### Tx High Channel – Dimmer2 with Bypass2 (worst case)



Fibar

Dimmer 2

TX Hi CH 2, -10dB, Z Axis

120V60Hz

RED:Horizontal, GREEN:Vertical

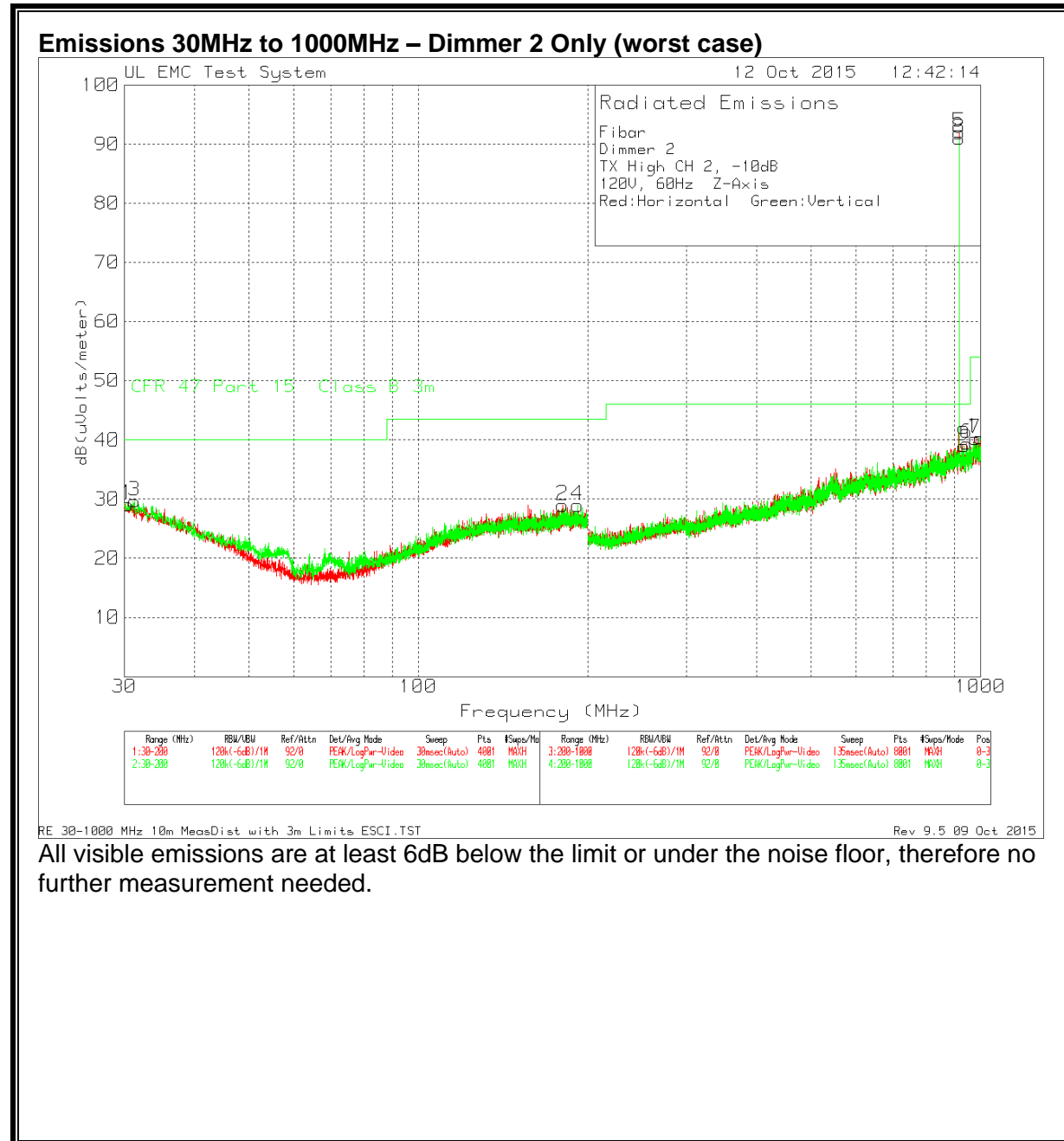
Test Frequency (GHz)	Meter Reading (dBuV)	Antenna Factor (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	PK Class B Limit	Margin (dB)	AV Class B Limit	Margin (dB)	Azimuth [Degr]	Height [cm]	Polarity
2.7479	80.35 Pk	22.1	-50.86	51.59	74	-22.41	54	-2.41	331	122	H
2.748	79.19 Av	22.1	-50.86	50.43	74	-23.57	54	-3.57	331	122	H
6.4117	70.35 Pk	29.2	-47.58	51.97	74	-22.03	54	-2.03	330	100	H
6.412	67.02 Av	29.2	-47.58	48.64	74	-25.36	54	-5.36	330	100	H
8.2443	65.87 Pk	36.4	-48.48	53.79	74	-20.21	54	-0.21	252	100	H
8.2439	57.76 Av	36.4	-48.49	45.67	74	-28.33	54	-8.33	252	100	H
8.2443	66.18 Pk	36.4	-48.48	54.1	74	-19.9	54	0.1	39	100	V
8.2439	58.23 Av	36.4	-48.49	46.14	74	-27.86	54	-7.86	39	100	V

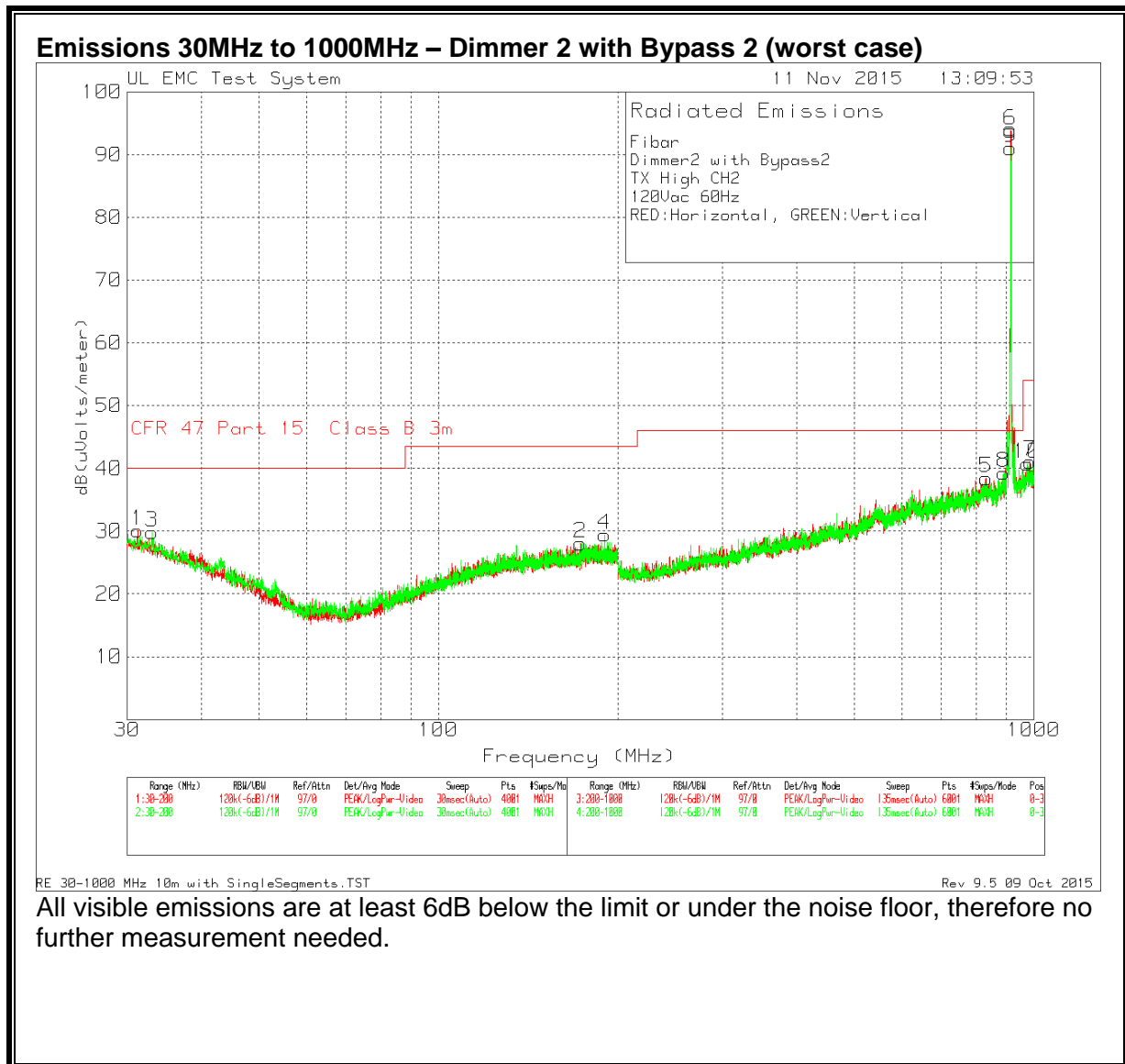
Pk - Peak detector

Av - Average detection

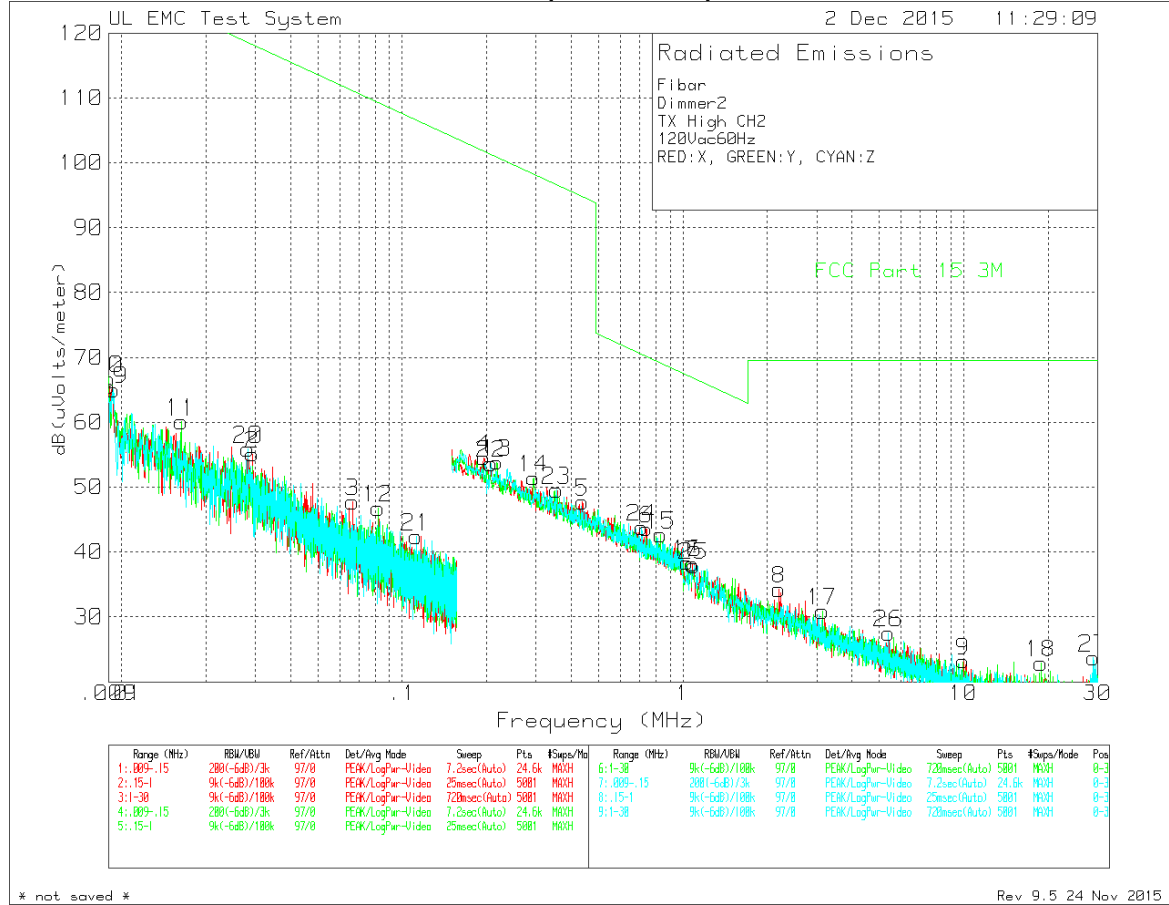
### 7.2.3. WORST-CASE BELOW 1 GHz

#### SPURIOUS EMISSIONS 30 TO 1000 MHz (HORIZONTAL)



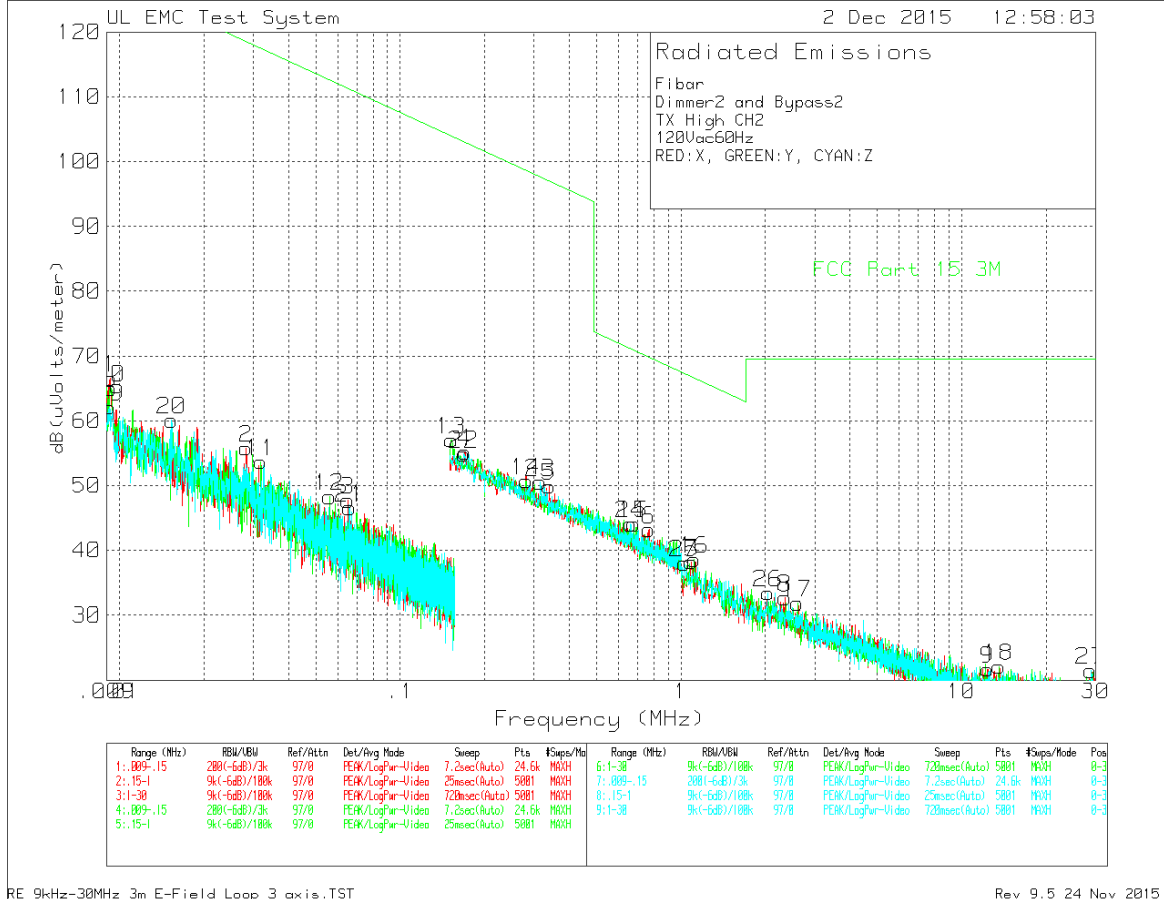


# Emissions 9kHz to 30MHz – Dimmer 2 (worst case)



All visible emissions are at least 6dB below the limit or under the noise floor, therefore no further measurement needed.

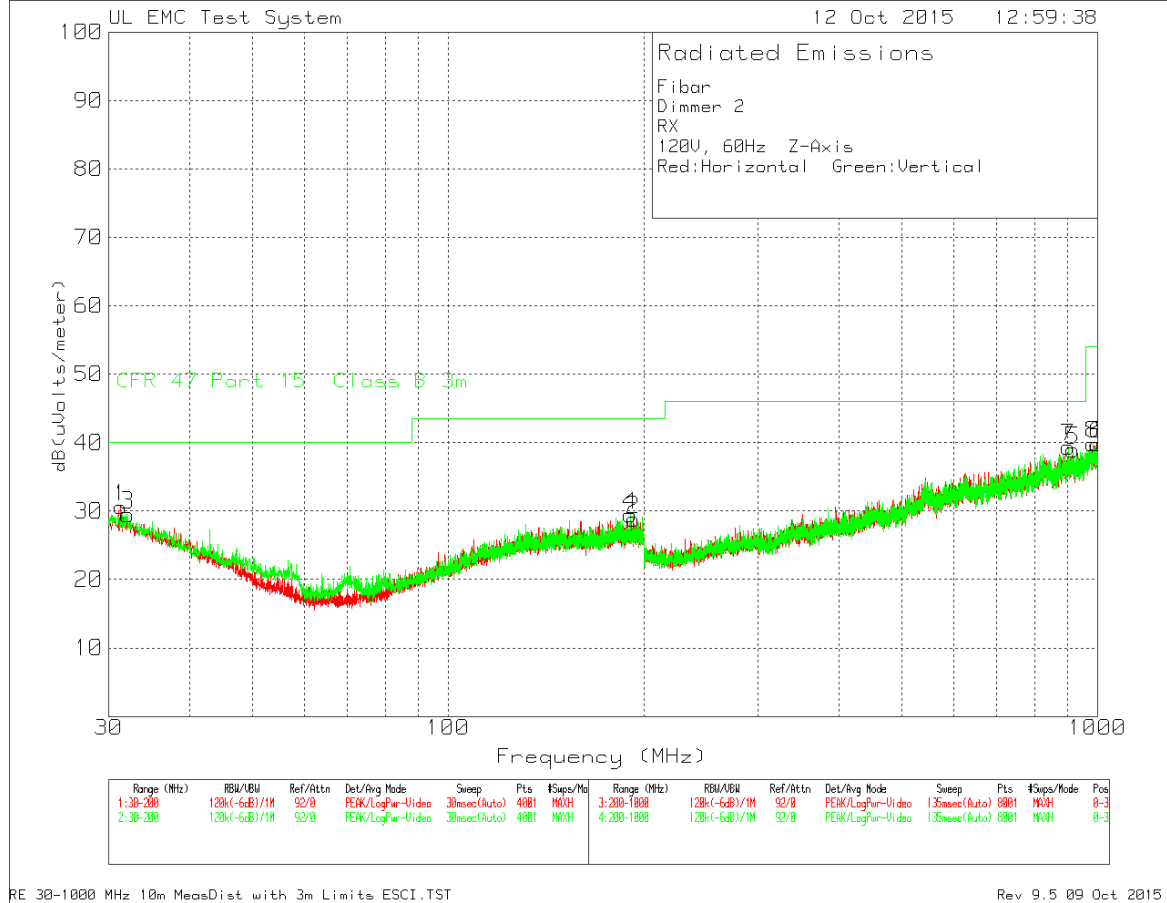
# Emissions 9kHz to 30MHz – Dimmer 2 with Bypass 2(worst case)



All visible emissions are at least 6dB below the limit or under the noise floor, therefore no further measurement needed.

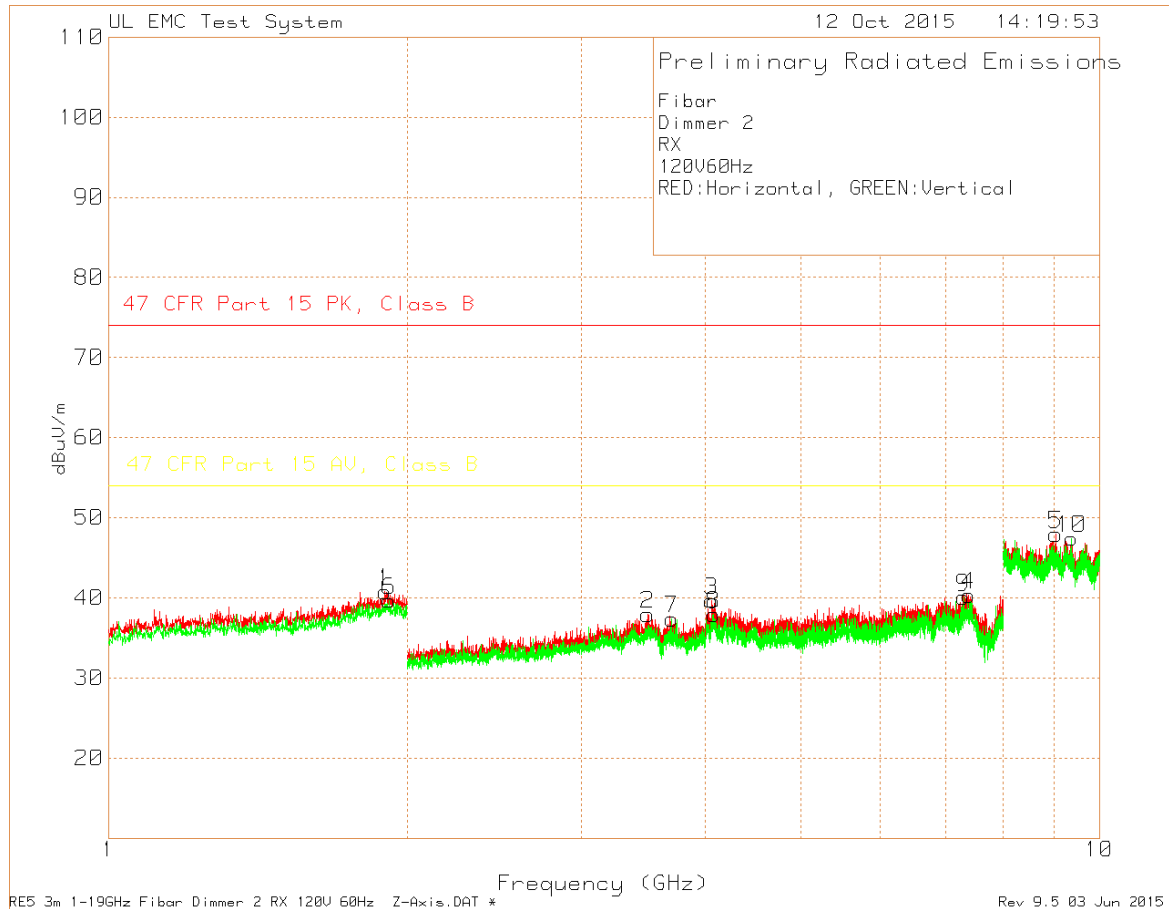
## 7.2.4. Transmitter RX Radiated Emissions

### Transmitter RX Radiated Emissions 30 MHz – 1000MHz – Dimmer 2 Only



All visible emissions are at least 6dB below the limit or under the noise floor, therefore no further measurement needed.

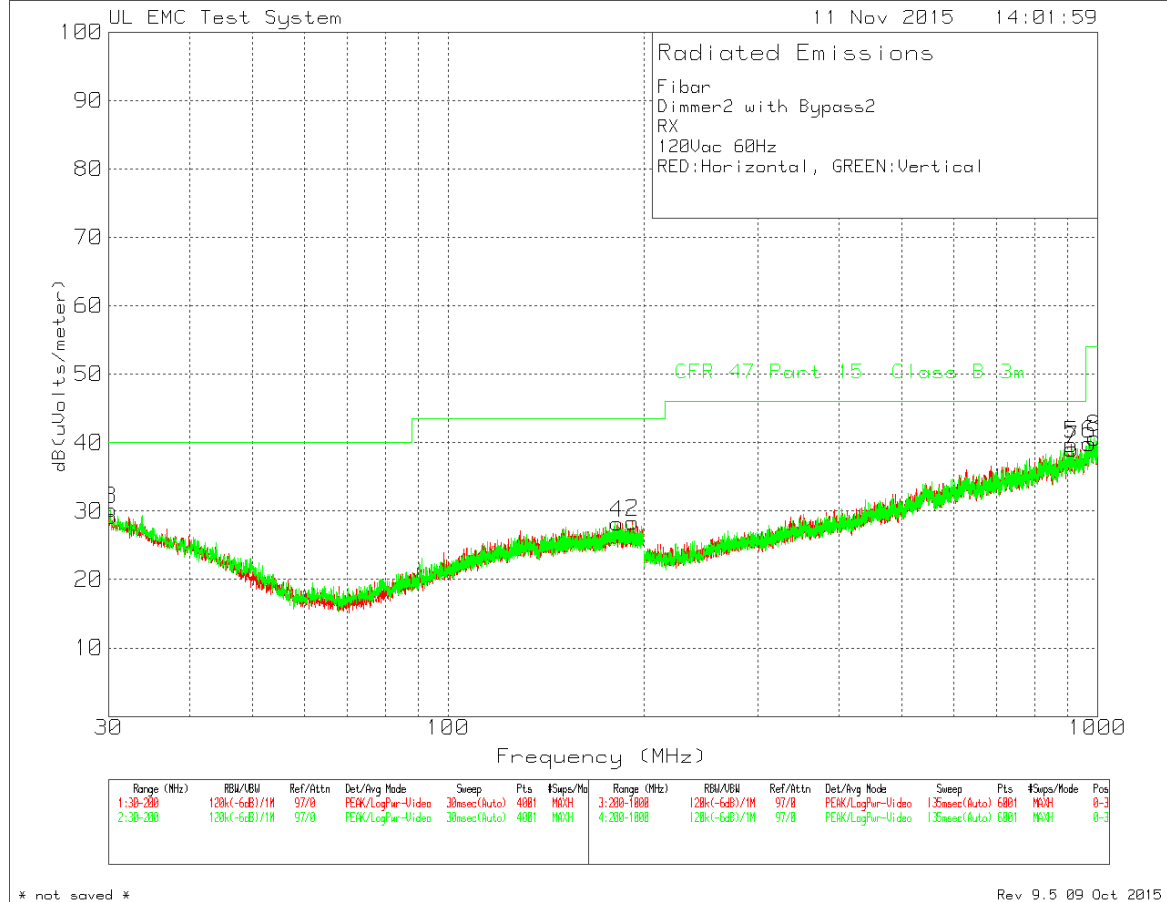
### Transmitter RX Radiated Emissions 1 GHz – 10GHz – Dimmer 2 Only



All visible emissions are at least 6dB below the limit or under the noise floor, therefore no further measurement needed.



# Transmitter RX Radiated Emissions 30 MHz – 1000MHz – Dimmer 2 with Bypass 2



All visible emissions are at least 6dB below the limit or under the noise floor, therefore no further measurement needed.

UL EMC Test System

11 Nov 2015 15:04:43

Preliminary Radiated Emissions

Fibar  
Dimmer2 and Bypass2  
RX  
120V60Hz  
RED:Horizontal, GREEN:Vertical

47 CFR Part 15 PK, Class B

47 CFR Part 15 AV, Class B

dBµV/m

Frequency (GHz)

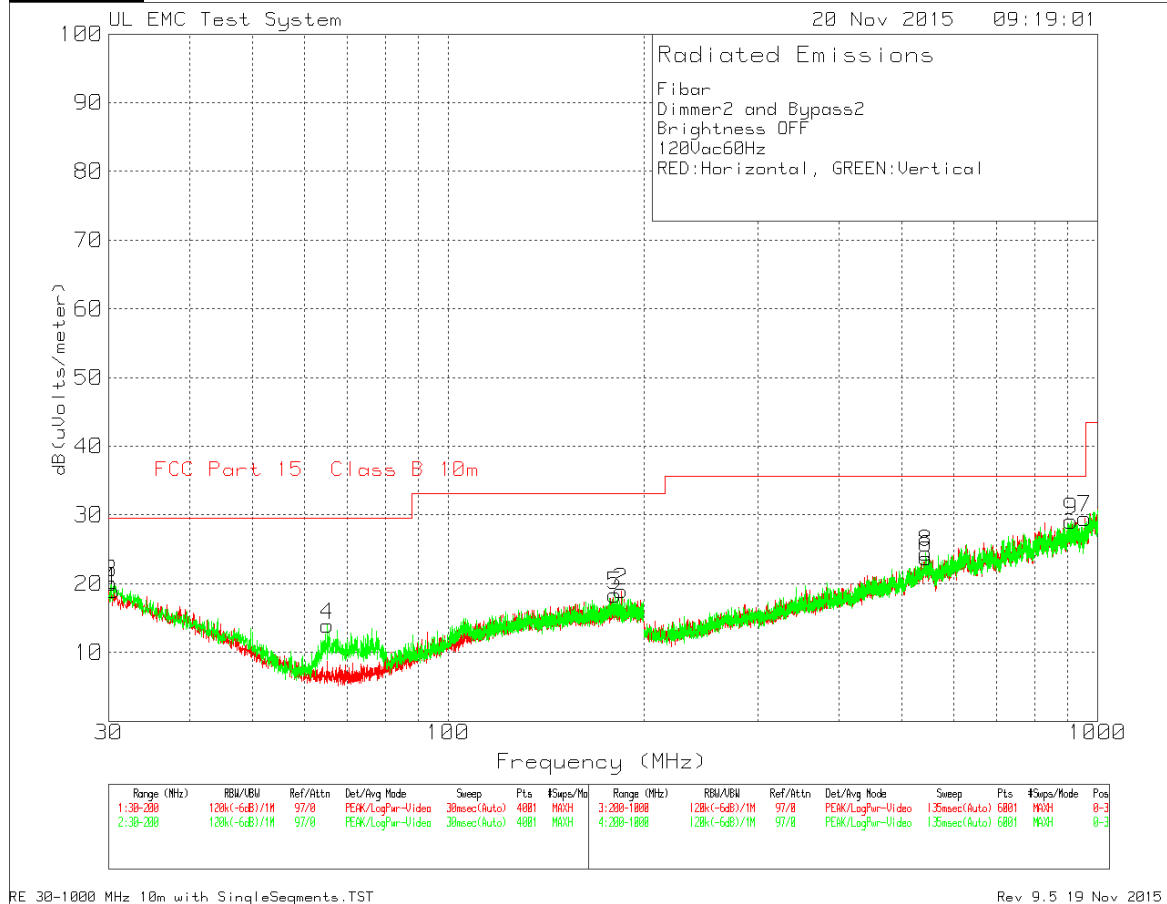
\* not saved \*

Rev 9.5 27 Oct 2015

Page 34 of 72

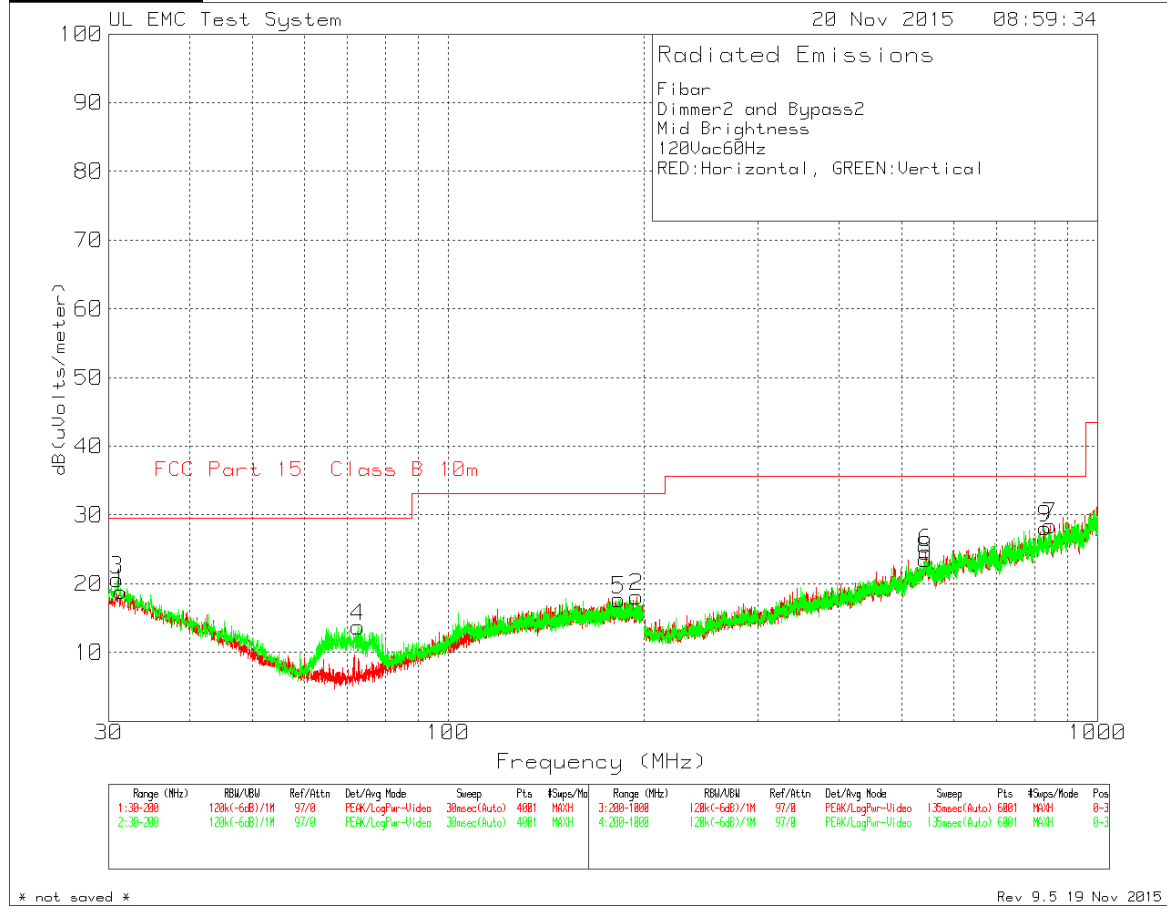
## 7.2.5. Digital Radiated Emissions

### Transmitter RX Radiated Emissions 30 MHz – 1000MHz – Dimmer 2 and Bypass 2 Light OFF



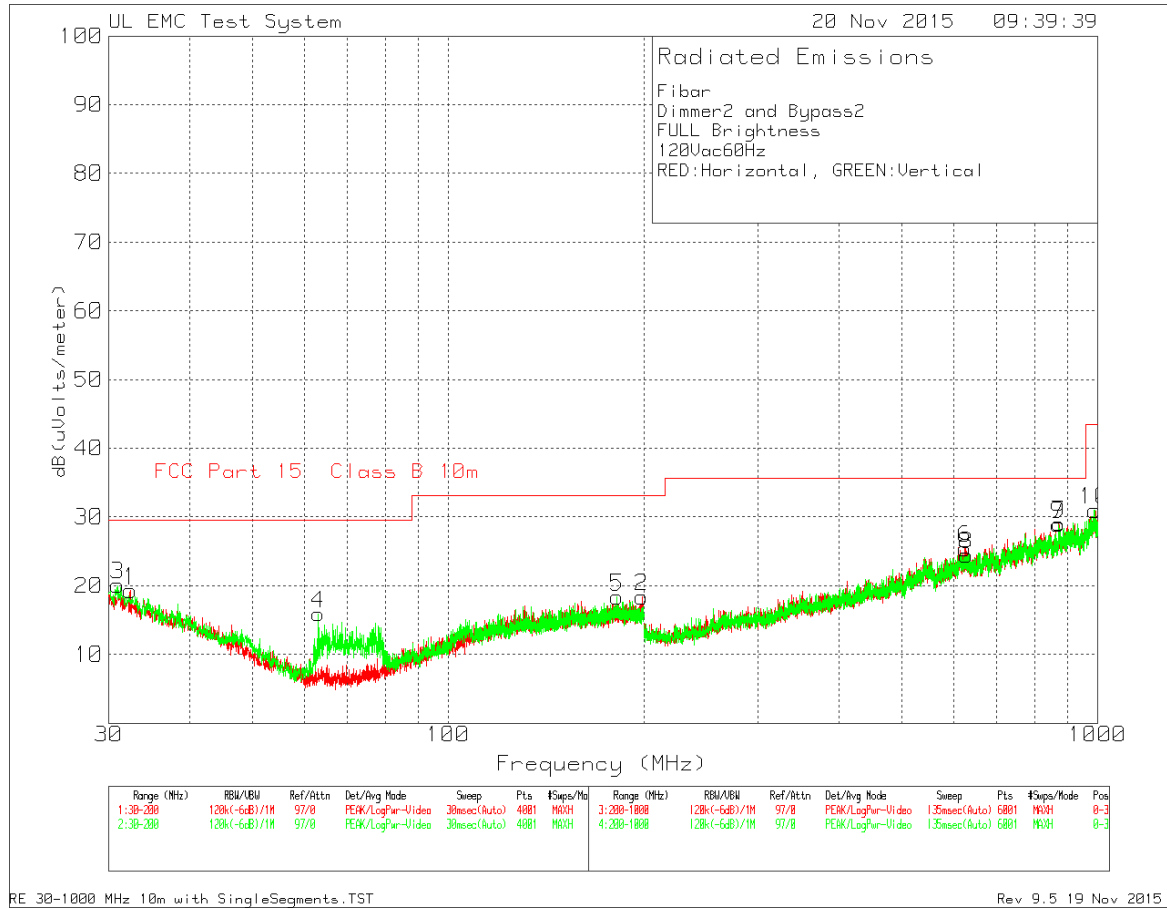
All visible emissions are at least 6dB below the limit or under the noise floor, therefore no further measurement needed.

# **Transmitter RX Radiated Emissions 30 MHz – 1000MHz – Dimmer 2 and Bypass 2 Brightness Mid**



All visible emissions are at least 6dB below the limit or under the noise floor, therefore no further measurement needed.

# **Transmitter RX Radiated Emissions 30 MHz – 1000MHz – Dimmer 2 and Bypass 2 Brightness Full**



All visible emissions are at least 6dB below the limit or under the noise floor, therefore no further measurement needed.

### 7.3. AC POWER LINE CONDUCTED EMISSIONS

#### LIMITS

FCC §15.207 (a)

RSS-Gen 8.8

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

<sup>\*</sup> 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.

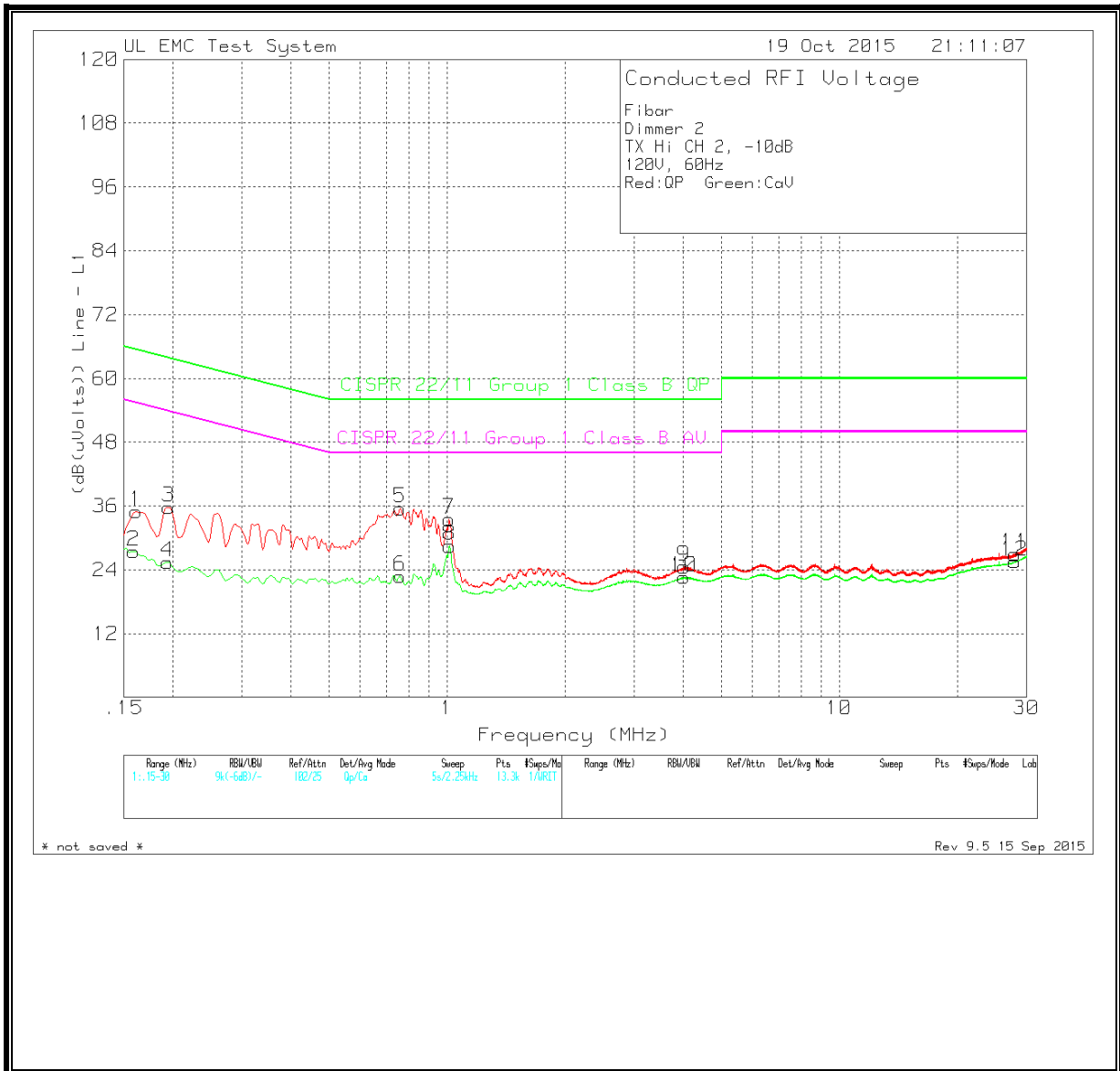
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

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

#### RESULTS

### 7.3.1. TRANSMITTER – AC POWER LINE CONDUCTED EMISSIONS

#### LINE 1 PLOT – TX Mode



**LINE 1 DATA – TX Mode**

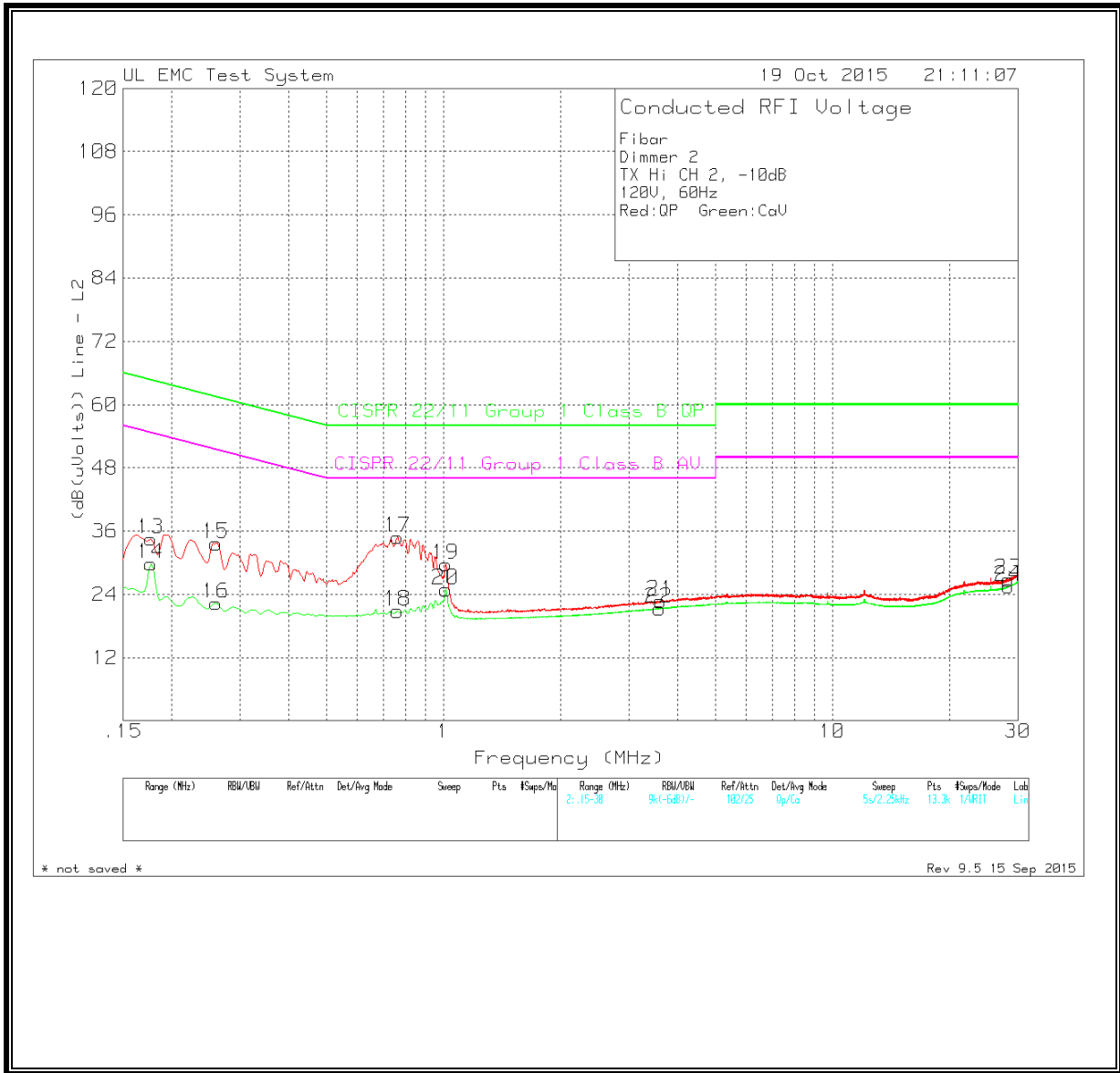
Fibar  
Dimmer 2  
TX Hi CH 2, -10dB  
120V, 60Hz  
Red:QP Green:CaV

Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	LISN 1 Factors dBm	Gain/Loss dBm	Corrected Reading dB(uVolts)	Class B QP Limit	QP Margin (dB)	Class B AV Limit	AV Margin (dB)
1	0.16125	22.4	Qp	0.1	12.5	35	65.4	-30.4	-	-
2	0.159	14.87	Ca	0.1	12.5	27.47	-	-	55.52	-28.05
3	0.195	24.18	Qp	0.1	11.5	35.78	63.82	-28.04	-	-
4	0.19388	13.83	Ca	0.1	11.5	25.43	-	-	53.87	-28.44
5	0.75975	24.85	Qp	0.1	10.6	35.55	56	-20.45	-	-
6	0.75975	12.1	Ca	0.1	10.6	22.8	-	-	46	-23.2
7	1.01175	22.77	Qp	0.1	10.6	33.47	56	-22.53	-	-
8	1.014	17.83	Ca	0.1	10.6	28.53	-	-	46	-17.47
9	4.02	13.8	Qp	0.1	10.7	24.6	56	-31.4	-	-
10	4.02	11.84	Ca	0.1	10.7	22.64	-	-	46	-23.36
11	28.00275	13.46	Qp	1.7	11.8	26.96	60	-33.04	-	-
12	28.0005	12.08	Ca	1.7	11.8	25.58	-	-	50	-24.42

Qp - Quasi-Peak detector  
Ca - CISPR Average detection



**LINE 2 PLOT – TX Mode**



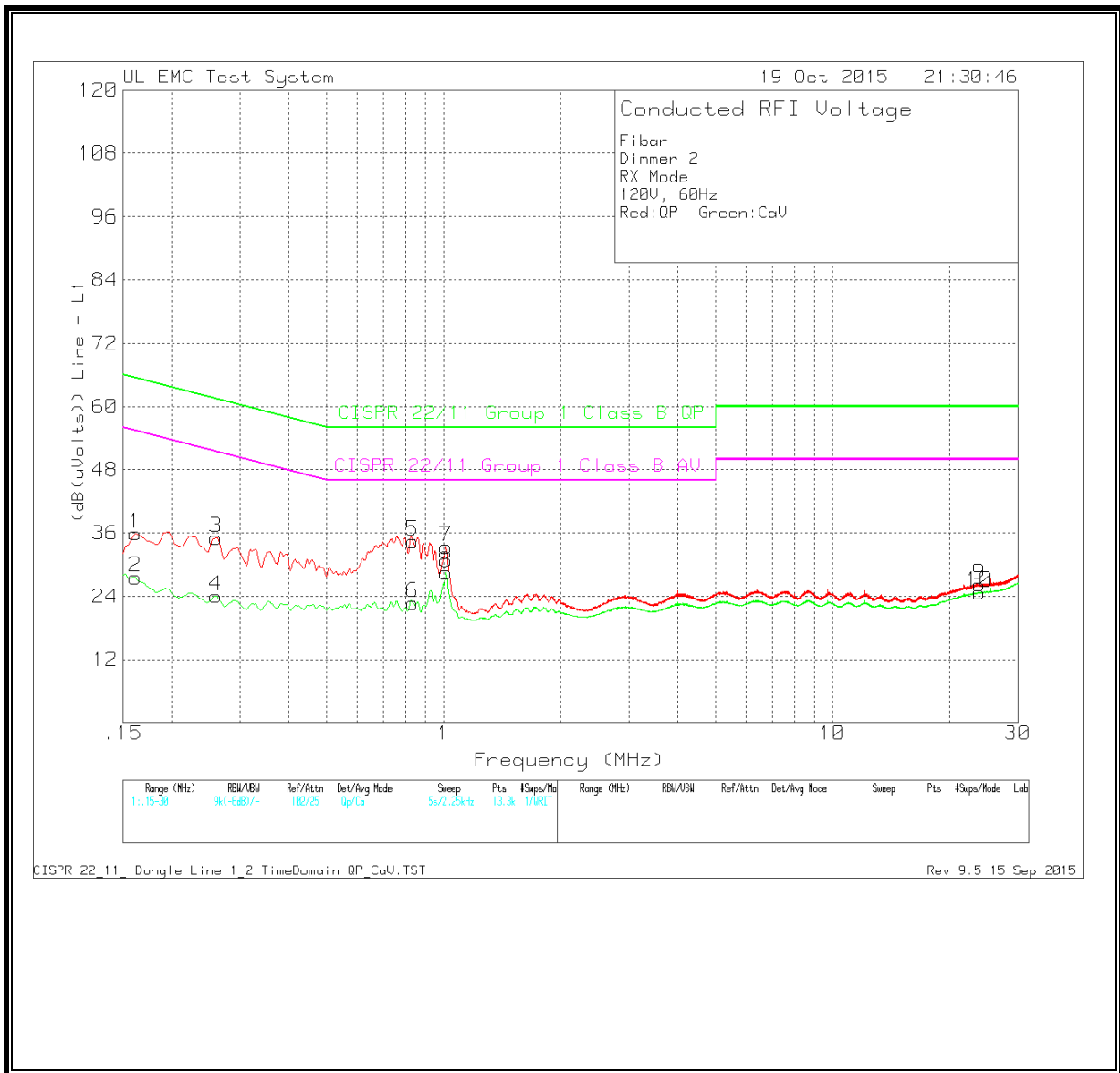
**LINE 2 DATA – TX Mode**

Fibar  
Dimmer 2  
TX Hi CH 2, -10dB  
120V, 60Hz  
Red:QP Green:CaV

Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	LISN 2 Factors dBm	Gain/Loss dBm	Corrected Reading dB(uVolts)	Class B QP Limit	QP Margin (dB)	Class B AV Limit	AV Margin (dB)
13	0.177	22.32	Qp	0.1	12.1	34.52	64.63	-30.11	-	-
14	0.177	17.6	Ca	0.1	12.1	29.8	-	-	54.63	-24.83
15	0.26025	22.35	Qp	0.1	11.2	33.65	61.42	-27.77	-	-
16	0.26025	11.03	Ca	0.1	11.2	22.33	-	-	51.42	-29.09
17	0.762	24.04	Qp	0.1	10.7	34.84	56	-21.16	-	-
18	0.762	10.03	Ca	0.1	10.7	20.83	-	-	46	-25.17
19	1.014	18.87	Qp	0.1	10.7	29.67	56	-26.33	-	-
20	1.014	14.07	Ca	0.1	10.7	24.87	-	-	46	-21.13
21	3.615	11.8	Qp	0.1	10.8	22.7	56	-33.3	-	-
22	3.588	10.45	Ca	0.1	10.8	21.35	-	-	46	-24.65
23	28.3335	13.41	Qp	1.5	11.9	26.81	60	-33.19	-	-
24	28.33575	12.11	Ca	1.5	11.9	25.51	-	-	50	-24.49

Qp - Quasi-Peak detector  
Ca - CISPR Average detection

**LINE 1 PLOT – RX Mode**



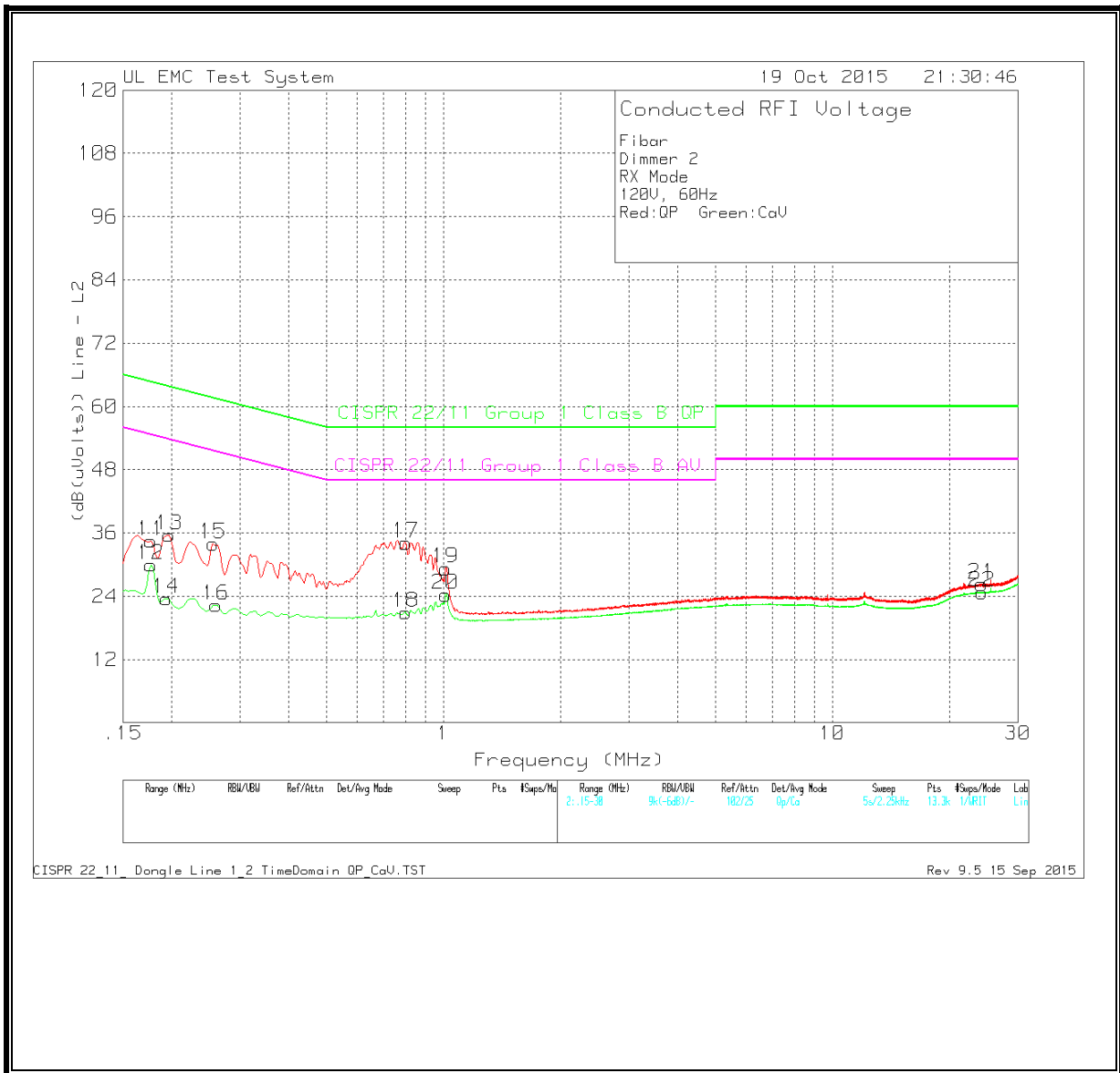
**LINE 1 DATA – RX Mode**

Fibar  
Dimmer 2  
RX Mode  
120V, 60Hz  
Red:QP Green:CaV

Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	LISN 1 Factors dBm	Gain/Loss dBm	Corrected Reading dB(uVolts)	Class B QP Limit	QP Margin (dB)	Class B AV Limit	AV Margin (dB)
1	0.16125	23.3	Qp	0.1	12.5	35.9	65.4	-29.5	-	-
2	0.16125	14.98	Ca	0.1	12.5	27.58	-	-	55.4	-27.82
3	0.26025	23.87	Qp	0.1	11.1	35.07	61.42	-26.35	-	-
4	0.26025	12.85	Ca	0.1	11.1	24.05	-	-	51.42	-27.37
5	0.834	23.72	Qp	0.1	10.6	34.42	56	-21.58	-	-
6	0.834	12.05	Ca	0.1	10.6	22.75	-	-	46	-23.25
7	1.014	22.67	Qp	0.1	10.6	33.37	56	-22.63	-	-
8	1.014	17.76	Ca	0.1	10.6	28.46	-	-	46	-17.54
9	23.88075	13.43	Qp	1.2	11.6	26.23	60	-33.77	-	-
10	23.8785	11.93	Ca	1.2	11.6	24.73	-	-	50	-25.27

Qp - Quasi-Peak detector  
Ca - CISPR Average detection

**LINE 2 PLOT – RX Mode**



**LINE 2 DATA – RX Mode**

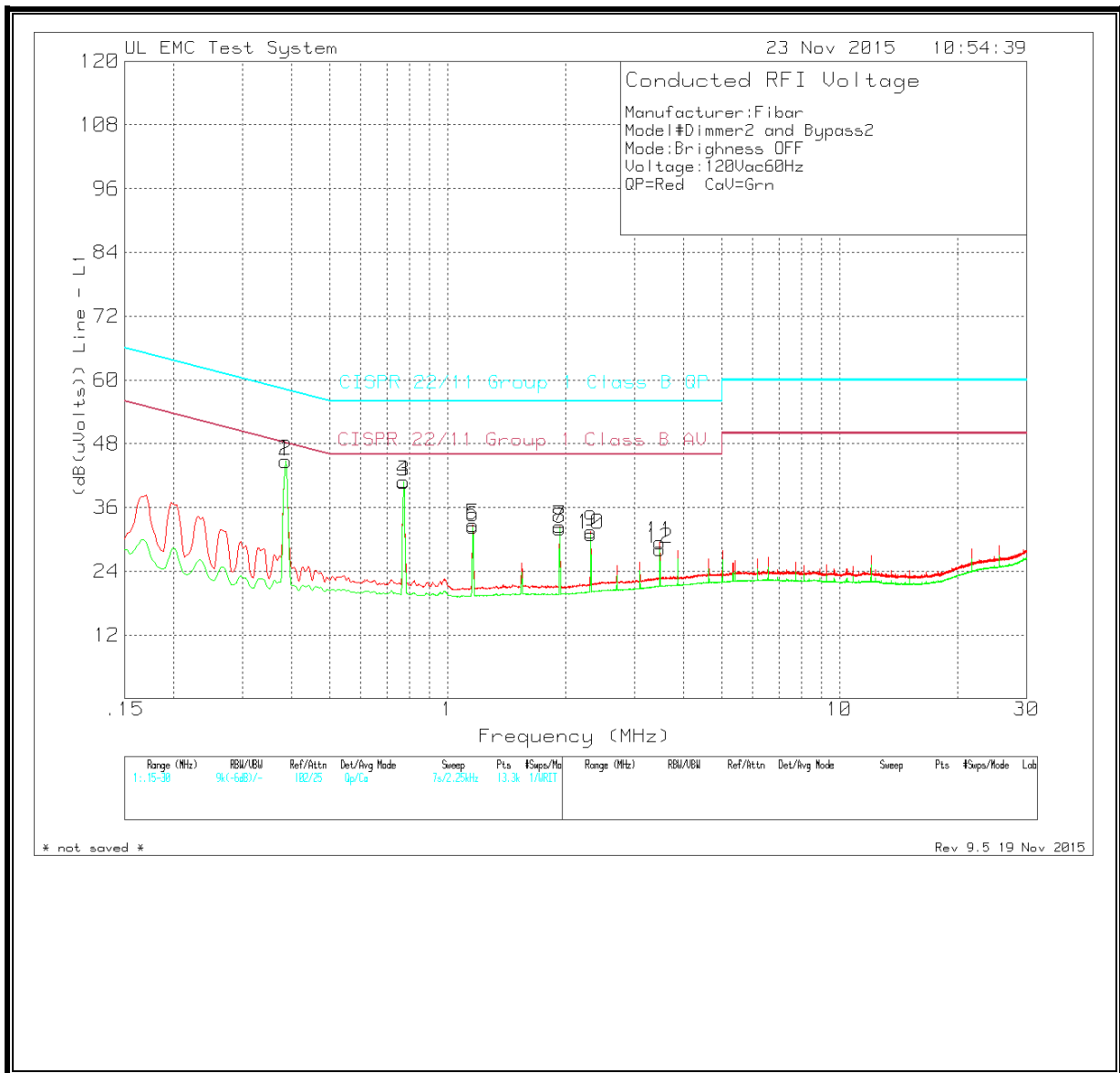
Fibar  
Dimmer 2  
RX Mode  
120V, 60Hz  
Red:QP Green:CaV

Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	LISN 2 Factors dBm	Gain/Loss dBm	Corrected Reading dB(uVolts)	Class B QP Limit	QP Margin (dB)	Class B AV Limit	AV Margin (dB)
11	0.177	22.29	Qp	0.1	12.1	34.49	64.63	-30.14	-	-
12	0.177	17.76	Ca	0.1	12.1	29.96	-	-	54.63	-24.67
13	0.19725	24.01	Qp	0.1	11.5	35.61	63.73	-28.12	-	-
14	0.19388	11.85	Ca	0.1	11.6	23.55	-	-	53.87	-30.32
15	0.25575	22.56	Qp	0.1	11.3	33.96	61.57	-27.61	-	-
16	0.26025	11.02	Ca	0.1	11.2	22.32	-	-	51.42	-29.1
17	0.80025	23.29	Qp	0.1	10.7	34.09	56	-21.91	-	-
18	0.80025	10.11	Ca	0.1	10.7	20.91	-	-	46	-25.09
19	1.01175	18.5	Qp	0.1	10.7	29.3	56	-26.7	-	-
20	1.01175	13.5	Ca	0.1	10.7	24.3	-	-	46	-21.7
21	24.2115	13.39	Qp	1.2	11.7	26.29	60	-33.71	-	-
22	24.25425	11.77	Ca	1.2	11.8	24.77	-	-	50	-25.23

Qp - Quasi-Peak detector  
Ca - CISPR Average detection

### 7.3.2. DIGITAL – AC POWER LINE CONDUCTED EMISSIONS

#### LINE 1 PLOT – Mode: Light OFF



**LINE 1 DATA – Mode: Light OFF**

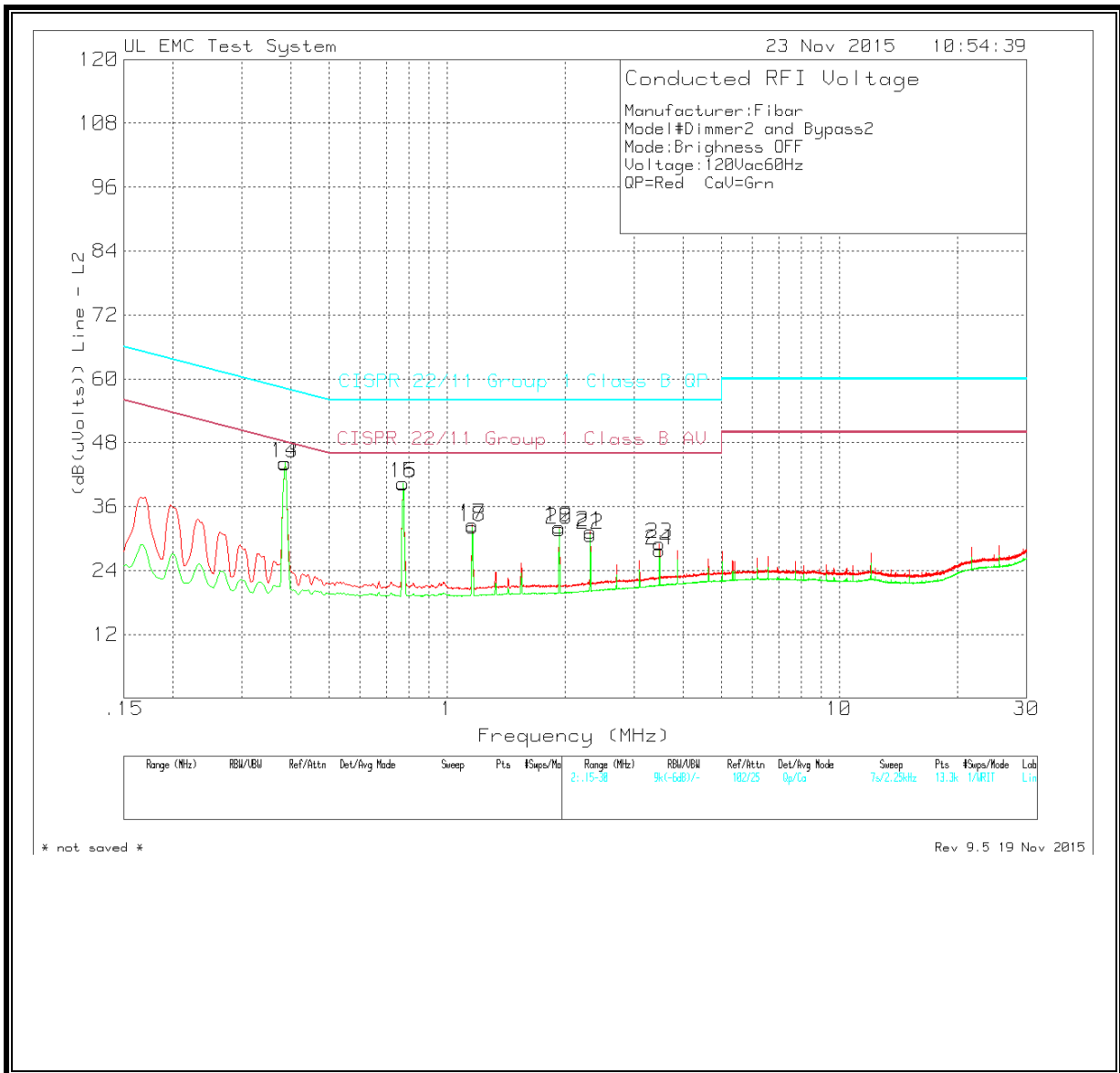
Manufacturer:Fibar  
Model#Dimmer2 and Bypass2  
Mode:Brighness OFF  
Voltage:120Vac60Hz  
QP=Red CaV=Grn

	Test	Meter		LISN 1		Corrected		QP		AV
Marker	Frequency	Reading		Factors	Gain/Loss	Reading	Class B	Margin	Class B	Margin
No.	(MHz)	(dBuV)	Detector	dBm	dBm	dB(uVolts)	QP Limit	(dB)	AV Limit	(dB)
	1	0.38625	33.93 Qp		0.1	10.7	44.73	58.14	-13.41	48.14 -
	2	0.38625	34 Ca		0.1	10.7	44.8	58.14	-	48.14 -3.34
	3	0.77325	30.15 Qp		0.1	10.6	40.85	56	-15.15	46 -
	4	0.77325	30.22 Ca		0.1	10.6	40.92	56	-	46 -5.08
	5	1.16025	22.01 Qp		0.1	10.6	32.71	56	-23.29	46 -
	6	1.16025	21.62 Ca		0.1	10.6	32.32	56	-	46 -13.68
	7	1.932	21.77 Qp		0.1	10.6	32.47	56	-23.53	46 -
	8	1.932	21.34 Ca		0.1	10.6	32.04	56	-	46 -13.96
	9	2.319	20.78 Qp		0.1	10.6	31.48	56	-24.52	46 -
	10	2.319	20.22 Ca		0.1	10.6	30.92	56	-	46 -15.08
	11	3.47775	18.67 Qp		0.1	10.7	29.47	56	-26.53	46 -
	12	3.47775	17.42 Ca		0.1	10.7	28.22	56	-	46 -17.78

Qp - Quasi-Peak detector  
Ca - CISPR Average detection



**LINE 2 PLOT – Mode: Light OFF**



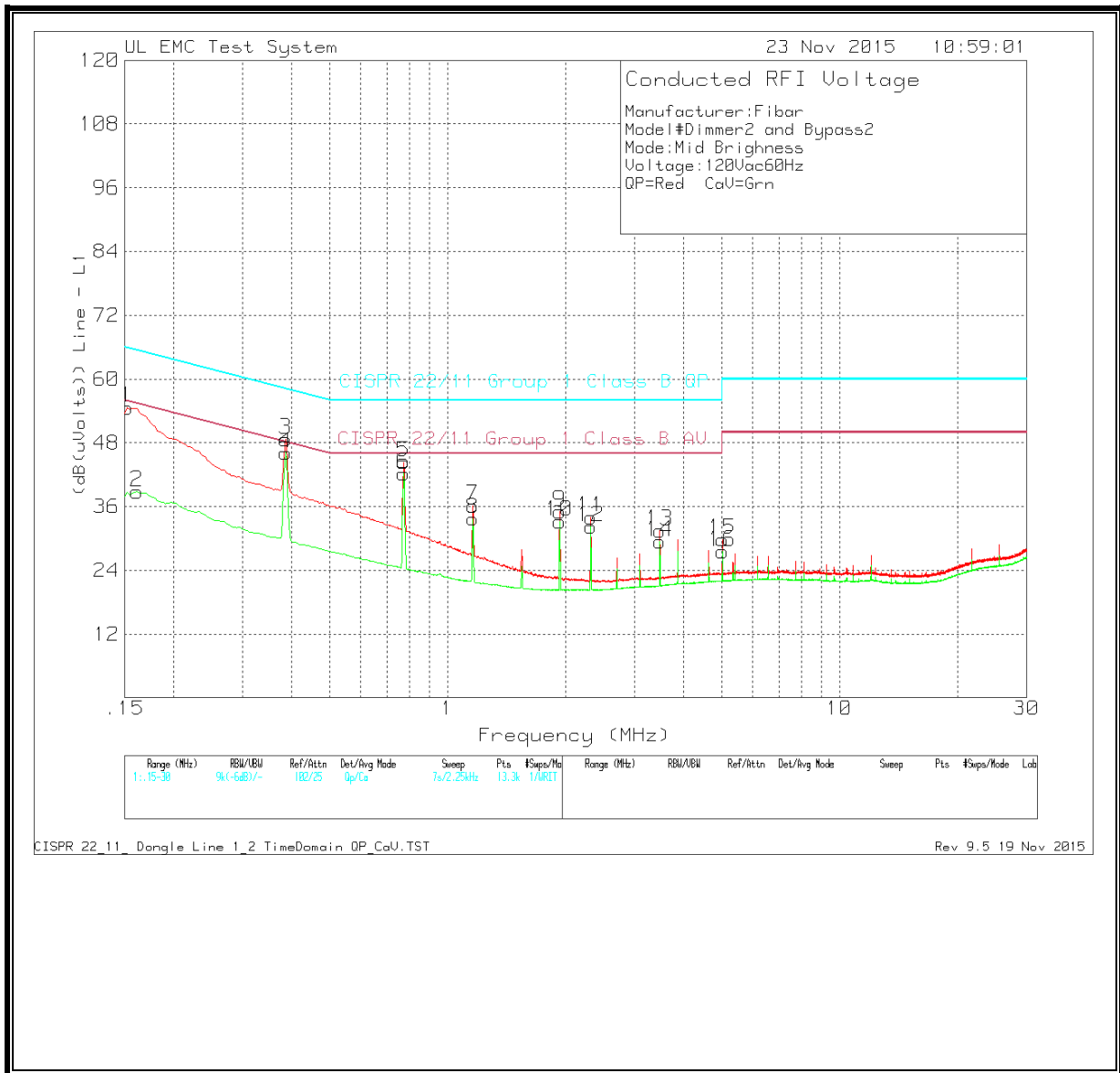
**LINE 2 DATA – Mode: Light OFF**

Manufacturer:Fibar  
Model#Dimmer2 and Bypass2  
Mode:Brighness OFF  
Voltage:120Vac60Hz  
QP=Red CaV=Grn

Marker No.	Test Frequency (MHz)	Meter Reading( dBuV) Detector	LISN 2 Factors dBm	Gain/Loss dBm	Corrected Reading dB(uVolts)	Class B QP Limit	QP Margin (dB)	Class B AV Limit	AV Margin (dB)
13	0.38625	33.25 Qp		0.1	10.8	44.15	58.14 -13.99	48.14 -	
14	0.38625	33.33 Ca		0.1	10.8	44.23	58.14 -	48.14 -	-3.91
15	0.77325	29.6 Qp		0.1	10.7	40.4	56 -15.6	46 -	
16	0.77325	29.66 Ca		0.1	10.7	40.46	56 -	46 -	-5.54
17	1.16025	21.76 Qp		0.1	10.7	32.56	56 -23.44	46 -	
18	1.16025	21.36 Ca		0.1	10.7	32.16	56 -	46 -	-13.84
19	1.932	21.38 Qp		0.1	10.7	32.18	56 -23.82	46 -	
20	1.932	20.97 Ca		0.1	10.7	31.77	56 -	46 -	-14.23
21	2.319	20.47 Qp		0.1	10.7	31.27	56 -24.73	46 -	
22	2.319	19.93 Ca		0.1	10.7	30.73	56 -	46 -	-15.27
23	3.47775	18.13 Qp		0.1	10.8	29.03	56 -26.97	46 -	
24	3.47775	16.91 Ca		0.1	10.8	27.81	56 -	46 -	-18.19

Qp - Quasi-Peak detector  
Ca - CISPR Average detection

**LINE 1 PLOT – Mode: Mid Brightness**



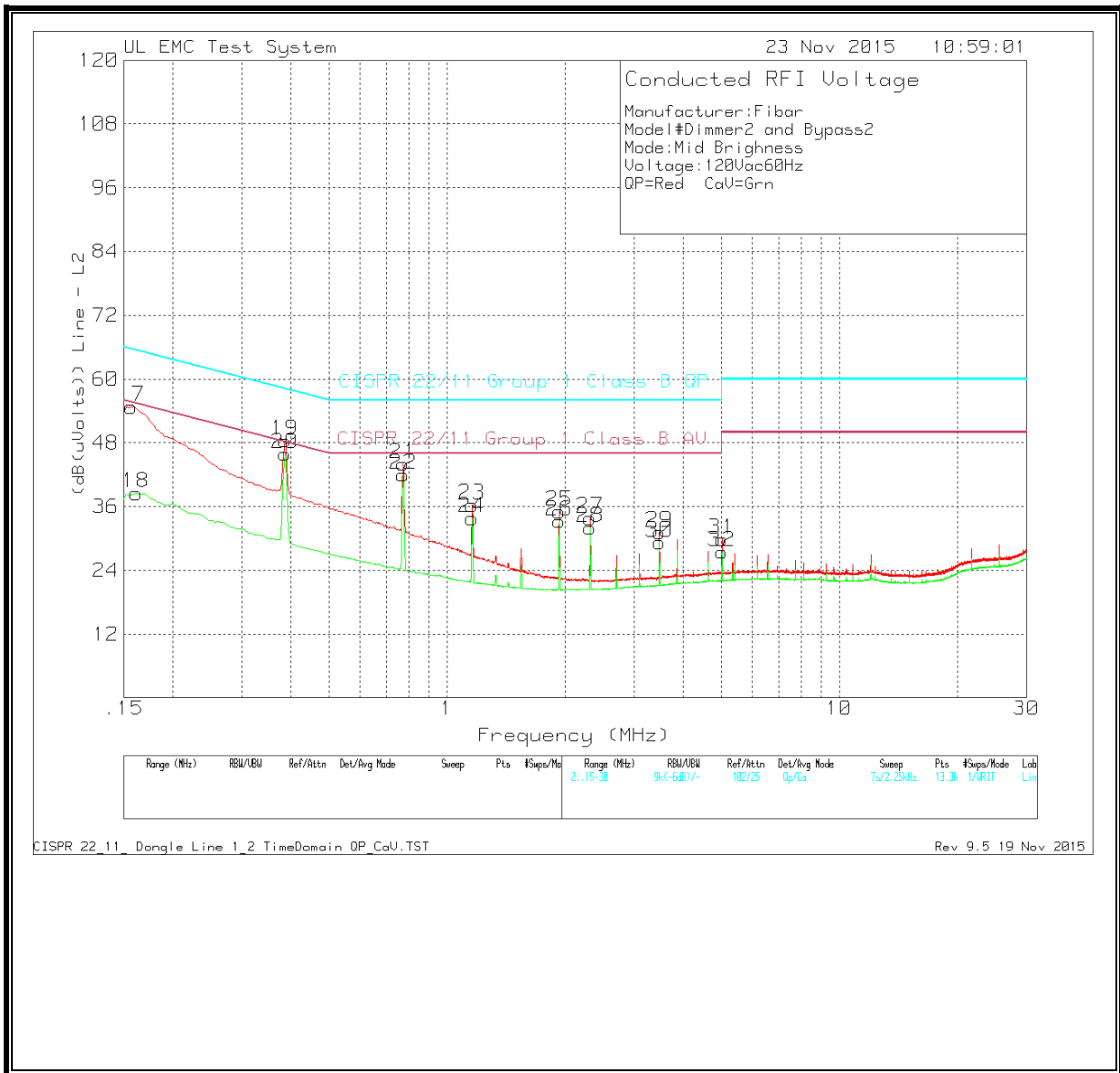
**LINE 1 DATA – Mode: Mid Brightness**

Manufacturer:Fibar  
Model#Dimmer2 and Bypass2  
Mode:Mid Brightness  
Voltage:120Vac60Hz  
QP=Red CaV=Grn

Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	LISN 1 Factors dBm	Gain/Loss dBm	Corrected Reading dB(uVolts)	Class B QP Limit	QP Margin (dB)	Class B AV Limit	AV Margin (dB)
1	0.15225	41.81	Qp	0.1	12.7	54.61	65.88	-11.27	55.88	-
2	0.16125	26.2	Ca	0.1	12.5	38.8	65.4	-	55.4	-16.6
3	0.38625	37.82	Qp	0.1	10.7	48.62	58.14	-9.52	48.14	-
4	0.38625	35.31	Ca	0.1	10.7	46.11	58.14	-	48.14	-2.03
5	0.77325	33.66	Qp	0.1	10.6	44.36	56	-11.64	46	-
6	0.77325	31.5	Ca	0.1	10.6	42.2	56	-	46	-3.8
7	1.16025	25.49	Qp	0.1	10.6	36.19	56	-19.81	46	-
8	1.16025	23.05	Ca	0.1	10.6	33.75	56	-	46	-12.25
9	1.932	24.34	Qp	0.1	10.6	35.04	56	-20.96	46	-
10	1.932	22.52	Ca	0.1	10.6	33.22	56	-	46	-12.78
11	2.319	23.27	Qp	0.1	10.6	33.97	56	-22.03	46	-
12	2.319	21.5	Ca	0.1	10.6	32.2	56	-	46	-13.8
13	3.47775	20.64	Qp	0.1	10.7	31.44	56	-24.56	46	-
14	3.47775	18.62	Ca	0.1	10.7	29.42	56	-	46	-16.58
15	5.0235	19.01	Qp	0.1	10.7	29.81	60	-30.19	50	-
16	5.0235	16.75	Ca	0.1	10.7	27.55	60	-	50	-22.45

Qp - Quasi-Peak detector  
Ca - CISPR Average detection

**LINE 2 PLOT – Mode: Mid Brightness**



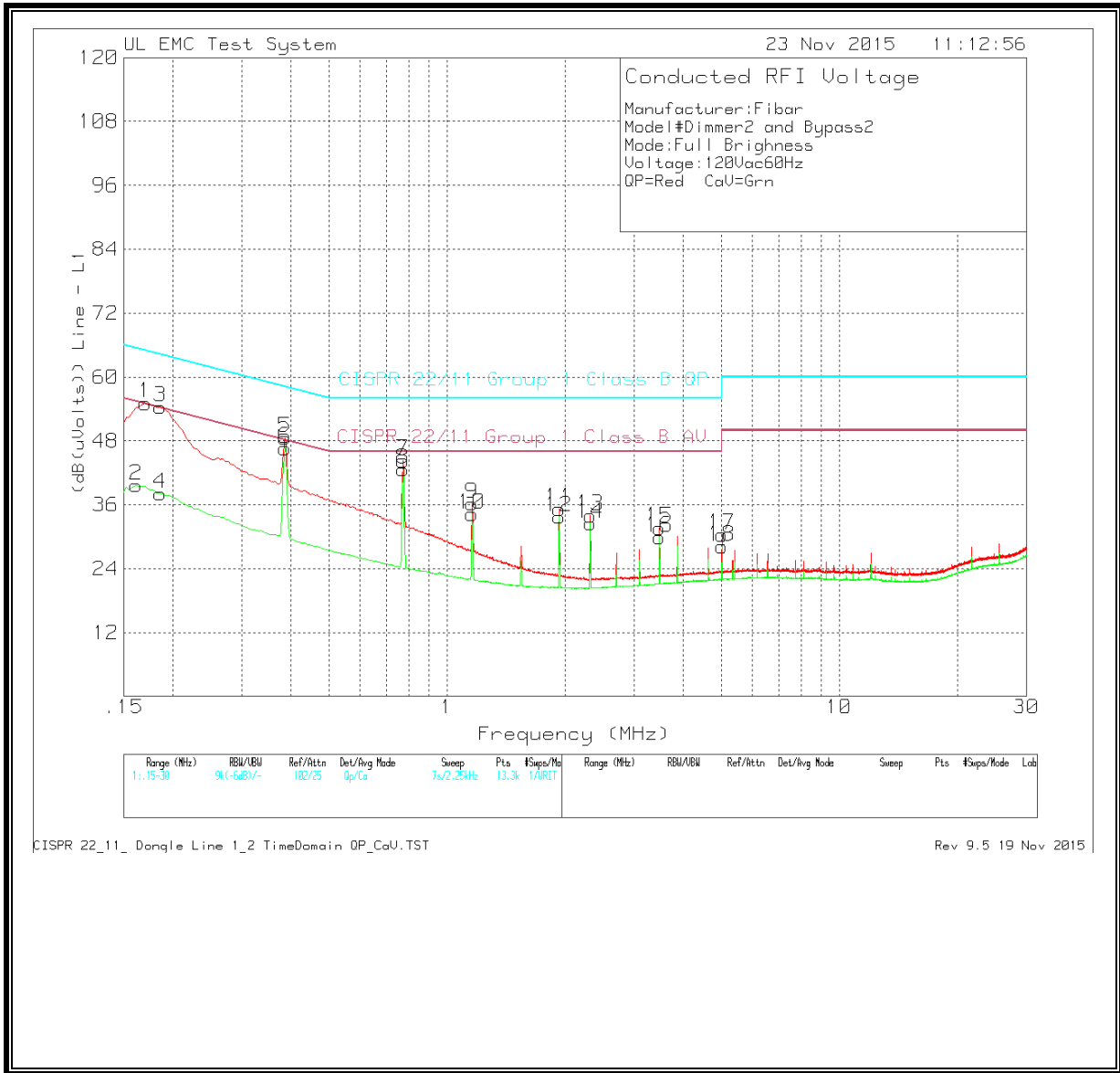
**LINE 2 DATA – Mode: Mid Brightness**

Manufacturer:Fibar  
Model#Dimmer2 and Bypass2  
Mode:Mid Brightness  
Voltage:120Vac60Hz  
QP=Red CaV=Grn

Marker No.	Test Frequency (MHz)	Meter Reading (dBuV) Detector	LISN 2 Factors dBm	Gain/Loss dBm	Corrected Reading dB(uVolts)	Class B QP Limit	QP Margin (dB)	Class B AV Limit	AV Margin (dB)
17	0.15675	42 Qp		0.1	12.7	54.8	65.63 -10.83	55.63 -	
18	0.16125	25.83 Ca		0.1	12.6	38.53	65.4 -	55.4 -16.87	
19	0.38625	37.54 Qp		0.1	10.8	48.44	58.14 -9.7	48.14 -	
20	0.38625	35.01 Ca		0.1	10.8	45.91	58.14 -	48.14 -2.23	
21	0.77325	33.27 Qp		0.1	10.7	44.07	56 -11.93	46 -	
22	0.77325	31.19 Ca		0.1	10.7	41.99	56 -	46 -4.01	
23	1.158	25.48 Qp		0.1	10.7	36.28	56 -19.72	46 -	
24	1.158	23.01 Ca		0.1	10.7	33.81	56 -	46 -12.19	
25	1.932	24.27 Qp		0.1	10.7	35.07	56 -20.93	46 -	
26	1.932	22.48 Ca		0.1	10.7	33.28	56 -	46 -12.72	
27	2.31675	22.98 Qp		0.1	10.7	33.78	56 -22.22	46 -	
28	2.31675	21.21 Ca		0.1	10.7	32.01	56 -	46 -13.99	
29	3.47775	20.24 Qp		0.1	10.8	31.14	56 -24.86	46 -	
30	3.47775	18.36 Ca		0.1	10.8	29.26	56 -	46 -16.74	
31	5.02125	18.85 Qp		0.1	10.9	29.85	60 -30.15	50 -	
32	5.02125	16.48 Ca		0.1	10.9	27.48	60 -	50 -22.52	

Qp - Quasi-Peak detector  
Ca - CISPR Average detection

**LINE 1 PLOT – Mode: Full Brightness**



**LINE 1 DATA – Mode: Full Brightness**

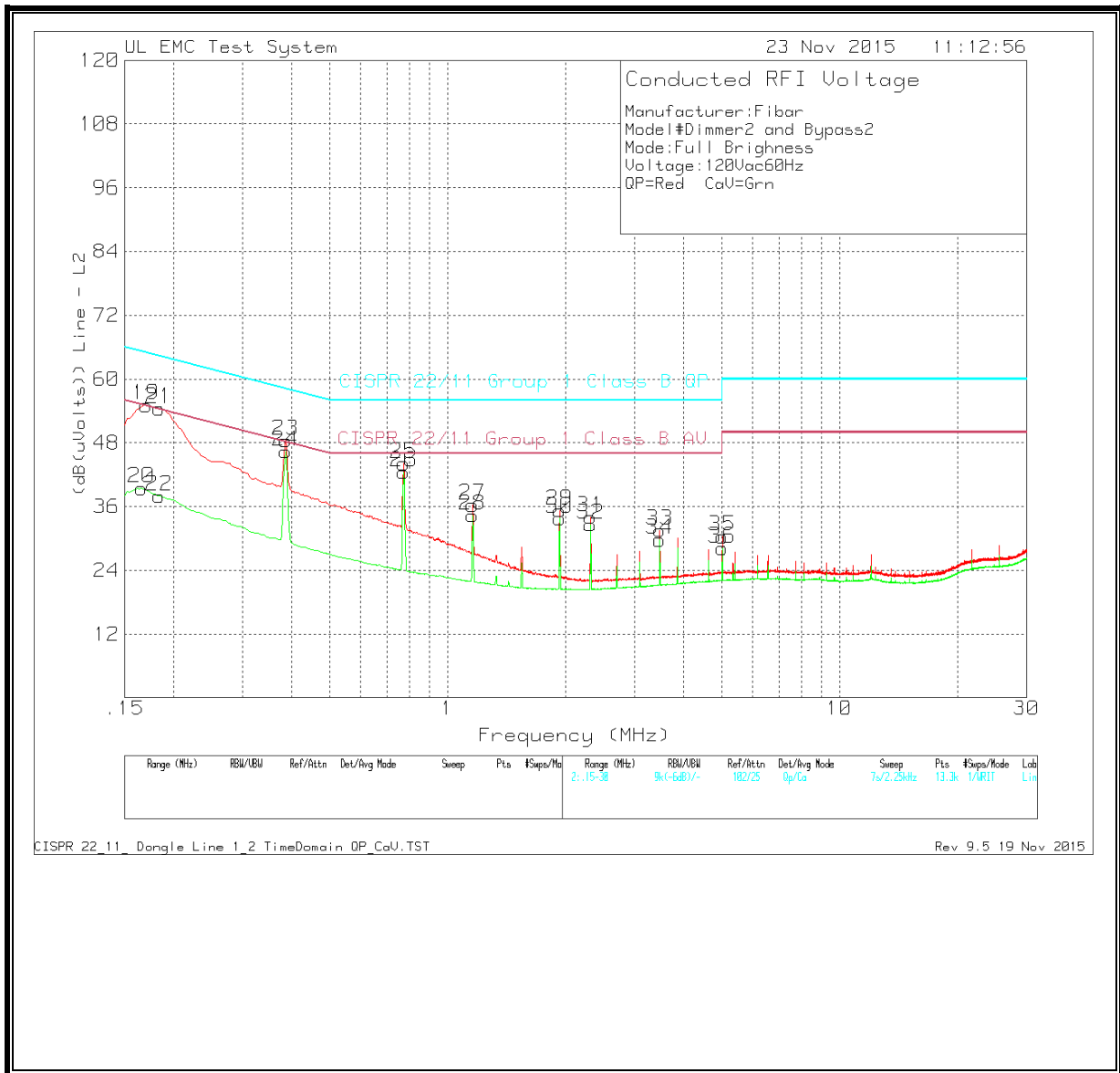
Manufacturer:Fibar  
Model#Dimmer2 and Bypass2  
Mode:Full Brightness  
Voltage:120Vac60Hz  
QP=Red CaV=Grn

Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	LISN 1 Factors dBm	Gain/Loss dBm	Corrected Reading dB(uVolts)	Class B QP Limit	QP Margin (dB)	Class B AV Limit	AV Margin (dB)
1	0.17025	42.81	Qp	0.1	12.2	55.11	64.95	-9.84	54.95	-
2	0.16125	27.07	Ca	0.1	12.5	39.67	65.4	-	55.4	-15.73
3	0.186	42.55	Qp	0.1	11.7	54.35	64.21	-9.86	54.21	-
4	0.186	26.3	Ca	0.1	11.7	38.1	64.21	-	54.21	-16.11
5	0.38625	37.8	Qp	0.1	10.7	48.6	58.14	-9.54	48.14	-
6	0.38625	35.8	Ca	0.1	10.7	46.6	58.14	-	48.14	-1.54
7	0.77325	33.59	Qp	0.1	10.6	44.29	56	-11.71	46	-
8	0.77325	31.96	Ca	0.1	10.6	42.66	56	-	46	-3.34
9	1.158	25.52	Qp	0.1	10.6	36.22	56	-19.78	46	-
10	1.158	23.54	Ca	0.1	10.6	34.24	56	-	46	-11.76
11	1.932	24.53	Qp	0.1	10.6	35.23	56	-20.77	46	-
12	1.932	23.05	Ca	0.1	10.6	33.75	56	-	46	-12.25
13	2.319	23.24	Qp	0.1	10.6	33.94	56	-22.06	46	-
14	2.319	21.81	Ca	0.1	10.6	32.51	56	-	46	-13.49
15	3.47775	20.82	Qp	0.1	10.7	31.62	56	-24.38	46	-
16	3.47775	19.07	Ca	0.1	10.7	29.87	56	-	46	-16.13
17	5.02125	19.55	Qp	0.1	10.7	30.35	60	-29.65	50	-
18	5.02125	17.36	Ca	0.1	10.7	28.16	60	-	50	-21.84

Qp - Quasi-Peak detector  
Ca - CISPR Average detection



**LINE 2 PLOT – Mode: Full Brightness**



**LINE 2 DATA – Mode: Full Brightness**

Manufacturer:Fibar  
Model#Dimmer2 and Bypass2  
Mode:Full Brightness  
Voltage:120Vac60Hz  
QP=Red CaV=Grn

Marker No.	Test Frequency (MHz)	Meter Reading (dBuV) Detector	LISN 2 Factors dBm	Gain/Loss dBm	Corrected Reading dB(uVolts)	Class B QP Limit	QP Margin (dB)	Class B AV Limit	AV Margin (dB)
19	0.17025	42.67 Qp		0.1	12.3	55.07	64.95 -9.88	54.95 -	
20	0.16575	26.96 Ca		0.1	12.4	39.46	65.17 -	55.17 -15.71	
21	0.18375	42.43 Qp		0.1	11.9	54.43	64.31 -9.88	54.31 -	
22	0.18375	25.99 Ca		0.1	11.9	37.99	64.31 -	54.31 -16.32	
23	0.38625	37.55 Qp		0.1	10.8	48.45	58.14 -9.69	48.14 -	
24	0.38625	35.5 Ca		0.1	10.8	46.4	58.14 -	48.14 -1.74	
25	0.77325	33.29 Qp		0.1	10.7	44.09	56 -11.91	46 -	
26	0.77325	31.7 Ca		0.1	10.7	42.5	56 -	46 -3.5	
27	1.158	25.51 Qp		0.1	10.7	36.31	56 -19.69	46 -	
28	1.158	23.56 Ca		0.1	10.7	34.36	56 -	46 -11.64	
29	1.932	24.47 Qp		0.1	10.7	35.27	56 -20.73	46 -	
30	1.932	23 Ca		0.1	10.7	33.8	56 -	46 -12.2	
31	2.31675	23.26 Qp		0.1	10.7	34.06	56 -21.94	46 -	
32	2.31675	21.82 Ca		0.1	10.7	32.62	56 -	46 -13.38	
33	3.47775	20.66 Qp		0.1	10.8	31.56	56 -24.44	46 -	
34	3.4755	18.88 Ca		0.1	10.8	29.78	56 -	46 -16.22	
35	5.02125	19.39 Qp		0.1	10.9	30.39	60 -29.61	50 -	
36	5.02125	17.17 Ca		0.1	10.9	28.17	60 -	50 -21.83	

Qp - Quasi-Peak detector  
Ca - CISPR Average detection