



FCC 47 CFR PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

Home Center Lite

MODEL NUMBER: FGHCL-001-ZW5

FCC ID: 2AA9MFGHCL001

IC: 20430-FGHCL001

REPORT NUMBER: 10340732-BV3

ISSUE DATE: September 25, 2015

Revision Date: November 2, 2015

Prepared for
Fibar Group S.A.
ul. Lotnicza 1
Poznań, Poland 60-421

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
--	04/21/15	Initial Issue	M.Ferrer
V2	09/25/15	Change company name, address and postal code	S. Kuwatani
V3	11/2/15	Updated Antn Gain, Added RE 9k-30MHz, Added 20dB BW data, updatd model #	M.Ferrer

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS.....	4
2. TEST METHODOLOGY	5
3. FACILITIES AND ACCREDITATION	5
4. CALIBRATION AND UNCERTAINTY.....	5
4.1. MEASURING INSTRUMENT CALIBRATION	5
4.2. SAMPLE CALCULATION	5
4.3. MEASUREMENT UNCERTAINTY.....	6
5.5. DESCRIPTION OF TEST SETUP	8
6. TEST AND MEASUREMENT EQUIPMENT	10
7. TEST RESULTS	11
7.1.1. 99% and 20dB BANDWIDTH	11
7.2. RADIATED EMISSIONS.....	15
7.2.1. FUNDAMENTAL FREQUENCY RADIATED EMISSION	16
7.2.2. HARMONICS AND SPURIOUS EMISSIONS ABOVE 1GHz	17
7.2.3. WORST-CASE BELOW 1 GHz	21
8. AC POWER LINE CONDUCTED EMISSIONS	25
9. SETUP PHOTOS	29

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Fibar Group S.A.
ul. Lotnicza 1
Poznan, Poland 60-421

EUT DESCRIPTION: Home Center Lite

MODEL: FGHCL-001_ZW5

SERIAL NUMBER: Prototype

DATE TESTED: November 19, 2014 – November 2, 2015

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

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

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

Approved & Released For
UL LLC By:



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 C63.4-2009, FCC CFR 47 Part 2, FCC CFR 47 Part 15,

Testing Deviation - EUT was tested 1.5m height for above 1GHz Radiated Emissions in accordance TCB Conference call Dec 2014.

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.

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

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a Zwave Hub that contains a 900MHz transmitter. EUT is AC powered

The radio module is manufactured by Fibar Group.

5.2. MAXIMUM OUTPUT E-FIELD STRENGTH

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

Frequency Range (MHz)	Mode	Output PK E-field Strength (dBuV/m)
908.4-916.025	TX	93.94

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a monopole antenna, with a maximum gain of 3.0 dBi.

5.4. WORST-CASE CONFIGURATION AND MODE

The EUT was set in worst axis as found in preliminary testing. This included different antenna directions and EUT orientations.

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Home Center Lite	Fibar	HCL	-	-
Power Supply	CMP	S012WU1200100	-	-

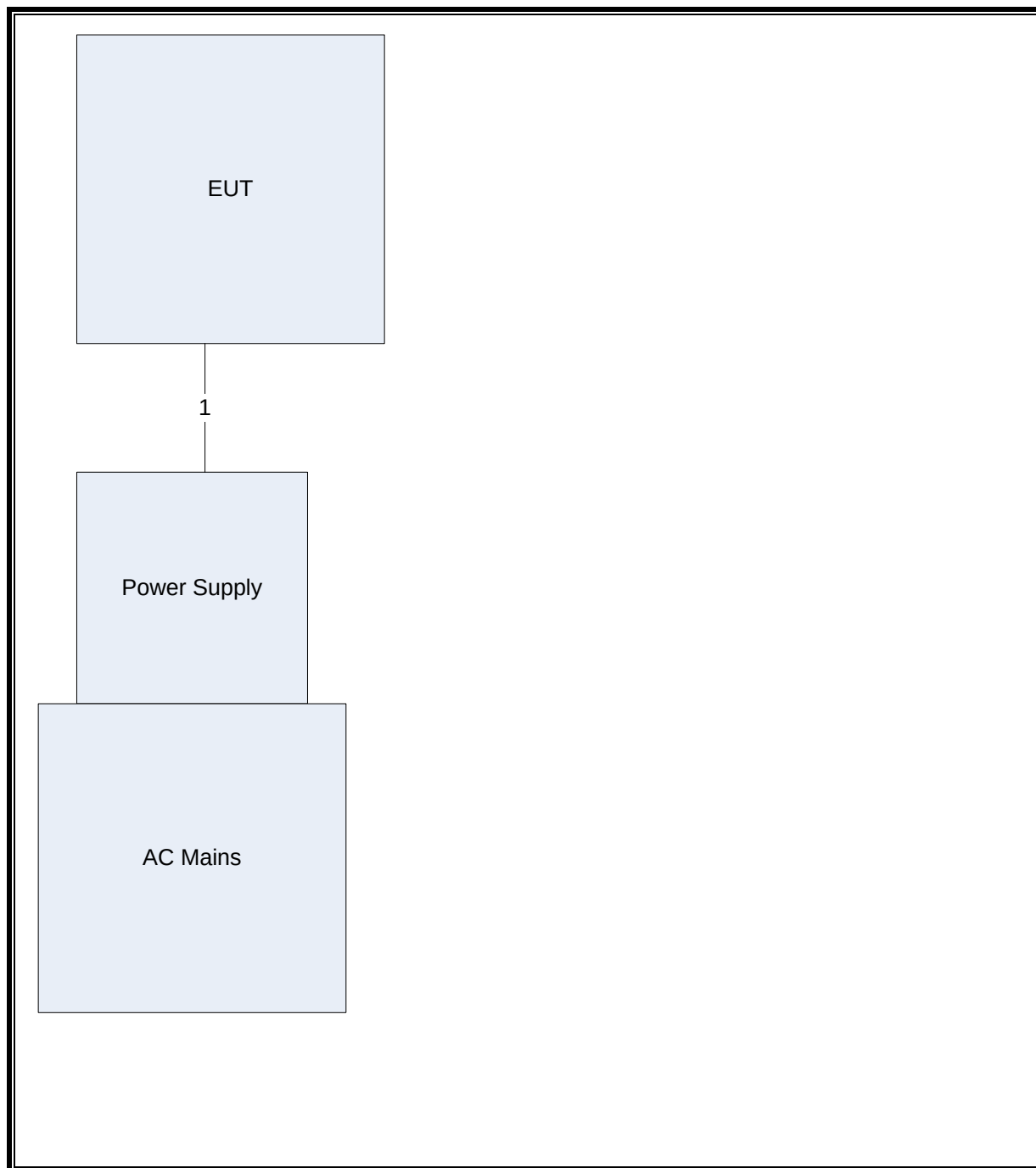
I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC	1	DC	2 wire	>3m	connection to DC supply

TEST SETUP

The EUT is setup as a table top unit. 2 separate EUT samples were preprogrammed with 100% duty cycle for Lo and Hi 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:

EMI Test Receiver	Rohde & Schwarz	ESCI	EMC4328	20141830	20151231
Bicon Antenna	Chase	VBA6106A	EMC4078	20140401	20150401
Log-P Antenna	Chase	UPA6109	EMC4313	24141119	20151130
Spectrum Analyzer	Rohde & Schwarz	ESU	EMC4323	20141216	20151231
Antenna Array	UL	BOMS	EMC4276	20141201	20151231
EMI Test Receiver	Agilent	N9030A	EMC4360	20141219	20151219
EMI Test Receiver	Rohde & Schwarz	ESR	EMC4377	20140401	20150401
LISN	Solar	8602-50-TS-	EMC4052	20150109	20160110
LISN	Solar	8602-50-TS-	EMC4064	20150109	20160110
Loop Antenna	EMCO	6502/1	EMC4026	20150420	20160430

7. TEST RESULTS

7.1.1. 99% and 20dB BANDWIDTH

LIMITS

None; for reporting purposes only.

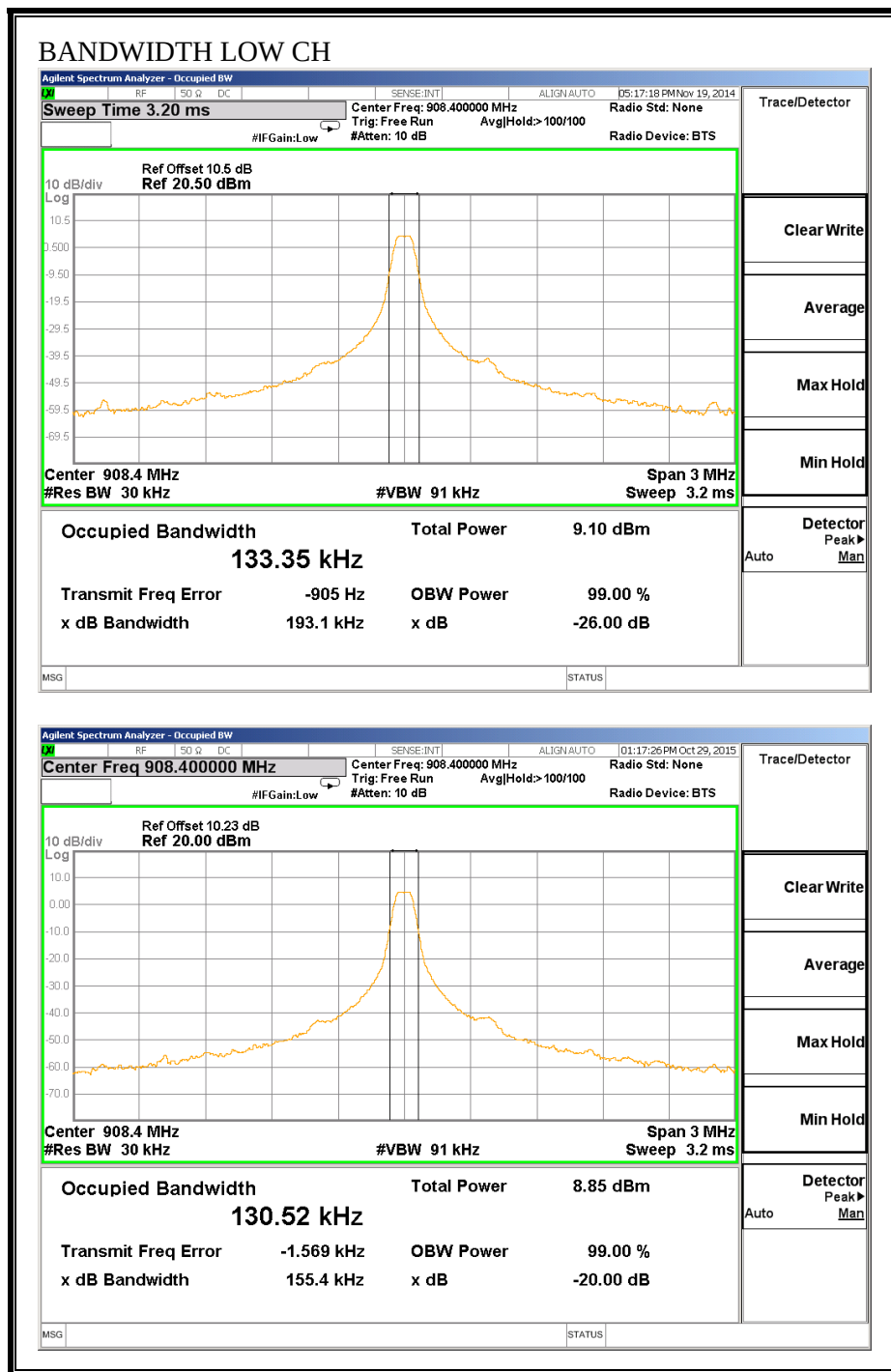
TEST PROCEDURE

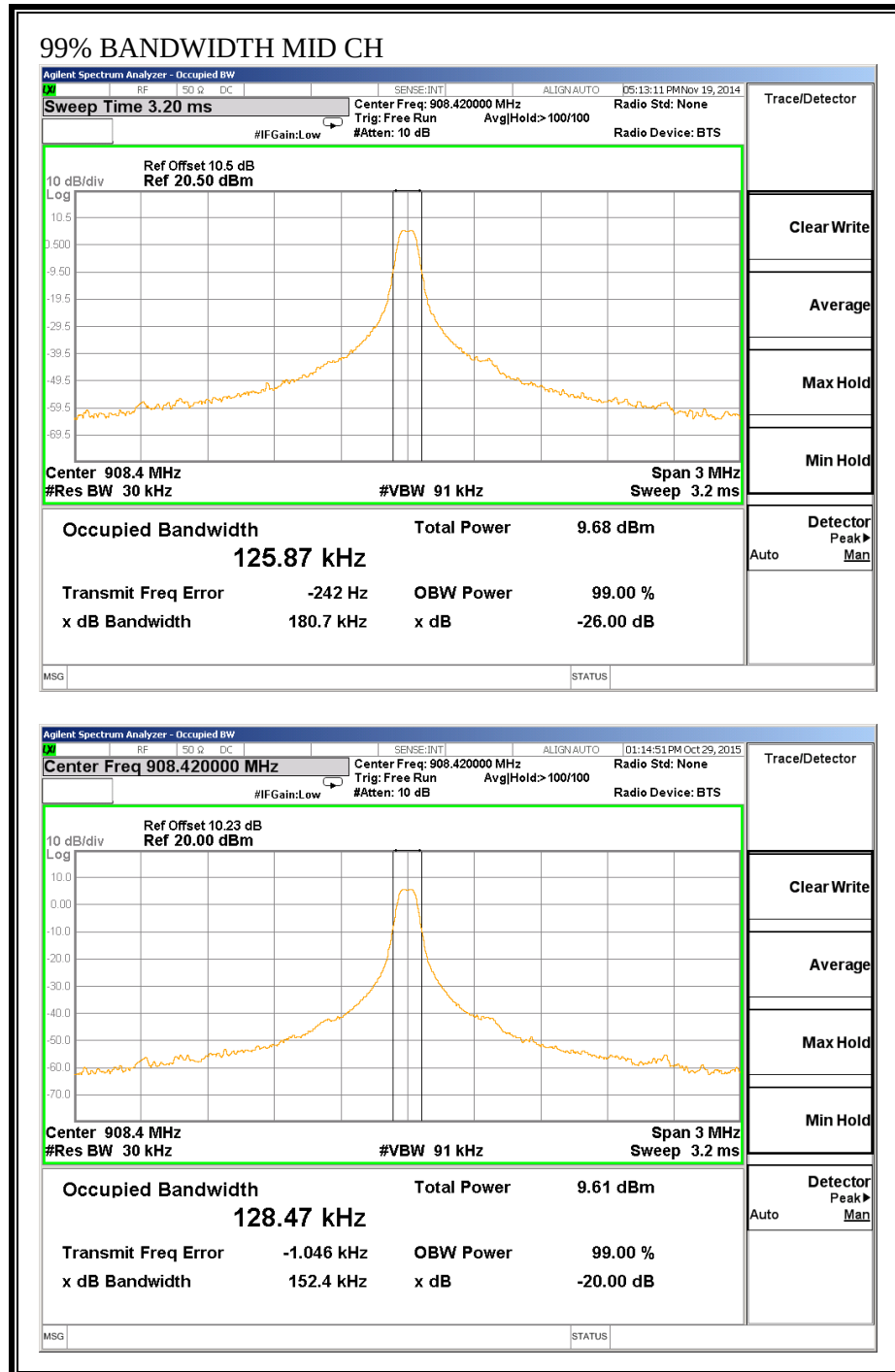
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% and 20dB bandwidth function is utilized.

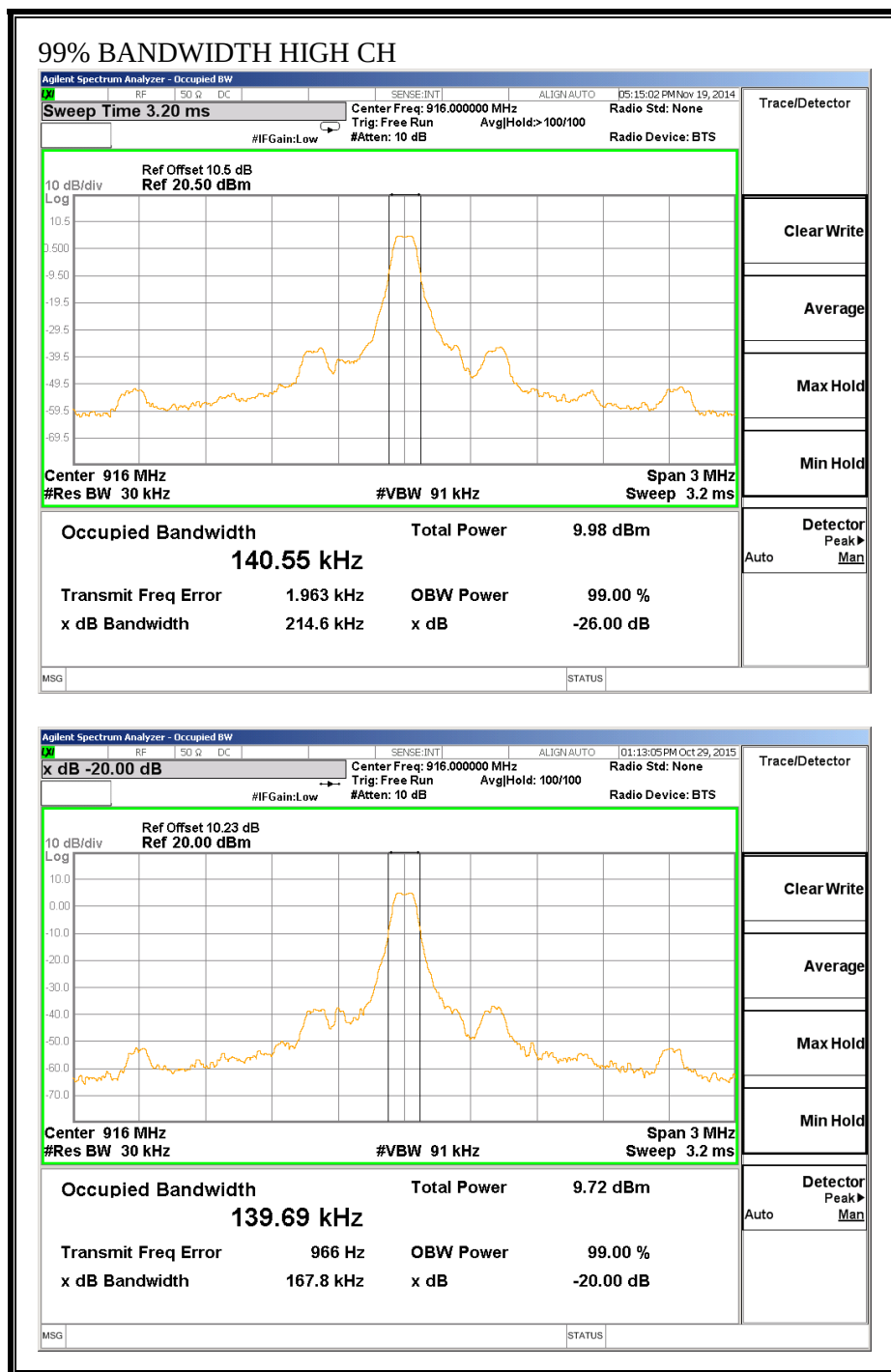
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)	20% Bandwidth (MHz)
Low	908.40	0.13335	0.1554
Middle	908.42	0.12587	0.1524
High	916.00	0.14055	0.1678

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

7.2.1. FUNDAMENTAL FREQUENCY RADIATED EMISSION

Radiated Emission Data										
Test	Meter	Transducer	Gain/Loss	Corrected	Limit:1	2	3	4	5	6
Notes										
Frequency (MHz)	Reading	Factor (dB)	Factor (dB)	Reading dB(uVolts/meter)						
=====										
=====										
Range 3: LogP Horizontal 200 - 1000MHz				-----						
916.0258	55.48dBuV	Qp	23.4	10.3	89.18	94	-	-	-	-
1										
Azimuth: 160	Height:161	Horz			Margin (dB): -4.82	-	-	-	-	-
908.38296	60.34dBuV	Qp	23.3	10.3	93.94	94	-	-	-	-
2										
Azimuth: 150	Height:159	Horz			Margin (dB): -.06	-	-	-	-	-

Notes:

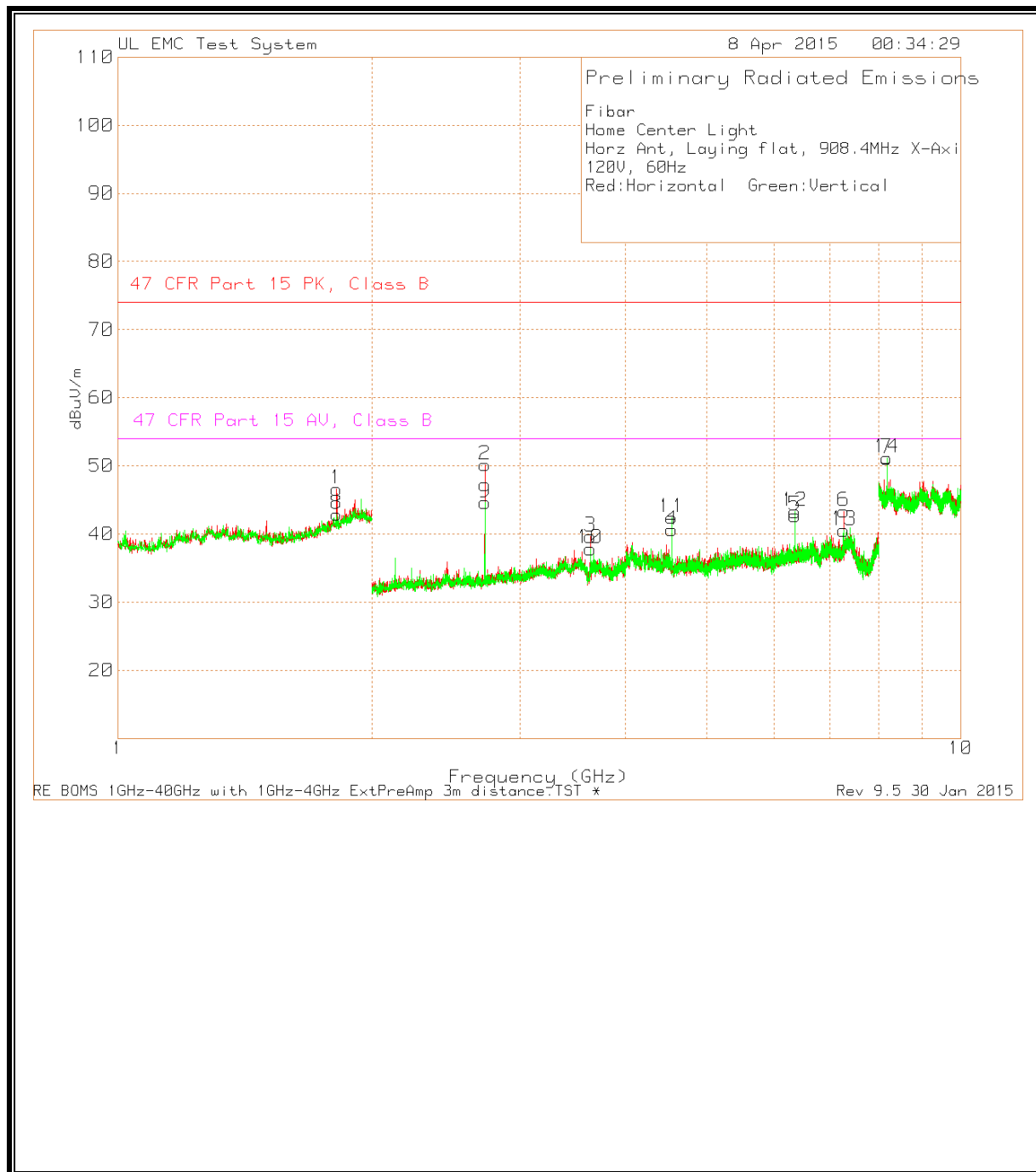
- 1 - 916.02 tx EUT Flat antenna sideways
- 2 - 908.38 tx EUT flat antenna sideways

LIMIT 1: Limit

Qp - Quasi-Peak detector

Worst Case emissions is displayed from preliminary measurements.

7.2.2. HARMONICS AND SPURIOUS EMISSIONS ABOVE 1GHz



Fibar

Home Center Light

Horz Ant, Laying flat, 908.4MHz X-Axis

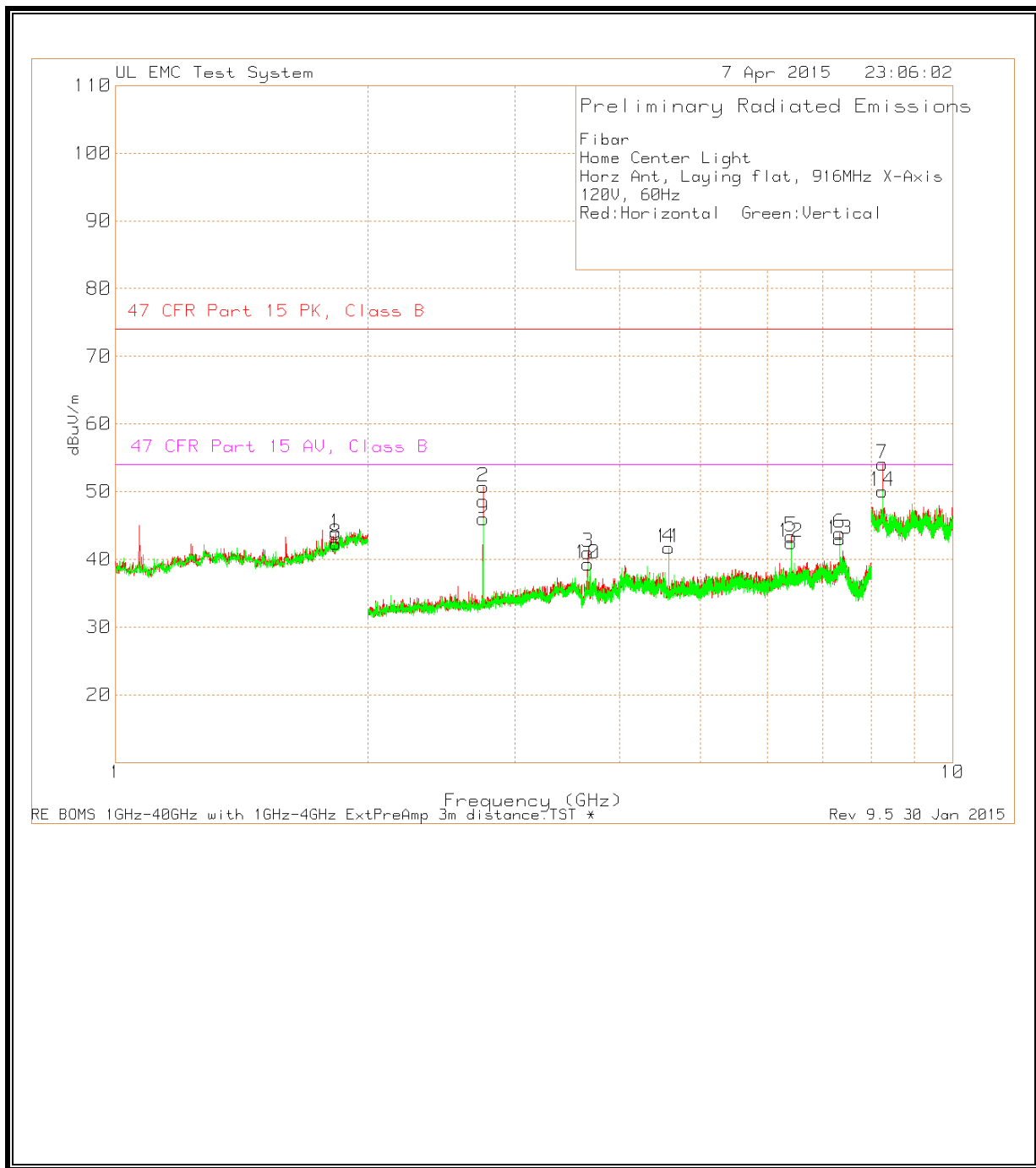
120V, 60Hz

Red:Horizontal Green:Vertical

Test	Meter	Antenna	47 CFR				47 CFR					
			Corrected	Part 15	Part 15	Part 15	Part 15	Part 15	Part 15	Part 15		
Frequenc	Reading	Factor	Gain/Loss	Reading	PK, Class	Margin	AV, Class	Margin	Azimuth	Height		
y (GHz)	(dBuV)	Detector	dB/m	(dB)	dBuV/m	B	(dB)	B	(dB)	[Deps]	[cm]	Polarity
2.7252	79.88 Pk		22.1	-51.33	50.65	74	-23.35	54	-3.35	246	247	H
2.7252	78.7 Av		22.1	-51.33	49.47	74	-24.53	54	-4.53	246	247	H
2.7252	74.59 Pk		22.1	-51.33	45.36	74	-28.64	54	-8.64	70	253	V
2.7252	72.45 Av		22.1	-51.33	43.22	74	-30.78	54	-10.78	70	253	V
8.1757	65.88 Pk		36.3	-48.24	53.94	74	-20.06	54	-0.06	187	178	H
8.1756	58.87 Av		36.3	-48.25	46.92	74	-27.08	54	-7.08	187	178	H
8.1758	65.45 Pk		36.3	-48.24	53.51	74	-20.49	54	-0.49	327	171	V
8.1756	57.87 Av		36.3	-48.25	45.92	74	-28.08	54	-8.08	327	171	V

Pk - Peak detector

Av - Average detection



Fibar

Home Center Light

Horz Ant, Laying flat, 916MHz X-Axis

120V, 60Hz

Red:Horizontal Green:Vertical

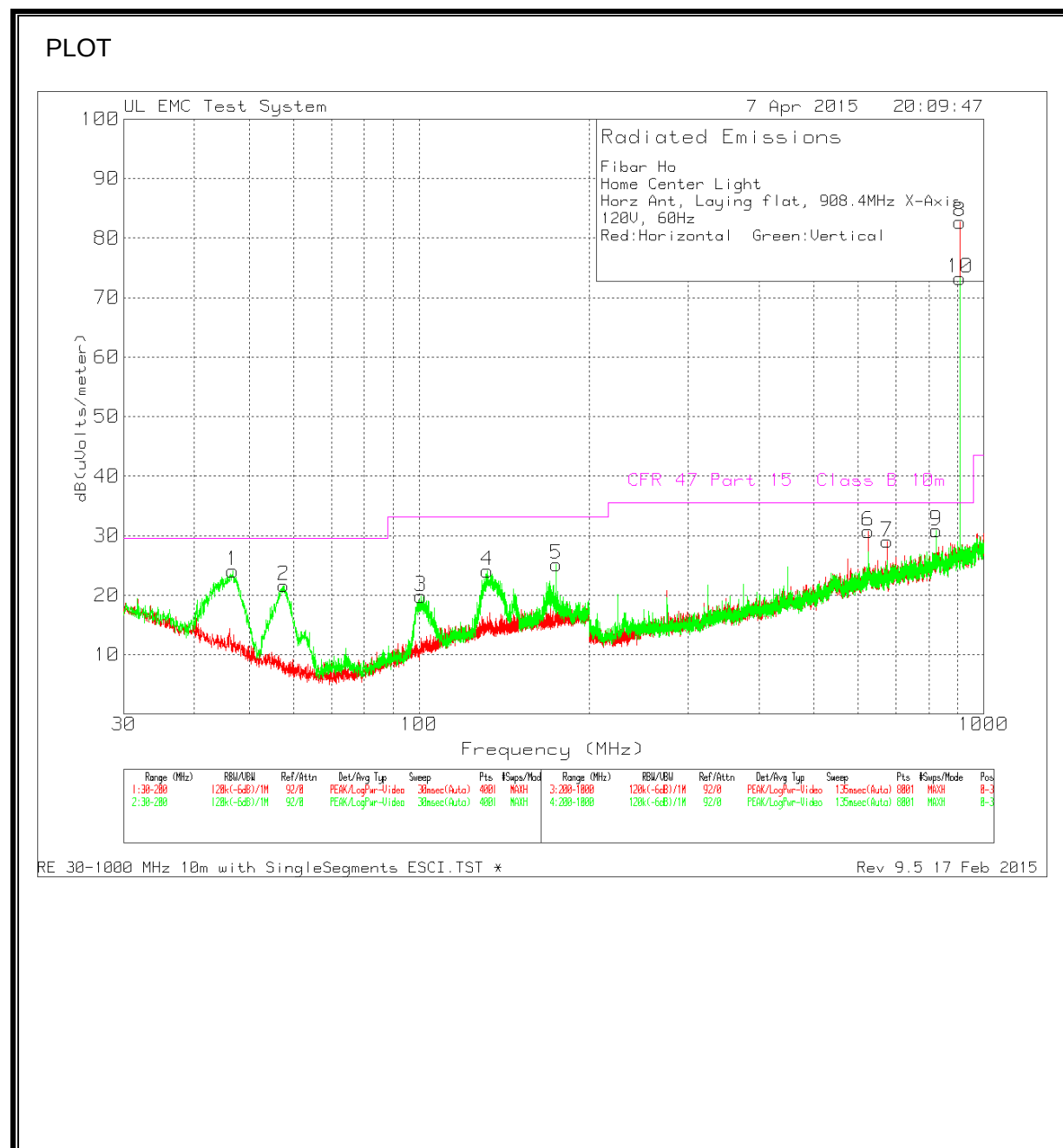
Test	Meter	Antenna	Corrected	47 CFR		47 CFR		Azimuth	Height	Polarity
				Part 15	Part 15	Part 15	Part 15			
Frequency	Reading	Factor	Gain/Loss	Reading	PK, Class	Margin	AV, Class	Margin		
(GHz)	(dBuV)	Detector	dB/m	(dB)	dBuV/m	B	(dB)	B	[Degs]	[cm]
2.748	79.25 Pk		22.1	-51.24	50.11	74	-23.89	-	253	114 H
2.748	78 Av		22.1	-51.24	48.86	-	-	54	-5.14	253
2.748	75.29 Pk		22.1	-51.24	46.15	74	-27.85	-	61	100 V
2.748	73.35 Av		22.1	-51.24	44.21	-	-	54	-9.79	61
8.2439	67.32 Pk		36.4	-47.02	56.7	74	-17.3	-	232	100 H
8.244	61.89 Av		36.4	-47.03	51.26	-	-	54	-2.74	232
8.2438	64.29 Pk		36.4	-47.02	53.67	74	-20.33	-	125	100 V
8.244	56.07 Av		36.4	-47.03	45.44	-	-	54	-8.56	125

Pk - Peak detector

Av - Average detection

7.2.3. WORST-CASE BELOW 1 GHz

SPURIOUS EMISSIONS 30 TO 1000 MHz

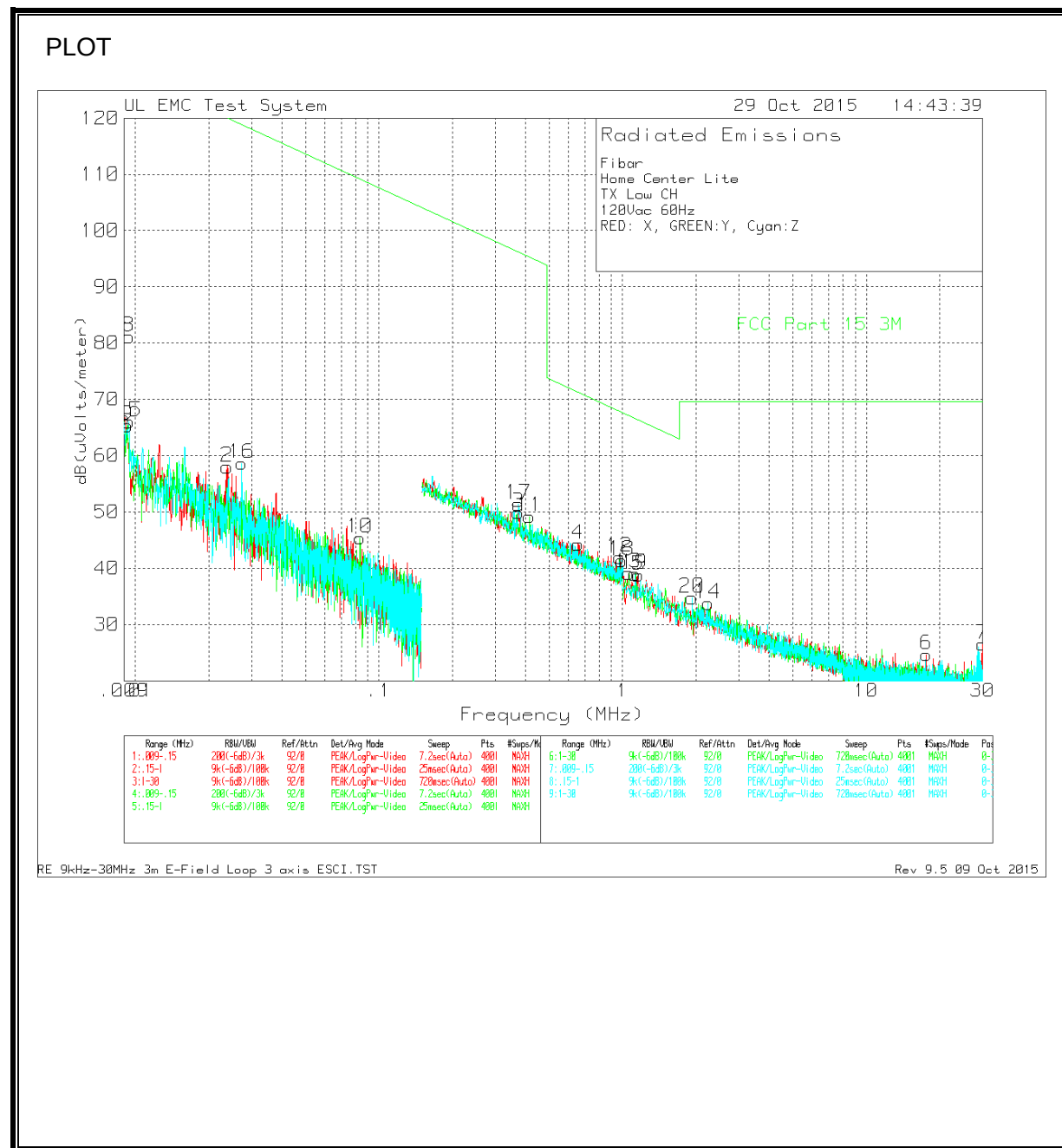


Fibar
Home Center Light
Horz Ant, Laying flat, 908.4MHz X-Axis
120V, 60Hz
Red:Horizontal Green:Vertical

Test	Meter	Antenna	Corrected CFR 47		Part 15	Margin	Azimuth	Height	Polarity
			Factor	Cable	Reading				
Frequenc	Reading	Detector	dB/m	Factor dB	dB(uVolts /meter)	Class B	(dB)	[Deps]	[cm]
y (MHz)	(dBuV)					10m			
46.775	39.05 Qp		11.5	-30.1	20.45	29.55	-9.1	164	100 V
625.0208	32.99 Qp		20.8	-26.3	27.49	35.57	-8.08	229	174 H
825.021	34.35 Qp		22.6	-26.6	30.35	35.57	-5.22	254	397 V

Qp - Quasi-Peak detector

SPURIOUS EMISSIONS 9k TO 30 MHz



Fibar

Home Center Lite

TX Low CH

120Vac 60Hz

RED: X, GREEN:Y, Cyan:Z

Parallel to ETU

Marker No.	Test Frequenc y (MHz)	Meter Reading(d BuV)	Antenna Factor dB/m	Cable Factor dB	Corrected Reading dB(uVolts /meter)	FCC Part 15 3M	Margin (dB)	Azimuth [Degs]
1	0.009035	44.36 Pk	22.4	0	66.76	128.47	-61.71	0-360
2	0.02384	41.58 Pk	16.4	0	57.98	120.04	-62.06	0-360
3	0.37259	38.01 Pk	11.9	0	49.91	96.18	-46.27	0-360
4	0.65588	32.27 Pk	12	0	44.27	71.27	-27	0-360
5	1.1595	26.07 Pk	12.6	0.1	38.77	66.32	-27.55	0-360
6	17.6315	13.53 Pk	10.9	0.2	24.63	69.54	-44.91	0-360
7	30	17.06 Pk	9.1	0.3	26.46	69.54	-43.08	0-360

Perpend to EUT

8	0.00942	59.23 Pk	21.9	0	81.13	128.1	-46.97	0-360
9	0.00928	43.38 Pk	22	0	65.38	128.23	-62.85	0-360
10	0.083655	32.49 Pk	12.9	0	45.39	109.15	-63.76	0-360
11	0.41497	37.3 Pk	11.9	0	49.2	95.24	-46.04	0-360
12	0.97165	29.35 Pk	12.5	0.1	41.95	67.85	-25.9	0-360
13	1.058	26.43 Pk	12.6	0.1	39.13	67.11	-27.98	0-360
14	2.247	21.41 Pk	12.2	0.1	33.71	69.54	-35.83	0-360

Parallel to GND

15	0.00942	44.13 Pk	21.9	0	66.03	128.1	-62.07	0-360
16	0.02734	42.45 Pk	16.2	0	58.65	118.85	-60.2	0-360
17	0.37386	39.46 Pk	11.9	0	51.36	96.15	-44.79	0-360
18	0.99199	28.63 Pk	12.6	0.1	41.33	67.67	-26.34	0-360
19	1.12325	26.23 Pk	12.6	0.1	38.93	66.59	-27.66	0-360
20	1.928	22.32 Pk	12.3	0.1	34.72	69.54	-34.82	0-360

Pk - Peak detector

8. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

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

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

TEST PROCEDURE

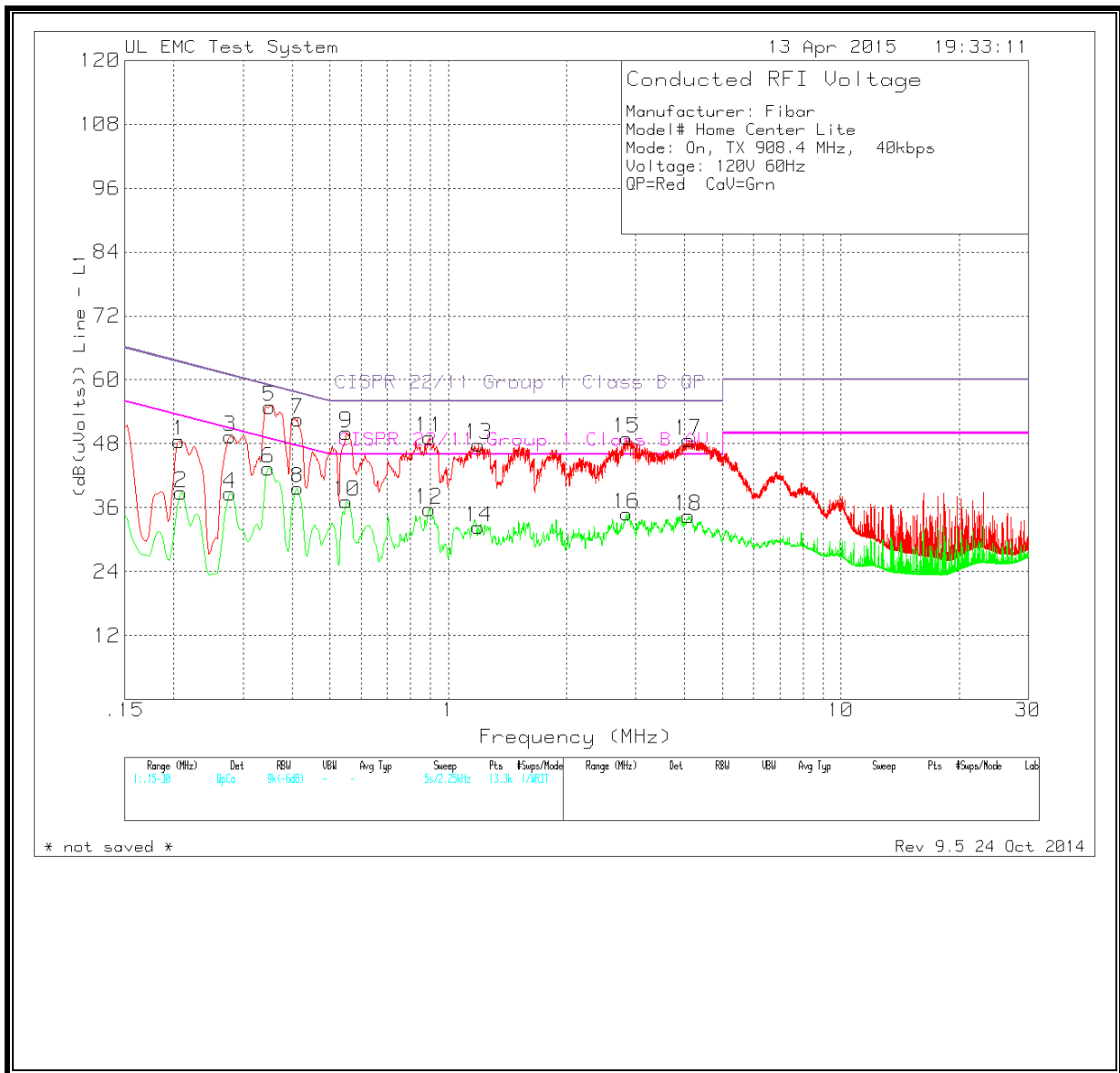
The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

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

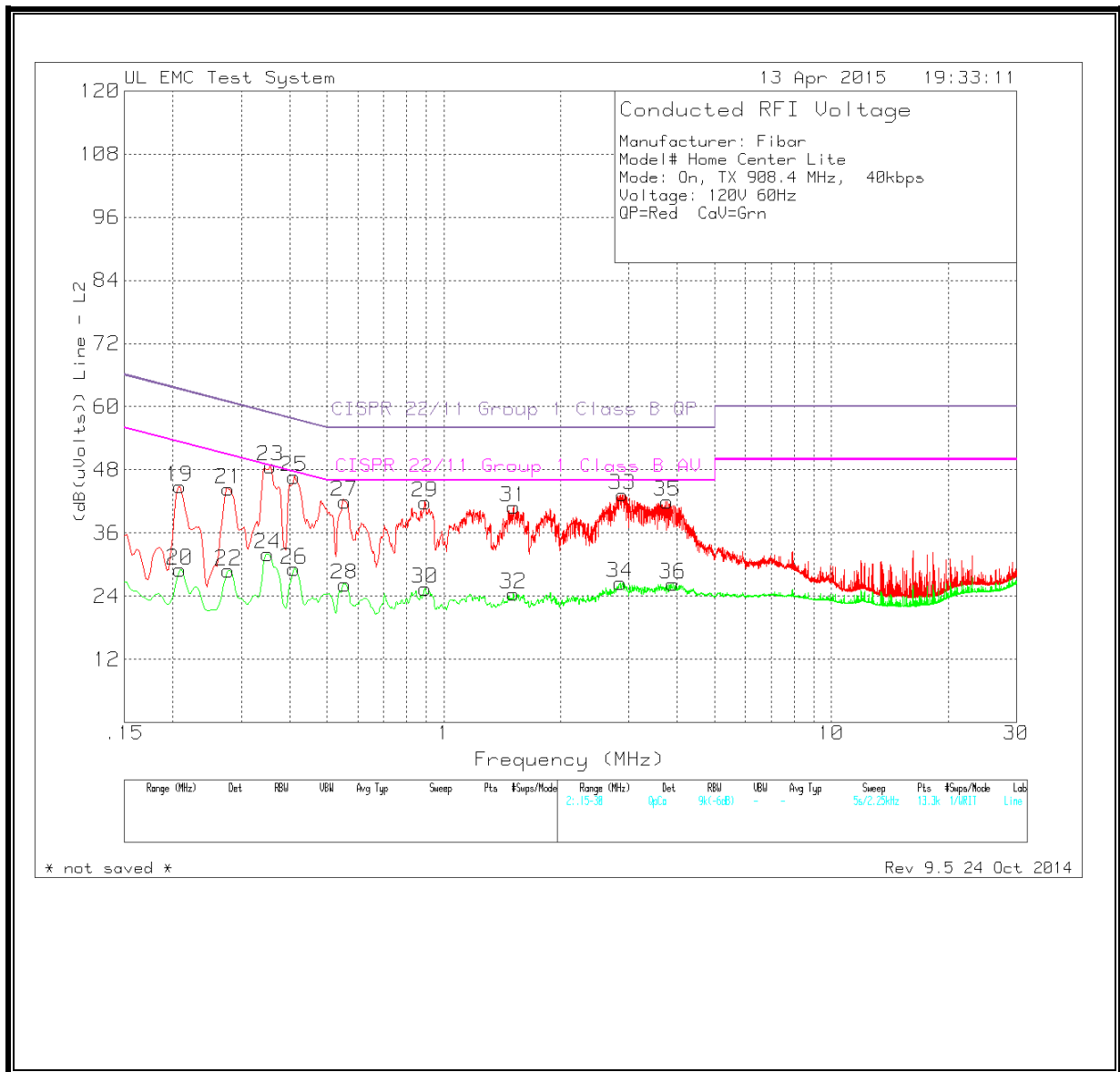
Line conducted data is recorded for both NEUTRAL and HOT lines.

RESULTS

LINE 1 RESULTS



LINE 2 RESULTS



Manufacturer: Fibar
Model# Home Center Lite
Mode: On, TX 908.4 MHz, 40kbps
Voltage: 120V 60Hz
QP=Red CaV=Grn

Line - L1 .15 - 30MHz

Marker No.	Test Frequency (MHz)	Meter Reading(dBuV)	Detector	LISN 1 Dongle.TX T	LINE 1 with fliter.TXT	Corrected Reading (dB(uV s))	CISPR 22/11		CISPR 22/11	
							Group 1 Class B QP	Margin (dB)	Group 1 Class B AV	Margin (dB)
1	0.20625	37.06	Qp		0.1	11.4	48.56	63.35	-14.79	-
2	0.2085	27.33	Ca		0.1	11.4	38.83	-	53.26	-14.43
3	0.27825	38.27	Qp		0.1	11	49.37	60.87	-11.5	-
4	0.27825	27.55	Ca		0.1	11	38.65	-	50.87	-12.22
5	0.35025	44.05	Qp		0.1	10.8	54.95	58.96	-4.01	-
6	0.348	32.47	Ca		0.1	10.8	43.37	-	49.01	-5.64
7	0.41325	41.81	Qp		0.1	10.7	52.61	57.58	-4.97	-
8	0.41325	28.91	Ca		0.1	10.7	39.71	-	47.58	-7.87
9	0.5505	39.35	Qp		0.1	10.6	50.05	56	-5.95	-
10	0.5505	26.51	Ca		0.1	10.6	37.21	-	46	-8.79
11	0.89475	38.48	Qp		0.1	10.6	49.18	56	-6.82	-
12	0.89475	25	Ca		0.1	10.6	35.7	-	46	-10.3
13	1.194	37.14	Qp		0.1	10.6	47.84	56	-8.16	-
14	1.194	21.69	Ca		0.1	10.6	32.39	-	46	-13.61
15	2.8455	38.35	Qp		0.1	10.6	49.05	56	-6.95	-
16	2.84663	24.17	Ca		0.1	10.6	34.87	-	46	-11.13
17	4.09425	37.85	Qp		0.1	10.7	48.65	56	-7.35	-
18	4.092	23.66	Ca		0.1	10.7	34.46	-	46	-11.54

Line - L2 .15 - 30MHz

Marker No.	Test Frequency (MHz)	Meter Reading(dBuV)	Detector	LISN 2 Dongle.TX T	LINE 2 with fliter.TXT	Corrected Reading (dB(uV s))	CISPR 22/11		CISPR 22/11	
							Group 1 Class B QP	Margin (dB)	Group 1 Class B AV	Margin (dB)
19	0.2085	33.26	Qp		0.1	11.5	44.86	63.26	-18.4	-
20	0.2085	17.39	Ca		0.1	11.5	28.99	-	53.26	-24.27
21	0.27825	33.2	Qp		0.1	11.1	44.4	60.87	-16.47	-
22	0.27825	17.65	Ca		0.1	11.1	28.85	-	50.87	-22.02
23	0.357	37.67	Qp		0.1	10.9	48.67	58.8	-10.13	-
24	0.35137	20.99	Ca		0.1	10.9	31.99	-	48.93	-16.94
25	0.411	35.74	Qp		0.1	10.8	46.64	57.63	-10.99	-
26	0.411	18.23	Ca		0.1	10.8	29.13	-	47.63	-18.5
27	0.555	31.16	Qp		0.1	10.7	41.96	56	-14.04	-
28	0.555	15.44	Ca		0.1	10.7	26.24	-	46	-19.76
29	0.89475	31	Qp		0.1	10.7	41.8	56	-14.2	-
30	0.89475	14.63	Ca		0.1	10.7	25.43	-	46	-20.57
31	1.5135	30.17	Qp		0.1	10.7	40.97	56	-15.03	-
32	1.51125	13.65	Ca		0.1	10.7	24.45	-	46	-21.55
33	2.8905	32.49	Qp		0.1	10.7	43.29	56	-12.71	-
34	2.85225	15.72	Ca		0.1	10.7	26.52	-	46	-19.48
35	3.77025	31.08	Qp		0.1	10.8	41.98	56	-14.02	-
36	3.8985	15.42	Ca		0.1	10.8	26.32	-	46	-19.68

Qp - Quasi-Peak detector
Ca - CISPR Average detection