



**FCC CFR47 PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 8**

**CERTIFICATION TEST REPORT
FOR
LENOVO TABLET PC WITH 802.11abgn**

MODEL NUMBER: TP00043AEF

FCC ID: PU5-TP00043AEF

IC: 4182A-TP00043AEF

REPORT NUMBER: 12U14468-2C

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Prepared for
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Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
--	08/08/12	Initial Issue	M.Ferrer
A	09/07/12	Revised FCC and IC numbers	M.Ferrer
B	09/14/12	Removed UNII Data	M.Ferrer
C	10/30/12	Removed target power levels	M.Ferrer

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: WISTRON CORPORATION
21F, 88, SEC. 1, HSIN TAI WU RD., HSICHIH
TAIPEI HSIEN 221,
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EUT DESCRIPTION: Lenovo Tablet PC with GSM/WCDMA

MODEL NUMBER: TP00043AEF

SERIAL NUMBER: Prototype

DATE TESTED: July 25, 2012 – July 28, 2012

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 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 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 and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL 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:

Tested By:



BART MUCHA
Staff Engineer
UL

MICHAEL FERRER
SENIOR PROJECT ENGINEER
UL

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 Pfungsten Road, Northbrook, IL 60193, 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:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	+/- 0.9 dB (k=2)
Radiated Disturbance, 30 to 1000 MHz	+/- 3.17 dB (k=2)

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is an 802.11a/b/g/n transceiver.

Wifi Card - Broadcom BCM94330LGA

5.2. DESCRIPTION OF AVAILABLE ANTENNAS

Antenna Specification	Wistron Neweb Corp. P/N: 25.90ADN.001 (Main) / 1.88 dBi 25.90ADP.001 (Aux) / 0.17 dBi WhaYu Industrial Co.,Ltd. P/N: 25.90AG6.001 (Main) / -0.04 dBi 25.90AG7.001 (Aux) / -2.23 dBi Antenna Type: WLAN 2.4GHz: PIFA antenna ; WLAN 5GHz: PIFA antenna
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5.3. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was Broadcom version 5.93.97.48.

The test utility software used during testing was Broadcom "wl command" utility.

5.4. WORST-CASE CONFIGURATION AND MODE

The fundamental of the EUT was investigated in three orthogonal orientations X,Y,Z, it was determined that Y for 2.4GHz and X for 5GHz orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in those orientation.

Worst-case data rates as provided by the client were:

802.11b mode: 1 Mbps

802.11g mode: 6 Mbps

802.11a mode: 6 Mbps

802.11n HT20mode: MCS0

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
AC Adapter	Lenovo	42T4416	11S42T4416Z1ZGWF0	DoC

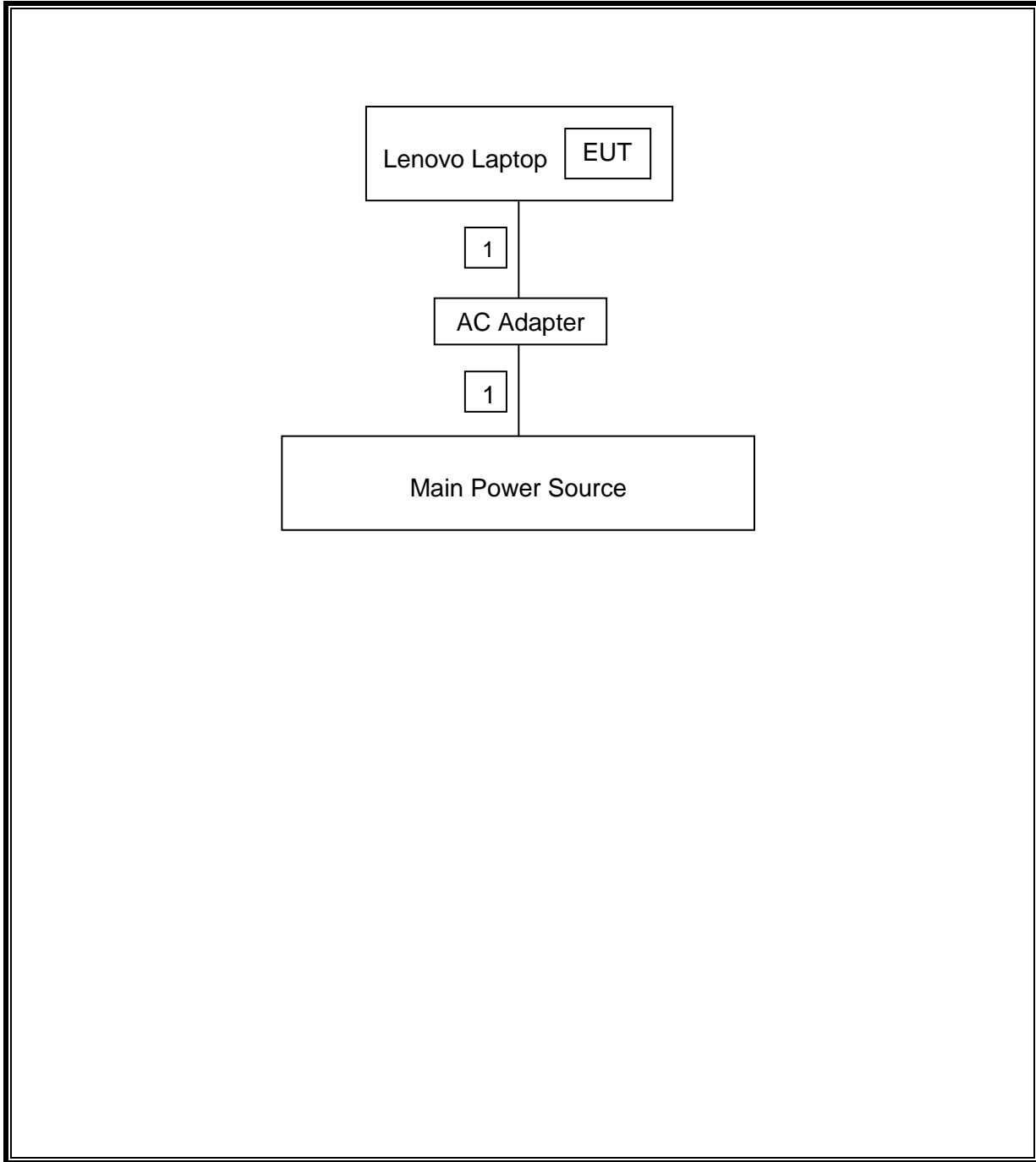
I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	DC	1	DC	Un-shielded	8 ft	AC adapter

TEST SETUP

Test software exercised the radio card.

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 Due
EMI Test Receiver	Rohde & Schwarz	ESCI	EMC4328	20121231
Bicon Antenna	Chase	VBA6106A	EMC4078	20130131
Log-P Antenna	Chase	UPA6109	EMC4258	20120928
Spectrum Analyzer	Rhode & Schwarz	FSEK	EMC4182	20121231
Antenna Array	UL	BOMS	EMC4276	20121231

7. RADIATED TEST RESULTS

7.1. 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

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

The spectrum from 30 MHz to 25 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

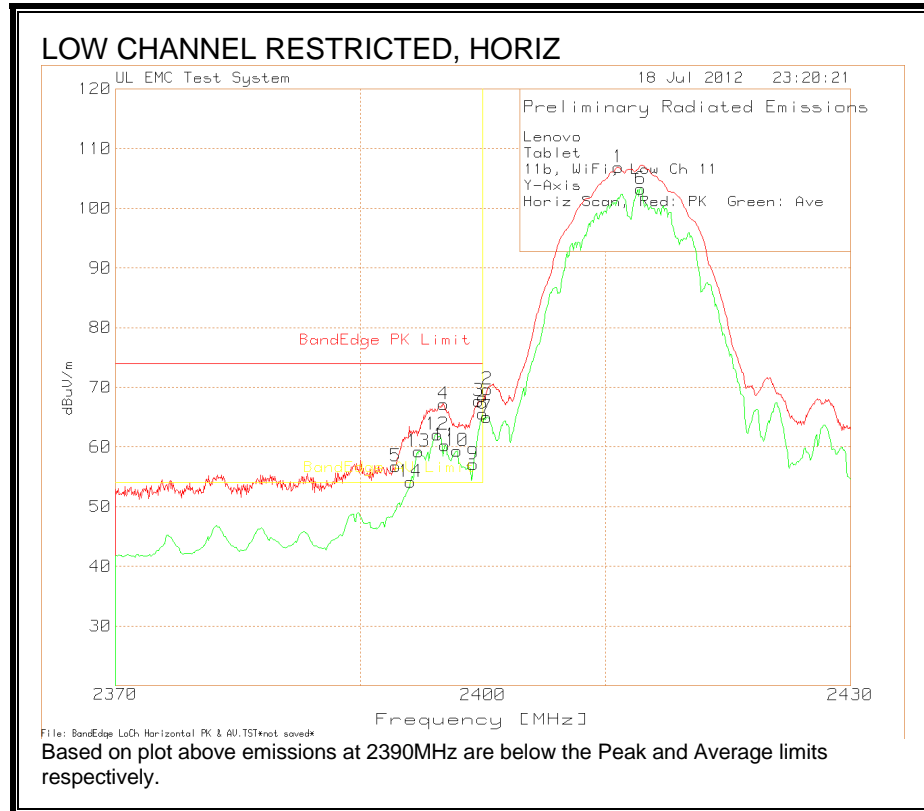
Pre scan was performed with the frequency range of interest. It is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters for below 1GHz and 1 to 2.5 meters for above 1GHz above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

For Bandedge measurements the emissions shall be below the general limit in the restricted band. Some limit shown in plots may not reflect the actual restricted band.

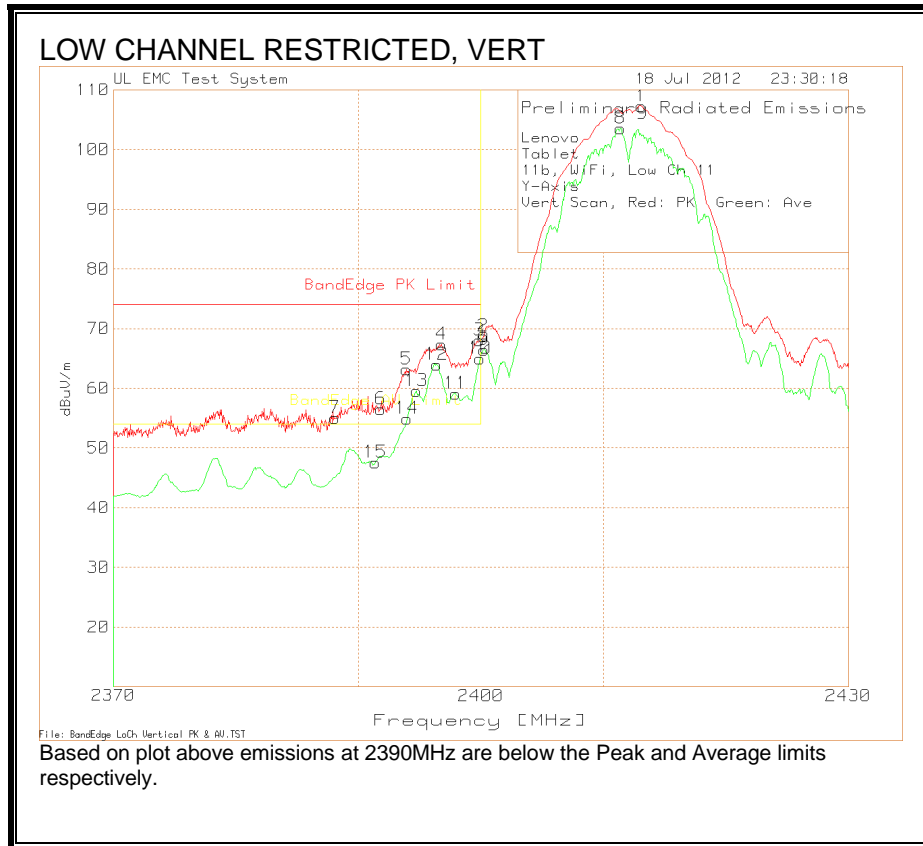
7.2. TRANSMITTER ABOVE 1 GHz

7.2.1. TX ABOVE 1 GHz FOR 802.11b 1TX MODE IN THE 2.4 GHz BAND

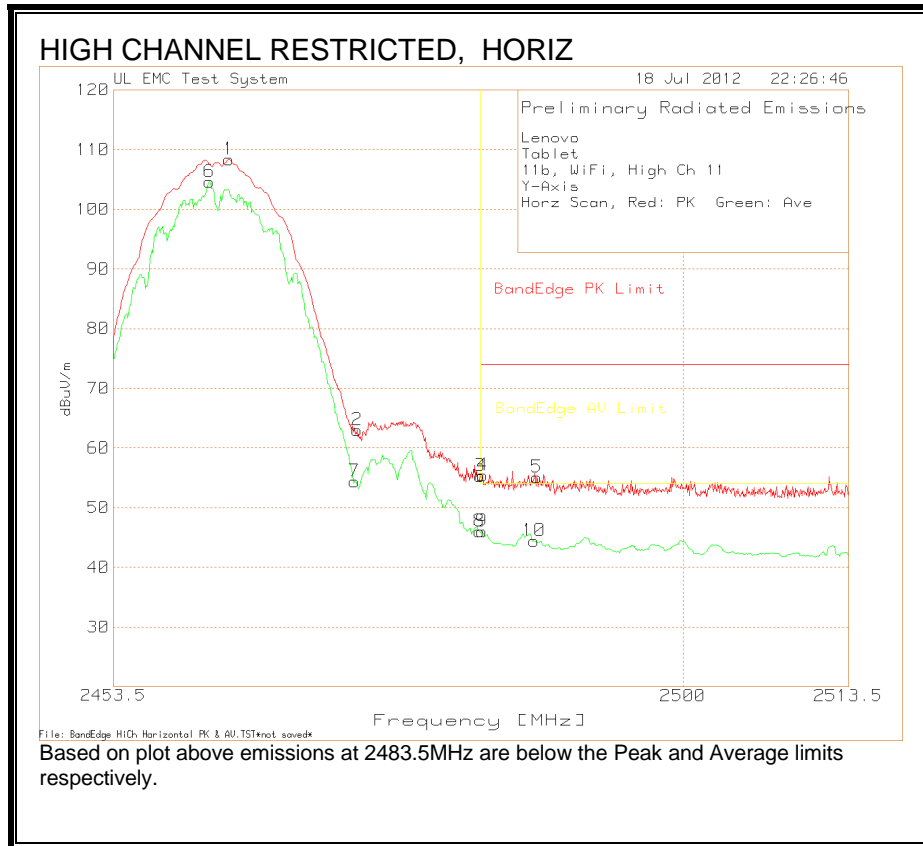
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



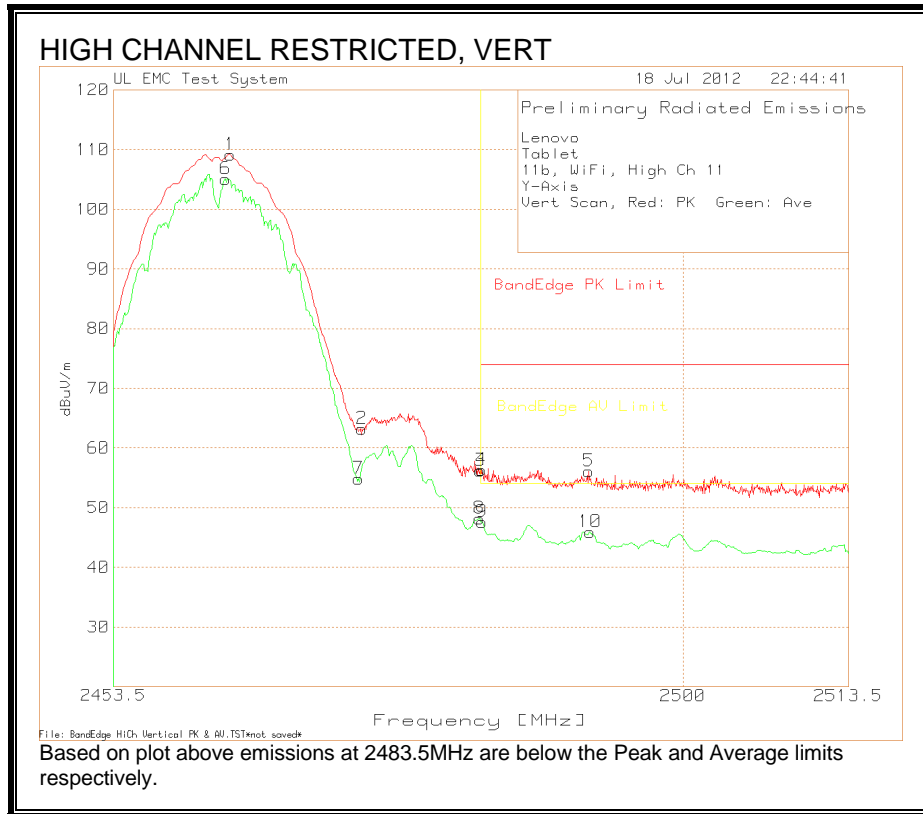
RESTRICTED BANEDGE (LOW CHANNEL, VERTICAL)



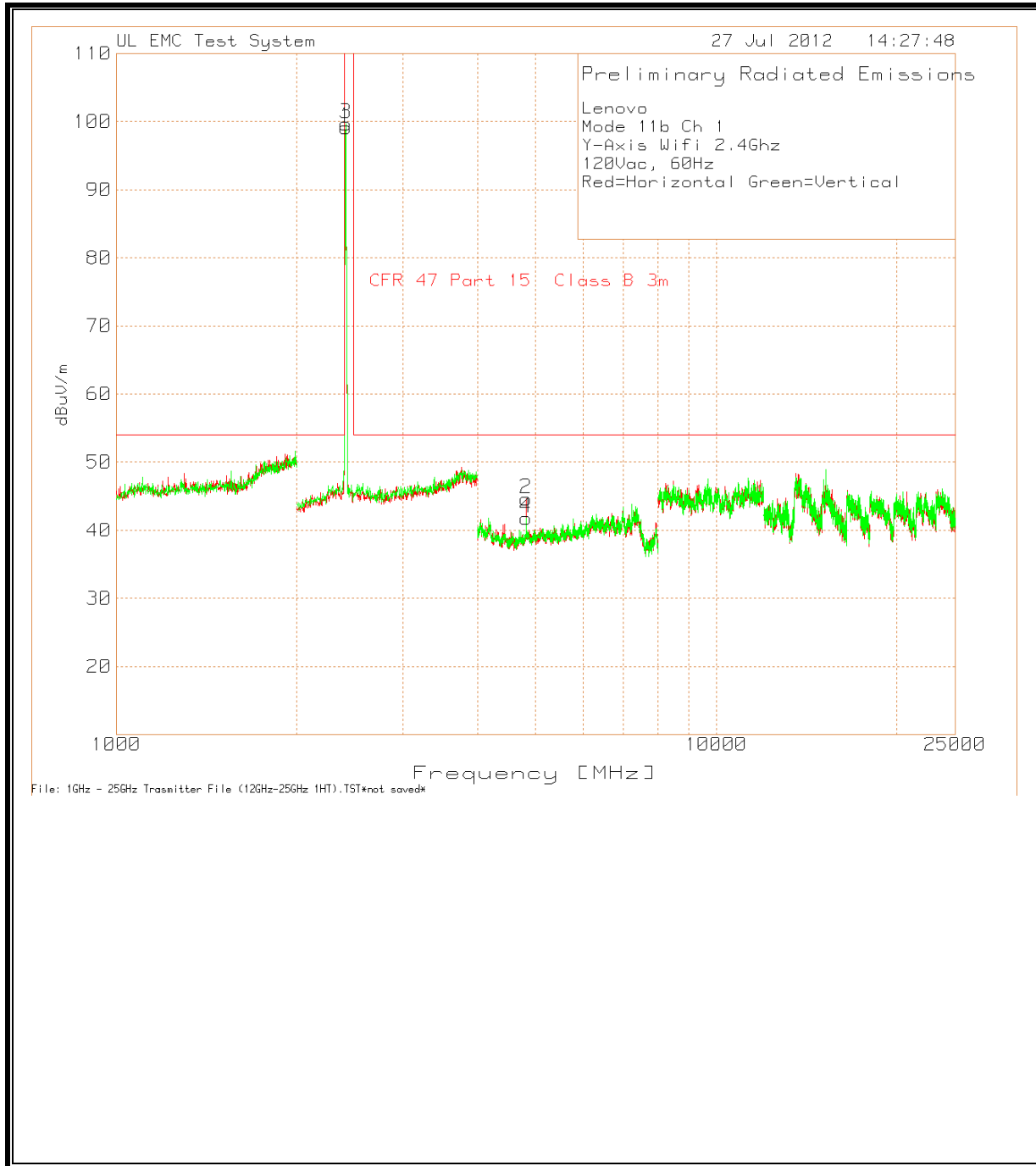
RESTRICTED BANEDGE (HIGH CHANNEL, HORIZONTAL)



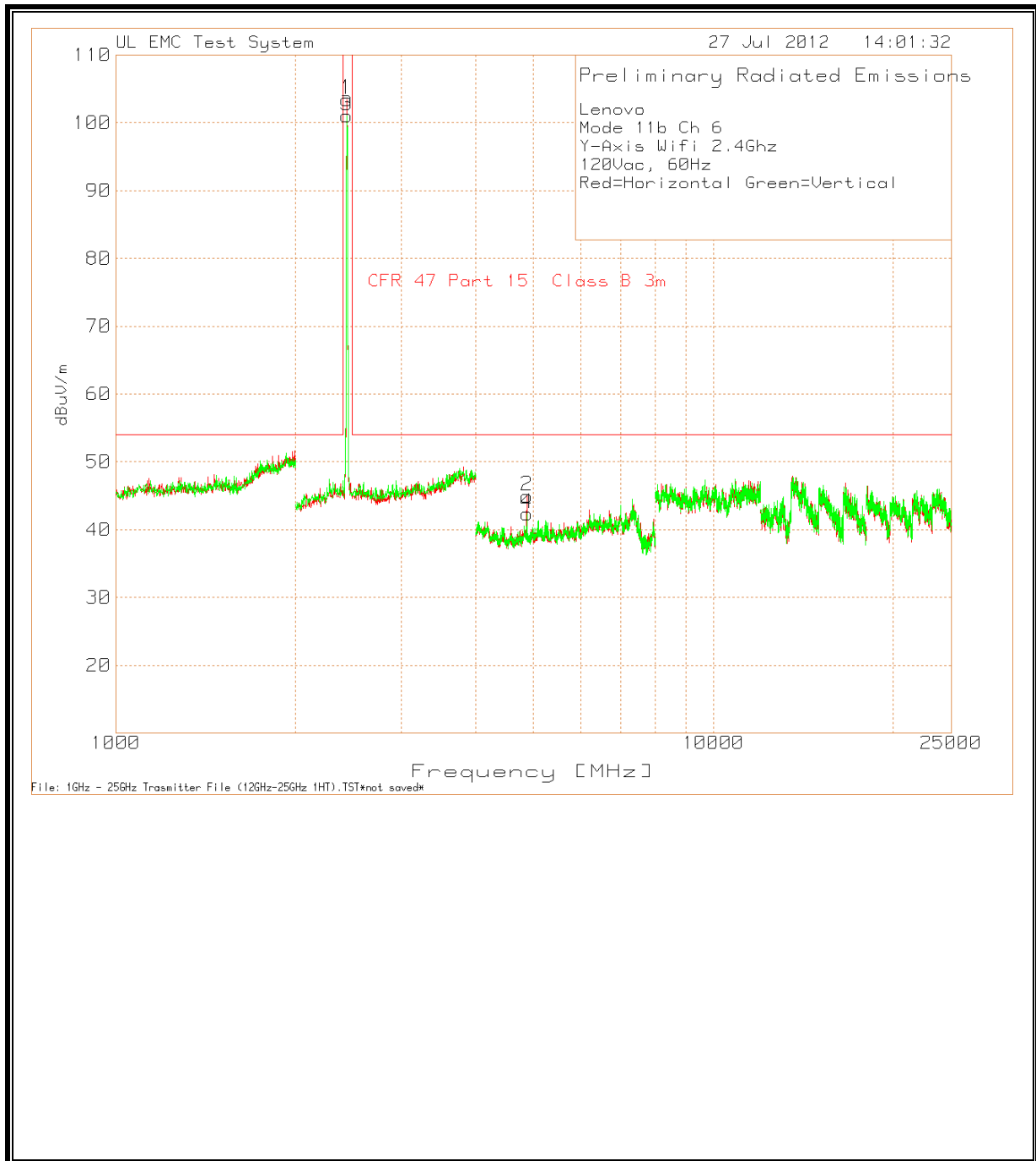
RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



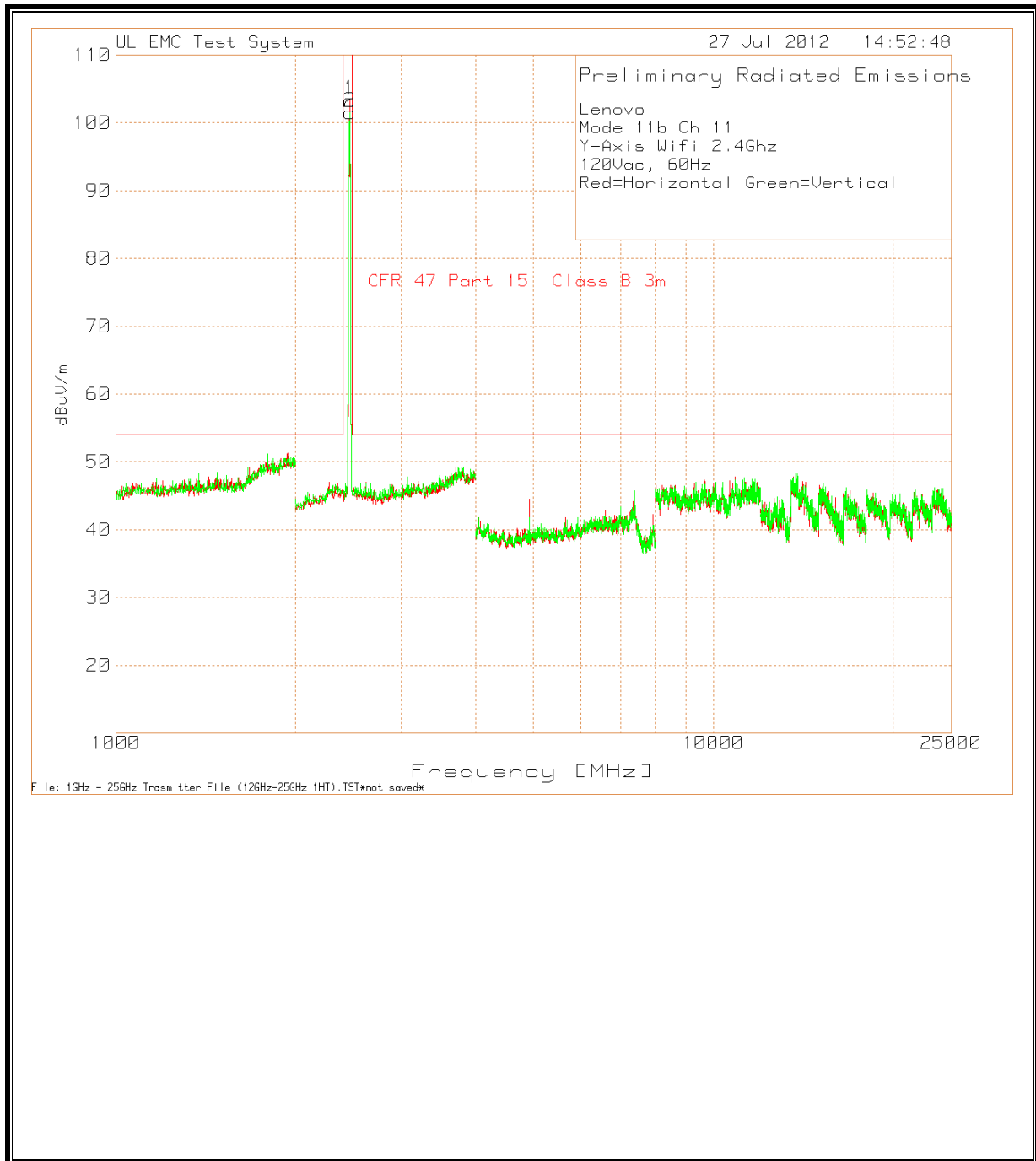
HARMONICS AND SPURIOUS EMISSIONS



HARMONICS AND SPURIOUS EMISSIONS

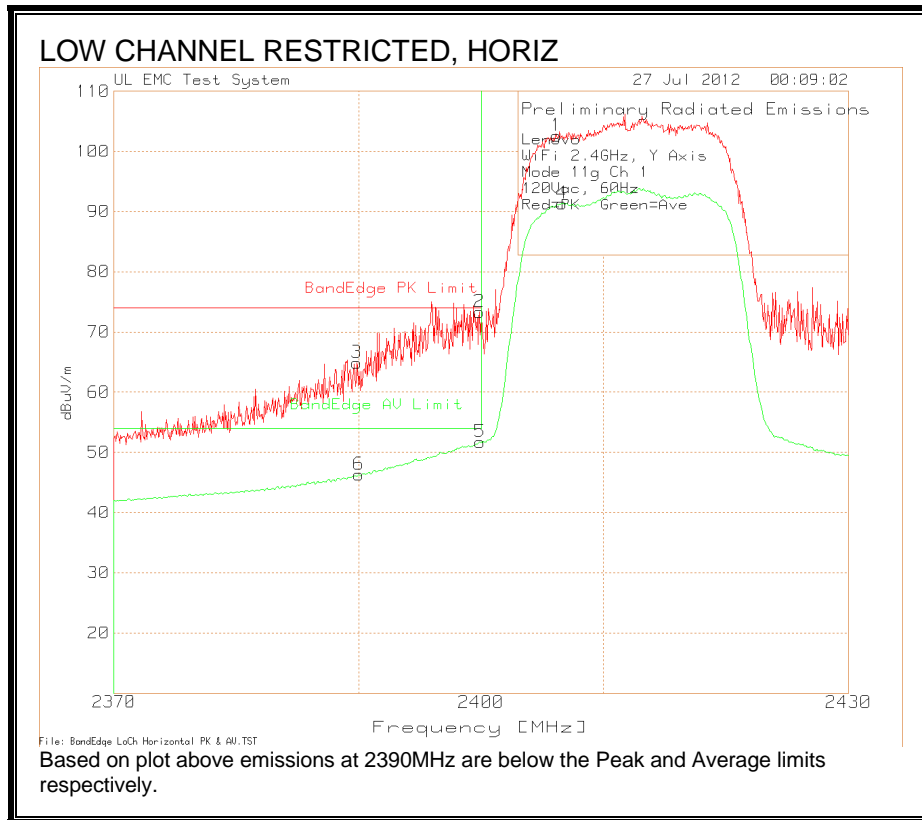


HARMONICS AND SPURIOUS EMISSIONS

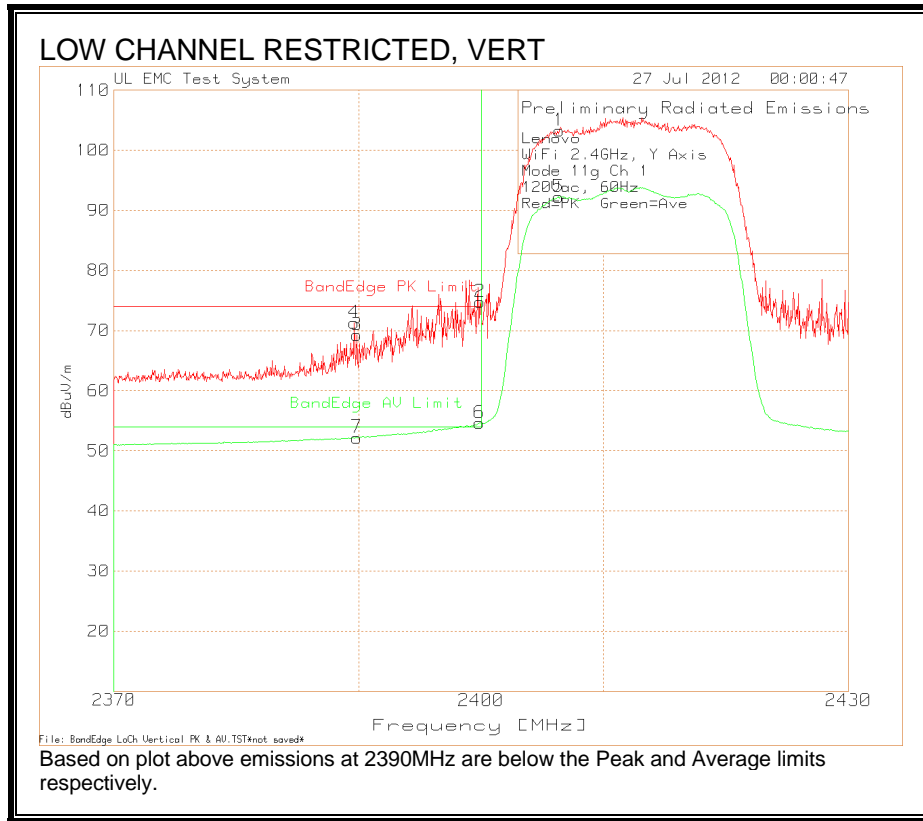


7.2.2. TX ABOVE 1 GHz FOR 802.11g 1TX MODE IN THE 2.4 GHz BAND

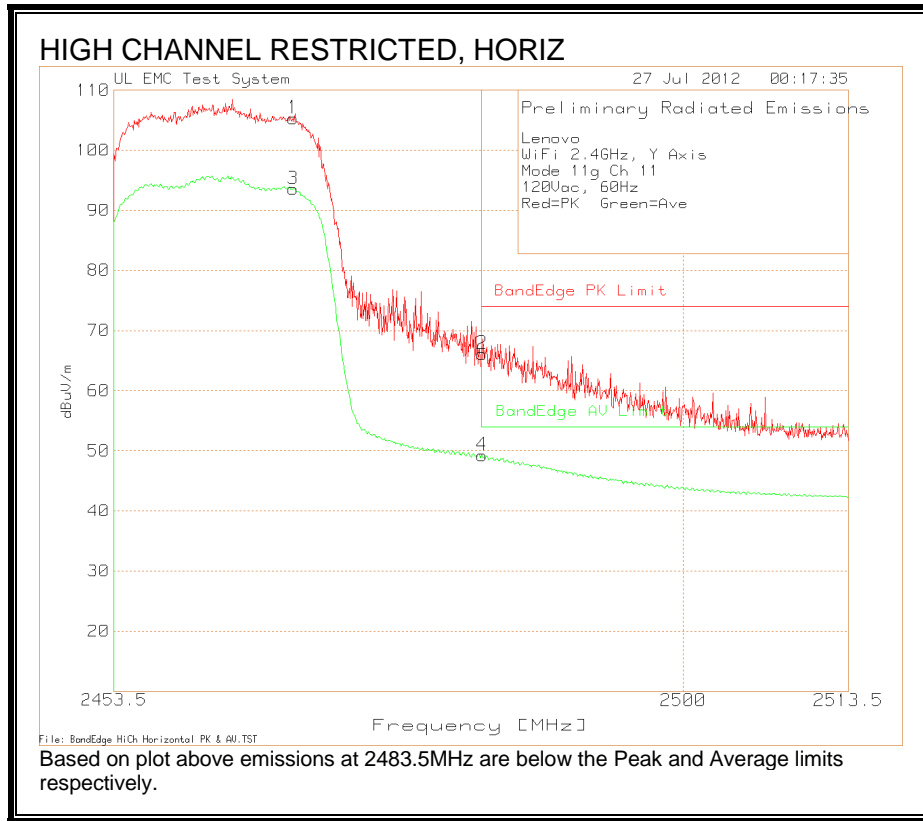
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



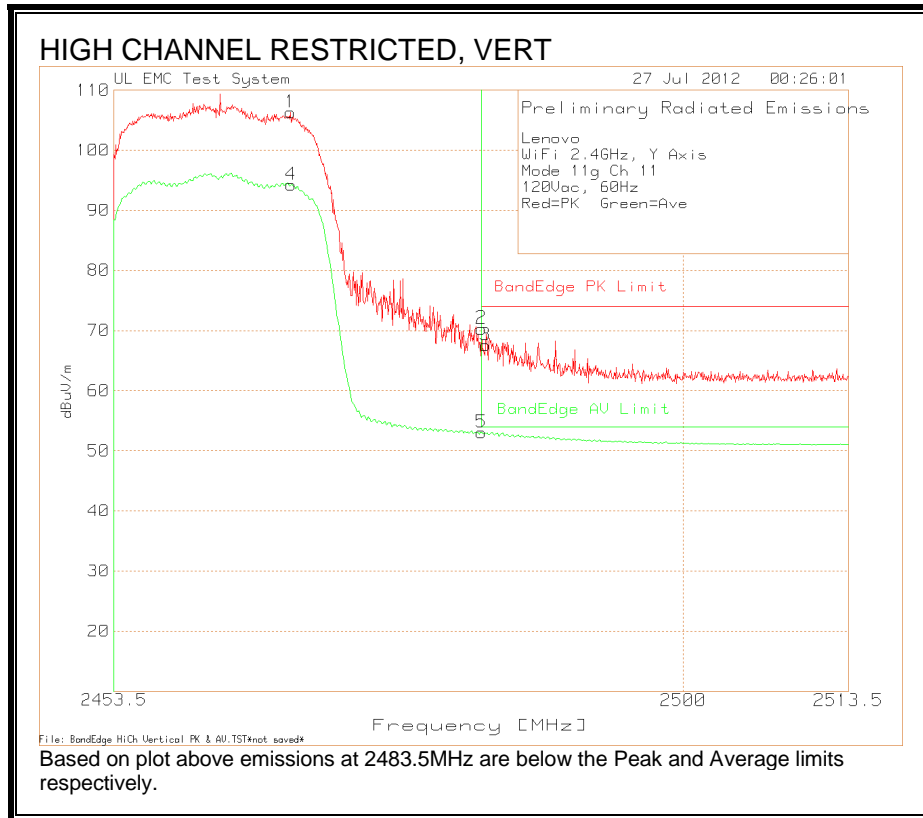
RESTRICTED BANEDGE (LOW CHANNEL, VERTICAL)



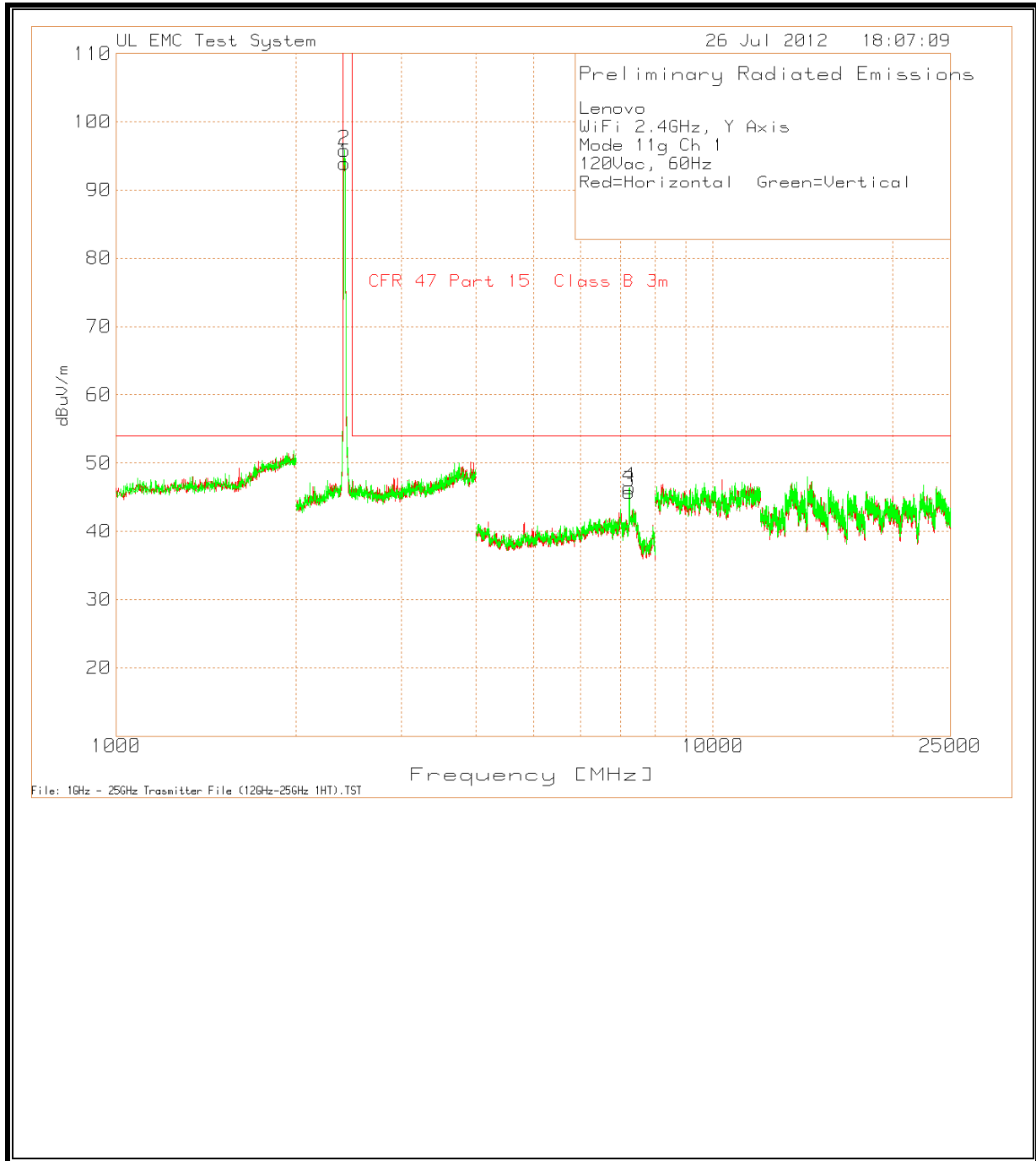
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



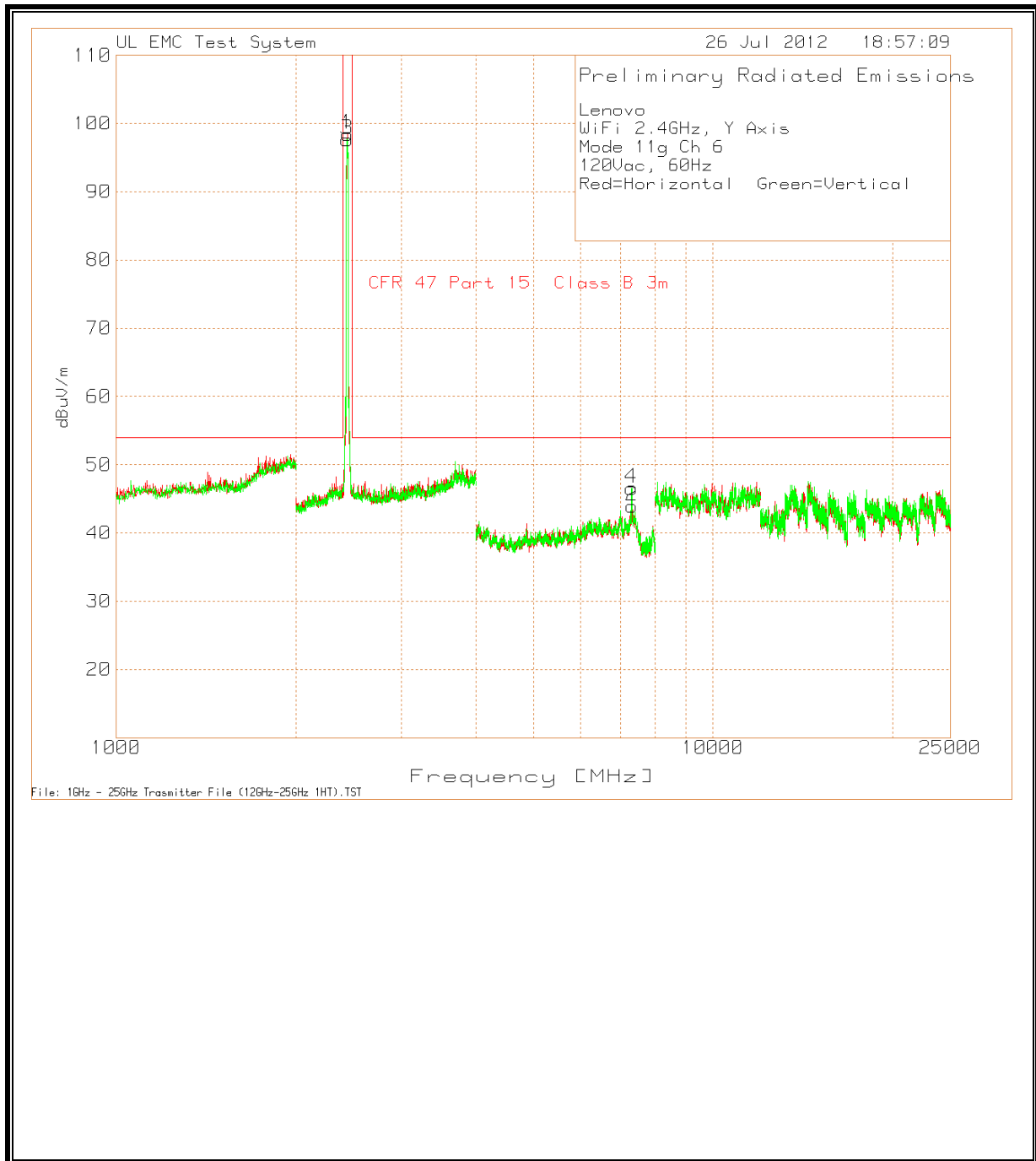
RESTRICTED BANEDGE (HIGH CHANNEL, VERTICAL)



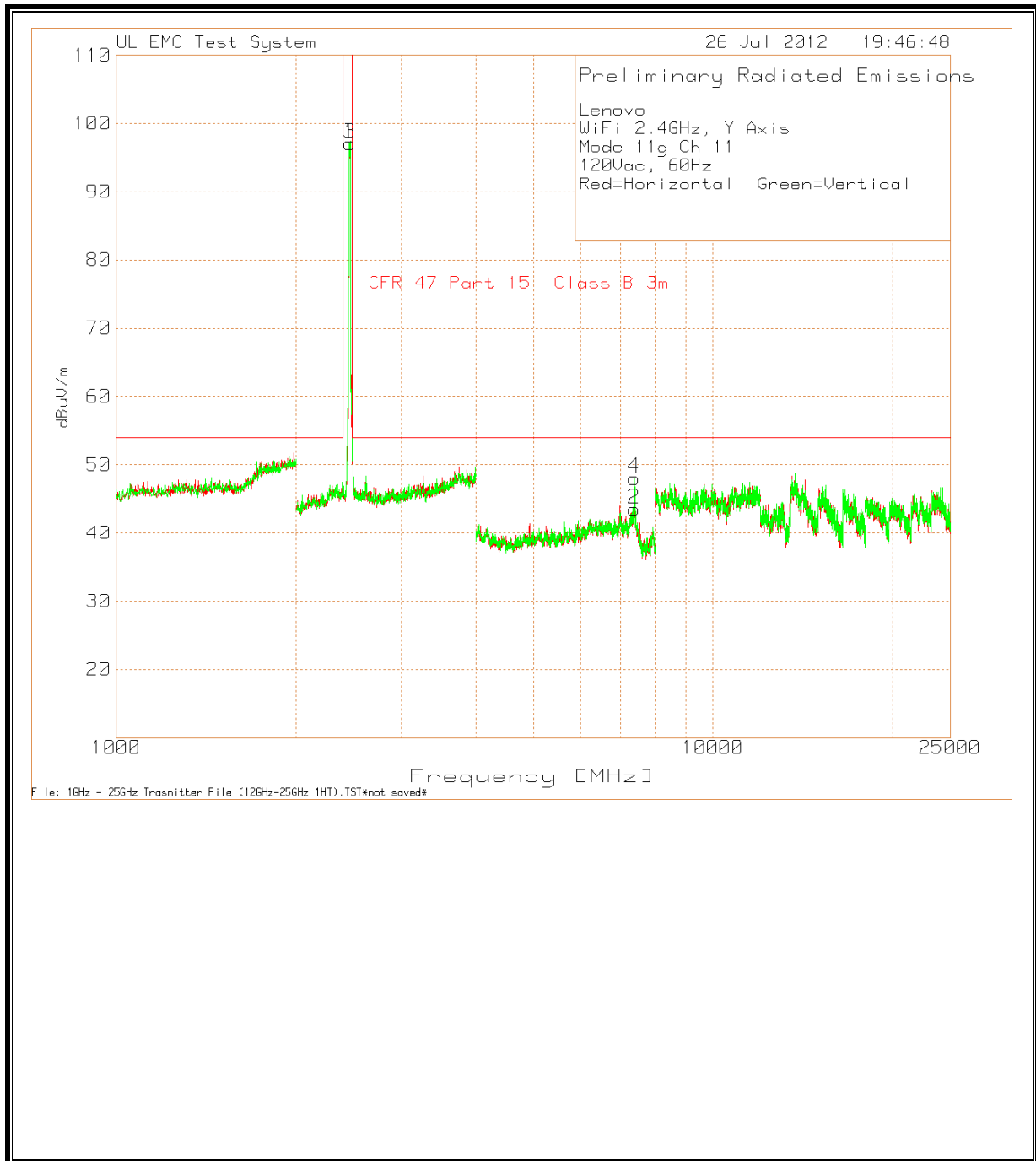
HARMONICS AND SPURIOUS EMISSIONS



HARMONICS AND SPURIOUS EMISSIONS

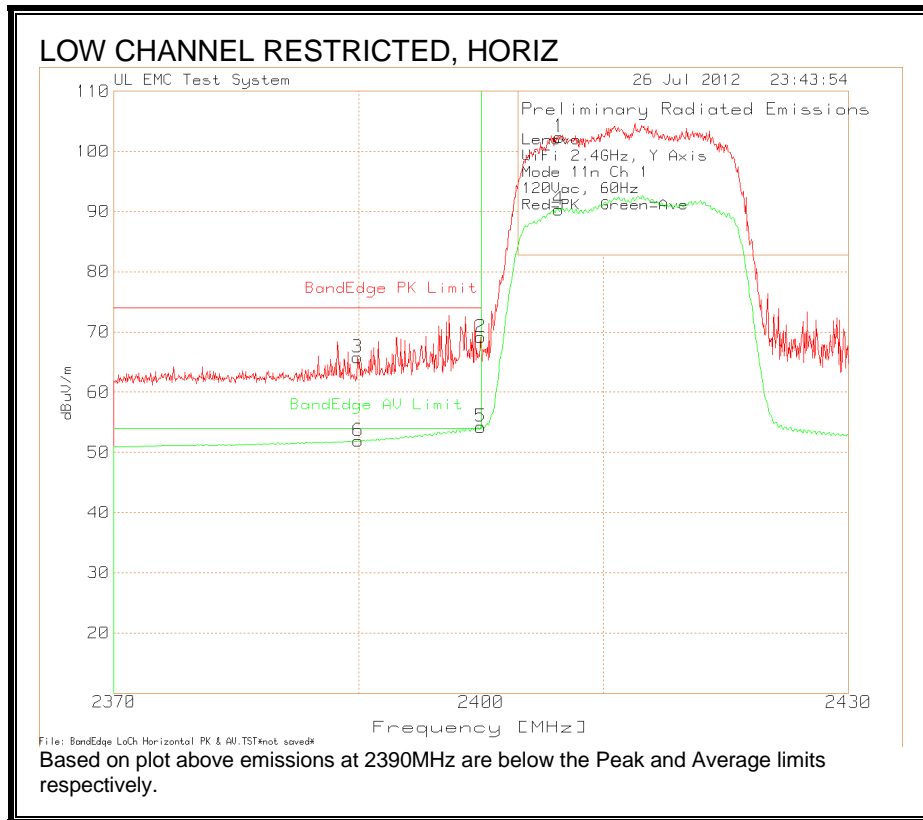


HARMONICS AND SPURIOUS EMISSIONS

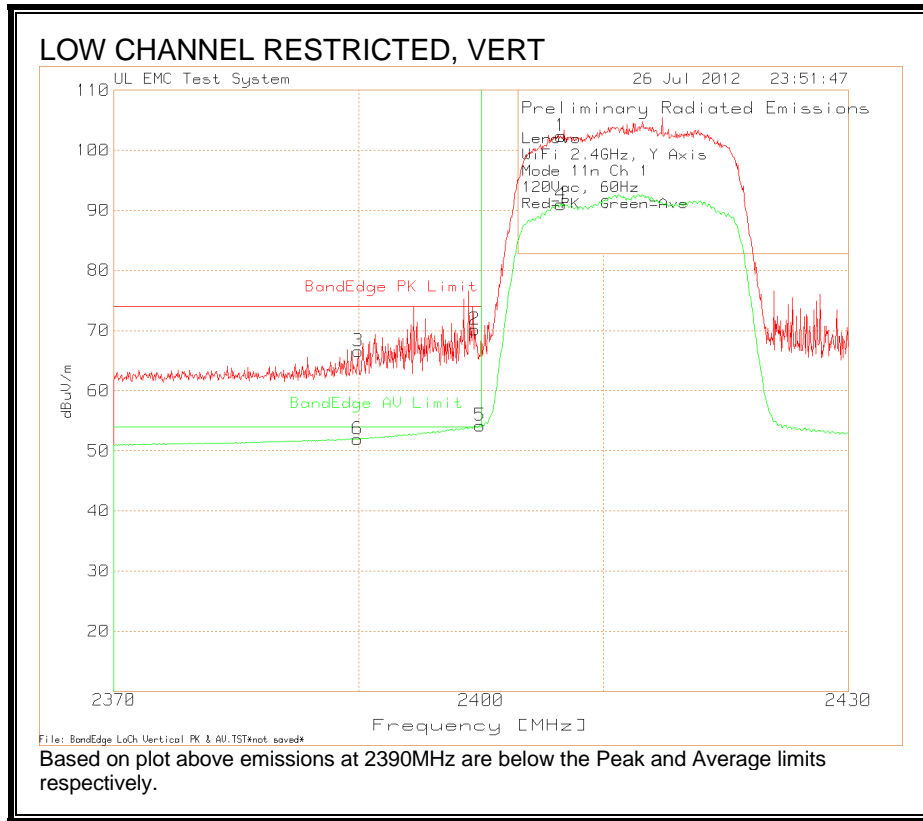


7.2.3. TX ABOVE 1 GHz FOR 802.11n HT20 1TX MODE IN THE 2.4 GHz BAND

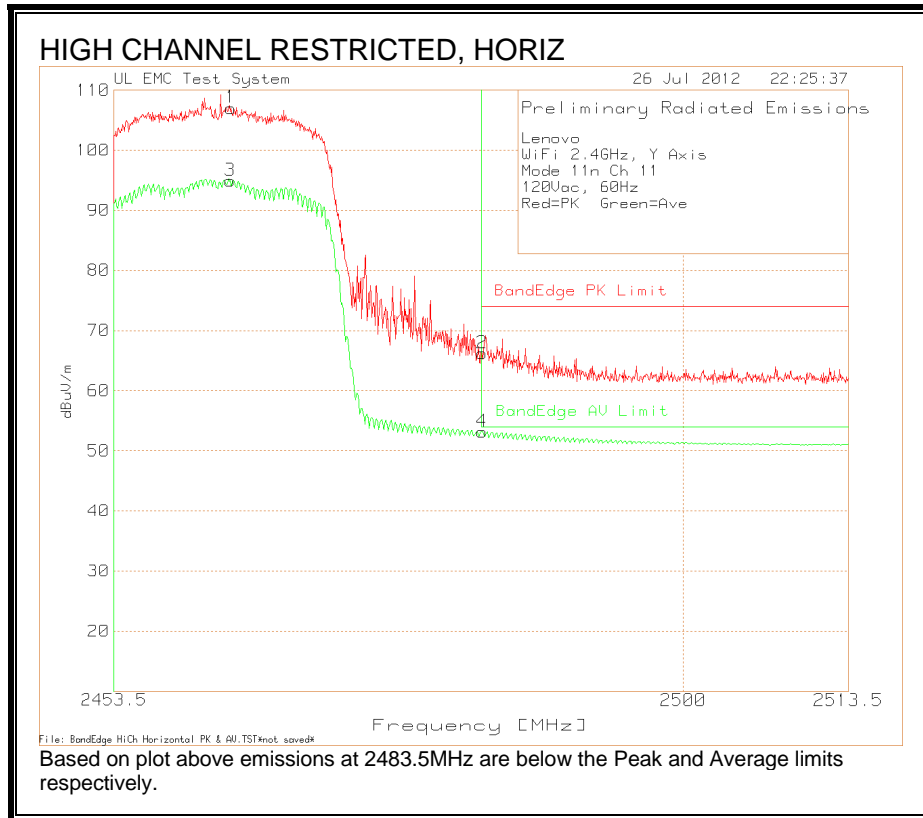
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



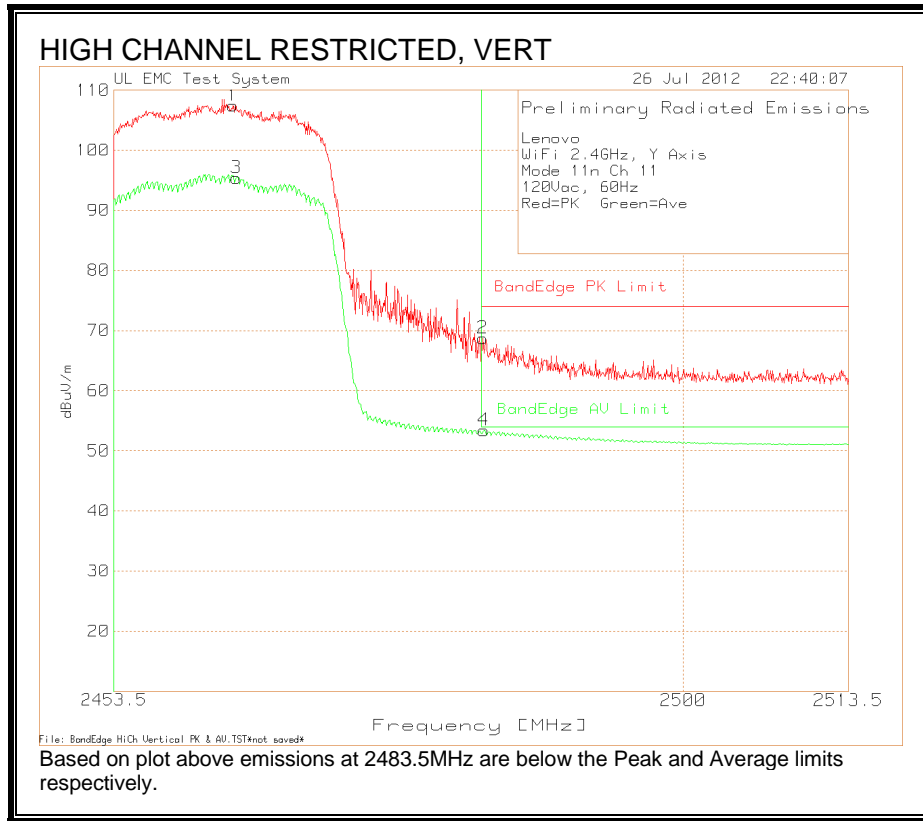
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

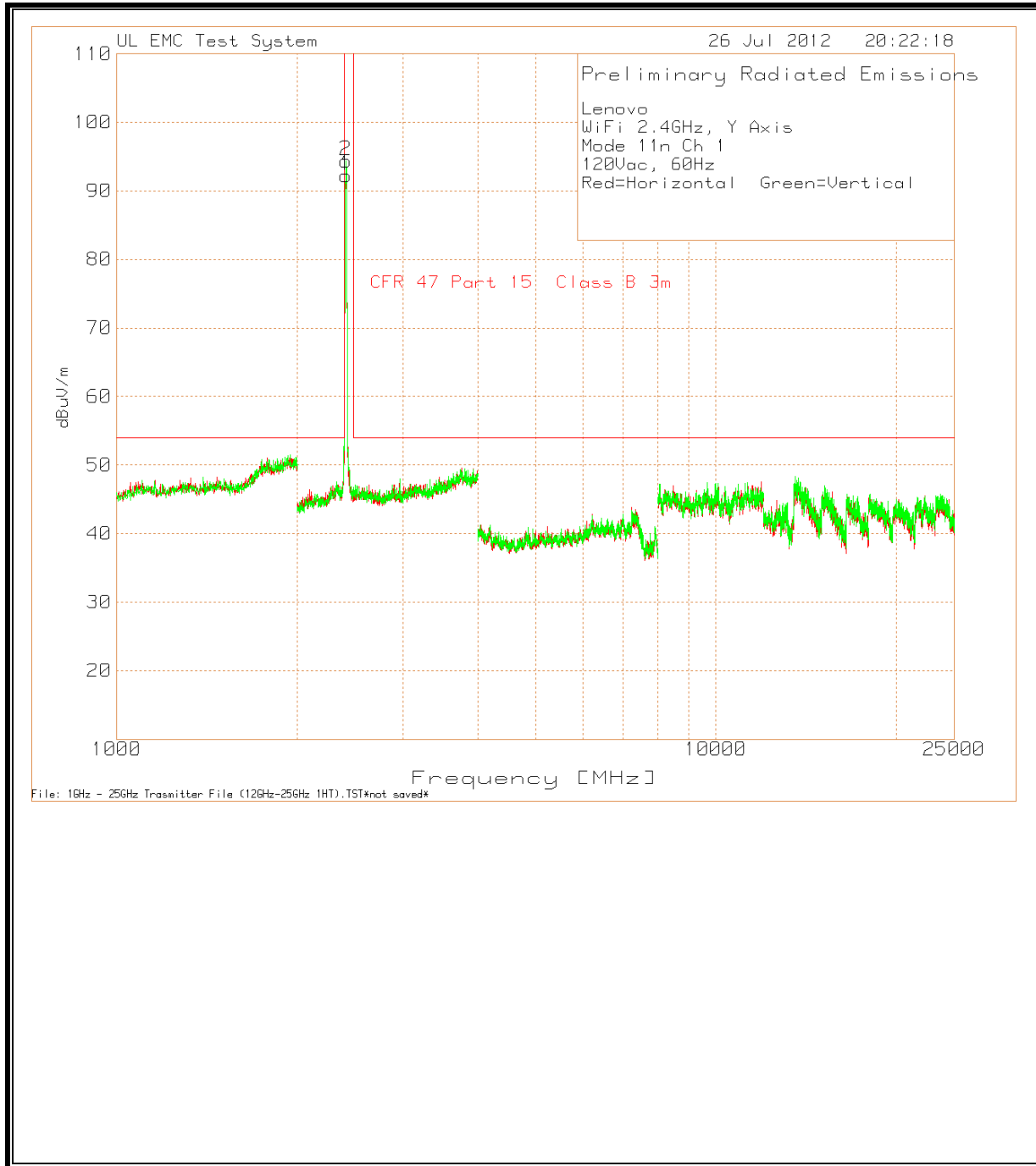


RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

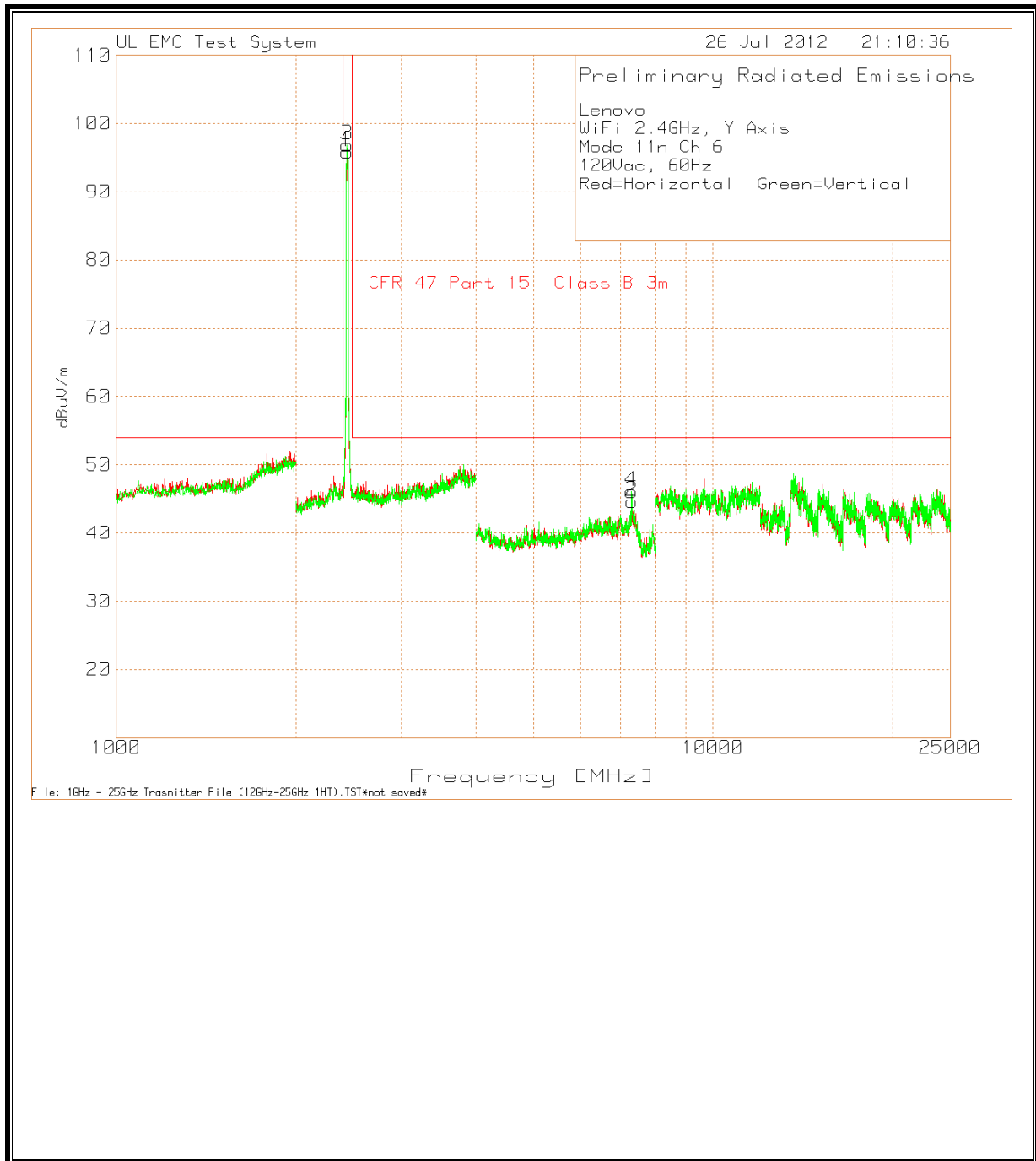


Lenovo												
WiFi 2.4GHz, Y Axis												
Mode 11n Ch 11												
120Vac, 60Hz												
Red=PK Green=Ave												
Peak 2453.5 - 2513.5MHz												
				EMCO316								
				1-02 S/N								
				99061052	BOMS							
Marker No.	Test Frequency	Meter Reading	Detector	3m UL (dB)	Factor (dB)	dBuV/m	BandEdge PK Limit	Margin	BandEdge AV Limit	Margin	Height [cm]	Polarity
1	2463.23	81.31	PK	22	4.07	107.38	-	-	-	-	150	Vert
2	2483.65	42.88	PK	22.1	3.77	68.75	74	-5.25	-	-	101	Vert
Avearge 2453.5 - 2513.5MHz												
3	2463.47	69.33	AV	22	4.07	95.4	-	-	-	-	150	Vert
4	2483.71	27.51	AV	22.1	3.77	53.38	-	-	54	-0.62	150	Vert
PK - Peak detector												
Av - Average detector												

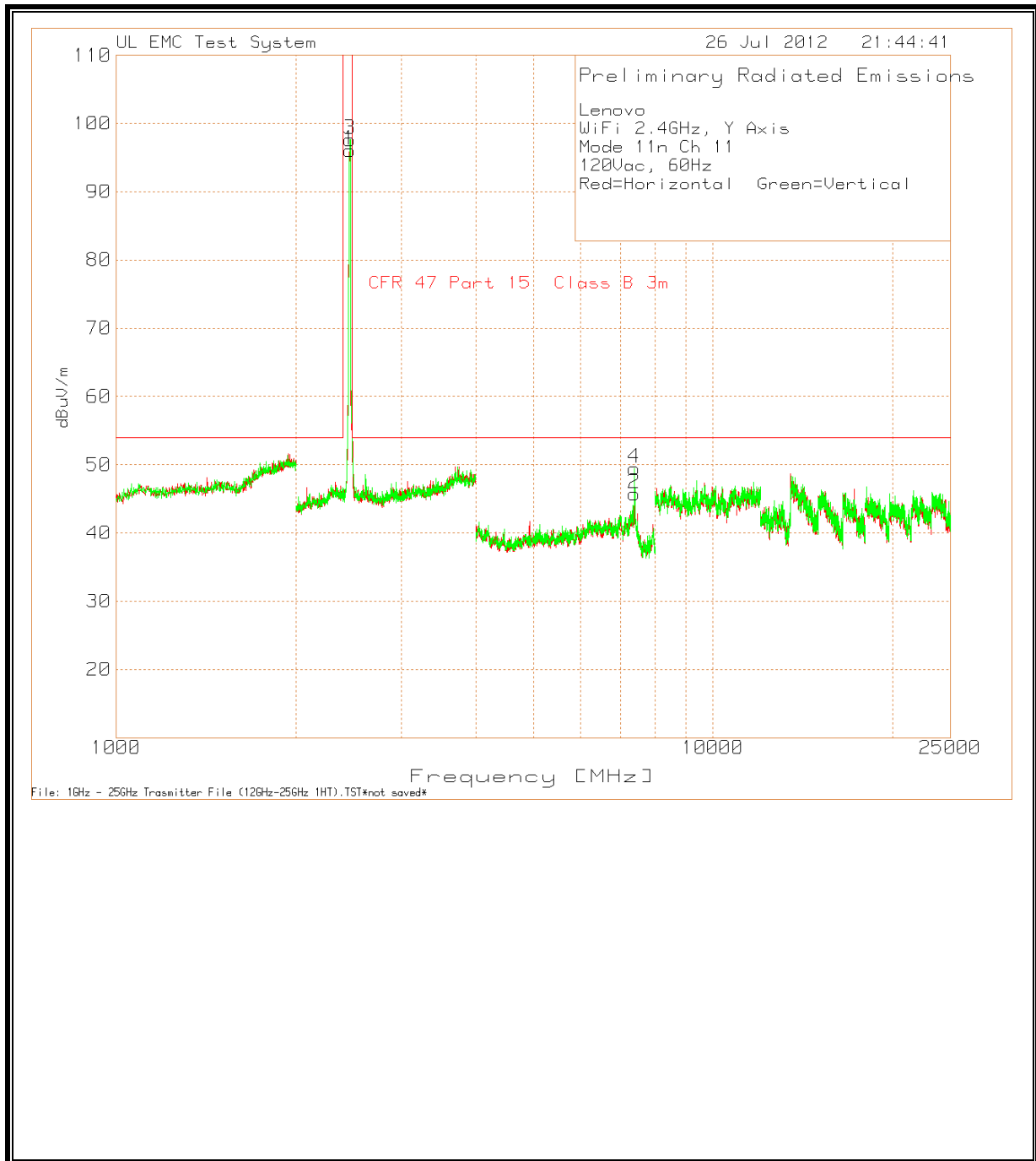
HARMONICS AND SPURIOUS EMISSIONS



HARMONICS AND SPURIOUS EMISSIONS

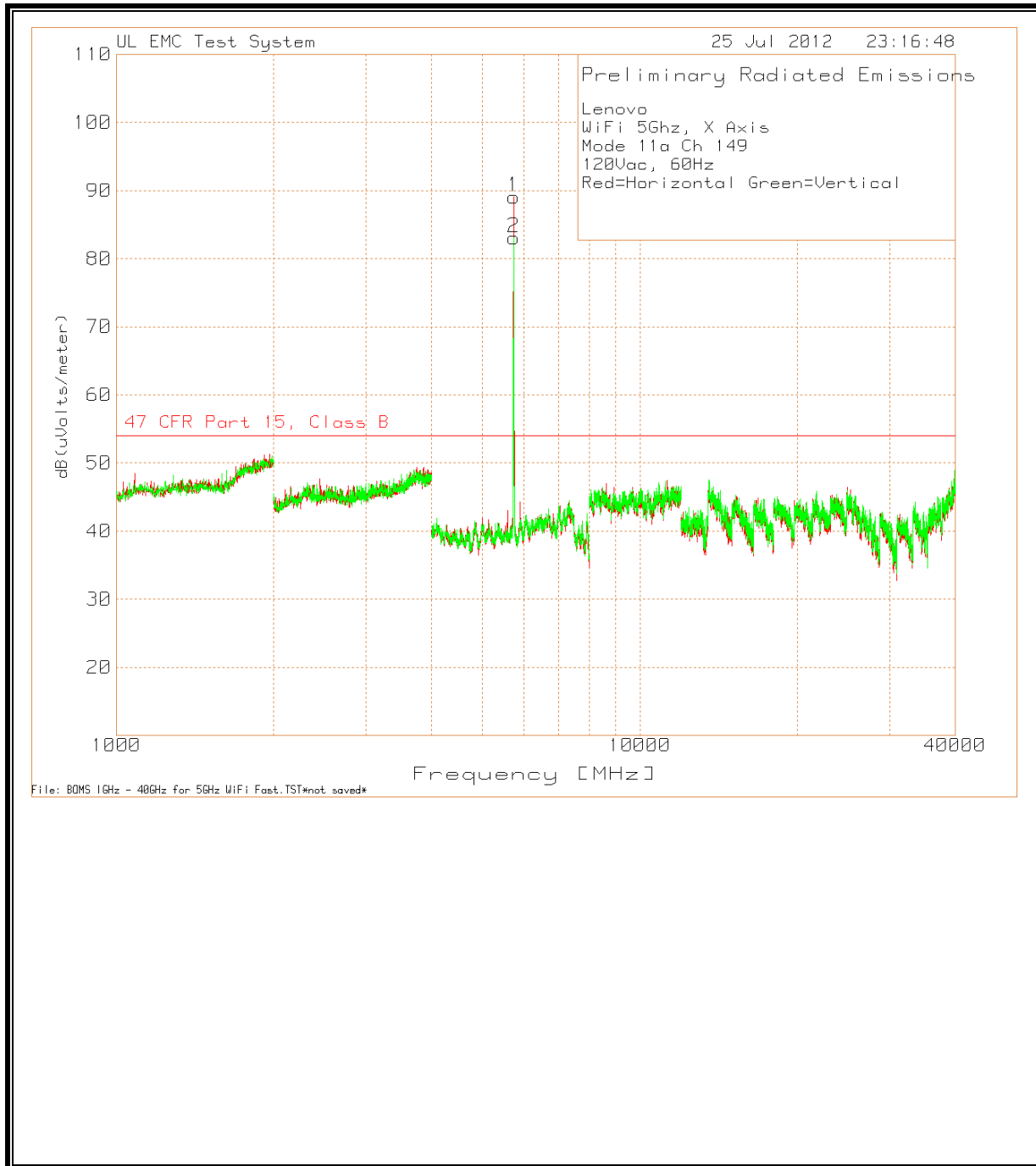


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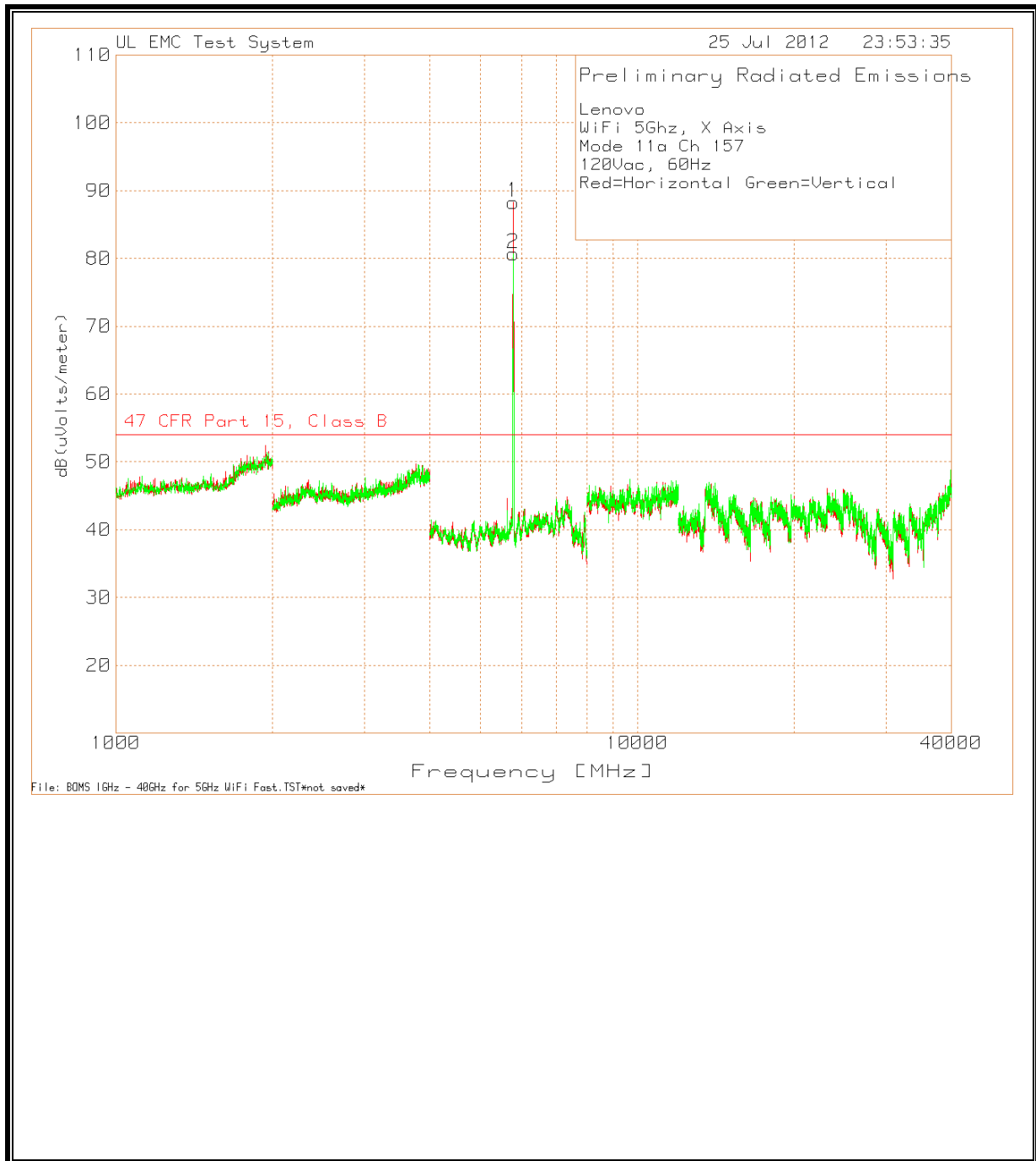


7.2.4. TRANSMITTER ABOVE 1 GHz FOR 802.11a MODE IN THE 5 GHz BAND 5.725-5.850GHz range

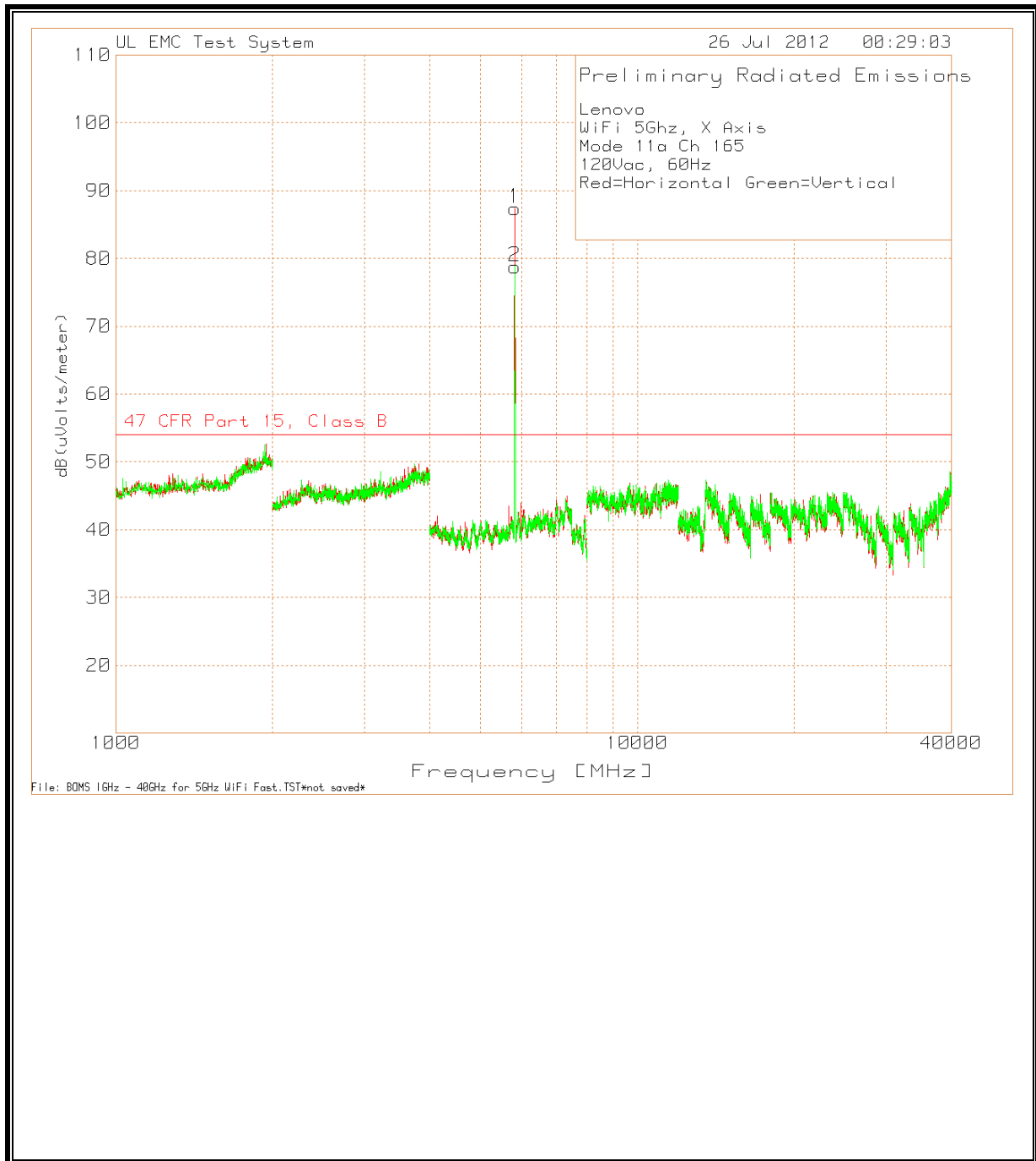
HARMONICS AND SPURIOUS EMISSIONS



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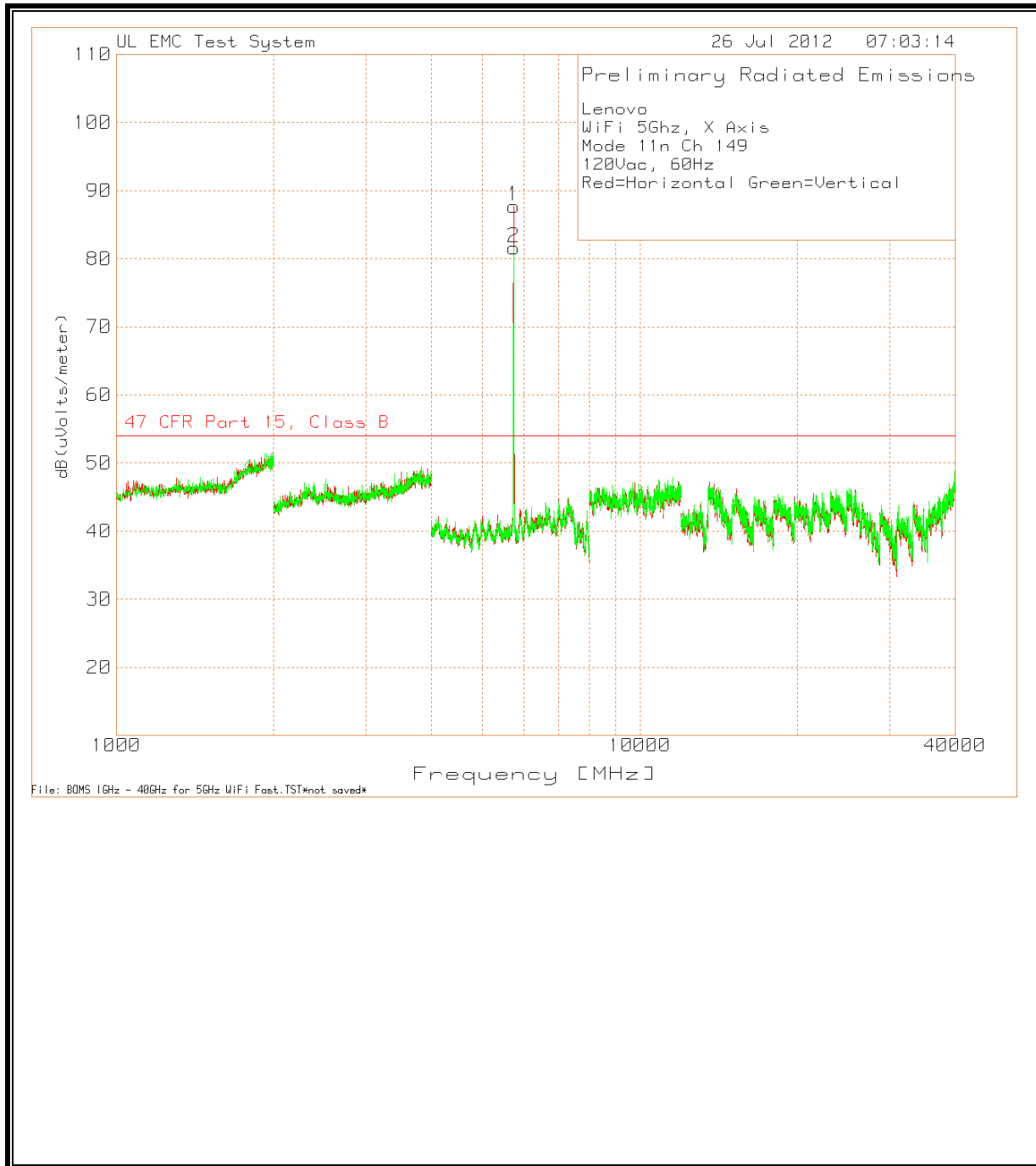


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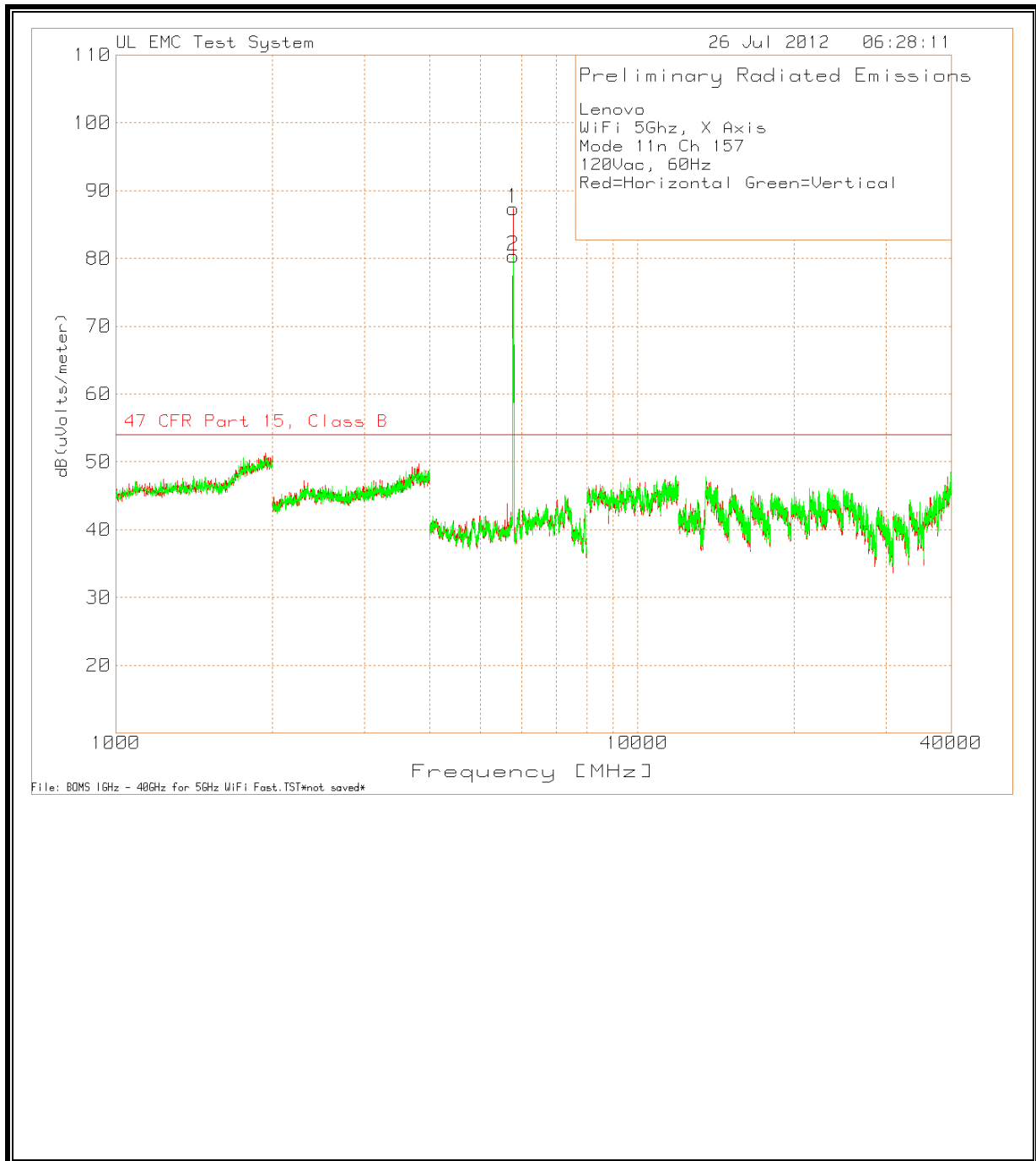


7.2.5. TRANSMITTER ABOVE 1 GHz FOR 802.11n HT20 MODE IN THE 5 GHz BAND 5.725-5.850GHz range

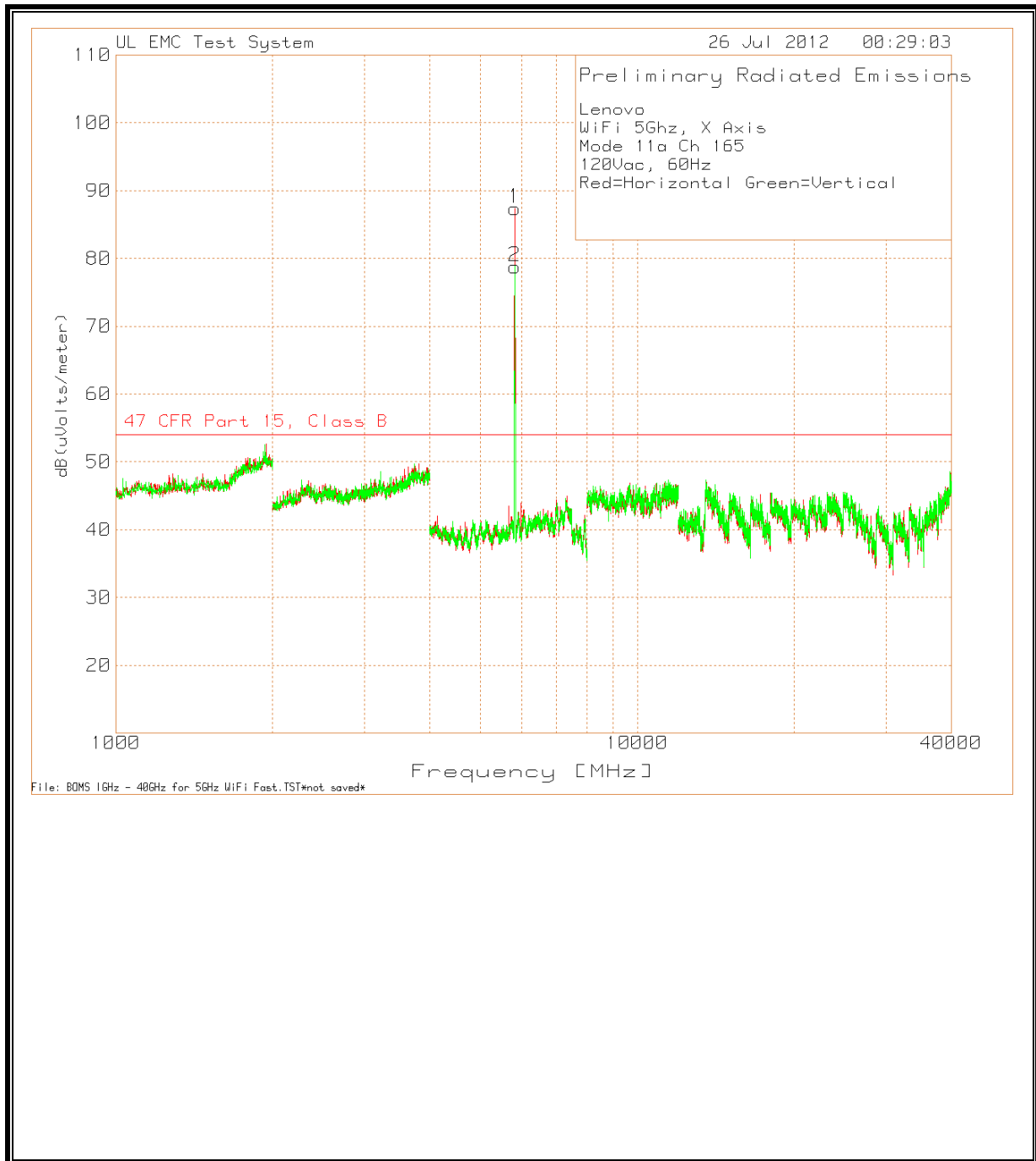
HARMONICS AND SPURIOUS EMISSIONS



HARMONICS AND SPURIOUS EMISSIONS



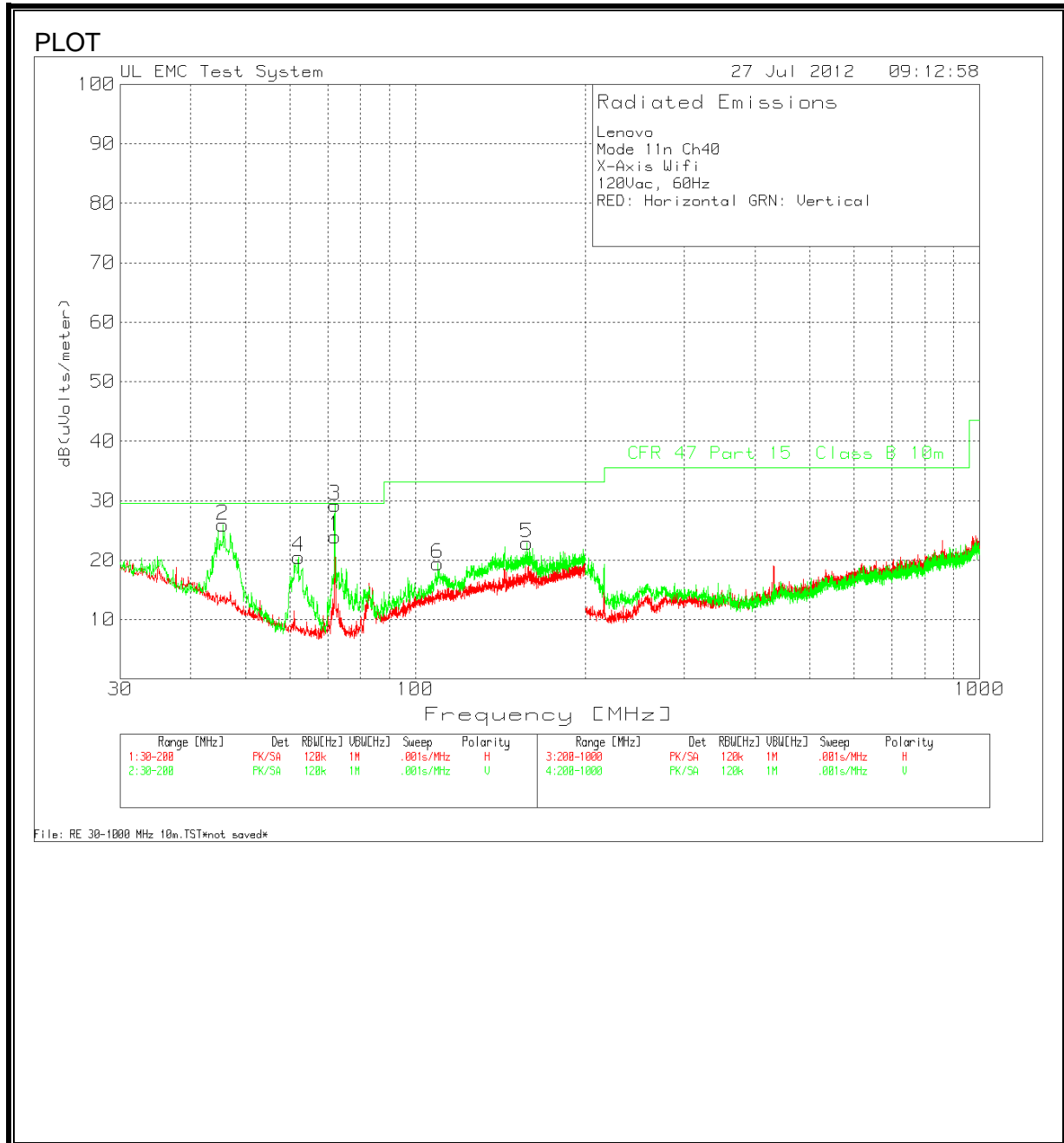
HARMONICS AND SPURIOUS EMISSIONS



7.3. WORST-CASE BELOW 1 GHz

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

Below 1GHz emissions is not dependent on TX channel during preliminary testing. Example data below will represent all modes



DATA

Lenovo										
Mode 11n Ch40										
X-Axis Wifi										
120Vac, 60Hz										
RED: Horizontal GRN: Vertical										
Bicon Horizonta 30 - 200MHz										
Marker No.	Test Frequency	Meter Reading	Detector	Antenna Factor	Gain/Loss Factor	dB(uVols/meter)	Class B 10m	Margin	Height [cm]	Polarity
1	71.969	47.04	PK	6.3	-29.4	23.94	29.6	-5.66	400	Horz
2	45.6322	43.39	PK	11.8	-29.3	25.89	29.6	-3.71	101	Vert
3	71.969	52.31	PK	6.3	-29.4	29.21	29.6	-0.39	300	Vert
4	62.029	43.34	PK	6.5	-29.3	20.54	29.6	-9.06	300	Vert
5	157.946	37.04	PK	15.1	-29.3	22.84	33.1	-10.26	101	Vert
6	109.6052	36.79	PK	12	-29.4	19.39	33.1	-13.71	101	Vert
CFR 47 Part 15										
Test Frequency	Meter Reading	Detector	Antenna Factor	Gain/Loss Factor	dB(uVolts/meter)	Class B 10m	Margin	Azimuth [Degs]	Height [cm]	Polarity
72.002033	44.14	QP	6.3	-29.4	21.04	29.6	-8.56	173	400	Horz
71.999213	50.91	QP	6.3	-29.4	27.81	29.6	-1.79	274	380	Vert
47.0575	36.91	QP	11.3	-29.3	18.91	29.6	-10.69	342	100	Vert
PK - Peak detector										
QP - Quasi-Peak detector										

