



**FCC CFR47 PART 15 SUBPART B  
ICES-003 ISSUE 4**

**TEST REPORT**

**FOR**

**OFDM SUBSCRIBER MODULE**

**MODEL NUMBERS: 5490SM**

**FCC ID: ABZ89FT7638  
IC: 109W-5490G**

**REPORT NUMBER: 10U13443-3**

**ISSUE DATE: NOVEMBER 04, 2010**

*Prepared for*  
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**NVLAP LAB CODE 200065-0**

Revision History

Rev.	Issue Date	Revisions	Revised By
--	11/04/10	Initial Issue	F. Ibrahim

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## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** MOTOROLA-SCHAUMBURG  
1299 E. ALGONQUIN RD.  
SCHAUMBURG, ILLINOISE 60156, U.S.A.

**EUT DESCRIPTION:** OFDM SUBSCRIBER MODULE

**MODEL:** 5490SM

**SERIAL NUMBER:** 0A-00-3E-B0-02-81  
0A-00-3E-30-2E-36

**DATE TESTED:** OCTOBER 13-14, 2010

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 15 SUBPART B	Pass
ICES-003 ISSUE 4	Pass

Compliance Certification Services, Inc. (CCS) 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 CCS based on interpretations and/or observations of test results. 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 CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by CCS will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By:



FRANK IBRAHIM  
EMC SUPERVISOR  
COMPLIANCE CERTIFICATION SERVICES

Tested By:



THANH NGUYEN  
EMC ENGINEER  
COMPLIANCE CERTIFICATION SERVICES

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003 and ICES-003 Issue 4.

## 3. FACILITIES AND ACCREDITATION

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

CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://www.ccsemc.com>.

## 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. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Power Line Conducted Emission	+/- 2.3 dB
Radiated Emission	+/- 3.4 dB

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

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is a frame based, UNII OFDM Subscriber Module for Fixed outdoor wireless application. It utilizes QPSK, 16QAM and 64QAM modulation with 10MHz and 20MHz bandwidths. The radio module is manufactured by Motorola.

#### GENERAL INFORMATION

Power Requirements	100-240 VAC / 50-60 Hz Input 29.5VDC Output
List of frequencies generated or used by the EUT	20MHz, 25MHz, 116MHz

### 5.2. TEST CONFIGURATIONS

EUT Configuration	Description
Typical Configuration	EUT connected to laptop PC, printer and USB mouse.

### 5.3. MODE(S) OF OPERATION

Mode	Description
TX ON and Pinging	TX ON and Laptop PC pinging EUT.

### 5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was Canopy 10.5 (Build 2) SM-DES.

## 5.5. DETAILS OF TESTED SYSTEM

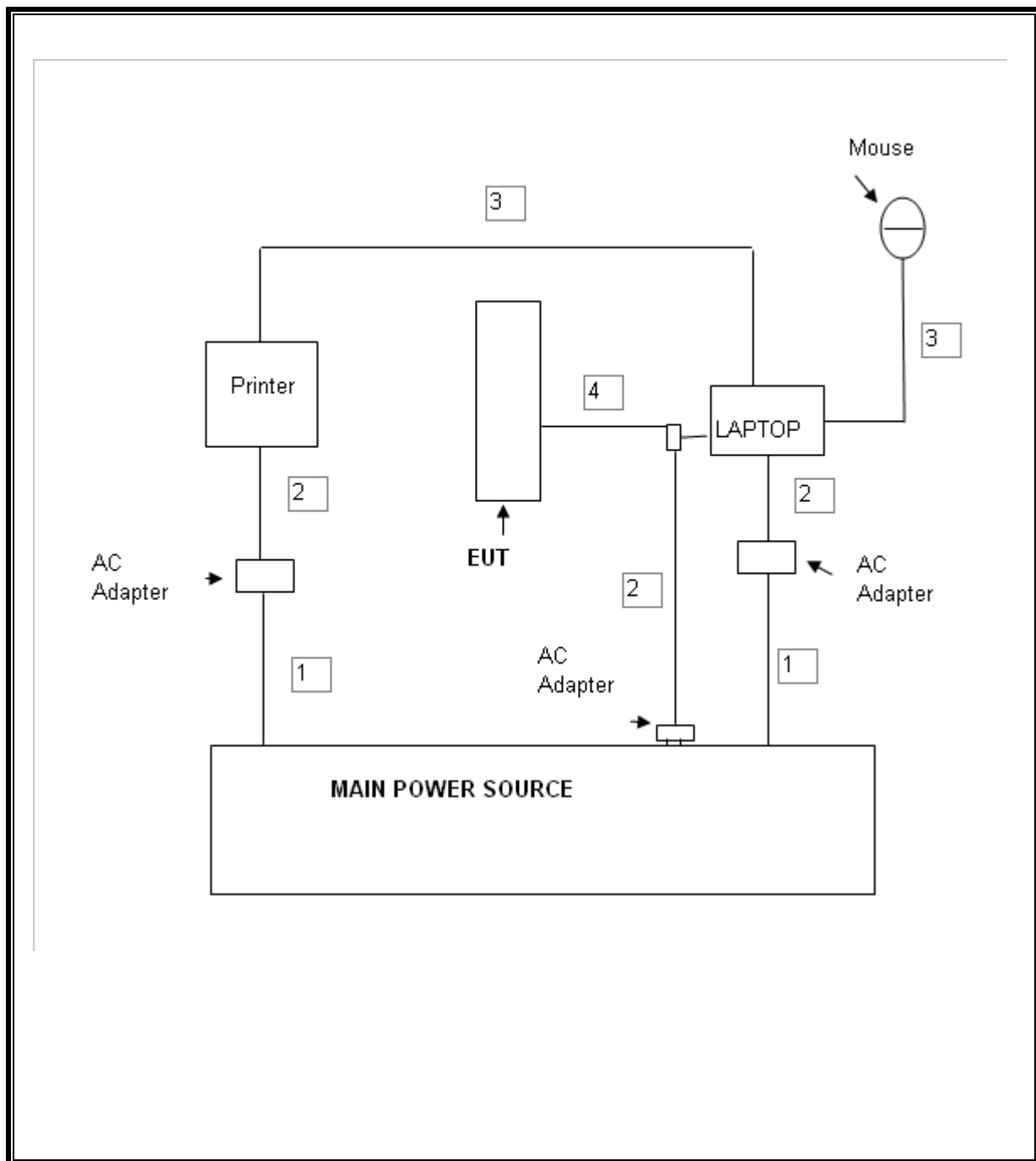
### SUPPORT EQUIPMENT & PERIPHERALS

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Printer	HP	7850	MY56K1304B	DoC
AC Adapter	HP	0957-2084	5175480604	DoC
Laptop	Dell	Latitude D620	CCSC01091	DoC
AC Adapter	Dell	LA65NS0-00	CN0DF263-71615	DoC
USB Mouse	Dell	M-UK DELL3	831890-0000	DoC

### I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	2	US 115V	Un-shielded	1.5m	N/A
2	DC	3	DC Plug	Un-shielded	1.5m	Ferrite at DC end
3	USB	2	USB	Shielded	1.5m	N/A
4	WLAN	1	RJ45	Un-shielded	1.5m	N/A

**TEST SETUP DIAGRAM**





## 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	Serial Number	Cal Due
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01069	4/5/2011
Antenna, Horn, 18 GHz	EMCO	3115	C00783	4/22/2011
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01016	1/14/2011
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01063	12/1/2010
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00580	12/1/2011

## 7. TEST RESULTS

### 7.1. RADIATED EMISSIONS

#### TEST PROCEDURE

ANSI C63.4

The highest clock frequency generated or used in the EUT is 116 MHz; therefore the frequency range was investigated from 30 MHz to 2000 MHz.

#### LIMIT

§15.109 (g) As an alternative to the radiated emission limits shown in paragraphs (a) and (b) of this section, digital devices may be shown to comply with the standards contained in Third Edition of the International Special Committee on Radio Interference (CISPR), Pub. 22, "Information Technology Equipment—Radio Disturbance Characteristics—Limits and Methods of Measurement" (incorporated by reference, see §15.38). In addition:

- (1) The test procedure and other requirements specified in this part shall continue to apply to digital devices.
- (2) If, in accordance with §15.33 of this part, measurements must be performed above 1000 MHz, compliance above 1000 MHz shall be demonstrated with the emission limit in paragraph (a) or (b) of this section, as appropriate. Measurements above 1000 MHz may be performed at the distance specified in the CISPR 22 publications for measurements below 1000 MHz provided the limits in paragraphs (a) and (b) of this section are extrapolated to the new measurement distance using an inverse linear distance extrapolation factor (20 dB/decade), e.g., the radiated limit above 1000 MHz for a Class B digital device is 150 uV/m, as measured at a distance of 10 meters.
- (3) The measurement distances shown in CISPR Pub. 22, including measurements made in accordance with this paragraph above 1000 MHz, are considered, for the purpose of §15.31(f)(4) of this part, to be the measurement distances specified in this part.
- (4) If the radiated emissions are measured to demonstrate compliance with the alternative standards in this paragraph, compliance must also be demonstrated with the conducted limits shown in §15.107(e).

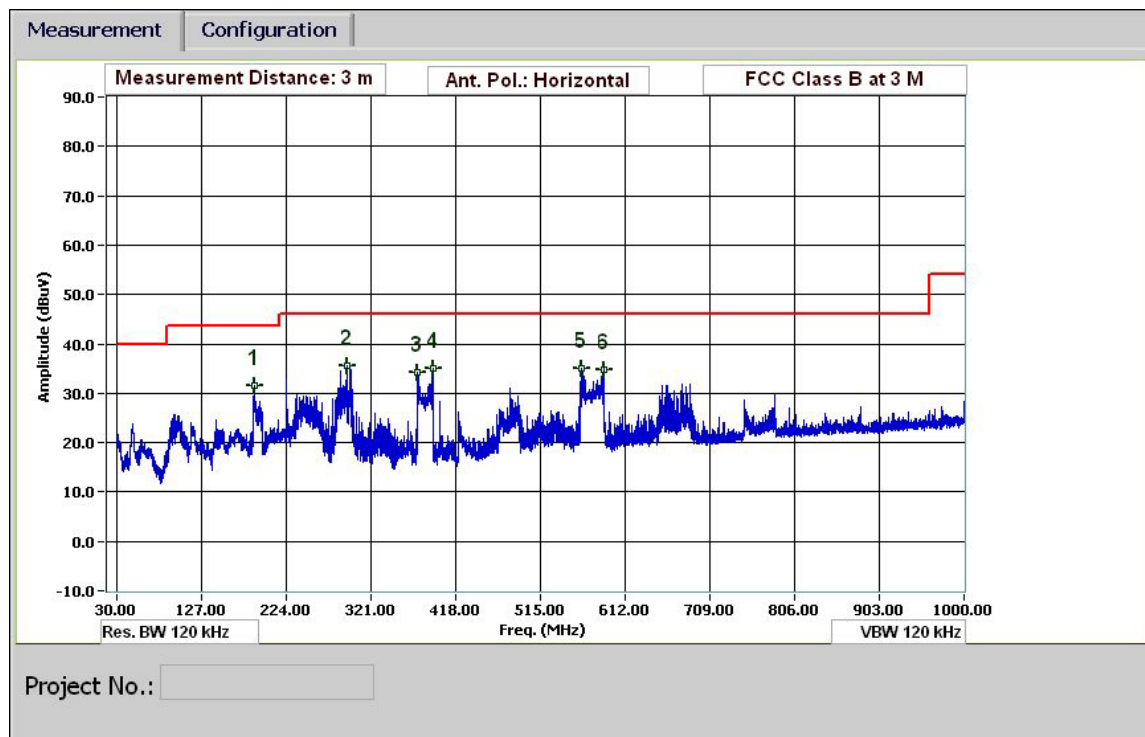
Limits for radiated disturbance of Class B ITE at measuring distance of 10 m	
Frequency range (MHz)	Quasi-peak limits (dB $\mu$ V/m)
30 to 230	30
230 to 1000	37
Note: The lower limit shall apply at the transition frequency.	

Limits for radiated disturbance of Class B ITE at measuring distance of 3 m		
Frequency range (MHz)	Peak limits (dB $\mu$ V/m)	Average limits (dB $\mu$ V/m)
Above 1000	74	54

## RESULTS

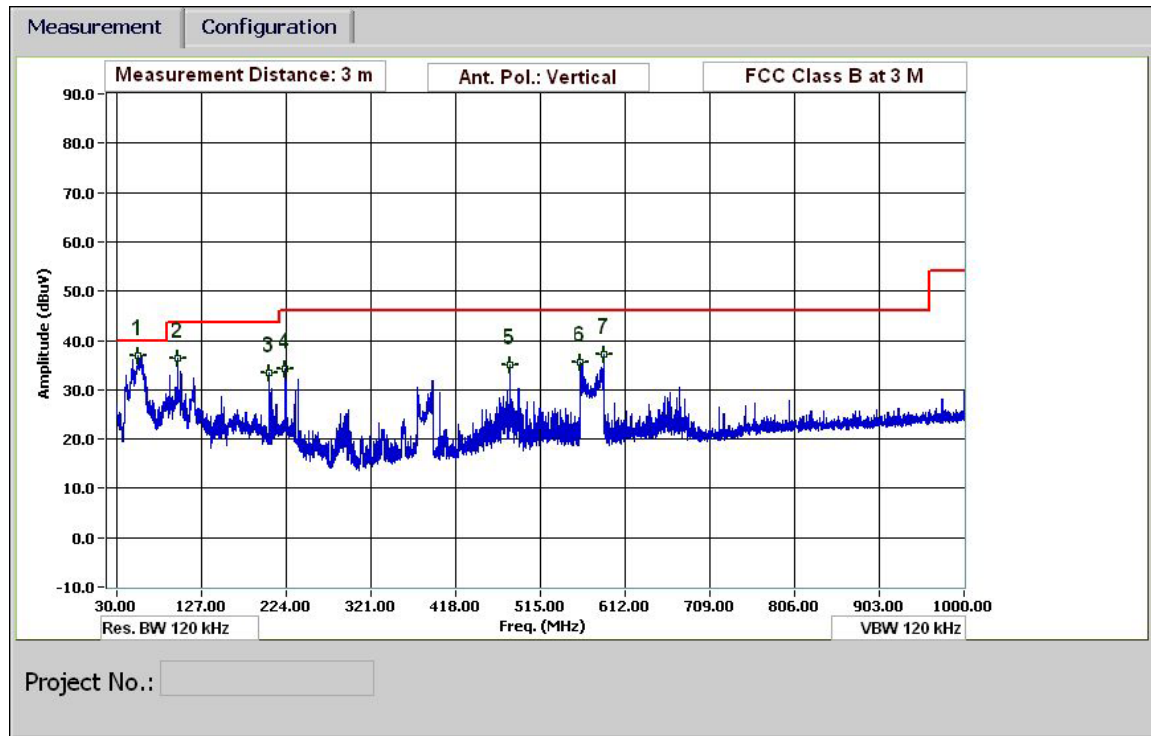
### SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

#### HORIZONTAL PLOT



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

VERTICAL PLOT



## EMI DATA

30-1000MHz Frequency Measurement  
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Thanh Nguyen  
Date: 10/13/10  
Project #: 10U13443  
Company: Motorola  
Test Target: FCC Part 15 Class B  
Mode Oper: Normal, digital configuration with peripheral

f Measurement Frequency Amp Preamp Gain Margin Margin vs. Limit  
Dist Distance to Antenna D Corr Distance Correct to 3 meters  
Read Analyzer Reading Filter Filter Insert Loss  
AF Antenna Factor Corr. Calculated Field Strength  
CL Cable Loss Limit Field Strength Limit

f MHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Pad dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Ant. High cm	Table Angle Degree	Notes
54.481	3.0	51.5	7.9	0.6	29.6	0.0	0.0	31.5	40.0	-8.5	V	QP	100.0	0 - 360	
203.887	3.0	49.1	12.0	1.3	28.9	0.0	0.0	33.5	43.5	-10.0	V	P	100.0	0 - 360	
222.608	3.0	49.9	11.9	1.4	28.9	0.0	0.0	34.3	46.0	-11.7	V	P	100.0	0 - 360	
480.019	3.0	46.1	16.4	2.1	29.6	0.0	0.0	35.0	46.0	-11.0	V	P	100.0	0 - 360	
559.942	3.0	45.2	17.7	2.3	29.7	0.0	0.0	35.5	46.0	-10.5	V	P	100.0	0 - 360	
587.543	3.0	46.5	18.1	2.4	29.6	0.0	0.0	37.3	46.0	-8.7	V	P	100.0	0 - 360	
187.326	3.0	48.2	11.1	1.2	29.0	0.0	0.0	31.5	43.5	-12.0	H	P	100.0	0 - 360	
294.131	3.0	49.6	13.1	1.6	28.8	0.0	0.0	35.5	46.0	-10.5	H	P	100.0	0 - 360	
374.534	3.0	47.0	14.6	1.8	29.2	0.0	0.0	34.2	46.0	-11.8	H	P	100.0	0 - 360	
391.695	3.0	47.4	14.9	1.9	29.3	0.0	0.0	34.9	46.0	-11.1	H	P	100.0	0 - 360	
561.742	3.0	44.9	17.7	2.3	29.7	0.0	0.0	35.2	46.0	-10.8	H	P	100.0	0 - 360	
587.423	3.0	43.9	18.1	2.4	29.6	0.0	0.0	34.7	46.0	-11.3	H	P	100.0	0 - 360	

Rev. 1.27.09

Note: No other emissions were detected above the system noise floor.

**SPURIOUS EMISSIONS ABOVE 1 GHz (WORST-CASE CONFIGURATION)**

High Frequency Measurement																
Compliance Certification Services, Fremont 5m Chamber																
Company:		Motorola														
Project #:		10U13443														
Date:		10/15/10														
Test Engineer:		Thanh Nguyen														
Configuration:		Digital device with peripheral														
Mode:		Normal Operation and pinging to support device.														
<b>Test Equipment:</b>																
Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 26-40GHz			Horn > 18GHz			Limit				
T59; S/N: 3245 @3m			T145 Agilent 3008A005t									FCC Class B				
Hi Frequency Cables																
3' cable 22807700			12' cable 22807600			20' cable 22807500			HPF			Reject Filter			Peak Measurements RBW=VBW=1MHz	
3' cable 22807700			12' cable 22807600			20' cable 22807500									Average Measurements RBW=1MHz; VBW=10Hz	
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Ftr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)	
1.102	3.0	57.5	43.4	24.3	2.5	-36.1	0.0	0.0	48.2	34.1	74	54	-25.8	-19.9	V	
2.340	3.0	42.4	32.1	28.1	3.8	-35.1	0.0	0.0	39.1	28.9	74	54	-34.9	-25.1	V	
3.290	3.0	42.3	35.5	30.6	4.6	-35.1	0.0	0.0	42.5	35.6	74	54	-31.5	-18.4	V	
5.864	3.0	42.3	31.7	33.8	6.5	-35.1	0.0	0.0	47.5	36.8	74	54	-26.5	-17.2	V	
1.025	3.0	43.7	32.2	24.0	2.4	-36.1	0.0	0.0	34.0	22.5	74	54	-40.0	-31.5	H	
1.120	3.0	44.3	32.6	24.4	2.5	-36.1	0.0	0.0	35.1	23.4	74	54	-38.9	-30.6	H	
1.225	3.0	43.6	36.6	24.8	2.6	-36.0	0.0	0.0	35.0	28.0	74	54	-39.0	-26.0	H	
1.550	3.0	49.5	36.6	26.0	3.0	-35.7	0.0	0.0	42.7	29.8	74	54	-31.3	-24.2	H	
5.869	3.0	42.7	30.4	33.8	6.5	-35.1	0.0	0.0	47.8	35.5	74	54	-26.2	-18.5	H	
No other emissions were detected above the the																
Rev. 07.22.09																
f	Measurement Frequency			Amp	Preamp Gain			Avg Lim	Average Field Strength Limit							
Dist	Distance to Antenna			D Corr	Distance Correct to 3 meters			Pk Lim	Peak Field Strength Limit							
Read	Analyzer Reading			Avg	Average Field Strength @ 3 m			Avg Mar	Margin vs. Average Limit							
AF	Antenna Factor			Peak	Calculated Peak Field Strength			Pk Mar	Margin vs. Peak Limit							
CL	Cable Loss			HPF	High Pass Filter											

## 7.2. AC MAINS LINE CONDUCTED EMISSIONS

### TEST PROCEDURE

ANSI C63.4

### LIMIT

§15.107 (a) Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Frequency range (MHz)	Limits (dB $\mu$ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Notes: 1. The lower limit shall apply at the transition frequencies 2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

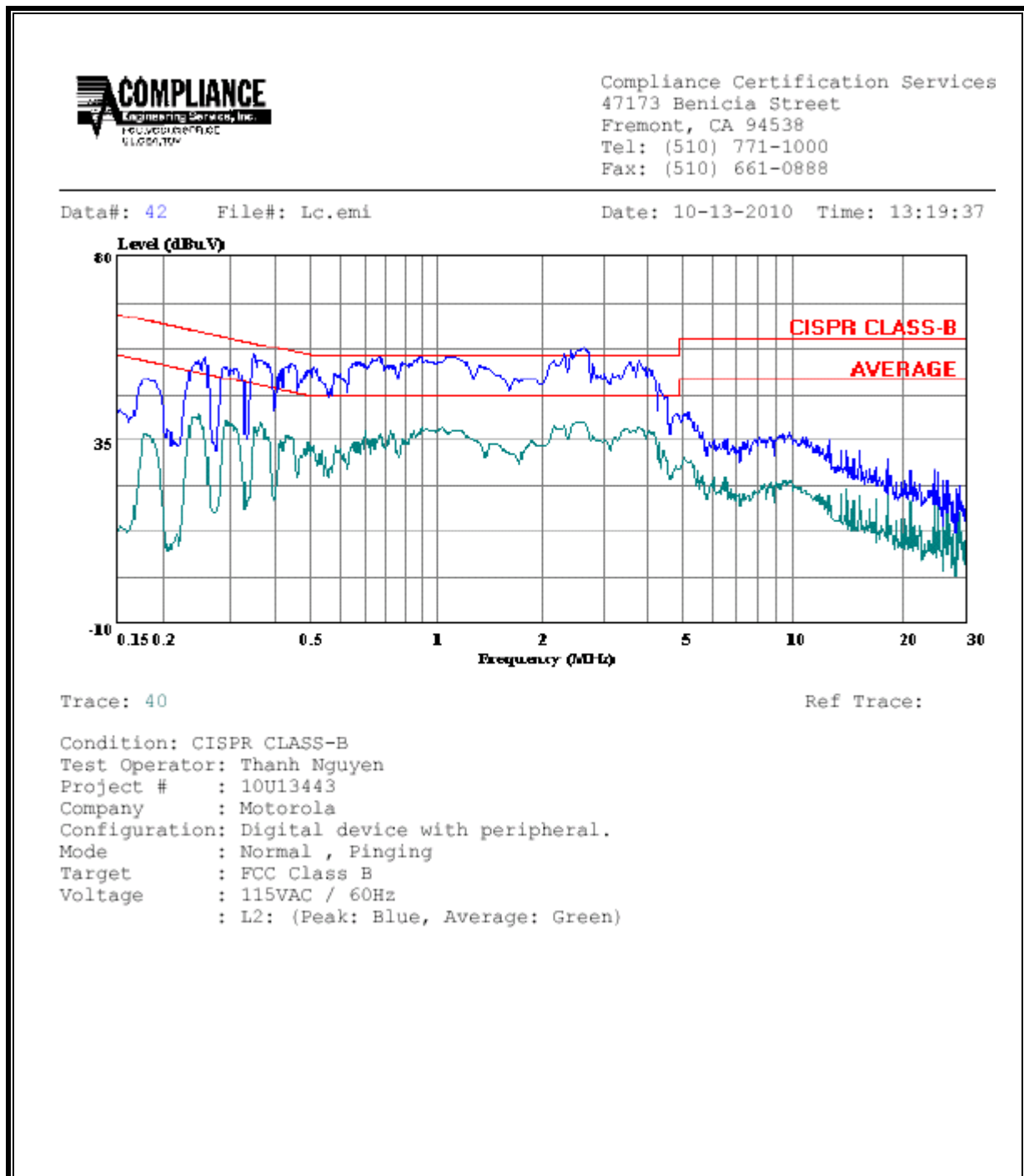


## RESULTS

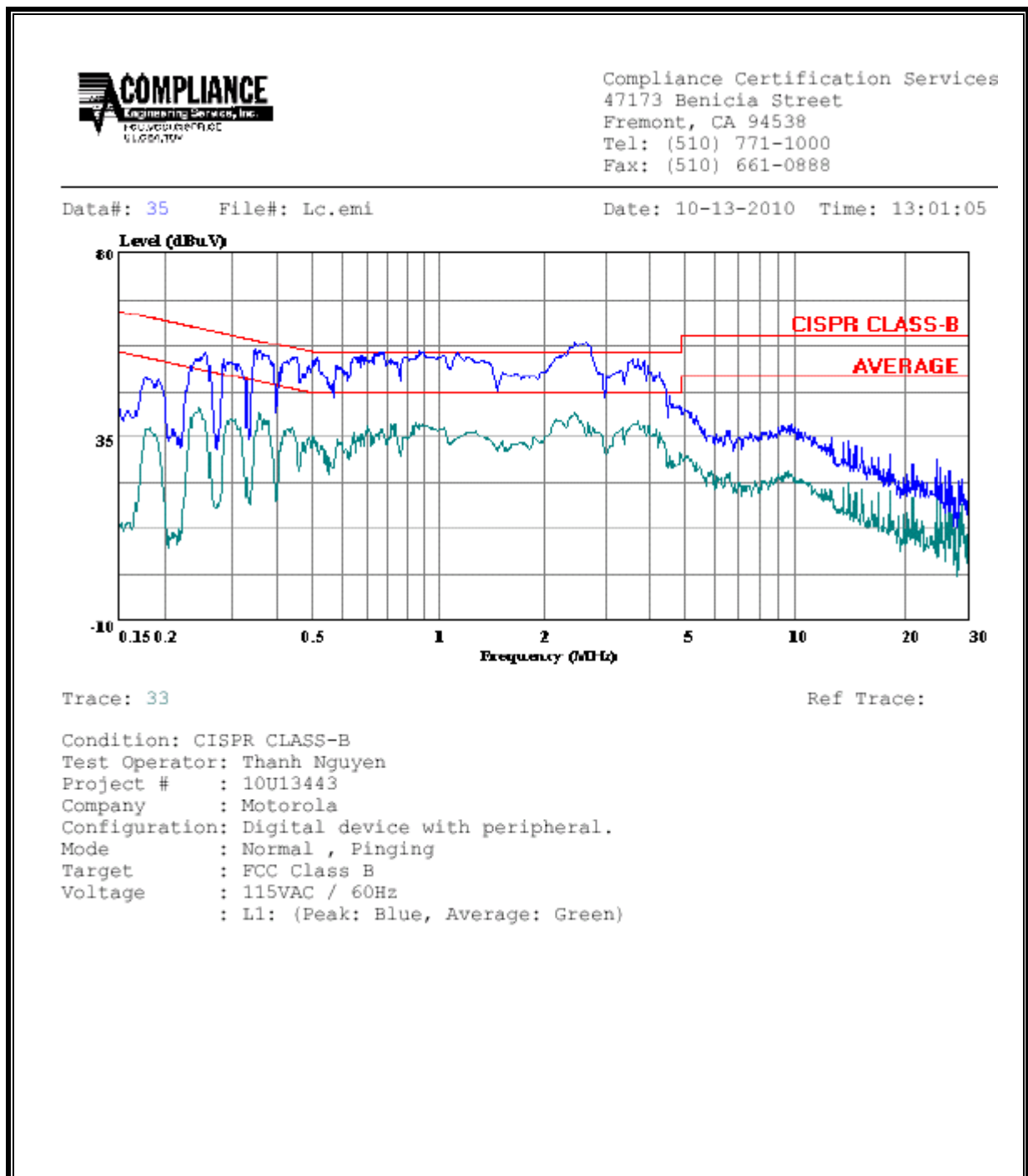
### 6 WORST EMISSIONS

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	EN_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.35	56.50	52.32	40.95	0.00	59.01	49.01	-6.69	-8.06	L1
0.97	56.06	52.30	38.55	0.00	56.00	46.00	-3.70	-7.45	L1
2.75	58.74	51.72	40.96	0.00	56.00	46.00	-4.28	-5.04	L1
0.35	56.04	52.50	39.60	0.00	58.96	48.96	-6.46	-9.36	L2
0.99	55.51	51.70	38.41	0.00	56.00	46.00	-4.30	-7.59	L2
2.75	57.95	50.50	39.46	0.00	56.00	46.00	-5.50	-6.54	L2
6 Worst Data									

## LINE 1 RESULTS

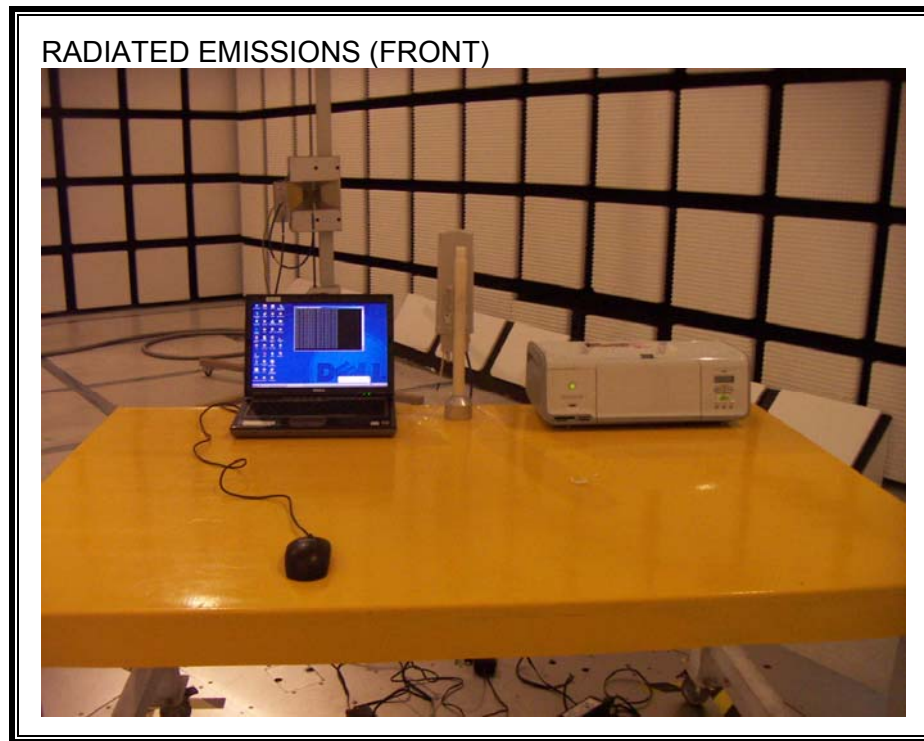


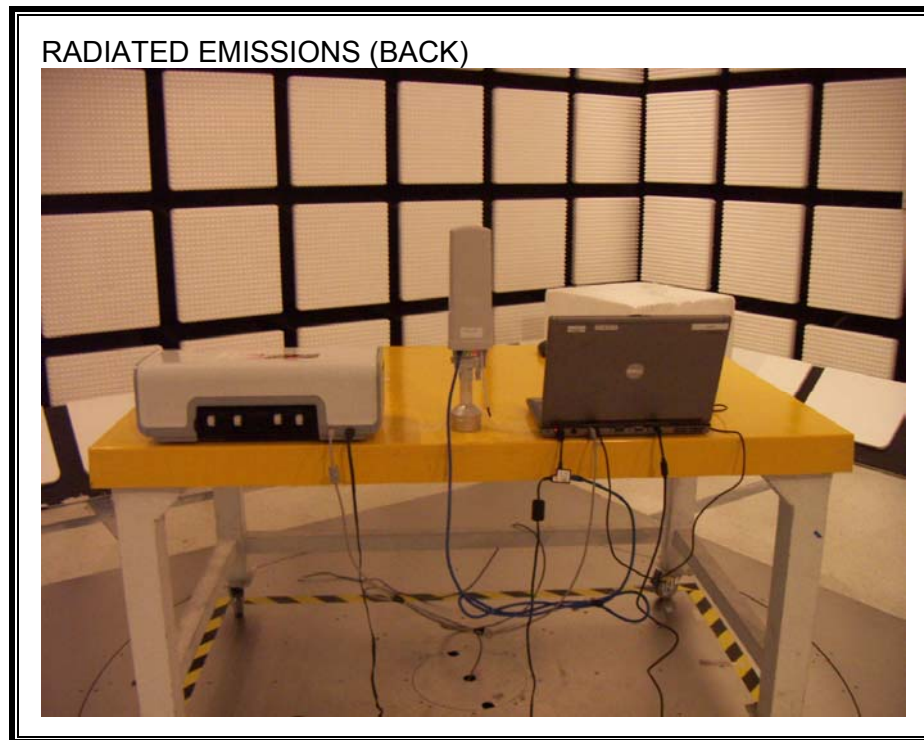
## LINE 2 RESULTS



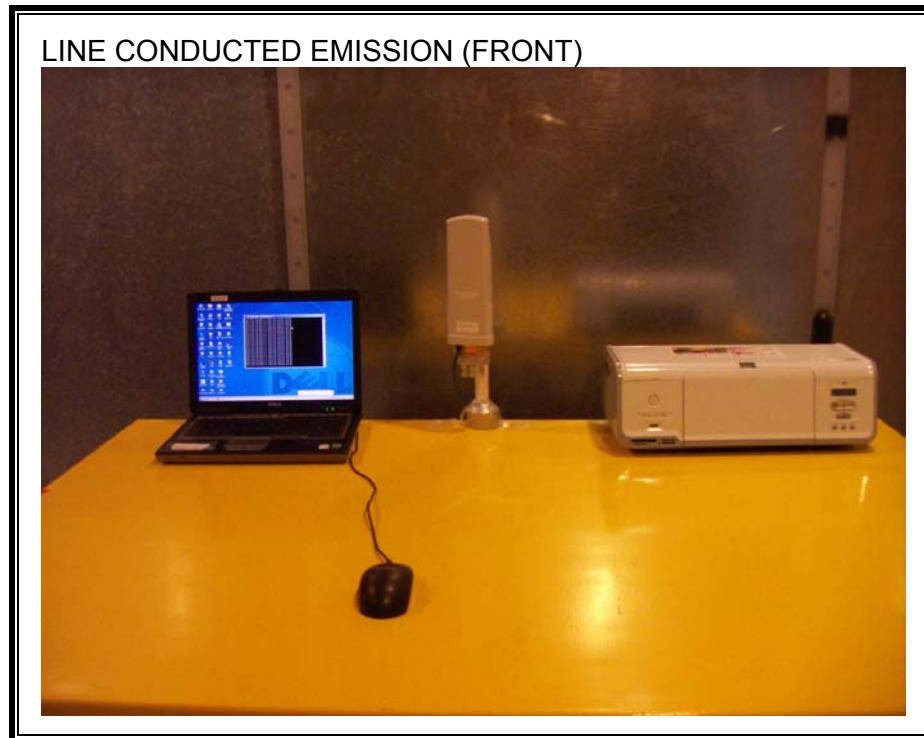
## 8. SETUP PHOTOS

### RADIATED EMISSION





**AC MAINS LINE CONDUCTED EMISSION**



LINE CONDUCTED EMISSION (BACK)



**END OF REPORT**