



**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

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Prepared for

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NVLAP®

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

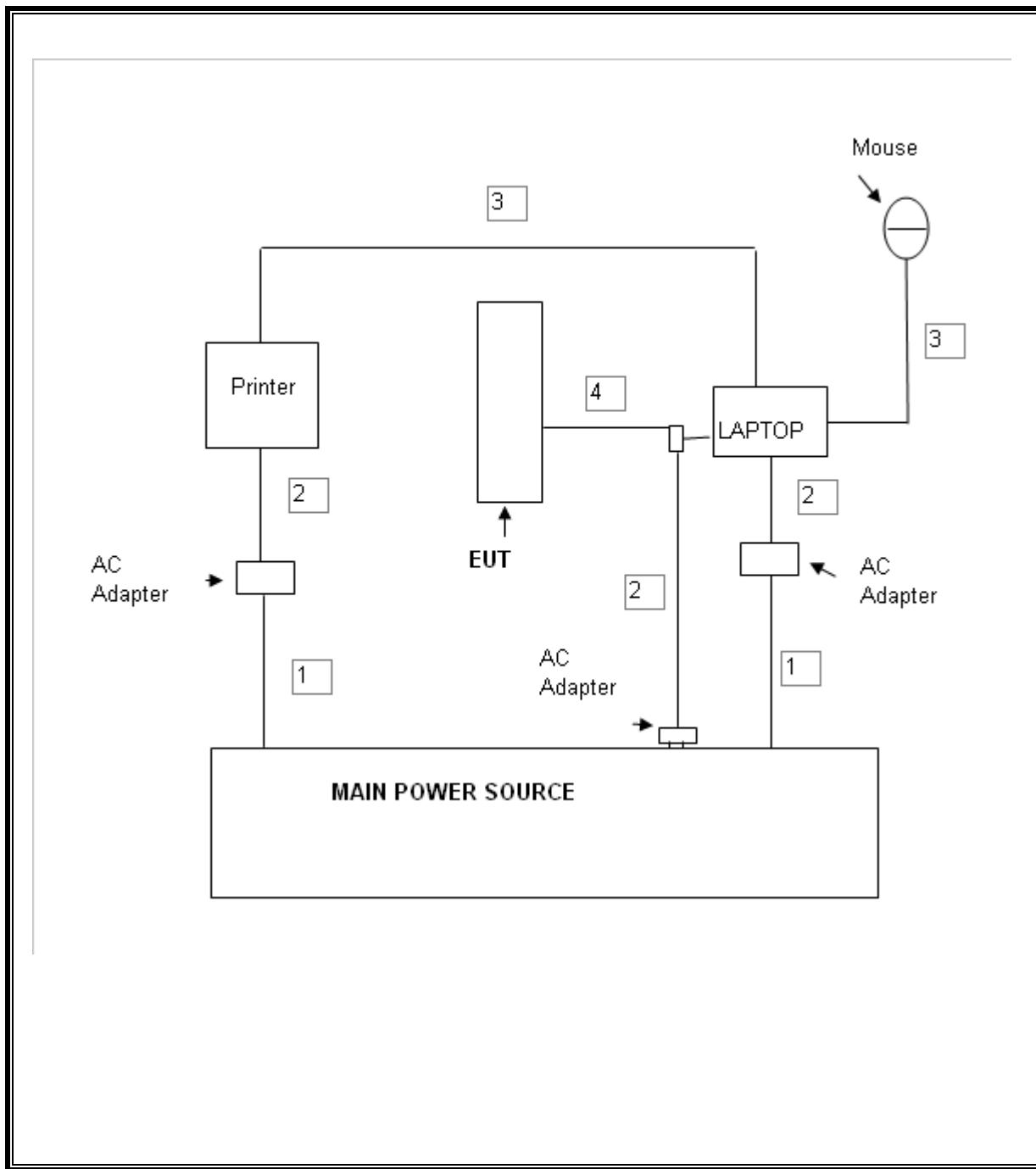
SUPPORT EQUIPMENT & PERIPHERALS

| 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).

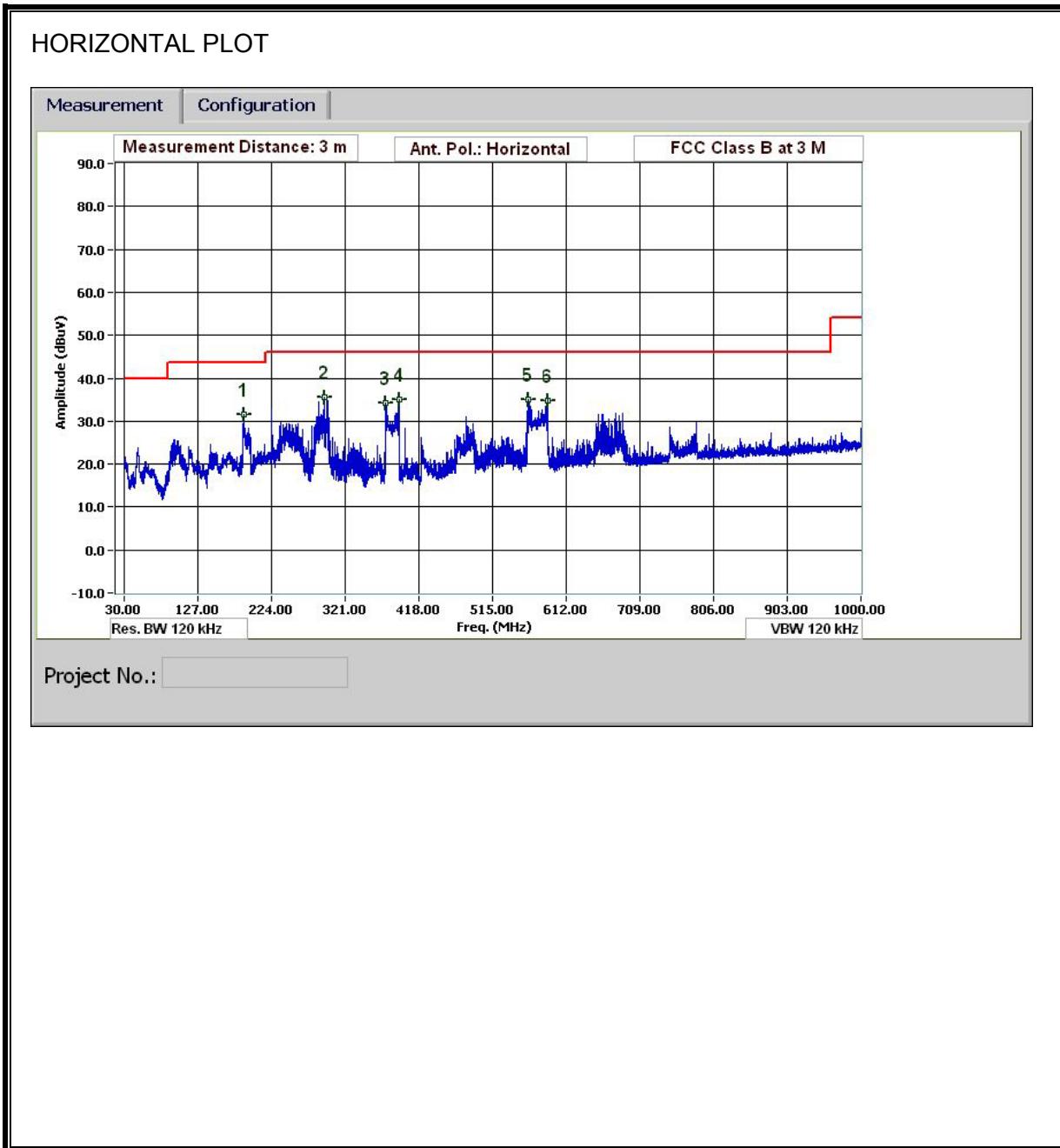
| Limits for radiated disturbance of Class B ITE at measuring distance of 10 m | |
|--|----------------------------------|
| Frequency range (MHz) | Quasi-peak limits (dB μ V/m) |
| 30 to 230 | 30 |
| 230 to 1000 | 37 |

Note: The lower limit shall apply at the transition frequency.

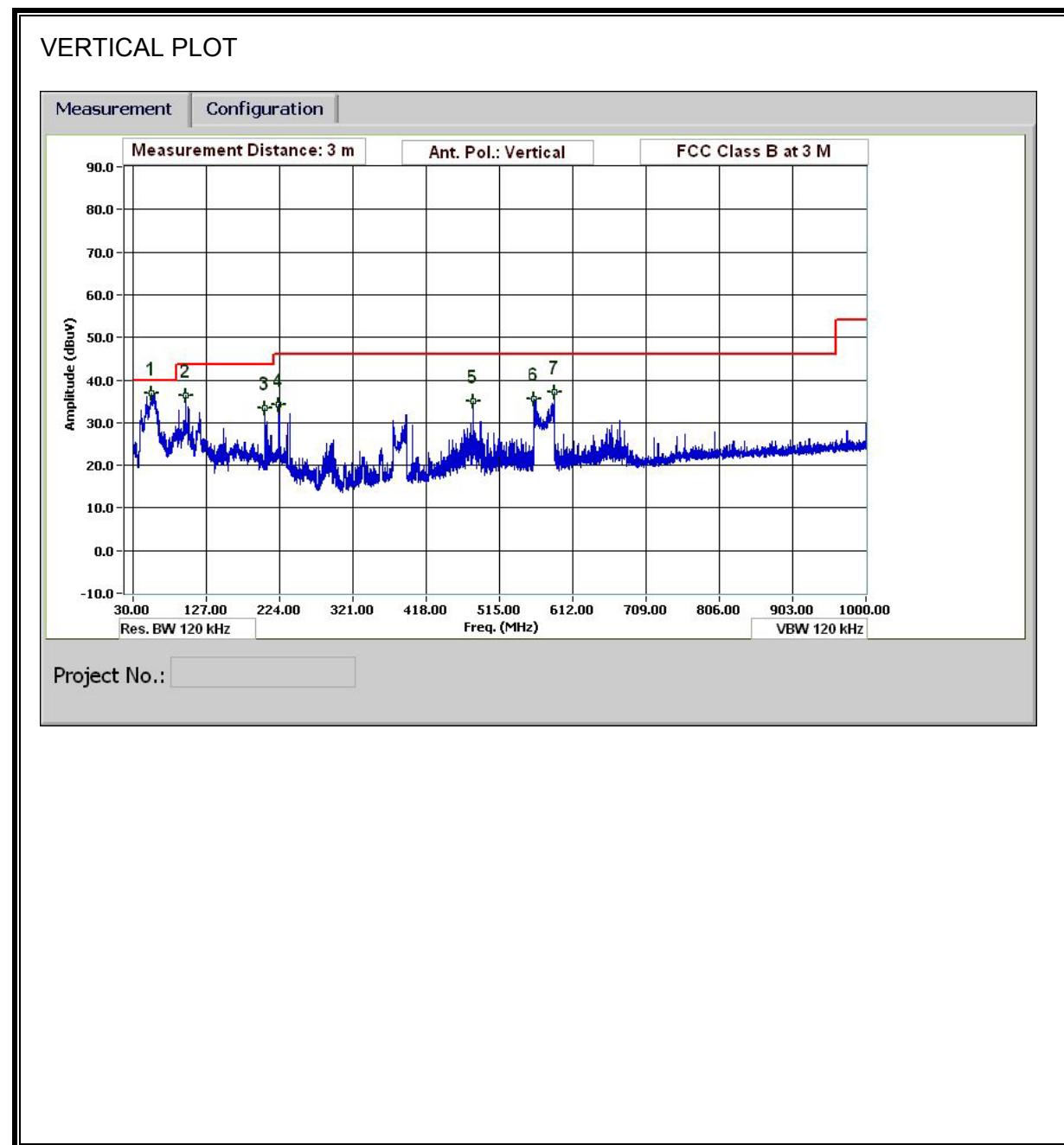
| Limits for radiated disturbance of Class B ITE at measuring distance of 3 m | | |
|---|----------------------------|-------------------------------|
| Frequency range (MHz) | Peak limits (dB μ V/m) | Average limits (dB μ V/m) |
| Above 1000 | 74 | 54 |

RESULTS

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



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



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. | | | | | | | | | | | | | | | | | |
| Test Equipment: | | | | | | | | | | | | | | | | | | |
| Horn 1-18GHz | | | | Pre-amplifier 1-26GHz | | | | Pre-amplifier 26-40GHz | | | | Horn > 18GHz | | | | Limit | | |
| T59; S/N: 3245 @3m | | | | T145 Agilent 3008A0054 | | | | | | | | | | | | 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 | Fltr 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 | 26.9 | 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 threshold. | | | | | | | | | | | | | | | | | | |
| 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 μ 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 μ 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:

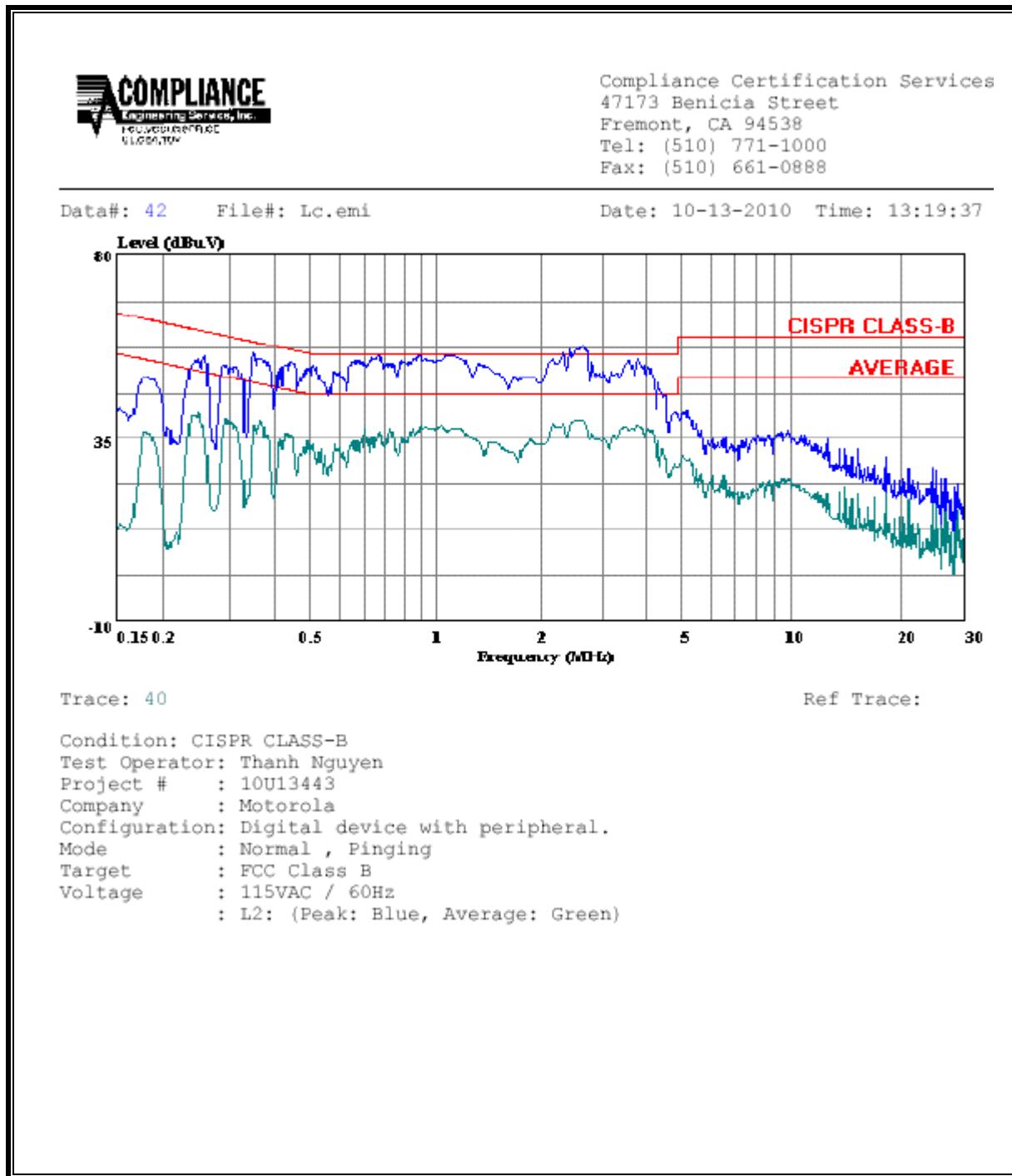
1. The lower limit shall apply at the transition frequencies
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

RESULTS

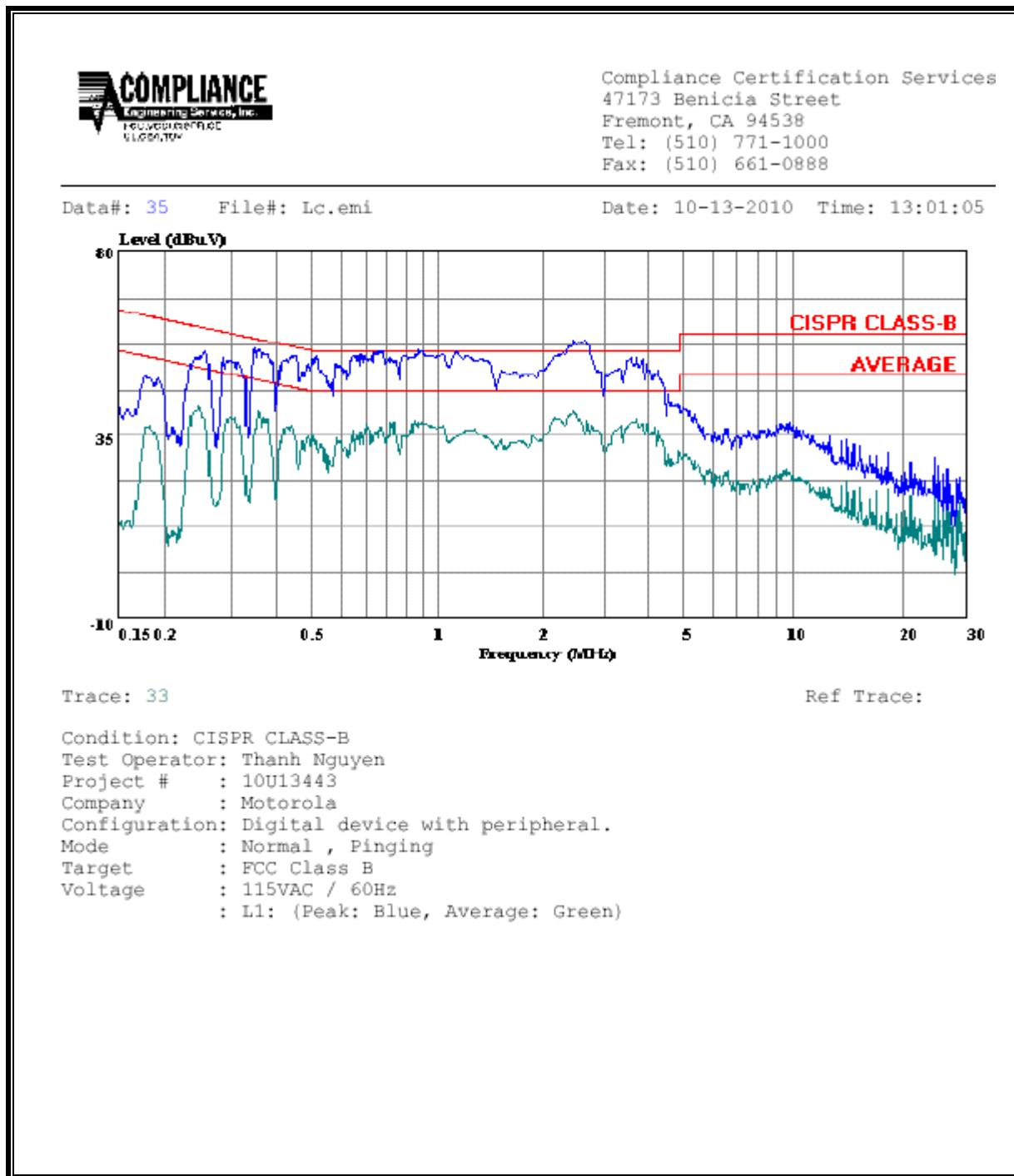
6 WORST EMISSIONS

| CONDUCTED EMISSIONS DATA (115VAC 60Hz) | | | | | | | | | |
|--|-----------|-----------|-----------|---------------|-------|-------|--------|-------|--------|
| Freq. (MHz) | Reading | | | Closs (dB) | Limit | EN_B | Margin | | Remark |
| | PK (dBuV) | QP (dBuV) | AV (dBuV) | | | | QP | AV | |
| 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

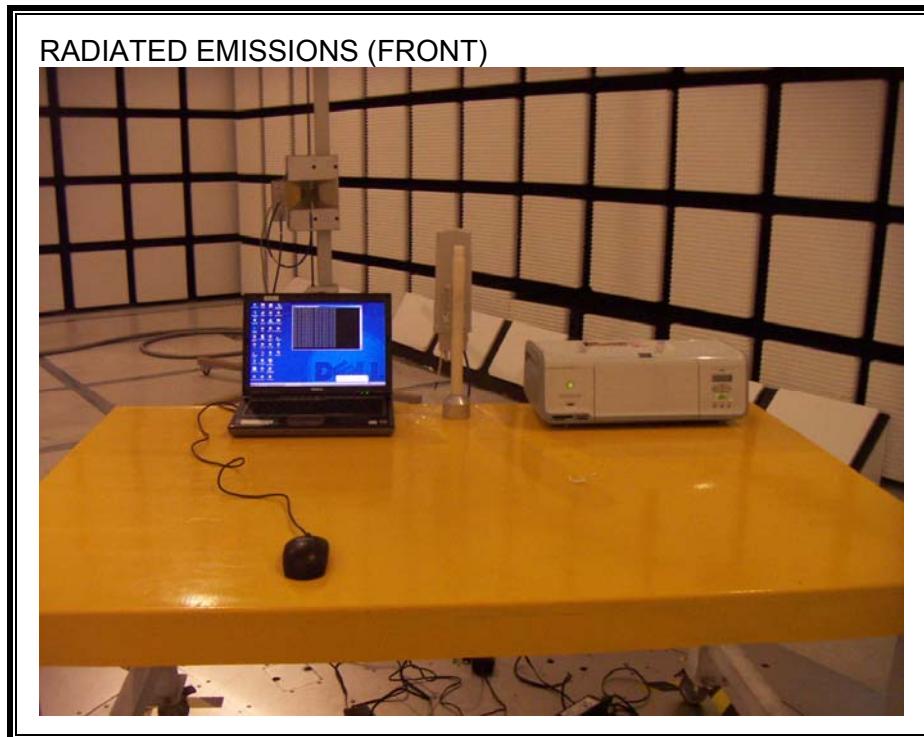


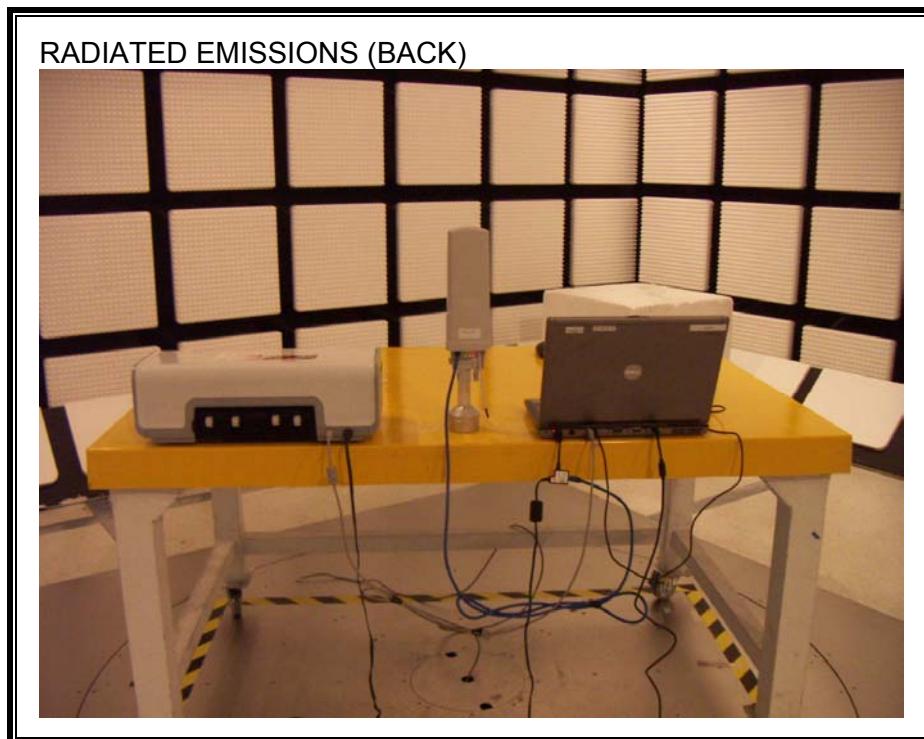
LINE 2 RESULTS



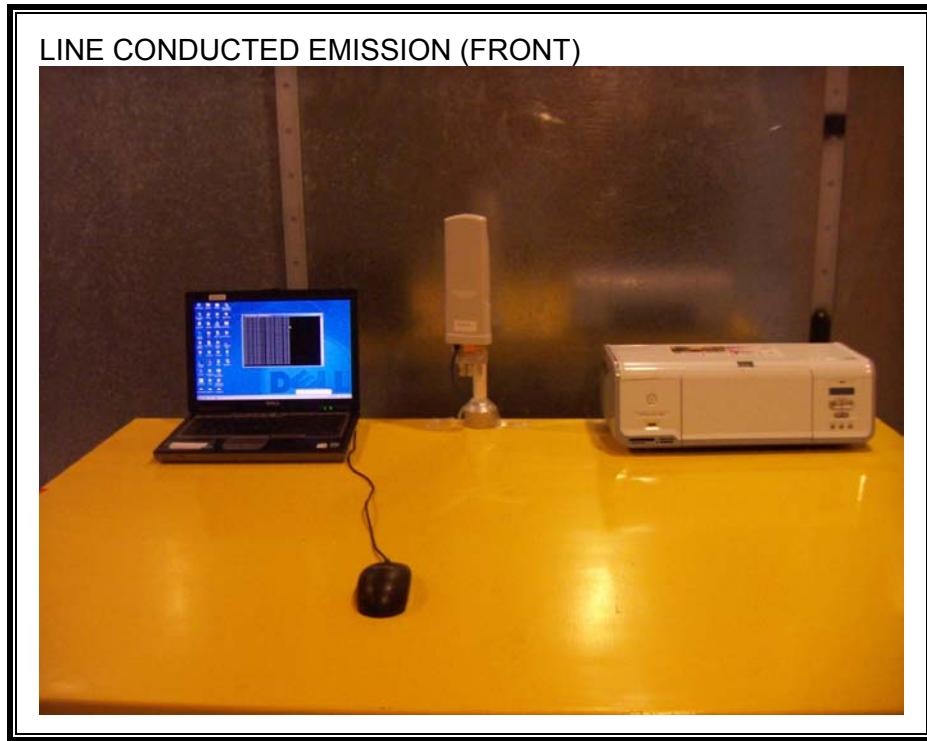
8. SETUP PHOTOS

RADIATED EMISSION





AC MAINS LINE CONDUCTED EMISSION



LINE CONDUCTED EMISSION (BACK)



END OF REPORT