



EMC

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Project Number:	07NK21548
File Number:	MC15003
Date:	September 17, 2007
Model:	IHDP56HM1

Electromagnetic Compatibility Test Report

For

Motorola Corp

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Project Number: 07NK21548
FCC ID: IHDP56HM1
Client Name: Motorola

File Number: MC15003

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Test Report Details

Tests Performed By: **Underwriters Laboratories Inc.
333 Pfingsten Rd.
Northbrook, IL 60062**

Tests Performed For: **Motorola Inc.
600 N. US HWY 45
Libertyville, IL 60048**

Applicant Contact: **Doug Hammers**

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Test Report Date: **September 17, 2007**

Product Type: **Bluetooth Cell Phone**

Product standards: **47 CFR Part 15**

Model Number: **IHDP56HM1**

EUT Category: **Transmitter**

Testing Start Date: **September 6, 2007**

Date Testing Complete: **September 13, 2007**

Overall Results: Compliant

Underwriters Laboratories Inc. reports apply only to the specific samples tested under stated test conditions. All samples tested were in good operating condition throughout the entire test program. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. Underwriters Laboratories Inc. shall have no liability for any deductions, inferences or generalizations drawn by the client or others from Underwriters Laboratories Inc. issued reports. This report shall not be used to claim, constitute or imply product certification, approval, or endorsement by NVLAP, A2LA, or any agency of the US government.

This report may contain test results that are not covered by the NVLAP or A2LA accreditation. The scope of accreditation is limited to the specific tests that are listed on the NVLAP and/or A2LA websites referenced at the end of this report.

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Report Revision History

Revision Date	Description	Revised By	Revision Reviewed By
none			

1.0 GENERAL - Product Description

1.1 Equipment Description

The Equipment Under Test (EUT) is a Bluetooth cell phone, FCC ID IHDP56HM1

1.2 Device Configuration During Test

1.2.1 Equipment Used During Test:

Use	Product Type	Manufacturer	Model	Comments
EUT	Cell Phone	Motorola	IHDP56HM1	Submission# 21073
Note: EUT - Equipment Under Test, AE - Auxiliary/Associated Equipment, or SIM - Simulator (Not Subjected to Test)				

1.2.2 Input/Output Ports:

Port #	Name	Type*	Cable Max. >3m (Y/N)	Cable Shielded (Y/N)	Comments
0	Enclosure	N/E	—	—	None
Note: AC = AC Power Port DC = DC Power Port N/E = Non-Electrical I/O = Signal Input or Output Port (Not Involved in Process Control) TP = Telecommunication Ports					

1.3 EUT Operation Modes

Mode #	Description
1	<ul style="list-style-type: none">-Per manufacturer's request, tests were performed in the Bluetooth mode only. See Appendix C. for manufacturer's provided instructions for configuring the phone to operate in this mode.-Tests were performed at low, mid, and high channels.-Test were performed with EUT oriented along X, Y, and Z orthogonal axis.

1.4 EUT Configurations

Mode #	Description
1	Phone was tested in battery mode. No external cables (USB, headphone, or charger) were attached per manufacturer.

2.0 Summary

The tests listed in the Summary of Testing section of this report have been performed and the results recorded by Underwriters Laboratories Inc. in accordance with the procedures stated in each test requirement and specification. The applicant determined the list of tests performed were applicable to the Equipment Under Test. As a result, the subject product has been verified to comply or not comply as noted in the Summary of Testing with each test specification. The test results relate only to the items tested.

2.1 Deviations from standard test methods

None

2.2 Device Modifications Necessary for Compliance

None

2.3 Reference Standards

Standard Number	Standard Name	Standard Date
47 CFR Part 15	Radio Frequency Devices	2007

2.4 Results Summary

This product is considered Class B

Requirement – Test	Result (Complaint / Non-Compliant)*
Radiated Spurious Emissions and Bandedge	Compliant



Michael Ferrer (Ext.41312)
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 Conformity Assessment Services-



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 Conformity Assessment Services

Any information and documentation involving UL Mark services are provided on behalf of Underwriters Laboratories Inc. (UL) or any authorized licensee of UL.

3.0 Calibration of Equipment Used for Measurement

All test equipment and test accessories are calibrated on a regular basis. The maximum time between calibrations is one year or the manufacturers' recommendation, whichever is less.

All test equipment calibrations are traceable to the National Institute of Standards and Technology (NIST); therefore, all test data recorded in this report is traceable to NIST.

4.0 EMISSIONS TEST RESULTS

The emissions tests were performed according to following regulations:

----- United States -----

Code of Federal Regulations Title 47	Part 15, Subpart C, Radio Frequency Devices
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- The **spurious radiated emission** requirements of paragraph **15.247(d) of CFR47 Part 15 2007**, specifically "radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).
- Under this project only 30 to 1000MHz, 1 to 25GHz and band-edge measurements were performed.
- Additional guidance was obtained from FCC Document, DA 00-705, Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems Released March 30, 2000

Unless specified otherwise in the individual Methods, the tests shall be conducted under the following ambient conditions. Confirmation of these conditions shall be verified at the time the test is conducted.

Ambient Temperature, °C	22.5 ± 2.5	Relative Humidity, %	45 ± 15	Barometric Pressure, mBar	950 ± 150
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4.1 Test Conditions and Results – RADIATED EMISSIONS

Test Description	Measurements were made in a 10-meter semi-anechoic chamber that complies to CISPR 16/ANSI C63.4. Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 10-meter or 3-meter as noted. The EUT was rotated 360° about its azimuth with the receive antenna located at various heights in both horizontal and vertical polarities. Final measurements (quasi-peak or average as noted) were then performed by rotating the EUT 360° and adjusting the receive antenna height. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable.	
Basic Standard	47 CFR Part 15	
UL LPG	80-EM-S0029	
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	30MHz – 1GHz	(10 meter measurement distance)
Fully configured sample scanned over the following frequency range	1-25GHz	(3 meter measurement distance)
Fully configured sample scanned over the following frequency range	Bandedge 2.370 – 2.510 GHz	(3 meter measurement distance)
Limits - Class B		
Frequency (MHz)	Limit (dBµV/m)	
	Quasi-Peak	Average
30-230	30	NA
230-1000	37	NA
1000-25000	NA	54
Supplementary information: None		

Table 1 Radiated Emissions EUT Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	1	1
Supplementary information: None		

Table 2 Radiated Emissions Test Equipment

Description	Manufacturer	Model	Identifier
Spectrum Analyzer	HP	8566B	EMC4085
Quasi-Peak Detector	HP	85650A	EMC4016
Bicon Antenna	Chase	VBA6106A	EMC4078
Log-P Antenna	Chase	UPA6109	EMC4258
Spectrum Analyzer	Rhode & Schwartz	FSEK	EMC4182
Antenna Array	UL	BOMS	EMC4276

All test equipment and test accessories are calibrated on a regular basis. The maximum time between calibrations is one year or the manufacturers' recommendation, whichever is less.

Figure 1 Test setup for Radiated Emissions

X-axis

For photo refer to test setup photos exhibit FCC IHDP56HM1

Y-axis

For photo refer to test setup photos exhibit FCC IHDP56HM1

Z-axis

For photo refer to test setup photos exhibit FCC IHDP56HM1

Figure 2 Radiated Emissions Graph

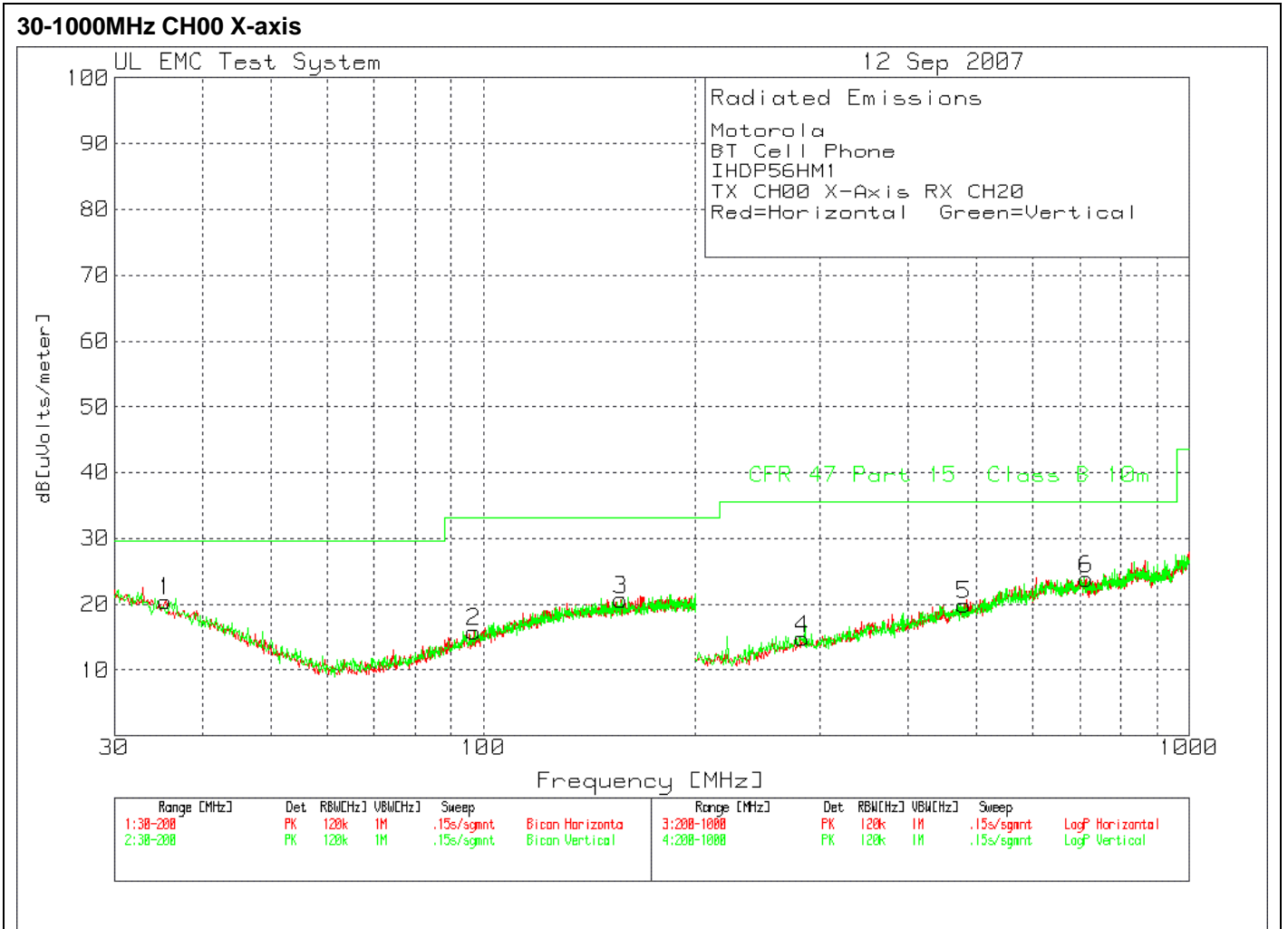


Figure 3 Radiated Emissions Graph

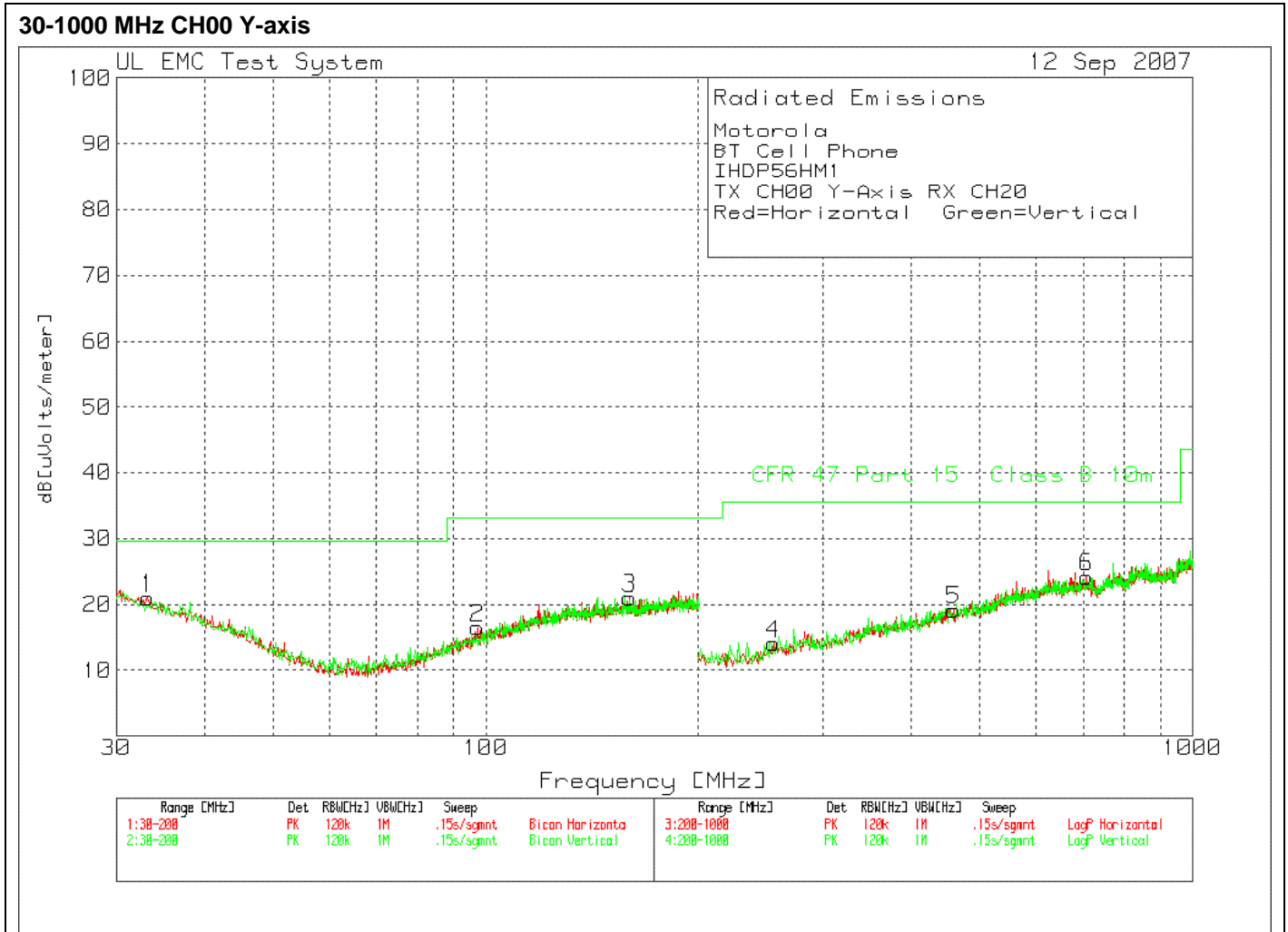


Figure 4 Radiated Emissions Graph

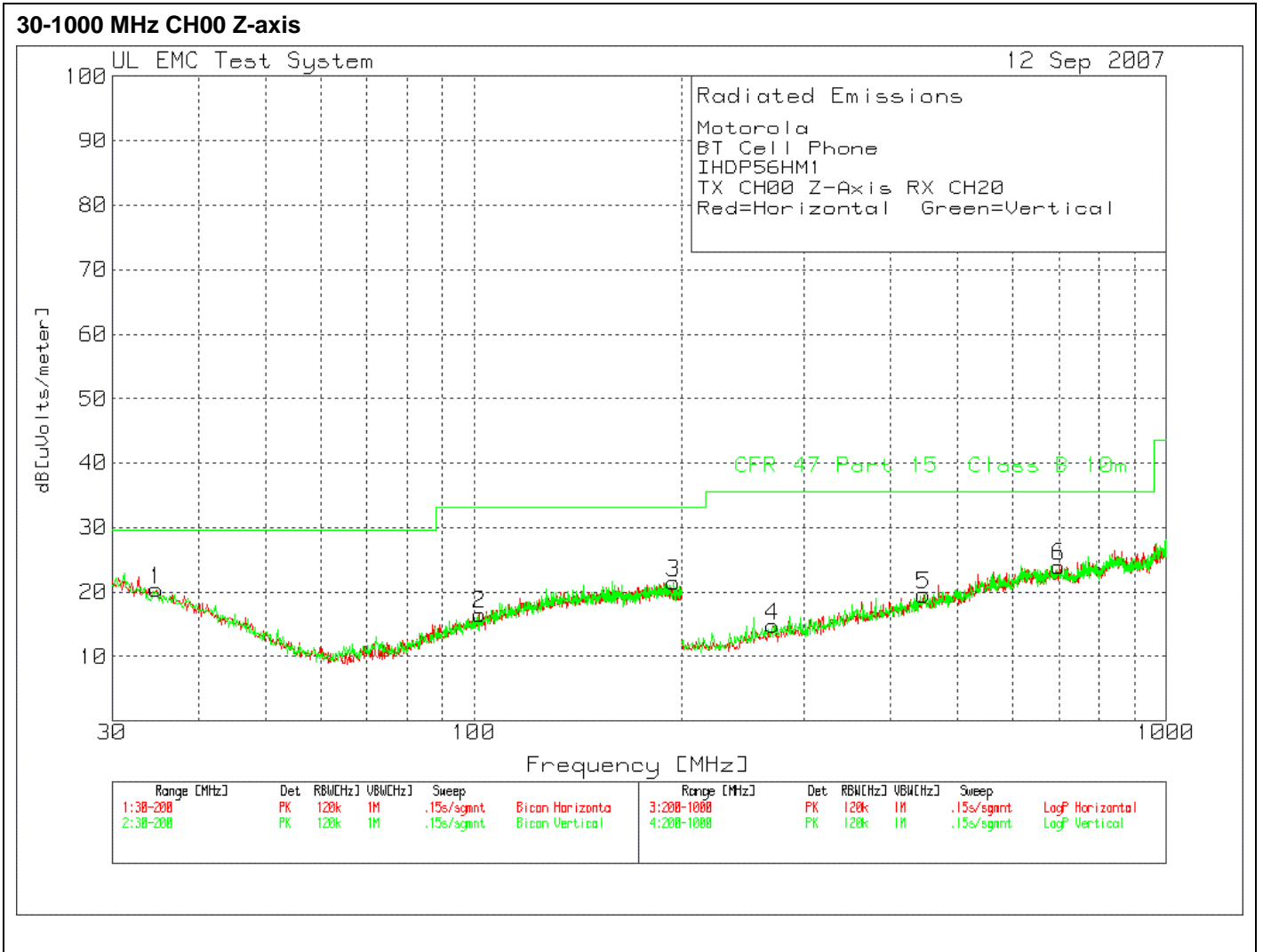


Figure 5 Radiated Emissions Graph

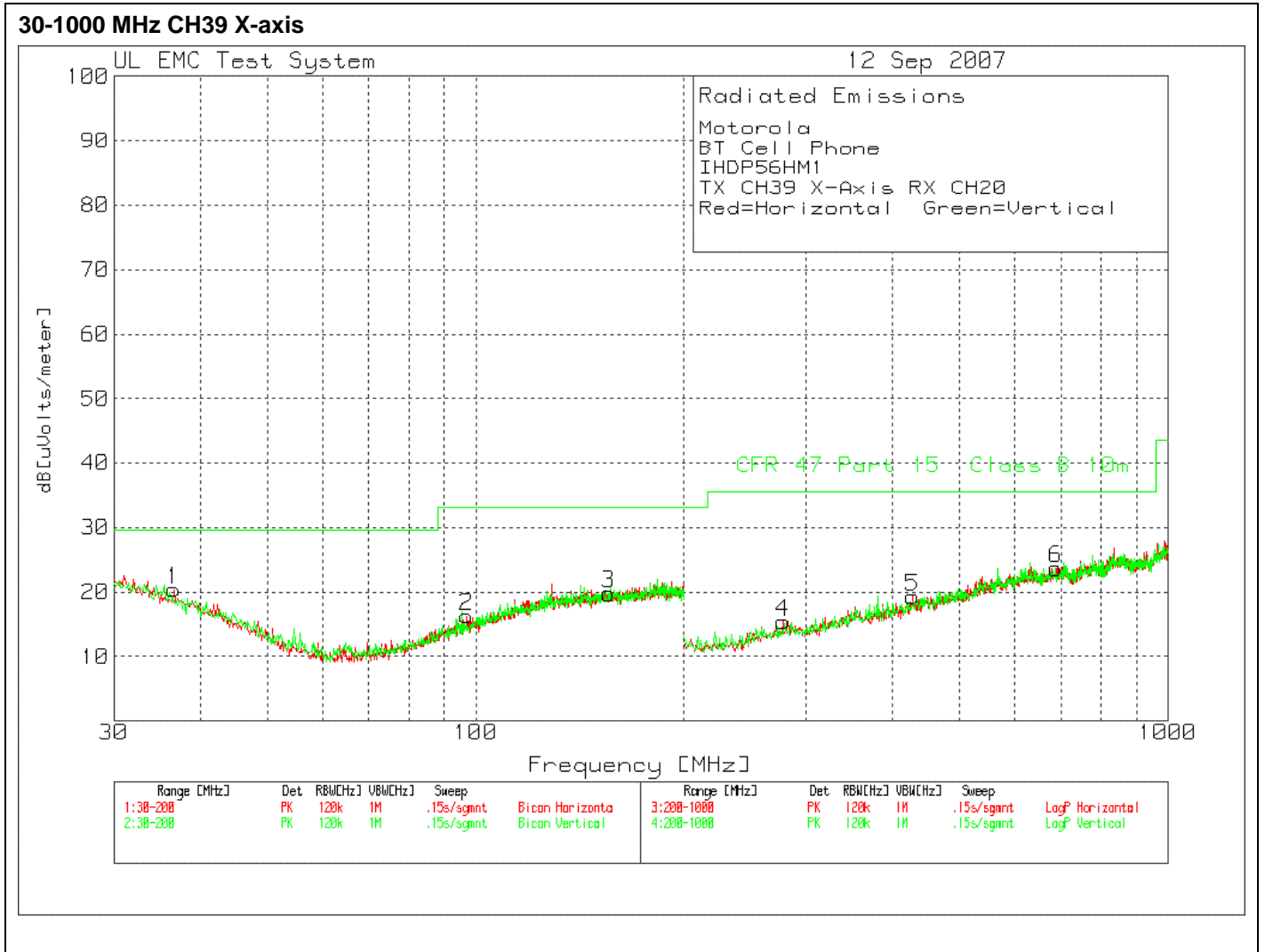


Figure 6 Radiated Emissions Graph

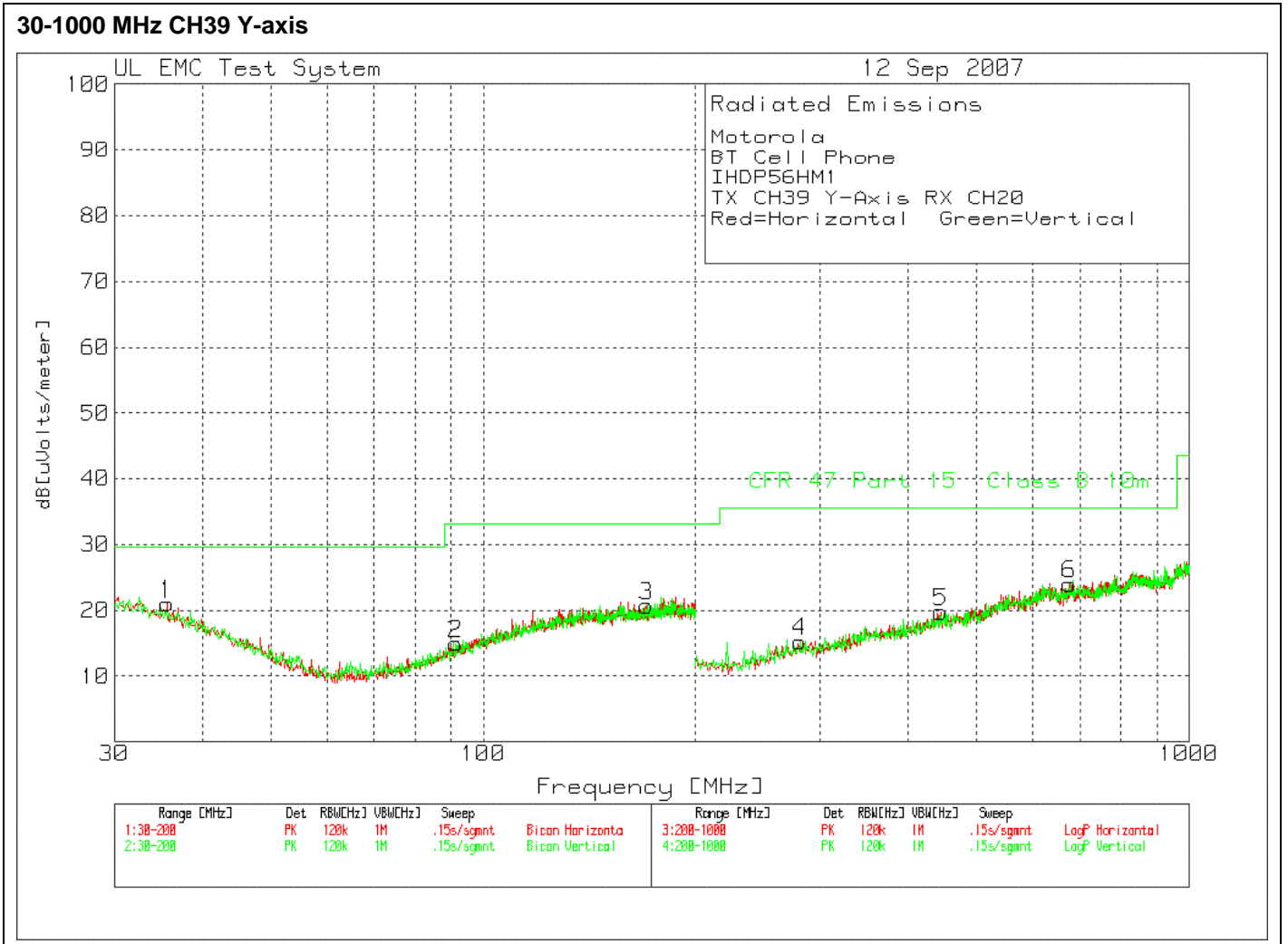


Figure 7 Radiated Emissions Graph

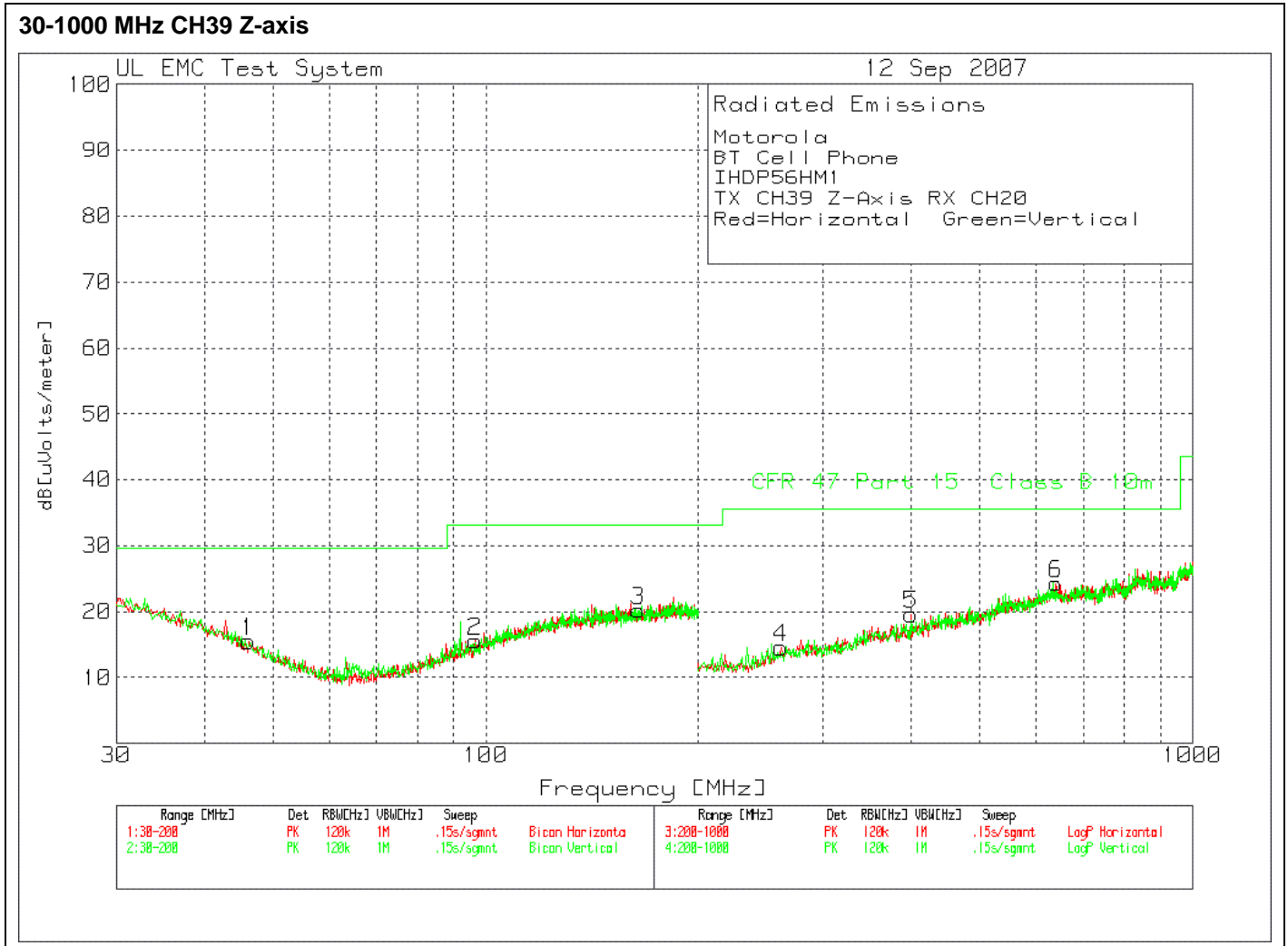


Figure 8 Radiated Emissions Graph

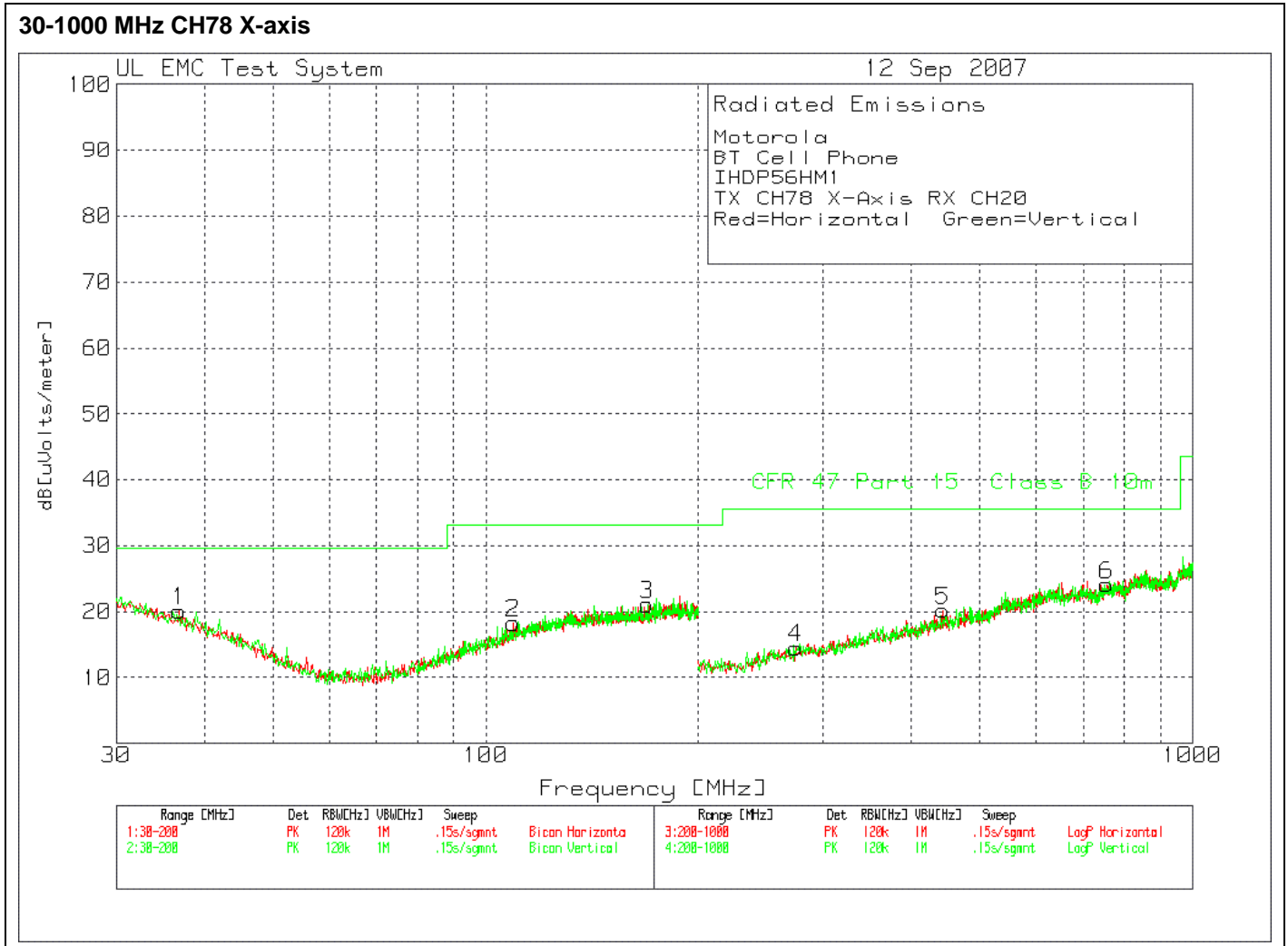


Figure 9 Radiated Emissions Graph

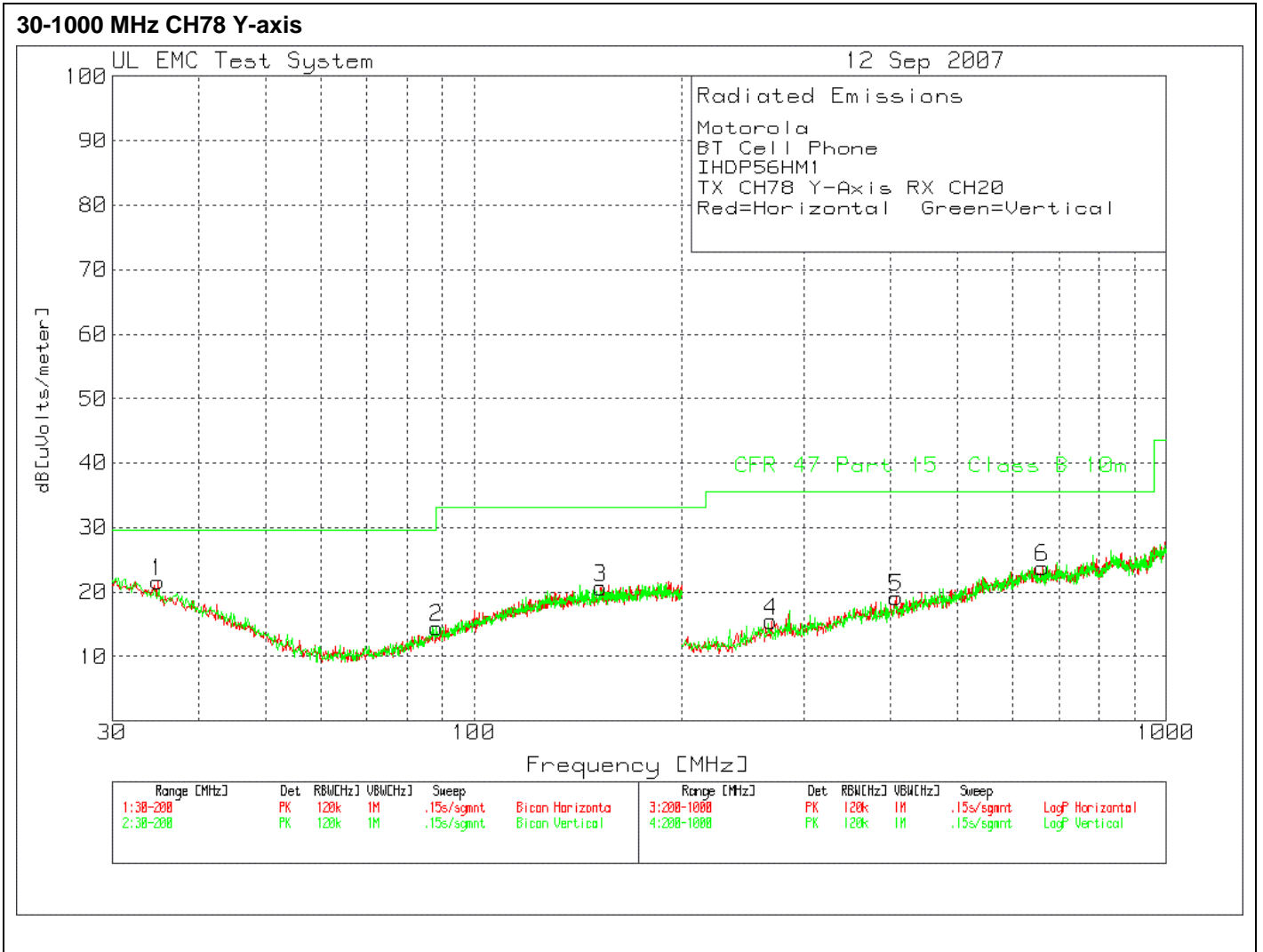


Figure 10 Radiated Emissions Graph

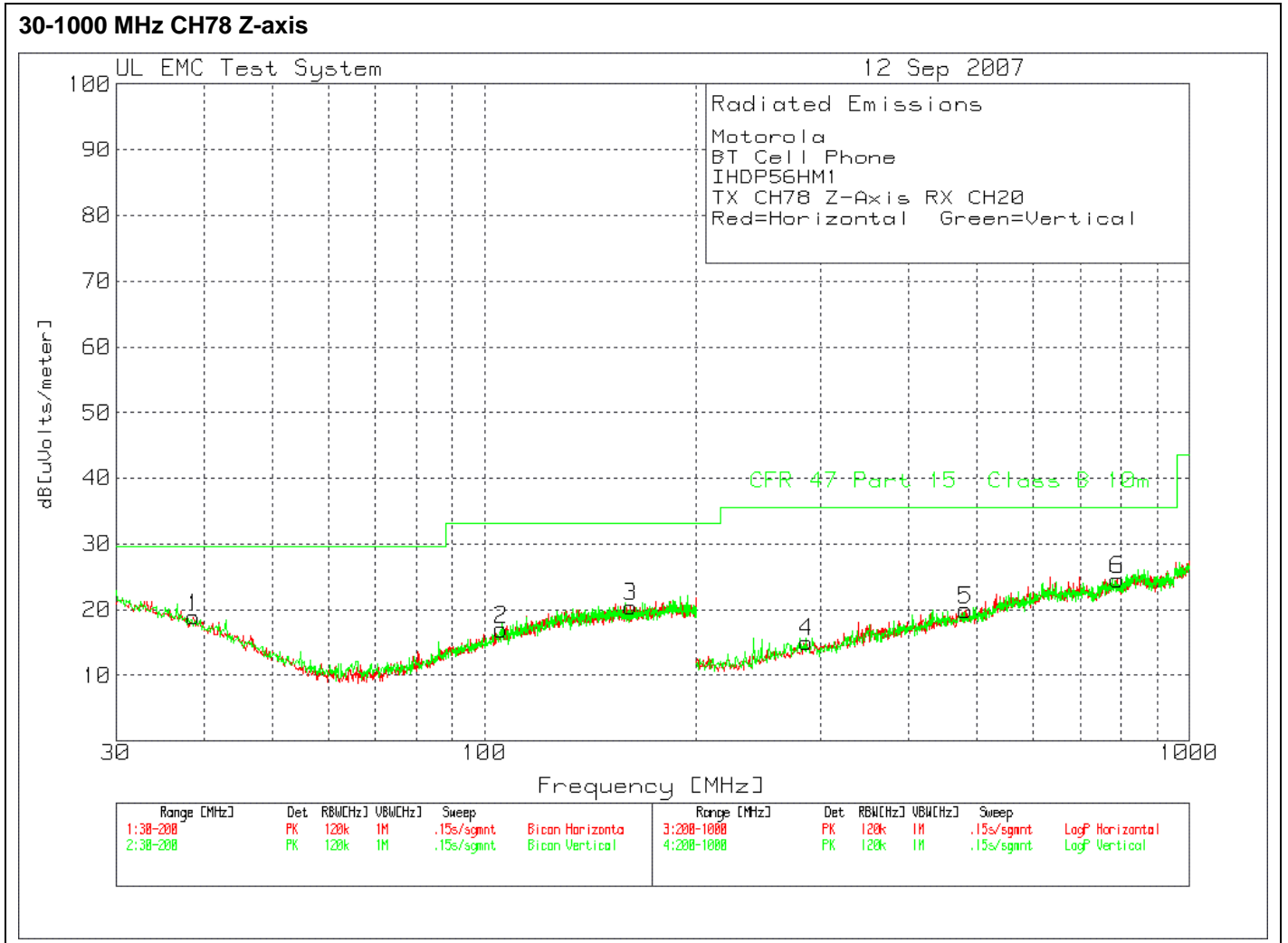


Figure 11 Radiated Emissions Graph

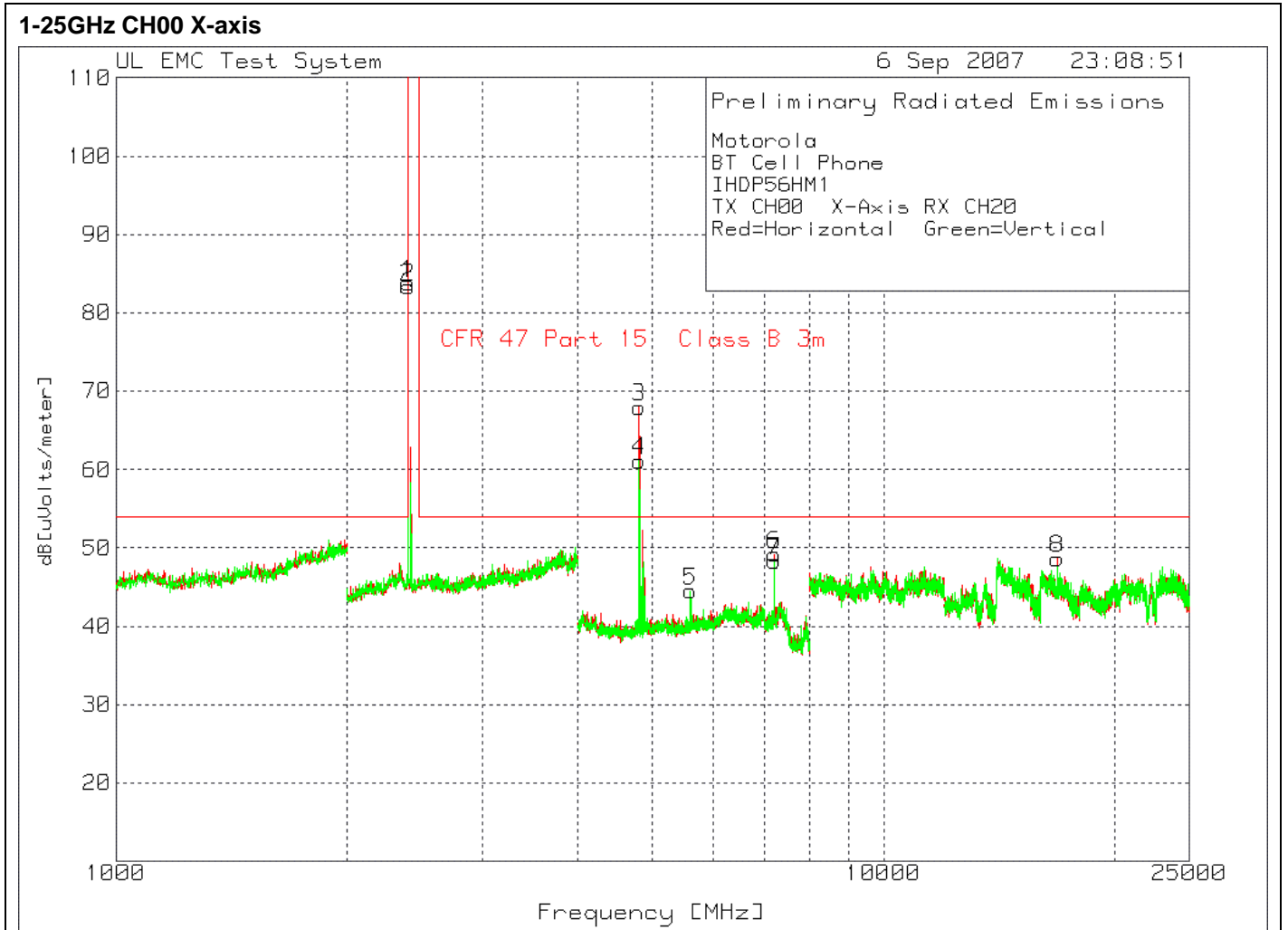


Figure 12 Radiated Emissions Graph

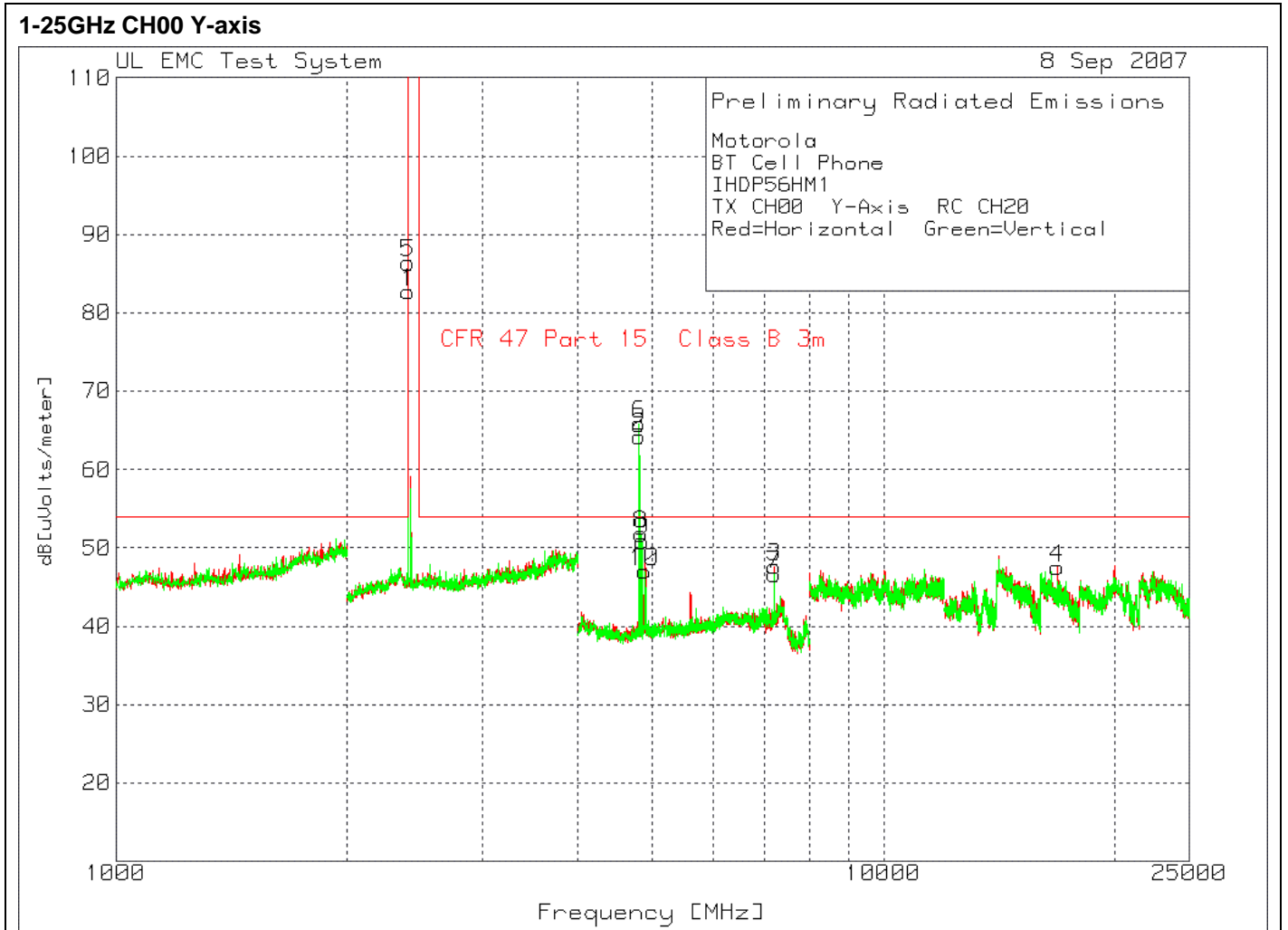


Figure 13 Radiated Emissions Graph

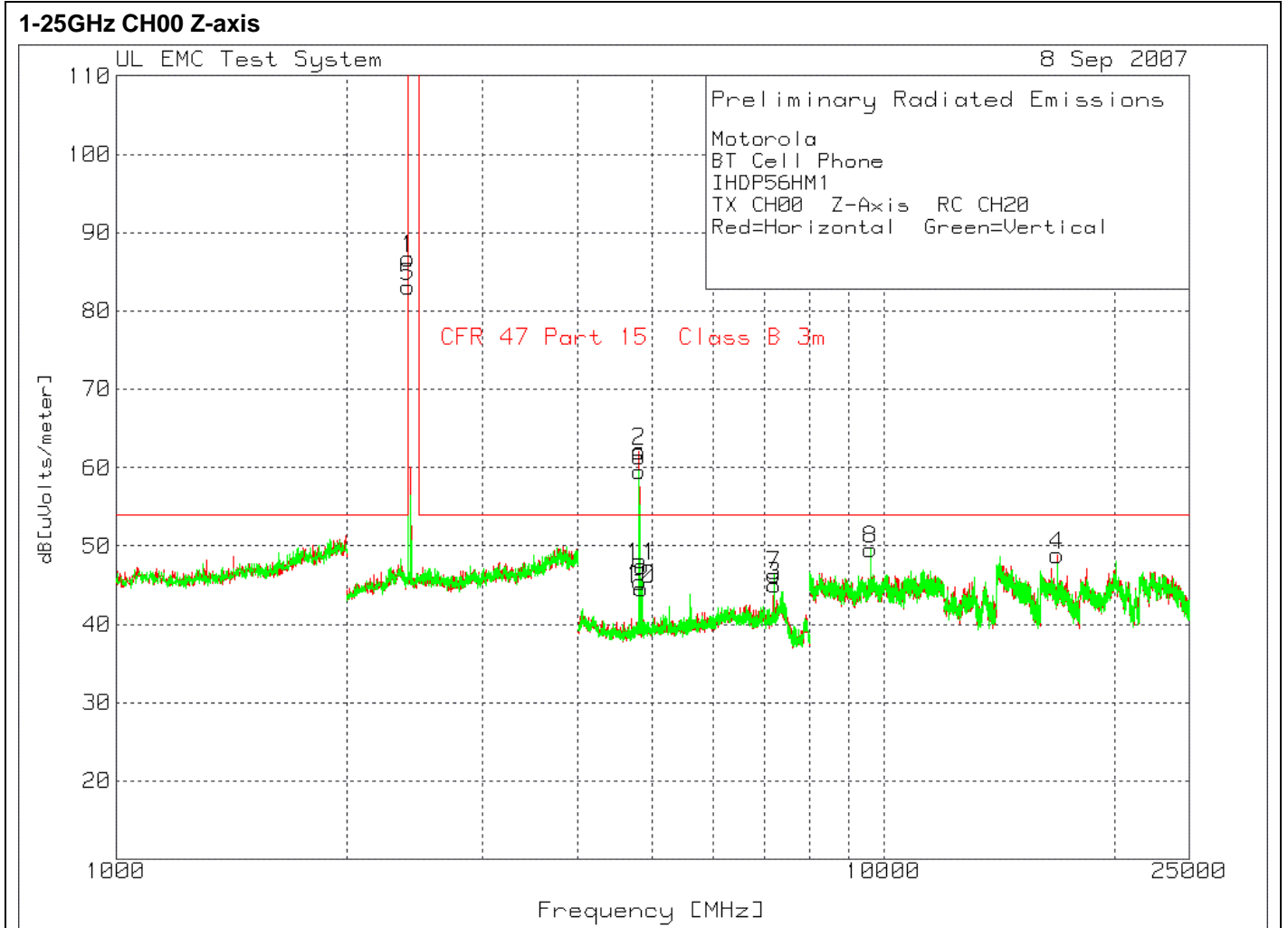


Figure 14 Radiated Emissions Graph

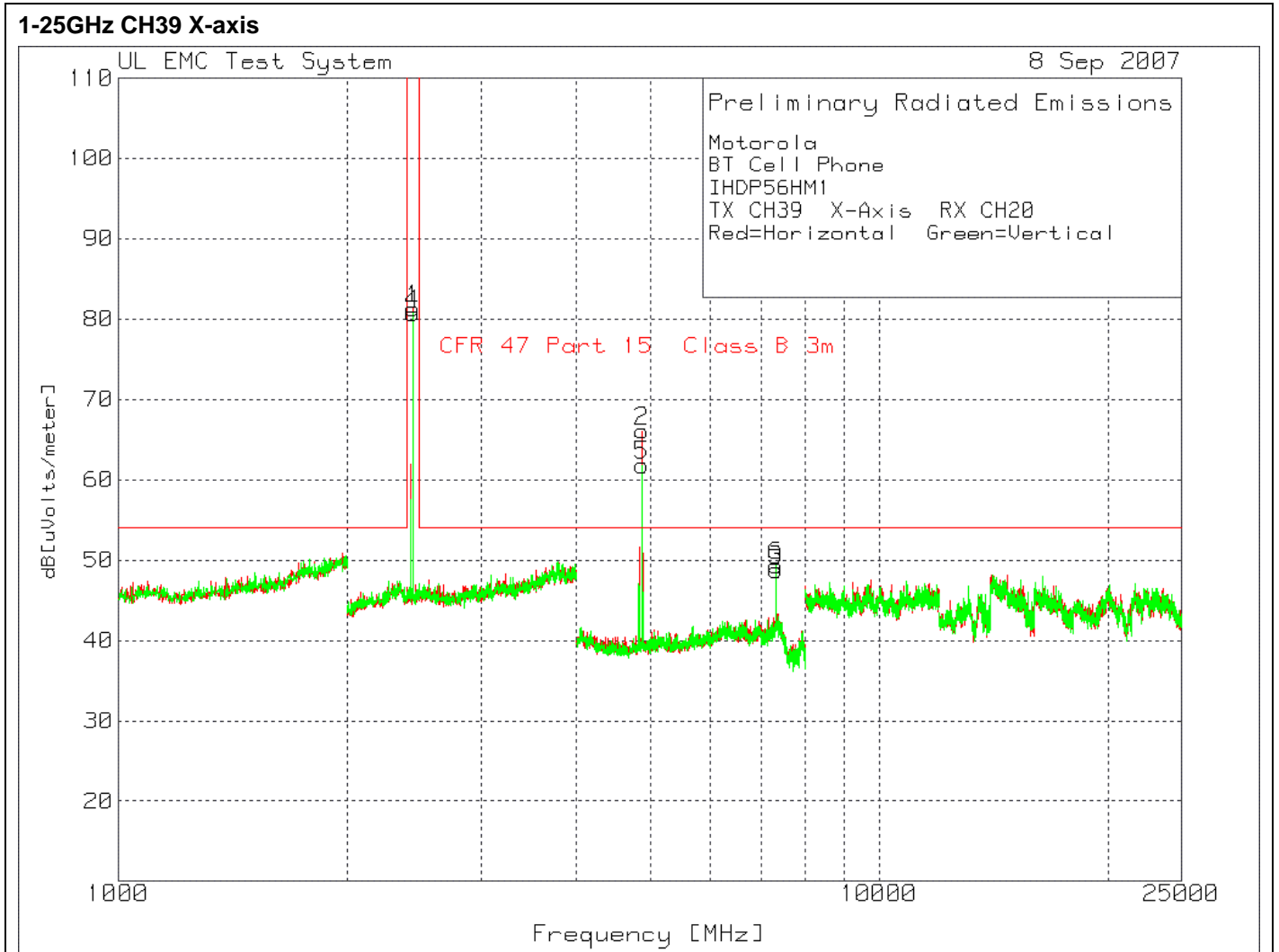


Figure 15 Radiated Emissions Graph

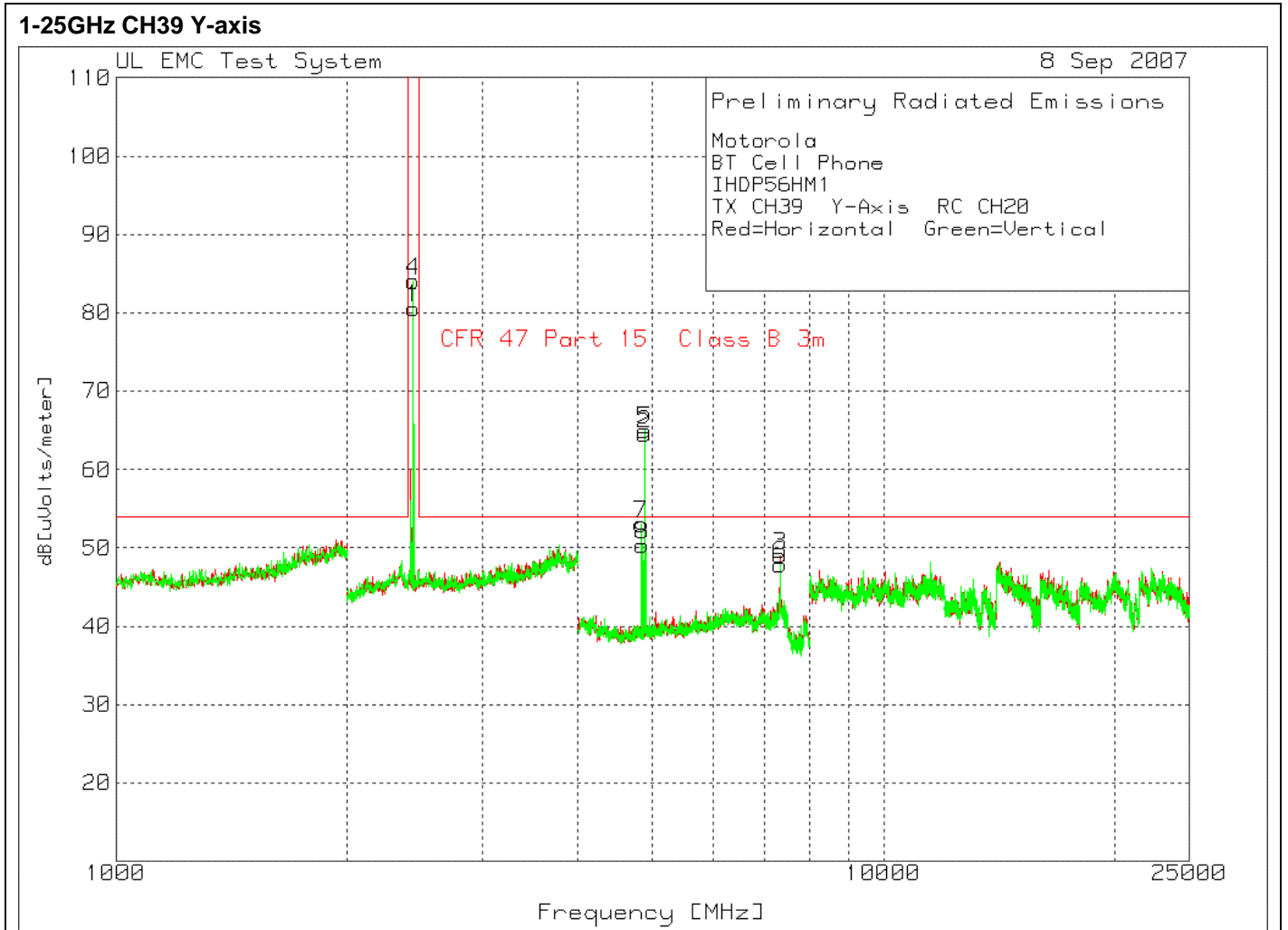


Figure 16 Radiated Emissions Graph

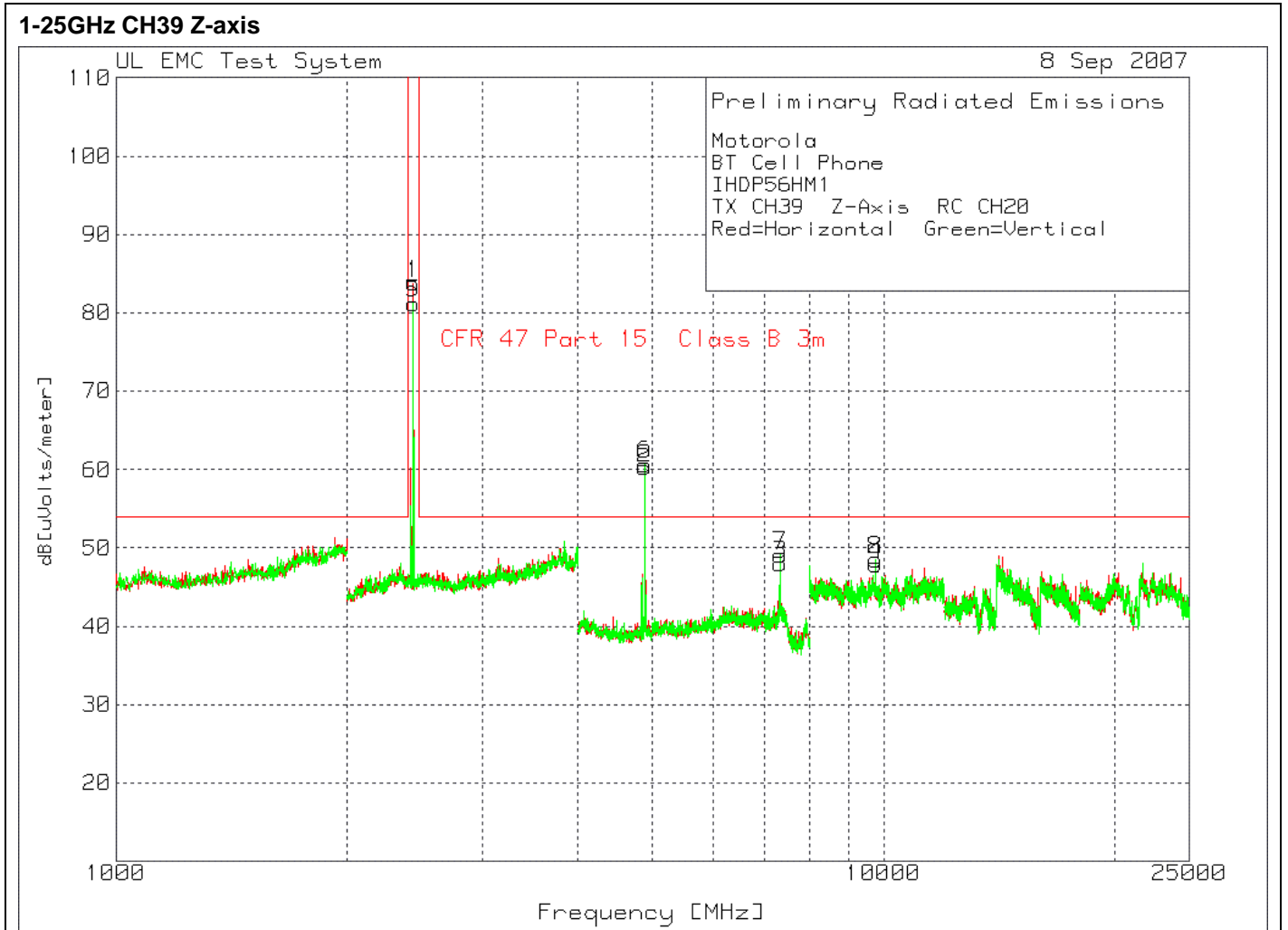


Figure 17 Radiated Emissions Graph

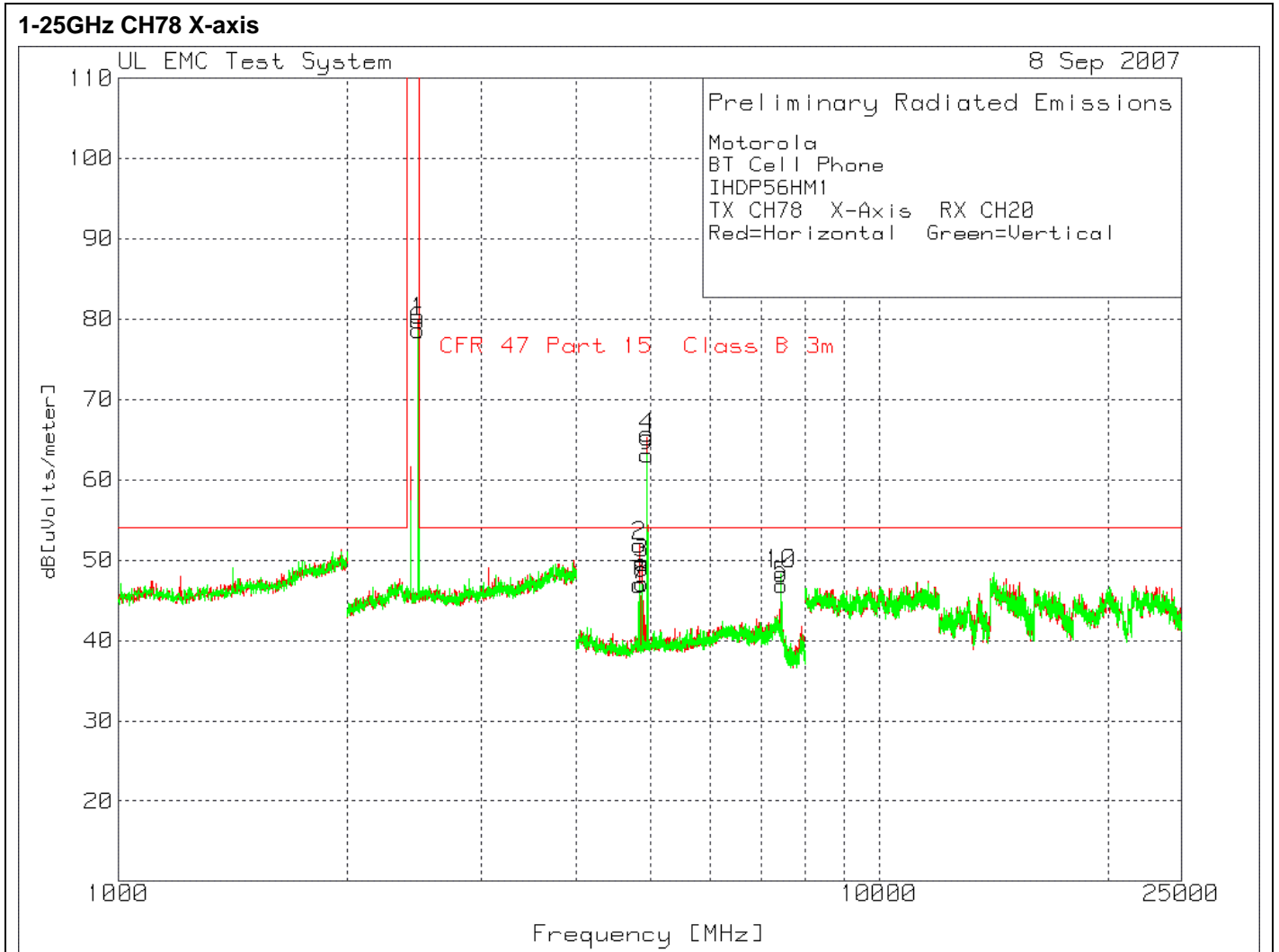


Figure 18 Radiated Emissions Graph

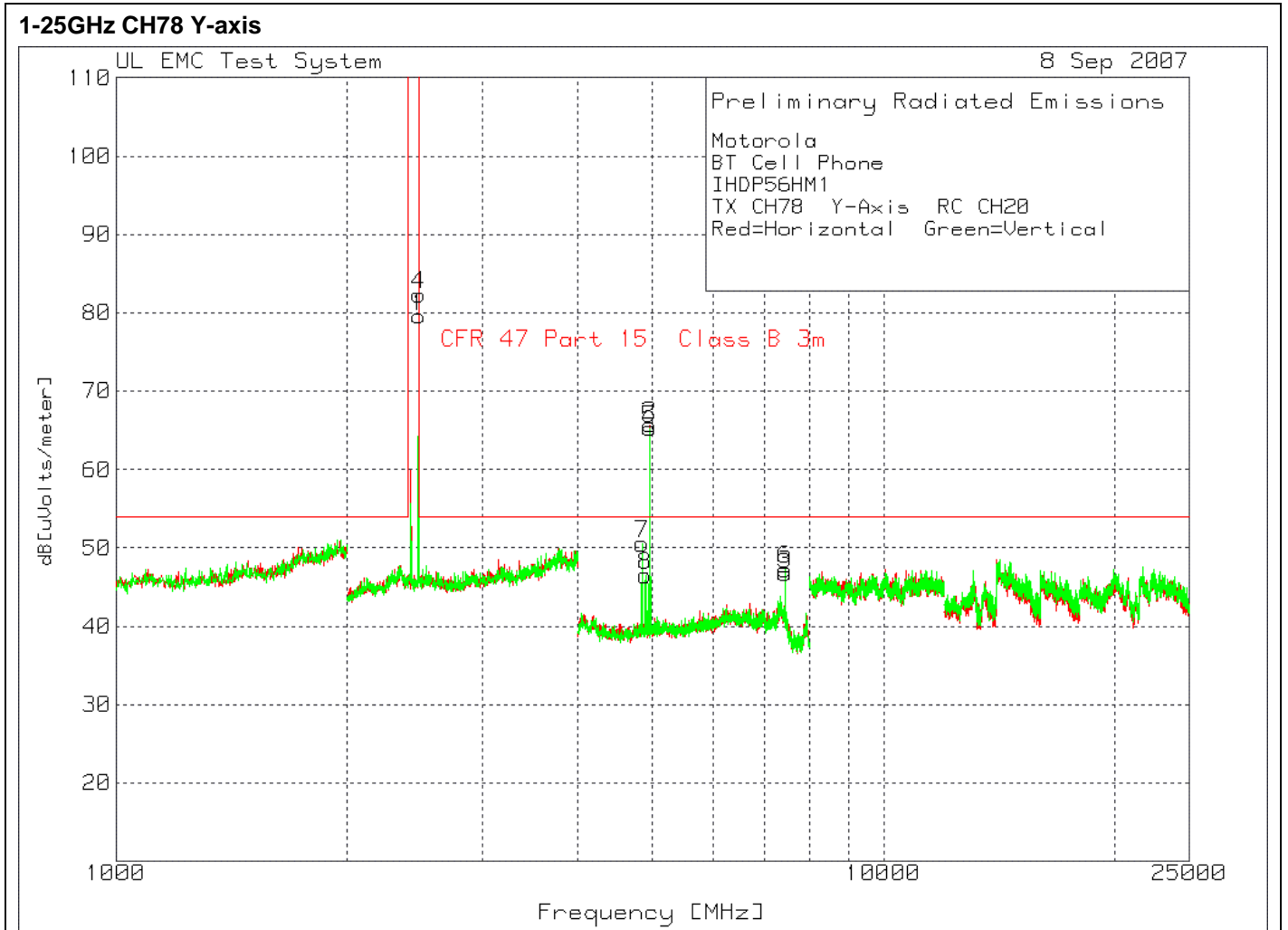
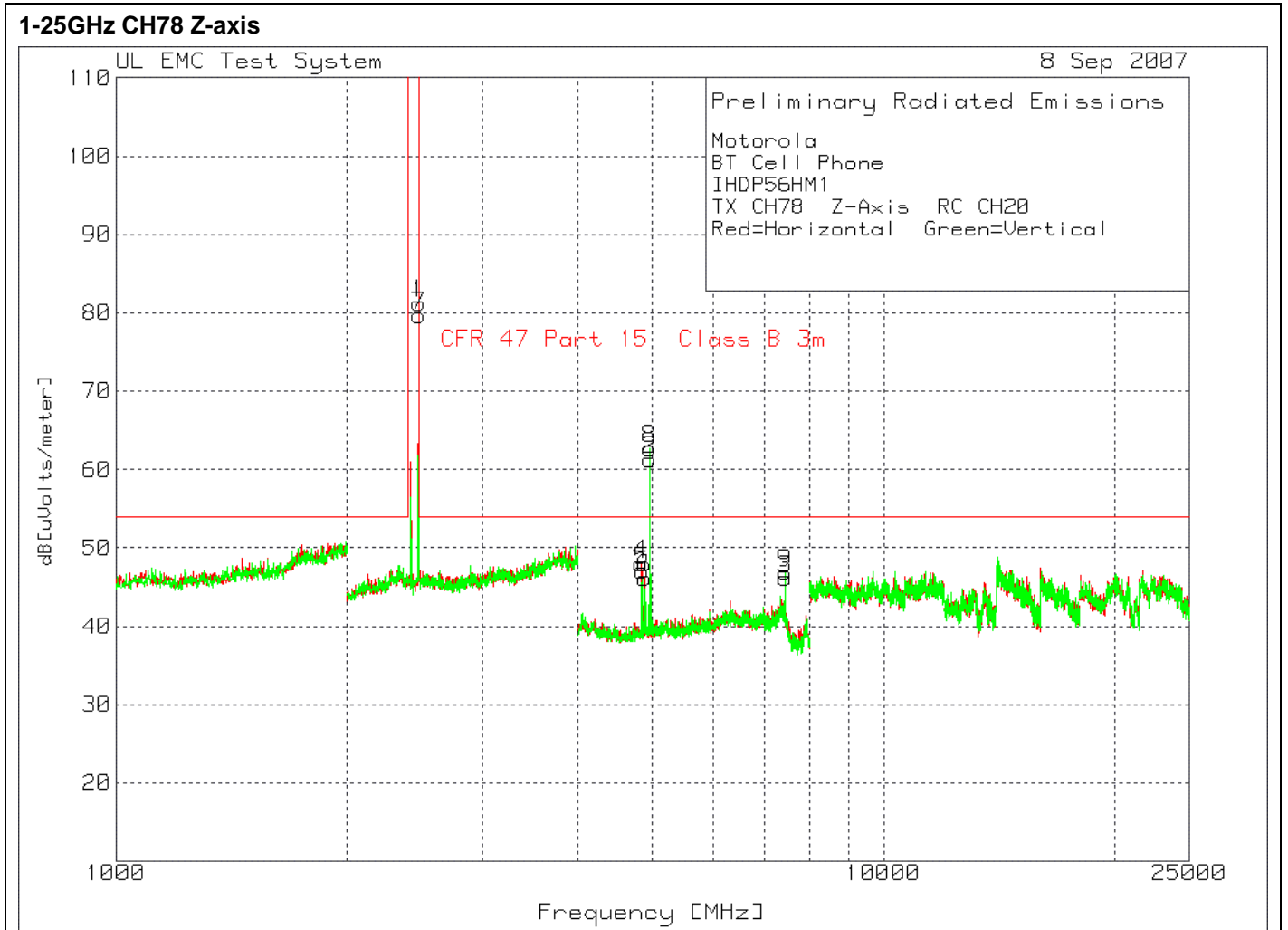


Figure 19 Radiated Emissions Graph



FINAL AVERAGE DATA

Preliminary peak scans were performed in low, mid and high channels as well as with EUT configured along X, Y and Z orthogonal axis.

Per clause 15.35 of CFR 47, Part 15 and DA 00-705, the measured field strength was determined by averaging the pulse train over a 0.1 second interval.

Per data provided by the manufacturer the EUT's measured dwell time is 2.875 ms and based on the fact that the same channel will not be reused within 100 ms period, the average value of measured emissions is calculated as follows:

$$2.875 \text{ ms} / 100\text{ms} = 0.02875$$

$$20\log (0.02875) = -30.83\text{dB}$$

When the calculated relaxation is applied to the measured field strength the levels were well below the limit.

See Appendix B for Dwell Time measurement provided by the manufacturer.

For emission frequencies found the non-restricted band, the limit is 20dB below the peak fundamental emission frequency level, clause 15.35(b).

Table 3 Radiated Emissions Final Average Data

FINAL AVERAGE DATA

Channel	Axis	Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uV]	Limit	Margin 1 [dB]	Azimuth [degs]	Height [cm]	Polarity	Duty Cycle Correction, See App C	Level dB[uV]	Margin 1 [dB]	Compliance
00	X	4804.1363	83.74	av	-51.41	27.7	60.03	54	6.03	87	101	Horz	-30.83	29.2	-24.8	Pass
00	Y	4804.1363	84.52	av	-51.41	27.7	60.81	54	6.81	78	137	Vert	-30.83	29.98	-24.02	Pass
39	X	4882.1653	80.83	av	-51.11	27.7	57.42	54	3.42	72	121	Horz	-30.83	26.59	-27.41	Pass
39	Y	4882.1653	83.76	av	-51.11	27.7	60.35	54	6.35	50	120	Vert	-30.83	29.52	-24.48	Pass
39	Y	7323.1132	55.26	av	-46.4	30.6	39.86	54	-14.54	22	100	Horz	-30.83	9.03	-44.97	Pass
39	X	7323.1132	59.87	av	-46.4	30.6	44.07	54	-9.93	42	113	Vert	-30.83	13.24	-40.76	Pass
78	Y	4960.0441	80.83	av	-51.3	27.8	56.93	54	2.93	135	113	Horz	-30.83	26.1	-27.9	Pass
78	Y	4960.0441	83.87	av	-51.3	27.8	60.37	54	6.37	49	129	Vert	-30.83	29.54	-24.46	Pass

Preliminary peak scans were performed in low, mid and high channels as well as with EUT configured along X, Y and Z orthogonal axis. Final maximized (azimuth and height) measurements were then performed under worst case configuration as determined during preliminary measurement.

Figure 20 Radiated Emissions Graph

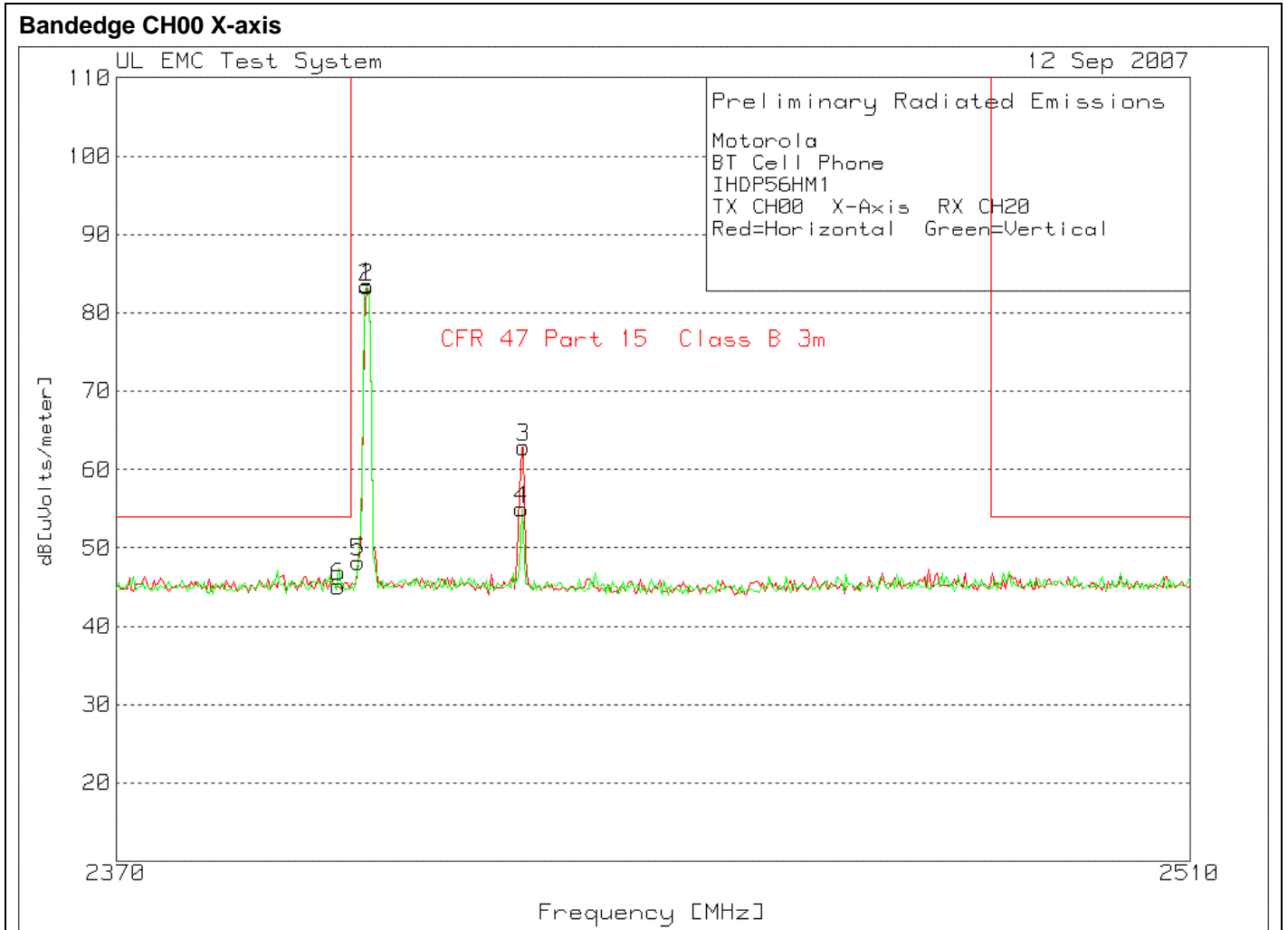


Figure 21 Radiated Emissions Graph

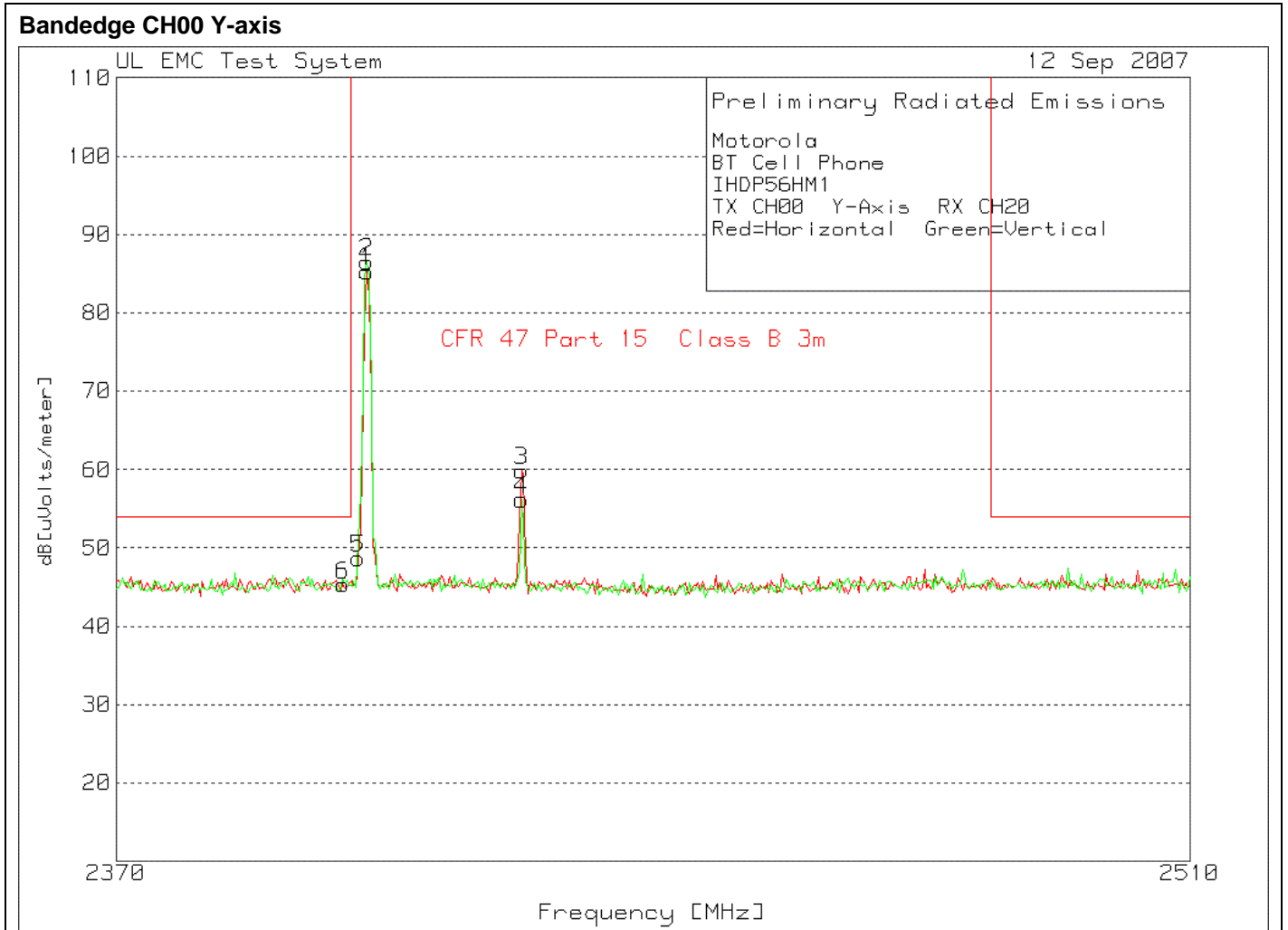


Figure 22 Radiated Emissions Graph

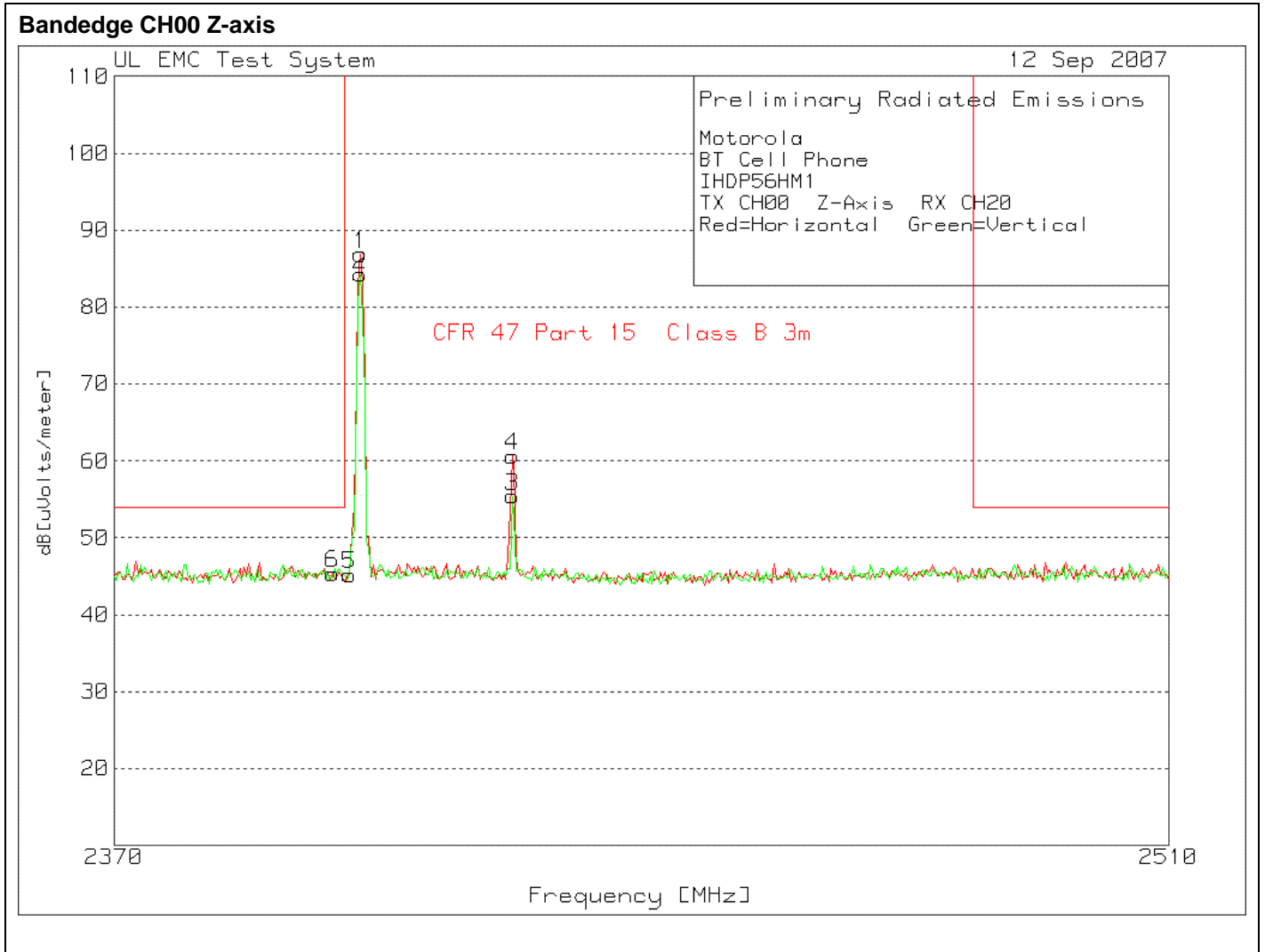


Figure 23 Radiated Emissions Graph

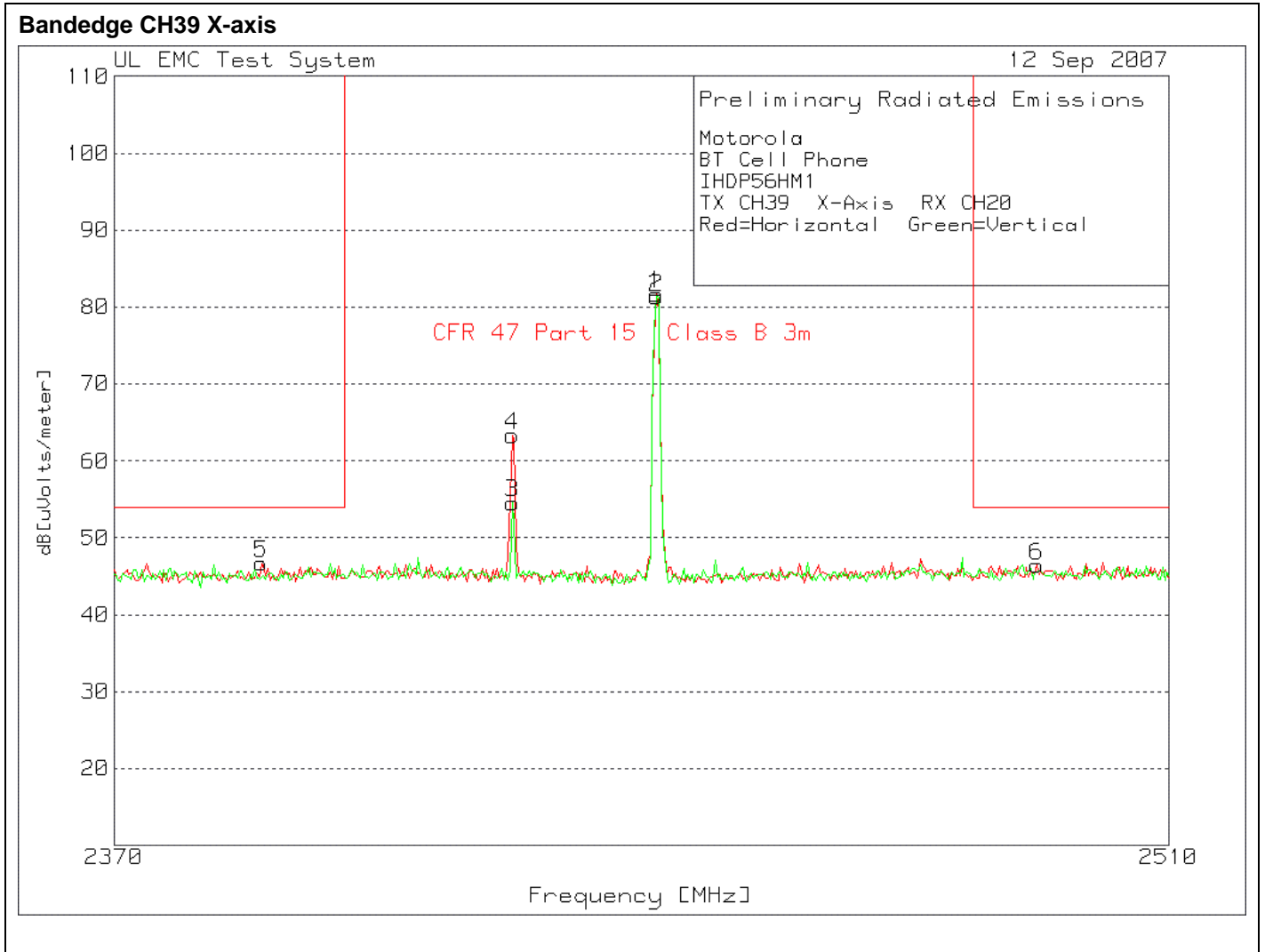


Figure 24 Radiated Emissions Graph

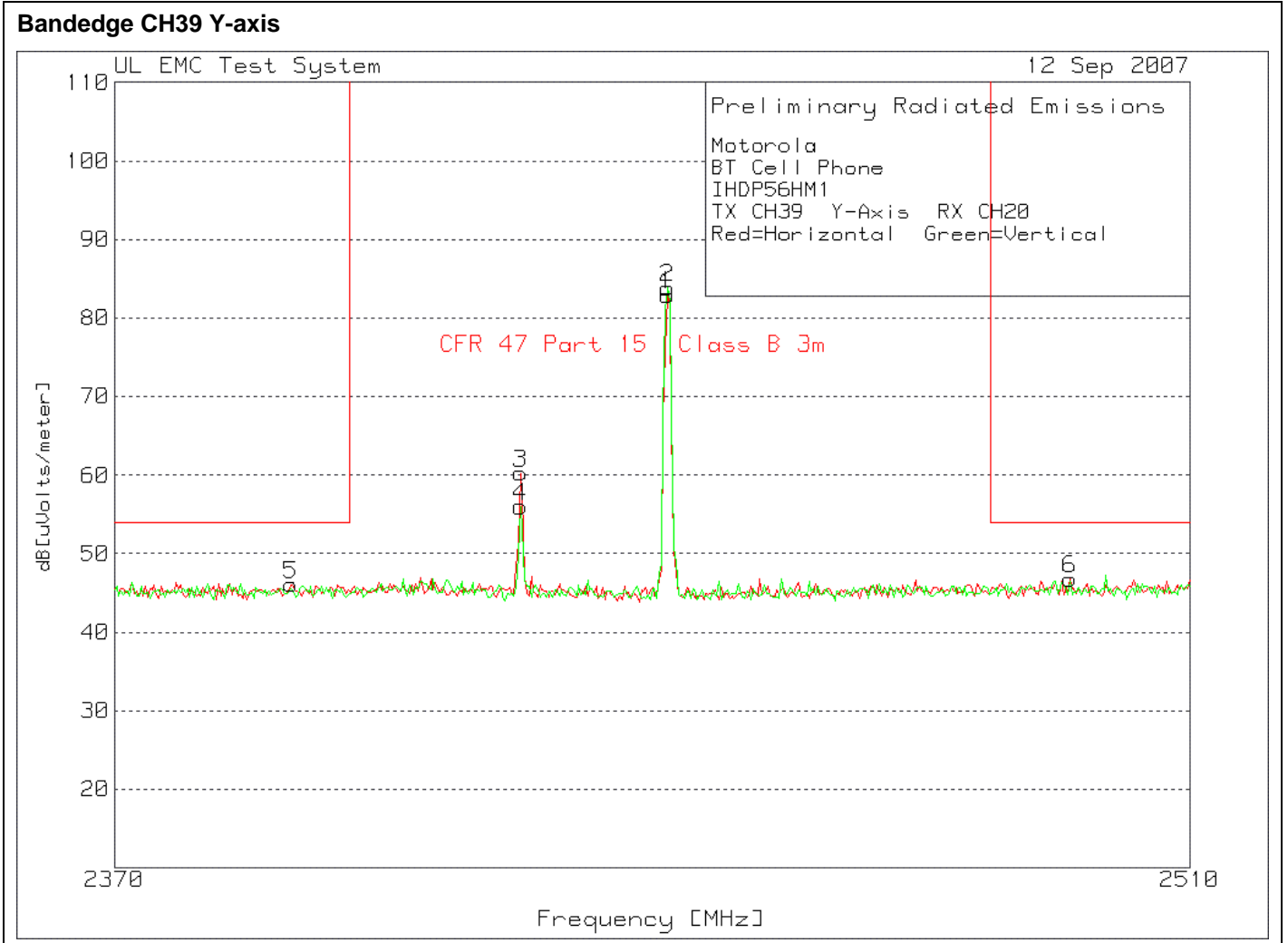


Figure 25 Radiated Emissions Graph

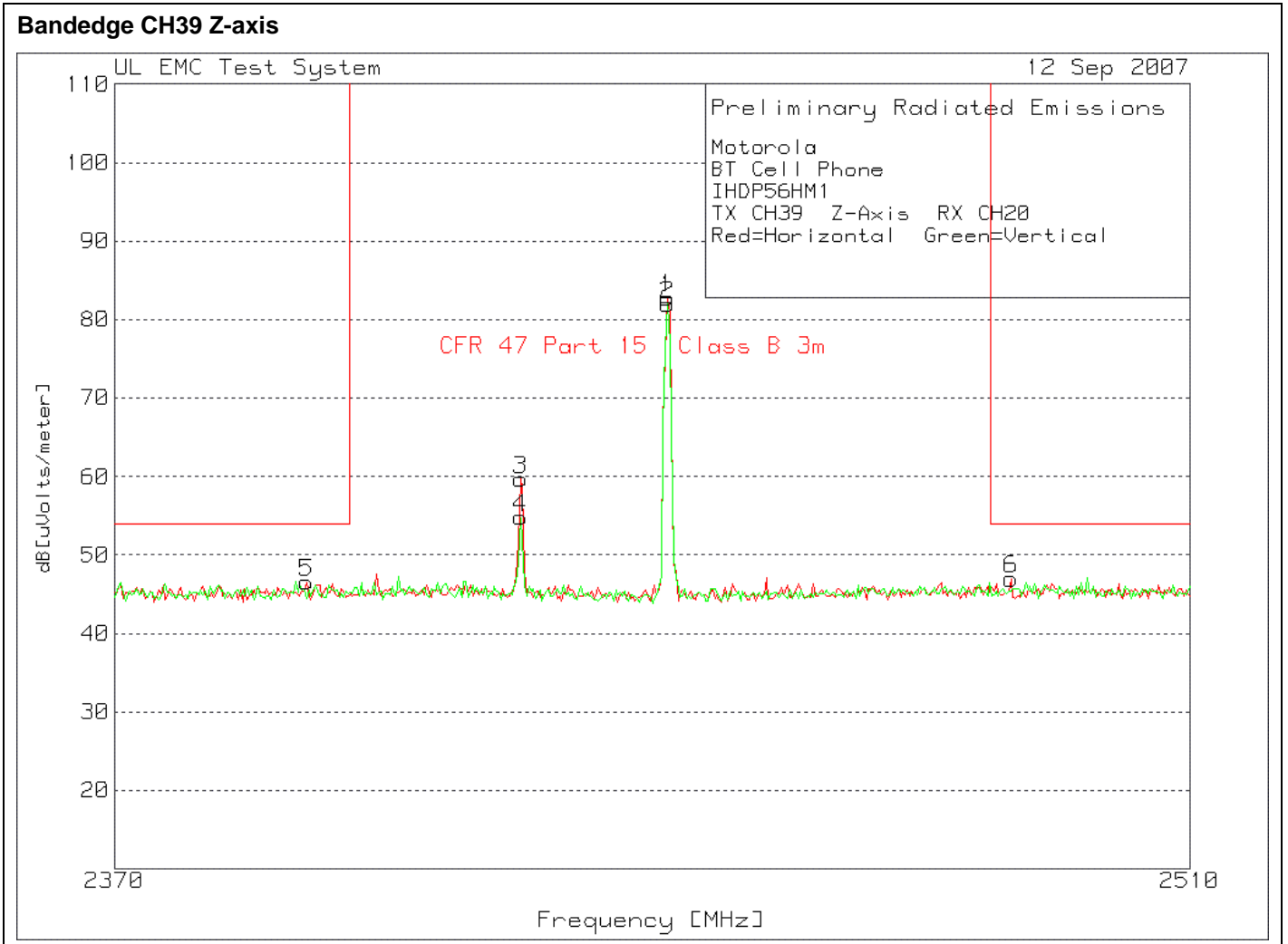


Figure 26 Radiated Emissions Graph

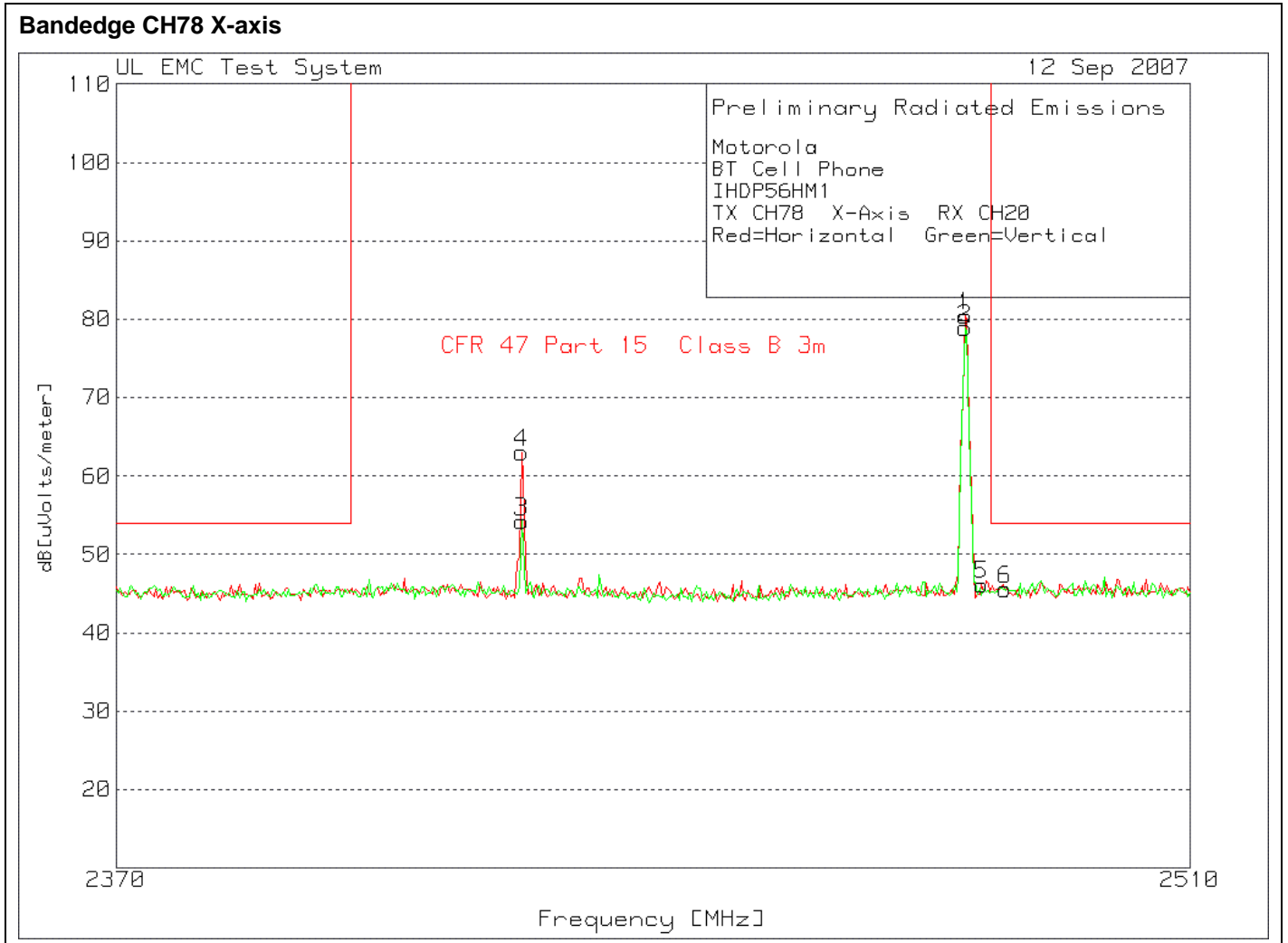


Figure 27 Radiated Emissions Graph

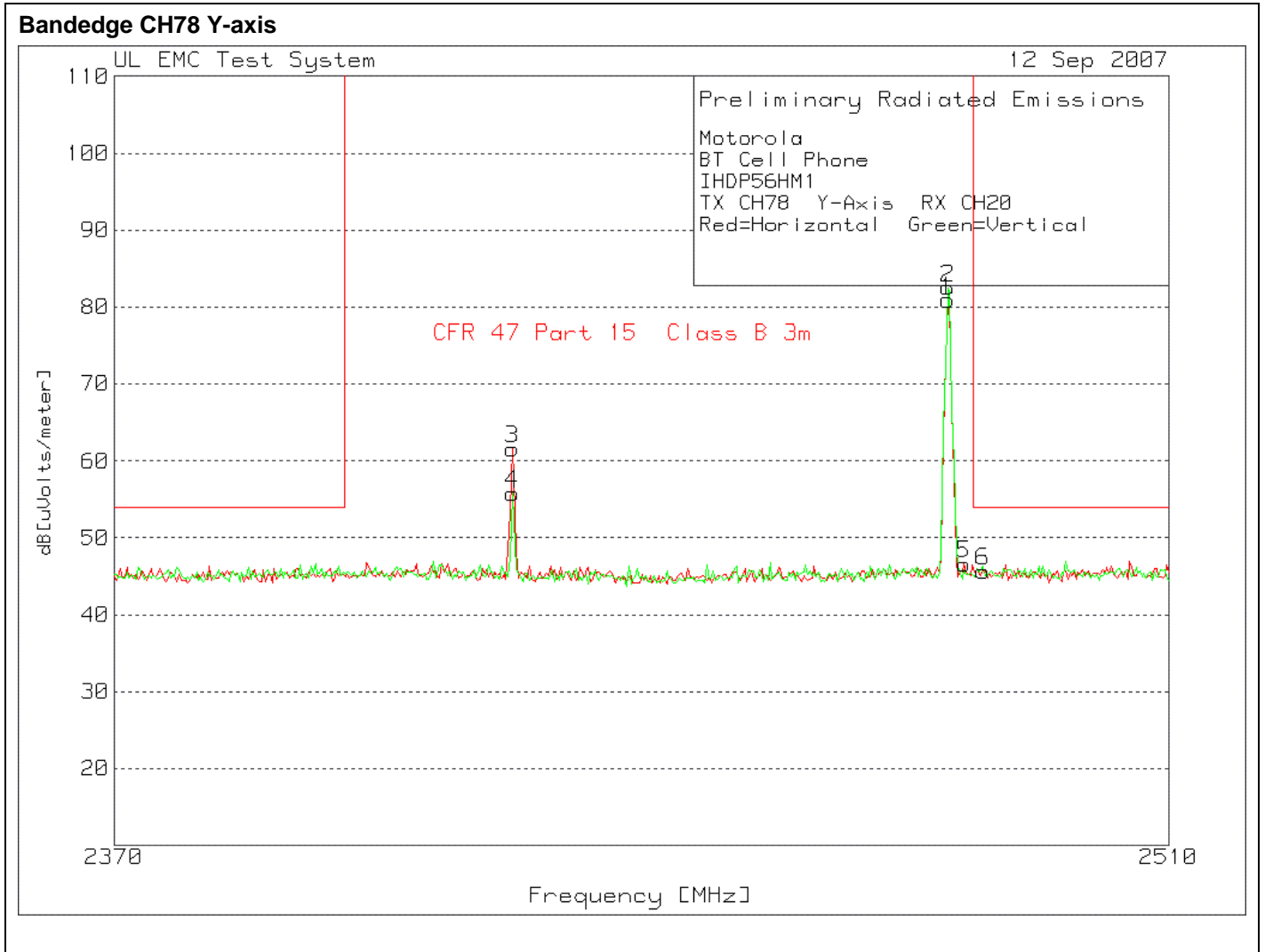
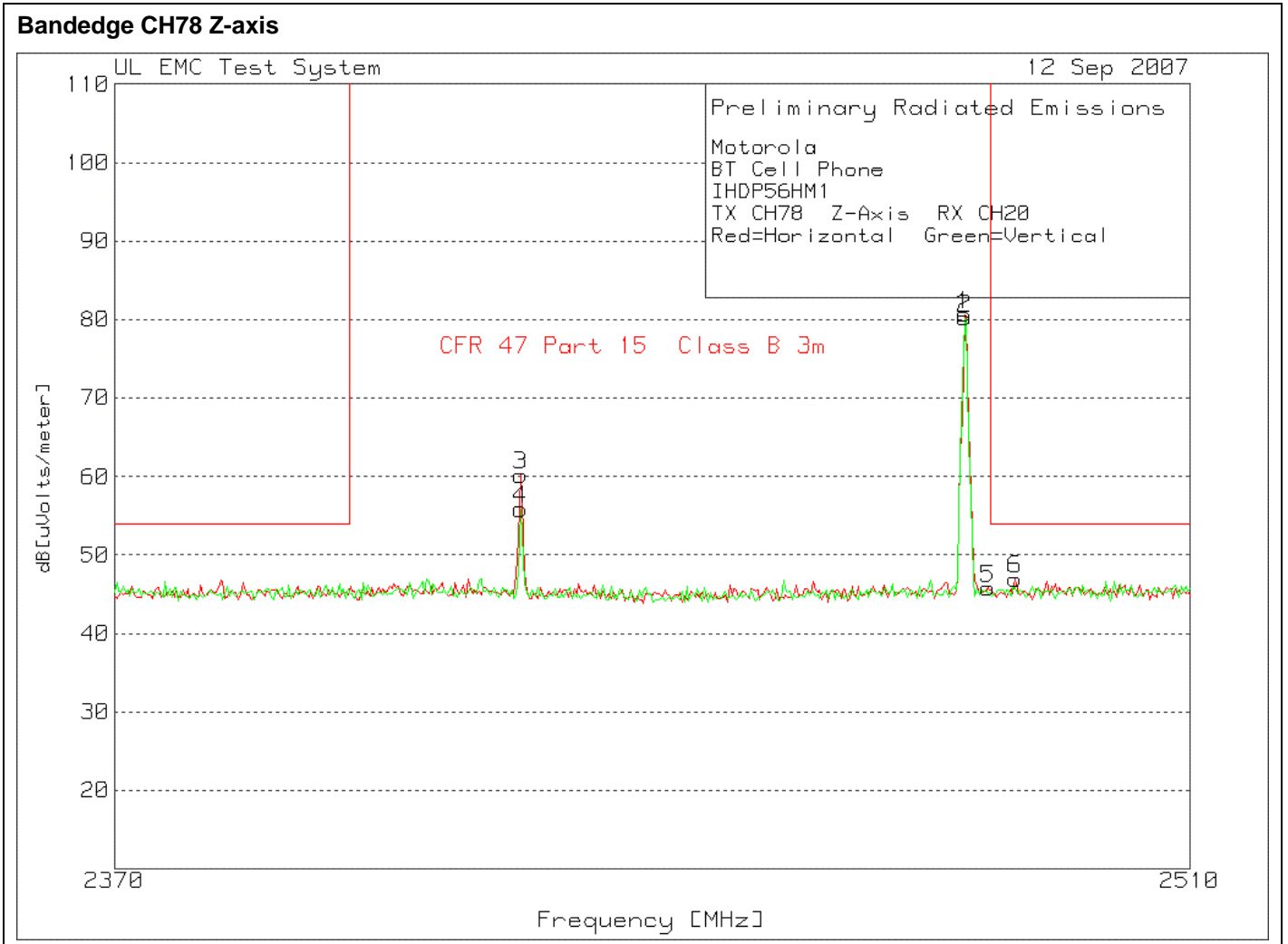


Figure 28 Radiated Emissions Graph



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5.0 IMMUNITY TEST RESULTS

Immunity testing was not performed per the request of the manufacturer nor required by 47 CFR Part 15

Appendix A

Accreditations and Authorizations



NVLAP Lab code: 100414-0

NVLAP: Recognized under the National Voluntary Laboratory Accreditation Program (NVLAP) for satisfactory compliance with criteria established in Title 15, Part 285 Code of Federal Regulations. These criteria encompass the requirements of ISO/IEC EN17025 and the relevant requirements of ISO 9002 (ANSI/ASQC Q92-1987) as suppliers of calibration or test results. For a full scope listing see <http://ts.nist.gov/ts/htdocs/210/214/scopes/1004140.htm>



FCC: Details of the measurement facilities used for these tests have been filed with the Federal Communications Commission's Laboratory in Columbia, Maryland (Ref. No. 91044).



Industry Canada Industrie Canada

Industry of Canada: Accredited by Industry Canada for performance of radiated measurements. Our test site complies with RSP 100, Issue 7, Section 3.3. File #: IC 2180



VCCI: Accepted as an Associate Member to the VCCI. The measurement facilities detailed in this test report have been registered in accordance with Regulations for Voluntary Control Measures, Article 8. Registration Nos.: Radiated Emissions R-621, Conducted Emissions C-642.



ICASA: ICASA (Independent Communications Authority of South Africa) has appointed UL as a Designated Test Laboratory to test Telecommunications equipment for type approval in compliance with CISPR 22 to assist in fulfilling its mandate under section 54(1) of the Telecommunications Act, 1996 (Act 103 of 1996).



NIST/CAB: Validated by the European Commission as a U.S. Conformity Assessment Body (CAB) of the U.S.-EU Mutual Recognition Agreement (MRA) for the Electromagnetic Compatibility - Council Directive 89/336/EEC, Article 10 (2). Also validated for the Telecommunication Equipment-Council Directive 99/5/EC, Annex III and IV, Identification Number: 0983.

NIST/CAB: Provisioned to act as a U.S. Conformity Assessment Body (CAB) under Appendix B, Phase I Procedures, of the Asia Pacific Economic Cooperation (APEC) MRA between the American Institute in Taiwan (AIT) and the United States. Our laboratory is considered qualified to test equipment subject to the applicable EMC regulations of the Chinese Taipei Bureau of Standards, Metrology and Inspection (BSMI) which require testing to CNS 13438 (CISPR 22).

NIST/CAB: Recognized by the Infocomm Development Authority of Singapore (IDA) under the Asia Pacific Economic Cooperation Mutual Recognition Agreement (APEC MRA). Our laboratory is provisionally designated to act as a Conformity Assessment Body (CAB) under Appendix B, Phase I Procedures, of the APEC MRA. Our scope of designation includes IDA TS EMC (CISPR 22), IEC 61000-4-2, -4-3, -4-4, -4-5, and -4-6

Appendix B

Time of Occupancy

Measurement Procedure

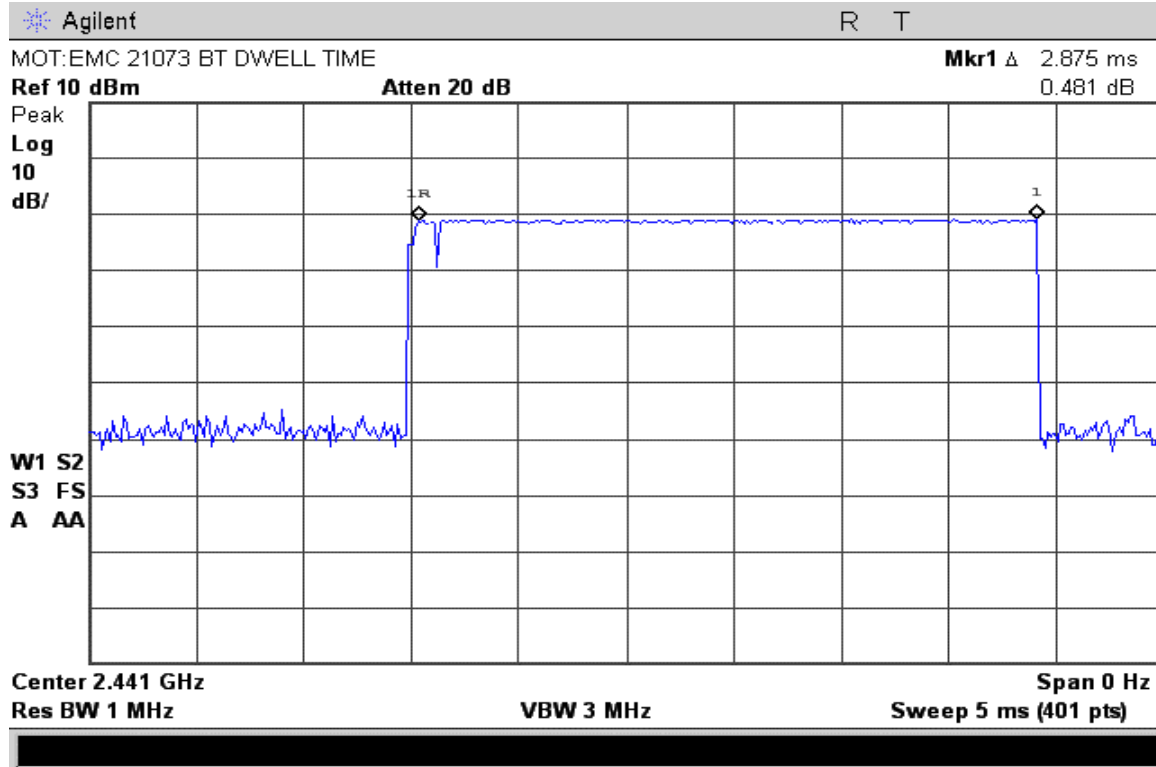
The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. A fully charged battery was used for the supply voltage.

The Bluetooth hopping function of the EUT was enabled. The following spectrum analyzer settings were used:

1. Span = zero span, centered on a hopping channel
2. RBW = 1 MHz
3. VBW \geq RBW
4. Sweep = as necessary to capture the entire dwell time per hopping channel
5. Detector function = peak
6. Trace = max hold

The marker-delta function was used to determine the dwell time.

Measurement Results



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Appendix C

Bluetooth operating instructions provided by Motorola in an e-mail communication dated September 6, 2007. For confidentiality reasons the information is not provided and it is available upon authorized request.