



UL International EMC Services
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<http://www.ul.com/emc/>

October 10, 2002

Motorola CDMA Wireless Products
Customer Integration Engineering
Attn: Mr. Terry Schwenk
IL75-Room F520
1455 Shure Dr.
Arlington Heights, IL 60004

UL Reference: File MC1281, Project 02NK41384

Subject: EMC Test and Measurement Report for
SC4812ET 1X @ 800MHz CDMA BTS Cellular Phone Base Station

Dear Mr. Schwenk:

We have provided with this letter your EMC Test Report for the above referenced model.
The product was determined to comply with the requirements noted in the report.

Please review the attached report and direct any questions or comments to me. Samples were
returned following testing. This closes Project No. 02NK41384.

We appreciate your interest in UL's EMC Services, and encourage you to contact us in the
future should you need EMC test services.

Best regards,

Reviewed by:

A handwritten signature in black ink, appearing to read 'Lou Madjarov'.

Lou Madjarov (Ext 43957)
EMC Sr. Project Engineer
International EMC Services

A handwritten signature in black ink, appearing to read 'Jack Steiner'.

Jack Steiner
Engineering Group Leader
International EMC Services

EMC – TEST REPORT

Issue Date: October 10, 2002

√ EMISSIONS IMMUNITY

Test Report File No. : **MC1281**
Project No. : **02NK41384**

Model / Type : **SC4812ET 1X @ 800MHz CDMA BTS**
Kind of Product : **Cellular Phone Base Station**

Applicant : **Motorola CDMA Wireless Products**
☐ **Customer Integration Engineering**

License Holder : **Motorola CDMA Wireless Products**
☐ **Customer Integration Engineering**

Address : **IL75-Room F520**
: **1455 Shure Dr.**
: **Arlington Heights, IL 60004**

Manufacturer : **Same as Applicant**
:

Test Result : COMPLIANT

This report without appendices consists of 13 pages. Appendix A contains test photos, and Appendix B contains original test data, Appendix C contains sample calculations and Appendix D contains Transmit Power, Occupied Bandwidth or RHO and Conducted Spurious and Harmonic Emissions test set-up.

The data contained in this report reflects only the items tested in the configurations and mode of operations described. An attempt has been made to arrange the EUT, with the equipment provided, into a test configuration which maximizes the observed emissions of the EUT while simulating, as close as practical, a typical end-use installation.

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Underwriters Laboratories Inc. 333 Pfingsten Rd. Northbrook, IL 60062
Fax: (847) 272-8864

REPORT DIRECTORY

<u>SECTION</u>	<u>TITLE</u>
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GENERAL

1.0	Revision History
1.1	General Product Description
1.2	Model Differences
1.3	Environmental Conditions in Test Lab
1.4	Calibration Details of Equipment Used for Measurement
1.5	EUT (Equipment Under Test) Configuration
1.6	EUT Operating Mode
1.7	Device Modifications

EMISSIONS

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	Radiated Electric Field Emissions
	Radiated Emissions – Substitution Method
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IMMUNITY

3.0	Immunity Test Regulations
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CONCLUSION

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APPENDICIES

A	Test Setups (Photos, Diagrams and Drawings)
B	Test Data
C	Sample calculations
D	Motorola Equipment and Test Set-Up

1.0 REVISION HISTORY

Revision	Changes	Date
1.0	Initial Release	October 10, 2002

1.1 GENERAL PRODUCT DESCRIPTION

The rated maximum average power out of the SC4812ET 1X @ 800MHz unit is 60W (47.78dBm)

1.1.1 Equipment Mobility:

Floor standing

1.1.2 Test Voltage and Frequency:

<u>Voltage (V)</u>	<u>Frequency (Hz)</u>
27V	DC

1.2 MODEL DIFFERENCES

Any other model(s) represented by the models tested in this investigation will be documented by the manufacturer.

1.3 ENVIRONMENTAL CONDITIONS IN TEST LAB

Temperature: 20-25 °C
Relative Humidity: 30-60% RH
Atmospheric Pressure: 860-1060 mbar

1.4 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 what is recommended by the manufacturer, 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.

The test laboratory facilities used for the collection of test data reported herein are accredited to comply with ISO Guide 25 quality measurements by the NVLAP. The test procedures and techniques for radiated emissions up to 2000MHz and AC Mains conducted emissions up to 30MHz are also NVLAP accredited, as applicable.

1.5 EUT CONFIGURATION(s)

See Appendix A for individual set-up configuration(s). In addition to the EUT, the following peripheral devices and/or cables were connected during the measurement:

Device	Manufacturer	Model	Serial #	FCC ID
SC4812ET 1X @ 800MHz CDMA BTS	Motorola	STLF1064	379GOU55HE	IHET5CT1

1.6 EUT OPERATING MODE(s)

The equipment under test was operated during the measurements under the following conditions:

Base station set at High Power 60W (47.78dBm) and Low Power 400mW (26dBm) operation at Low Channel 1013 (869.7 MHz) and at High Channel 777 (893.3 MHz). Refer to Appendix D for more information.

1.7 DEVICE MODIFICATIONS

The following modifications were necessary for compliance:

None.

2.0 EMISSIONS TEST REGULATIONS

The EUT was considered to be a Class B device.

Emissions testing was performed according to the following regulations:

47 CFR Part 15 Subpart B: 2000 + ANSI C63.4 – 1992

47 CFR Part 22/24: 2001

Per manufacturer's specifications the following test were conducted:

- Conducted Spurious Emissions: 30MHz – 10GHz
- Radiated Electric Field Emissions: 30MHz – 1000MHz
- Radiated Electric Field Spurious Emissions: 1GHz – 10GHz
- Substitution Method - Radiated Spurious Harmonics Emissions
- Occupied Bandwidth
- Rho

Radiated Spurious Emissions - Substitution Method was performed per
ANSI/TIAEIA-603-1992, Section 2.2.12

**Conducted voltage measurements were not considered necessary as EUT is rated
27Vdc and is not intended for connection to AC mains.**

CONDUCTED SPURIOUS EMISSIONS

Test Location

10 Meter Semi-Anechoic Chamber

UL Procedure

3014ANBK-LPG-001CSE

Test Instruments

Spectrum Analyzer

Rhode & Schwarz, Spectrum Analyzer, 9KHz-40GHz, EMC 4182

Motorola Measurement Equipment

30dB attenuator, NARDA High Power Attenuator, Model 769-30 S/N 04405

20dB attenuator, NARDA, Model 766-20

Bidirectional coaxial coupler, model #3022, NARDA

Band pass filter, Filtronix

High power 50ohm load, (58883464-R01)

Frequency Range on each line

30MHz – 10GHz

Test Results

The requirements are:

MET

Remarks

See App. B for complete test results.

RADIATED ELECTRIC FIELD EMISSIONS, 30 TO 1000MHz

Test Location

10 Meter Semi-Anechoic Chamber

UL Procedure

3014ANBK-LPG-002

Test Instruments

Spectrum Analyzer / Quasi-peak Adapter / Preamplifier / Preselector

Hewlett Packard Model 8566B Spectrum Analyzer

Model 85650A Quasi-peak Adapter

Miteq AM-3A-000110-N Preamp No. FCA4003, EMC4016, EMC4151

Model 85685A RF Preselector No. EMC4015

Antennas

Chase EMC Ltd., Biconical Antenna Model VBA6106A

S/N 1237

Chase EMC Ltd., Log Periodic Antenna Model UPA6108

S/N 1120

Frequency Range of Measurement

30-1000MHz

Measurement Distance

10 meters

Test Results

The requirements are:

MET

Remarks

See App. B for complete test results.

RADIATED ELECTRIC FIELD EMISSIONS, 1 TO 10 GHz

Test Location

10 Meter Semi-Anechoic Chamber

UL Procedure

3014ANBK-LPG-002A

Test Instruments

Spectrum Analyzer

Hewlett Packard Model 8566B Spectrum Analyzer

Hewlett Packard Preamplifier Model 8449A, EMC4201

Antennas

EMCO, Model 3115, EMC No. 4033

Frequency Range of Measurement

1 to 10 GHz

Measurement Distance

3 meters

Test Results

The requirements are:

MET

Remarks

See App. B for complete test results.

RADIATED SPURIOUS EMISSIONS – SUBSTITUTION METHOD

Test Location

10 Meter Semi-Anechoic Chamber

UL Procedure

3014ANBK-LPG-002SM

Test Instruments

Spectrum Analyzer

Rhode & Schwarz, Spectrum Analyzer, 9KHz-40GHz, EMC 4182

Signal Generator

Anritsu, Model 68369B 10MHz – 40GHz,

Antennas

EMCO, Horn Model 3115, S/N 8812-3032

EMCO, Horn Model 3115, S/N 3012

Frequency Range on each line

30MHz – 10GHz

Measurement Distance

3 meters

Test Results

The requirements are:

MET

Remarks

See App. B for complete test results.

OCCUPIED BANDWIDTH MEASUREMENTS

Test Location

10 Meter Semi-Anechoic Chamber

Test Instruments

Power Meter

Hewlett Packard, Model 437B, S/N 3125U15845,
Last Cal. 6-13-02, Next Cal. 6-13-03
(Motorola equipment)

HEWLETT PACKARD POWER SENSOR

MODEL: 8481A
LAST CAL: 12/5/01
CAL DUE: 12/5/02
S/N: 2702A57644
(Motorola equipment)

HEWLETT PACKARD VSA SERIES TRANSMIT TESTER

MODEL: E4406A
LAST CAL: 11/1/01
CAL DUE: 11/1/02
S/N: US38450220
(Motorola equipment)

Test Results

The requirements are: MET

Remarks

See App. B for complete test results.

RHO MEASUREMENTS

Test Location

10 Meter Semi-Anechoic Chamber

Test Instruments

Power Meter

Hewlett Packard, Model 437B, S/N 3125U15845,
Last Cal. 6-13-02, Next Cal. 6-13-03
(Motorola equipment)

HEWLETT PACKARD POWER SENSOR

MODEL: 8481A
LAST CAL: 12/5/01
CAL DUE: 12/5/02
S/N: 2702A57644
(Motorola equipment)

HEWLETT PACKARD VSA SERIES TRANSMIT TESTER

MODEL: E4406A
LAST CAL: 11/1/01
CAL DUE: 11/1/02
S/N: US38450220
(Motorola equipment)

Test Results

The requirements are: MET

Remarks

See App. B for complete test results.

3.0 IMMUNITY TEST REGULATIONS

Immunity testing was not performed.

4.0 GENERAL REMARKS

Sample Receipt Date : September 23, 2002

Test Dates

Start : September 23, 2002
End : October 4, 2002

4.1 SUMMARY

The requirements according to the technical regulations are:

MET

Underwriters Laboratories Inc.
333 Pfingsten Road
Northbrook, IL 60062 USA

Test Engineer,



Lou Madjarov (Ext 43957)
EMC Sr. Project Engineer
International EMC Services

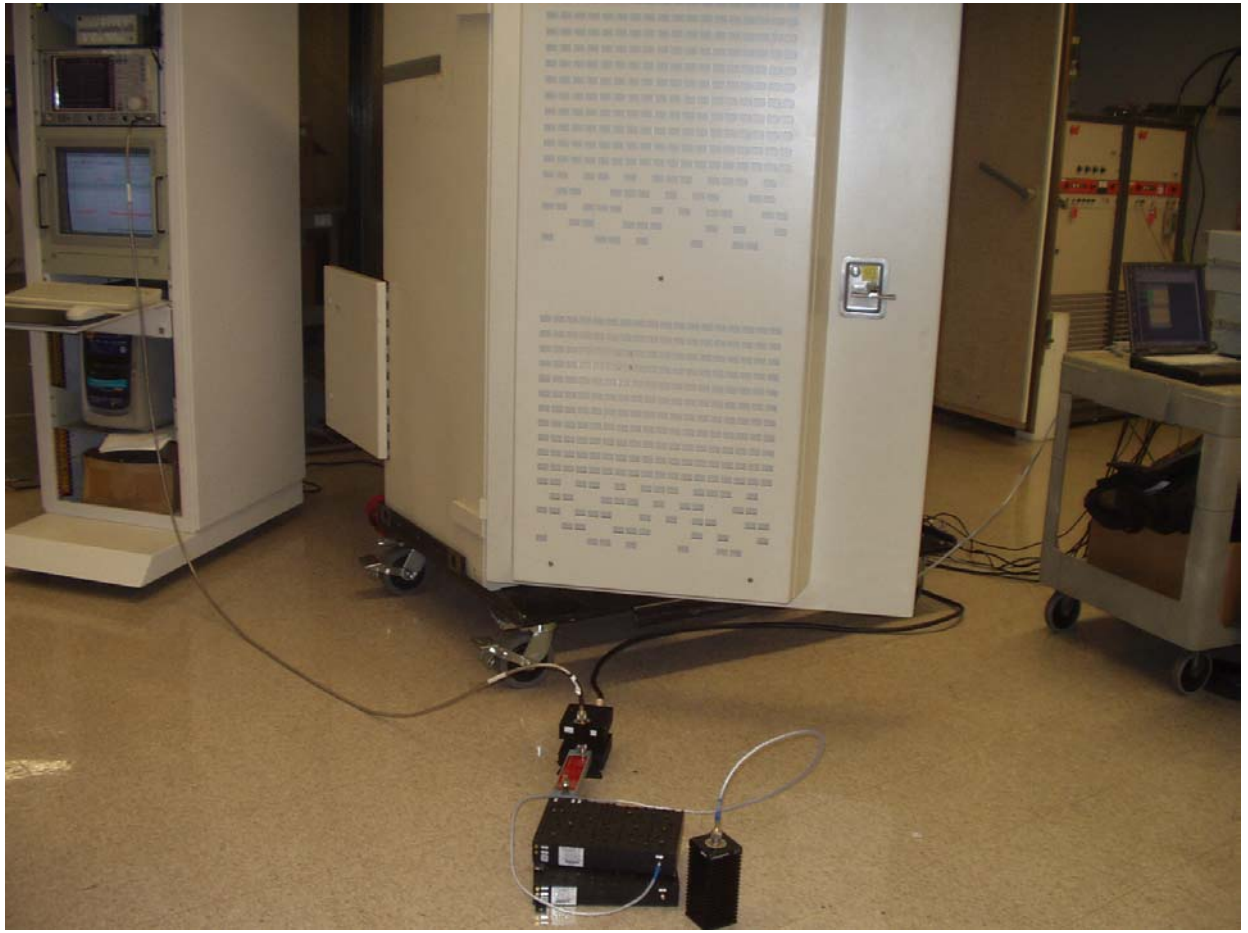
Reviewed by:



Jack Steiner
Engineering Group Leader
International EMC Services

APPENDIX A

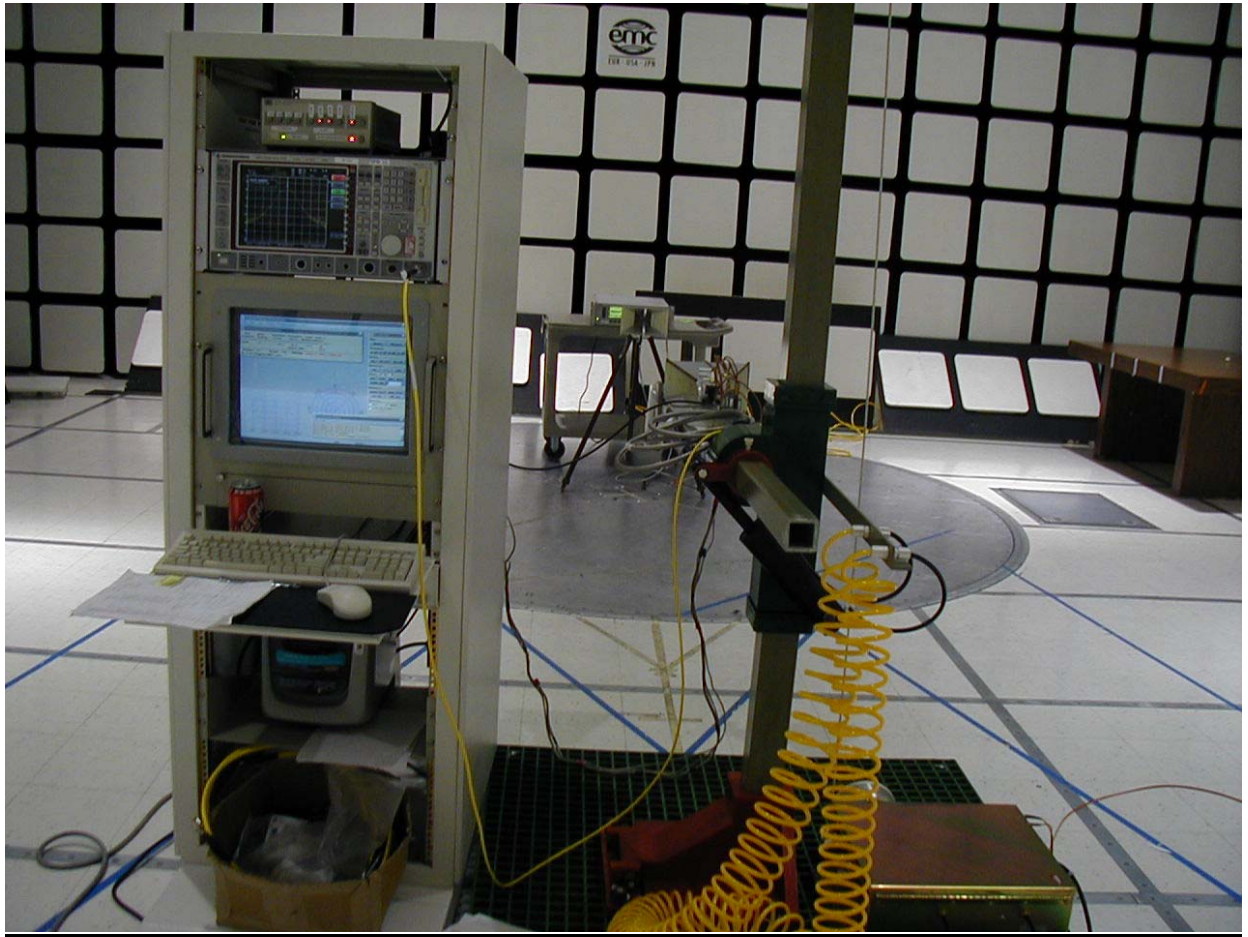
PHOTOS



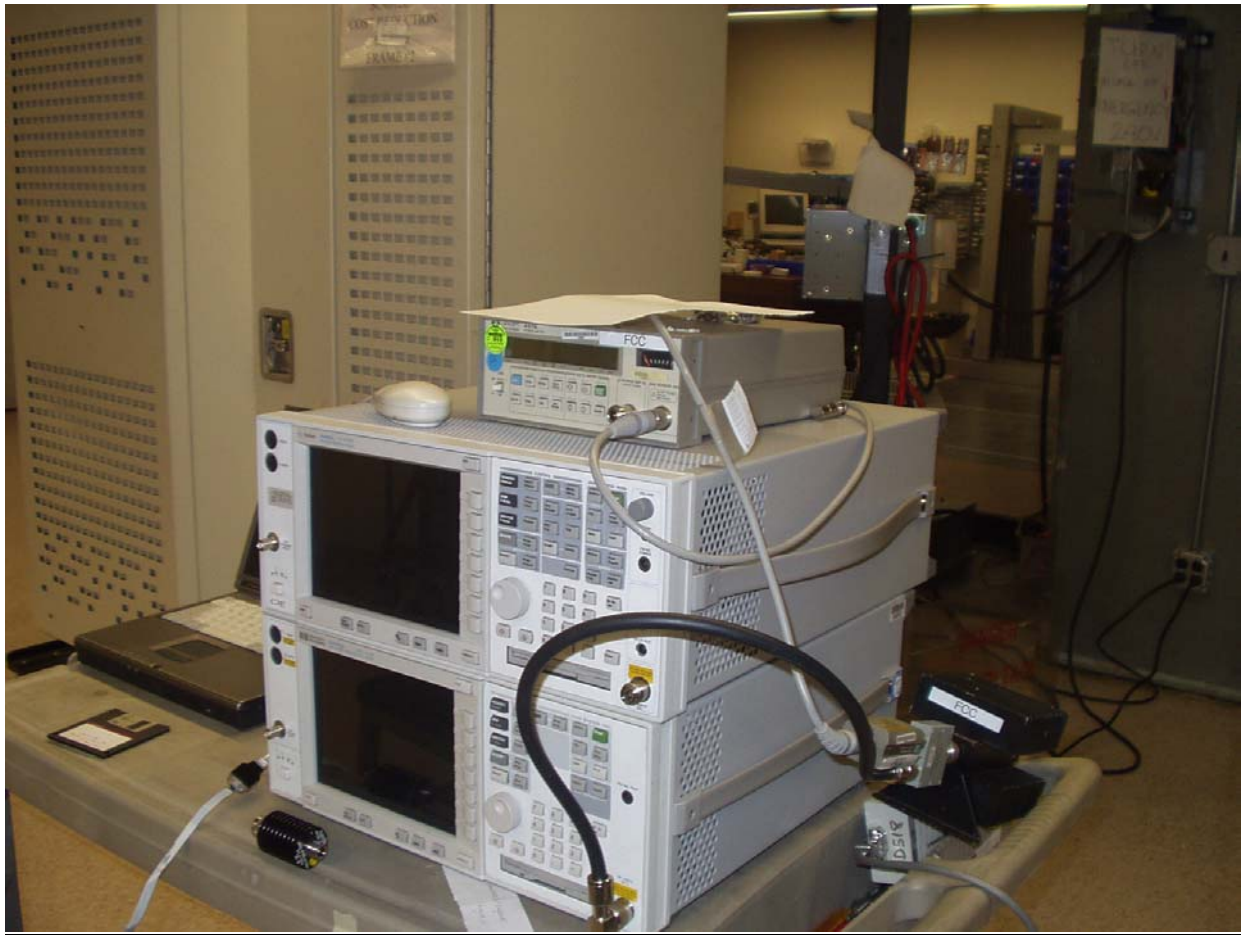
Conducted Spurious Emissions



Radiated Emissions



Substitution Method - Radiated Emissions



Occupied Bandwidth and Rho

APPENDIX B

TEST DATA

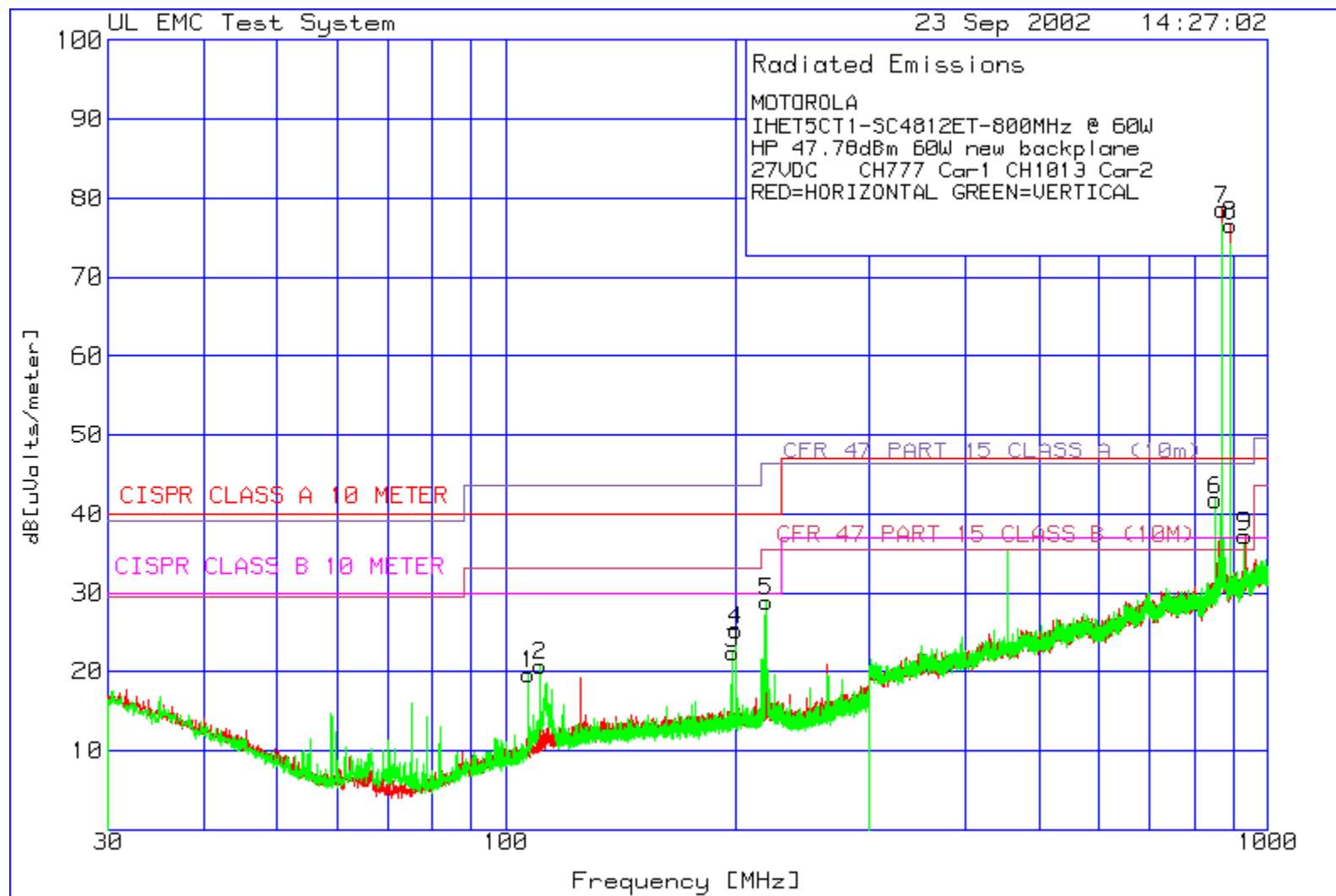
EMISSIONS

Radiated Electric Field Emissions 30MHz - 1000MHz
Radiated Electric Field Emissions 1GHz - 10GHz
Conducted Spurious Emissions 30MHz – 10GHz
Substitution Method - Radiated Emissions
Occupied Bandwidth
Rho

UNDERWRITERS LABORATORIES INC.
Radiated Emissions

Date Tested: 9-23-2002

Manufacturer	: Motorola CDMA Wireless Products Customer Integration Engineering
Equipment Under Test	: SC4812ET 800MHz Cellular Phone Base Station
Requirement	: CFR 47 PART 15 B Class B
Detection Mode	: Quasi-peak (qp)
Bandwidth	: 120 kHz, 30-1000MHz
Measurement Distance	: 10 meter
Antenna Type	: 30 - 300MHz, Biconical 300 - 1000MHz, Log-Periodic



MOTOROLA

IHET5CT1-SC4812ET-800MHz @ 60W

HP 47.78dBm 60W new backplane

27VDC CH777 Carl CH1013 Car2

RED=HORIZONTAL GREEN=VERTICAL

Marker	Test	Meter	Detector	Gain/Loss	Transducer	Level	Limit 1	Margin 1	Limit 2	Margin 2	Limit 3						
3[dB]	Limit 4	Margin 4	4[dB]	Azimuth	[deg]	Height	[cm]	Polarity									
Number	Frequency	Reading	Type	Factor	Factor	dB[uVolts/meter]											
	[MHz]	[dB(uV)]		[dB]	[dB]												
Vertical 30 - 300MHz																	
1	106.7574	37.6	pk	-29.5	11.6	19.7	40	-20.3	30	-10.3	43.5	-23.8	33.1	-13.4	222	100	
	Vert																
2	110.7369	38.1	pk	-29.4	12.1	20.8	40	-19.2	30	-9.2	43.5	-22.7	33.1	-12.3	0	100	
	Vert																
3	198.2188	35.6	pk	-29.1	15.9	22.4	40	-17.6	30	-7.6	43.5	-21.1	33.1	-10.7	161	200	
	Vert																
4	200.2423	38.5	pk	-29.1	15.9	25.3	40	-14.7	30	-4.7	43.5	-18.2	33.1	-7.8	161	200	
	Vert																
5	219.2631	41.7	pk	-28.9	16.1	28.9	40	-11.1	30	-1.1	46.4	-17.5	35.6	-6.7	4	299	
	Vert																
Horizontal 300 - 1000MHz																	
7	869.5478	50.8	pk	3.6	24.2	78.6	47	31.6	37	41.6	46.4	32.2	35.6	43	185	100	
	Horz carrier frequency																
8	893.5049	49.8	pk	3.6	23.2	76.6	47	29.6	37	39.6	46.4	30.2	35.6	41	264	100	
	Horz carrier frequency																
9	931.8011	9.3	pk	3.8	24.1	37.2	47	-9.8	37	.2	46.4	-9.2	35.6	1.6	169	199	
	Horz not from EUT																
Vertical 300 - 1000MHz																	
6	852.061	15.6	pk	3.5	22.7	41.8	47	-5.2	37	4.8	46.4	-4.6	35.6	6.2	343	199	Vert
Test Meter Detector Gain/Loss Transducer Level Limit 1 Margin 1[dB] Limit 2 Margin 2[dB] Limit 3 Margin 3[dB]																	
	Limit 4	Margin 4	4[dB]	Azimuth	[deg]	Height	[cm]	Polarity									
Frequency	Reading	Type	Factor	Factor	dB[uVolts/meter]												
	[MHz]	[dB(uV)]	[dB]	[dB]													
Vertical 30 - 300MHz																	
197.926	34.48	qp	-29.1	15.9	21.28	40	-18.72	30	-8.72	43.5	-22.22	33.1	-11.82	206	101	Vert	
199.9189	37.23	qp	-29.1	15.9	24.03	40	-15.97	30	-5.97	43.5	-19.47	33.1	-9.07	187	138	Vert	
218.674	42.19	qp	-28.9	16.2	29.49	40	-10.51	30	-.51	46.4	-16.91	35.6	-6.11	11	327	Vert	

LIMIT 1: CISPR CLASS A 10 METER

LIMIT 2: CISPR CLASS B 10 METER

LIMIT 3: CFR 47 PART 15 CLASS A (10m)

LIMIT 4: CFR 47 PART 15 CLASS B (10M)

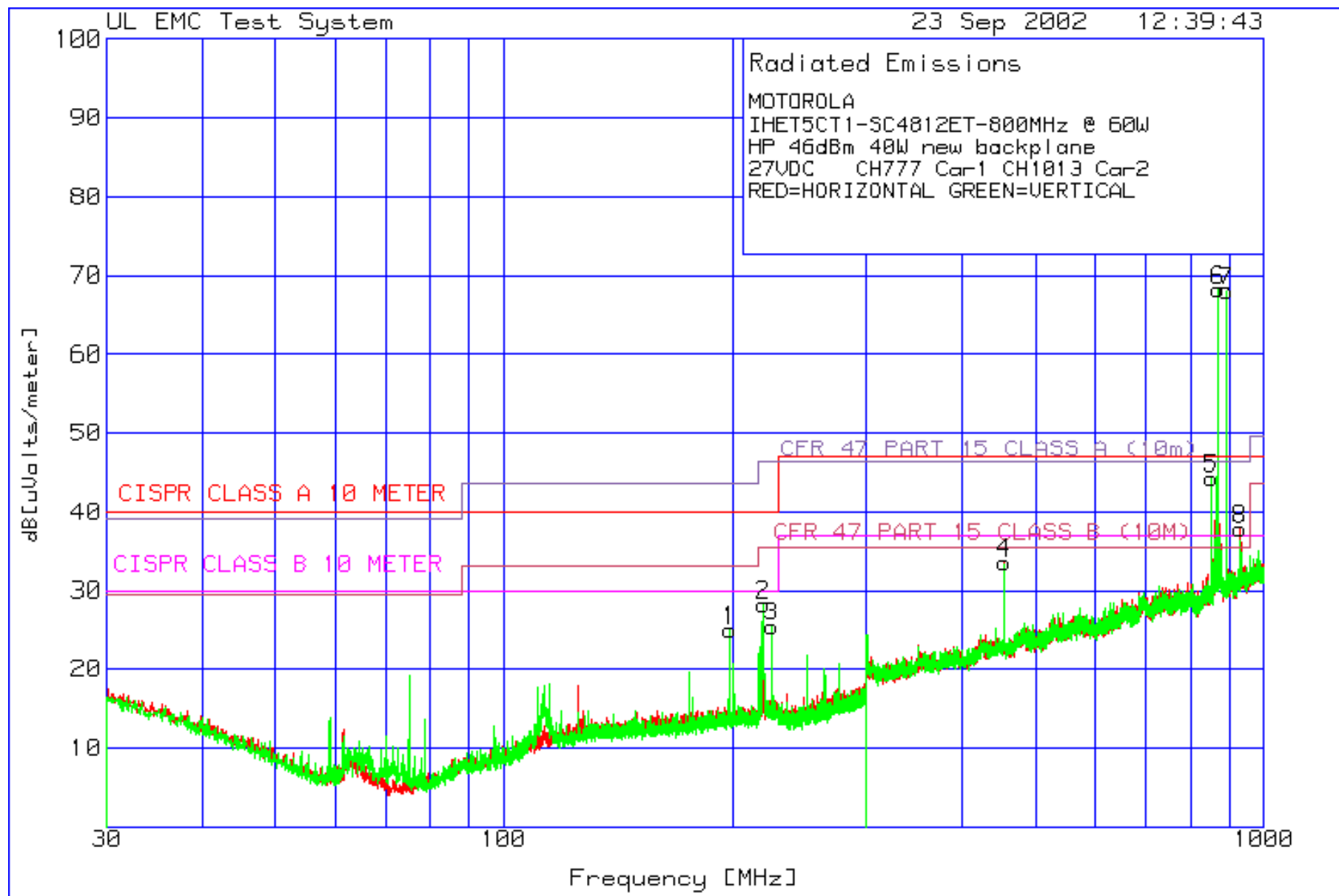
pk - Peak detector

qp - Quasi-Peak detector

av - Average detector

avlg - Average log detector

avem - EMI Average detector



MOTOROLA

IHET5CT1-SC4812ET-800MHz @ 60W

HP 46dBm 40W new backplane

27VDC CH777 Carl CHI013 Car2

RED=HORIZONTAL GREEN=VERTICAL

Marker	Test	Meter	Detector	Gain/Loss	Transducer	Level	Limit 1	Margin 1	Limit 2	Margin 2	Limit 3	Margin 3				
3[dB]	Limit 4	Margin 4	Azimuth	[deg]	Height	[cm]	Polarity									
Number	Frequency	Reading	Type	Factor	Factor	dB[uVolts/meter]										
	[MHz]	[dB (uV)]		[dB]	[dB]											
Vertical 30 - 300MHz																
1	198.2863	38.2	pk	-29.1	15.9	25	40	-15	30	-5	43.5	-18.5	33.1	-8.1	183	100
	Vert															
2	219.0607	41	pk	-28.9	16.1	28.2	40	-11.8	30	-1.8	46.4	-18.2	35.6	-7.4	0	400
	Vert															
3	225.3335	38.3	pk	-29	16.2	25.5	40	-14.5	30	-4.5	46.4	-20.9	35.6	-10.1	25	400
	Vert															
Horizontal 300 - 1000MHz																
4	454.4092	14.4	pk	2.3	16.9	33.6	47	-13.4	37	-3.4	46.4	-12.8	35.6	-2	114	100
	Horz															
8	929.0032	10.2	pk	3.8	23.8	37.8	47	-9.2	37	.8	46.4	-8.6	35.6	2.2	225	300
	Horz	not from EUT														
Vertical 300 - 1000MHz																
5	852.7604	18	pk	3.5	22.8	44.3	47	-2.7	37	7.3	46.4	-2.1	35.6	8.7	51	399
	Vert	not from EUT														
6	869.7227	40.4	pk	3.6	24.2	68.2	47	21.2	37	31.2	46.4	21.8	35.6	32.6	209	300
	Vert	carrier frequency														
7	892.9803	41.3	pk	3.6	23.2	68.1	47	21.1	37	31.1	46.4	21.7	35.6	32.5	225	300
	Vert	carrier frequency														
Test	Meter	Detector	Gain/Loss	Transducer	Level	Limit 1	Margin 1	Limit 2	Margin 2	Limit 3	Margin 3					
	Limit 4	Margin 4	Azimuth	[deg]	Height	[cm]	Polarity									
Frequency	Reading	Type	Factor	Factor	dB[uVolts/meter]											
[MHz]	[dB (uV)]		[dB]	[dB]												
Vertical 30 - 300MHz																
197.9573	33	qp	-29.1	15.9	19.8	40	-20.2	30	-10.2	43.5	-23.7	33.1	-13.3	181	118	Vert
218.673	40.99	qp	-28.9	16.2	28.29	40	-11.71	30	-1.71	46.4	-18.11	35.6	-7.31	20	315	Vert
224.9217	37.89	qp	-29	16.2	25.09	40	-14.91	30	-4.91	46.4	-21.31	35.6	-10.51	24	303	Vert

LIMIT 1: CISPR CLASS A 10 METER

LIMIT 2: CISPR CLASS B 10 METER

LIMIT 3: CFR 47 PART 15 CLASS A (10m)

LIMIT 4: CFR 47 PART 15 CLASS B (10M)

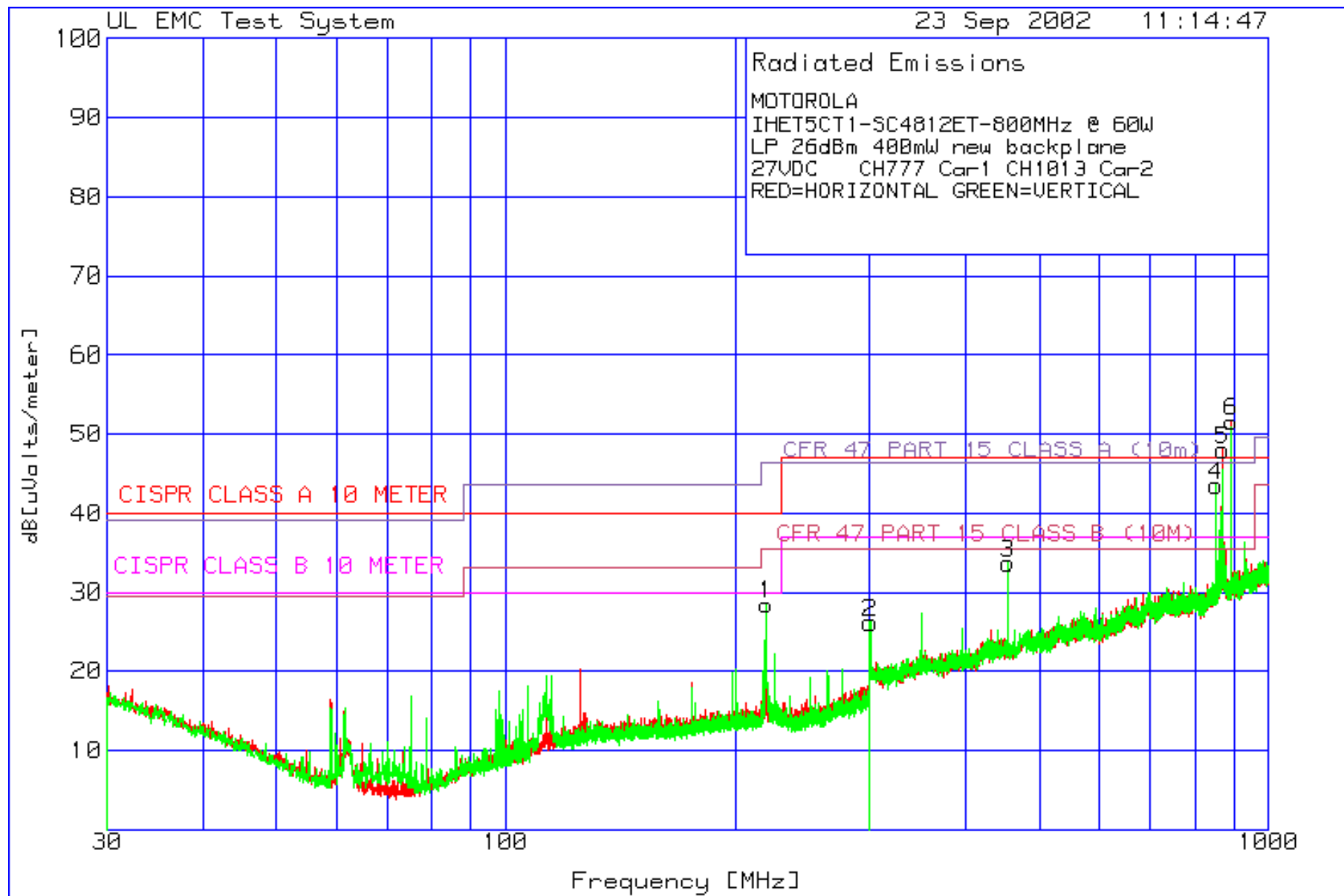
pk - Peak detector

qp - Quasi-Peak detector

av - Average detector

avlg - Average log detector

avem - EMI Average detector



MOTOROLA

IHET5CT1-SC4812ET-800MHz @ 60W

LP 26dBm 400mW new backplane

27VDC CH777 Carl CH1013 Car2

RED=HORIZONTAL GREEN=VERTICAL

Marker	Test	Meter	Detector	Gain/Loss	Transducer	Level	Limit 1	Margin 1	Limit 2	Margin 2	Limit 3					
3[dB]	Limit	4 Margin	4[dB]	Azimuth	[deg]	Height	[cm]	Polarity								
Number	Frequency	Reading	Type	Factor	Factor	dB[uVolts/meter]										
	[MHz]	[dB(uV)]		[dB]	[dB]											
Vertical 30 - 300MHz																
1	219.0607	41.3	pk	-28.9	16.1	28.5	40	-11.5	30	-1.5	46.4	-17.9	35.6	-7.1	0	200
Vert																
Horizontal 300 - 1000MHz																
CARRIER FREQUENCY																
5	870.0724	20.2	pk	3.6	24.2	48	47	1	37	11	46.4	1.6	35.6	12.4	161	199
Horz																
CARRIER FREQUENCY																
6	892.6305	24.8	pk	3.6	23.2	51.6	47	4.6	37	14.6	46.4	5.2	35.6	16	146	100
Horz																
Vertical 300 - 1000MHz																
2	300.1749	9.1	pk	1.8	15.3	26.2	47	-20.8	37	-10.8	46.4	-20.2	35.6	-9.4	272	100
Vert																
NOT FROM EUT																
3	454.4092	14.5	pk	2.3	16.9	33.7	47	-13.3	37	-3.3	46.4	-12.7	35.6	-1.9	272	199
Vert																
NOT FROM EUT																
4	852.7604	17.2	pk	3.5	22.8	43.5	47	-3.5	37	6.5	46.4	-2.9	35.6	7.9	335	100
Vert																

LIMIT 1: CISPR CLASS A 10 METER

LIMIT 2: CISPR CLASS B 10 METER

LIMIT 3: CFR 47 PART 15 CLASS A (10m)

LIMIT 4: CFR 47 PART 15 CLASS B (10M)

LIMIT 5: NONE

LIMIT 6: NONE

pk - Peak detector

qp - Quasi-Peak detector

av - Average detector

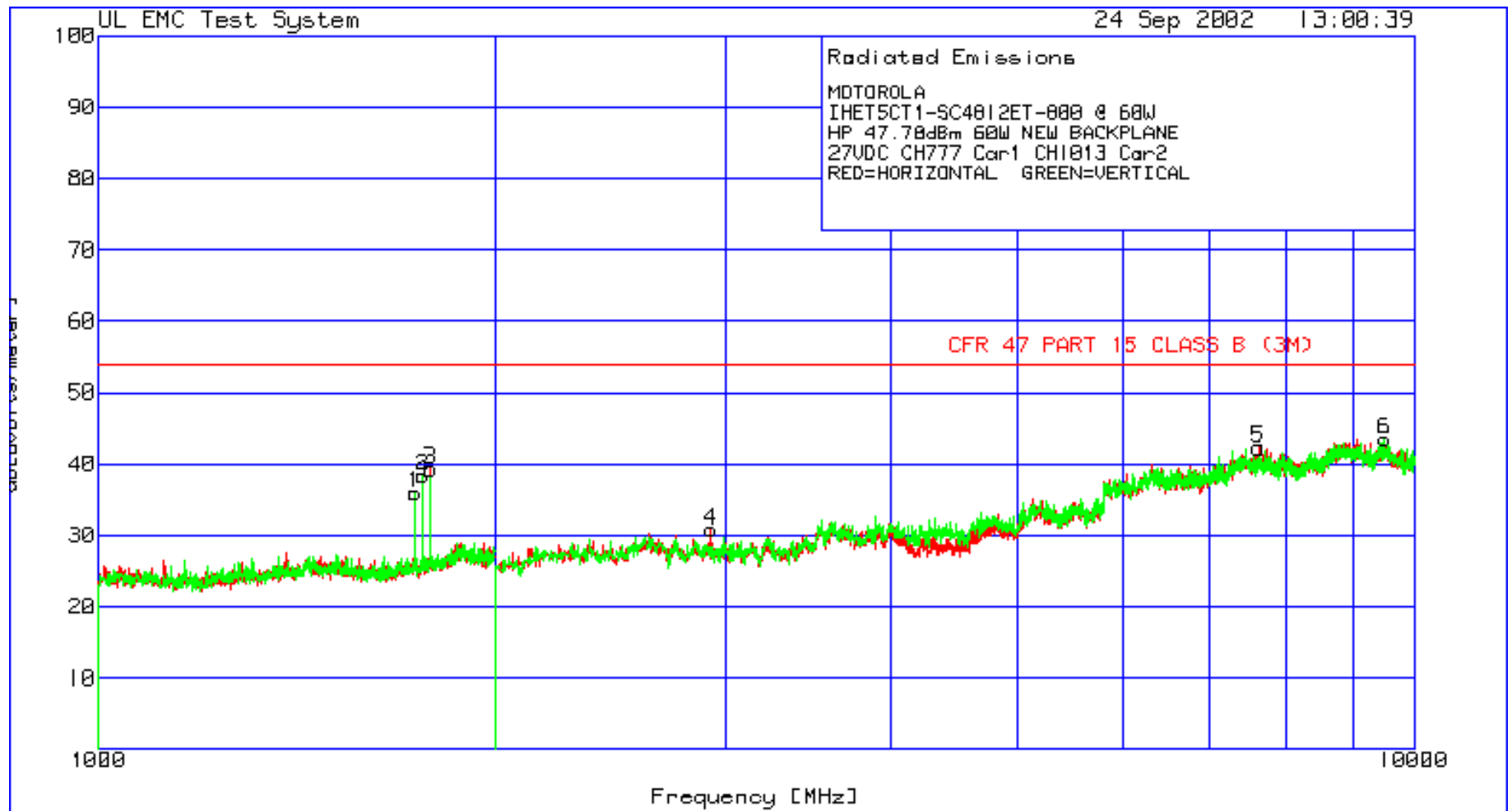
avlg - Average log detector

avem - EMI Average detector

UNDERWRITERS LABORATORIES INC.
Radiated Emissions

Date Tested: 9-24-2002

Manufacturer	: Motorola CDMA Wireless Products Customer Integration Engineering
Equipment Under Test	: SC4812ET 800MHz Cellular Phone Base Station
Requirement	: CFR 47 PART 15 B Class B
Detection Mode	: Average (av)
Bandwidth	: 100KHz, 1-10GHz
Measurement Distance	: 3 meter
Antenna Type	: 1-10GHz, Horn



MOTOROLA

IHET5CT1-SC4812ET-800 @ 60W

HP 47.78dBm 60W NEW BACKPLANE

27VDC CH777 Car1 CH1013 Car2

RED=HORIZONTAL GREEN=VERTICAL

Marker	Test	Meter	Detector	Gain/Loss	Transducer	Level	Limit 1	Margin 1[dB]	Azimuth
[deg]	Height	[cm]	Polarity						
Number	Frequency	Reading	Type	Factor	Factor		dB[uVolts/meter]		
	[MHz]	[dB(uV)]	[dB]	[dB]					
Horizontal 1000 - 2000MHz									
3	1786	41	pk	-29.8	28.1	39.3	54	-14.7 235	100 Horz
Horizontal 1000 - 2000MHz									
1	1739	38.2	pk	-30	27.8	36	54	-18 56	100 Vert
2	1762	40.4	pk	-30	28	38.4	54	-15.6 36	100 Vert
Horizontal 2000 - 10000MHz									
4	2919.387	28.8	pk	-29.5	31.5	30.8	54	-23.2 206	200 Horz
5	7617.588	25.8	pk	-21.6	38.1	42.3	54	-11.7 356	200 Horz
Horizontal 2000 - 10000MHz									
6	9496.336	26	pk	-21	38.5	43.5	54	-10.5 297	200 Vert

LIMIT 1: CFR 47 PART 15 CLASS B (3M)

LIMIT 2: NONE

LIMIT 3: NONE

LIMIT 4: NONE

LIMIT 5: NONE

LIMIT 6: NONE

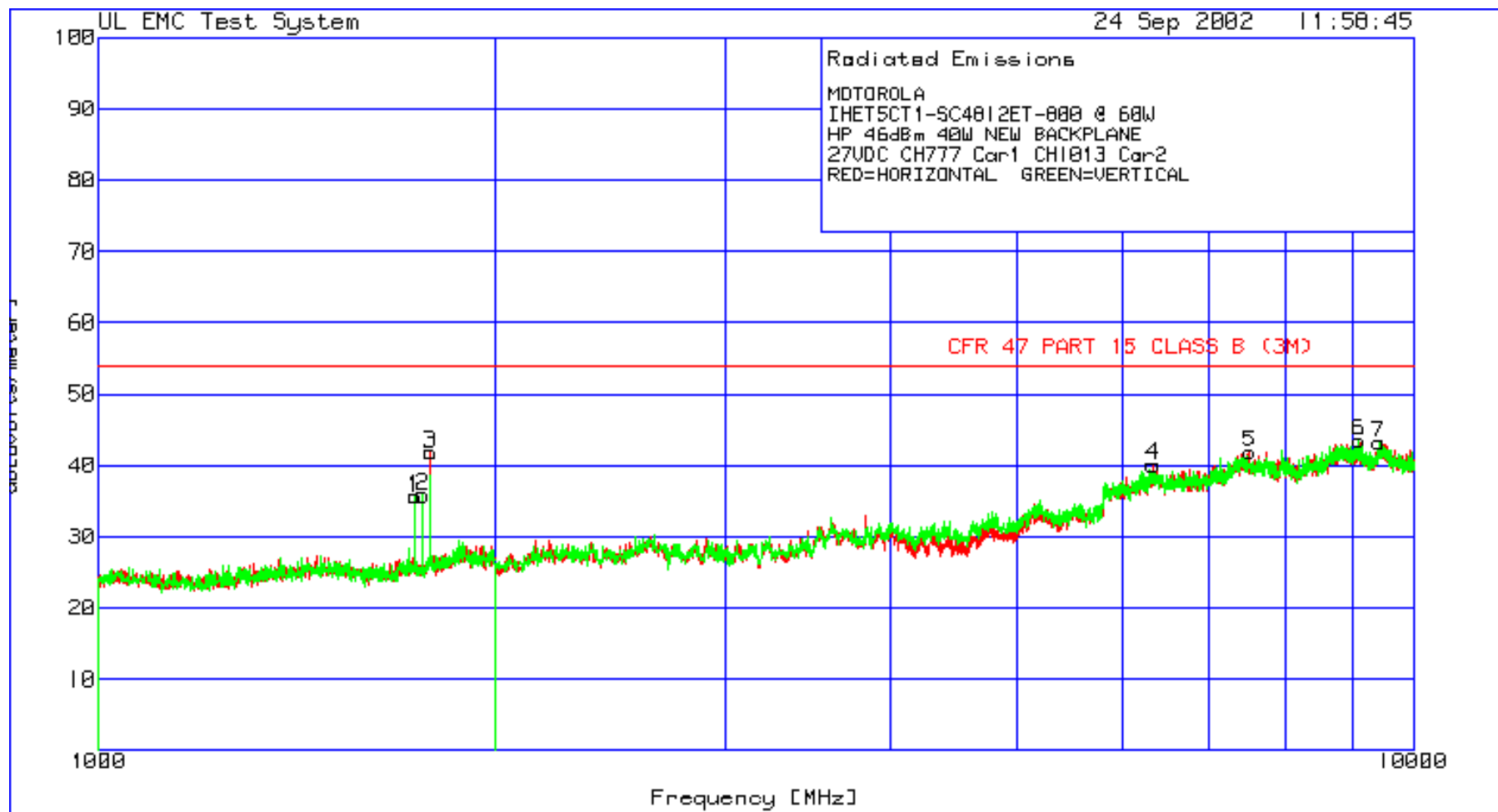
pk - Peak detector

qp - Quasi-Peak detector

av - Average detector

avlg - Average log detector

avem - EMI Average detector



MOTOROLA

IHET5CT1-SC4812ET-800 @ 60W

HP 46dBm 40W NEW BACKPLANE

27VDC CH777 Car1 CH1013 Car2

RED=HORIZONTAL GREEN=VERTICAL

Marker	Test	Meter	Detector	Gain/Loss	Transducer	Level	Limit 1	Margin 1[dB]	Azimuth
[deg]	Height	[cm]	Polarity						
Number	Frequency	Reading	Type	Factor	Factor				
	[MHz]	[dB (uV)]	[dB]	[dB]					
Horizontal 1000 - 2000MHz									
3	1786	43.5	pk	-29.8	28.1	41.8	54	-12.2 233	100 Horz
Horizontal 1000 - 2000MHz									
1	1739	37.8	pk	-30	27.8	35.6	54	-18.4 38	100 Vert
2	1762	37.8	pk	-30	28	35.8	54	-18.2 38	100 Vert
Horizontal 2000 - 10000MHz									
4	6335.776	26.4	pk	-22.9	36.6	40.1	54	-13.9 324	200 Horz
5	7502.998	26	pk	-22.4	38.3	41.9	54	-12.1 0	100 Horz
Horizontal 2000 - 10000MHz									
6	9091.272	25.6	pk	-21.7	39.6	43.5	54	-10.5 297	100 Vert
7	9413.724	25.6	pk	-21.1	38.7	43.2	54	-10.8 297	200 Vert

LIMIT 1: CFR 47 PART 15 CLASS B (3M)

LIMIT 2: NONE

LIMIT 3: NONE

LIMIT 4: NONE

LIMIT 5: NONE

LIMIT 6: NONE

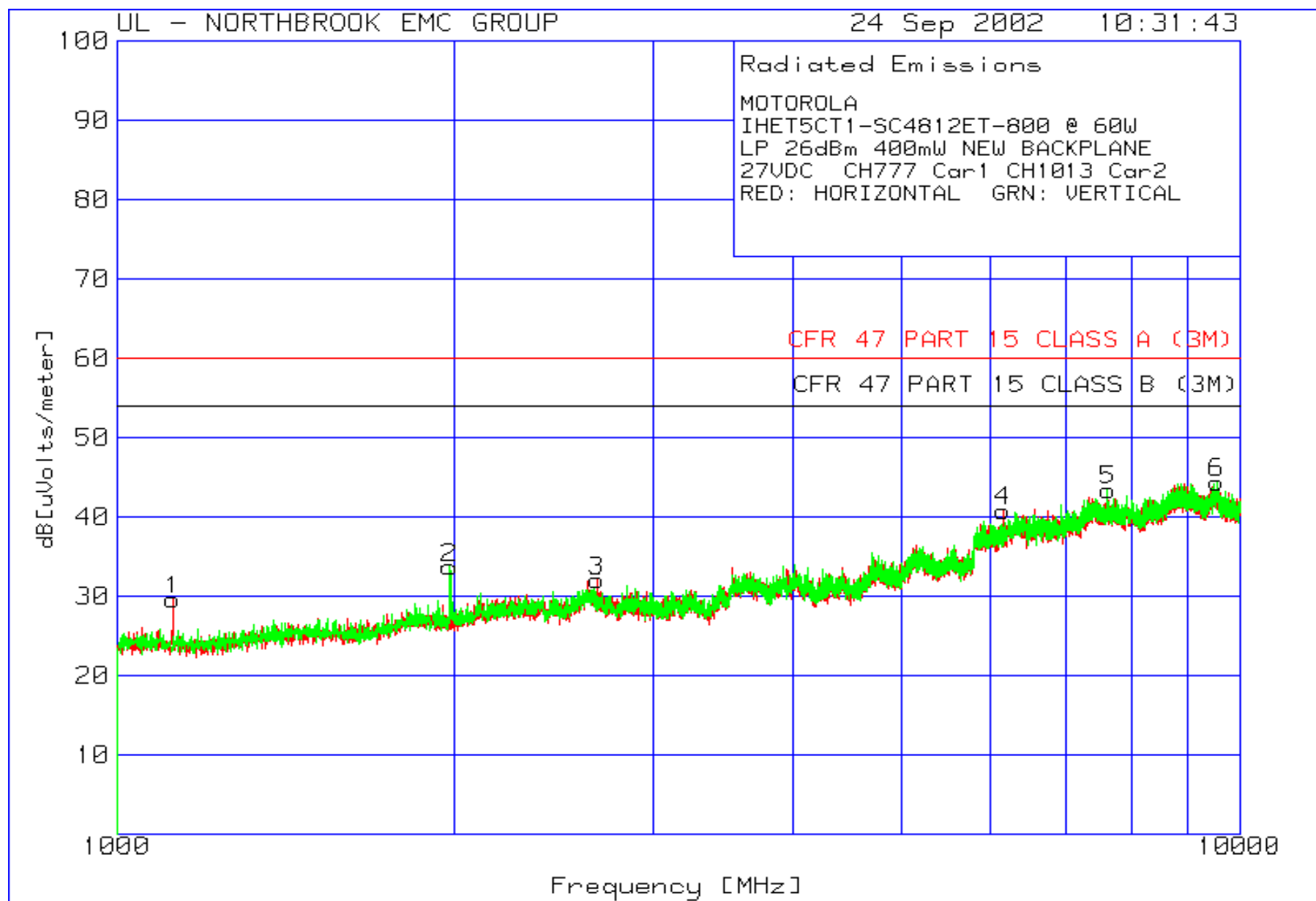
pk - Peak detector

qp - Quasi-Peak detector

av - Average detector

avlg - Average log detector

avem - EMI Average detector



MOTOROLA
 IHET5CT1-SC4812ET-800 @ 60W
 LP 26dBm 400mW NEW BACKPLANE
 27VDC CH777 Car1 CH1013 Car2
 RED: HORIZONTAL GRN: VERTICAL

No.	Test Frequency [MHz]	Meter Reading [dB (uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1	2
=====							
Range: 1 1000 - 10000MHz -----							
1	1121.394	32.86 pk	-28.6	25.34	29.6	60	53.98
	Azimuth:239	Height:100	Horz	Margin [dB]		-30.4	-24.38
3	2675.909	30.81 pk	-29.86	31.05	32	60	53.98
	Azimuth:239	Height:100	Horz	Margin [dB]		-28	-21.98
4	6154.74	28.61 pk	-24.56	36.75	40.8	60	53.98
	Azimuth:143	Height:100	Horz	Margin [dB]		-19.2	-13.18

Range: 1 1000 - 10000MHz -----							
2	1977.894	34.15 pk	-29.44	28.99	33.7	60	53.98
	Azimuth:314	Height:100	Vert	Margin [dB]		-26.3	-20.28
5	7629.449	27.19 pk	-21.88	38.09	43.4	60	53.98
	Azimuth:354	Height:100	Vert	Margin [dB]		-16.6	-10.58
6	9541.401	26.78 pk	-20.9	38.52	44.4	60	53.98
	Azimuth:39	Height:100	Vert	Margin [dB]		-15.6	-9.58

LIMIT 1: CFR 47 PART 15 CLASS A (3M)
 LIMIT 2: CFR 47 PART 15 CLASS B (3M)
 LIMIT 3: NONE
 LIMIT 4: NONE
 LIMIT 5: NONE
 LIMIT 6: NONE

pk - Peak detector
 qp - Quasi-Peak detector
 av - Average detector
 avlg - denotes average log detection
 tm - Trace Math Result

UNDERWRITERS LABORATORIES INC.
Radiated Emissions Substitution Method

Date Tested: 10-4-2002

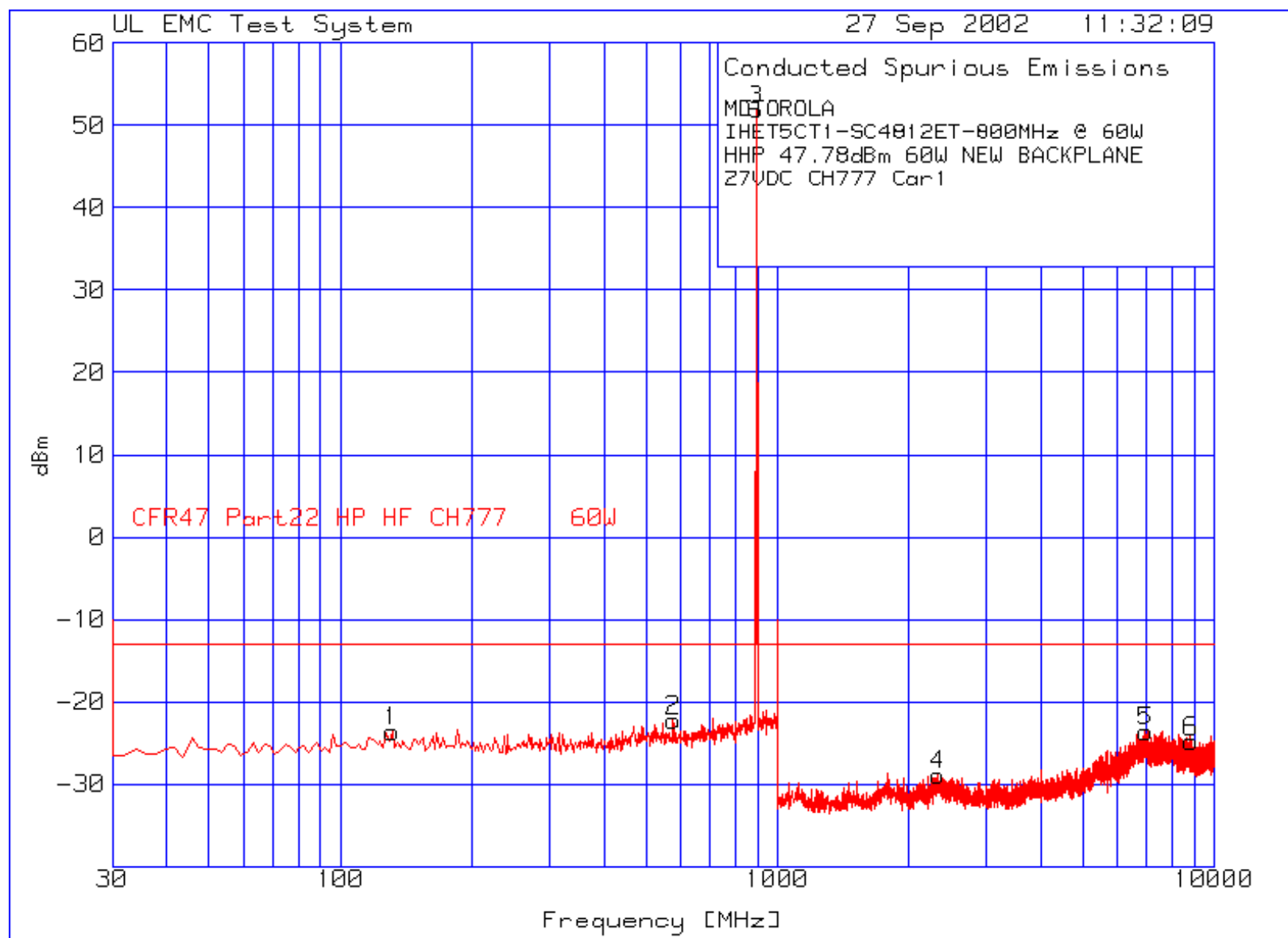
Manufacturer : MOTOROLA HP 46dBm 40W
Equipment Under Test : IHET5CT1-SC4812ET 800MHz @60W
: new backplane CH777 Car1 CH1013 Car2
Requirement : FCC Part 22/24 : Substitution Method–TIA/EIA–603 :1992, : Section 2.2.12*
Detection Mode : Pick
Measurement Distance : 3 meter

Radiated			Substituted Power					
Spurious Fr. (MHz) channel mode of operation	Antenna Polarity	Measured Radiated Field Strength (dBuV/m)	Signal Generator Output Level (dBm)	Tx Antenna Terminal Voltage (dBm)	Substitution Antenna Gain (dBi)	Calculated EIRP (dBm)	EDRP (EIRP -2.15) (dBm)	FCC Part 22/24 MAX LIMIT (dBm)
1786	H	41.8	-57.1	-58.6	7	-51.6	-53.75	- 13
1739	V	35.6	-64.8	-66.3	7	-59.3	-61.45	- 13

UNDERWRITERS LABORATORIES INC.
Conducted Spurious Emissions

Date Tested: 9-27-2002

Manufacturer : Motorola CDMA Wireless products Customer Integration
Engineering
Equipment Under Test : SC4812ET 800MHz Cellular Phone Base Station
Requirement : CFR47 Part 22/24 , ANSI/TIAEIA-603-1992, Section 2.2.12
Detection Mode : Quasi-peak (qp) or Peak (pk) or Average (ave)



MOTOROLA

IHET5CT1-SC4812ET-800MHz @ 60W

HHP 47.78dBm 60W NEW BACKPLANE

27VDC CH777 Car1

Marker	Test	Meter	Detector	Gain/Loss	Transducer	Level	Limit 1	Margin 1[dB]
Number	Frequency	Reading	Type	Factor	Factor	dBm		
	[MHz]	[dB(uV)]		[dB]				
Range: 1 30 - 1000MHz								
1	131.0822	33.32	pk	50.1	-107	-23.58 -13	-10.58	
2	576.2325	34.05	pk	50.7	-107	-22.25 -13	-9.25	
3	895.0301	107.88	pk	51	-107	51.88 47.8	4.08	carrier frequency

Range: 2 1000 - 10000MHz

4	2326.865	26.25	pk	51.9	-107	-28.85 -13	-15.85	
5	6942.989	29.72	pk	53.7	-107	-23.58 -13	-10.58	
6	8833.367	28.02	pk	54.2	-107	-24.78 -13	-11.78	

LIMIT 1: CFR47 Part22 HP HF CH777 60W

LIMIT 2: NONE

LIMIT 3: NONE

LIMIT 4: NONE

LIMIT 5: NONE

LIMIT 6: NONE

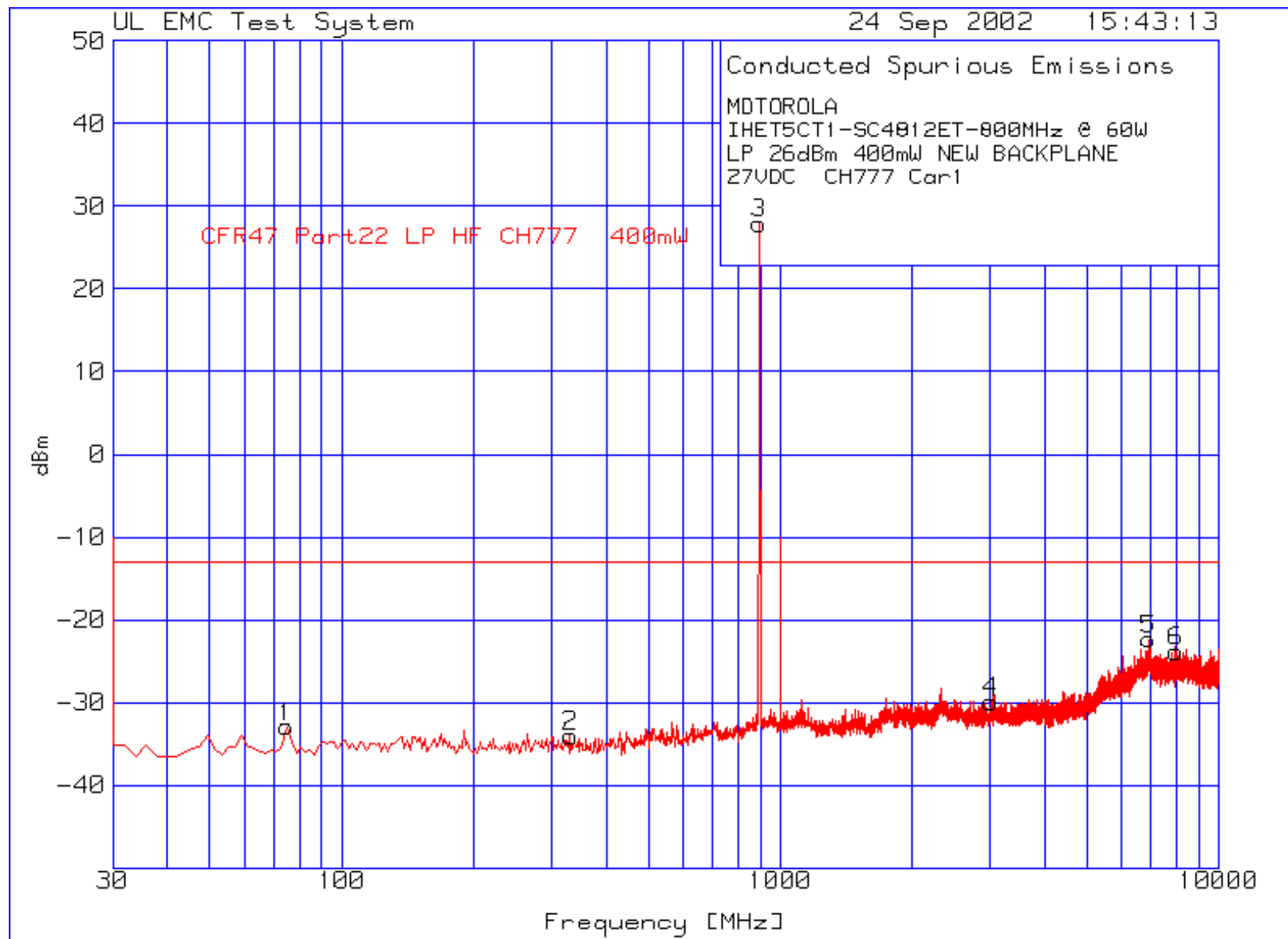
pk - Peak detector

qp - Quasi-Peak detector

av - Average detector

avlg - Average log detector

avem - EMI Average detector

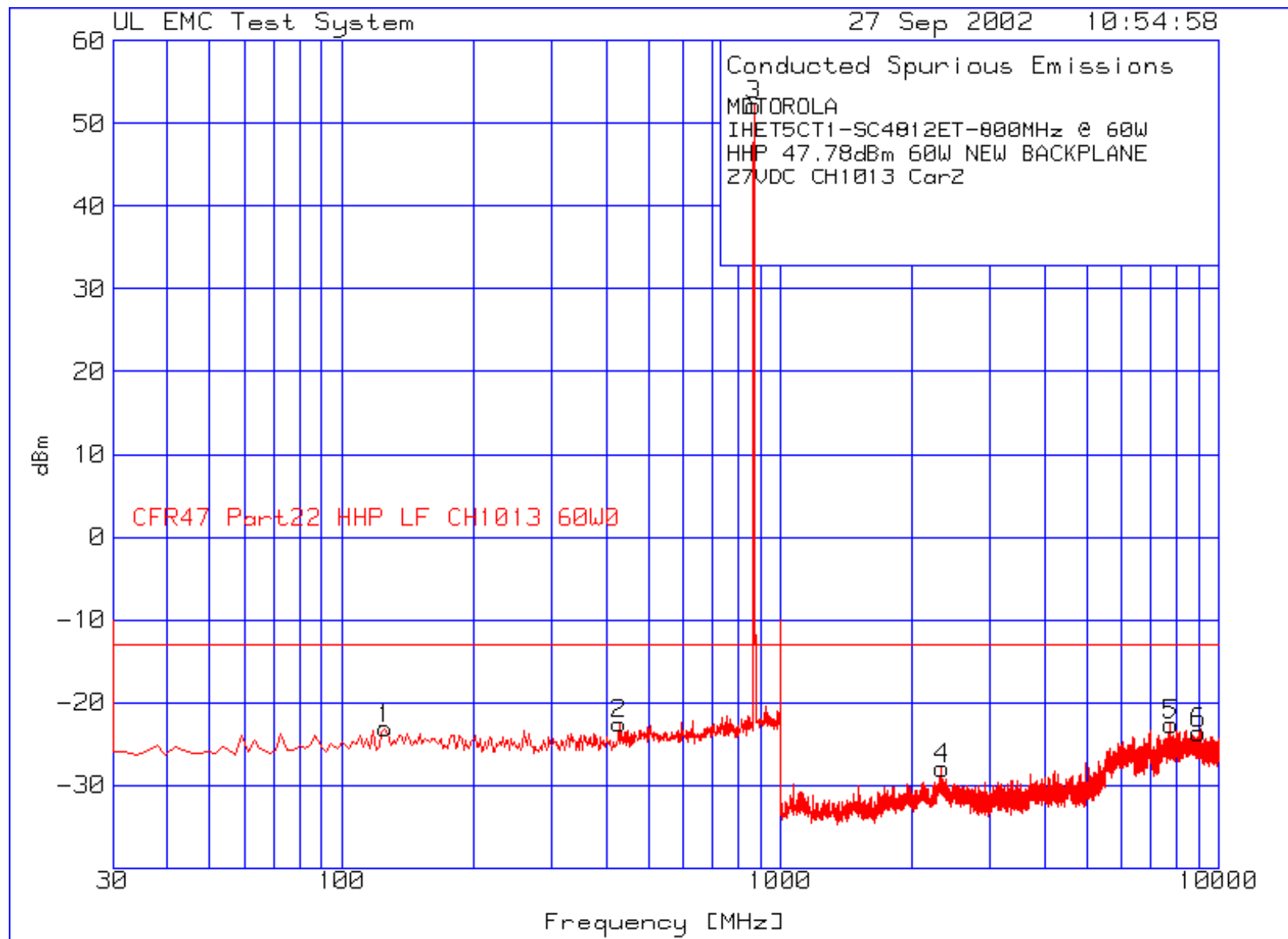


MOTOROLA
 IHET5CT1-SC4812ET-800MHz @ 60W
 LP 26dBm 400mW NEW BACKPLANE
 27VDC CH777 Carl

Marker Number	Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector	Gain/Type [dB]	Loss/Factor [dB]	Transducer Factor dBm	Level	Limit 1	Margin 1 [dB]
Range: 1 30 - 1000MHz									
1	74.7094	23.98	pk	50.1	-107	-32.92 -13	-19.92		
2	331.3026	22.58	pk	50.4	-107	-34.02 -13	-21.02		
3	895.0301	83.93	pk	51	-107	27.93 26	1.93	carrier frequency	
Range: 2 1000 - 10000MHz									
4	3023.605	25	pk	52.1	-107	-29.9 -13	-16.9		
5	6919.584	31.06	pk	53.6	-107	-22.34 -13	-9.34		
6	7987.197	29.11	pk	54.1	-107	-23.79 -13	-10.79		

LIMIT 1: CFR47 Part22 LP HF CH777 400mW
 LIMIT 2: NONE
 LIMIT 3: NONE
 LIMIT 4: NONE
 LIMIT 5: NONE
 LIMIT 6: NONE

pk - Peak detector
 qp - Quasi-Peak detector
 av - Average detector
 avlg - Average log detector
 avem - EMI Average detector

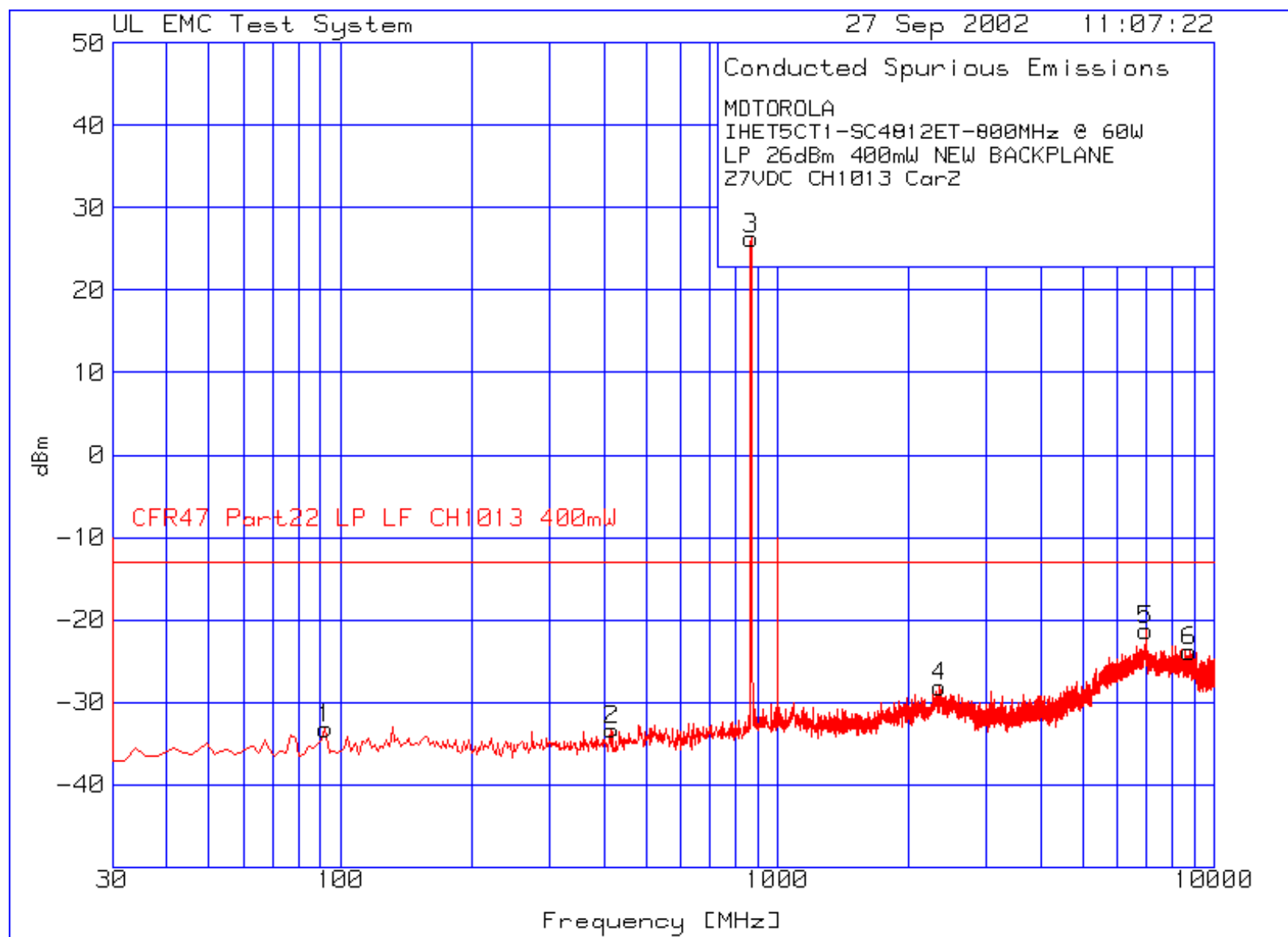


MOTOROLA
 IHET5CT1-SC4812ET-800MHz @ 60W
 HHP 47.78dBm 60W NEW BACKPLANE
 27VDC CH1013 Car2

Marker Number	Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector	Gain/Loss Type [dB]	Factor [dB]	Transducer Factor dBm	Level	Limit 1	Margin 1[dB]
Range: 1 30 - 1000MHz									
1	125.2505	33.8	pk	50.1	-107	-23.1 -13	-10.1		
2	428.497	33.93	pk	50.5	-107	-22.57 -13	-9.57		
3	869.7595	108.2	pk	51	-107	52.2 47.8	4.4	carrier frequency	
Range: 2 1000 - 10000MHz									
4	2332.266	27.18	pk	51.9	-107	-27.92 -13	-14.92		
5	7749.55	30.56	pk	53.8	-107	-22.64 -13	-9.64		
6	8971.994	29.36	pk	54	-107	-23.64 -13	-10.64		

LIMIT 1: CFR47 Part22 HHP LF CH1013 60W0
 LIMIT 2: NONE
 LIMIT 3: NONE
 LIMIT 4: NONE
 LIMIT 5: NONE
 LIMIT 6: NONE

pk - Peak detector
 qp - Quasi-Peak detector
 av - Average detector
 avlg - Average log detector
 avem - EMI Average detector

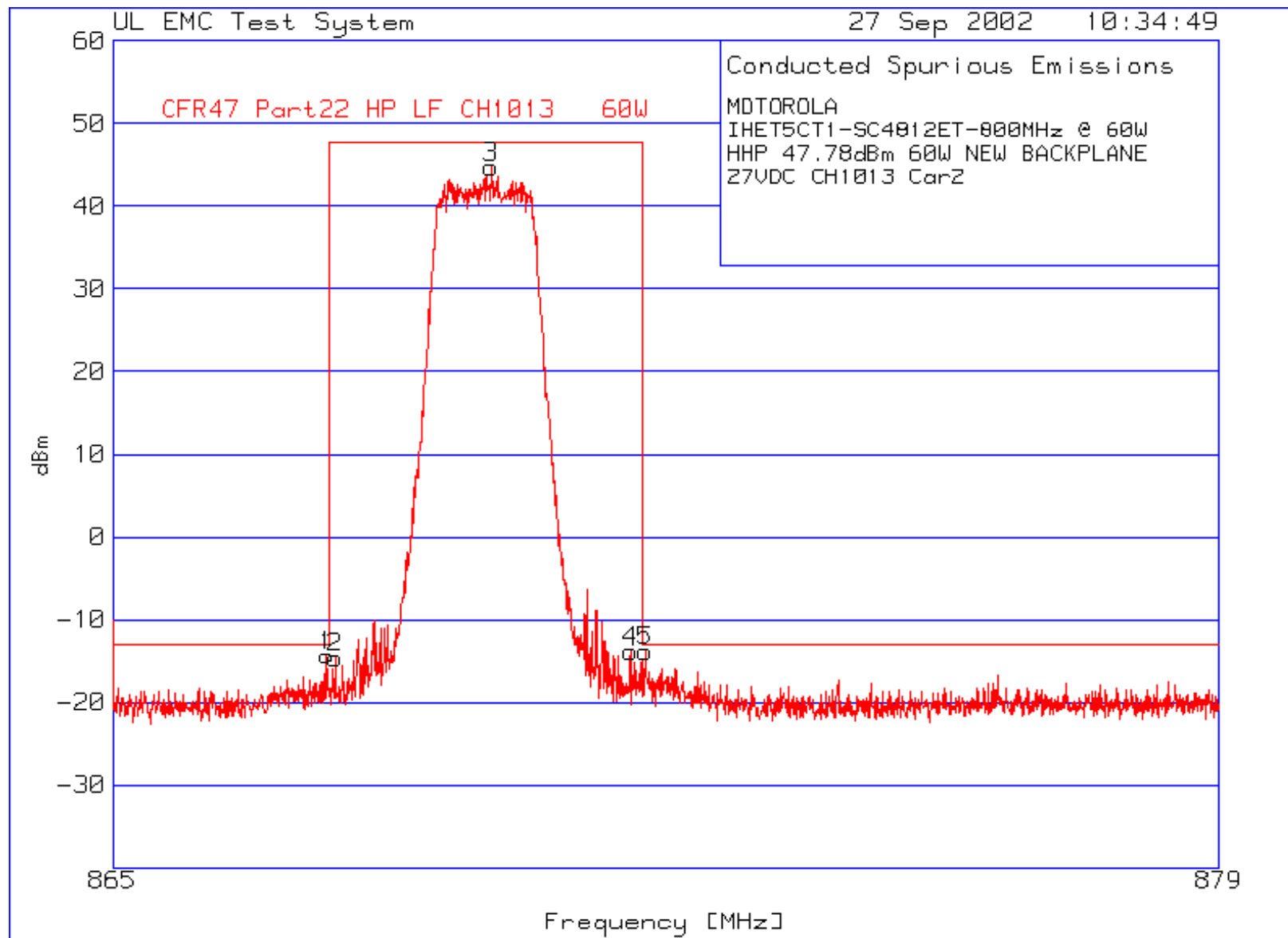


MOTOROLA
 IHET5CT1-SC4812ET-800MHz @ 60W
 LP 26dBm 400mW NEW BACKPLANE
 27VDC CH1013 Car2

Marker Number	Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector	Gain/Loss Type [dB]	Factor	Transducer Factor dBm	Level	Limit 1	Margin 1[dB]
Range: 1 30 - 1000MHz									
1	92.2044	23.73	pk	50.1	-107	-33.17 -13	-20.17		
2	416.8337	23.15	pk	50.5	-107	-33.35 -13	-20.35		
3	869.7595	82.27	pk	51	-107	26.27 26	.27	carrier frequency	
Range: 2 1000 - 10000MHz									
4	2346.669	27.02	pk	51.9	-107	-28.08 -13	-15.08		
5	6959.192	32.07	pk	53.7	-107	-21.23 -13	-8.23		
6	8773.955	29.02	pk	54.2	-107	-23.78 -13	-10.78		

LIMIT 1: CFR47 Part22 LP LF CH1013 400mW
 LIMIT 2: NONE
 LIMIT 3: NONE
 LIMIT 4: NONE
 LIMIT 5: NONE
 LIMIT 6: NONE

pk - Peak detector
 qp - Quasi-Peak detector
 av - Average detector
 avlg - Average log detector
 avem - EMI Average detector



MOTOROLA

IHET5CT1-SC4812ET-800MHz @ 60W

HHP 47.78dBm 60W NEW BACKPLANE

27VDC CH1013 Car2

Marker	Test	Meter	Detector	Gain/Loss	Transducer	Level	Limit 1	Margin 1[dB]
Number	Frequency	Reading	Type	Factor	Factor	dBm		
	[MHz]	[dB(uV)]		[dB]	[dB]			
Range: 1 865 - 879MHz								
1	867.6893	21.67	pk	71	-107	-14.33 -13	-1.33	
2	867.8014	21.41	pk	71	-107	-14.59 47.8	-62.39	
3	869.7624	80.7	pk	71	-107	44.7 47.8	-3.1	
4	871.5273	22.14	pk	71	-107	-13.86 47.8	-61.66	
5	871.7094	22.22	pk	71	-107	-13.78 -13	-.78	

LIMIT 1: CFR47 Part22 HP LF CH1013 60W

LIMIT 2: NONE

LIMIT 3: NONE

LIMIT 4: NONE

LIMIT 5: NONE

LIMIT 6: NONE

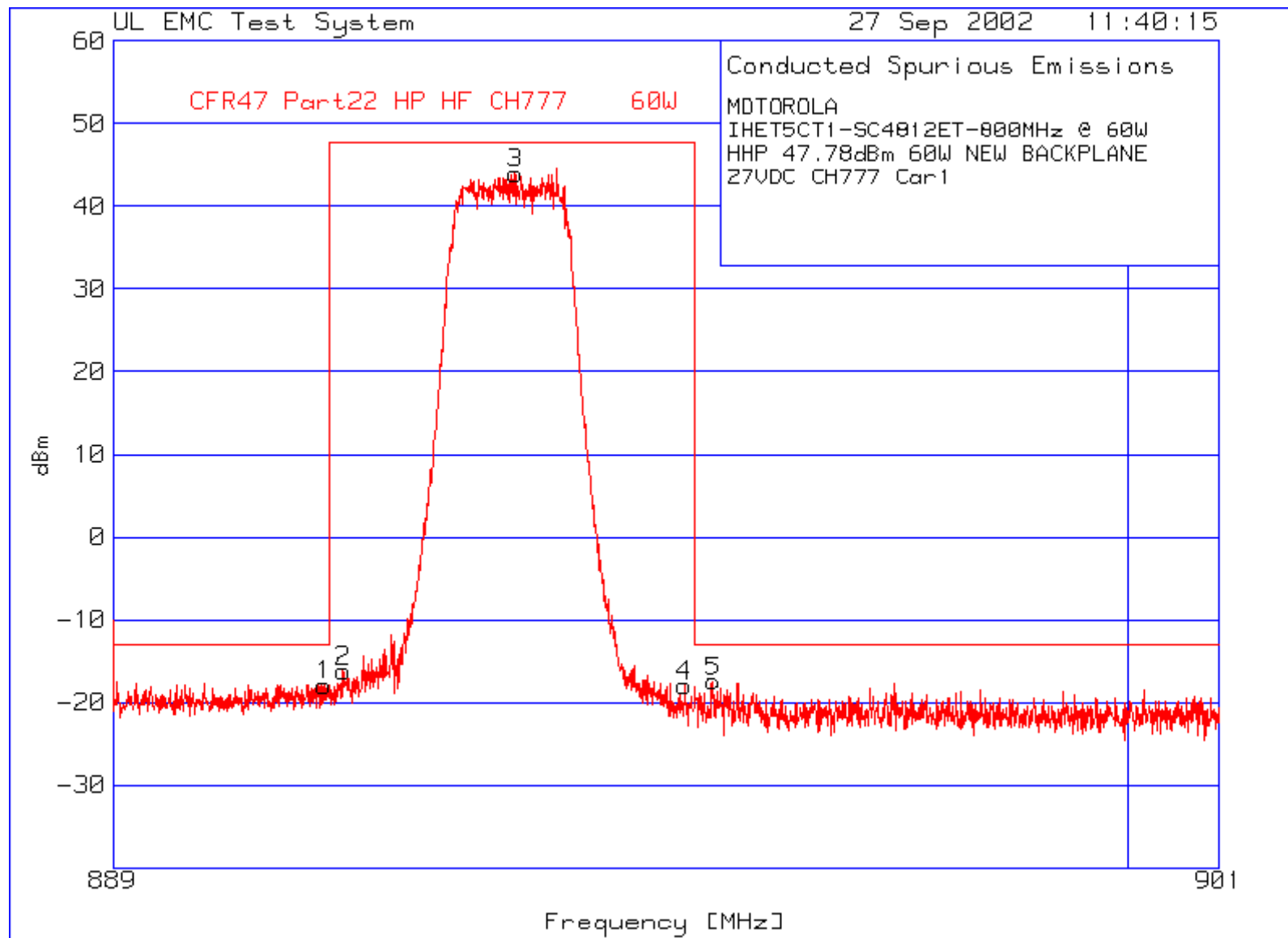
pk - Peak detector

qp - Quasi-Peak detector

av - Average detector

avlg - Average log detector

avem - EMI Average detector



MOTOROLA

IHET5CT1-SC4812ET-800MHz @ 60W

HHP 47.78dBm 60W NEW BACKPLANE

27VDC CH777 Car1

Marker Number	Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector	Gain/Type [dB]	Loss/Factor [dB]	Transducer Factor dBm	Level	Limit 1	Margin 1 [dB]
Range: 1 889 - 901MHz									
1	891.2811	18.09	pk	71	-107	-17.91 -13	-4.91		
2	891.4852	19.81	pk	71	-107	-16.19 47.8	-63.99		
3	893.3462	79.99	pk	71	-107	43.99 47.8	-3.81		
4	895.1831	18.01	pk	71	-107	-17.99 47.8	-65.79		
5	895.4892	18.57	pk	71	-107	-17.43 -13	-4.43		

LIMIT 1: CFR47 Part22 HP HF CH777 60W

LIMIT 2: NONE

LIMIT 3: NONE

LIMIT 4: NONE

LIMIT 5: NONE

LIMIT 6: NONE

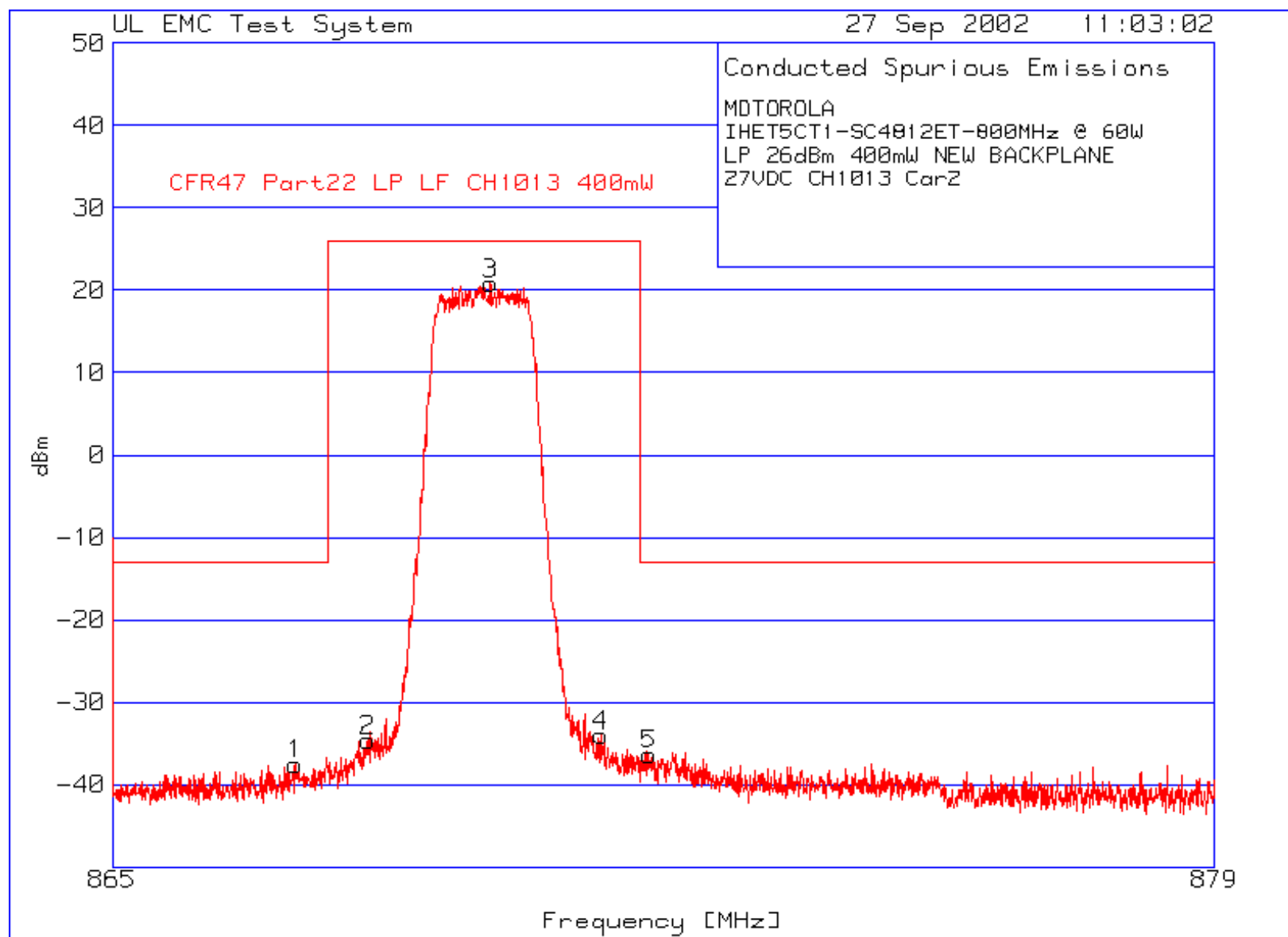
pk - Peak detector

qp - Quasi-Peak detector

av - Average detector

avlg - Average log detector

avem - EMI Average detector

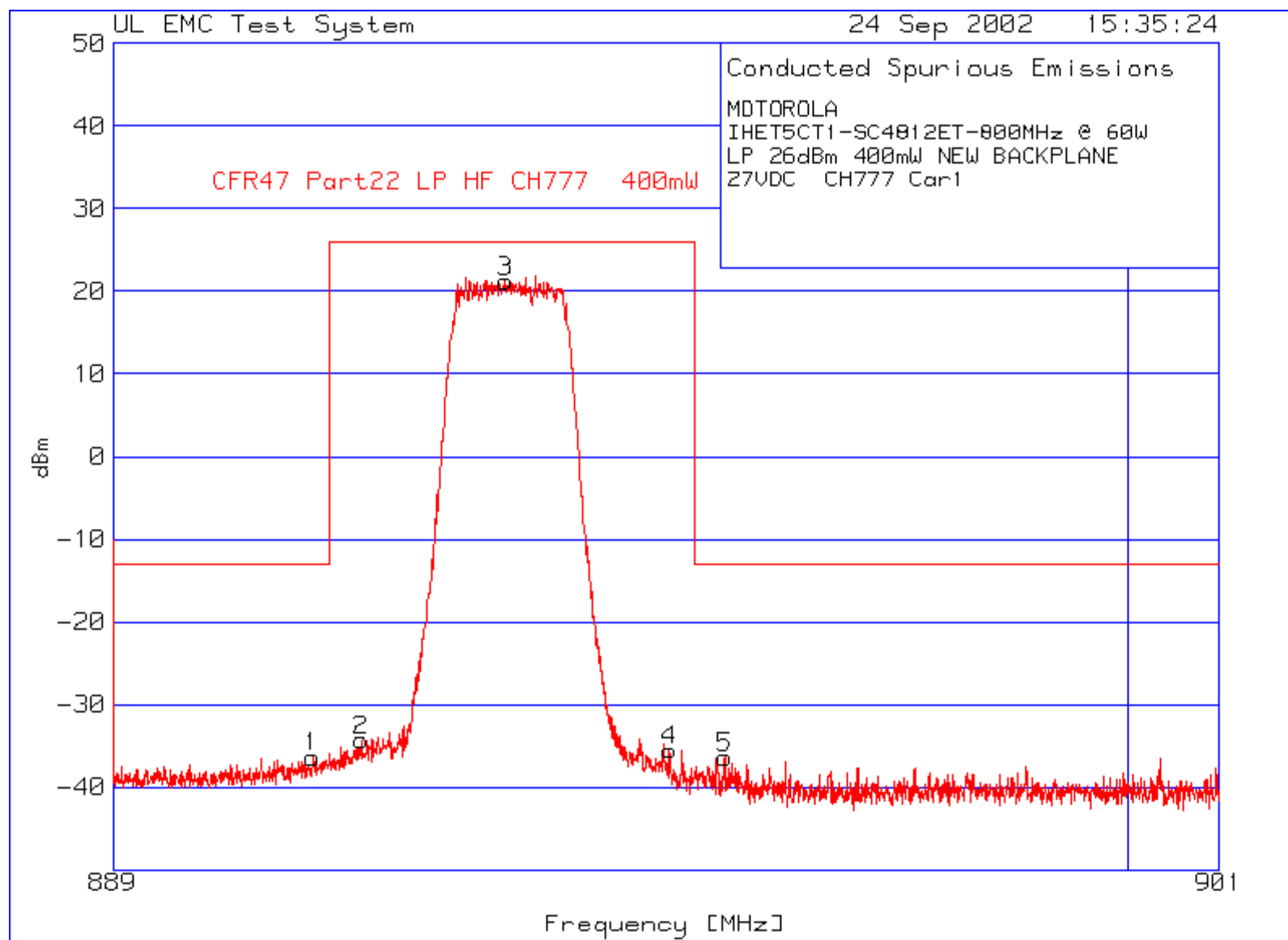


MOTOROLA
 IHET5CT1-SC4812ET-800MHz @ 60W
 LP 26dBm 400mW NEW BACKPLANE
 27VDC CH1013 Car2

Marker	Test	Meter	Detector	Gain/Loss	Transducer	Level	Limit 1	Margin 1[dB]
Number	Frequency	Reading	Type	Factor	Factor	dBm		
	[MHz]	[dB(uV)]		[dB]	[dB]			
Range: 1 865 - 879MHz								
1	867.3112	18.49	pk	51	-107	-37.51 -13	-24.51	
2	868.2286	21.38	pk	51	-107	-34.62 26	-60.62	
3	869.7764	76.77	pk	51	-107	20.77 26	-5.23	
4	871.1841	21.93	pk	51	-107	-34.07 26	-60.07	
5	871.7864	19.69	pk	51	-107	-36.31 -13	-23.31	

LIMIT 1: CFR47 Part22 LP LF CH1013 400mW
 LIMIT 2: NONE
 LIMIT 3: NONE
 LIMIT 4: NONE
 LIMIT 5: NONE
 LIMIT 6: NONE

pk - Peak detector
 qp - Quasi-Peak detector
 av - Average detector
 avlg - Average log detector
 avem - EMI Average detector



MOTOROLA
 IHET5CT1-SC4812ET-800MHz @ 60W
 LP 26dBm 400mW NEW BACKPLANE
 27VDC CH777 Carl

Marker	Test	Meter	Detector	Gain/Loss	Transducer	Level	Limit 1	Margin 1[dB]
Number	Frequency	Reading	Type	Factor	Factor dBm			
	[MHz]	[dB(uV)]		[dB]	[dB]			
Range: 1 889 - 901MHz								
1	891.1551	19.66	pk	51	-107	-36.34	-13	-23.34
2	891.6833	21.72	pk	51	-107	-34.28	26	-60.28
3	893.2381	77.17	pk	51	-107	21.17	26	-4.83
4	895.015	20.52	pk	51	-107	-35.48	26	-61.48
5	895.6213	19.62	pk	51	-107	-36.38	-13	-23.38

LIMIT 1: CFR47 Part22 LP HF CH777 400mW
 LIMIT 2: NONE
 LIMIT 3: NONE
 LIMIT 4: NONE
 LIMIT 5: NONE
 LIMIT 6: NONE

pk - Peak detector
 qp - Quasi-Peak detector
 av - Average detector
 avlg - Average log detector
 avem - EMI Average detector

UNDERWRITERS LABORATORIES INC.
Occupied Bandwidth

Date Tested: 9-27-2002

Manufacturer : Motorola CDMA Wireless products Customer Integration Engineering
Equipment Under Test : SC4812ET 800MHz Cellular Phone Base Station
Requirement : CFR47 Part 22/24

Section 2.1047 Measurement Required: **Occupied Bandwidth**

DEFINITION

The measured spectral width of an emission. The measurement determines occupied bandwidth as the difference between upper and lower frequencies where 0.5% of the emission power is above the upper frequency and 0.5% of the emission power is below the lower frequency at rated power, with Pilot, Page, Sync, and Traffic Channel modulation.

Data to show the bandwidth occupied by this transmitter and output power is presented in the form of Channel Power Measurement plots from a spectrum analyzer. The Channel Power Measurement divides the Channel Power Bandwidth into increments (defined by the Resolution Bandwidth Setting selected), then sums the energy contained in each of those increments to provide an integrated measurement of the power in the Channel Power Bandwidth.

METHOD OF MEASUREMENT

Connect a spectrum analyzer to the BTS RF Transmit Port. Set the CDMA signal power to maximum. Setup the spectrum analyzer to make the following integrated Channel Power Measurements:

1. Channel Power Measurement of the CDMA Carrier Centered at 869.70 (Ch. 1013).

Channel Power Bandwidth: 1.30 MHz

Resolution Bandwidth: 30 KHz

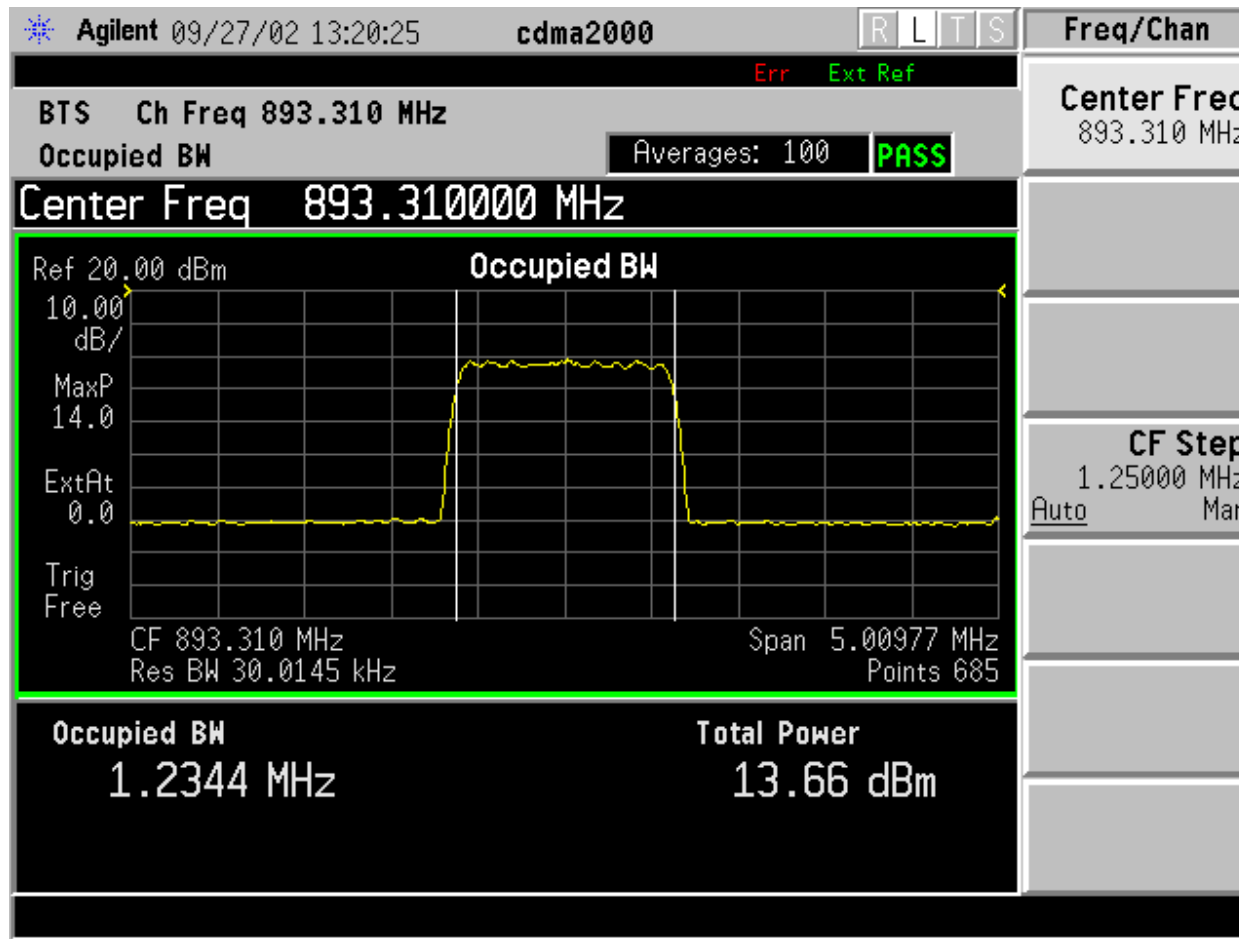
2. Channel Power Measurement of the CDMA Carrier Centered at 893.31 (Ch. 777).

Channel Power Bandwidth: 1.30 MHz

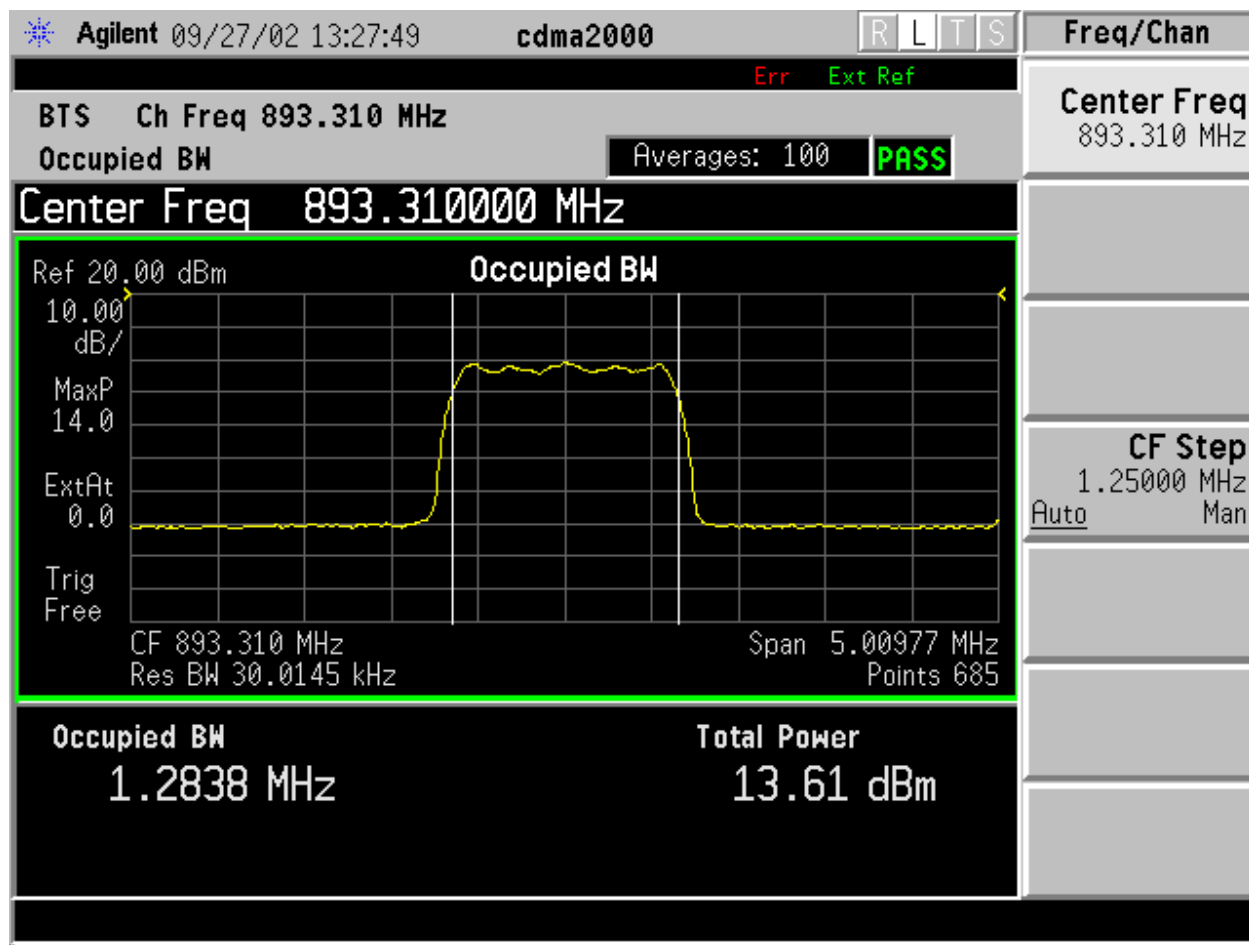
Resolution Bandwidth: 30 KHz

Record the Channel Power Measurements.

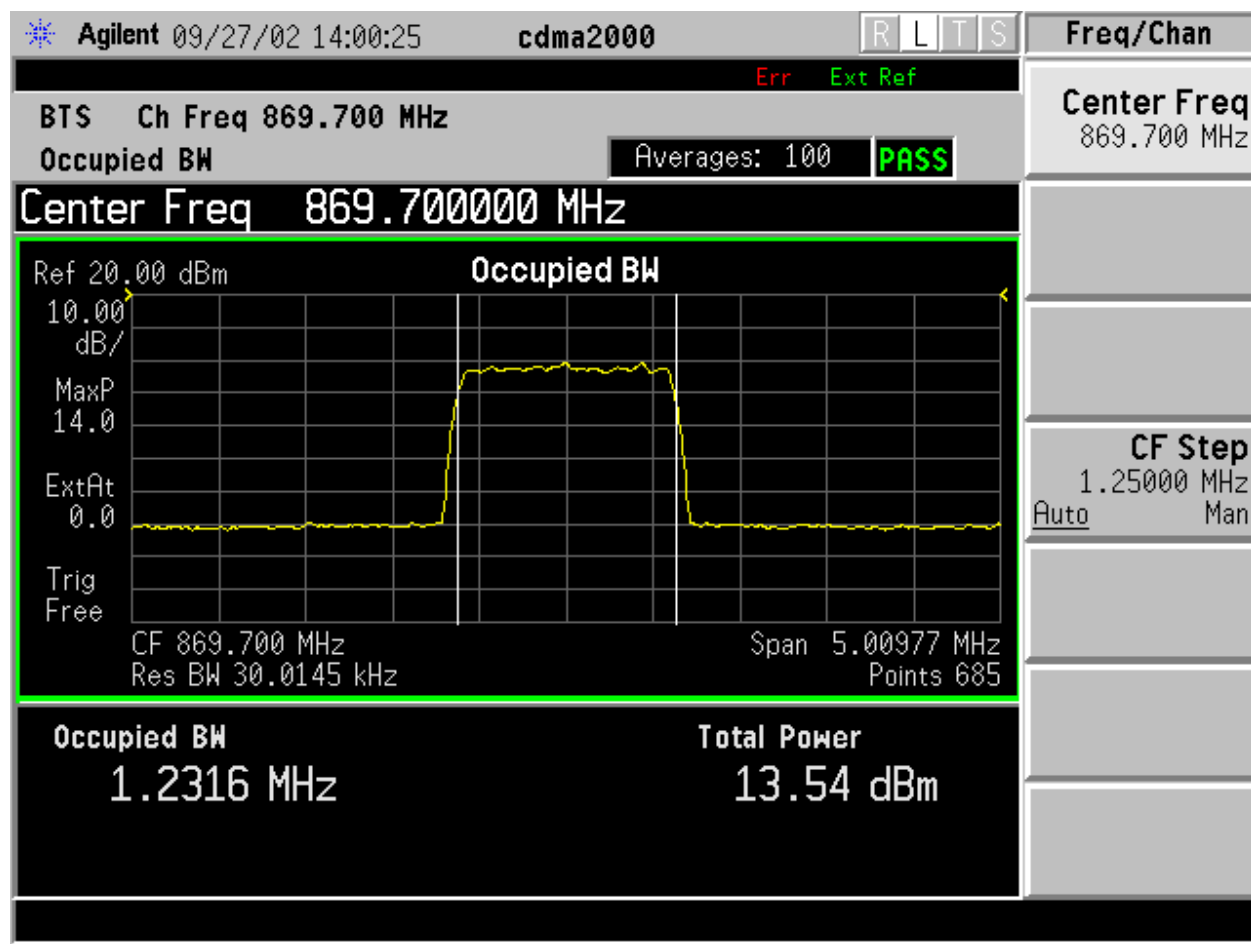
Repeat the procedure with the CDMA signal power set to Minimum level.



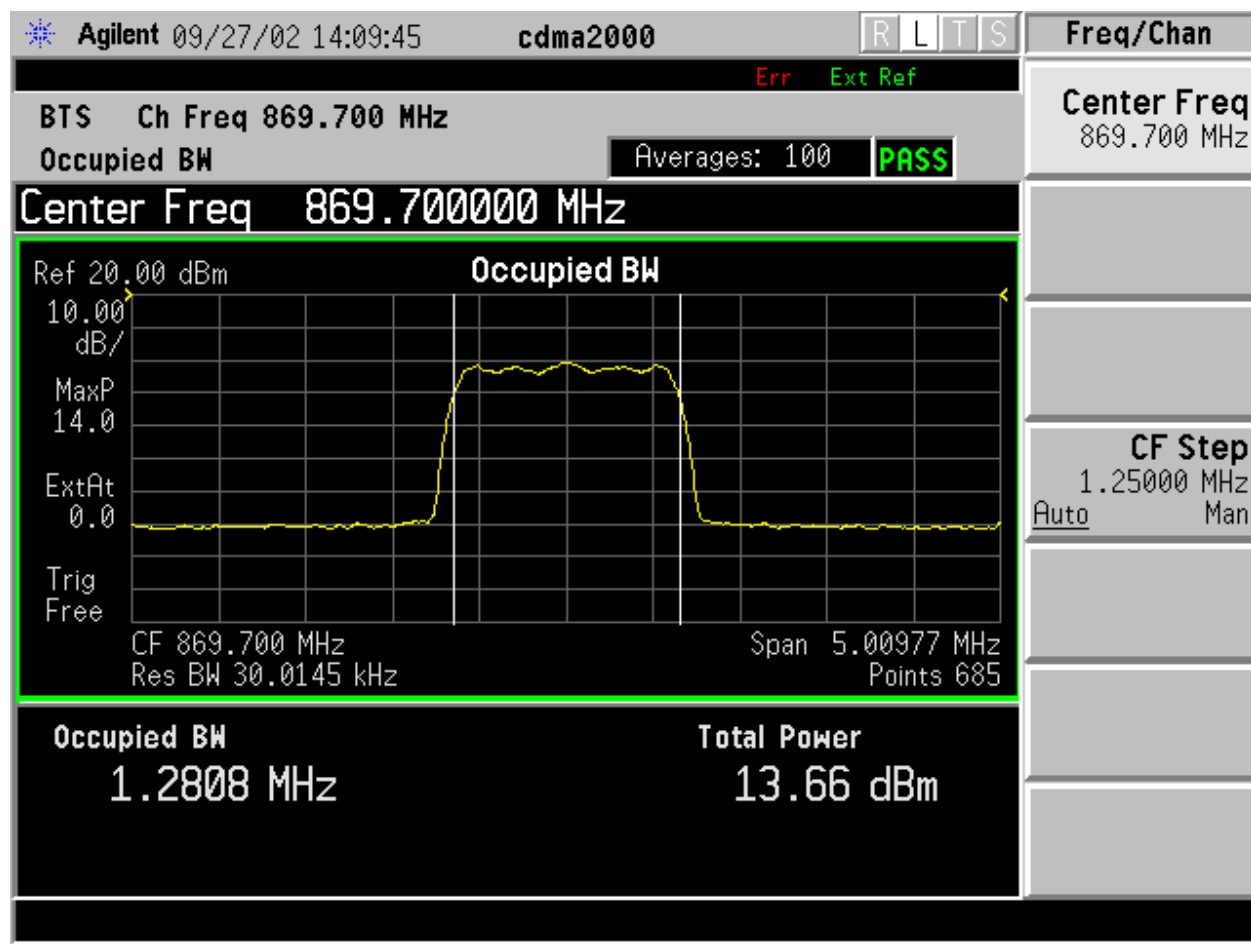
OBW - HP HF 47.78dBm Long Filter



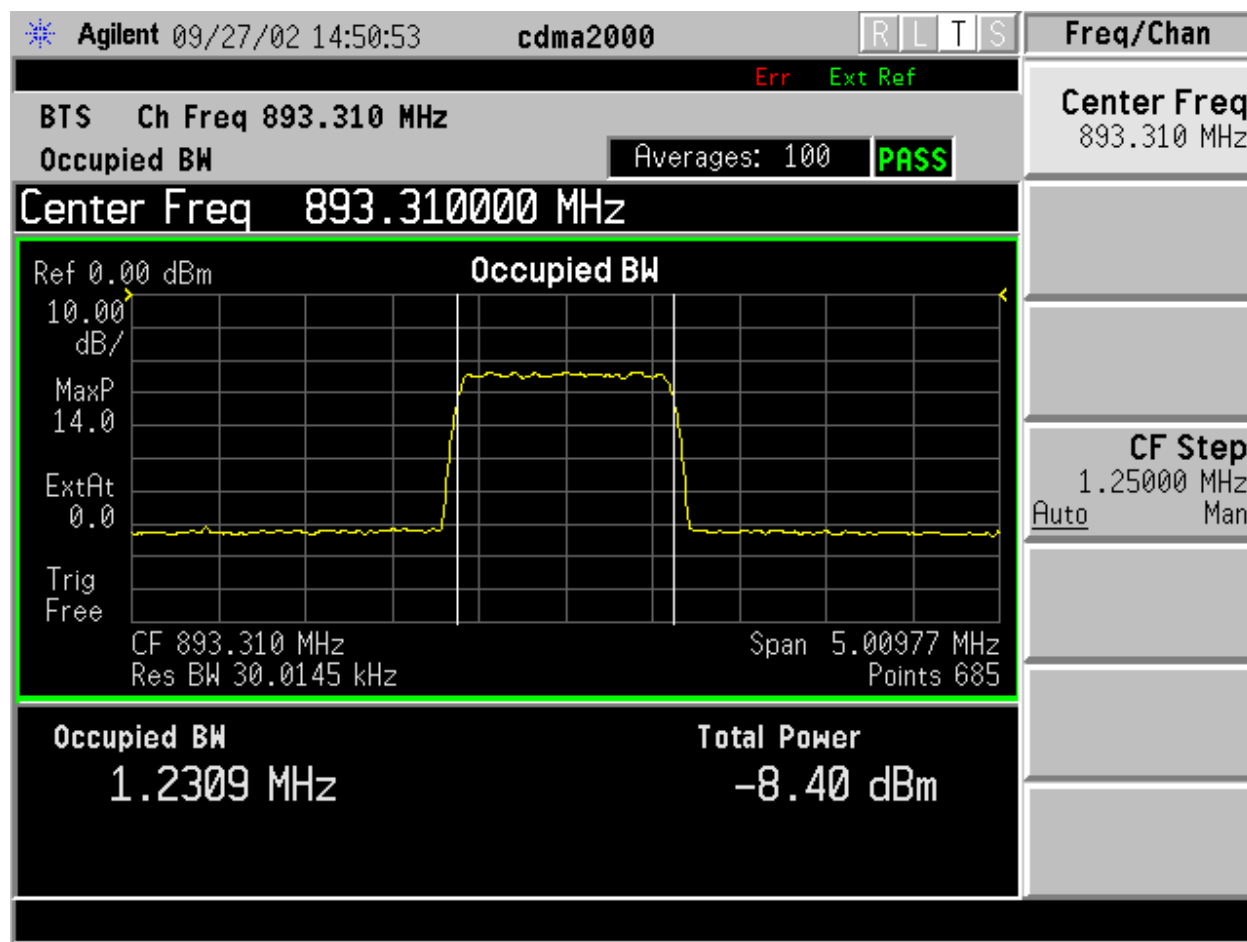
OBW - HP HF 47.78dBm Short Filter



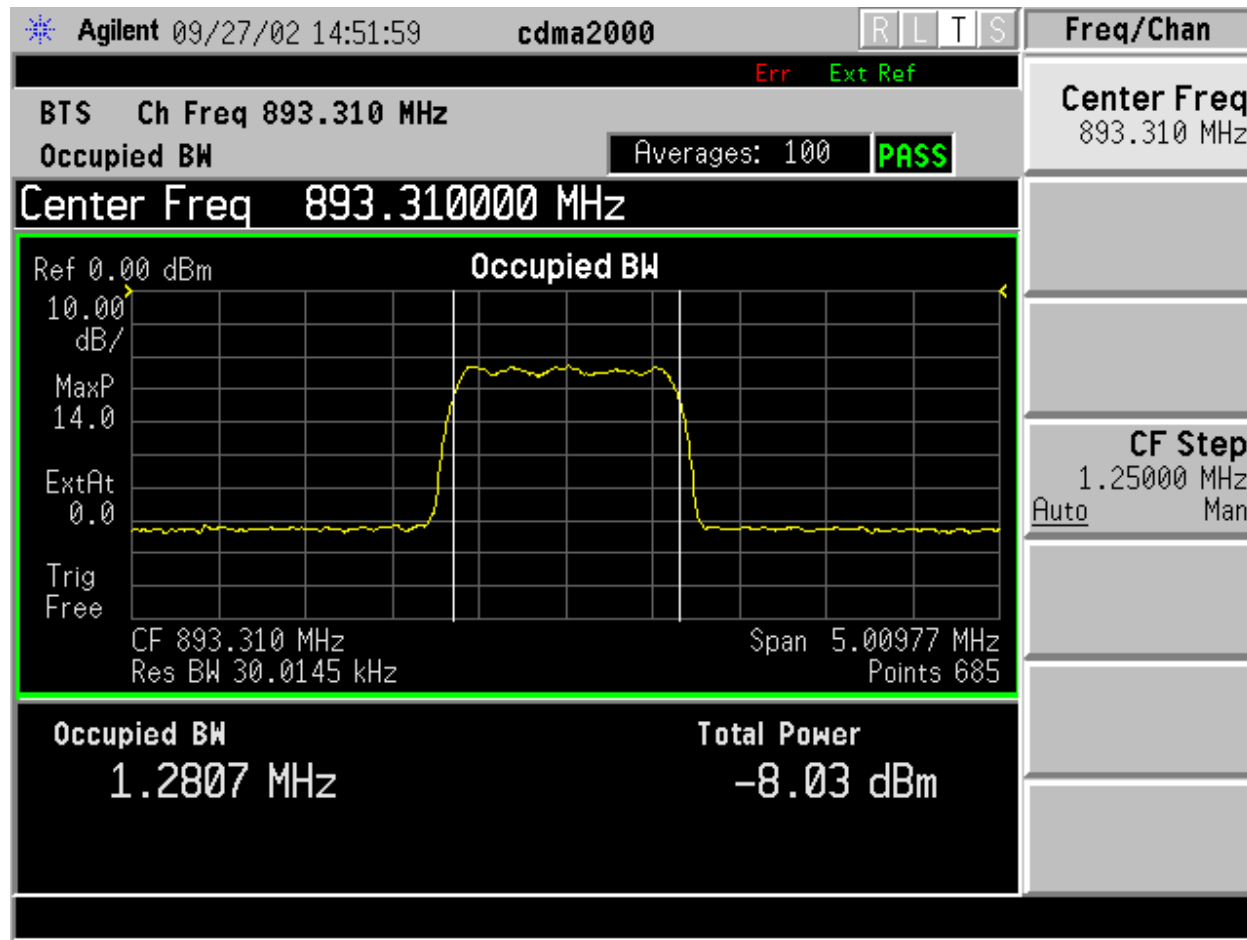
OBW - HP LF 47.78dBm Long Filter



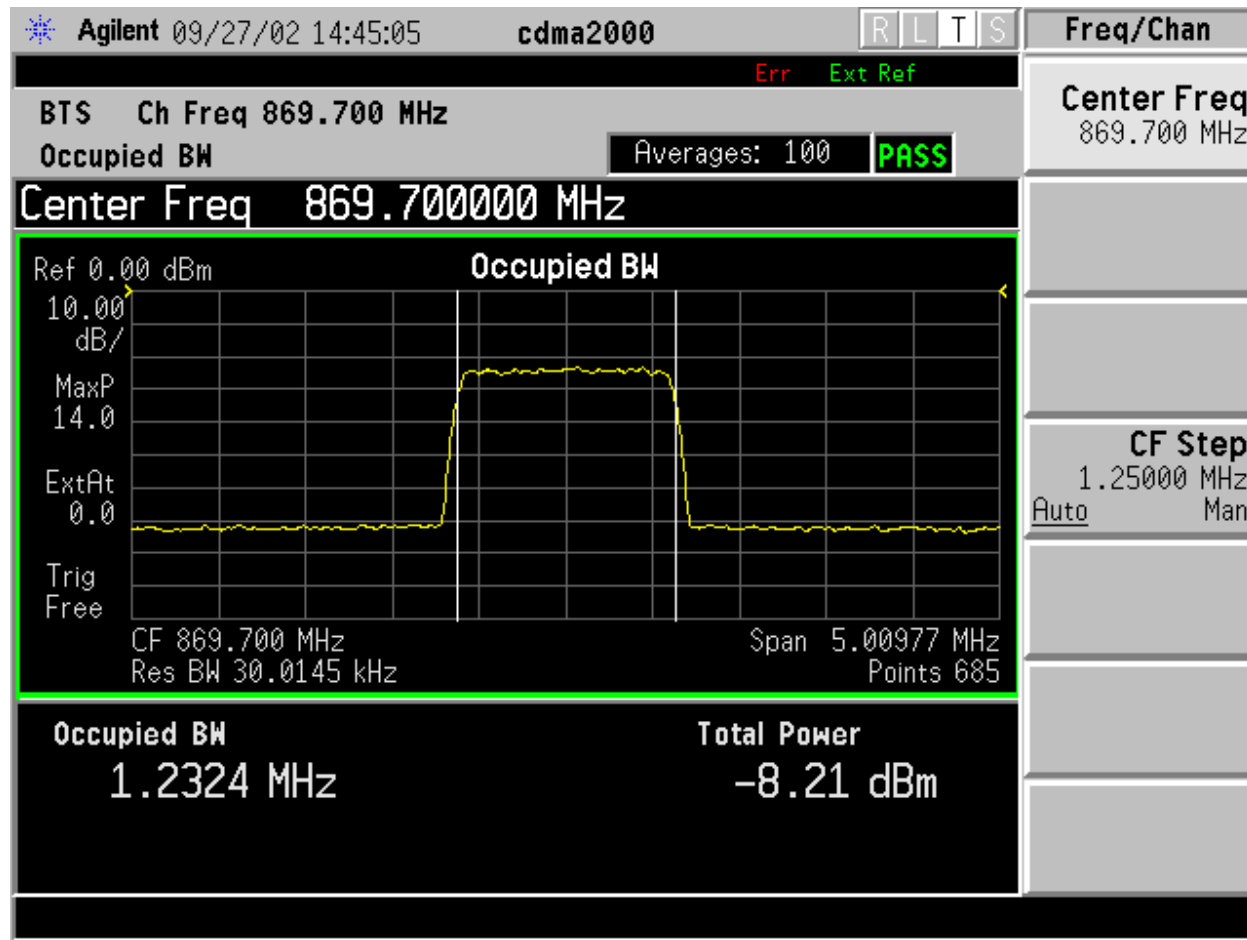
OBW - HP LF 47.78dBm Short Filter



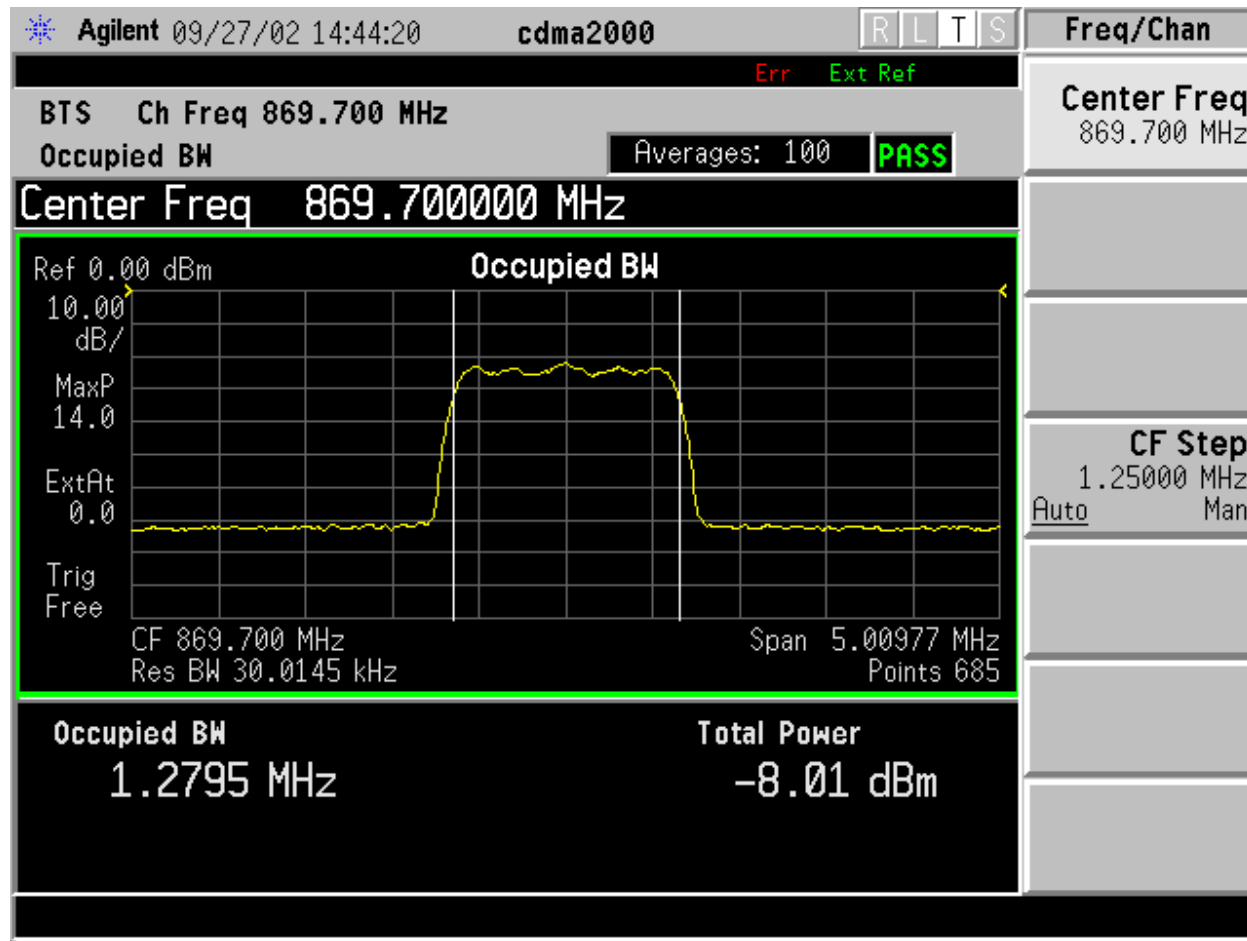
OBW - LP HF 26.0dBm Long Filter



OBW - LP HF 26.0dBm Short Filter



OBW - LP LF 26.0dBm Long Filter



OBW - LP LF 26.0dBm Short Filter

UNDERWRITERS LABORATORIES INC.

Rho

Date Tested: 9-27-2002

Manufacturer : Motorola CDMA Wireless products Customer Integration Engineering
Equipment Under Test : SC4812ET 800MHz Cellular Phone Base Station
Requirement : CFR47 Part 22/24

Section 2.987(d) Measurements Required: **Modulation Characteristics**
Waveform Quality (ρ)

DEFINITION

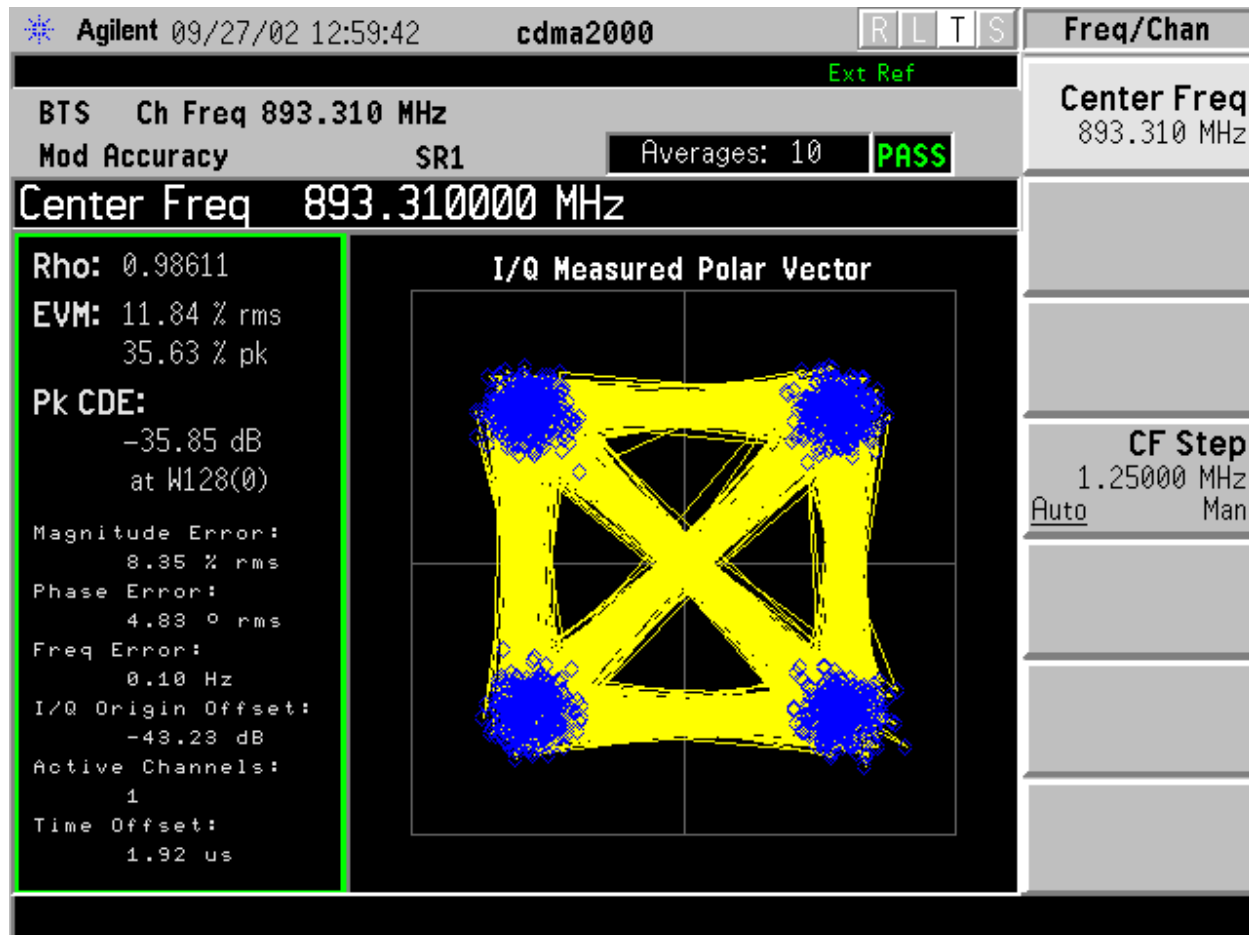
Transmit waveform quality is the normalized correlated power between the actual waveform and the ideal waveform. The range of values for the transmit waveform quality is from 1.0, a perfect CDMA waveform, to 0.0, a non-CDMA signal. As an example, a base station with a -0.4 dB degradation in its transmit waveform would have a quality (ρ) of $10^{(-0.4/10)} = 0.912$.

MINIMUM STANDARD

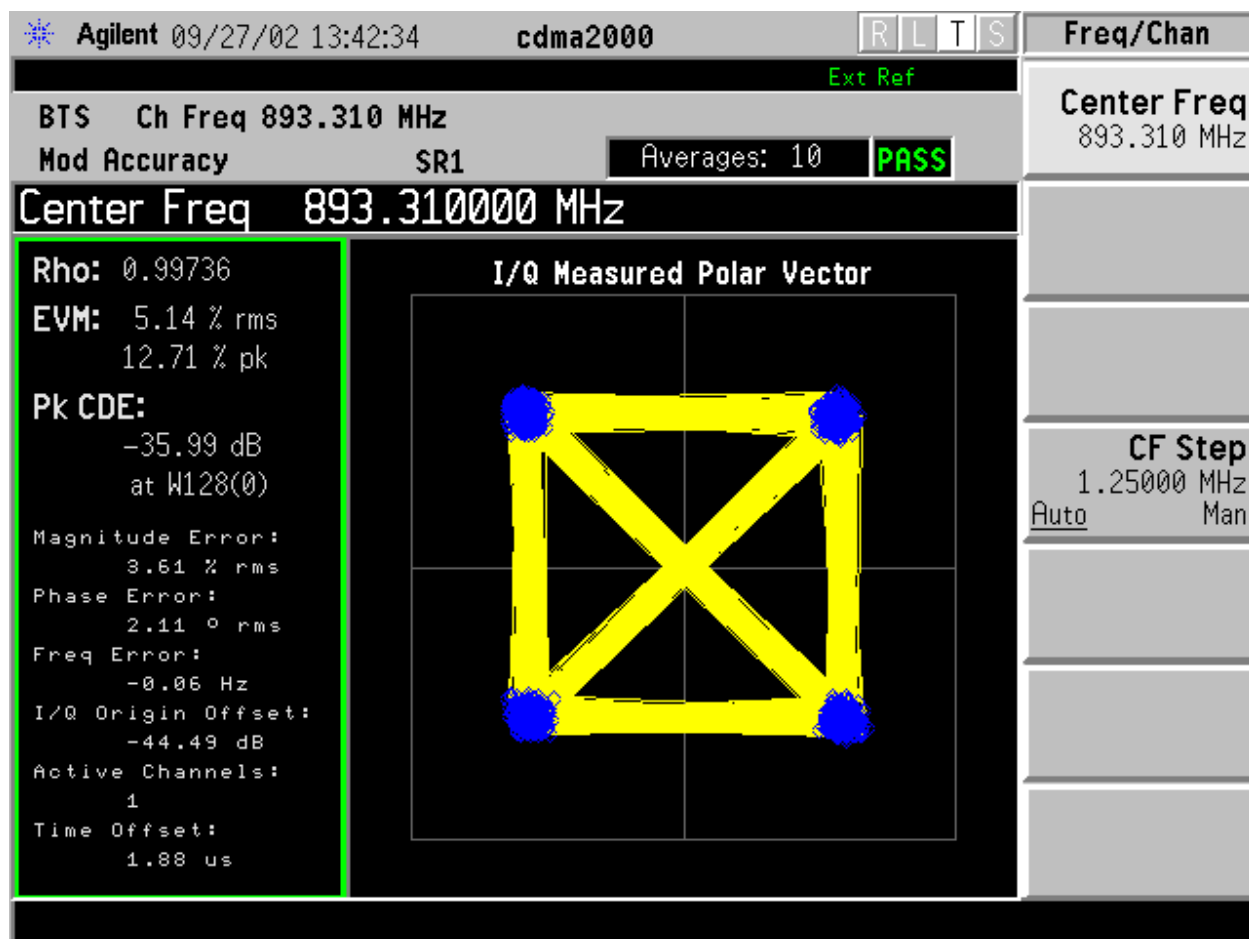
The minimum waveform quality figure for a spread-spectrum CDMA signal is -0.4 dB or 0.912 as measured with a Rho meter.

METHOD OF MEASUREMENT

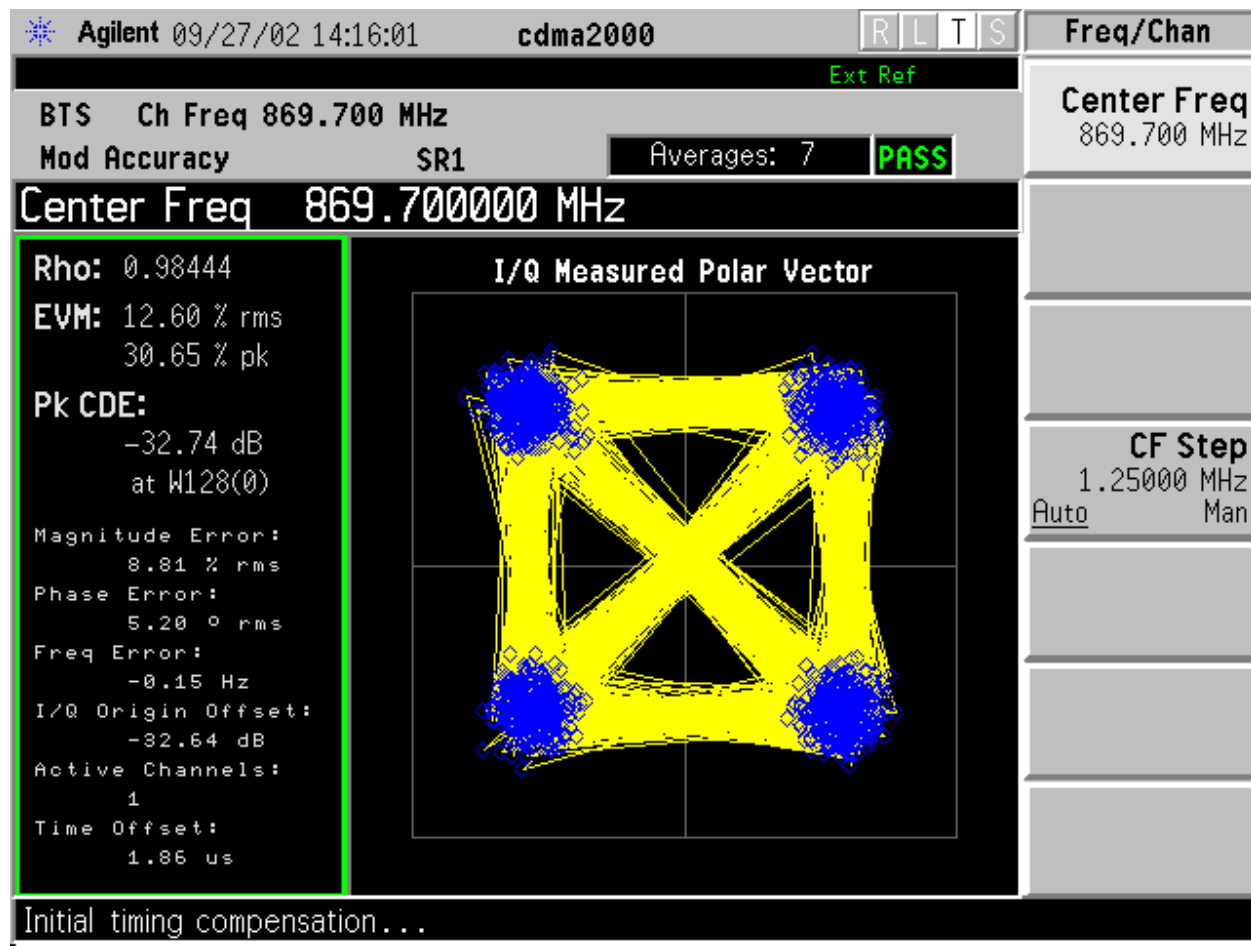
Set the pilot level to 20% of the CDMA Avg. power, and transmit the pilot signal only. Connect the Rho meter directly to the transmit port. On the CDMA Rho Meter, disable the RF generator and set the tuning mode to manual. Enter the base station's RF transmit frequency and set the input attenuation to hold. Set the input attenuation to 20 dB. Now, set the DSP Analyzer test mode to continuous and chose the Rho measurement as the measurement type. Set the channel to forward and choose amplitude middle as the trigger qualifier. Set the gain to 0 dB. Set the reference frequency to 19.6608 MHz. Select internal to lock-on to the CDMA time base reference. Read the measured value for Rho on the Rho meter.



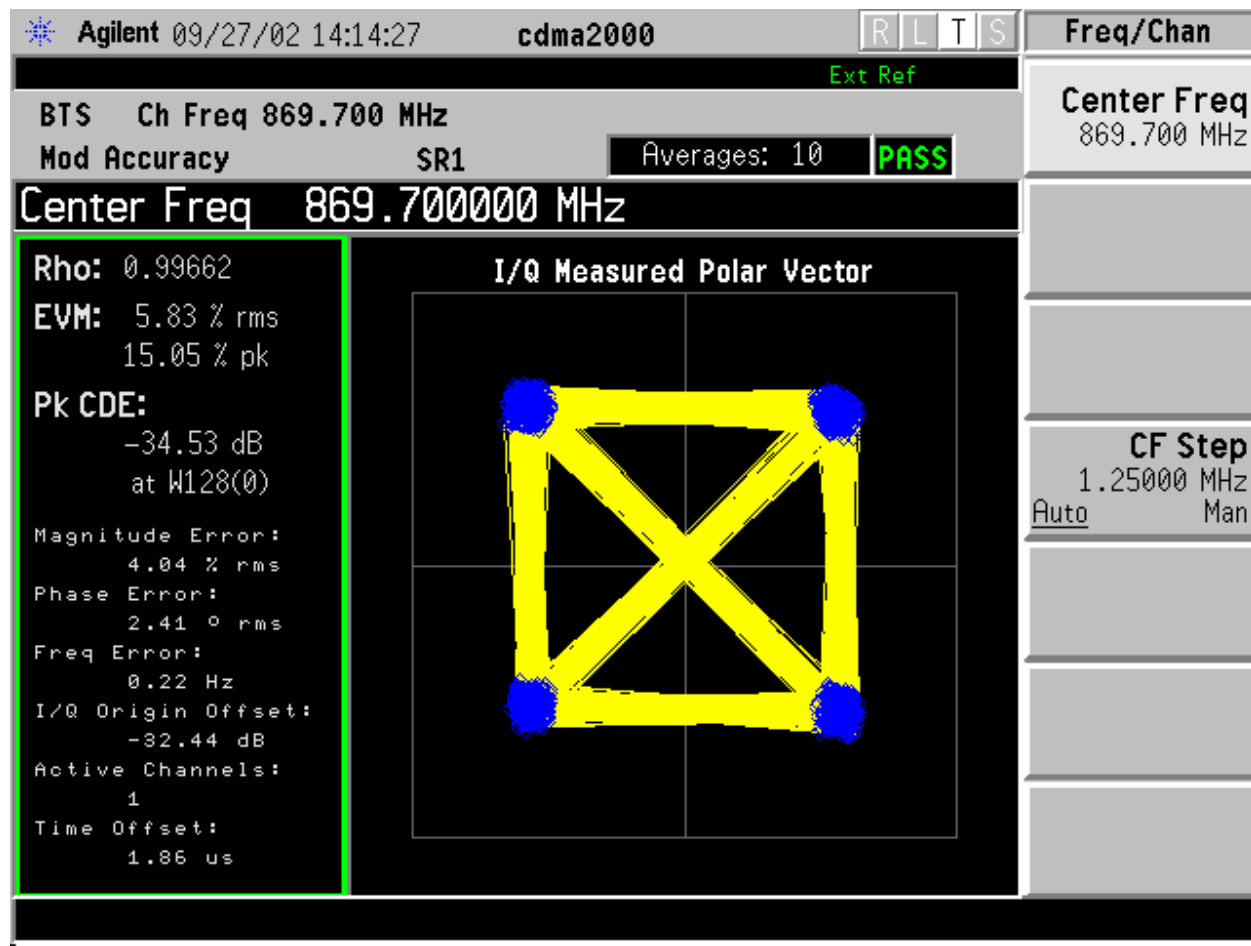
RHO - HP HF 47.78 dBm Long Filter



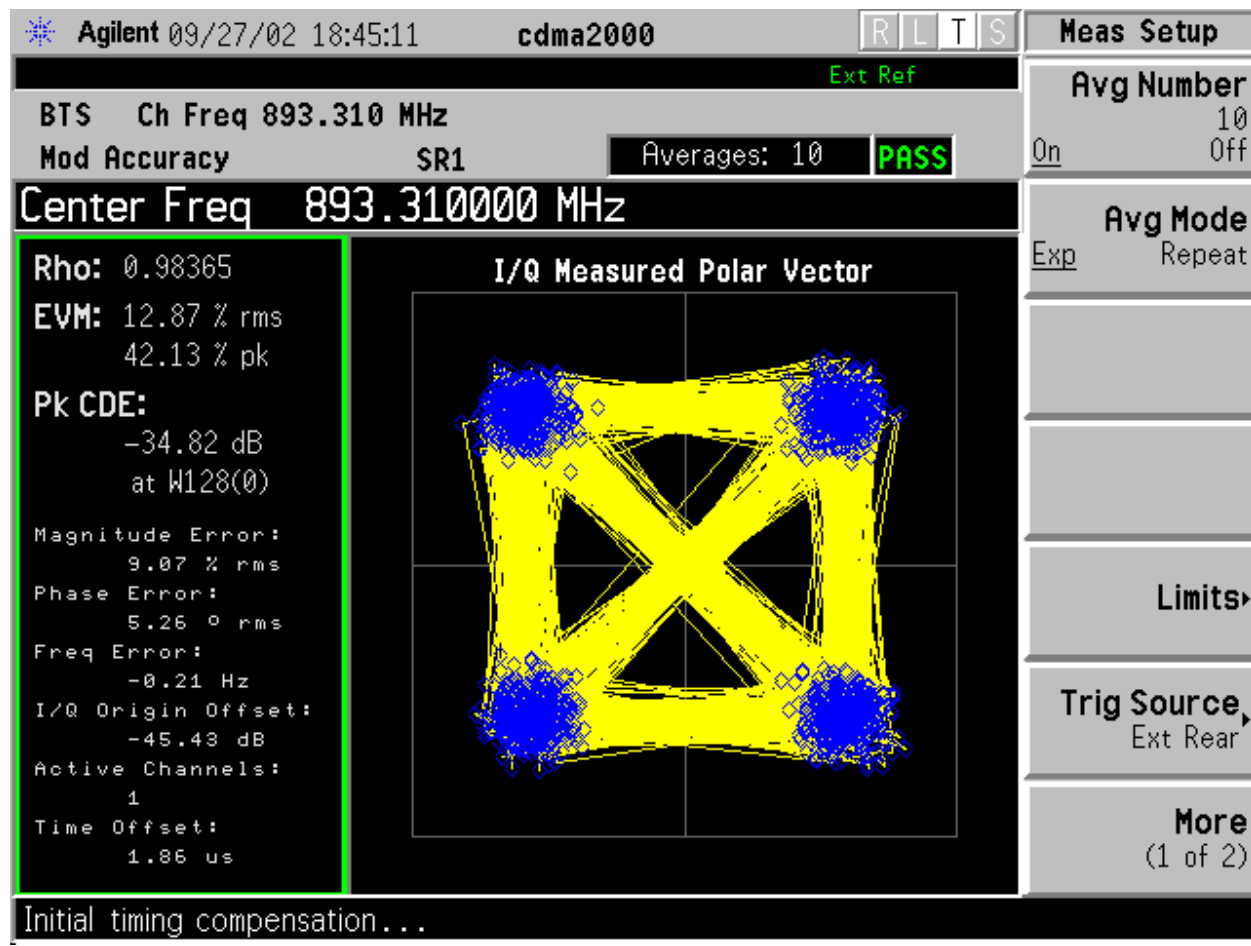
RHO - HP HF 47.78dbm Short Filter



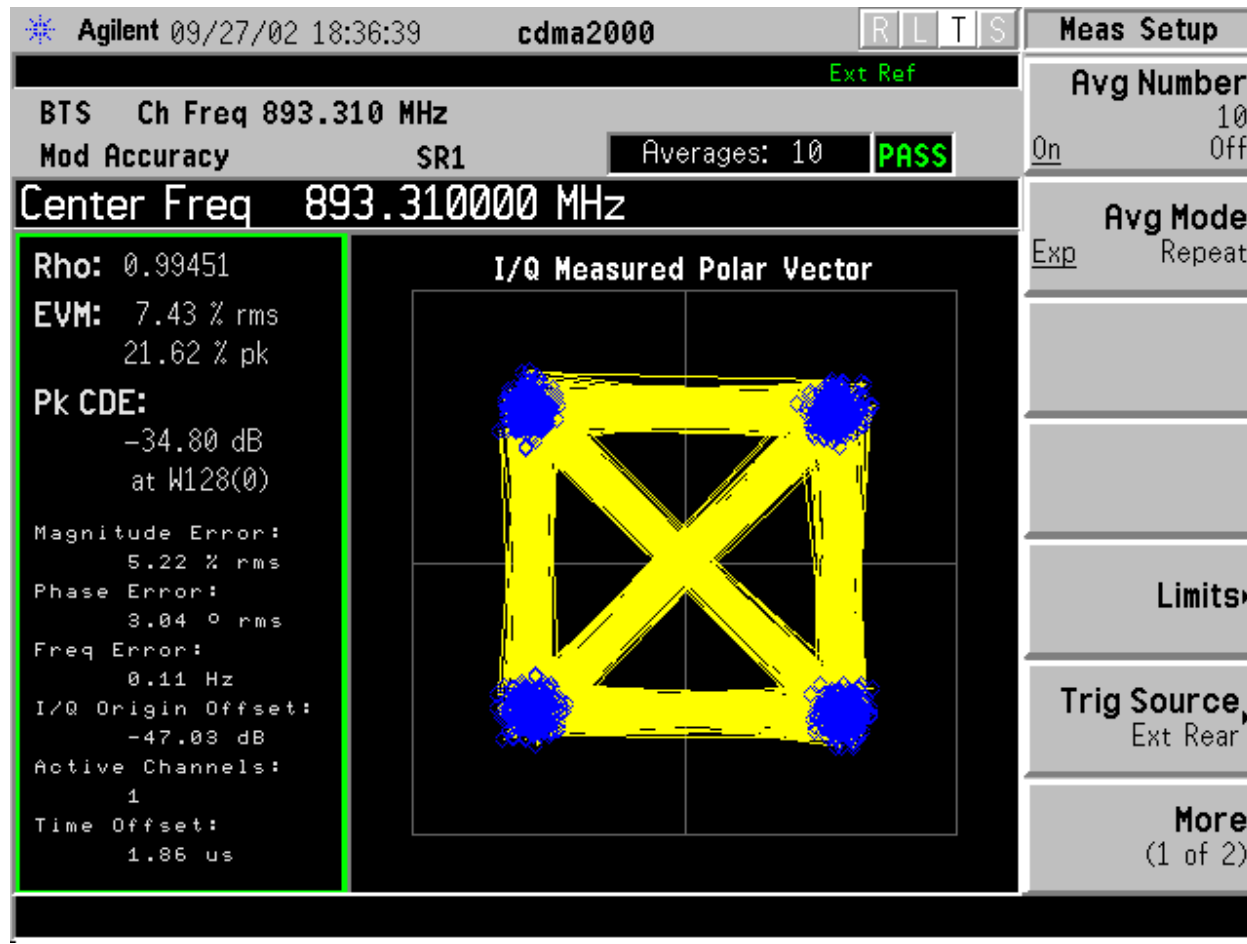
RHO - HP LF 47.78dBm Long Filter



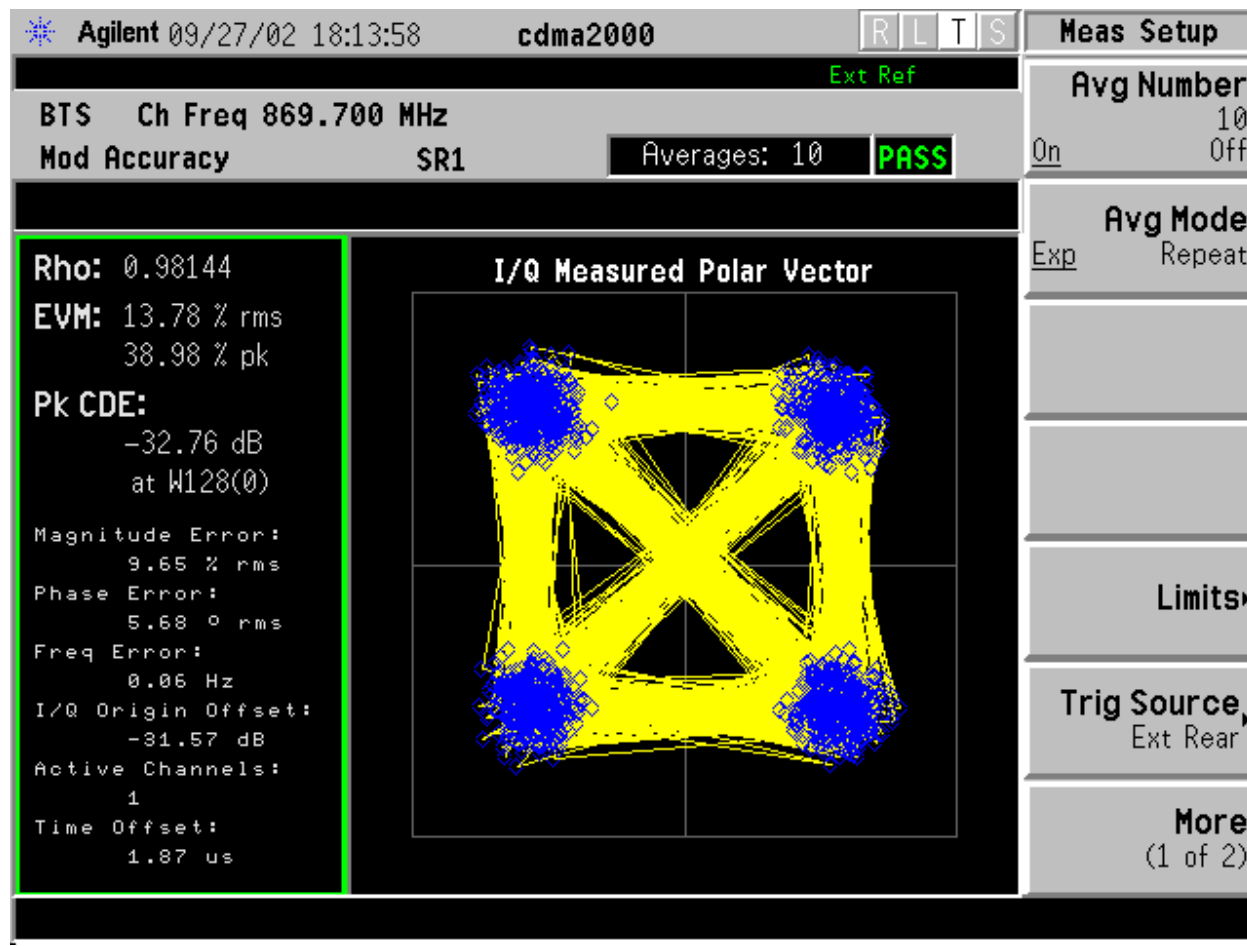
RHO - HP LF 47.78dBm Short Filter



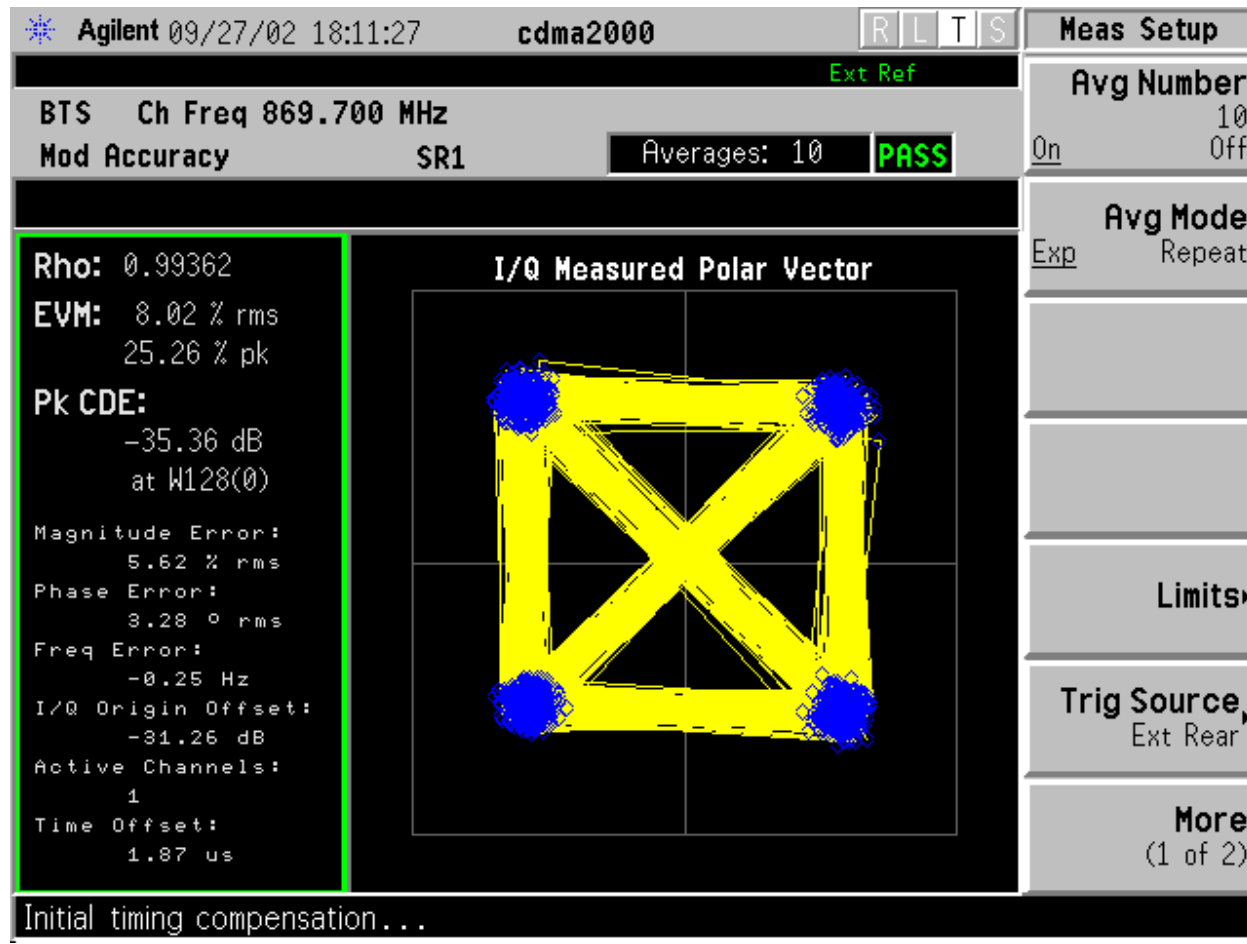
RHO - LP HF 26.00dbm Long Filter



RHO - LP HF 26.00dBm Short Filter



RHO - LP LF 26.00dBm Long Filter



RHO - LP LF 26.00dBm Short Filter

APPENDIX C

Sample Calculations

Per 22.917 (b) (2) any frequency removed from the carrier was attenuated below the mean power of the unmodulated carrier wave by $43+10\log P$ (dBc) as follows:

Low Power

$$\begin{aligned} P &= 400\text{mW} = 0.4\text{W} = 26\text{dBm} = 133\text{dB}\mu\text{V} \\ 43 + 10\log(0.4) &= 39\text{dB} \\ \text{Limit} &= 26\text{dBm} - 39\text{dB} = -13\text{dBm} = 94\text{dB}\mu\text{V} \end{aligned}$$

High Power

$$\begin{aligned} P &= 60\text{W} = 47.78\text{dBm} = 154.78\text{dB}\mu\text{V} \\ 43 + 10\log(60) &= 60.78\text{dB} \\ \text{Limit} &= 47.78\text{dBm} - 60.78\text{dB} = -13\text{dBm} = 94\text{dB}\mu\text{V} \end{aligned}$$

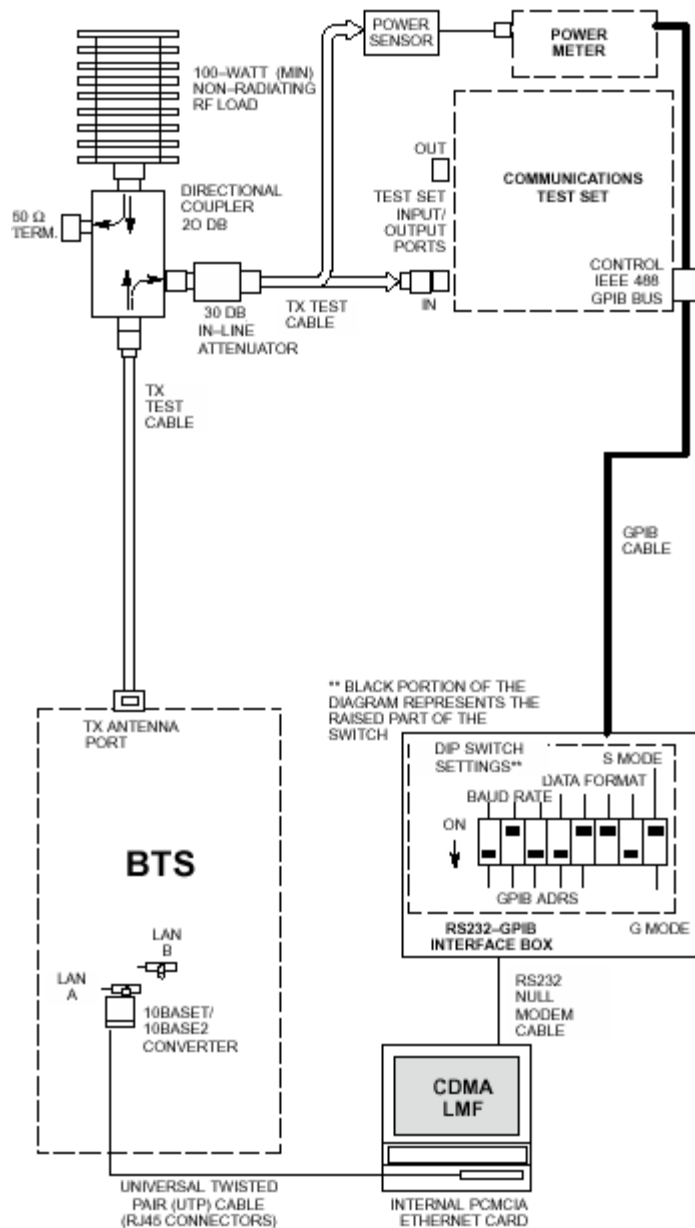
APPENDIX D

Transmit Power, Occupied Bandwidth or RHO

TEST SET-UP

The following test set-up below was used either to test for Transmit Power, Occupied Bandwidth or RHO. The BTS was configured for maximum power out of 47.78 dBm and minimum power out of 26.0 dBm respectively. The output power was set respectively to 60.0 Watts or 400 mWatts using an HP437B power meter.

Transmit Power Out, Occupied Bandwidth and RHO TEST SET-UP



Conducted Spurious and Harmonic Emissions

NOTE: In Band Spurious Emissions plots are measured in a 100 kHz resolution bandwidth. The following formula is used to obtain the correct zero dB reference point relative to the bandwidth of the 1.2288 MHz CDMA signal.

$$\text{Power (measured in 100 kHz bandwidth)} + 10 \log (1.2288 \text{ MHz} / 100 \text{ kHz})$$

UL witnessed that the BTS was configured for maximum power out of 60.0 dBm and minimum power out of 26.0 dBm respectively.

The output power was set respectively to 60.0 Watts or 400 mWatts using an HP437B power meter.

NOTE: Out of Band Spurious and Harmonic Emissions plots are measured in a 1MHz resolution bandwidth.

OCCUPIED BANDWIDTH

NOTE: The occupied bandwidth plots are measured in a 30 kHz resolution bandwidth. The following formula is used to obtain the correct zero dB reference point relative to the bandwidth of the 1.2288 MHz CDMA signal.

$$\text{Power (measured in 30 kHz bandwidth)} + 10 \log (1.2288 \text{ MHz} / 30 \text{ kHz})$$

UL witnessed that the BTS was configured for maximum power out of 60.0 dBm and minimum power out of 26.0 dBm respectively.

The output power was set respectively to 60.0 Watts or 400 mWatts using an HP437B power meter.