Elliott

EMC Test Data

Client:	Standard Communications	Job Number:	J42845
Model:	CRM4200	T-Log Number:	T42858
		Proj Eng:	David Bare
Contact:	Michael Malin		
Emissions Spec:	FCC 22 (Cellular)	Class:	N/A
Immunity Spec:		Environment:	

EMC Test Data

For The

Standard Communications

Model

CRM4200

Client:	Standard Communications	Job Number:	J42845
Model:	CRM4200	T-Log Number:	T42858
		Proj Eng:	David Bare
Contact:	Michael Malin		
Emissions Spec:	FCC 22 (Cellular)	Class:	N/A
Immunity Spec:	Enter immunity spec on cover	Environment:	

EUT INFORMATION

General Description

The EUT is a Cellular radio module which is designed to transmitt data from vendor machines, credit card transactions, GPS, and monitoring devices. Normally, the EUT would be placed on a table top during operation. The EUT was, therefore, treated as table-top equipment during testing to simulate the end user environment. The electrical rating of the EUT 5 Vdc.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
Standrad Communications	CRM4200	Cellular module	N/A	APV09002

Other EUT Details

EUT Enclosure

The EUT does not have a main enclouser, but does have shields for the RF circuit section. It measures approximately 4.9784 cm wide by 11.176 cm deep by 1.3462 cm high.

Modification History

Mod. #	Test	Date	Modificaiton
1			
2			
3			

Elliott

EMC Test Data

Client:	Standard Communications	Job Number:	J42845
Model:	CRM4200	T-Log Number:	T42858
		Proj Eng:	David Bare
Contact:	Michael Malin		
Emissions Spec:	FCC 22 (Cellular)	Class:	N/A
Immunity Spec:	Enter immunity spec on cover	Environment:	

Test Configuration #1

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
None	None	None	None	None

Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
None	None	None	None	None

EUT Interface Ports

		Cable(s)		
EUT Port	Connected To	Description	Shielded or Unshielded	Length(m)
None	None	None		

EUT Operation During Emissions

EUT was set to transmit continously

Client:	Standard Communications	Job Number:	J42845
Model:	CRM4200	T-Log Number:	T42858
		Proj Eng:	David Bare
Contact:	Michael Malin		
Spec:	FCC 22 (Cellular)	Class:	N/A

Section 2.1046: RF Power

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 4/5/2001
Test Engineer: jmartinez
Test Location: SVOATS #1

Config. Used: 1
Config Change: None
EUT Voltage: 5 Vdc

General Test Configuration

The EUT and all local support equipment were located on the table for testing. The Eut was connected directly to Test Receiver. A 20-dB attenuator was used between the EUT and Test Receiver.

Ambient Conditions:

Temperature: 14°C
Rel. Humidity: 52%

Summary of Results

Plot	Test Performed	Limit	Result	Comment
# 1	Power Output	22.917(a)	Pass	Level 0
# 2	Power Output	22.917(a)	Pass	Level 1
# 3	Power Output	22.917(a)	Pass	Level 2
# 4	Power Output	22.917(a)	Pass	Level 3
# 5	Power Output	22.917(a)	Pass	Level 4
# 6	Power Output	22.917(a)	Pass	Level 5

Modifications Made During Testing:

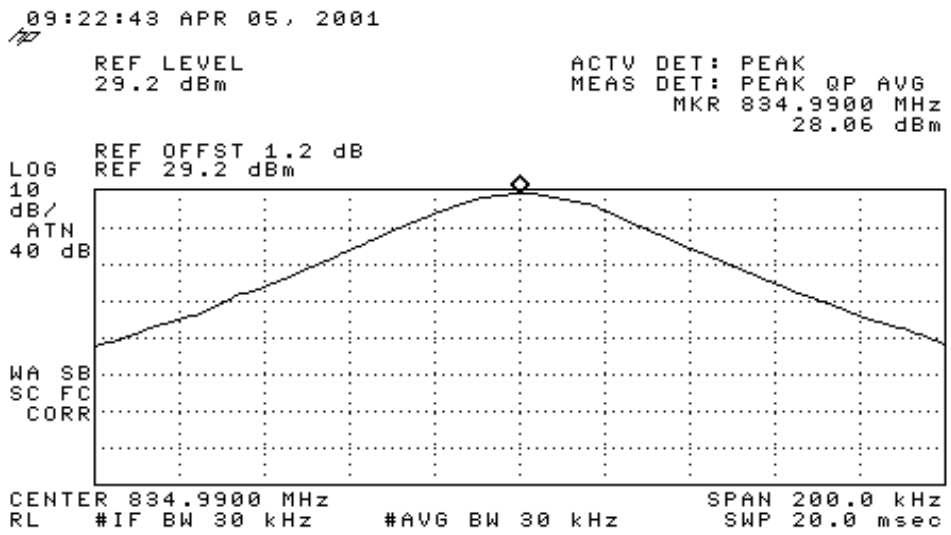
No modifications were made to the EUT during testing

Deviations From The Standard

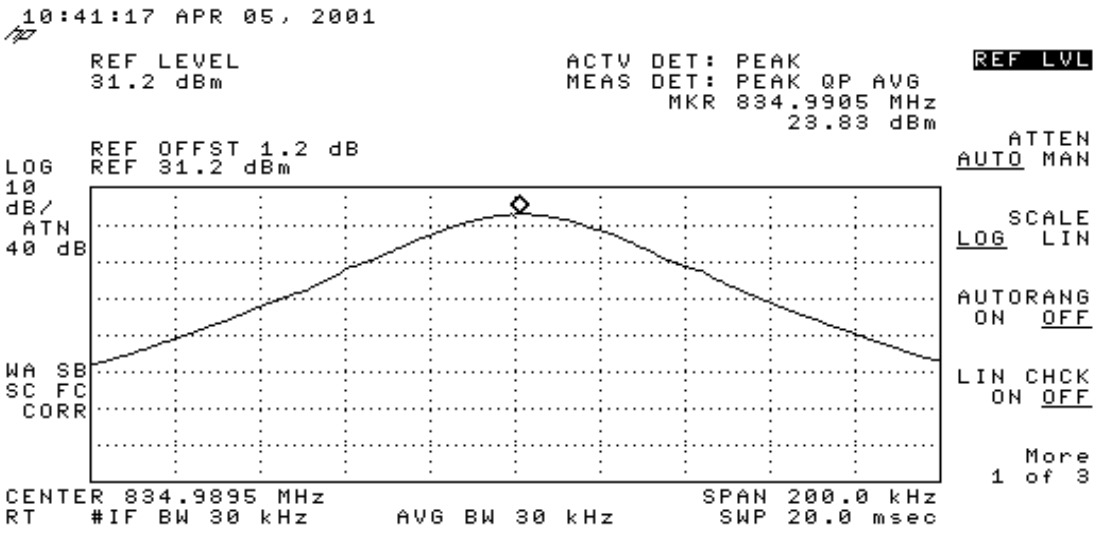
No deviations were made from the requirements of the standard.

Client:	Standard Communications	Job Number:	J42845
Model:	CRM4200	T-Log Number:	T42858
		Proj Eng:	David Bare
Contact:	Michael Malin		
Spec:	FCC 22 (Cellular)	Class:	N/A

Plot# 1

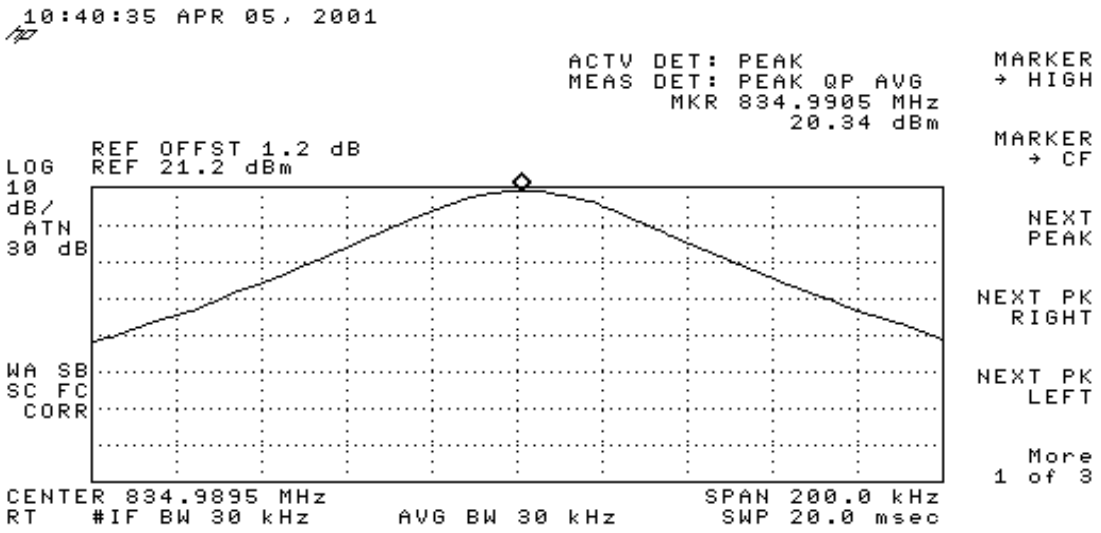


Plot# 2

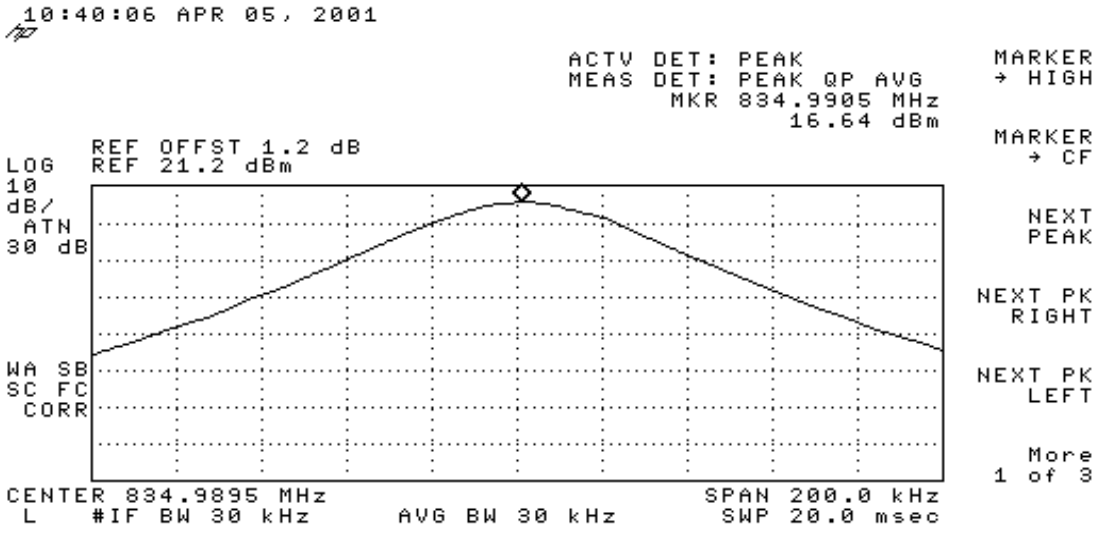


Client:	Standard Communications	Job Number:	J42845
Model:	CRM4200	T-Log Number:	T42858
		Proj Eng:	David Bare
Contact:	Michael Malin		
Spec:	FCC 22 (Cellular)	Class:	N/A

Plot# 3

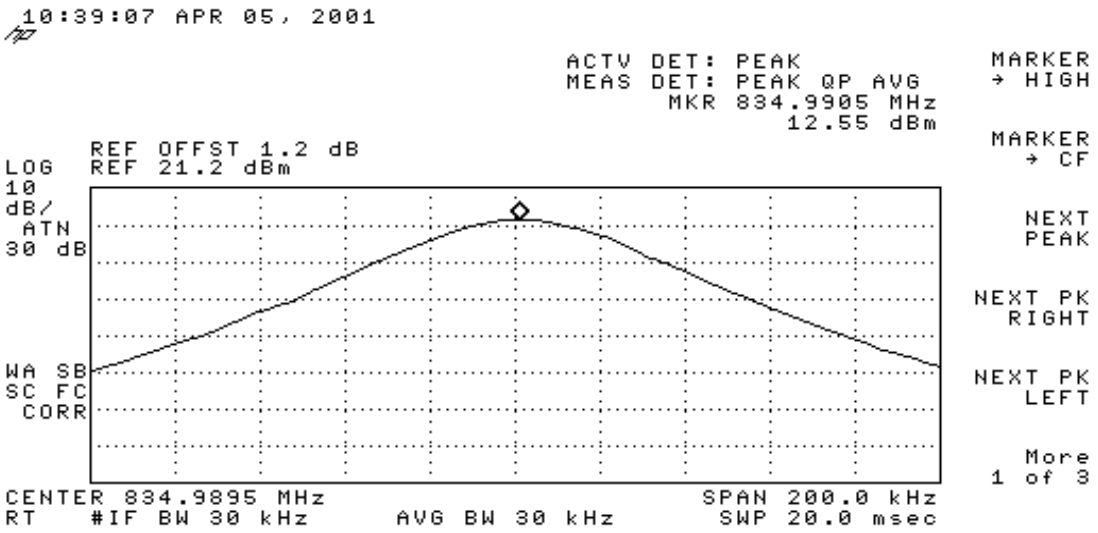


Plot# 4

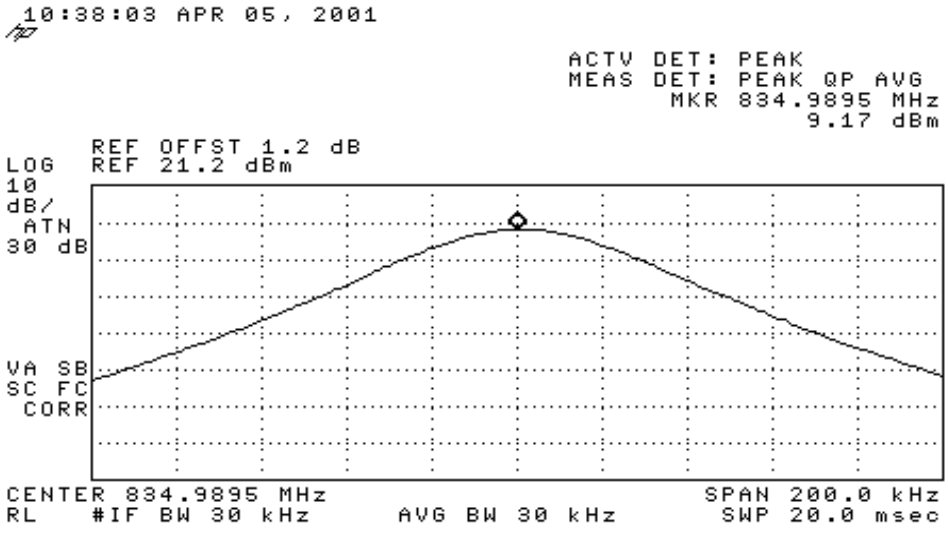


Client:	Standard Communications	Job Number:	J42845
Model:	CRM4200	T-Log Number:	T42858
		Proj Eng:	David Bare
Contact:	Michael Malin		
Spec:	FCC 22 (Cellular)	Class:	N/A

Plot# 5



Plot# 6



Client:	Standard Communications	Job Number:	J42845
Model:	CRM4200	T-Log Number:	T42858
		Proj Eng:	David Bare
Contact:	Michael Malin		
Spec:	FCC 22 (Cellular)	Class:	N/A

Section 2.1047: Modulation Characteristics

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 12/26/2000
Test Engineer: jmartinez
Test Location: SVOATS #2

Config. Used: 1
Config Change: None
EUT Voltage: 12 Vdc and 5 Vdc

General Test Configuration

The EUT and all local support equipment were located on the table for testing. The Eut was connected directly to Test Receiver. A 20-dB attenuator was used between the EUT and Test Receiver.

Ambient Conditions:

Temperature: 23°C
Rel. Humidity: 31%

Summary of Results

Run	Test Performed	Limit	Result	Comment
#1	Modulation limiting	22.915(b)(1) & 22.915 (c)	Pass	

Plot	Test Performed	Limit	Result	Comment
# 7	Frequency Response (300 - 3000 kHz)	22.915(d)(1)	Pass	
# 8	Frequency Response (3000 - 30,000 kHz)	22.915(d)(1)	Pass	

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Standard Communications	Job Number:	J42845
Model:	CRM4200	T-Log Number:	T42858
		Proj Eng:	David Bare
Contact:	Michael Malin		
Spec:	FCC 22 (Cellular)	Class:	N/A

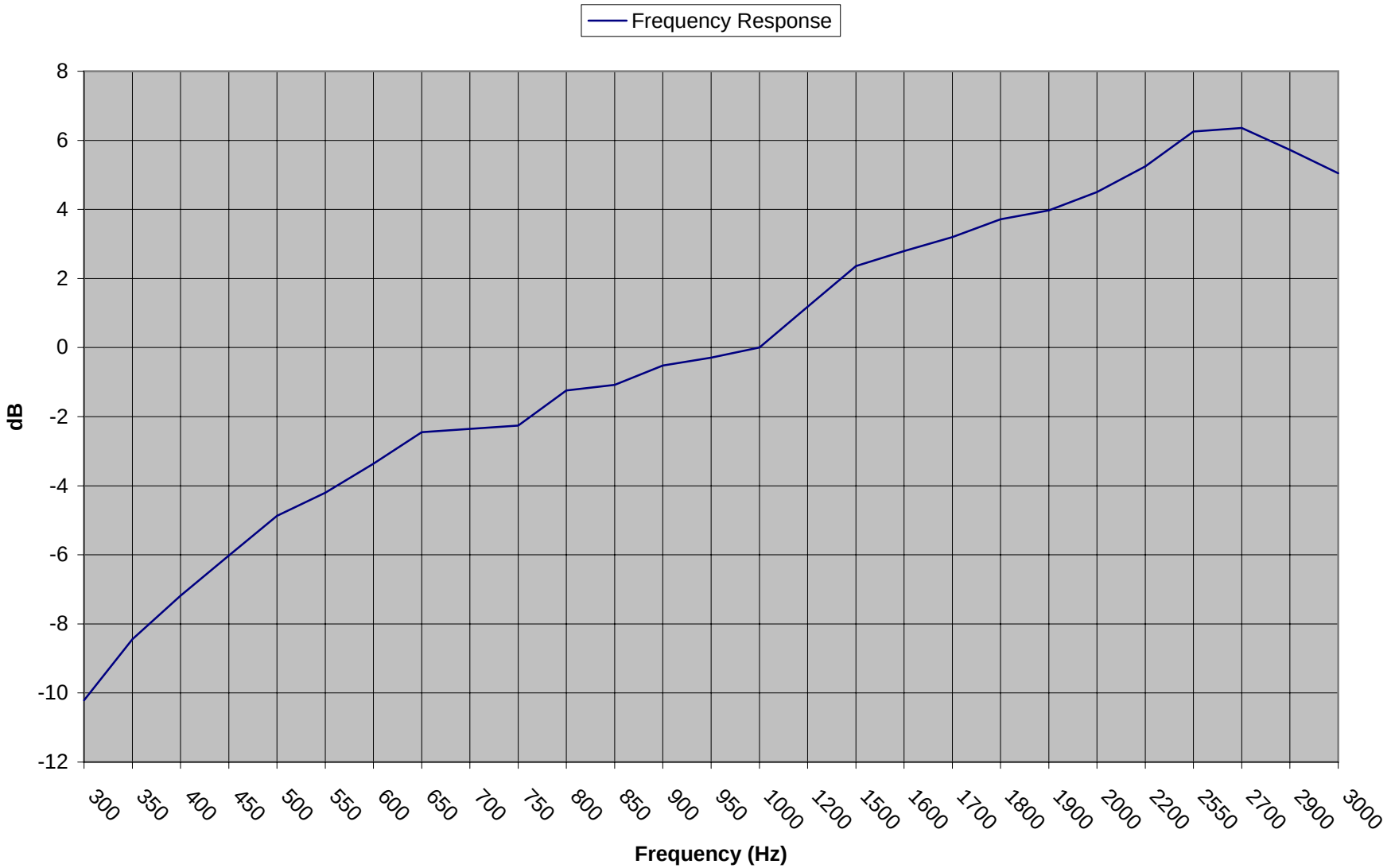
Run# 1: Modulation Limiting response.

Modulation Limiting

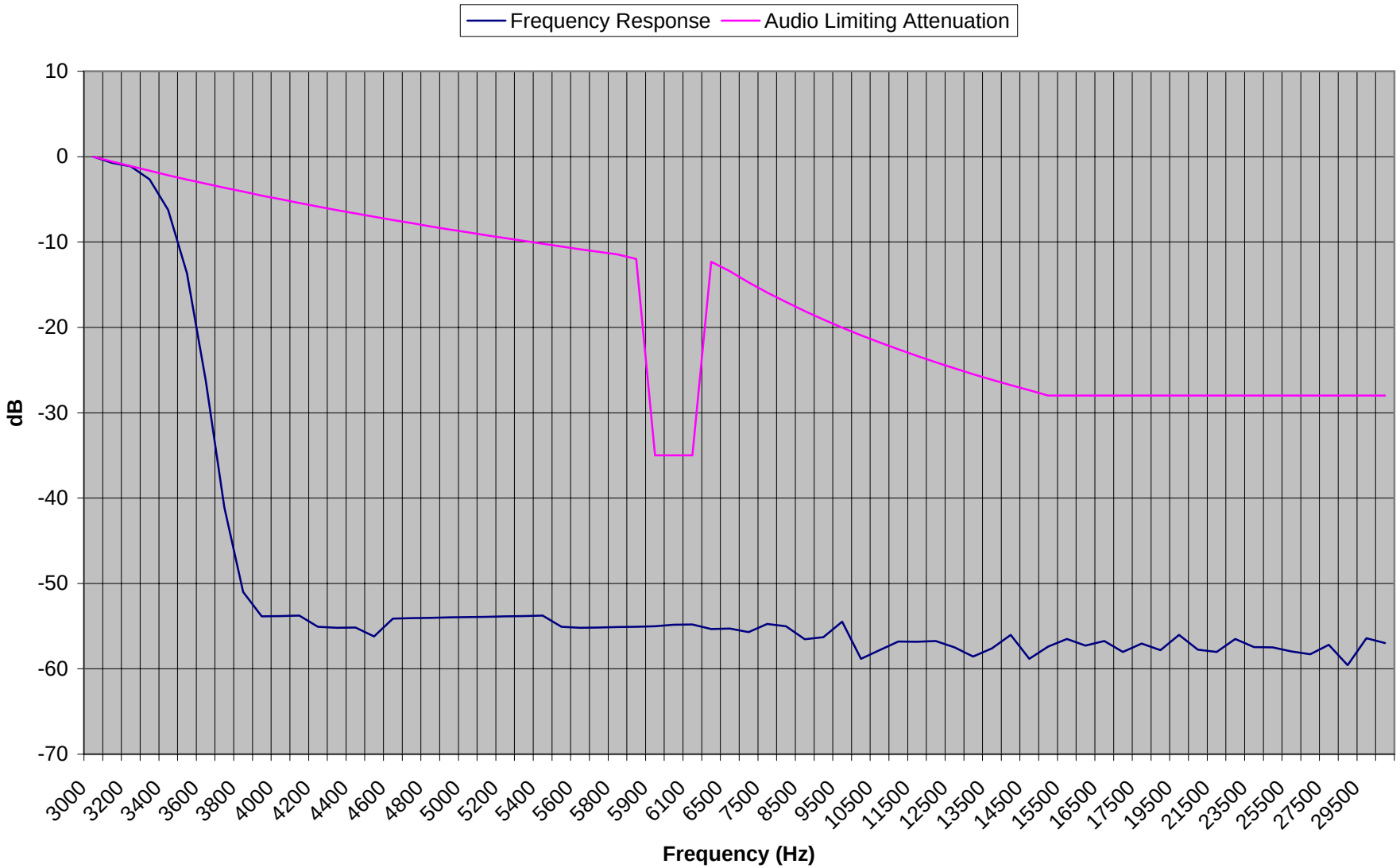
Limiting	300 Hz	1kHz	2.5 kHz	3kHz	15 kHz
10%	-58.4	-77.7	-80	-74	**-29.9**
20%	-45.4	-69.4	-75.9	-61.9	-
30%	-36.5	-62.9	-72	-69.1	-
40%	-32.8	-58.1	-68.9	-66.6	-
50%	**-29.9**	-54.4	-66	-63.2	-
60%	-	-51.4	-63.3	**-60.4**	-
70%	-	-48.6	-60.9	-	-
80%	-	-46.4	-58.8	-	-
90%	-	**-44.4**	-56.5	-	-
100%	-	-	**-49.3**	-	-
110%	-	-	-	-	-
120%	-	-	-	-	-
130%	-	-	-	-	-

Input levels are in dBm units.
Note: Although input levels are not stated, the input voltage was increase, but no deviation was produce beyond limiting point.

Frequency Response (.3 - 3000 MHz) Plot# 7



Frequency Response (3 - 30 kHz) Plot# 8



Client:	Standard Communications	Job Number:	J42845
Model:	CRM4200	T-Log Number:	T42858
		Proj Eng:	David Bare
Contact:	Michael Malin		
Spec:	FCC 22 (Cellular)	Class:	N/A

Section 2.1049: Occupied Bandwidth

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 4/5/2001
Test Engineer: jmartinez
Test Location: SVOATS #1

Config. Used: 1
Config Change: None
EUT Voltage: 5 Vdc

General Test Configuration

The EUT and all local support equipment were located on the table for testing. The Eut was connected directly to Test Receiver. A 20-dB attenuator was used between the EUT and Test Receiver.

Ambient Conditions:

Temperature: 14°C
Rel. Humidity: 52%

Summary of Results

Plot	Test Performed	Limit	Result	Comment
# 9	Occupied Bandwidth	22.917(b)	Pass	Voice + SAT
# 10	Occupied Bandwidth	22.917(d)	Pass	Wideband data

Modifications Made During Testing:

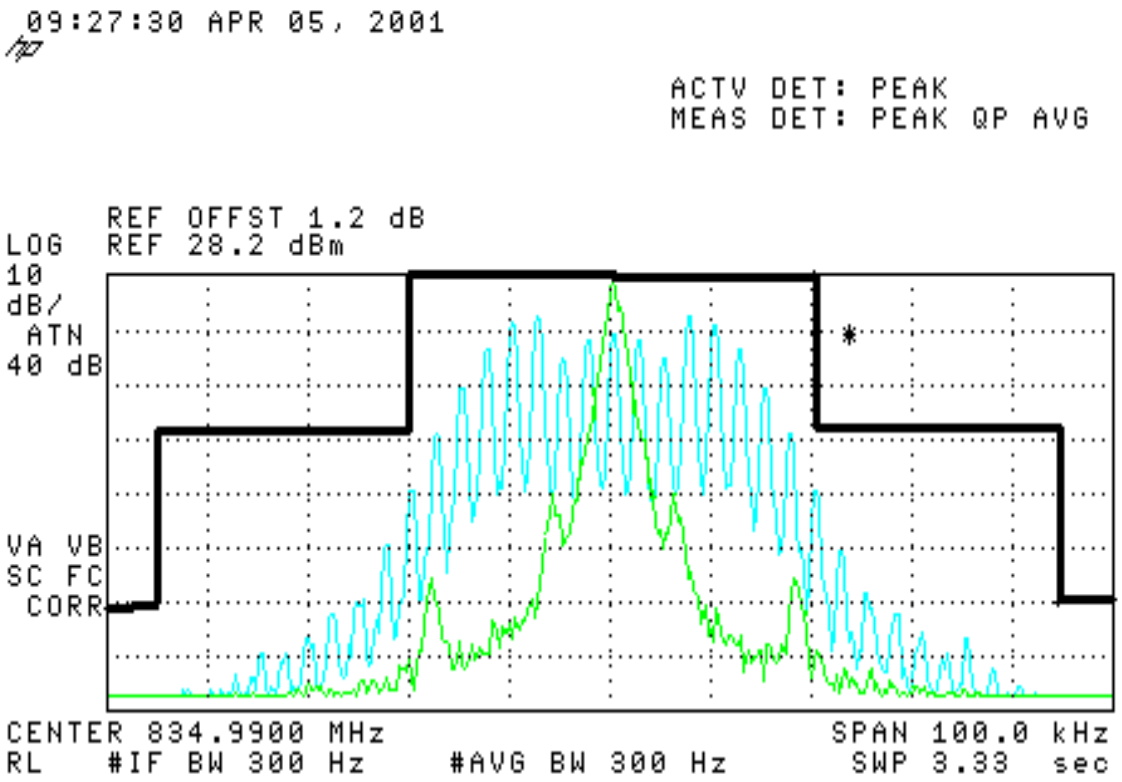
No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

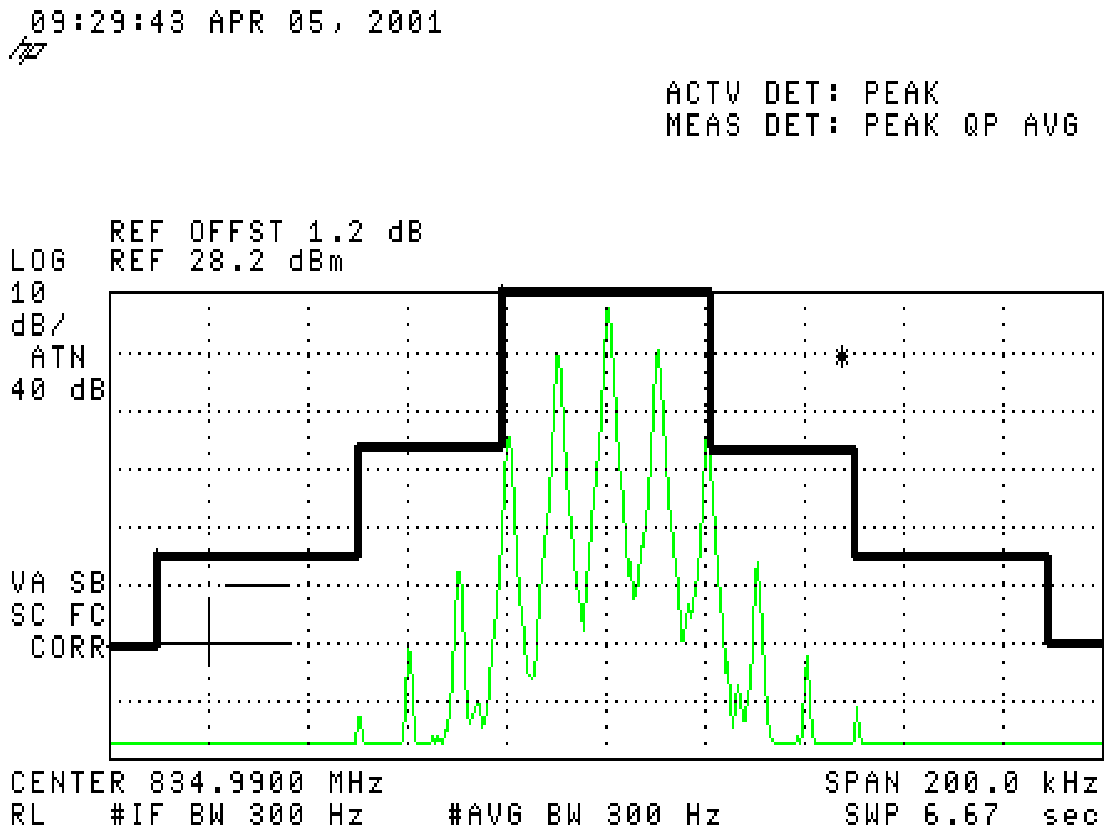
Client:	Standard Communications	Job Number:	J42845
Model:	CRM4200	T-Log Number:	T42858
		Proj Eng:	David Bare
Contact:	Michael Malin		
Spec:	FCC 22 (Cellular)	Class:	N/A

Plot# 9



Client:	Standard Communications	Job Number:	J42845
Model:	CRM4200	T-Log Number:	T42858
		Proj Eng:	David Bare
Contact:	Michael Malin		
Spec:	FCC 22 (Cellular)	Class:	N/A

Plot# 10



Client:	Standard Communications	Job Number:	J42845
Model:	CRM4200	T-Log Number:	T42858
		Proj Eng:	David Bare
Contact:	Michael Malin		
Spec:	FCC 22 (Cellular)	Class:	N/A

Section 2.1051: Spurious emission at the Antenna Terminal

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 4/5/2001
Test Engineer: jmartinez
Test Location: SVOATS #1
Config. Used: 1
Config Change: None
EUT Voltage: 5 Vdc

General Test Configuration

The EUT and all local support equipment were located on the table for testing. The Eut was connected directly to Test Receiver. A 20-dB attenuator was used between the EUT and Test Receiver.

Ambient Conditions:

Temperature: 14°C
Rel. Humidity: 52%

Summary of Results

Plot	Test Performed	Limit	Result	Comment
# 11	Out-Of-Band	22.917(e)	Pass	Voice + SAT
# 12	Out-Of-Band	22.917(e)	Pass	Voice + SAT
# 13	Out-Of-Band	22.917(e)	Pass	Wideband data
# 14	Out-Of-Band	22.917(e)	Pass	Wideband data
# 15	Mobile Emission	22.917 (f)	Pass	Voice + SAT
# 16	Mobile Emission	22.917 (f)	Pass	Voice + SAT
# 17	Mobile Emission	22.917 (f)	Pass	Wideband data
# 18	Mobile Emission	22.917 (f)	Pass	Wideband data

Modifications Made During Testing:

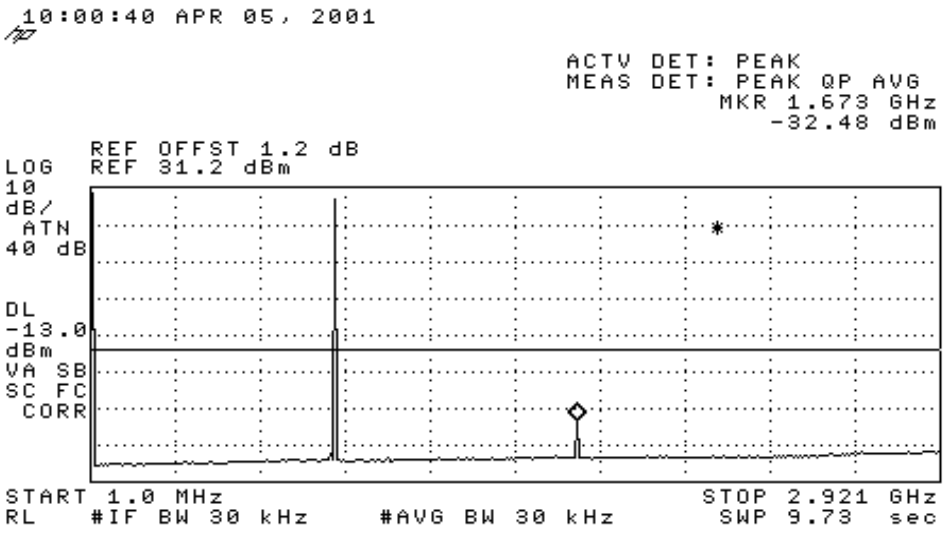
No modifications were made to the EUT during testing

Deviations From The Standard

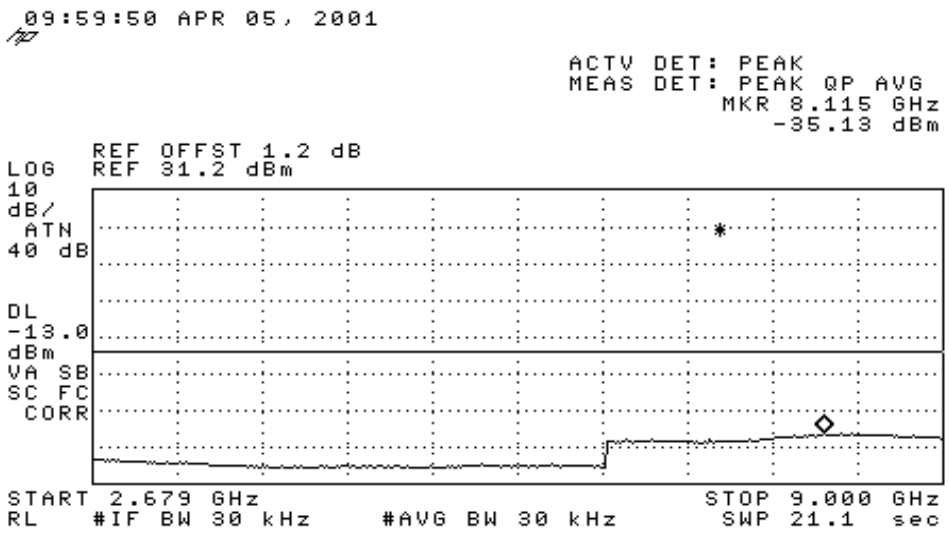
No deviations were made from the requirements of the standard.

Client:	Standard Communications	Job Number:	J42845
Model:	CRM4200	T-Log Number:	T42858
		Proj Eng:	David Bare
Contact:	Michael Malin		
Spec:	FCC 22 (Cellular)	Class:	N/A

Plot# 11

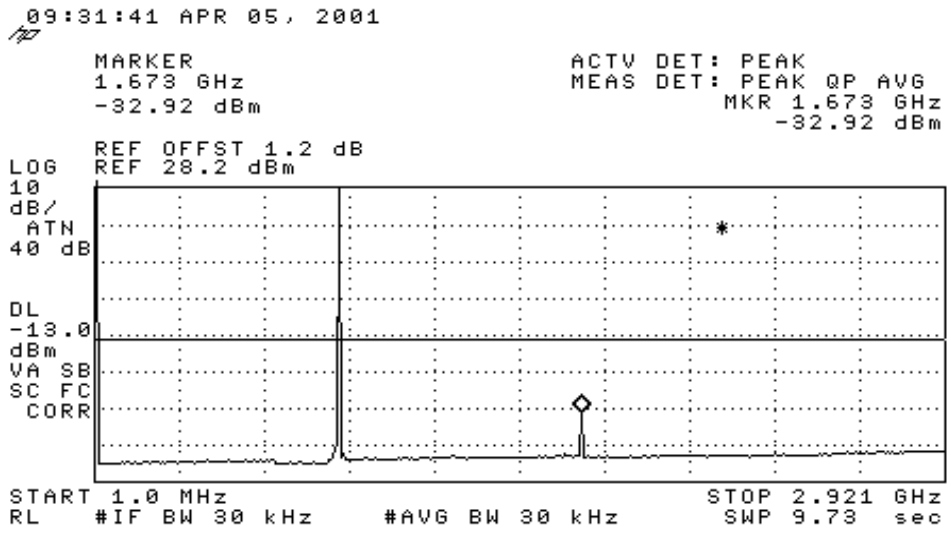


Plot# 12

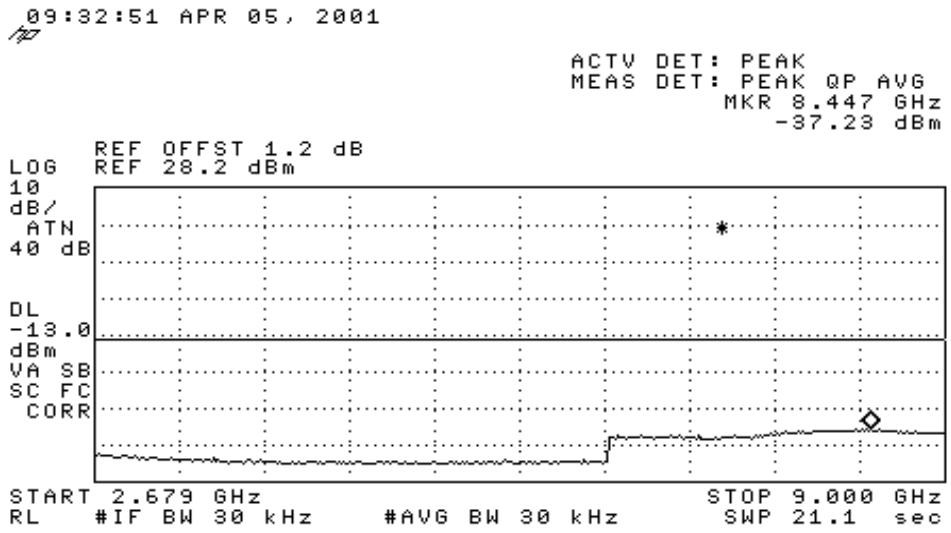


Client:	Standard Communications	Job Number:	J42845
Model:	CRM4200	T-Log Number:	T42858
		Proj Eng:	David Bare
Contact:	Michael Malin		
Spec:	FCC 22 (Cellular)	Class:	N/A

Plot# 13

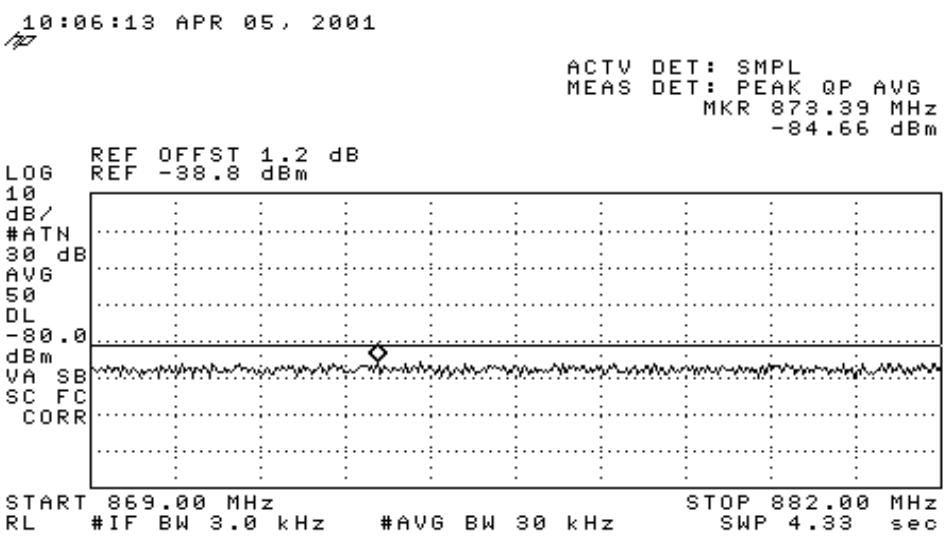


Plot# 14

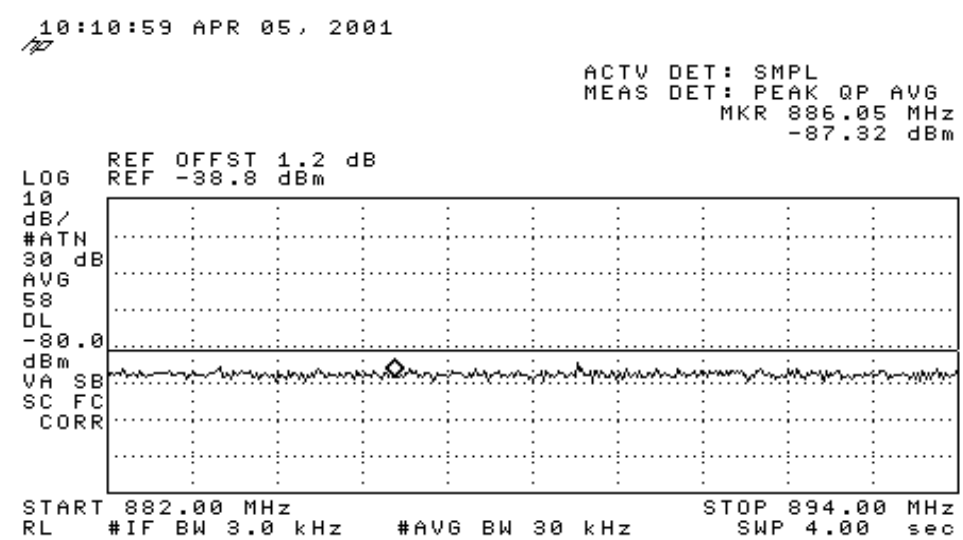


Client:	Standard Communications	Job Number:	J42845
Model:	CRM4200	T-Log Number:	T42858
		Proj Eng:	David Bare
Contact:	Michael Malin		
Spec:	FCC 22 (Cellular)	Class:	N/A

Plot# 15

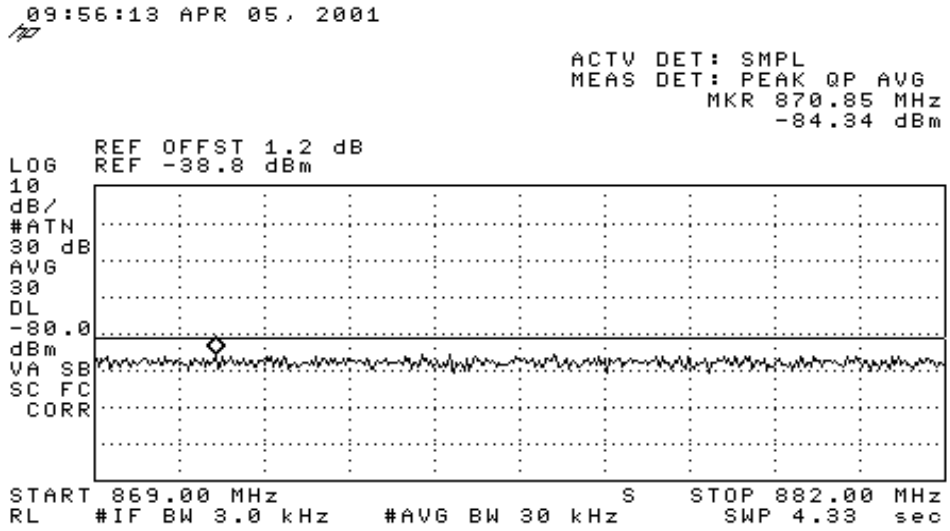


Plot# 16

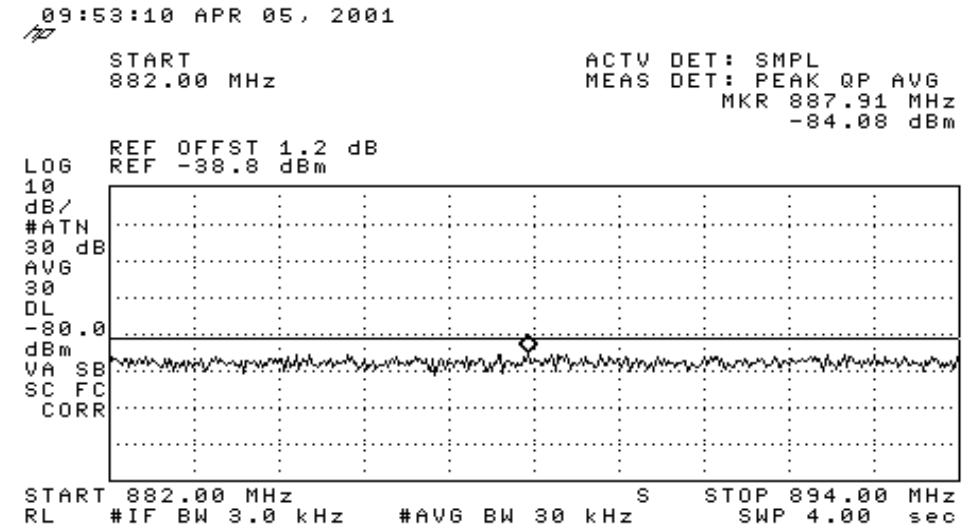


Client:	Standard Communications	Job Number:	J42845
Model:	CRM4200	T-Log Number:	T42858
		Proj Eng:	David Bare
Contact:	Michael Malin		
Spec:	FCC 22 (Cellular)	Class:	N/A

Plot# 17



Plot# 18



Client:	Standard Communications	Job Number:	J42845
Model:	CRM4200	T-Log Number:	T42858
		Proj Eng:	David Bare
Contact:	Michael Malin		
Spec:	FCC 22 (Cellular)	Class:	N/A

Section 2.1053: Field strenght of Spurious emissions

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 12/21/2000
Test Engineer: jmartinez
Test Location: SVOATS #2

Config. Used: 1
Config Change: None
EUT Voltage: 12 Vdc and 5 Vdc

General Test Configuration

The EUT was located on the turntable for radiated emissions testing.

On the OATS, the measurement antenna was located 3m from the EUT for the frequency range 1 - 10 GHz.

Note, **preliminary** testing indicates that the emissions were maximized by orientation of the EUT and elevation of the measurement antenna. **Maximized** testing indicated that the emissions were maximized by orientation of the EUT, elevation of the measurement antenna, and manipulation of the EUT's interface cables.

Ambient Conditions:

Temperature: 21°C
Rel. Humidity: 35%

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	RE, 1000 - 9000 MHz Maximized Emissions	22.917(e)	Pass	-2.7dB @ 1669.88 MHz

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Elliott

EMC Test Data

Client:	Standard Communications	Job Number:	J42845
Model:	CRM4200	T-Log Number:	T42858
		Proj Eng:	David Bare
Contact:	Michael Malin		
Spec:	FCC 22 (Cellular)	Class:	N/A

Run #1: Maximized readings, 1000 - 9000 MHz

Harmonic measurments of the Fudamental Frequency of 834.99 MHz

Frequency	Level	Pol	FCC 22.917(e)		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Power set to Maximum.								
1669.880	81.7	H	84.4	-2.7	Pk	145	1.1	Peak reading, peak limit
2504.877	66.2	H	84.4	-18.2	Pk	203	1.0	Peak reading, peak limit
3339.877	65.3	H	84.4	-19.1	Pk	165	1.2	Peak reading, peak limit
4174.930								Analyzer Noise floor
5010.072								Analyzer Noise floor
5845.163								Analyzer Noise floor
6680.000								Analyzer Noise floor
7515.000								Analyzer Noise floor
8350.000								Analyzer Noise floor
1669.942	81.6	V	84.4	-2.8	Pk	140	1.0	Peak reading, peak limit
2504.876	68.7	V	84.4	-15.7	Pk	193	1.0	Peak reading, peak limit
3339.837	64.8	V	84.4	-19.6	Pk	169	1.1	Peak reading, peak limit
4174.930	59.4	V	84.4	-25.0	Pk	228	1.1	Peak reading, peak limit
5010.072	62.0	V	84.4	-22.4	Pk	125	1.1	Peak reading, peak limit
5845.163	64.1	V	84.4	-20.3	Pk	132	1.1	Peak reading, peak limit
6680.000								Analyzer Noise floor
7515.000								Analyzer Noise floor
8350.000								Analyzer Noise floor

Client:	Standard Communications	Job Number:	J42845
Model:	CRM4200	T-Log Number:	T42858
		Proj Eng:	David Bare
Contact:	Michael Malin		
Spec:	FCC 22 (Cellular)	Class:	N/A

Section 2.1055: Frequency Stability

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 12/29/2000
Test Engineer: jmartinez
Test Location: Enviromental Chamber
Config. Used: 1
Config Change: None
EUT Voltage: 12 Vdc and 5 Vdc

General Test Configuration

EUT was place inside the Temperature Chamber and all local support equipment were located outside on a table for testing. The Eut was connected directly to Test Receiver. A 20-dB attenuator was used between the EUT and Test Receiver.

Chamber was set to -30 to 50 degrees Celsius (60 degrees Celsius for Canada). Incremented 10 degress per temperature and let unit stabilized for every temperature.

Voltage stability was done at 25 degress Celsius. For battery operated units decrease DC voltage until battery end-point was found. For Canada testing set to 80% of the nominal voltage.

Ambient Conditions:

Temperature: N/A
Rel. Humidity: N/A

Summary of Results

Run #	Test Performed	Limit	Result	Comment
1a & 1b	Temperature Vs. Frequency	22.355	Pass	
2a & 2b	Voltage Vs. Frequency	22.355	Pass	Battery end point is Model 4200: 2.3 Vdc.

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Standard Communications	Job Number:	J42845
Model:	CRM4200	T-Log Number:	T42858
		Proj Eng:	David Bare
Contact:	Michael Malin		
Spec:	FCC 22 (Cellular)	Class:	N/A

Run# 1a: Temperature Vs. Frequency

2.5ppm * 834.99 = 2087.475 Hz

Temperature (Celsius)	Drift (Hz)	Limit (Hz)
-30	-308.0	2087.475
-20	-208.0	2087.475
-10	-108.0	2087.475
0	25.0	2087.475
10	-25.0	2087.475
20	467.0	2087.475
30	-230.0	2087.475
40	-360.0	2087.475
50	110.0	2087.475
60	390.0	2087.475

Run# 1b: Temperature Vs. Power

Reference Power = 35.17 dBm

Temperature (Celsius)	Deviation (dB)	Power (dBm)
-30	0.33	35.5
-20	0.03	35.2
-10	0.00	35.17
0	0.33	35.5
10	0.03	35.2
20	0.33	35.5
30	0.03	35.2
40	0.03	35.2
50	0.13	35.3
60	0.016	35.3

Client:	Standard Communications	Job Number:	J42845
Model:	CRM4200	T-Log Number:	T42858
		Proj Eng:	David Bare
Contact:	Michael Malin		
Spec:	FCC 22 (Cellular)	Class:	N/A

Run# 2a: Voltage Vs. Frequency

Model 4200 (5 Vdc):

Battery end point is **2.3Vdc**. This will be stated by the manufacturer. No frequency drift occurred, only power decreased as voltage decreased.

Run# 2b: Voltage Vs. Frequency

Nomianl Voltage is 12Vdc.

Voltage	Drift	Limit
(Dc)	(Hz)	(Hz)
80%	3.0	2087.475