Elliott

EMC Test Data

Client:	Repeater Technologies	Job Number:	J43477
Model:	RC1920C	T-Log Number:	T43891
		Proj Eng:	David Bare
Contact:	Dirk Kieger		
Emissions Spec:	FCC 24 E & IC-RSS 133	Class:	N/A
Immunity Spec:		Environment:	

EMC Test Data

For The

Repeater Technologies

Model

RC1920C

Client:	Repeater Technologies	Job Number:	J43477
Model:	RC1920C	T-Log Number:	T43891
		Proj Eng:	David Bare
Contact:	Dirk Kieger		
Emissions Spec:	FCC 24 E & IC-RSS 133	Class:	N/A
Immunity Spec:	Enter immunity spec on cover	Environment:	

EUT INFORMATION

General Description

The EUT is an repeater amplifier which is designed to be used with base station PCS towers. 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 is 120V, 60 Hz, 12 Amps.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
Repeater Technologies	RC1920C	amplifier	N/A	

EUT Enclosure

The EUT enclosure is primarily constructed of fabricated sheet steel. It measures approximately 35.6 cm wide by 29.2 cm deep by 40.6 cm high.

Modification History

Mod. #	Test	Date	Modification
1			
2			
3			

Client:	Repeater Technologies	Job Number:	J43477
Model:	RC1920C	T-Log Number:	T43891
		Proj Eng:	David Bare
Contact:	Dirk Kieger		
Emissions Spec:	FCC 24 E & IC-RSS 133	Class:	N/A
Immunity Spec:	Enter immunity spec on cover	Environment:	

Test Configuration #1

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Rohde and Schwarz	SMIQ O3E	PCS Signal Generator	DE22078	N/A
Rohde and Schwarz	SMIQ O3E	PCS Signal Generator	DE26557	N/A
Mini Circuits	15542 ZAPD-2-21-3W	Combiner	0 0124	N/A
HP	Pavilion 7840	PC	KR10504395	DoC

Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
None				

EUT Interface Ports

		Cable(s)		
EUT Port	Connected To	Description	Shielded or Unshielded	Length(m)
EUT RF In	Combiner Output	Direct Connection	-	-
EUT RF Out #1	20dB Attenuator	Direct Connection	-	-
EUT RF Out #2	20dB Attenuator	Direct Connection	-	-
EUT Serial	Laptop Serial	DB9-DB9	Shielded	3

EUT Operation During Emissions

A signal generator was used to provide CDMA modulation to EUT, which was set to produce maximum output power.

Client:	Repeater Technologies	Job Number:	J43477
Model:	RC1920C	T-Log Number:	T43891
		Proj Eng:	David Bare
Contact:	Dirk Kieger		
Spec:	FCC 24 E & IC-RSS 133	Class:	N/A

Section 2.1046 & RSS-133 (6.2): 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: 6/19/2001 & 10/12/2001
Test Engineer: jmartinez / Mark Briggs
Test Location: SVOATS #2

Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz

General Test Configuration

The EUT was located on the turntable for radiated field strength measurements and the local support equipment was located underneath the table.

A power meter was used to measure both the low and high channels on the Base and mobile channels

Ambient Conditions:

Temperature: 30°C
Rel. Humidity: 14%

Summary of Results

Run #	Test Performed	Limit	Result	Comment
1	Conducted Output Power	24.232(a) & RSS-133(6.2)	Pass	Main (Reverse)
2	Conducted Output Power	24.232(b) & RSS-133(6.2)	Pass	Base (Forward)

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:	Repeater Technologies	Job Number:	J43477
Model:	RC1920C	T-Log Number:	T43891
		Proj Eng:	David Bare
Contact:	Dirk Kieger		
Spec:	FCC 24 E & IC-RSS 133	Class:	N/A

Run #1: Conducted Output Power (Mobile (Reverse))

Output power measured with a HP438A Power Meter and 8481A Sensor Head:

Block	Freq (MHz)	Measured Value (dBm)	Corredion factor (dB)	Power Output (dBm)	Comments
A	1851.25	-2.1	20.0	17.9	Power Meter
C	1908.75	-1.9	20.0	18.1	Power Meter

Correction factor for power meter measurement accounts for attenuator between rf output and power meter

Run #2: Conducted Output Power (Base (forward))

Output power measured with a HP438A Power Meter and 8481A Sensor Head:

Block	Freq (MHz)	Measured Value (dBm)	Corredion factor (dB)	Power Output (dBm)	Comments
A	1931.25	19.7	20.0	39.7	Power Meter
C	1987.75	20.4	20.2	40.6	Power Meter

Correction factor for power meter measurement accounts for attenuator between rf output and power meter

Client:	Repeater Technologies	Job Number:	J43477
Model:	RC1920C	T-Log Number:	T43891
		Proj Eng:	David Bare
Contact:	Dirk Kieger		
Spec:	FCC 24 E & IC-RSS 133	Class:	N/A

Section 2.1049 & RSS-133 (5.6): 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: 6/19/2001 & 10/12/2001
Test Engineer: jmartinez / Mark Briggs
Test Location: SVOATS #2
Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz

General Test Configuration

When performing conducted measurements from the EUT's antenna port, the antenna port of the EUT was connected to the spectrum analyzer or power meter via a suitable attenuator to prevent overloading the measurement system. All measurements are corrected. Modulation must not exceed manufactures stated bandwidth.

For this specific test the occupied bandwidth was measured to provide the correct Resolution bandwidth that will be used for the bandedge measurements. This requirement is specified in 24.238(b) and RSS-133 (5.9) & (6.3)(a).

Because the EUT is an amplifer, input and output plots were made to show that the bandwidth was not altered. By altered we refer to the bandwidth increasing in width.

Ambient Conditions:

Temperature: 30°C
Rel. Humidity: 14%

Summary of Results

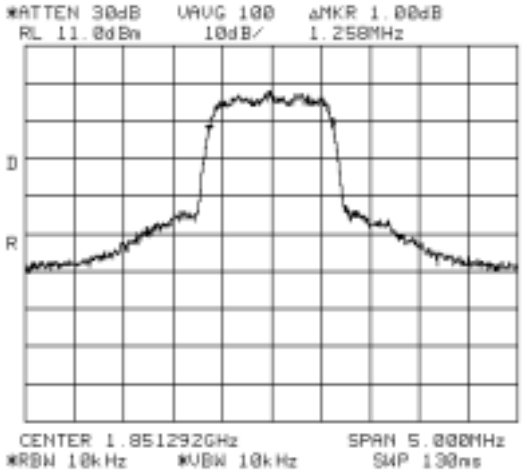
Run	Test Performed	Limit	Result	Comment
1	Occupied Bandwidth	24.238(b) & RSS-133(5.6)	Pass	Main (Reverse)
2	Occupied Bandwidth	24.238(b) & RSS-133(5.6)	Pass	Base (Forward)

Client:	Repeater Technologies	Job Number:	J43477
Model:	RC1920C	T-Log Number:	T43891
		Proj Eng:	David Bare
Contact:	Dirk Kieger		
Spec:	FCC 24 E & IC-RSS 133	Class:	N/A

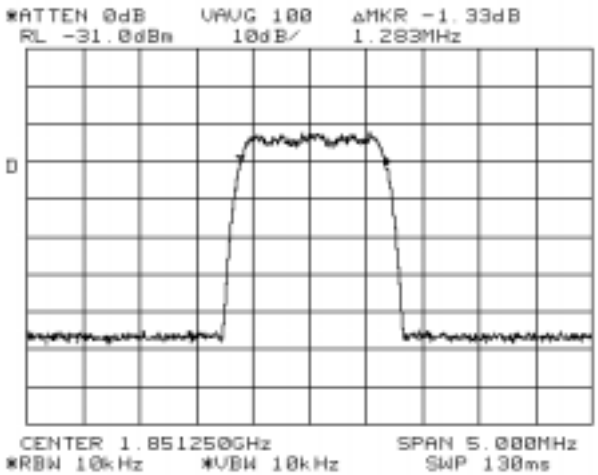
Run #1: Occupied Bandwidth (Mobile (Reverse))

Measured Value	Specified Bandwidth	Resolution	Comments
(dBm)	MHz	(kHz)	
1.258	1.25	10	

Output Plot Low Channel



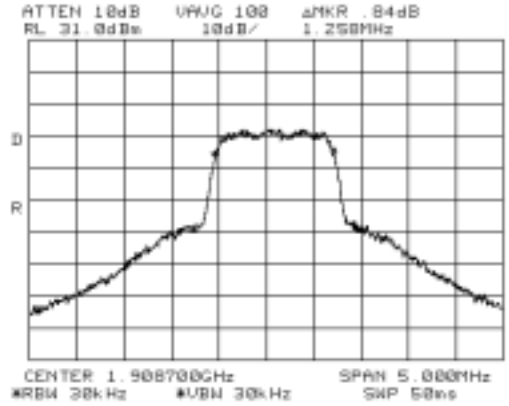
Input Plot Low Channel



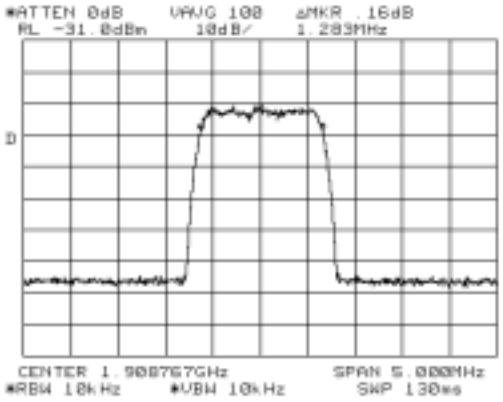
Client:	Repeater Technologies	Job Number:	J43477
Model:	RC1920C	T-Log Number:	T43891
		Proj Eng:	David Bare
Contact:	Dirk Kieger		
Spec:	FCC 24 E & IC-RSS 133	Class:	N/A

Measured Value	Specified Bandwidth	Resolution	Comments
(dBm)	MHz	(kHz)	
1.258	1.25	10	

Output Plot High Channel



Input Plot High Channel



Client:	Repeater Technologies	Job Number:	J43477
Model:	RC1920C	T-Log Number:	T43891
		Proj Eng:	David Bare
Contact:	Dirk Kieger		
Spec:	FCC 24 E & IC-RSS 133	Class:	N/A

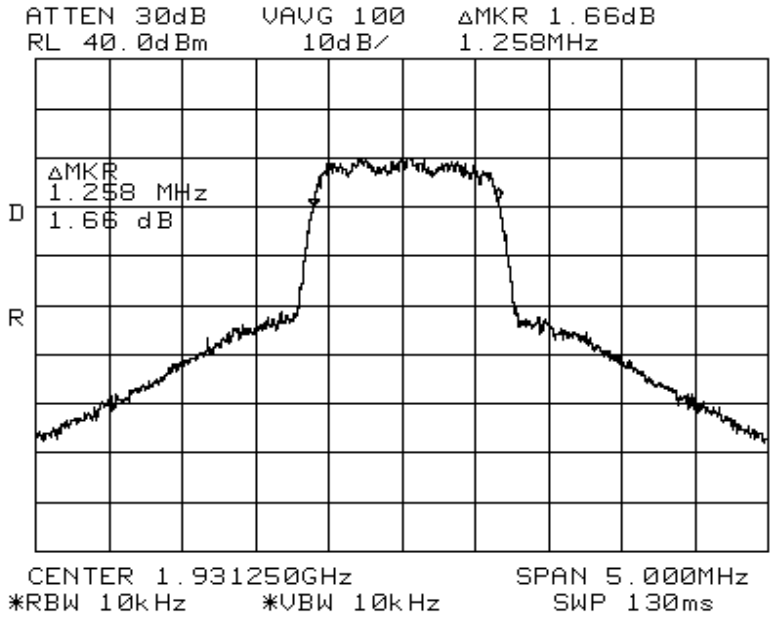
Run #2: Occupied Bandwidth (Base (forward))

Block	Freq (MHz)	Measured Value (dBm)	Specified Bandwidth MHz	Resolution (kHz)	Comments
A	1931.25	1.258	1.25	10	See plot
C	1943.75	1.242	1.25	10	See plot

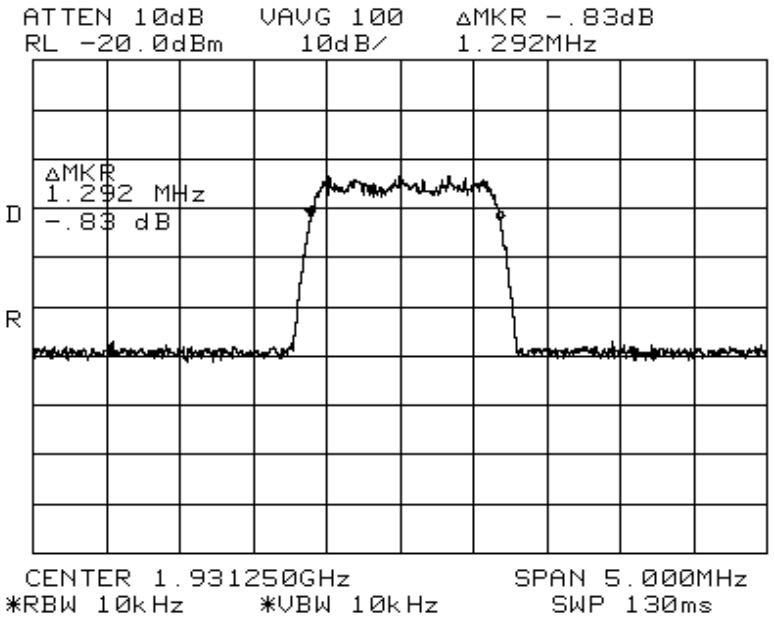
Plots were also made of the spectral content of the input signals at 1931.2 MHz and 1943.75 MHz

Client:	Repeater Technologies	Job Number:	J43477
Model:	RC1920C	T-Log Number:	T43891
		Proj Eng:	David Bare
Contact:	Dirk Kieger		
Spec:	FCC 24 E & IC-RSS 133	Class:	N/A

1931.25 MHz Bandwidth (EUT RF Output)

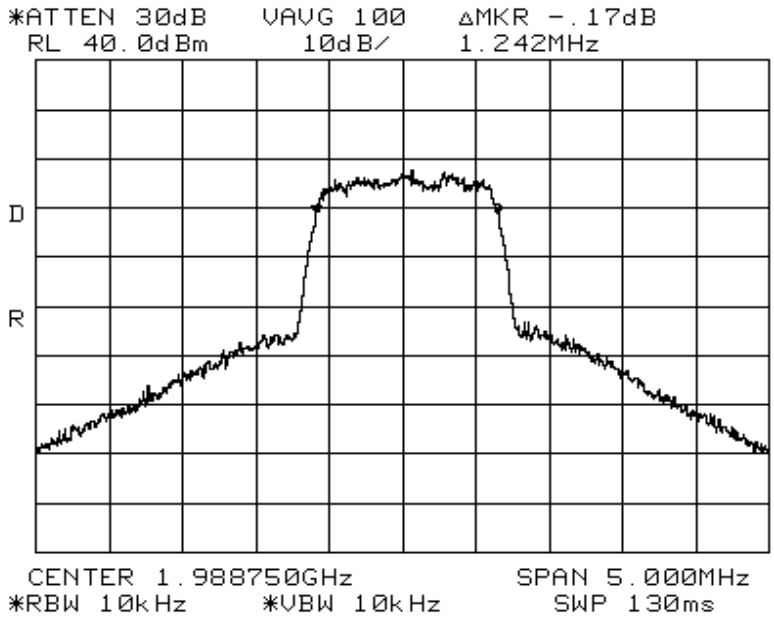


1931.25 MHz Bandwidth (EUT RF Input)

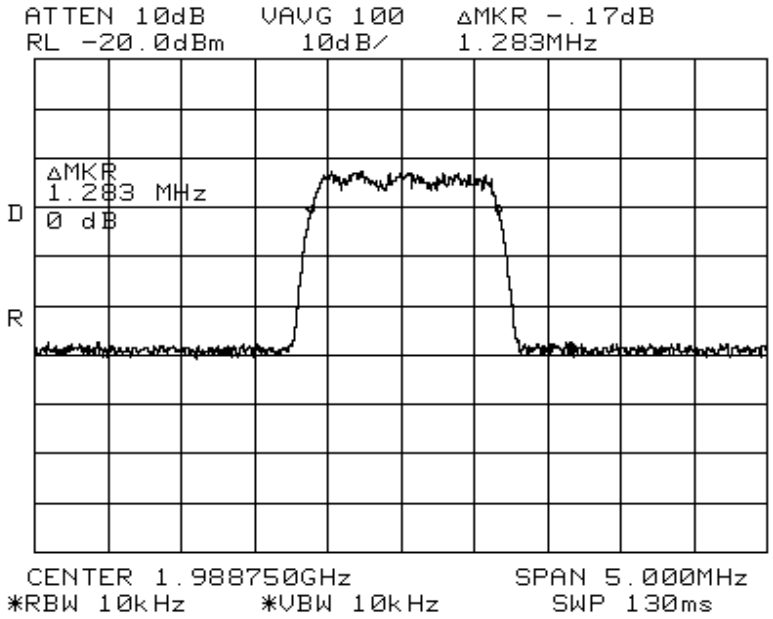


Client:	Repeater Technologies	Job Number:	J43477
Model:	RC1920C	T-Log Number:	T43891
		Proj Eng:	David Bare
Contact:	Dirk Kieger		
Spec:	FCC 24 E & IC-RSS 133	Class:	N/A

1988.75 MHz Bandwidth (EUT RF Output)



1988.75 MHz Bandwidth (EUT RF Input)



Client:	Repeater Technologies	Job Number:	J43477
Model:	RC1920C	T-Log Number:	T43891
		Proj Eng:	David Bare
Contact:	Dirk Kieger		
Spec:	FCC 24 E & IC-RSS 133	Class:	N/A

Section 2.1051, RSS-133 (6.3): 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: 6/19/01
Test Engineer: jmartinez
Test Location: SVOATS #2
Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz

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.

Bandedge measurements were made with a lower resolation then the calculated 1% requirement. The bandedge measurements were then corrected using the 10*log (1% RB / RB used). Were 1% RB is the 26-dB or 99 % measured emission Bandwidth and RB used is the Spectrum analyzer setting used for the Bandedge measurement.

Ambient Conditions:

Temperature: 23°C
Rel. Humidity: 31%

Summary of Results

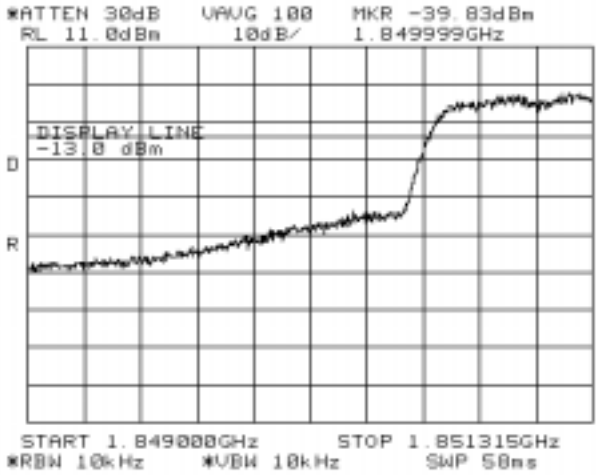
Run	Test Performed	Limit	Result	Comment
1	Bandedge Measurement & Out-Of-Band emission	24.238(a) & RSS-133 (6.3)	Pass	Mobile (Forward) Channel 1
2	Bandedge Measurement & Out-Of-Band emission	24.238(a) & RSS-133 (6.3)	Pass	Mobile (Forward) Channel 2
3	Bandedge Measurement & Out-Of-Band emission	24.238(a) & RSS-133 (6.3)	Pass	Base testing at Main antenna
4	Bandedge Measurement & Out-Of-Band emission	24.238(a) & RSS-133 (6.3)	Pass	Base testing at Diversity antenna

Client:	Repeater Technologies	Job Number:	J43477
Model:	RC1920C	T-Log Number:	T43891
		Proj Eng:	David Bare
Contact:	Dirk Kieger		
Spec:	FCC 24 E & IC-RSS 133	Class:	N/A

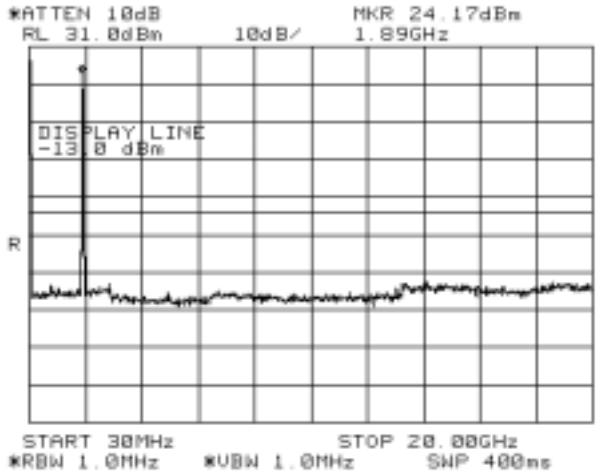
Run #1: Bandedge Measurement & Out-Of-Band emissions; (Mobile (Reverse) Channel 1)

Channel	Frequency (MHz)	Resolution used (kHz)	1% Resolution BW (kHz)	Correction (dB)	Measured Bandedge (dBm)	Corrected Value (dBm)
Low	1850	10	12.5	1.25	-39.83	-38.58

Low channel Bandedge



Low channel Out-of-Band

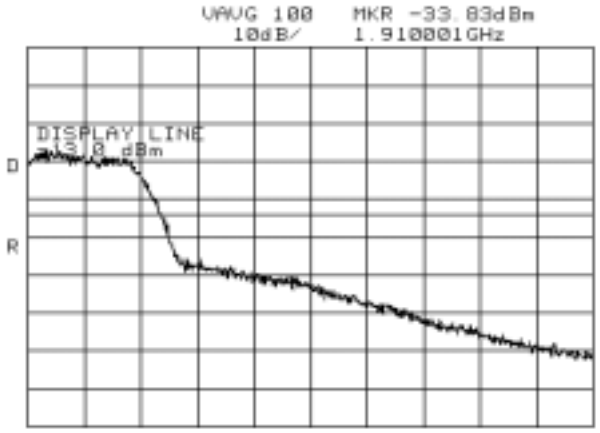


EMC Test Data

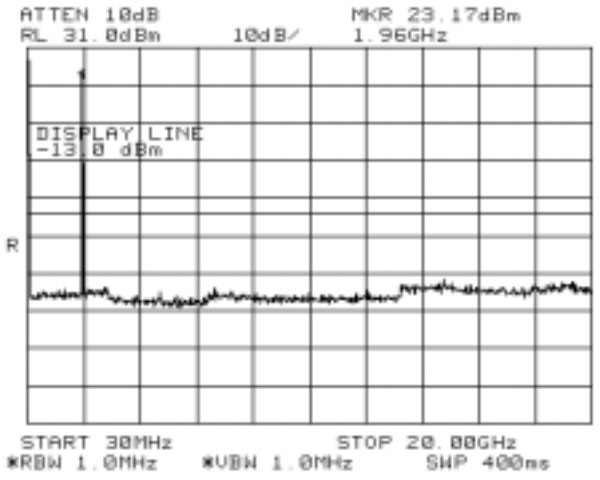
Client:	Repeater Technologies	Job Number:	J43477
Model:	RC1920C	T-Log Number:	T43891
		Proj Eng:	David Bare
Contact:	Dirk Kieger		
Spec:	FCC 24 E & IC-RSS 133	Class:	N/A

Channel	Frequency (MHz)	Resolution used (kHz)	1% Resolution BW (kHz)	Correction (dB)	Measured Bandedge (dBm)	Corrected Value (dBm)
High	1910	10	12.5	1.25	-33.83	-32.58

High channel Bandedge



High channel Out-of-Band

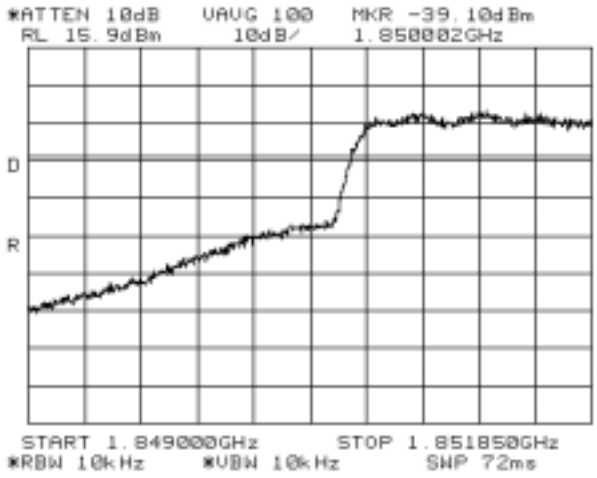


Client:	Repeater Technologies	Job Number:	J43477
Model:	RC1920C	T-Log Number:	T43891
		Proj Eng:	David Bare
Contact:	Dirk Kieger		
Spec:	FCC 24 E & IC-RSS 133	Class:	N/A

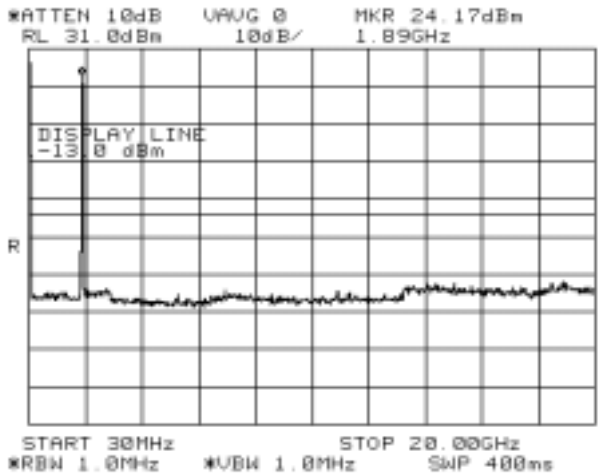
Run #2: Bandedge Measurement & Out-Of-Band emissions; (Mobile (Reverse) Channel 2)

Channel	Frequency (MHz)	Resolution used (kHz)	1% Resolution BW (kHz)	Correction (dB)	Measured Bandedge (dBm)	Corrected Value (dBm)
Low	1850	10	12.5	1.25	-39.1	-37.85

Low channel Bandedge



Low channel Out-of-Band

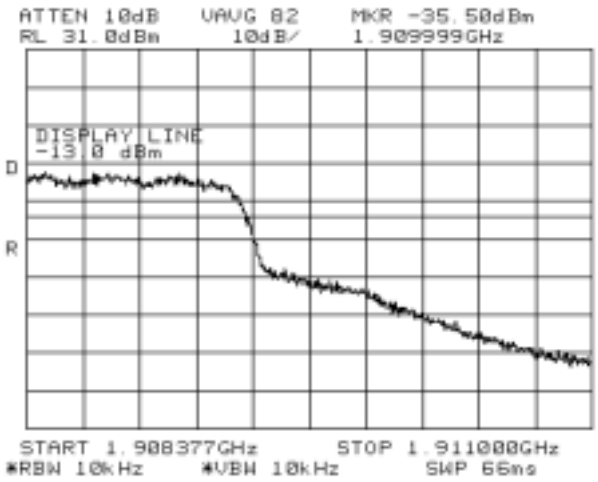


EMC Test Data

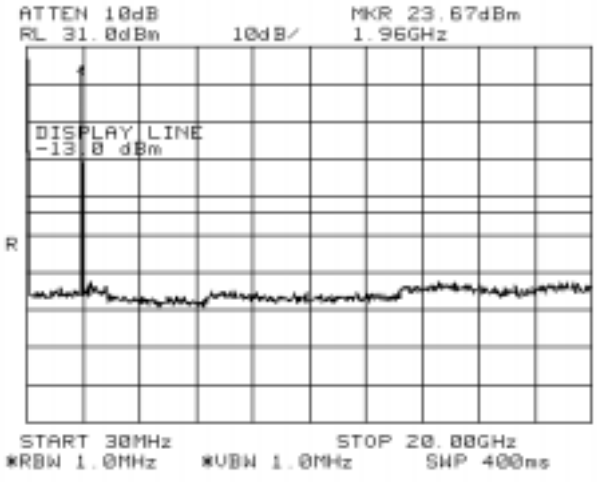
Client:	Repeater Technologies	Job Number:	J43477
Model:	RC1920C	T-Log Number:	T43891
		Proj Eng:	David Bare
Contact:	Dirk Kieger		
Spec:	FCC 24 E & IC-RSS 133	Class:	N/A

Channel	Frequency (MHz)	Resolution used (kHz)	1% Resolution BW (kHz)	Correction (dB)	Measured Bandedge (dBm)	Corrected Value (dBm)
High	1910	10	12.5	1.25	-35.5	-34.25

High channel Bandedge



High channel Out-of-Band

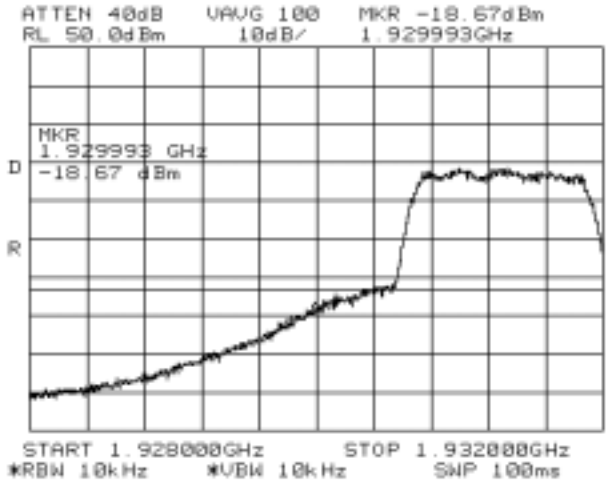


Client:	Repeater Technologies	Job Number:	J43477
Model:	RC1920C	T-Log Number:	T43891
		Proj Eng:	David Bare
Contact:	Dirk Kieger		
Spec:	FCC 24 E & IC-RSS 133	Class:	N/A

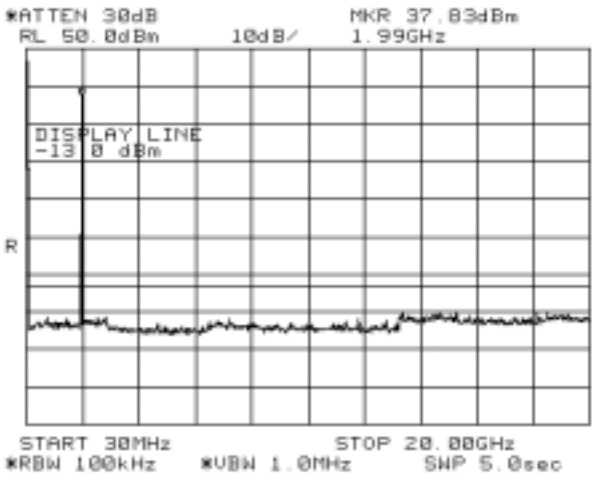
Run #3: Bandedge Measurement & Out-Of-Band emissions; (Base testing at Main port)

Channel	Frequency (MHz)	Resolution used (kHz)	1% Resolution BW (kHz)	Correction (dB)	Measured Bandedge (dBm)	Corrected Value (dBm)
Low	1930	10	12.5	1.25	-18.67	-17.42

Low channel Bandedge



Low channel Out-of-Band

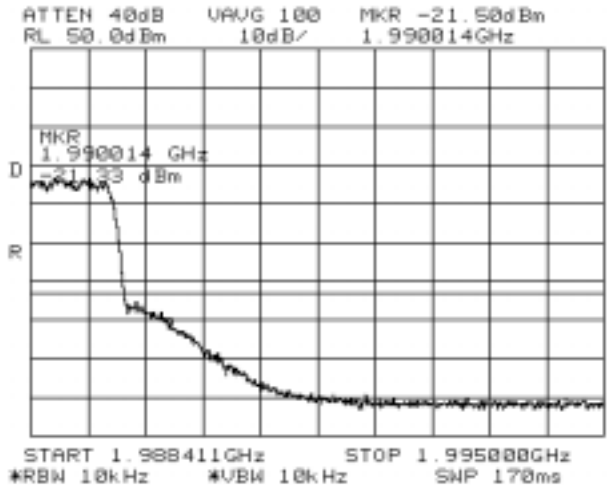


EMC Test Data

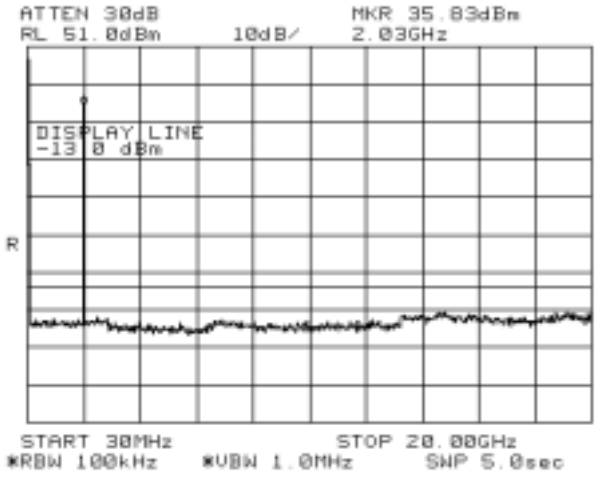
Client:	Repeater Technologies	Job Number:	J43477
Model:	RC1920C	T-Log Number:	T43891
		Proj Eng:	David Bare
Contact:	Dirk Kieger		
Spec:	FCC 24 E & IC-RSS 133	Class:	N/A

Channel	Frequency (MHz)	Resolution used (kHz)	1% Resolution BW (kHz)	Correction (dB)	Measured Bandedge (dBm)	Corrected Value (dBm)
High	1990	10	12.5	1.25	-21.5	-20.25

High channel Bandedge



High channel Out-of-Band

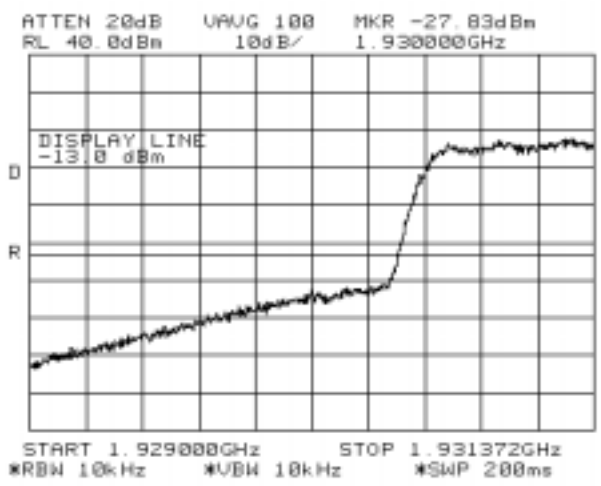


Client:	Repeater Technologies	Job Number:	J43477
Model:	RC1920C	T-Log Number:	T43891
		Proj Eng:	David Bare
Contact:	Dirk Kieger		
Spec:	FCC 24 E & IC-RSS 133	Class:	N/A

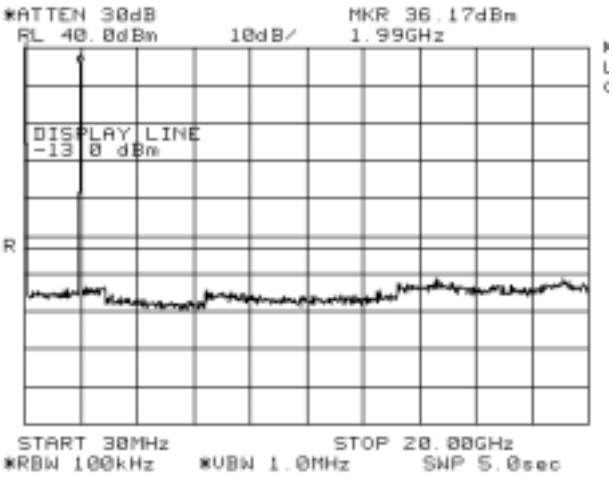
Run #4: Bandedge Measurement & Out-Of-Band emissions; (Base testing at Diversity Antenna)

Channel	Frequency (MHz)	Resolution used (kHz)	1% Resolution BW (kHz)	Correction (dB)	Measured Bandedge (dBm)	Corrected Value (dBm)
Low	1930	10	12.5	1.25	-27.83	-26.58

Low channel Bandedge



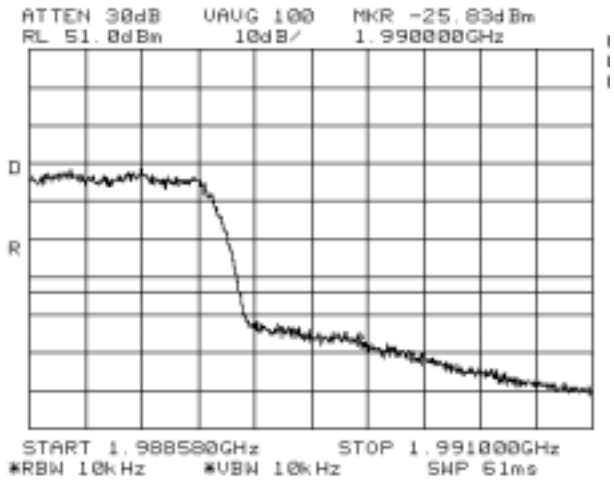
Low channel Out-of-Band



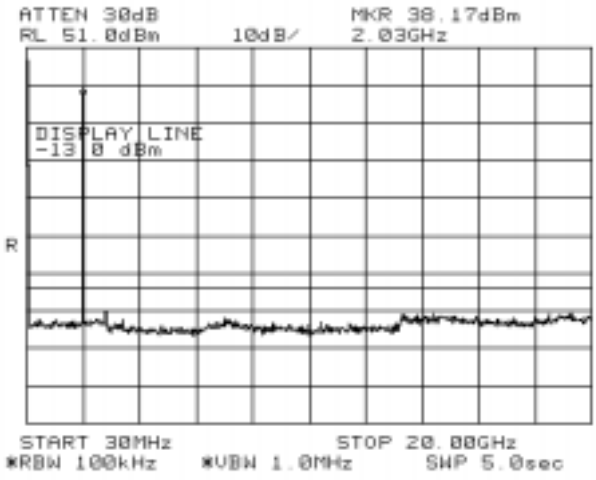
Client:	Repeater Technologies	Job Number:	J43477
Model:	RC1920C	T-Log Number:	T43891
		Proj Eng:	David Bare
Contact:	Dirk Kieger		
Spec:	FCC 24 E & IC-RSS 133	Class:	N/A

Channel	Frequency (MHz)	Resolution used (kHz)	1% Resolution BW (kHz)	Correction (dB)	Measured Bandedge (dBm)	Corrected Value (dBm)
High	1990	10	12.5	1.25	-25.83	-24.58

High channel Bandedge



High channel Out-of-Band



Client:	Repeater Technologies	Job Number:	J43477
Model:	RC1920C	T-Log Number:	T43891
		Proj Eng:	David Bare
Contact:	Dirk Kieger		
Spec:	FCC 24 E & IC-RSS 133	Class:	N/A

Section 2.1053 & RSS-133 (6.3): 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: 6/19/01
Test Engineer: jmartinez
Test Location: SVOATS #2

Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz

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 - 20 GHz.

For radiated emissions testing the measurement antenna was located 3 meters from the EUT. For any Spurious emission more than 20-dB of the field strenght limit, substitution was performed. Substitution Method is not required for Spurious emissions 20-dB below the calculated field strength limit.

Ambient Conditions:

Temperature: 21°C
Rel. Humidity: 35%

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	RE, 1000 - 19000 MHz Maximized Emissions	24.238(a) & RSS-133 (6.3)(a)(ii)	Pass	-20dB @ 3977.5 MHz
2	RE, 1000 - 19000 MHz Maximized Emissions	24.238(a) & RSS-133 (6.3)(a)(ii)	Pass	-22.45dB @ 3952 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.

Client:	Repeater Technologies	Job Number:	J43477
Model:	RC1920C	T-Log Number:	T43891
		Proj Eng:	David Bare
Contact:	Dirk Kieger		
Spec:	FCC 24 E & IC-RSS 133	Class:	N/A

Run #1: Maximized readings, 1000 - 19000 MHz

Harmonic measurments of the Fudamental Frequency of 1988.75 MHz

Frequency	Level	Pol	24.238(a)		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Power set to Maximum.								
3977.500	64.2	H	84.2	-20.0	Pk	145	1.1	Peak reading, peak limit (Note 2)
3977.500	63.8	V	84.2	-20.4	Pk	140	1.0	Peak reading, peak limit (Note 2)
7955.000	49.2	H	84.2	-35.0	Pk	165	1.2	Peak reading, peak limit (Note 2)
7955.000	47.4	V	84.2	-36.8	Pk	169	1.1	Peak reading, peak limit (Note 2)
5966.250	47.3	H	84.2	-37.0	Pk	203	1.0	Peak reading, peak limit (Note 2)
5966.250	46.6	V	84.2	-37.6	Pk	193	1.0	Peak reading, peak limit (Note 2)
9943.75	45.3	H	84.2	-38.9	Pk	125	1.1	Peak reading, peak limit (Note 2)
13921.25	44.5	H	84.2	-39.7	Pk	0	1.1	Note 1
19887.50	44.3	V	84.2	-39.9	Pk	0	1.1	Note 1
11932.50	44.2	H	84.2	-40.0	Pk	0	1.1	Note 1
19887.50	44.2	H	84.2	-40.0	Pk	0	1.1	Note 1
17898.75	44.2	V	84.2	-40.0	Pk	0	1.1	Note 1
17898.75	44.1	H	84.2	-40.1	Pk	0	1.1	Note 1
15910.00	43.2	H	84.2	-41.0	Pk	0	1.1	Note 1
9943.75	43.2	V	84.2	-41.0	Pk	228	1.1	Peak reading, peak limit (Note 2)
13921.25	42.2	V	84.2	-42.0	Pk	0	1.1	Note 1
15910.00	40.5	V	84.2	-43.7	Pk	0	1.1	Note 1
11932.50	40.2	V	84.2	-44.0	Pk	0	1.1	Note 1

Note 1:	No other emission detected, within 20-dB of the limit, beyond the 4th harmonic.
Note 2:	Substitution was not performed since the measured field strenght is 20-dB below the limit.

Client:	Repeater Technologies	Job Number:	J43477
Model:	RC1920C	T-Log Number:	T43891
		Proj Eng:	David Bare
Contact:	Dirk Kieger		
Spec:	FCC 24 E & IC-RSS 133	Class:	N/A

Run #2: Maximized readings, 1000 - 19000 MHz

Harmonic measurments of the Fudamental Frequency of 1976.25 MHz

Frequency	Level	Pol	24.238(a)		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Power set to Maximum.								
3952.000	61.8	V	84.2	-22.5	Pk	56	1.1	Peak reading, peak limit (Note 2)
3952.000	57.8	H	84.2	-26.4	Pk	91	1.2	Peak reading, peak limit (Note 2)
5928.000	51.3	V	84.2	-32.9	Pk	25	1.1	Peak reading, peak limit (Note 2)
5928.000	48.8	H	84.2	-35.4	Pk	45	1.2	Peak reading, peak limit (Note 2)
7905.000	47.6	V	84.2	-36.6	Pk	35	1.1	Peak reading, peak limit (Note 2)
7905.000	47.1	H	84.2	-37.1	Pk	315	1.2	Peak reading, peak limit (Note 2)
19762.00	44.8	V	84.2	-39.4	Pk	0	1.1	Note 1
17786.00	44.5	V	84.2	-39.7	Pk	0	1.1	Note 1
9881.00	44.2	H	84.2	-40.0	Pk	0	1.1	Note 1
13833.00	44.2	V	84.2	-40.0	Pk	0	1.1	Note 1
15810.00	44.1	H	84.2	-40.1	Pk	0	1.1	Note 1
11857.00	43.2	H	84.2	-41.0	Pk	0	1.1	Note 1
15810.00	43.2	V	84.2	-41.0	Pk	0	1.1	Note 1
19762.00	42.3	H	84.2	-41.9	Pk	0	1.1	Note 1
13833.00	42.1	H	84.2	-42.1	Pk	0	1.1	Note 1
11857.00	42.1	V	84.2	-42.1	Pk	0	1.1	Note 1
17786.00	40.2	H	84.2	-44.0	Pk	0	1.1	Note 1
9881.00	40.2	V	84.2	-44.0	Pk	0	1.1	Note 1

Note 1:	No other emission detected, within 20-dB of the limit, beyond the 3th harmonic.
Note 2:	Substitution was not performed since the measured field strenght is 20-dB below the limit.

Client:	Repeater Technologies	Job Number:	J43477
Model:	RC1920C	T-Log Number:	T43891
		Proj Eng:	David Bare
Contact:	Dirk Kieger		
Spec:	FCC 24 E & IC-RSS 133	Class:	N/A

Section 2.1055 & RSS-133 (7): 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:		Config. Used:	
Test Engineer:		Config Change:	
Test Location:	Enviromental Chamber	EUT Voltage:	

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. An 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 20 degress Celsius. For battery operated units decrease DC voltage until battery end-point was found.

Voltage stability was done at 20 degress Celsius. For AC operated units varied voltage at 85% and 115% of the nomial AC voltage.

Ambient Conditions:

Temperature: N/A

Rel. Humidity: N/A

Summary of Results

Run #	Test Performed	Limit	Result	Comment
1a	Temperature Vs. Frequency	24.235		No test

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:	Repeater Technologies	Job Number:	J43477
Model:	RC1920C	T-Log Number:	T43891
		Proj Eng:	David Bare
Contact:	Dirk Kieger		
Spec:	FCC 24 E & IC-RSS 133	Class:	N/A

Run# 1a: Temperature Vs. Frequency

Customer has provided explanation as to the frequency correction during extreme temperature or voltage changes.
Please refer to Schematics label "S87-1304-01 rev. 11a" page 5 of 7.