



## EMC Test Data

Client:	Repeater Technologies	Job Number:	J46669
Model:	RC19-2X15	T-Log Number:	T46670
		Proj Eng:	David Bare
Contact:	Frank Bidwell		
Emissions Spec:	FCC 24E & IC-RSS133	Class:	N/A
Immunity Spec:		Environment:	

## EMC Test Data

For The

### Repeater Technologies

Model

**RC19-2X15**



## EMC Test Data

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		Proj Eng:	David Bare
Contact:	Frank Bidwell		
Emissions Spec:	FCC 24E & IC-RSS133	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 wall or rack during operation. The EUT was instead treated as table-top equipment during testing to simulate the end user environment. The electrical rating of the EUT is 120V, 60 Hz, 2 Amps.

### Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
Repeater Technologies	RC19-2X15	amplifier	N/A	

### EUT Enclosure

The EUT enclosure is primarily constructed of fabricated sheet steel. It measures approximately 20 cm wide by 16 cm deep by 30 cm high.

### Modification History

Mod. #	Test	Date	Modification
1			
2			
3			



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Contact:	Frank Bidwell		
Emissions Spec:	FCC 24E & IC-RSS133	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				

#### Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Dell	PPI	Laptop	N/A	DoC
Rohde & Shwards	SMIQ 03E	Signal Generator	DE23520	N/A
Hewlett Packard	438A	Power Meter	3008A07305	N/A

#### EUT Interface Ports

EUT Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
RF power port 1 & 2	Spectrum Analyzer	BNC Female	-	-
Serial	Laptop	RS-232	Unshielded	0.8
1xTelephone	Unterminated	RJ-11	-	-
AC input	AC outlet	3-prong USA type	Unshielded	1.5

#### EUT Operation During Emissions

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



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Contact:	Frank Bidwell		
Spec:	FCC 24E & IC-RSS133	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: 3/25/2002 Config. Used: 1  
Test Engineer: jmartinez Config Change: None  
Test Location: SVOATS #4 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 the RF power of the EUT. An attenuator was used to protect the front end of the power sensor head. Also, the attenuator value was programmed into the power meter.

**Ambient Conditions:** Temperature: 22°C  
Rel. Humidity: 49%

## Summary of Results

Run #	Test Performed	Limit	Result	Comment
1	Output Power	24.232(a) & RSS-133(6.2)	Pass	Base (Forward)
2	Output Power	24.232(a) & RSS-133(6.2)	Pass	Mobile (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.



## EMC Test Data

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		Proj Eng:	David Bare
Contact:	Frank Bidwell		
Spec:	FCC 24E & IC-RSS133	Class:	N/A

### Run #1: 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	41.70	0.0	41.70	Power Meter
C	1988.75	41.80	0.0	41.80	Power Meter

Attenuator value enter into power meter.

### Run #2: 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	20.00	0.0	20.00	Power Meter
C	1908.75	20.00	0.0	20.00	Power Meter

Attenuator value enter into power meter.



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		Proj Eng:	David Bare
Contact:	Frank Bidwell		
Spec:	FCC 24E & IC-RSS133	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: 3/25/2002 Config. Used: 1  
Test Engineer: jmartinez Config Change: None  
Test Location: SVOATS #4 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 manufacturers 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 amplifier, 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: 22°C  
Rel. Humidity: 49%

## Summary of Results

Run	Test Performed	Limit	Result	Comment
1	Occupied Bandwidth & Input - output plots	24.238(b) & RSS- 133(5.6)	Pass	
2	Occupied Bandwidth & Input - output plots	24.238(b) & RSS- 133(5.6)	Pass	
3	Occupied Bandwidth & Input - output plots	24.238(b) & RSS- 133(5.6)	Pass	
4	Occupied Bandwidth & Input - output plots	24.238(b) & RSS- 133(5.6)	Pass	



## EMC Test Data

Client: Repeater Technologies

Job Number: J46669

Model: RC19-2X15

T-Log Number: T46670

Contact: Frank Bidwell

Proj Eng: David Bare

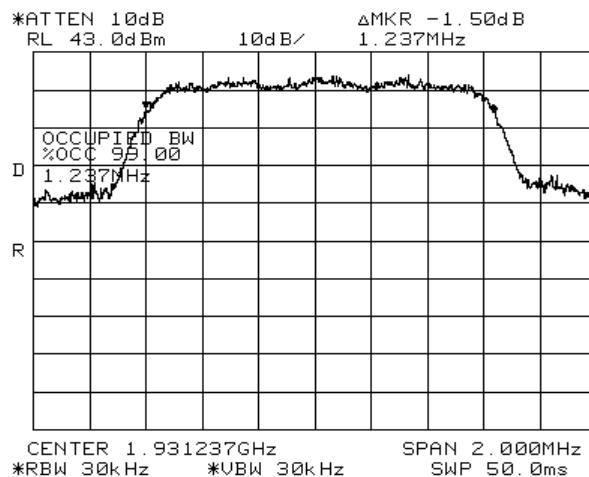
Spec: FCC 24E & IC-RSS133

Class: N/A

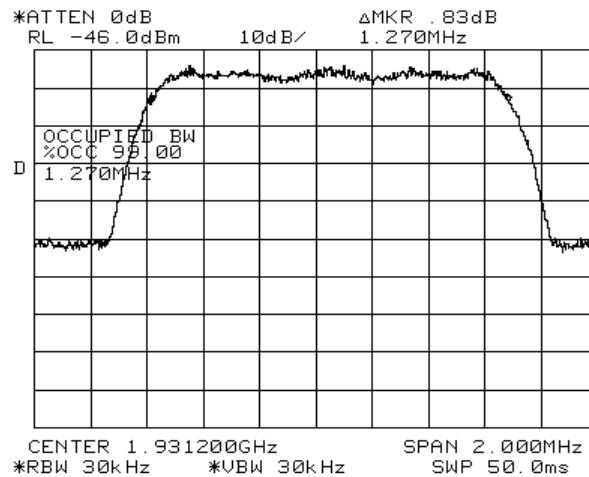
### Run #1: Occupied Bandwidth (Base forward); Low Block A

Measured Value	Specified Bandwidth	Resolution	Comments
(MHz)	(MHz)	(kHz)	
1237.0	1250	30	

Output Plot



Input Plot



Client: Repeater Technologies

Job Number: J46669

Model: RC19-2X15

T-Log Number: T46670

Contact: Frank Bidwell

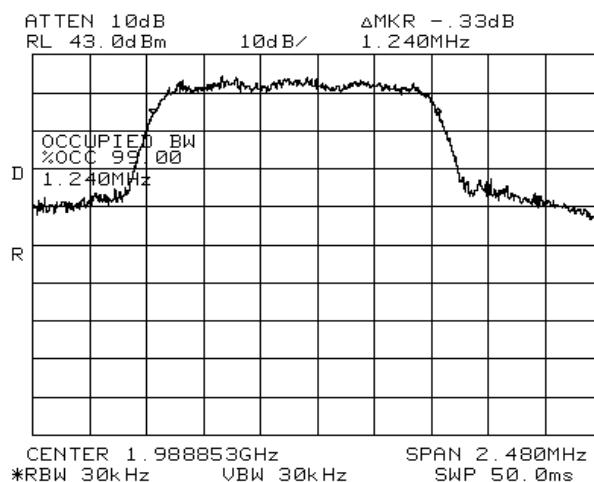
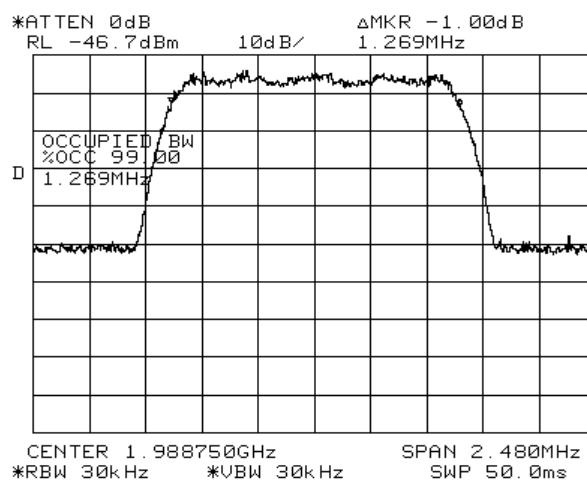
Proj Eng: David Bare

Spec: FCC 24E &amp; IC-RSS133

Class: N/A

**Run #2: Occupied Bandwidth (Base forward); High Block C**

Measured Value	Specified Bandwidth	Resolution	Comments
(MHz)	(MHz)	(kHz)	
1240	1250	30	

**Output Plot**

**Input Plot**


Client: Repeater Technologies

Job Number: J46669

Model: RC19-2X15

T-Log Number: T46670

Contact: Frank Bidwell

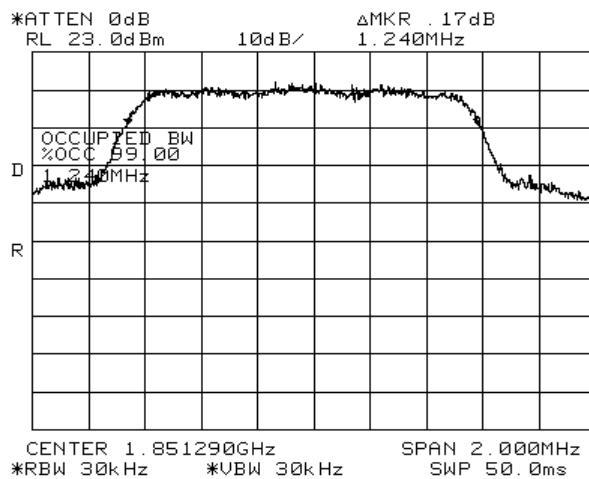
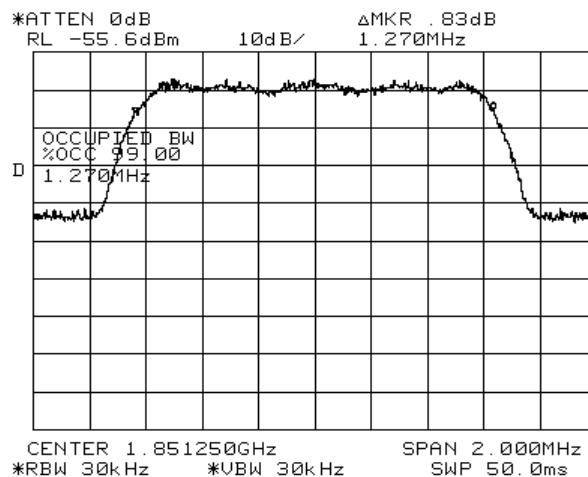
Proj Eng: David Bare

Spec: FCC 24E &amp; IC-RSS133

Class: N/A

**Run #3: Occupied Bandwidth (Mobile Reverse); Low Block A**

Measured Value	Specified Bandwidth	Resolution	Comments
(MHz)	(MHz)	(kHz)	
1240	1250	30	

**Output Plot**

**Input Plot**


Client: Repeater Technologies

Job Number: J46669

Model: RC19-2X15

T-Log Number: T46670

Contact: Frank Bidwell

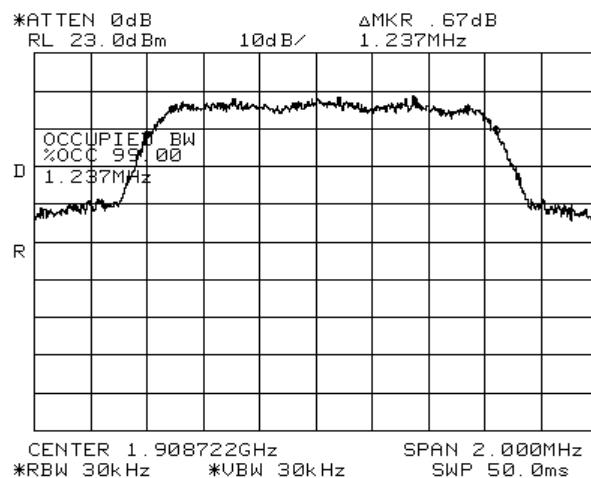
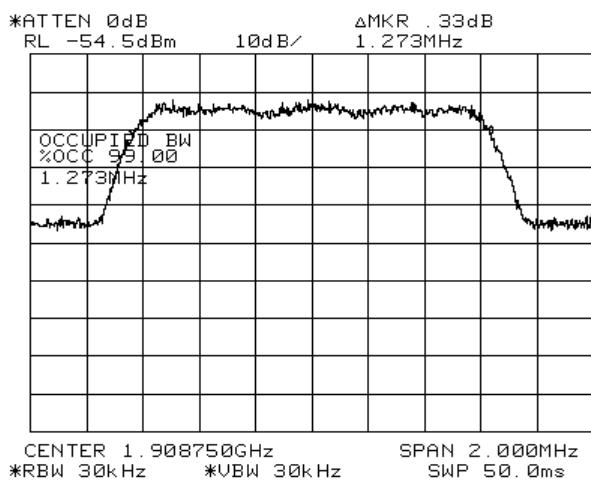
Proj Eng: David Bare

Spec: FCC 24E &amp; IC-RSS133

Class: N/A

**Run #4: Occupied Bandwidth (Mobile Reverse); High Block C**

Measured Value	Specified Bandwidth	Resolution	Comments
(MHz)	(MHz)	(kHz)	
1237	1250	30	

**Output Plot**

**Input Plot**




## *EMC Test Data*

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		Proj Eng:	David Bare
Contact:	Frank Bidwell		
Spec:	FCC 24E & IC-RSS133	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: 3/25/2002

Config. Used: 1

Test Engineer: jmartinez

Config Change: None

Test Location: SVOATS #4

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 50-dB attenuator was used between the EUT and Test Receiver.

### Ambient Conditions:

Temperature: 22°C

Rel. Humidity: 49%

## Summary of Results

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

### 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.



## EMC Test Data

Client: Repeater Technologies

Job Number: J46669

Model: RC19-2X15

T-Log Number: T46670

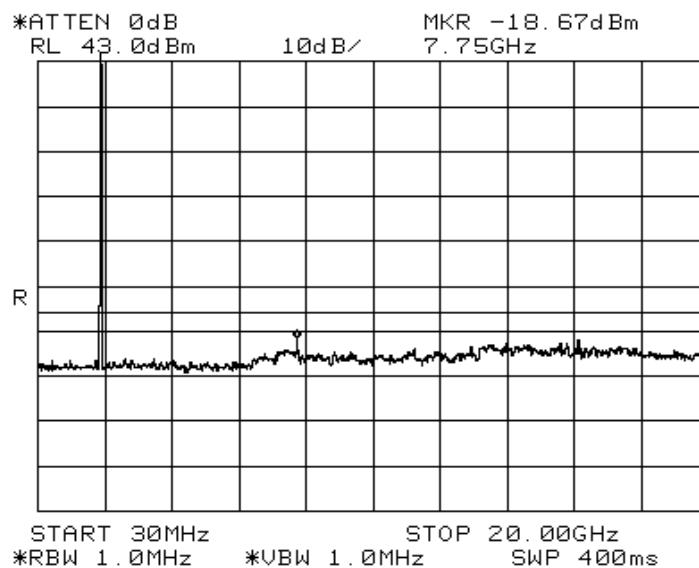
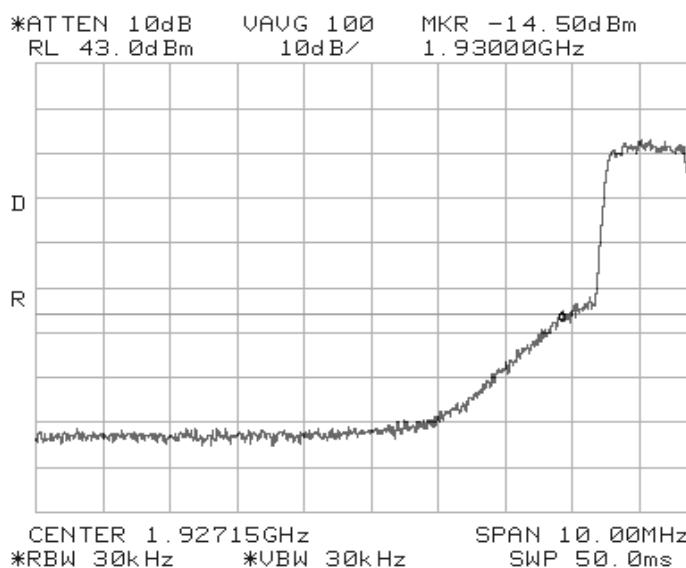
Contact: Frank Bidwell

Proj Eng: David Bare

Spec: FCC 24E & IC-RSS133

Class: N/A

### Run #1: Bandedge Measurement & Out-Of-Band emissions; (Base forward Channel 1); Low Block A





## EMC Test Data

Client: Repeater Technologies

Job Number: J46669

Model: RC19-2X15

T-Log Number: T46670

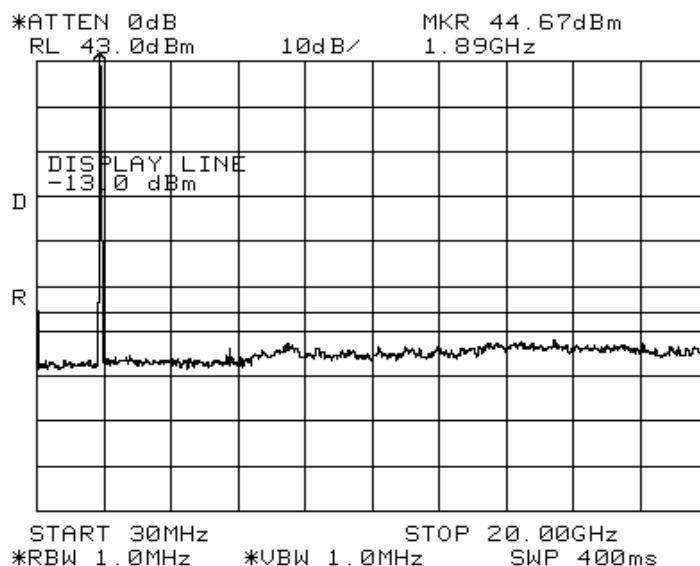
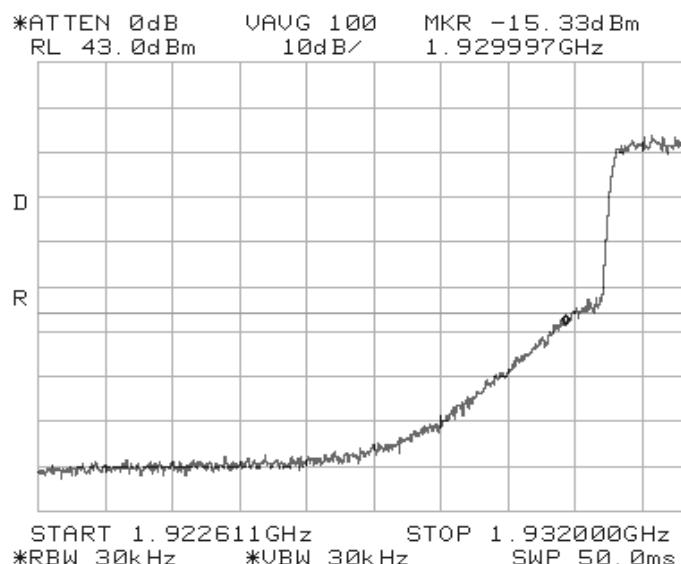
Contact: Frank Bidwell

Proj Eng: David Bare

Spec: FCC 24E & IC-RSS133

Class: N/A

### Run #2: Bandedge Measurement & Out-Of-Band emissions; (Base forward Channel 2); Low Block A





## EMC Test Data

Client: Repeater Technologies

Job Number: J46669

Model: RC19-2X15

T-Log Number: T46670

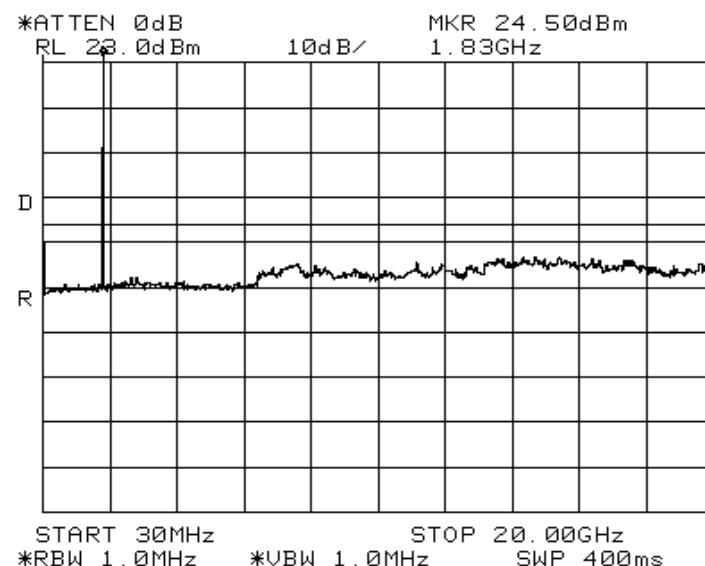
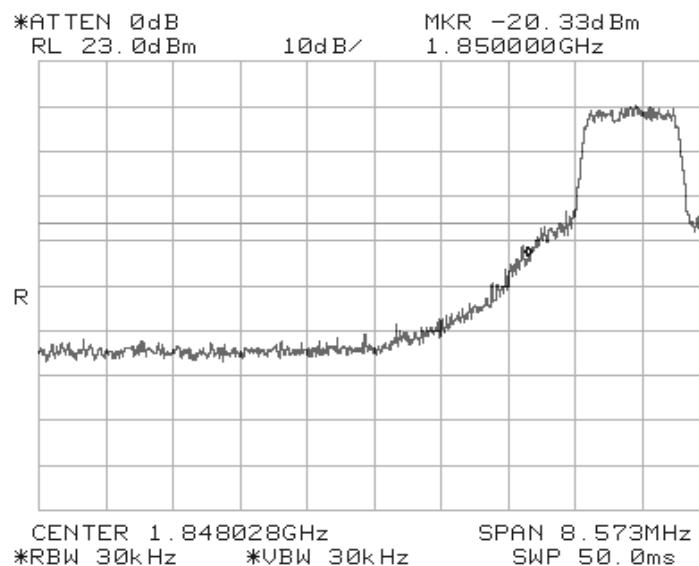
Contact: Frank Bidwell

Proj Eng: David Bare

Spec: FCC 24E & IC-RSS133

Class: N/A

### Run #3: Bandedge Measurement & Out-Of-Band emissions; (Mobile Reverse Channel 1); Low Block A

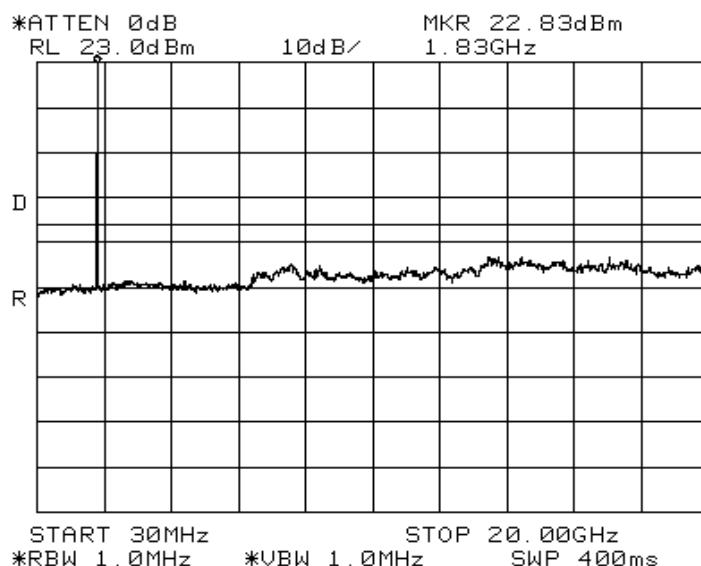
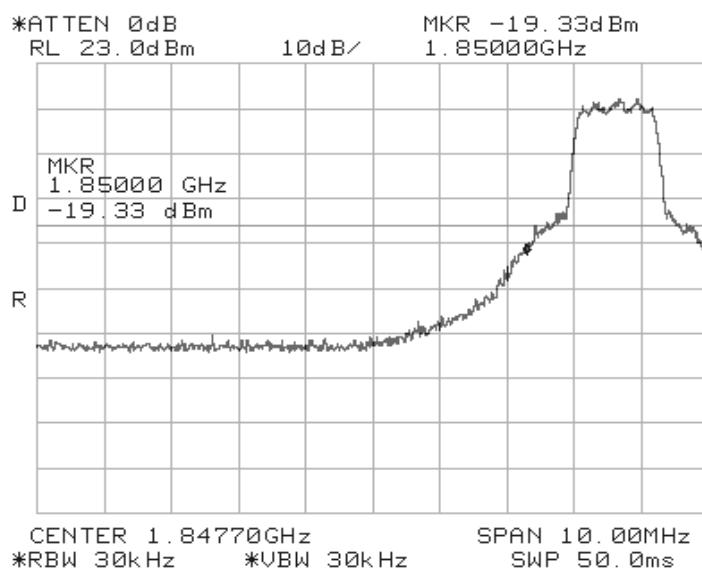




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Client:	Repeater Technologies	Job Number:	J46669
Model:	RC19-2X15	T-Log Number:	T46670
		Proj Eng:	David Bare
Contact:	Frank Bidwell		
Spec:	FCC 24E & IC-RSS133	Class:	N/A

Run #4: Bandedge Measurement & Out-Of-Band emissions; (Mobile Reverse Channel 2); Low Block A





## EMC Test Data

Client: Repeater Technologies

Job Number: J46669

Model: RC19-2X15

T-Log Number: T46670

Contact: Frank Bidwell

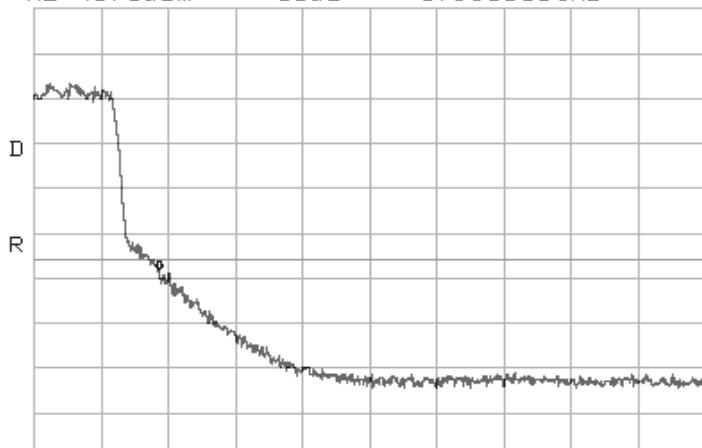
Proj Eng: David Bare

Spec: FCC 24E & IC-RSS133

Class: N/A

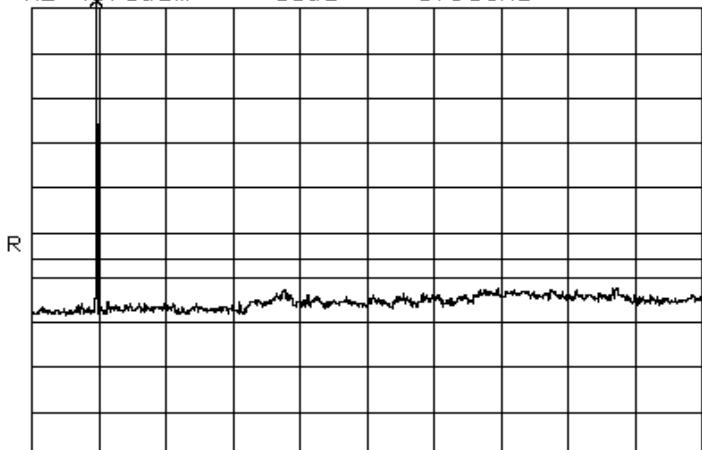
### Run #5: Bandedge Measurement & Out-Of-Band emissions; (Base forward Channel 1); High Block C

ATTEN 10dB VAVG 100 MKR -15.17dBm  
RL 43.0dBm 10dB/ 1.990005GHz



START 1.988225GHz STOP 1.997762GHz  
\*RBW 30kHz VBW 30kHz SWP 50.0ms

\*ATTEN 0dB MKR 44.67dBm  
RL 43.0dBm 10dB/ 1.96GHz



START 30MHz STOP 20.00GHz  
\*RBW 1.0MHz \*VBW 1.0MHz SWP 400ms



## EMC Test Data

Client: Repeater Technologies

Job Number: J46669

Model: RC19-2X15

T-Log Number: T46670

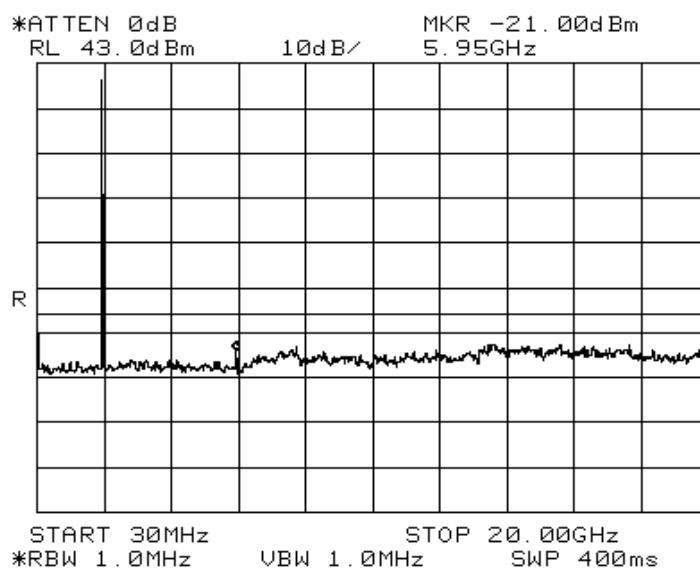
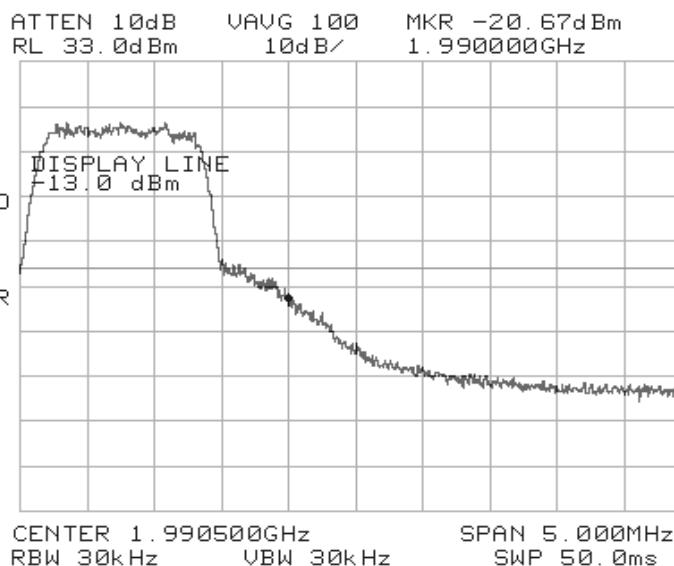
Contact: Frank Bidwell

Proj Eng: David Bare

Spec: FCC 24E & IC-RSS133

Class: N/A

### Run #6: Bandedge Measurement & Out-Of-Band emissions; (Base forward Channel 2); High Block C





## EMC Test Data

Client: Repeater Technologies

Job Number: J46669

Model: RC19-2X15

T-Log Number: T46670

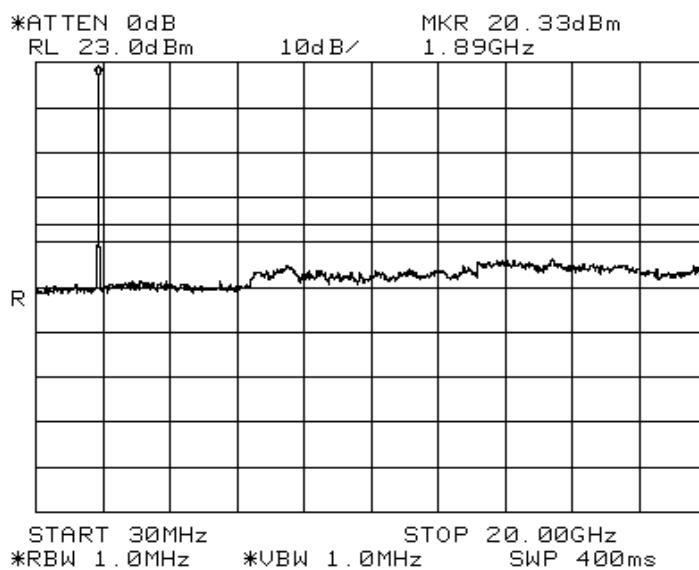
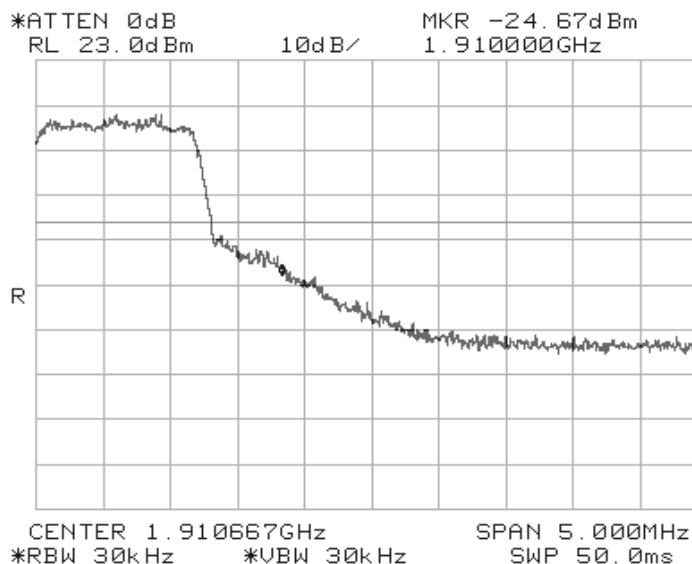
Contact: Frank Bidwell

Proj Eng: David Bare

Spec: FCC 24E & IC-RSS133

Class: N/A

### Run #7: Bandedge Measurement & Out-Of-Band emissions; (Mobile Reverse Channel 1); High Block C

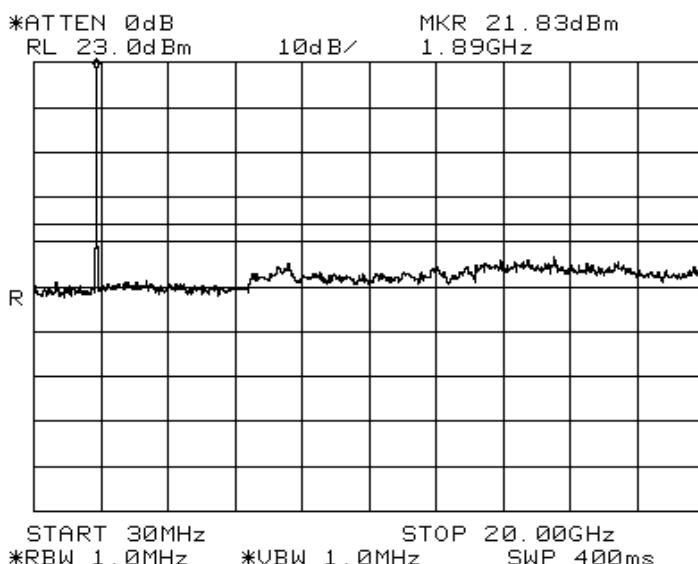
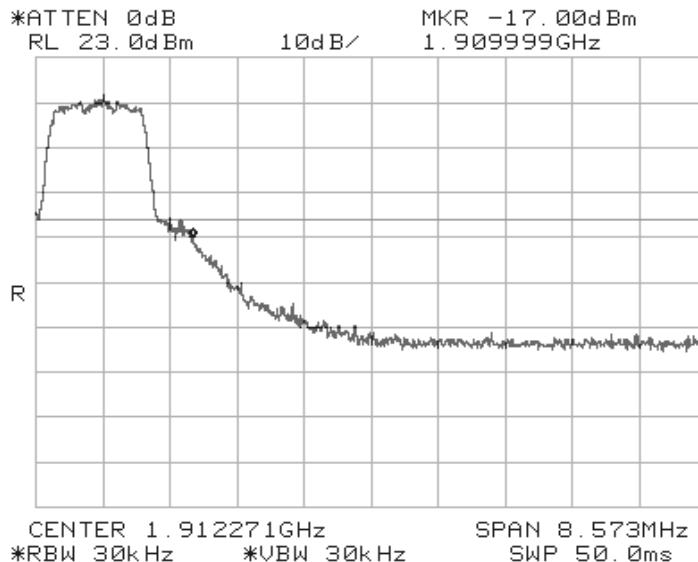




## *EMC Test Data*

Client:	Repeater Technologies	Job Number:	J46669
Model:	RC19-2X15	T-Log Number:	T46670
		Proj Eng:	David Bare
Contact:	Frank Bidwell		
Spec:	FCC 24E & IC-RSS133	Class:	N/A

Run #8: Bandedge Measurement & Out-Of-Band emissions; (Mobile Reverse Channel 2); High Block C





## EMC Test Data

Client:	Repeater Technologies	Job Number:	J46669
Model:	RC19-2X15	T-Log Number:	T46670
		Proj Eng:	David Bare
Contact:	Frank Bidwell		
Spec:	FCC 24E & IC-RSS133	Class:	N/A

## Section 2.1053 & RSS-133 (6.3): Field strength 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: 3/25/2002

Config. Used: 1

Test Engineer: jmartinez

Config Change: None

Test Location: SVOATS #4

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 substitution was performed. Substitution Method is not required for Spurious emissions 20-dB below the calculated field strength limit.

### Ambient Conditions:

Temperature: 22°C

Rel. Humidity: 49%

### 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	-25.67dB @ 11625MHz

### 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.



## EMC Test Data

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		Proj Eng:	David Bare
Contact:	Frank Bidwell		
Spec:	FCC 24E & IC-RSS133	Class:	N/A

### Run #1: Maximized readings, 1000 - 19000 MHz

Harmonic measurements of the Fundamental Frequency of 1937.5 MHz (Block A).

Power set to Maximum.		24.238(a)		Detector	Azimuth	Height	Comments
Frequency MHz	Level dB $\mu$ V/m	Pol v/h	Limit	Margin	Pk/QP/Avg	degrees	meters
11625.00	58.5	H	84.2	-25.7	Avg	0	1.4
9687.00	57.7	H	84.2	-26.5	Avg	33	1.4
7750.000	57.4	H	84.2	-26.8	Avg	248	1.4
7750.000	55.9	V	84.2	-28.3	Avg	45	1.5
9687.00	53.9	V	84.2	-30.3	Avg	0	1.4
11625.00	53.4	V	84.2	-30.8	Avg	59	1.5
3875.000	47.0	V	84.2	-37.2	Avg	0	1.6
5812.500	46.7	V	84.2	-37.5	Avg	19	1.6
5812.500	46.5	H	84.2	-37.7	Avg	43	1.3
3875.000	43.2	H	84.2	-41.0	Avg	0	1.4

Note 1: No other emission detected, within 20-dB of the limit, beyond the 6th harmonic.

Note 2: Substitution was not performed since the measured field strength is 20-dB below the limit.

### Run #2: Maximized readings, 1000 - 19000 MHz

Harmonic measurements of the Fundamental Frequency of 1937.5 MHz (Block C).

Power set to Maximum.		24.238(a)		Detector	Azimuth	Height	Comments
Frequency MHz	Level dB $\mu$ V/m	Pol v/h	Limit	Margin	Pk/QP/Avg	degrees	meters
11898.00	57.4	v	84.2	-26.8	Avg	0	1.5
7931.000	56.5	v	84.2	-27.7	Avg	45	1.5
7931.000	55.4	h	84.2	-28.8	Avg	354	1.0
9914.00	52.2	v	84.2	-32.0	Avg	0	1.5
3964.000	45.4	v	84.2	-38.8	Avg	0	1.5
5948.000	40.4	h	84.2	-43.8	Avg	53	1.0
5948.000	40.2	v	84.2	-44.0	Avg	218	1.5
9914.00	21.3	h	84.2	-62.9	Avg	0	1.0
3964.000	47.5	h	84.2	-36.7	Avg	12	1.5
11898.00	53.2	h	84.2	-31.0	Avg	0	1.0

Note 1: No other emission detected, within 20-dB of the limit, beyond the 6th harmonic.

Note 2: Substitution was not performed since the measured field strength is 20-dB below the limit.



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		Proj Eng:	David Bare
Contact:	Frank Bidwell		
Spec:	FCC 24E & IC-RSS133	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: Environmental Chamber

EUT Voltage:

#### General Test Configuration

EUT was placed 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 degrees per temperature and let unit stabilize for every temperature.

Voltage stability was done at 20 degrees Celsius. For battery operated units decrease DC voltage until battery end-point was found.

Voltage stability was done at 20 degrees Celsius. For AC operated units varied voltage at 85% and 115% of the nominal 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 & RSS-133 (7)		refer to notes
2a	Voltage Vs. Frequency	24.235 & RSS-133 (7)		refer to notes

#### 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.



## EMC Test Data

Client:	Repeater Technologies	Job Number:	J46669
Model:	RC19-2X15	T-Log Number:	T46670
		Proj Eng:	David Bare
Contact:	Frank Bidwell		
Spec:	FCC 24E & IC-RSS133	Class:	N/A

### Frequency Stability:

+/- 2 ppm reference clock used by the Repeater.

FCC 24.235 & RSS-133 (7) states: "The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block."

The carrier is 1.25 MHz wide centered at these frequencies (Forward: 1931.25 to 1988.75 MHz; Reverse: 1851.25 to 1908.75 MHz). IE 1931.25 MHz would have the fc centered at 1931.25 MHz with a band width of 1.25Mhz or 1930 to 1932.5 MHz. This provides a guard band of 1.25 MHz (1931.25 MHz - 1930 MHz).

The RC19-2X15 is designed with a +/- 2-ppm XTAL over temperature. Based on the tolerance of the XTAL and the 1.25 MHz guard band for both 1930 and 1990 MHz, bandedges, the device will maintain emissions within the PCS bands under normal operating conditions.