FCC/IC Test Report

FOR:

Model Name: Ranger 4 EVDO

Rugged and compact vehicular computer connecting the fleet and the office, supports voice and data, automatic vehicle location, e-work orders and vehicle telemetry

FCC ID: RZ3RAN45728
IC ID: 2234A-RAN45728

47 CFR Part 2, 22, 24

RSS-132 Issue 2

RSS-133 Issue 5

TEST REPORT #: EMC_MENTO_003_10004_FCC22_24EVDO_Rev1
DATE: 2012-03-28

ACCREDITED
TESTING LABORATORY
Certificate #2135.01

Bluetooth Qualification Test Facility (BQTF)

CTIA Authorized Test Lab
LAB CODE 20020328-00

FCC listed: A2LA Accredited

IC recognized # 3462B-1

***CETECOM* Inc.**
411 Dixon Landing Road ◆ Milpitas, CA 95035 ◆ U.S.A.
Phone: + 1 (408) 586 6200 ◆ Fax: + 1 (408) 586 6299 ◆ E-mail: info@cetecomusa.com ◆ http://www.cetecom.com
CETECOM Inc. is a Delaware Corporation with Corporation number: 2113686

Table of Contents

1 Assessment

The following device was tested against the applicable criteria specified in FCC rules Parts 2, 22 and 24 of Title 47 of the Code of Federal Regulations and Industry Canada Standards RSS 132 and RSS 133 and no deviations were ascertained during the course of the tests performed.

Company	Description	Model #
Mentor Engineering Inc.	**Rugged and compact vehicular computer, connecting the fleet and the office, supports voice and data, automatic vehicle location,e-work orders and vehicle telemetry**	**Ranger 4 EVDO**

Responsible for Testing Laboratory:

Date	Section	Name	Signature
2012-03-28	Compliance	Sajay Jose (EMC Lab Manager)	Sajay Jose 2012.03.28 13:51:39 -07'00'

Responsible for the Report:

Date	Section	Name	Signature
2012-03-28	Compliance	Josie Sabado (Project Engineer)	

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the EMC Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Address:	411 Dixon Landing Road Milpitas, CA 95035 U.S.A.
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
Test Lab Director:	Heiko Strehlow
Responsible Project Leader:	Satya Radhakrishna

2.2 Identification of the Client

Applicant's Name:	Mentor Engineering Inc.
Street Address:	10, 2175 - 29th St NE
City/Zip Code	Calgary, Alberta /T1Y 7H8
Country	Canada
Contact Person:	Dominic Pituch
Phone No.	403-777-3760 x289
Fax:	403-777-3769
e-mail:	dpituch@mentoreng.com

2.3 Identification of the Manufacturer

Same as above.

3 Equipment under Test (EUT)

3.1 Specification of the Equipment under Test

Marketing Name:	Ranger 4.0
Model No:	Ranger 4 EVDO
Product Type:	Rugged and compact vehicular computer, connecting the fleet and the office, supports voice and data, automatic vehicle location, e-work orders and vehicle telemetry
Hardware Revision :	4
Software Revision :	1.02
FCC-ID:	RZ3RAN45728
IC-ID :	2234A-RAN45728
Frequency:	Cellular US CDMA: 824.70-848.31 MHz PCS CDMA: 1851.25- 1908.75 MHz
Antenna Type:	Monopole Printed Trace Antenna
Power Supply:	12 Vdc ; Car battery
Temperature Range:	-40ºC to 85ºC

3.2 Identification of the Equipment Under Test (EUT)

EUT #	Model No.	HW Version	SW Version	Serial Number
1	Ranger 4 EVDO	4	1.02	31-11100024

3.3 Identification of Accessory equipment

AE #	Type	Manufacturer	Model	Serial Number
1	DC power cable	Mentor Engineering Inc.	4-CAS-CGRDMMLX18-31	PO.00009069-2

4 Subject of Investigation

The objective of the measurements done by Cetecom Inc. was to measure the performance of the EUT as specified by requirements listed in the following test standards:

- 47 CFR Part 2: Title 47 of the Code of Federal Regulations: Chapter I-Federal Communications Commission Frequency allocations and radio treaty matters; general rules and regulations.
- 47 CFR Part 22: Title 47 of the Code of Federal Regulations: Chapter I-Federal Communications Commission subchapter B- common carrier services; Part 22- Public mobile services
- 47 CFR Part 24: Title 47 of the Code of Federal Regulations: Chapter I-Federal Communications Commission subchapter B- common carrier services; Part 24- Personal communication services
- RSS 132- Issue 2: Spectrum management and telecommunication policy- Radio Standards Specifications Cellular telephones employing new technologies operating in the bands 824-849MHz and 869-894MHz
- RSS 133- Issue 5: Spectrum management and telecommunication policy- Radio Standards Specifications- 2GHz personal communication services

This test report is to support a request for new equipment authorization under the FCC ID RZ3RAN45728 and IC ID 2234A-RAN45728. All testing was performed on the product referred to in Section 3 as EUT.

The EUT uses Sierra Wireless's, FCC certified MC5728V module (FCC ID: N7N-MC5728). All conducted test data other than output power for this module is obtained from the module test report # 08U12326-1C. Output power was measured at Cetecom Inc. for verification purposes.

Summary of Measurement Results

850 Band:

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §22.913 (a) RSS132 4.4	RF Output Power	Nominal	CDMA 850	■	☐	☐	☐	Complies
			EVDO 850	■	☐	☐	☐	Complies
§2.1055 §22.355 RSS132 4.3	Frequency Stability	Nominal	CDMA 850	☐	☐	☐	■	Complies*
			EVDO 850	☐	☐	☐	■	Complies*
§2.1049 §22.917(b) RSS132 4.2	Occupied Bandwidth	Nominal	CDMA 850	☐	☐	☐	■	Complies*
			EVDO 850	☐	☐	☐	■	Complies*
§2.1051 §22.917 RSS132 4.5	Band Edge Compliance	Nominal	CDMA 850	☐	☐	☐	■	Complies*
			EVDO 850	☐	☐	☐	■	Complies*
§2.1051 §22.917 RSS132 4.5	Conducted Spurious Emissions	Nominal	CDMA 850	☐	☐	☐	■	Complies*
			EVDO 850	☐	☐	☐	■	Complies*
§2.1053 §22.917 RSS132 4.5	Radiated Spurious Emissions	Nominal	CDMA 850	■	☐	☐	☐	Complies
			EVDO 850	■	☐	☐	☐	Complies

Note: NA= Not Applicable; NP= Not Performed.

1. Line Conducted Emissions not applicable since device is Vehicular DC powered.
2. *Frequency Stability, Occupied Bandwidth, Band Edge Compliance, Conducted Spurious Emissions are not performed. Please refer module conducted test report under FCC ID: N7N-MC5728. Report# 08U12326-1C.

1900 Band:

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §24.232 (a) RSS133 6.4	RF Output Power	Nominal	CDMA 1900	■	☐	☐	☐	Complies
			EVDO 1900	■	☐	☐	☐	Complies
§2.1055 §24.235 RSS133 6.3	Frequency Stability	Nominal	CDMA 1900	☐	☐	☐	■	Complies*
			EVDO 1900	☐	☐	☐	■	Complies*
§2.1049 §24.238(b) RSS133 6.2	Occupied Bandwidth	Nominal	CDMA 1900	☐	☐	☐	■	Complies*
			EVDO 1900	☐	☐	☐	■	Complies*
§2.1051 §24.238 RSS133 6.5	Band Edge Compliance	Nominal	CDMA 1900	☐	☐	☐	■	Complies*
			EVDO 1900	☐	☐	☐	■	Complies*
§2.1051 §24.238 RSS133 6.5	Conducted Spurious Emissions	Nominal	CDMA 1900	☐	☐	☐	■	Complies*
			EVDO 1900	☐	☐	☐	■	Complies*
§2.1053 §24.238 RSS133 6.5	Radiated Spurious Emissions	Nominal	CDMA 1900	■	☐	☐	☐	Complies
			EVDO 1900	■	☐	☐	☐	Complies

Note: NA= Not Applicable; NP= Not Performed.

1. Line Conducted Emissions not applicable since device is Vehicular DC powered.
2. *Frequency Stability, Occupied Bandwidth, Band Edge Compliance, Conducted Spurious Emissions are not performed. Please refer module conducted test report under FCC ID: N7N-MC5728. Report#08U12326-1C.

5 Measurements

5.1 RF Power Output

5.1.1 References

FCC: CFR Part 2.1046, CFR Part 22.913, CFR Part 24.232
IC: RSS-Gen Section 4.8; RSS 132 Section 4.4; RSS 133 Section 6.4

5.1.2 Measurement requirements:

5.1.2.1 FCC 2.1046: RF power output.

Power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on circuit elements as specified. The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

5.1.2.2 RSS-Gen 4.8: RF power output.

Transmitter output power measurements shall be carried out before the unwanted emissions test. The transmitter output power value, obtained from this test, serves as the reference level used to determine the unwanted emissions.

5.1.3 Limits:

5.1.3.1 FCC 22.913 (a) Effective radiated power limits.

The effective radiated power (ERP) of mobile transmitters must not exceed 7 Watts.

5.1.3.2 FCC 24.232 (b)(c) Power limits.

(b) Mobile/portable stations are limited to 2 Watts effective isotropic radiated power (EIRP).
(c) Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms equivalent voltage. The measurement results shall be properly adjusted for any limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement over the full bandwidth of the channel.

5.1.3.3 RSS-132 Section 4.4

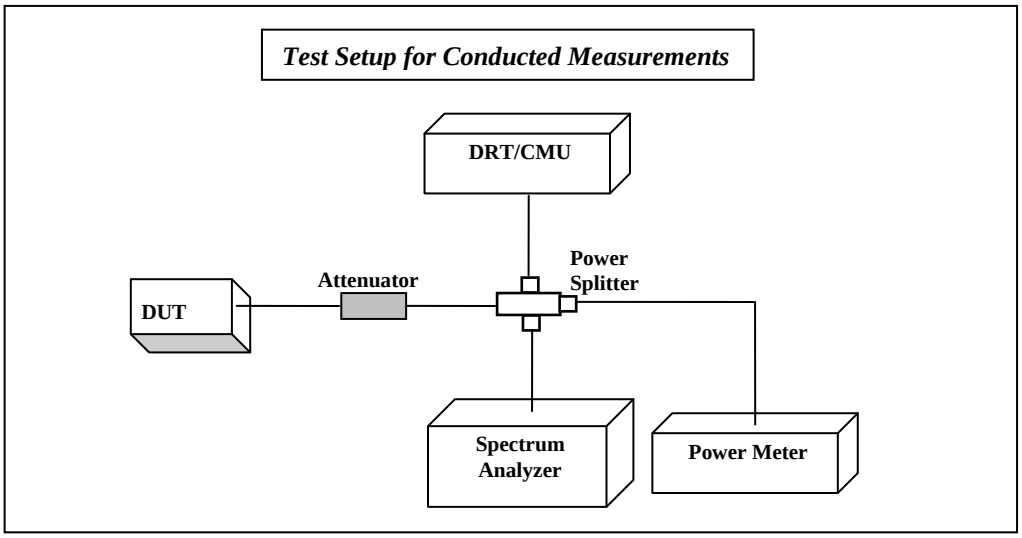
The transmitter output power shall not exceed the limits given in SRSP-503.
SRSP-503: The maximum EIRP shall be 11.5W for mobile stations.

5.1.3.4 RSS-133 Section 6.4

The average equivalent isotropically radiated power (e.i.r.p.) for transmitters shall not exceed the limits given in SRSP-510.
SRSP-510: Mobile stations and hand-held portables are limited to 2 watts maximum e.i.r.p.
In addition, when the transmitter power is measured in terms of average value, the peak-to-average ratio of the power shall not exceed 13 dB.

5.2 Conducted Output Power Measurement procedure

Ref: TIA-603C 2004 2.2.1 Conducted Carrier Output Power Rating

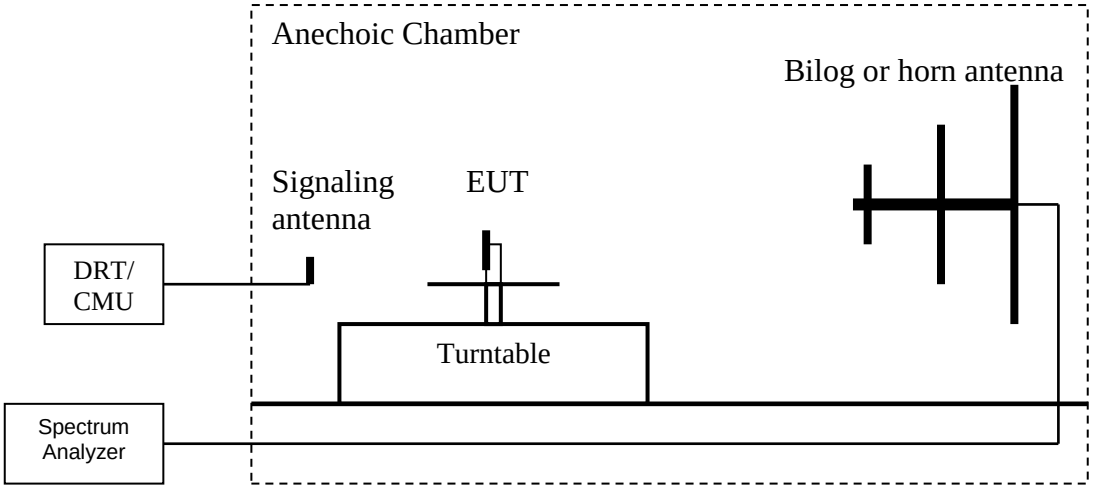


1. Connect the equipment as shown in the above diagram. A Digital Radio Communication Tester (DRT- CMU200 here) is used to enable the EUT to transmit and to measure the output power.
2. Adjust the settings of the DRT to set the EUT to its maximum power at the required channel.
3. Record the output power level measured by the DRT.
4. Correct the measured level for all losses in the RF path.
5. Measurements are to be performed with the EUT set to the low, middle and high channel of each frequency band.

Spectrum Analyzer Settings:
CDMA: RBW/VBW=3MHz; Span=10MHz; Detector: Peak- Max Hold; Sweep time: Auto.
Average measurements performed using RMS detector functionality of the Spectrum Analyzer.
Worst case configuration is tested with RC3/SO55 with ”All Up“ Power Control Bits.

5.3 Radiated Output Power Measurement procedure

Ref: TIA-603C 2004 -2.2.17.2 Effective Radiated Power (ERP) or Effective Isotropic Radiated Power (EIRP)



1. Connect the equipment as shown in the above diagram with the EUT's antenna in center of the turn table.
2. Adjust the settings of the Digital Radio Communication Tester (DRT) to set the EUT to its maximum power at the required channel.
3. Set the spectrum analyzer to the channel frequency. Set the analyzer to measure peak hold with the required settings.
4. Rotate the EUT 360°. Record the peak level in dBm (**LVL**).
5. Replace the EUT with a vertically polarized half wave dipole or known gain antenna. The center of the antenna should be at the same location as the center of the EUT's antenna.
6. Connect the antenna to a signal generator with known output power and record the path loss in dB (**LOSS)**. **LOSS** = Generator Output Power (dBm) – Analyzer reading (dBm).
7. Determine the ERP using the following equation:
   ERP (dBm) = **LVL** (dBm) + **LOSS** (dB)
8. Determine the EIRP using the following equation:
   EIRP (dBm) = **ERP** (dBm) + 2.14 (dB)
9. Measurements are to be performed with the EUT set to the low, middle and high channel of each frequency band.

Spectrum analyzer settings: RBW=VBW=1MHz

(**Note:** Steps 5 and 6 above are performed prior to testing and **LOSS** is recorded by test software. Steps 3, 4, 7 and 8 above are performed with test software.)

5.4 Sample Calculations for Radiated Measurements

5.4.1 Field Strength Measurements:

Field Strength measurements are directly taken from the Spectrum Analyzer/ Receiver, taking into account the cable loss between the Receiving Antenna and the Spectrum Analyzer/ Receiver. Antenna Factor is accounted for by the test SW.

FS (dBµV/m)= Measured Value on SA (dBµV)+ Cable Loss (dB)
Eg:

Frequency (MHz)	Measured SA (dBµV)	Cable Loss (dB)	Field Strength Result (dBµV/m)
1000	95.5	3.5	99.0

5.4.2 Power Measurements using Substitution Procedure:

The measurement on the Spectrum Analyzer is used as a basis for the Substitution procedure.
The EUT is replaced with a Signal Generator and an antenna. The setting on the Signal Generator is varied until the Spectrum Analyzer displays the original reading. EIRP is calculated as-

EIRP (dBm)= Signal Generator setting (dBm)- Cable Loss (dB)+ Antenna Gain (dBi)
Eg:

Frequency (MHz)	Measured SA (dBµV)	Signal Generator setting (dBm)	Antenna Gain (dBi)	Dipole Gain (dBd)	Cable Loss (dB)	EIRP (dBm)
1000	95.5	24.5	6.5	0	3.5	27.5

5.5 RF Power Output 850MHz band

Limit: FCC: Nominal Peak Output Power < 38.45 dBm (7W)
IC: Nominal Peak Output Power < 40.60 dBm (11.5W)
Measurement Uncertainty (Conducted): ±0.5 dB
Measurement Uncertainty (Radiated): ±3.0 dB

CDMA 850		
Frequency (MHz)	**Conducted Power Peak Power (dBm)**	**Radiated Power ERP (dBm)**
824.70	28.85	30.1
836.52	28.74	29.5
848.31	28.34	29.1

EVDO 850		
Frequency (MHz)	**Conducted Power Peak Power (dBm)**	**Radiated Power ERP (dBm)**
824.70	28.44	30.7
836.52	28.70	30.2
848.31	28.40	29.6

5.5.1 Measurement Result

Pass.

5.6 RF Power Output 1900MHz band

Limit: Nominal Peak Output Power < 33 dBm (2W)
PAR many not exceed 13dB
Measurement Uncertainty (Conducted): ±0.5 dB
Measurement Uncertainty (Radiated): ±3.0 dB

For the radiated power measurements in the PCS 1900 MHz band (FCC CFR47 24.232):

(d) Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of §24.51. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

(e) Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, *etc.* , so as to obtain a true peak measurement for the emission in question over the full bandwidth of the channel.

CDMA 1900		
Frequency (MHz)	**Conducted Peak Power (dBm)**	**Radiated Power EIRP RMS (dBm)**
1851.21	28.25	29.37
1880.0	28.23	26.33
1908.75	27.8	26.11

EVDO 1900		
Frequency (MHz)	**Conducted Peak Power (dBm)**	**Radiated Power EIRP RMS (dBm)**
1851.21	27.90	29.38
1880.0	28.23	26.04
1908.75	28.62	25.79

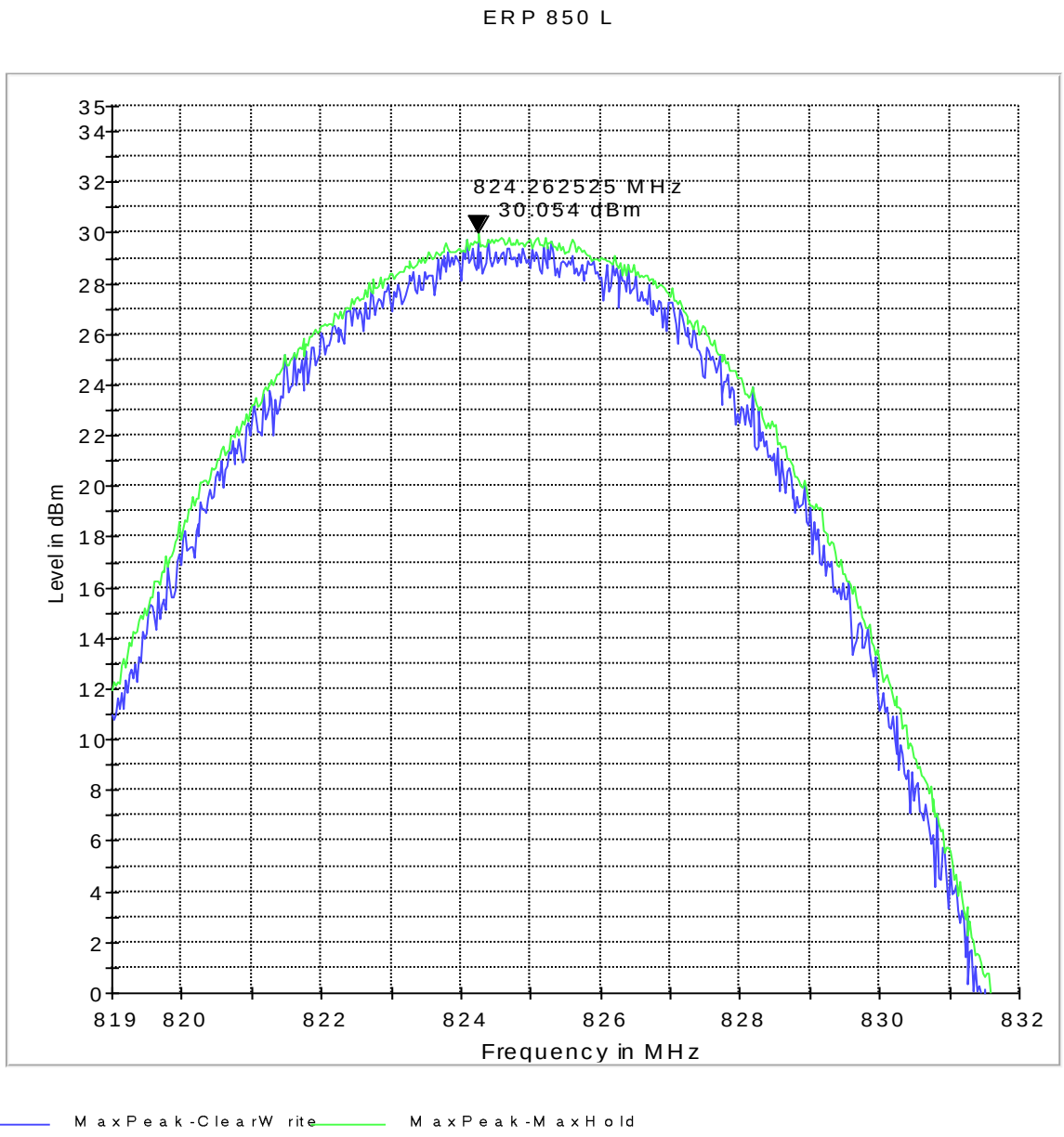
5.6.1 Measurement Result

Pass.

5.7 Results

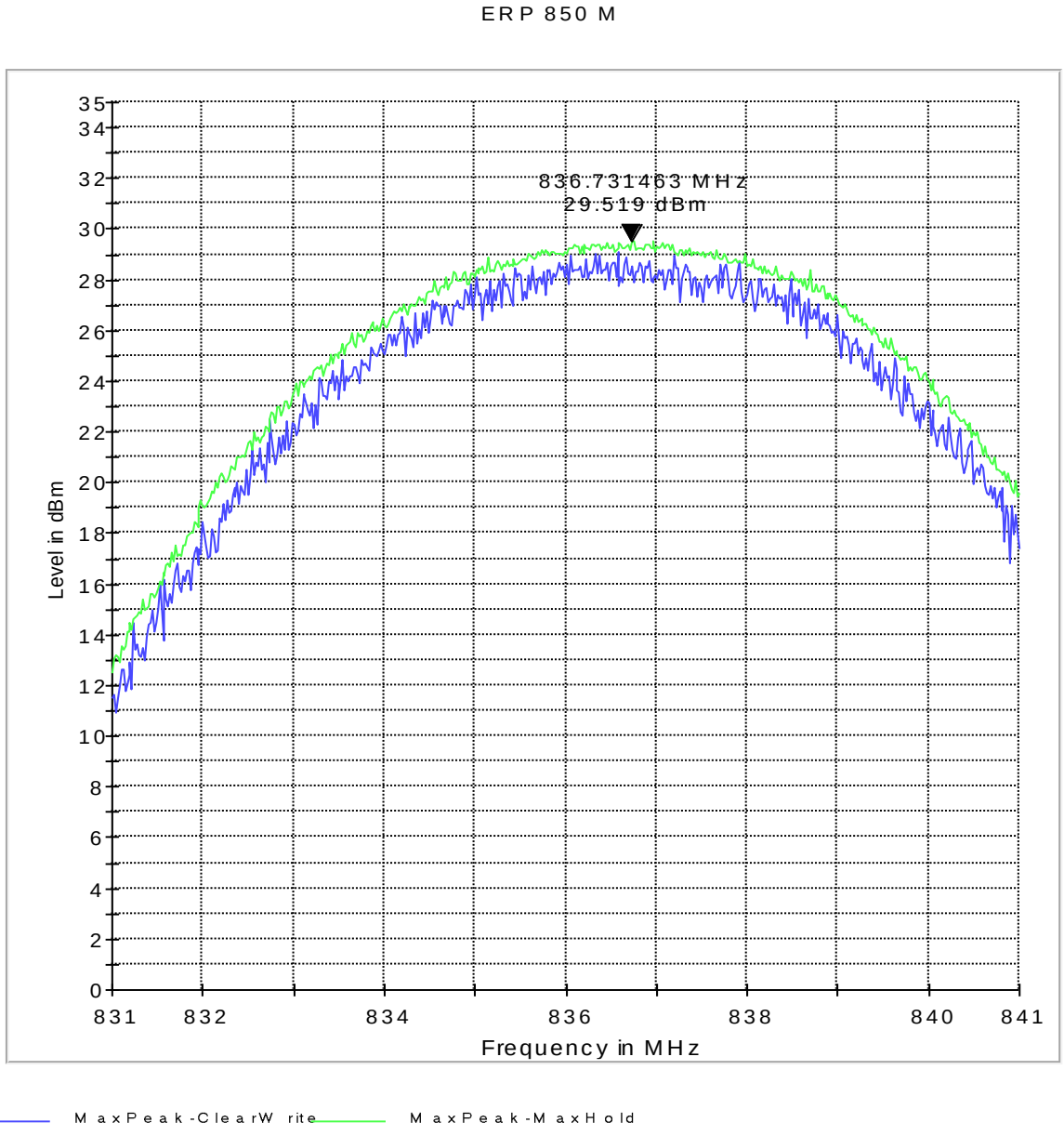
ERP (CDMA 850) CHANNEL 1013

EUT Name:	Ranger 4 EVDO
Manufacturer:	Mentor Engineering Inc.
Serial Number:	31-11100024
Comment:	12V; CDMA CELLULAR



ERP (CDMA 850) CHANNEL 384

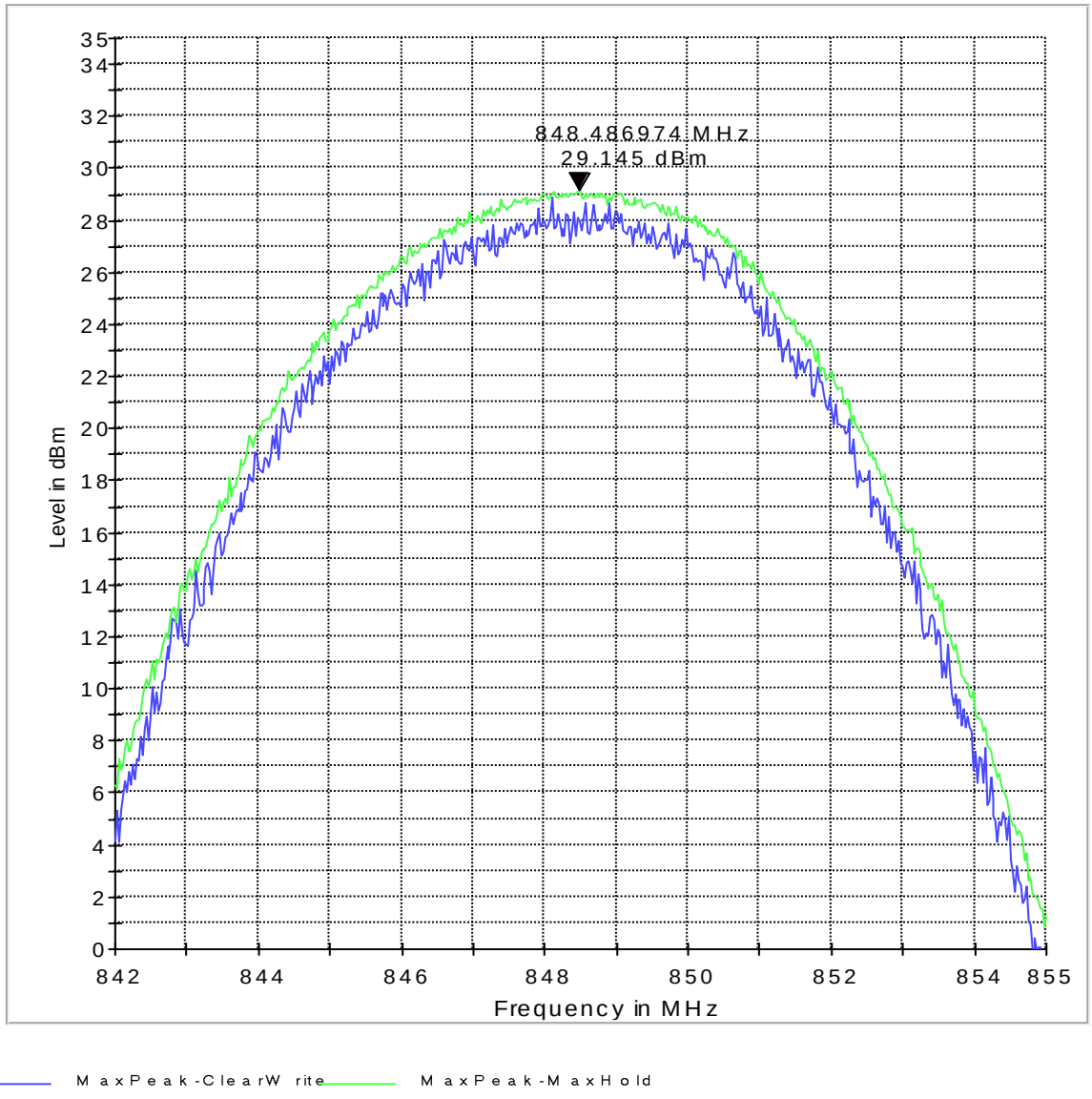
EUT Name:	Ranger 4 EVDO
Manufacturer:	Mentor Engineering Inc.
Serial Number:	31-11100024
Comment:	12v; CDMA CELLULAR



ERP (CDMA 850) CHANNEL 777

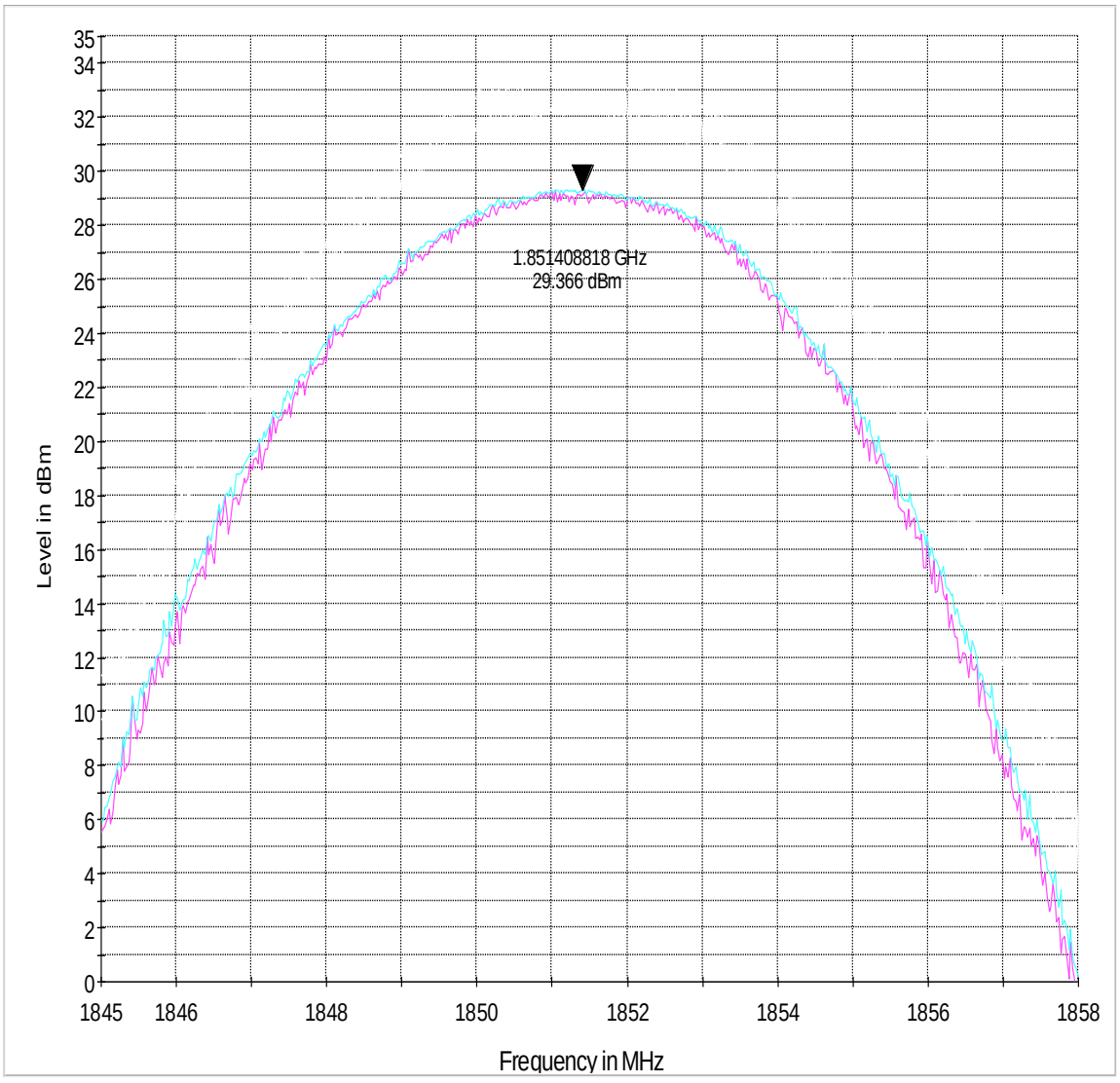
EUT Name:	Ranger 4 EVDO
Manufacturer:	Mentor Engineering Inc.
Serial Number:	31-11100024
Comment:	12v; CDMA CELLULAR

ERP 850 H



EIRP (CDMA-1900) CHANNEL 25

EUT Name:	Ranger 4 EVDO
Manufacturer:	Mentor Engineering Inc.
Serial Number:	31-11100024
Comment:	12v; CDMA PCS



EIRP (CDMA-1900) CHANNEL 600

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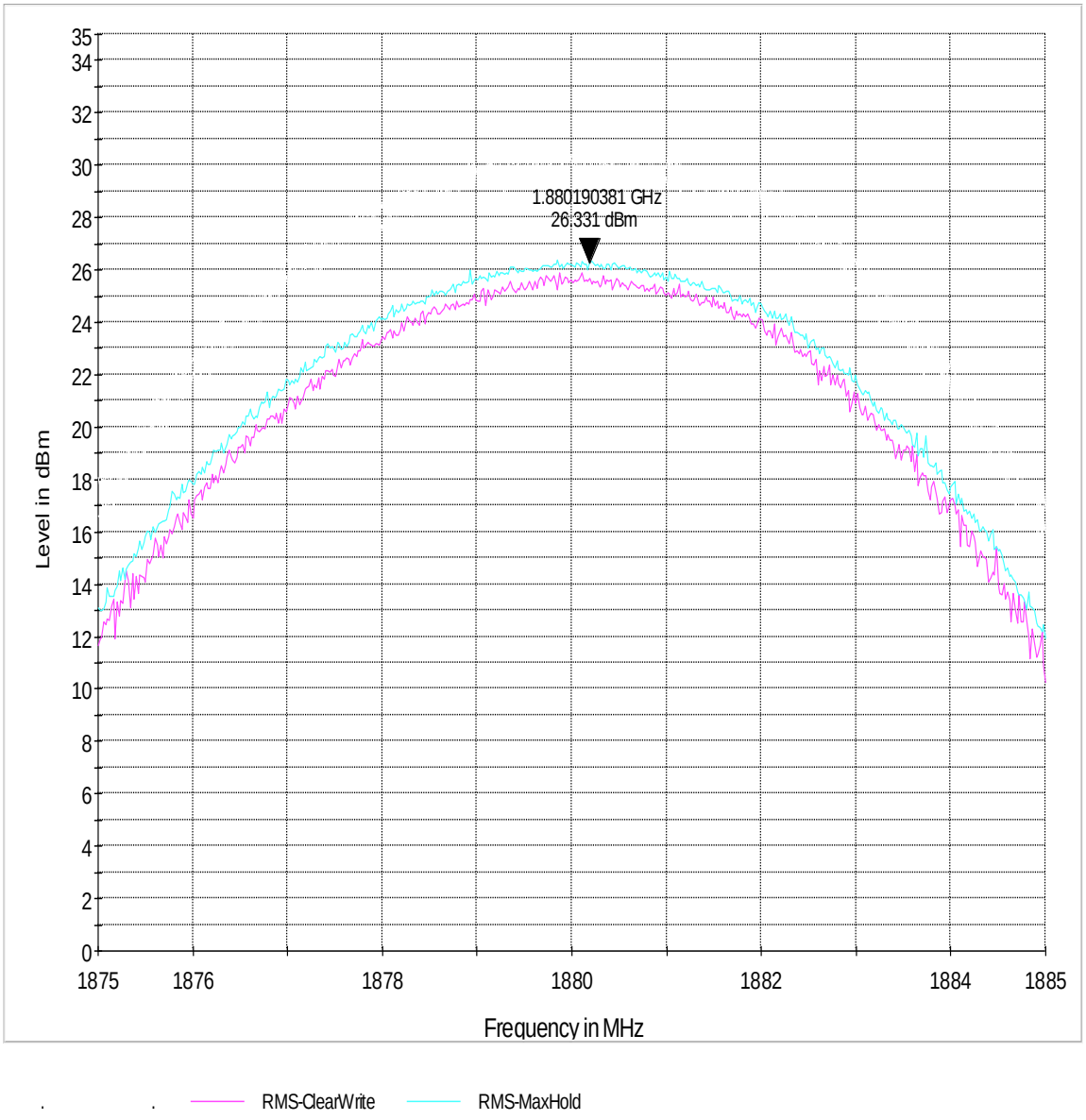
Manufacturer:	Mentor Engineering Inc.
Serial Number:	31-11100024
Comment:	12v; CDMA PCS



EIRP (CDMA-1900) CHANNEL 1175

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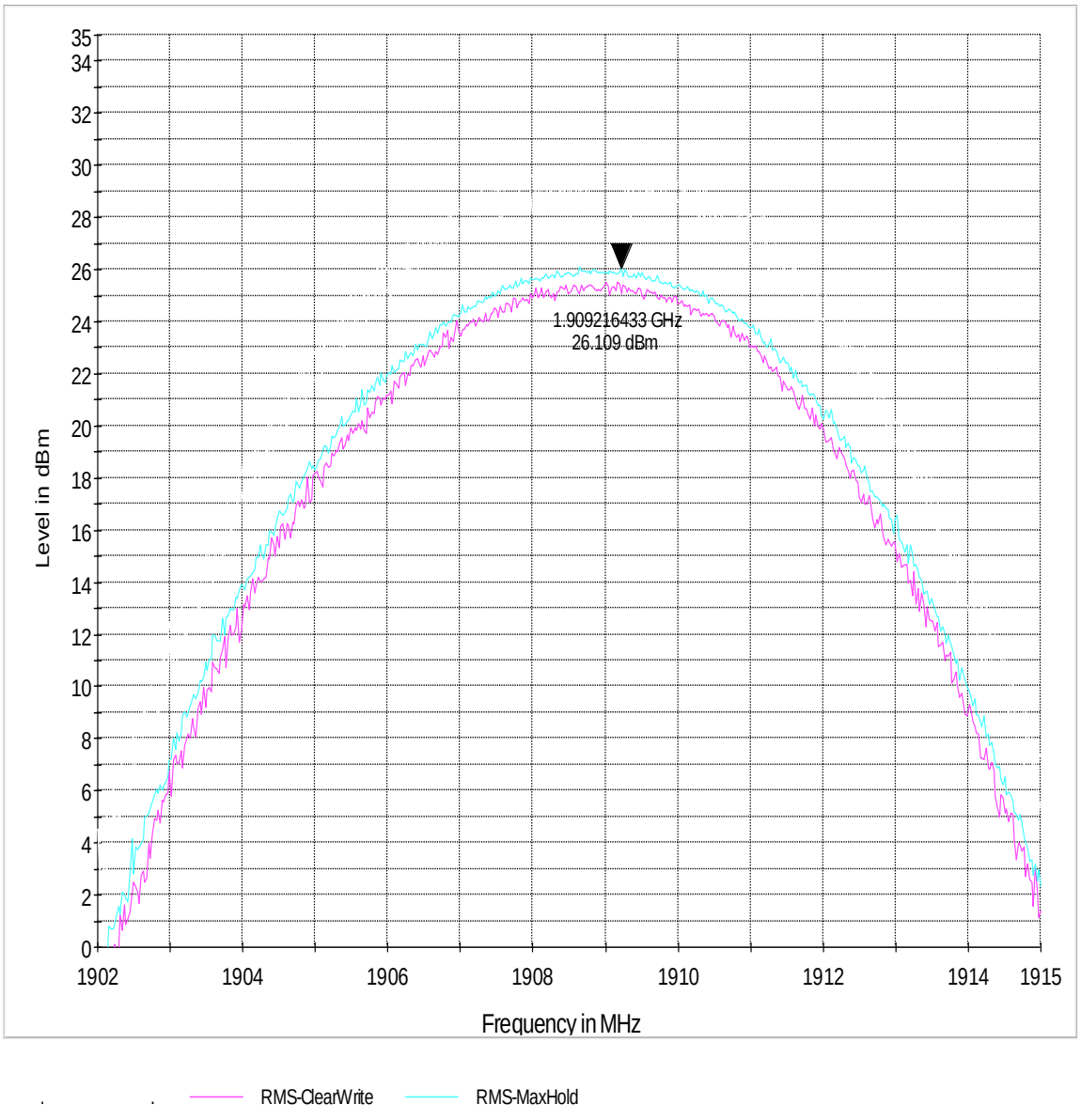
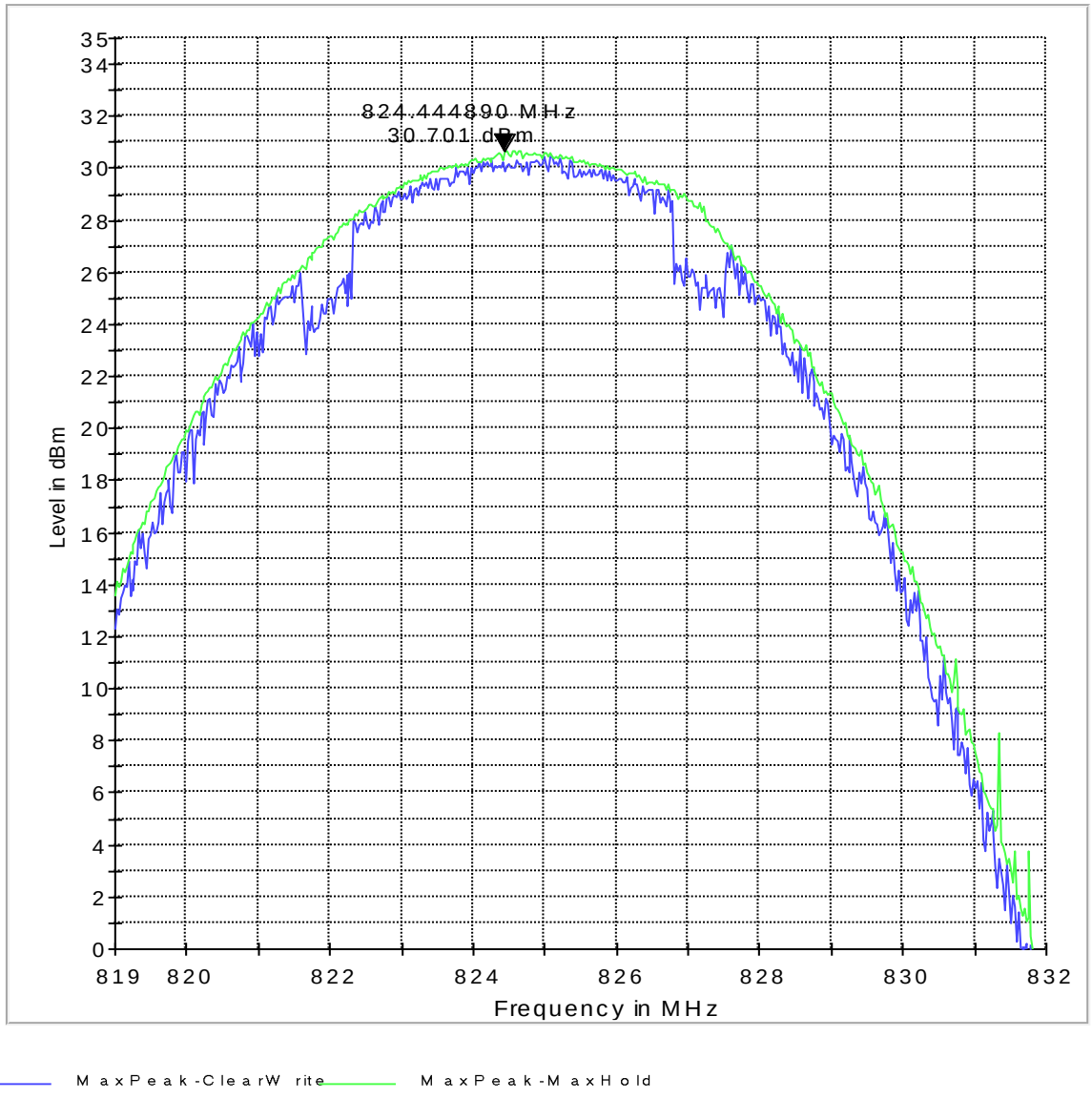
Manufacturer:	Mentor Engineering Inc.
Serial Number:	31-11100024
Comment:	12v; CDMA PCS



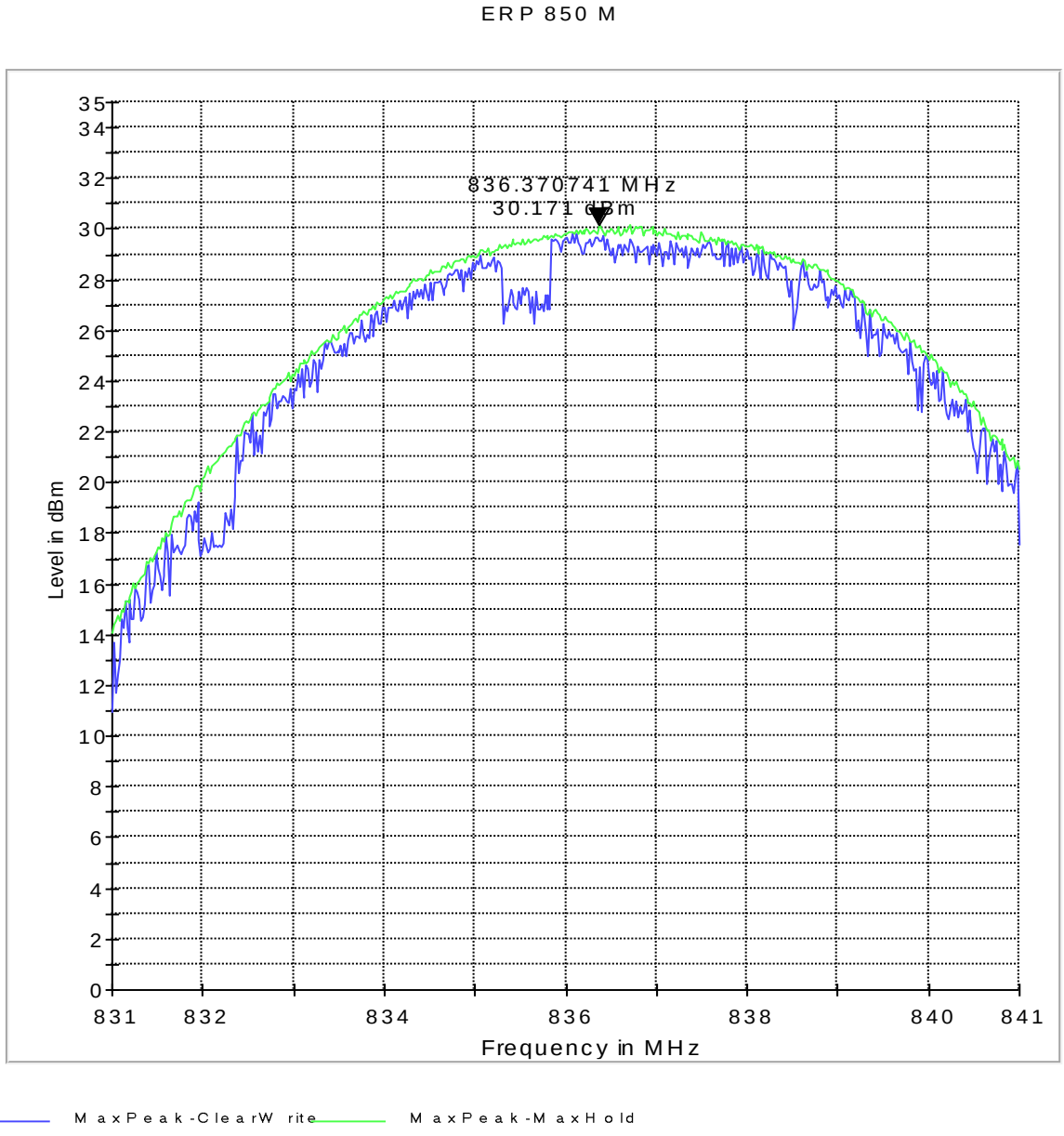
ERP (EVDO 850) CHANNEL 1013

EUT Name:	Ranger 4 EVDO
Manufacturer:	Mentor Engineering Inc.
Serial Number:	31-11100024
Comment:	12v;



ERP (EVDO 850) CHANNEL 384

EUT Name:	Ranger 4 EVDO
Manufacturer:	Mentor Engineering Inc.
Serial Number:	31-11100024
Comment:	12v;



ERP (EVDO 850) CHANNEL 777

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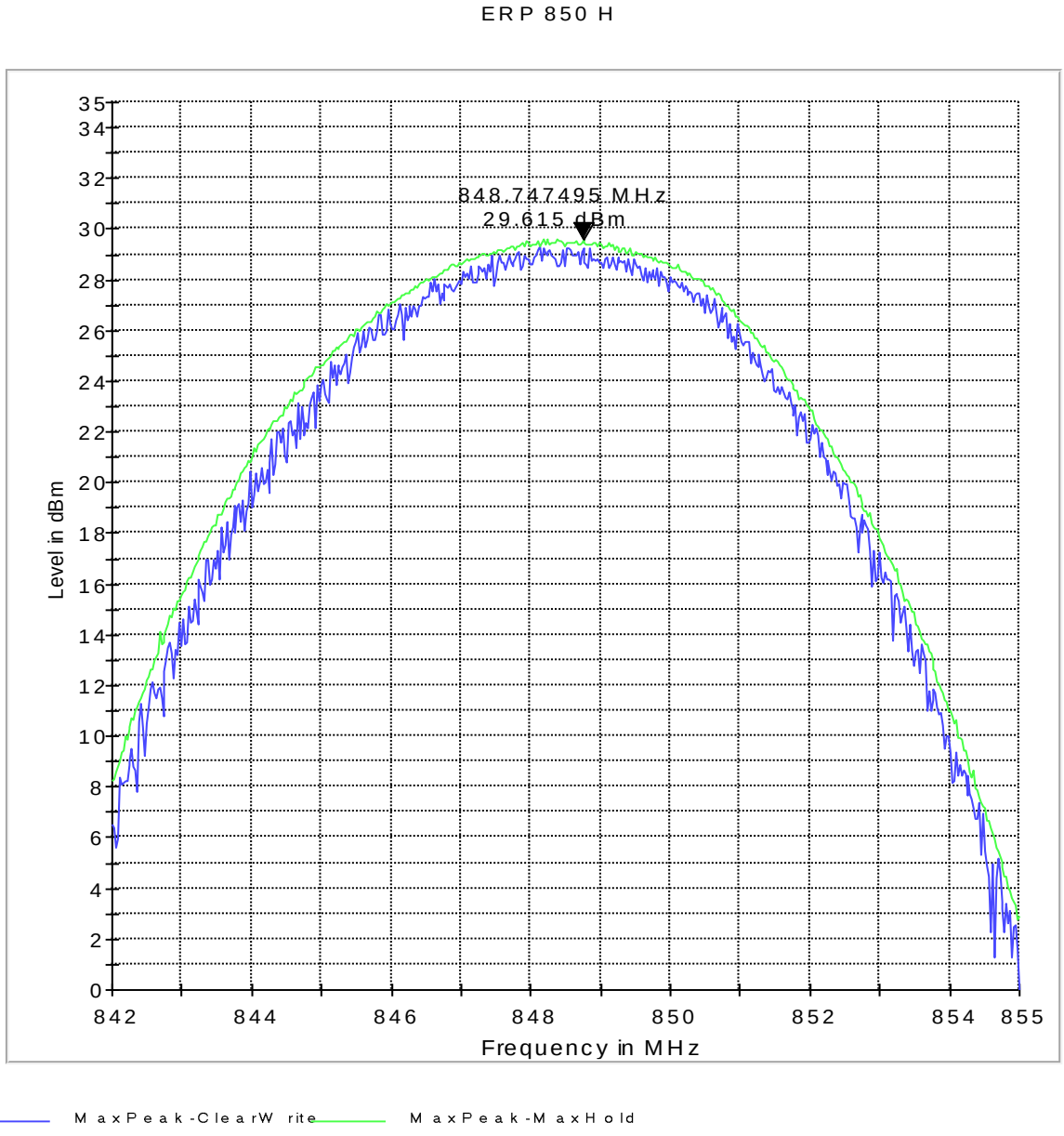
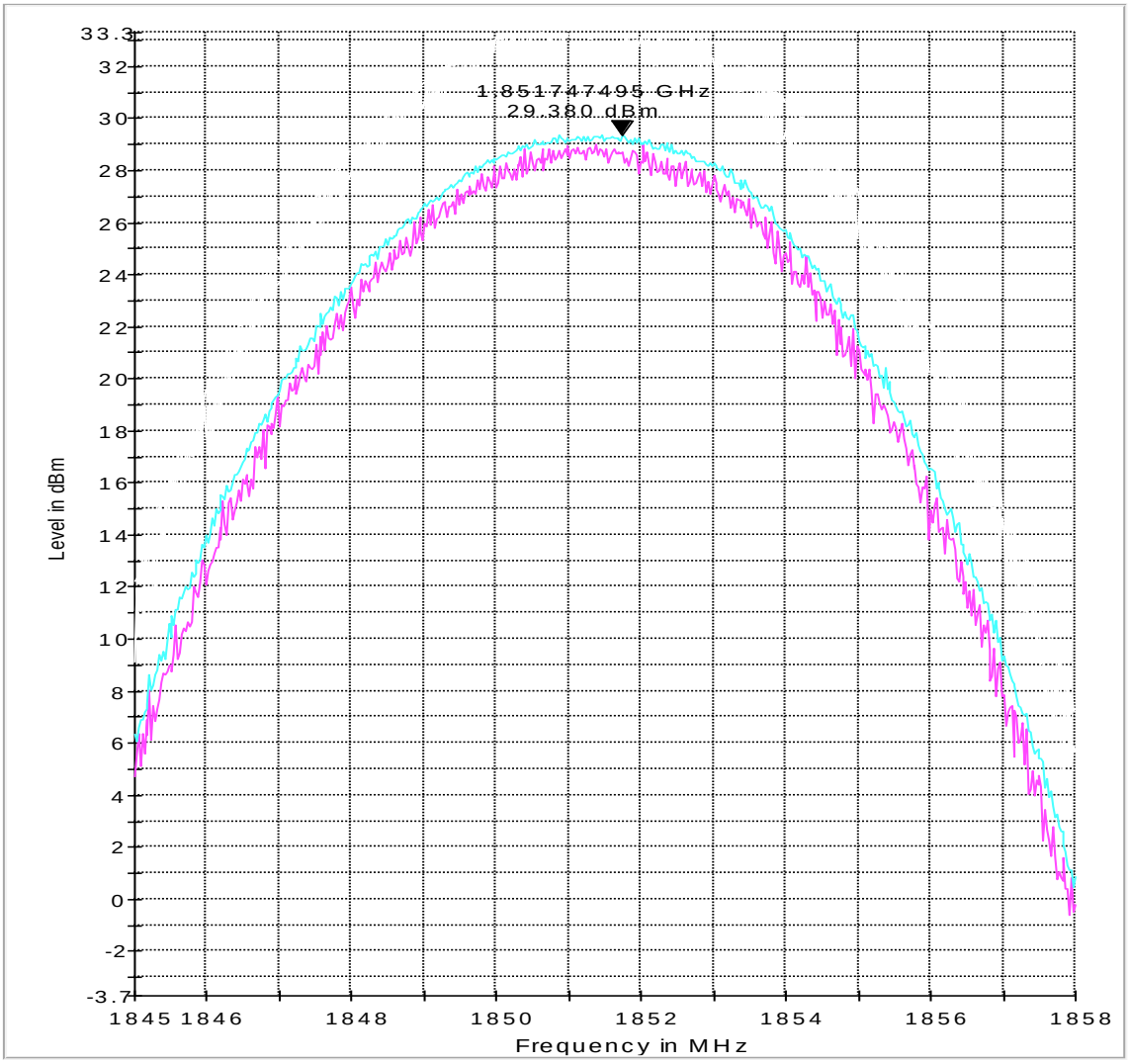
Manufacturer:	Mentor Engineering Inc.
Serial Number:	31-11100024
Comment:	12v;



EIRP (EVDO-1900) CHANNEL 25

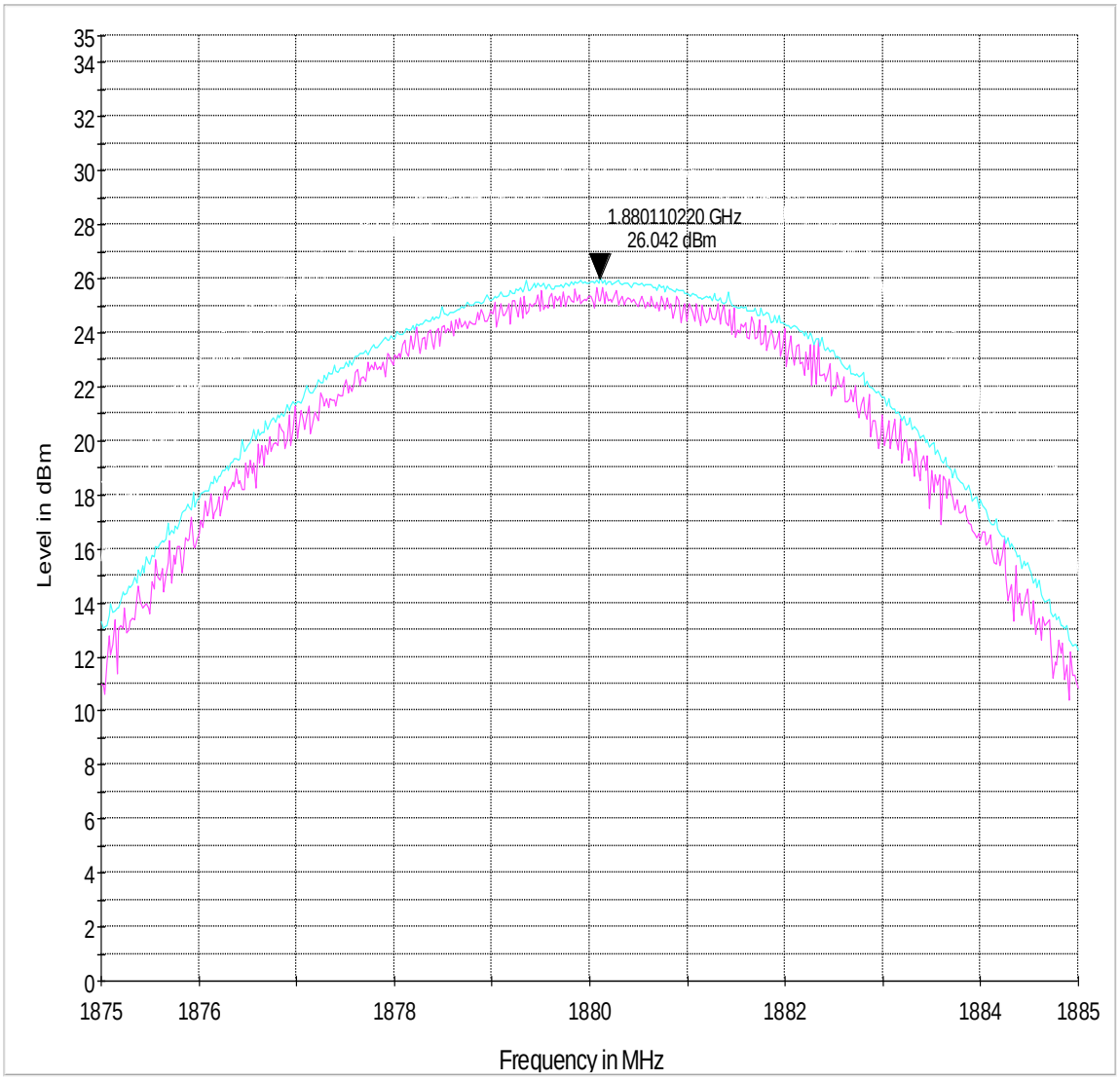
EUT Name:	Ranger 4 EVDO
Manufacturer:	Mentor Engineering Inc.
Serial Number:	31-11100024
Comment:	12v;

EIRP 1900 L



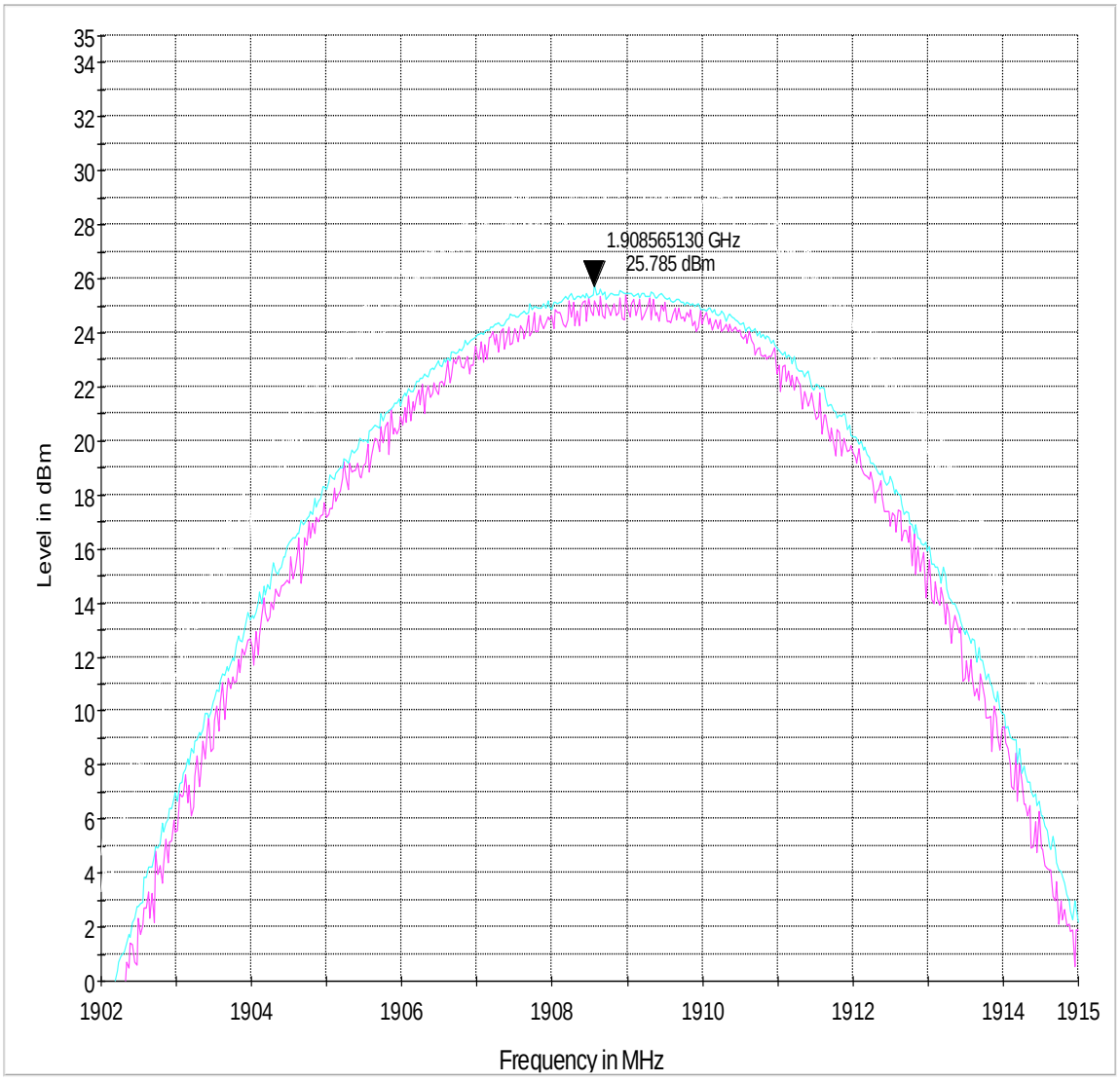
EIRP (EVDO-1900) CHANNEL 600

EUT Name:	Ranger 4 EVDO
Manufacturer:	Mentor Engineering Inc.
Serial Number:	31-11100024
Comment:	12v;



EIRP (EVDO-1900) CHANNEL 1175

EUT Name:	Ranger 4 EVDO
Manufacturer:	Mentor Engineering Inc.
Serial Number:	31-11100024
Comment:	12v;



5.8 Spurious Emissions Radiated

5.8.1 References

5.8.2 References

FCC: CFR Part 2.1053, CFR Part 22.917, CFR Part 24.238
IC: RSS-Gen Section 4.9; RSS 132 Section 4.5; RSS 133 Section 6.5

5.8.3 Measurement requirements:

5.8.3.1 FCC 2.1053: Field strength of spurious radiation.

Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission.

5.8.3.2 RSS-Gen 4.9: Transmitter unwanted spurious emissions

The same parameter, peak power or average power, used for the transmitter output power measurement shall be used for unwanted emission measurements.
The search for unwanted emissions shall be from the lowest frequency internally generated or used in the device (local oscillator, intermediate or carrier frequency), or from 30 MHz, whichever is the lower, to the 5th harmonic of the highest frequency generated without exceeding 40 GHz.

5.8.4 Limits:

(a) *Out of band emissions*. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.
For all power levels +30dBm to 0dBm, this becomes a constant specification of -13dBm.

5.8.4.1 FCC 22.917 Emission limitations for cellular equipment.

The rules in this section govern the spectral characteristics of emissions in the Cellular Radiotelephone Service.
(b) *Measurement procedure.* Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*i.e.* 100 kHz of 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

5.8.4.2 FCC 24.238 Emission limitations for Broadband PCS equipment.

The rules in this section govern the spectral characteristics of emissions in the Broadband Personal Communications Service.
(b) Measurement procedure. Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution

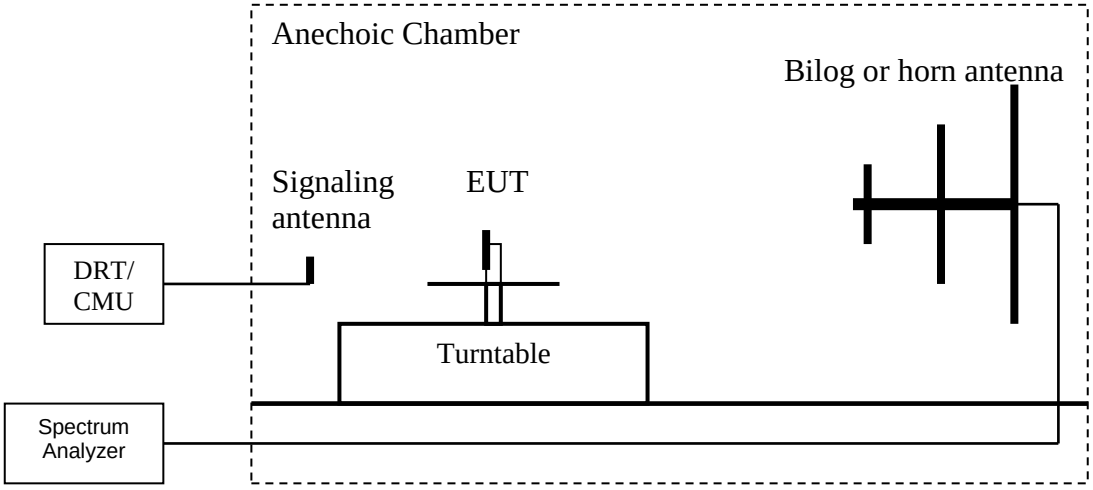
bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*i.e.* 100 kHz of 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

5.8.4.3 RSS-132 Section 4.5.1.1 and RSS-133 Section 6.5.1

In the first 1.0 MHz band immediately outside and adjacent to the licensee's frequency block, the power of emissions per any 1% of the emission bandwidth shall be attenuated below the transmitter output power P (in watts) by at least $43 + 10 \log_{10}(P)$, dB. After the first 1.0 MHz, the power of emissions shall be attenuated below the transmitter output power by at least $43 + 10 \log_{10}(P)$, dB, in any 100 kHz bandwidth.
After the first 1.5 MHz, the power of emissions shall be attenuated below the transmitter output power by at least $43 + 10 \log_{10}(P)$, dB, in any MHz of bandwidth.

5.8.5 Radiated out of band measurement procedure:

Ref: TIA-603C 2004- 2.2.12 Unwanted emissions: Radiated Spurious



1. Connect the equipment as shown in the above diagram with the EUT's antenna in a horizontal orientation.
2. Adjust the settings of the Digital RadioCommunication Tester (DRT) to set the EUT to its maximum power at the required channel.
3. Set the spectrum analyzer to measure peak hold with the required settings.
4. Place the measurement antenna in a horizontal orientation. Rotate the EUT 360°. Raise the measurement antenna up to 4 meters in 0.5 meters increments and rotate the EUT 360° at each height to maximize all emissions. Measure and record all spurious emissions (**LVL**) up to the tenth harmonic of the carrier frequency.
5. Replace the EUT with a horizontally polarized half wave dipole or known gain antenna. The center of the antenna should be at the same location as the center of the EUT's antenna.
6. Connect the antenna to a signal generator with known output power and record the path loss in dB (**LOSS)**. **LOSS** = Generator Output Power (dBm) – Analyzer reading (dBm).
7. Determine the level of spurious emissions using the following equation:
   Spurious (dBm) = **LVL** (dBm) + **LOSS** (dB):
8. Repeat steps 4, 5 and 6 with all antennas vertically polarized.
9. Determine the level of spurious emissions using the following equation:
   Spurious (dBm) = **LVL** (dBm) + **LOSS** (dB):
10. Measurements are to be performed with the EUT set to the low, middle and high channel of each frequency band.
    (N**ote:** Steps 5 and 6 above are performed prior to testing and **LOSS** is recorded by test software. Steps 3, 4 and 7 above are performed with test software.)

Spectrum analyzer settings: RBW=VBW=1MHz

Measurement Survey:

The site is constructed in accordance with ANSI C63.4 requirements and is recognized by the FCC to be in compliance for a 3m site. The spectrum is scanned from 30MHz to the 10th harmonic of the highest frequency generated by the EUT.
Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the 850 & 1900 bands. It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the 850 & 1900 band into any of the other blocks respectively. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

All measurements are done in horizontal and vertical antenna polarization; and on three orientations of the EUT. The plots show the worst case where it is not indicated otherwise. Unless mentioned otherwise, the peaks in the plots are from the carrier frequency.

5.8.6 Radiated out of band emissions results on EUT- Transmit Mode:

5.8.6.1 Test Results Transmitter Spurious Emission CDMA/EVDO 850:

Harmonic	Tx ch-1013 Freq. (MHz)	Level (dBm)	Tx ch-384 Freq. (MHz)	Level (dBm)	Tx ch-777 Freq. (MHz)	Level (dBm)
1	**824.7**	-	**836.52**	-	**848.31**	-
2	**1649.4**	NF	**1673.04**	NF	**1696.62**	NF
3	**2474.1**	NF	**2509.56**	NF	**2544.93**	NF
4	**3298.8**	NF	**3346.08**	NF	**3393.24**	NF
5	**4123.5**	NF	**4182.6**	NF	**4241.55**	NF
6	**4948.2**	NF	**5019.12**	NF	**5089.86**	NF
7	**5772.9**	NF	**5855.64**	NF	**5938.17**	NF
8	**6597.6**	NF	**6692.16**	NF	**6786.48**	NF
9	**7422.3**	NF	**7528.68**	NF	**7634.79**	NF
10	**8247**	NF	**8365.2**	NF	**8483.1**	NF
NF = Noise Floor Measurement Uncertainty: ±3dB						

5.8.6.2 Measurement Result

Pass.

Legend for the plots:

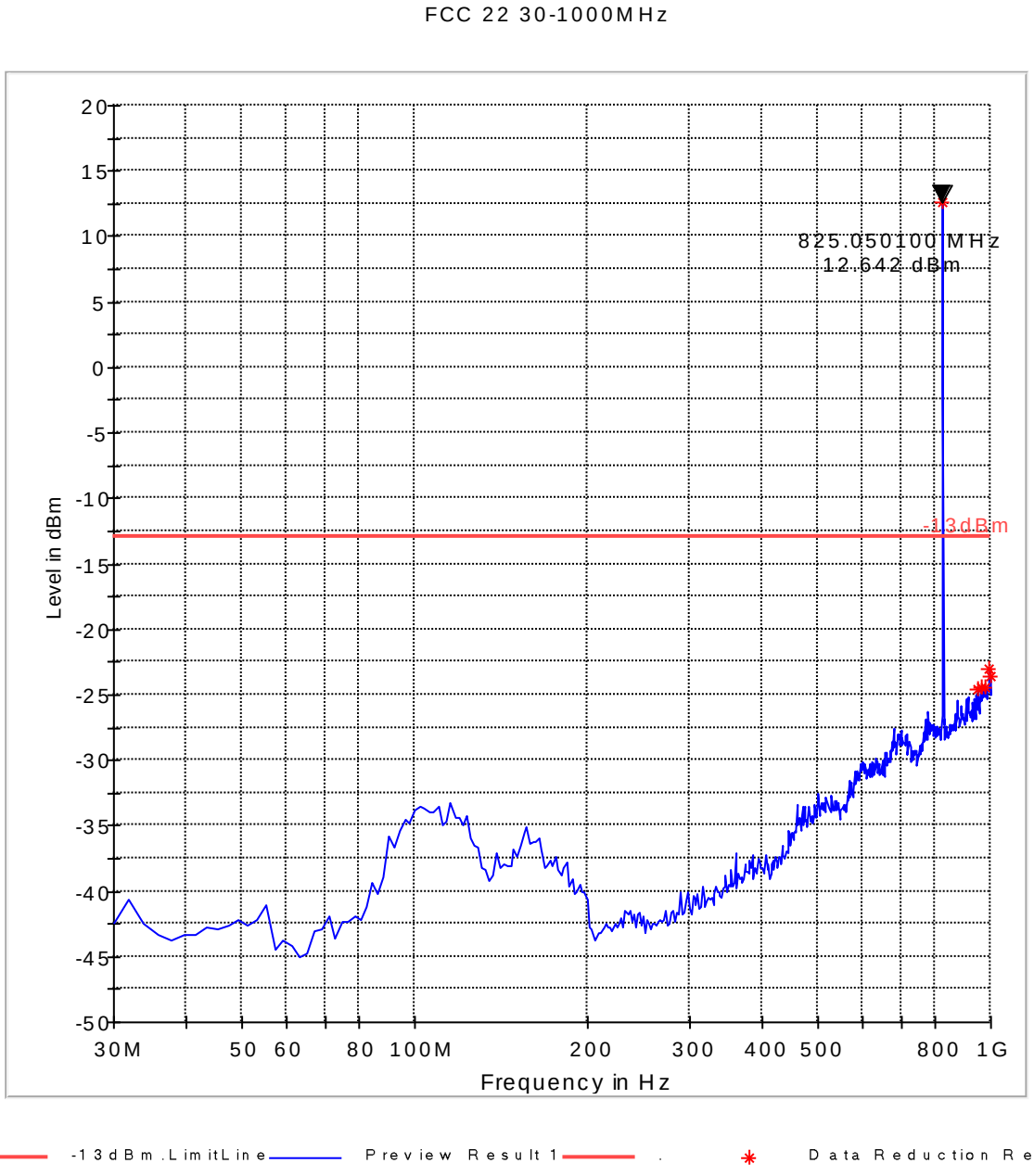
-13dBm.LimitLine
Preview Result
Data Reduction Result
Final Measurement Result

Note: Since there are higher values of ERP observed in EVDO mode. All radiated spurious emissions measurements are performed in this mode.

Radiated Spurious Emissions (EVDO-850) Tx: Low Channel

30MHz-1GHz

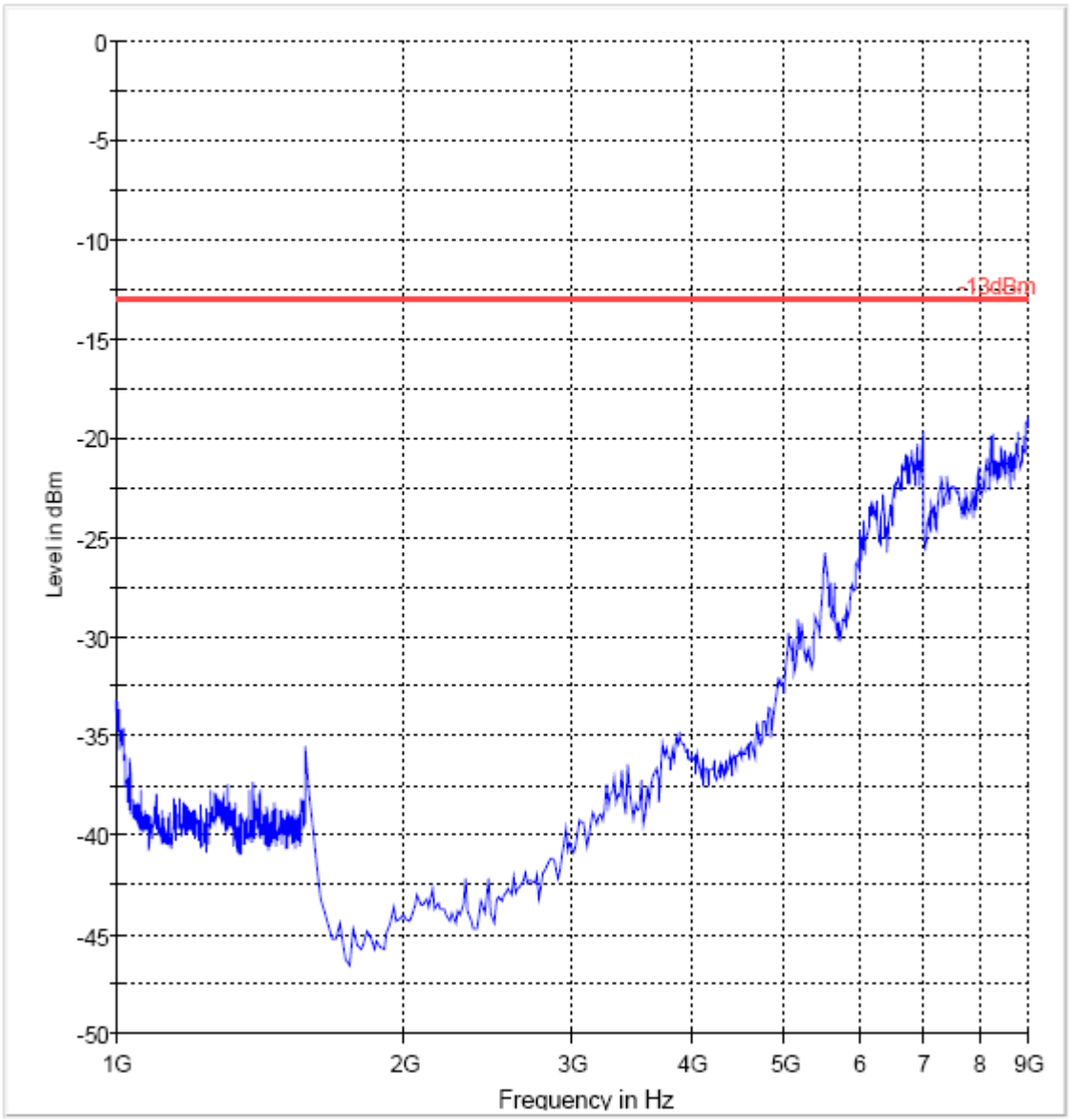
EUT Name:	Ranger 4 EVDO
Manufacturer:	Mentor Engineering Inc.
Serial Number:	31-11100024
Comment:	12v; EVDO ; marker on transmit signal



1GHz-9GHz

EUT Name:	Ranger 4 EVDO
Manufacturer:	Mentor Engineering Inc.
Serial Number:	31-11100024
Comment:	12v; EVDO ; marker on transmit signal

FCC 22 1-9GHz

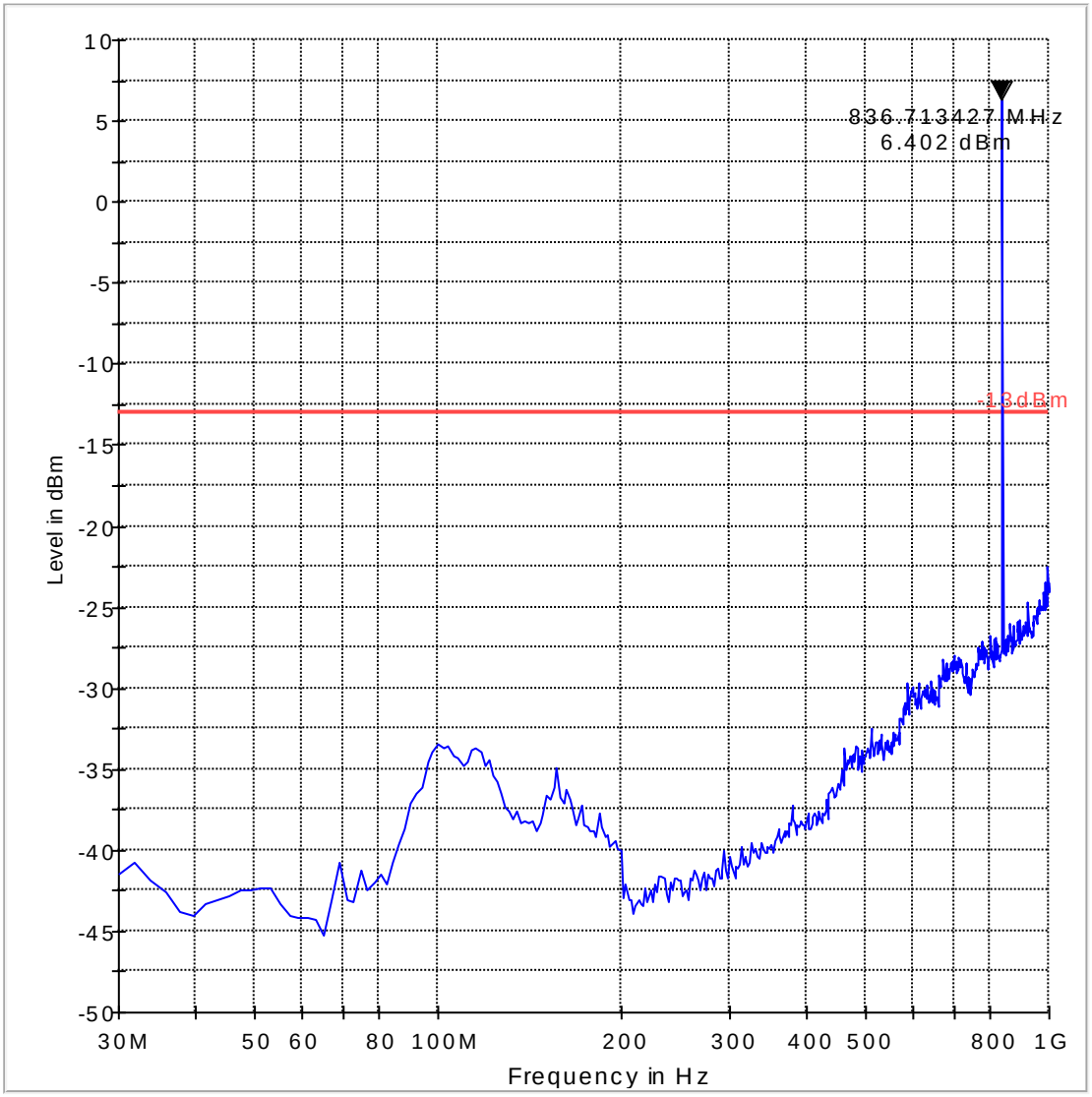


Radiated Spurious Emissions (EVDO-850) Tx: Mid Channel

30MHz-1GHz

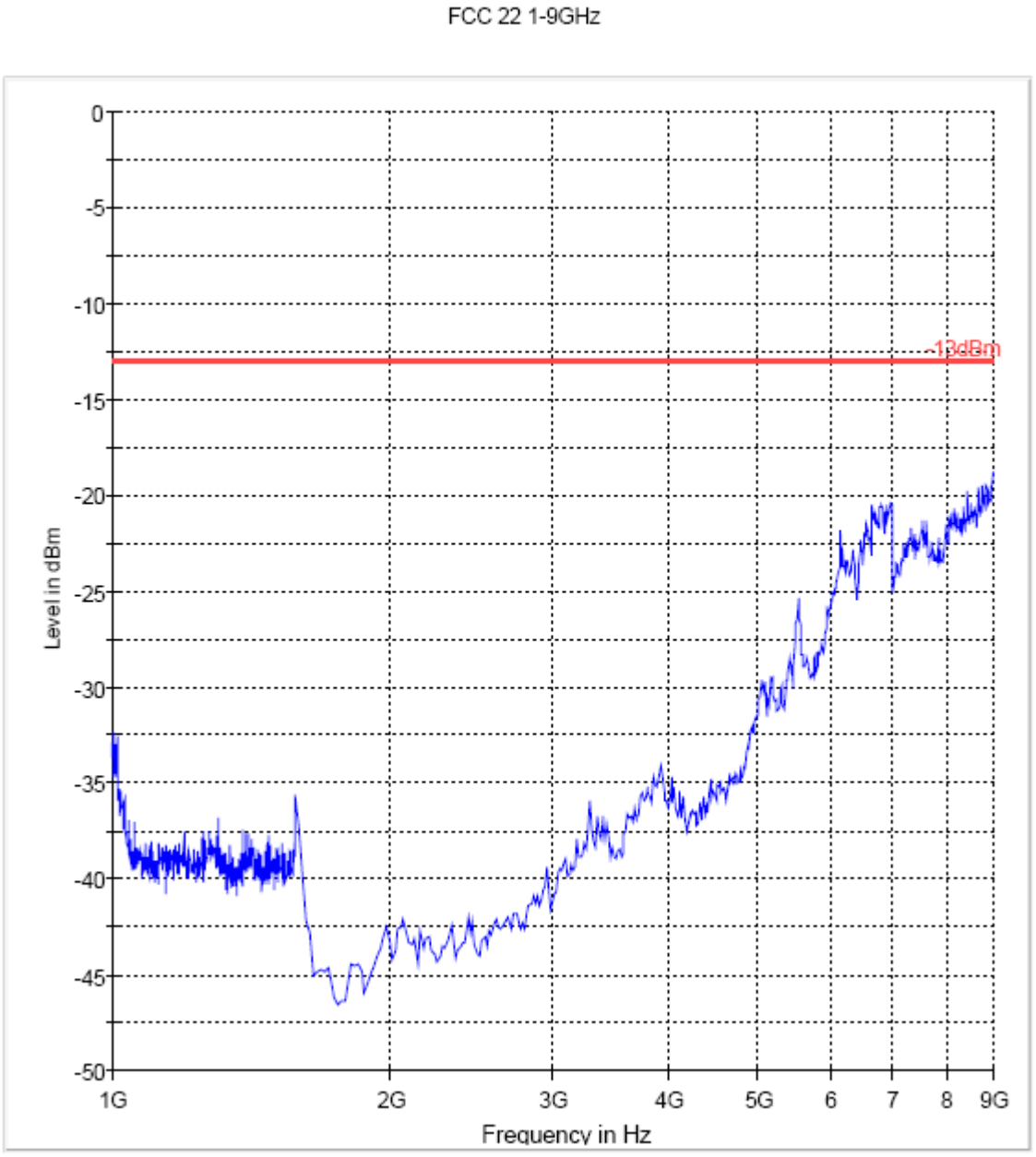
EUT Name:	Ranger 4 EVDO
Manufacturer:	Mentor Engineering Inc.
Serial Number:	31-11100024
Comment:	12v; EVDO ; marker on transmit signal

FCC 22 30-1000MHz



1GHz-9GHz

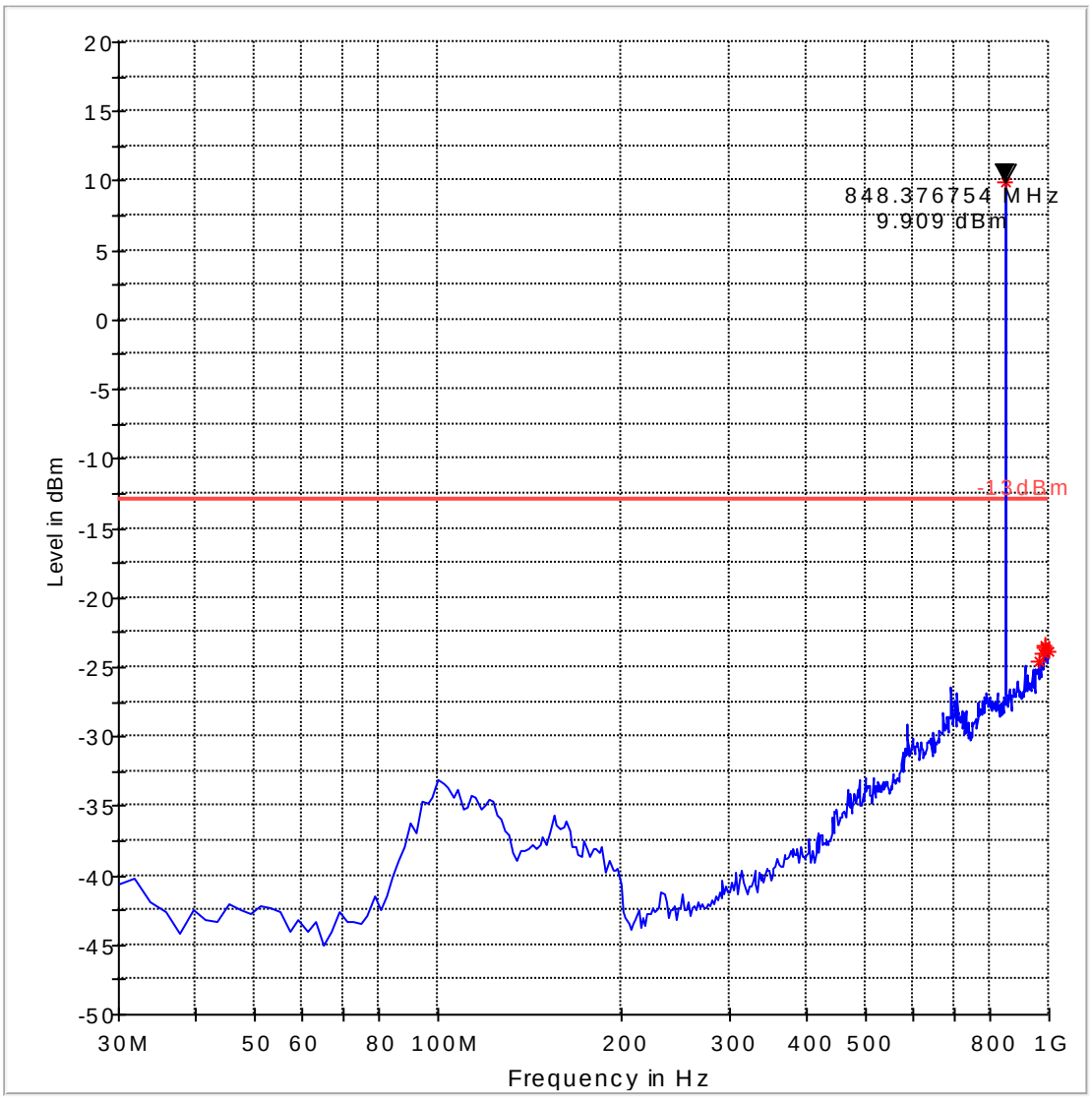
EUT Name:	Ranger 4 EVDO
Manufacturer:	Mentor Engineering Inc.
Serial Number:	31-11100024
Comment:	12v; EVDO ; marker on transmit signal



Radiated Spurious Emissions (EVDO-850) Tx: High Channel

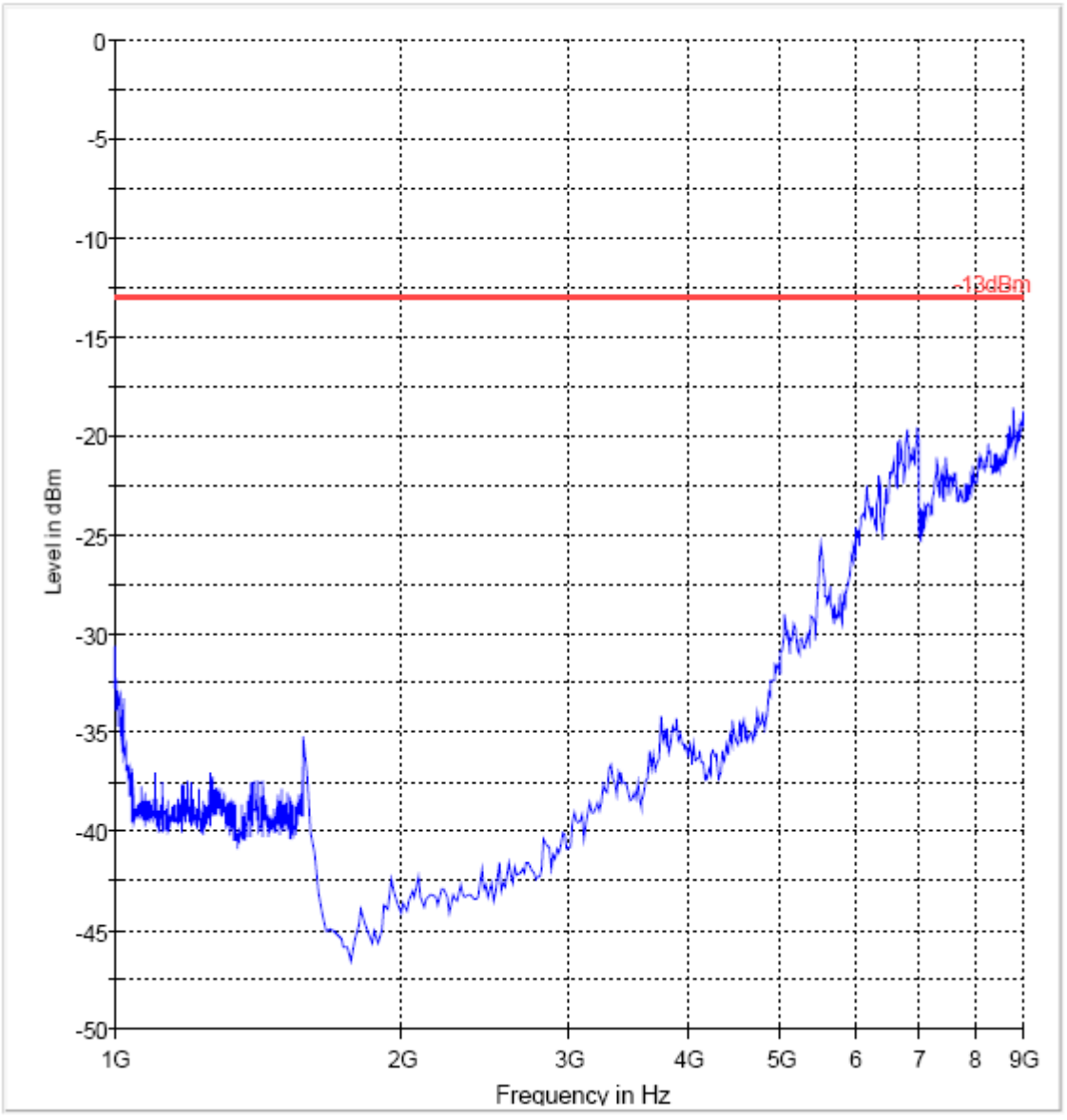
30MHz-1GHz

EUT Name:	Ranger 4 EVDO
Manufacturer:	Mentor Engineering Inc.
Serial Number:	31-11100024
Comment:	12v; EVDO ;marker placed on transmit signal



1GHz-9GHz

EUT Name:	Ranger 4 EVDO
Manufacturer:	Mentor Engineering Inc.
Serial Number:	31-11100024
Comment:	12v; EVDO ;marker placed on transmit signal



5.8.6.3 Test Results Transmitter Spurious Emission CDMA-1900:

Harmonic	Tx ch-25 Freq.(MHz)	Level (dBm)	Tx ch-600 Freq. (MHz)	Level (dBm)	Tx ch-1175 Freq. (MHz)	Level (dBm)
1	**1851.25**	-	**1880.0**	-	**1908.75**	-
2	**3702.5**	NF	**3760**	-42	**3817.5**	-34.8
3	**5553.75**	NF	**5640**	NF	**5726.25**	NF
4	**7405**	NF	**7520**	NF	**7635**	NF
5	**9256.25**	NF	**9400**	NF	**9543.75**	NF
6	**11107.5**	NF	**11280**	NF	**11452.5**	NF
7	**12958.75**	NF	**13160**	NF	**13361.25**	NF
8	**14810**	NF	**15040**	NF	**15270**	NF
9	**16661.25**	NF	**16920**	NF	**17178.75**	NF
10	**18512.5**	NF	**18800**	NF	**19087.5**	NF
NF = Noise Floor Measurement Uncertainty: ±3dB						

5.8.6.4 Measurement Result

Pass.

Legend for the plots:

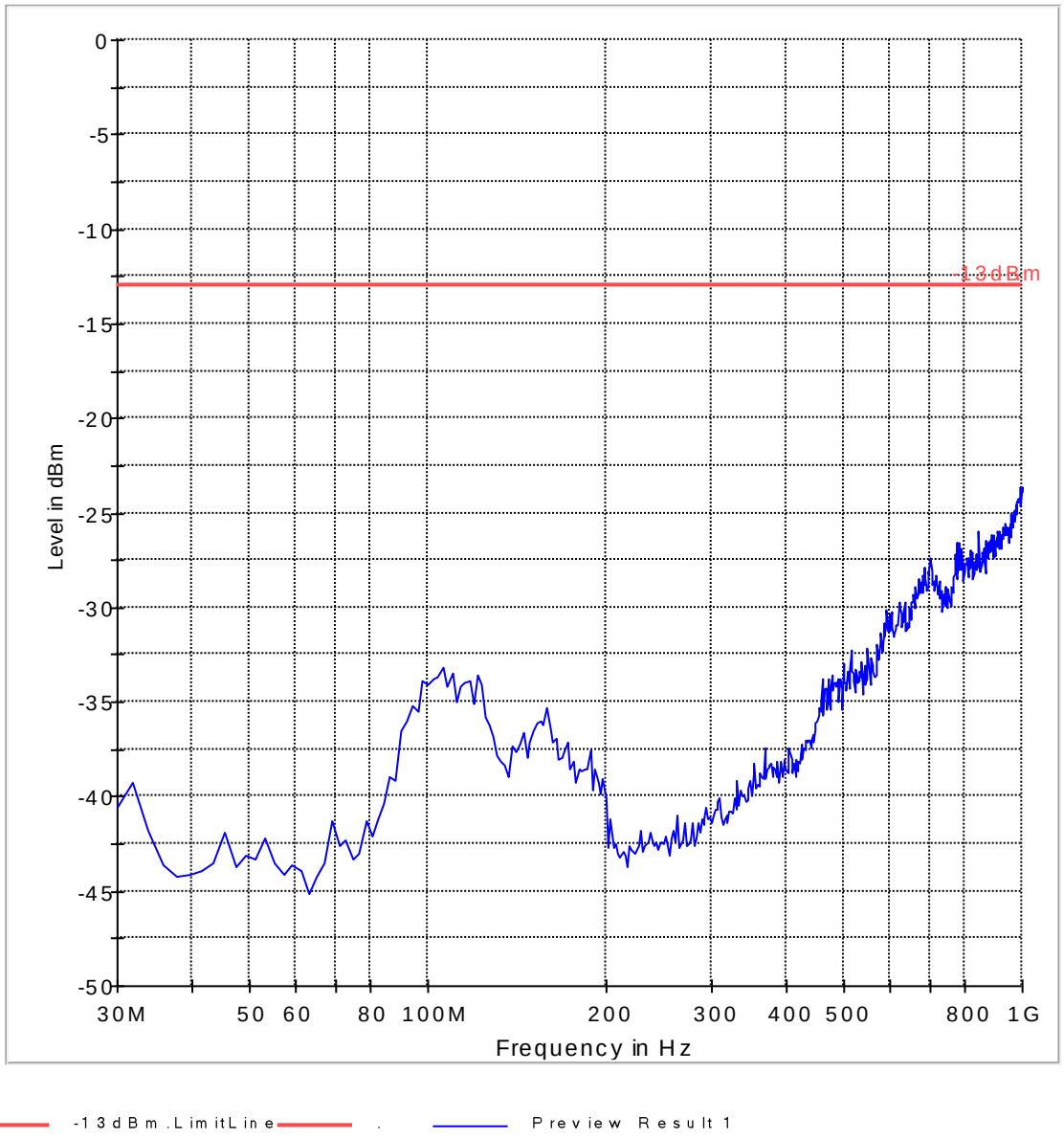
-13dBm.LimitLine
Preview Result
Data Reduction Result
Final Measurement Result

Note: Since there are higher values of EIRP observed in EVDO mode. All radiated spurious emissions measurements are performed in this mode.

Radiated Spurious Emissions (EVDO-1900) Tx: Low Channel

30MHz-1GHz

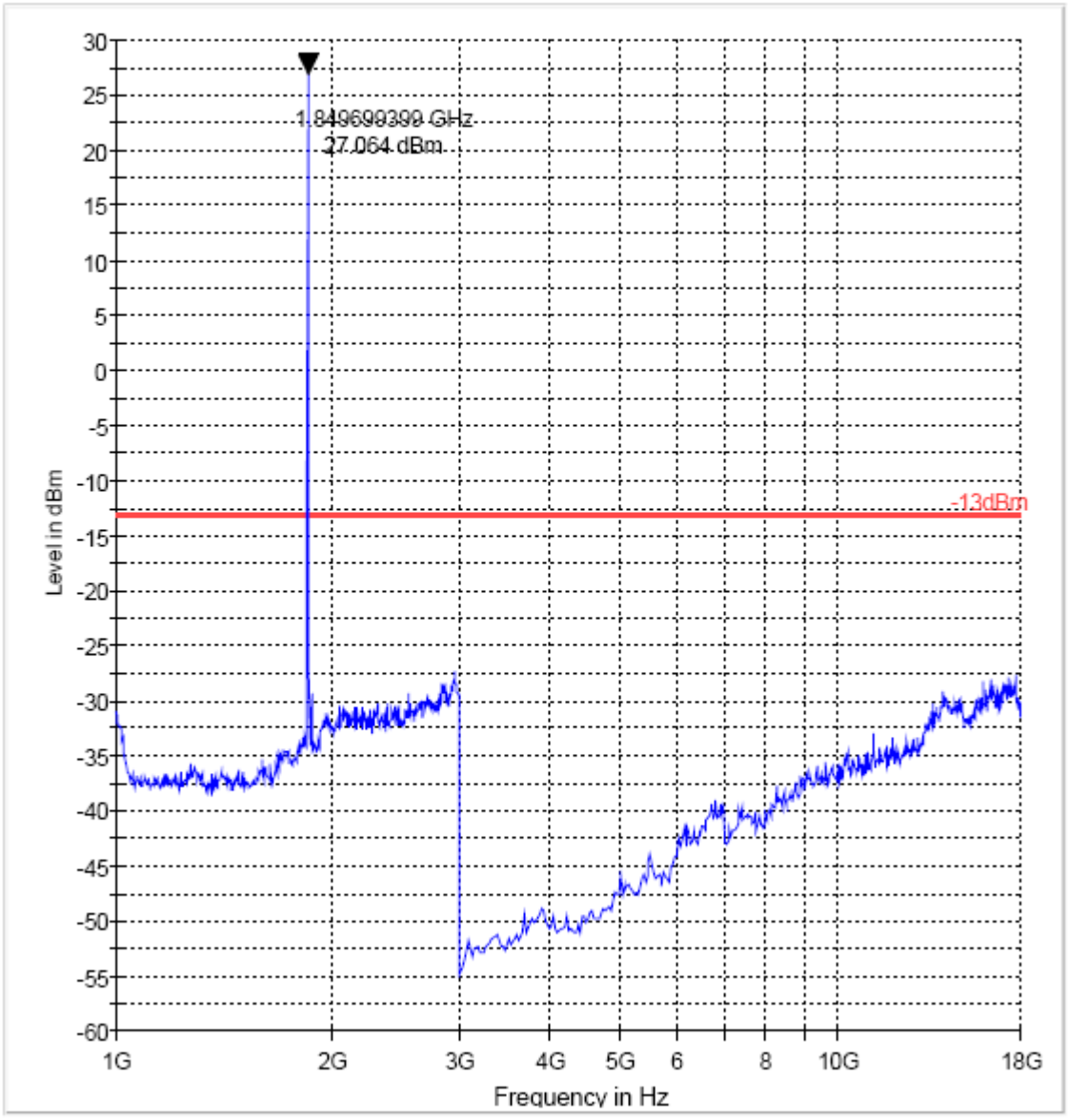
EUT Name:	Ranger 4 EVDO
Manufacturer:	Mentor Engineering Inc.
Serial Number:	31-11100024
Comment:	12v; EVDO



1GHz-18GHz

EUT Name:	Ranger 4 EVDO
Manufacturer:	Mentor Engineering Inc.
Serial Number:	31-11100024
Comment:	12v; EVDO PCS; marker on transmit signal

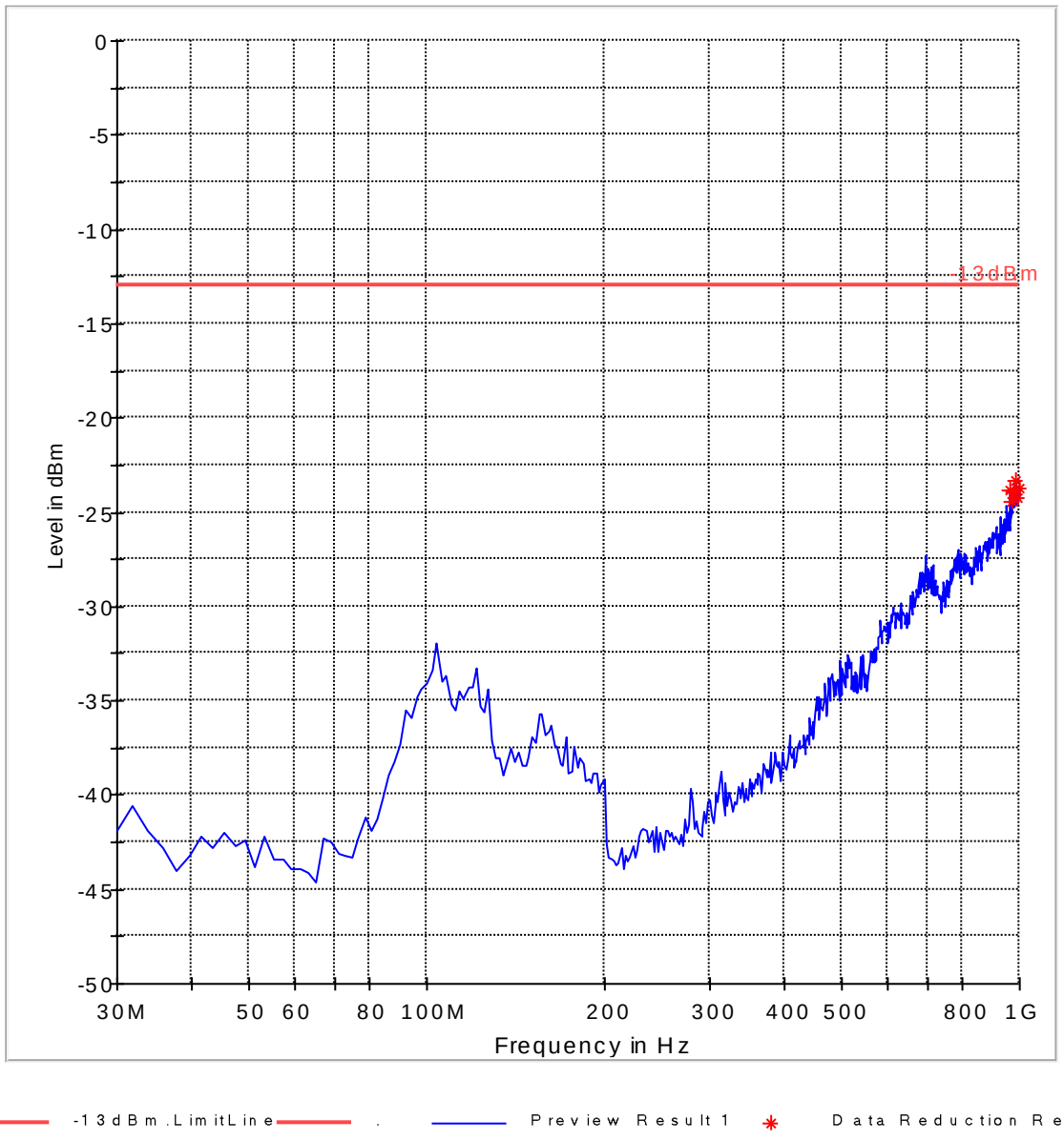
FCC 24 1-18GHz



Radiated Spurious Emissions (EVDO-1900) Tx: Mid Channel

30MHz-1GHz

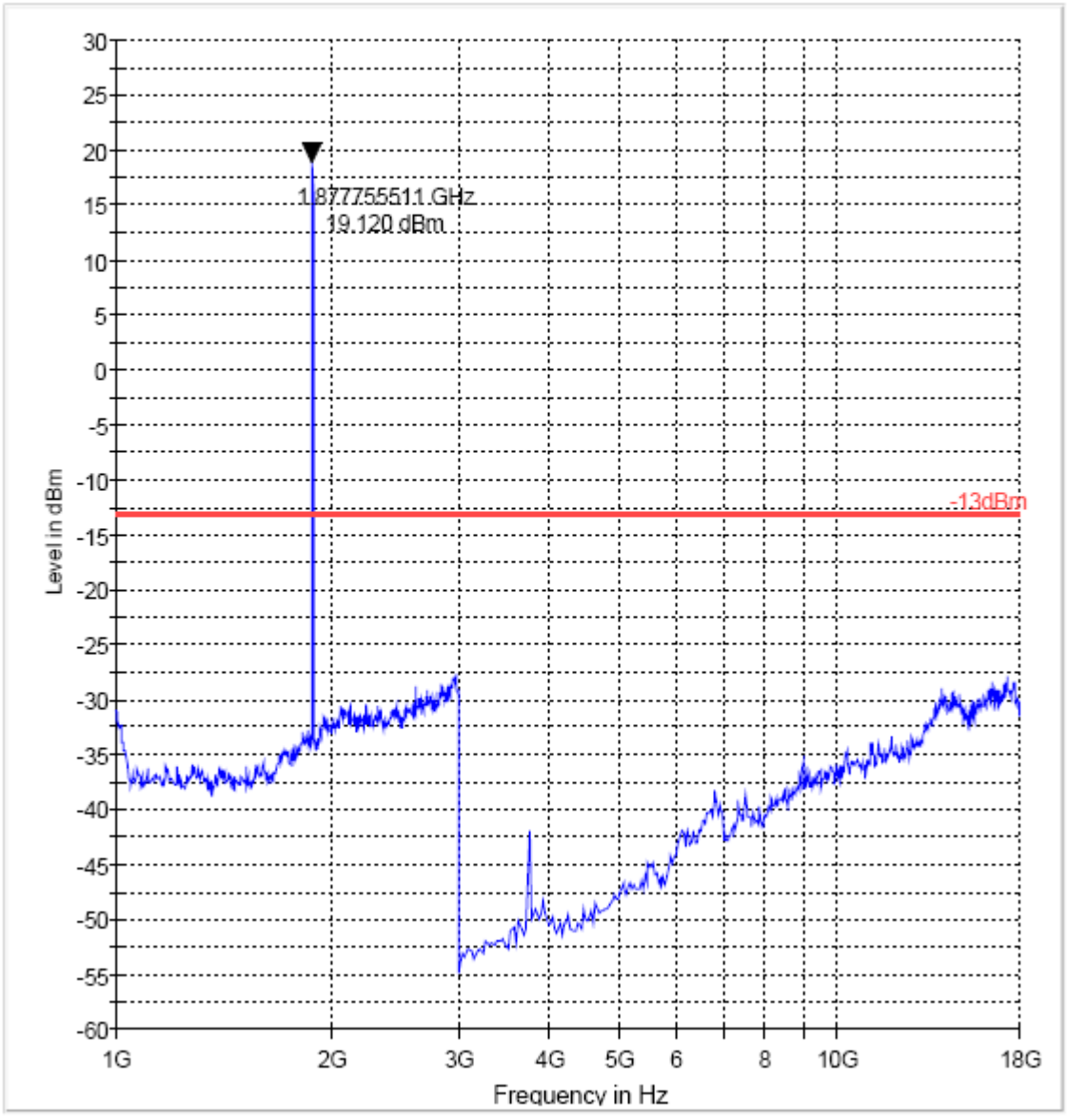
EUT Name:	Ranger 4 EVDO
Manufacturer:	Mentor Engineering Inc.
Serial Number:	31-11100024
Comment:	12v; EVDO



1GHz-18GHz

EUT Name:	Ranger 4 EVDO
Manufacturer:	Mentor Engineering Inc.
Serial Number:	31-11100024
Comment:	12v; EVDO PCS; marker on transmit signal

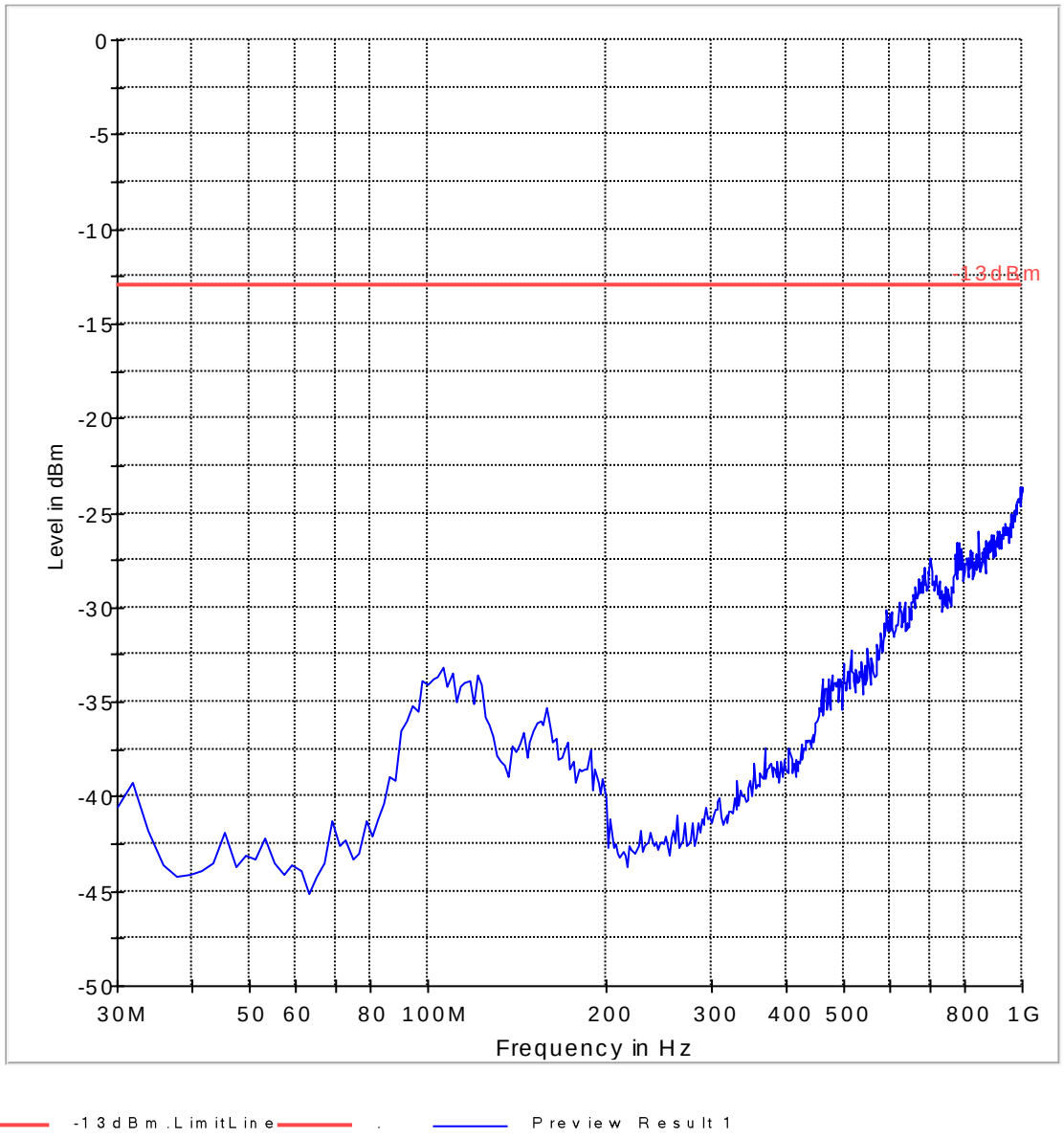
FCC 24 1-18GHz



Radiated Spurious Emissions (EVDO-1900) Tx: High Channel

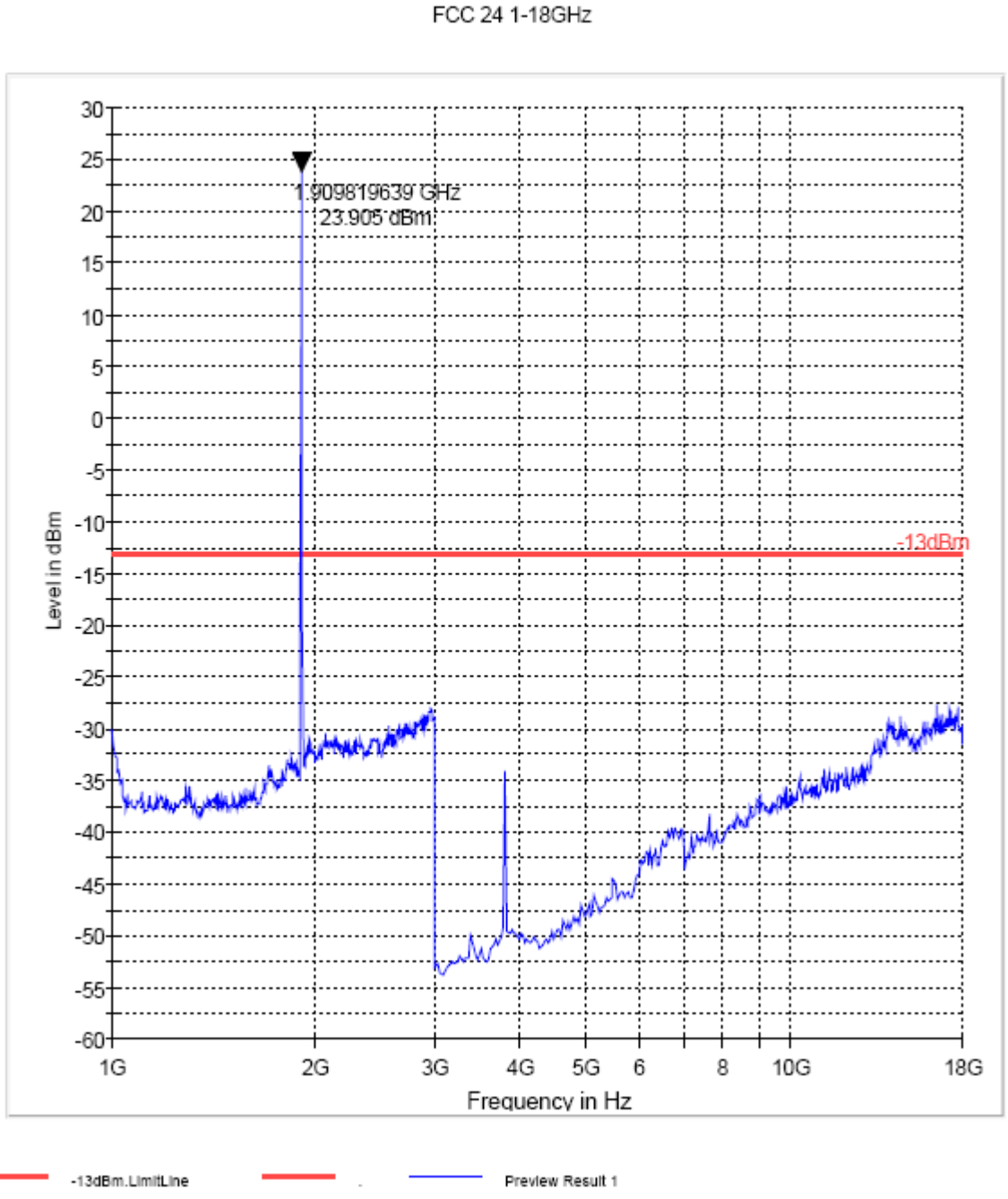
30MHz-1GHz

EUT Name:	Ranger 4 EVDO
Manufacturer:	Mentor Engineering Inc.
Serial Number:	31-11100024
Comment:	12v; EVDO



1GHz-18GHz

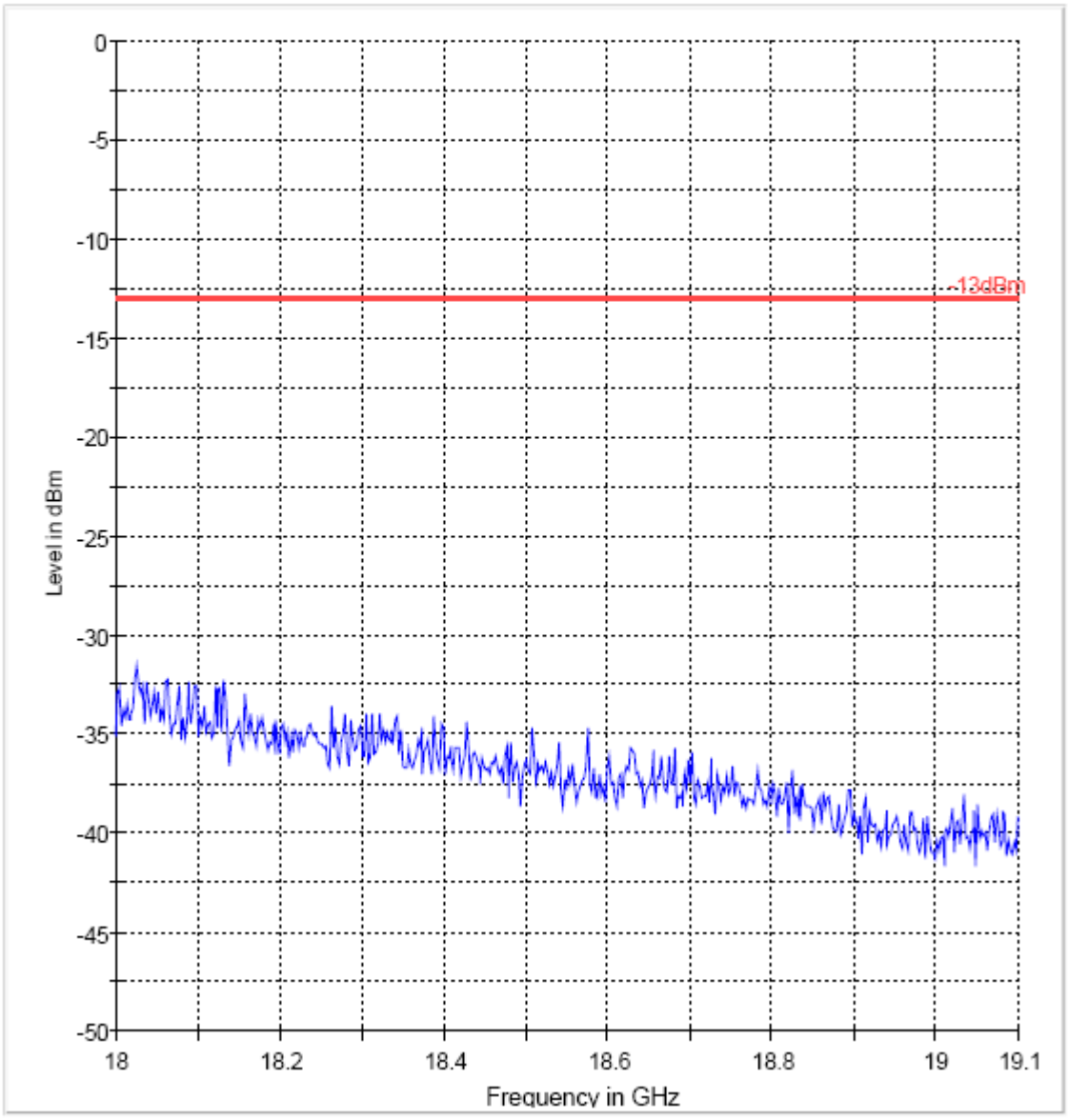
EUT Name:	Ranger 4 EVDO
Manufacturer:	Mentor Engineering Inc.
Serial Number:	31-11100024
Comment:	12v; EVDO PCS; marker on transmit signal



18GHz-19.1GHz

EUT Name:	Ranger 4 EVDO
Manufacturer:	Mentor Engineering Inc.
Serial Number:	31-11100024
Comment:	12v; EVDO PCS;

Note: This result is worst case representation for all channels.

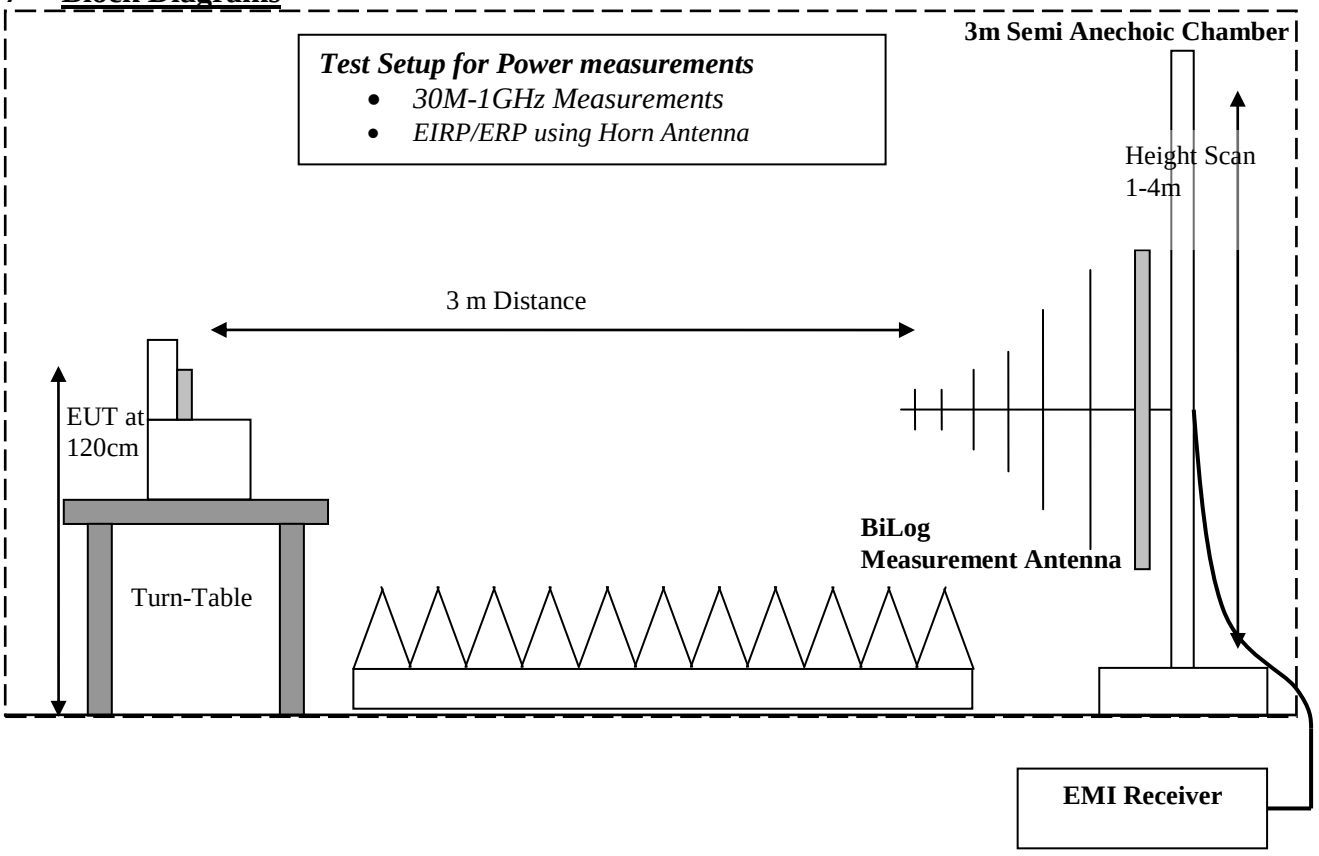


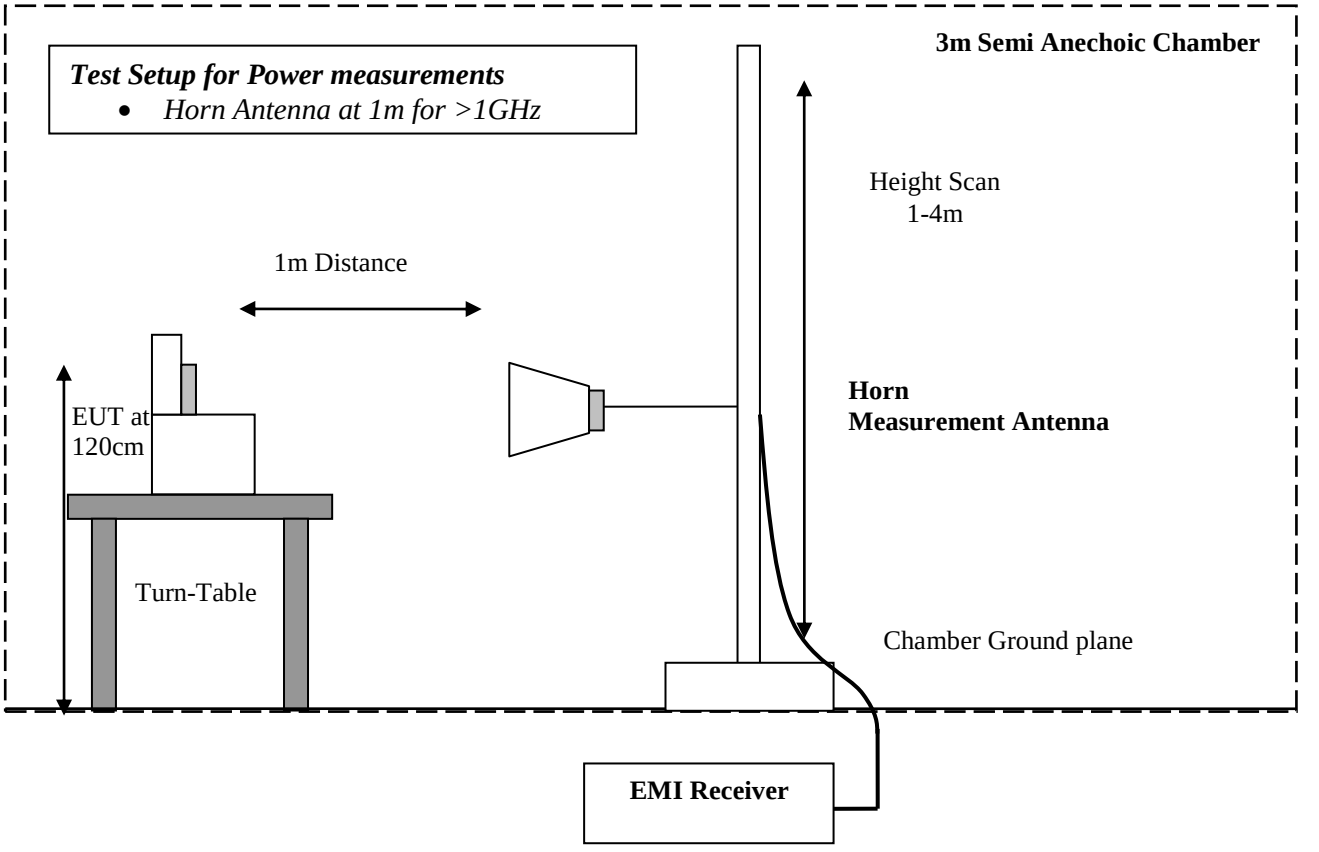
6 Test Equipment and Ancillaries used for tests

Instrument/Ancillary	Model	Manufacturer	Serial No.	Cal Date	Cal Interval
Radio Communication Tester	CMU 200	Rohde & Schwarz	101821	May 2011	1 year
Radio Communication Tester	CMU 200	Rohde & Schwarz	109879	May 2011	1 year
Radio Communication Tester	CMU 200	Rohde & Schwarz	110759	May 2011	1 year
Bluetooth Tester	CBT	Rohde & Schwarz	100212	May 2011	2 Years
EMI Receiver/Analyzer	ESIB 40	Rohde & Schwarz	100107	May 2011	1 year
Spectrum Analyzer	FSU	Rohde & Schwarz	200302	May 2011	1 year
Loop Antenna	6512	EMCO	00049838	Oct 2011	3 years
Biconilog Antenna	3141	EMCO	0005-1186	June 2009	3 years
Horn Antenna (1-18GHz)	3115	ETS	00035111	Jan 2009	3 years
Horn Antenna (1-18GHz)	3115	ETS	00035111	Mar 2009	3 years
Horn Antenna (18-40GHz)	3116	ETS	00070497	Oct 2011	3 years
Communication Antenna	IBP5-900/1940	Kathrein	n/a	n/a	n/a
High Pass Filter	5HC2700	Trilithic Inc.	9926013	Part of system calibration	
High Pass Filter	4HC1600	Trilithic Inc.	9922307	Part of system calibration	
6GHz High Pass Filter	HPM50106	Microtronics	001	Part of system calibration	
Pre-Amplifier	JS4-00102600	Miteq	00616	Part of system calibration	
LISN	50-25-2-08	FCC	08014	June 2011	1 year
LISN	R&S	ESH3-Z5	836679/003	May 2011	2 Years
LISN	R&S	ESH3-Z6	836154/011	May 2011	2 Years
Power Smart Sensor	R&S	NRP-Z81	100161	May 2011	1 Year
DC Power Supply	E3610A	Hewlett Packard	KR83021224	n/a	n/a
DC Power Supply	E3610A	Hewlett Packard	KR83023316	n/a	n/a
DC Power Supply	6632A	Hewlett Packard	3524A-12822	n/a	n/a
DC Power Supply	6655A	Hewlett Packard	3403A-00487	n/a	n/a
Multimeter	MM200	Klein	N/A	Apr 2011	1 Year
Temp Hum Logger	TM320	Dickson	03280063	Feb 2011	1 Year
Temp Hum Logger	TM325	Dickson	5285354	Feb 2011	1 Year

Note: Testing performed when equipment calibration status was valid.

7 Block Diagrams





8 Revision History

Date	Report Name	Changes to report	Report prepared by
2012-02-14	EMC_MENTO_003_10002_FCC22_24EVDO	First Version	Satya Radhakrishna
2012-03-28	EMC_MENTO_003_10002_FCC22_24EVDO_Rev1	Corrected typo for Model number.	Josie Sabado