



FCC/IC Test Report

FOR:

Model Name: Ranger 4 HSPA

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: RZ3RAN48790
IC ID: 2234A-RAN48790

47 CFR Part 2, 22, 24
RSS-132 Issue 2
RSS-133 Issue 5

TEST REPORT #: EMC_MENTO_003_10002_FCC22_24HSPA
DATE: 2012-02-13



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	3
2	Administrative Data	4
2.1	Identification of the Testing Laboratory Issuing the EMC Test Report.....	4
2.2	Identification of the Client	4
2.3	Identification of the Manufacturer	4
3	Equipment under Test (EUT)	5
3.1	Specification of the Equipment under Test	5
3.2	Identification of the Equipment Under Test (EUT)	5
3.3	Identification of Accessory equipment.....	5
4	Subject of Investigation	6
5	Summary of Measurement Results.....	7
6	Measurements.....	9
6.1	RF Power Output.....	9
6.1.1	References	9
6.1.2	Measurement requirements:.....	9
6.1.3	Limits:	9
6.2	Conducted Output Power Measurement procedure.....	10
6.3	Radiated Output Power Measurement procedure.....	11
6.4	Sample Calculations for Radiated Measurements.....	12
6.4.1	Field Strength Measurements:	12
6.4.2	Power Measurements using Substitution Procedure:	12
6.5	RF Power Output 850MHz band.....	13
6.5.1	Measurement Result	13
6.6	RF Power Output 1900MHz band.....	14
6.6.1	Measurement Result	14
6.7	Results	15
6.8	Spurious Emissions Radiated	33
6.8.1	References	33
6.8.2	Measurement requirements:.....	33
6.8.3	Limits:	33
6.8.4	Radiated out of band measurement procedure:	35
6.8.5	Radiated out of band emissions results on EUT- Transmit Mode:.....	37
7	Test Equipment and Ancillaries used for tests	67
8	Block Diagrams	68
9	Revision History	69

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 HSPA

Responsible for Testing Laboratory:

2012-02-13	Compliance	Sajay Jose (EMC Lab Manager)	
Date	Section	Name	Signature

Responsible for the Report:

2012-02-13	Compliance	Satya Radhakrishna (EMC Project Engineer)	
Date	Section	Name	Signature

The test results of this test report relate exclusively to the test item specified in Section 3.

CETECOM Inc. USA does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CETECOM Inc. USA.

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 - 29 th 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 HSPA
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/ IC ID:	RZ3RAN48790/2234A-RAN48790
Frequency:	GSM 850: 824.2-848.8MHz; PCS 1900: 1850.2-1909.8MHz FDD V: 826.4-846.6MHz; FDD II: 1852.4-1907.6MHz
Type(s) of Modulation:	GMSK; 8-PSK; QPSK; 16QAM
Number of channels:	GSM850: 125 and PCS 1900: 300 FDD II: 278/ FDD V: 103
Antenna Type:	Monopole Printed Trace Antenna
Power Supply:	12 Vdc ; Car battery
Temperature Range:	-40°C to 85°C

3.2 Identification of the Equipment Under Test (EUT)

EUT #	Model No.	HW Version	SW Version	Serial Number	Comments
1	Ranger 4 HSPA	4	1.02	31-11100019	Radiated unit
2	Ranger 4 HSPA	4	1.02	31-11100025	Conducted unit

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 RZ3RAN48790 and IC ID 2234A-RAN48790. All testing was performed on the products referred to in Section 3 as EUT.

The EUT uses Sierra Wireless' FCC certified MC8790V module (FCC ID: N7NMC8790). All conducted test data other than output power for this module is obtained from the module test report. Output power was measured at Cetecom Inc. for verification purposes.

5 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	GSM 850	■	□	□	□	Complies
			UMTS Band V	■	□	□	□	Complies
§2.1055 §22.355 RSS132 4.3	Frequency Stability	Nominal	GSM 850	□	□	□	■	Complies*
			UMTS Band V	□	□	□	■	Complies*
§2.1049 §22.917(b) RSS132 4.2	Occupied Bandwidth	Nominal	GSM 850	□	□	□	■	Complies*
			UMTS Band V	□	□	□	■	Complies*
§2.1051 §22.917 RSS132 4.5	Band Edge Compliance	Nominal	GSM 850	□	□	□	■	Complies*
			UMTS Band V	□	□	□	■	Complies*
§2.1051 §22.917 RSS132 4.5	Conducted Spurious Emissions	Nominal	GSM 850	□	□	□	■	Complies*
			UMTS Band V	□	□	□	■	Complies*
§2.1053 §22.917 RSS132 4.5	Radiated Spurious Emissions	Nominal	GSM 850	■	□	□	□	Complies
			UMTS Band V	■	□	□	□	Complies
			UMTS Band V	□	□	■	□	-

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: N7NMC8790. Report# MC8790 Test report

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	GSM 1900	■	□	□	□	Complies
			UMTS Band II	■	□	□	□	Complies
§2.1055 §24.235 RSS133 6.3	Frequency Stability	Nominal	GSM 1900	□	□	□	■	Complies*
			UMTS Band II	□	□	□	■	Complies*
§2.1049 §24.238(b) RSS133 6.2	Occupied Bandwidth	Nominal	GSM 1900	□	□	□	■	Complies*
			UMTS Band II	□	□	□	■	Complies*
§2.1051 §24.238 RSS133 6.5	Band Edge Compliance	Nominal	GSM 1900	□	□	□	■	Complies*
			UMTS Band II	□	□	□	■	Complies*
§2.1051 §24.238 RSS133 6.5	Conducted Spurious Emissions	Nominal	GSM 1900	□	□	□	■	Complies*
			UMTS Band II	□	□	□	■	Complies*
§2.1053 §24.238 RSS133 6.5	Radiated Spurious Emissions	Nominal	GSM 1900	■	□	□	□	Complies
			UMTS Band II	■	□	□	□	Complies
			UMTS Band II	□	□	■	□	-

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: N7NMC8790. Report# MC8790 Test report

6 Measurements

6.1 RF Power Output

6.1.1 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

6.1.2 Measurement requirements:

6.1.2.1 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.

6.1.2.2 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.

6.1.3 Limits:

6.1.3.1 FCC 22.913 (a) Effective radiated power limits.

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

6.1.3.2 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.

6.1.3.3 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.

6.1.3.4 RSS-133 Section 6.4

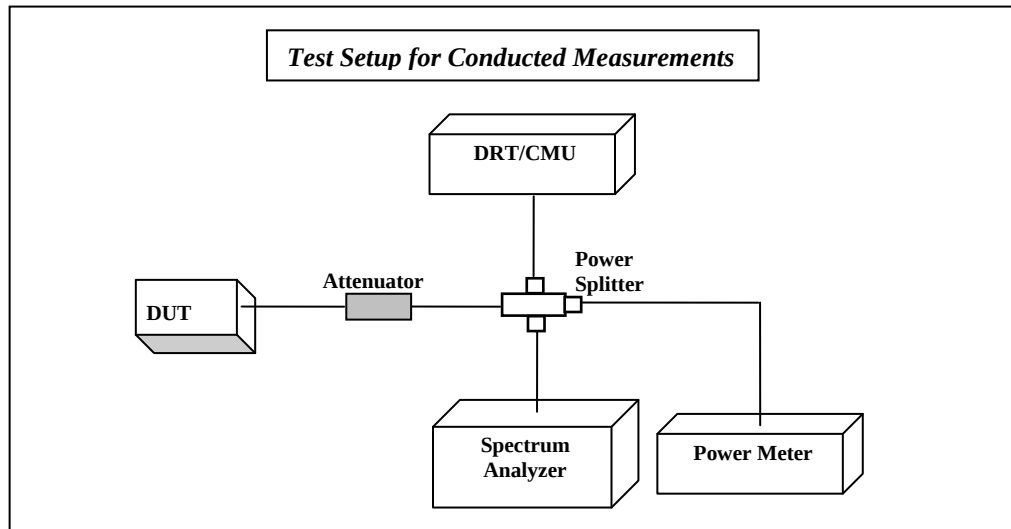
The average equivalent isotropically radiated power (e.i.r.p.) for transmitters shall not exceed the limits given in SRSP-510.

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.

6.2 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:

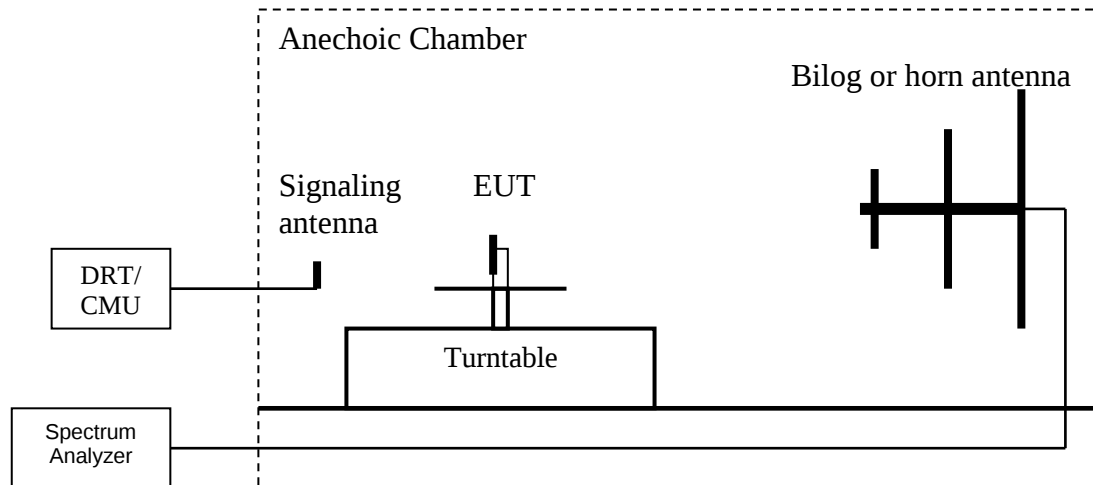
GSM: RBW=3MHz; VBW=10MHz; Span=10MHz; Detector: Peak- Max Hold;
Sweep time: Auto.

UMTS: RBW=5MHz; VBW=10MHz; Span=10MHz; Detector: Peak- Max Hold;
Sweep time: Auto.

Average measurements performed using RMS detector functionality of the Spectrum Analyzer.

6.3 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.)

6.4 Sample Calculations for Radiated Measurements

6.4.1 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 (dB μ V/m)= Measured Value on SA (dB μ V)+ Cable Loss (dB)

Eg:

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

6.4.2 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 (dB μ V)	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

6.5 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**

Frequency (MHz)	GSM 850: GMSK Mode	EDGE 850: 8-PSK Mode	FDD5 850: QPSK Mode
	Conducted Power (dBm)	Conducted Power (dBm)	Conducted Power (dBm)
824.2	31.7	27.0	23.04
836.6	31.6	26.9	23.25
848.8	31.6	26.8	22.79

Frequency (MHz)	GSM 850: GMSK Mode	EDGE 850: 8-PSK Mode	FDD5 850: QPSK Mode
	Radiated Power	Radiated Power	Radiated Power
	ERP (dBm)	ERP (dBm)	ERP (dBm)
824.2	33.09	27.17	25.23
836.6	34.28	31.54	27.0
848.8	33.91	29.89	26.72

6.5.1 Measurement Result

Pass.

6.6 RF Power Output 1900MHz band

Limit: Nominal Peak Output Power < 33 dBm (2W)

Measurement Uncertainty (Conducted): ± 0.5 dB

Measurement Uncertainty (Radiated): ± 3.0 dB

Frequency (MHz)	GSM 1900: GMSK Mode	EDGE 1900: 8-PSK Mode	FDD5 1900: QPSK Mode
	Conducted Power (dBm)	Conducted Power (dBm)	Conducted Power (dBm)
1850.2	29.0	26.2	23.12
1880.0	28.9	26.2	23.23
1909.8	28.8	26.1	23.24

Frequency (MHz)	GSM 1900: GMSK Mode	EDGE 1900: 8-PSK Mode	FDD5 1900: QPSK Mode
	Radiated Power	Radiated Power	Radiated Power
	EIRP (dBm)	EIRP (dBm)	EIRP (dBm)
1850.2	31.75	27.51	30.42
1880.0	31.32	25.72	29.42
1909.8	31.5	26.2	29.04

6.6.1 Measurement Result

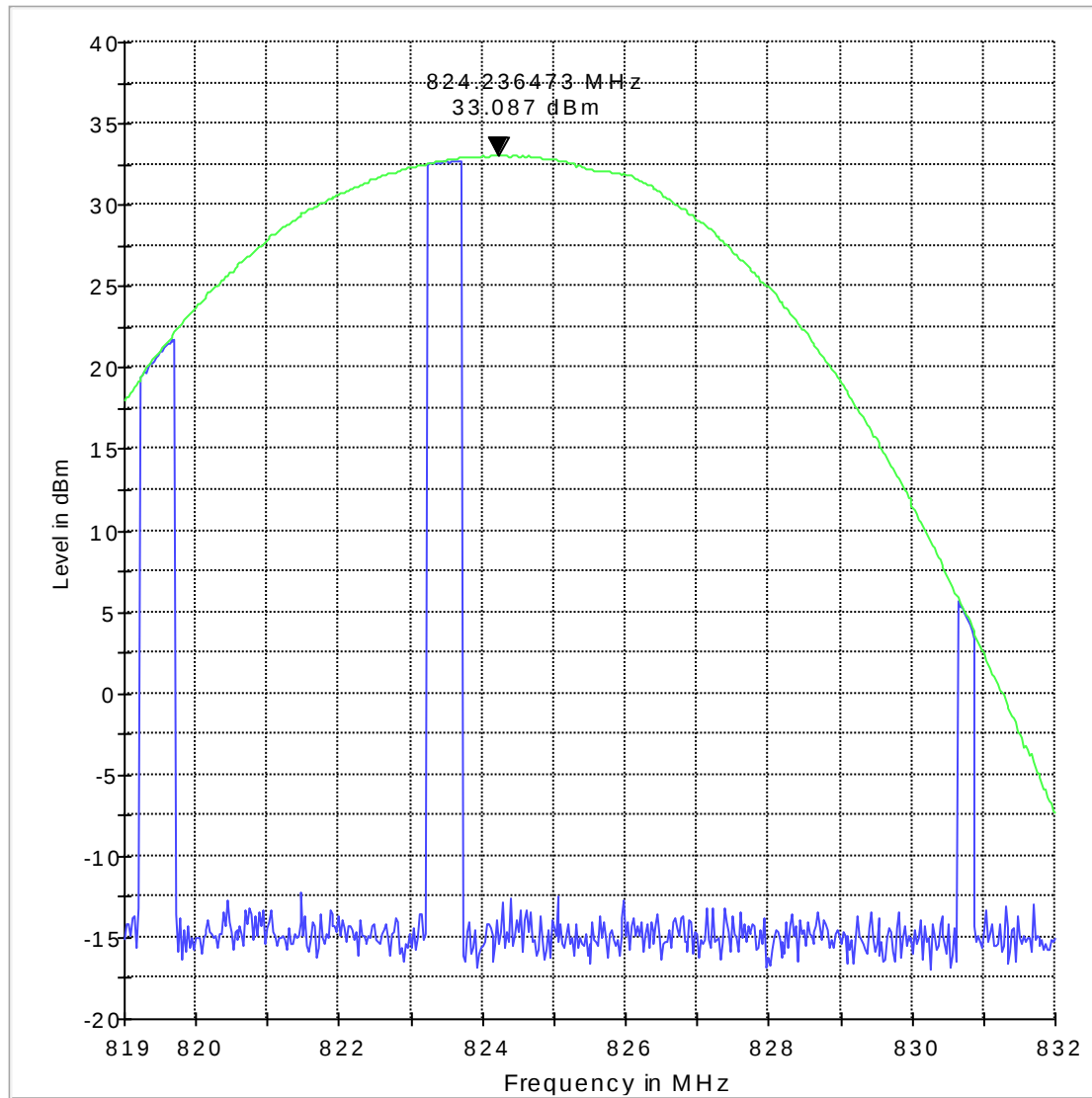
Pass.

6.7 Results

ERP (GSM 850) CHANNEL 128

EUT Name:	Ranger 4 HSPA
Manufacturer:	Mentor Engineering Inc.
Serial No:	31-11100019
Comment:	12V

ERP 850 L

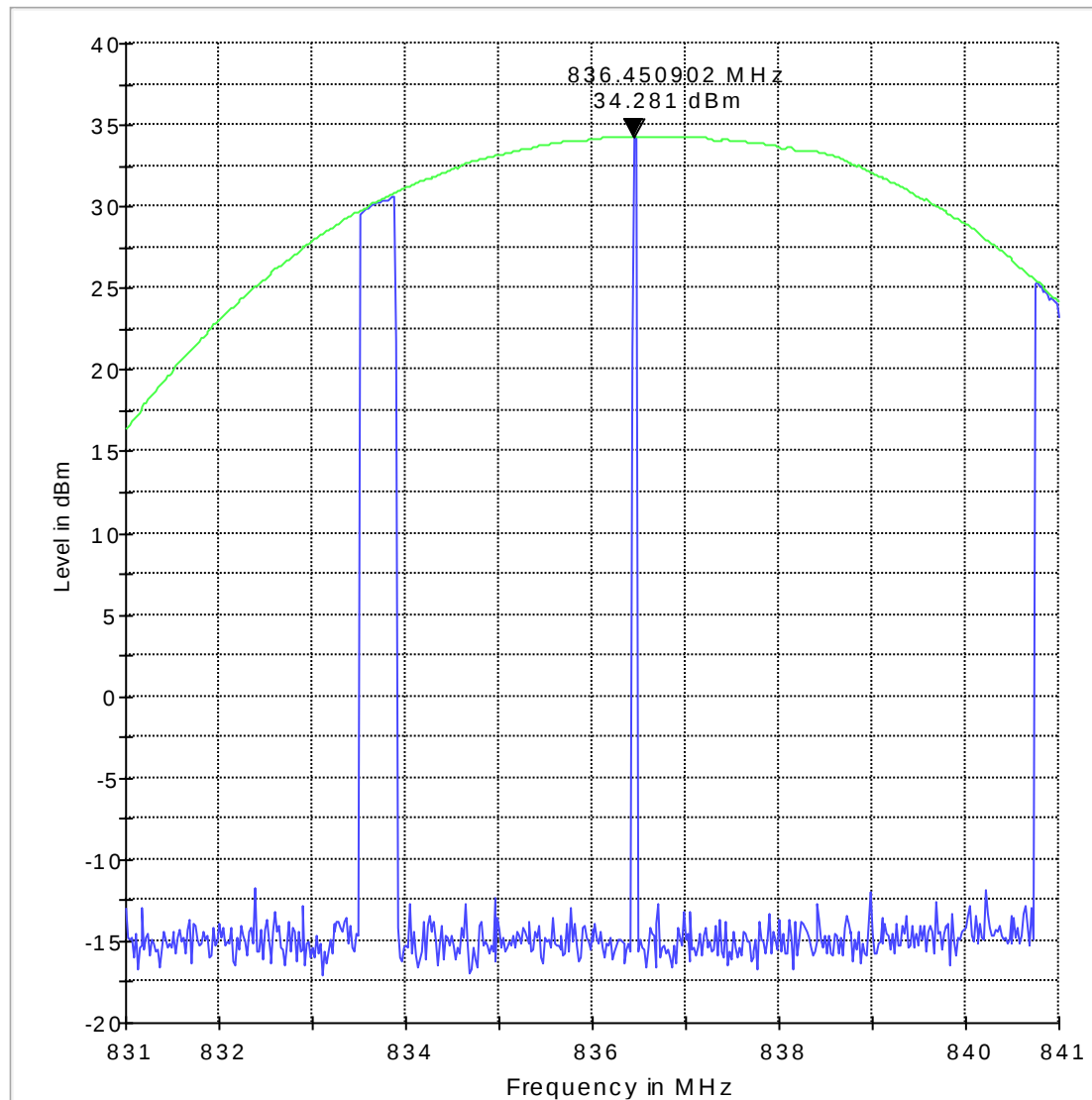


MaxPeak-ClearWrite MaxPeak-MaxHold

ERP (GSM 850) CHANNEL 190

EUT Name: Ranger 4 HSPA
Manufacturer: Mentor Engineering Inc.
Serial No: 31-11100019
Comment: 12V

ERP 850 M

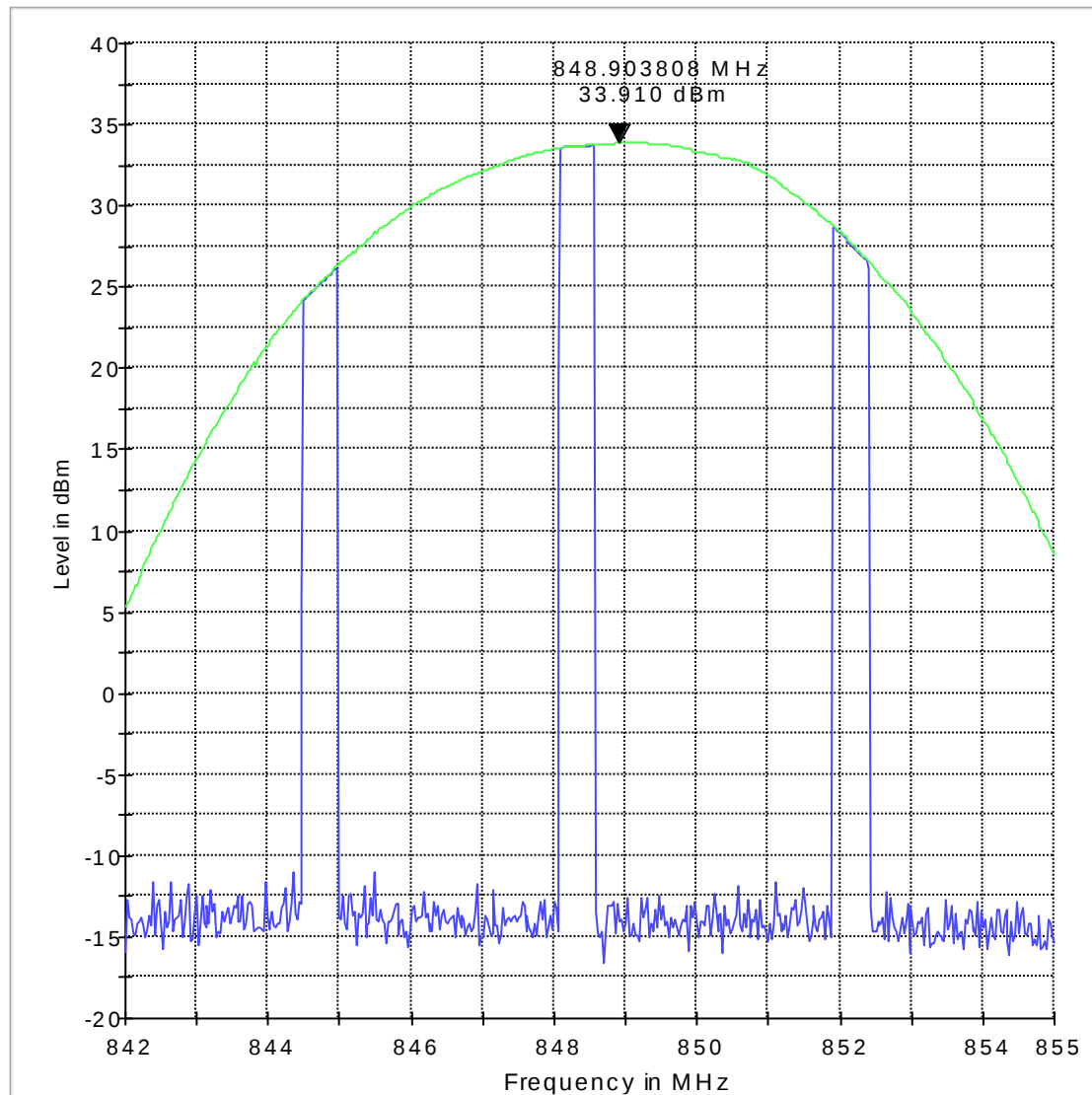


MaxPeak-ClearWrite MaxPeak-MaxHold

ERP (GSM 850) CHANNEL 251

EUT Name: Ranger 4 HSPA
Manufacturer: Mentor Engineering Inc.
Serial No: 31-11100019
Comment: 12V

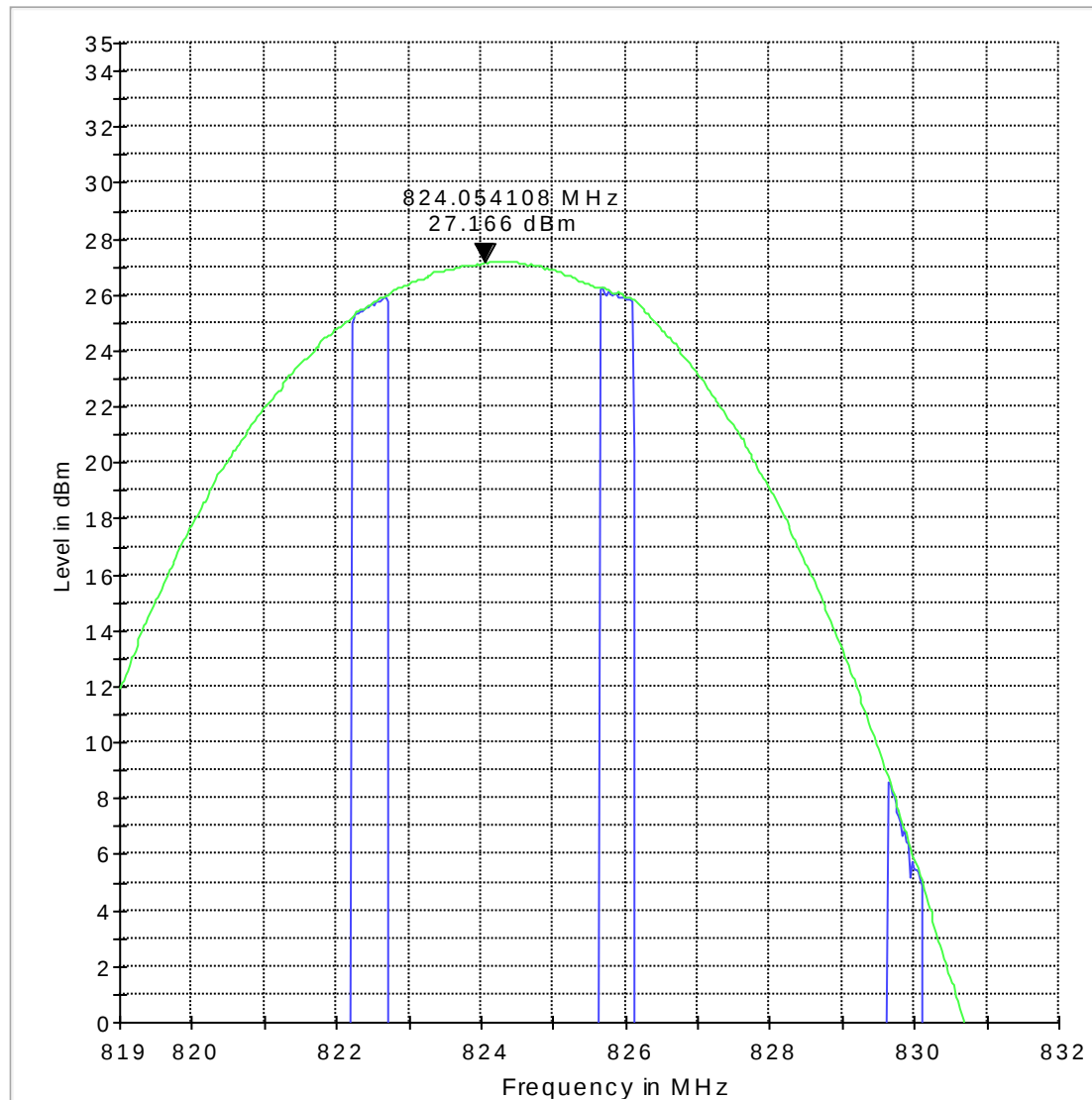
ERP 850 H



MaxPeak-ClearWrite MaxPeak-MaxHold

ERP (EGPRS 850) CHANNEL 128

EUT Name: Ranger 4 HSPA
Manufacturer: Mentor Engineering Inc.
Serial No: 31-11100019
Comment: 12v

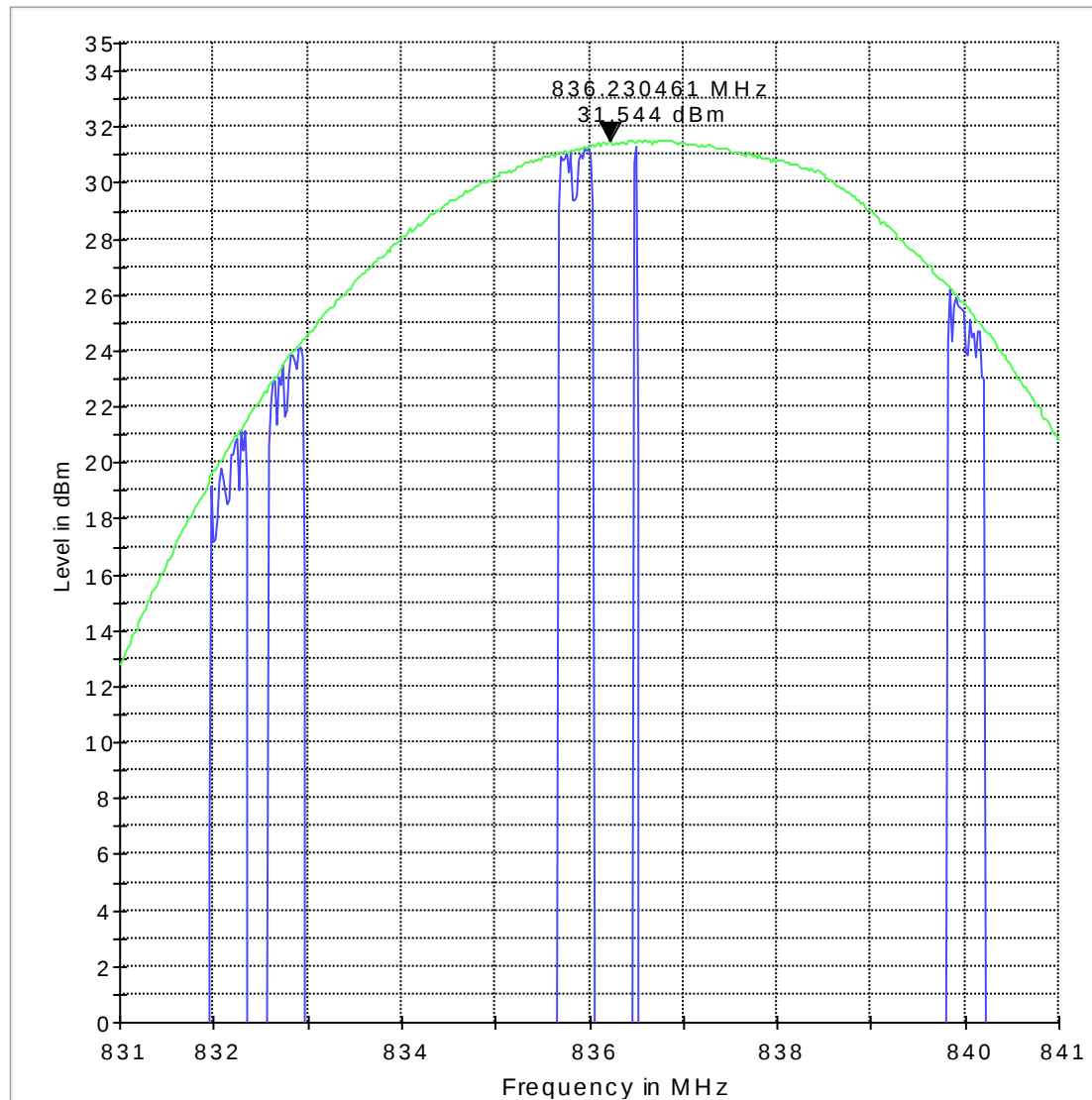
ERP 850 L

MaxPeak-ClearWrite MaxPeak-MaxHold

ERP (EGPRS 850) CHANNEL 190

EUT Name: Ranger 4 HSPA
Manufacturer: Mentor Engineering Inc.
Serial No: 31-11100019
Comment: 12v

ERP 850 M

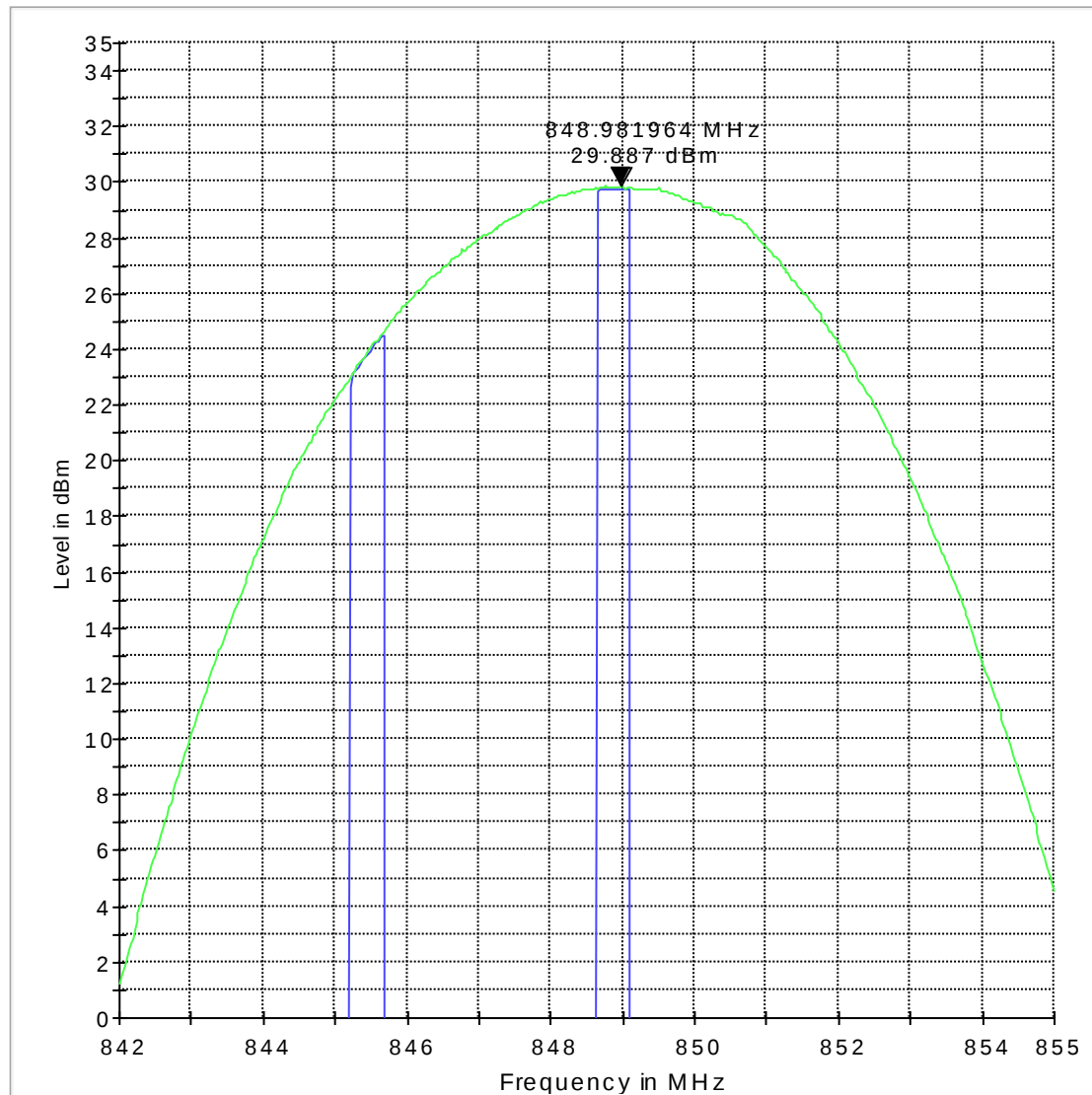


MaxPeak-ClearWrite MaxPeak-MaxHold

ERP (EGPRS 850) CHANNEL 251

EUT Name: Ranger 4 HSPA
Manufacturer: Mentor Engineering Inc.
Serial No: 31-11100019
Comment: 12v

ERP 850 H



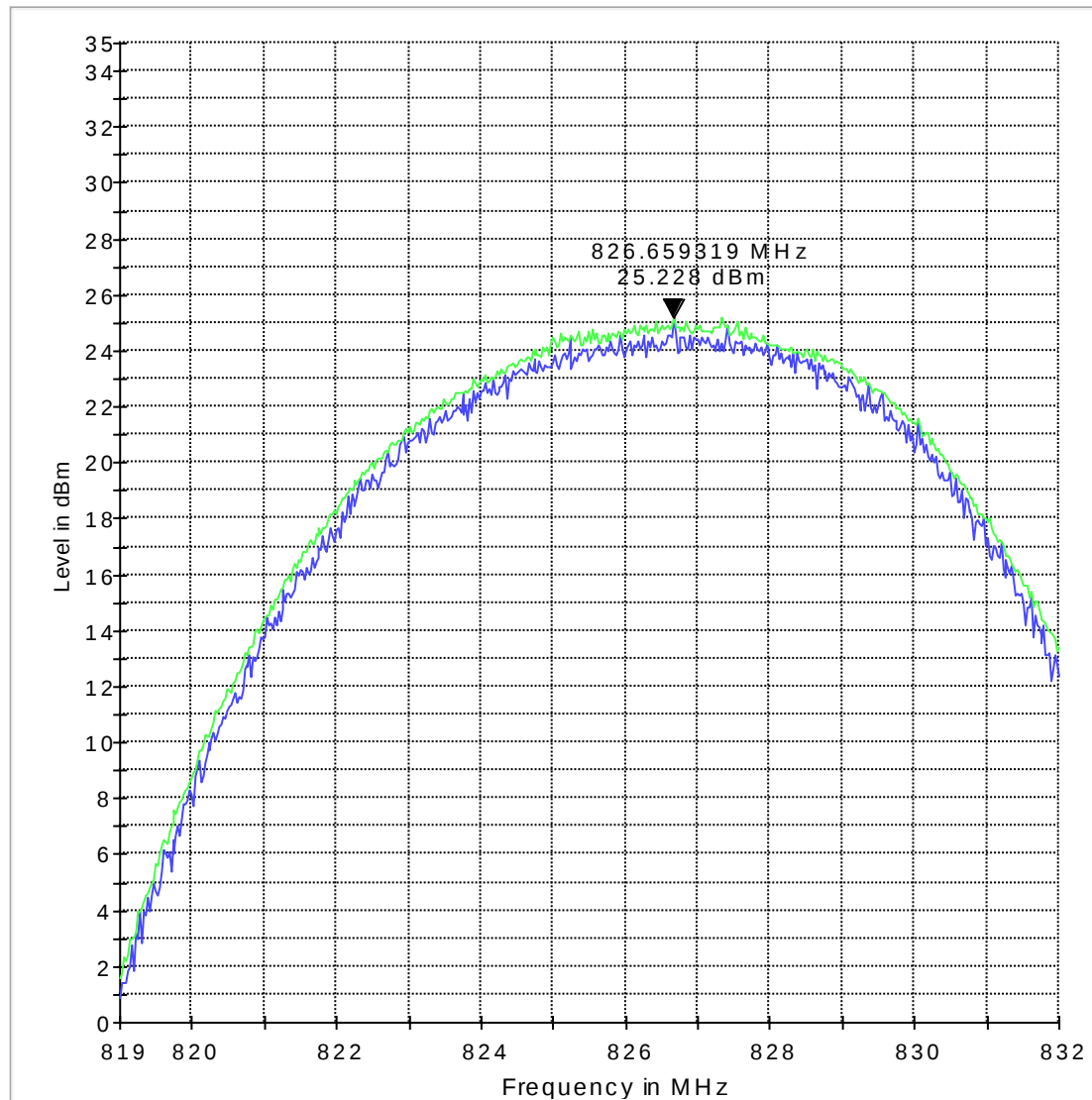
MaxPeak-ClearWrite MaxPeak-MaxHold

ERP (UMTS FDD5) CHANNEL 4132

Description:

EUT Name:	Ranger 4 HSPA
Manufacturer:	Mentor Engineering Inc.
Serial No:	31-11100019
Comment:	12V

ERP 850 L



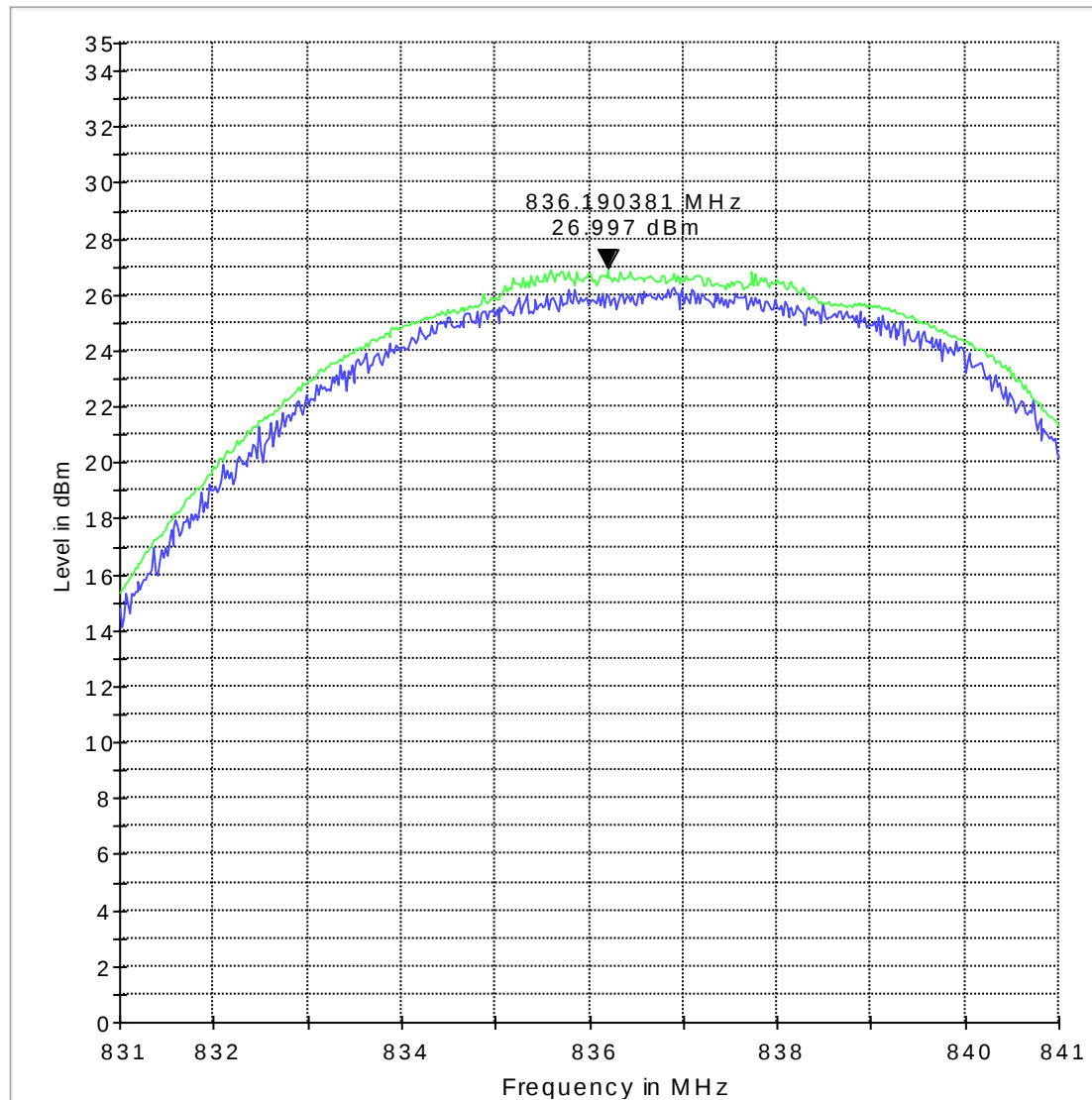
— MaxPeak-ClearWrite — MaxPeak-MaxHold

ERP (UMTS FDD5) CHANNEL 4183

Description:

EUT Name:	Ranger 4 HSPA
Manufacturer:	Mentor Engineering Inc.
Serial No:	31-11100019
Comment:	12V

ERP 850 M

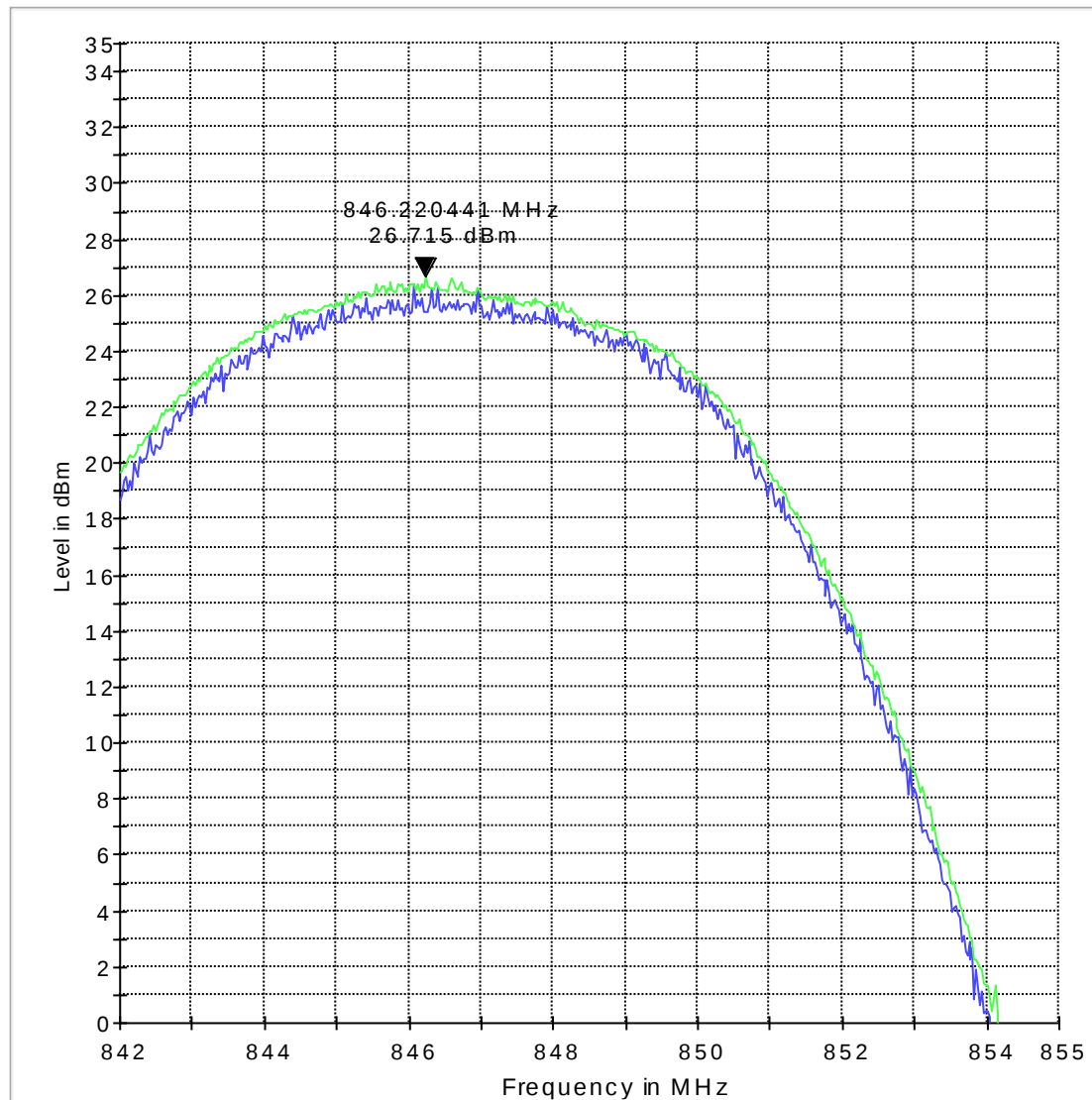


MaxPeak-ClearWrite MaxPeak-MaxHold

ERP (UMTS FDD5) CHANNEL 4233

EUT Name: Ranger 4 HSPA
Manufacturer: Mentor Engineering Inc.
Serial No: 31-11100019
Comment: 12V

ERP 850 H

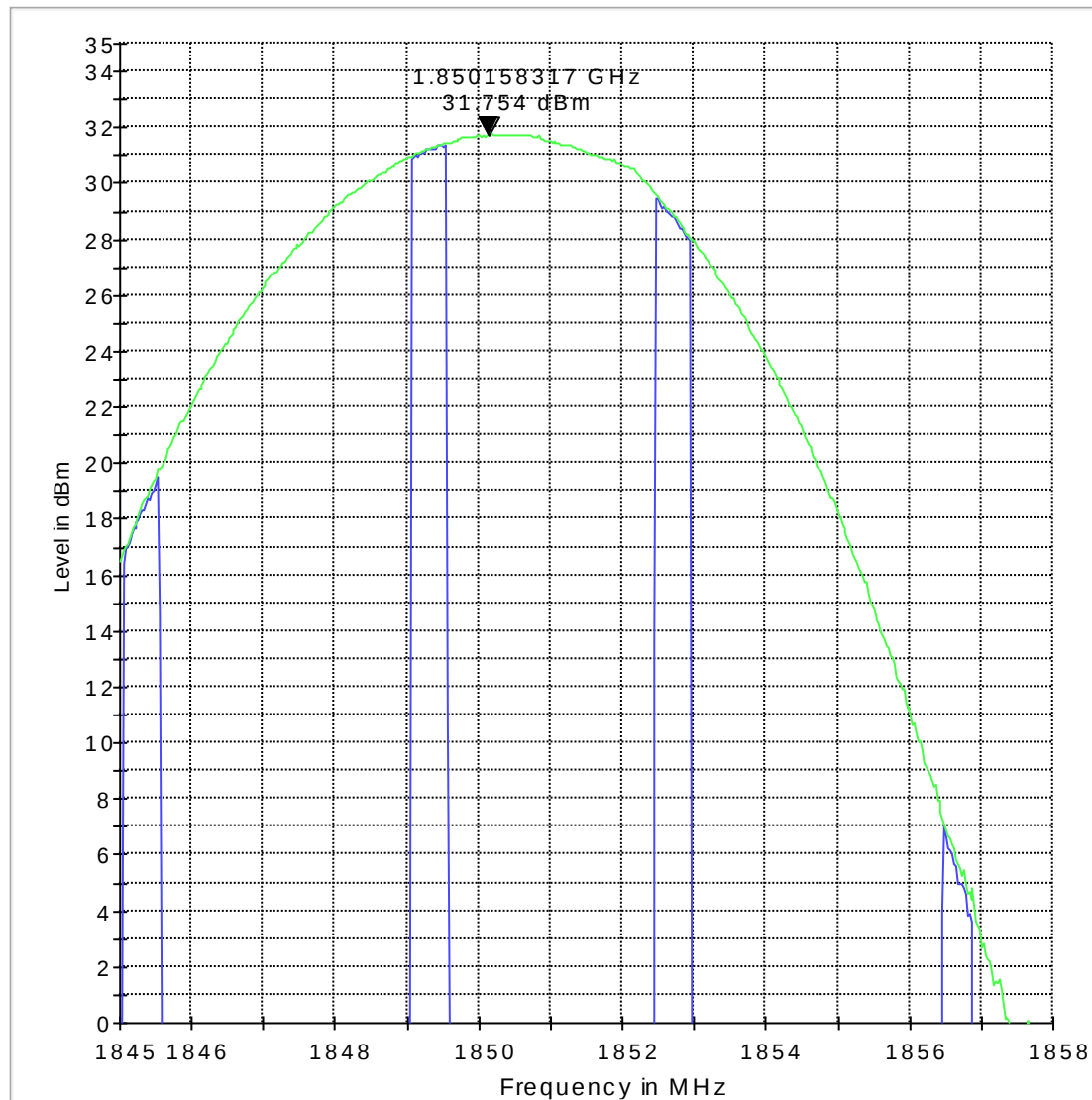


MaxPeak-ClearWrite MaxPeak-MaxHold

EIRP (PCS-1900) CHANNEL 512

EUT Name: Ranger 4 HSPA
Manufacturer: Mentor Engineering Inc.
Serial No: 31-11100019
Comment: 12V

EIRP 1900 L

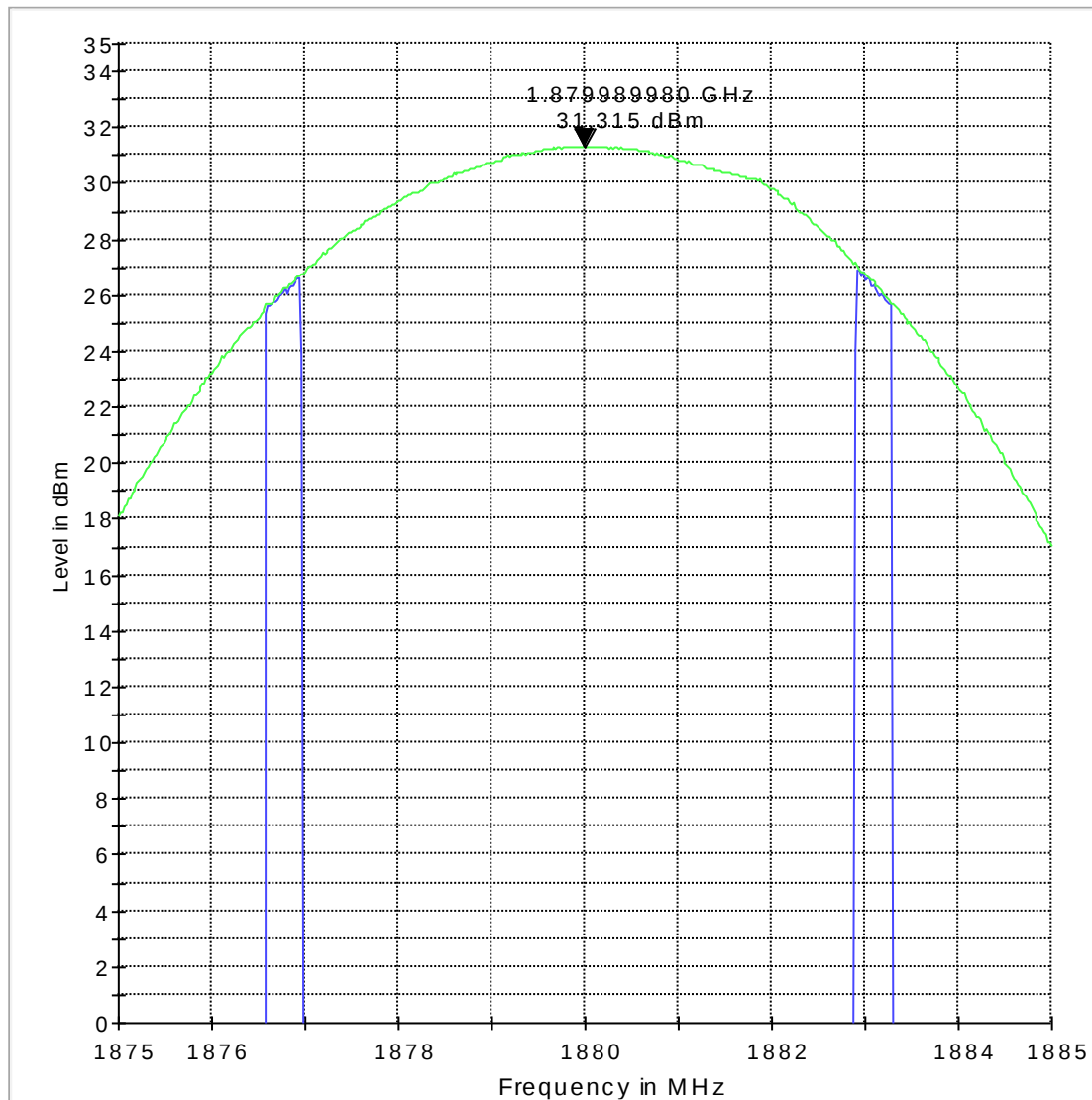


MaxPeak-ClearWrite MaxPeak-MaxHold

EIRP (PCS-1900) CHANNEL 661

EUT Name: Ranger 4 HSPA
Manufacturer: Mentor Engineering Inc.
Serial No: 31-11100019
Comment: 12V

EIR P 1900 M

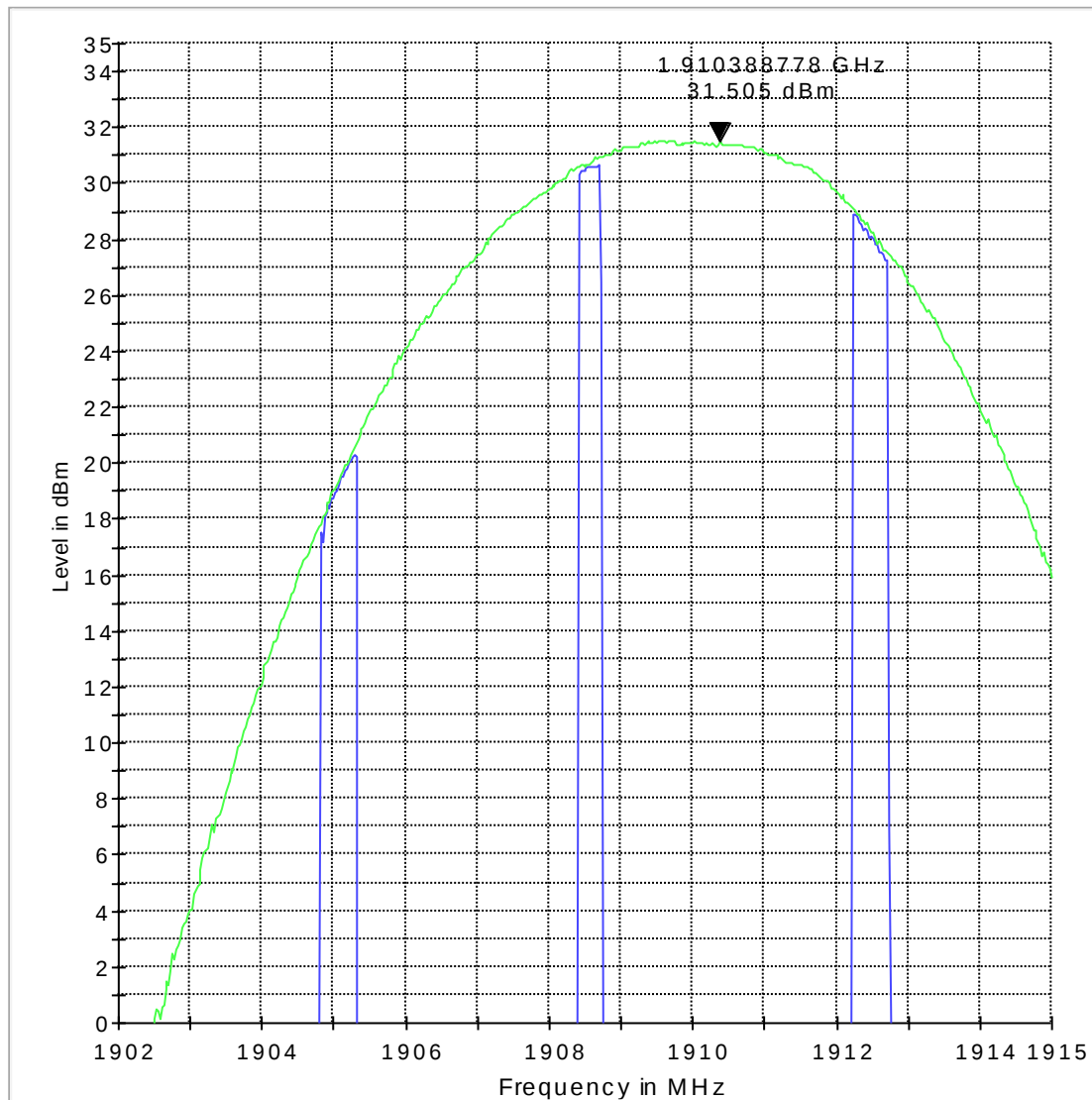


MaxPeak-ClearWrite MaxPeak-MaxHold

EIRP (PCS-1900) CHANNEL 810

EUT Name: Ranger 4 HSPA
Manufacturer: Mentor Engineering Inc.
Serial No: 31-11100019
Comment: 12V

EIR P 1900 H

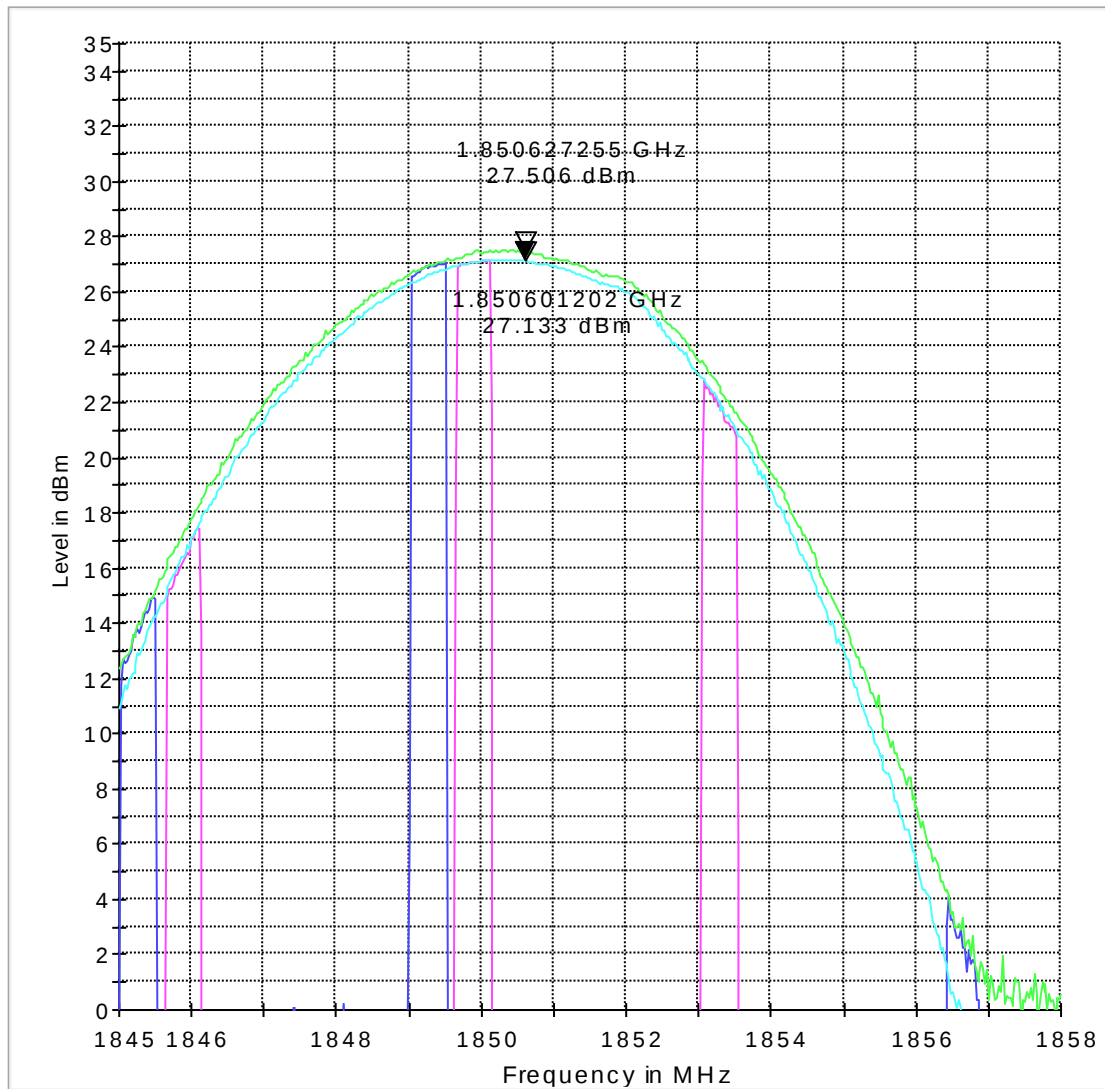


MaxPeak-ClearWrite MaxPeak-MaxHold

EIRP (EGPRS 1900) CHANNEL 512

EUT Name: Ranger 4 HSPA
Manufacturer: Mentor Engineering Inc.
Serial No: 31-11100019
Comment: 12v

EIRP 1900 L

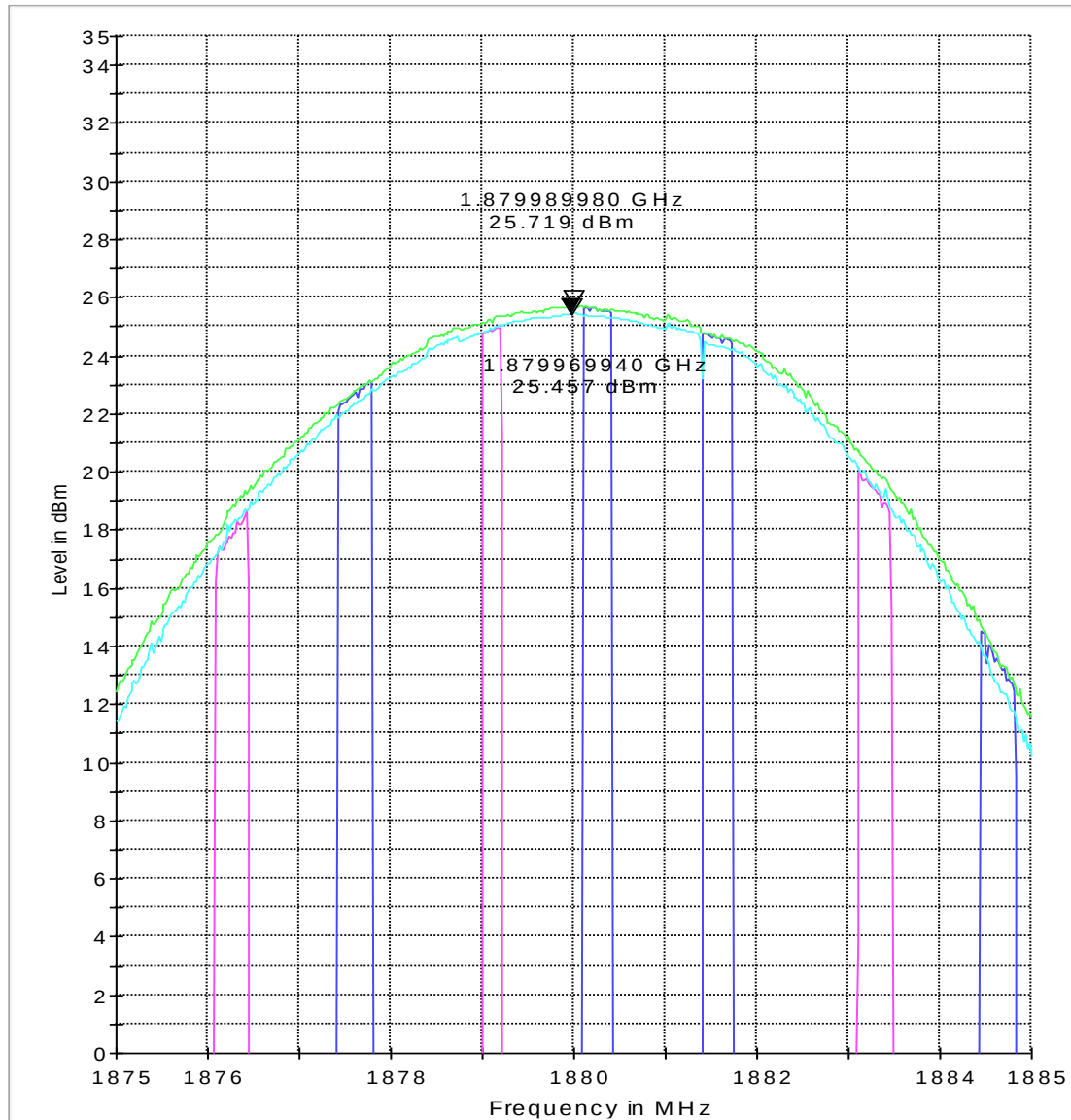


MaxPeak-ClearWrite MaxPeak-MaxHold
RMS-ClearWrite RMS-MaxHold

EIRP (EGPRS 1900) CHANNEL 661

EUT Name: Ranger 4 HSPA
Manufacturer: Mentor Engineering Inc.
Serial No: 31-11100019
Comment: 12v

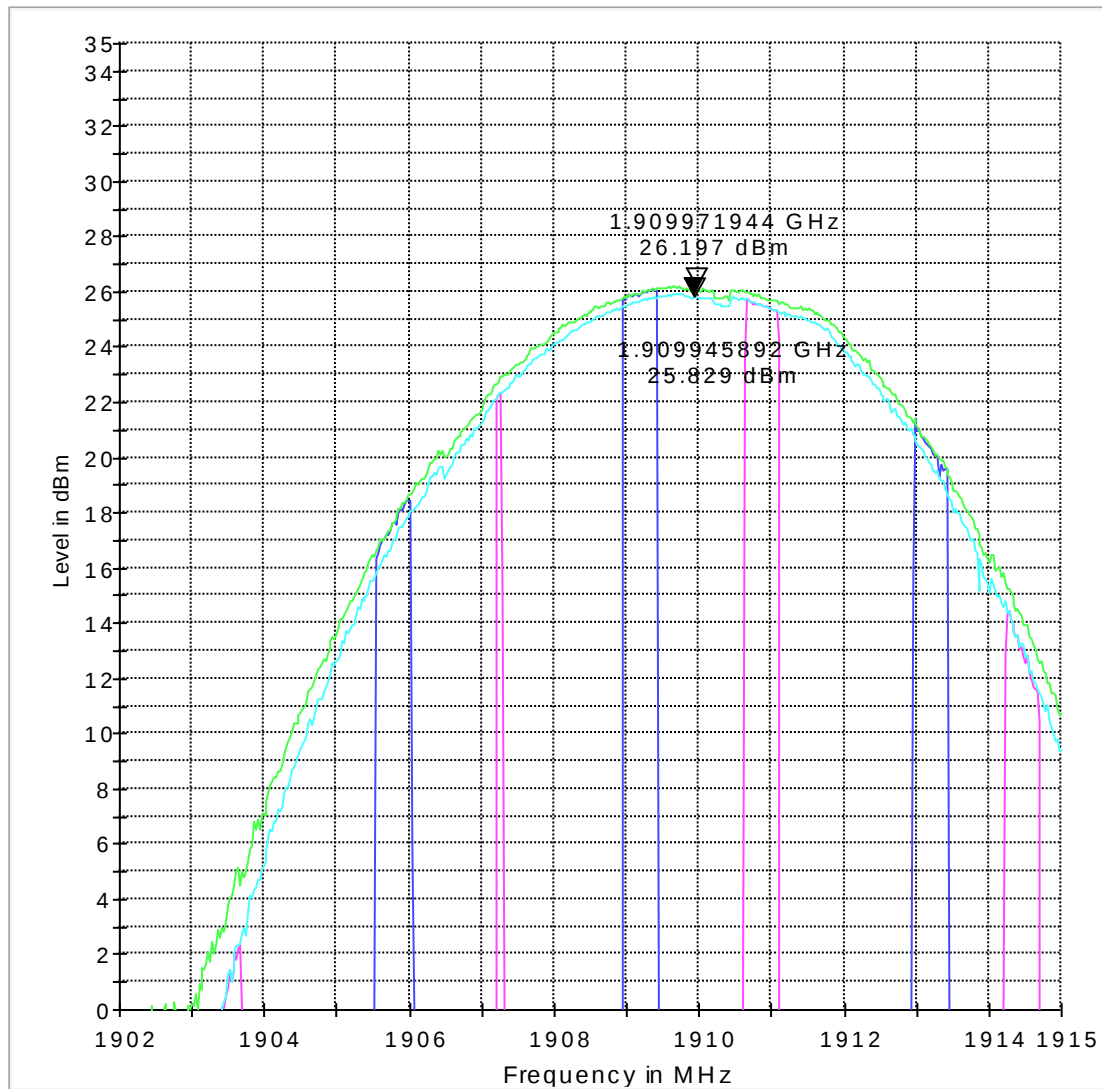
EIR P 1900 M



MaxPeak-ClearWrite MaxPeak-MaxHold
RMS-ClearWrite RMS-MaxHold

EIRP (EGPRS 1900) CHANNEL 810

EUT Name: Ranger 4 HSPA
Manufacturer: Mentor Engineering Inc.
Serial No: 31-11100019
Comment: 12v

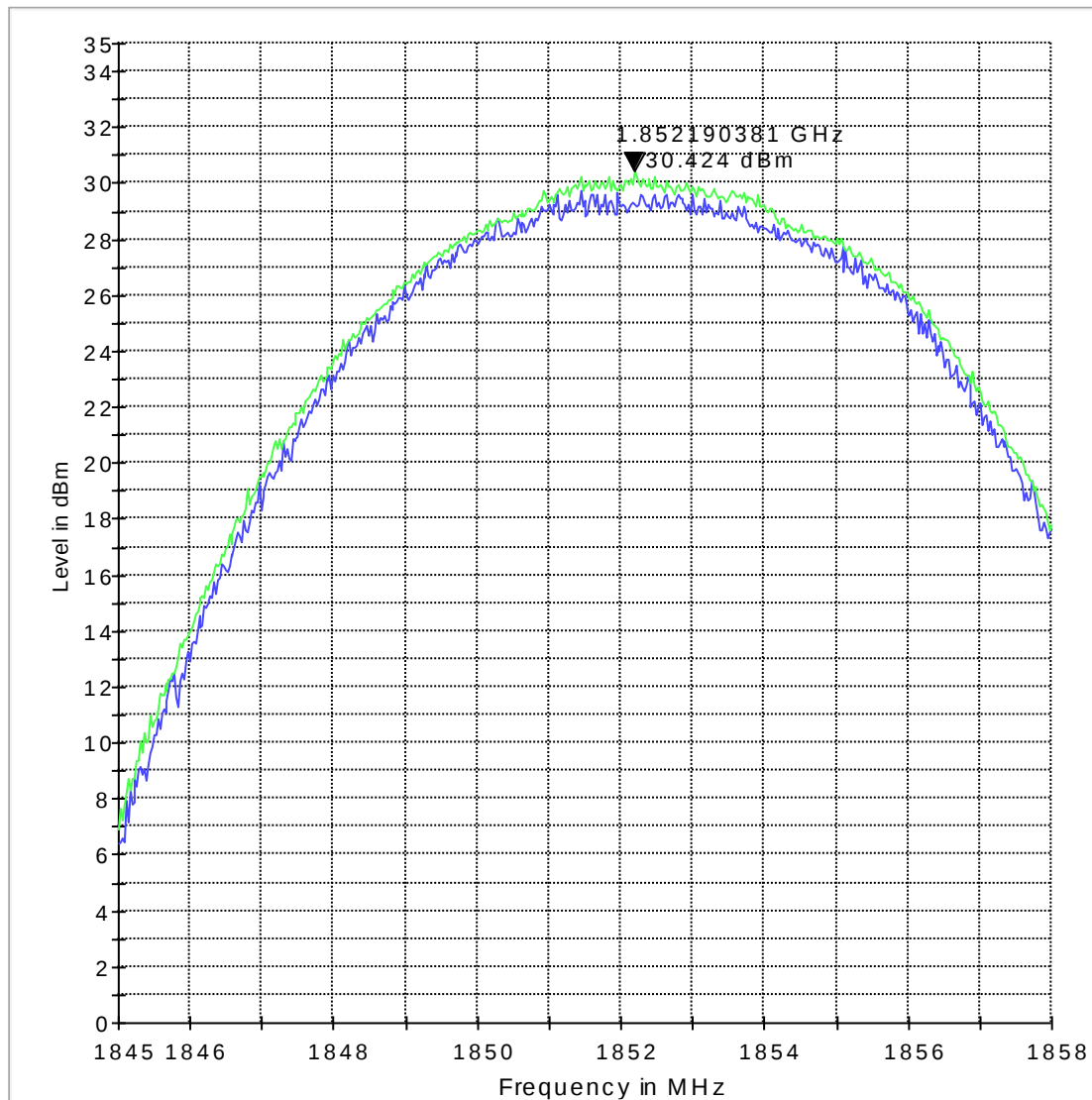
EIR P 1900 H

MaxPeak-ClearWrite MaxPeak-MaxHold
RMS-ClearWrite RMS-MaxHold

EIRP (UMTS FDD2) CHANNEL 9262

EUT Name: Ranger 4 HSPA
Manufacturer: Mentor Engineering Inc.
Serial No: 31-11100019
Comment: 12V

EIRP 1900 L

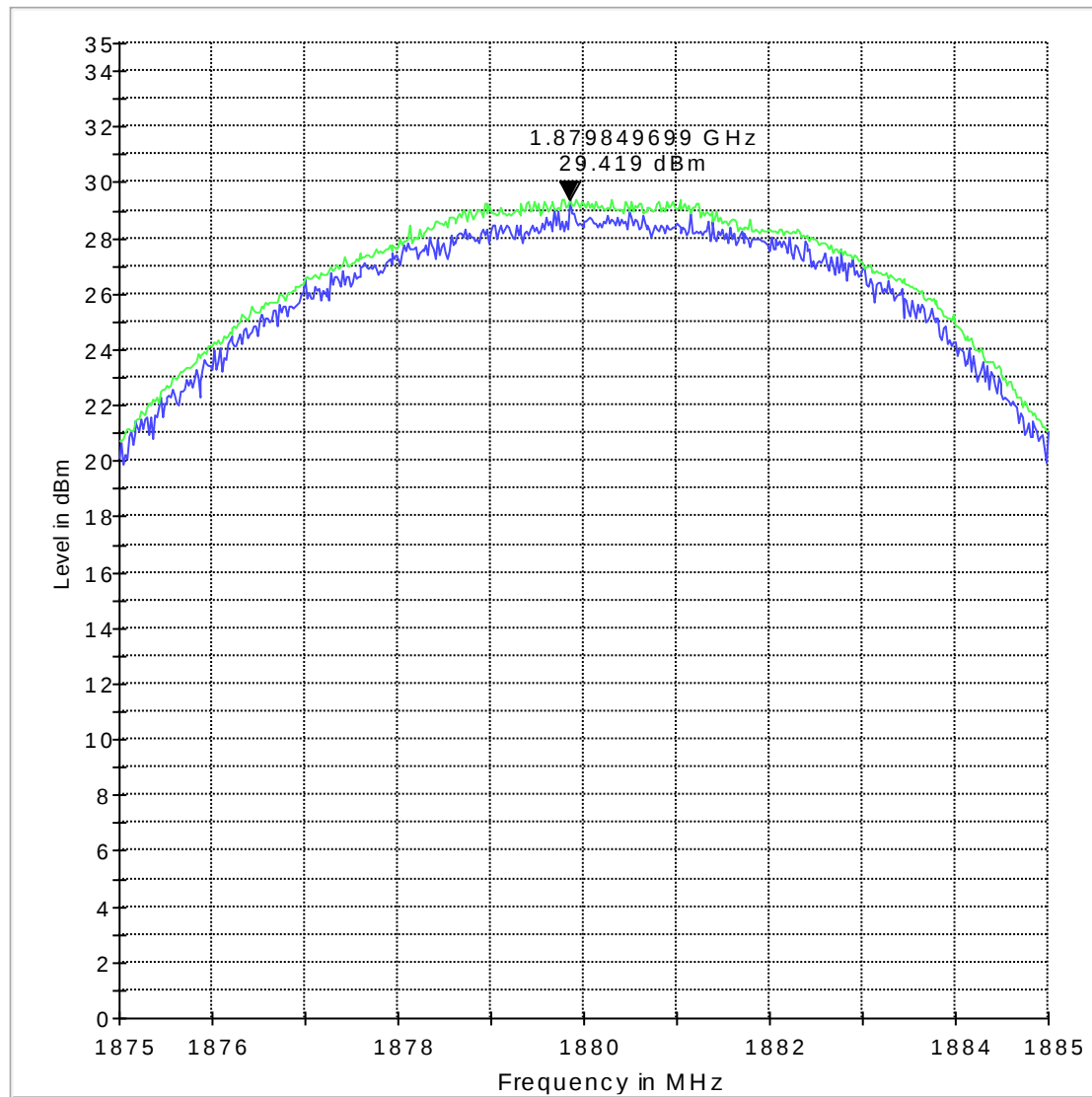


MaxPeak-ClearWrite MaxPeak-MaxHold

EIRP (UMTS FDD2) CHANNEL 9400

EUT Name: Ranger 4 HSPA
Manufacturer: Mentor Engineering Inc.
Serial No: 31-11100019
Comment: 12V

EIR P 1900 M

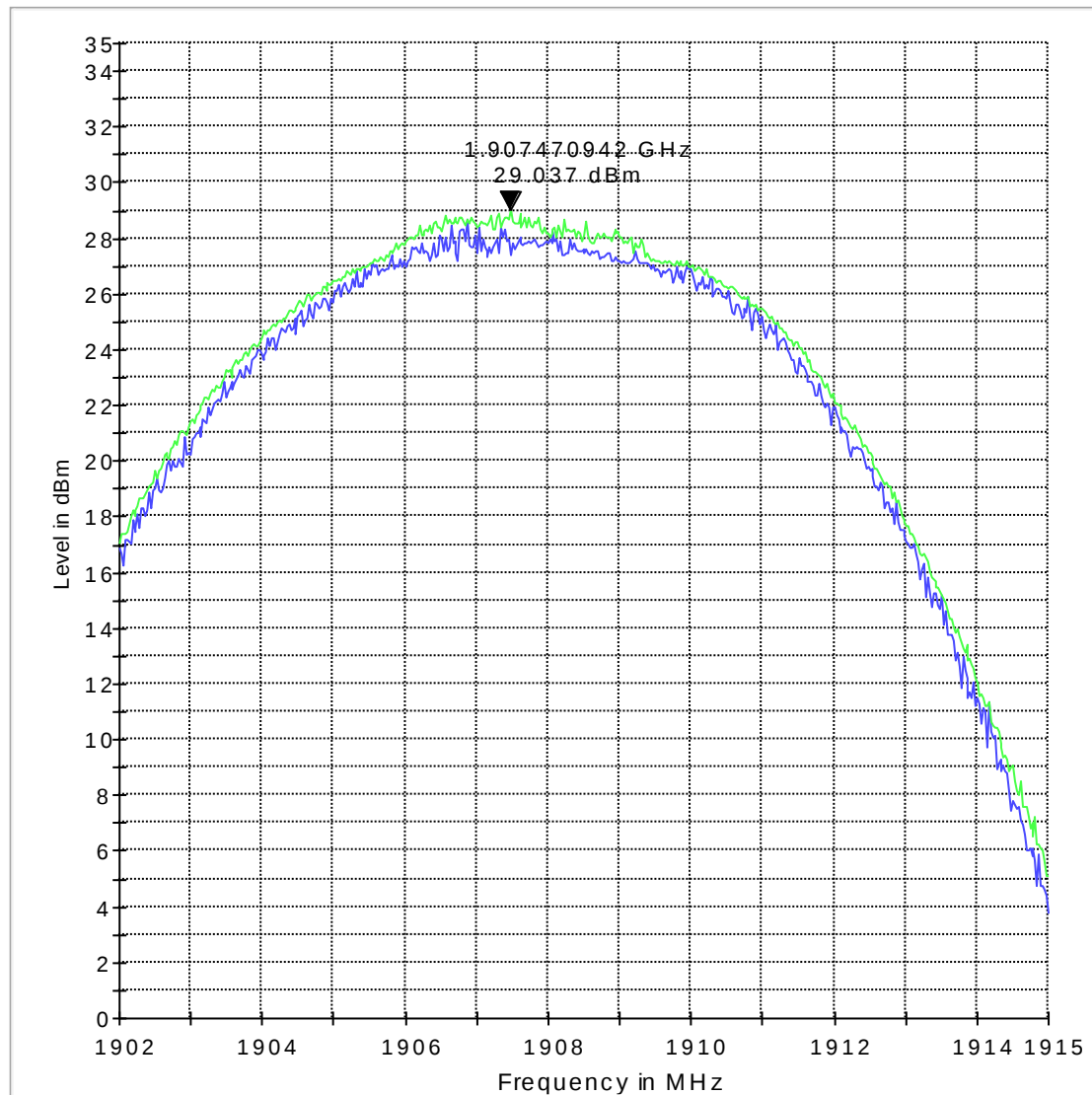


MaxPeak-ClearWrite MaxPeak-MaxHold

EIRP (UMTS FDD2) CHANNEL 9538

EUT Name: Ranger 4 HSPA
Manufacturer: Mentor Engineering Inc.
Serial No: 31-11100019
Comment: 12V

EIRP 1900 H



MaxPeak-ClearWrite MaxPeak-MaxHold

6.8 Spurious Emissions Radiated

6.8.1 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

6.8.2 Measurement requirements:

6.8.2.1 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.

6.8.2.2 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.

6.8.3 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.

6.8.3.1 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.

6.8.3.2 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.

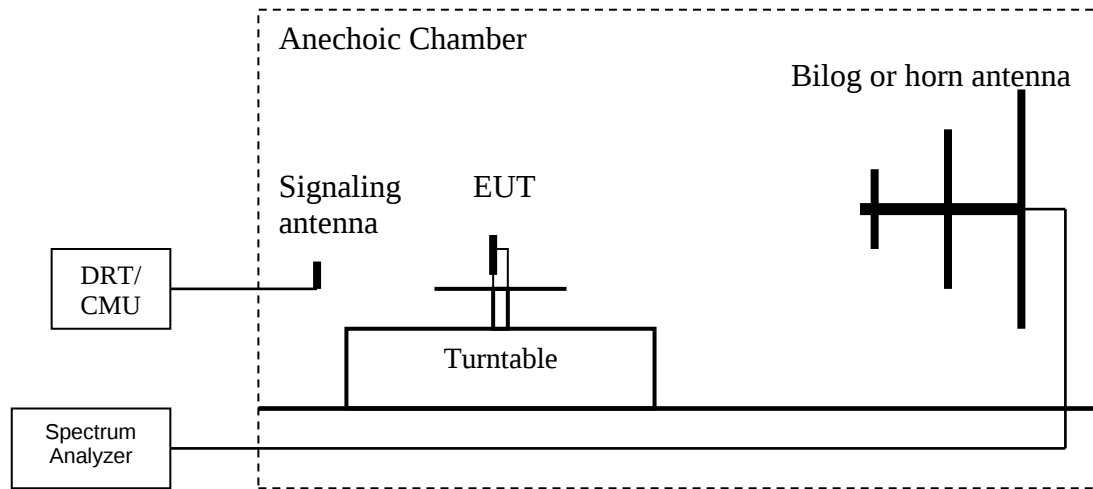
6.8.3.3 RSS-132 Section 4.5.1.1 and RSS-133 Section 6.5.1

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.

6.8.4 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.
(**Note:** 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 GSM-850 & PCS-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 GSM-850 & PCS-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.

Radiated emission measurements were made only with Circuit Switched mode GMSK modulation because this mode represents the worse case emission for all the modulations for GSM. 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.

Radiated emissions measurements were also performed with UMTS FDD mode.

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

6.8.5.1 Test Results Transmitter Spurious Emission GSM850:

Harmonic	Tx ch-128 Freq. (MHz)	Level (dBm)	Tx ch-190 Freq. (MHz)	Level (dBm)	Tx ch-251 Freq. (MHz)	Level (dBm)
1	824.2	-	836.6	-	848.8	-
2	1648.4	NF	1673.2	NF	1697.6	NF
3	2472.6	-37	2509.8	-40	2546.4	-42
4	3296.8	NF	3346.4	NF	3395.2	NF
5	4121	NF	4183	NF	4244	NF
6	4945.2	NF	5019.6	NF	5092.8	NF
7	5769.4	NF	5856.2	NF	5941.6	NF
8	6593.6	NF	6692.8	NF	6790.4	NF
9	7417.8	NF	7529.4	NF	7639.2	NF
10	8242	NF	8366	NF	8488	NF
NF = Noise Floor Measurement Uncertainty: ± 3 dB						

6.8.5.2 Measurement Result

Pass.

Legend for the plots:

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

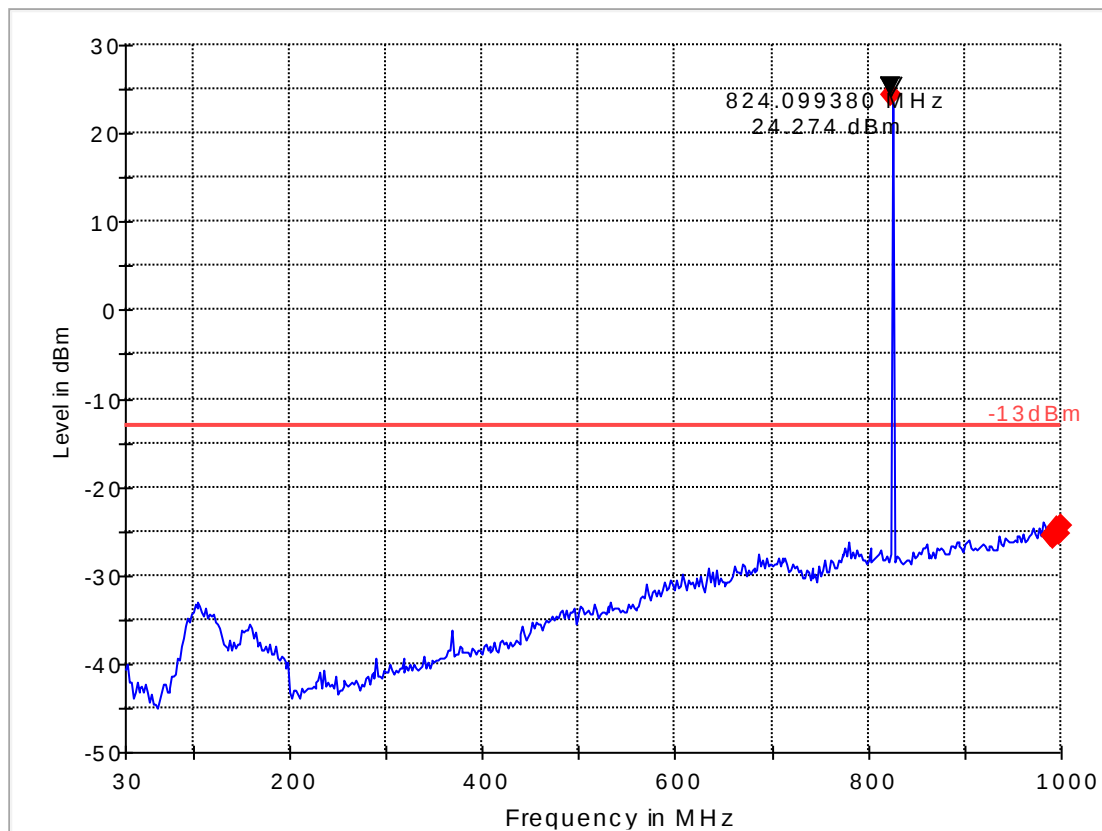
Radiated Spurious Emissions (GSM-850) Tx: Low Channel

Test results 30M-1GHz

EUT Name: Ranger 4 HSPA
 Manufacturer: Mentor Engineering Inc.
 Serial No: 31-11100019
 Comment: 12V ; signal over limit is transmit signal

Frequency (MHz)	MaxPeak (dBm)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBm)
824.099380	24.3	20.0	100.000	121.0	H	0.0	-71.0	-37.3	-13.0
990.222907	-25.6	20.0	100.000	171.0	V	90.0	-68.6	12.6	-13.0
990.719170	-25.6	20.0	100.000	121.0	H	159.0	-69.0	12.6	-13.0
996.407265	-24.6	20.0	100.000	171.0	V	7.0	-68.3	11.6	-13.0
997.790159	-25.3	20.0	100.000	167.0	H	68.0	-68.9	12.3	-13.0
999.016091	-24.4	20.0	100.000	171.0	V	158.0	-68.2	11.4	-13.0

FCC 22 30-1000MHz

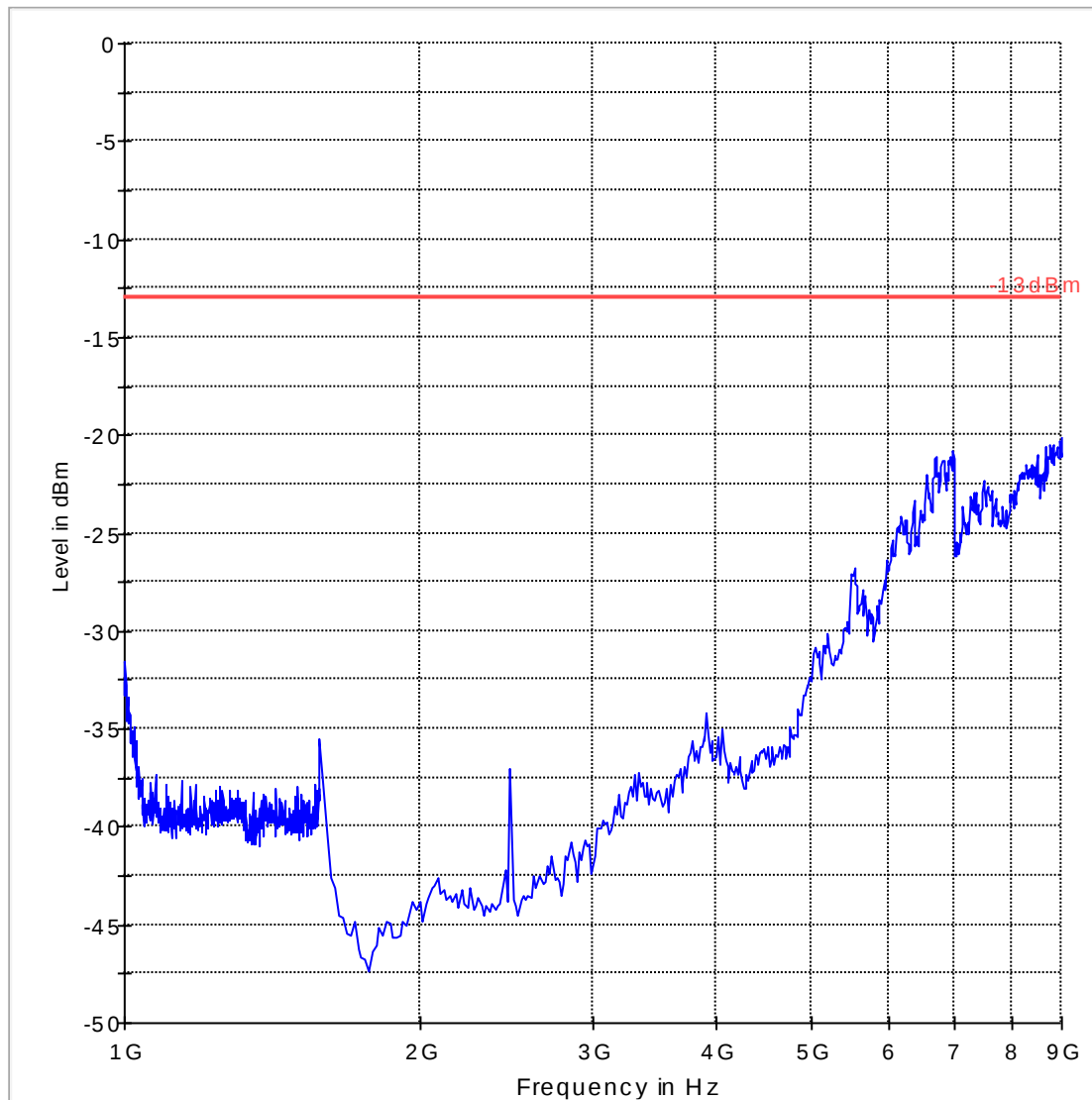


— -13 dBm . Limit Line — Preview Result 1 ◆ Final Result 1

Test results 1GHz-9GHz

EUT Name: Ranger 4 HSPA
Manufacturer: Mentor Engineering Inc.
Serial No: 31-11100019
Comment: 12V

FCC 22 1-9GHz



— -13 dBm Limit Line — 3 — Preview Result 1

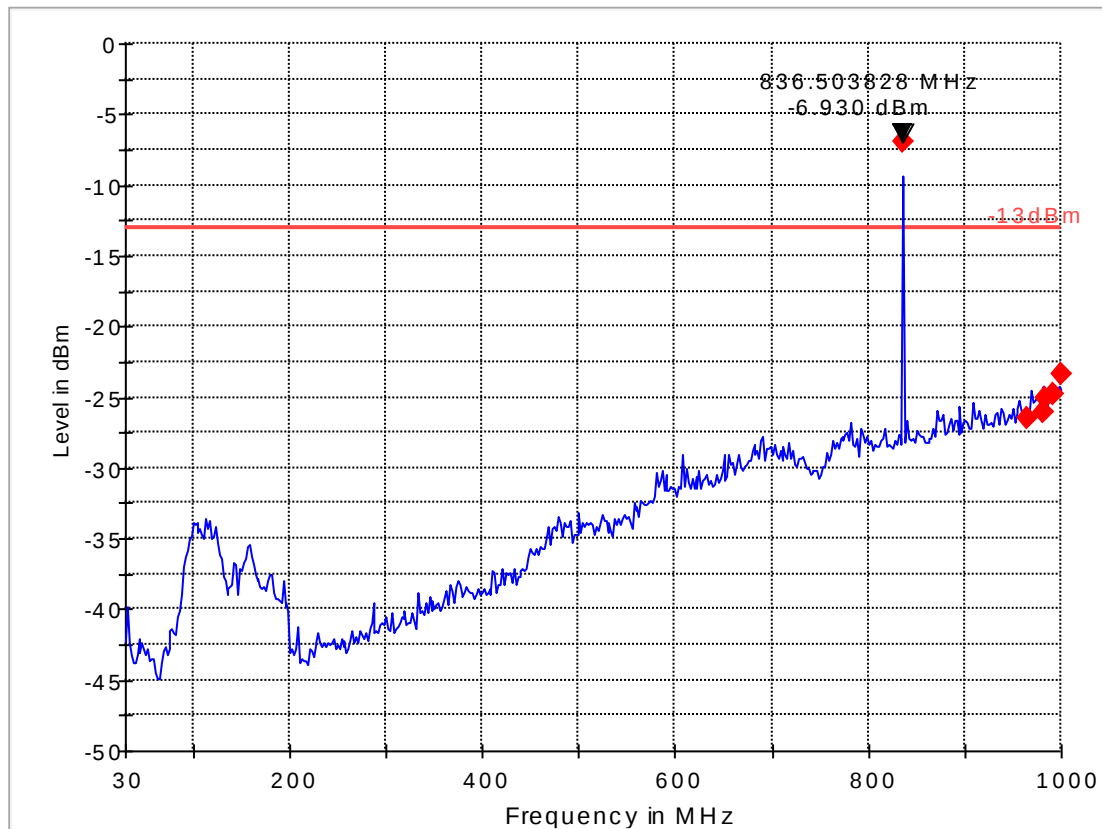
Radiated Spurious Emissions (GSM-850) Tx: Mid Channel

Test results 30M-1GHz

EUT Name: Ranger 4 HSPA
 Manufacturer: Mentor Engineering Inc.
 Serial No: 31-11100019
 Comment: 12V ; signal over limit is transmit signal

Frequency (MHz)	MaxPeak (dBm)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBm)
836.503828	-6.9	20.0	100.000	145.0	V	81.0	-70.2	-6.1	-13.0
963.900619	-26.5	20.0	100.000	171.0	H	292.0	-69.4	13.5	-13.0
980.654503	-26.1	20.0	100.000	171.0	H	288.0	-69.1	13.1	-13.0
983.023542	-25.1	20.0	100.000	154.0	H	112.0	-69.1	12.1	-13.0
992.615895	-24.8	20.0	100.000	121.0	V	22.0	-68.5	11.8	-13.0
999.207263	-23.4	20.0	100.000	121.0	V	264.0	-68.2	10.4	-13.0

FCC 22 30-1000MHz

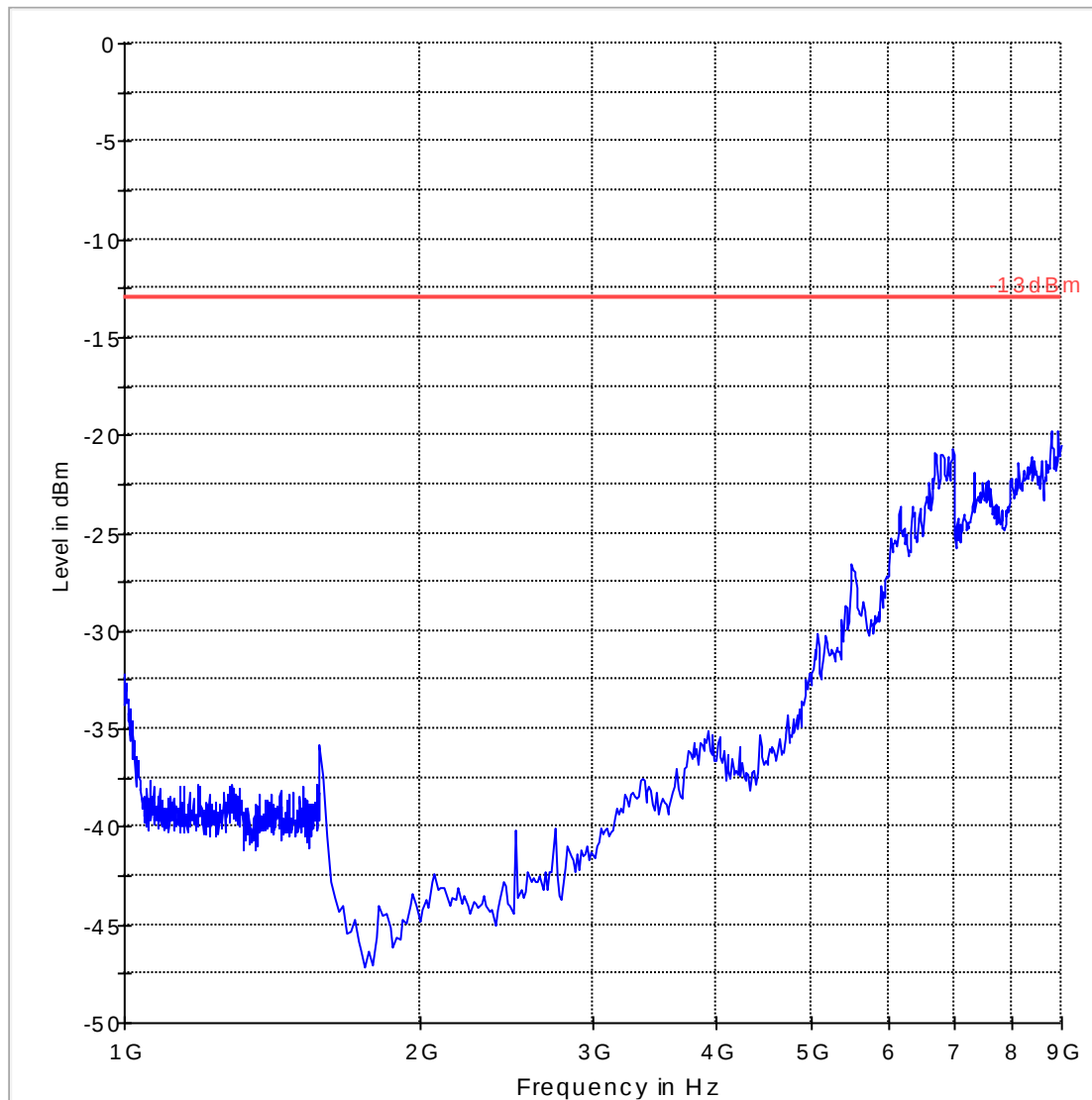


— -13 dBm Limit Line — Preview Result 1 ◆ Final Result 1

Test results 1GHz-9GHz

EUT Name: Ranger 4 HSPA
Manufacturer: Mentor Engineering Inc.
Serial No: 31-11100019
Comment: 12V

FCC 22 1-9GHz



— -13 dBm Limit Line — 3 — Preview Result 1

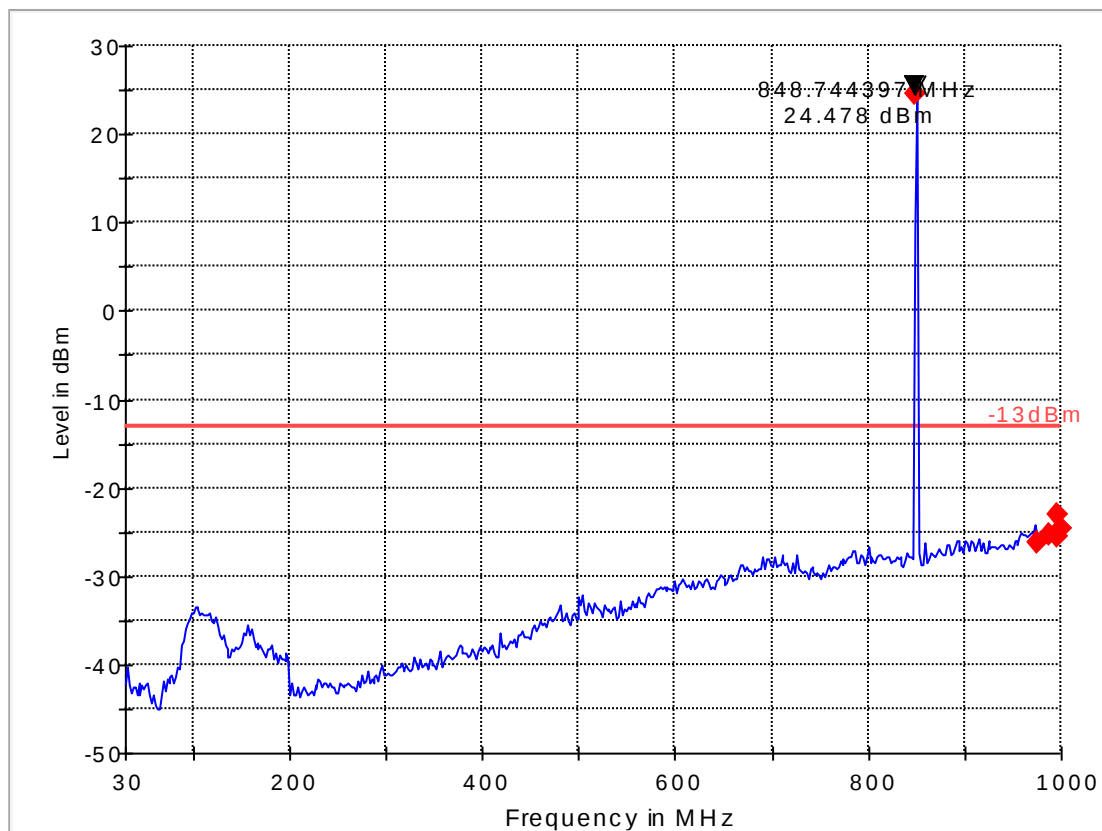
Radiated Spurious Emissions (GSM-850) Tx: High Channel

Test results 30M-1GHz

EUT Name: Ranger 4 HSPA
 Manufacturer: Mentor Engineering Inc.
 Serial No: 31-11100019
 Comment: 12V; signal over limit is transmit signal

Frequency (MHz)	MaxPeak (dBm)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBm)
848.744397	24.5	20.0	100.000	139.0	H	0.0	-70.7	-37.5	-13.0
974.881239	-26.2	20.0	100.000	170.0	H	189.0	-69.2	13.2	-13.0
987.136759	-25.3	20.0	100.000	170.0	H	7.0	-69.0	12.3	-13.0
995.080455	-23.1	20.0	100.000	152.0	V	263.0	-68.4	10.1	-13.0
995.741483	-25.4	20.0	100.000	145.0	V	7.0	-68.4	12.4	-13.0
999.539873	-24.5	20.0	100.000	120.0	V	249.0	-68.2	11.5	-13.0

FCC 22 30-1000MHz

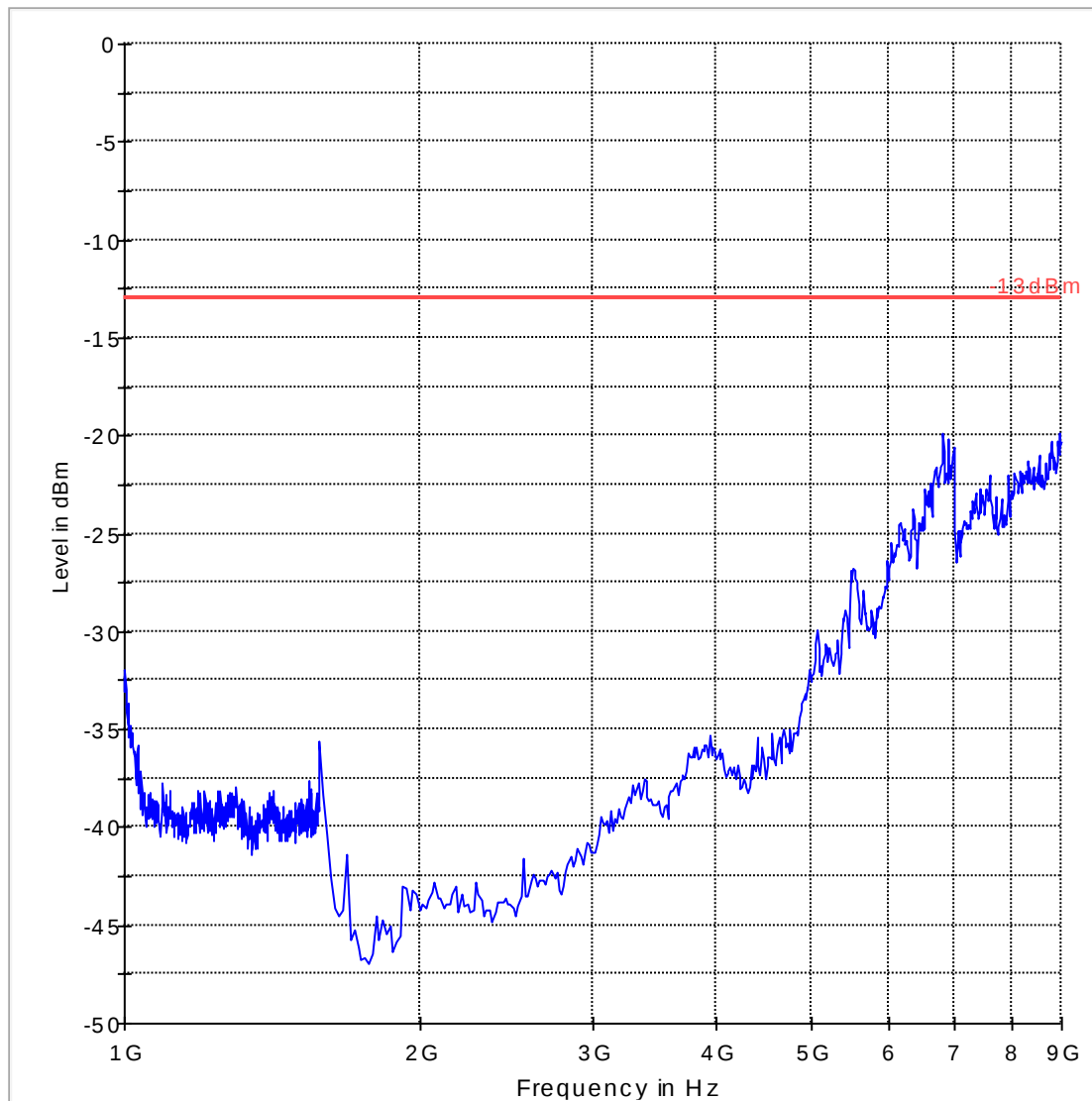


— -13 dBm Limit Line — Preview Result 1 ◆ Final Result 1

Test results 1GHz-9GHz

EUT Name: Ranger 4 HSPA
Manufacturer: Mentor Engineering Inc.
Serial No: 31-11100019
Comment: 12V

FCC 22 1-9GHz



— -13 dBm Limit Line — 3 — Preview Result 1

6.8.5.3 Test Results Transmitter Spurious Emission UMTS FDDV

Harmonic	Tx ch-4132 Freq. (MHz)	Level (dBm)	Tx ch-4183 Freq. (MHz)	Level (dBm)	Tx ch-4233 Freq. (MHz)	Level (dBm)
1	826.4	-	836.6	-	846.6	-
2	1652.8	NF	1673.2	NF	1693.2	NF
3	2479.2	NF	2509.8	NF	2539.8	NF
4	3305.6	NF	3346.4	NF	3386.4	NF
5	4132	NF	4183	NF	4233	NF
6	4958.4	NF	5019.6	NF	5079.6	NF
7	5784.8	NF	5856.2	NF	5926.2	NF
8	6611.2	NF	6692.8	NF	6772.8	NF
9	7437.6	NF	7529.4	NF	7619.4	NF
10	8264	NF	8366	NF	8466	NF
NF= Noise Floor Measurement Uncertainty: ± 3 dB						

6.8.5.4 Measurement Result

Pass.

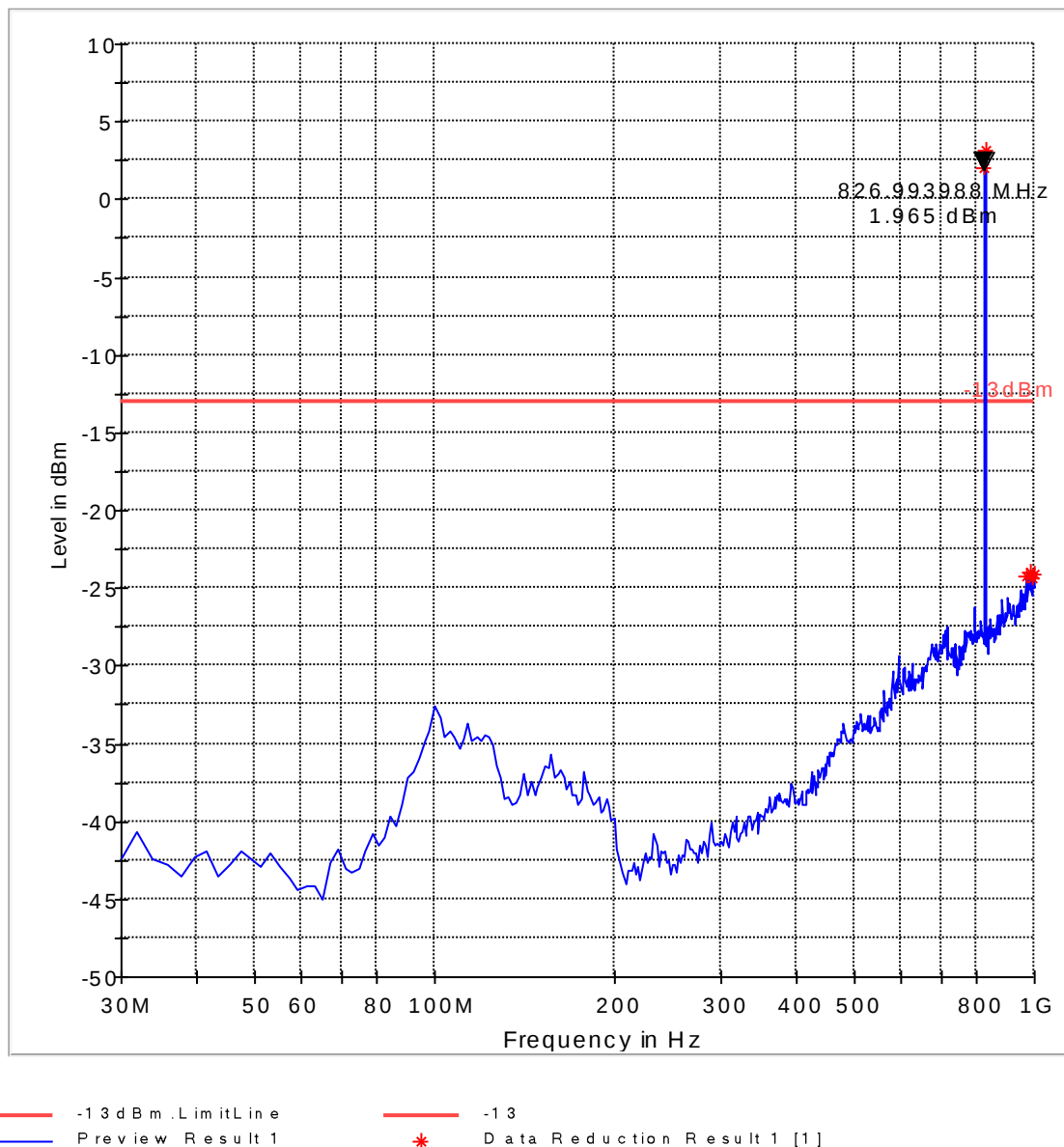
Legend for the plots:

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

Radiated Spurious Emissions (UMTS Band 5) Tx: Low Channel**Test results 30M-1GHz**

EUT Name: Ranger 4 HSPA
Manufacturer: Mentor Engineering Inc.
Serial No: 31-11100019
Comment: 12V

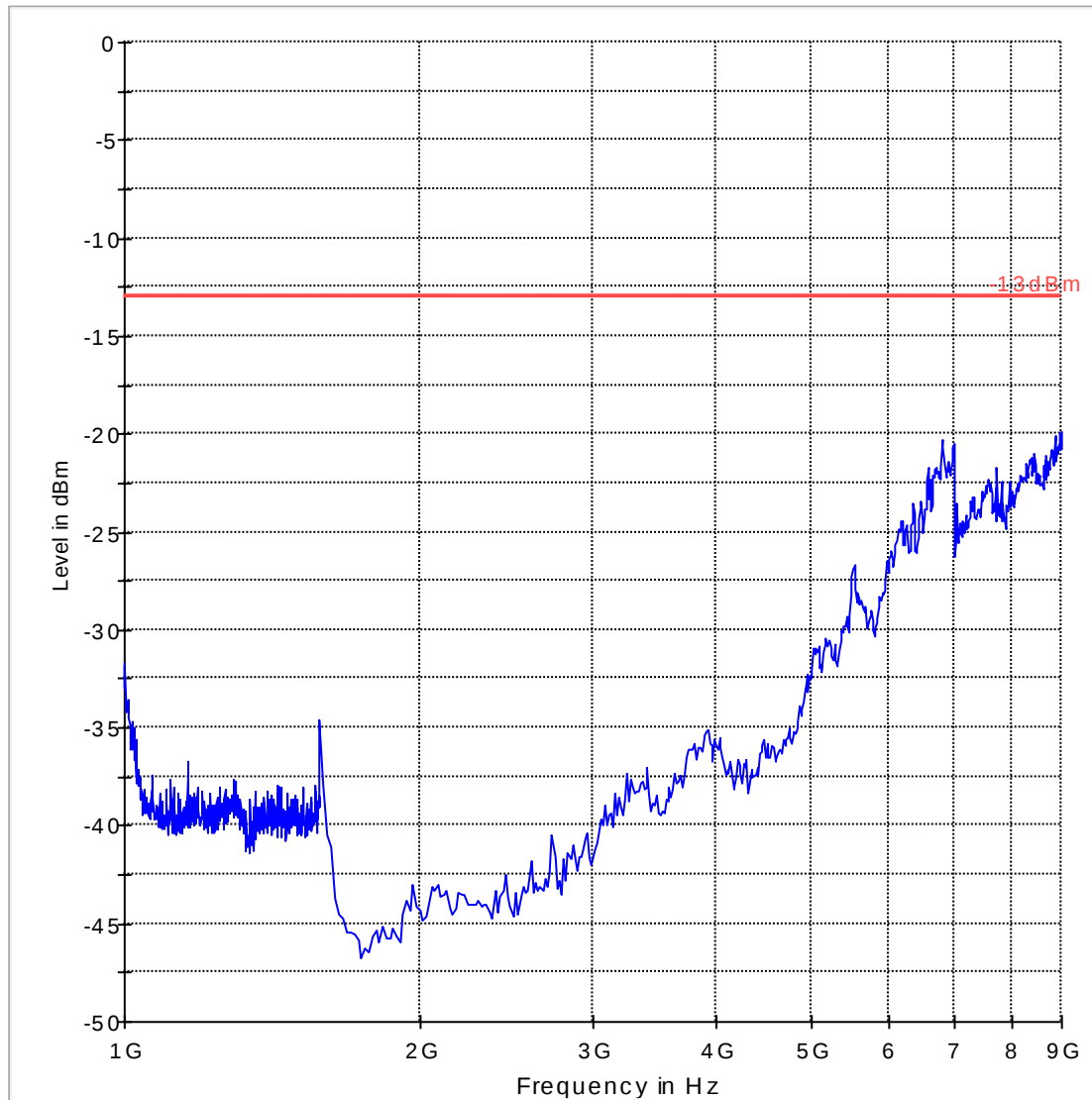
FCC 22 30-1000MHz



Test results 1GHz-9GHz

EUT Name: Ranger 4 HSPA
Manufacturer: Mentor Engineering Inc.
Serial No: 31-11100019
Comment: 12V

FCC 22 1-9GHz

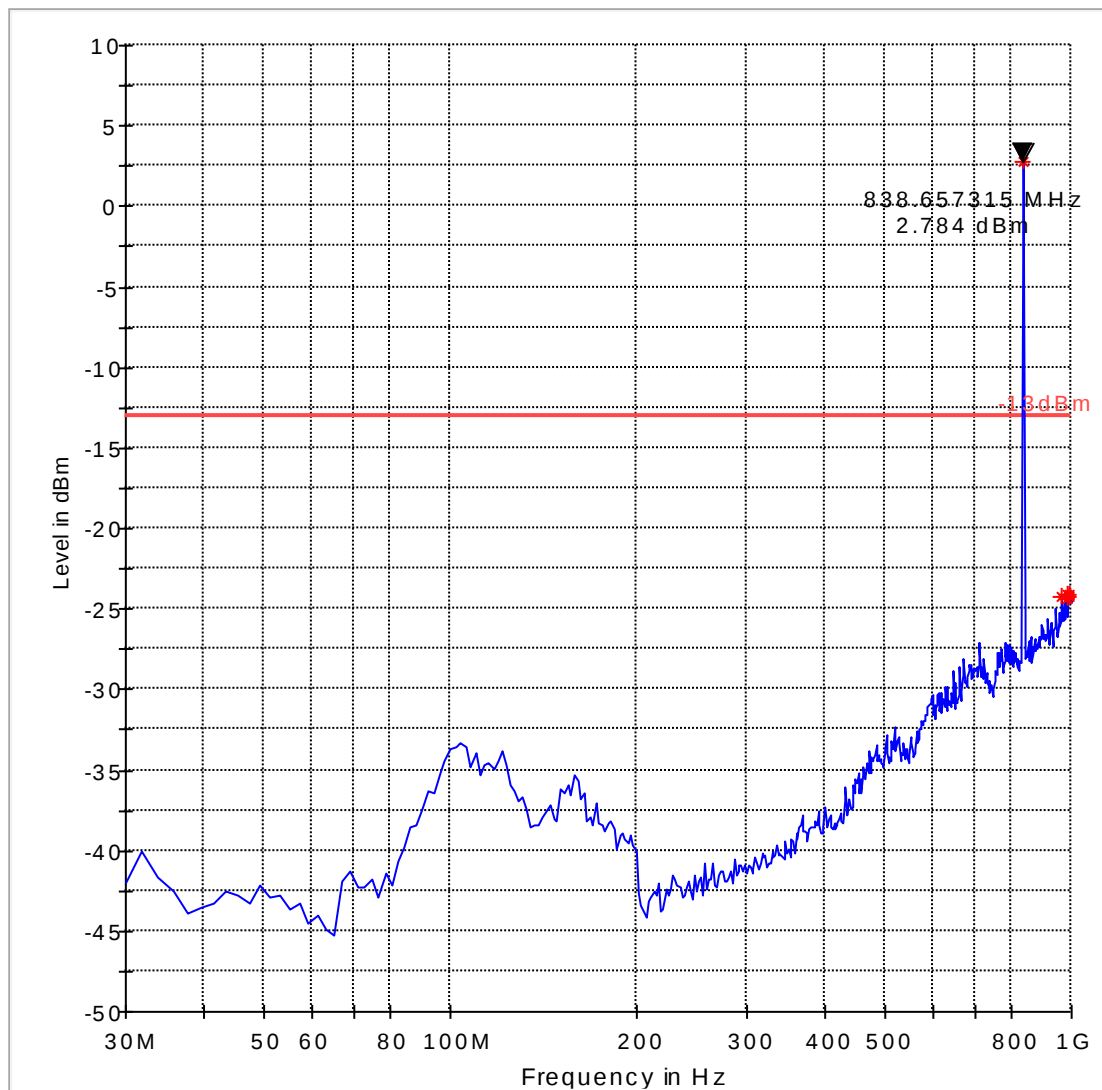


— -13 dBm Limit Line — -13 — Preview Result 1

Radiated Spurious Emissions (UMTS Band 5) Tx: Mid Channel**Test results 30M-1GHz**

EUT Name: Ranger 4 HSPA
Manufacturer: Mentor Engineering Inc.
Serial No: 31-11100019
Comment: 12V ;marker placed on transmit signal

FCC 22 30-1000MHz



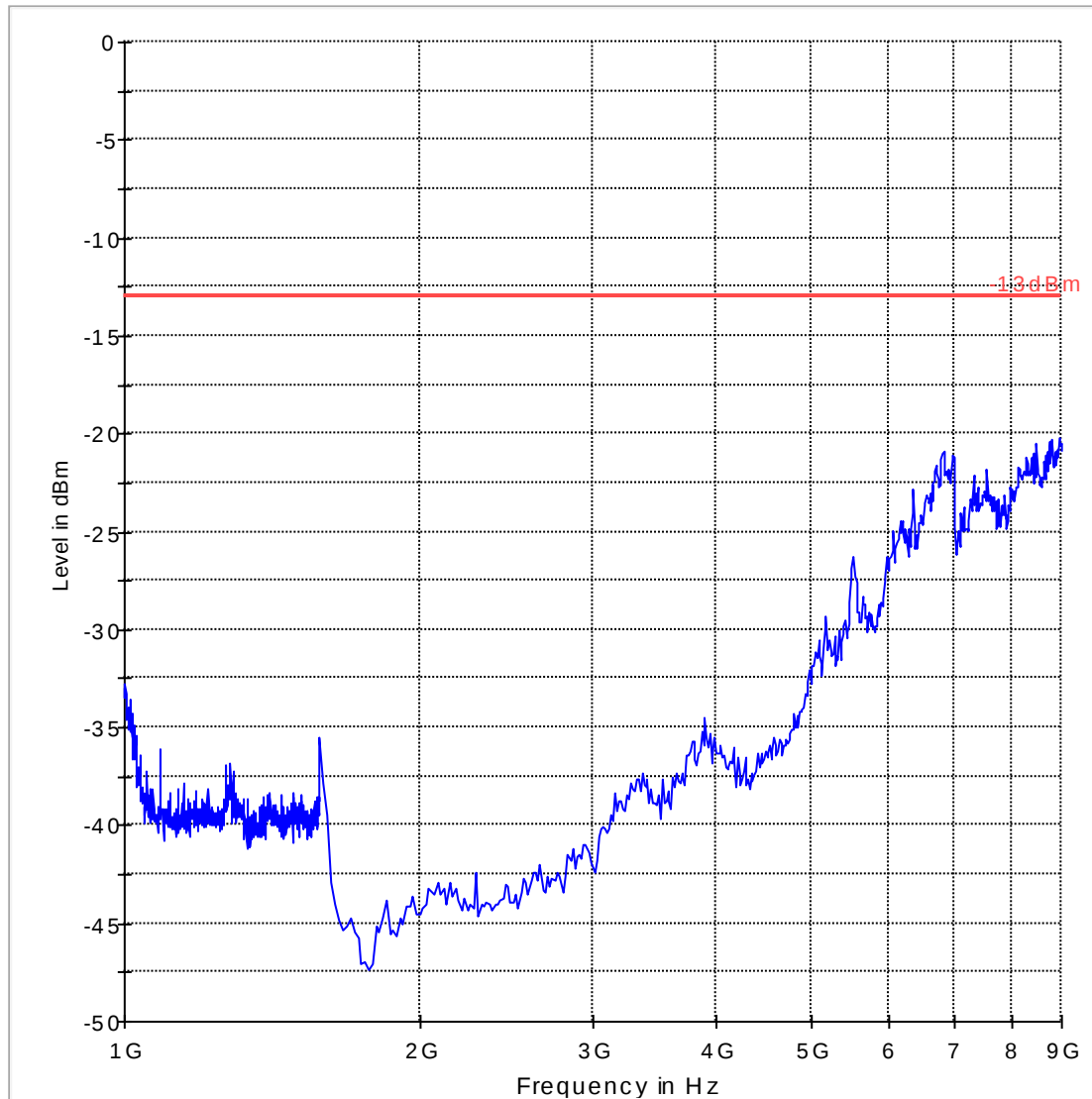
— -13 dBm . LimitLine
— Preview Result 1

— -13
* Data Reduction Result 1 [1]

Test results 1GHz-9GHz

EUT Name: Ranger 4 HSPA
Manufacturer: Mentor Engineering Inc.
Serial No: 31-11100019
Comment: 12V

FCC 22 1-9GHz

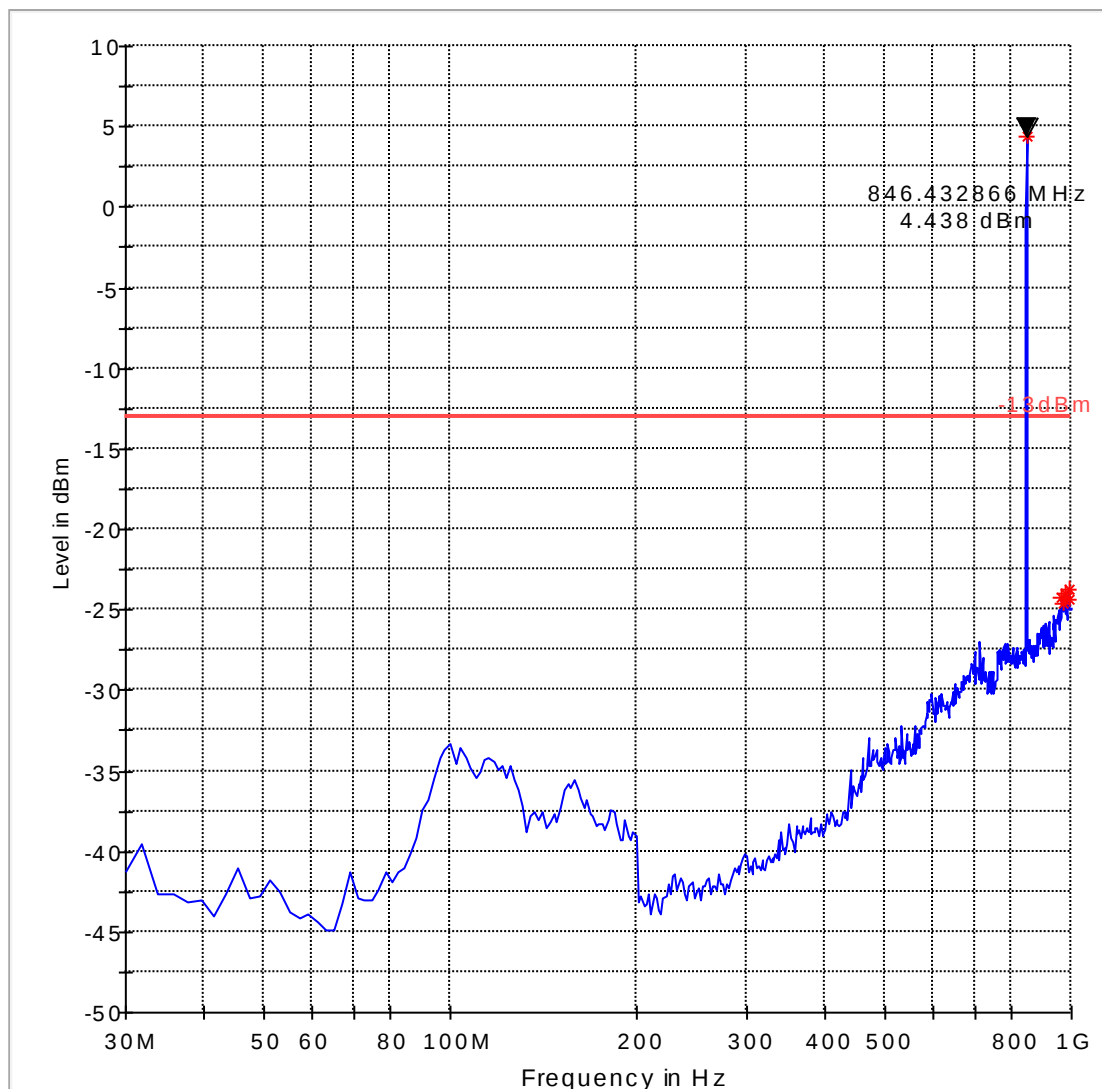


— -13 dBm Limit Line — -13 — Preview Result 1

Radiated Spurious Emissions (UMTS Band 5) Tx: High Channel**Test results 30M-1GHz**

EUT Name: Ranger 4 HSPA
Manufacturer: Mentor Engineering Inc.
Serial No: 31-11100019
Comment: 12V ;marker placed on transmit signal

FCC 22 30-1000MHz



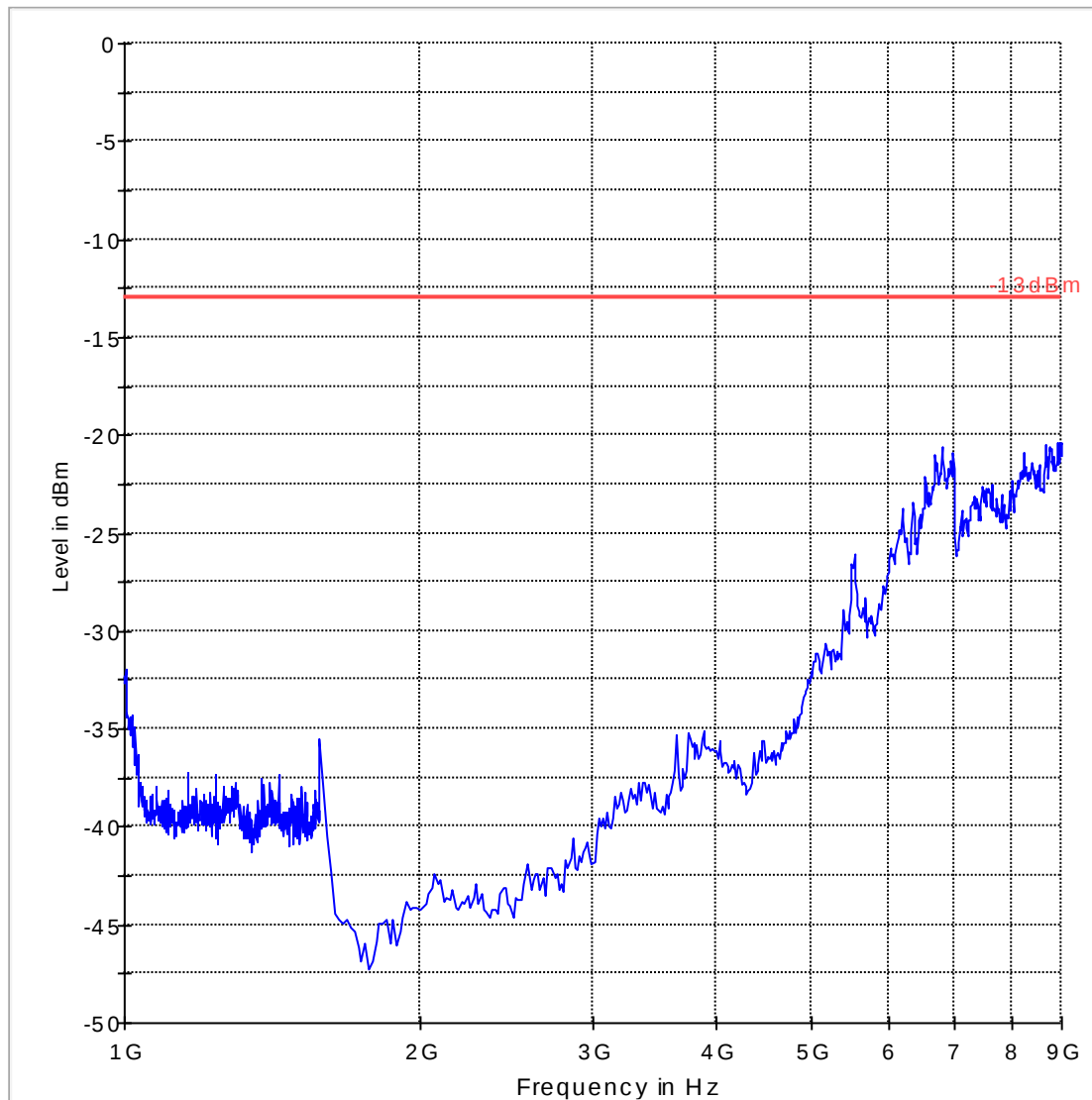
— -13 dBm Limit Line
— Preview Result 1

— -13
* Data Reduction Result 1 [1]

Test results 1GHz-9GHz

EUT Name: Ranger 4 HSPA
Manufacturer: Mentor Engineering Inc.
Serial No: 31-11100019
Comment: 12V

FCC 22 1-9GHz



— -13 dBm Limit Line — -13 — Preview Result 1

6.8.5.5 Test Results Transmitter Spurious Emission PCS-1900:

Harmonic	Tx ch-512 Freq.(MHz)	Level (dBm)	Tx ch-661 Freq. (MHz)	Level (dBm)	Tx ch-810 Freq. (MHz)	Level (dBm)
1	1850.2	-	1880.0	-	1909.8	-
2	3700.4	NF	3760	NF	3819.6	NF
3	5550.6	NF	5640	NF	5729.4	NF
4	7400.8	NF	7520	NF	7639.2	NF
5	9251	NF	9400	NF	9549	NF
6	11101.2	NF	11280	NF	11458.8	NF
7	12951.4	NF	13160	NF	13368.6	NF
8	14801.6	NF	15040	NF	15278.4	NF
9	16651.8	NF	16920	NF	17188.2	NF
10	18502	NF	18800	NF	19098	NF
NF = Noise Floor Measurement Uncertainty: ± 3 dB						

6.8.5.6 Measurement Result

Pass.

Legend for the plots:

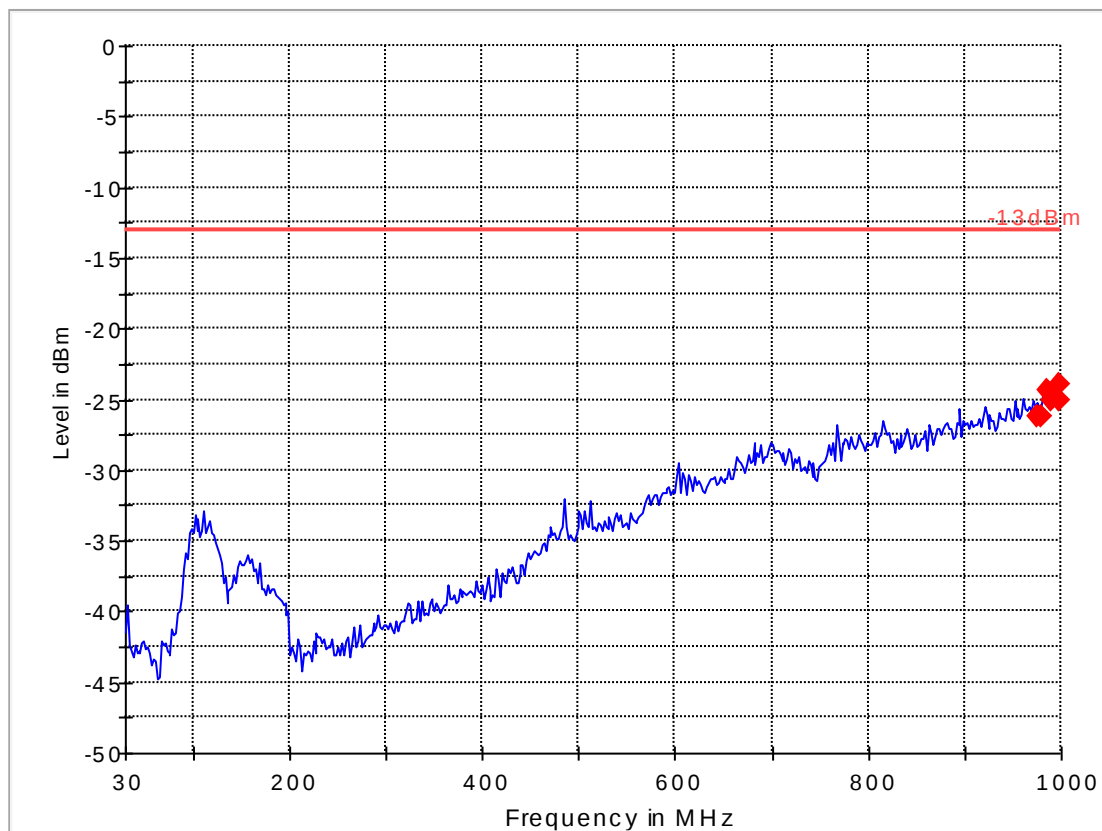
-  -13dBm.LimitLine
-  Preview Result
-  Data Reduction Result
-  Final Measurement Result

Radiated Spurious Emissions (GSM-1900) Tx: Low Channel**Test results 30M-1GHz**

EUT Name: Ranger 4 HSPA
Manufacturer: Mentor Engineering Inc.
Serial No: 31-11100019
Comment: 12V

Frequency (MHz)	MaxPeak (dBm)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBm)
975.777472	-26.2	20.0	100.000	170.0	V	22.0	-69.2	13.2	-13.0
979.275663	-26.2	20.0	100.000	170.0	V	68.0	-69.0	13.2	-13.0
985.171885	-24.4	20.0	100.000	145.0	V	198.0	-68.8	11.4	-13.0
989.359977	-25.1	20.0	100.000	120.0	V	285.0	-68.6	12.1	-13.0
997.094188	-24.0	20.0	100.000	139.0	V	22.0	-68.3	11.0	-13.0
998.873208	-25.1	20.0	100.000	120.0	V	83.0	-68.2	12.1	-13.0

FCC 22 30-1000MHz

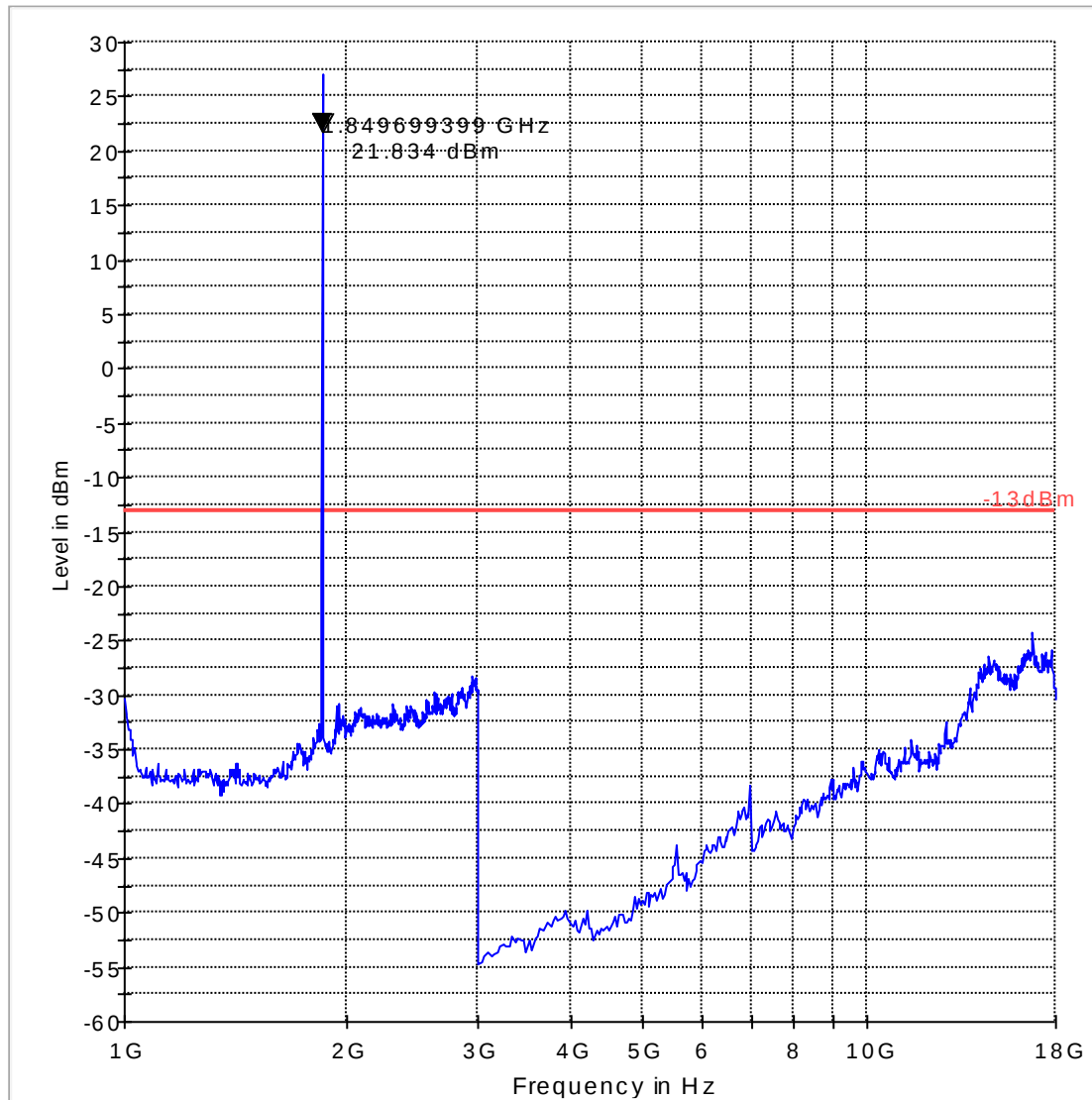


— -13 dBm Limit Line — Preview Result 1 ◆ Final Result 1

Test results 1GHz-18GHz

EUT Name: Ranger 4 HSPA
Manufacturer: Mentor Engineering Inc.
Serial No: 31-11100019
Comment: 12V ;marker placed on transmit signal

FCC 24 1-18GHz



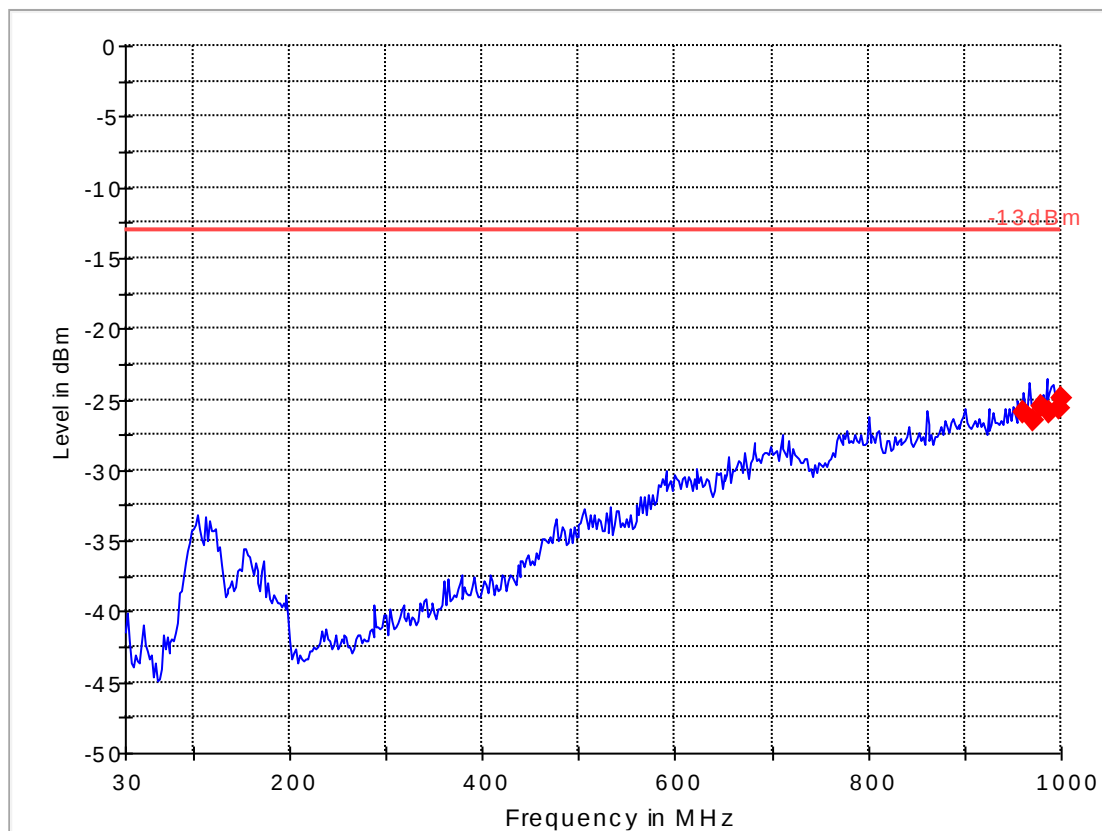
— -13 dBm . Limit Line — 3 — Preview Result 1

Radiated Spurious Emissions (GSM-1900) Tx: Mid Channel**Test results 30M-1GHz**

EUT Name: Ranger 4 HSPA
Manufacturer: Mentor Engineering Inc.
Serial No: 31-11100019
Comment: 12V

Frequency (MHz)	MaxPeak (dBm)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBm)
960.627382	-25.9	20.0	100.000	170.0	H	292.0	-69.4	12.9	-13.0
970.126725	-26.5	20.0	100.000	170.0	H	195.0	-69.3	13.5	-13.0
980.179363	-25.5	20.0	100.000	170.0	H	99.0	-69.1	12.5	-13.0
988.276553	-25.9	20.0	100.000	120.0	H	22.0	-69.0	12.9	-13.0
997.665930	-25.6	20.0	100.000	138.0	V	292.0	-68.3	12.6	-13.0
999.934707	-24.9	20.0	100.000	159.0	V	249.0	-68.2	11.9	-13.0

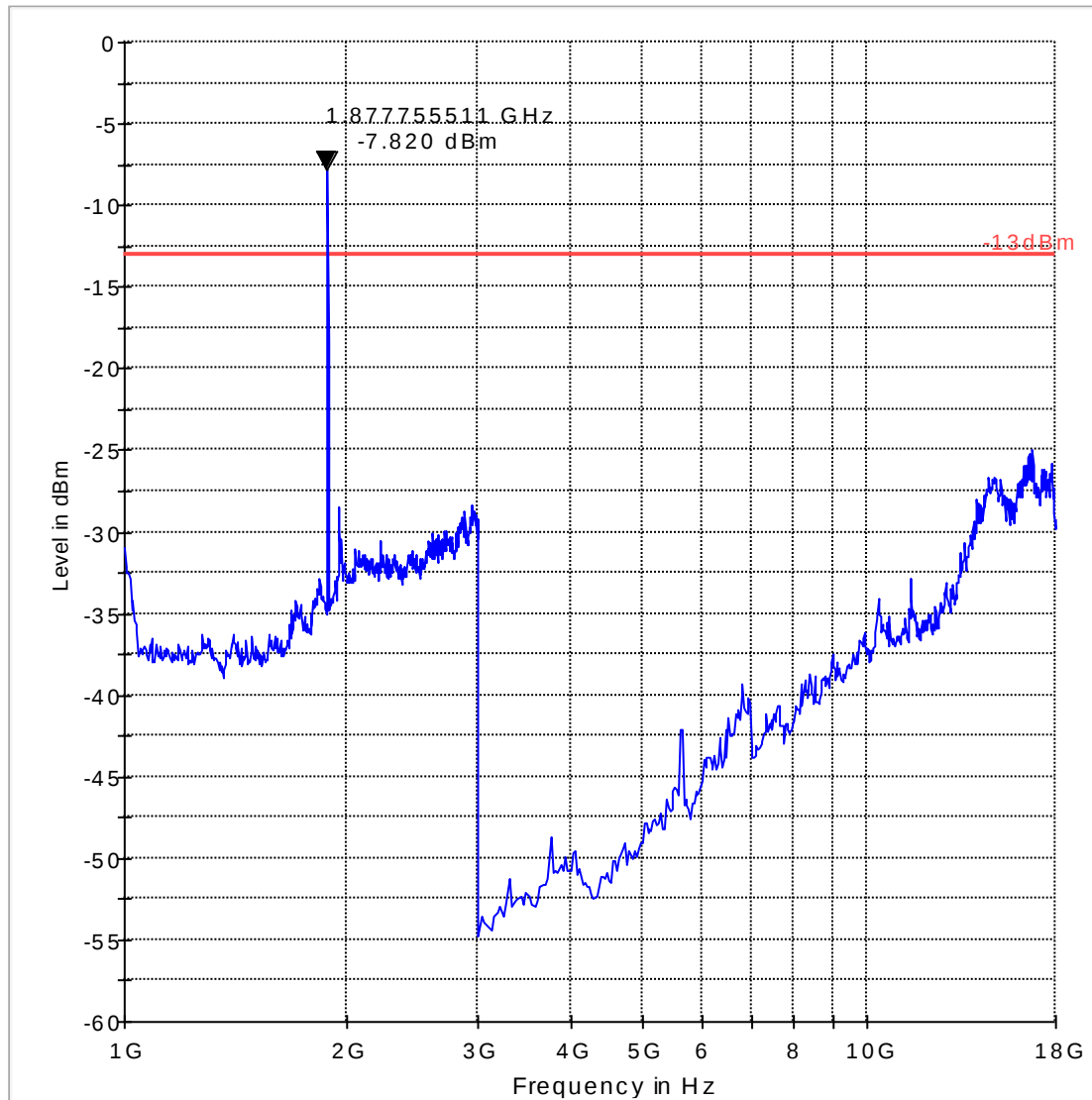
FCC 22 30-1000MHz



Test results 1GHz-18GHz

EUT Name: Ranger 4 HSPA
Manufacturer: Mentor Engineering Inc.
Serial No: 31-11100019
Comment: 12V ;marker placed on transmit signal

FCC 24 1-18GHz

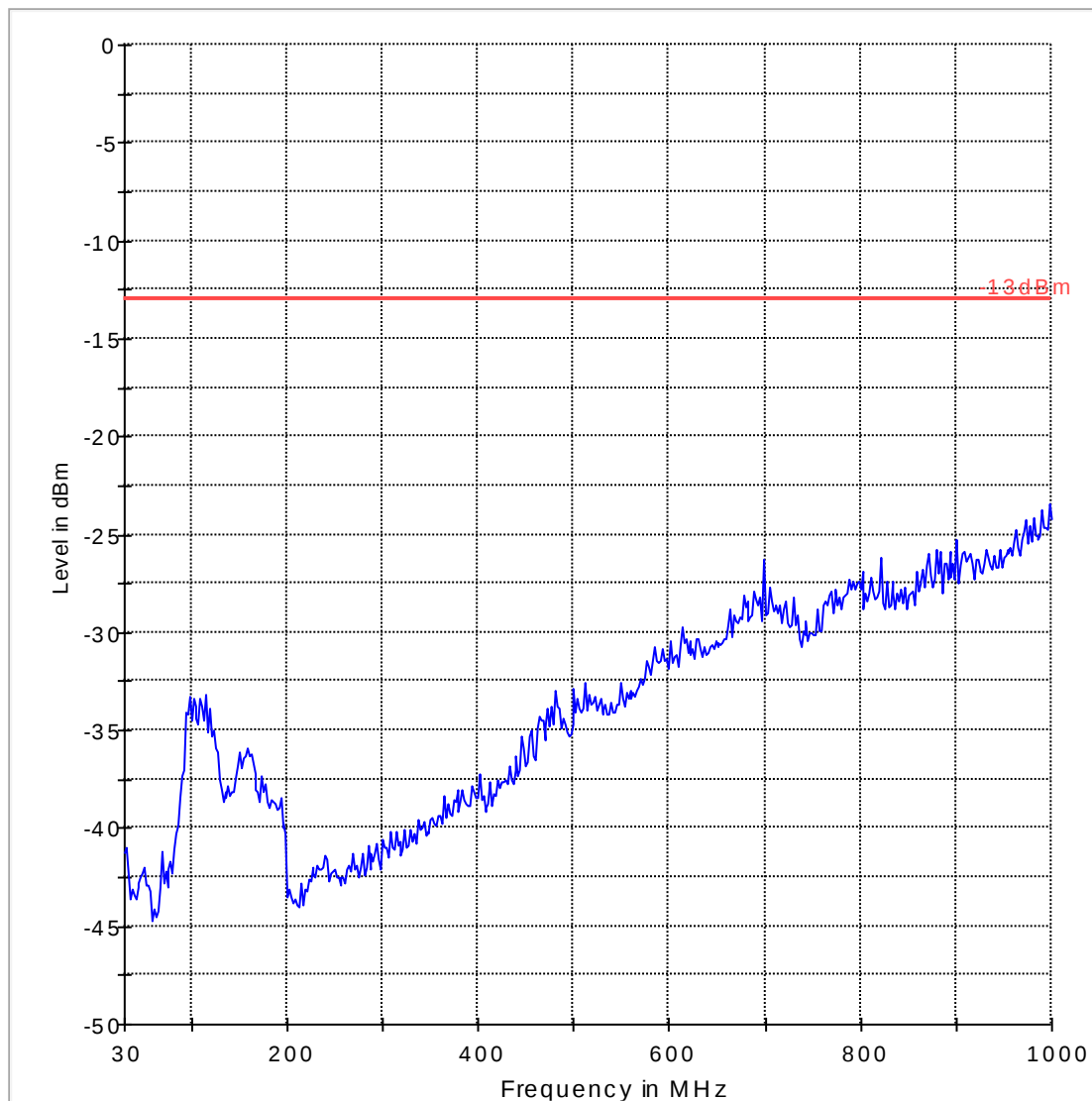


— -13 dBm . Limit Line — 3 — Preview Result 1

Radiated Spurious Emissions (GSM-1900) Tx: High Channel**Test results 30M-1GHz**

EUT Name:	Ranger 4 HSPA
Manufacturer:	Mentor Engineering Inc.
Serial No:	31-11100019
Comment:	12V

FCC 22 30-1000MHz

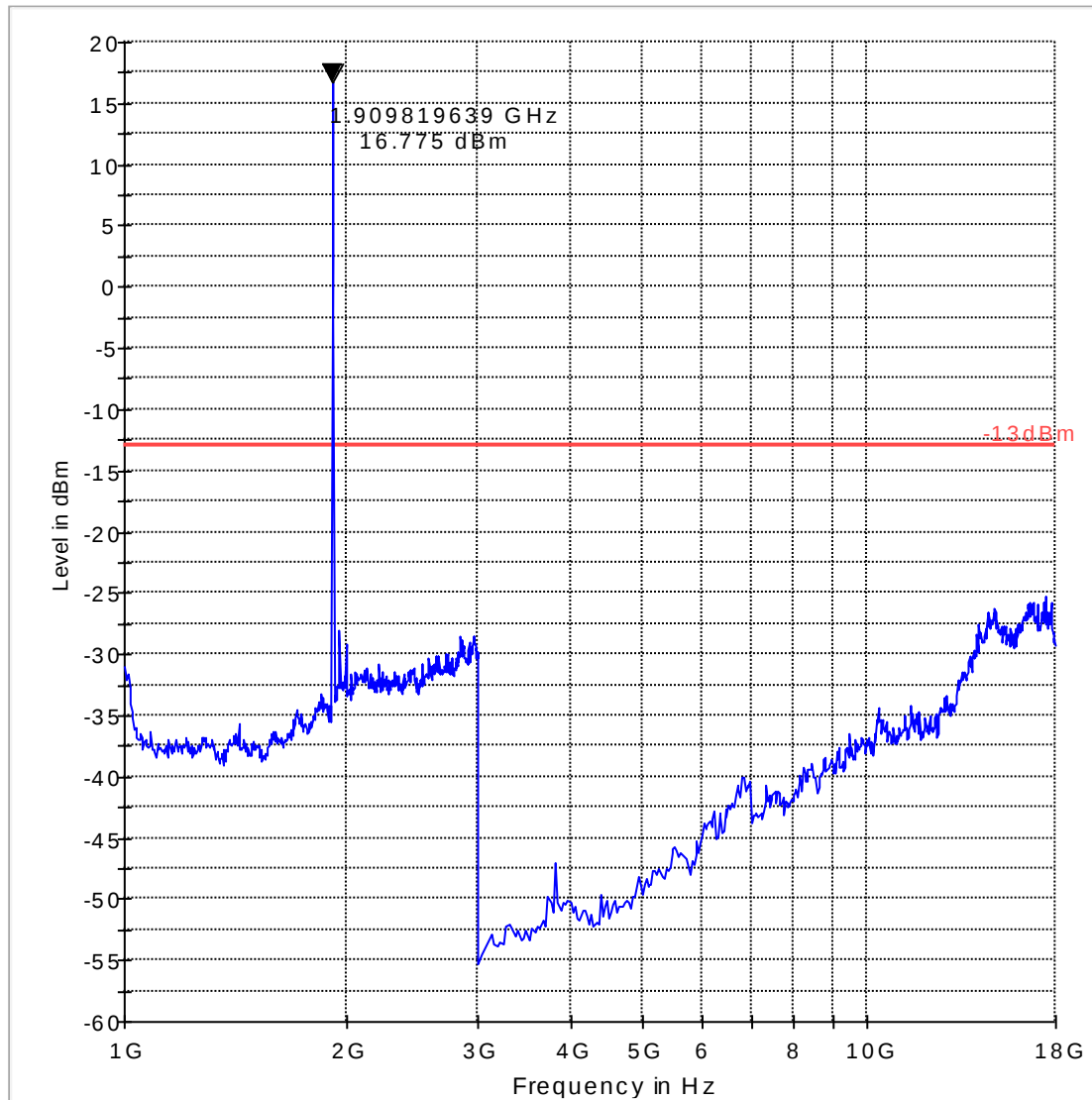


— -13 dBm Limit Line — Preview Result 1

Test results 1GHz-18GHz

EUT Name: Ranger 4 HSPA
Manufacturer: Mentor Engineering Inc.
Serial No: 31-11100019
Comment: 12V ;marker placed on transmit signal

FCC 24 1-18GHz



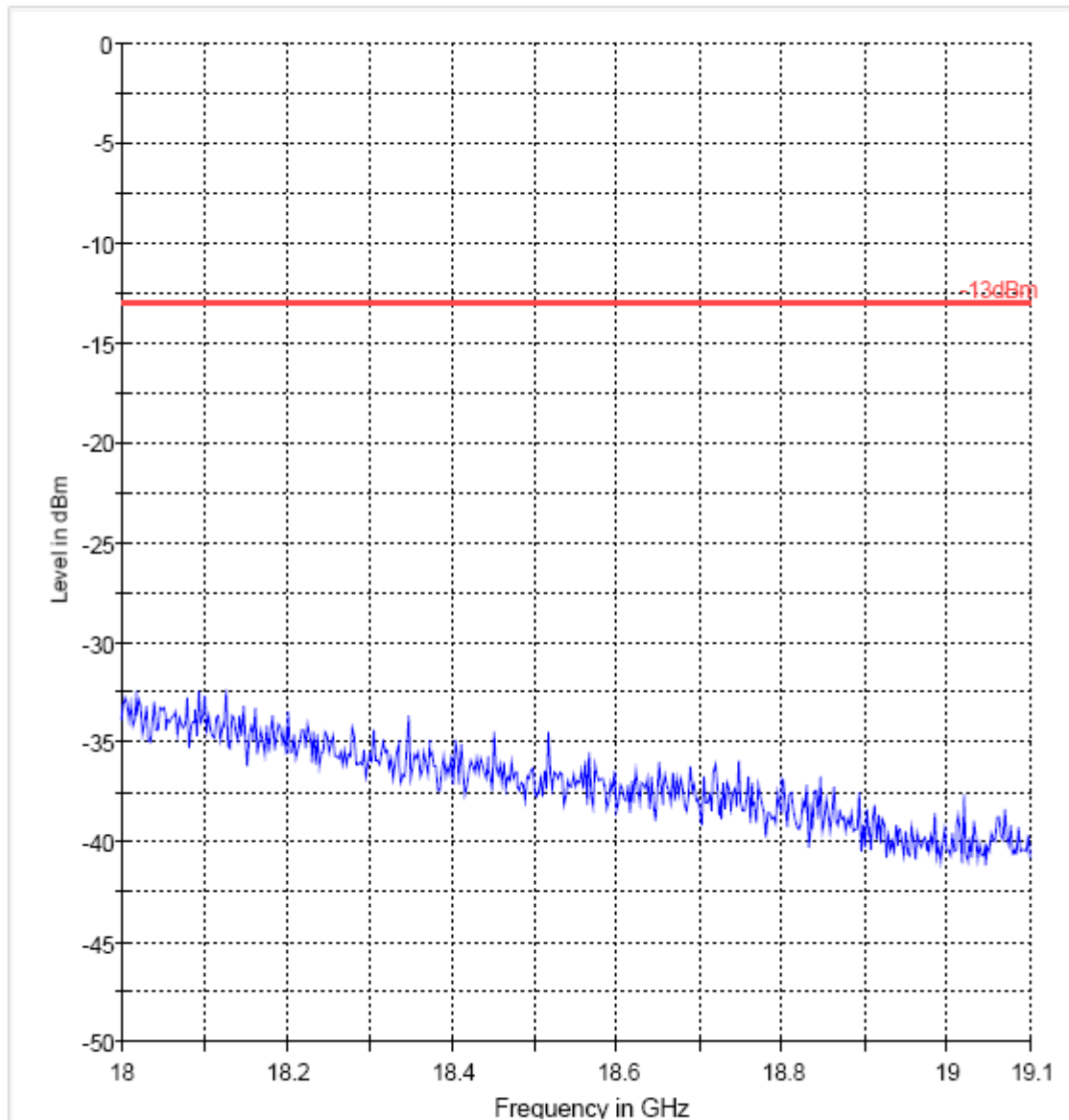
— -13 dBm Limit Line — -13 — Preview Result 1

Test results 18GHz-19.1GHz

Note: Worst case representation of all channels

EUT Name: Ranger 4 HSPA
Manufacturer: Mentor Engineering Inc.
Serial No: 31-11100019
Comment: 12V ;

FCC 24 18-19.1GHz



— -13dBm.LimitLine — Preview Result 1

6.8.5.7 Test Results Transmitter Spurious Emission UMTS FDD2:

Harmonic	Tx ch-9262 Freq. (MHz)	Level (dBm)	Tx ch-9400 Freq. (MHz)	Level (dBm)	Tx ch-9538 Freq. (MHz)	Level (dBm)
1	1852.4	-	1880.0	-	1907.6	-
2	3704.8	-33.4	3760	-33.4	3815.2	-23.3
3	5557.2	NF	5640	NF	5722.8	NF
4	7409.6	NF	7520	NF	7630.4	NF
5	9262	NF	9400	NF	9538	NF
6	11114.4	NF	11280	NF	11445.6	NF
7	12966.8	NF	13160	NF	13353.2	NF
8	14819.2	NF	15040	NF	15260.8	NF
9	16671.6	NF	16920	NF	17168.4	NF
10	18524	NF	18800	NF	19076	NF
NF= Noise Floor Measurement Uncertainty: ± 3 dB						

6.8.5.8 Measurement Result

Pass.

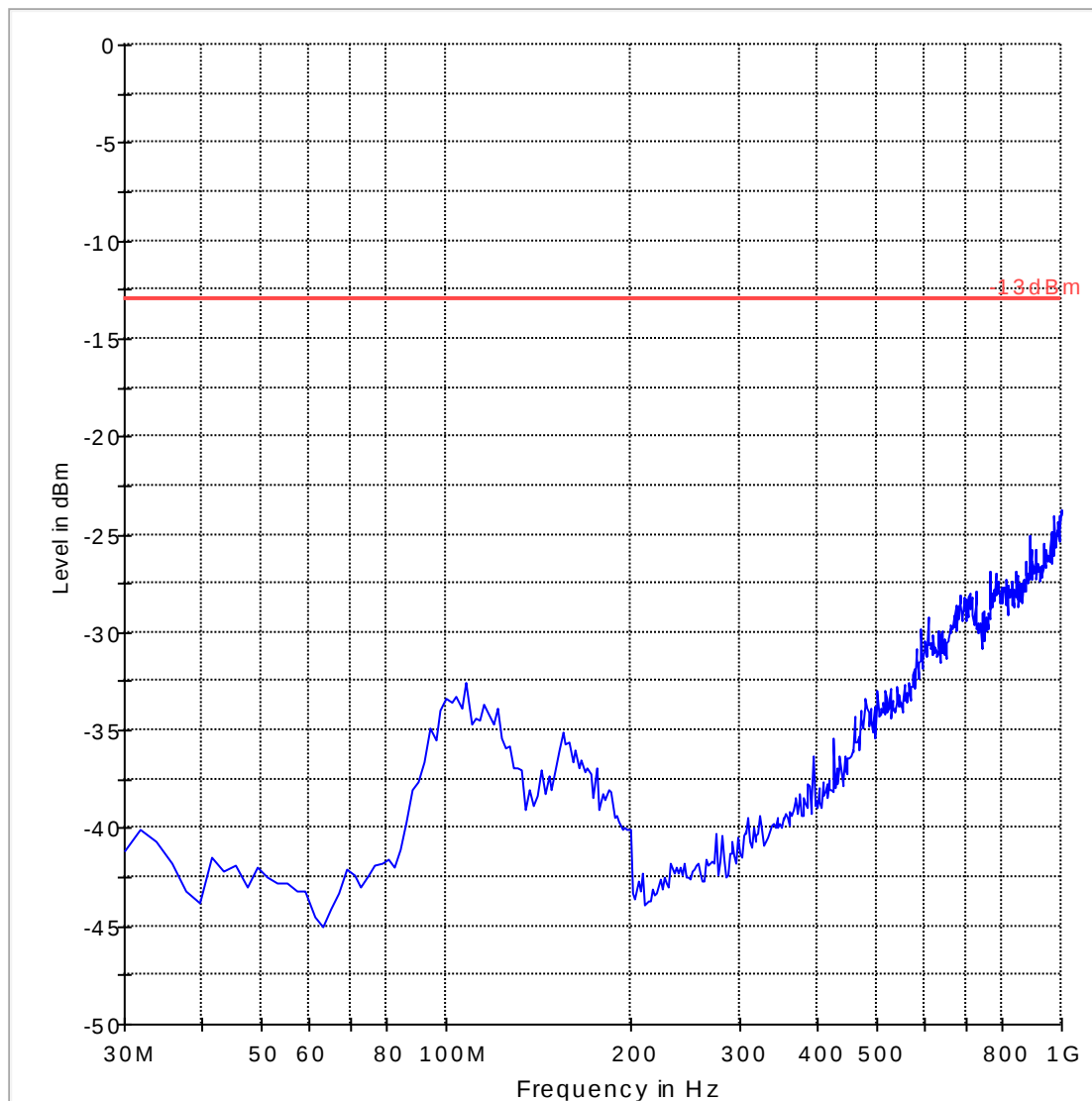
Legend for the plots:

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

Radiated Spurious Emissions (UMTS Band 2) Tx: Low Channel**Test results 30M-1GHz**

EUT Name:	Ranger 4 HSPA
Manufacturer:	Mentor Engineering Inc.
Serial No:	31-11100019
Comment:	12V

FCC 22 30-1000MHz

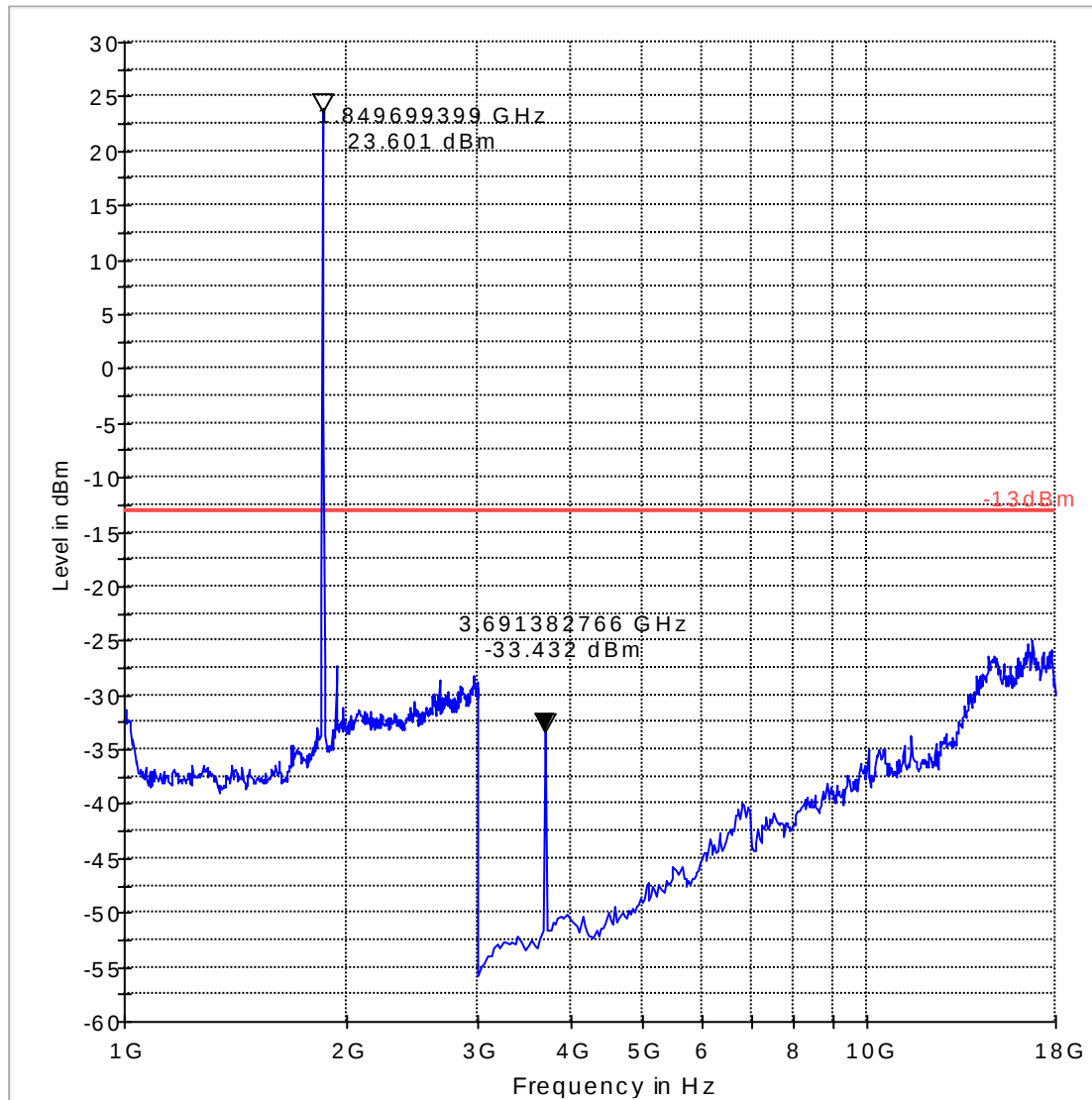


— -13 dBm Limit Line — -13 — Preview Result 1

Test results 1GHz-18GHz

EUT Name: Ranger 4 HSPA
Manufacturer: Mentor Engineering Inc.
Serial No: 31-11100019
Comment: 12V ;signal over the limit is transmit signal

FCC 24 1-18GHz

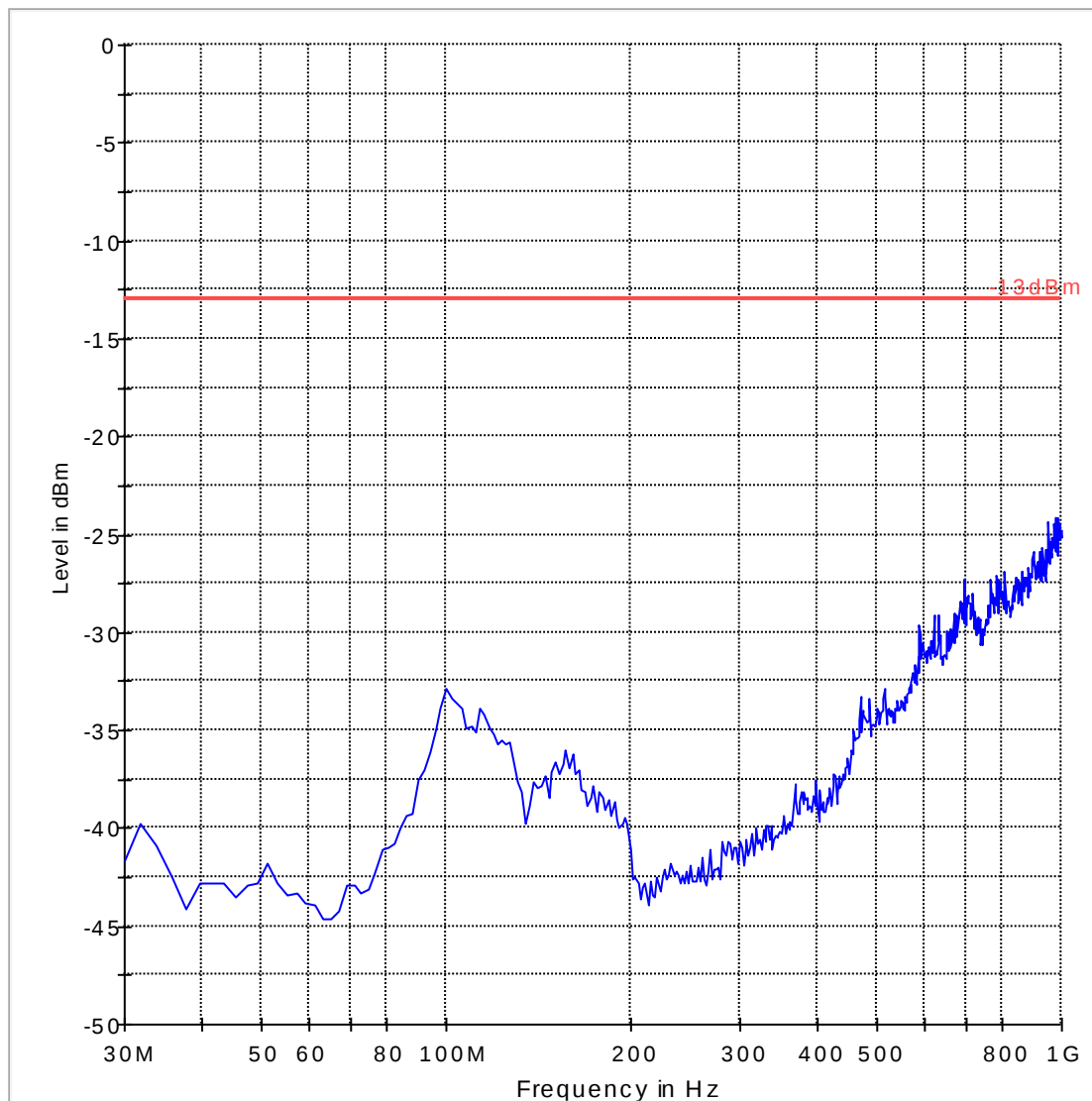


— -13 dBm Limit Line — -13 — Preview Result 1

Radiated Spurious Emissions (UMTS Band 2) Tx: Mid Channel**Test results 30M-1GHz**

EUT Name: Ranger 4 HSPA
Manufacturer: Mentor Engineering Inc.
Serial No: 31-11100019
Comment: 12V

FCC 22 30-1000MHz

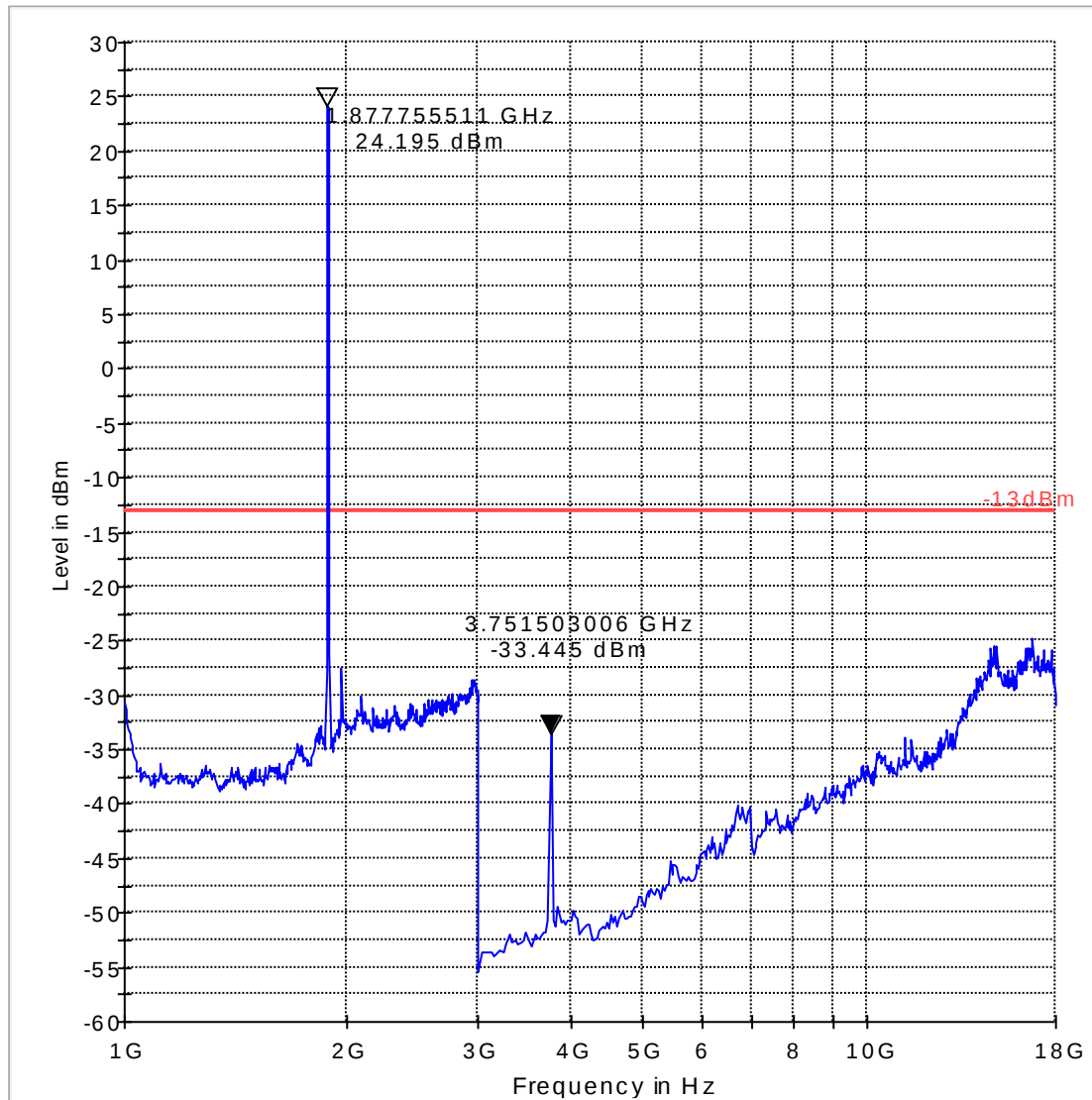


— -13 dBm Limit Line — -13 — Preview Result 1

Test results 1GHz-18GHz

EUT Name: Ranger 4 HSPA
Manufacturer: Mentor Engineering Inc.
Serial No: 31-11100019
Comment: 12V ; signal over the limit is transmit signal

FCC 24 1-18GHz

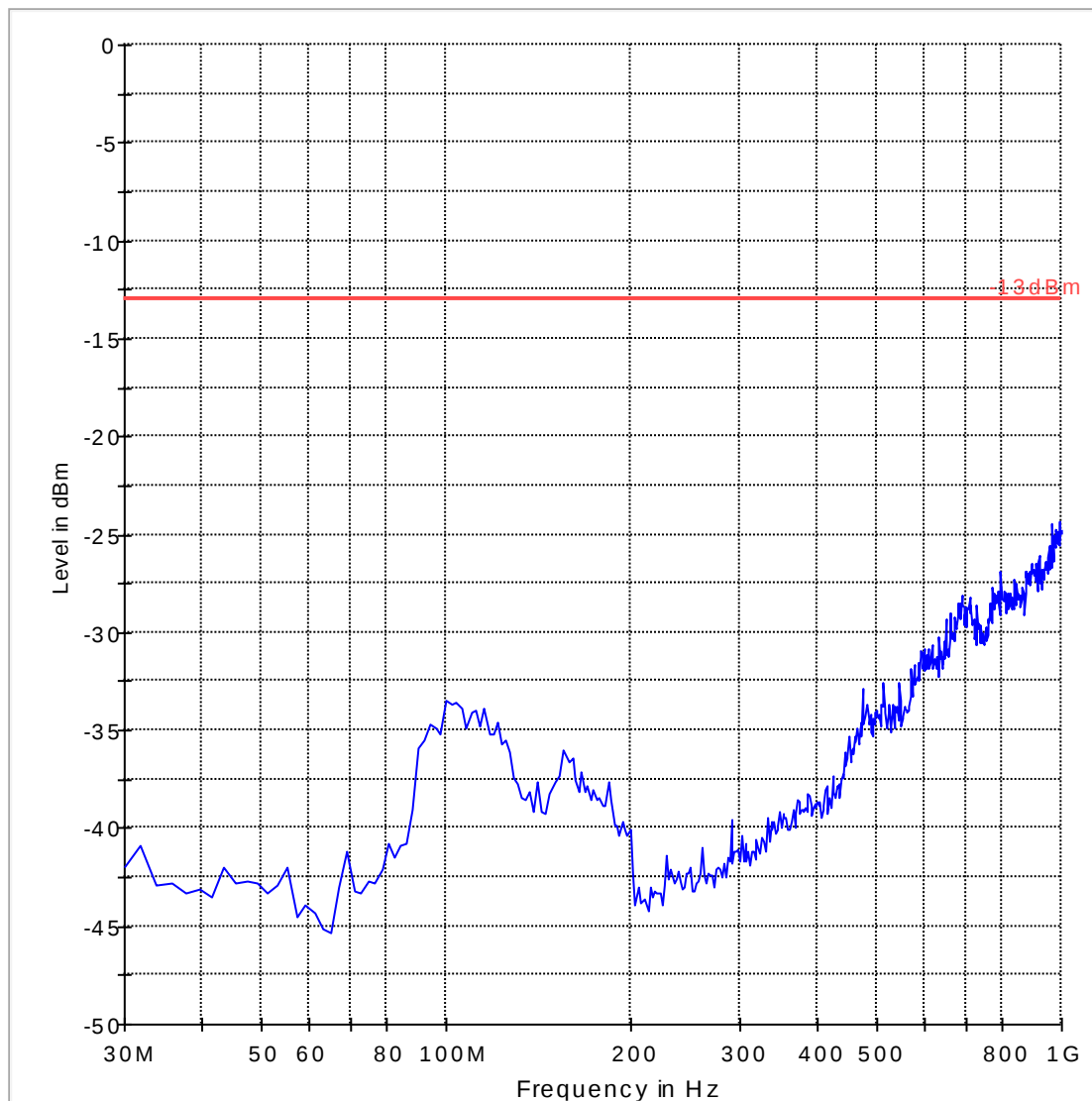


— -13 dBm Limit Line — -13 — Preview Result 1

Radiated Spurious Emissions (UMTS Band 2) Tx: High Channel**Test results 30M-1GHz**

EUT Name: Ranger 4 HSPA
Manufacturer: Mentor Engineering Inc.
Serial No: 31-11100019
Comment: 12V

FCC 22 30-1000MHz

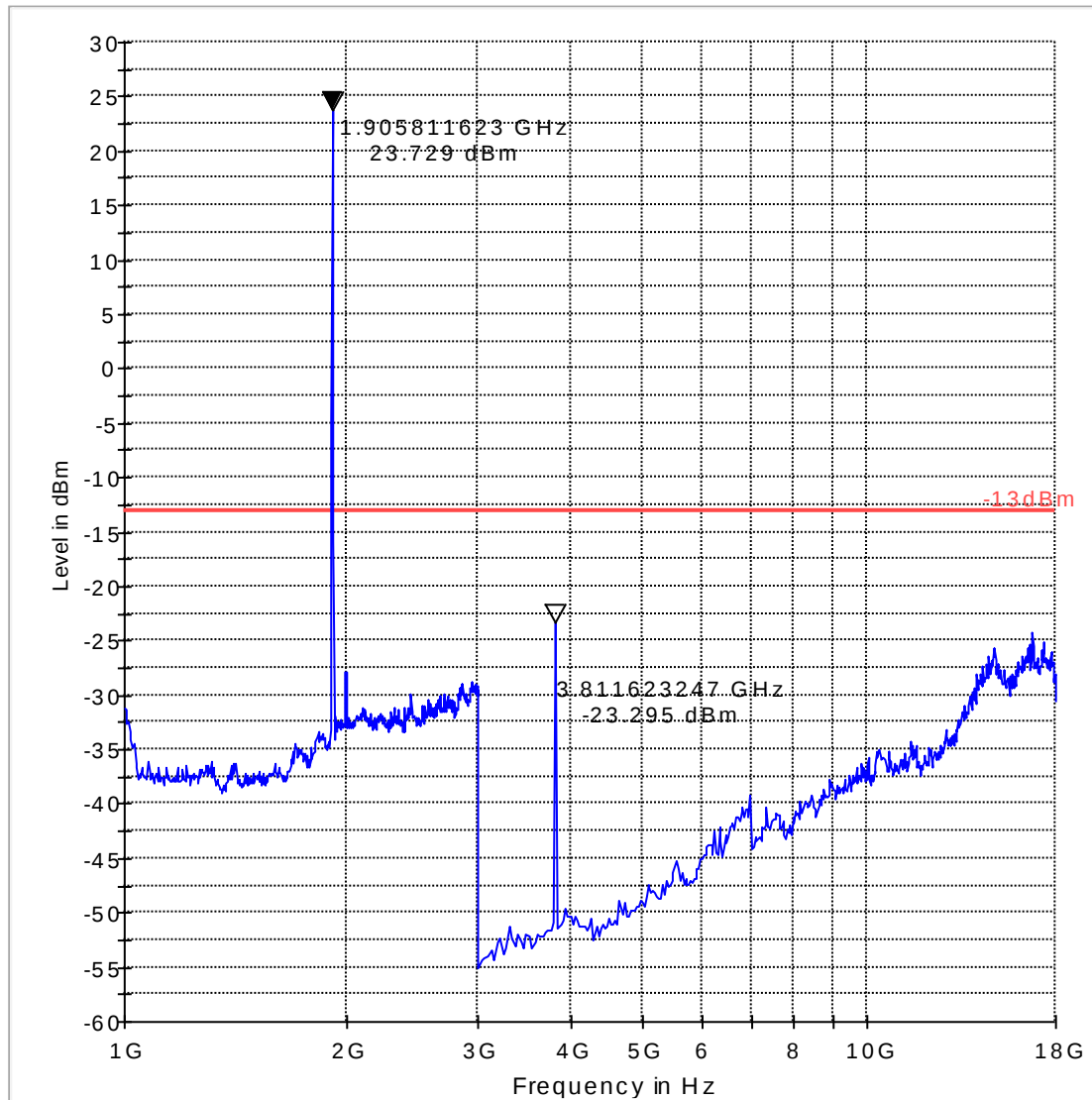


— -13 dBm Limit Line — -13 — Preview Result 1

Test results 1GHz-18GHz

EUT Name: Ranger 4 HSPA
Manufacturer: Mentor Engineering Inc.
Serial No: 31-11100019
Comment: 12V; signal at 1.905GHz is the transmit signal

FCC 24 1-18GHz



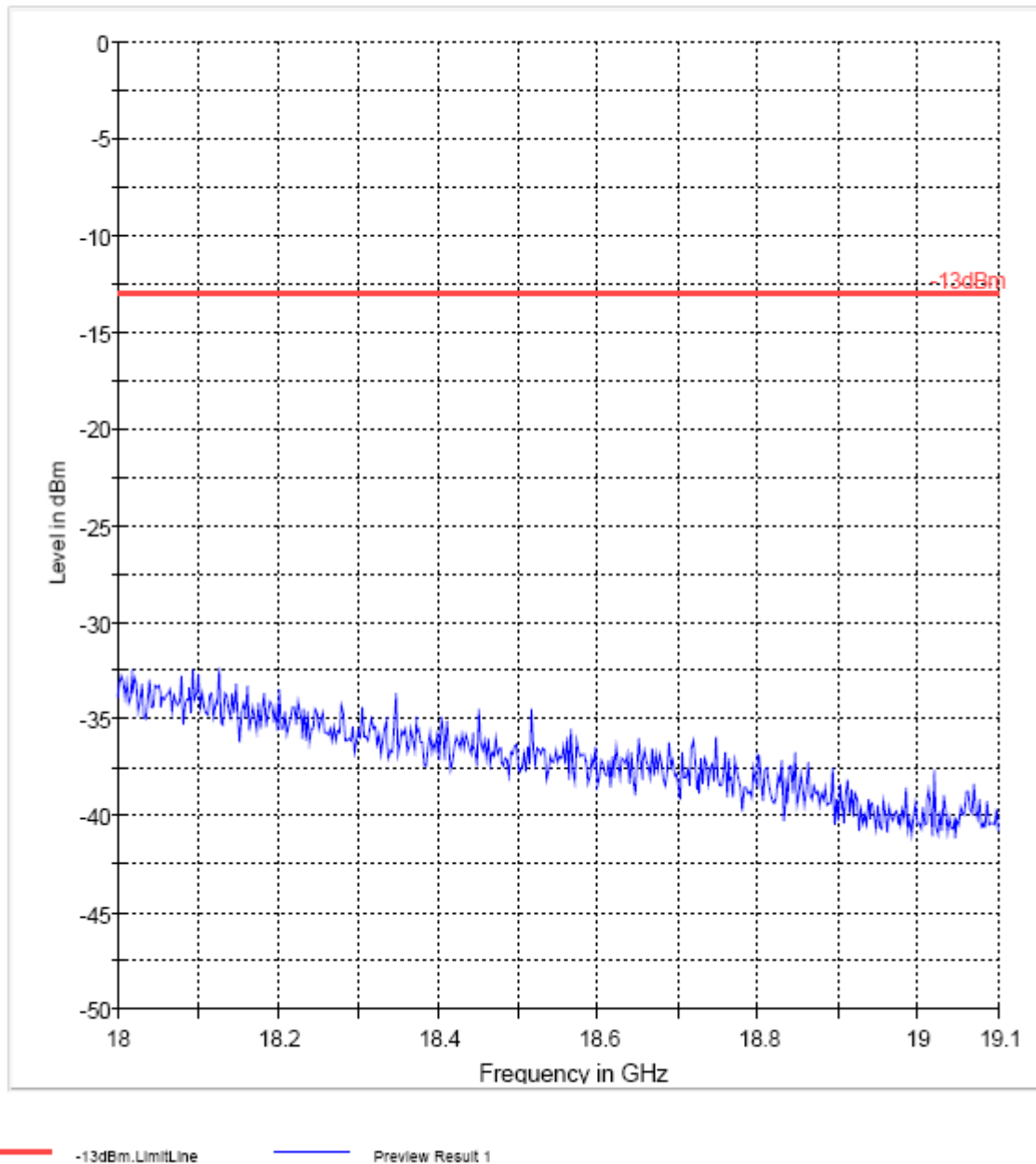
— -13 dBm Limit Line — -13 — Preview Result 1

Test results 18GHz-19.1GHz

Note: Worst case representation of all channels

EUT Name: Ranger 4 HSPA
Manufacturer: Mentor Engineering Inc.
Serial No: 31-11100019
Comment: 12V

FCC 24 18-19.1GHz

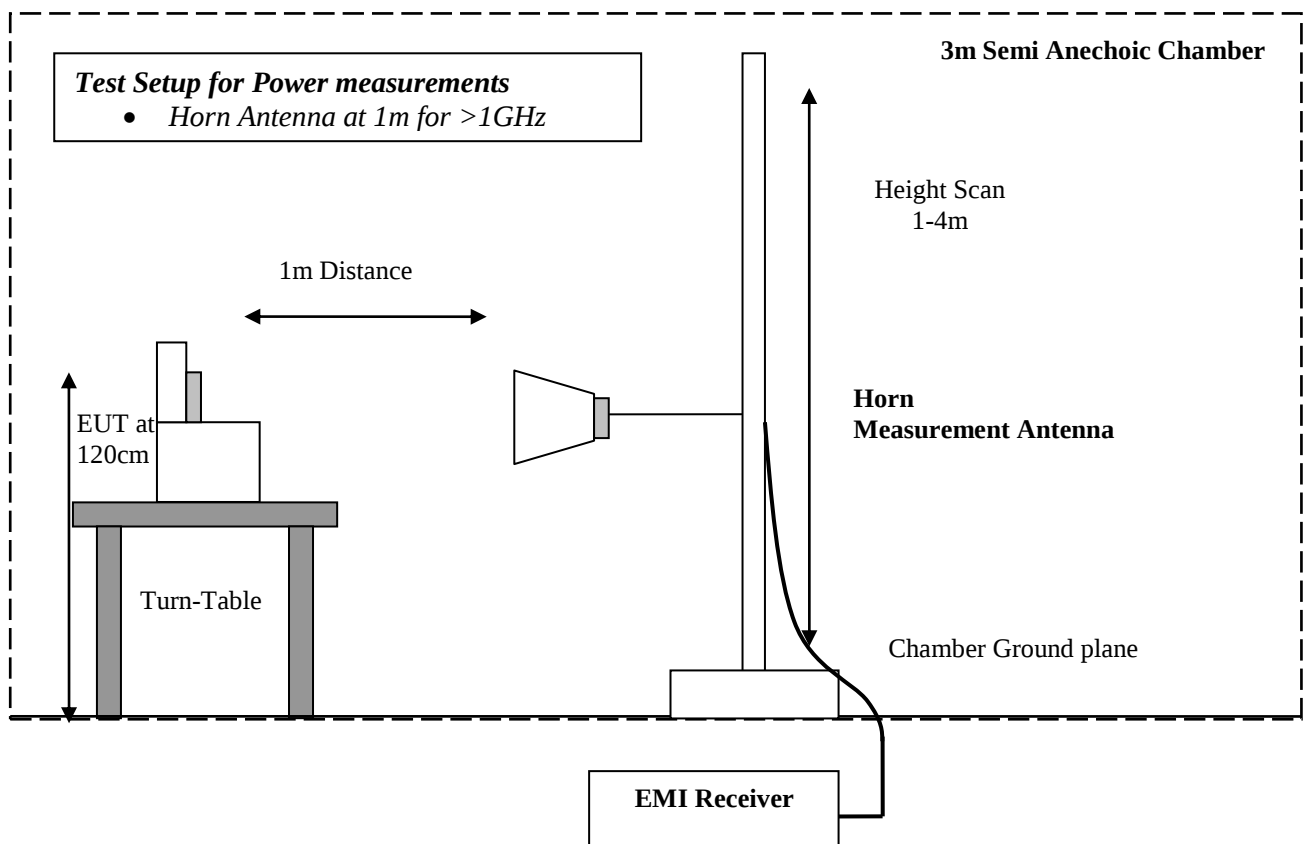
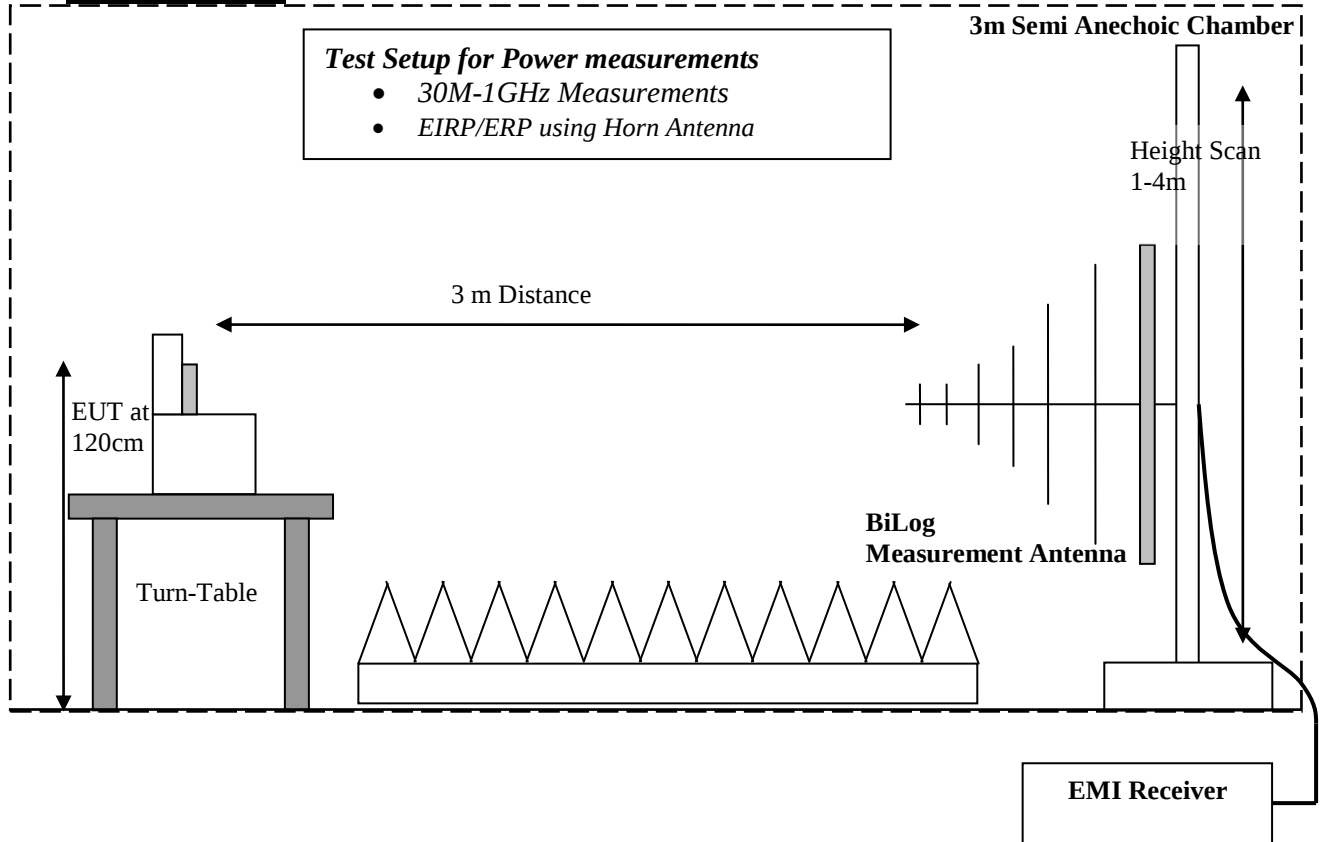


7 Test Equipment and Ancillaries used for tests

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	00035114	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 done while the calibration status was valid.

8 Block Diagrams



9 Revision History

Date	Report Name	Changes to report	Report prepared by
2012-02-13	EMC_MENTO_003_10002_FCC22_24HSPA	First Version	Satya Radhakrishna