FCC Test Report

ResMed Ltd.

Model Number: 28326

Product Description: Continuous Positive Airway Pressure (CPAP) Device

FCC ID: 2ACHL-A10STACD

47 CFR Part 22, 24

TEST REPORT #: EMC_CONN-046-15001_FCC 22_24_WWAN_v1.2
DATE: 11/14/2015

FCC Recognized
A2LA Accredited
IC recognized # 3462E-1

***CETECOM* Inc.**
6370 Nancy Ridge Drive Suite 101 ◆ San Diego, CA 92121 ◆ U.S.A.
Phone: + 1 (858) 362 2400 ◆ Fax: + 1 (858) 587 4809 ◆ E-mail: info@cetecomusa.com ◆ http://www.cetecom.com
CETECOM Inc. is a Delaware Corporation with Corporation number: 2905571

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.

No deviations were ascertained during the course of the tests performed.

Company	Description	Model #
ResMed Ltd.	Continuous Positive Airway Pressure (CPAP) Device	28326

Responsible for Testing Laboratory:

Date	Section	Name	Signature
11/14/2015	Compliance	Milton Ponce de Leon (Test Lab Manager)	Milton Ponce de Leon Digitally signed by Milton Ponce de Leon DN: cn=Milton Ponce de Leon, c=US, o=Cetecom Inc., ou=OTA, email=milton.deleon@cetecom.com Date: 2015.11.13 14:41:54 -08'00'

Responsible for the Report:

Date	Section	Name	Signature
11/14/2015	Compliance	Anthony Planinac (EMC Engineer)	Anthony Planinac Digitally signed by Anthony Planinac DN: cn=Anthony Planinac, c=US, o=CETECOM, ou=EMC SD, email=anthony.planinac@cetecom.com Reason: release Date: 2015.11.13 14:46:24 -08'00'

The test results of this test report relate exclusively to the test item specified in Section3.
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 Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Address:	6370 Nancy Ridge Drive, Suite 101 San Diego, CA 92121 U.S.A.
Telephone:	+1 (858) 362 2400
Fax:	+1 (858) 587 4809
Test Lab Manager:	Milton Ponce de Leon
Responsible Project Leader	Anthony Planinac

2.2 Identification of the Client

Applicant's Name:	ResMed Ltd.
Street Address:	1 Elizabeth Macarthur Drive
City/Zip Code	Bella Vista, NWS, 2153
Country	Australia
Contact Person:	Gerry O'Connor
Phone No.	+612-8884-2165
e-mail:	Gerrry.O'Connor@resmed.com.au

2.3 Identification of the Manufacturer

Manufacturer's Name:	Same as client.
Manufacturers Address:	
City/Zip Code	
Country	

3 Equipment under Test (EUT)

3.1 Specification of the Equipment under Test

Marketing Name / Description:	AirCurve 10 ST-A
Model Number:	28326
FCC-ID :	2ACHL-A10STACD
Product Description:	Continuous Positive Airway Pressure (CPAP) Device
Technology / Type(s) of Modulation:	CDMA 2000
Operating Frequency Ranges (MHz) / Channels:	850MHz 1900MHz
Max. declared conducted power + tune up	24dBm +1/-0.5dBs
Antenna info:	Taoglas PA.25a, BC0 Gain =1.49dBi, BC1 Gain=2.3dBi
Rated Operating Voltage Range:	Vmin: 23V – Vmax: 25V
Rated Operating Temperature Range:	5ºC to 35ºC
Test Sample Status:	Prototype
Radios contained in the device:	Telit CE910-dual, FCC ID:R17CE910-Dual

3.2 Identification of the Equipment under Test (EUT)

EUT #	Serial Number	Model	SAMPLE	HW Version	SW Version
1	22151827466	28326	RADIATED	BOM 28326	SX558
2	22151827483	28326	CONDUCTED	BOM 28326	SX558

3.3 Identification of Accessory equipment

AE #	Type	Manufacturer	Model	Part Number
1	AC Adapter	Resmed	370002	NA

3.4 Environmental conditions during Test:

The following environmental conditions were maintained during the course of testing:
Ambient Temperature: 20-25^{o}C
Relative humidity: 40-60%

3.5 Dates of Testing:

09/15/2015 – 09/18/2015

4 Subject of Investigation

The objective of the measurements applied by CETECOM Inc. Was to establish compliance of the EUT as described under Ch. 3 of this Test Report, with the applicable criteria specified in

- 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

This test report is to support a request for new equipment authorization under the
FCC ID: **2ACHL-A10STACD**
All testing was performed on the product referred to in Section 3 as EUT.

This product integrates the precertified WWAN module : Telit CE910-dual.

Per guidelines from KDB 996369, conducted signal test results from module certification is re-used for this certification as the output power has been verified to be within the specified production tolerances and measurement uncertainities.

The module test data can be obtained under the FCC Filing ID: **R17CE910-Dual**

5 Summary of Measurement Results

BC0 850 MHz Band:

Specifications	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §22.913 (b)	RF Output Power	Nominal	BC0	■	☐	☐	☐	Complies
§2.1055 §22.355	Frequency Stability	Nominal	BC0	☐	☐	☐	■	Complies
§2.1049 §22.917(b)	Occupied Bandwidth	Nominal	BC0	☐	☐	☐	■	Complies
§2.1051 §22.917	Band Edge Compliance	Nominal	BC0	☐	☐	☐	■	Complies
§2.1051 §22.917	Conducted Spurious Emissions	Nominal	BC0	☐	☐	☐	■	Complies
§2.1053 §22.917	Radiated Spurious Emissions	Nominal	BC0	■	☐	☐	☐	Complies

Note: NA= Not Applicable; NP= Not Performed (Leveraged from module certification).

BC1 1900 MHz Band:

Specifications	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §24.232 (c)(d)	RF Output Power	Nominal	BC1	■	☐	☐	☐	Complies
§24.232 (d)	Frequency Stability	Nominal	BC1	☐	☐	☐	■	Complies
§2.1049 §22.917(b) RSS132 5.2	Occupied Bandwidth	Nominal	BC1	☐	☐	☐	■	Complies
§2.1051 §24.238	Band Edge Compliance	Nominal	BC1	☐	☐	☐	■	Complies
§2.1051 §22.917	Conducted Spurious Emissions	Nominal	BC1	☐	☐	☐	■	Complies
§2.1053 §24.238	Radiated Spurious Emissions	Nominal	BC1	■	☐	☐	☐	Complies

Note: NA= Not Applicable; NP= Not Performed (Leveraged from module certification).

6 Measurements

6.1 RF Power Output

6.1.1 References

FCC: CFR Part 2.1046, CFR Part 22.913, CFR Part 24.232, CFR Part 27.50

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. RSS-Gen 4.8: RF power output.

6.1.3 Limits:

ERP (BC0 Band)

FCC Part 22.913 (a)

FCC: Peak ERP < 38.45 dBm (7W)
The effective radiated power (ERP) of mobile transmitters must not exceed 7 Watts.

EIRP (1900 MHz Band)

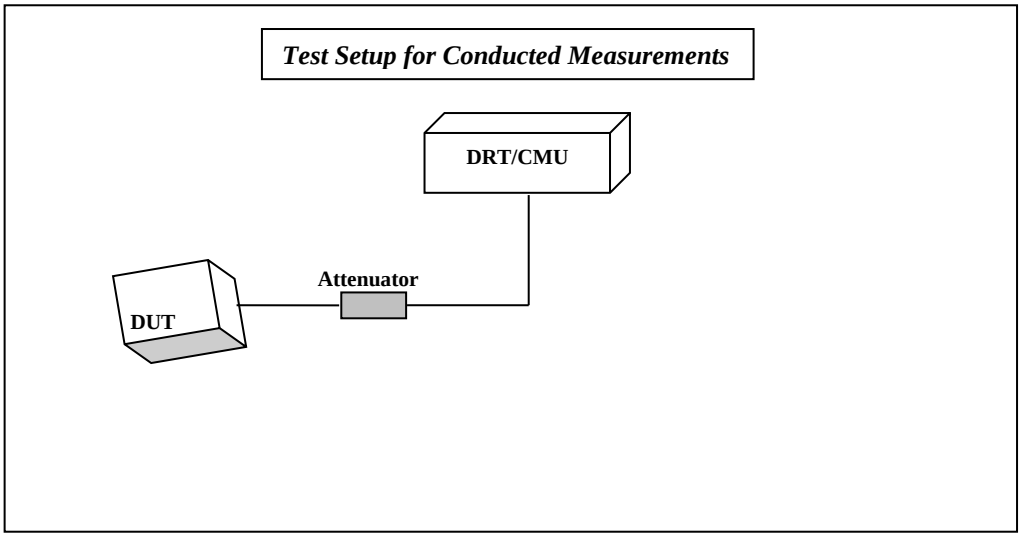
FCC Part 24.232 I I

FCC: Peak EIRP < 33 dBm (2W)
(b) Mobile/portable stations are limited to 2 Watts effective isotropic radiated power (EIRP).
I 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.

6.1.4 Conducted Output Power Measurement

6.1.4.1 Measurement Procedure:

Measurement according to KDB 971168 D01v02r02 (Measurement guidance for certification of Licensed Digital Transmitters)
Section 5.1.1 for peak power
Section 5.2.2 for average power



1. Connect the equipment as shown in the above diagram. A Digital Radio Communication Tester (DRT: R&S CMU200 here) is used to enable the EUT to transmit and to measure the output power.
2. Adjust the settings of the CMU200 to set the EUT to its maximum power at the required channel.
3. Record the Peak and Average Output power level measured by the CMU200.
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 and for all types of modulation schemes.

6.1.4.2 Measurement Uncertainty

+/- 0.5 dB

6.1.4.3 Test Conditions:

Tnom: 20°C; Vnom: 24 V

Measurement Results (Conducted Power Verification):

ERP BC0

BC0: CDMA Mode Antenna Gain = 1.50 dBi FCC: Peak ERP < 38.45 dBm (7W)					
Frequency	**PEAK Conducted Output Power**	**Average Conducted Output Power**	**Calculated Peak EIRP** EIRP = Conducted + gain	**Calculated Peak ERP** (ERP = EIRP – 2.15 dB)	**Calculated Average EIRP** Avg EIRP = Conducted + gain
(MHz)	**(dBm)**	**(dBm)**	**(dBm)**	**(dBm)**	**(dBm)**
824.7(1013)	27.9	23.4	29.4	**27.25**	25.55
836.52(384)	27.9	23.2	29.4	**27.25**	25.35
848.31(777)	27.7	23.2	29.2	27.05	25.35

EIRP BC1

BC1: CDMA Mode Antenna Gain = 2.2 dBi FCC: Peak EIRP < 33 dBm (2W)					
Frequency	**PEAK Conducted Output Power**	**Average Conducted Output Power**	**Calculated Peak EIRP** EIRP = Conducted + gain	**Calculated Peak ERP** (ERP = EIRP – 2.15 dB)	**Calculated Average EIRP** Avg EIRP = Conducted + gain
(MHz)	**(dBm)**	**(dBm)**	**(dBm)**	**(dBm)**	**(dBm)**
1851.25(25)	27.5	23.1	**29.7**	27.55	25.3
1880 (600)	27.5	23.0	**29.7**	27.55	25.1
1908.75 (1175)	27.0	22.4	29.2	27.05	24.6

6.1.4.4 Verification Result

the measured conducted average powers are 0.1 to 1.1 dB lower than the declared module powers minus declared variation. This may be expected due to ohmic and mismatch losses by integrating the module. This verification supports leveraging of conducted results from module report for certification.

6.1.4.4.1 Test Verdict

Pass.

6.2 Spurious Emissions Radiated

6.2.1 References

FCC: CFR Part 2.1053, CFR Part 22.917, CFR Part 24.238, CFR Part 27.53

6.2.2 Measurement requirements:

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.

6.2.3 Limits:

(1) *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.

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.

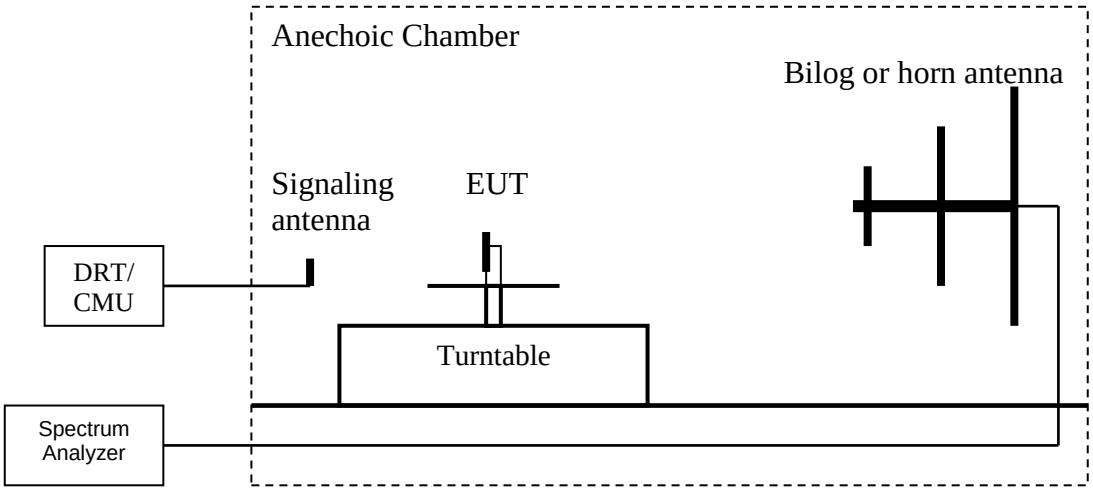
6.2.3.1 FCC 24.238 Emission limitations for Broadband PCS equipment.

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.

6.2.4 **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 Radio Communication 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.)

6.2.5 Sample Calculations for Radiated Measurements

6.2.5.1 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)

Example:

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

6.2.6 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 MHz and 1900 MHz bands of operation.
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 BC0-850 MHz and the BC1-1900 MHz 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 in CDMA mode.
Additional spot checks in mid channel of operation for all modes were performed with the slimmer battery option of the device.

For radiated measurements, all data in this report shows the worst case emissions data between H/V antenna polarizations and for all 3 orthogonal orientations of the EUT.

Unless mentioned otherwise, the emission signals above the limit line in the plots are from the carrier

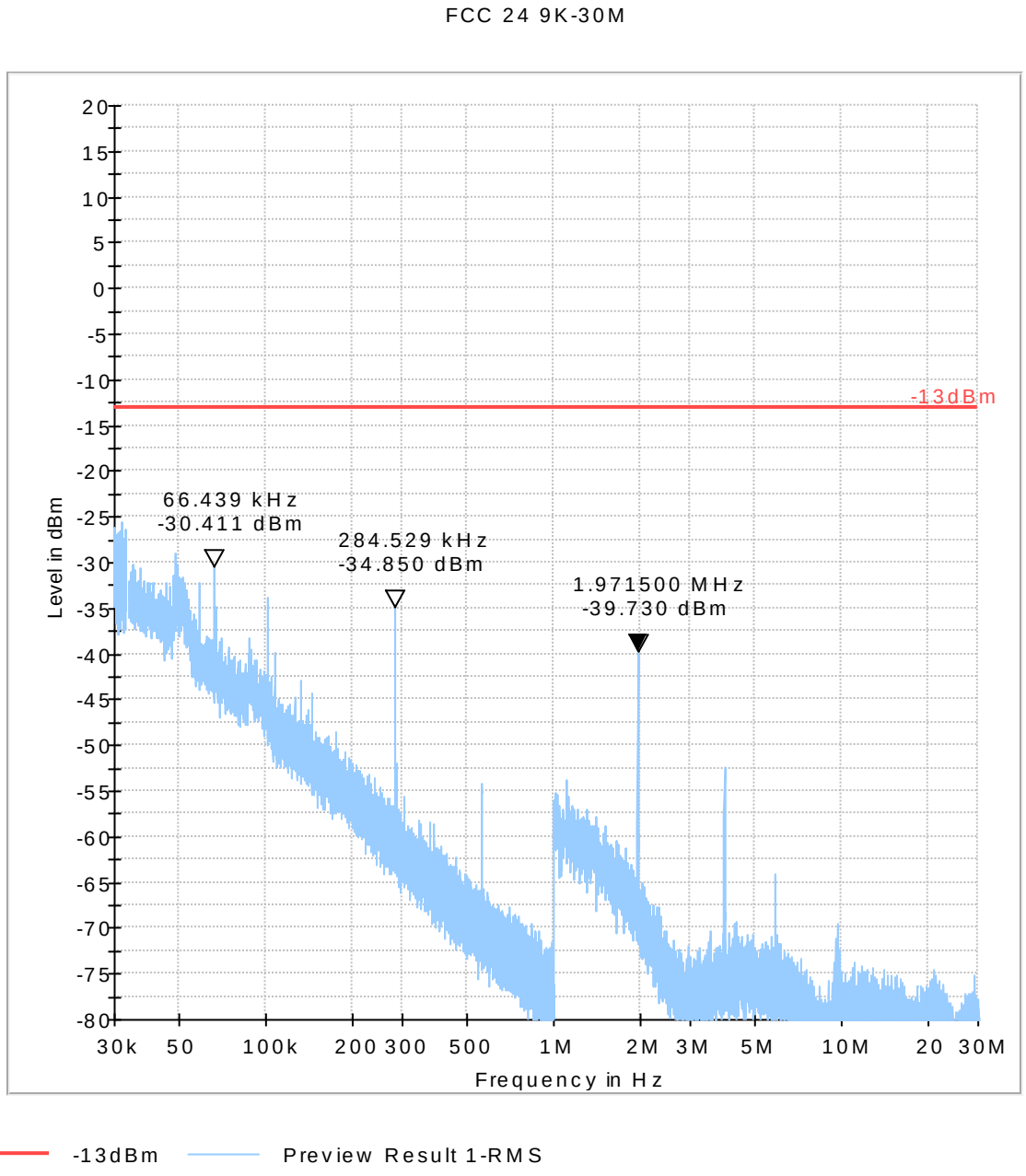
6.2.7 Test Conditions:

Tnom: 20^{o}C; Vnom: 24 V

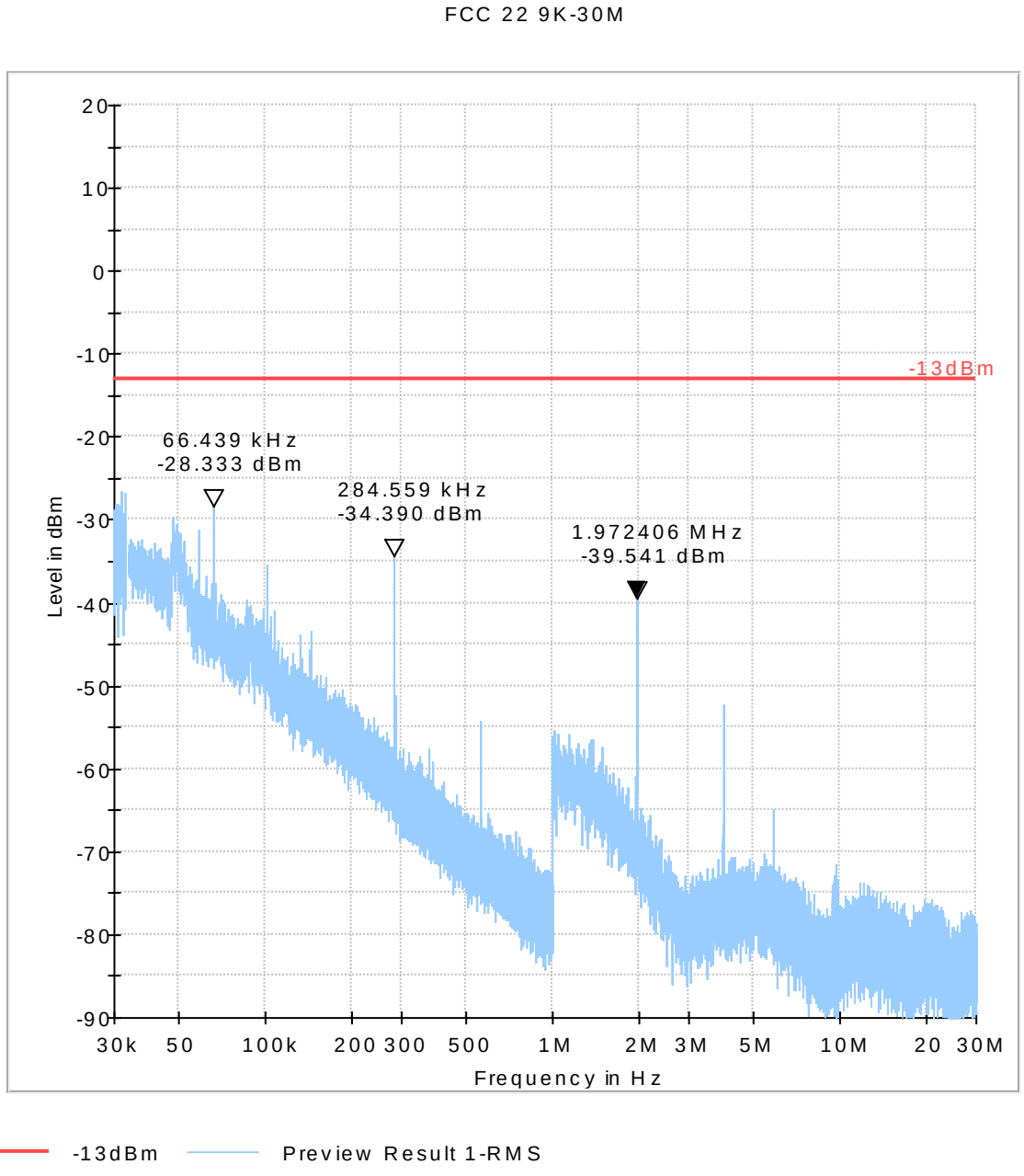
6.2.8 Test Results for Radiated Spurious Emissions:

Radiated Spurious Emissions (BC0-850) Tx:

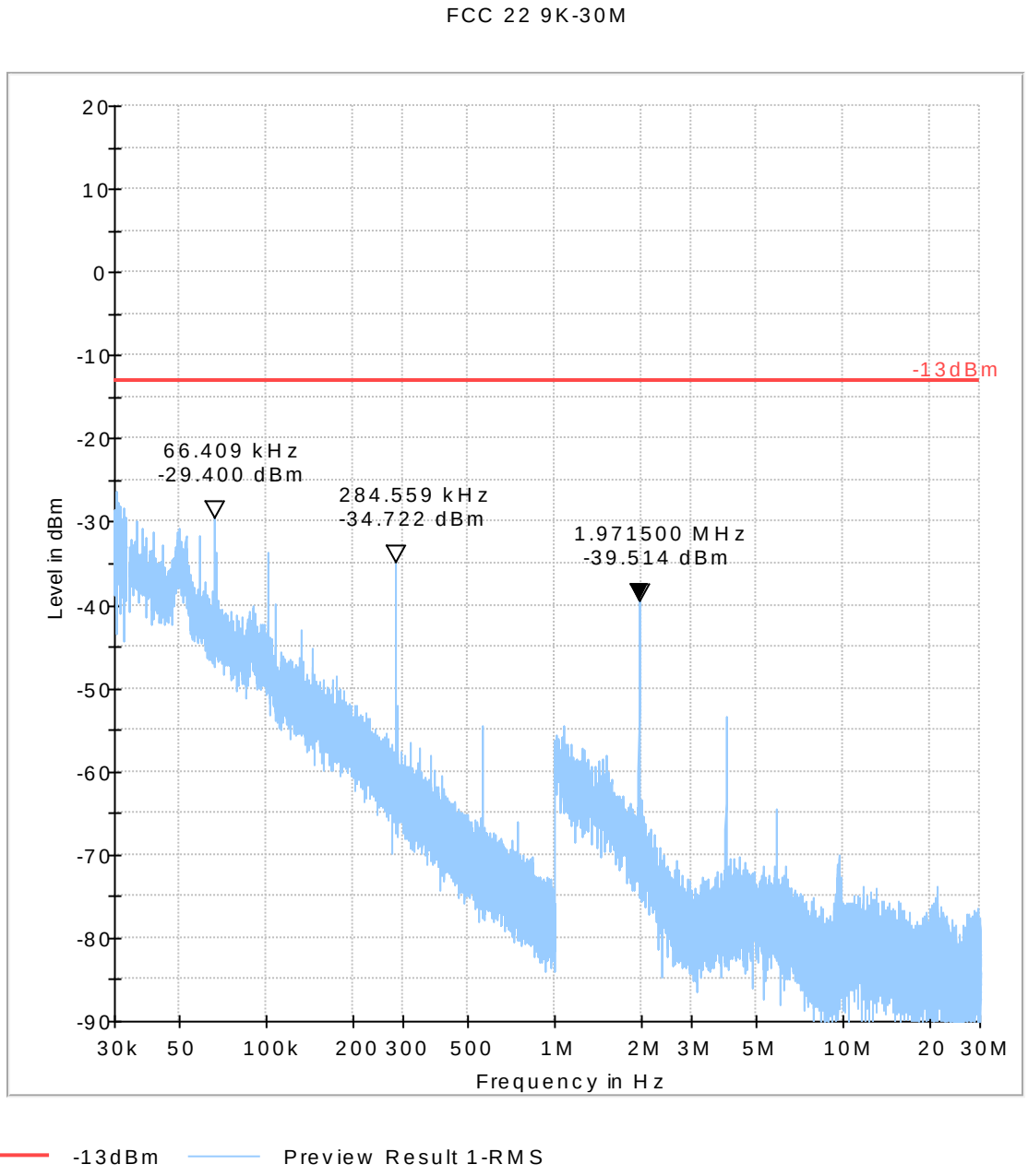
Test results: 30 kHz- 30 MHz – Low Channel (BC0-850)



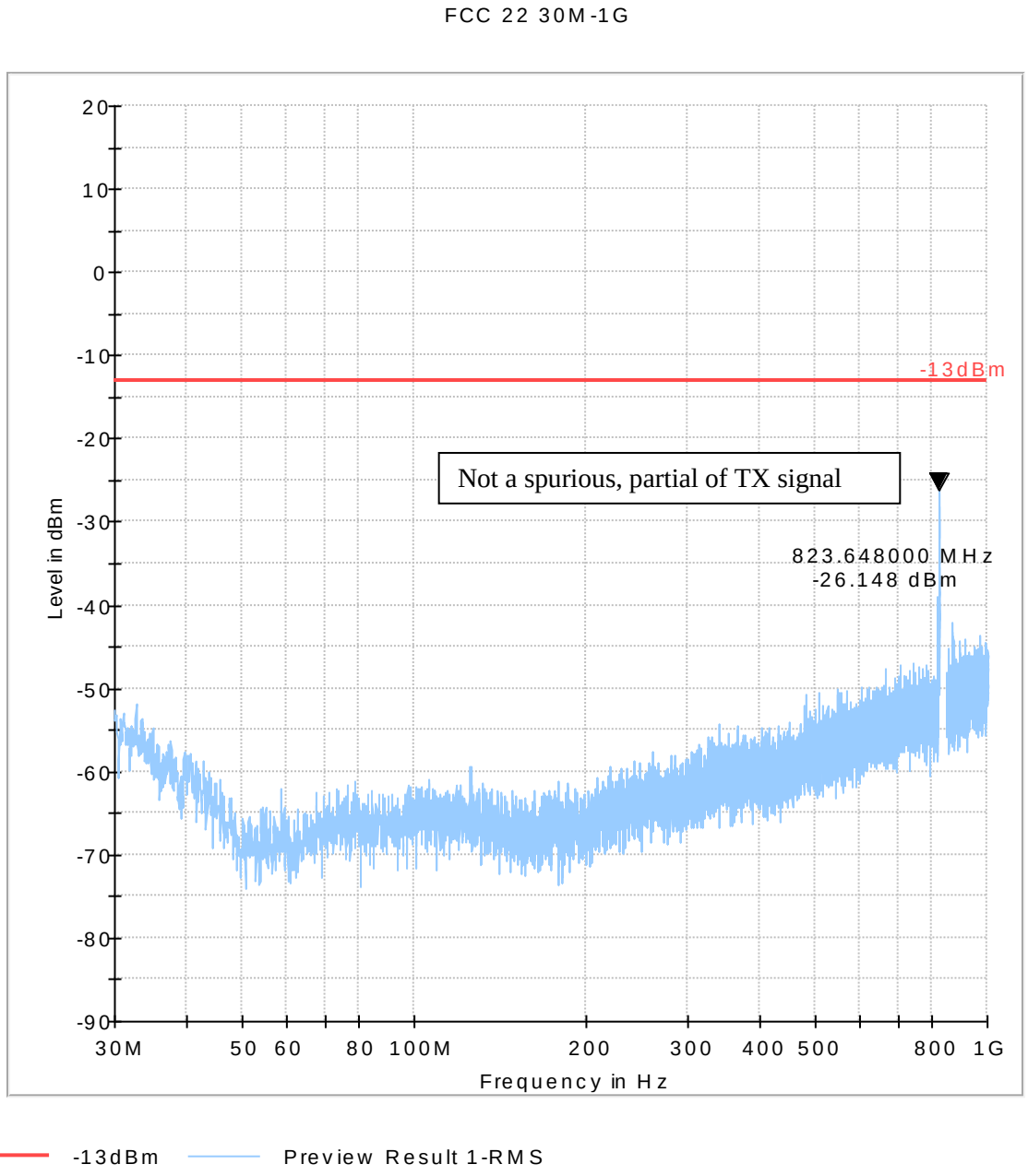
Test results: 30 kHz- 30 MHz – Mid Channel (BC0-850)



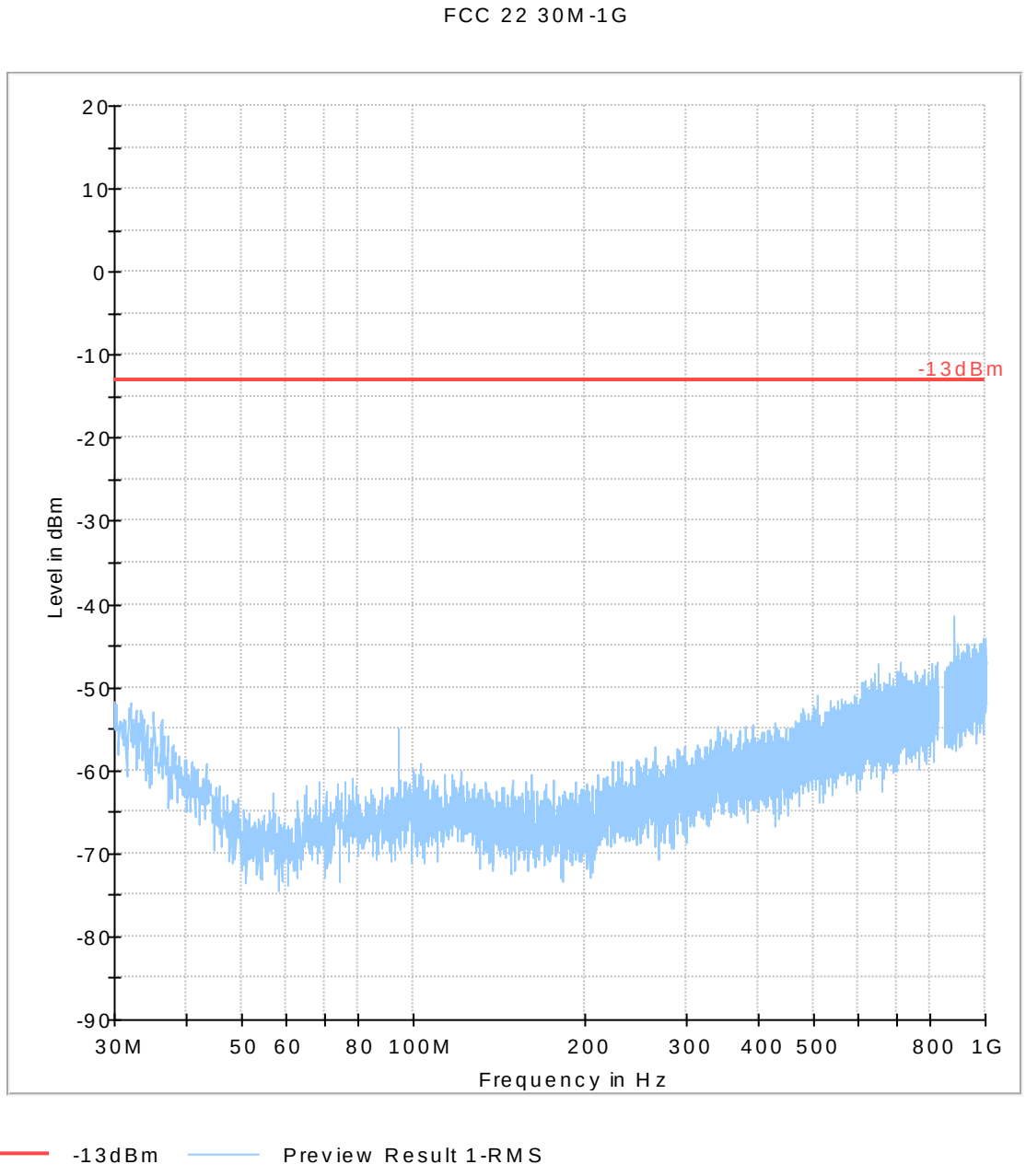
Test results: 30 kHz- 30 MHz – High Channel (BC0-850)



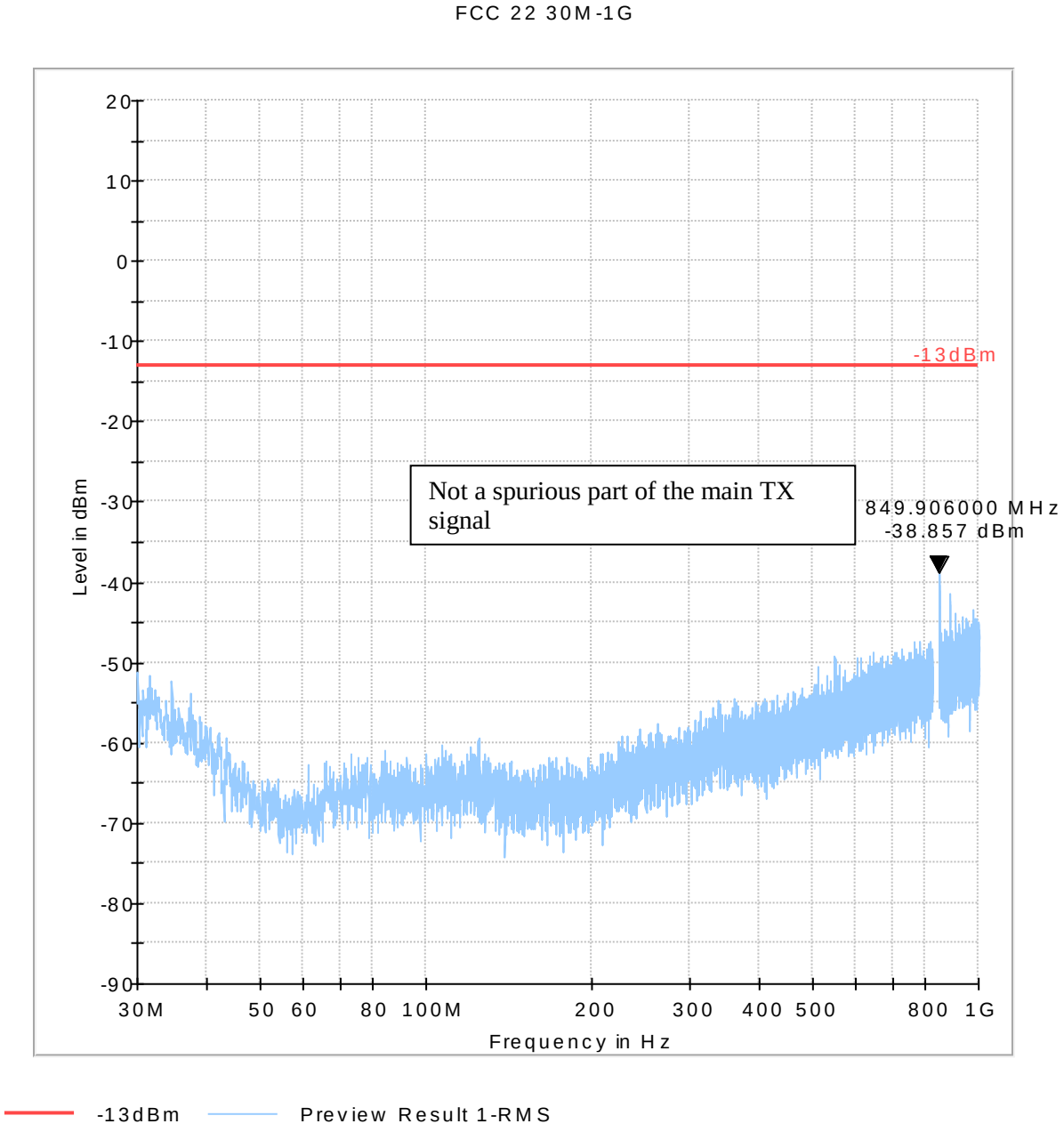
Test results – 30 MHz – 1GHz –Low Channel (BC0-850).



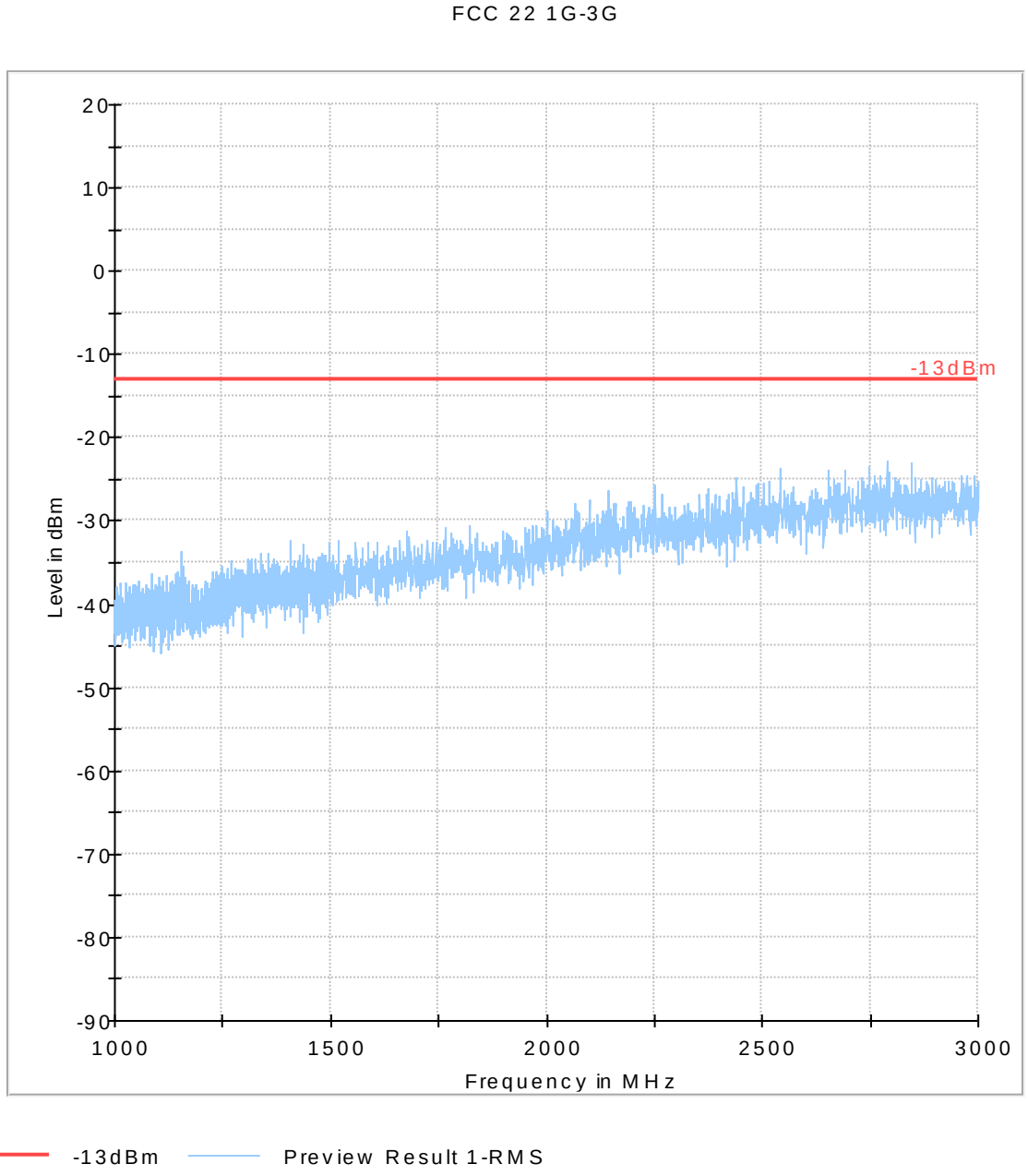
Test results – 30 MHz – 1GHz –Mid Channel (BC0-850).



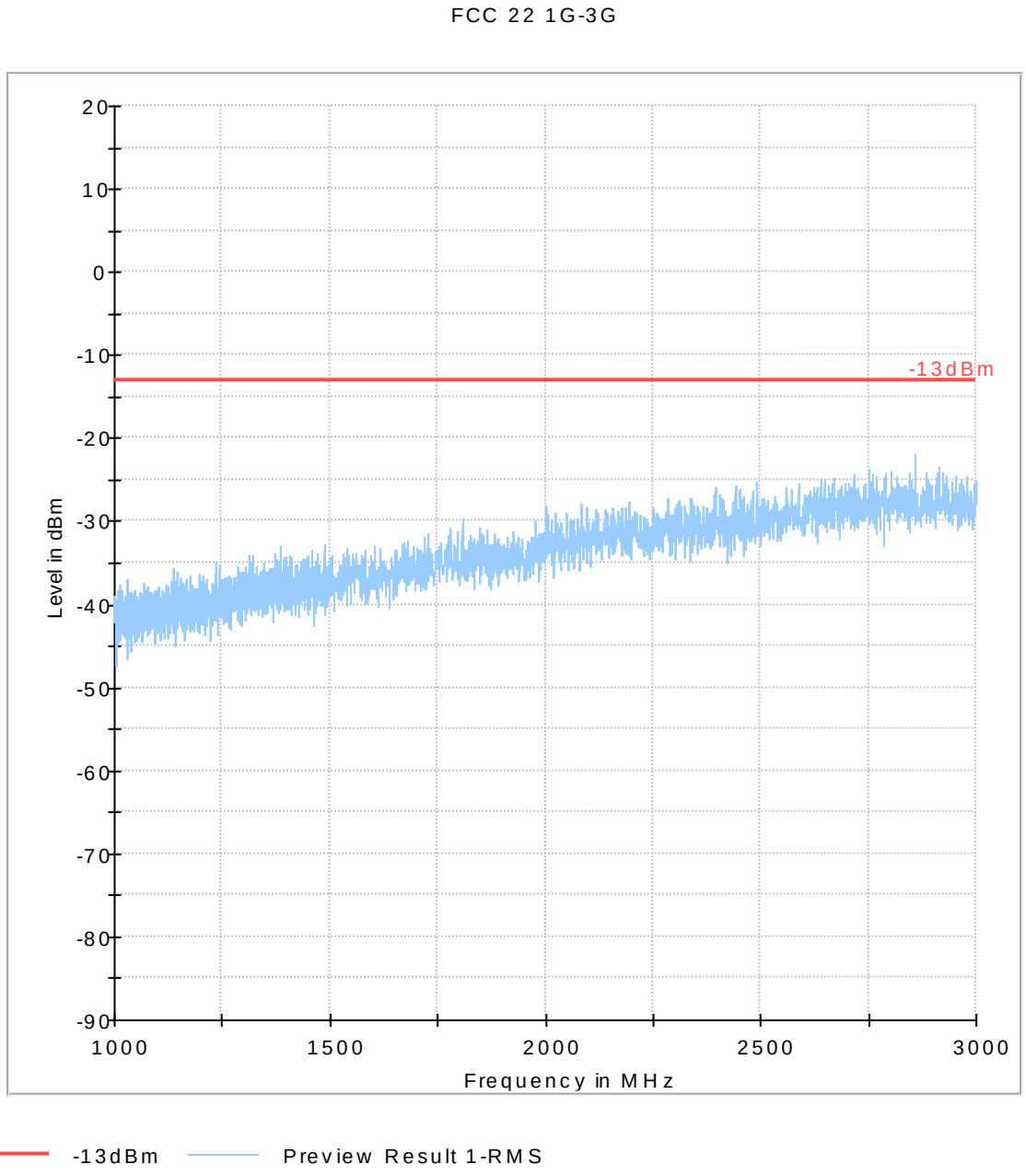
Test results – 30 MHz – 1GHz –High Channel (BC0-850).



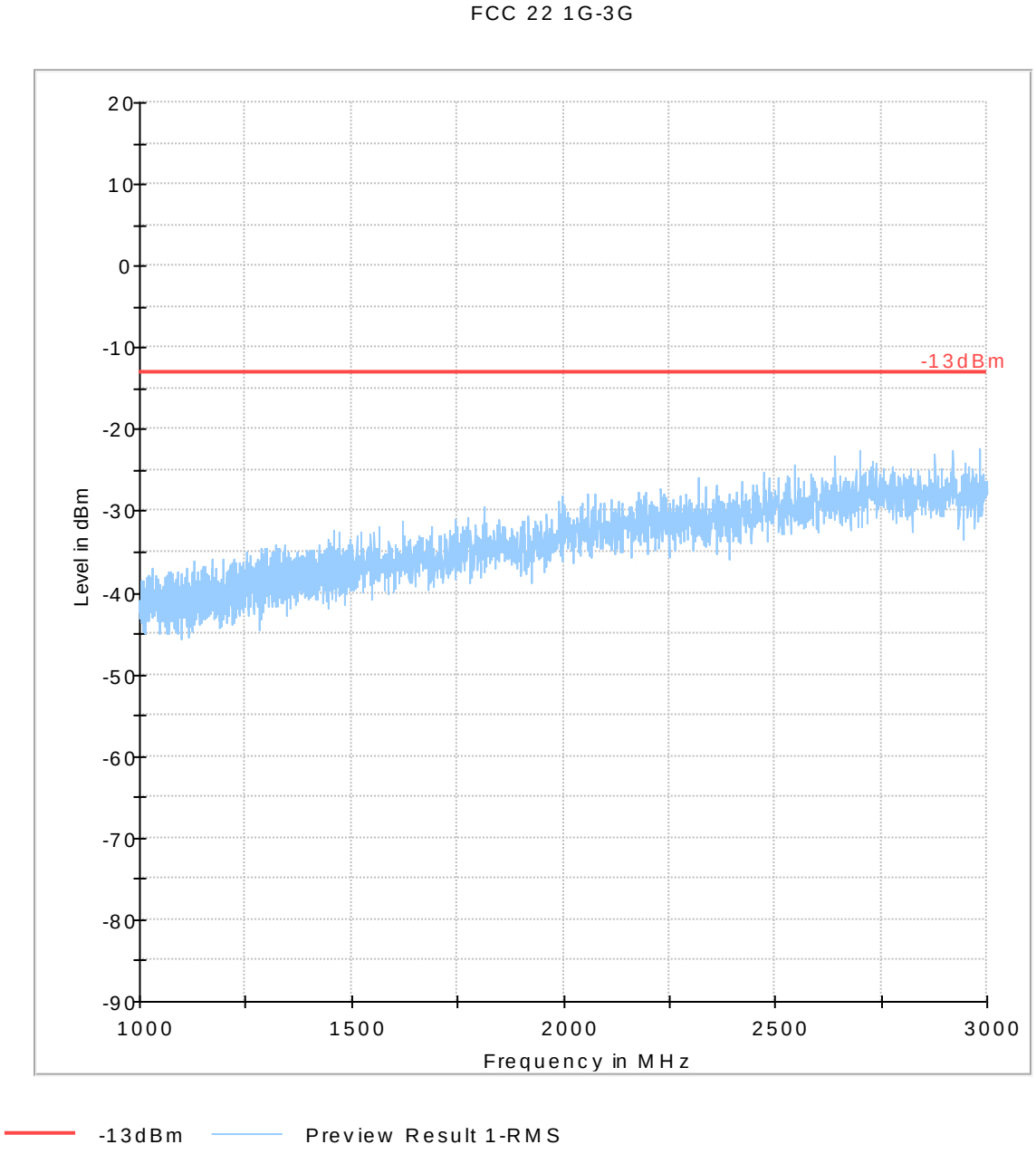
Test results – 1GHz – 3GHz –Low Channel (BC0-850)



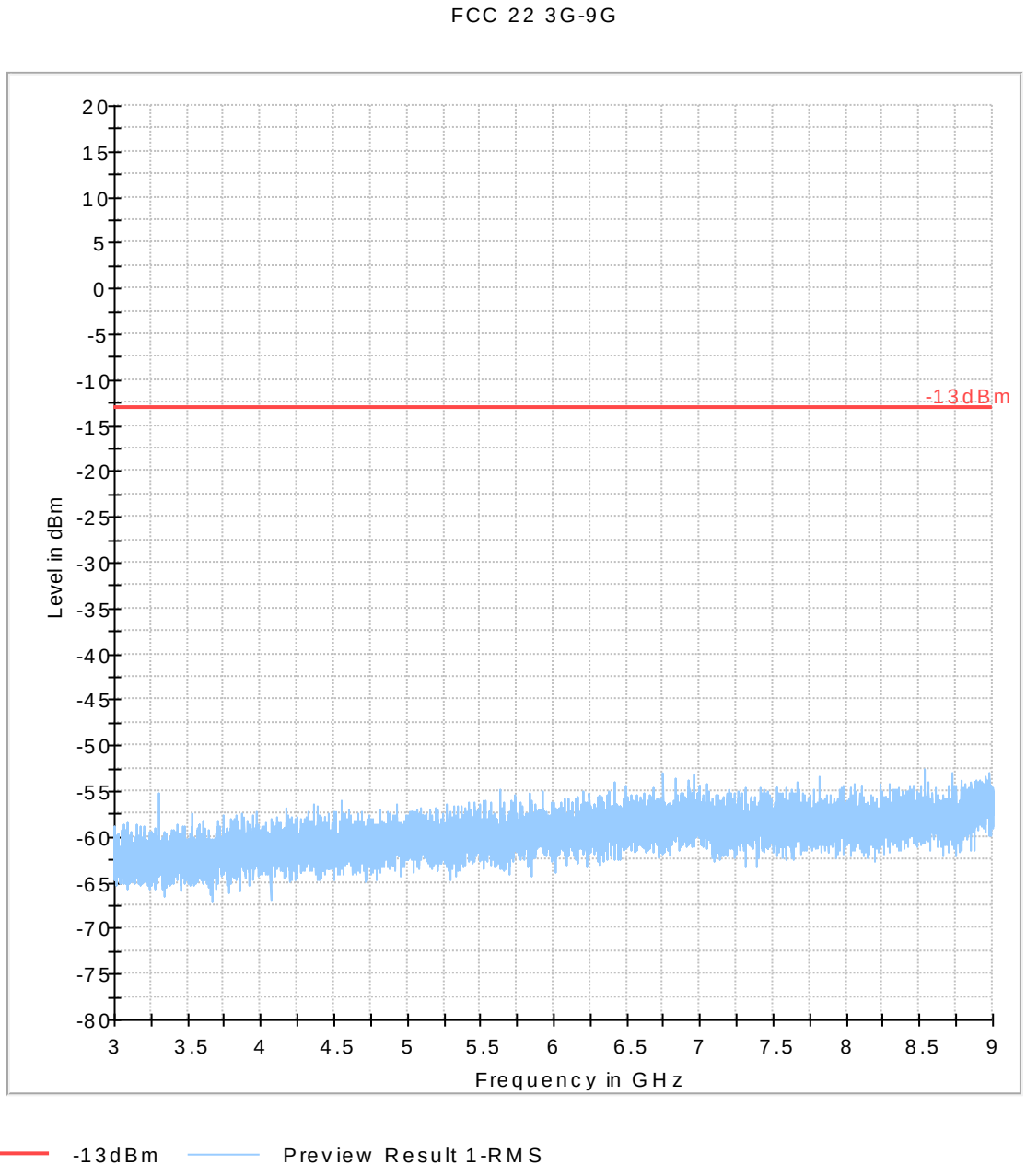
Test results – 1GHz – 3GHz –Mid Channel (BC0-850)



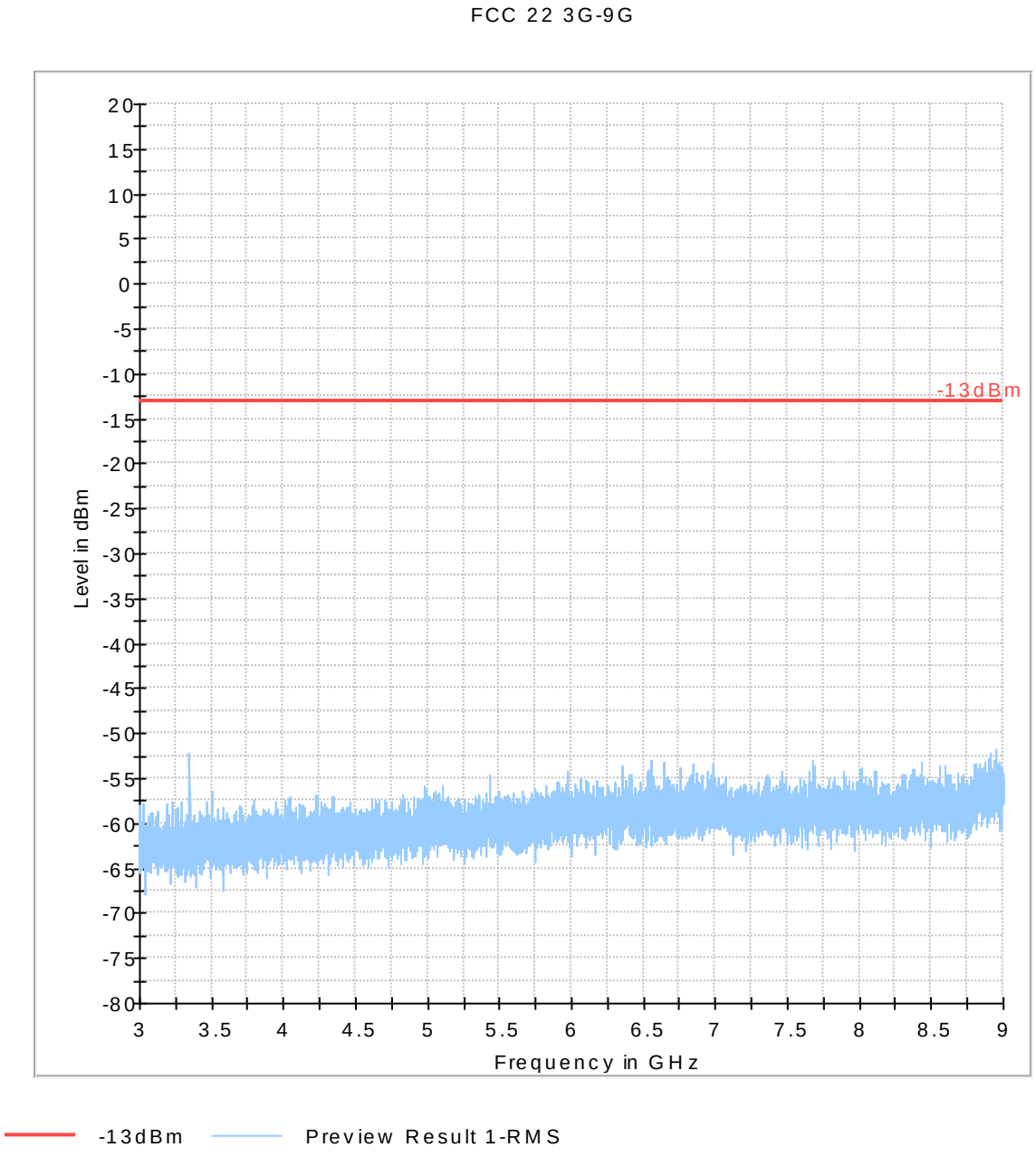
Test results – 1GHz – 3GHz –High Channel (BC0-850)



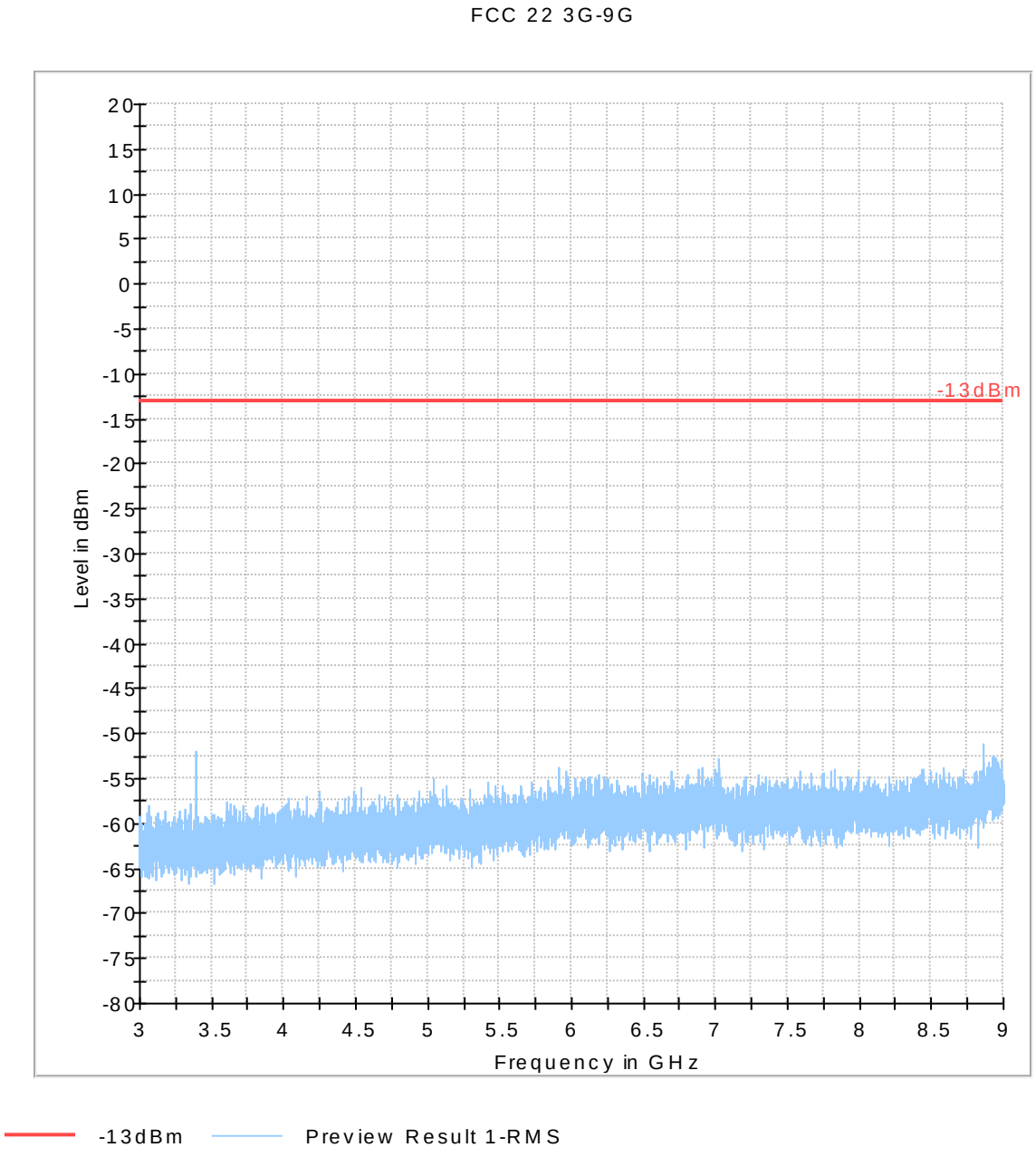
Test results – 3GHz – 9GHz –Low Channel (BC0-850)



Test results – 3GHz – 9GHz –Mid Channel (BC0-850)

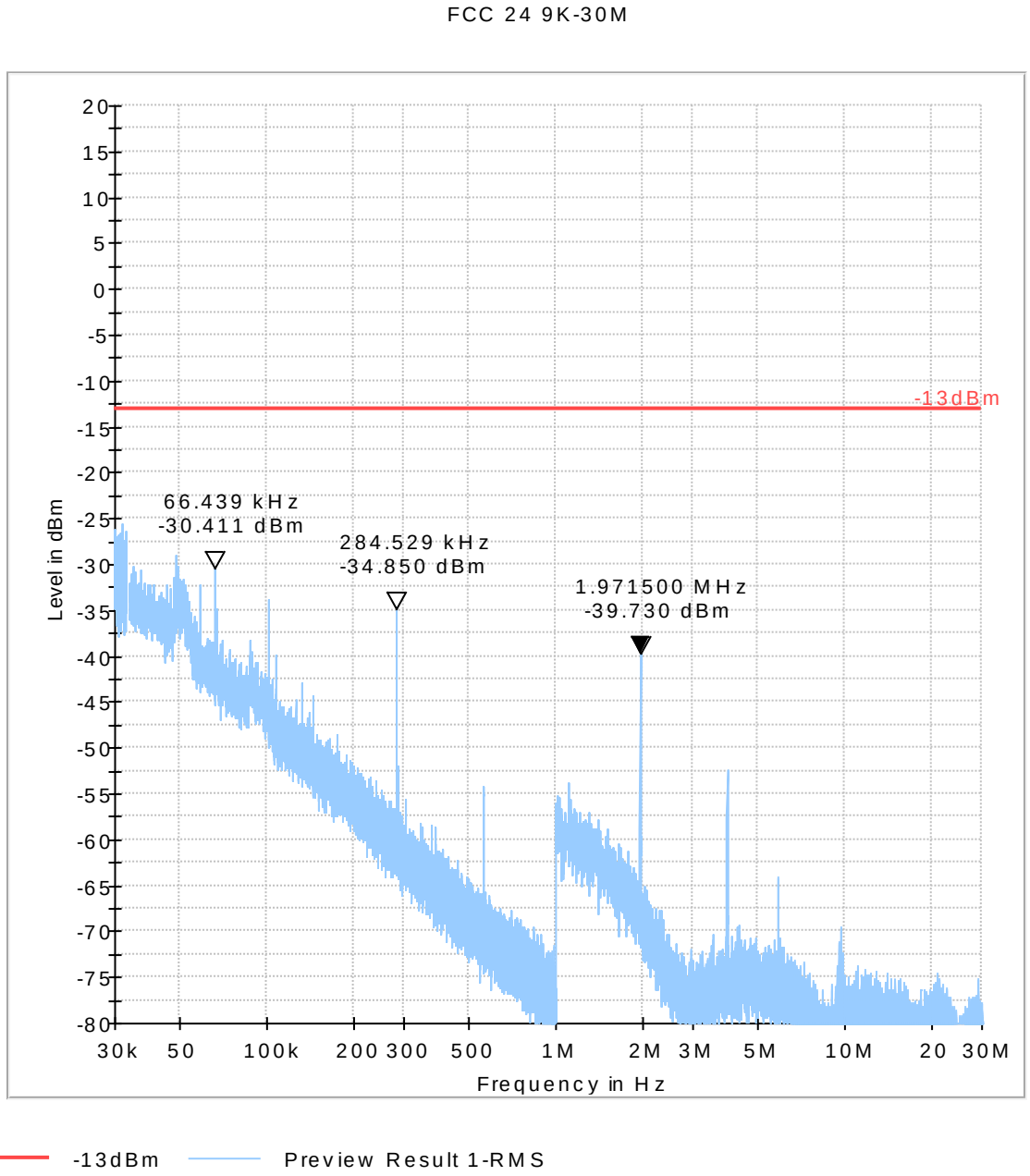


Test results – 3GHz – 9GHz –High Channel (BC0-850)

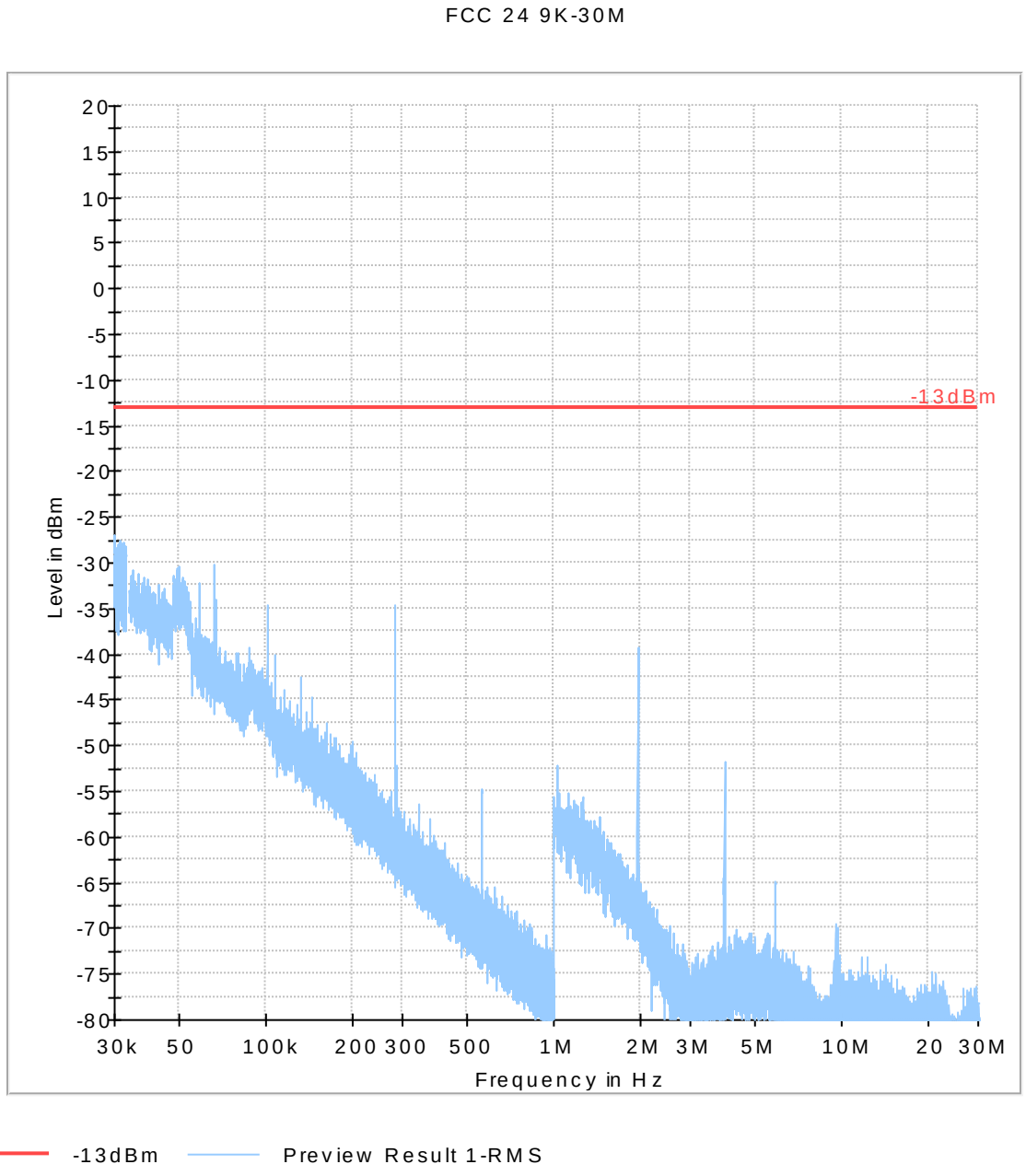


Radiated Spurious Emissions (BC1-1900) Tx:

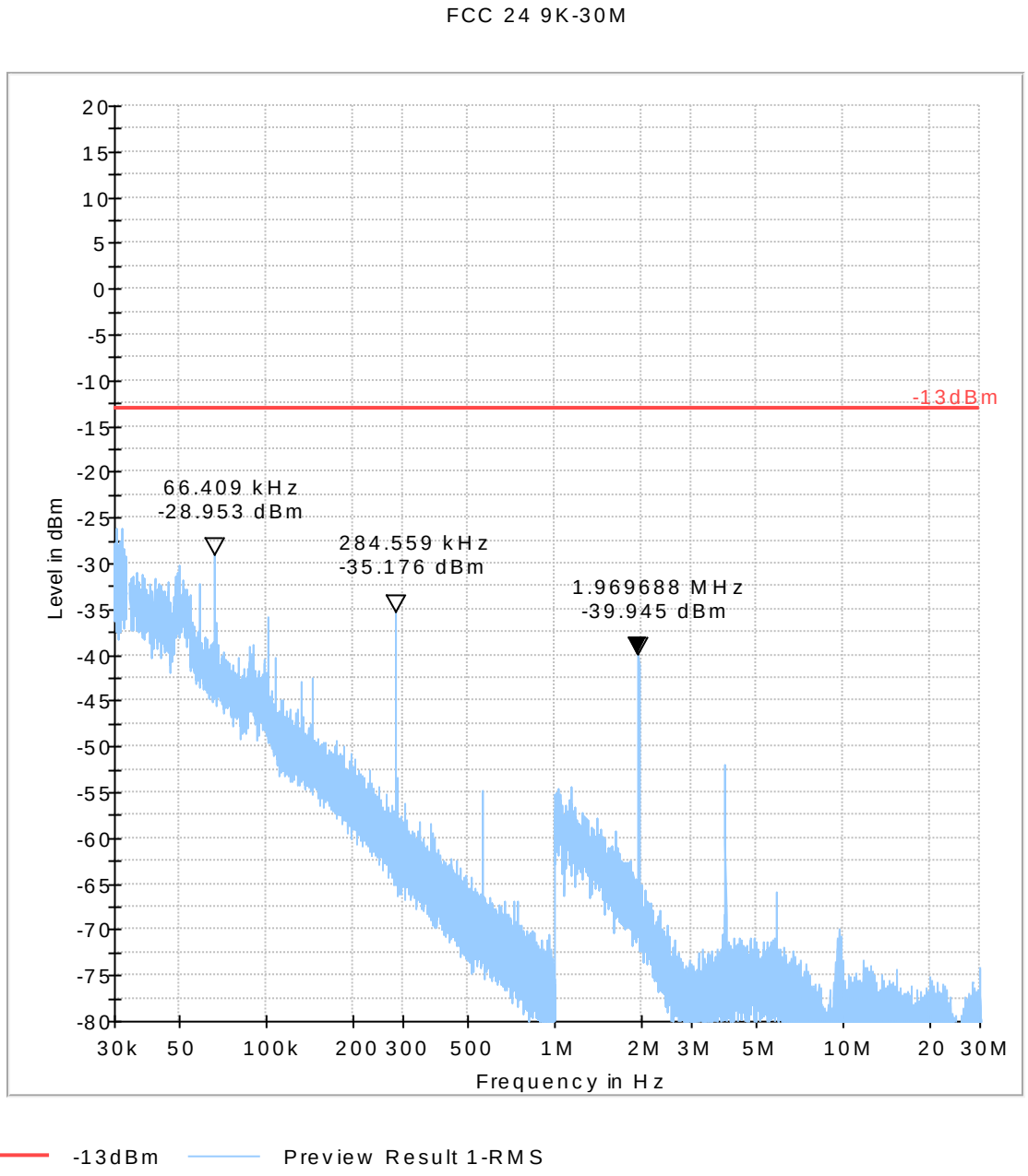
Test results 30 kHz- 30 MHz – Low Channel (BC1-1900)



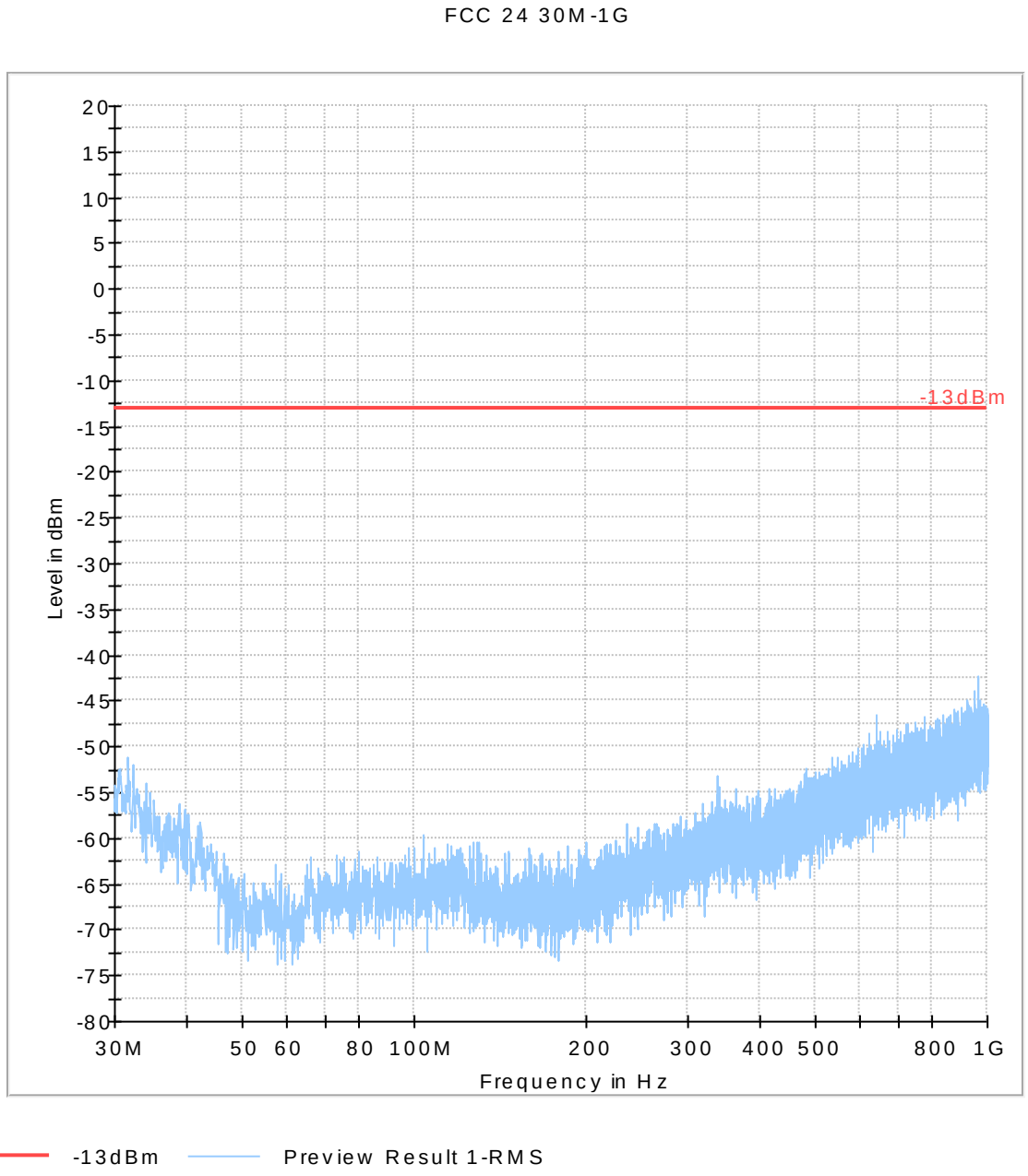
Test results 30 kHz- 30 MHz – Mid Channel (BC1-1900)



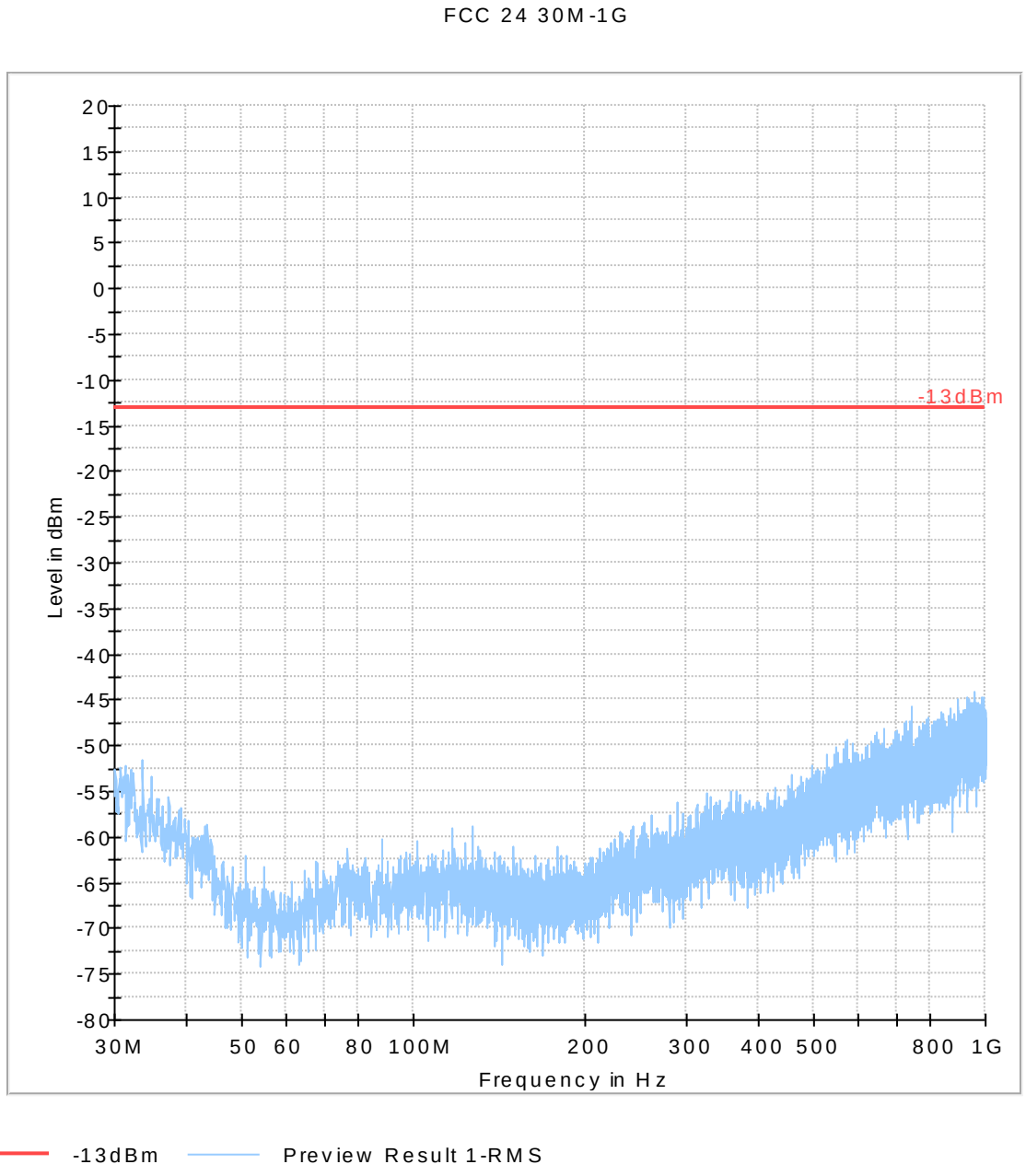
Test results 30 kHz- 30 MHz – High Channel (BC1-1900)



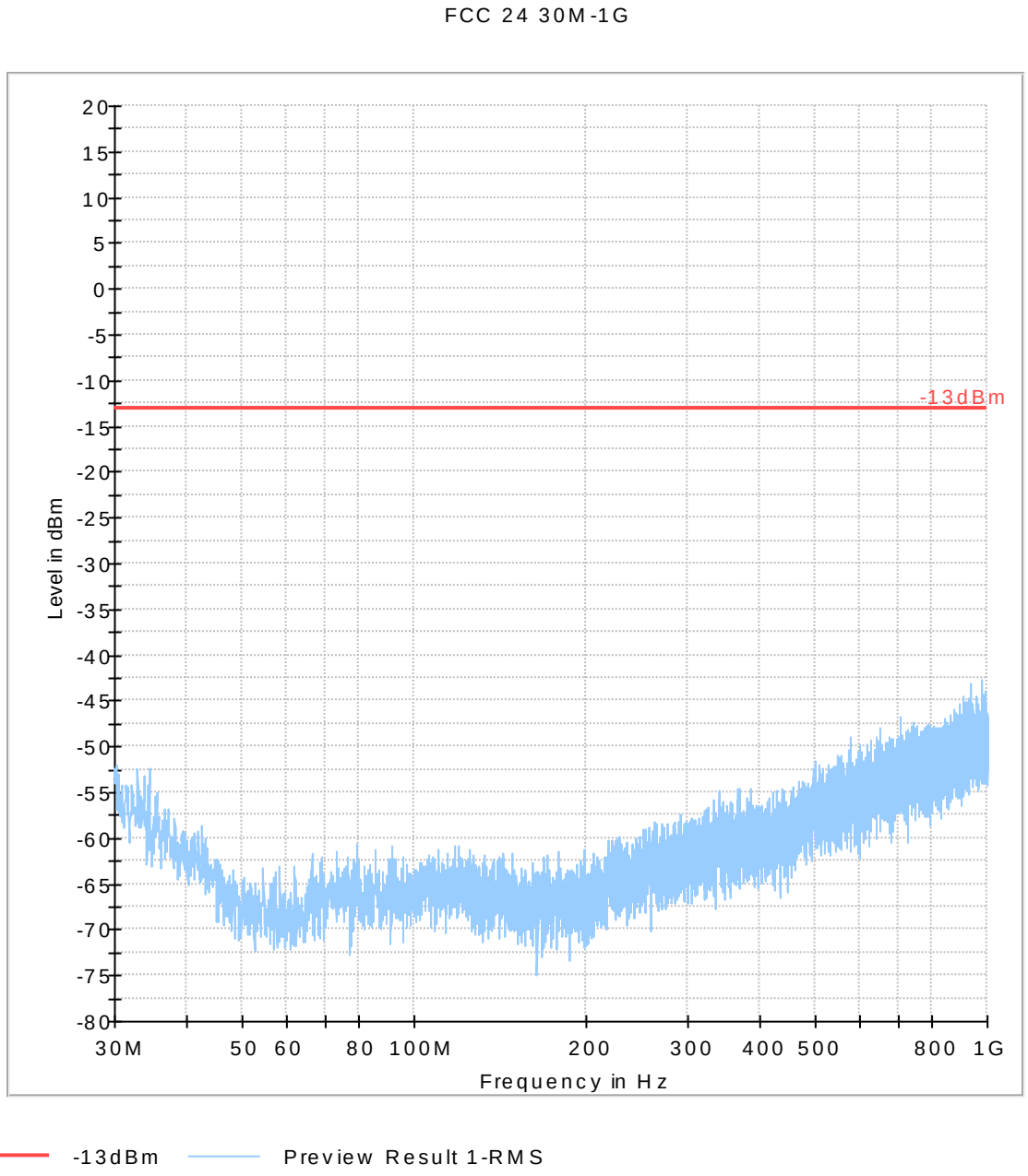
Test results – 30 MHz – 1GHz –Low Channel (BC1- 1900)



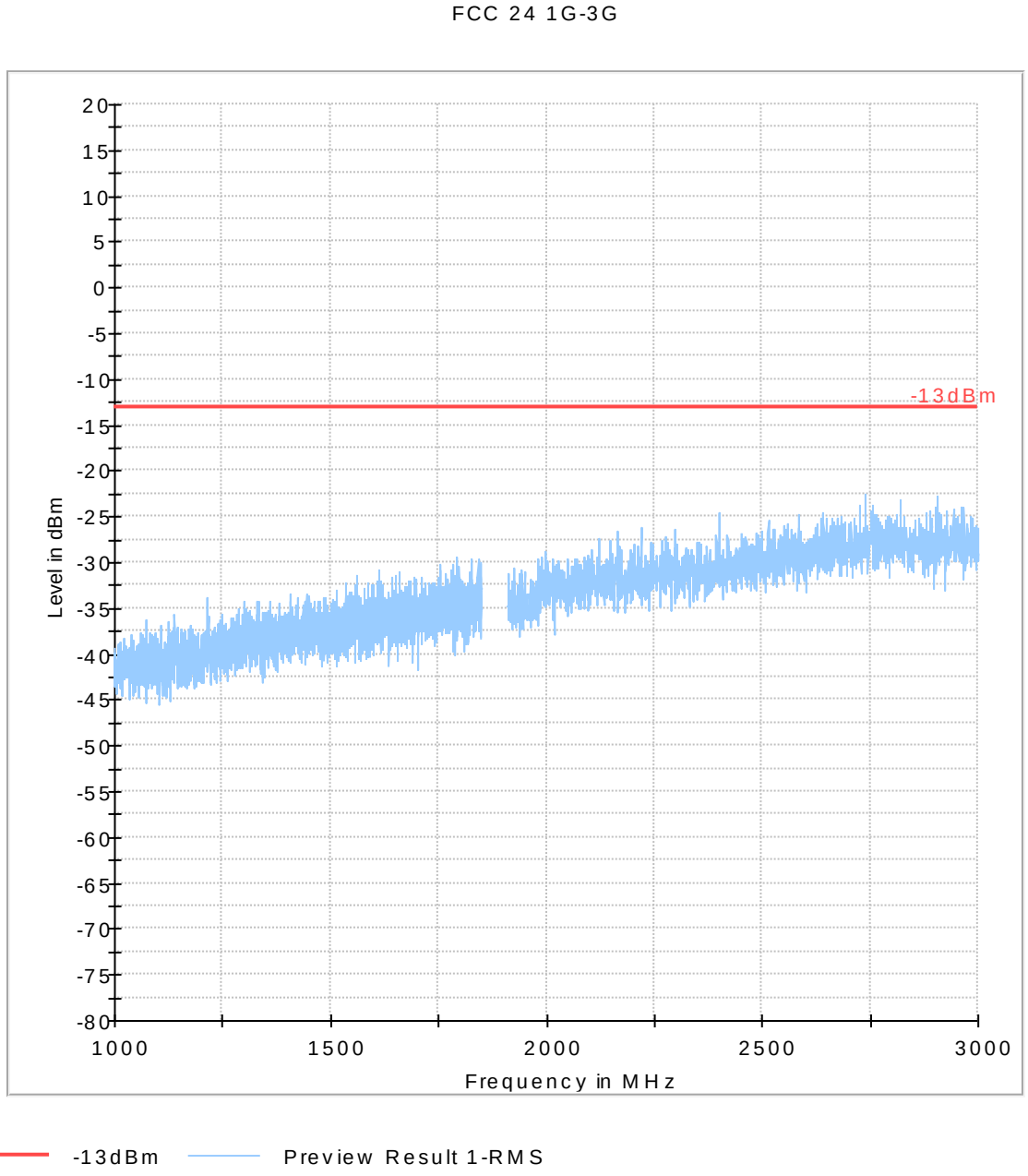
Test results – 30 MHz – 1GHz –Mid Channel (BC1-1900)



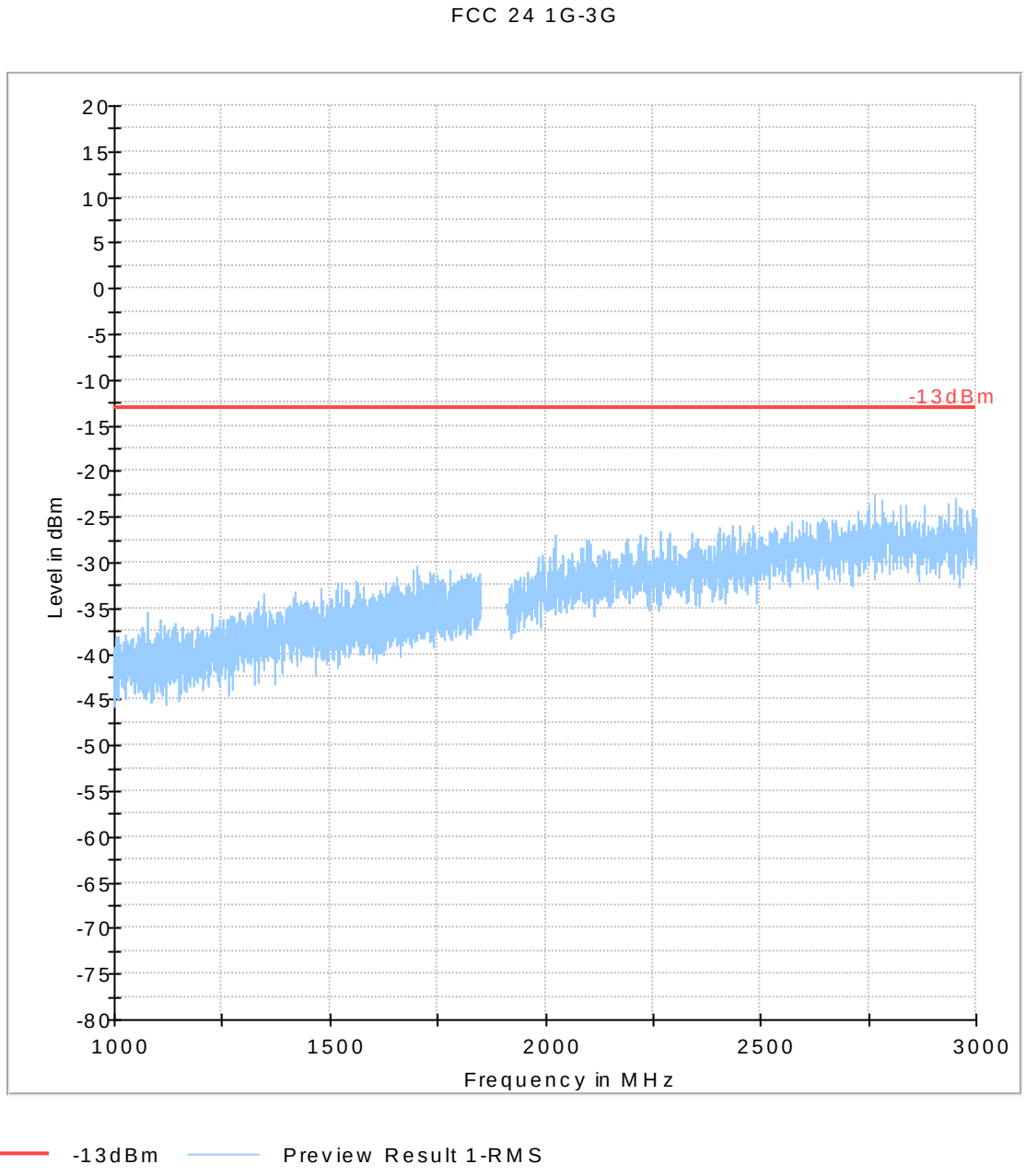
Test results – 30 MHz – 1GHz –High Channel (BC1-1900)



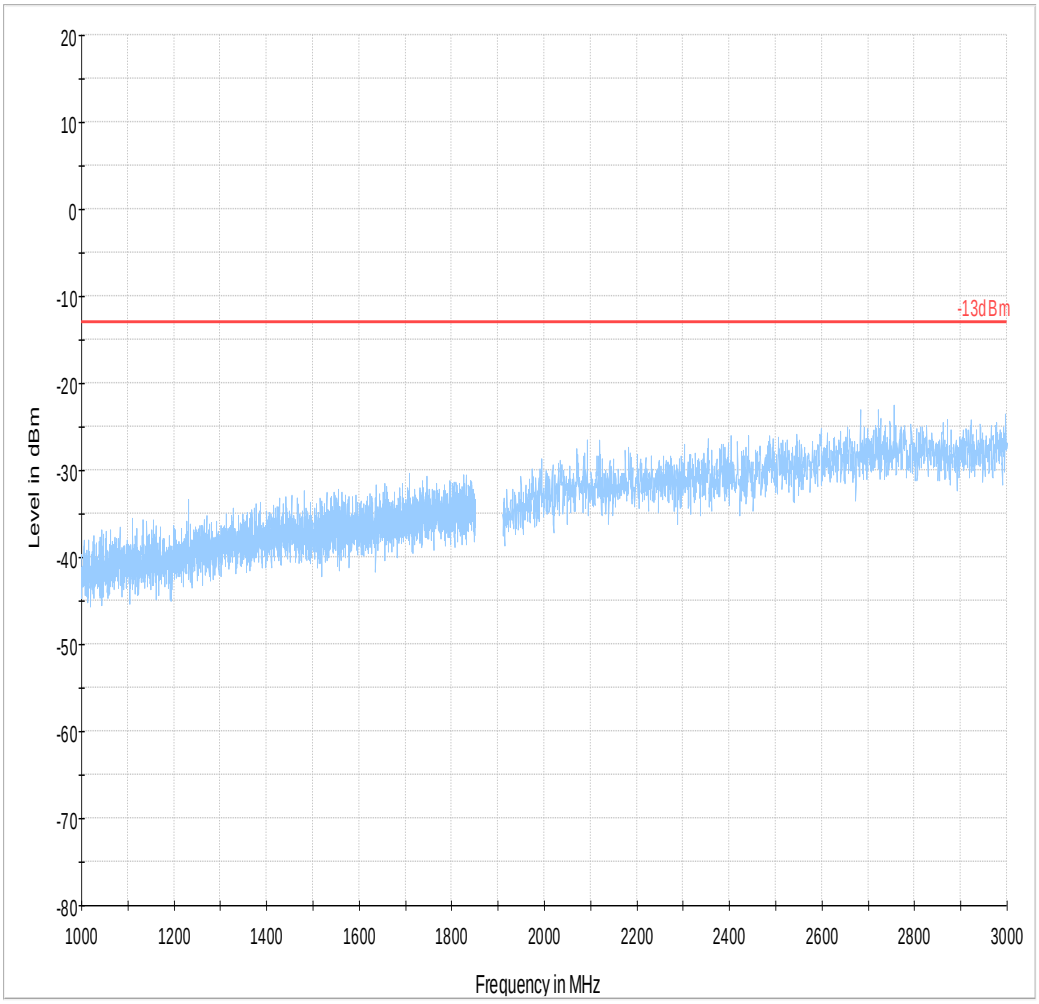
Test results – 1GHz – 3GHz –Low Channel (BC1-1900)



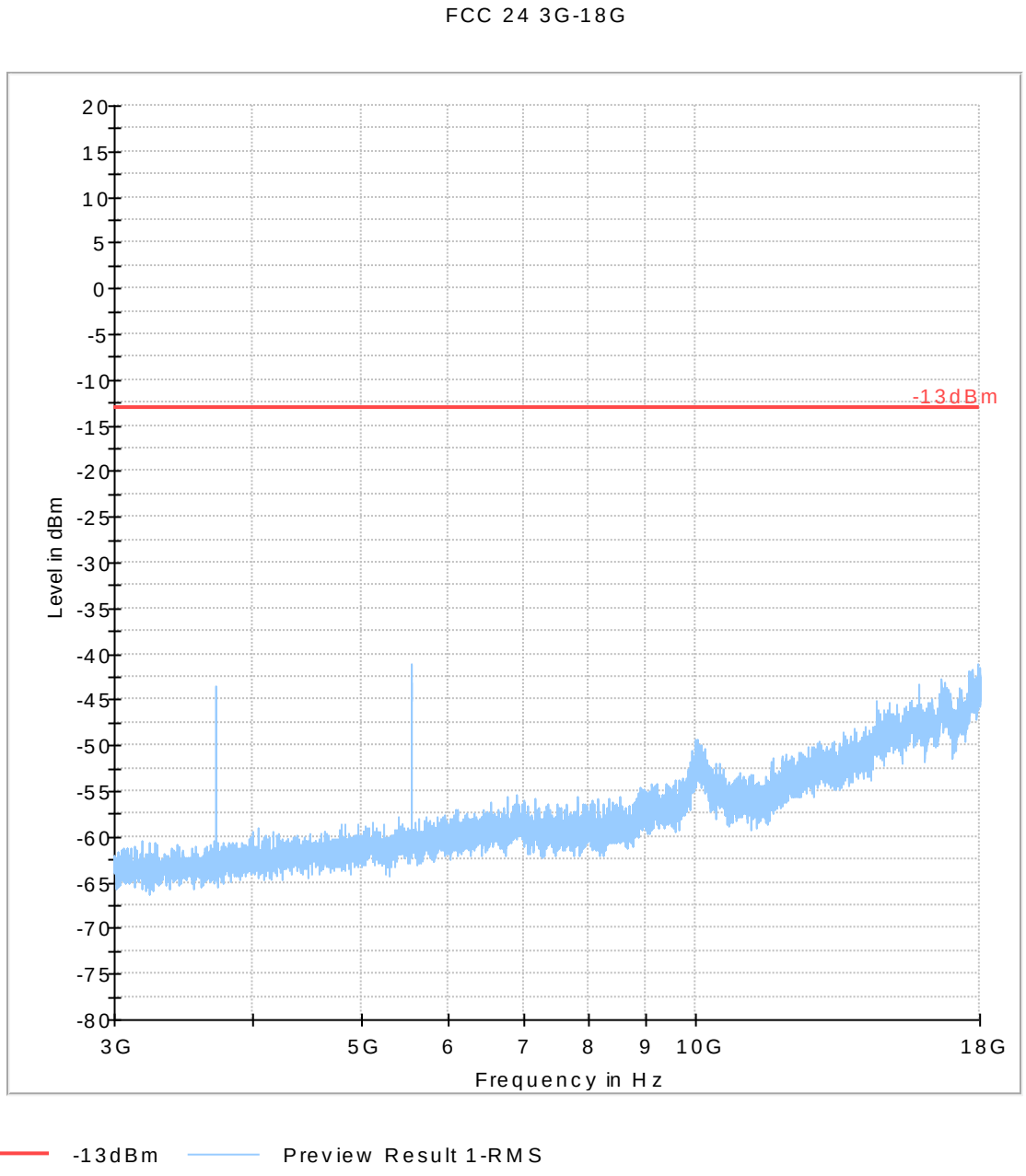
Test results – 1GHz – 3GHz –Mid Channel (BC1-1900)



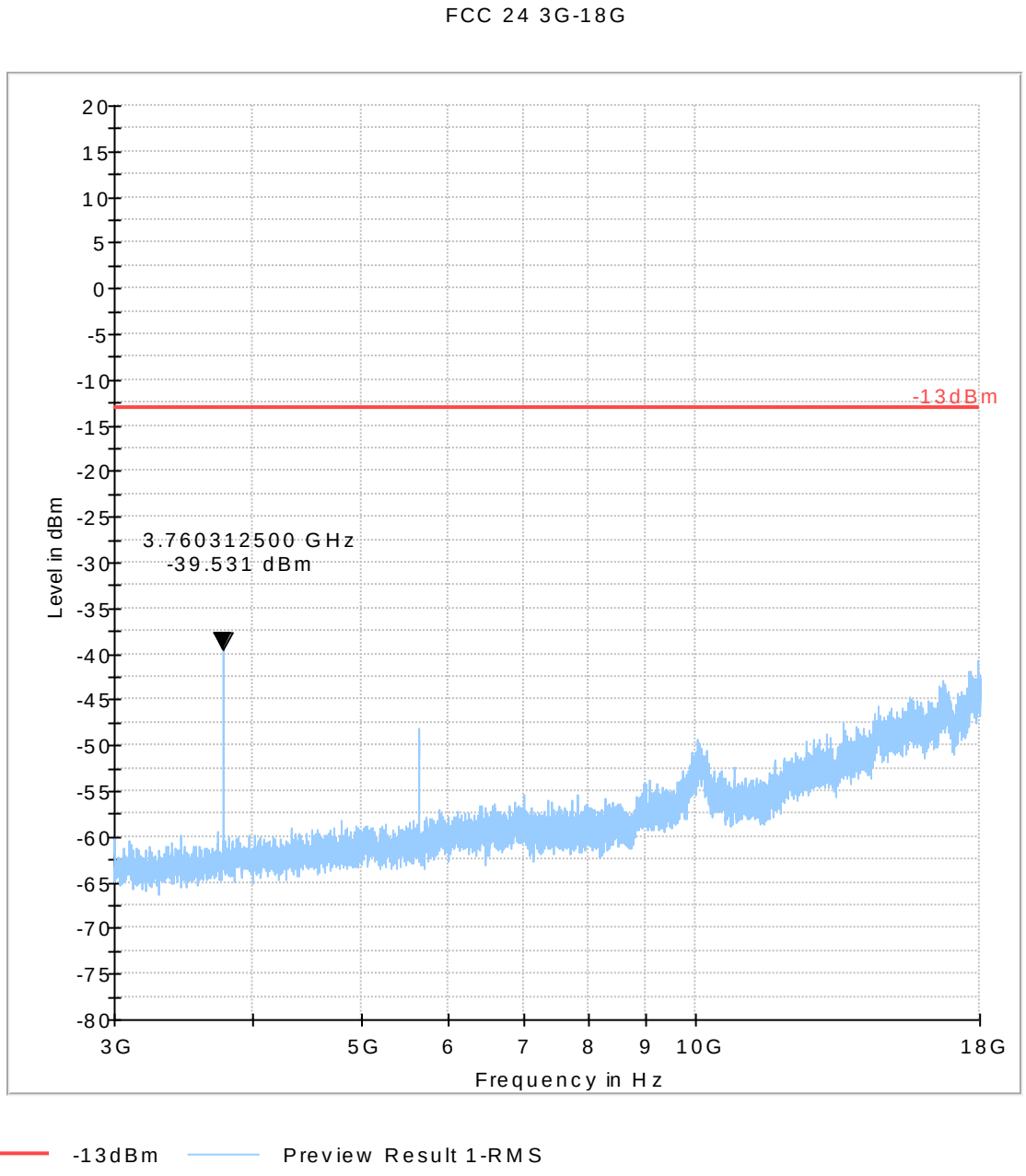
Test results – 1GHz – 3GHz –High Channel (BC1-1900)



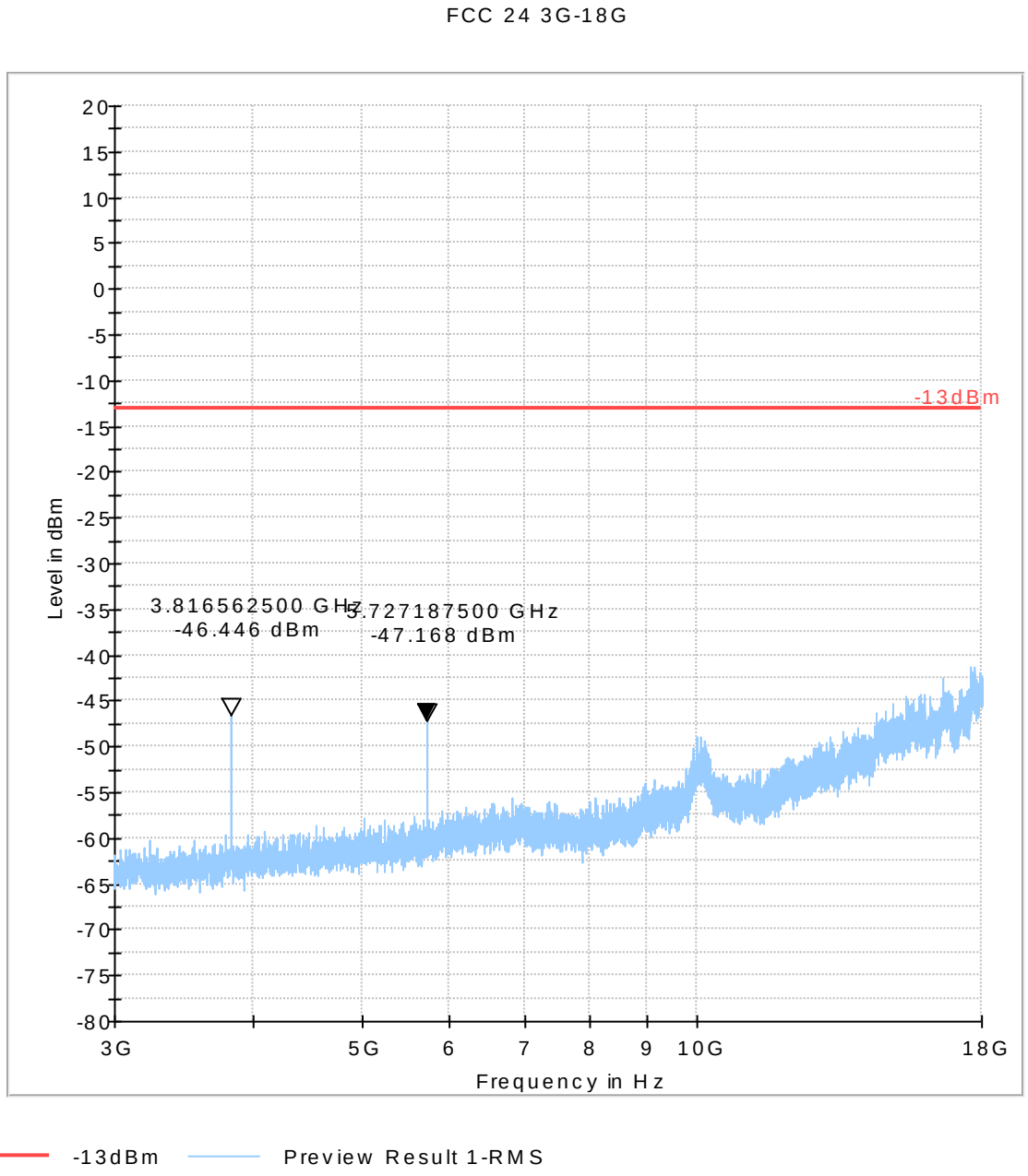
Test results – 3GHz – 18GHz –Low Channel (BC1-1900)



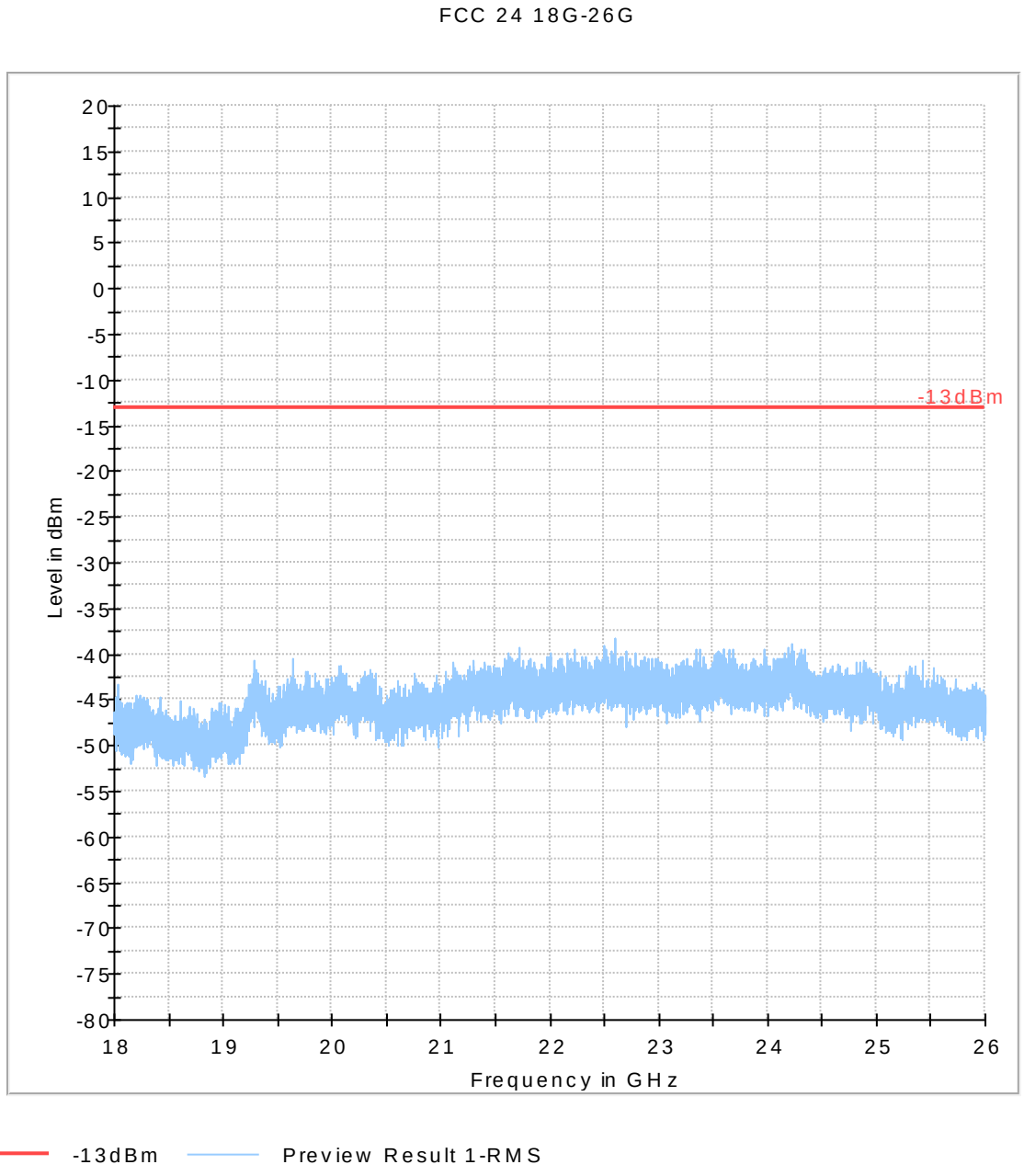
Test results – 3GHz – 18GHz –Mid Channel (BC1-1900)



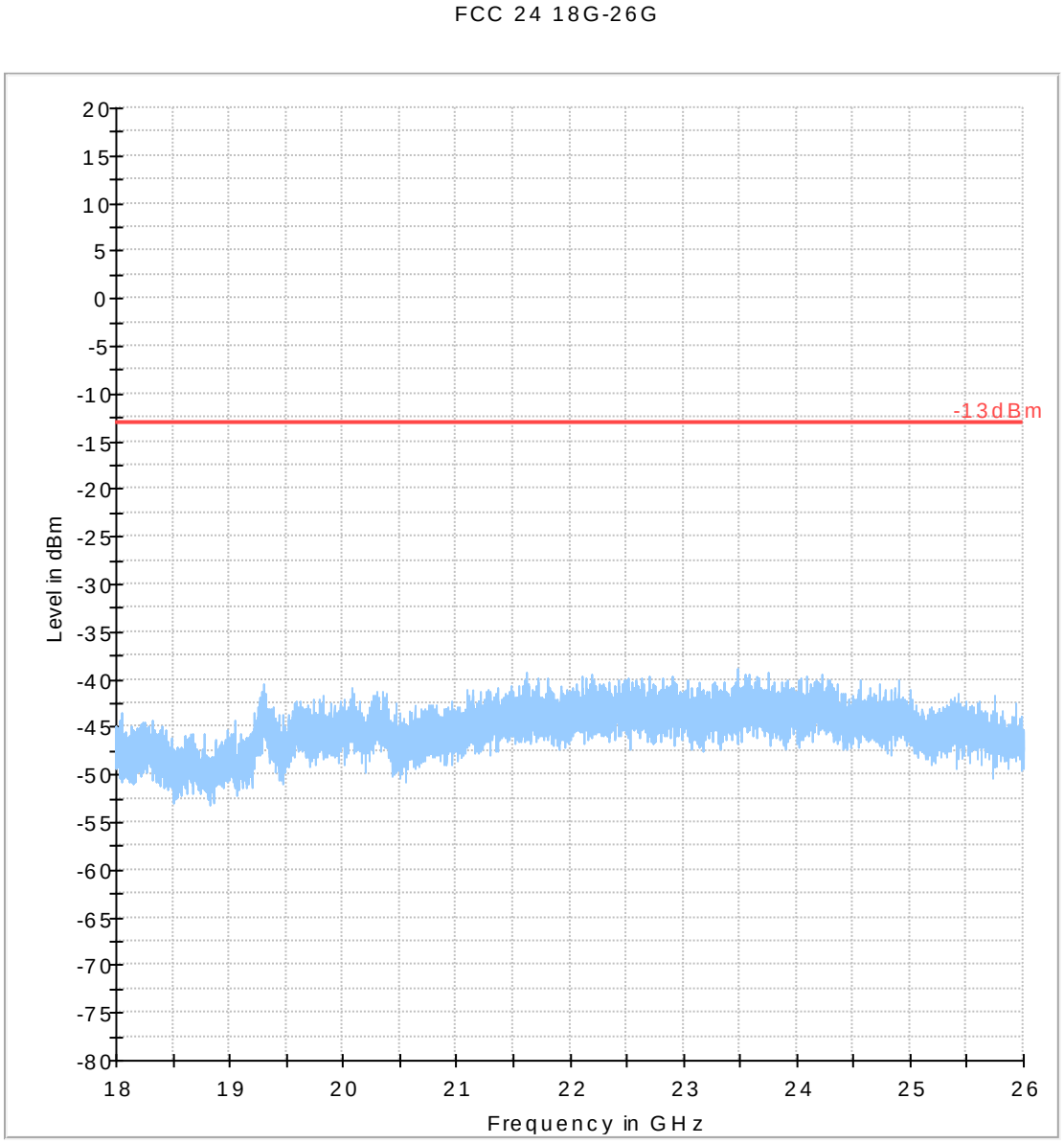
Test results – 3GHz – 18GHz –High Channel (BC1-1900)



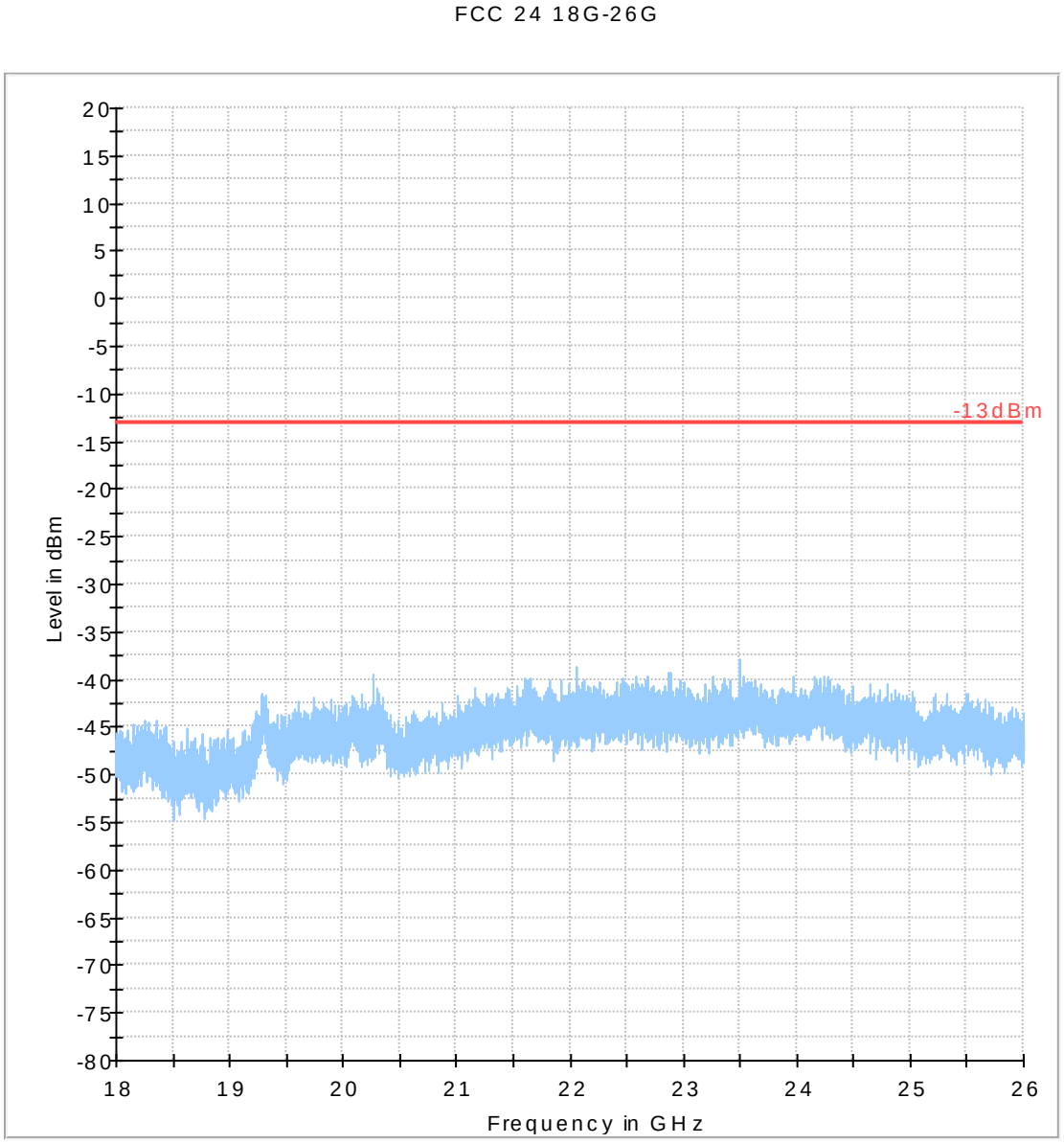
Test results – 18GHz – 26GHz –Low Channel (BC1-1900)



Test results – 18GHz – 26GHz –Mid Channel (BC1-1900)



Test results – 18GHz – 26GHz –High Channel (BC1-1900)



7 Test Equipment and Ancillaries used for tests

Equipment Name	Manufacturer	Type/Model	Serial No.	Cal Date	Cal Interval	Next cal date
3m Semi- Anechoic Chamber and Ground Plane:						
Spectrum Analyzer	Rohde und Schwarz	FSV 40	101022	7/2014	3 years	7/2017
Receiver	Rohde und Schwarz	ESR3	101663	7/2015	3 years	7/2018
LISN	Rohde und Schwarz	ESV 216	101129	7/2015	3 years	7/2018
Radio Communications Tester	Rohde and Schwarz	CMU 200	121672	7/2015	3 years	7/2018
Log Periodic Antenna	Rohde and Schwarz	HL 050	100515	4/2013	3 year	4/2016
Ultralog Antenna	Rohde and Schwarz	HL 562	100495	5/2015	3 year	5/2018
Double-ridge Horn Antenna (1G-18G)	ETS-Lindgren	3117-PA	00167061	7/2014	3 year	7/2017
Double-ridge Horn Antenna (18G-40G)	ETS-Lindgren	3116C-PA	00166821	7/2014	3 year	7/2017
Loop Antenna	ETS-Lindgren	6512	00164698	7/2014	3 year	7/2017
Open Switch Control Unit	Rohde and Schwarz	OPS 130	10085	n/a		
Extention Unit Open Switch Control Unit	Rohde and Schwarz	OSP 150	10086	n/a		
Turn Table TT	Maturo	1.5 SI	TT 1.5SI/204/6070 910	n/a		
Compact antenna Mast	Maturo	BAM 4.0-P	078/16550515	n/a		
Multiple Control Unit	Maturo	MCU	214/0000915	n/a		
Multiple Control Unit	Maturo	NCD	169/16550515			
Pre-Amplifier	Rohde and Schwarz	TS-PR 18	100072	Part of the system calibration		

8 Revision History

Date	Report Name	Changes to report	Report prepared by
10/13/2015	EMC_CONN-046-15001_FCC_22_24_WWAN_v1.0	First Revision	MPDL
11/05/2015	EMC_CONN-046-15001_FCC_22_24_WWAN_v1.1	Add max. Declared power and notes	MPDL
11/11/2015	EMC_CONN-046-15001_FCC_22_24_WWAN_v1.2	Updated comducted setup	MPDL