FCC/IC Test Report

FOR:

Wi-MM Corporation

Model:
BP100-2-2-1

FCC ID: 2ABUE-BP100-2-2-1
IC Certification Number: 11915A- BP100221

47 CFR Part 15.247

IC RSS-210 Issue 8

TEST REPORT #: EMC_ WIMML_002_14001_BP-100_DSS
DATE: 2014-06-27

ACCREDITED
TESTING LABORATORY
Certificate #2135.01

CTIA Authorized Test Lab
LAB CODE 20020328-00

FCC:
Accredited

IC recognized #
3462B-1

***CETECOM* Inc.**
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CETECOM Inc. is a Delaware Corporation with Corporation number: 2905571

TABLE OF CONTENTS

1 Assessment

The following equipment (and as identified in Ch.3 of this test report) was evaluated against the applicable criteria specified in FCC CFR47 Part 15.247, 15.207, 15.209 and Industry Canada Radio Standard Specification RSS 210 Issue 8,
No deviations were ascertained during the course of the tests performed.

Company	Description	Model #
Wi-MM Corporation	Bike computer with location, alarm and performance information	BP100-2-2-1

Report reviewed by:

Date	Section	Name	Signature
2014-06-27	Compliance	Franz Engert (Compliance Manager)	Digitally signed by Franz Engert DN: cn=Franz Engert, c=US, o=CETECOM, ou=Complience, email=franz.engert@cetecom.com Date: 2014.06.27 20:15:54 -07'00'

Responsible for the Report:

Date	Section	Name	Signature
2014-06-27	Compliance	Danh Le (EMC Engineer)	Digitally signed by Danh Le DN: cn=Danh Le, o=Cetecom, ou=Compliance, email=danh.le@cetecom.com, c=US Date: 2014.07.02 01:54:08 -07'00'

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:	CETECOM Inc. 411 Dixon Landing Rd Milpitas, CA 95035
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
Compliance Manager:	Franz Engert

2.2 Identification of the Client

Applicant's Name:	Wi-MM Corporation
Street Address:	1885 De La Cruz Blvd
City/Zip Code	San Jose CA 95050
Country	United States
Contact Person:	Les Levitt
Phone No.	(408) 373-6624
Fax:	
e-mail:	llevitt@wi-mm.com

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

Model Number:	BP100-2-2-1
FCC-ID :	2ABUE-BP100-2-2-1
IC ID:	11915A- BP100221
Product Description:	Bike computer with location, alarm and performance information.
Nominal Frequency Band of Operation:	ISM: 2400 – 2483.5 MHz
Channel Center to Center Frequency band of operation:	2402-2480 MHz
No. of Channels:	40
Type(s) of Modulation:	Bluetooth: GFSK
Integrated Module Info:	Bluegiga BLE113 Bluetooth 4.0 (FCC ID: QOQBLE113/ IC ID: 5123A-BLE113)
Antenna info:	Integrated ceramic chip Peak gain: 0.5 dBi
Output Powers:	**Measured Conducted output power:** GFSK: 0.68 dBm/0.0012W; **Calculated Radiated output power:** GFSK: 1.18 dBm/0.0013 W;
Other Radios included:	1. U-BLOX LISA-C200 800/1900 MHz CDMA 1xRTT modulation: QPSK and HPSK 2. GPS U-Blox MAX-7Q L1C/A (1575.42 MHz) (Receiver only)
Rated Operating Voltage Range:	Vmin: 3.3V/ Vnom: 3.7/ Vmax: 4.2V
Rated Operating Temperature Range:	Tmin 0 °C/ Tmax: 50°C
Test Sample Status:	Prototype

3.2 Identification of the Equipment Under Test (EUT)

EUT #	Serial Number	Sample	HW/SW Version
1	232611140038	Conducted	BP100 2.2.1/1.0
2	232611140027	Radiated	BP100 2.2.1/1.0

3.3 Environmental conditions during Test:

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

3.4 Dates of Testing:

2014-03-25

3.5 Other Testing Notes:

1. The EUT was set in BT Test mode using a development version of the SW available on the device.
2. The EUT was tested on low, mid and high channels in GFSK mode.
3. The EUT was tested on fixed channels at 2402MHz, 2440MHz and 2480MHz. It was transmitting continuously (DC 100%).

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

- FCC CFR47 Parts 15.247, 15.207, 15.209 and
- Industry Canada Radio Standard Specifications RSS-210 Issue 8, RSS-Gen Issue 3

This test report is to support a request for new equipment authorization under the
FCC ID: 2ABUE-BP100-2-2-1 and IC Certification Number: 11915A- BP100221

Taking into account guidance from FCC KDB 996369 (modular approval) and where relevant test procedures did not change most conducted test results are leveraged from the related test report #268252-1 as issued on April 26, 2013 by SGS Fimko Ltd., Finland for the certification of the integrated Bluegiga Bluetooth LE combo module (see section 3.1).

5 Summary of Measurement Results

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§15.247(e) RSS210 A8.2(b)	Power Spectral Density	Nominal	-	☐	☐	☐	■	Note 1
§15.247(a)(1) RSS210 A8.2(a)	Spectrum Bandwidth	Nominal	GFSK	☐	☐	☐	■	Note 1
§15.247(b)(1) RSS210 A8.4(2)	Maximum Peak Conducted Output Power	Nominal	GFSK	■	☐	☐	☐	Complies
§15.247(d) RSS210 A8.5	Band edge compliance-Conducted	Nominal	GFSK	☐	☐	☐	■	Note 2
§15.247(d) RSS210 A8.5	Band edge compliance-Radiated	Nominal	GFSK	■	☐	☐	☐	Complies
§15.247(d) RSS210 A8.5	TX Spurious emissions-Conducted	Nominal	GFSK	☐	☐	☐	■	Note 1
§15.247(d) RSS210 A8.5	TX Spurious emissions-Radiated	Nominal	GFSK	■	☐	☐	☐	Complies
§15.207(a) RSS Gen	Conducted Emissions <30MHz	Nominal	GFSK	☐	☐	■	☐	Note 2

Note: NA= Not Applicable; NP= Not Performed.
Note 1: Leveraged from module certification.
Note 2: Measurements for unwanted emissions in restricted bands are performed as a radiated measurement. Conducted Measurements are not required because EUT is tested against stricter limits.
Note 3: DUT is battery powered.

6 Measurements

6.1 Measurement Uncertainty

	Uncertainty in dB radiated <30MHz	Uncertainty in in dB radiated 30MHz - 1GHz	Uncertainty in dB radiated > 1GHz	Uncertainty in dB Conducted measurement
standard deviation k=1	2.48	1.94	2.16	0.64
95% confidence interval in dB	4.86	3.79	4.24	1.25
95% confidence interval in dB in delta to Result	+-2.5 dB	+-2.0 dB	+- 2.3dB	+-0.7dB

6.2 Measurement Method:

Measurement method is according to KDB 558074 D01 DTS Meas Guidance v03r01

6.3 Radiated Measurement Procedure

The radiated measurement is performed according to:
ANSI C63.4 (2009)
ANSI C63.10 (2009)

- The exploratory measurement is accomplished by running a matrix of 16 sweeps over the required frequency range with R&S Test-SW EMC32 for 4 positions of the turntable, two orthogonal positions of the EUT and both antenna polarizations. This procedure exceeds the requirement of the above standards to cover the 3 orthogonal axis of the EUT. A max peak detector is utilized during the exploratory measurement. The Test-SW creates an overall maximum trace for all 12 sweeps and saves the settings for each point of this trace. The maximum trace is part of the test report.
- The 10 highest emissions are selected with an automatic algorithm of EMC32 searching for peaks in the noise floor and ensuring that broadband signals are not selected multiple times.
- The maxima are then put through the final measurement and again maximized in a 90deg range of the turntable, fine search in frequency domain and height scan between 1m and 4m.
- The above procedure is repeated for all possible ways of power supply to EUT and for all supported modulations.
- In case there are no emissions above noise floor level only the maximum trace is reported as described above.
- The results are split up into up to 4 frequency ranges due to antenna bandwidth restrictions. A magnetic loop is used from 9kHz to 30MHz, a Biconlog antenna is used from 30MHz to 1GHz, two different horn antennas are used to cover frequencies up to 40GHz.

6.4 Sample Calculations for Radiated Measurements

6.4.1.1 Field Strength Measurements:

Measurements from the Spectrum Analyzer/ Receiver is used to calculate the Field Strength, taking into account the following parameters:

1. Measured reading in dBµV
2. Cable Loss between the receiving antenna and SA in dB and
3. Antenna Factor in dB/m

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

Frequency (MHz)	Measured SA (dBµV)	Cable Loss (dB)	Antenna Factor Correction (dB)	Field Strength Result (dBµV/m)
1000	80.5	3.5	14	98.0

All radiated measurement plots in this report are taken from a test SW that calculates the Field Strength based on the above equation.

6.5 Conducted Measurement Procedure

1. EUT Bluetooth antenna port was connected to a spectrum analyzer with appropriate attenuation.
2. EUT used test software to transmit in one channel only.
3. Measurements are to be performed with the EUT set to the low, middle and high channels and for GFSK modulation scheme.

6.6 Maximum Peak Output Power

6.6.1 Limits:

§15.247 (b)(3)

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the *maximum conducted output power* is the highest total transmit power occurring in any mode.

RSS 210- A8.4(4)

For systems employing digital modulation techniques operating in the bands 902–928 MHz, 2400–2483.5 MHz and 5725–5850 MHz, the maximum peak conducted output power shall not exceed 1 W.

As an alternative to a peak power measurement, compliance can be based on a measurement of the maximum conducted output power. The maximum conducted output power is the total transmit power delivered to all antennas and antenna elements, averaged across all symbols in the signalling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or transmitting at a reduced power level. If multiple modes of operation are implemented, the maximum conducted output power is the highest total transmit power occurring in any mode.

6.6.2 Test Conditions:

Tnom: 20°C; Vnom: 3.7 V
Hopping OFF

6.6.3 Test Procedure:

Measurement method is according to 558074 D01 DTS Meas Guidance v03r02

Measurement Settings:

Conducted output power measured using a Power meter per 558074 D01 DTS Meas Guidance v03r02 Section 9.2.3.1
The EUT was transmitting continuously on a fixed channel.
Radiated EIRP calculated using the formula= Conducted Power+ Antenna Gain.
Max. Antenna Gain (dBi): +0.5

6.6.4 Test Result:

Measured Max Peak Output Power- Conducted (dBm)			
GFSK	**Frequency (MHz)**		
	2402	**2442**	**2480**
Pre-Certified Module	0.54	-0.39	-1.27
Measurement Verification	0.68	-0.04	-0.84

Calculated Max Peak Output Power- Radiated EIRP (dBm)			
Modulation	**Frequency (MHz)**		
	2402	**2442**	**2480**
GFSK	1.18	0.46	-0.27

Note: Radiated EIRP = *Conducted Measurement + Antenna Gain*

6.6.4.1 Measurement Verdict:
Pass.

6.7 Restricted Band Edge Compliance

6.7.1 References:

FCC CFR §15.35 (b)
RSS-210 A8.5

6.7.2 Limits: §15.247/15.205

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])
13.36 - 13.41			

15.209 (a) Emission Limits:

The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (m)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30
30–88	100**	3
88–216	150**	3
216–960	200**	3
Above 960	500	3

6.7.3 Test Conditions:

Tnom: 20°C; Vnom: 3.7V
Hopping OFF

6.7.4 Test Procedure:

Measurement method according to KDB 558074 D01 DTS Meas Guidance v03r01 Section 12.1

Spectrum Analyzer Settings

	Low Band Edge – Peak	Low Band Edge – Average	High Band Edge – Peak	High Band Edge - Average
Start Frequency	2.31 GHz	2.31 GHz	2.46 GHz	2.46 GHz
Stop Frequency	2.42 GHz	2.42 GHz	2.51 GHz	2.51 GHz
Resolution Bandwidth	1 MHz	1 MHz	1 MHz	1 MHz
Video Bandwidth	1 MHz	10 Hz	1 MHz	10 Hz
Detector	Peak	Peak	Peak	Peak
Trace Mode	Max Hold	Max Hold	Max Hold	Max Hold
Sweep Time	Auto	Auto	Auto	Auto

Peak measurements are made using a peak detector and RBW=1MHz.
*PEAK LIMIT= 74dBµV/m

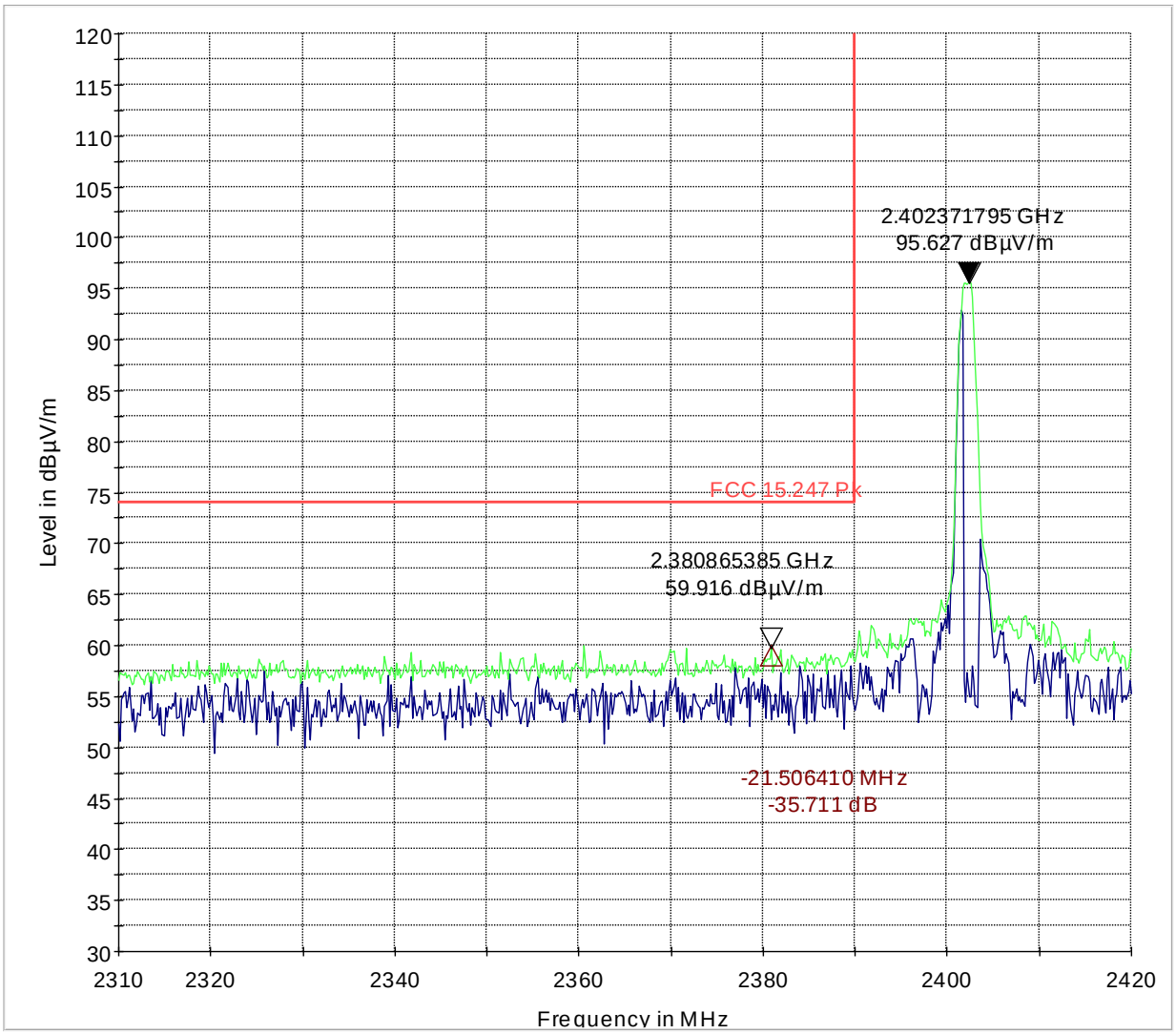
Average measurements performed using a peak detector and according to video averaging procedure with RBW=1MHz and VBW=10Hz.
*AVG. LIMIT= 54dBµV/m

6.7.4.1 Measurement Verdict

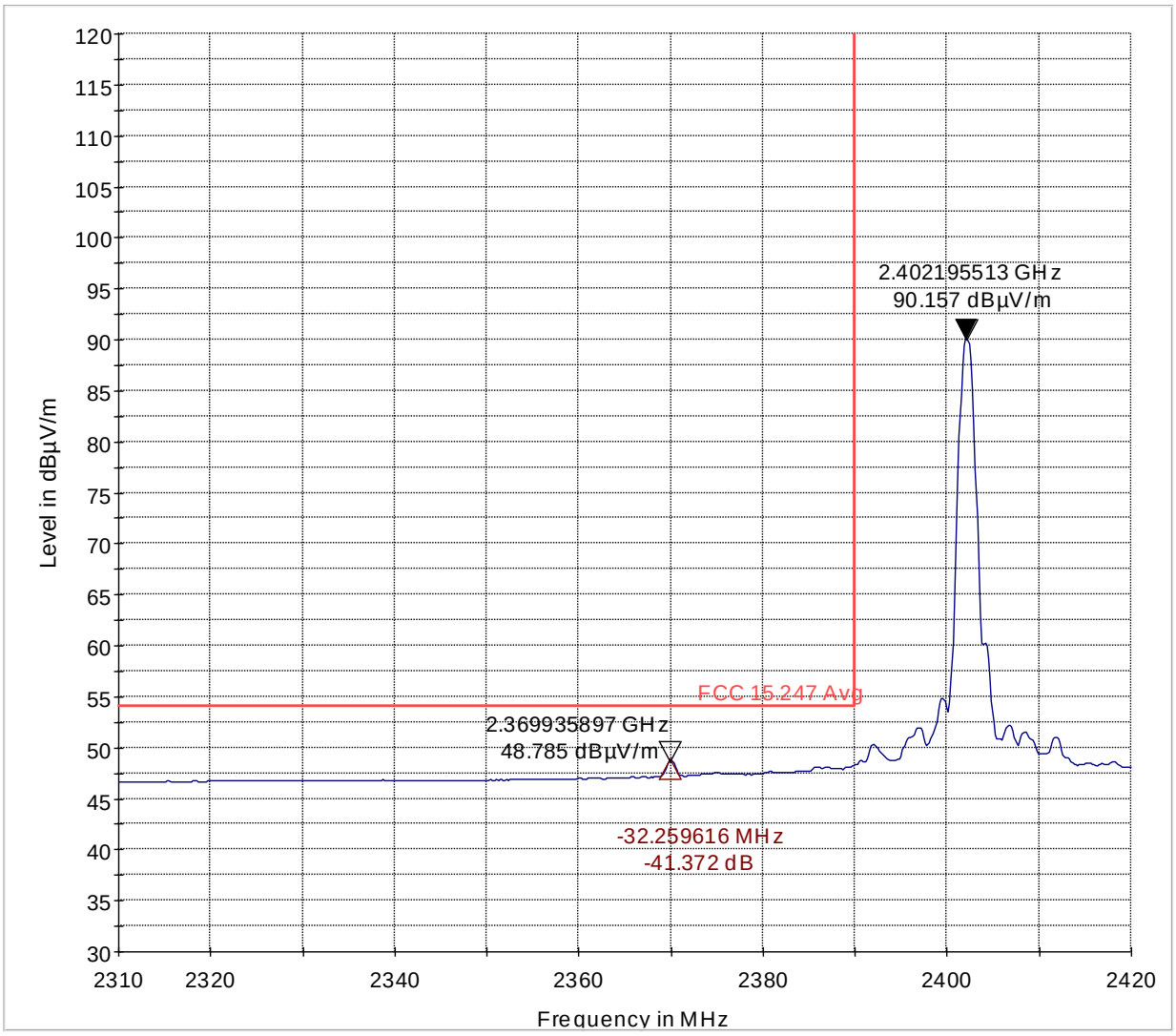
Pass.

6.7.5 Test Data/plots:

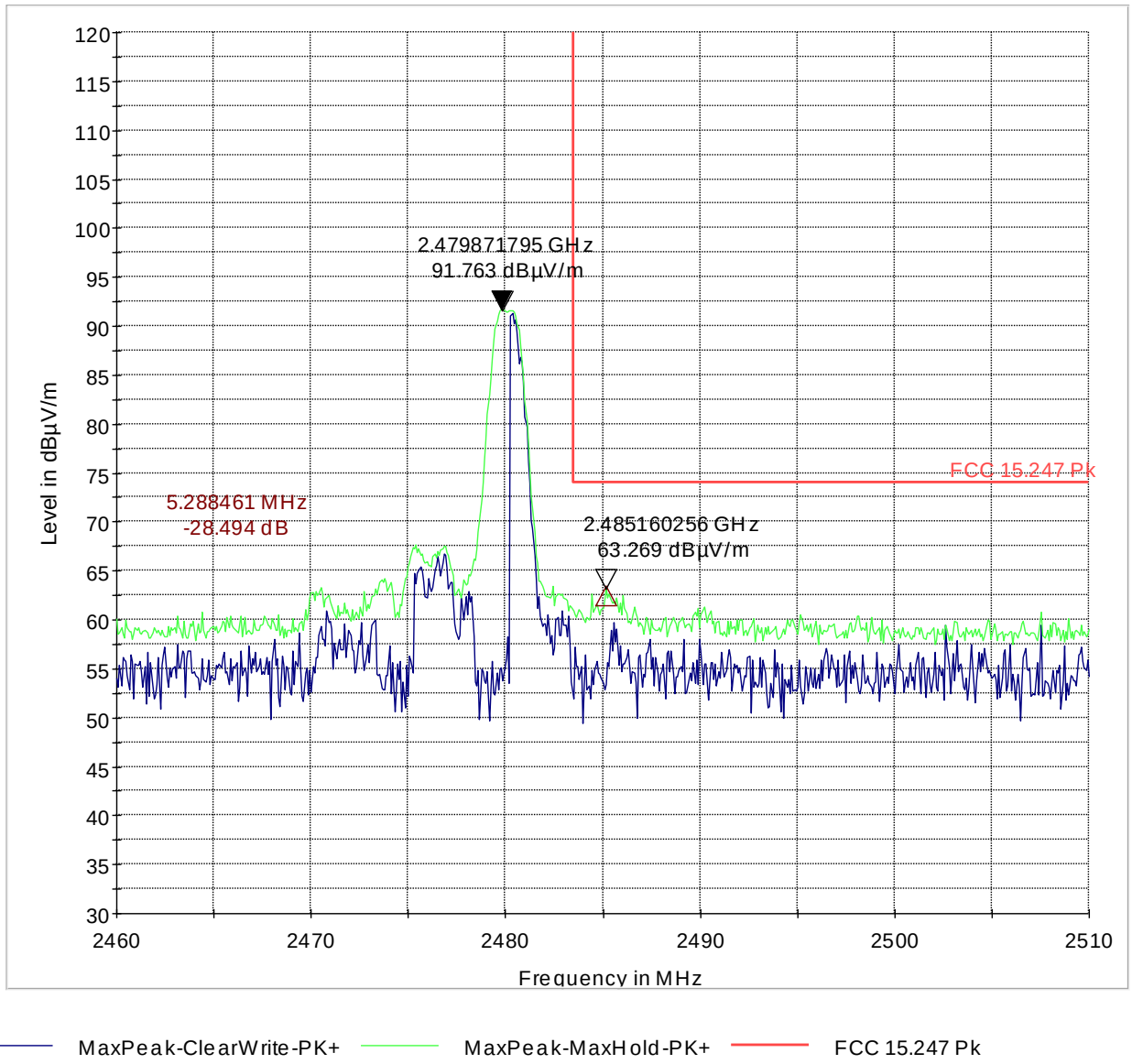
Lower band edge peak -GFSK modulation



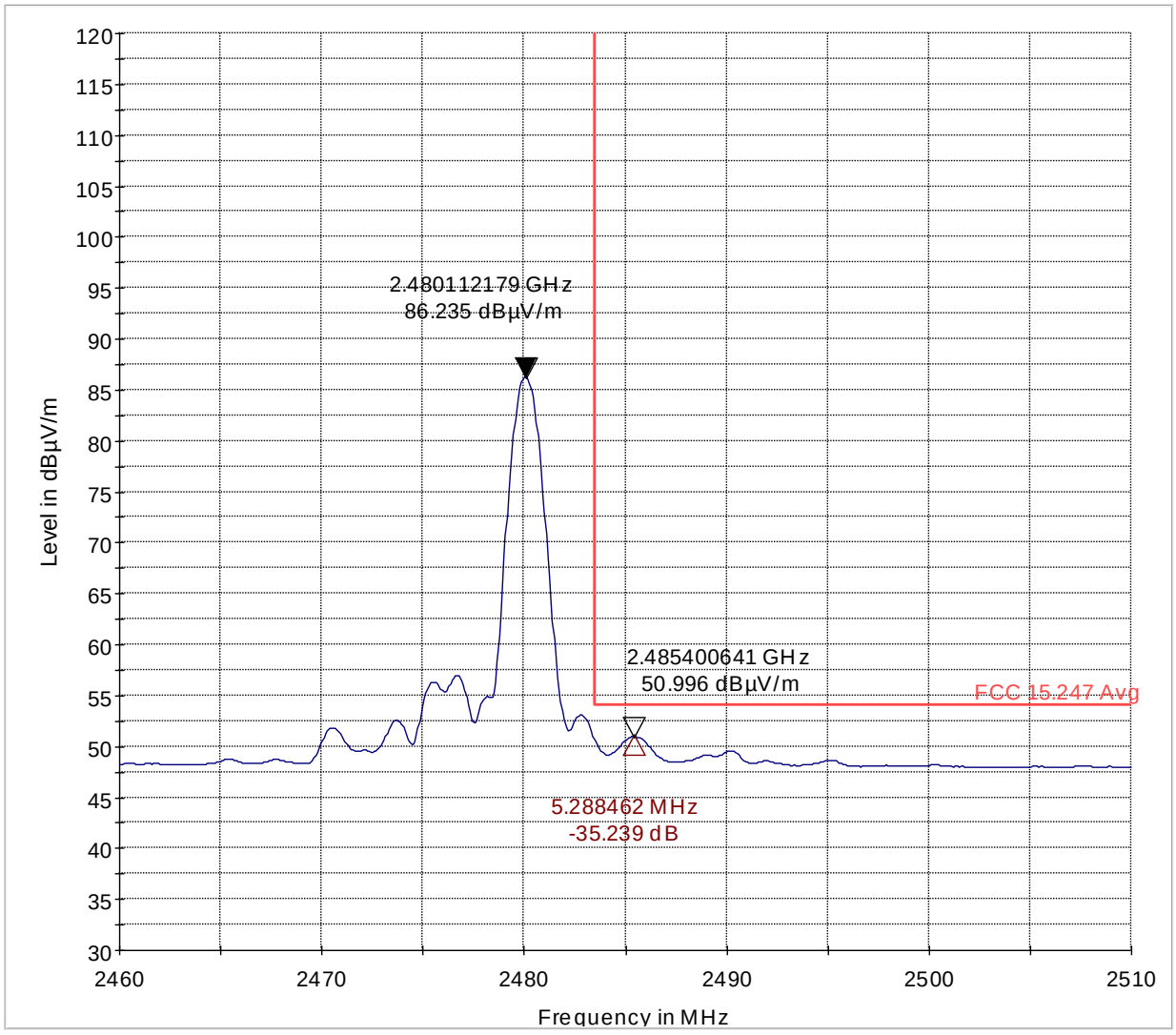
Lower band edge average -GFSK modulation



Higher band edge peak -GFSK modulation



Higher band edge average-GFSK modulation



6.8 Transmitter Spurious Emissions- Radiated

6.8.1 Limits:

§15.247/15.205
RSS 210-A8.5

Frequency of emission (MHz)	Field strength (µV/m)	Measurement Distance (m)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30

Frequency of emission (MHz)	Field strength (µV/m)
30–88	100 (40dBµV/m)
88–216	150 (43.5 dBµV/m)
216–960	200 (46 dBµV/m)
Above 960	500 (54 dBµV/m)

6.8.2 Receiver Settings

	Transmitter Spurious Emissions 9 kHz – 1 GHz				
	9 – 150 kHz	**150 – 490 kHz**	**490 kHz – 30 MHz**	**30 MHz – 1 GHz**	**>1GHz**
Resolution Bandwidth	200 Hz	9 kHz	9 kHz	120 kHz	1 MHz
Video Bandwidth	2 kHz	100 kHz	100 kHz	1 MHz	10 MHz
Detector	Peak	Peak	Peak	Peak	Peak Average
Trace Mode	Max Hold	Max Hold	Max Hold	Max Hold	Max Hold
Sweep Time	Auto	Auto	Auto	Auto	Auto

6.8.3 Testing Notes:

The device was set to operate in GFSK test mode (highest conducted output power) and measurement results as reported here, represents the worst case radiated spurious emissions.
Unless mentioned otherwise, the emissions outside the limit lines in the plots are from the transmit signal.

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.

Measurement distance: 3 m

Measurements below 1000 MHz are performed with a peak detector and compared to quasi-peak limits. Quasi-peak measurements are performed when the peak measurement is within 6 dB of the limit.

6.8.4 Test Conditions:

Tnom: 20°C; Vnom: 3.7V
Hopping OFF

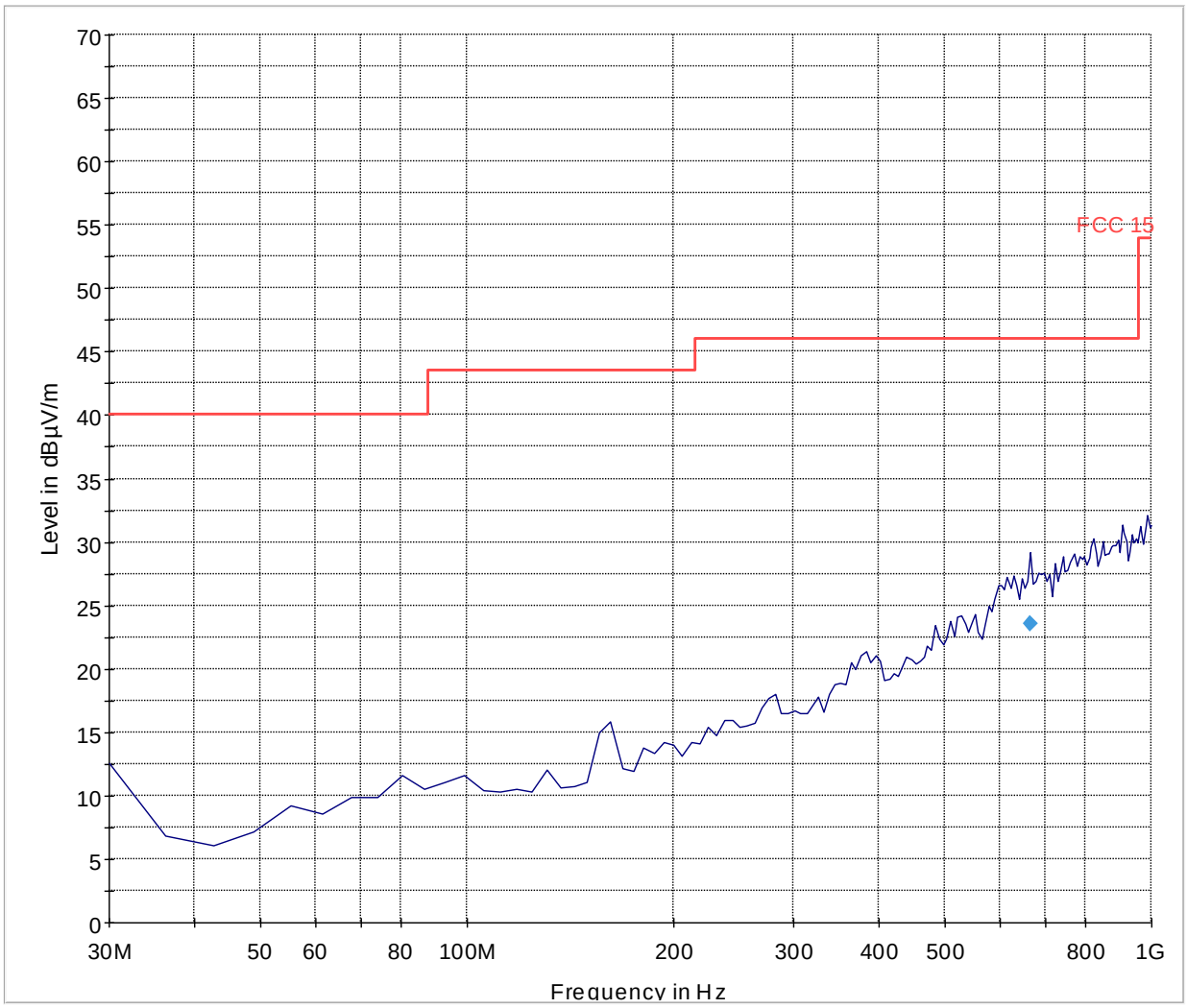
6.8.4.1 Measurements Verdict

Pass.

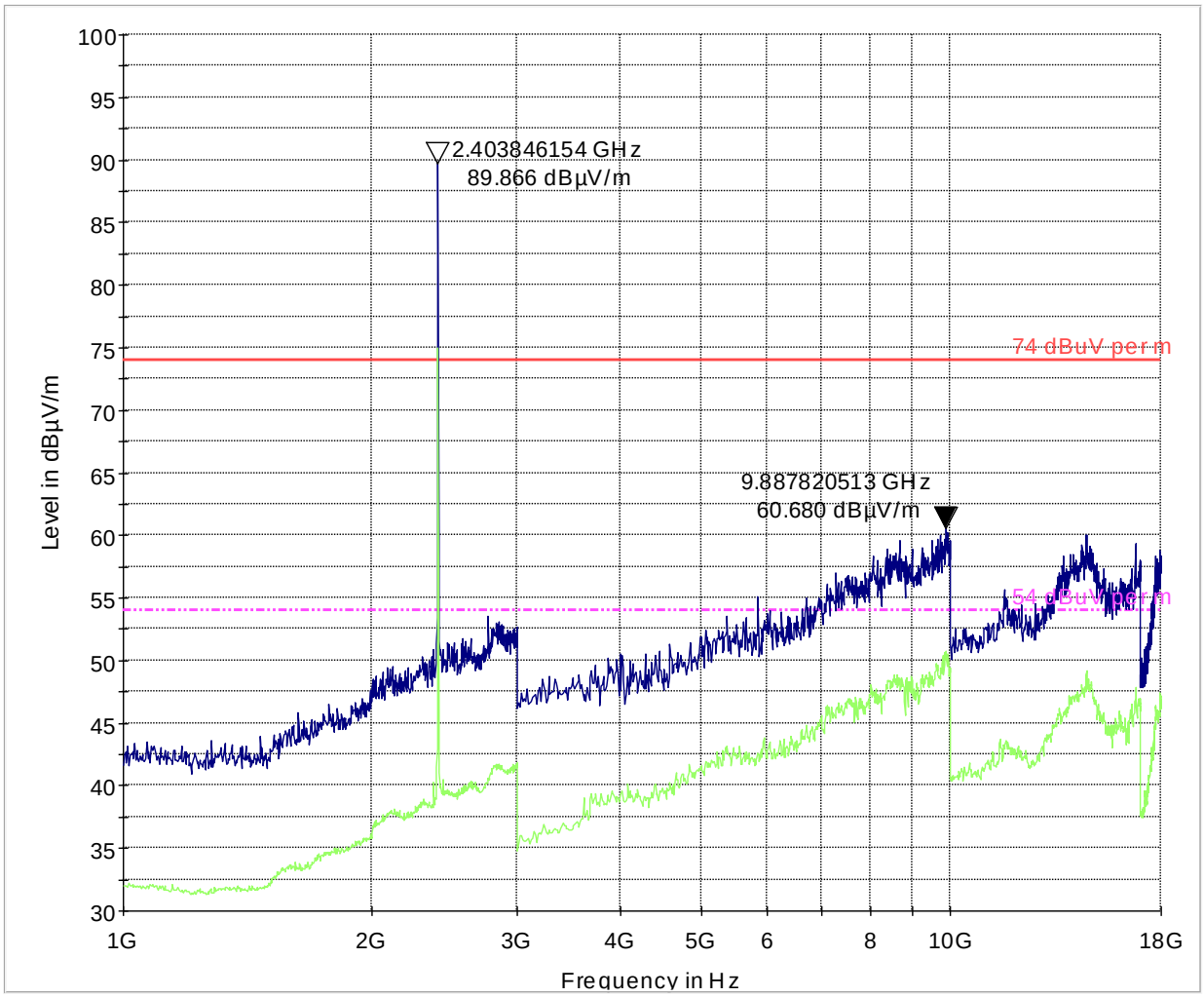
6.8.5 Test data/ plots:

Note: Worst case representation for all modes of operation in this frequency range-
Limits adjusted for 3m measurement.

Transmitter Radiated Spurious Emission- Ch0- 30MHz-1GHz

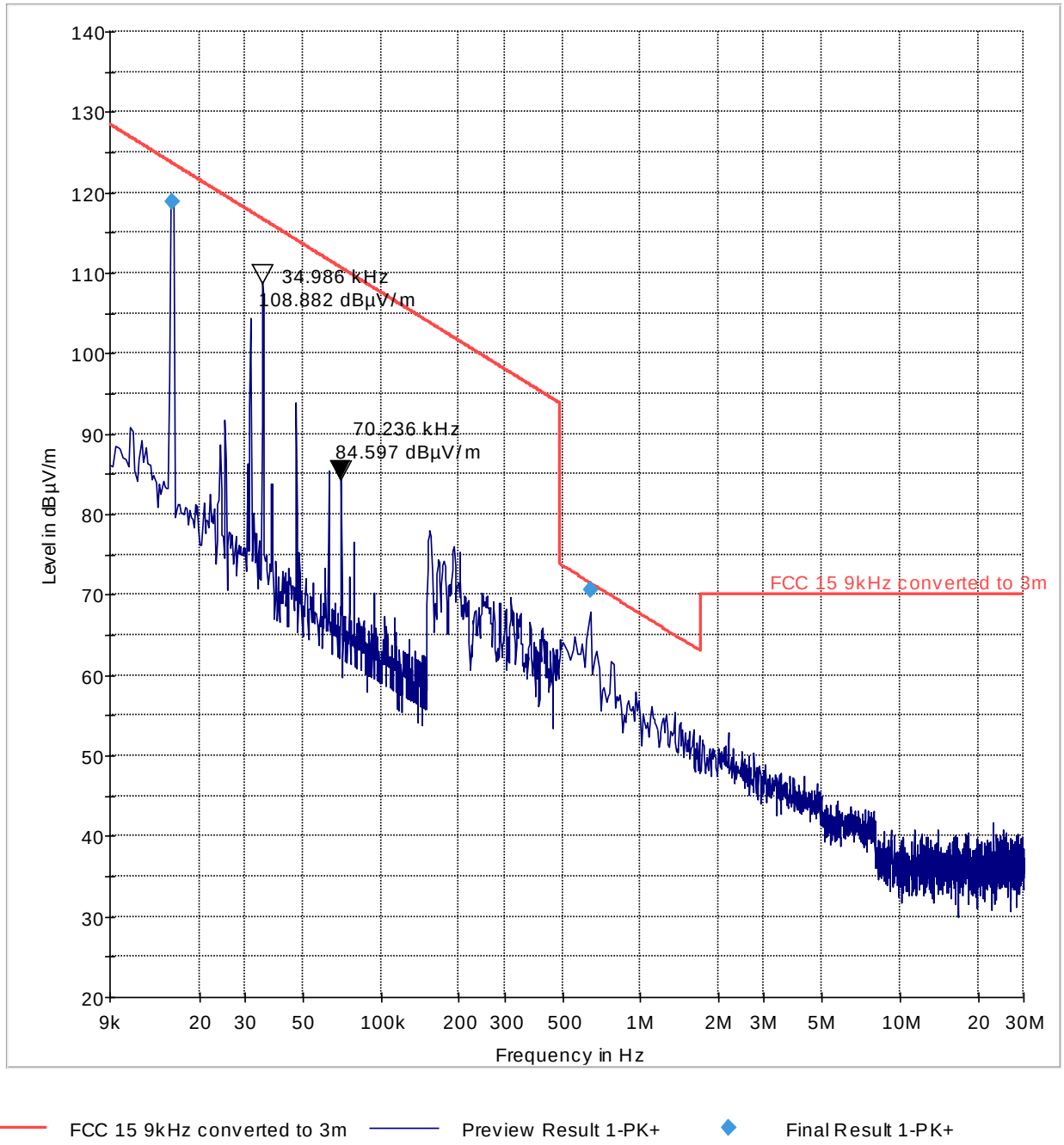


Transmitter Radiated Spurious Emission- Ch0- 1GHz-18GHz

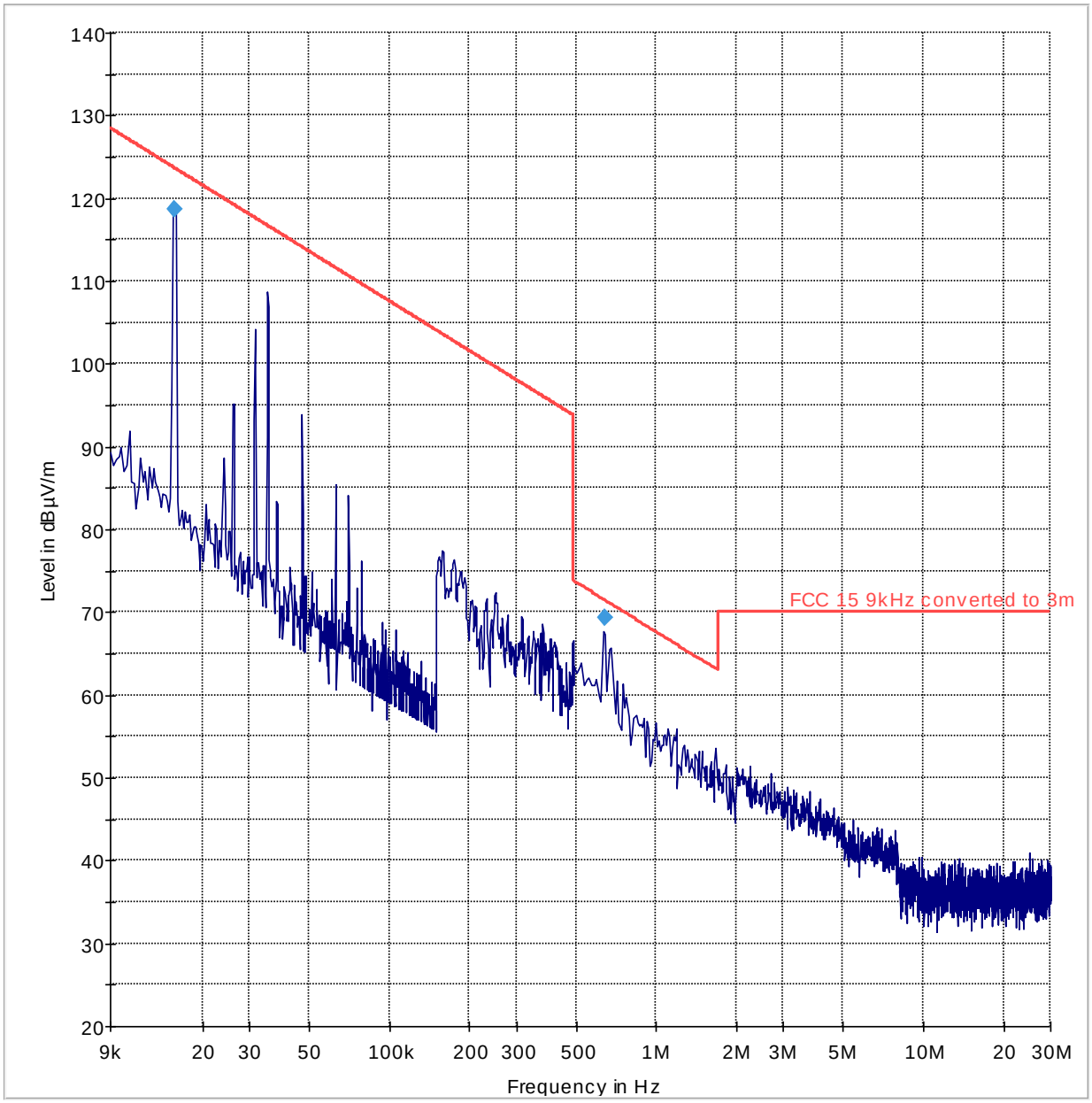


Transmitter Radiated Spurious Emission: Ch20- 9KHz-30MHz

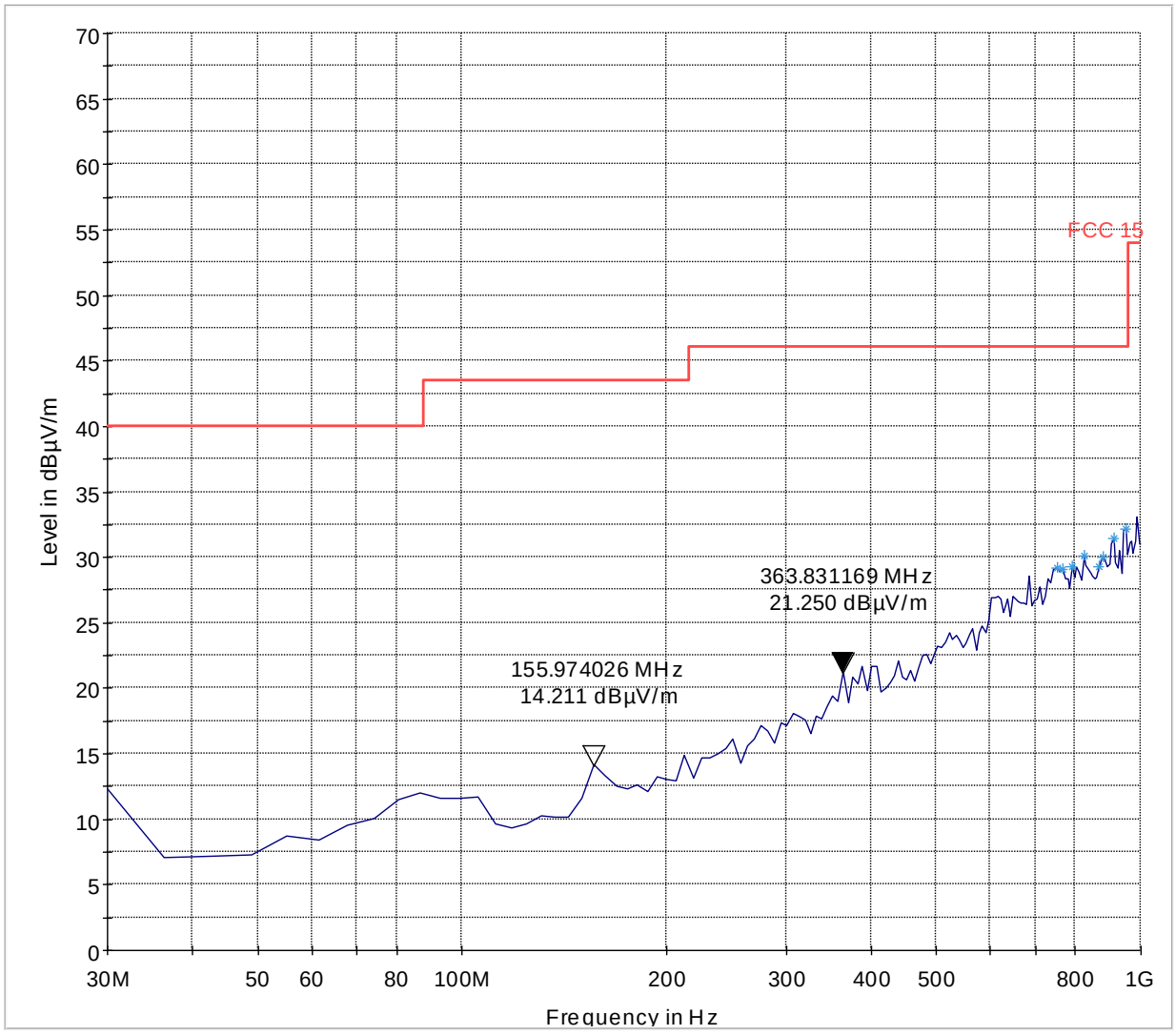
Note: Emissions at 15.7 KHz, 35 KHz, 84.6 KHz and 540 KHz are a result of ambient noise in chamber, as shown in the following ambient scan.



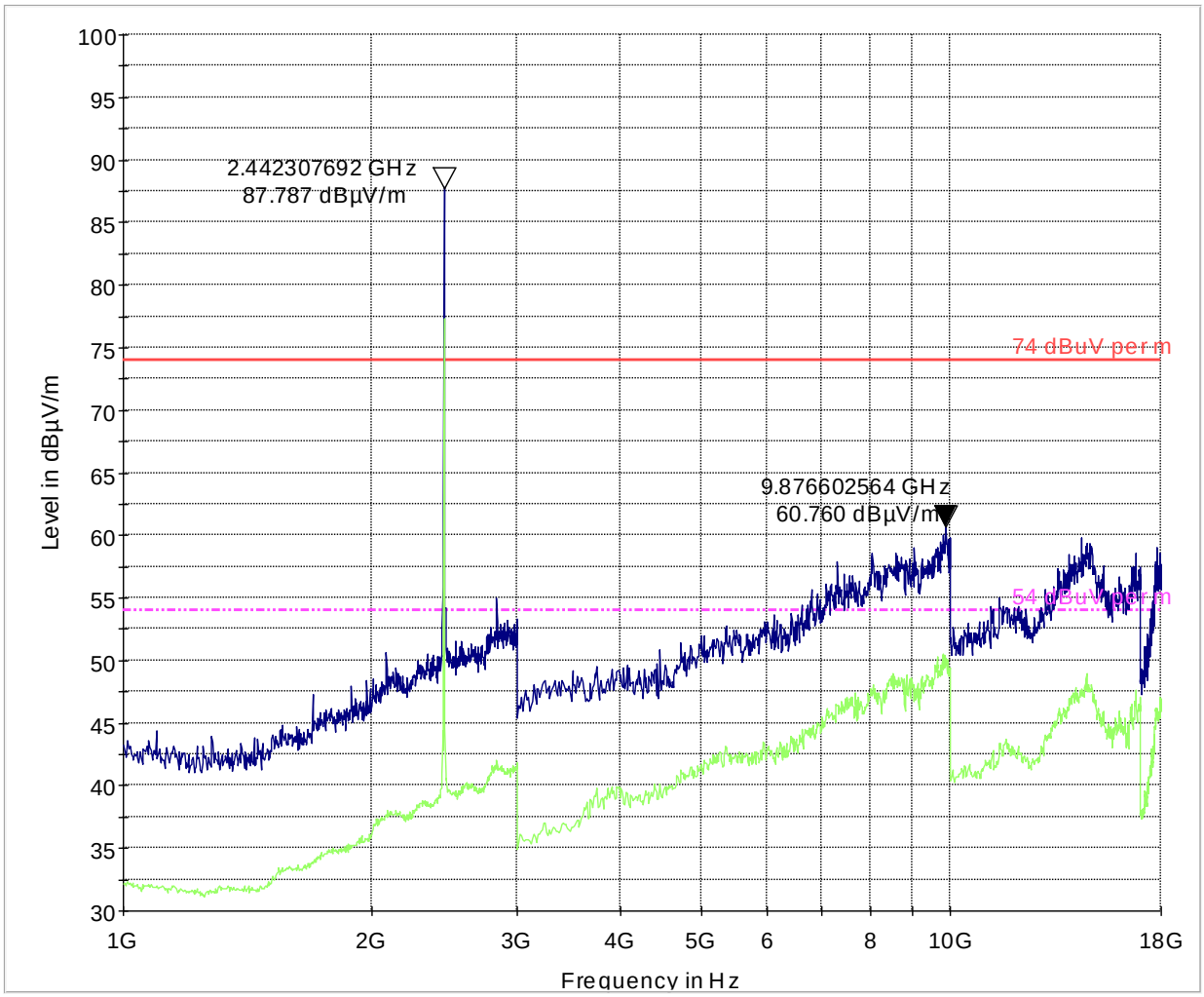
Transmitter Radiated Spurious Emission: 9KHz-30MHz Ambient Scan



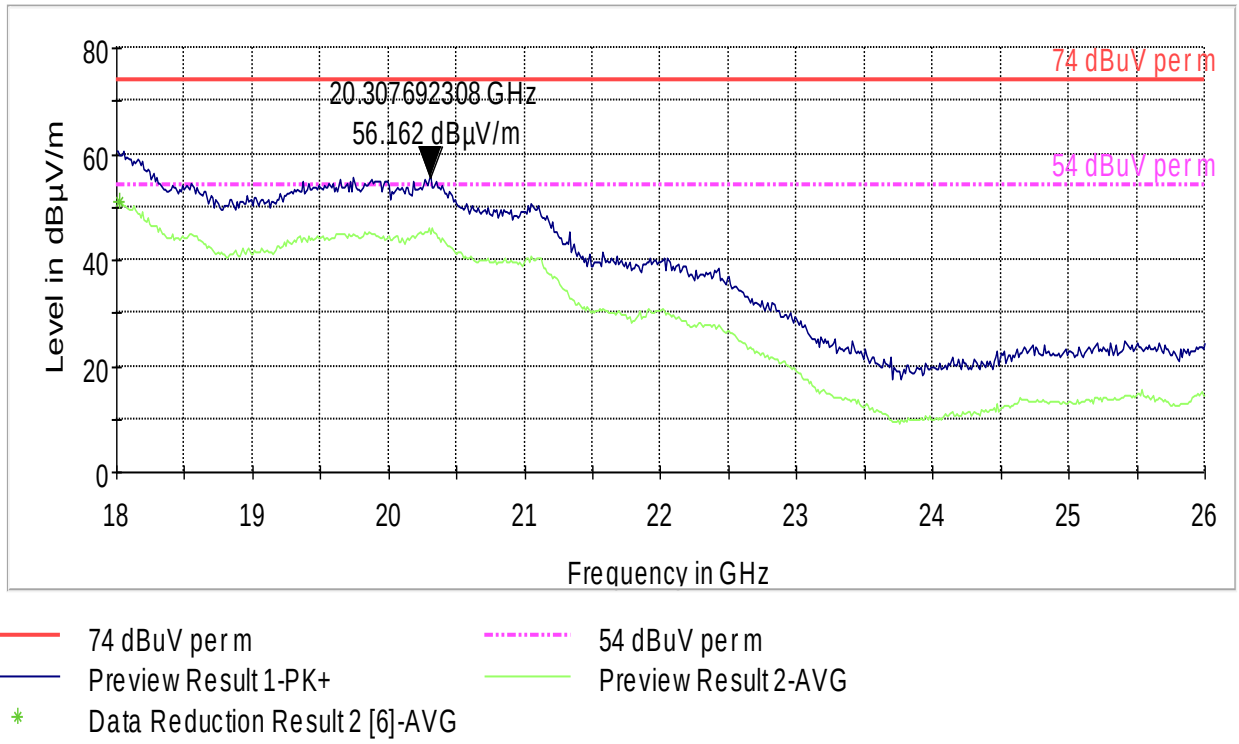
Transmitter Radiated Spurious Emission- Ch20- 30MHz-1GHz



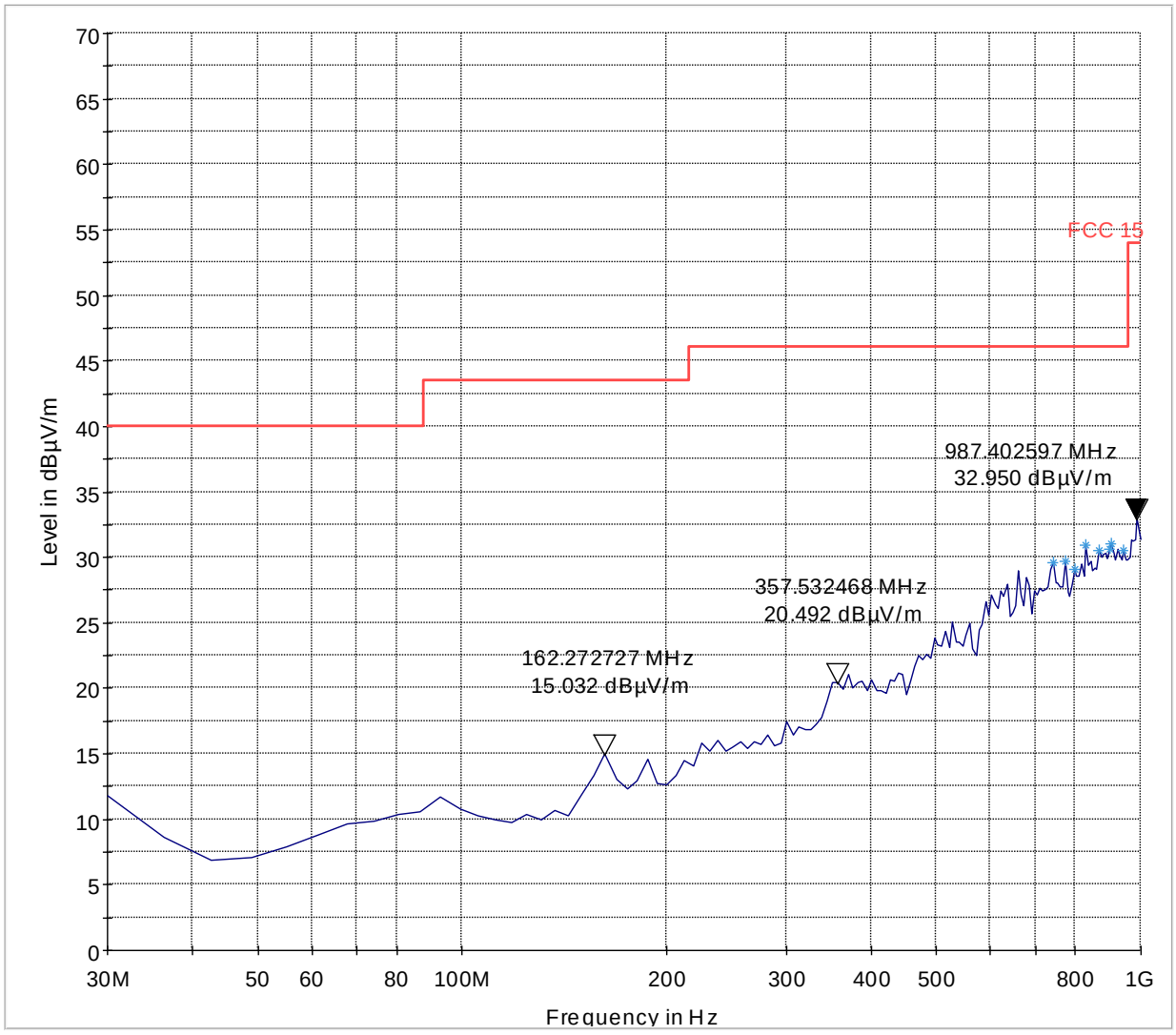
Transmitter Radiated Spurious Emission- Ch20- 1GHz-18GHz



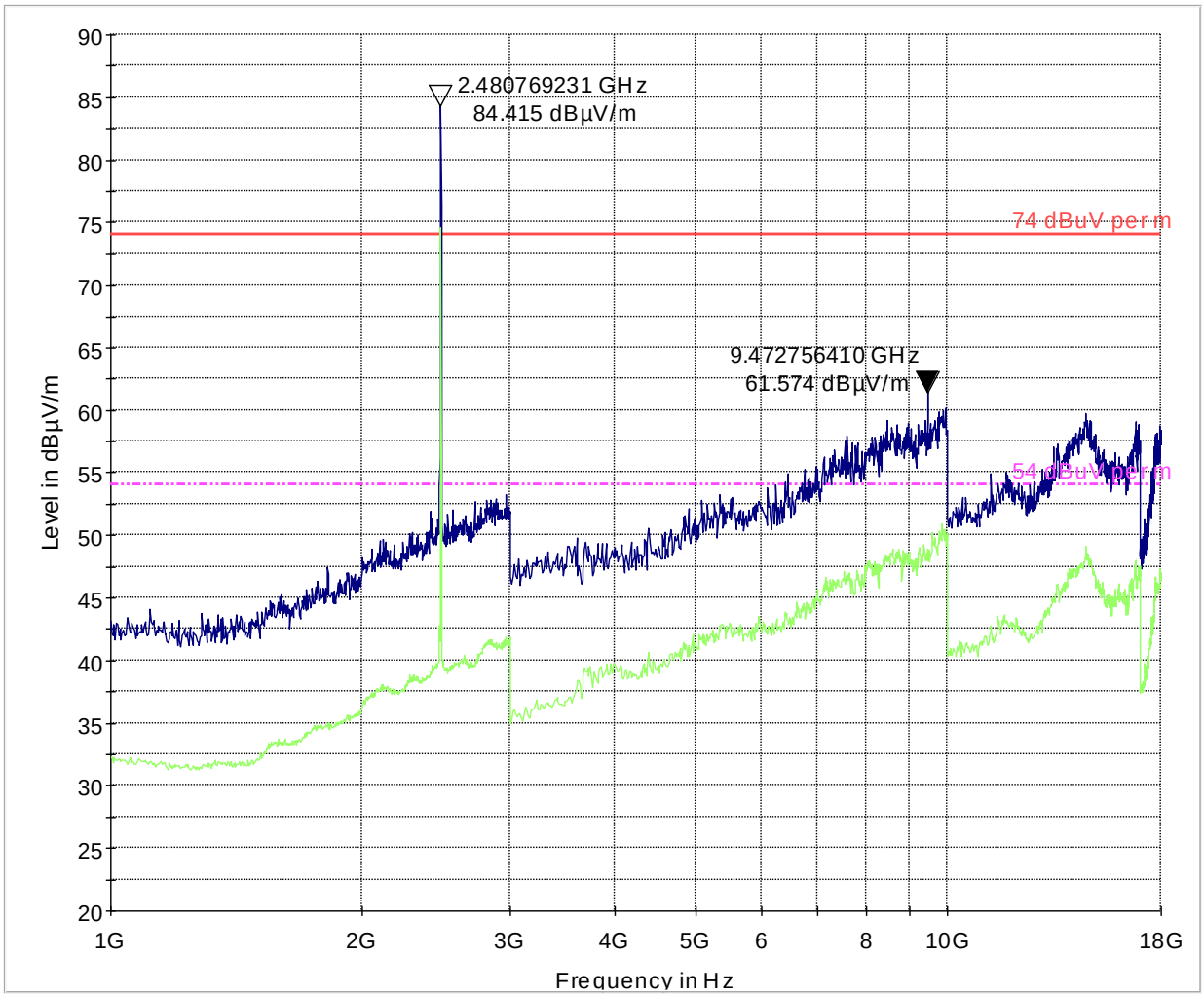
Transmitter Radiated Spurious Emission- Ch20- 18GHz-26GHz
NOTE: Worst case representation for all modes of operation in this range of test.



Transmitter Radiated Spurious Emission: Ch39- 30MHz-1GHz



Transmitter Radiated Spurious Emission- Ch39- 1GHz-18GHz

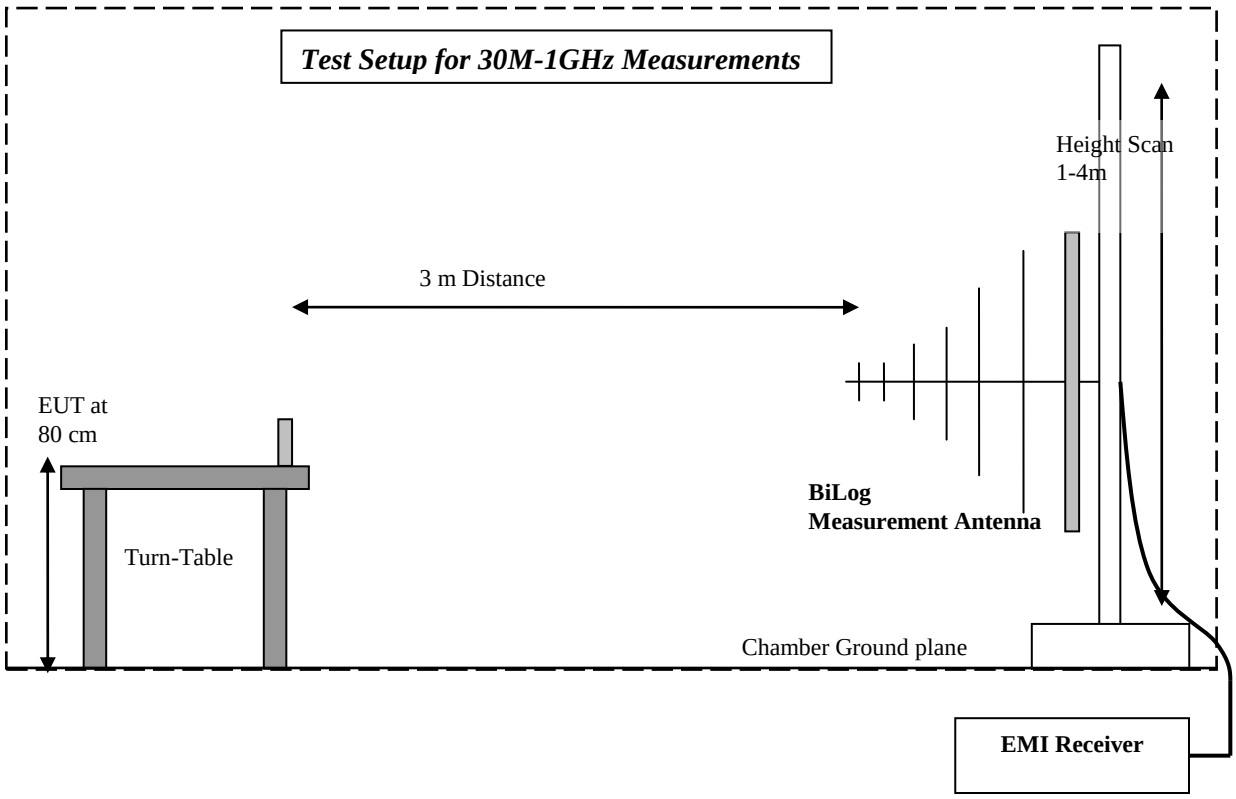


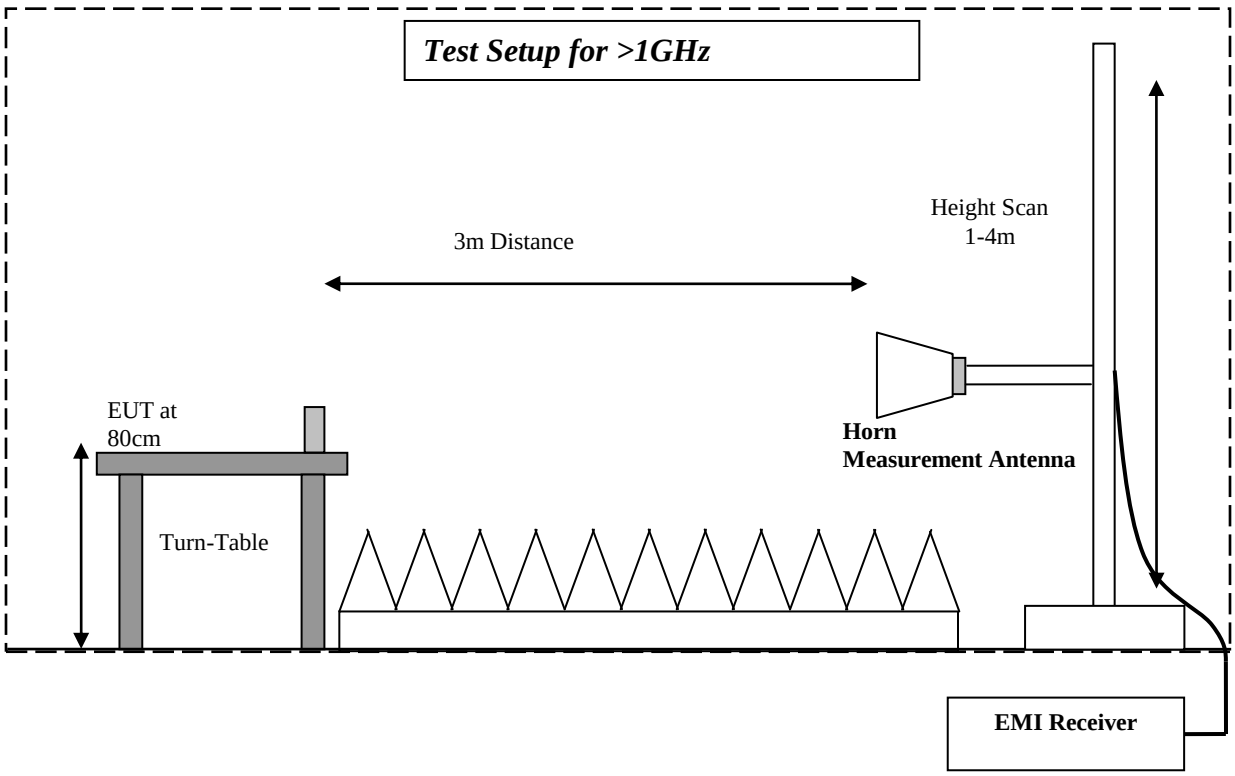
7 Test Equipment and Ancillaries used for tests

No.	Equipment Name	Manufacturer	Type/model	Serial No.	Cal Date	Cal Interval
3m Semi- Anechoic Chamber:						
	EMC32 Measurement Software	Rohde&Schwarz	8.52.0	N/A	N/A	N/A
	Turn table	EMCO	2075	N/A	N/A	N/A
	MAPS Position Controller	ETS Lindgren	2092	0004-1510	N/A	N/A
	Antenna Mast	EMCO	2075	N/A	N/A	N/A
	Relay Switch Unit	Rohde&Schwarz	RSU	338964/001	N/A	N/A
	EMI Receiver/Analyzer	Rohde&Schwarz	ESU 40	100251	Sep 2013	1 Year
	1500MHz HP Filter	Filtek	HP12/1700	14c48	N/A	N/A
	2800 MHz HP Filter	Filtek	HP12/2800	14C47	N/A	N/A
	Pre-Amplifier	Miteq	JS40010260	340125	N/A	N/A
	Binconilog Antenna	EMCO	3141	0005-1186	Apr 2012	3 Years
	Horn Antenna	EMCO	3115	35114	Mar 2012	3 Years
	Horn Antenna	ETS Lindgren	3116	70497	Mar 2012	3 Years
	Spectrum Analyzer	Rohde&Schwarz	FSU	100189	Jun 2013	2 Years
	Loop Antenna 6512	ETS Lindgren	6512	49838	Mar 2014	3 Years
Ancillary equipment						
	Humidity Temperature Logger	Dickson	TM320	03280063	Apr 2013	1 Year
	Communication Antenna	IBP5-900/1940	Kathrein	N/A	N/A	N/A

Calibration status valid at the time of testing.
Equipment used meets the measurement uncertainty requirements as required per applicable standards for 95% confidence levels.
Calibration due dates, unless defined specifically, falls on the last day of the month.
Items indicated “N/A” for cal status either do not specifically require calibration or is internally characterized before use.

8 Test Setup Info:





9 Revision History

Date	Report Name	Changes to report	Report prepared by
2014-06-24	EMC_WIMML_002_14001__DSS	First Version	Dantioco