FCC Test Report

FOR:

Model Name: HAA
Handheld Mobile Telemetry device
FCC ID: YCVBRHA01

47 CFR Part 15.247 for FHSS Systems

TEST REPORT #: EMC_BIOME_001_10001_15.247BT
DATE: 2010-05-12

ACCREDITED
TESTING LABORATORY
CERTIFICATE # 2135.01

Bluetooth Qualification Test Facility (BQTF)

CTIA Authorized Test Lab
LAB CODE 20020328-00

FCC listed
A2LA Accredited

IC recognized # 3462B

***CETECOM* Inc.**
411 Dixon Landing Road ◆ Milpitas, CA 95035 ◆ U.S.A.
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CETECOM Inc. is a Delaware Corporation with Corporation number: 2113686
Board of Directors: Dr. Harald Ansorge, Dr. Klaus Matkey, Hans Peter May

TABLE OF CONTENTS

1 Assessment

The following is in compliance with the applicable criteria specified in FCC rules Parts 15.247 of Title 47 of the Code of Federal Regulations.

Company	Description	Model #
Biomedical Systems Corporation	**Handheld Mobile Telemetry device**	**HAA**

Responsible for Testing Laboratory:

Date	Section	Name	Signature
2010-05-12	Compliance	Marc Douat (Test Lab Manager)	

Responsible for the Report:

Date	Section	Name	Signature
2010-05-12	Compliance	Satya Radhakrishna (EMC Project Engineer)	Satya Radhakrishna I am the author of this document

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
Responsible Test Lab Manager:	Marc Douat
Responsible Project Leader:	Satya Radhakrishna

2.2 Identification of the Client

Applicant's Name:	Biomedical Systems Corporation
Street Address:	77 Progress Parkway
City/Zip Code	St. Louis/ 63043
Country	United States of America
Contact Person:	Kenneth Kroehnke
Phone No.	314-576-6800
Fax:	877-581-7858
e-mail:	kmk@biomedsys.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:	TrueVue™ Handheld
Model No:	HAA
Product Type:	Handheld Mobile Telemetry device
Hardware Revision :	3.0
Software Revision :	V0.28.02.HW3
FCC-ID:	YCVBRHA01
Frequency:	ISM Band 2400-2483.5 MHz
Type(s) of Modulation:	GFSK, π/4 DQPSK, 8- DPSK (FHSS)
Number of channels:	79
Antenna Type/Gain:	Antennova Mica Chip Antenna/ 1.8dBi peak
Equipment Classification:	☐Fixed ☐Vehicular ■Portable ☐Module
Power Supply:	3.7V Lithium Ion battery
Temperature Range:	0ºC-70ºC

3.2 Identification of Equipment

EUT #	Serial Number	HW Version	SW Version
1	HAADEV50	3.0	V0.28.02.HW3
2	HAADEV51	3.0	V0.28.02.HW3

3.3 Identification of Accessory equipment

None

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 FCC rules Part 15.247 of Title 47 of the Code of Federal Regulations.

This test report is to support a request for new equipment authorization under the FCC ID YCVBRHA01. All testing was performed on the product referred to in Section 3 as EUT. This test report contains full radiated and conducted testing results as per FCC15.247. Radiated tests were performed on EUT#2 and conducted tests were performed on EUT#1.

During the testing process the EUT was tested on a single channel using PRBS payload using DH5, 2DH5 or 3DH5 packets, all data in this report shows the worst case between horizontal and vertical polarization measurements.

The device is powered by an internal battery and according to 15.207c, “Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines“therefore the conducted emissions test is not applicable.

5 Measurements

5.1 Radiated Measurement Procedure

ANSI C63.4 Section 8.3.1.1: Exploratory radiated emission measurements

Exploratory radiated measurements shall be performed at the measurement distance or at a closer distance than that specified for compliance to determine the emission characteristics of the EUT. At near distances, for EUTs of comparably small size, it is relatively easy to determine the spectrum signature of the EUT and, if applicable, the EUT configuration that produces the maximum level of emissions. A shielded room may be used for exploratory testing, but may have anomalies that can lead to significant errors in amplitude measurements.

Broadband antennas and a spectrum analyzer or a radio-noise meter with a panoramic display are often useful in this type of testing. It is recommended that either a headset or loudspeaker be connected as an aid in detecting ambient signals and finding frequencies of significant emission from the EUT when the exploratory and final testing is performed in an OATS with strong ambient signals. Caution should be taken if either antenna height between 1 and 4 meters or EUT azimuth is not fully explored. Not fully exploring these parameters during exploratory testing may require complete testing at the OATS or semi-anechoic chamber when the final full spectrum testing is conducted.

The EUT should be set up in its typical configuration and arrangement, and operated in its various modes. For tabletop systems, cables or wires should be manipulated within the range of likely arrangements. For floor-standing equipment, the cables or wires should be located in the same manner as the user would install them and no further manipulation is made. For combination EUTs, the tabletop and floor-standing portions of the EUT shall follow the procedures for their respective setups and cable manipulation. If the manner of cable installation is not known, or if it changes with each installation, cables or wires for floor-standing equipment shall be manipulated to the extent possible to produce the maximum level of emissions.

For each mode of operation required to be tested, the frequency spectrum shall be monitored. Variations in antenna height between 1 and 4 m, antenna polarization, EUT azimuth, and cable or wire placement (each variable within bounds specified elsewhere) shall be explored to produce the emission that has the highest amplitude relative to the limit. A step-by-step technique for determining this emission can be found in Annex C.

When measuring emissions above 1 GHz, the frequencies of maximum emission shall be determined by manually positioning the antenna close to the EUT and by moving the antenna over all sides of the EUT while observing a spectral display. It will be advantageous to have prior knowledge of the frequencies of emissions above 1 GHz. If the EUT is a device with dimensions approximately equal to that of the measurement antenna beamwidth, the measurement antenna shall be aligned with the EUT.

ANSI C63.4 Section 8.3.1.2: Final radiated emission measurements

Based on the measurement results in 8.3.1.1, the one EUT, cable and wire arrangement, and mode of operation that produces the emission that has the highest amplitude relative to the limit is selected for the final measurement. The final measurement is then performed on a site meeting the requirements of 5.3, 5.4, or 5.5 as appropriate without variation of the EUT arrangement or EUT mode of operation. If the EUT is relocated from an exploratory test site to a final test site, the highest emission shall be remaximized at the final test location before final radiated emissions measurements are performed. However, antenna height and polarity and EUT azimuth are to be varied. In addition, the full frequency spectrum (for the range to be checked for meeting compliance) shall be investigated.

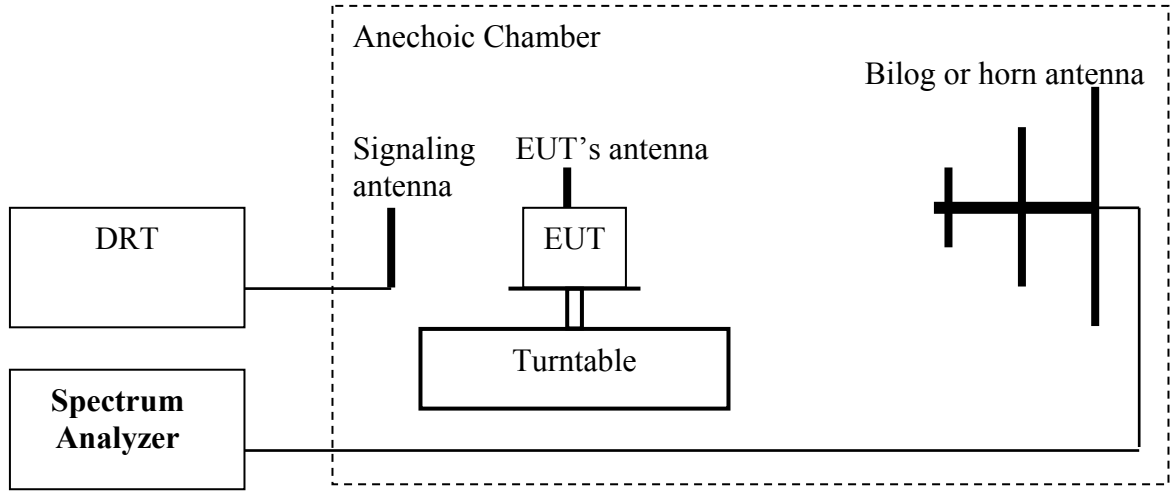
This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. During the full frequency spectrum investigation, particular focus should be made on those frequencies found in exploratory testing that were used to find the final test configuration, mode of operation, and arrangement (associated with achieving the least margin with respect to the limit). This full spectrum test constitutes the compliance measurement.

For measurements above 1 GHz, use the cable, EUT arrangement, and mode of operation determined in the exploratory testing to produce the emission that has the highest amplitude relative to the limit. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the antenna in the “cone of radiation” from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response. The antenna may have to be higher or lower than the EUT, depending on the EUT’s size and mounting height, but the antenna should be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane. If the transmission line for the measurement antenna restricts its range of height and polarization, the steps needed to ensure the correct measurement of the maximum emissions, shall be described in detail in the report of measurements. Data collected shall satisfy the report requirements of Clause 10.

NOTES

1— Where limits are specified by agencies for both average and peak (or quasi-peak) detection, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.
2—Use of waveguide and flexible waveguide may be necessary at frequencies above 10 GHz to achieve usable signal-to noise ratios at required measurement distances. If so, it may be necessary to restrict the height search of the antenna, and special care should be taken to ensure that maximum emissions are correctly measured.
3—All presently known devices causing emissions above 10 GHz are physically small compared with the beam-widths of typical horn antennas used for EMC measurements. For such EUTs and frequencies, it may be preferable to vary the height and polarization of the EUT instead of the receiving antenna to maximize the measured emissions.

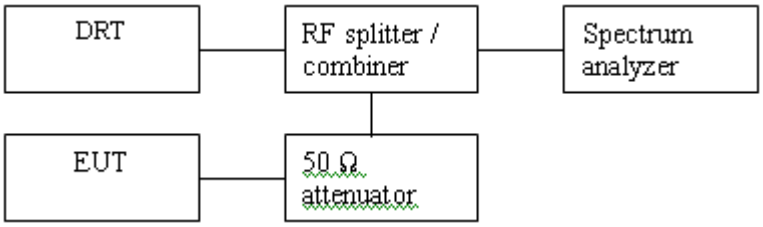
Ref: TIA-603C 2004 -2.2.17.2 Effective Radiated Power (ERP) or Effective Isotropic Radiated Power (EIRP)



1. Connect the equipment as shown in the above diagram with the EUT's antenna in a vertical 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 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 channels.

Spectrum analyzer settings: RBW=VBW=3MHz

5.2 Conducted Measurement Procedure



1. Connect the equipment as shown in the above diagram.
2. Adjust the settings of the Digital RadioCommunication Tester (DRT) to set the EUT to its maximum power at the required channel.
3. Measurements are to be performed with the EUT set to the low, middle and high channels.

5.3 Maximum Peak Output Power

5.3.1 Limits: §15.247 (b)(1)

Nominal Peak Output Power < 30 dBm (1W)

5.3.2 Test Conditions:

Tnom: 23ºC; Vnom: 3.7 V

5.3.3 Test Result:

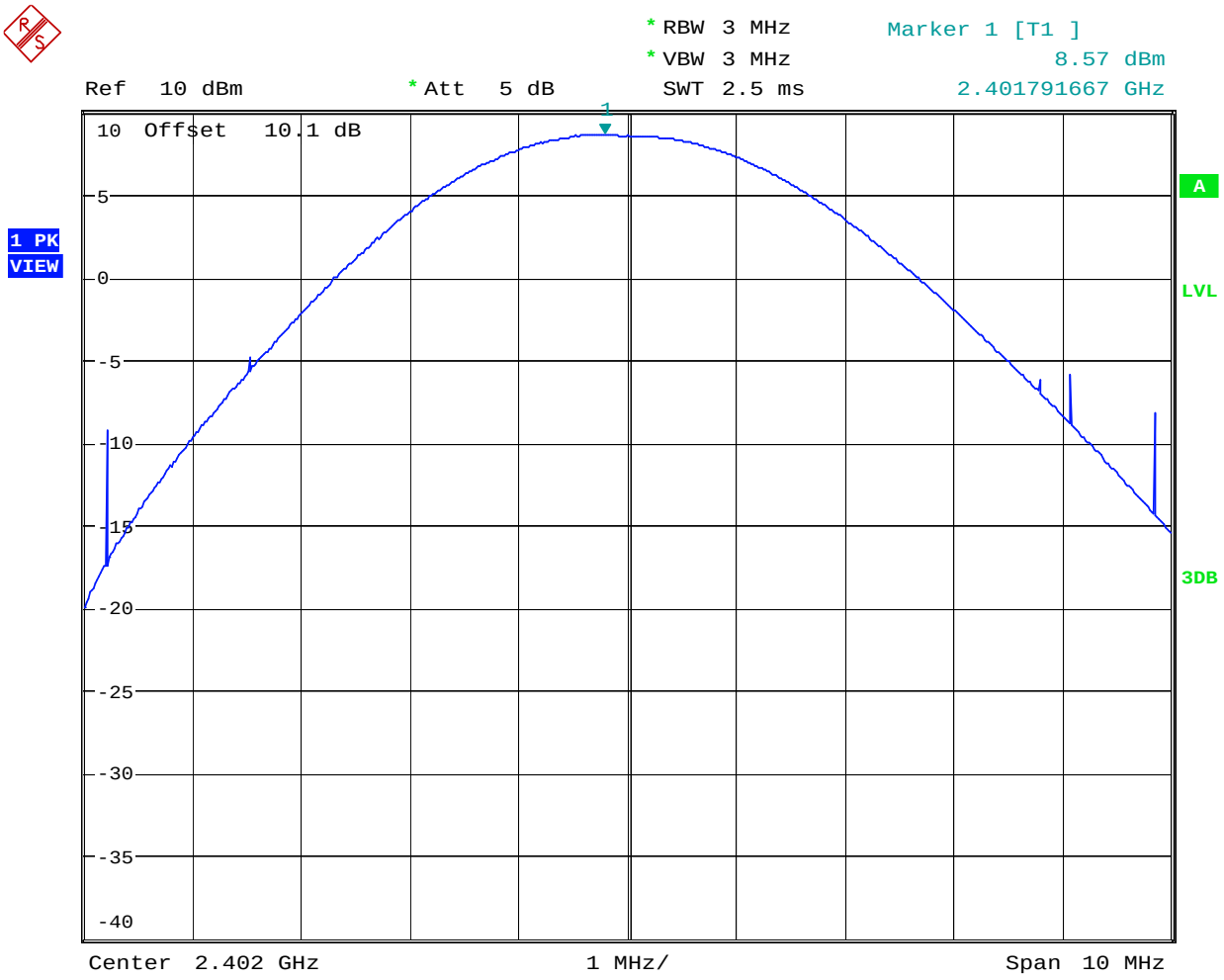
Max Peak Output Power- Conducted (dBm)			
Modulation	**Frequency (MHz)**		
	2402	**2441**	**2480**
GFSK	8.57	9.66	9.46
π/4 DQPSK	11.11	11.94	11.47
8-DPSK	11.44	12.19	11.81
Measurement Uncertainty: ±0.5dB			

EIRP values are calculated by adding antenna gain to the Peak Conducted Power values.
EIRP =Antenna Gain(dBi) + Conducted Peak Power(dBm) / Antenna Gain=1.8dBi

Max Peak Output Power- Radiated (dBm)			
Modulation	**Frequency (MHz)**		
	2402	**2441**	**2480**
GFSK	10.37	11.46	11.26
π/4 DQPSK	12.91	13.74	13.27
8-DPSK	13.24	13.99	13.61
Measurement Uncertainty: ±3dB			

5.3.4 Test Data/plots:

Conducted Peak Power GFSK 2402 MHz



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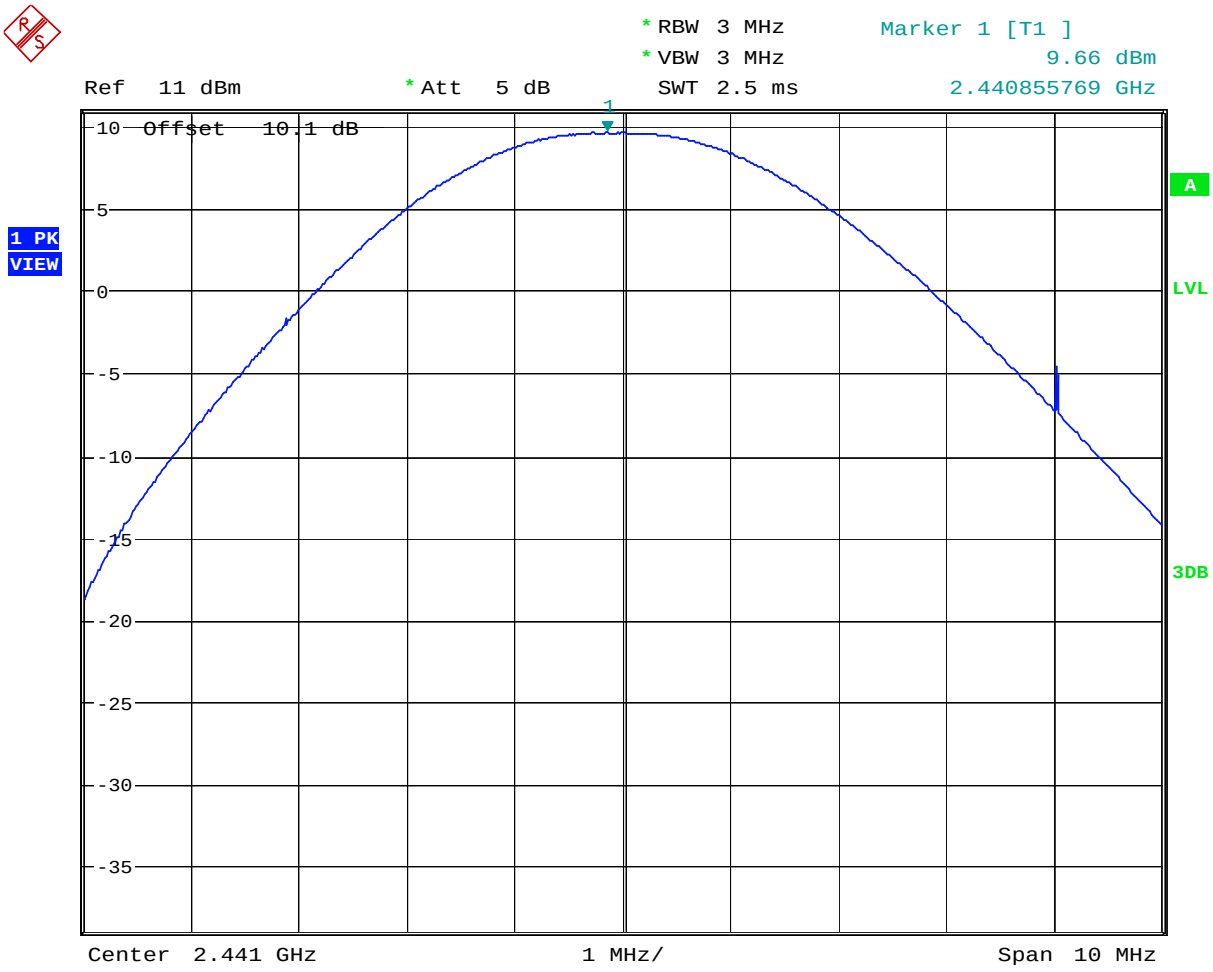
Conducted Peak Power GFSK 2441 MHz



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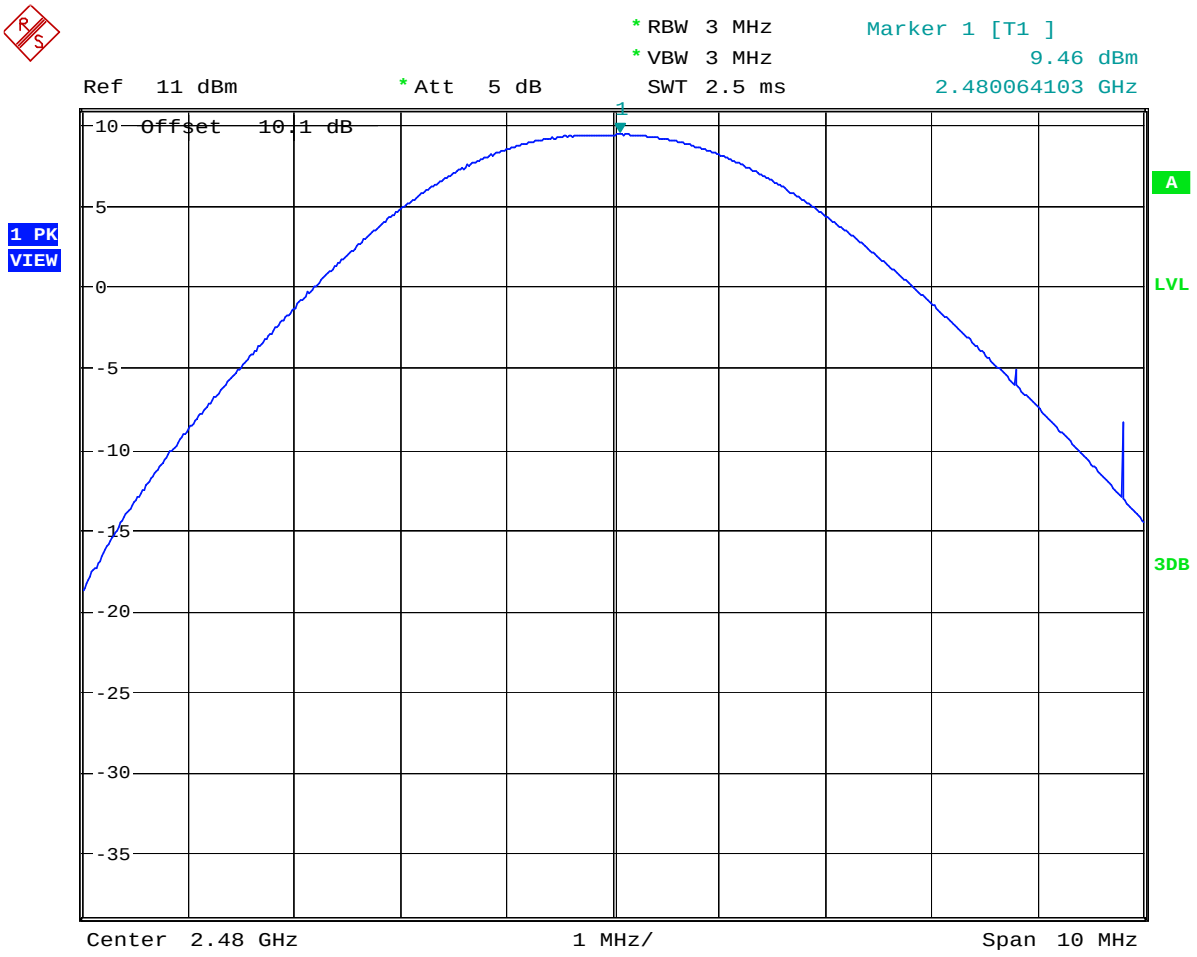
Conducted Peak Power GFSK 2480 MHz



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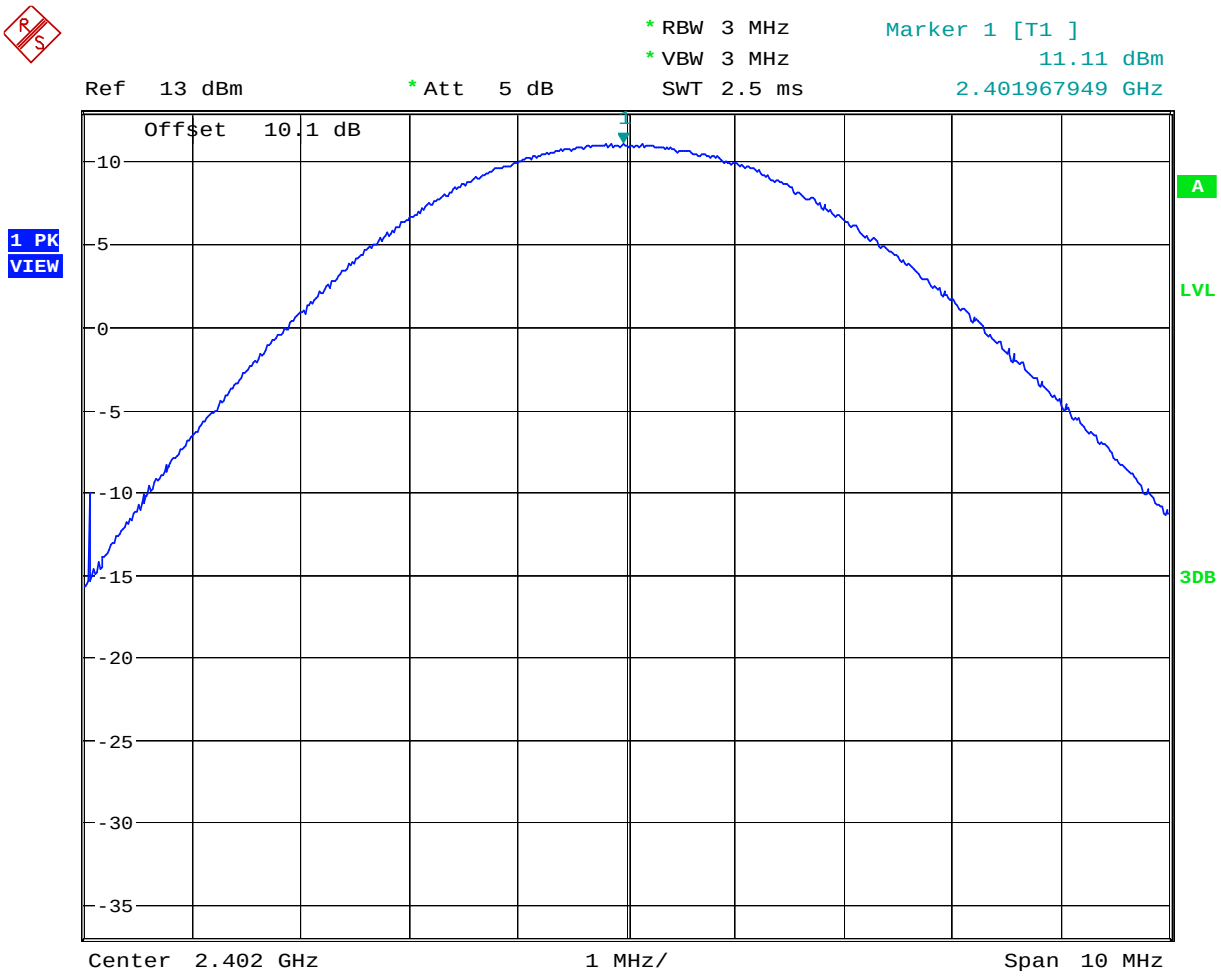
Conducted Peak Power π / 4 DQPSK 2402 MHz



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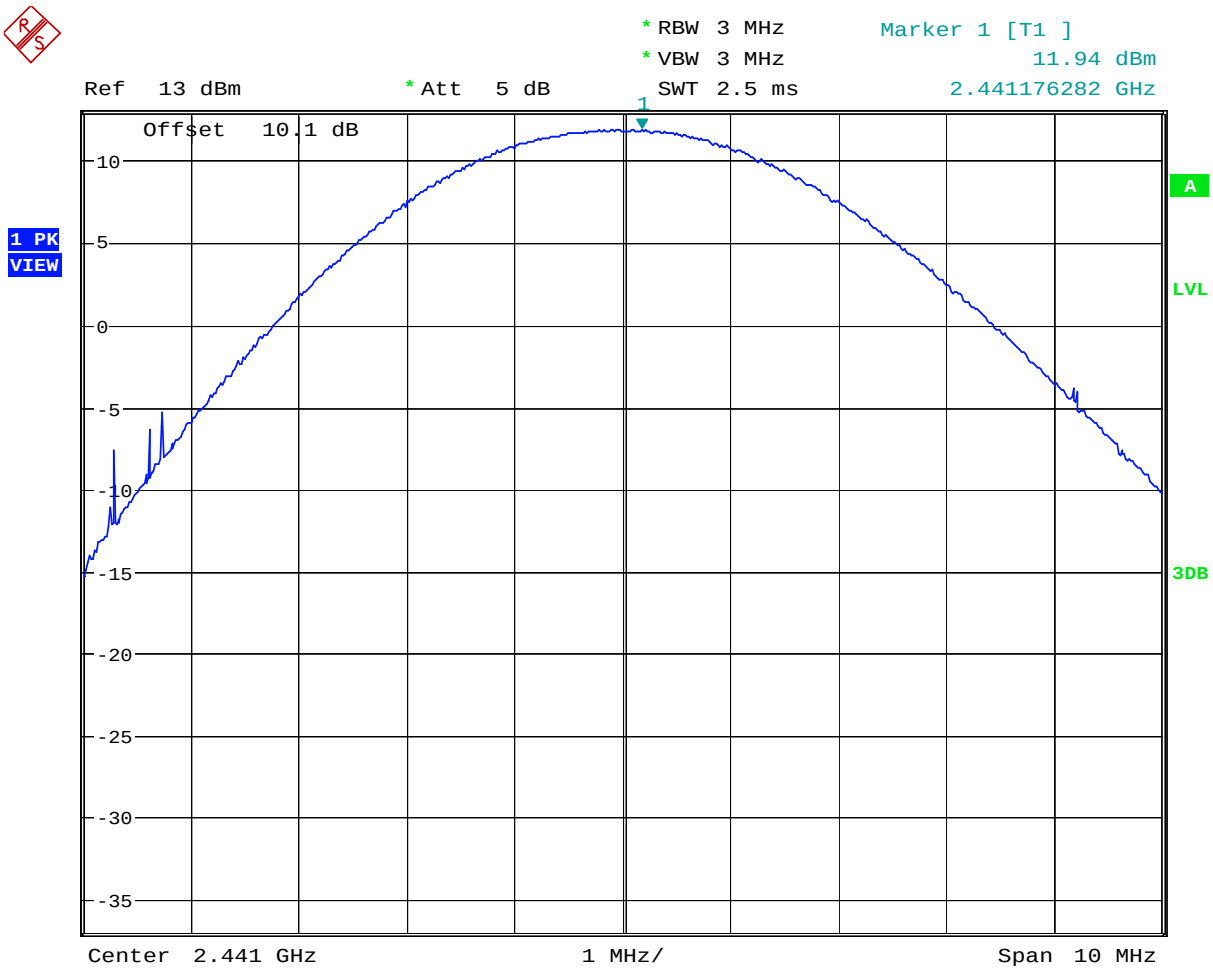
Conducted Peak Power π / 4 DQPSK 2441 MHz



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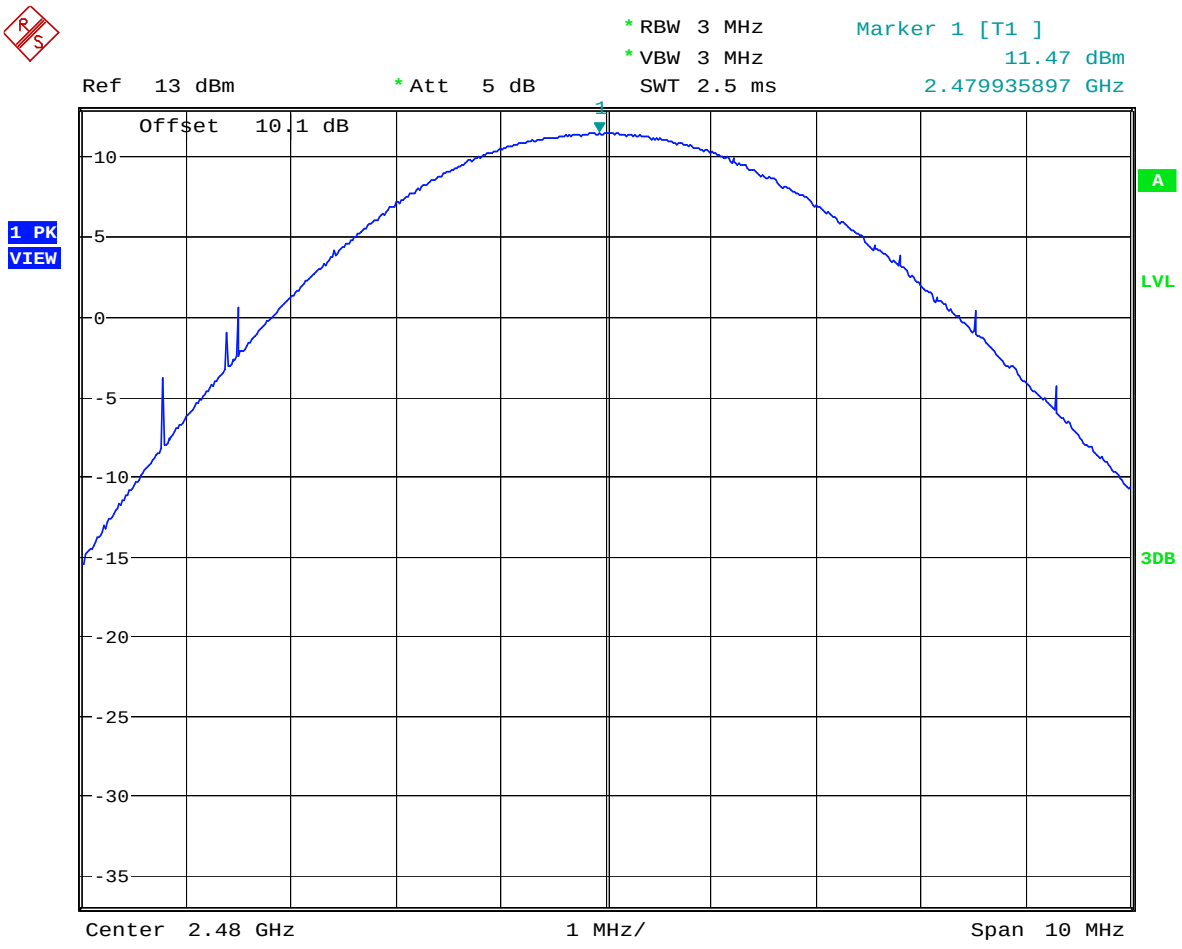
Conducted Peak Power π / 4 DQPSK 2480 MHz



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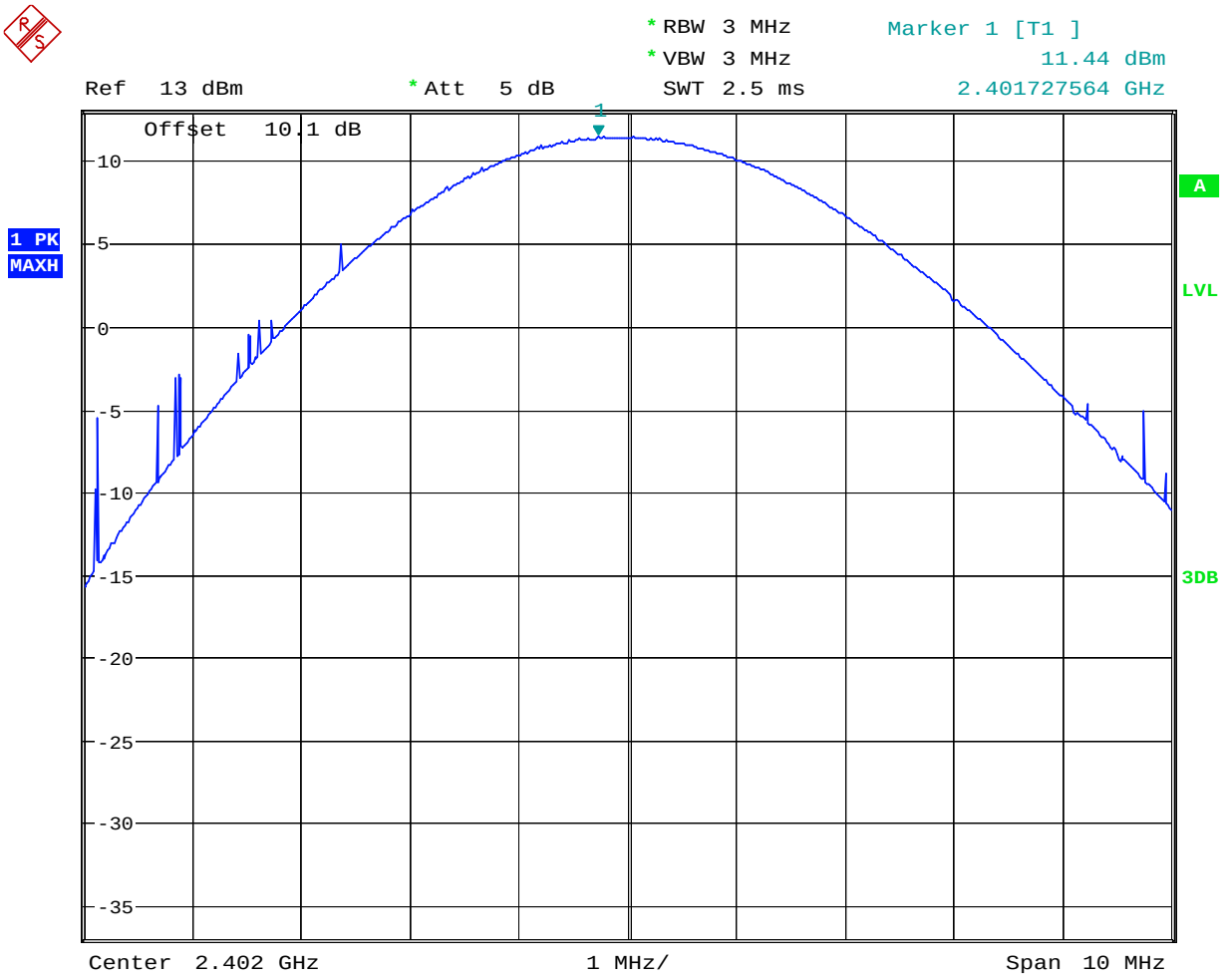
Conducted Peak Power 8DPSK 2402 MHz



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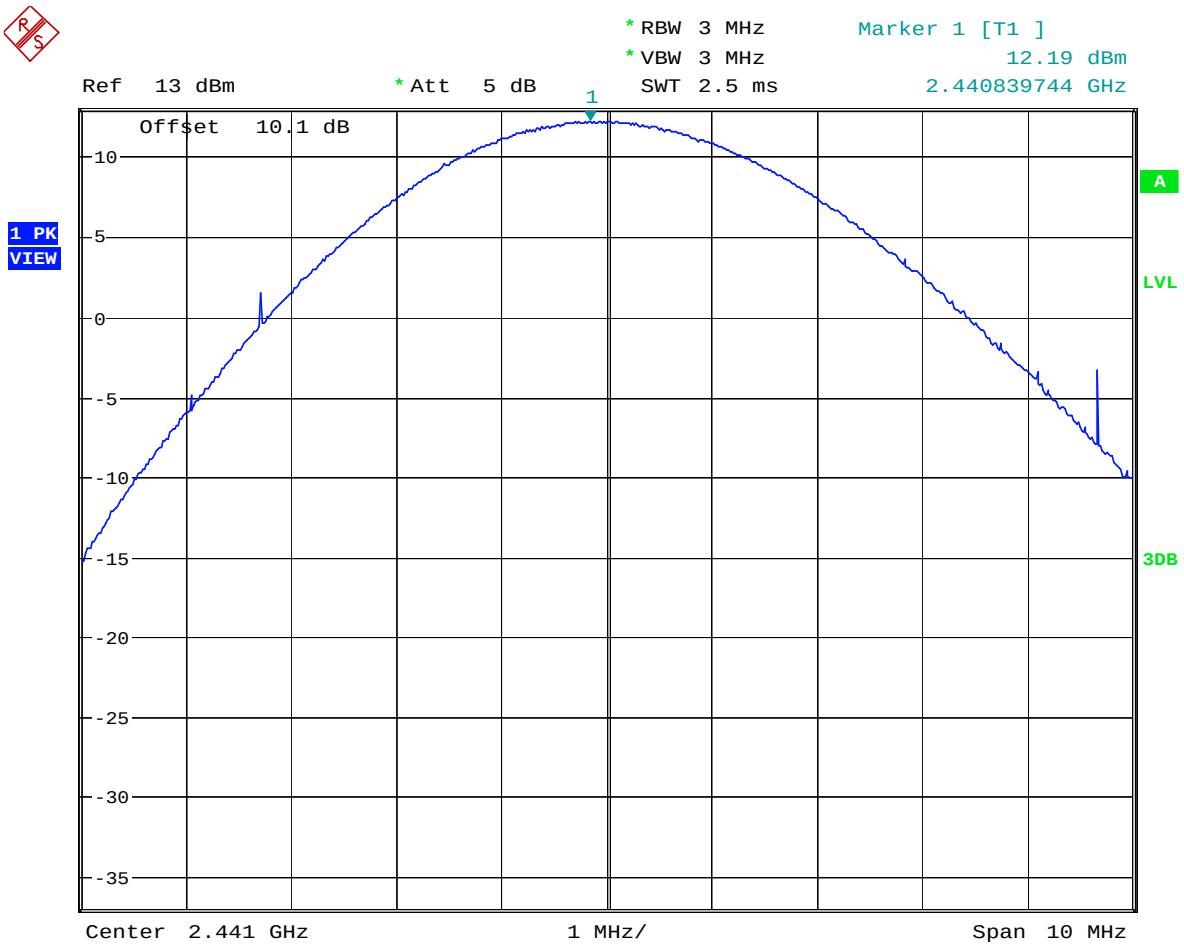
Conducted Peak Power 8DPSK 2441 MHz



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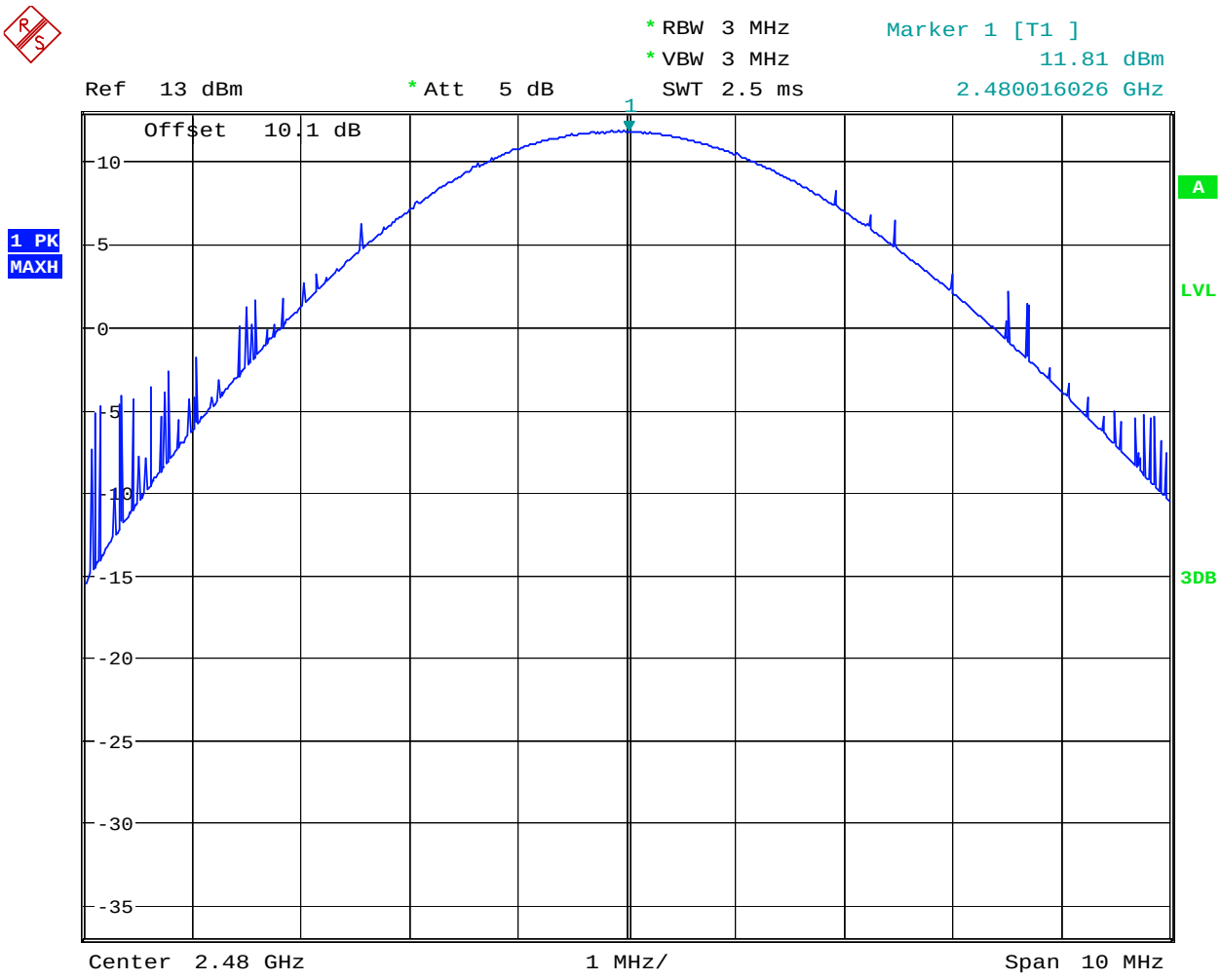
Conducted Peak Power 8DPSK 2480 MHz



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5.4 Restricted Band Edge Compliance

5.4.1 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:

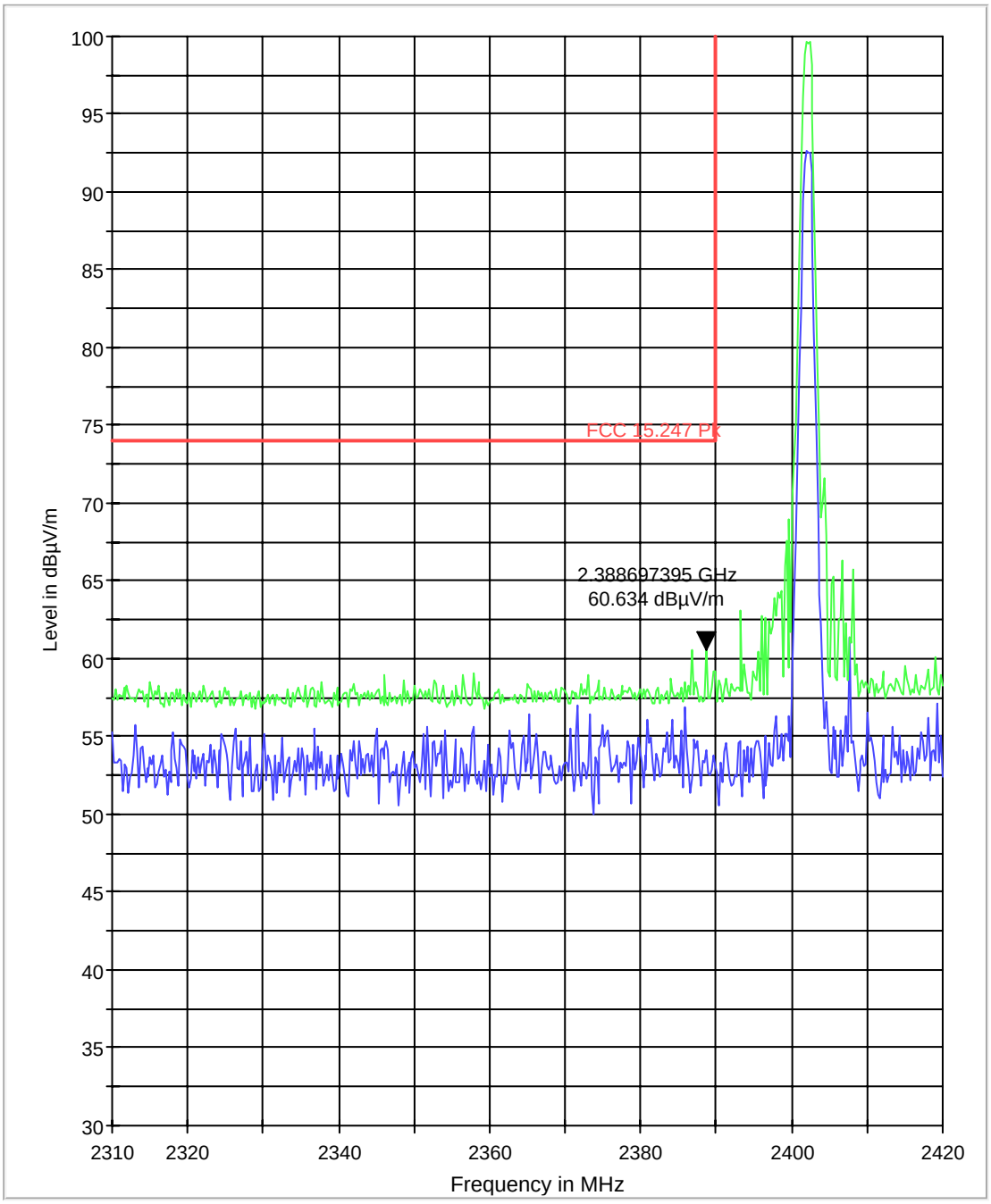
MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 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			

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

*PEAK LIMIT= 74dBµV/m
*AVG. LIMIT= 54dBµV/m

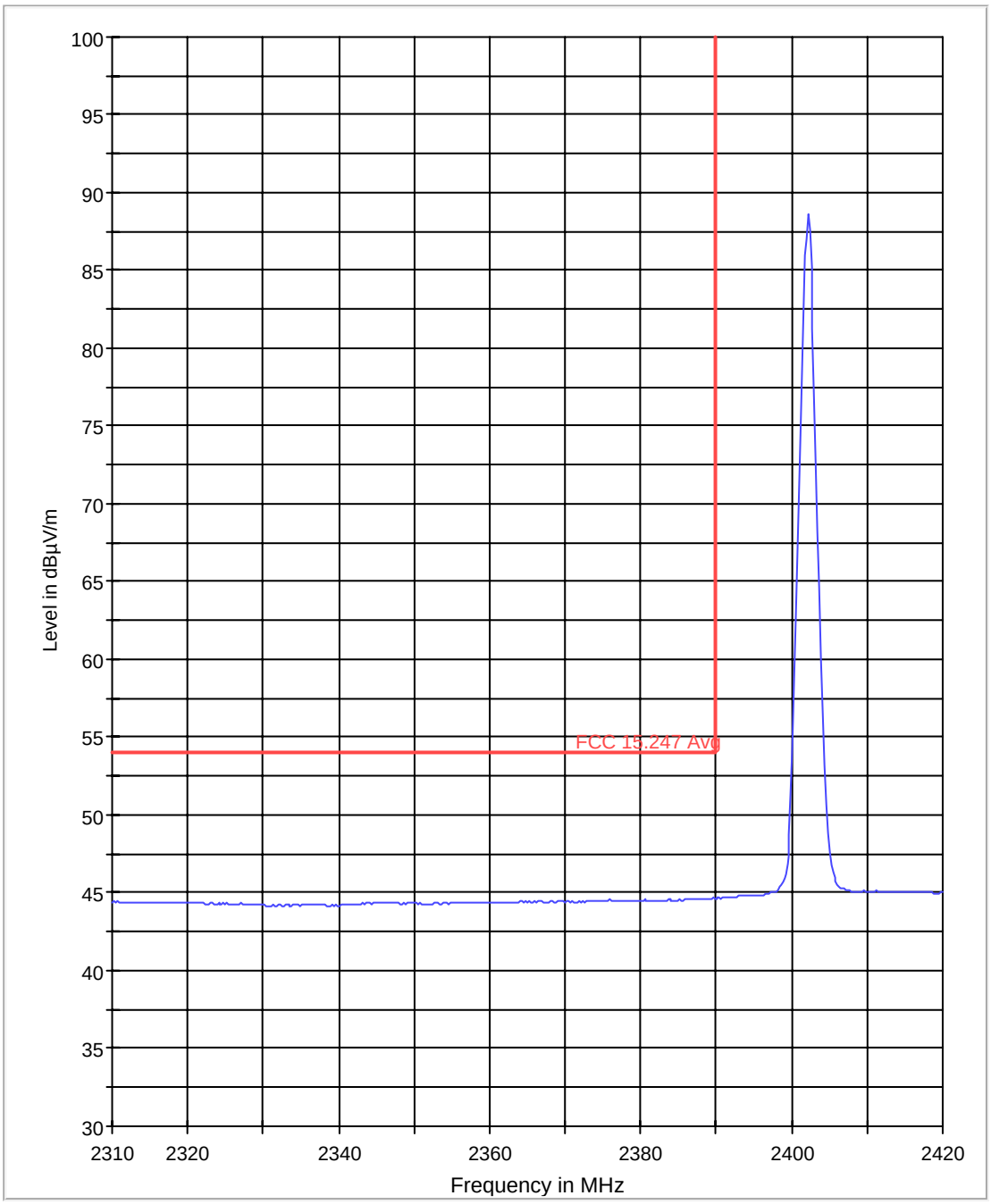
5.4.2 Test Data/plots:

Lower band edge peak -GFSK modulation

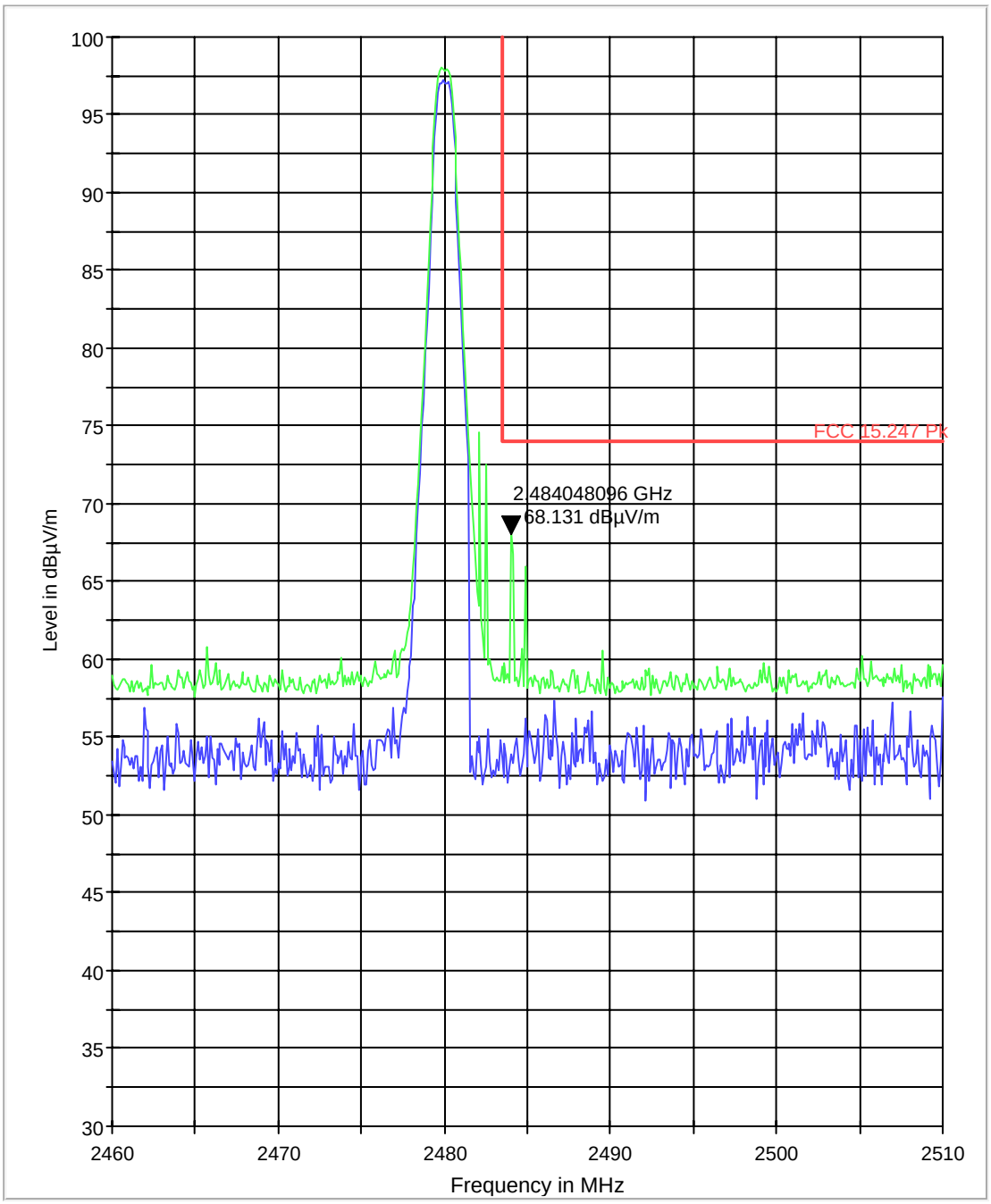


Lower band edge average -GFSK modulation

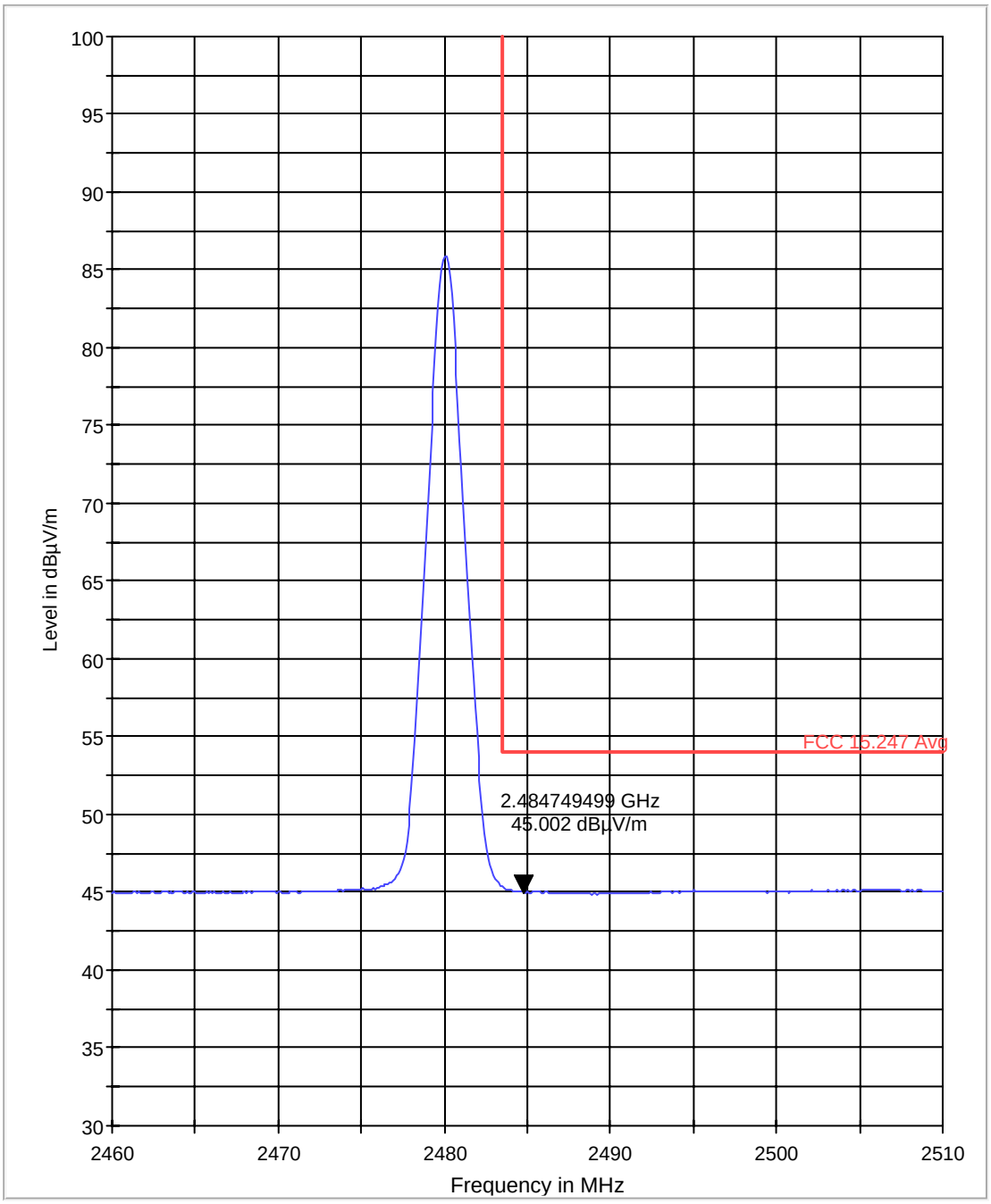
FCC 15.247 LBE Avg 3m



Higher band edge peak -GFSK modulation

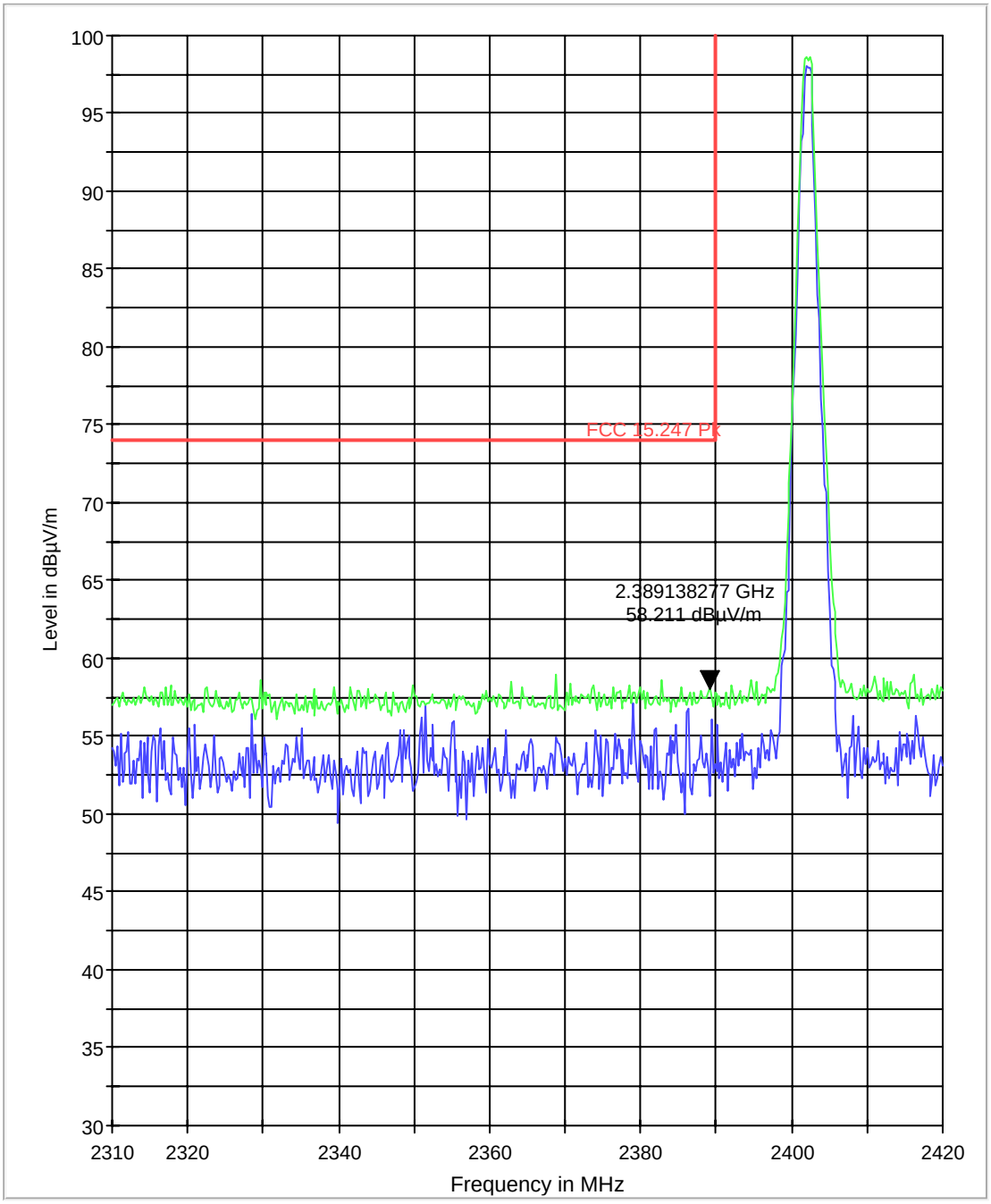


Higher band edge average-GFSK modulation

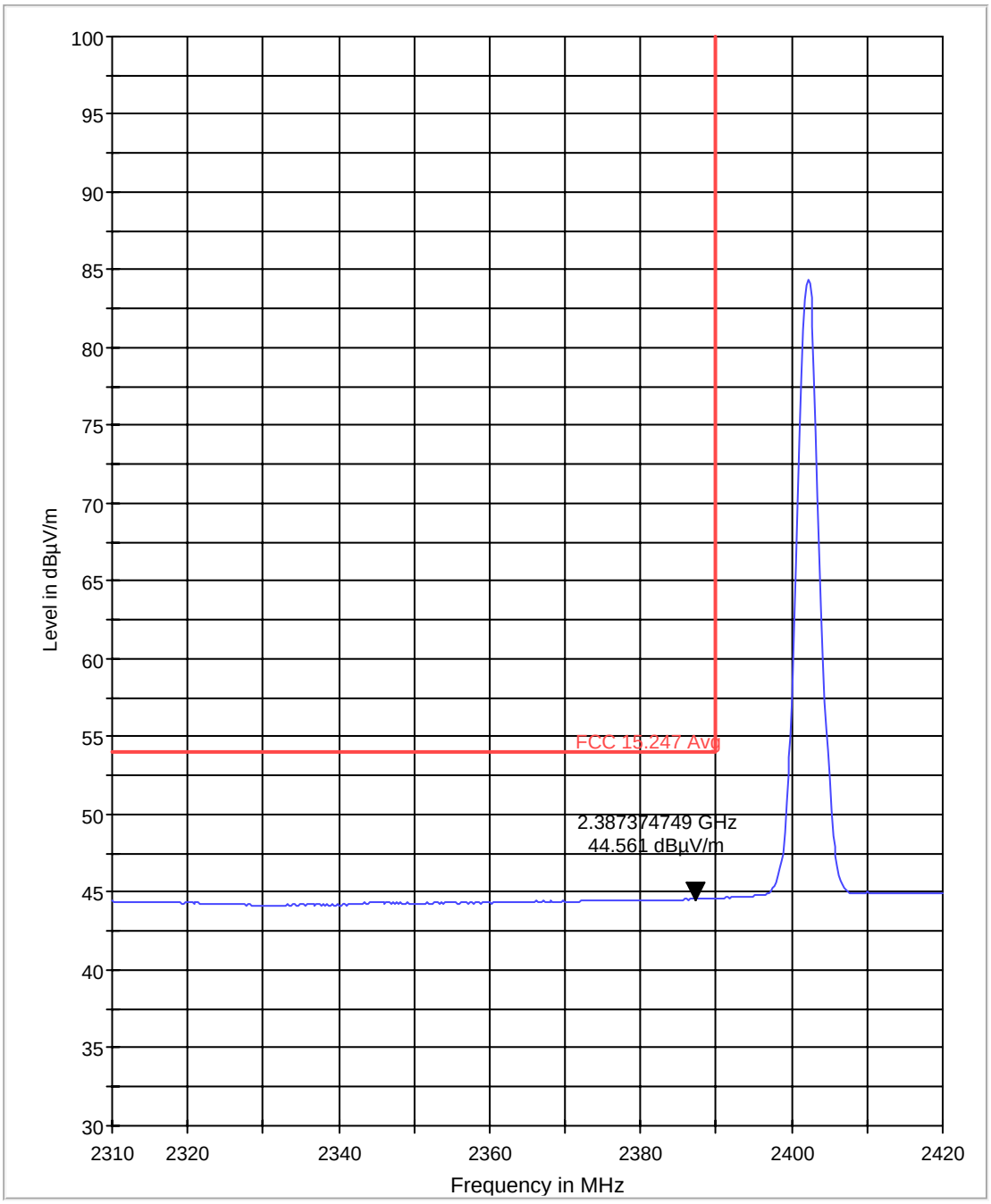


Lower band edge peak - π/4 DQPSK modulation

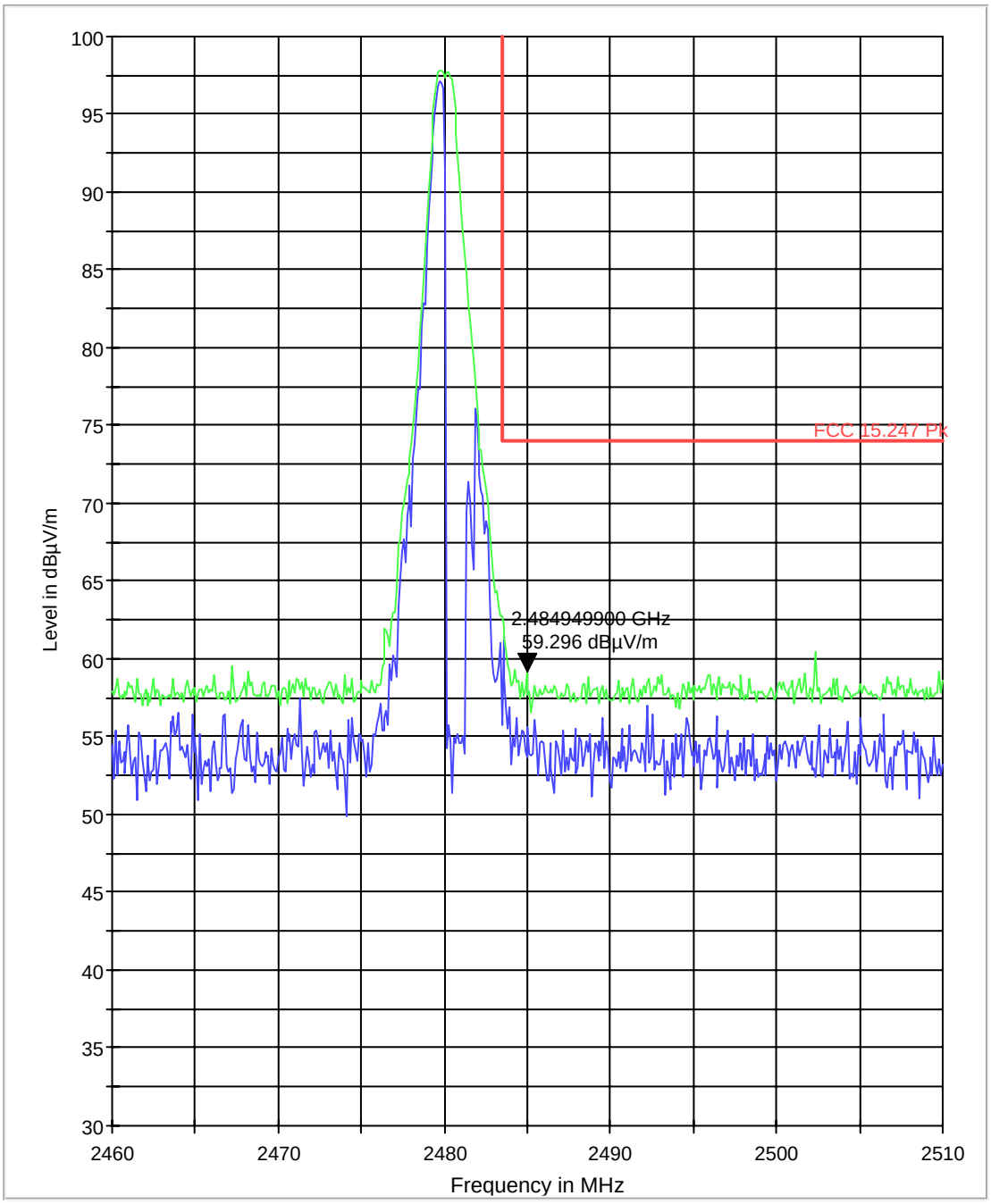
FCC 15.247 LBE Pk 3m



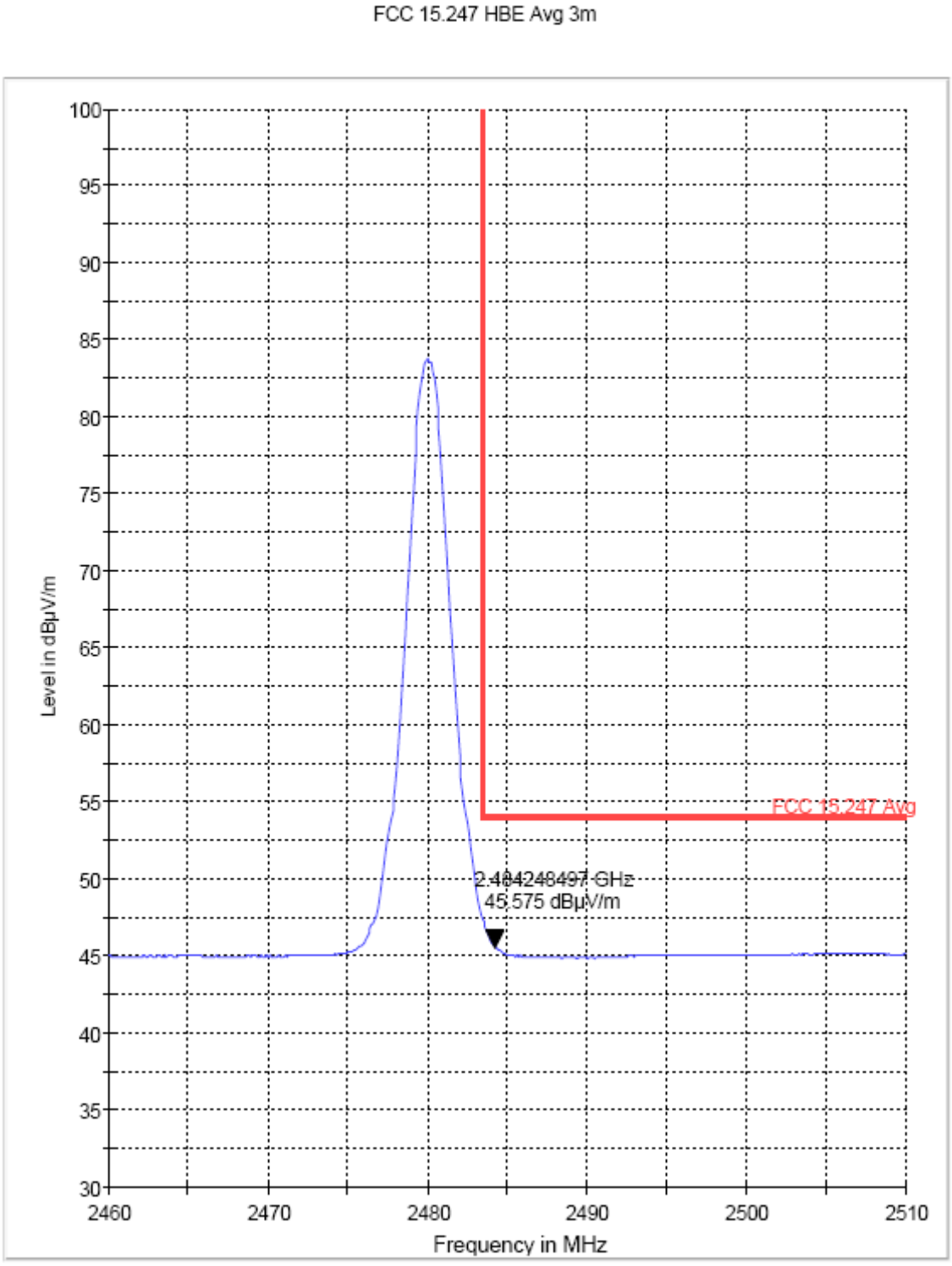
Lower band edge average -π/4 DQPSK modulation



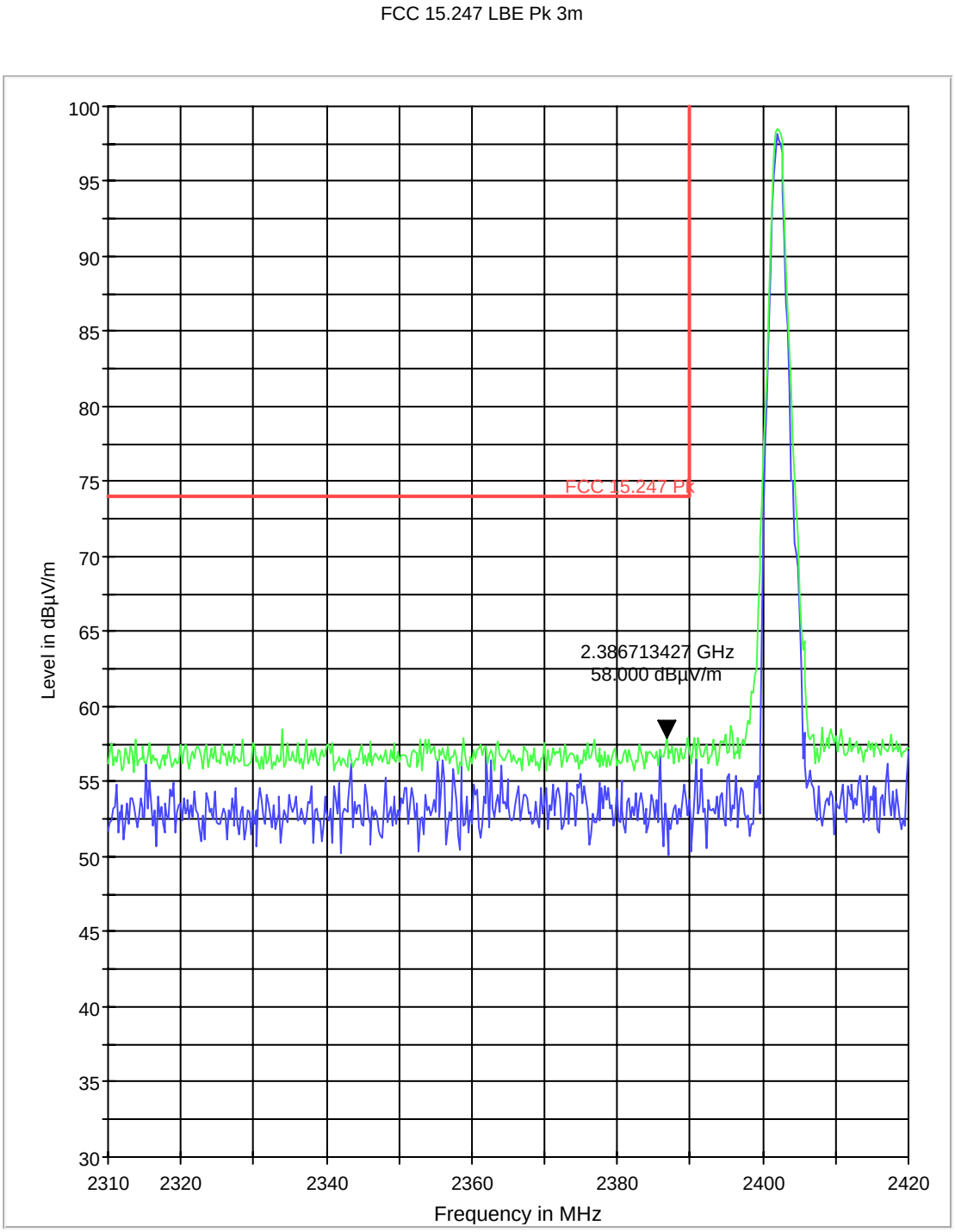
Higher band edge peak -π/4 DQPSK modulation



Higher band edge average- π/4 DQPSK modulation

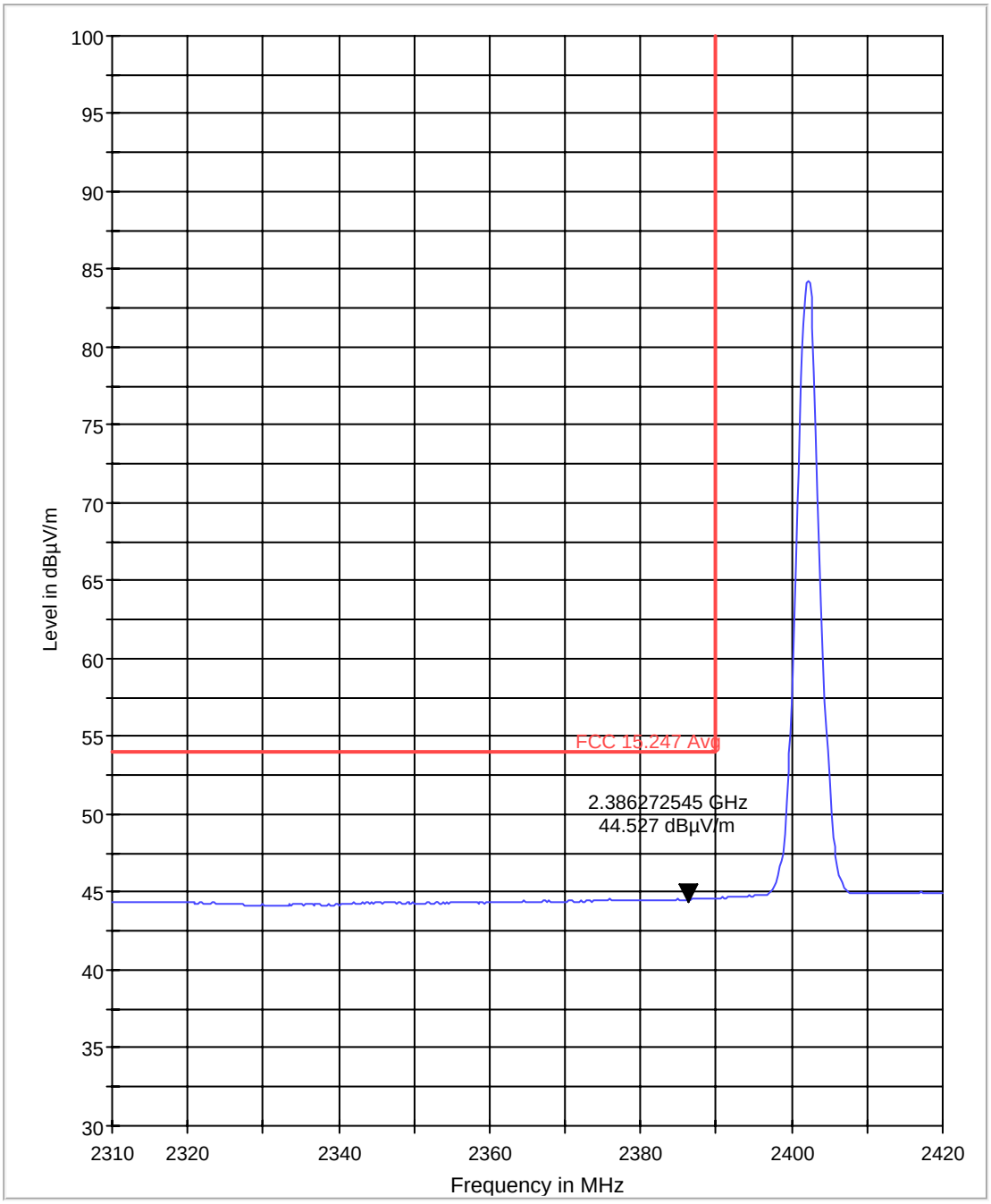


Lower band edge peak - 8DPSK modulation

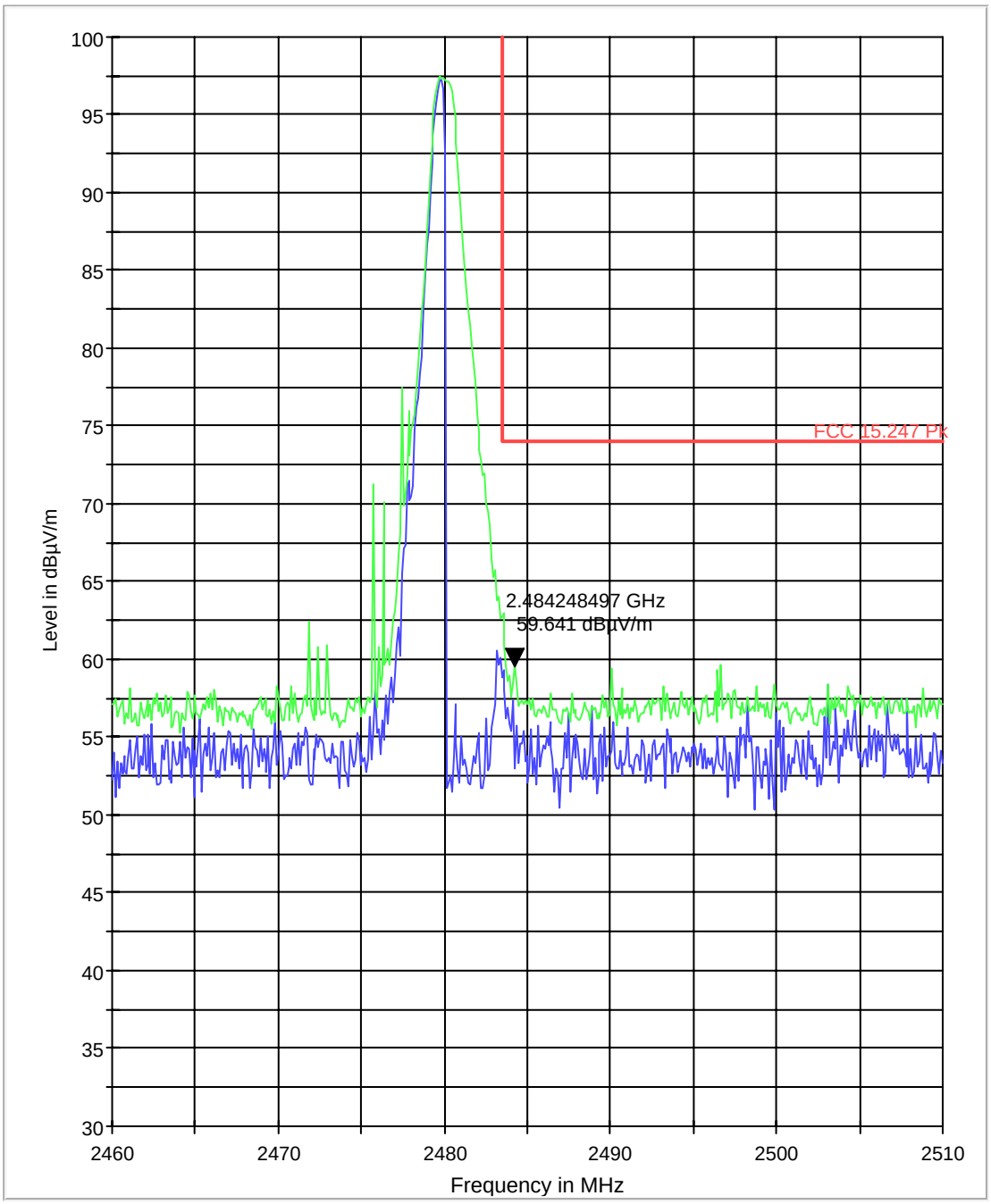


Lower band edge average -8DPSK modulation

FCC 15.247 LBE Avg 3m

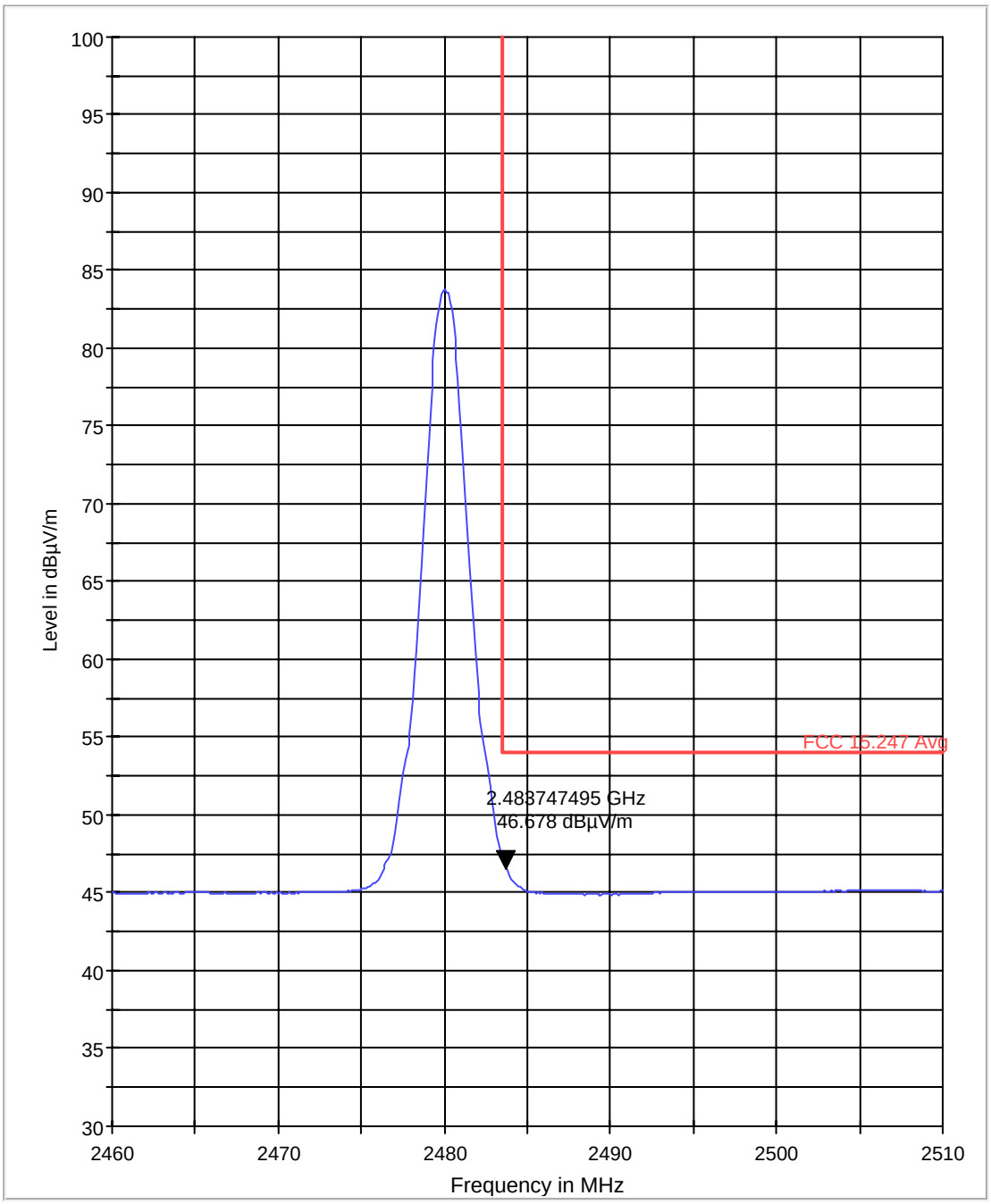


Higher band edge peak - 8DPSK modulation



Higher band edge average-8DPSK modulation

FCC 15.247 HBE Avg 3m



5.5 Spectrum Bandwidth/ 20dB Bandwidth

5.5.1 Limits: § 15.247 (a)(1)

Frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

GFSK < 1000 kHz
π / 4 DQPSK < 1500 kHz
8 dPSK < 1500kHz

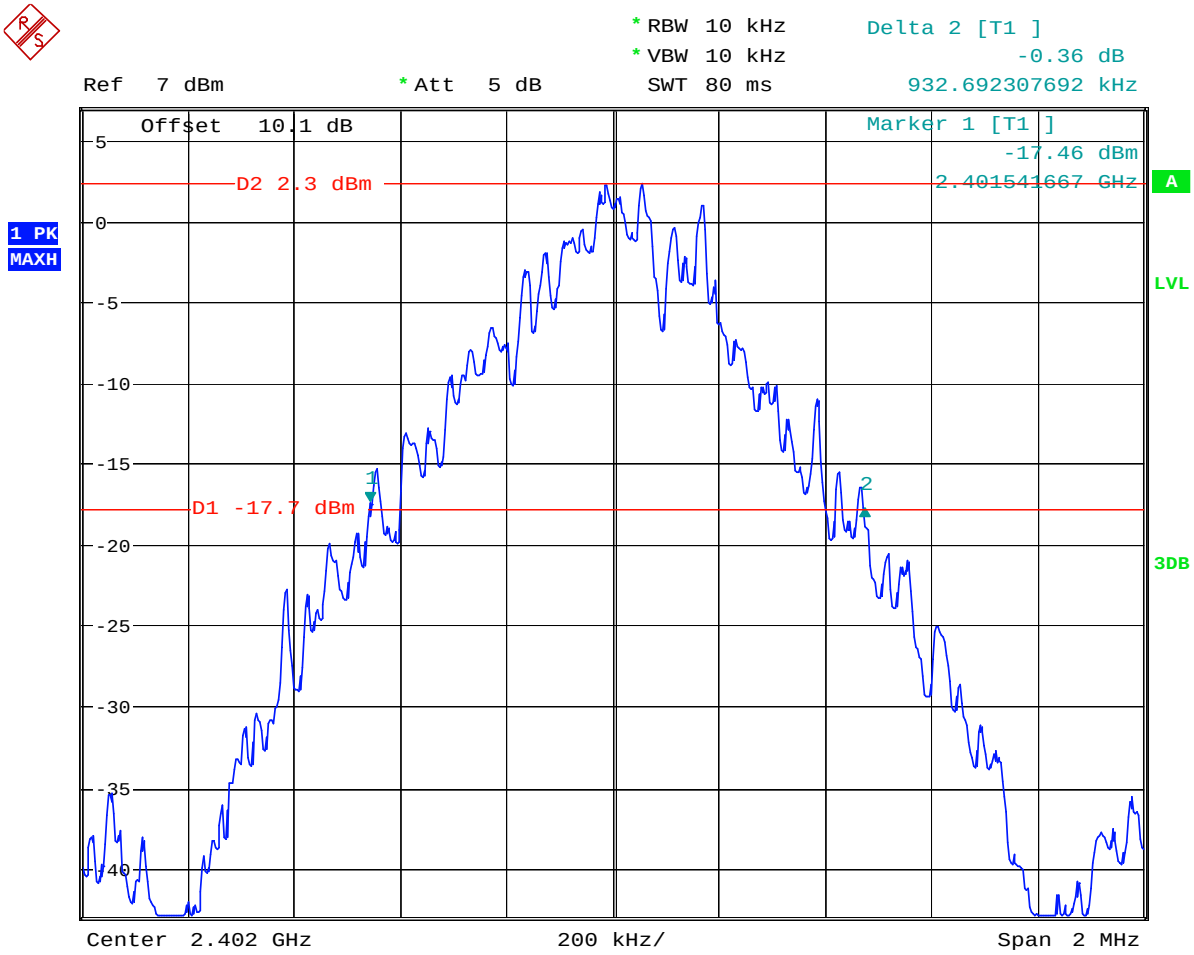
5.5.2 Test Result:

20dB Bandwidth (kHz)			
Modulation	**Frequency (MHz)**		
	2402	**2441**	**2480**
GFSK	0.933	0.936	0.936
π/4 DQPSK	1.333	1.330	1.327
8-DPSK	1.305	1.301	1.305
Measurement Uncertainty: ±1 kHz			

RBW=VBW=10 kHz

5.5.3 Test Data/plots:

20dB Bandwidth GFSK 2402MHz



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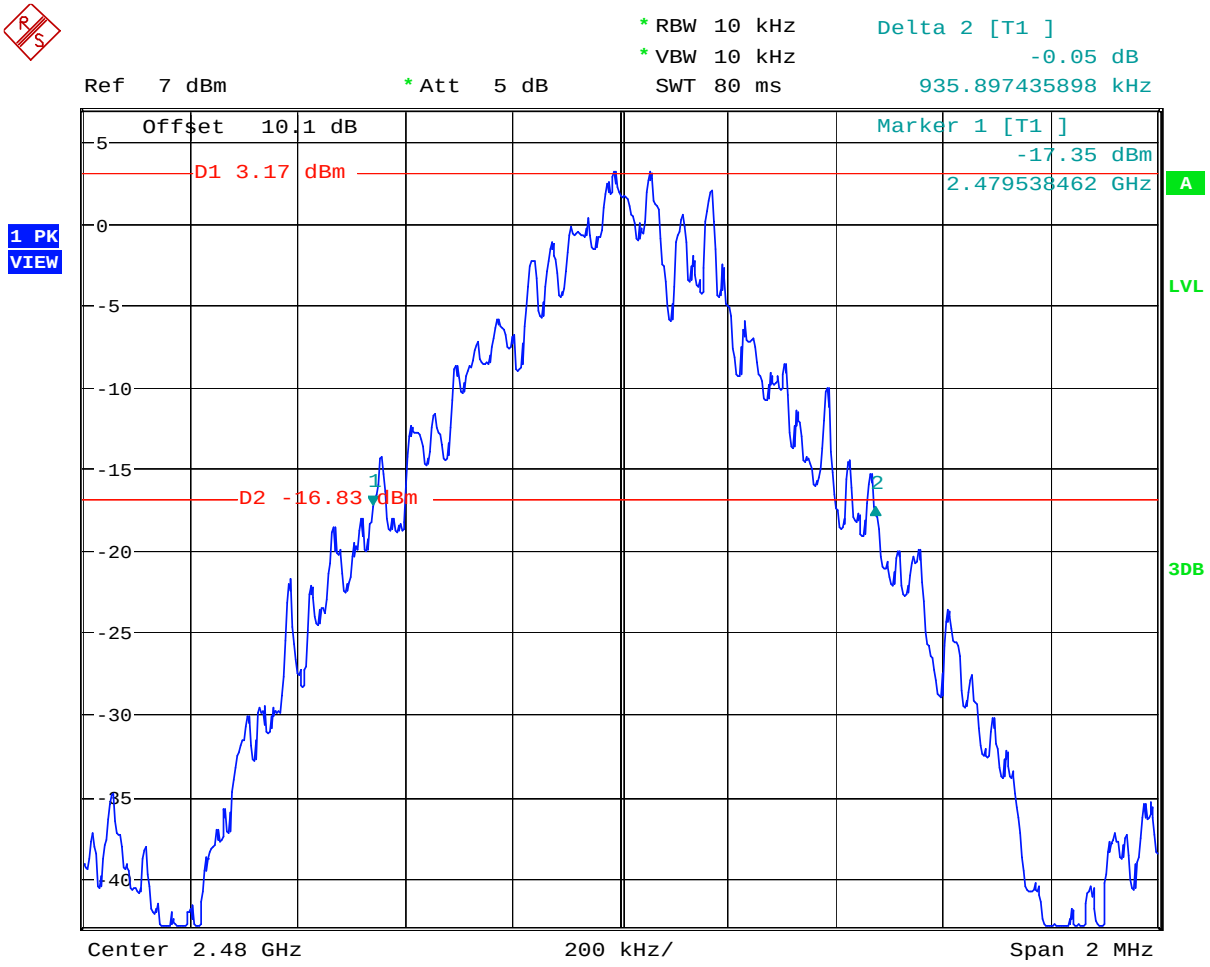
20dB Bandwidth GFSK 2441MHz

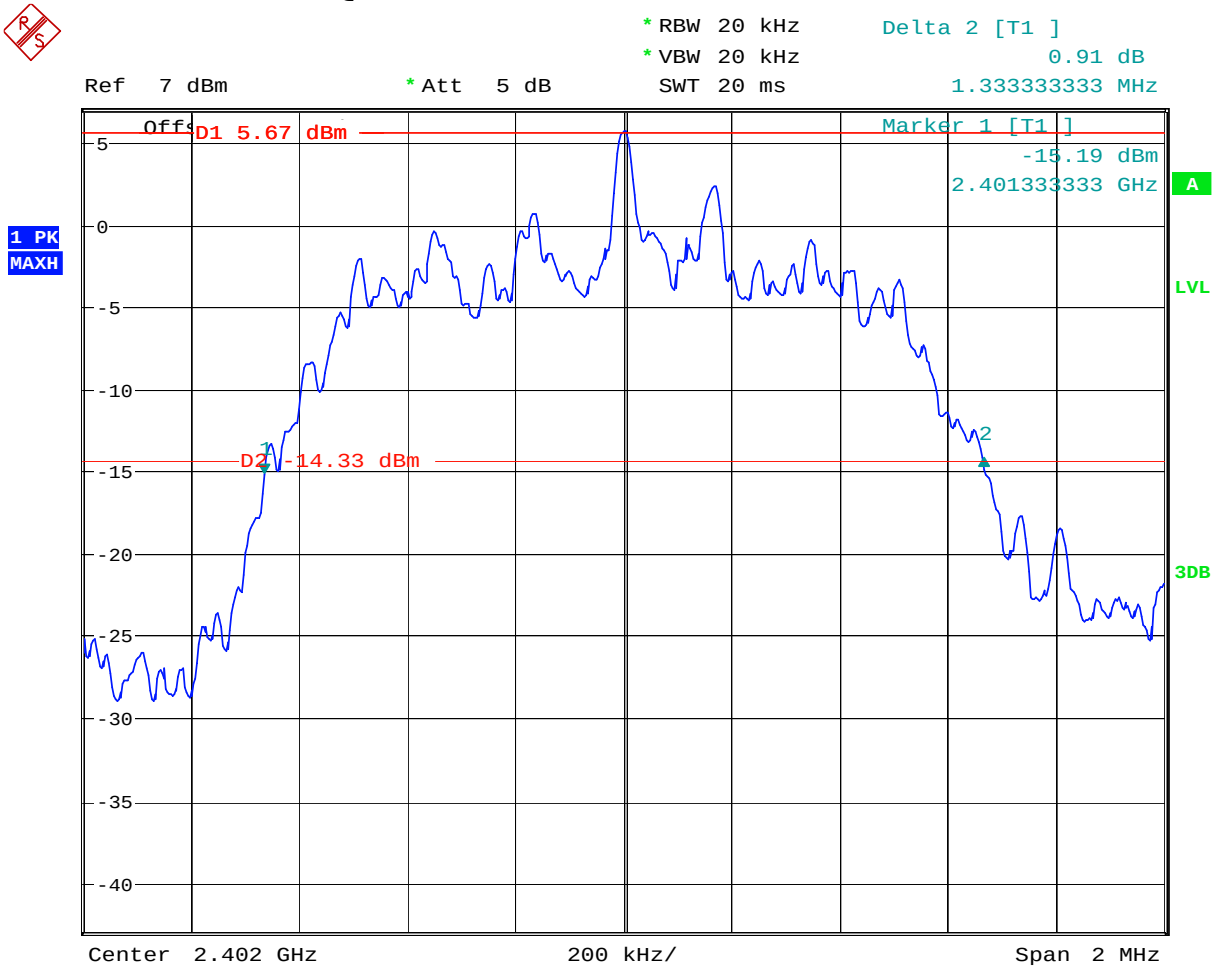
Date: 3.MAY.2010 16:23:41

20dB Bandwidth GFSK 2480MHz



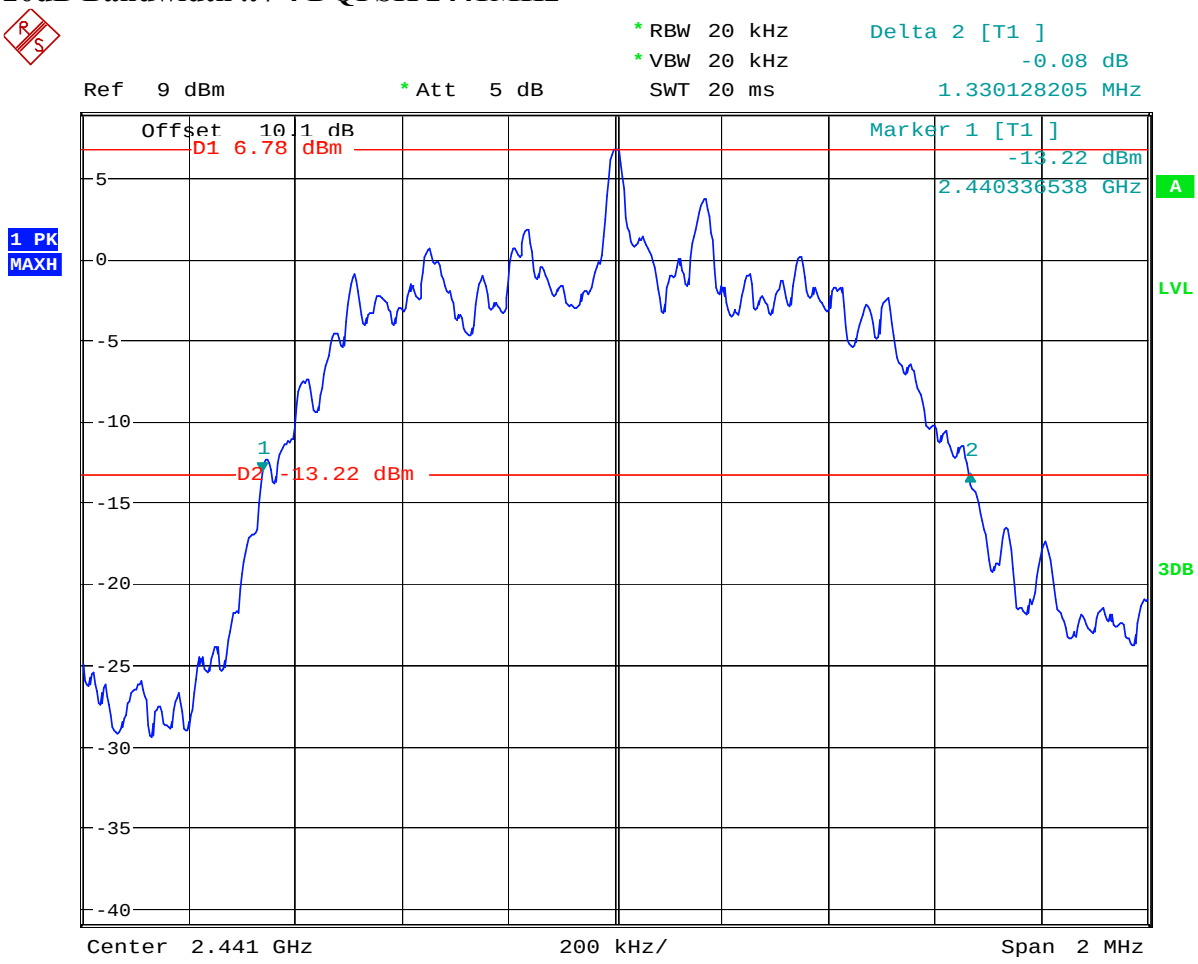
Date: 3.MAY.2010 16:26:21

20dB Bandwidth π / 4 DQPSK 2402MHz



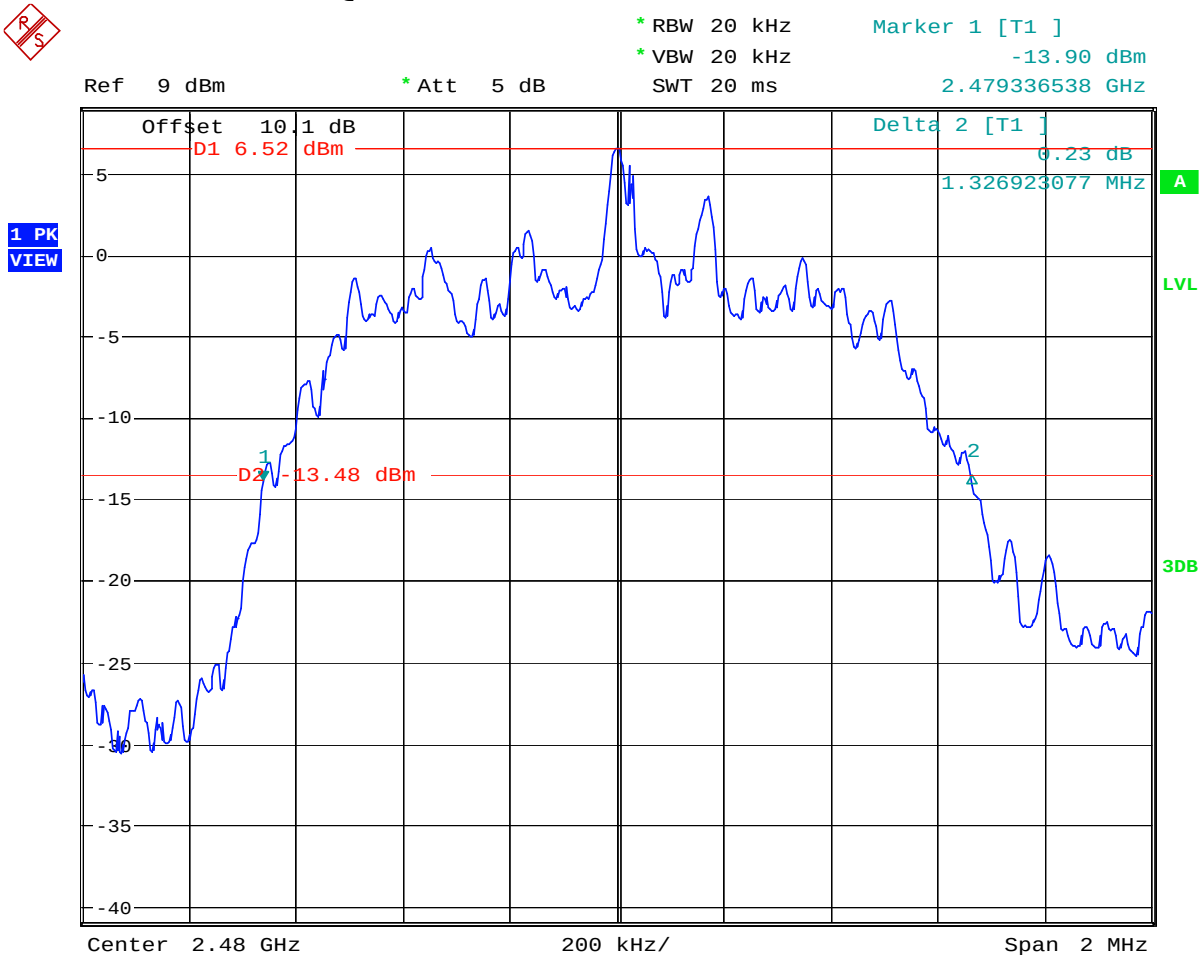
Date: 3.MAY.2010 16:31:32

20dB Bandwidth π / 4 DQPSK 2441MHz



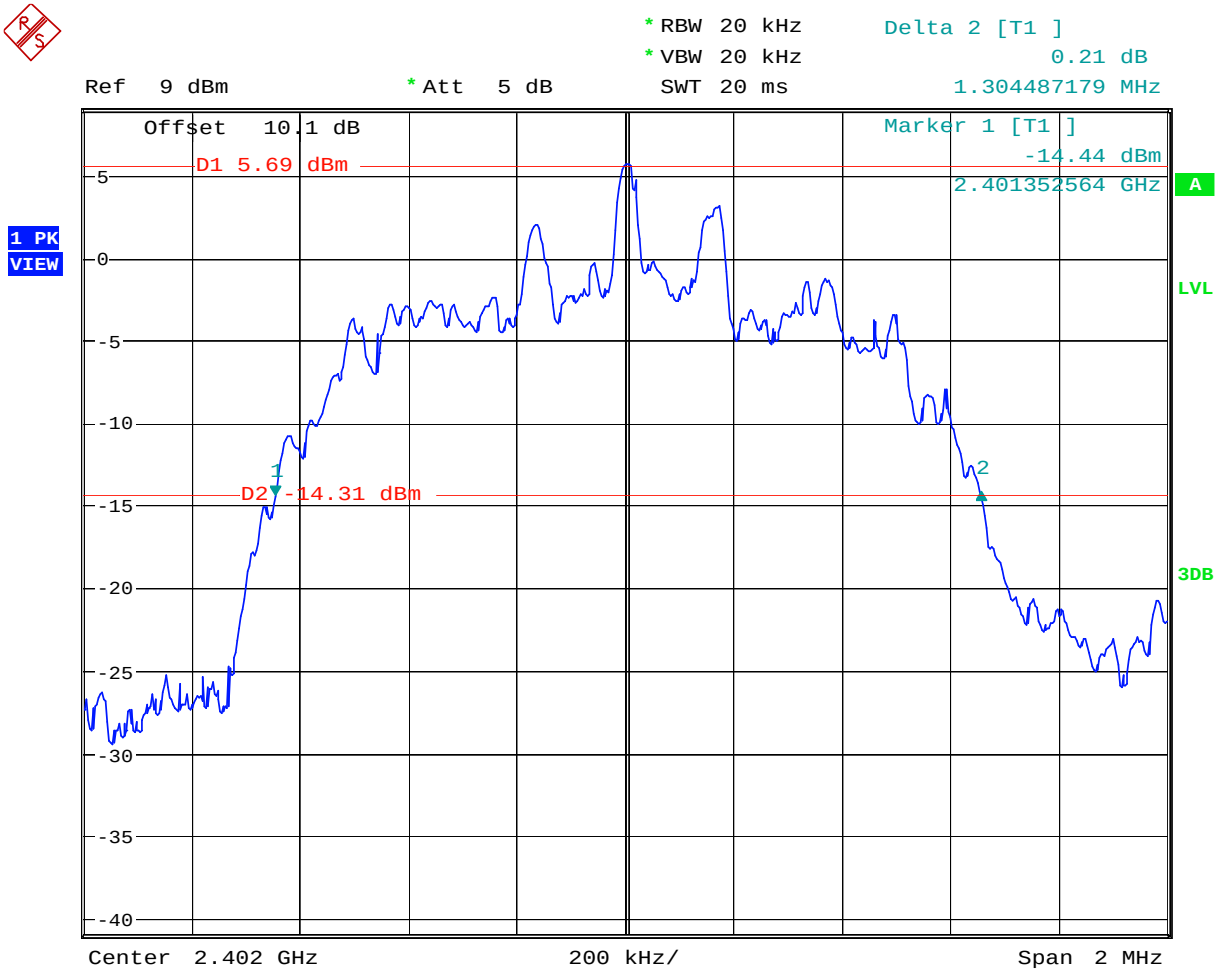
Date: 3.MAY.2010 16:36:49

20dB Bandwidth π / 4 DQPSK 2480MHz



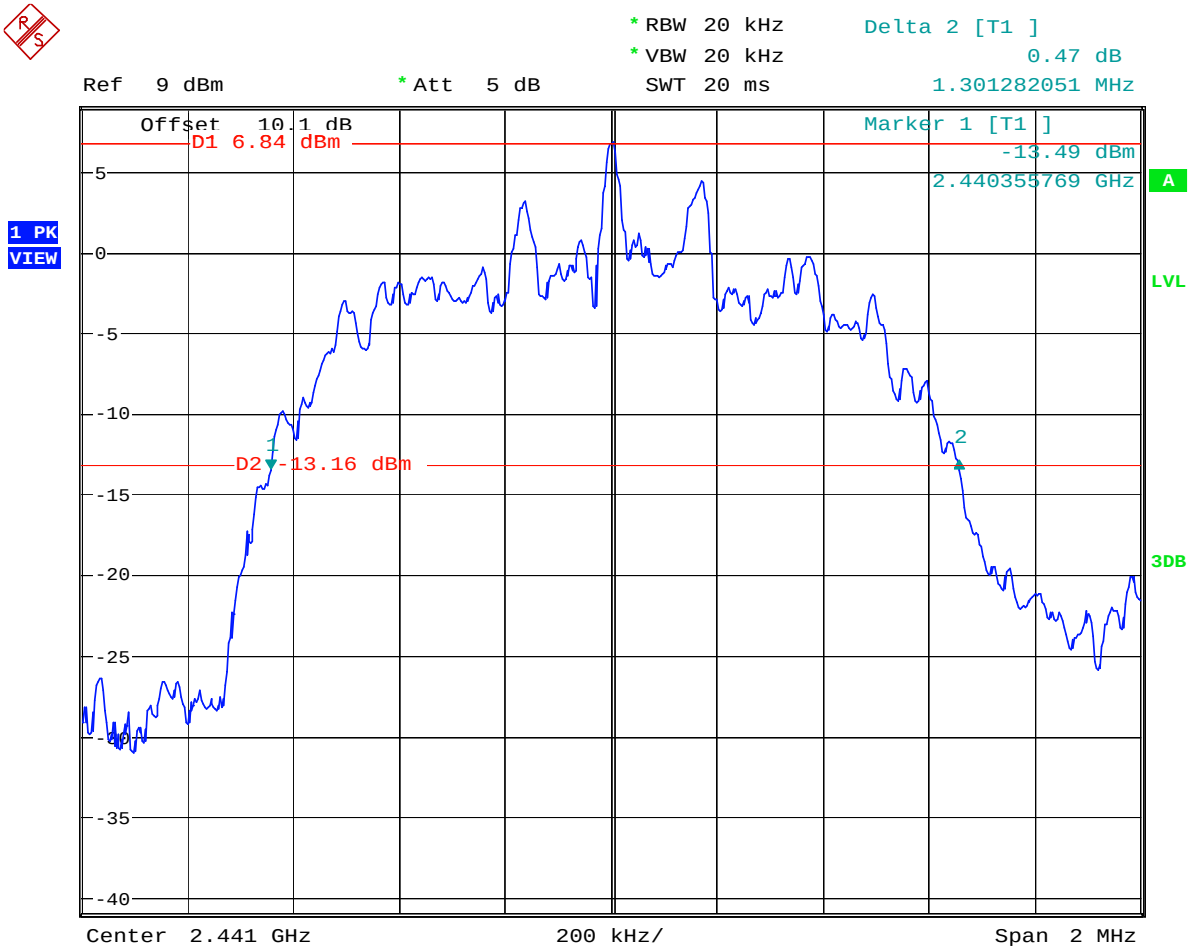
Date: 3.MAY.2010 16:38:54

20dB Bandwidth 8PSK 2402MHz



Date: 3.MAY.2010 16:44:30

20dB Bandwidth 8PSK 2441MHz



Date: 3.MAY.2010 16:46:49

20dB Bandwidth 8PSK 2480MHz

Date: 3.MAY.2010 16:41:54

5.6 Carrier Frequency Separation

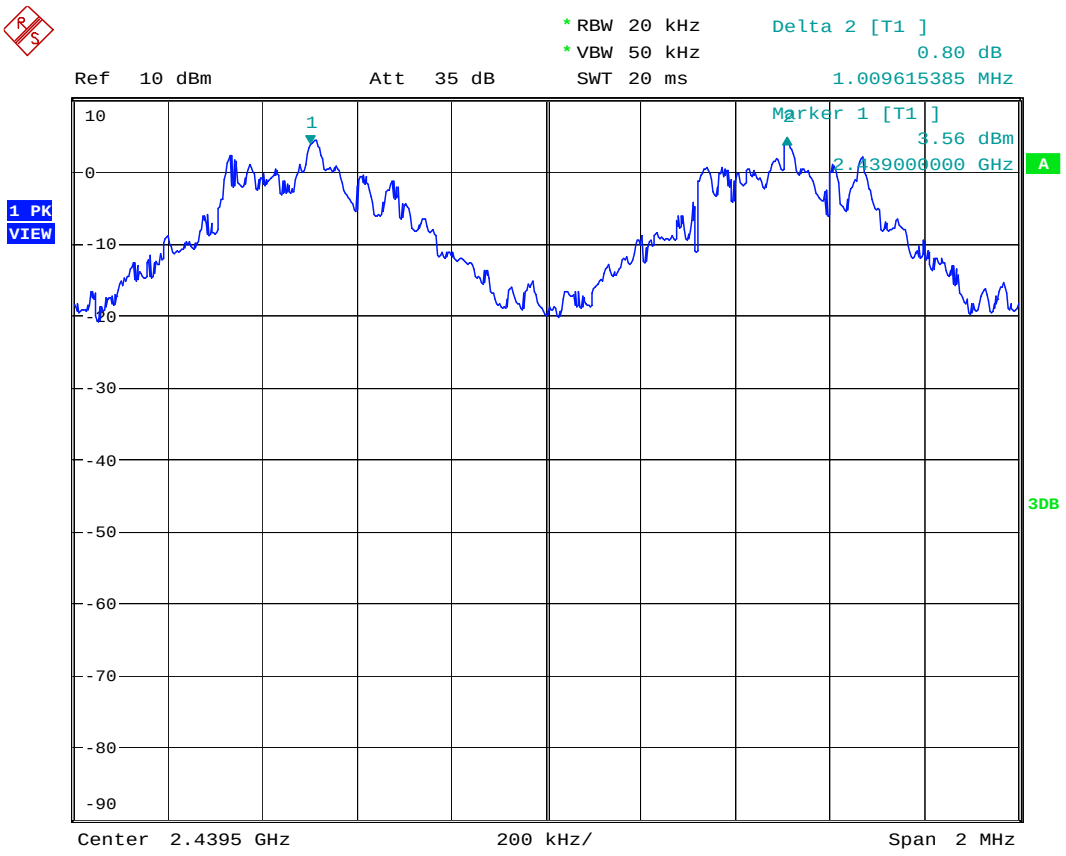
5.6.1 Limits: § 15.247 (a) (1)

Minimum 25kHz or 2/3 of the 20dB bandwidth of the hopping system

5.6.2 Test Result:

Modulation: GFSK
Channel Separation: 1.0096 MHz

5.6.3 Test Data/plot:



Date: 3.MAY.2010 17:26:52

5.7 Number of hopping channels

5.7.1 Limits: § 15.247 (a) (1)

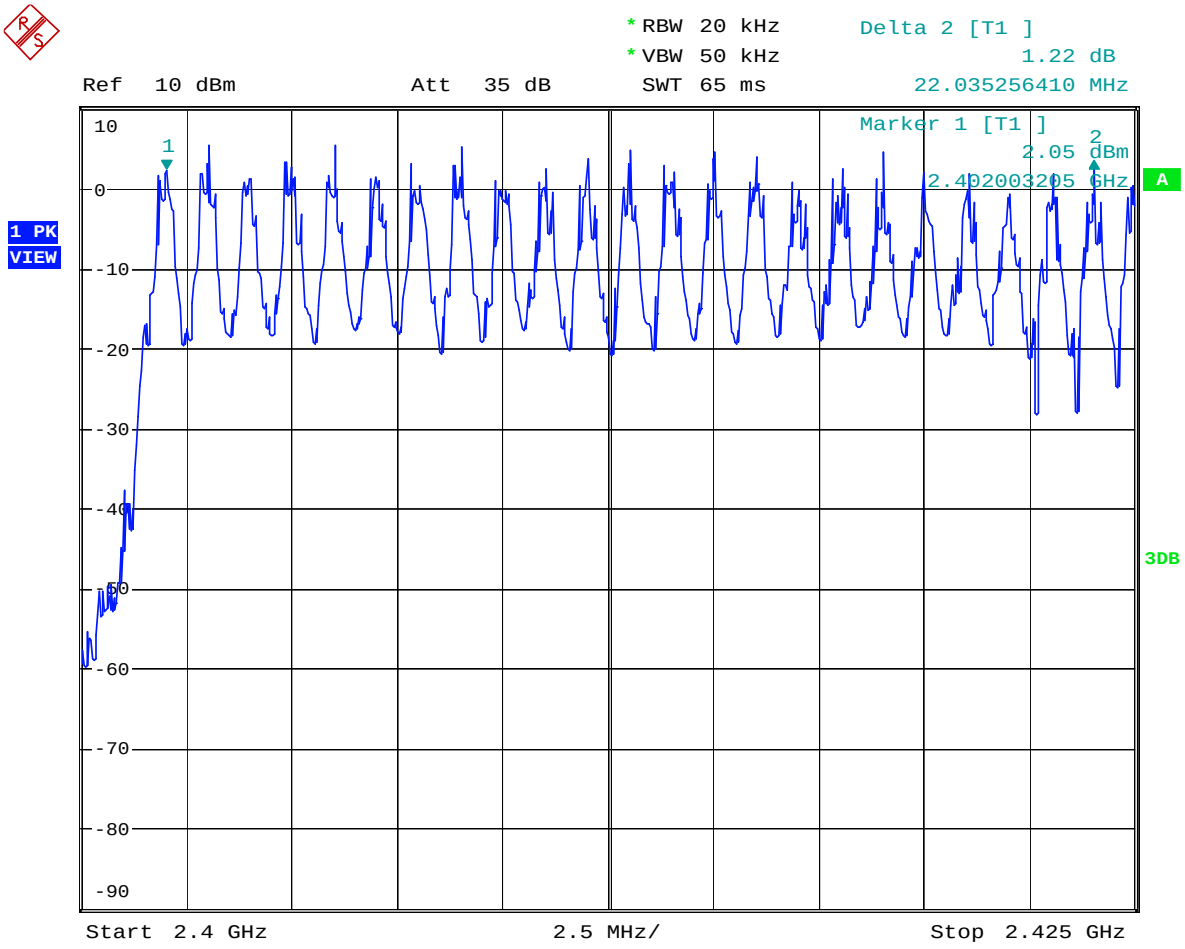
Atleast 15 non-overlapping channels

5.7.2 Test Result:

Modulation: GFSK
Number of hopping channels: 79

Channel 0 to Channel 22

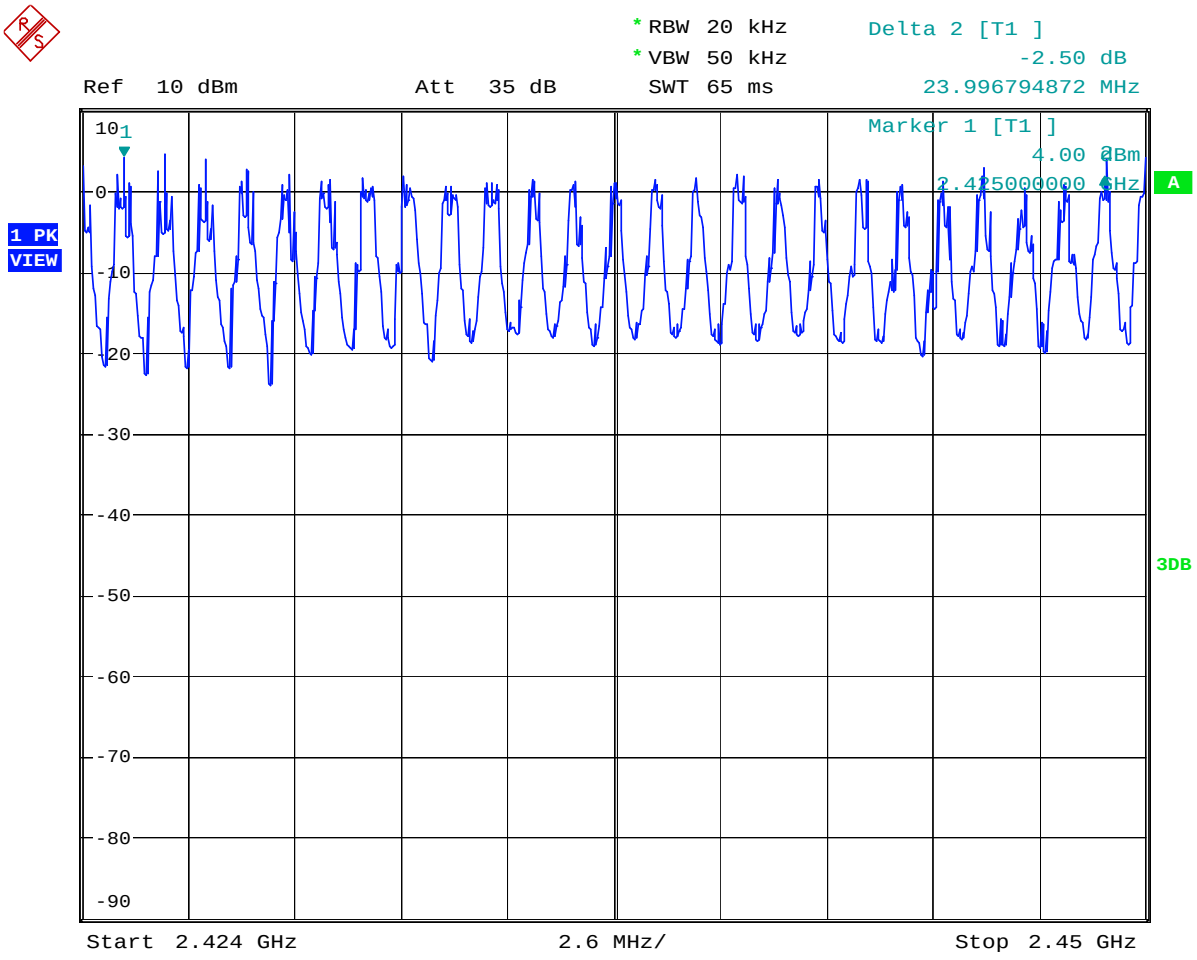
No. of Channels: 23



Date: 3.MAY.2010 17:29:40

Channel 23 to Channel 47

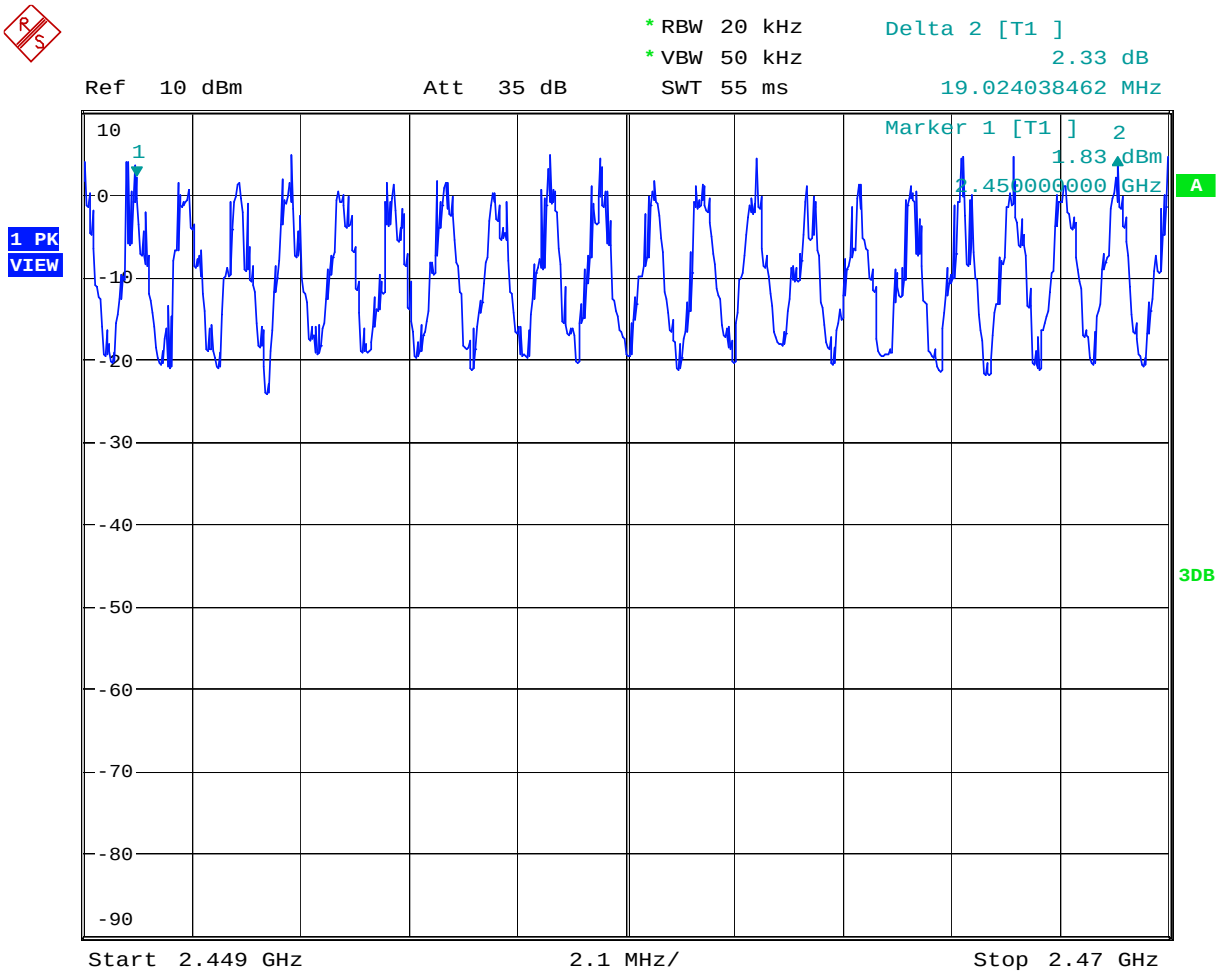
No of Channels: 25



Date: 3.MAY.2010 17:32:30

Channel 48 to Channel 67

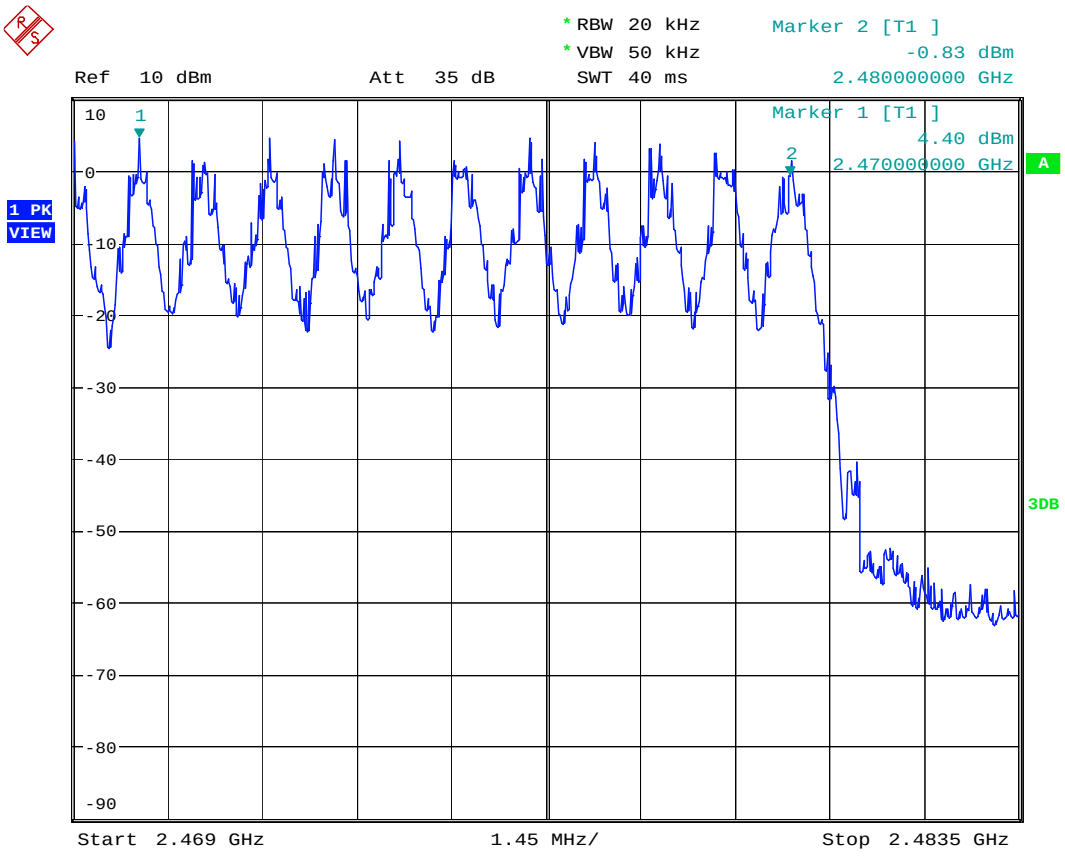
No of Channels: 20



Date: 3.MAY.2010 17:35:04

Channel 68 to Channel 78

No of Channels: 11



Date: 3.MAY.2010 17:37:02

5.8 Time of occupancy (Dwell time)

5.8.1 Limits: § 15.247 (a) (1) (iii)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

5.8.2 Test Result:

For Bluetooth devices:

The dwell time of 0.4 s within a 31.6 second period in data mode is independent from the packet type (packet length). The calculation for a 31.6 second period is a follows:

Dwell time = time slot length * hop rate / number of hopping channels *31.6 s

Example for a DH1 packet (with a maximum length of one time slot)
Dwell time = 625 µs * 1600 1/s / 79 * 31.6 s = 0.4 s (in a 31.6 s period)

For multi-slot packet the hopping is reduced according to the length of the packet.
Example for a DH5 packet (with a maximum length of five time slots)
Dwell time = 5 * 625 µs * 1600 * 1/5 *1/s / 79 * 31.6 s = 0.4 s (in a 31.6 s period)

This is according to Bluetooth Core Specification for all Bluetooth devices. Therefore all BT devices satisfy FCC requirement on time of occupancy (dwell time) in the data mode.

5.9 Power Spectral Density (Hybrid system in Inquiry mode/ Page scan)

5.9.1 Limits: § 15.247 (e)

For digitally modulated systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

5.9.2 Test Result:

Not Applicable.

5.10 Transmitter Spurious Emissions- Conducted

5.10.1 Limits: § 15.247 (d)

30dBm for the transmitter.
-20dBc in the frequency range 30MHz- 25GHz.

5.10.2 Test Conditions:

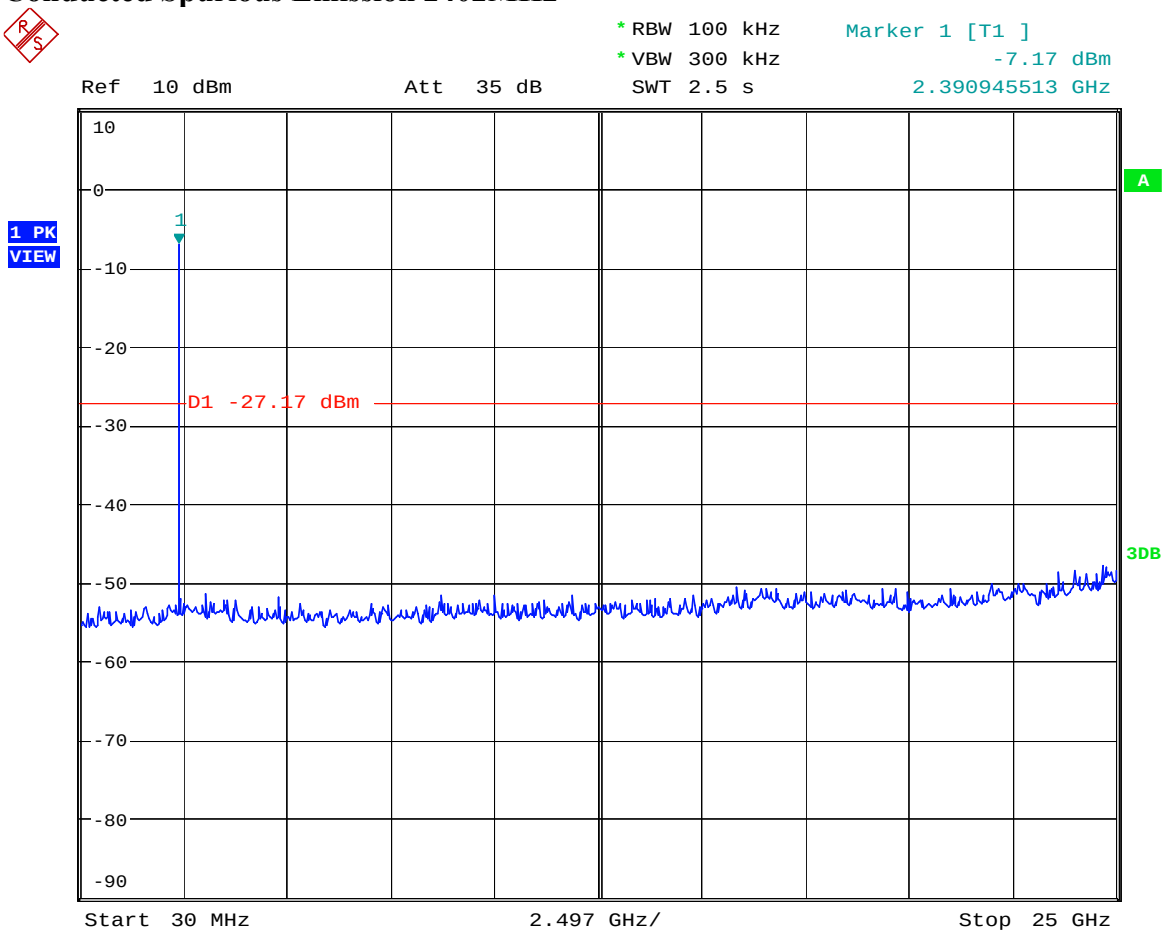
Modulation: GFSK
Analyzer settings: F<1GHz: RBW=VBW=100 kHz
F>1GHz: RBW=VBW=1 MHz

5.10.3 Test data/ plots:

Conducted Spurious Emissions			
Channel	**Frequency (MHz)**	**Amplitude (dBm)**	**Limits**
Low	**2402**	-7.17	30dBm
	No critical peaks		-20dBc
Mid	**2441**	-4.03	30 dBm
	No critical peaks		-20dBc
High	**2480**	-3.46	30 dBm
	No critical peaks		-20dBc
Measurement Uncertainty: ±1 dB			

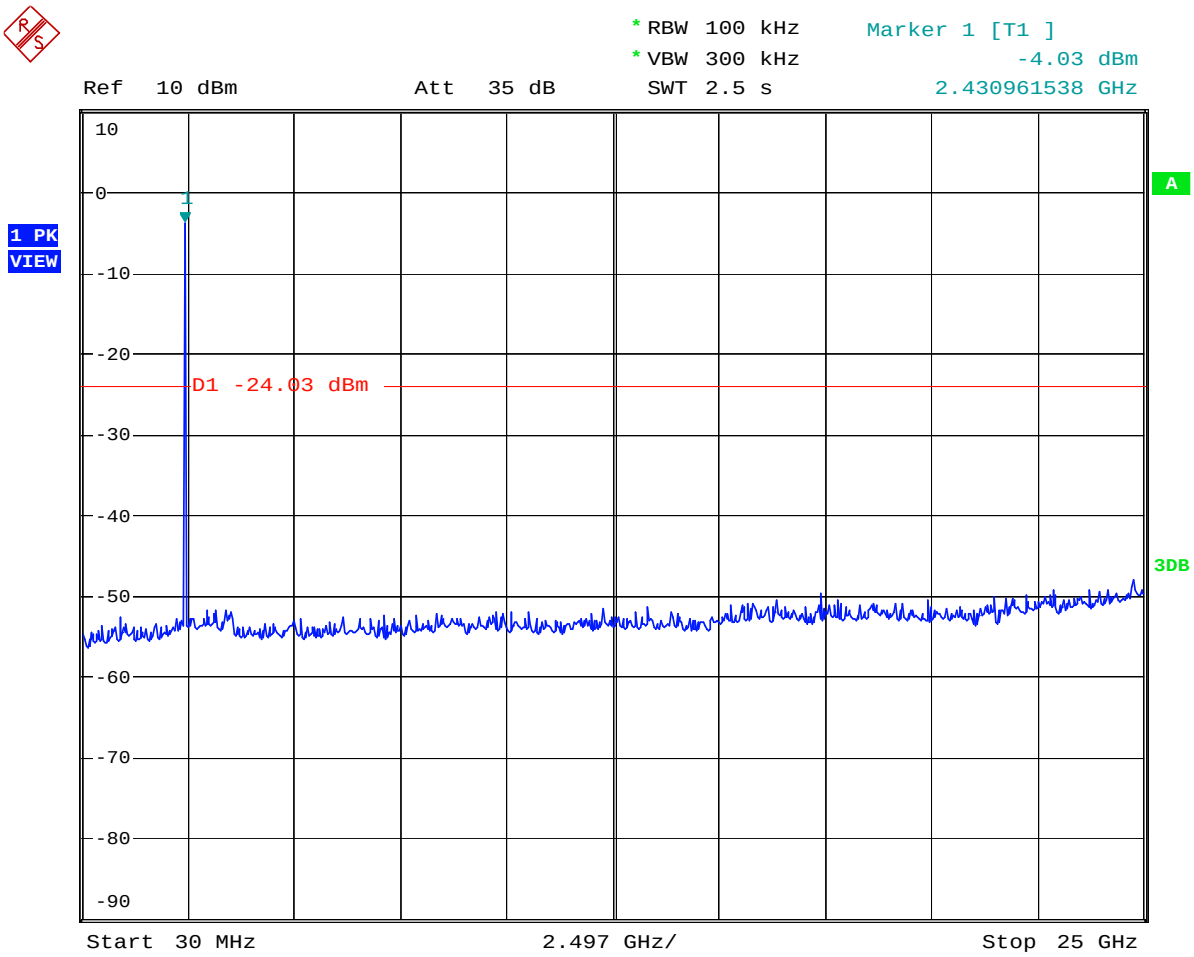
5.10.4 Test data/ plots:

Conducted Spurious Emission 2402MHz



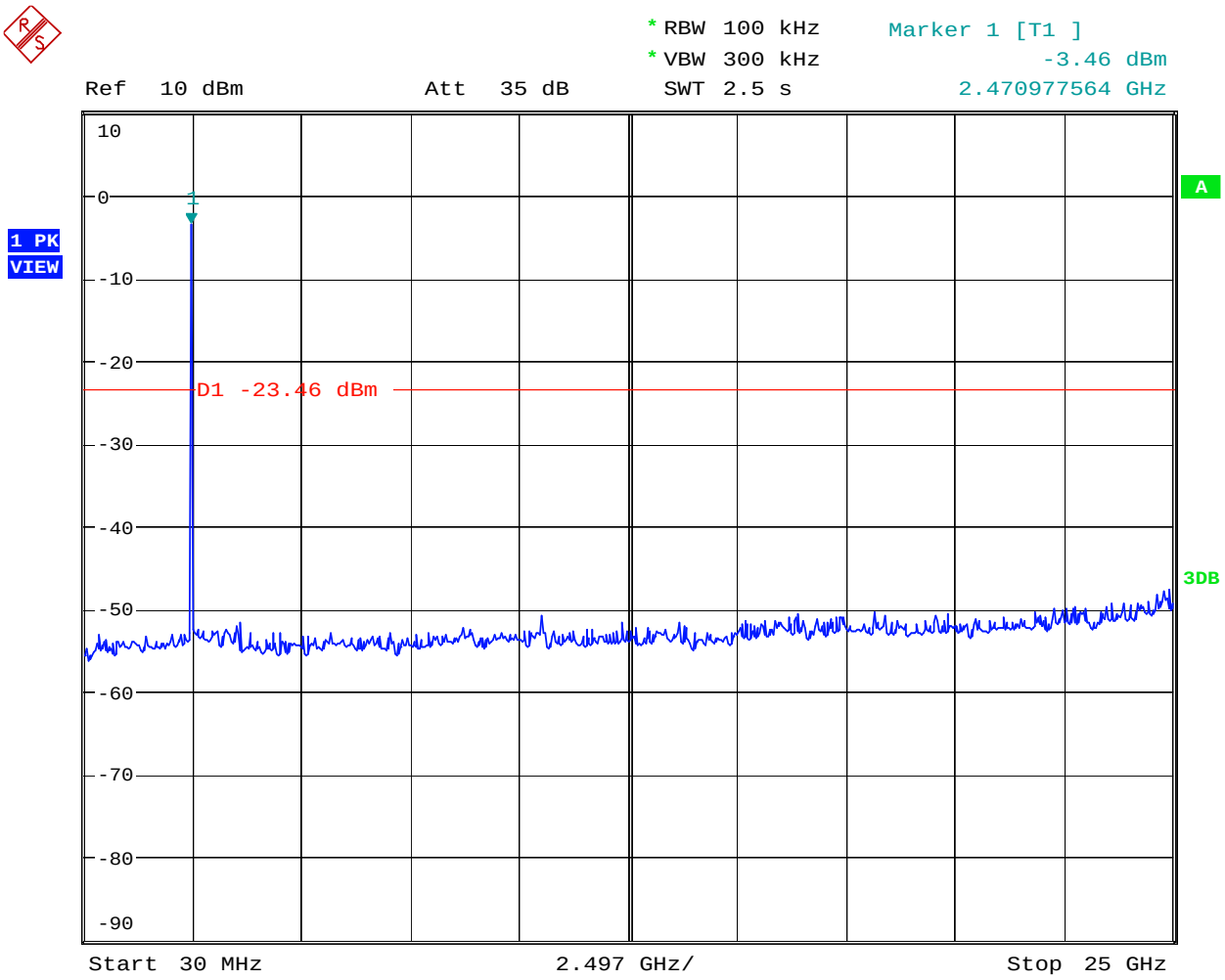
Date: 3.MAY.2010 16:50:56

Conducted Spurious Emission 2441 MHz



Date: 3.MAY.2010 16:49:40

Conducted Spurious Emission 2480MHz



Date: 3.MAY.2010 16:52:50

5.11 Transmitter Spurious Emissions- Radiated

5.11.1 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			

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).
*PEAK LIMIT= 74dBµV/m
*AVG. LIMIT= 54dBµV/m

5.11.2 Limits: §15.209

(For measurement distance of 3m)

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)

NOTE:
1. The radiated emissions were done with different settings, using the relevant pre-amplifiers for the relevant frequency ranges. This is the reason that the graphs show different noise levels. In the range between 3 and 25 GHz very short cable connections to the antenna was used to minimize the noise level.

2. All measurements are done in Peak mode using an Average limit, unless specified within the plots.

5.11.3 Limits: §15.209

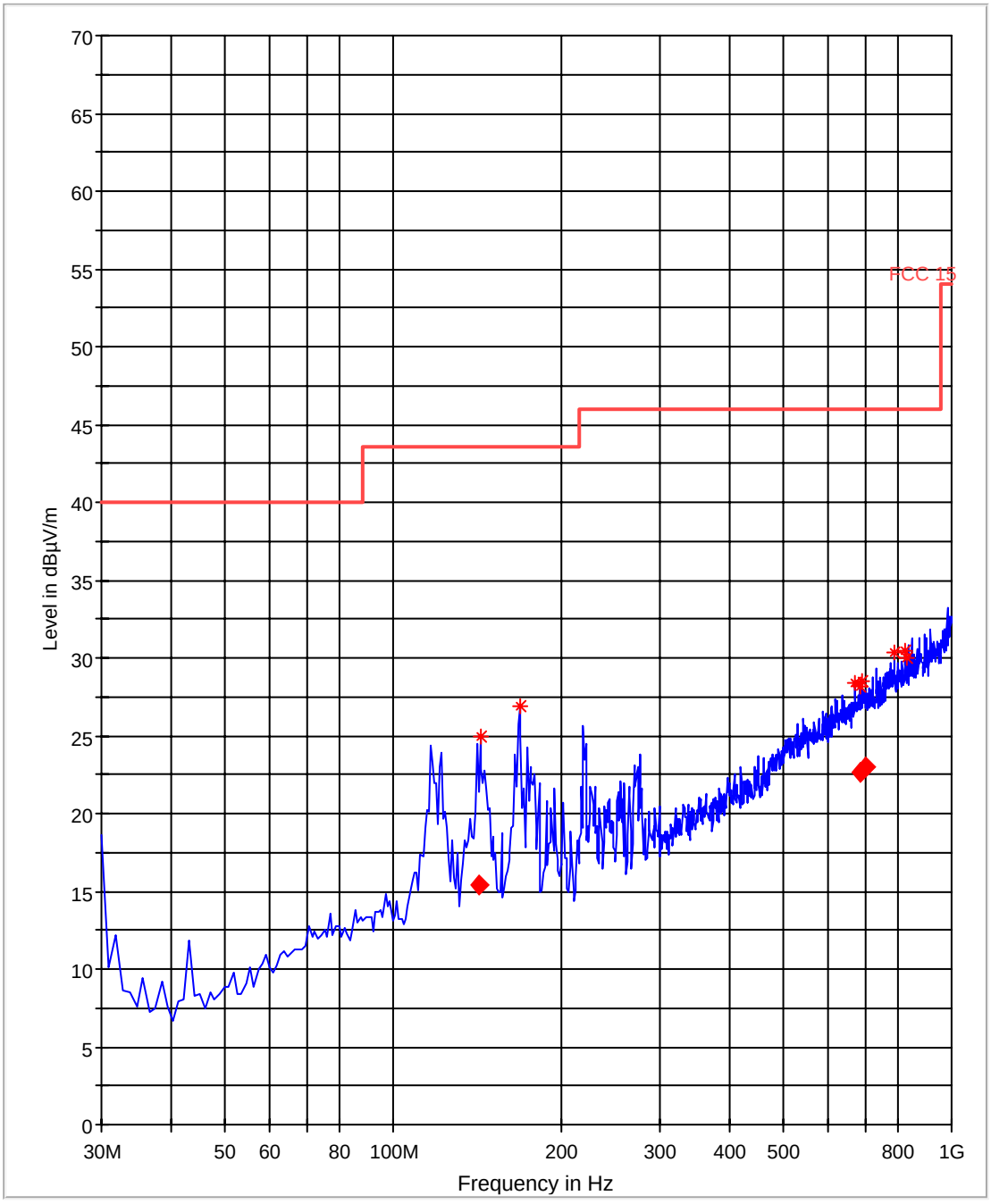
Frequency of emission (MHz)	Field strength (µV/m)	Measurement Distance (m)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30

5.11.4 Test Result:
No significant emissions measurable. Plots reported here represent the worse case emissions.

5.11.5 Test data/ plots:

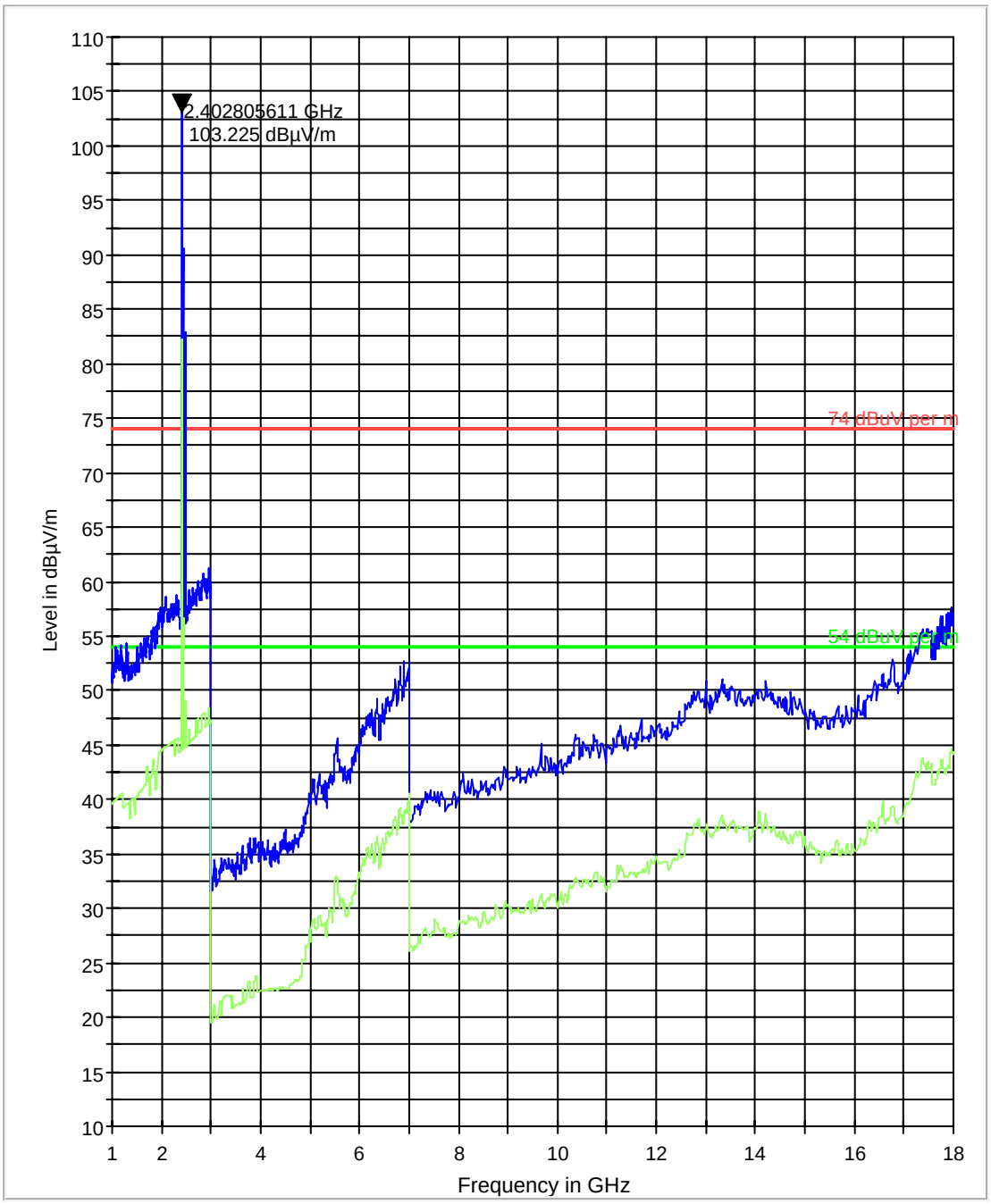
Radiated Spurious Emissions (8DPSK CH 0: 2402 MHz) Tx: Low Channel
Test results 30MHz-1GHz

FCC 15 30-1000MHz



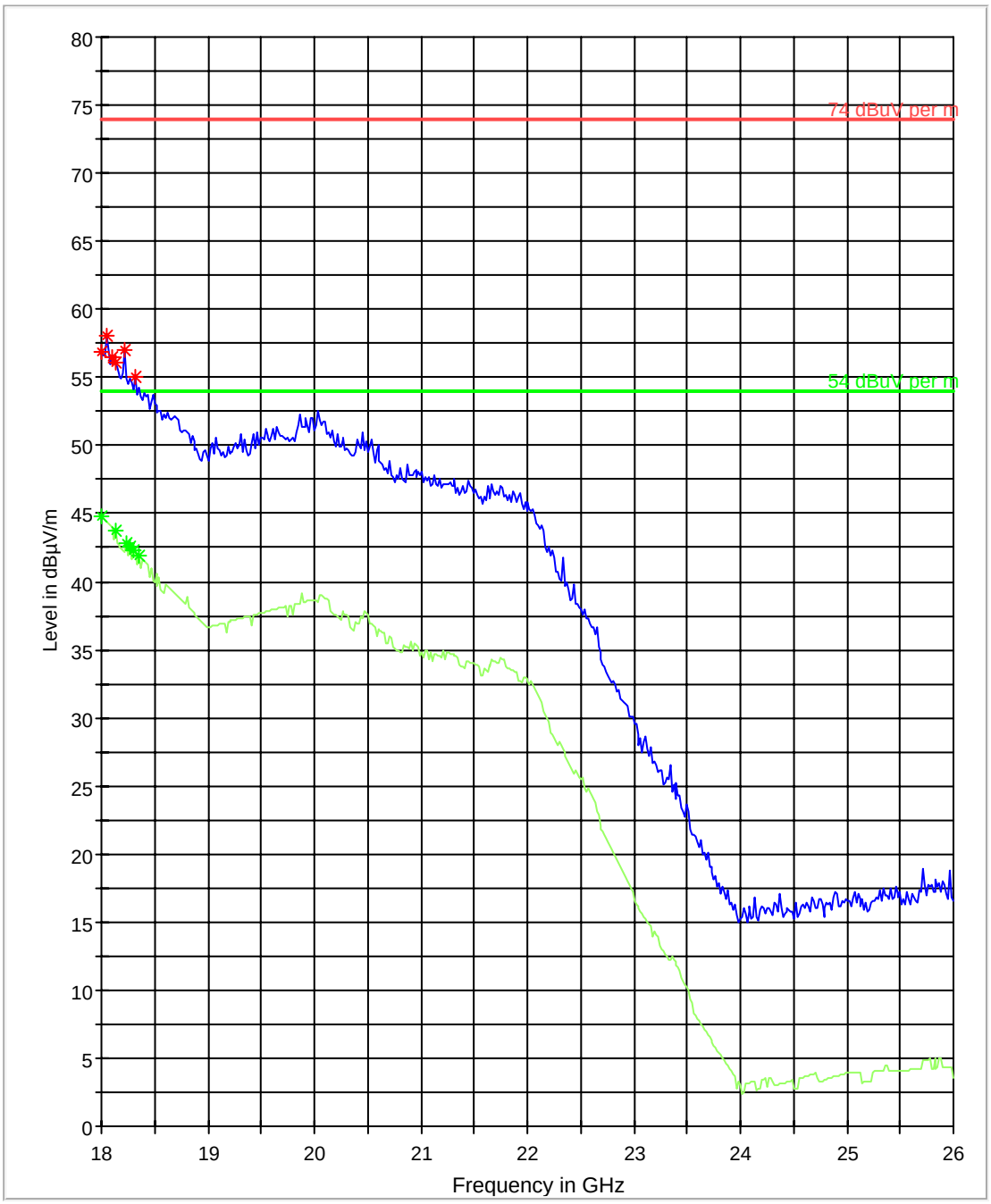
Test results 1GHz-18GHz
Marker placed on transmit signal

FCC 15 1-18GHz



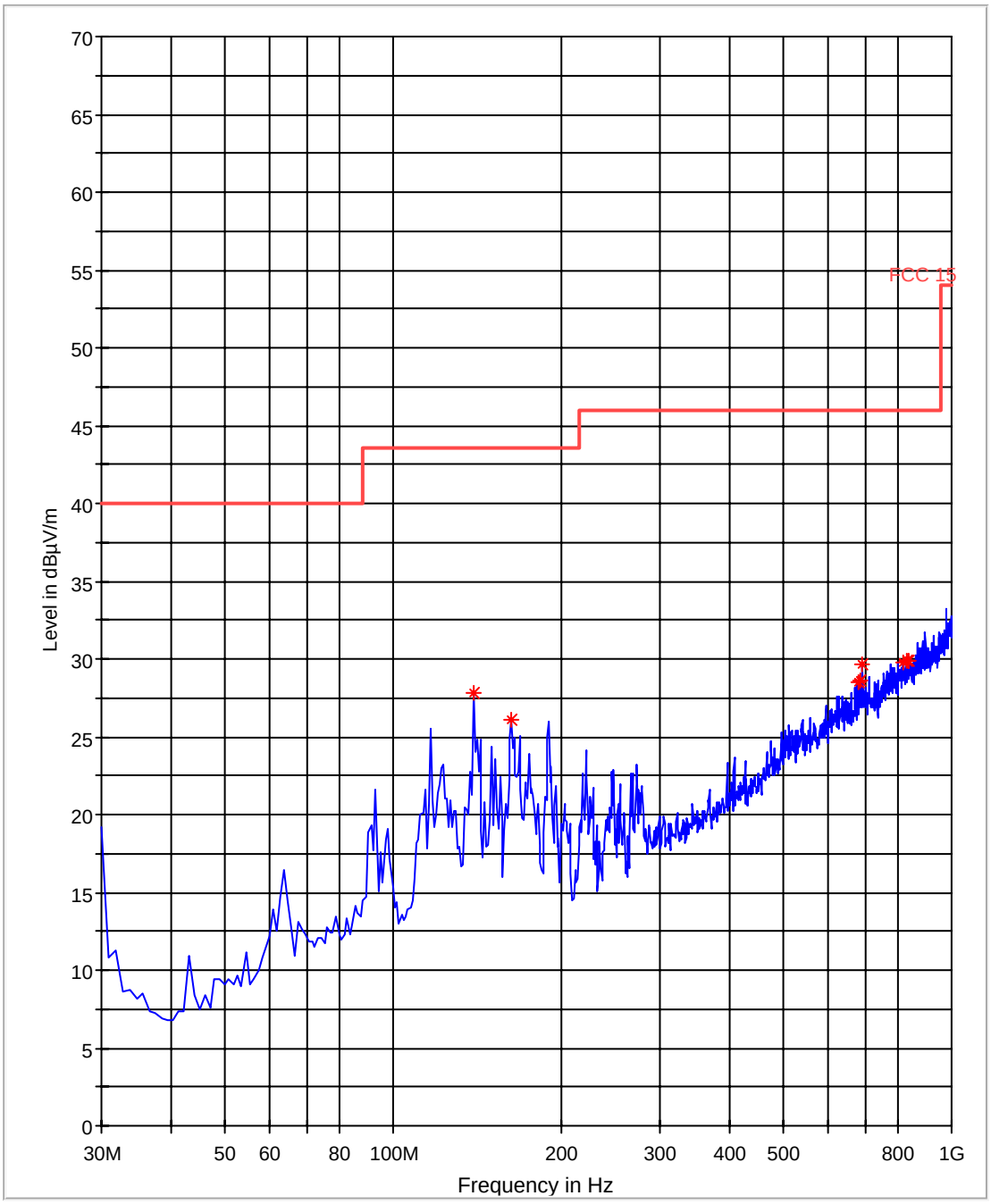
Test results 18GHz-26.5GHz

FCC 15 18-26GHz



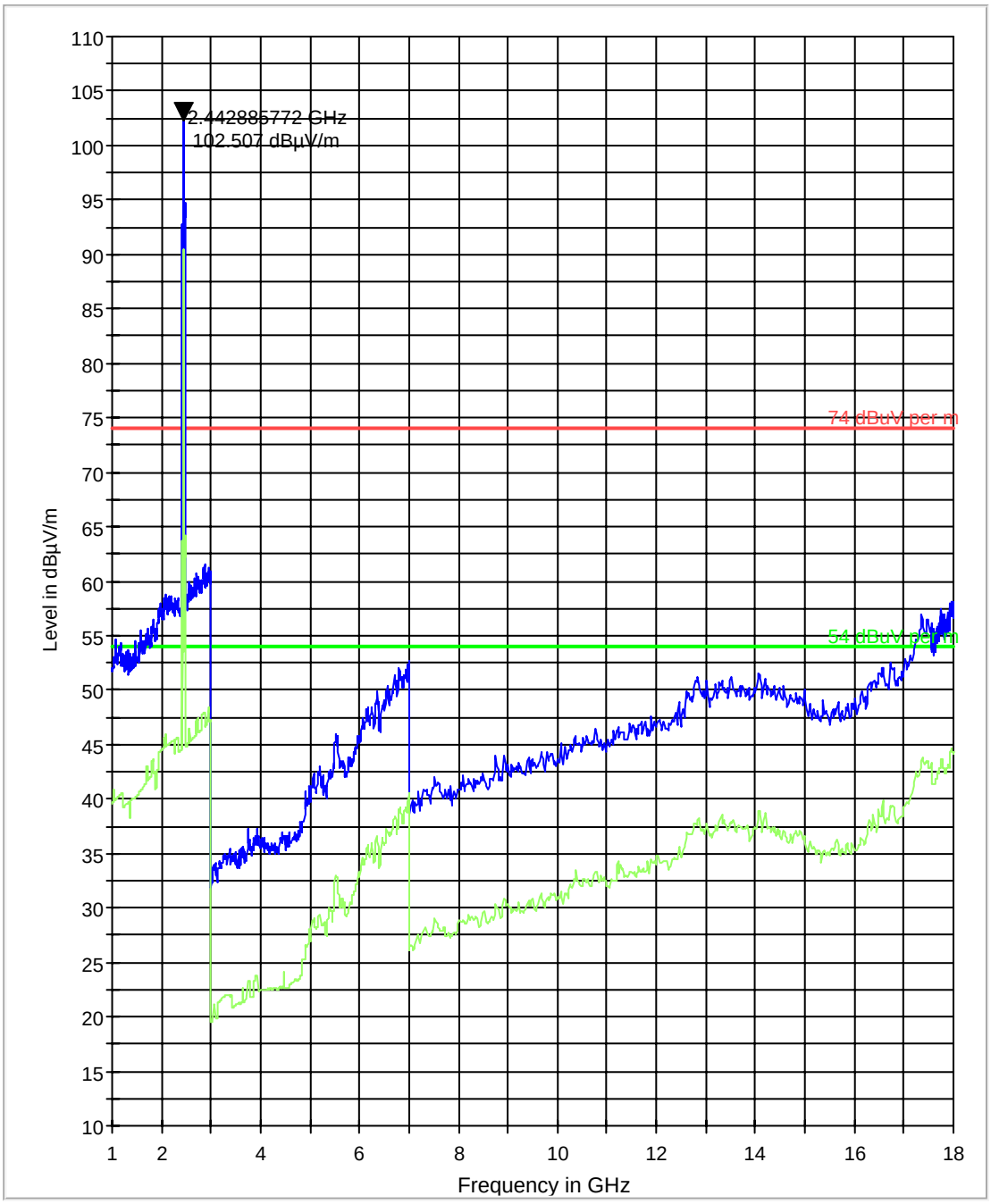
Radiated Spurious Emissions (CH 39: 2441 MHz) Tx: Mid Channel
Test results 30MHz-1GHz

FCC 15 30-1000MHz



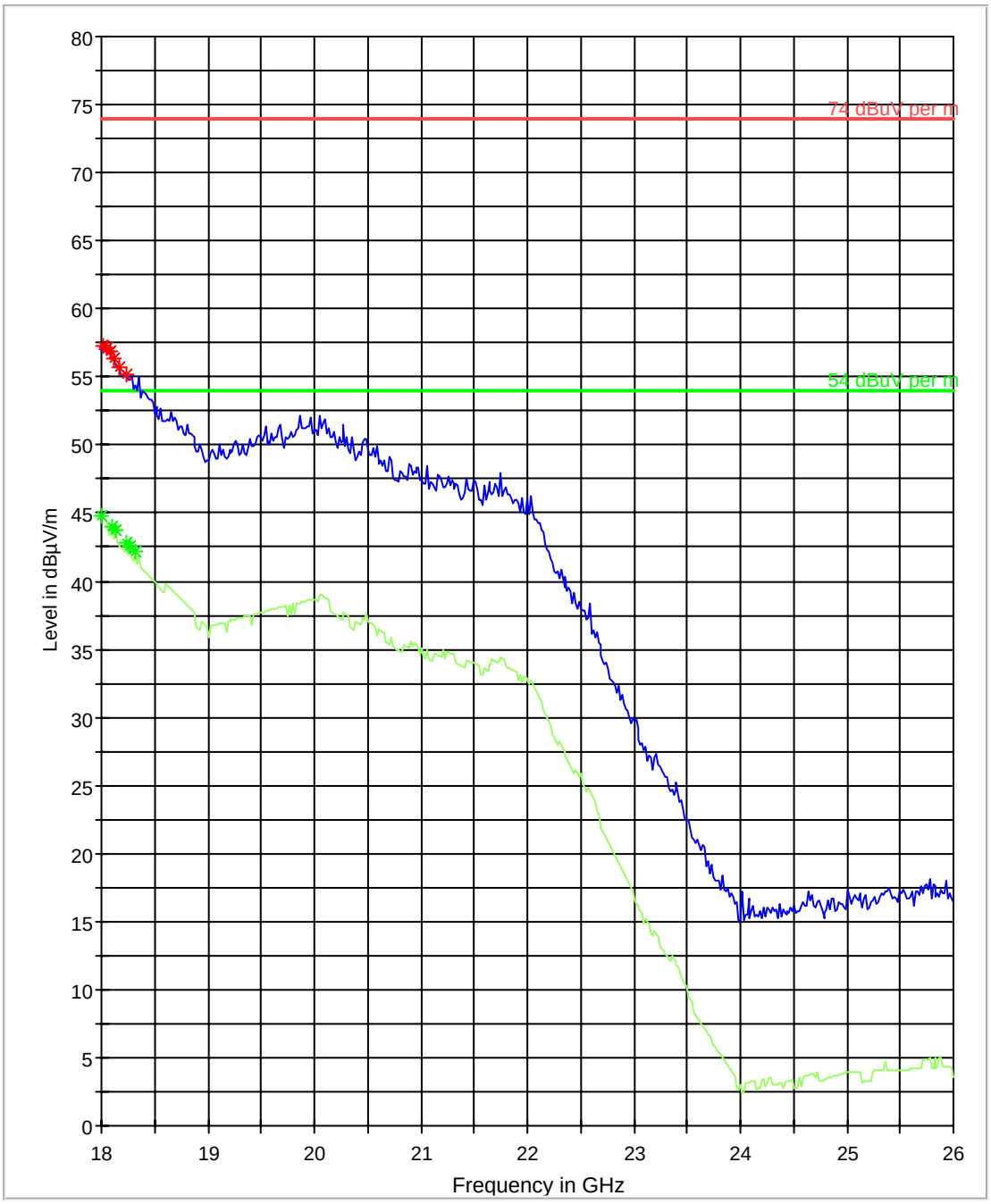
Test results 1GHz-18GHz
Marker placed on transmit signal

FCC 15 1-18GHz



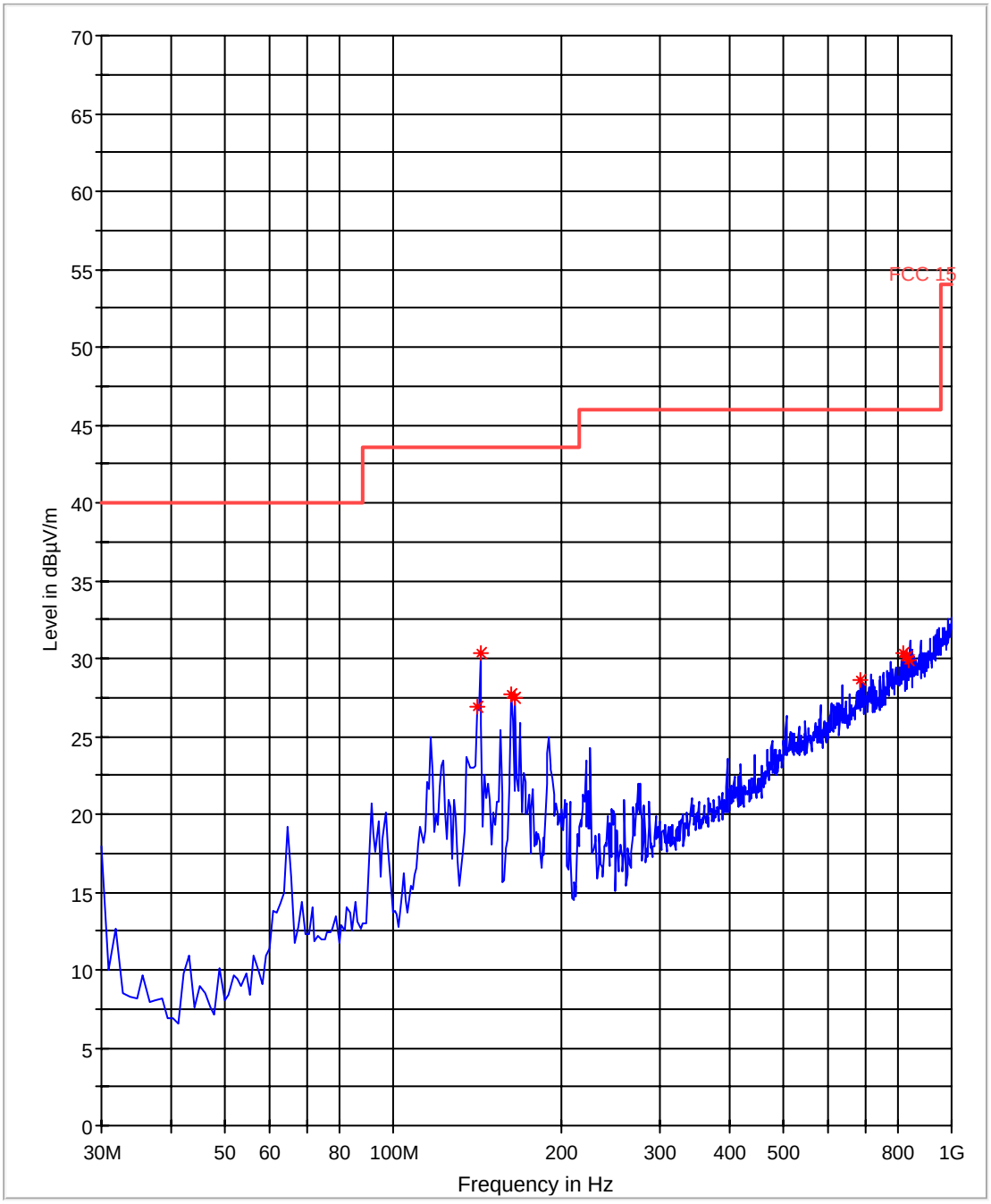
Test results 18GHz-26.5GHz

FCC 15 18-26GHz



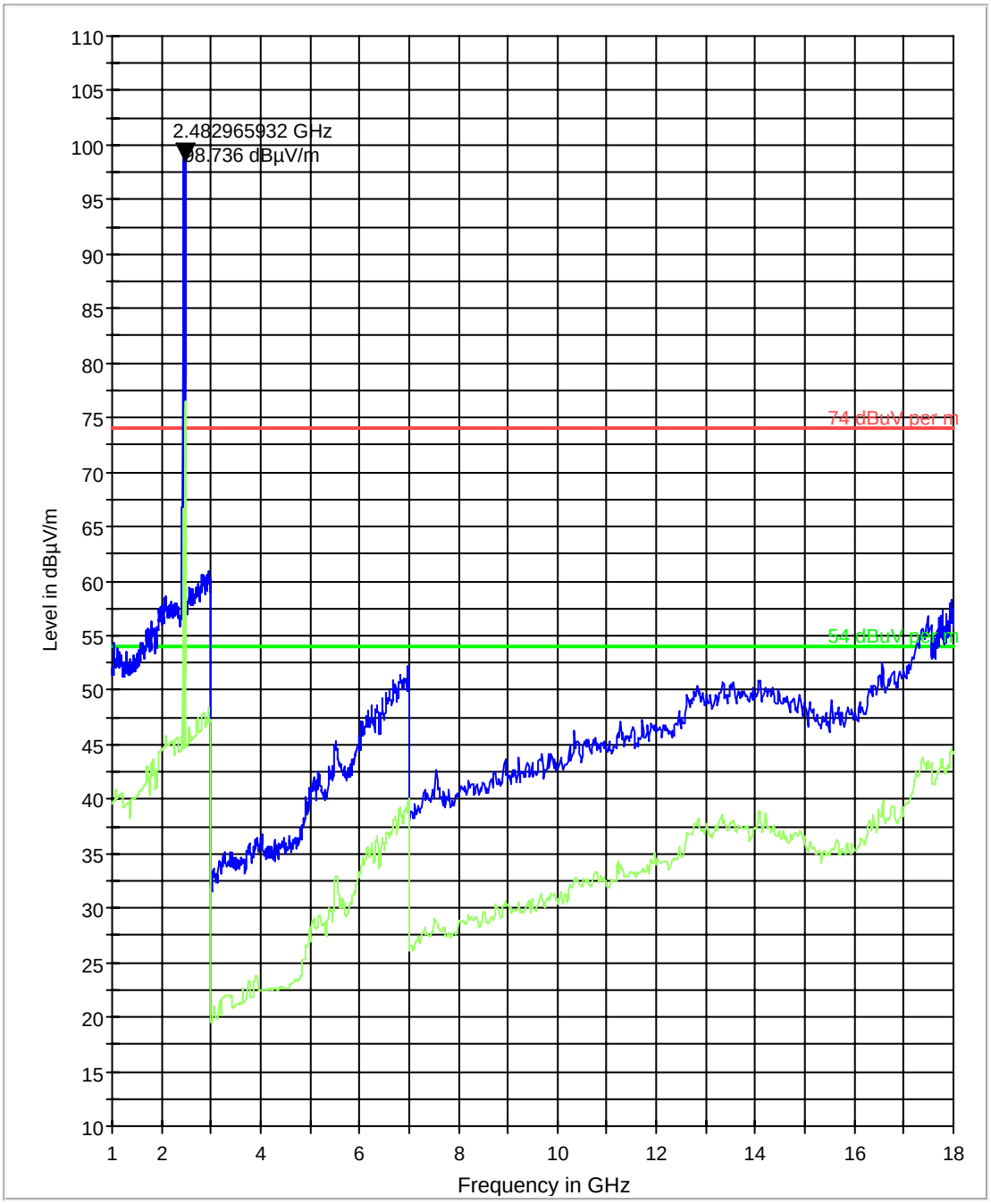
Radiated Spurious Emissions (CH 78: 2480 MHz) Tx: High Channel
Test results 30M-1GHz

FCC 15 30-1000MHz



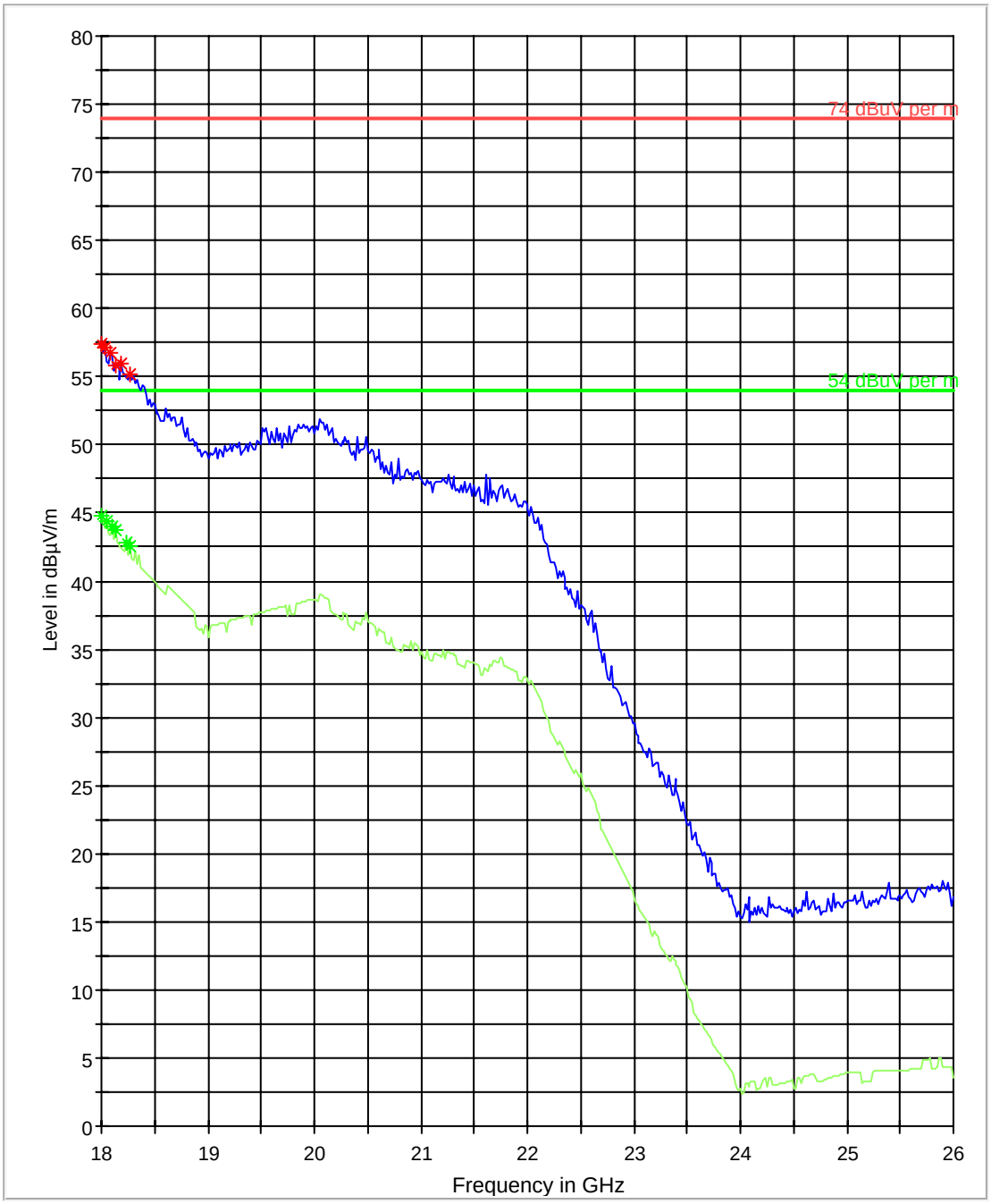
Test results 1GHz-18GHz
Marker placed on transmit signal

FCC 15 1-18GHz



Test results 18GHz-26.5GHz

FCC 15 18-26GHz



5.12 Receiver Spurious Emissions- Radiated

5.12.1 Limits: §15.109

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
30–88	100 (40dBµV/m)	3
88–216	150 (43.5 dBµV/m)	3
216–960	200 (46 dBµV/m)	3
Above 960	500 (54 dBµV/m)	3

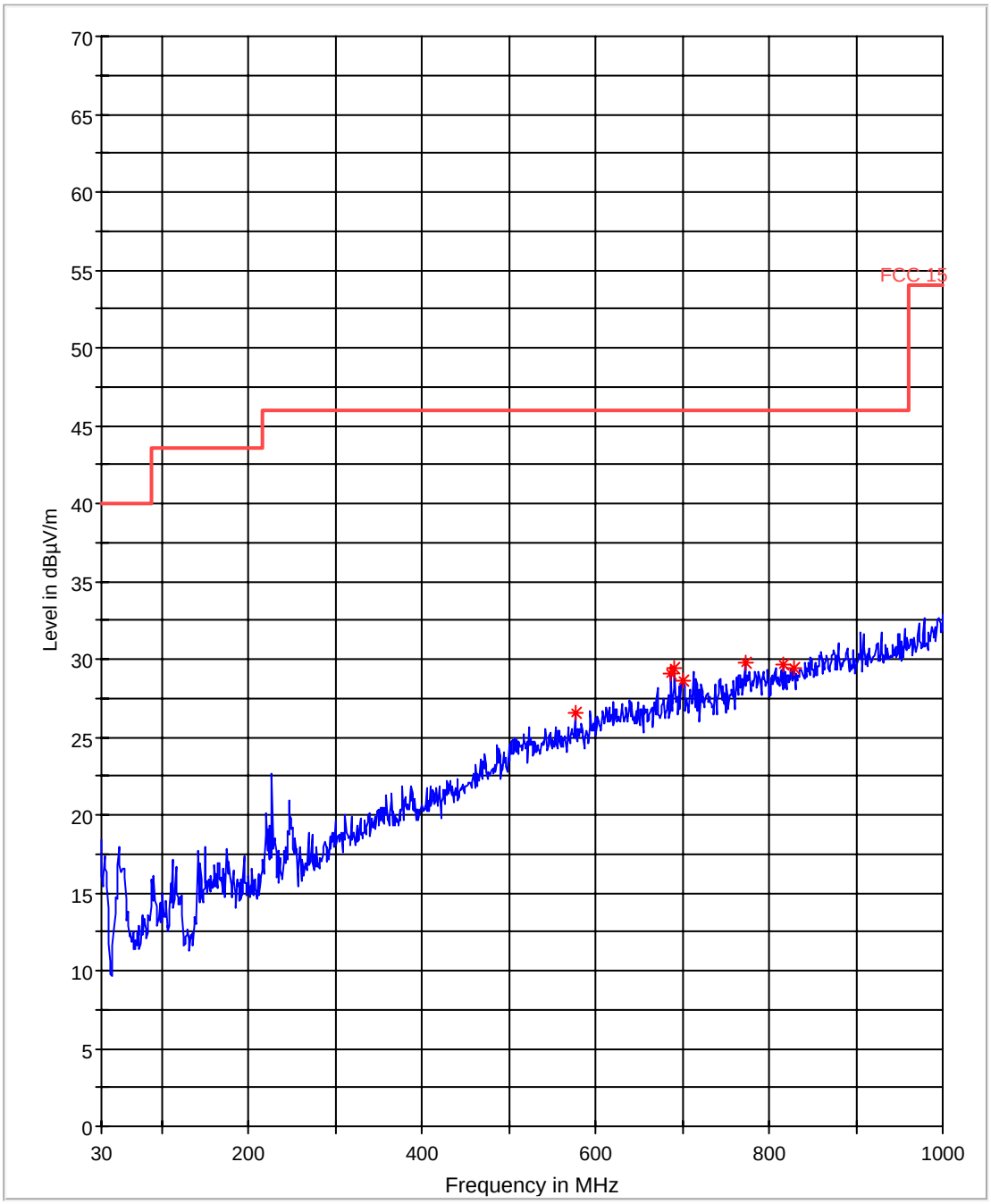
5.12.2 Test Conditions:
Modulation: GFSK

5.12.3 Test Result:
No significant emissions measurable. Plots reported here represent the worse case emissions.

5.12.4 Test data/ plots:

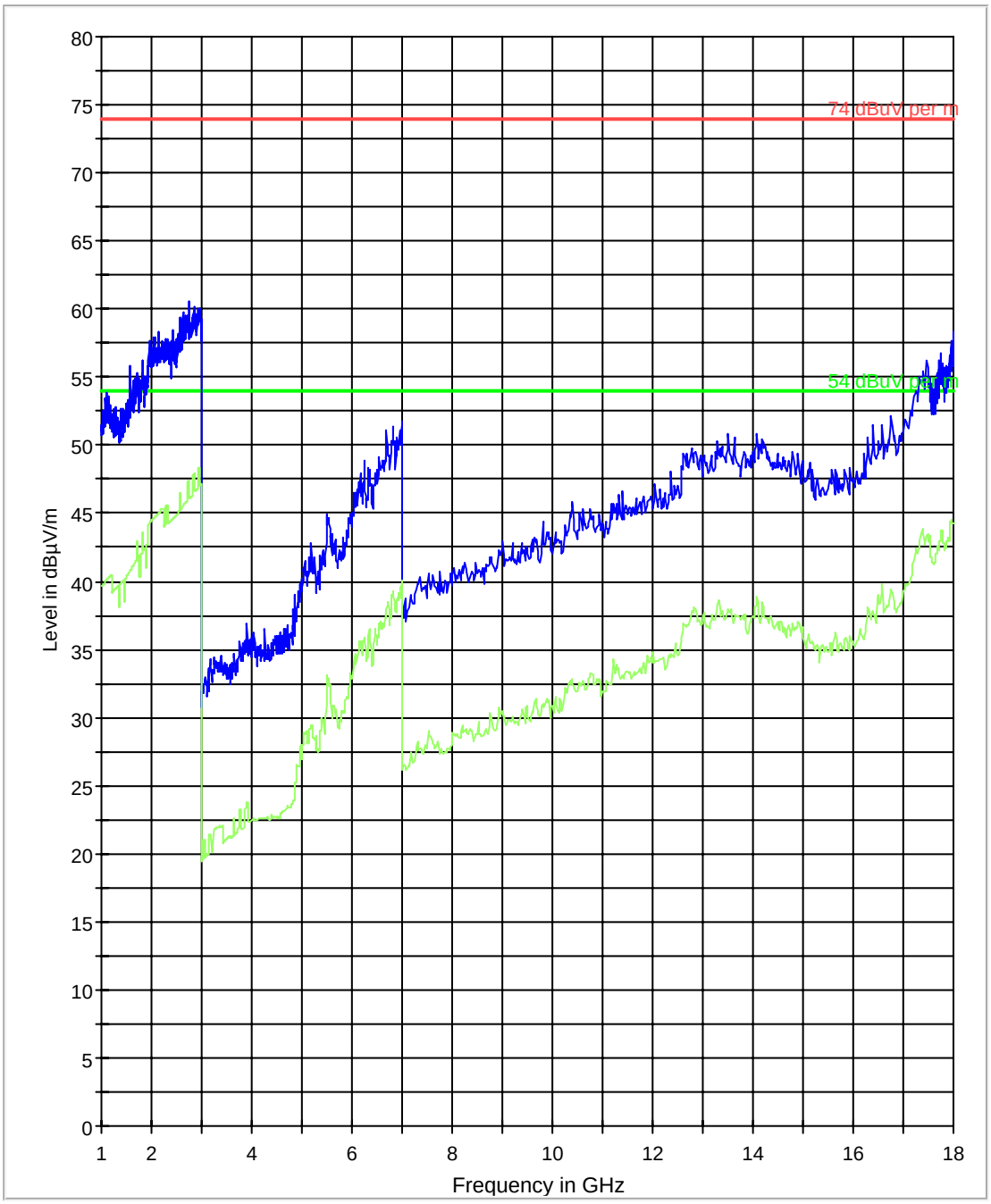
30MHz-1GHz

FCC 15 30-1000MHz



1GHz-18GHz

FCC 15 1-18GHz

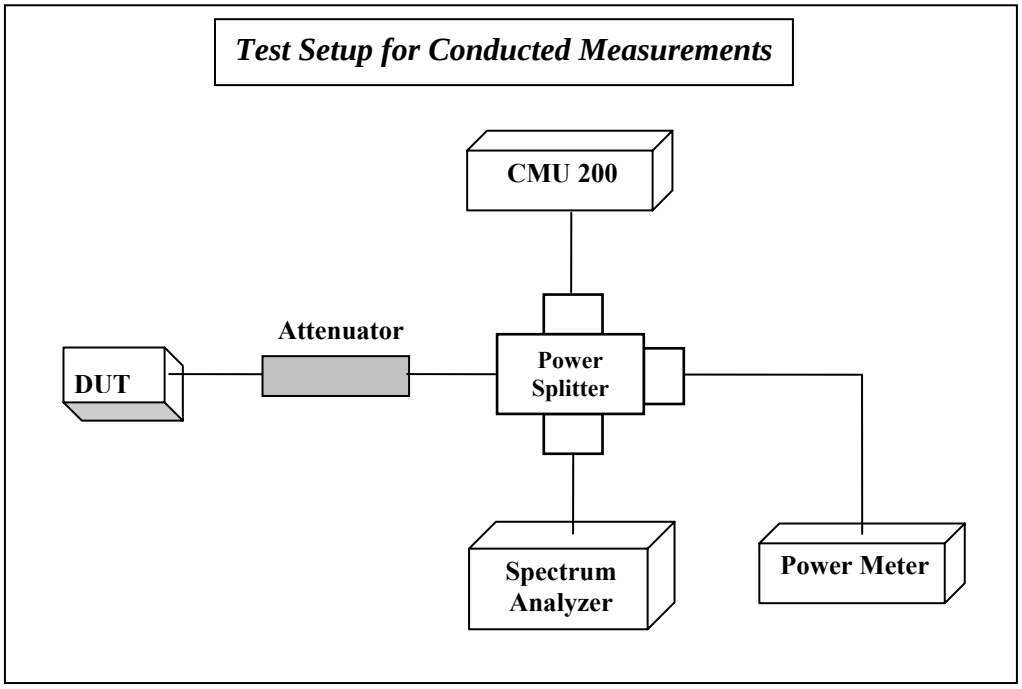


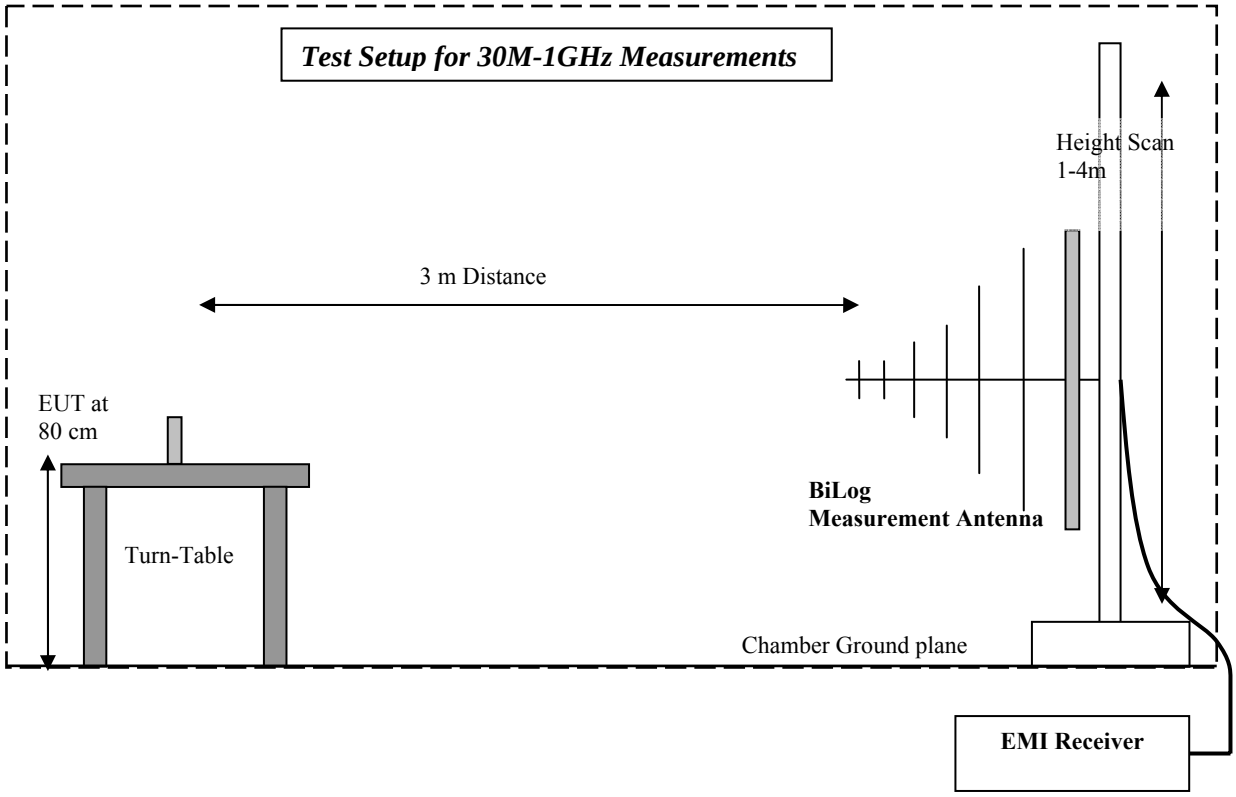
6 Test Equipment and Ancillaries used for tests

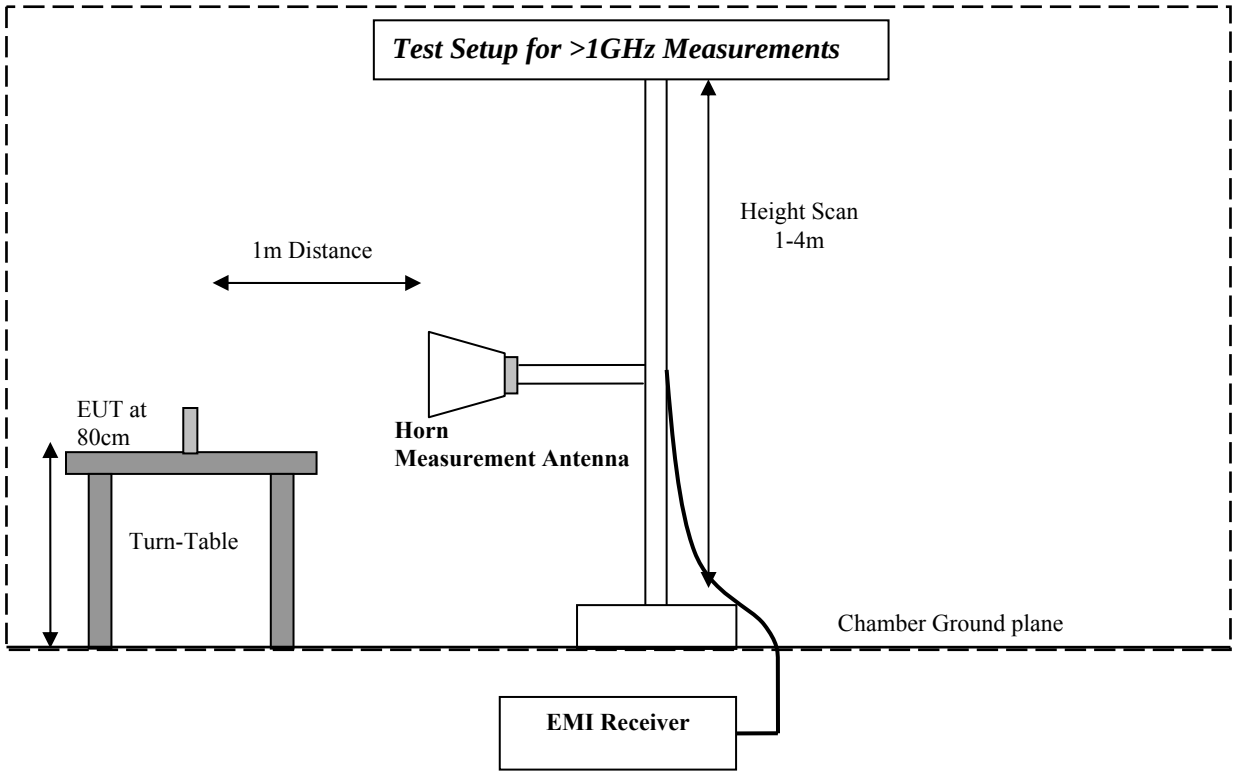
Instrument/Ancillary	Model	Manufacturer	Serial No.	Cal Date	Cal Interval
Radio Communication Tester	CMU 200	Rohde & Schwarz	101821	May 2009	1 year
Radio Communication Tester	CMU 200	Rohde & Schwarz	109879	May 2009	1 year
Radio Communication Tester	CMU 200	Rohde & Schwarz	110759	May 2009	1 year
Bluetooth Tester	CBT	Rohde & Schwarz	100212	May 2009	1 year
EMI Receiver/Analyzer	ESIB 40	Rohde & Schwarz	100107	May 2009	1 year
Spectrum Analyzer	FSU	Rohde & Schwarz	200302	Dec 2009	1 year
Loop Antenna	6512	EMCO	00049838	July 2008	2 years
Biconilog Antenna	3141	EMCO	0005-1186	June 2009	2 years
Horn Antenna (1-18GHz)	3115	ETS	00035111	Jan 2009	3 years
Horn Antenna (18-40GHz)	3116	ETS	00070497	Jan 2009	3 years
Communication Antenna	IBP5-900/1940	Kathrein	n/a	n/a	n/a
High Pass Filter	5HC2700	Trilithic Inc.	9926013	n/a	n/a
High Pass Filter	4HC1600	Trilithic Inc.	9922307	n/a	n/a
6GHz High Pass Filter	HPM50106	Microtronics	001	n/a	n/a
Pre-Amplifier	JS4-00102600	Miteq	00616	May 2009	1 year
LISN	50-25-2-08	FCC	08014	Apr 2009	1 year
Power Smart Sensor	R&S	NRP-Z81	100161	May 2009	1 Year
Power Smart Sensor	R&S	NRP-Z22	100223	May 2009	1 Year
Upconverter	PXI-5610	NI	E93740	Aug 2008	2 years
Waveform Generator	PXI-5421	NI	E965F1	Aug 2008	2 years
10dB attenuator	ATT-0298-10	MidwestMicrowav	n/a	n/a	n/a
Power Splitter	11667B	Hewlett Packard	645348	n/a	n/a
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	179	Fluke	N/A	Feb 2010	1 Year
Temp Hum Logger	TM320	Dickson	03280063	Feb 2010	1 Year
Temp Hum Logger	TM325	Dickson	5285354	Feb 2010	1 Year
Climatic Chamber	VT4004	Votsch	G1115	May 2009	1 year

Note:
Equipment calibration is performed by an accredited calibration lab according to ISO 17025 requirements.
Calibration intervals are determined from manufacturer recommendation and/or lab discretion.
Cetecom Inc takes all measures to calibrate equipment before the due date; for instances when the equipment has to be used beyond the calibration due date, necessary steps are taken for calibration verification and documented to meet the Quality System requirements.

7 BLOCK DIAGRAMS






Test Setup for >1GHz Measurements
Height Scan
1-4m
1m Distance
EUT at
80cm
Horn
Measurement Antenna
Turn-Table
Chamber Ground plane
EMI Receiver

8 Revision History

Date	Report Name	Changes to report	Report prepared by
2010-05-17	EMC_BIOME_001_10001_15.247BT	Original report	Satya Radhakrishna