



FCC/IC Test Report

FOR

Xirgo Technologies

Model Number: XT-4860G5

Product Description: GPS Asset Tracking Device

FCC ID: GKM-XT4800

IC ID: 10281A-XT4800

47 CFR Part 15.247 for DTS Systems

IC RSS-210 Issue 8

TEST REPORT #: EMC_XIRGO-080-14001_DTS_rev2

DATE: 08-27-2017



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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 and Industry Canada Standards RSS 210 Issue 8

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

Company	Description	Model #
Xirgo Technologies	GPS Asset Tracking Device	XT-4860G5

Responsible for Testing Laboratory:

08-27-2014	Compliance	Milton Ponce de Leon (Test Lab Manager)	
Date	Section	Name	Signature

Responsible for the Report:

08-27-2014	Compliance	Muhammad Umair Anees (EMC Engineer)	
Date	Section	Name	Signature

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 Deleon

2.2 Identification of the Client

Applicant's Name:	Xirgo Technologies, Inc
Street Address:	188 Camino Ruiz
City/Zip Code	Camarillo CA 93012
Country	United States
Contact Person:	Nader Barakat
Phone No.	805-233-0583
Fax:	
e-mail:	nbarakat@xirgotech.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

Marketing Name:	XT-4860G5
Model Number:	XT-4860G5
FCC-ID :	GKM-XT4800
IC ID:	10281A-XT4800
Product Description:	GPS Asset Tracking device
Technology / Type(s) of Modulation	ZigBee IEEE 802.15.4, using DSSS with O-QPSK
Operating Frequency Ranges (MHz) / Channels:	Nominal band: 2400 – 2483.5; Center to center: 2405(Ch 11) - 2475 (Ch 25), 16 channels Note: the Zigbee chip integrated to the product works on the given operating frequency range which was subject to test. However, according to the Xirgo's technical description only channel 16 (2430MHz) is utilized in their end-product.
Antenna info:	Internal Ceramic chip antenna Manufacturer stated antenna gain: 2.45 GHz = 0.5dBi peak; -0.5dBi avg
Max. Output Power:	Conducted: 10.76dBm Radiated: 11.26 dBm
Other Radios included:	1. U-blox LISA-U200-01 Radio module GSM: 850/900/180//1900 UMTS FDD: Band 1,2,4,5 and 8 2. Zigbee • TI CC2530F256RHAR • 2.4 GHz band of operation 3. GPS 1575.42 MHz
Rated Operating Voltage Range:	Vmin: 8V/ Vnom: 12V/ Vmax: 24V
Rated Operating Temperature Range:	Tmin: -30°C/ Tmax: 70°C
Test Sample Status:	Prototype

3.2 Identification of the Equipment Under Test (EUT)

EUT #	Serial Number	Sample	HW/SW Version	Note
1	1	Radiated	XT-4860G5-001 XT-4860-01; 22.90	
2	2	Conducted	XT-4860G5-001 XT-4860-01; 22.90	

3.3 Identification of Accessory Equipment

STE #	Type	Manufacturer	Model	Serial Number
1	Not Applicable			

3.4 Environmental conditions during Test:

The following environmental conditions were maintained during the course of testing:

Ambient Temperature: 20-25°C

Relative humidity: 40-60%

3.5 Dates of Testing:

07/02/2014 – 07/03/2014

3.6 Other Testing Notes:

The device was configured for Zigbee operation by a set of commands provided by the manufacturer, capable of setting the unit in different supported modulation schemes, data rates and channels of operation.

The EUT was tested on low, mid and high channels specified in the **IEEE 802.15.4 ZigBee** standard. Per the customer the device was set to transmit at its maximum power, so the measurements taken depict the worst case scenario. Device was powered using a 12VDC external power supply.

Radiated portion of the testing was performed in Milpitas facility, while conducted measurements were performed in the San Diego facility of CETECOM Inc.

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
- IC RSS-210 Issue 8

This test report is to support a request for new equipment authorization under the FCC ID: **GKM-XT4800** and IC ID: **10281A-XT4800**

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	802.15.4 ZigBee	■	□	□	□	Complies
§15.247(a)(1) RSS210 A8.2(a)	Emission Bandwidth	Nominal	802.15.4 ZigBee	■	□	□	□	Complies
§15.247(b)(1) RSS210 A8.4(2)	Maximum Peak Conducted Output Power and EIRP	Nominal	802.15.4 ZigBee	■	□	□	□	Complies
§15.247(d) §15.209(a) RSS210 A8.5 RSS Gen 7.2.2	Band edge compliance	Nominal	802.15.4 ZigBee	■	□	□	□	Complies
§15.247(d) RSS210 A8.5	TX Spurious emissions-Conducted	Nominal	802.15.4 ZigBee	■	□	□	□	Complies
§15.247(d) §15.209(a) RSS210 A8.5 RSS Gen 7.2.2	TX Spurious emissions-Radiated	Nominal	802.15.4 ZigBee	■	□	□	□	Complies

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

6 Measurements

6.1 Radiated Measurement Procedure

6.2 Measurement Method:

All radiated and conducted testing is performed according to guidelines in FCC publication KDB558074 D01Meas Guidance v03r02: Measurement Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) operating under 15.247, June 2014.

6.3 Radiated Measurement Procedure

ANSI C63.4 (2009) 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 beam width, the measurement antenna shall be aligned with the EUT.

ANSI C63.4 (2009) 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 re-maximized 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.

Measurement Uncertainty: $\pm 3\text{dB}$

6.4 Sample Calculations for Radiated Measurements

6.4.1.1 Field Strength Measurements:

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

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

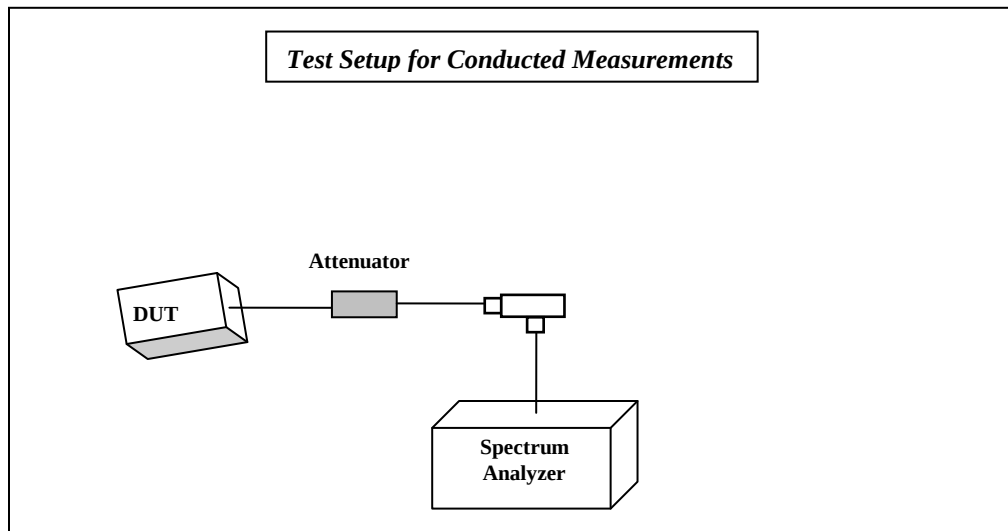
FS (dB μ V/m) = Measured Value on SA (dB μ V) + Cable Loss (dB) + Antenna Factor (dB/m)

Eg:

Frequency (MHz)	Measured SA (dB μ V)	Cable Loss (dB)	Antenna Factor Correction (dB)	Field Strength Result (dB μ V/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. Connect the equipment as shown in the above diagram.
2. Test instructions provided by the manufacturer is used to control the different modulations, data rates and max output power configurations.
3. Measurements are to be performed with the EUT set to the low, middle and high channels.

Measurement Uncertainty = ± 0.5 dB;

6.6 Maximum Peak Conducted Output Power

6.6.1 Limits:

Maximum Peak Output Power:

FCC §15.247 (b)(3): 1W

IC RSS-210 Issue 8, annex 8.4(2): 1W

EIRP:

IC RSS-210 Issue 8, annex 8.

6.6.2 Test Conditions:

Tnom: 20°C; Vnom: 12 {VDC}

6.6.3 Test Procedure:

Measurement according to FCC KDB 558074 D01 DTS Meas Guidance v03r02, section 9.1.1

Spectrum Analyzer settings:

RBW=1MHz,

VBW=3MHz,

Detector: Peak

Trace Mode: Max Hold.

Sweep Time: Auto

Span= 20 MHz (to fully encompass DTS Bandwidth)

Antenna Gain (dBi): 0.5 dBi

6.6.4 Test Results:

Measured Maximum Peak Conducted Output Power (dBm)				
Mode		Frequency (MHz)		
	2405 Channel 11	2430 Channel 16	2440 Channel 18	2475 Channel 25
	Peak	Peak	Peak	Peak
802.15.4 ZigBee	10.76	10.36	10.54	10.07

Calculated Maximum Peak Radiated Output Power (dBm)				
Mode		Frequency (MHz)		
	2405 Channel 11	2430 Channel 16	2440 Channel 18	2475 Channel 25
802.15.4 ZigBee	11.26	10.86	11.04	10.57

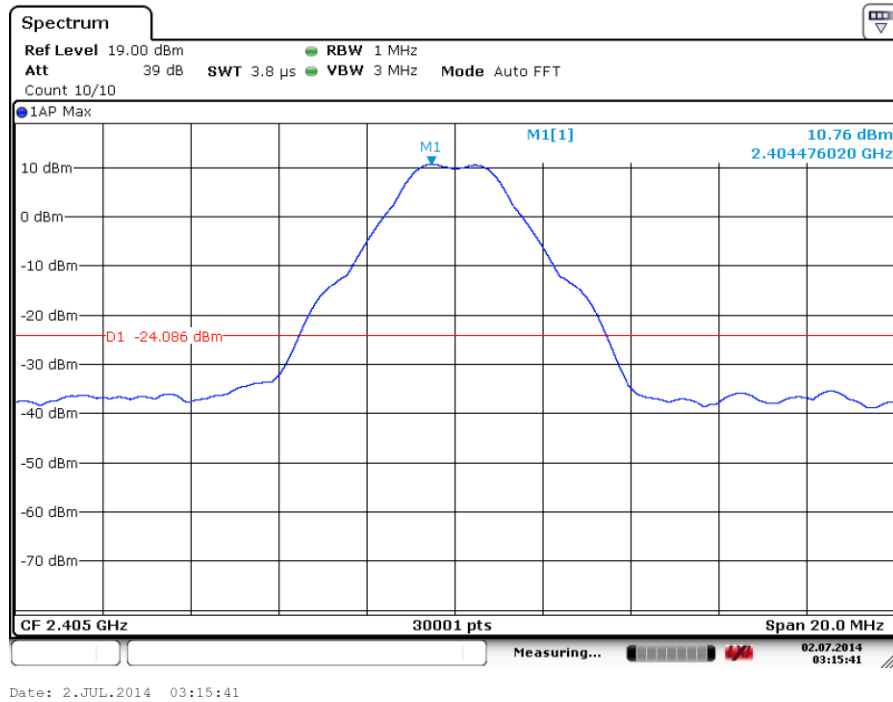
Note: Radiated EIRP is calculated as
Conducted Measurement + Antenna Gain

6.6.4.1 Measurement Verdict:

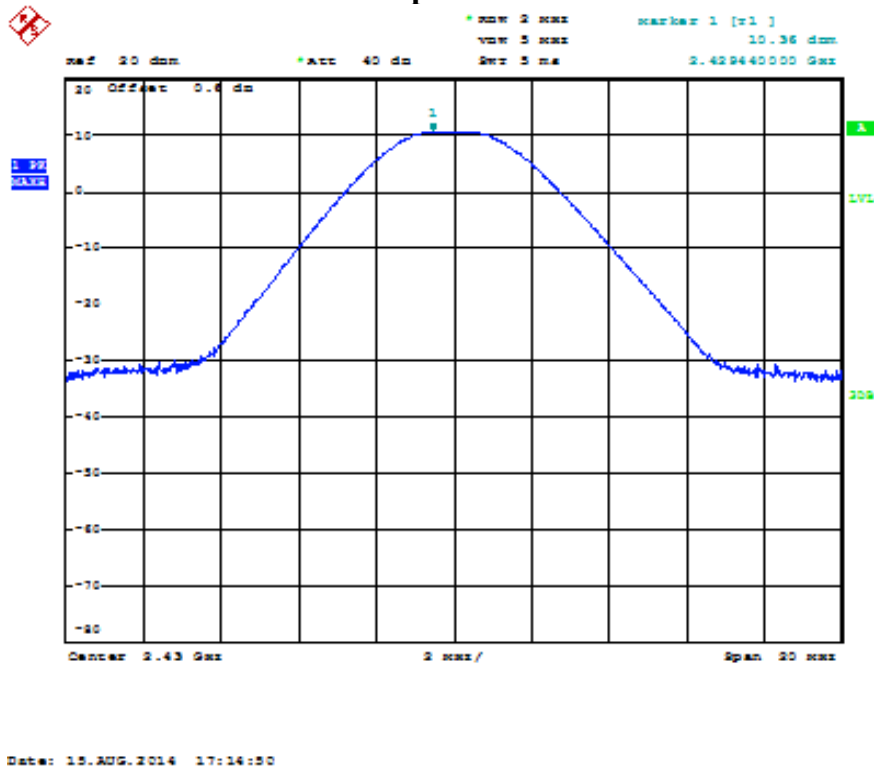
Pass.

6.6.5 Test Data/Plots:

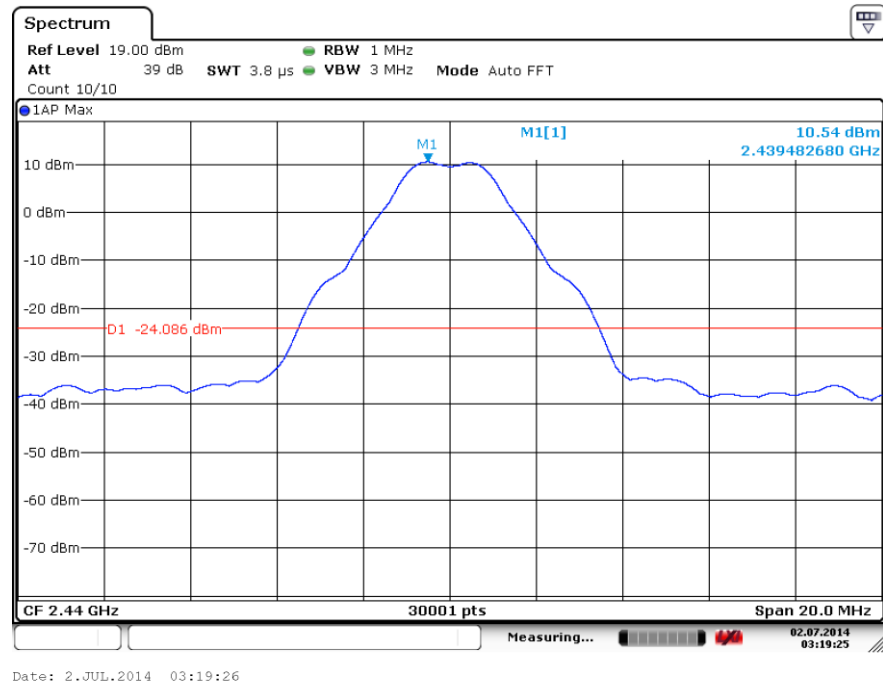
Measured Maximum Peak Conducted Output Power: 2405 MHz



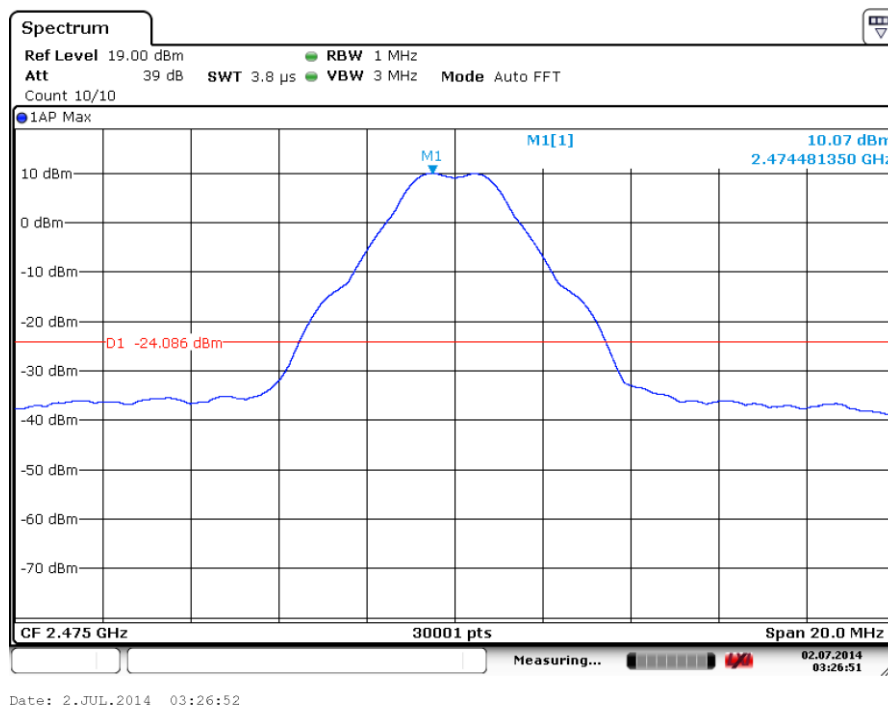
Measured Maximum Peak Conducted Output Power: 2430 MHz



Measured Maximum Peak Conducted Output Power: 2440 MHz



Measured Maximum Peak Conducted Output Power: 2475 MHz



6.7 Emission and Occupied Bandwidth

6.7.1 Limits:

§15.247 (a)(2)

RSS-210 A8.2 (a)

Minimum 6 dB bandwidth shall be 500 kHz.

6.7.2 Test Conditions:

Tnom: 20°C; Vnom: 12 VDC

Measurement Uncertainty= ±100 kHz

6.7.3 Test Procedure:

According to FCC KDB 558074 D01 Meas Guidance v03r02, section 8.1, Option 1 for DTS BW and C63.10:2009 for 99% BW

Spectrum Analyzer settings:

DTS (6dB) Bandwidth:

RBW = 100 kHz, VBW = 300 kHz,

Detector: Peak, Trace Mode: Max hold;

Sweep Time: Auto

99% Bandwidth:

RBW = 100 kHz, VBW = 300 kHz, Detector: Peak, Trace Mode: Max hold;

Sweep Time: Auto

Span = 2 - 5 x Signal Bandwidth

6.7.4 Test Results:

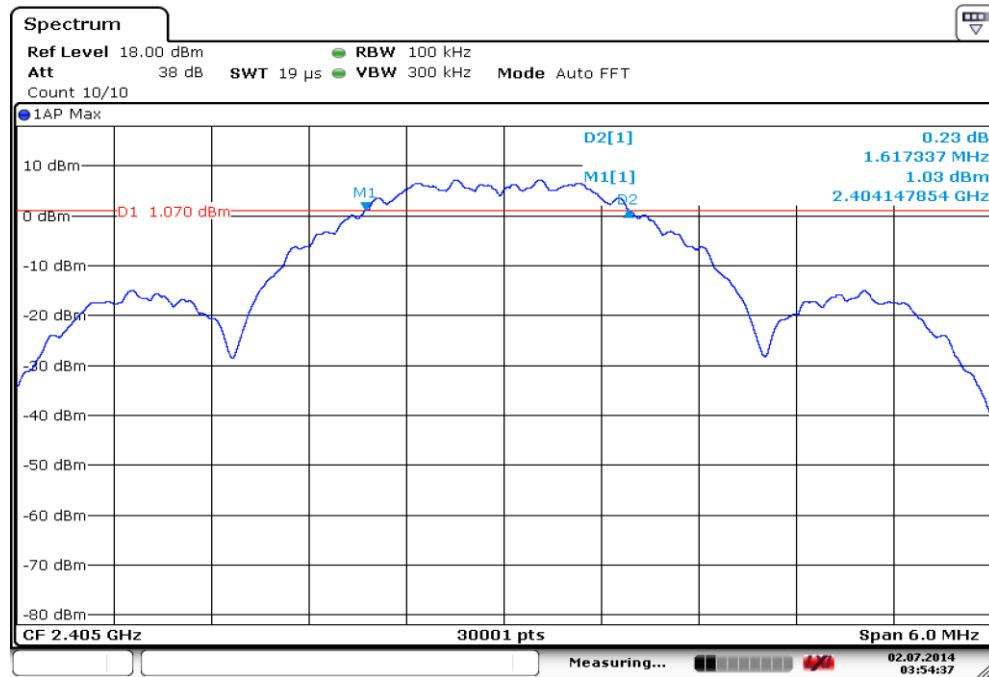
Occupied Bandwidth (MHz)						
Mode	Frequency (MHz)					
	2405 Channel 11		2440 Channel 18		2475 Channel 25	
	6dB	99%	6dB	99%	6dB	99%
802.15.4 ZigBee	1.61	2.6	1.62	2.6	1.61	2.6

6.7.4.1 Measurement Verdict

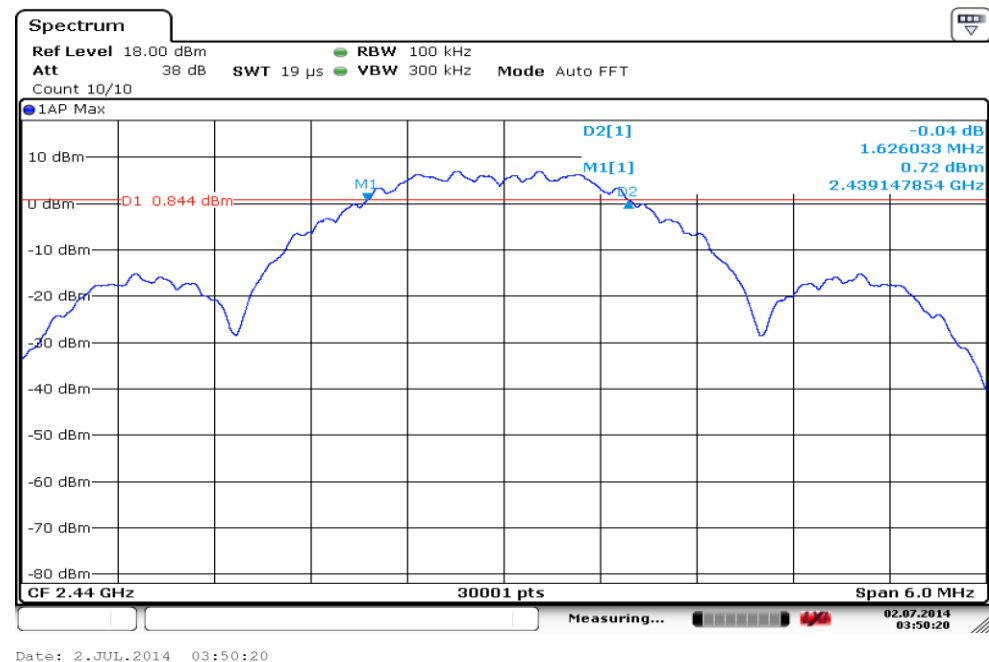
Pass.

6.7.5 Test Data/plots:

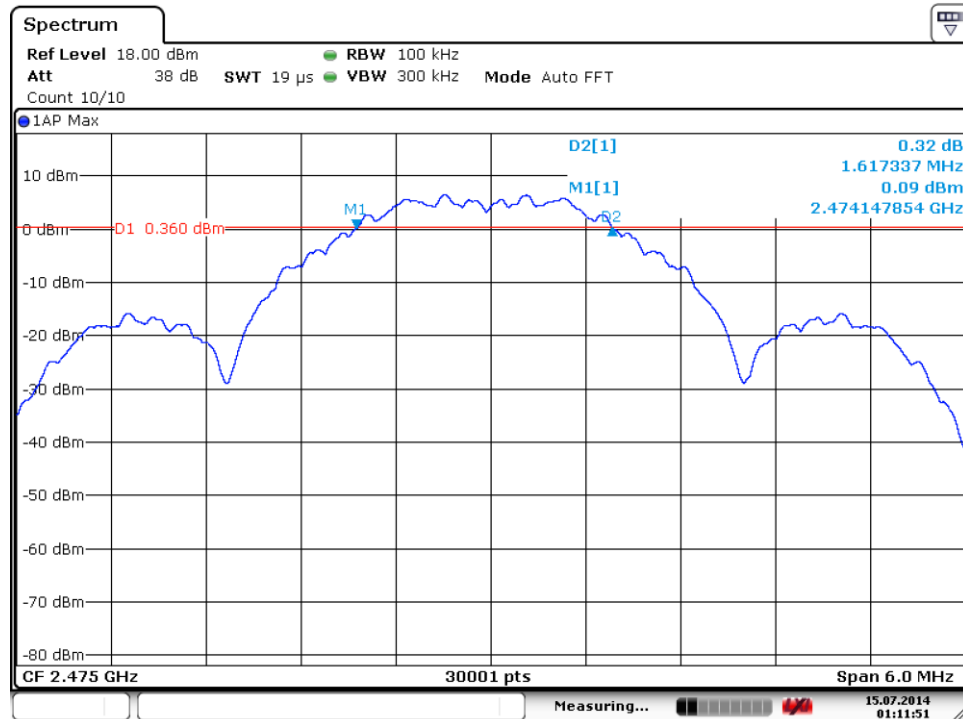
6dB Bandwidth: 2405 MHz



6dB Bandwidth: 2440 MHz

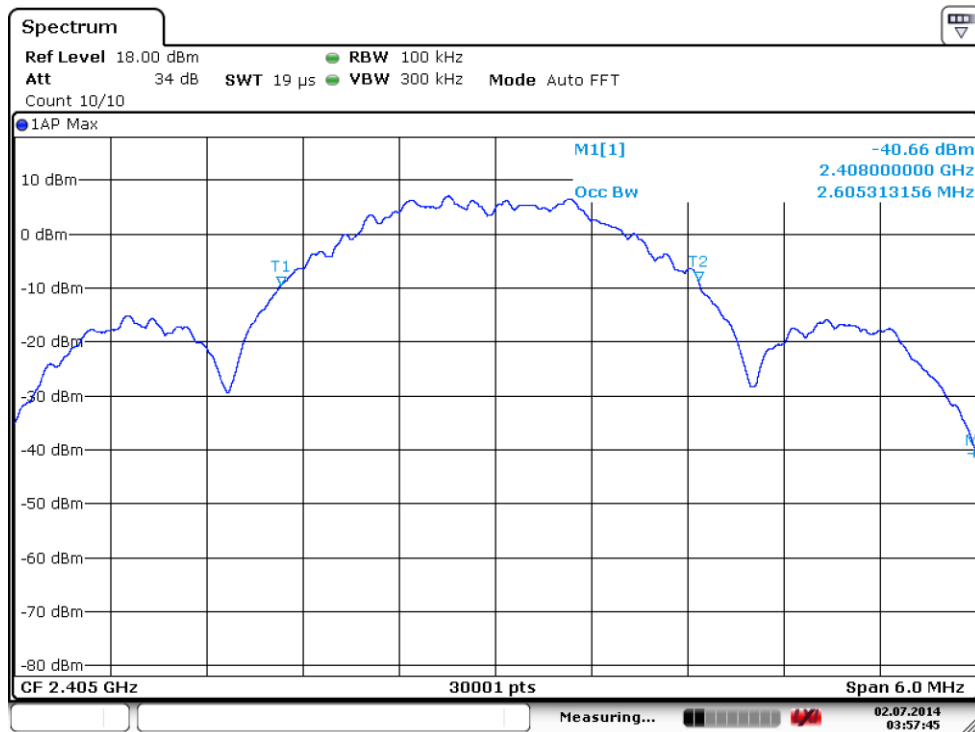


6dB Bandwidth: 2475 MHz



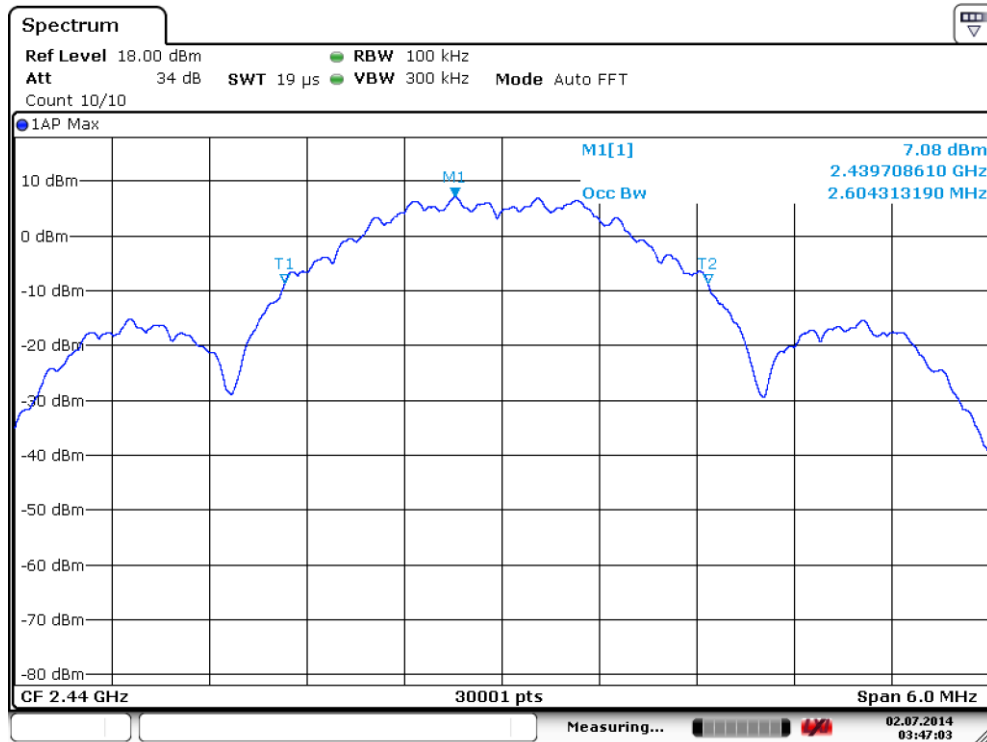
Date: 15.JUL.2014 01:11:51

99% Bandwidth: 2405 MHz



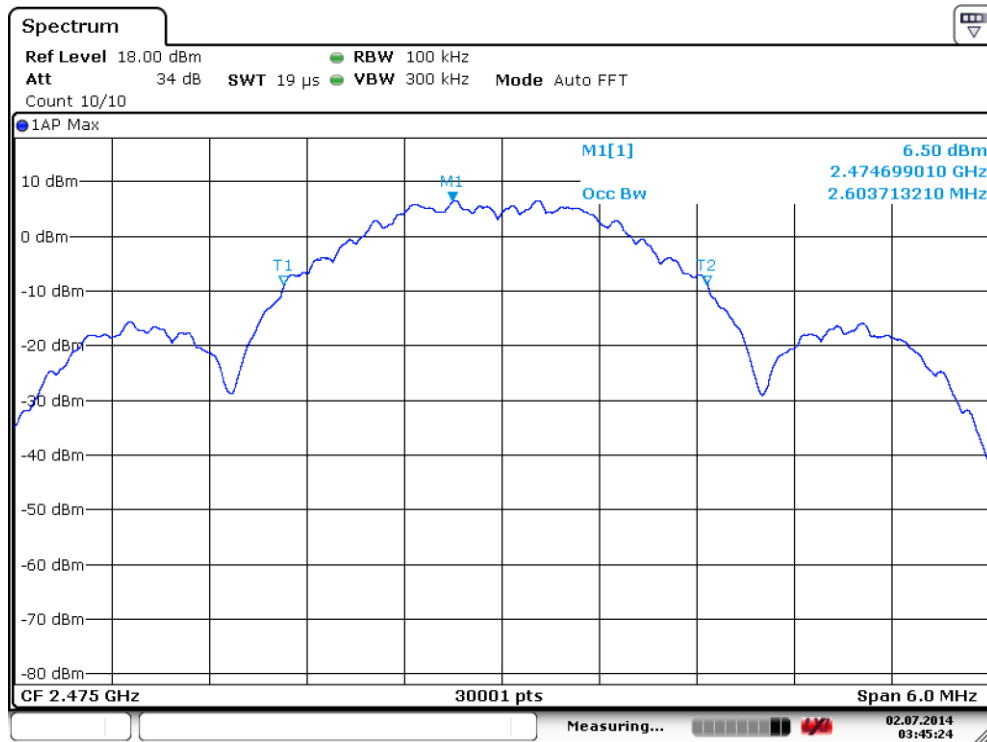
Date: 2.JUL.2014 03:57:46

99% Bandwidth: 2440 MHz



Date: 2.JUL.2014 03:47:03

99% Bandwidth: 2475 MHz



Date: 2.JUL.2014 03:45:24

6.8 Maximum Power Spectral Density Level in the Fundamental Emission

6.8.1 Limits:

§ 15.247 (e)

RSS-210 A8.2 (b)

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.

6.8.2 Test procedure:

Measurement according to FCC KDB 558074 D01 Meas Guidance v03r02, section 10.2

1. Set the analyzer center frequency to DTS channel center frequency
2. Span = 1.5 x DTS channel Bandwidth
3. RBW = 100 KHz; VBW = 300 KHz; Detector: Peak – Max hold
4. Use the peak marker function to determine the maximum power level in any 100kHz band segment within the fundamental EBW.
5. Scale the observed power level to an equivalent value in 3KHz by adjusting using the bandwidth correction factor(BWCF) where $BWCF = 10\log(3\text{kHz}/100\text{kHz}) = -15.2$

6.8.3 Test Conditions:

Tnom: 20°C; Vnom: 12.0 VDC

6.8.4 Test results:

Measured Conducted Power Spectral Density (dBm)				
Mode		Frequency (MHz)		
	2405 Channel 11	2430 Channel 16	2440 Channel 18	2475 Channel 25
802.15.4 ZigBee	7.75	6.65	7.71	7.11

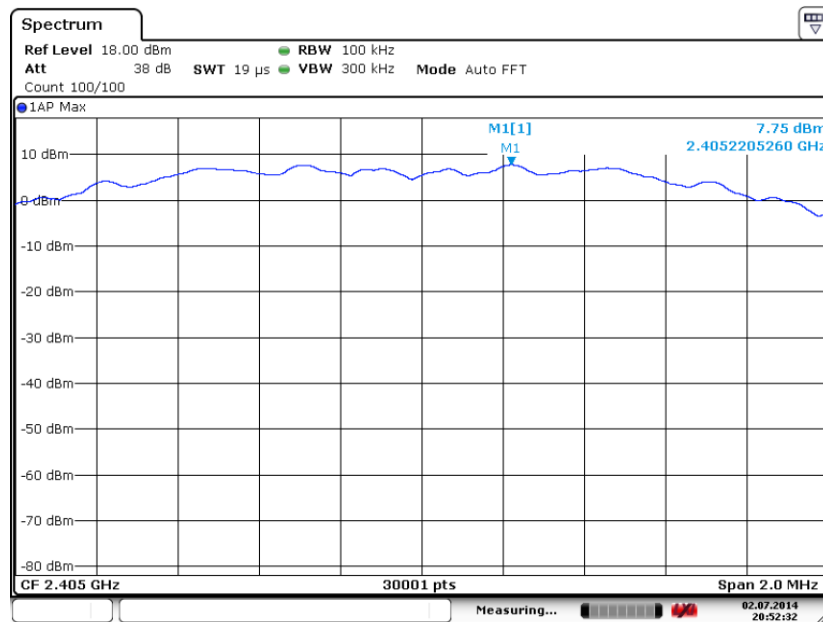
Corrected Power Spectral Density (dBm) for 3kHz BW				
Mode		Frequency (MHz)		
	2405 Channel 11	2430 Channel 16	2440 Channel 18	2475 Channel 25
802.15.4 ZigBee	-7.47	-8.55	-7.49	-8.09

6.8.4.1 Measurement Verdict

Pass

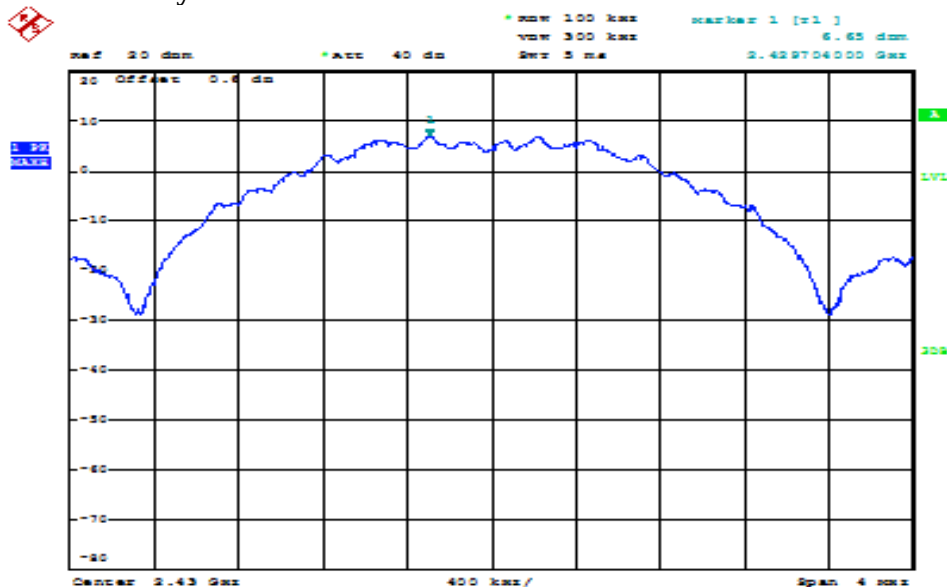
6.8.5 Test Data/plots:

Power Spectral Density: 2405 MHz



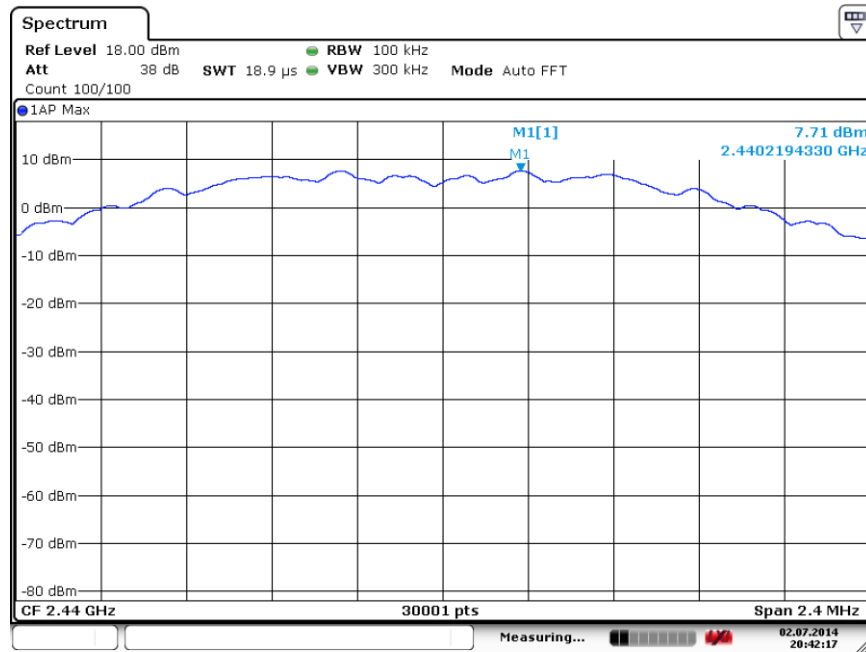
Date: 2.JUL.2014 20:52:32

Power Spectral Density: 2430 MHz



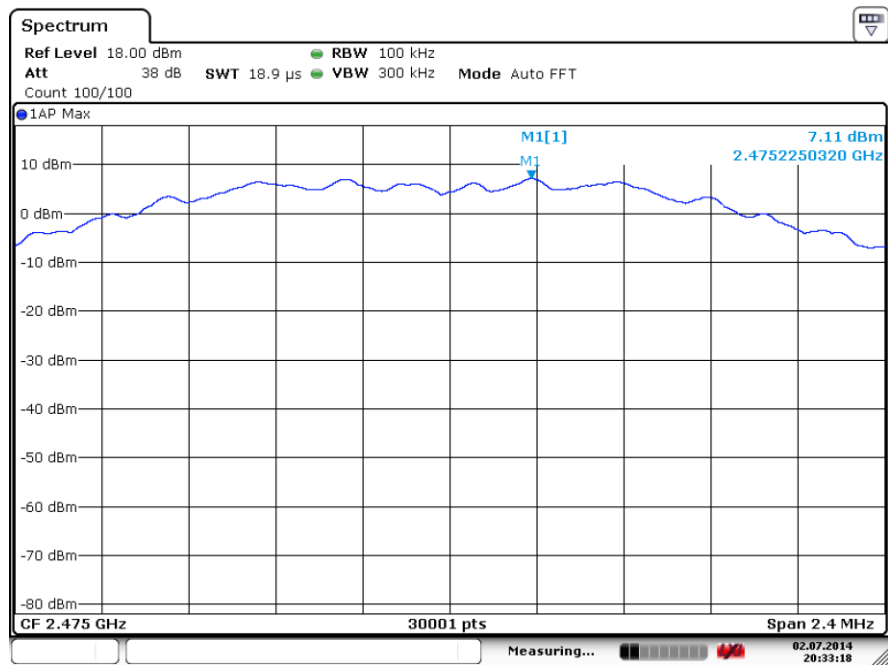
Date: 15.AUG.2014 15:15:47

Power Spectral Density: 2440 MHz



Date: 2.JUL.2014 20:42:18

Power Spectral Density: 2475 MHz



Date: 2.JUL.2014 20:33:18

6.9 Unwanted Emissions into Non-Restricted Frequency Bands - Conducted

6.9.1 Reference and Limits:

FCC part 15.247 (d), IC RSS-210 A8.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced 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.

6.9.2 Test Conditions:

Tnom: 20°C; Vnom: 12 VDC

Measurement Uncertainty: ± 1.0 dB

6.9.3 Test Procedure:

Measurement according to FCC KDB 558074 D01 Meas Guidance v03r02, section 11.1 – Unwanted Emissions into Non-Restricted Frequency Bands

Spectrum Analyzer settings:

RBW=100 kHz, VBW=300 kHz, Detector: Peak- Max hold;

Sweep Time: Auto

Span=Full range

6.9.4 Test Result:

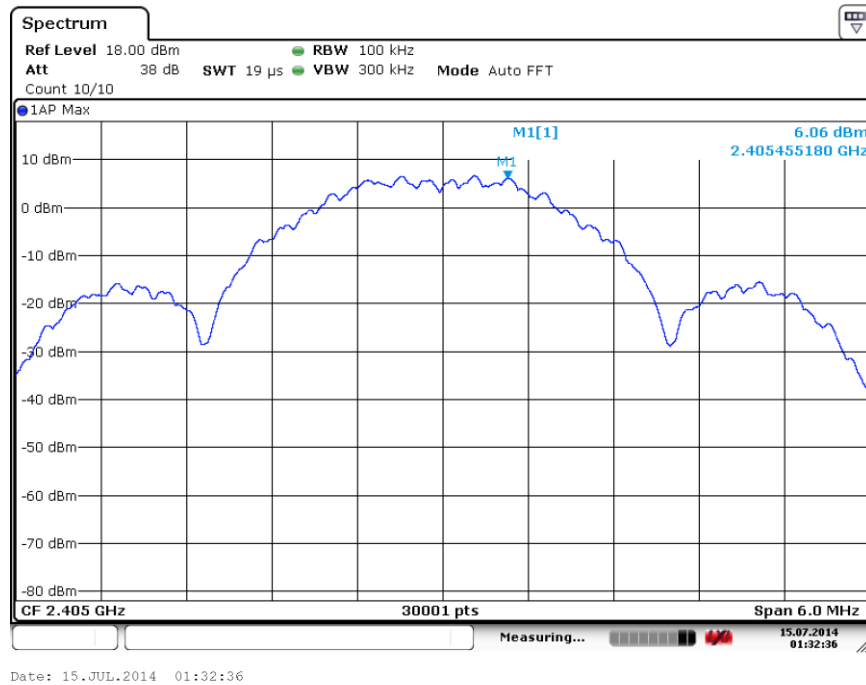
Conducted Spurious Emissions			
Channel	Frequency (MHz)	Amplitude (dBm)	Limits
		802.15.4 ZigBee	
Low	2405	6.04	30dBm
	Spurious	All other peaks >20dB below limit	-20dBc
Mid	2440	6.87	30 dBm
	Spurious	All other peaks >20dB below limit	-20dBc
High	2475	6.36	30 dBm
	Spurious	All other peaks >20dB below limit	-20dBc
Measurement Uncertainty: ± 1.0 dB			

6.9.5 Measurement Verdict:

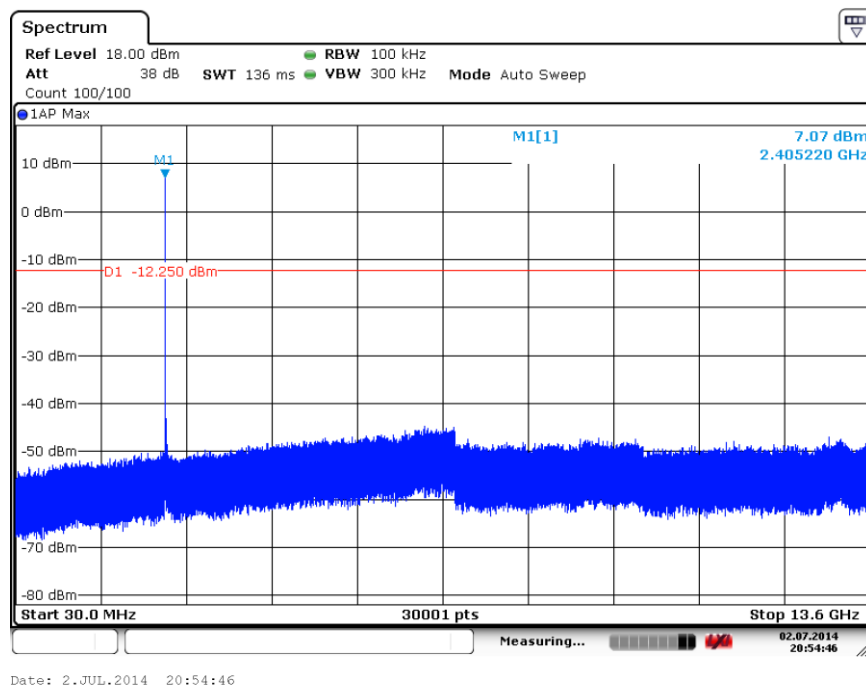
Pass.

6.9.6 Test data/ plots:

Conducted Spurious Emission: 2405 MHz

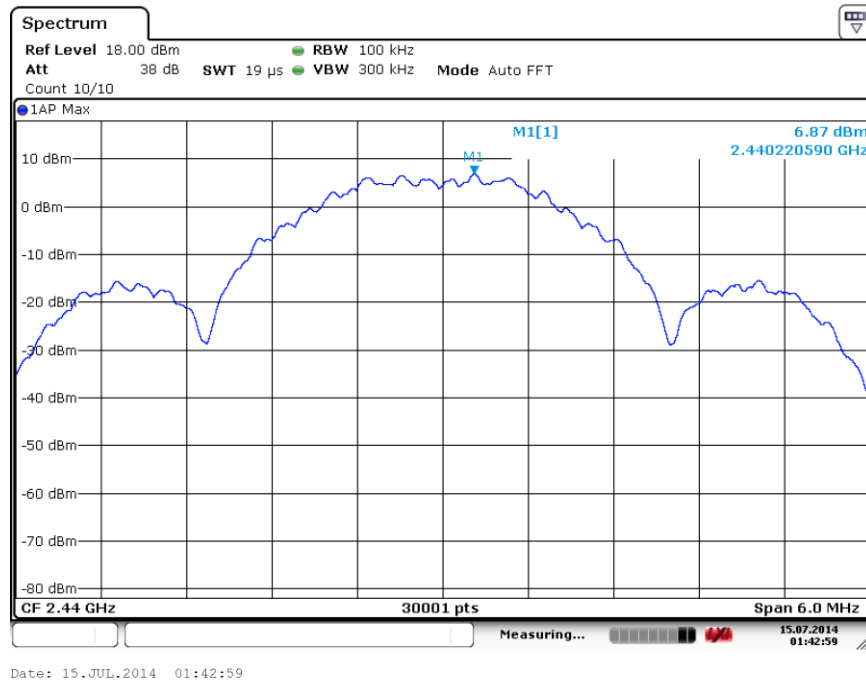


Reference level measurement

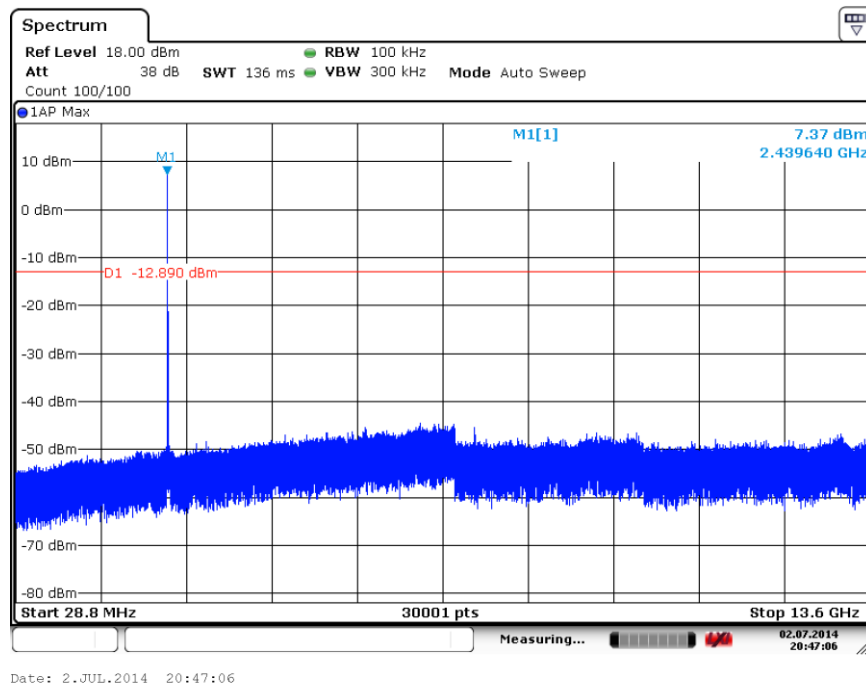


Unwanted emissions measurement

Conducted Spurious Emission: 2440 MHz

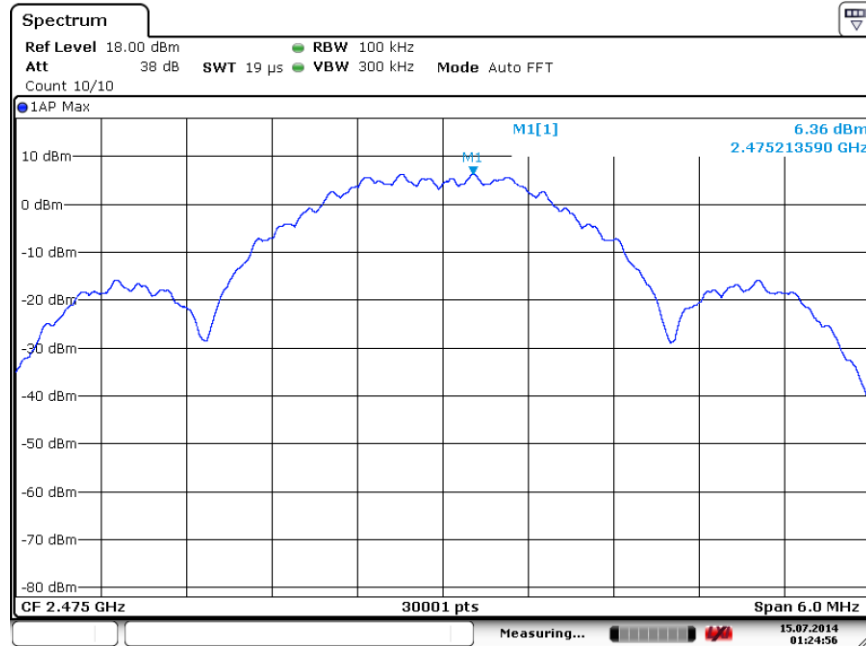


Reference level measurement



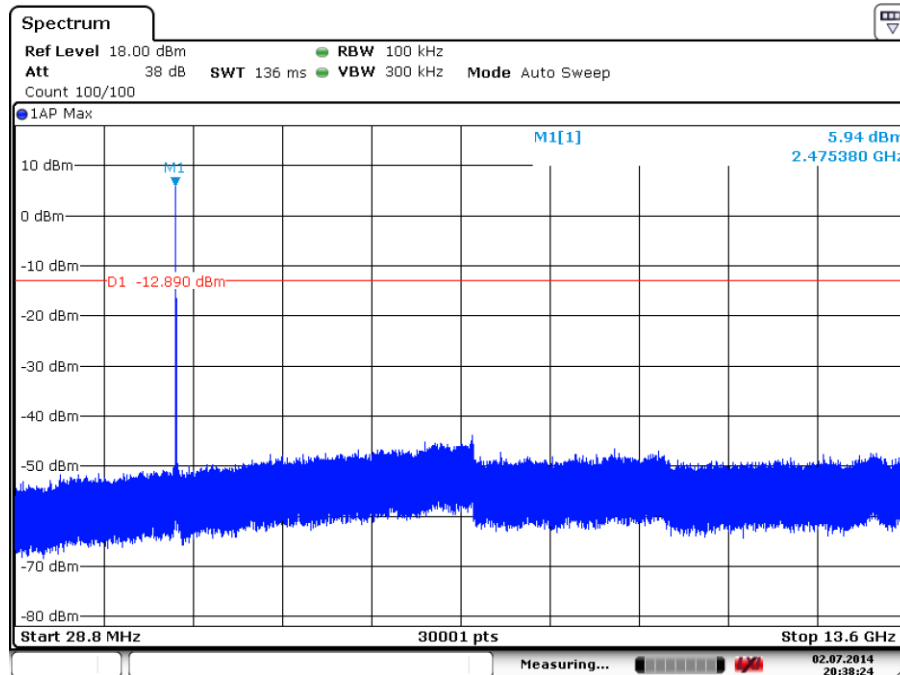
Unwanted emissions measurement

Conducted Spurious Emission: 2475 MHz



Date: 15.JUL.2014 01:24:56

Reference level measurement



Date: 2.JUL.2014 20:38:24

Unwanted emissions measurement

6.10 Band Edge Compliance – at restricted and non-restricted band edges

6.10.1 Limits:

§15.209/15.205/15.247 (d) & RSS-Gen 7.2.2/ 7.2.5, RSS-210 8.5

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).

6.10.2 Test Conditions:

Tnom: 21°C; Vnom: 12 VDC

6.10.3 Measurement Procedure:

Measurement according to FCC KDB 558074 D01 v03r02 sections 11/12.1

For Band Edge measurement

Peak measurements are made using a peak detector and RBW=100 KHz.

Average measurements performed using a peak detector and according to video averaging procedure with RBW=100 KHz and VBW=10Hz.

*PEAK LIMIT= 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

*AVG. LIMIT= 30 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

For Restricted Band measurement

Peak measurements are made using a peak detector and RBW=100 KHz.

Average measurements performed using a peak detector and according to video averaging procedure with RBW=100 KHz and VBW=10Hz.

*PEAK LIMIT= 74dB μ V/m (-21.2 dBm, for 3m)

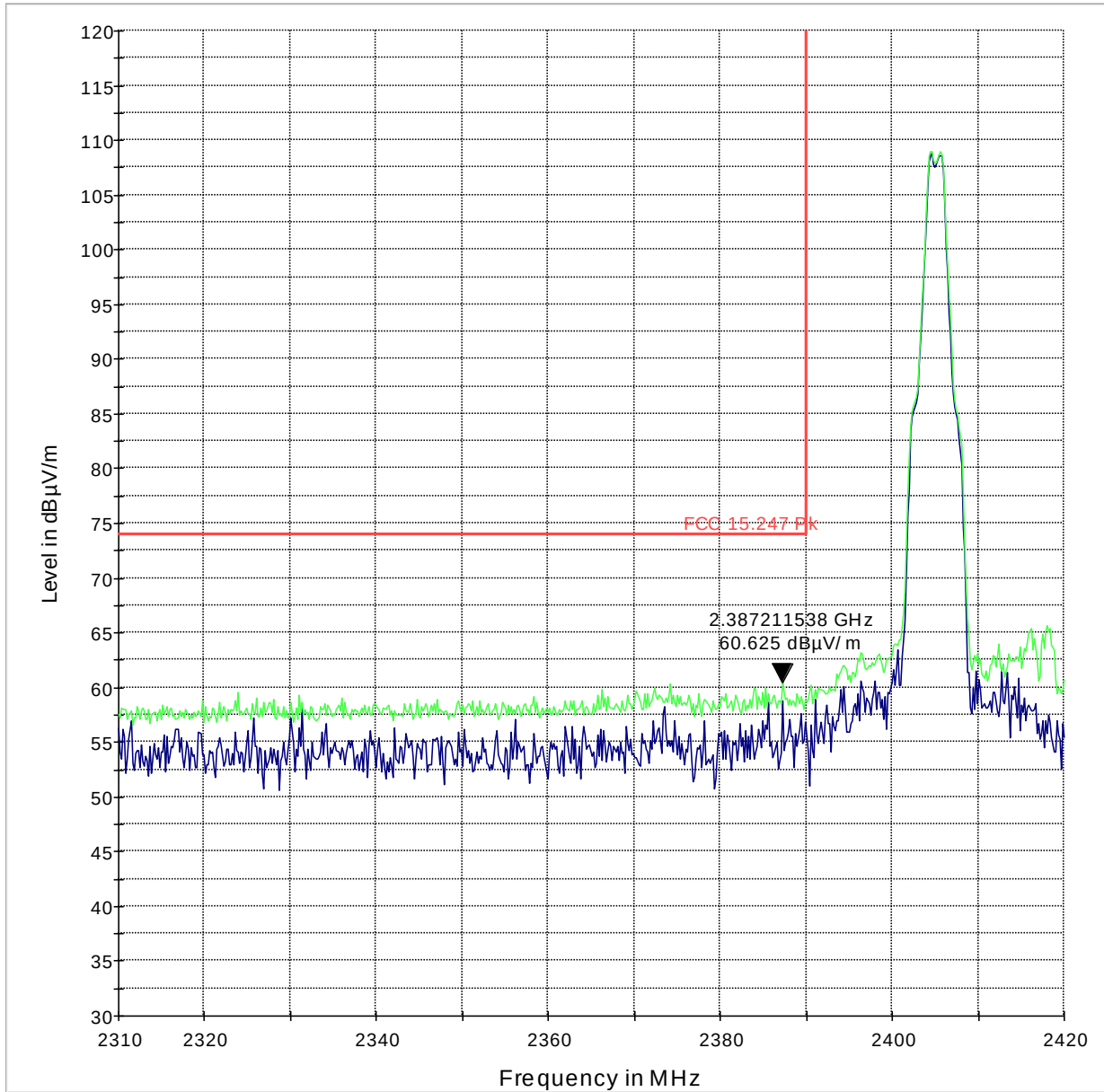
*AVG. LIMIT = 54dB μ V/m (-41.2 dBm, for 3m)

6.10.4 Measurement Result

Pass.

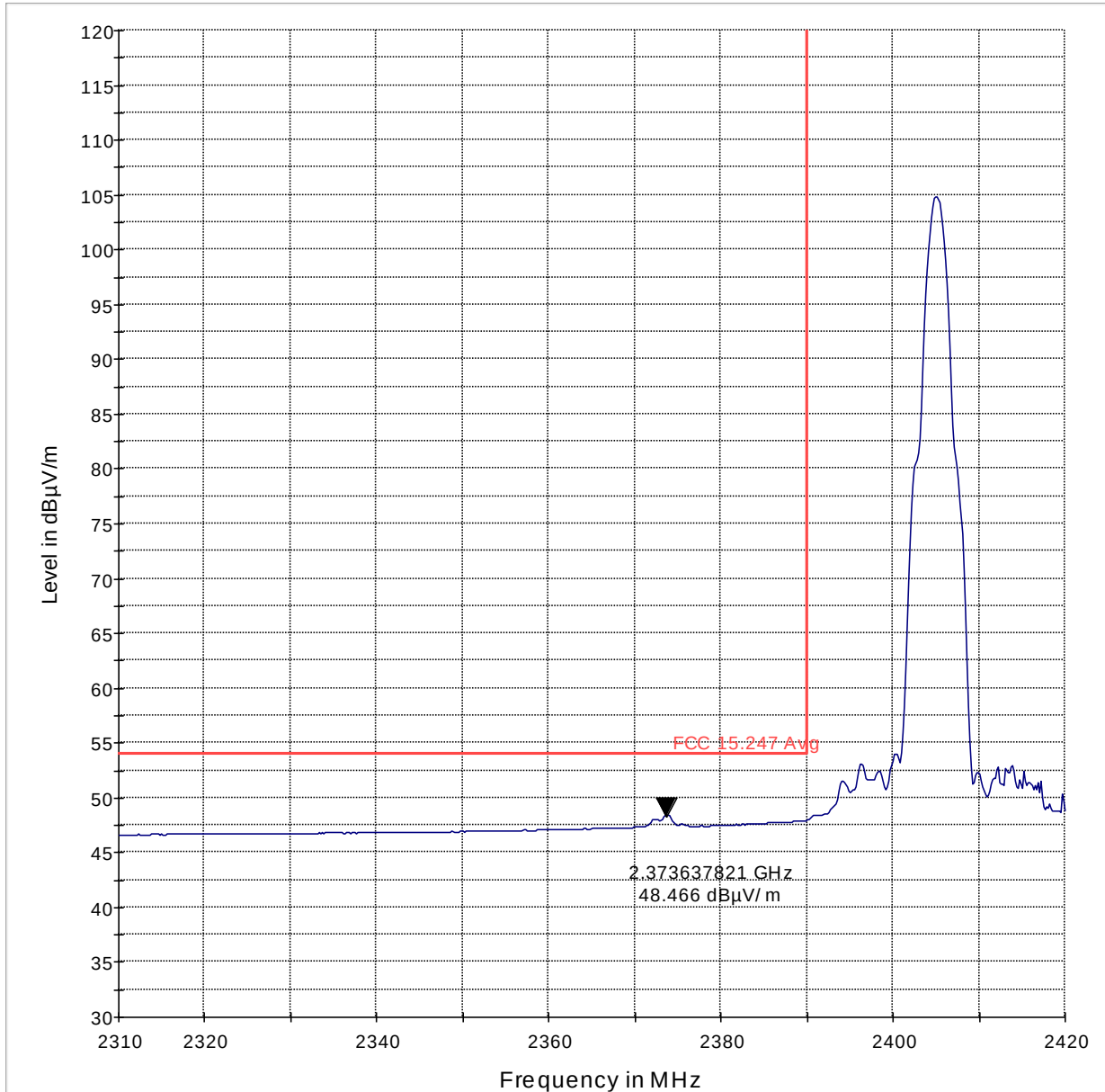
6.10.5 Test Data/plots:

Lower band edge peak – Zigbee mode: 2405 MHz



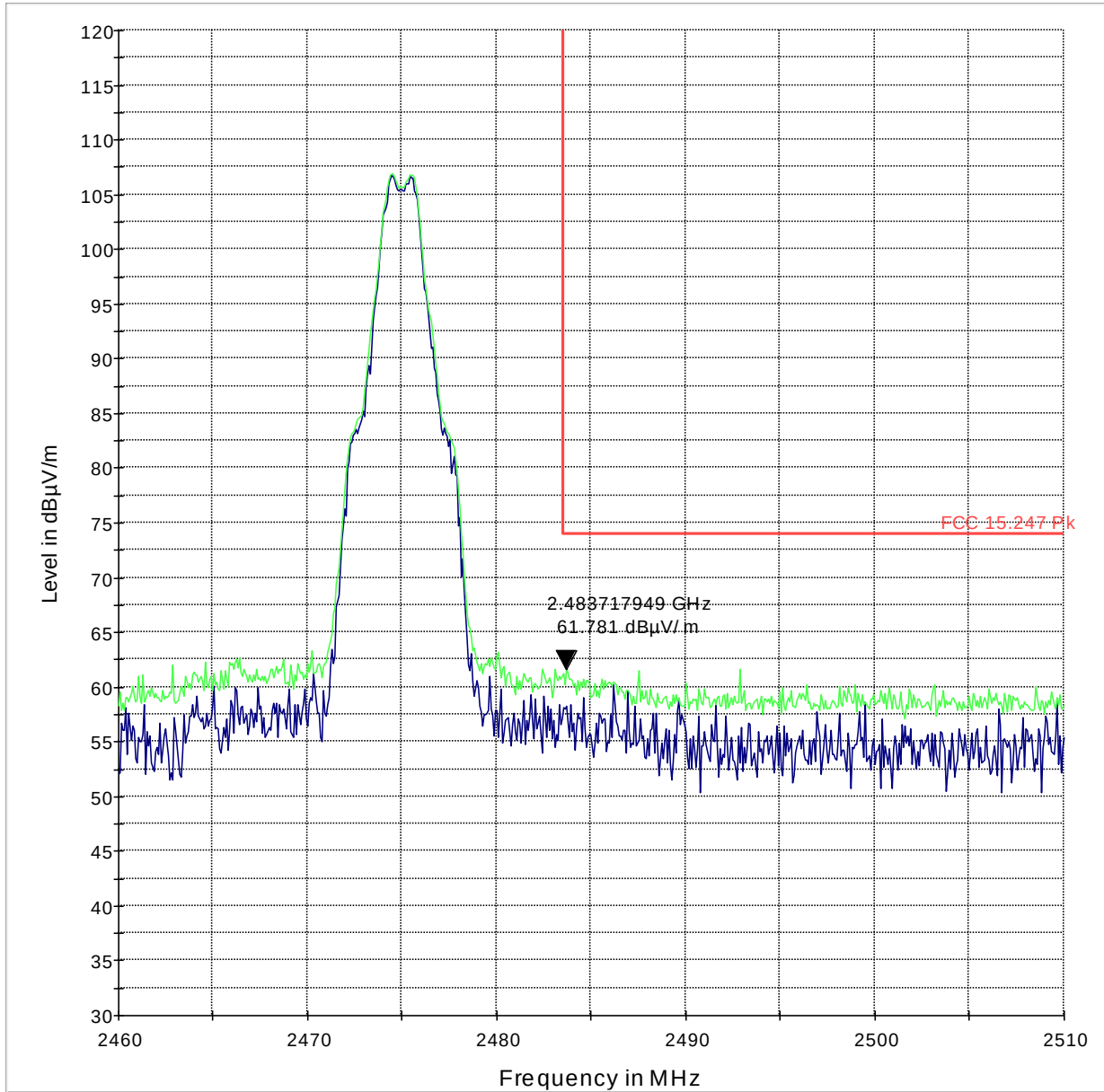
MaxPeak-ClearWrite-PK+ MaxPeak-MaxHold-PK+ FCC 15.247 Pk

Lower band edge average -Zigbee mode: 2405 MHz



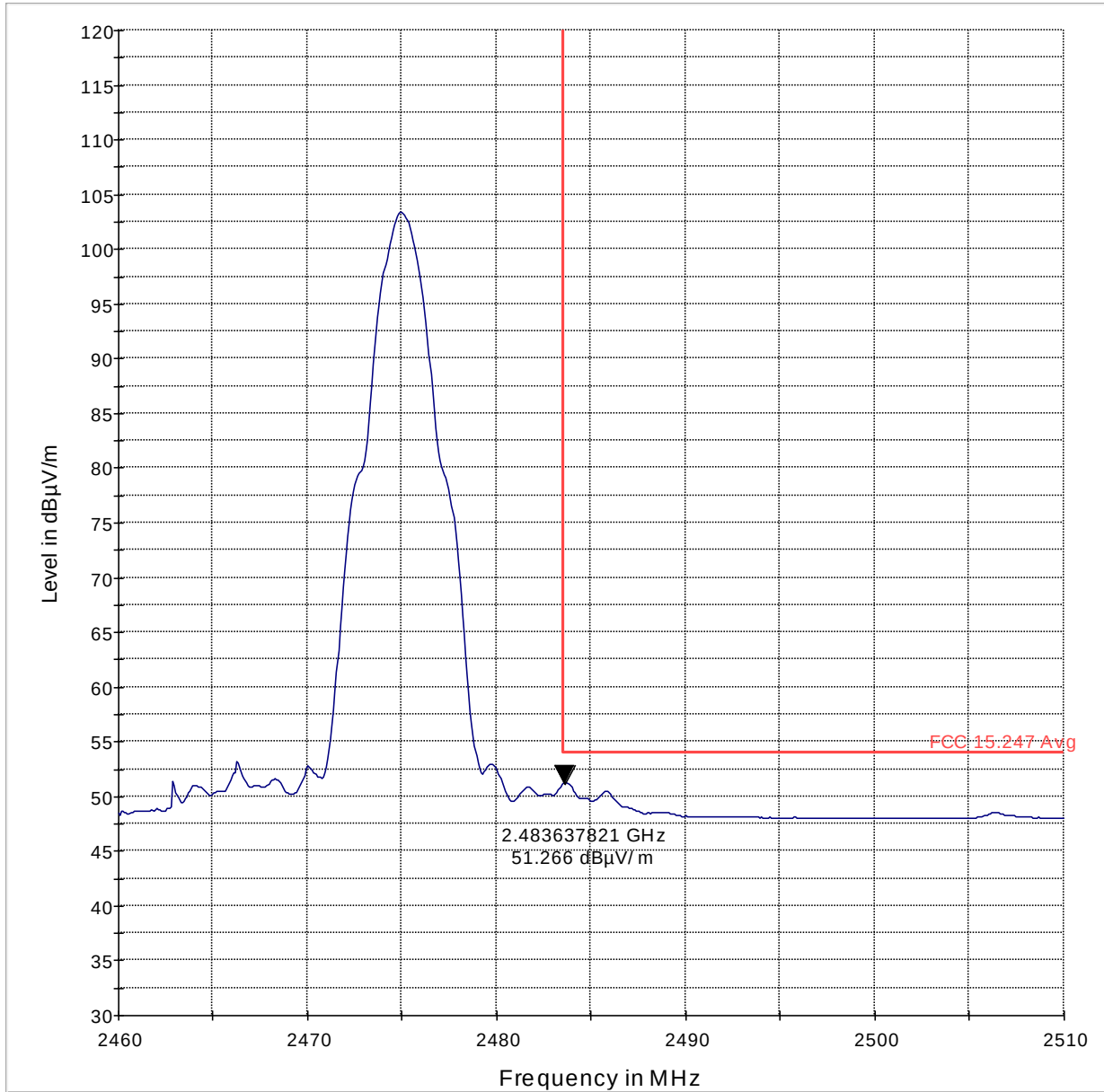
MaxPeak-MaxHold-PK+ Average-MaxHold-AVG FCC 15.247 Avg

Higher band edge peak -Zigbee mode: 2475 MHz



MaxPeak-ClearWrite-PK+ MaxPeak-MaxHold-PK+ FCC 15.247 Pk

Higher band edge average-Zigbee mode: 2475 MHz



— MaxPeak-MaxHold-PK+ — FCC 15.247 Avg

6.11 Transmitter Spurious Emissions - Radiated

6.11.1 Limits:

§15.209/15.205 & RSS-Gen 7.2.2/ 7.2.5

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			

Table 1:

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

Table 2:

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)

6.11.2 Test Conditions:

Tnom: 20°C; Vnom: 12 VDC

6.11.3 Measurement procedure:

Measurement according to ANSI C63.10:2009 (also refer to section 6.1 in this test report)

6.11.4 Test Result:

Plots reported here represent the worst case emissions for horizontal and vertical antenna polarizations and for three orientations of the EUT.

Unless mentioned otherwise, the emissions outside the limit lines in the plots are from the transmit signal.

Measurement Uncertainty: $\pm 3.0\text{dB}$

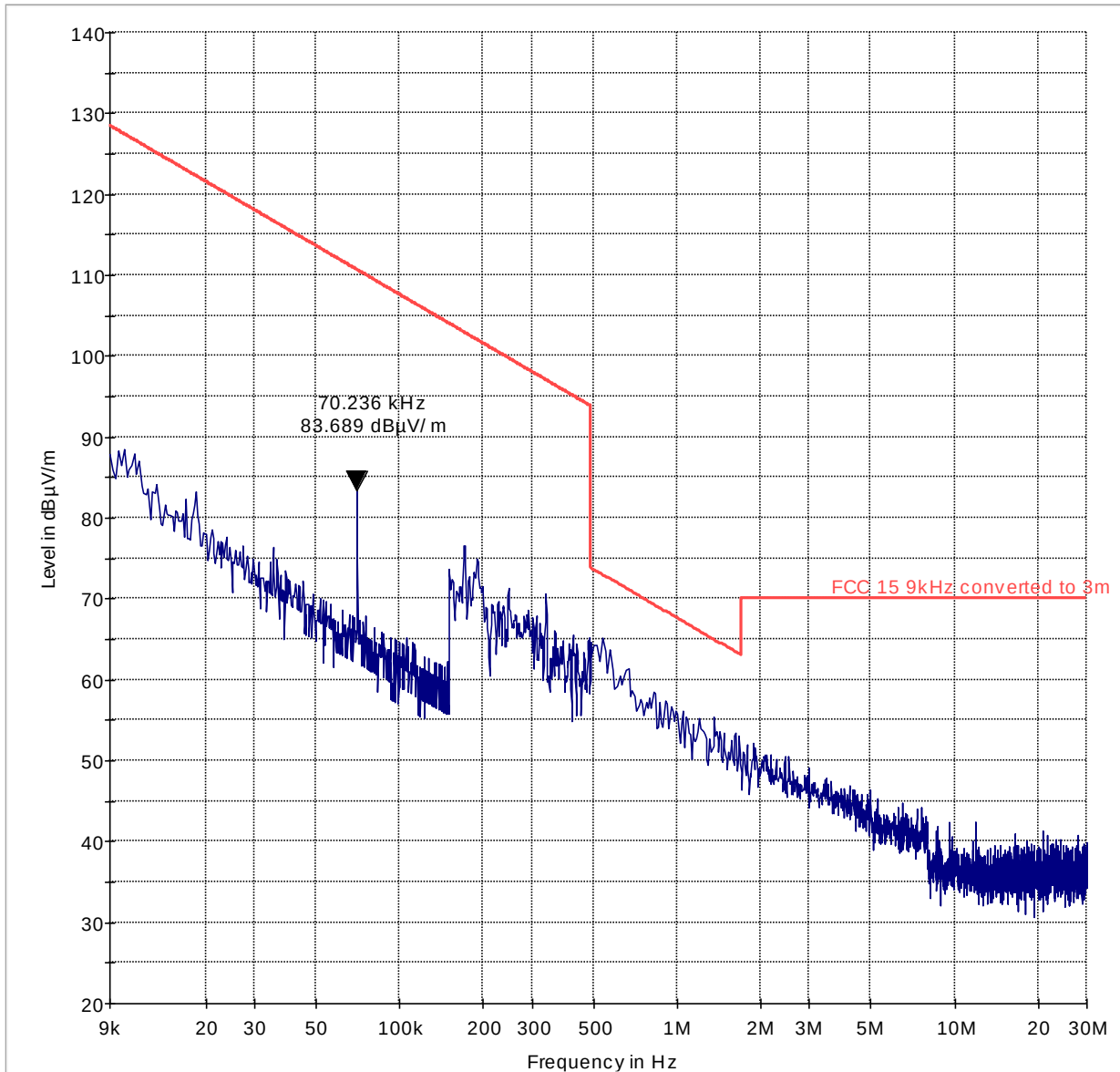
6.11.5 Measurement Verdict

Pass.

6.11.6 Test data/ plots:

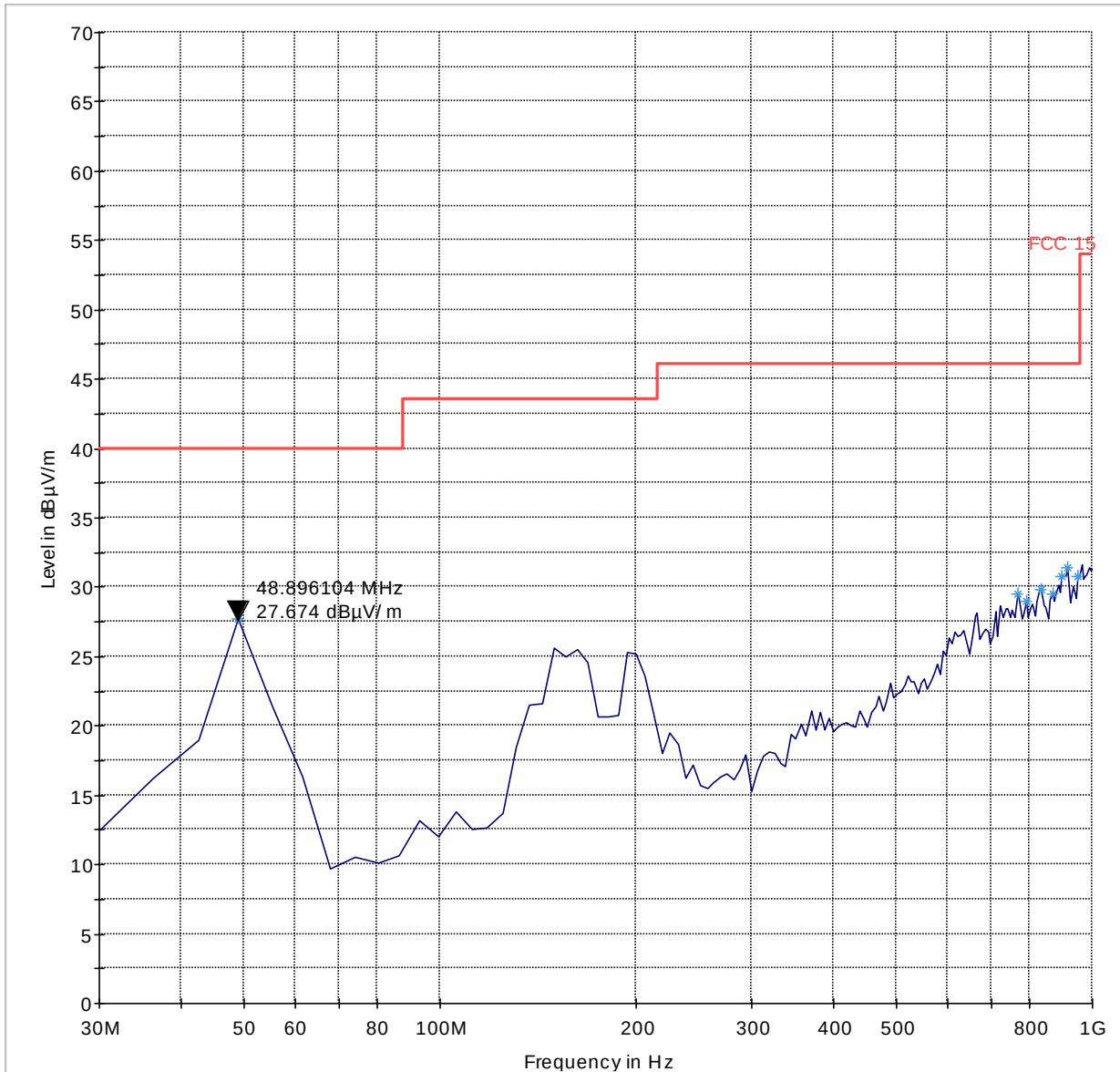
Transmitter Radiated Spurious Emission- 802.15.4; <30MHz

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



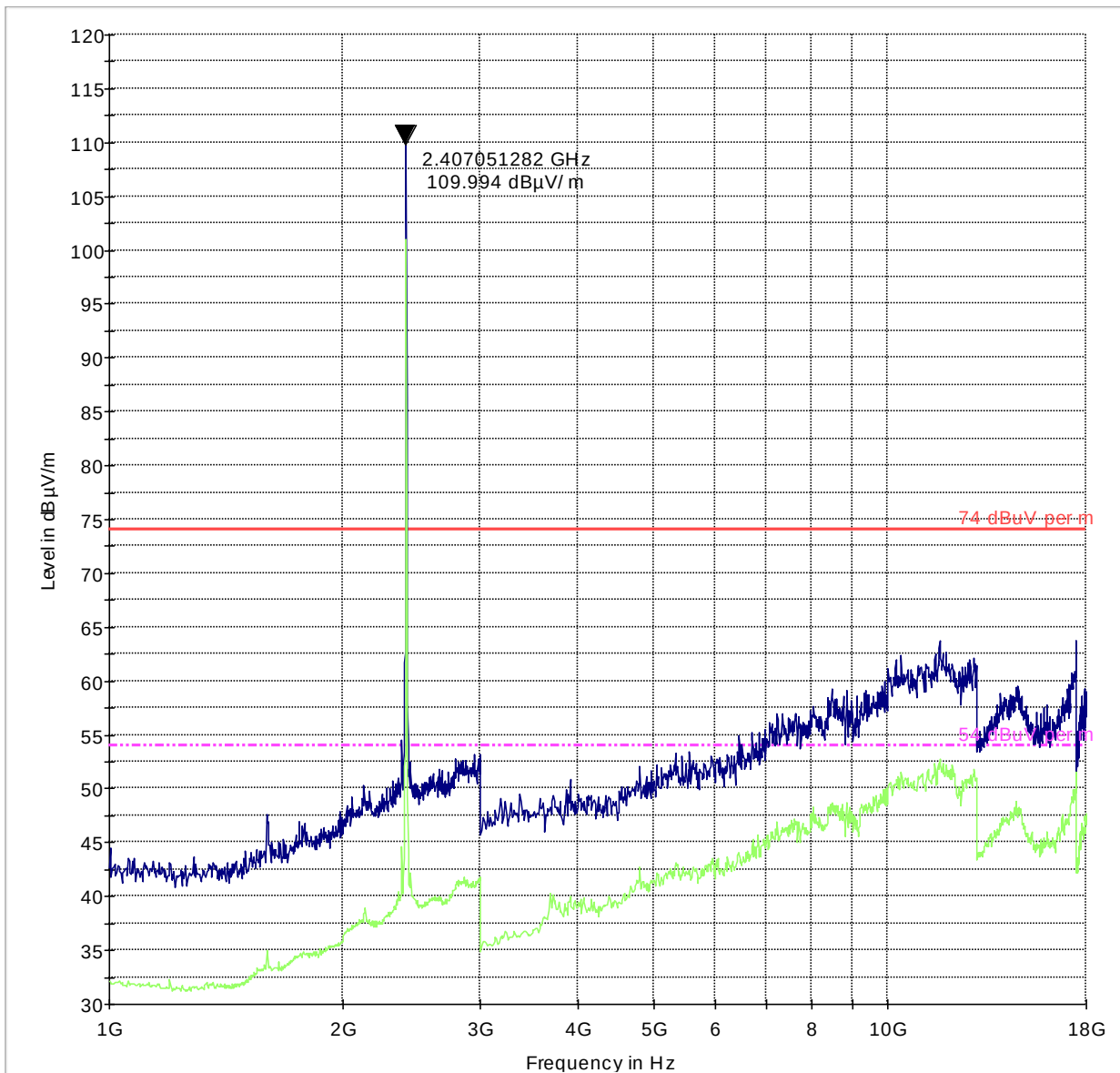
— FCC 15 9kHz converted to 3m — Preview Result 1-PK+

Transmitter Radiated Spurious Emission- Ch11 (2405 MHz): 30M-1GHz



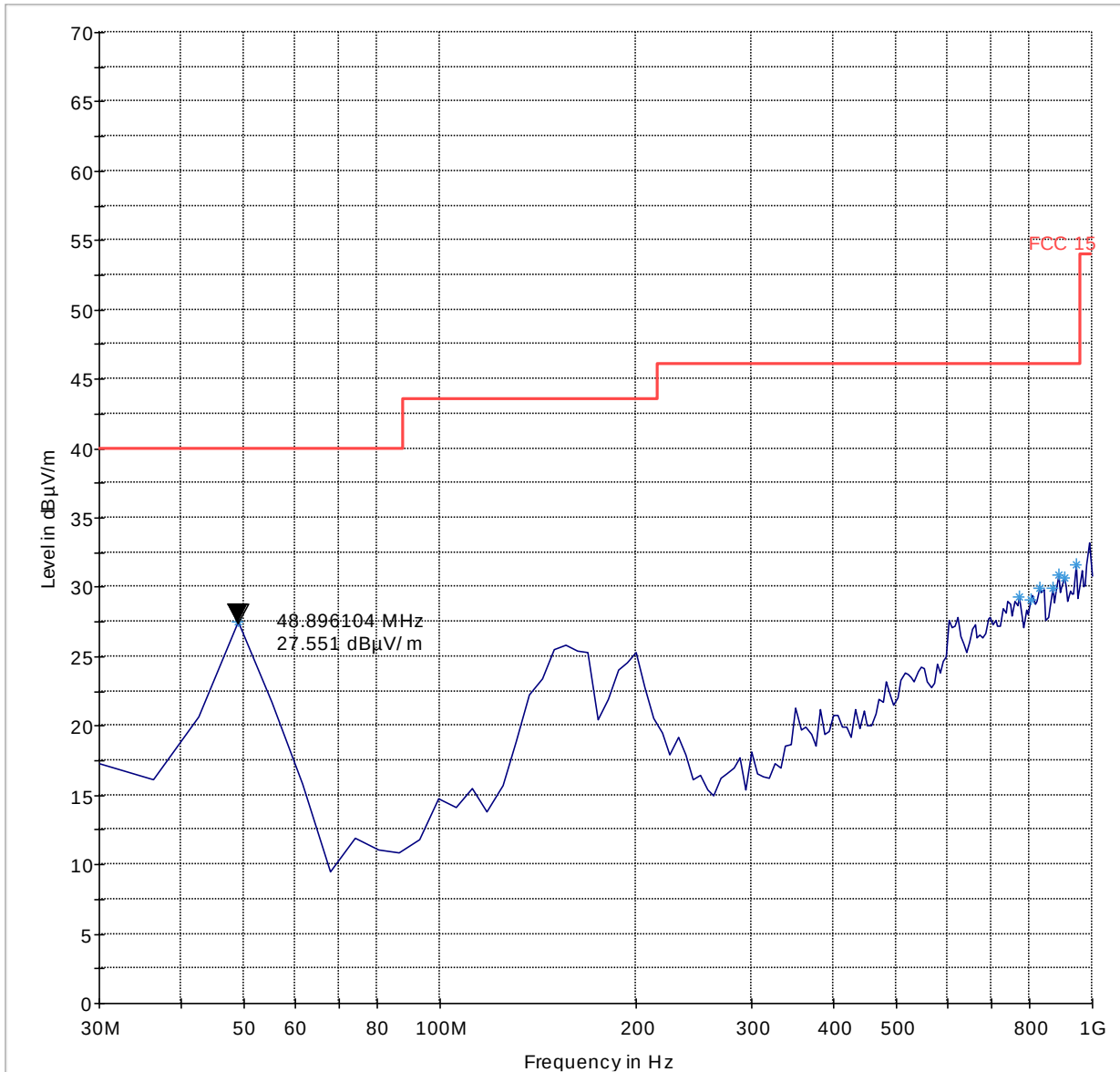
— FCC 15 — Preview Result 1-PK+ * Data Reduction Result 1 [3]-PK+

Transmitter Radiated Spurious Emission- Ch11 (2405 MHz): 1G-18GHz
Emission above the limit line from the transmitter.



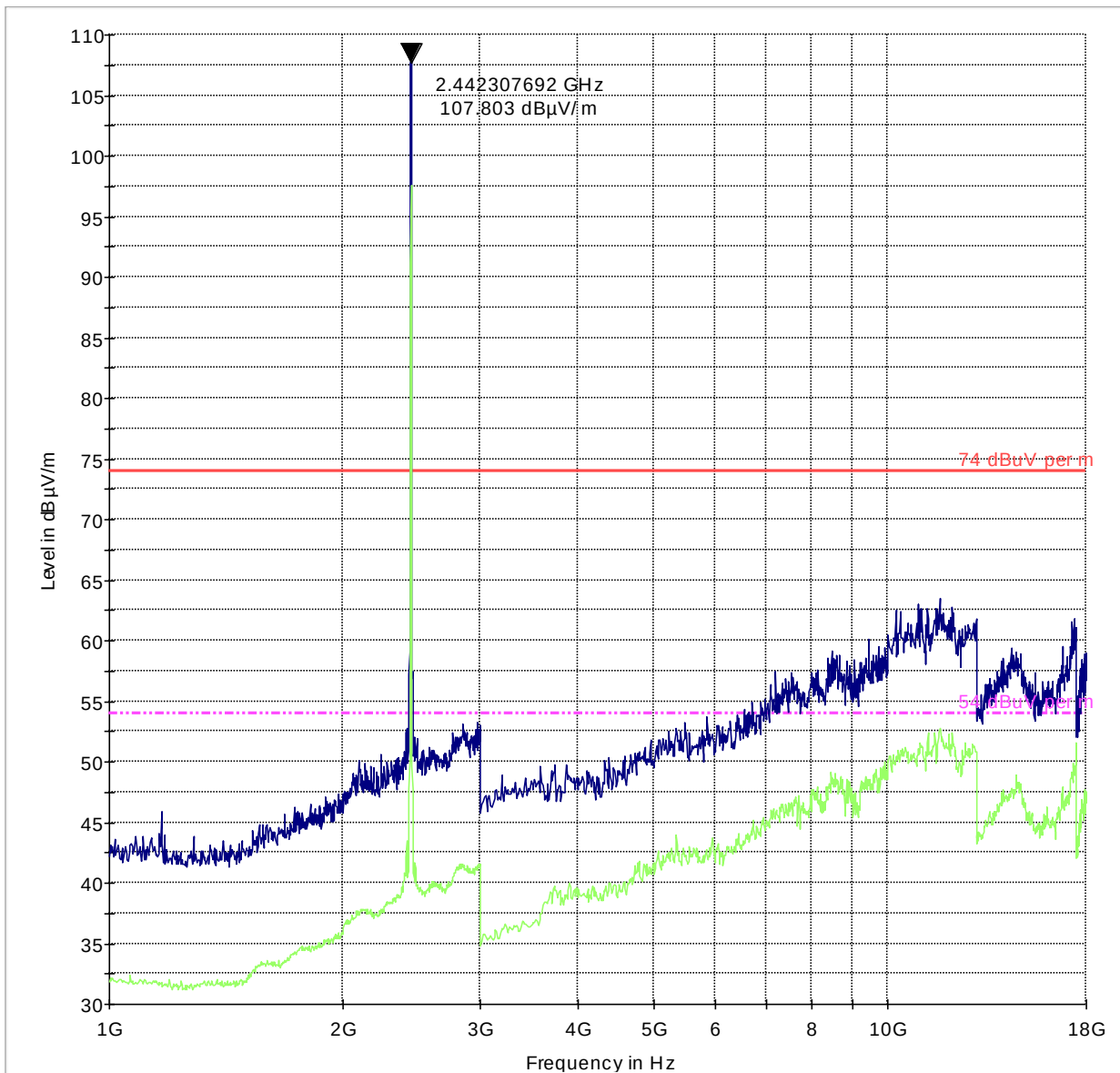
— 74 dBuV per m - - - 54 dBuV per m — Preview Result 1-PK+ — Preview Result 2-AVG

Transmitter Radiated Spurious Emission- Ch18 (2440 MHz): 30M-1GHz



— FCC 15 — Preview Result 1-PK+ * Data Reduction Result 1 [3]-PK+

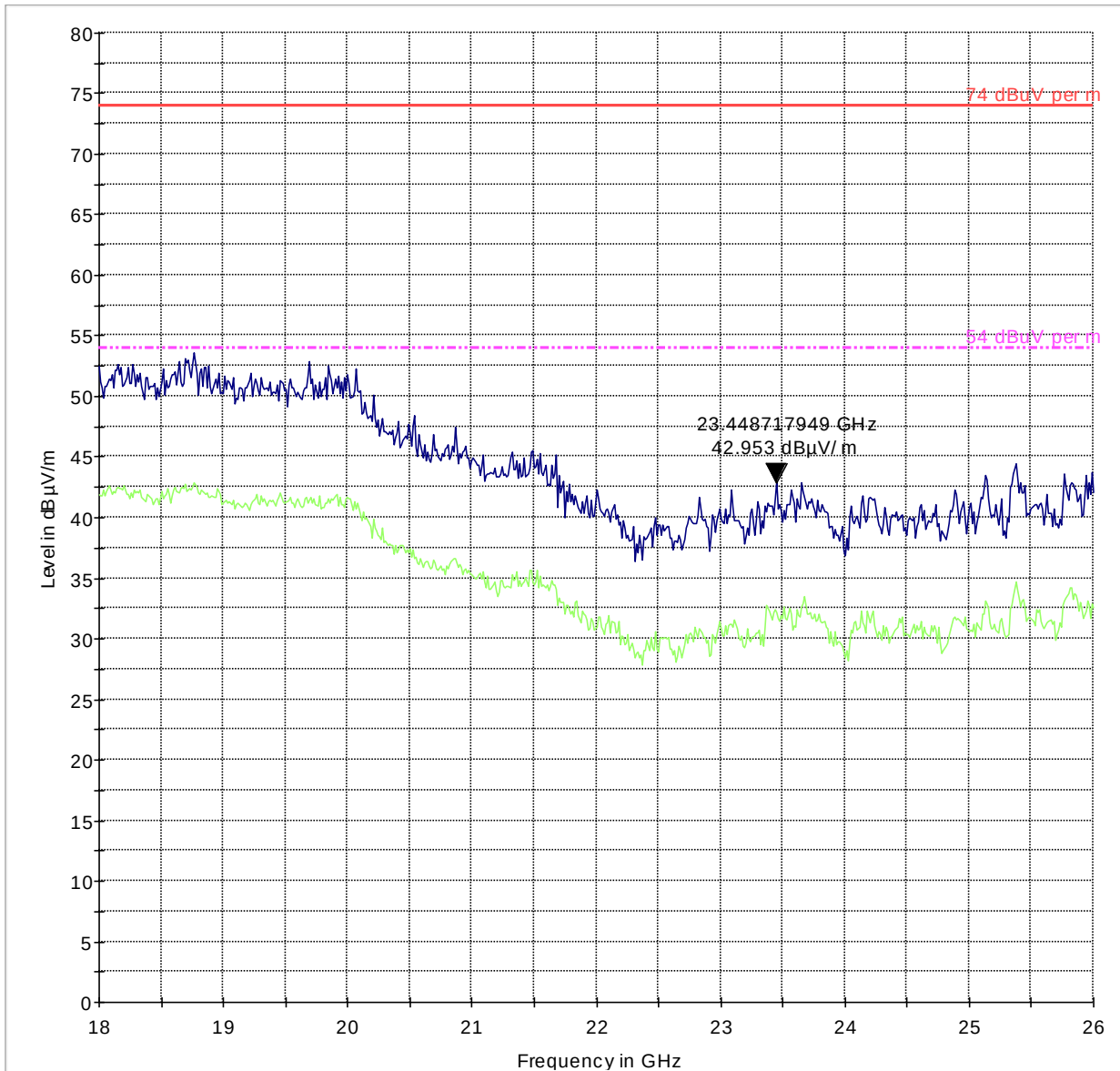
Transmitter Radiated Spurious Emission- Ch18(2440 MHz): 1G-18GHz
Emission above the limit line from the transmitter.



— 74 dBuV per m - - - - 54 dBuV per m — Preview Result 1-PK+ — Preview Result 2-AVG

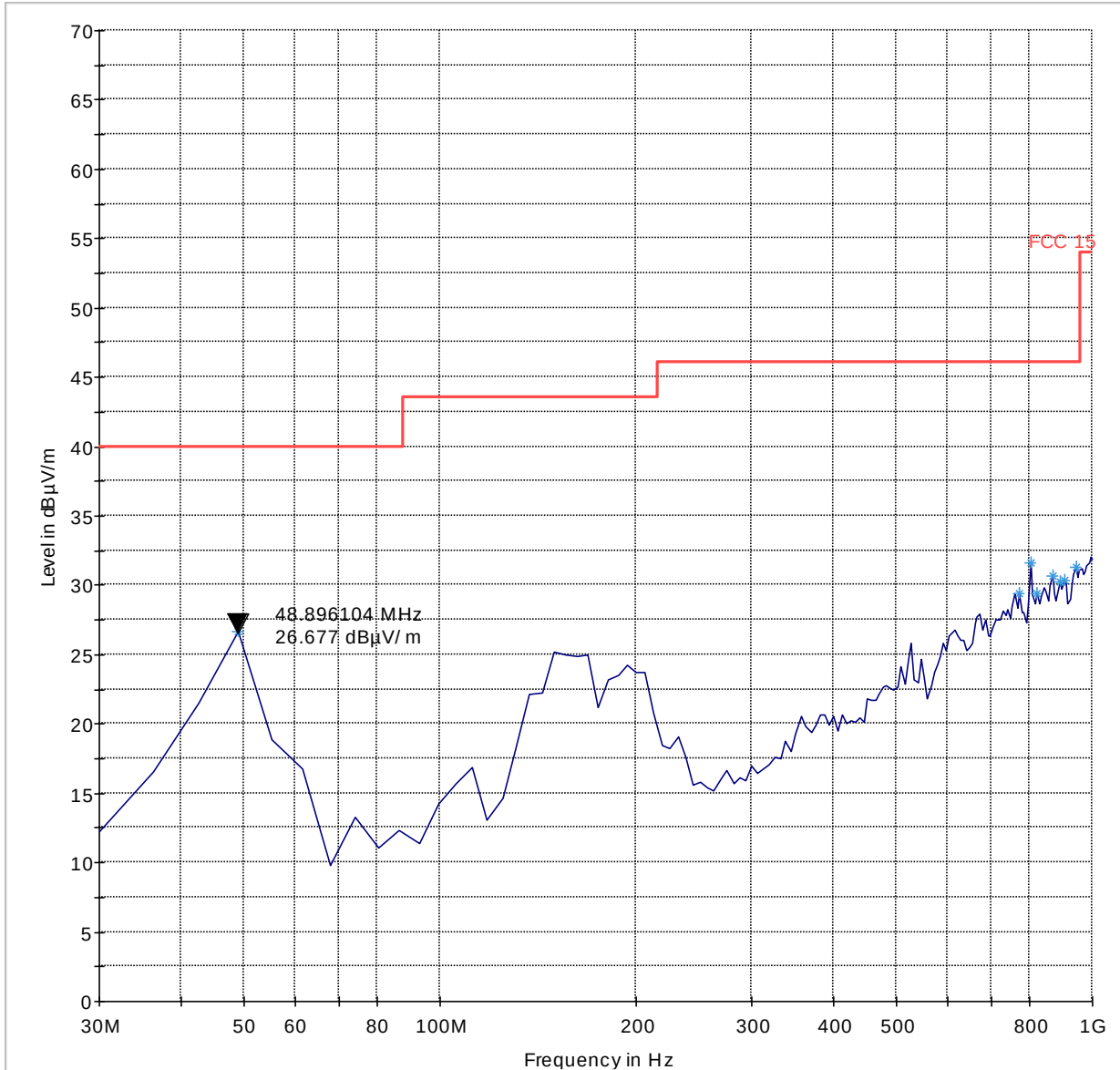
Transmitter Radiated Spurious Emission- Ch18 (2440 MHz): 18G-26GHz

Note: Worst case representation of all channels



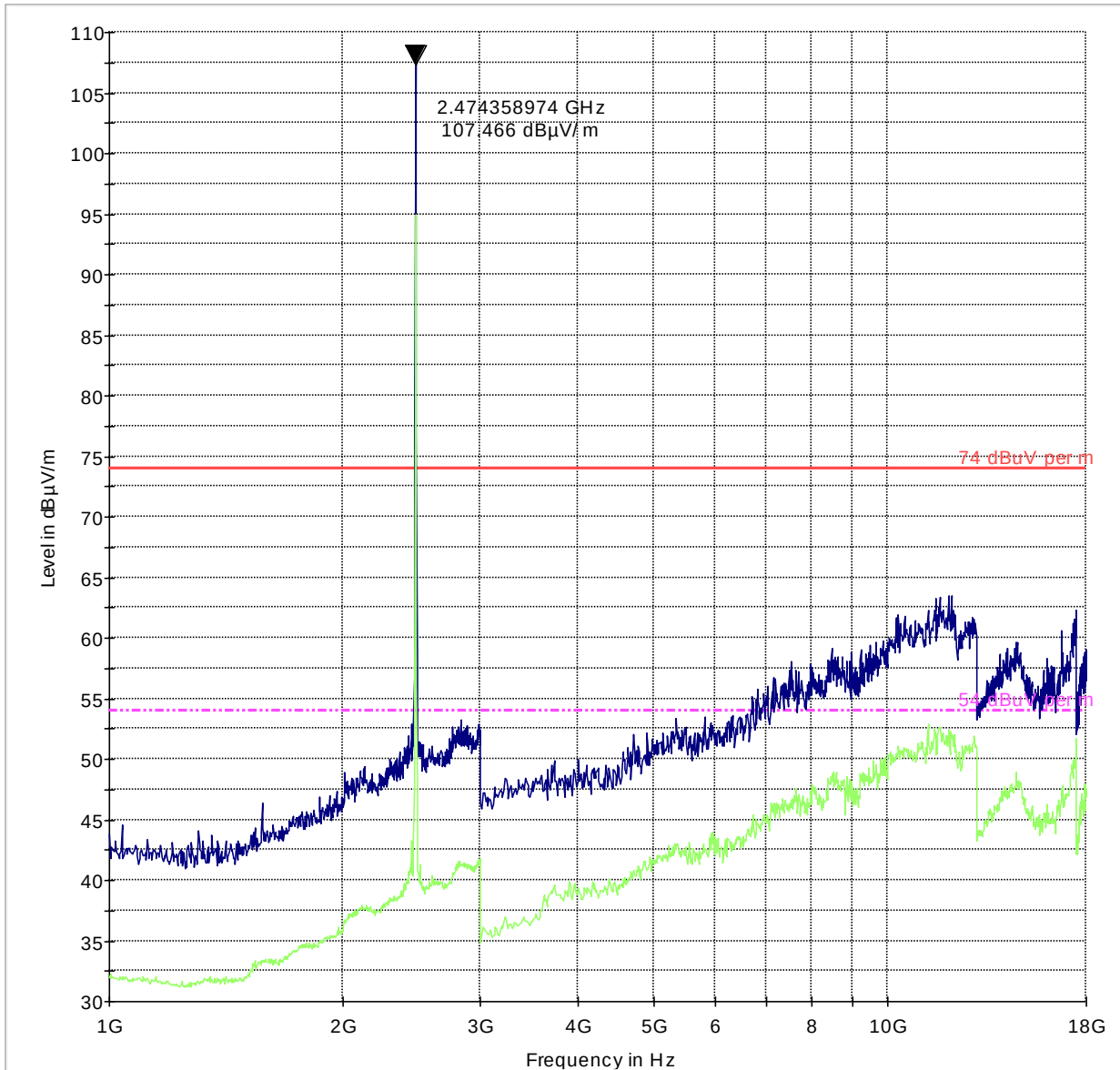
— 74 dBµV per m - - - 54 dBµV per m — Preview Result 1-PK+ — Preview Result 2-AVG

Transmitter Radiated Spurious Emission- Ch25 (2475 MHz): 30M-1GHz



— FCC 15 — Preview Result 1-PK+ * Data Reduction Result 1 [3]-PK+

Transmitter Radiated Spurious Emission- Ch25 (2475 MHz): 1G-18GHz
Emission above the limit line from the transmitter.



— 74 dBuV per m - - - - 54 dBuV per m — Preview Result 1-PK+ — Preview Result 2-AVG

7 Test Equipment and Ancillaries used for tests

7.1 CETECOM Inc. San Diego EMC Lab

Equipment Name	Manufacturer	Type/Model	Serial No.	Cal Date	Cal Interval	Next cal date
3m Semi- Anechoic Chamber:						
Spectrum Analyzer	Rohde und Schwarz	FSU 26	200302	6/2013	2 years	6/2015
Receiver	Rohde und Schwarz	ESR3	101663	2/2013	2 years	2/2015
LISN	Rohde und Schwarz	ESV 216	101129	1/2013	2 years	1/2015
Radiocommunication Tester	Rohde and Schwarz	CMU 200	121672	7/2013	2 years	7/2015
Log Periodic Antenna	Rohde and Schwarz	HL 050	100515	4/2013	3 year	4/2016
Ultralog Antenna	Rohde and Schwarz	HL 562	100495	2/2012	3 year	2/2015
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/204/60709 10	n/a		
Compact antenna Mast	Maturo	CAM 4.0-P	CAM4.0-P/067/6000910	n/a		
Multiple Control Unit	Maturo	MCU	2140910	n/a		
Pre-Amplifier	Rohde and Schwarz	TS-PR 18	100072	Part of the system calibration		
High Pass Filter	Mini-Circuits	SHP-1200+	RUU11201224	Part of the system calibration		
High Pass Filter	Wainwright Instr.	WHKX 3.0/18	109	Part of the system calibration		

7.2 CETECOM Inc. Milpitas EMC Lab

Instrument/Ancillary	Model	Manufacturer	Serial No.	Cal Date	Cal Interval
EMI Receiver/Analyzer	ESU 40	Rohde & Schwarz	100251	Sept 2013	1 Years
Spectrum Analyzer	FSU	Rohde & Schwarz	200302	Jun 2013	2 Years
Pre-Amplifier	Miteq	JS40010260	340125	N/A	N/A
Binconilog Antenna	EMCO	3141	0005-1186	Apr 2012	3 Years
Binconilog Antenna	ETS	3149	J000123908	Feb 2012	3 years
Horn Antenna	EMCO	3115	35114	Mar 2012	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	R&S	ESH3-Z5	836679/003	Jun 2013	3 Years

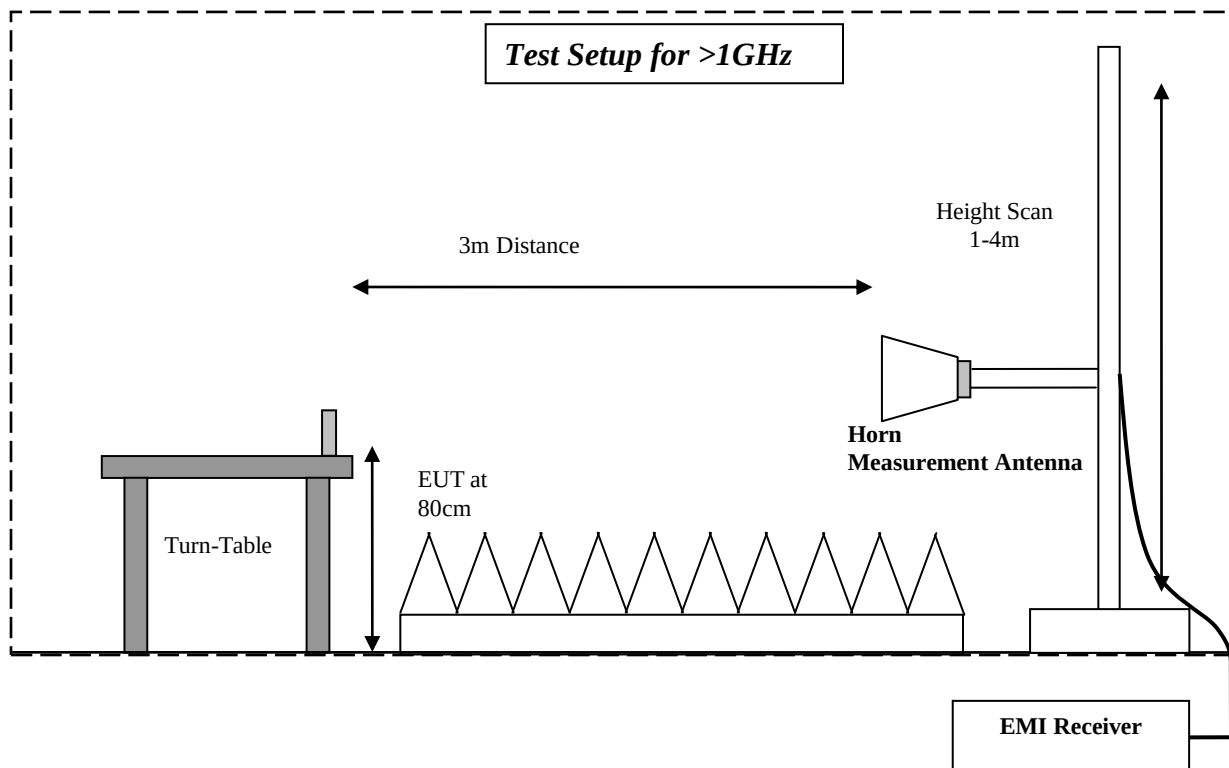
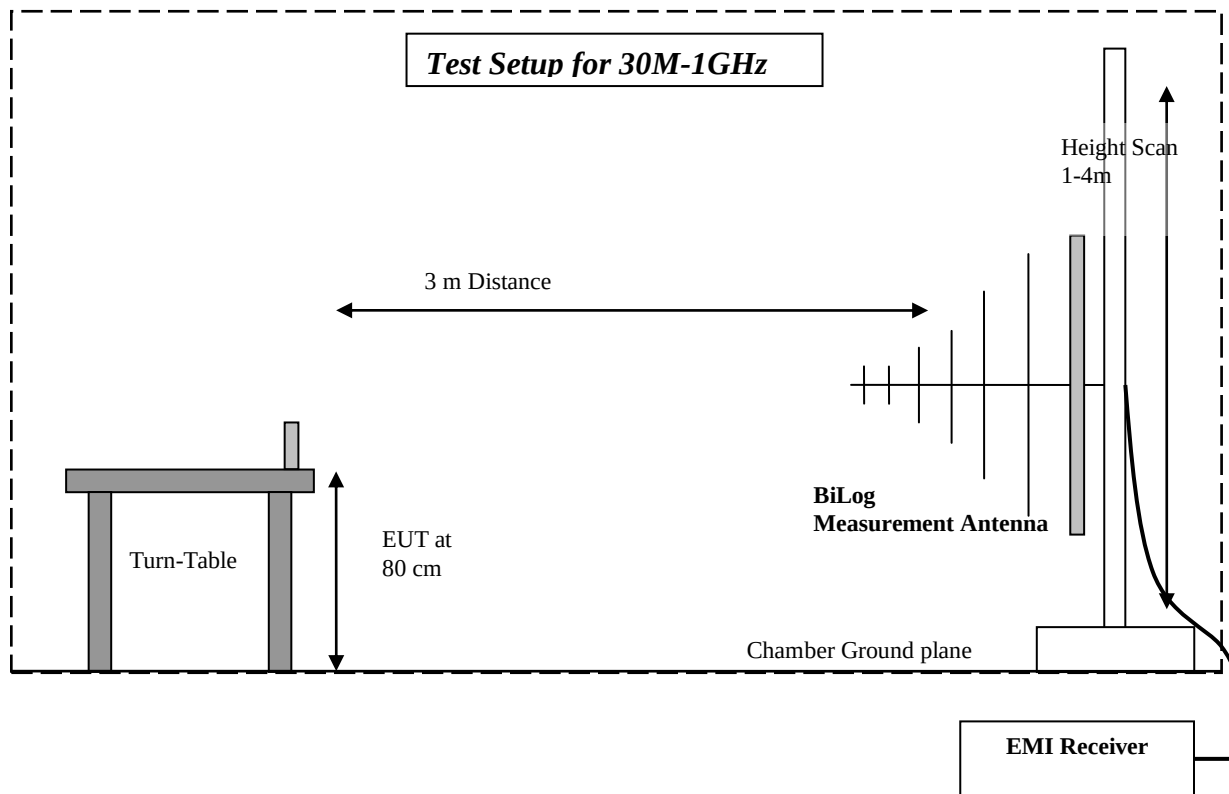
Calibration status valid at the time of testing.

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 Diagrams:



Test Report #: EMC_Xirgo-080-14001_DTS_rev2

Date of Report : 08-27-2014

FCC ID: GKM-XT4800

IC ID: 10281A-XT4800



Revision History

Date	Report Name	Changes to report	Report prepared by
07-11-2014	EMC_Xirgo-080-14001_DTS	First Version	M.Anees
08-27-2014	EMC_Xirgo-080-14001DTS_rev2	Added Ch 2430 readings and formatted the report.	M.Anees