



FCC/IC Partial Test Report

FOR

Manufacturer: Securitron Magnalock Corp.

Model Number: R100-1-PA

Product Description: Aperio Wall Mounted Reader

FCC ID: KSF-R1001PA

IC Certification Number: 11564A-R1001PA

FCC CFR 47 Part 15.247 for DTS

IC RSS-210 Issue 8, Annex 8

TEST REPORT #: EMC_HANC1_002_13502_R100_DTS-R

DATE: March 11, 2014



**FCC :
Accredited**

**IC recognized #
3462B-1**

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1 Assessment

The following equipment, as detailed in section 3 of this test report, was evaluated against the applicable criteria specified in FCC CFR 47 Part 15.247 and Industry Canada Standards RSS 210 Issue 8, Annex 8.

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

This partial scope test report only contains the details of the *radiated* measurements of the above listed rules. *Conducted* RF antenna port measurements are documented in a separate test report as identified in section 4.

Manufacturer	Description	Model #
Securitron Magnalock Corp.	Aperio Wall Mounted Reader	R100-1-PA

Responsible for Testing Laboratory:

Franz Engert

March 11, 2014 Compliance (Manager of Compliance)

Date	Section	Name	Signature
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Responsible for the Report:

Josie Sabado

March 11, 2014 Compliance (Test Lab Manager)

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

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

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2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the 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
Acting Test Lab Manager:	Franz Engert
Test Engineer:	Josie Sabado

2.2 Identification of the Client

Applicant's Name:	Assa Abloy
Street Address:	10027 S. 51st St. Ste. 102
City/Zip Code	Phoenix, AZ 85044
Country	USA
Contact Person:	Josh Peabody
Phone No.	623-582-4626
e-mail:	josh.peabody@assaabloy.com

2.3 Identification of the Manufacturer

Manufacturer's Name:	Securitron Magnalock Corp.
Manufacturers Address:	10027 S. 51st St. Ste. 102
City/Zip Code	Phoenix, AZ 85044
Country	USA

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3 Equipment under Test (EUT)

3.1 Specification of the Equipment under Test

Marketing Name:	R100-1-PA Aperio Reader
Model Number:	R100-1-PA
FCC-ID :	KSF-R1001PA
IC Certification Number:	11564A-R1001PA
Product Description:	Aperio Wall Mounted Reader
Technology / Type(s) of Modulation:	802.15.4 Zigbee: OQPSK
Nominal Channel Bandwidths:	5 MHz
Operating Frequency Ranges (MHz) / Channels:	Nominal band: 2400 – 2483.5; Channel Center to center: 2405 (Ch. 11) – 2475 (Ch. 25), 15 channels
Antenna info:	Chip Antenna, Manufacturer stated max antenna gain 0.5 dBi
Max. Output Powers:	Radiated (EIRP): -16.28 dBm
Rated Operating Voltage Range:	Battery, type CR2, 3.0V Li-ion
Rated Operating Temperature Range:	-40 °C to +50 °C
Test Sample Status:	Prototype
Other Radios included:	13.56 MHz RFID

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3.2 Identification of the Equipment Under Test (EUT)

EUT #	Serial Number	Sample	HW/SW Version	Note
1	10046	7080058.014	r100_main2_aperio_lowFreq -0.0.24450_bl-0.0.24450	

3.3 Identification of Accessory Equipment

No accessory equipment

3.4 Other EUT Notes

The device was configured with manufacturer provided test software, capable of setting the unit in different supported modulation schemes, data rates and channels of operation.

The device was set to continuous framed transmit (burst) mode per test software, which allowed the EUT to be operated with 100% duty cycle during testing.

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4 Summary of Measurement Results

Test Specification	Test Case	Temperature and Voltage Conditions	Pass	Fail	NA	NP	Result
§15.247(a)(2) RSS210 A8.2(a)	6 dB Bandwidth	Nominal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	■	Note 1
§15.247(b)(3) RSS210 A8.4(4)	Maximum Peak Conducted Output Power	Nominal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	■	Note 1
§15.247(b)(4)	Antenna Gain	Nominal	■	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies
RSS210 A8.4(4)	EIRP	Nominal	■	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies
§15.247(d) RSS210 A8.5	Unwanted Emissions at the Band Edges - Conducted	Nominal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	■	Note 1
§15.247(d) RSS210 A8.5	Unwanted Emissions at the Band Edges - Radiated	Nominal	■	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies
§15.247(d) RSS210 A8.5	Unwanted Emissions into Non-Restricted Bands	Nominal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	■	Note 1
§15.247(d) RSS210 A8.5	Unwanted Emissions into Restricted Bands	Nominal	■	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies
§15.247(e) RSS210 A8.2(b)	Power Spectral Density	Nominal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	■	Note 1
§15.207(a) RSS Gen	AC Power Line Conducted Emissions	Nominal	<input type="checkbox"/>	<input type="checkbox"/>	■	<input type="checkbox"/>	Note 2

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

1. Conducted RF antenna port measurements are documented in a separate test report described in section 5.7.
2. EUT is battery operated. AC power line conducted emissions is not applicable.

5 Measurement Information

5.1 Dates of Testing

November 20, 2013

5.2 Measurement Uncertainty

The following measurement uncertainties are applicable to the measurements described in this test report:

Conducted power and emission measurements: +/- 0.5dB

Radiated power and emission measurements: +/- 3.0 dB

5.3 Nominal EUT Conditions During Test

The following nominal EUT conditions were used during the course of testing, unless otherwise stated:

EUT Voltage: Li-ion Battery, 3.0 VDC nominal

5.4 Nominal Environmental Conditions During Test

The following nominal environmental conditions were maintained during the course of testing, unless otherwise stated:

Ambient Temperature: 20-25°C

Relative humidity: 40-60%

5.5 Measurement Method

All radiated testing is performed according to guidelines in FCC publication KDB 558074 D01Meas Guidance v03r01: Measurement Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) operating under 15.247, April 2013 and in ANSI C63.4 (2009).

5.6 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

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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.

All radiated test data in this report shows the worst case emissions for H/V measurement antenna polarizations and for all three orthogonal orientations of the EUT.

5.6.1 Sample Calculations for Radiated 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.

5.7 Associated Test Reports

Conducted RF antenna port measurements are documented in test report number EMC_HANC1-001-13501_R100LF_DTS-C issued by CETECOM Inc.

5.8 Other Testing Notes

The EUT was tested on the low, mid and high channels of the tested frequency band.

6 Measurement Results

6.1 Antenna Gain / EIRP

6.1.1 References

§15.247 (b)(4)

The conducted output power limit specified in FCC §15.247 (b)(3) is based on the use of antennas with directional gains that do not exceed 6 dBi.

RSS-210 A8.4(4)

The EIRP shall not exceed 4 W (36 dBm).

6.1.2 Testing Notes

Radiated EIRP is calculated as

$$\text{Radiated EIRP} = \text{Conducted Measurement} + \text{Antenna Gain}$$

6.1.3 Test Result

Maximum Antenna Gain: 0.5 dBi (Manufacturer Declared)

The following maximum peak conducted output power measurements are taken from the test report referenced in section 4.

Measured Maximum Peak Conducted Output Power (dBm)			
Mode	Frequency (MHz)		
	2405 Channel 11	2440 Channel 18	2475 Channel 25
802.15.4 ZigBee	-17.64	-16.78	-16.81

Calculated Maximum Peak Radiated Output Power (dBm)			
Mode	Frequency (MHz)		
	2405 Channel 11	2440 Channel 18	2475 Channel 25
802.15.4 ZigBee	-17.14	-16.28	-16.31

6.1.4 Measurement Verdict

Pass

6.2 Unwanted Emissions at the Band Edges – Radiated

6.2.1 References

§15.247 (d)

RSS-210 A8.5

Radiated emissions which fall in the restricted bands, as defined in §15.205 (a) and RSS-Gen 7.2.2 (c), must also comply with the radiated emission limits specified in §15.209 (a) and RSS-Gen 7.2.5.

§15.205 (a)

RSS-Gen 7.2.2 (c)

Only spurious emissions are permitted in any of the frequency bands listed in the tables in these sections.

§15.209

RSS-Gen 7.2.5

The emissions from an intentional radiator shall not exceed the limits in the tables in these sections using an average detector.

§15.35 (b)

When average radiated emissions measurements are specified, the limit on the peak level of the radio frequency emissions is 20 dB above the maximum permitted average emission limit.

6.2.2 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

6.2.3 Testing Notes

Measurement distance: 3 m

6.2.4 Measurement Verdict

Pass

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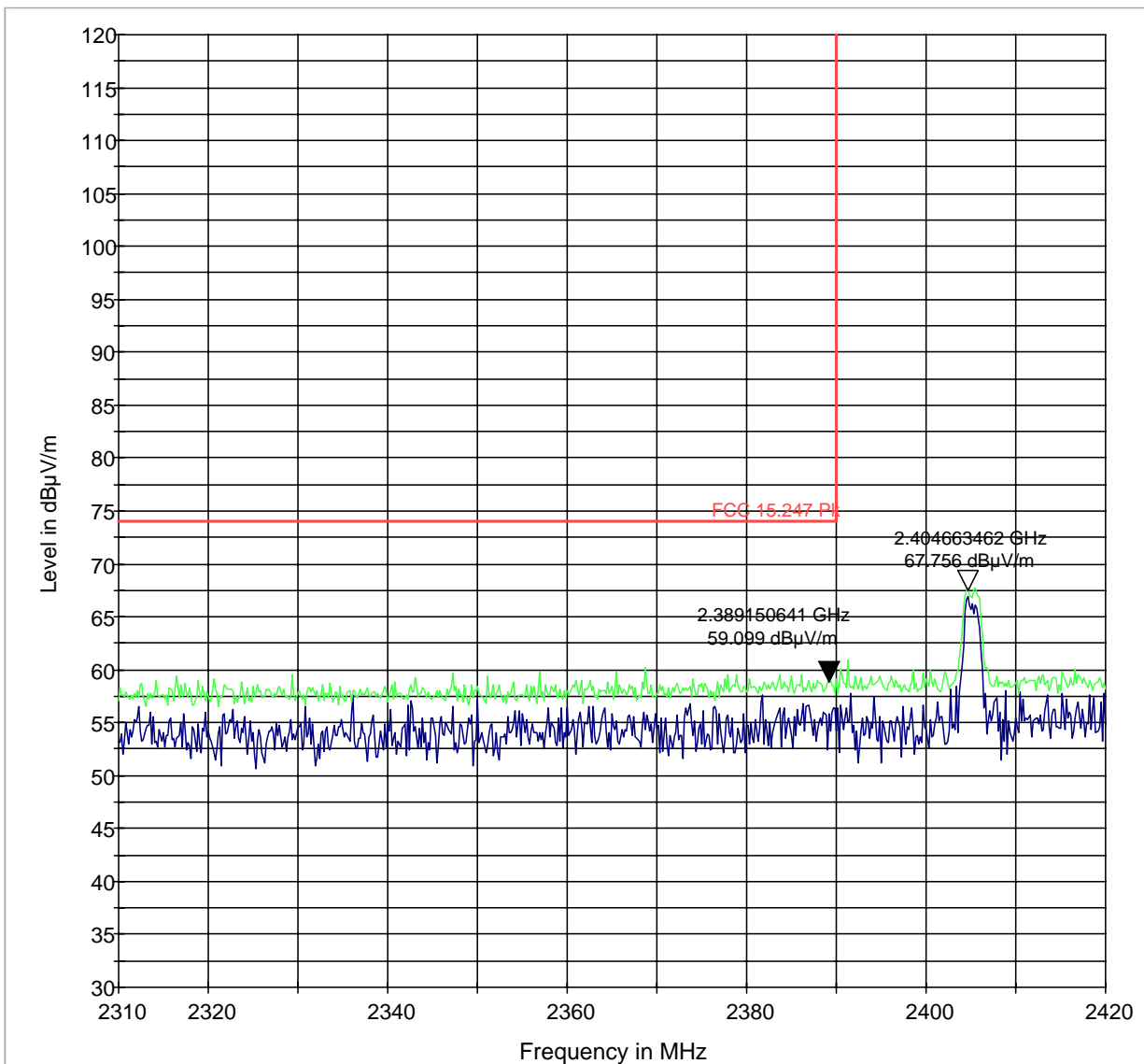
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6.2.5 Test Plots

Lower band edge peak – Zigbee mode: 2405 MHz



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

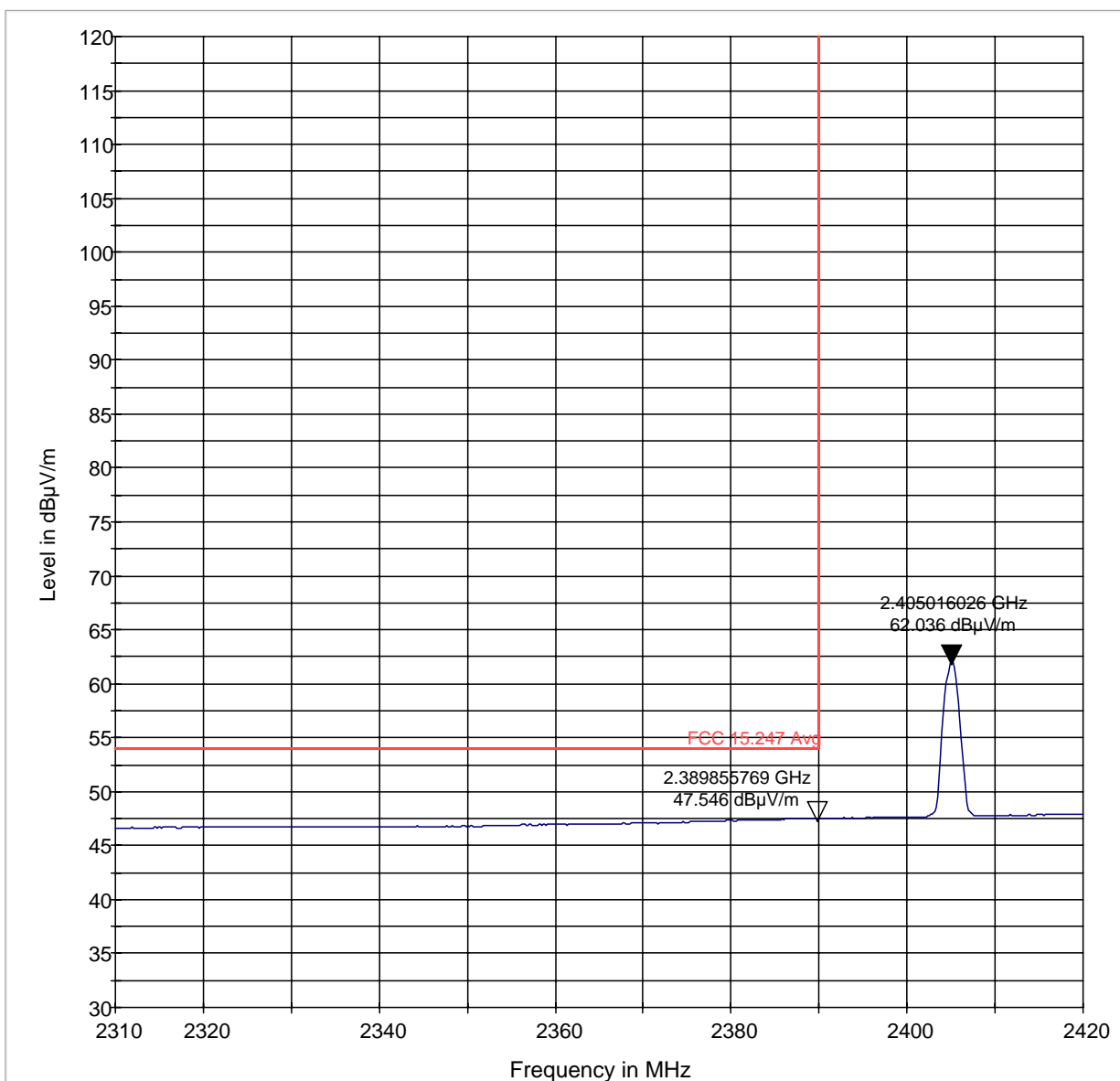
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Lower band edge average -Zigbee mode: 2405 MHz



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

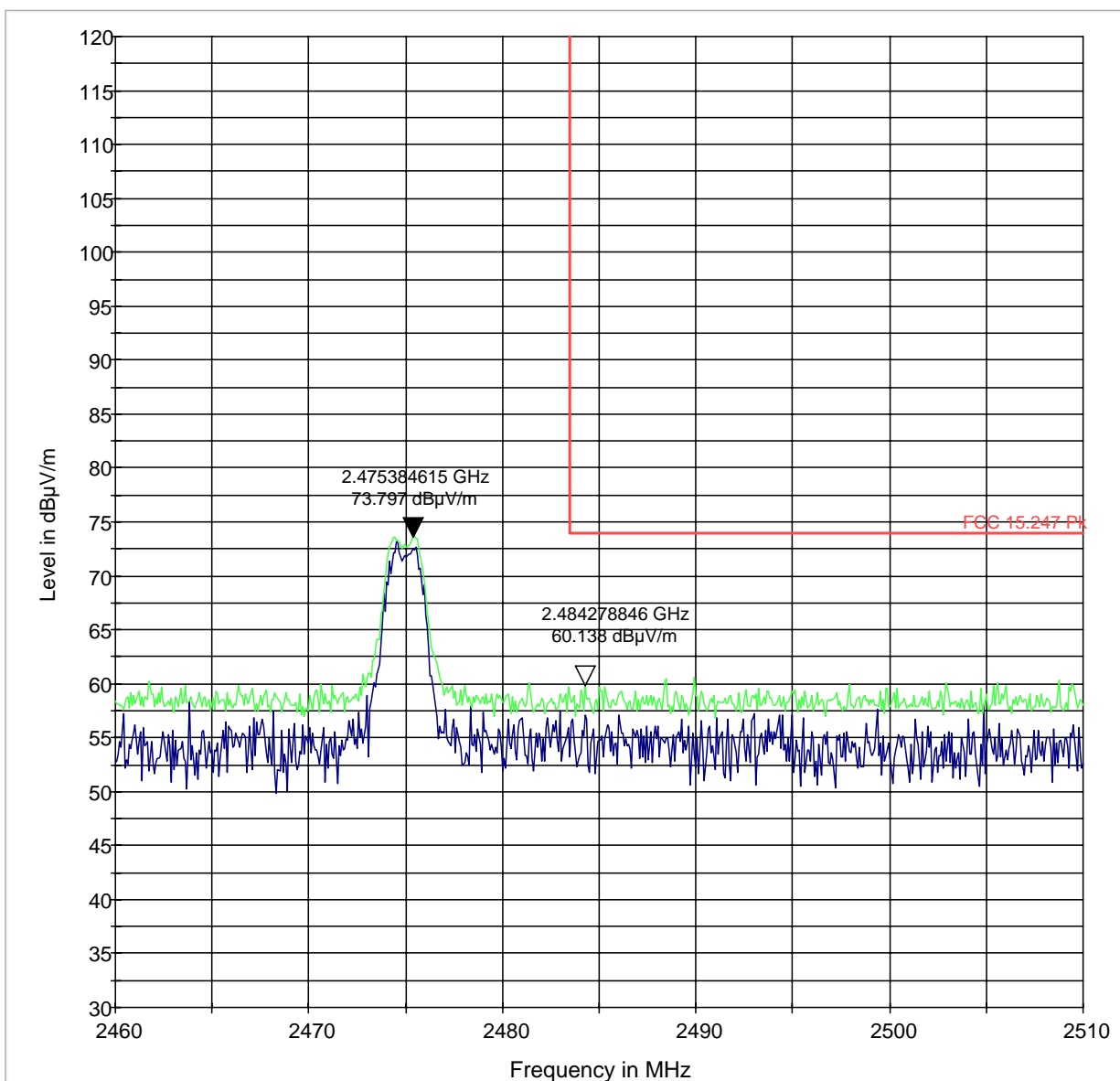
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Higher band edge peak -Zigbee mode: 2475 MHz



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

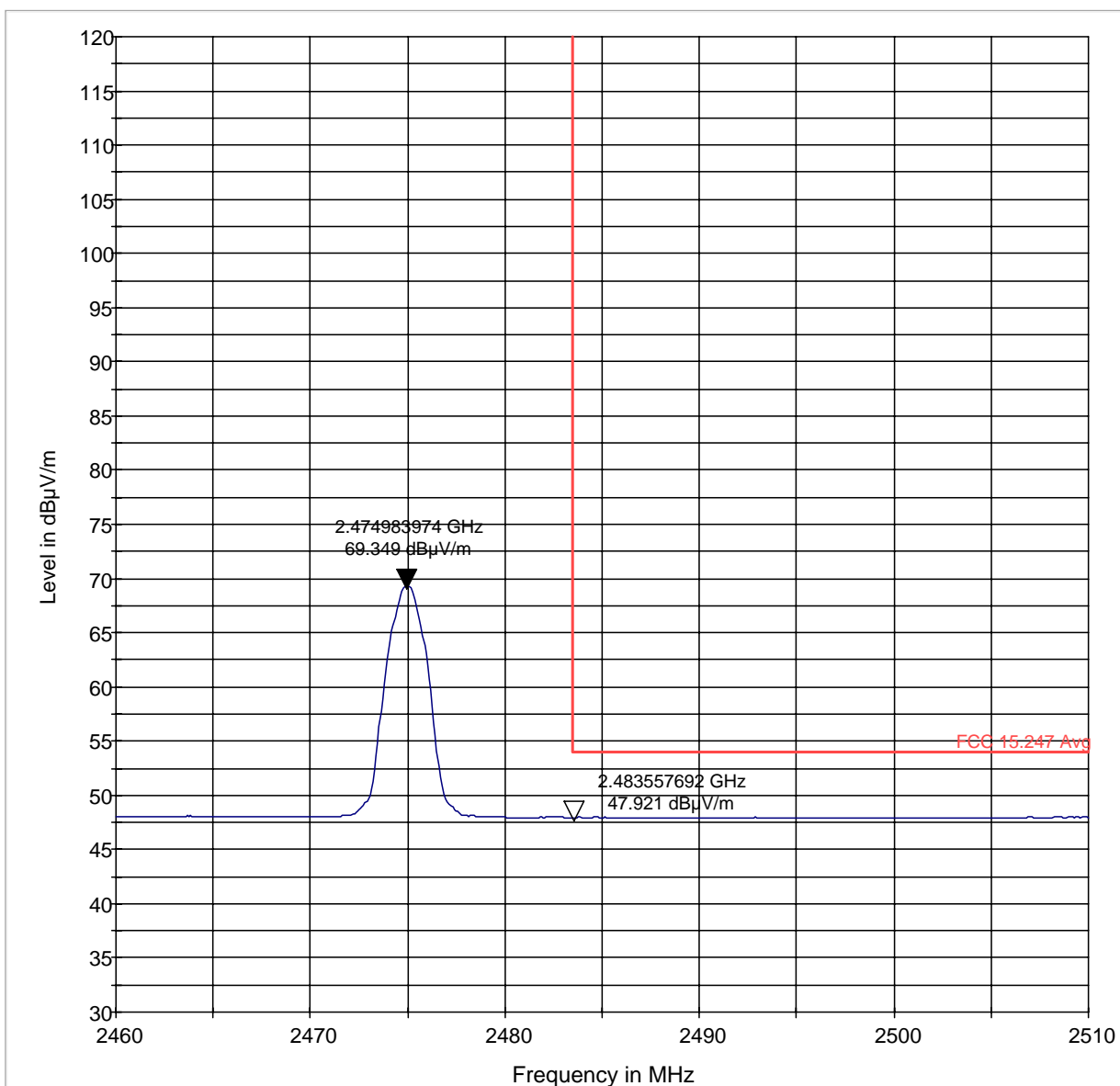
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Higher band edge average-Zigbee mode: 2475 MHz



— MaxPeak-MaxHold-PK+ — FCC 15.247 Avg

6.3 Unwanted Emissions into Restricted Frequency Bands - Radiated**6.3.1 References****§15.247 (d)****RSS-210 A8.5**

Radiated emissions which fall in the restricted bands, as defined in §15.205 (a) and RSS-Gen 7.2.2 (c), must also comply with the radiated emission limits specified in §15.209 (a) and RSS-Gen 7.2.5.

§15.205 (a)**RSS-Gen 7.2.2 (c)**

Only spurious emissions are permitted in any of the frequency bands listed in the tables in these sections.

§15.209**RSS-Gen 7.2.5**

The emissions from an intentional radiator shall not exceed the limits in the tables in these sections using an average detector.

§15.35 (b)

When average radiated emissions measurements are specified, the limit on the peak level of the radio frequency emissions is 20 dB above the maximum permitted average emission limit.

6.3.2 Spectrum Analyzer Settings

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

	Transmitter Spurious Emissions 1 GHz – 26 GHz					
	1 – 3 GHz	3 – 10 GHz	10 – 13 GHz	13 – 17.5 GHz	17.5 – 18 GHz	18 – 26 GHz
Resolution Bandwidth	1 MHz	1 MHz	120 kHz	120 kHz	10 kHz	1 MHz
Video Bandwidth	10 MHz	10 MHz	1 MHz	1 MHz	100 kHz	10 MHz
Detector	Peak Average	Peak Average	Peak Average	Peak Average	Peak Average	Peak Average
Trace Mode	Max Hold	Max Hold	Max Hold	Max Hold	Max Hold	Max Hold
Sweep Time	Auto	Auto	Auto	Auto	Auto	Auto

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6.3.3 Testing Notes

Measurement distance: 3 m

For the measurement range up to 30 MHz in the following plots the field strength results from 3m distance measurement are extrapolated to 300m and 30m distance respectively, by 40dB/decade, according to part 15.31(f)(2), per antenna factor scaling. The red limit line shows the 300 m limit up to 490 kHz, the 30m limit up to 30 MHz and 3m limit above 30MHz.

Measurements below 1000 MHz are performed with a peak detector and compared to average limits. Measurements with an average detector are not required.

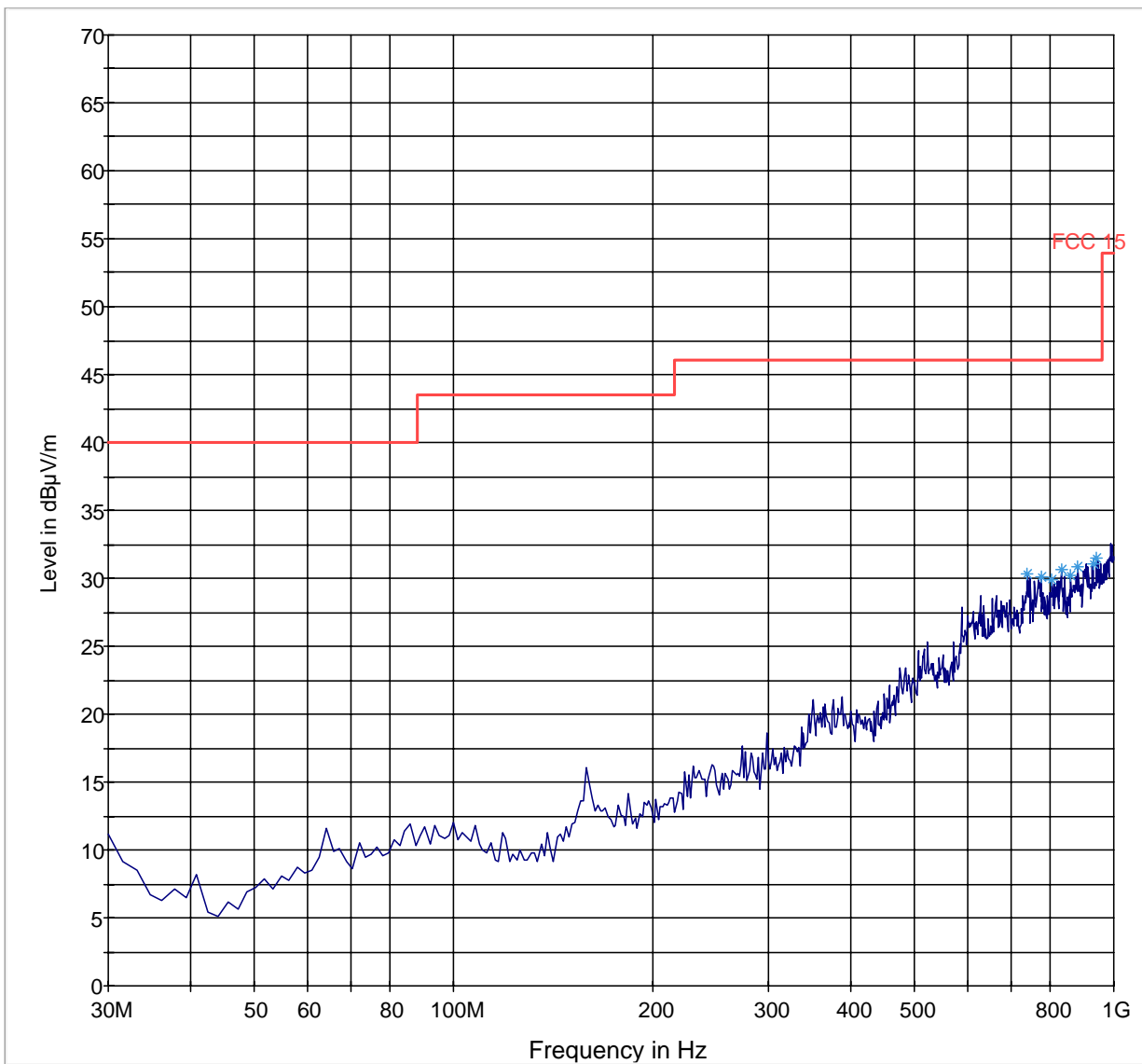
Measurements between 9 kHz – 30 MHz and between 18 GHz – 26 GHz are performed at one channel because the emissions in these frequency ranges are the same for all channels.

6.3.4 Measurement Verdict

Pass

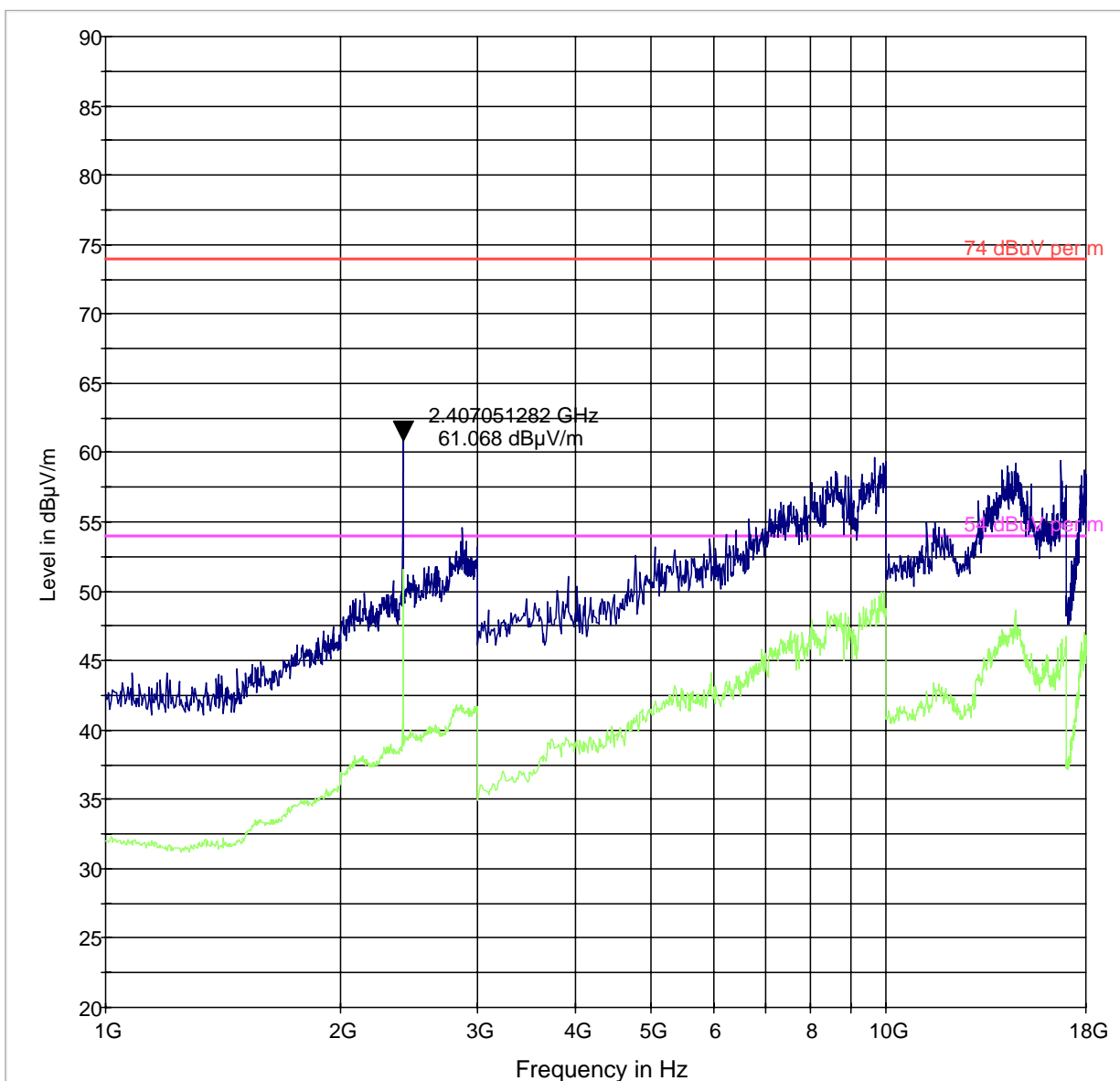
6.3.5 Test Plots

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



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

Transmitter Radiated Spurious Emission- Ch11 (2405 MHz): 1 GHz – 18 GHz



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

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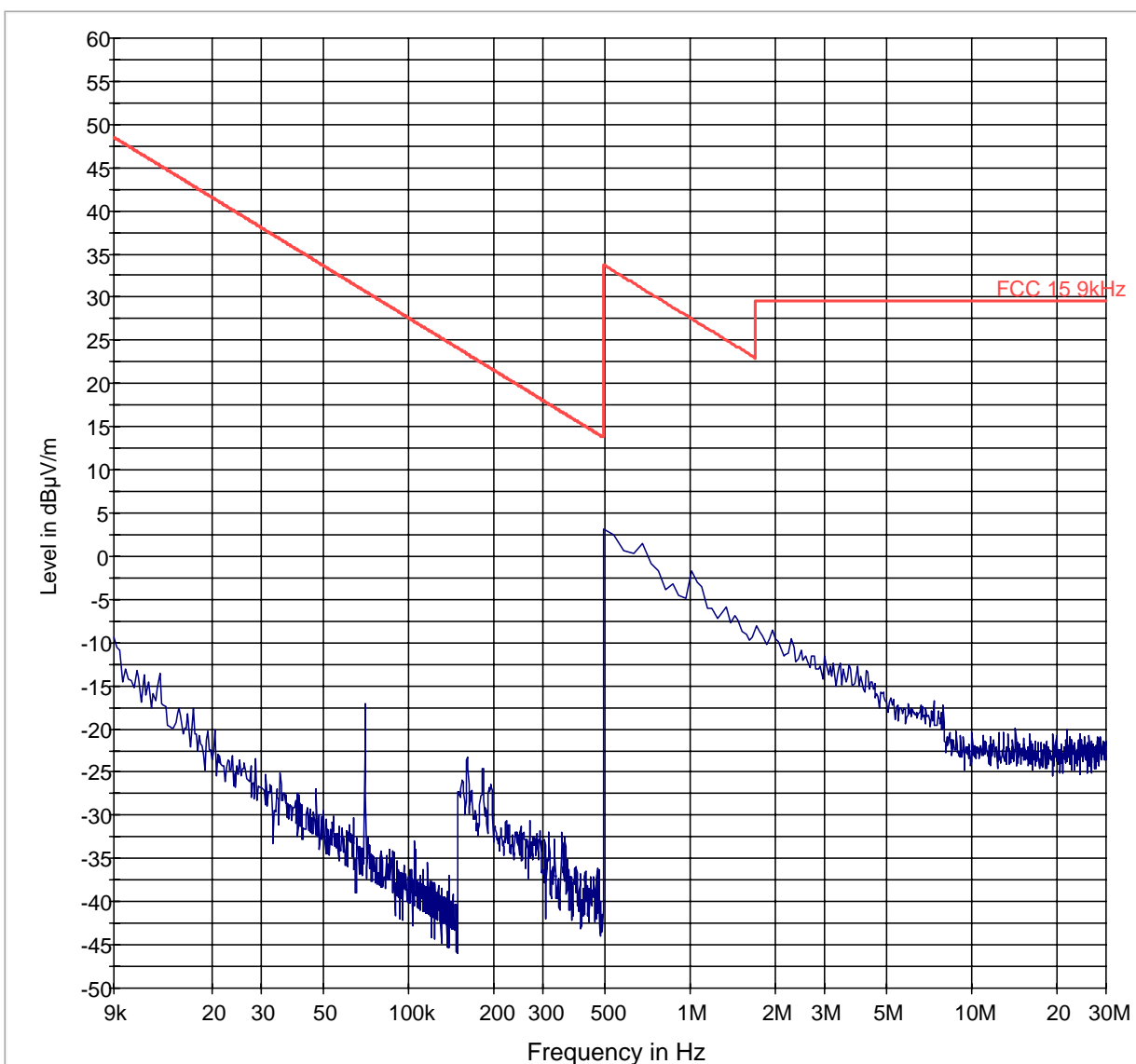
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Transmitter Radiated Spurious Emission- Ch 18 (2440 MHz): 9 kHz – 30 MHz

Note: Worst case representation for all channels in this frequency range



— FCC 15.9kHz — Preview Result 1-PK+

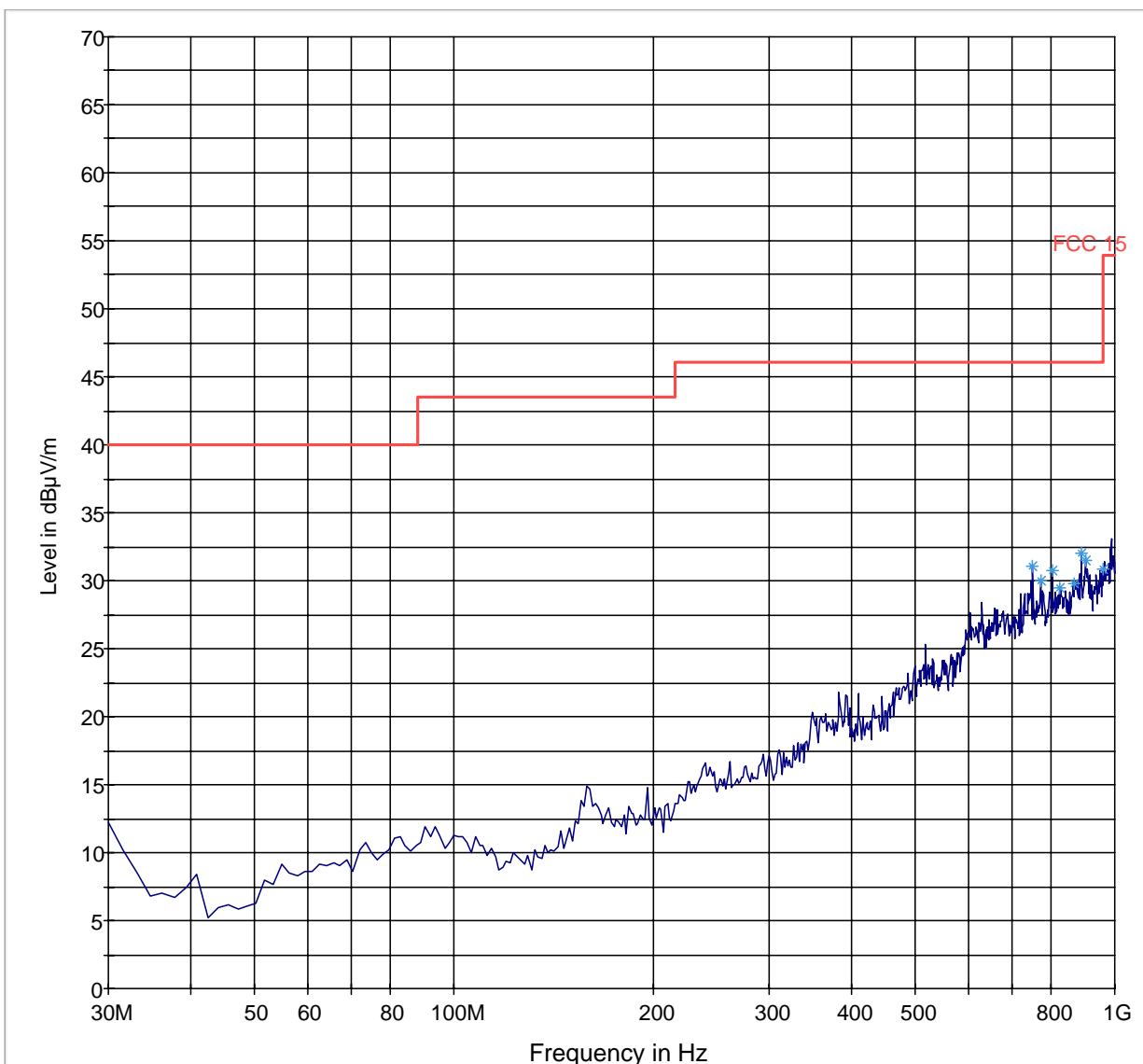
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Transmitter Radiated Spurious Emission- Ch18 (2440 MHz): 30 MHz – 1 GHz



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

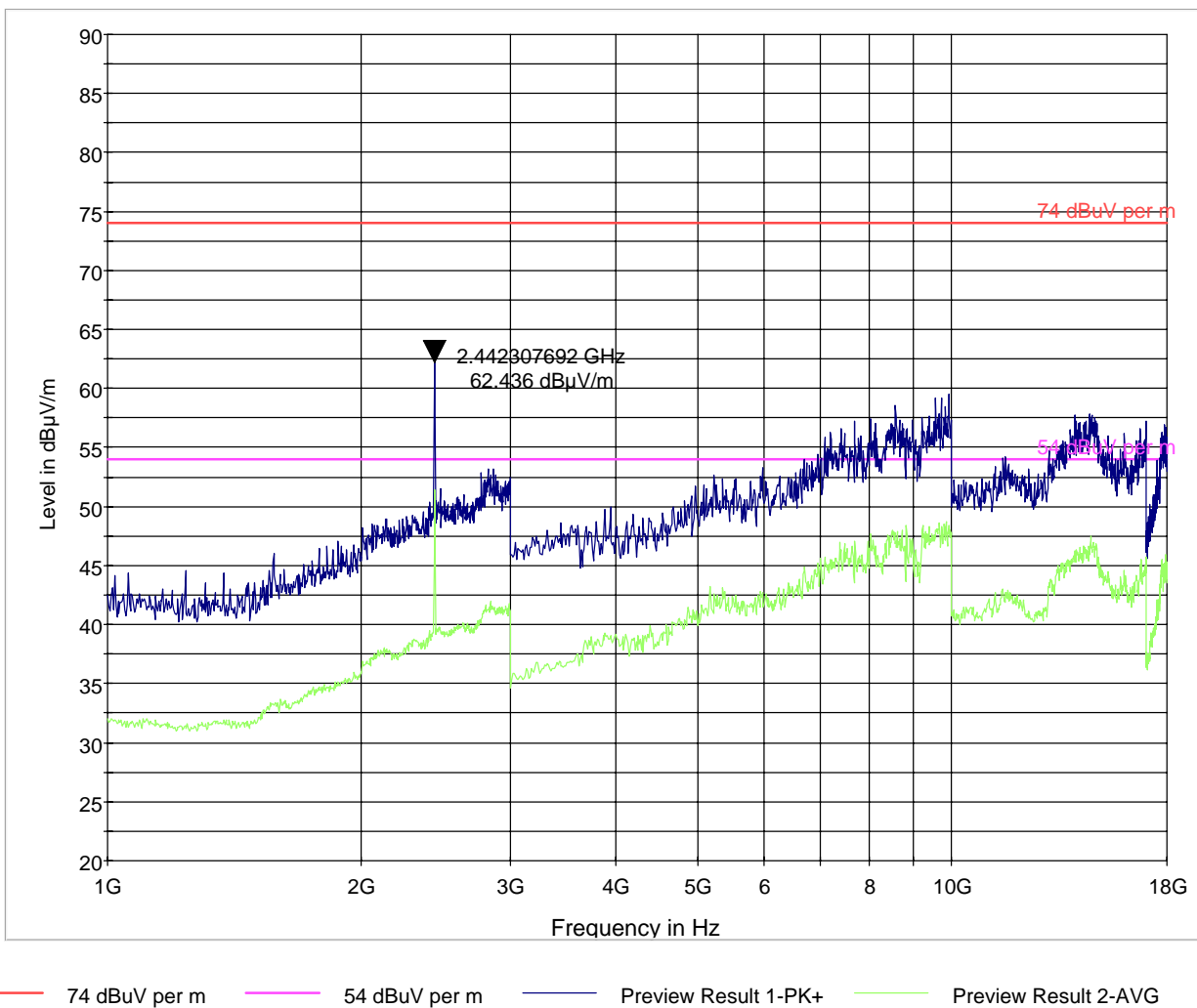
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Transmitter Radiated Spurious Emission- Ch18 (2440 MHz): 1 GHz – 18 GHz



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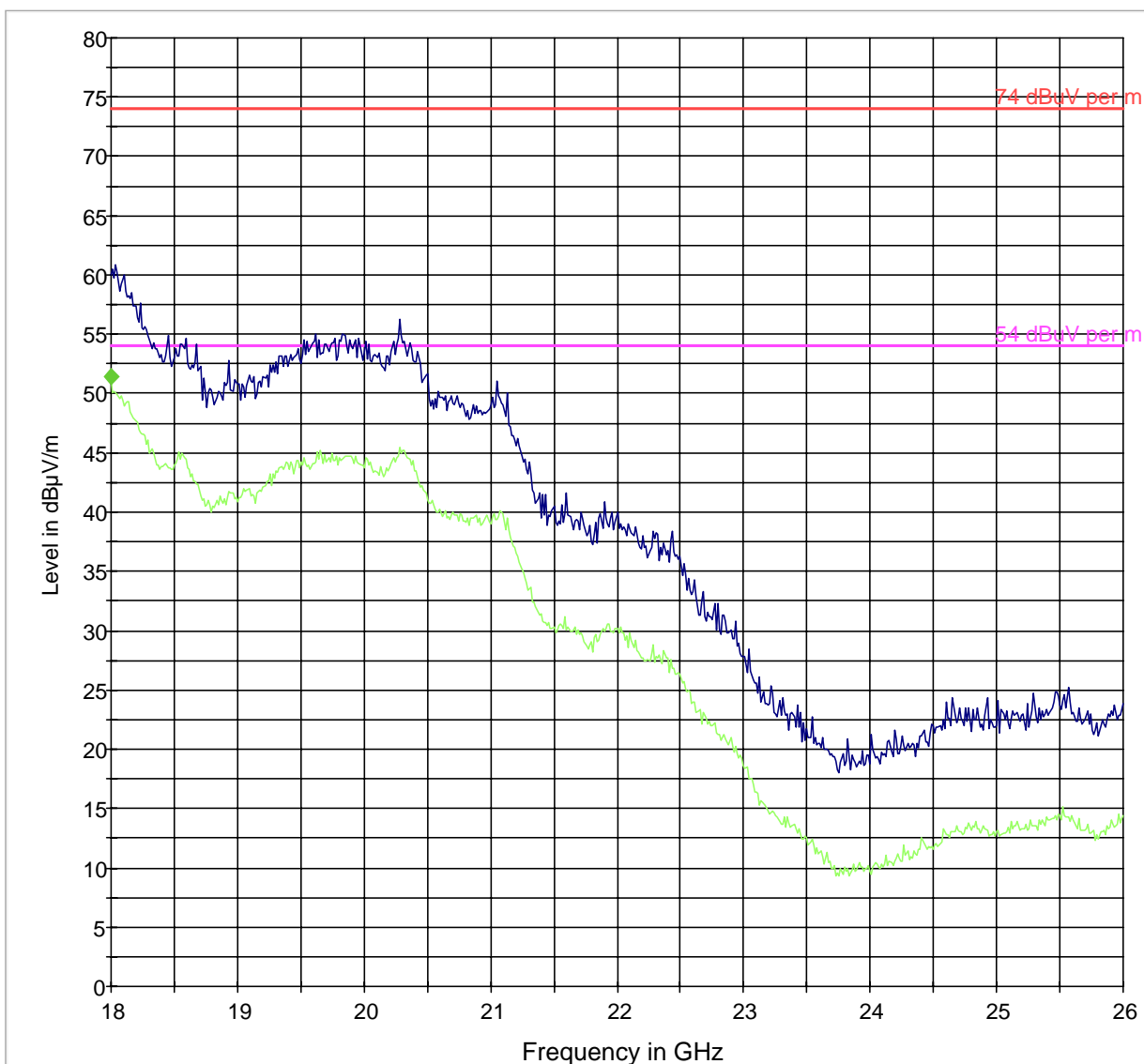
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Transmitter Radiated Spurious Emission- Ch18 (2440 MHz): 18 GHz – 26 GHz

Note: Worst case representation of all channels



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

— Preview Result 2-AVG
 ◆ Final Result 2-AVG

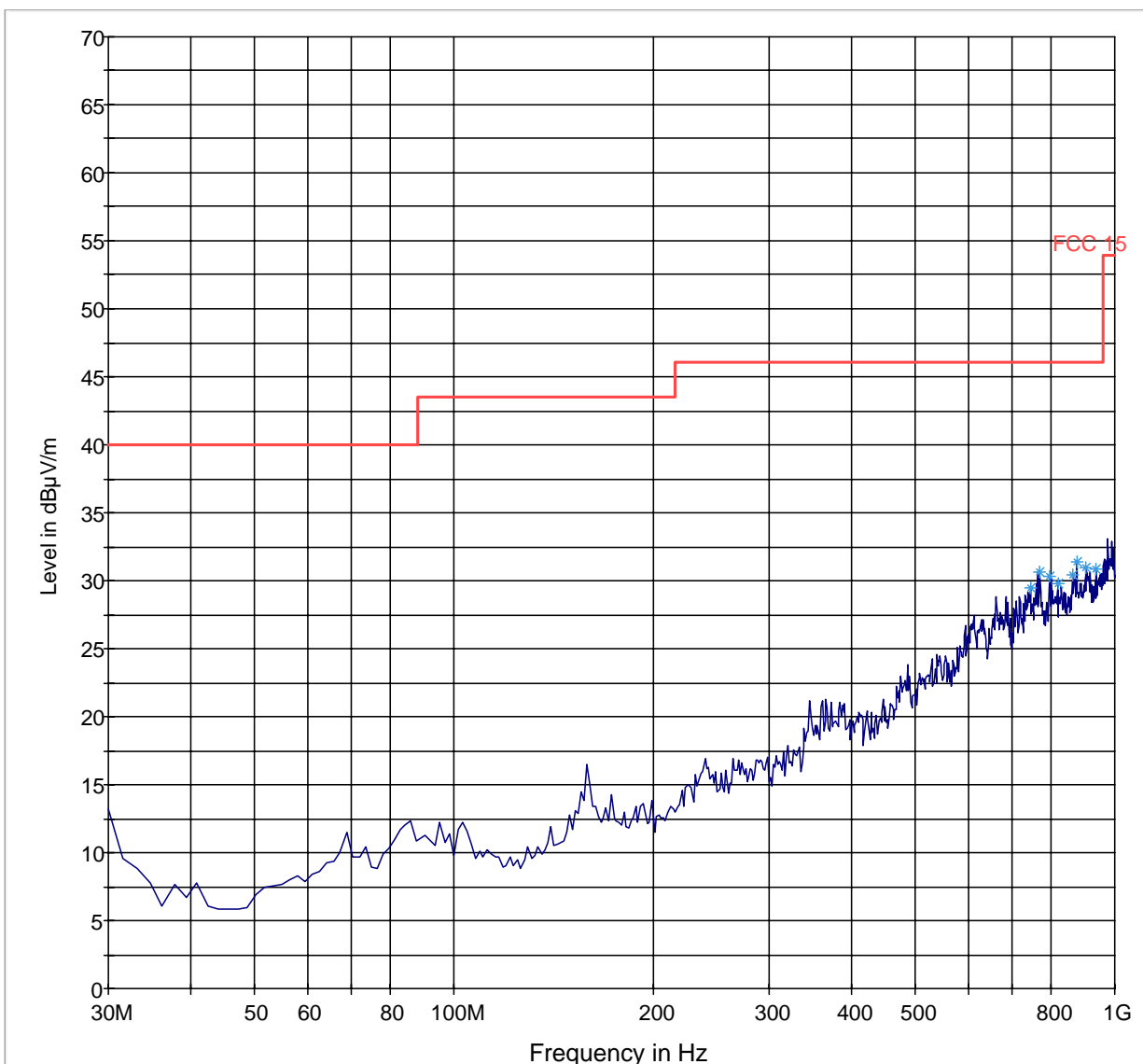
Test Report #: EMC_HANC1_002_13502_R100_DTS-R

FCC ID: KSF-R1001PA

Date of Report : March 11, 2014

IC Cert. No.: 11564A-R1001PA

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



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

Test Report #: EMC_HANC1_002_13502_R100_DTS-R

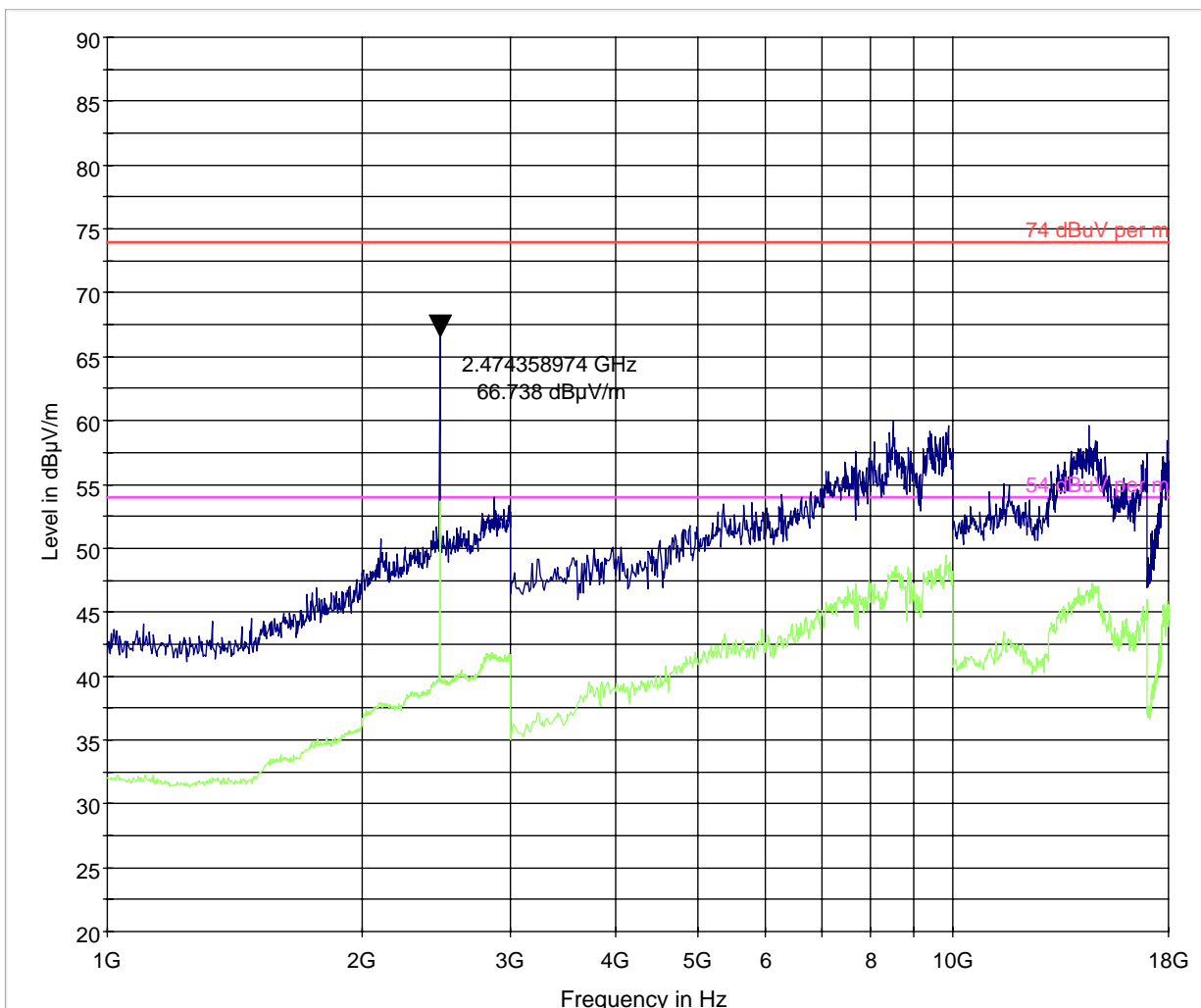
FCC ID: KSF-R1001PA

Date of Report : March 11, 2014

IC Cert. No.: 11564A-R1001PA

Transmitter Radiated Spurious Emission- Ch25 (2475 MHz): 1 GHz – 18 GHz

Emission above the limit line from the transmitter.



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

Test Report #: EMC_HANC1_002_13502_R100_DTS-R

FCC ID: KSF-R1001PA

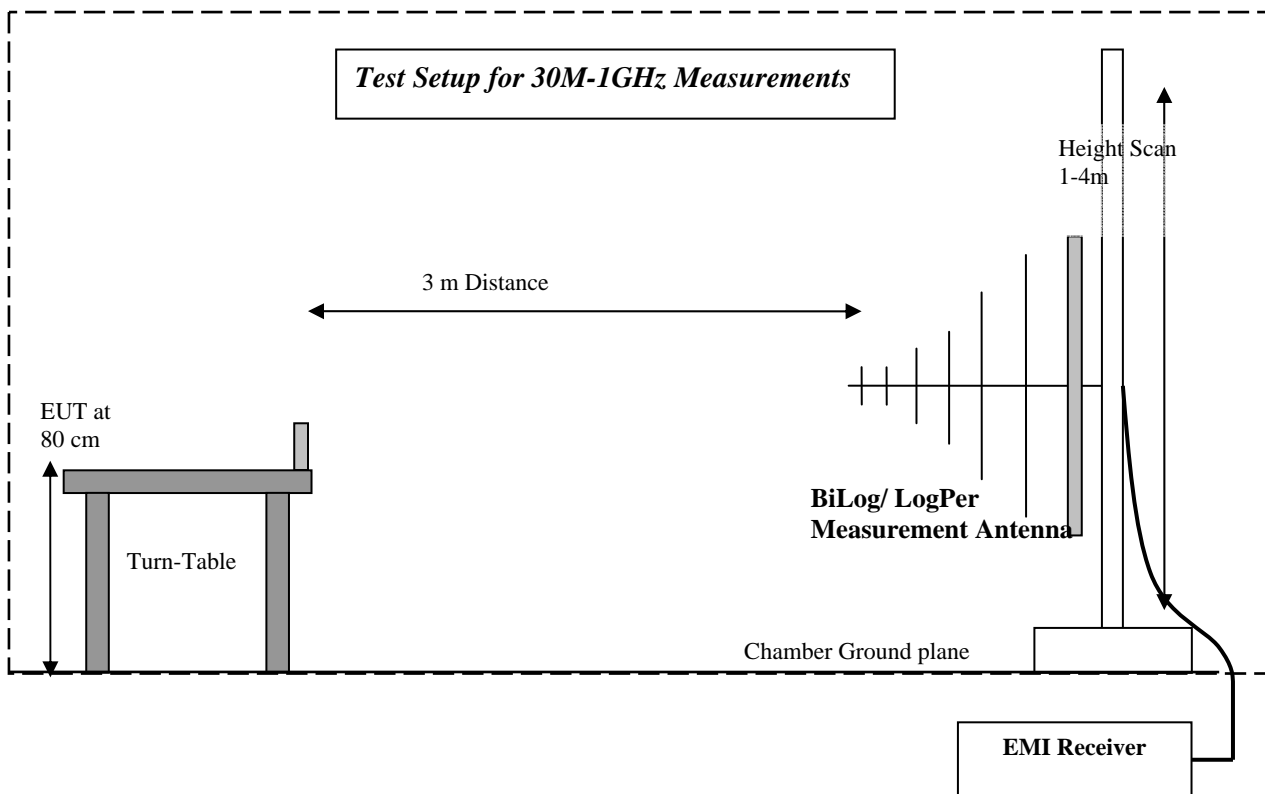
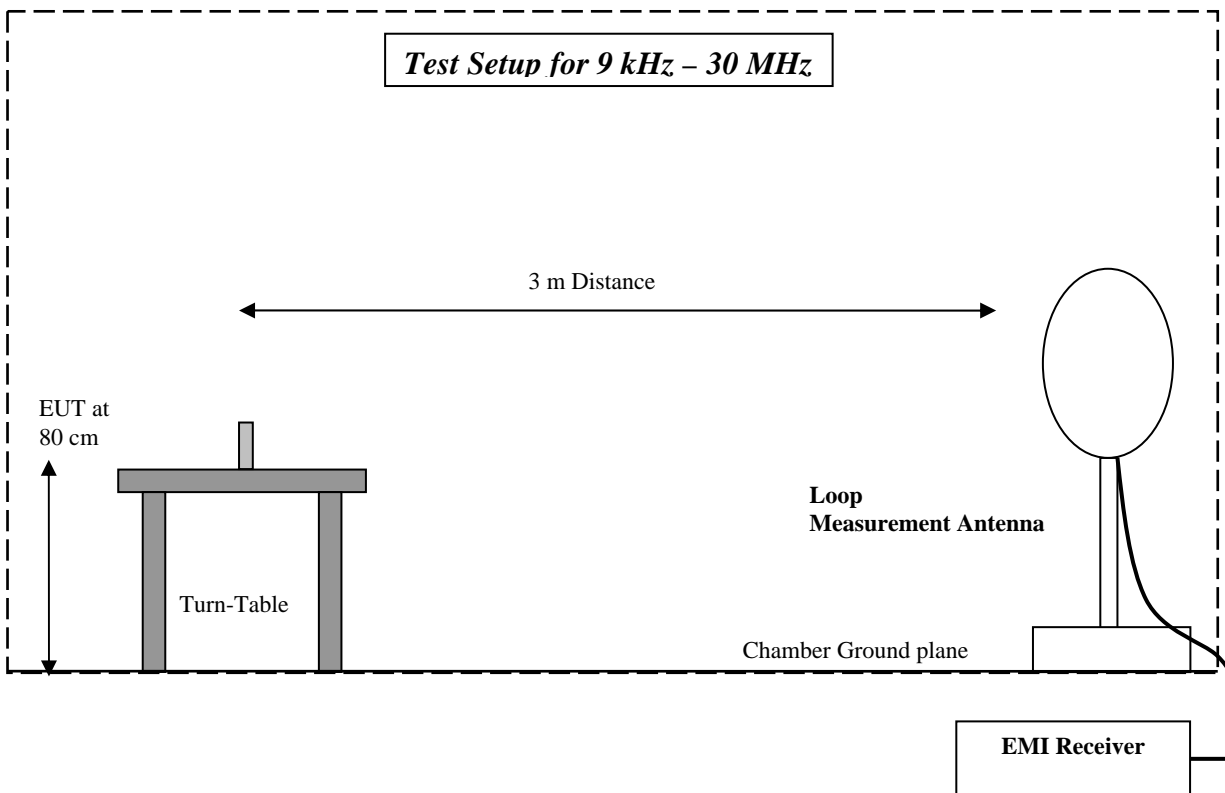
Date of Report : March 11, 2014

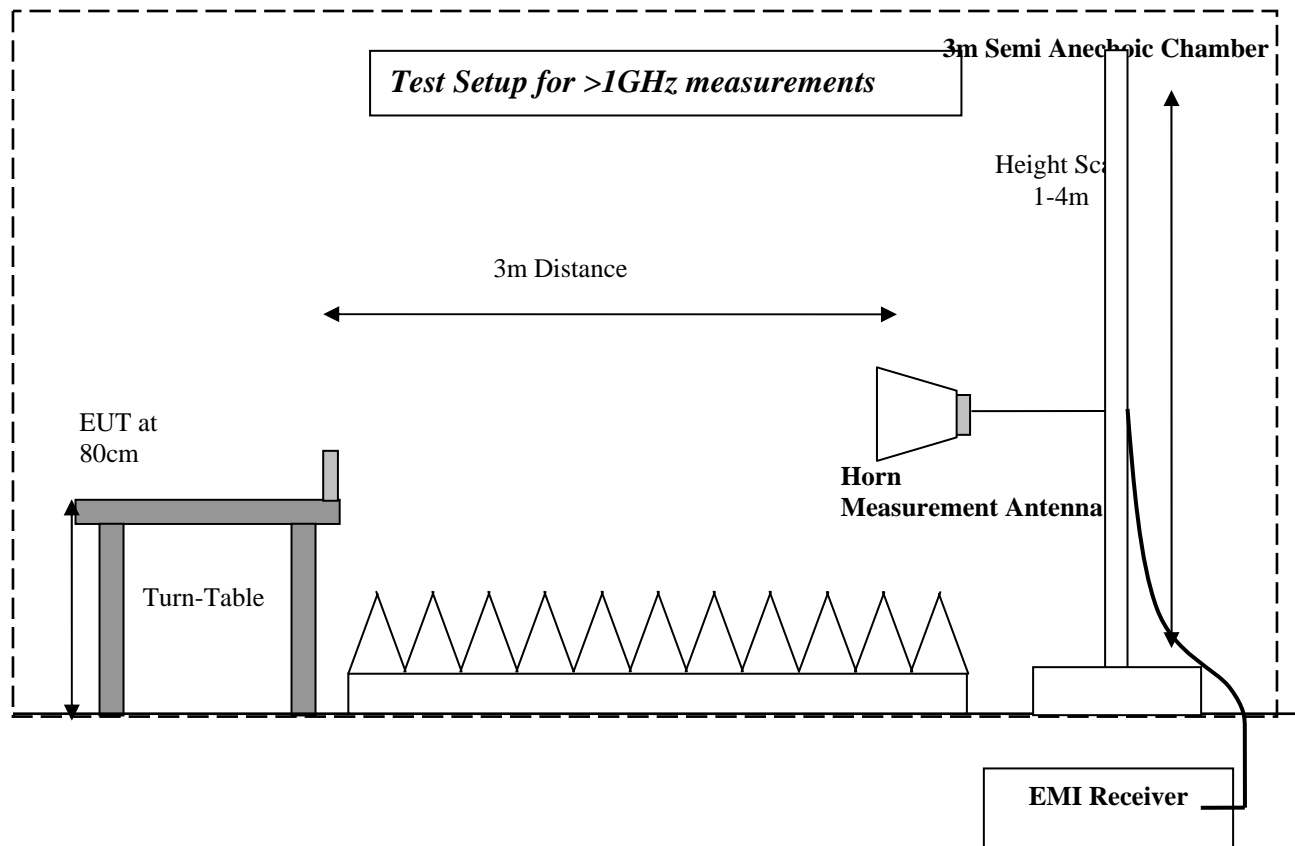
IC Cert. No.: 11564A-R1001PA

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	100365	Feb 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
	Binconilog Antenna	ETS	3149	J000123908	Feb 2012	3 years
	Horn Antenna	EMCO	3115	35114	Mar 2012	3 Years
	LISN	FCC	50-25-2-08	08014	Jul 2012	2 Year
Ancillary equipment						
	Multimeter	Klein Tools	MM200	001	Apr 2011	3 Years
	Humidity Temperature Logger	Dickson	TM320	03280063	Apr 2013	1 Year
	Digital Barometer	VWR	35519-055	91119547	Nov 2011	3 Years
	DC Power Supply	HP	E3610A	KR83023316	N/A	N/A
	DC Power Supply	Protek	3003B	H012771	N/A	N/A
	Communication Antenna	IBP5-900/1940	Kathrein	N/A	N/A	N/A

8 Block Diagrams





Test Report #: EMC_HANC1_002_13502_R100_DTS-R**FCC ID:** KSF-R1001PA**Date of Report :** March 11, 2014**IC Cert. No.:** 11564A-R1001PA

9 Revision History

Date	Report Name – Changes to Report	Report prepared by
March 11, 2014	EMC_HANC1_002_13502_R100_DTS-R 1. Original Report	J. Sabado