FCC Test Report

Test report no.: EMC_826FCC15.247_2004_WLAN

FCC Part 15.247 for DSSS systems / CANADA RSS-210

Model: D9500LUP
FCC ID: HD59500LUP

Deutscher Akkreditierungs Rat

TTI-P-G 081/94-A0

Accredited according to **ISO/IEC 17025**

Bluetooth Qualification Test Facility (BQTF)

CTIA Authorized Test Lab
LAB CODE 20020328-00

FCC listed # 101450

IC recognized # 3925

***CETECOM* Inc.**

411 Dixon Landing Road ◆ Milpitas, CA 95035 ◆ U.S.A.

Phone: + 1 (408) 586 6200 ◆ Fax: + 1 (408) 586 6299 ◆ E-mail: info@cetecomusa.com ◆ http://www.cetecom.com

CETECOM Inc. is a Delaware Corporation with Corporation number: 2113686
Board of Directors: Dr. Harald Ansorge, Dr. Klaus Matkey, Hans Peter May

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1 General information

1.1 Notes

The test results of this test report relate exclusively to the test item specified in 1.5. The 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 the CETECOM Inc USA.

TEST REPORT PREPARED BY:
EMC Engineer: Harpreet Sidhu

1.2 Testing laboratory

CETECOM Inc.
411 Dixon Landing Road, Milpitas, CA-95035, USA
Phone: +1 408 586 6200 Fax: +1 408 586 6299
E-mail: lothar.schmidt@cetecomusa.com
Internet: www.cetecom.com

1.3 Details of applicant

Name	**:**	Hand Held Products, Inc.
Street	**:**	700 Vision Drive
City / Zip Code	**:**	Skaneateles Falls, NY 13153
Country	**:**	U.S.A
Contact	**:**	Naveen Velagapudi
Telephone	**:**	+1 315 685 2931
Tele-fax	**:**	+1 315 685 1210
e-mail	**:**	velagapudin@hhp.com

1.4 Application details

Date of receipt test item	:	2004-12-15
Date of test	:	2004-12-15/16

1.5 Test item

Manufacturer	:	Applicant
Marketing Name	:	Dolphin 9500LUP
Model No.	:	**D9500LUP**
Description	:	Dolphin 9500 is a ruggedized handheld computer which can read barcodes and other auto ID codes. It contains three different transmitters (BT, WLAN and GSM) to send and receive data.
FCC-ID	:	D9500LUP

Additional information

Frequency	:	2412MHz – 2462MHz
Type of modulation	:	DSSS
Number of channels	:	11
Antenna	:	External
Output power	:	16.0dBm (0.04W) conducted peak power

1.6 Test standards: FCC Part 15 §15.247 / CANADA RSS-210

PROJECT OVERVIEW:

NOTE: This test report covers all radiated measurements as per FCC15.247 for WLAN module in HHP handheld computer model#D9500LUP. For all conducted measurements please refer to *test report# 2L0523RUS1_WLAN_cond*

2 Technical test

2.1 Summary of test results

No deviations from the technical specification(s) were ascertained in the course of the tests Performed	
Final Verdict: (Only “passed” if all single measurements are “passed”)	**Passed**

Technical responsibility for area of testing:

Date	Section	Name	Signature
2004-12-20	EMC & Radio	Lothar Schmidt (Manager)	

Responsible for test report and project leader:

Date	Section	Name	Signature
2004-12-20	EMC & Radio	Harpreet Sidhu (EMC Engineer)	

2.2 Test report

TEST REPORT

Test report no.: EMC_826FCC15.247_2004_WLAN

TEST REPORT REFERENCE

MAXIMUM PEAK OUTPUT POWER (Conducted) § 15.247 (b) (1)

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)			
Frequency (MHz)			2412	2437	2462
T_{nom}(23)°C	V_{nom}	Pk	16.0	16.0	16.0
Measurement uncertainty		±0.5dBm			

LIMIT SUBCLAUSE § 15.247 (b) (1)

Frequency range	RF power output
2400-2483.5 MHz	1.0 Watt / 30dBm conducted

MAXIMUM PEAK OUTPUT POWER (RADIATED) **§ 15.247 (b) (1)**

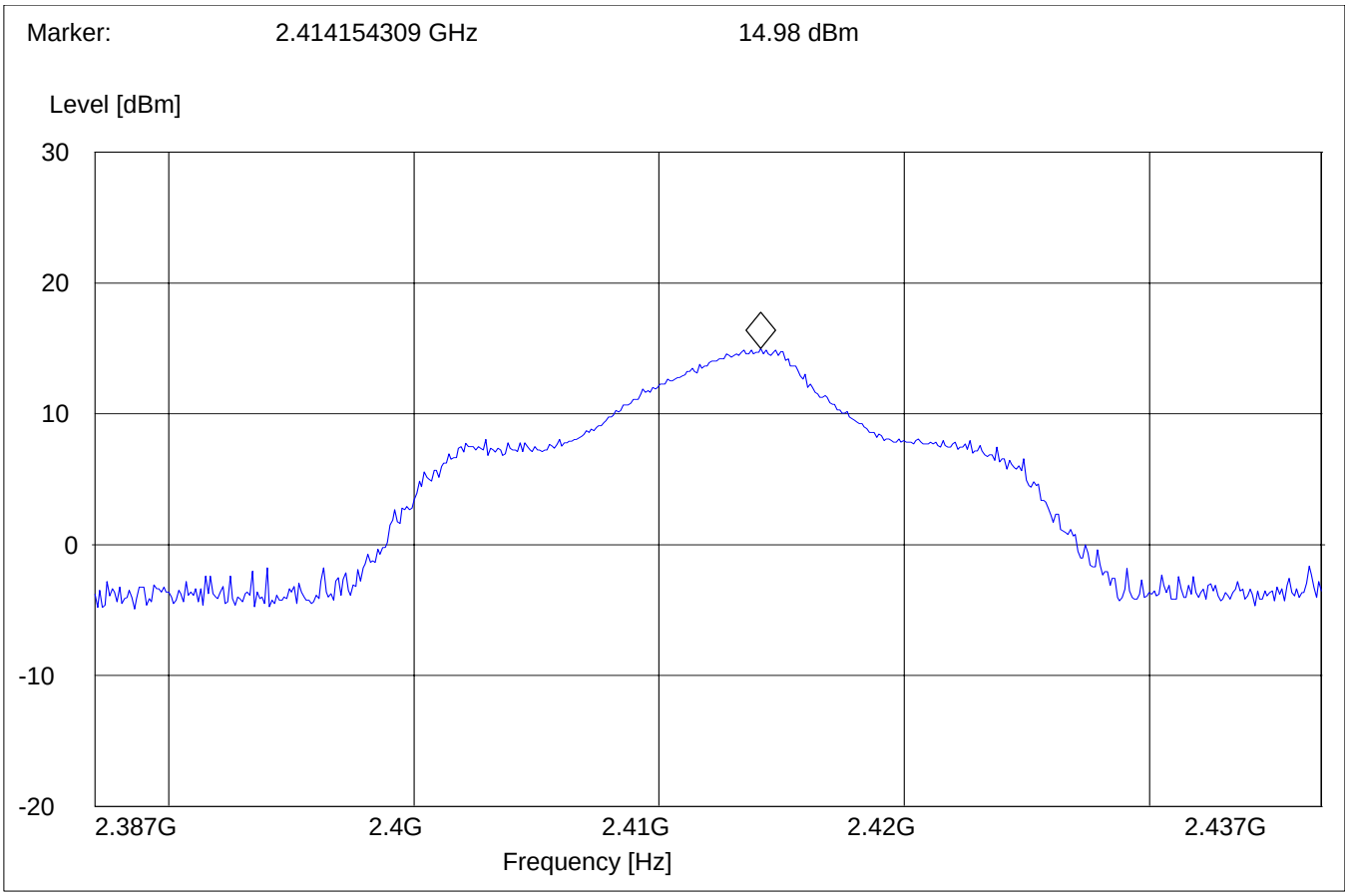
EIRP:

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)		
Frequency (MHz)		2412	2437	2462
T_{nom}(23)°C	V_{nom}	14.98	16.64	16.45
Measurement uncertainty		±0.5dBm		

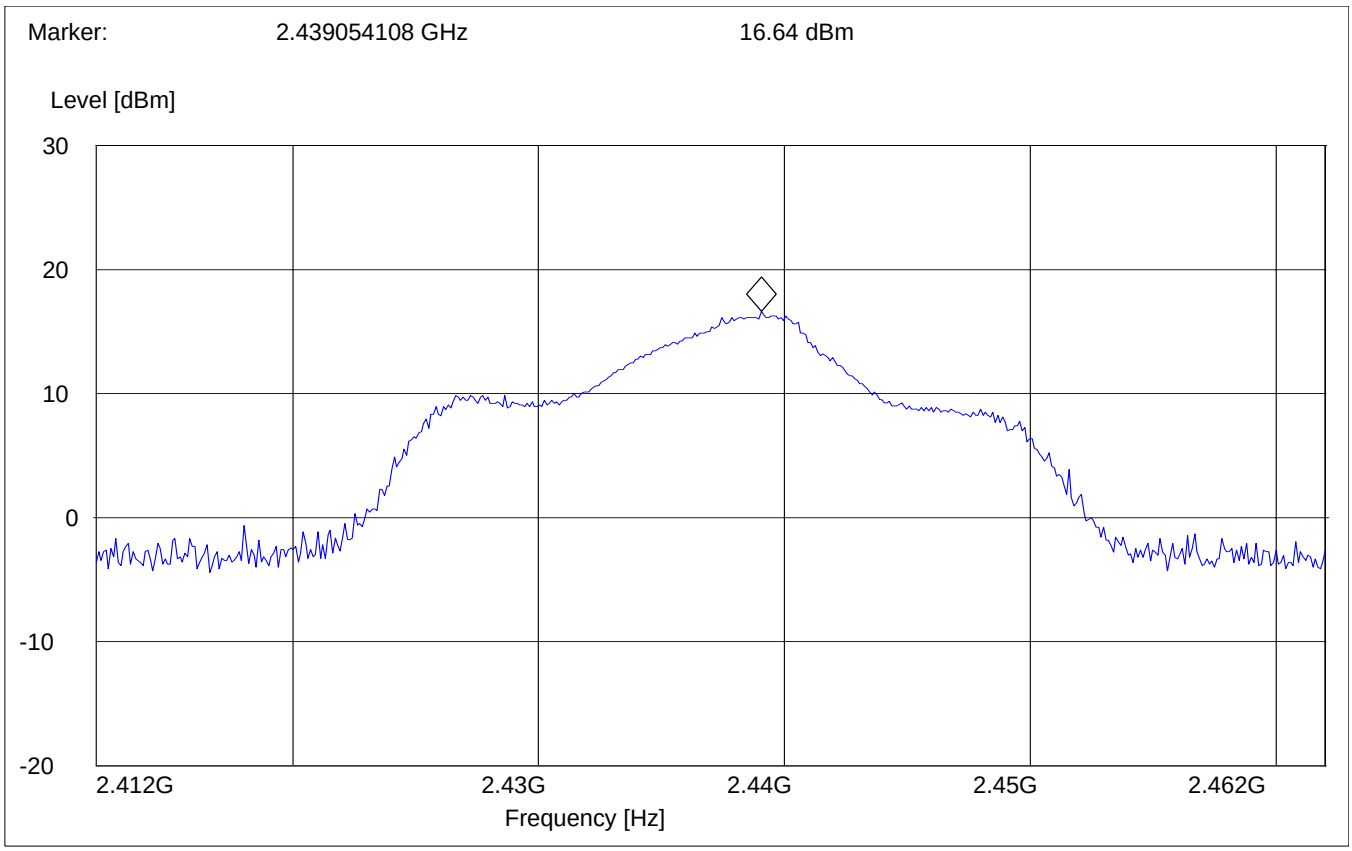
LIMIT **SUBCLAUSE § 15.247 (b) (1)**

Frequency range	RF power output
2400-2483.5 MHz	30dBm on Conducted

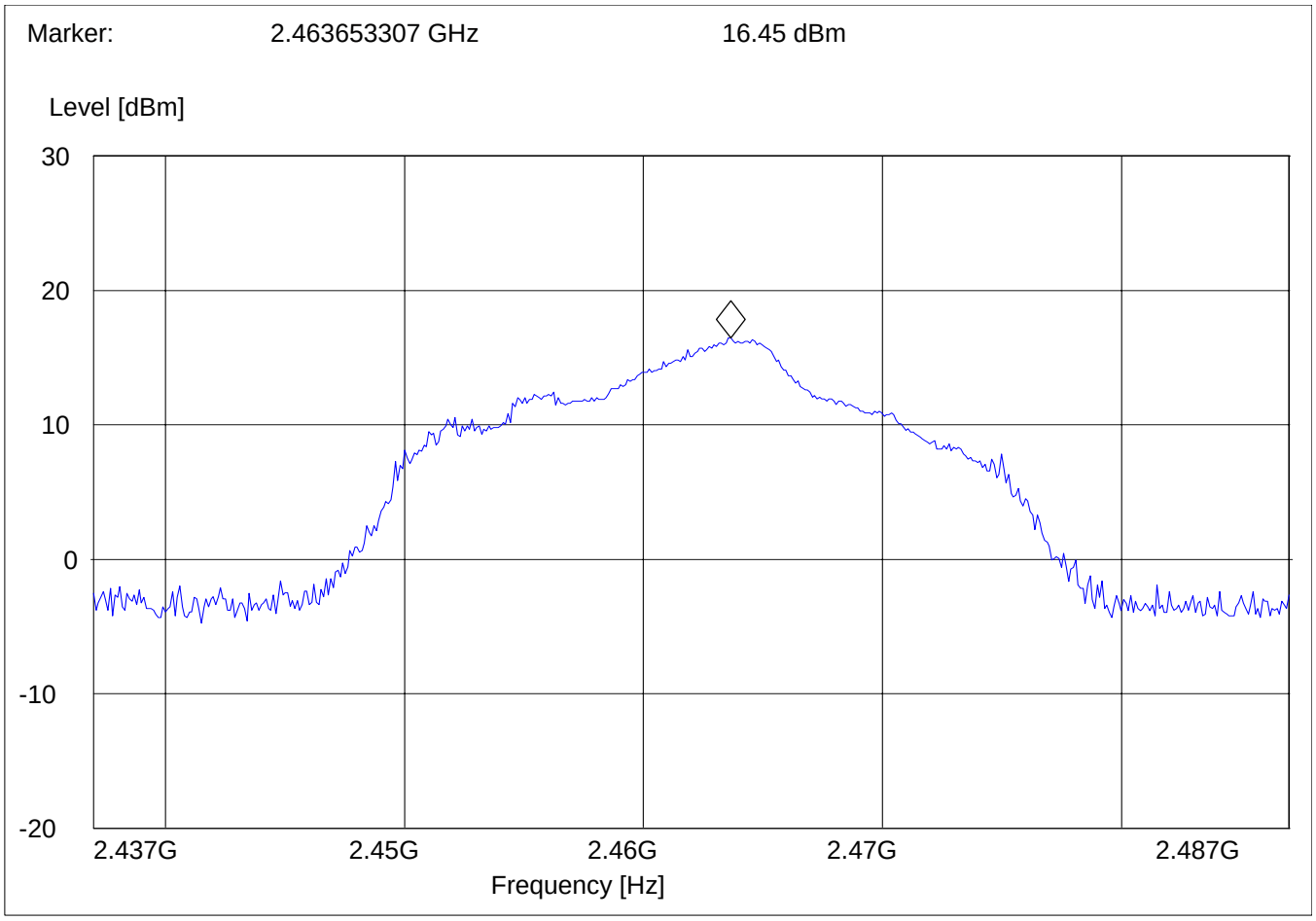
EIRP: 2412MHz



EIRP: 2437MHz



EIRP: 2462MHz

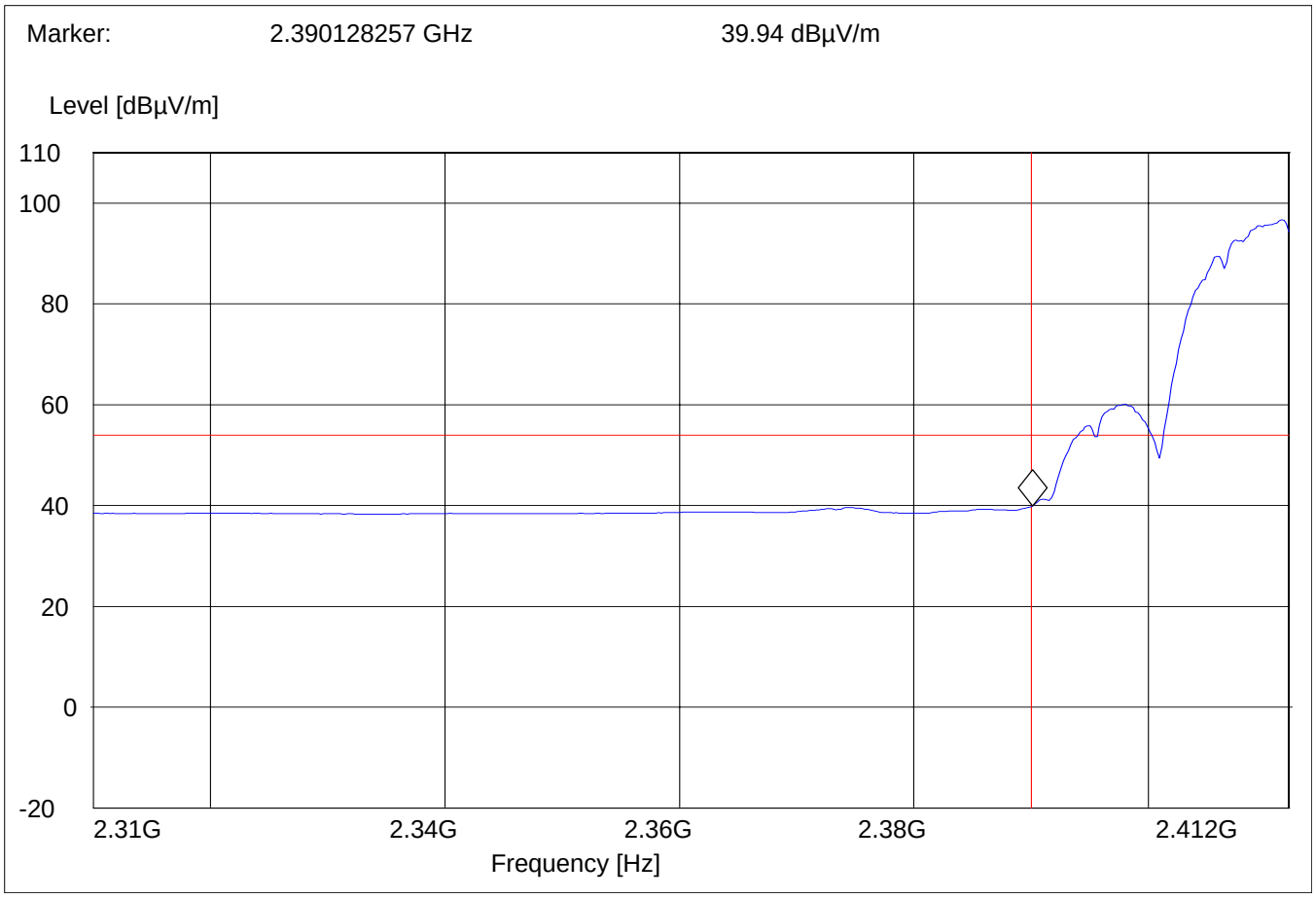


BAND EDGE COMPLIANCE §15.247 (c)

Low frequency section (spurious in the restricted band 2310 – 2390 MHz) (Average measurement)

Operating condition : Tx at 2412MHz
SWEEP TABLE : "FCC15.247 LBE_AVG"
Limit Line : 54dBµV

Start Frequency	Stop Frequency	Detector Time	Meas. Bandw.	RBW	VBW	Transducer
2.31 GHz	2.412 GHz	MaxPeak	Coupled	1 MHz	10Hz	#326 horn (dBi)

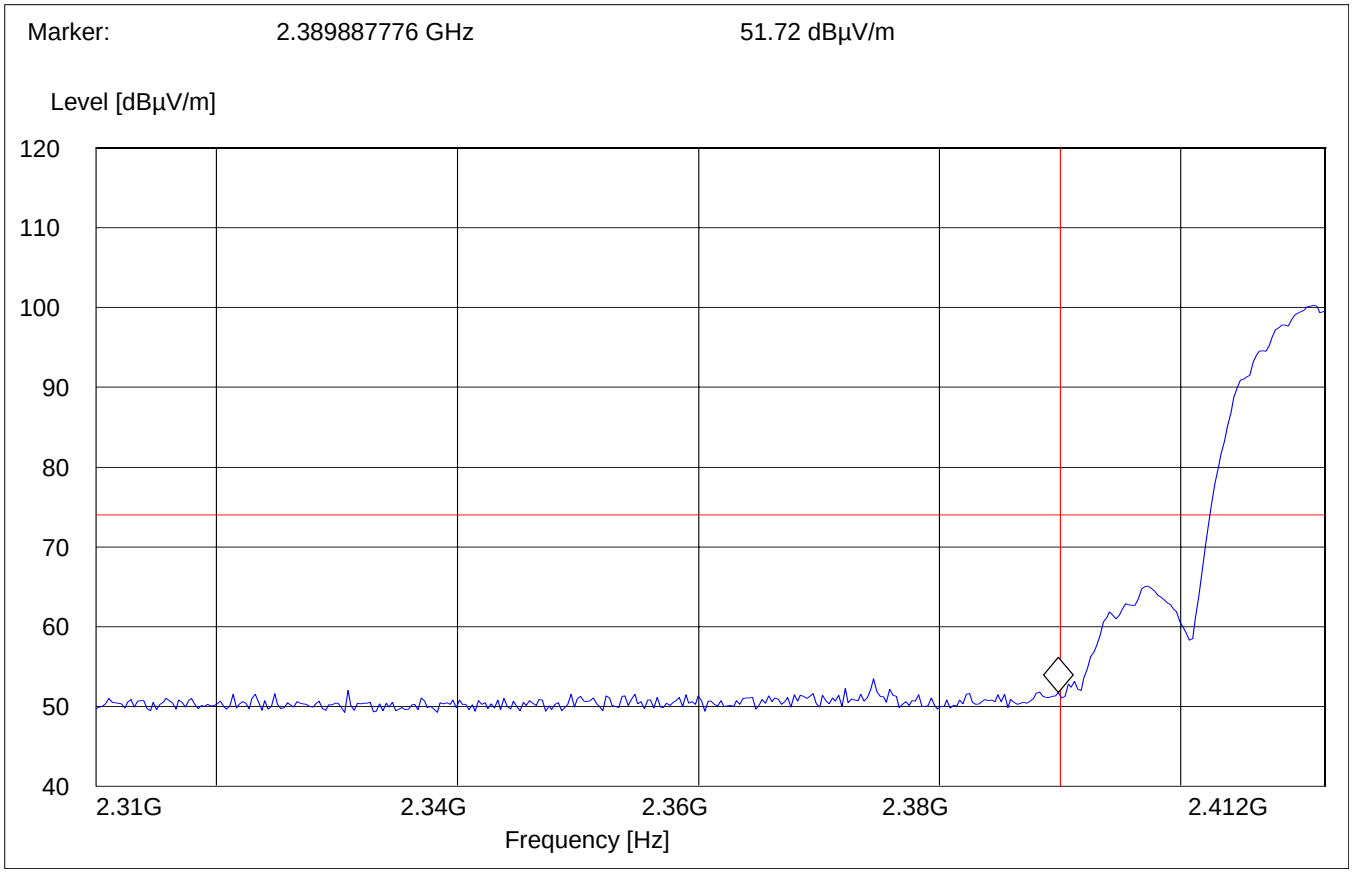


BAND EDGE COMPLIANCE §15.247 (c)

Low frequency section (spurious in the restricted band 2310 – 2390 MHz) (Peak measurement)

Operating condition : Tx at 2412MHz
SWEEP TABLE : "FCC15.247 LBE_Pk"
Limit Line : 74dBµV

Start Frequency	Stop Frequency	Detector Time	Meas. Bandw.	RBW	VBW	Transducer
2.31 GHz	2.412 GHz	MaxPeak	Coupled	1 MHz	1MHz	#326 horn (dBi)

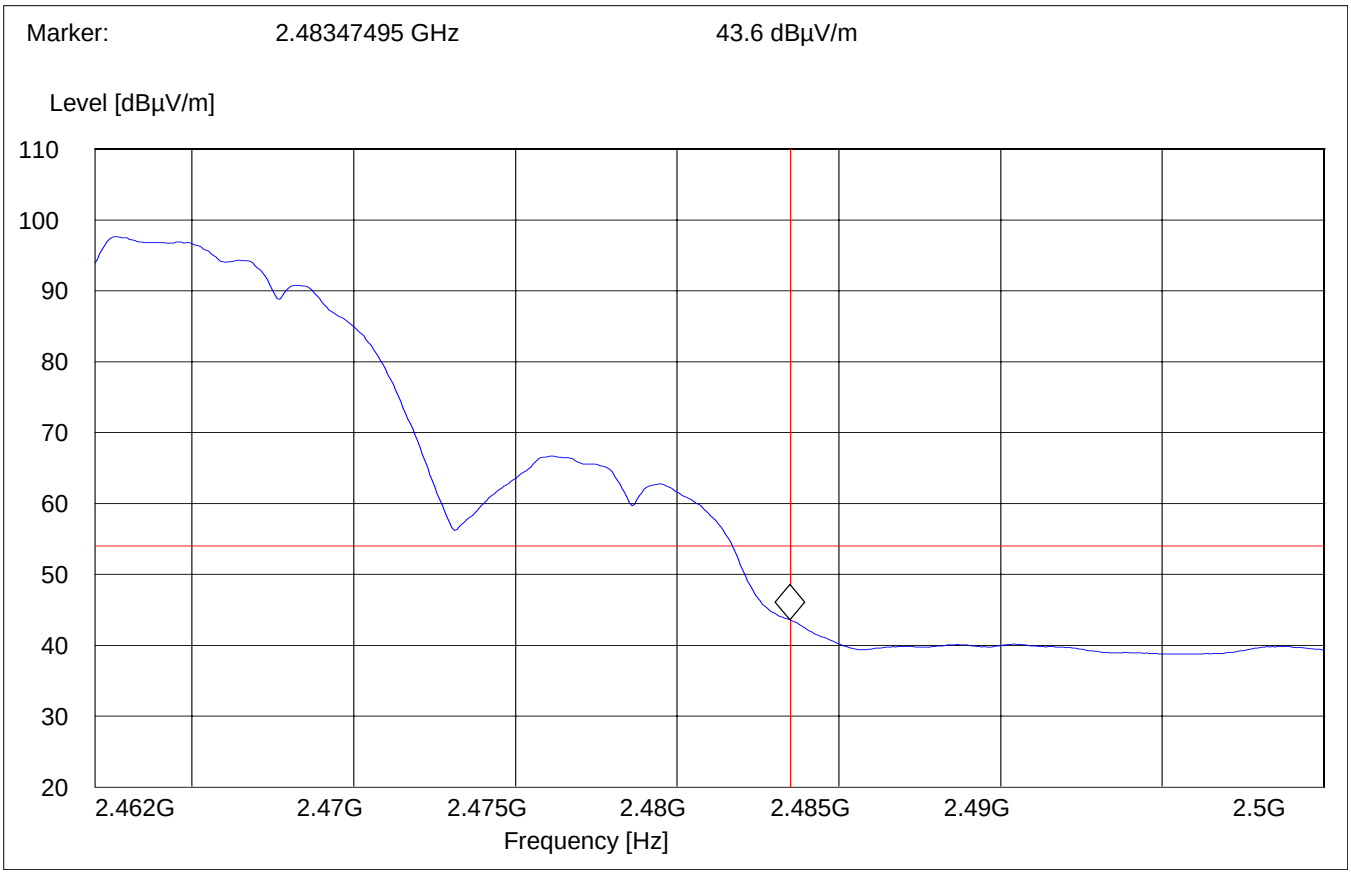


BAND EDGE COMPLIANCE §15.247 (c)

High frequency section (spurious in the restricted band 2483.5 – 2500 MHz) (Average measurement)

Operating condition : Tx at 2462MHz
SWEEP TABLE : "FCC15.247 HBE_AVG"
Limit Line : 54dBµV

Start Frequency	Stop Frequency	Detector Time	Meas. Bandw.	RBW	VBW	Transducer
2.462 GHz	2.5 GHz	MaxPeak	Coupled	1 MHz	10Hz	#326 horn (dBi)

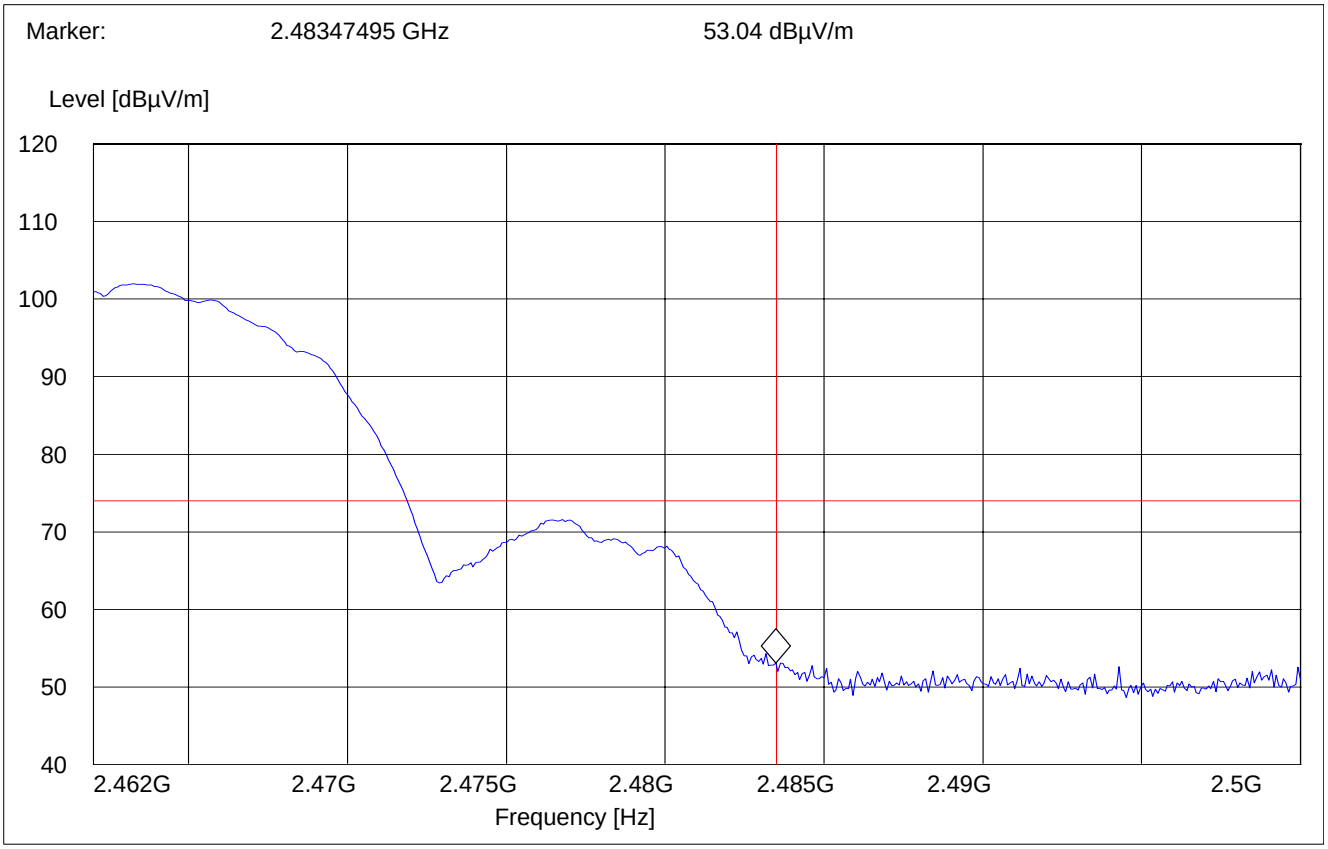


BAND EDGE COMPLIANCE §15.247 (c)

High frequency section (spurious in the restricted band 2483.5 – 2500 MHz) (Peak measurement)

Operating condition : Tx at 2462MHz
SWEEP TABLE : "FCC15.247 HBE_PK"
Limit Line : 74dBµV

Start Frequency	Stop Frequency	Detector Time	Meas. Bandw.	RBW	VBW	Transducer
2.462 GHz	2.5 GHz	MaxPeak	Coupled	1 MHz	1MHz	#326 horn (dBi)



EMISSION LIMITATIONS **§ 15.247 (c) (1)**
Transmitter (Radiated)

LIMITS

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. 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)).

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 26.5 GHz very short cable connections to the antenna was used to minimize the noise level.

2. All measurements are done in peak mode unless specified with the plots.

Results for the radiated measurements below 30MHz according § 15.33

Frequency	Measured values	Remarks
9KHz – 30MHz	No emissions found, caused by the EUT	This is valid for all the tested channels

EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (c) (1)

Transmit at Lowest channel Frequency 2412MHz			
Frequency (MHz)	Level (dBµV/m)		
	Peak	Quasi-Peak	Average
SEE PLOTS			

Transmit at Middle channel Frequency 2437MHz			
Frequency (MHz)	Level (dBµV/m)		
	Peak	Quasi-Peak	Average
SEE PLOTS			

Transmit at Highest channel Frequency 2462MHz			
Frequency (MHz)	Level (dBµV/m)		
	Peak	Quasi-Peak	Average
SEE PLOTS			

EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (c) (1)

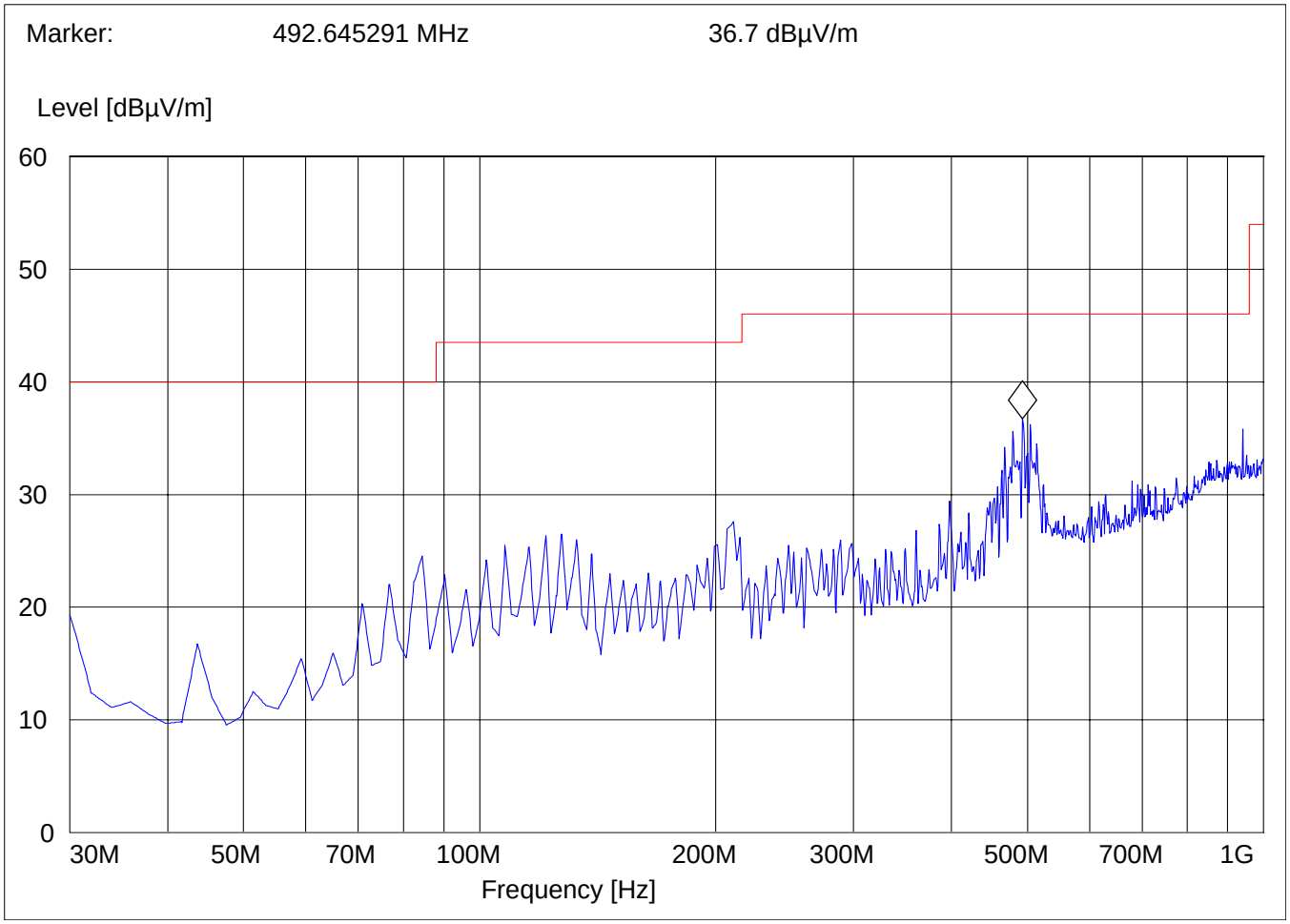
Lowest Channel (2412MHz): 30MHz – 1GHz

Antenna: Vertical

Note: This plot is valid for low, mid, high channels (worst-case plot)

SWEEP TABLE: "Spuri hi 30-1G"

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW VBW	Transducer
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	3141-#1186

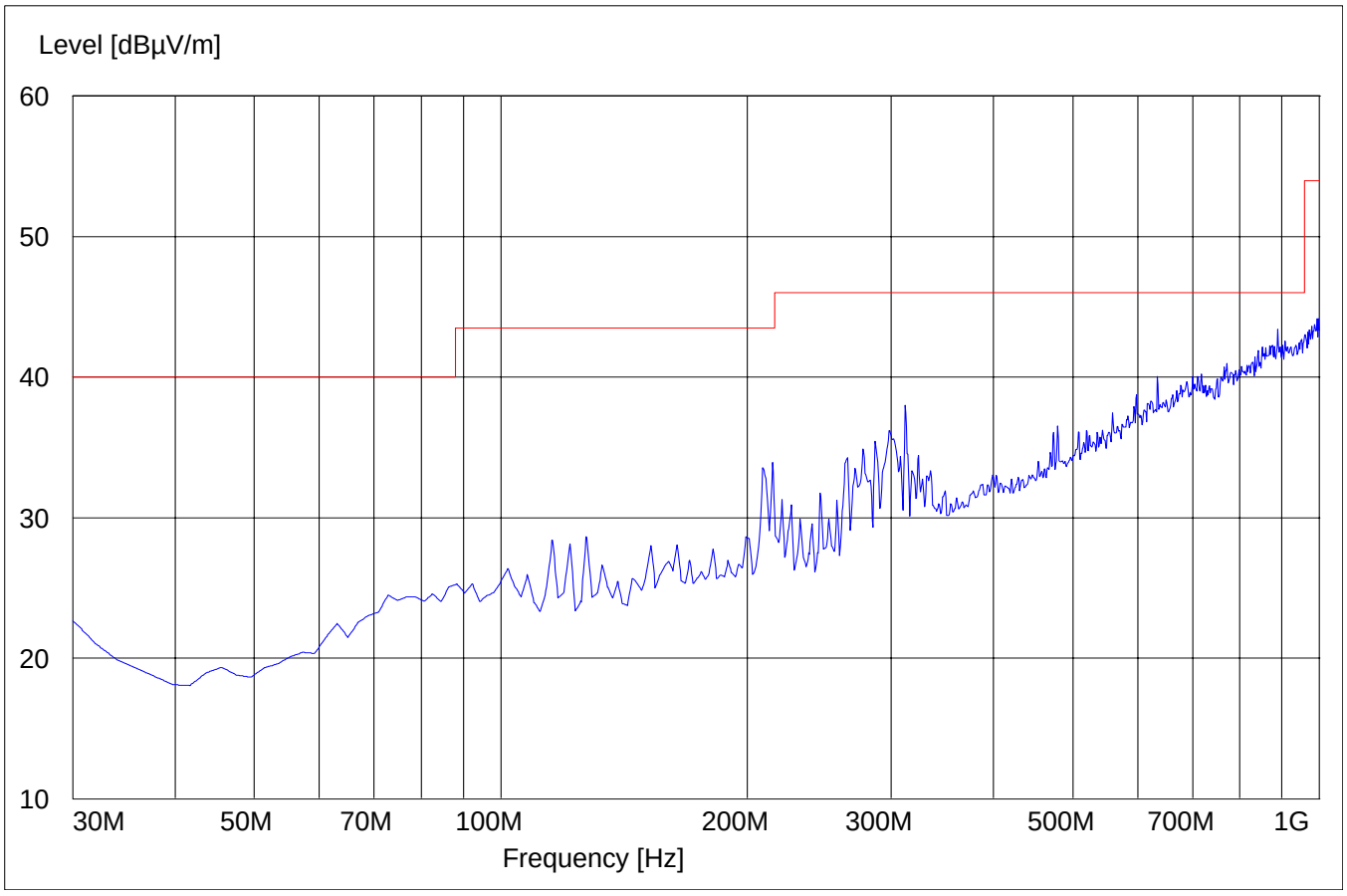


EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (c) (1)
Lowest Channel (2412MHz): 30MHz – 1GHz
Antenna: Horizontal

Note: This plot is valid for low, mid, high channels (worst-case plot)

SWEEP TABLE: "Spuri hi 30-1G"

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW VBW	Transducer
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	3141-#1186



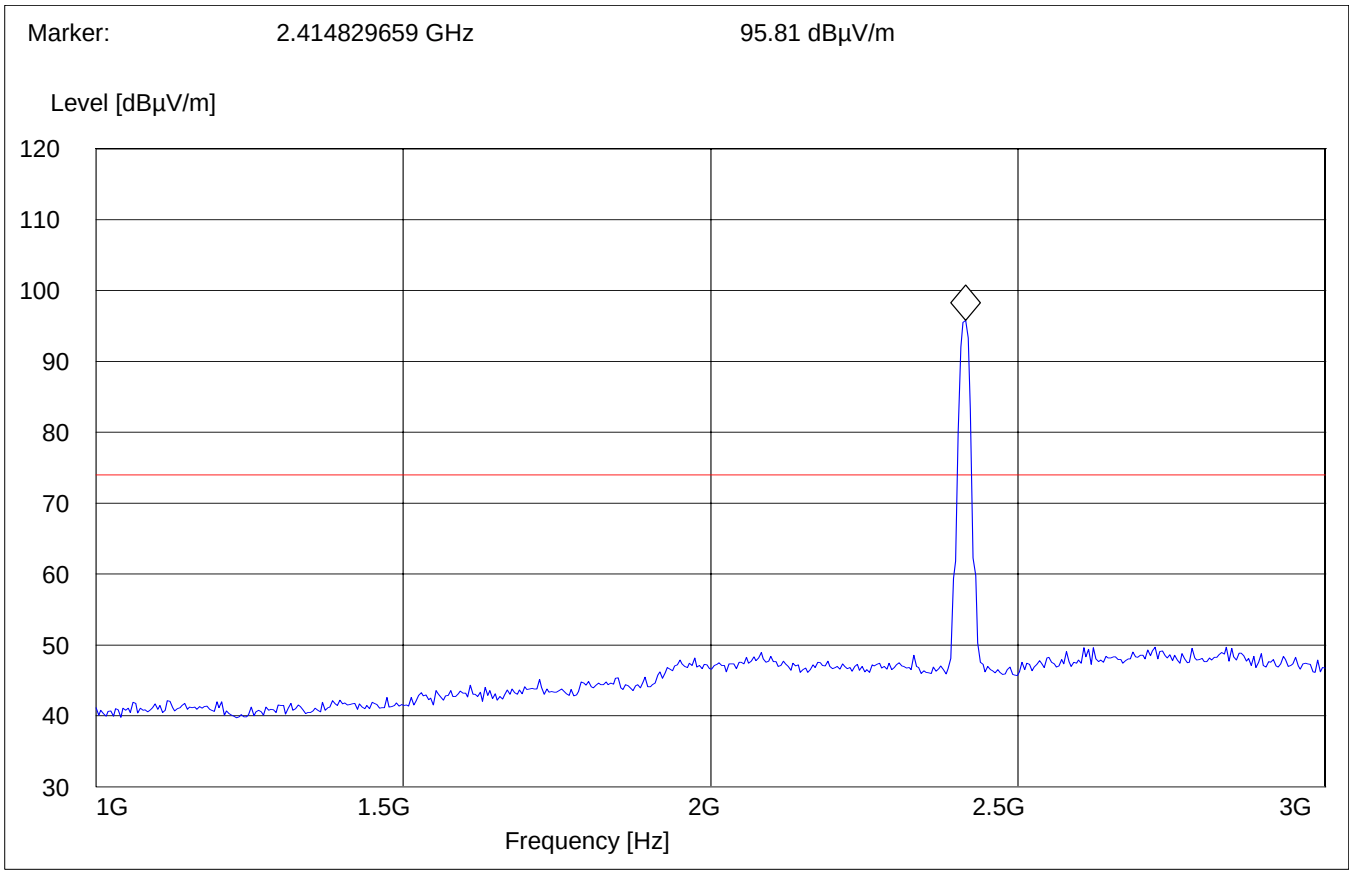
EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (c) (1)

Lowest Channel (2412MHz): 1GHz – 3GHz

Note: Peak above the limit line is the carrier freq.

SWEEP TABLE: "Spuri hi 1-3G"

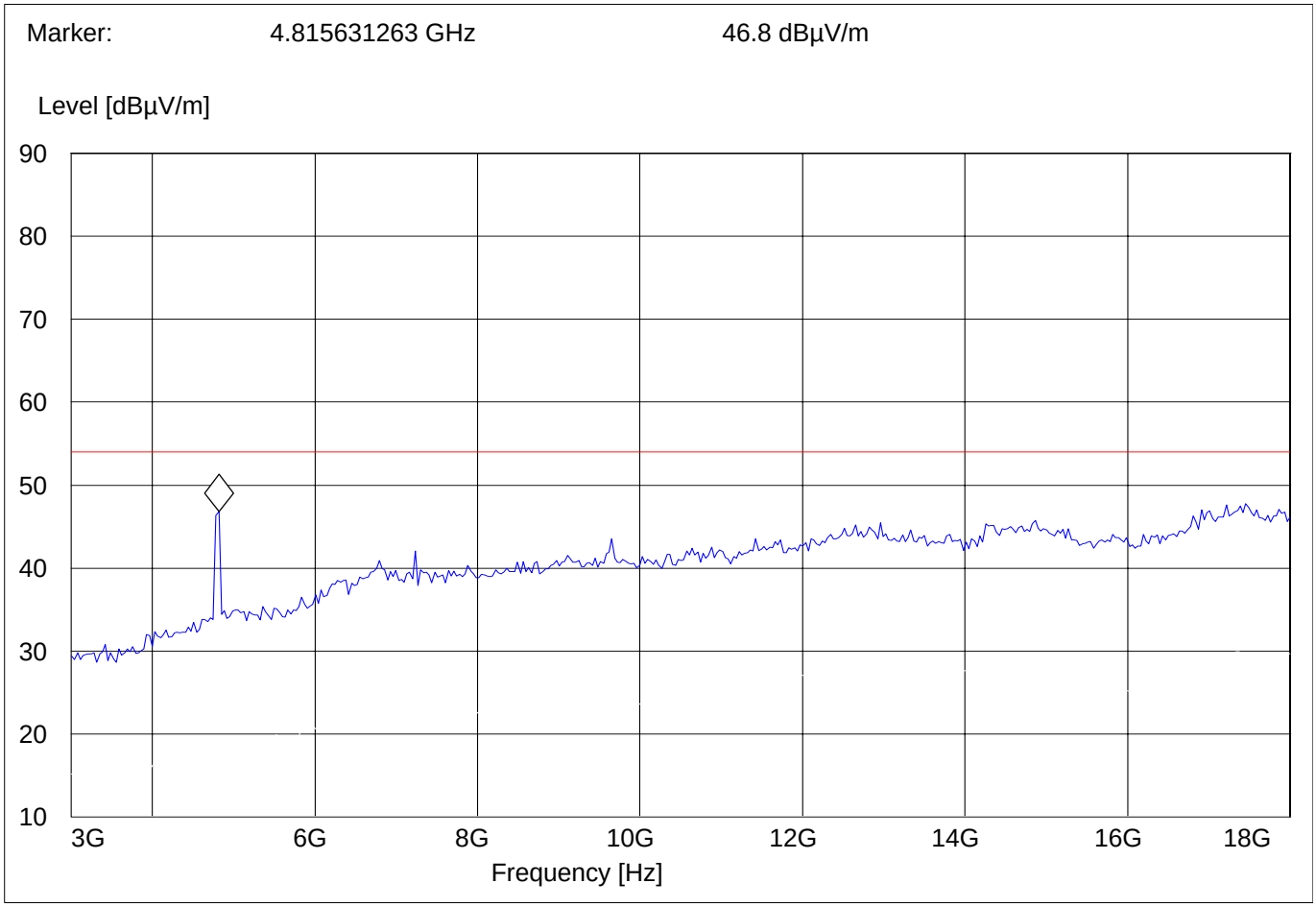
Start Frequency	Stop Frequency	Detector Time	Meas. Bandw.	RBW	VBW	Transducer
1.0 GHz	3.0 GHz	MaxPeak	Coupled	1 MHz	10Hz	#326 horn (dBi)



EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (c) (1)
Lowest Channel (2412MHz): 3GHz – 18GHz

SWEEP TABLE: "Spuri hi 3-18G"

Start Frequency	Stop Frequency	Detector Time	Meas. Bandw.	RBW VBW	Transducer
3.0 GHz	18.0 GHz	MaxPeak	Coupled	1 MHz	#326 horn (dBi)

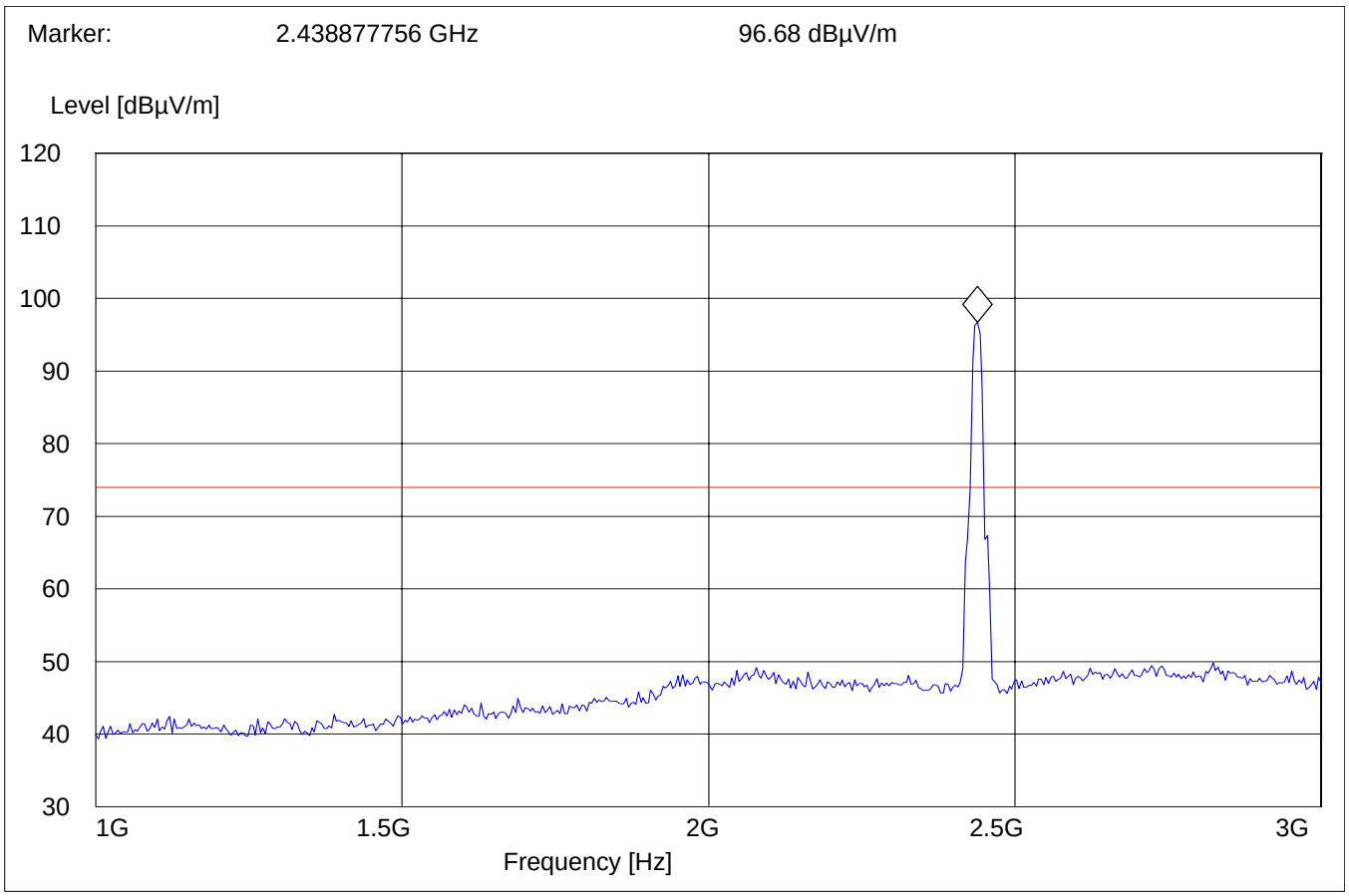


EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (c) (1)
Mid Channel (2437MHz): 1GHz – 3GHz

Note: The peak above the limit line is the carrier freq.

SWEEP TABLE: "Spuri hi 1-3G"

Start Frequency	Stop Frequency	Detector Time	Meas. Bandw.	RBW VBW	Transducer
1.0 GHz	3.0 GHz	MaxPeak	Coupled	1 MHz	#326 horn (dBi)

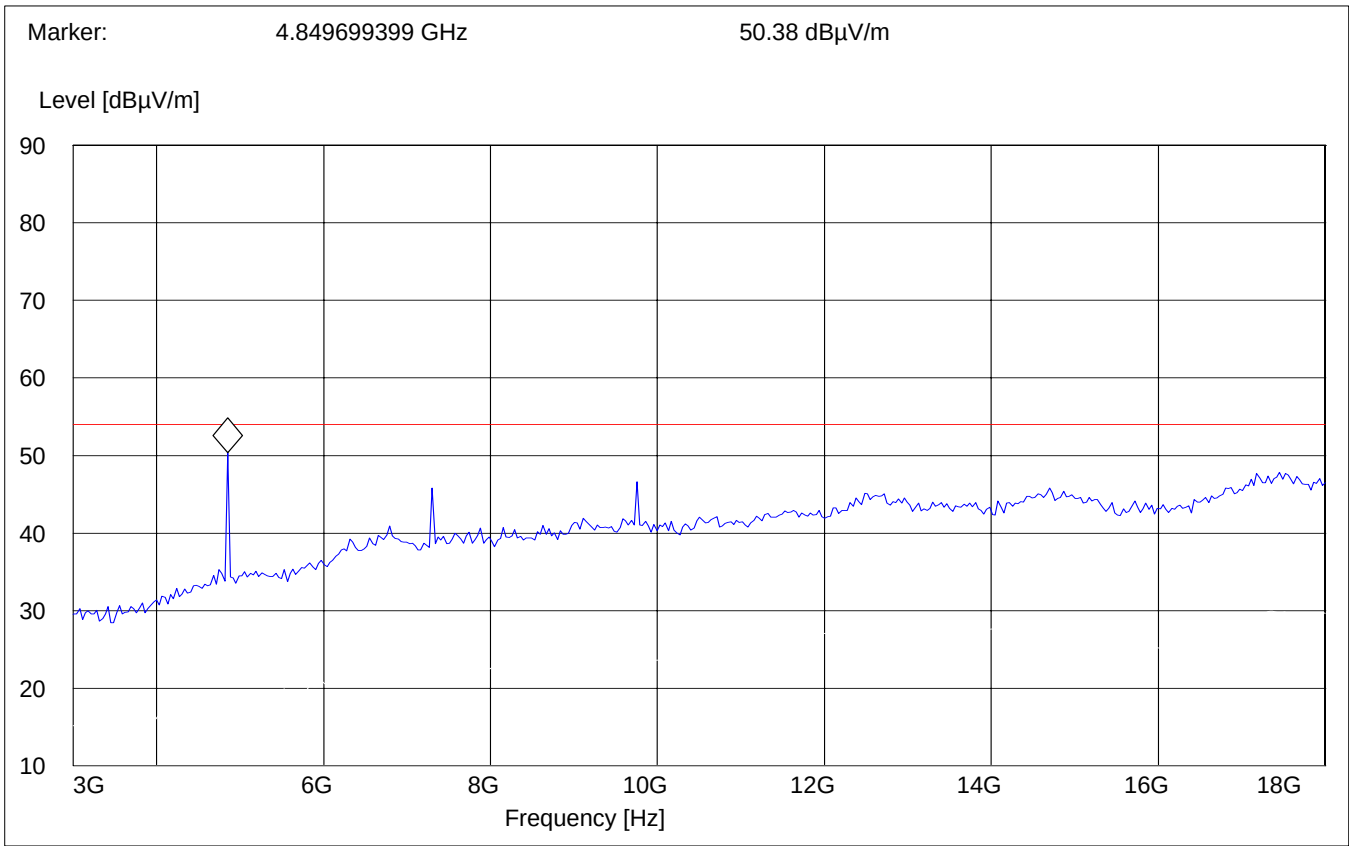


EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (c) (1)
Mid Channel (2437MHz): 3GHz – 18GHz

Average Measurement

SWEEP TABLE: "Spuri hi 3-18G"

Start Frequency	Stop Frequency	Detector Time	Meas. Bandw.	RBW VBW	Transducer
3.0 GHz	18.0 GHz	MaxPeak	Coupled	1 MHz	#326 horn (dBi)

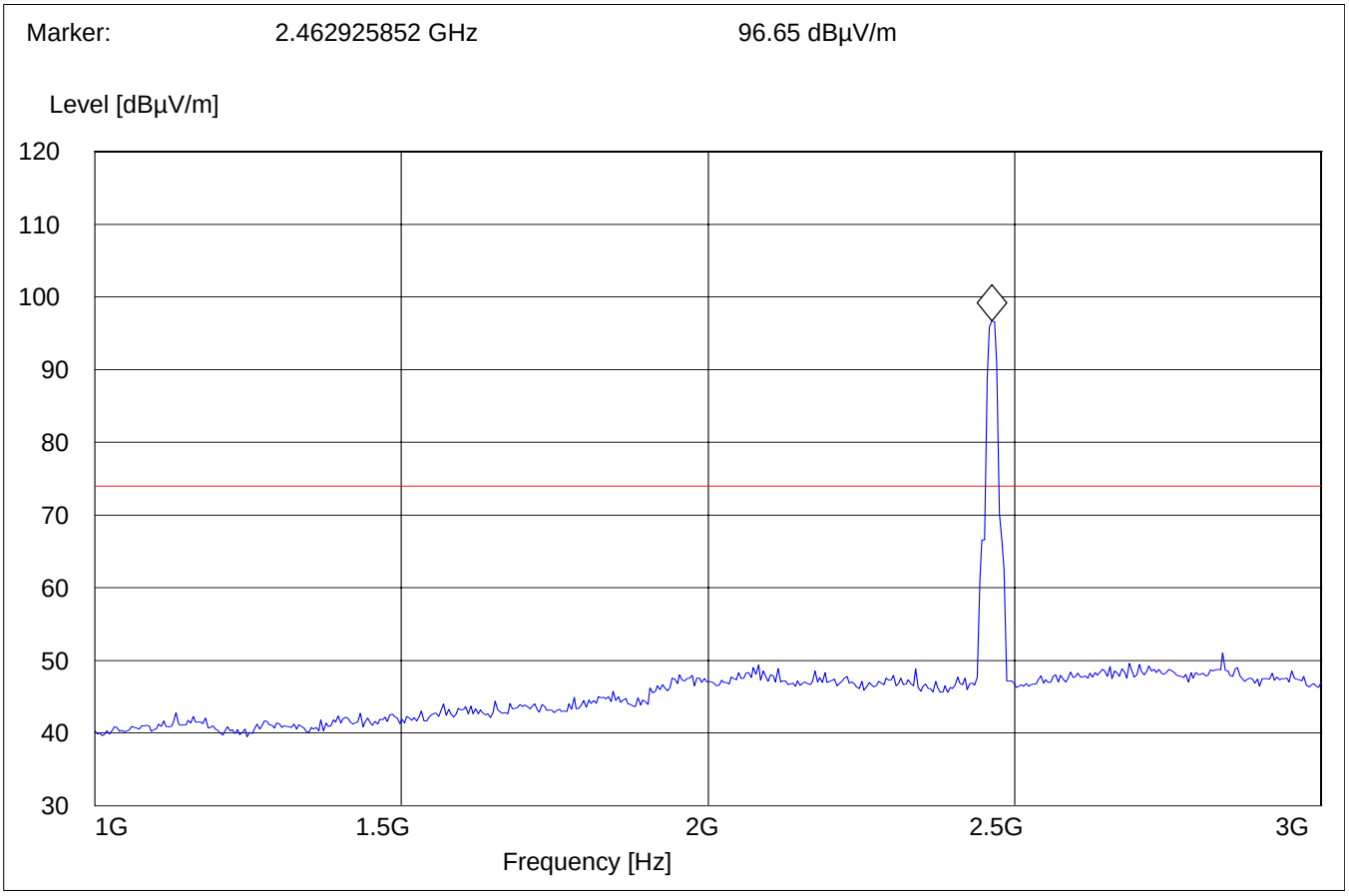


EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (c) (1)
Highest Channel (2462MHz): 1GHz – 3GHz

Note: The peak above the limit line is the carrier freq.

SWEEP TABLE: "Spuri hi 1-3G"

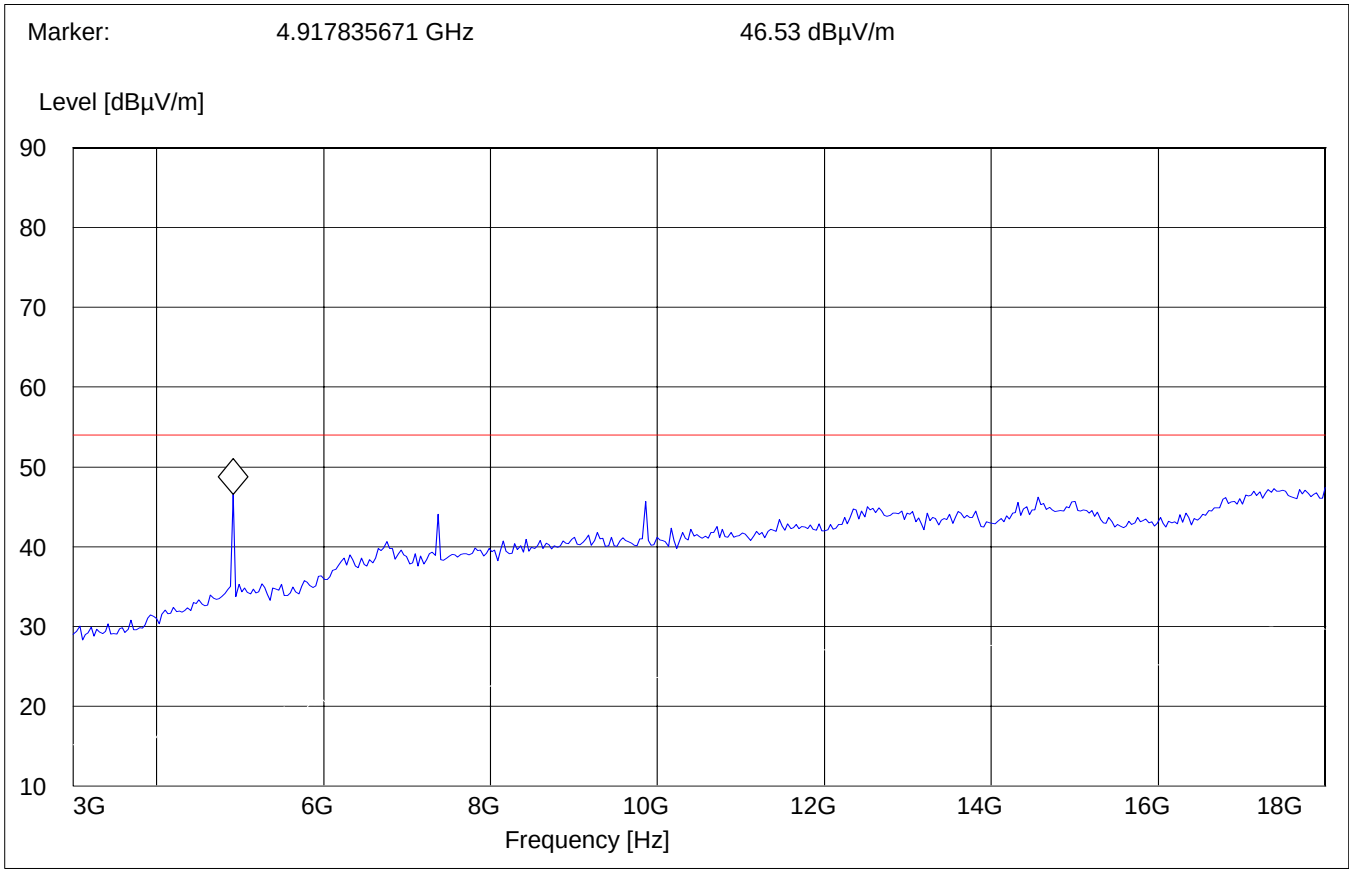
Start Frequency	Stop Frequency	Detector Time	Meas. Bandw.	RBW VBW	Transducer
1.0 GHz	3.0 GHz	MaxPeak	Coupled	1 MHz	#326 horn (dBi)



EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (c) (1)
Highest Channel (2462MHz): 3GHz – 18GHz
Average Measurement

SWEEP TABLE: "Spuri hi 3-18G"

Start Frequency	Stop Frequency	Detector Time	Meas. Bandw.	RBW	VBW	Transducer
3.0 GHz	18.0 GHz	MaxPeak	Coupled	1 MHz	10Hz	#326 horn (dBi)



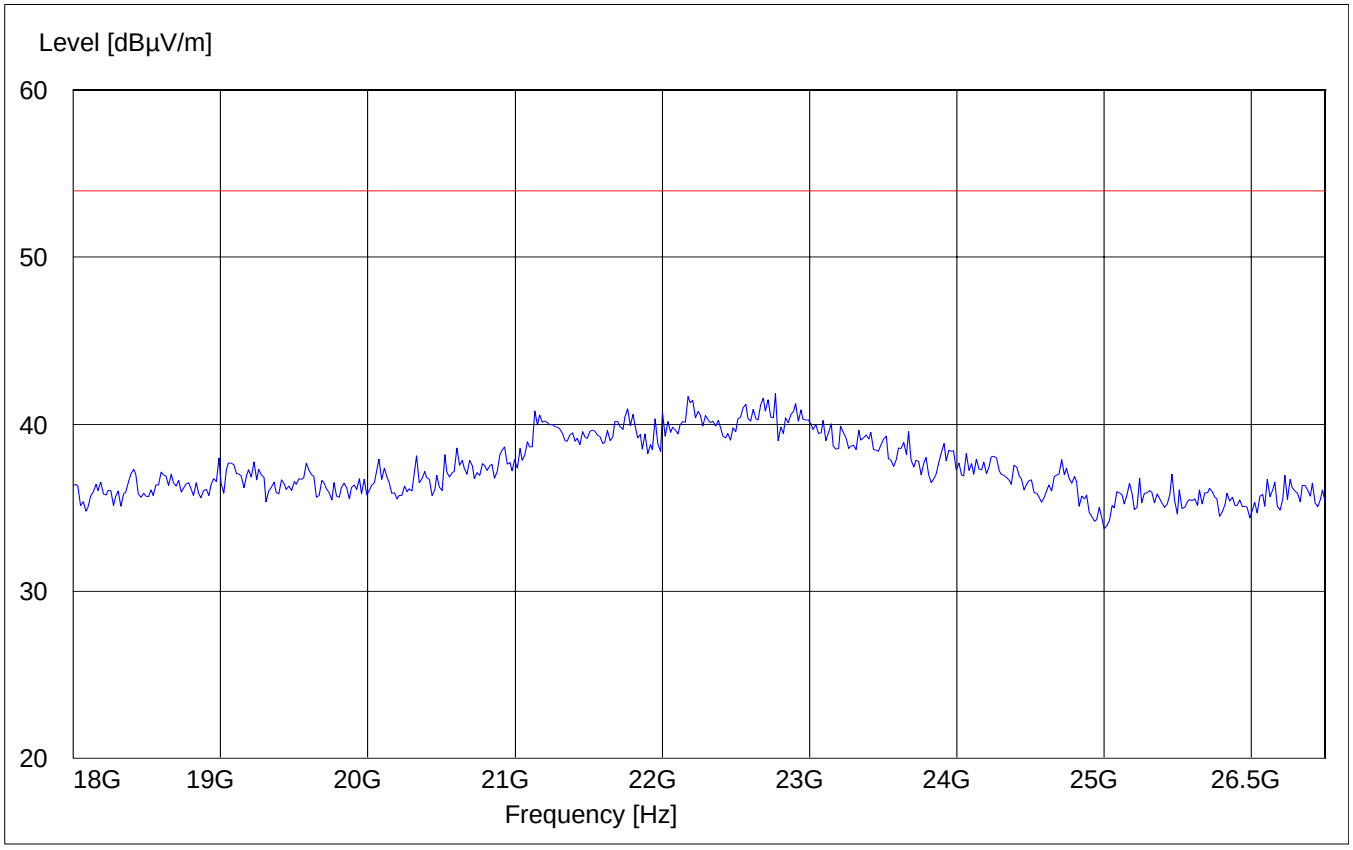
EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (c) (1)

18GHz – 26.5GHz

Note: This plot is valid for low, mid, high channels (worst-case plot)

SWEEP TABLE: "Spuri hi 18-26.5G"

Start Frequency	Stop Frequency	Detector Time	Meas. Bandw.	RBW VBW	Transducer
18 GHz	26.5 GHz	MaxPeak	Coupled	1 MHz	#326 horn (dBi)



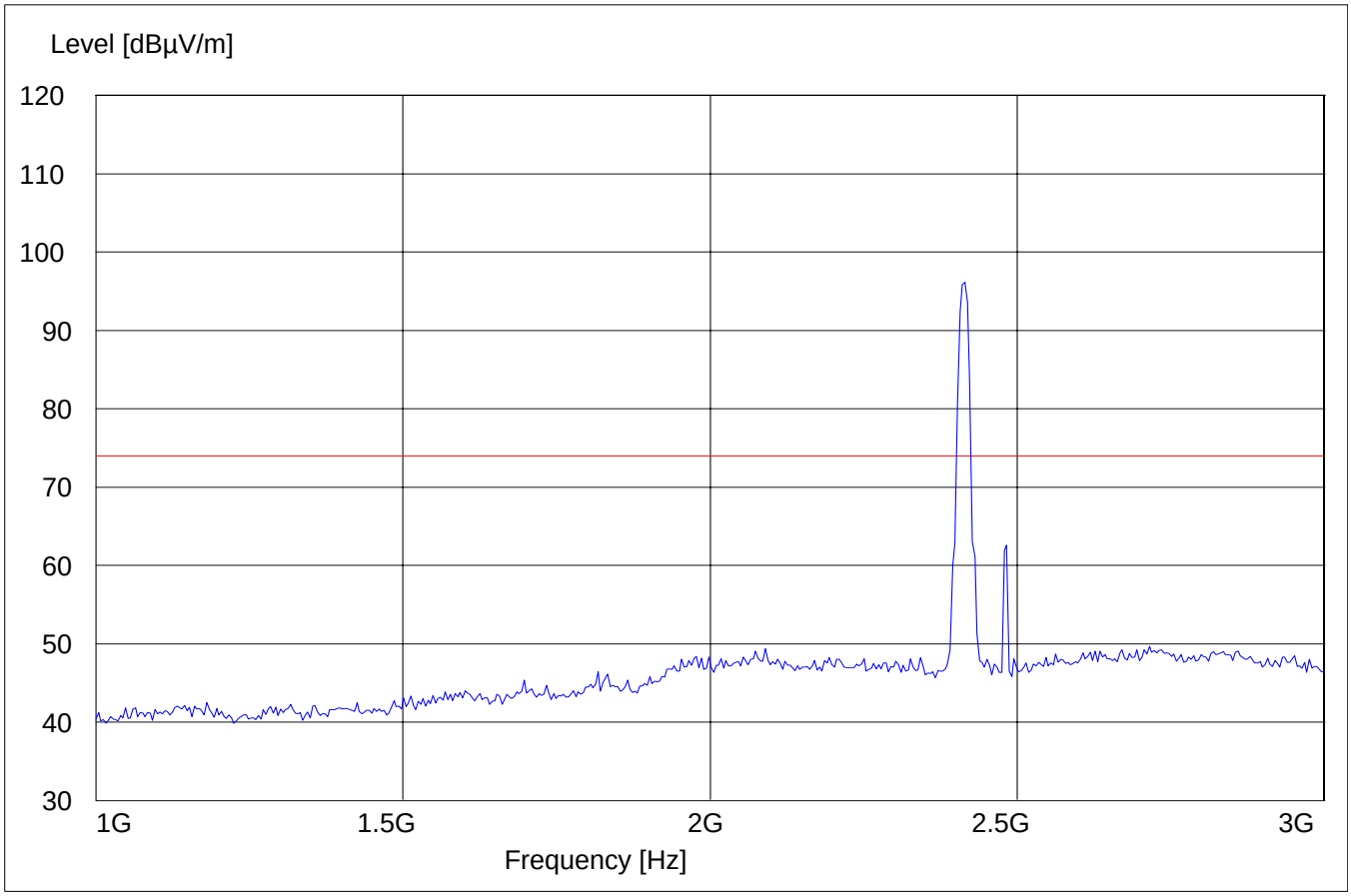
COLLOCATION BT & WLAN:

EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (c) (1)

1-3GHz
BT Tx @ 2480MHz
WLAN Tx @ 2412MHz

NOTE: The peaks above the limit are above mentioned carrier frequencies.

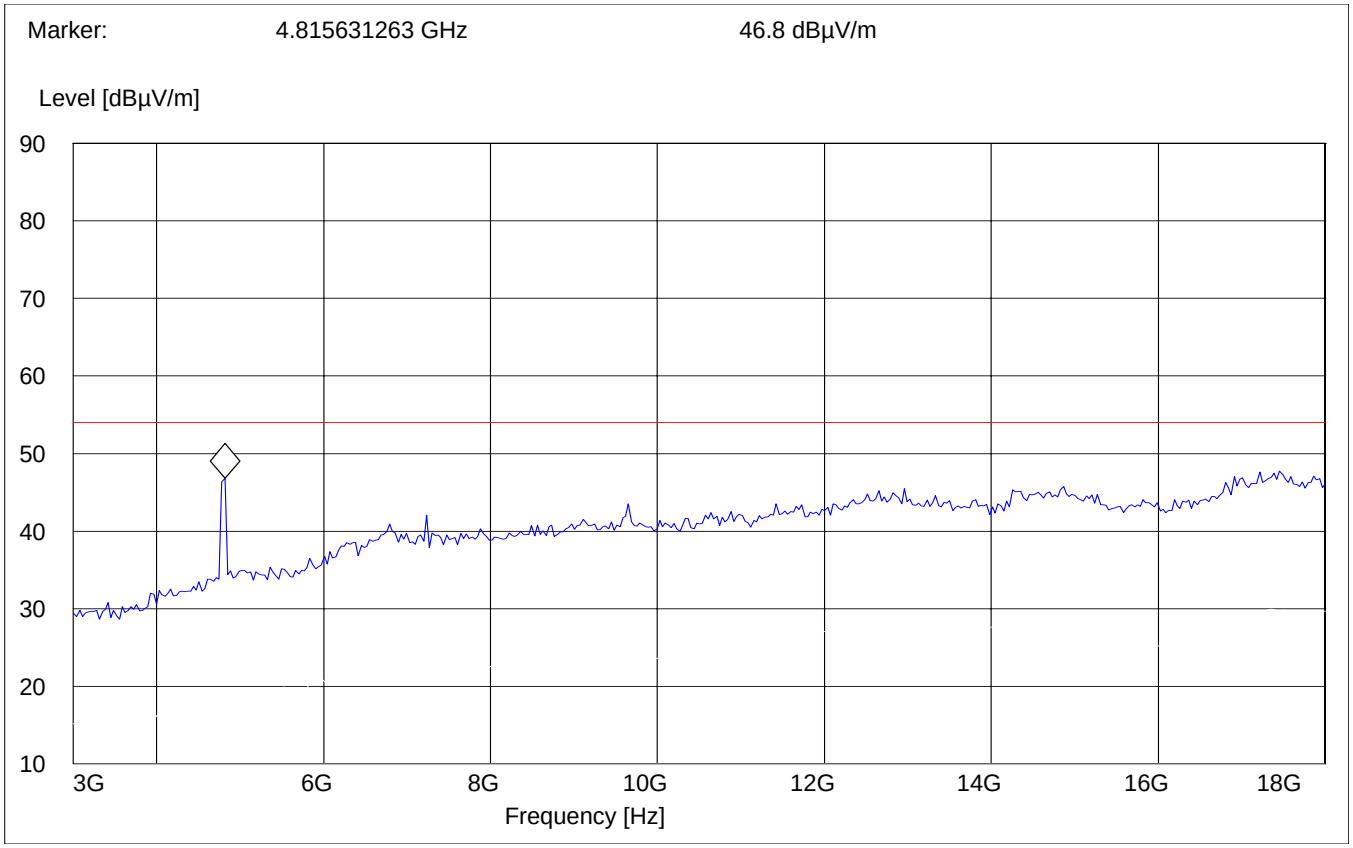
SWEEP TABLE:		"Spuri hi 1-3G"			
Short Description:		Bluetooth Spurious 1-3GHz			
Start Frequency	Stop Frequency	Detector Time	Meas. Bandw.	RBW VBW	Transducer
1.0 GHz	3.0 GHz	MaxPeak	Coupled	1 MHz	#326 horn (dBi)



EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (c) (1)

3-18GHz
BT Tx @ 2480MHz
WLAN Tx @ 2412MHz

SWEEP TABLE:		"Spuri hi 3-18G"			
Short Description:		Bluetooth Spurious 3-18 GHz			
Start Frequency	Stop Frequency	Detector Time	Meas. Bandw.	RBW VBW	Transducer
3.0 GHz	18.0 GHz	MaxPeak	Coupled	1 MHz	#326 horn (dBi)



CONDUCTED EMISSIONS § 15.107/207

Measured with AC/DC power adapter

SWEEP TABLE: "55022 cond"

Short Description: EN 55022 for 150KHz-30MHz

Start Frequency	Stop Frequency	Detector	Meas Time	IF Bandw.	Transducer
150.0 kHz	30.0 MHz	MaxPeak	Coupled	10 kHz	None

Technical specification: 15.107 / 15.207 (Revised as of August 20, 2002)

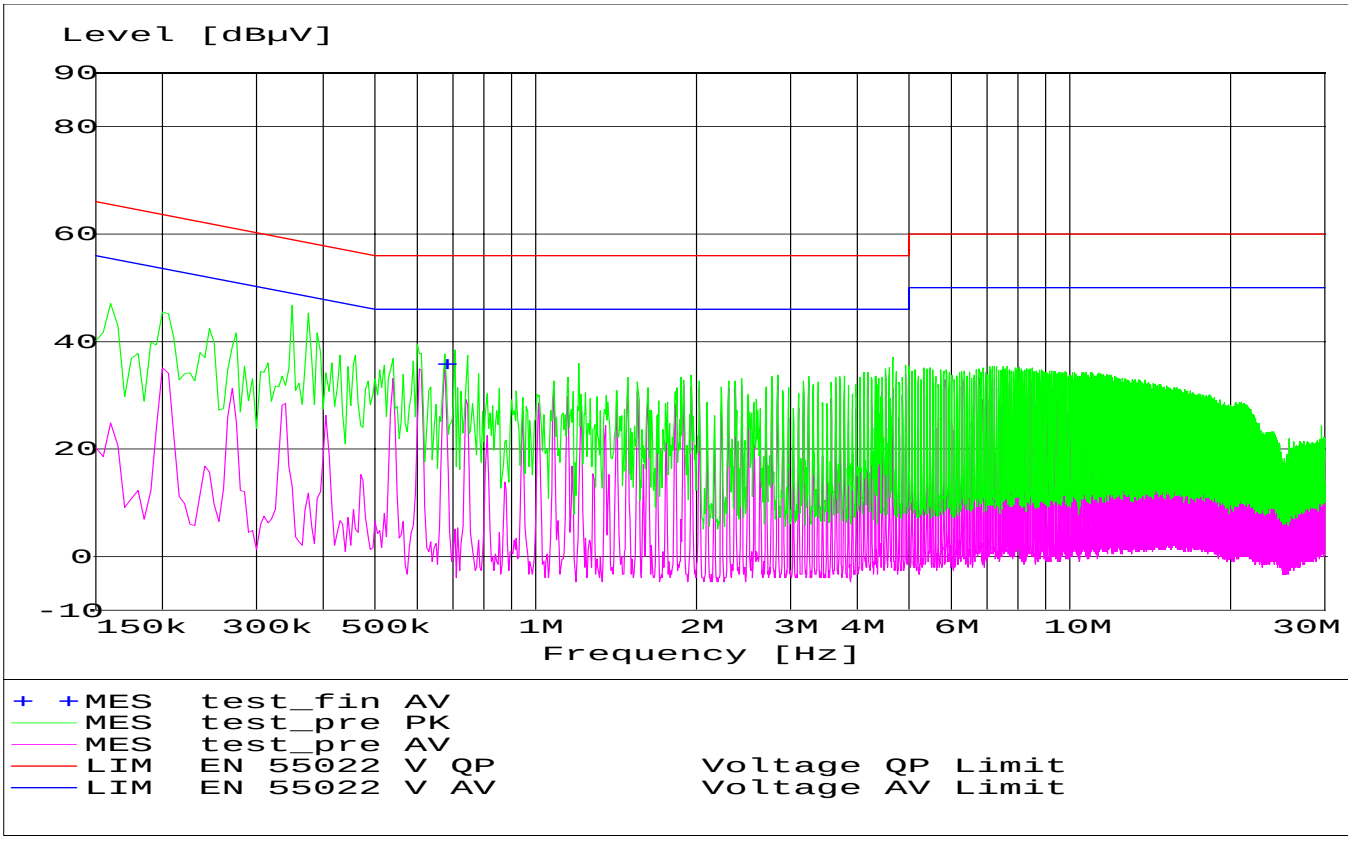
Limit

Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	Quasi-Peak	Average
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30	60	50
* Decreases with logarithm of the frequency		

ANALYZER SETTINGS: RBW = 10KHz VBW = 10KHz

MEASUREMENT RESULT: "test_fin AV"

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.675000	35.70	0.0	46	10.3	N	GND



TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

No	Instrument/Ancillary	Type	Manufacturer	Serial No.
01	Spectrum Analyzer	ESIB 40	Rohde & Schwarz	100107
02	Spectrum Analyzer	FSEM 30	Rohde & Schwarz	826880/010
03	Biconilog Antenna	3141	EMCO	0005-1186
04	Horn Antenna (700M-18GHz)	SAS-200/571	AH Systems	325
05	Horn Antenna (18-26.5GHz)	3160-09	EMCO	1240
06	2-3GHz Band reject filter	BRM50701	Microtronics	6
07	Power-Meter	NRVD	Rohde & Schwarz	0857.8008.02
08	Pre-Amplifier	TS-ANA	Rohde & Schwarz	--
09	Pre-Amplifier	JS4-00102600	Miteq	00616

BLOCK DIAGRAMS
Radiated Testing