



# FCC Test Report

Test report no.: EMC\_843FCC15.247\_2005\_LUP\_WLAN

FCC Part 15.247 for DSSS systems / CANADA RSS-210

Model: D7900LUP  
FCC ID: HD57900LUP  
IC: 1693B-79LUP



**TTI-P-G 081/94-A0**

Accredited according to **ISO/IEC 17025**



**Bluetooth Qualification  
Test Facility  
(BQTF)**

**CTIA Authorized Test Lab**

FCC listed # 101450

IC recognized # 3925

## **CETECOM Inc.**

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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

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<b>1</b>	<b>General information</b>
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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**  
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**Phone: +1 408 586 6200 Fax: +1 408 586 6299**  
**E-mail: [lothar.schmidt@cetekomusa.com](mailto:lothar.schmidt@cetekomusa.com)**  
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**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](mailto:velagapudin@hhp.com)

**1.4 Application details**

Date of receipt test item : 2004-08-16  
Date of test : 2004-08-16/17/18

**1.5 Test item**

**Manufacturer** : Applicant  
**Marketing Name** : Dolphin 7900LUP  
**Model No.** : **D7900LUP**  
**Description** : Dolphin 7900 is a ruggedized handheld computer which can read Barcodes and other Auto ID codes. It contains three different wire less transmitters (BT, WLAN-802.11b and GSM/GPRS) to send and receive data..  
**FCC-ID** : HD57900LUP  
**IC ID** : 1693B-79LUP

**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#D7900LUP. 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:****2005-04-25    EMC & Radio    Lothar Schmidt (Manager)****Date****Section****Name****Signature****Responsible for test report and project leader:****2005-04-25    EMC & Radio    Harpreet Sidhu (EMC Engineer)****Date****Section****Name****Signature**

## 2.2 Test report

### TEST REPORT

Test report no.: EMC\_843FCC15.247\_2005\_LUP\_WLAN

**TEST REPORT REFERENCE**

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

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)			
Frequency (MHz)		2412	2437	2462	
T <sub>nom</sub> (23)°C	V <sub>nom</sub>	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



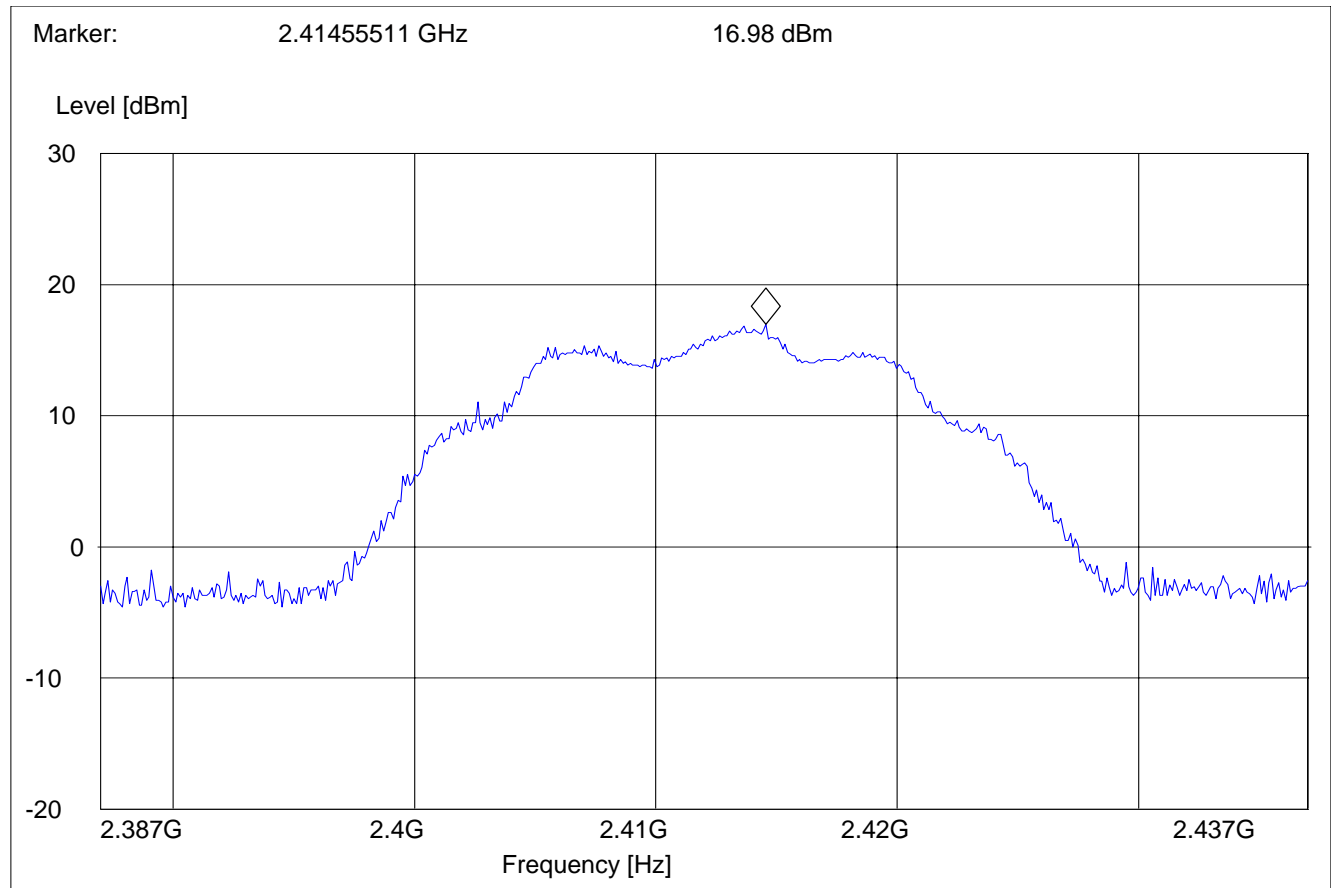
**MAXIMUM PEAK OUTPUT POWER  
(RADIATED)****§ 15.247 (b) (1)****EIRP:**

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)		
Frequency (MHz)		2412	2437	2462
T <sub>nom</sub> (23)°C	V <sub>nom</sub>	16.98	18.99	18.25
Measurement uncertainty		±0.5dBm		

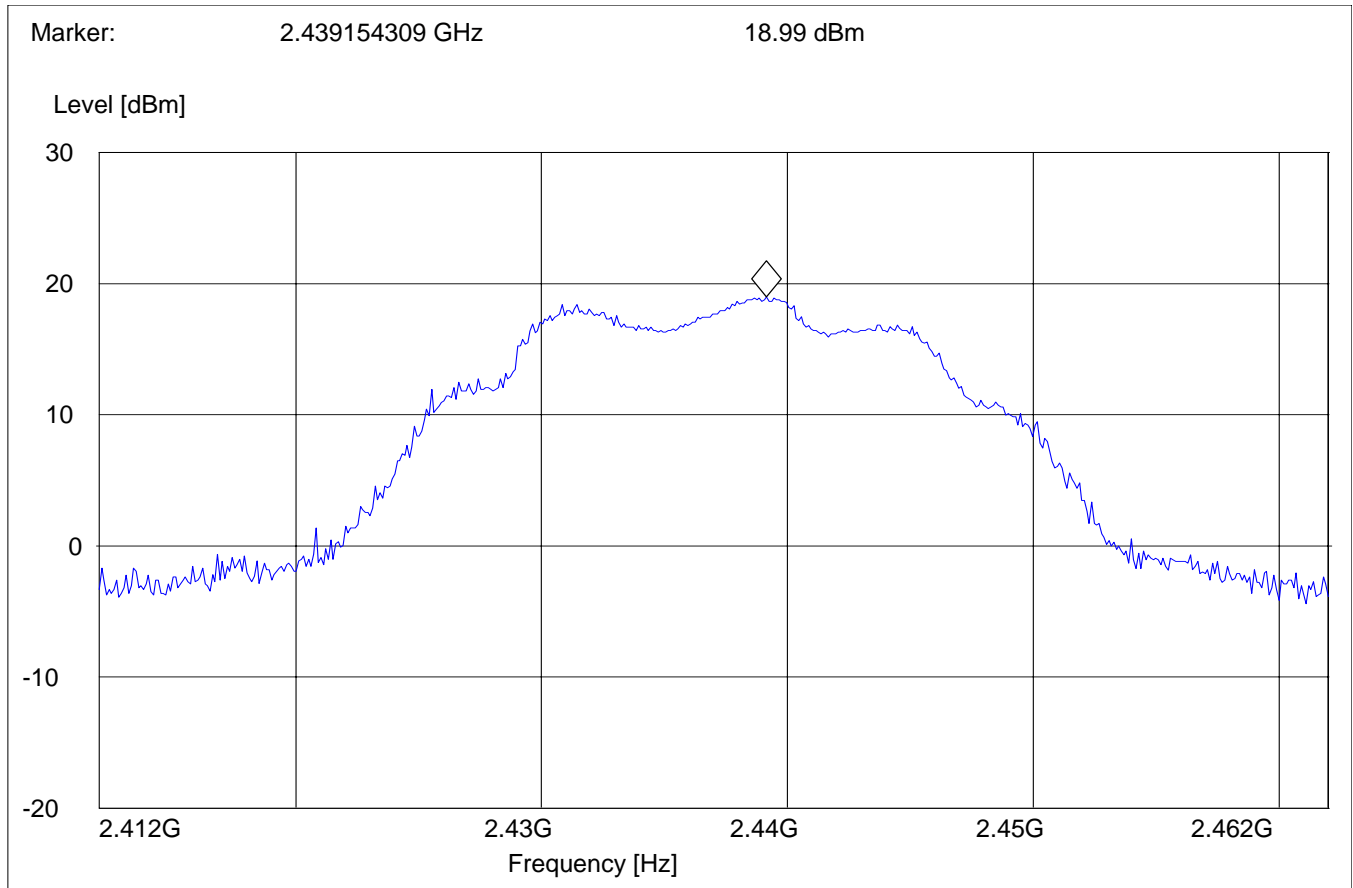
**LIMIT****SUBCLAUSE § 15.247 (b) (1)**

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

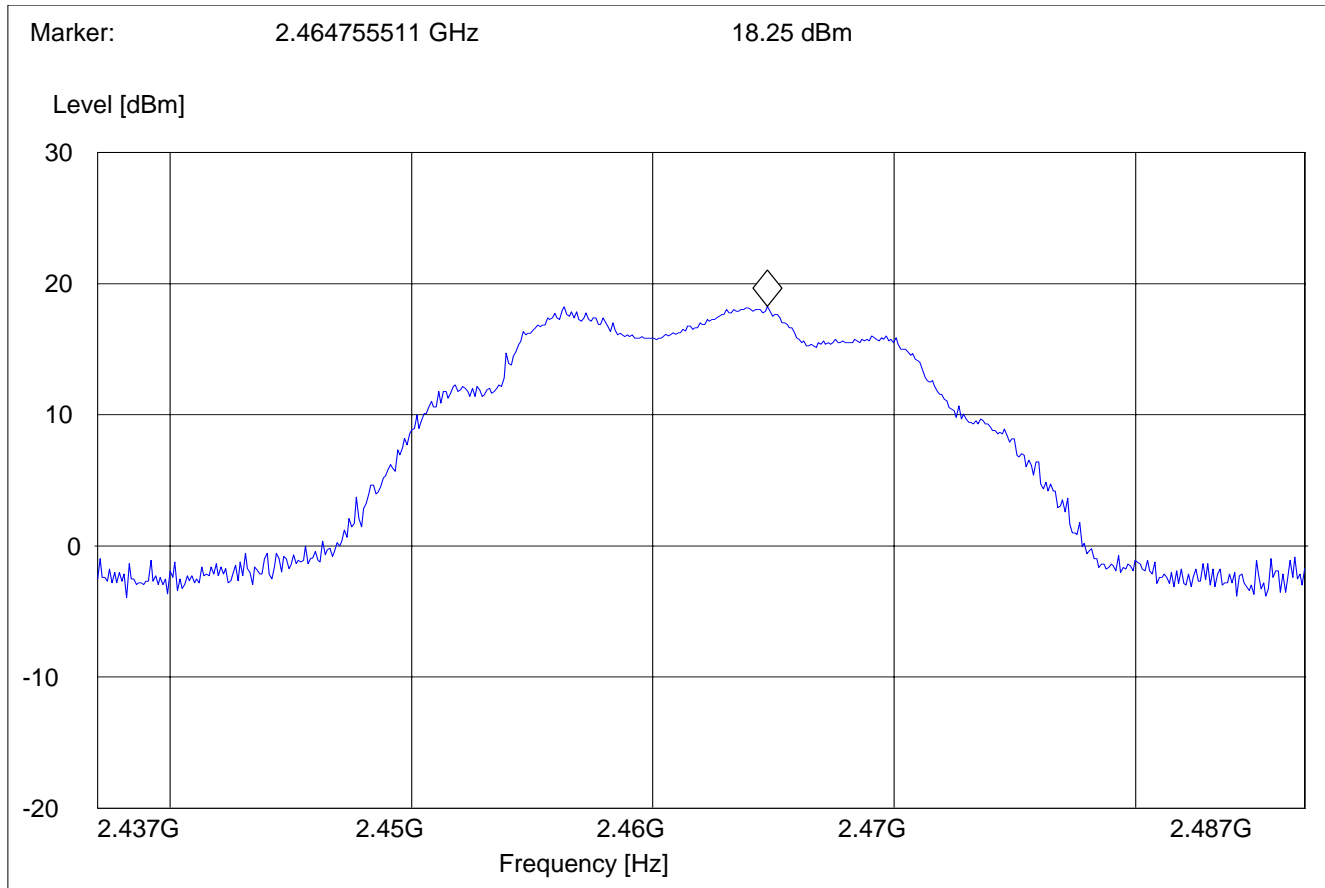
EIRP: 2412MHz



EIRP: 2437MHz



**EIRP: 2462MHz**



## BAND EDGE COMPLIANCE

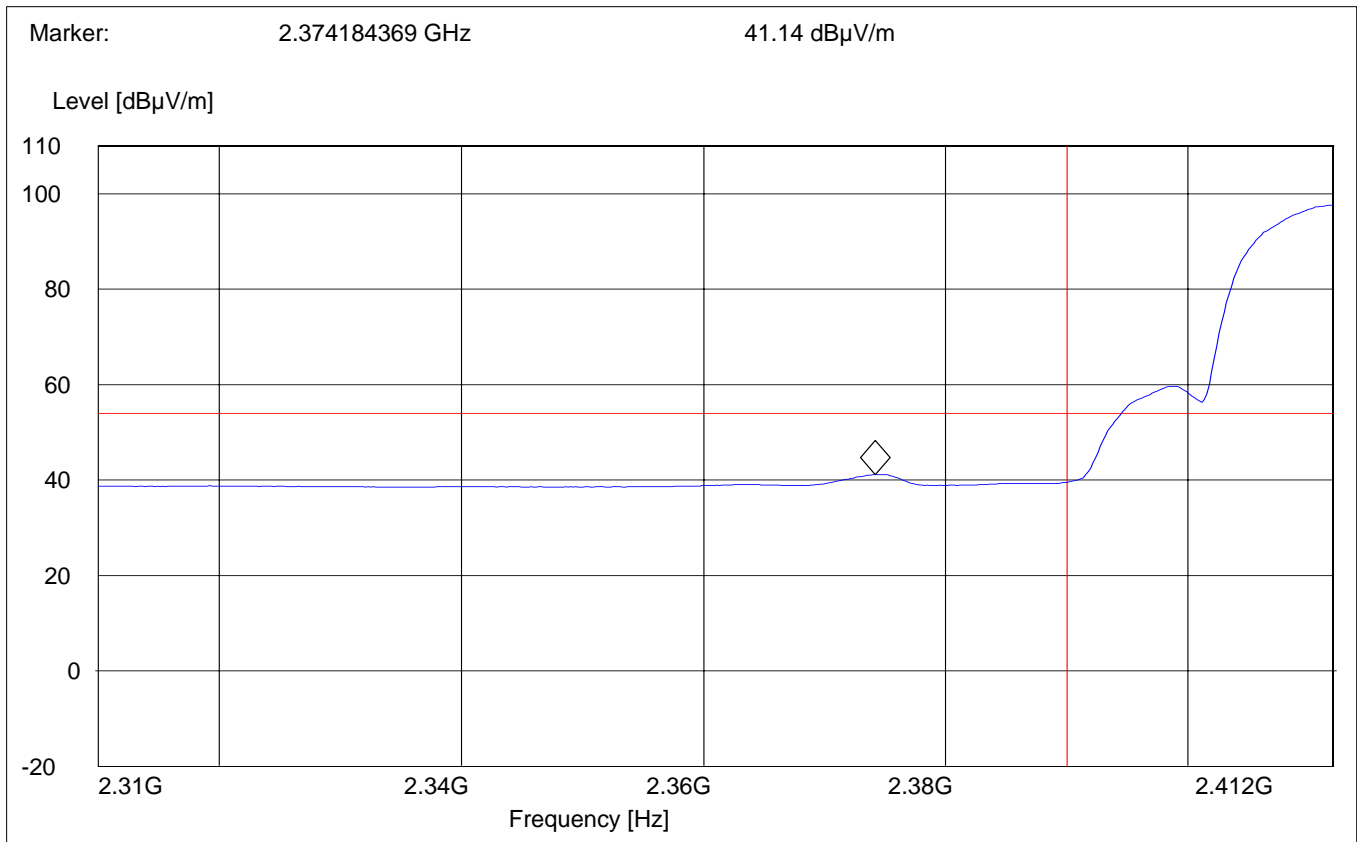
§15.247 (c)

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



## BAND EDGE COMPLIANCE

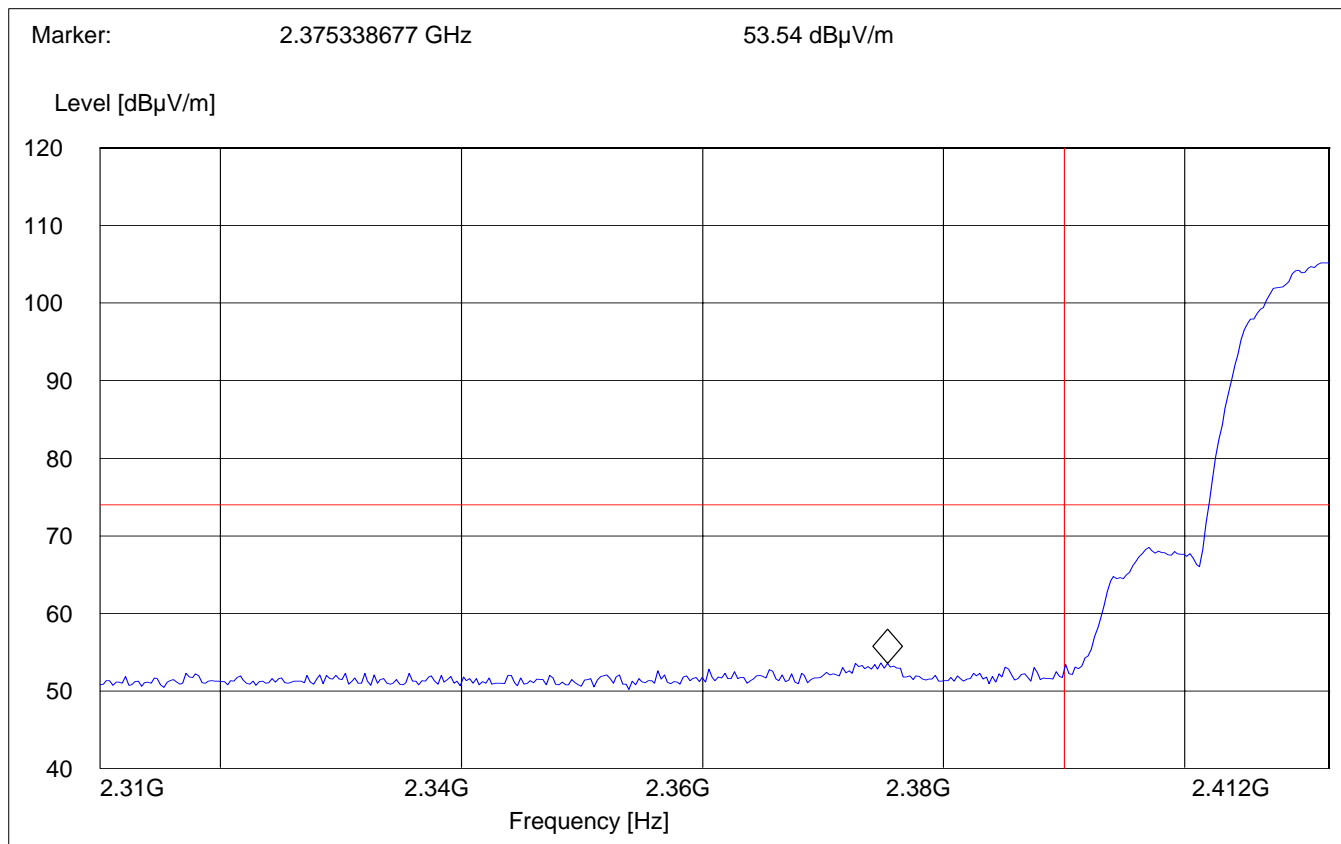
§15.247 (c)

### 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 : 74dB $\mu$ V

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



## BAND EDGE COMPLIANCE

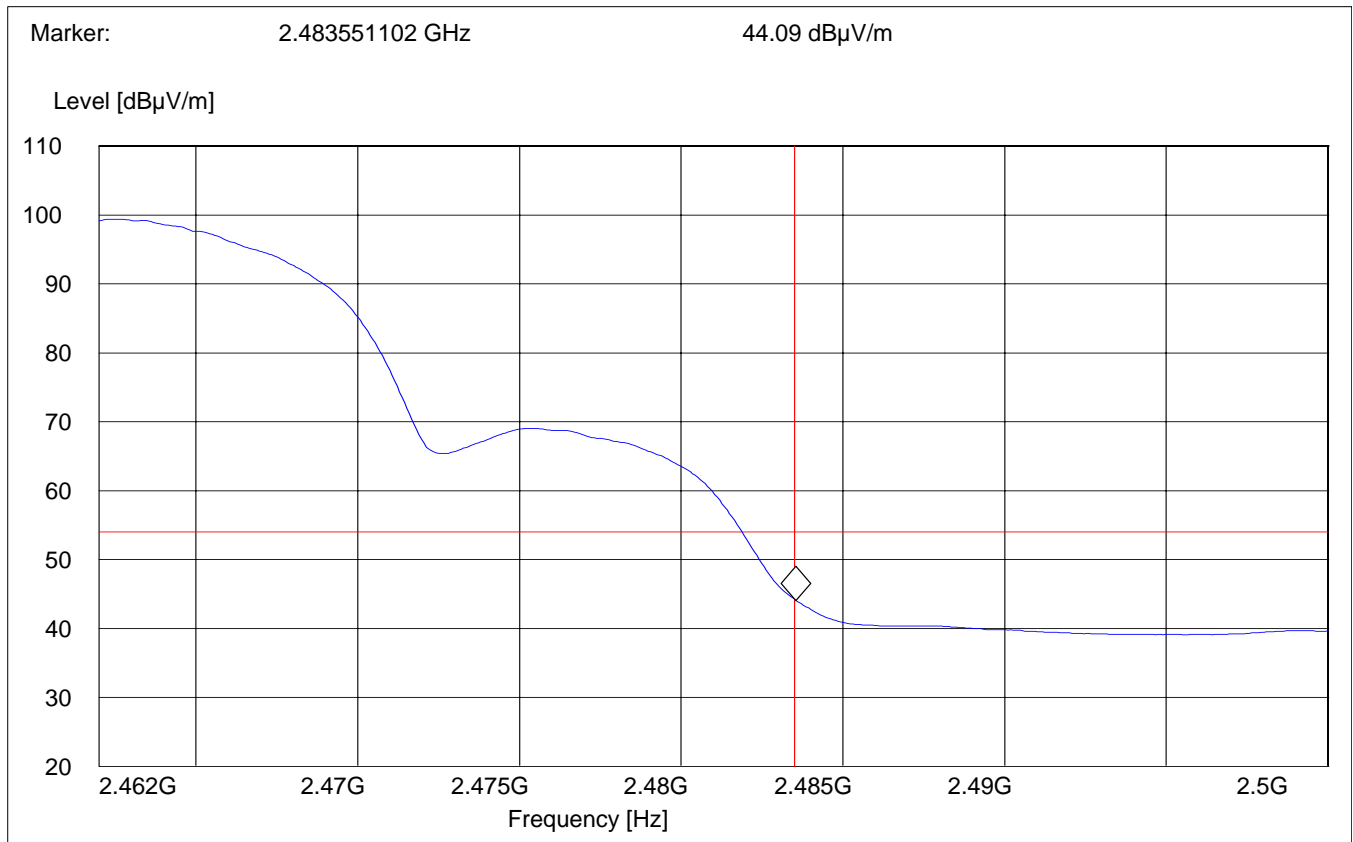
§15.247 (c)

### 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)



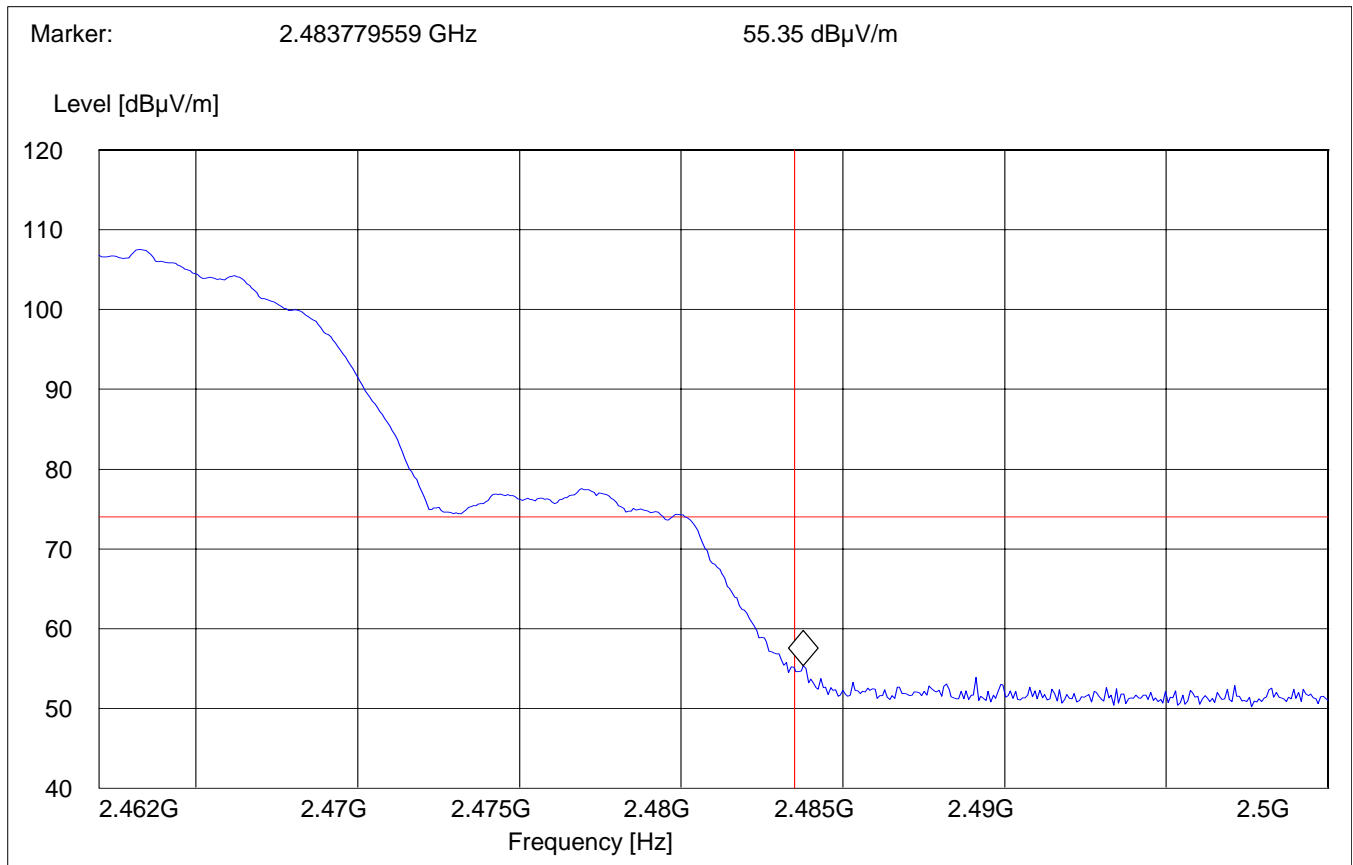
## BAND EDGE COMPLIANCE

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

<b>Frequency</b>	<b>Measured values</b>	<b>Remarks</b>
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
4815	39.94		
9653	44.39		
Transmit at Middle channel Frequency 2437MHz			
Frequency (MHz)	Level (dBµV/m)		
	Peak	Quasi-Peak	Average
4849	41.77		28.16
7302	55.35		43.91
Transmit at Highest channel Frequency 2462MHz			
Frequency (MHz)	Level (dBµV/m)		
	Peak	Quasi-Peak	Average
4917	44.77		29.41
7370	56.10		43.17
9857	44.43		

## EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.247 (c) (1)

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

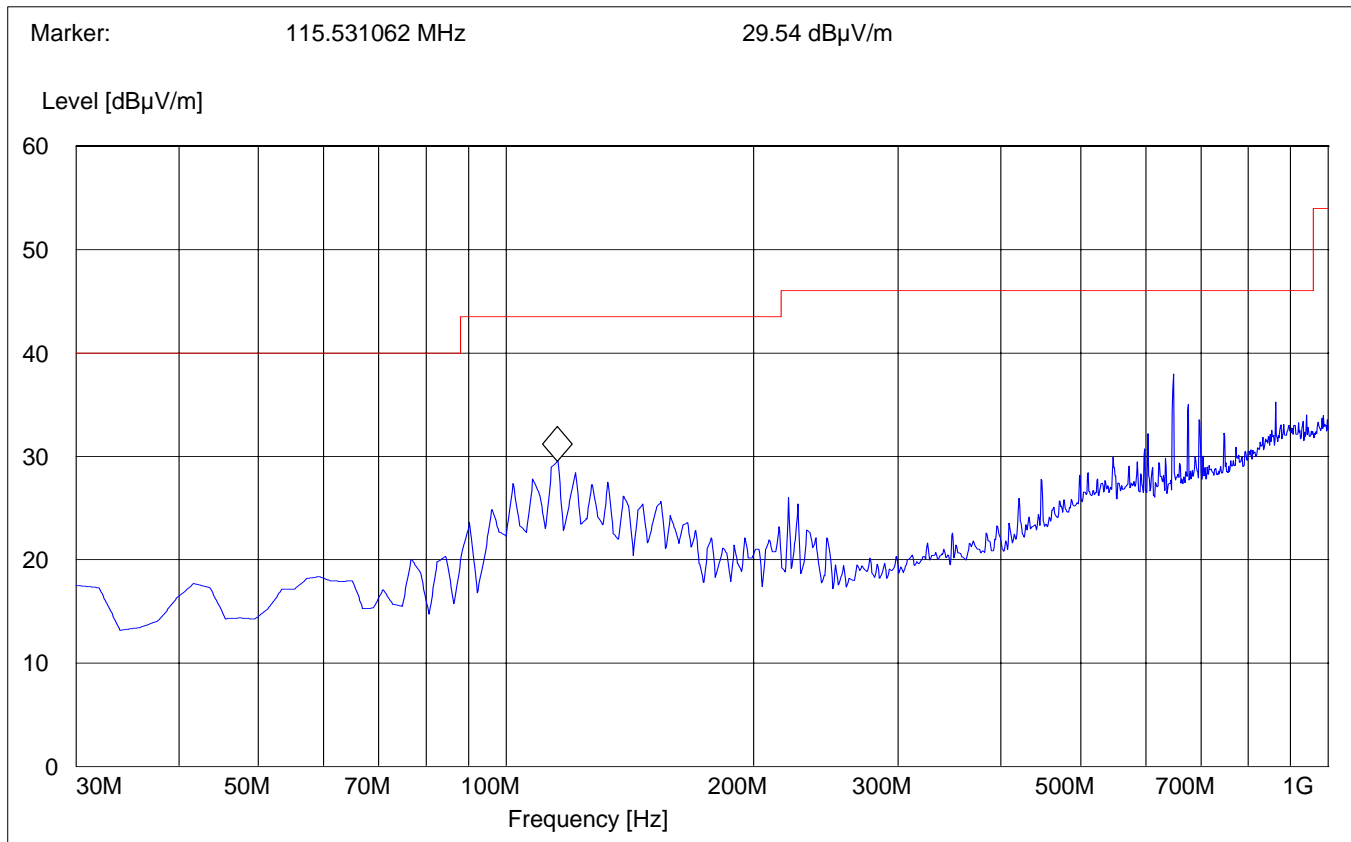
Antenna: Vertical

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

### SWEEP TABLE:

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

"Spuri hi 30-1G"



## EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.247 (c) (1)

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

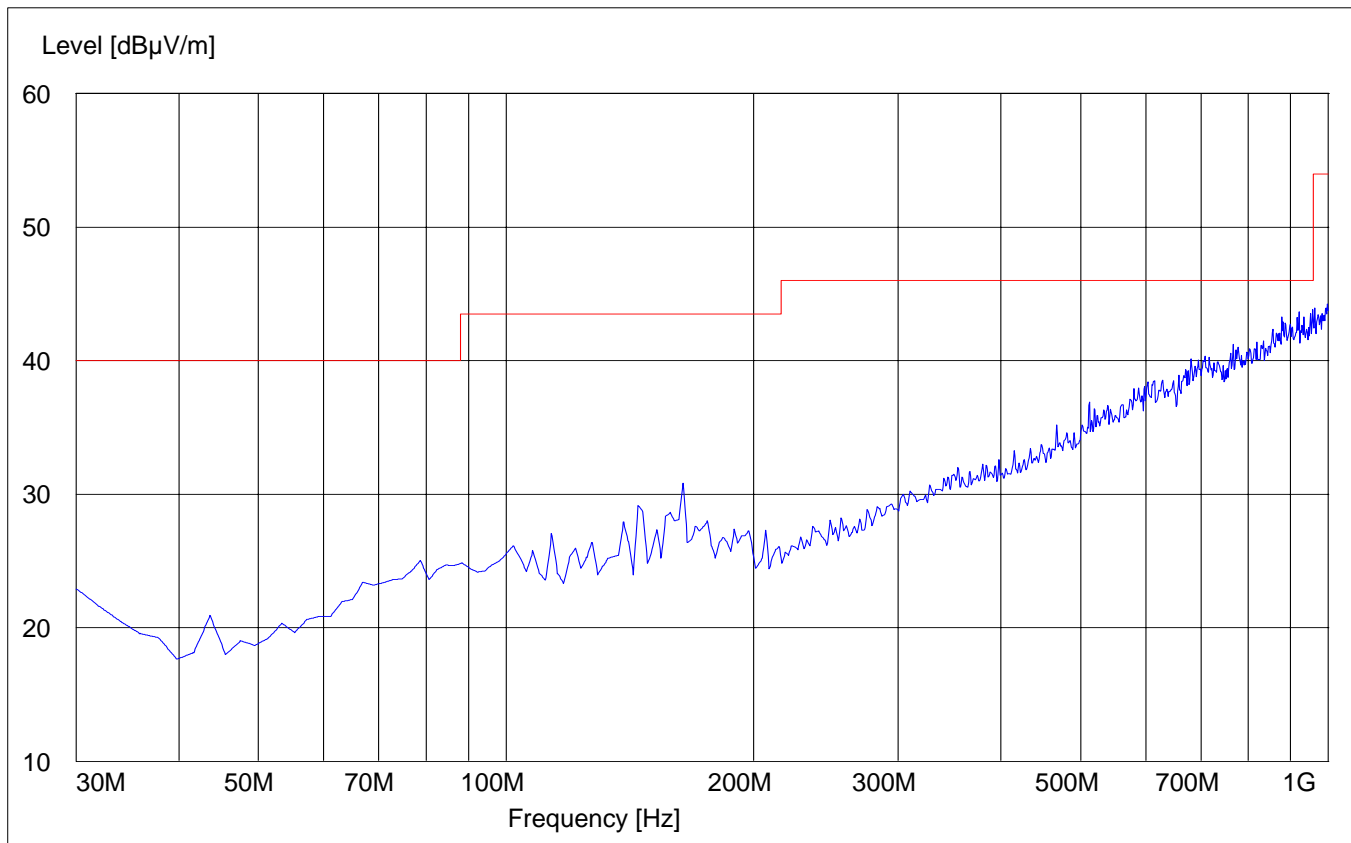
Antenna: Horizontal

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

### SWEEP TABLE:

"Spuri hi 30-1G"

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



## EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.247 (c) (1)

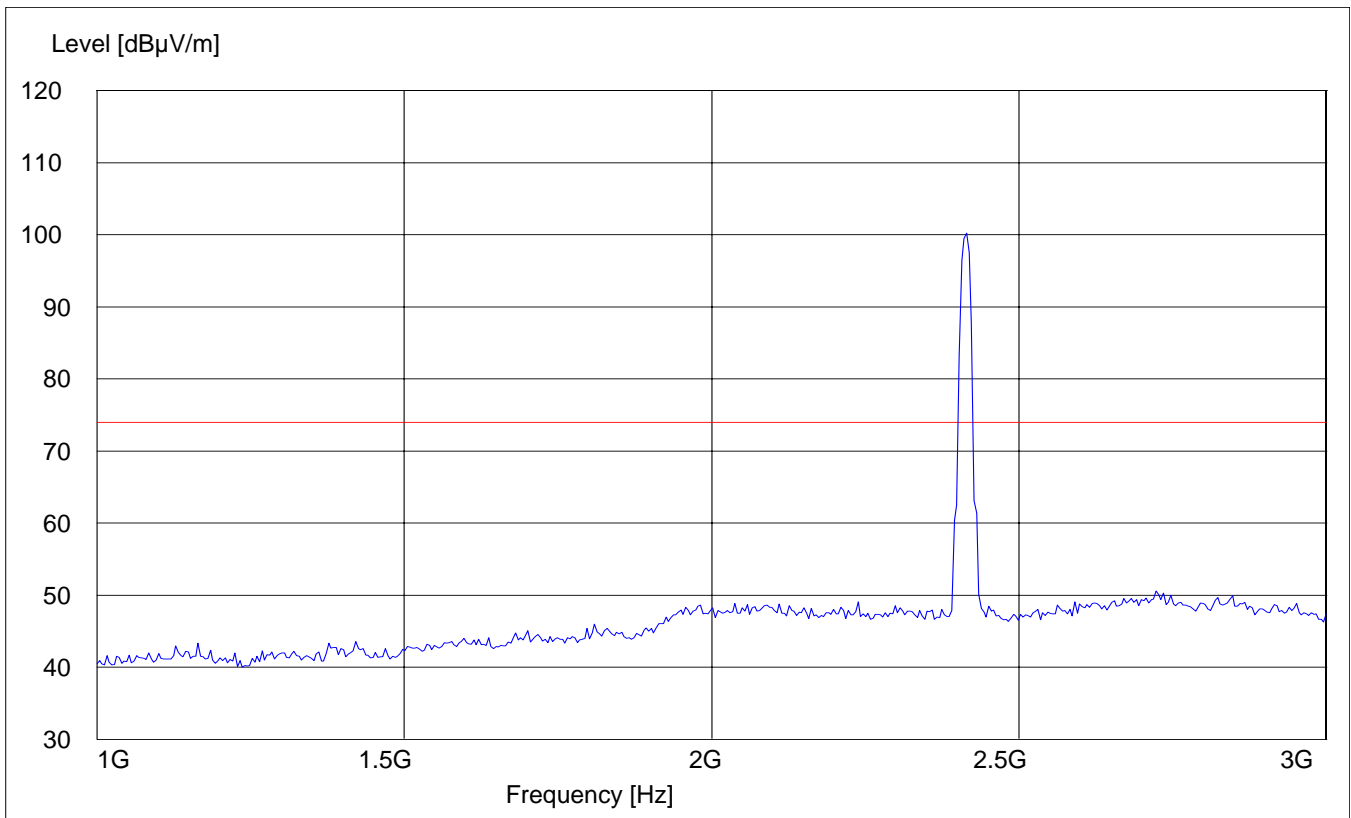
Lowest Channel (2412MHz): 1GHz – 3GHz

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

### SWEEP TABLE:

"Spuri hi 1-3G"

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



## EMISSION LIMITATIONS - Radiated (Transmitter)

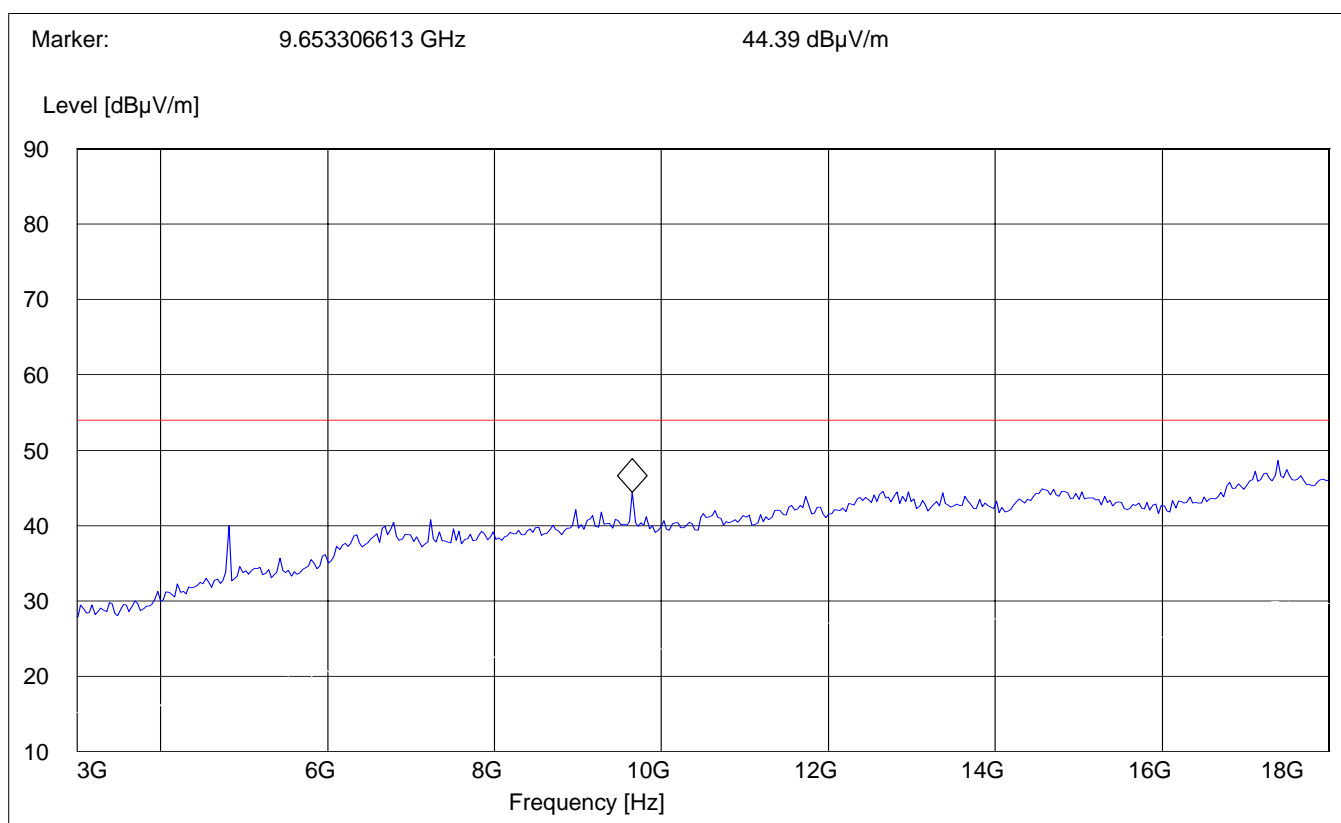
§ 15.247 (c) (1)

Lowest Channel (2412MHz): 3GHz – 18GHz

### SWEEP TABLE:

"Spuri hi 3-18G"

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



## EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.247 (c) (1)

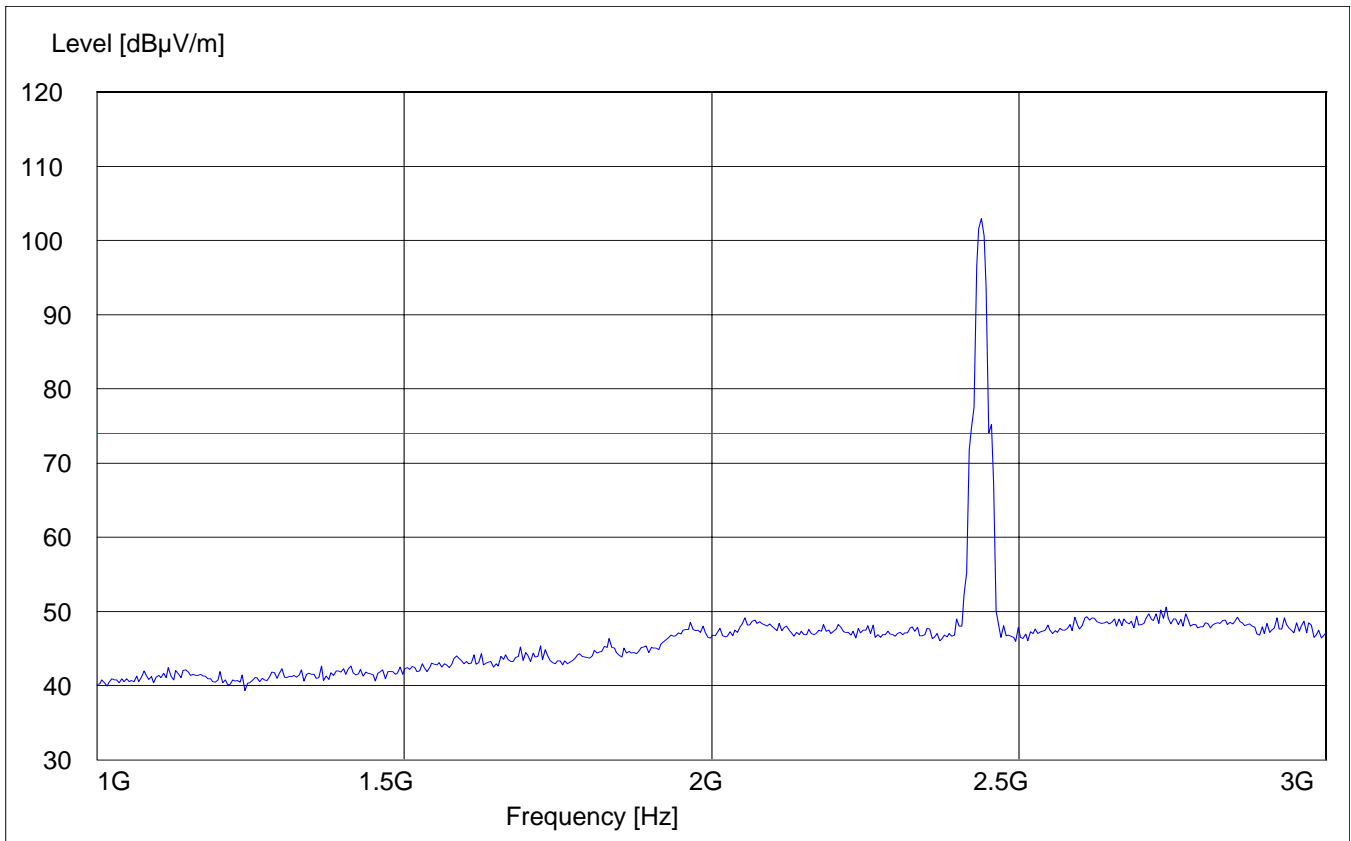
Mid Channel (2437MHz): 1GHz – 3GHz

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

### SWEEP TABLE:

"Spuri hi 1-3G"

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



## EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.247 (c) (1)

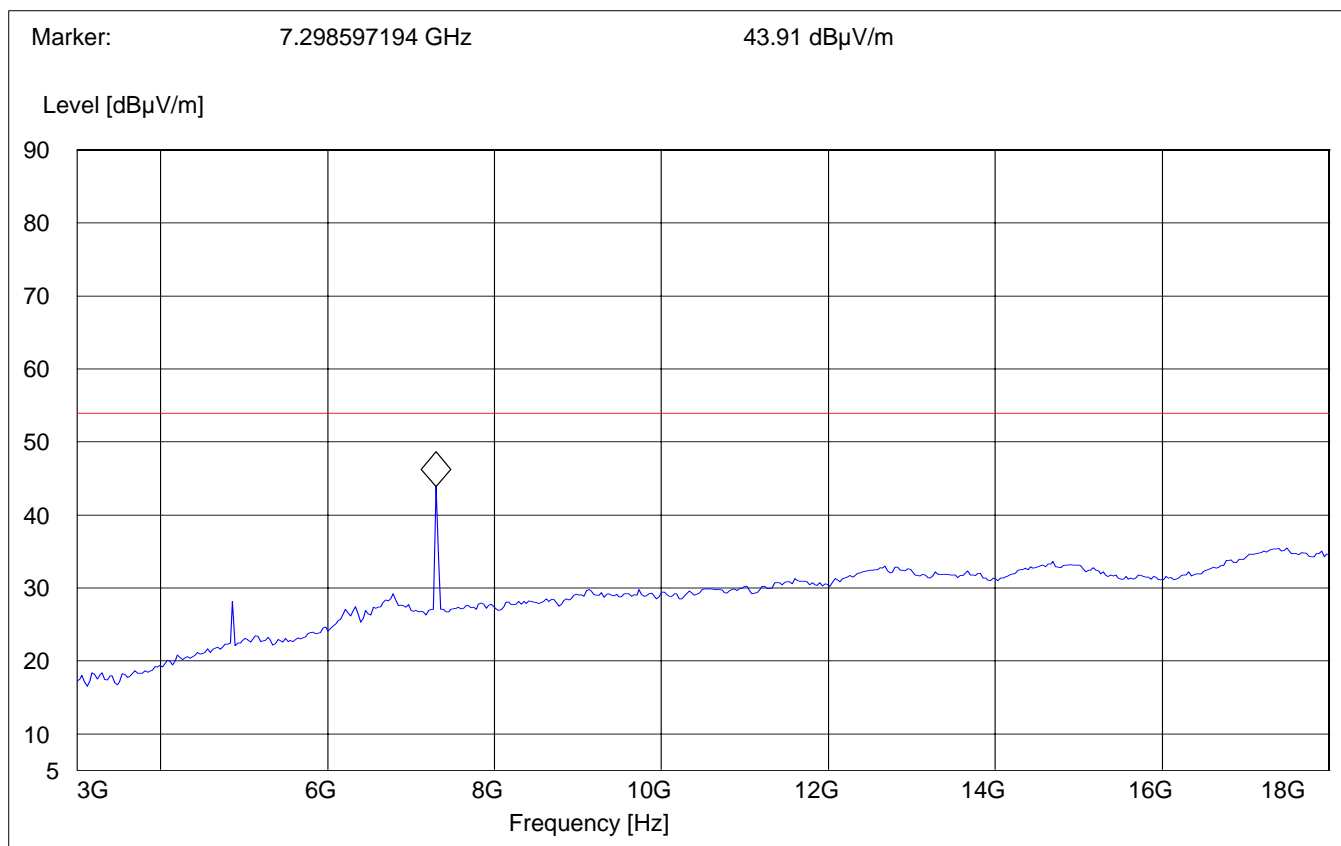
Mid Channel (2437MHz): 3GHz – 18GHz

### Average Measurement

#### SWEEP TABLE:

"Spuri hi 3-18G"

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





## EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.247 (c) (1)

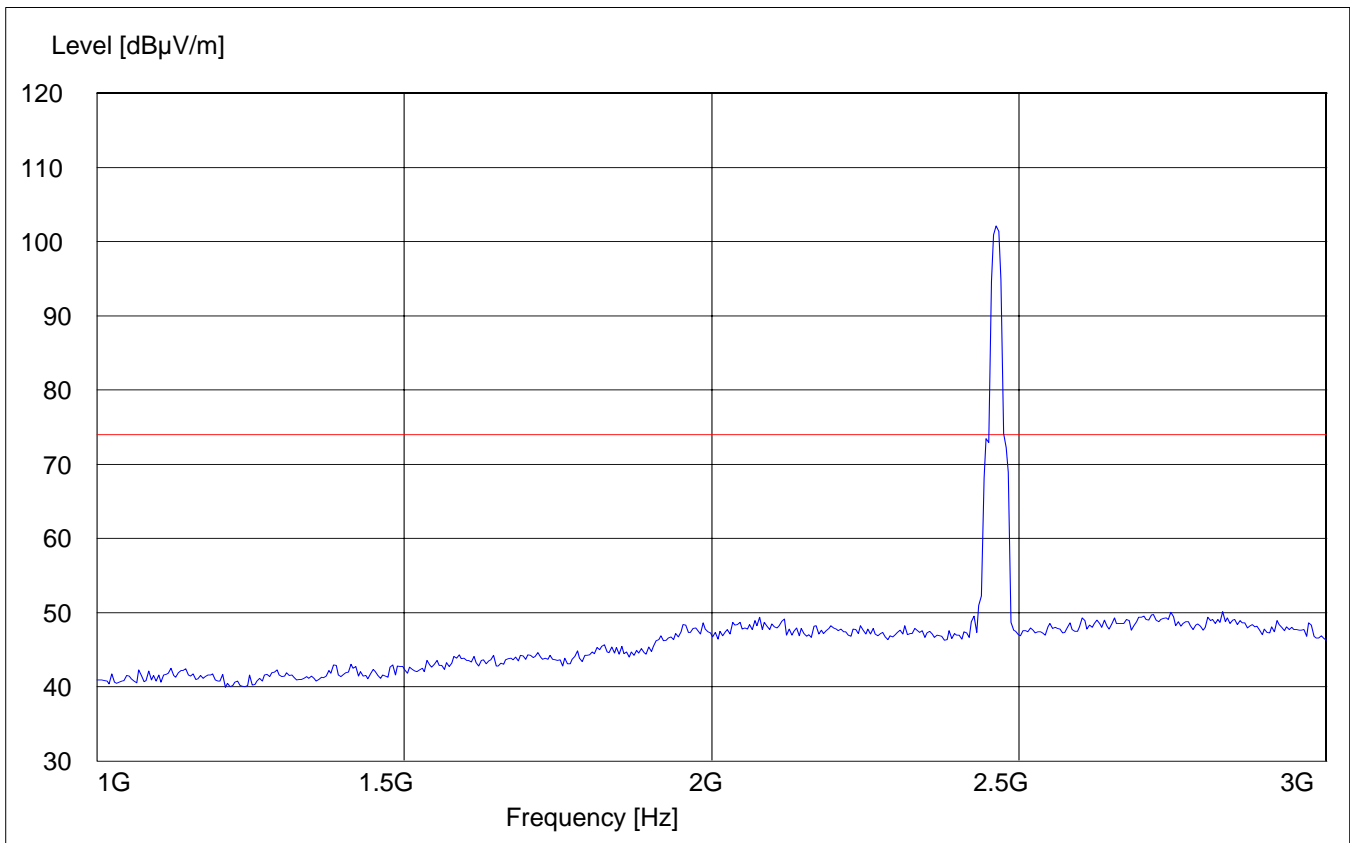
Highest Channel (2462MHz): 1GHz – 3GHz

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

### SWEEP TABLE:

"Spuri hi 1-3G"

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



## EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.247 (c) (1)

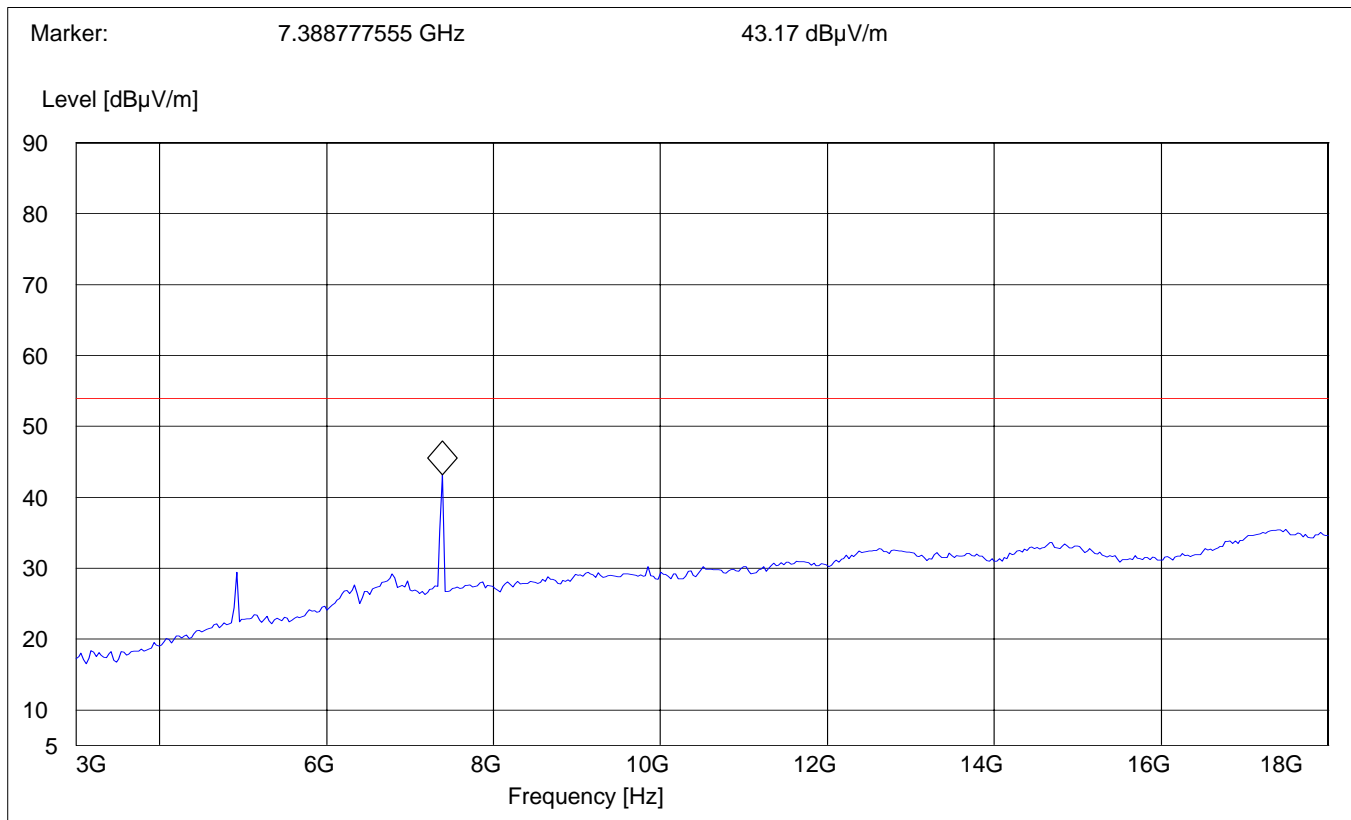
Highest Channel (2462MHz): 3GHz – 18GHz

Average Measurement

SWEEP TABLE:

"Spuri hi 3-18G"

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



## EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.247 (c) (1)

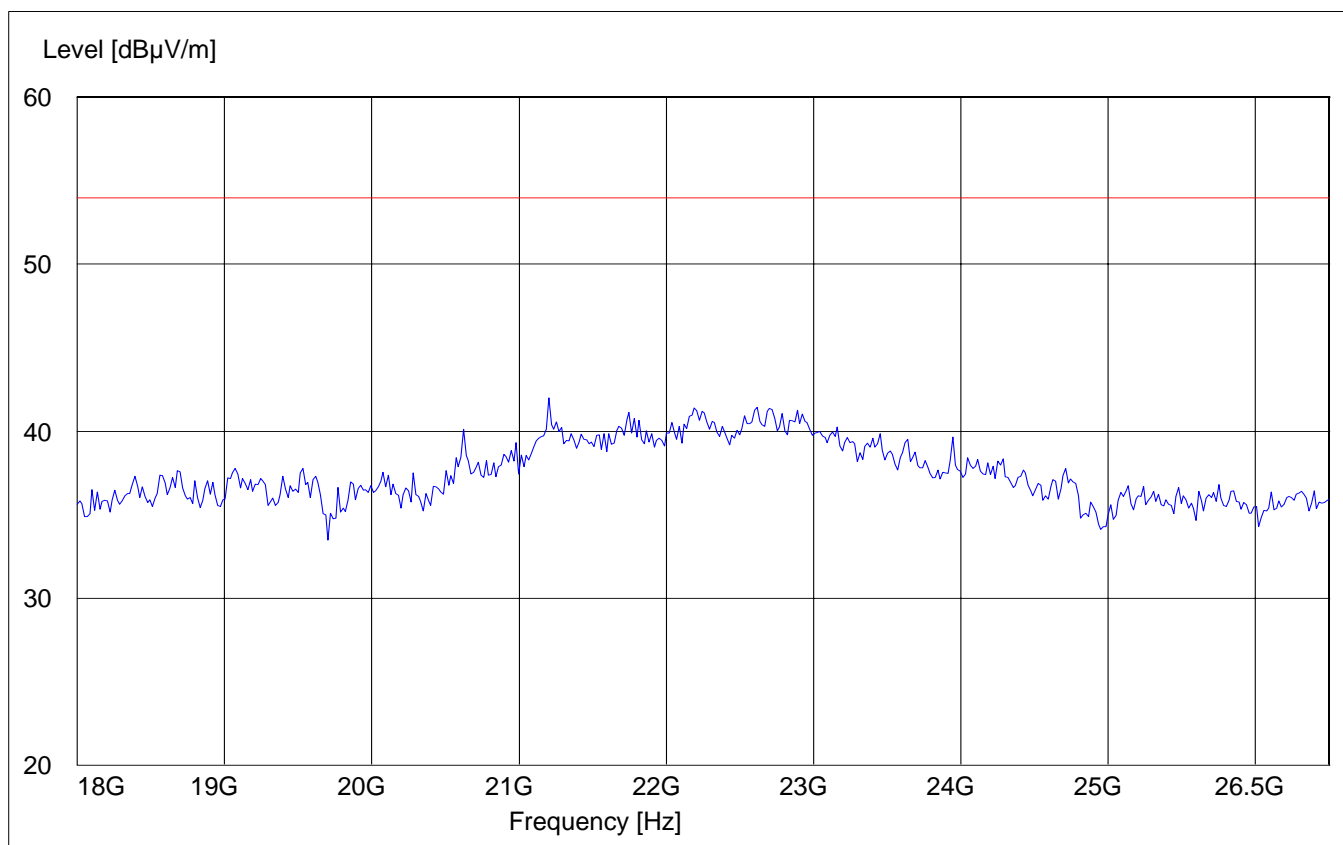
18GHz – 26.5GHz

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

### SWEEP TABLE:

"Spuri hi 18-26.5G"

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



## COLLOCATION: WLAN + BT

### EMISSION LIMITATIONS - Radiated (Transmitter)

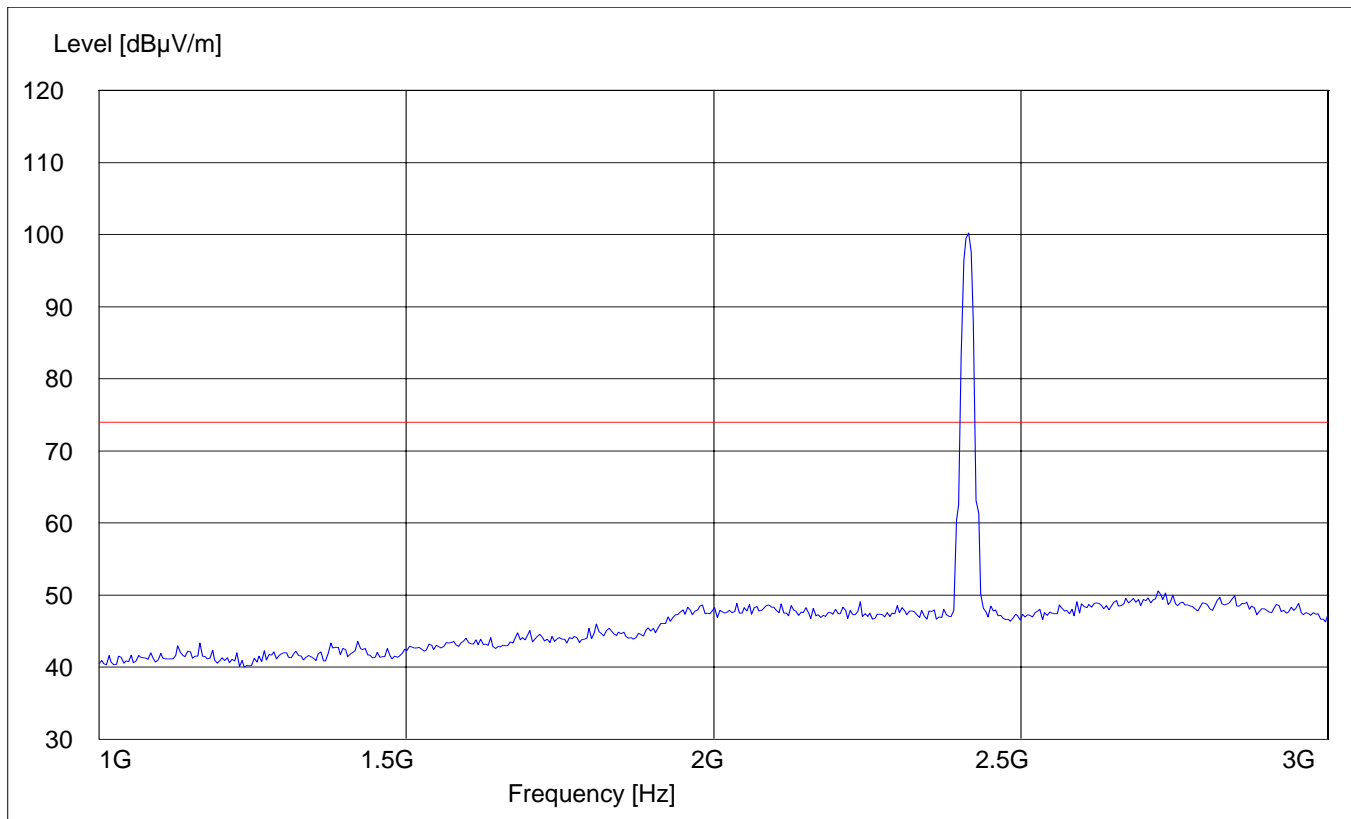
§ 15.247 (c) (1)

Operating Mode: BT @ CH 0 + WLAN @ CH 1

**Note: Peak above the limit line is the WLAN carrier freq. BT carrier freq. is not in plot, since BT power is very low it is in the noise floor.**

#### SWEEP TABLE:

		"Spuri hi 1-3G"				
Start	Stop	Detector	Meas.	RBW	Transducer	
Frequency	Frequency	Time	Bandw.		VBW	
1.0 GHz	3.0 GHz	MaxPeak	Coupled	1 MHz	10Hz	#326 horn (dBi)



## EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.247 (c) (1)

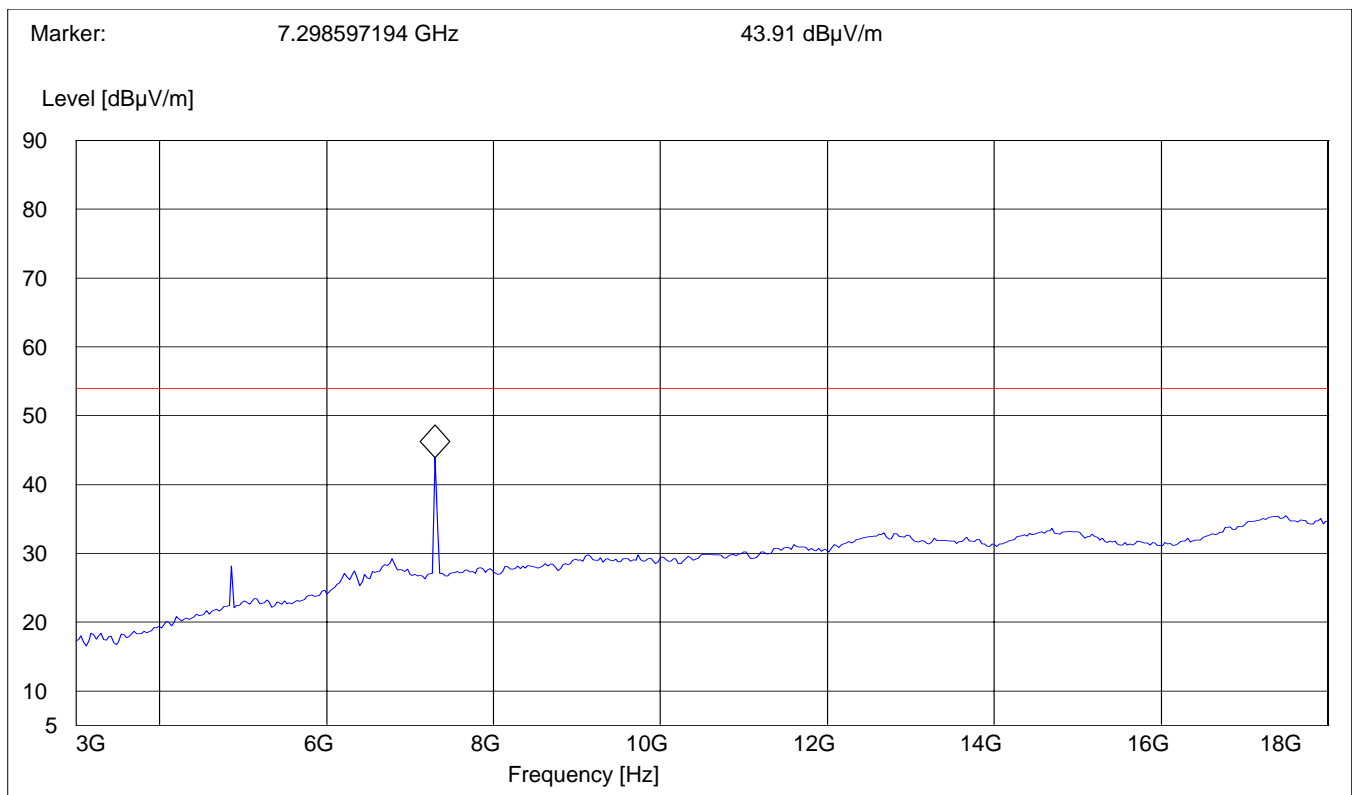
Operating Mode: BT @ CH 0 + WLAN @ CH 1

### Average Measurement

SWEEP TABLE:

"Spuri hi 3-18G"

Start	Stop	Detector	Meas.	RBW	VBW	Transducer
Frequency	Frequency	Time	Bandw.			
3.0 GHz	18.0 GHz	MaxPeak	Coupled	1 MHz	10Hz	#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 Stop Detector Meas IF Transducer  
Frequency Frequency Time Bandw.  
150.0 kHz 30.0 MHz MaxPeak Coupled 10 kHz None

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

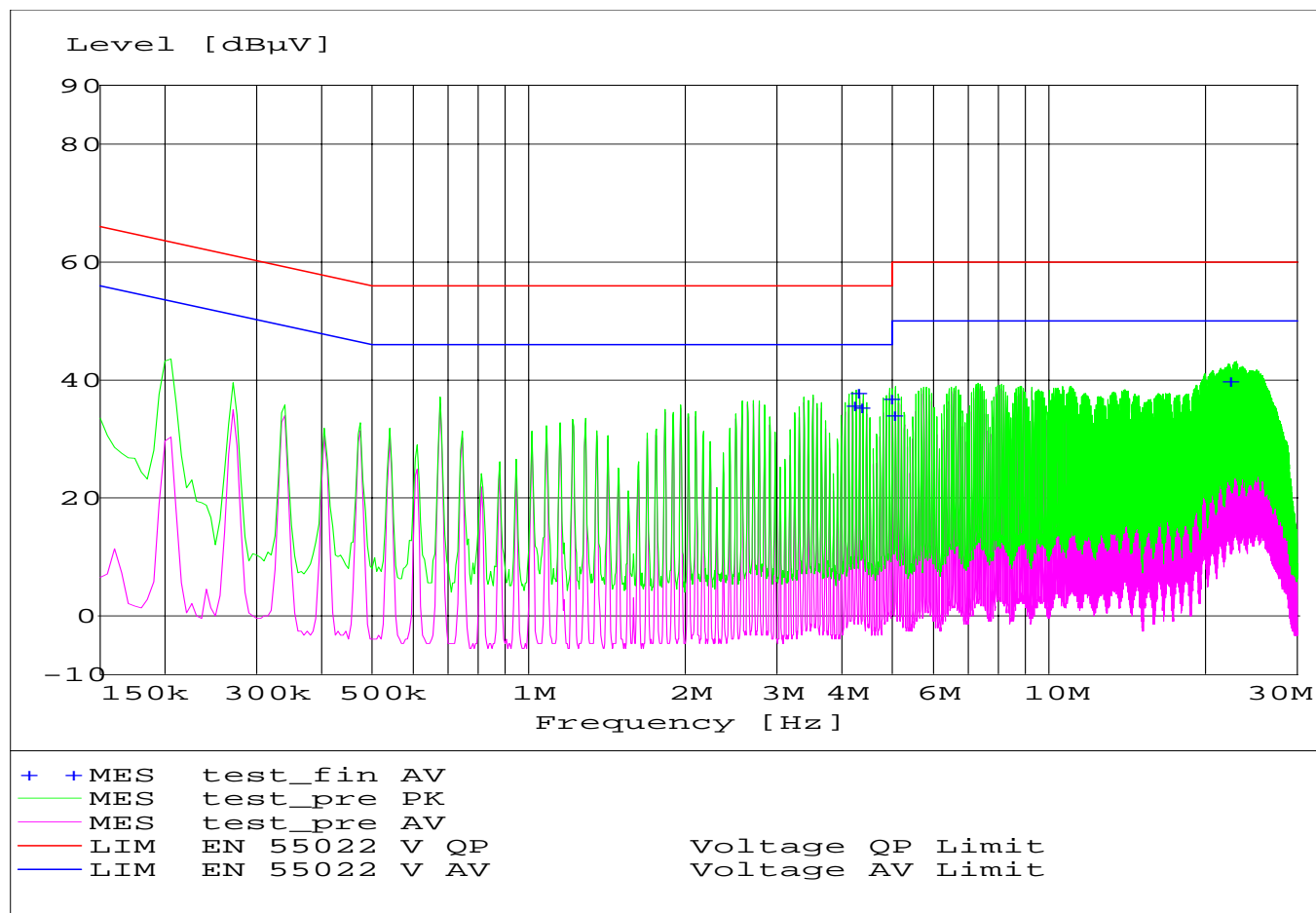
### Limit

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	Level	Transd	Limit	Margin	Line	PE
MHz	dBμV	dB	dBμV	dB		
4.190000	35.80	0.0	46	10.2	N	GND
4.260000	37.90	0.0	46	8.1	N	GND
4.325000	35.40	0.0	46	10.6	N	GND
4.935000	36.90	0.0	46	9.1	N	GND
5.000000	34.00	0.0	46	12.0	N	GND
22.110000	39.90	0.0	50	10.1	N	GND

**RECEIVER SPURIOUS RADIATION****§ 15.209****Limits**

Frequency (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	3
88 - 216	150	3
216 - 960	200	3
above 960	500	3

**NOTE:**

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.



## RECEIVER SPURIOUS RADIATION

§ 15.209

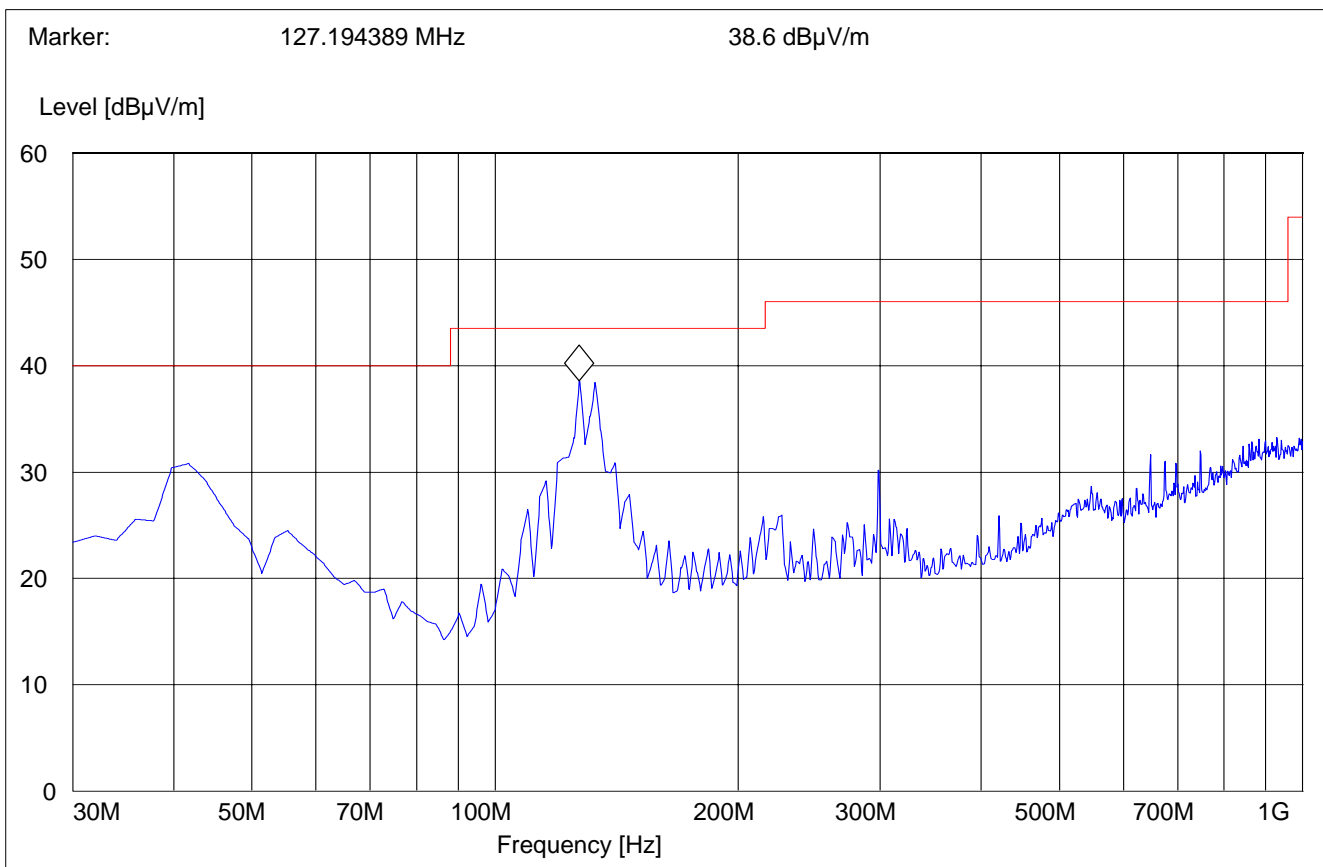
30MHz – 1GHz

Antenna: vertical

SWEEP TABLE:

"Spuri hi 30-1G"

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



## RECEIVER SPURIOUS RADIATION

§ 15.209

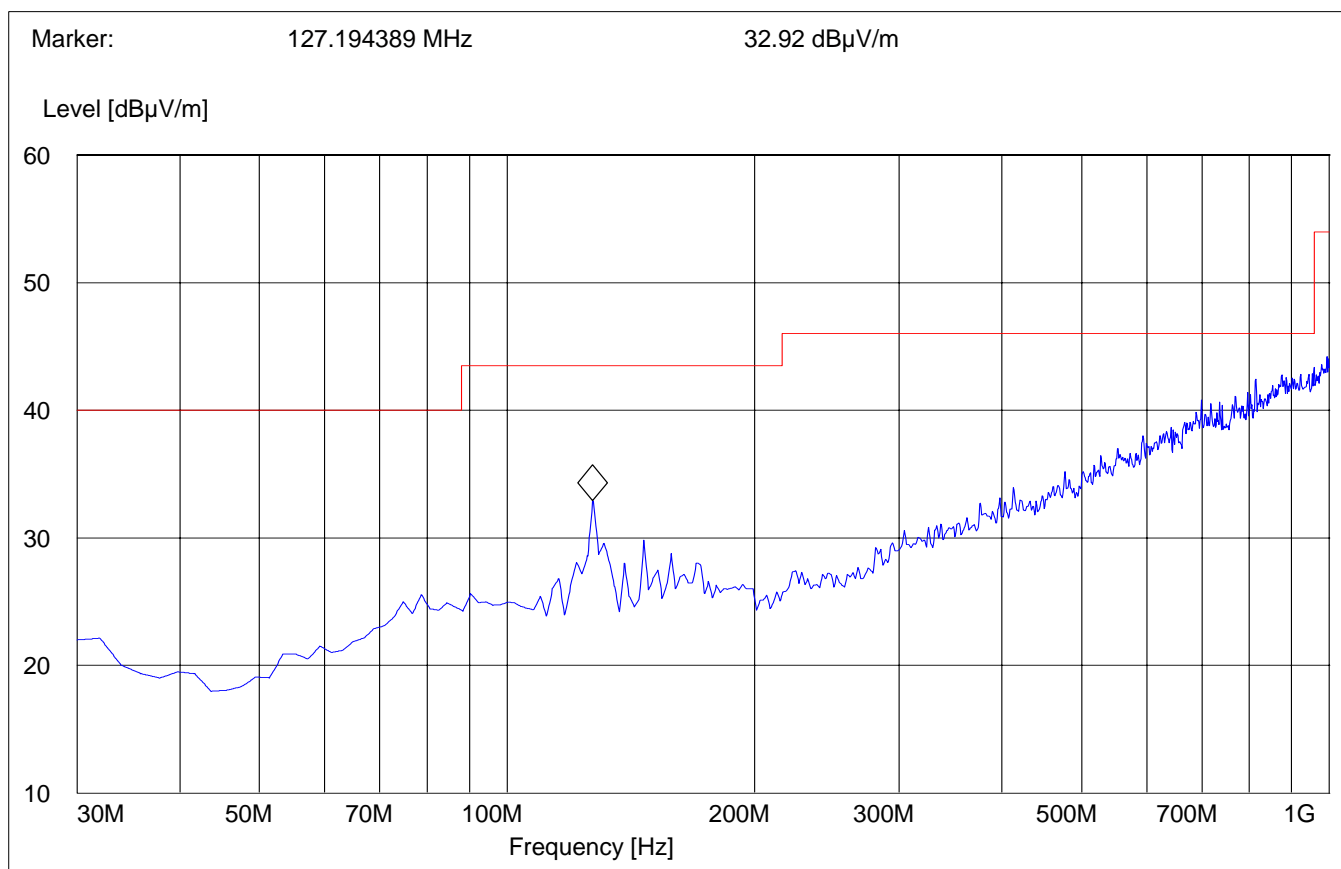
30MHz – 1GHz

Antenna: horizontal

SWEEP TABLE:

"Spuri hi 30-1G"

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



## RECEIVER SPURIOUS RADIATION

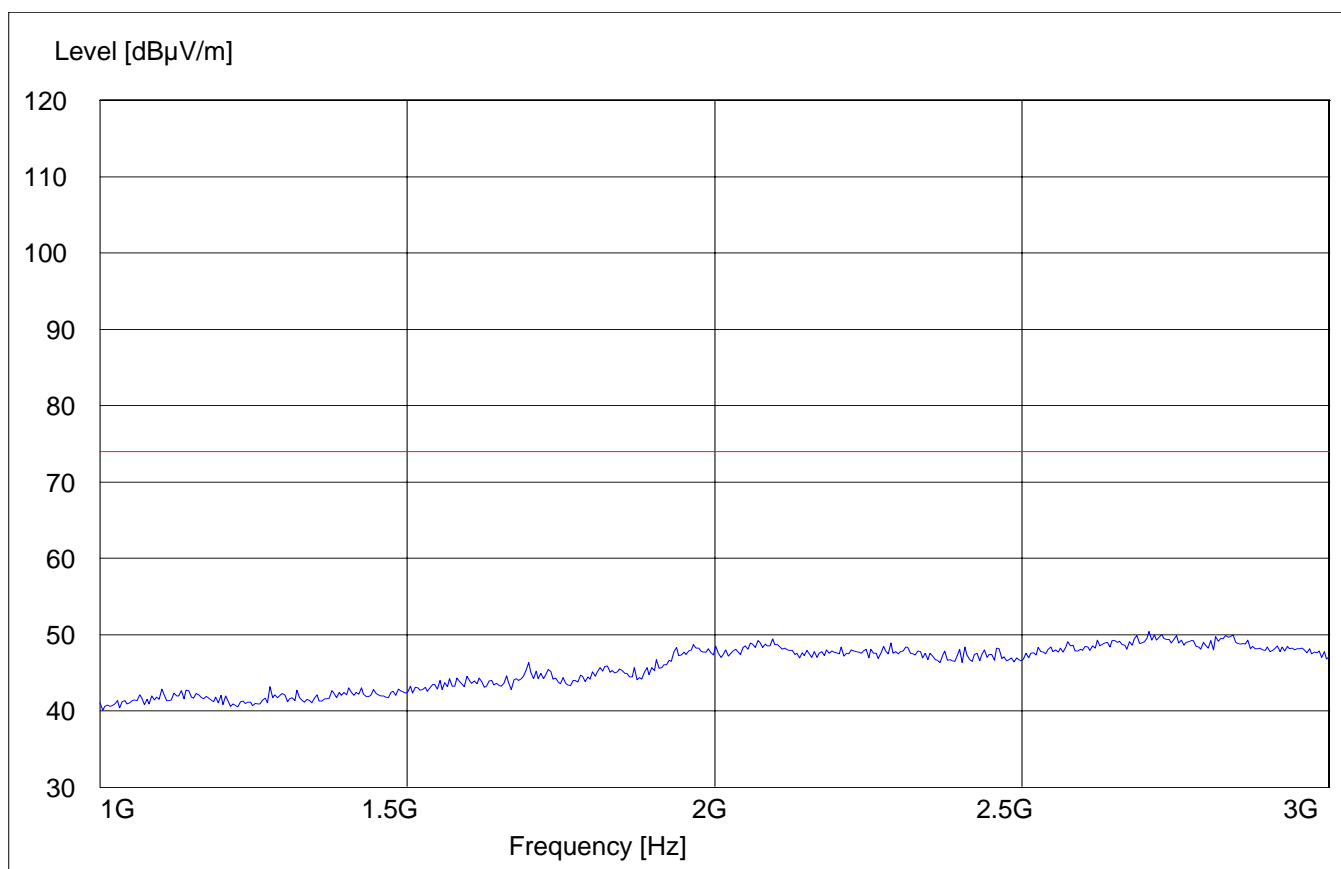
§ 15.209

1GHz – 3GHz

### SWEEP TABLE:

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

"Spuri hi 1-3G"



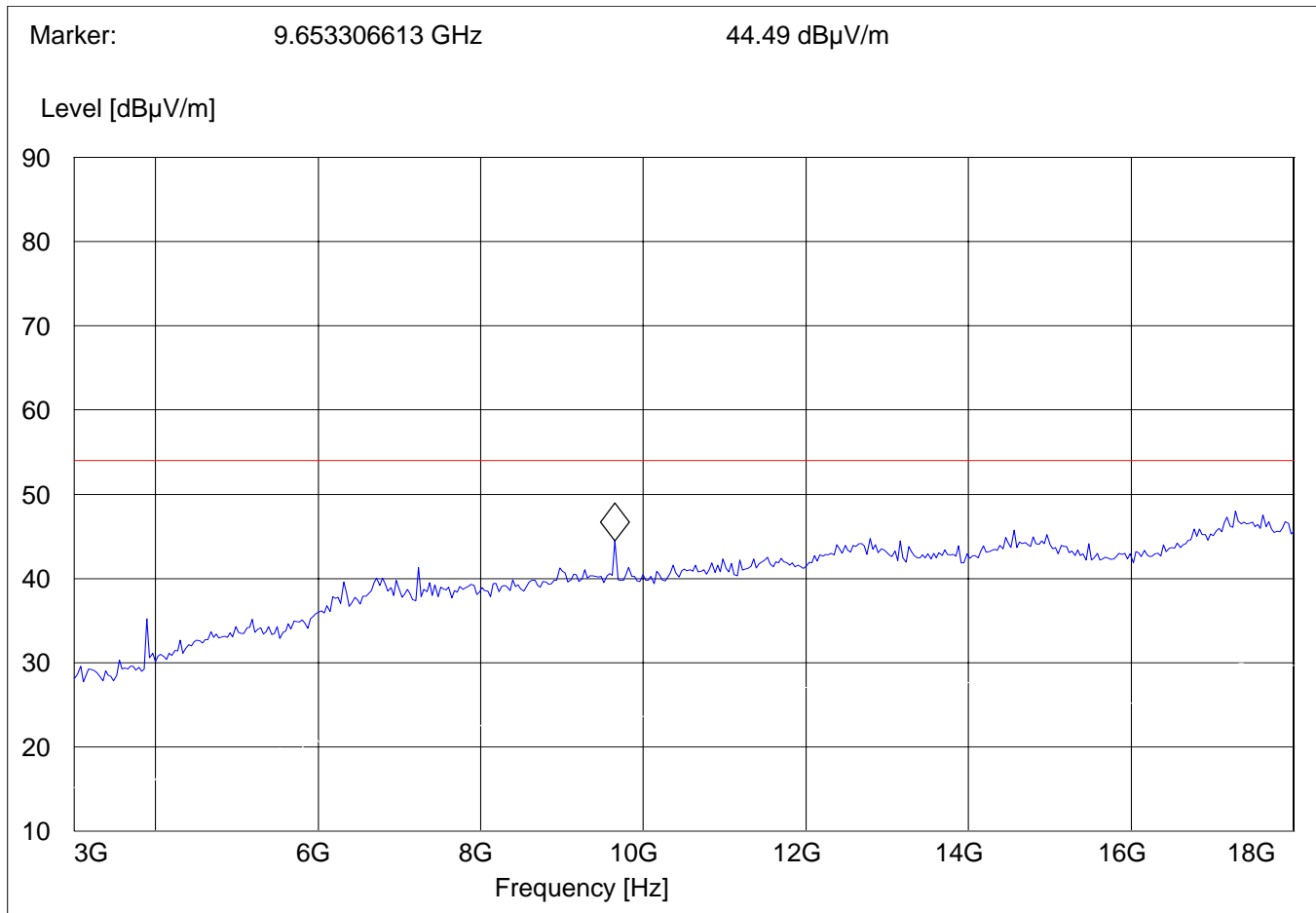
## RECEIVER SPURIOUS RADIATION 3GHz – 18GHz

§ 15.209

### SWEEP TABLE:

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

"Spuri hi 3-18G"

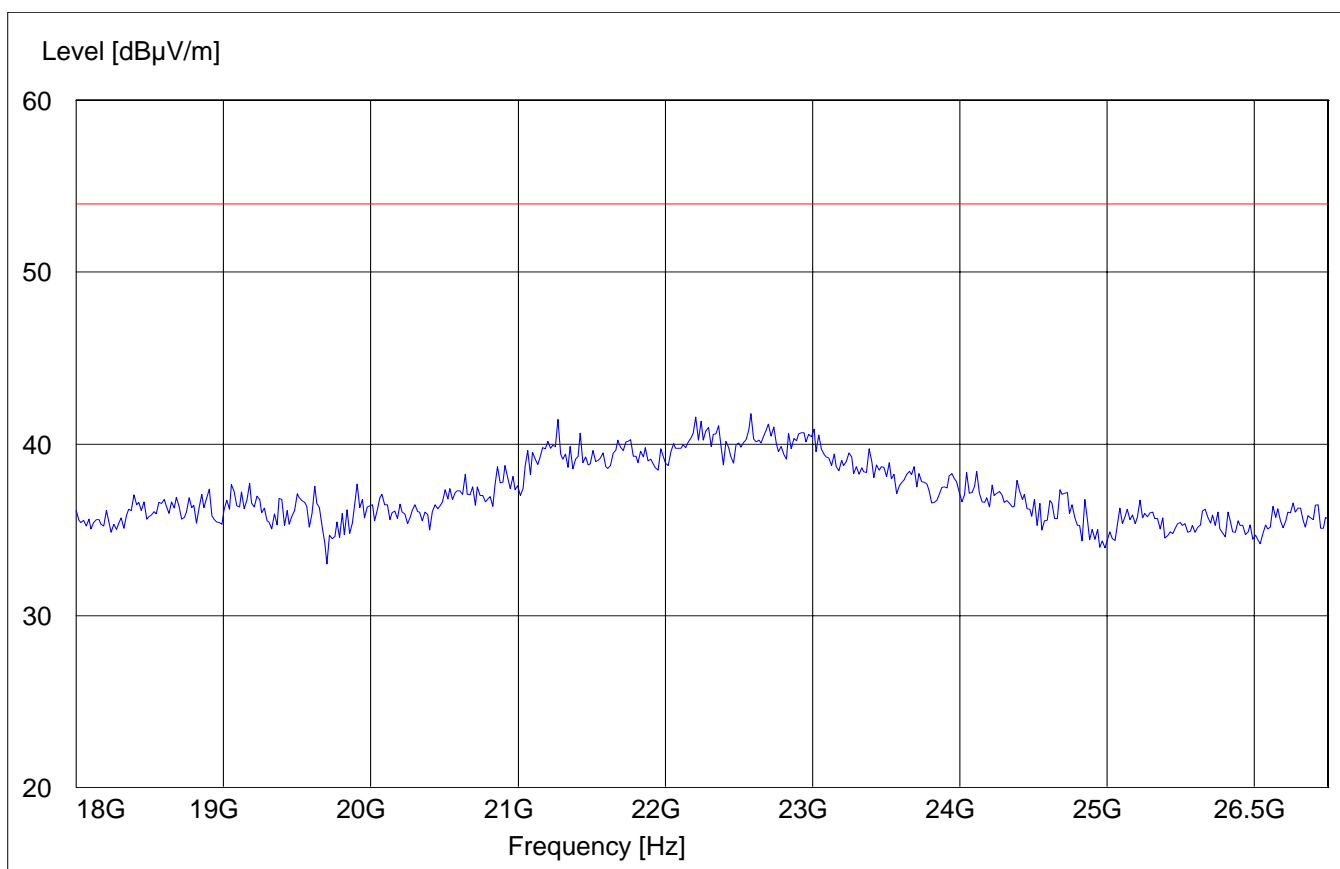


## RECEIVER SPURIOUS RADIATION 18GHz – 26.5GHz

§ 15.209

### SWEEP TABLE:

		"Spuri hi 18-26.5G"			
Start	Stop	Detector	Meas.	RBW	Transducer
Frequency	Frequency	Time	Bandw.	VBW	
18 GHz	26.5 GHz	MaxPeak	Coupled	1 MHz	#141 horn (dBi)



**TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS**

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

**BLOCK DIAGRAMS**  
**Radiated Testing**

**ANECHOIC CHAMBER**

