



FCC Test Report

Test report no.: EMC_624FCC15.247_2004_WLAN

FCC Part 15.247 for DSSS systems / CANADA RSS-210
Model: MBS1000-2
FCC ID: P5IMBS2A
IC ID: 1478A-MBS2A



Accredited according to **ISO/IEC 17025**



FCC listed # 101450

IC recognized # 3925

CETECOM Inc.

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 - 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.

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E-mail: lothar.schmidt@cetecomusa.com

Internet: www.cetecom.com

1.3 Details of applicant

Name : Wireless Matrix Corporation
Street : 12369-B Sunrise Valley Drive
City / Zip Code : Reston, VA 20164
Country : USA
Contact : Darryl Strucko
Telephone : 703 262 4021
Tele-fax : 703 262 3085
e-mail : darryl.strucko@wrx-us.com

1.4 Application details

Date of receipt test item : 2004-03-01
Date of test : 2004-03-01/02/03

1.5 Test item

Manufacturer : Applicant
Marketing Name : Mobile Base Station 2
Model No. : MBS1000-2
Description : [Mobile base station with GSM 850/1900, WLAN 802.11b & Satellite Transmitters.](#)
FCC-ID : **P5IMBS2A**
IC-ID : **1478A-MBS2A**

Additional information

Frequency : 2412MHz – 2462MHz
Type of modulation : DSSS
Number of channels : 11
Antenna : Elevated Dipole for 802.11b WLAN
Power supply : 13.6VDC Nominal voltage
Emission Designator : 18M0P7D
Output power : 20dBm (0.1W) max. conducted peak power
Extreme temp. Tolerance : Lower: -20°C Upper: +60°C

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

Note: All radiated measurements were made in all three orthogonal planes. The values reported are the maximum values.

[The EUT \(Mobile Base Station 2\) carries pre-certified CISCO WLAN module model# AIR-LMC352 with FCC ID: LDK102040 & IC ID: 24611032079A317](#)


[This test report covers full radiated testing as per FCC 15.247 on EUT with WLAN module. All conducted measurements are covered under test report# MFA_p0080005](#)

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:

2004-03-12	EMC & Radio	Lothar Schmidt (Manager)	
Date	Section	Name	Signature

Responsible for test report and project leader:

2004-03-12	EMC & Radio	Harpreet Sidhu (EMC Engineer)	
Date	Section	Name	Signature

2.2 Test report

TEST REPORT

Test report no.: EMC_624FCC15.247_2004_WLAN

TEST REPORT REFERENCE

LIST OF MEASUREMENTS

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**MAXIMUM PEAK OUTPUT POWER
(CONDUCTED)**

§ 15.247 (b) (1)

TEST CONDITIONS	MAXIMUM PEAK OUTPUT POWER (dBm)		
	Frequency (MHz)	2412	2437
T _{nom} (23)°C	19.22	20.0	19.79
Measurement uncertainty	±0.5dBm		

LIMIT

SUBCLAUSE § 15.247 (b) (1)

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

**MAXIMUM PEAK OUTPUT POWER
(RADIATED)**

§ 15.247 (b) (1)

EIRP:

TEST CONDITIONS	MAXIMUM PEAK OUTPUT POWER (dBm)		
	2412	2437	2462
Frequency (MHz)			
T _{nom} (23)°C	27.28	28.23	27.58
Measurement uncertainty	±0.5dBm		

ANALYZER SETTINGS: RBW = VBW = 10MHz

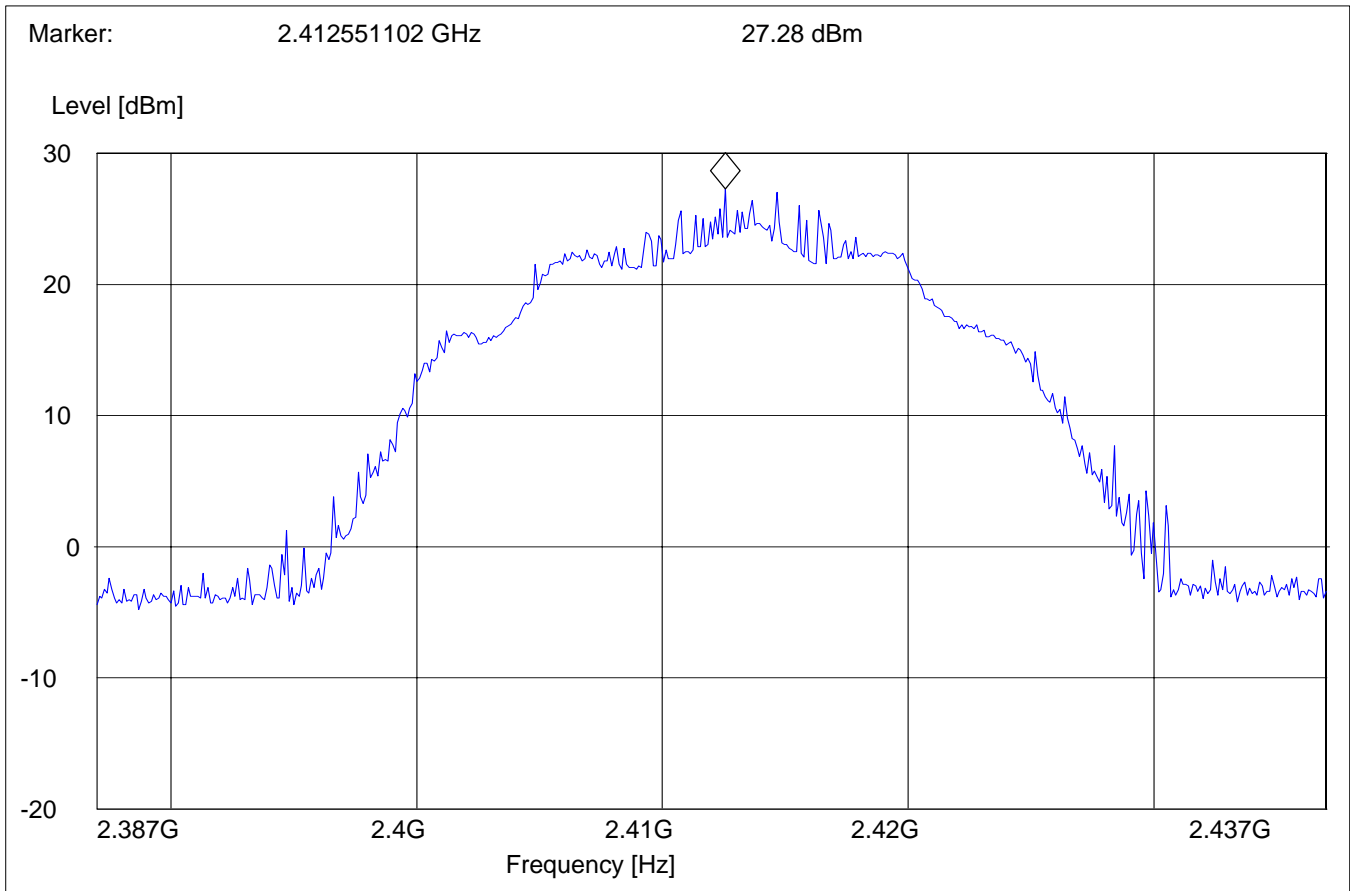
LIMIT

SUBCLAUSE § 15.247 (b) (1)

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

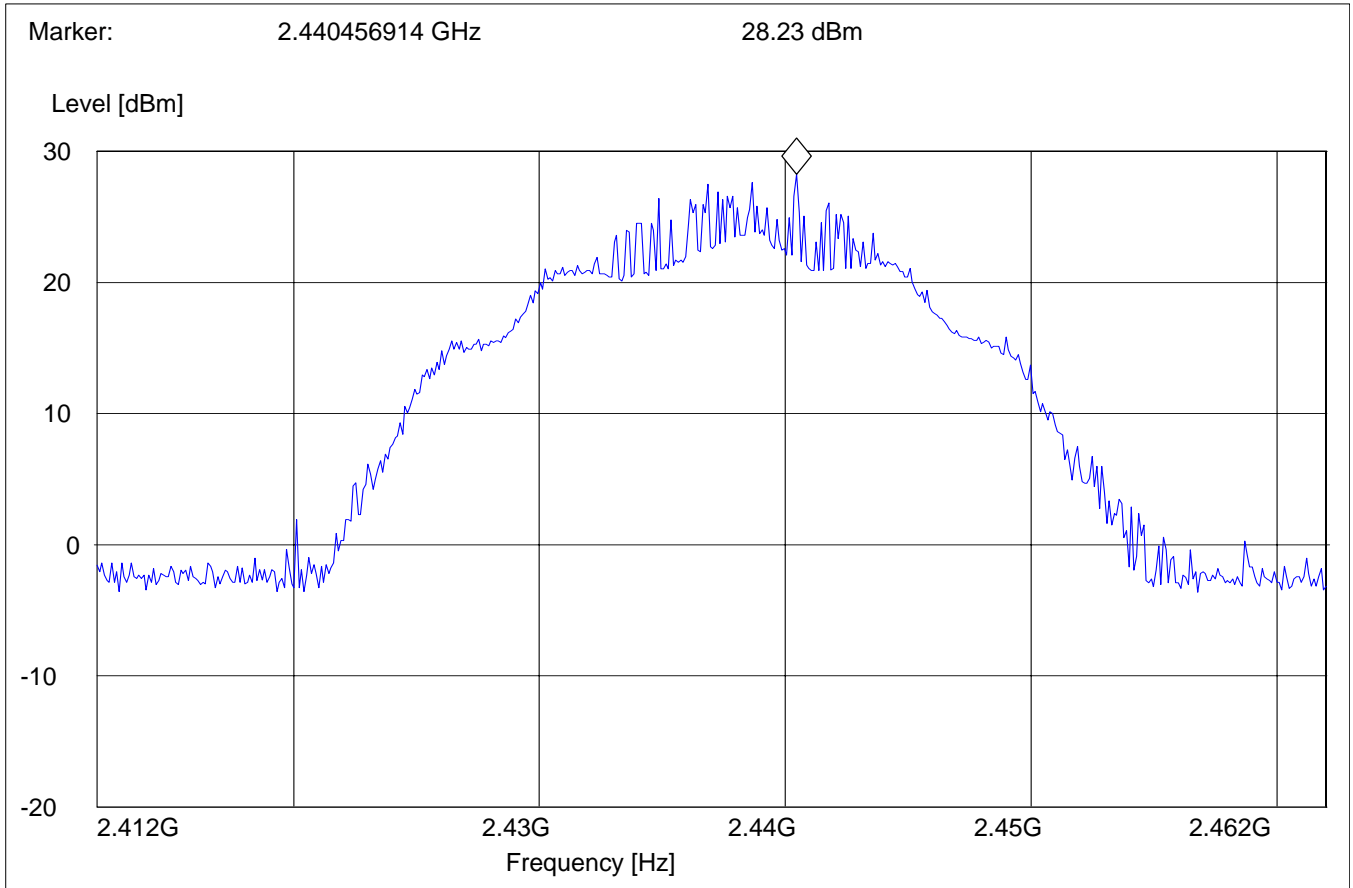
EIRP

Lowest Channel (2412MHz)



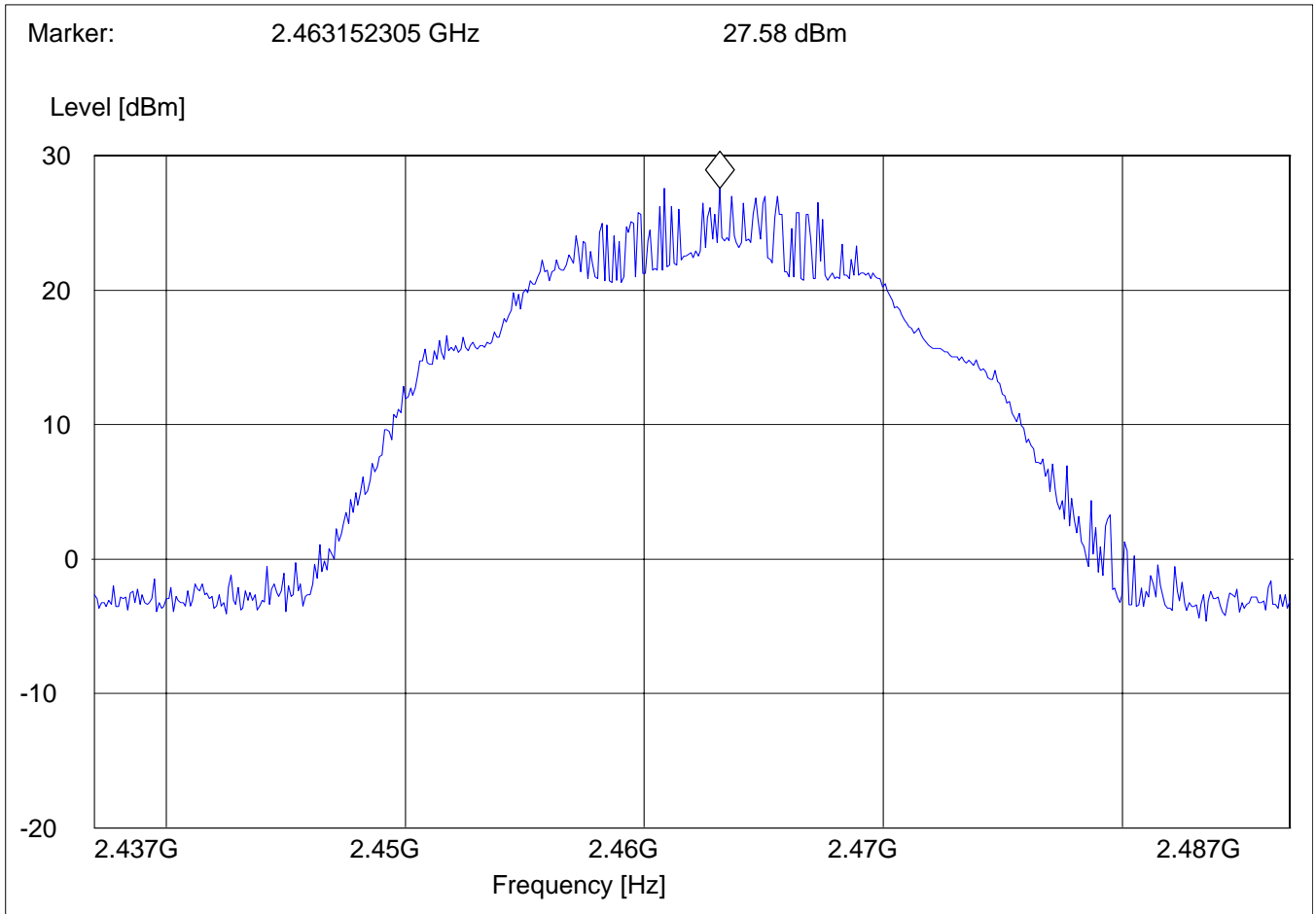
EIRP

Mid Channel (2437MHz)



EIRP

Highest Channel (2462MHz)



BAND EDGE COMPLIANCE

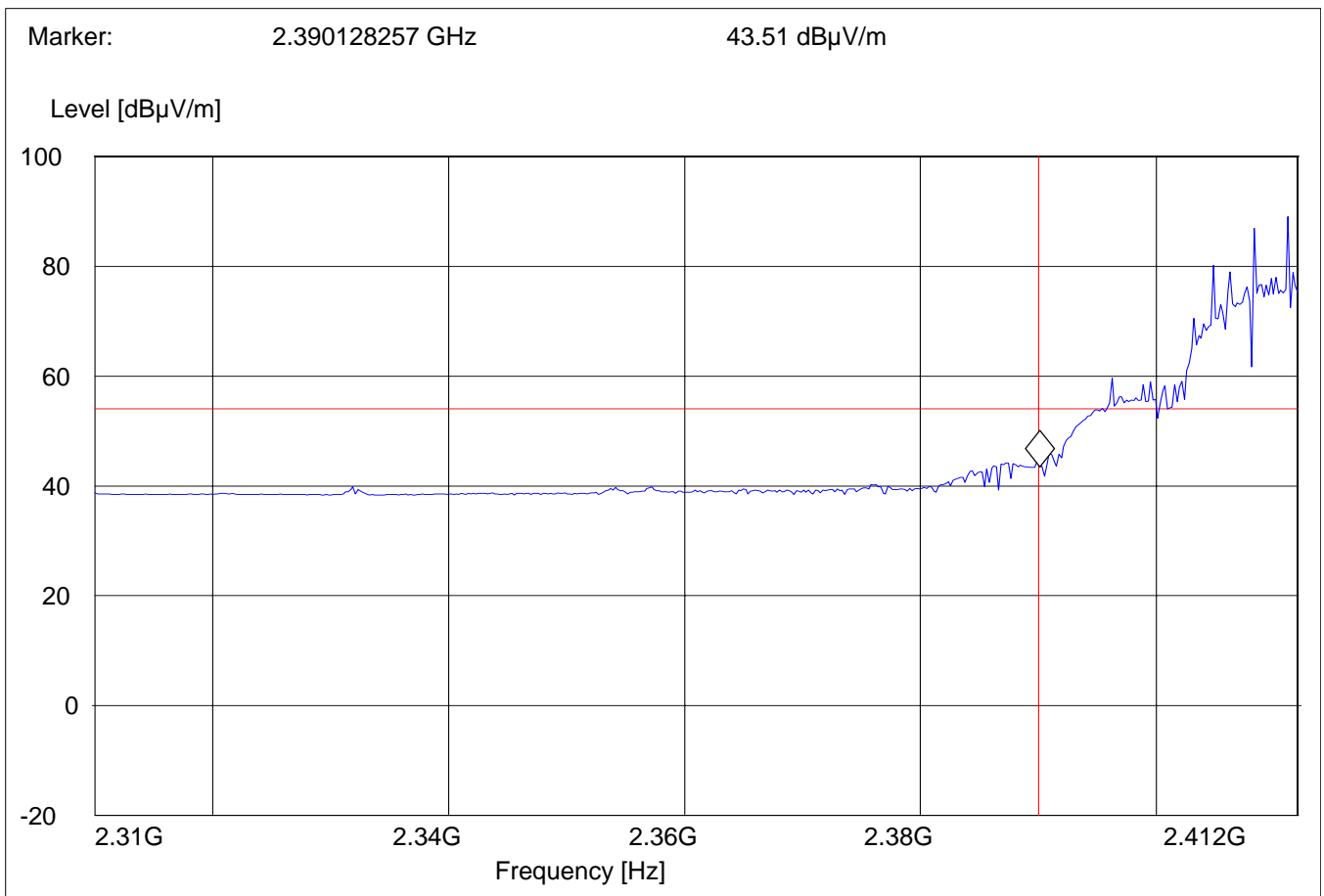
§15.247 (c)

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)



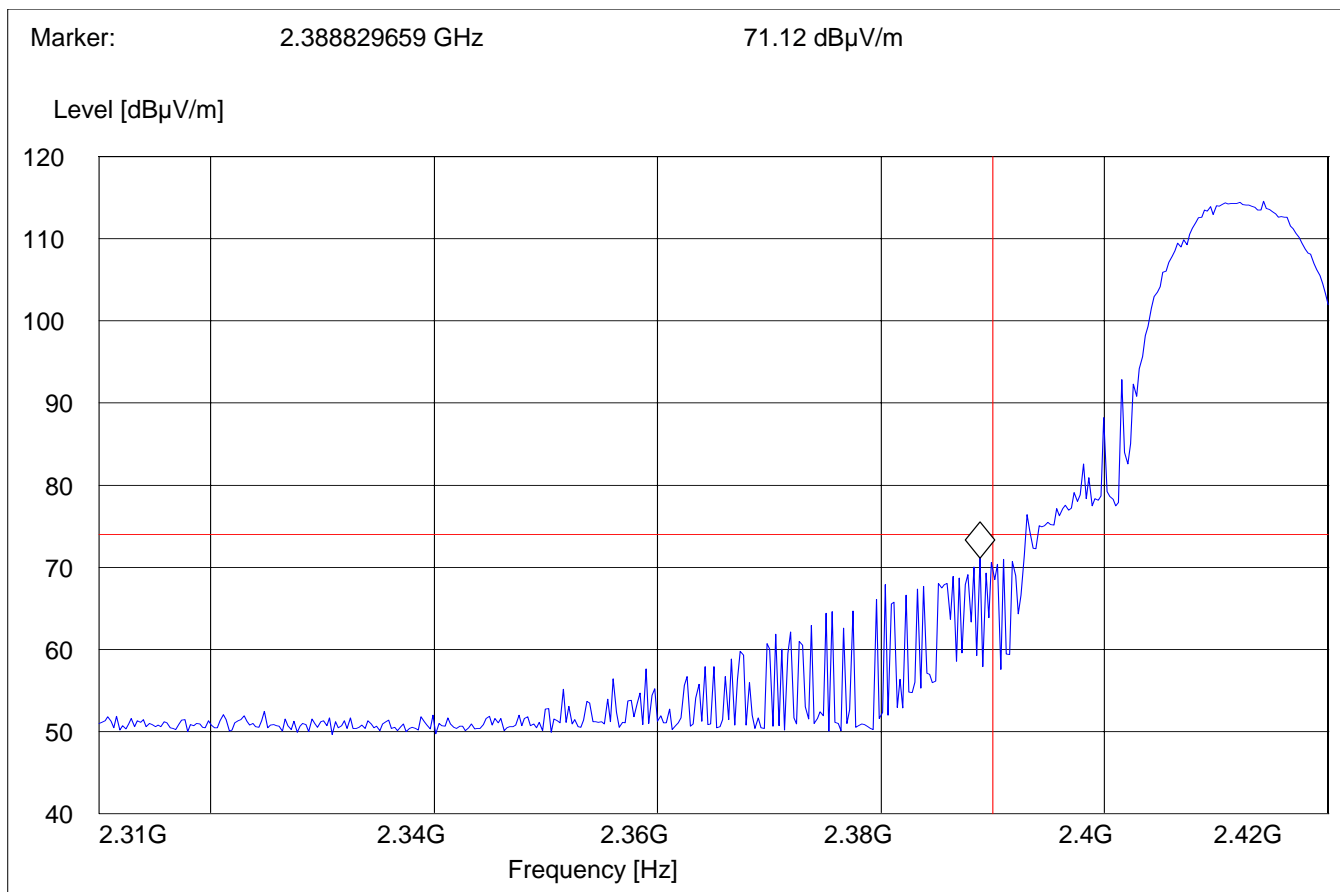
BAND EDGE COMPLIANCE

§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 : 74dBμV

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

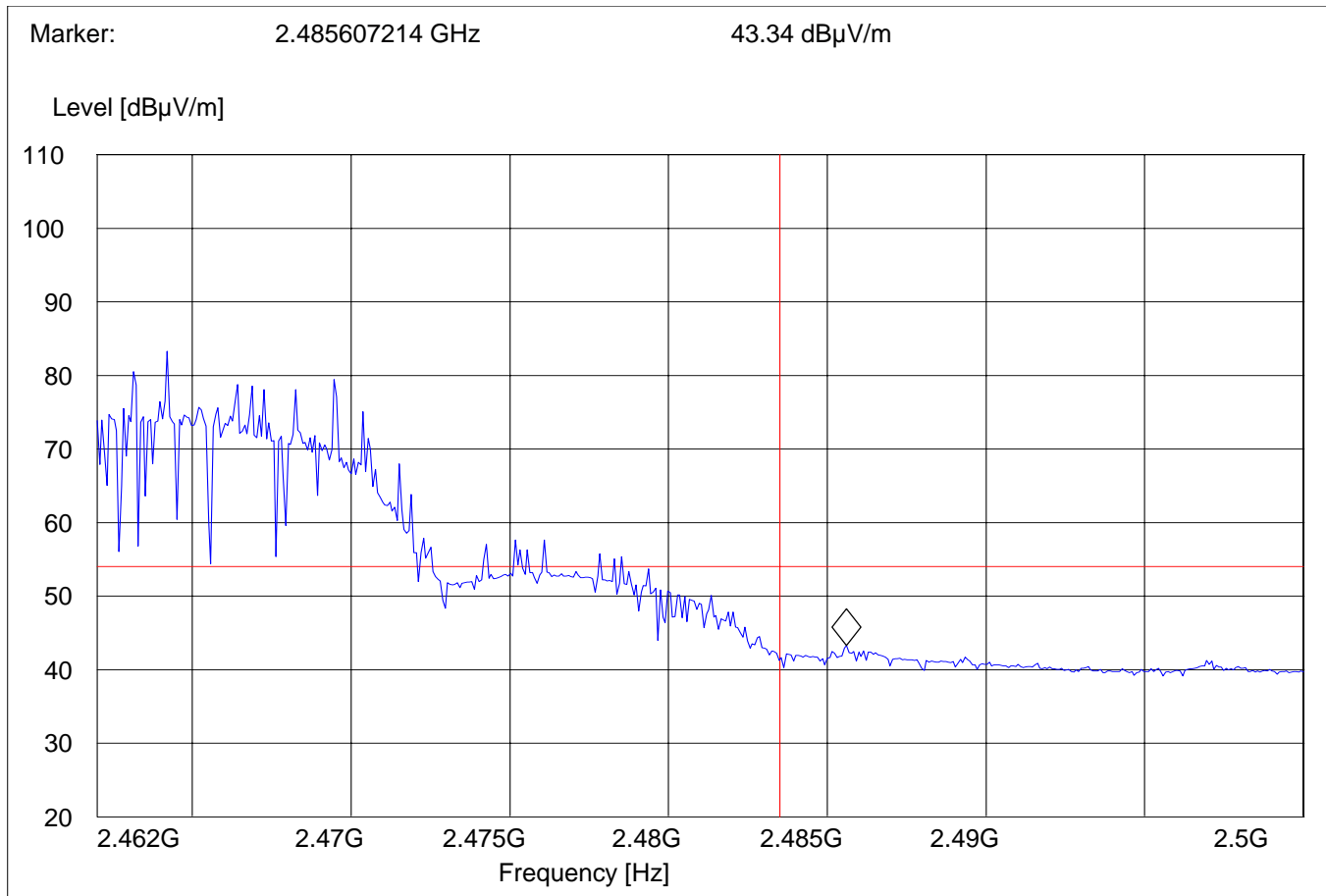
§15.247 (c)

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)



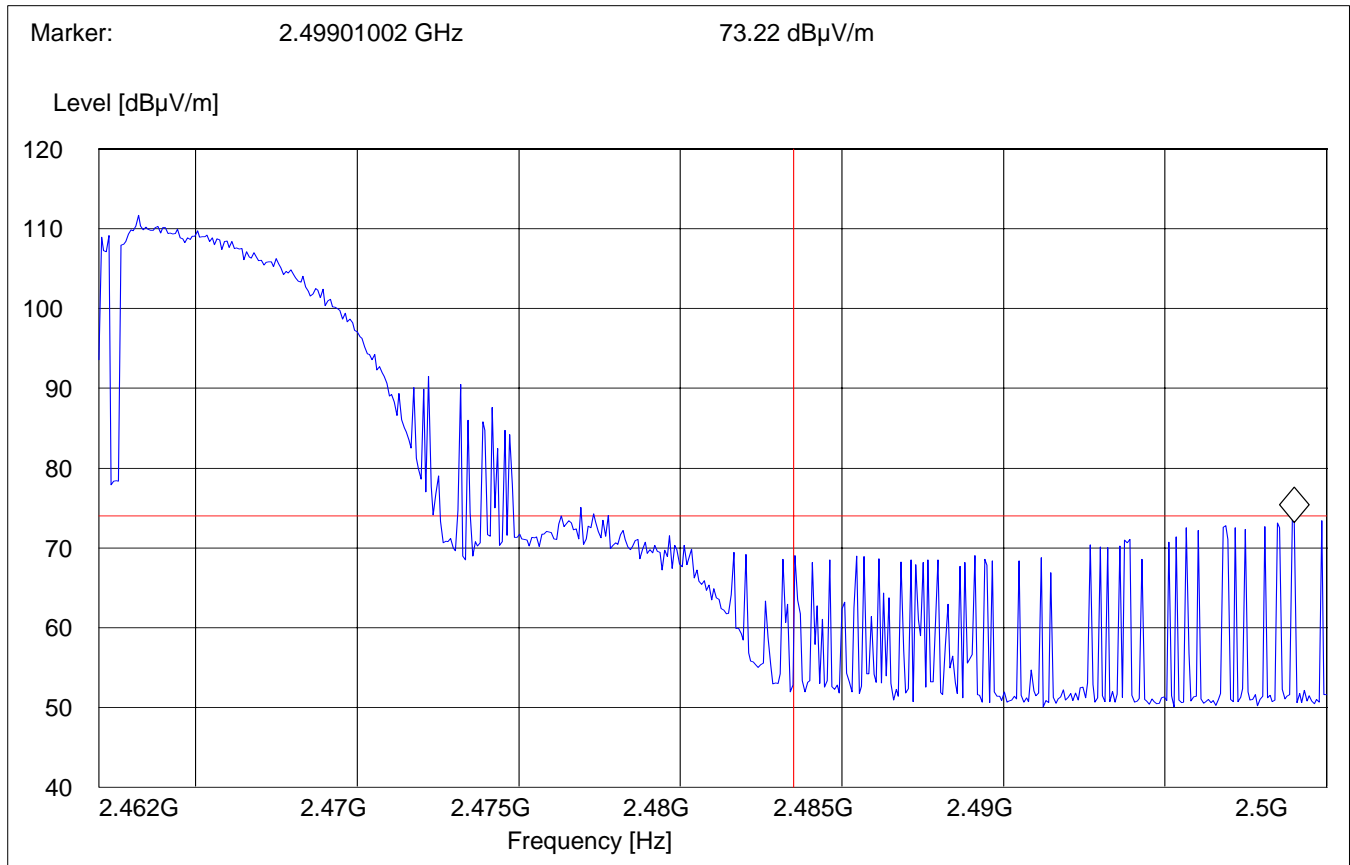
BAND EDGE COMPLIANCE

§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	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 25 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

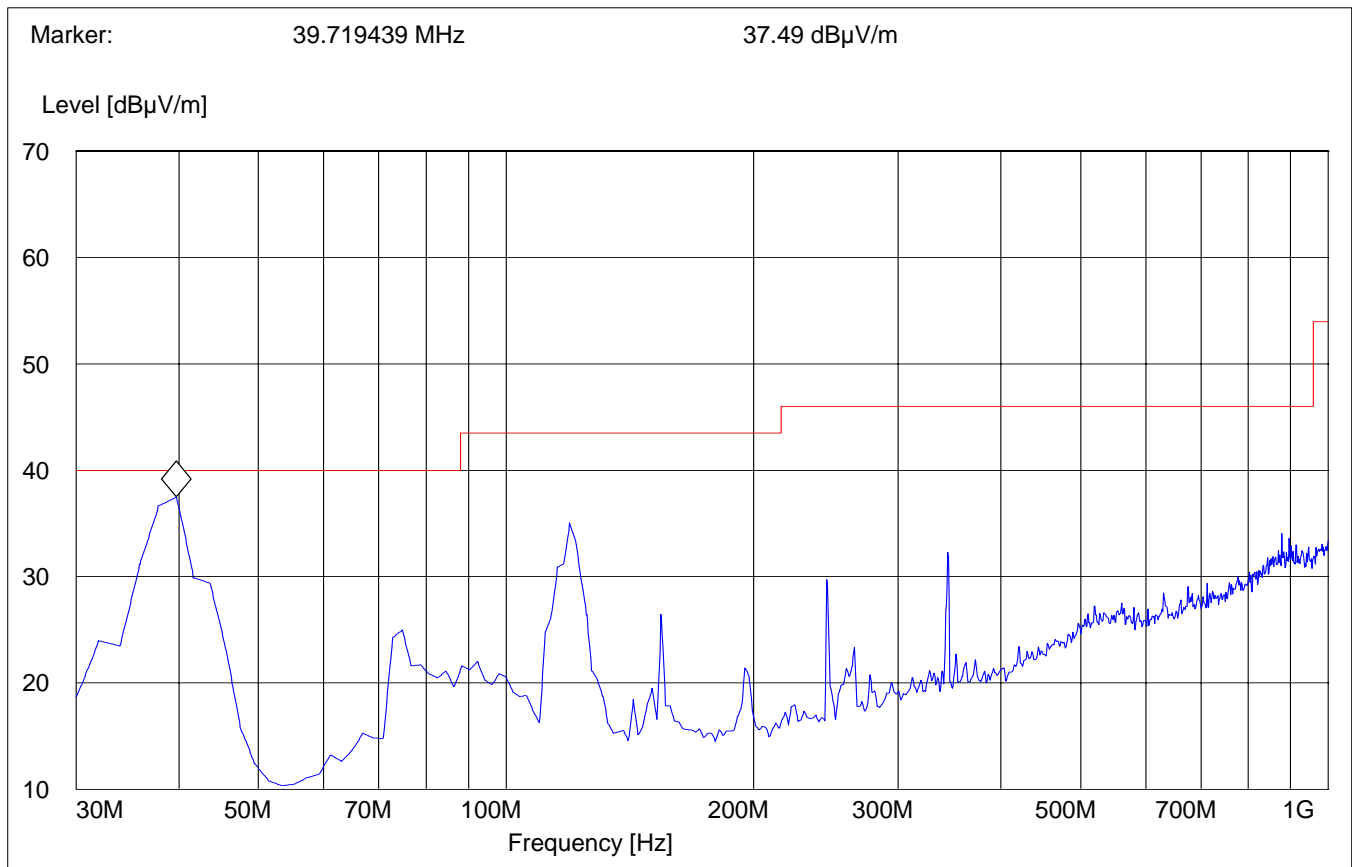
Antenna: Vertical

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

SWEEP TABLE:

"FCC 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

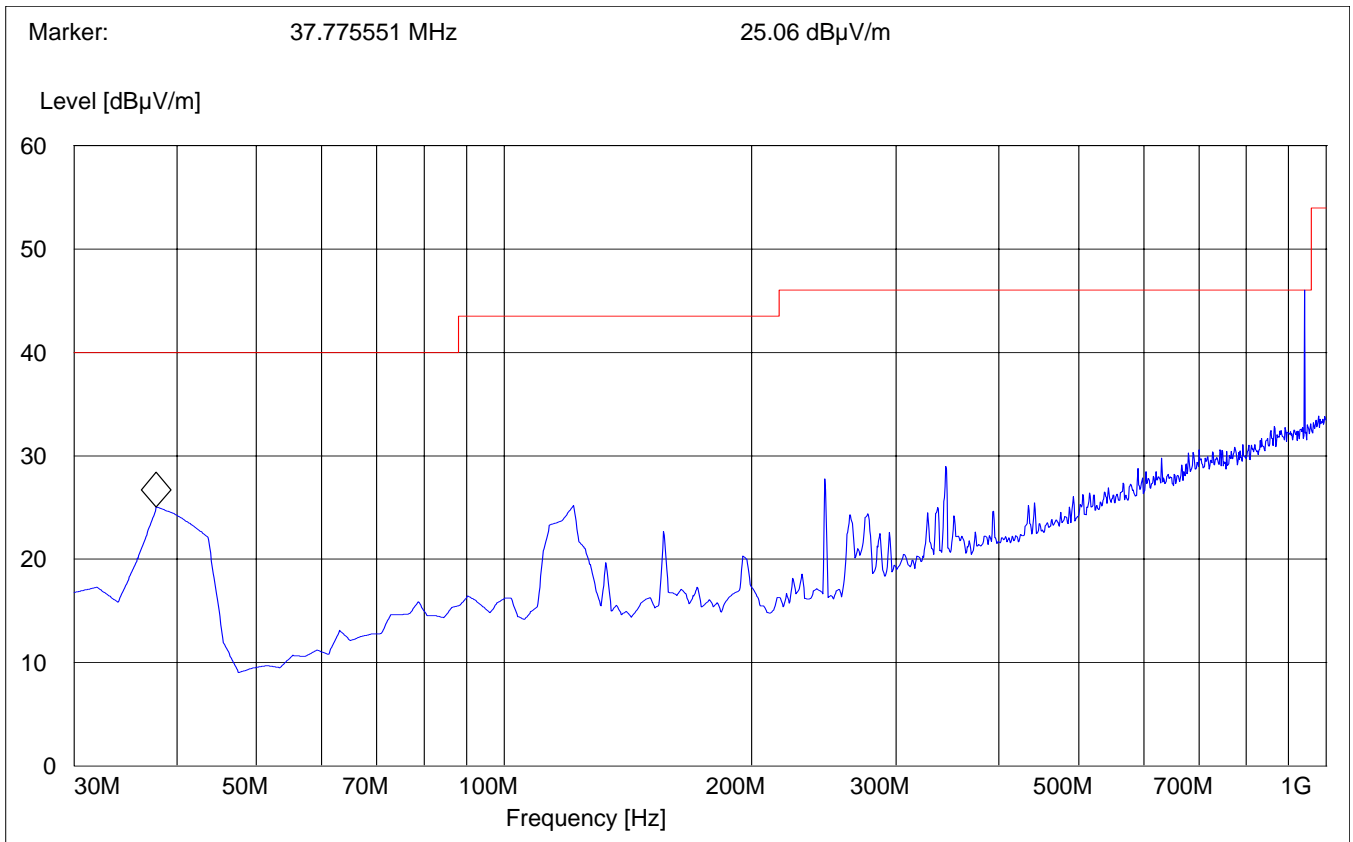
Note:

- 1. This plot is valid for low, mid, high channels (worst-case plot)**
- 2. Peak touching the limit line is an ambient signal.**

SWEEP TABLE:

" FCC Spuri hi 30-1G"

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	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

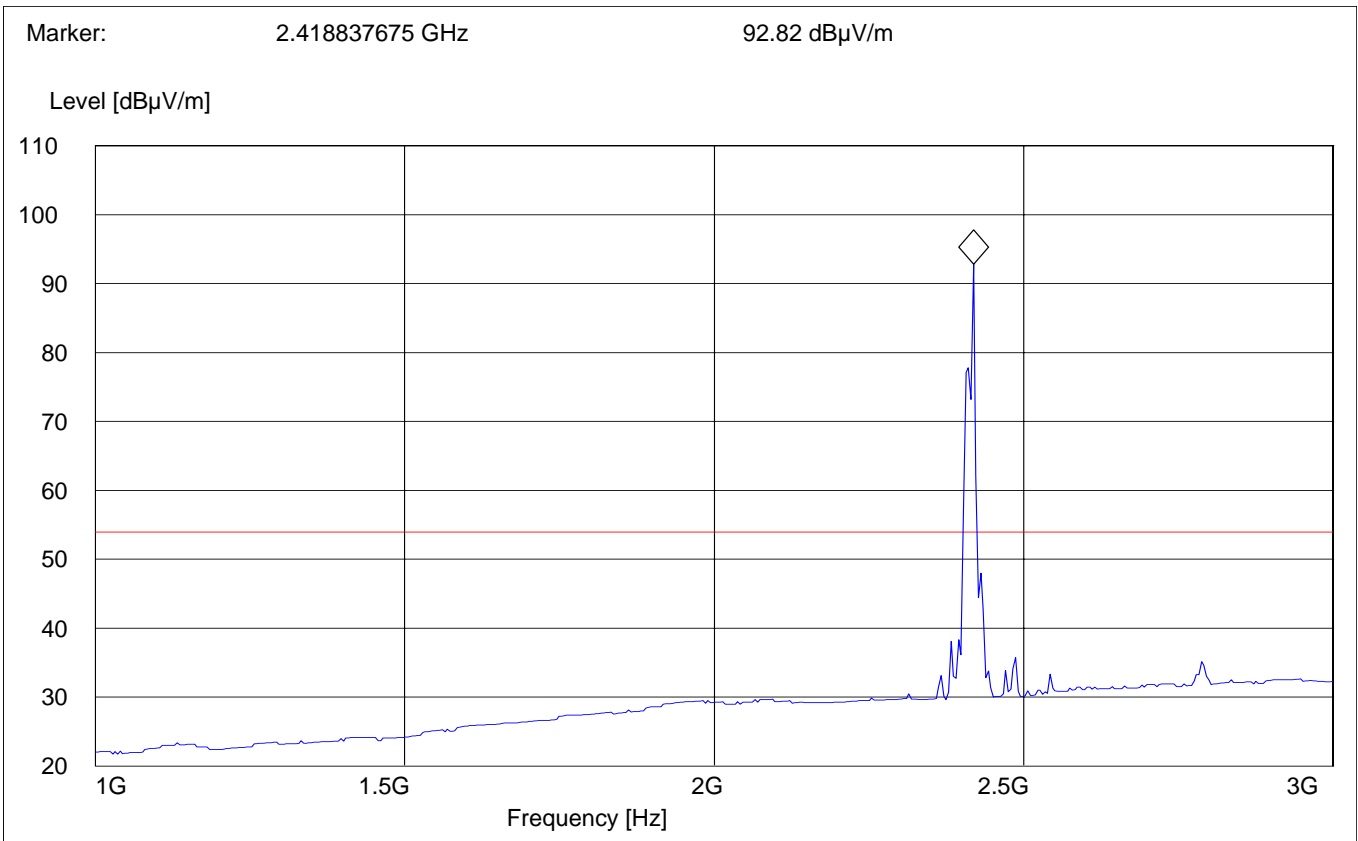
Average Measurement

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

SWEEP TABLE:

" FCC 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)

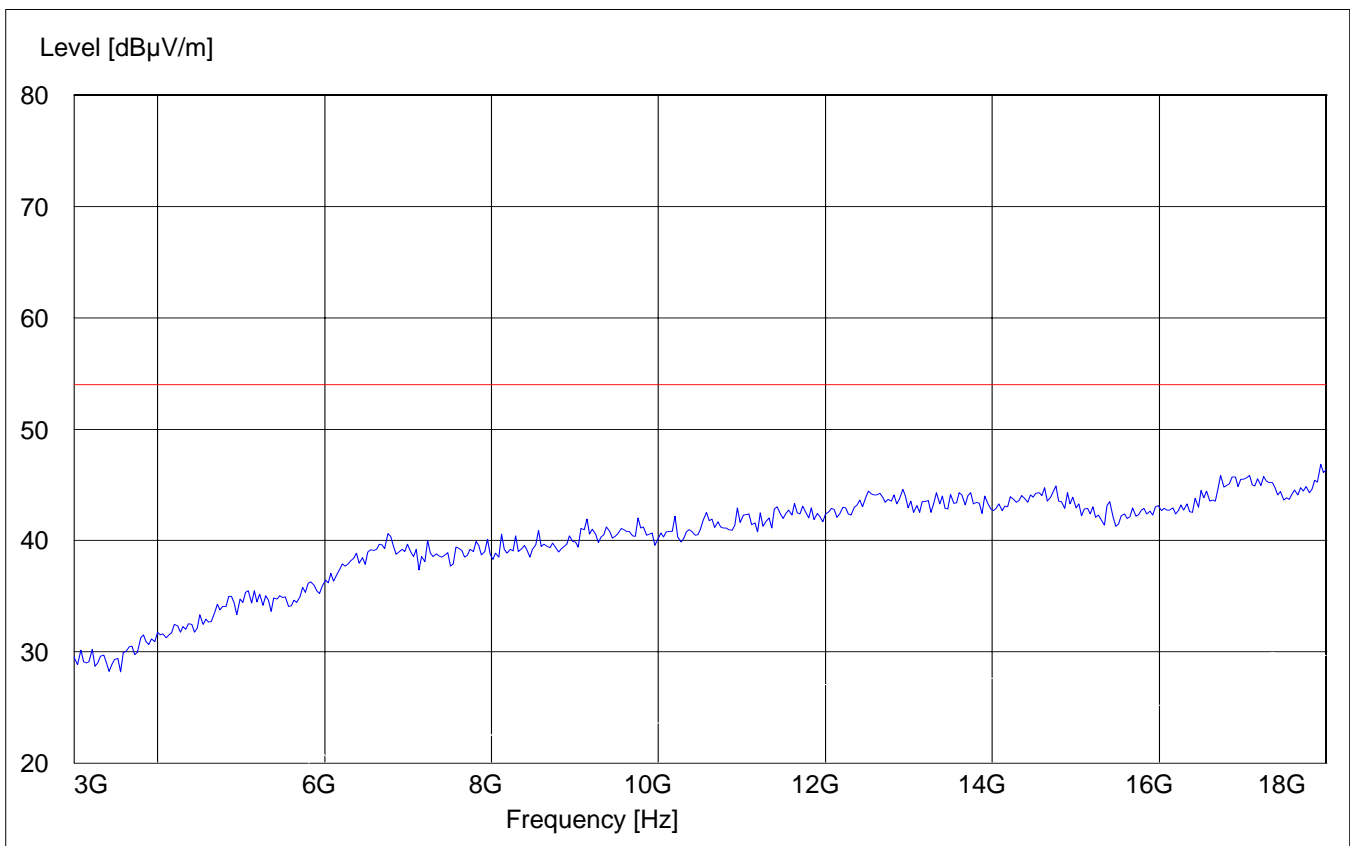
§ 15.247 (c) (1)

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

SWEEP TABLE:

" FCC Spuri hi 3-18G"

Start Frequency	Stop Frequency	Detector	Meas. Bandw.	RBW	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

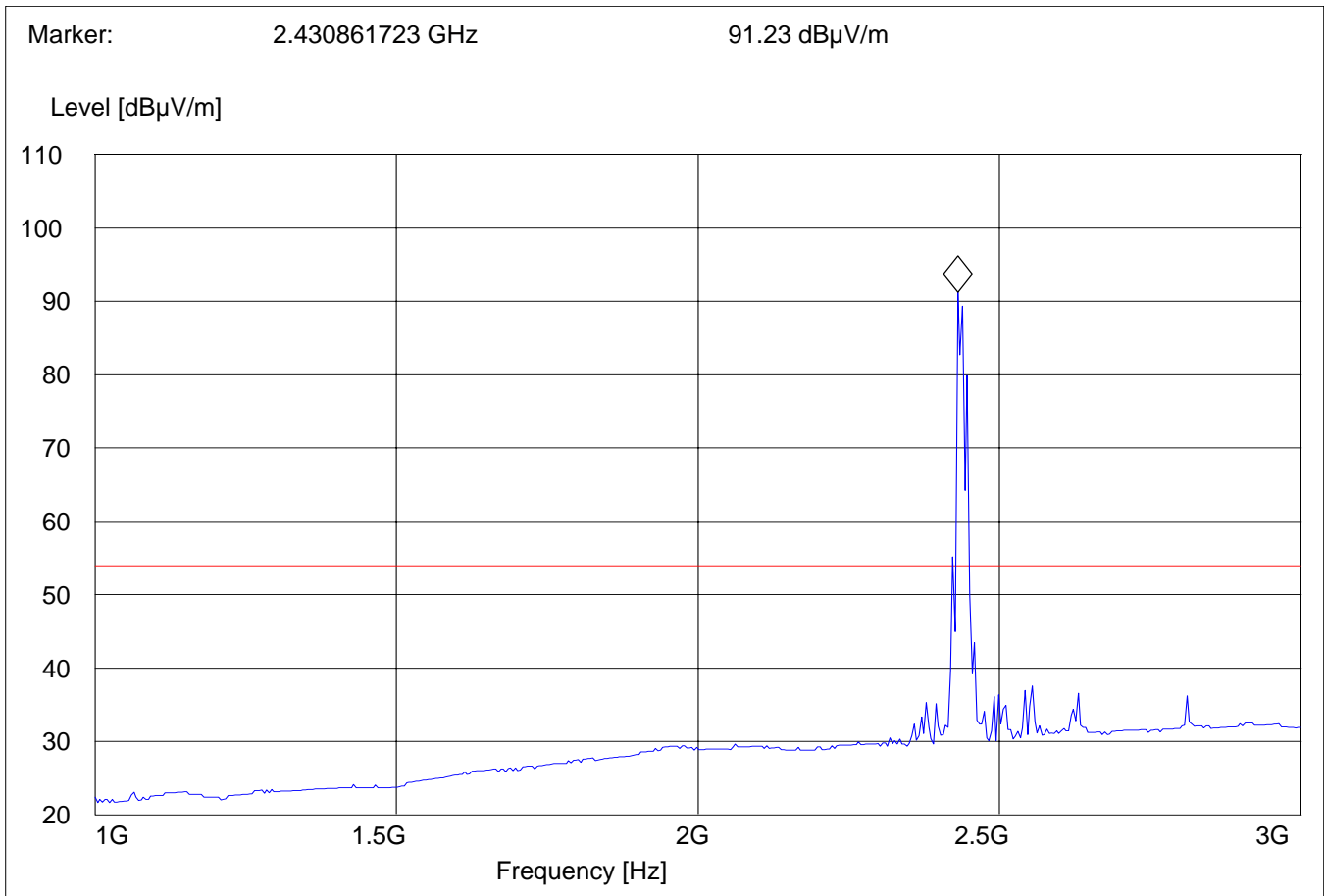
Average measurement

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

SWEEP TABLE:

" FCC 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)

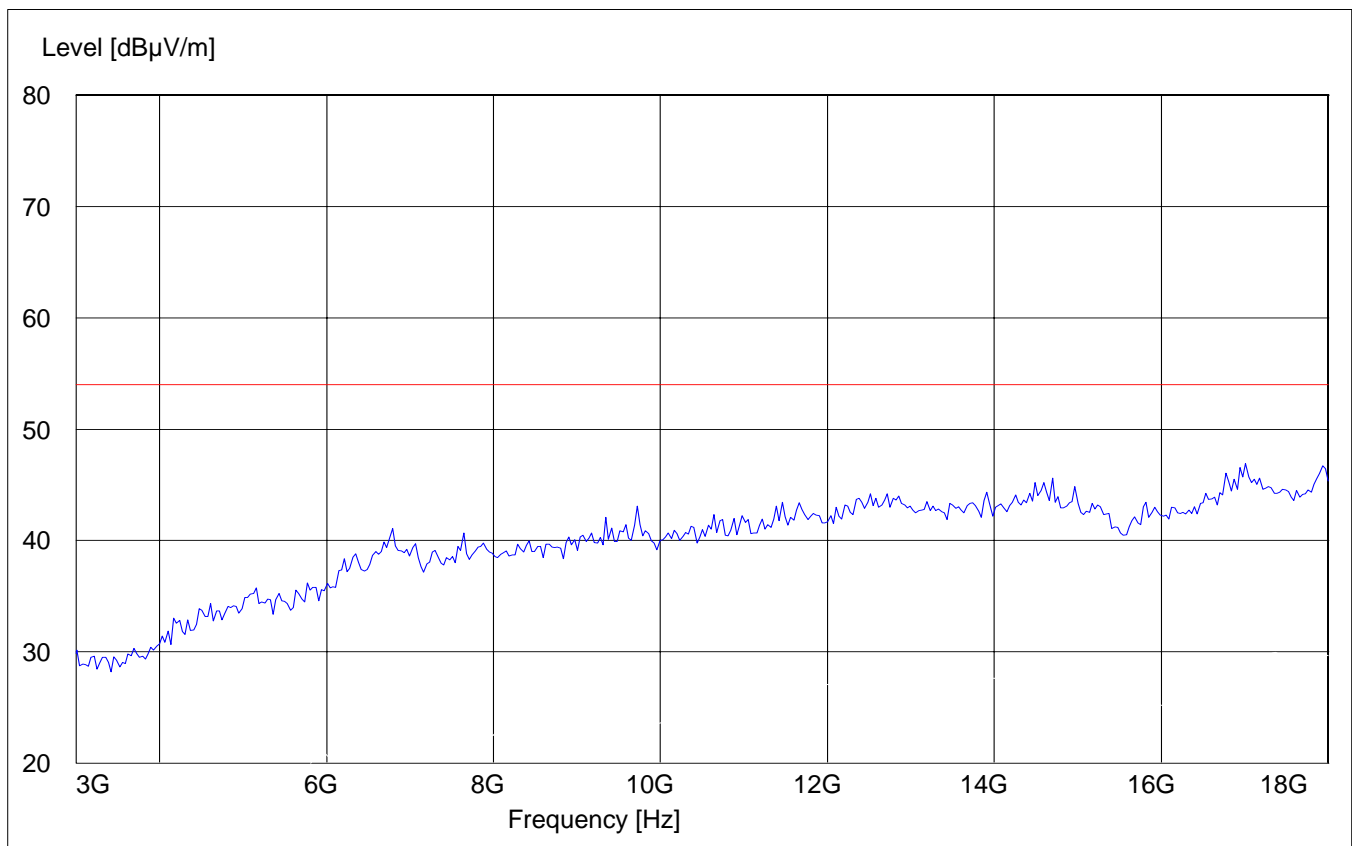


EMISSION LIMITATIONS - Radiated (Transmitter)
Mid Channel (2437MHz): 3GHz – 18GHz

§ 15.247 (c) (1)

SWEEP TABLE: " FCC 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

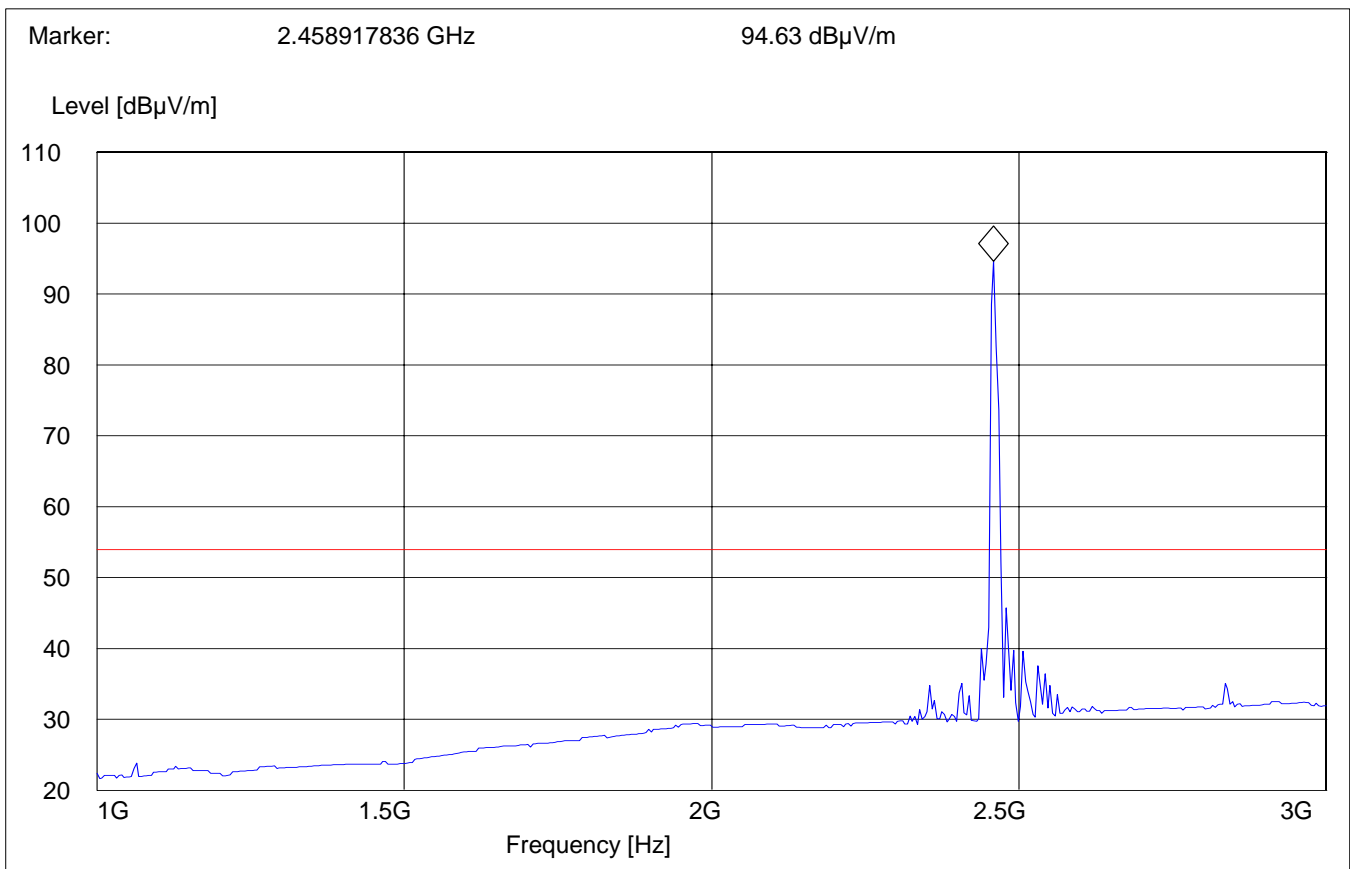
Average measurement

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

SWEEP TABLE:

" FCC 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)

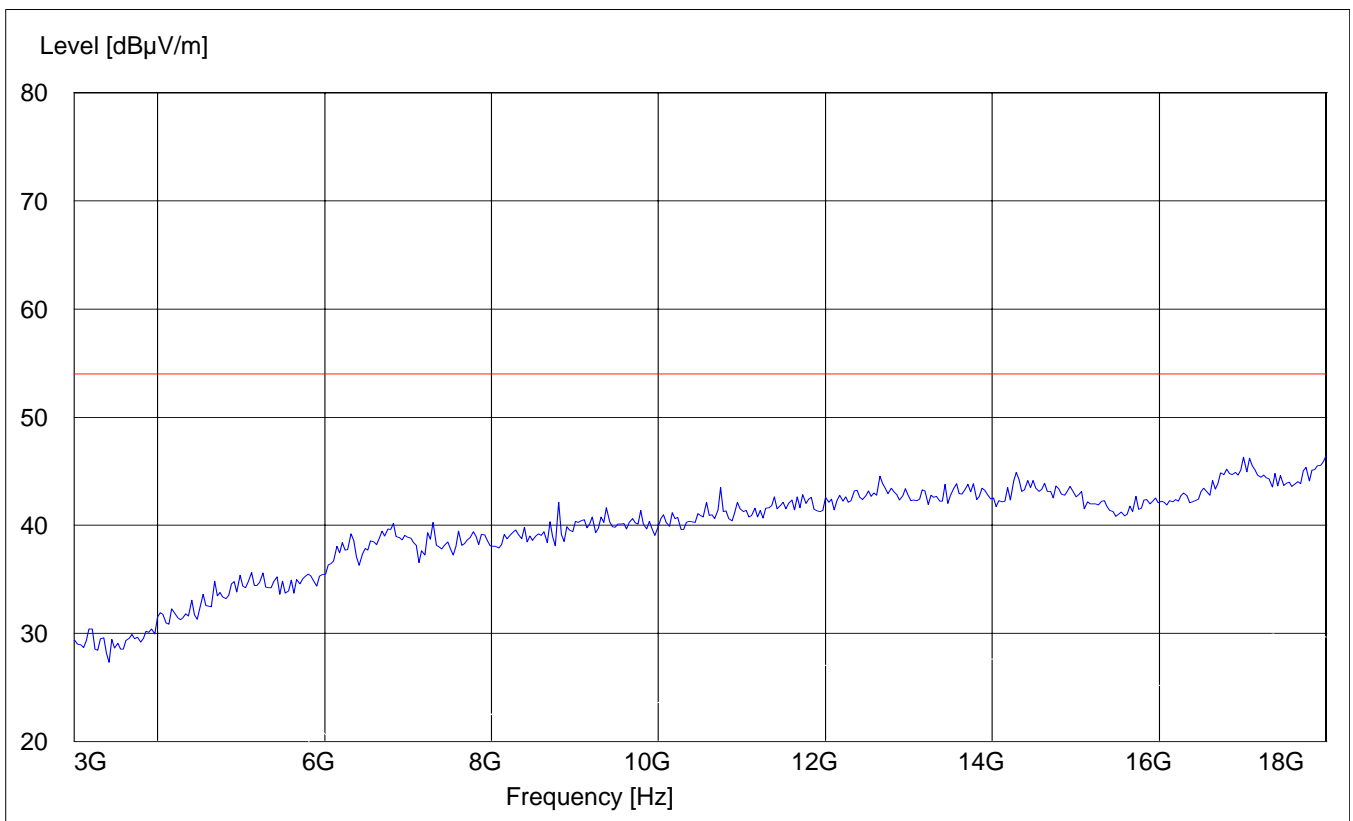
§ 15.247 (c) (1)

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

SWEEP TABLE:

" FCC Spuri hi 3-18G"

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



EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.247 (c) (1)

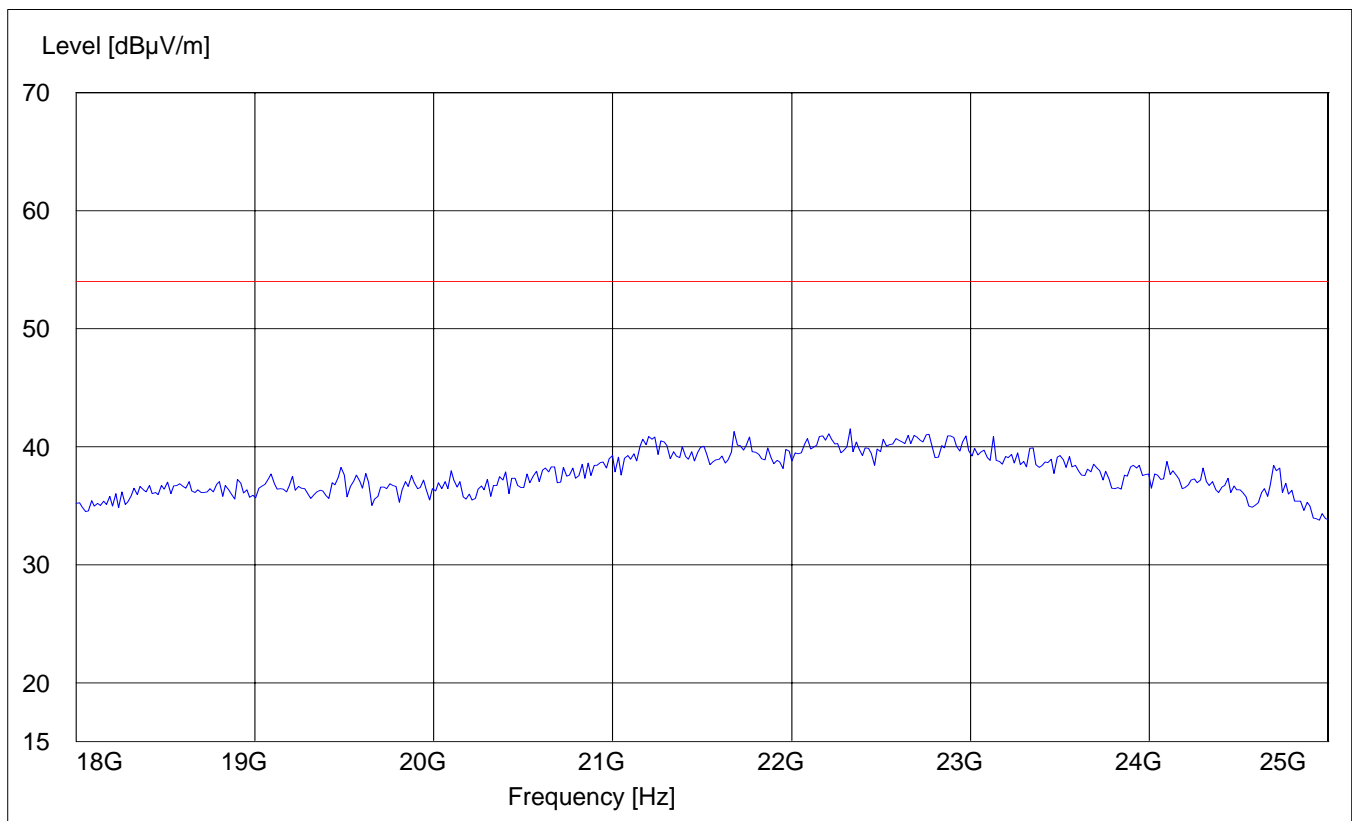
18GHz – 25GHz

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

SWEEP TABLE:

" FCC Spuri hi 18-25G"

Start Frequency	Stop Frequency	Detector	Meas. Bandw.	RBW	Transducer
18 GHz	25 GHz	MaxPeak	Coupled	1 MHz	#326 horn (dBi)



CONDUCTED EMISSIONS

§ 15.107/207

This test is not applicable for the EUT

RECEIVER SPURIOUS RADIATION

§ 15.209

Limits

Frequency (MHz)	Field strength ($\mu\text{V/m}$)	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 25 GHz very short cable connections to the antenna was used to minimize the noise level.

RECEIVER SPURIOUS RADIATION

§ 15.209

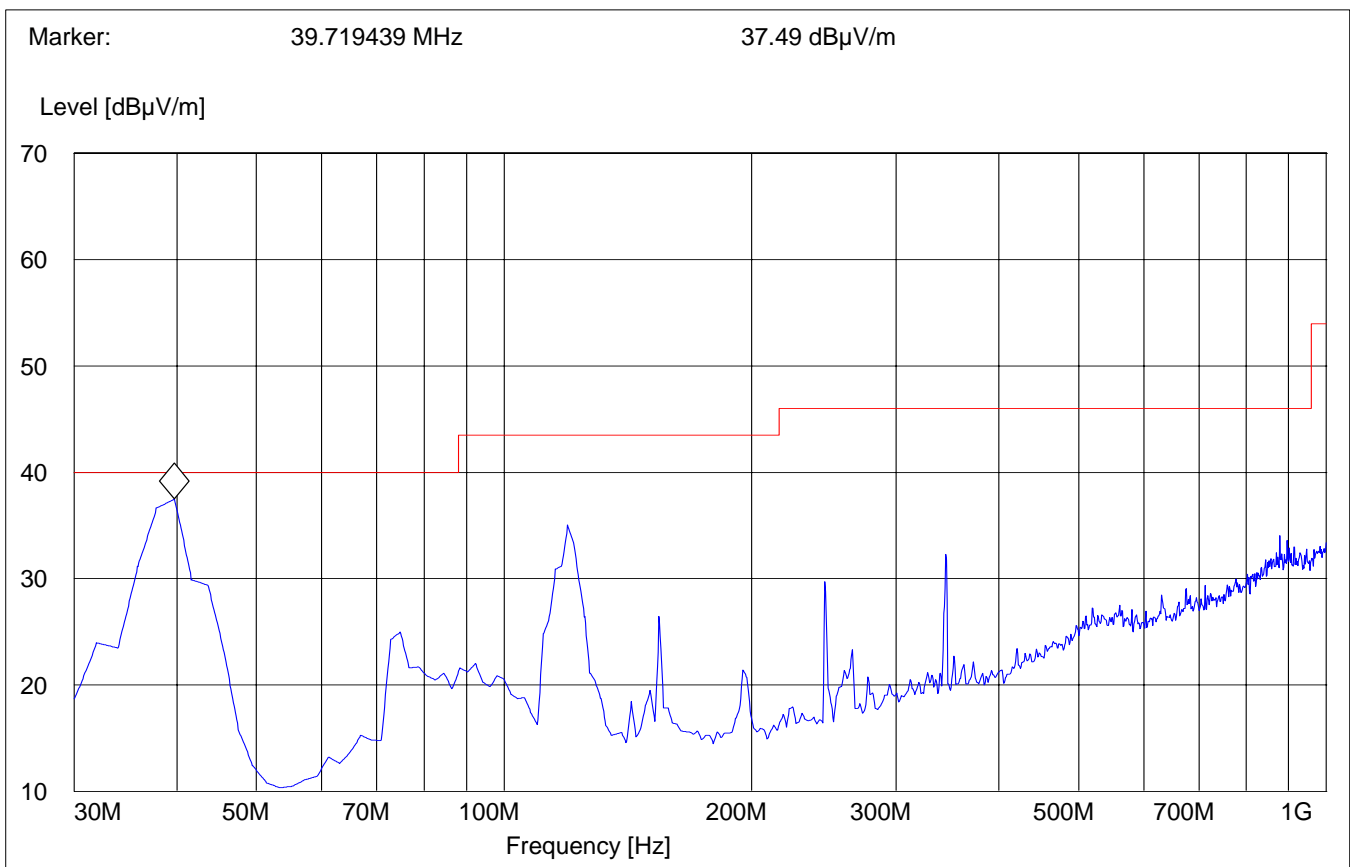
30MHz – 1GHz

Antenna: vertical

Note: This plot is valid for both polarities (worst-case plot)

SWEEP TABLE: " FCC Spuri hi 30-1G"

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



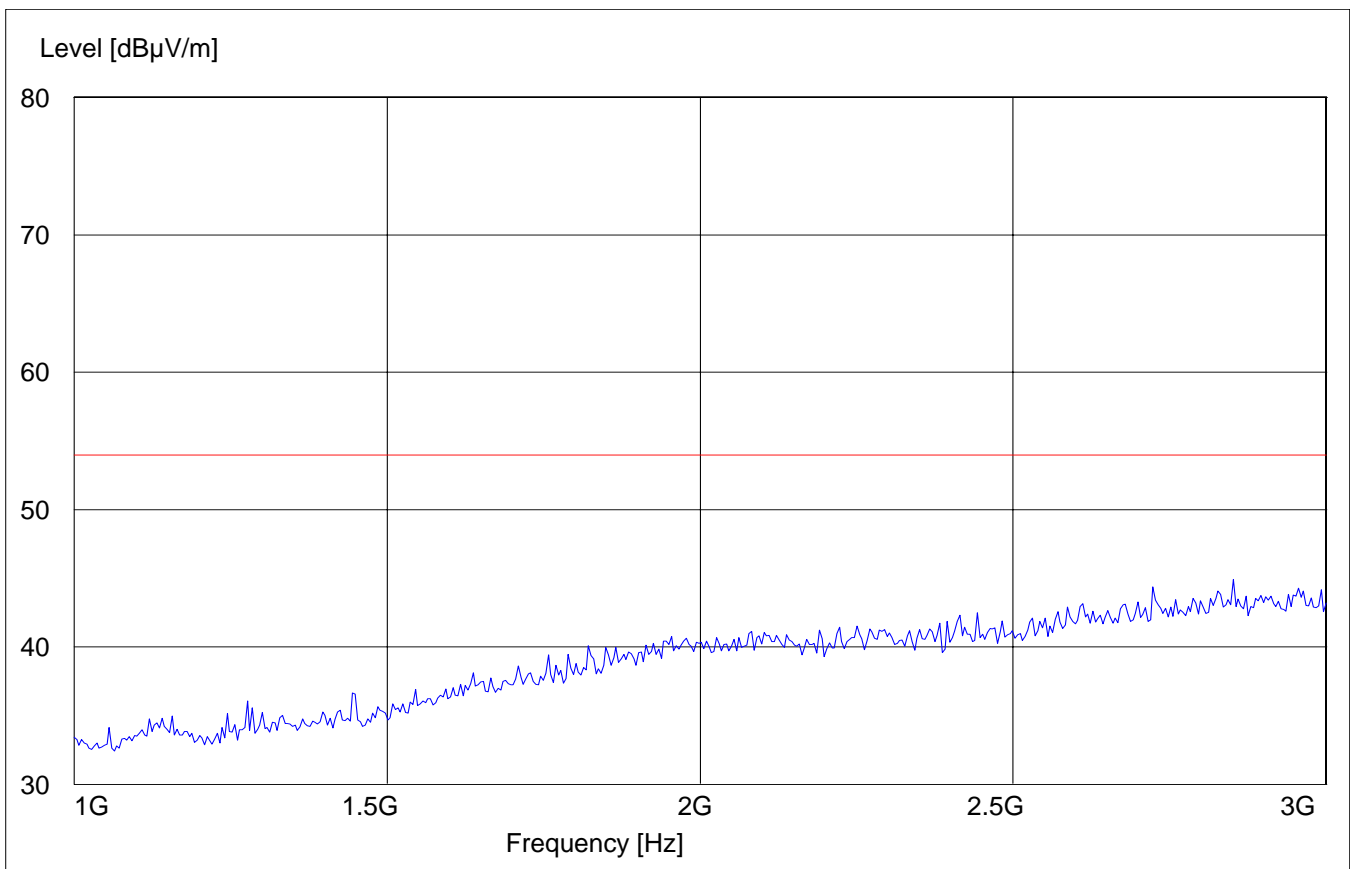
RECEIVER SPURIOUS RADIATION
1GHz – 3GHz

§ 15.209

SWEEP TABLE:

" FCC 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	1MHz	#326 horn (dBi)



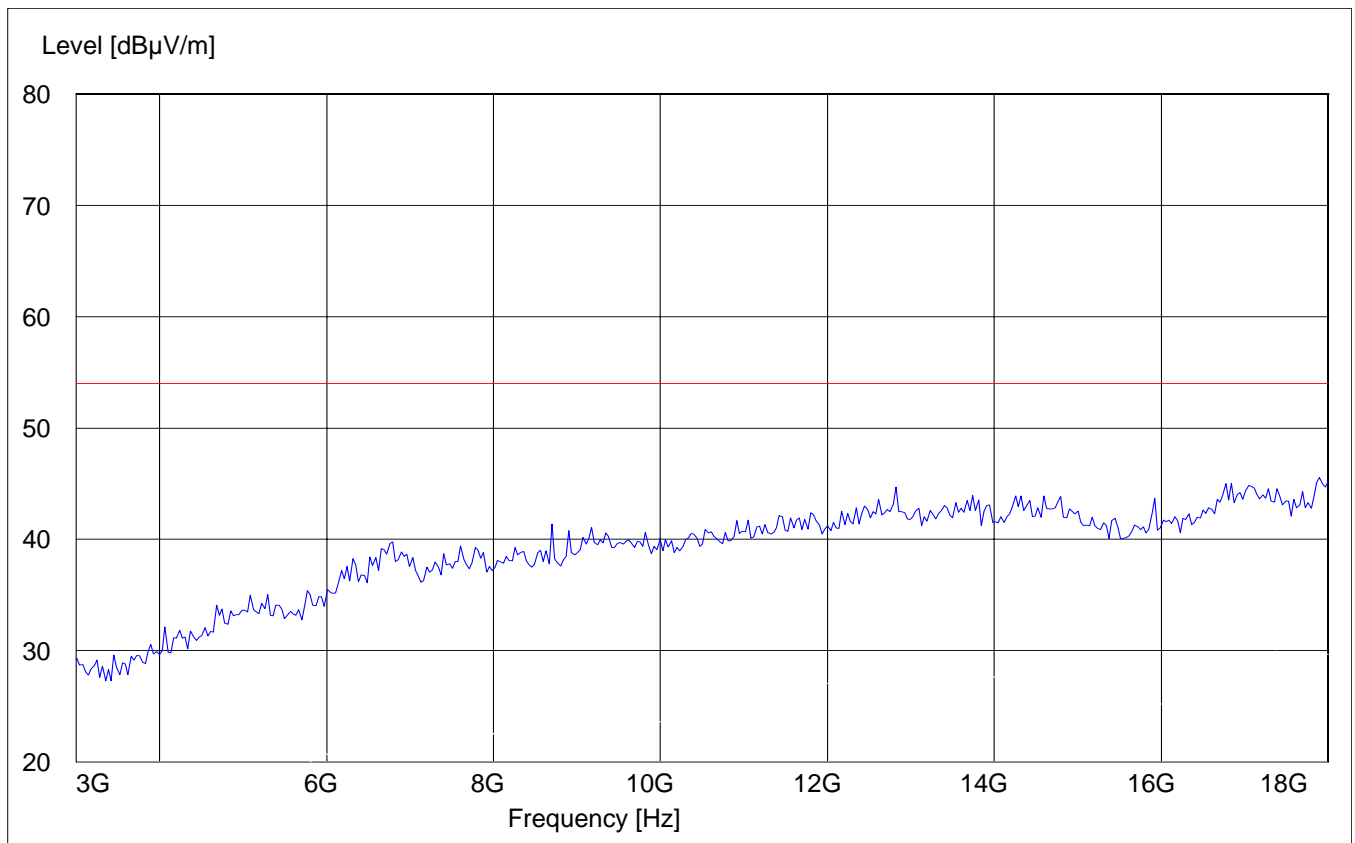
RECEIVER SPURIOUS RADIATION
3GHz – 18GHz

§ 15.209

SWEEP TABLE:

" FCC Spuri hi 3-18G"

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

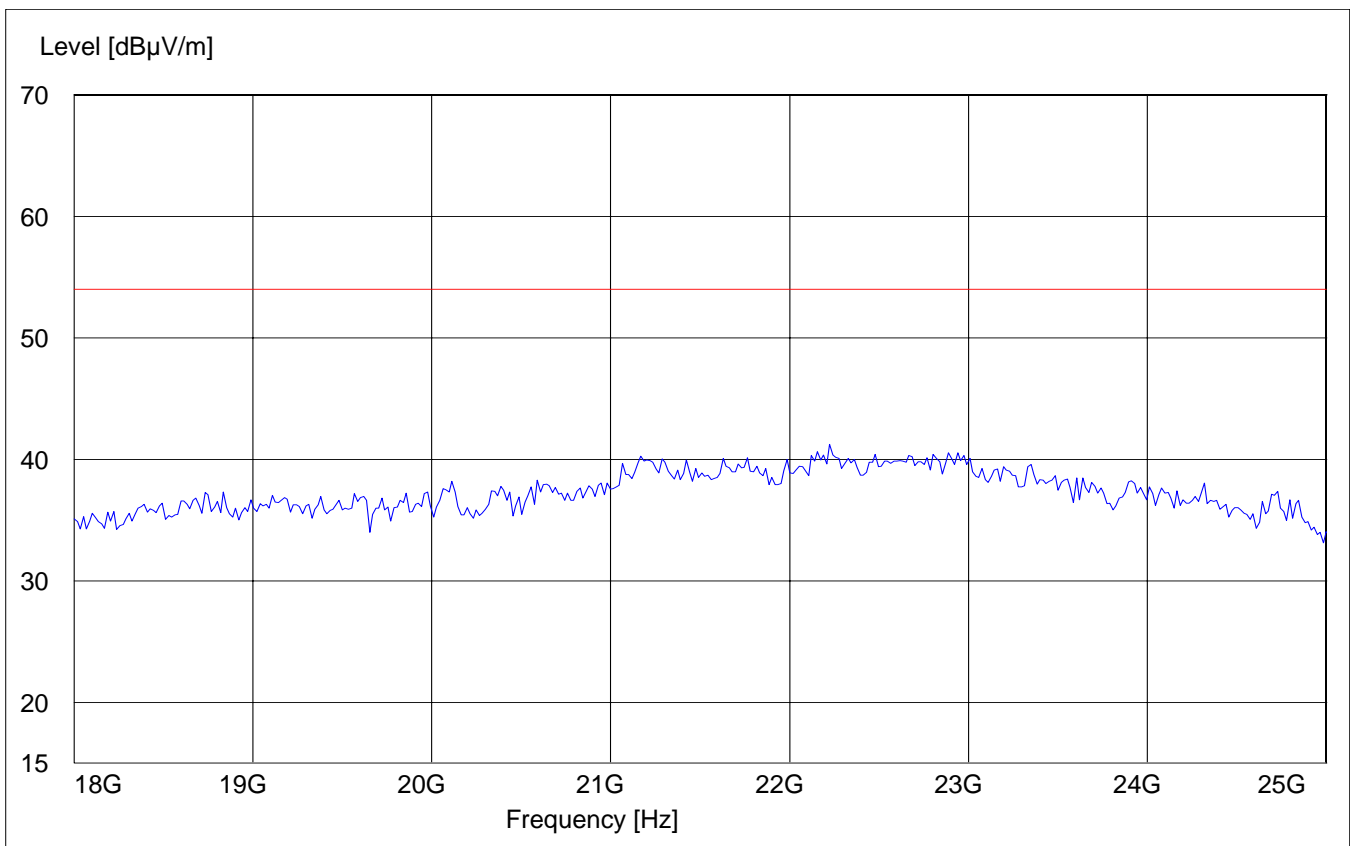


RECEIVER SPURIOUS RADIATION
18GHz – 25GHz

§ 15.209

SWEEP TABLE: " FCC Spuri hi 18-25G"

Start	Stop	Detector	Meas.	RBW	Transducer
Frequency	Frequency	Time	Bandw.	VBW	
18 GHz	25 GHz	MaxPeak	Coupled	1 MHz	#141 horn (dBi)



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

ANECHOIC CHAMBER

