



FCC Test Report

Test report no.: EMC_815FCC15.247_2004

FCC Part 15.247 for DSSS systems / CANADA RSS-210

Model: iWM3130

FCC ID: PDC-IWM313XSM

IC ID: 5079A-IWM313XS



TTI-P-G 081/94-A0

Accredited according to **ISO/IEC 17025**



**Bluetooth Qualification
Test Facility
(BQTF)**



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
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E-mail: lothar.schmidt@cetecomusa.com
Internet: www.cetecom.com

1.3 Details of applicant

Name : At Road, Inc.
Street : 47200 Bayside Pkwy
City / Zip Code : Fremont, CA 94538
Country : USA
Contact : Hung Phan
Telephone : 510 870 1252
Tele-fax : 510 870 1281
e-mail : hphan@road-inc.com

1.4 Application details

Date of receipt test item : 2004-11-01
Date of test : 2004-11-01/02

1.5 Test item

Manufacturer : Applicant
Marketing Name : iWM313X
Model No. : iWM3130
Description : [GSM 850/1900 & 802.11b WLAN model for vehicular use](#)
FCC-ID : **PDC-IWM313XSM**
IC-ID : **5079A-IWM313XS**

Additional information

Frequency : 2412MHz – 2462MHz
Type of modulation : DSSS
Number of channels : 11
Antenna : External
Power supply : 5VDC
Output power : 18.15dBm (65.32mW) conducted peak power
Extreme temp. Tolerance : Lower: -20°C Upper: +60°C

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

The EUT (iWM3130) carries pre-certified Z-COM, INC. BT module model# XI-325 & XI-325B with FCC ID: M4Y-000325


This test report covers full radiated testing as per FCC 15.247 on EUT with BT module. All conducted measurements for are covered under *test report# RF900628R02*

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:

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

Responsible for test report and project leader:

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

2.2 Test report

TEST REPORT

Test report no.: EMC_815FCC15.247_2004

FCC Part 15.247 for DSSS systems / CANADA RSS-210

TEST REPORT REFERENCE

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**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	V _{nom}	21.66	21.91	21.20
Measurement uncertainty		±0.5dBm		

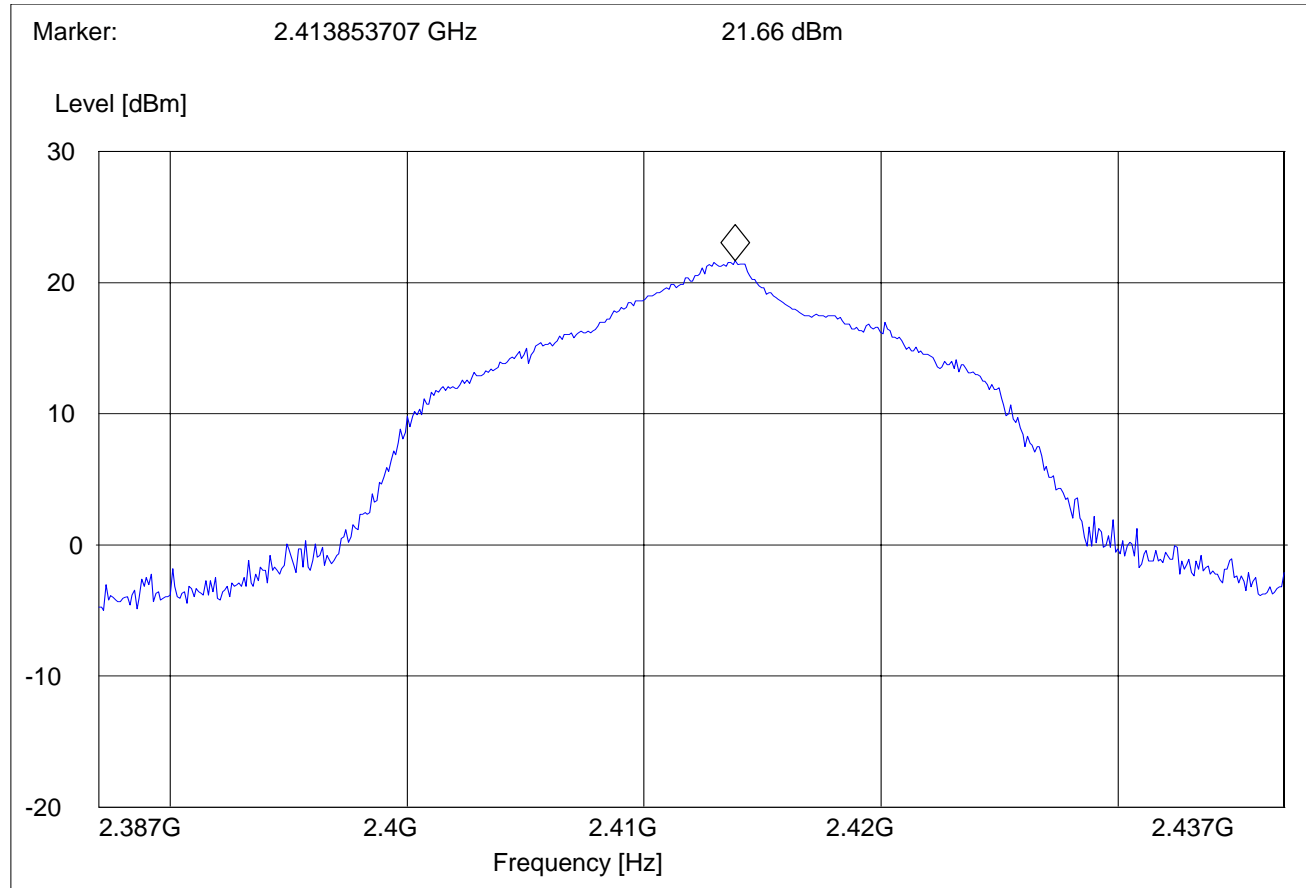
RBW/VBW: 10MHz

LIMIT

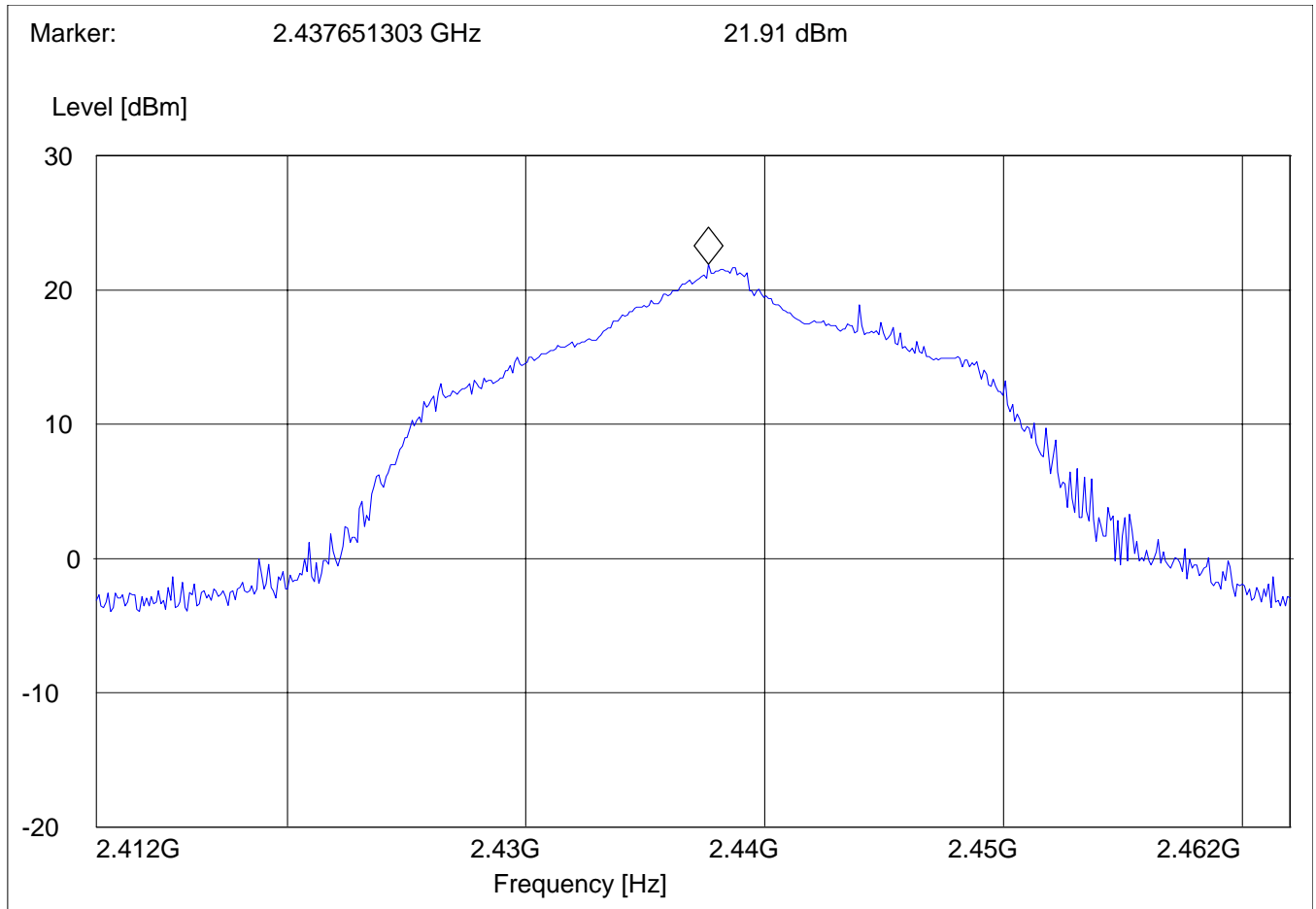
SUBCLAUSE § 15.247 (b) (1)

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

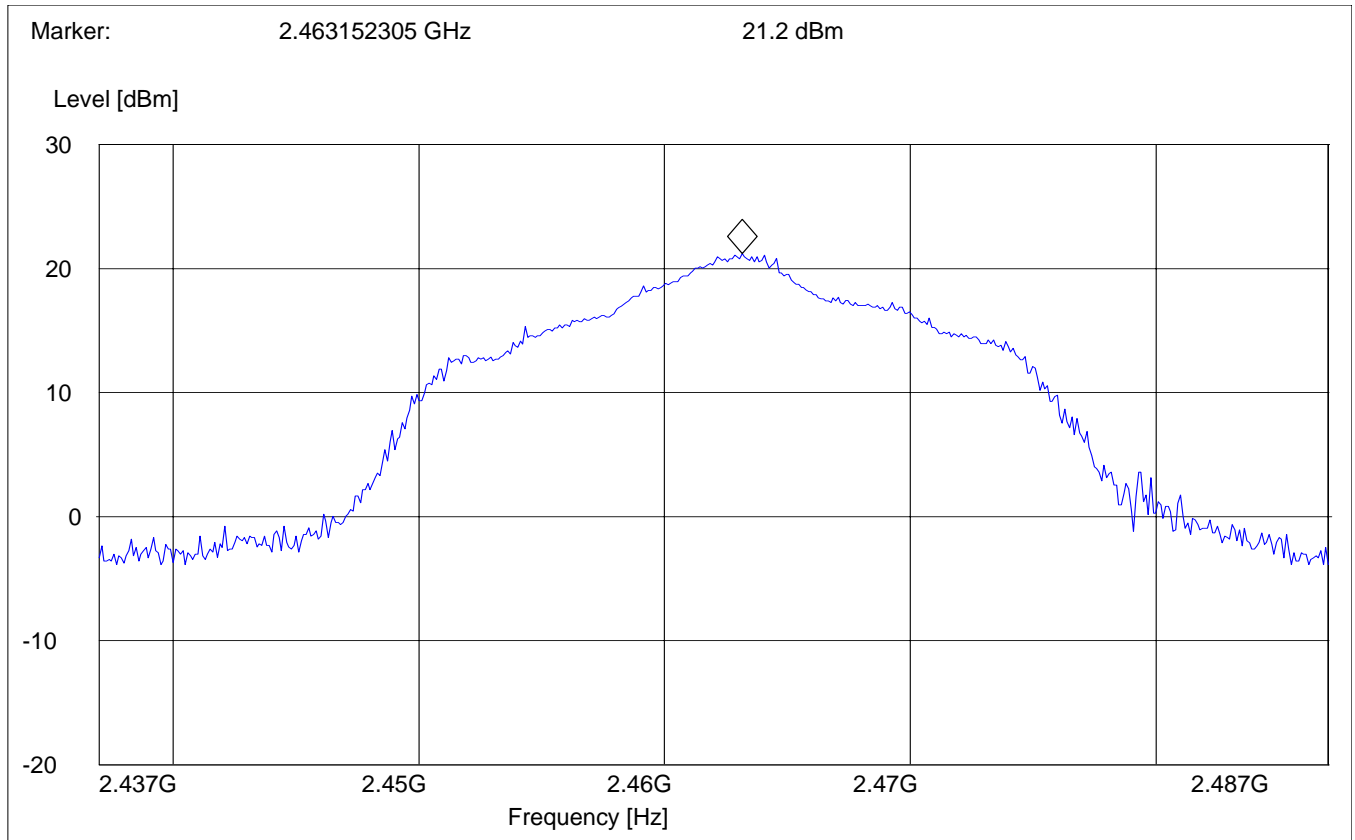
EIRP (2412MHz):



EIRP (2437MHz):



EIRP (2462MHz):



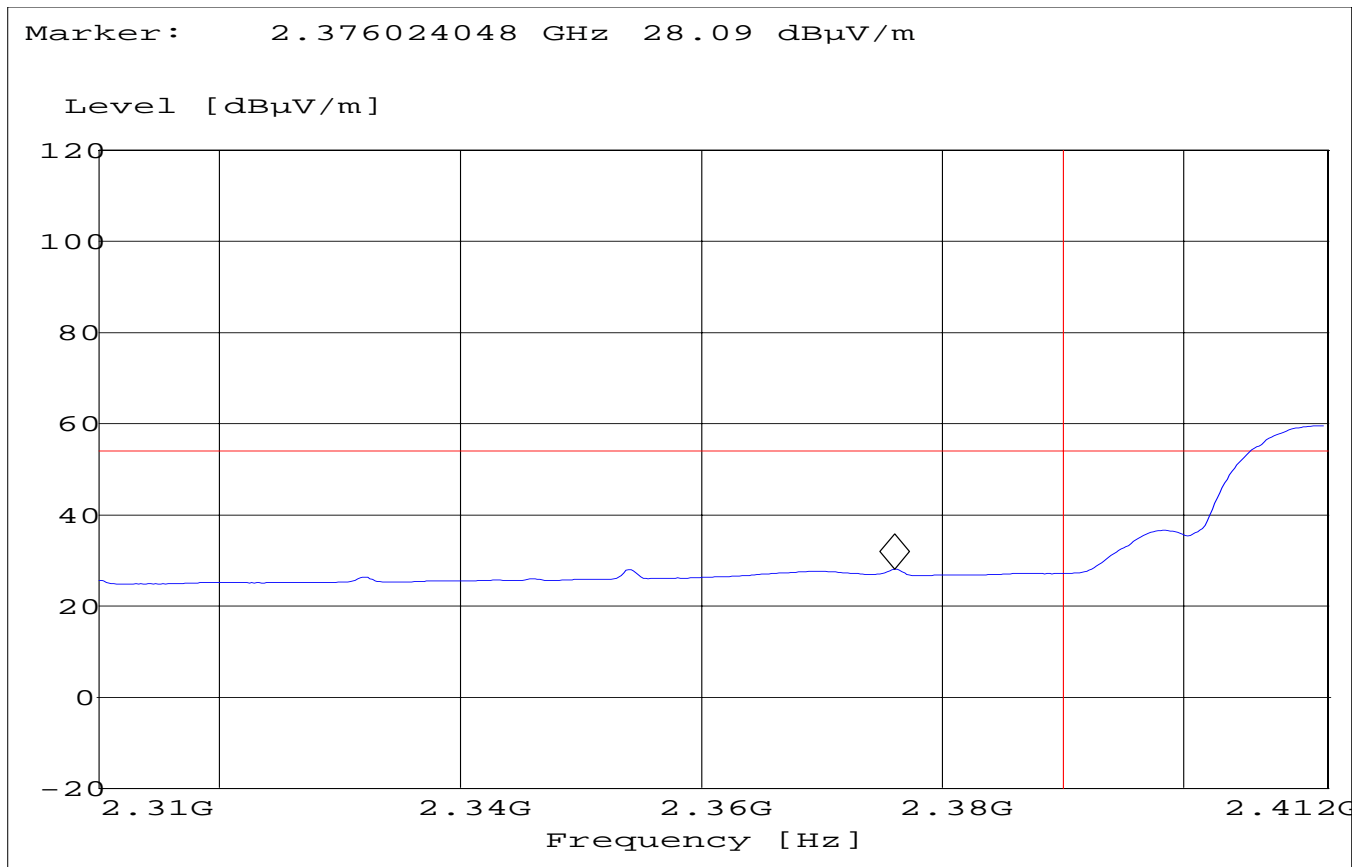
BAND EDGE COMPLIANCE

§15.247 (c)

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

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

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



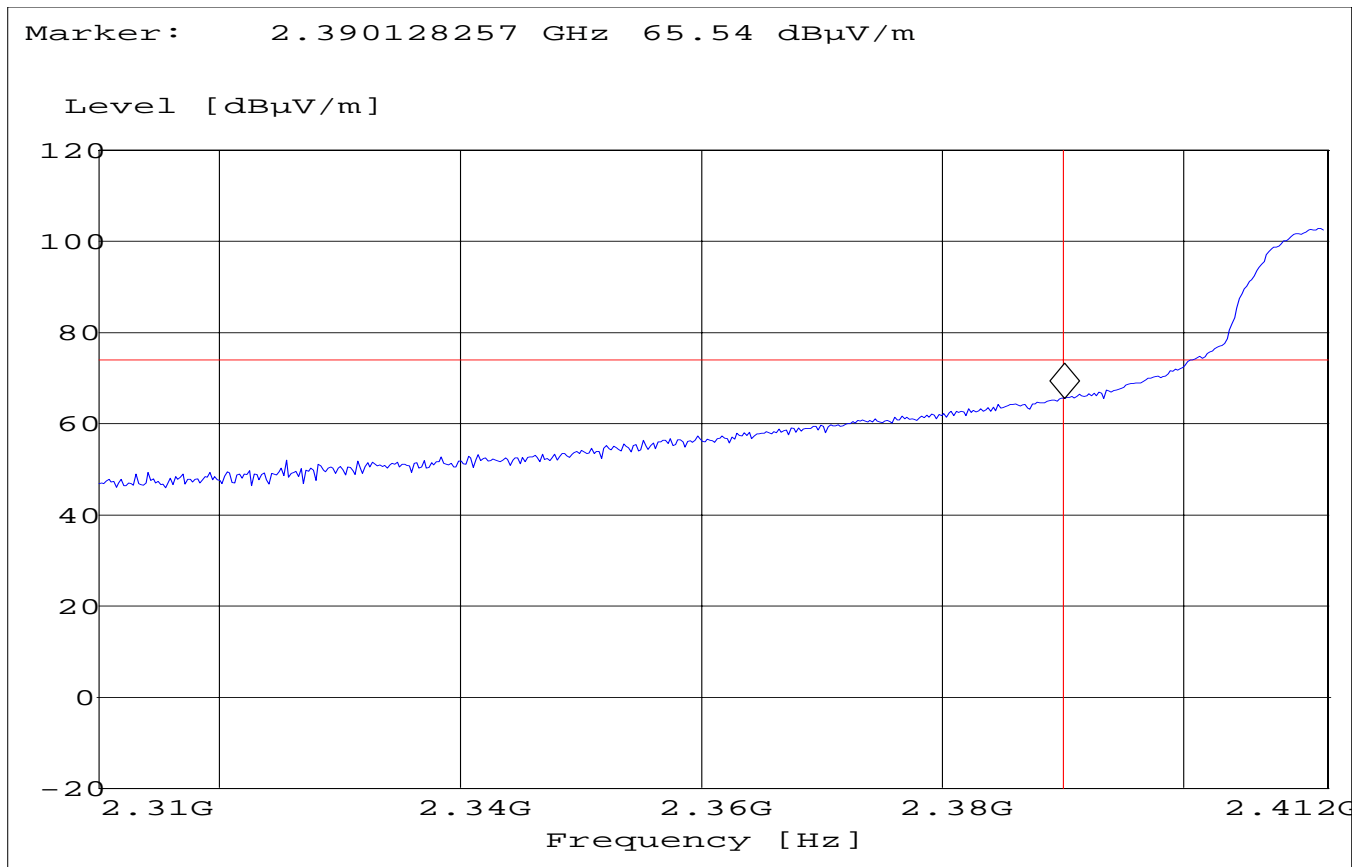
BAND EDGE COMPLIANCE

§15.247 (c)

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

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

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)



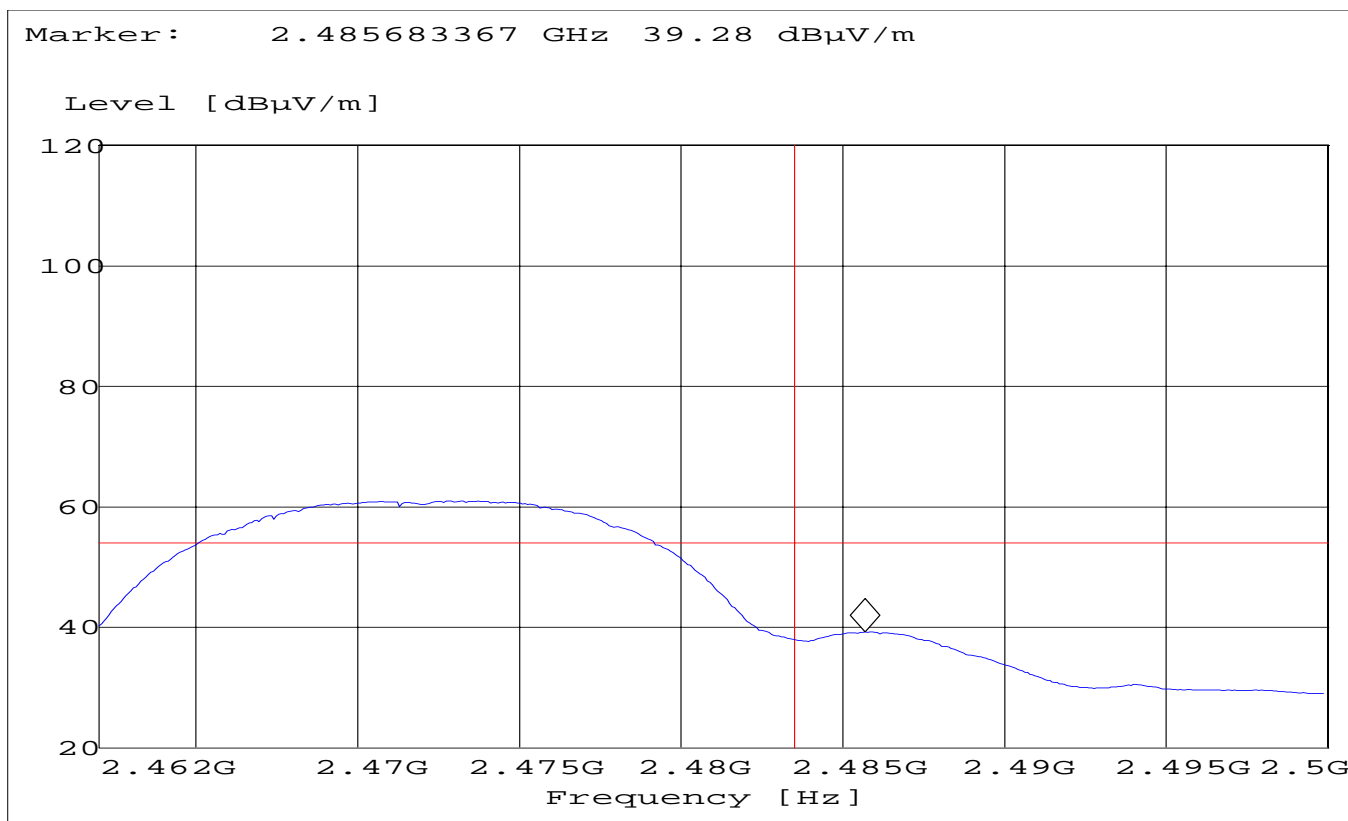
BAND EDGE COMPLIANCE

§15.247 (c)

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

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)



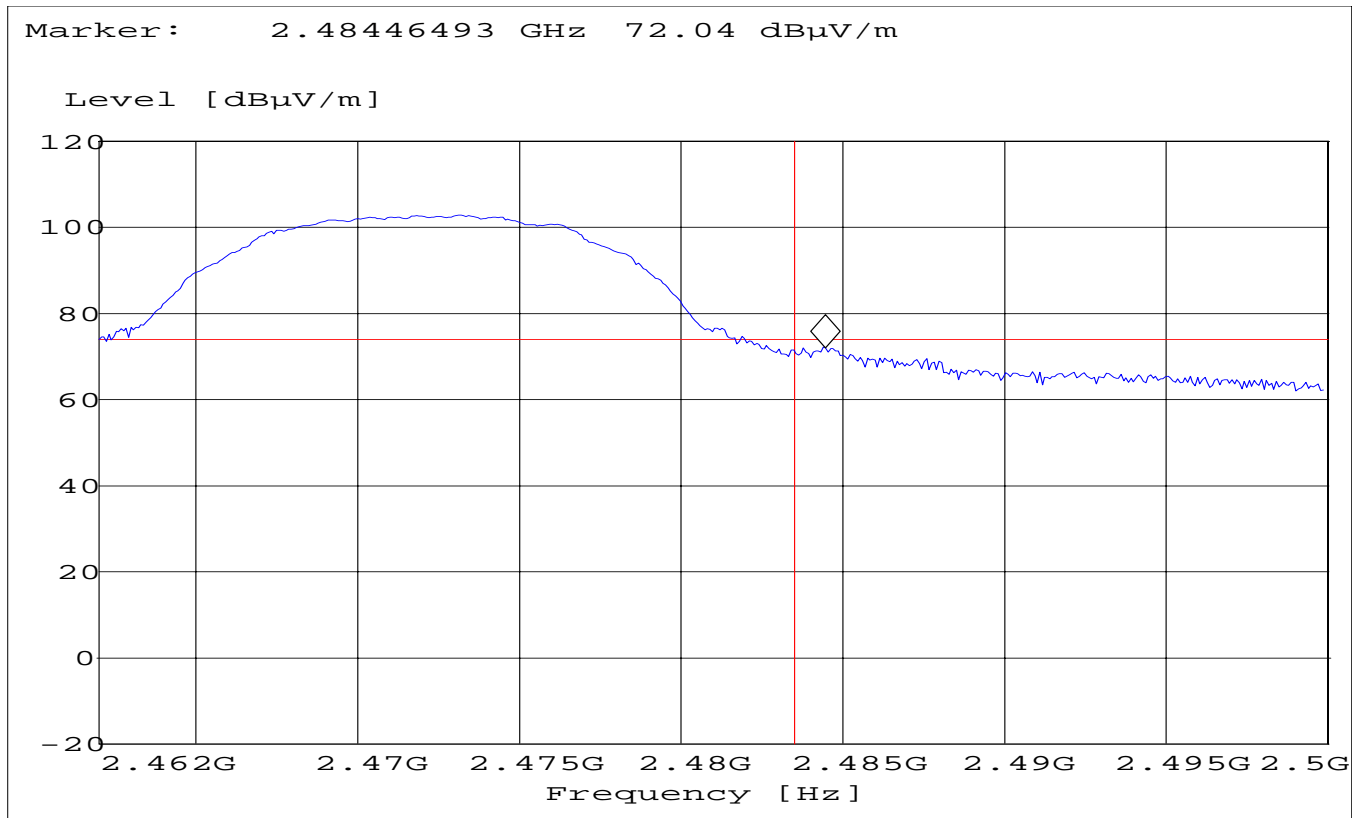
BAND EDGE COMPLIANCE

§15.247 (c)

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

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

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 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)

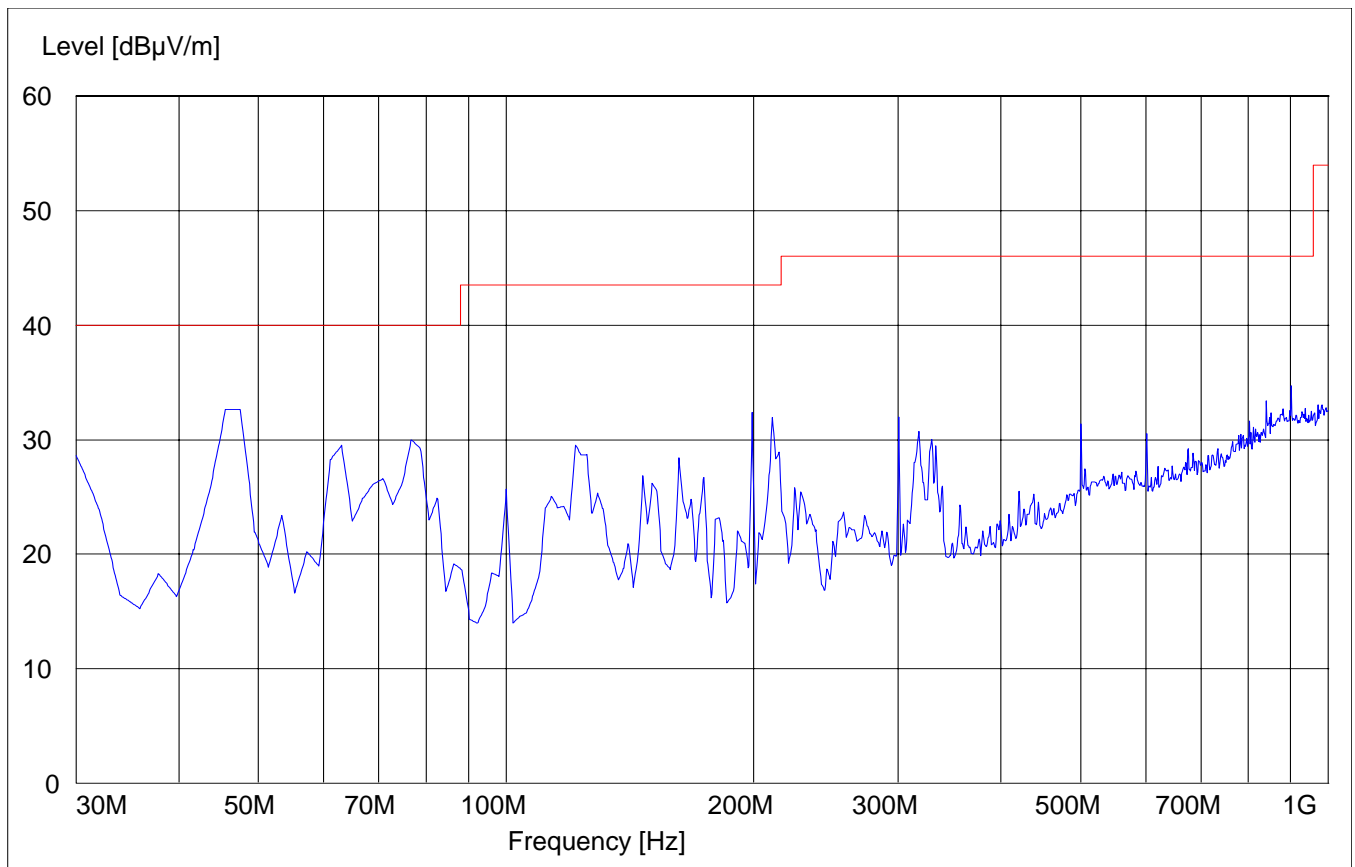
30MHz – 1GHz

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

SWEEP TABLE:

"Spuri hi 30-1G"

Start	Stop	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)

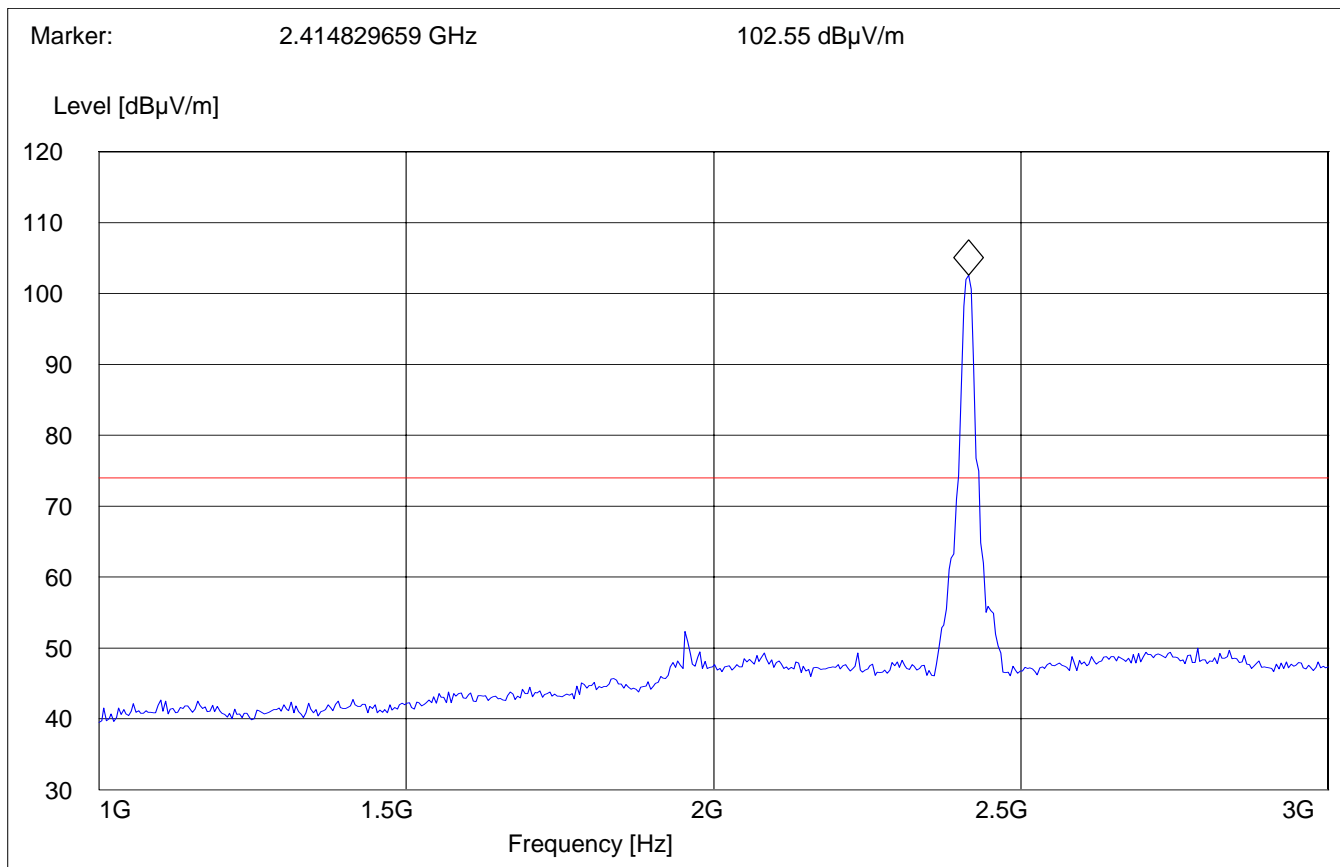
Lowest Channel (2412MHz): 1GHz – 3GHz

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

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"

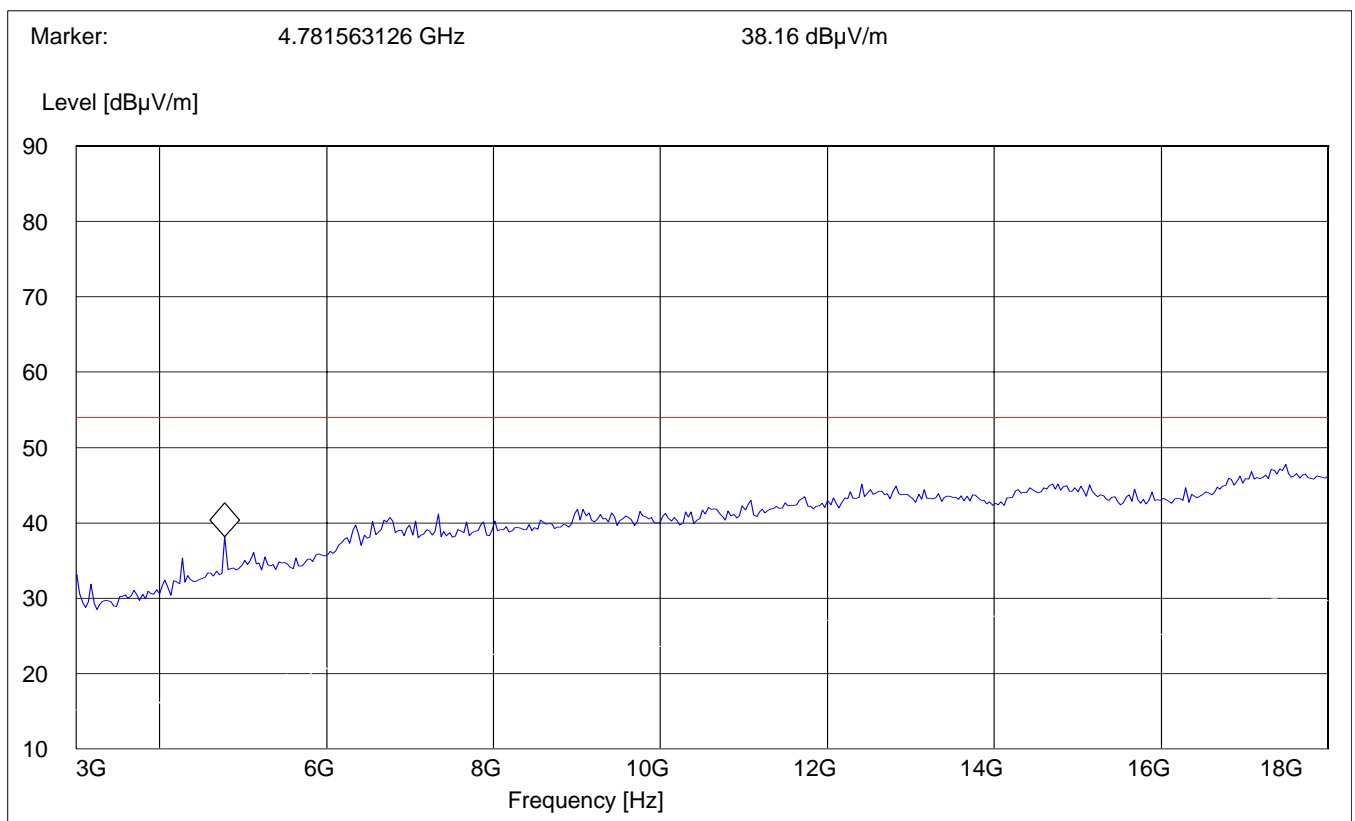


EMISSION LIMITATIONS - Radiated (Transmitter)
Lowest Channel (2412MHz): 3GHz – 18GHz

§ 15.247 (c) (1)

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	1MHz	#326 horn (dBi)

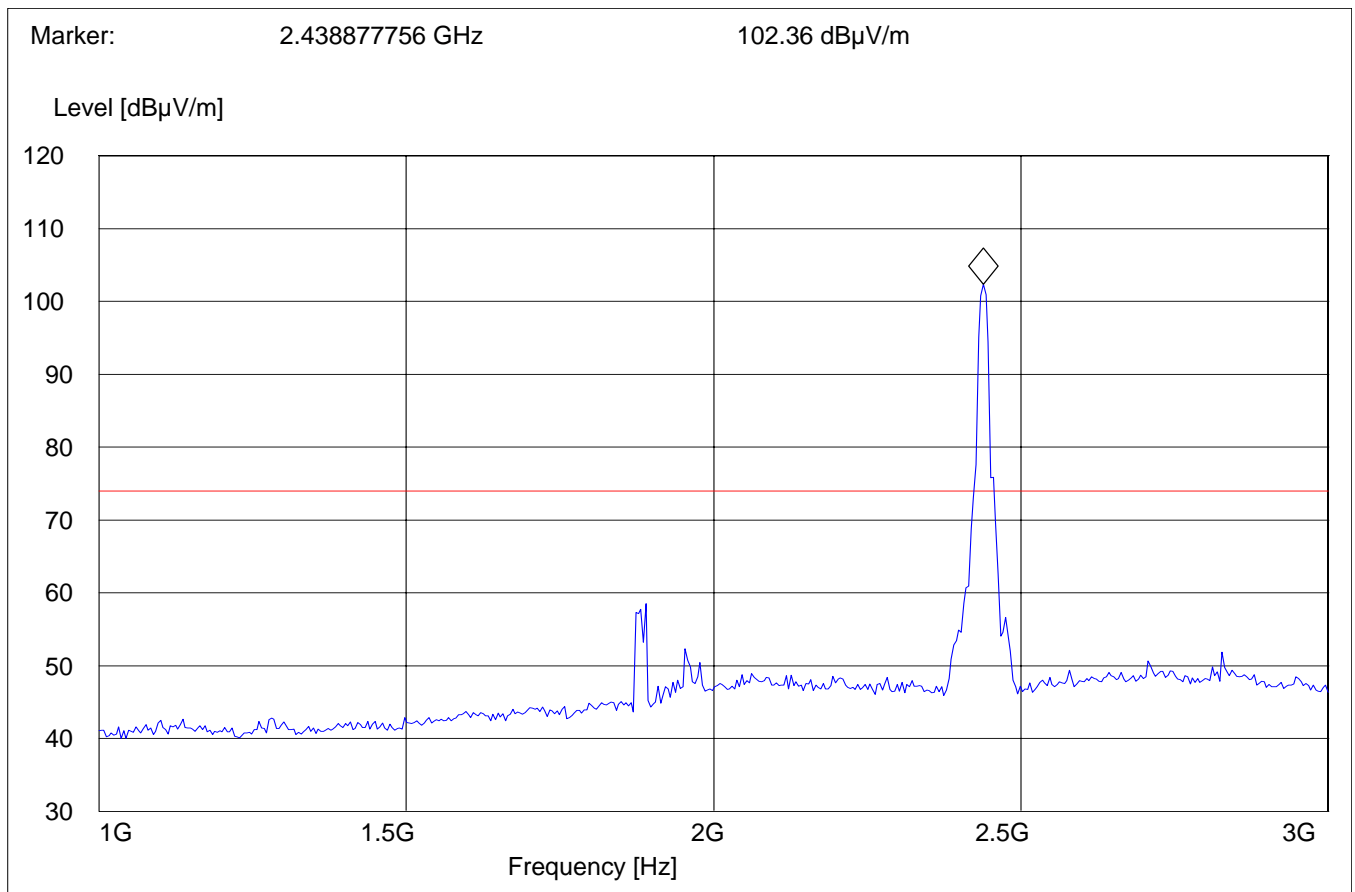


EMISSION LIMITATIONS - Radiated (Transmitter)
Mid Channel (2437MHz): 1GHz – 3GHz

§ 15.247 (c) (1)

Note: The 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	1MHz	#326 horn (dBi)



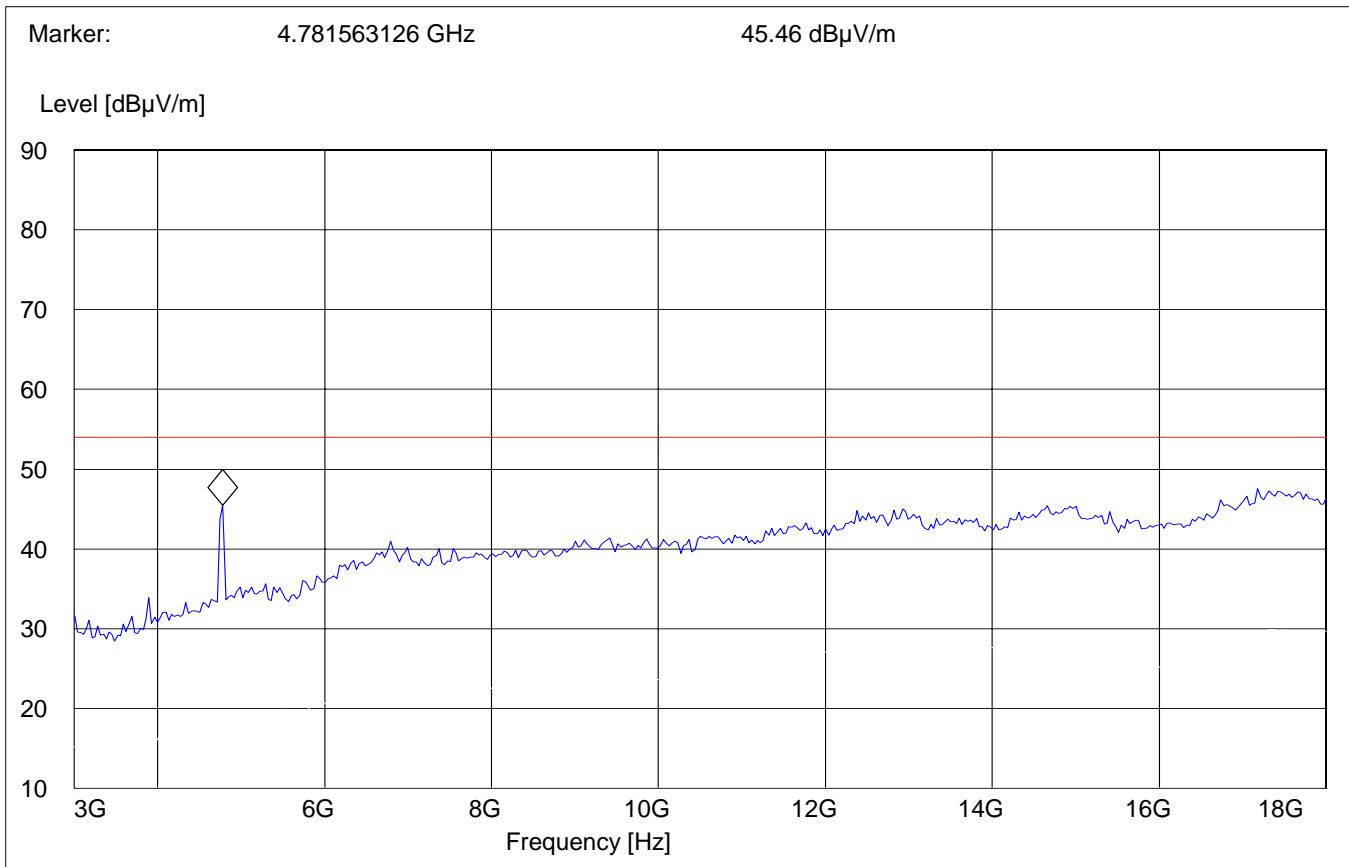
EMISSION LIMITATIONS - Radiated (Transmitter)
Mid Channel (2437MHz): 3GHz – 18GHz

§ 15.247 (c) (1)

SWEEP TABLE:

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

"Spuri hi 3-18G"



EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.247 (c) (1)

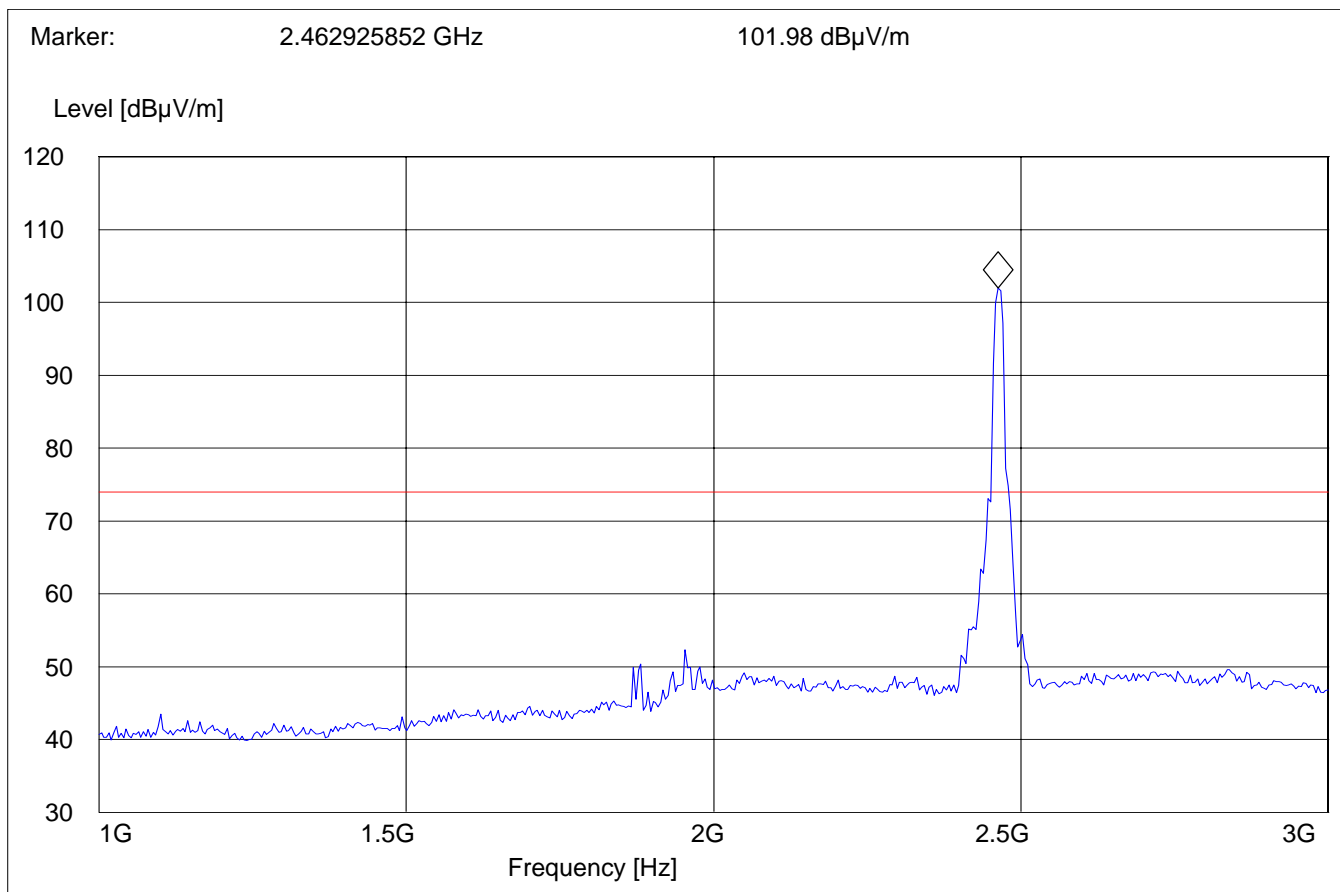
Highest Channel (2462MHz): 1GHz – 3GHz

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

SWEEP TABLE:

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"



EMISSION LIMITATIONS - Radiated (Transmitter)

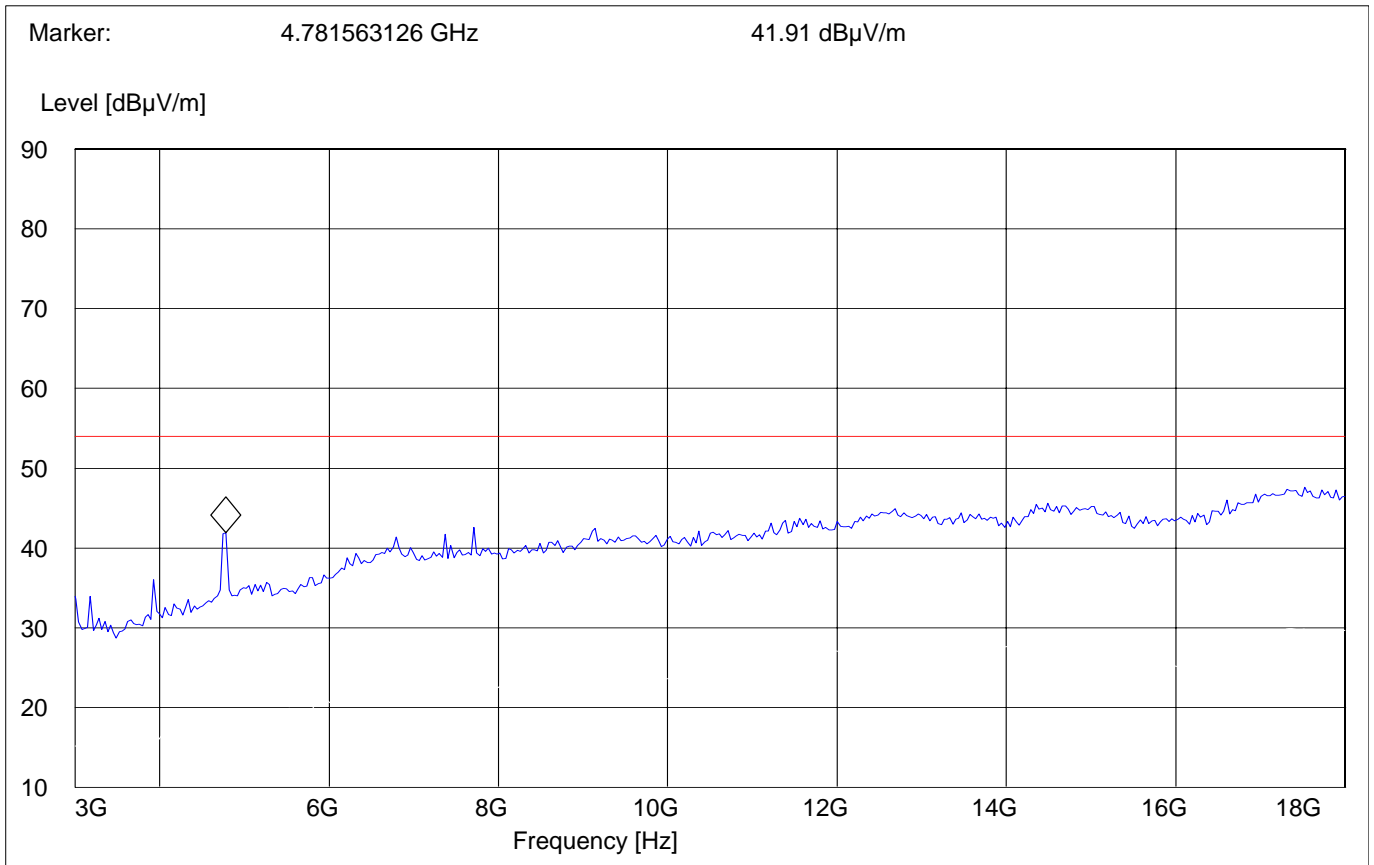
§ 15.247 (c) (1)

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

SWEEP TABLE:

"Spuri hi 3-18G"

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



EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.247 (c) (1)

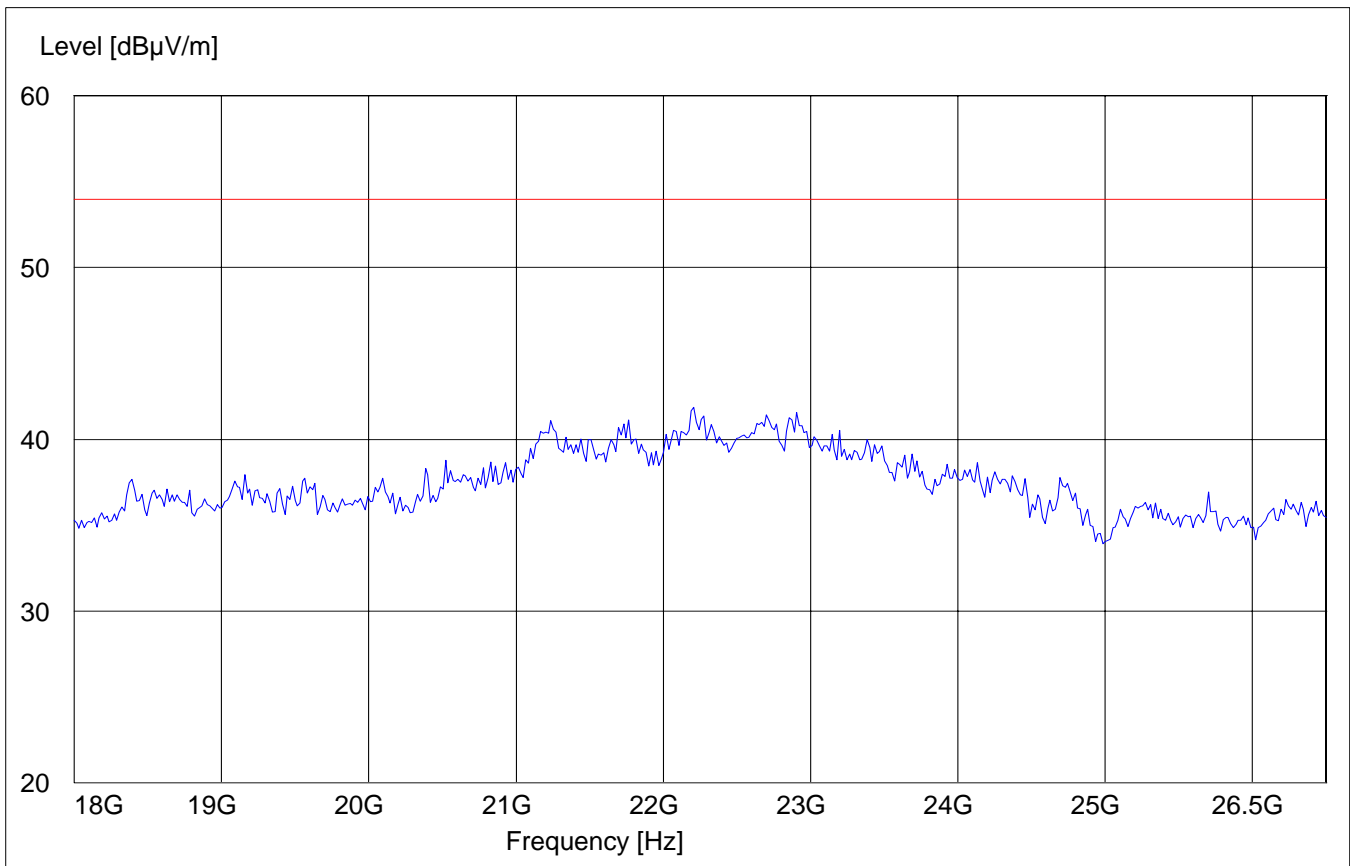
18GHz – 25GHz

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

SWEEP TABLE:

"Spuri hi 18-25G"

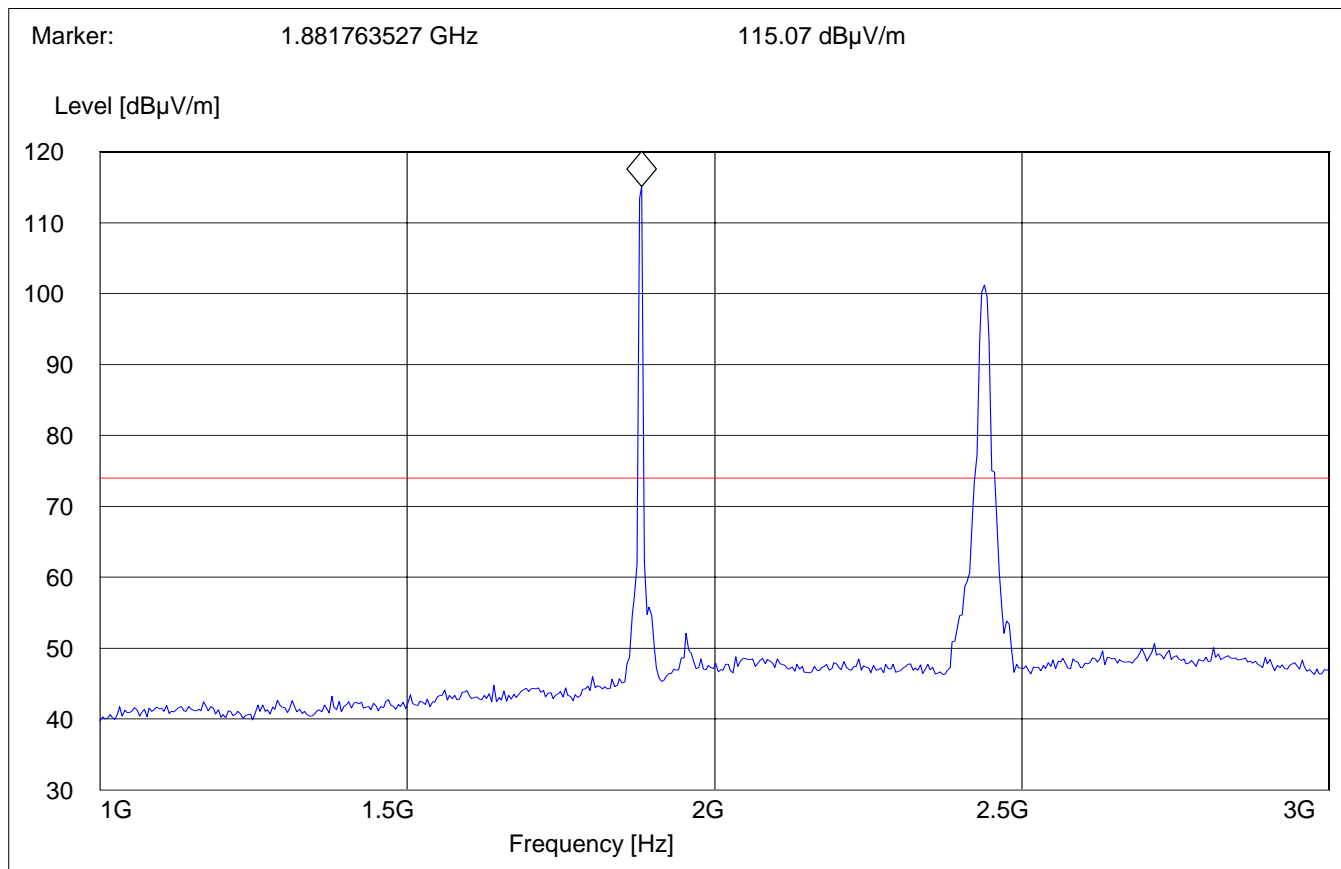
Start Frequency	Stop Frequency	Detector	Meas. Bandw.	RBW	VBW	Transducer
18 GHz	25 GHz	MaxPeak	Coupled	1 MHz		#326 horn (dBi)



**RADIATED EMISSIONS COLLOCATION WLAN & GSM
EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (c) (1)
1GHz – 3GHz
Operating Mode: WLAN channel-6 and PCS 1900 channel-661**

Note: The peak above the limit line are the carrier freq.'s for GSM & WLAN respectively.

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	1MHz	#326 horn (dBi)



3GHz – 18GHz

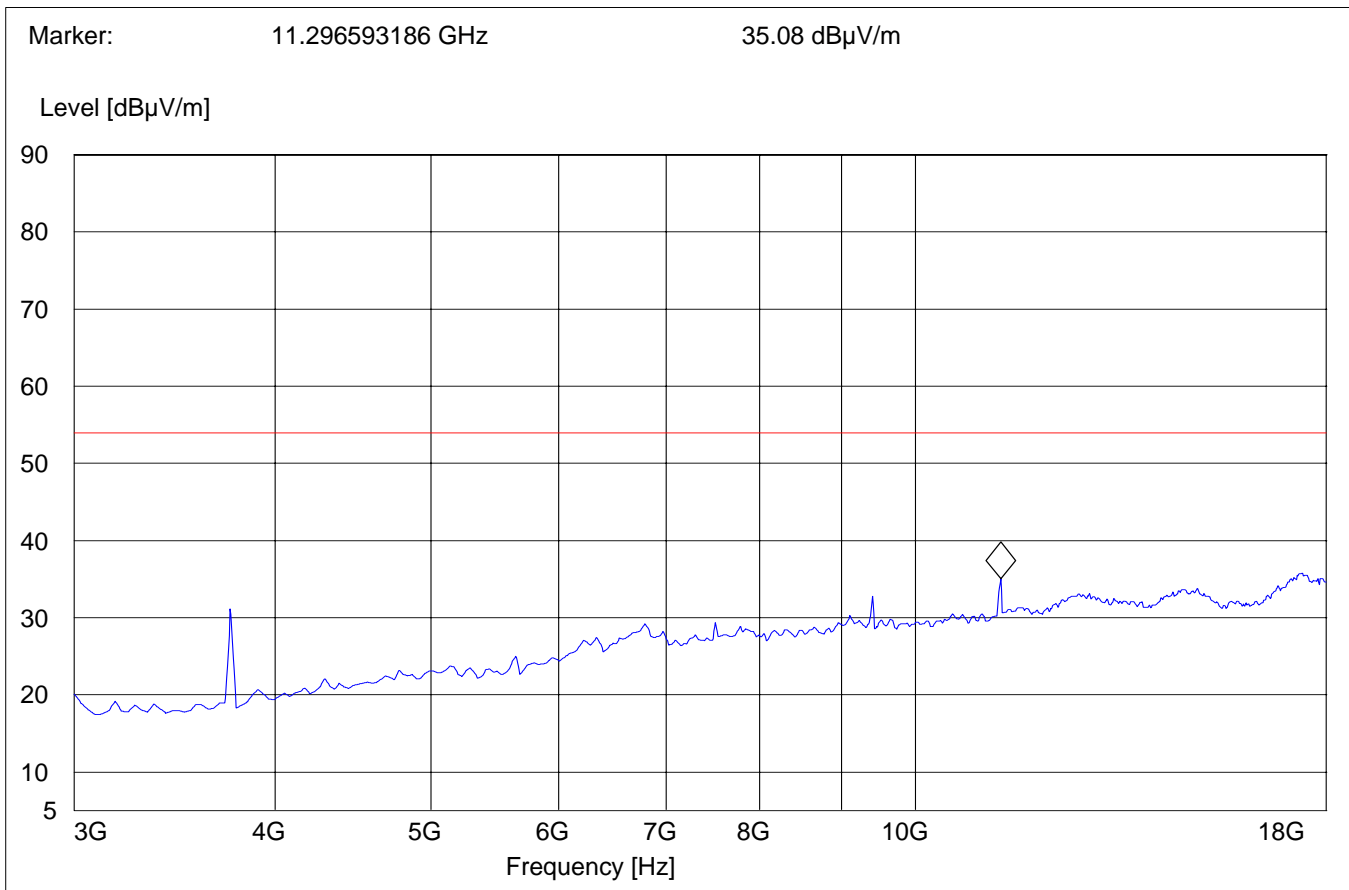
Operating Mode: WLAN channel-6 and PCS 1900 channel-661

Average Measurement

SWEEP TABLE:

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

"Spuri hi 3-18G"



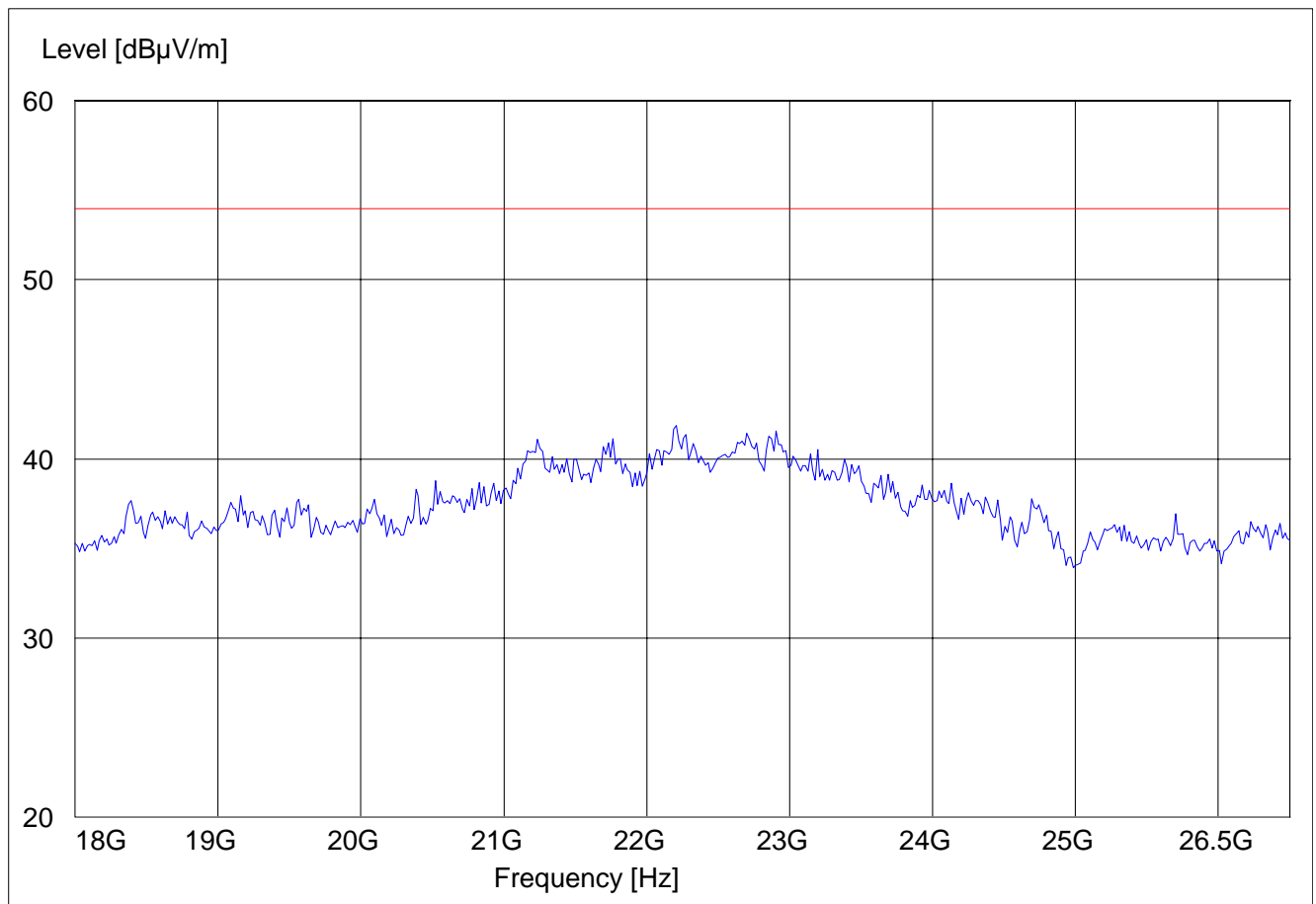
18GHz – 26.5GHz

Operating Mode: WLAN channel-6 and PCS 1900 channel-661

SWEEP TABLE:

"Spuri hi 3-18G"

Start Frequency	Stop Frequency	Detector	Meas. Bandw.	RBW	VBW	Transducer
3.0 GHz	18.0 GHz	MaxPeak	Coupled	1 MHz	1MHz	#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 26.5 GHz very short cable connections to the antenna was used to minimize the noise level.

RECEIVER RADIATED EMISSIONS

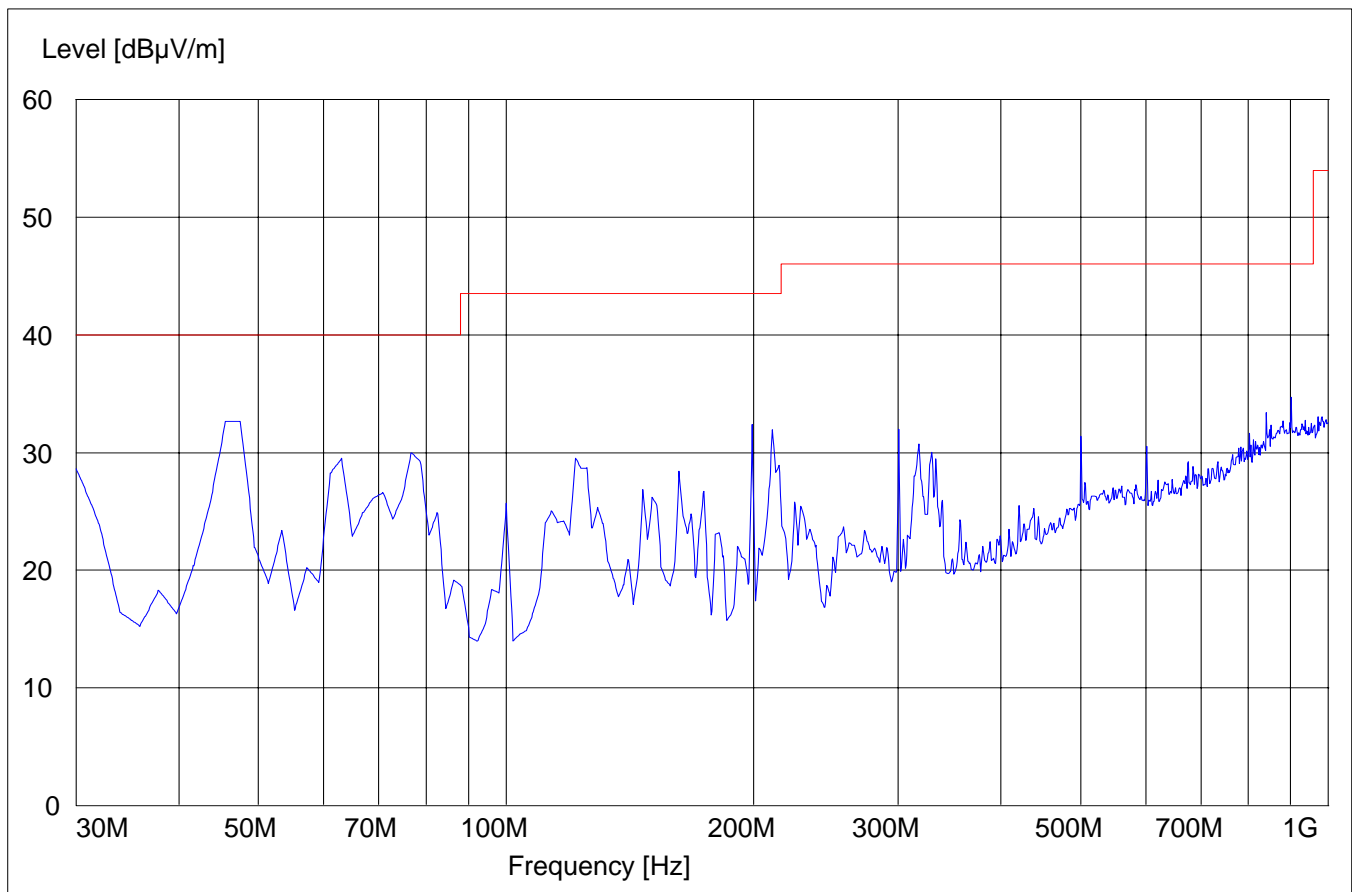
EUT in Idle Mode: 30MHz – 1GHz

Antenna: vertical

SWEEP TABLE: "FCCSpur 30M-1G"

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW/VBW
30MHz	1GHz	Max Peak	Coupled	100KHz

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

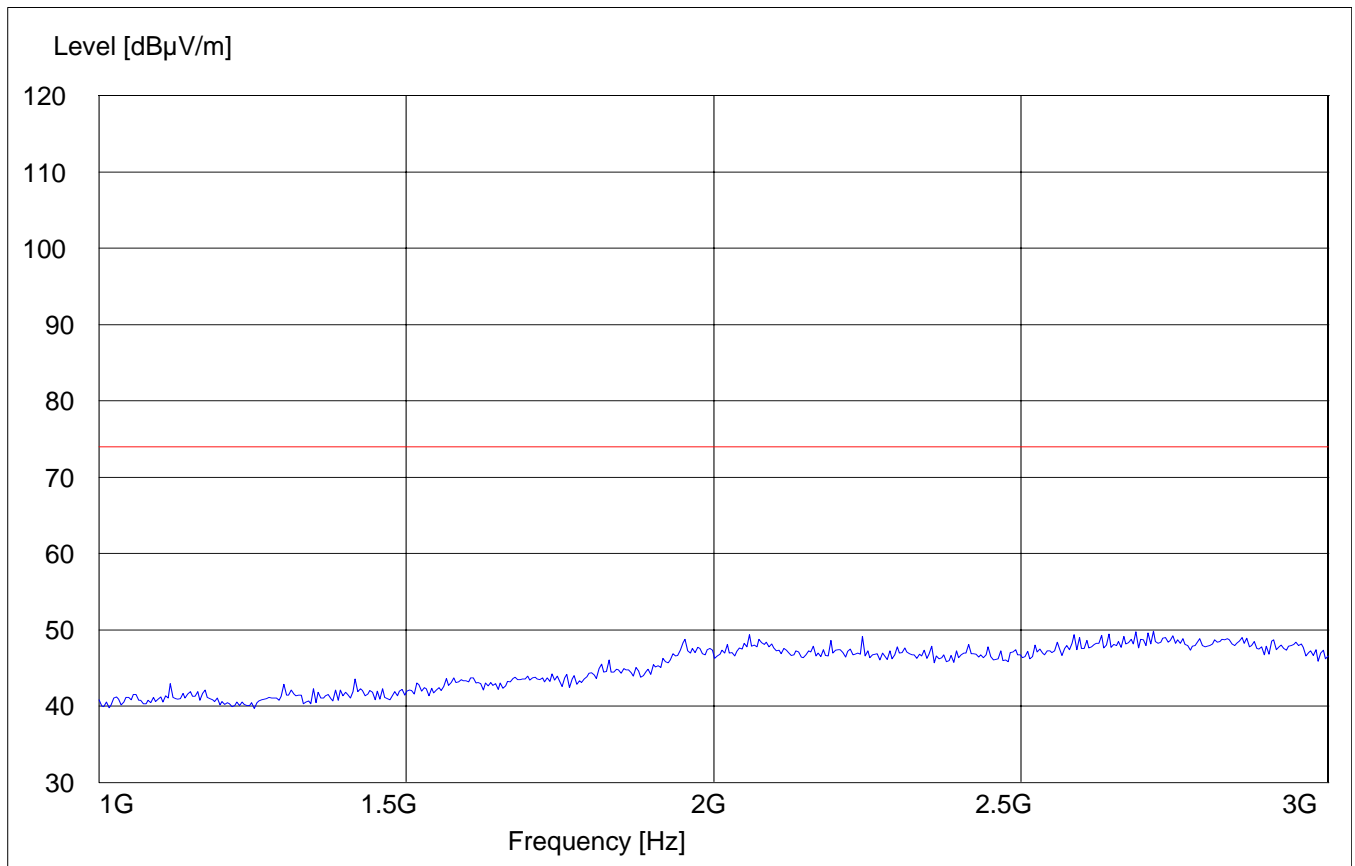


RECEIVER RADIATED EMISSIONS
EUT in Idle Mode: 1GHz – 3GHz

Note: marked peak is downlink from the base station

SWEEP TABLE: "FCC Spuri 1-3G"

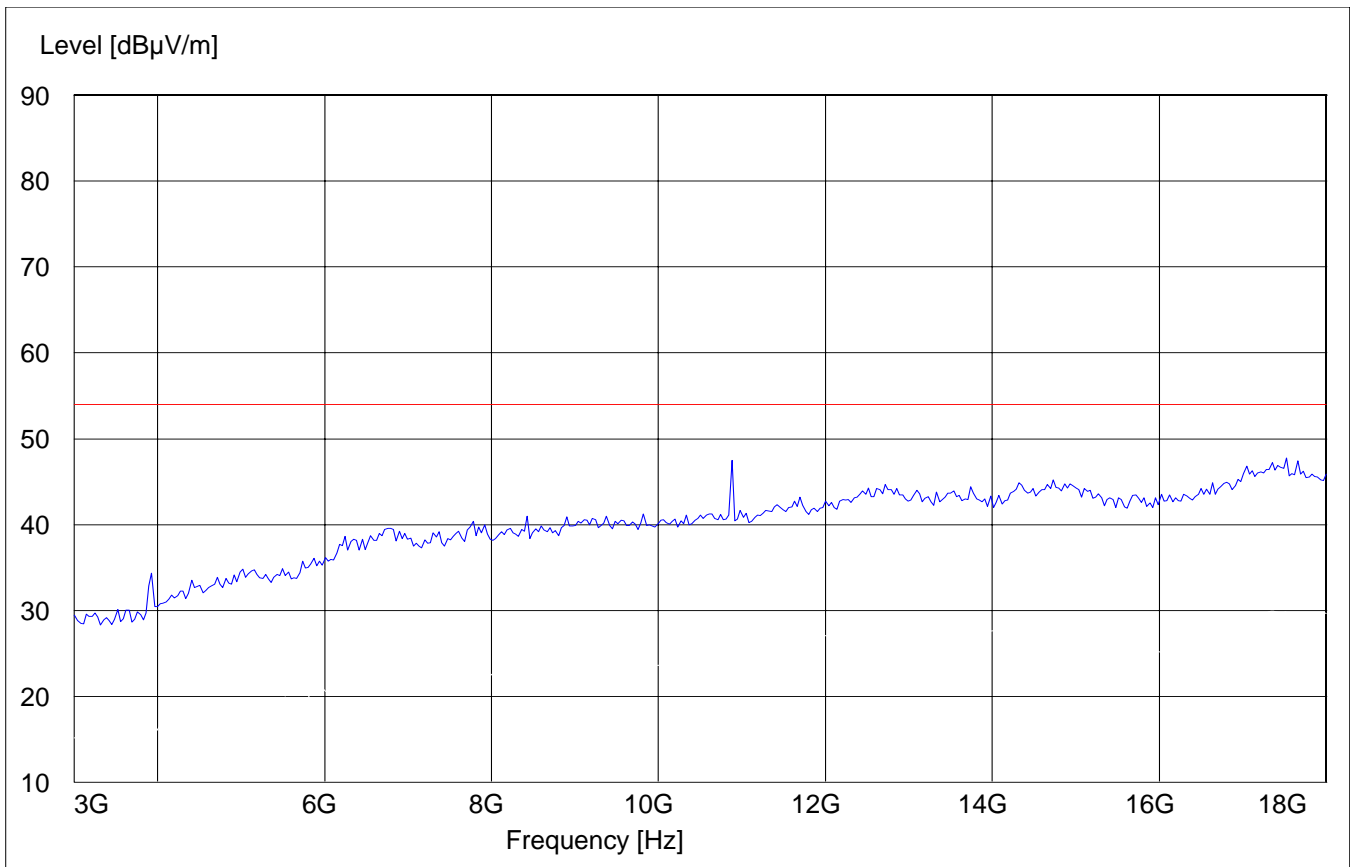
<i>Start</i>	<i>Stop</i>	<i>Detector</i>	<i>Meas.</i>	<i>RBW/VBW</i>
<i>Frequency</i>	<i>Frequency</i>		<i>Time</i>	
1GHz	3GHz	Max Peak	Coupled	1 MHz



RECEIVER RADIATED EMISSIONS
EUT in Idle Mode: 3GHz – 18GHz

SWEEP TABLE: "FCC 24 spuri 3-18G"

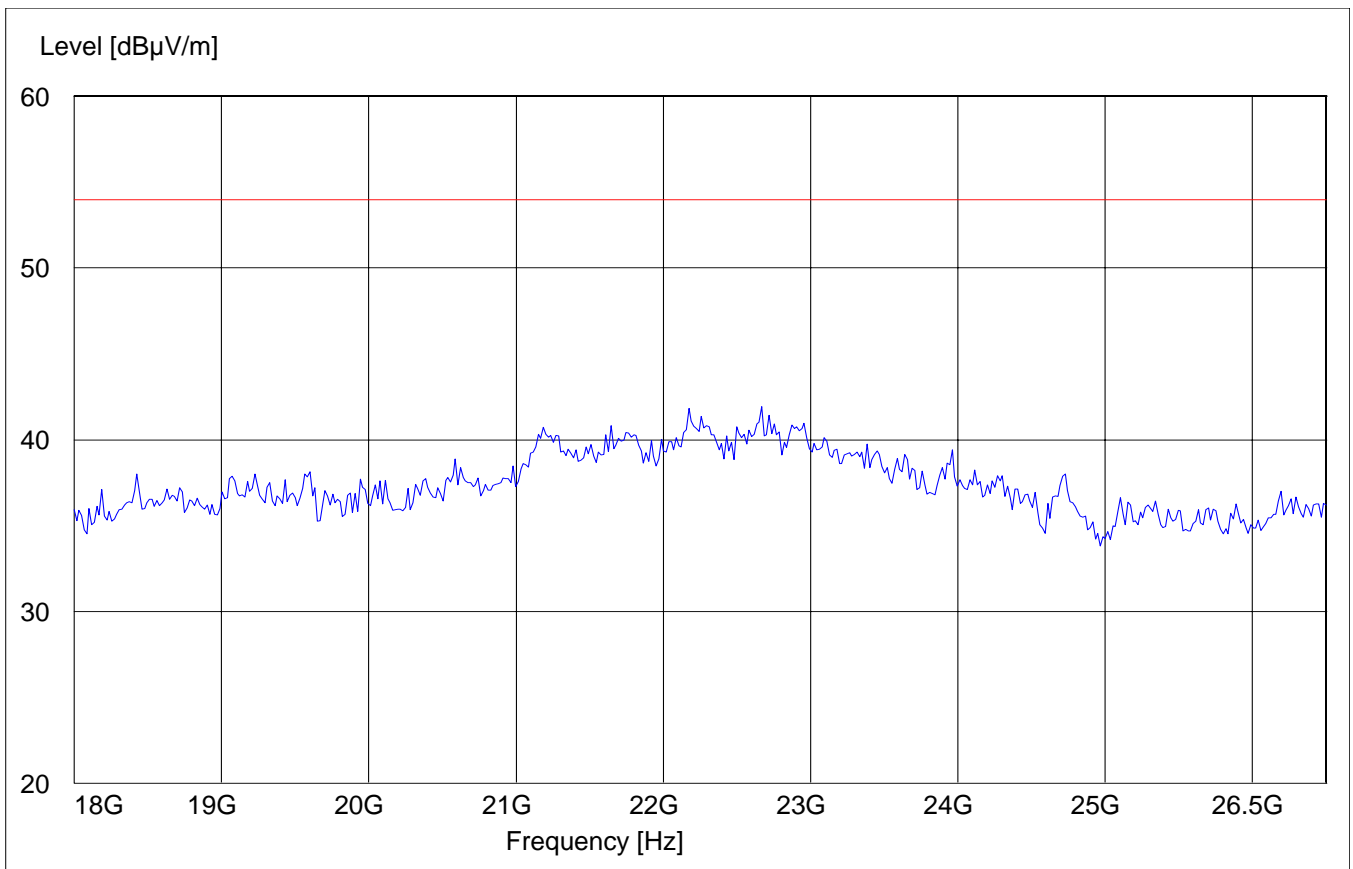
Start Frequency	Stop Frequency	Detector	Meas. Time	RBW/VBW
3GHz	18GHz	Max Peak	Coupled	1 MHz



RECEIVER RADIATED EMISSIONS
EUT in Idle Mode: 18GHz – 19.1GHz

SWEEP TABLE: "FCC 24 spuri 18-19.1G"

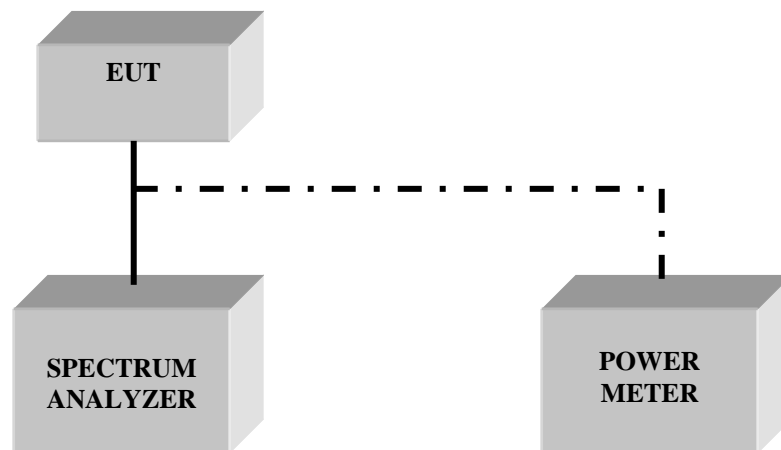
<i>Start</i>	<i>Stop</i>	<i>Detector</i>	<i>Meas.</i>	<i>RBW/VBW</i>
<i>Frequency</i>	<i>Frequency</i>		<i>Time</i>	
18GHz	19.1GHz	Max Peak	Coupled	1 MHz



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
Conducted Testing



Radiated Testing

ANECHOIC CHAMBER

