



# FCC Test Report

Test report no.: EMC\_678FCC15.247\_2004\_BT\_124

FCC Part 15.247 for FHSS systems / CANADA RSS-210

EUT Tablet PC      Model: iX104-TM60+2200

with

BT module      Model: TM60M665

WLAN module      Model: 2200BG

FCC ID: Q2GIX104-124

IC: 4596A-iX104WBG



**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.**

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](mailto: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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<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**  
**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](mailto:lothar.schmidt@cetecomusa.com)**  
**Internet: [www.cetecom.com](http://www.cetecom.com)**

### 1.3 Details of applicant

Name : Xplore Technologies  
Street : 14000 Summit Road, Suite 900  
City / Zip Code : Austin, TX 78728  
Country : USA  
Contact : Douglas L. Fowler  
Telephone : +1 512 336 7797  
Tele-fax : +1 512 336 7791  
e-mail : [dfowler@xploretech.com](mailto:dfowler@xploretech.com)

### 1.4 Application details

Date of receipt test item : 2004-06-21  
Date of test : 2004-06-21/22/23

### 1.5 Test item

Manufacturer : Applicant  
Marketing Name : iX104-TM60+2200  
Model No. : iX104-TM60+2200  
Description : [Tablet PC with BT & WLAN module](#)  
FCC-ID : Q2GIX104-124  
IC ID : 4596A-iX104WBG

### Additional information

Test Sample ID : HELEN  
Frequency : 2402MHz – 2480MHz for BT  
Type of modulation : GFSK  
Number of channels : 79  
Antenna : Embedded  
Power supply : via host Tablet PC  
Output power : 3.5dBm (0.00224W) max. conducted peak power  
Extreme temp. Tolerance : -30°C to +50°C

**1.6 Test standards: FCC Part 15 §15.247 (DA00-705) / RSS 210**

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

**The Tablet PC (model# iX104-TM60) carries pre-certified BT module with FCC ID: MCLT60M665**

**This test report only covers full radiated testing as per FCC 15.247 on Tablet PC with BT module. All conducted measurements are covered under test report# R0301173Rpt  
For WLAN test results refer to test report# EMC\_678FCC15.247\_2004\_WLAN\_124**

**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:**

2004-07-13 EMC & Radio Lothar Schmidt (Manager)



Date

Section

Name

Signature

**Responsible for test report and project leader:**

2004-07-13 EMC & Radio Harpreet Sidhu (EMC Engineer)



Date

Section

Name

Signature

## 2.2 Test report

### TEST REPORT

Test report no.: EMC\_678FCC15.247\_2004\_BT\_124

**TEST REPORT REFERENCE**

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**MAXIMUM PEAK OUTPUT POWER  
(RADIATED)**

§ 15.247 (b) (1)

**EIRP:**

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)		
		2402	2441	2480
$T_{nom}$ (23)°C	$V_{nom}$ (2.5)VDC	-10.7	-6.88	-5.05
Measurement uncertainty		±0.5dBm		

RBW/VBW: 3 MHz

**LIMIT**

SUBCLAUSE § 15.247 (b) (1)

Frequency range	RF power output
2400-2483.5 MHz	1.0 Watt

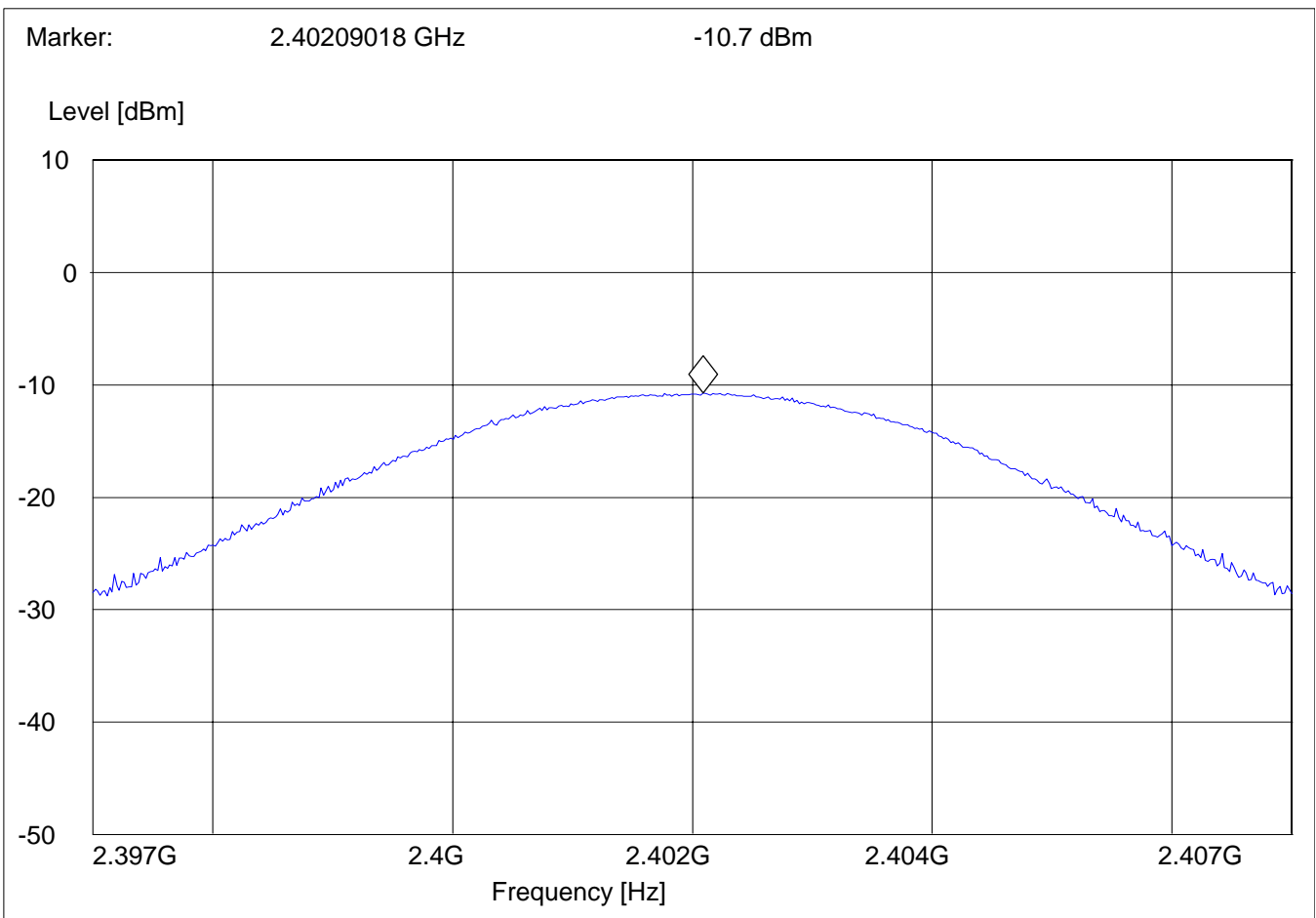
**PEAK OUTPUT POWER (RADIATED)**

**§15.247 (b) (1)**

**Lowest Channel: 2402MHz**

SWEEP TABLE: "EIRP BT low channel"

Short Description:		EIRP Bluetooth channel-2402MHz		
Start	Stop	Detector	Meas.	IF
Frequency	Frequency		Time	BW
2.397GHz	2.407GHz	MaxPeak	Coupled	3 MHz





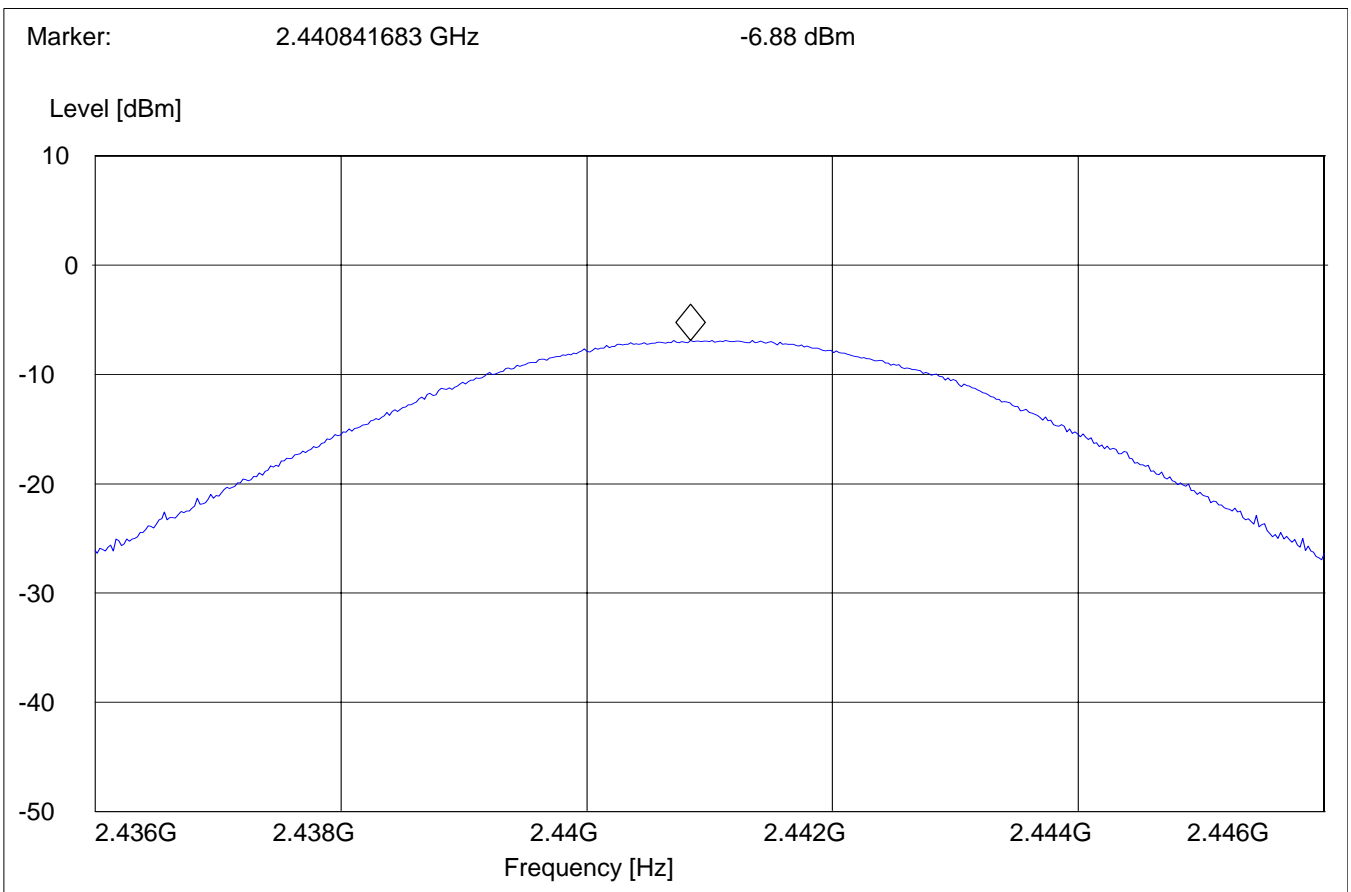
**PEAK OUTPUT POWER (RADIATED)**

**§15.247 (b) (1)**

**Mid Channel: 2441MHz**

SWEEP TABLE: "EIRP BT Mid channel"

Short Description:		EIRP Bluetooth channel-2441MHz		
Start	Stop	Detector	Meas. Time	IF BW
2.436GHz	2.446GHz	MaxPeak	Coupled	3 MHz

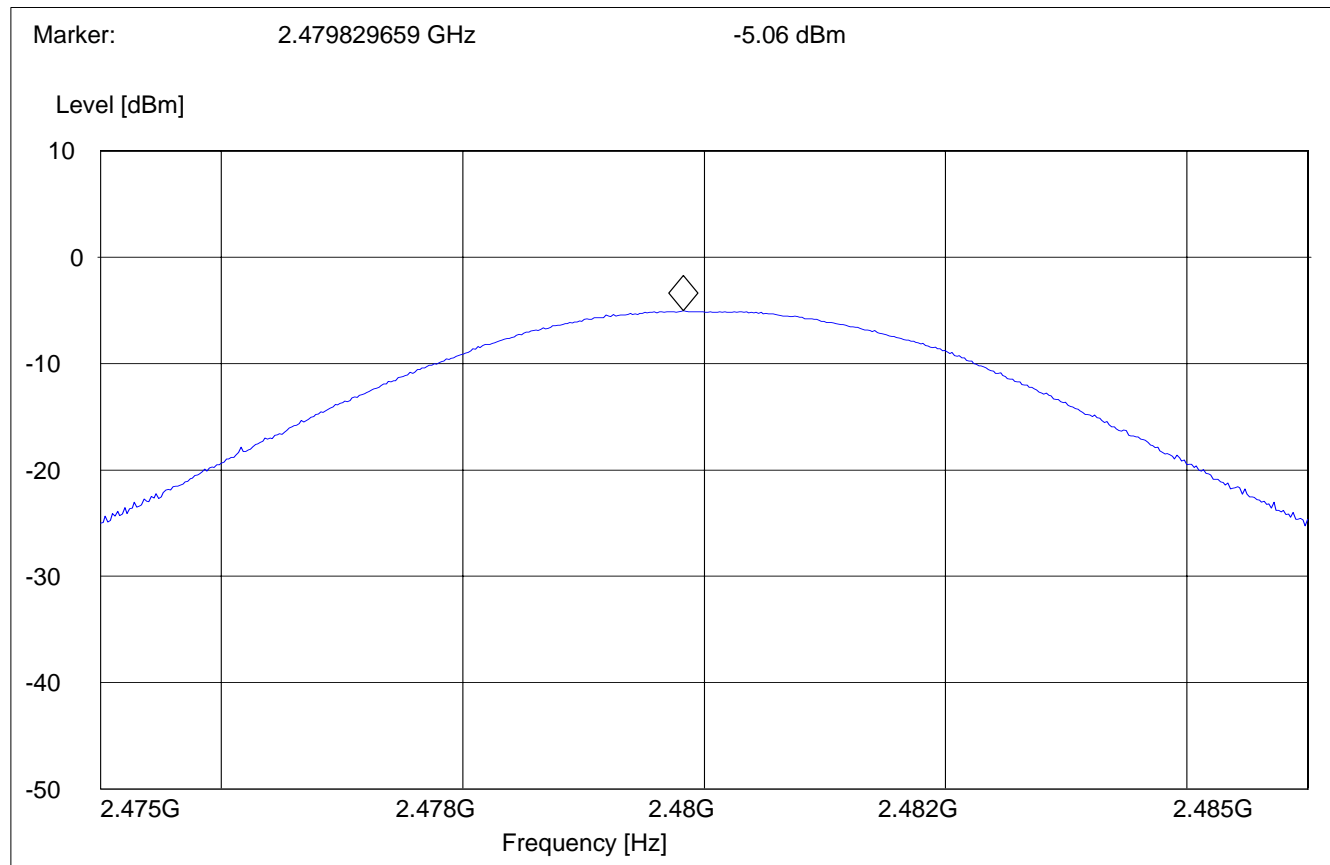


**PEAK OUTPUT POWER (RADIATED)****§15.247 (b) (1)****Highest Channel: 2480MHz**

SWEEP TABLE: "EIRP BT High channel"

Short Description: EIRP Bluetooth channel-2480MHz

Start	Stop	Detector	Meas.	IF
Frequency	Frequency		Time	BW
2.475GHz	2.485GHz	MaxPeak	Coupled	3 MHz



**BAND EDGE COMPLIANCE**

§15.247 (c)

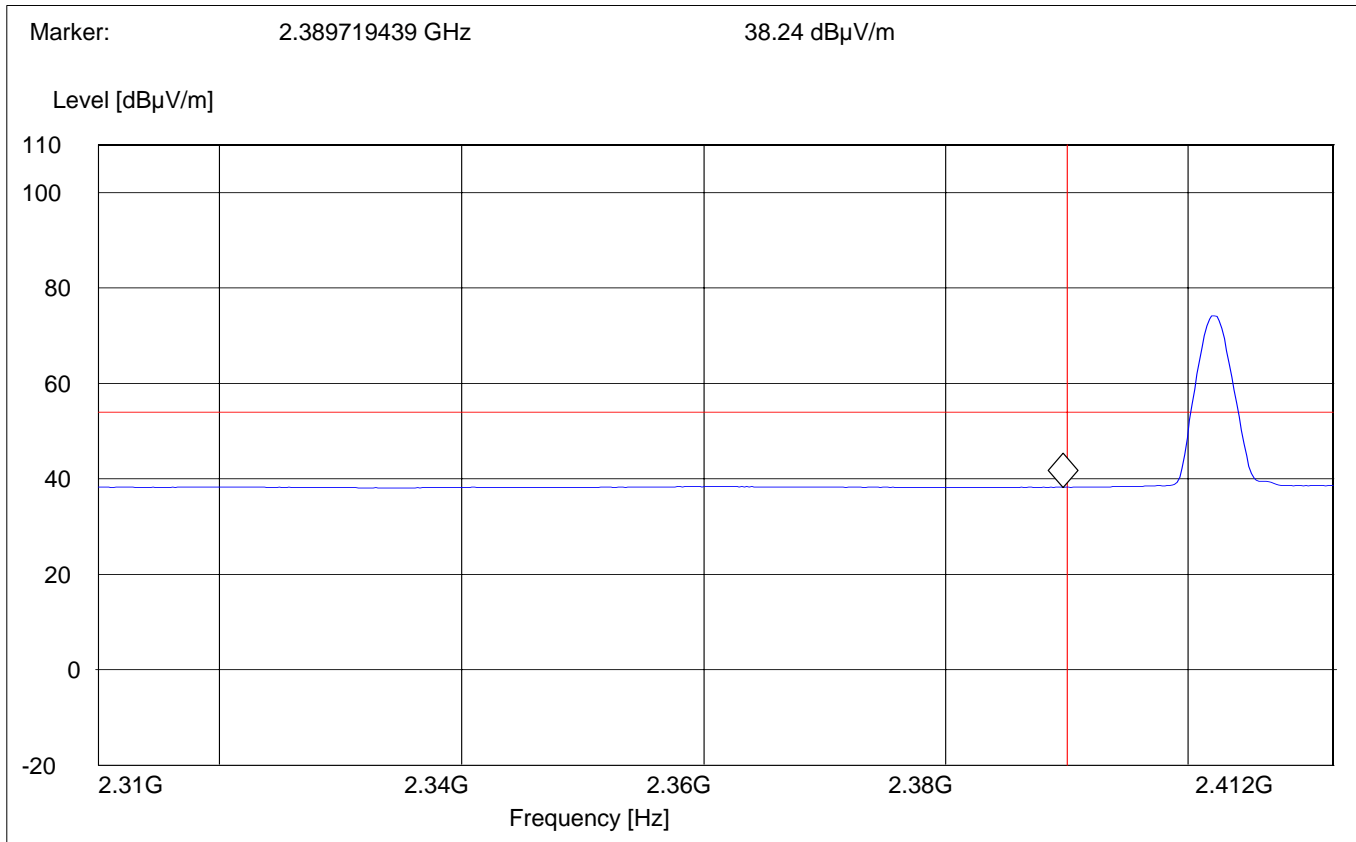
**Low frequency section (spurious in the restricted band 2310 – 2390 MHz)**

**Average Measurement**

**(This plot is valid for both Hopping ON & OFF)**

Operating condition : Tx at 2402MHz  
 SWEEP TABLE : "FCC15.247 LBE\_AVG"  
 Short Description : FCC15.247 BT Low-band-edge  
 Limit Line : 54dB $\mu$ 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)

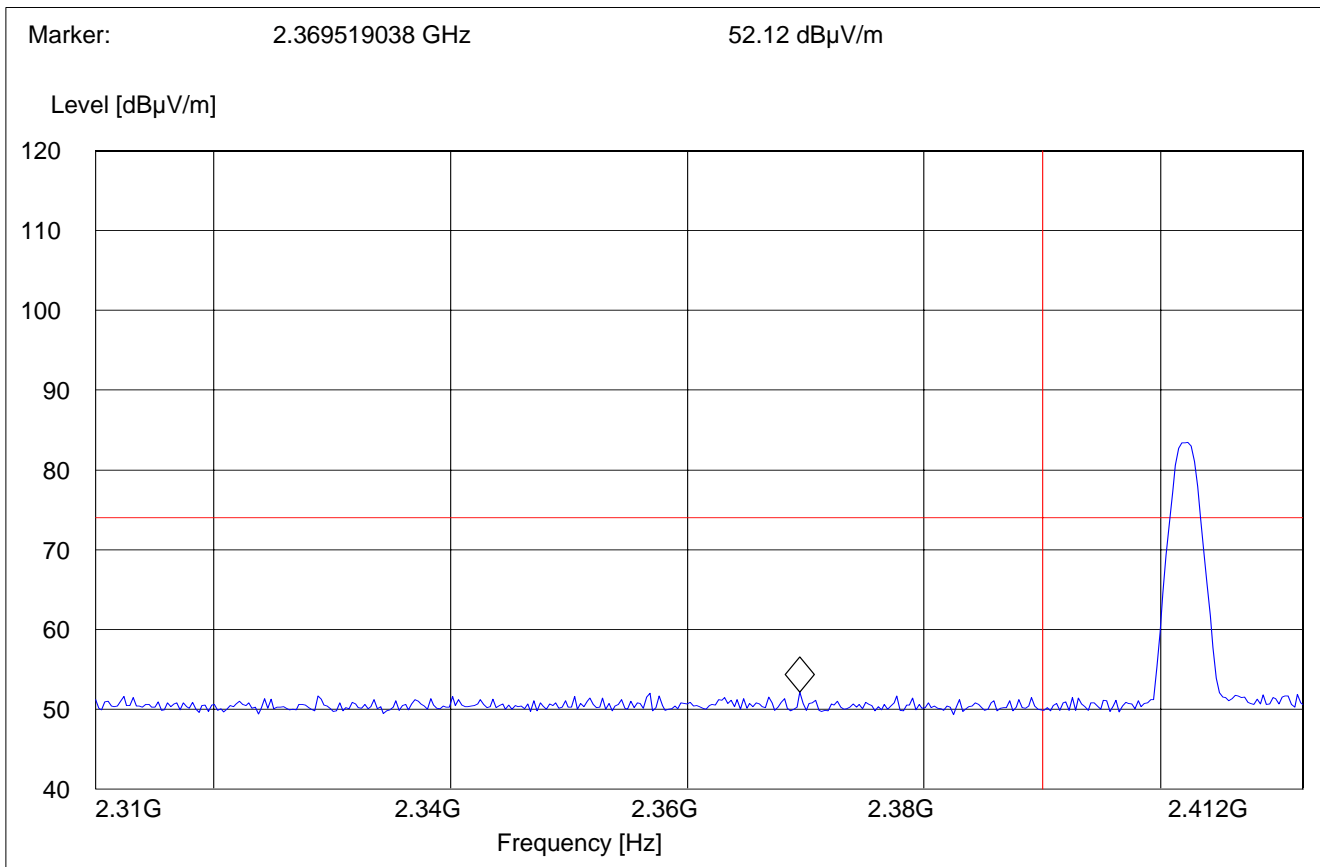
**Low frequency section (spurious in the restricted band 2310 – 2390 MHz)**

**Peak Measurement**

**(This plot is valid for both Hopping ON & OFF)**

Operating condition : Tx at 2402MHz  
 SWEEP TABLE : "FCC15.247 LBE\_Pk"  
 Short Description : FCC15.247 BT Low-band-edge  
 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)

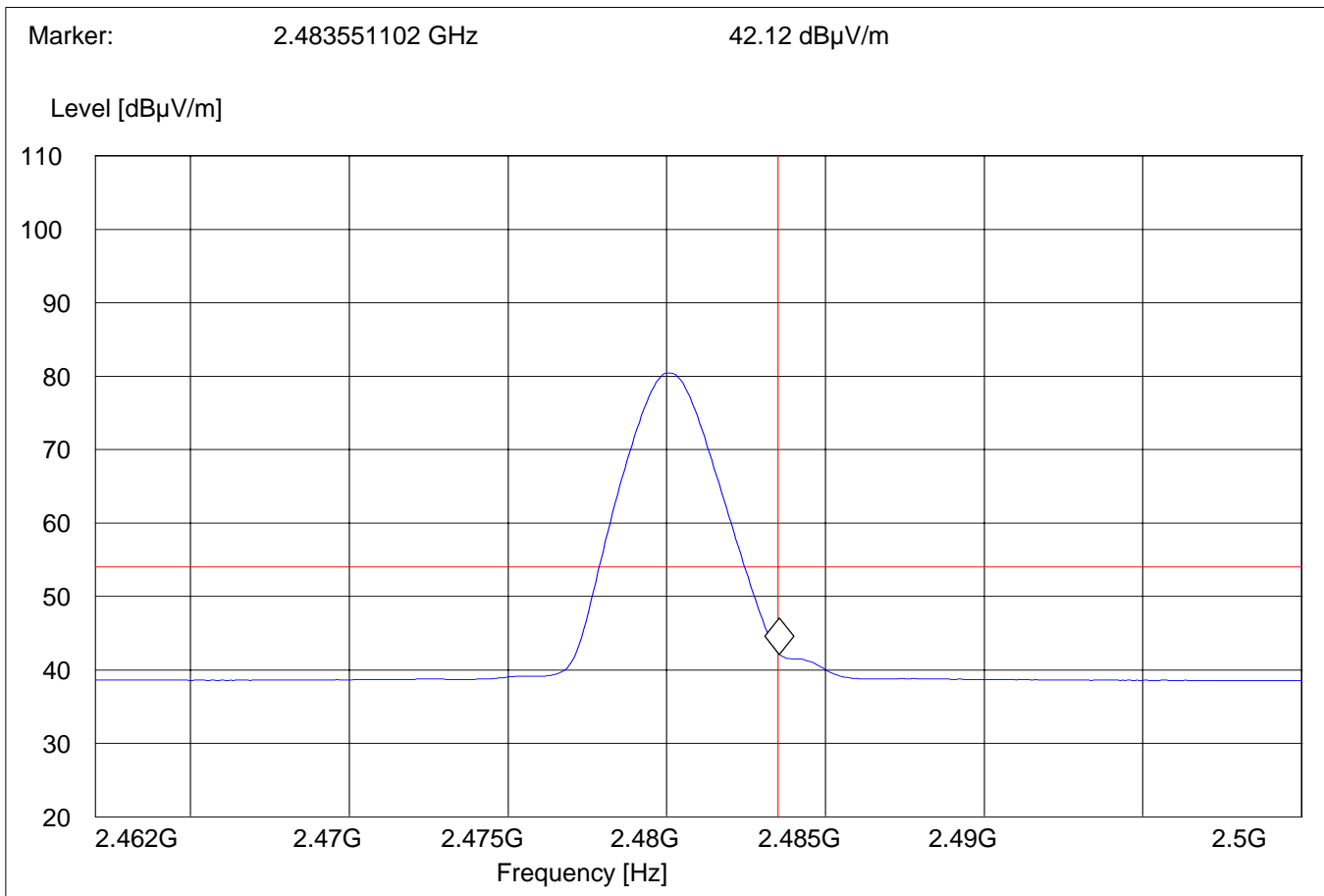
**High frequency section (spurious in the restricted band 2483.5 – 2500 MHz)**

**Average Measurement**

**(This plot is valid for both Hopping ON & OFF)**

Operating condition : Tx at 2480MHz  
 SWEEP TABLE : "FCC15.247 HBE\_AVG"  
 Short Description : FCC15.247 BT High-band-edge  
 Limit Line : 54dB $\mu$ V

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)

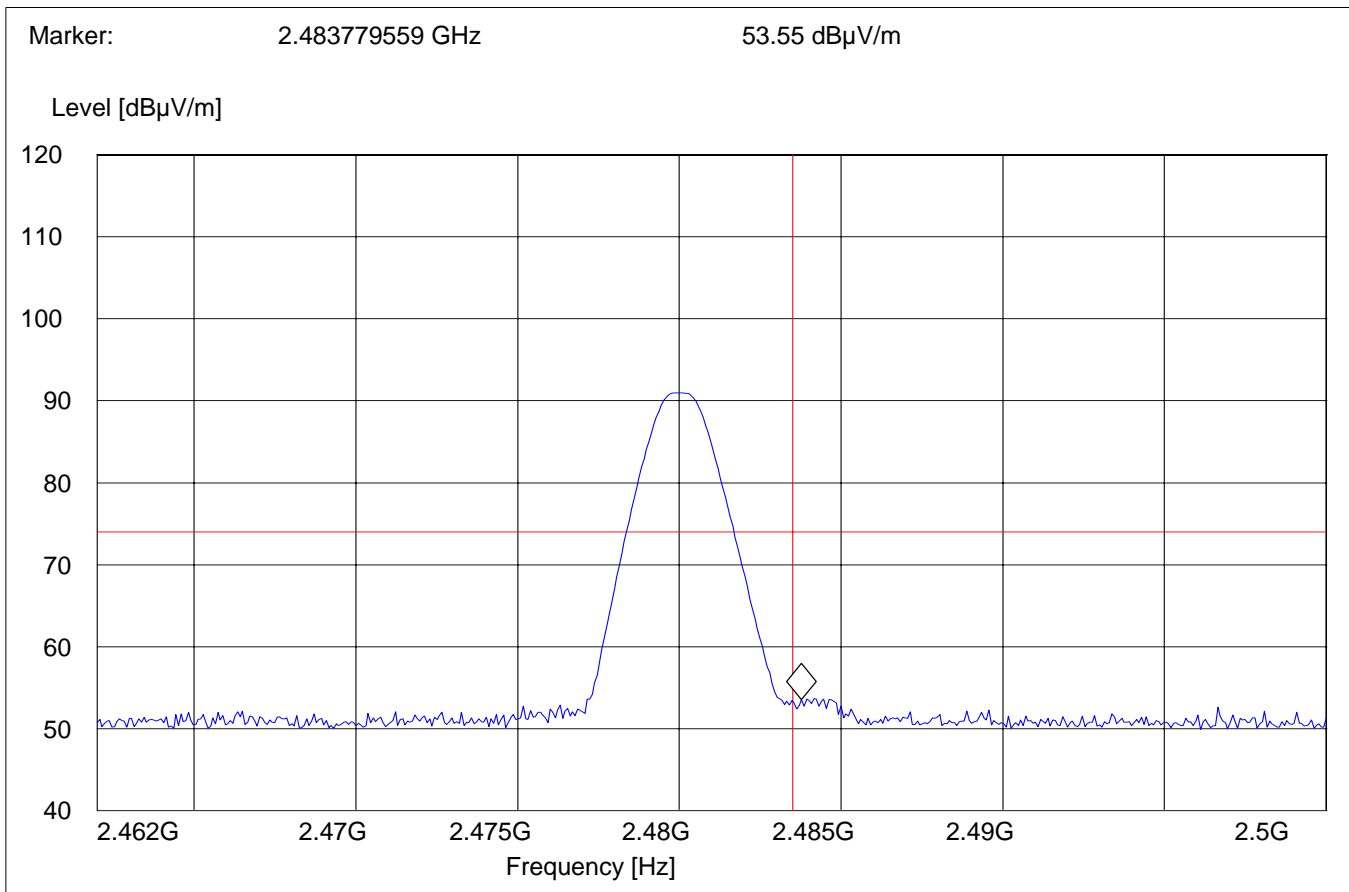
**High frequency section (spurious in the restricted band 2483.5 – 2500 MHz)**

**Peak Measurement**

**(This plot is valid for both Hopping ON & OFF)**

Operating condition : Tx at 2480MHz  
 SWEEP TABLE : "FCC15.247 HBE\_PK"  
 Short Description : FCC15.247 BT High-band-edge  
 Limit Line : 74dB $\mu$ V

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 that 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. Frequency resolution is not fine enough to show the exact frequency of the carrier, refer to plots under EIRP.
3. All measurements are done in peak mode unless specified with 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)

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

<b>Transmit at Lowest channel Frequency 2402MHz</b>			
<b>Frequency (MHz)</b>	<b>Level (dBµV/m)</b>		
	<b>Peak</b>	<b>Quasi-Peak</b>	<b>Average</b>
See plots			
<b>Transmit at Middle channel Frequency 2441MHz</b>			
<b>Frequency (MHz)</b>	<b>Level (dBµV/m)</b>		
	<b>Peak</b>	<b>Quasi-Peak</b>	<b>Average</b>
See plots			
<b>Transmit at Highest channel Frequency 2480MHz</b>			
<b>Frequency (MHz)</b>	<b>Level (dBµV/m)</b>		
	<b>Peak</b>	<b>Quasi-Peak</b>	<b>Average</b>
See plots			



**EMISSION LIMITATIONS - Radiated (Transmitter)**

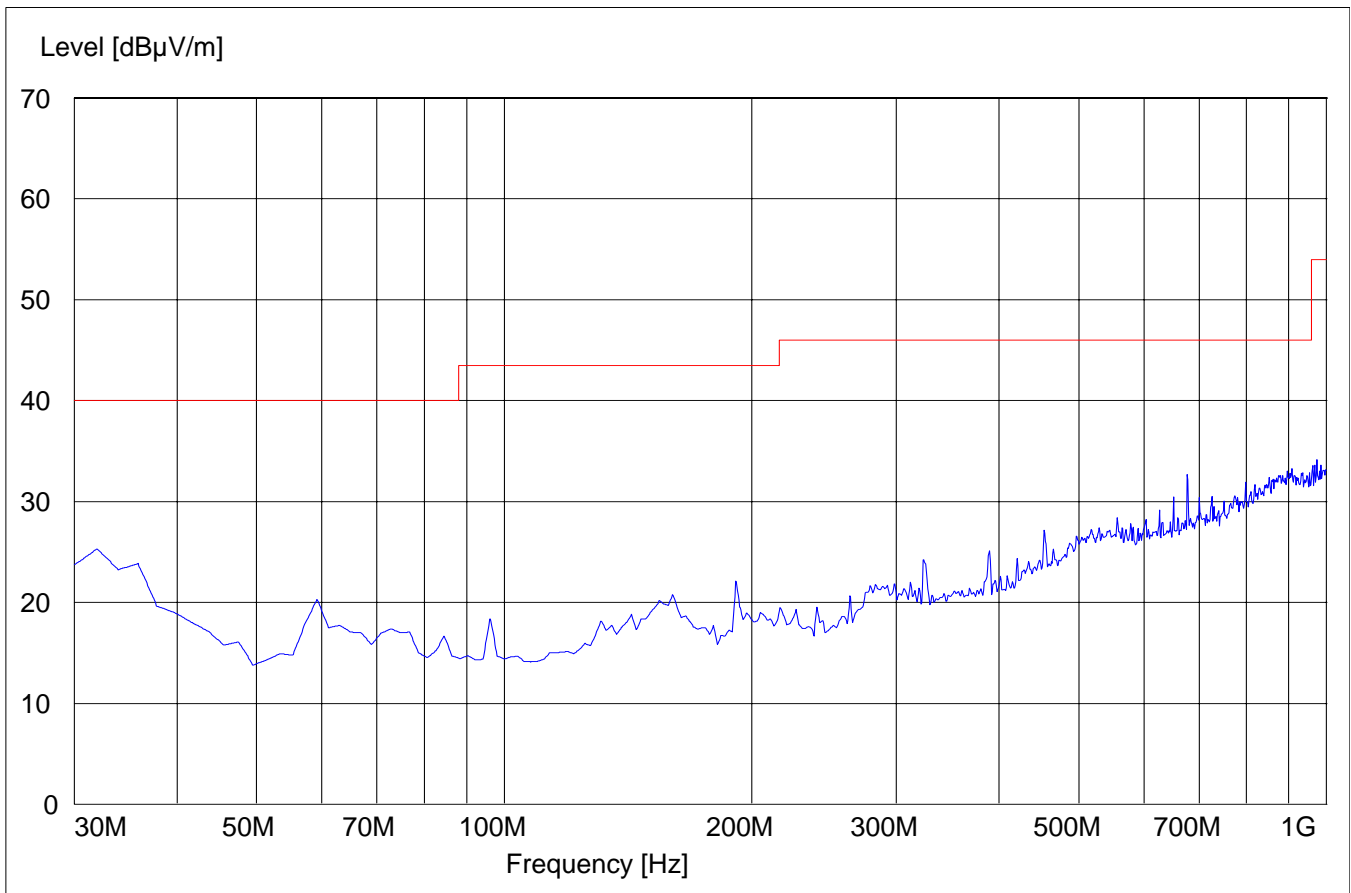
**§ 15.247 (c) (1)**

**30MHz – 1GHz**

**Antenna: vertical**

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

SWEEP TABLE:		"BT Spuri hi 30-1G"			
Short Description:		Bluetooth 30MHz-1GHz			
Start	Stop	Detector	Meas. Time	RBW	Transducer
Frequency	Frequency			VBW	
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	3141-#1186



**EMISSION LIMITATIONS - Radiated (Transmitter)**

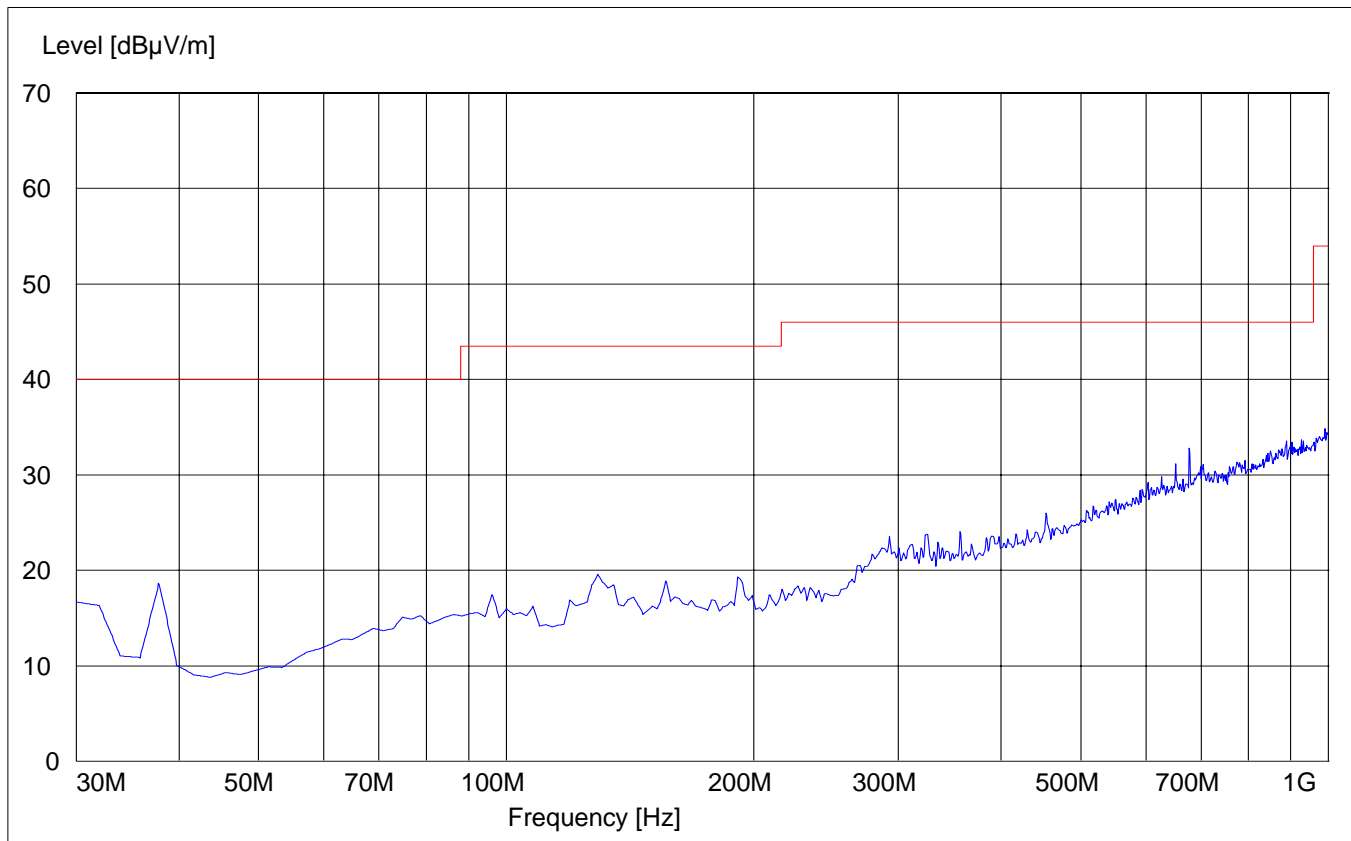
§ 15.247 (c) (1)

**30MHz – 1GHz**

**Antenna: horizontal**

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

SWEEP TABLE:		"BT Spuri hi 30-1G"			
Short Description:		Bluetooth 30MHz-1GHz			
Start	Stop	Detector	Meas.	RBW	Transducer
Frequency	Frequency		Time	VBW	
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	3141-#1186

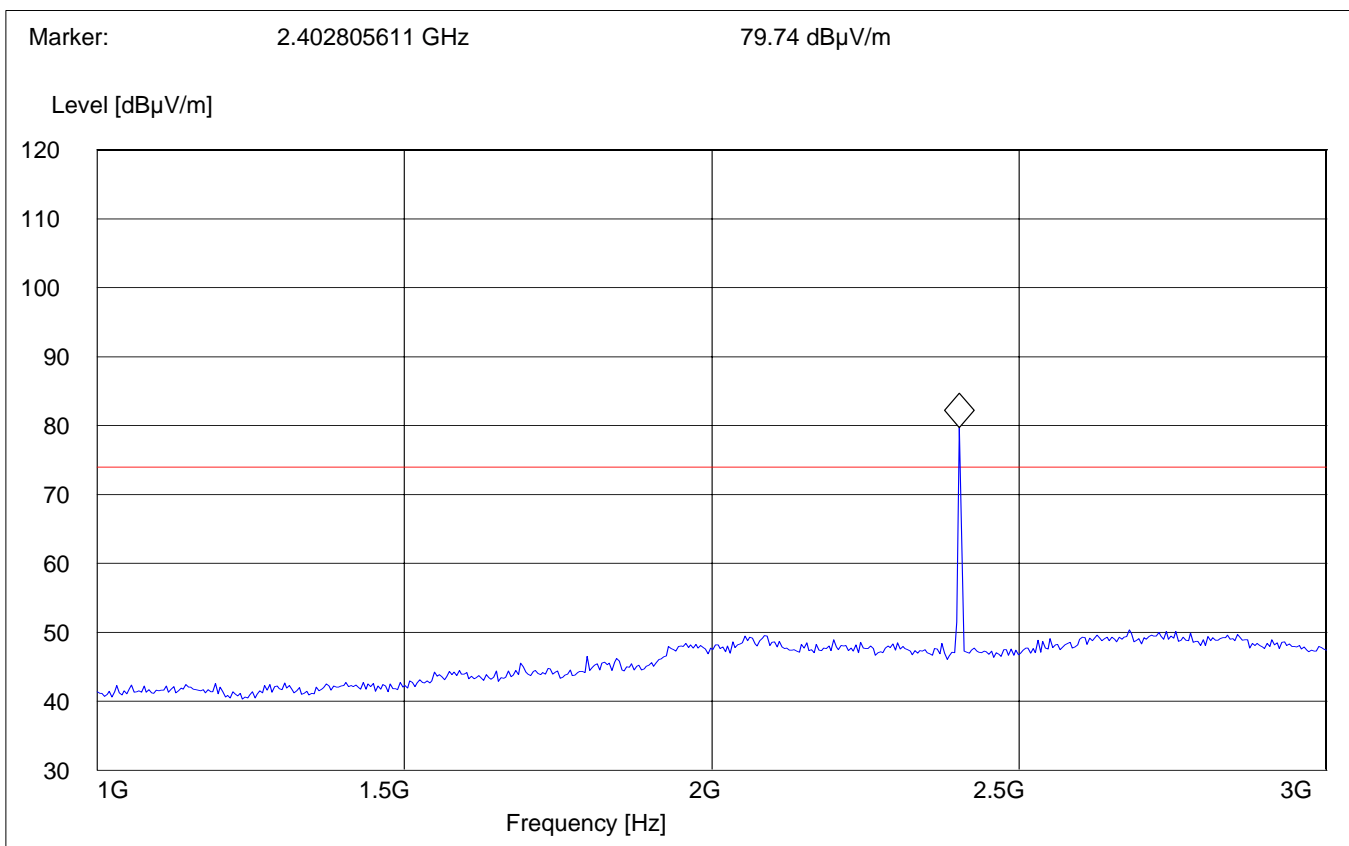


**EMISSION LIMITATIONS - Radiated (Transmitter)**  
**Lowest Channel (2402MHz): 1GHz – 3GHz**

§ 15.247 (c) (1)

**NOTE: The peak above the limit is the carrier frequency.**

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

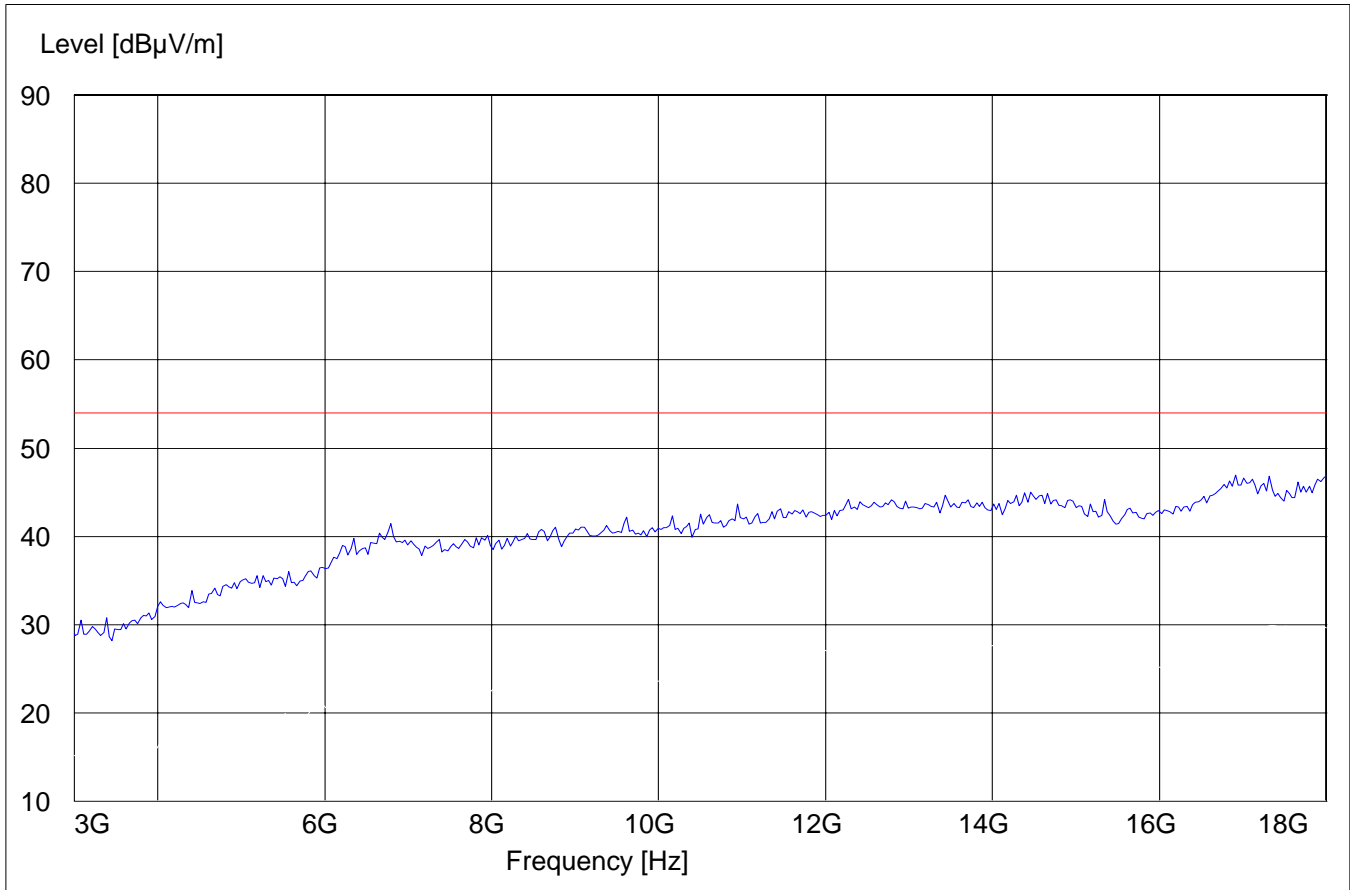


**EMISSION LIMITATIONS - Radiated (Transmitter)**

§ 15.247 (c) (1)

**Lowest Channel (2402MHz): 3GHz – 18GHz**

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

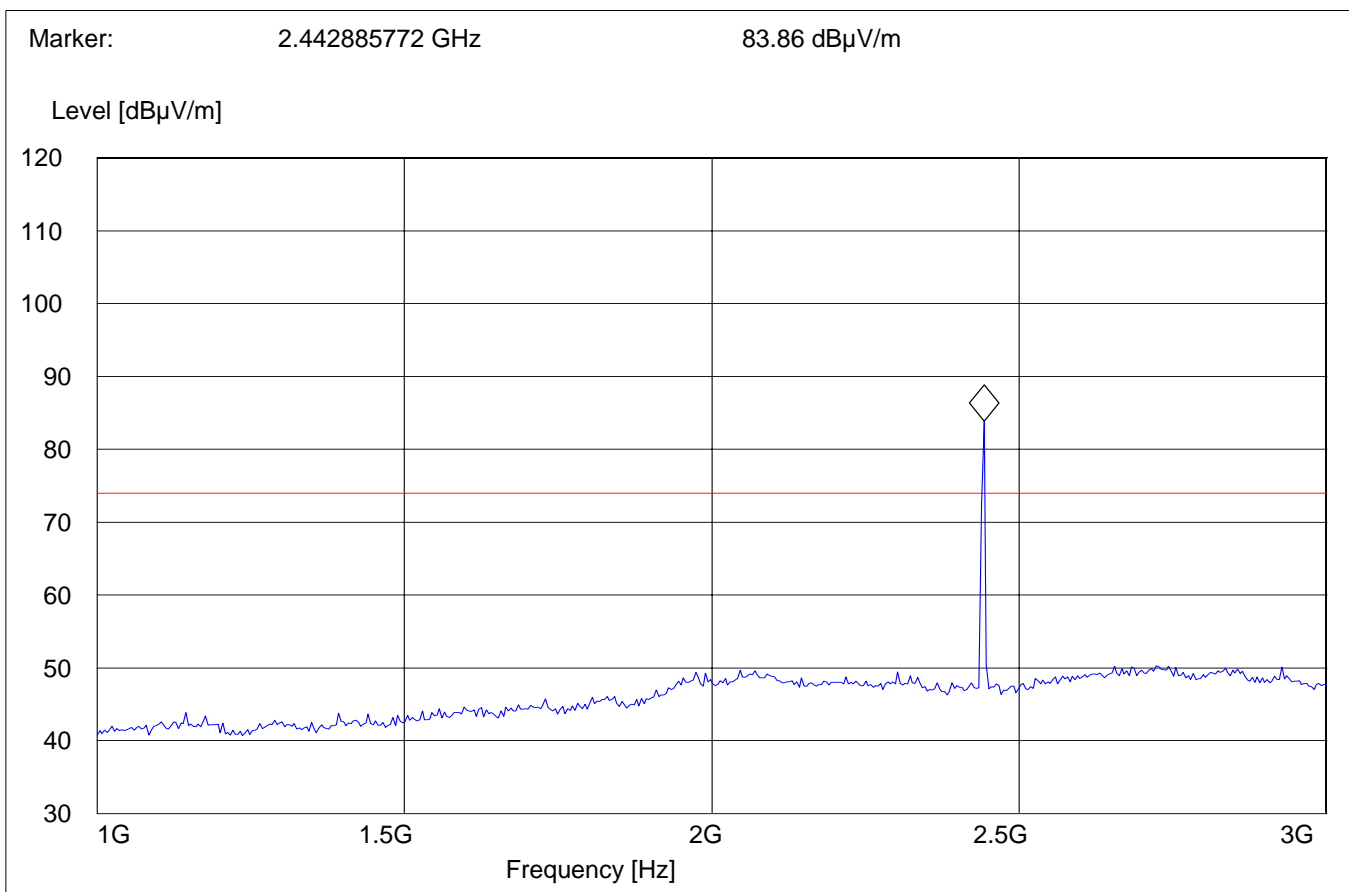


**EMISSION LIMITATIONS - Radiated (Transmitter)**  
**Middle Channel (2441MHz): 1GHz – 3GHz**

§ 15.247 (c) (1)

**NOTE: The peak above the limit is the carrier frequency.**

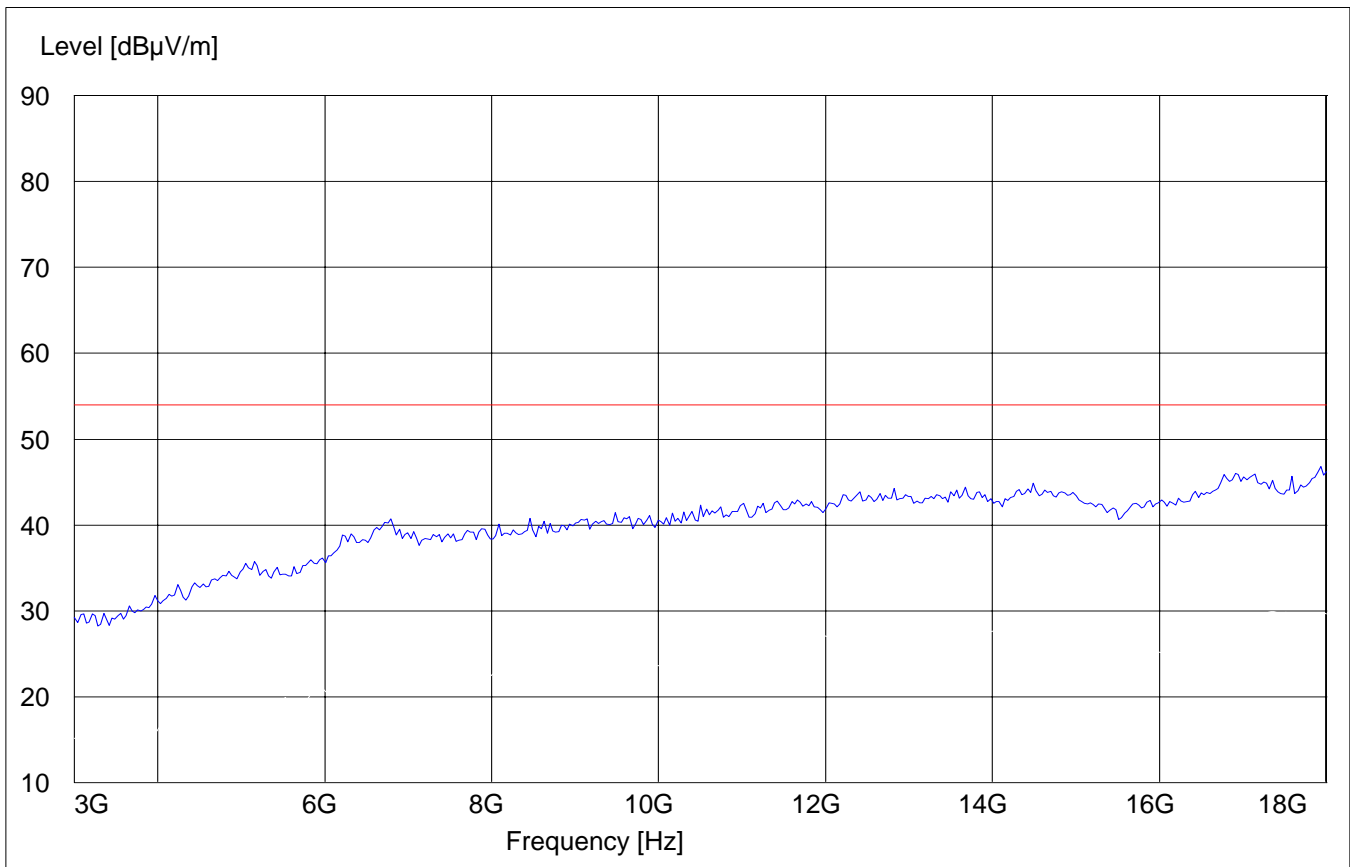
SWEEP TABLE:		"BT Spuri hi 1-3G"			
Short Description:		Bluetooth Spurious 1-3GHz			
Start	Stop	Detector	Meas.	RBW	Transducer
Frequency	Frequency	Time	Bandw.	VBW	
1.0 GHz	3.0 GHz	MaxPeak	Coupled	1 MHz	#326 horn (dBi)



**EMISSION LIMITATIONS - Radiated (Transmitter)**  
**Middle Channel (2441MHz): 3GHz – 18GHz**

§ 15.247 (c) (1)

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

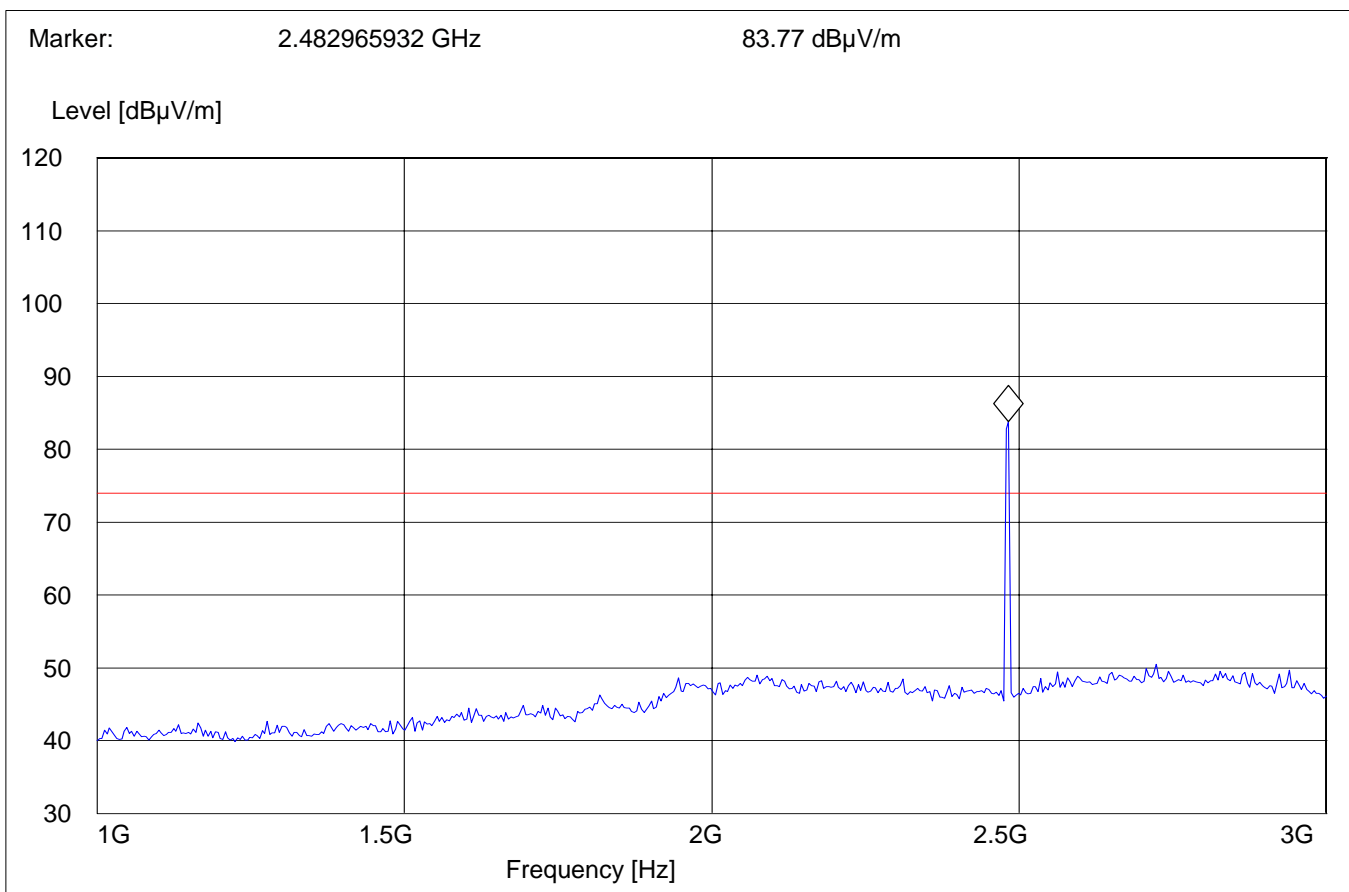


**EMISSION LIMITATIONS - Radiated (Transmitter)**  
**Highest Channel (2480MHz): 1GHz – 3GHz**

§ 15.247 (c) (1)

**NOTE: The peak above the limit is the carrier frequency.**

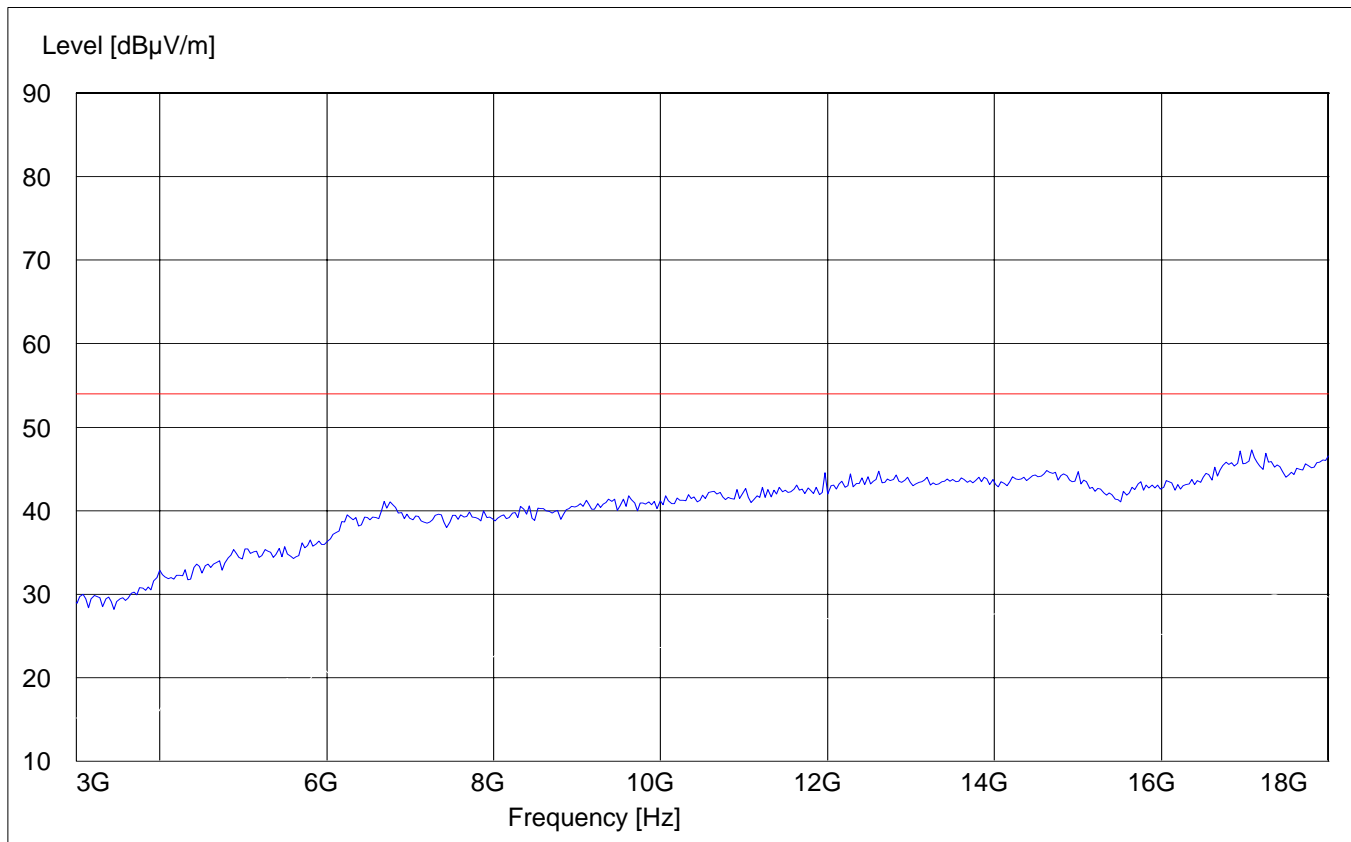
SWEEP TABLE:		"BT Spuri hi 1-3G"			
Short Description:		Bluetooth Spurious 1-3GHz			
Start	Stop	Detector	Meas.	RBW	Transducer
Frequency	Frequency	Time	Bandw.	VBW	
1.0 GHz	3.0 GHz	MaxPeak	Coupled	1 MHz	#326 horn (dBi)



**EMISSION LIMITATIONS - Radiated (Transmitter)**  
**Highest Channel (2480MHz): 3GHz – 18GHz**

§ 15.247 (c) (1)

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





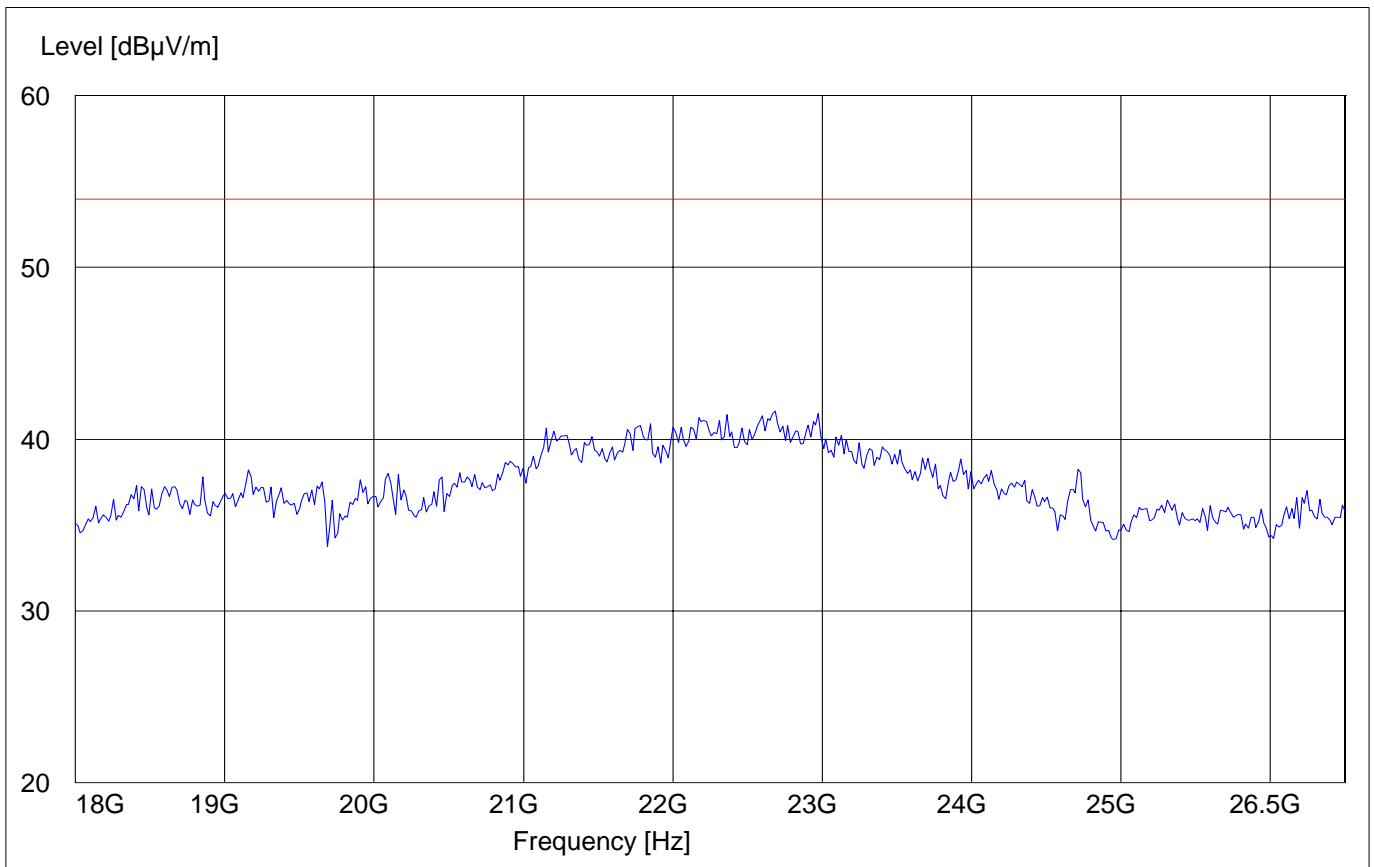
## EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.247 (c) (1)

18GHz – 26.5GHz

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

SWEEP TABLE:		"BT Spuri hi 18-26.5G"			
Short Description:		Bluetooth Spurious 18-26.5GHz			
Start	Stop	Detector	Meas.	RBW	Transducer
Frequency	Frequency	Time	Bandw.	VBW	
18 GHz	26.5 GHz	MaxPeak	Coupled	1 MHz	#141 horn (dBi)



**CONDUCTED EMISSIONS**

§ 15.107/207

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

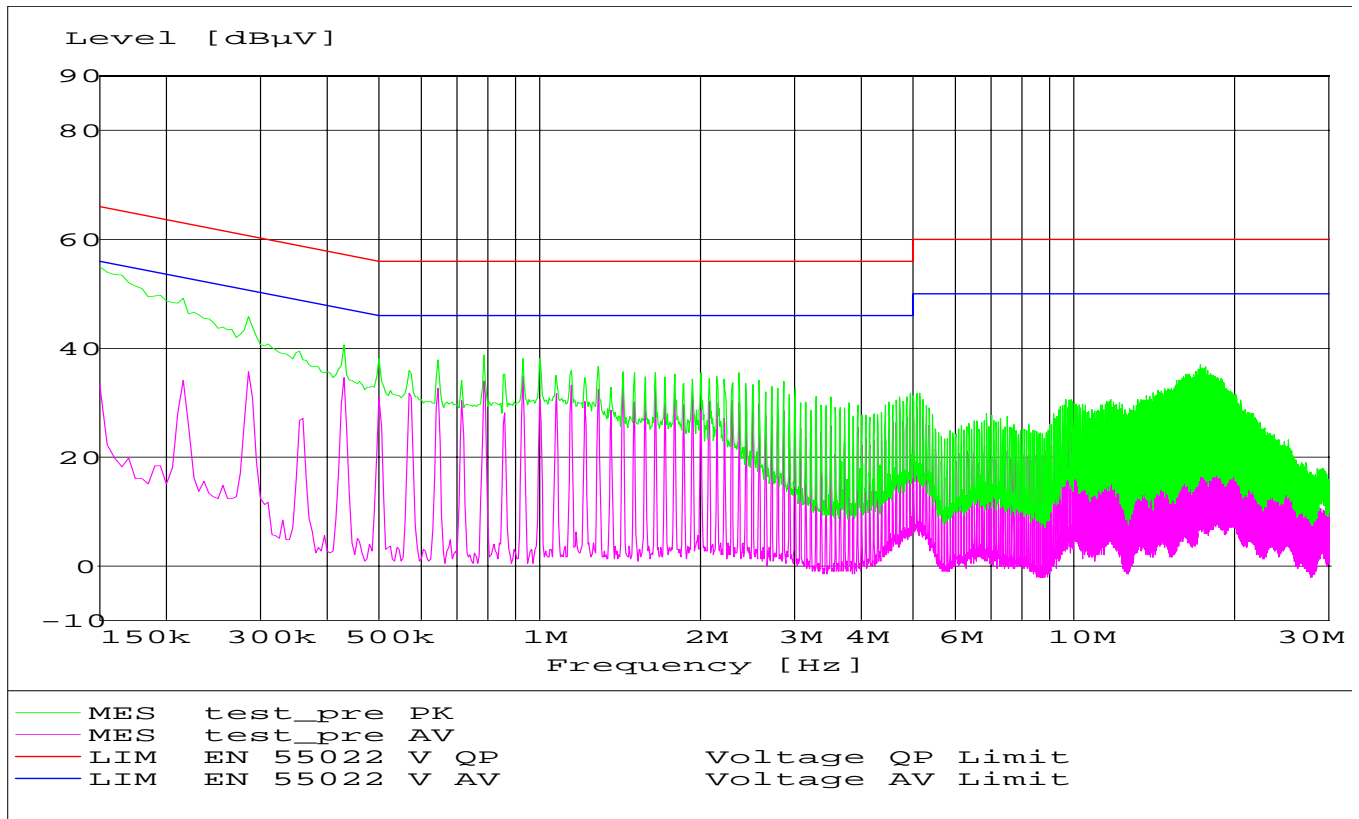
**Limit**

Frequency of Emission (MHz)	Conducted Limit (dB $\mu$ V)	
	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



**RECEIVER SPURIOUS RADIATION**

§ 15.209

**Limits**

<b>Frequency (MHz)</b>	<b>Field strength (<math>\mu\text{V/m}</math>)</b>	<b>Measurement distance (m)</b>
<b>0.009 - 0.490</b>	<b>2400/F(kHz)</b>	<b>300</b>
<b>0.490 - 1.705</b>	<b>24000/F(kHz)</b>	<b>30</b>
<b>1.705 - 30.0</b>	<b>30</b>	<b>30</b>
<b>30 - 88</b>	<b>100</b>	<b>3</b>
<b>88 - 216</b>	<b>150</b>	<b>3</b>
<b>216 - 960</b>	<b>200</b>	<b>3</b>
<b>above 960</b>	<b>500</b>	<b>3</b>

**NOTE:**

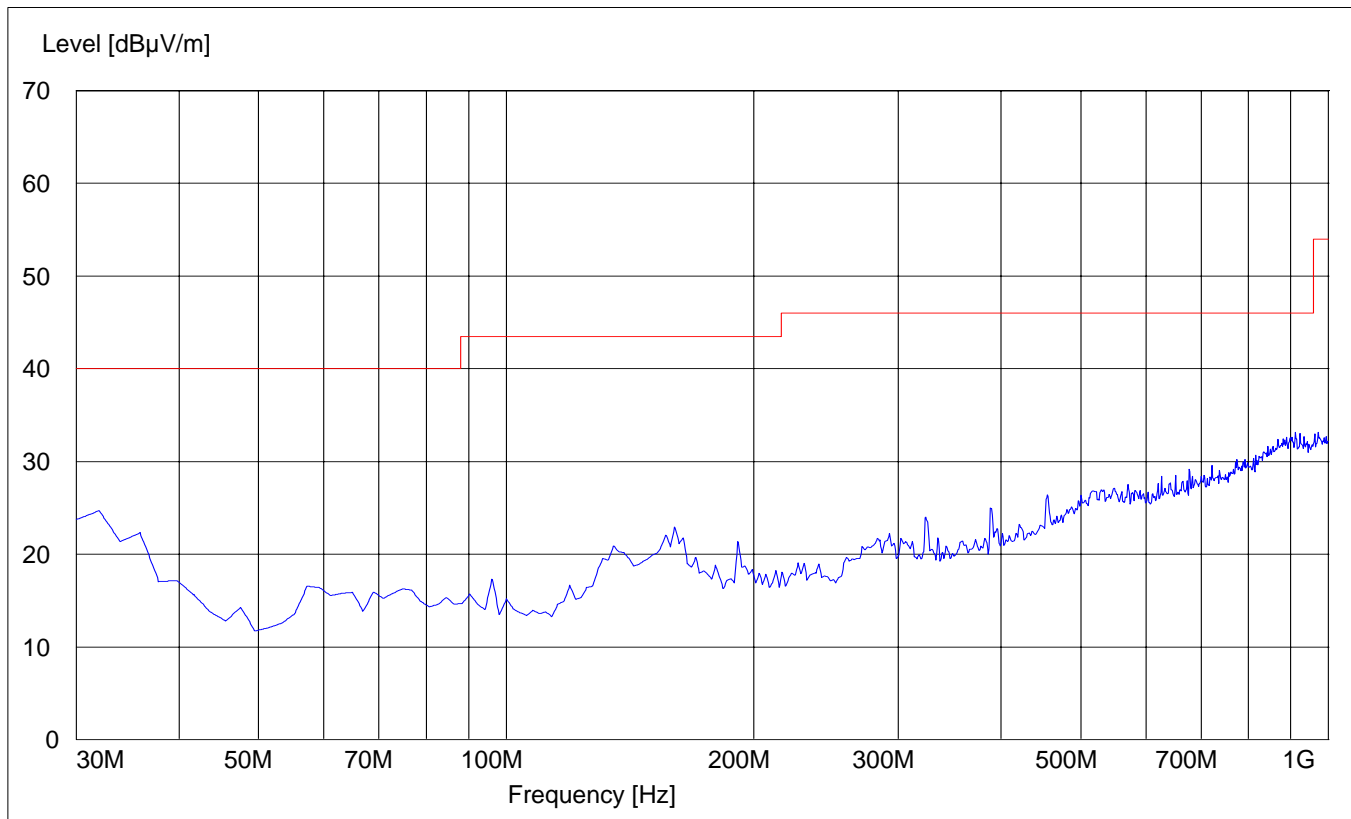
1. The radiated emissions were done with different settings, using the relevant pre-amplifiers for the relevant frequency ranges. This is the reason that the graphs show different noise levels. In the range between 3 and 26.5 GHz very short cable connections to the antenna was used to minimize the noise level.
2. All measurements are done in peak mode unless specified with the plots.

**RECEIVER SPURIOUS RADIATION**

§ 15.209

**30MHz – 1GHz****Antenna: vertical**

SWEEP TABLE:		"BT Spuri hi 30-1G"			
Short Description:		Bluetooth 30MHz-1GHz			
Start	Stop	Detector	Meas.	RBW	Transducer
Frequency	Frequency		Time	VBW	
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	3141-#1186

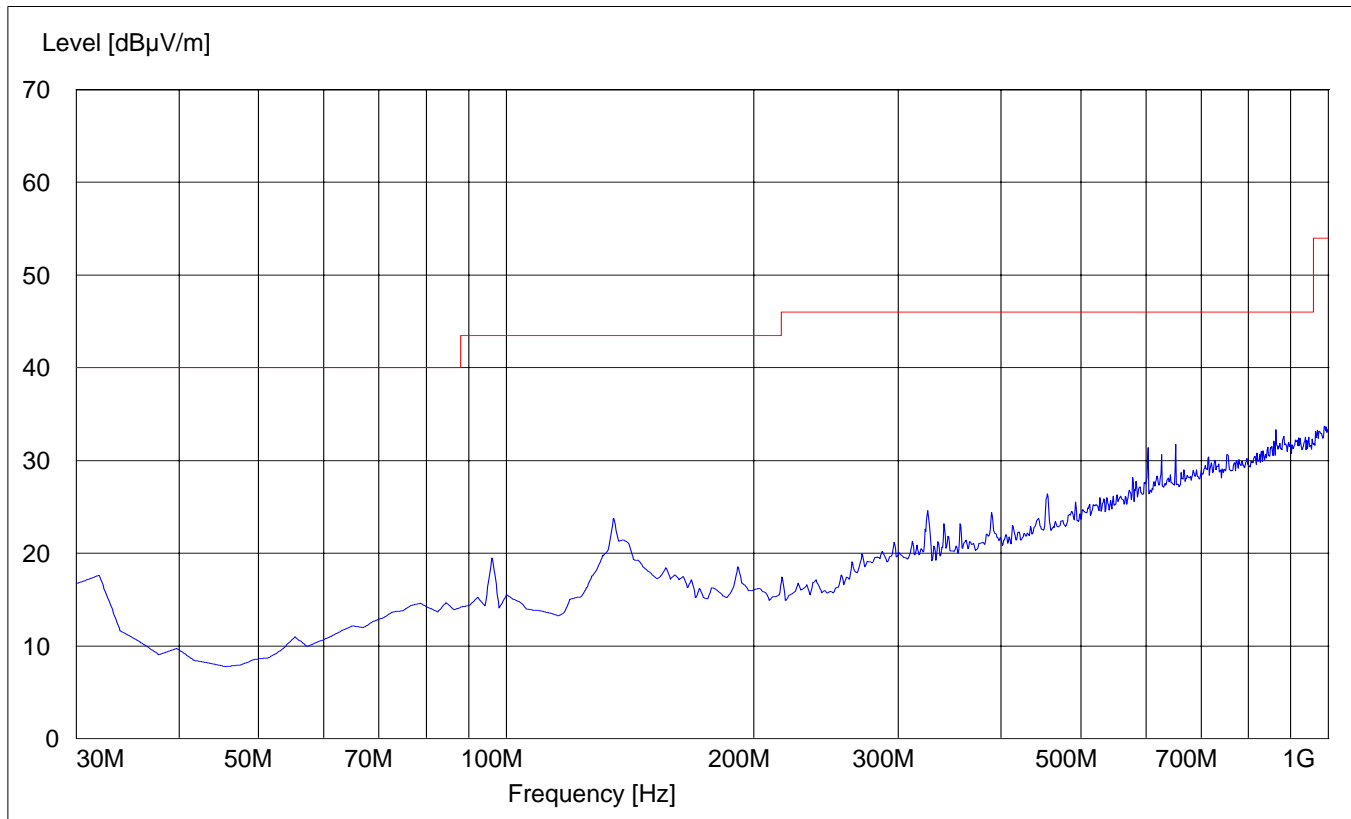


**RECEIVER SPURIOUS RADIATION**

§ 15.209

**30MHz – 1GHz****Antenna: Horizontal**

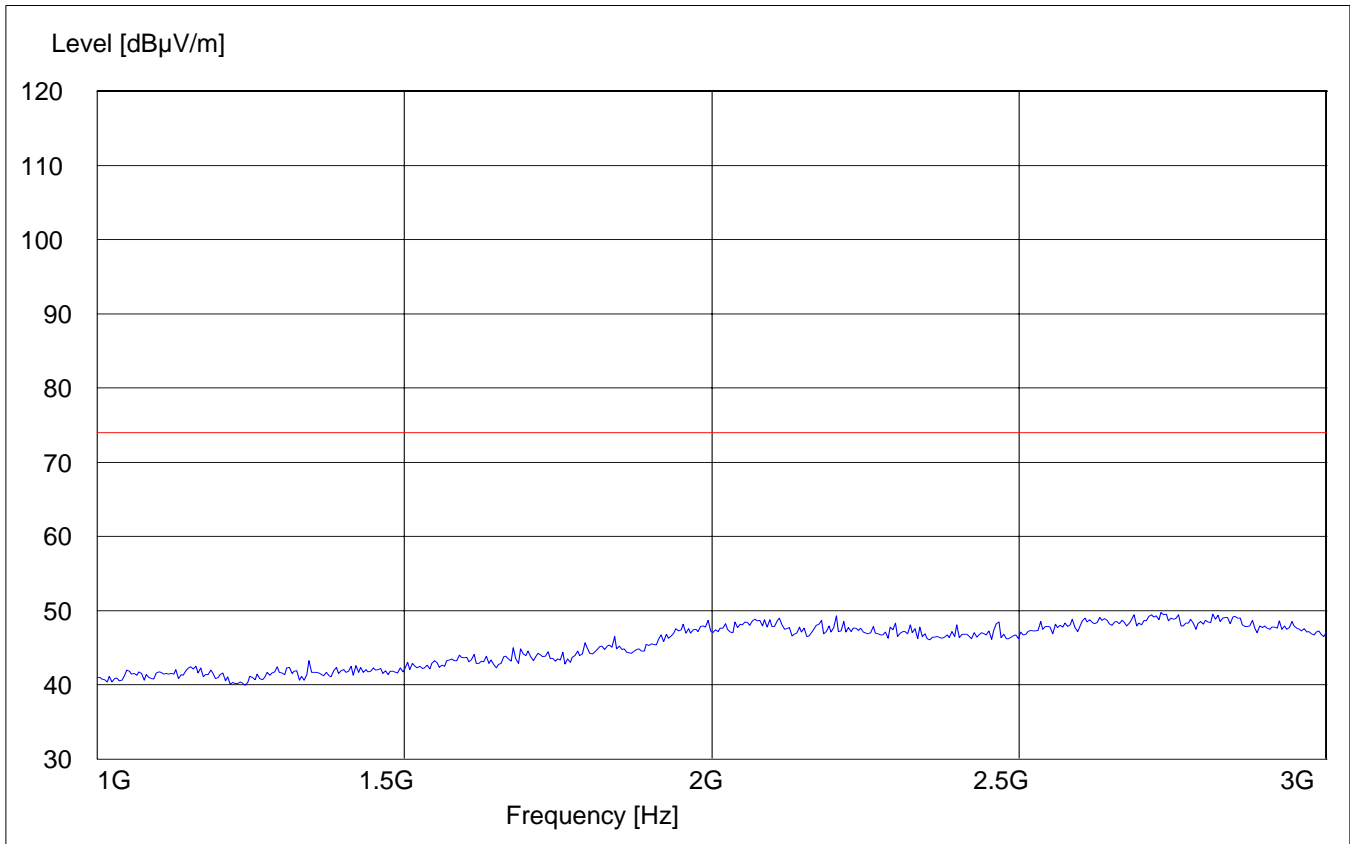
SWEEP TABLE:		"BT Spuri hi 30-1G"			
Short Description:		Bluetooth 30MHz-1GHz			
Start	Stop	Detector	Meas.	RBW	Transducer
Frequency	Frequency		Time	VBW	
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	3141-#1186



**RECEIVER SPURIOUS RADIATION**  
**1GHz – 3GHz**

§ 15.209

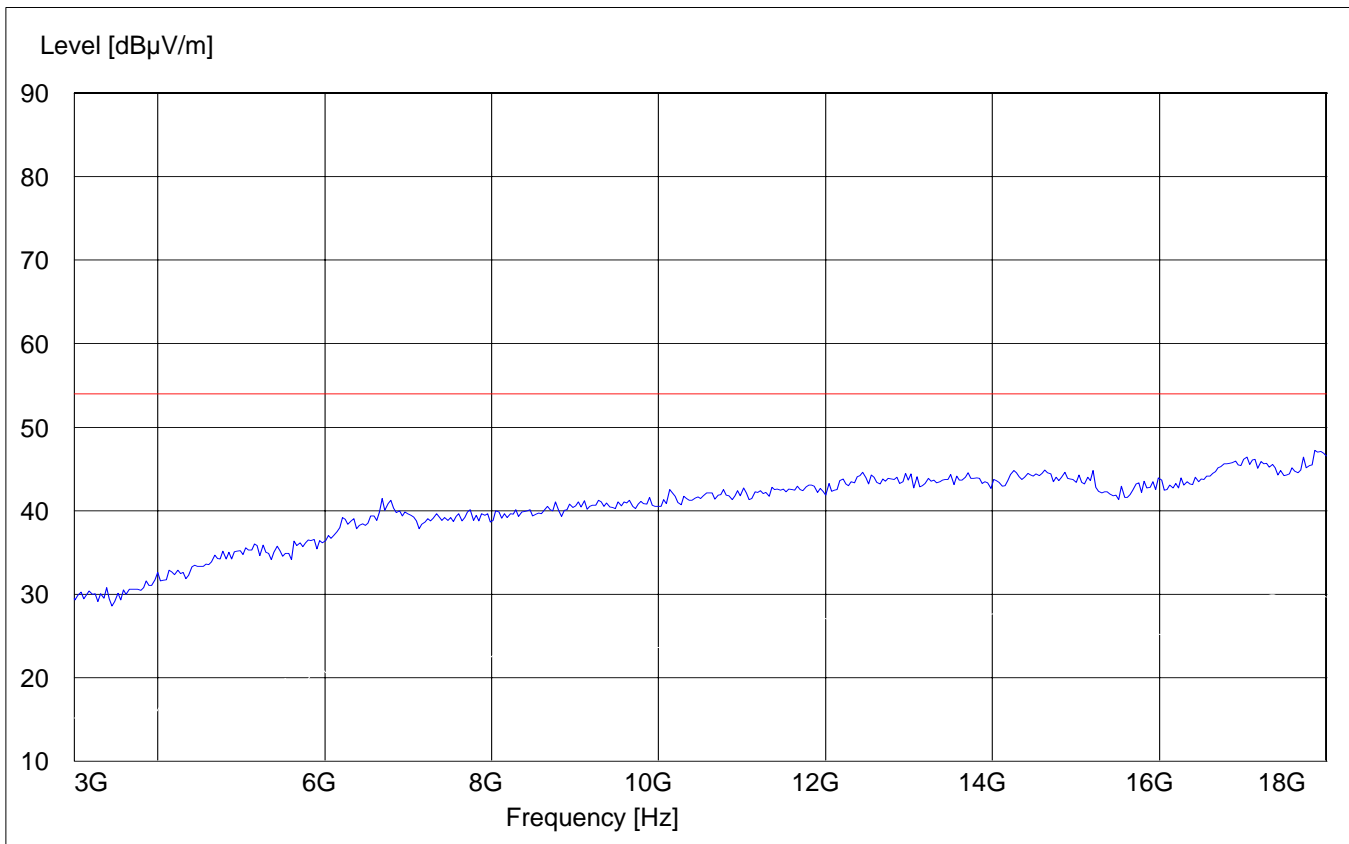
SWEEP TABLE:		"BT Spuri hi 1-3G"			
Short Description:		Bluetooth Spurious 1-3GHz			
Start	Stop	Detector	Meas.	RBW	Transducer
Frequency	Frequency	Time	Bandw.	VBW	
1.0 GHz	3.0 GHz	MaxPeak	Coupled	1 MHz	#326 horn (dBi)



**RECEIVER SPURIOUS RADIATION  
3GHz – 18GHz**

§ 15.209

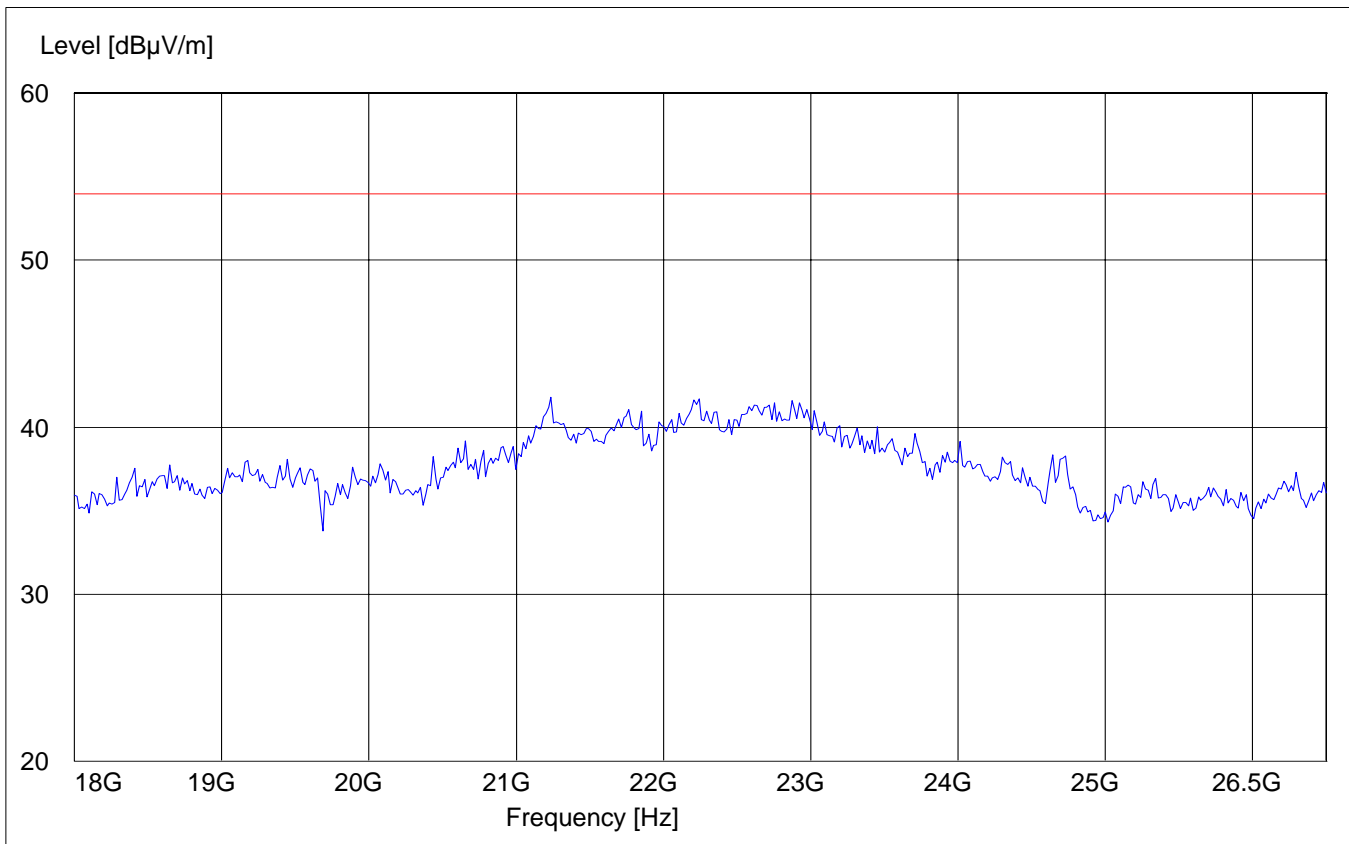
SWEEP TABLE:		"BT Spuri hi 3-18G"			
Short Description:		Bluetooth Spurious 3-18 GHz			
Start	Stop	Detector	Meas.	RBW	Transducer
Frequency	Frequency	Time	Bandw.	VBW	
3.0 GHz	18.0 GHz	MaxPeak	Coupled	1 MHz	#326 horn (dBi)



**RECEIVER SPURIOUS RADIATION**  
**18GHz – 26.5GHz**

§ 15.209

SWEEP TABLE:		"BT Spuri hi 18-26.5G"			
Short Description:		Bluetooth Spurious 18-26.5GHz			
Start	Stop	Detector	Meas.	RBW	Transducer
Frequency	Frequency	Time	Bandw.	VBW	
18.0 GHz	26.5 GHz	MaxPeak	Coupled	1 MHz	#326 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	Pre-Amplifier	TS-ANA	Rohde & Schwarz	--
08	Pre-Amplifier	JS4-00102600	Miteq	00616

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

**ANECHOIC CHAMBER**

