



FCC Test Report

Test report no.: EMC_453_FCC15.247_2003

FCC Part 15.247 for DSSS systems / CANADA RSS-210 for DSSS systems

EUT: WLAN

HOST: Dell Laptop

Model: BCM94306MP

Model: PPT

FCC ID: QDS-BRCM1005-D



TTI-P-G 081/94-A0
Accredited according to ISO/IEC 17025



FCC listed # 101450
IC recognized # 3925

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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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E-mail: lothar.schmidt@cetecomusa.com

Internet: www.cetecom.com

1.3 Details of applicant

Name : **Broadcom corporation**
Street : **190 Mathilda Place**
City / Zip Code : **Sunnyvale, CA 94086**
Country : **USA**
Contact : **Chris McGough**
Telephone : **408-922-5810**
Tele-fax : **408-543-3399**
e-mail : **cmcgough@broadcom.com**

1.4 Application details

Date of receipt of application : 2003-04-01
Date of receipt test item : 2003-04-03
Date of test : 2003-04-03

1.5 Test item

Manufacturer : Applicant
Model No.(EUT) : BCM94306MP
Model No.(Host) : Dell Laptop PC Model No: PPT
Description : **54g wireless LAN mini PCI card in Dell Laptop**
FCC ID : QDS-BRCM1005-D

Additional information

Frequency : 2412MHz – 2462MHz for 54g
Type of modulation : DSSS / OFDM (orthogonal frequency division multiplexing)
Number of channels : 11
Power supply : 3.3 VDC from Host
Antenna : 2.55dBi max. gain antenna by Wistron NeWeb
Output power : 25.55dBm (359mW) conducted peak power

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

Note: This test report covers all radiated measurements and AC line conducted emissions for new Host Laptop. No conducted measurements were done except conducted peak power to ensure transmitter functionality at maximum power level.

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
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Technical responsibility for area of testing:

2003-04-25 EMC & Radio Lothar Schmidt (Manager)



Date

Section

Name

Signature

Responsible for test report and project leader:

2003-04-25 EMC & Radio Harpreet Sidhu (EMC Engineer)



Date

Section

Name

Signature

2.2 Test report

TEST REPORT

Test report no.: EMC_453_FCC15.247_2003

FCC ID: QDS-BRCM1005-D

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
$T_{\text{nom}}(23)^\circ\text{C}$	$V_{\text{nom}}(3.3)\text{VDC}$	25.55	24.48	24.11
Measurement uncertainty		$\pm 0.5\text{dBm}$		

RBW / VBW: 10 MHz

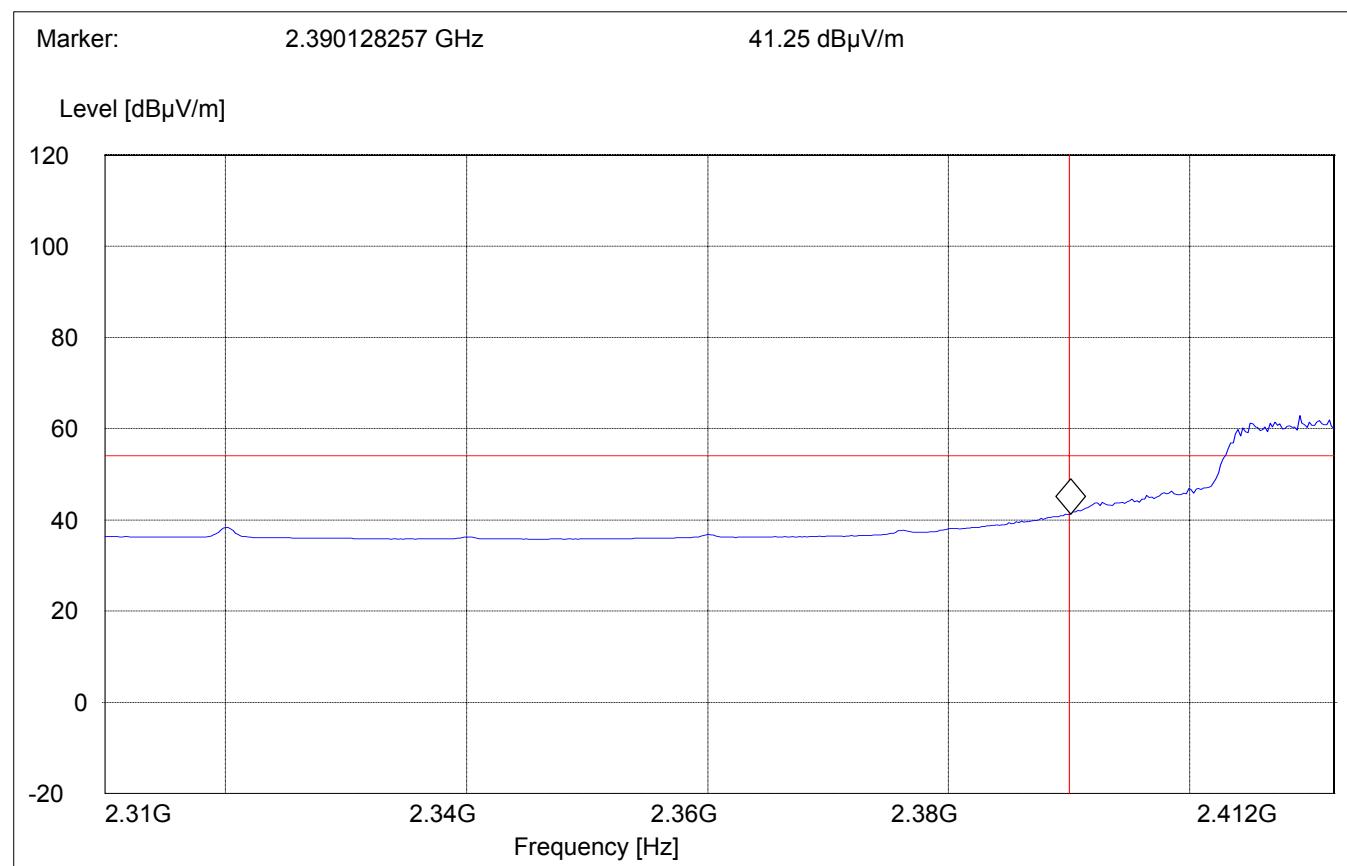
LIMIT**SUBCLAUSE § 15.247 (b) (1)**

Frequency range	RF power output
2400-2483.5 MHz	1.0 Watt

BAND EDGE COMPLIANCE**§15.247 (c)****Low frequency section
(Average measurement)**

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

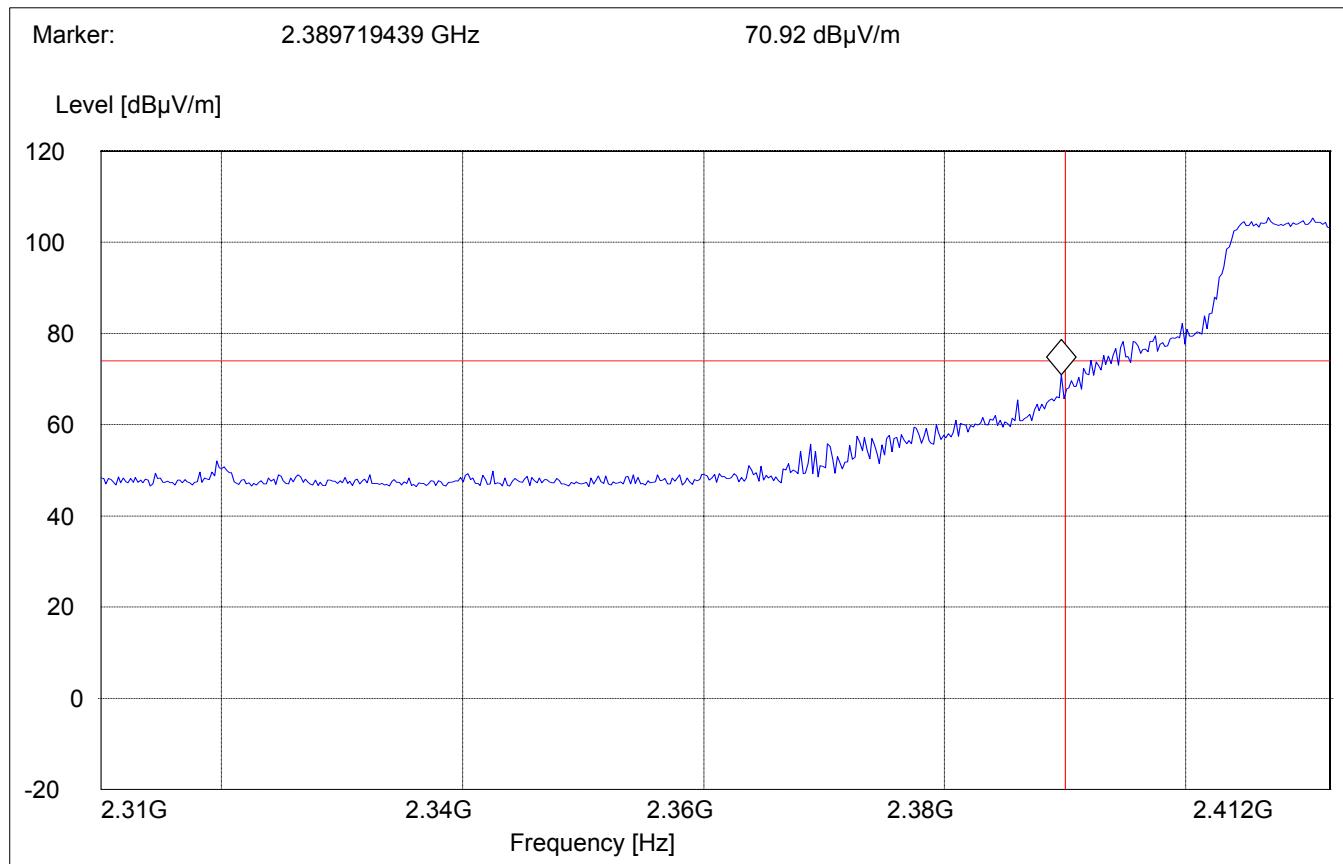
Start Frequency	Stop Frequency	Detector Time	Meas.	RBW	VBW	Transducer
2.31 GHz	2.412 GHz	MaxPeak	Bandw. Coupled	1 MHz	10Hz	#326 horn (dBi)



BAND EDGE COMPLIANCE**§15.247 (c)****Low frequency section****(Peak measurement)**

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

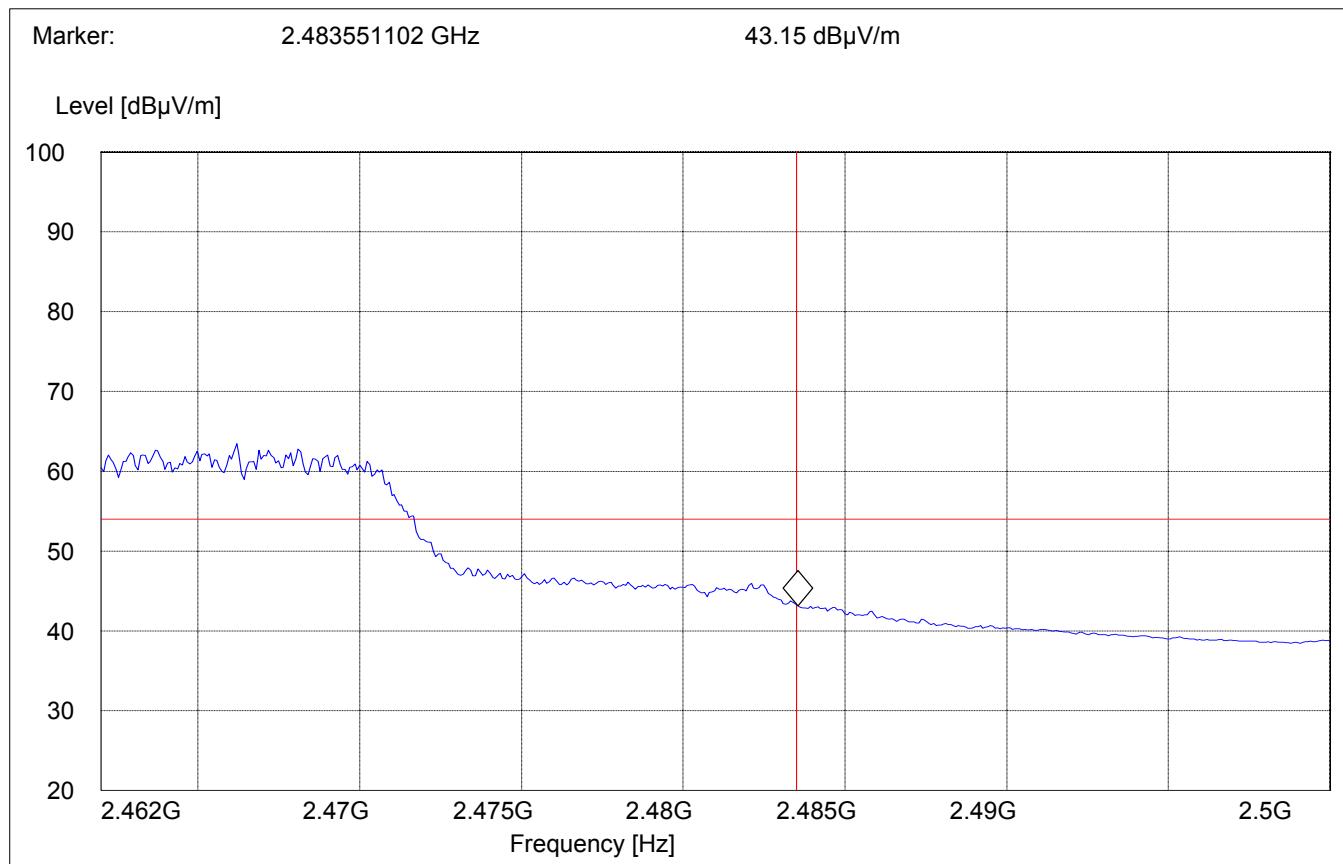
Start Frequency	Stop Frequency	Detector	Meas.	RBW	VBW	Transducer
2.31 GHz	2.412 GHz	Time	Bandw.	1 MHz	1MHz	#326 horn (dBi)
		MaxPeak	Coupled			



BAND EDGE COMPLIANCE**§15.247 (c)****High frequency section****(Average measurement)**

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

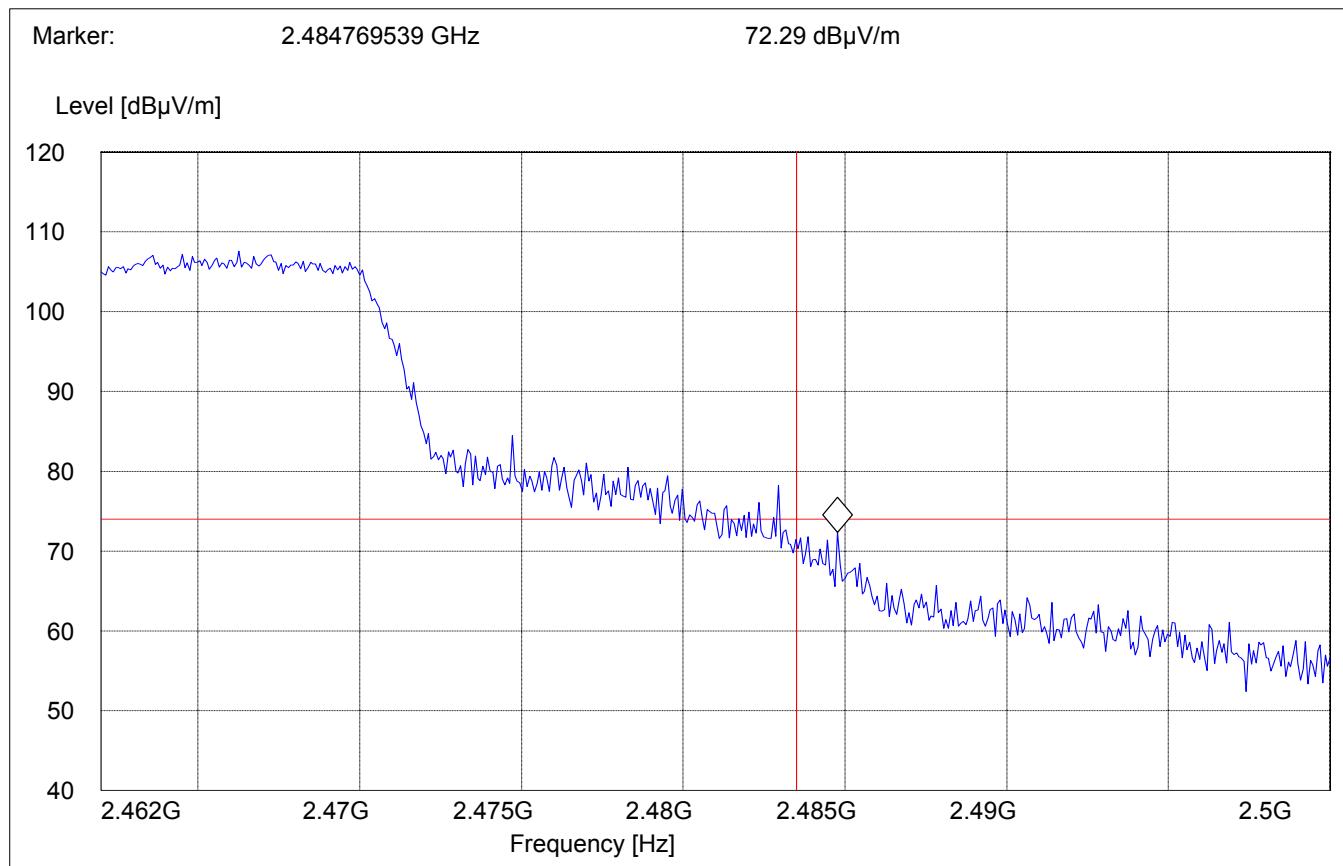
Start Frequency	Stop Frequency	Detector Time	Meas. Bandw.	RBW	VBW	Transducer
2.462 GHz	2.5 GHz	MaxPeak	Coupled	1 MHz	10Hz	#326 horn (dBi)



BAND EDGE COMPLIANCE**§15.247 (c)****High frequency section****(Peak measurement)**

Operating condition : Tx at 2462MHz
SWEEP TABLE : "FCC15.247 HBE_PK"
Limit Line : 74dB μ 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 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 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)****Lowest Channel (2412MHz): 30MHz – 1GHz****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 Frequency

Stop Frequency

Detector

Meas.

RBW

Transducer

30.0 MHz

1.0 GHz

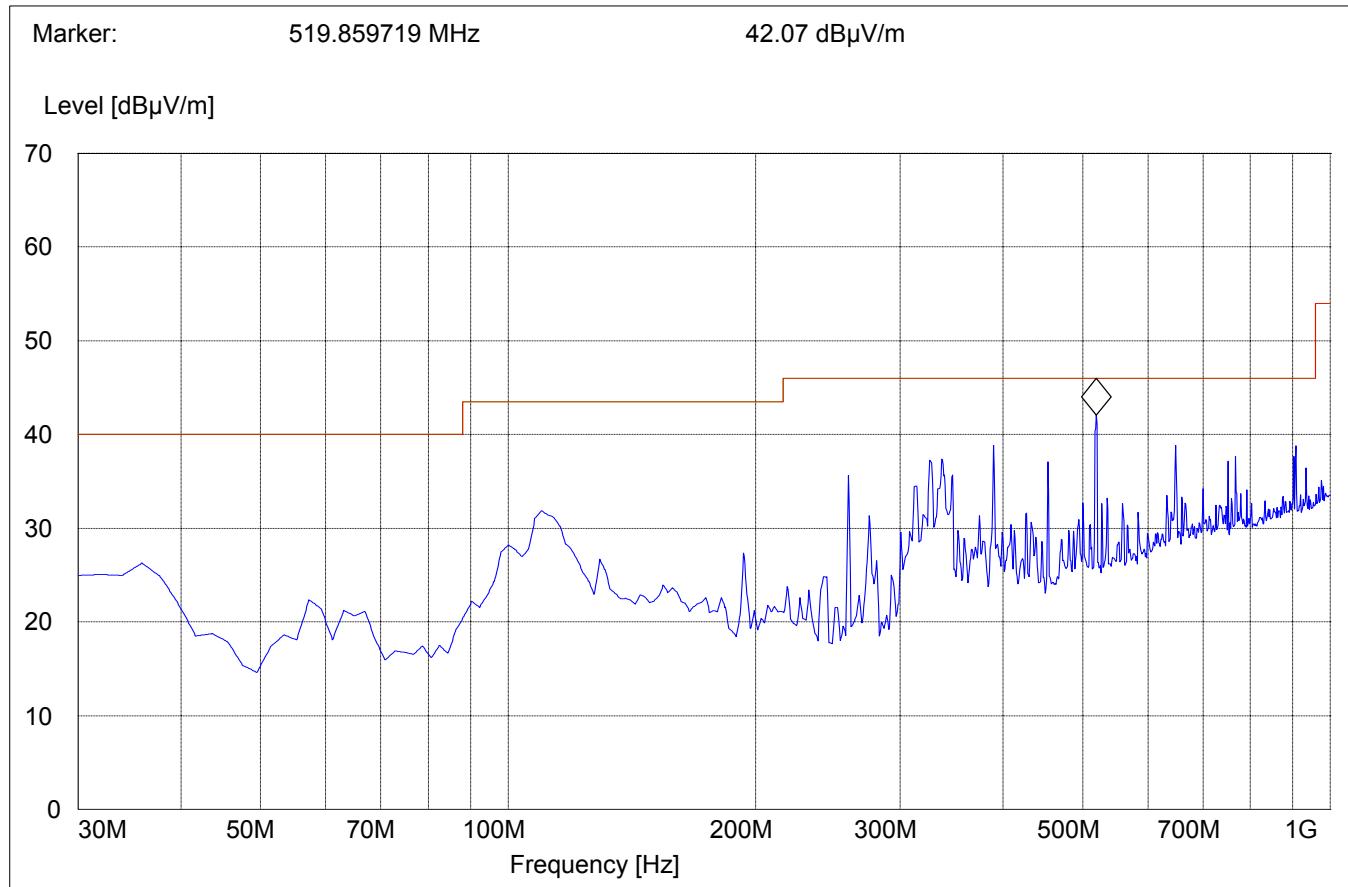
MaxPeak

Time

VBW

100 kHz

3141-#1186

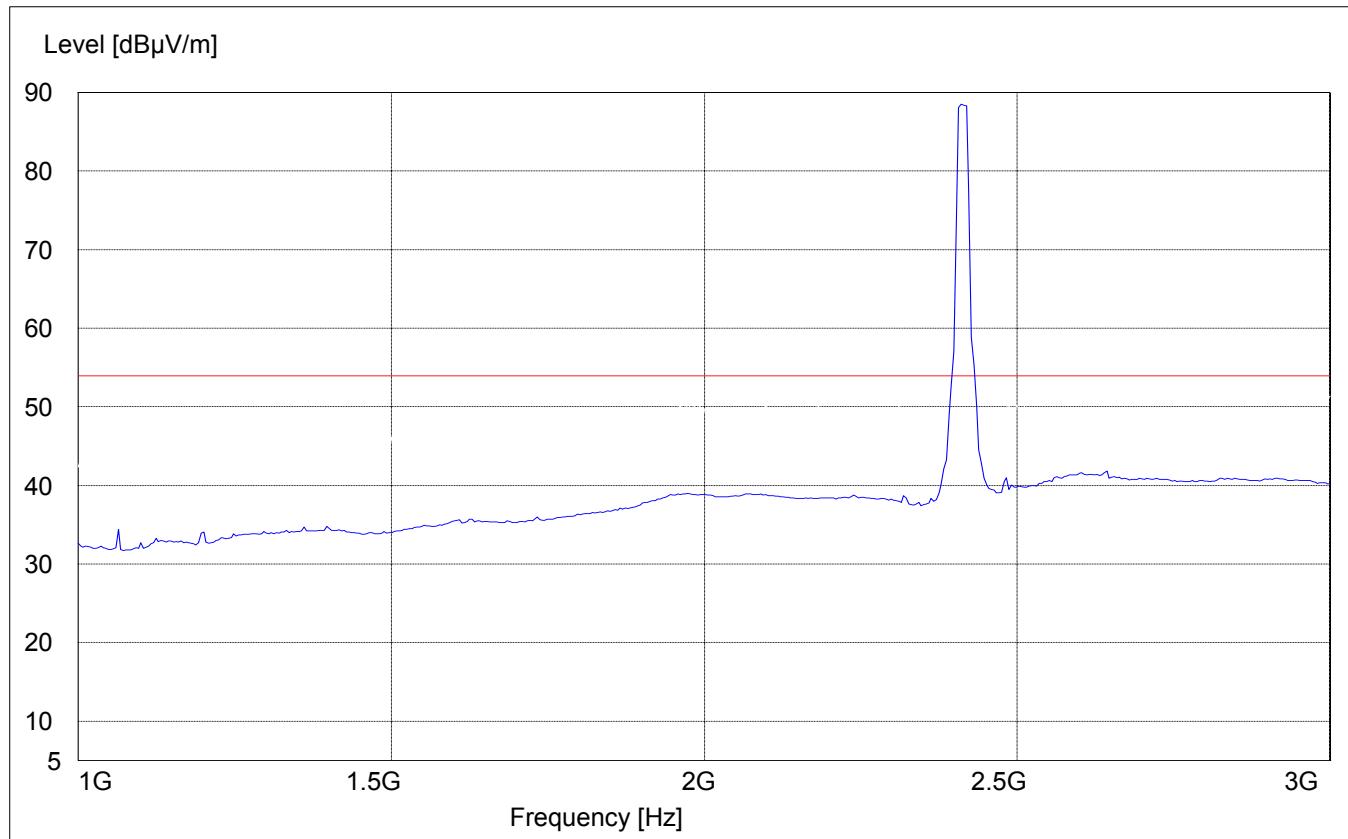


EMISSION LIMITATIONS - Radiated (Transmitter)**§ 15.247 (c) (1)****Lowest Channel (2412GHz): 1GHz – 3GHz****(Average measurement)****NOTE: The peak above the limit is the carrier frequency.**

SWEEP TABLE: "BT Spuri hi 1-3G"

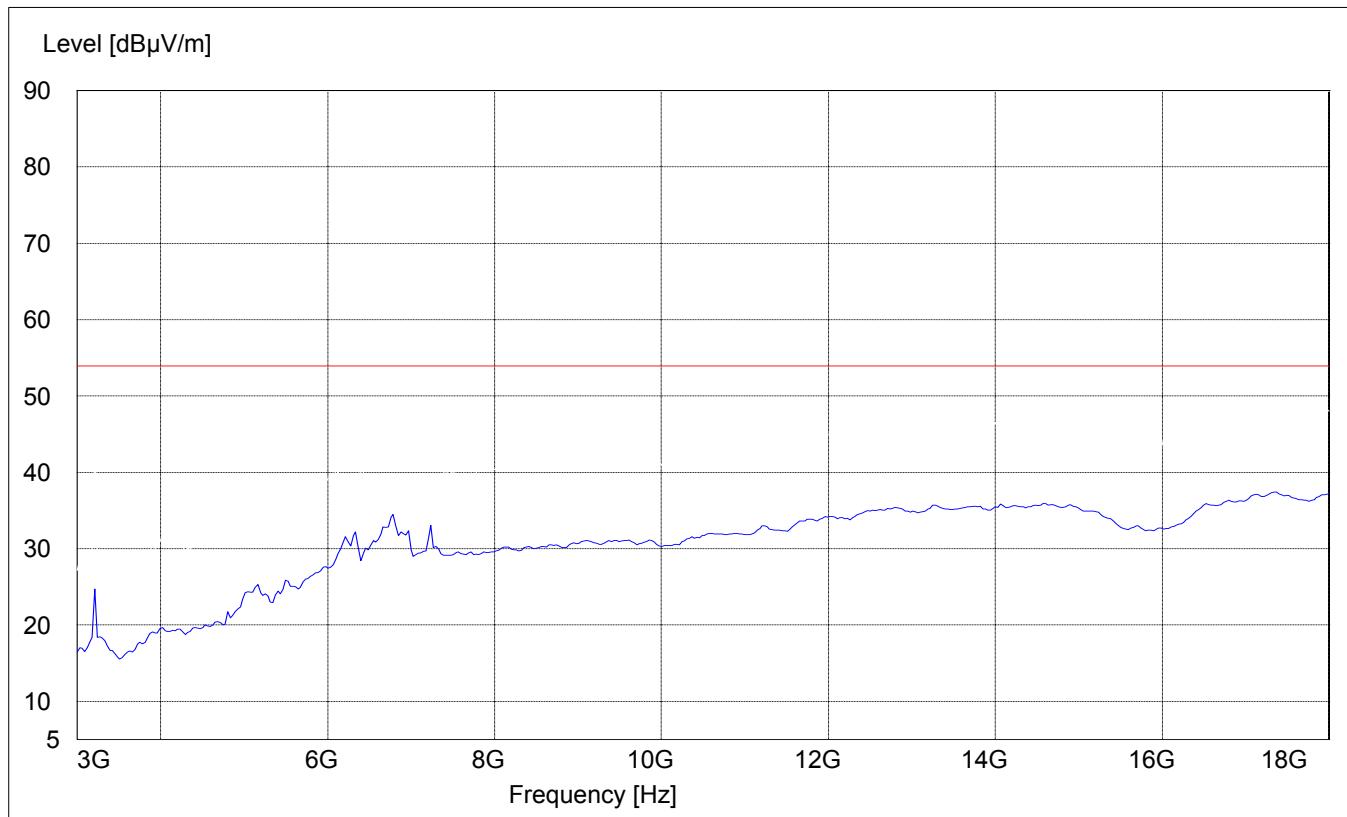
Short Description: Bluetooth Spurious 1-3 GHz

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



EMISSION LIMITATIONS - Radiated (Transmitter)**§ 15.247 (c) (1)****Lowest Channel(2412MHz): 3GHz – 18GHz****SWEEP TABLE:****"BT Spuri hi 3-18G"****Short Description:****Bluetooth Spurious 3-8 GHz**

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

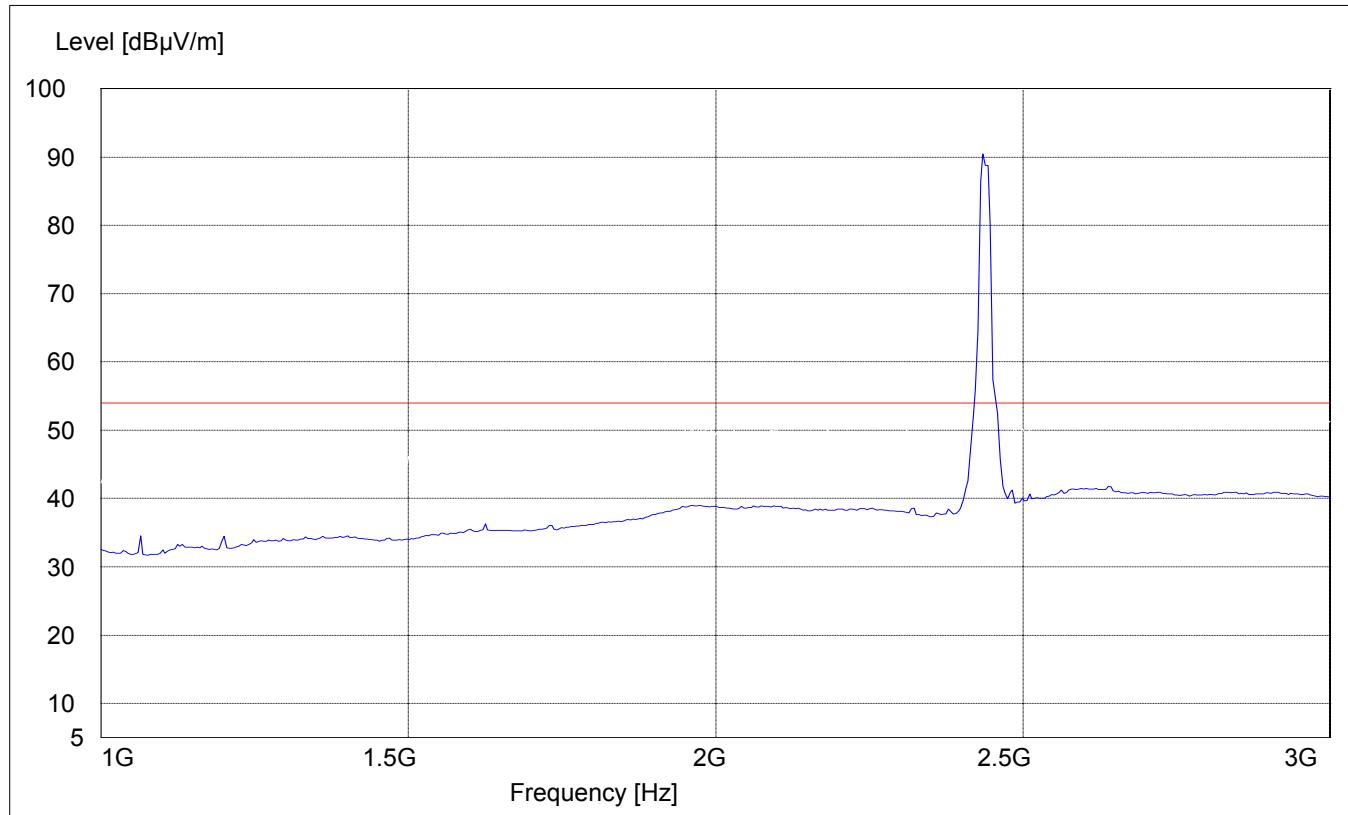


EMISSION LIMITATIONS - Radiated (Transmitter)
Middle Channel (2437MHz): 1GHz – 3GHz**§ 15.247 (c) (1)****(Average measurement)****NOTE: The peak above the limit is the carrier frequency.**

SWEEP TABLE: "BT Spuri hi 1-3G"

Short Description: Bluetooth Spurious 1-3 GHz

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

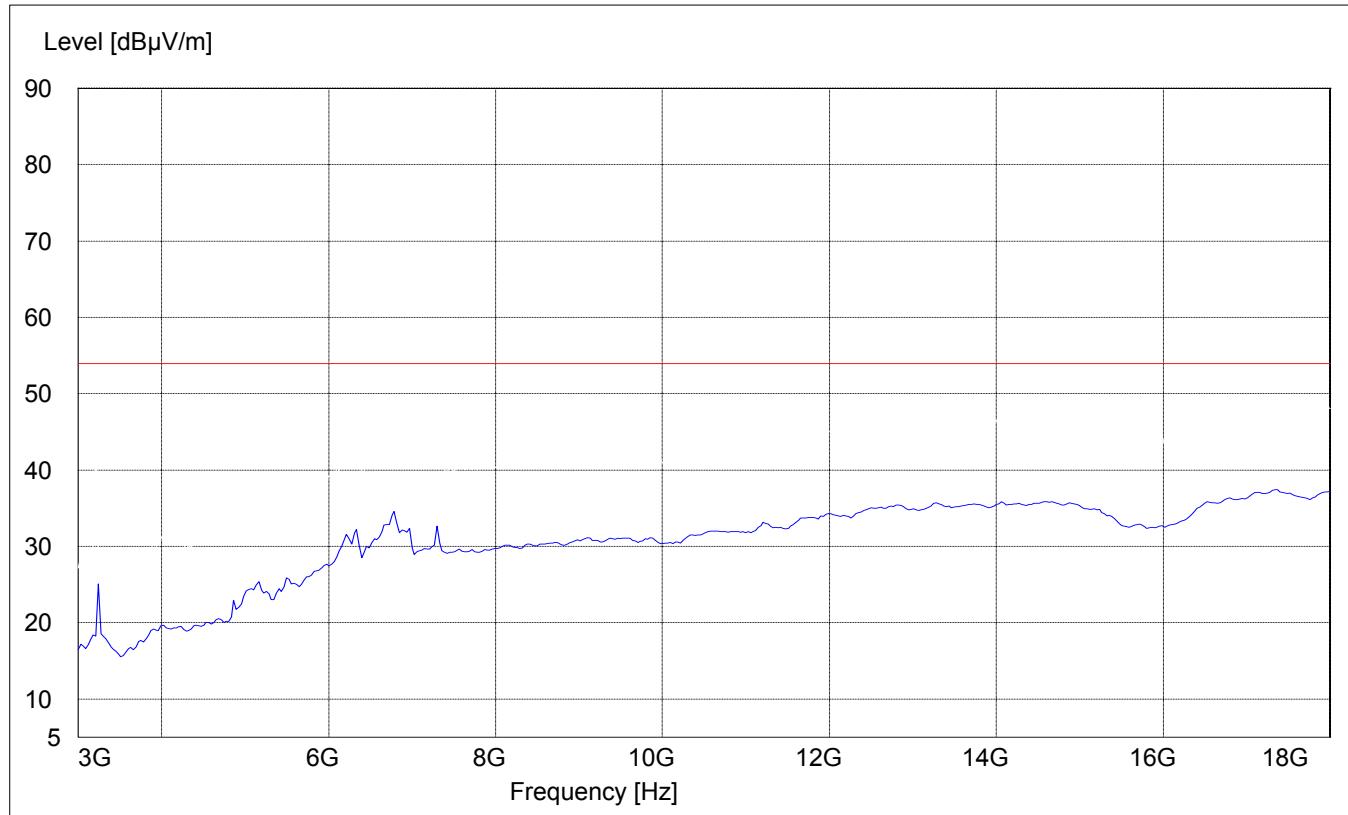


EMISSION LIMITATIONS - Radiated (Transmitter)**§ 15.247 (c) (1)****Middle Channel (2437MHz): 3GHz – 18GHz**

SWEEP TABLE: "BT Spuri hi 3-18G"

Short Description: Bluetooth Spurious 3-8 GHz

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

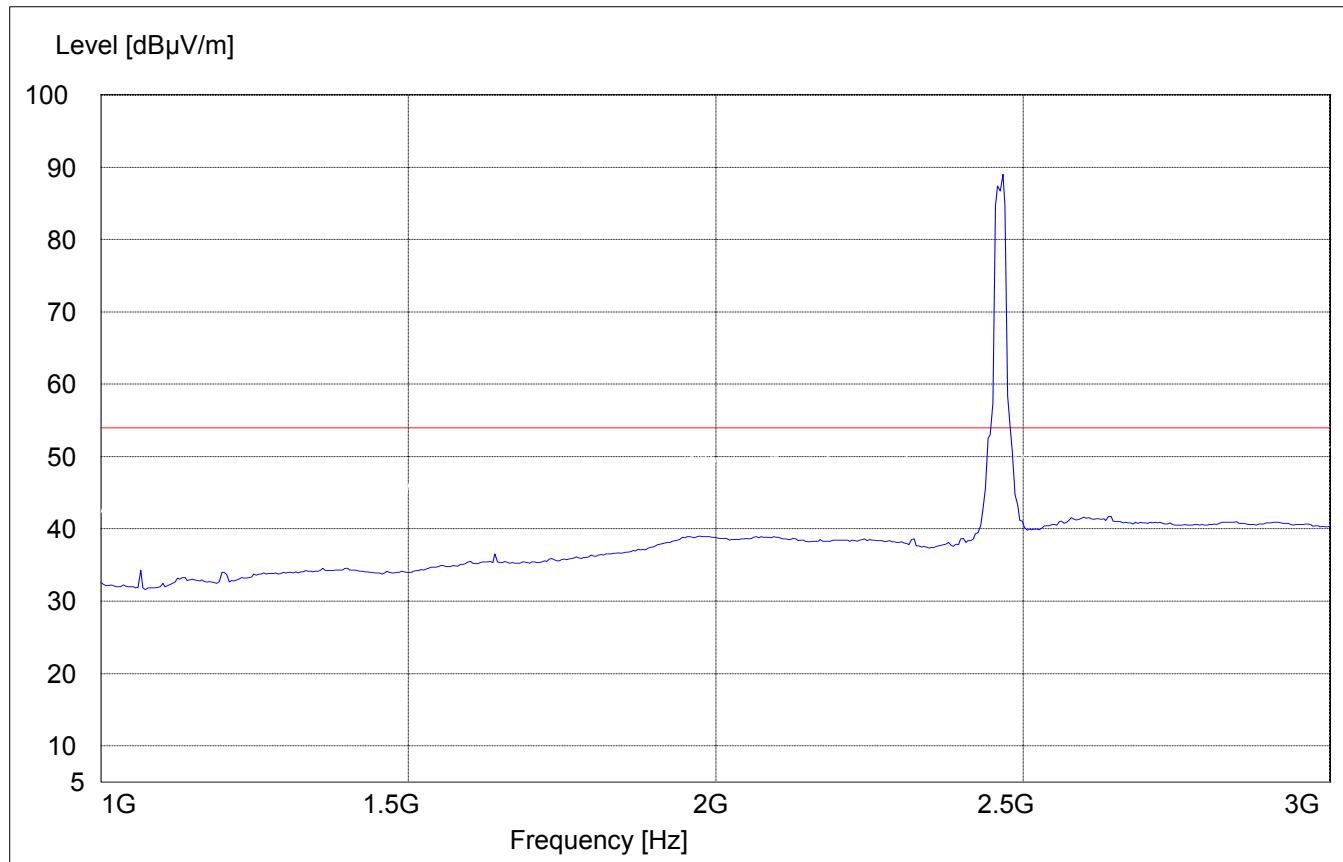


EMISSION LIMITATIONS - Radiated (Transmitter)**§ 15.247 (c) (1)****Highest Channel (2462MHz): 1GHz – 3GHz****(Average measurement)****NOTE: The peak above the limit is the carrier frequency.**

SWEEP TABLE: "BT Spuri hi 1-3G"

Short Description: Bluetooth Spurious 1-3 GHz

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

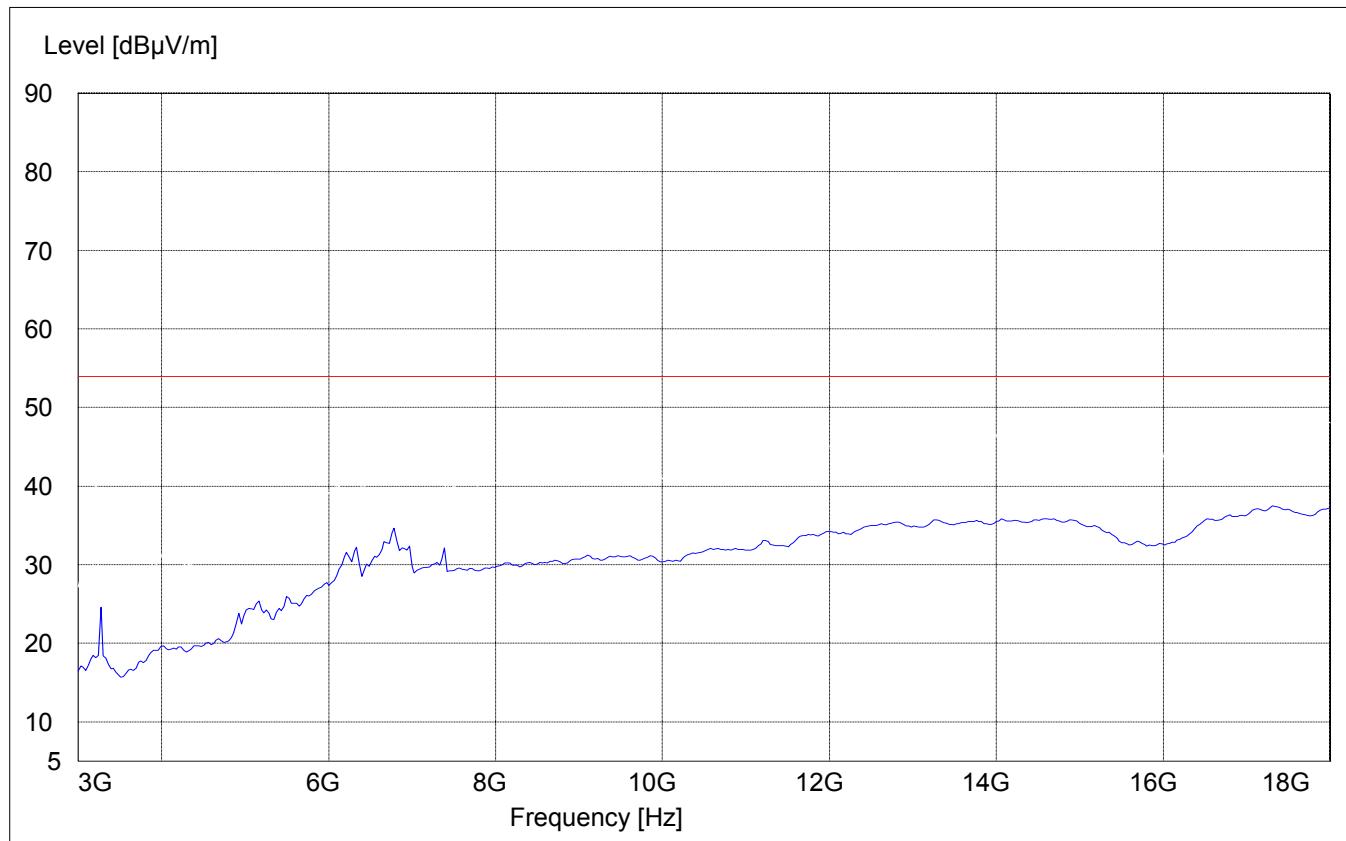


EMISSION LIMITATIONS - Radiated (Transmitter)**§ 15.247 (c) (1)****Highest Channel (2462MHz): 3GHz – 18GHz**

SWEEP TABLE: "BT Spuri hi 3-18G"

Short Description: Bluetooth Spurious 3-8 GHz

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

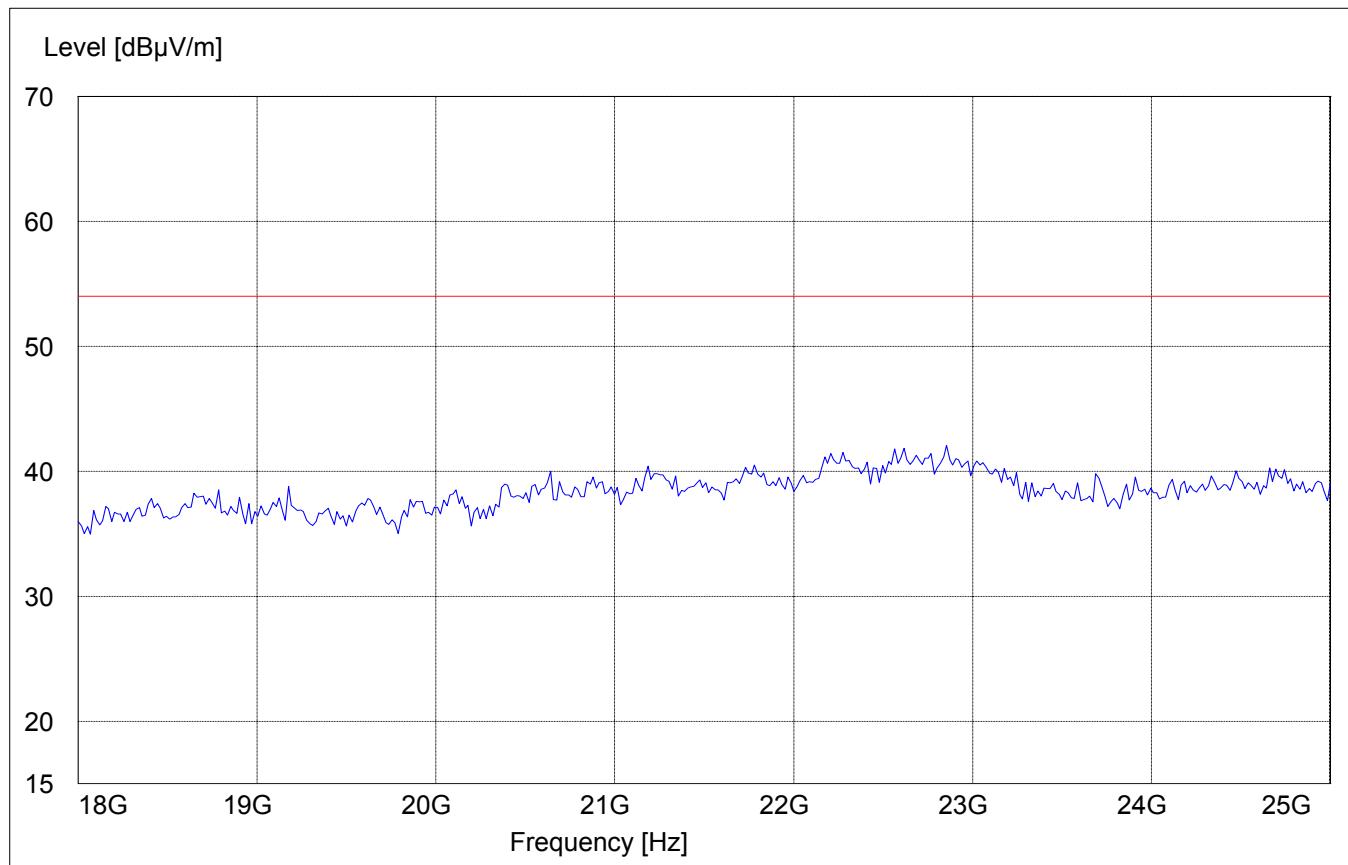


EMISSION LIMITATIONS - Radiated (Transmitter)**§ 15.247 (c) (1)****18GHz – 25GHz****Note: This plot is valid for low, mid & high channels (worst-case plot)**

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

Short Description: Bluetooth Spurious 18-25GHz

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



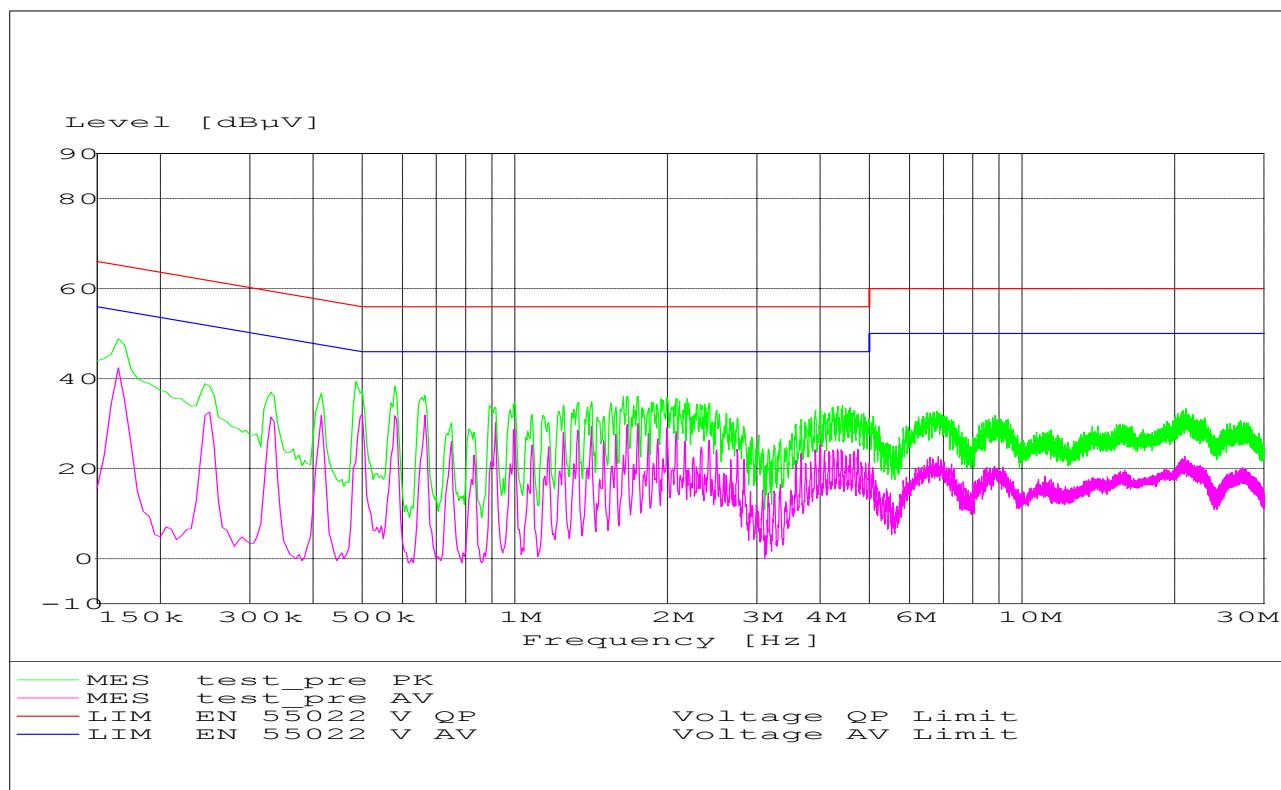
CONDUCTED EMISSIONS**§ 15.107/207**

Measured with AC/DC power adapter

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

Frequency of Emission (MHz)	Conducted Limit (dB μ 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

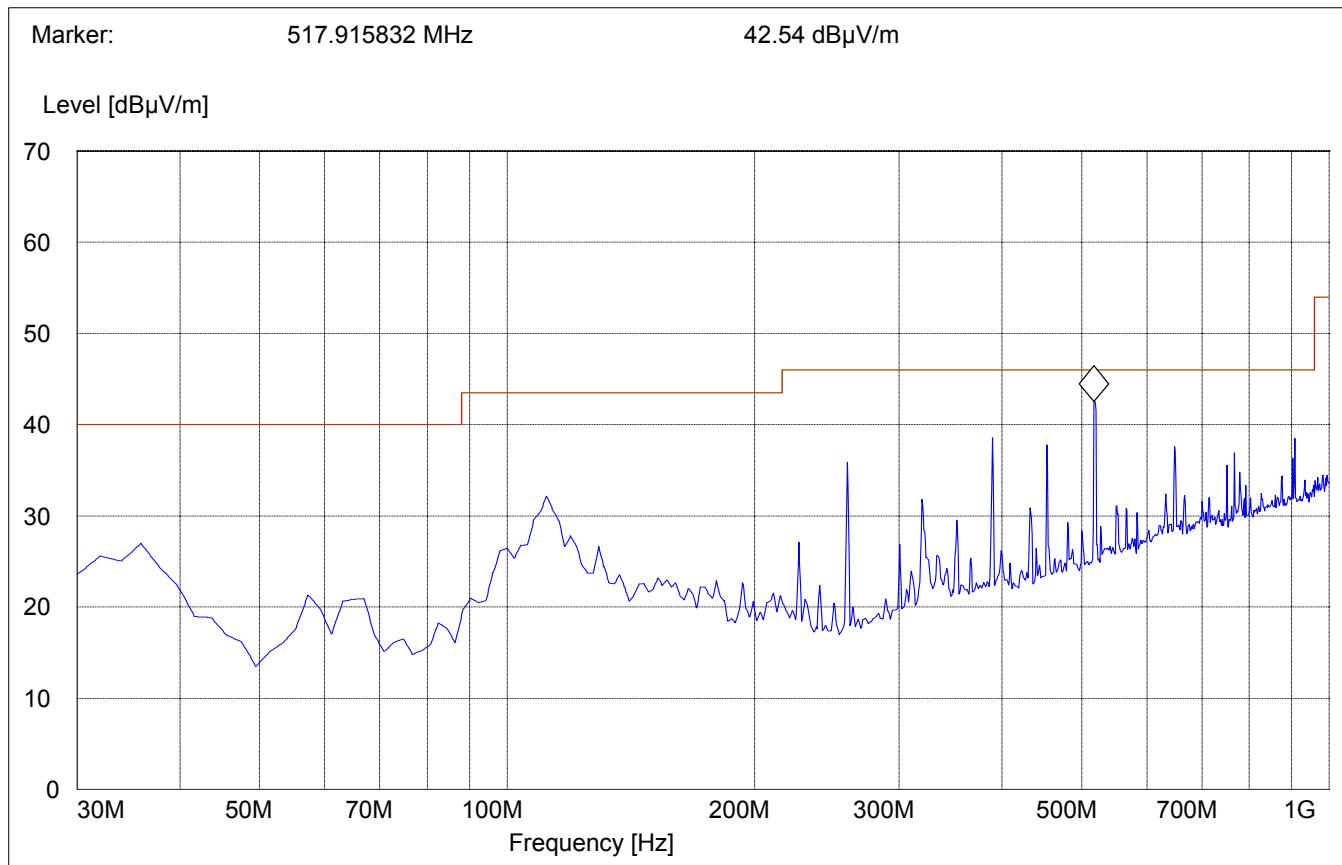
ANALYZER SETTINGS: RBW = 10KHz**VBW = 10KHz**

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

Frequency (MHz)	Field strength (μ 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:

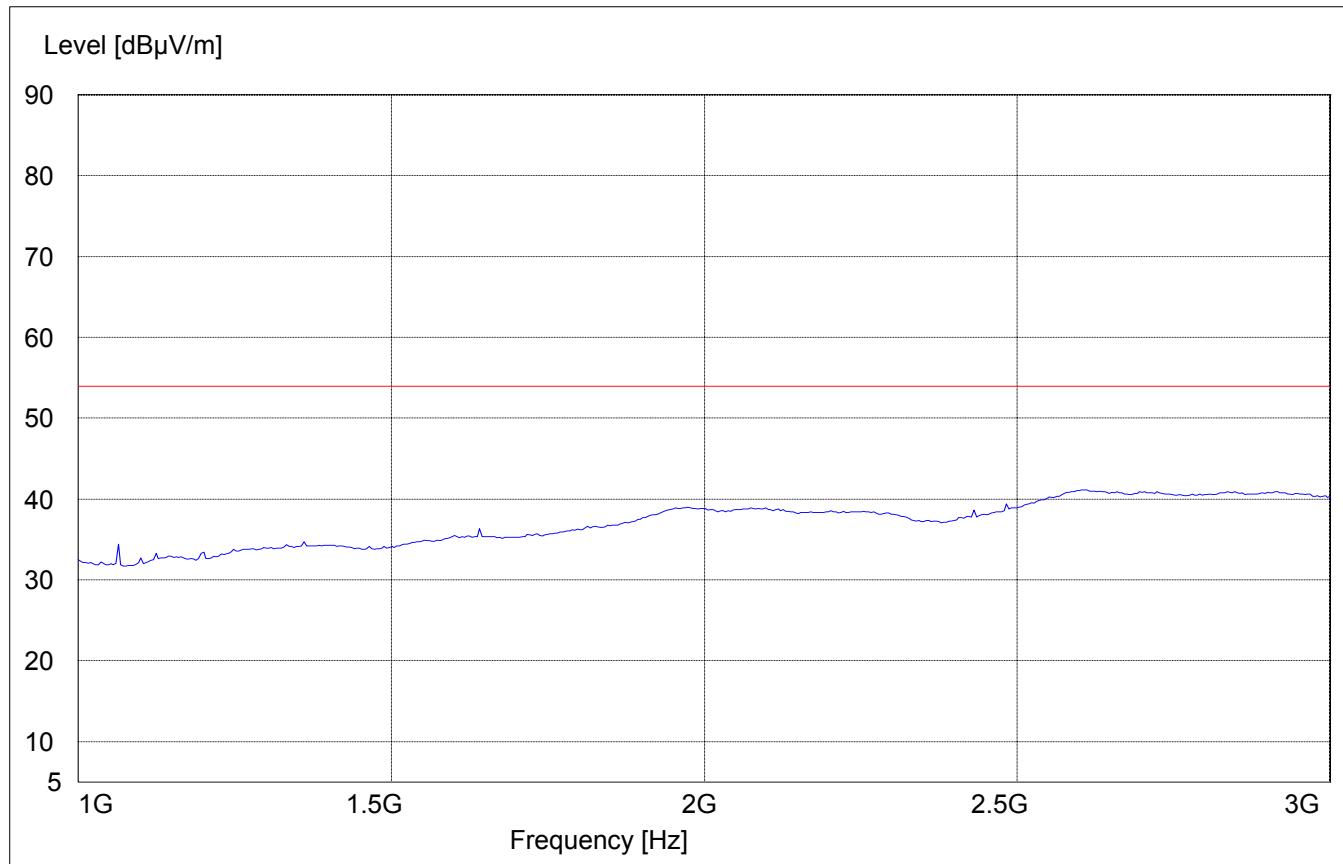
1. The radiated emissions were done with different settings, using the relevant pre-amplifiers for the relevant frequency ranges. This is the reason that the graphs show different noise levels. In the range between 3 and 25 GHz very short cable connections to the antenna was used to minimize the noise level.
2. All measurements are done in peak mode unless specified with plots.

RECEIVER SPURIOUS RADIATION**§ 15.209****30MHz – 1GHz**SWEET TABLE: "BT Spuri hi 30-1G"
Short Description: Bluetooth 30MHz-1GHzStart 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**

SWEET TABLE: "BT Spuri hi 1-3G"
Short Description: Bluetooth Spurious 1-3 GHz

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

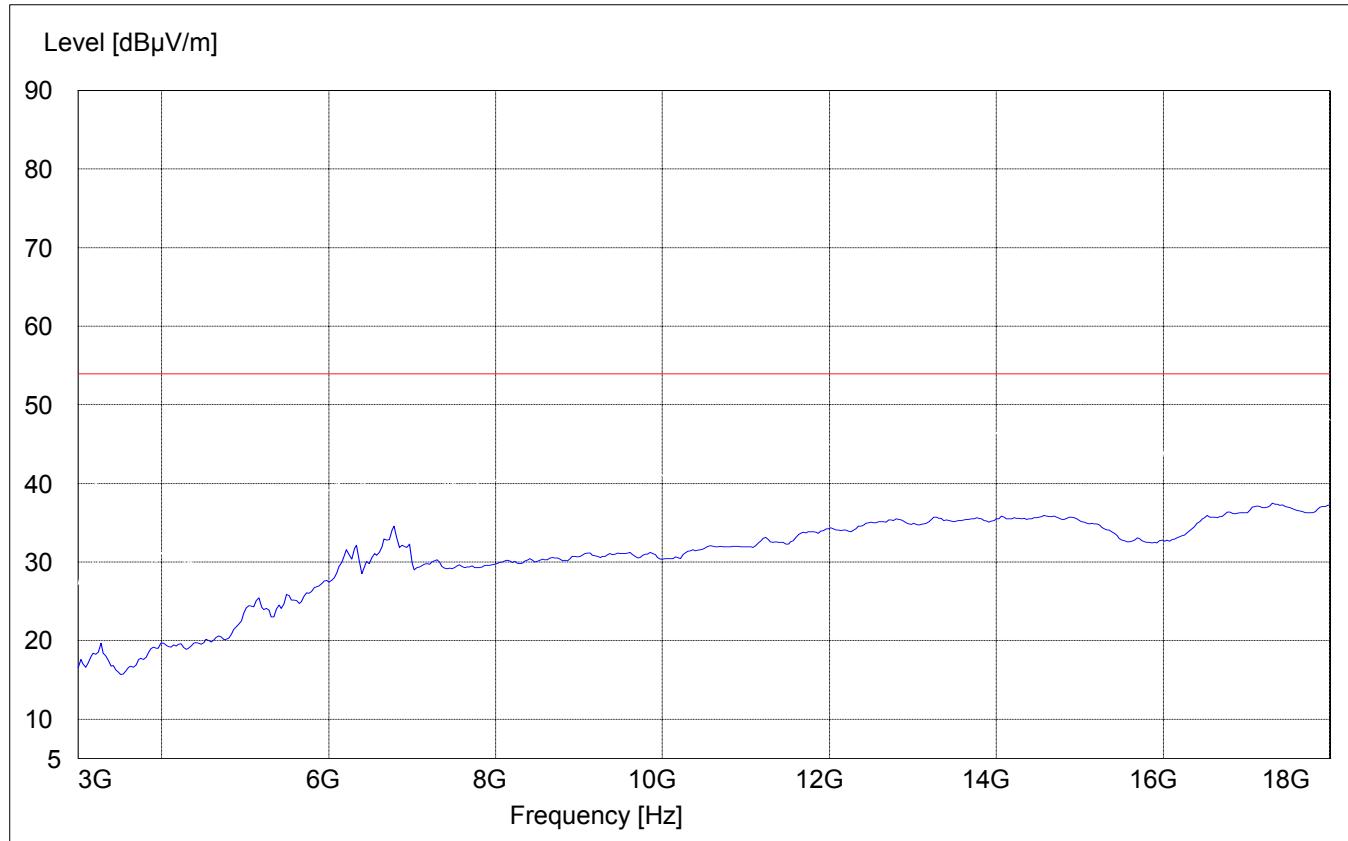


RECEIVER SPURIOUS RADIATION**§ 15.209****3GHz – 18GHz**

SWEEP TABLE: "BT 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)

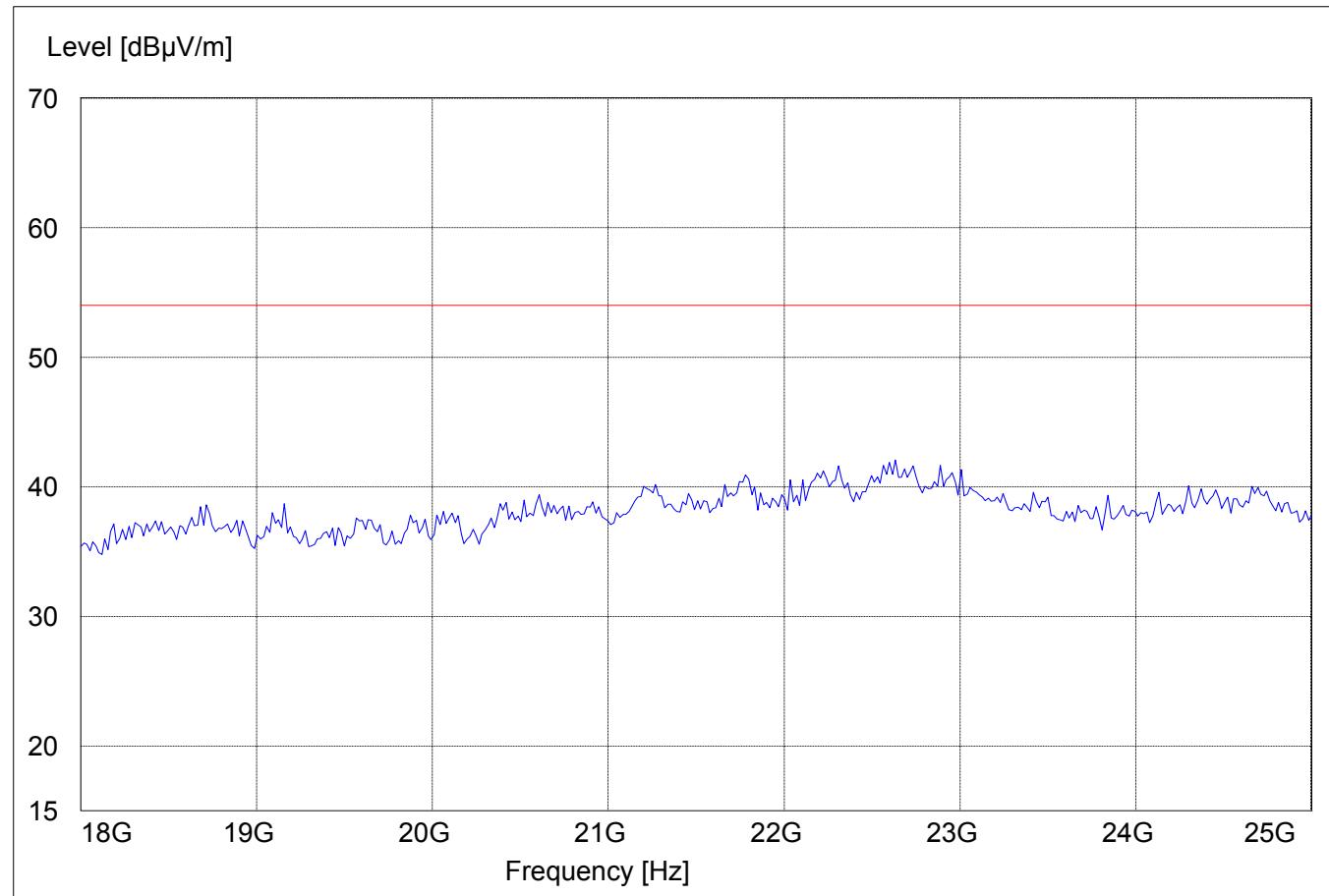


RECEIVER SPURIOUS RADIATION**§ 15.209****18GHz – 25GHz**

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

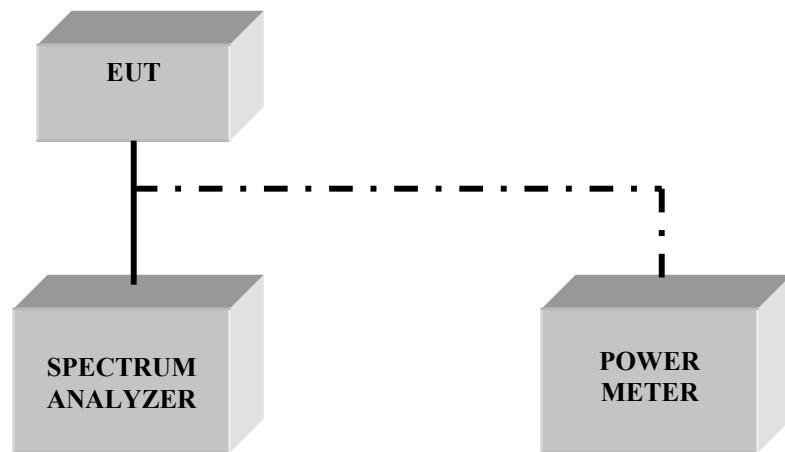
Short Description: Bluetooth Spurious 18-25GHz

Start Frequency	Stop Frequency	Detector	Meas.	RBW	Transducer
18.0 GHz	25 GHz	Time	Bandw.	VBW	#326 horn (dBi)
			MaxPeak	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	Biconilog Antenna	3141	EMCO	0005-1186
03	Horn Antenna (700M-18GHz)	SAS-200/571	AH Systems	325
04	Horn Antenna (18-26.5GHz)	3160-09	EMCO	1240
05	Horn Antenna (26.5-40GHz)	3160-10	EMCO	1156
06	2-3GHz Band reject filter	BRM50701	Microtronics	6
07	7-18GHz High Pass Filter	HPM50106	Microtronics	1
08	Pre-Amplifier	TS-ANA	Rohde & Schwarz	--
09	Pre-Amplifier	JS4-00102600	Miteq	00616

BLOCK DIAGRAMS**Conducted Testing**

Radiated Testing**ANECHOIC CHAMBER**