

CETECOM Inc.



CETECOM Inc.

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Issued test report consists of 25 Pages

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<p>FCC LISTED, REG. NO.: 101450 & RECOGNIZED BY INDUSTRY CANADA IC – 3925</p>

Test report no.:233FCC/2002
FCC Part 15.247
(Zebra Bluetooth Radio Module)

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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 generalisations 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.

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TEST REPORT PREPARED BY:

EMC & Radio Engineer: Harpreet Sidhu

1.2 Testing laboratory**CETECOM Inc.**

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1.3 Details of applicant

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City : Warwick, RI 02886
Country : USA
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e-mail : bheon@zebra.com

1.4 Application details

Date of receipt of application : 2001-12-21
Date of receipt of test item : 2002-01-10
Date of test : 2002-01-10/11

1.5 Test item

Manufacturer : Zebra Technologies Corporation
Street Address : 30 Plan Way
City / Country : Warwick, RI 02886, USA
Name of EUT : Zebra Bluetooth Radio Module
Description : 2.4GHz FHSS radio transceiver module
Model No. : CC15727-1
Serial No. : N/A
FCC ID. : I28MD-BTC2-E

Additional information

Frequency : 2402MHz – 2480MHz
Type of modulation : GFSK with BT=0.5
Number of channels : 79
Antenna : Modified Dipole
Power supply : Battery
Output power : 6.05dBm (4.03mW)
Extreme vol. Limits : The module requires regulated 5 volts
Extreme temp. Tolerance : -20°C - +55°C

1.6 Test standards: FCC Part 15 §15.247 (DA00-705)

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.

Technical responsibility for area of testing :

2002-01-29**EMC & Radio****Lothar Schmidt**

Date**Section****Name****Signature**

2.2 Testreport

TEST REPORT

Test report no. : 233FCC/2002
(Zebra Bluetooth Radio Module)

TEST REPORT REFERENCE**LIST OF MEASUREMENTS**

Paragraph	PARAMETER TO BE MEASURED	PAGE
	Testing Strategy	7
	Transmitter parameters	
§ 15.247 (b)(2)	Maximum peak output power	8
§15.247	Band edge compliance	9
§ 15.247 (c)(1)	Emission limitations	11
	Receiver parameters	
§ 15.209	Spurious radiations - Radiated	20
	Test equipment listing	25

TESTING STRATEGY

The preliminary testing was carried out on Ericsson Bluetooth Module with nine different Ericsson approved antennas built in small printers. The antenna (ENCORE-4) with max. EIRP was chosen for final radiated testing. The conducted output power was found identical with test results in test report no. [5BT_Ericsson_Qual_02_c](#) and is used as reference. For all other conducted measurements please refer to test report no. [5BT_Ericsson_Qual_02_c](#).

Antenna (built in printer)	Tx Antenna Polarity	Rx Antenna Polarity	Power in dBm		
			Low ch. 2402MHz	Mid ch. 2441MHz	High ch. 2480MHz
Encore 2	Horizontal	Vertical	-2.19	-0.58	-0.37
Encore 3	Horizontal	Horizontal	1.90	1.32	1.93
Encore 4	Vertical	Horizontal	2.44	3.71	6.05
Cameo 2	Horizontal	Horizontal	0.05	-0.56	-0.77
Cameo 3	Horizontal	Horizontal	0.75	-0.99	-1.64
Cameo 3 PEP	Vertical	Horizontal	-2.47	-1.12	-1.83
Cameo 3 SC	Horizontal	Horizontal	-7.14	-5.94	-4.68
QL-320	Vertical	Horizontal	-0.5	2.65	2.0
ZPR	Horizontal	Vertical	-6.52	-2.63	-2.78

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

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)		
Frequency (MHz)		2402	2442	2480
$T_{nom}(23)^{\circ}C$	$V_{nom}0V$	2.44	3.71	6.05
Measurement uncertainty		$\pm 3dB$		

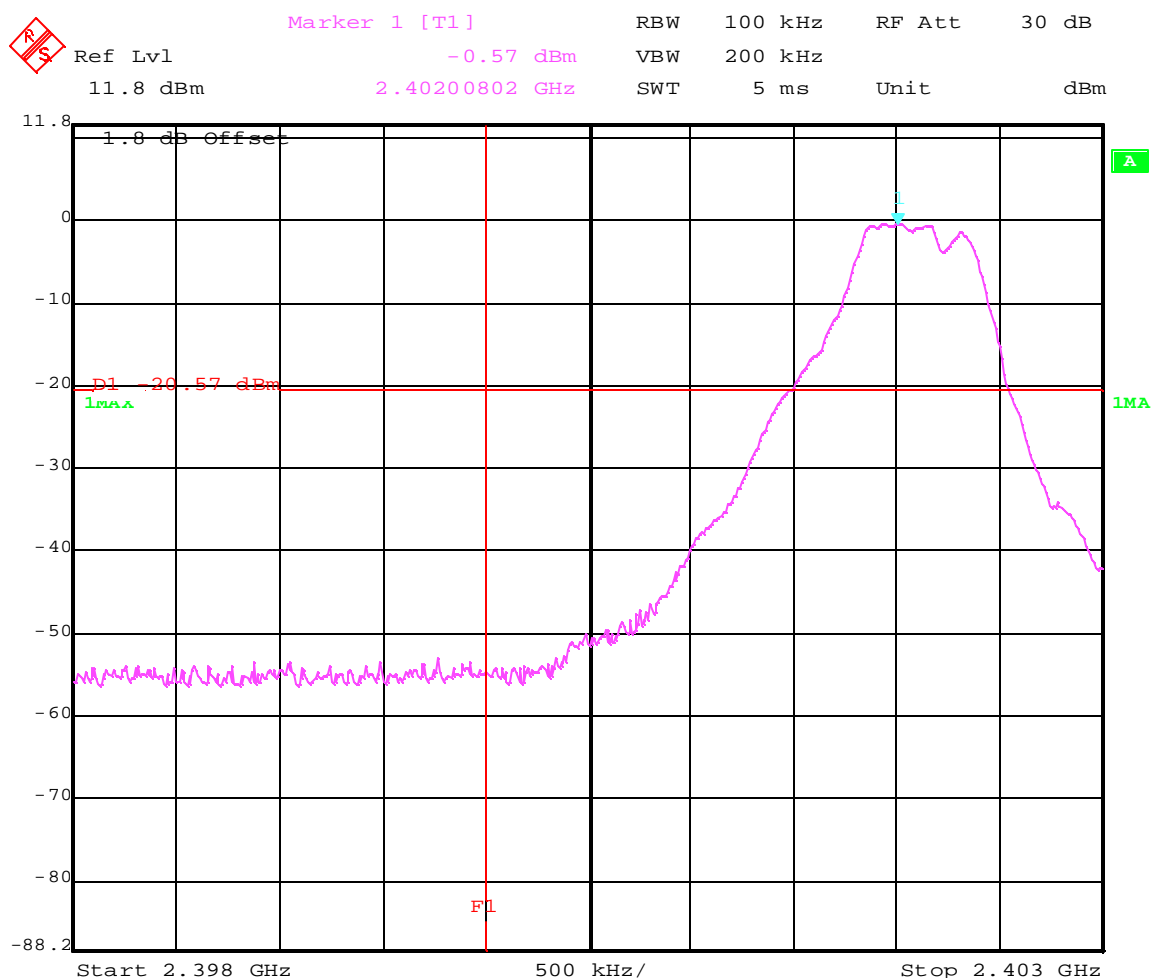
RBW/VBW : 3 MHz**LIMIT****SUBCLAUSE § 15.247 (b) (1)**

Frequency range	RF power output
2400-2483.5 MHz	1.0 Watt

BAND EDGE COMPLIANCE

§15.247 (c)

Low frequency section (2400MHz)
(valid for both hopping ON & OFF)

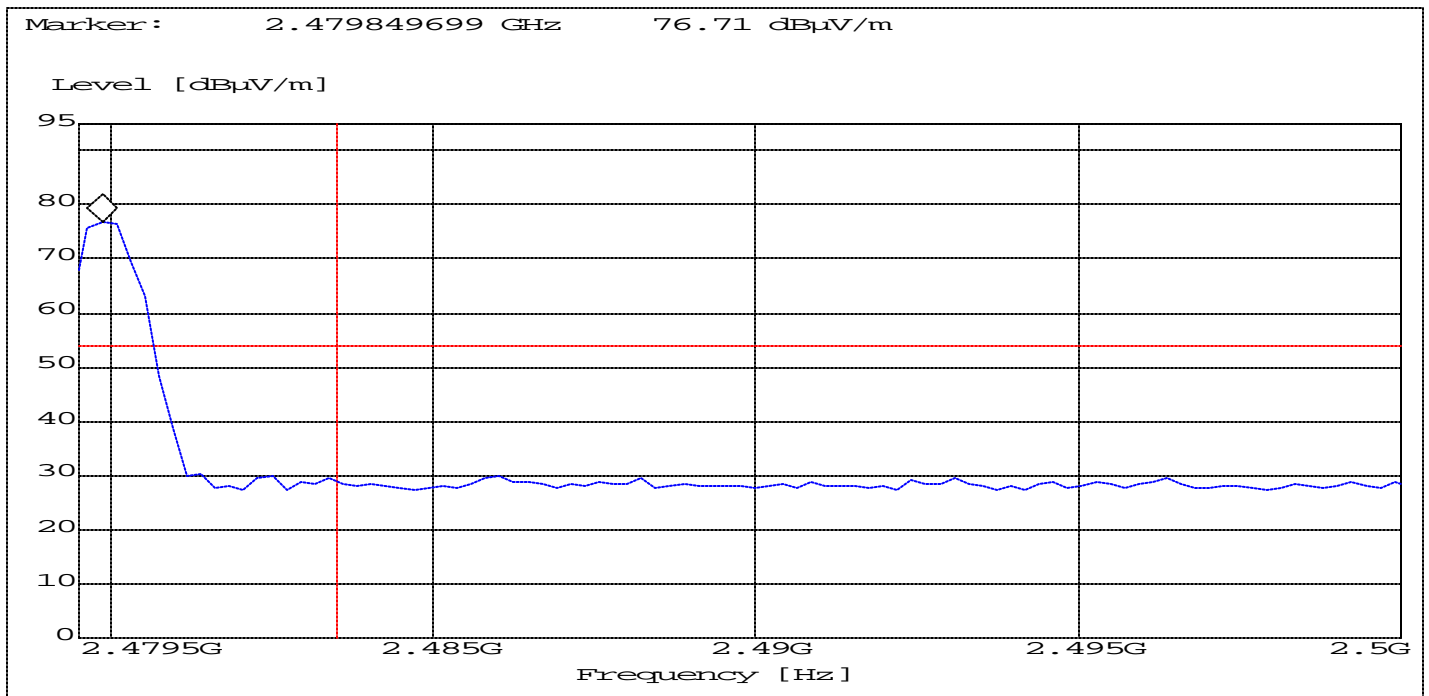


Date: 17.JAN.2002 08:01:09

BAND EDGE COMPLIANCE

§15.247 (c)

high frequency section (spurious in the restricted band 2483.5 – 2500 MHz)
(valid for both hopping ON & OFF)



ANALYZER SETTINGS: RBW = 100KHz

VBW = 200KHz

EMISSION LIMITATIONS - Radiated (Transmitter) SUBCLAUSE § 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 18 and 25 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.

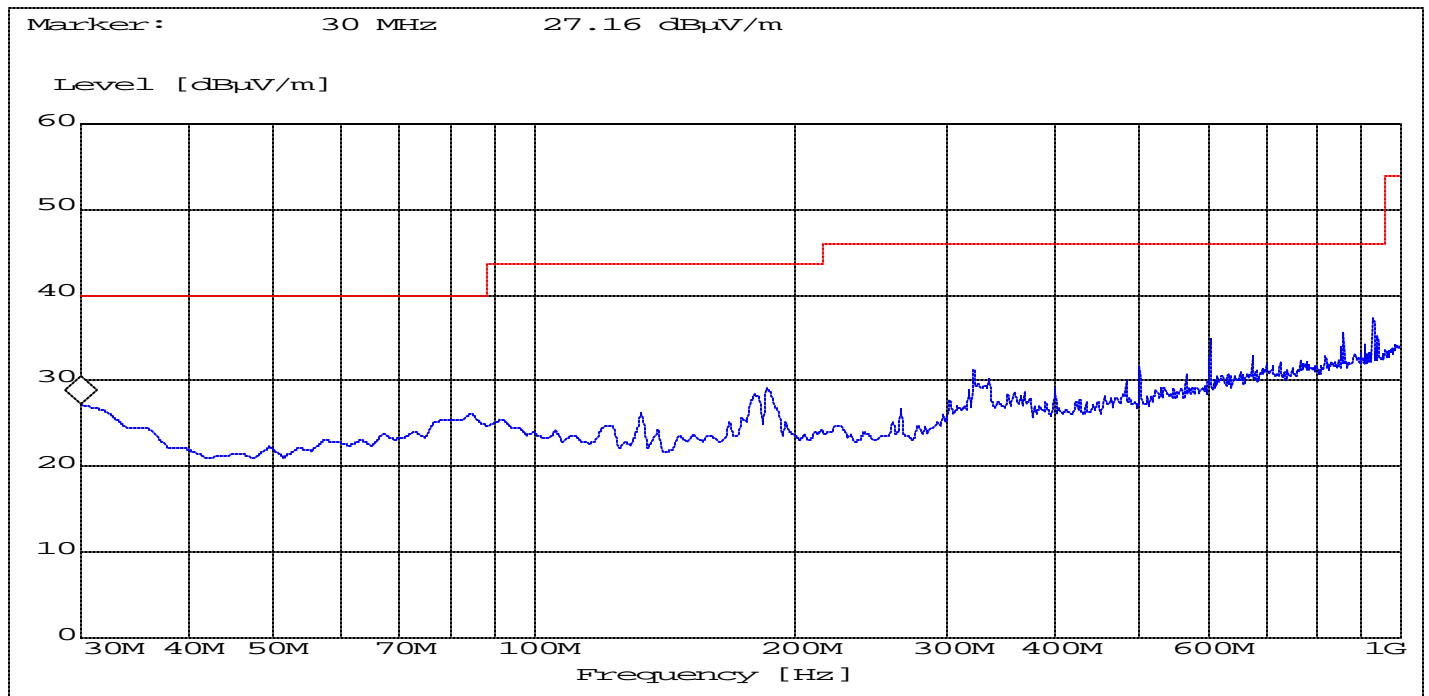
Results for the radiated measurements below 30MHz according § 15.33

Frequency	Measured values	Remarks
10KHz – 30MHz	No emissions found, caused by the EUT	This is valid for all the tested channels

EMISSION LIMITATIONS - Radiated (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Lowest Channel(2402MHz): 30MHz – 1GHz



ANALYZER SETTINGS: RBW = 100KHz

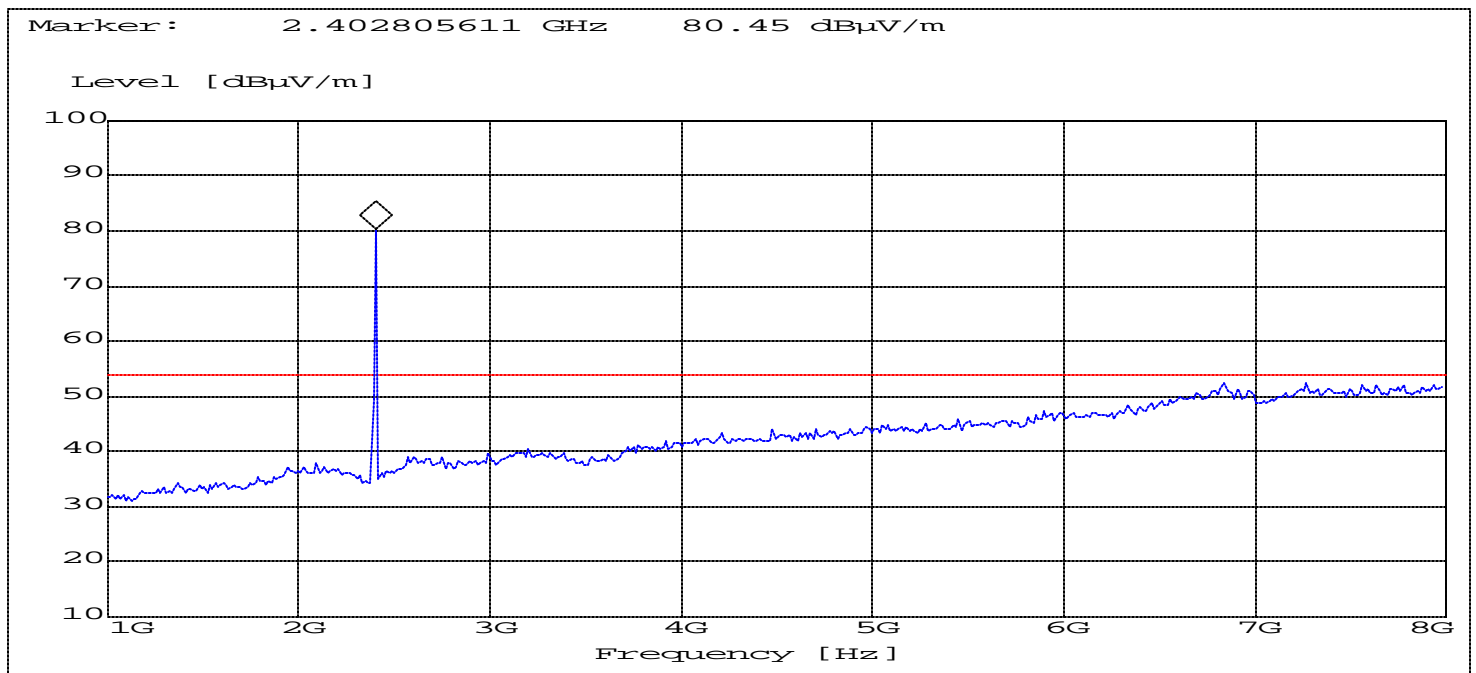
VBW = 100KHz

EMISSION LIMITATIONS - Radiated (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Lowest Channel(2402MHz): 1GHz – 8GHz

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



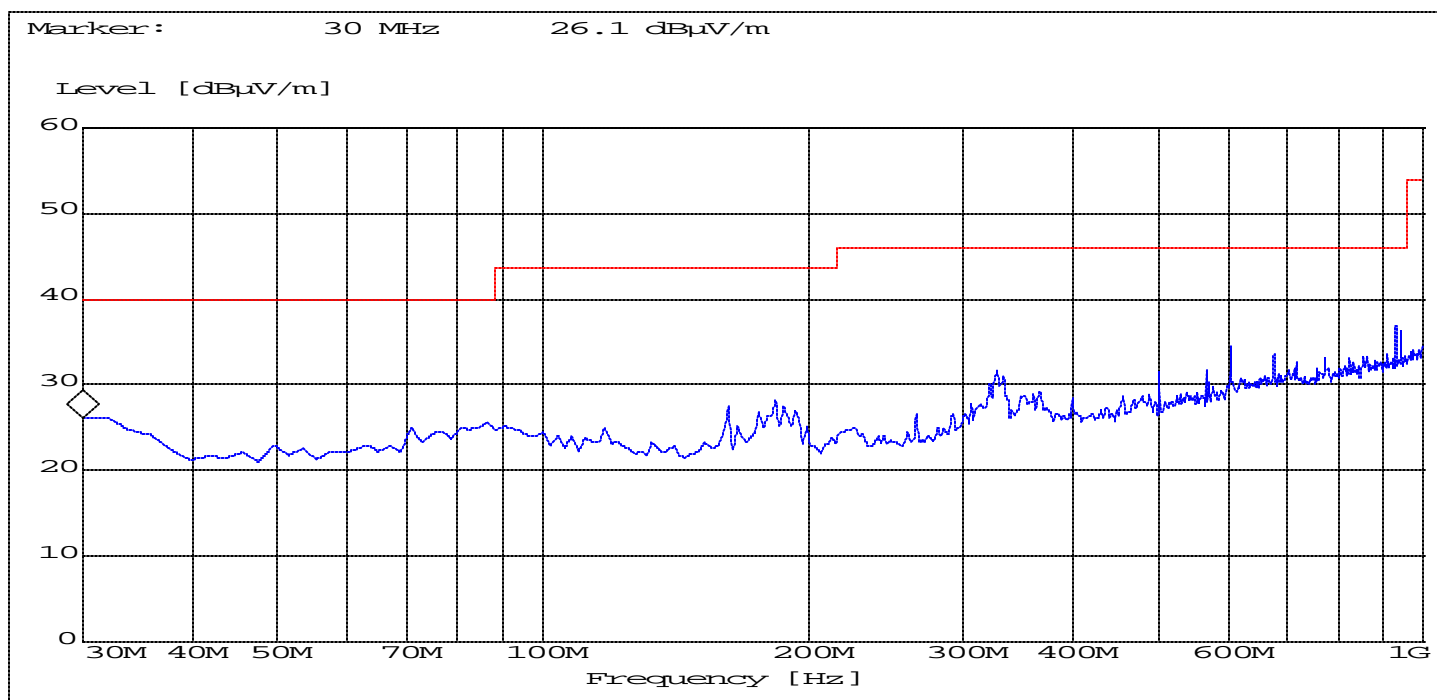
ANALYZER SETTINGS: RBW = 1MHz

VBW = 1MHz

EMISSION LIMITATIONS - Radiated (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Mid Channel(2441MHz): 30MHz – 1GHz



ANALYZER SETTINGS: RBW = 100KHz

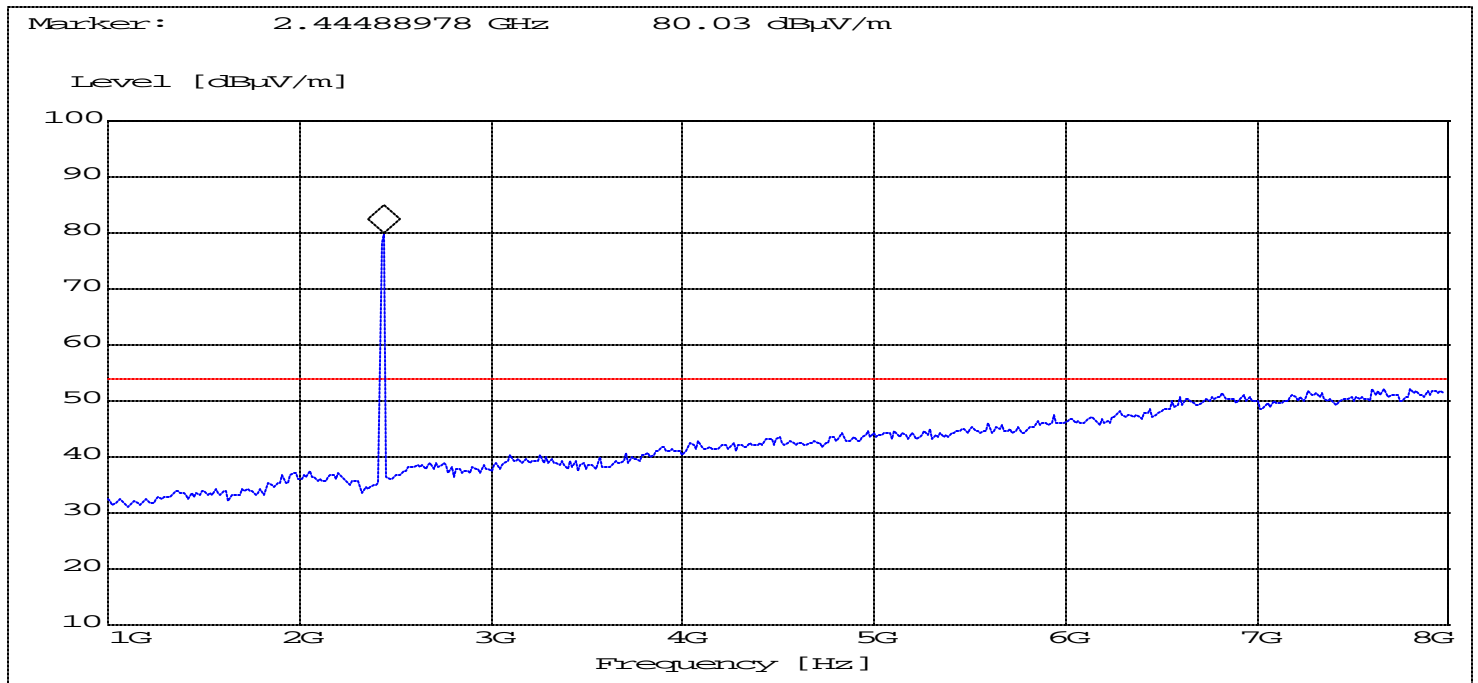
VBW = 100KHz

EMISSION LIMITATIONS - Radiated (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Mid Channel(2441MHz): 1GHz – 8GHz

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



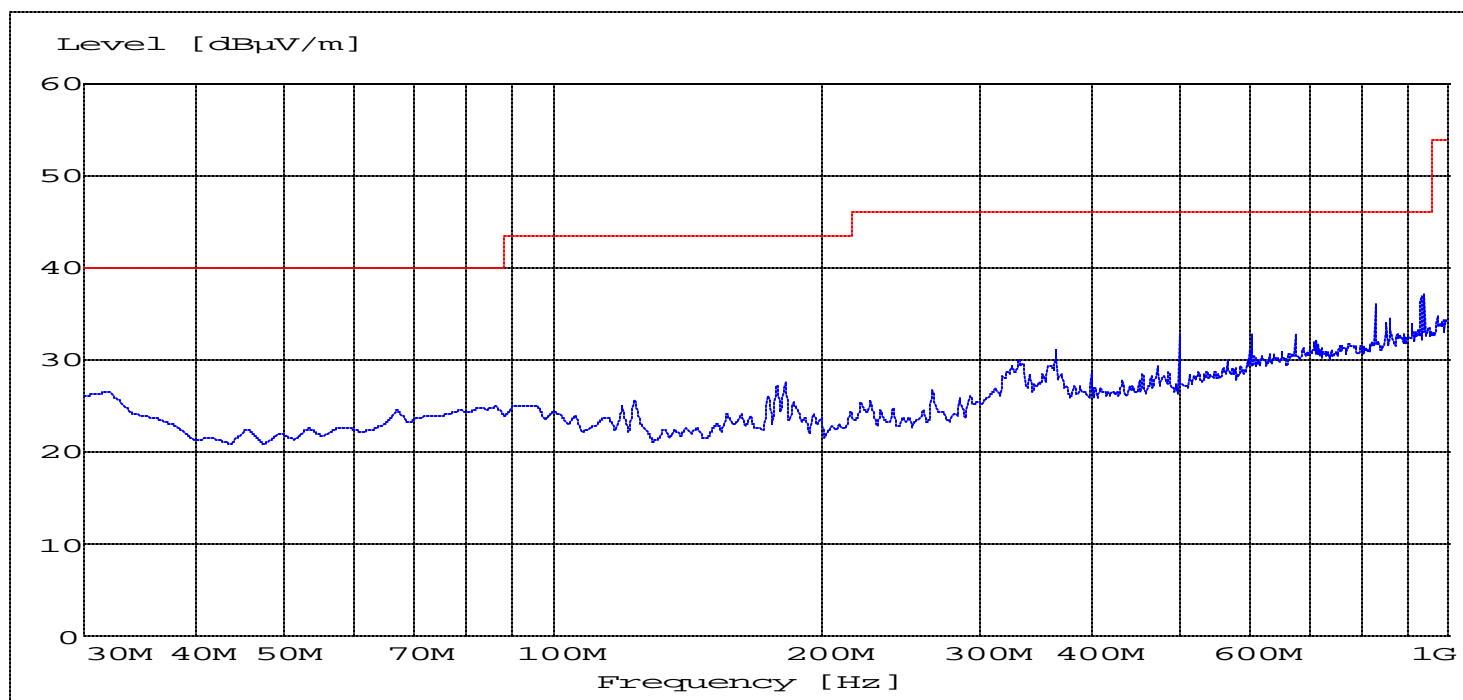
ANALYZER SETTINGS: RBW = 1MHz

VBW = 1MHz

EMISSION LIMITATIONS - Radiated (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Highest Channel(2480MHz): 30MHz – 1GHz



ANALYZER SETTINGS: RBW = 100KH

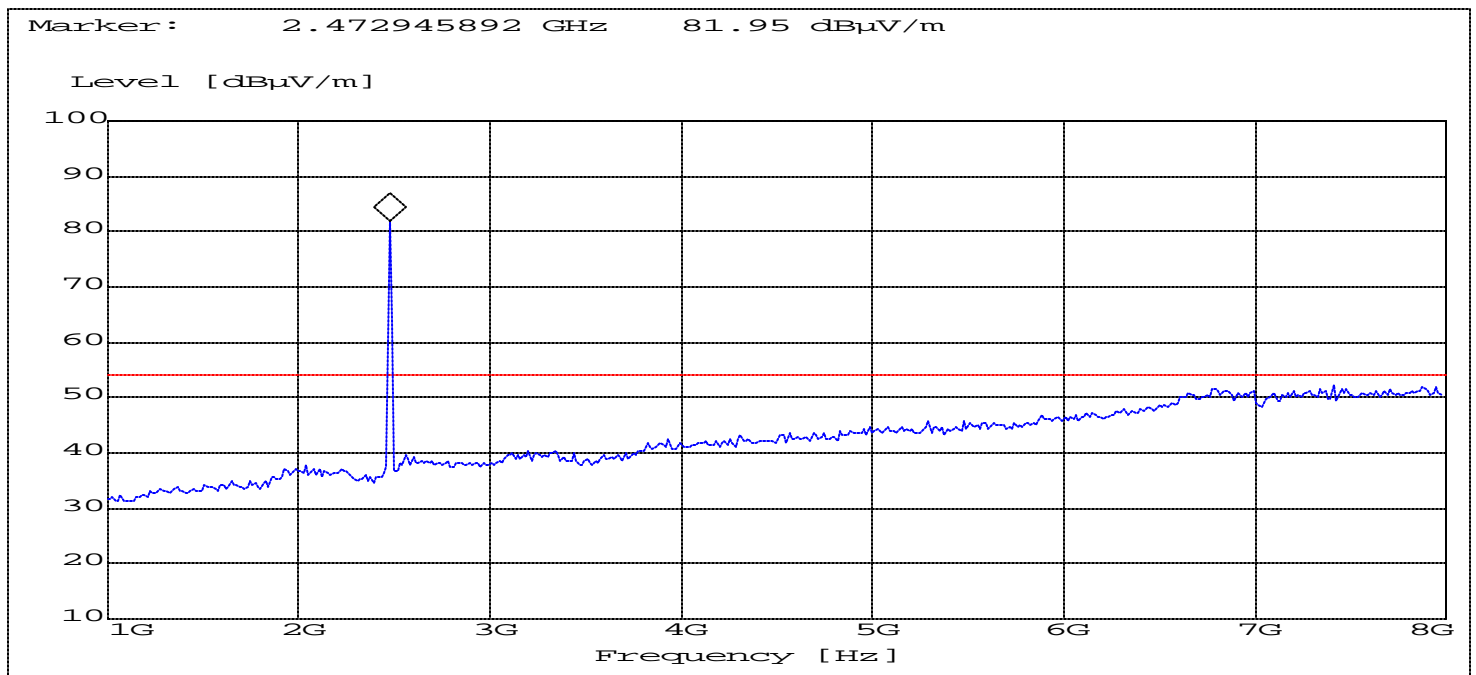
VBW = 100KHz

EMISSION LIMITATIONS - Radiated (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Highest Channel: 1GHz – 8GHz

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



ANALYZER SETTINGS: RBW = 1MHz

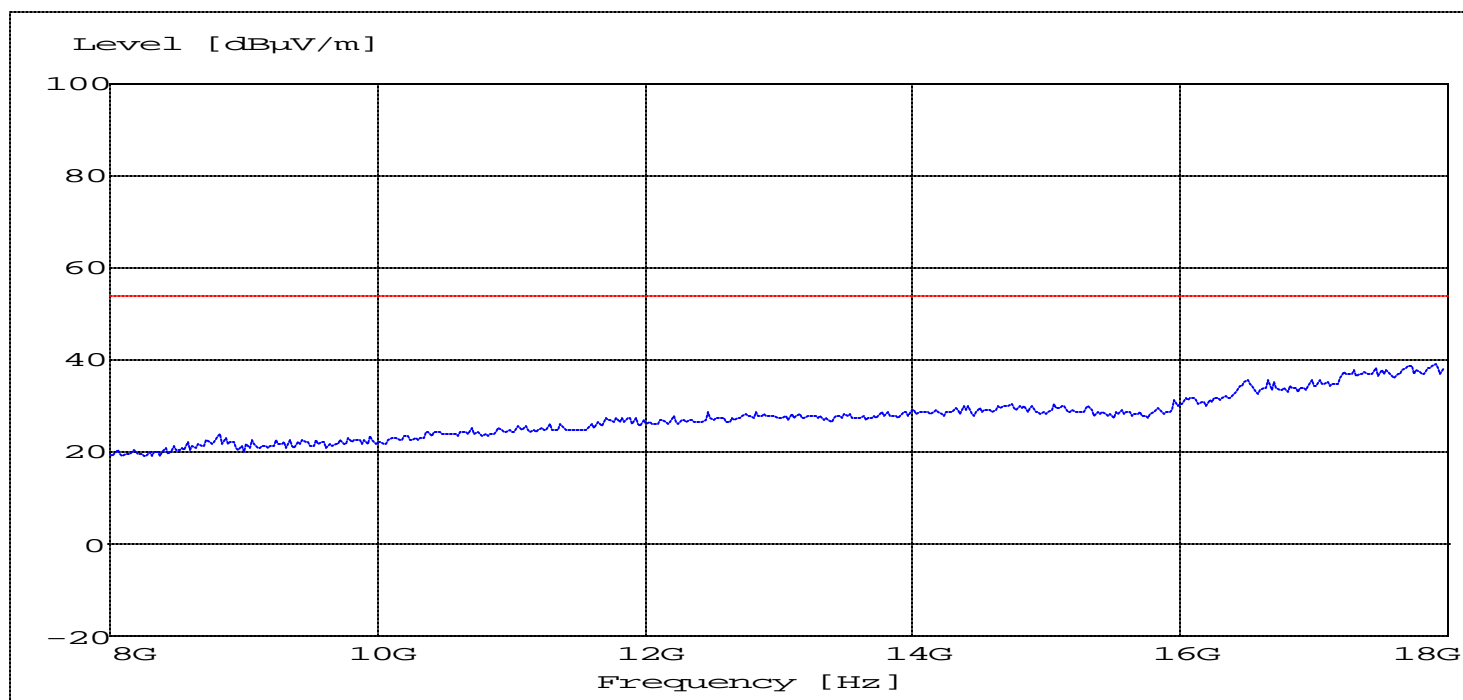
VBW = 1MHz

EMISSION LIMITATIONS - Radiated (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

8GHz – 18GHz

(This plot is valid for all three channels)



ANALYZER SETTINGS: RBW = 1MHz

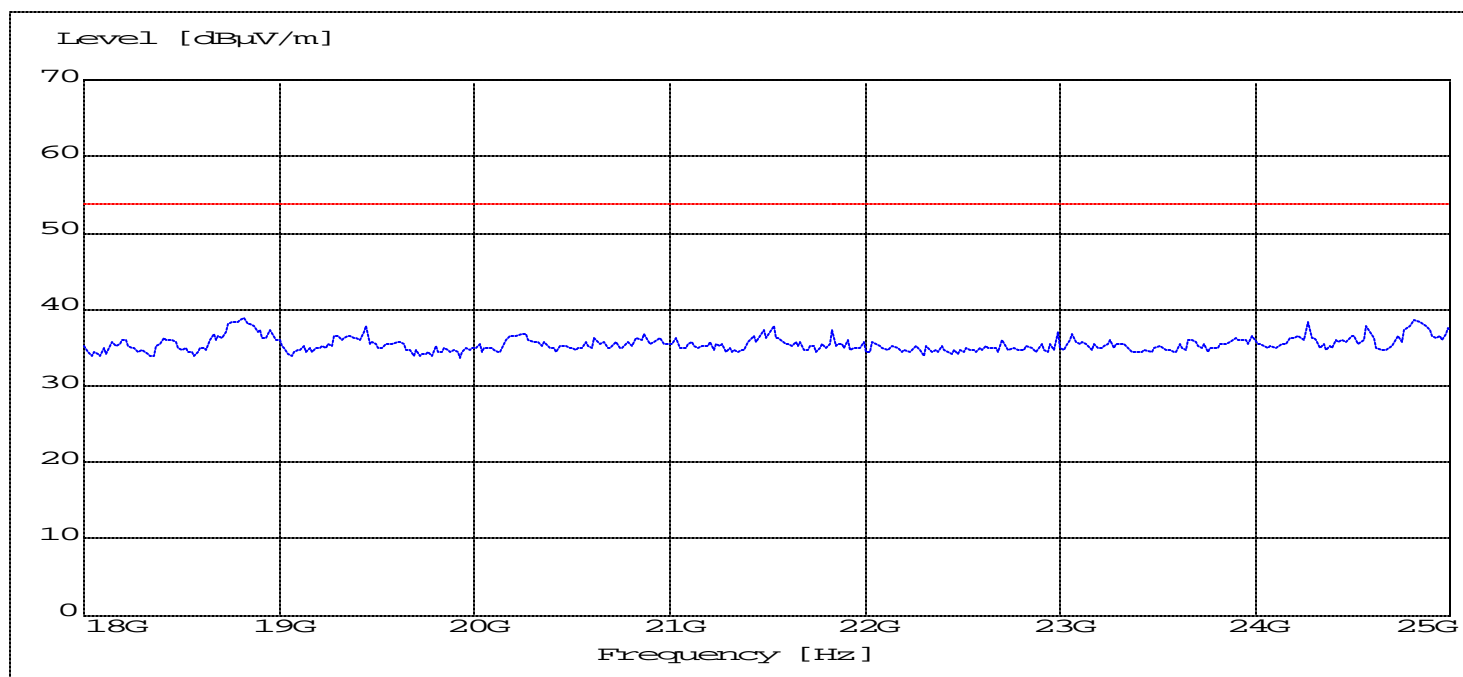
VBW = 1MHz

EMISSION LIMITATIONS - Radiated (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

18GHz – 25GHz

(This plot is valid for all three channels)



ANALYZER SETTINGS: RBW = 1MHz

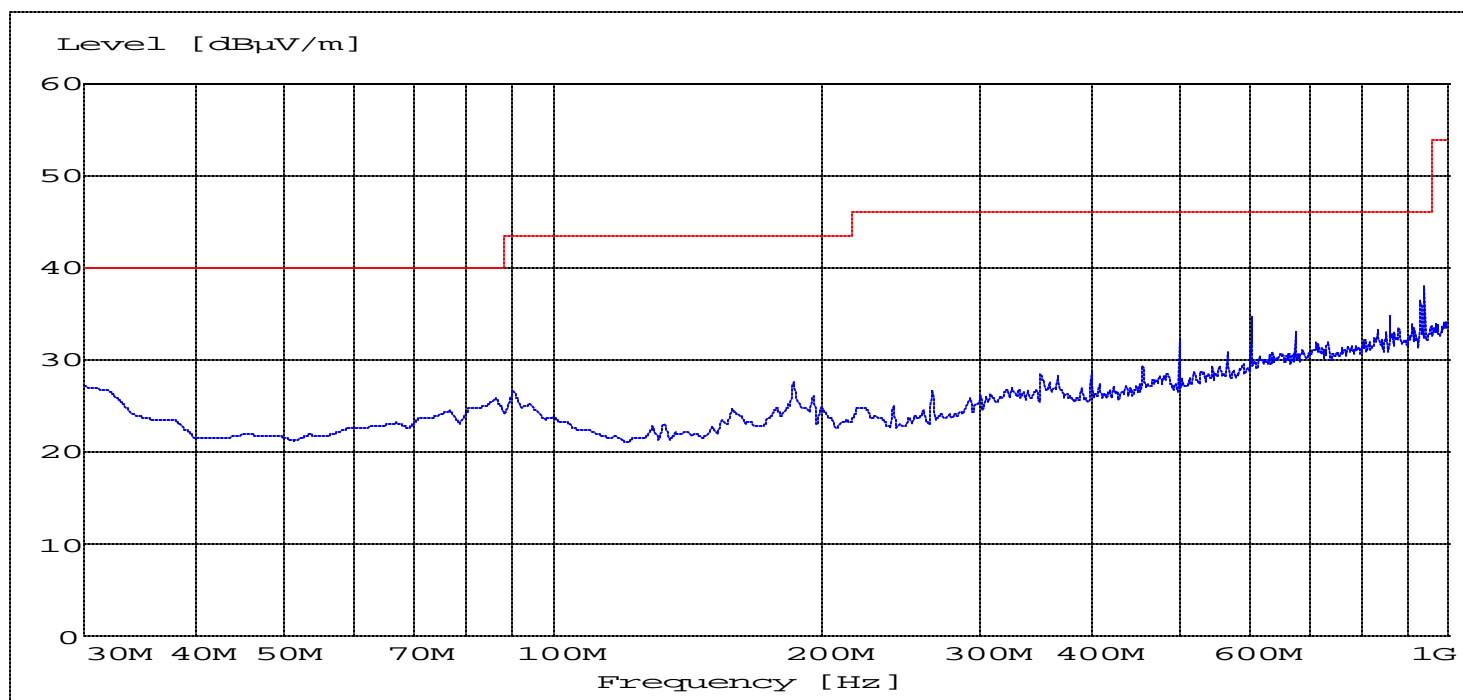
VBW = 1MHz

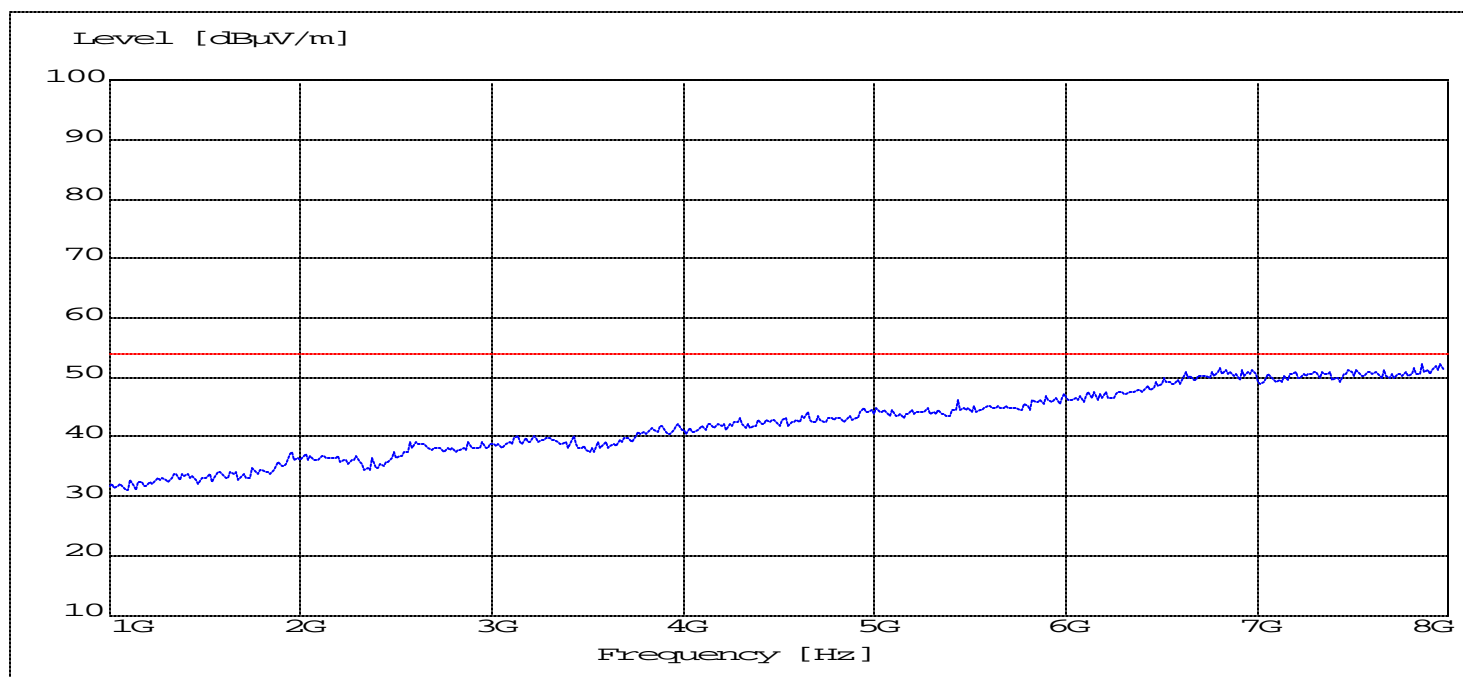
RECEIVER SPURIOUS RADIATION**§ 15.209****Limits**

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:

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 18 and 25 GHz very short cable connections to the antenna was used to minimize the noise level.
2. Measurements were done on low, mid & high channels, but plots depicting the worst case are submitted in the test report.

RECEIVER SPURIOUS RADIATION**§ 15.209****30MHz – 1GHz****(This plot is valid for all three channels)****ANALYZER SETTINGS: RBW = 100KHz****VBW = 100KHz**

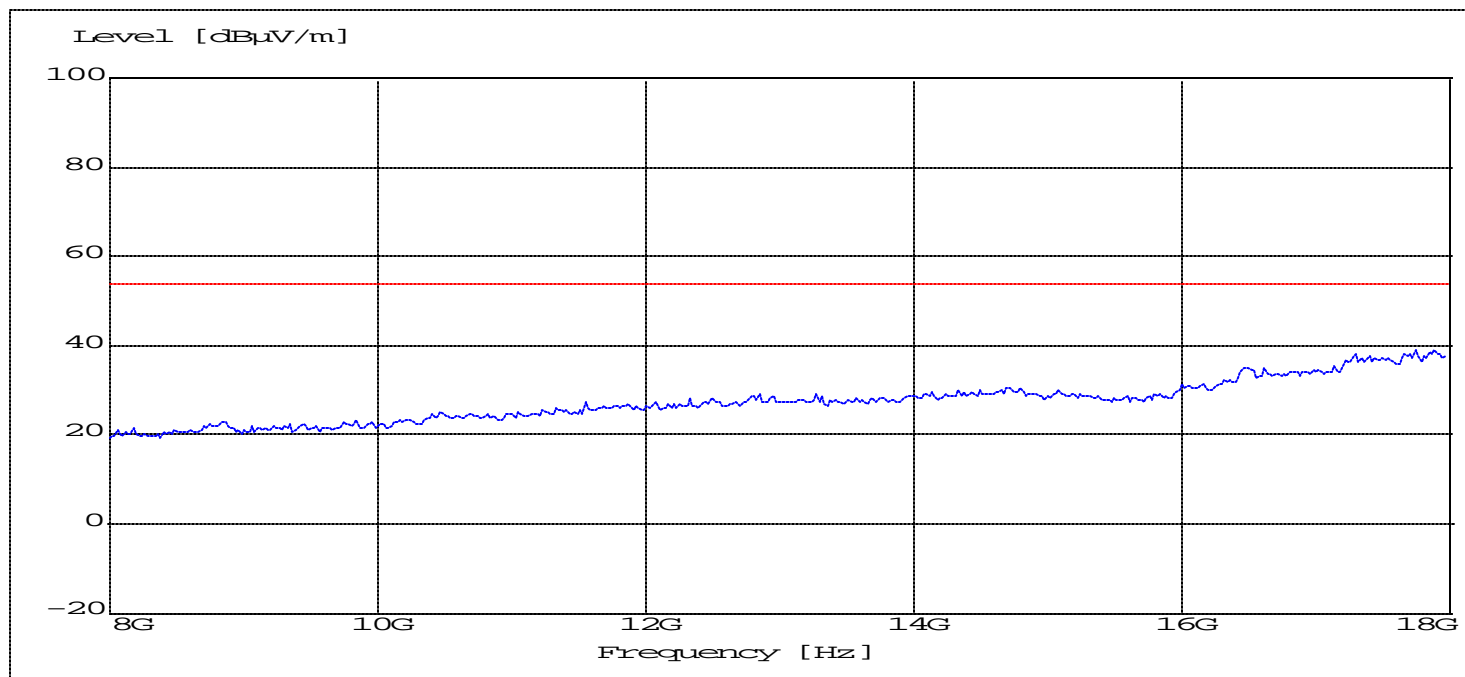
RECEIVER SPURIOUS RADIATION**§ 15.209****1GHz – 8GHz****(This plot is valid for all three channels)****ANALYZER SETTINGS: RBW = 1MHz****VBW = 1MHz**

RECEIVER SPURIOUS RADIATION

§ 15.209

8GHz – 18GHz

(This plot is valid for all three channels)



ANALYZER SETTINGS: RBW = 1MHz

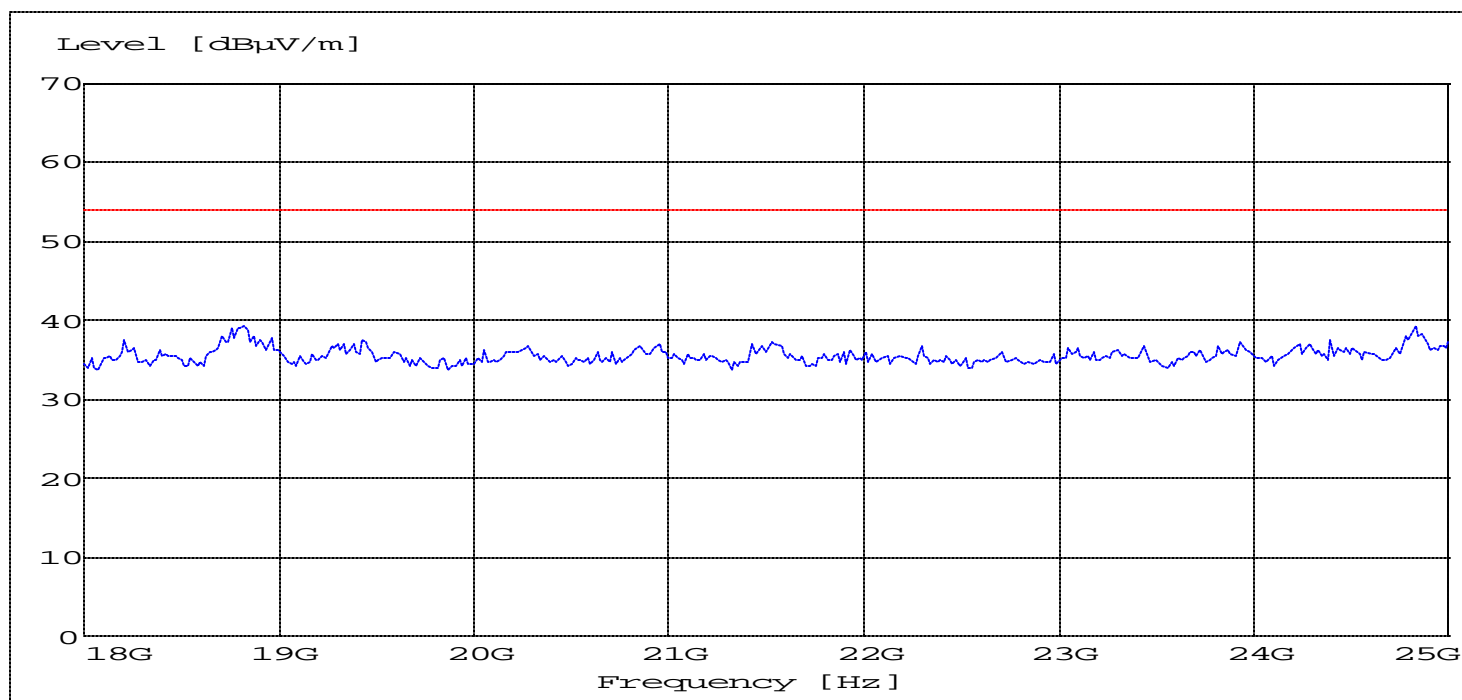
VBW = 1MHz

RECEIVER SPURIOUS RADIATION

§ 15.209

18GHz – 25GHz

(This plot is valid for all three channels)



ANALYZER SETTINGS: RBW = 1MHz

VBW = 1MHz

[illegible]