

CETECOM Inc.



CETECOM Inc.

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Issued test report consists of 49 Pages

Page 1 (49)

**FCC LISTED, REG. NO.: 101450
&
RECOGNIZED BY INDUSTRY CANADA
IC – 3925**

**Test report no.:221FCC/2001
FCC Part 15.247
WL-306**

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1 General information

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 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. Reproduction or publication of extracts from the report requires the prior written approval of the CETECOM Inc. USA.

TEST REPORT PREPARED BY:

EMC & Radio 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

Internet: www.cetecom.com

1.3 Details of applicant

Name : 3COM Corporation
Street : 5400 Bayfront Plaza
City : Santa Clara, CA 95052
Country : USA
Contact : Chris McGough
Telephone : +1 408 326 8474
Telefax : +1 408 326 5854
e-mail : chris_mcgough@3com.com

1.4 Application details

Date of receipt of application : 2001-12-10
Date of receipt of test item : 2001-12-13
Date of test : 2001-12-13/14

1.5 Test item

Manufacturer : applicant
Name of EUT : 3COM Model WL-306
Description : [Wireless LAN Access Point](#)
Model No. : WL-306
Serial No. : N/A
FCC ID :

Additional informations

Frequency : 2402 – 2472 MHz
Type of modulation : DSSS
Number of channels : 13
Antenna : External 18dBi additiona antennas see certificate
Power supply : powered by external power supply (100 – 250 V)
Output power : 28.06 dBm
Extreme Vol. Limits : ±10%
Extreme Temp. Limits : -20°C - +55°C

1.6 Test standards : **FCC Part 15 §15.247**

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 :

2002-01-08

EMC & Radio

Lothar Schmidt



Date

Section

Name

Signature

2.2 Testreport

TEST REPORT

**Testreport no. : 221FCC/2001
WL-306**

TEST REPORT REFERENCE**LIST OF MEASUREMENTS**

Paragraph	PARAMETER TO BE MEASURED	PAGE
	Transmitter parameters	
§ 15.247 (a)(2)	Spectrum Bandwith of a DSSS System	7
§ 15.247 (b)(1)	Maximum peak output power	11
§ 15.247 (c)(1)	Emission limitations	19
§ 15.247 (d)	Power Spectral Density	37
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§ 15.107	Conducted emissions	42
	Receiver parameters	
§ 15.209	Receiver Spurious Radiation	44
	Test equipment listing	49

NOTE: This test report is based on the following test set up of EUT;

Antenna : 18dBi

Antenna Cable: 50ft

Power setting: 160

Additional testing was done to verify the out put power with different combinations of antenna, antenna cable and four power level settings. Refer to certificate showing power level configuration for all different combinations.

SPECTRUM BANDWITH OF DSSS-SYSTEM

SUBCLAUSE § 15.247 (a)(2)

TEST CONDITIONS		6 dB BANDWIDTH (kHz)		
		2412	2442	2472
Frequency (MHz)				
T _{nom} (23)°C	V _{nom} (230)VAC	9719.43	9769.53	9969.93
Measurement uncertainty		±3dB		

LIMIT

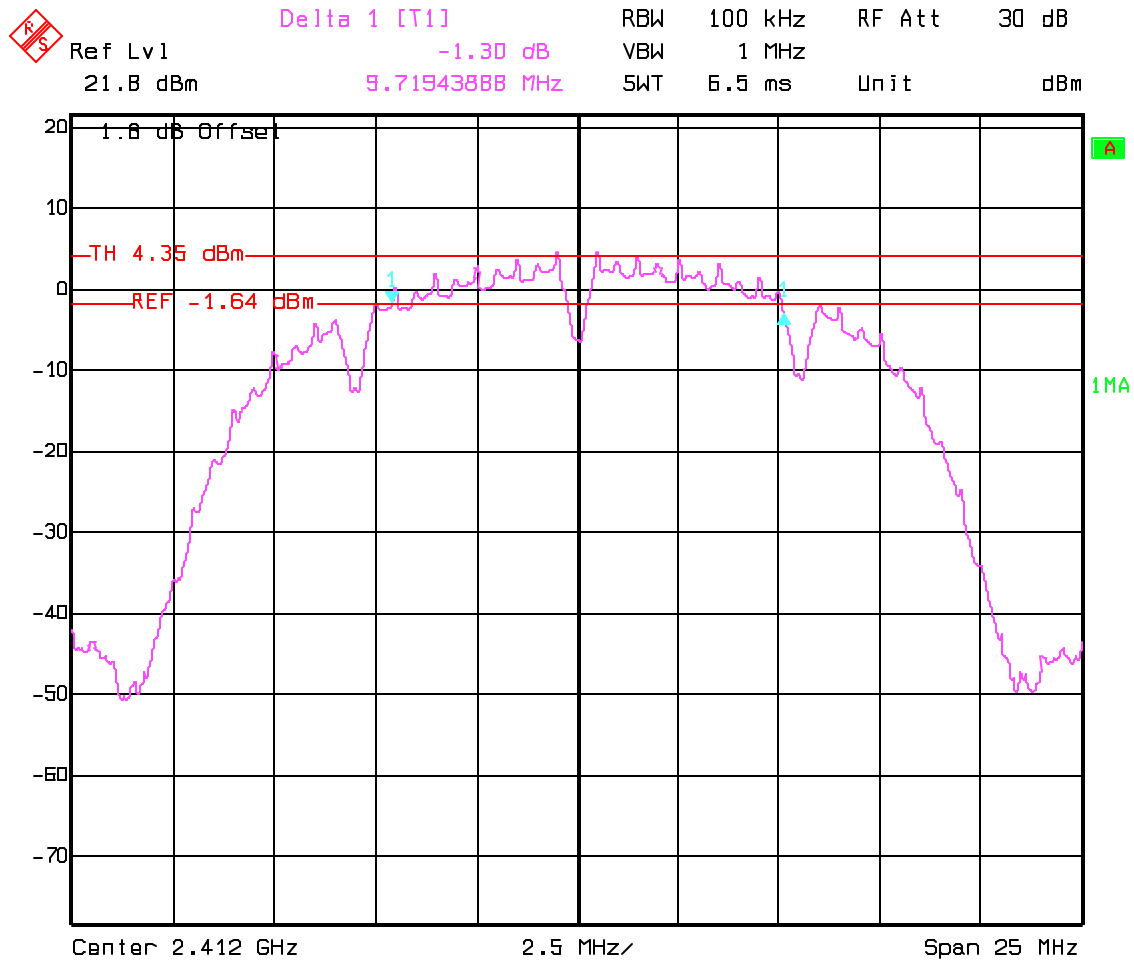
SUBCLAUSE §15.247(a) (2)

The minimum 6dB bandwidth shall shall be at least 500 KHz

SPECTRUM BANDWIDTH OF DSSS-SYSTEM

SUBCLAUSE § 15.247 (a)(2)

Low Channel: 2412 MHz



LIMIT

SUBCLAUSE §15.247(a) (2)

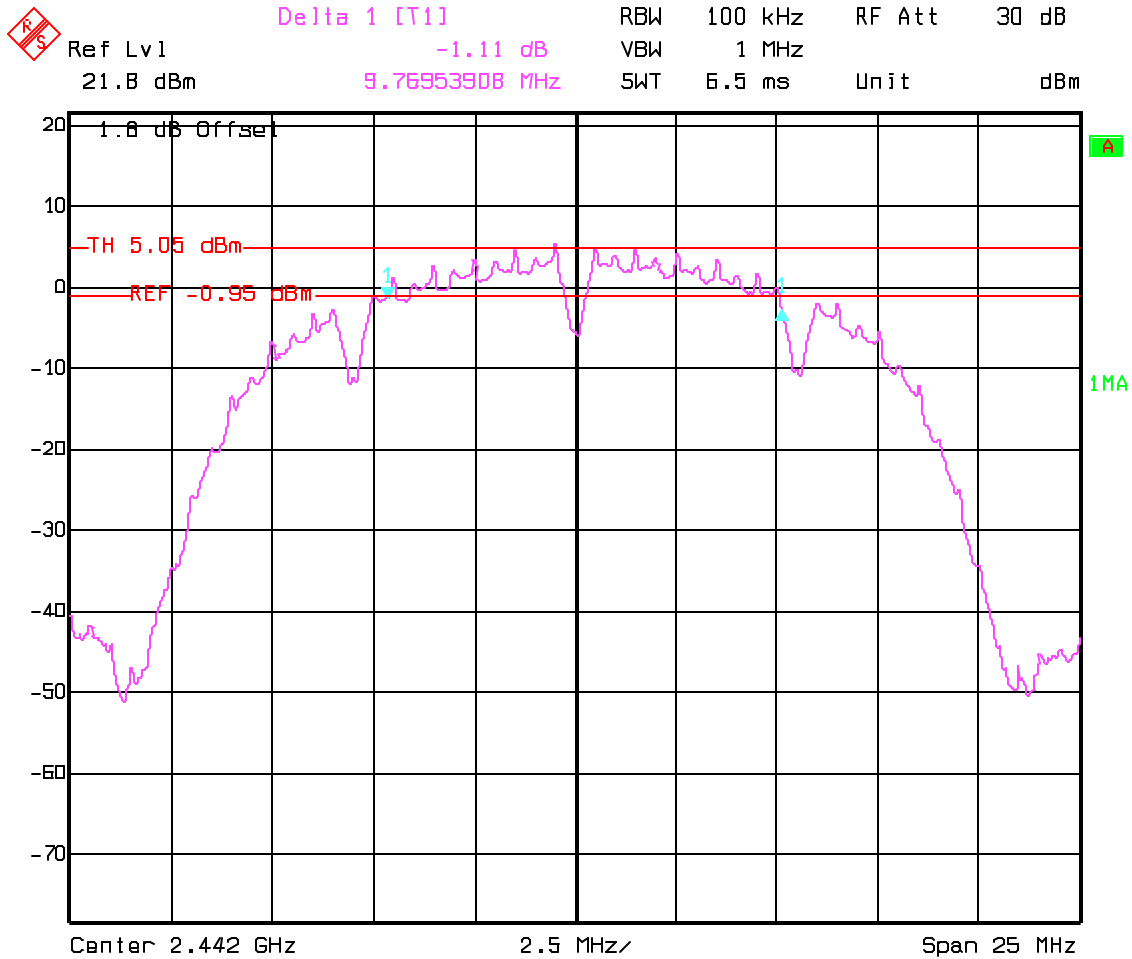
The minimum 6dB bandwidth shall be at least 500 KHz

ANALYZER SETTINGS: RBW=100KHz , VBW=1MHz

SPECTRUM BANDWIDTH OF DSSS-SYSTEM

SUBCLAUSE § 15.247 (a)(2)

Mid Channel: 2442 MHz



Date: 14.DEC.01 15:13:06

LIMIT

SUBCLAUSE §15.247(a) (2)

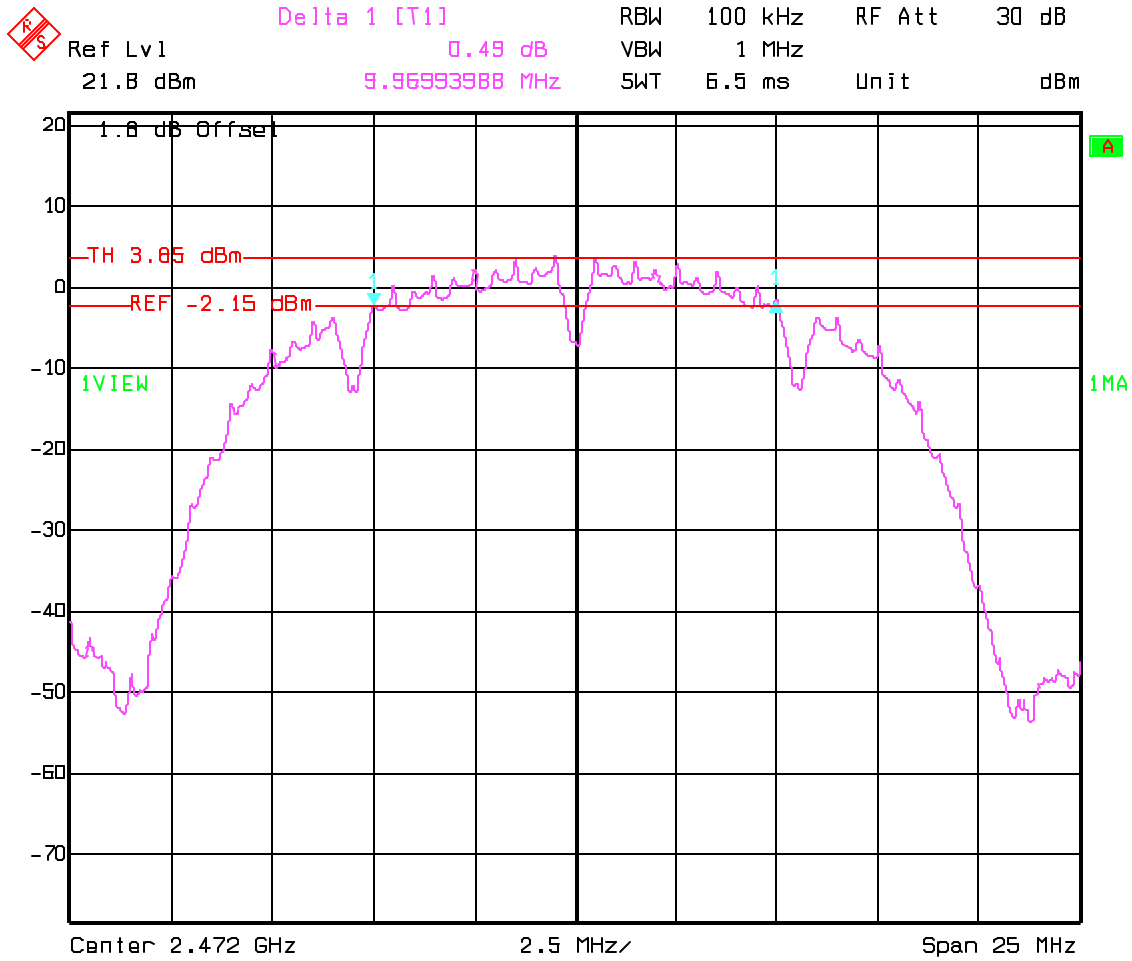
The minimum 6dB bandwidth shall be at least 500 KHz

ANALYZER SETTINGS: RBW=100KHz , VBW=1MHz

SPECTRUM BANDWITH OF DSSS-SYSTEM

SUBCLAUSE § 15.247 (a)(2)

High Channel: 2472 MHz



Date: 14.DEC.01 15:19:41

LIMIT

SUBCLAUSE §15.247(a) (2)

The minimum 6dB bandwidth shall shall be at least 500 KHz

ANALYZER SETTINGS: RBW=100KHz, VBW=1MHz

**MAXIMUM PEAK OUTPUT POWER
(CONDUCTED)**

SUBCLAUSE § 15.247 (b) (1)

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)					
		2412		2442		2472	
Frequency (MHz)		Pk	19.98	Pk	20.20	Pk	19.20
$T_{nom} (23) ^\circ C$	$V_{nom} (230) VAC$	Av	12.03	Av	12.60	Av	11.21
Measurement uncertainty		±3dB					

LIMIT

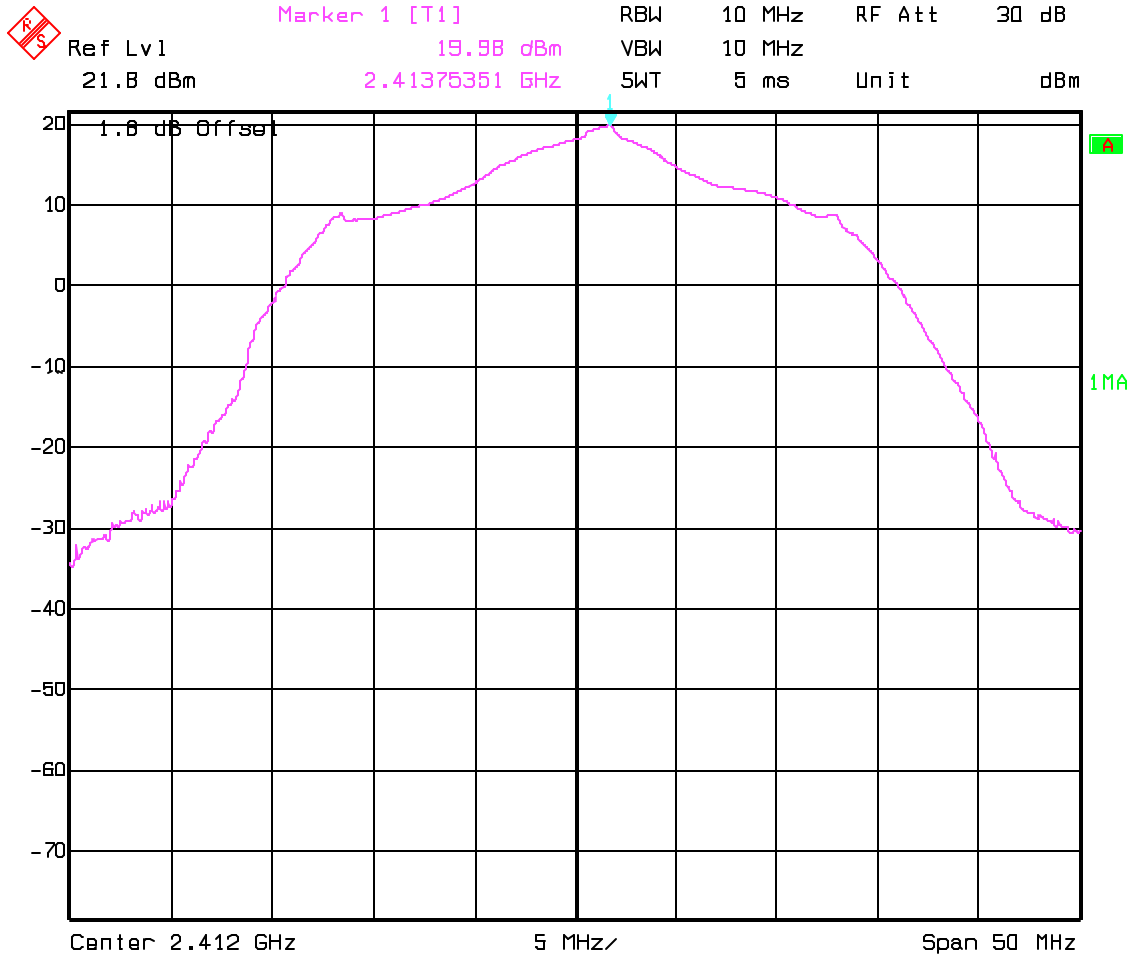
SUBCLAUSE § 15.247 (b) (1)

Frequency range	RF power output
2400-2483.5 MHz / 5725 – 5850 MHz	1.0 Watt

**MAXIMUM PEAK OUTPUT POWER
(CONDUCTED)**

SUBCLAUSE § 15.247 (b) (1)

Low Channel: 2412 MHz

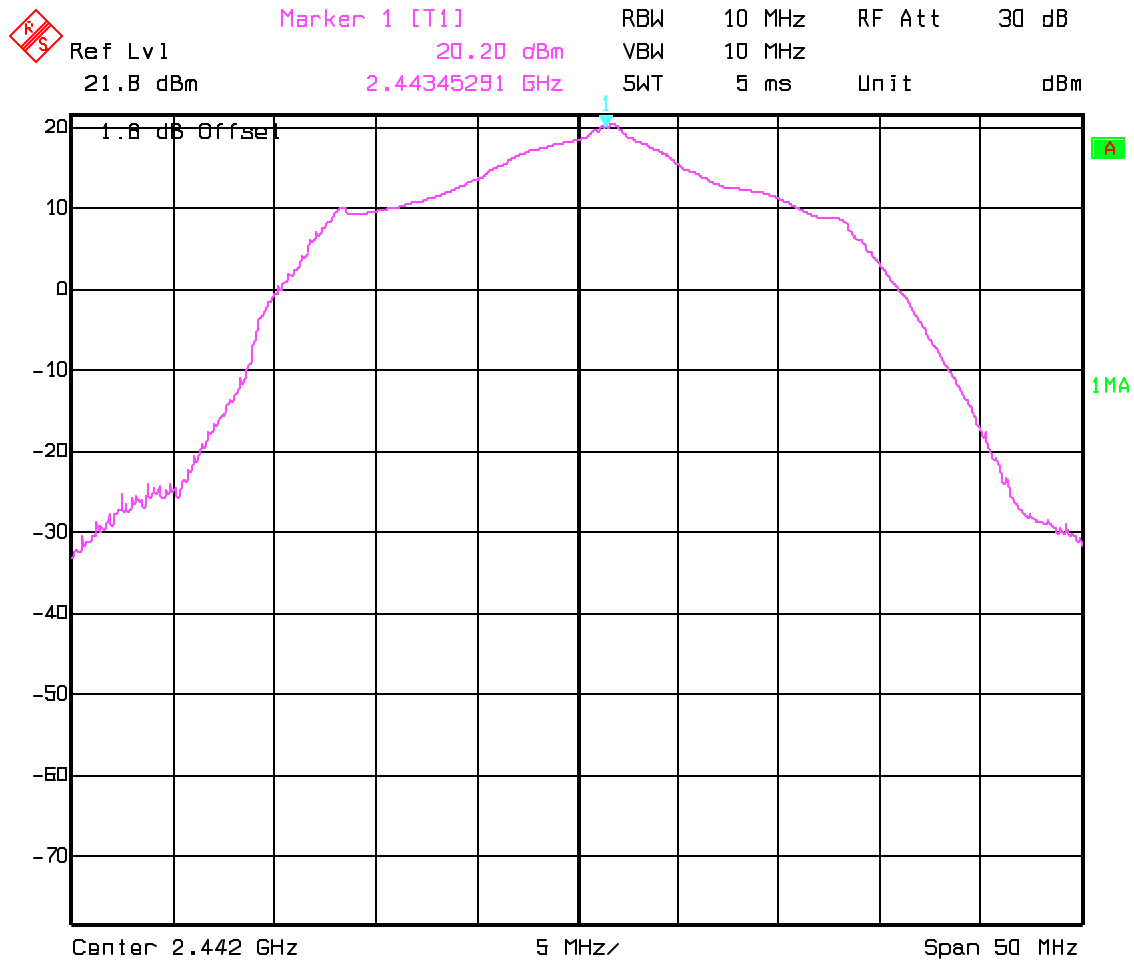


Date: 14.DEC.01 15:31:26

MAXIMUM PEAK OUTPUT POWER
(CONDUCTED)

SUBCLAUSE § 15.247 (b) (1)

Mid Channel: 2442 MHz

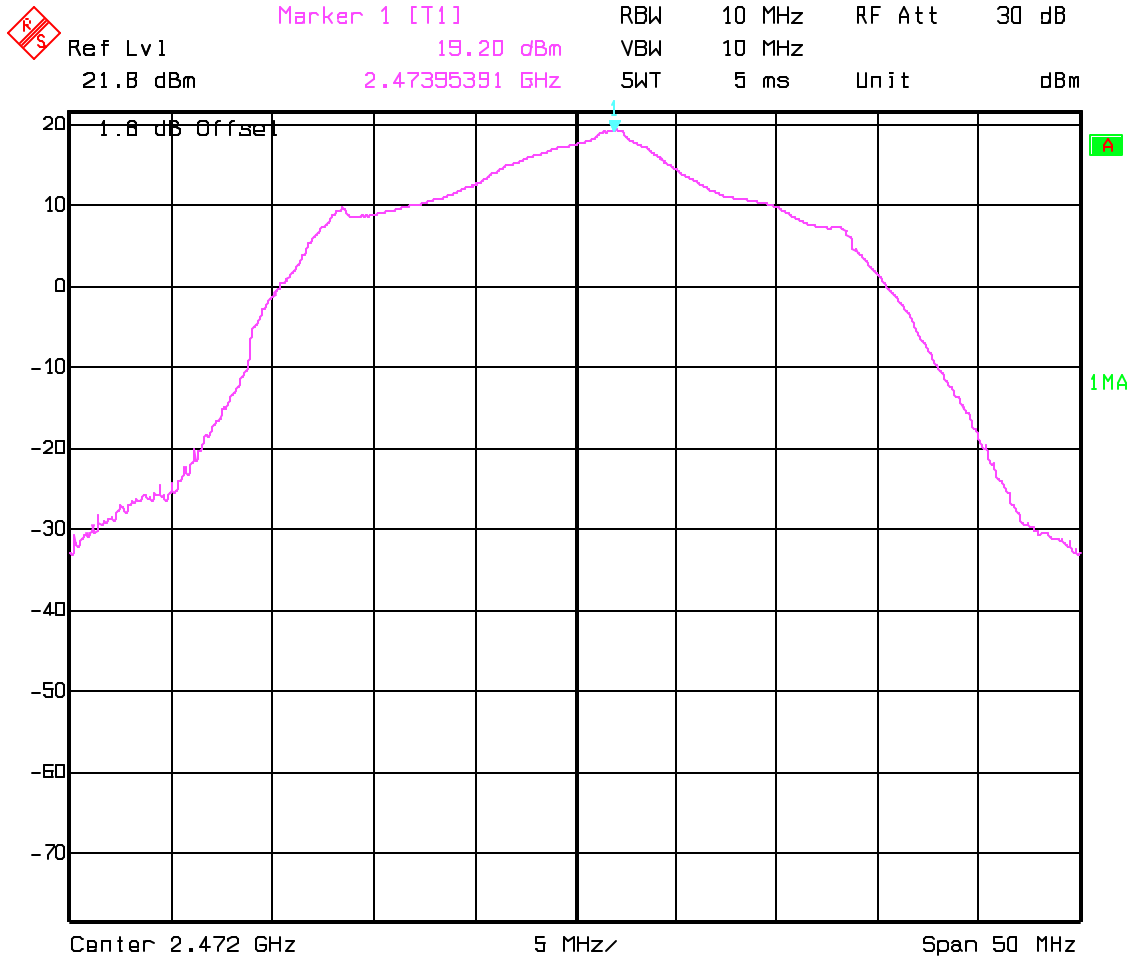


Date: 14.DEC.01 15:29:21

MAXIMUM PEAK OUTPUT POWER
(CONDUCTED)

SUBCLAUSE § 15.247 (b) (1)

High Channel: 2472 MHz



Date: 14.DEC.01 15:23:21

**MAXIMUM PEAK OUTPUT POWER (EIRP)
(RADIATED)**

SUBCLAUSE § 15.247 (b) (1)

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)		
		18 dBi antenna 50 ft cable		
Frequency (MHz)		2412	2442	2472
T _{nom} (23)°C	V _{nom} (230)VAC	24.70	24.78	23.18
Measurement uncertainty		±3dB		

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)		
		18 dBi antenna 20 ft cable		
Frequency (MHz)		2412	2442	2472
T _{nom} (23)°C	V _{nom} (230)VAC	27.97	28.06	26.46
Measurement uncertainty		±3dB		

LIMIT

SUBCLAUSE § 15.247 (b) (1)

Frequency range	RF power output
2400-2483.5 MHz / 5725 – 5850 MHz	1.0 Watt

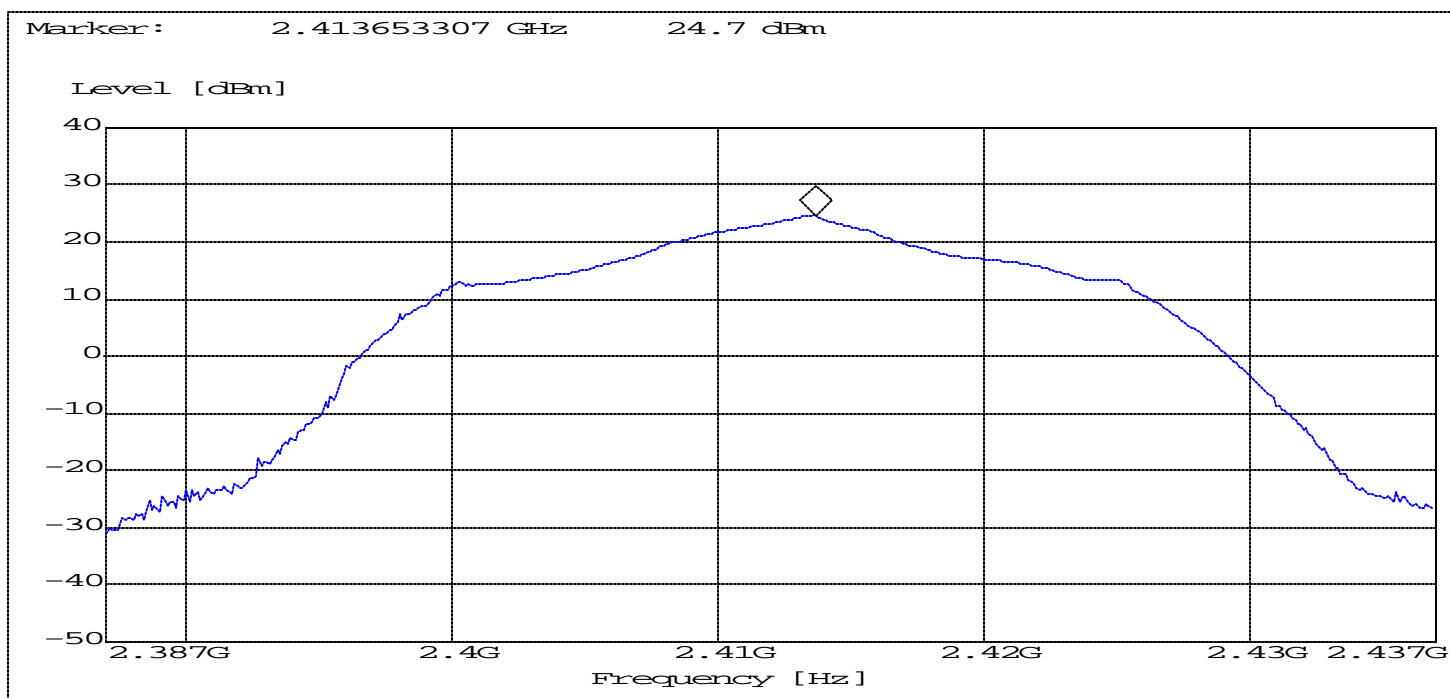
ANALYZER SETTINGS: RBW=10MHz, VBW=10MHz

**MAXIMUM PEAK OUTPUT POWER (EIRP)
(RADIATED)**

SUBCLAUSE § 15.247 (b) (1)

Low Channel: 2412 MHz

ANALYZER SETTINGS: RBW=10MHz, VBW=10MHz

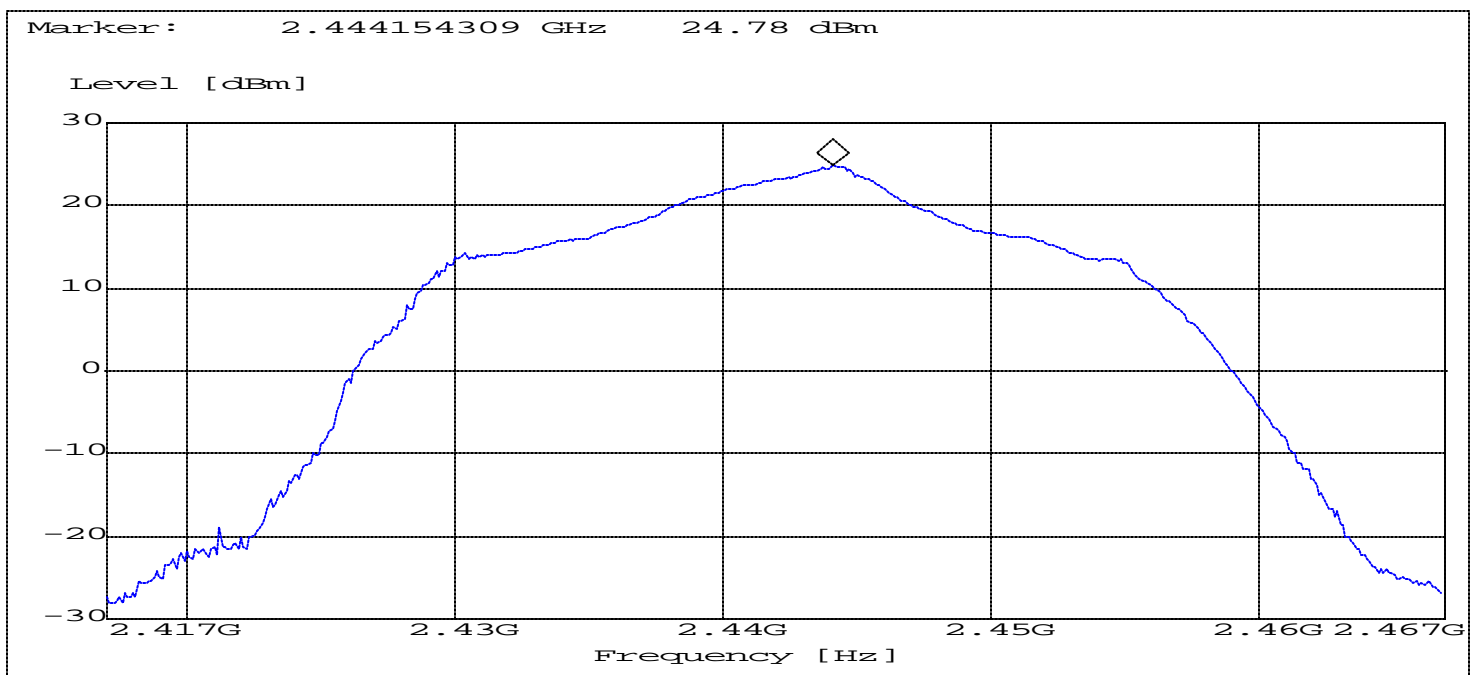


**MAXIMUM PEAK OUTPUT POWER (EIRP)
(RADIATED)**

SUBCLAUSE § 15.247 (b) (1)

Mid Channel: 2442 MHz

ANALYZER SETTINGS: RBW=10MHz, VBW=10MHz

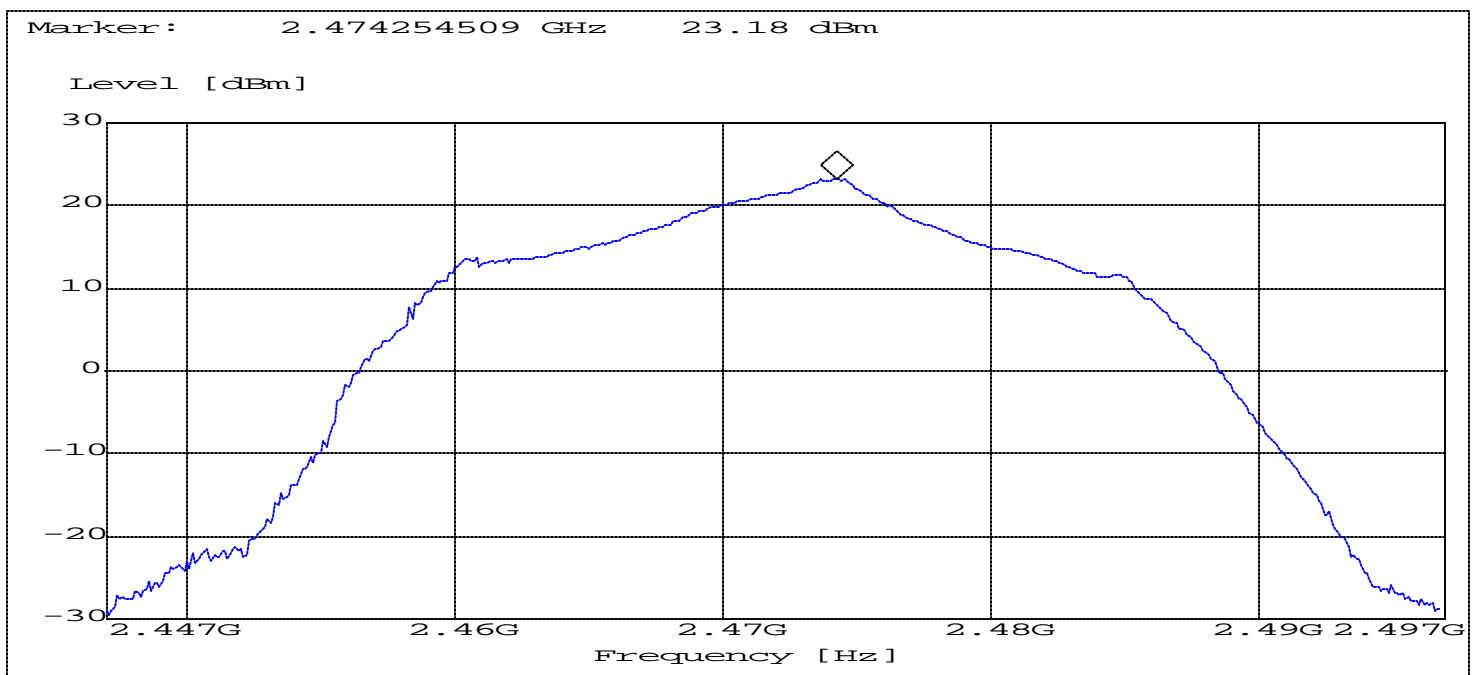


**MAXIMUM PEAK OUTPUT POWER (EIRP)
(RADIATED)**

SUBCLAUSE § 15.247 (b) (1)

High Channel: 2472 MHz

ANALYZER SETTINGS: RBW=10MHz , VBW=10MHz



EMISSION LIMITATIONS - Conducted (Transmitter)

§ 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)).

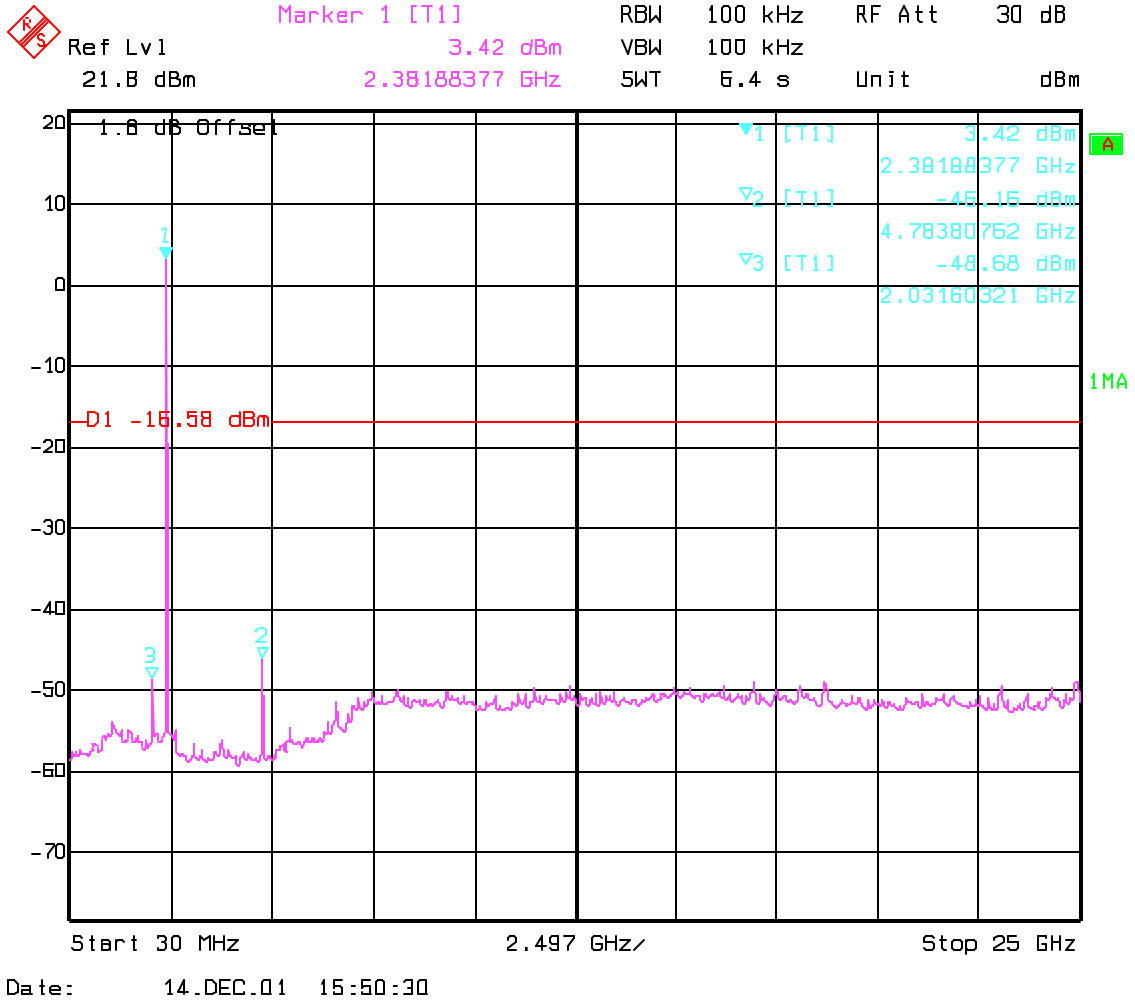
NOTE: Frequency resolution is not fine enough to show the exact frequency of the carrier, refer to plots under EIRP.

EMISSION LIMITATIONS (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Conducted

Low Channel (2412 MHz): 30MHz – 25GHz



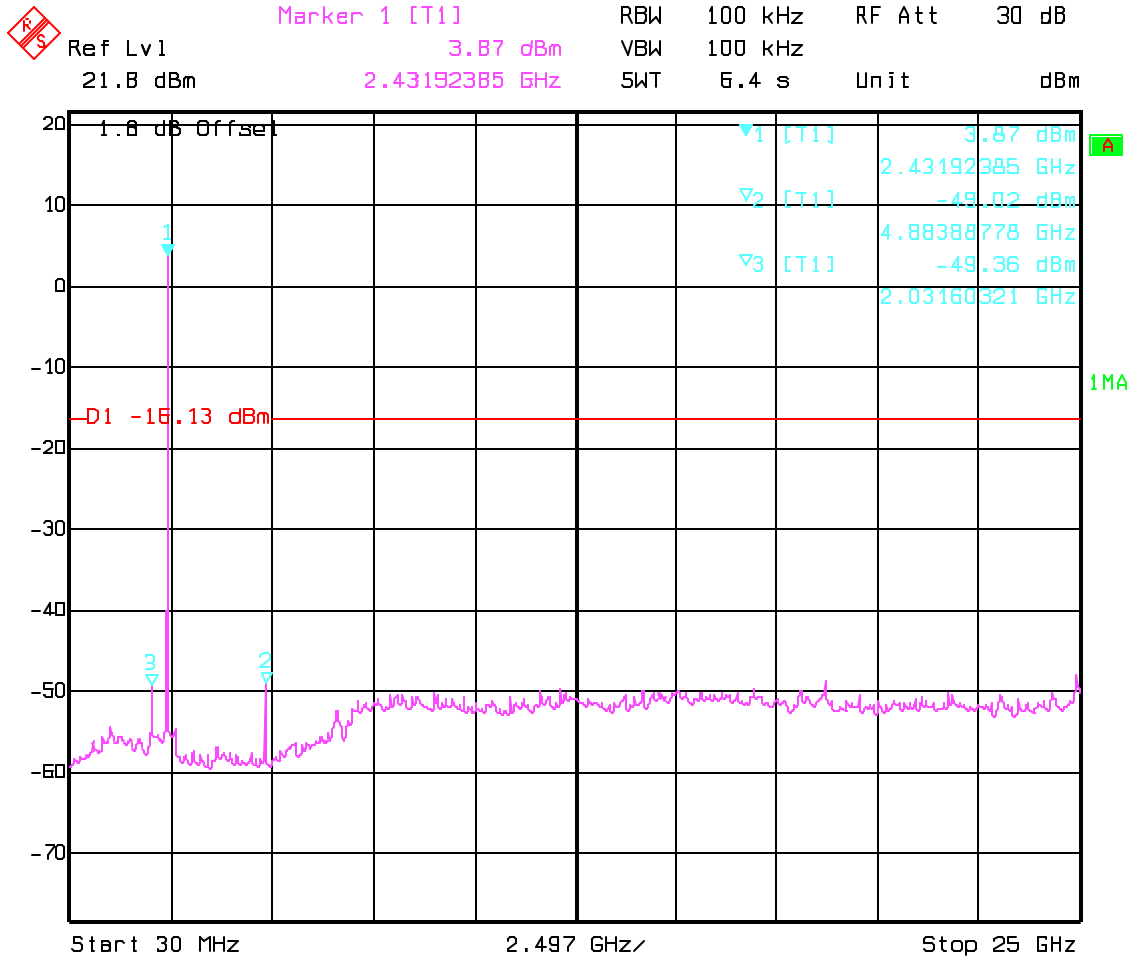
NOTE: The peak above the limit line is the carrier frequency.

EMISSION LIMITATIONS (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

conducted

Mid Channel (2442 MHz): 30MHz – 25GHz



Date: 14.DEC.01 15:52:20

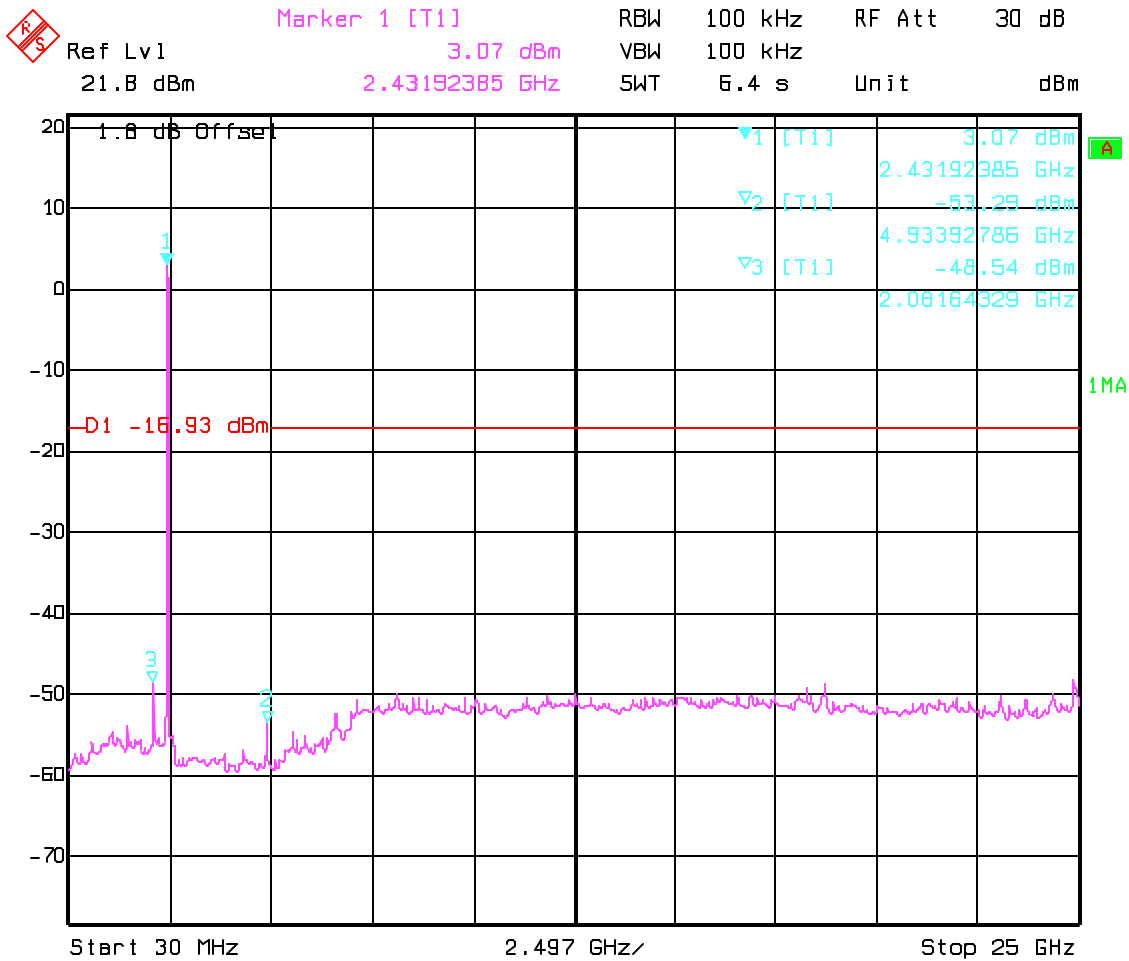
NOTE: The peak above the limit line is the carrier frequency.

EMISSION LIMITATIONS (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

conducted

High Channel (2472 MHz): 30MHz – 25GHz



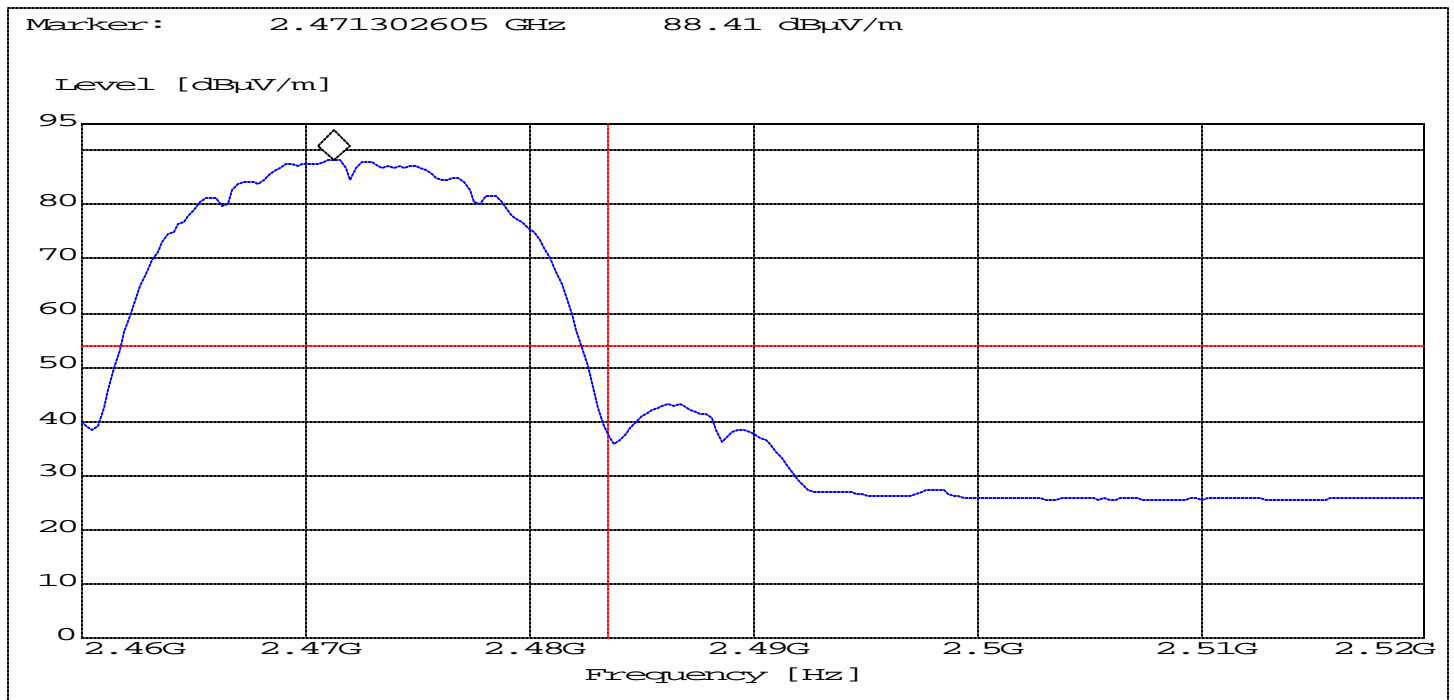
Date: 14 .DEC .01 15:54:38

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

EMISSION LIMITATIONS (Transmitter)

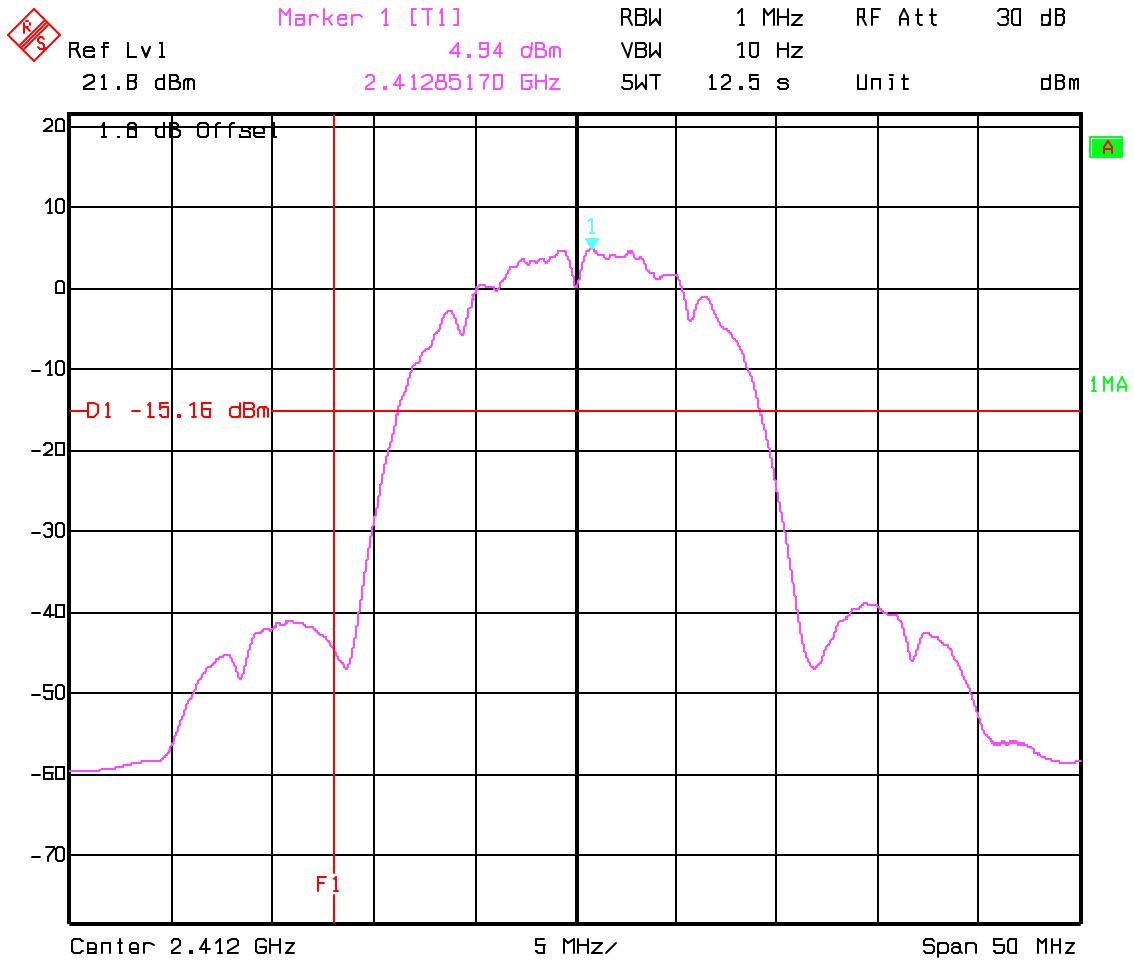
SUBCLAUSE § 15.247 (c) (2)

spurious in the restricted band 2483.5 – 2500 MHz
(Higher Band Edge)



ANALYZER SETTINGS: RBW=1MHz VBW=10Hz

Lower Band Edge: (2400MHz)



Date: 14.DEC.01 15:40:59

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.
3. All emission measurements were done in Peak mode. In case limits are exceeded the measurements will be repeated and documented in the test report either with Quasi Peak or average detector depending on the frequency range specified in FCC 15 and/or DA00-705. Bandwidth, sweeptime etc. were set according DA00-705 and recorded

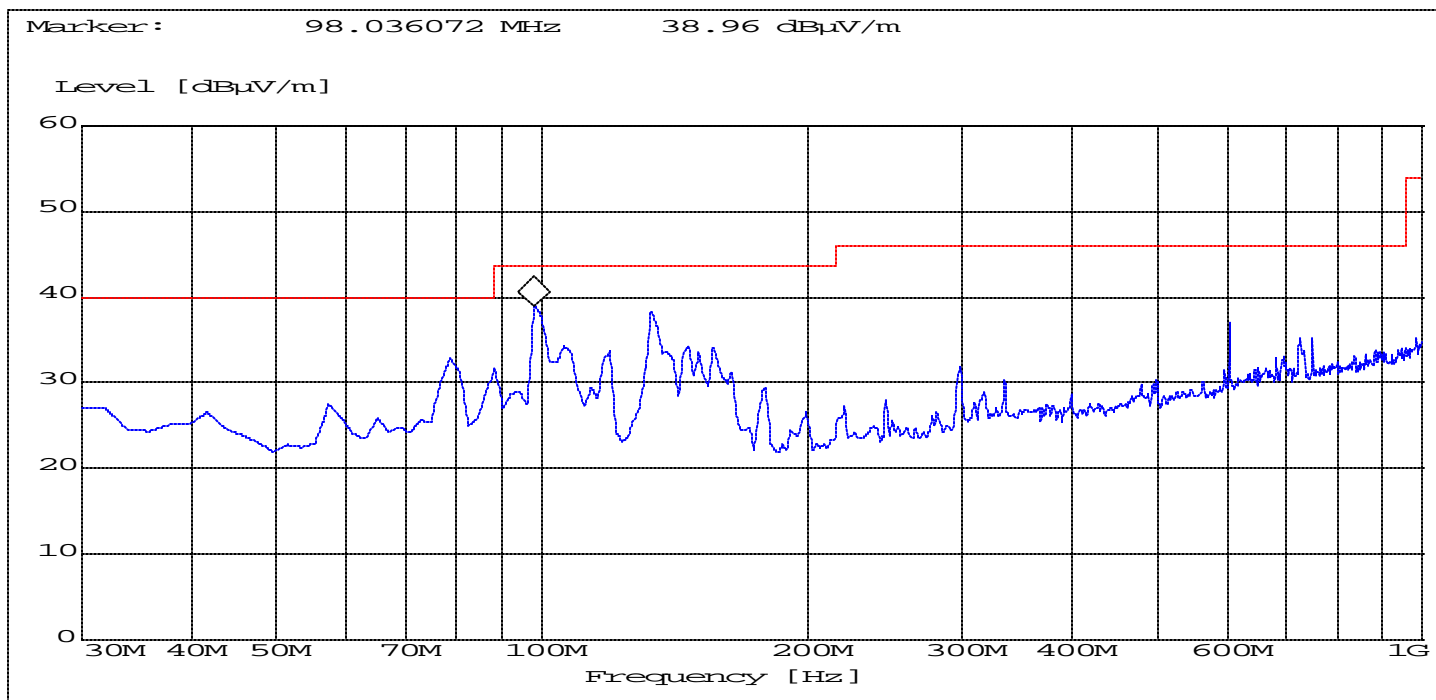
Results for the radiated measurements below 30MHz according § 15.33

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

EMISSION LIMITATIONS (Transmitter)
Radiated

SUBCLAUSE § 15.247 (c) (1)

Low Channel(2412MHz): 30MHz-1GHz



ANALYZER SETTINGS: f < 1 GHz : RBW/VBW: 100 kHz

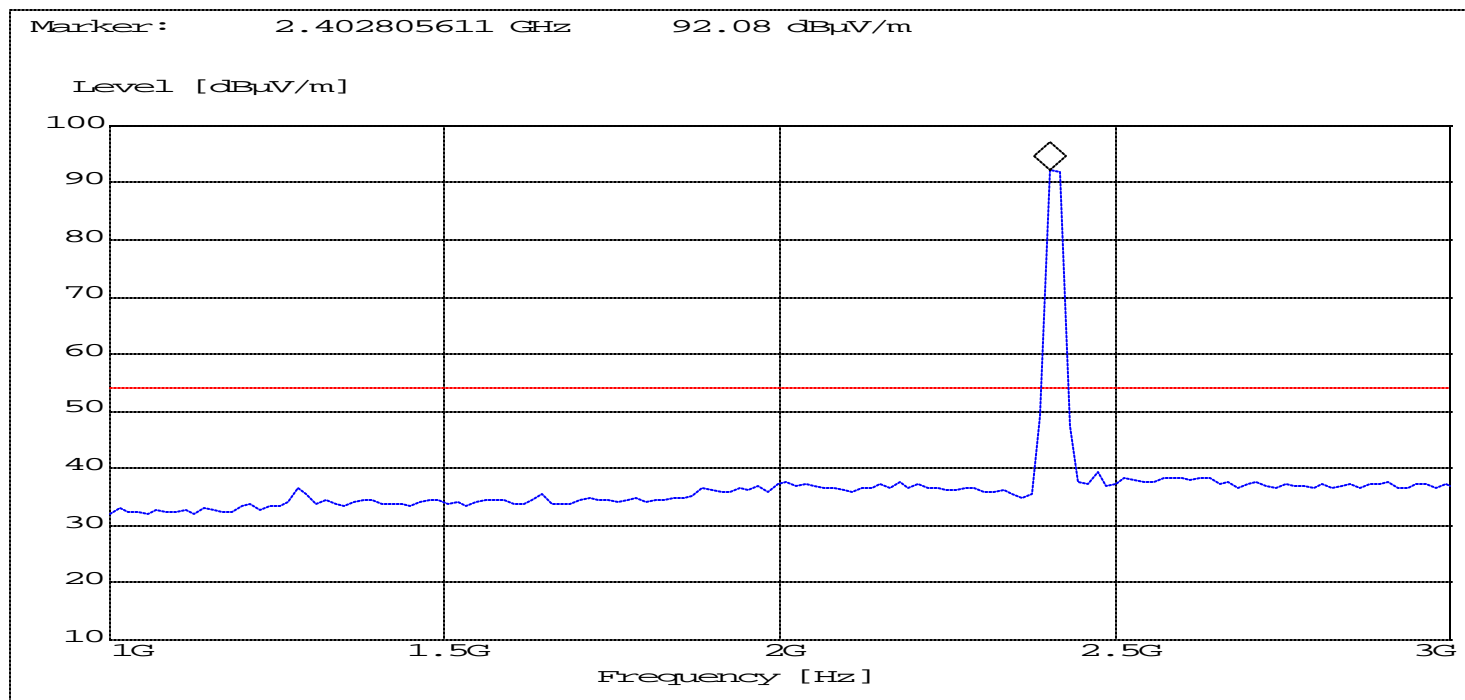
f ≥ 1GHz : RBW/VBW: 1 MHz

EMISSION LIMITATIONS (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Radiated

Low Channel(2412MHz): 1GHz-3GHz



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

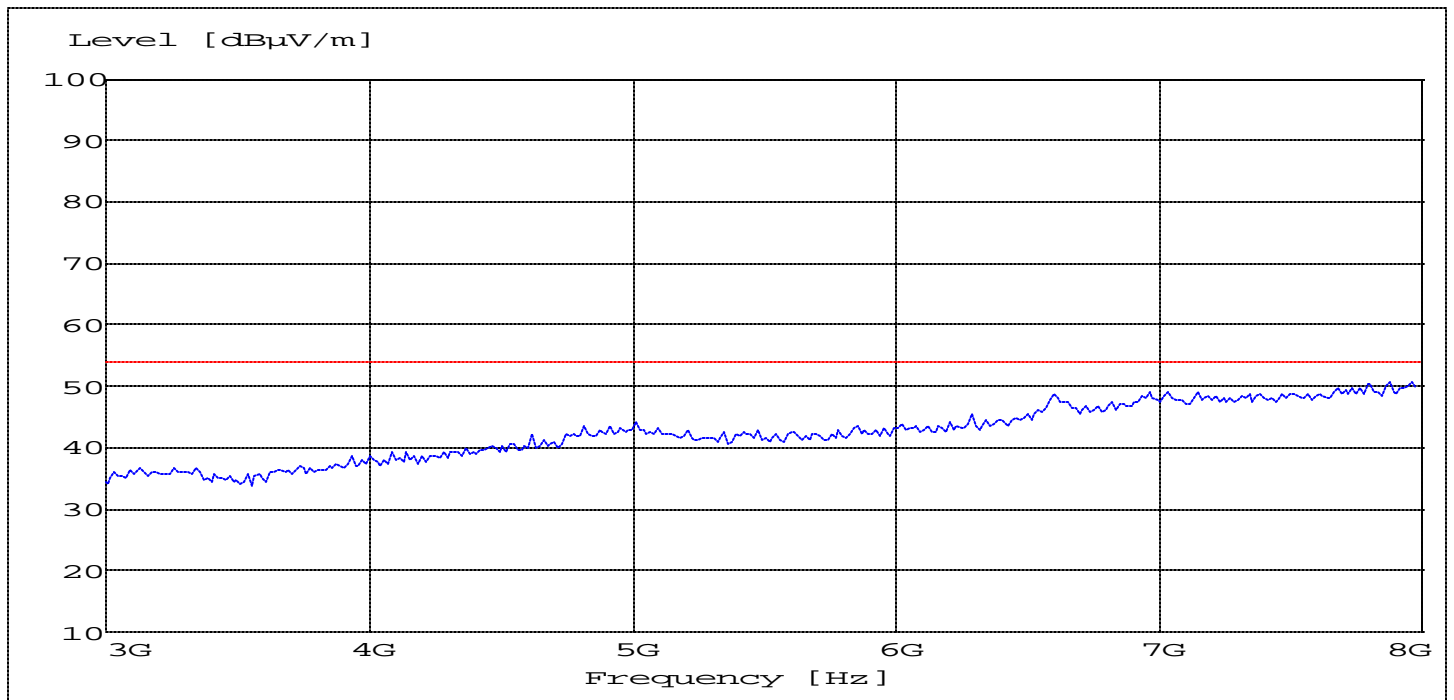
ANALYZER SETTINGS: f < 1 GHz : RBW/VBW: 100 kHz

f \ge 1GHz : RBW/VBW: 1 MHz

EMISSION LIMITATIONS (Transmitter)
Radiated

SUBCLAUSE § 15.247 (c) (1)

Low Channel(2412MHz): 3GHz-8GHz



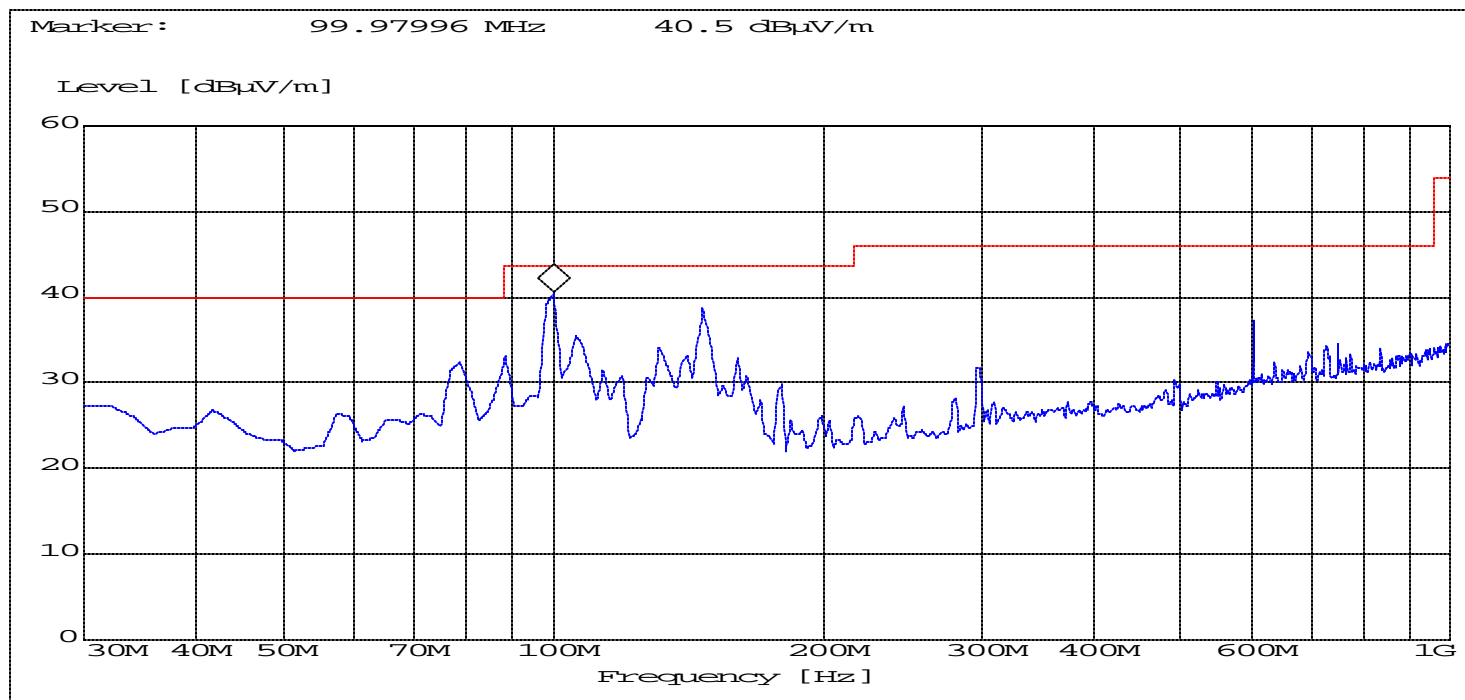
ANALYZER SETTINGS: f < 1 GHz : RBW/VBW: 100 kHz

f ≥ 1GHz : RBW/VBW: 1 MHz

EMISSION LIMITATIONS (Transmitter)
Radiated

SUBCLAUSE § 15.247 (c) (1)

Mid Channel(2442MHz): 30MHz-1GHz



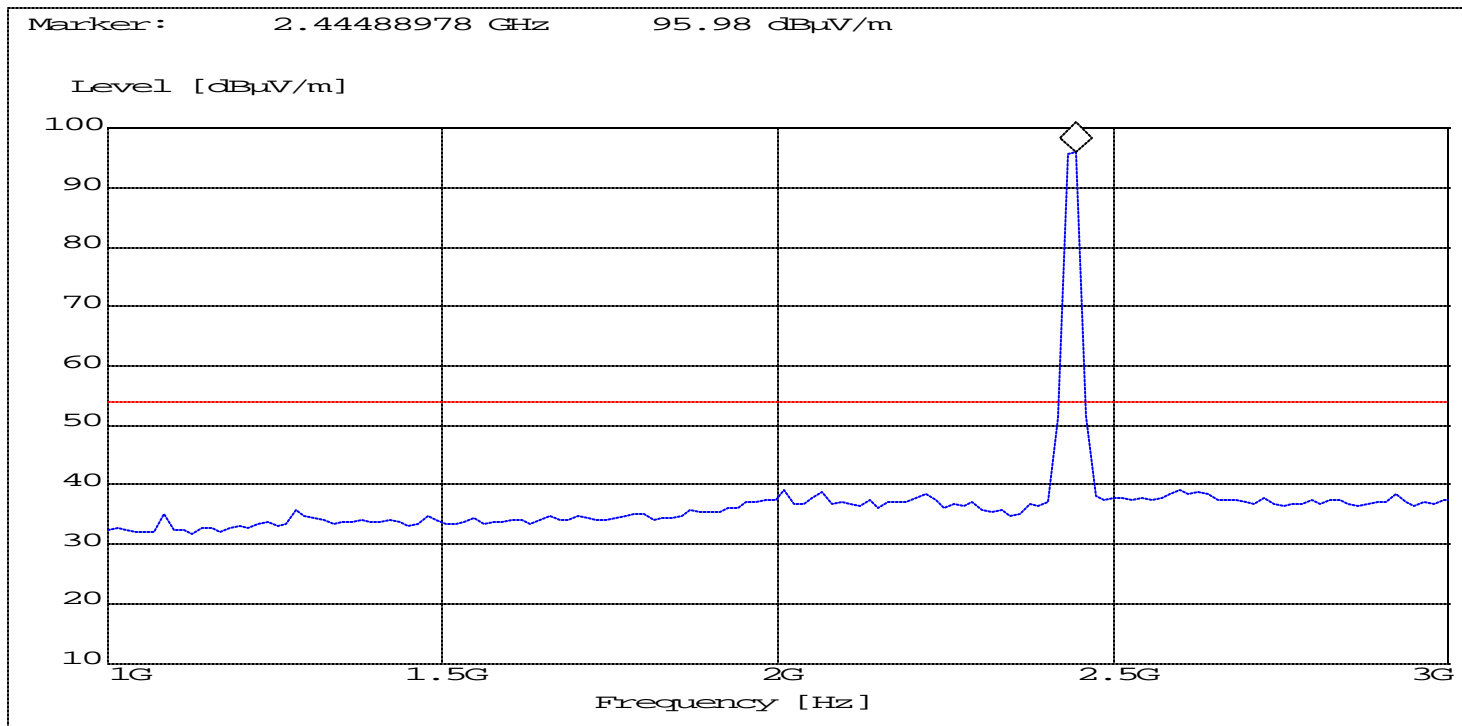
ANALYZER SETTINGS: f < 1 GHz : RBW/VBW: 100 kHz

f \geq 1GHz : RBW/VBW: 1 MHz

EMISSION LIMITATIONS (Transmitter)
Radiated

SUBCLAUSE § 15.247 (c) (1)

Mid Channel(2442MHz): 1GHz-3GHz



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

ANALYZER SETTINGS: f < 1 GHz : RBW/VBW: 100 kHz

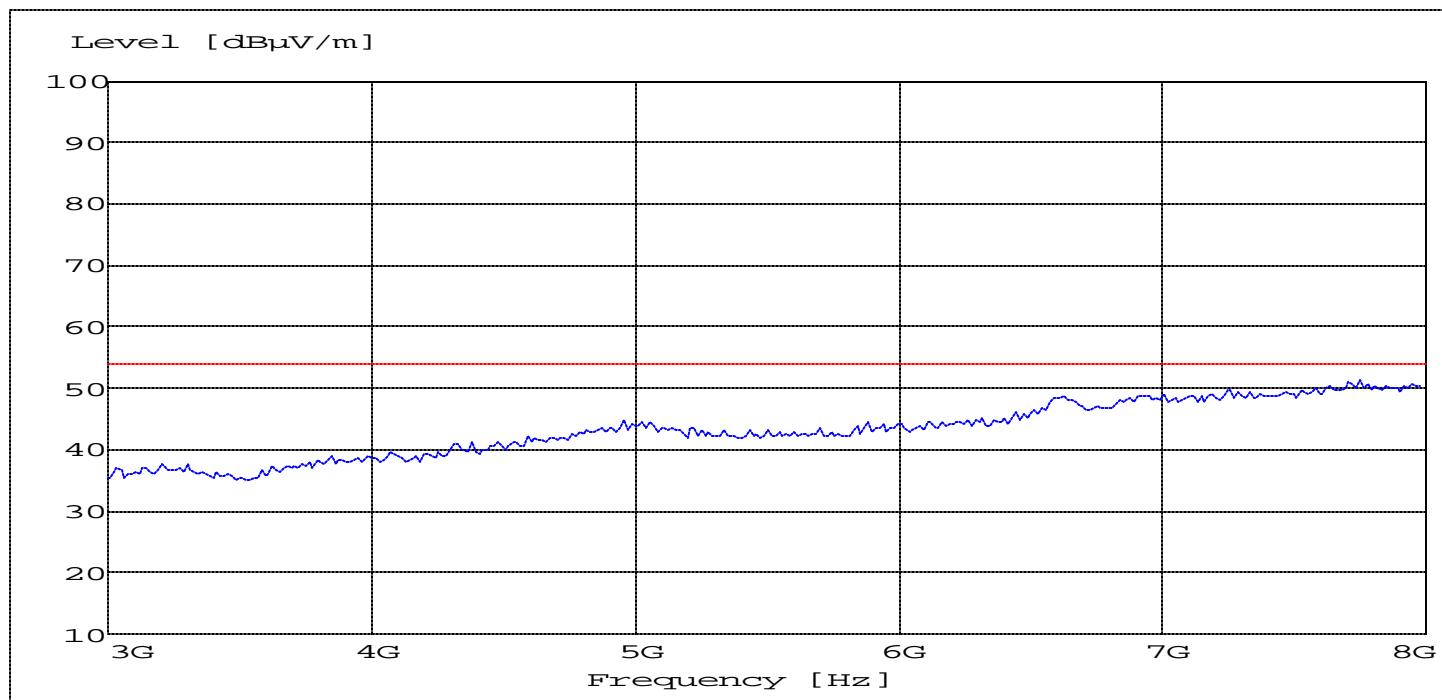
f \geq 1GHz : RBW/VBW: 1 MHz

EMISSION LIMITATIONS (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Radiated

Mid Channel(2442MHz): 3GHz-8GHz



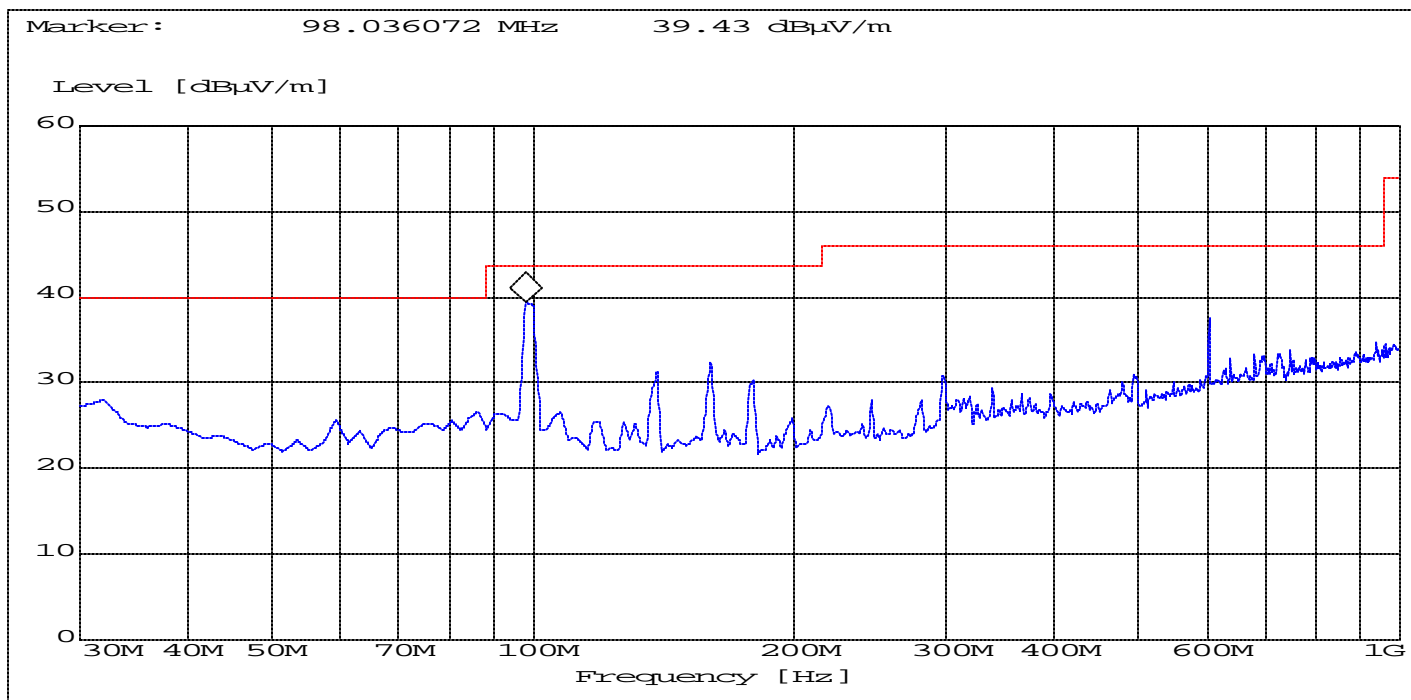
ANALYZER SETTINGS: f < 1 GHz : RBW/VBW: 100 kHz

f ≥ 1GHz : RBW/VBW: 1 MHz

EMISSION LIMITATIONS (Transmitter)
Radiated

SUBCLAUSE § 15.247 (c) (1)

Hihg Channel(2472MHz): 30MHz-1GHz



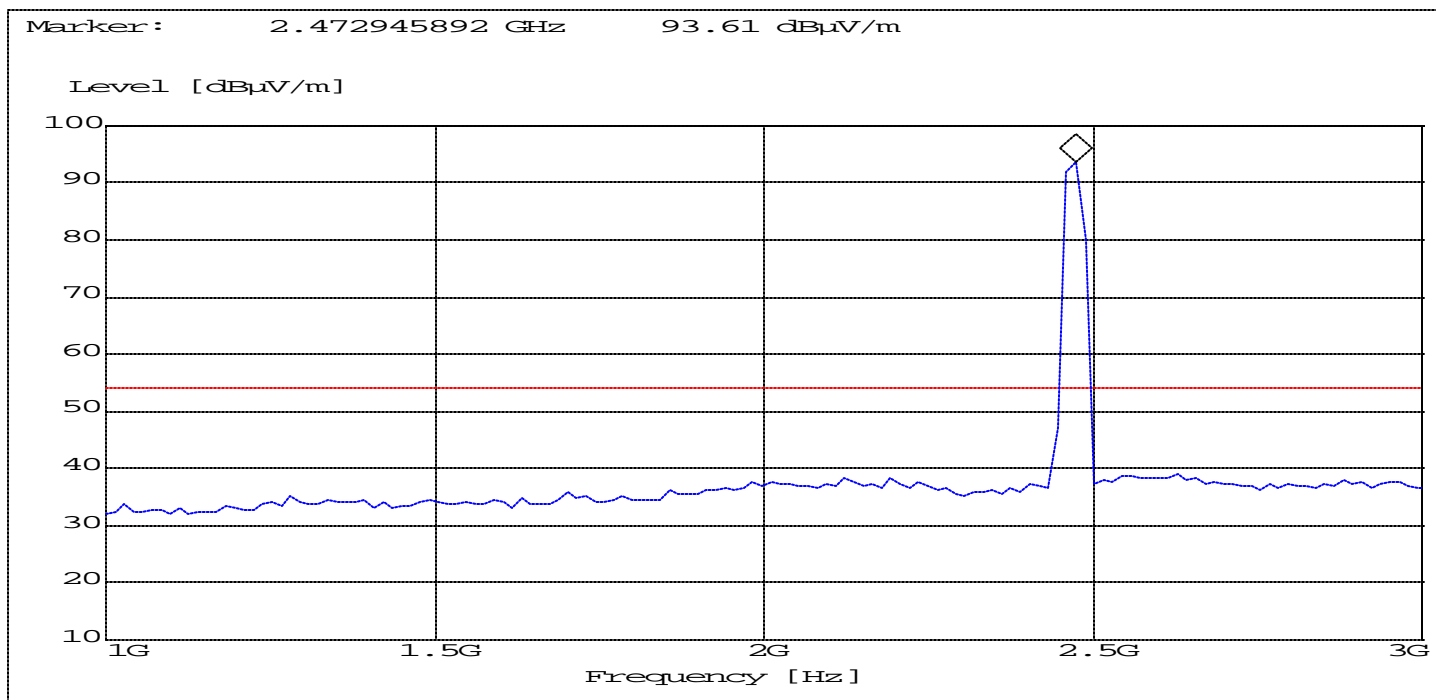
ANALYZER SETTINGS: f < 1 GHz : RBW/VBW: 100 kHz

f \geq 1GHz : RBW/VBW: 1 MHz

EMISSION LIMITATIONS (Transmitter)
Radiated

SUBCLAUSE § 15.247 (c) (1)

Hihg Channel(2472MHz): 1GHz-3GHz



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

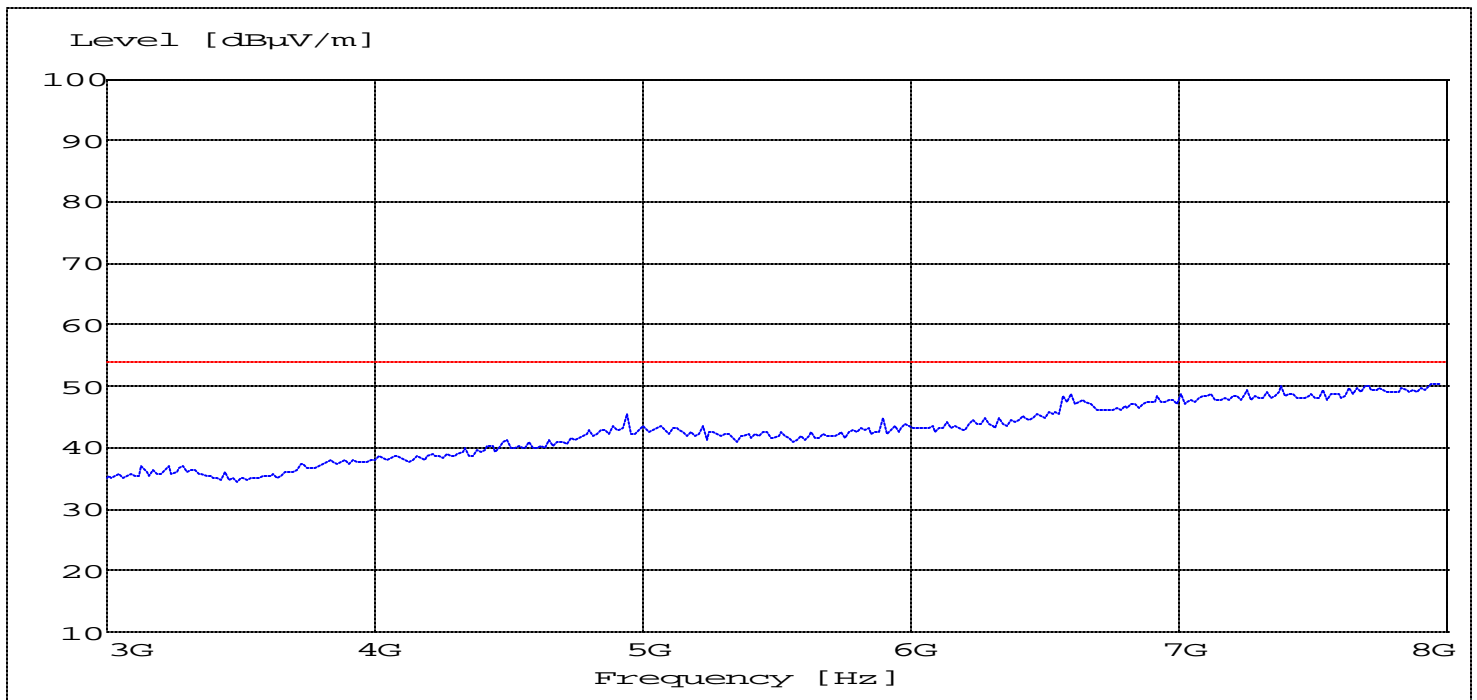
ANALYZER SETTINGS: f < 1 GHz : RBW/VBW: 100 kHz

f \geq 1GHz : RBW/VBW: 1 MHz

EMISSION LIMITATIONS (Transmitter)
Radiated

SUBCLAUSE § 15.247 (c) (1)

Hihg Channel(2472MHz): 3GHz-8GHz



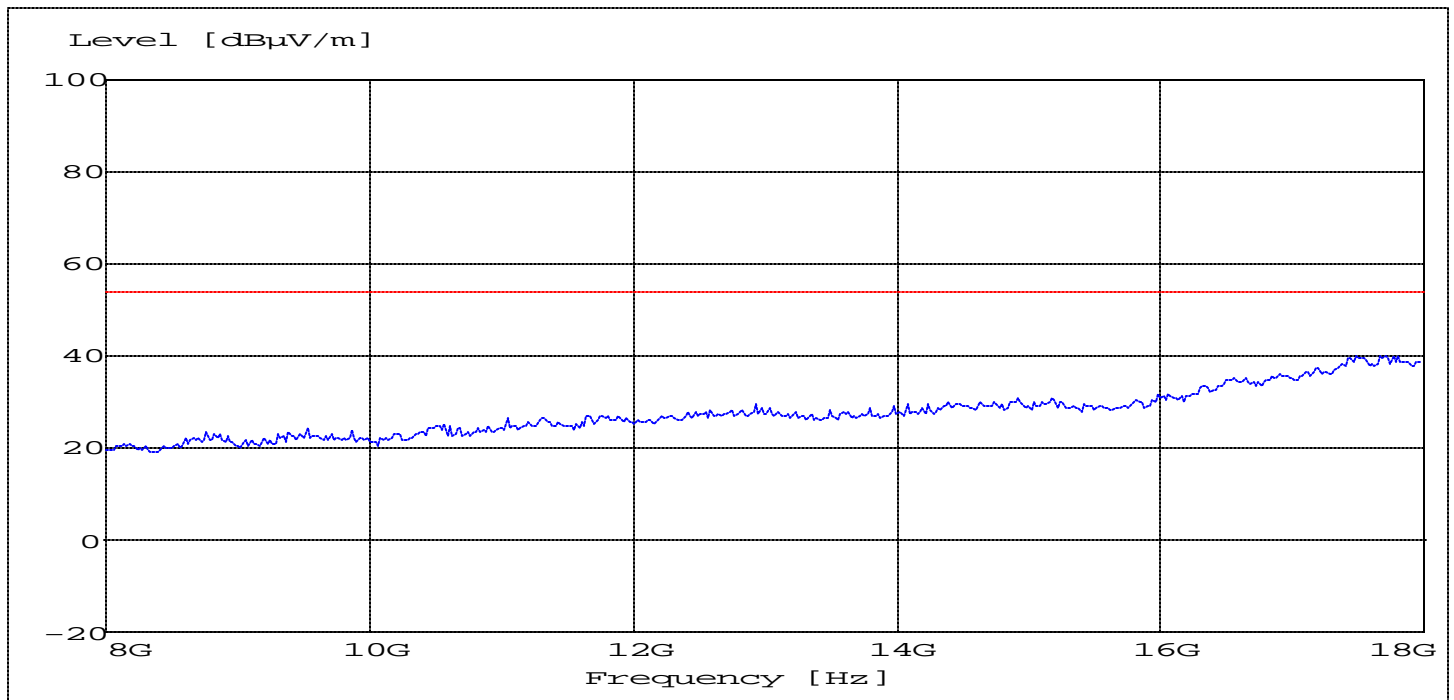
ANALYZER SETTINGS: f < 1 GHz : RBW/VBW: 100 kHz

f ≥ 1GHz : RBW/VBW: 1 MHz

EMISSION LIMITATIONS (Transmitter)
Radiated

SUBCLAUSE § 15.247 (c) (1)

8GHz – 18GHz (This plot is applicable for all three channels)



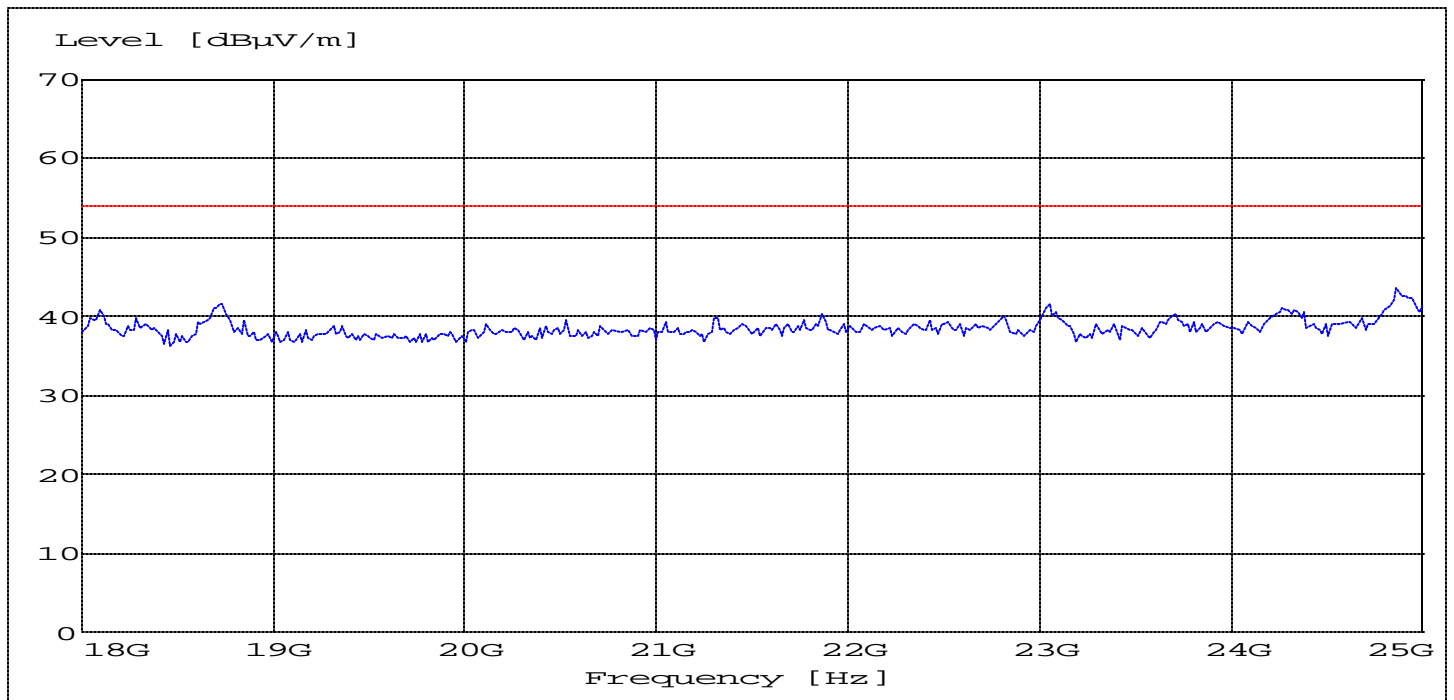
ANALYZER SETTINGS: f < 1 GHz : RBW/VBW: 100 kHz

f ≥ 1GHz : RBW/VBW: 1 MHz

EMISSION LIMITATIONS (Transmitter)
Radiated

SUBCLAUSE § 15.247 (c) (1)

18GHz – 25GHz (This plot is applicable for all three channels)



ANALYZER SETTINGS: f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW/VBW: 1 MHz

POWER SPECTRAL DENSITY

SUBCLAUSE § 15.247 (d)

TEST CONDITIONS		RF POWER LEVEL IN 3 kHz BW		
		2412	2442	2472
Frequency (MHz)				
T _{nom} (23)° C	V _{nom} (230)VAC	-14.65 dBm	-13.97dBm	-14.91 dBm
Measurement uncertainty		±3dB		

LIMIT

SUBCLAUSE §15.247(d)

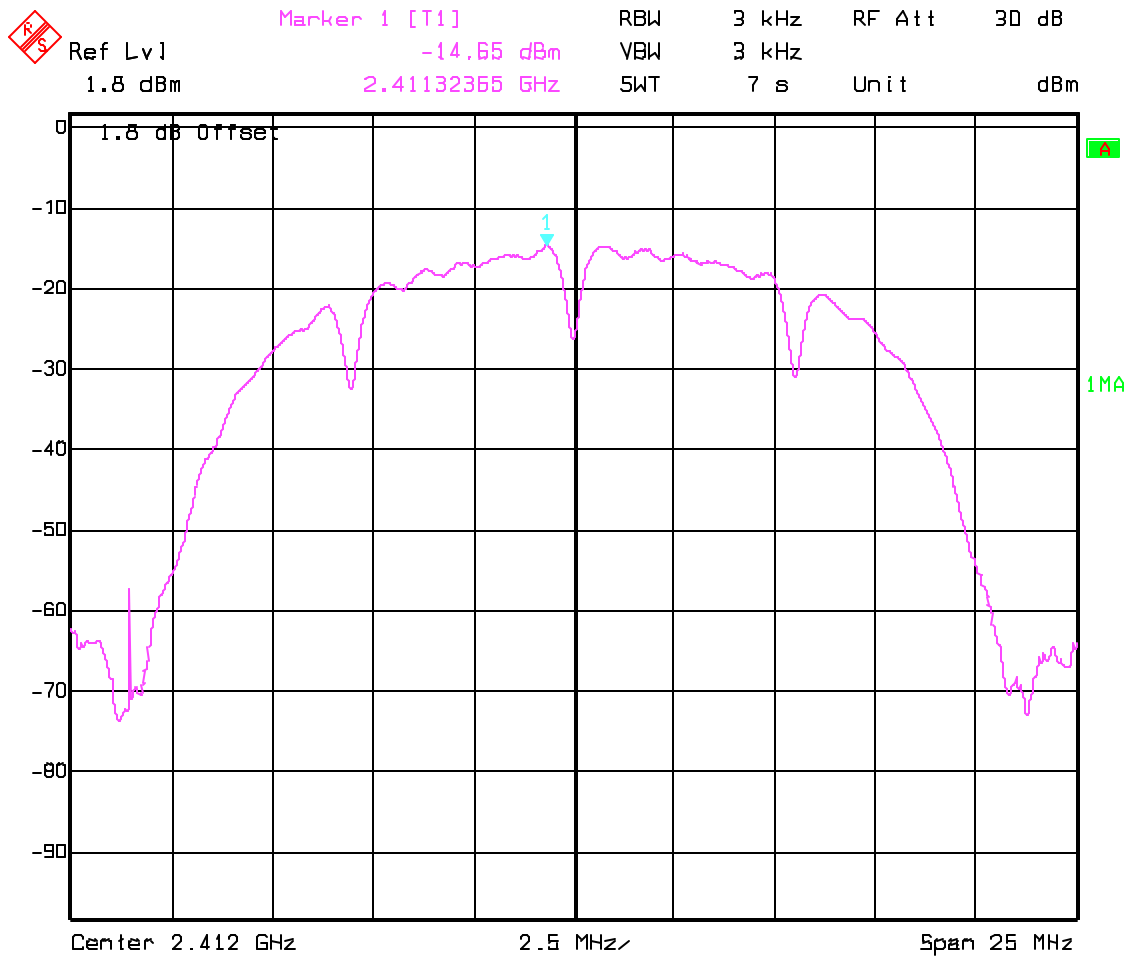
The peak power spectral density shall not be greater than 8 dBm in any 3 kHz band

ANALYZER SETTINGS: RBW=3KHz, VBW=3KHz

POWER SPECTRAL DENSITY

SUBCLAUSE § 15.247 (d)

Low Channel: 2412 MHz

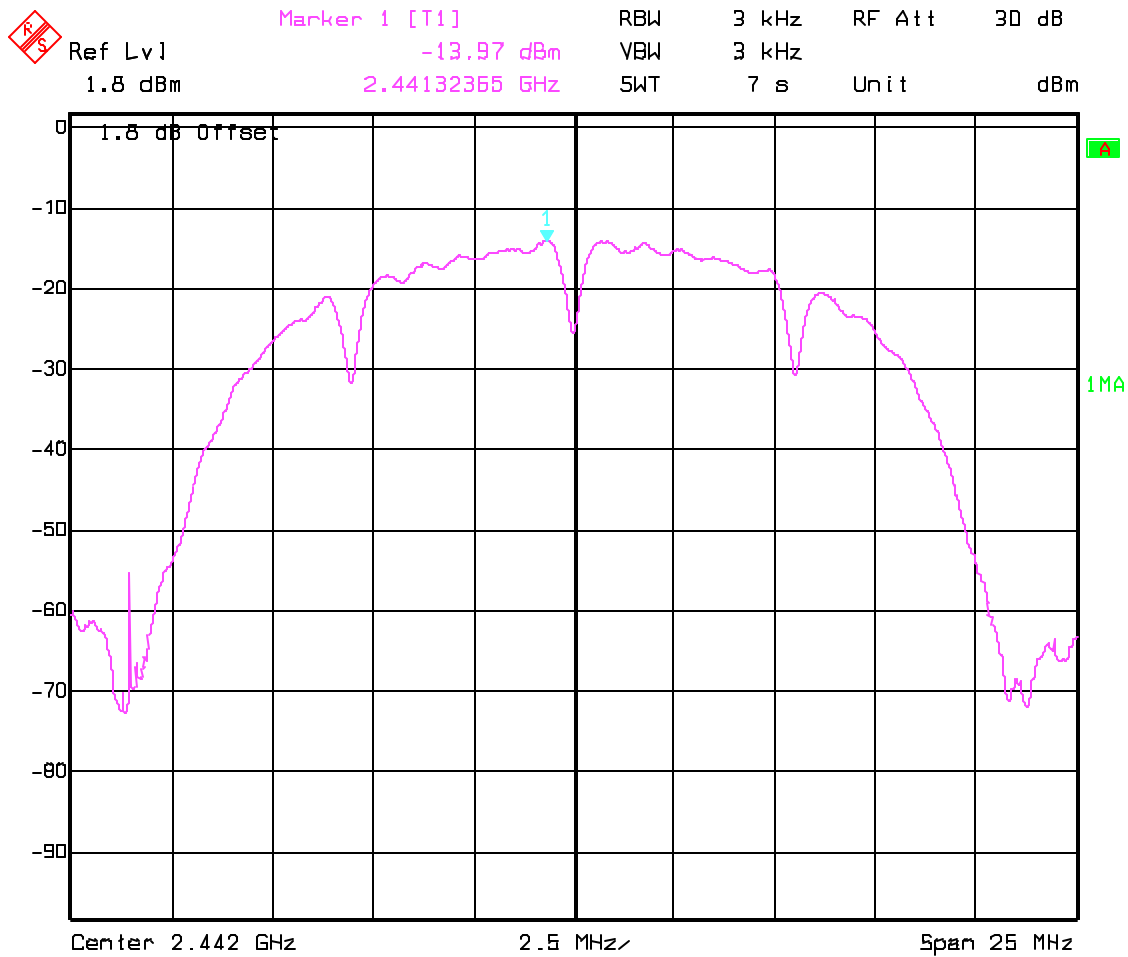


Date: 14.DEC.01 16:09:22

POWER SPECTRAL DENSITY

SUBCLAUSE § 15.247 (d)

Mid Channel: 2442 MHz

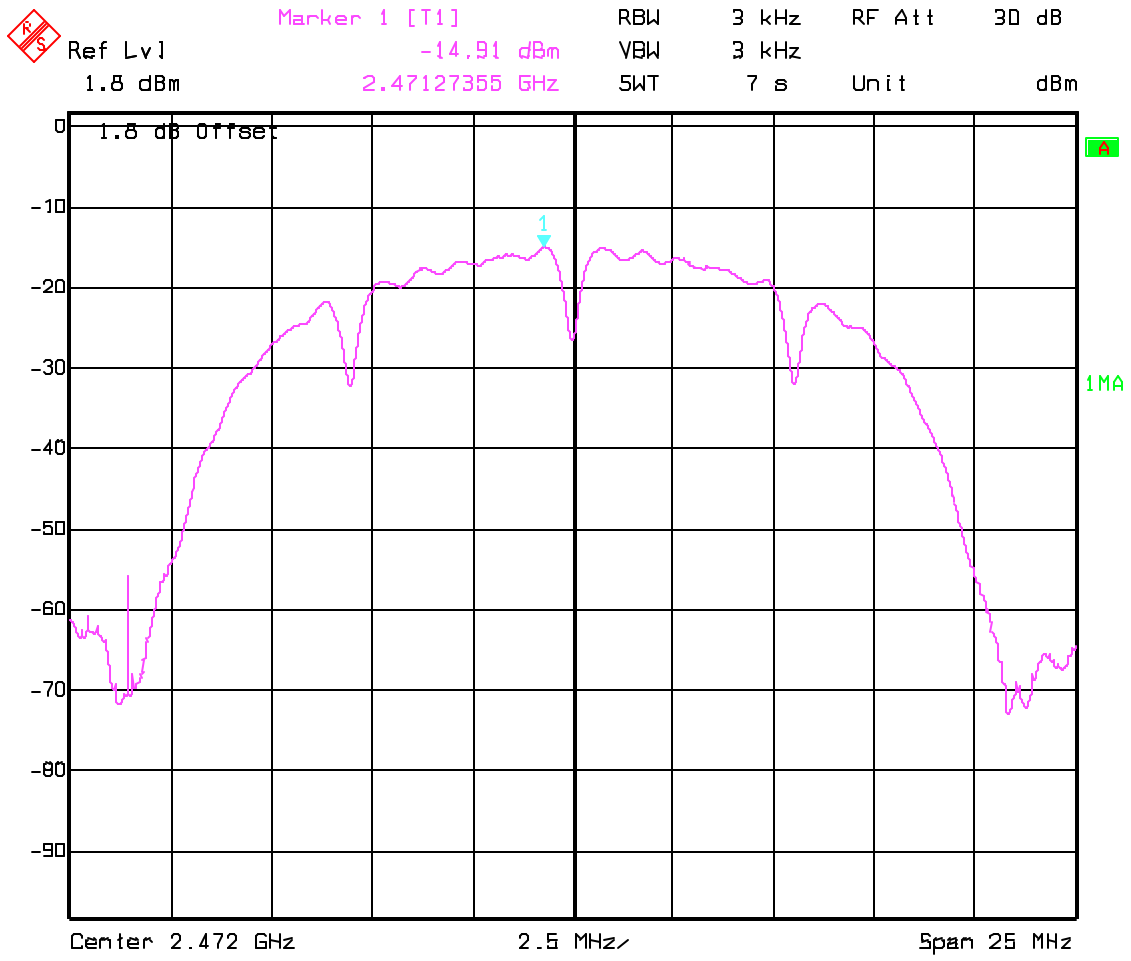


Date: 14.DEC.01 16:07:50

POWER SPECTRAL DENSITY

SUBCLAUSE § 15.247 (d)

High Channel: 2472 MHz



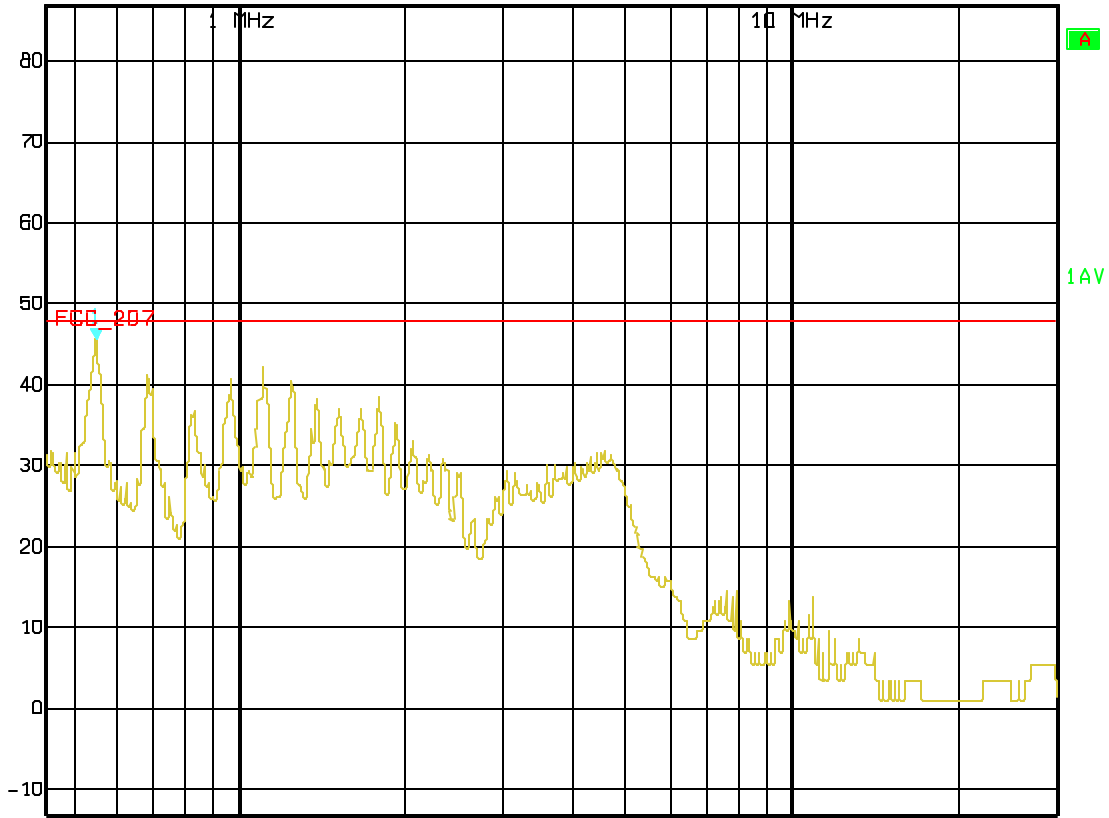
Date: 14.DEC.01 16:05:10

PROCESSING GAIN OF DSSS SYSTEMS SUBCLAUSE §15.247 (e)

(NOTE: The processing gain data is provided by Chip Set Manufacturer – see separate test report)

Phase: Neutral

Ref Lvl 87 dB μ V
Marker 1 [T1] 45.74 dB μ V
RBW 10 kHz
RF Att 10 dB
550.72599910 kHz
VBW 30 kHz
SWT 20 s
Unit dB μ V



Start 450 kHz

Stop 30 MHz

Date: 27.NOV.01 13:04:03

Technical specification : 15.107 / 15.207 (Revised as of October 1, 1991)

Limit

0.45 to 30 MHz	250 μ V / 47.96 dB μ V
----------------	--------------------------------

RECEIVER SPURIOUS RADIATION

§ 15.209

Limits

Frequency (MHz)	Field strength (µV/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

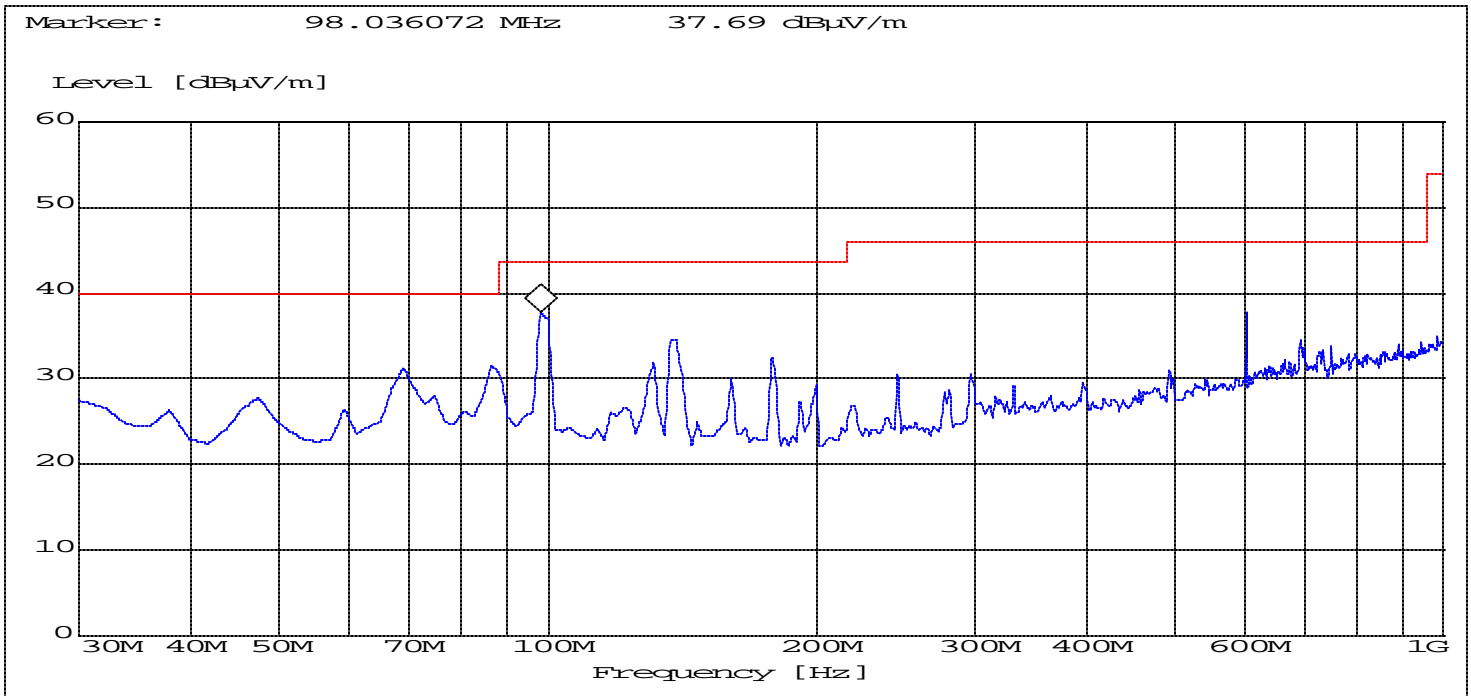
NOTE:

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.
3. All emission measurements were done in Peak mode. In case limits are exceeded the measurements will be repeated and documented in the test report either with Quasi Peak or average detector depending on the frequency range specified in FCC 15 and/or DA00-705. Bandwidth, sweep time etc. were set according DA00-705 and recorded
4. 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)



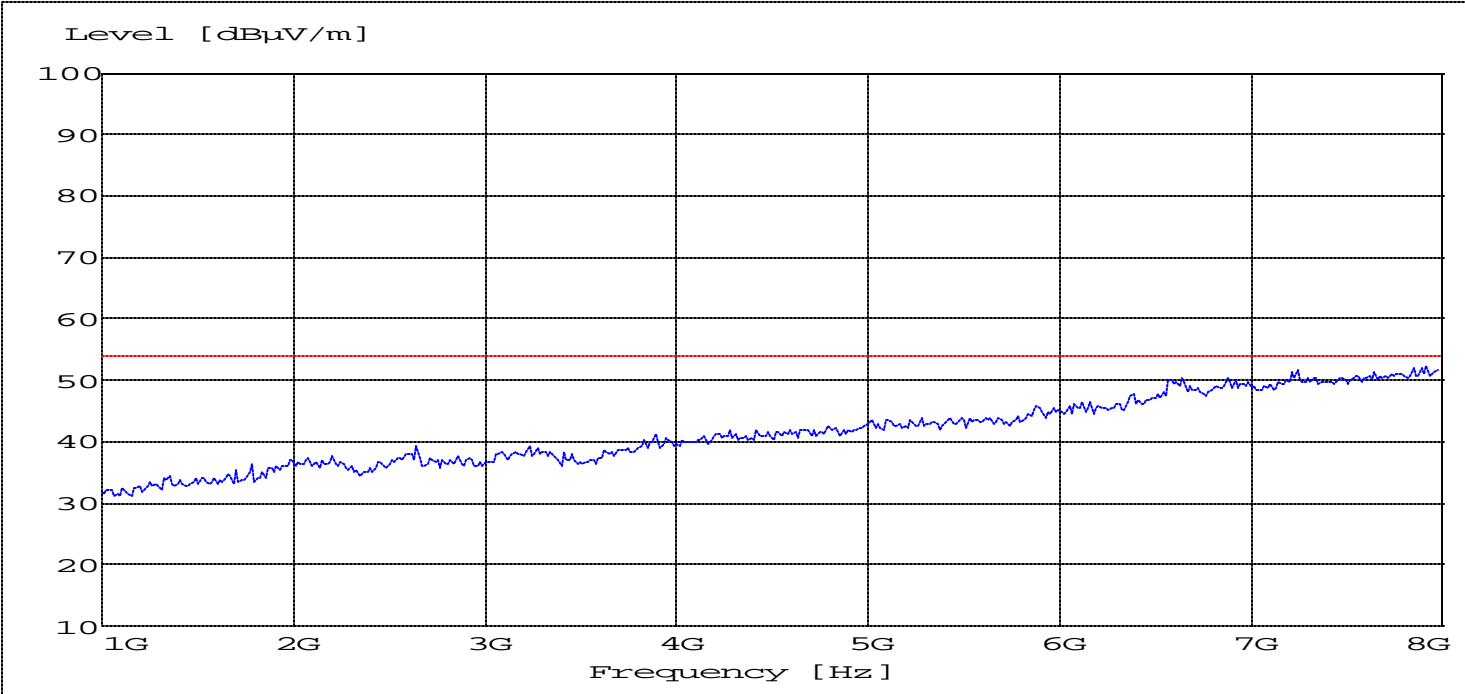
ANALYZER SETTINGS: f < 1 GHz : RBW/VBW: 100 kHz

f \ge 1GHz : RBW/VBW: 1 MHz

RECEIVER SPURIOUS RADIATION

§ 15.209

1GHz – 8GHz (This plot is valid for all three channels)

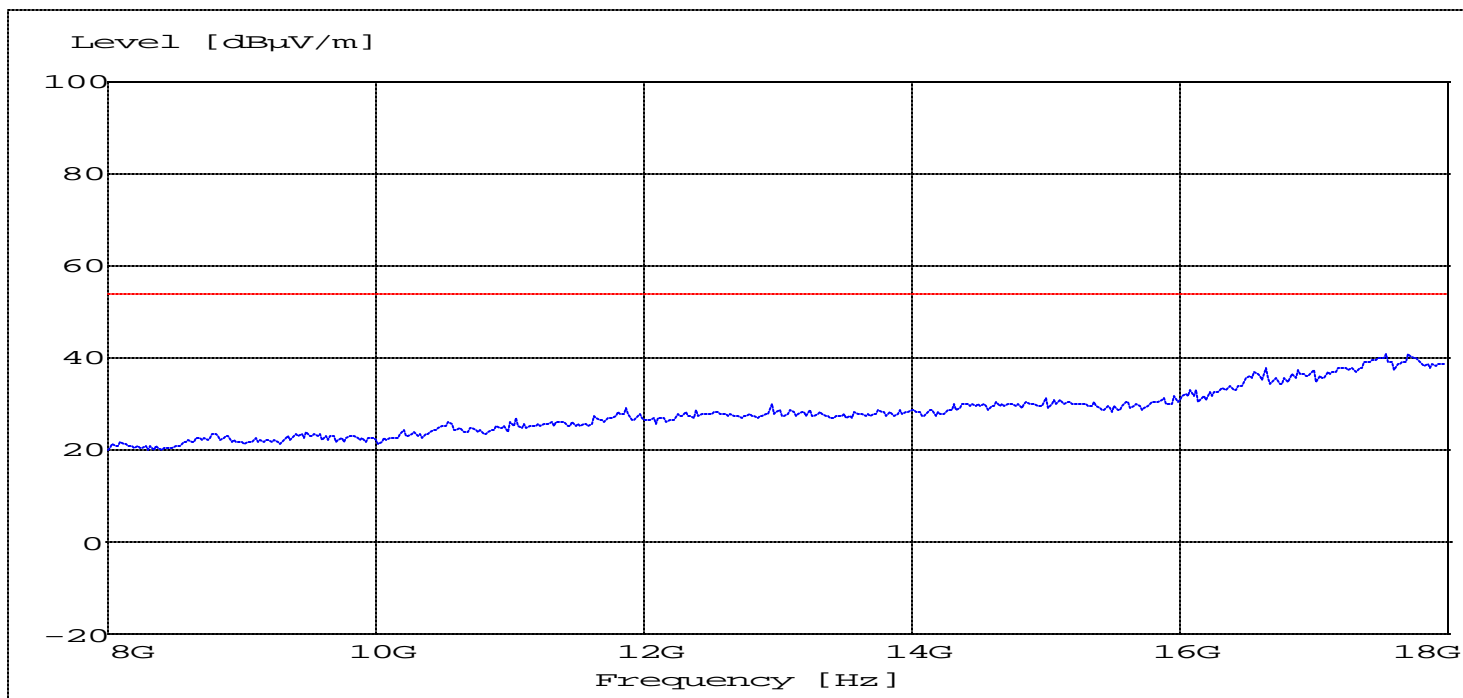


ANALYZER SETTINGS: f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW/VBW: 1 MHz

RECEIVER SPURIOUS RADIATION

§ 15.209

8GHz – 18GHz (This plot is valid for all three channels)



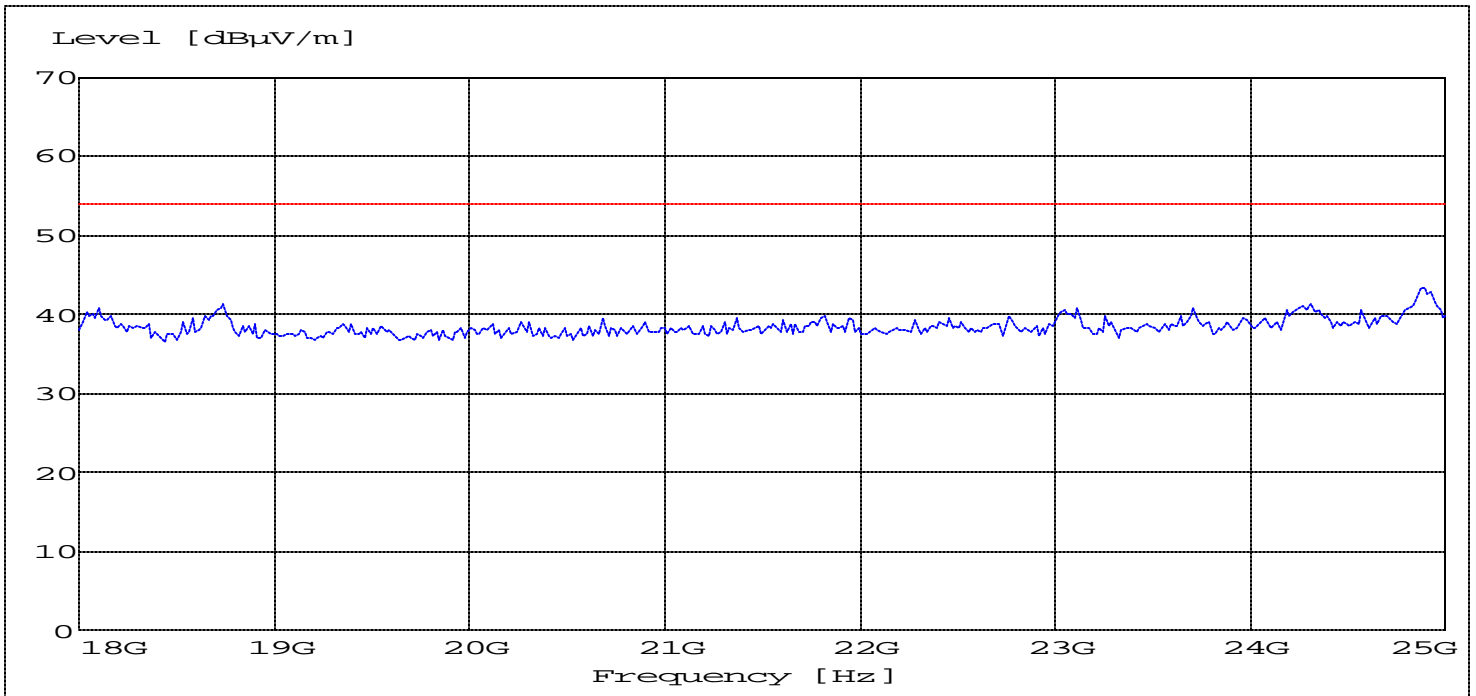
ANALYZER SETTINGS: f < 1 GHz : RBW/VBW: 100 kHz

f ≥ 1GHz : RBW/VBW: 1 MHz

RECEIVER SPURIOUS RADIATION

§ 15.209

18GHz – 25GHz (This plot is valid for all three channels)



ANALYZER SETTINGS: f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW/VBW: 1 MHz

