

CETECOM Inc.



CETECOM Inc.

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Issued test report consists of 58 Pages

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

Test report no.: 217FCC/2001
FCC Part 15.247
(HP Jetdirect 280m)

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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. 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.**

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1.3 Details of applicant

Name : Hewlett Packard
Street : 8000 Foothills Blvd..
City : Roseville, CA 95747
Country : USA
Contact : Glenn Beckett
Telephone : +1 916 785 4668
Telefax :
e-mail : glenn_beckett@hp.com

1.4 Application details

Date of receipt of application : 2001-11-15
Date of receipt of test item : 2001-12-10
Date of test : 2001-12-10/11

1.5 Test item

Manufacturer : applicant
Name of EUT : HP Jetdirect 280m
Description : 5185-3843 WLAN (802.11b) built in RSVLD-0102 Print Server
Model No. : RSVLD-0102
Serial No. : N/A
FCC ID :

Additional informations

Frequency : 2412MHz – 2472MHz
Type of modulation : DSSS
Number of channels : 13
Antenna : Diversity Internal & Dipole External
Power supply : 3.3VDC
Output power :
Extreme Vol. Limits : 3.3VDC ±10%
Extreme Temp. Limits : +9°C to +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 :

2002-01-07**EMC & Radio****Lothar Schmidt**

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

2.2 Testreport

TEST REPORT

**Testreport no. : 217FCC/2001
(HP Jetdirect 280m)**

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	48
§ 15.107	Conducted emissions	52
	Receiver parameters	
§ 15.209	Receiver Spurious Radiation	53
	Test equipment listing	58

SPECTRUM BANDWITH OF DSSS-SYSTEM**SUBCLAUSE § 15.247 (a)(2)**

TEST CONDITIONS		6 dB BANDWIDTH (kHz)		
Frequency (MHz)		2412	2442	2472
$T_{nom}(23)^{\circ}C$	$V_{nom}(3.3)V$	9969.93	9969.93	9969.93
Measurement uncertainty		$\pm 3dB$		

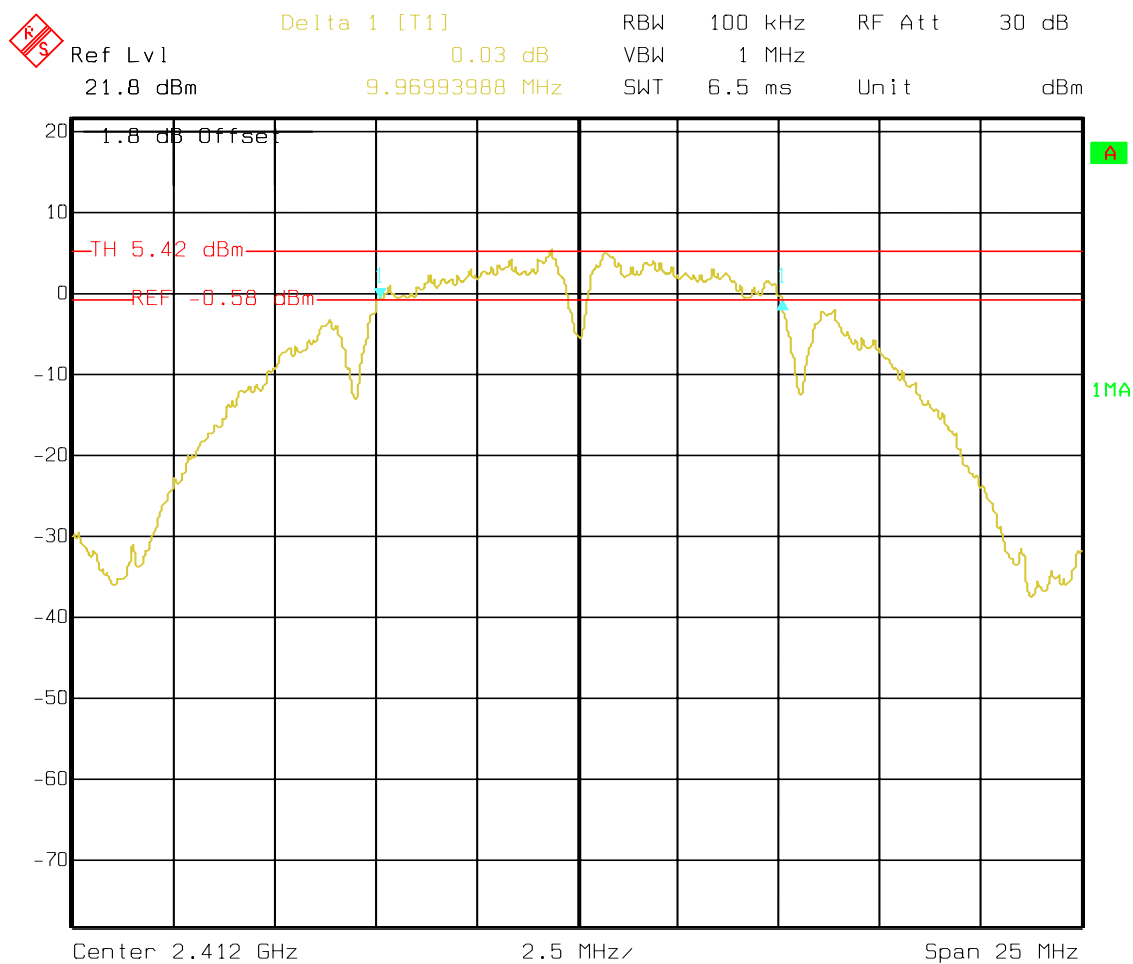
LIMIT**SUBCLAUSE §15.247(a) (2)**

The minimum 6dB bandwidth shall be at least 500 KHz

SPECTRUM BANDWITH OF DSSS-SYSTEM

SUBCLAUSE § 15.247 (a)(2)

Low Channel: 2412 MHz



Date: 11.DEC.01 18:34:23

LIMIT

SUBCLAUSE §15.247(a) (2)

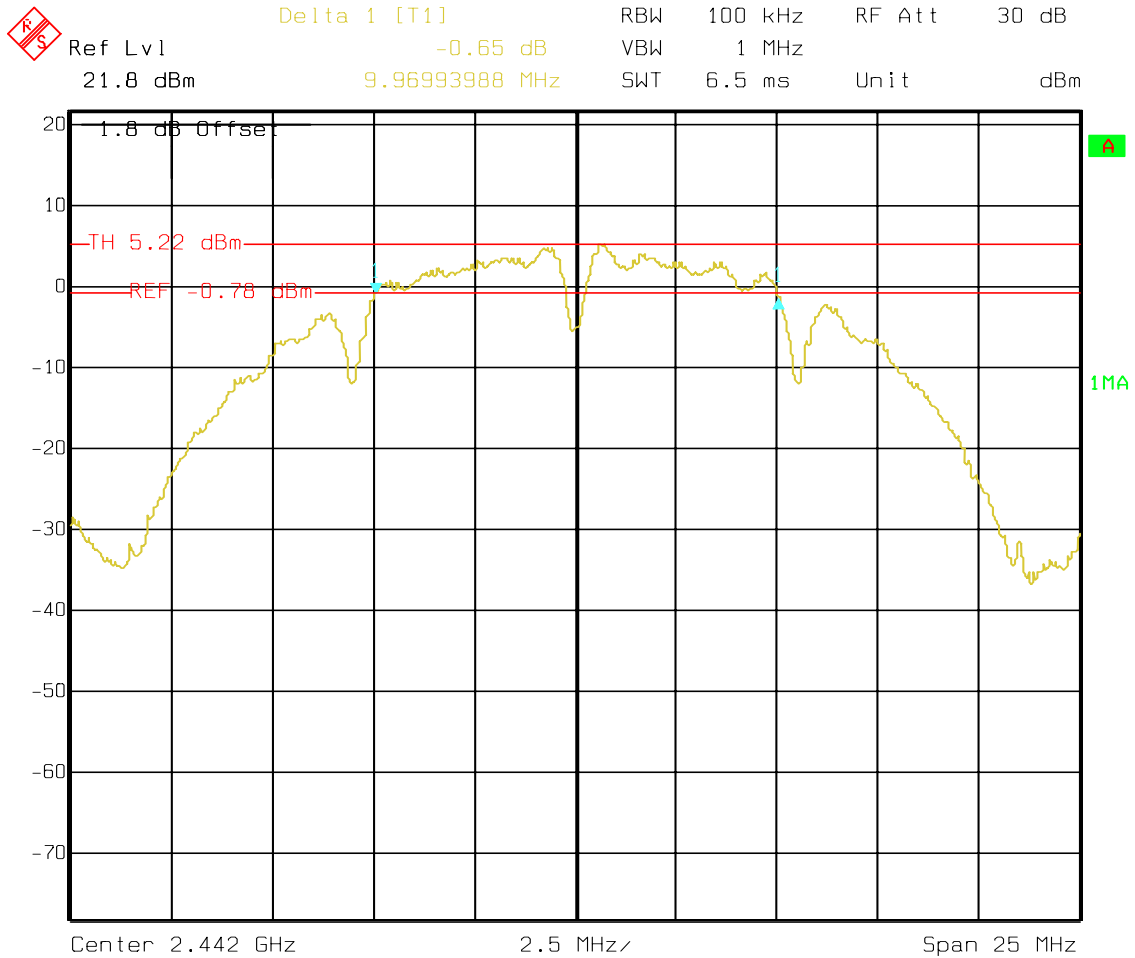
The minimum 6dB bandwidth shall be at least 500 KHz

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

SPECTRUM BANDWITH OF DSSS-SYSTEM

SUBCLAUSE § 15.247 (a)(2)

Mid Channel: 2442 MHz



Date: 11.DEC.01 18:32:19

LIMIT

SUBCLAUSE §15.247(a) (2)

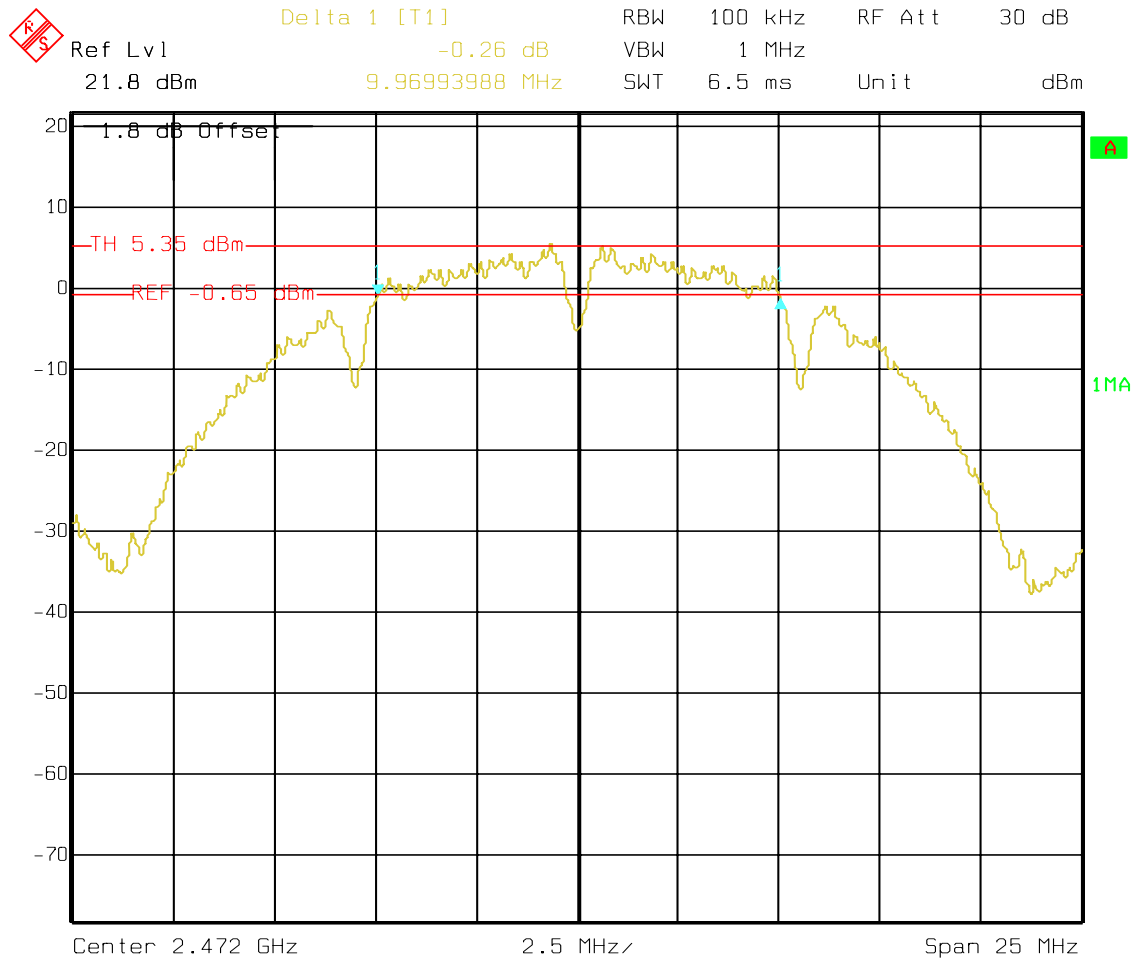
The minimum 6dB bandwidth shall be at least 500 KHz

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

SPECTRUM BANDWITH OF DSSS-SYSTEM

SUBCLAUSE § 15.247 (a)(2)

High Channel: 2472 MHz



Date: 11.DEC.01 18:30:27

LIMIT

SUBCLAUSE §15.247(a) (2)

The minimum 6dB bandwidth 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)					
Frequency (MHz)		2412		2442		2472	
T _{nom} (23)°C	V _{nom} (3.3)V	Pk	20.61	Pk	20.50	Pk	20.28
		Av	12.17	Av	12.60	Av	12.04
Measurement uncertainty		±3dB					

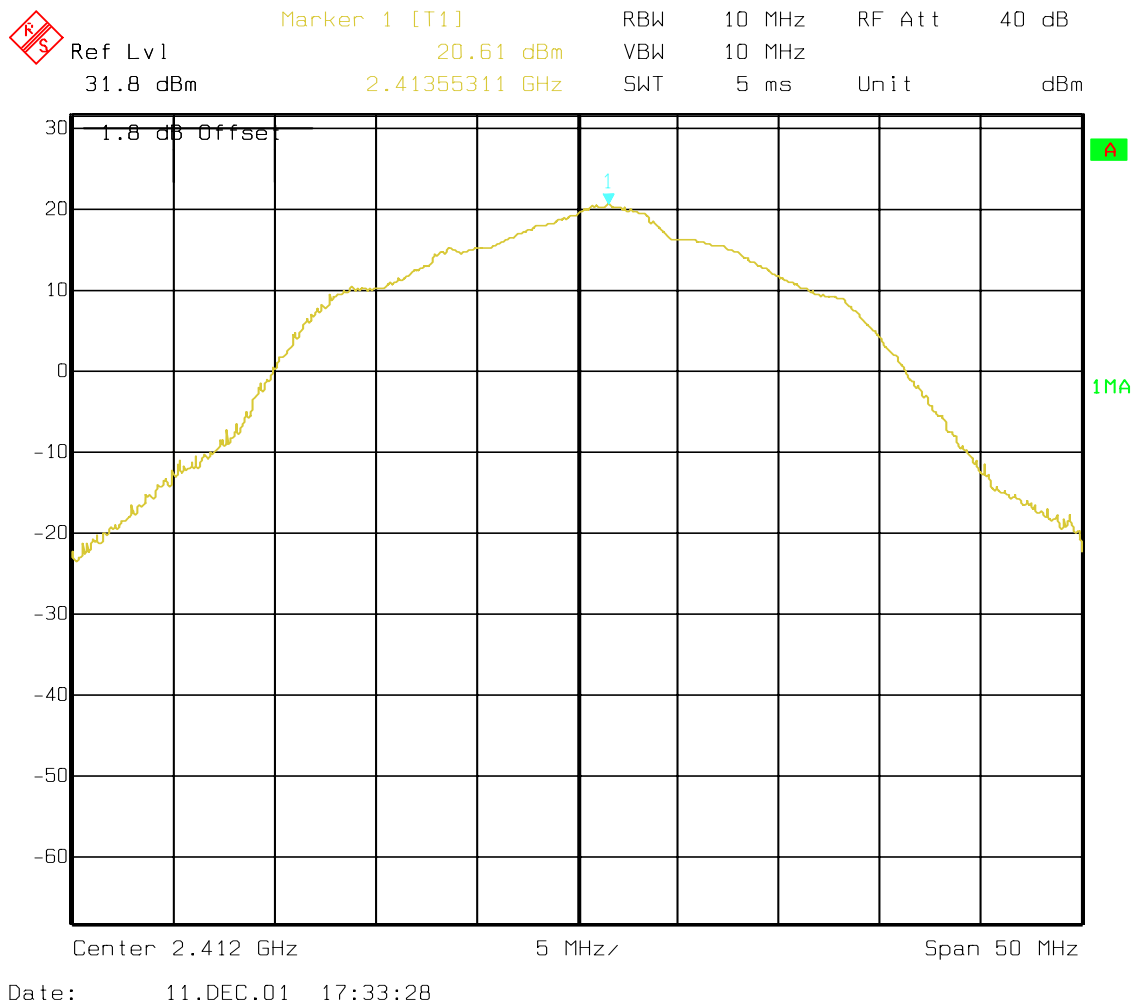
LIMIT**SUBCLAUSE § 15.247 (b) (1)**

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)

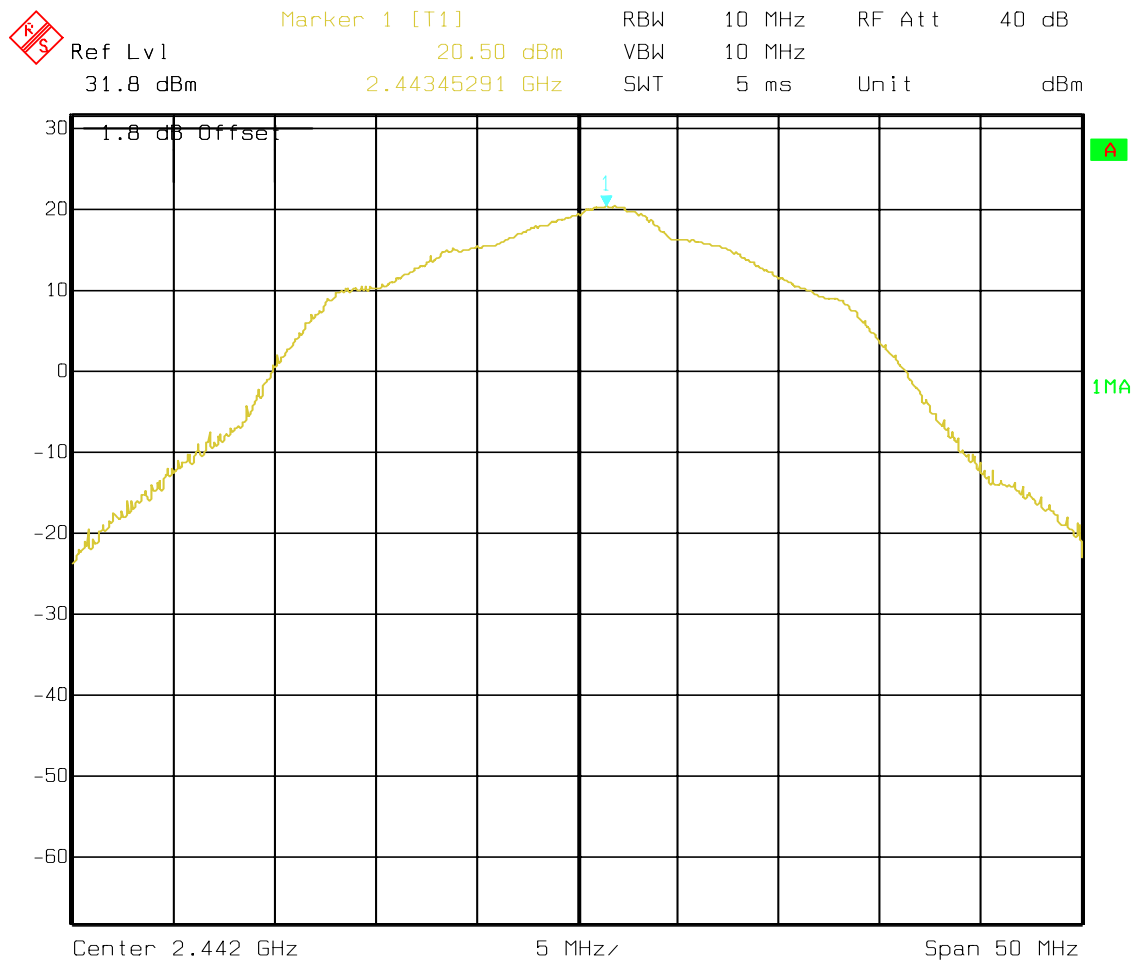
Low Channel: 2412 MHz



MAXIMUM PEAK OUTPUT POWER
(CONDUCTED)

SUBCLAUSE § 15.247 (b) (1)

Mid Channel: 2442 MHz

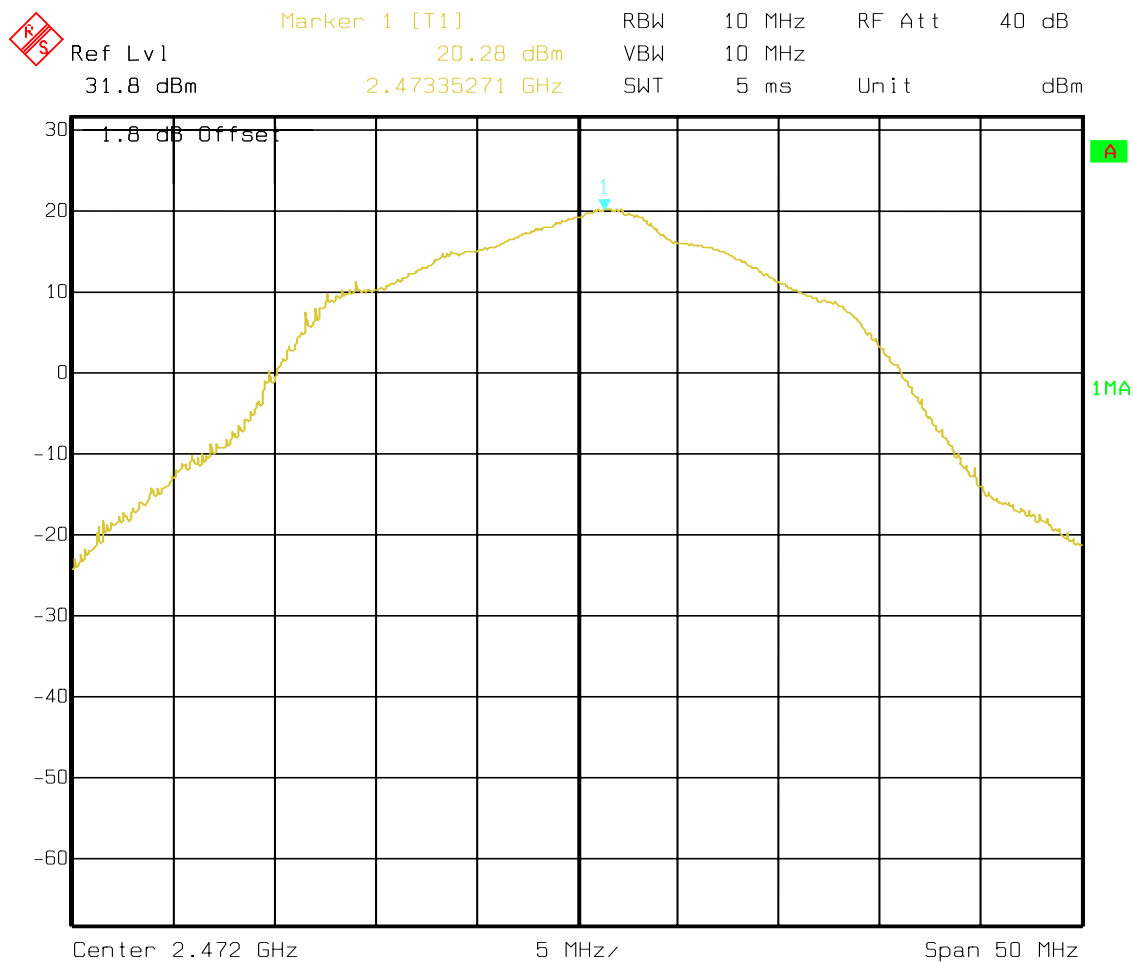


Date: 11.DEC.01 17:35:38

MAXIMUM PEAK OUTPUT POWER (CONDUCTED)

SUBCLAUSE § 15.247 (b) (1)

High Channel: 2472 MHz



Date: 11.DEC.01 17:36:43

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

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)		
Frequency (MHz)		2412	2442	2472
T _{nom} (23)°C	V _{nom} (3.3)V	21.75	21.03	21.64
Measurement uncertainty		±3dB		

Note: Radiated measurements done with the 2 dBi gain external antenna.

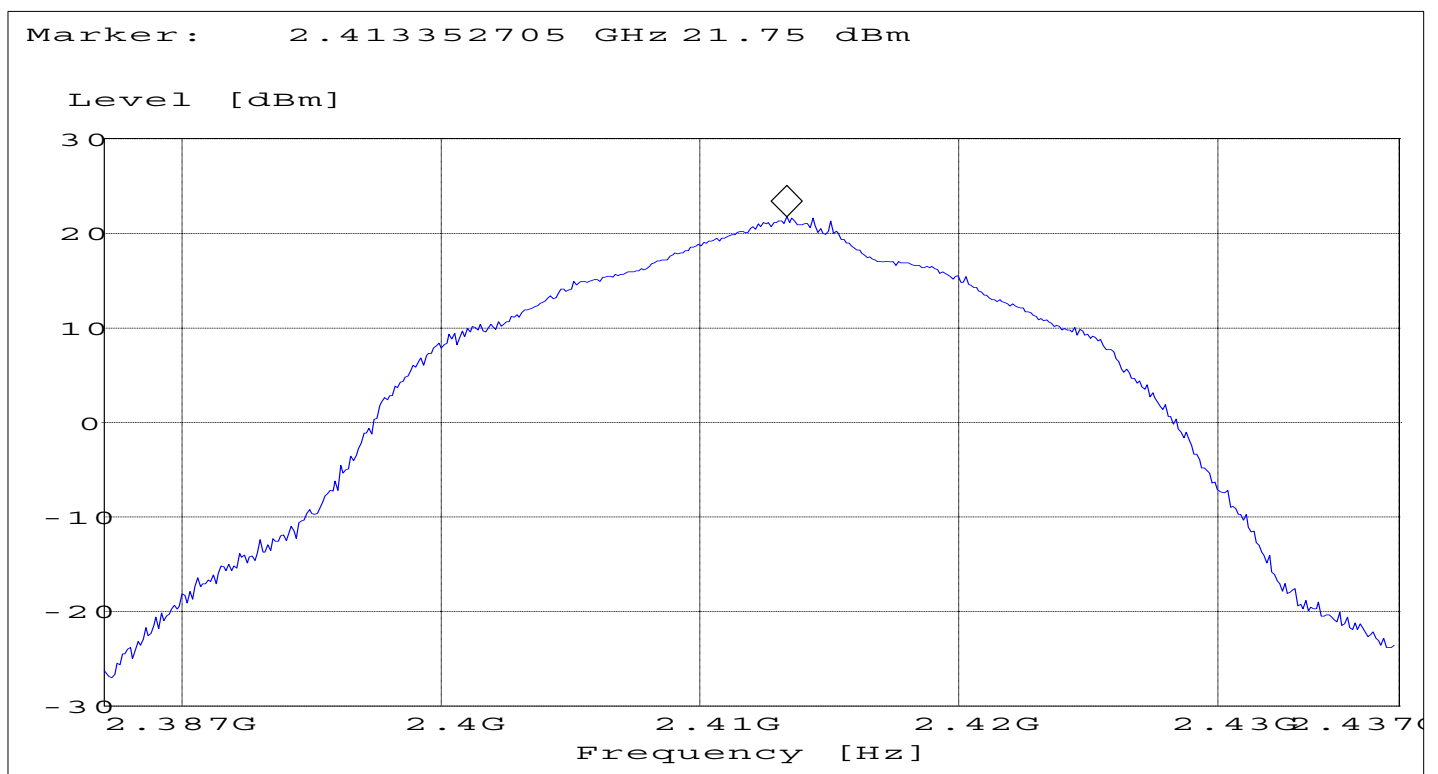
LIMIT**SUBCLAUSE § 15.247 (b) (1)**

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)**

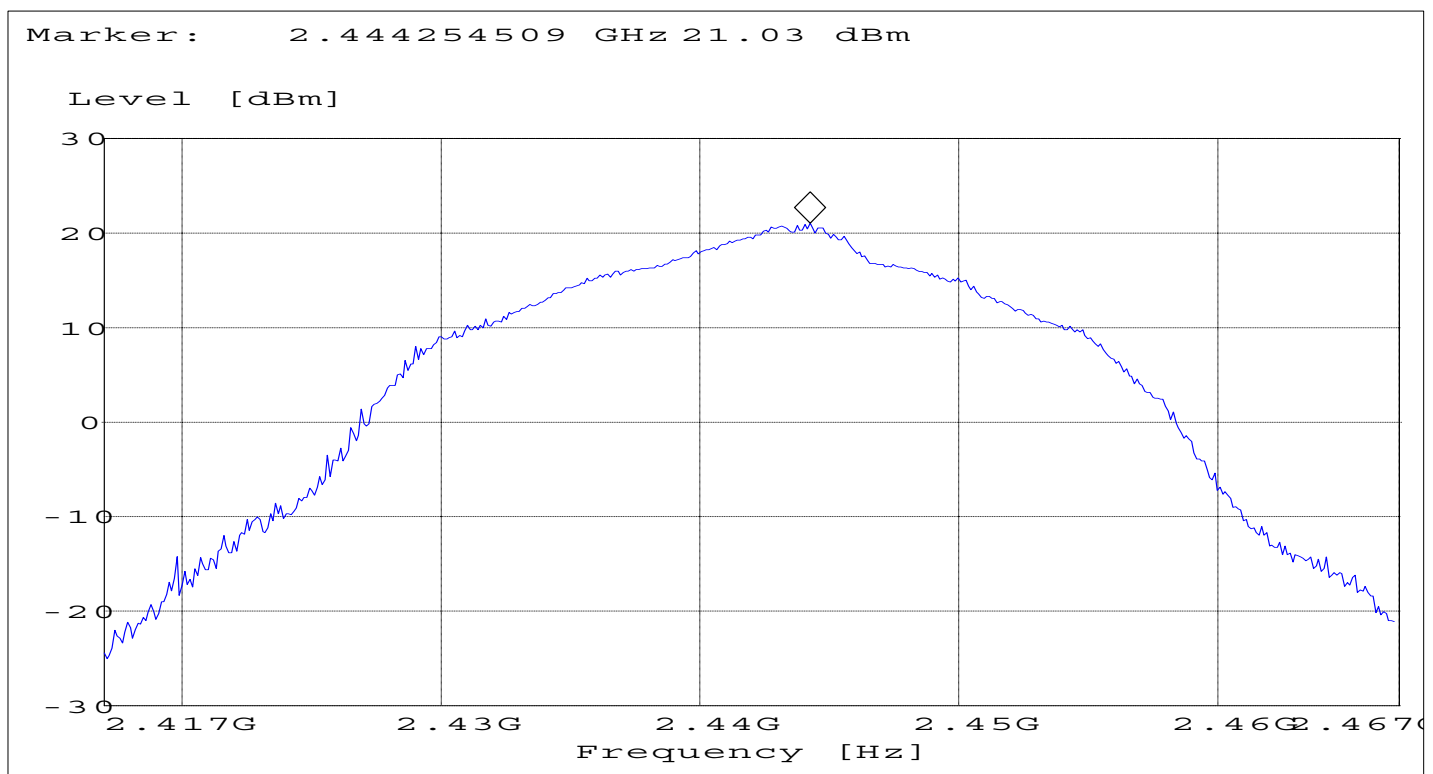
Low Channel: 2412 MHz

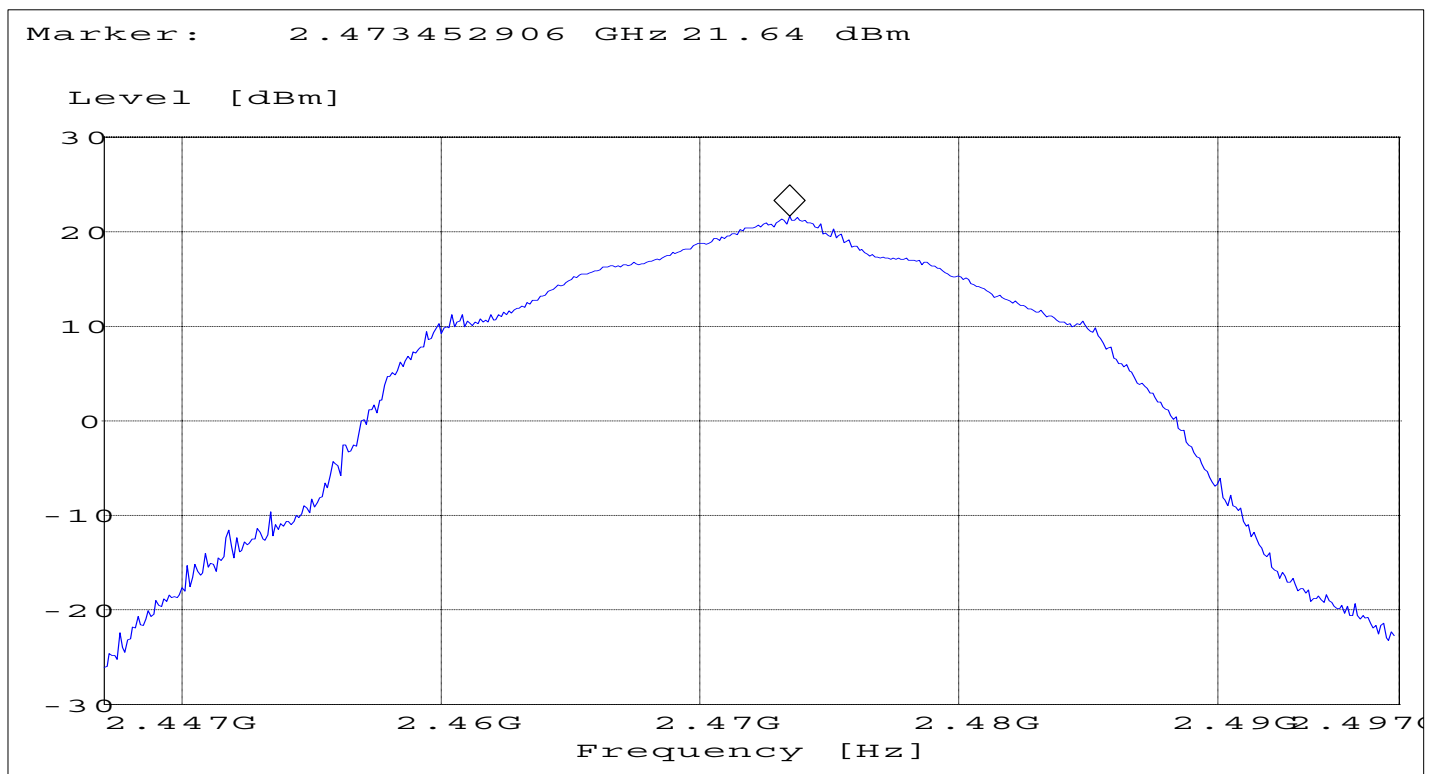
ANALYZER SETTINGS: RBW=10MHz , VBW=10MHz

**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)).

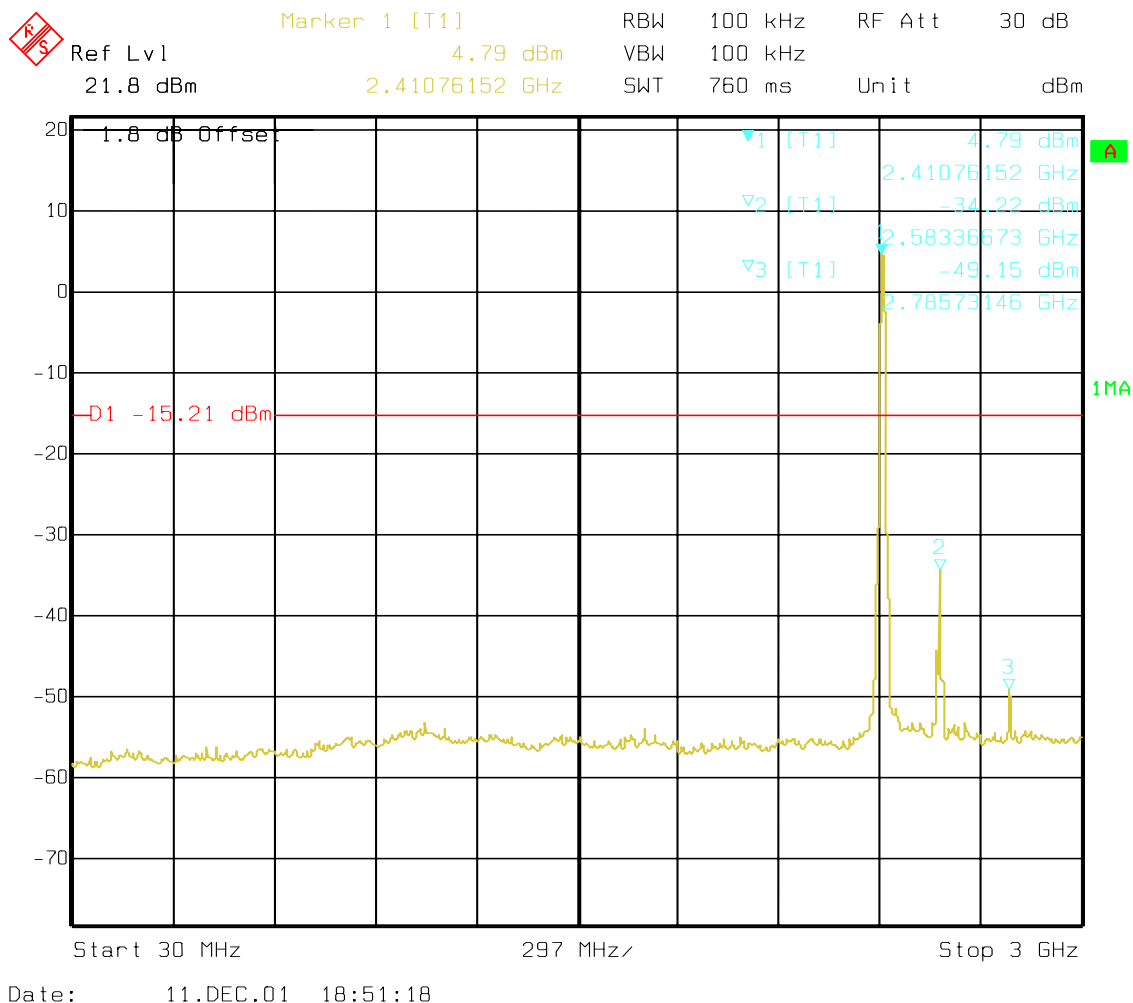
NOTE: Frequency resolution is not fine enough to show the exact frequency of the carrier, refer to plots under EIRP.

EMISSION LIMITATIONS (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Conducted

Low Channel (2412 MHz): 30MHz – 3GHz

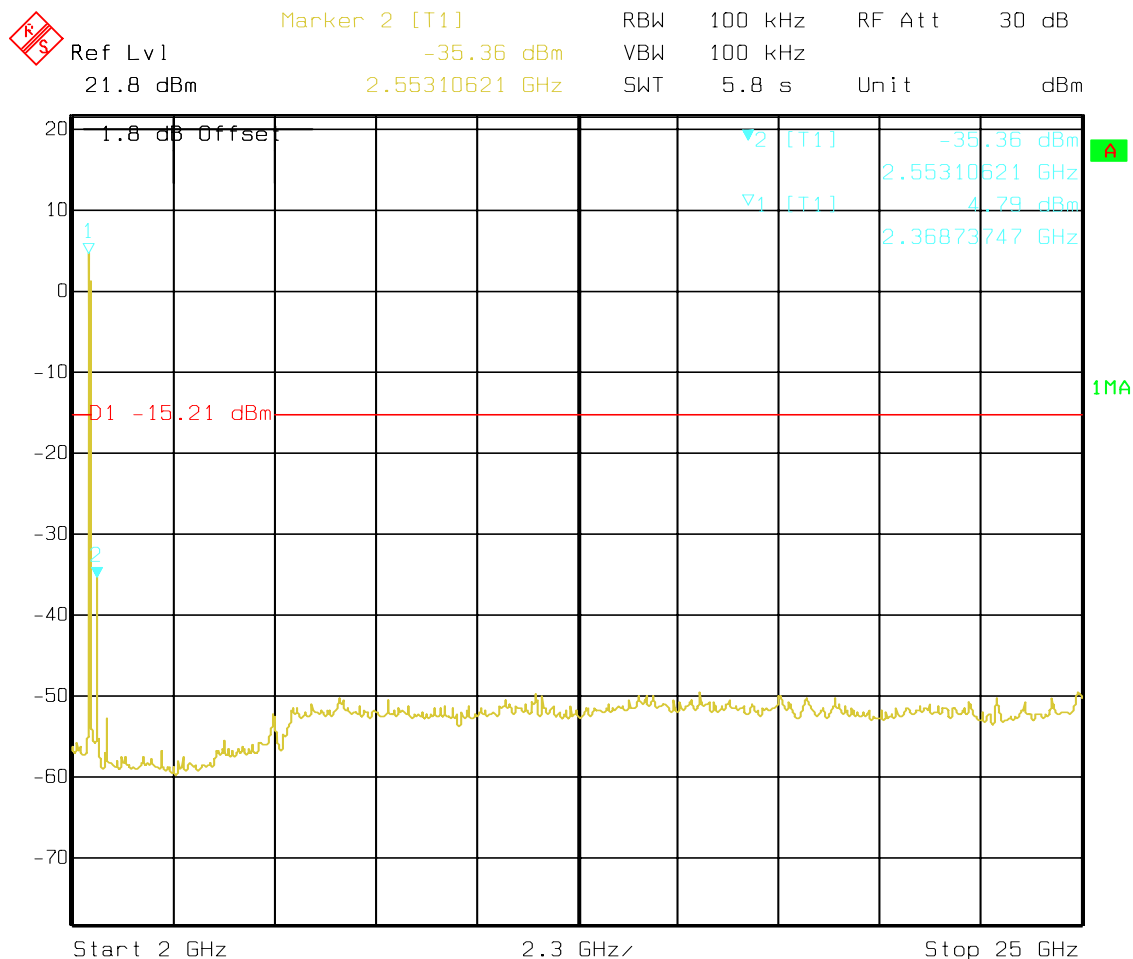


NOTE: The peak above the limit line is the carrier frequency.

EMISSION LIMITATIONS (Transmitter) conducted

SUBCLAUSE § 15.247 (c) (1)

Low Channel (2412 MHz): 2GHz – 25GHz



Date: 11.DEC.01 18:53:03

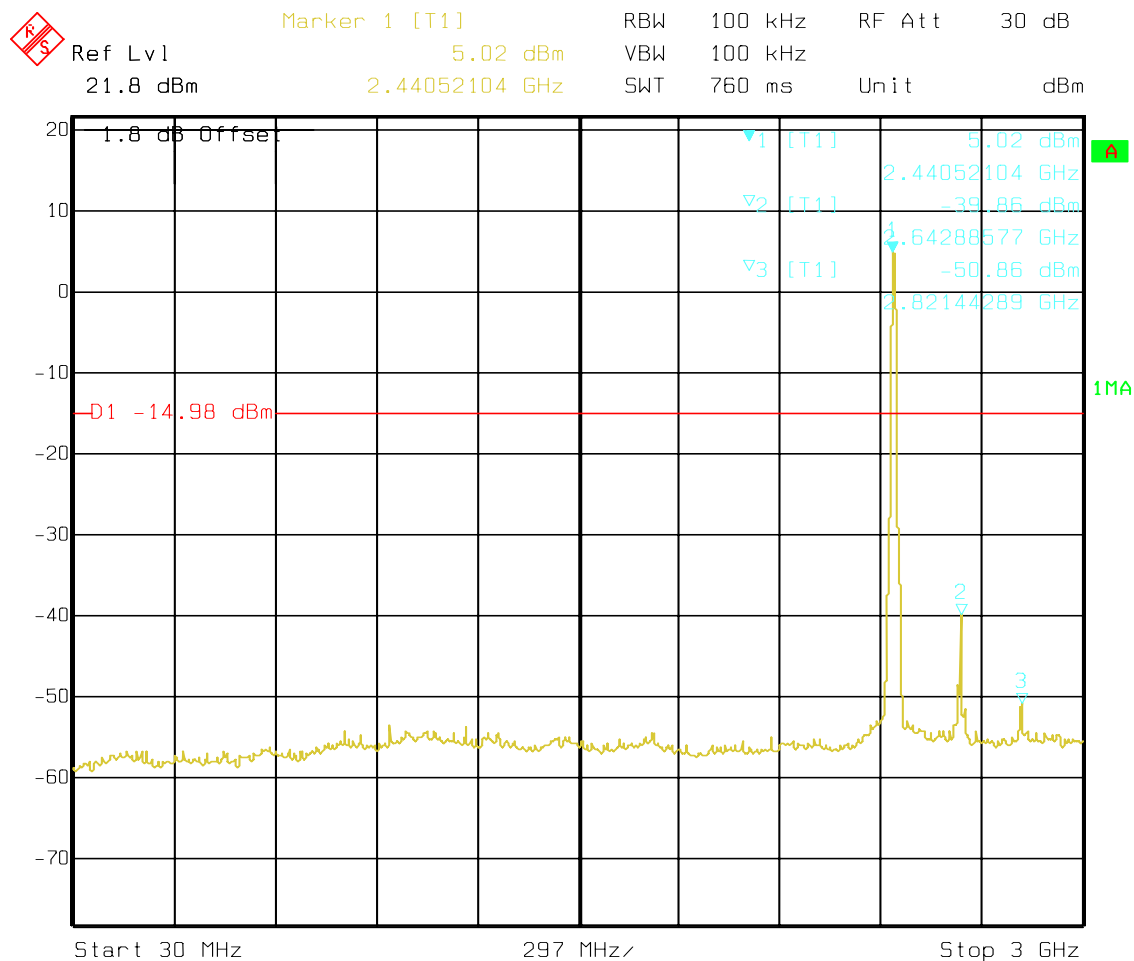
NOTE: The peak above the limit line is the carrier frequency.

EMISSION LIMITATIONS (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

conducted

Mid Channel (2442 MHz): 30MHz – 3GHz



Date: 11.DEC.01 18:59:52

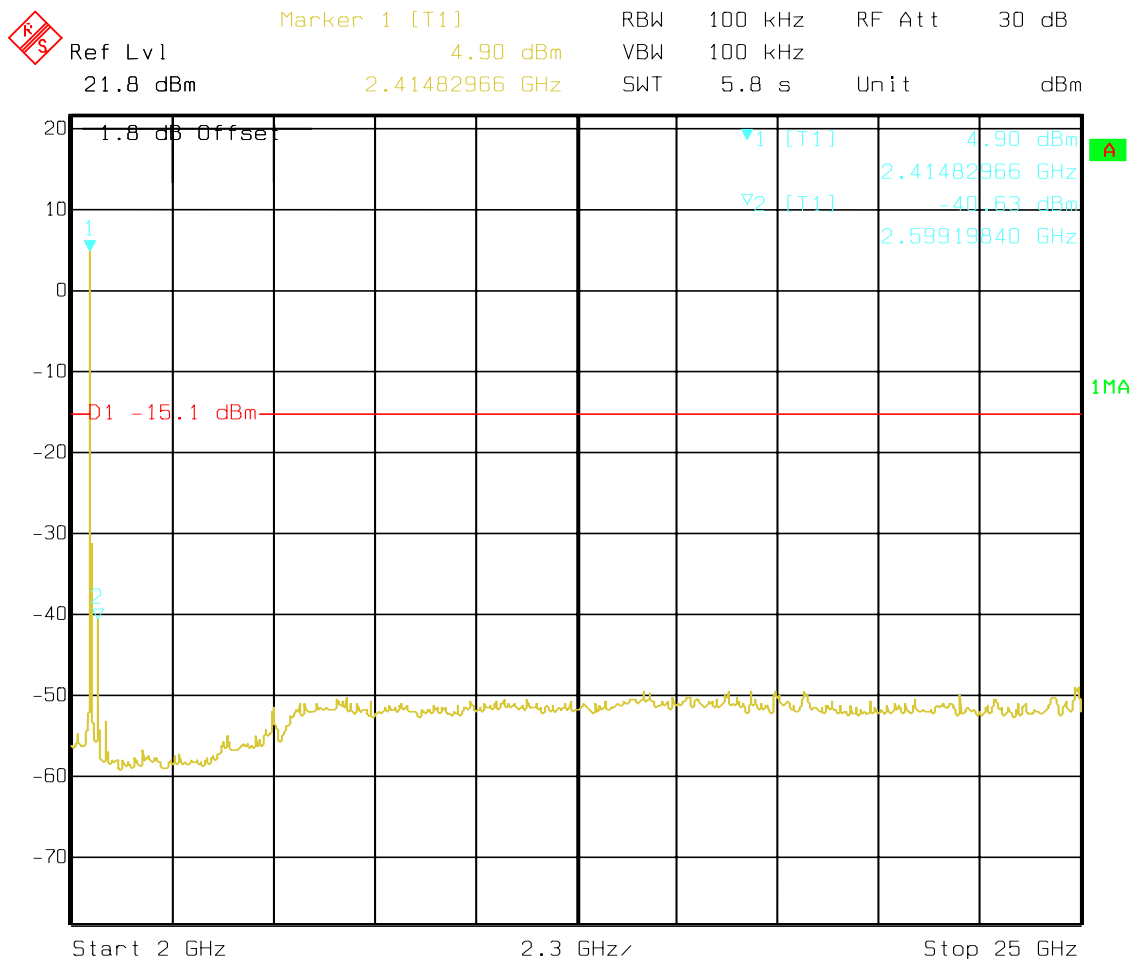
NOTE: The peak above the limit line is the carrier frequency.

EMISSION LIMITATIONS (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Conducted

Mid Channel (2442 MHz): 2GHz – 25GHz



Date: 11.DEC.01 18:55:53

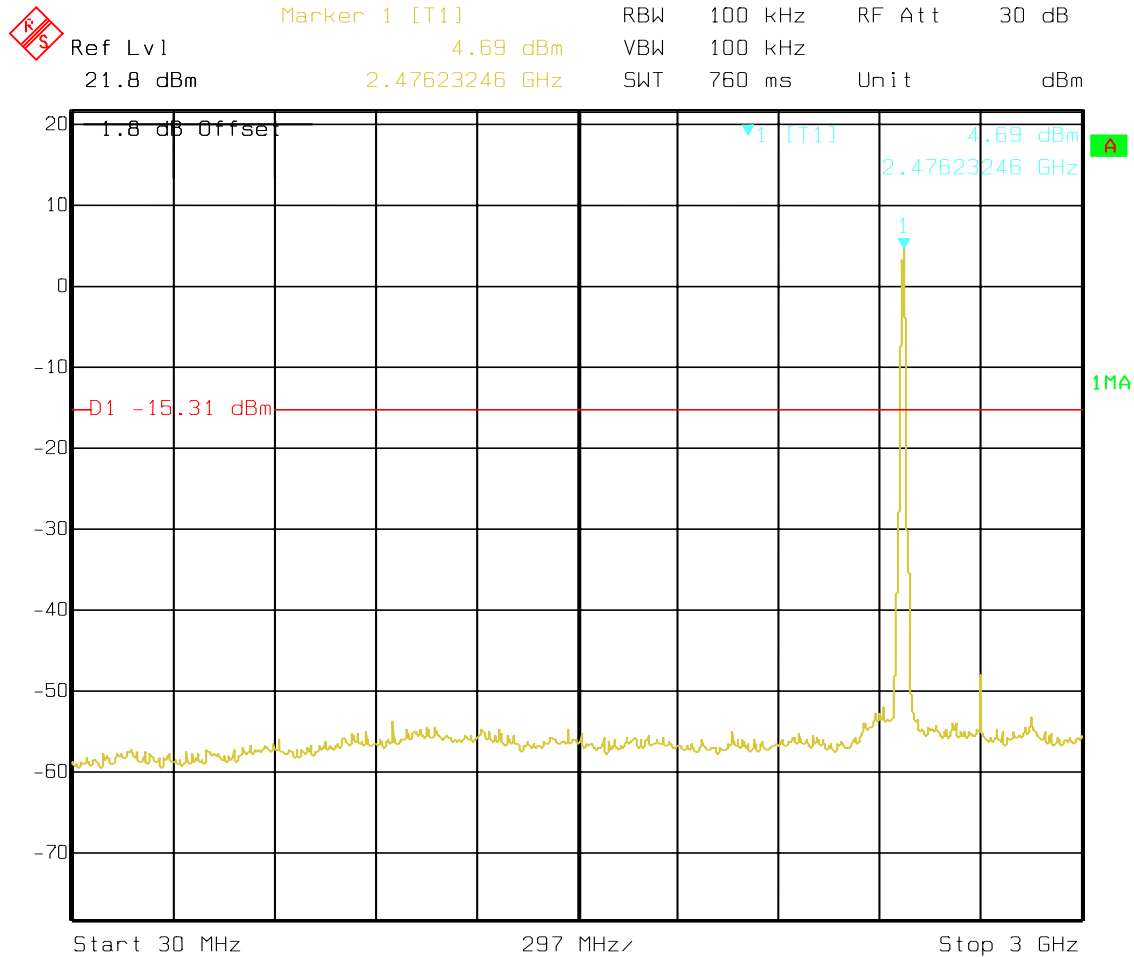
NOTE: The peak above the limit line is the carrier frequency.

EMISSION LIMITATIONS (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

conducted

High Channel (2472 MHz): 30MHz – 3GHz

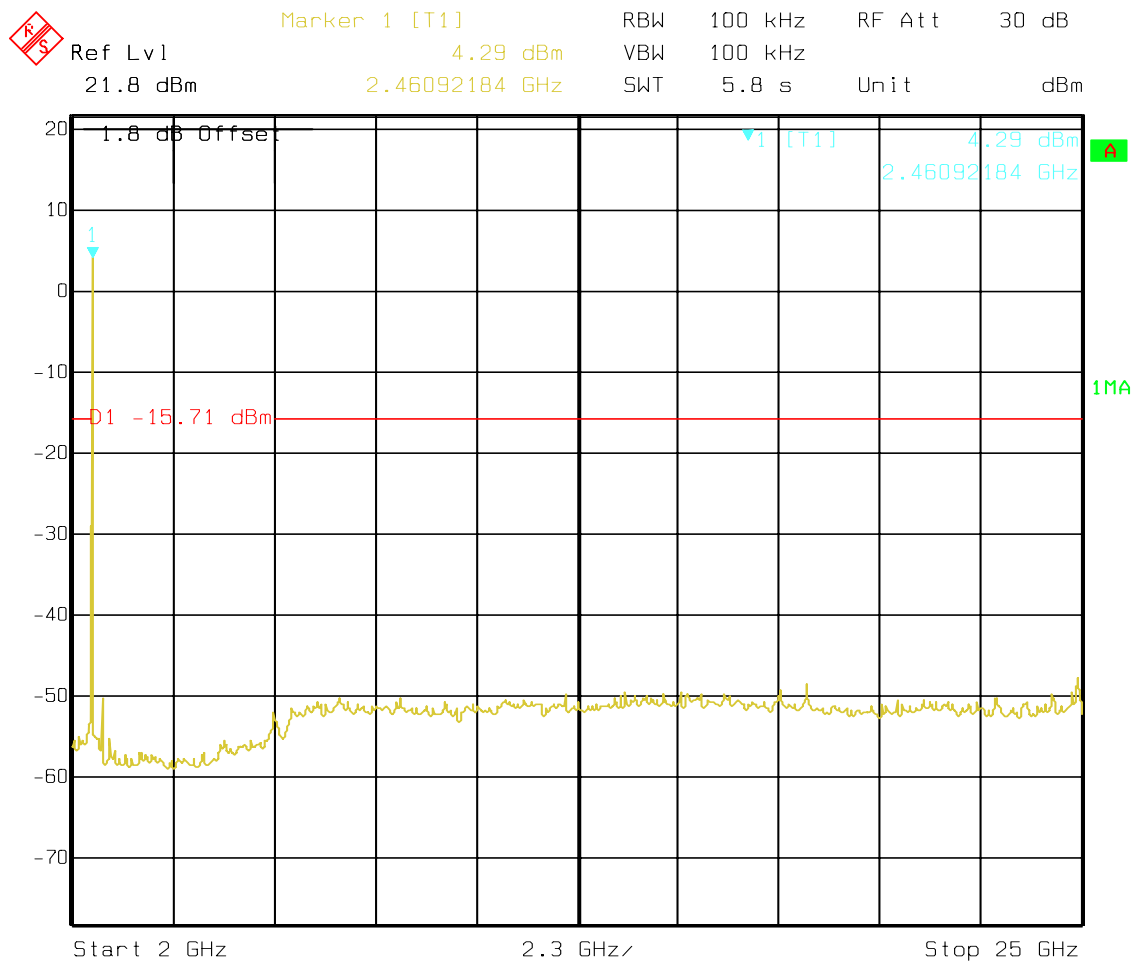


Date: 11.DEC.01 19:02:01

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

EMISSION LIMITATIONS (Transmitter)
Conducted
High Channel (2472 MHz): 2GHz – 25GHz

SUBCLAUSE § 15.247 (c) (1)



Date: 11.DEC.01 19:05:12

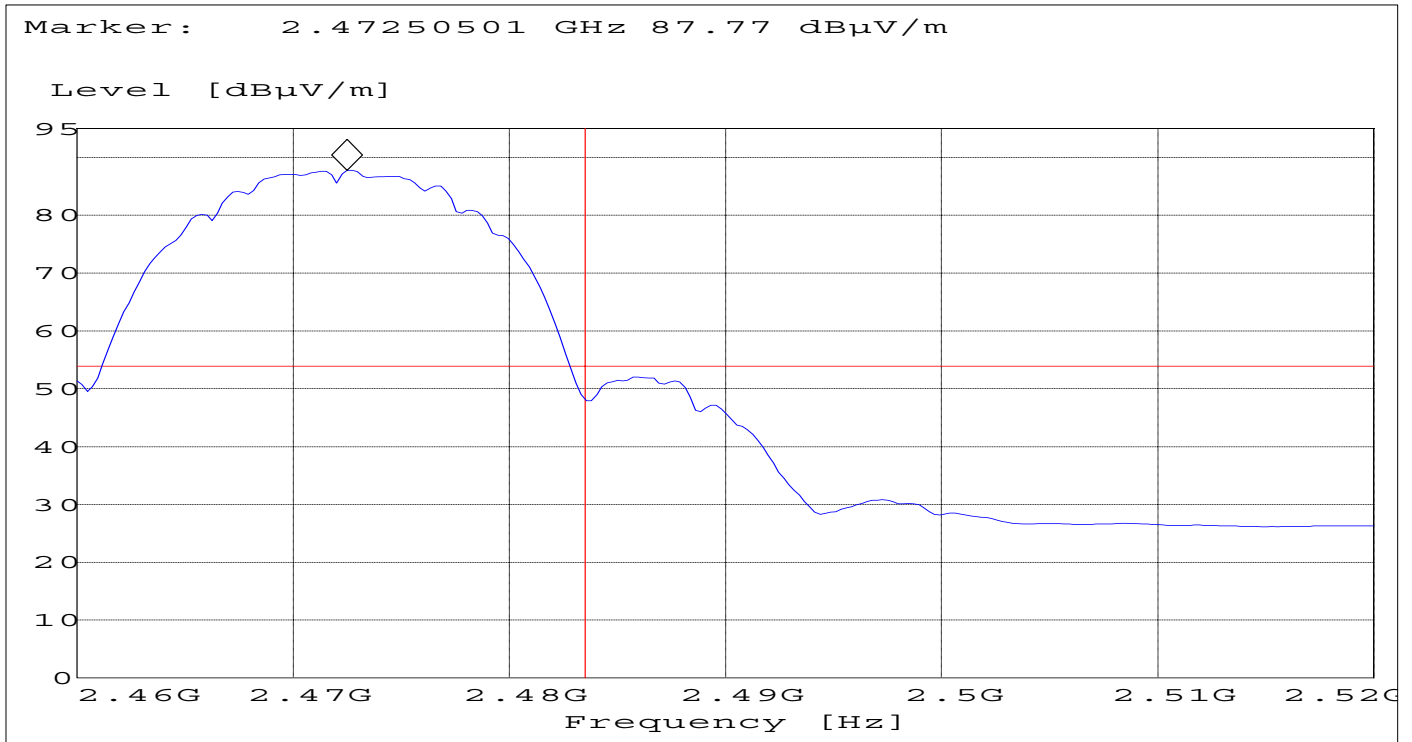
NOTE: The peak above the limit line is the carrier frequency.

EMISSION LIMITATIONS (Transmitter)

SUBCLAUSE § 15.247 (c) (2)

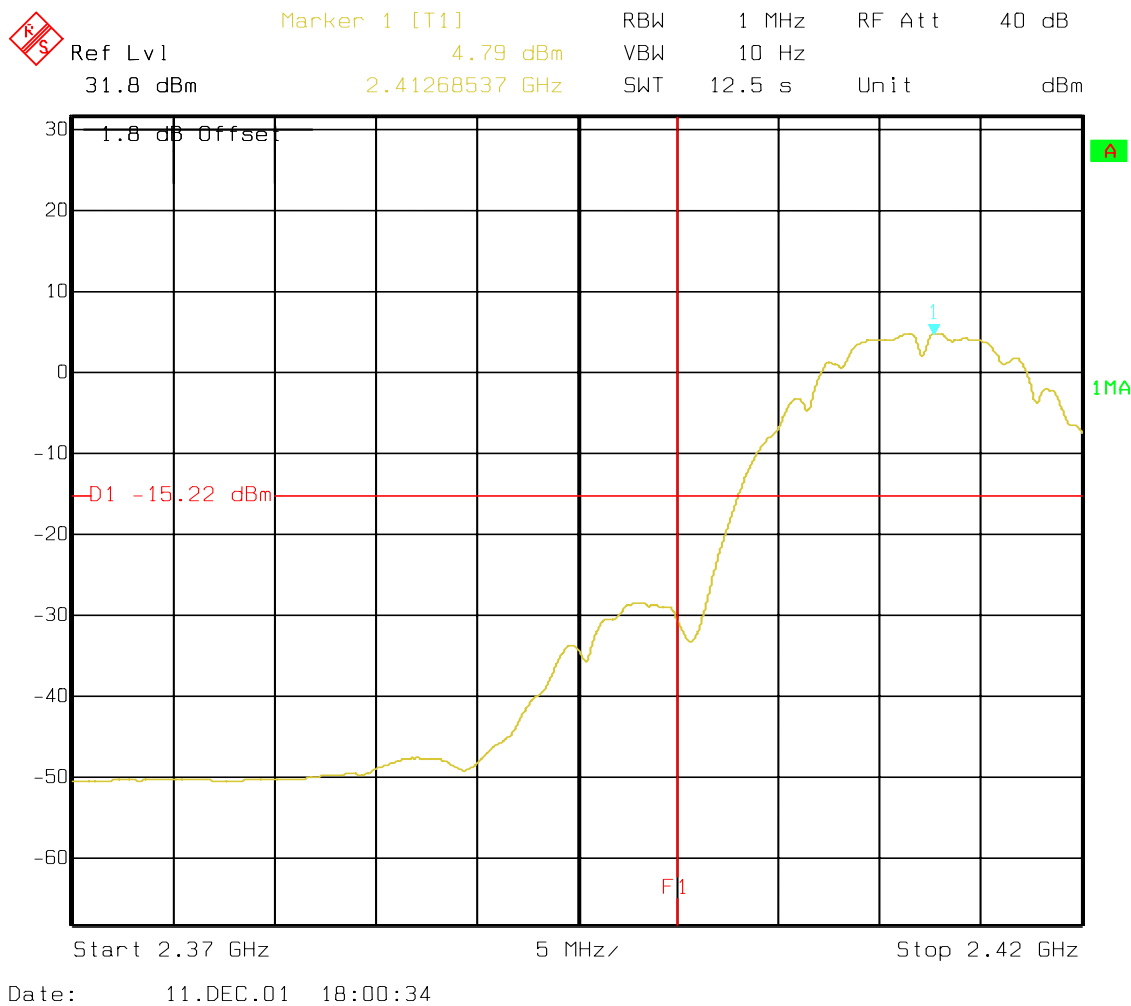
spurious in the restricted band 2483.5 – 2500 MHz

Higher Band Edge



ANALYZER SETTINGS: RBW=1MHz VBW=10Hz

Lower Band Edge
2400 MHz



EMISSION LIMITATIONS - Radiated (Transmitter) SUBCLAUSE § 15.247 (c) (1)

Radiated Emissions from EUT were observed under following test set-ups;

- 1. Radio Plugged into printer with external antenna.**
- 2. Radio stand alone with external antenna.**
- 3. Radio stand alone with internal antenna.**

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, sweep time etc. were set according DA00-705 and recorded

Results for the radiated measurements below 30MHz according § 15.33

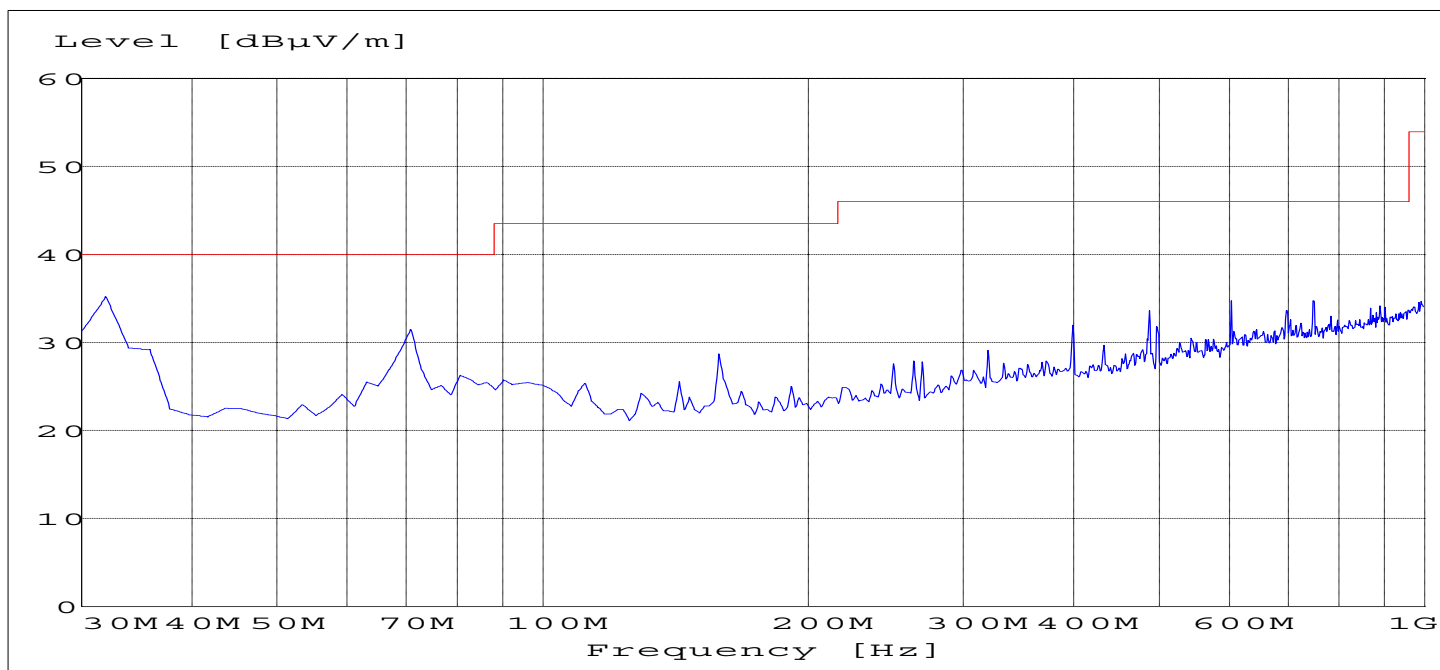
Frequency	Measured values	Remarks
10KHz – 30MHz	No emissions found, caused by the EUT	This is valid for all the tested channels

EMISSION LIMITATIONS (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Radiated (Radio Plugged into printer with external antenna)

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



ANALYZER SETTINGS: $f < 1 \text{ GHz}$: RBW/VBW: 100 kHz

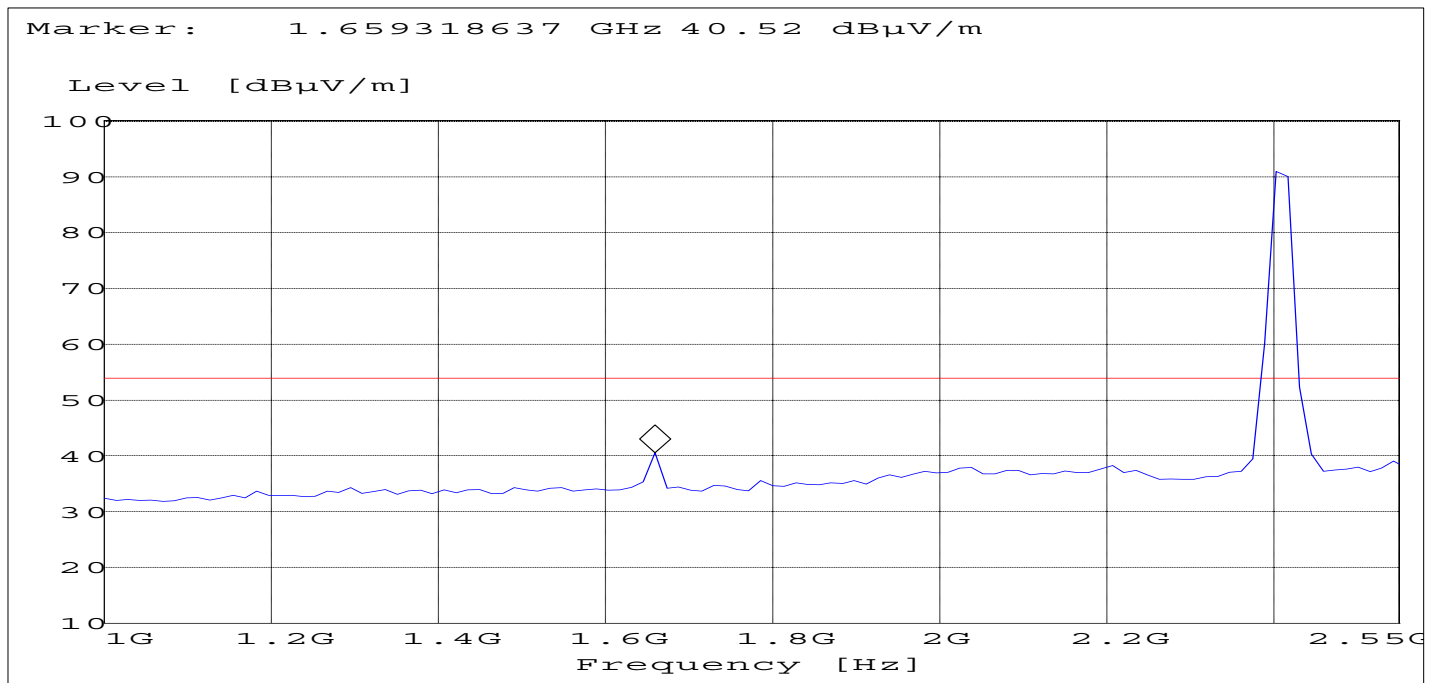
$f \geq 1 \text{ GHz}$: RBW/VBW: 1 MHz

EMISSION LIMITATIONS (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Radiated (Radio Plugged into printer with external antenna)

Low Channel(2412MHz): 1GHz – 2.55GHz



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

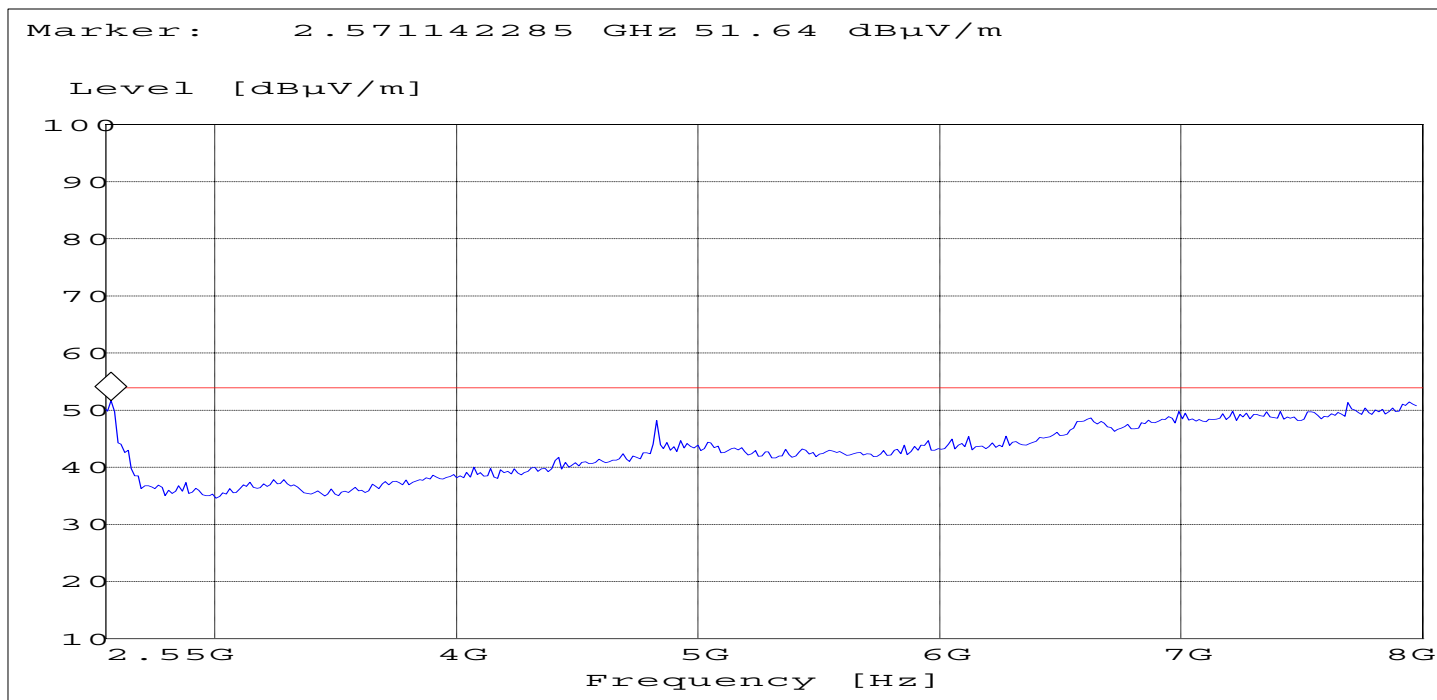
ANALYZER SETTINGS: $f < 1$ GHz : RBW/VBW: 100 kHz $f \geq 1$ GHz : RBW/VBW: 1 MHz

EMISSION LIMITATIONS (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Radiated (Radio Plugged into printer with external antenna)

Low Channel(2412MHz): 2.55GHz – 8GHz



ANALYZER SETTINGS: $f < 1 \text{ GHz}$: RBW/VBW: 100 kHz

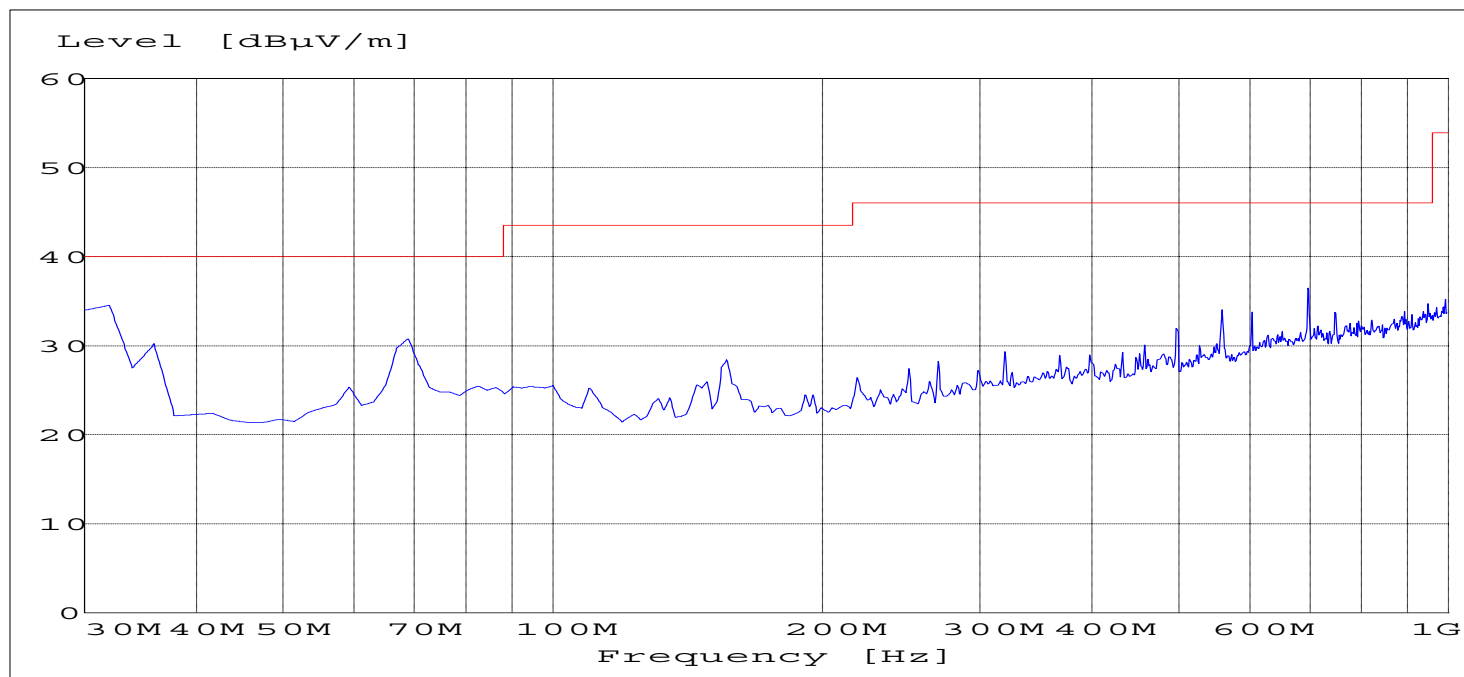
$f \geq 1 \text{ GHz}$: RBW/VBW: 1 MHz

EMISSION LIMITATIONS (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

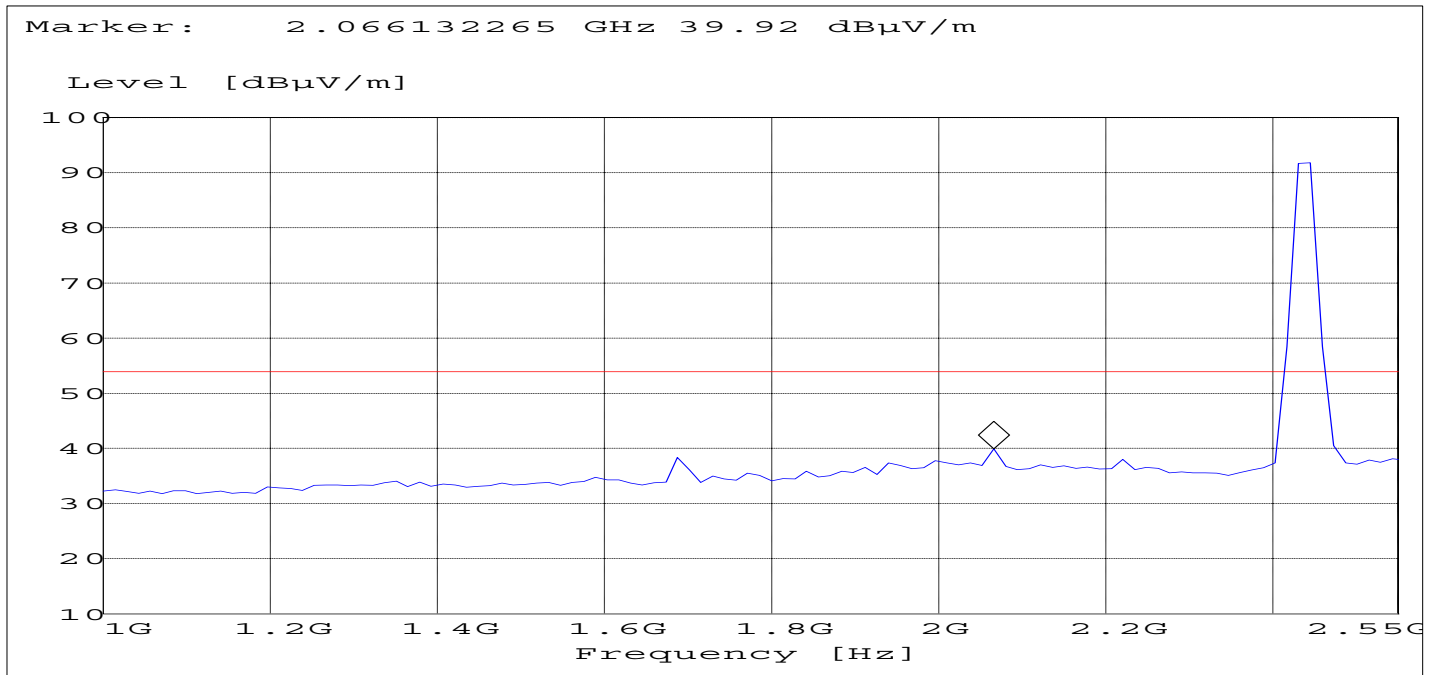
Radiated (Radio Plugged into printer with external antenna)

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



ANALYZER SETTINGS: $f < 1 \text{ GHz}$: RBW/VBW: 100 kHz

$f \geq 1 \text{ GHz}$: RBW/VBW: 1 MHz

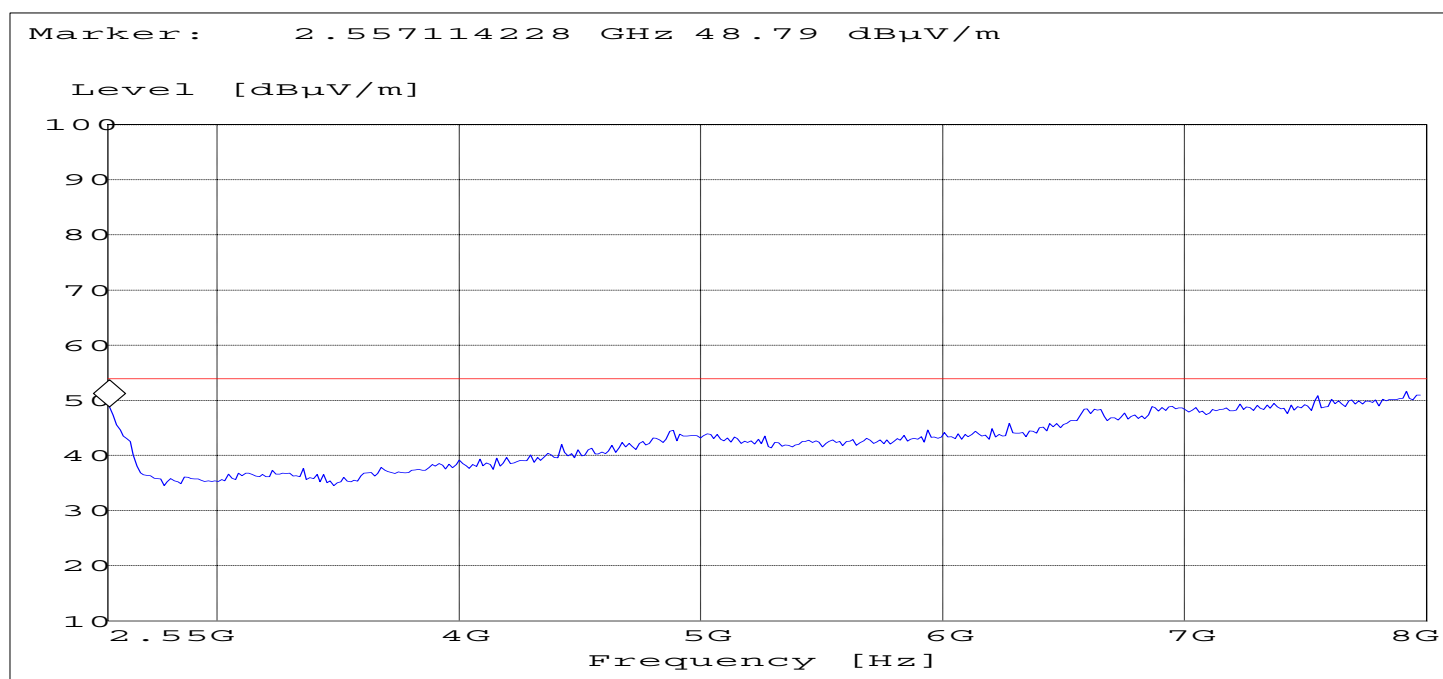
EMISSION LIMITATIONS (Transmitter)**SUBCLAUSE § 15.247 (c) (1)****Radiated** (Radio Plugged into printer with external antenna)**Mid Channel(2442MHz): 1GHz – 2.55GHz****NOTE: The peak above the limit line is the carrier frequency.****ANALYZER SETTINGS: $f < 1\text{ GHz}$: RBW/VBW: 100 kHz** **$f \geq 1\text{ GHz}$: RBW/VBW: 1 MHz**

EMISSION LIMITATIONS (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

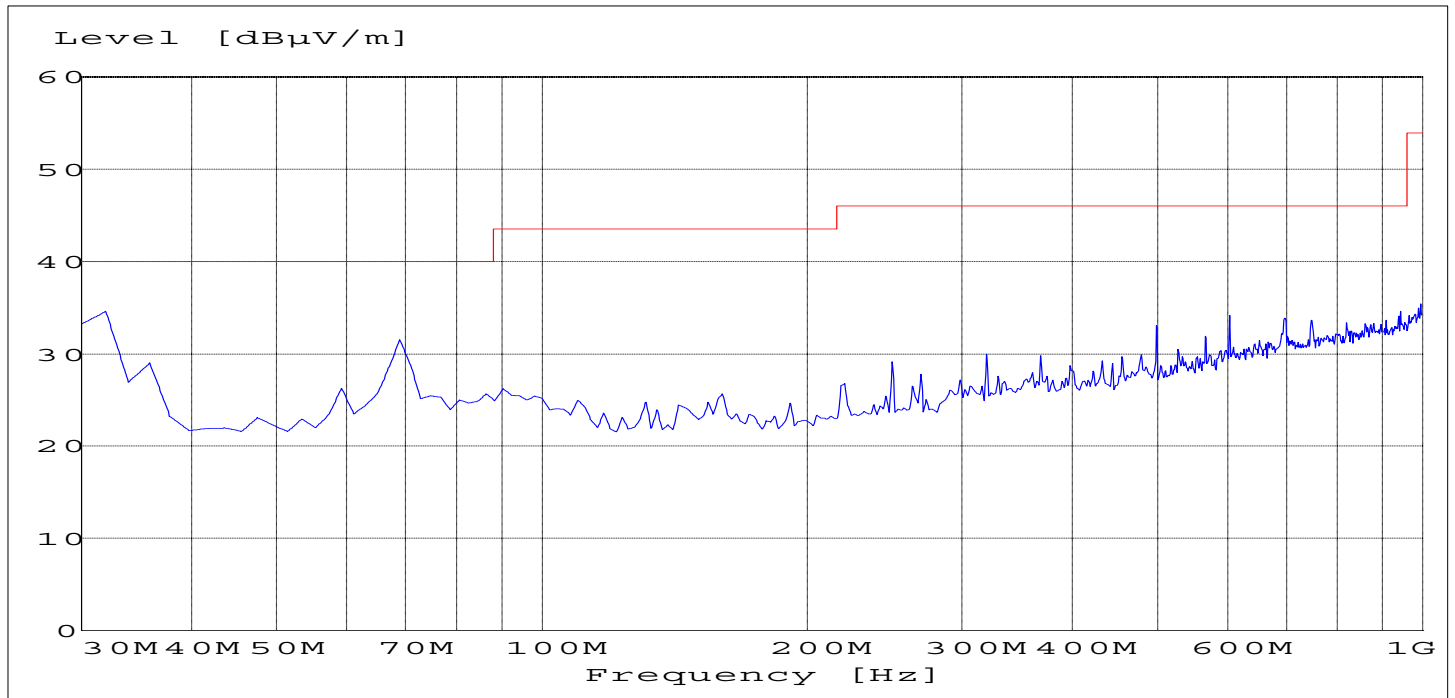
Radiated (Radio Plugged into printer with external antenna)

Mid Channel(2442MHz): 2.55GHz – 8GHz



ANALYZER SETTINGS: $f < 1 \text{ GHz}$: RBW/VBW: 100 kHz

$f \geq 1 \text{ GHz}$: RBW/VBW: 1 MHz

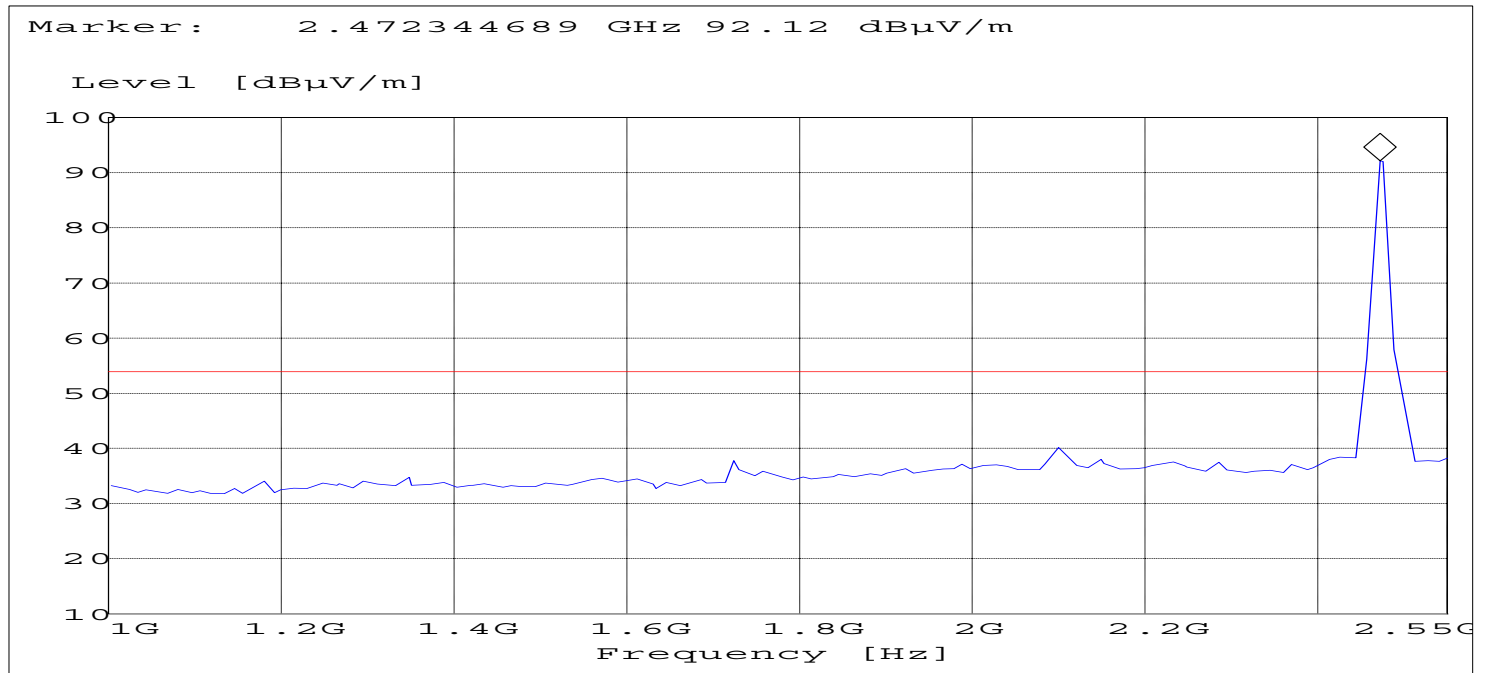
EMISSION LIMITATIONS (Transmitter)**SUBCLAUSE § 15.247 (c) (1)****Radiated** (Radio Plugged into printer with external antenna)**High Channel(2472MHz): 30MHz-1GHz****ANALYZER SETTINGS: $f < 1\text{ GHz}$: RBW/VBW: 100 kHz** **$f \geq 1\text{ GHz}$: RBW/VBW: 1 MHz**

EMISSION LIMITATIONS (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Radiated (Radio Plugged into printer with external antenna)

High Channel(2472MHz): 1GHz – 2.55GHz



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

ANALYZER SETTINGS: $f < 1 \text{ GHz}$: RBW/VBW: 100 kHz

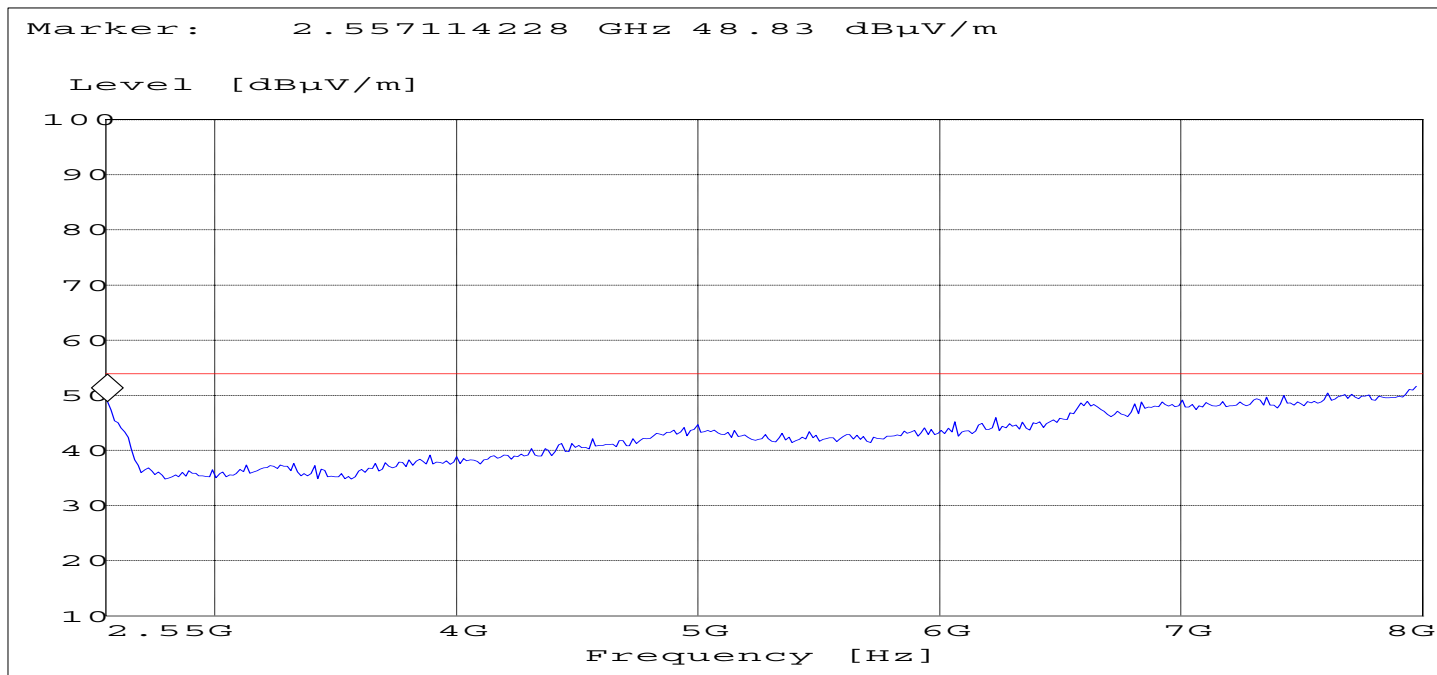
$f \geq 1 \text{ GHz}$: RBW/VBW: 1 MHz

EMISSION LIMITATIONS (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Radiated (Radio Plugged into printer with external antenna)

High Channel(2472MHz): 2.55GHz – 8GHz



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

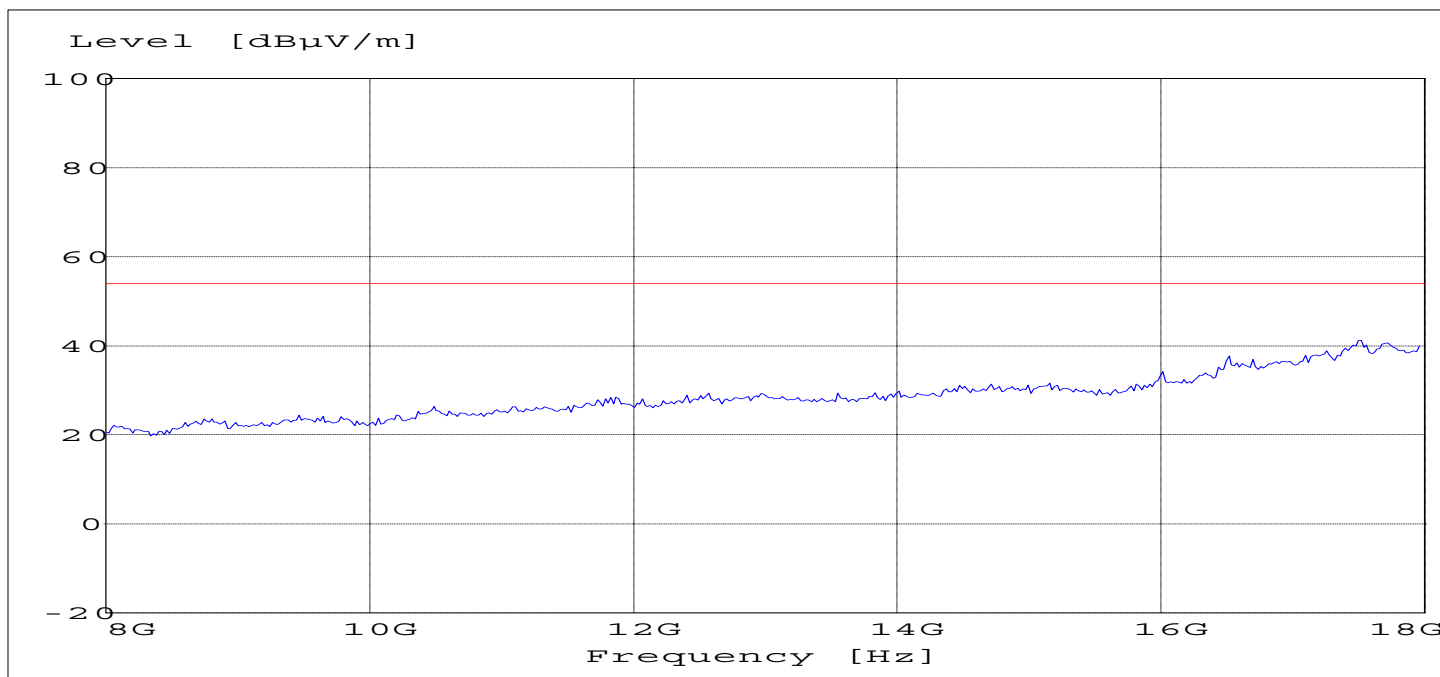
$f \geq 1$ GHz : RBW/VBW: 1 MHz

EMISSION LIMITATIONS (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Radiated (Radio Plugged into printer with external antenna)

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



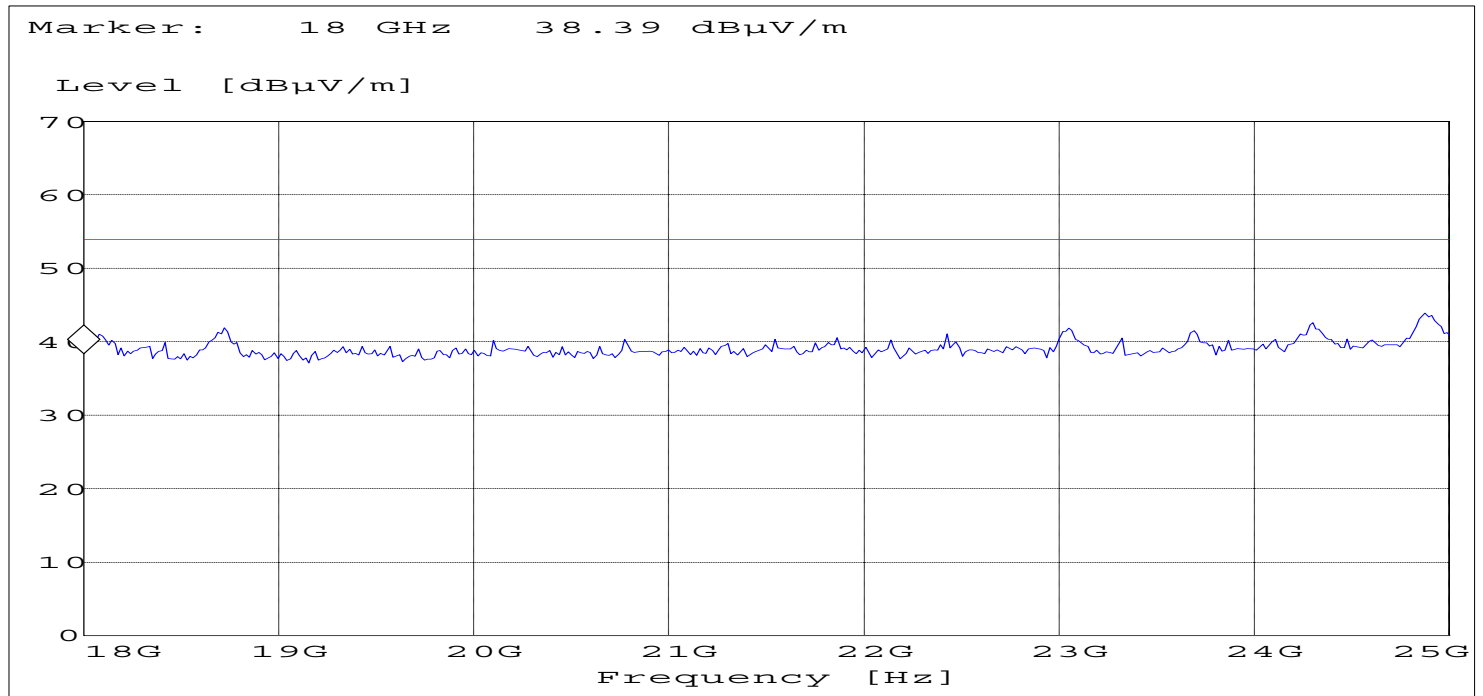
ANALYZER SETTINGS: $f < 1\text{ GHz}$: RBW/VBW: 100 kHz $f \geq 1\text{ GHz}$: RBW/VBW: 1 MHz

EMISSION LIMITATIONS (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Radiated (Radio Plugged into printer with external antenna)

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



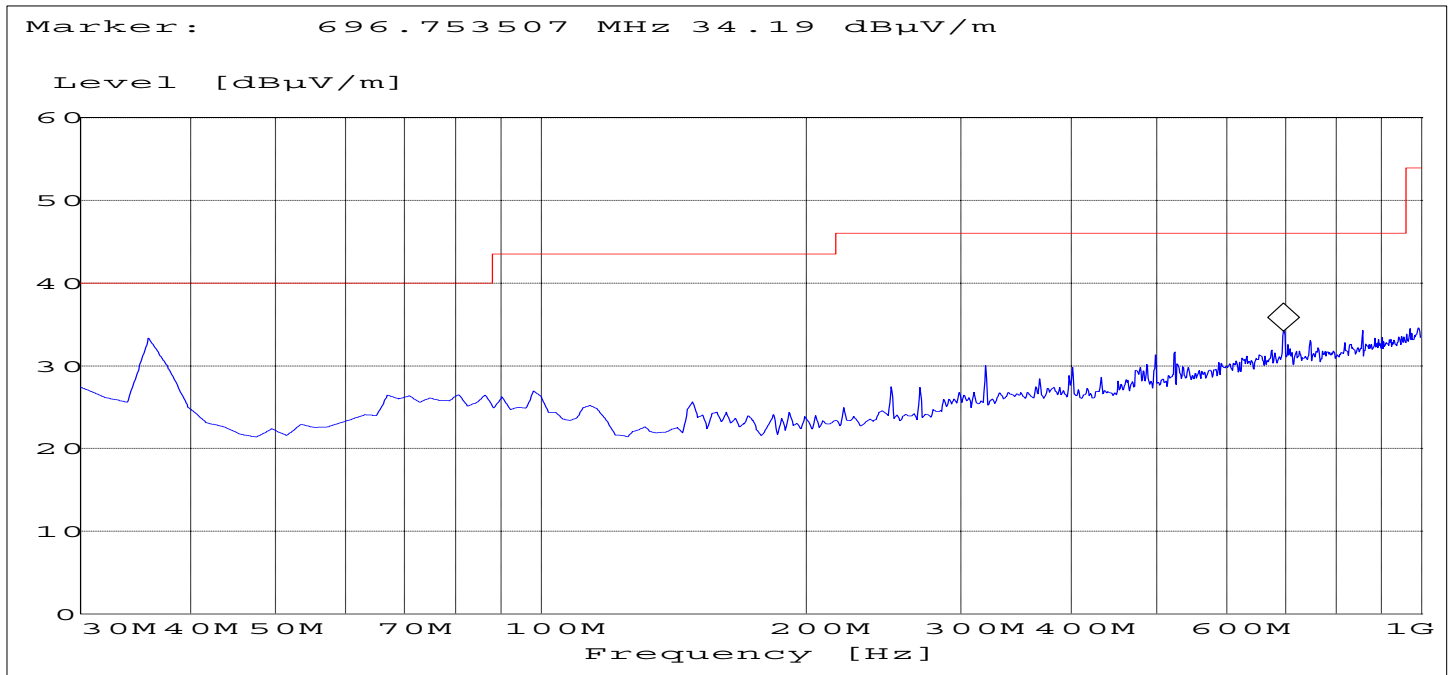
ANALYZER SETTINGS: $f < 1 \text{ GHz}$: RBW/VBW: 100 kHz $f \geq 1 \text{ GHz}$: RBW/VBW: 1 MHz

EMISSION LIMITATIONS (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Radiated (Radio stand alone with external antenna)

30MHz-1GHz (This plot is valid for all three channels)



ANALYZER SETTINGS: $f < 1\text{ GHz}$: RBW/VBW: 100 kHz

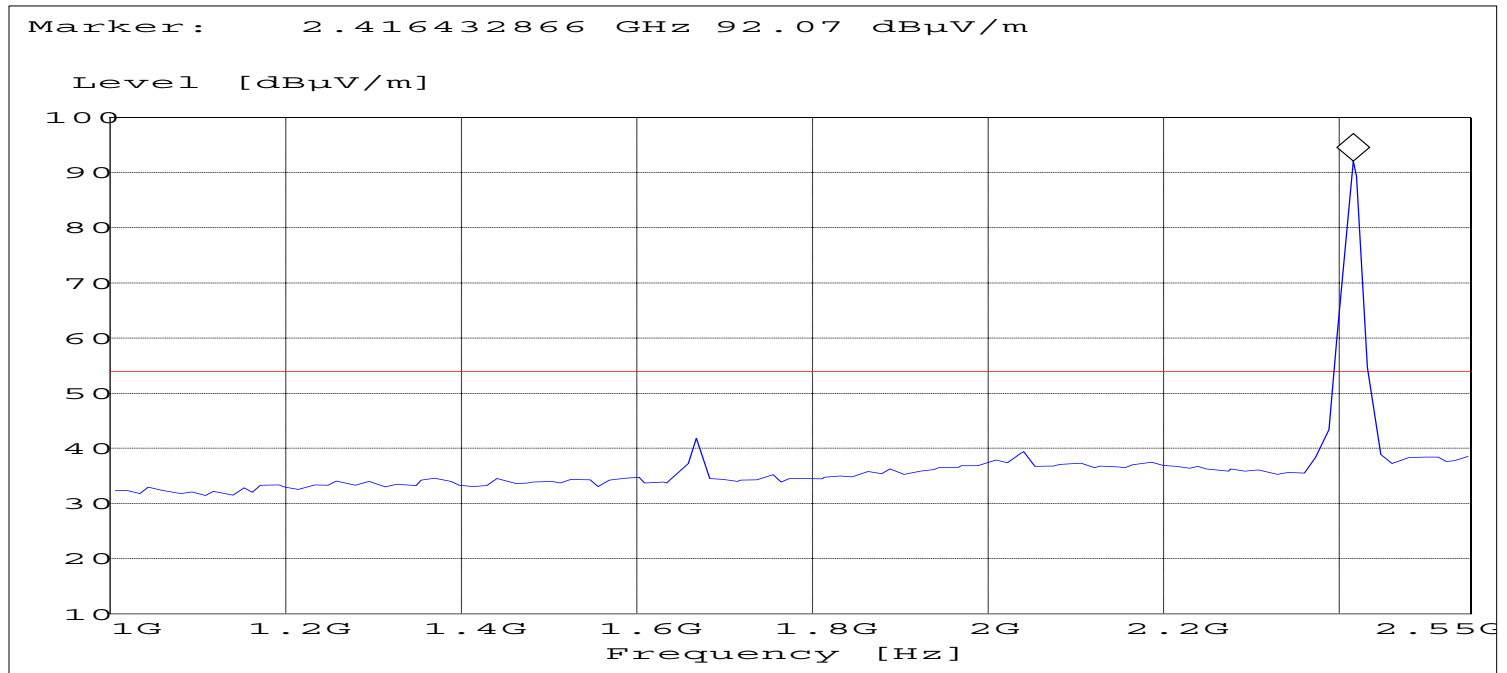
$f \geq 1\text{ GHz}$: RBW/VBW: 1 MHz

EMISSION LIMITATIONS (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Radiated (Radio stand alone with external antenna)

1GHz – 2.55GHz (This plot is valid for all three channels)



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

ANALYZER SETTINGS: $f < 1 \text{ GHz}$: RBW/VBW: 100 kHz

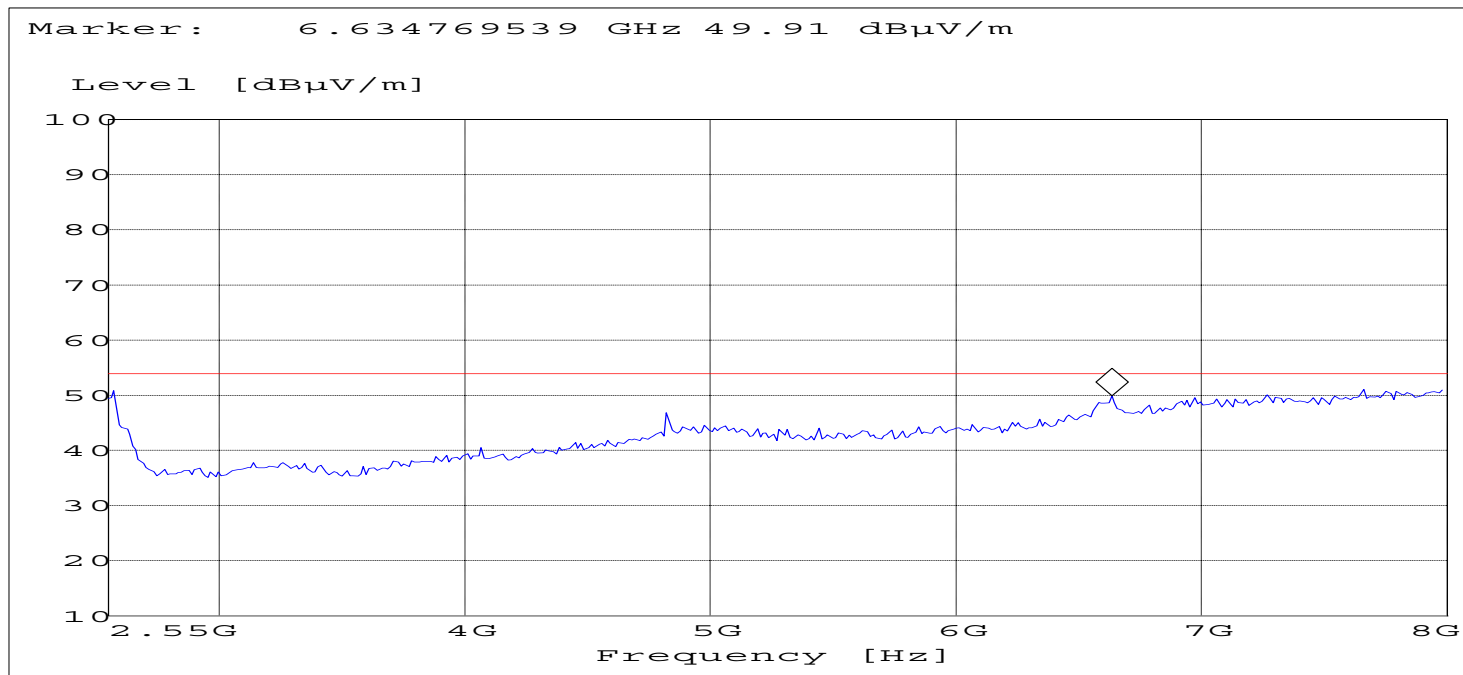
$f \geq 1 \text{ GHz}$: RBW/VBW: 1 MHz

EMISSION LIMITATIONS (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Radiated (Radio stand alone with external antenna)

2.55GHz – 8GHz (This plot is valid for all three channels)



ANALYZER SETTINGS: $f < 1 \text{ GHz}$: RBW/VBW: 100 kHz

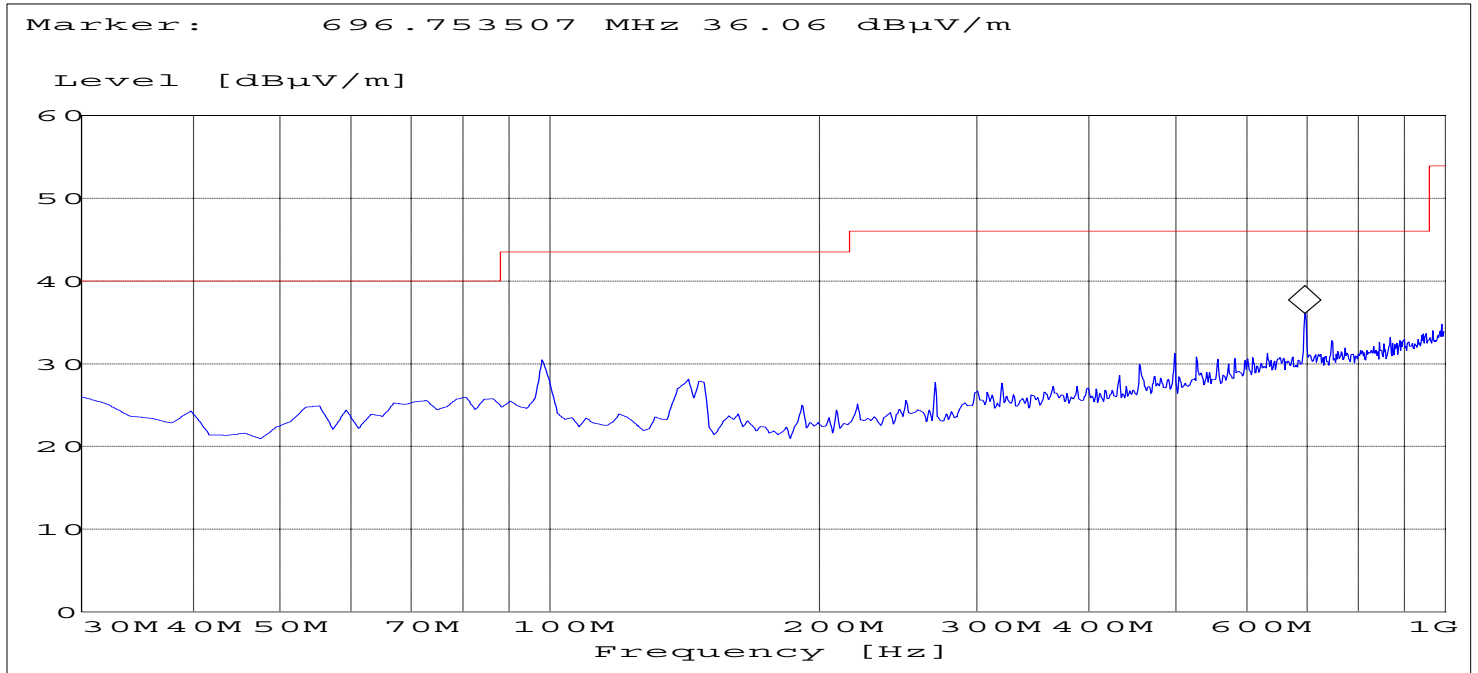
$f \geq 1 \text{ GHz}$: RBW/VBW: 1 MHz

EMISSION LIMITATIONS (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Radiated (Radio stand alone with internal antenna)

30MHz – 1GHz (This plot is valid for all three channels)



ANALYZER SETTINGS: $f < 1 \text{ GHz}$: RBW/VBW: 100 kHz

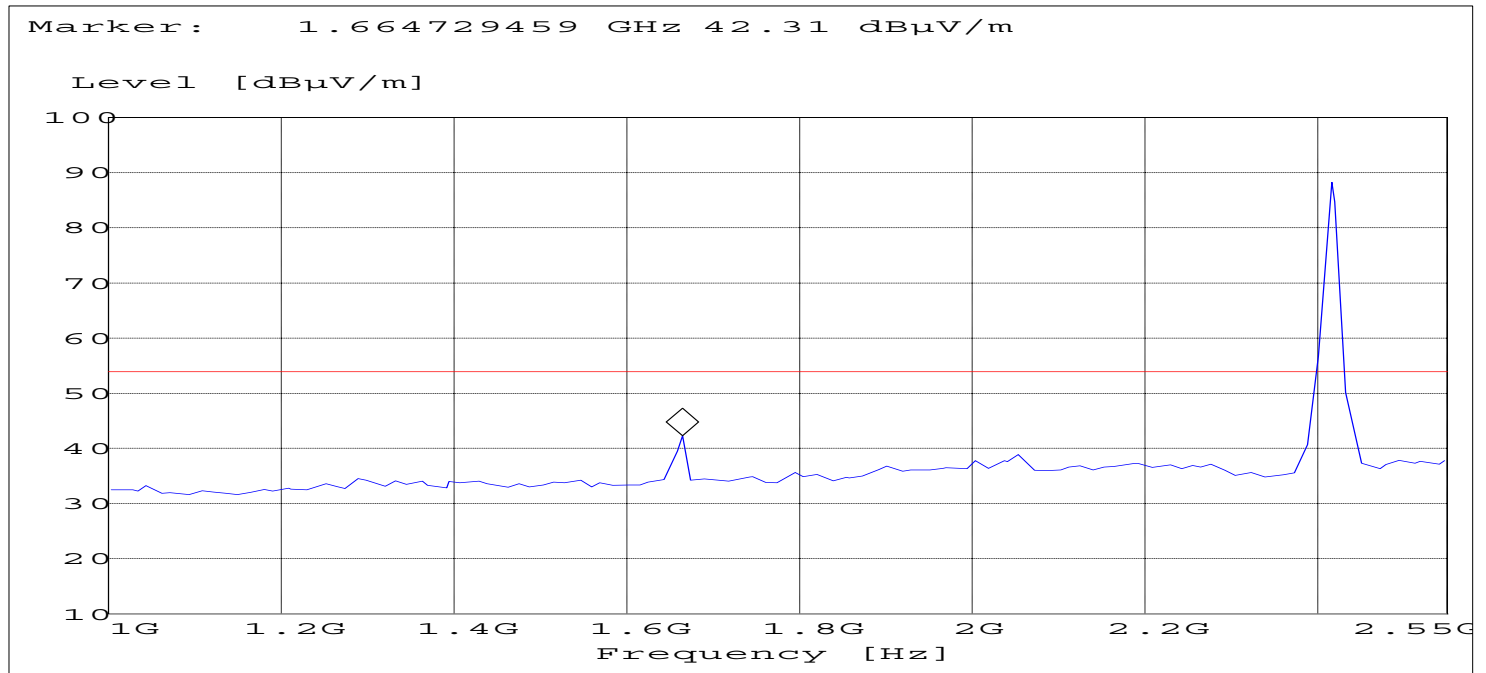
$f \geq 1 \text{ GHz}$: RBW/VBW: 1 MHz

EMISSION LIMITATIONS (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Radiated (Radio stand alone with internal antenna)

1GHz – 2.55GHz (This plot is valid for all three channels)



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

ANALYZER SETTINGS: $f < 1 \text{ GHz}$: RBW/VBW: 100 kHz

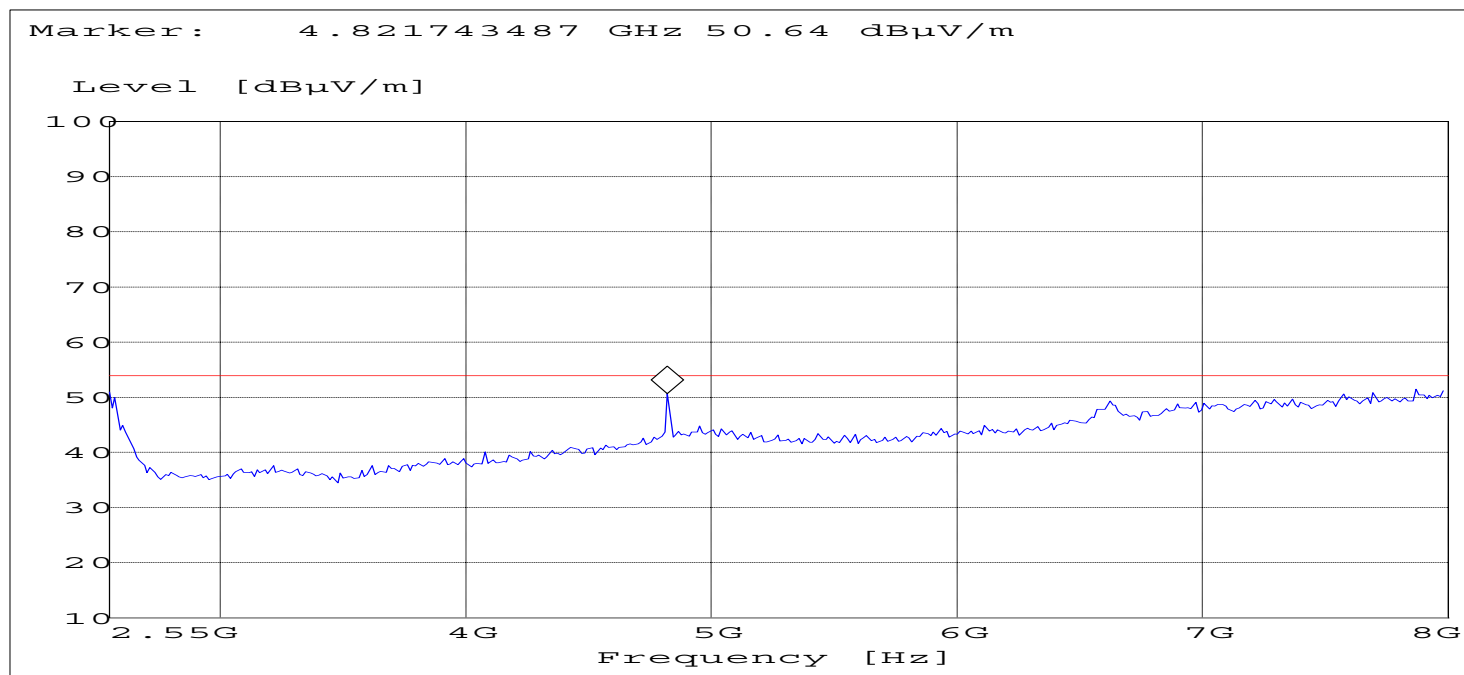
$f \geq 1 \text{ GHz}$: RBW/VBW: 1 MHz

EMISSION LIMITATIONS (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Radiated (Radio stand alone with internal antenna)

2.55GHz – 8GHz (This plot is valid for all three channels)



ANALYZER SETTINGS: $f < 1 \text{ GHz}$: RBW/VBW: 100 kHz

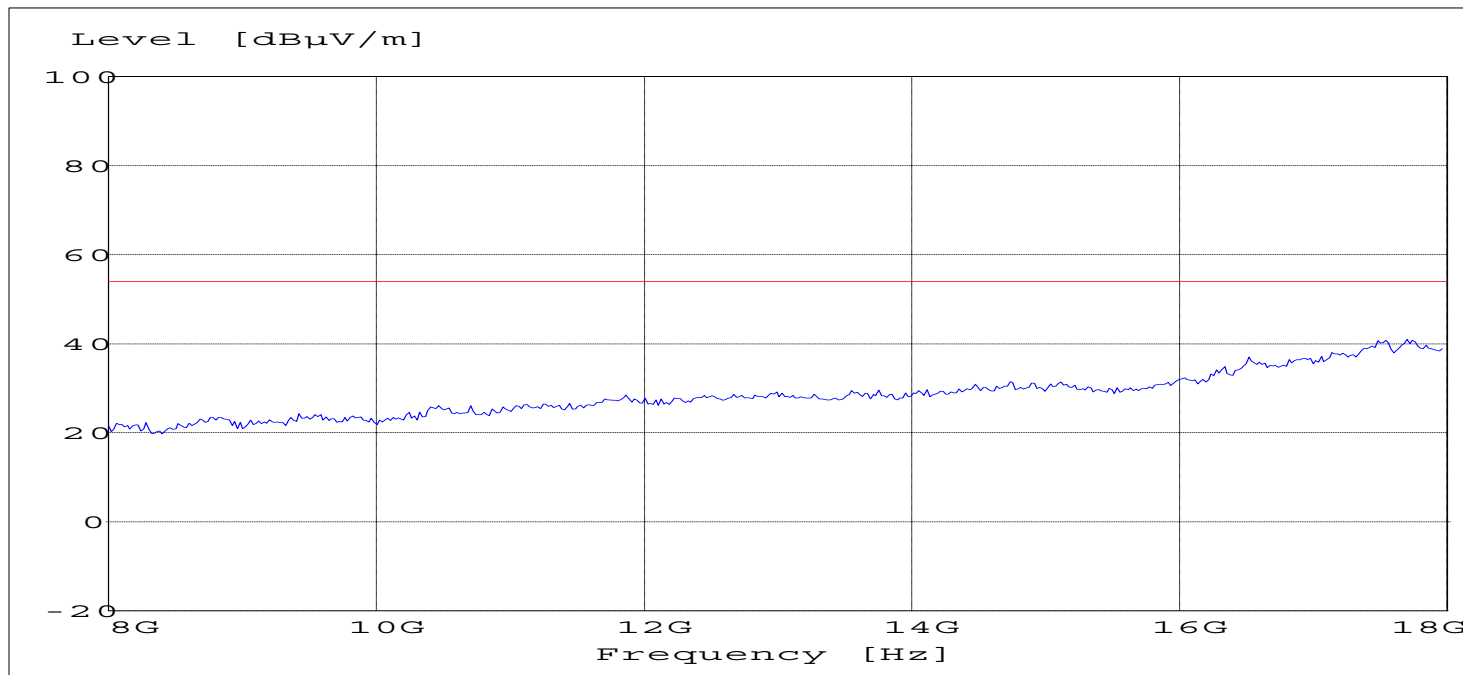
$f \geq 1 \text{ GHz}$: RBW/VBW: 1 MHz

EMISSION LIMITATIONS (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Radiated (Radio stand alone with internal / external antenna)

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



ANALYZER SETTINGS: $f < 1 \text{ GHz}$: RBW/VBW: 100 kHz

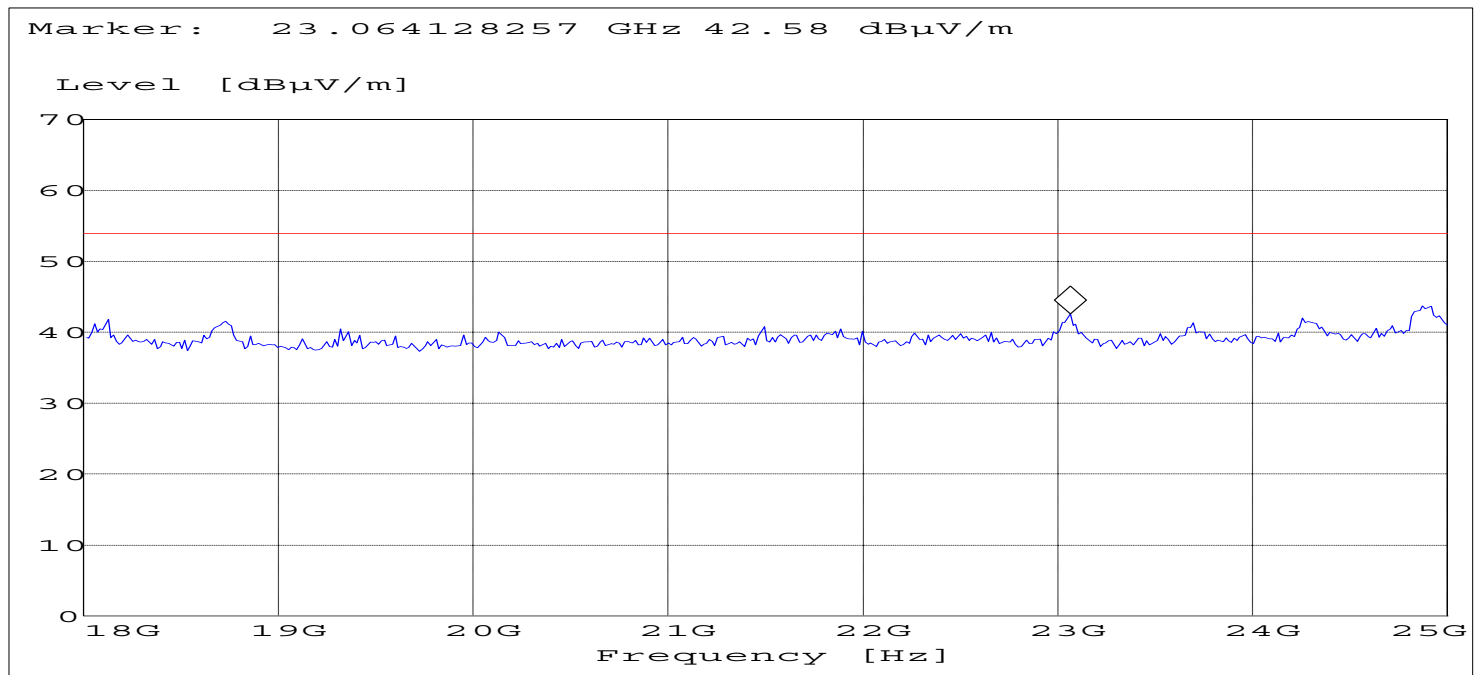
$f \geq 1 \text{ GHz}$: RBW/VBW: 1 MHz

EMISSION LIMITATIONS (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Radiated (Radio stand alone with internal / external antenna)

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



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

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

POWER SPECTRAL DENSITY**SUBCLAUSE § 15.247 (d)**

TEST CONDITIONS		RF POWER LEVEL IN 3 kHz BW		
Frequency (MHz)		2412	2442	2472
T _{nom} (23)°C	V _{nom} (3.3)V	-9.48 dBm	-8.78 dBm	-9.66 dBm
Measurement uncertainty		±3dB		

LIMIT**SUBCLAUSE §15.247(d)**

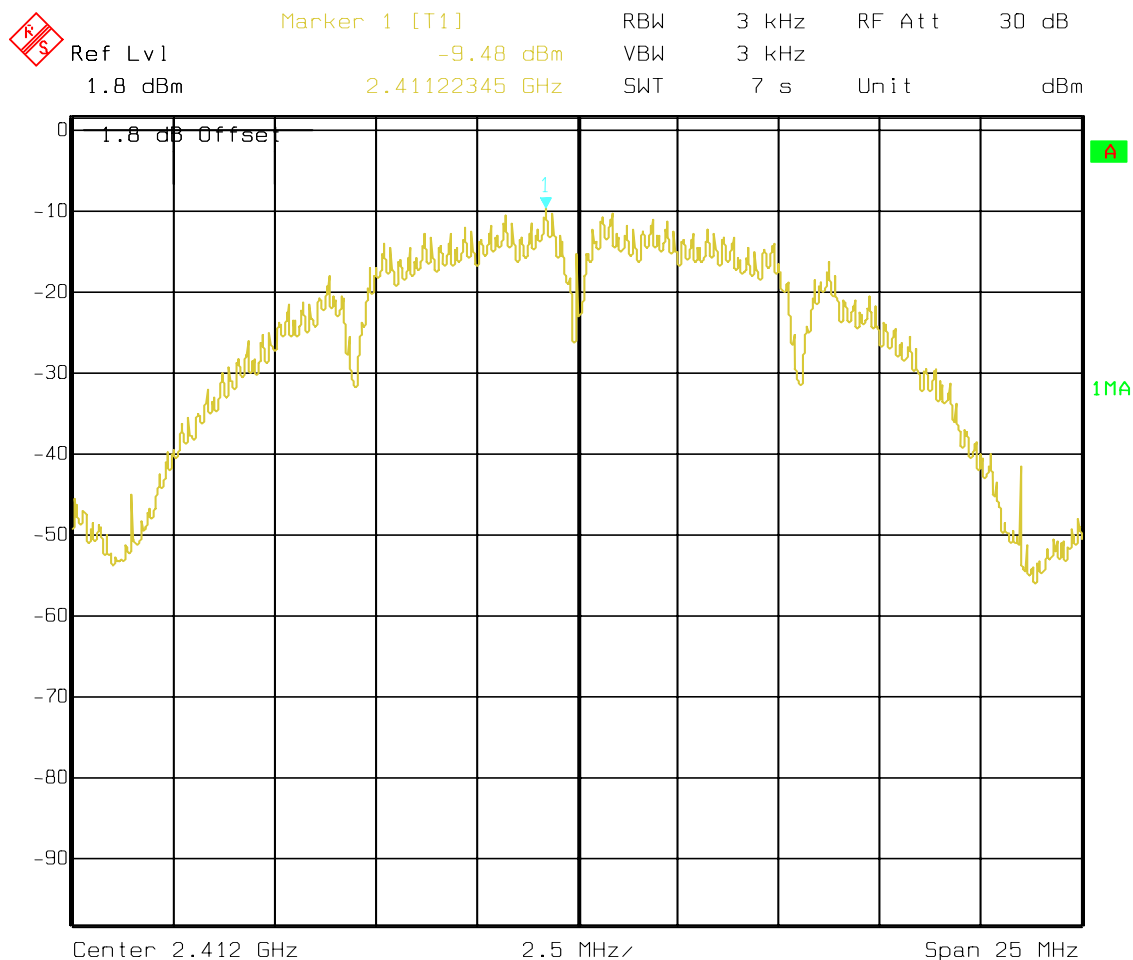
The peak power spectral density shall not be greater than 8 dBm in any 3 kHz band

ANALYZER SETTINGS: RBW=3KHz VBW=3KHz

POWER SPECTRAL DENSITY

SUBCLAUSE § 15.247 (d)

Low Channel: 2412 MHz

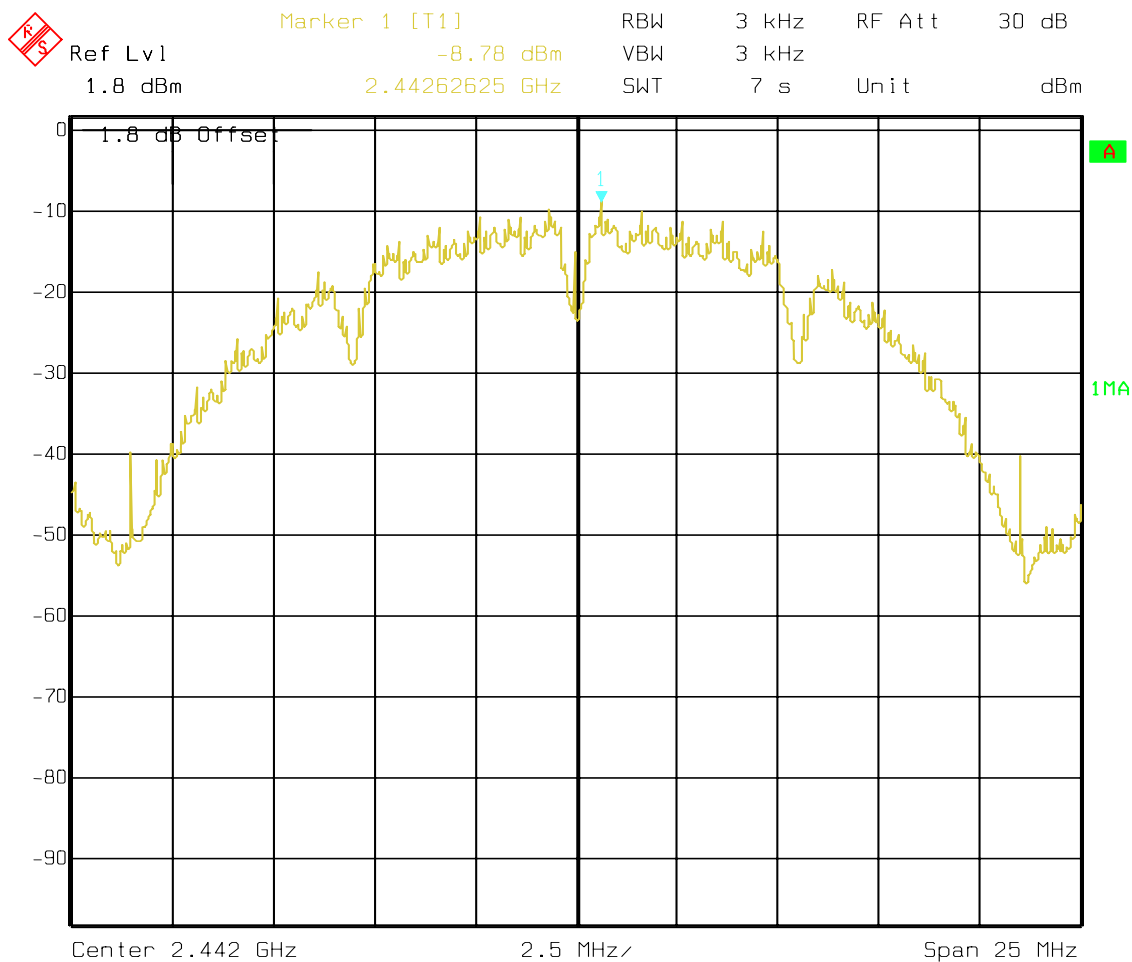


Date: 11.DEC.01 18:07:12

POWER SPECTRAL DENSITY

SUBCLAUSE § 15.247 (d)

Mid Channel: 2442 MHz

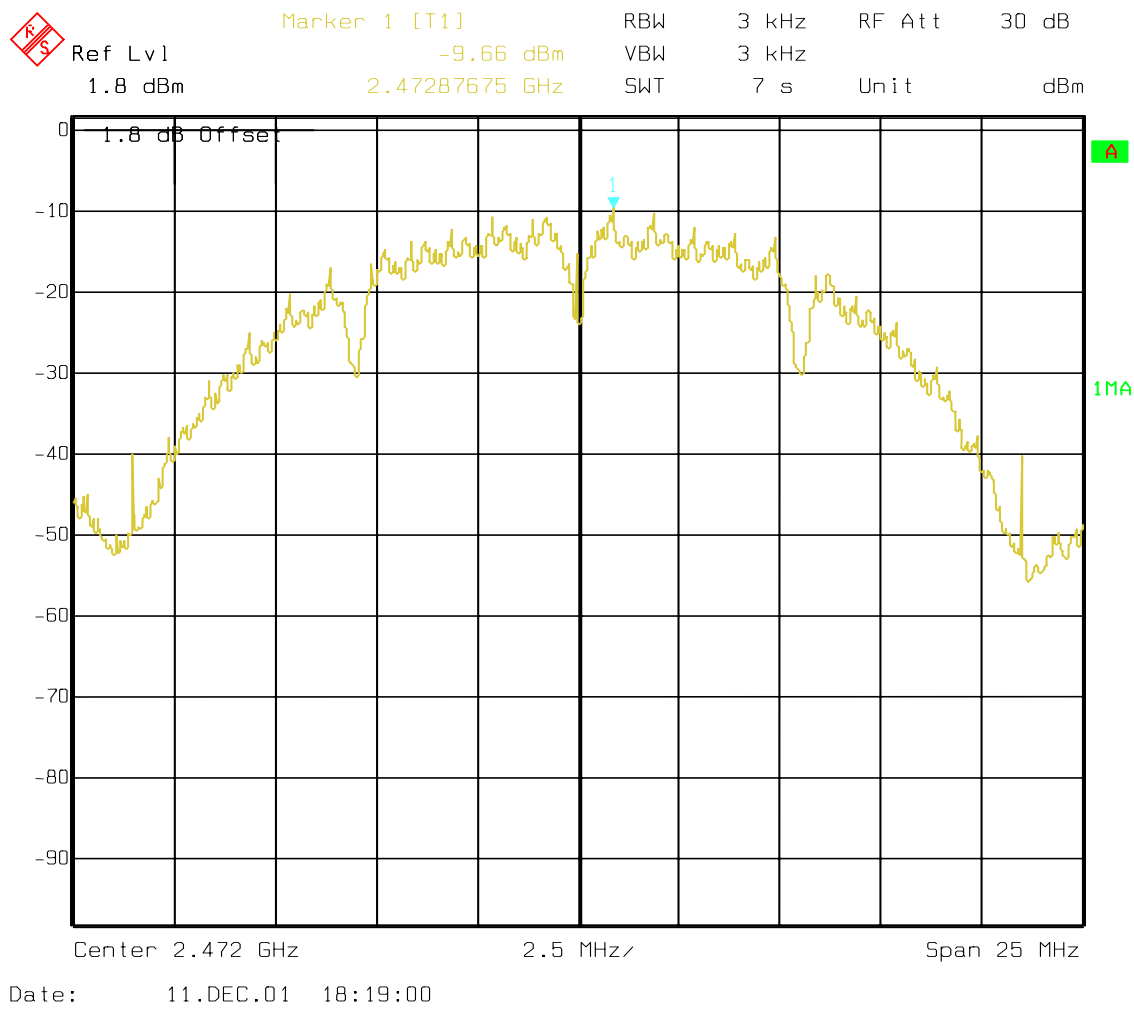


Date: 11.DEC.01 18:16:59

POWER SPECTRAL DENSITY

SUBCLAUSE § 15.247 (d)

High Channel: 2472 MHz

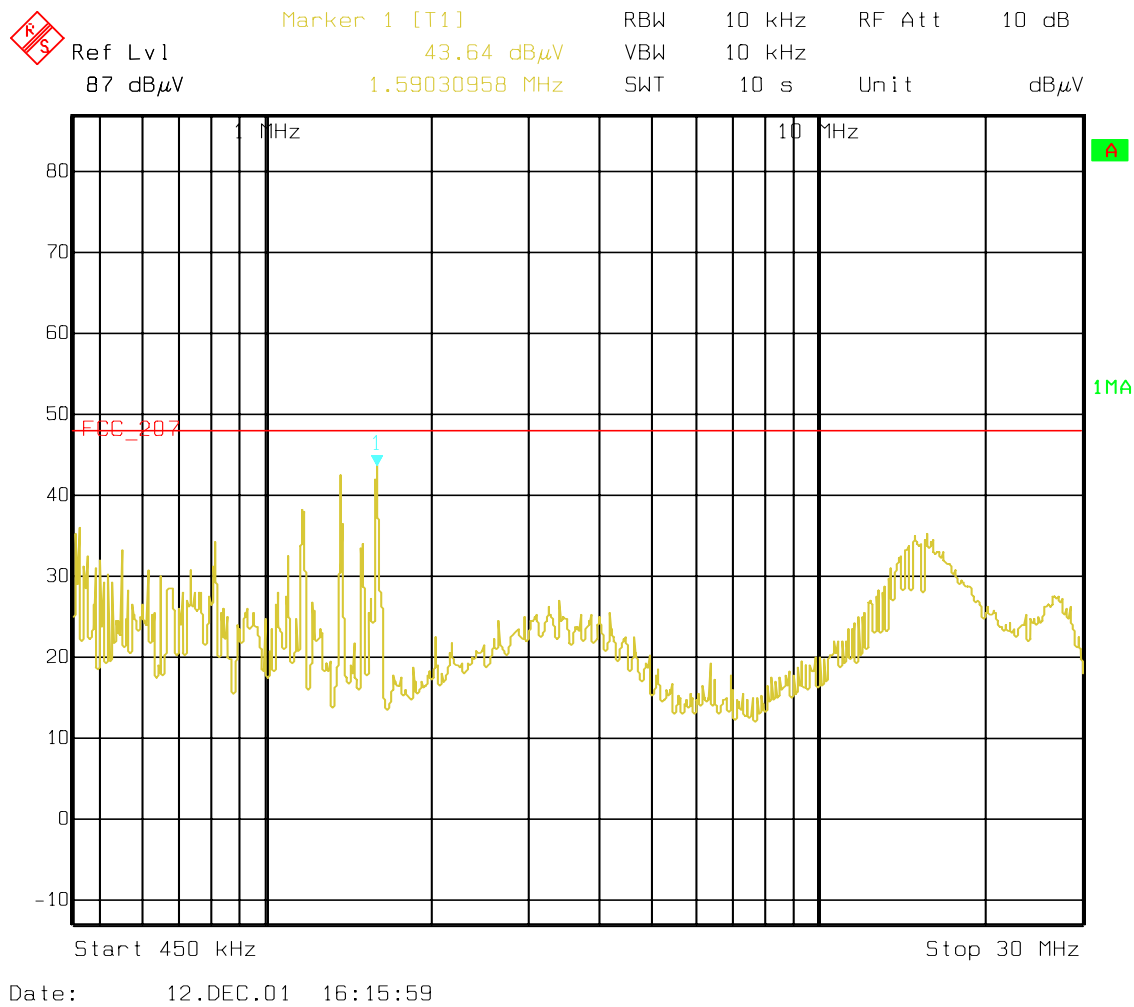


CONDUCTED EMISSIONS

§ 15.107/207

Measured with AC/DC power adapter plugged in LISN

Test valid for both Line and Neutral



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

Limit

0.45 to 30 MHz	250 μV / 47.96 dBμV
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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:

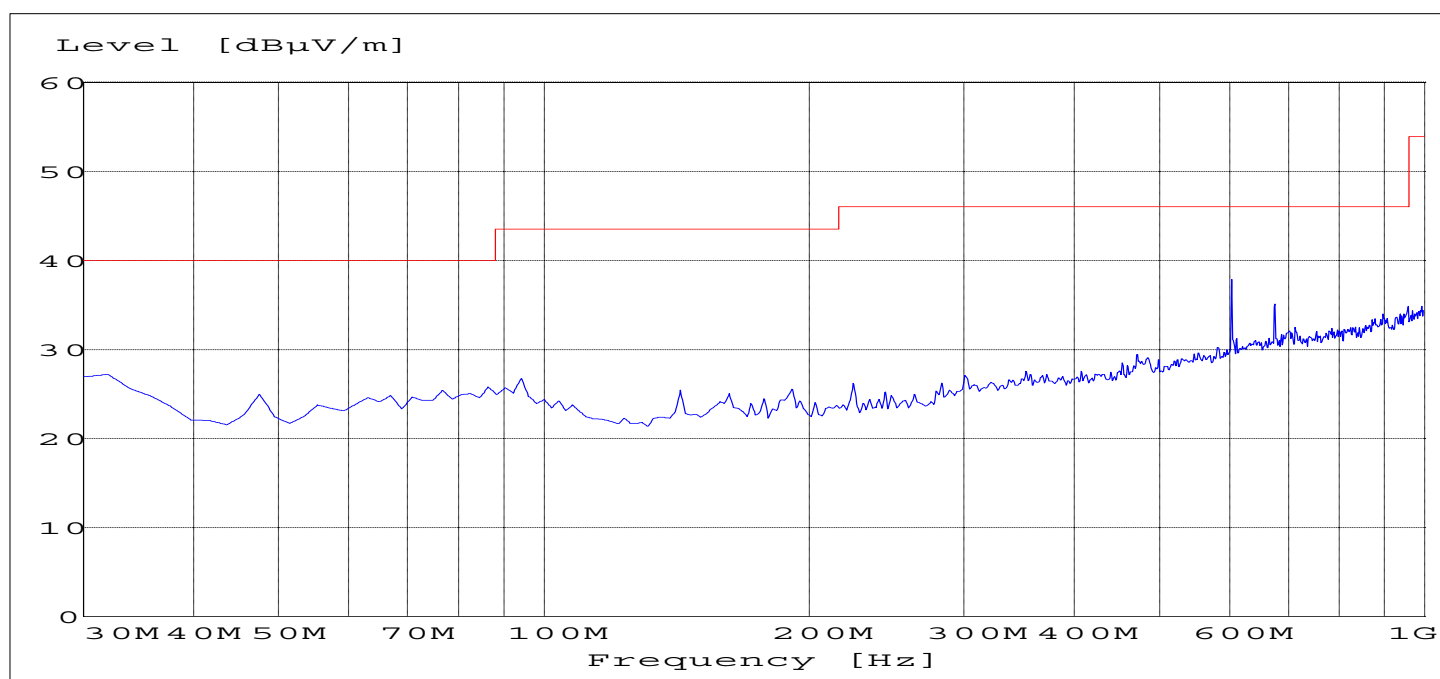
1. The radiated emissions were done with different settings, using the relevant pre-amplifiers for the relevant frequency ranges. This is the reason that the graphs show different noise levels. In the range between 18 and 25 GHz very short cable connections to the antenna was used to minimize the noise level.
2. Measurements were done on low, mid & high channels, but plots depicting the worst case are submitted in the test report.
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

RECEIVER SPURIOUS RADIATION

§ 15.209

30MHz – 1GHz (Radio plugged into printer with external antenna)

(This plot is valid for all three channels)

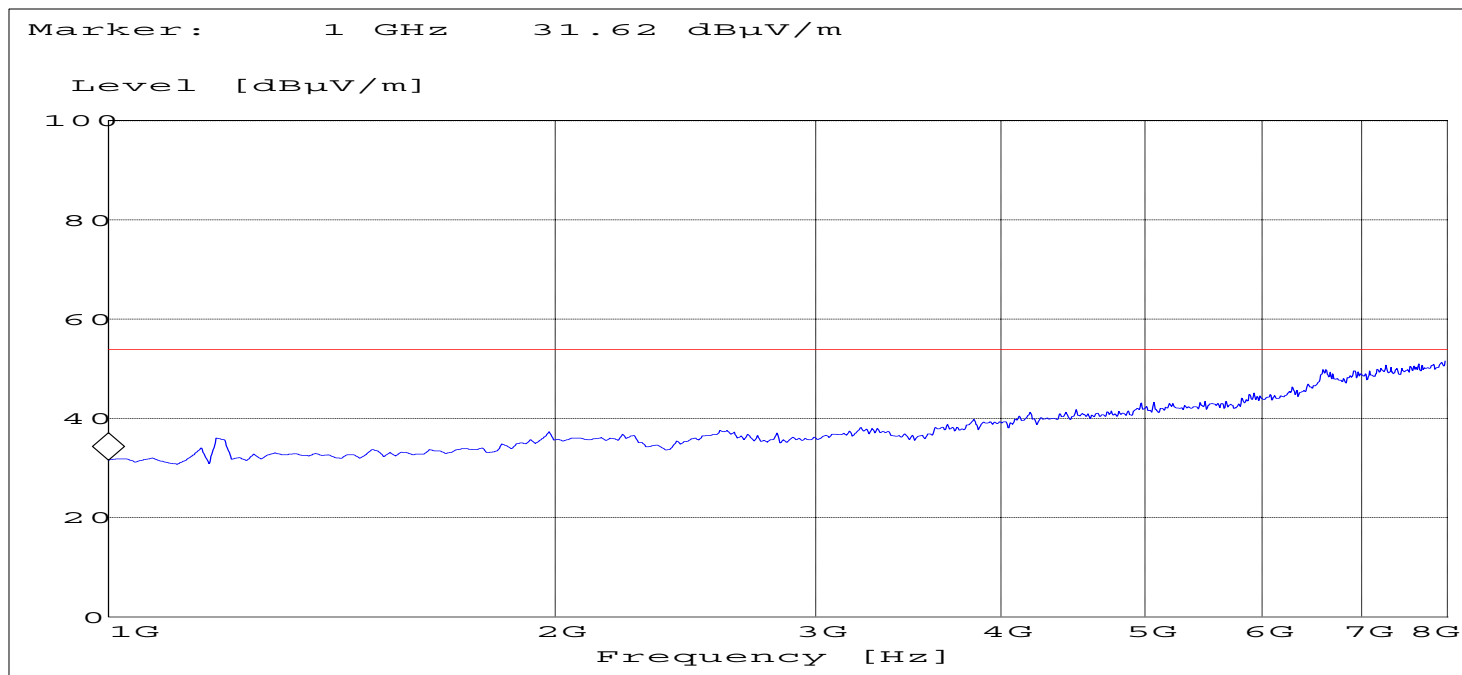
ANALYZER SETTINGS: $f < 1 \text{ GHz}$: RBW/VBW: 100 kHz $f \geq 1 \text{ GHz}$: RBW/VBW: 1 MHz

RECEIVER SPURIOUS RADIATION

§ 15.209

1GHz – 8GHz (Radio plugged into printer with external antenna)

(This plot is valid for all three channels)

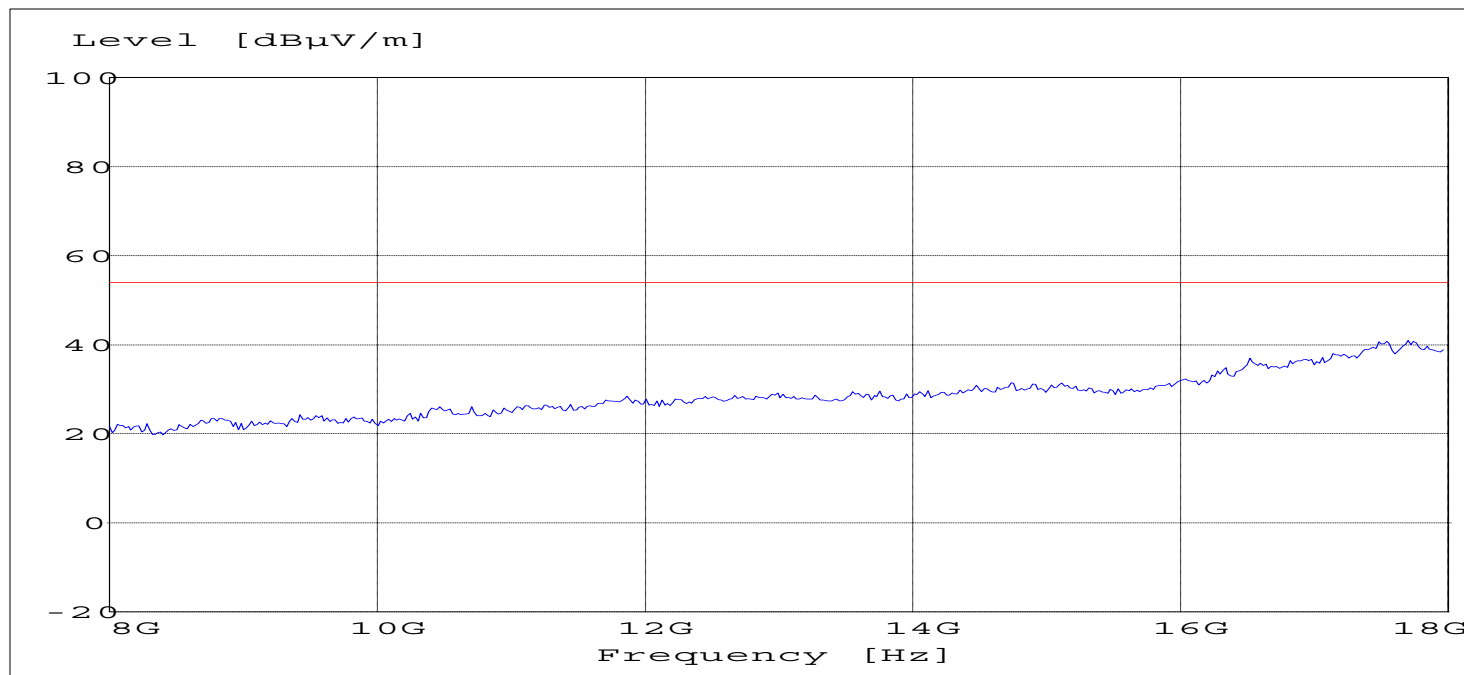
ANALYZER SETTINGS: $f < 1\text{ GHz}$: RBW/VBW: 100 kHz $f \geq 1\text{ GHz}$: RBW/VBW: 1 MHz

RECEIVER SPURIOUS RADIATION

§ 15.209

8GHz – 18GHz (Radio plugged into printer with external antenna)

(This plot is valid for all three channels)



ANALYZER SETTINGS: $f < 1 \text{ GHz}$: RBW/VBW: 100 kHz

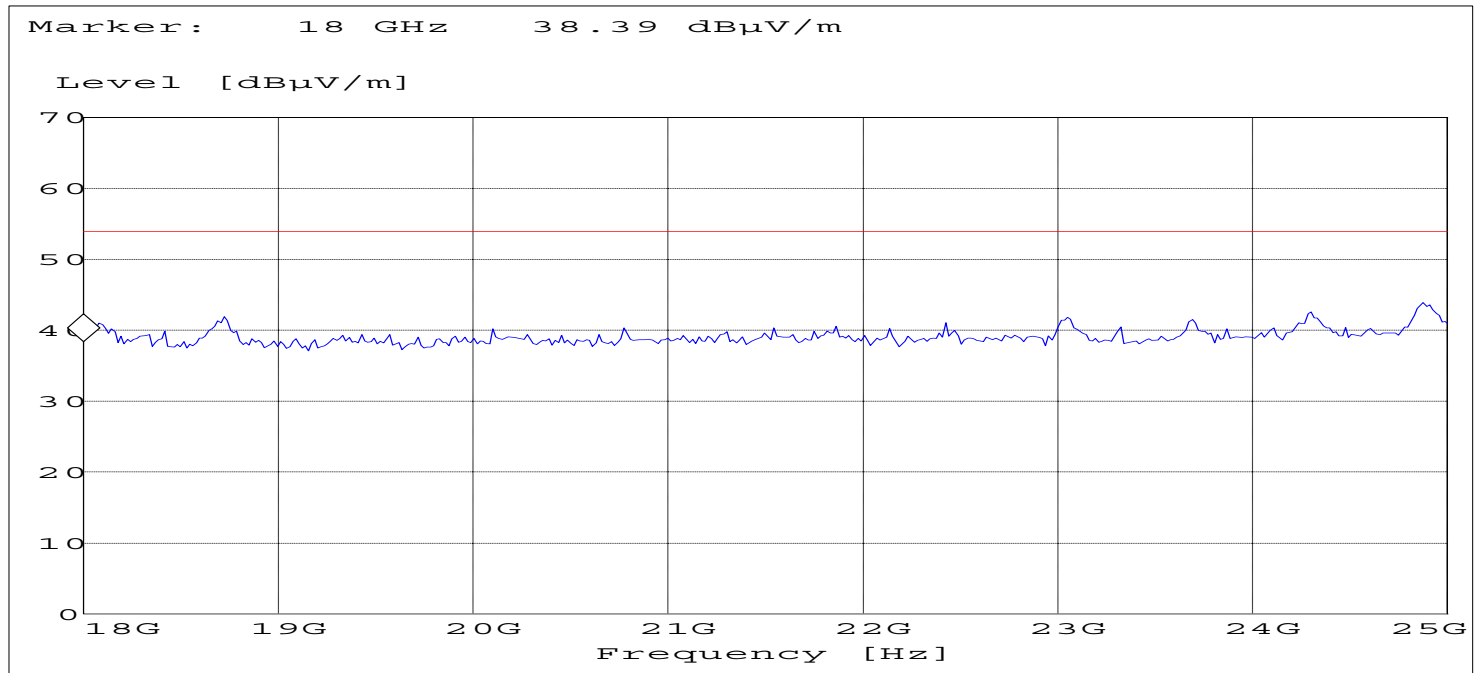
$f \geq 1 \text{ GHz}$: RBW/VBW: 1 MHz

RECEIVER SPURIOUS RADIATION

§ 15.209

18GHz – 25GHz (Radio plugged into printer with external antenna)

(This plot is valid for all three channels)



ANALYZER SETTINGS: $f < 1 \text{ GHz}$: RBW/VBW: 100 kHz

$f \geq 1 \text{ GHz}$: RBW/VBW: 1 MHz

[illegible]