

CETECOM Inc.



CETECOM Inc.

411 Dixon Landing Road, Milpitas, CA-95035, USA

Phone: +1 408 586 6200 Fax: +1 408 586 6299

www.cetecom.com

Issued test report consists of 48 Pages

Page 1 (48)

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

**Test report no.:173FCC/2001_2WLAN
FCC Part 15.247
FCC ID: B94xt1000WLAN
(HP Omnibook xt1000)**

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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 : Hewlett Packard
Street : 19310 Pruneridge Av.
City : Cupertino, CA
Country : USA
Contact : Richard Barbin
Telephone : 408 343 7972
Telefax : 408 343 7366
e-mail : richard_barbin@hp.com

1.4 Application details

Date of receipt of application : 2001-07-10
Date of receipt of test item : 2001-09-26
Date of test : 2001-09-26/27/28

1.5 Test item

Manufacturer : applicant
Name of EUT : T60H300.01 installed into HP Omnibook xt1000
[Description](#) : [802.11b wireless card](#)
Model No. : T60H300.01
Serial No. : N/A
FCC ID : B94xt1000WLAN

Additional informations

Frequency : 2.412 – 2.462 GHz for US, 2.412 – 2.472 GHz for EU
Type of modulation : DBPSK at 1Mb/s; DQPSK at 2Mb/s; CCK at 5.5.11Mb/s
Number of channels : 11 Channels in US, 13 Channels in EU
Antenna : Internal
Power supply : 3.3V
Output power : 15dBm
Extreme Vol. Limits : 2.97V – 3.63V
Extreme Temp. Limits : 0°C - +40°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 :

2001-10-25**EMC & Radio****Lothar Schmidt**

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

2.2 Testreport

TEST REPORT

**Testreport no. : 173FCC/2001_2WLAN
FCC ID: B94xt1000WLAN
(HP Omnibook xt1000)**

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
§ 15.107	Conducted emissions	41
	Receiver parameters	
§ 15.209	Receiver Spurious Radiation	43
	Test equipment listing	48

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

TEST CONDITIONS		6 dB BANDWIDTH (kHz)		
Frequency (MHz)		2412	2437	2462
T _{nom} (23)°C	V _{nom} (3.3)V	9919	9619	9919
Measurement uncertainty		±3dB		

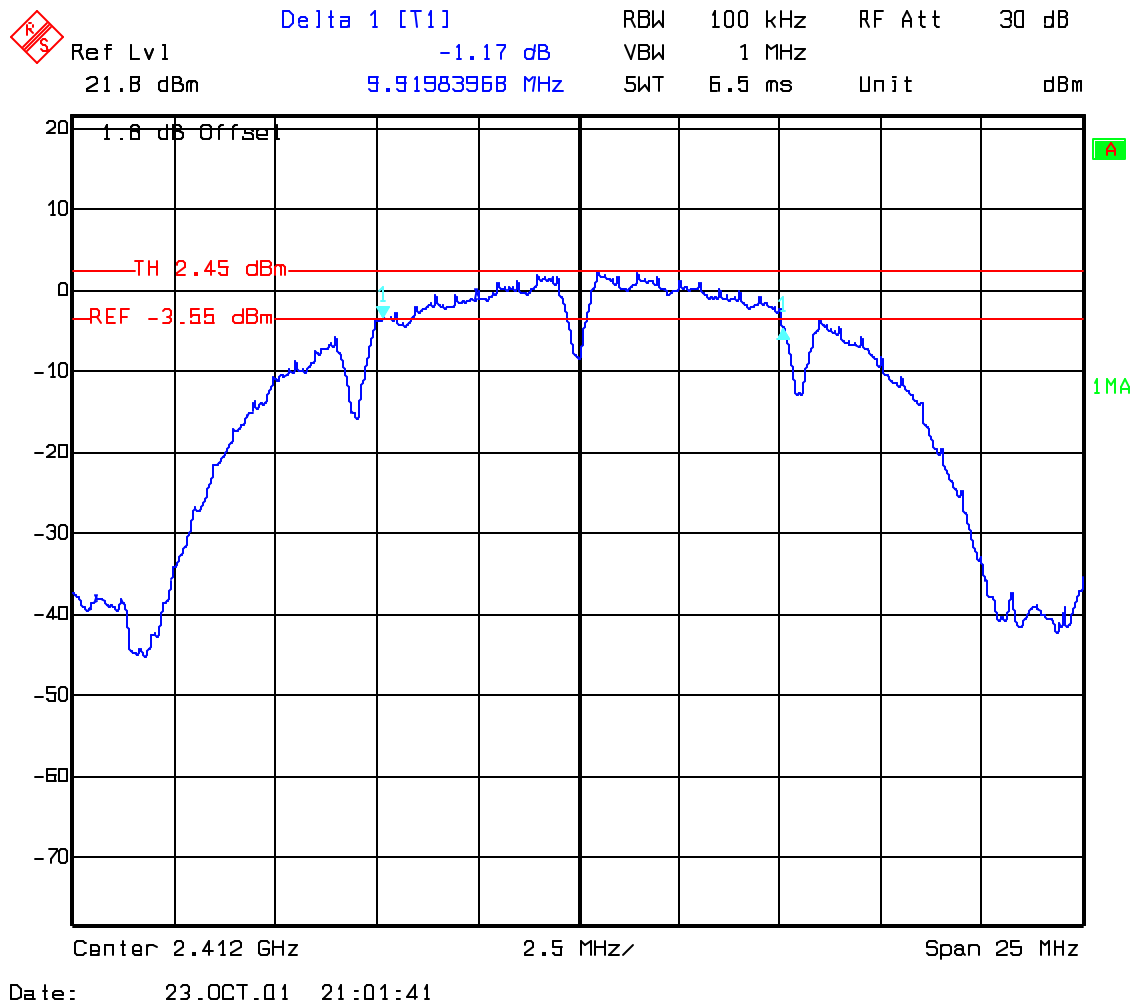
LIMIT**SUBCLAUSE §15.247(a) (2)**

The minimum 6dB bandwidth shall be at least 500 KHz

SPECTRUM BANDWIDTH OF DSSS-SYSTEM

SUBCLAUSE § 15.247 (a)(2)

Low Channel: 2412 MHz



LIMIT

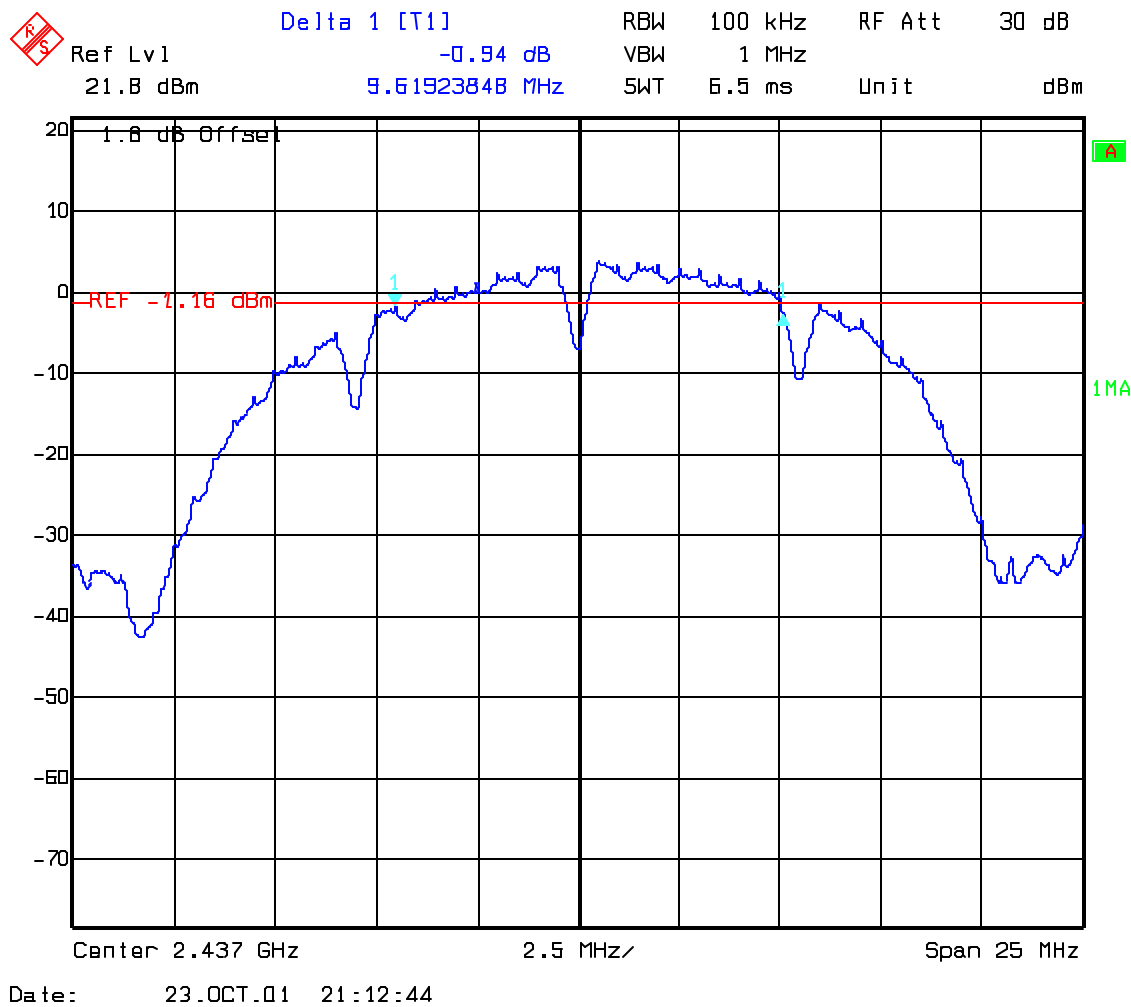
SUBCLAUSE §15.247(a) (2)

The minimum 6dB bandwidth shall be at least 500 KHz

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

SPECTRUM BANDWITH OF DSSS-SYSTEM
Mid Channel: 2437 MHz

SUBCLAUSE § 15.247 (a)(2)



LIMIT

SUBCLAUSE §15.247(a) (2)

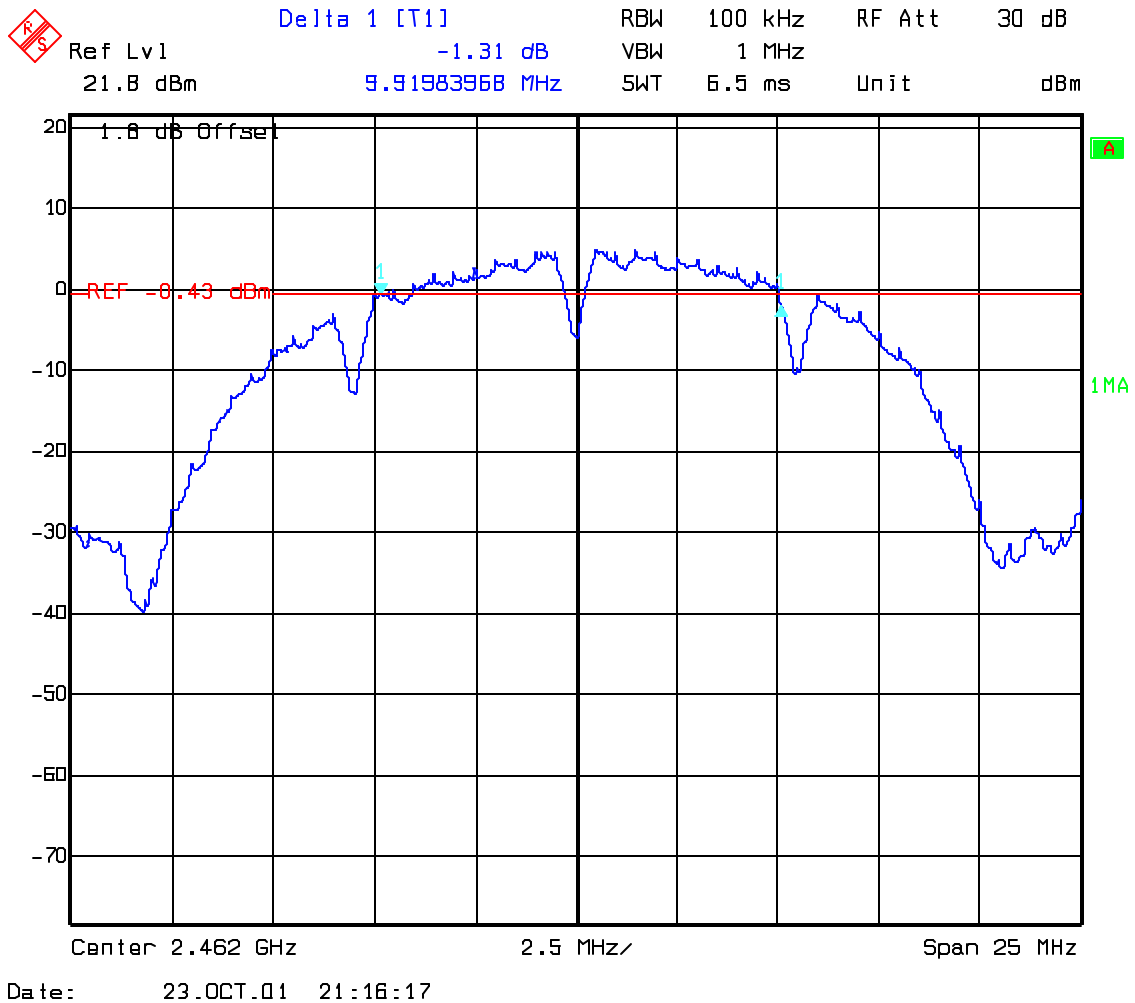
The minimum 6dB bandwidth shall be at least 500 KHz

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

SPECTRUM BANDWITH OF DSSS-SYSTEM

SUBCLAUSE § 15.247 (a)(2)

High Channel: 2462 MHz



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		2437		2462	
T _{nom} (23)° C	V _{nom} (3.3)V	Pk	17.74	Pk	18.91	Pk	19.67
		Av	10.60	Av	12.06	Av	12.65
Measurement uncertainty		±3dB					

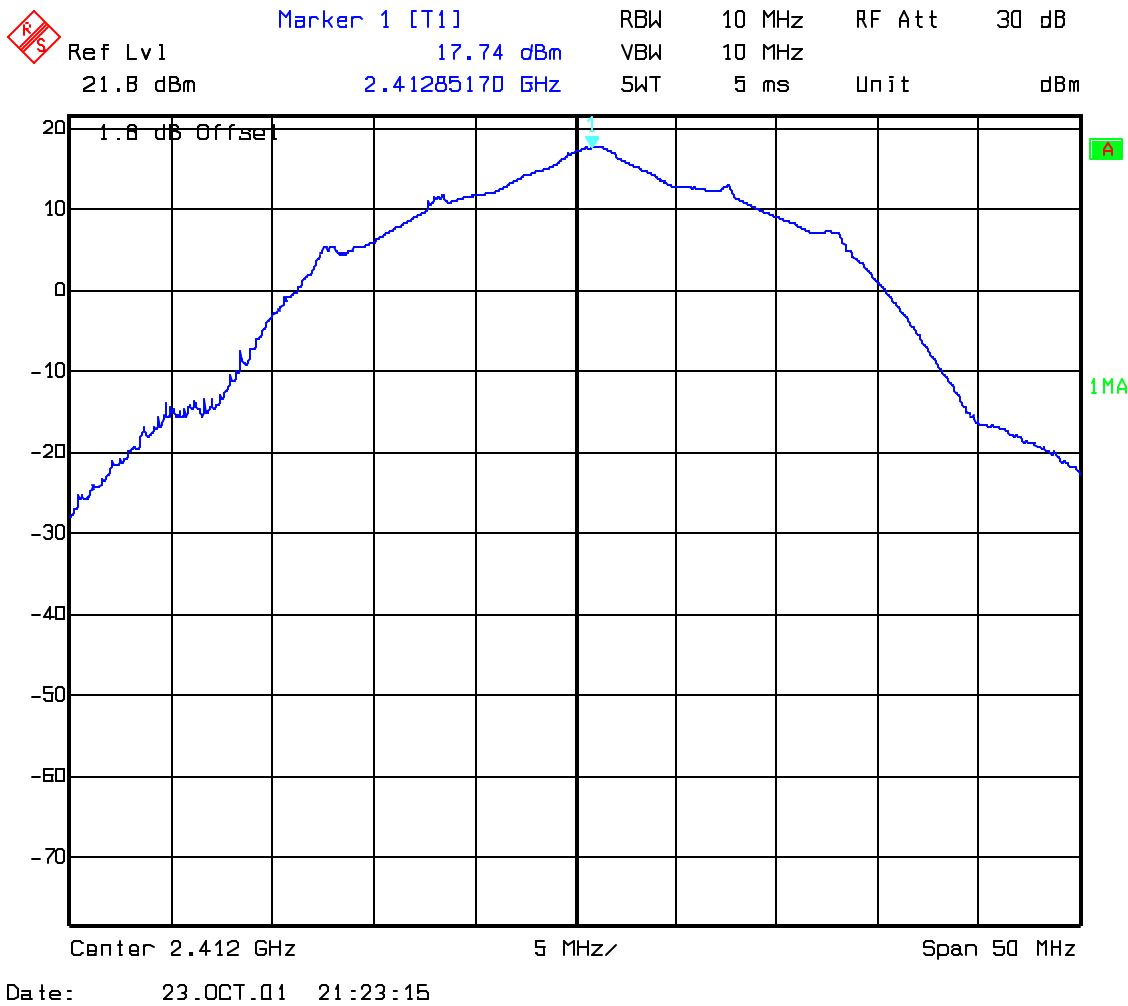
LIMIT
SUBCLAUSE § 15.247 (b) (1)

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)

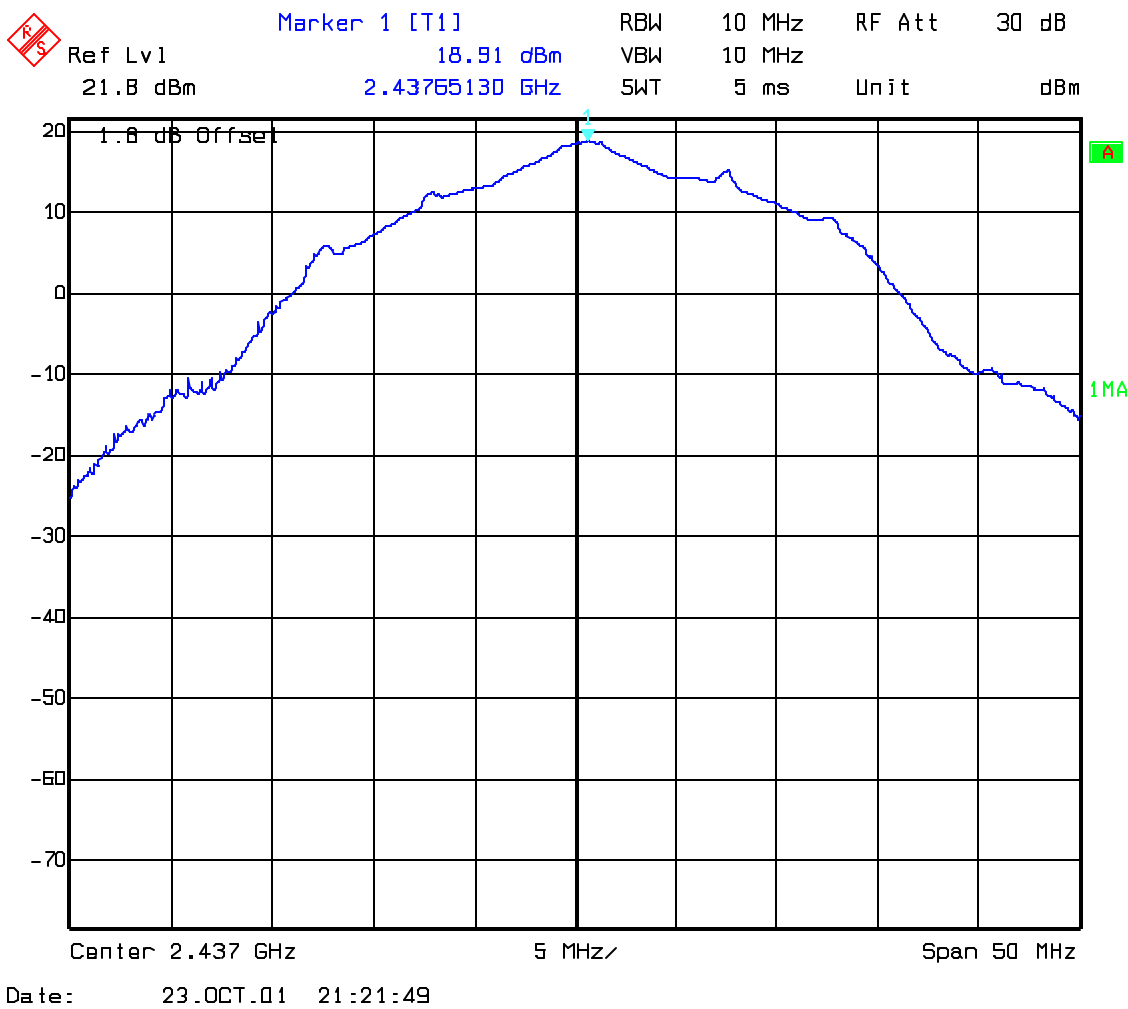
Low Channel: 2412 MHz



MAXIMUM PEAK OUTPUT POWER
(CONDUCTED)

SUBCLAUSE § 15.247 (b) (1)

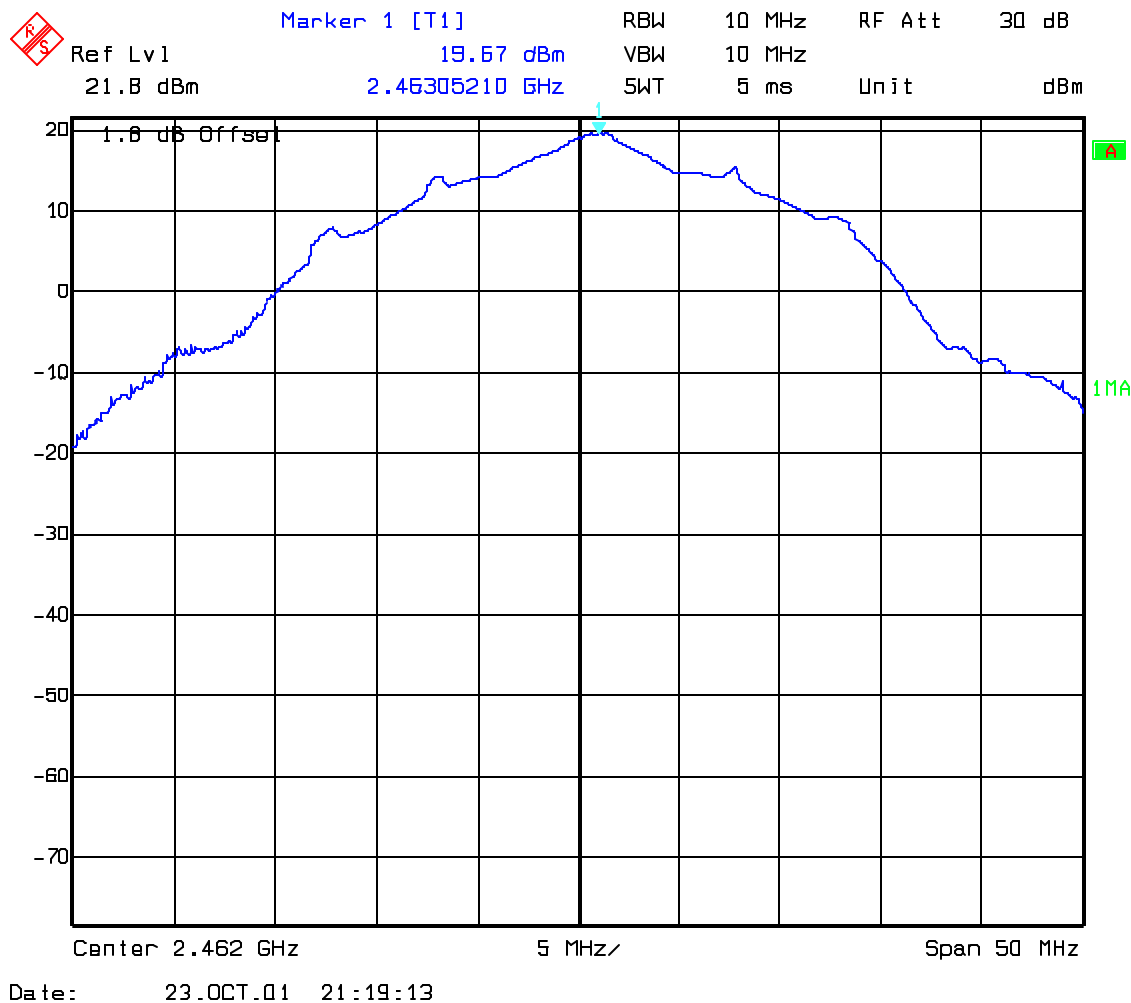
Mid Channel: 2437 MHz



MAXIMUM PEAK OUTPUT POWER
(CONDUCTED)

SUBCLAUSE § 15.247 (b) (1)

High Channel: 2462 MHz



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

SUBCLAUSE § 15.247 (b) (1)

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)		
Frequency (MHz)		2412	2437	2462
T _{nom} (23)°C	V _{nom} (3.3)V	16.69	16.49	16.74
Measurement uncertainty		±3dB		

LIMIT

SUBCLAUSE § 15.247 (b) (1)

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

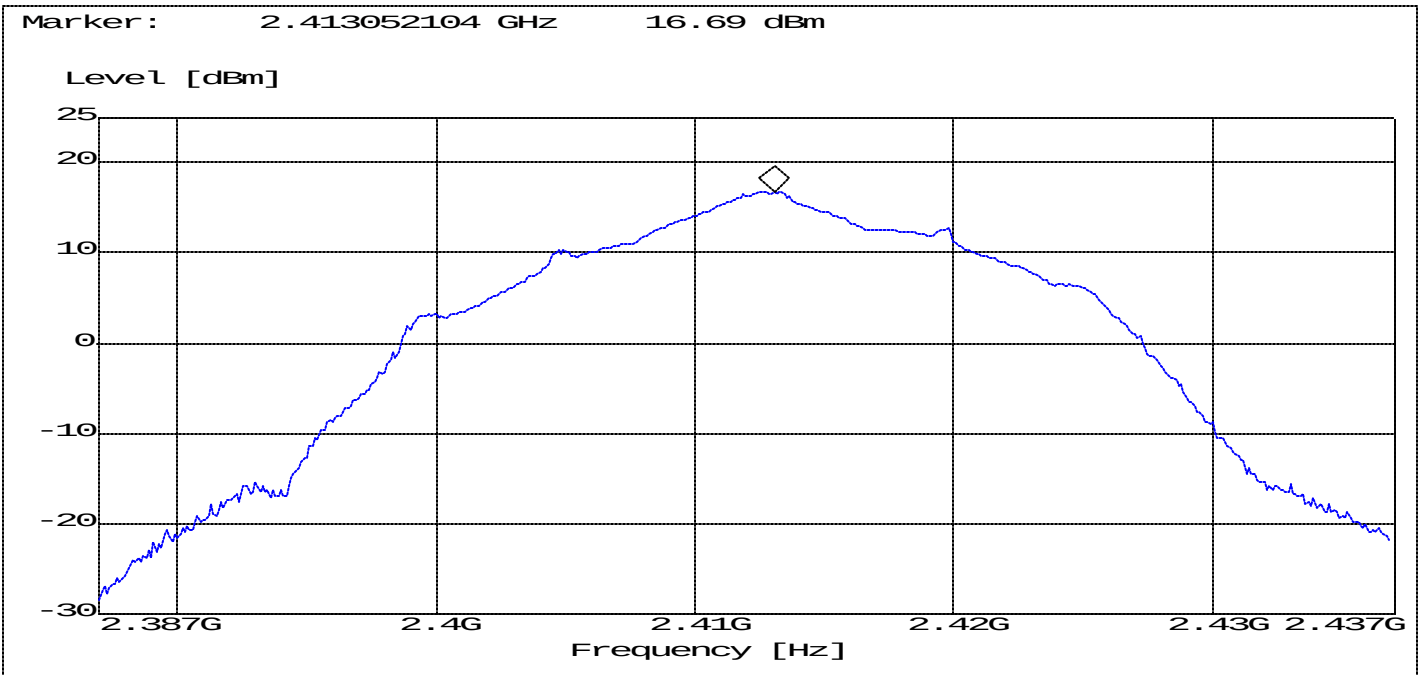
ANALYZER SETTINGS: RBW=10MHz, VBW=10MHz

MAXIMUM PEAK OUTPUT POWER (EIRP)
(RADIATED)

SUBCLAUSE § 15.247 (b) (1)

Low Channel: 2412 MHz

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

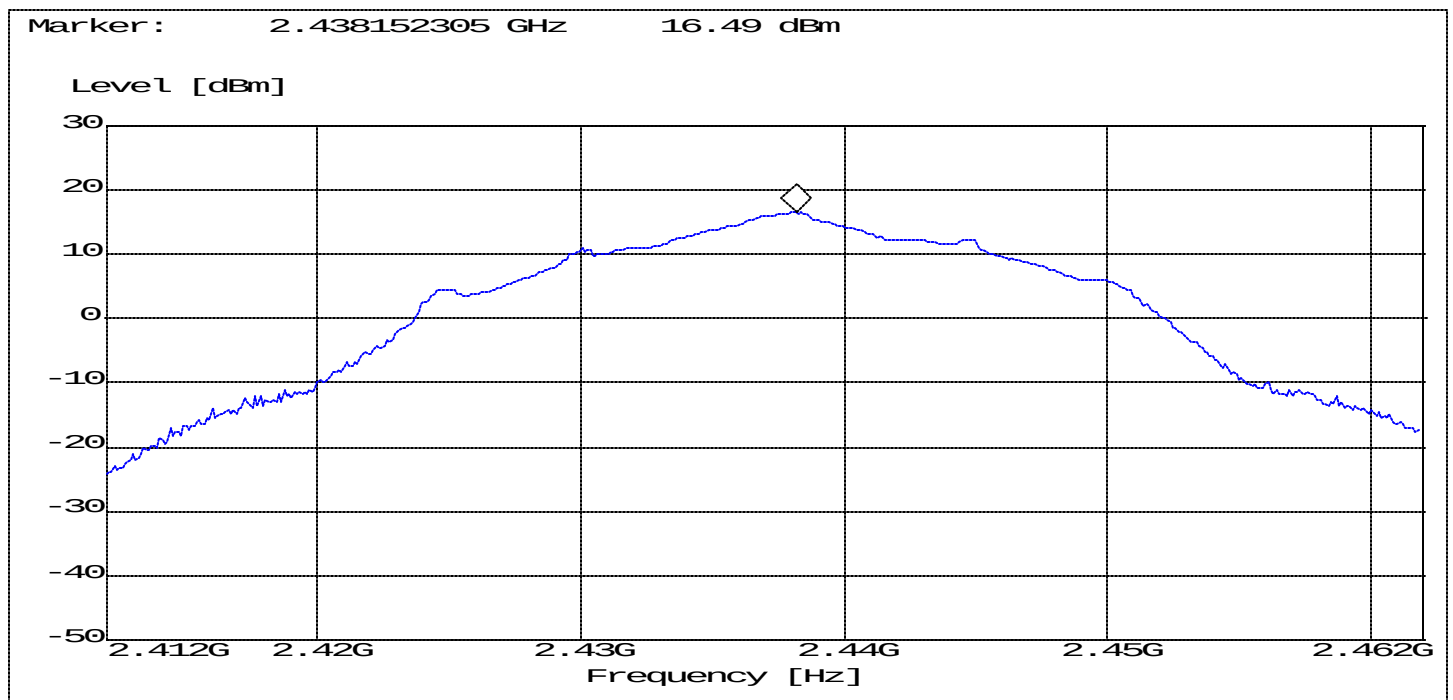


**MAXIMUM PEAK OUTPUT POWER (EIRP)
(RADIATED)**

SUBCLAUSE § 15.247 (b) (1)

Mid Channel: 2437 MHz

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

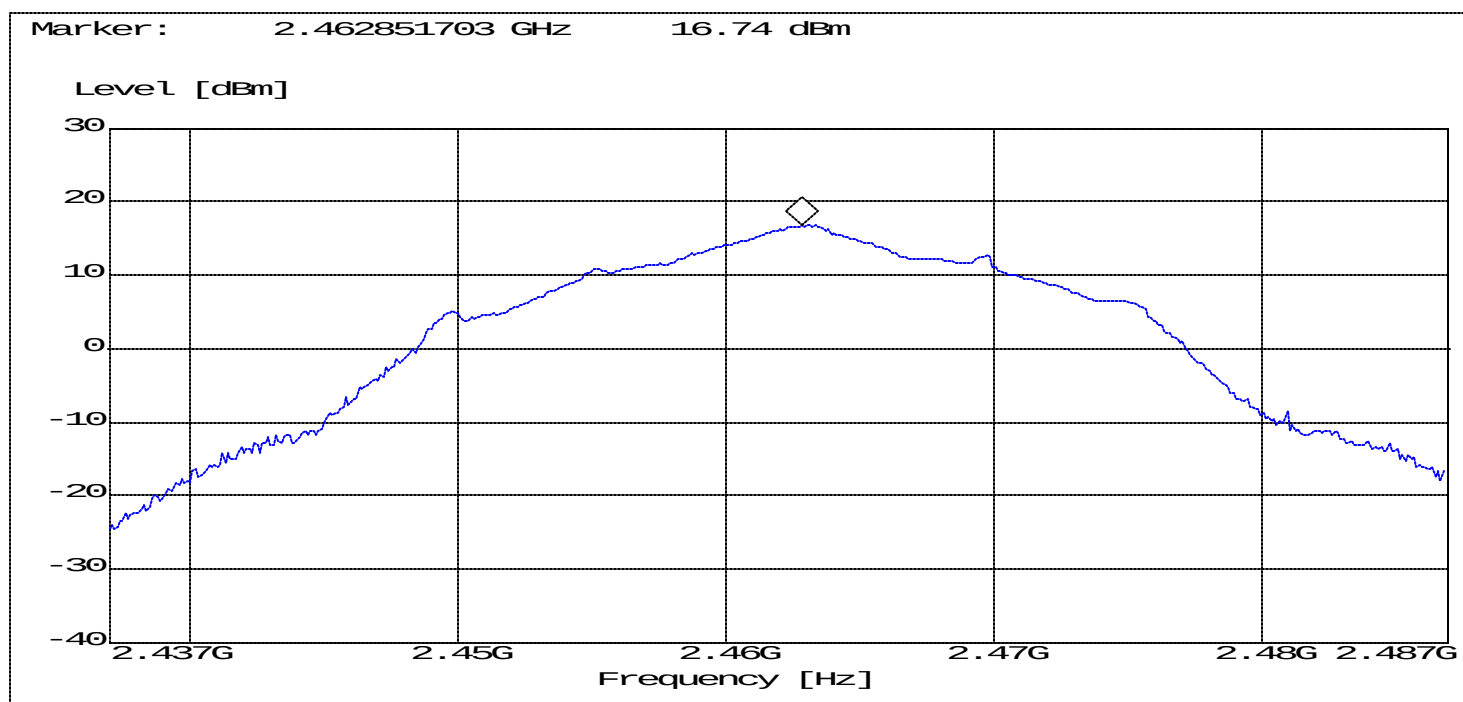


MAXIMUM PEAK OUTPUT POWER (EIRP)
(RADIATED)

SUBCLAUSE § 15.247 (b) (1)

High Channel: 2462 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)).

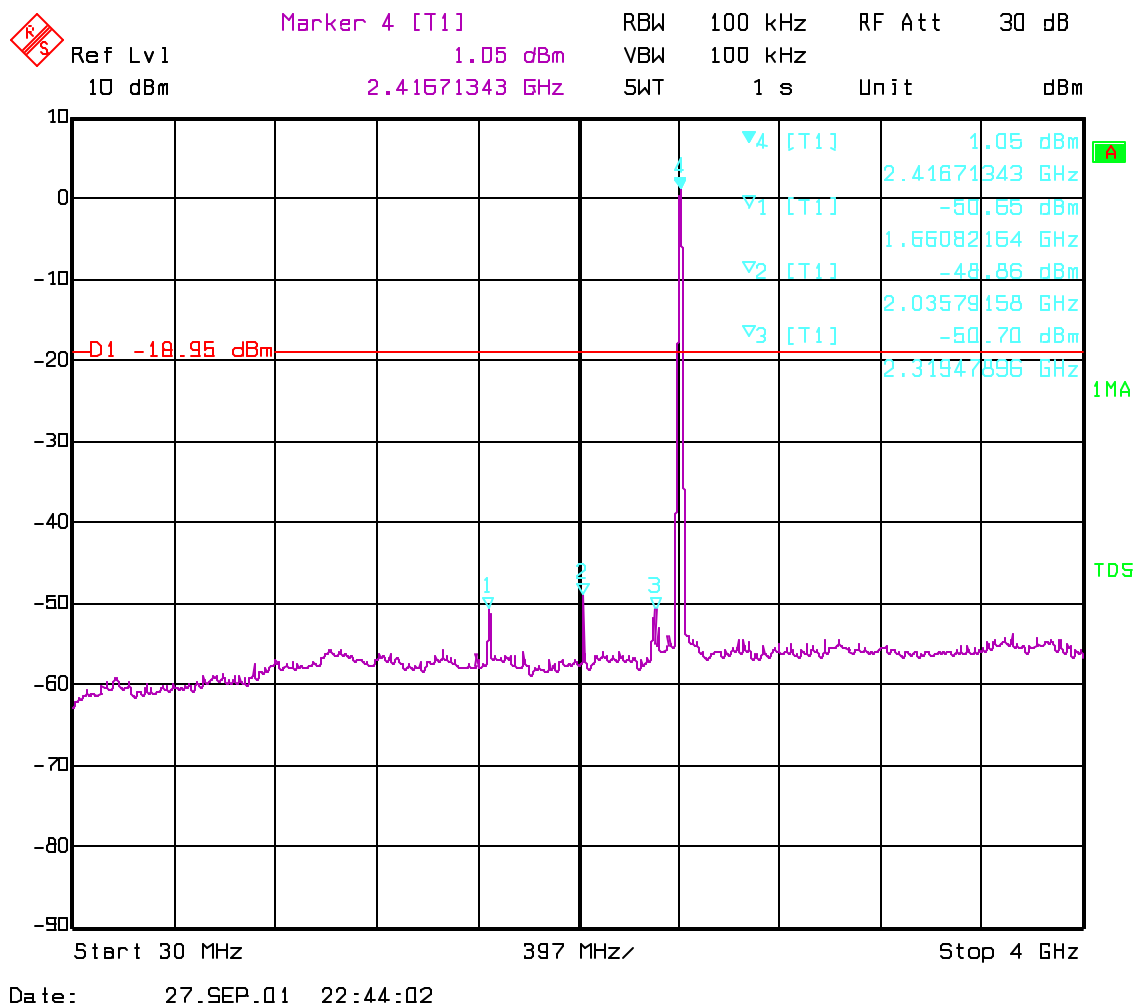
NOTE: Frequency resolution is not fine enough to show the exact frequency of the carrier, refer to plots under EIRP.

EMISSION LIMITATIONS (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Conducted

Low Channel (2412 MHz): 30MHz – 4GHz

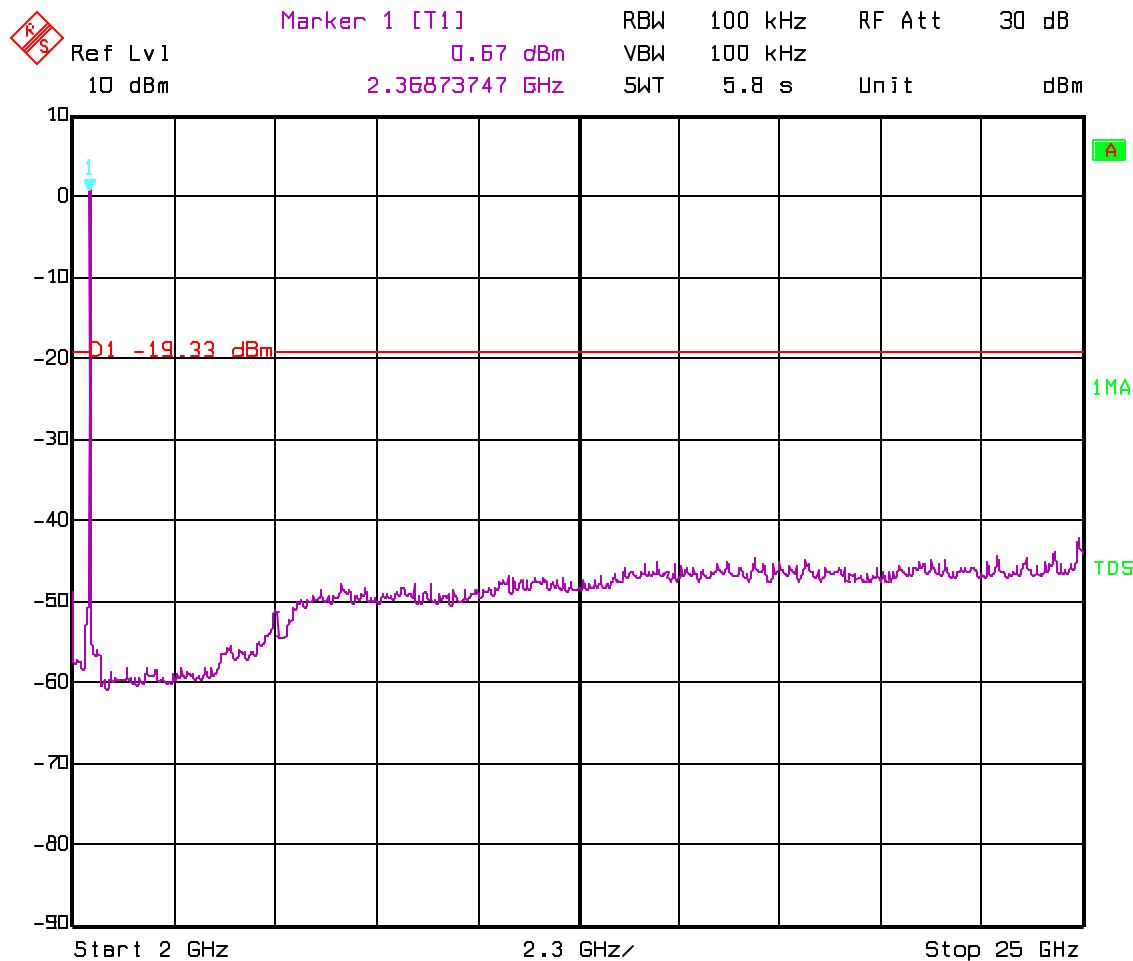


NOTE: The peak above the limit line is the carrier frequency.

EMISSION LIMITATIONS (Transmitter)
conducted

SUBCLAUSE § 15.247 (c) (1)

Low Channel (2412 MHz): 2GHz – 25GHz



Date: 27.SEP.01 23:05:16

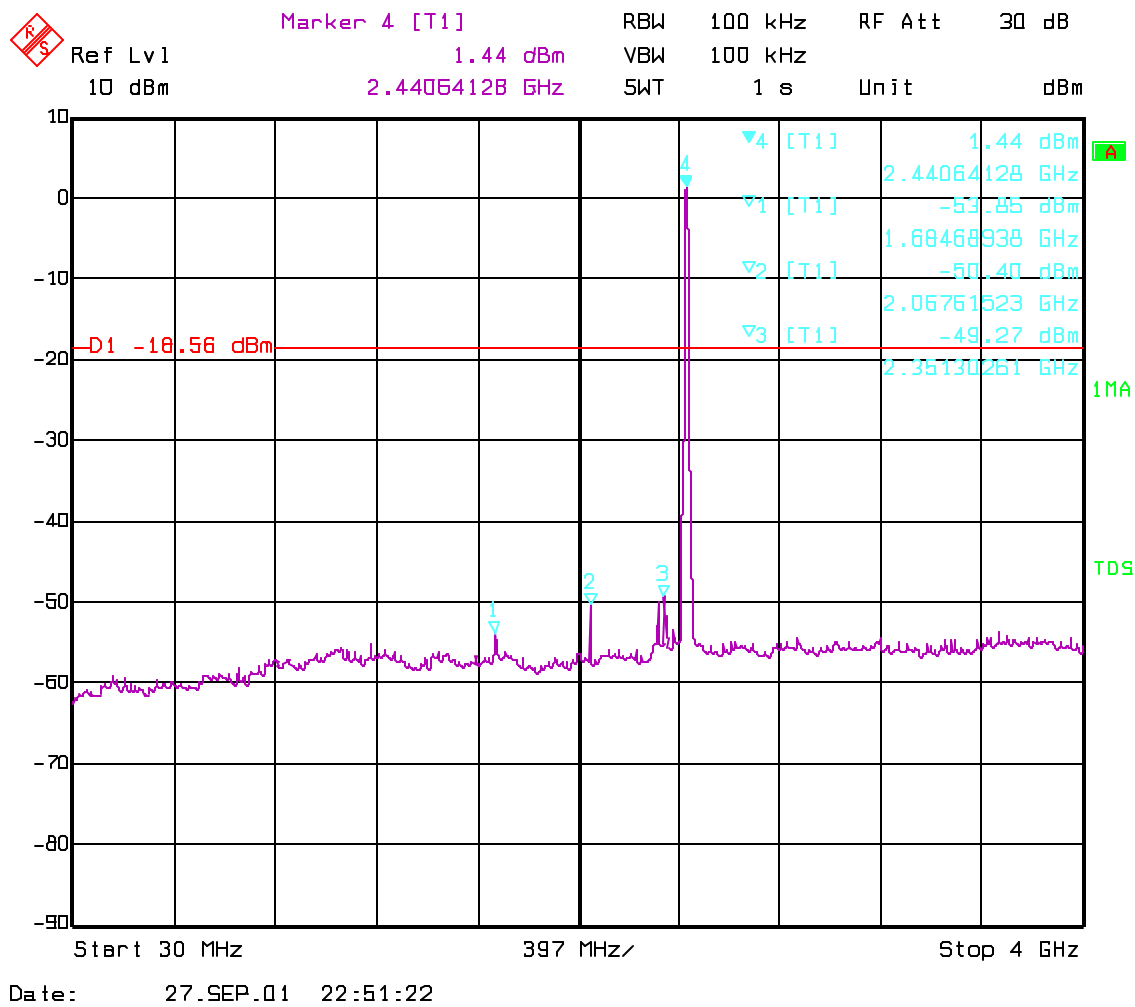
NOTE: The peak above the limit line is the carrier frequency.

EMISSION LIMITATIONS (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

conducted

Mid Channel (2437 MHz): 30MHz – 4GHz



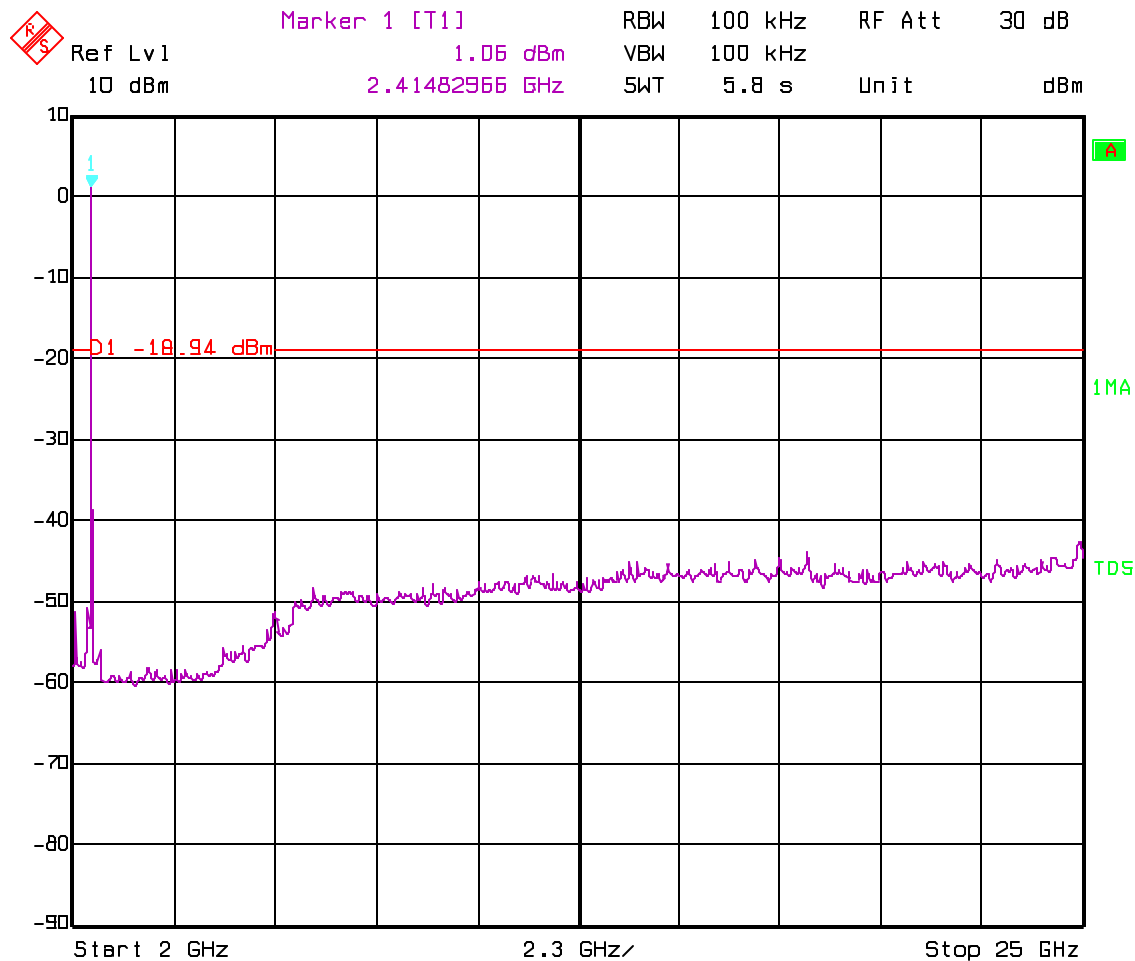
NOTE: The peak above the limit line is the carrier frequency.

EMISSION LIMITATIONS (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Conducted

Mid Channel (2437 MHz): 2GHz – 25GHz



Date: 27.SEP.01 23:02:14

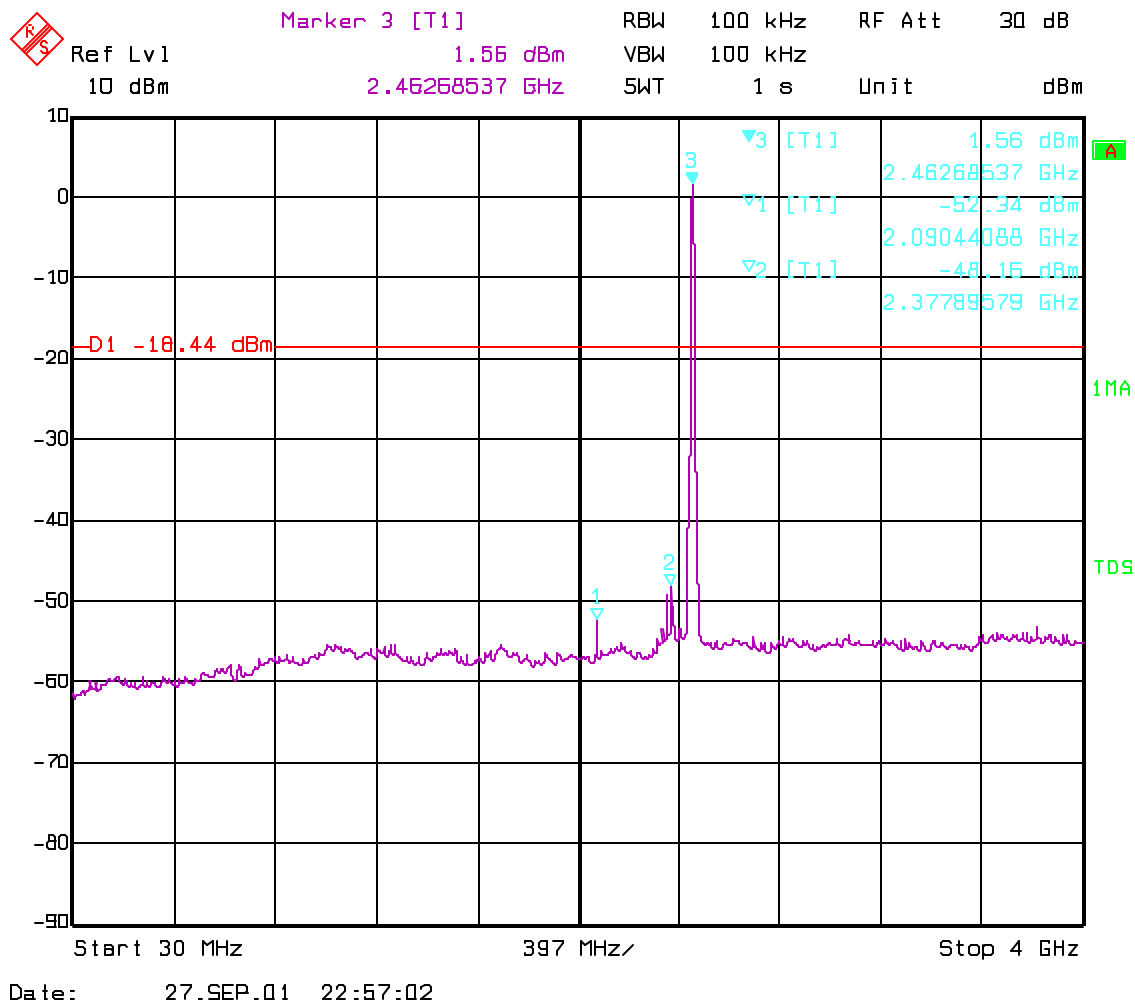
NOTE: The peak above the limit line is the carrier frequency.

EMISSION LIMITATIONS (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

conducted

High Channel (2462 MHz): 30MHz – 4GHz



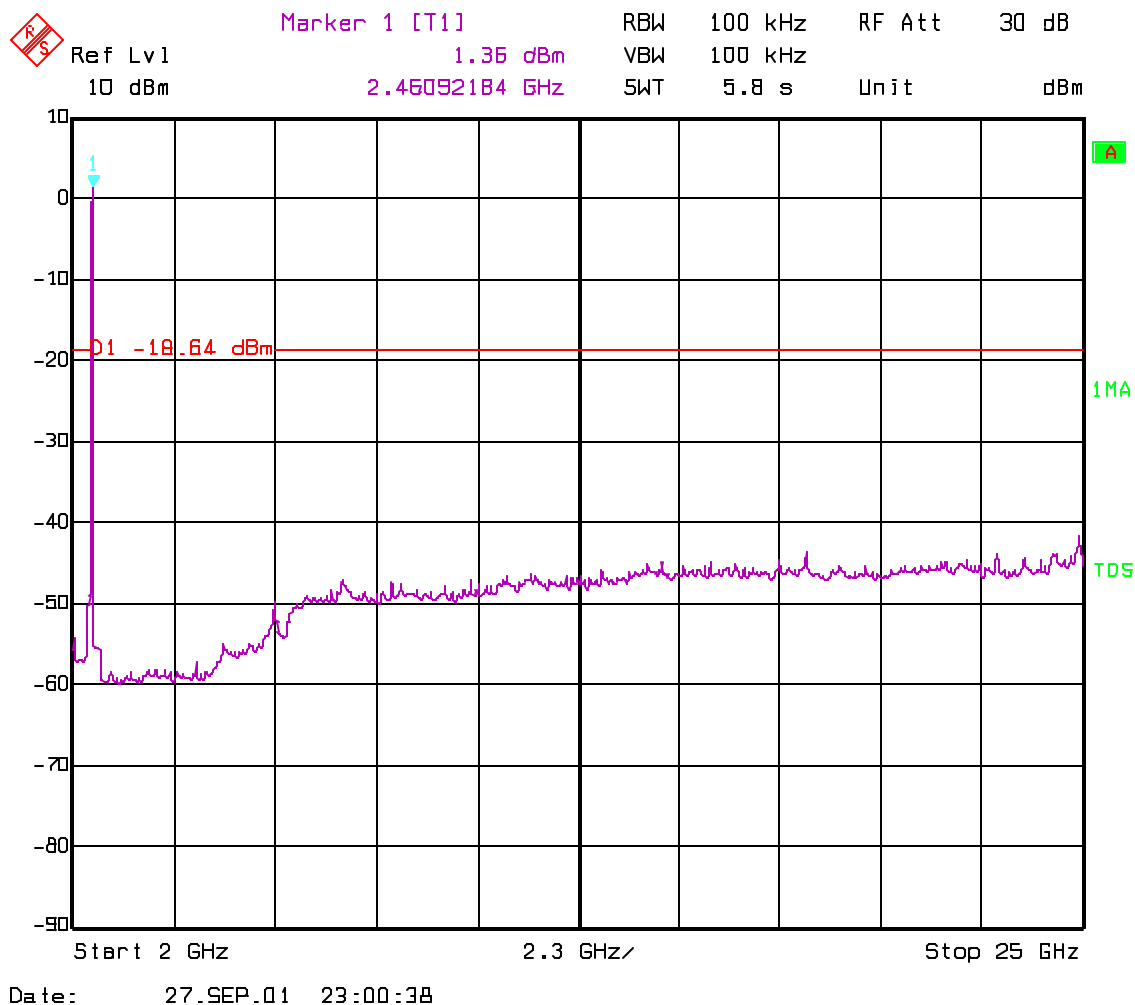
NOTE: The peak above the limit line is the carrier frequency.

EMISSION LIMITATIONS (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Conducted

High Channel (2462 MHz): 2GHz – 25GHz



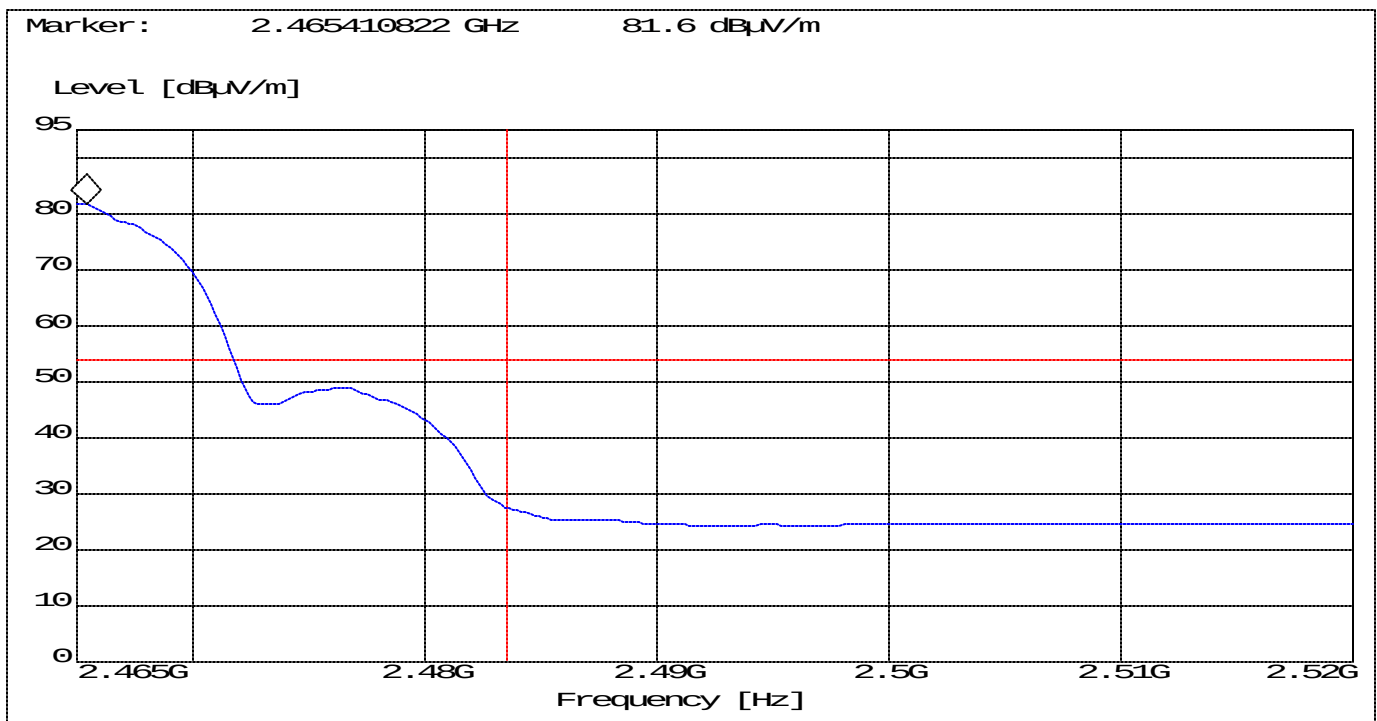
NOTE: The peak above the limit line is the carrier frequency.

EMISSION LIMITATIONS (Transmitter)

SUBCLAUSE § 15.247 (c) (2)

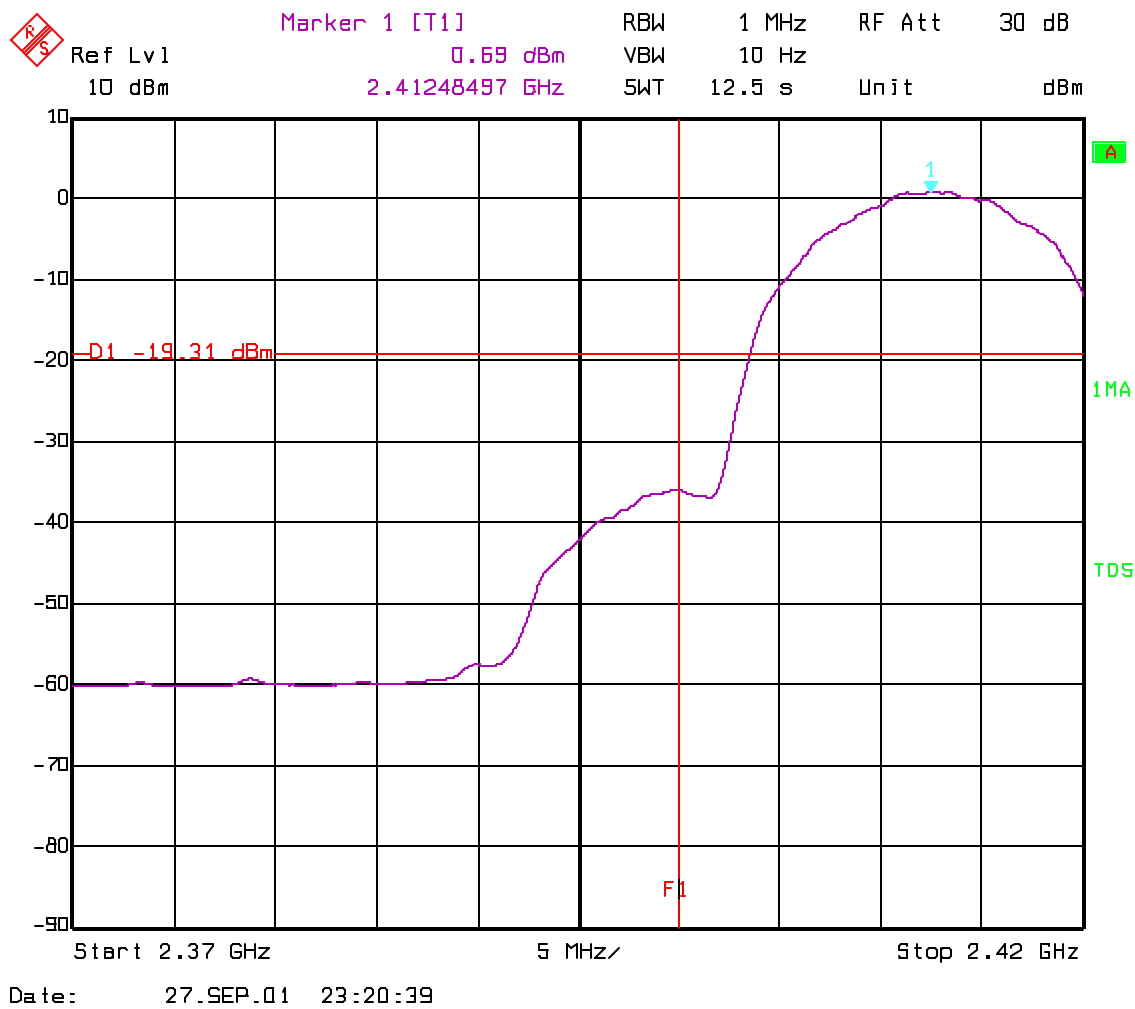
spurious in the restricted band 2483.5 – 2500 MHz

Higher Band Edge



ANALYZER SETTINGS: RBW=1MHz VBW=10Hz

Lower Band Edge



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

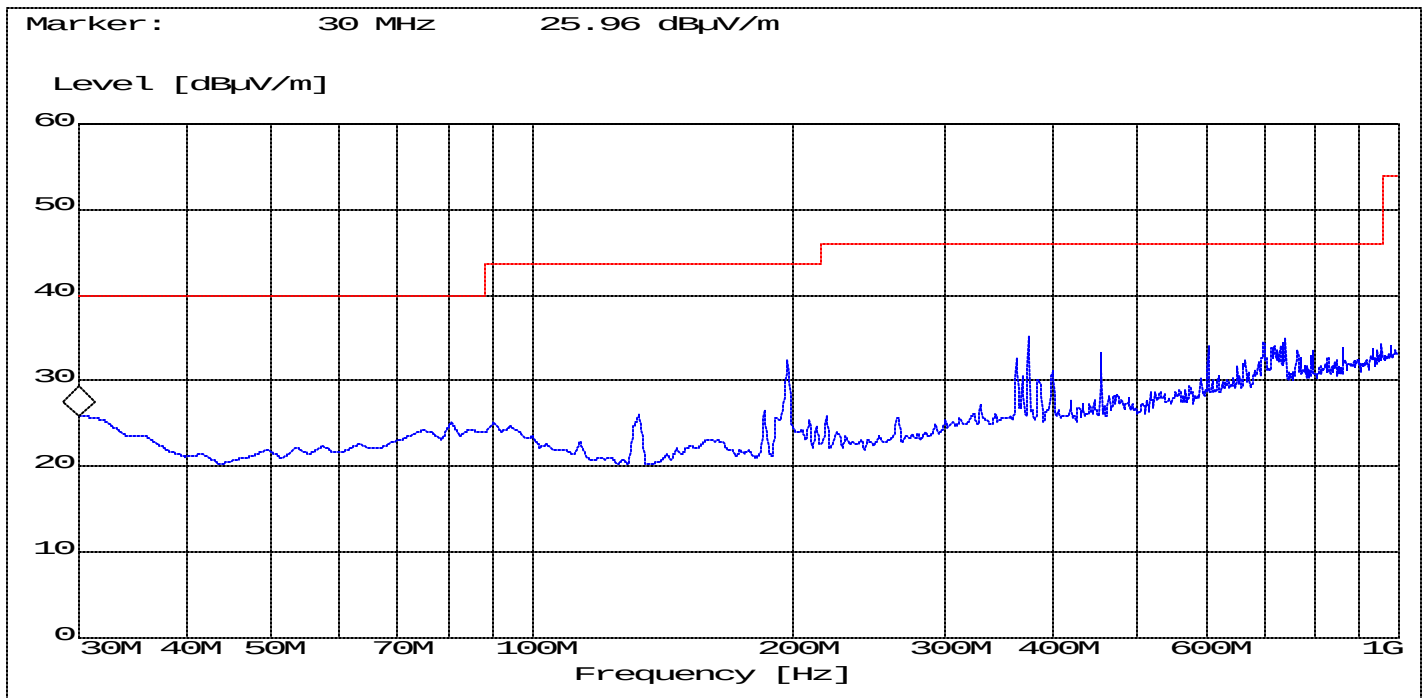
Results for the radiated measurements below 30MHz according § 15.33

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

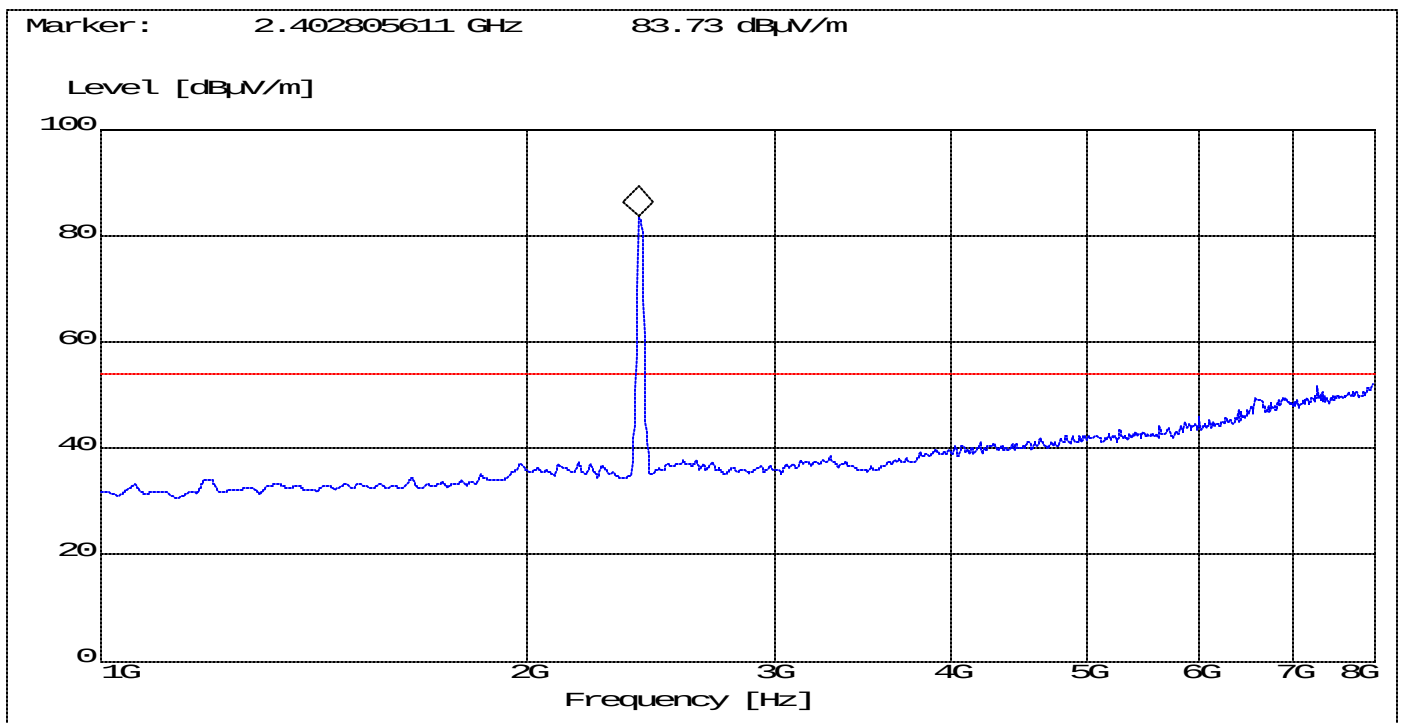
$f \geq 1 \text{ GHz}$: RBW/VBW: 1 MHz

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

Radiated

Low Channel(2412MHz): 1GHz-8GHz

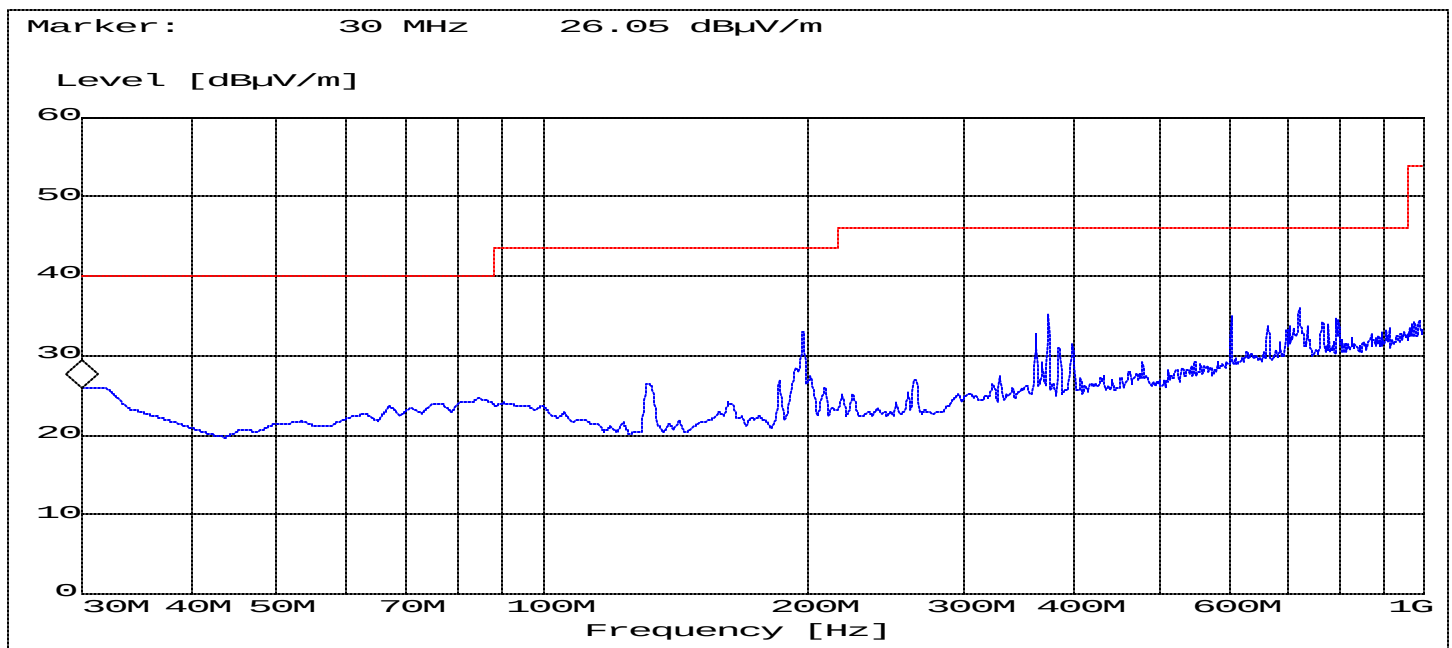
NOTE: The peak above the limit line is the carrier frequency.



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

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

Mid Channel(2437MHz): 30MHz-1GHz



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

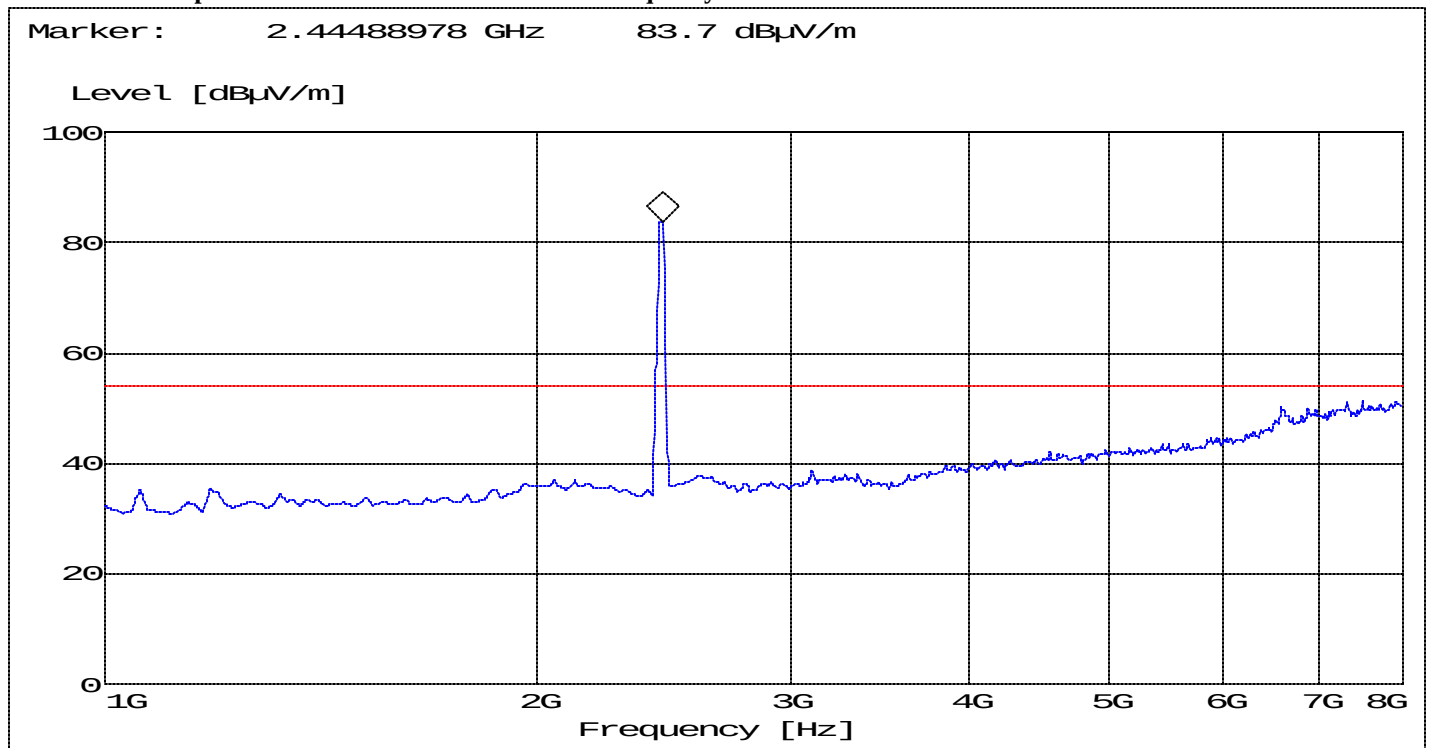
f ≥ 1GHz : RBW/VBW: 1 MHz

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

Radiated

Mid Channel(2437MHz): 1GHz-8GHz

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

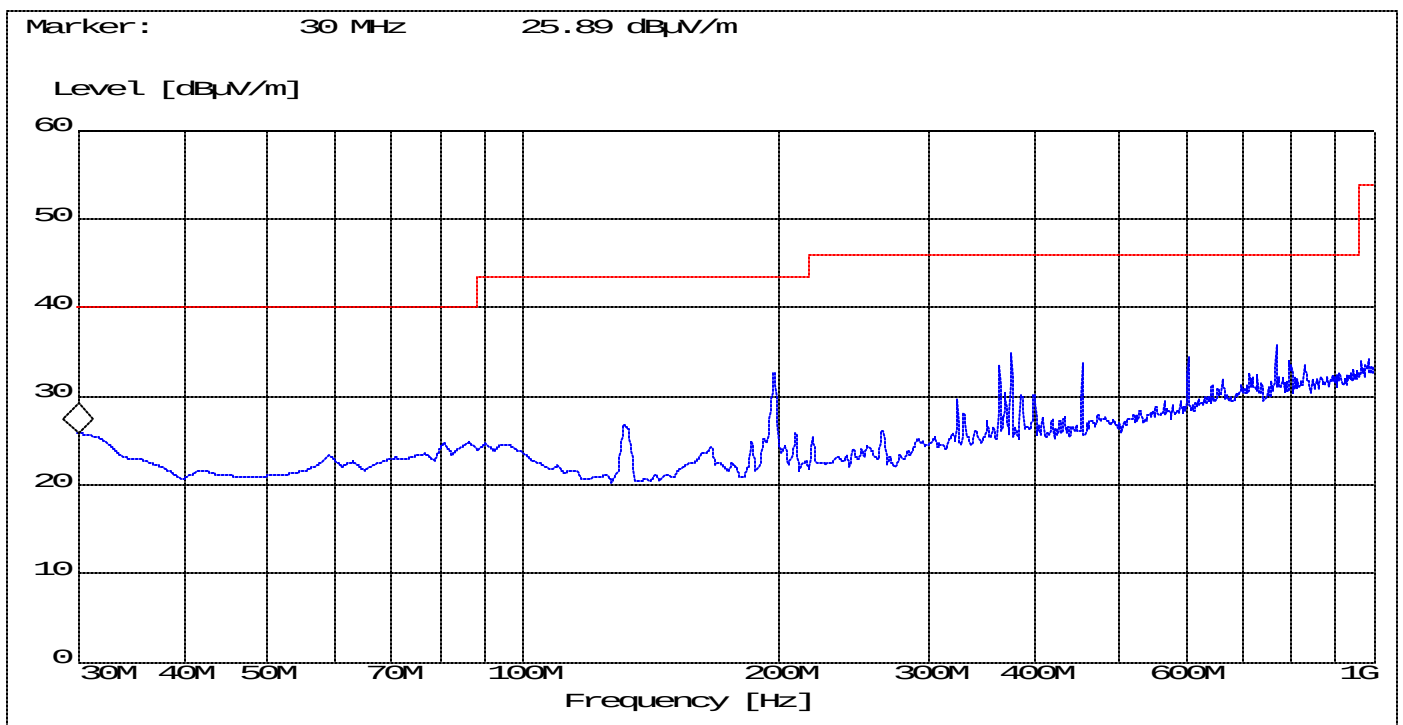


ANALYZER SETTINGS: f < 1 GHz : RBW/VBW: 100 kHz

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

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

Hihg Channel(2462MHz): 30MHz-1GHz



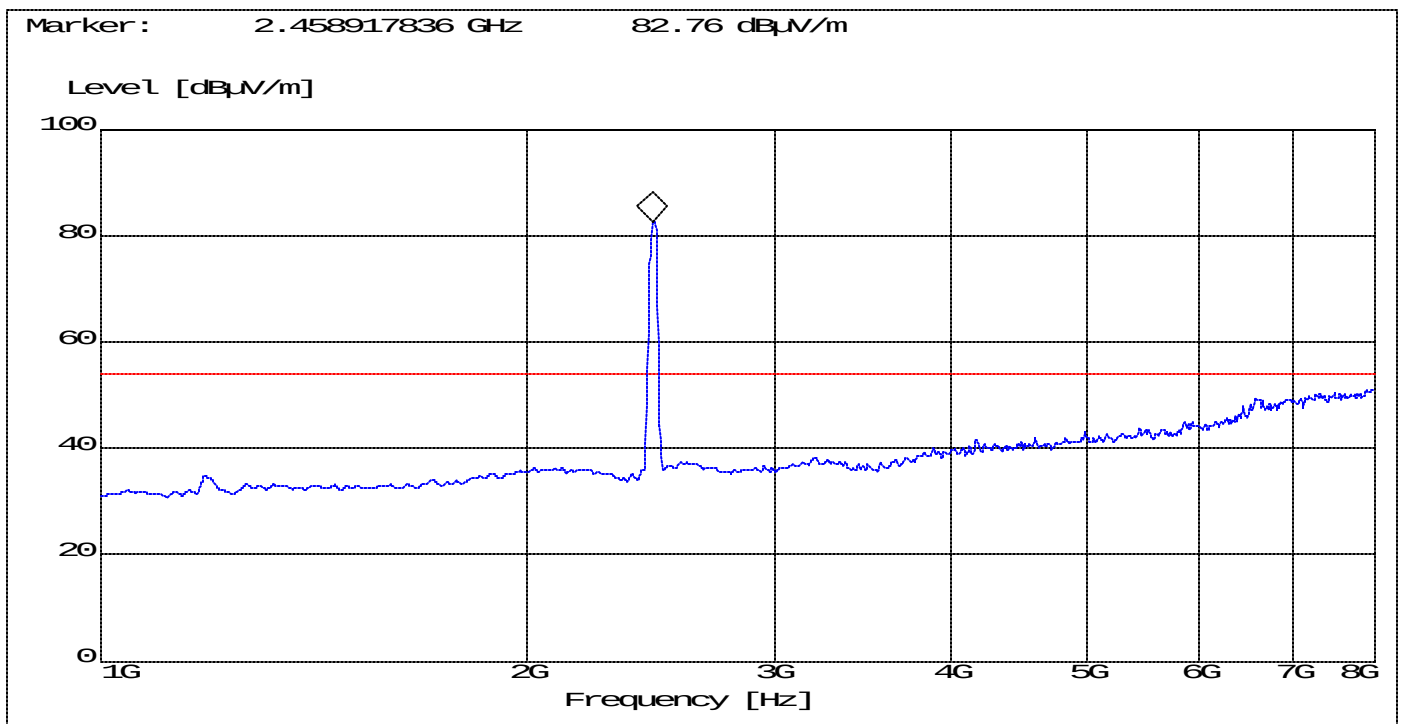
ANALYZER SETTINGS: f < 1 GHz : RBW/VBW: 100 kHz

f ³ 1GHz : RBW/VBW: 1 MHz

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

High Channel(2462MHz): 1GHz-8GHz

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

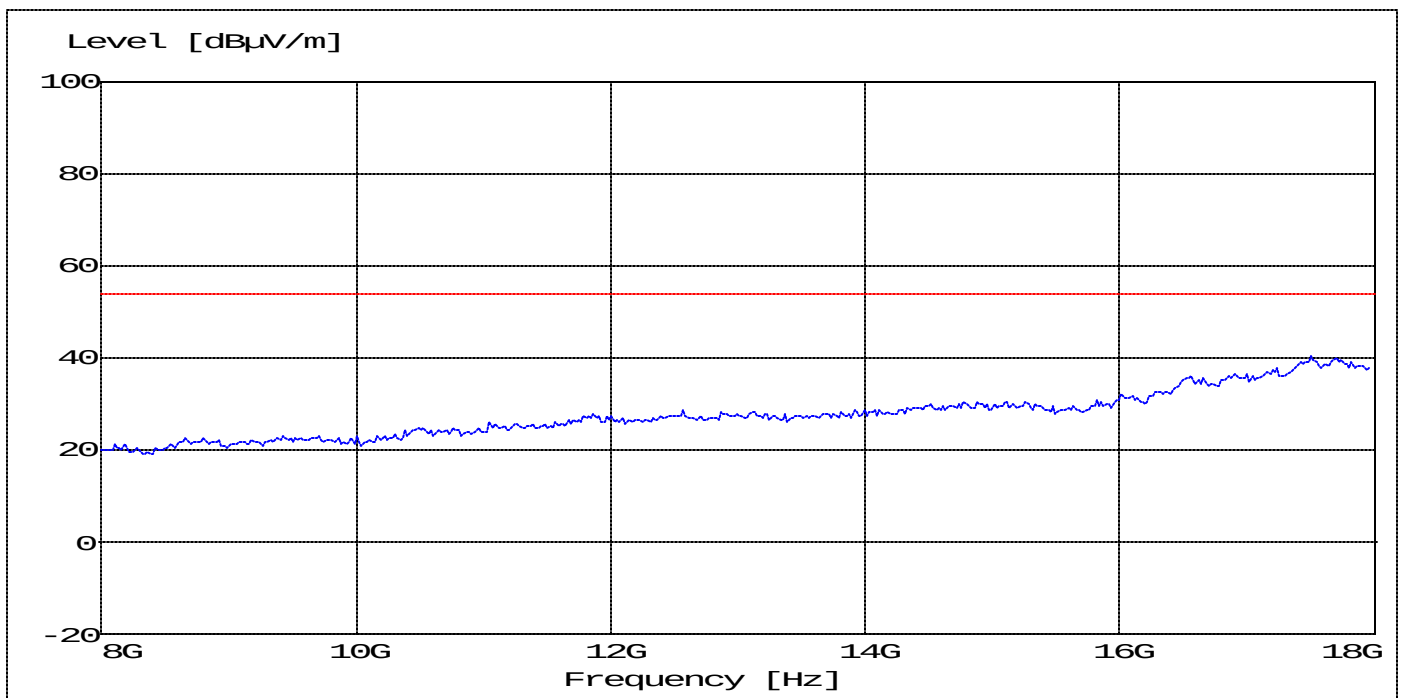


ANALYZER SETTINGS: f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW/VBW: 1 MHz

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

8GHz-18GHz

(This plot is valid for all three channels)



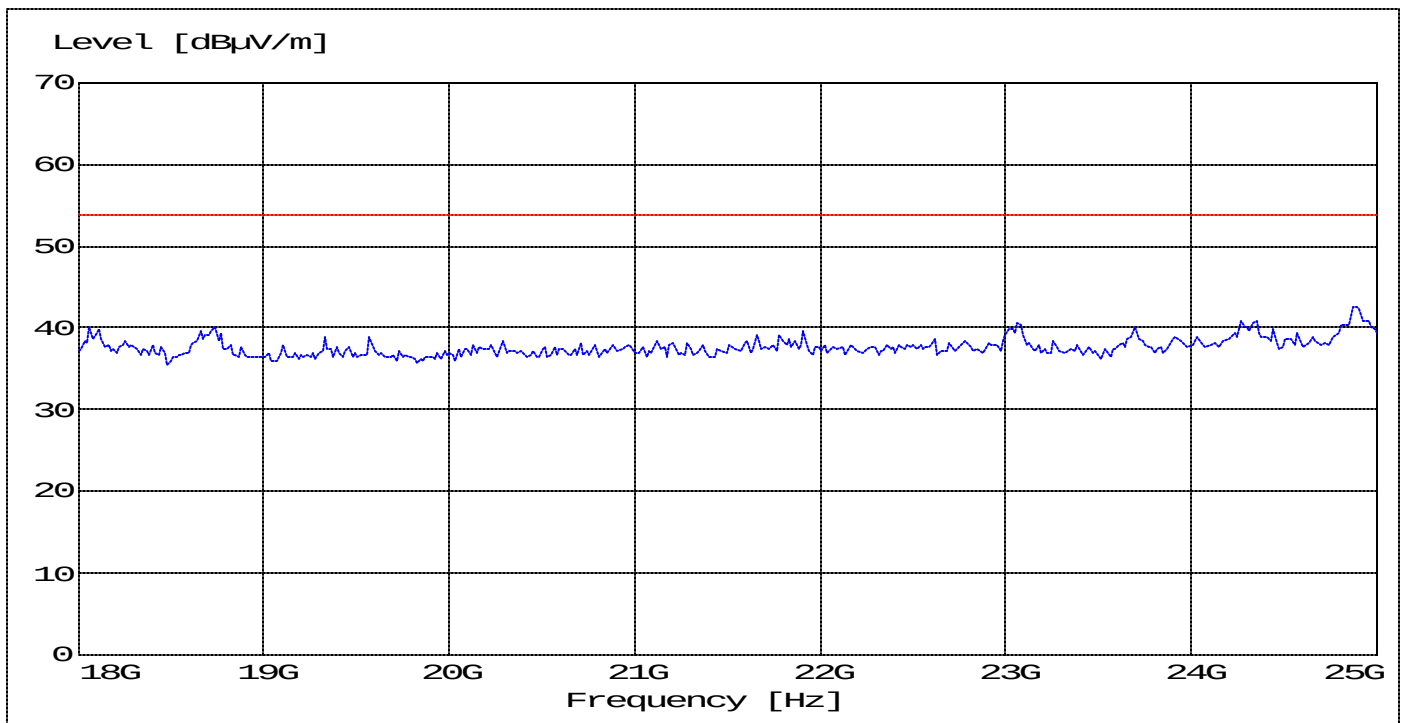
ANALYZER SETTINGS: f < 1 GHz : RBW/VBW: 100 kHz

f ≥ 1GHz : RBW/VBW: 1 MHz

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

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

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

TEST CONDITIONS		RF POWER LEVEL IN 3 kHz BW		
Frequency (MHz)		2412	2437	2462
T _{nom} (23)°C	V _{nom} (3.3)V	-12.95 dBm	-12.35dBm	-12.28 dBm
Measurement uncertainty		±3dB		

LIMIT**SUBCLAUSE §15.247(d)**

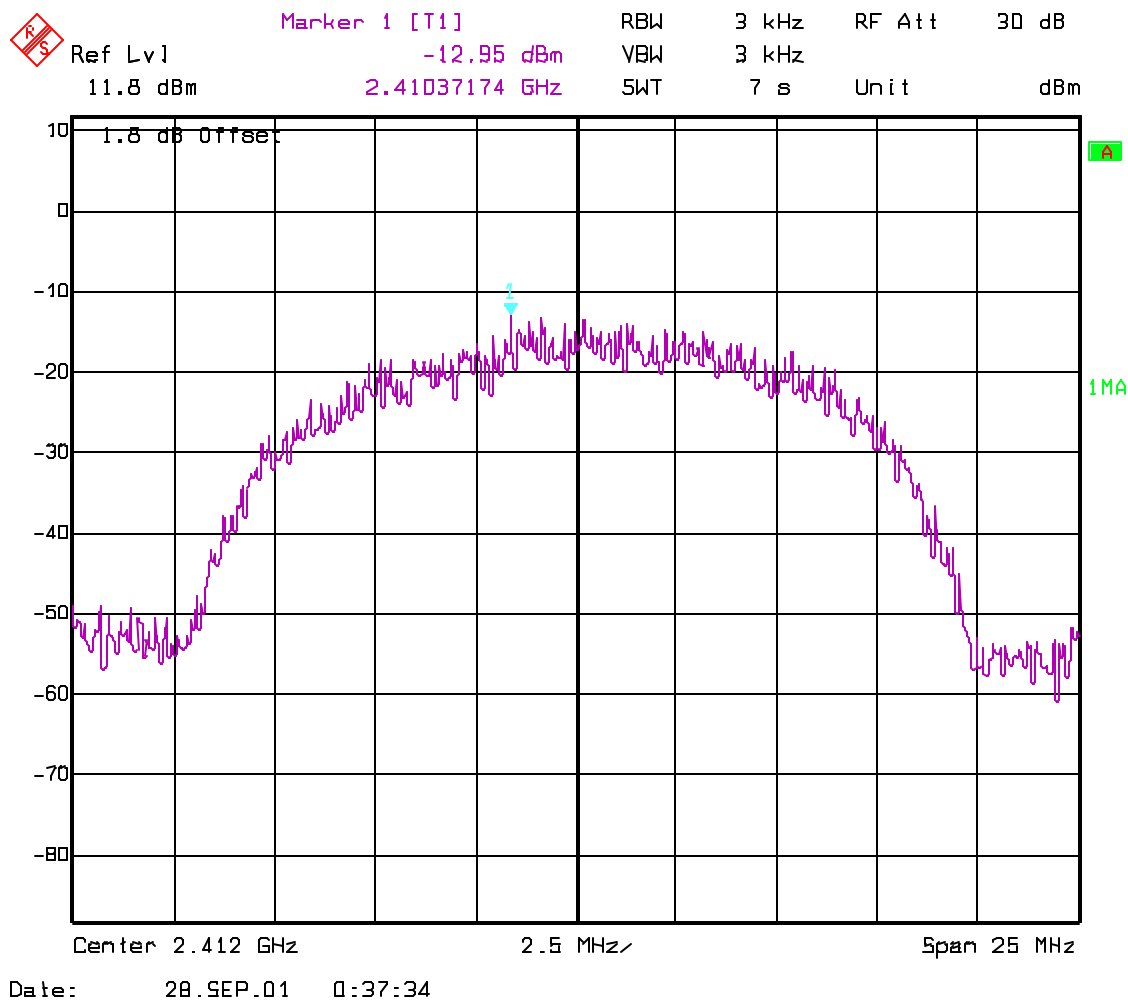
The peak power spectral density shall not be greater than 8 dBm in any 3 kHz band
--

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

POWER SPECTRAL DENSITY

SUBCLAUSE § 15.247 (d)

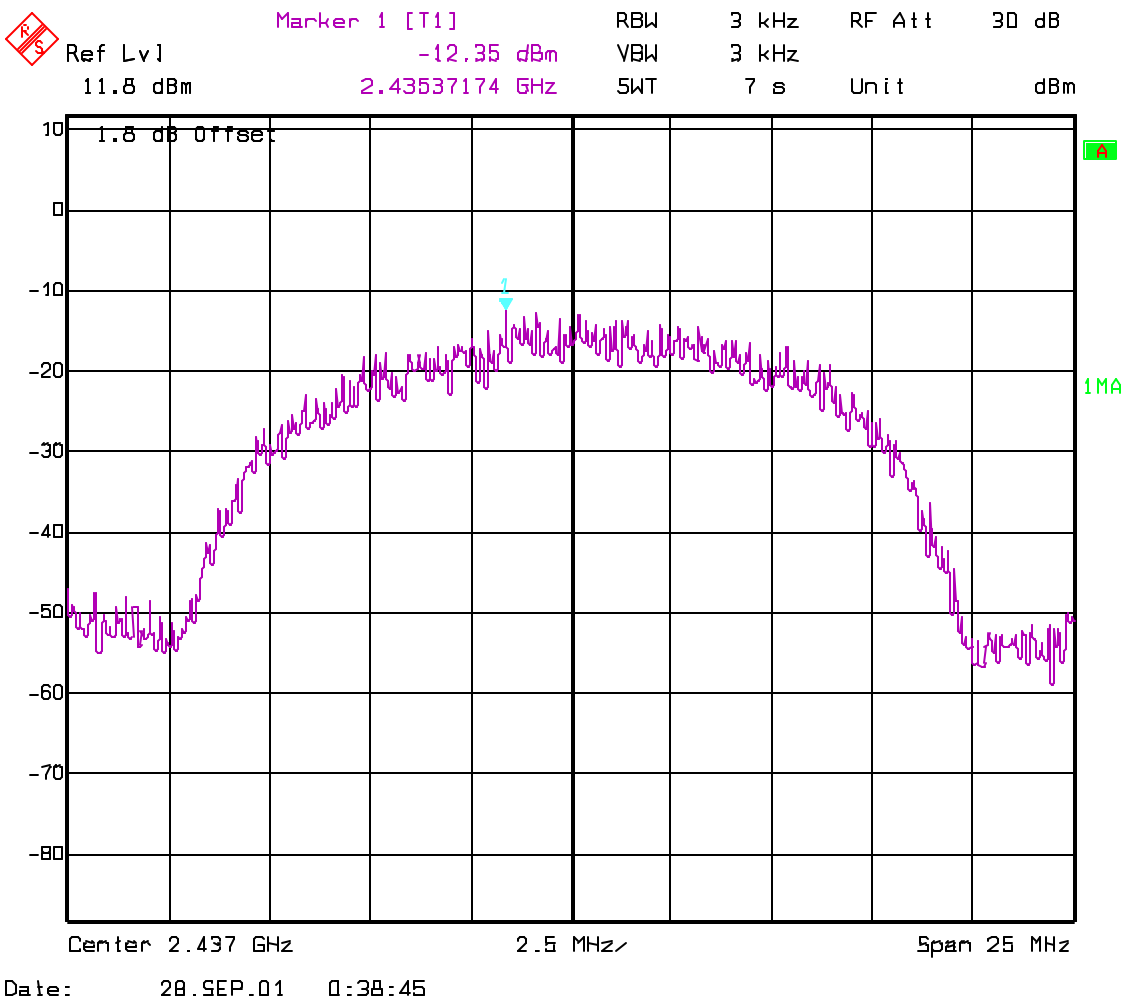
Low Channel: 2412 MHz



POWER SPECTRAL DENSITY

SUBCLAUSE § 15.247 (d)

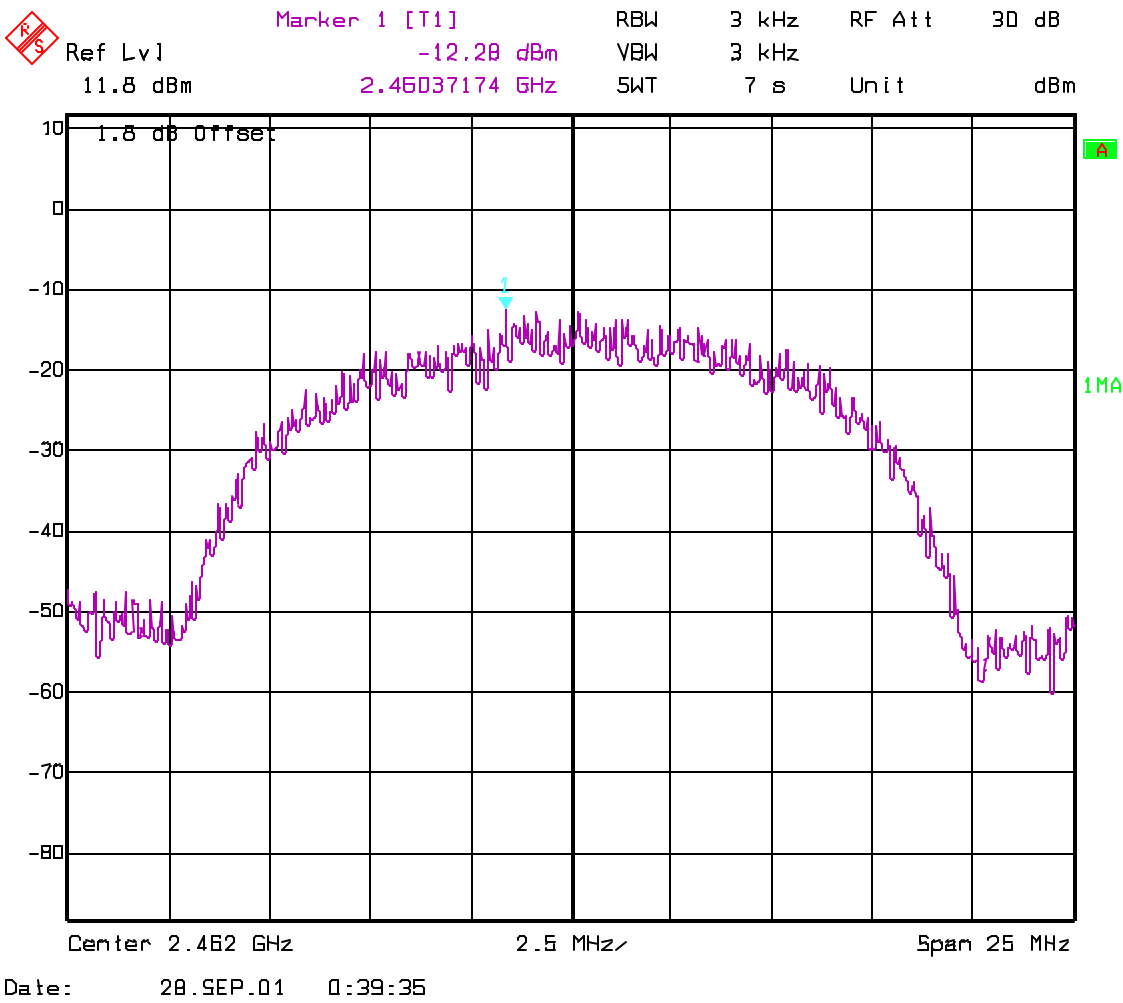
Mid Channel: 2437 MHz



POWER SPECTRAL DENSITY

SUBCLAUSE § 15.247 (d)

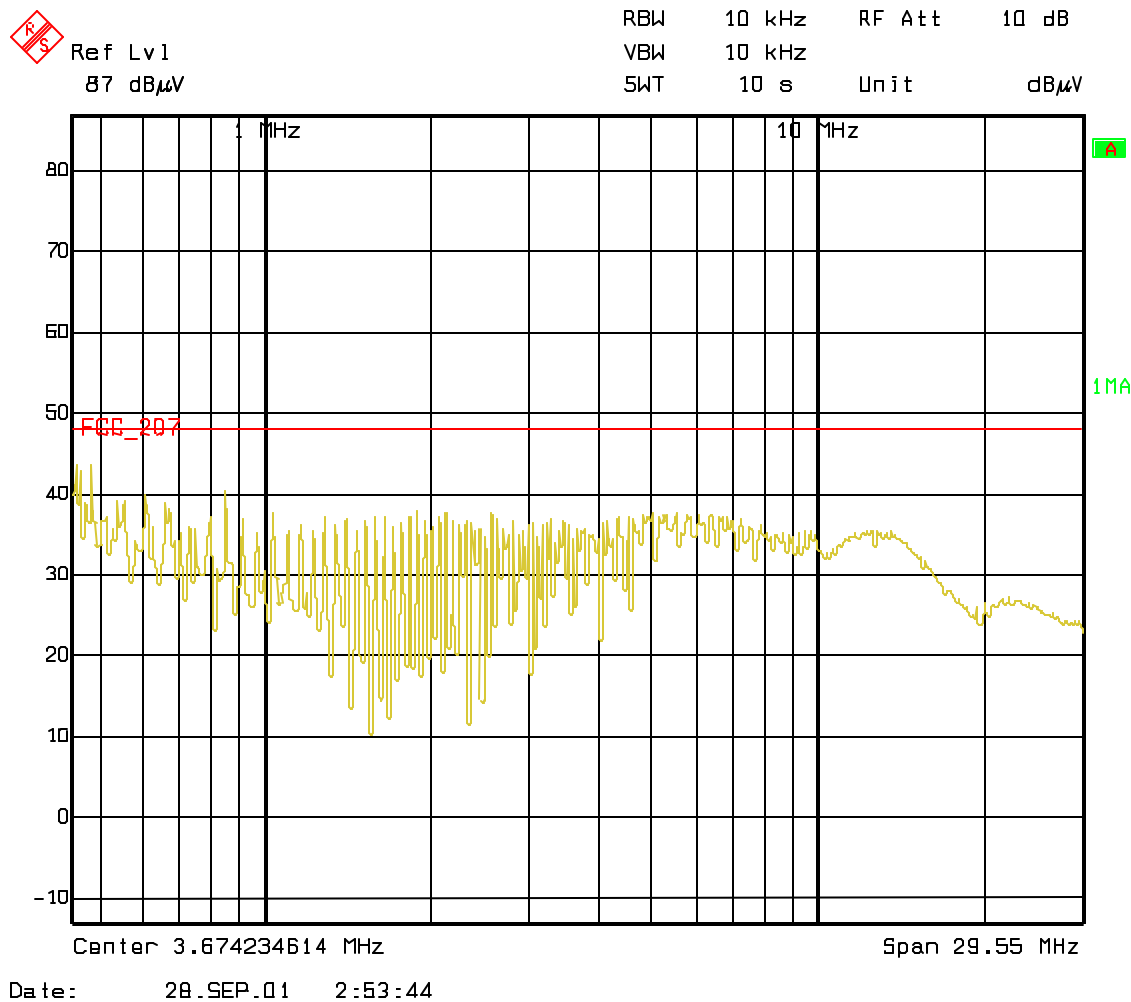
High Channel: 2462 MHz



CONDUCTED EMISSIONS § 15.107/207

Measured with AC/DC power adapter plugged in LISN

Phase: Line

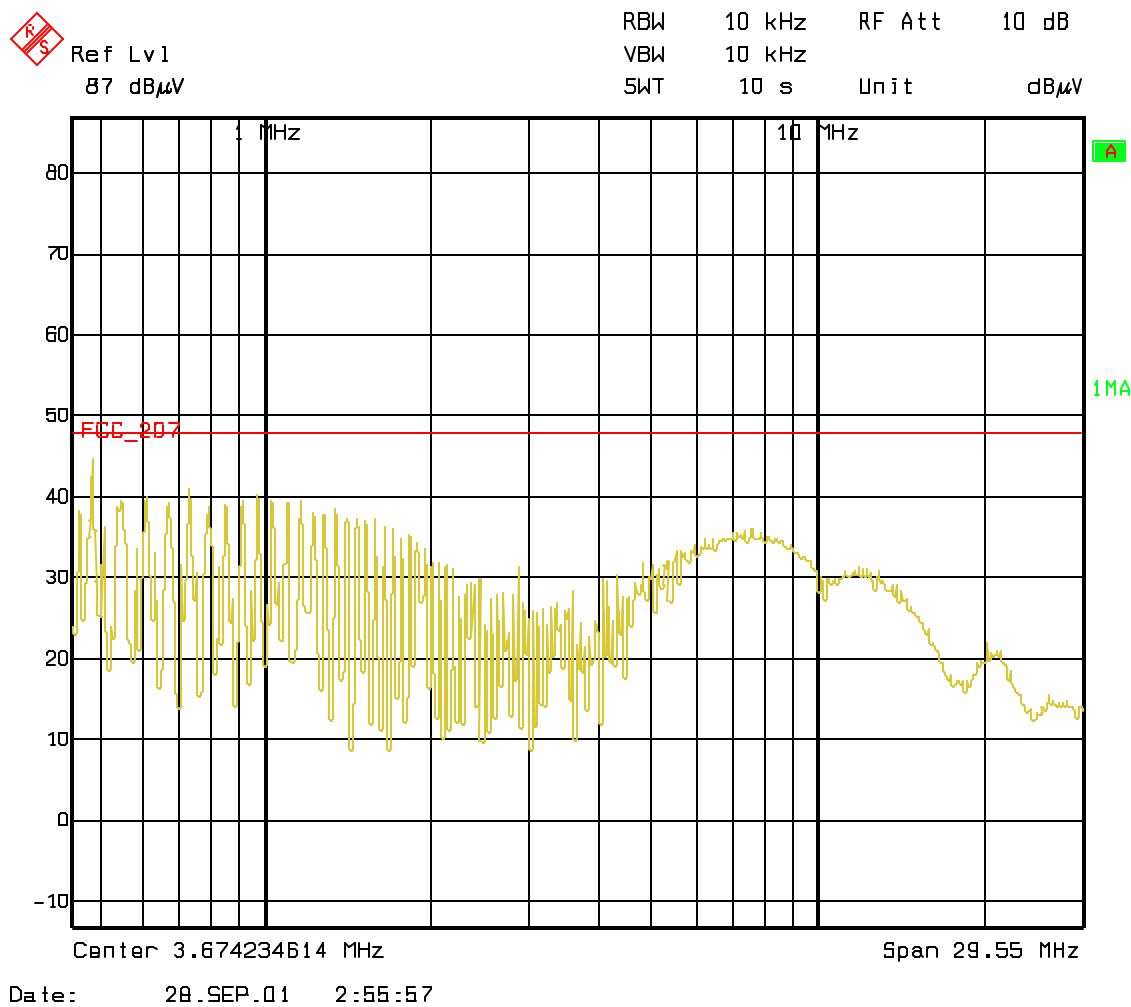


Technical specification : 15.107 / 15.207 (Revised as of October 1, 1991)

Limit

0.45 to 30 MHz	250 μV / 47.96 dBμV
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Phase: Neutral



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

0.45 to 30 MHz	250 μV / 47.96 dBμV
----------------	---------------------

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:

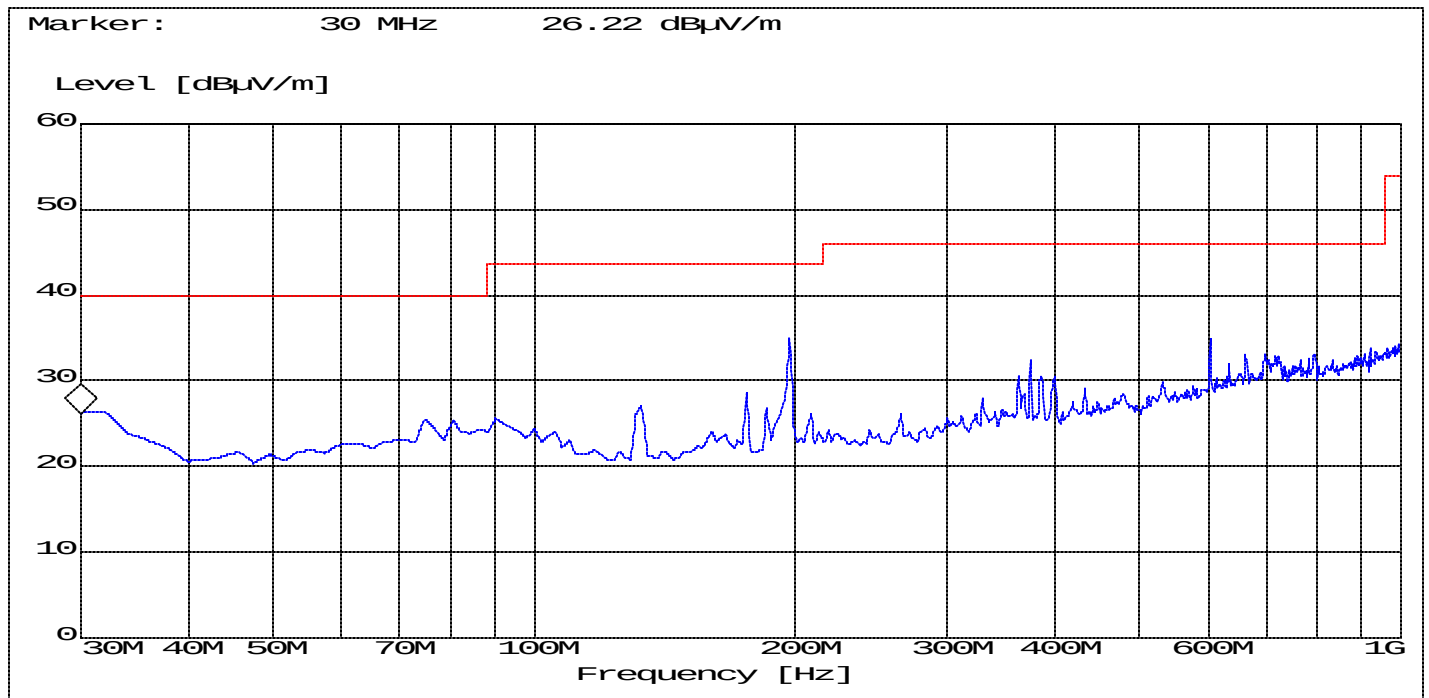
1. The radiated emissions were done with different settings, using the relevant pre-amplifiers for the relevant frequency ranges. This is the reason that the graphs show different noise levels. In the range between 18 and 25 GHz very short cable connections to the antenna was used to minimize the noise 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

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 ≥ 1GHz : RBW/VBW: 1 MHz

RECEIVER SPURIOUS RADIATION

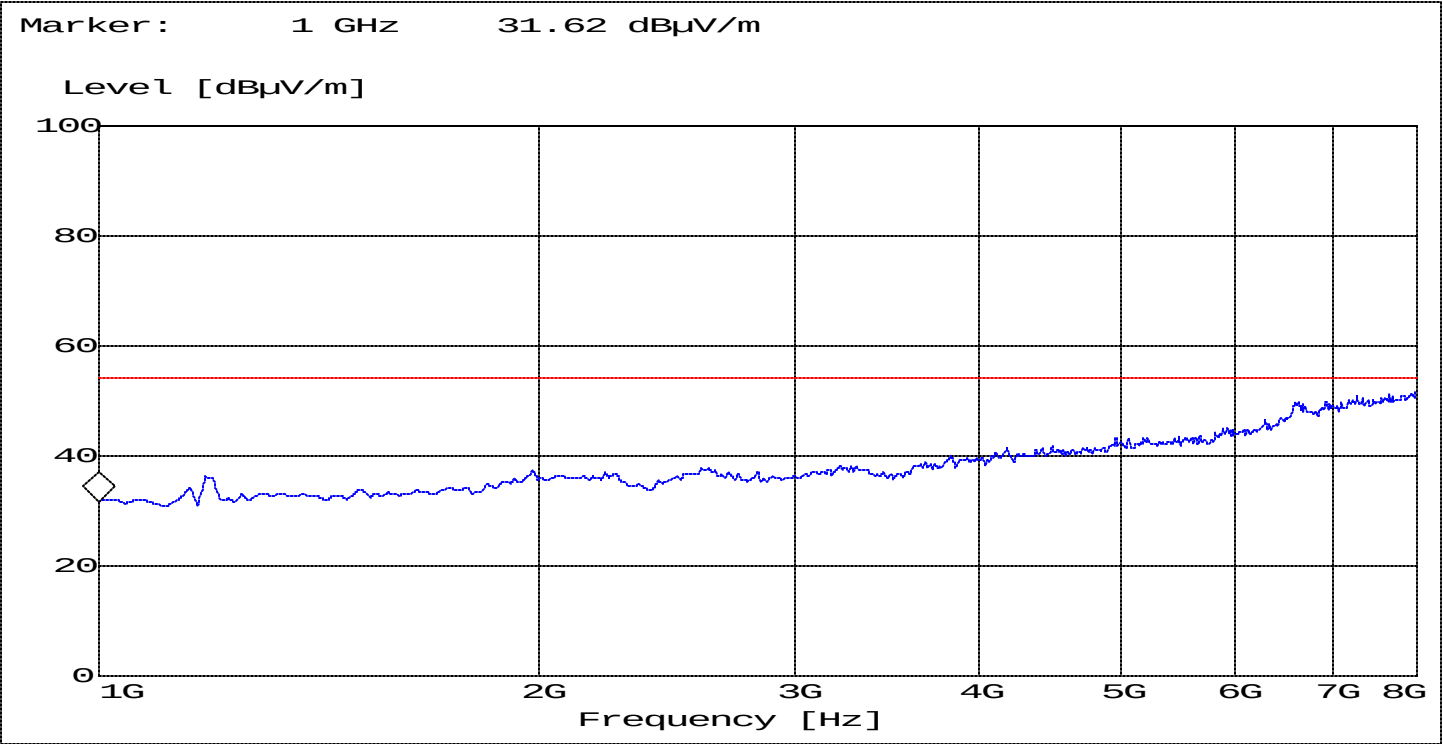
§ 15.209

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

Marker : 1 GHz 31.62 dBμV/m

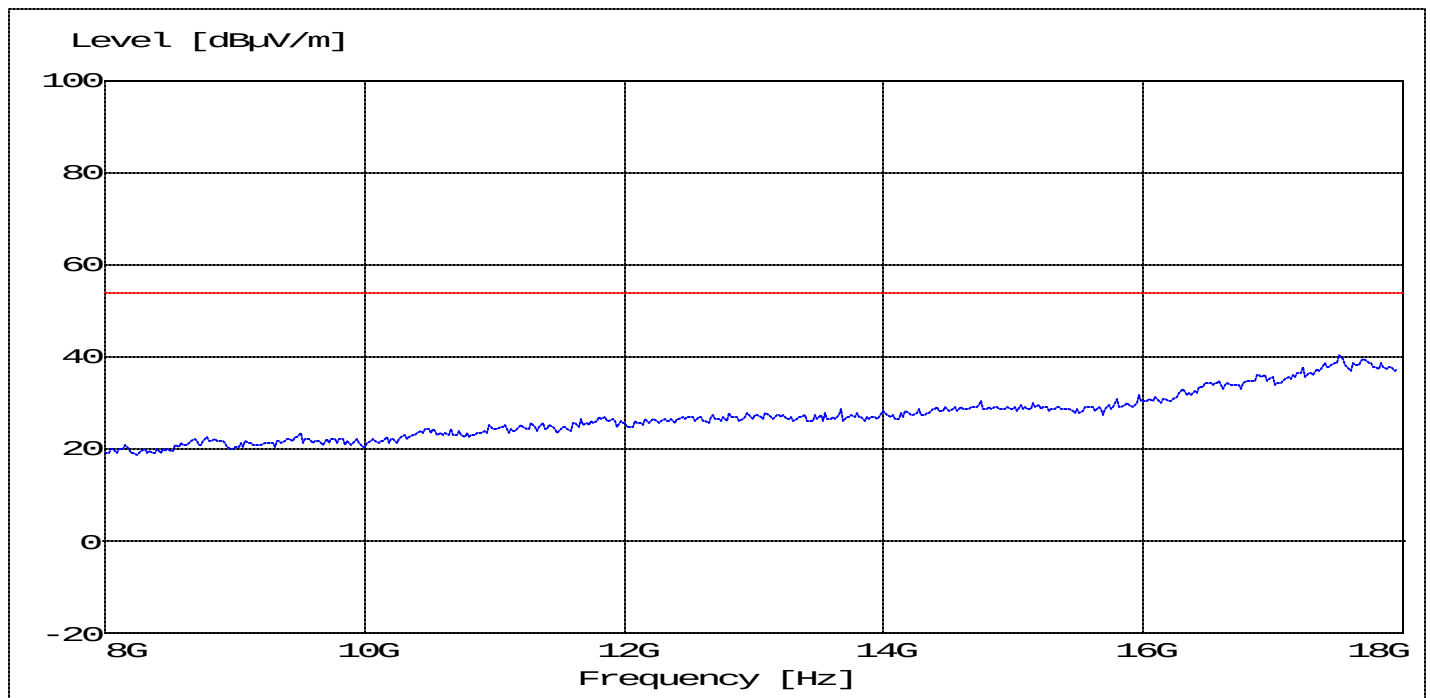


RECEIVER SPURIOUS RADIATION

§ 15.209

8GHz – 18GHz

(NOTE: This plot is valid for all three channels)



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

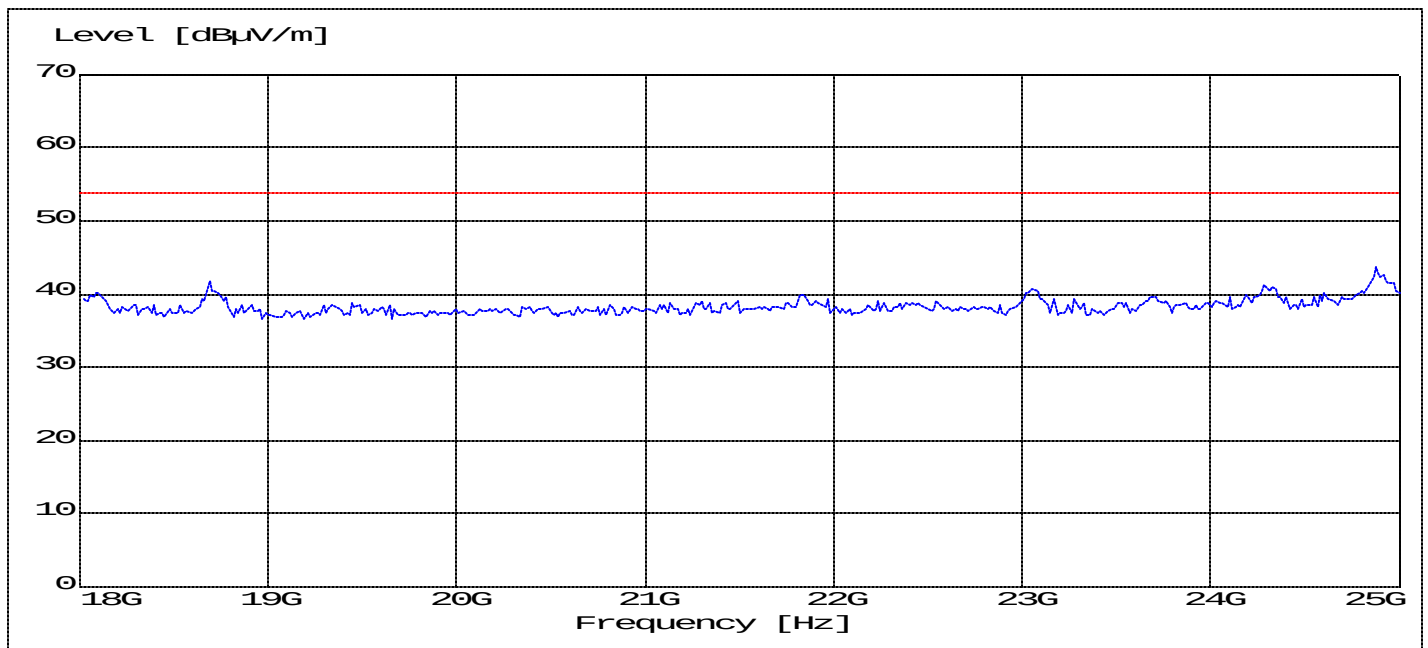
$f \geq 1 \text{ GHz}$: RBW/VBW: 1 MHz

RECEIVER SPURIOUS RADIATION

§ 15.209

18GHz – 25GHz

(NOTE: 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]