

CETECOM Inc.



CETECOM Inc.

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Issued test report consists of 50 Pages

Page 1 (50)

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

Test report no.: 173FCC/2001_2BT

FCC Part 15.247

FCC ID: B94xt1000bt

(HP Omnibook xt1000)

Table of Contents**1 General information****1.1 Notes****1.2 Testing laboratory****1.3 Details of applicant****1.4 Application details****1.5 Test item****1.6 Test standards****2 Technical test****2.1 Summary of test results****2.2 Test report****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.**

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1.3 Details of applicant

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Street : 19310 Pruneridge Ave.
City : Cupertino CA
Country : USA
Contact : Richard Barbin
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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 : 2001-10-01
Date of test : 2001-10-01/02/04

1.5 Test item

Manufacturer : 3 COM
Name of EUT : SL-1021 installed into HP Omnibook xt1000
Description : [Bluetooth wireless Module](#)
Model No. : SL-1021
Serial No. : N/A
FCC ID : B94xt1000BT

Additional information

Frequency : 2.4 – 2.48 GHz
Type of modulation : Bluetooth Standard
Number of channels : 79
Antenna : Internal
Power supply : 5V
Output power : 0 dBm
Extreme Vol. Limits :
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 :

2001-11-07

EMC & Radio

Lothar Schmidt



Date

Section

Name

Signature

2.2 Testreport

TEST REPORT

Test report no. : 173FCC/2001_2BT
FCC ID: B94xt1000BT
(HP Omnibook xt1000)

TEST REPORT REFERENCE**LIST OF MEASUREMENTS**

Paragraph	PARAMETER TO BE MEASURED	PAGE
	Transmitter parameters	
§ 15.204	Antenna gain	7
§ 15.247 (a)	Carrier frequency separation	8
§ 15.247 (a)	Number of hopping channels	9
§ 15.247 (a)	Time of occupancy (dwell time)	13
§ 15.247 (a)(1)	Spectrum Bandwidth of a FHSS System	16
§ 15.247 (b)(2)	Maximum peak output power	20
§15.247	Band edge compliance	28
§ 15.247 (c)(1)	Emission limitations	30
§ 15.107/207	AC Line Conducted Emission	43
	Receiver parameters	
§ 15.209	Spurious radiations - Radiated	45
	Test equipment listing	50

Antenna Gain

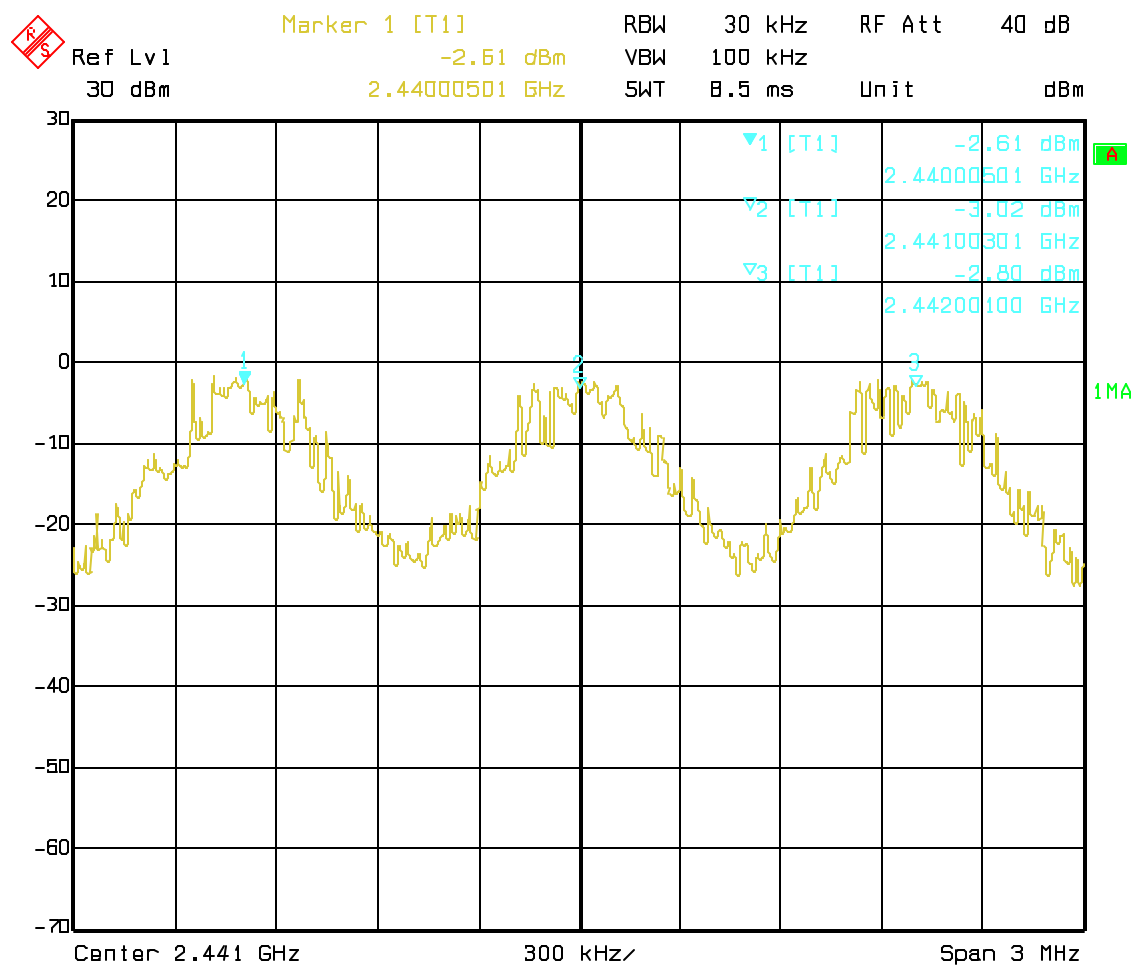
SUBCLAUSE § 15.204

The max gain is +1.2dBi

(measured effective radiated power – measured conducted power with a temporary RF-connector)

CARRIER FREQUENCY SEPERATION

§15.247(a)



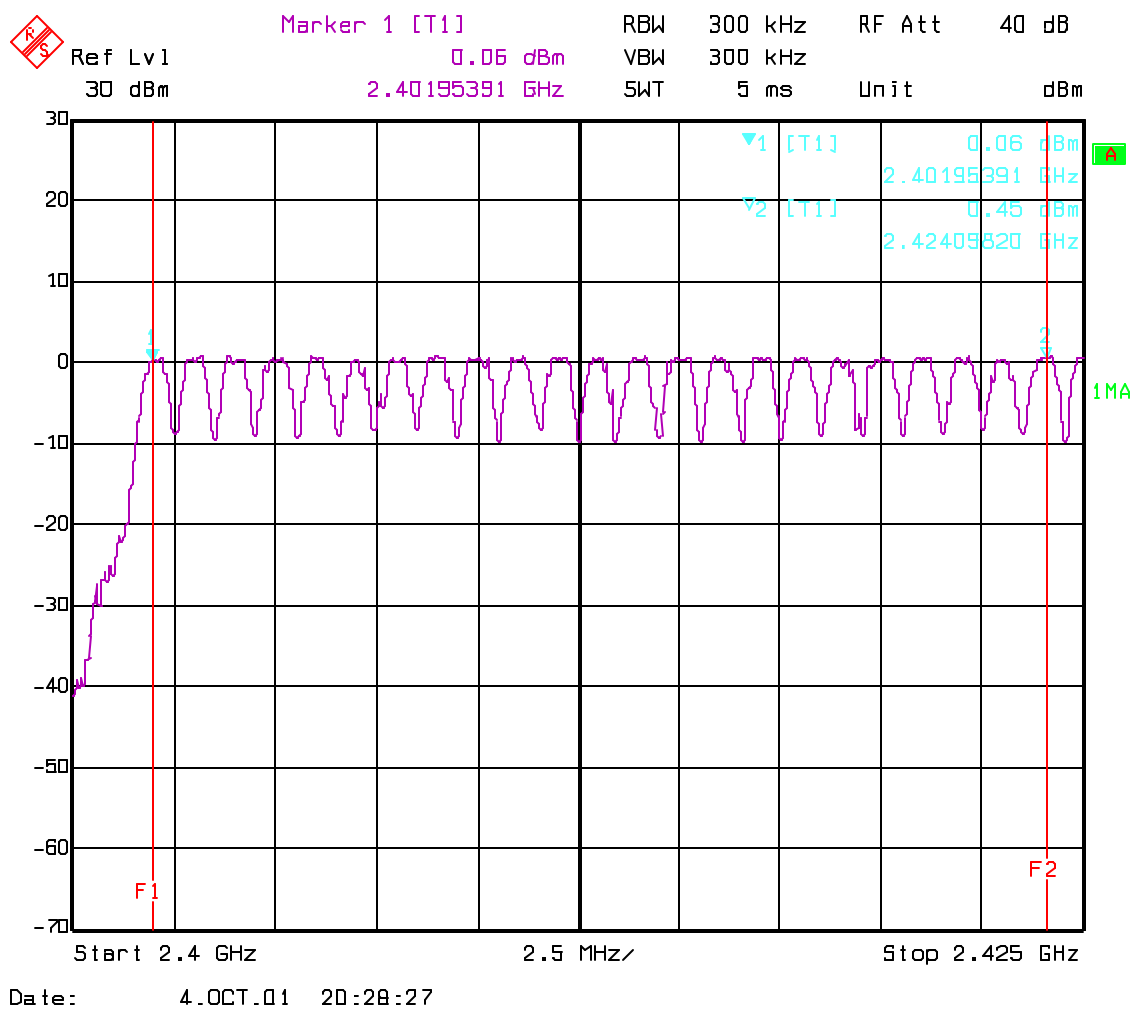
Date: 4.OCT.01 20:22:07

NUMBER OF HOPPING CHANNELS

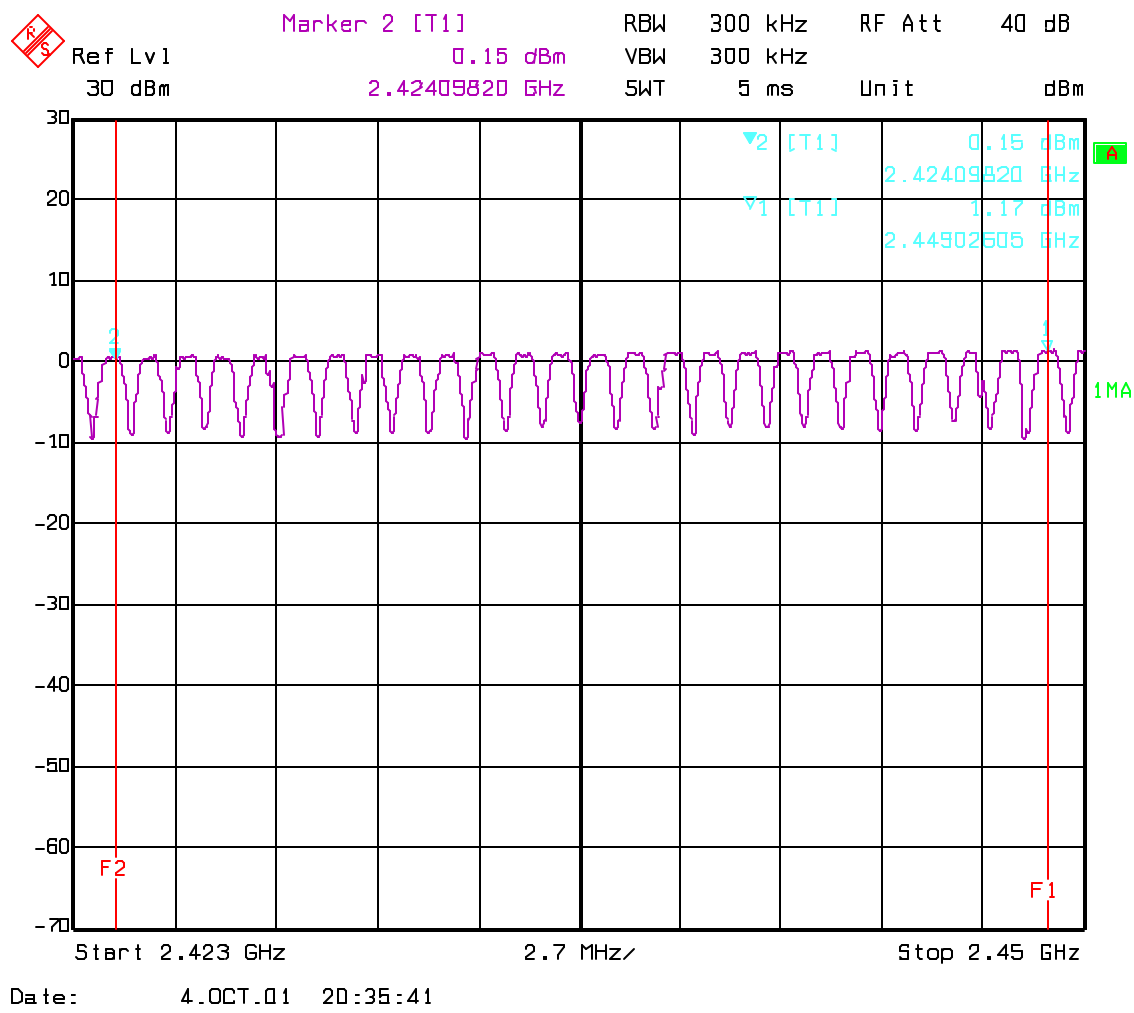
§15.247(a)

The number of hopping channels is 79 (see next 4 plots)
The right red line corresponds to the left red line from the next plot.

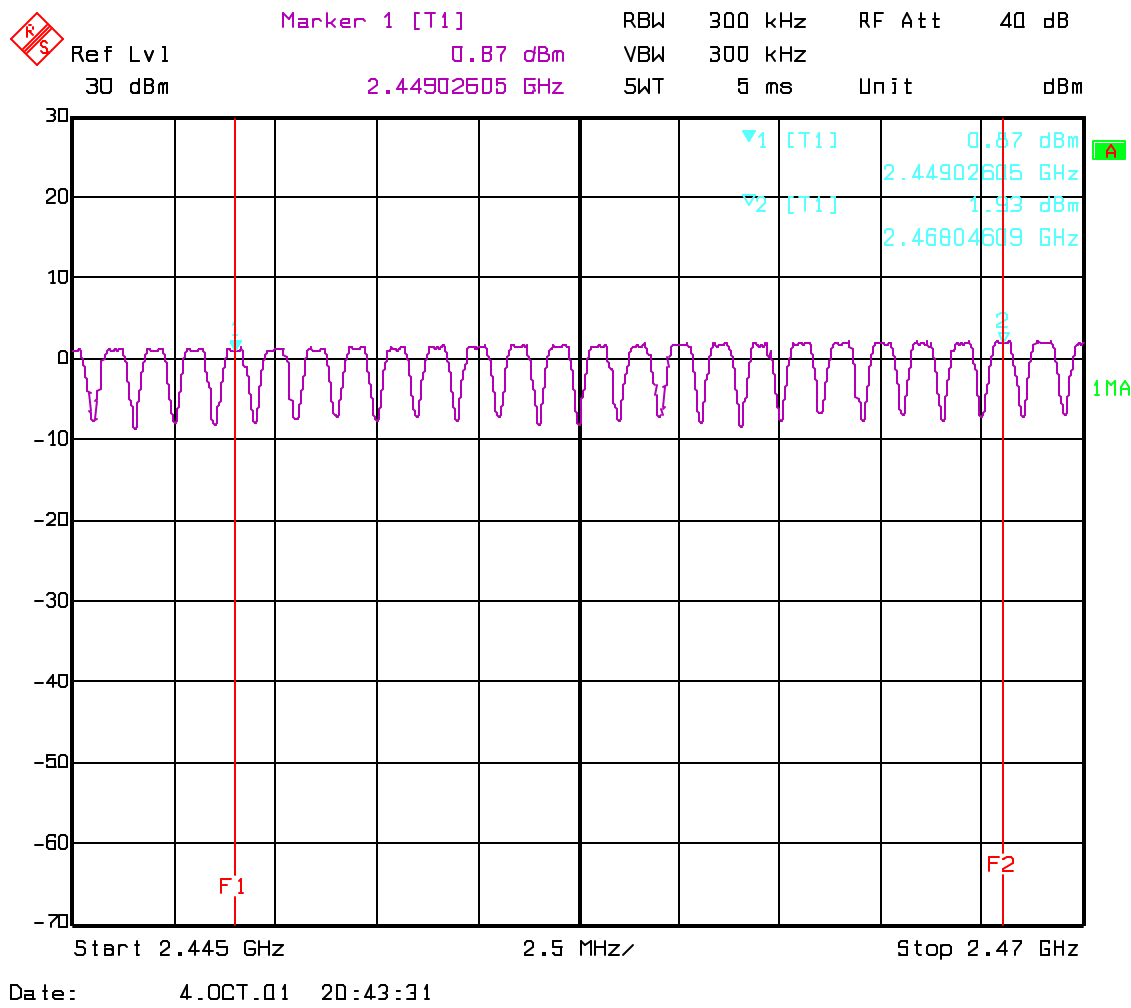
Plot 1: Total 23



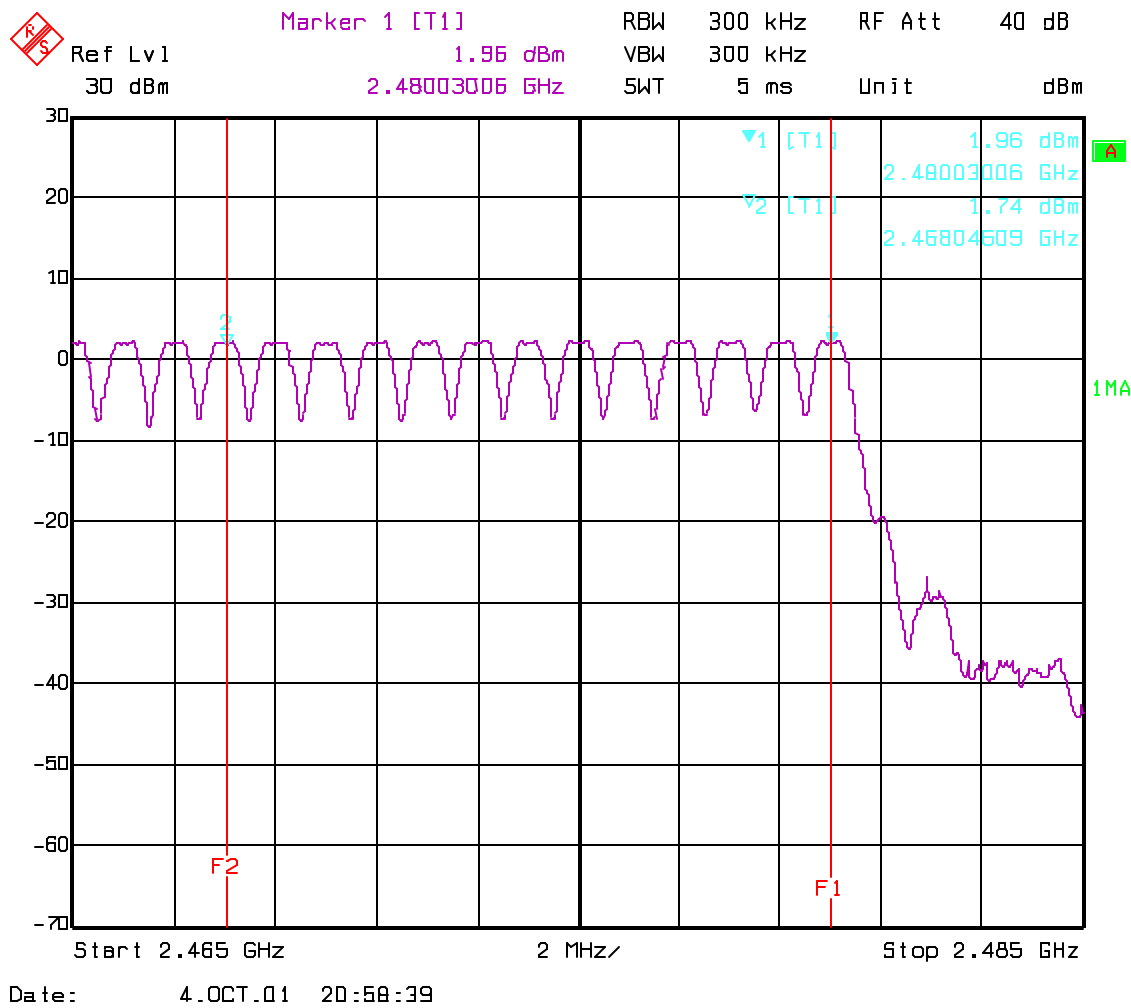
Plot 2: Total 25



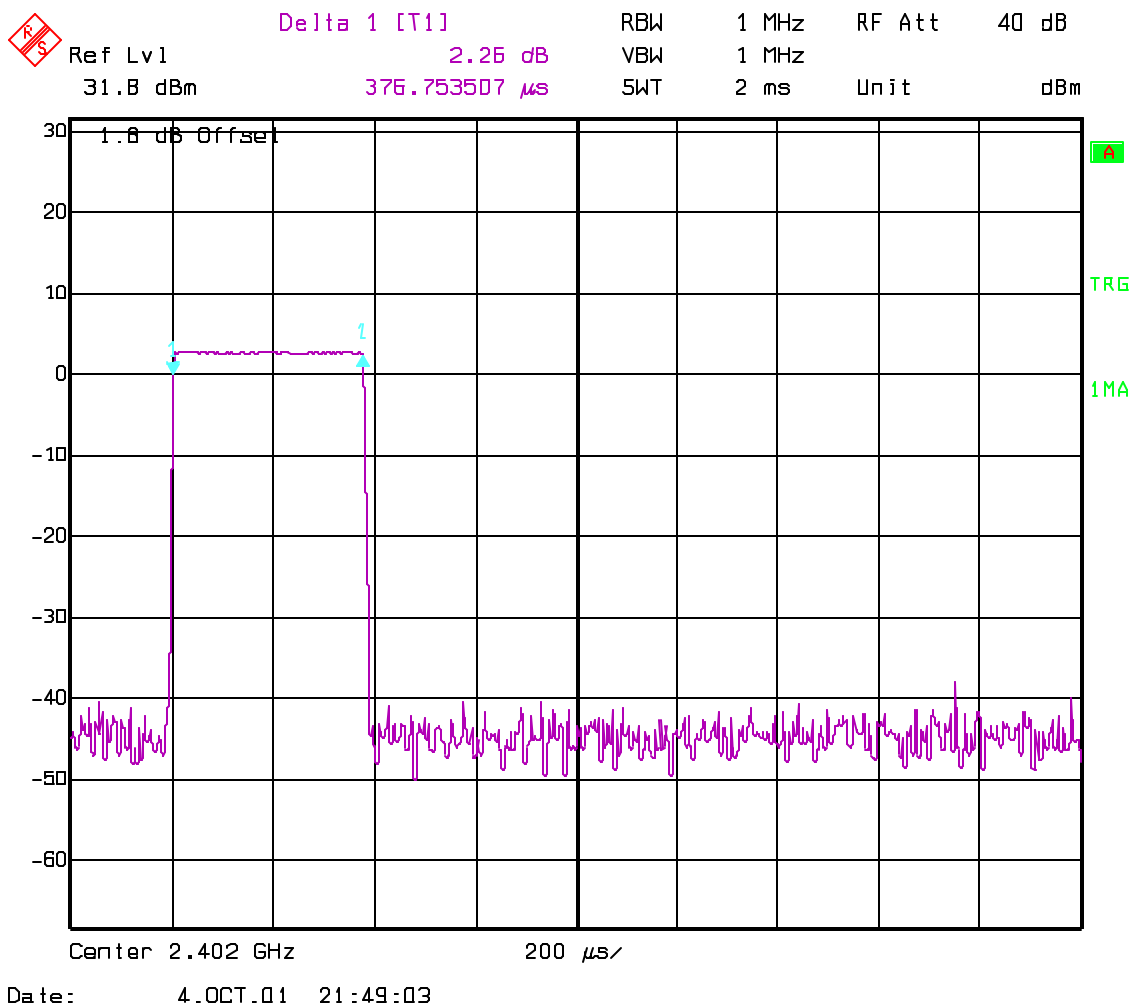
Plot 3: Total 19



Plot 4: Total 12



So we have $303.9 * 376.75 \mu s = 114.49 \text{ ms}$ per 30 seconds.



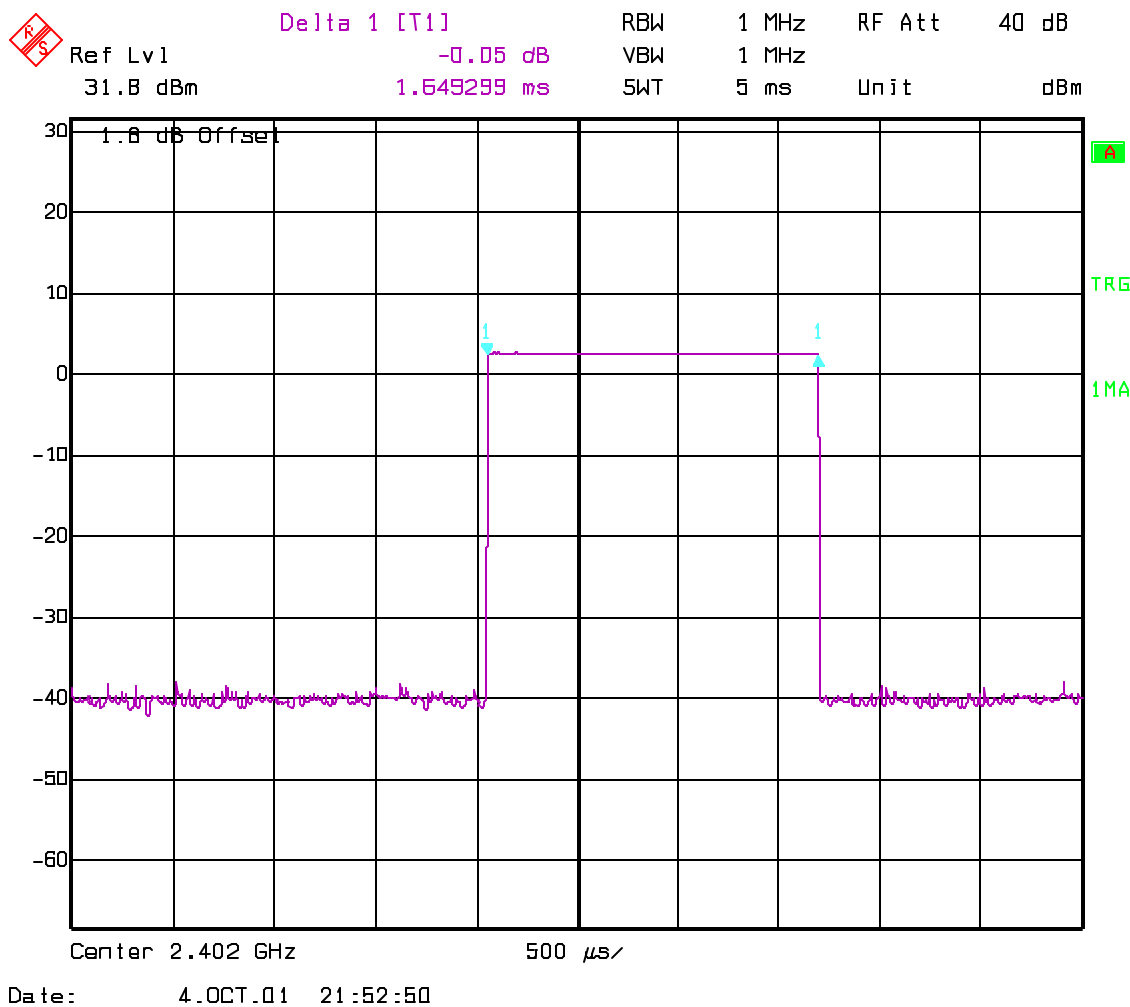
TIME OF OCCUPANCY (DWELL TIME) FOR DH3

§15.247(a)

A DH3 Packets need 3 time slots for transmit and 1 for receicing, then the system makes worst case 400 hops per second with 79 channels. So you have each channel 5.1 times per second and so for 30 seconds you have 153 times of appearance .

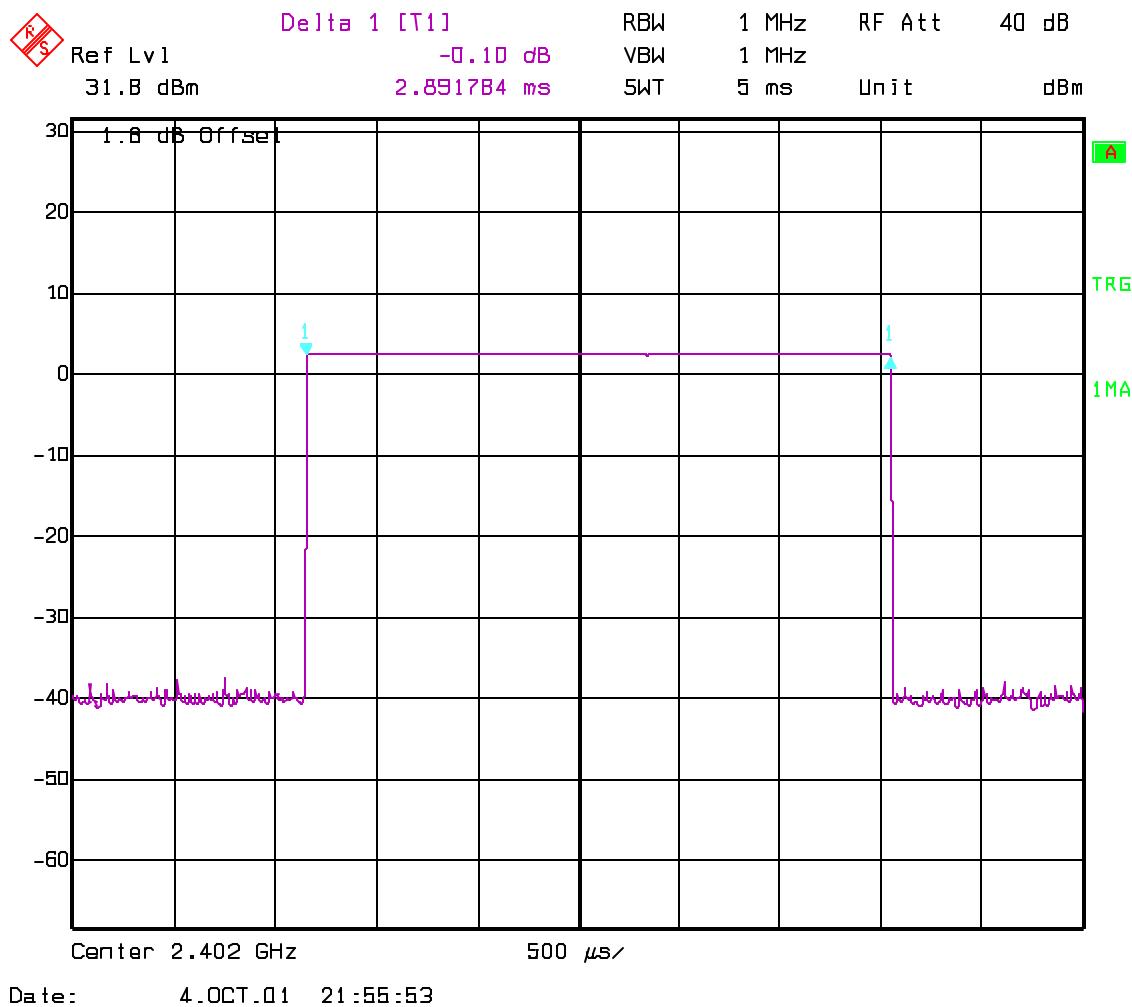
Each Tx-time per appearance is 1.65 ms.

So we have 153 * 1.65 ms = 252.45 ms per 30 seconds.



TIME OF OCCUPANCY (DWELL TIME) FOR DH5 §15.247(a)

At DH5 Packets you need 5 time slots for transmit and 1 for receicing,then the system makes worst case 266,7 hops per second with 79 channels. So you have each channel 3.36 times per second and so for 30 seconds you have 100,8 times of appearance .
Each tx-time per appearance is 2.89 ms.
So we have 100.8 * 2.89ms = 291.31 ms per 30 seconds.



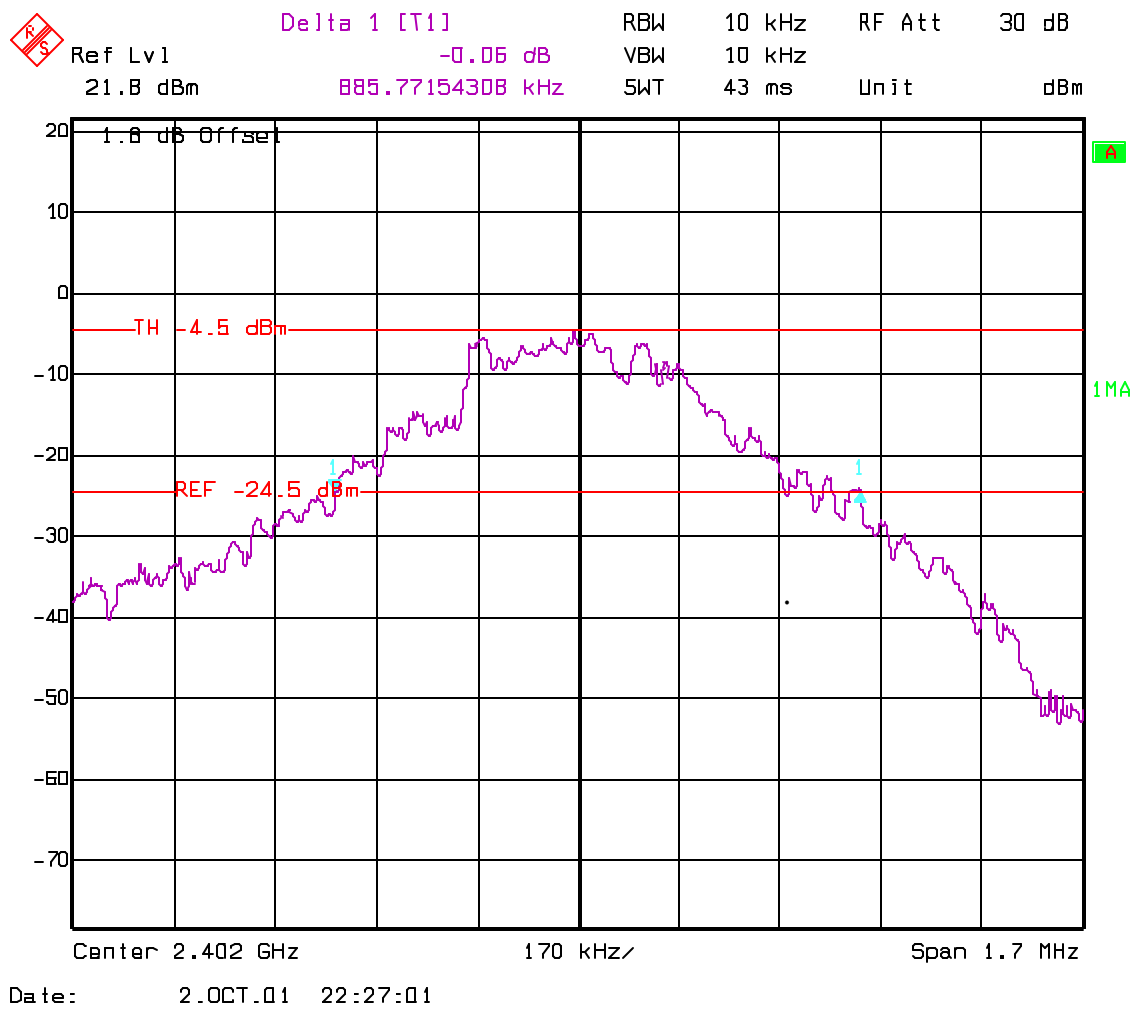
**SPECTRUM BANDWIDTH OF FHSS SYSTEM
20 dB bandwidth****§15.247(a)**

TEST CONDITIONS		20 dB BANDWIDTH (kHz)		
Frequency (MHz)		2402	2441	2480
T _{nom} (23)°C	V _{nom} (5)V	885.77	993.46	868.73
Measurement uncertainty		±3dB		

RBW / VBW as provided in the "Measurement Guidelines" (DA 00-705, March 30, 2000)**LIMIT****SUBCLAUSE §15.247(a) (1)****The maximum 20dB bandwidth shall be at maximum 1000 KHz**

SPECTRUM BANDWIDTH OF FHSS SYSTEM §15.247(a)
20 dB bandwidth

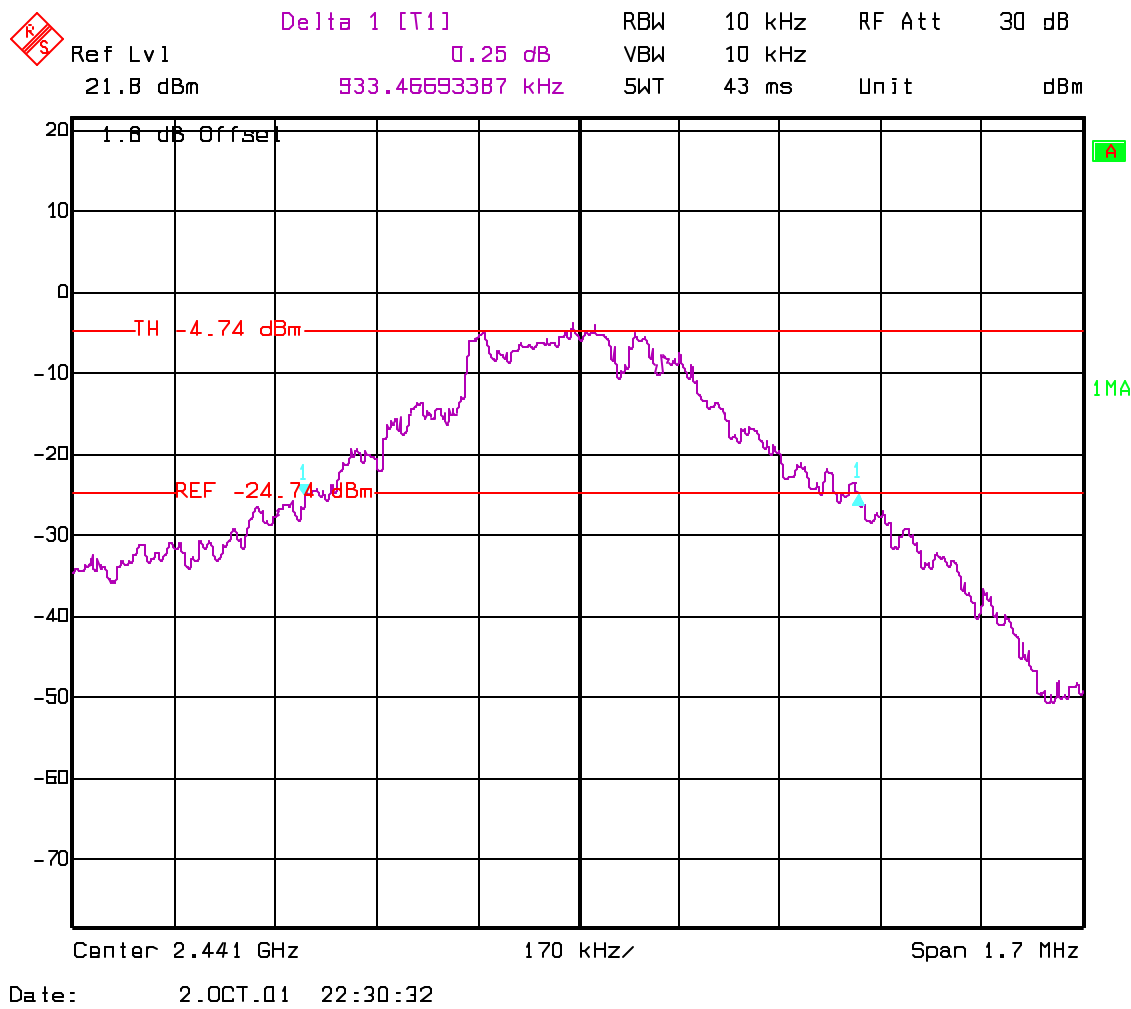
Lowest Channel: 2402MHz



SPECTRUM BANDWIDTH OF FHSS SYSTEM
20 dB bandwidth

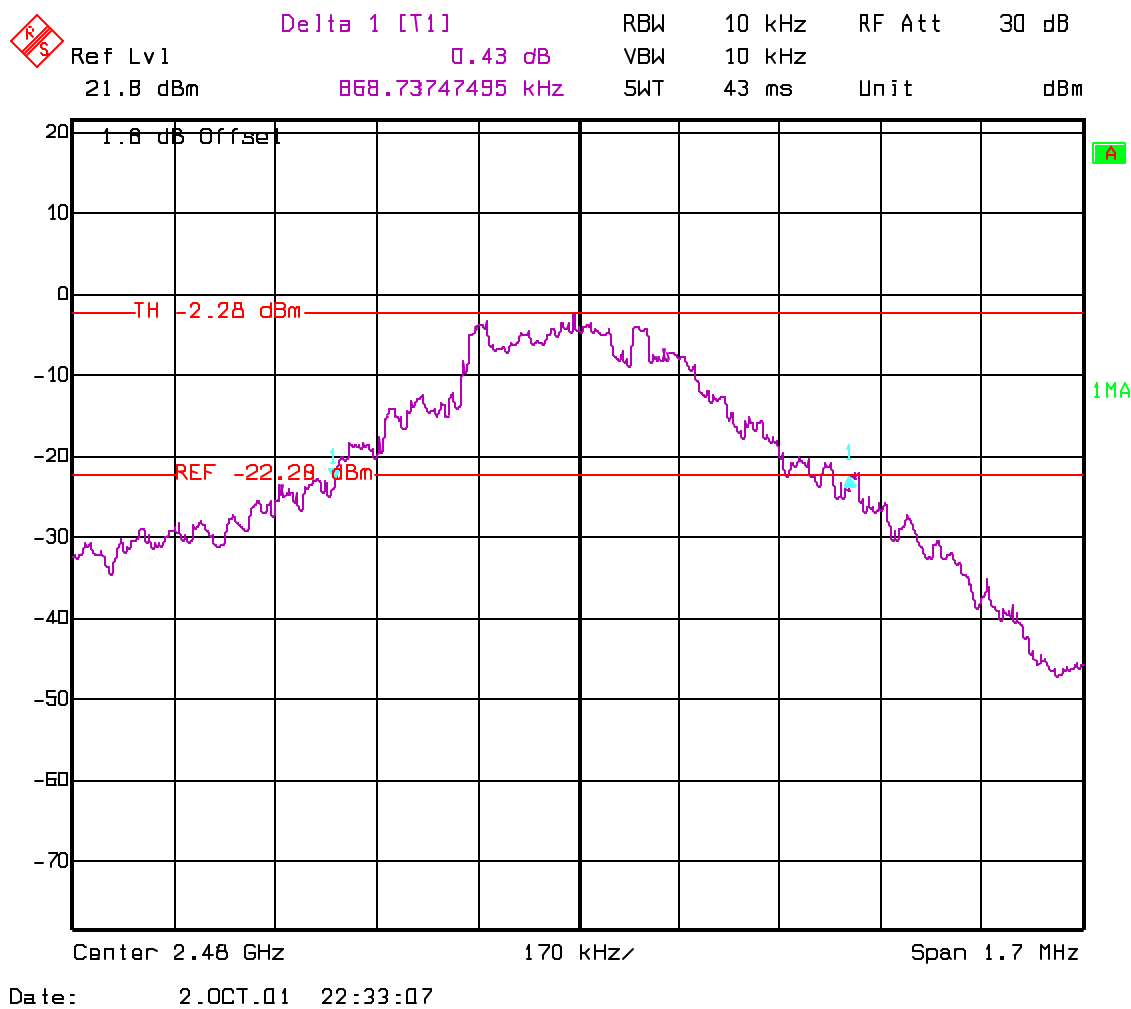
§15.247(a)

Mid Channel: 2441MHz



SPECTRUM BANDWIDTH OF FHSS SYSTEM §15.247(a)
20 dB bandwidth

Highest Channel: 2480MHz



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

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)			
Frequency (MHz)			2402	2441	2480
T _{nom} (23)°C	V _{nom} (5)V	PK	2.54	3.21	4.39
Measurement uncertainty		±3dB			

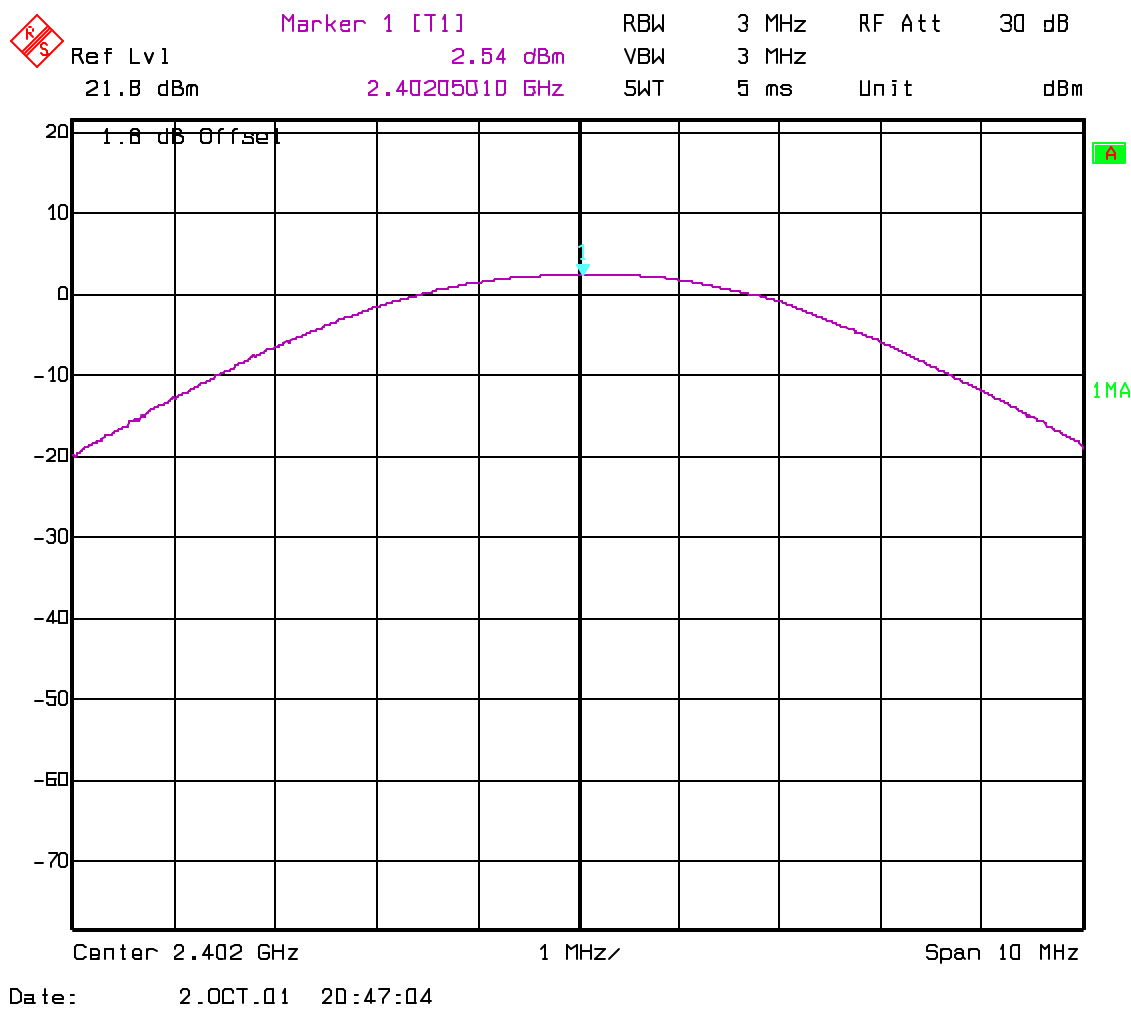
RBW / VBW : 3 MHz**LIMIT****SUBCLAUSE § 15.247 (b) (1)**

Frequency range	RF power output
2400-2483.5 MHz	1.0 Watt

PEAK OUTPUT POWER (CONDUCTED)

§15.247 (b)

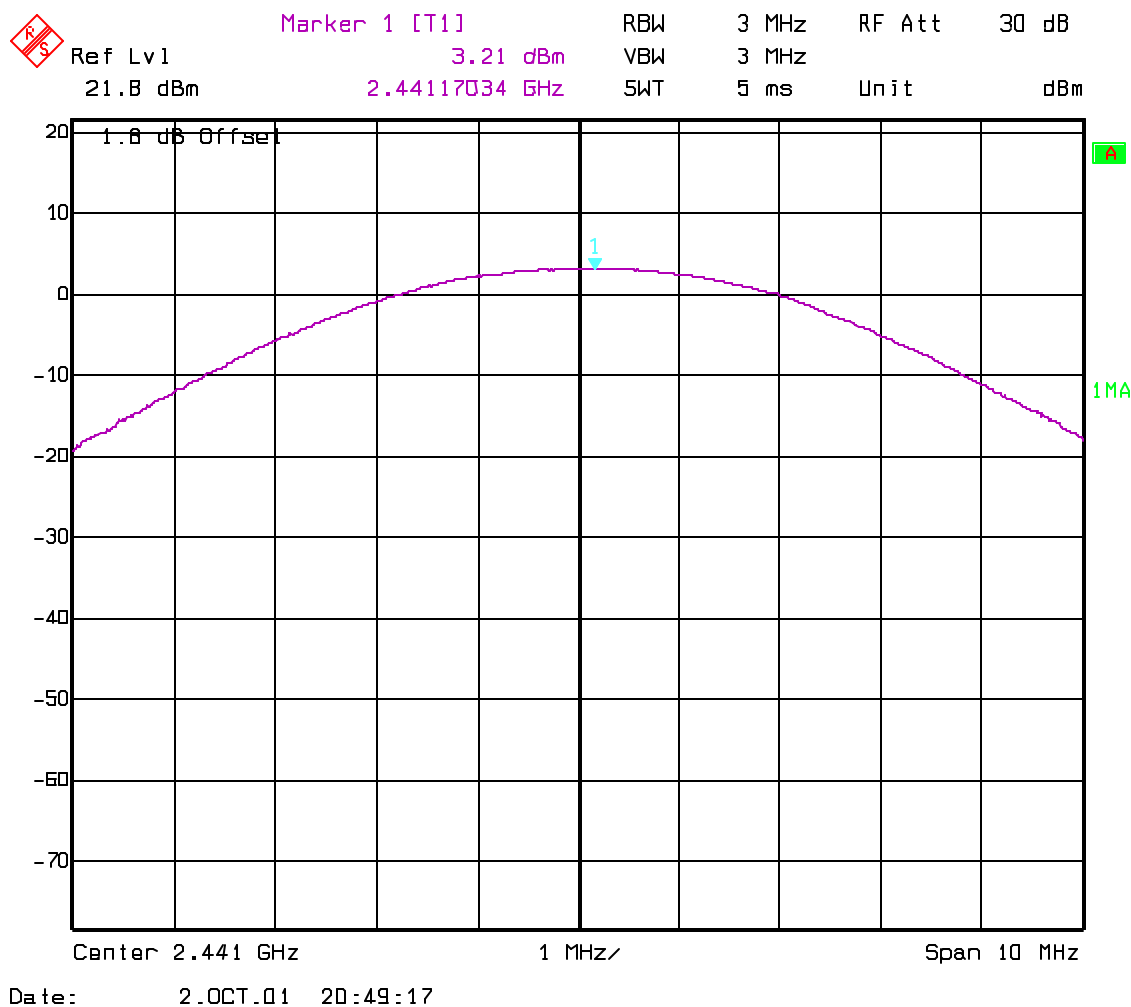
Lowest Channel: 2402MHz



PEAK OUTPUT POWER (CONDUCTED)

§15.247 (b)

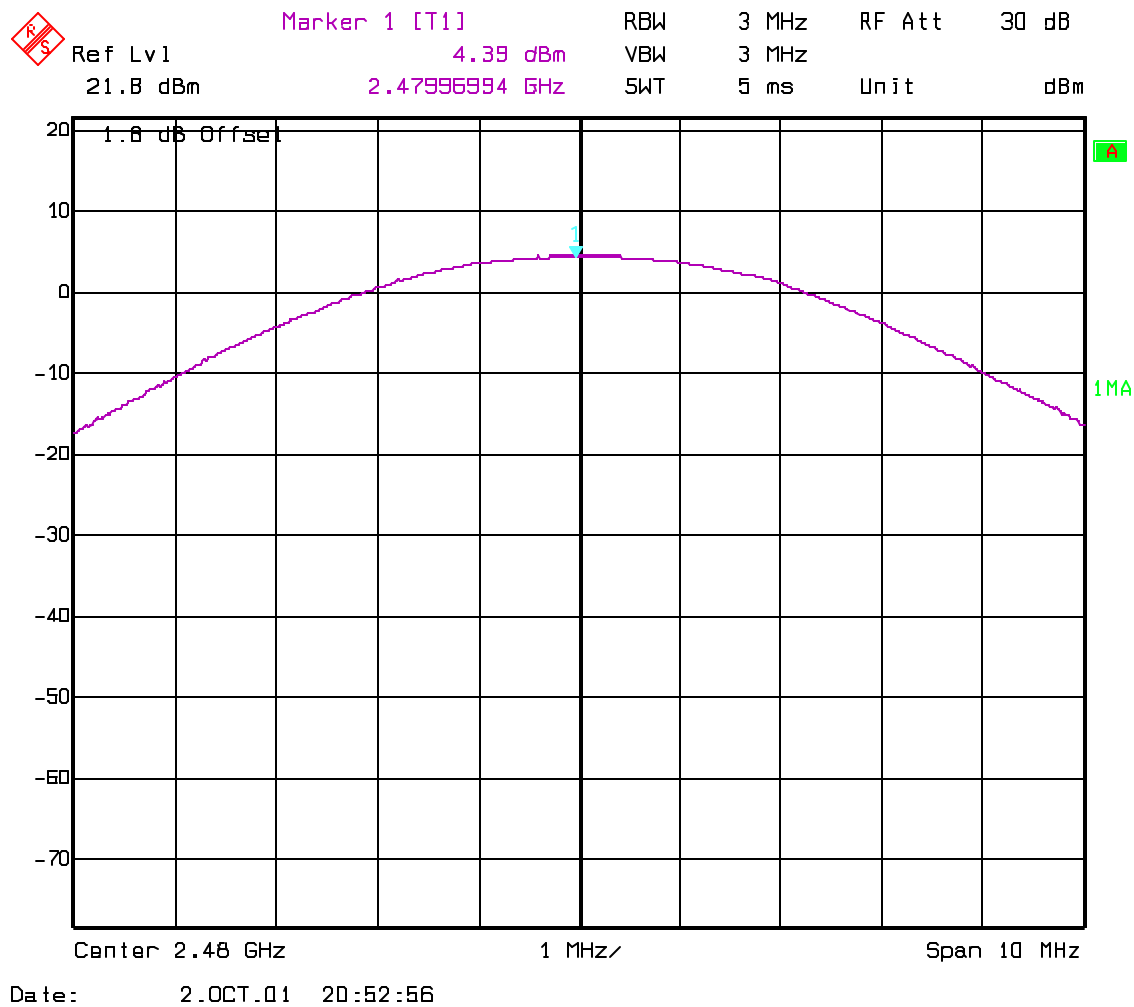
Mid Channel: 2441MHz



PEAK OUTPUT POWER (CONDUCTED)

§15.247 (b)

Highest Channel: 2480MHz



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

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)		
Frequency (MHz)		2402	2441	2480
T _{nom} (23)°C	V _{nom} (5)V	4.71	5.50	3.51
Measurement uncertainty		±3dB		

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

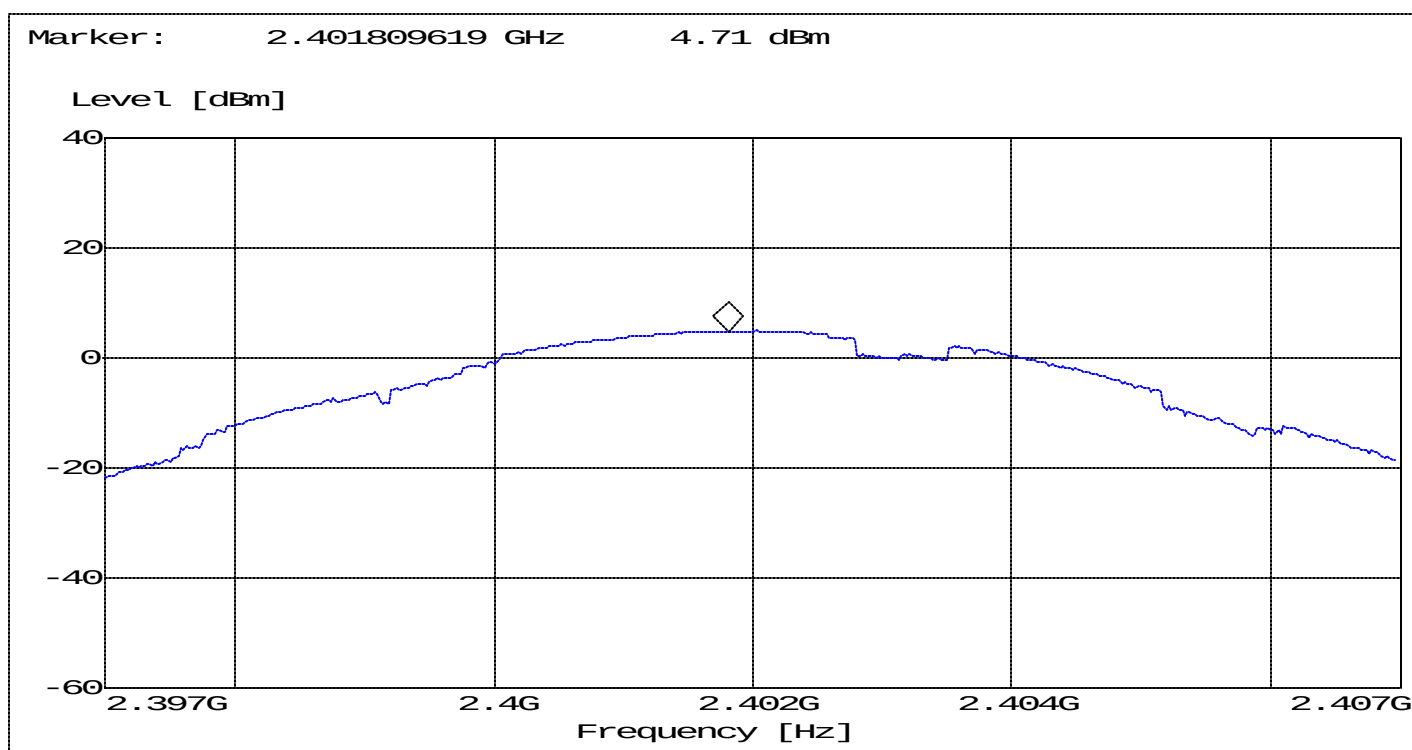
Frequency range	RF power output
2400-2483.5 MHz	1.0 Watt

PEAK OUTPUT POWER (RADIATED)

§15.247 (b) (1)

Lowest Channel: 2402MHz

ANALYZER SETTINGS: RBW = 3MHz VBW = 3MHz

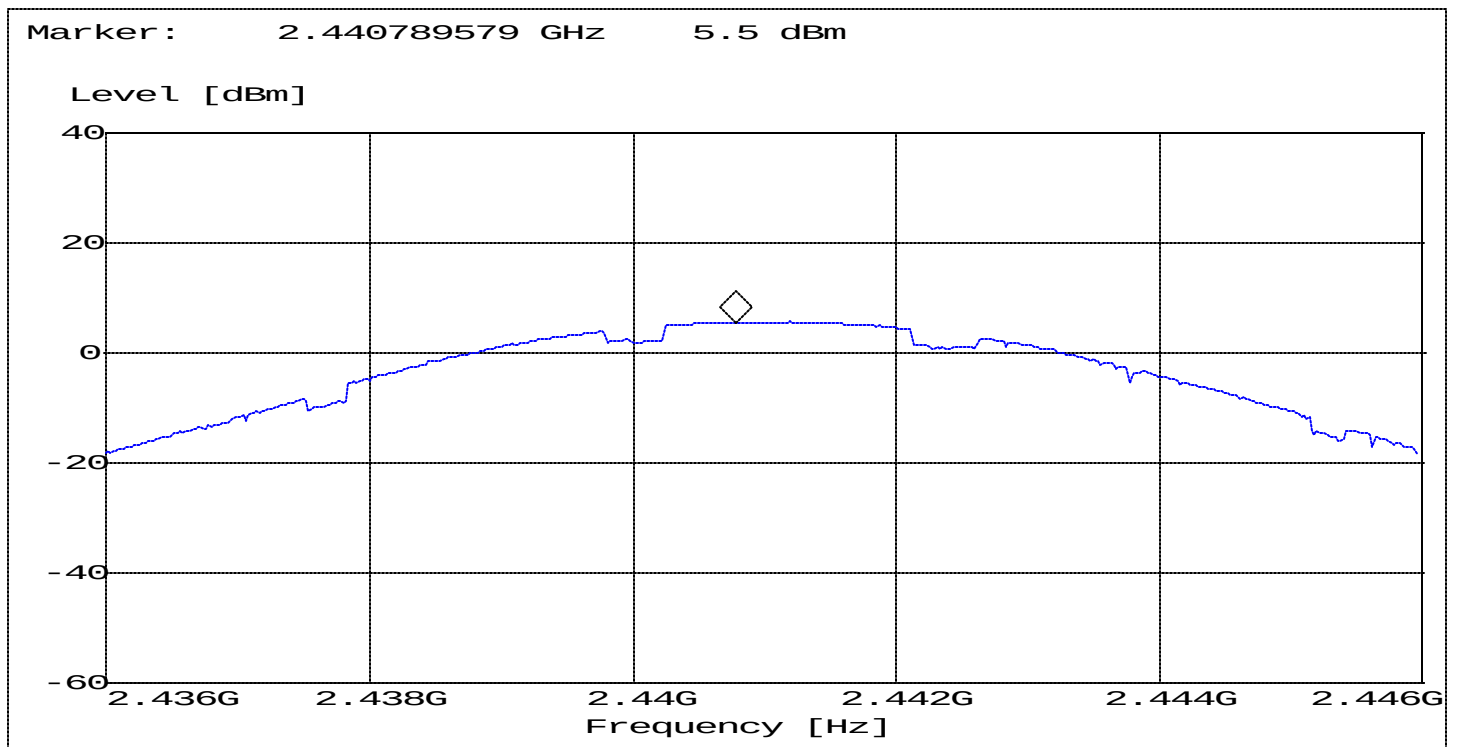


PEAK OUTPUT POWER (RADIATED)

§15.247 (b) (1)

Mid Channel: 2441MHz

ANALYZER SETTINGS: RBW = 3MHz VBW = 3MHz

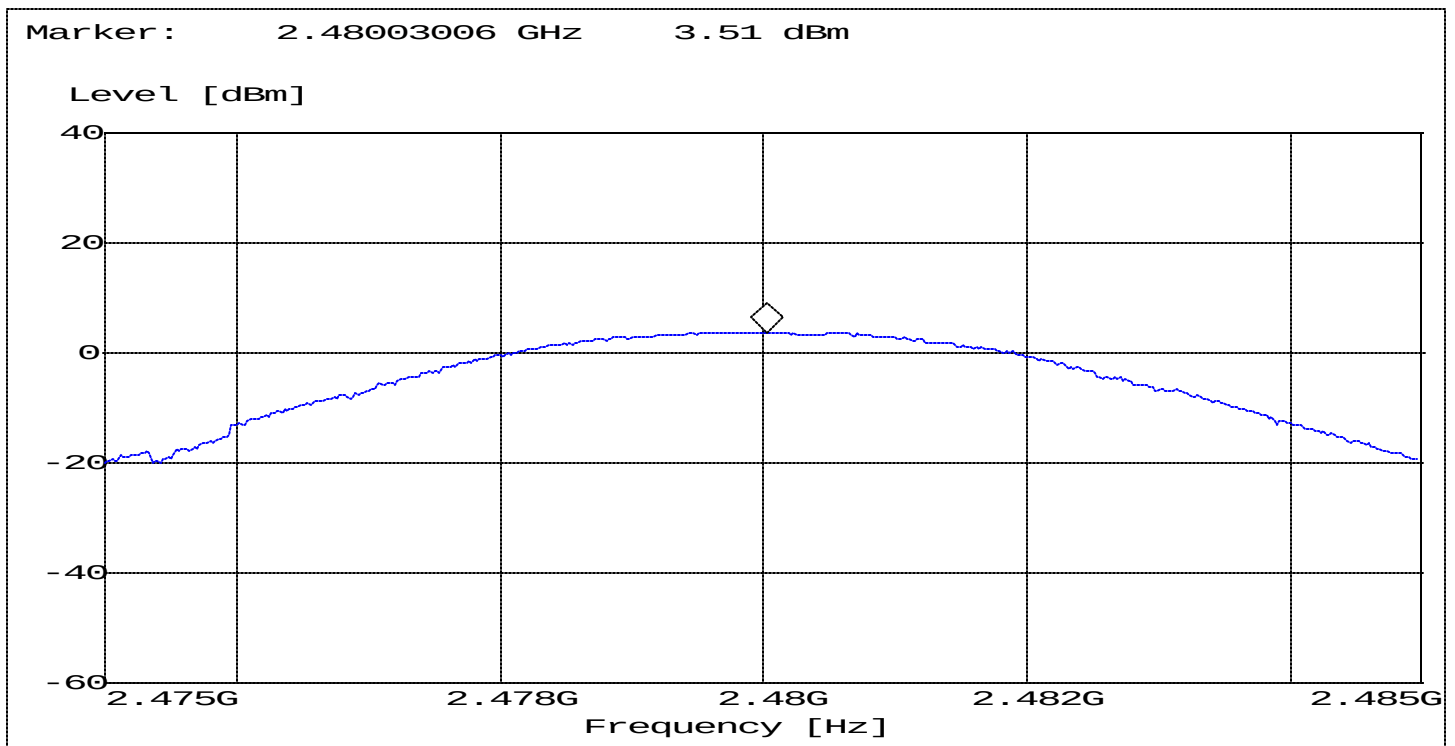


PEAK OUTPUT POWER (RADIATED)

§15.247 (b) (1)

Highest Channel: 2480MHz

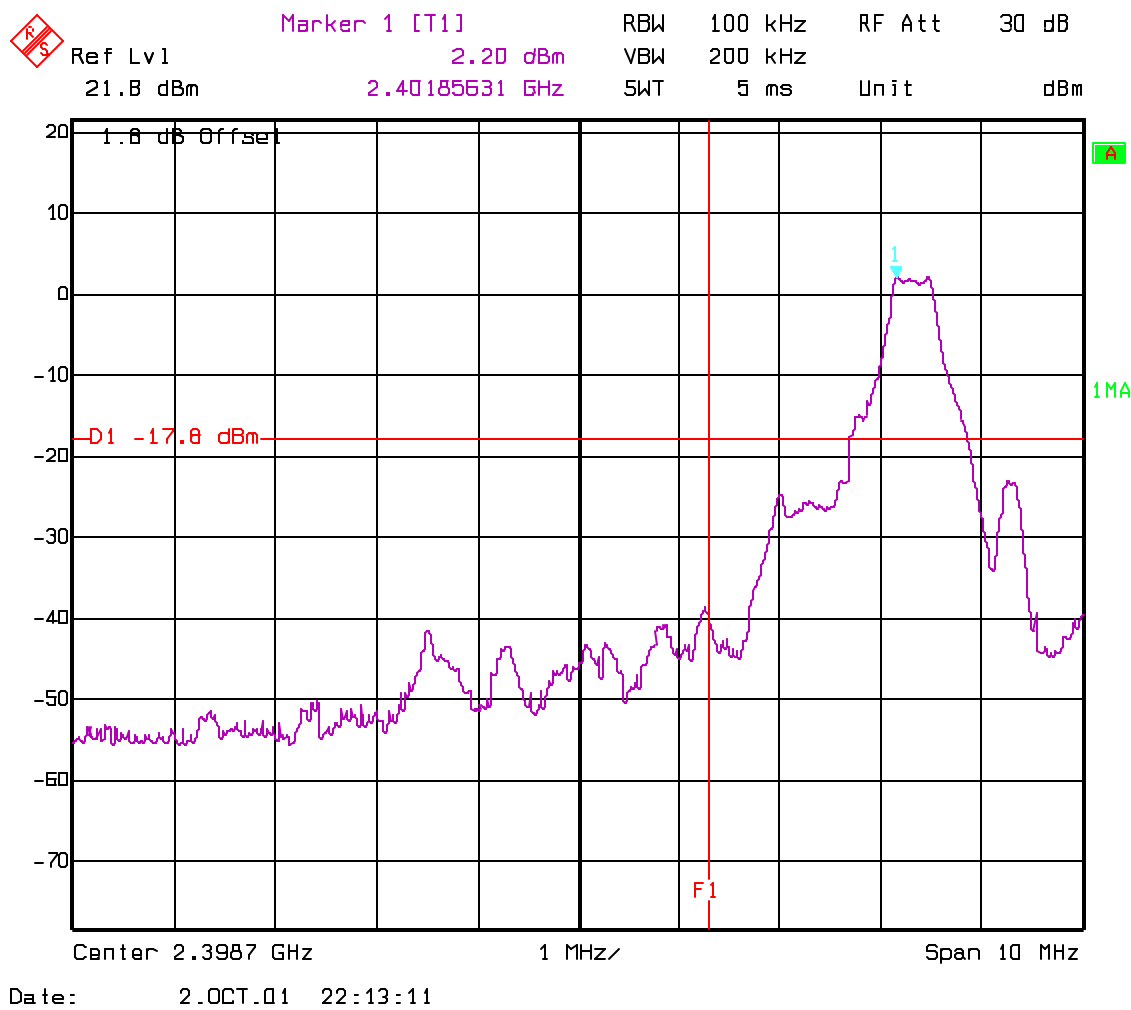
ANALYZER SETTINGS: RBW = 3MHz VBW = 3MHz



BAND EDGE COMPLIANCE

§15.247 (c)

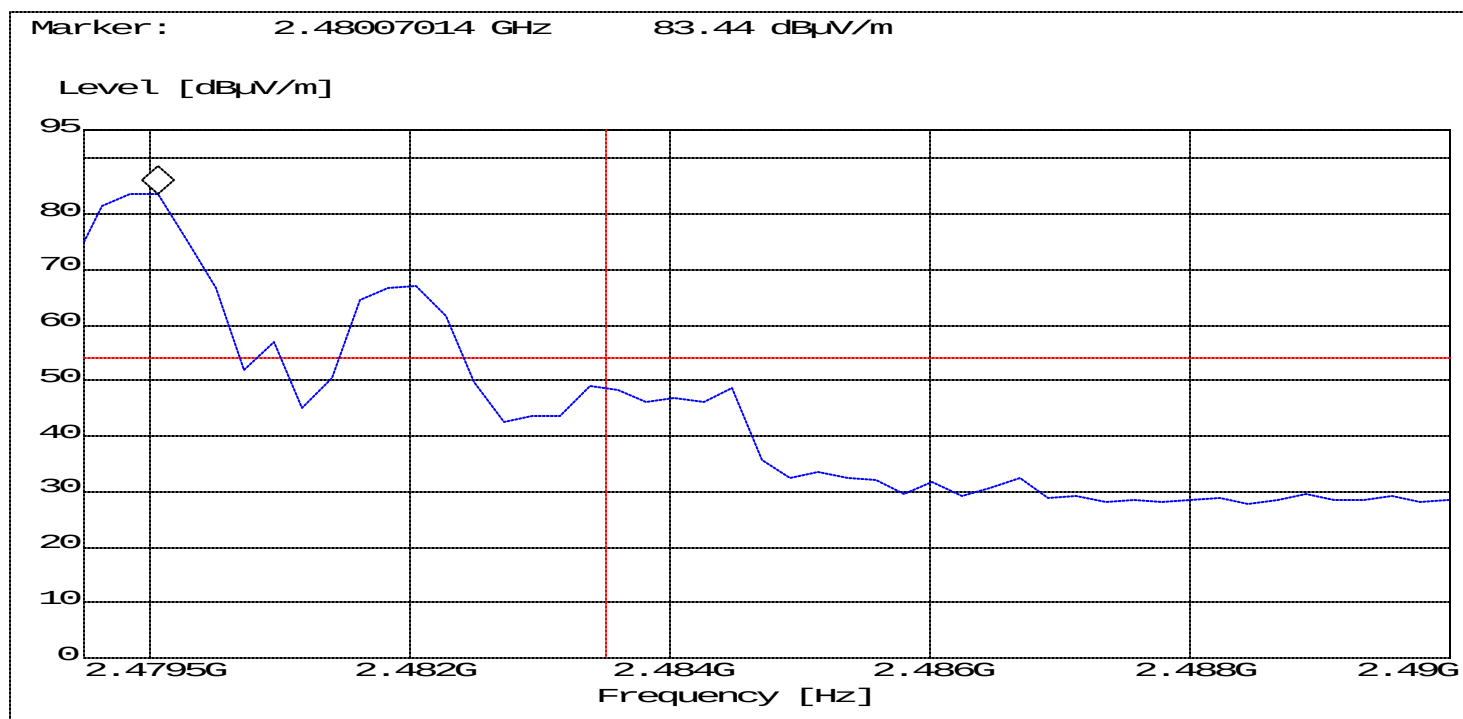
Low frequency section
(valid for both hopping ON & OFF)



BAND EDGE COMPLIANCE

§15.247 (c)

high frequency section
 (valid for both hopping ON & OFF)



ANALYZER SETTINGS: RBW = 100KHz VBW = 200KHz

EMISSION LIMITATIONS - Conducted (Transmitter)

§ 15.247 (c) (1)

LIMITS

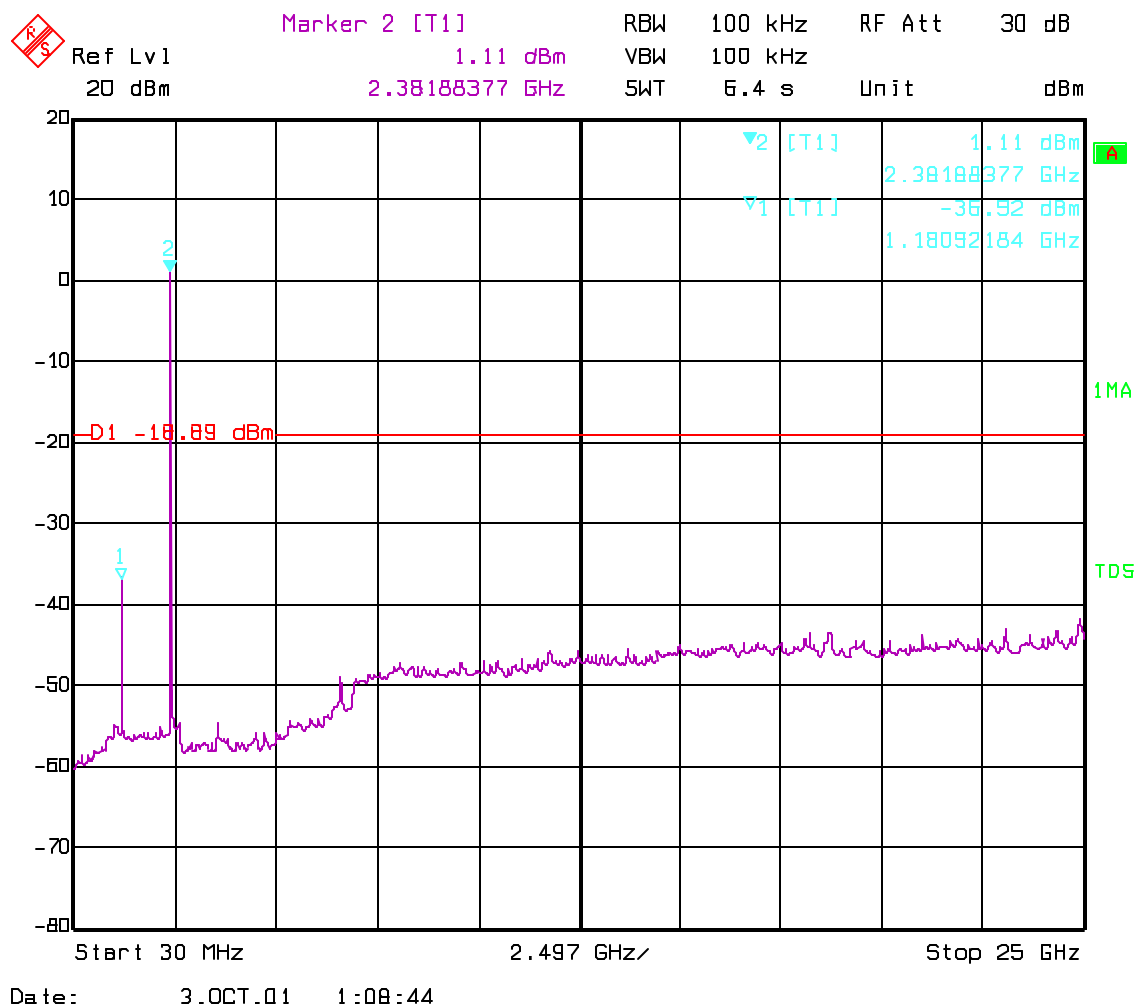
In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

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

EMISSION LIMITATIONS - Conducted (Transmitter)

§ 15.247 (c) (1)

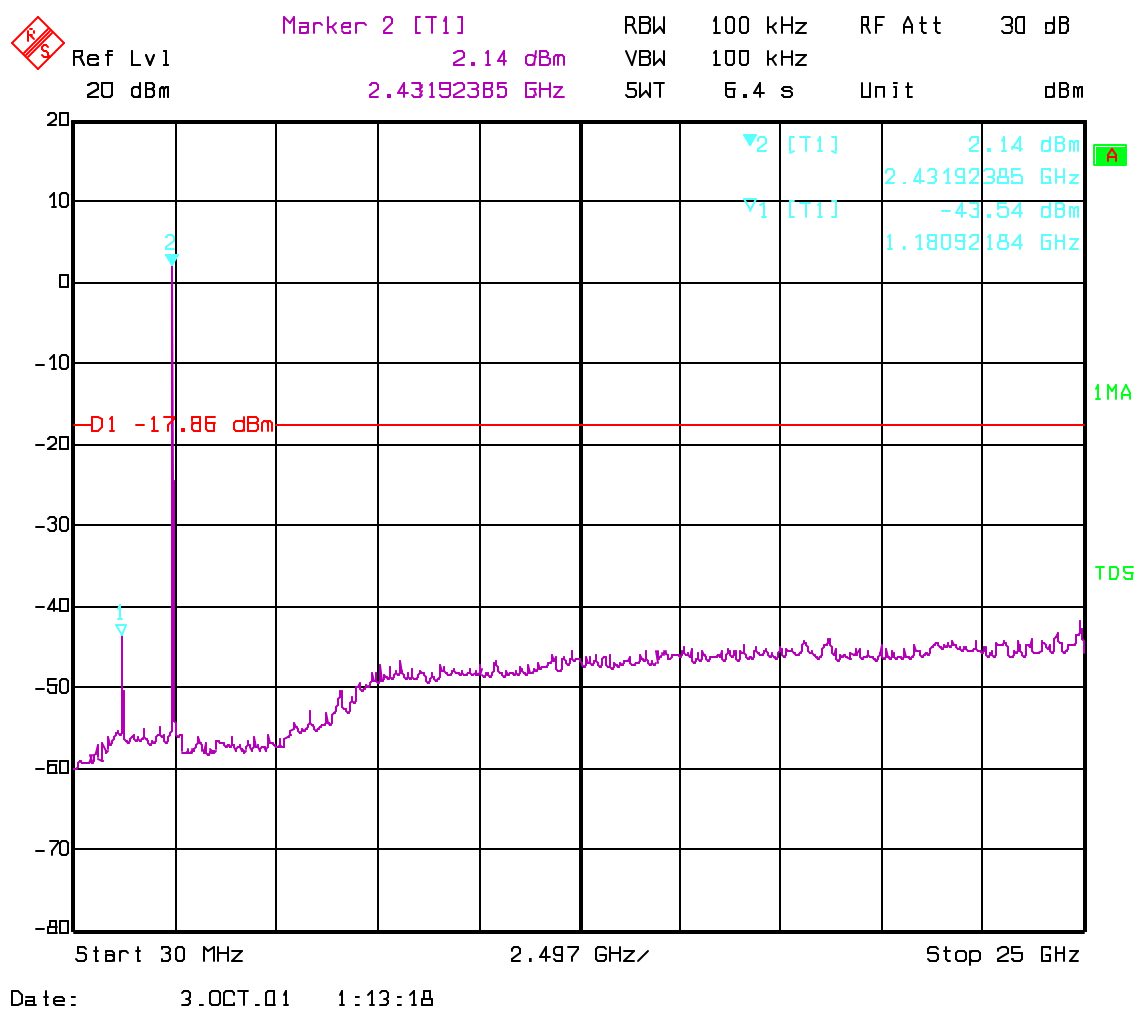
Lowest Channel(2402MHz): 30MHz - 25 GHz



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

EMISSION LIMITATIONS - Conducted (Transmitter) § 15.247 (c) (1)

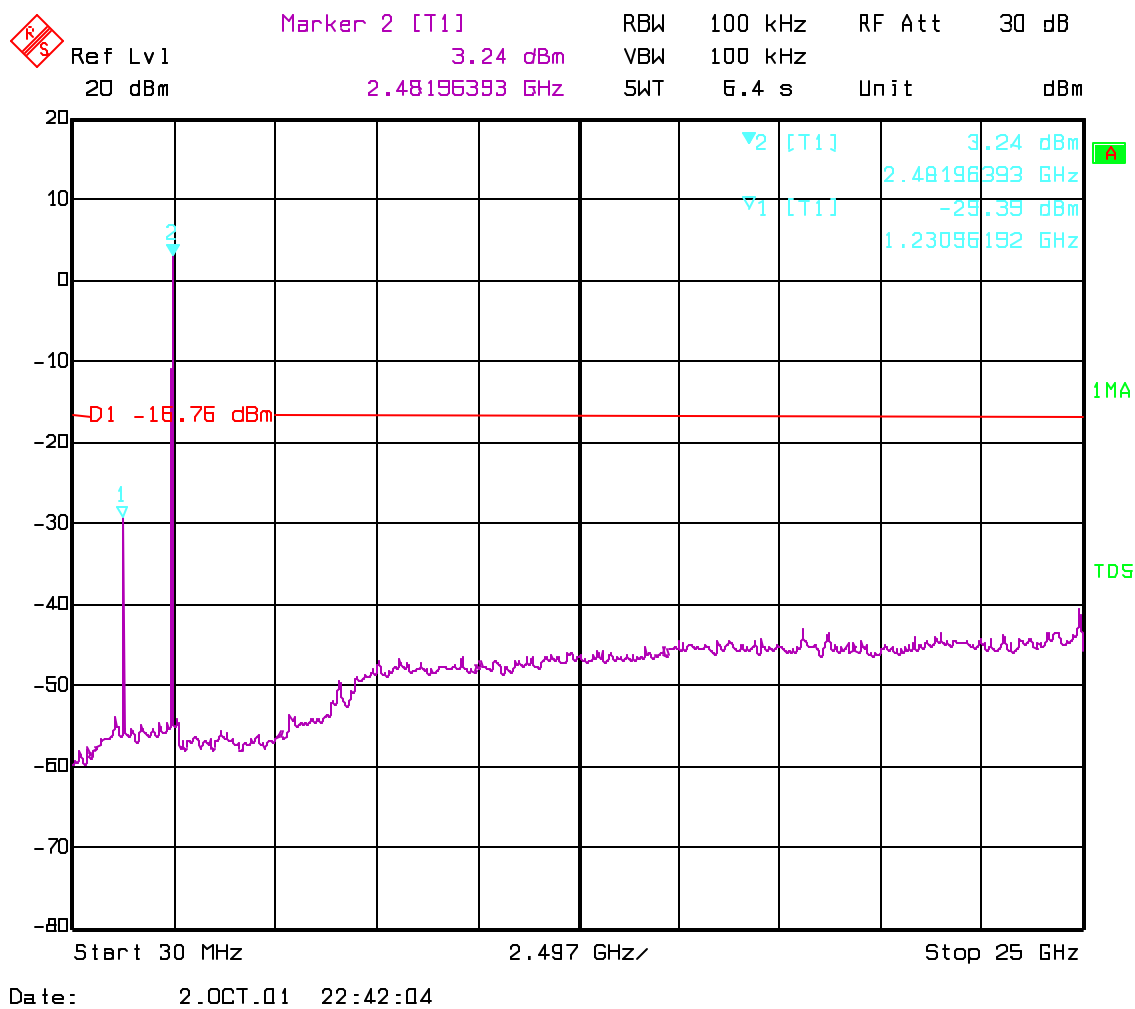
Mid Channel(2441MHz): 30MHz - 25GHz



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

EMISSION LIMITATIONS - Conducted (Transmitter) § 15.247 (c) (1)

Highest Channel(2480MHz): 30MHz - 25GHz



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

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.

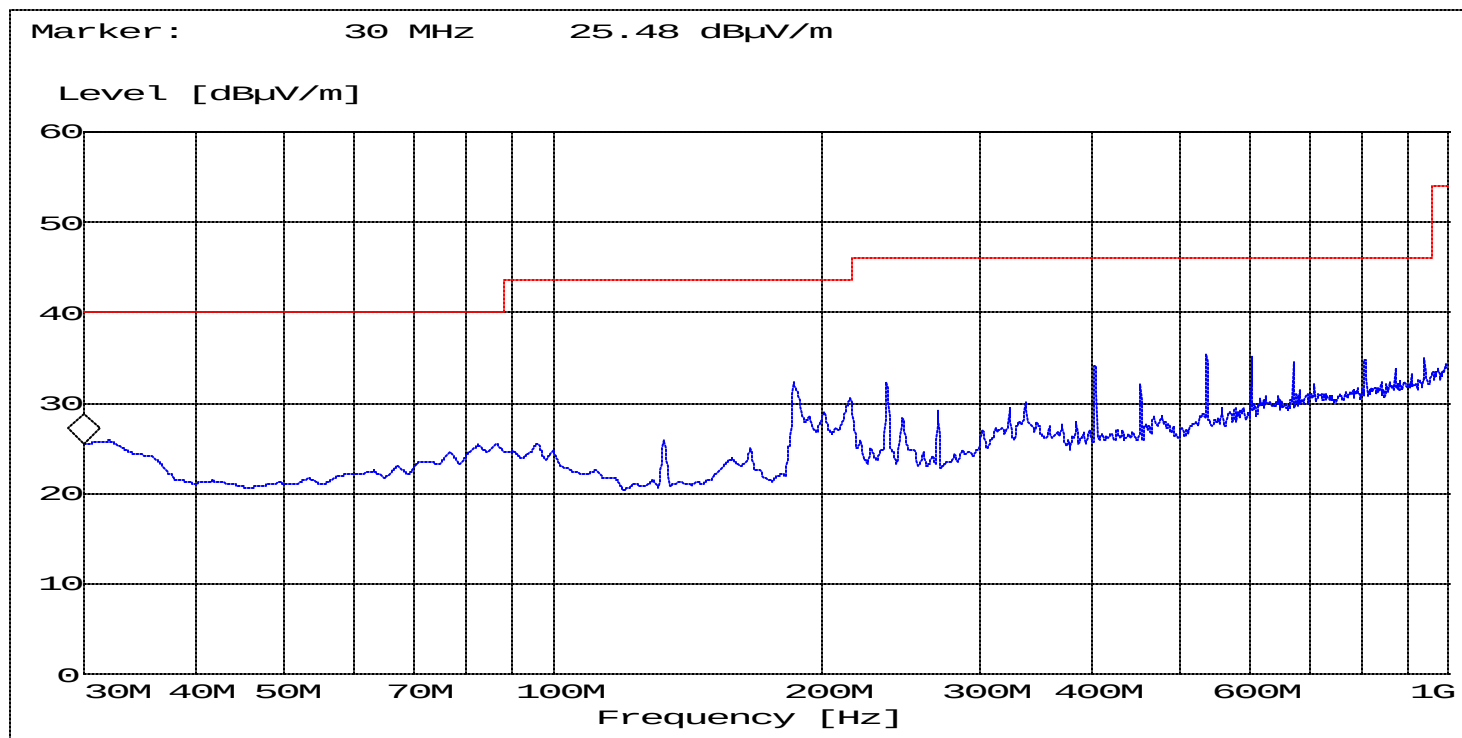
Results for the radiated measurements below 30MHz according § 15.33

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



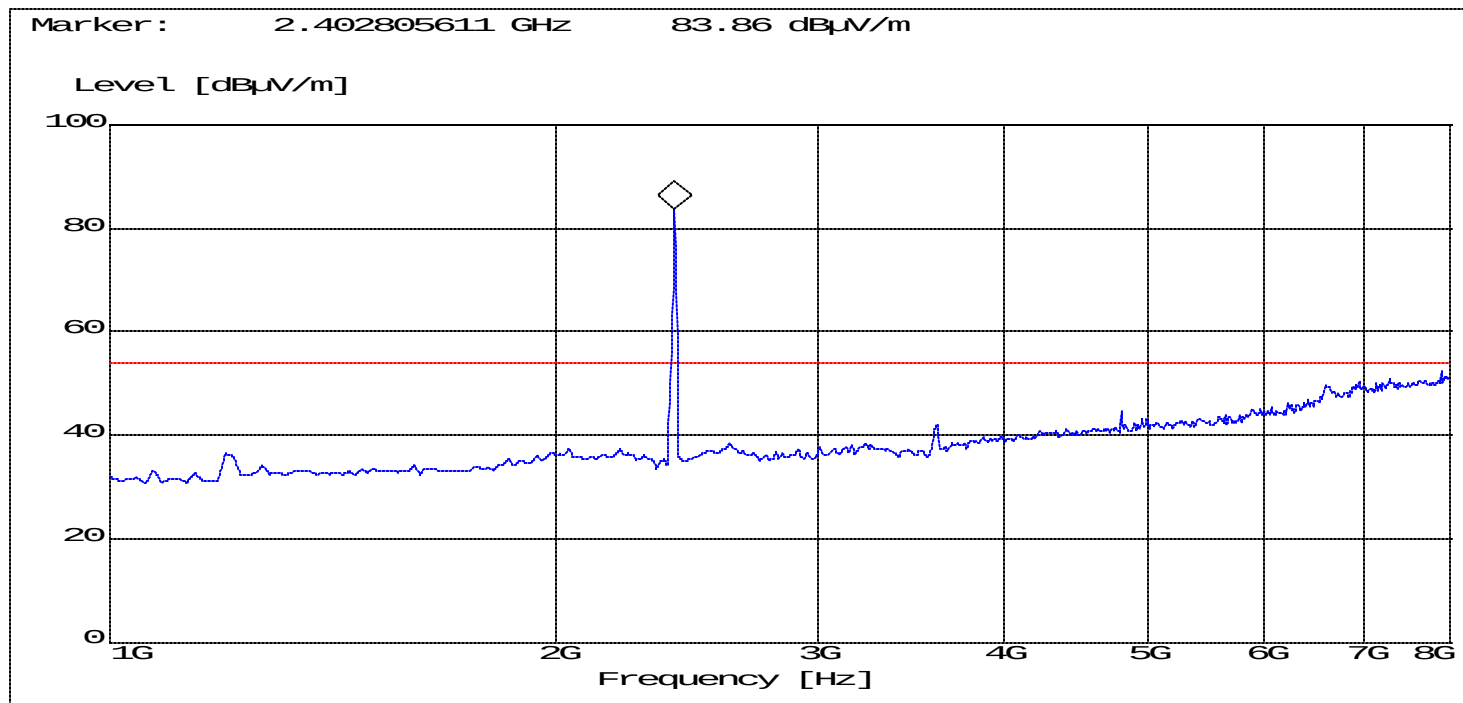
ANALYZER SETTINGS: RBW = 100KHz VBW = 100KHz

EMISSION LIMITATIONS - Radiated (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Lowest Channel(2402MHz): 1GHz – 8GHz

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

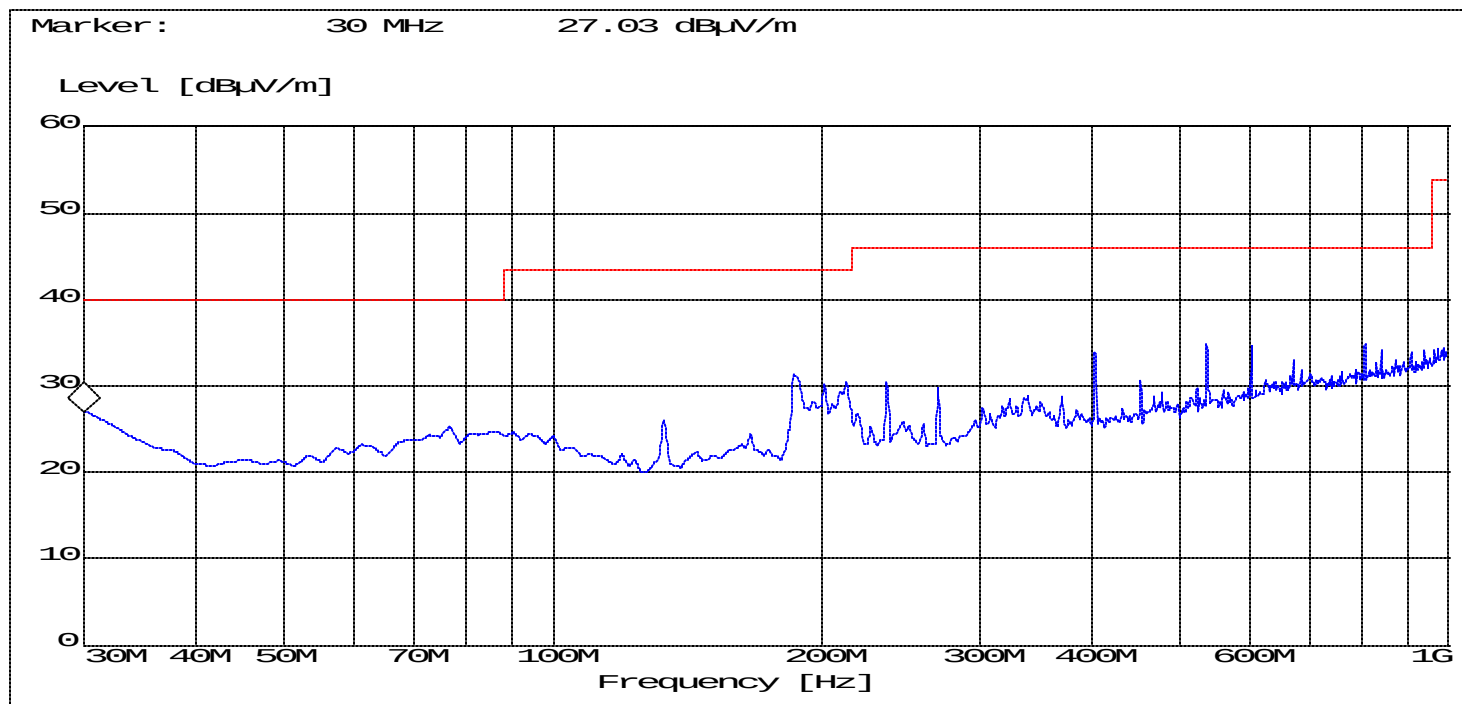


ANALYZER SETTINGS: RBW = 1MHz VBW = 1MHz

EMISSION LIMITATIONS - Radiated (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Mid Channel(2441MHz): 30MHz – 1GHz



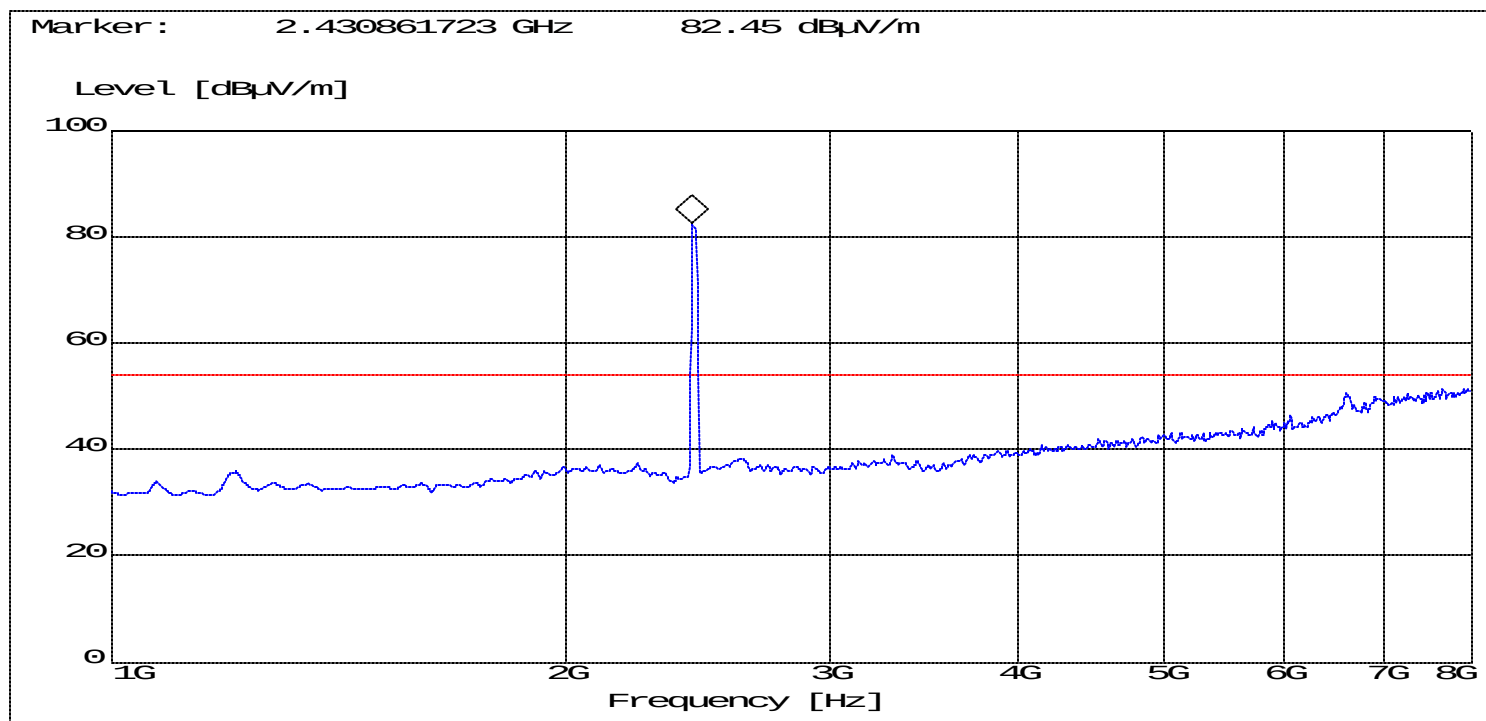
ANALYZER SETTINGS: RBW = 100KHz VBW = 100KHz

EMISSION LIMITATIONS - Radiated (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Mid Channel(2441MHz): 1GHz – 8GHz

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

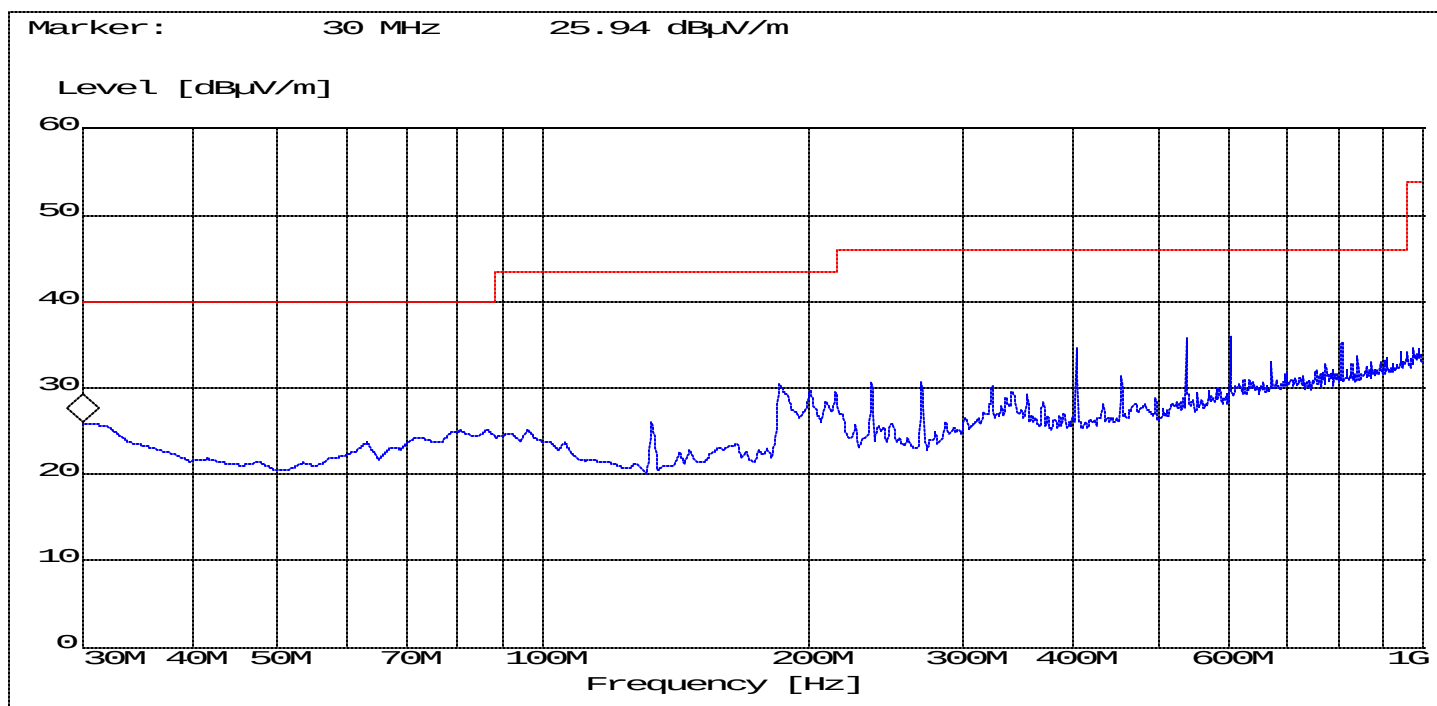


ANALYZER SETTINGS: RBW = 1MHz VBW = 1MHz

EMISSION LIMITATIONS - Radiated (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

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



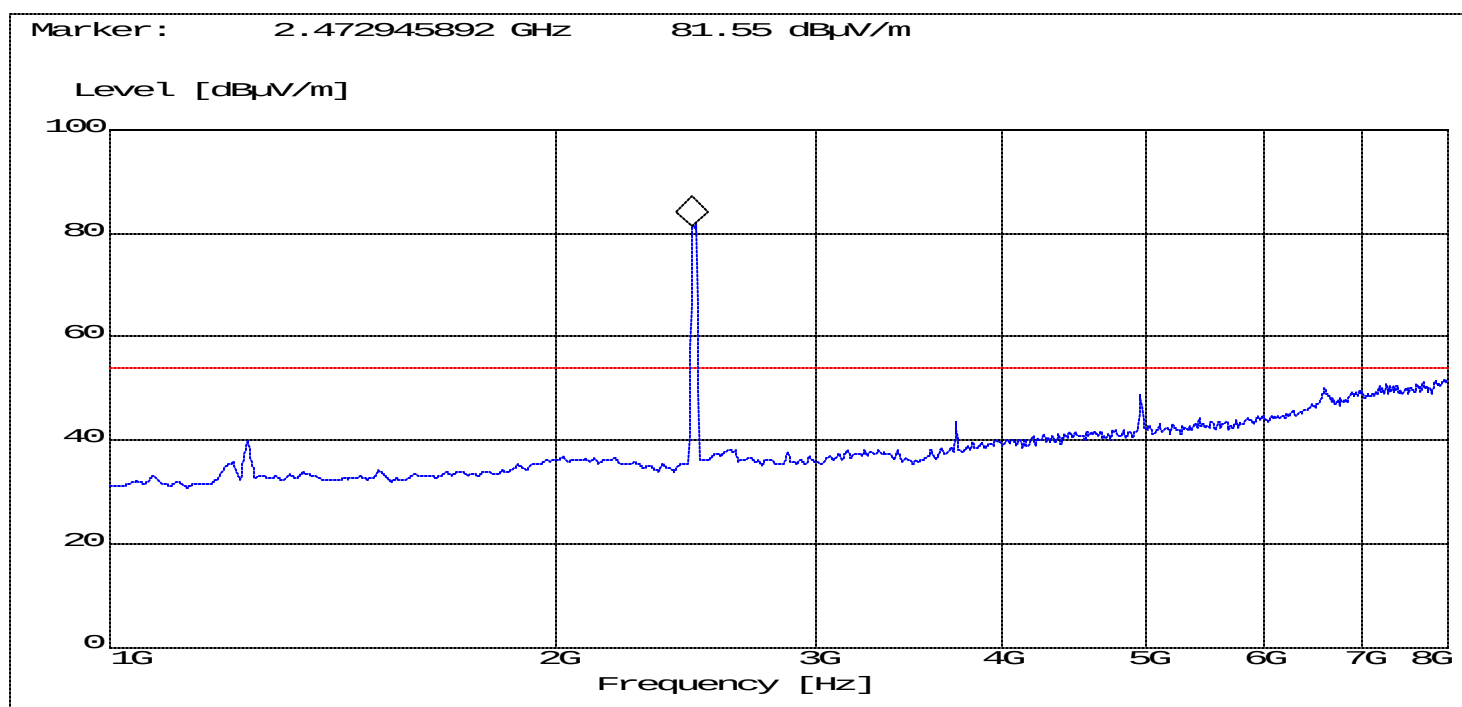
ANALYZER SETTINGS: RBW = 100KHz VBW = 100KHz

EMISSION LIMITATIONS - Radiated (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

Highest Channel: 1GHz – 8GHz

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



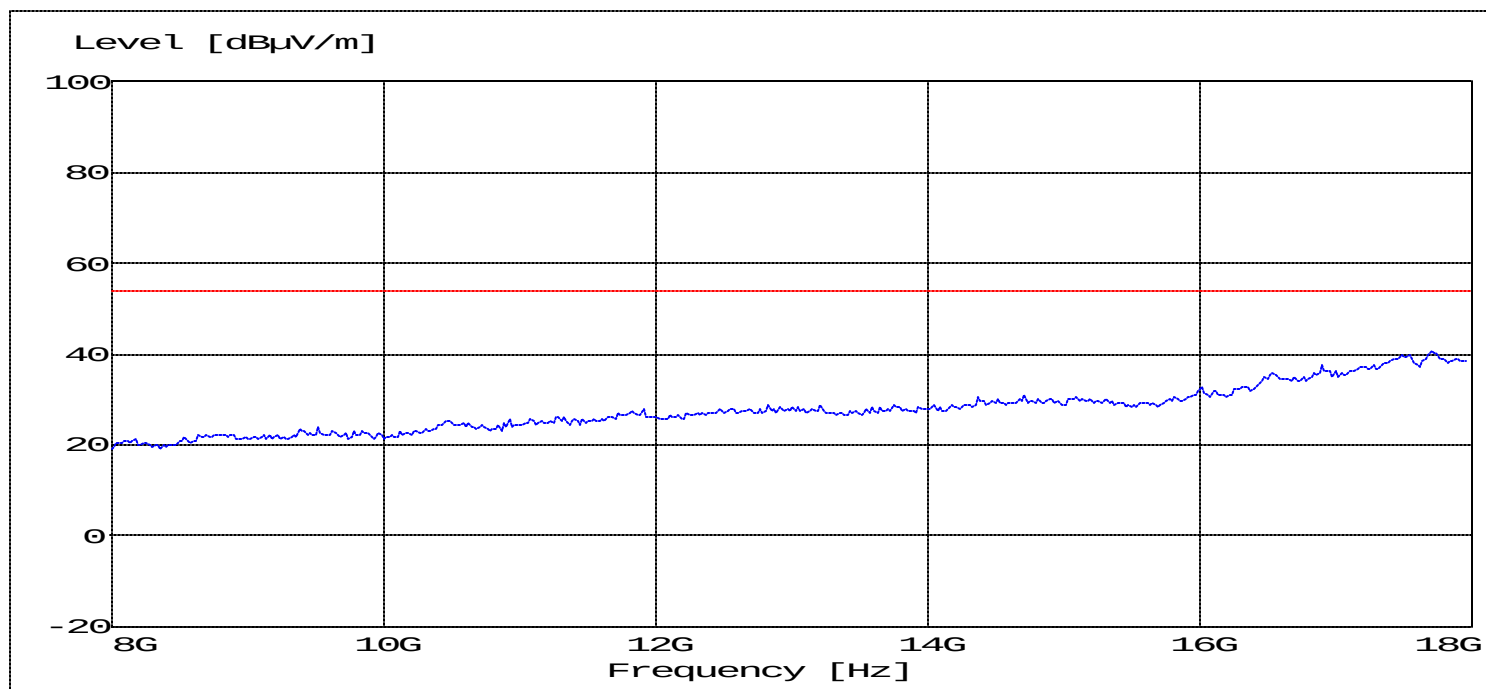
ANALYZER SETTINGS: RBW = 1MHz VBW = 1MHz

EMISSION LIMITATIONS - Radiated (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

8GHz – 18GHz

(This plot is valid for all three channels)



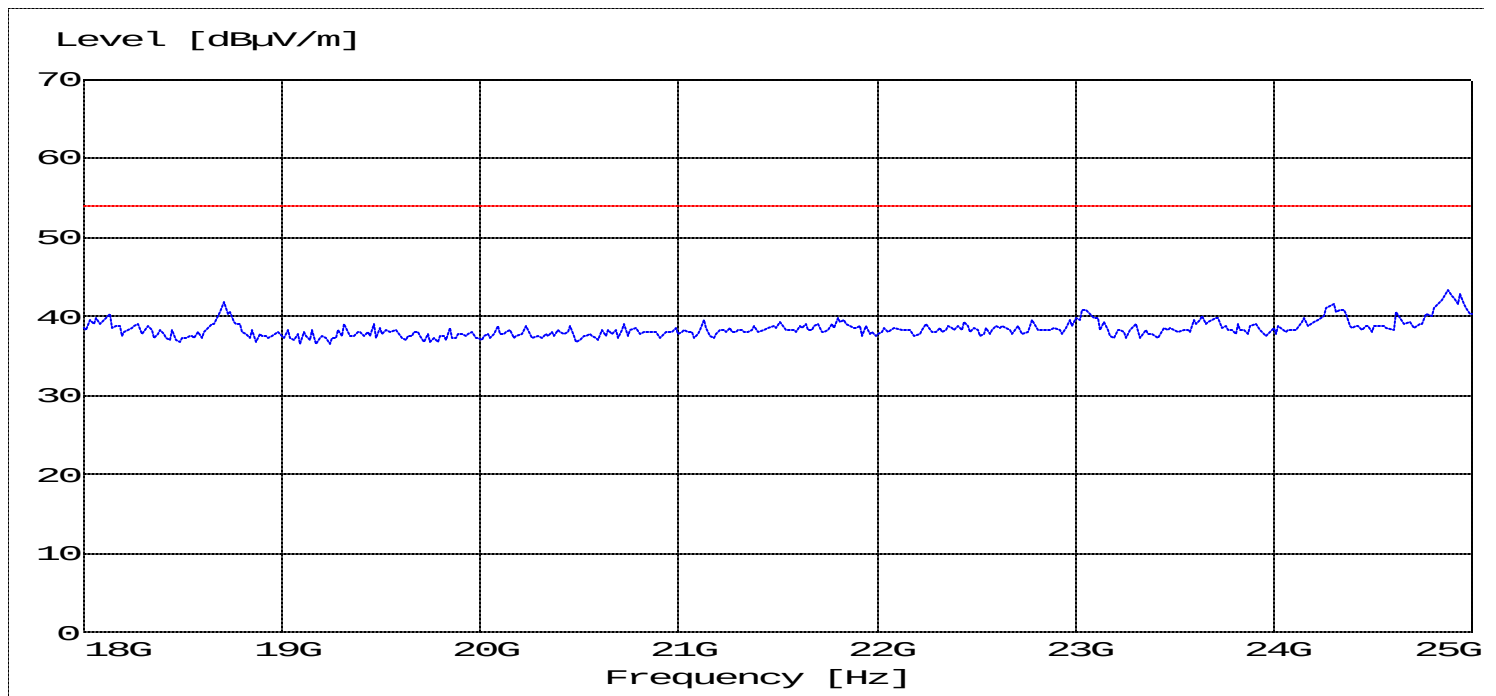
ANALYZER SETTINGS: RBW = 1MHz VBW = 1MHz

EMISSION LIMITATIONS - Radiated (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

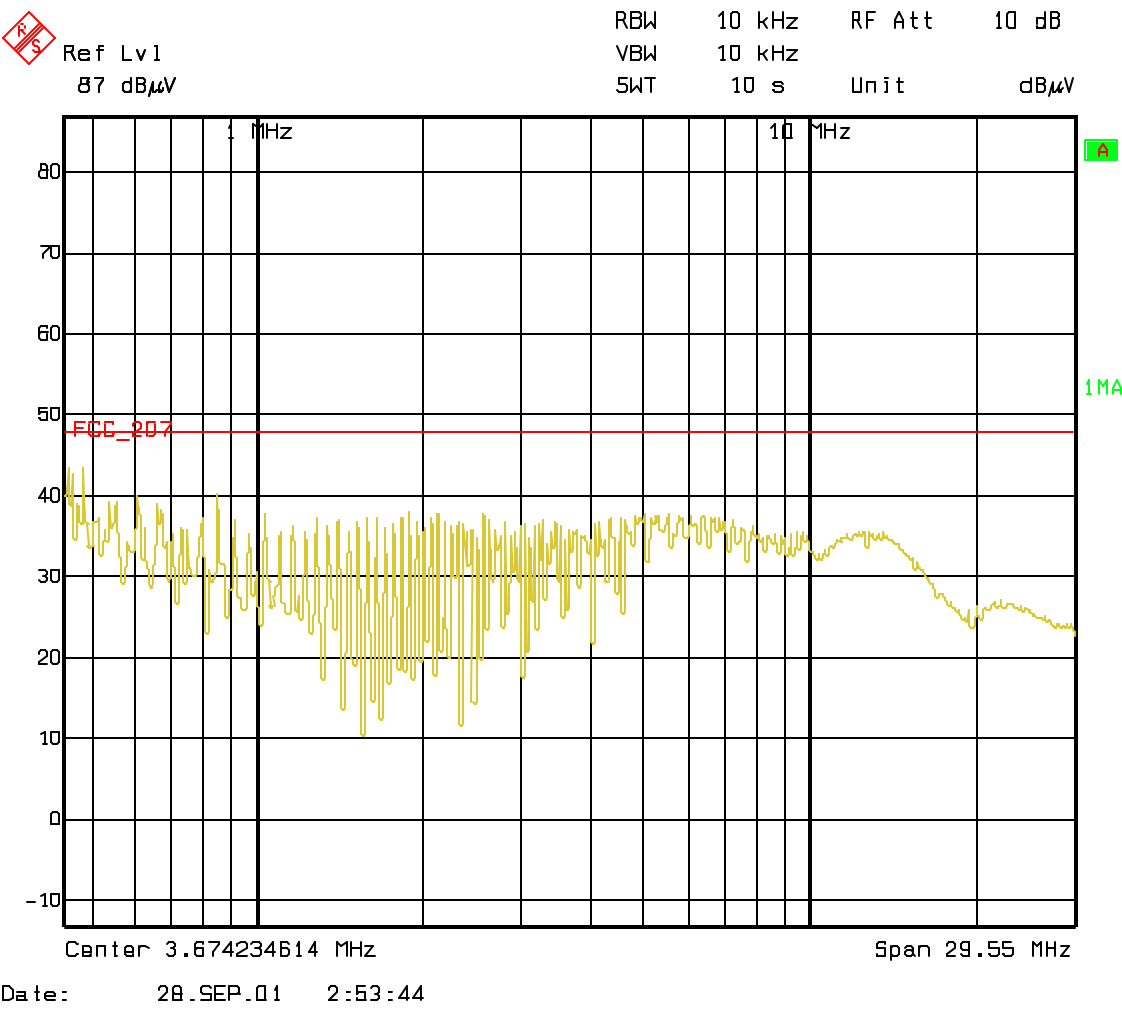
18GHz – 25GHz

(This plot is valid for all three channels)



ANALYZER SETTINGS: RBW = 1MHz VBW = 1MHz

CONDUCTED EMISSIONS § 15.107/207
Measured with AC/DC power adapter
Phase: Line

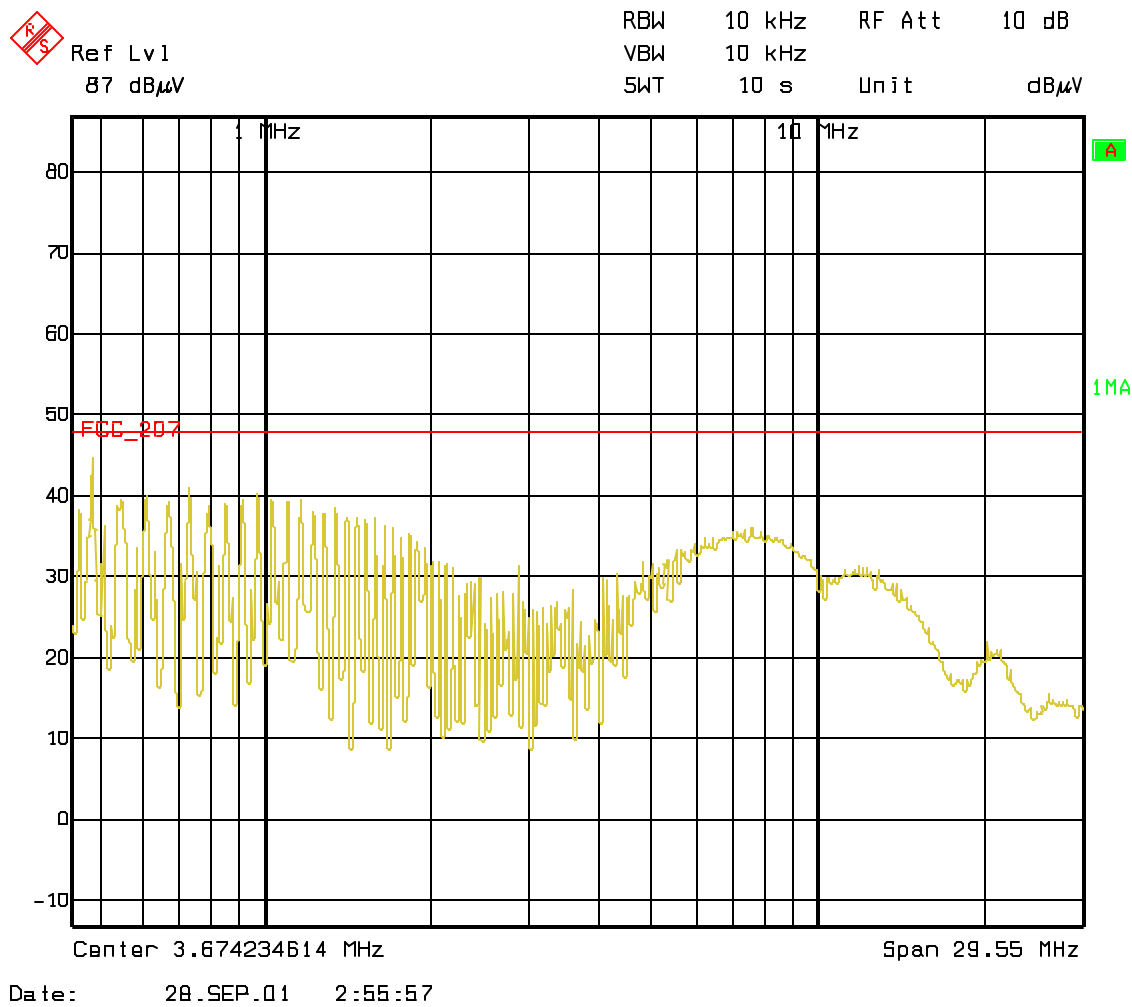


Technical specification: 15.107 / 15.207 (Revised as of October 1, 1991)
Limit

0.45 to 30 MHz	250 µV / 47.96dBµV
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ANALYZER SETTINGS: RBW = 10KHz VBW = 10KHz

Phase: Neutral



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

Limit

0.45 to 30 MHz	250 μ V / 47.96dB μ V
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ANALYZER SETTINGS: RBW = 10KHz VBW = 10KHz

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:

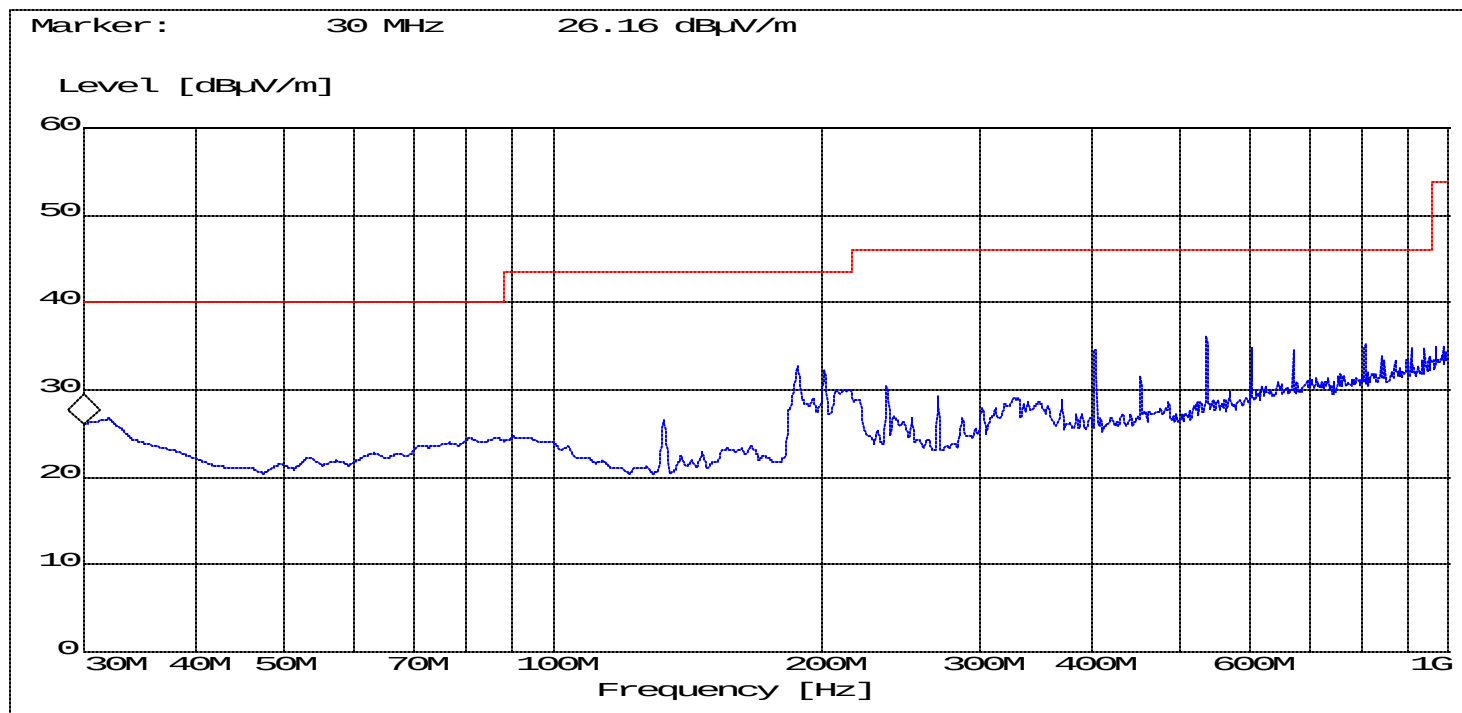
1. The radiated emissions were done with different settings, using the relevant pre-amplifiers for the relevant frequency ranges. This is the reason that the graphs show different noise levels. In the range between 18 and 25 GHz very short cable connections to the antenna was used to minimize the noise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

RECEIVER SPURIOUS RADIATION

§ 15.209

30MHz – 1GHz

(This plot is valid for all three channels)



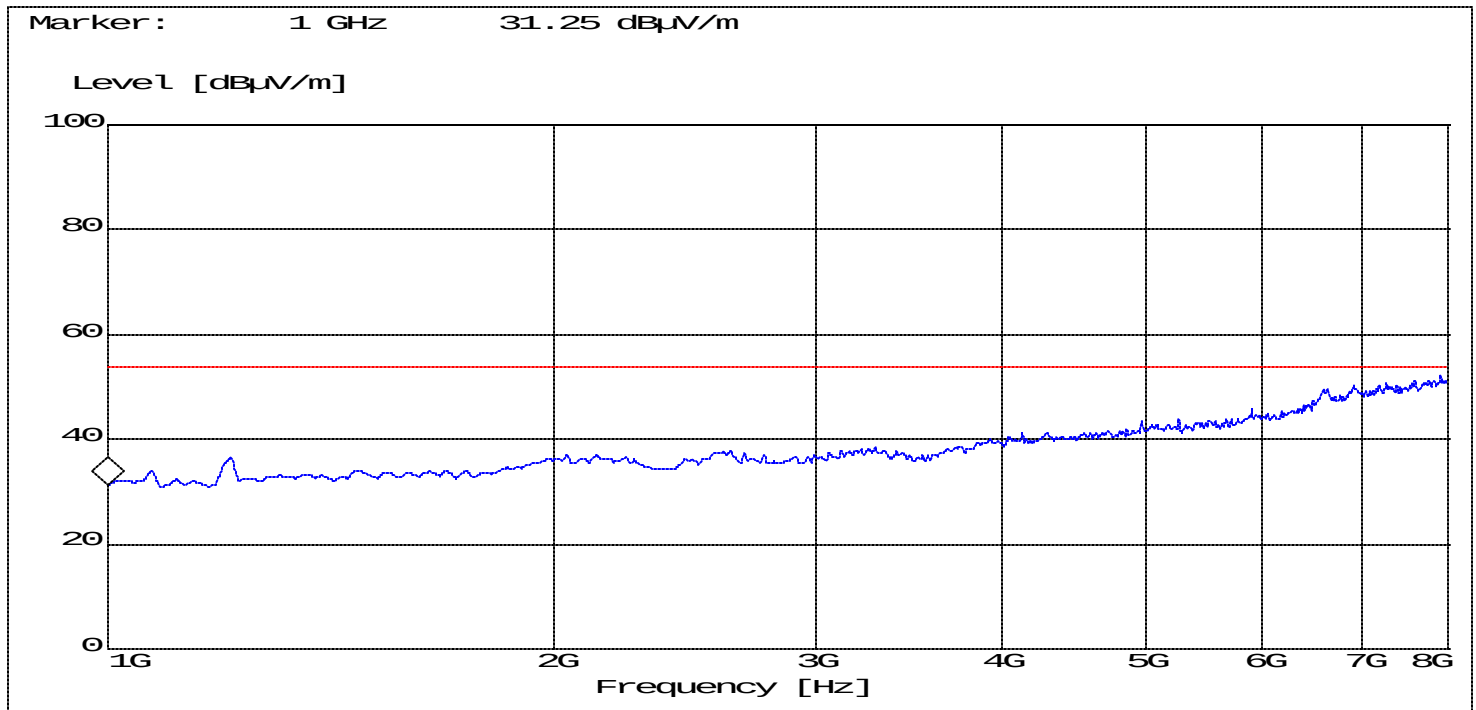
ANALYZER SETTINGS: RBW = 100KHz VBW = 100KHz

RECEIVER SPURIOUS RADIATION

§ 15.209

1GHz – 8GHz

(This plot is valid for all three channels)



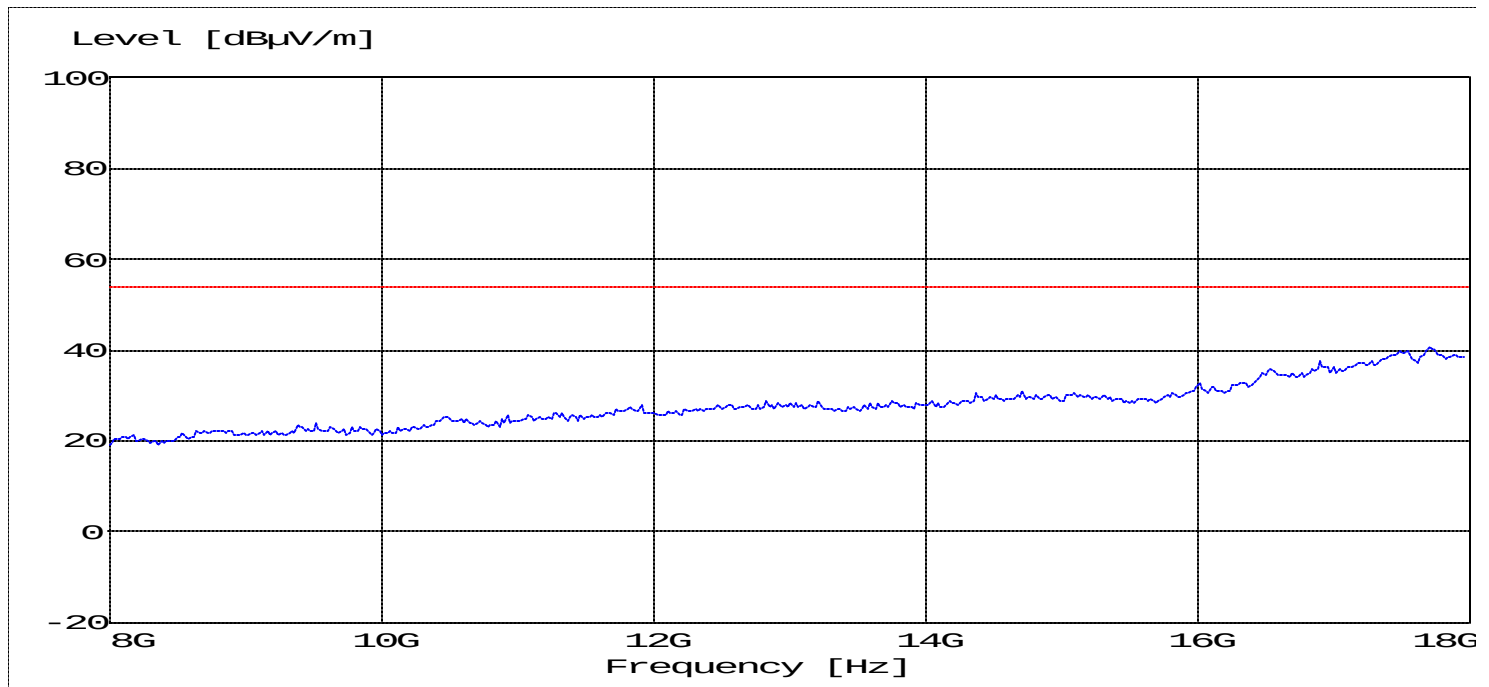
ANALYZER SETTINGS: RBW = 1MHz VBW = 1MHz

RECEIVER SPURIOUS RADIATION

§ 15.209

8GHz – 18GHz

(This plot is valid for all three channels)



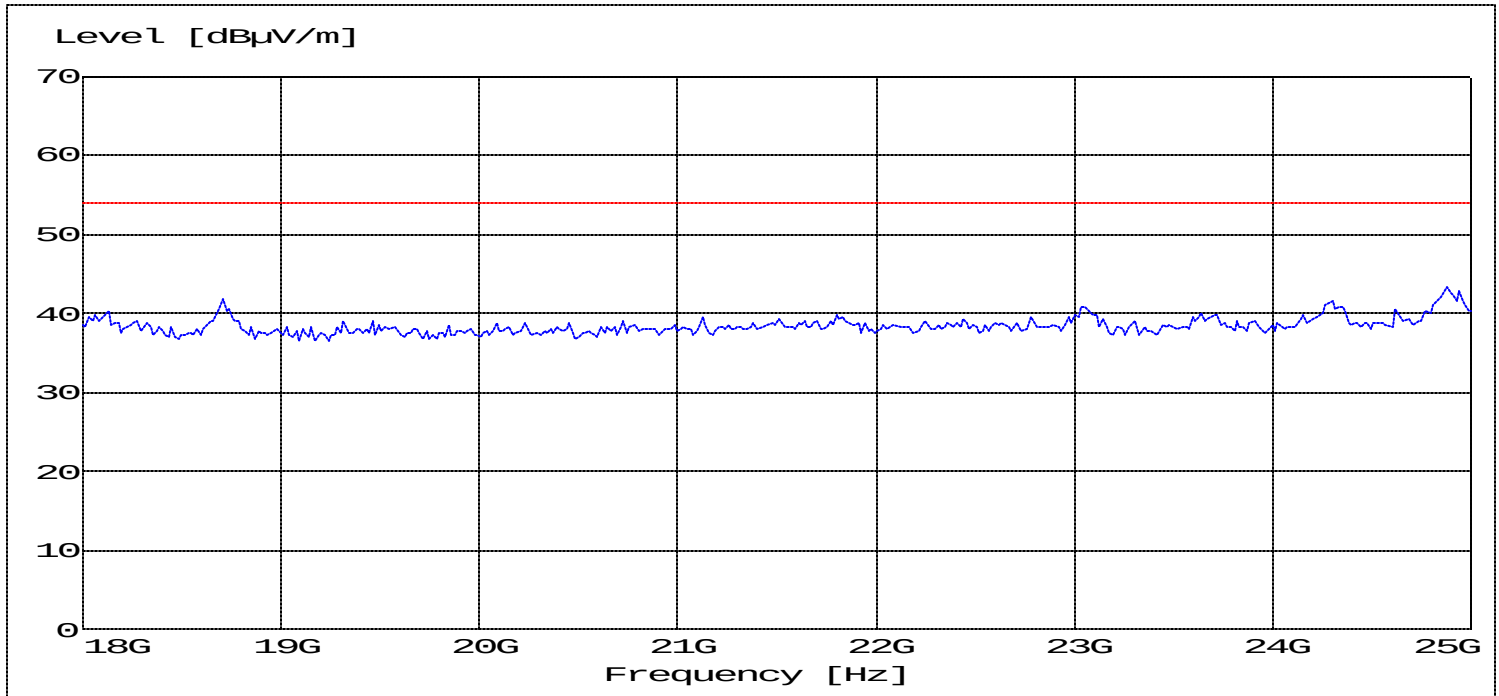
ANALYZER SETTINGS: RBW = 1MHz VBW = 1MHz

RECEIVER SPURIOUS RADIATION

§ 15.209

18GHz – 26GHz

(This plot is valid for all three channels)



ANALYZER SETTINGS: RBW = 1MHz VBW = 1MHz

TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

[illegible]