



# FCC Test Report

Test report no.: EMC\_614FCC15.247\_2004\_M2500

FCC Part 15.247 for FHSS systems / CANADA RSS-210

Model: M2500

FCC ID: AL8-M2500

IC: 457A-M2500



**TTI-P-G 081/94-A0**

Accredited according to **ISO/IEC 17025**



FCC listed # 101450

IC recognized # 3925

## **CETECOM Inc.**

411 Dixon Landing Road ♦ Milpitas, CA 95035 ♦ U.S.A.

Phone: + 1 (408) 586 6200 ♦ Fax: + 1 (408) 586 6299 ♦ E-mail: [info@cetecomusa.com](mailto:info@cetecomusa.com) ♦ <http://www.cetecom.com>

CETECOM Inc. is a Delaware Corporation with Corporation number: 2113686

Board of Directors: Dr. Harald Ansorge, Dr. Klaus Matkey, Hans Peter May

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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 generalizations 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 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](mailto:lothar.schmidt@cetecomusa.com)**  
**Internet: [www.cetecom.com](http://www.cetecom.com)**

**1.3 Details of applicant**

**Name** : Plantronics Inc.  
**Street** : 345 Encinal Street  
**City / Zip Code** : Santa Cruz, Ca 95060  
**Country** : USA  
**Contact** : Sid Sin  
**Telephone** : +831 458 4476  
**Tele-fax** : +831 429 5731  
**e-mail** : [sid.sin@plantronics.com](mailto:sid.sin@plantronics.com)

**1.4 Application details**

Date of receipt test item : 2004-02-09  
Date of test : 2004-02-11/12/13/15/16/18

**1.5 Test item**

Manufacturer : Applicant  
Marketing Name : M2500  
Model No. : M2500  
[Description](#) : [Bluetooth Headset](#)  
FCC-ID : AL8-M2500  
IC ID : 457A-M2500

**Additional information**

Frequency : 2402MHz – 2480MHz  
Type of modulation : GFSK  
Number of channels : 79  
Antenna : Integral  
Power supply : NiMH Battery (170mAH)  
Output power : 1.89dBm (1.545mW) max. conducted peak power  
Extreme vol. Limits : 2.2 – 2.9VDC (2.5VDC nominal)  
Extreme temp. Tolerance : 0°C-55°C

**1.6 Test standards:** FCC Part 15 §15.247 (DA00-705) / RSS 210

**Note:** All radiated measurements were made in all three orthogonal planes. The values reported are the maximum values.

**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

Final Verdict:  
(only “passed” if all single measurements are “passed”)

**Passed**

**Technical responsibility for area of testing:**

2004-03-05 EMC & Radio

Lothar Schmidt  
(EMC Manager)



Date

Section

Name

Signature

**Responsible for test report and project leader:**

2004-03-05 EMC & Radio Harpreet Sidhu (EMC Engineer)



Date

Section

Name

Signature

## **2.2 Test report**

### **TEST REPORT**

**Test report no.: EMC\_614FCC15.247\_2004\_M2500  
(Model:M2500)**

**TEST REPORT REFERENCE**

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## CARRIER FREQUENCY SEPERATION

§15.247(a)



Marker 1 [T1]

RBW 30 kHz RF Att 40 dB

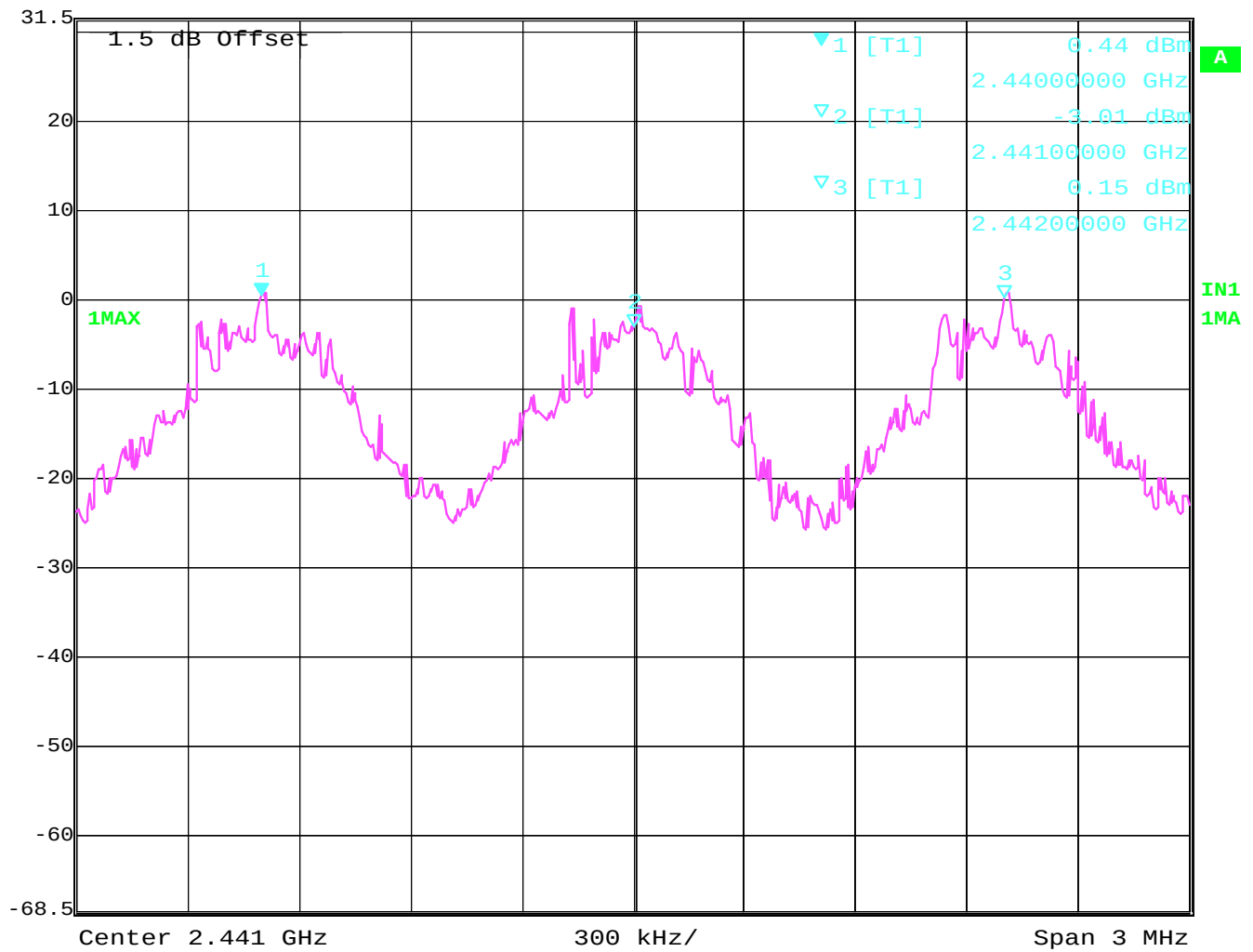
Ref Lvl 0.44 dBm

VBW 100 kHz

31.5 dBm 2.44000000 GHz

SWT 8.5 ms

Unit dBm



Date: 11.FEB.2004 08:41:25

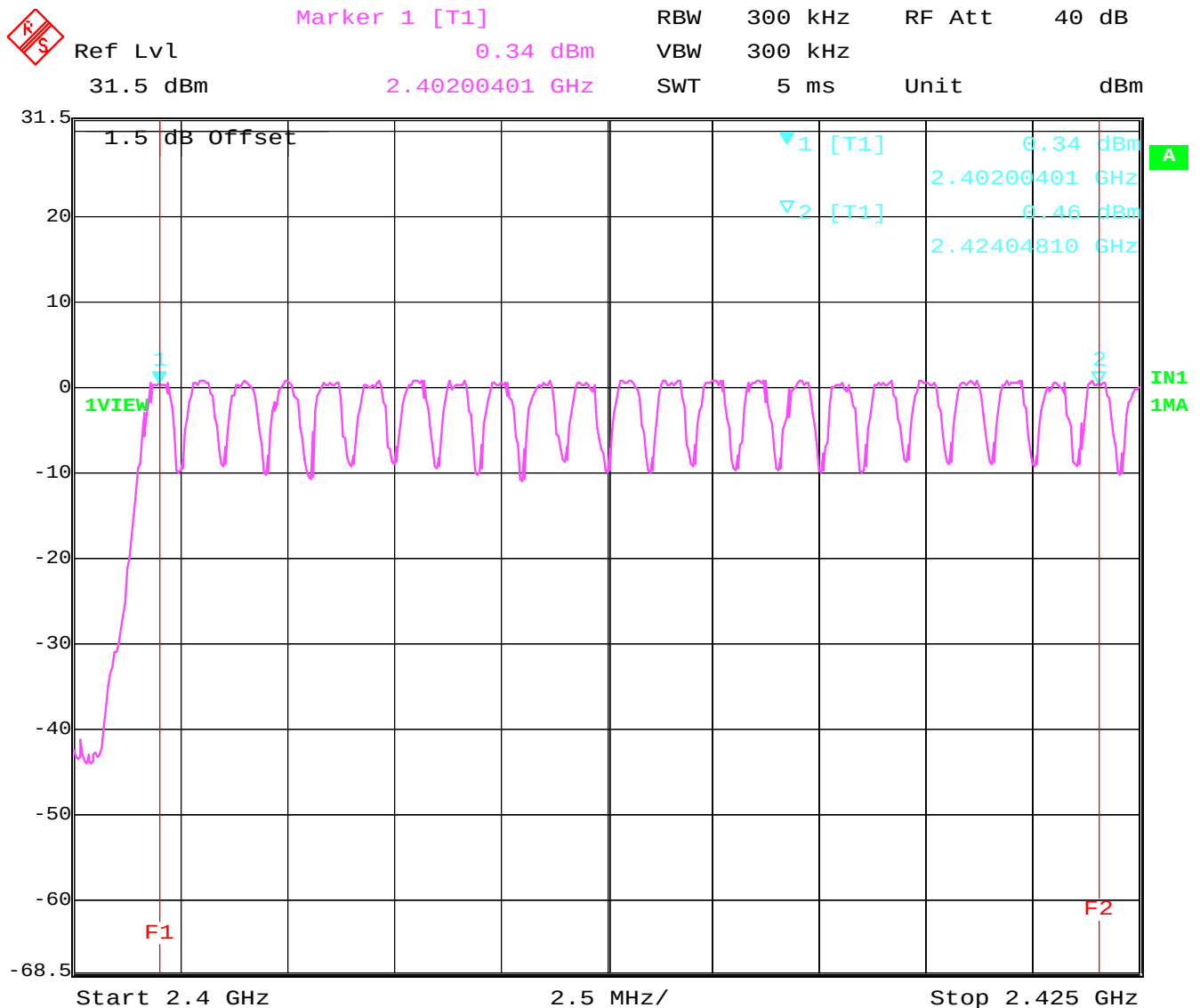
## NUMBER OF HOPPING CHANNELS

§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

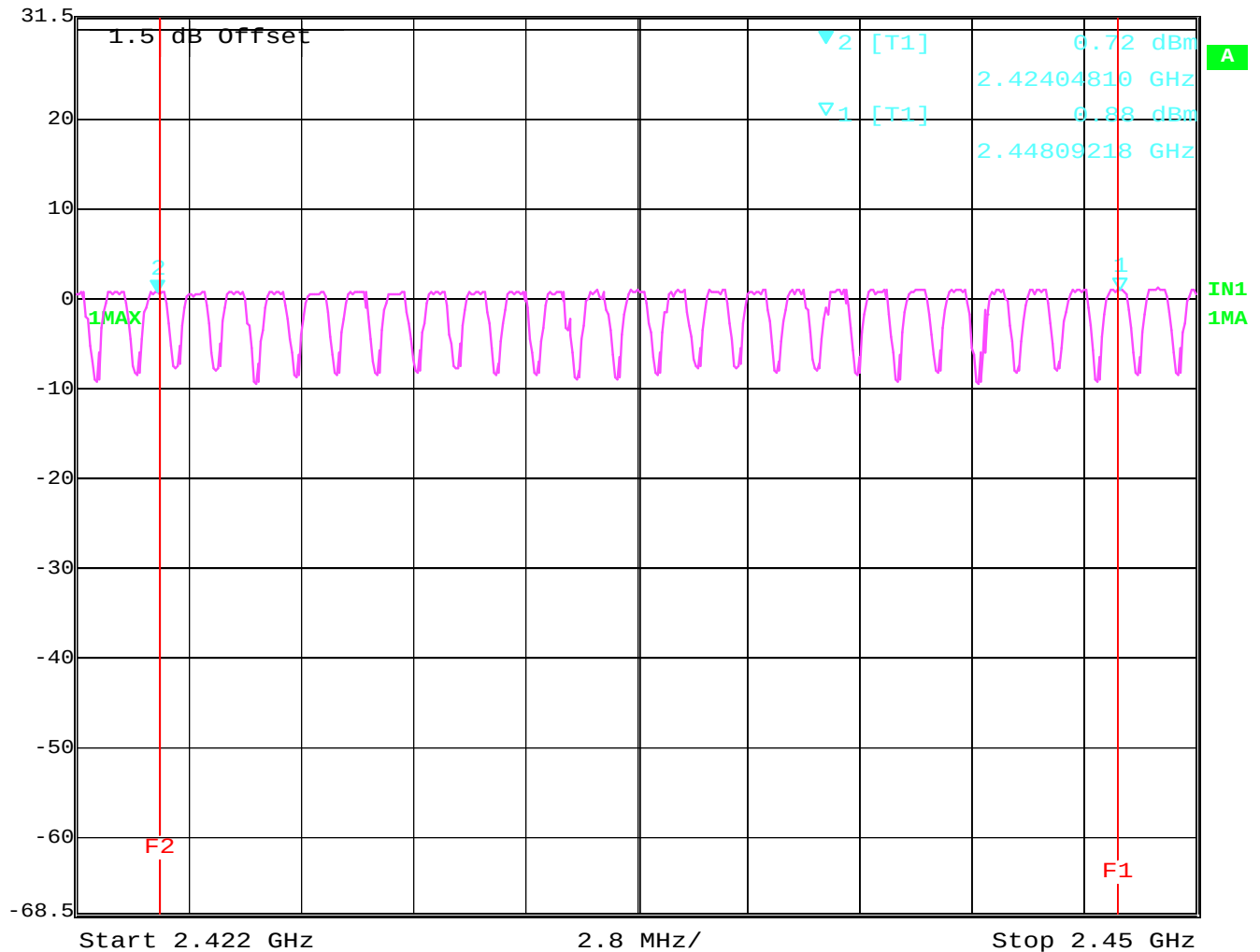


Date: 11.FEB.2004 08:57:08

## Plot 2: Total 24



Ref Lvl 31.5 dBm  
 Marker 2 [T1] 0.72 dBm  
 2.42404810 GHz  
 RBW 300 kHz  
 VBW 300 kHz  
 SWT 5 ms  
 RF Att 40 dB  
 Unit dBm

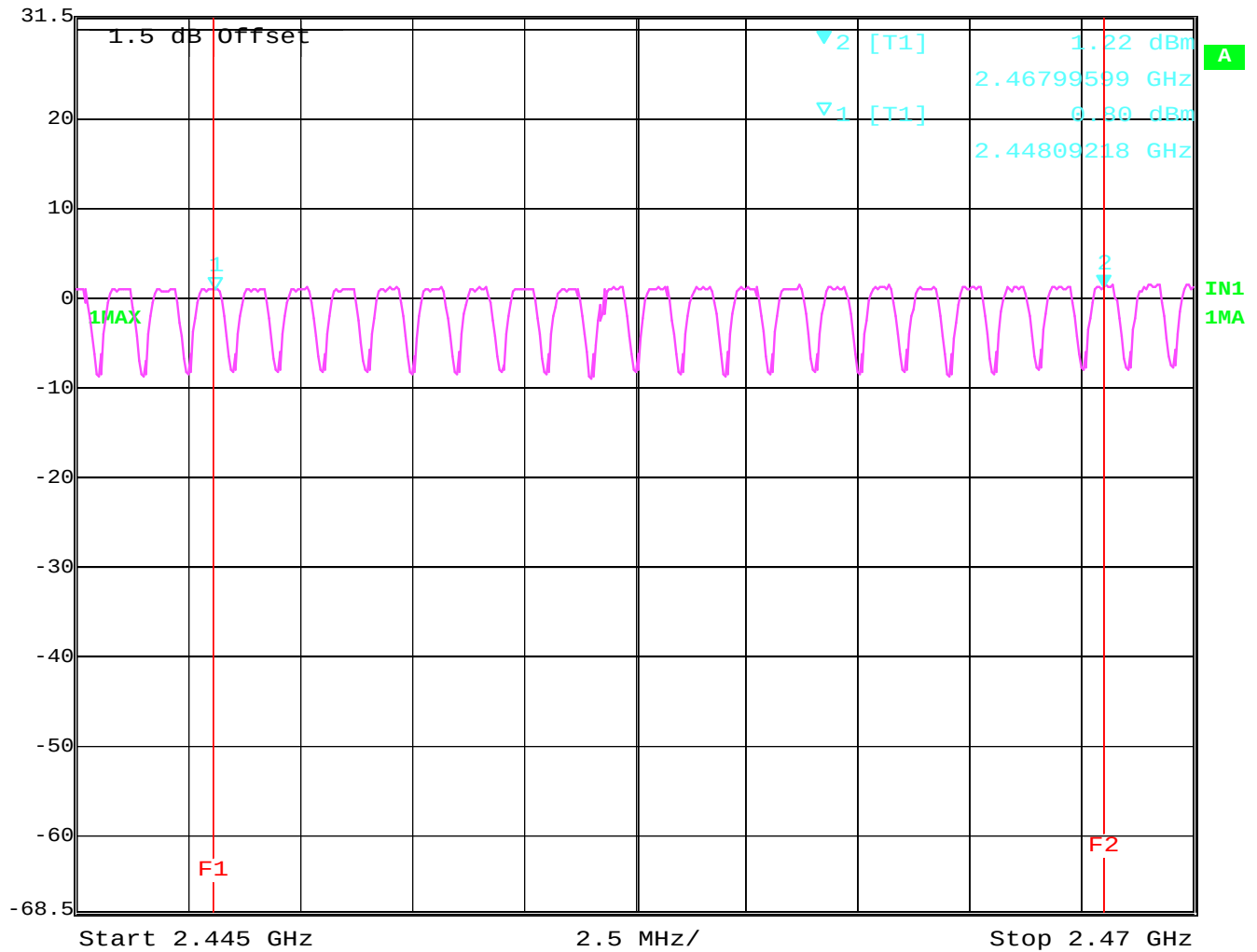


Date: 11.FEB.2004 08:59:35

## Plot 3: Total 20

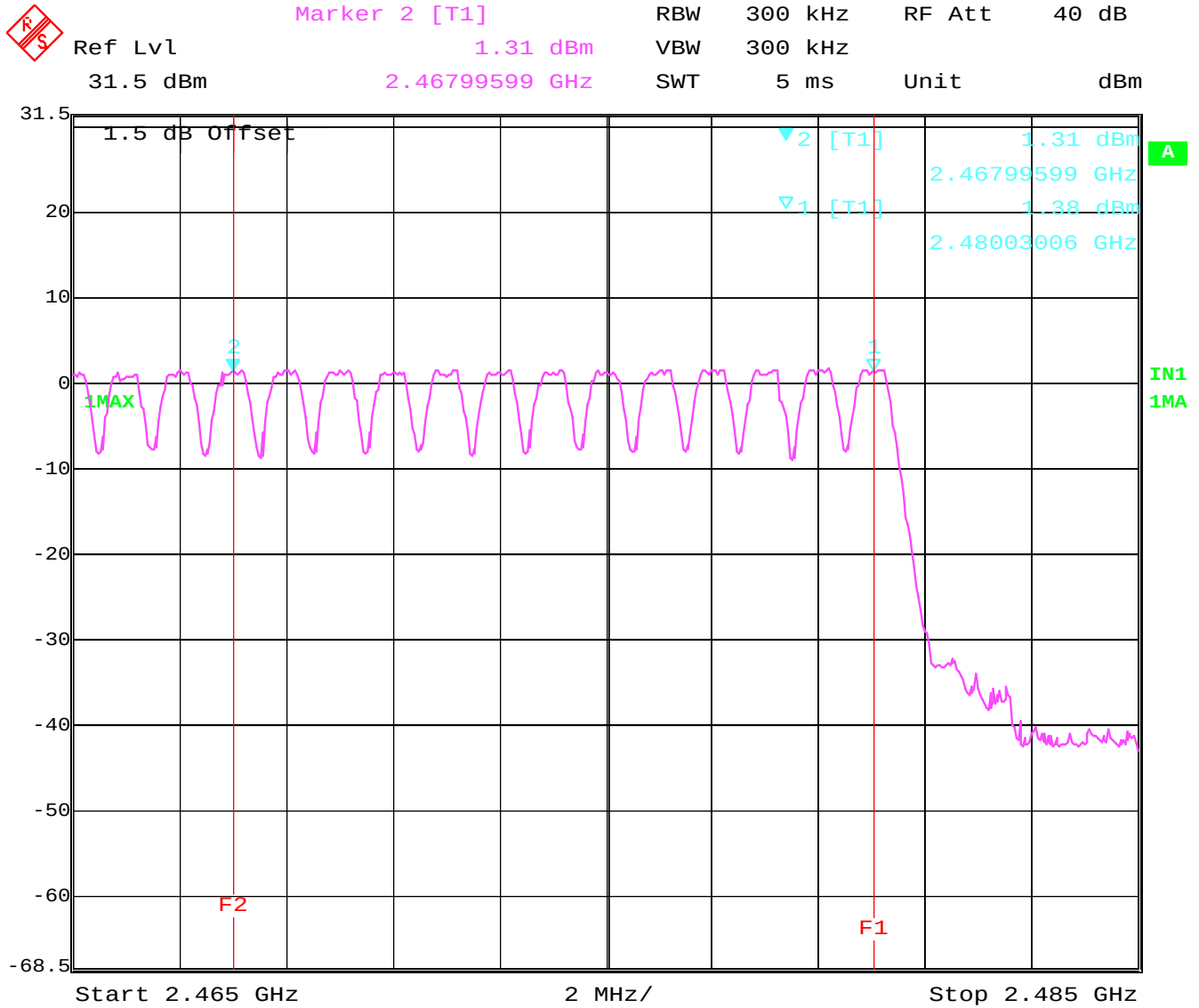


Ref Lvl 31.5 dBm  
 Marker 2 [T1] 1.22 dBm  
 2.46799599 GHz  
 RBW 300 kHz  
 VBW 300 kHz  
 SWT 5 ms  
 RF Att 40 dB  
 Unit dBm



Date: 11.FEB.2004 09:03:14

## Plot 4: Total 12



Date: 11.FEB.2004 09:05:21

## TIME OF OCCUPANCY (DWELL TIME)

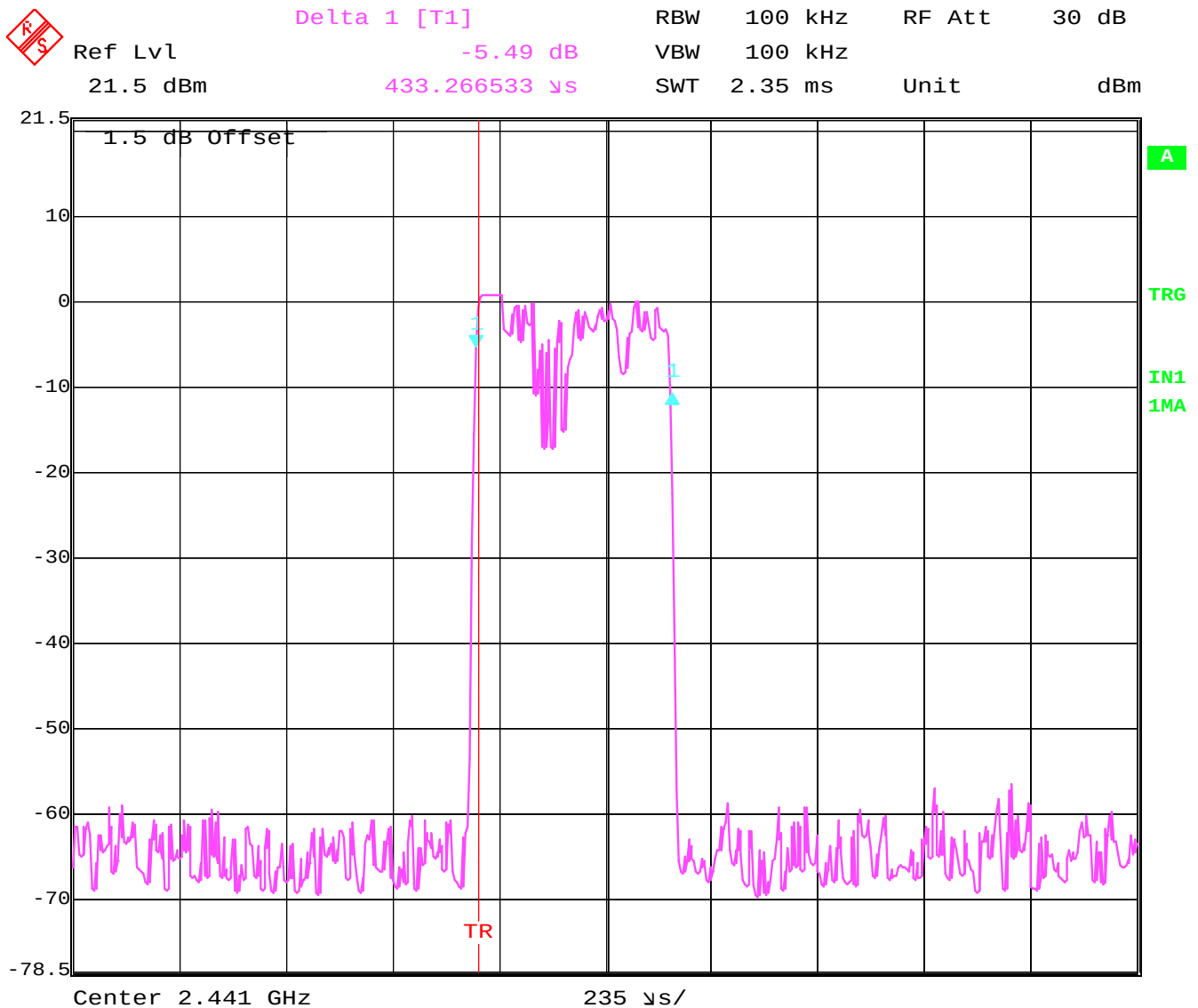
§15.247(a)

### DH1 – Packet

The system makes worst case 1600 hops per second or 1 time slot has a length of 625µs with 79 channels. A DH1 Packet need 1 time slot for transmitting and 1 time slot for receiving. Then the system makes worst case 800 hops per second with 79 channels. So you have each channel 10.13 times per second and so for 31.6 seconds you have 320.108 times of appearance.

Each Tx-time per appearance is 433.26µs.

So we have  $320.108 * 433.26\mu s = 138.69ms$  per 31.6 seconds.



Date: 11.FEB.2004 08:49:44

Date: 11.FEB.2004 08:51:11

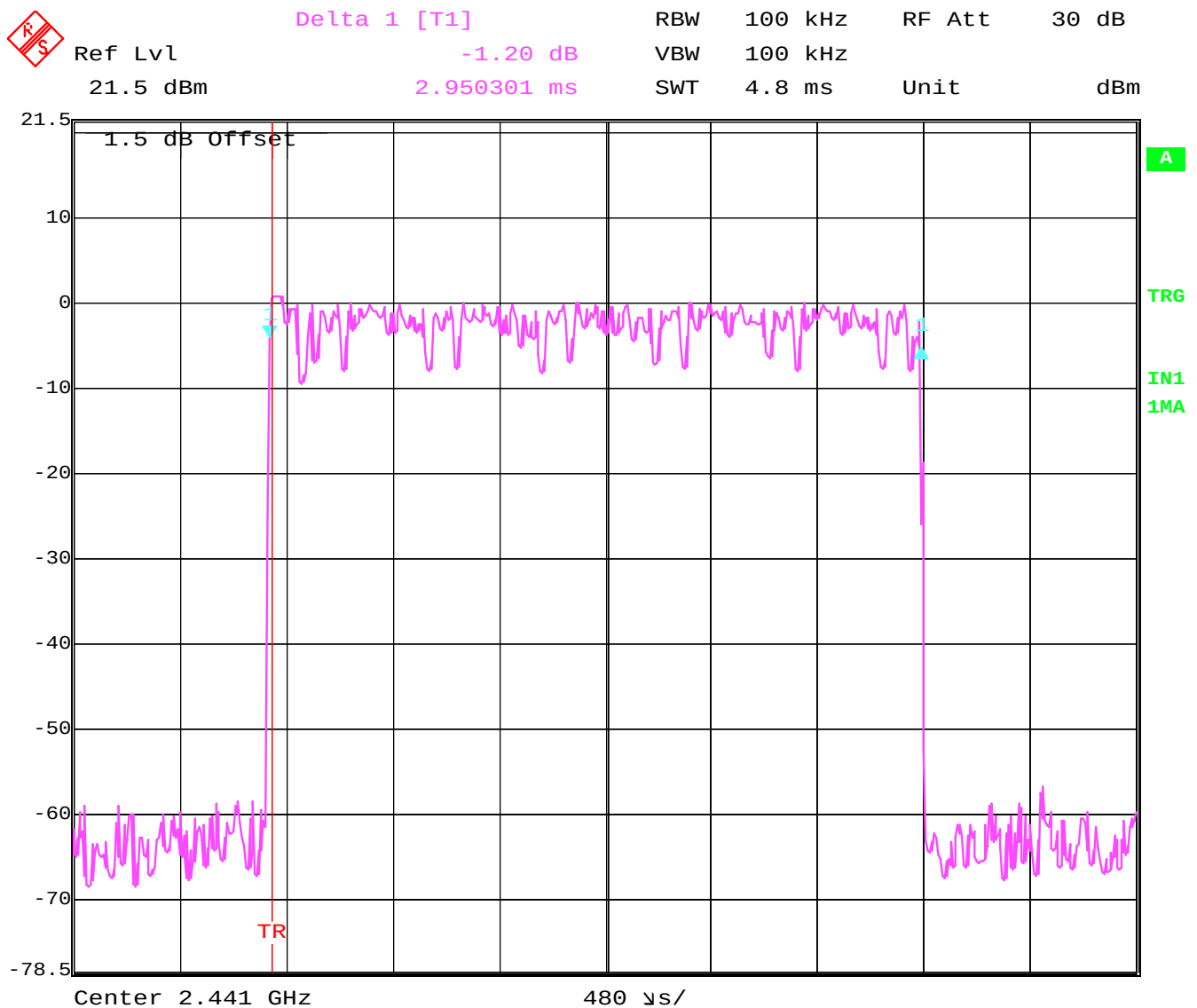
## TIME OF OCCUPANCY (DWELL TIME) DH5 – Packet

§15.247(a)

At DH5 Packets you need 5 time slots for transmit and 1 for receiving, 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 106.176 times of appearance.

Each Tx-time per appearance is 2.95ms.

So we have  $106.176 * 2.95\text{ms} = 313.21\text{ms}$  per 31.6 seconds.



Date: 11.FEB.2004 08:52:49

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

| TEST CONDITIONS         |                           | 20 dB BANDWIDTH (kHz) |        |        |
|-------------------------|---------------------------|-----------------------|--------|--------|
| Frequency (MHz)         |                           | 2402                  | 2441   | 2480   |
| T <sub>nom</sub> (23)°C | V <sub>nom</sub> (2.5)VDC | 825.65                | 825.65 | 825.65 |

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**

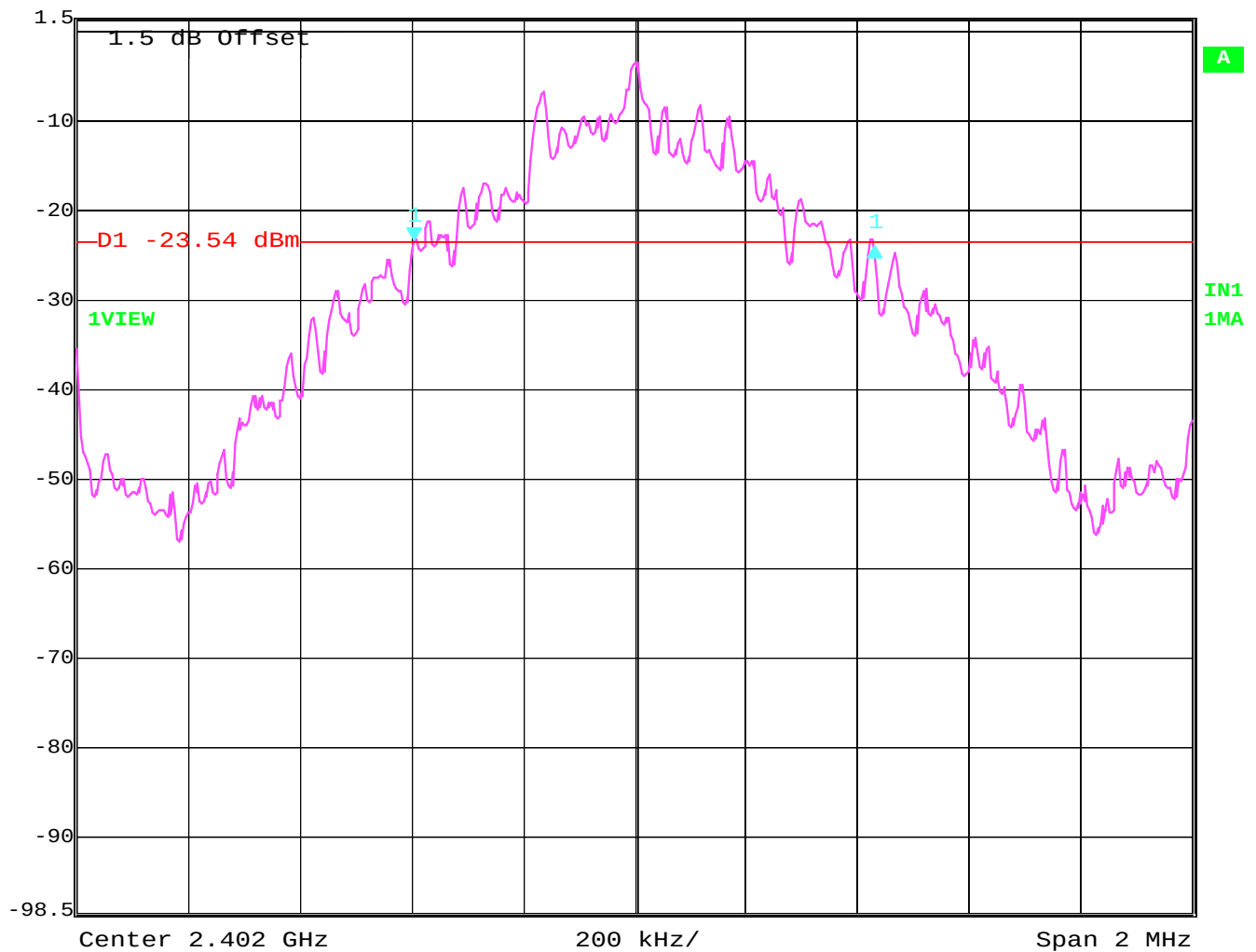
## SPECTRUM BANDWIDTH OF FHSS SYSTEM 20 dB bandwidth

§15.247(a)

Lowest Channel: 2402MHz



|         |                  |     |        |        |       |
|---------|------------------|-----|--------|--------|-------|
| Ref Lvl | Delta 1 [T1]     | RBW | 10 kHz | RF Att | 20 dB |
| 1.5 dBm | -0.64 dB         | VBW | 10 kHz |        |       |
|         | 825.65130260 kHz | SWT | 50 ms  | Unit   | dBm   |



Date: 11.FEB.2004 08:05:51

## SPECTRUM BANDWIDTH OF FHSS SYSTEM 20 dB bandwidth

§15.247(a)

Mid Channel: 2441MHz



Delta 1 [T1]

RBW 10 kHz RF Att 20 dB

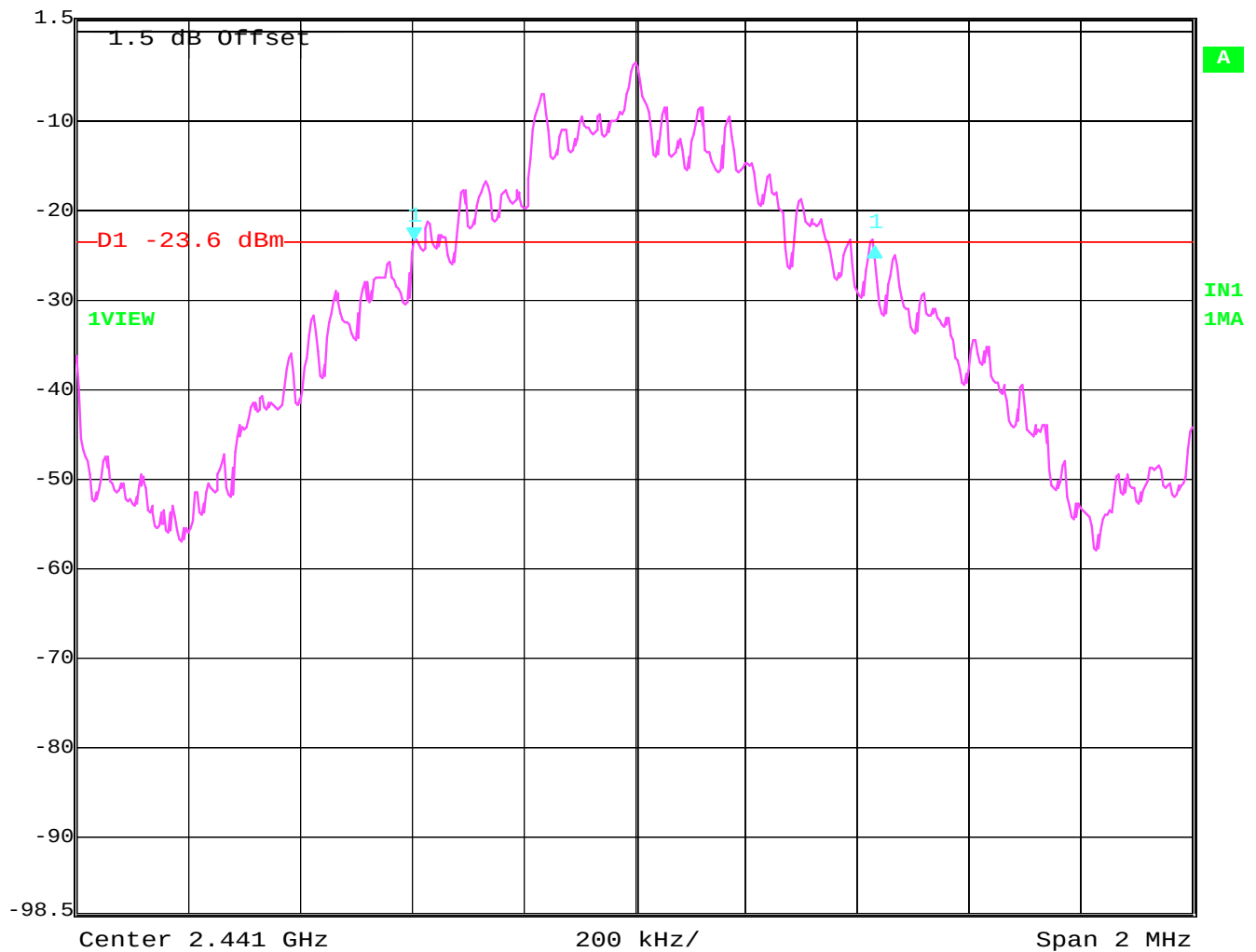
Ref Lvl -0.84 dB

VBW 10 kHz

1.5 dBm 825.65130260 kHz

SWT 50 ms

Unit dBm

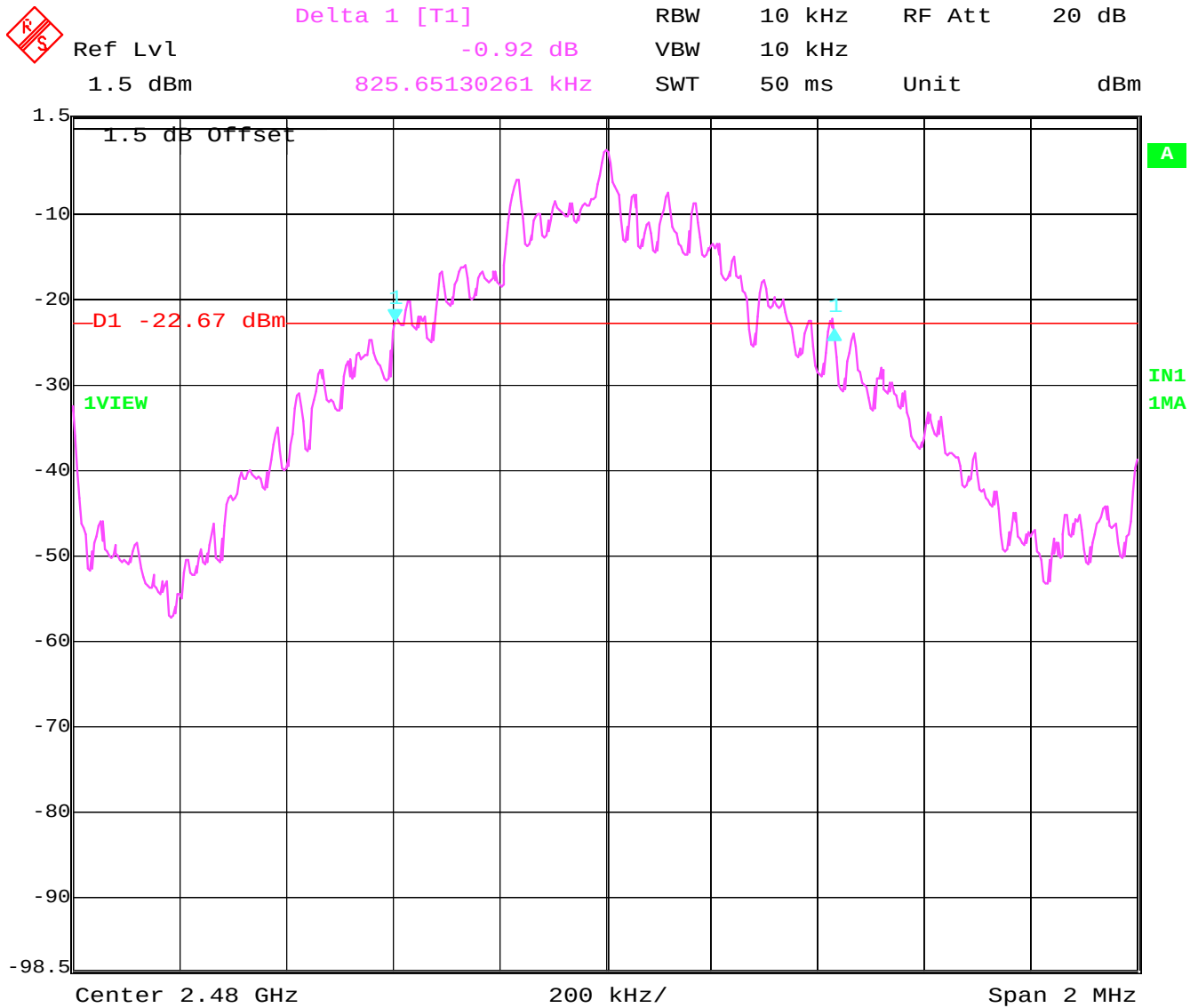


Date: 11.FEB.2004 08:07:22

## SPECTRUM BANDWIDTH OF FHSS SYSTEM 20 dB bandwidth

§15.247(a)

Highest Channel: 2480MHz



Date: 11.FEB.2004 08:08:23

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

| TEST CONDITIONS         |                           | POWER SPECTRAL DENSITY (dBm) |        |        |
|-------------------------|---------------------------|------------------------------|--------|--------|
| Frequency (MHz)         |                           | 2402                         | 2441   | 2480   |
| T <sub>nom</sub> (23)°C | V <sub>nom</sub> (2.5)VDC | -12.22                       | -12.45 | -11.75 |

**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**

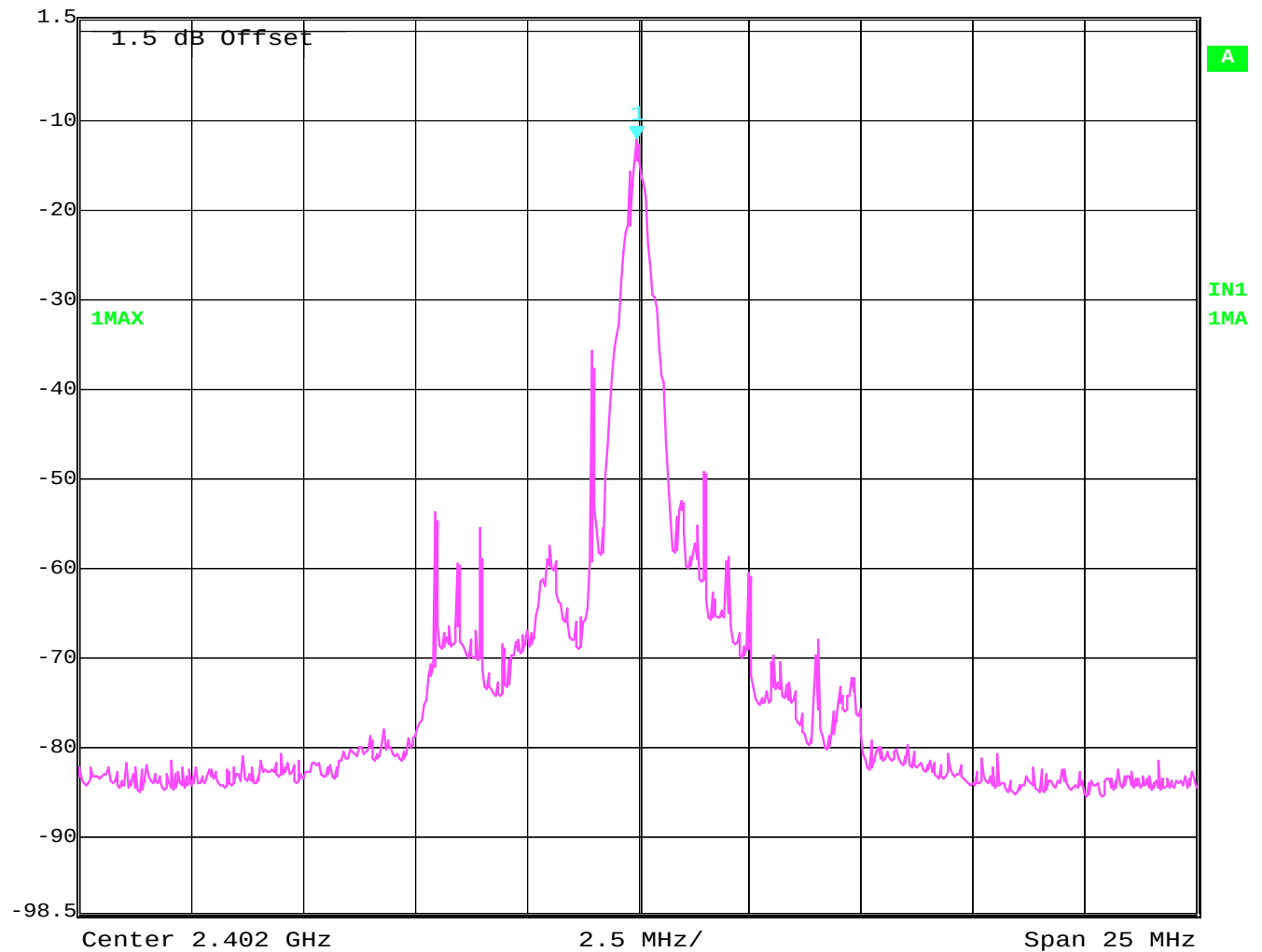
## POWER SPECTRAL DENSITY

§15.247(d)

Lowest Channel: 2402MHz



Marker 1 [T1] RBW 3 kHz RF Att 20 dB  
 Ref Lvl -12.22 dBm VBW 3 kHz  
 1.5 dBm 2.40197495 GHz SWT 7 s Unit dBm



Date: 11.FEB.2004 08:10:55

## POWER SPECTRAL DENSITY

§15.247(d)

Middle Channel: 2441MHz



Marker 1 [T1]

RBW 3 kHz RF Att 20 dB

Ref Lvl

-12.45 dBm

VBW 3 kHz

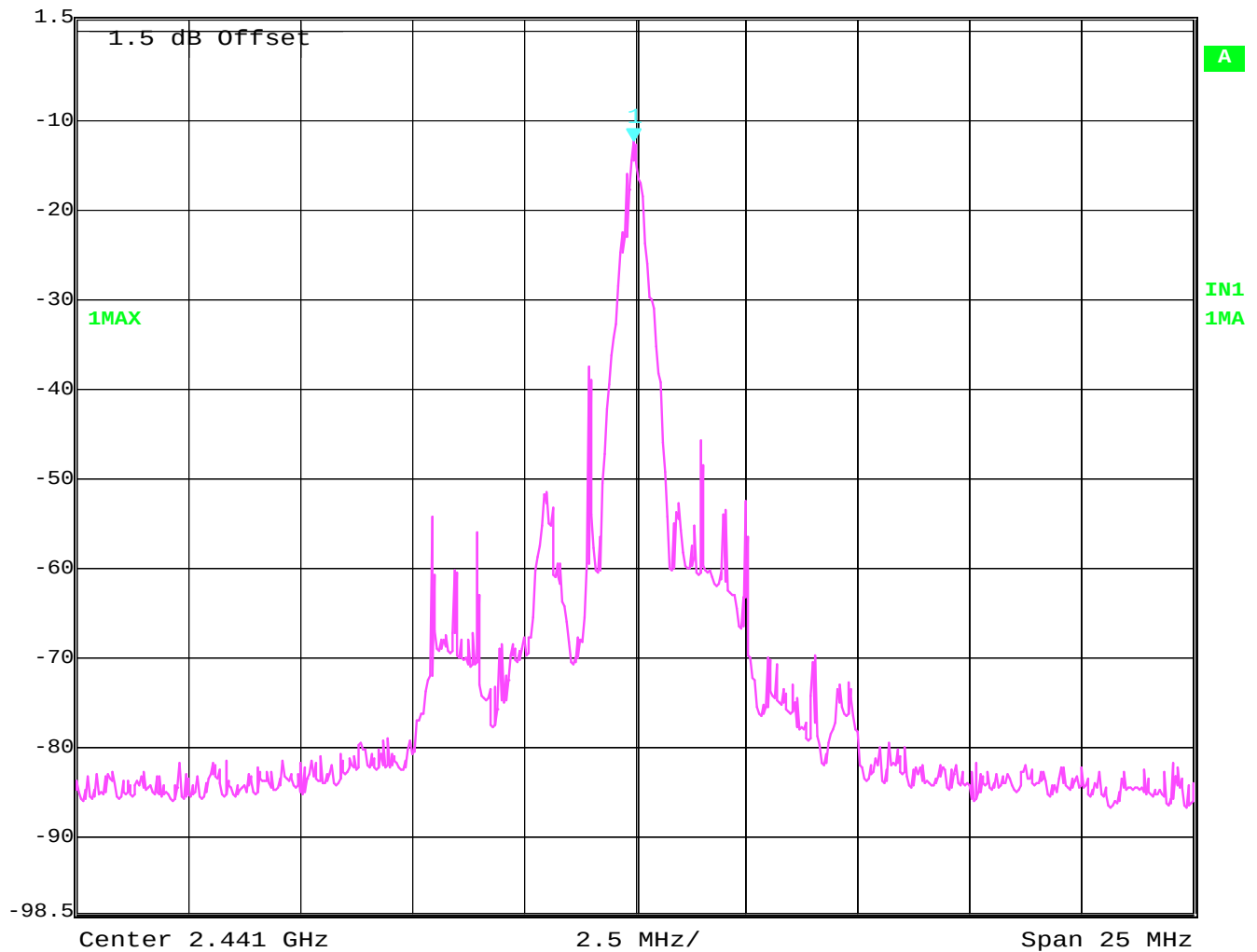
1.5 dBm

2.44097495 GHz

SWT 7 s

Unit

dBm



Date: 11.FEB.2004 08:11:35

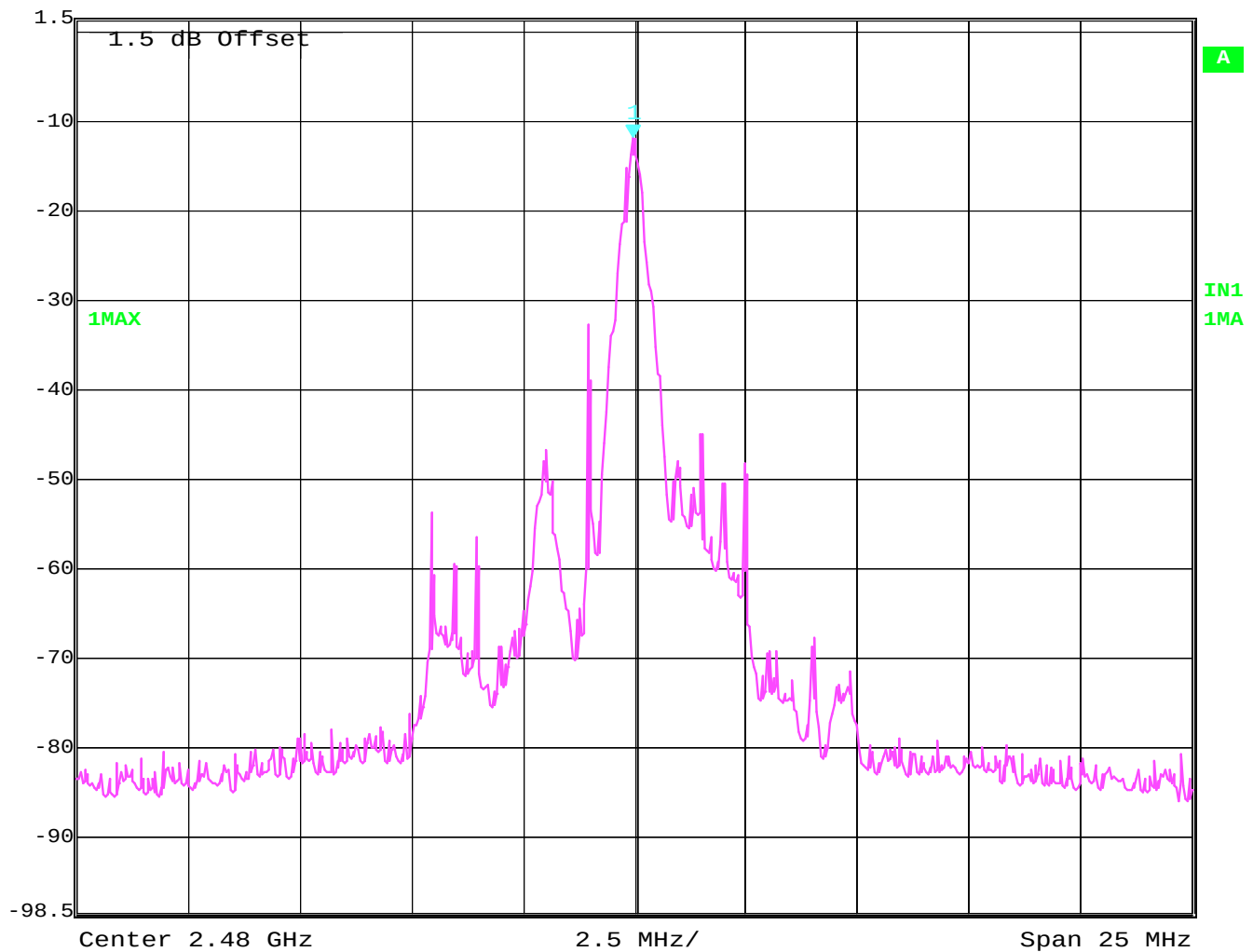
## POWER SPECTRAL DENSITY

§15.247(d)

Highest Channel: 2480MHz



Marker 1 [T1] RBW 3 kHz RF Att 20 dB  
 Ref Lvl -11.75 dBm VBW 3 kHz  
 1.5 dBm 2.47997495 GHz SWT 7 s Unit dBm



Date: 11.FEB.2004 08:12:45

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

| TEST CONDITIONS         |                           | MAXIMUM PEAK OUTPUT POWER (dBm) |      |      |
|-------------------------|---------------------------|---------------------------------|------|------|
| Frequency (MHz)         |                           | 2402                            | 2441 | 2480 |
| T <sub>nom</sub> (23)°C | V <sub>nom</sub> (2.5)VDC | 0.82                            | 0.83 | 1.89 |
| Measurement uncertainty |                           | ±0.5dBm                         |      |      |

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



Marker 1 [T1]

RBW 3 MHz RF Att 20 dB

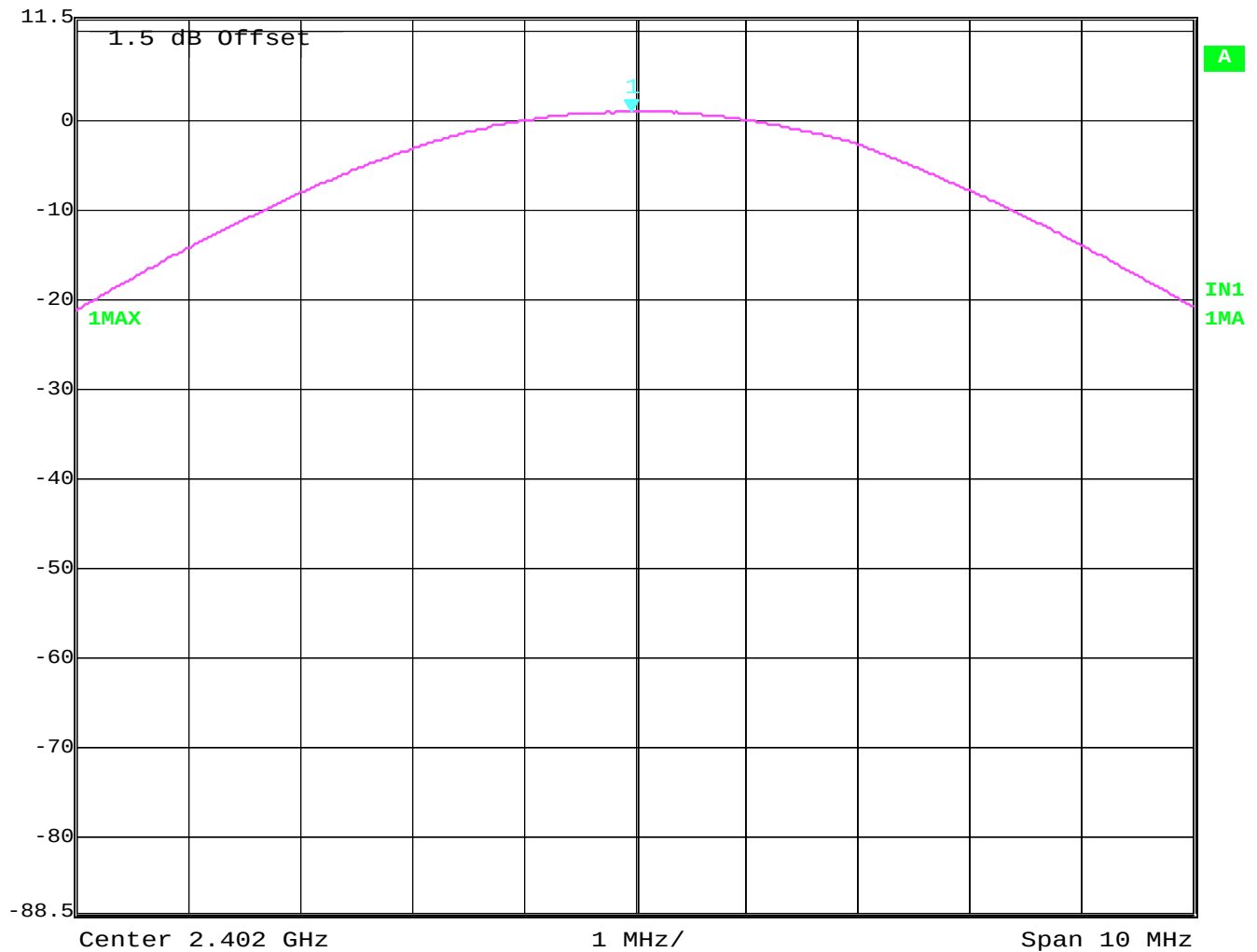
Ref Lvl 0.82 dBm

VBW 3 MHz

11.5 dBm 2.40196994 GHz

SWT 5 ms

Unit dBm



Date: 11.FEB.2004 08:01:36

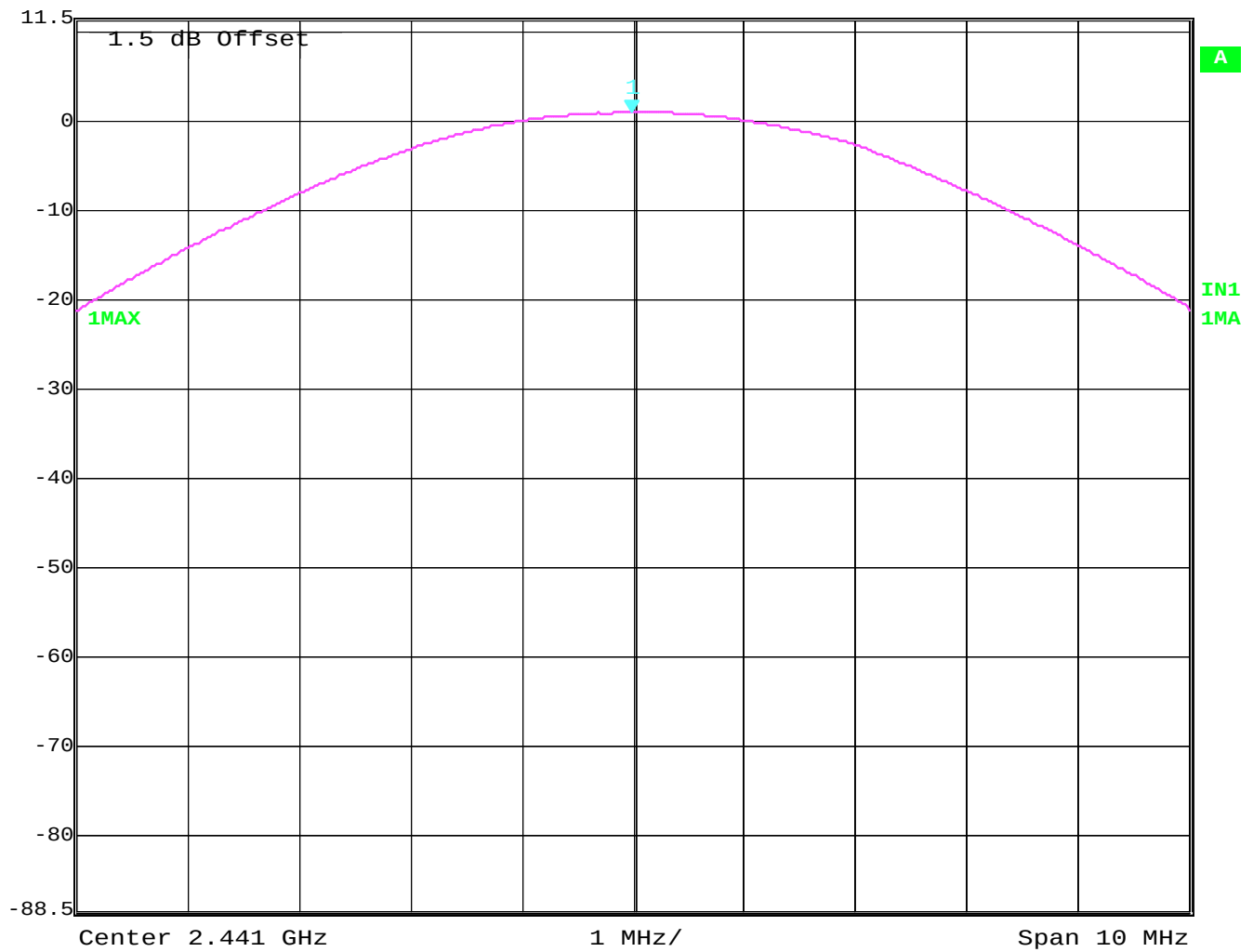
## PEAK OUTPUT POWER (CONDUCTED)

§15.247 (b)

Mid Channel: 2441MHz



Marker 1 [T1] RBW 3 MHz RF Att 20 dB  
 Ref Lvl 0.83 dBm VBW 3 MHz  
 11.5 dBm 2.44098998 GHz SWT 5 ms Unit dBm



Date: 11.FEB.2004 08:02:13

**PEAK OUTPUT POWER (CONDUCTED)**

**§15.247 (b)**

**Highest Channel: 2480MHz**



Marker 1 [T1]

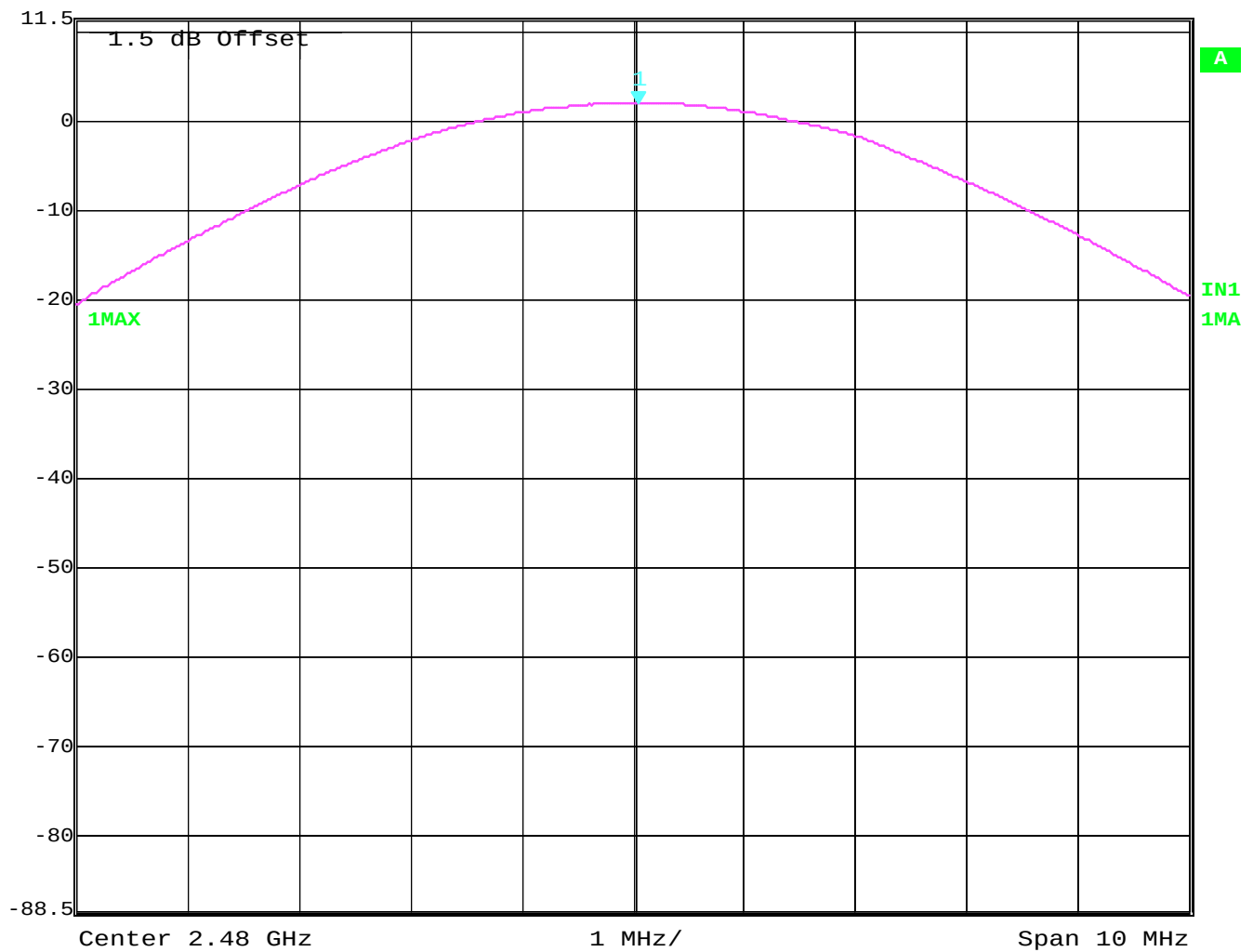
RBW 3 MHz RF Att 20 dB

Ref Lvl 1.89 dBm

VBW 3 MHz

11.5 dBm 2.48005010 GHz

SWT 5 ms Unit dBm



Date: 11.FEB.2004 08:02:57

**MAXIMUM PEAK OUTPUT POWER  
(RADIATED)**

§ 15.247 (b) (1)

**EIRP:**

| TEST CONDITIONS         |                           | MAXIMUM PEAK OUTPUT POWER (dBm) |       |       |
|-------------------------|---------------------------|---------------------------------|-------|-------|
| Frequency (MHz)         |                           | 2402                            | 2441  | 2480  |
| T <sub>nom</sub> (23)°C | V <sub>nom</sub> (2.5)VDC | -1.19                           | -0.20 | -0.27 |
| Measurement uncertainty |                           | ±0.5dBm                         |       |       |

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)

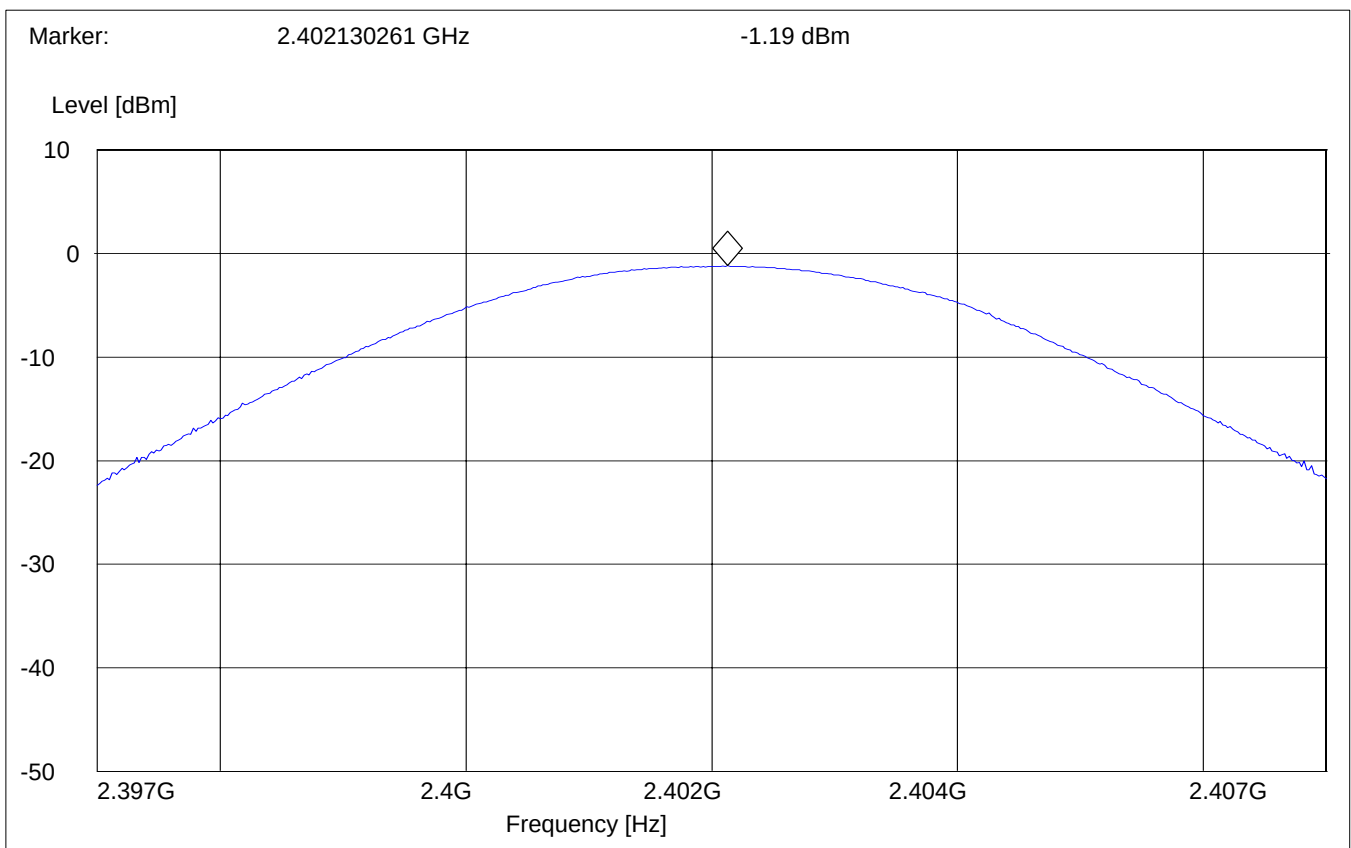
§15.247 (b) (1)

## Lowest Channel: 2402MHz

SWEEP TABLE: "EIRP BT low channel"

Short Description: EIRP Bluetooth channel-2402MHz

| Start     | Stop      | Detector | Meas.   | IF    |
|-----------|-----------|----------|---------|-------|
| Frequency | Frequency |          | Time    | BW    |
| 2.397GHz  | 2.407GHz  | MaxPeak  | Coupled | 3 MHz |



# PEAK OUTPUT POWER (RADIATED)

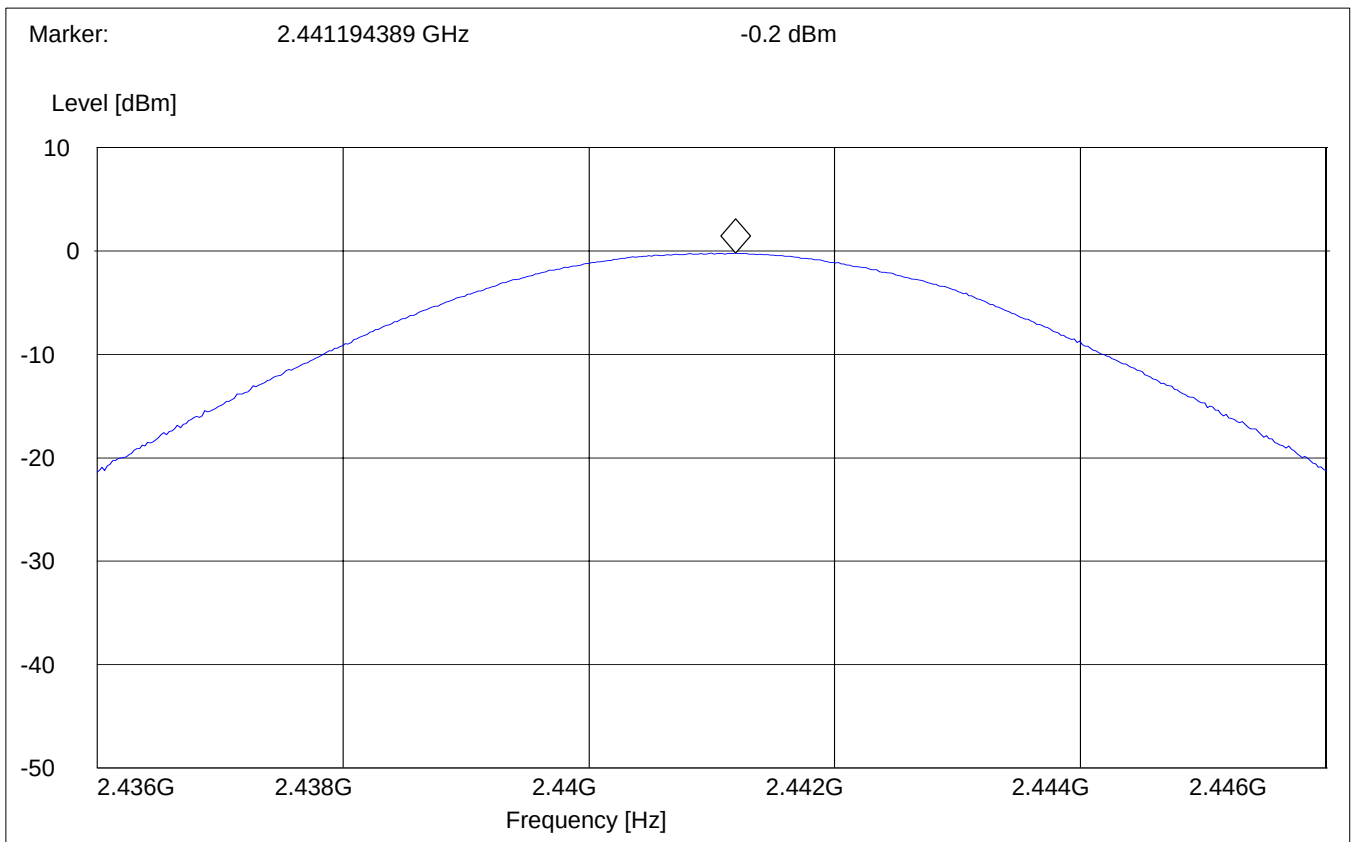
§15.247 (b) (1)

## Mid Channel: 2441MHz

SWEEP TABLE: "EIRP BT Mid channel"

Short Description: EIRP Bluetooth channel-2441MHz

|           |           |          |         |       |
|-----------|-----------|----------|---------|-------|
| Start     | Stop      | Detector | Meas.   | IF    |
| Frequency | Frequency | Time     | BW      |       |
| 2.436GHz  | 2.446GHz  | MaxPeak  | Coupled | 3 MHz |



# PEAK OUTPUT POWER (RADIATED)

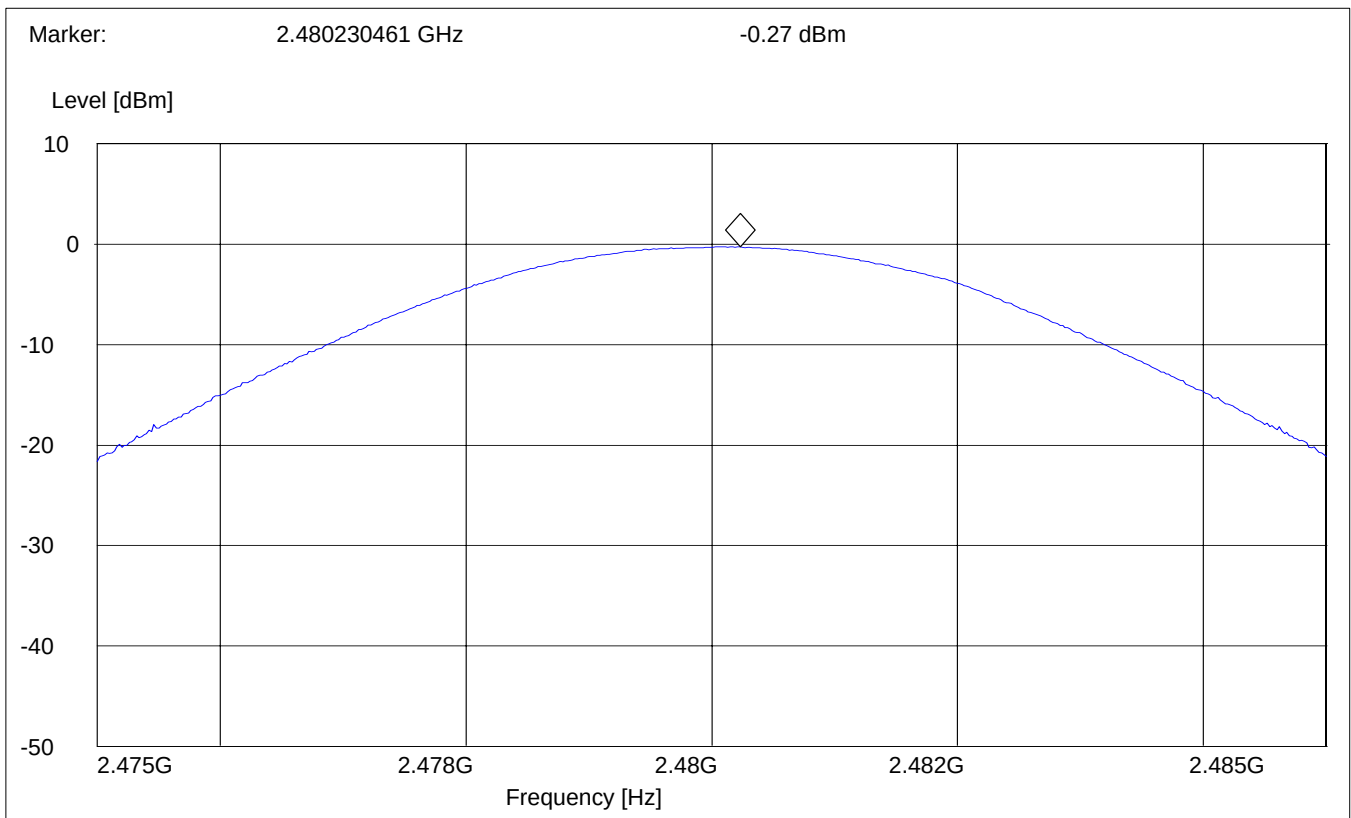
§15.247 (b) (1)

## Highest Channel: 2480MHz

SWEEP TABLE: "EIRP BT High channel"

Short Description: EIRP Bluetooth channel-2480MHz

| Start     | Stop      | Detector | Meas.   | IF    |
|-----------|-----------|----------|---------|-------|
| Frequency | Frequency |          | Time    | BW    |
| 2.475GHz  | 2.485GHz  | MaxPeak  | Coupled | 3 MHz |



# BAND EDGE COMPLIANCE

§15.247 (c)

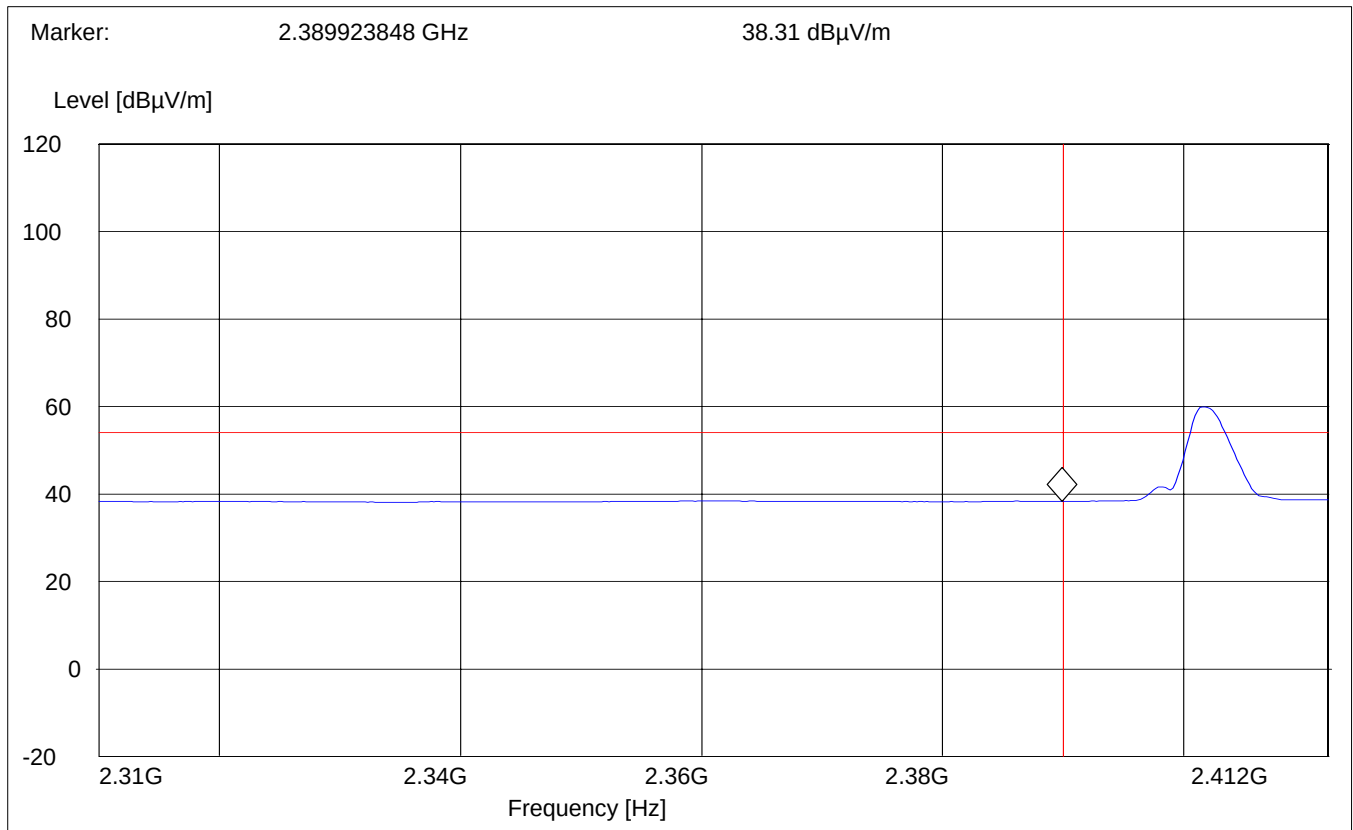
## Low frequency section (spurious in the restricted band 2310 – 2390 MHz)

### Average Measurement

(This plot is valid for both Hopping ON &amp; OFF)

Operating condition : Tx at 2402MHz  
 SWEEP TABLE : "FCC15.247 LBE\_AVG"  
 Short Description : FCC15.247 BT Low-band-edge  
 Limit Line : 54dBμV

| Start Frequency | Stop Frequency | Detector | Meas. Bandw. | RBW   | VBW  | Transducer      |
|-----------------|----------------|----------|--------------|-------|------|-----------------|
| 2.31 GHz        | 2.412 GHz      | MaxPeak  | Coupled      | 1 MHz | 10Hz | #326 horn (dBi) |



## BAND EDGE COMPLIANCE

§15.247 (c)

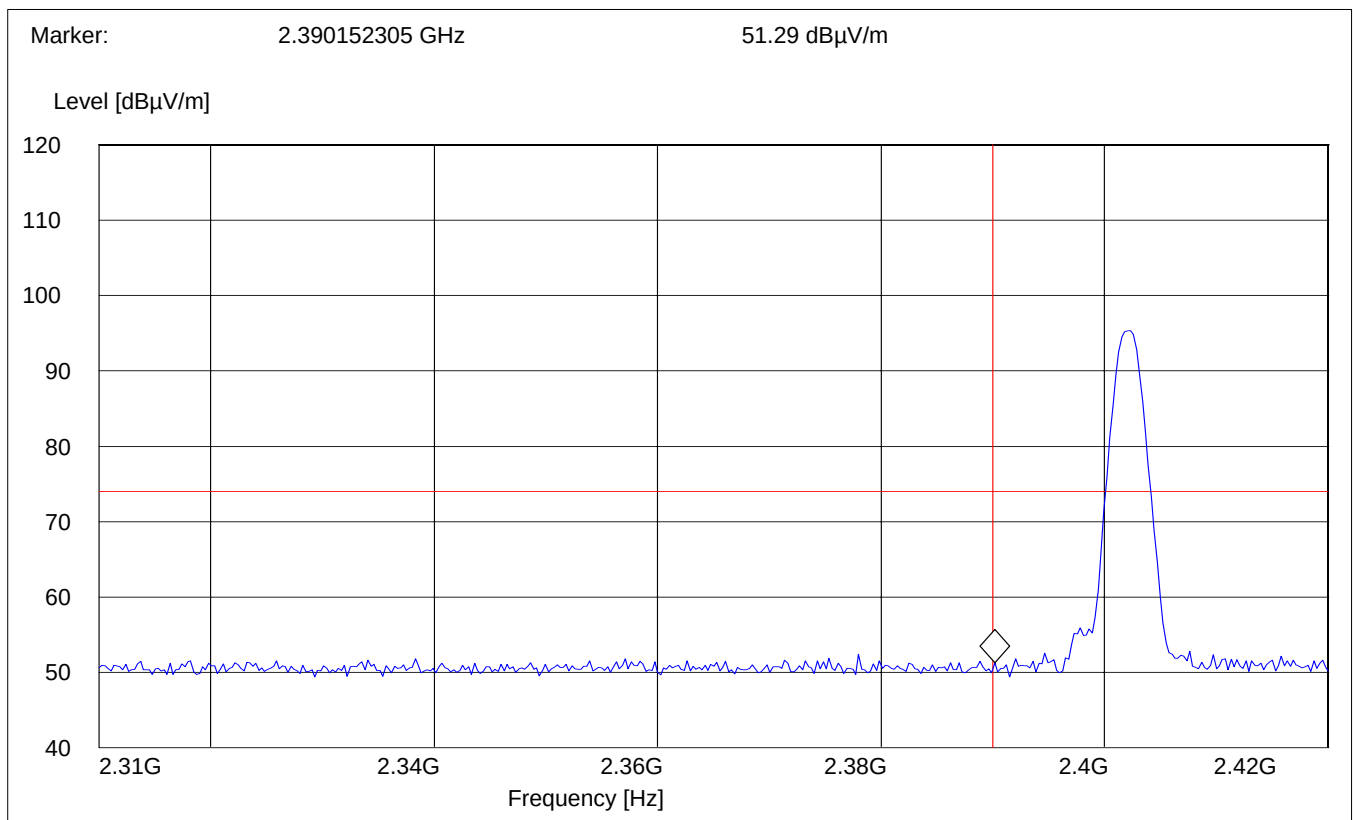
**Low frequency section (spurious in the restricted band 2310 – 2390 MHz)**

### Peak Measurement

**(This plot is valid for both Hopping ON & OFF)**

Operating condition : Tx at 2402MHz  
 SWEEP TABLE : "FCC15.247 LBE\_Pk"  
 Short Description : FCC15.247 BT Low-band-edge  
 Limit Line : 74dBμV

| Start Frequency | Stop Frequency | Detector Time | Meas. Bandw. | RBW   | VBW  | Transducer      |
|-----------------|----------------|---------------|--------------|-------|------|-----------------|
| 2.31 GHz        | 2.412 GHz      | MaxPeak       | Coupled      | 1 MHz | 1MHz | #326 horn (dBi) |



# BAND EDGE COMPLIANCE

§15.247 (c)

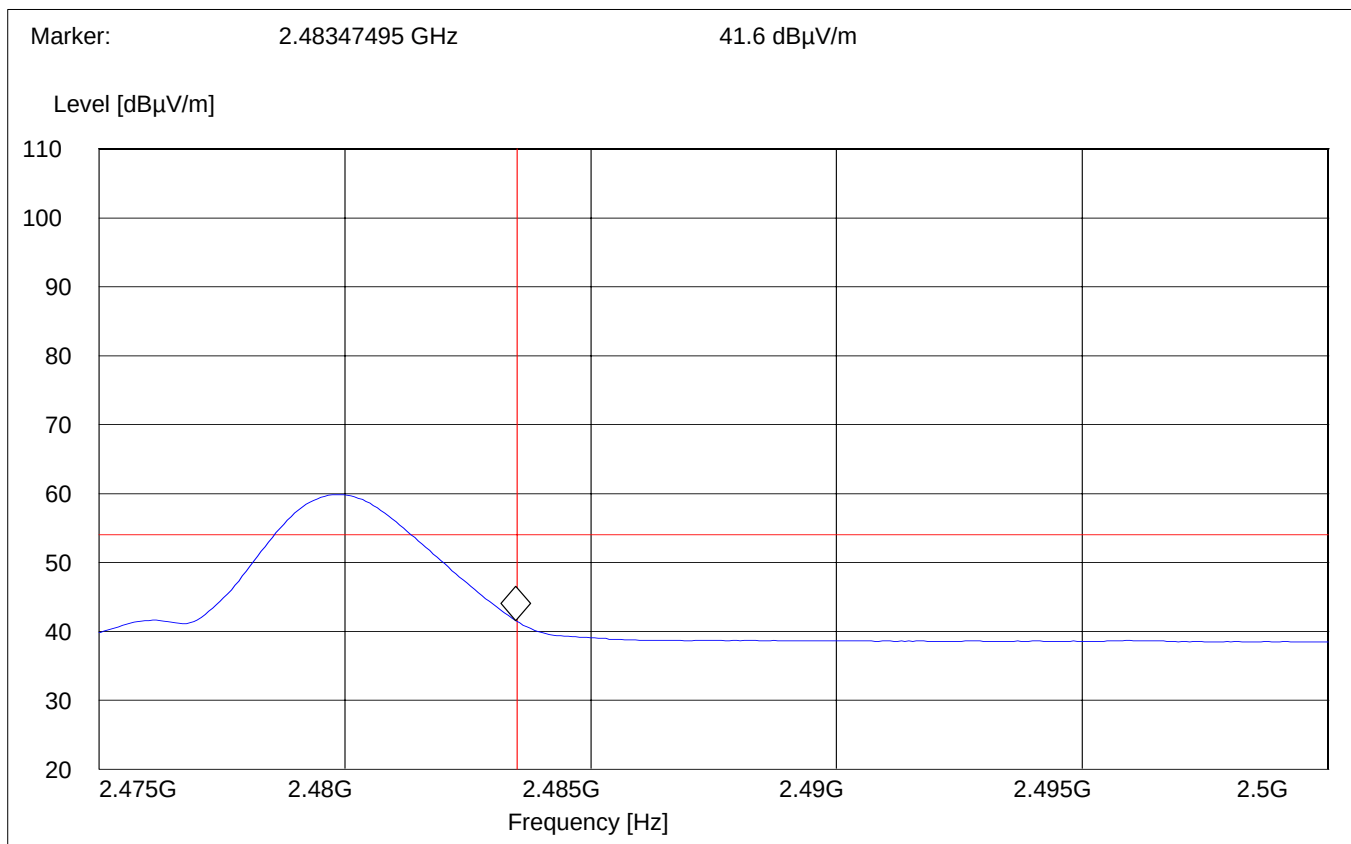
## High frequency section (spurious in the restricted band 2483.5 – 2500 MHz)

### Average Measurement

(This plot is valid for both Hopping ON &amp; OFF)

Operating condition : Tx at 2480MHz  
SWEEP TABLE : "FCC15.247 HBE\_AVG"  
Short Description : FCC15.247 BT High-band-edge  
Limit Line : 54dBμV

| Start Frequency | Stop Frequency | Detector Time | Meas. Bandw. | RBW   | VBW  | Transducer      |
|-----------------|----------------|---------------|--------------|-------|------|-----------------|
| 2.475 GHz       | 2.5 GHz        | MaxPeak       | Coupled      | 1 MHz | 10Hz | #326 horn (dBi) |



# BAND EDGE COMPLIANCE

§15.247 (c)

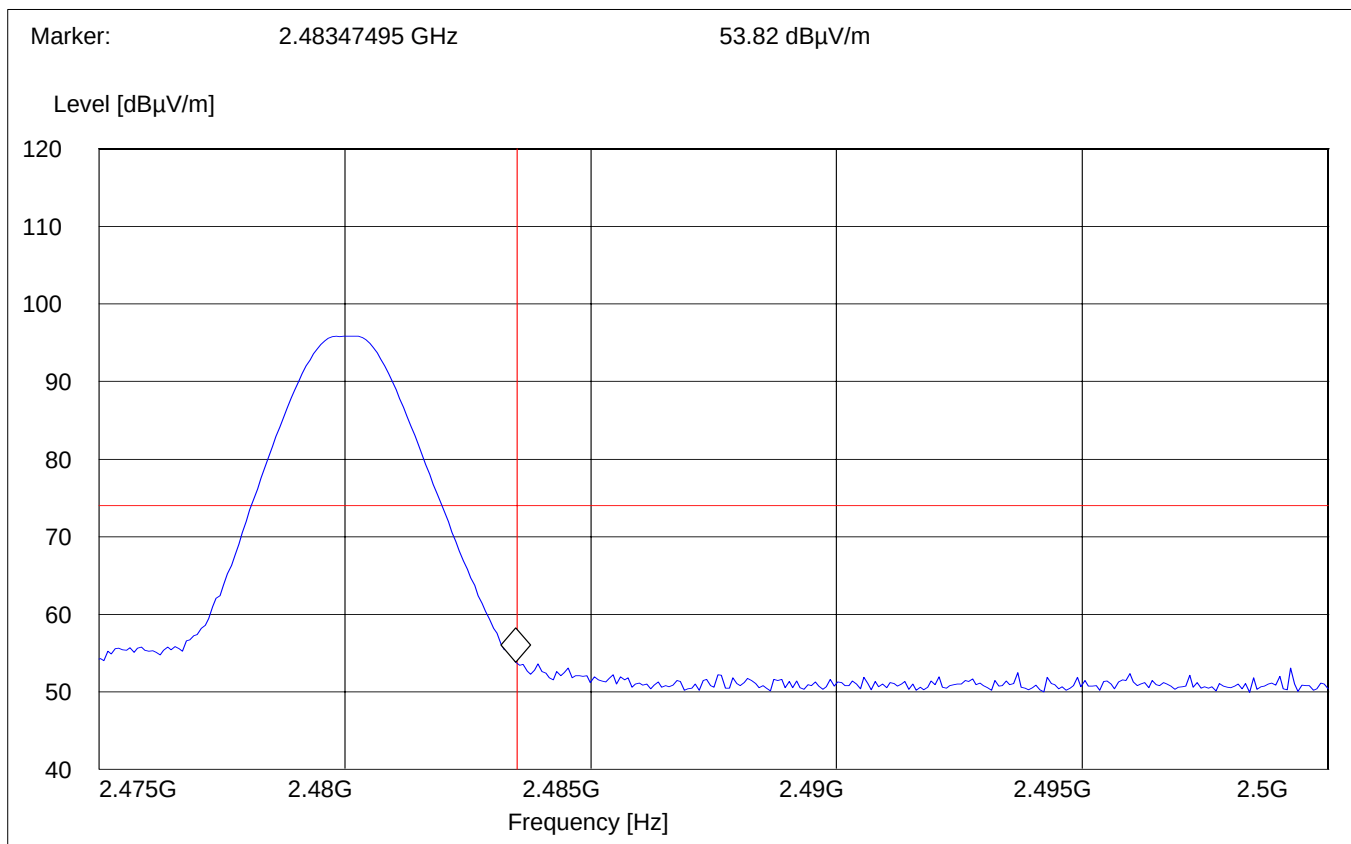
## High frequency section (spurious in the restricted band 2483.5 – 2500 MHz)

### Peak Measurement

(This plot is valid for both Hopping ON &amp; OFF)

Operating condition : Tx at 2480MHz  
SWEEP TABLE : "FCC15.247 HBE\_PK"  
Short Description : FCC15.247 BT High-band-edge  
Limit Line : 74dBμV

|           |           |          |         |       |      |                 |
|-----------|-----------|----------|---------|-------|------|-----------------|
| Start     | Stop      | Detector | Meas.   | RBW   | VBW  | Transducer      |
| Frequency | Frequency | Time     | Bandw.  |       |      |                 |
| 2.475 GHz | 2.5 GHz   | MaxPeak  | Coupled | 1 MHz | 1MHz | #326 horn (dBi) |



**EMISSION LIMITATIONS**  
**Transmitter (Conducted)**  
**LIMITS**

§ 15.247 (c) (1)

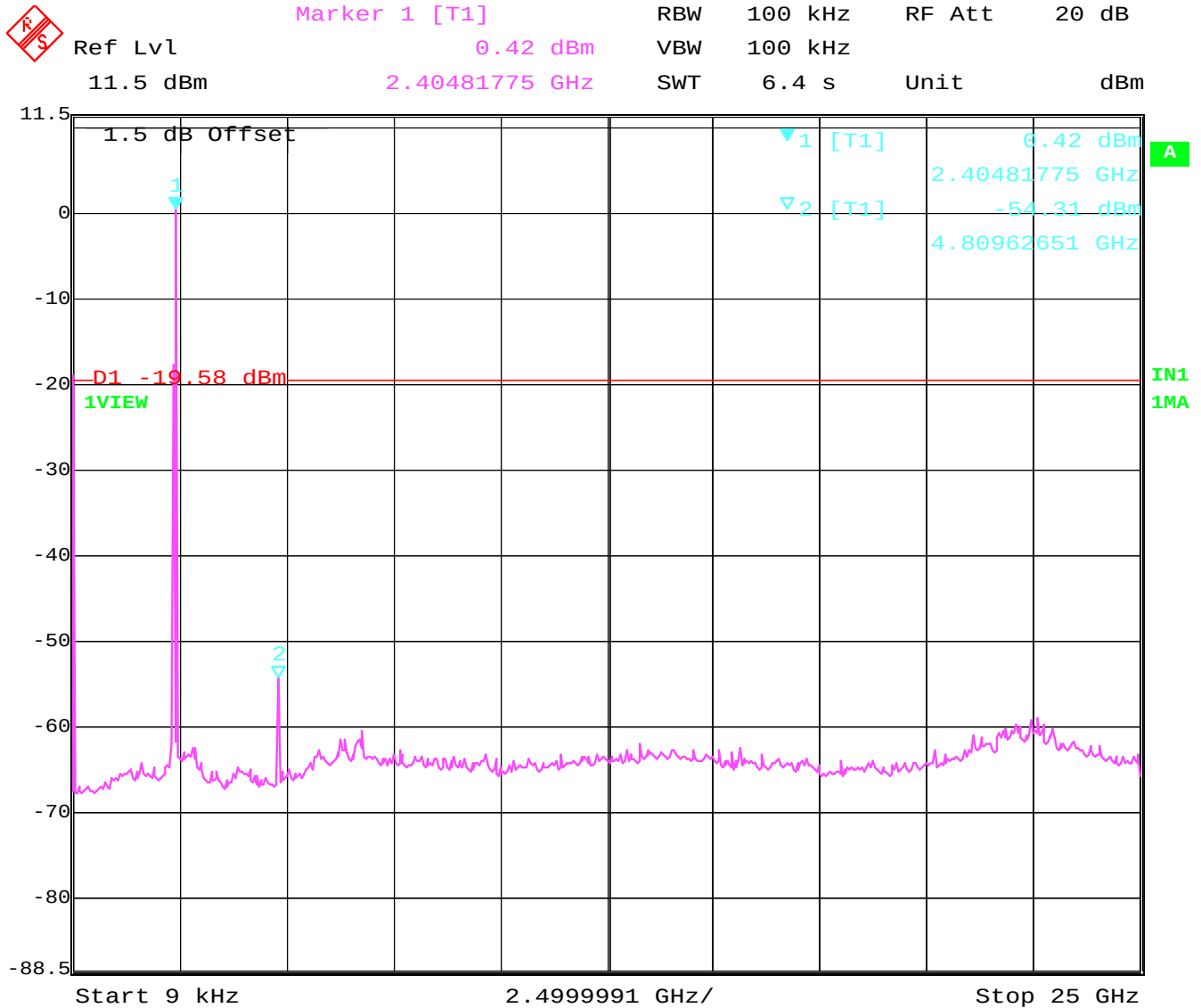
In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions that fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

**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): 9KHz - 25GHz



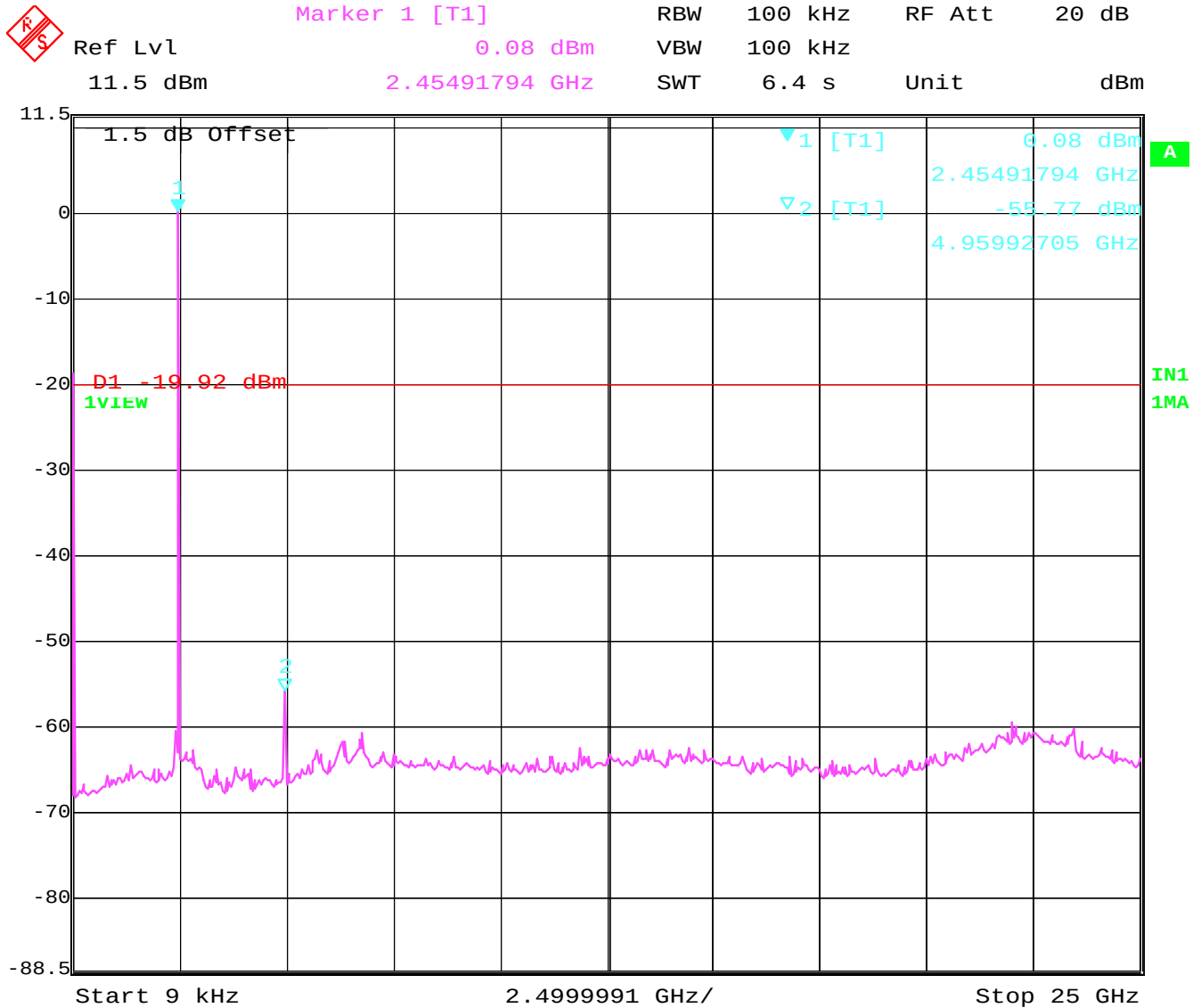
Date: 11.FEB.2004 08:15:47

Date: 11.FEB.2004 08:17:10

## EMISSION LIMITATIONS - Conducted (Transmitter)

§ 15.247 (c) (1)

Highest Channel (2480MHz): 9KHz - 25GHz



Date: 11.FEB.2004 08:21:58

**EMISSION LIMITATIONS**  
**Transmitter (Radiated)**

§ 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 that 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 3 and 26.5 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 measurements are done in peak mode unless specified with plots.

**Results for the radiated measurements below 30MHz according § 15.33**

| Frequency    | Measured values                       | Remarks                                   |
|--------------|---------------------------------------|-------------------------------------------|
| 9KHz – 30MHz | No emissions found, caused by the EUT | This is valid for all the tested channels |

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

**Note: All radiated measurements were made in all three orthogonal planes. The values reported are the maximum values.**

| Transmit at Lowest channel Frequency 2402MHz  |                |            |         |
|-----------------------------------------------|----------------|------------|---------|
| Frequency (MHz)                               | Level (dBµV/m) |            |         |
|                                               | Peak           | Quasi-Peak | Average |
| 4781.56                                       | 50.38          |            | 29.5    |
|                                               |                |            |         |
|                                               |                |            |         |
| Transmit at Middle channel Frequency 2441MHz  |                |            |         |
| Frequency (MHz)                               | Level (dBµV/m) |            |         |
|                                               | Peak           | Quasi-Peak | Average |
| 1220.44                                       | 39.04          |            |         |
| 4883.7                                        | 50.51          |            | 29.83   |
|                                               |                |            |         |
| Transmit at Highest channel Frequency 2480MHz |                |            |         |
| Frequency (MHz)                               | Level (dBµV/m) |            |         |
|                                               | Peak           | Quasi-Peak | Average |
| 1240.48                                       | 37.87          |            |         |
| 4951.9                                        | 48.51          |            | 28.41   |
|                                               |                |            |         |

## EMISSION LIMITATIONS - Radiated (Transmitter)

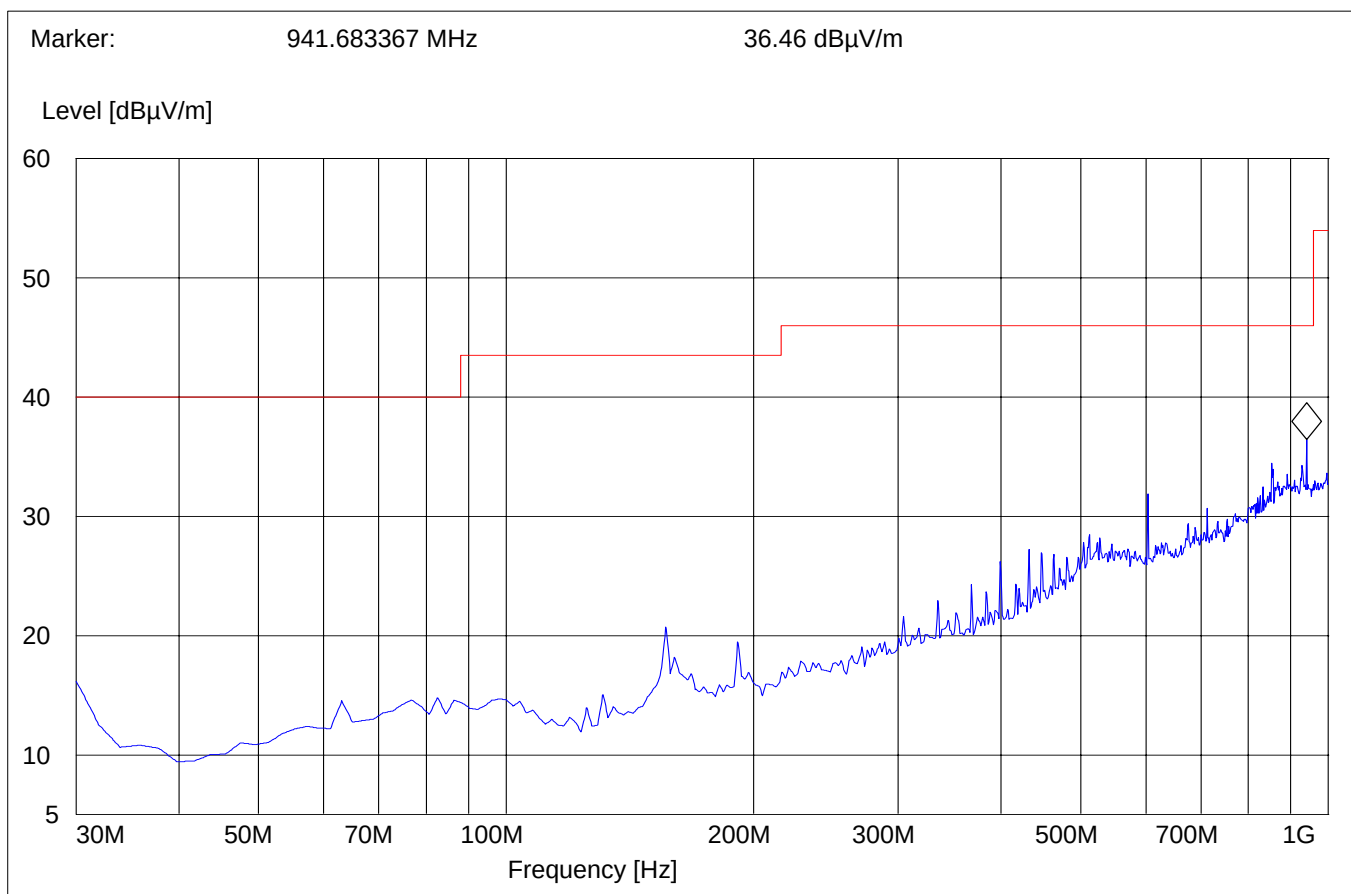
§ 15.247 (c) (1)

30MHz – 1GHz

Antenna: vertical

**Note: This plot is valid for low, mid & high channels (worst-case plot)**

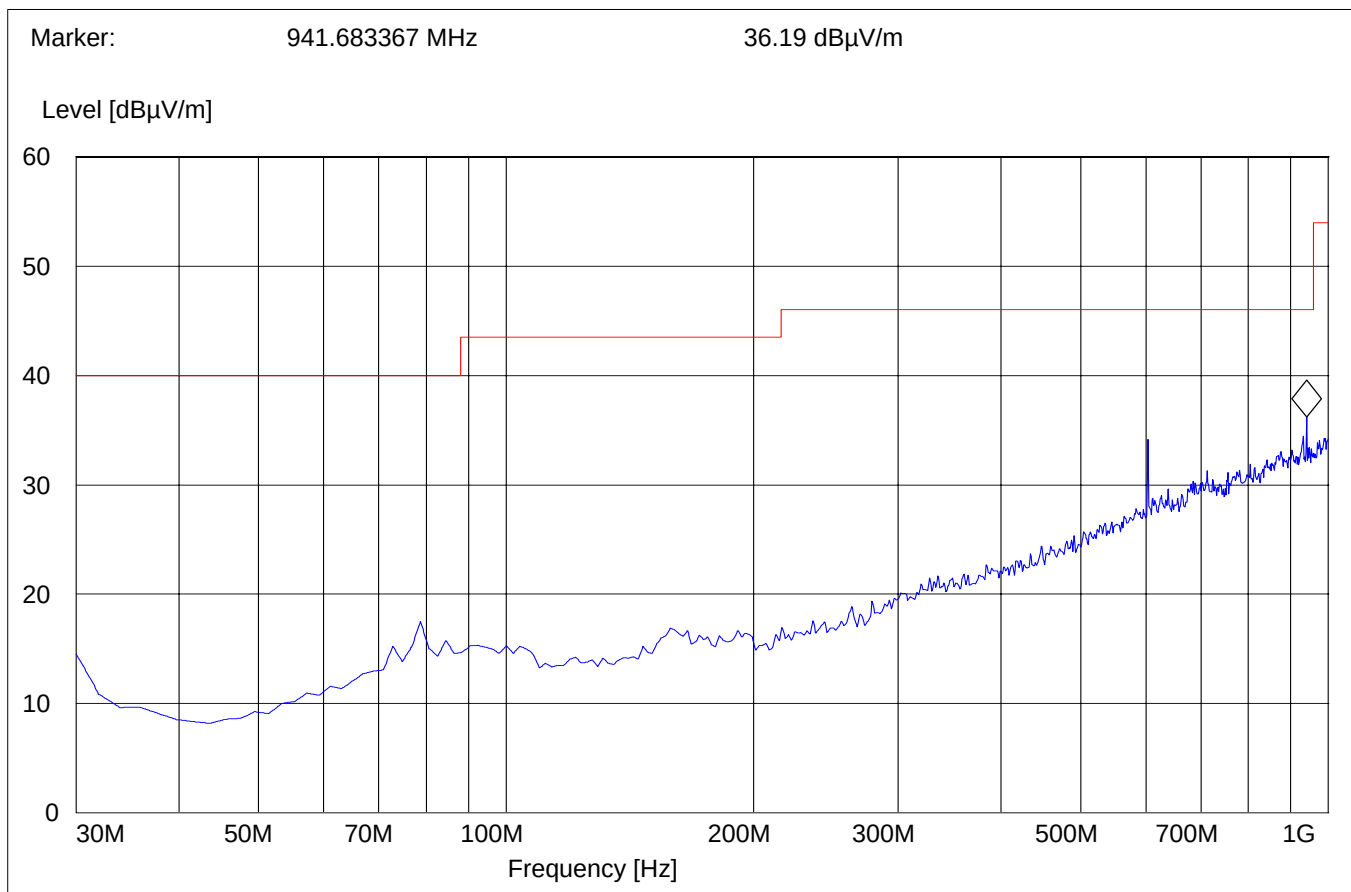
|                    |           |                      |         |         |            |
|--------------------|-----------|----------------------|---------|---------|------------|
| SWEEP TABLE:       |           | "BT Spuri hi 30-1G"  |         |         |            |
| Short Description: |           | Bluetooth 30MHz-1GHz |         |         |            |
| Start              | Stop      | Detector             | Meas.   | RBW     | Transducer |
| Frequency          | Frequency |                      | Time    | VBW     |            |
| 30.0 MHz           | 1.0 GHz   | MaxPeak              | Coupled | 100 kHz | 3141-#1186 |



**EMISSION LIMITATIONS - Radiated (Transmitter)****§ 15.247 (c) (1)****30MHz – 1GHz****Antenna: horizontal****Note: This plot is valid for low, mid & high channels (worst-case plot)**

SWEEP TABLE: "BT Spuri hi 30-1G"  
Short Description: Bluetooth 30MHz-1GHz

| Start    | Stop    | Detector | Meas. Time | RBW     | VBW | Transducer |
|----------|---------|----------|------------|---------|-----|------------|
| 30.0 MHz | 1.0 GHz | MaxPeak  | Coupled    | 100 kHz |     | 3141-#1186 |



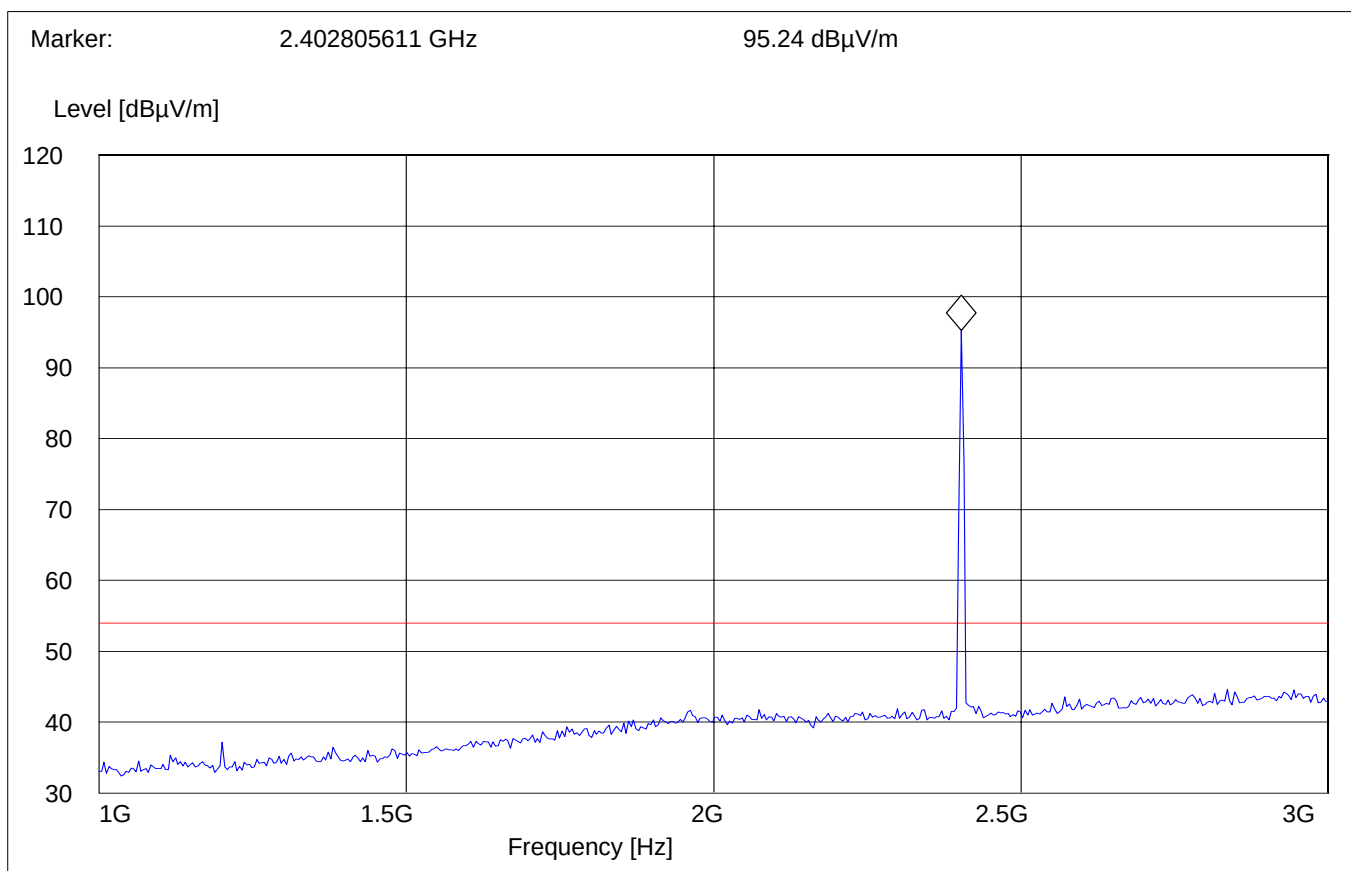
# EMISSION LIMITATIONS - Radiated (Transmitter)

## Lowest Channel (2402MHz): 1GHz – 3GHz

§ 15.247 (c) (1)

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

|                    |           |                           |         |       |                 |
|--------------------|-----------|---------------------------|---------|-------|-----------------|
| SWEEP TABLE:       |           | "BT Spuri hi 1-3G"        |         |       |                 |
| Short Description: |           | Bluetooth Spurious 1-3GHz |         |       |                 |
| Start              | Stop      | Detector                  | Meas.   | RBW   | Transducer      |
| Frequency          | Frequency | Time                      | Bandw.  | VBW   |                 |
| 1.0 GHz            | 3.0 GHz   | MaxPeak                   | Coupled | 1 MHz | #326 horn (dBi) |

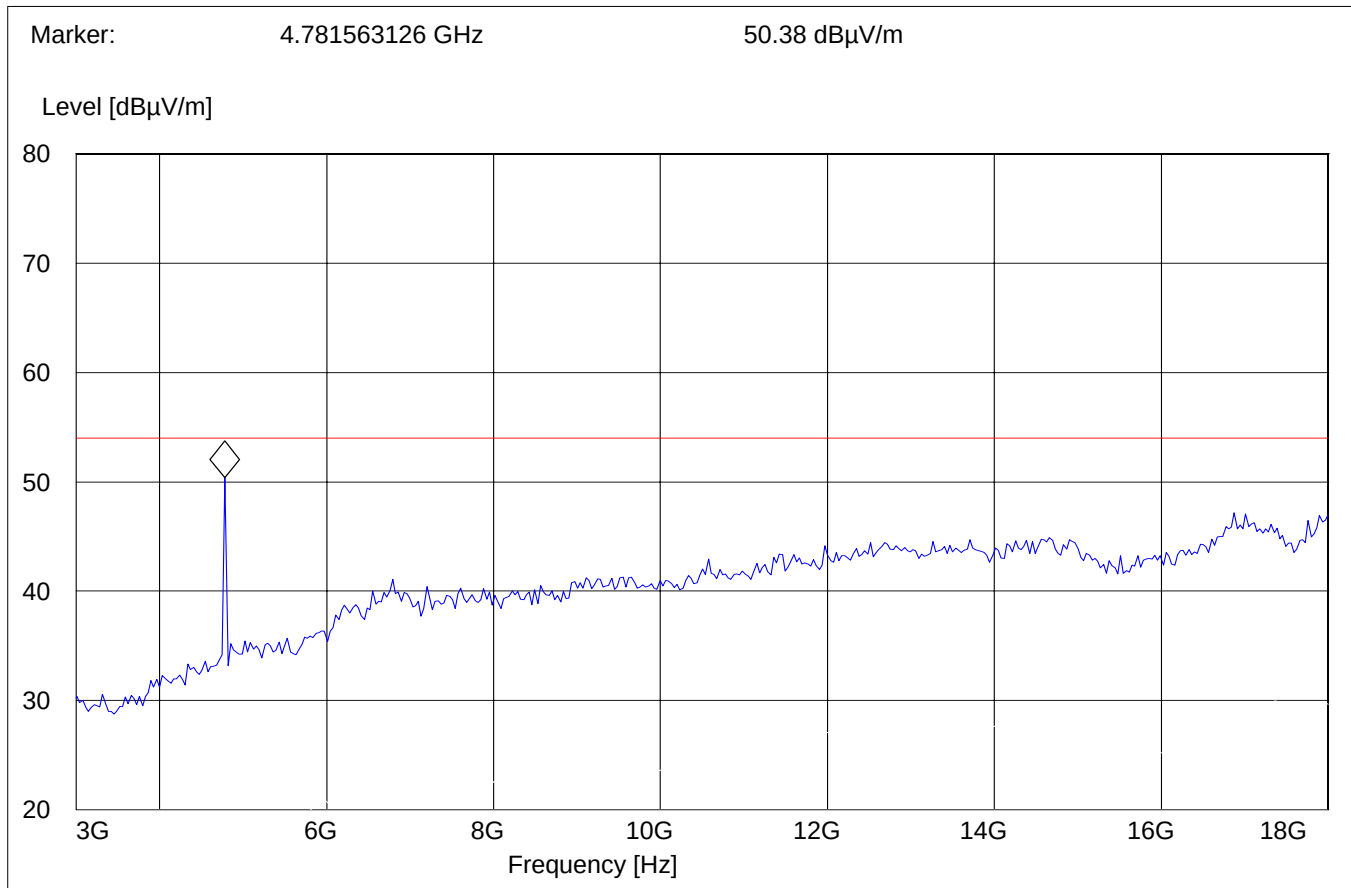


# EMISSION LIMITATIONS - Radiated (Transmitter)

## Lowest Channel (2402MHz): 3GHz – 18GHz

§ 15.247 (c) (1)

|                    |           |                             |         |       |                 |
|--------------------|-----------|-----------------------------|---------|-------|-----------------|
| SWEEP TABLE:       |           | "BT Spuri hi 3-18G"         |         |       |                 |
| Short Description: |           | Bluetooth Spurious 3-18 GHz |         |       |                 |
| Start              | Stop      | Detector                    | Meas.   | RBW   | Transducer      |
| Frequency          | Frequency | Time                        | Bandw.  | VBW   |                 |
| 3.0 GHz            | 18.0 GHz  | MaxPeak                     | Coupled | 1 MHz | #326 horn (dBi) |



**EMISSION LIMITATIONS - Radiated (Transmitter)**  
**Middle Channel (2441MHz): 1GHz – 3GHz**

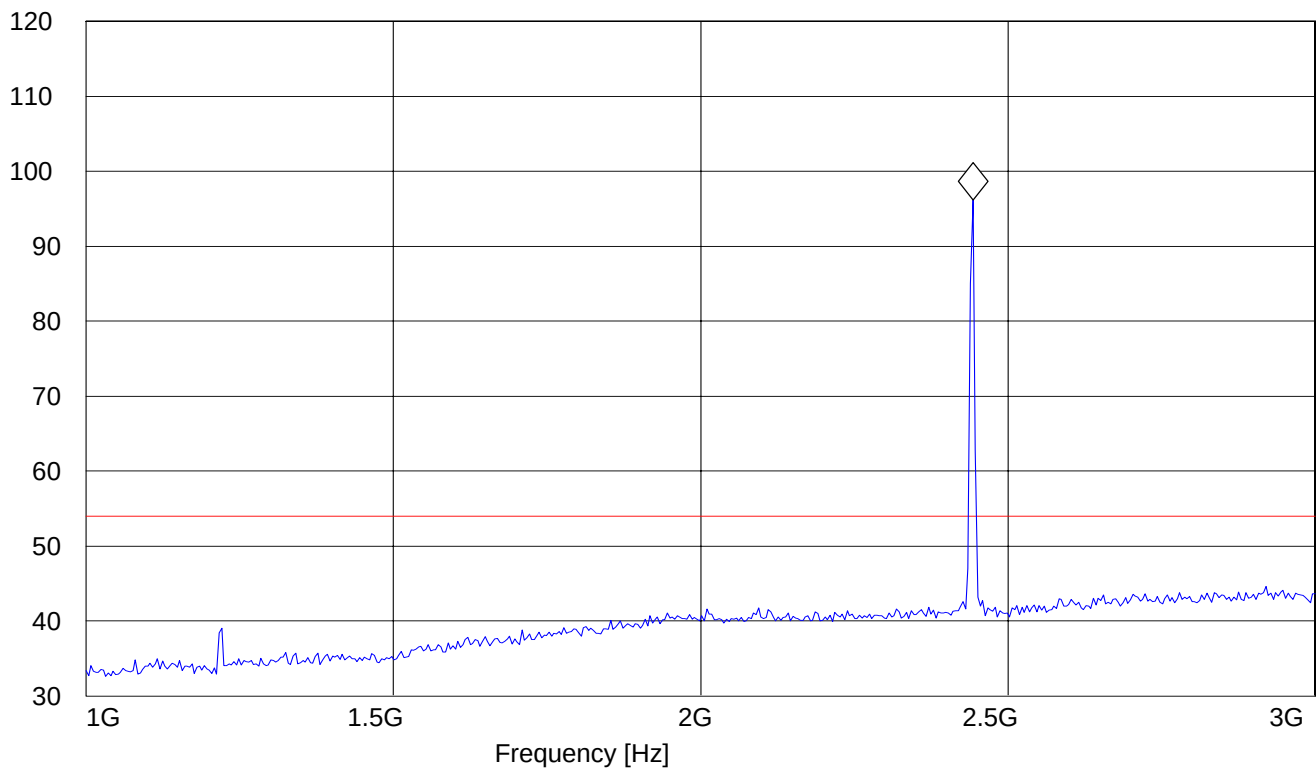
§ 15.247 (c) (1)

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

|                    |           |                           |         |       |                 |
|--------------------|-----------|---------------------------|---------|-------|-----------------|
| SWEEP TABLE:       |           | "BT Spuri hi 1-3G"        |         |       |                 |
| Short Description: |           | Bluetooth Spurious 1-3GHz |         |       |                 |
| Start              | Stop      | Detector                  | Meas.   | RBW   | Transducer      |
| Frequency          | Frequency | Time                      | Bandw.  | VBW   |                 |
| 1.0 GHz            | 3.0 GHz   | MaxPeak                   | Coupled | 1 MHz | #326 horn (dBi) |

Marker: 2.442885772 GHz 96.15 dBμV/m

Level [dBμV/m]

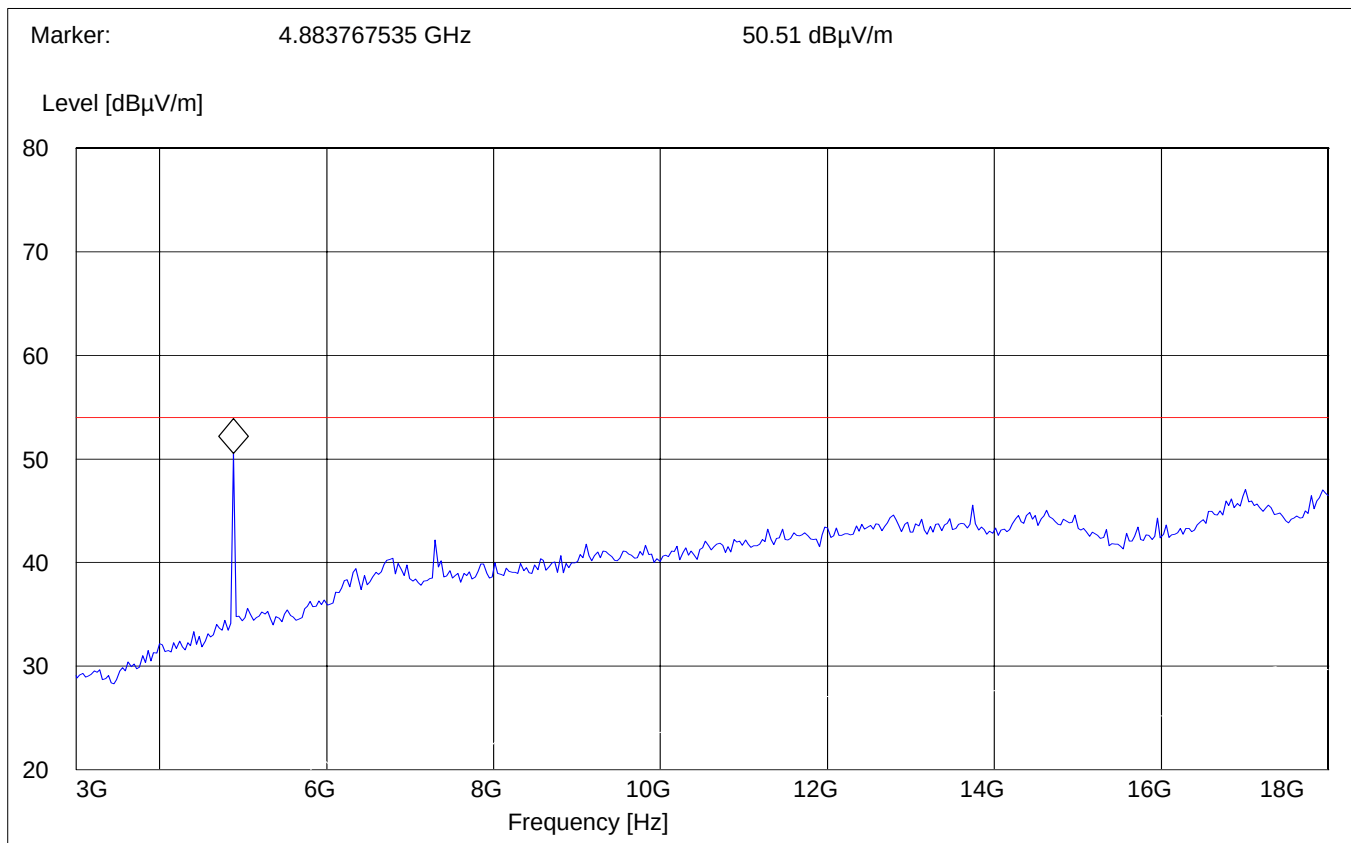


**EMISSION LIMITATIONS - Radiated (Transmitter)**  
**Middle Channel (2441MHz): 3GHz – 18GHz**

§ 15.247 (c) (1)

SWEEP TABLE: "BT Spuri hi 3-18G"  
Short Description: Bluetooth Spurious 3-18GHz  

| Start     | Stop      | Detector | Meas.   | RBW   | Transducer      |
|-----------|-----------|----------|---------|-------|-----------------|
| Frequency | Frequency | Time     | Bandw.  | VBW   |                 |
| 3.0 GHz   | 18.0 GHz  | MaxPeak  | Coupled | 1 MHz | #326 horn (dBi) |



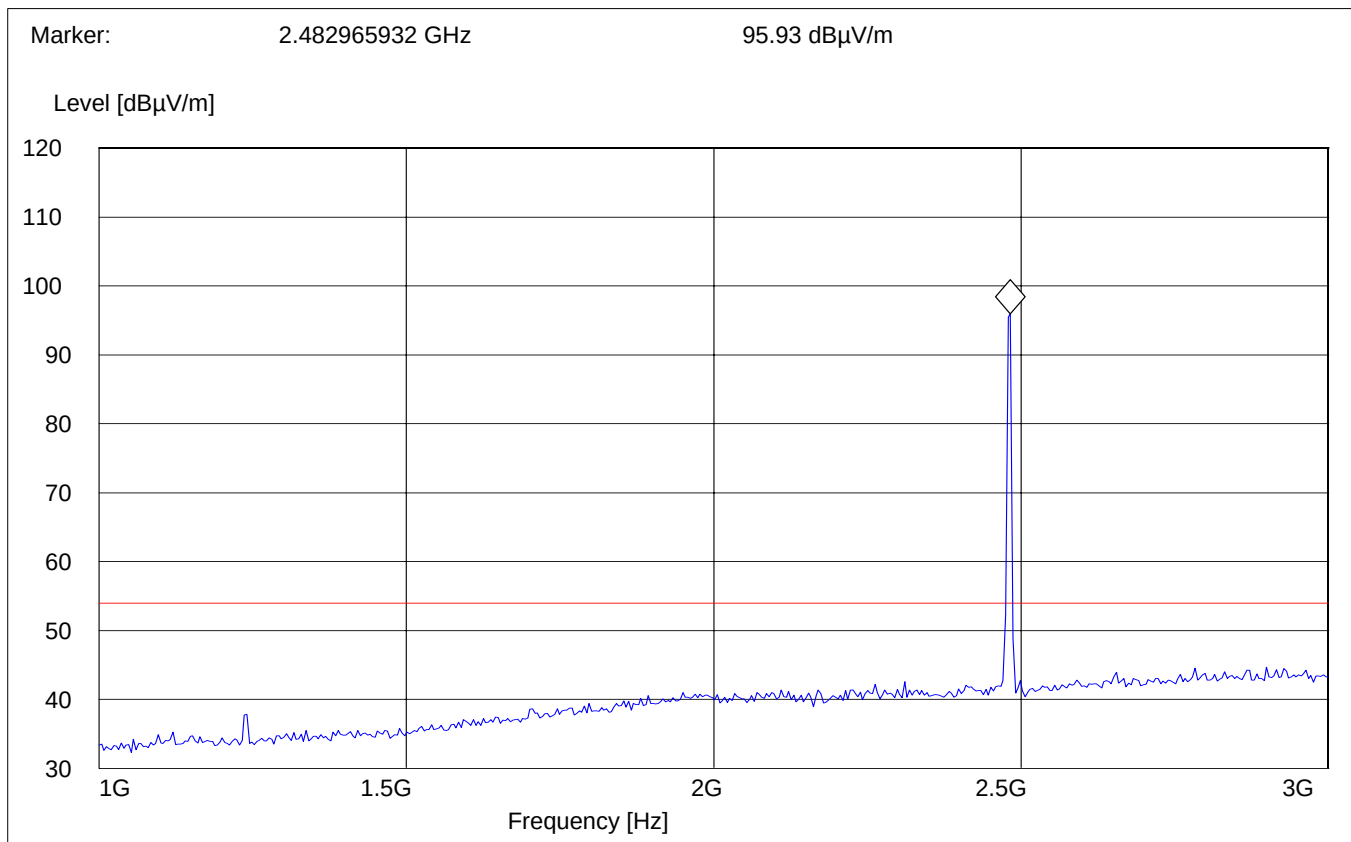
## EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.247 (c) (1)

Highest Channel (2480MHz): 1GHz – 3GHz

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

|                    |           |                           |         |       |                 |
|--------------------|-----------|---------------------------|---------|-------|-----------------|
| SWEEP TABLE:       |           | "BT Spuri hi 1-3G"        |         |       |                 |
| Short Description: |           | Bluetooth Spurious 1-3GHz |         |       |                 |
| Start              | Stop      | Detector                  | Meas.   | RBW   | Transducer      |
| Frequency          | Frequency | Time                      | Bandw.  | VBW   |                 |
| 1.0 GHz            | 3.0 GHz   | MaxPeak                   | Coupled | 1 MHz | #326 horn (dBi) |

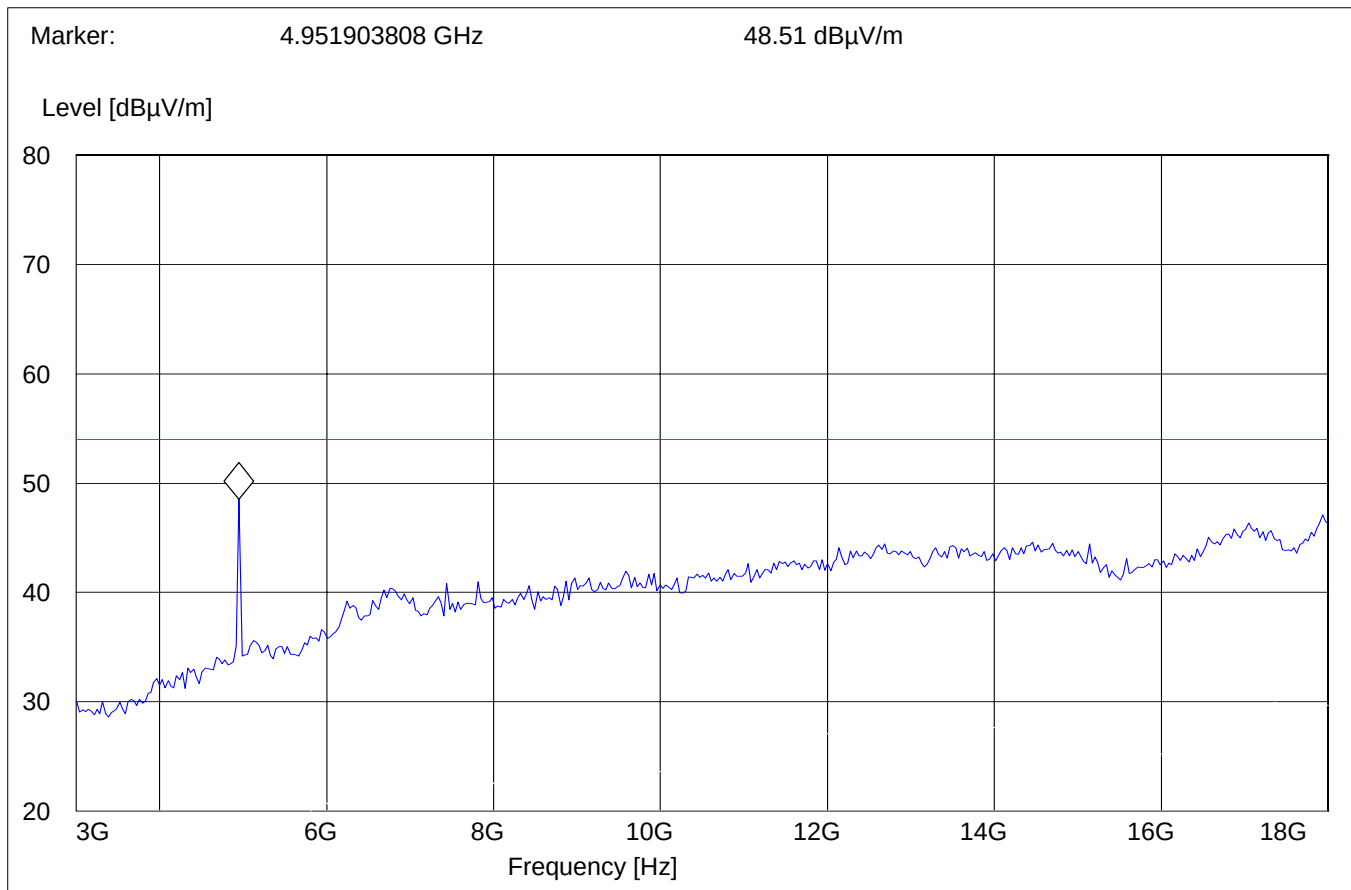


# EMISSION LIMITATIONS - Radiated (Transmitter)

## Highest Channel (2480MHz): 3GHz – 18GHz

§ 15.247 (c) (1)

|                    |           |                            |         |       |                 |
|--------------------|-----------|----------------------------|---------|-------|-----------------|
| SWEEP TABLE:       |           | "BT Spuri hi 3-18G"        |         |       |                 |
| Short Description: |           | Bluetooth Spurious 3-18GHz |         |       |                 |
| Start              | Stop      | Detector                   | Meas.   | RBW   | Transducer      |
| Frequency          | Frequency | Time                       | Bandw.  | VBW   |                 |
| 3.0 GHz            | 18.0 GHz  | MaxPeak                    | Coupled | 1 MHz | #326 horn (dBi) |

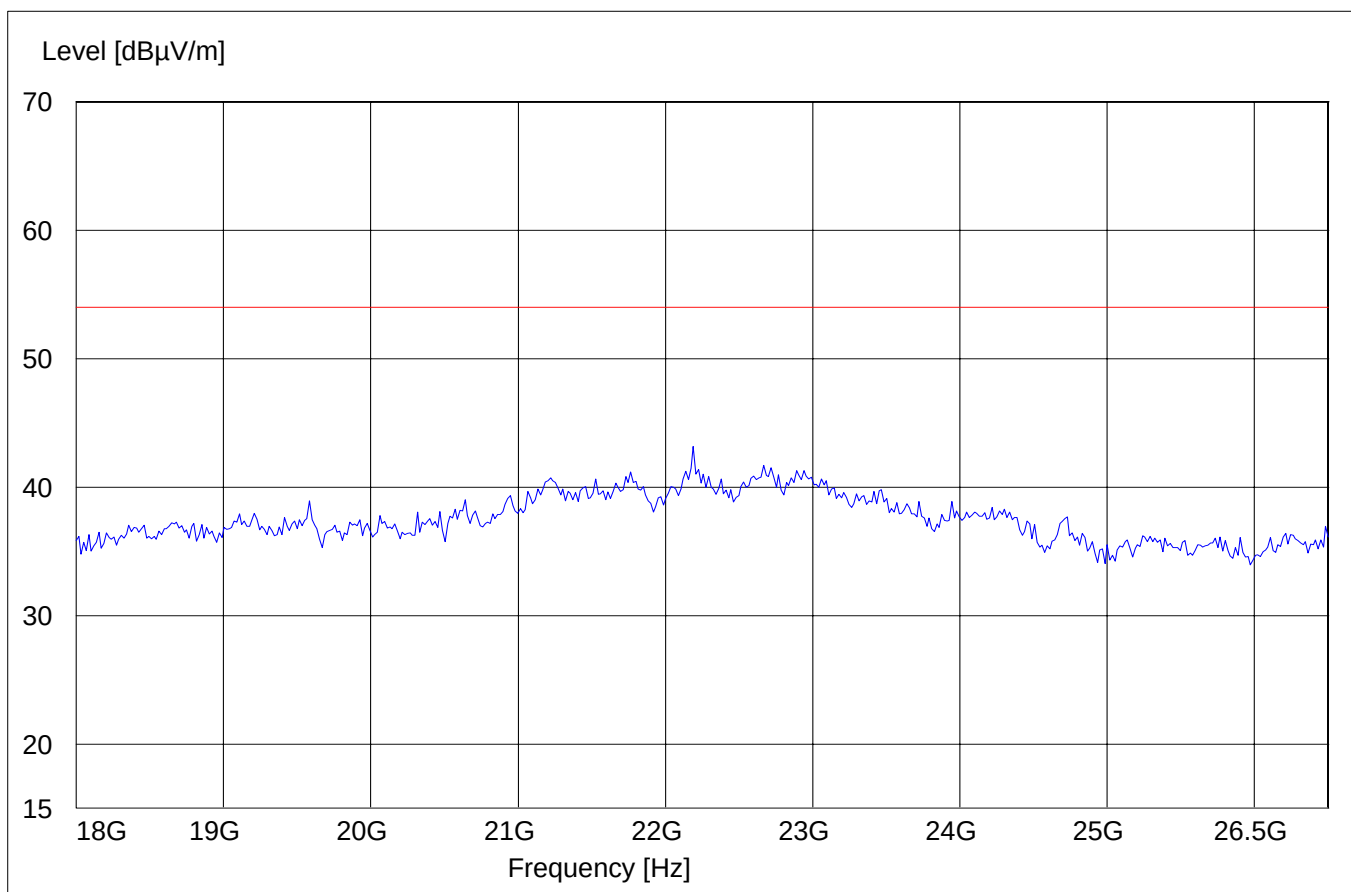


**EMISSION LIMITATIONS - Radiated (Transmitter)**  
**18GHz – 26.5GHz**

§ 15.247 (c) (1)

**Note: This plot is valid for low, mid & high channels (worst-case plot)**

|                    |           |                               |         |       |                 |
|--------------------|-----------|-------------------------------|---------|-------|-----------------|
| SWEEP TABLE:       |           | "BT Spuri hi 18-26.5G"        |         |       |                 |
| Short Description: |           | Bluetooth Spurious 18-26.5GHz |         |       |                 |
| Start              | Stop      | Detector                      | Meas.   | RBW   | Transducer      |
| Frequency          | Frequency | Time                          | Bandw.  | VBW   |                 |
| 18 GHz             | 26.5 GHz  | MaxPeak                       | Coupled | 1 MHz | #141 horn (dBi) |



# CONDUCTED EMISSIONS

§ 15.107/207

Measured with AC/DC power adapter

Technical specification: 15.107 / 15.207 (Revised as of August 20, 2002)

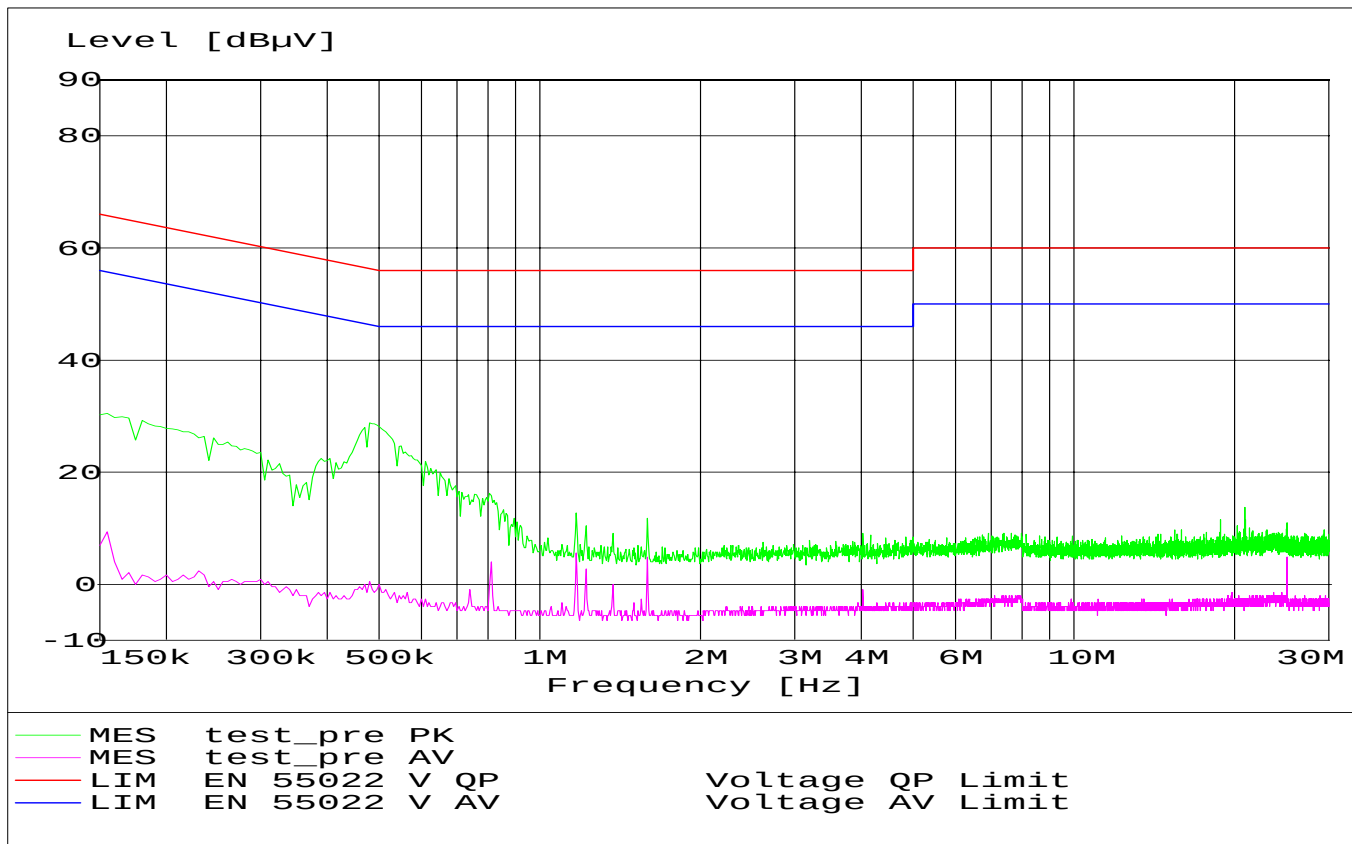
## Limit

| Frequency of Emission (MHz) | Conducted Limit (dBµV) |           |
|-----------------------------|------------------------|-----------|
|                             | Quasi-Peak             | Average   |
| 0.15 – 0.5                  | 66 to 56*              | 56 to 46* |
| 0.5 – 5                     | 56                     | 46        |
| 5 – 30                      | 60                     | 50        |

\* Decreases with logarithm of the frequency

ANALYZER SETTINGS: RBW = 10KHz

VBW = 10KHz



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

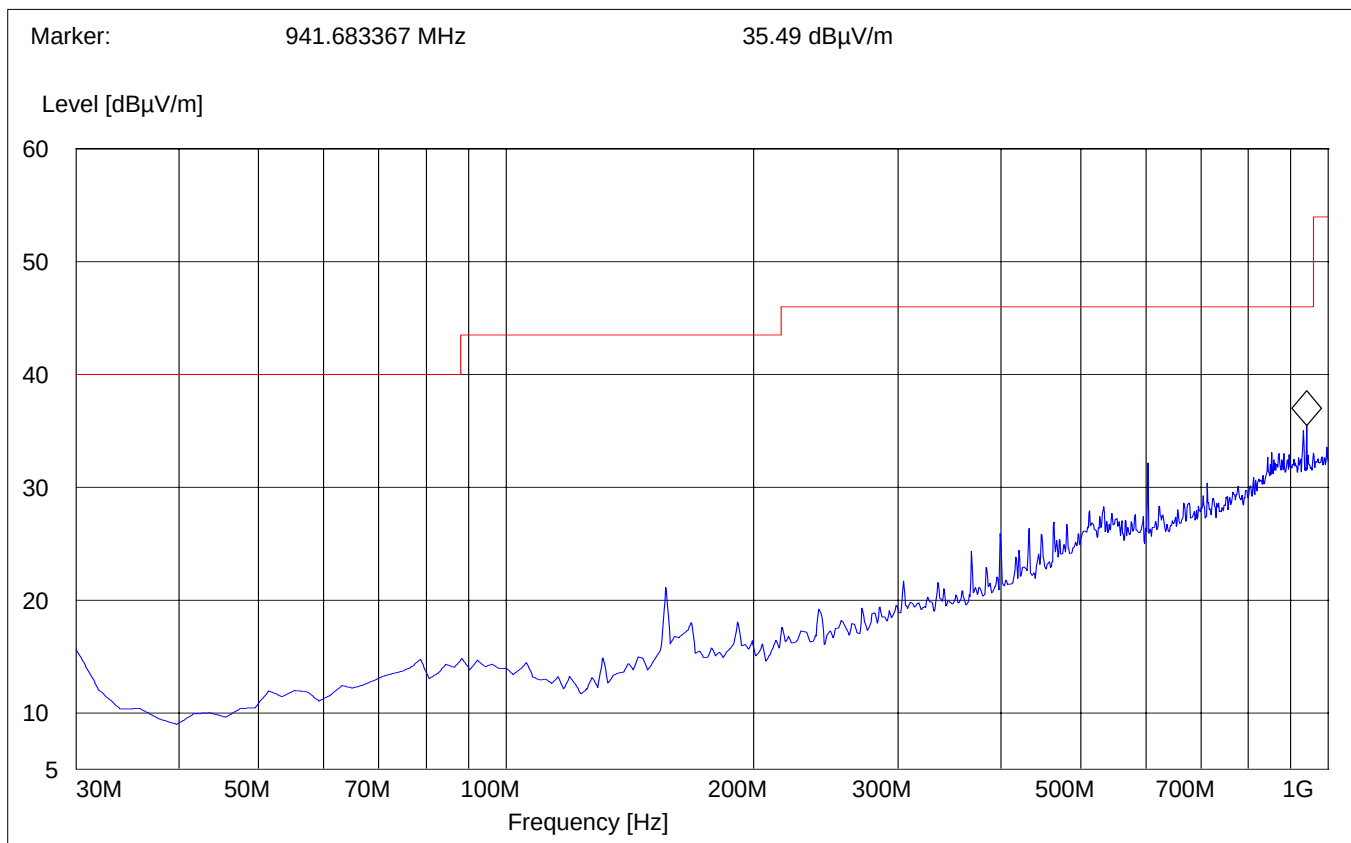
| <b>Frequency (MHz)</b> | <b>Field strength (µV/m)</b> | <b>Measurement distance (m)</b> |
|------------------------|------------------------------|---------------------------------|
| <b>0.009 - 0.490</b>   | <b>2400/F(kHz)</b>           | <b>300</b>                      |
| <b>0.490 - 1.705</b>   | <b>24000/F(kHz)</b>          | <b>30</b>                       |
| <b>1.705 - 30.0</b>    | <b>30</b>                    | <b>30</b>                       |
| <b>30 - 88</b>         | <b>100</b>                   | <b>3</b>                        |
| <b>88 - 216</b>        | <b>150</b>                   | <b>3</b>                        |
| <b>216 - 960</b>       | <b>200</b>                   | <b>3</b>                        |
| <b>above 960</b>       | <b>500</b>                   | <b>3</b>                        |

**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 3 and 26.5 GHz very short cable connections to the antenna was used to minimize the noise level.
2. All measurements are done in peak mode unless specified with the plots.

**RECEIVER SPURIOUS RADIATION****§ 15.209****30MHz – 1GHz****Antenna: vertical (worst-case plot)**

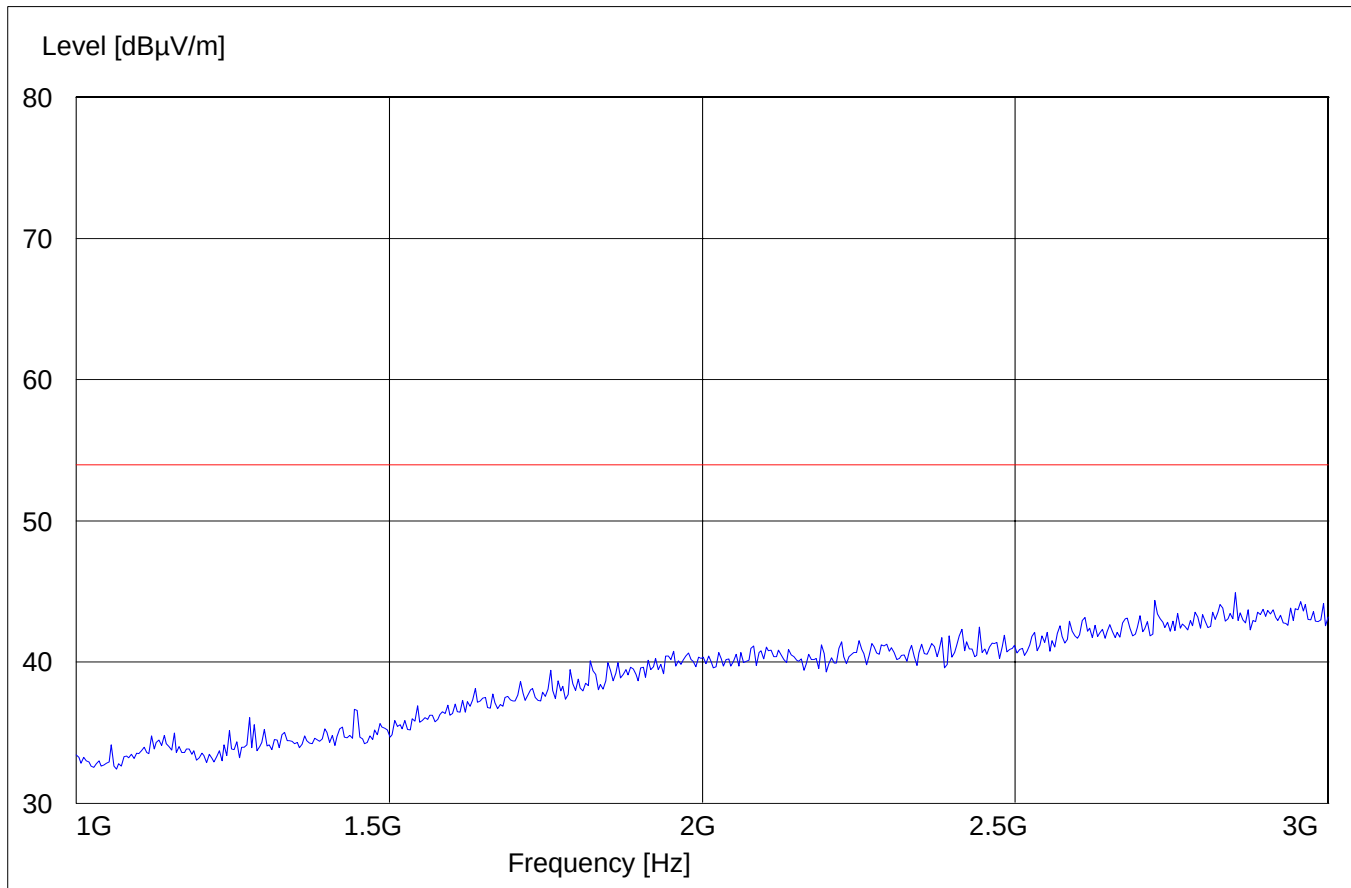
|                    |           |                      |         |         |            |
|--------------------|-----------|----------------------|---------|---------|------------|
| SWEEP TABLE:       |           | "BT Spuri hi 30-1G"  |         |         |            |
| Short Description: |           | Bluetooth 30MHz-1GHz |         |         |            |
| Start              | Stop      | Detector             | Meas.   | RBW     | Transducer |
| Frequency          | Frequency |                      | Time    | VBW     |            |
| 30.0 MHz           | 1.0 GHz   | MaxPeak              | Coupled | 100 kHz | 3141-#1186 |



**RECEIVER SPURIOUS RADIATION**  
**1GHz – 3GHz**

§ 15.209

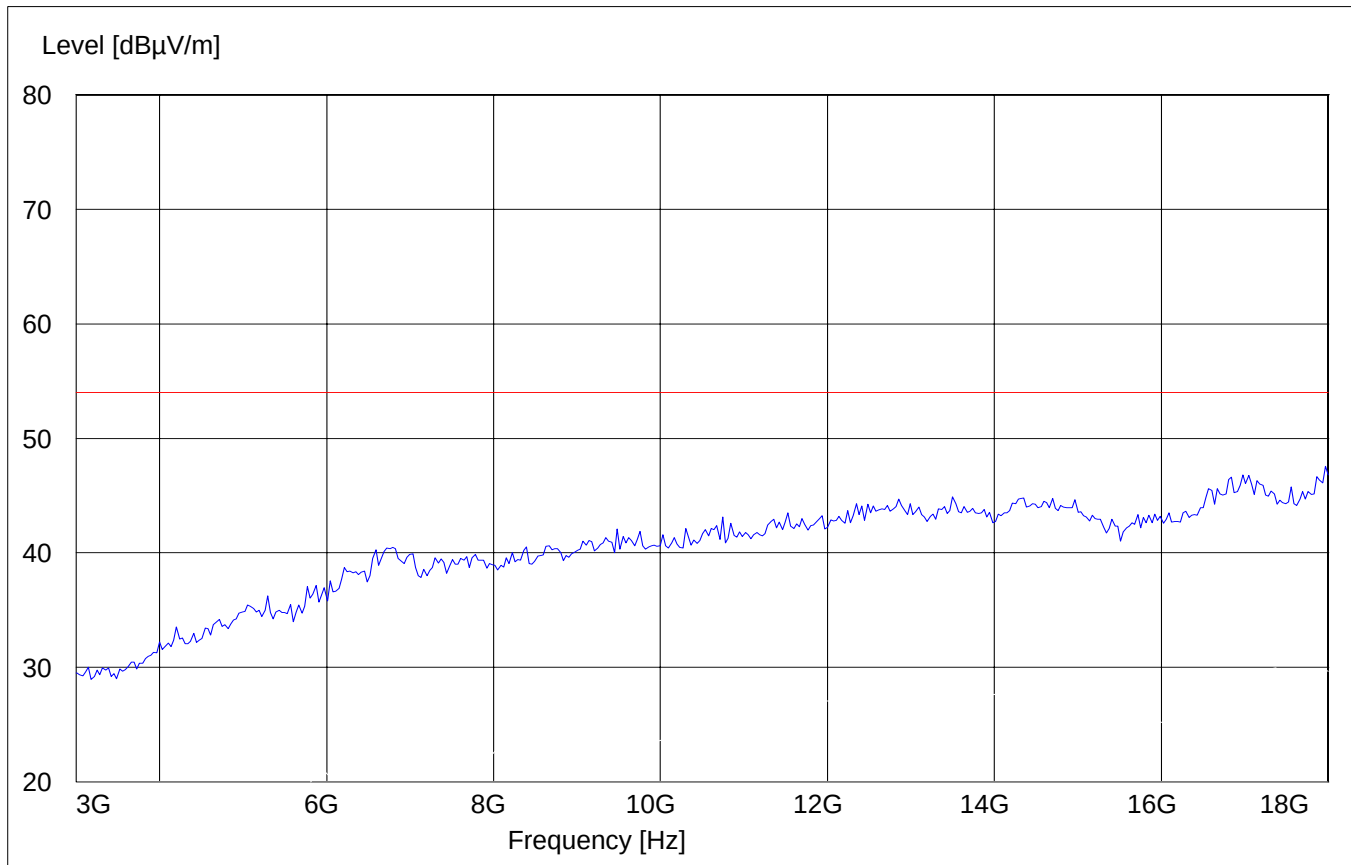
|                    |           |                           |         |       |                 |
|--------------------|-----------|---------------------------|---------|-------|-----------------|
| SWEEP TABLE:       |           | "BT Spuri hi 1-3G"        |         |       |                 |
| Short Description: |           | Bluetooth Spurious 1-3GHz |         |       |                 |
| Start              | Stop      | Detector                  | Meas.   | RBW   | Transducer      |
| Frequency          | Frequency | Time                      | Bandw.  | VBW   |                 |
| 1.0 GHz            | 3.0 GHz   | MaxPeak                   | Coupled | 1 MHz | #326 horn (dBi) |



**RECEIVER SPURIOUS RADIATION**  
**3GHz – 18GHz**

§ 15.209

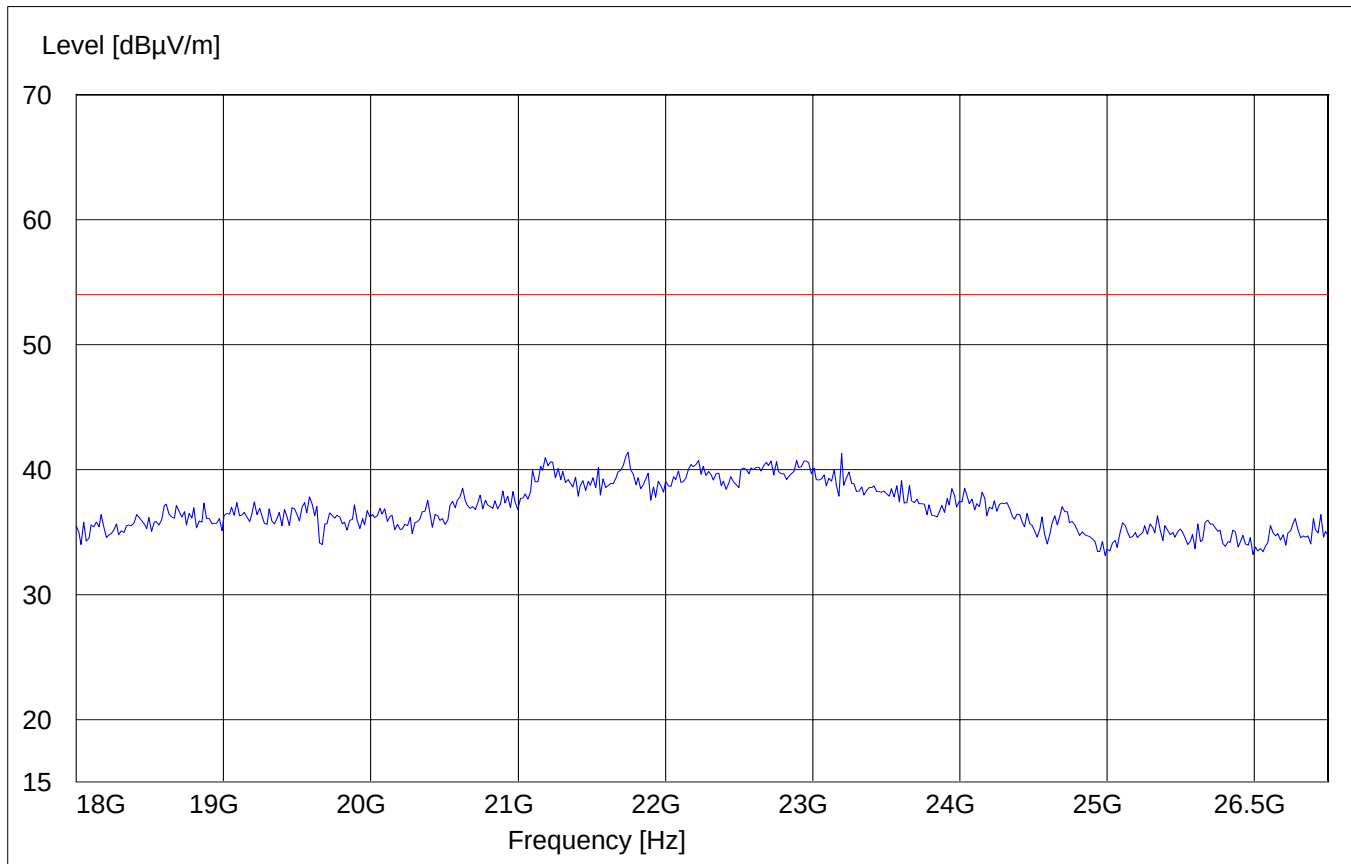
|                    |           |                             |         |       |                 |
|--------------------|-----------|-----------------------------|---------|-------|-----------------|
| SWEEP TABLE:       |           | "BT Spuri hi 3-18G"         |         |       |                 |
| Short Description: |           | Bluetooth Spurious 3-18 GHz |         |       |                 |
| Start              | Stop      | Detector                    | Meas.   | RBW   | Transducer      |
| Frequency          | Frequency | Time                        | Bandw.  | VBW   |                 |
| 3.0 GHz            | 18.0 GHz  | MaxPeak                     | Coupled | 1 MHz | #326 horn (dBi) |



**RECEIVER SPURIOUS RADIATION**  
**18GHz – 25GHz**

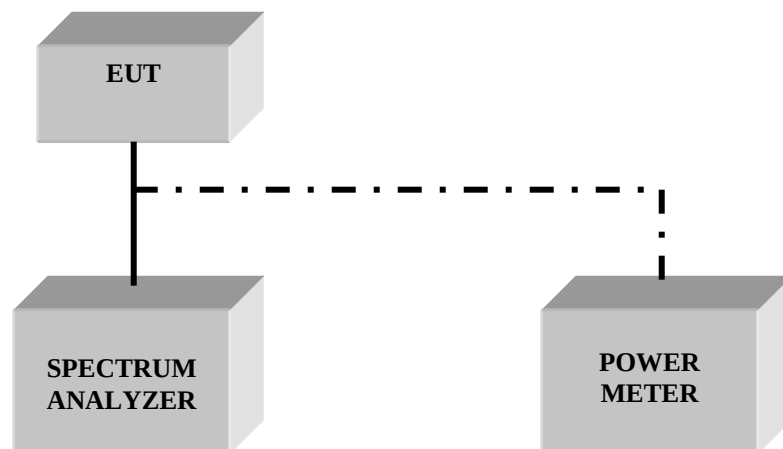
§ 15.209

|                    |           |                               |         |       |                 |
|--------------------|-----------|-------------------------------|---------|-------|-----------------|
| SWEEP TABLE:       |           | "BT Spuri hi 18-26.5G"        |         |       |                 |
| Short Description: |           | Bluetooth Spurious 18-26.5GHz |         |       |                 |
| Start              | Stop      | Detector                      | Meas.   | RBW   | Transducer      |
| Frequency          | Frequency | Time                          | Bandw.  | VBW   |                 |
| 18.0 GHz           | 26.5 GHz  | MaxPeak                       | Coupled | 1 MHz | #326 horn (dBi) |



**TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS**

| No | Instrument/Ancillary      | Type         | Manufacturer    | Serial No. |
|----|---------------------------|--------------|-----------------|------------|
| 01 | Spectrum Analyzer         | ESIB 40      | Rohde & Schwarz | 100107     |
| 02 | Spectrum Analyzer         | FSEM 30      | Rohde & Schwarz | 826880/010 |
| 03 | Biconilog Antenna         | 3141         | EMCO            | 0005-1186  |
| 04 | Horn Antenna (700M-18GHz) | SAS-200/571  | AH Systems      | 325        |
| 05 | Horn Antenna (18-26.5GHz) | 3160-09      | EMCO            | 1240       |
| 06 | 2-3GHz Band reject filter | BRM50701     | Microtronics    | 6          |
| 07 | Pre-Amplifier             | TS-ANA       | Rohde & Schwarz | --         |
| 08 | Pre-Amplifier             | JS4-00102600 | Miteq           | 00616      |

**BLOCK DIAGRAMS****Conducted Testing**

**Radiated Testing****ANECHOIC CHAMBER**