

**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)

---

|                                                                                                                           |
|---------------------------------------------------------------------------------------------------------------------------|
| <p><b>FCC LISTED, REG. NO.: 101450</b><br/><b>&amp;</b><br/><b>RECOGNIZED BY INDUSTRY CANADA</b><br/><b>IC – 3925</b></p> |
|---------------------------------------------------------------------------------------------------------------------------|

**Test report no.: 249FCC/2002**  
**FCC Part 15.247**  
**(M500 Bluetooth adapter & M1000 Bluetooth Headset)**

**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:****Designation: Name****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@ceteconomusa.com](mailto:lothar.schmidt@ceteconomusa.com)Internet: [www.cetecom.com](http://www.cetecom.com)

**1.3 Details of applicant**

**Name** : Plantronics  
**Street** : 345 Encinal St.  
**City** : Santa Cruz,CA 95060  
**Country** : USA  
**Contact** : John Mihelic  
**Telephone** : (831) 458-7659  
**Telefax** : N/A  
**e-mail** : John.mihelic@plantronics.com

**1.4 Application details**

**Date of receipt of application** : 2/1/2002  
**Date of receipt test item** : 2/15/2002  
**Date of test** : 2/15, 2/19, 2/20, 2/21 & 4/26, 2002

**1.5 Test item**

**Manufacturer** : Plantronics  
**Street Address** : 345 Encinal St.  
**City / Country** : Santa Cruz,CA 95060, USA  
**Name of EUT** : M500, M1000 & M1500  
**Type name:** OEM Philips HSBX 38  
**Description** : Bluetooth Headset  
**Model No.** : A500, M1000 & M1500  
**Serial No.** : A21V301357  
**FCC ID.** : AL8-M1000

**Additional information**

**Frequency** : 2402MHz – 2480MHz  
**Type of modulation** : GFSK  
**Number of channels** : 79  
**Antenna** : Integral  
**Power supply** : Battery 2.5VDC  
**Output power** : Max. EIRP (in dBm and Watt)  
**Extreme vol. Limits** : 2.9VDC – 2.1VDC  
**Extreme temp. Tolerance** : 0°C - +50°C

**1.6 Test standards: FCC Part 15 §15.247 (DA00-705)****Additional Description:**

The Equipment under test (EUT) consists of a Bluetooth headset model name M1000 and a Bluetooth adapter model name A500. The two models will be marketed both individually and as a system. When

both the headset and adapter are marketed together the model name for the system will be M1500. An identical transceiver module is used in both the headset and the adapter. Antenna port conducted tests were performed on one model, the headset M1000. These tests are valid for both models. Radiated tests were performed for both models.

**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 :**

**2002-01-23****EMC & Radio****Lothar Schmidt**

---

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

## **2.2 Testreport**

### **TEST REPORT**

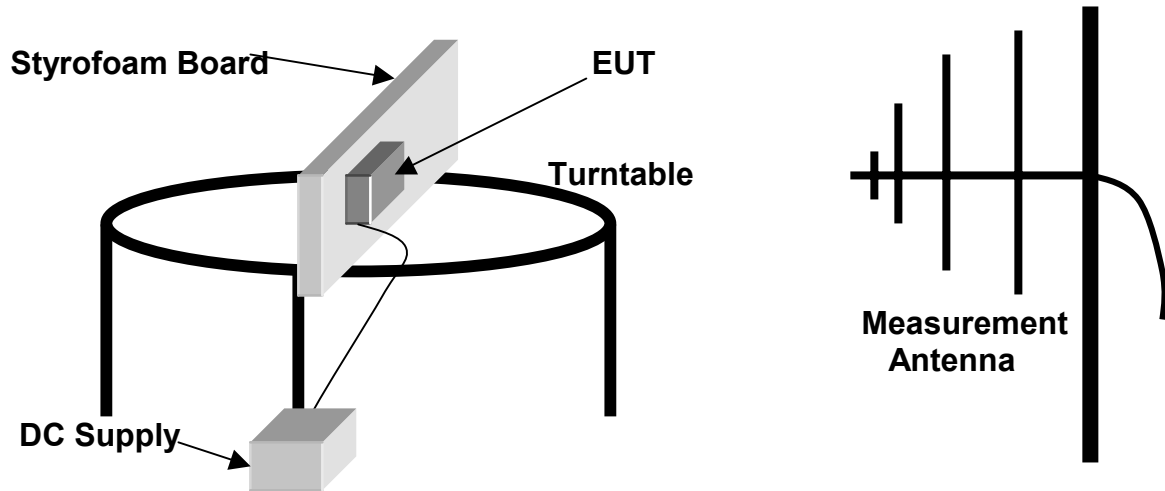
**Test report no. : 249FCC/2002**  
**(M500 Bluetooth Adapter & M1000 Bluetooth Headset)**

**TEST REPORT REFERENCE****LIST OF MEASUREMENTS**

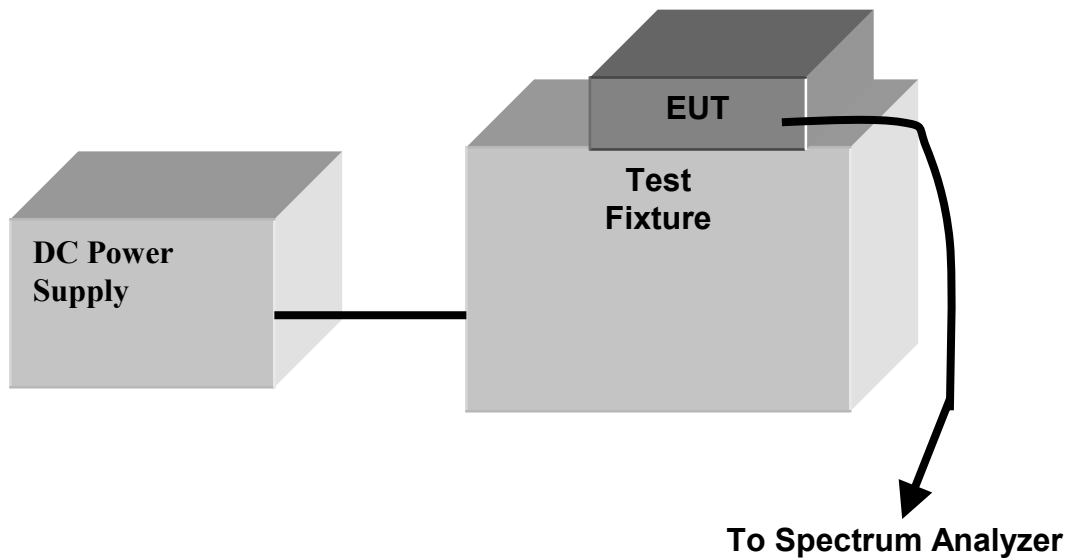
| <b>Paragraph</b> | <b>PARAMETER TO BE MEASURED</b>     | <b>PAGE</b> |
|------------------|-------------------------------------|-------------|
|                  | <b>Transmitter parameters</b>       |             |
| § 15.247 (a)     | Carrier frequency separation        | 8           |
| § 15.247 (a)     | Number of hopping channels          | 9           |
| § 15.247 (a)     | Time of occupancy (dwell time)      | 11          |
| § 15.247 (a)(1)  | Spectrum Bandwidth of a FHSS System | 12          |
| § 15.247 (b)(2)  | Maximum peak output power           | 16          |
| §15.247          | Band edge compliance                | 24          |
| § 15.247 (c)(1)  | Emission limitations                | 26          |
| § 15.107/207     | AC Line Conducted Emission          | 35          |
|                  | <b>Receiver parameters</b>          |             |
| § 15.209         | Spurious radiations - Radiated      | 36          |
|                  | Test equipment listing              | 39          |

**TEST CONFIGURATION**

**RADIATED SETUP:**



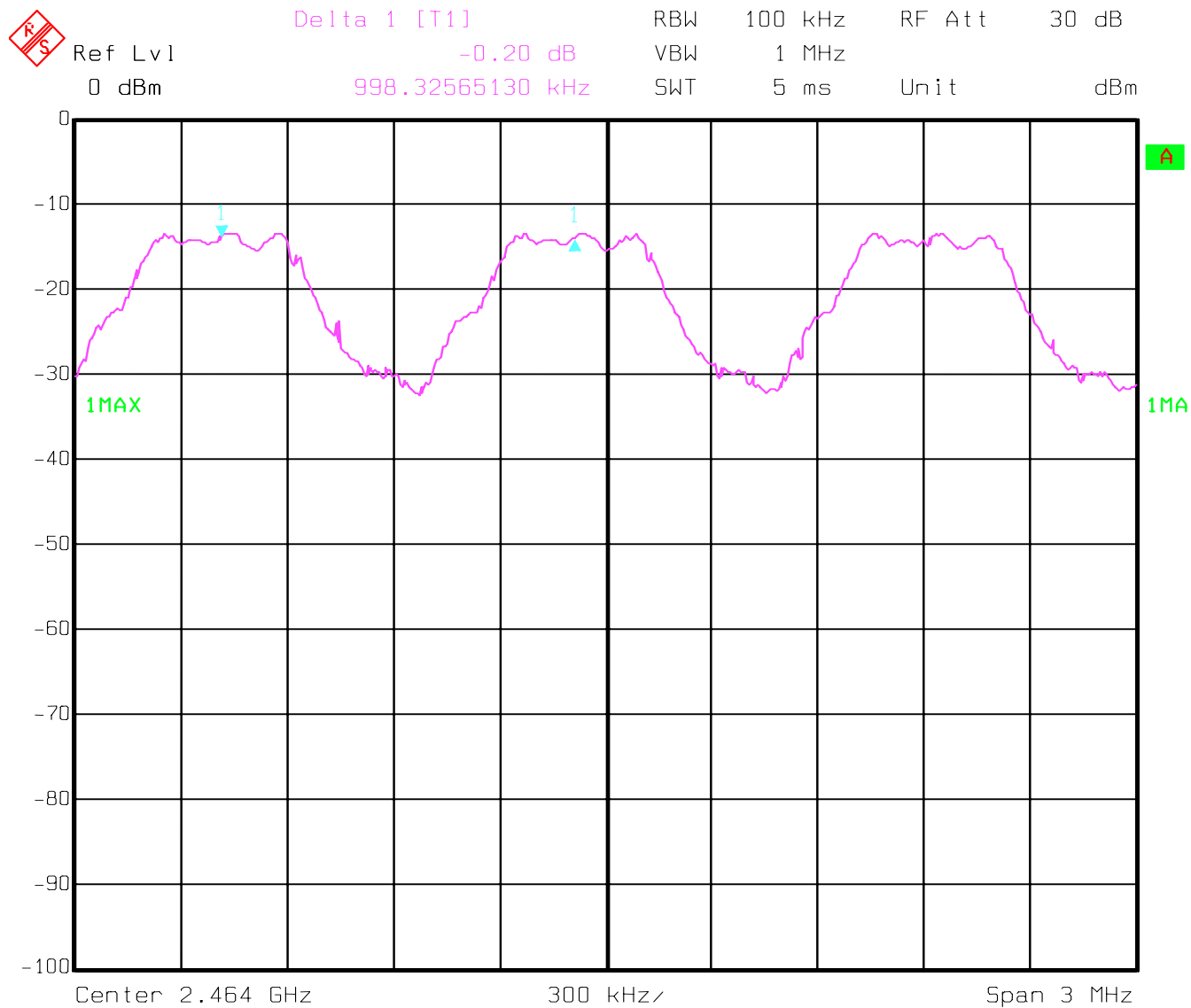
**CONDUCTED SETUP:**



## CARRIER FREQUENCY SEPERATION

§15.247(a)

The carrier frequency seperation is 998.3256 KHz.



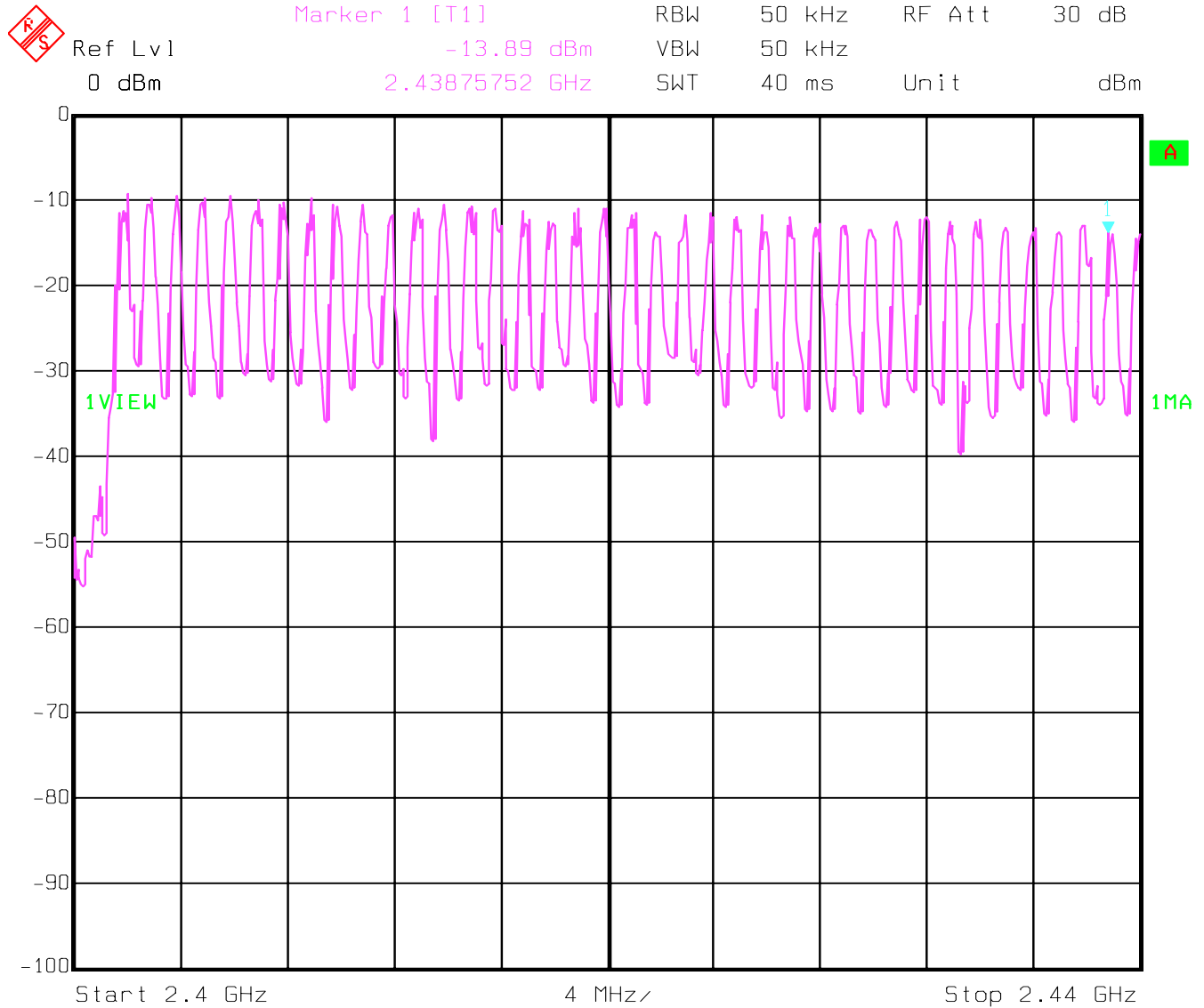
Date: 19.FEB.2002 17:04:22

## NUMBER OF HOPPING CHANNELS

§15.247(a)

The number of hopping channels is 79 (see next 2 plots)  
The marker corresponds to the marker from the next plot.

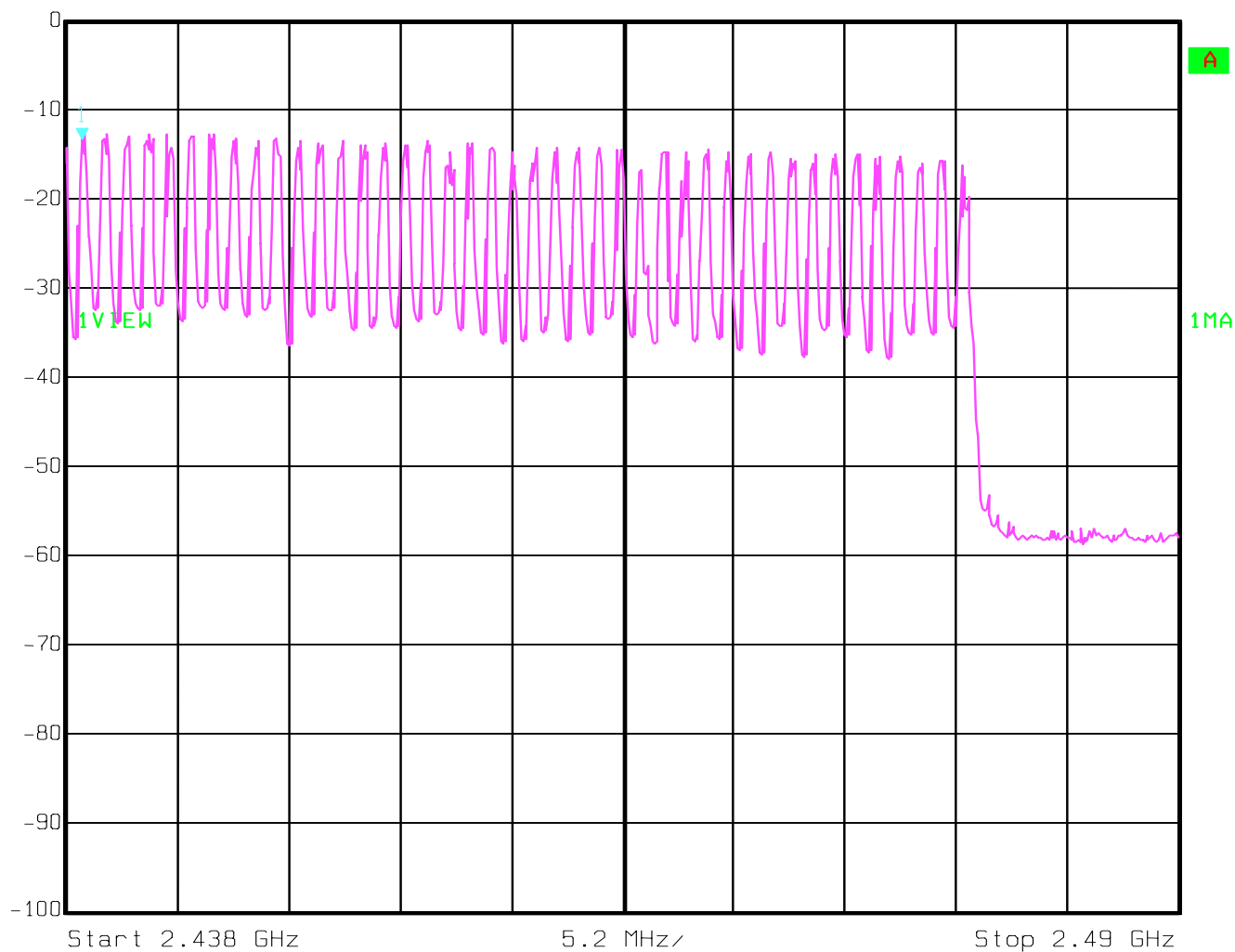
### Plot 1: Total 38 channels



Date: 19.FEB.2002 16:31:47

## Plot 2: Total 41 channels

|                                                                                   |         |                |     |        |        |       |
|-----------------------------------------------------------------------------------|---------|----------------|-----|--------|--------|-------|
|  | Ref Lvl | Marker 1 [T1]  | RBW | 50 kHz | RF Att | 30 dB |
|                                                                                   | 0 dBm   | -13.40 dBm     | VBW | 50 kHz |        |       |
|                                                                                   |         | 2.43875752 GHz | SWT | 52 ms  | Unit   | dBm   |



Date: 19.FEB.2002 16:37:28

## TIME OF OCCUPANCY (DWELL TIME) FOR DH1

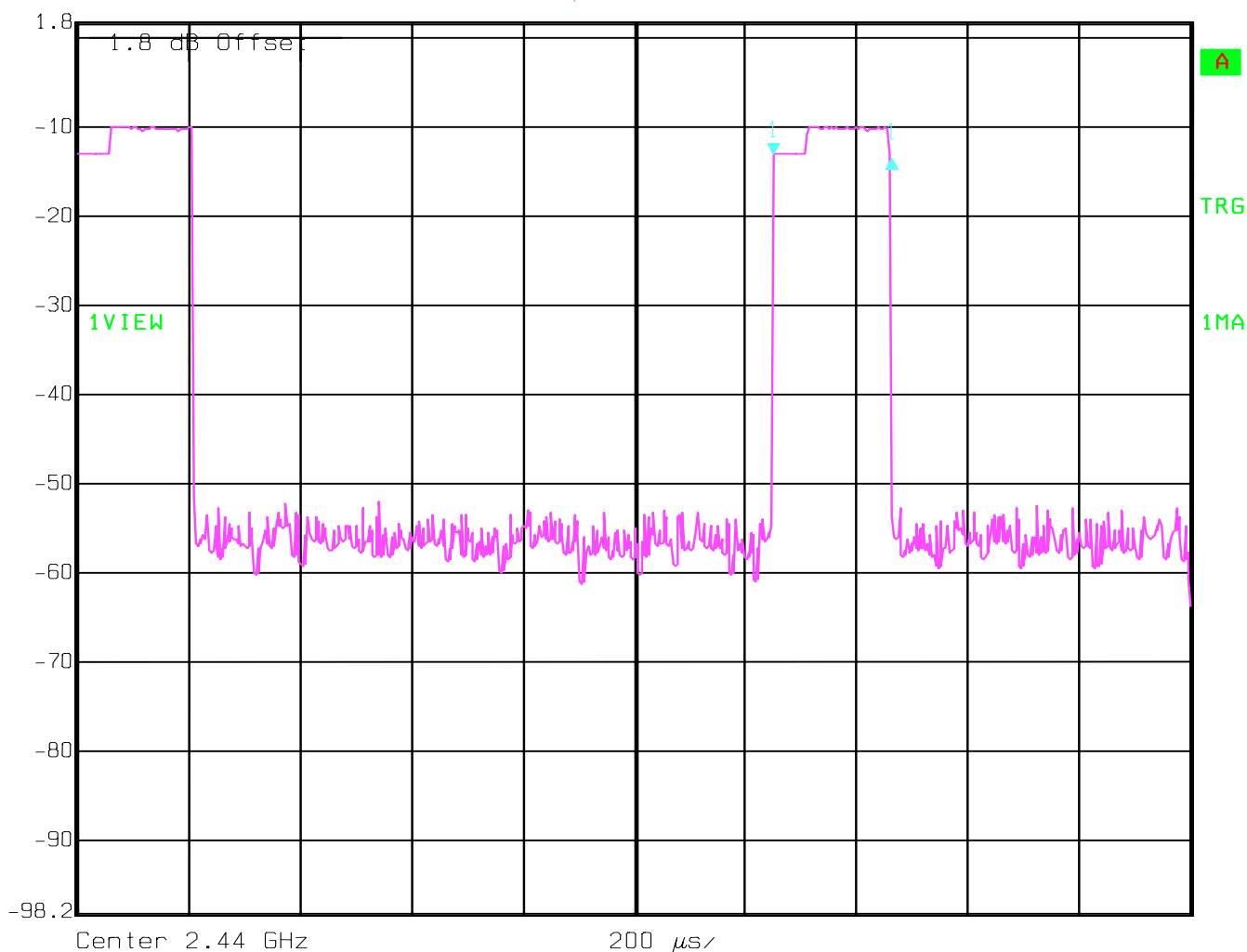
§15.247(a)

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 30 seconds you have 303.9 times of appearance . Each Tx-time per appearance is 214.4289 μs.

303.9 \* 214.4289 μs = 65.165 ms per 30 seconds.

The EUT only supports DH-1 type packets.

|                                                                                   |              |     |       |        |       |
|-----------------------------------------------------------------------------------|--------------|-----|-------|--------|-------|
|  | Delta 1 [T1] | RBW | 1 MHz | RF Att | 30 dB |
|                                                                                   | Ref Lvl      | VBW | 1 MHz |        |       |
|                                                                                   | 1.8 dBm      | SWT | 2 ms  | Unit   | dBm   |
|                                                                                   |              |     |       |        |       |



Date: 19.FEB.2002 20:05:28

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

| TEST CONDITIONS           |                         | 20 dB BANDWIDTH ( kHz ) |         |         |
|---------------------------|-------------------------|-------------------------|---------|---------|
| Frequency (MHz)           |                         | 2402                    | 2440    | 2480    |
| T <sub>nom</sub> ( 23 )°C | V <sub>nom</sub> (2.5)V | 713.427                 | 713.426 | 709.419 |
| Measurement uncertainty   |                         | ±3dB                    |         |         |

RBW / VBW as provided in the "Measurement Guidelines" (DA 00-705, March 30, 2000)

Note: An UNCAL condition occurred during the 20dB B/W measurements. This was due to the incorrect sweep time being set manually. This was not noticed until after testing was completed. The measurements were determined to be valid, because this condition will not affect relative measurements.

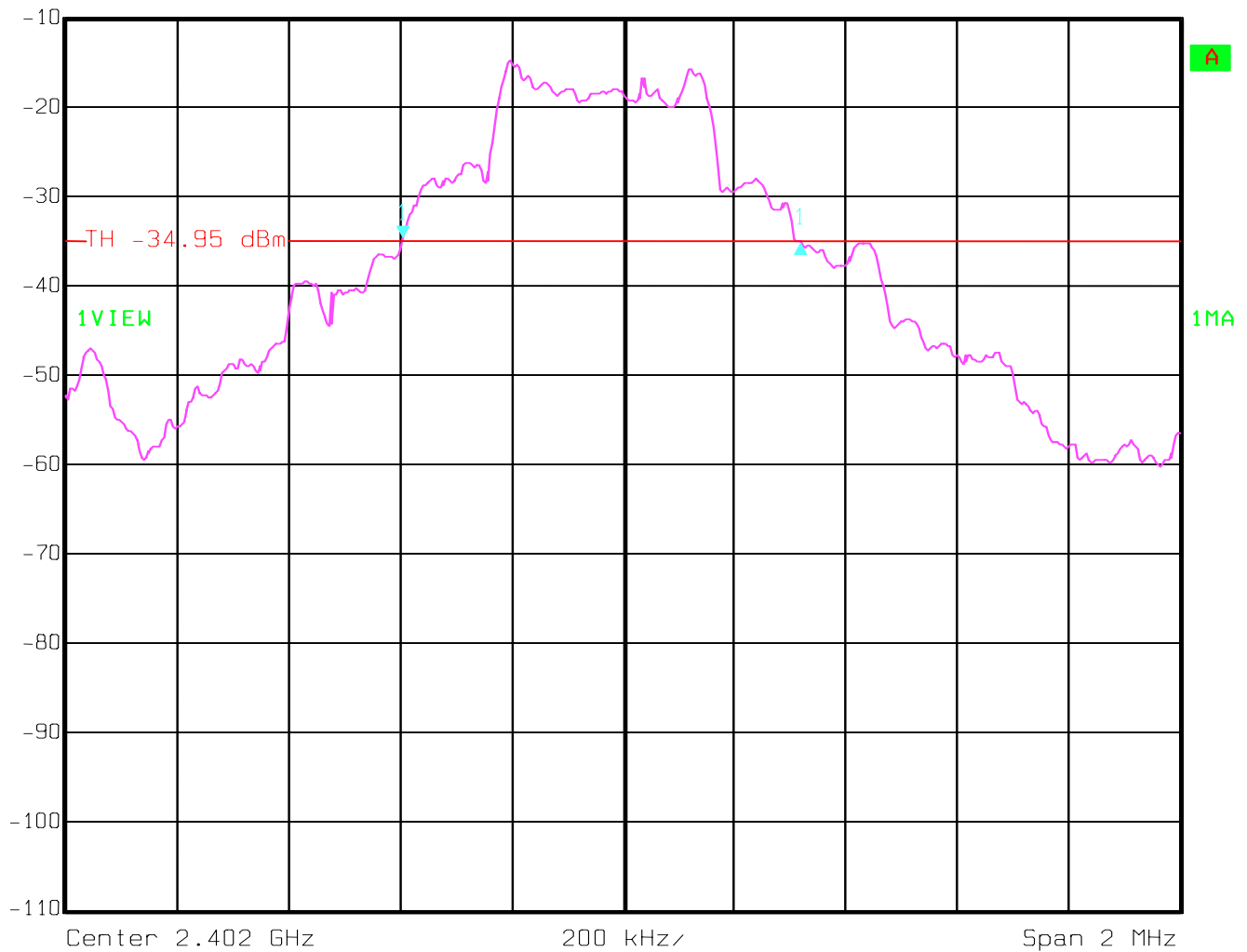
**LIMIT****SUBCLAUSE §15.247(a) (1)****The maximum 20dB bandwidth shall be at maximum 1000 KHz**

## SPECTRUM BANDWIDTH OF FHSS SYSTEM 20 dB bandwidth

§15.247(a)

### Lowest Channel: 2402MHz

|                                                                                   |         |                  |     |        |        |       |
|-----------------------------------------------------------------------------------|---------|------------------|-----|--------|--------|-------|
|  | UNCAL   | Delta 1 [T1]     | RBW | 10 kHz | RF Att | 20 dB |
|                                                                                   | Ref Lvl | -0.38 dB         | VBW | 10 kHz |        |       |
|                                                                                   | -10 dBm | 713.42685371 kHz | SWT | 5 ms   | Unit   | dBm   |



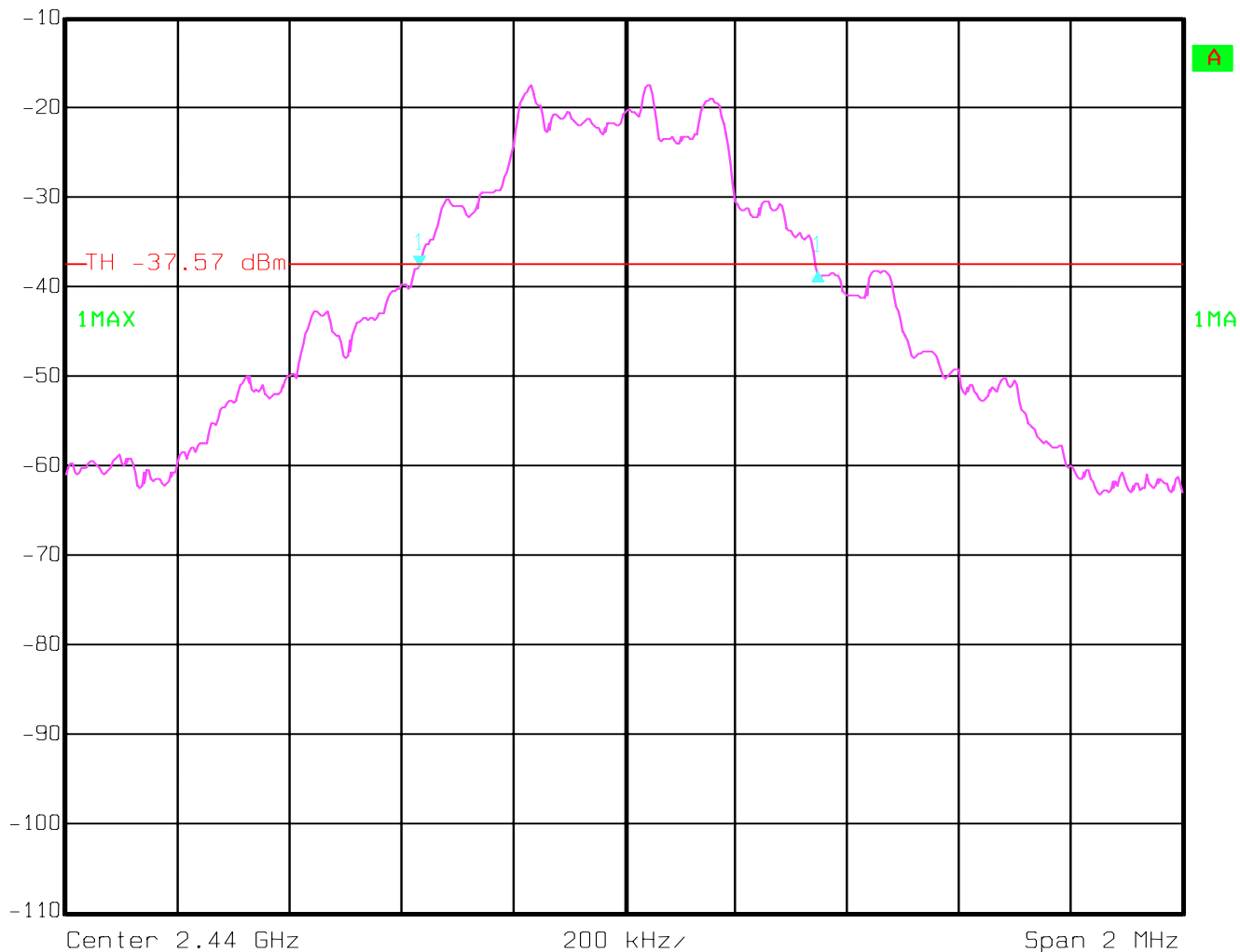
Date: 19.FEB.2002 18:58:06

## SPECTRUM BANDWIDTH OF FHSS SYSTEM 20 dB bandwidth

§15.247(a)

Mid Channel: 2440MHz

|                                                                                   |         |                  |     |        |        |       |
|-----------------------------------------------------------------------------------|---------|------------------|-----|--------|--------|-------|
|  | UNCAL   | Delta 1 [T1]     | RBW | 10 kHz | RF Att | 20 dB |
|                                                                                   | Ref Lvl | -0.27 dB         | VBW | 10 kHz |        |       |
|                                                                                   | -10 dBm | 713.42685371 kHz | SWT | 5 ms   | Unit   | dBm   |



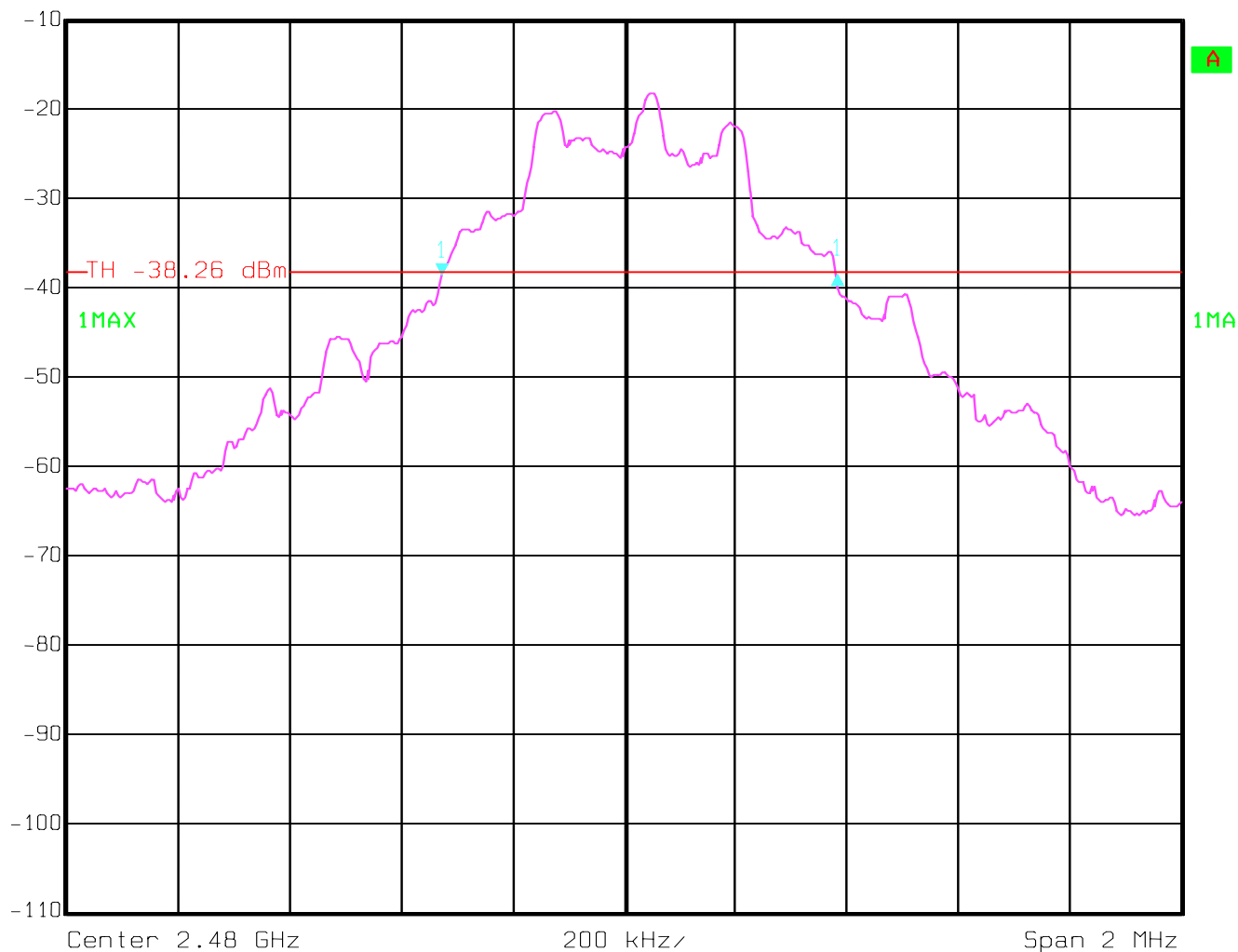
Date: 19.FEB.2002 18:46:08

## SPECTRUM BANDWIDTH OF FHSS SYSTEM 20 dB bandwidth

§15.247(a)

Highest Channel: 2480MHz


**UNCAL**      Delta 1 [T1]      RBW    10 kHz    RF Att    20 dB  
 Ref Lvl      0.45 dB      VBW    10 kHz  
 -10 dBm      709.4183768 kHz      SWT    5 ms    Unit      dBm



Date: 19.FEB.2002 18:53:33

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

(conducted)

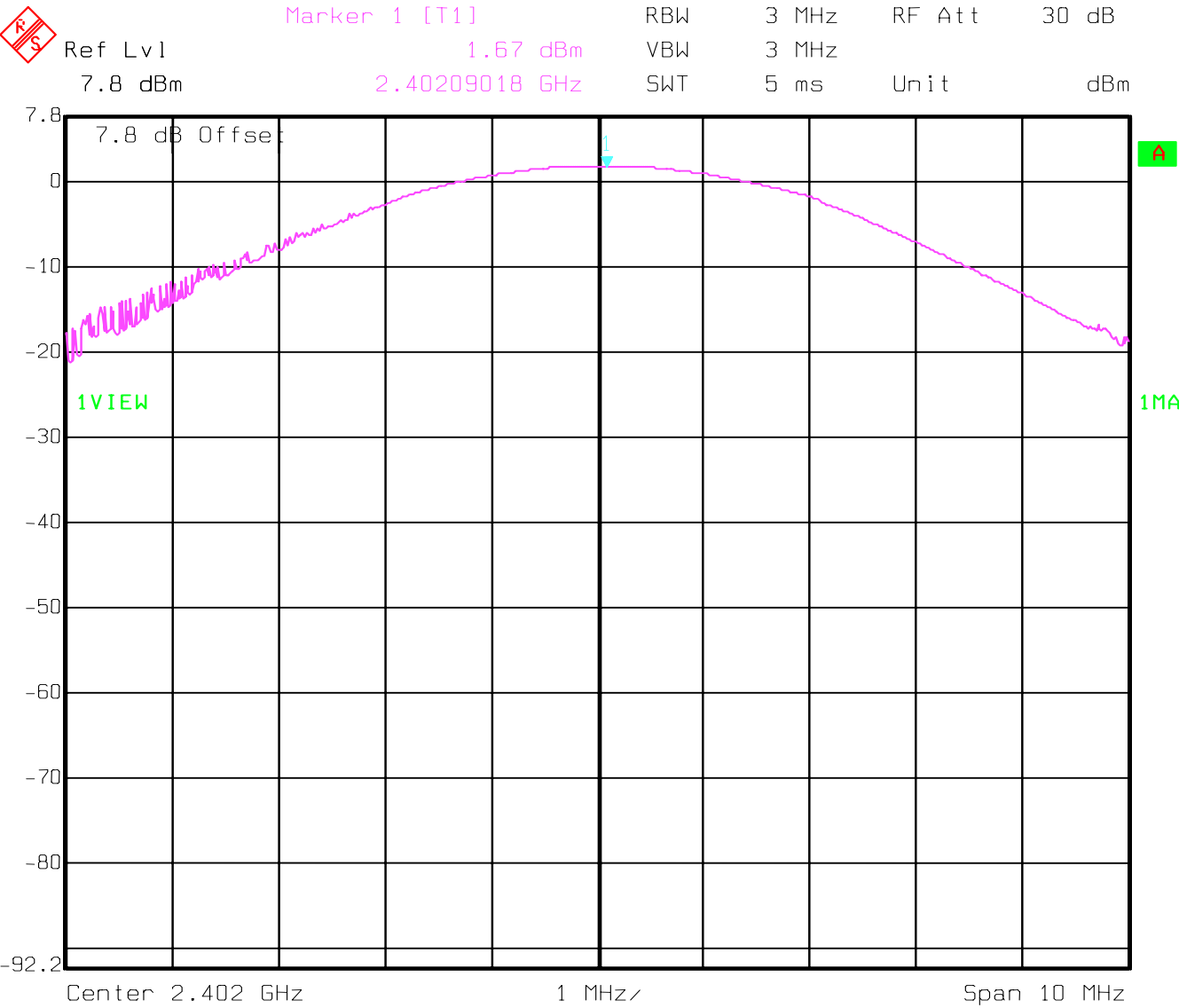
Measurements for Headset M1000 below:

Measurements are made with the EUT in a test jig. All attenuations are offset for in the plots.

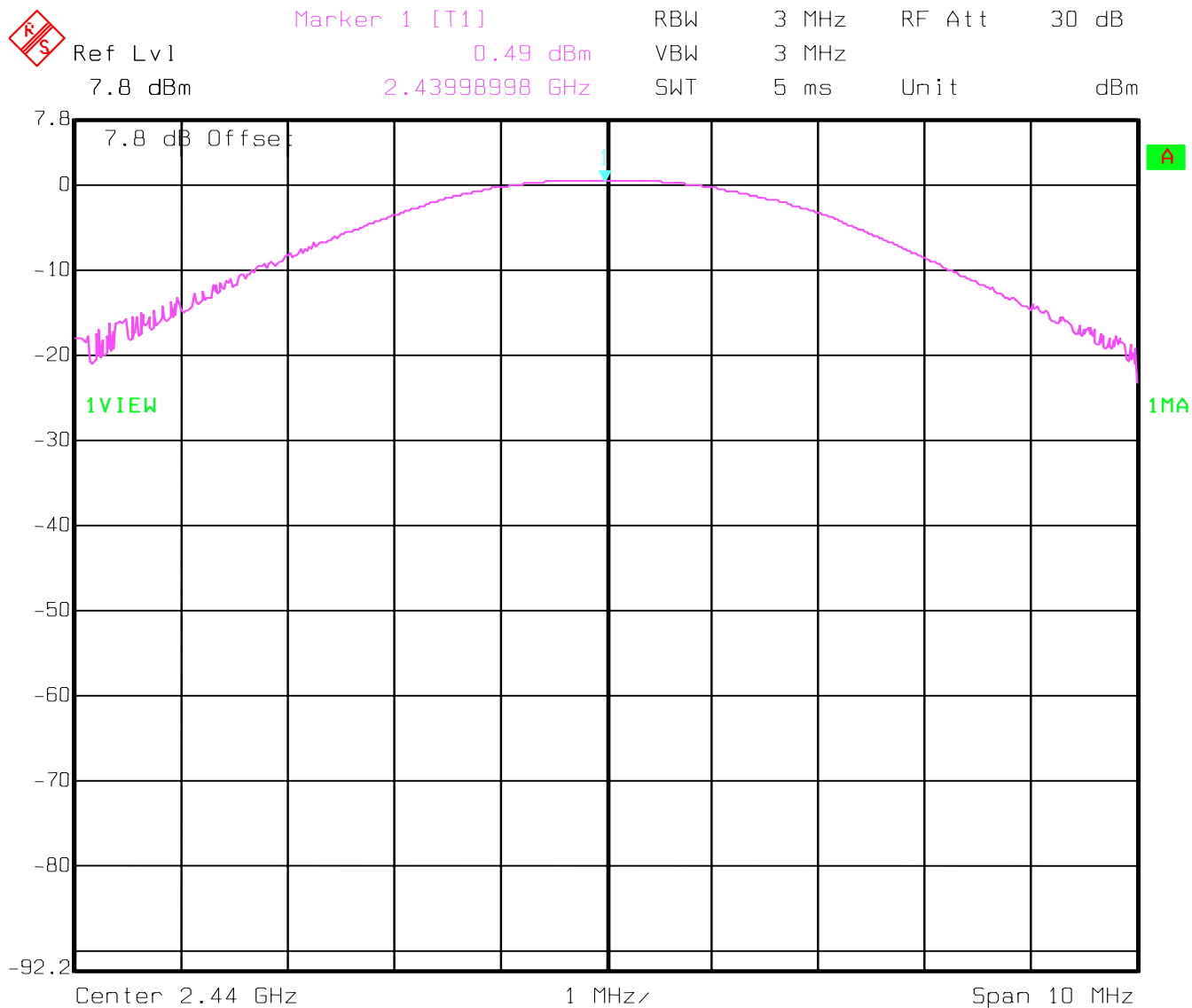
| TEST CONDITIONS           |                         | MAXIMUM PEAK OUTPUT POWER (dBm) |      |      |       |
|---------------------------|-------------------------|---------------------------------|------|------|-------|
| Frequency (MHz)           |                         | 2402                            |      | 2440 | 2480  |
| T <sub>nom</sub> ( 23 )°C | V <sub>nom</sub> (2.5)V | PK                              | 1.67 | 0.49 | -3.08 |
| Measurement uncertainty   |                         | ±3dB                            |      |      |       |

**LIMIT****SUBCLAUSE § 15.247 (b) (1)**

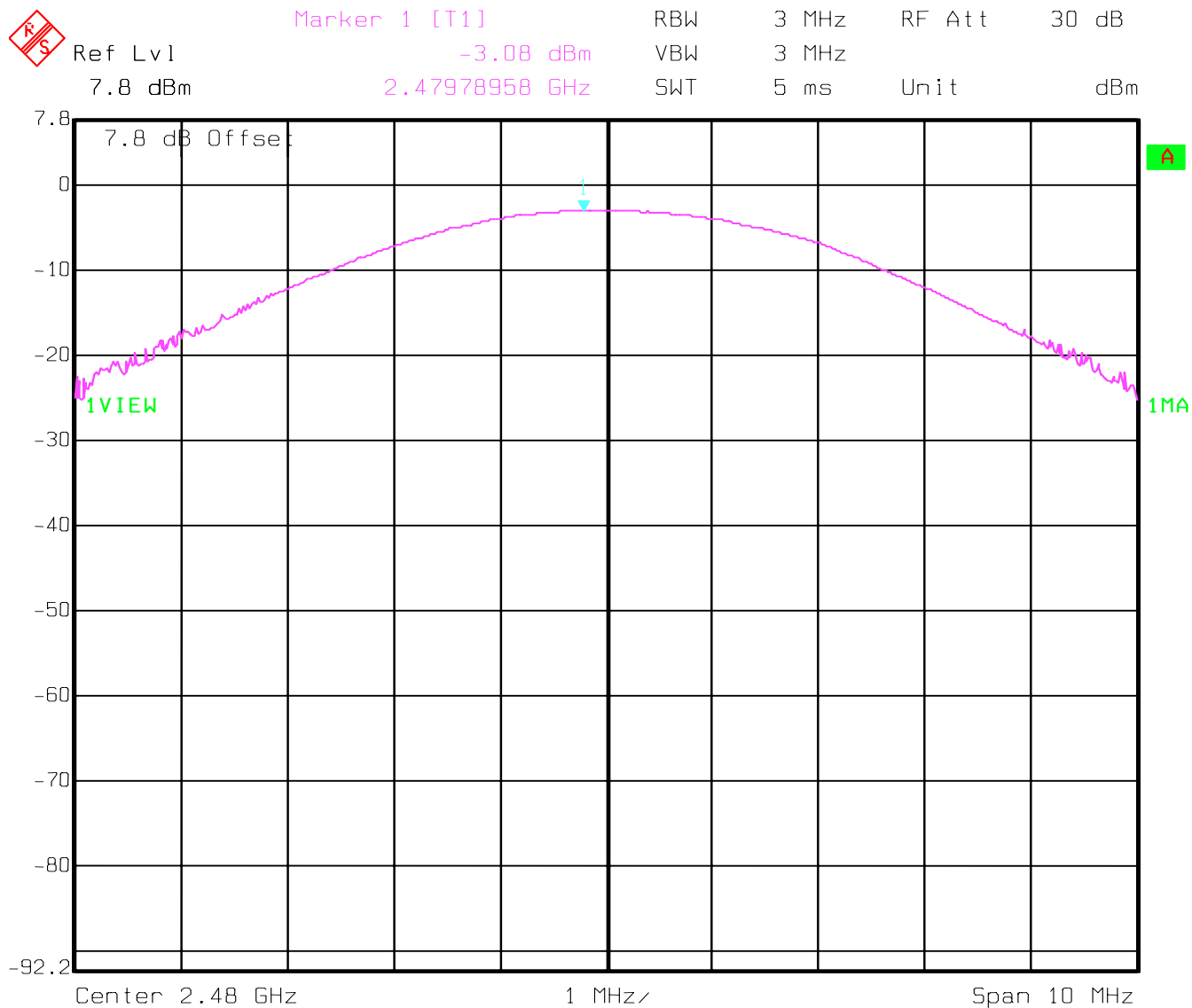
| Frequency range | RF power output |
|-----------------|-----------------|
| 2400-2483.5 MHz | 1.0 Watt        |



Date: 26.APR.2002 13:19:33



Date: 26.APR.2002 13:21:49



Date: 26.APR.2002 13:22:48

**MAXIMUM PEAK OUTPUT POWER  
(RADIATED)**  
Measurements for Headset M1000 below:  
**EIRP:**

**SUBCLAUSE § 15.247 (b) (1)**

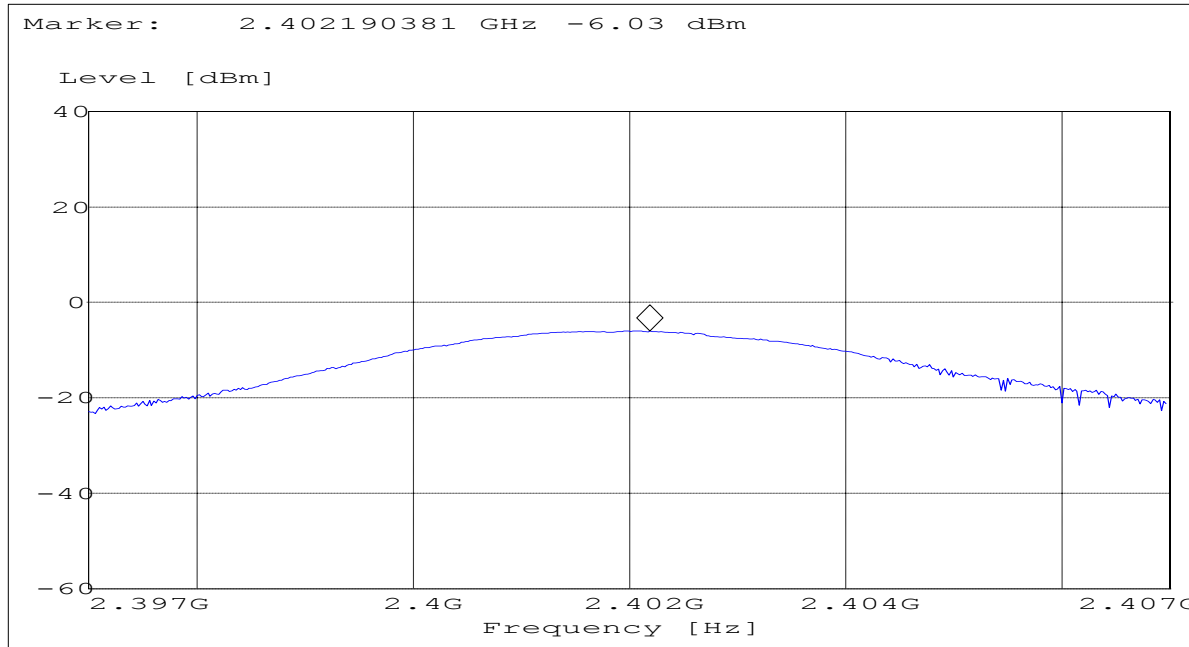
| TEST CONDITIONS           |                         | MAXIMUM PEAK OUTPUT POWER (dBm) |       |       |
|---------------------------|-------------------------|---------------------------------|-------|-------|
| Frequency (MHz)           |                         | 2402                            | 2440  | 2480  |
| T <sub>nom</sub> ( 23 )°C | V <sub>nom</sub> (2.5)V | -6.03                           | -5.18 | -8.65 |
| Measurement uncertainty   |                         | ±3dB                            |       |       |

**RBW/VBW : 3 MHz**

**LIMIT**

**SUBCLAUSE § 15.247 (b) (1)**

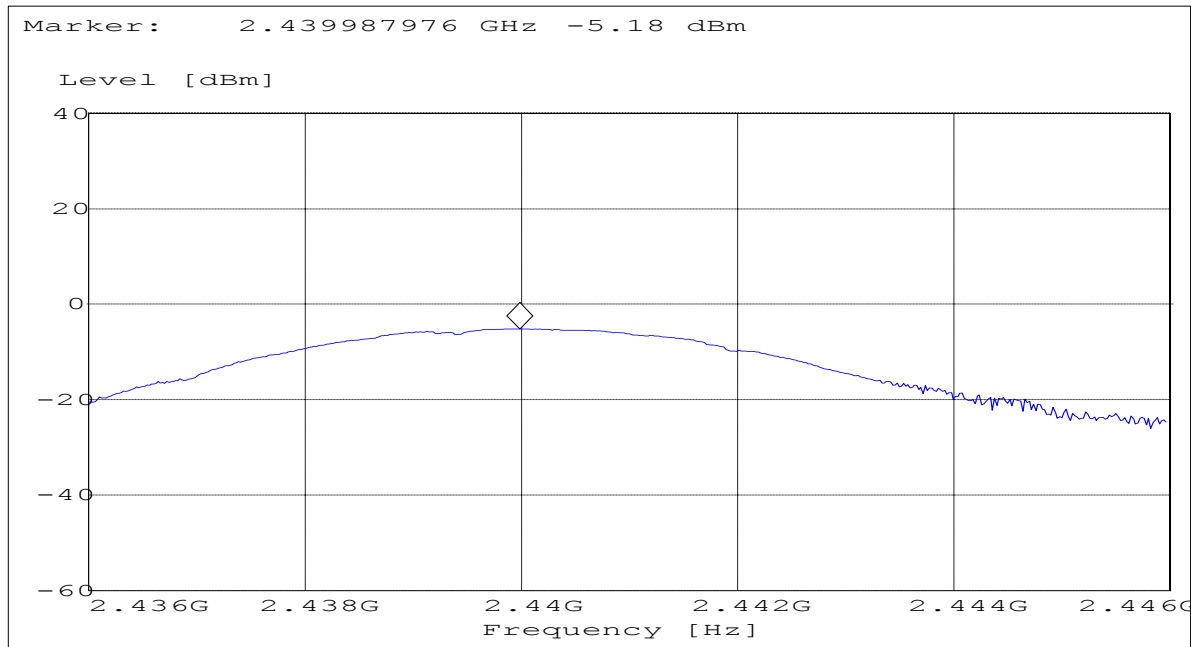
| Frequency range | RF power output |
|-----------------|-----------------|
| 2400-2483.5 MHz | 1.0 Watt        |

**PEAK OUTPUT POWER (RADIATED)****§15.247 (b) (1)****ANALYZER SETTINGS: RBW = 3MHz VBW = 3MHz**

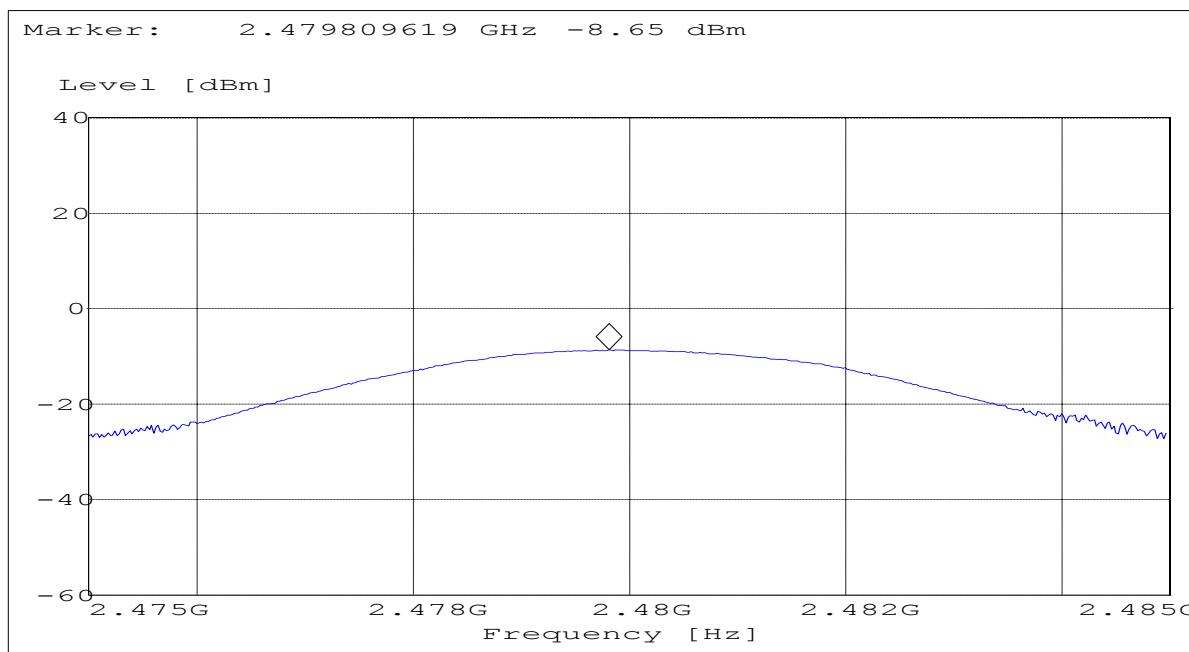
## PEAK OUTPUT POWER (RADIATED)

§15.247 (b) (1)

Mid Channel: 2440MHz



ANALYZER SETTINGS: RBW = 3MHz VBW = 3MHz

**PEAK OUTPUT POWER (RADIATED)****§15.247 (b) (1)****Highest Channel: 2480MHz****ANALYZER SETTINGS: RBW = 3MHz VBW = 3MHz**

Measurements for Adapter M500 below:

**EIRP:**

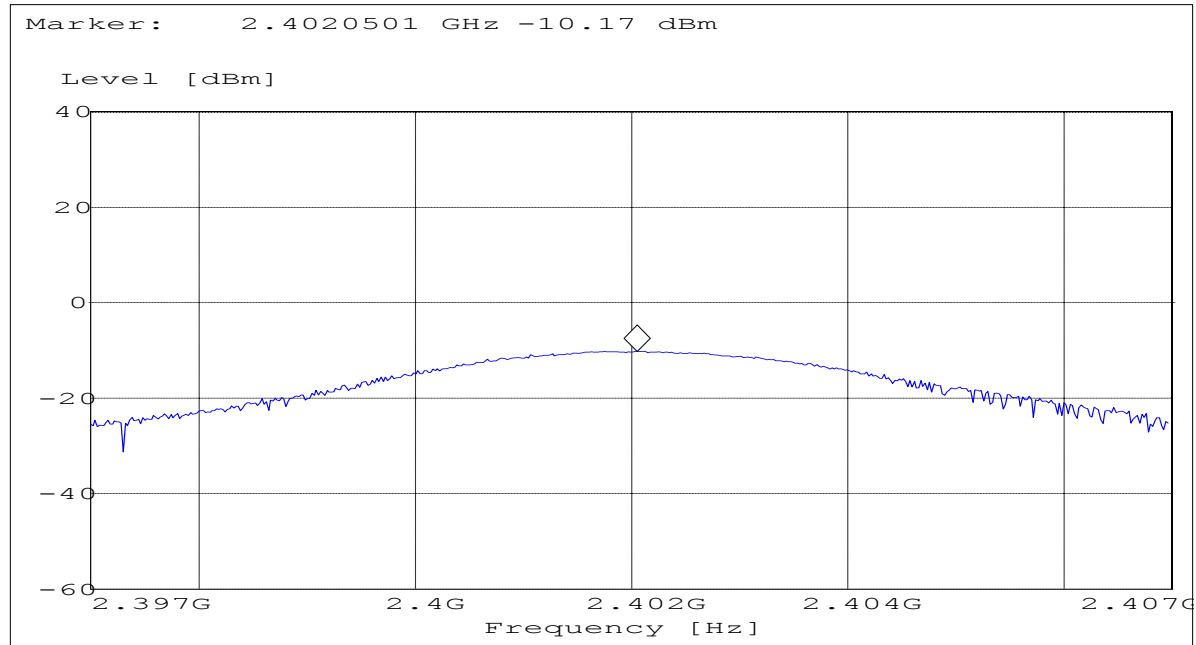
| TEST CONDITIONS           |                         | MAXIMUM PEAK OUTPUT POWER (dBm) |       |        |
|---------------------------|-------------------------|---------------------------------|-------|--------|
| Frequency (MHz)           |                         | 2402                            | 2440  | 2480   |
| T <sub>nom</sub> ( 23 )°C | V <sub>nom</sub> (2.5)V | -10.17                          | -9.48 | -10.33 |
| Measurement uncertainty   |                         | ±3dB                            |       |        |

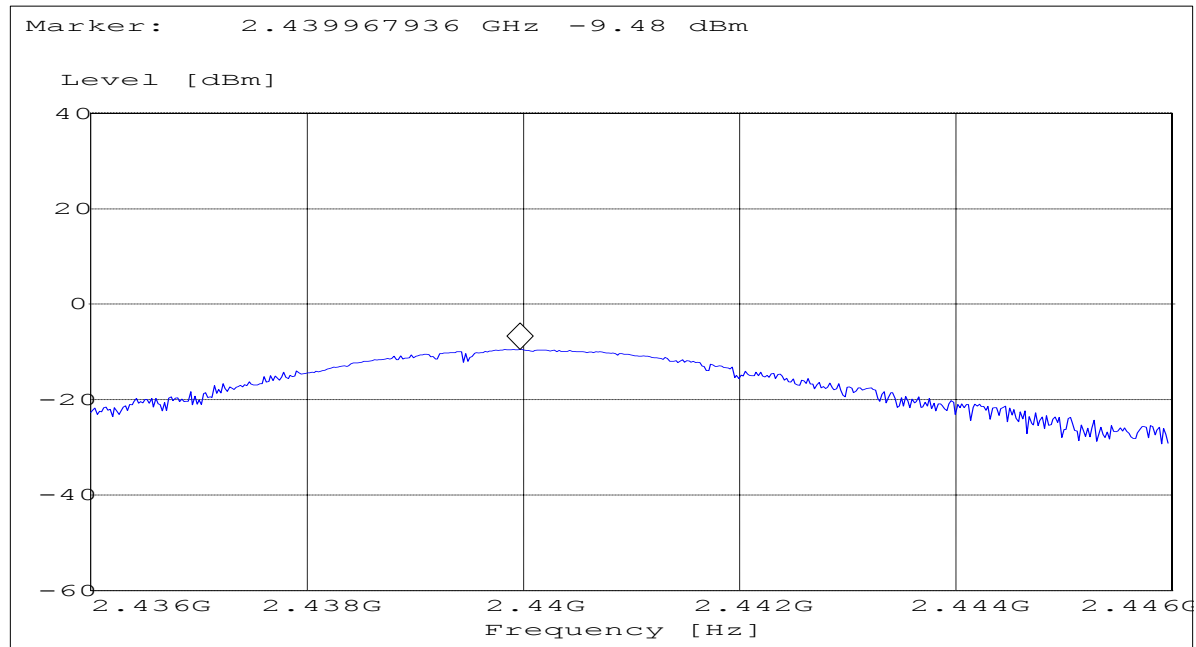
RBW/VBW : 3 MHz

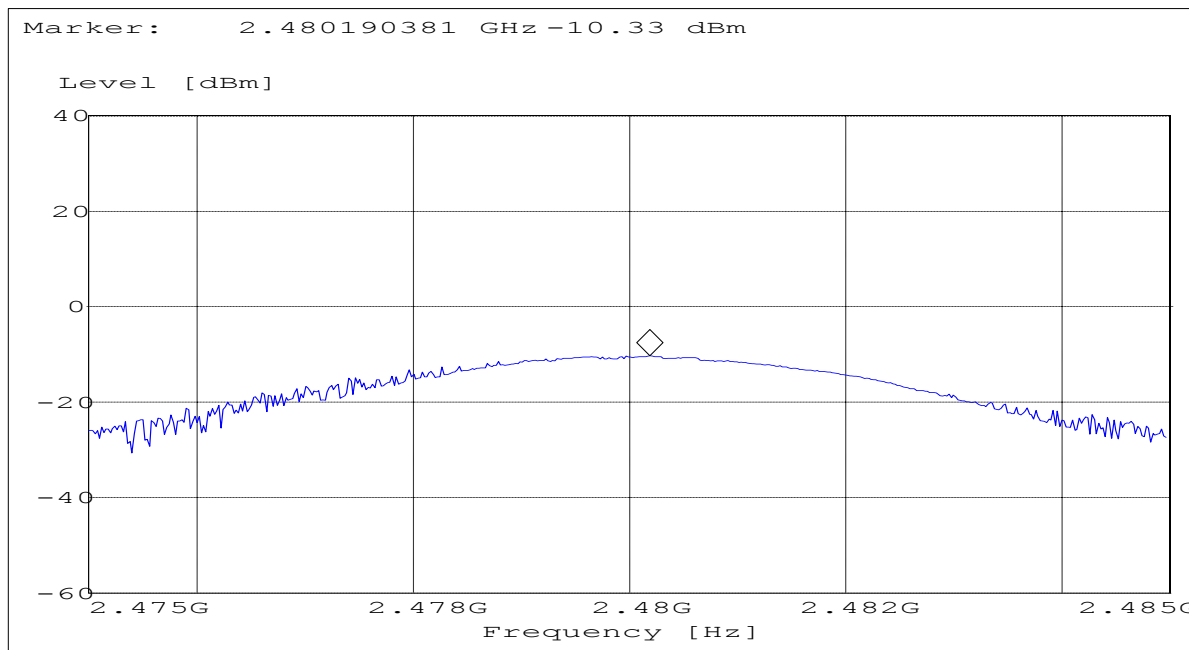
LIMIT

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)****Low Channel: 2402MHz****ANALYZER SETTINGS: RBW = 3MHz VBW = 3MHz**

**PEAK OUTPUT POWER (RADIATED)****§15.247 (b) (1)****Mid Channel: 2440MHz****ANALYZER SETTINGS: RBW = 3MHz VBW = 3MHz**

**PEAK OUTPUT POWER (RADIATED)****§15.247 (b) (1)****Highest Channel: 2480MHz****ANALYZER SETTINGS: RBW = 3MHz VBW = 3MHz**

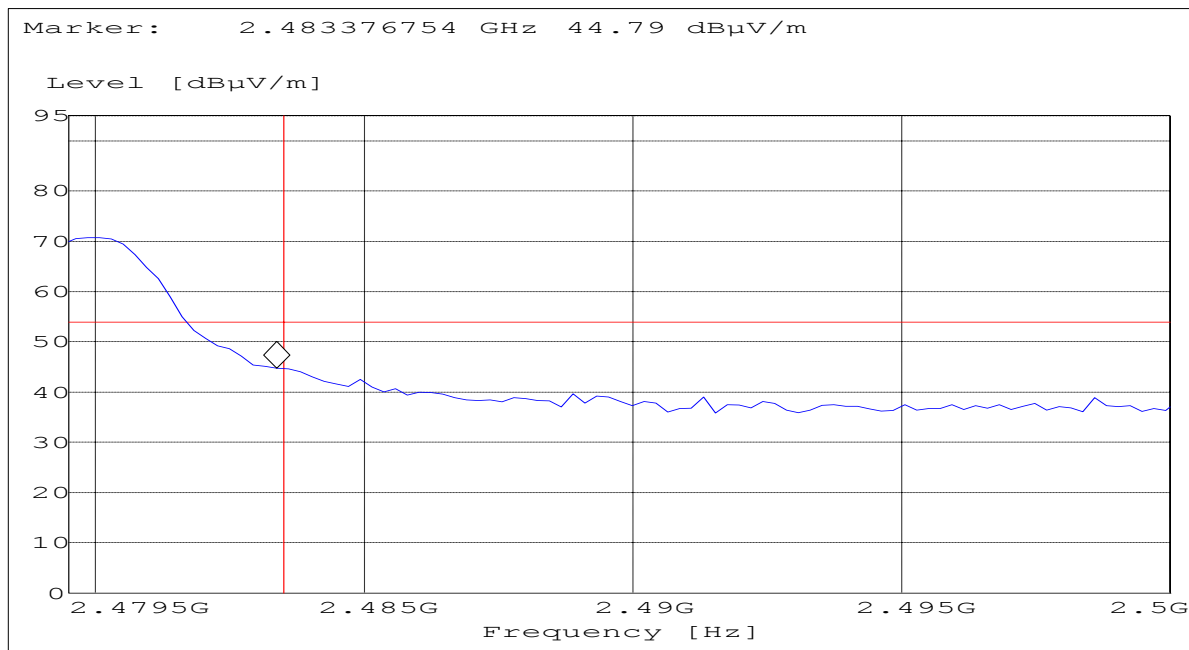
**BAND EDGE COMPLIANCE**

§15.247 (c)

Measurements for Headset M1000 below:

spurious in the restricted band 2483.5 – 2500 MHz

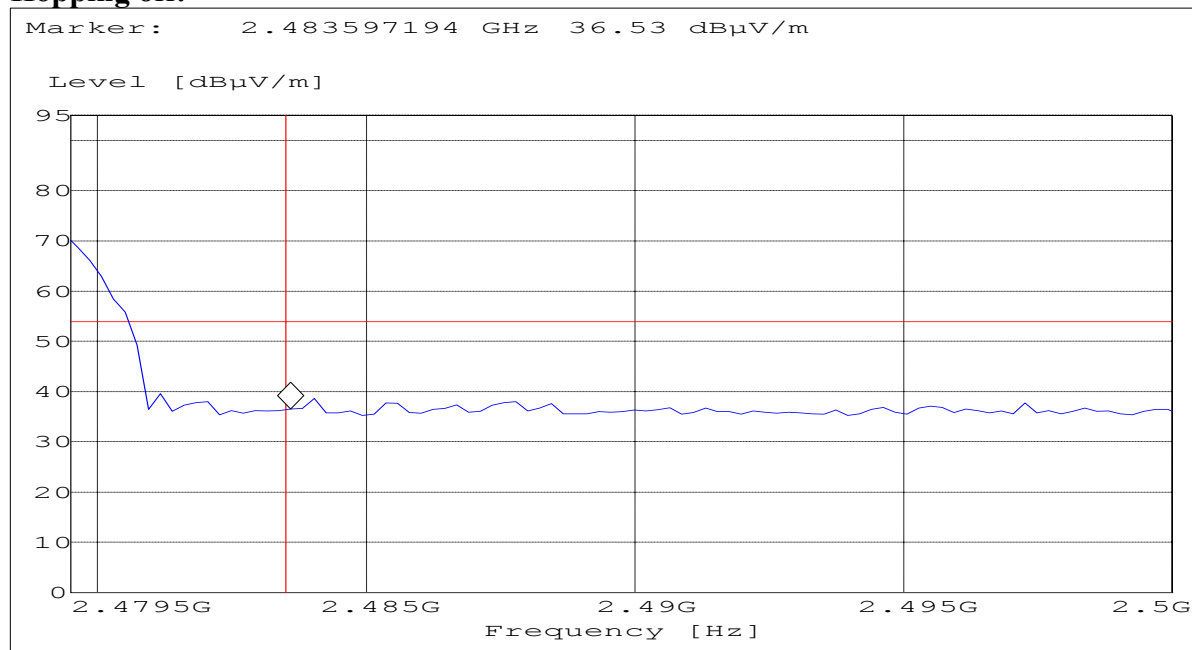
hopping on:



ANALYZER SETTINGS: RBW = 1MHz

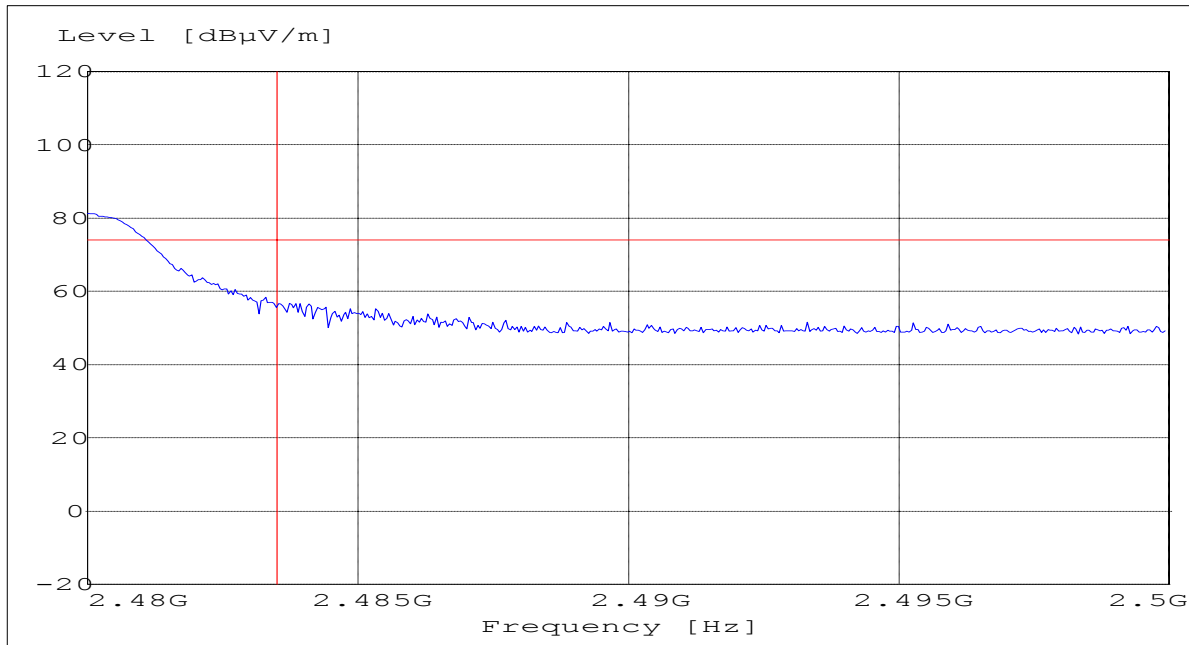
VBW = 1MHz

**Hopping off:**

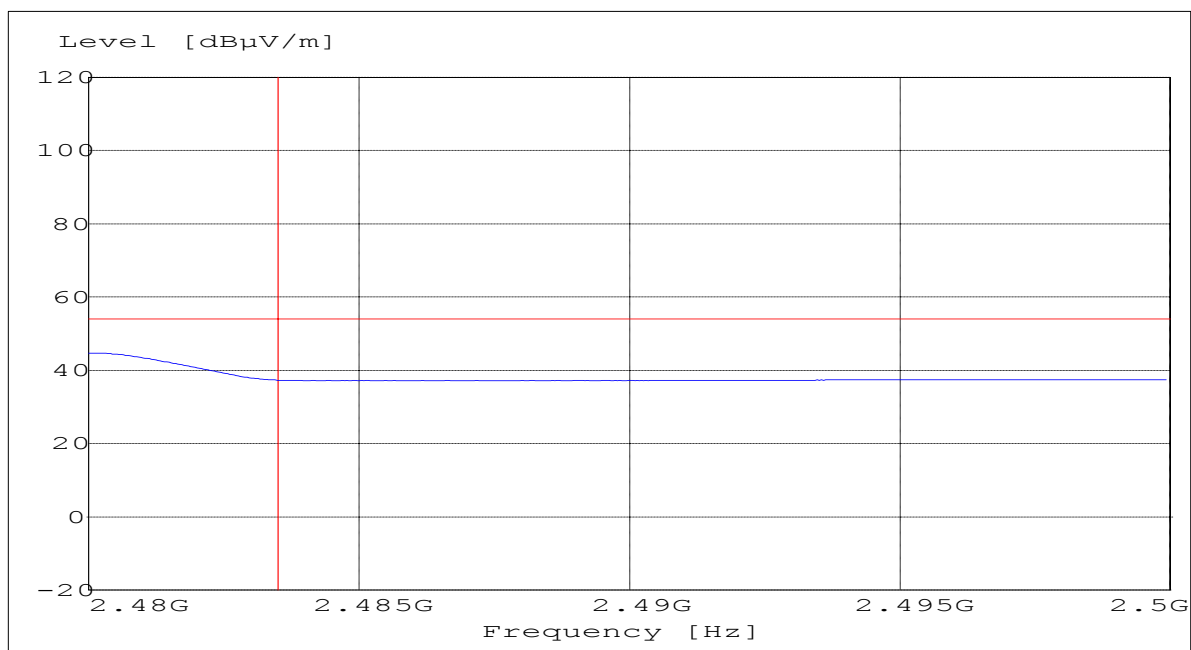


**Measurements for Adapter M500 below:**

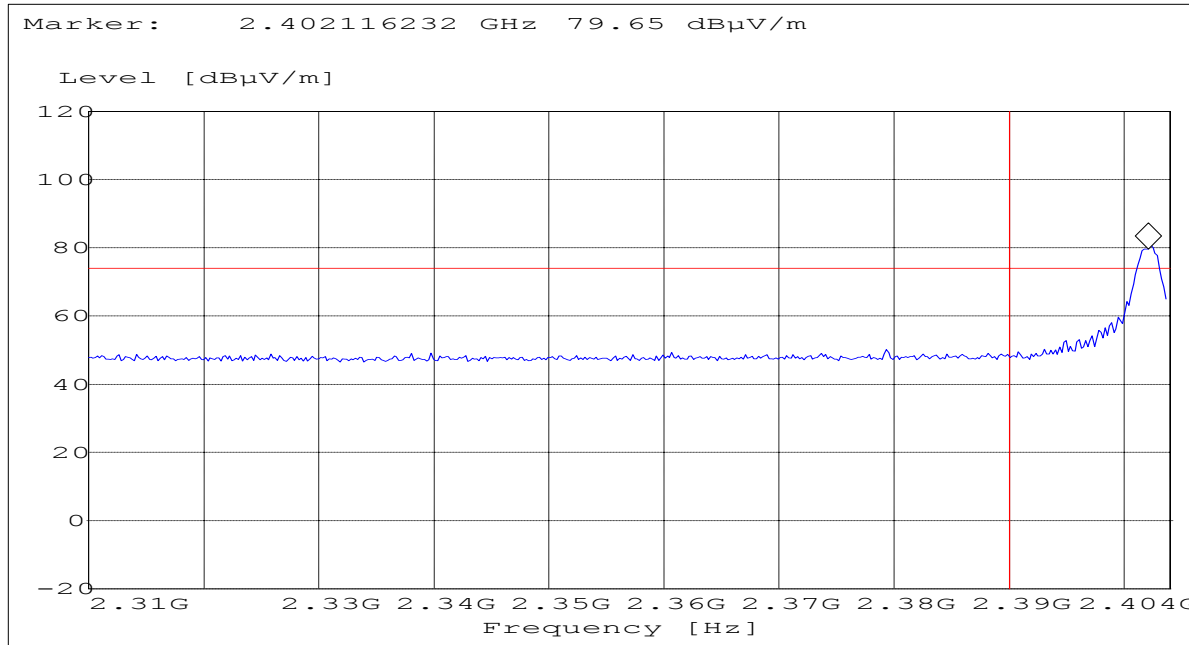
**spurious in the restricted band 2483.5 – 2500 MHz  
hopping off, Peak:**

**ANALYZER SETTINGS: RBW = 1MHz****VBW = 1MHz**

**Hopping off, Average:**



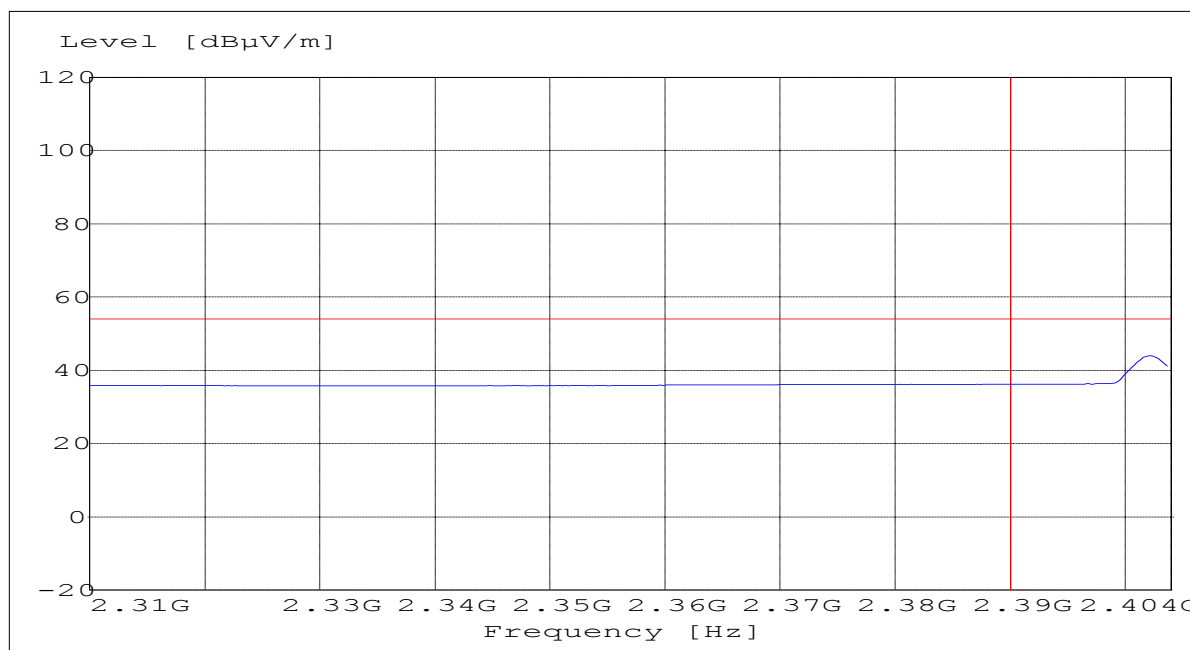
spurious in the restricted band 2310 – 2390 MHz  
hopping off, Peak:



ANALYZER SETTINGS: RBW = 1MHz

VBW = 1MHz

**Hopping off, Average:**



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

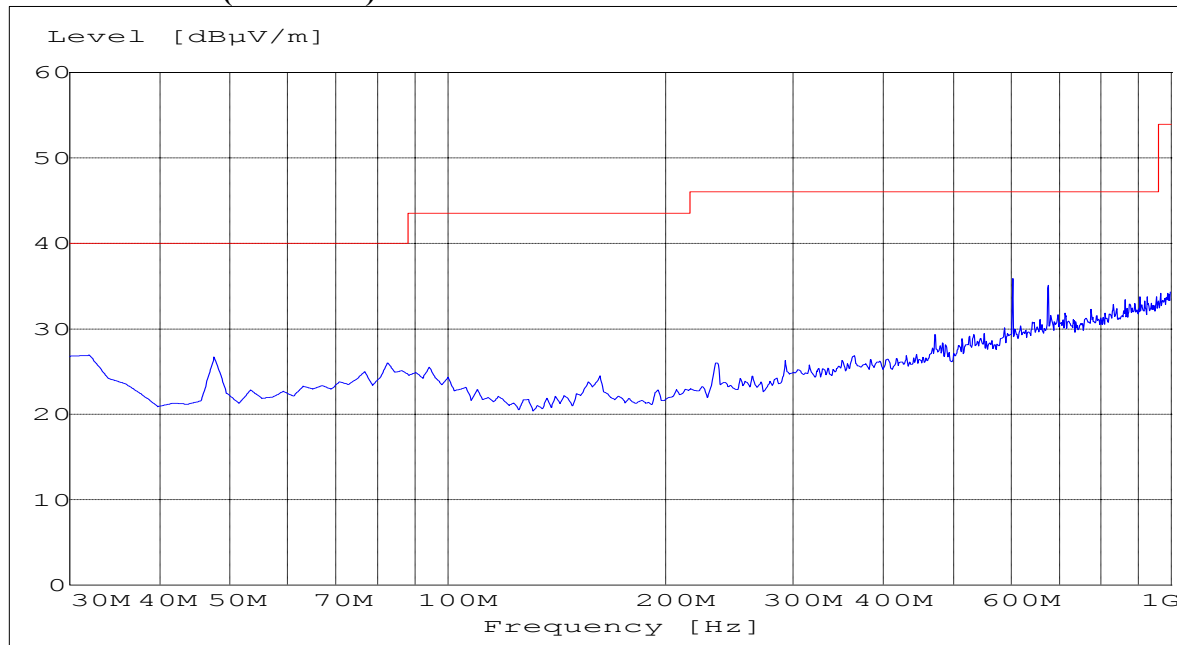
**LIMITS**

**FCC 15.209(a) limits were used for radiated plots.**

**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. Emission levels from the adapter M500 were lower than those from the headset M1000. Only plots of headset emissions are included below.

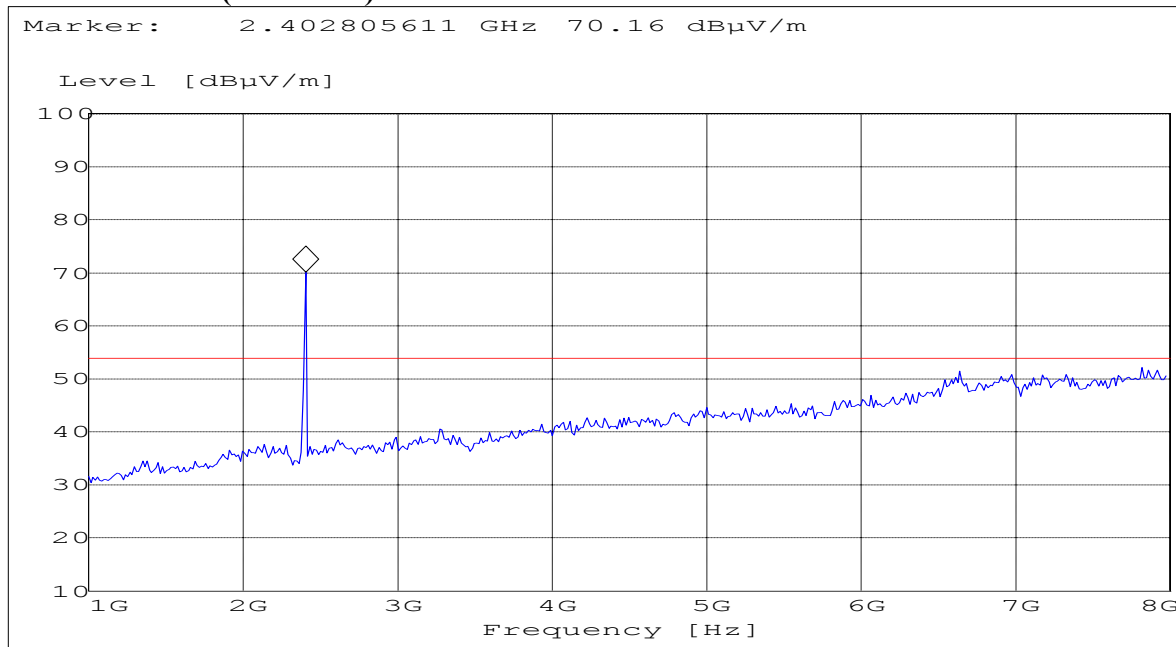
**EMISSION LIMITATIONS - Radiated (Transmitter) SUBCLAUSE § 15.247 (c) (1)**  
**Lowest Channel(2402MHz): 30MHz – 1GHz**



**ANALYZER SETTINGS: RBW = 100KHz**

**VBW = 100KHz**

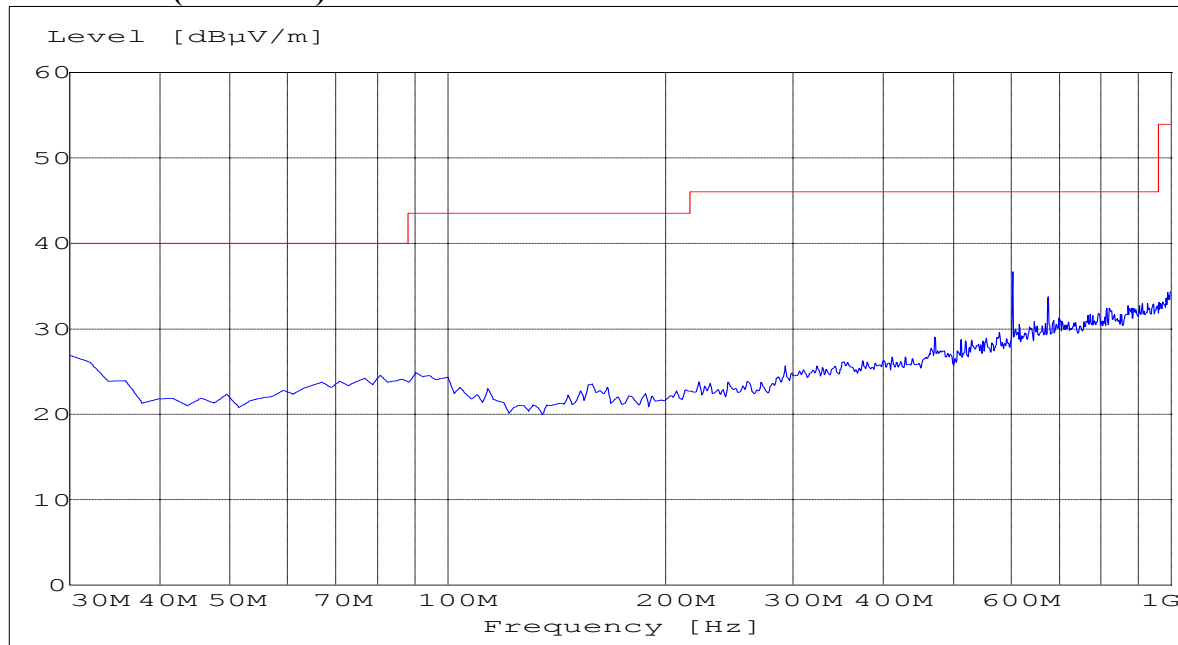
**EMISSION LIMITATIONS - Radiated (Transmitter) SUBCLAUSE § 15.247 (c) (1)**  
**Lowest Channel(2402MHz): 1GHz – 8GHz**



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

**ANALYZER SETTINGS: RBW = 1MHz VBW = 1MHz**

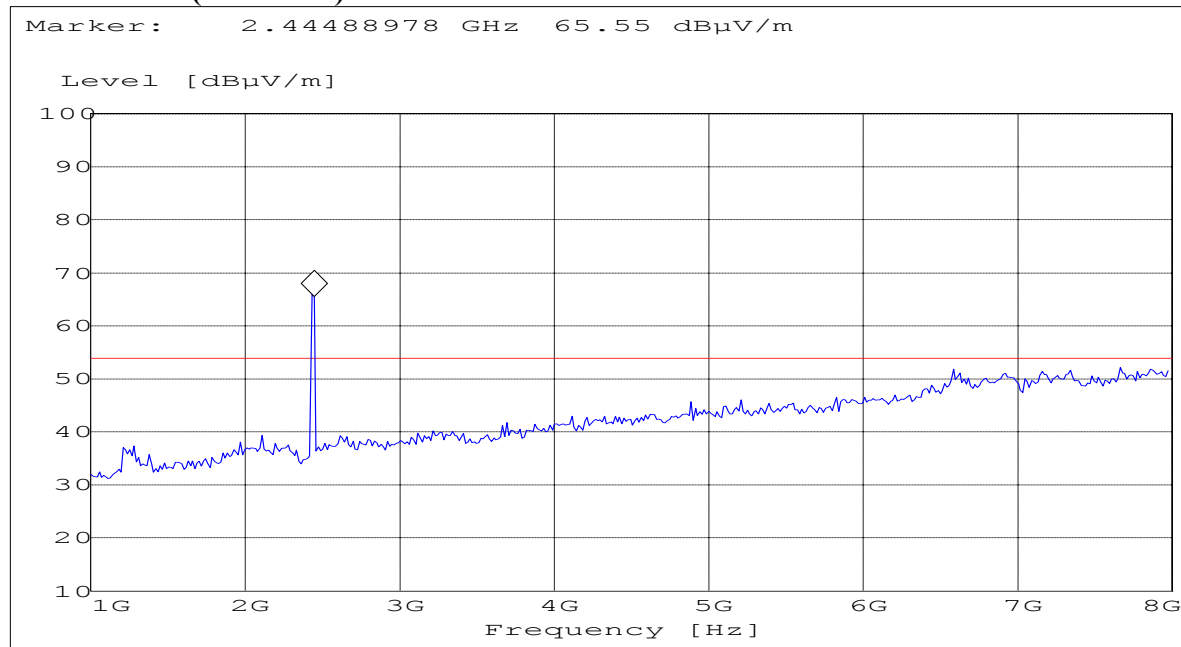
**EMISSION LIMITATIONS - Radiated (Transmitter) SUBCLAUSE § 15.247 (c) (1)**  
**Mid Channel(2440MHz): 30MHz – 1GHz**



**ANALYZER SETTINGS: RBW = 100KHz**

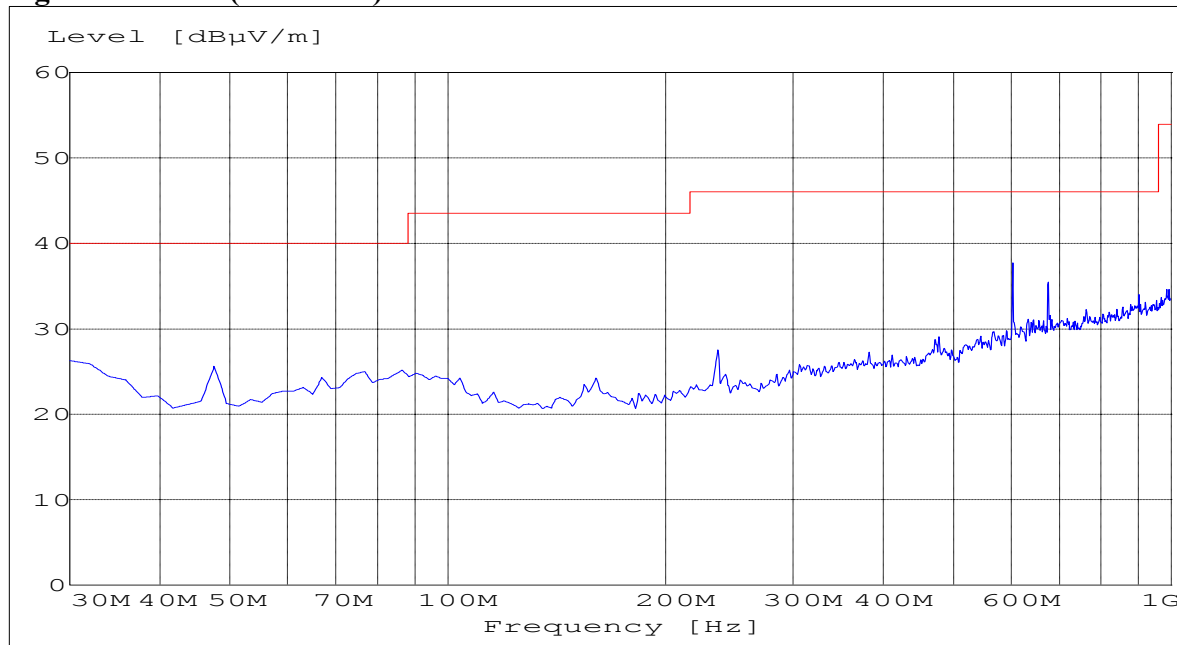
**VBW = 100KHz**

**EMISSION LIMITATIONS - Radiated (Transmitter) SUBCLAUSE § 15.247 (c) (1)**  
**Mid Channel(2440MHz): 1GHz – 8GHz**



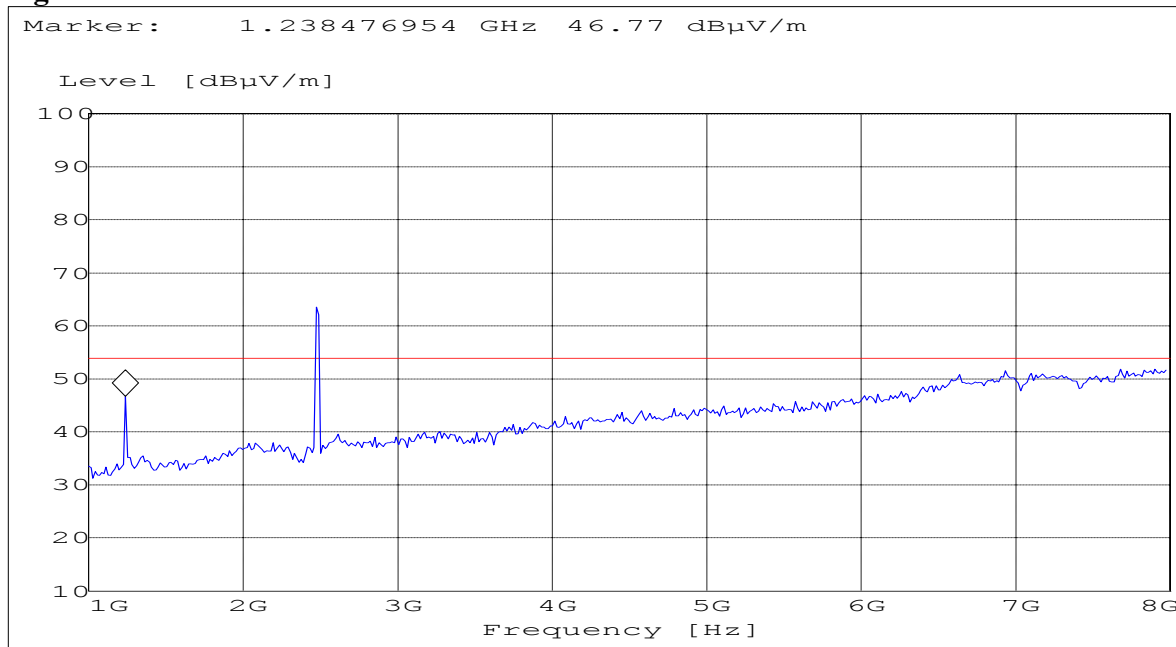
**NOTE: The peak above the limit is the carrier frequency.**  
**ANALYZER SETTINGS: RBW = 1MHz VBW = 1MHz**

**EMISSION LIMITATIONS - Radiated (Transmitter) SUBCLAUSE § 15.247 (c) (1)**  
**Highest Channel(2480MHz): 30MHz – 1GHz**



**ANALYZER SETTINGS: RBW = 100KH VBW = 100KHz**

## EMISSION LIMITATIONS - Radiated (Transmitter) SUBCLAUSE § 15.247 (c) (1) Highest Channel: 1GHz – 8GHz

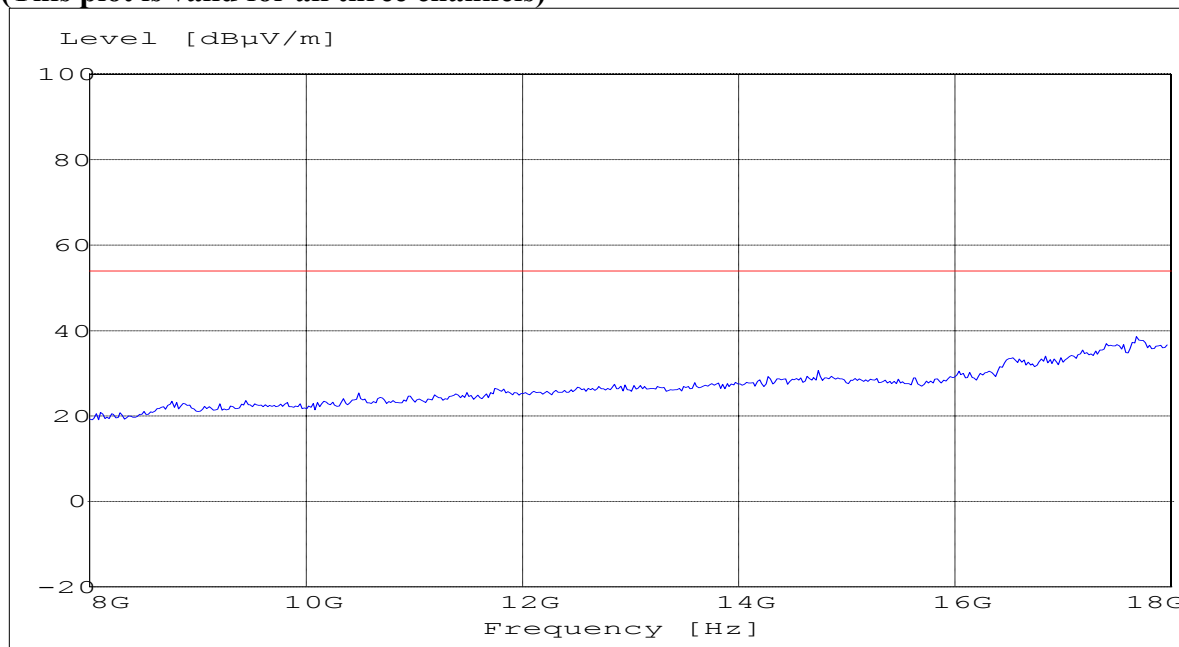


**NOTE:** The peak above the limit is the carrier frequency.

**ANALYZER SETTINGS:** RBW = 1MHz VBW = 1MHz

**EMISSION LIMITATIONS - Radiated (Transmitter) SUBCLAUSE § 15.247 (c) (1)**  
**8GHz – 18GHz**

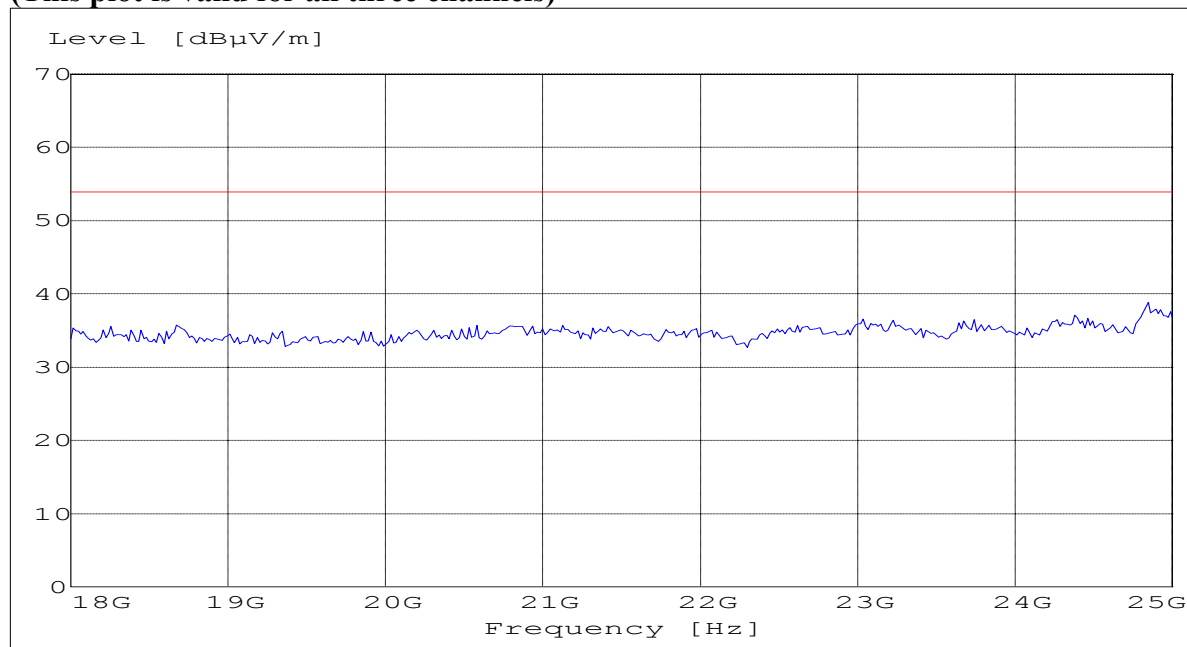
**(This plot is valid for all three channels)**



**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)

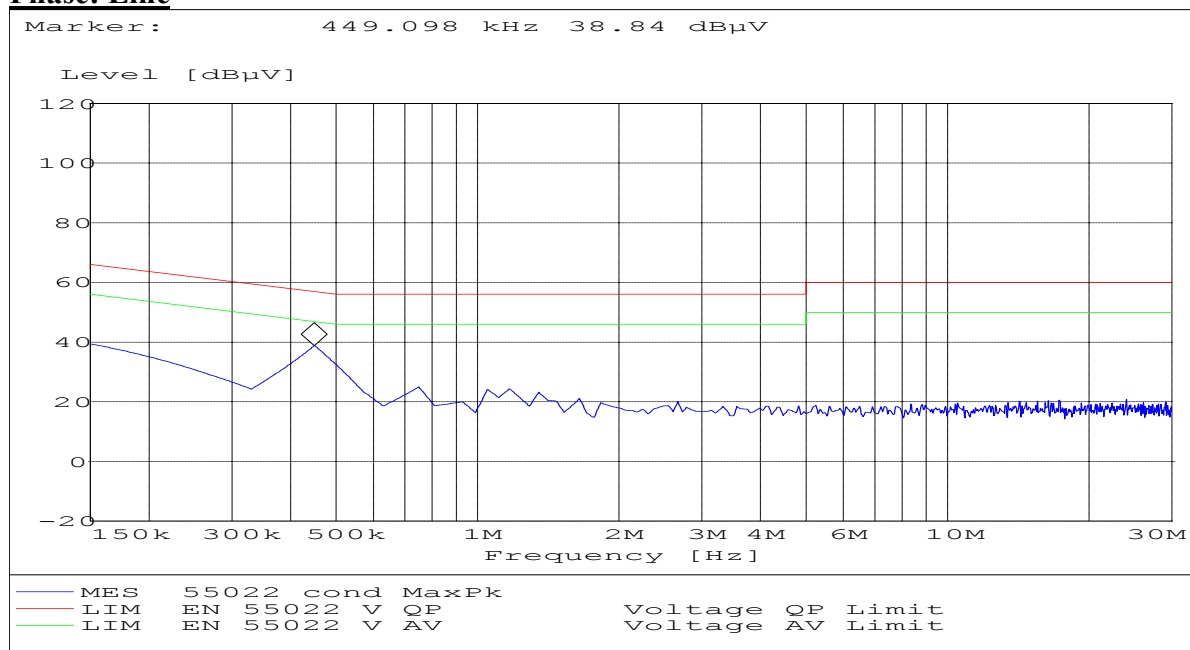


ANALYZER SETTINGS: RBW = 1MHz VBW = 1MHz

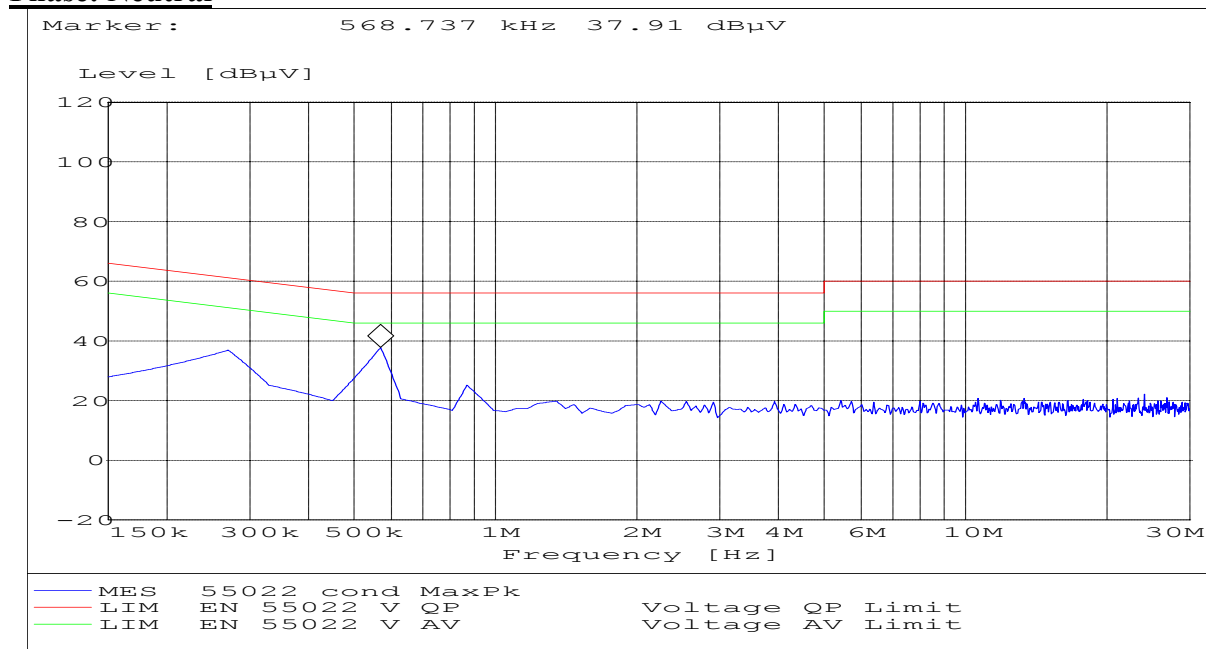
## CONDUCTED EMISSIONS

§ 15.107/207

### Phase: Line



### Phase: Neutral



For the AC line conduction tests shown above a dual charger was used with both the headset M1000 and adapter M500 connected. Both units were transmitting and drawing maximum current from the charger.

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

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

ANALYZER SETTINGS: RBW = 10KHz VBW = 10KHz

EN55022B limit lines were used to show compliance.

**RECEIVER SPURIOUS RADIATION**

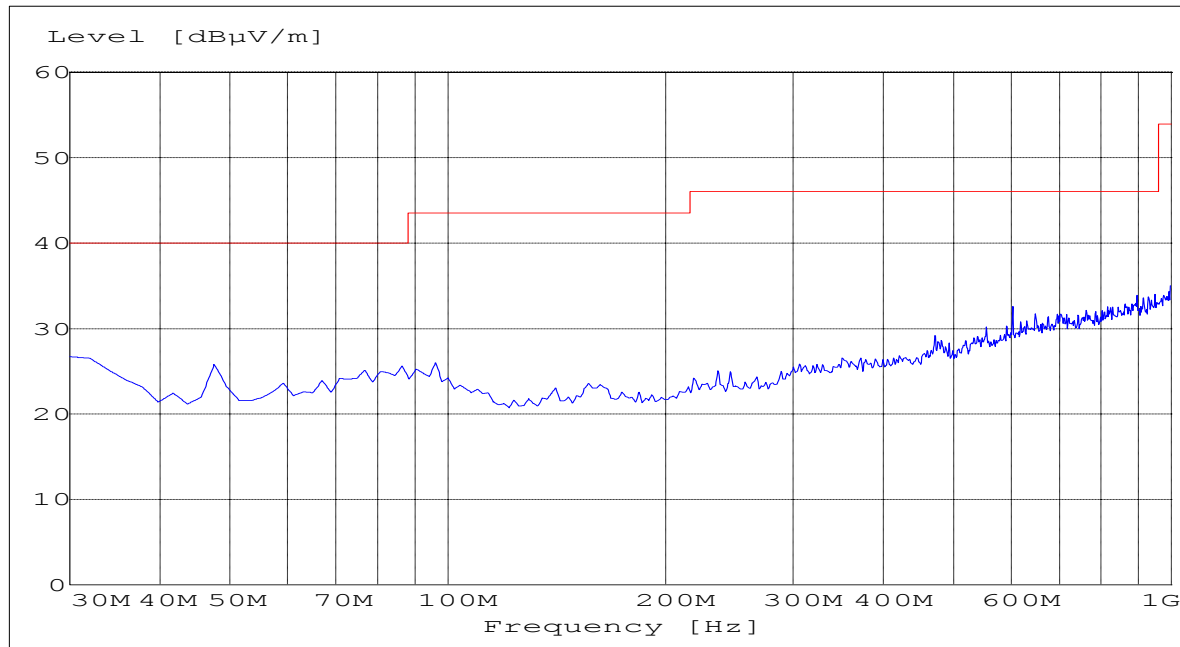
§ 15.209

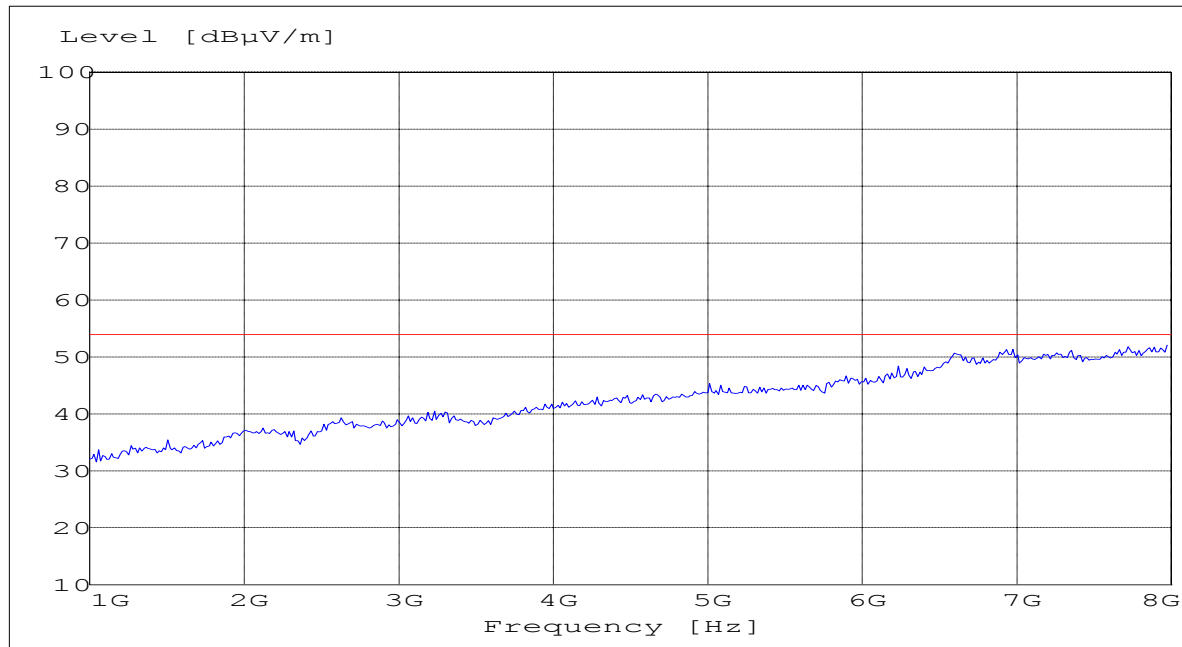
**Limits**

| 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. Emission levels from the adapter M500 were lower than those from the headset M1000. Only plots of headset emissions are included below.

**RECEIVER SPURIOUS RADIATION****§ 15.209****30MHz – 1GHz****ANALYZER SETTINGS: RBW = 100KHz****VBW = 100KHz**

**RECEIVER SPURIOUS RADIATION****§ 15.209****1GHz – 8GHz****ANALYZER SETTINGS: RBW = 1MHz VBW = 1MHz**

[illegible]