CETECOM Inc.

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

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

Table of Contents

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

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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 : 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 transciever 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 :

Date	Section	Name	Signature
2002-01-23	EMC & Radio	Lothar Schmidt	

2.2 Testreport

TEST REPORT

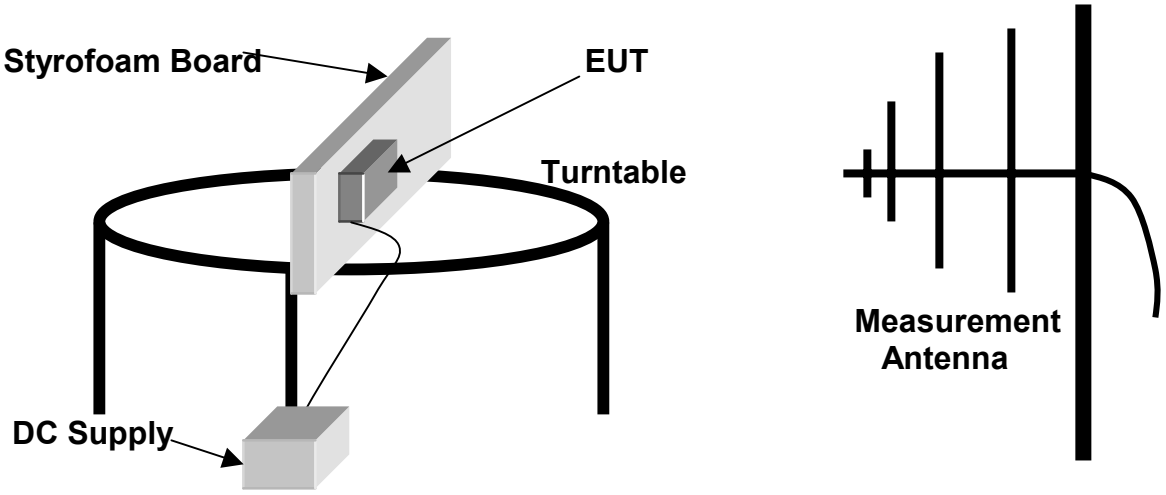
Test report no. : 249FCC/2002
(M500 Bluetooth Adapter & M1000 Bluetooth Headset)

TEST REPORT REFERENCE

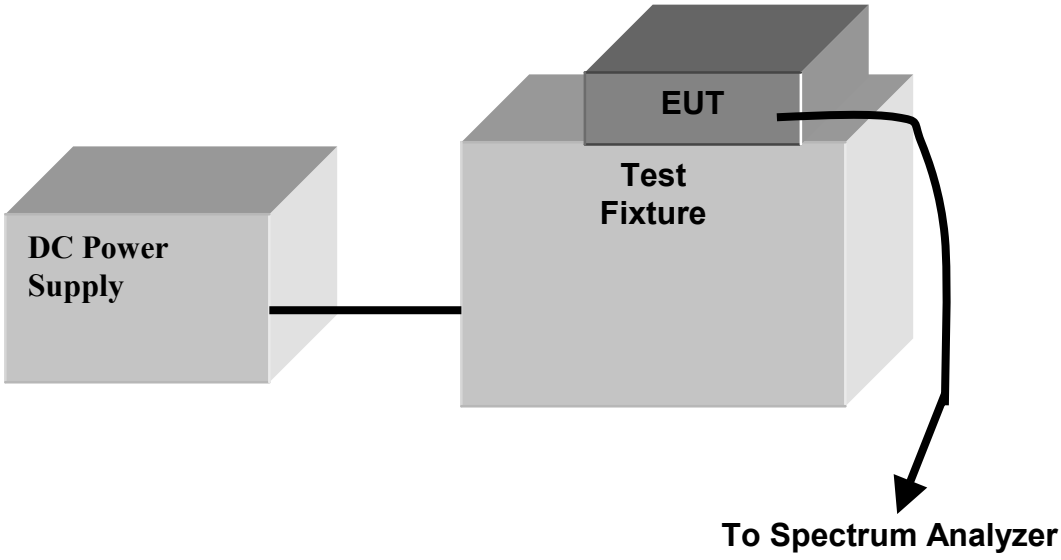
LIST OF MEASUREMENTS

TEST CONFIGURATION

RADIATED SETUP:

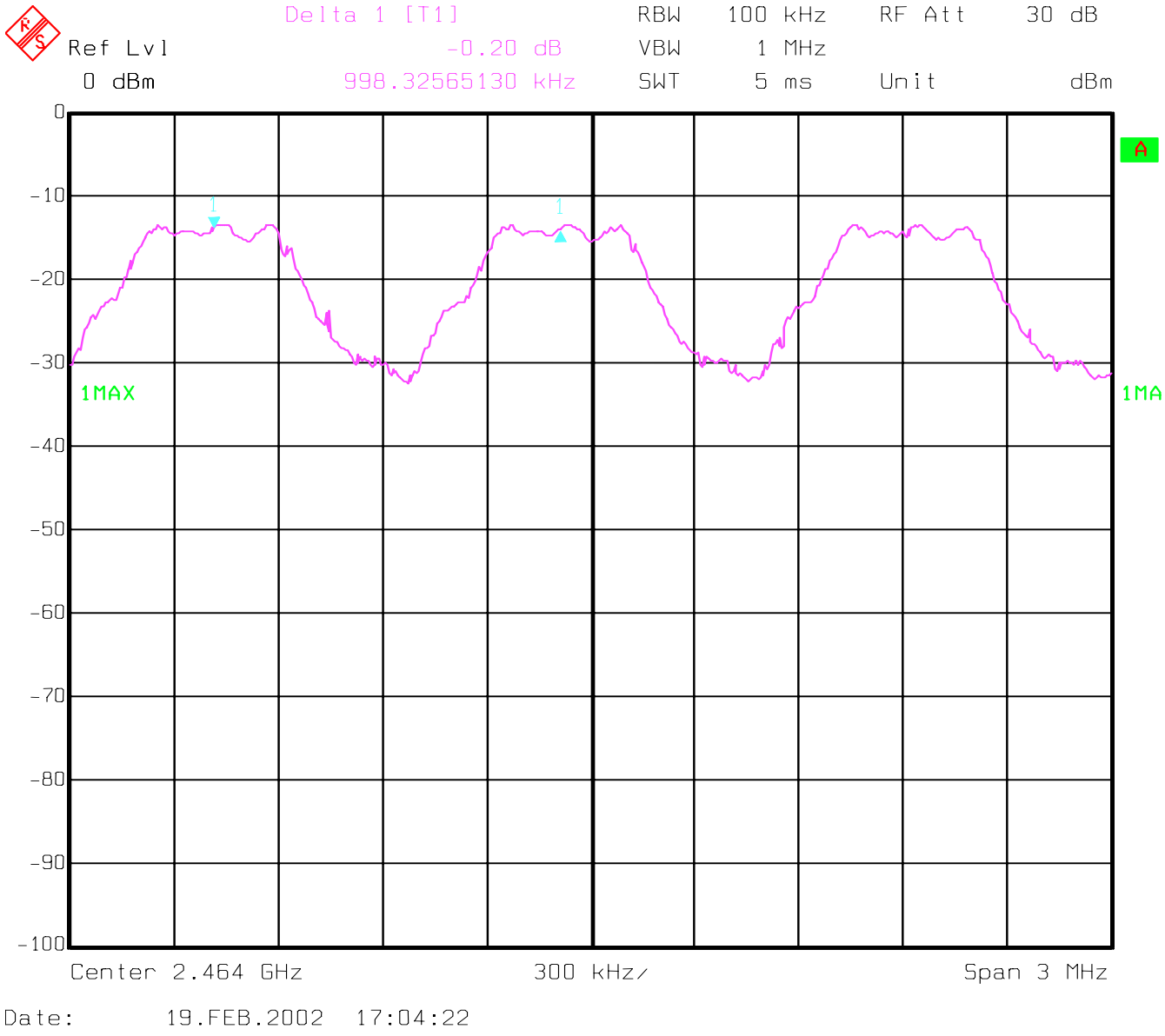


CONDUCTED SETUP:



CARRIER FREQUENCY SEPERATION §15.247(a)

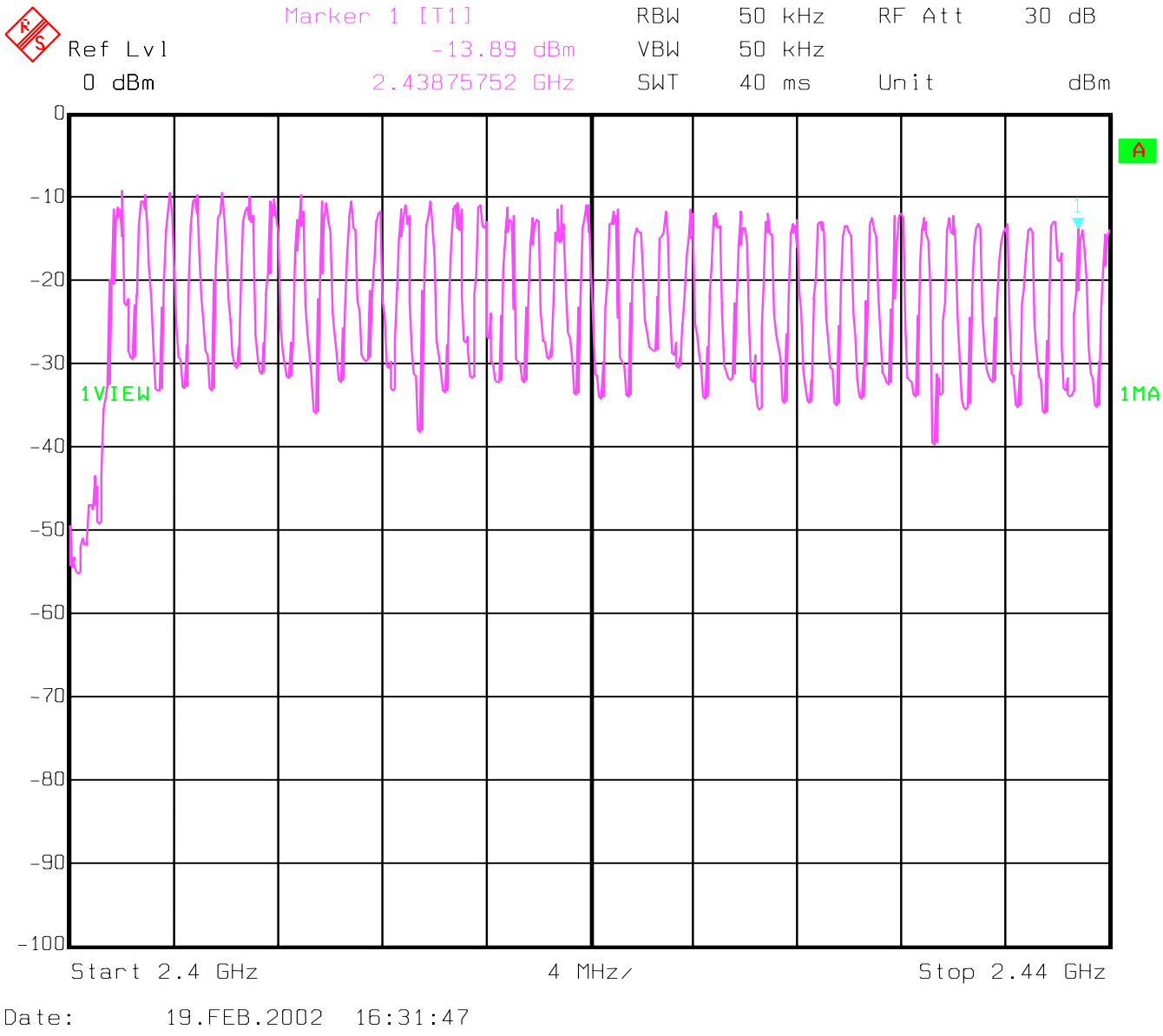
The carrier frequency seperation is 998.3256 KHz.



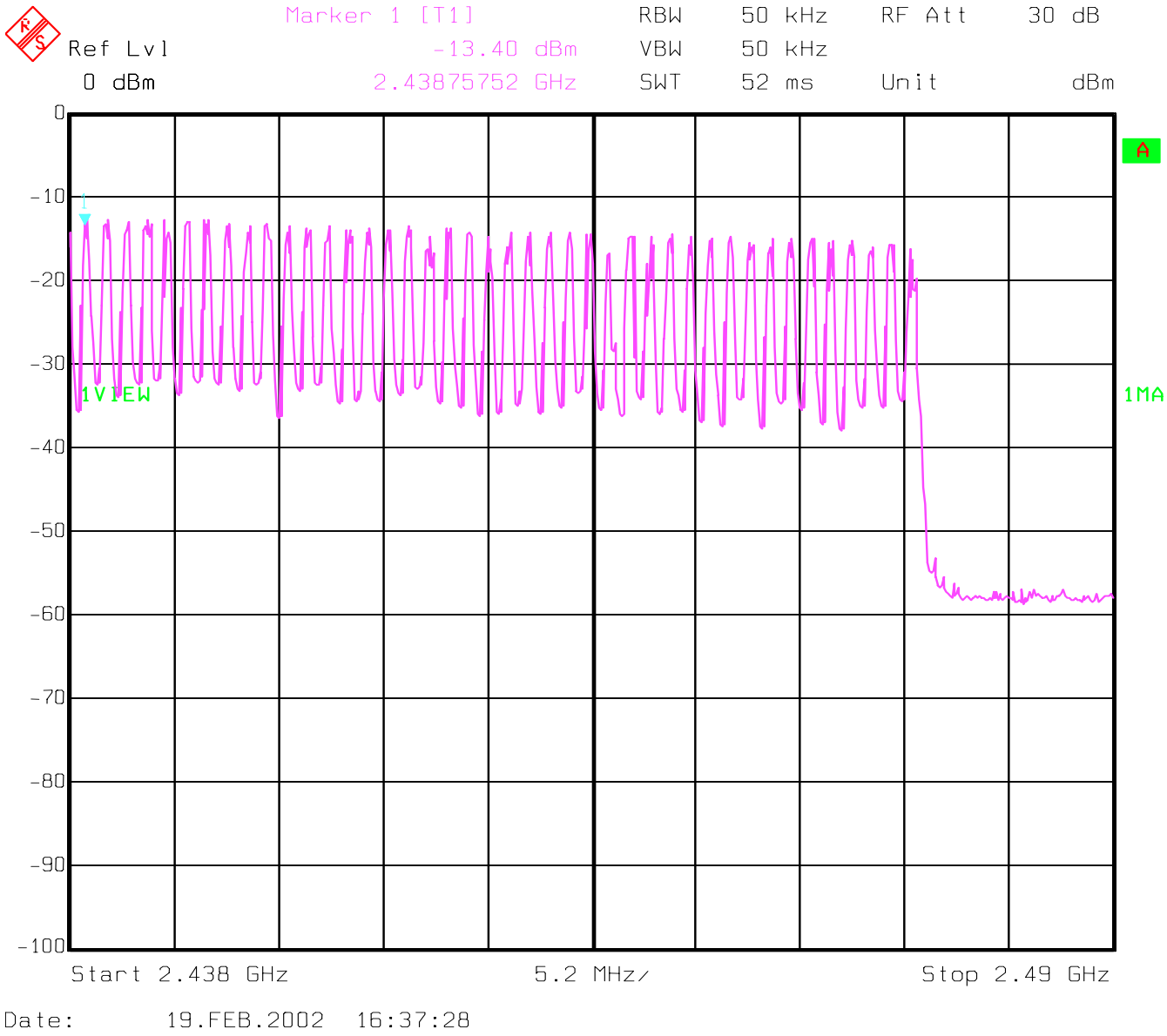
NUMBER OF HOPPING CHANNELS §15.247(a)

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



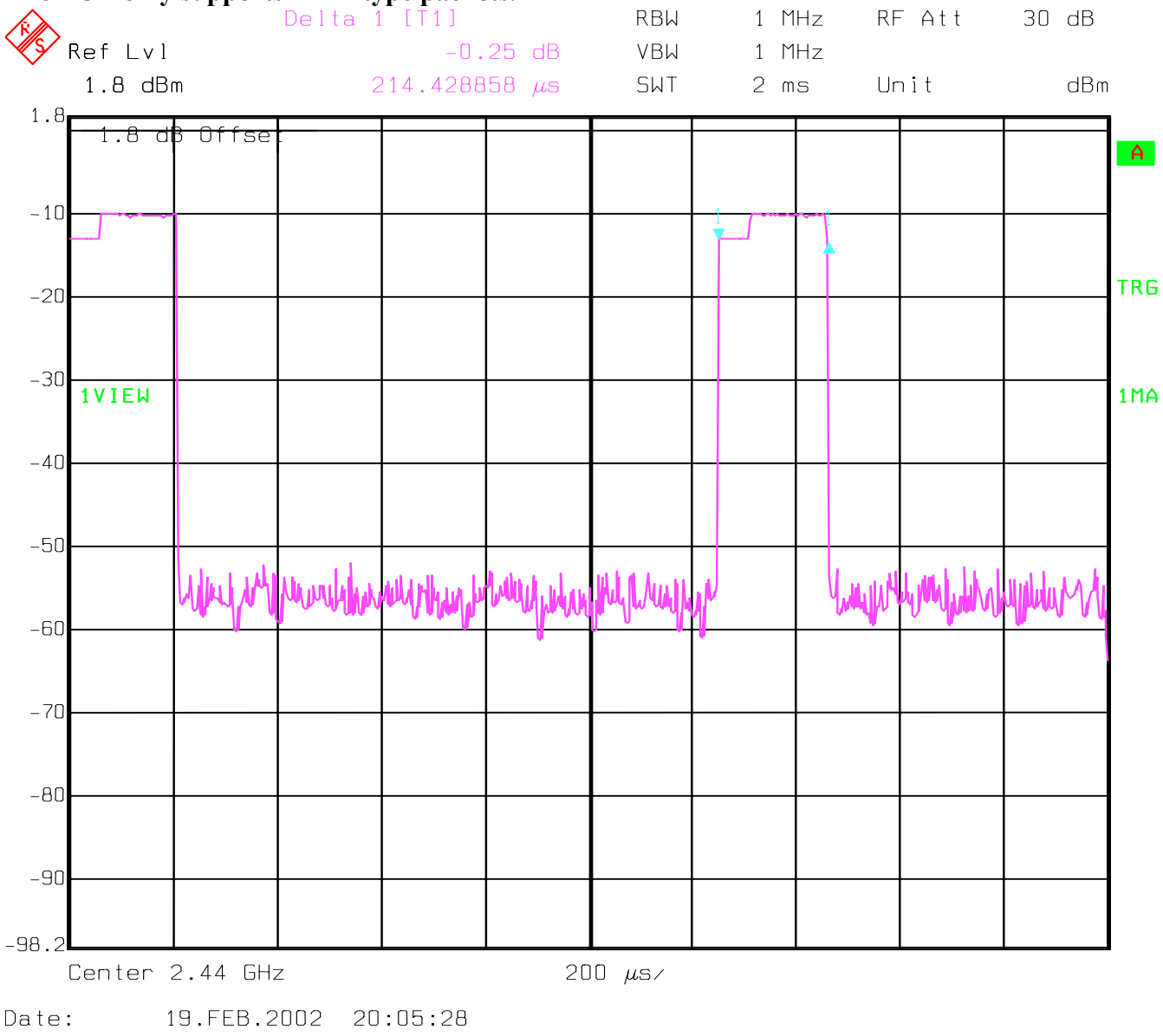
Plot 2: Total 41 channels



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 appearence .
Each Tx-time per appearence is 214.4289 µs.

303.9 * 214.4289 µs = 65.165 ms per 30 seconds.
The EUT only supports DH-1 type packets.



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

TEST CONDITIONS		20 dB BANDWIDTH (kHz)		
Frequency (MHz)		2402	2440	2480
T_{nom}(23)°C	V_{nom}(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)

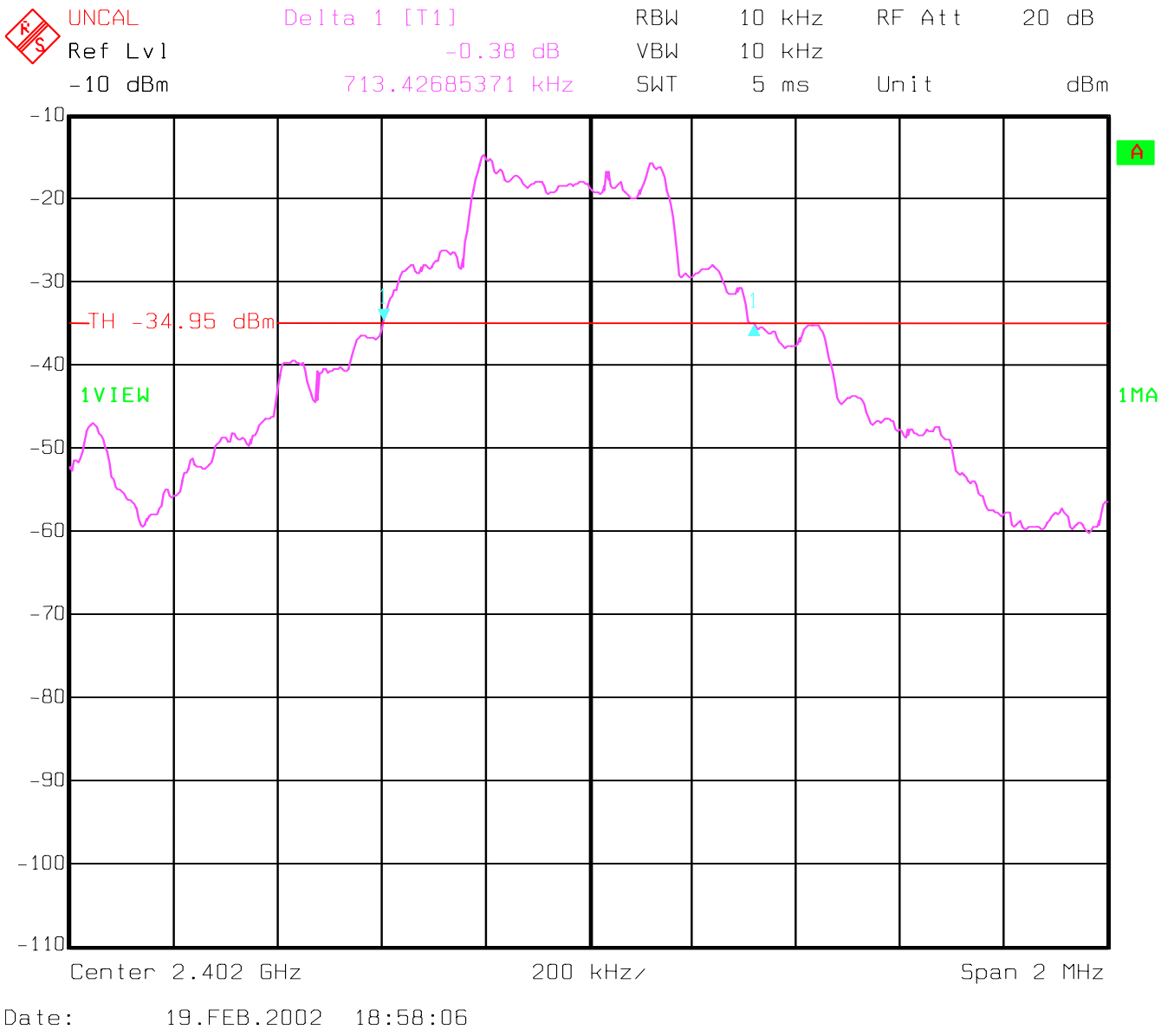
Note: An UNCAL condition occured during the 20dB B/W measurements. This was due to the incorrect sweeptime being set manually. This was not noticed until after testing was completed. The measurements were determined to be valid, because this condition will not affect relative measurements.

LIMIT **SUBCLAUSE §15.247(a) (1)**

The maximum 20dB bandwith shall be at maximum 1000 KHz

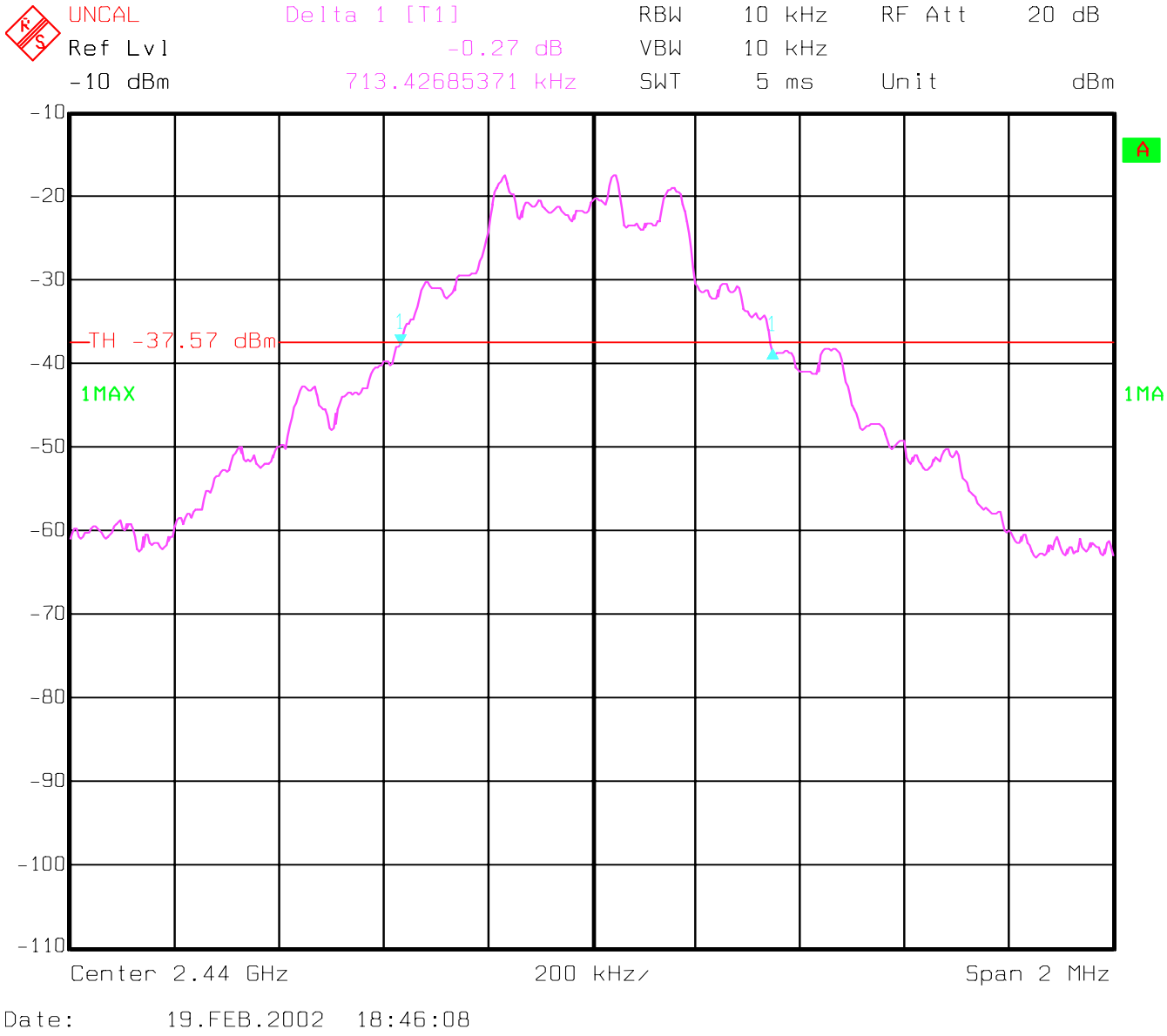
SPECTRUM BANDWIDTH OF FHSS SYSTEM **§15.247(a)**
20 dB bandwidth

Lowest Channel: 2402MHz



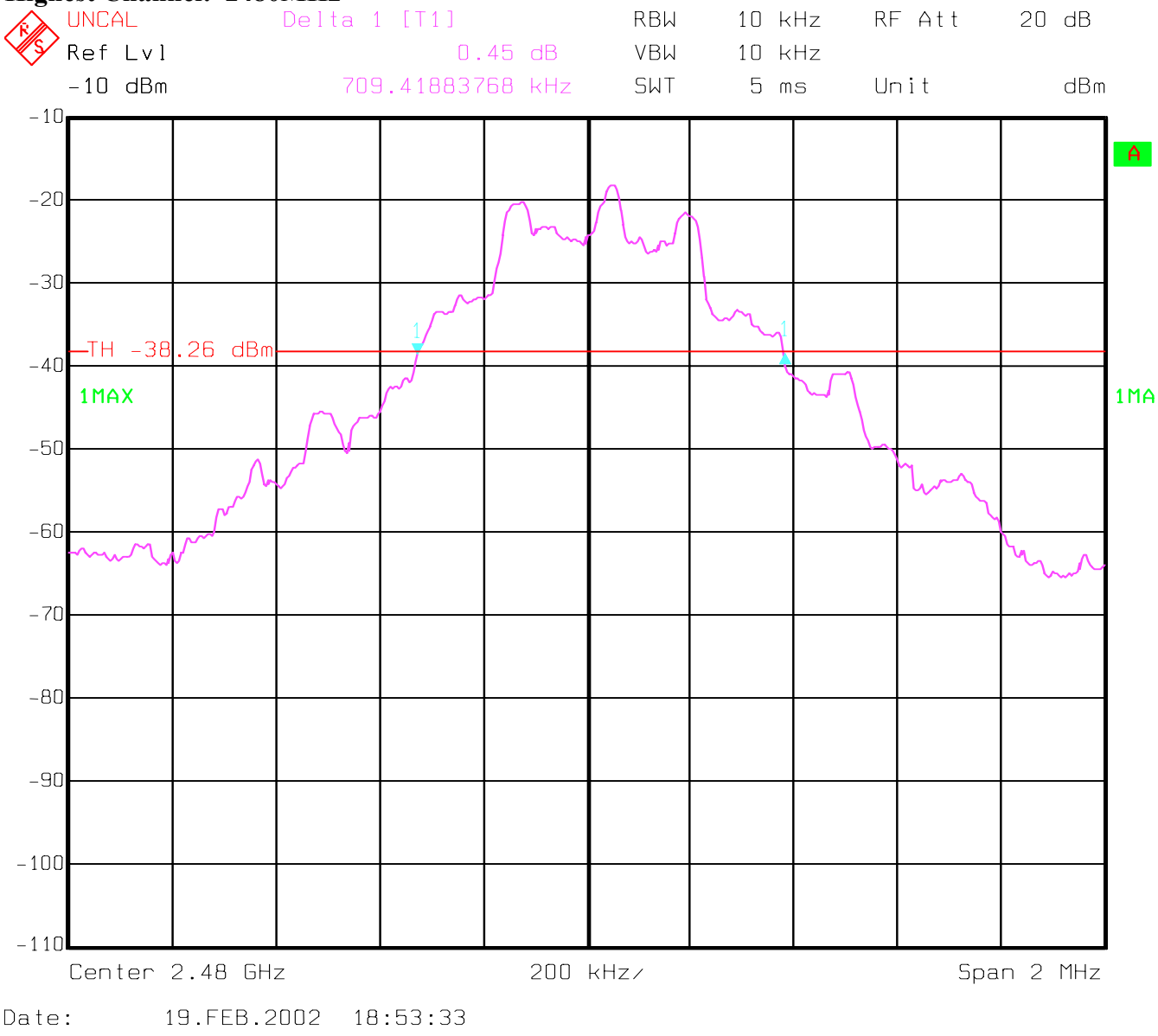
SPECTRUM BANDWIDTH OF FHSS SYSTEM §15.247(a)
20 dB bandwidth

Mid Channel: 2440MHz



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

Highest Channel: 2480MHz

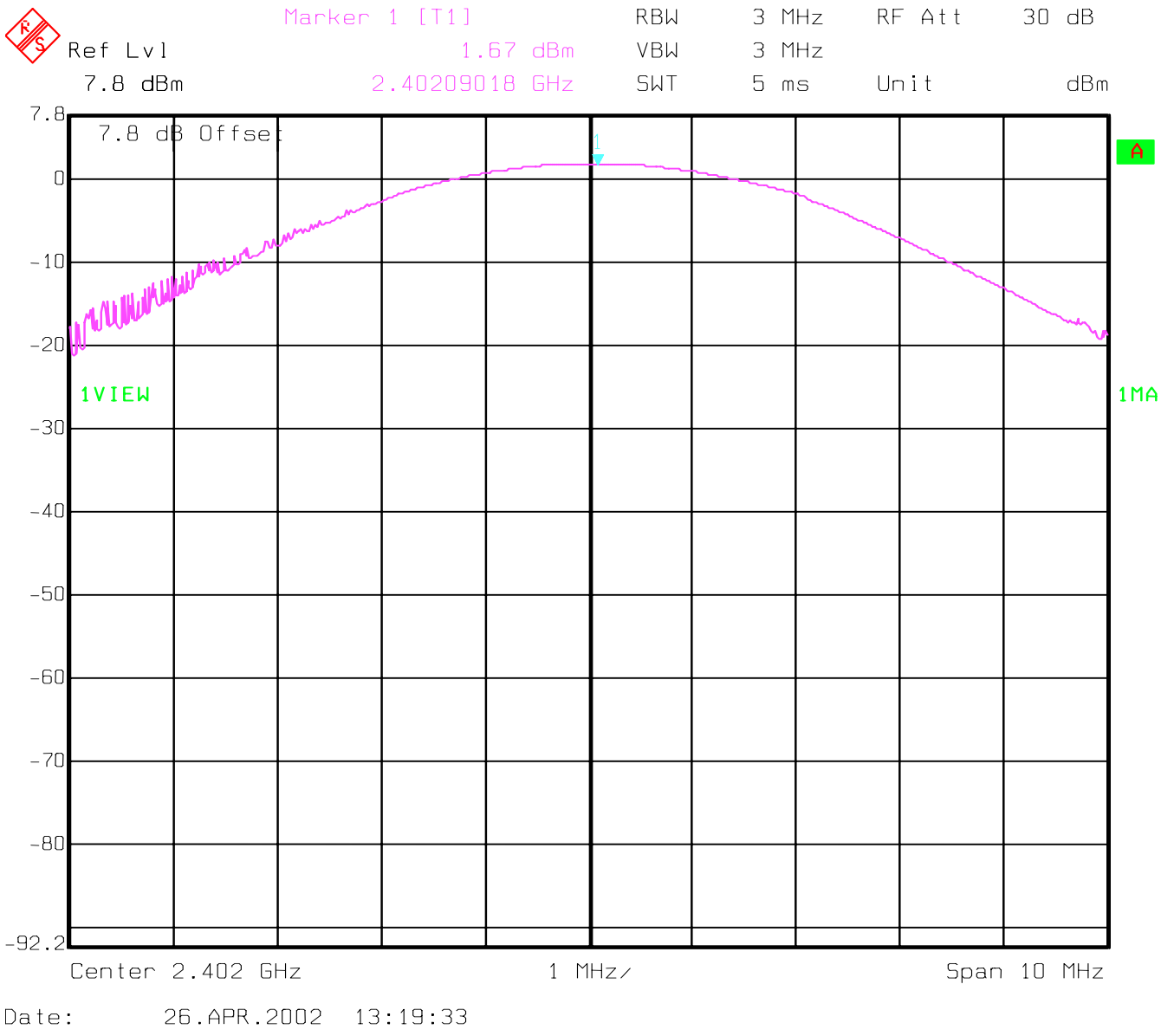


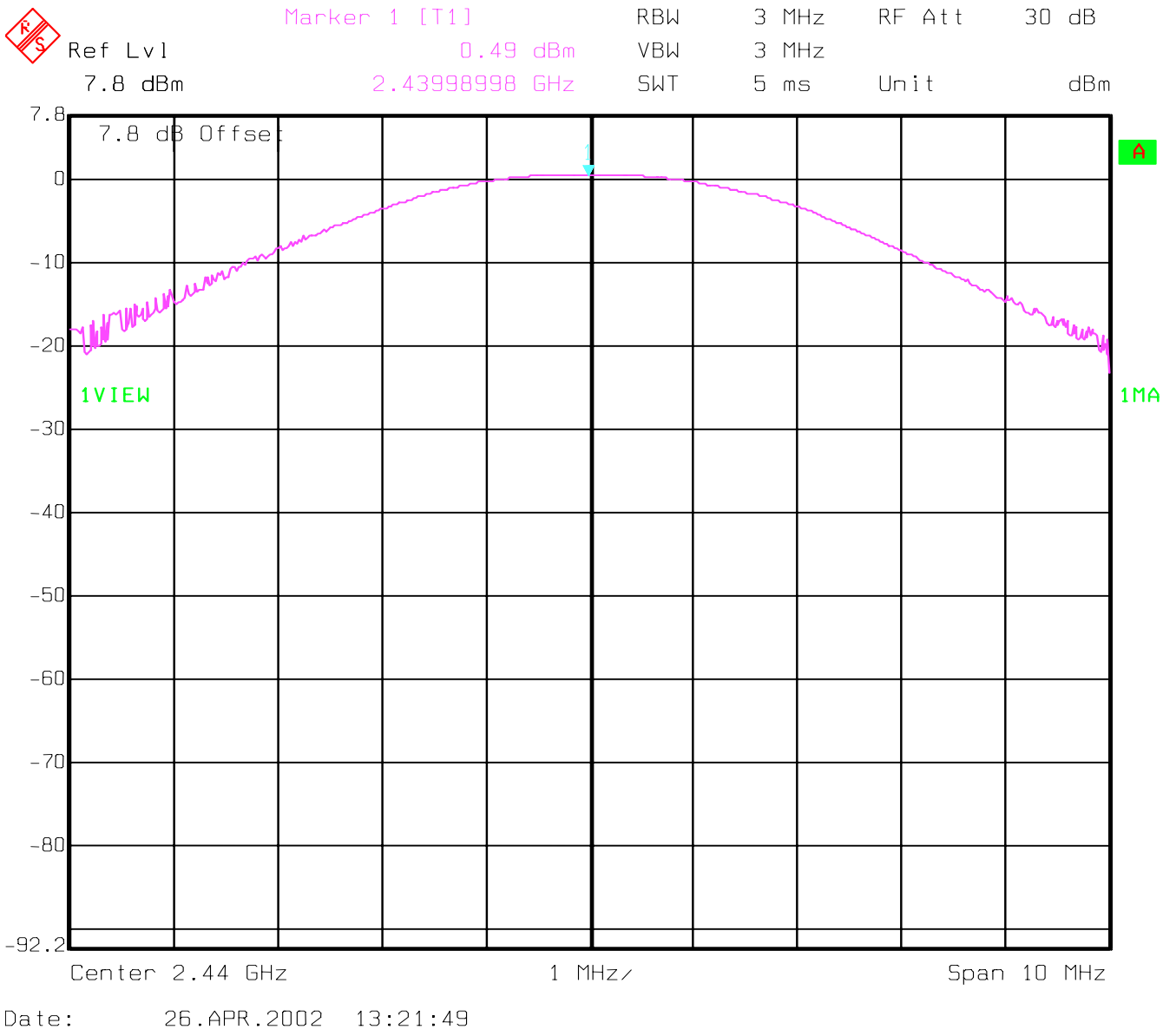
MAXIMUM PEAK OUTPUT POWER **SUBCLAUSE § 15.247 (b) (1)**
(conducted)
Measurements for Headset M1000 below:
Measurements are made with the EUT in a test jig. All attenuations are offset for in the plots.

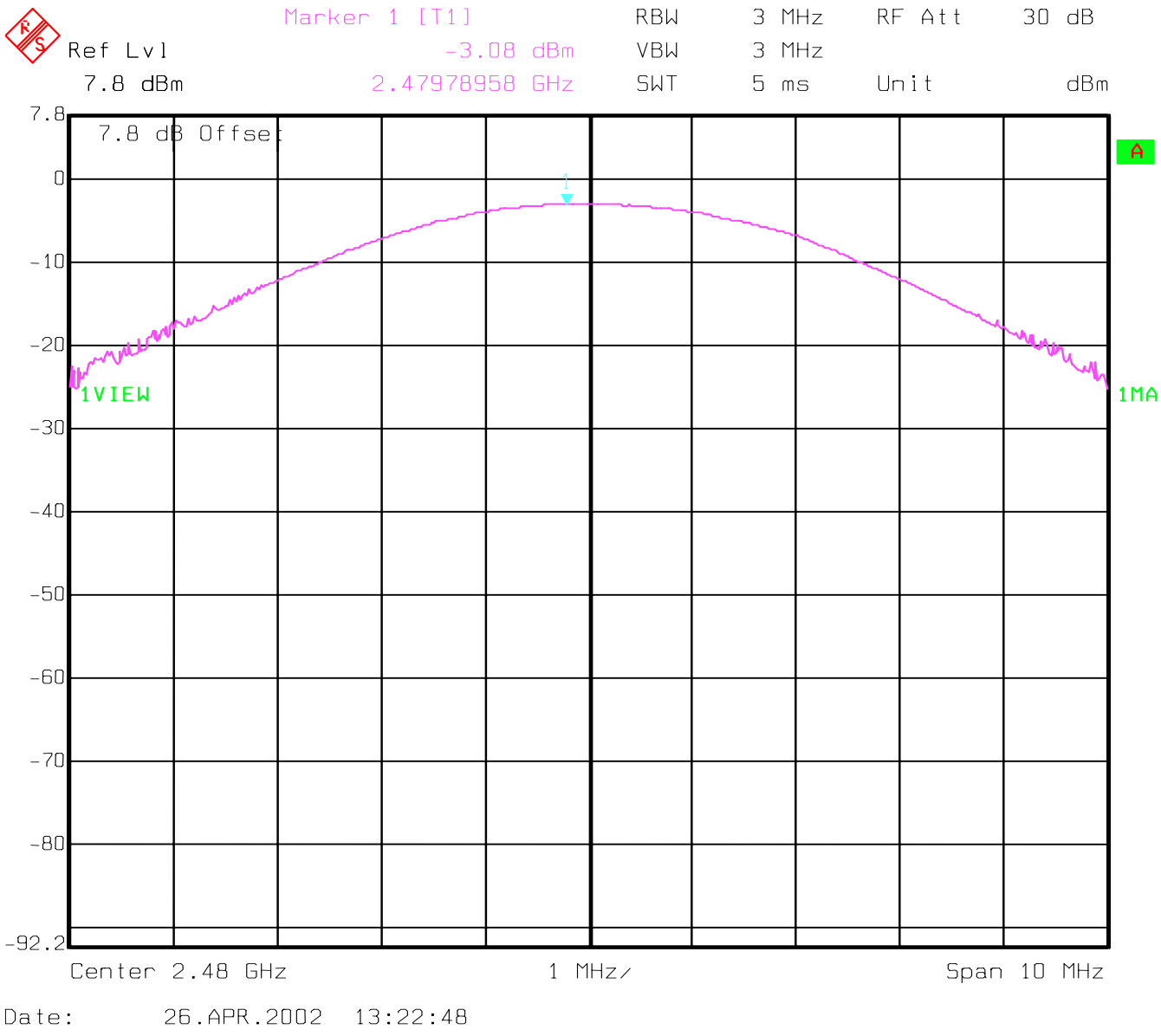
TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)			
Frequency (MHz)			2402	2440	2480
T_{nom}(23)°C	V_{nom}(2.5)V	PK	1.67	0.49	-3.08
Measurement uncertainty		±3dB			

LIMIT **SUBCLAUSE § 15.247 (b) (1)**

Frequency range	RF power output
2400-2483.5 MHz	1.0 Watt


Marker 1 [T1]
Ref Lvl
7.8 dBm
1.67 dBm
2.40209018 GHz
RBW 3 MHz
VBW 3 MHz
SWT 5 ms
RF Att 30 dB
Unit dBm
7.8 dB Offset
7.8
0
-10
-20
-30
-40
-50
-60
-70
-80
-92.2
1VIEW
1MA
A
Center 2.402 GHz
1 MHz/
Span 10 MHz
Date: 26.APR.2002 13:19:33


Marker 1 [T1]
RBW 3 MHz
RF Att 30 dB
Ref Lvl
0.49 dBm
VBW 3 MHz
7.8 dBm
2.43998998 GHz
SWT 5 ms
Unit dBm
7.8
7.8 dB Offset
0
-10
-20
-30
-40
-50
-60
-70
-80
-92.2
1VIEW
1MA
A
Center 2.44 GHz
1 MHz/
Span 10 MHz
Date: 26.APR.2002 13:21:49


Marker 1 [T1]
-3.08 dBm
2.47978958 GHz
RBW 3 MHz
VBW 3 MHz
SWT 5 ms
RF Att 30 dB
Unit dBm
Ref Lvl
7.8 dBm
7.8 dB Offset
7.8
0
-10
-20
-30
-40
-50
-60
-70
-80
-92.2
1VIEW
1MA
A
Center 2.48 GHz
1 MHz/
Span 10 MHz
Date: 26.APR.2002 13:22:48

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

Measurements for Headset M1000 below:

EIRP:

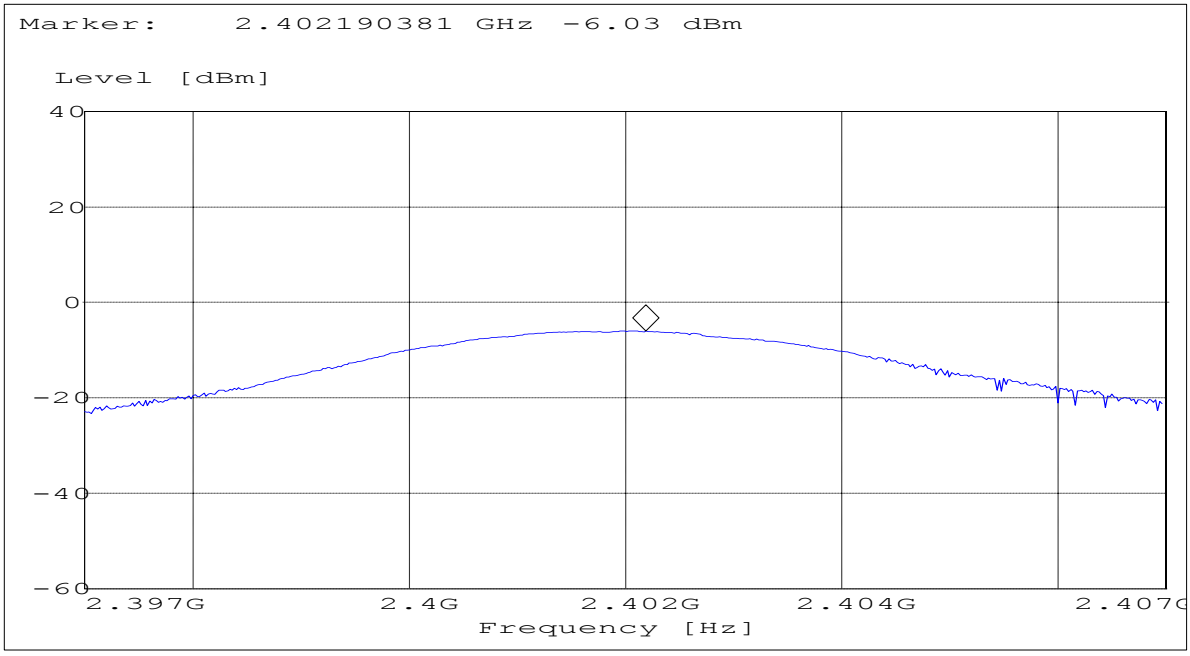
TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)		
Frequency (MHz)		2402	2440	2480
T_{nom}(23)°C	V_{nom}(2.5)V	-6.03	-5.18	-8.65
Measurement uncertainty		±3dB		

RBW/VBW : 3 MHz

LIMIT **SUBCLAUSE § 15.247 (b) (1)**

Frequency range	RF power output
2400-2483.5 MHz	1.0 Watt

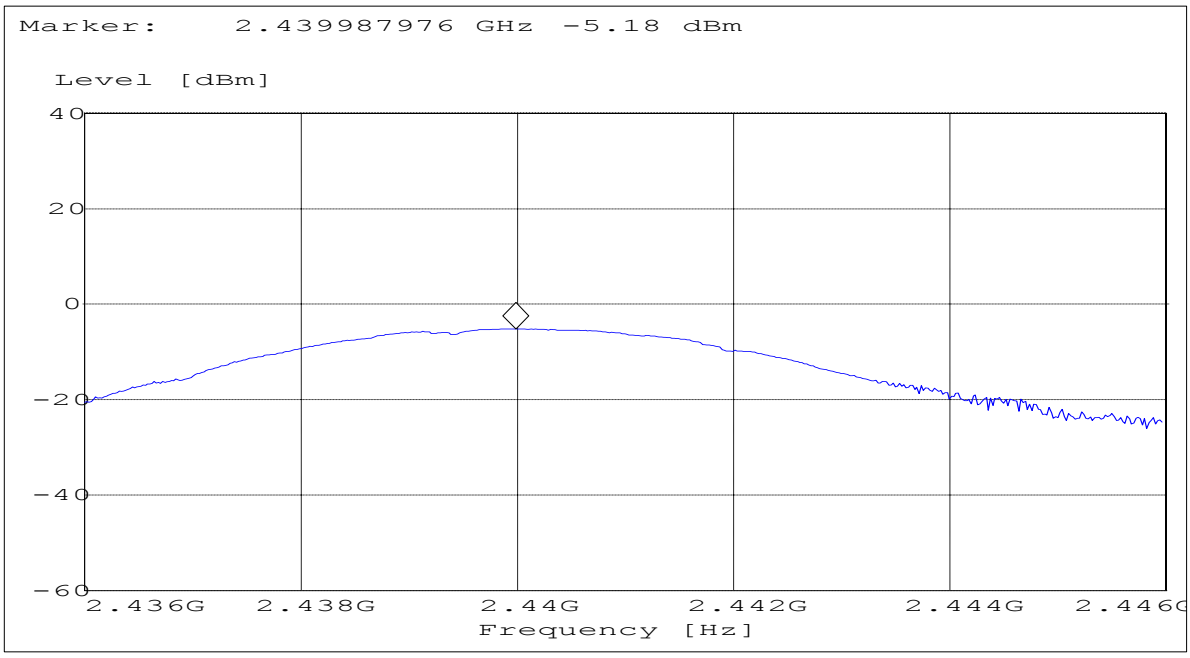
PEAK OUTPUT POWER (RADIATED) §15.247 (b) (1)



ANALYZER SETTINGS: RBW = 3MHz VBW = 3MHz

PEAK OUTPUT POWER (RADIATED) **§15.247 (b) (1)**

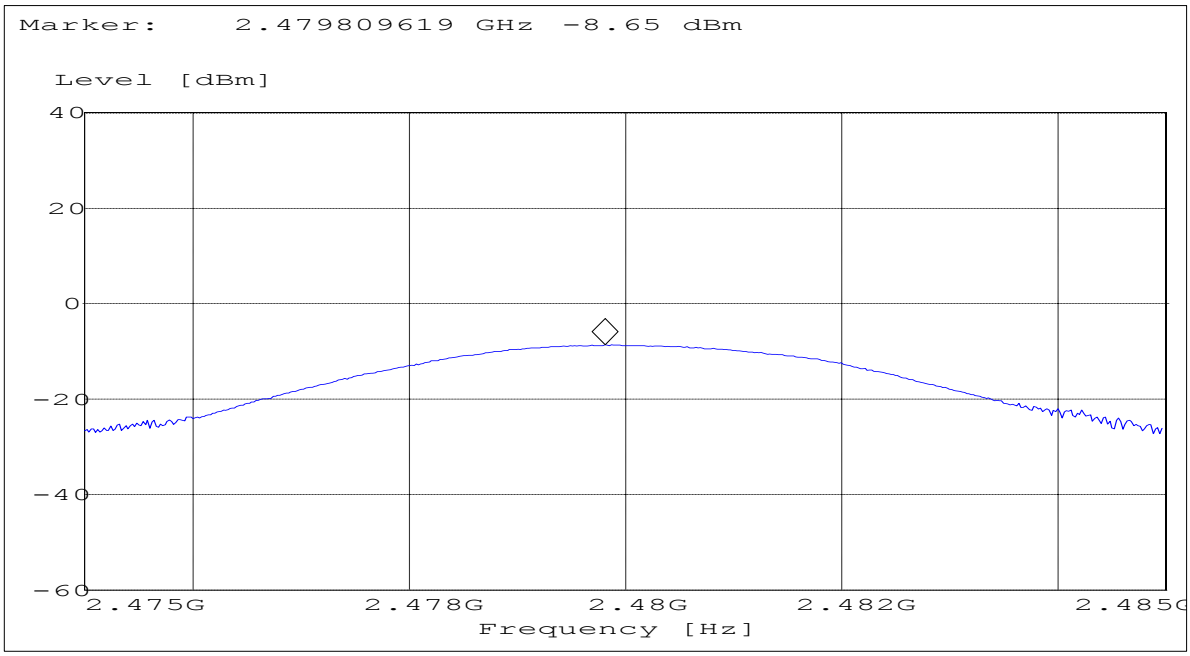
Mid Channel: 2440MHz



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_{nom}(23)°C	V_{nom}(2.5)V	-10.17	-9.48	-10.33
Measurement uncertainty		±3dB		

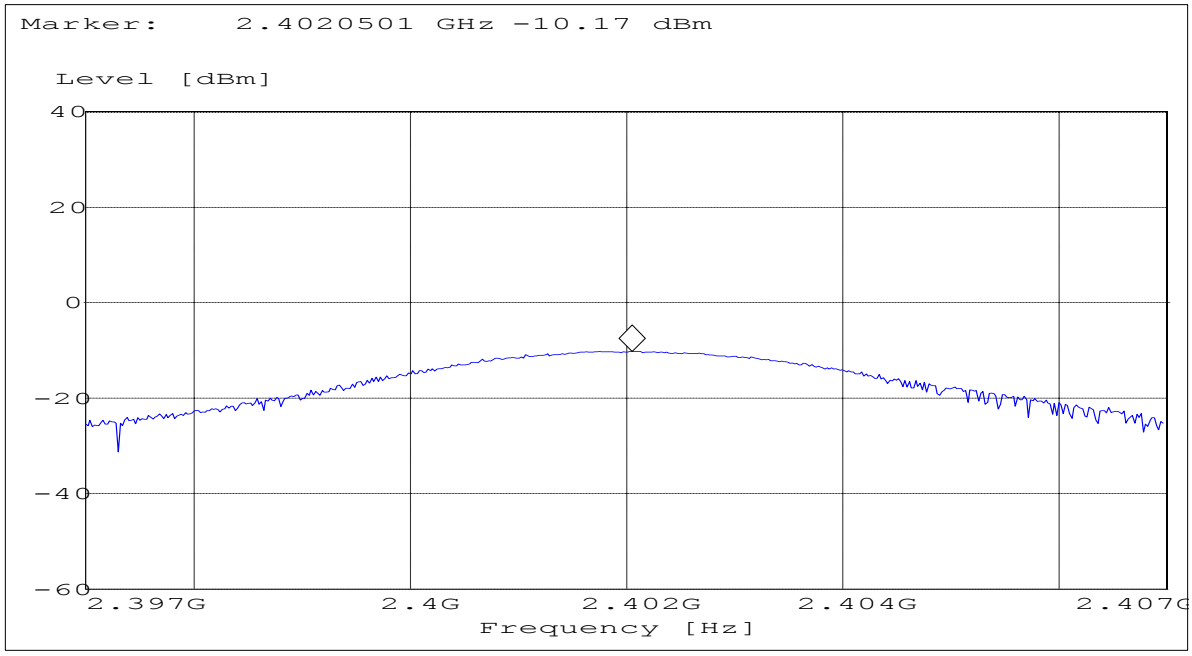
RBW/VBW : 3 MHz

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)**

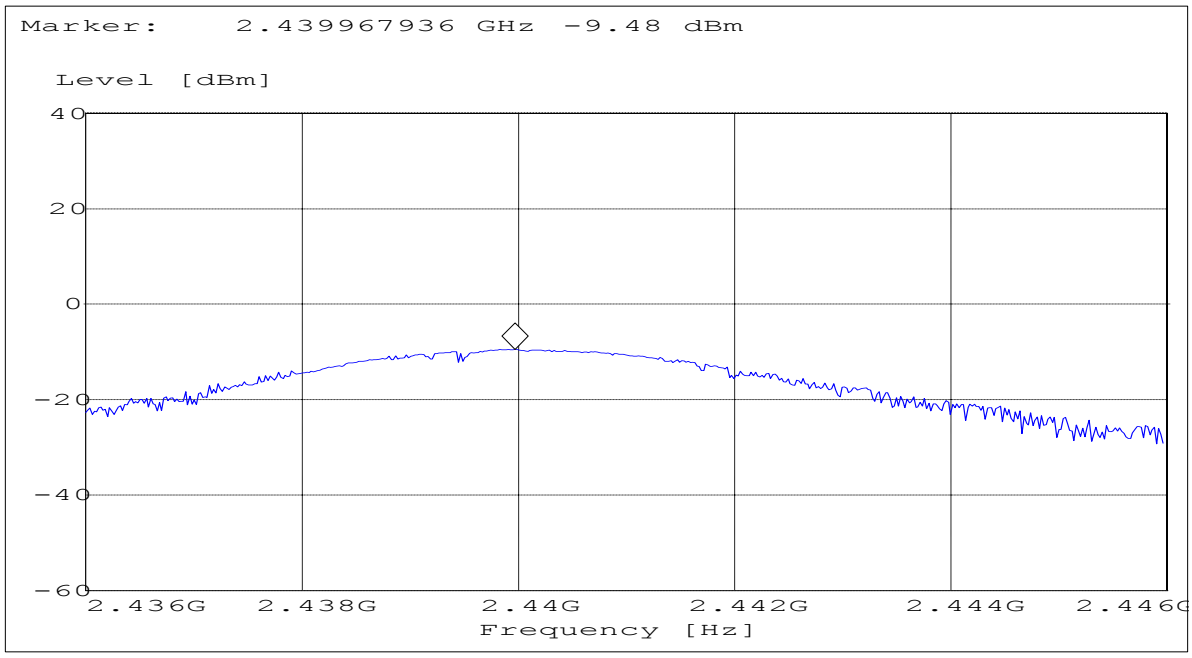
Low Channel: 2402MHz



ANALYZER SETTINGS: RBW = 3MHz VBW = 3MHz

PEAK OUTPUT POWER (RADIATED) **§15.247 (b) (1)**

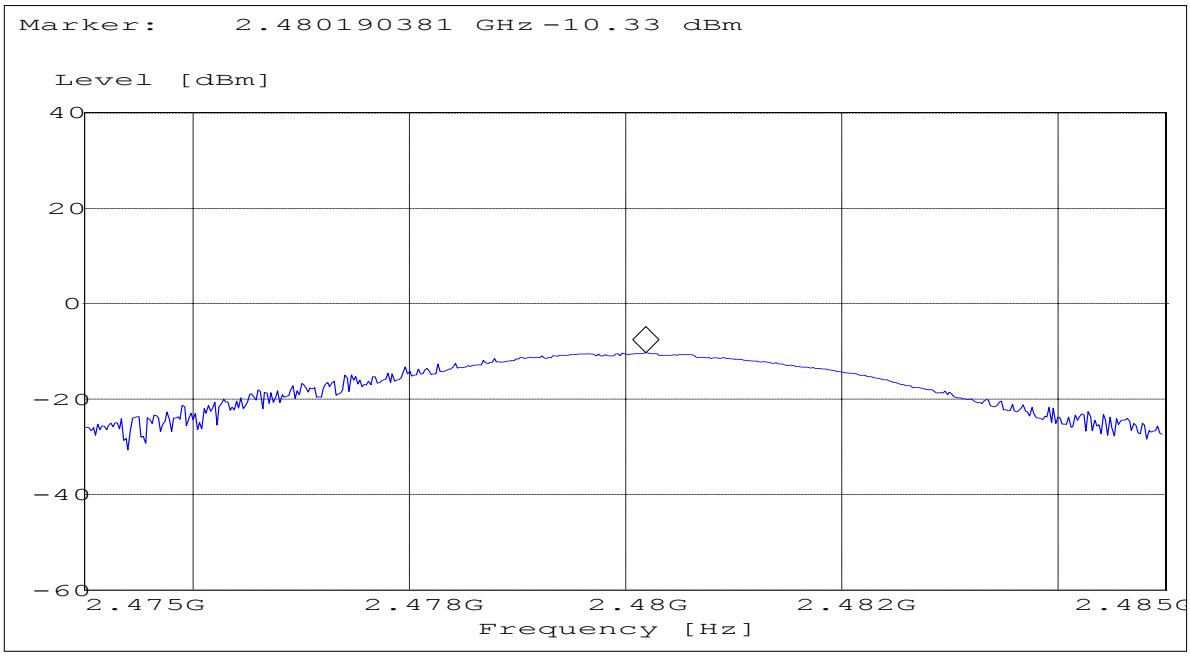
Mid Channel: 2440MHz



ANALYZER SETTINGS: RBW = 3MHz VBW = 3MHz

PEAK OUTPUT POWER (RADIATED) **§15.247 (b) (1)**

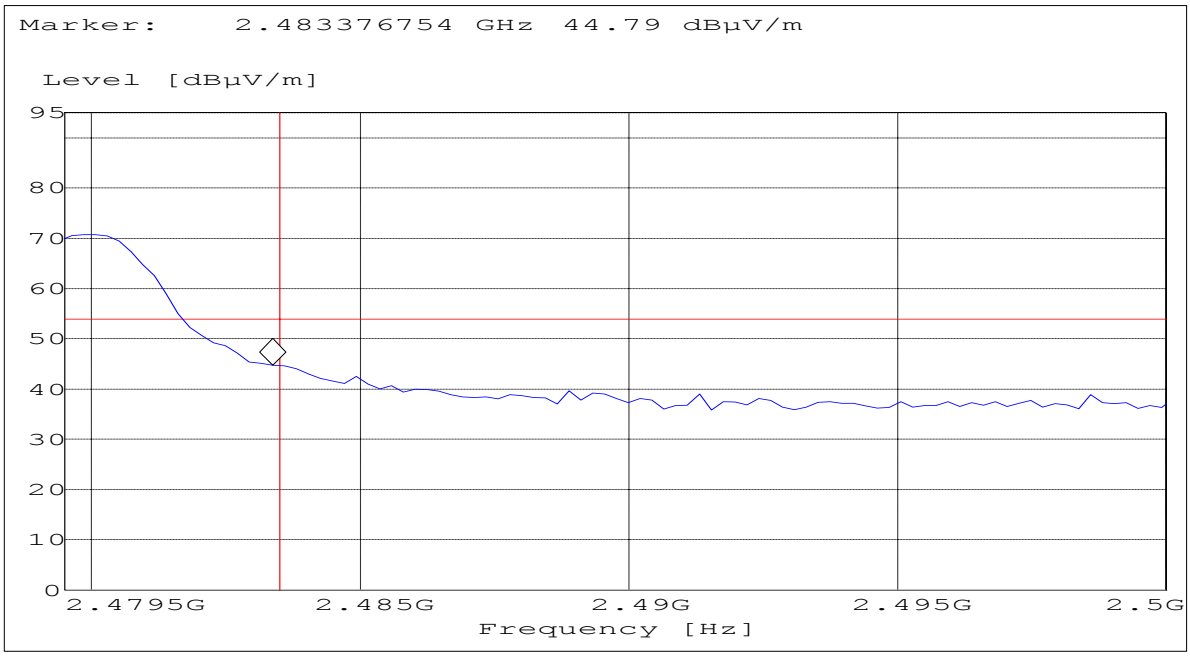
Highest Channel: 2480MHz



ANALYZER SETTINGS: RBW = 3MHz VBW = 3MHz

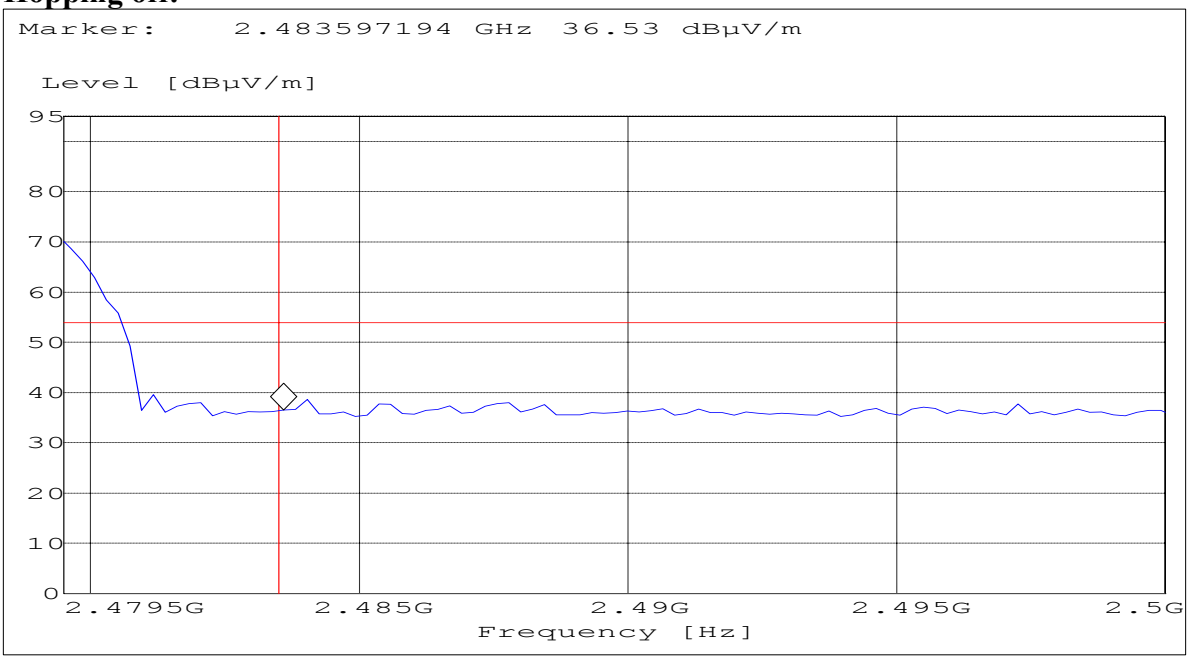
BAND EDGE COMPLIANCE **§15.247 (c)**

Measurements for Headset M1000 below:
spurious in the restricted band 2483.5 – 2500 MHz
hopping on:



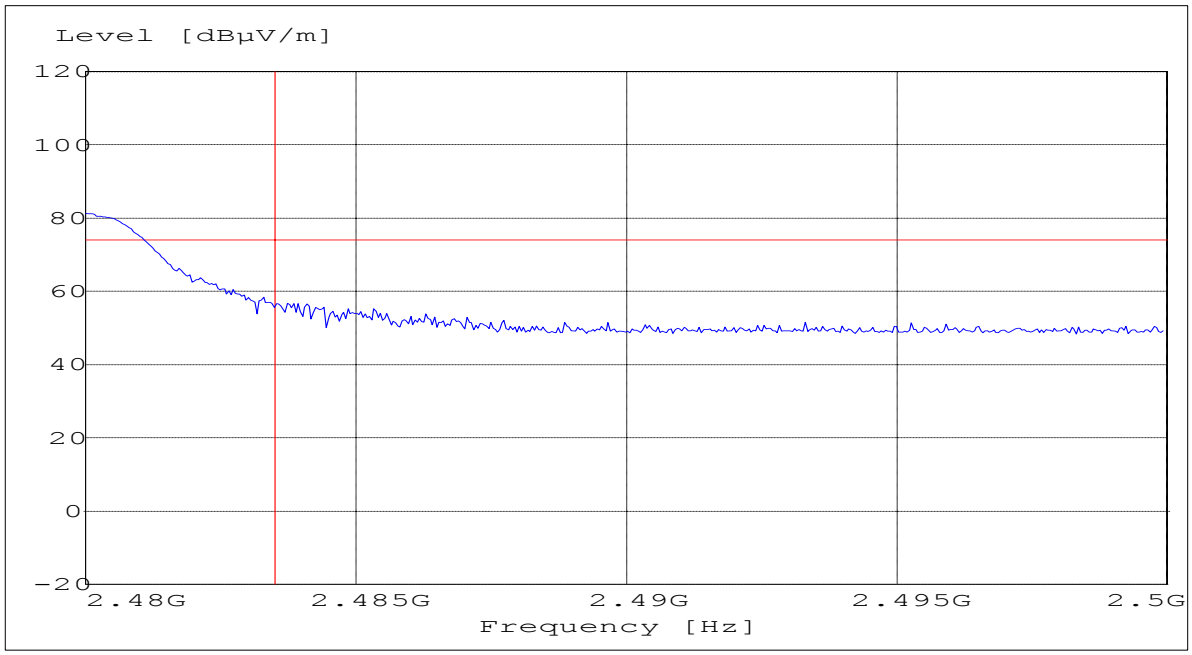
ANALYZER SETTINGS: RBW = 1MHz VBW = 1MHz

Hopping off:


Marker: 2.483597194 GHz 36.53 dBµV/m
Level [dBµV/m]
95
80
70
60
50
40
30
20
10
0
2.4795G
2.485G
2.49G
2.495G
2.5G
Frequency [Hz]

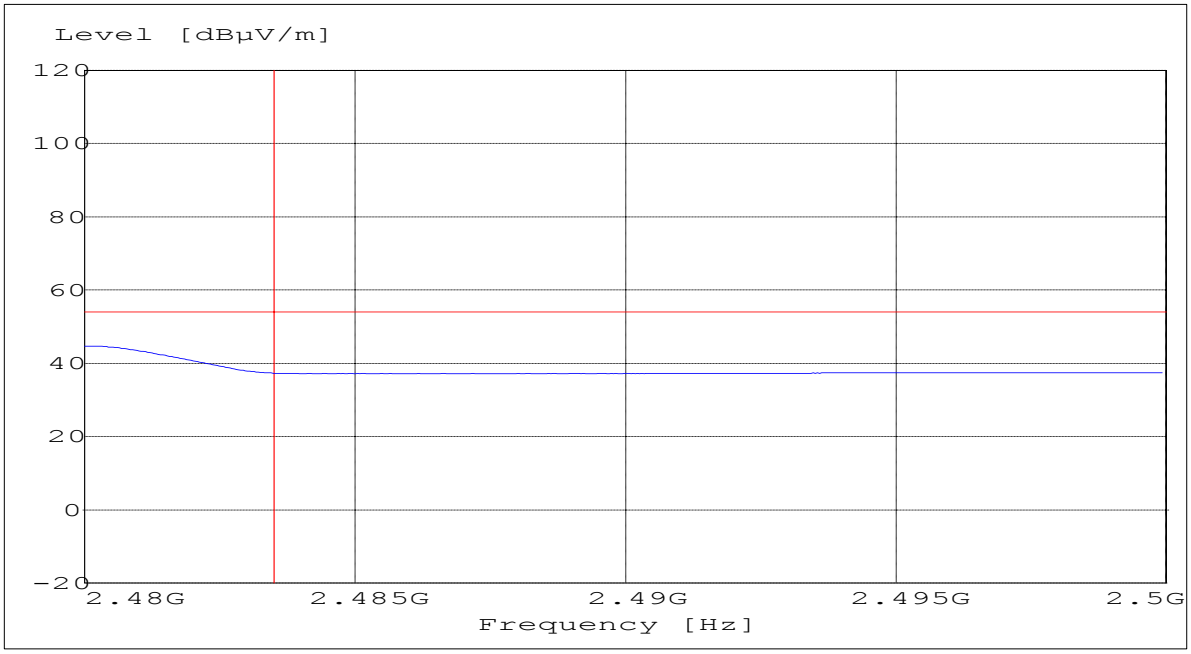
Measurements for Adapter M500 below:

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

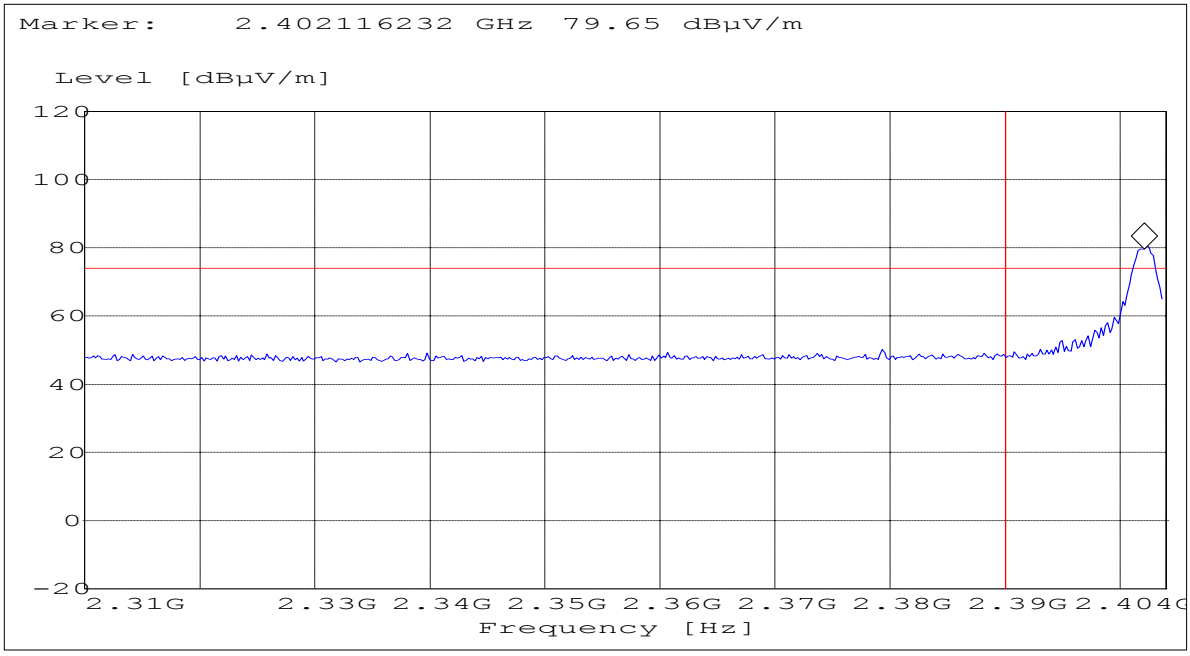


ANALYZER SETTINGS: RBW = 1MHz VBW = 1MHz

Hopping off, Average:

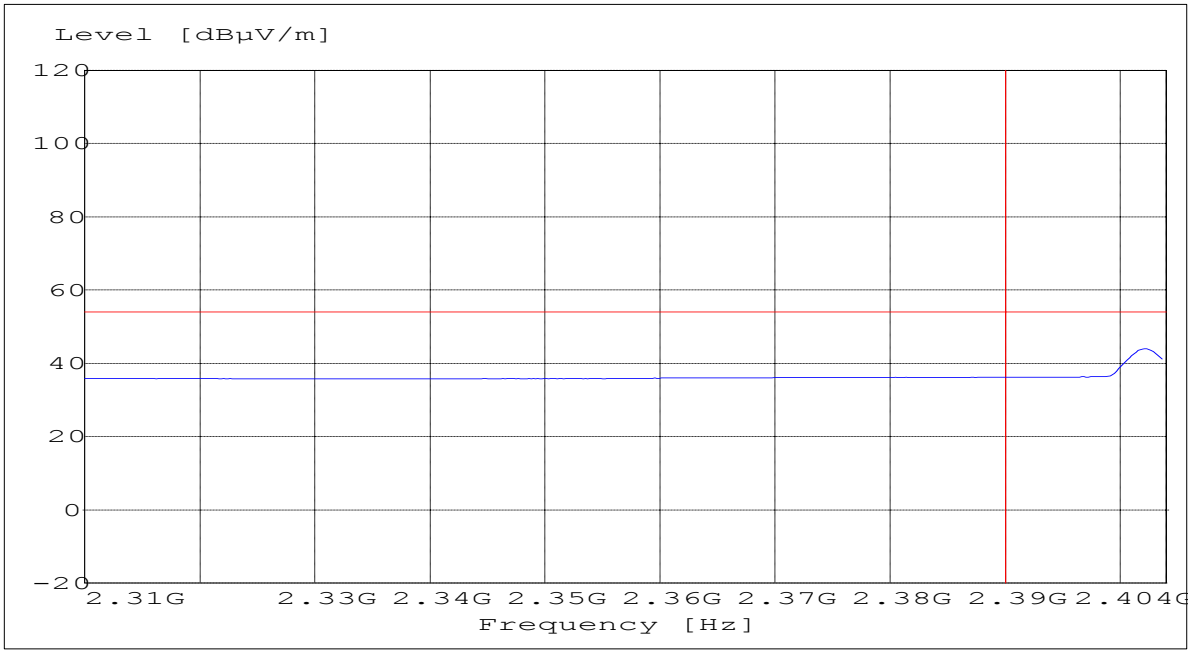


spurious in the restricted band 2310 – 2390 MHz
hopping off, Peak:



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.

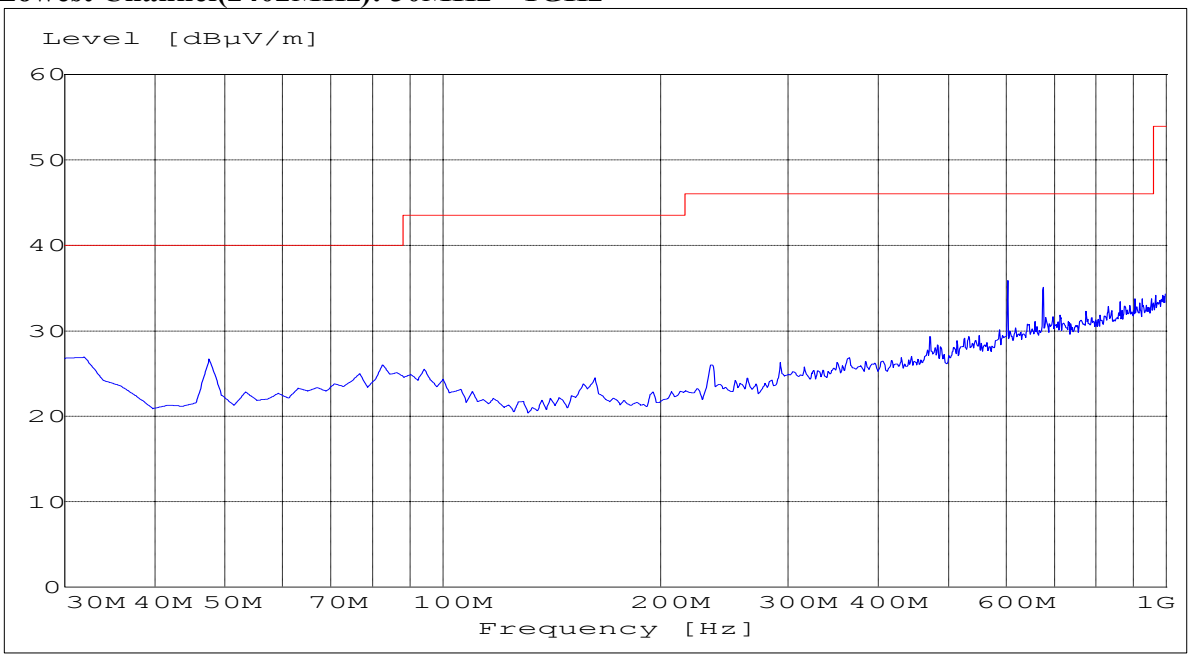
NOTE:

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.

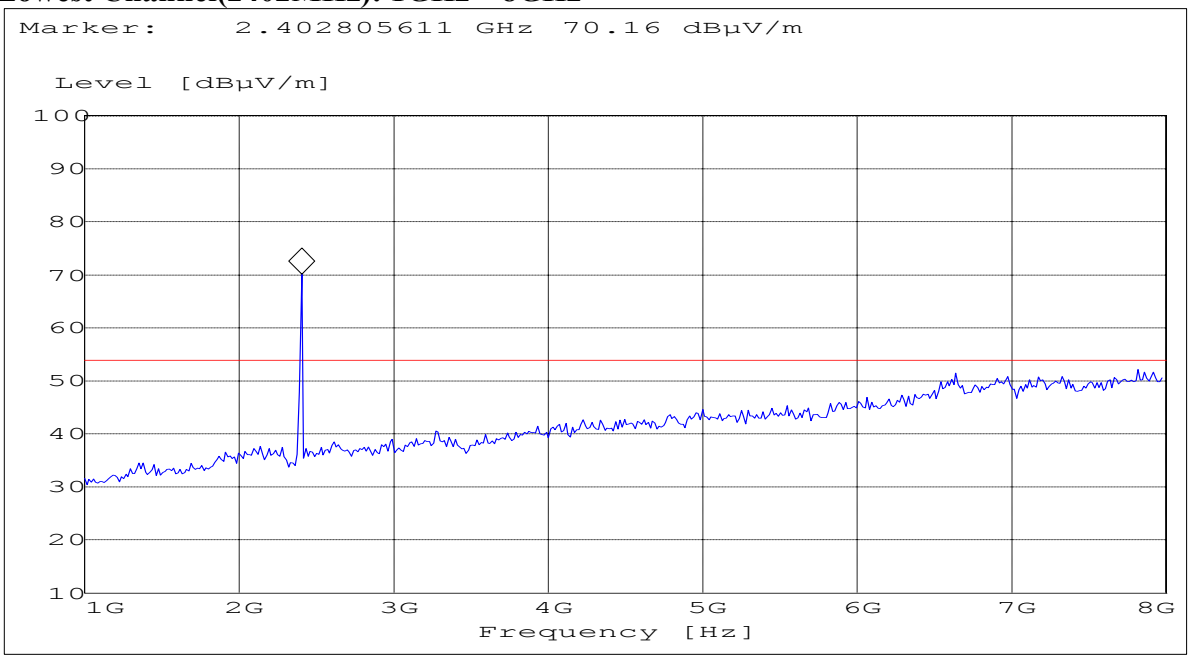
3. Emission levels from the adapter M500 were lower than those from the headset M1000. Only plots of headset emissions are included below.

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



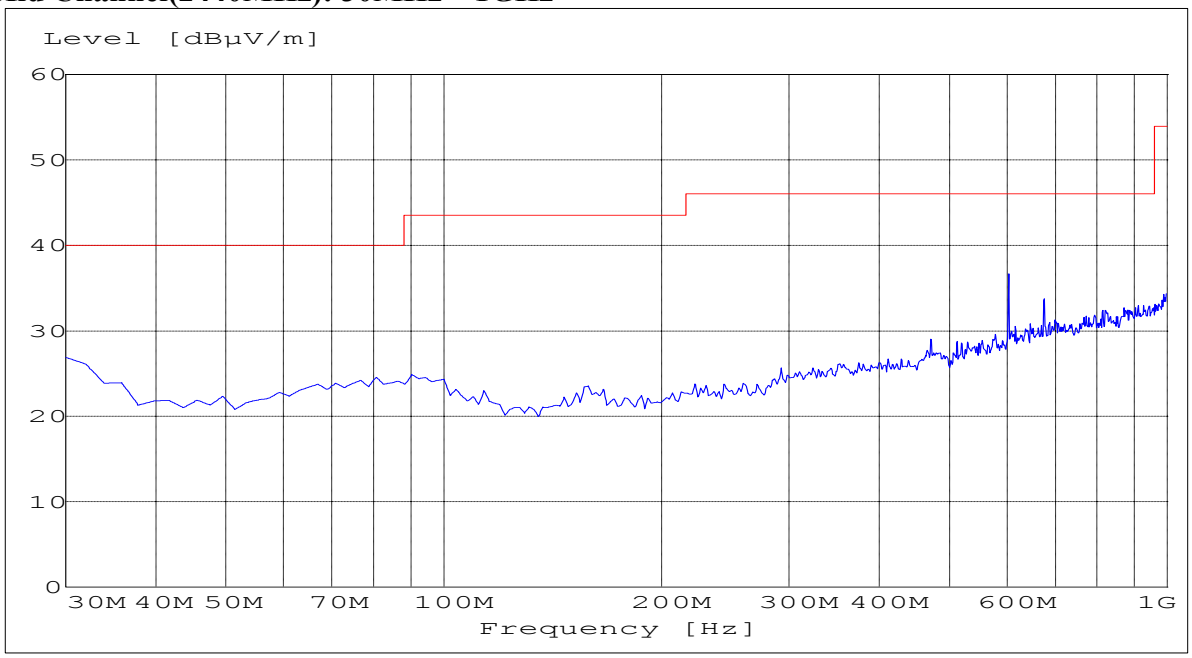
ANALYZER SETTINGS: RBW = 100KHz VBW = 100KHz

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



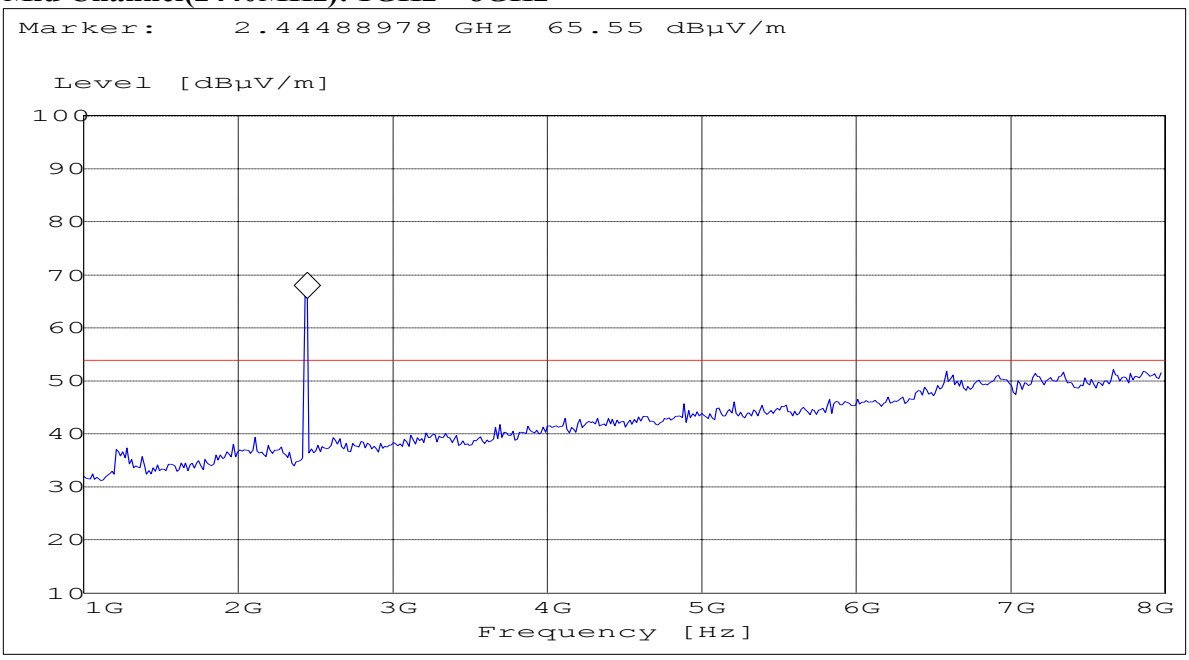
NOTE: The peak above the limit is the carrier frequency.
ANALYZER SETTINGS: RBW = 1MHz VBW = 1MHz

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



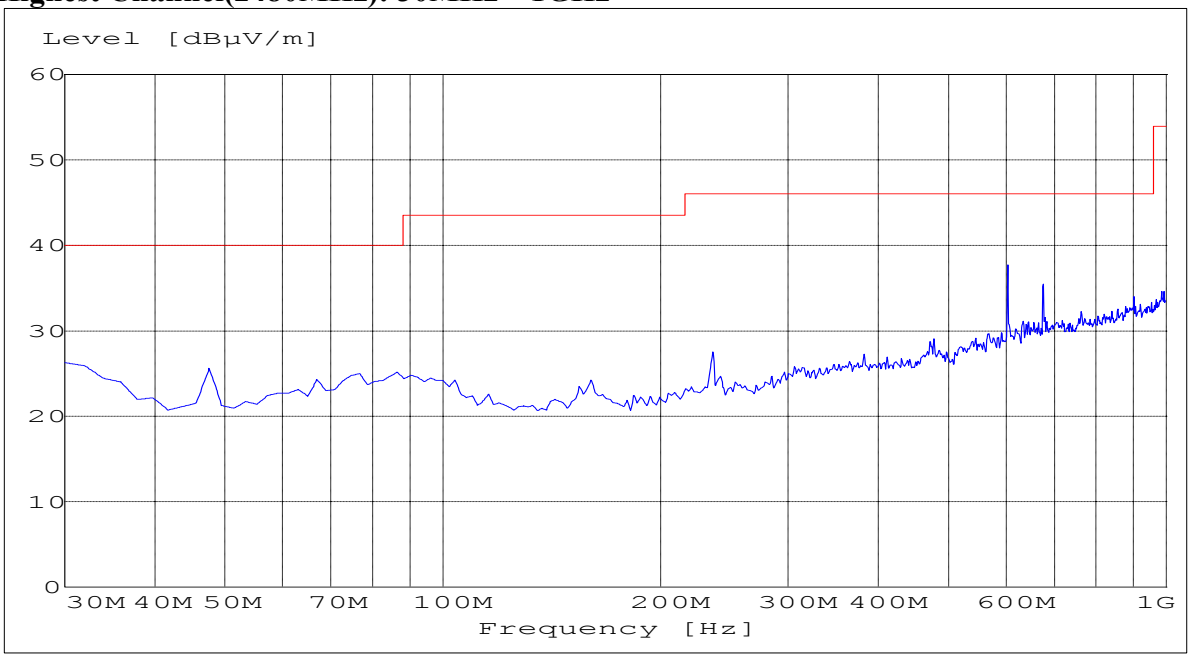
ANALYZER SETTINGS: RBW = 100KHz VBW = 100KHz

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



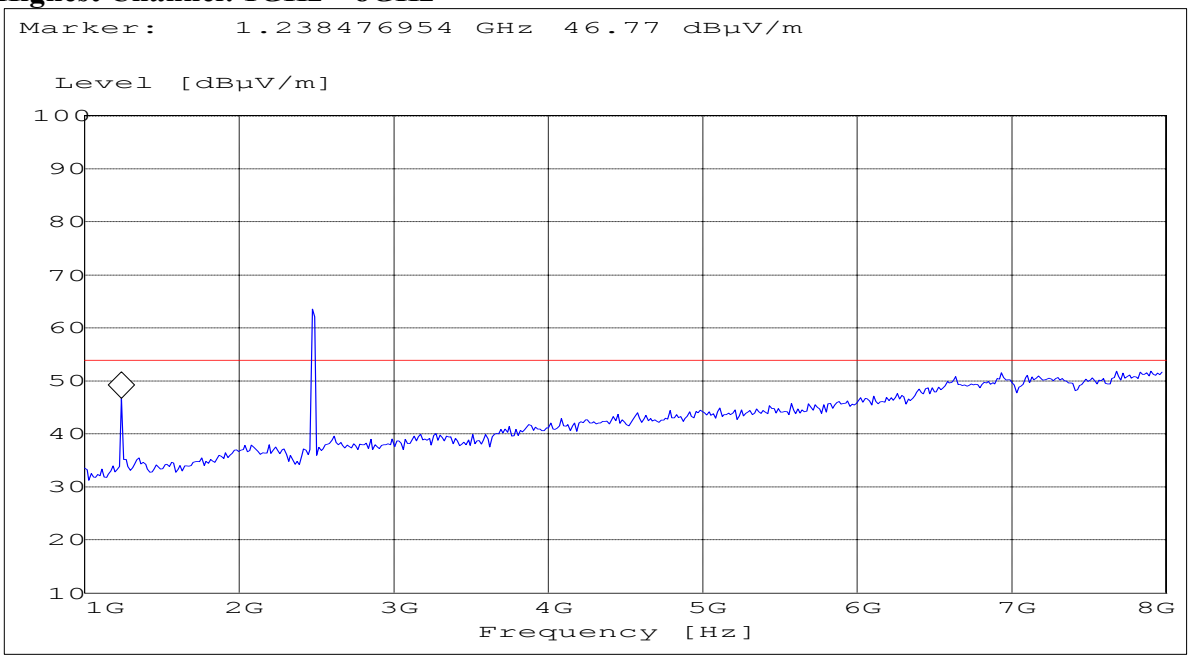
NOTE: The peak above the limit is the carrier frequency.
ANALYZER SETTINGS: RBW = 1MHz VBW = 1MHz

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



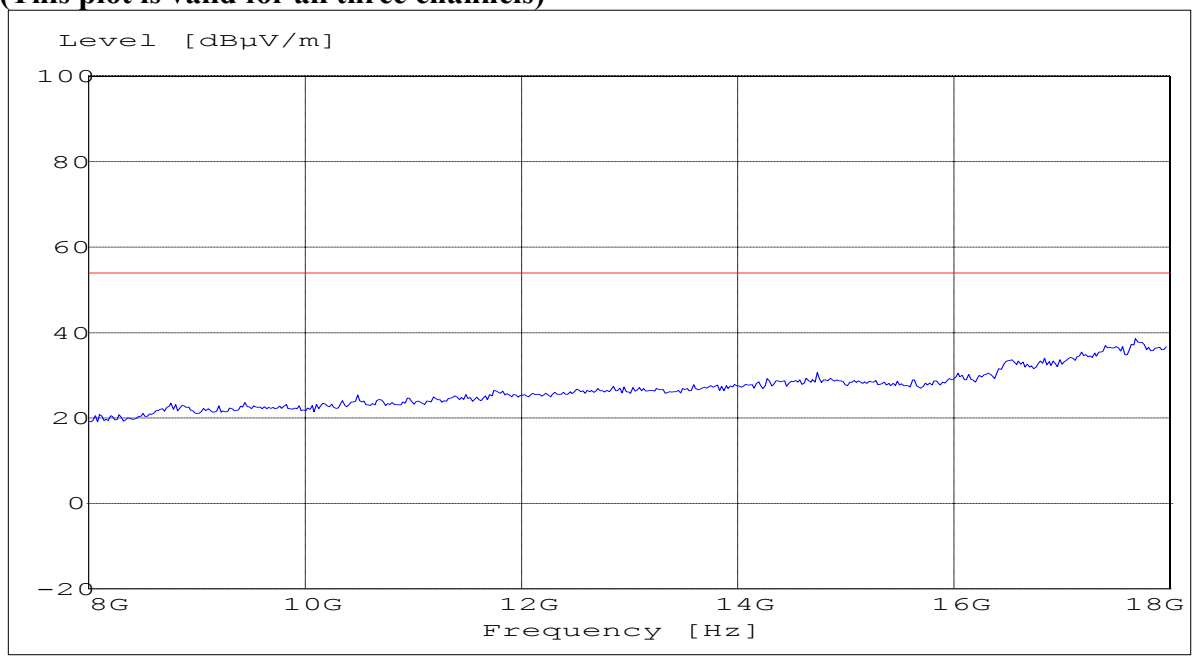
ANALYZER SETTINGS: RBW = 100KH VBW = 100KHz

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



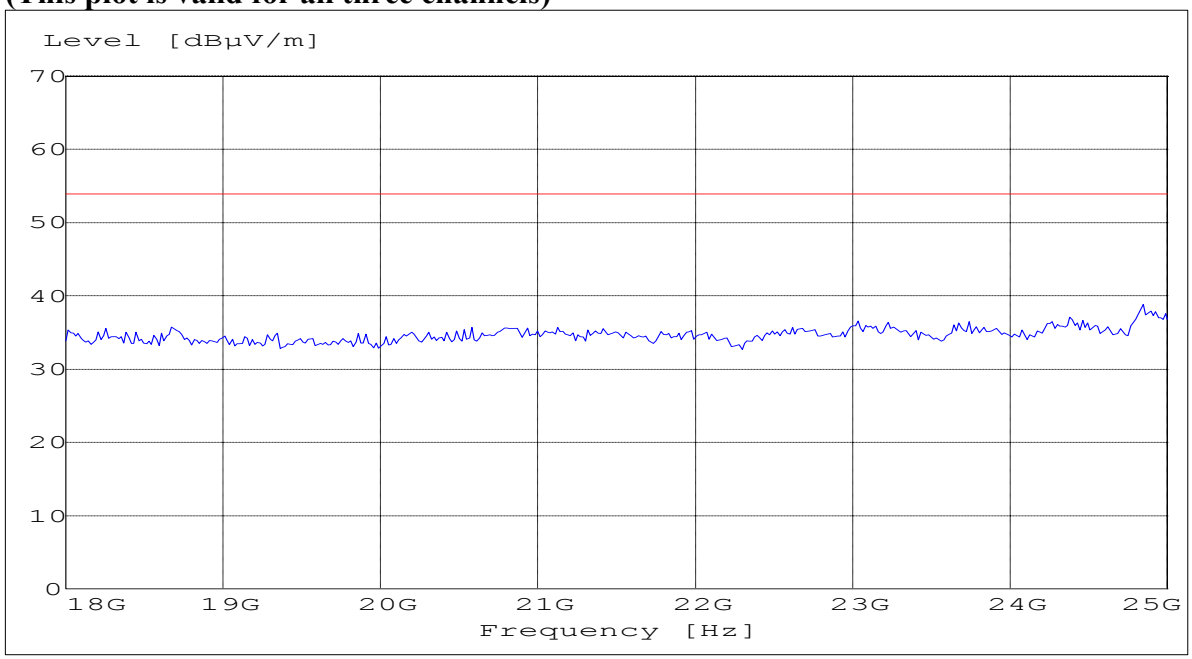
NOTE: The peak above the limit is the carrier frequency.
ANALYZER SETTINGS: RBW = 1MHz VBW = 1MHz

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

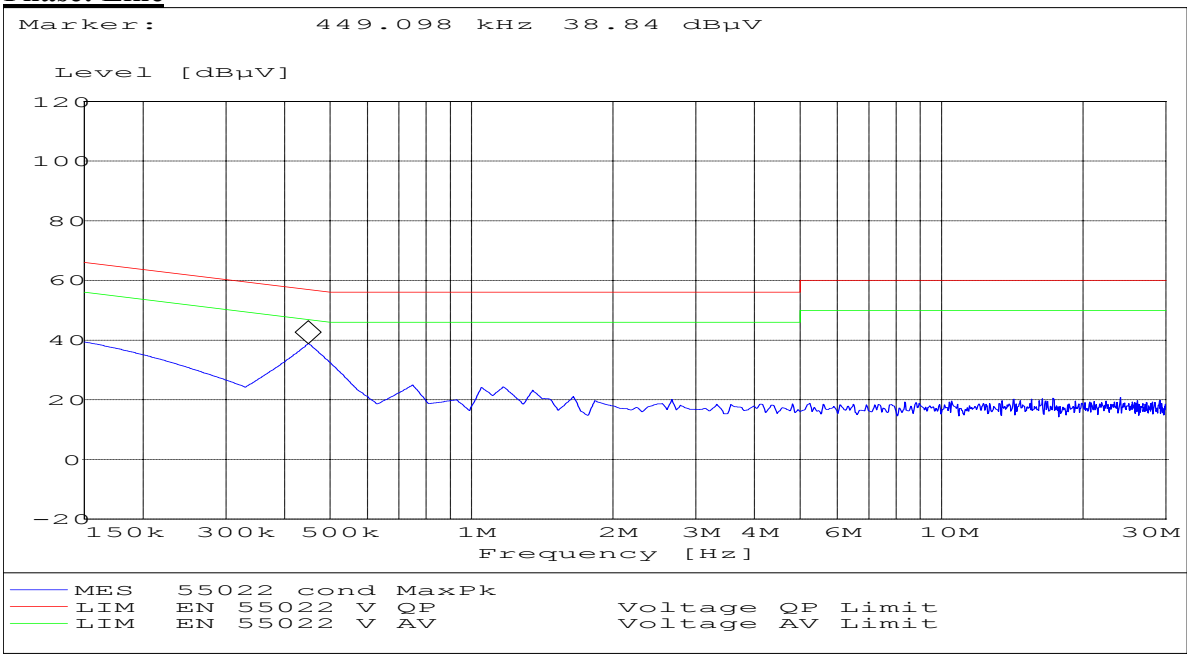
EMISSION LIMITATIONS - Radiated (Transmitter) SUBCLAUSE § 15.247 (c) (1)
18GHz – 25GHz
(This plot is valid for all three channels)



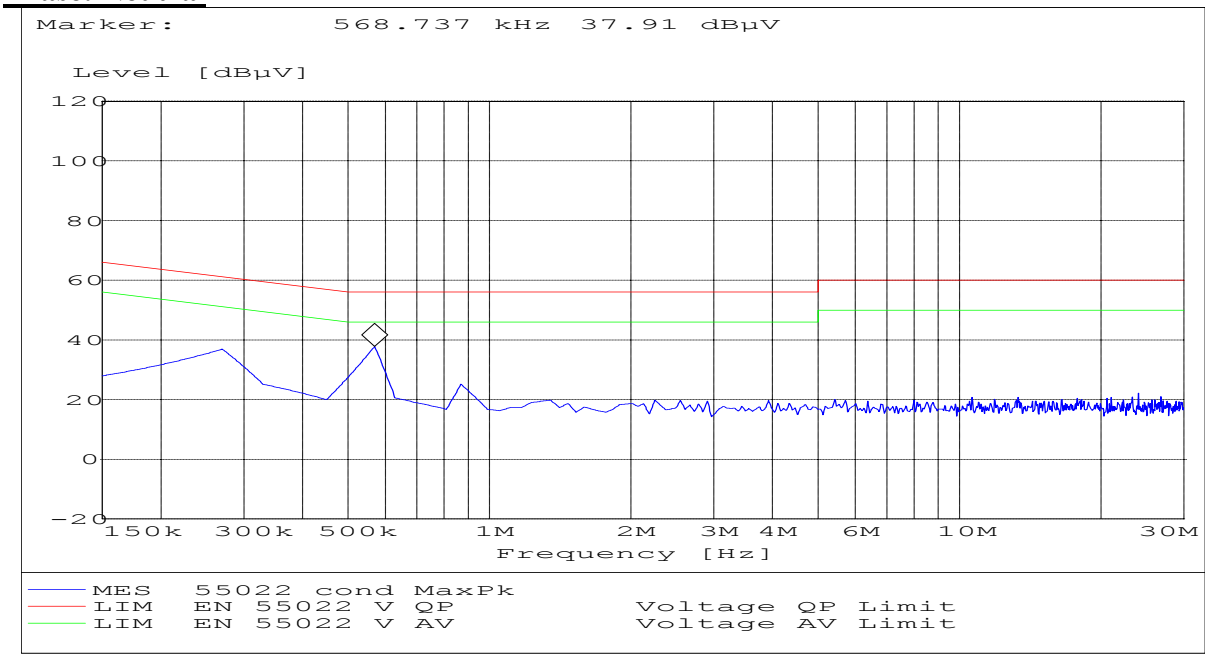
ANALYZER SETTINGS: RBW = 1MHz VBW = 1MHz

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:

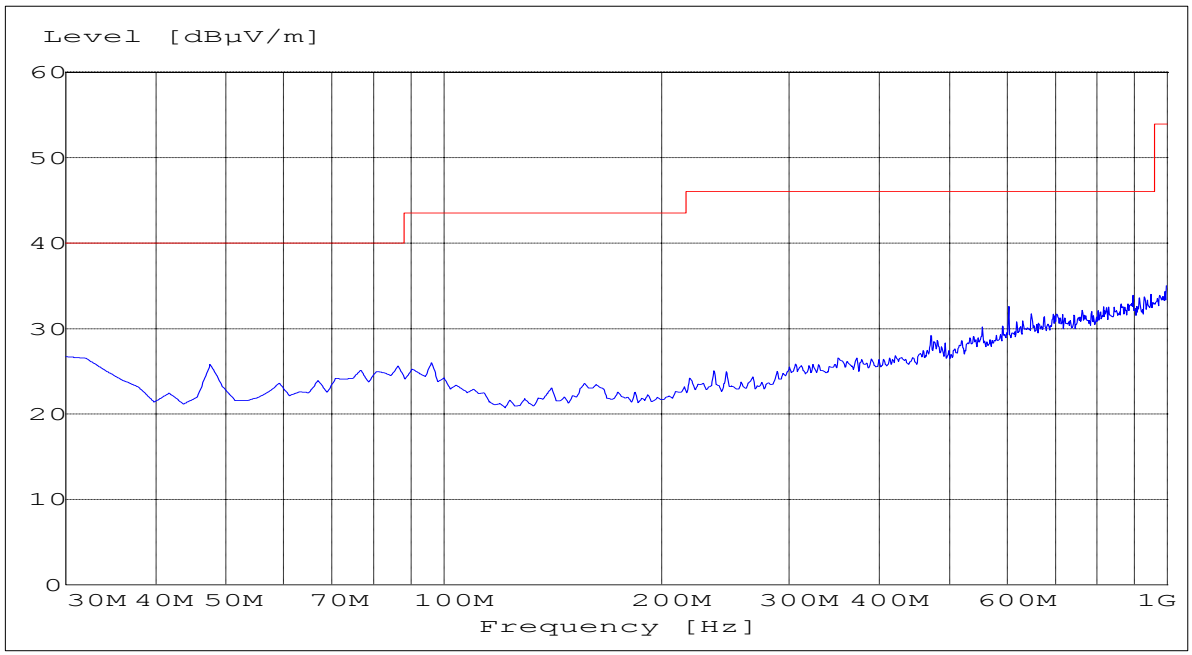
1. The radiated emissions were done with different settings, using the relevant pre-amplifiers for the relevant frequency ranges. This is the reason that the graphs show different noise levels. In the range between 18 and 25 GHz very short cable connections to the antenna was used to minimize the noise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

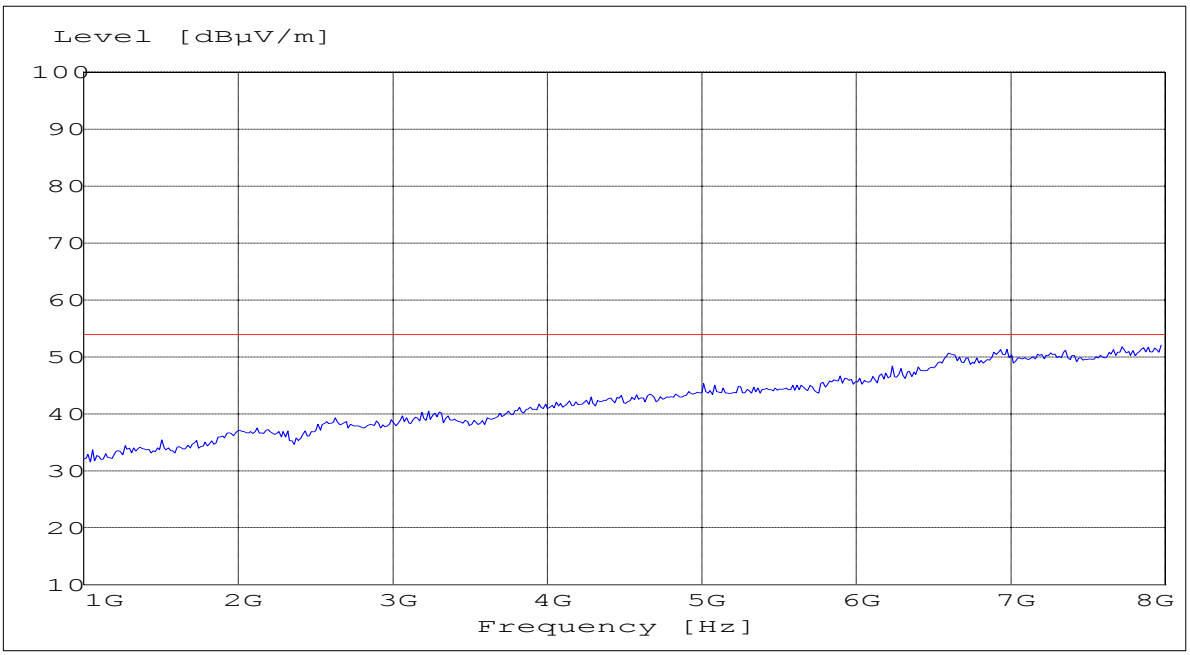
30MHz – 1GHz



ANALYZER SETTINGS: RBW = 100KHz VBW = 100KHz

RECEIVER SPURIOUS RADIATION § 15.209

1GHz – 8GHz



ANALYZER SETTINGS: RBW = 1MHz VBW = 1MHz

TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

No	Instrument/Ancillary	Type	Manufacturer	Serial No.
01	Spectrum Analyzer	FSEM 30	Rohde & Schwarz	826880/010
02	Signal Generator	SMY0	Rohde & Schwarz	836878/011
03	Power-Meter	NRVD	Rohde & Schwarz	0857.8008.02
04	Power Amlifier	250W1000	Amplifier Research	300031
05	Biconilog Antenna	3141	EMCO	0005-1186
06	Horn Antenna	SAS-200/571	AH Systems	325
07	Power Splitter	11667B	Hewlett Packard	645348
08	Climatic Chamber	VT4004	Votch	G1115
09	Pre-Amplifier	JS4-00102600	Miteq	00616
10	Power Sensor	URV5-Z2	Rohde & Schwarz	DE30807
11	Power Sensor	URV5-Z2	Rohde & Schwarz	DE30808