



FCC Test Report

Test report no.: EMC_597FCC15.247_2003_1003

FCC Part 15.247 for FHSS systems / CANADA RSS-210

Model: 1003

FCC ID: C3K1003

IC: 3048A-1003



TTI-P-G 081/94-A0

Accredited according to **ISO/IEC 17025**



FCC listed # 101450

IC recognized # 3925

CETECOM Inc.

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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@ceteconomusa.com****Internet: www.cetecom.com**

1.3 Details of applicant

Name : Microsoft Corporation
Street : One Microsoft Way
City / Zip Code : Redmond 98052
Country : USA
Contact : Robert Lawrence
Telephone : +1 425 705 5369
Tele-fax : +1 425 939 7329
e-mail : roblaw@microsoft.com

1.4 Application details

Date of receipt test item : 2003-12-15
Date of test : 2003-12-15/16, 2004-01-05 to 26

1.5 Test item

Manufacturer : Flextronics Industrial (Shenzhen) Company Ltd.
Street : Block C9, 2nd Industrial Zone
City / Zip Code : Xixang Shenzhen Guangdong 51826
Country : People's Republic of China
Marketing Name : Microsoft® Wireless Transceiver for Bluetooth® 2.0
Model No. : 1003
Description : [Bluetooth Transceiver \(Dongle\)](#)
FCC-ID : C3K1003
IC ID : 3048A-1003

Additional information

Test Sample : #221 for Radiated measurements
#159 for Conducted measurements
Frequency : 2402MHz – 2480MHz
Type of modulation : GFSK
Number of channels : 79
Antenna : PCBA Printed
Power supply : 5 Volts: USB Port Power
Output power : 3.9dBm (2.45mW) conducted peak power
Extreme vol. Limits : Critical: 4.4V, Max: 5.25V
Extreme temp. Tolerance : 0°C-40°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:

2004-02-26 EMC & Radio Lothar Schmidt (Manager)



Date

Section

Name

Signature

Responsible for test report and project leader:

2004-02-26 EMC & Radio Harpreet Sidhu (EMC Engineer)



Date

Section

Name

Signature

2.2 Test report

TEST REPORT

**Test report no.: EMC_597FCC15.247_2003_1003
(Model: 1003)**

TEST REPORT REFERENCE

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TEST & OPERATING MODES

TEST MODES

For all under listed test modes EUT remains plugged into USB port of Desktop PC (Dell S/No. DBM7N21)

Test mode-1(Transmitting at single frequency)

EUT is set to Transmit at particular channel frequency with highest output power using test software “Bluetooth Tools”

Test mode-2 (Hopping mode)

EUT is set to enter into special test mode using test software “Bluetooth Tools”. This test mode enables EUT to establish an air link with BT test system CMU-200. After the link being established, EUT is forced into hopping mode from CMU-200 with choice of different packet types. (DHI, DH3, DH5)

Test mode-3 (Normal operation)

EUT is set to communicate with Bluetooth Mouse (model# 1001) & Bluetooth Keyboard (model# 1002) over an air link. BT link between EUT and Mouse is evidenced by cursor drawing a diamond shape continuously in Mousetrap window on monitor (Dell S/No. 8164560) screen. BT link between EUT and Keyboard is evidenced by repetitive typing of following characters in notepad on monitor screen, “BT RF test pattern”

Test mode-4 (Receive/standby mode)

For BT devices this mode corresponds to transmitter standby mode.

EUT is set to receive mode by putting transmitter into standby mode using test software “Bluetooth Tools”

OPERATING MODES

Op. mode-1

Transmit @ 2402MHz

Op. mode-2

Transmit @ 2441 MHz

Op. mode-3

Transmit @ 2480MHz

Op. mode-4

Hopping mode

Op. mode-5

Normal operation

Op. mode-6

Receive/standby mode

CARRIER FREQUENCY SEPERATION

§15.247(a)

Test mode-2

Op. mode-4



Marker 1 [T1]

RBW 100 kHz RF Att 40 dB

Ref Lvl

1.93 dBm

VBW 100 kHz

37.5 dBm

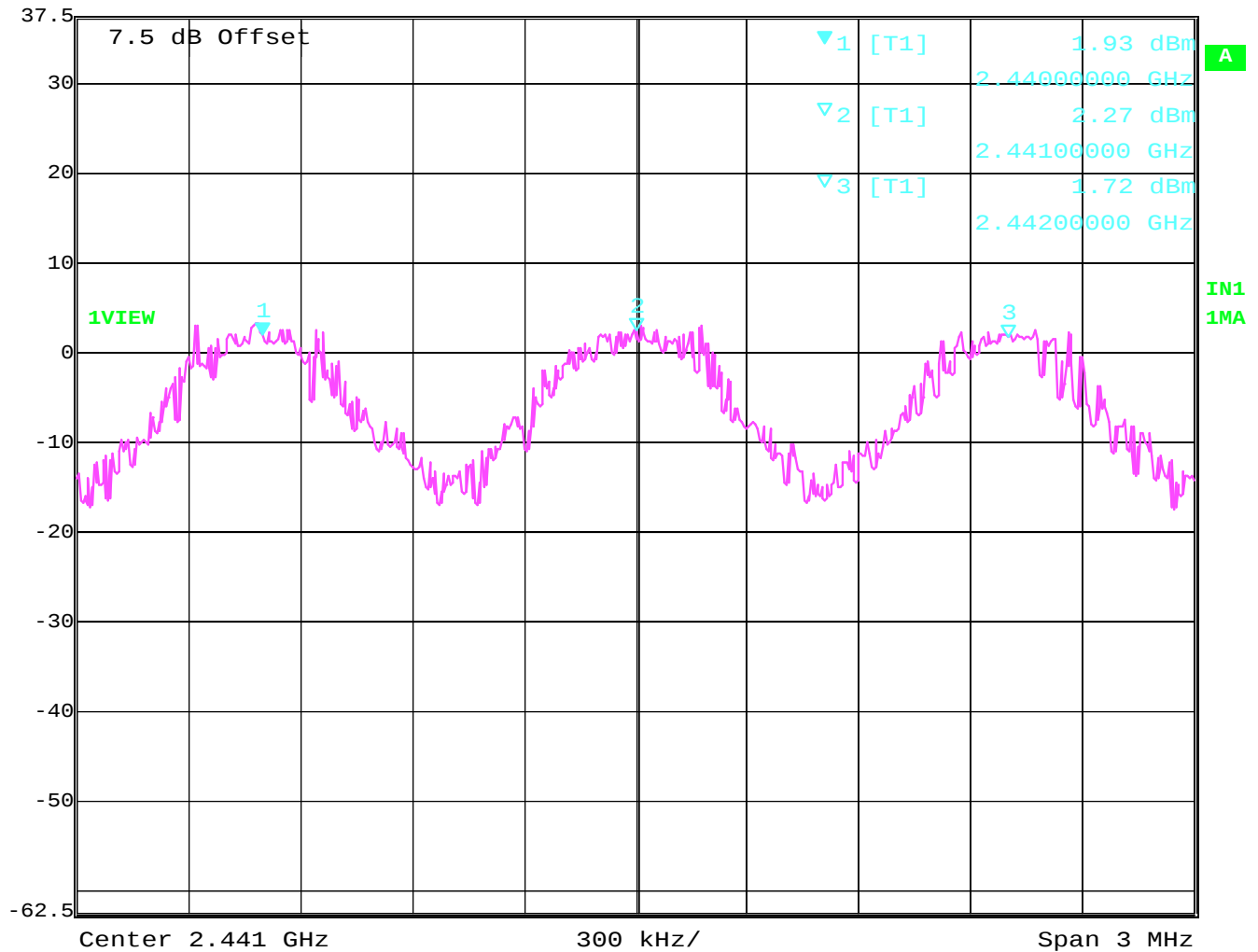
2.44000000 GHz

SWT

5 ms

Unit

dBm



Date: 7.JAN.2004 13:52:28

NUMBER OF HOPPING CHANNELS

§15.247(a)

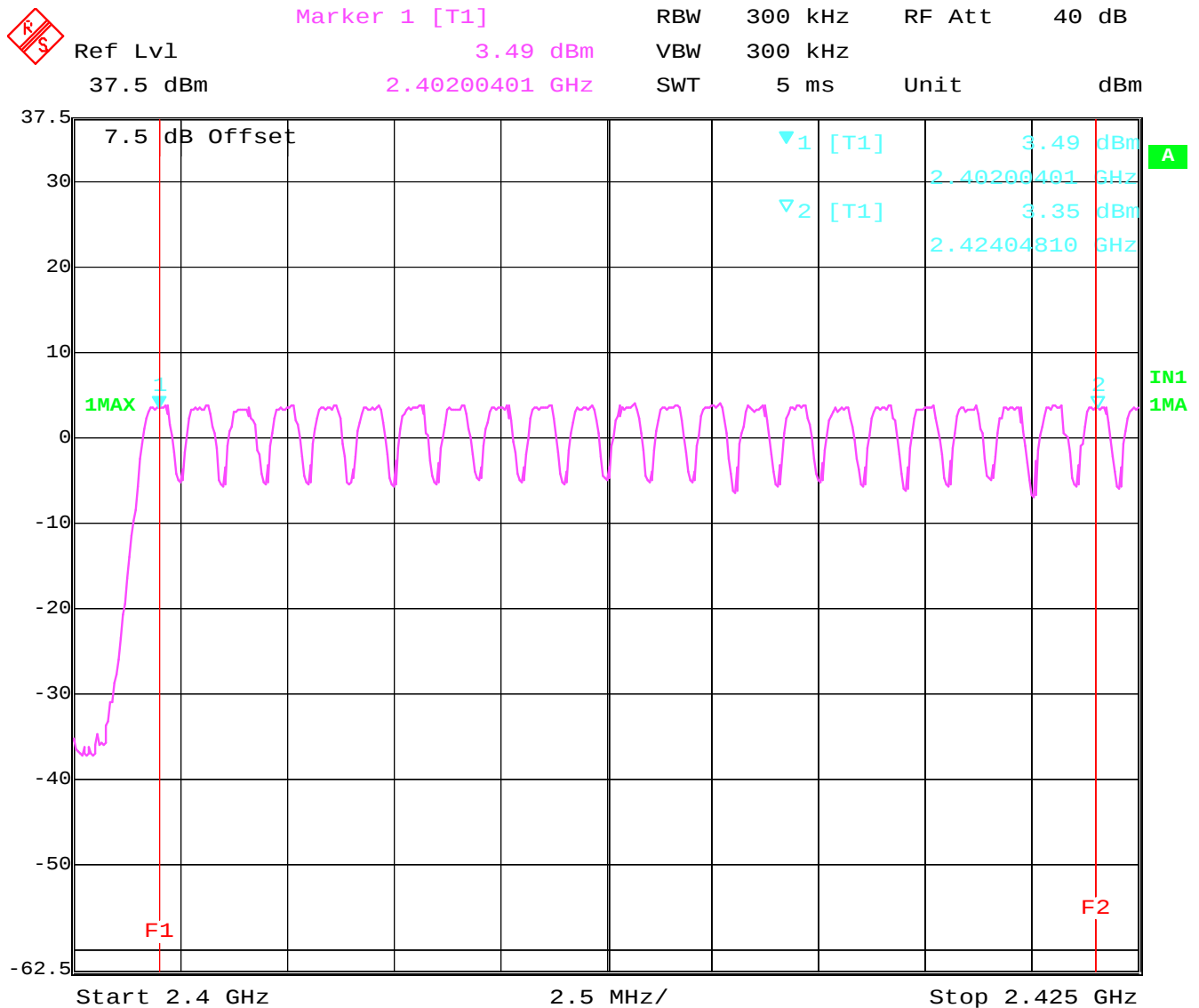
Test mode-2

Op. mode-4

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: 7.JAN.2004 13:54:58

Plot 2: Total 24

Test mode-2

Op. mode-4



Marker 2 [T1]

RBW 300 kHz RF Att 40 dB

Ref Lvl 3.20 dBm

VBW 300 kHz

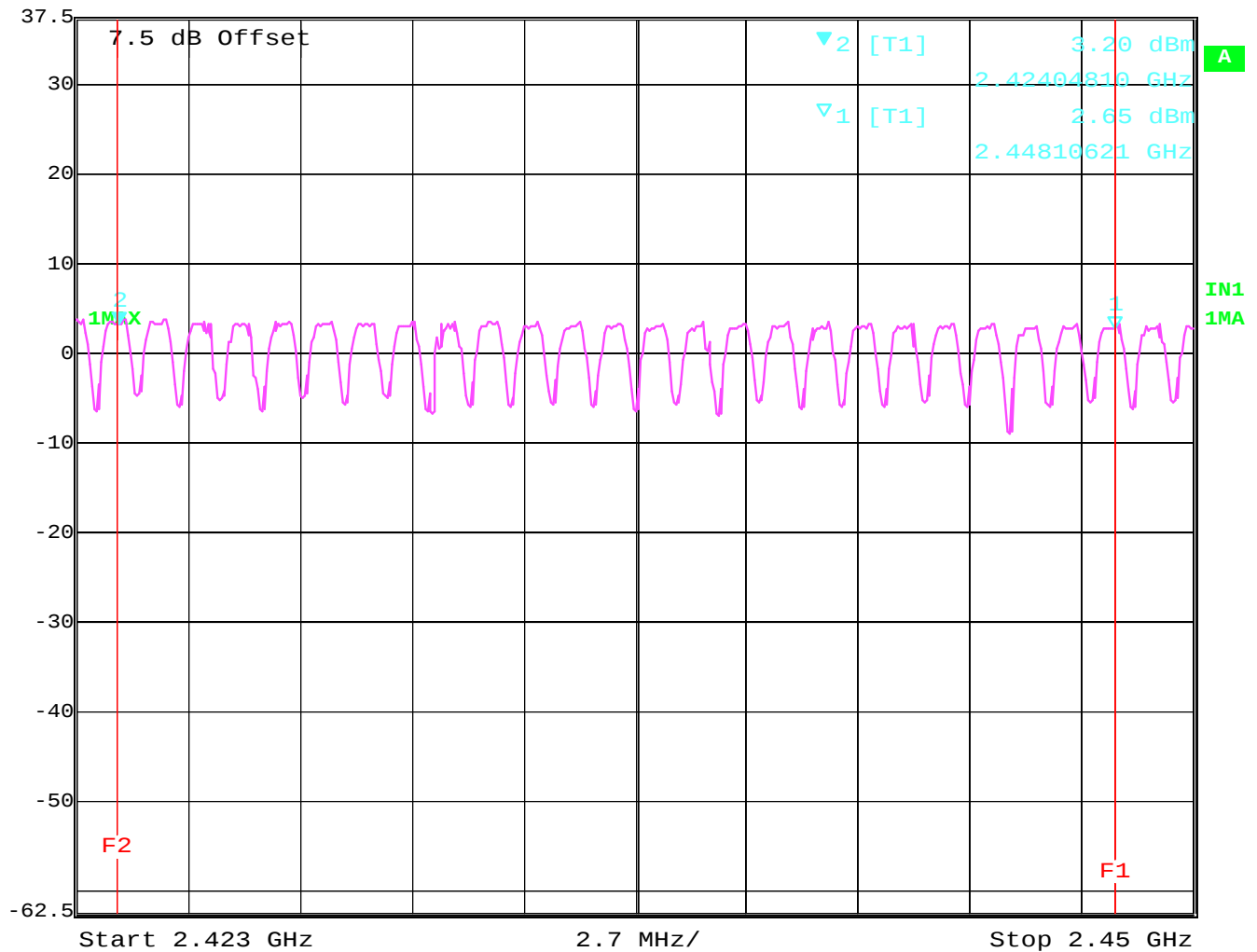
37.5 dBm

2.42404810 GHz

SWT 5 ms

Unit

dBm



Date: 7. JAN. 2004 13:56:24

Plot 3: Total 20

Test mode-2

Op. mode-4



Marker 1 [T1]

RBW 300 kHz RF Att 40 dB

Ref Lvl 3.03 dBm

VBW 300 kHz

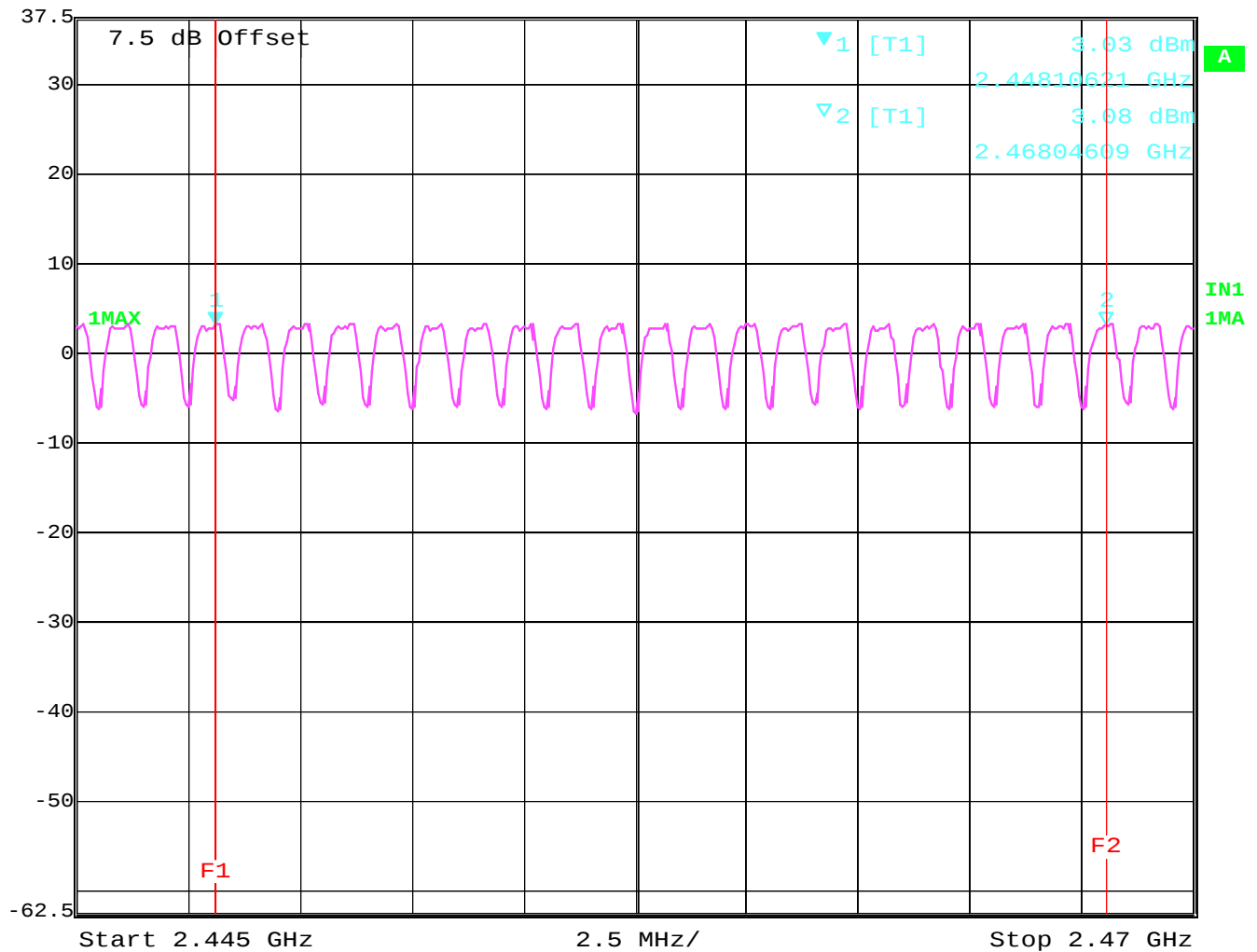
37.5 dBm

2.44810621 GHz

SWT 5 ms

Unit

dBm



Date: 7. JAN. 2004 13:58:31

Plot 4: Total 12

Test mode-2

Op. mode-4



Marker 2 [T1]

RBW 300 kHz RF Att 40 dB

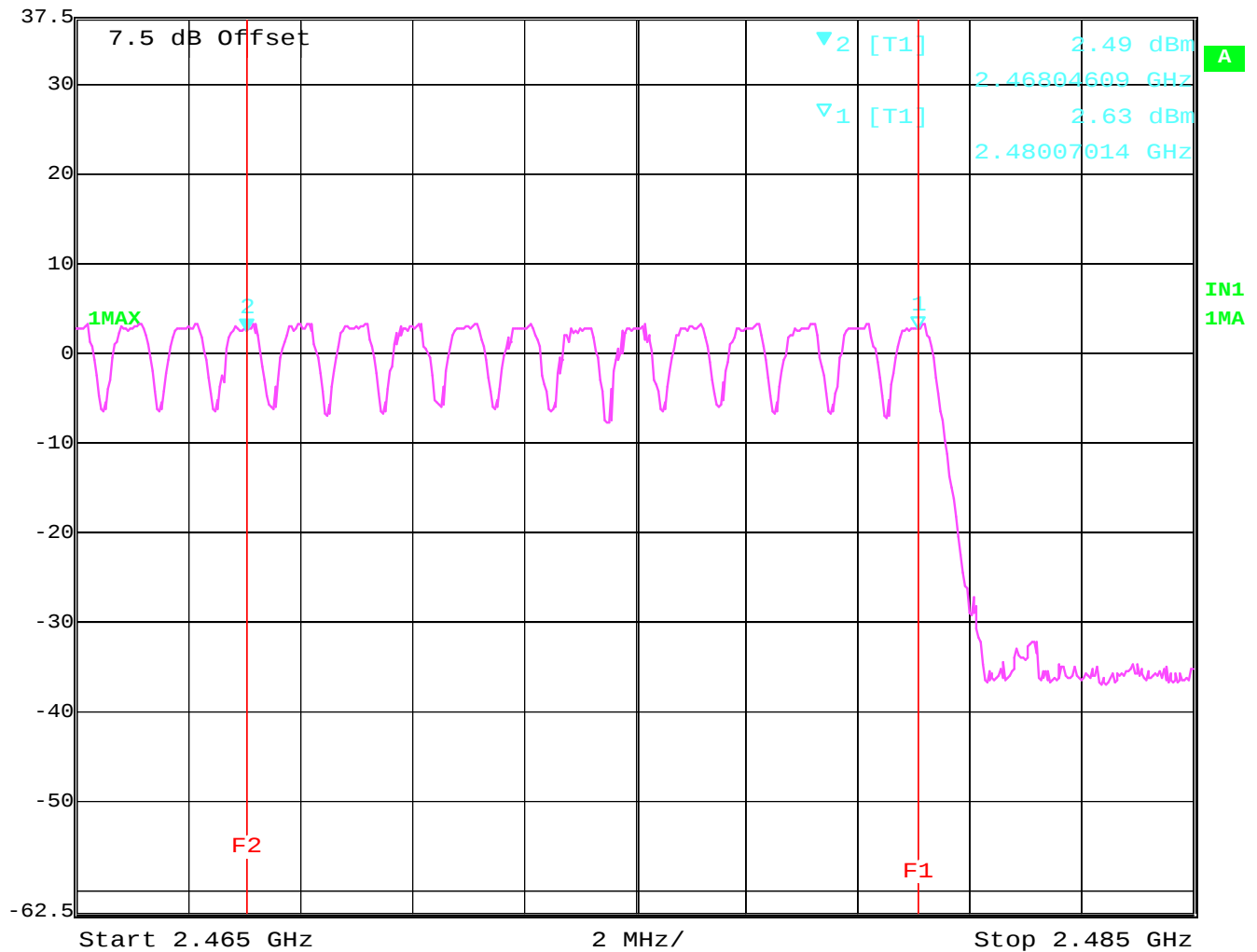
Ref Lvl 2.49 dBm

VBW 300 kHz

37.5 dBm 2.46804609 GHz

SWT 5 ms

Unit dBm



Date: 7. JAN. 2004 13:59:55

TIME OF OCCUPANCY (DWELL TIME)

§15.247(a)

DH1 – Packet

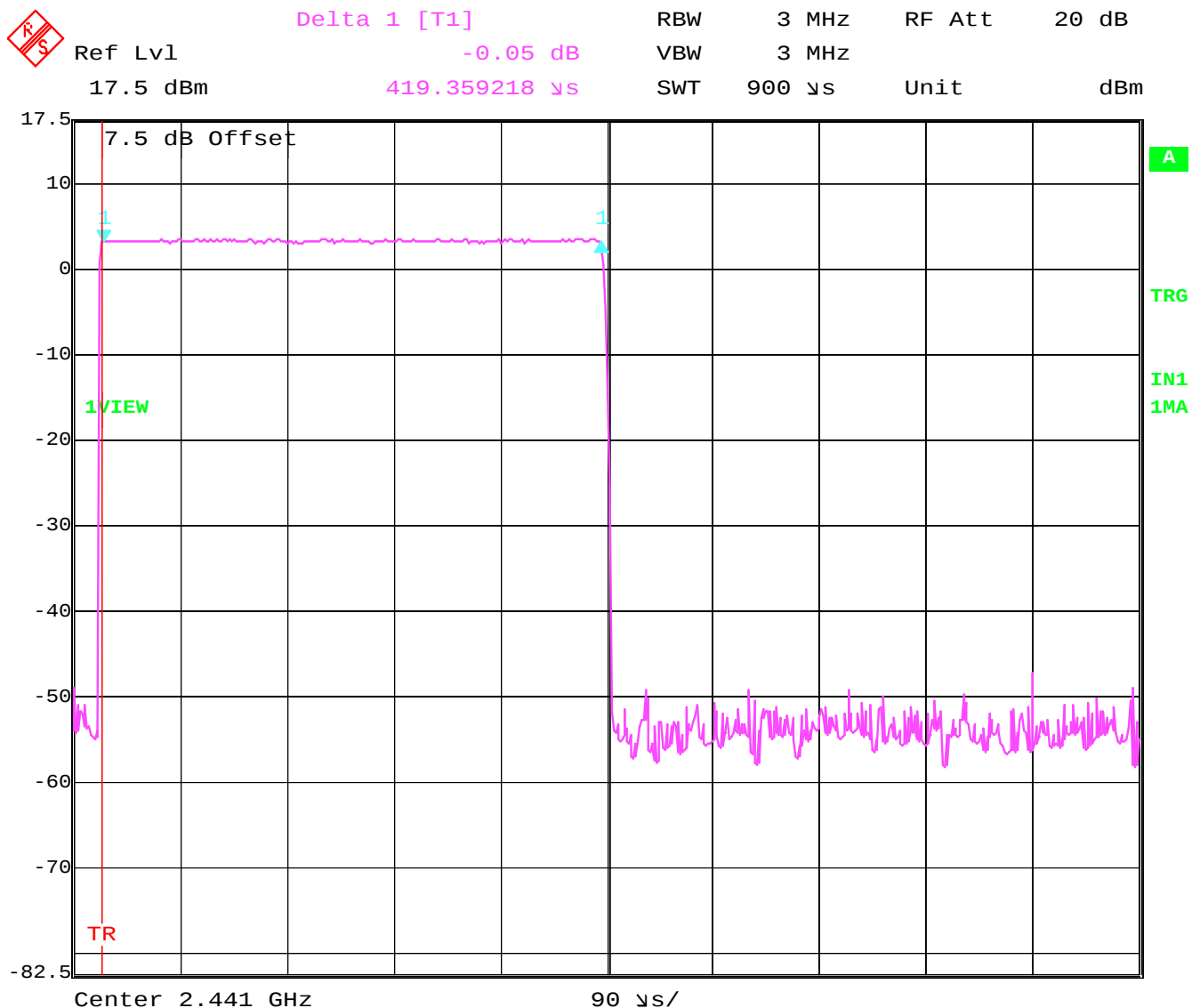
Test mode-2

Op. mode-4

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 419.35µs.

So we have $320.108 * 419.35\mu s = 134.23ms$ per 31.6 seconds.



Date: 7. JAN. 2004 13:44:01

TIME OF OCCUPANCY (DWELL TIME)

§15.247(a)

DH3 – Packet

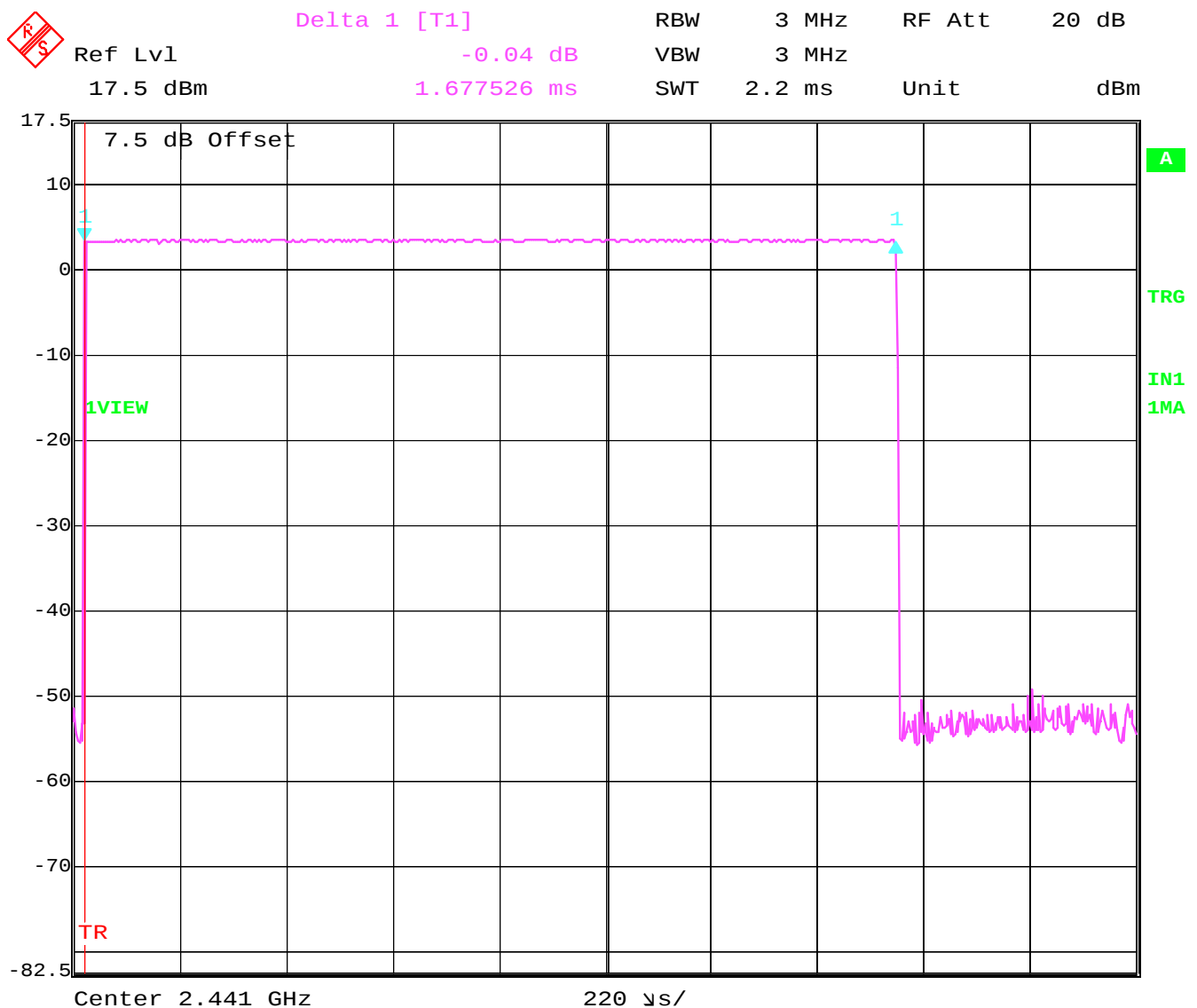
Test mode-2

Op. mode-4

A DH3 Packets need 3 time slots for transmit and 1 for receiving, 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 31.6 seconds you have 161.16 times of appearance.

Each Tx-time per appearance is 1.67ms.

So we have $161.16 * 1.67\text{ms} = 269.13\text{ms}$ per 31.6 seconds.



Date: 7. JAN. 2004 13:33:24

TIME OF OCCUPANCY (DWELL TIME)

§15.247(a)

DH5 – Packet

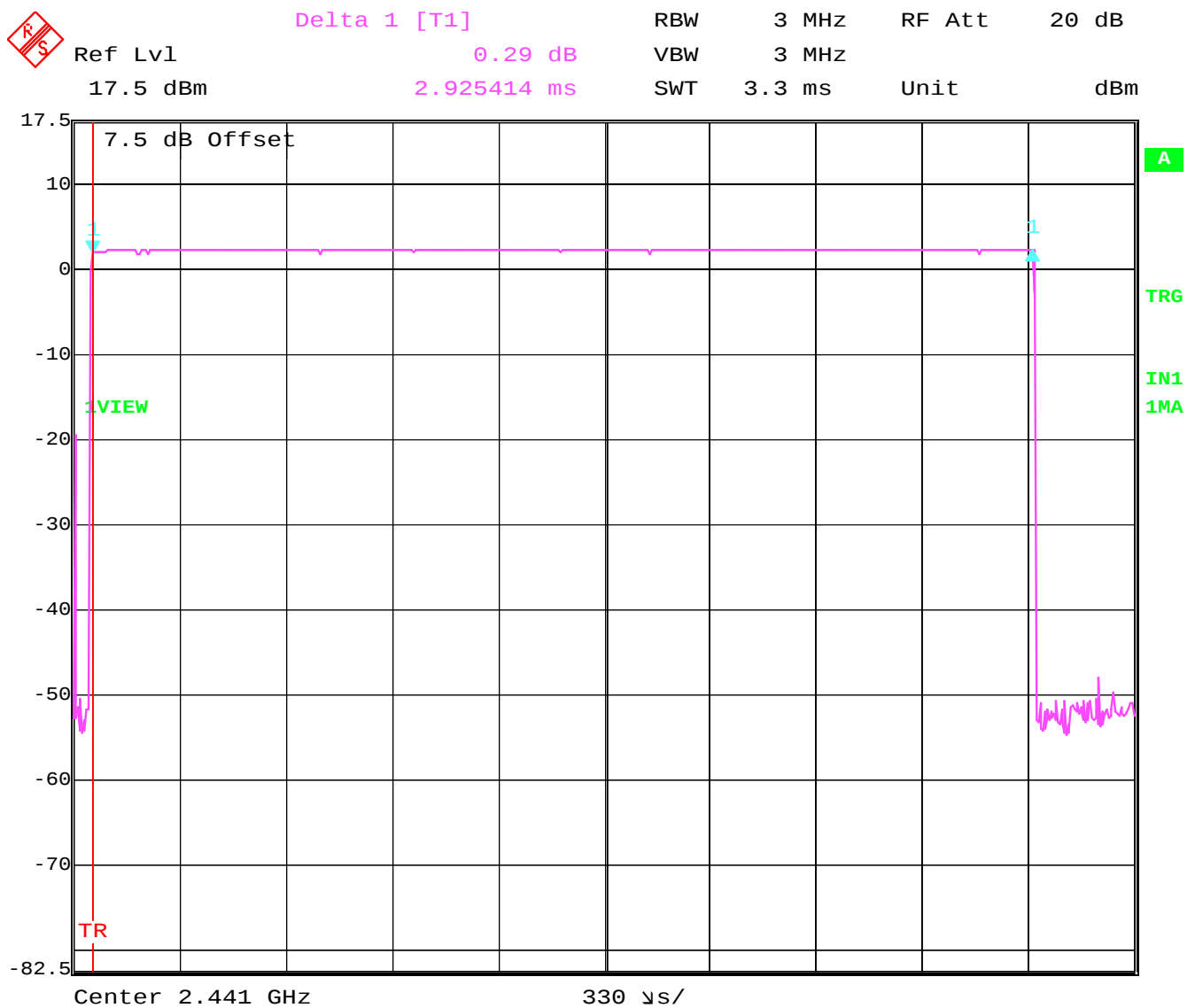
Test mode-2

Op. mode-4

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 2.92ms.

So we have $106.176 * 2.92\text{ms} = 310.03\text{ms}$ per 31.6 seconds.



Date: 7. JAN. 2004 13:47:55

SPECTRUM BANDWIDTH OF FHSS SYSTEM**§15.247(a)****20 dB bandwidth****Test mode-1**

TEST CONDITIONS		20 dB BANDWIDTH (kHz)		
Frequency (MHz)		2402	2441	2480
T _{nom} (23)°C	V _{nom} (5.0)VDC	945.89	945.89	945.89

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

Test mode-1

Op. mode-1

Lowest Channel: 2402MHz



Delta 1 [T1]

RBW 10 kHz RF Att 20 dB

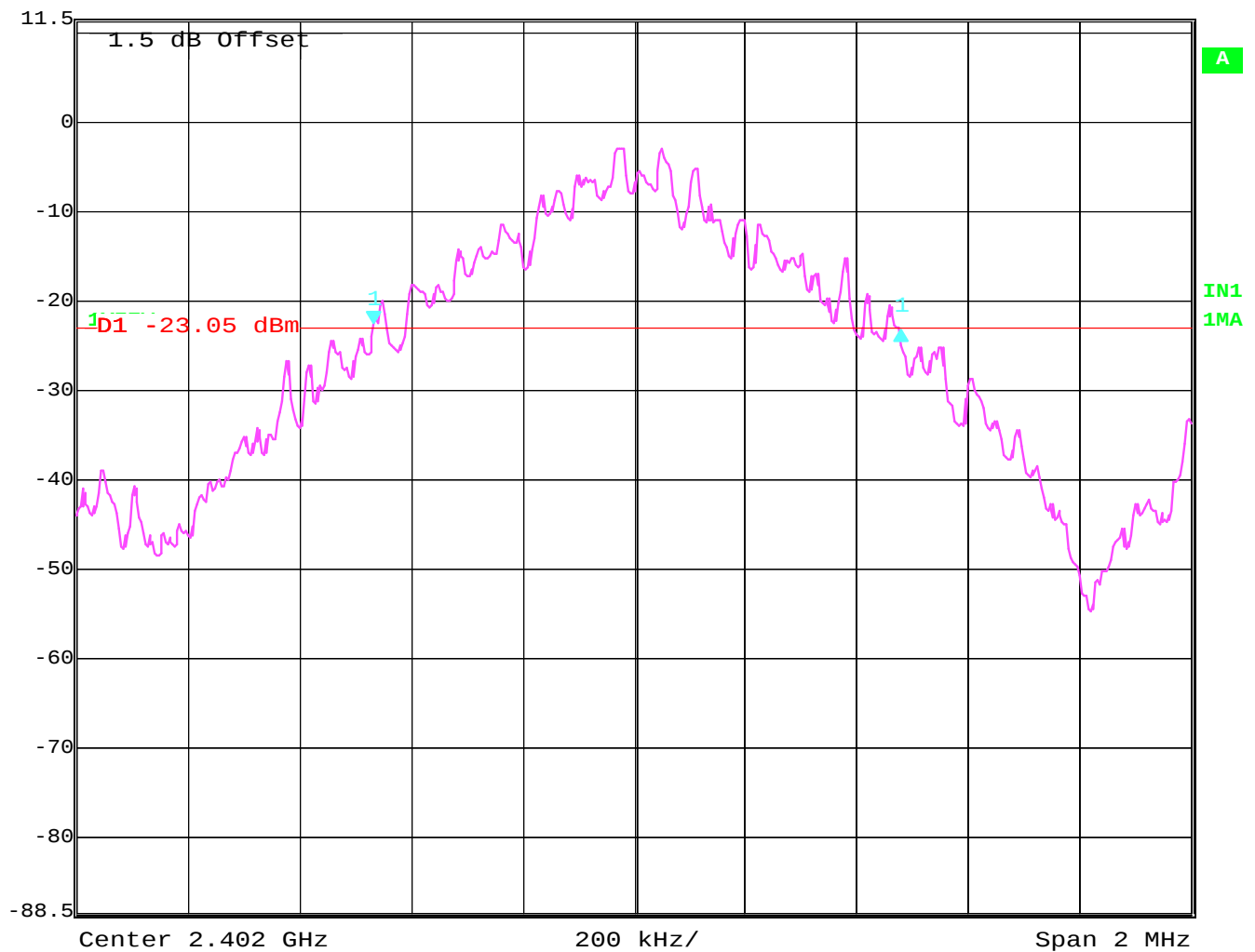
Ref Lvl -0.64 dB

VBW 10 kHz

11.5 dBm 945.89178357 kHz

SWT 50 ms

Unit dBm



Date: 7. JAN. 2004 07:59:30

SPECTRUM BANDWIDTH OF FHSS SYSTEM

§15.247(a)

20 dB bandwidth

Test mode-1

Op. mode-2

Mid Channel: 2441MHz



Delta 1 [T1]

RBW 10 kHz RF Att 20 dB

Ref Lvl -0.86 dB

VBW 10 kHz

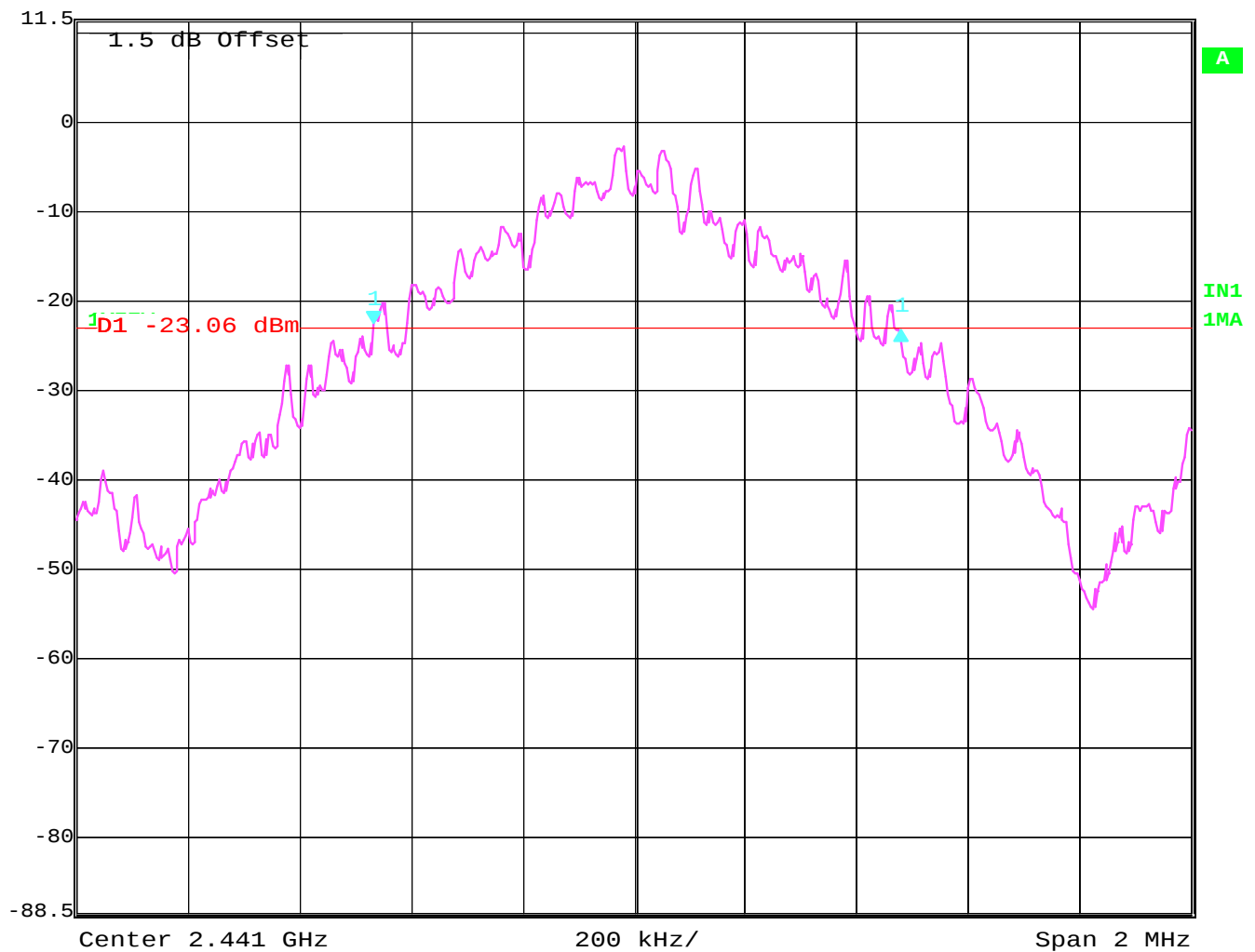
11.5 dBm

945.89178357 kHz

SWT 50 ms

Unit

dBm



Date: 7. JAN. 2004 07:58:24

SPECTRUM BANDWIDTH OF FHSS SYSTEM

§15.247(a)

20 dB bandwidth

Test mode-1

Op. mode-3

Highest Channel: 2480MHz



Delta 1 [T1]

RBW 10 kHz RF Att 20 dB

Ref Lvl 0.08 dB

VBW 10 kHz

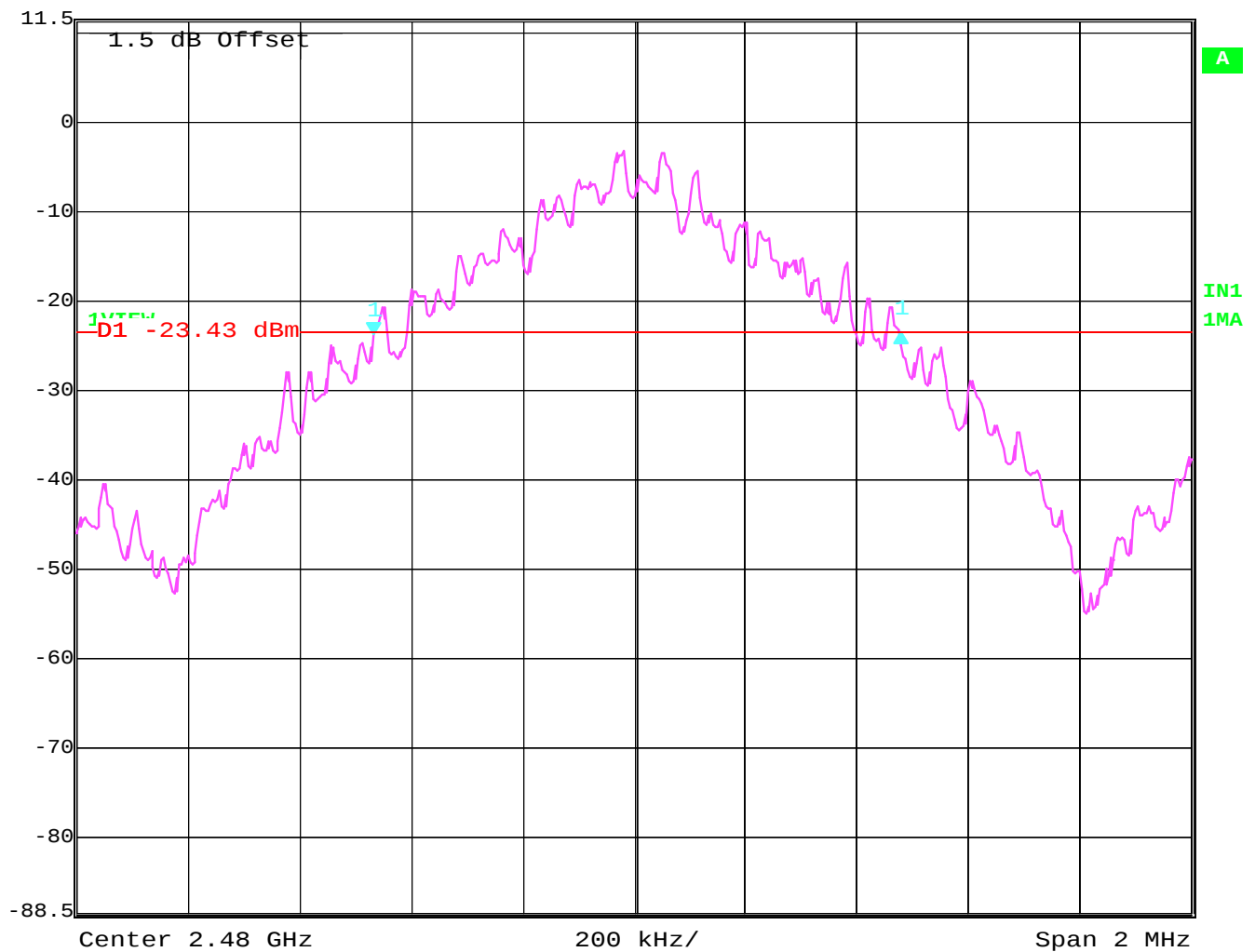
11.5 dBm

945.89178357 kHz

SWT 50 ms

Unit

dBm



Date: 7. JAN. 2004 07:57:22

POWER SPECTRAL DENSITY**§15.247 (d)**

Test mode-1

TEST CONDITIONS		POWER SPECTRAL DENSITY (dBm)		
Frequency (MHz)		2402	2441	2480
T _{nom} (23)°C	V _{nom} (5.0)VDC	-8.50	-8.41	-8.95

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)

Test mode-1

Op. mode-1

Lowest Channel: 2402MHz



Marker 1 [T1]

RBW 3 kHz RF Att 20 dB

Ref Lvl -8.50 dBm

VBW 3 kHz

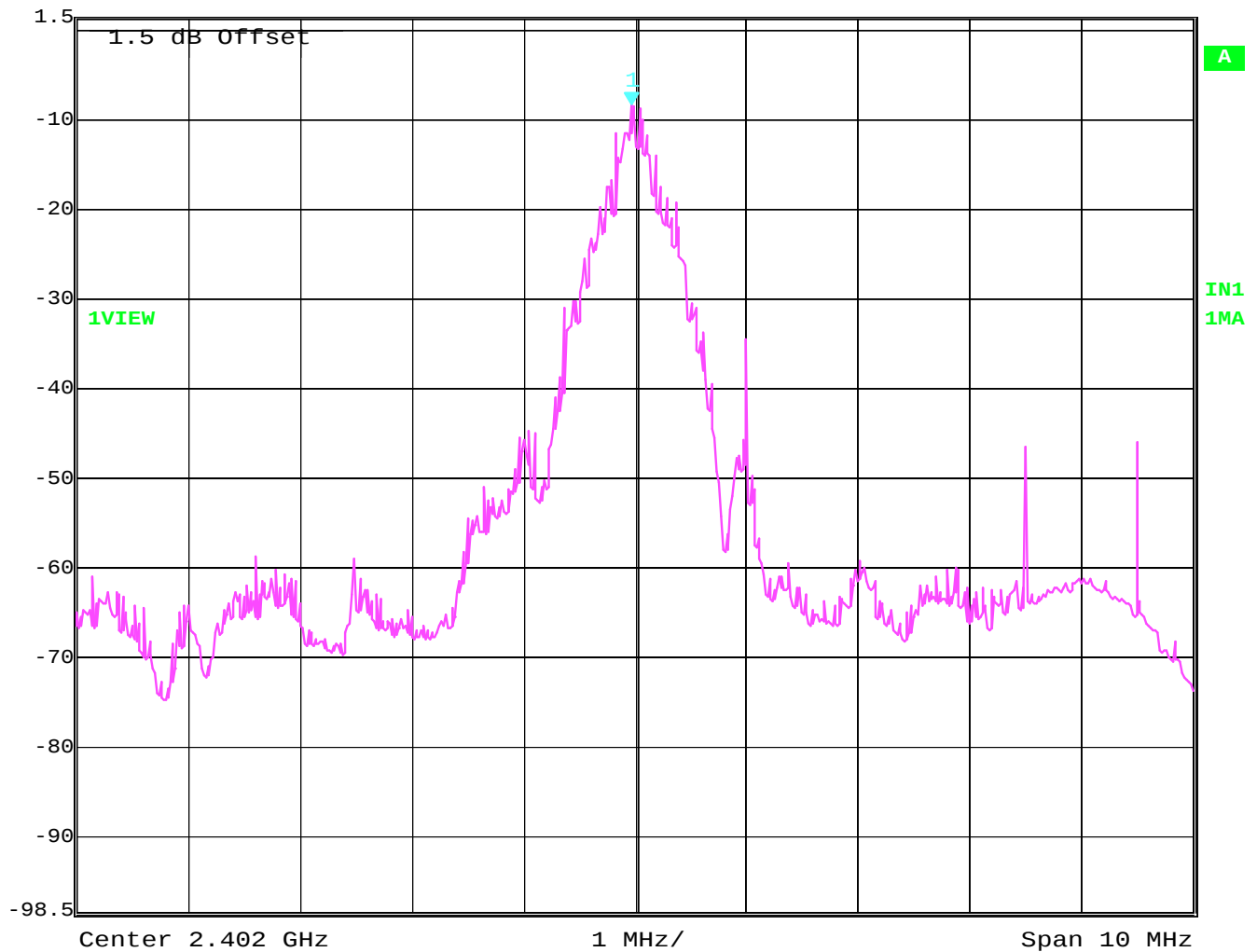
1.5 dBm

2.40196994 GHz

SWT 2.8 s

Unit

dBm



Date: 7.JAN.2004 08:00:56

POWER SPECTRAL DENSITY

§15.247(d)

Test mode-1

Op. mode-2

Middle Channel: 2441MHz



Marker 1 [T1]

RBW 3 kHz RF Att 20 dB

Ref Lvl -8.41 dBm

VBW 3 kHz

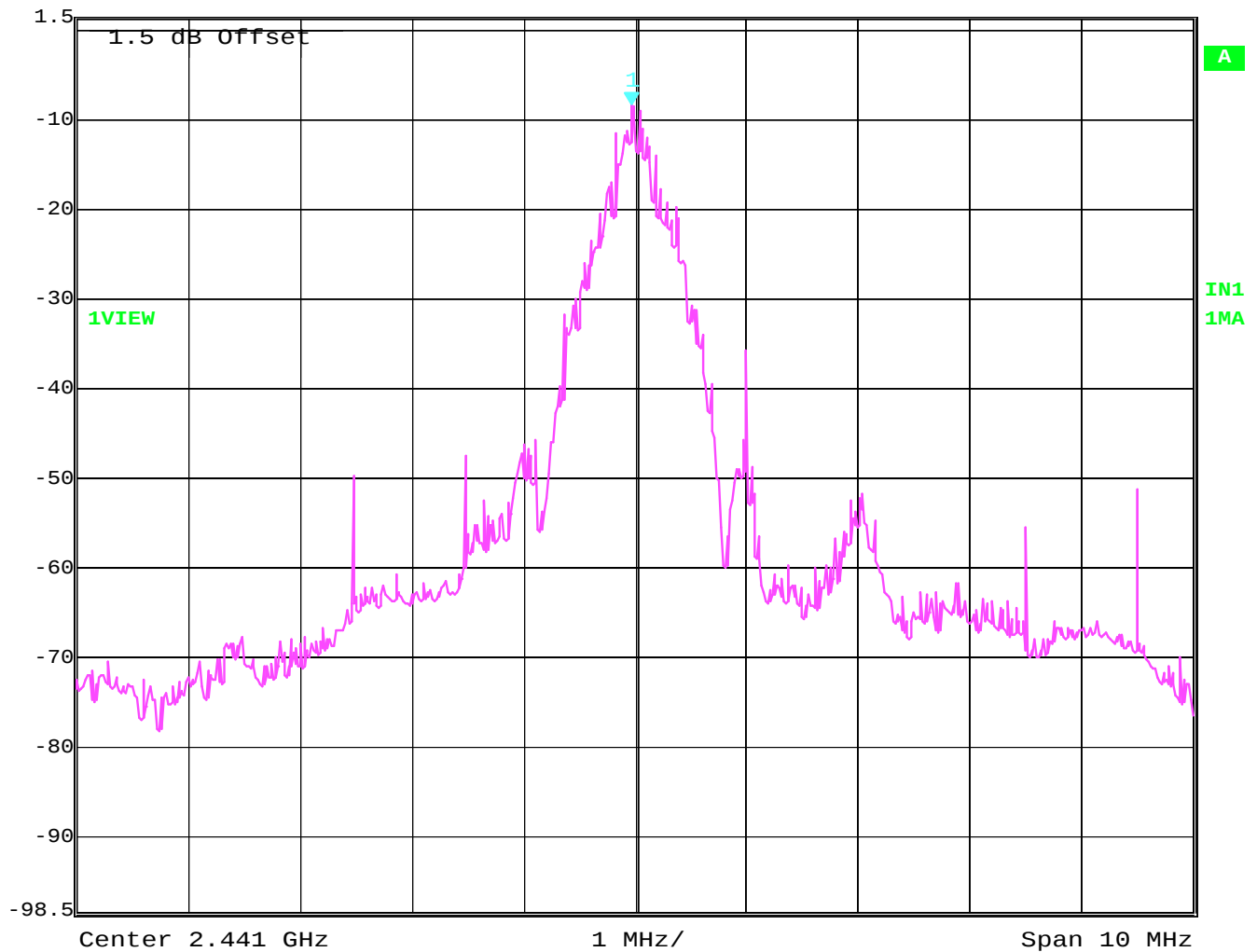
1.5 dBm

2.44096994 GHz

SWT 2.8 s

Unit

dBm



Date: 7.JAN.2004 08:01:37

POWER SPECTRAL DENSITY

§15.247(d)

Test mode-1

Op. mode-3

Highest Channel: 2480MHz



Marker 1 [T1]

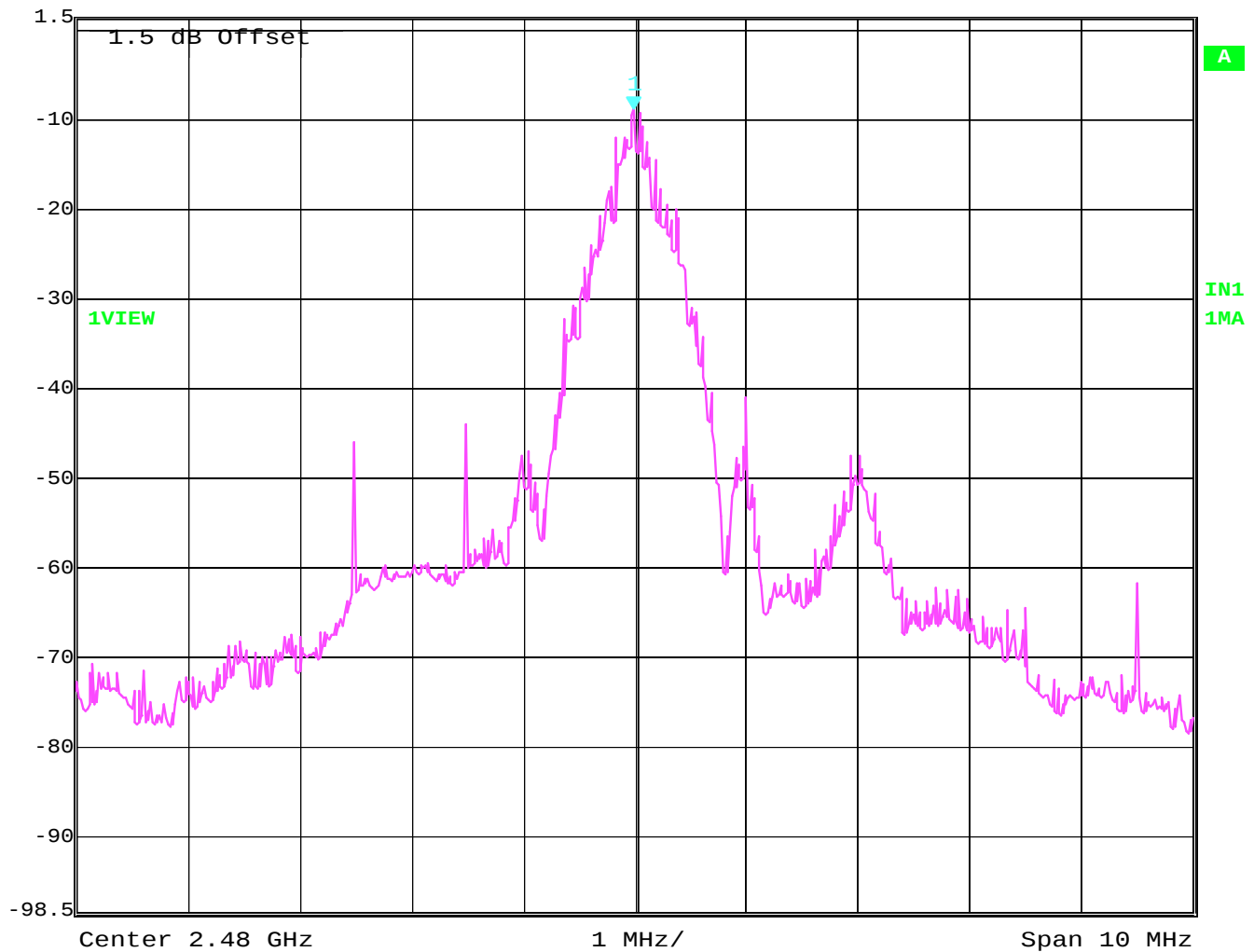
RBW 3 kHz RF Att 20 dB

Ref Lvl -8.95 dBm

VBW 3 kHz

1.5 dBm 2.47998998 GHz

SWT 2.8 s Unit dBm



Date: 7.JAN.2004 08:02:19

MAXIMUM PEAK OUTPUT POWER
(Conducted)
Test mode-1

§ 15.247 (b) (1)

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)		
Frequency (MHz)		2402	2441	2480
T _{nom} (23)°C	V _{nom} (5.0)VDC	3.90	3.78	3.40
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)

Test mode-1

Op. mode-1

Lowest Channel: 2402MHz



Marker 1 [T1]

RBW 3 MHz RF Att 20 dB

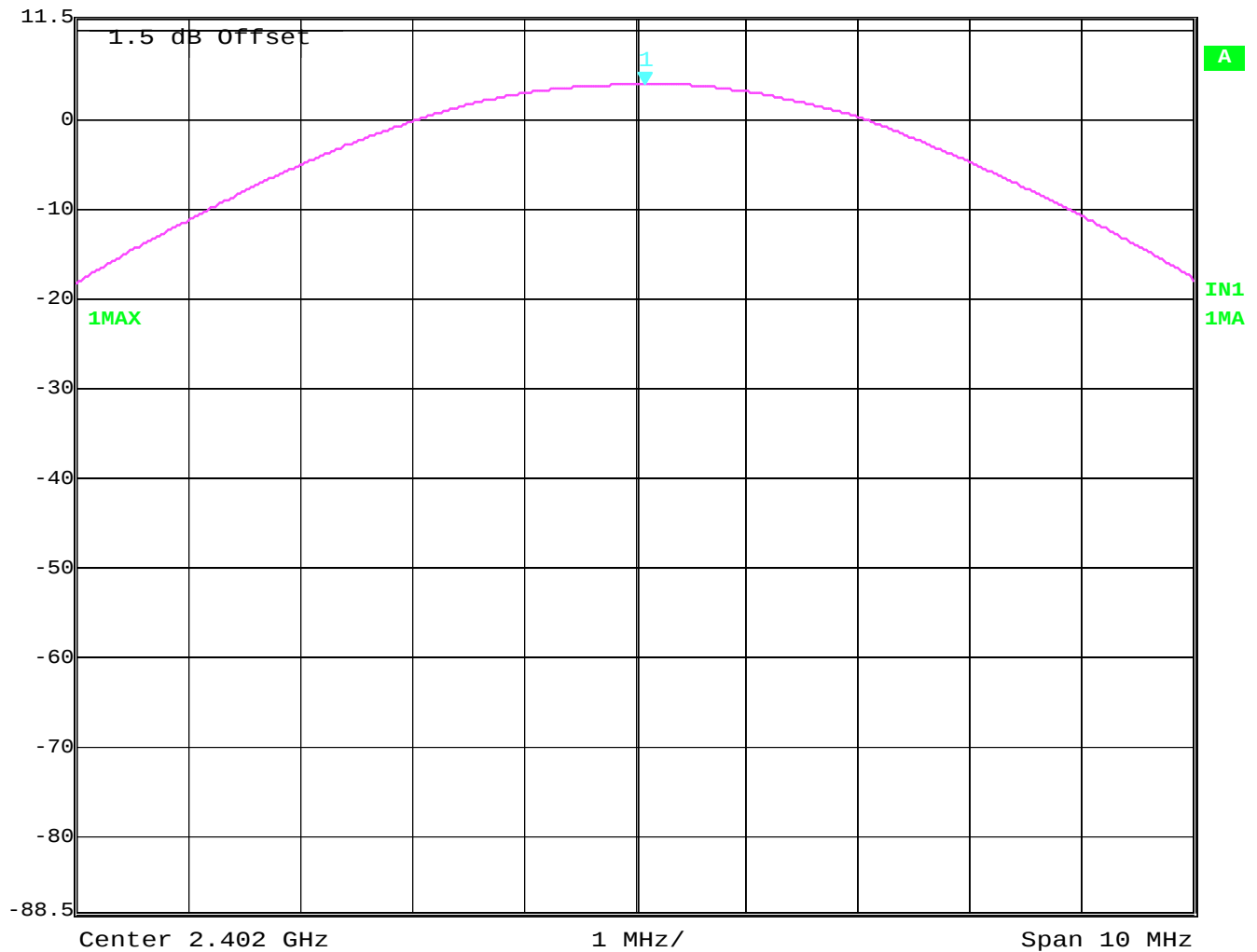
Ref Lvl 11.5 dBm 3.90 dBm

VBW 3 MHz

2.40209018 GHz

SWT 5 ms

Unit dBm



Date: 7.JAN.2004 07:54:44

PEAK OUTPUT POWER (CONDUCTED)

§15.247 (b)

Test mode-1

Op. mode-2

Mid Channel: 2441MHz



Marker 1 [T1]

RBW 3 MHz RF Att 20 dB

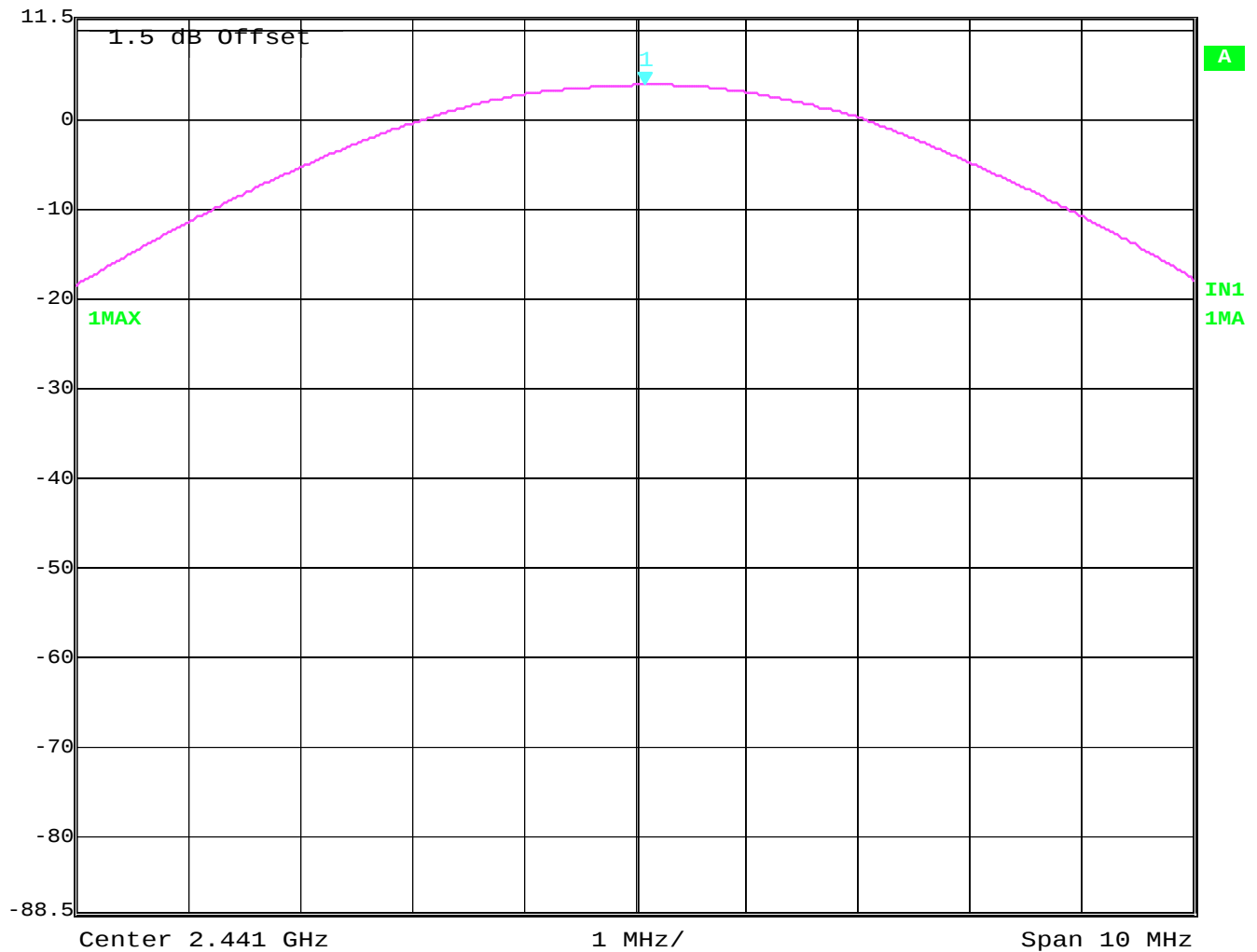
Ref Lvl 11.5 dBm 3.78 dBm

VBW 3 MHz

2.44109018 GHz

SWT 5 ms

Unit dBm



Date: 7.JAN.2004 07:55:35

PEAK OUTPUT POWER (CONDUCTED)

§15.247 (b)

Test mode-1

Op. mode-3

Highest Channel: 2480MHz



Marker 1 [T1]

RBW 3 MHz RF Att 20 dB

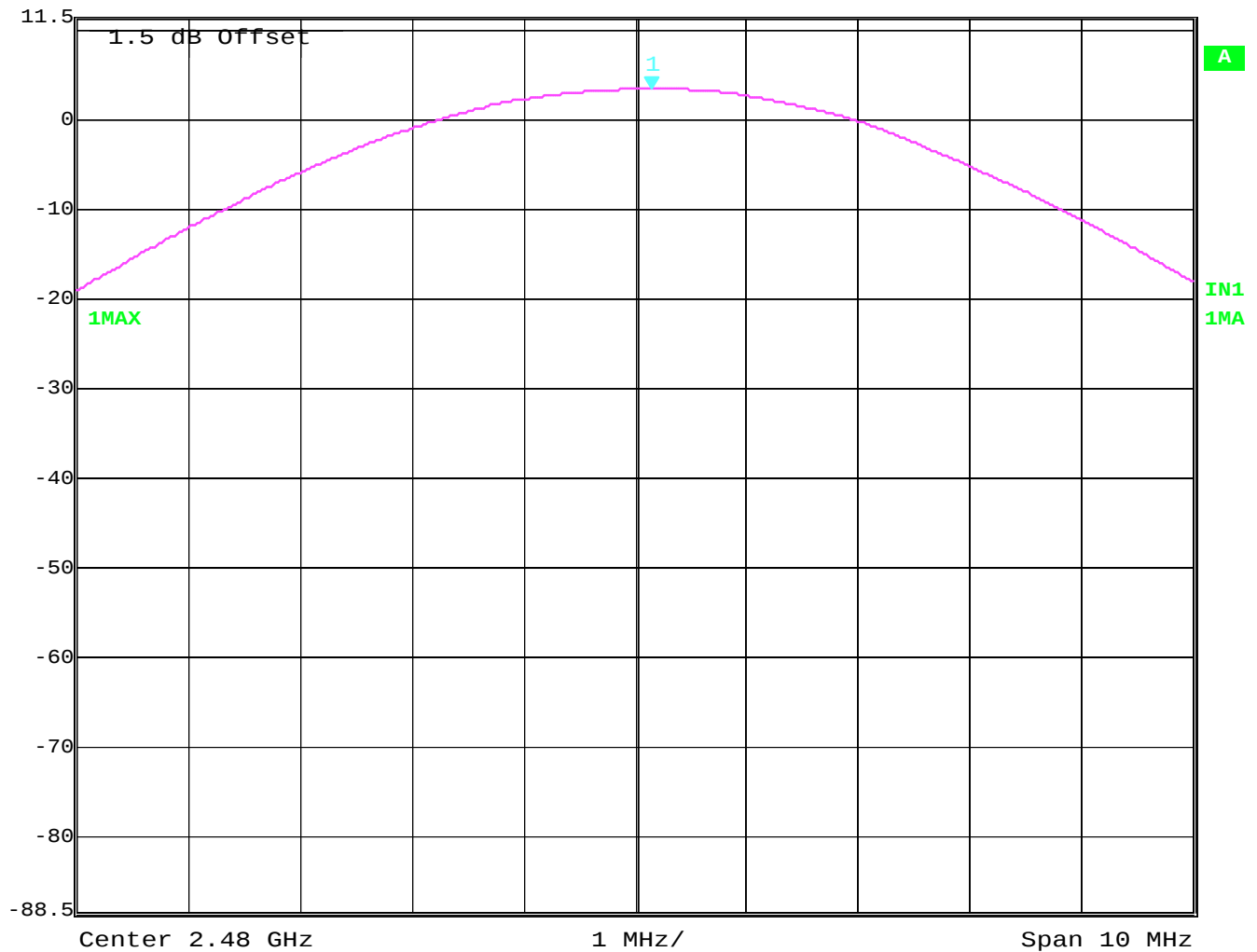
Ref Lvl 11.5 dBm 3.40 dBm

VBW 3 MHz

2.48015030 GHz

SWT 5 ms

Unit dBm



Date: 7.JAN.2004 07:56:09

**MAXIMUM PEAK OUTPUT POWER
(RADIATED)**

§ 15.247 (b) (1)

Test mode-1

Op. mode-1/2/3

EIRP:

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)		
Frequency (MHz)		2402	2441	2480
T _{nom} (23)°C	V _{nom} (5.0)VDC	*-0.44	*-1.42	*-1.84
Measurement uncertainty		±0.5dBm		

*EIRP measurements were done in Antenna pattern measurement chamber.

For details refer to test report# *Antenna_MSDBGT***LIMIT**

SUBCLAUSE § 15.247 (b) (1)

Frequency range	RF power output
2400-2483.5 MHz	1.0 Watt

BAND EDGE COMPLIANCE

§15.247 (c)

Test mode-1

Op. mode-1

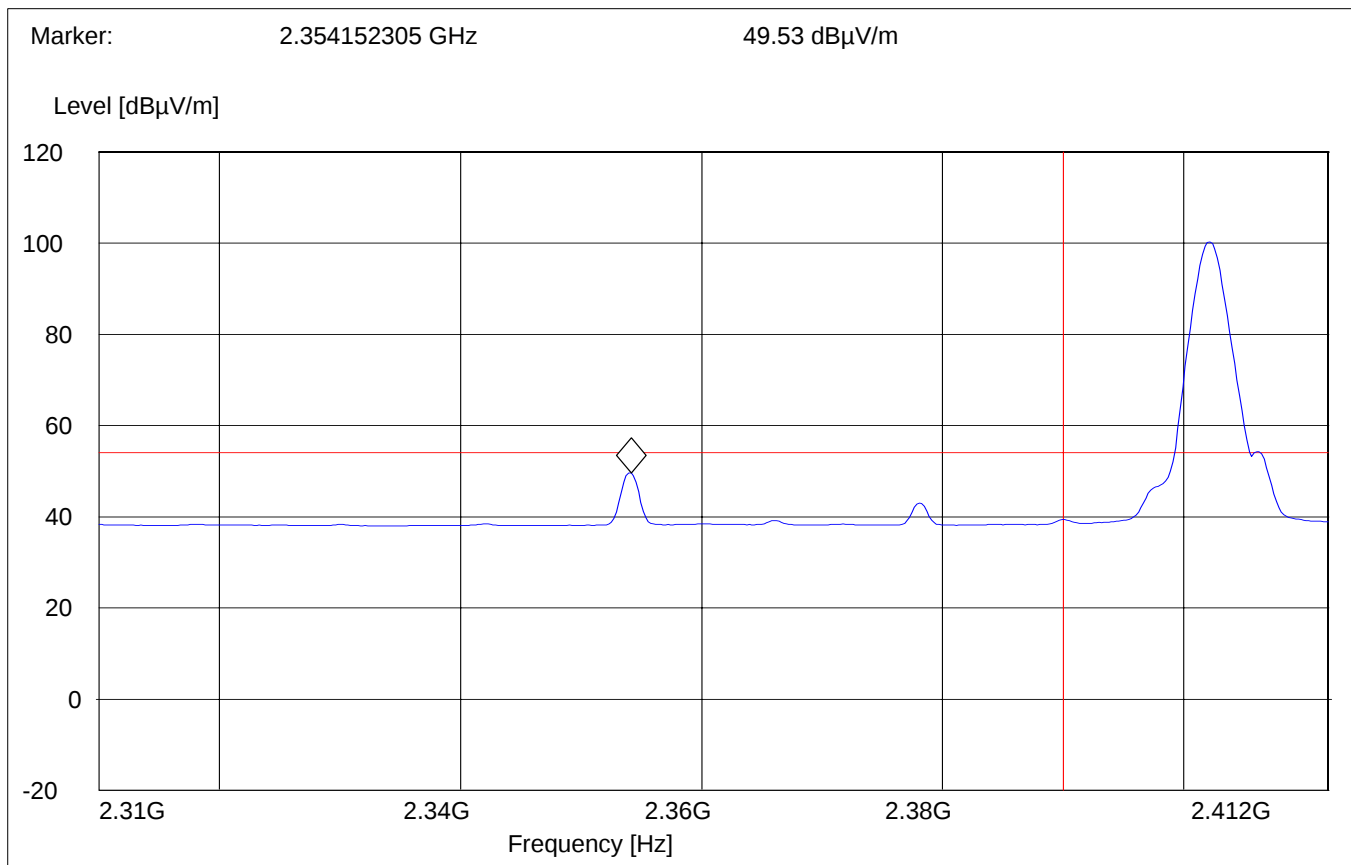
Low frequency section (spurious in the restricted band 2310 – 2390 MHz)

Average Measurement

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

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

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



BAND EDGE COMPLIANCE

§15.247 (c)

Test mode-1

Op. mode-1

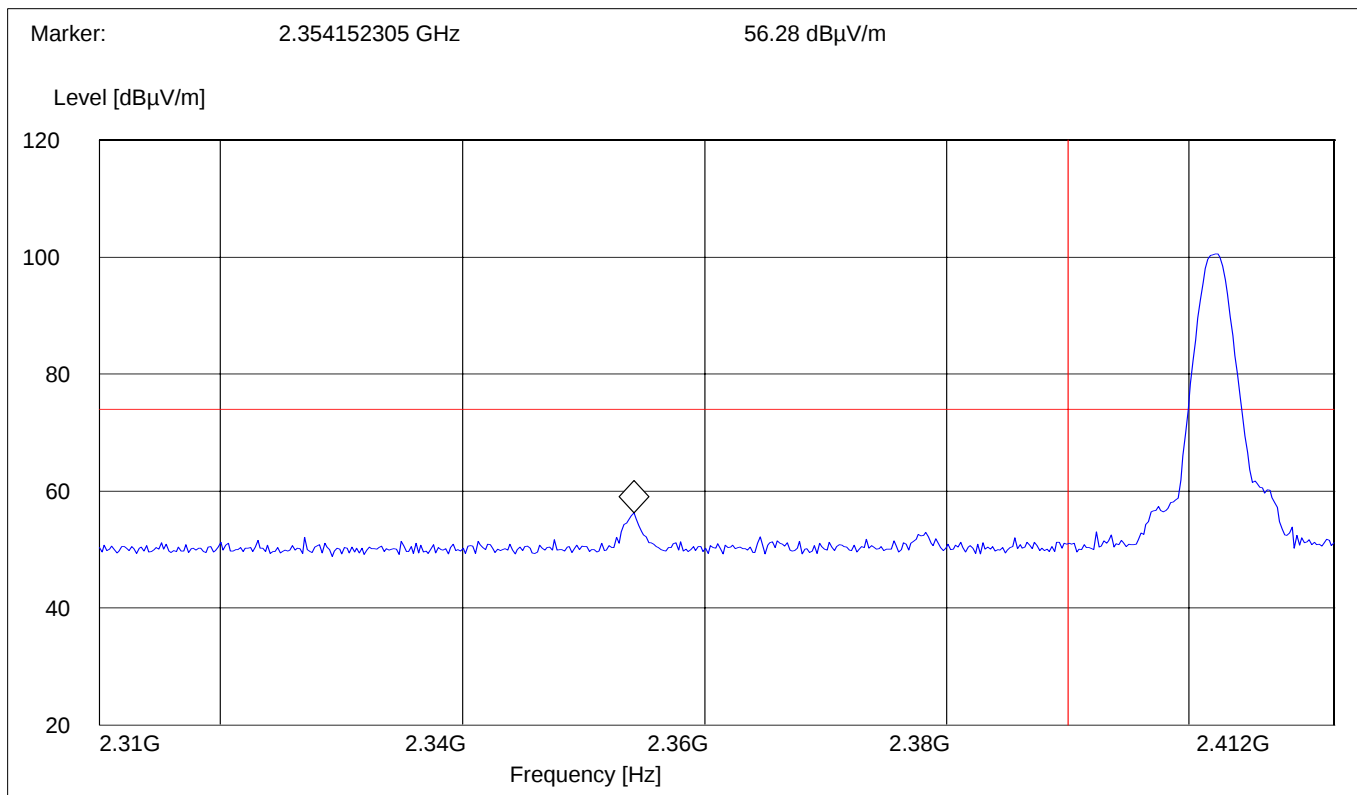
Low frequency section (spurious in the restricted band 2310 – 2390 MHz)

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)

Test mode-1

Op. mode-3

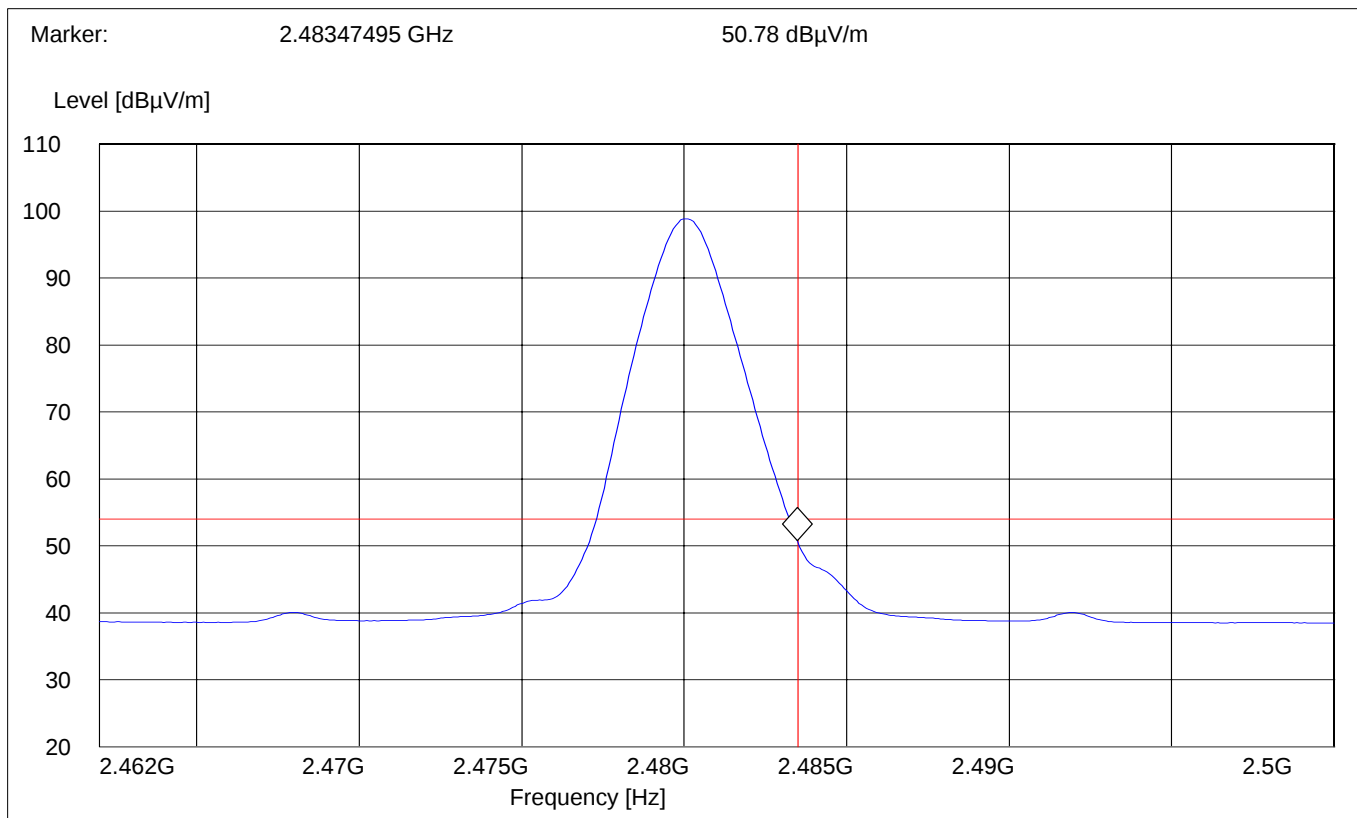
High frequency section (spurious in the restricted band 2483.5 – 2500 MHz)

Average Measurement

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

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

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



BAND EDGE COMPLIANCE

§15.247 (c)

Test mode-1

Op. mode-3

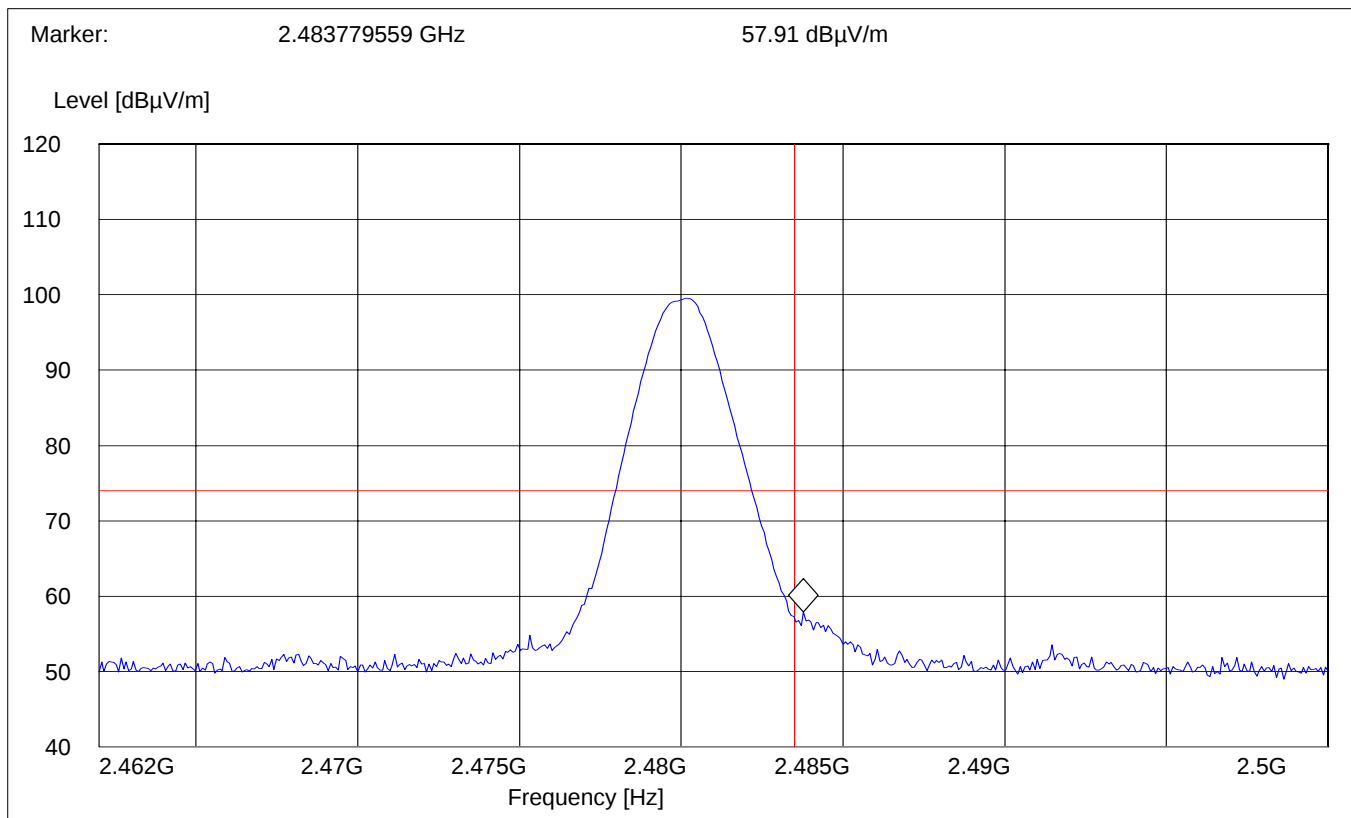
High frequency section (spurious in the restricted band 2483.5 – 2500 MHz)

Peak Measurement

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

Operating condition : Tx at 2480MHz
SWEEP TABLE : "FCC15.247 HBE_PK"
Short Description : FCC15.247 BT High-band-edge
Limit Line : 74dB μ V

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



EMISSION LIMITATIONS

§ 15.247 (c)

Transmitter (Conducted)**Test mode-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)).

Transmit at Lowest channel Frequency 2402MHz	
Frequency (MHz)	Peak Level (dBm)
601.21	-57.06
4809.62	-24.97
7214.43	-48.78
9619.24	-34.35
12024.05	-58.98
14428.86	-54.84
Transmit at Middle channel Frequency 2441MHz	
Frequency (MHz)	Peak Level (dBm)
601.21	-57.81
4859.72	-28.39
7314.63	-42.48
9769.54	-34.29
14629.26	-53.67
17084.17	-60.42
Transmit at Highest channel Frequency 2480MHz	
Frequency (MHz)	Peak Level (dBm)
601.21	-57.48
4959.92	-27.52
7414.83	-41.55
9919.84	-40.49
14879.76	-53.20
17384.77	-60.65

EMISSION LIMITATIONS - Conducted (Transmitter)

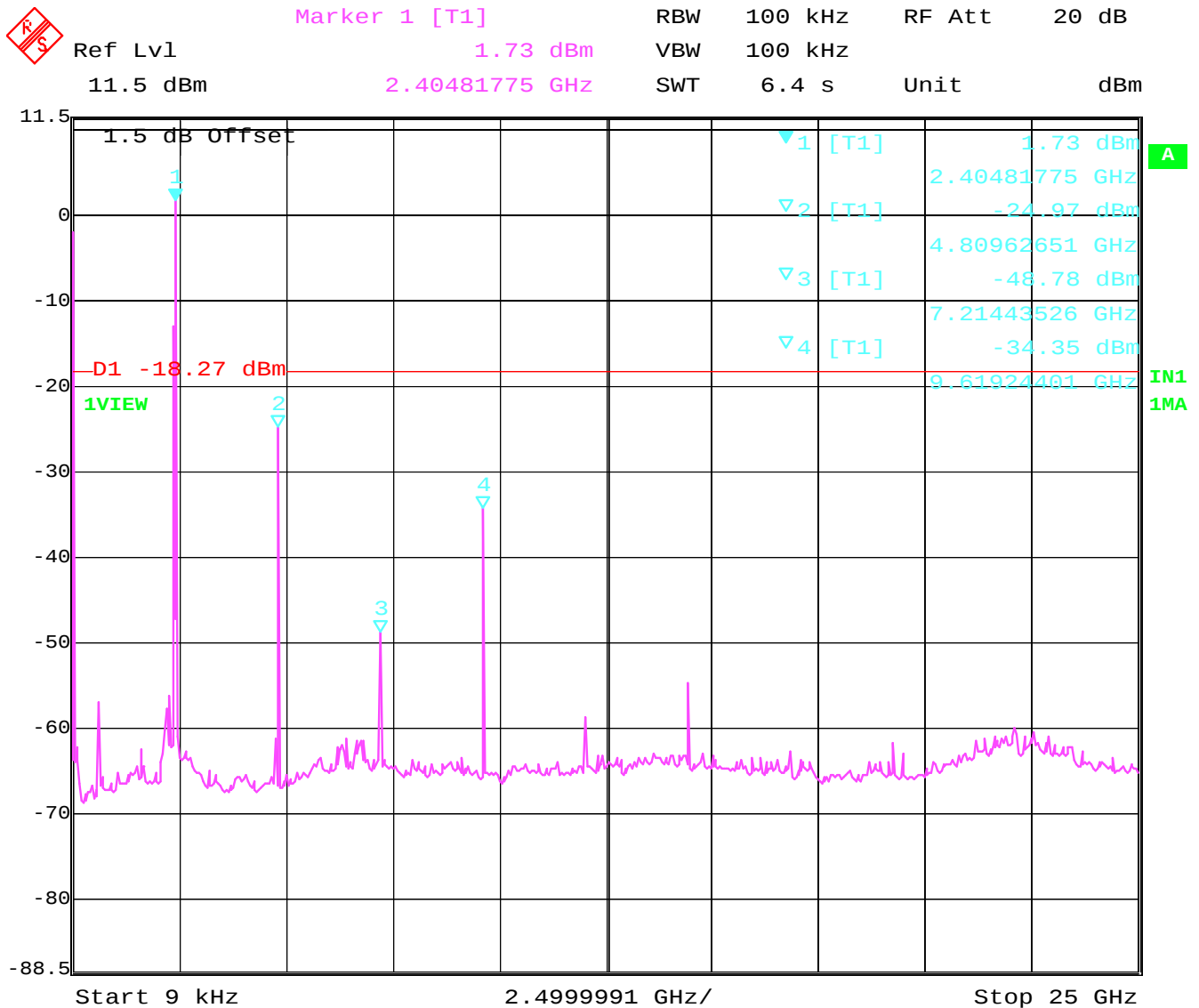
§ 15.247 (c)

Test mode-1

Op. mode-1

Lowest Channel (2402MHz): 9KHz - 25GHz

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



Date: 7.JAN.2004 08:16:12

EMISSION LIMITATIONS - Conducted (Transmitter)

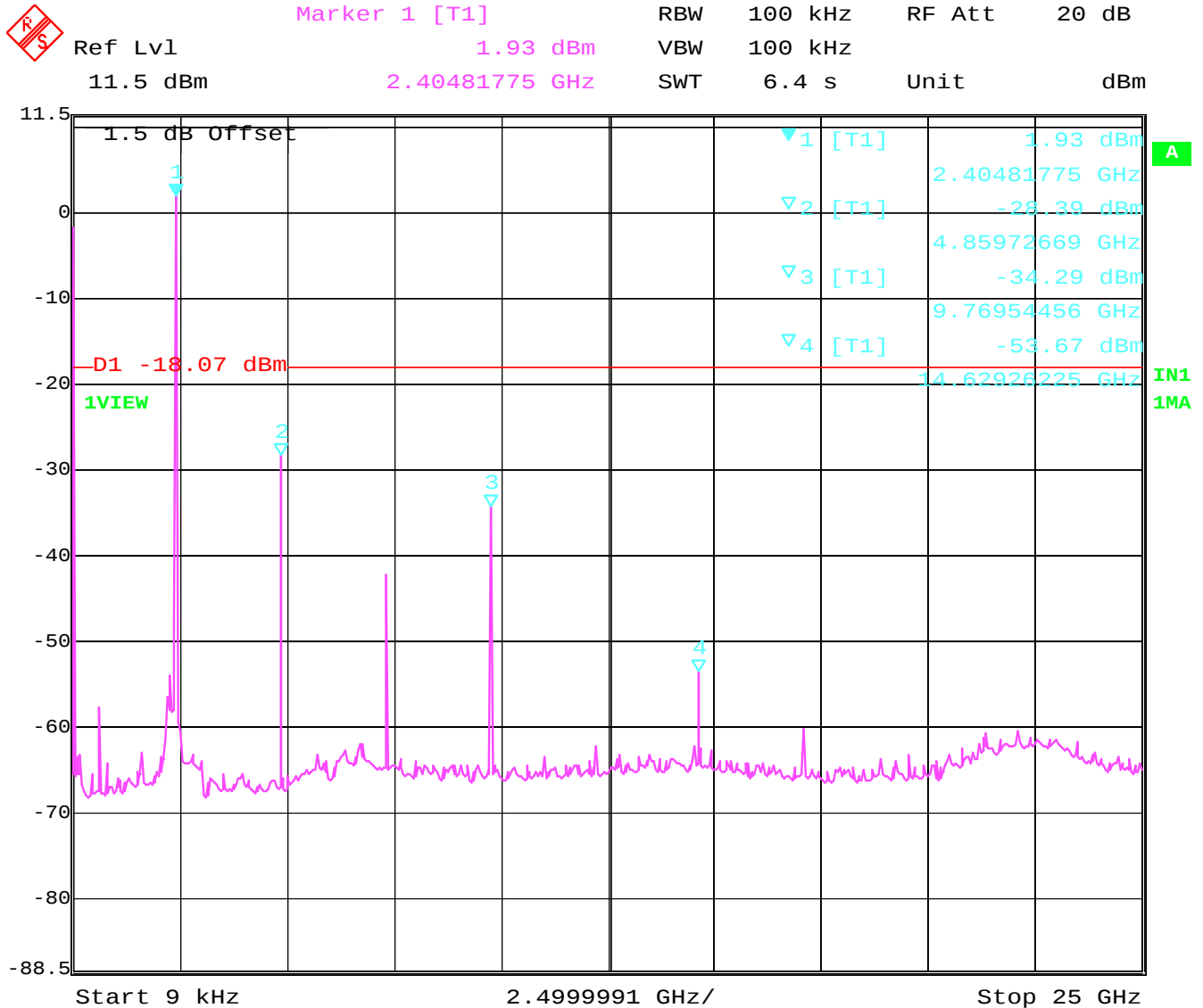
§ 15.247 (c)

Test mode-1

Op. mode-2

Mid Channel (2441MHz): 9KHz - 25GHz

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



Date: 7. JAN. 2004 08:09:47

EMISSION LIMITATIONS - Conducted (Transmitter)

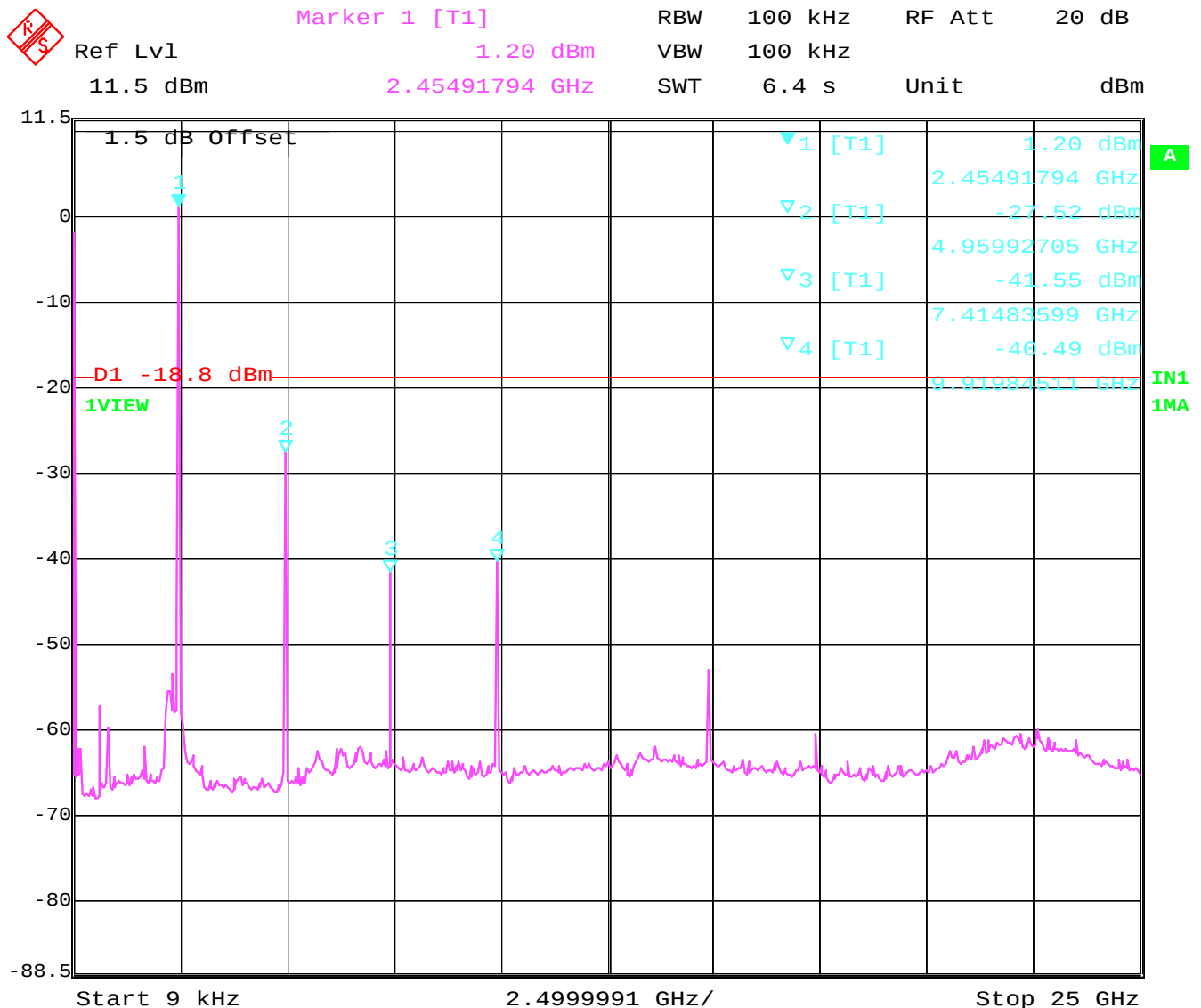
§ 15.247 (c)

Test mode-1

Op. mode-3

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

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



Date: 7.JAN.2004 08:06:36

EMISSION LIMITATIONS
Transmitter (Radiated)

§ 15.247 (c)

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. 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)**

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
3112	38.53		
3248	43.11		
4803	57.12		33.74
7200	44.95		
9619	47.95		
14422	48.722		
Transmit at Middle channel Frequency 2441MHz			
Frequency (MHz)	Level (dBµV/m)		
	Peak	Quasi-Peak	Average
3112	41.96		
3248	40.63		
4863	55.57		32.76
7302	44.37		
9040	42.94		
9755	44.57		
14661	48.16		
Transmit at Highest channel Frequency 2480MHz			
Frequency (MHz)	Level (dBµV/m)		
	Peak	Quasi-Peak	Average
3112	38.04		
3248	37.41		
4953	51.96		30.62
7438	42.73		
9925	45.14		

EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.247 (c)

30MHz – 1GHz

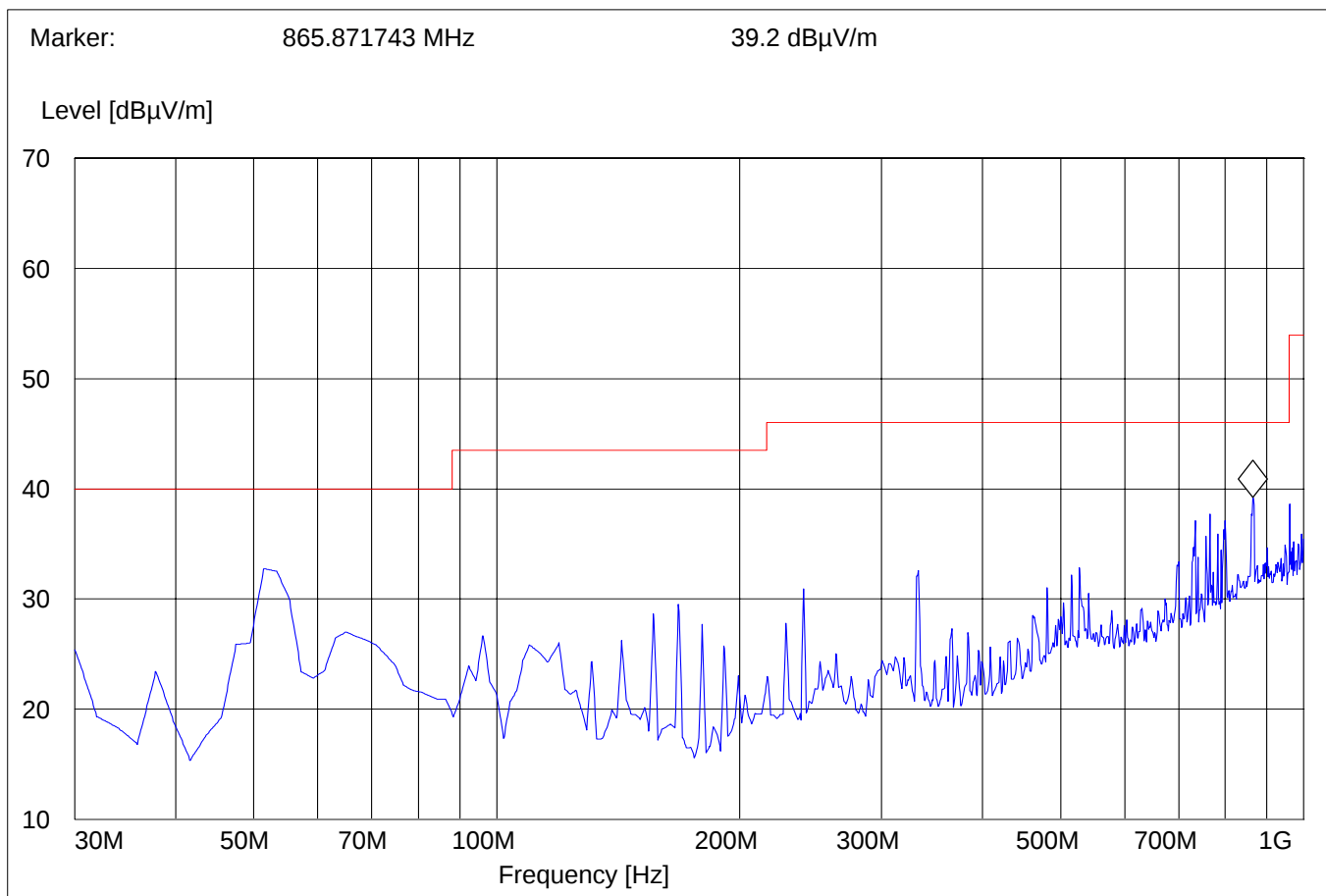
Test mode-3

Op. mode-5

Note:

- 1. This plot is valid for low, mid & high channels (worst-case plot)**
- 2. Rx antenna polarity: vertical**

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)

30MHz – 1GHz

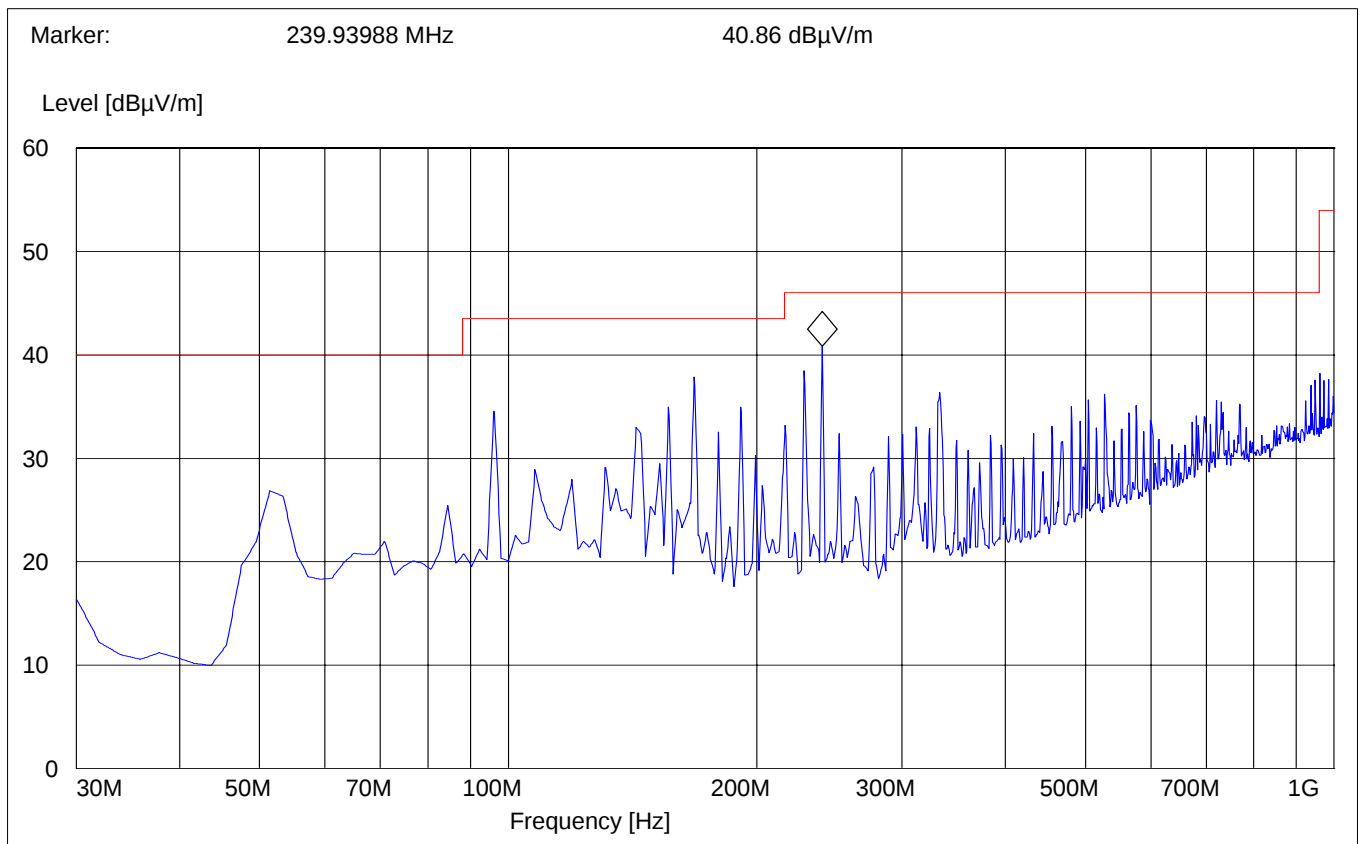
Test mode-3

Op. mode-5

Note:

1. This plot is valid for low, mid & high channels (worst-case plot)
2. Rx antenna polarity: Horizontal

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)

Lowest Channel (2402MHz): 1GHz – 3GHz

Test mode-1

Op. mode-1

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

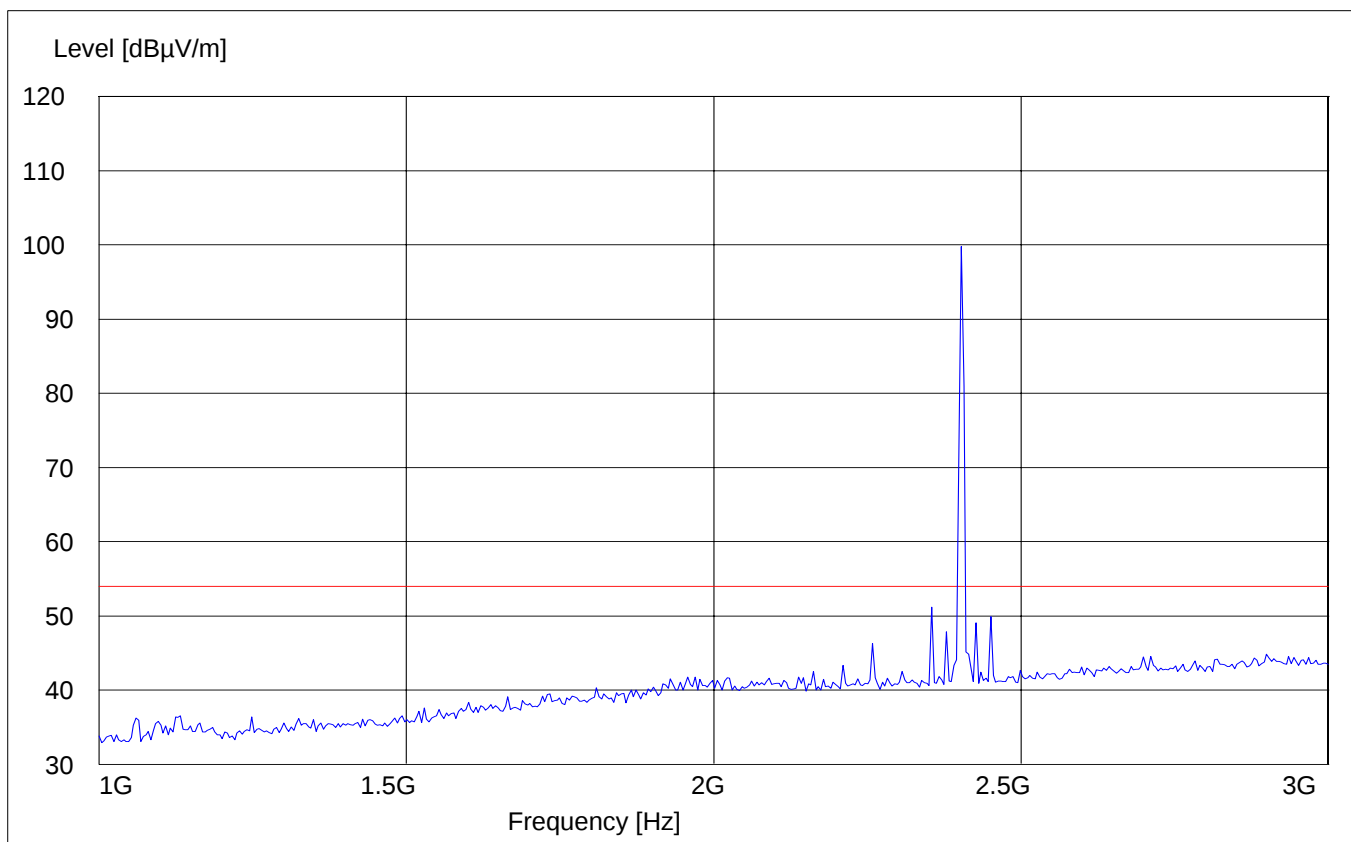
SWEEP TABLE:

"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)

§ 15.247 (c)

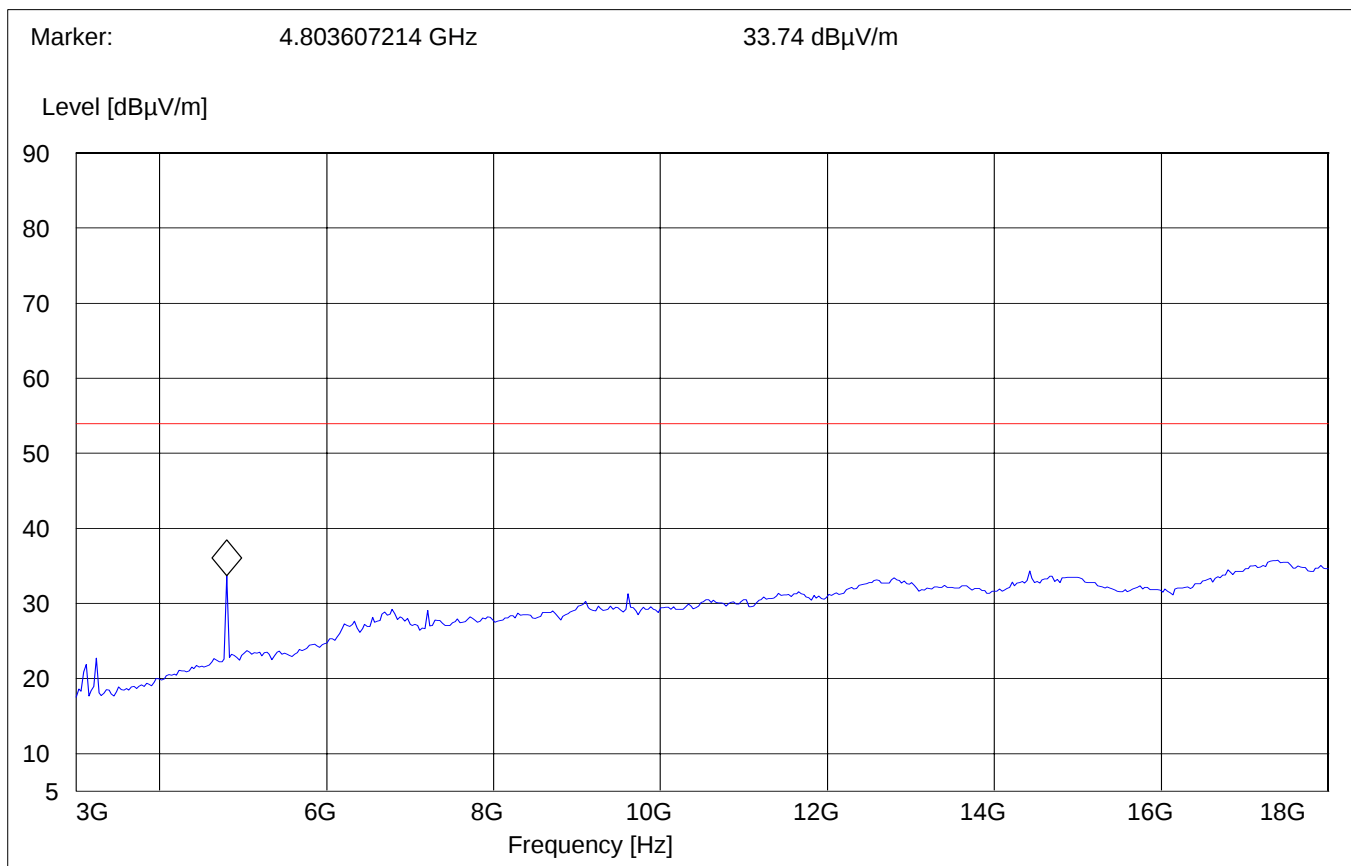
Lowest Channel (2402MHz): 3GHz – 18GHz

Test mode-1

Op. mode-1

Average measurement

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	10Hz	#326 horn (dBi)



EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.247 (c)

Middle Channel (2441MHz): 1GHz – 3GHz
Test mode-1
Op. mode-2
NOTE: The peak above the limit is the carrier frequency.

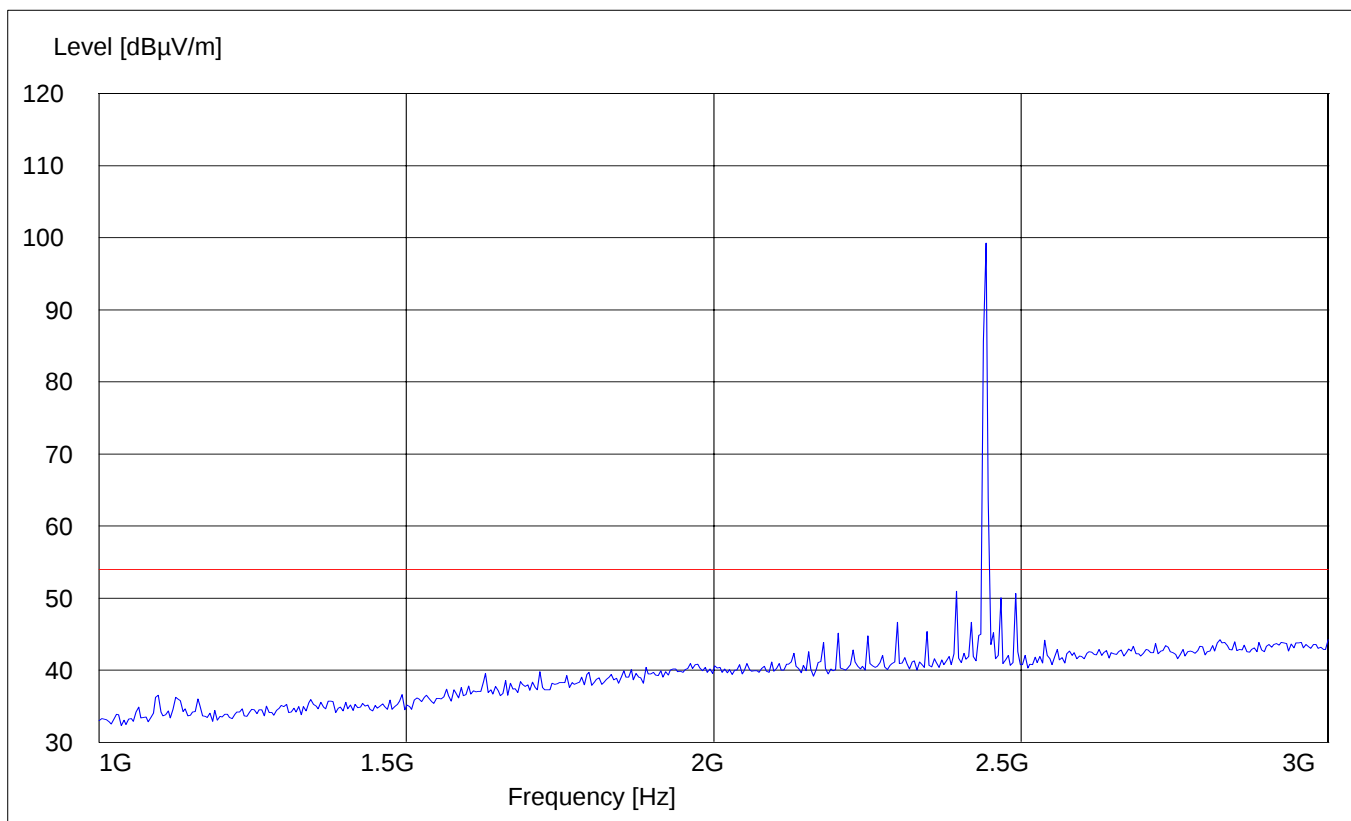
SWEEP TABLE:

"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)

§ 15.247 (c)

Middle Channel (2441MHz): 3GHz – 18GHz

Test mode-1

Op. mode-2

Average measurement

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

10Hz

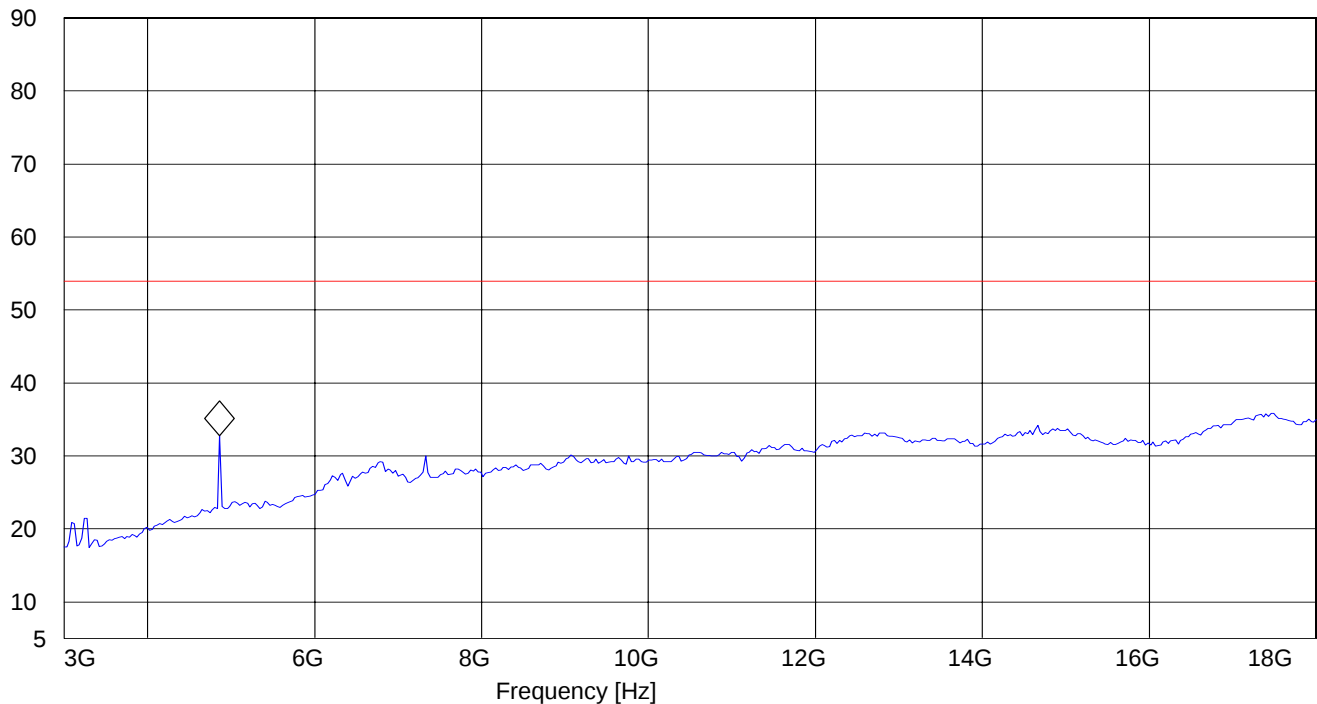
#326 horn (dBi)

Marker:

4.863727455 GHz

32.76 dBµV/m

Level [dBµV/m]



EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.247 (c)

Highest Channel (2480MHz): 1GHz – 3GHz
Test mode-1
Op. mode-3
NOTE: The peak above the limit is the carrier frequency.

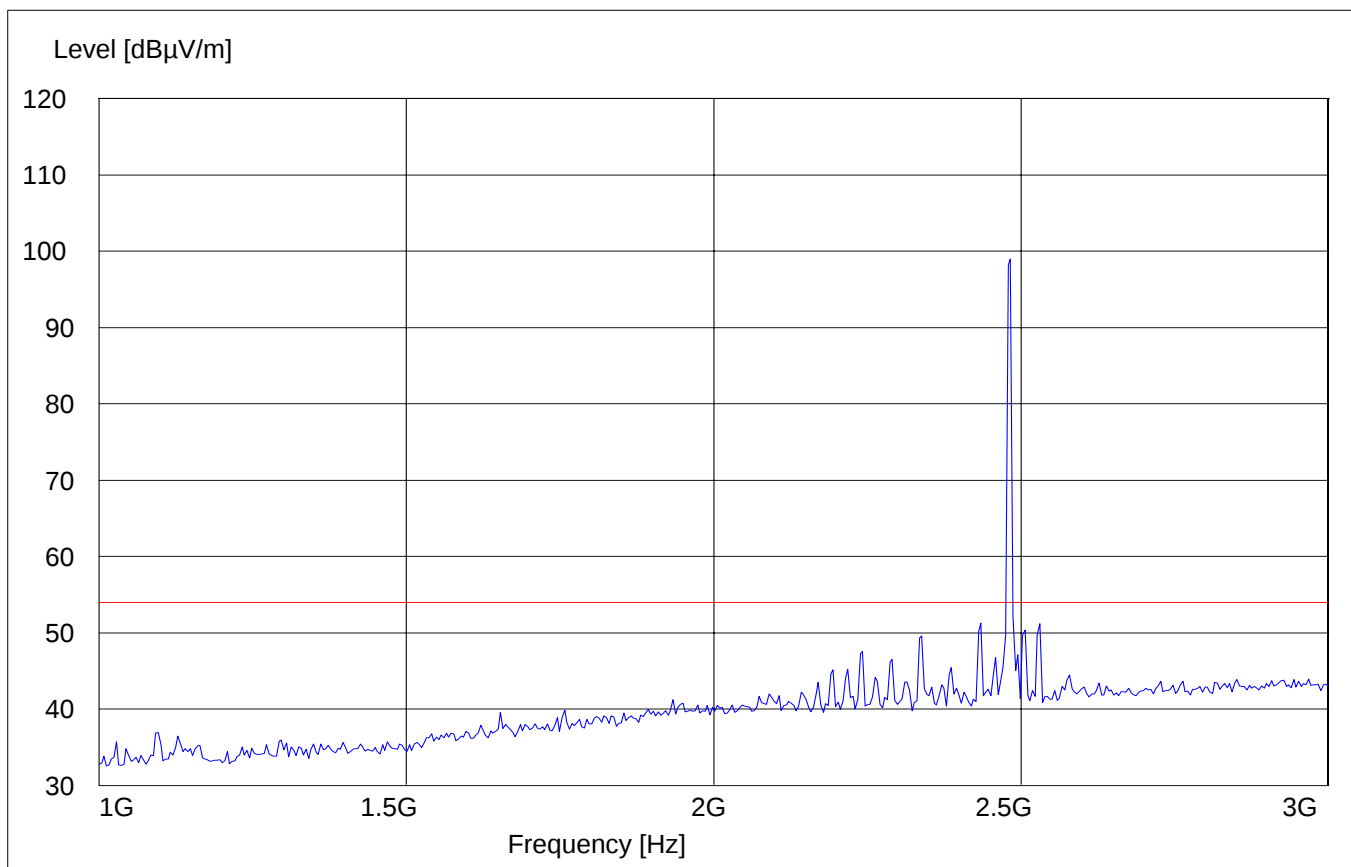
SWEEP TABLE:

"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)

§ 15.247 (c)

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

Test mode-1

Op. mode-3

Average measurement

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

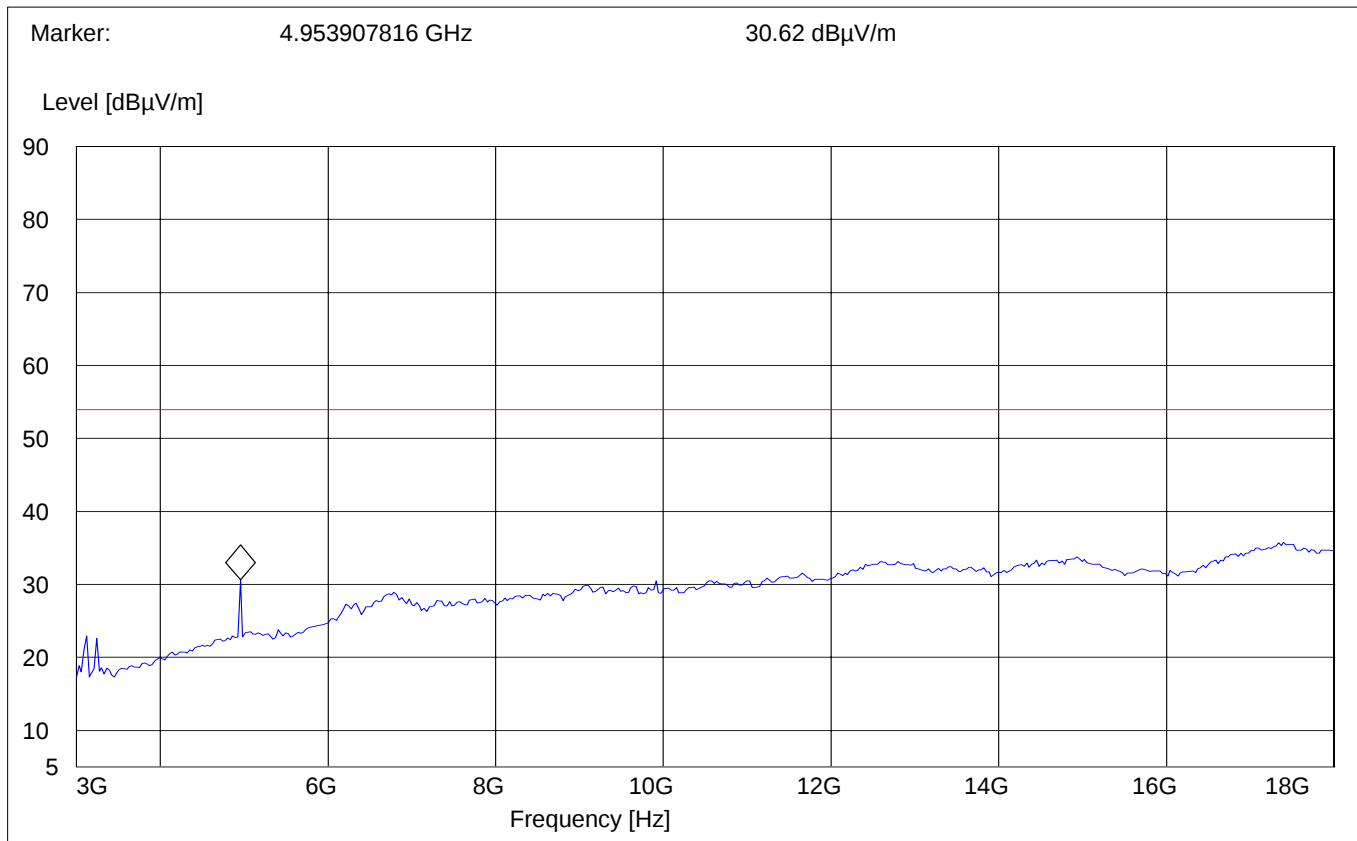
MaxPeak

Coupled

1 MHz

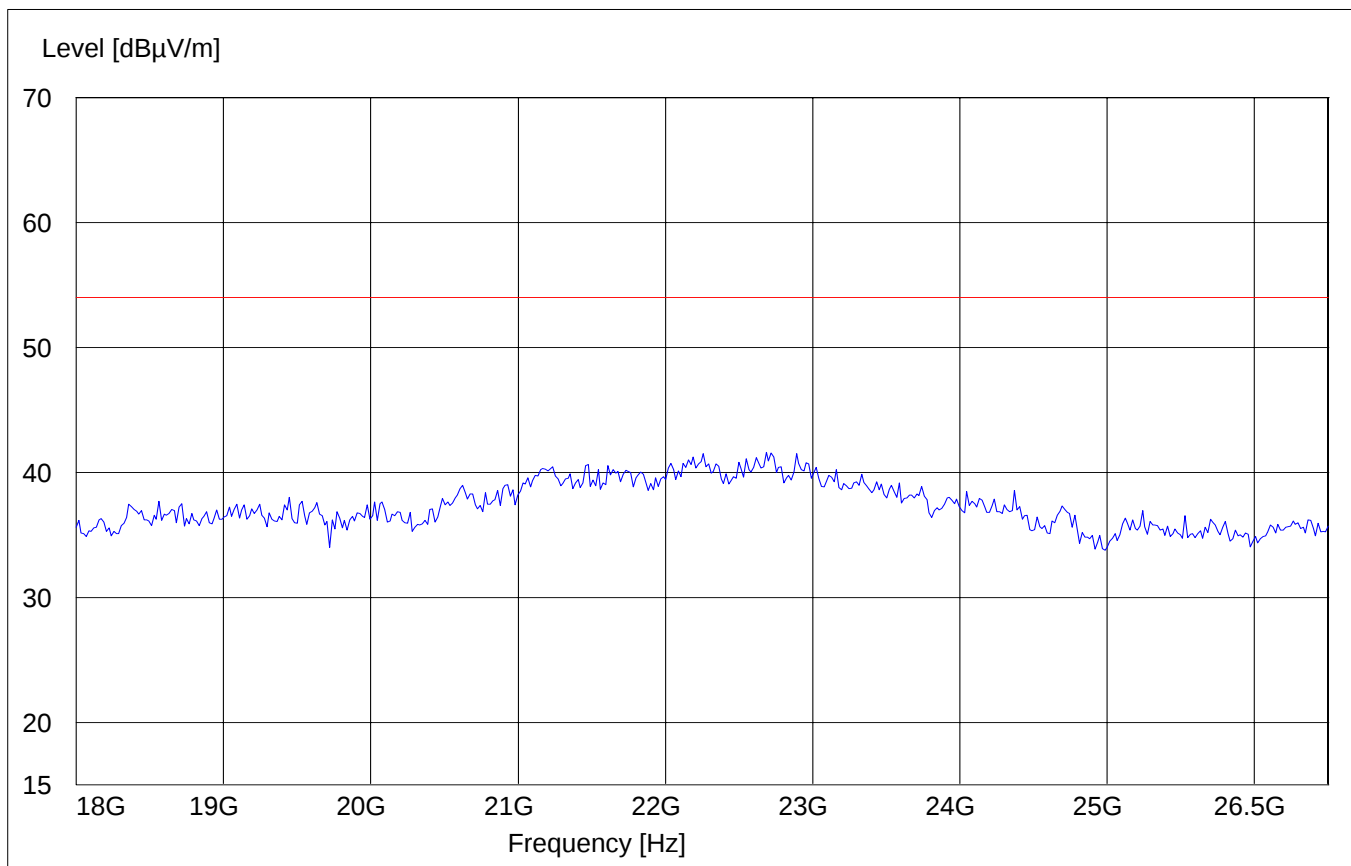
10Hz

#326 horn (dBi)



EMISSION LIMITATIONS - Radiated (Transmitter)
§ 15.247 (c)
18GHz – 26.5GHz
Test mode-1
Op. mode-2
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

Test mode-3

Op. mode-5

SWEEP TABLE: "55022 cond"

Short Description: EN 55022 for 150KHz-30MHz

Start Frequency	Stop Frequency	Detector	Meas Time	IF Bandw.	Transducer
150.0 kHz	30.0 MHz	MaxPeak	Coupled	10 kHz	None

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

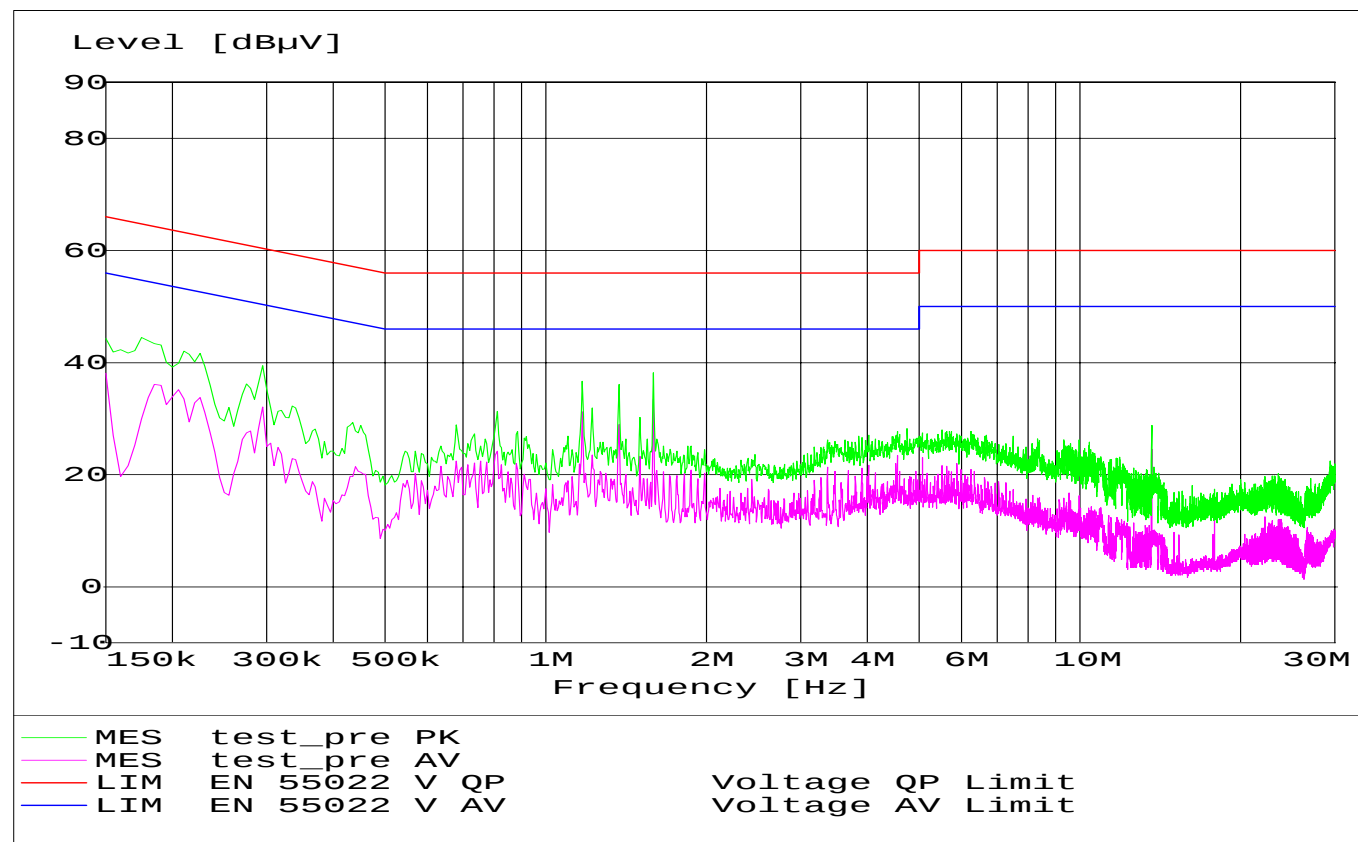
Limit

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**

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

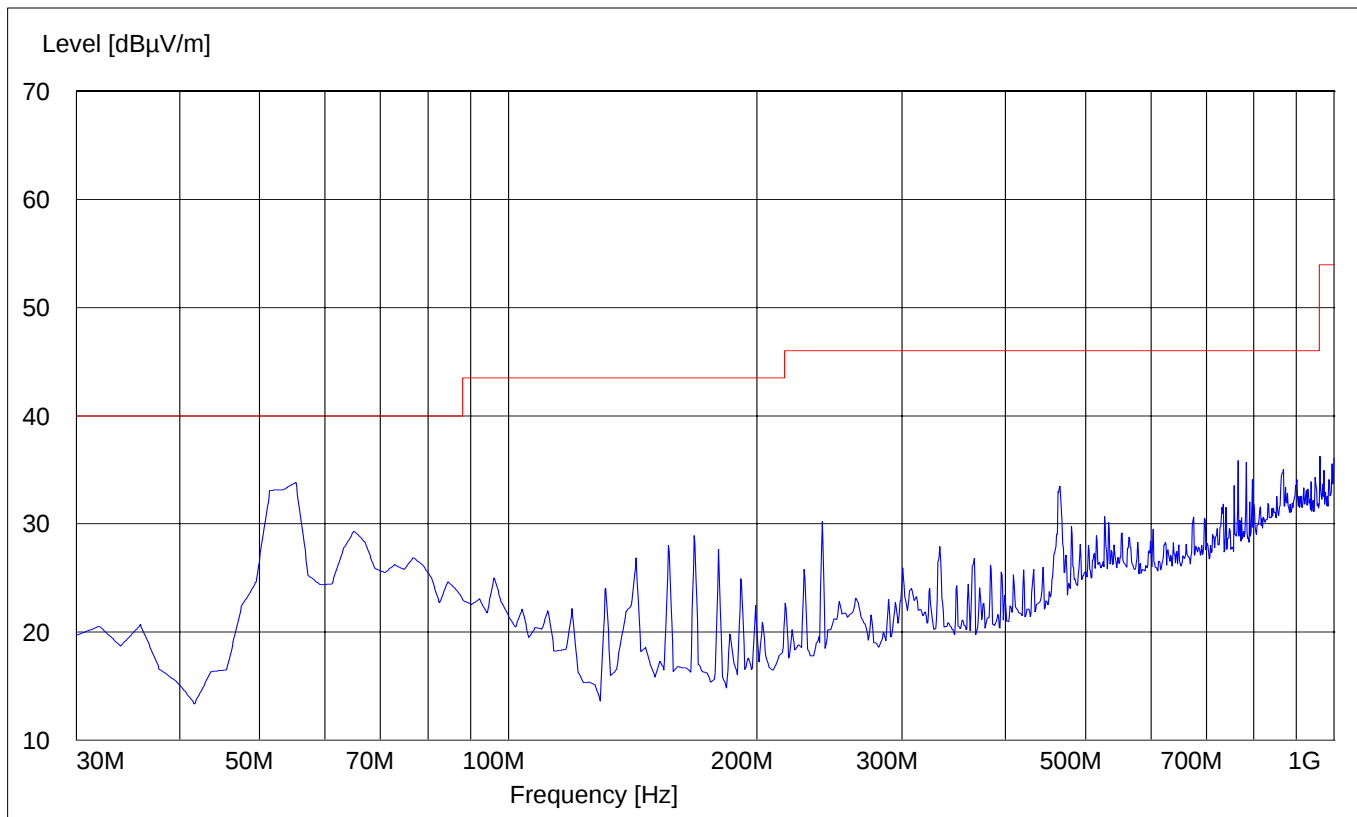
NOTE:

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 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****Test mode-3****Op. mode-5****Note:**

1. This plot is valid for low, mid & high channels (worst-case plot)
2. Rx antenna polarity: Vertical

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

§ 15.209

30MHz – 1GHz

Test mode-3

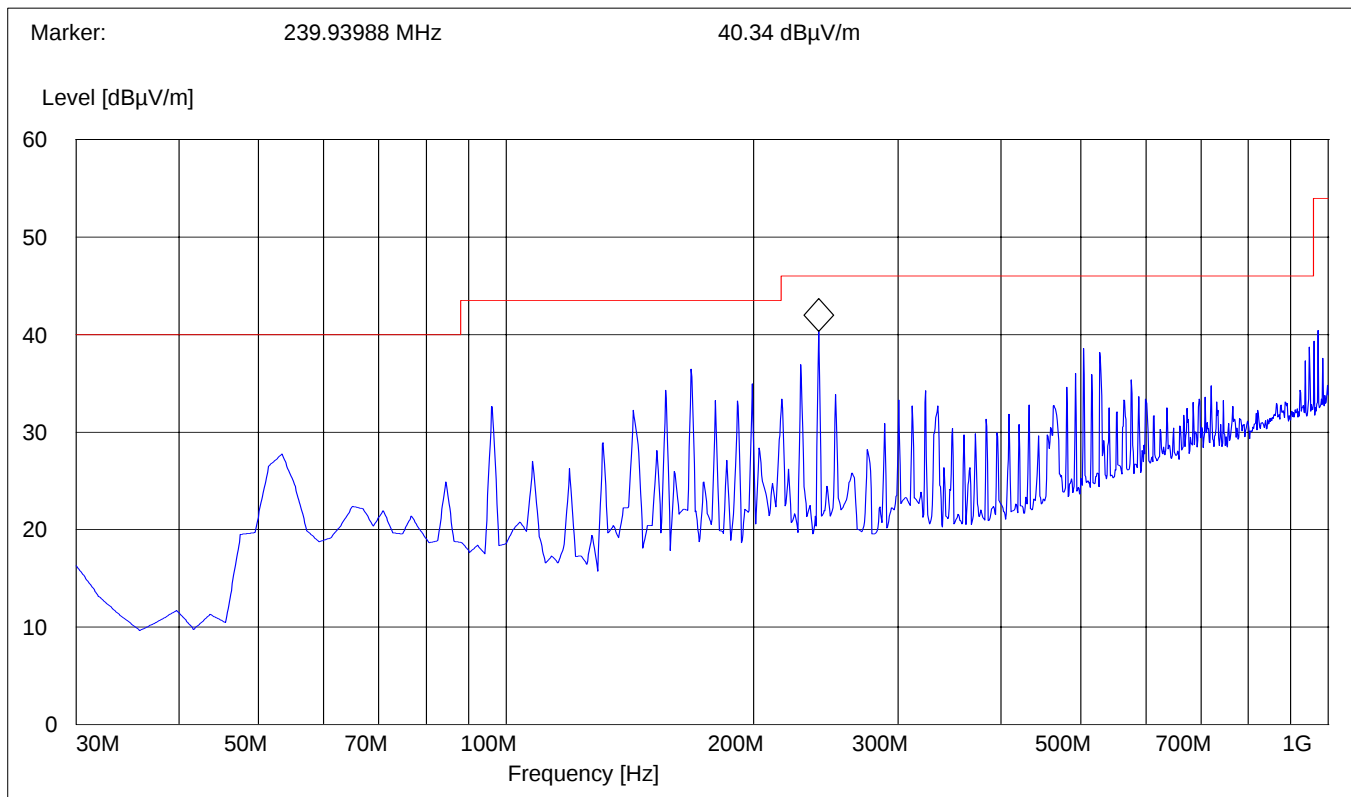
Op. mode-5

Note:

1. This plot is valid for low, mid & high channels (worst-case plot)
2. Rx antenna polarity: Horizontal

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

§ 15.209

1GHz – 3GHz

Test mode-4

Op. mode-6

SWEEP TABLE:

"BT Spuri hi 1-3G"

Short Description:

Bluetooth Spurious 1-3GHz

Start Stop

Detector

Meas.

RBW

Transducer

Frequency Frequency

Time

Bandw.

VBW

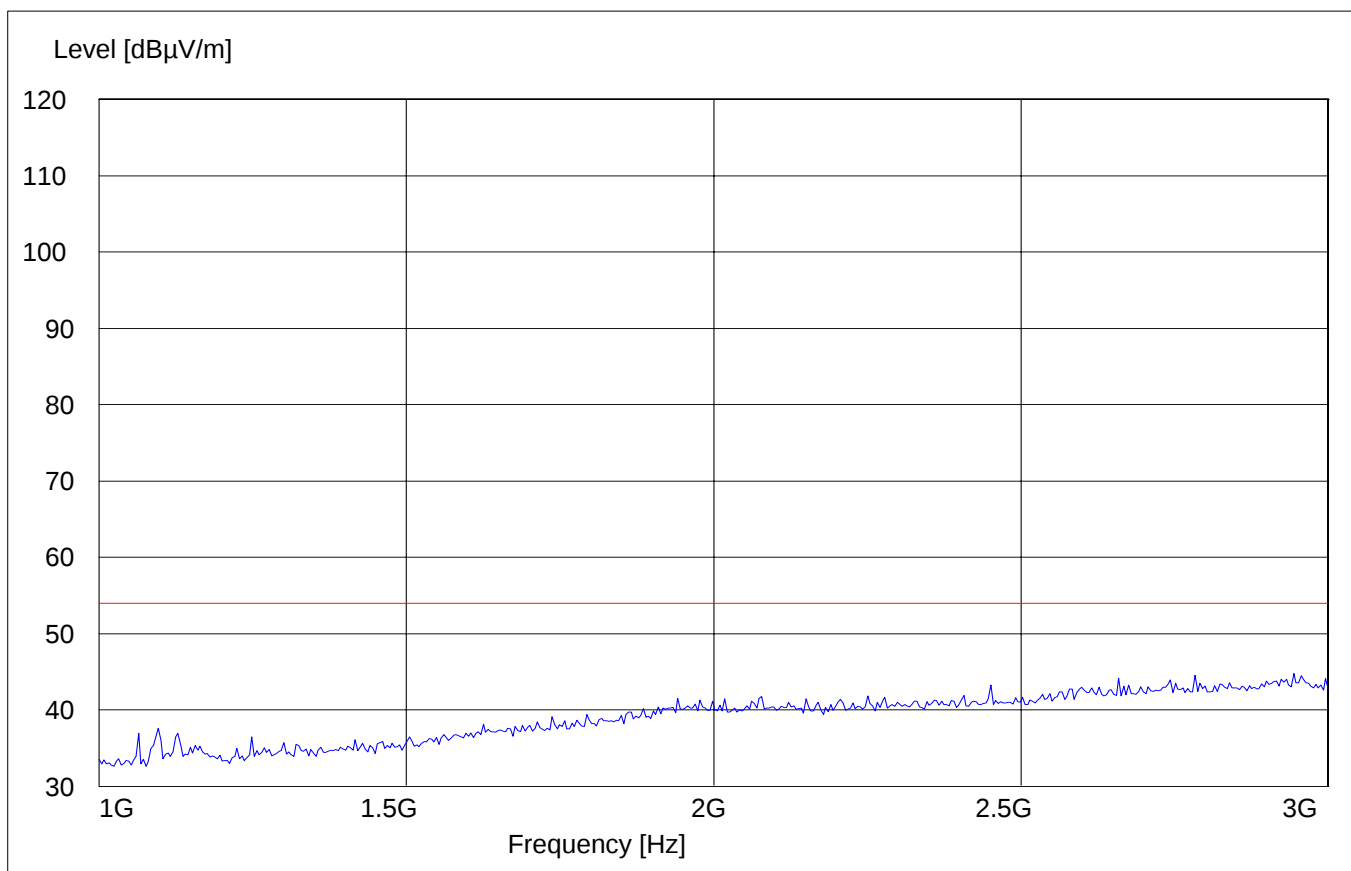
1.0 GHz 3.0 GHz

MaxPeak

Coupled

1 MHz

#326 horn (dBi)



RECEIVER SPURIOUS RADIATION**§ 15.209****3GHz – 18GHz****Test mode-4****Op. mode-6**

SWEEP TABLE:

"BT Spuri hi 3-18G"

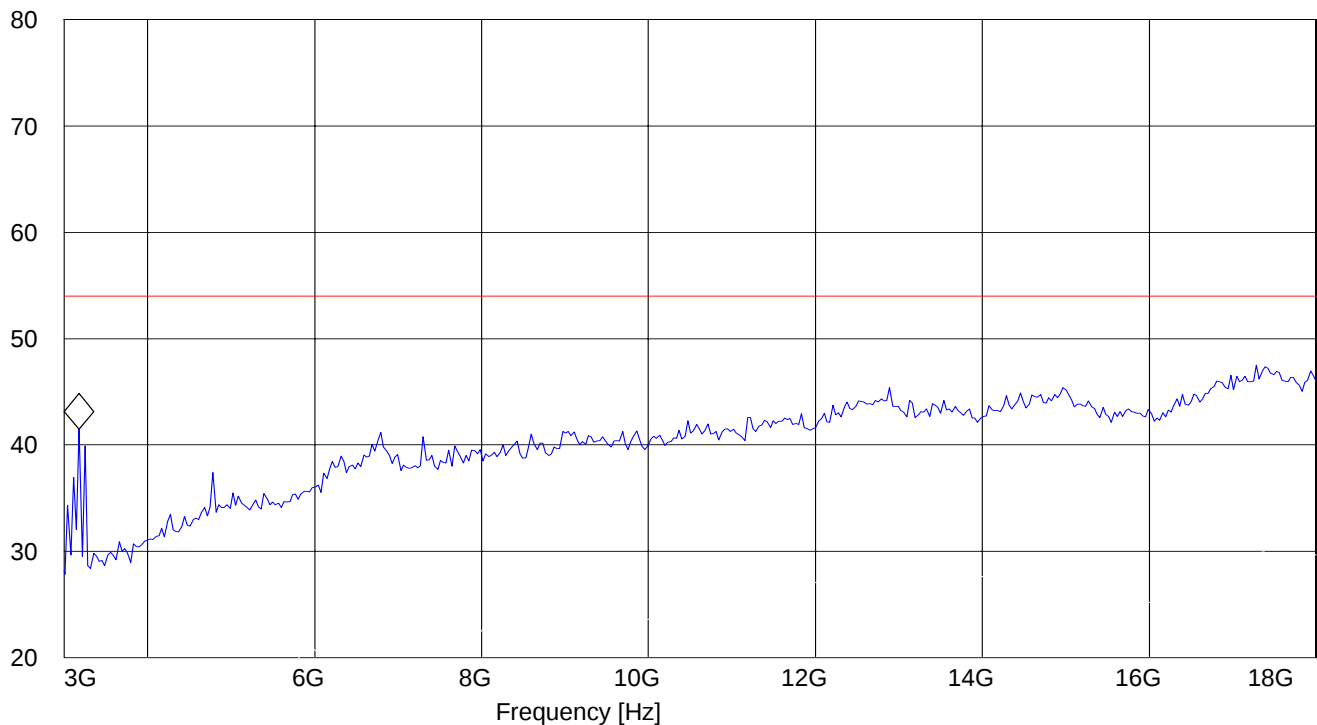
Short Description:

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)

Marker:

3.180360721 GHz

41.46 dB μ V/mLevel [dB μ V/m]

RECEIVER SPURIOUS RADIATION**§ 15.209****18GHz – 26.5GHz****Test mode-4****Op. mode-6**

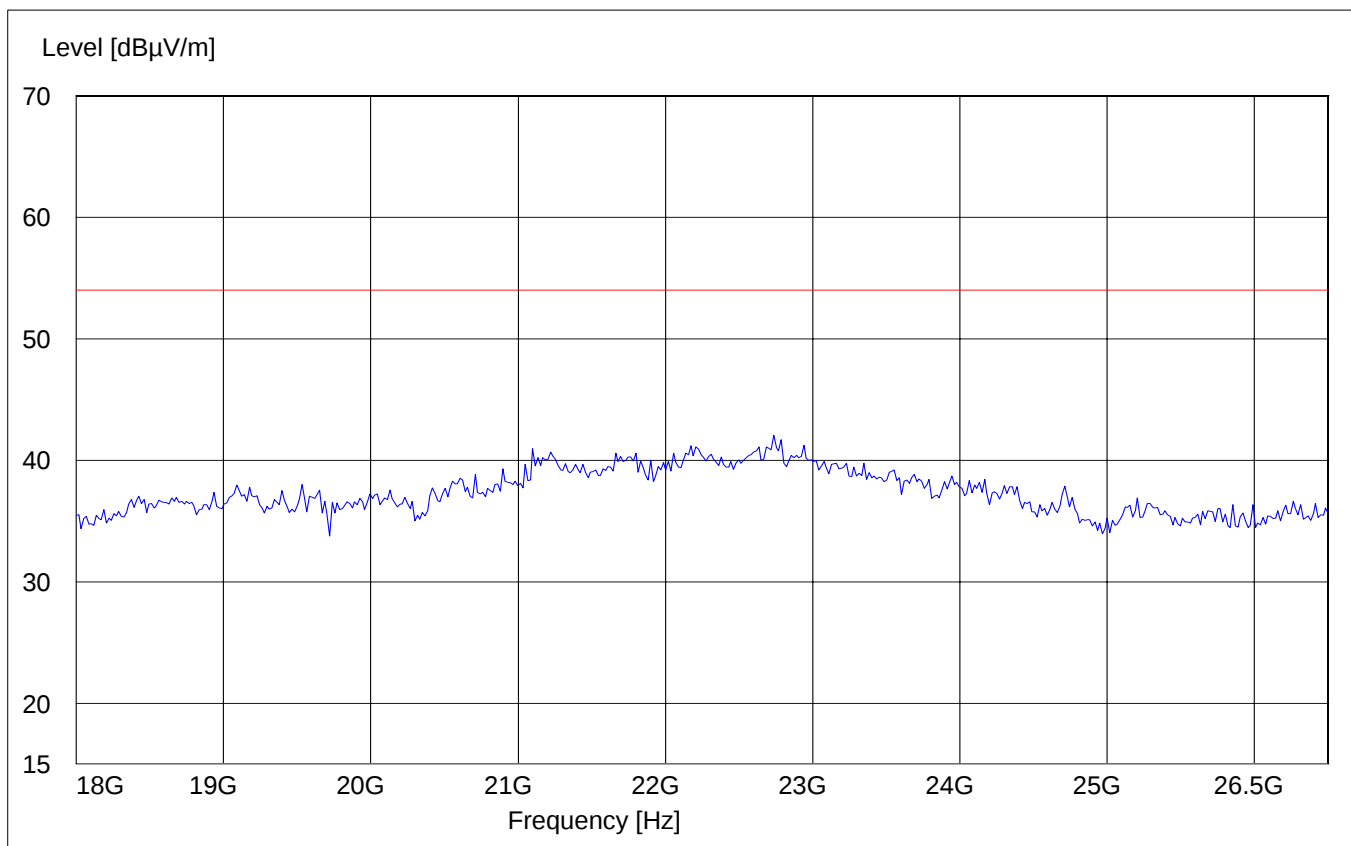
SWEEP TABLE:

"BT Spuri hi 18-25G"

Short Description:

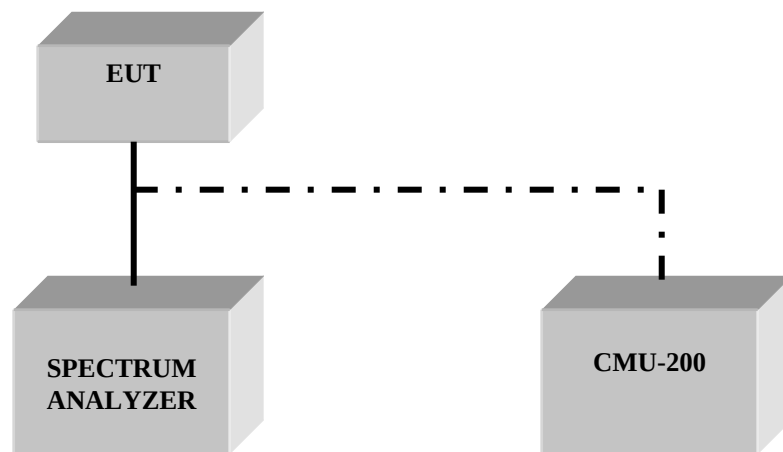
Bluetooth Spurious 18-25GHz

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**