



FCC Test Report
FCC Part 15.247 for FHSS systems/
CANADA RSS-210

FOR:

Bluetooth module for MX7 and HX2
BTMX7, BTHX2

125 Technology Parkway
Norcross, GA 30092
U.S.A

FCC ID: KDZLXEBT001

TEST REPORT #: EMC_LXEIN_001_07002_15.247BT_KDZLXEBT001
DATE: 2007-05-7



FCC listed#
101450
IC recognized #
3925

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

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1 Assessment

The following is in compliance with the applicable criteria specified in FCC rules Part 15.247 of the Code of Federal Regulations and in compliance with the applicable criteria specified in Industry Canada rules RSS210.

Company	Description	Model #
LXE Inc.	Bluetooth Module for MX7 and HX2	BTMX7, BTHX2

This report is reviewed by:

Ivaylo Tankov

2007-5-7 EMC & Radio (EMC Project Engineer)

Date	Section	Name	Signature
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The test results of this test report relate exclusively to the test item specified in Identification of the Equipment under Test. 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.

This report is prepared by:

Peter Mu

2007-5-7 EMC & Radio (EMC Project Engineer)

Date	Section	Name	Signature
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2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the EMC Test Report

Company Name:	CETECOM Inc.
Department:	EMC
Address:	411 Dixon Landing Road Milpitas, CA 95035 U.S.A.
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
Responsible Test Lab Manager:	Lothar Schmidt
Responsible Project Leader:	Peter Mu
Date of test:	2007-4-26 to 2007-5-3

2.2 Identification of the Client

APPLICANT	
Applicant (Company Name)	LXE, Inc
Street Address	125 Technology Parkway
City/Zip Code	Norcross, Georgia, US 30092
Country	USA
Contact Person	Cyril Binnom Jr.
Telephone	(770) 447-4224 x3240
Fax	(770) 447-6928
e-mail	Binnom_c@lxe.com

2.3 Identification of the Manufacturer

MANUFACTURER	
Manufacturer	LXE, Inc
Street Address	125 Technology Parkway
City/Zip Code	Norcross, Georgia, US 30092
Country	U.S.A

3 Equipment under Test (EUT)

3.1 Specification of the Equipment under Test

Marketing Name:	
Description:	Bluetooth Modules for MX7 and HX2
Model No:	BTMX7, BTHX2
Antenna Type:	0dBi Dipole
Type(s) of Modulation:	GFSK
Additional Modulation Type:	Module
Frequency Band(s) of Operation:	2400~2483.5MHz
Numbers of Channels:	79
Equipment Classification: (CLASS)	☐ FIXED ☐ VEHICULAR ☐ PORTABLE ☒ MODULE
Equipment Classification: (POWER(AC MAINS))	☐ 120VAC (GROUND) ☒ 120VAC (NO GROUND) ☒ 7.2VDC ☐ 24VDC

3.2 Identification of the Equipment Under Test (EUT)

EUT #	TYPE	MANF.	MODEL	SERIAL #
1	EUT	LXE Inc	BTMX7	1611621014106S00007
2	EUT	LXE Inc	BTHX2	0807

3.3 Identification of Accessory equipment

AE #	TYPE	MANF.	MODEL	SERIAL #
1	Host Device	LXE INC	MX7	MX7APPR001
2	Host Device	LXE, INC	HX2	HX207120240

3.4 Test mode

The module is tested on a "stand-alone" basis while connected to the host device via a ribbon cable. A communication link is set up to the Bluetooth tester and the module is put into Bluetooth test mode. Packet type is DH5, 2-DH5 and 3-DH5.

4 Subject Of Investigation

All testing was performed on the product referred to in Section 3 as EUT. This test report contains full radiated testing as per FCC15.247 on the EUT with the Bluetooth module.

Transmitter Radiated Spurious Emission testing were done on both the BTMX7 and the BTHX2 model with both modules in a stand-alone configuration. Since the Bluetooth modules themselves used in the two models have identical components and only differ by layout, all conducted measurements, band edge, and EIRP are measured with the BTMX7 model only. Test results apply to both models.

During the testing process the EUT was tested on a single channel using PRBS9 payload using DH5, 2DH5 or 3DH5 packets, all data in this report shows the worst case between horizontal and vertical polarization for above 1GHz.

The objective of the measurements done by Cetecom Inc. was to measure the performance of the EUT as specified by requirements listed in FCC rules Part 15.247 of Title 47 of the Code of Federal Regulations and Industry Canada rules RSS210. The maximization of portable equipment is conducted in accordance with ANSI C63.4.

5 Measurements (Radiated)

5.1 MAXIMUM PEAK OUTPUT POWER

EIRP: GFSK

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)		
Frequency (MHz)		2402	2441	2480
T _{nom} (23)°C	V _{nom} VDC	-2.65	-1.65	-1.74
Measurement uncertainty		±0.5dBm		

EIRP: $\pi / 4$ DQPSK

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)		
Frequency (MHz)		2402	2441	2480
T _{nom} (23)°C	V _{nom} VDC	-0.92	-0.36	-0.71
Measurement uncertainty		±0.5dBm		

EIRP: 8DPSK

4

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)		
Frequency (MHz)		2402	2441	2480
T _{nom} (23)°C	V _{nom} VDC	-0.62	-0.18	-0.64
Measurement uncertainty		±0.5dBm		



EIRP LOW CHANNEL-GFSK

CETECOM Inc., 411 Dixon Landing Road, Milpitas CA 95035, USA

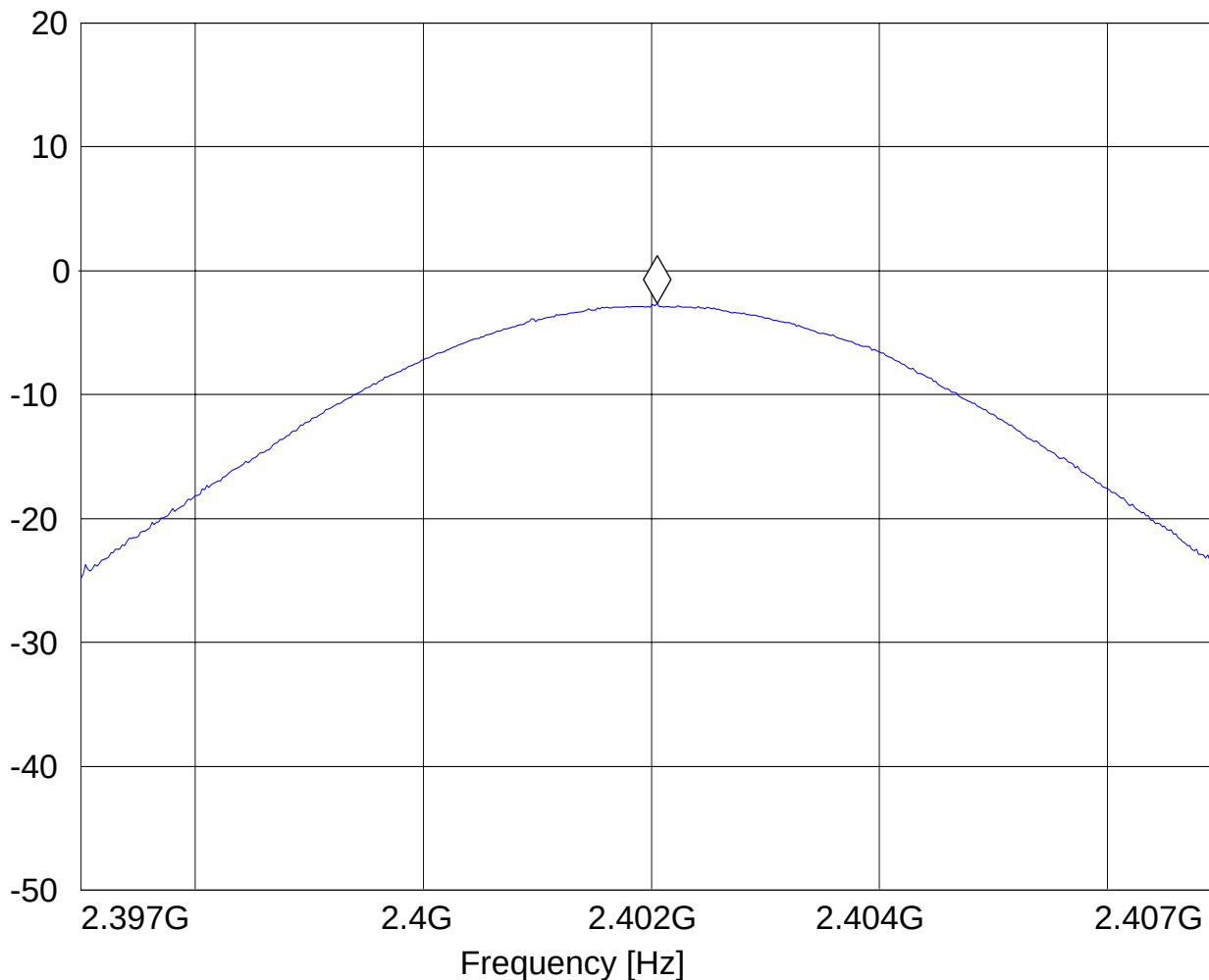
EUT: MX7
Customer: LXE
Test Mode: BT, TX ch 0, GFSK
ANT Orientation: V
EUT Orientation: V
Test Engineer: Ed
Power Supply:: AC Adapter
Comments:

SWEEP TABLE: "EIRP BT low channel"

Short Description:	EIRP Bluetooth channel-2402MHz				
Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency		Time	Bandw.	
2.4 GHz	2.4 GHz	MaxPeak	Coupled	3 MHz	DUMMY-DBM
		MaxPeak			

Marker: 2.4020501 GHz -2.65 dBm

Level [dBm]





EIRP MIDDLE CHANNEL-GFSK

CETECOM Inc., 411 Dixon Landing Road, Milpitas CA 95035, USA

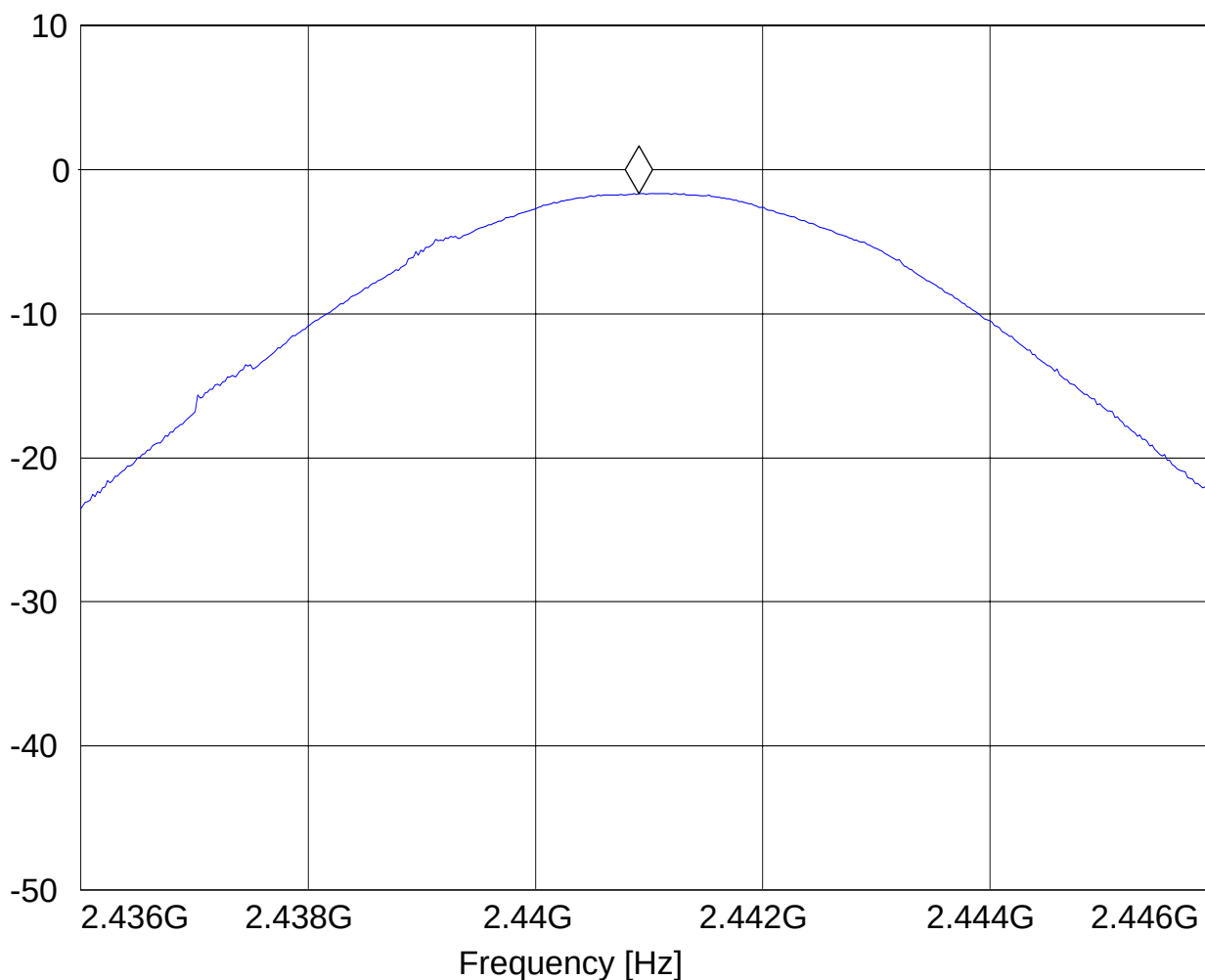
EUT: MX7
Customer: LXE
Test Mode: BT, TX ch 39, GFSK
ANT Orientation: V
EUT Orientation: V
Test Engineer: Ed
Power Supply:: AC Adapter
Comments:

SWEEP TABLE: "EIRP BT mid channel"

Short Description:		EIRP Bluetooth channel-2441MHz			
Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency		Time	Bandw.	
2.4 GHz	2.4 GHz	MaxPeak	Coupled	3 MHz	DUMMY-DBM

Marker: 2.440907816 GHz -1.65 dBm

Level [dBm]





EIRP HIGH CHANNEL-GFSK

CETECOM Inc., 411 Dixon Landing Road, Milpitas CA 95035, USA

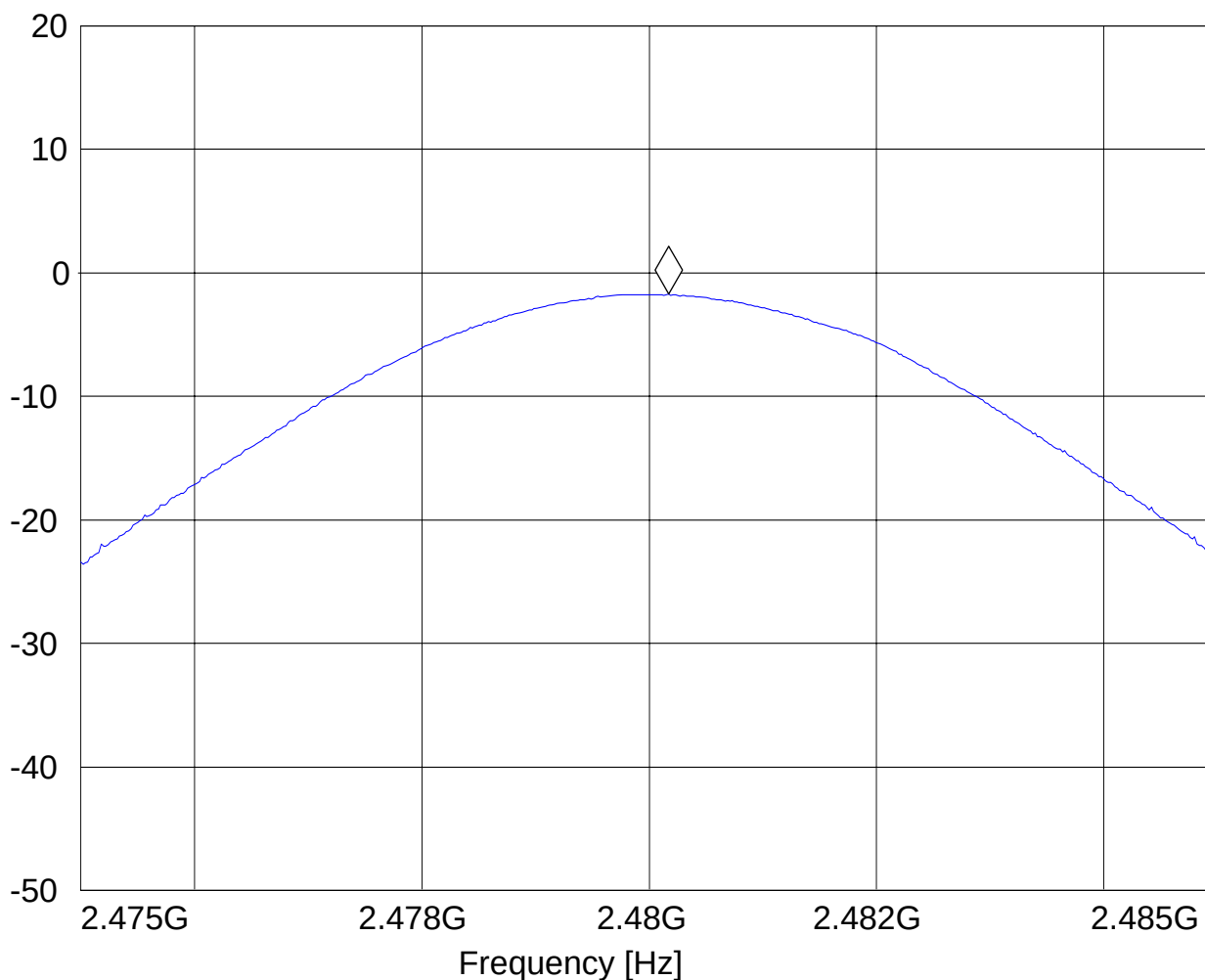
EUT: MX7
Customer: LXE
Test Mode: BT, TX ch 78, GFSK
ANT Orientation: V
EUT Orientation: V
Test Engineer: Ed
Power Supply:: AC Adapter
Comments:

SWEEP TABLE: "EIRP BT high channel"

Short Description:		EIRP Bluetooth channel-2480MHz			
Start	Stop	Detector	Meas. Time	IF Bandw.	Transducer
2.5 GHz	2.5 GHz	MaxPeak	Coupled	3 MHz	DUMMY-DBM
		MaxPeak			

Marker: 2.480170341 GHz -1.74 dBm

Level [dBm]



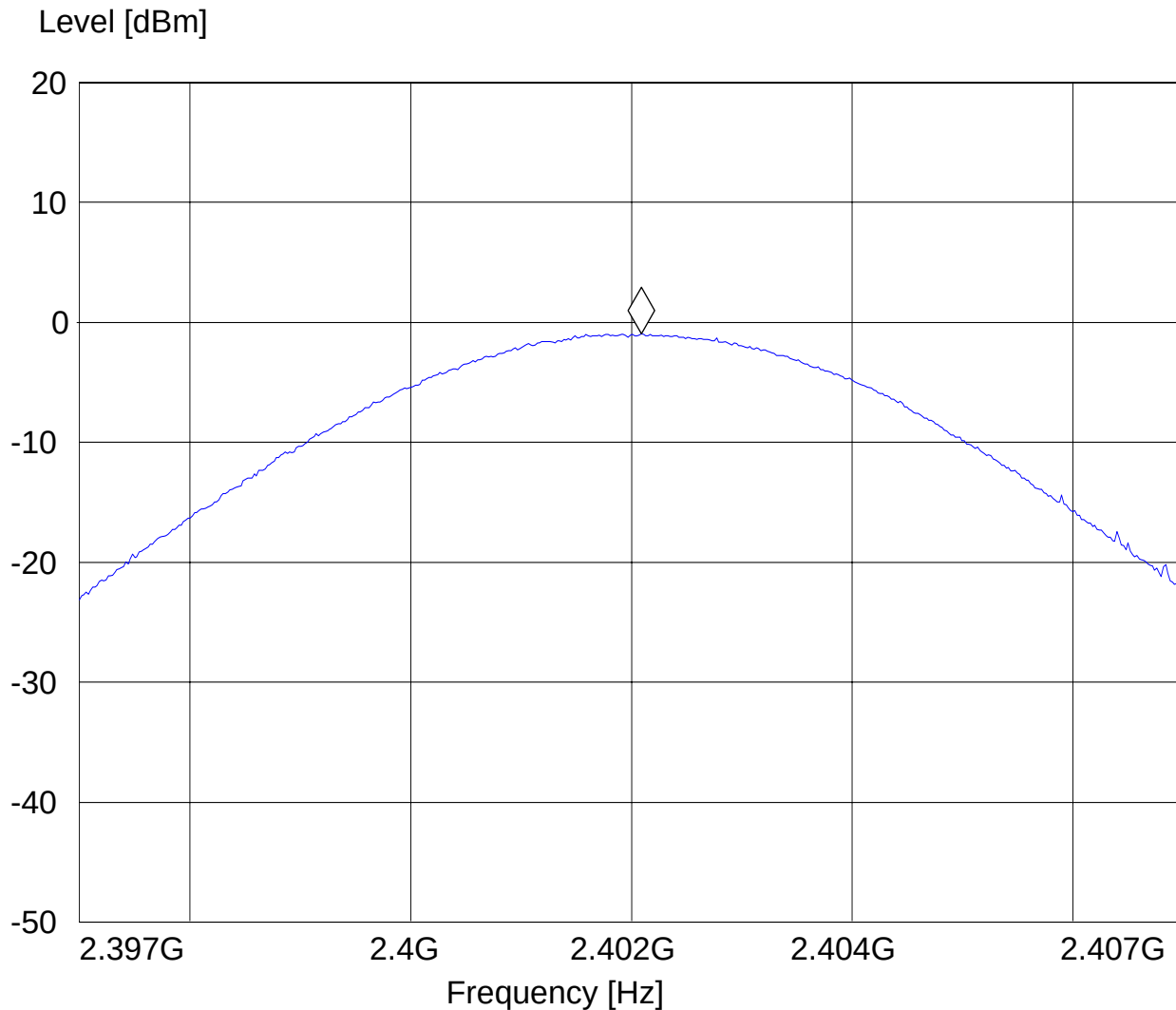
EIRP LOW CHANNEL- $\pi / 4$ DQPSK

EUT: MX7
Customer: LXE
Test Mode: BT, TX ch 0, DQPSK
ANT Orientation: V
EUT Orientation: V
Test Engineer: Ed
Power Supply: AC Adapter
Comments:

SWEEP TABLE: "EIRP BT low channel"

Short Description: EIRP Bluetooth channel-2402MHz
Unit: dBm
Detector: Mode:

Marker: 2.40209018 GHz -0.92 dBm



EIRP MIDDLE CHANNEL- $\pi / 4$ DQPSK

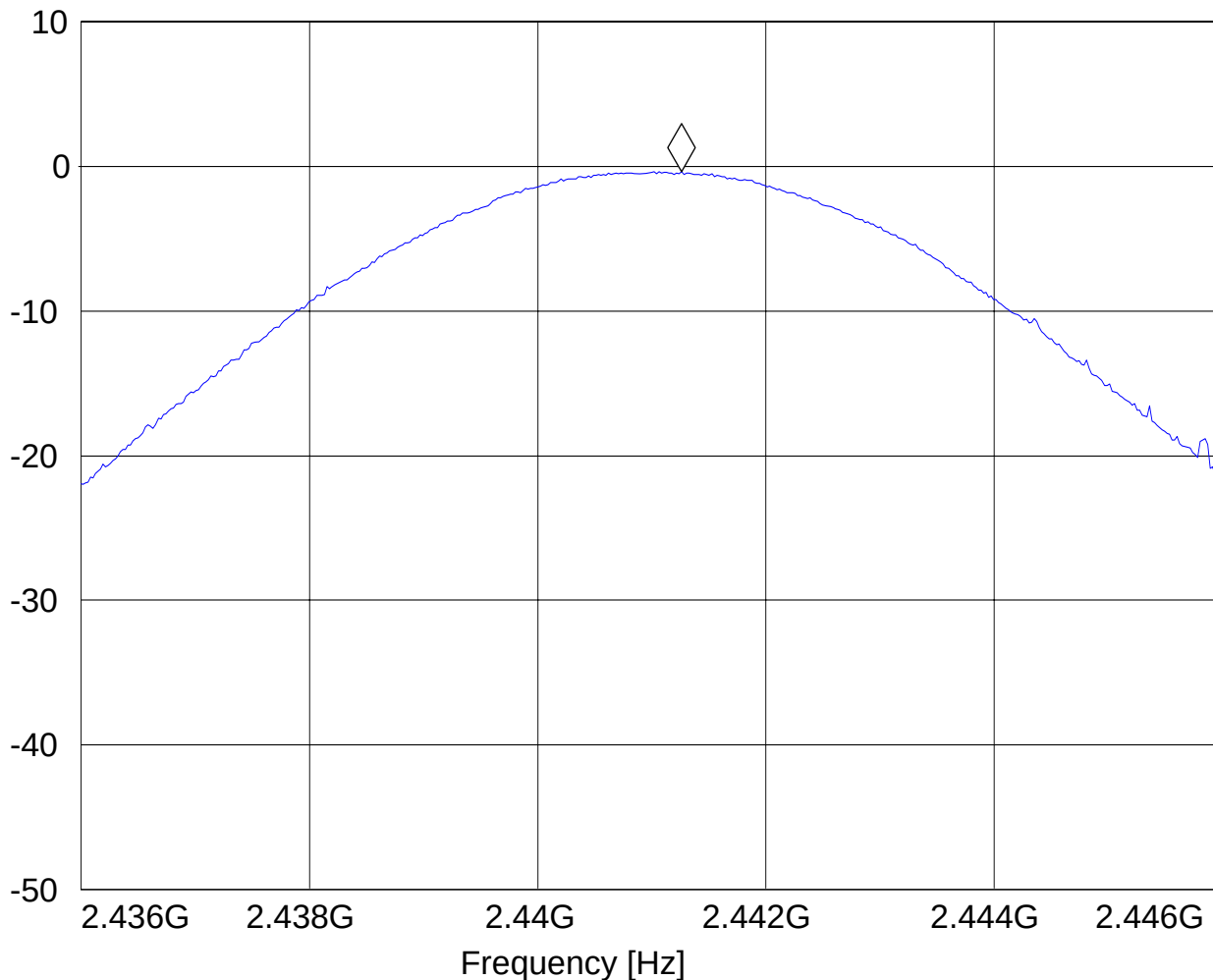
EUT: MX7
Customer: LXE
Test Mode: BT, TX ch 39, DQPSK
ANT Orientation: V
EUT Orientation: V
Test Engineer: Ed
Power Supply: AC Adapter
Comments:

SWEEP TABLE: "EIRP BT mid channel"

Short Description: EIRP Bluetooth channel-2441MHz
Unit: dBm
Detector: Mode:

Marker: 2.441260521 GHz -0.36 dBm

Level [dBm]



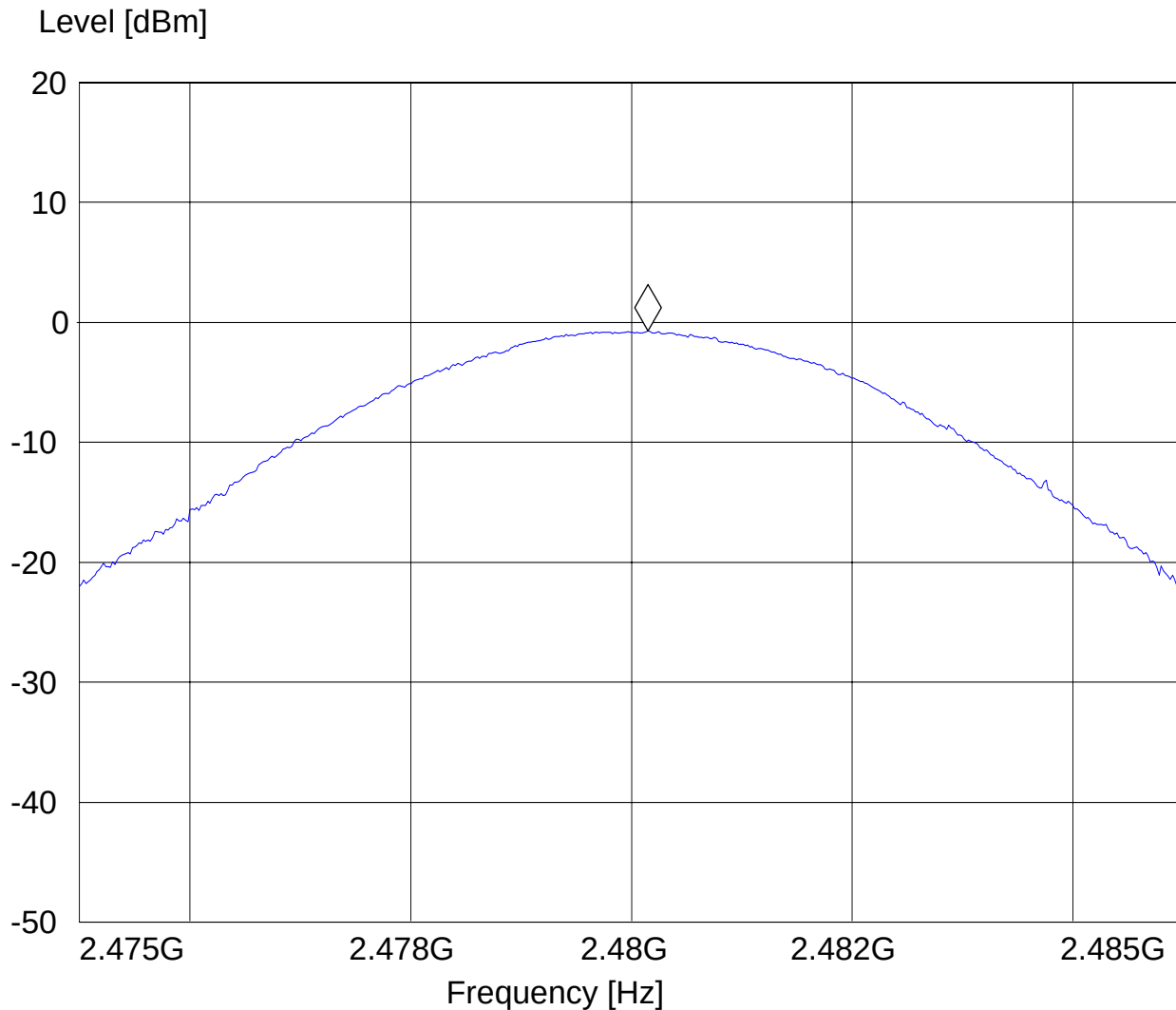
EIRP HIGH CHANNEL- π / 4 DQPSK

EUT: MX7
Customer: LXE
Test Mode: BT, TX ch 78, DQPSK
ANT Orientation: V
EUT Orientation: V
Test Engineer: Ed
Power Supply: AC Adapter
Comments:

SWEEP TABLE: "EIRP BT high channel"

Short Description: EIRP Bluetooth channel-2480MHz
Unit: dBm
Detector: Mode:

Marker: 2.480150301 GHz -0.71 dBm





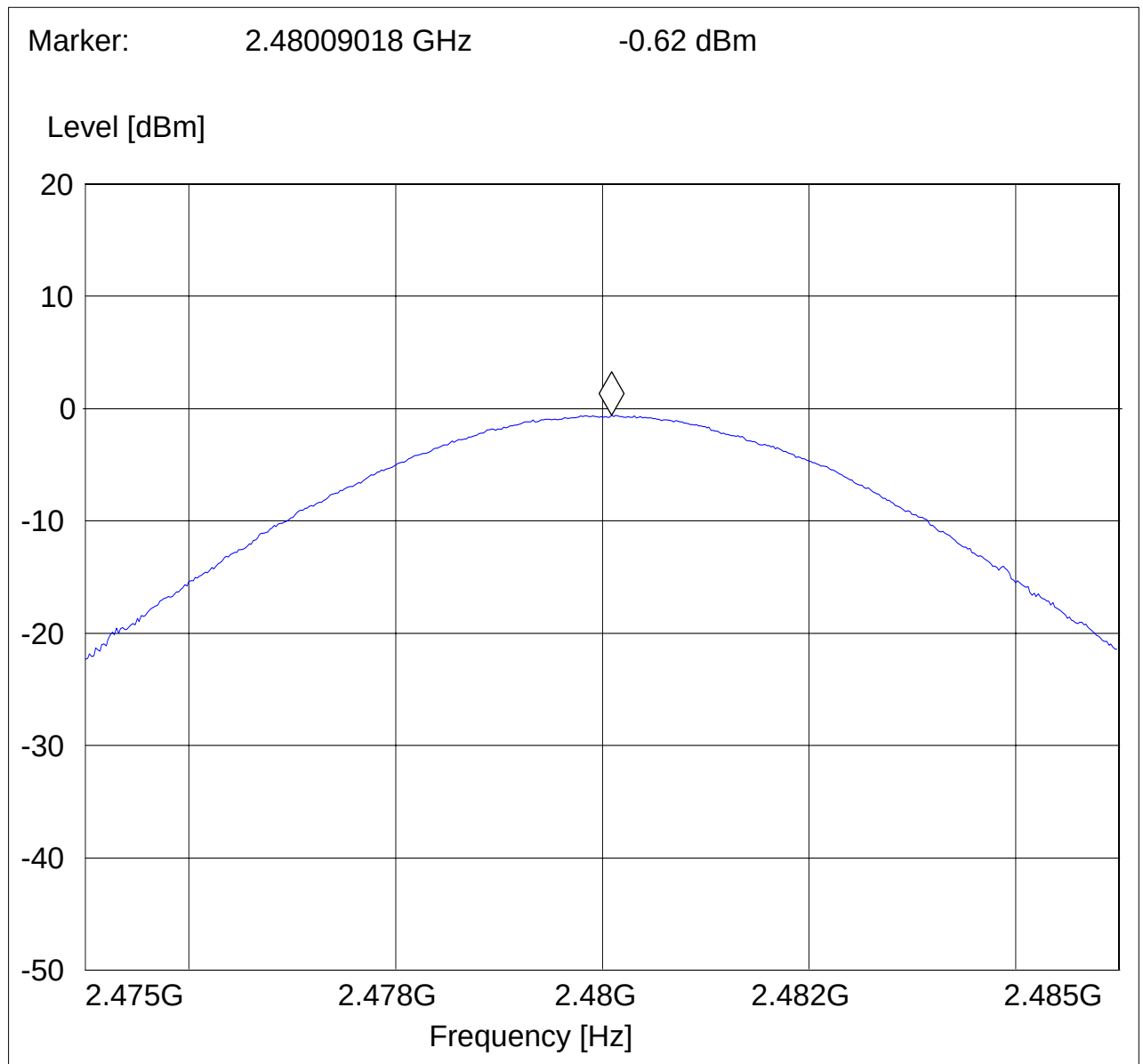
EIRP LOW CHANNEL- 8DPSK

EUT: MX7
Customer: LXE
Test Mode: BT, TX ch 78, 8DPSK
ANT Orientation: V
EUT Orientation: V
Test Engineer: Ed
Power Supply:: AC Adapter
Comments:

SWEEP TABLE: "EIRP BT high channel"

Short Description: EIRP Bluetooth channel-2480MHz
Unit: dBm

Detector: Mode:





EIRP MIDDLE CHANNEL- 8DPSK

EUT: MX7
Customer: LXE
Test Mode: BT, TX ch 39, 8DPSK
ANT Orientation: V
EUT Orientation: V
Test Engineer: Ed
Power Supply:: AC Adapter
Comments:

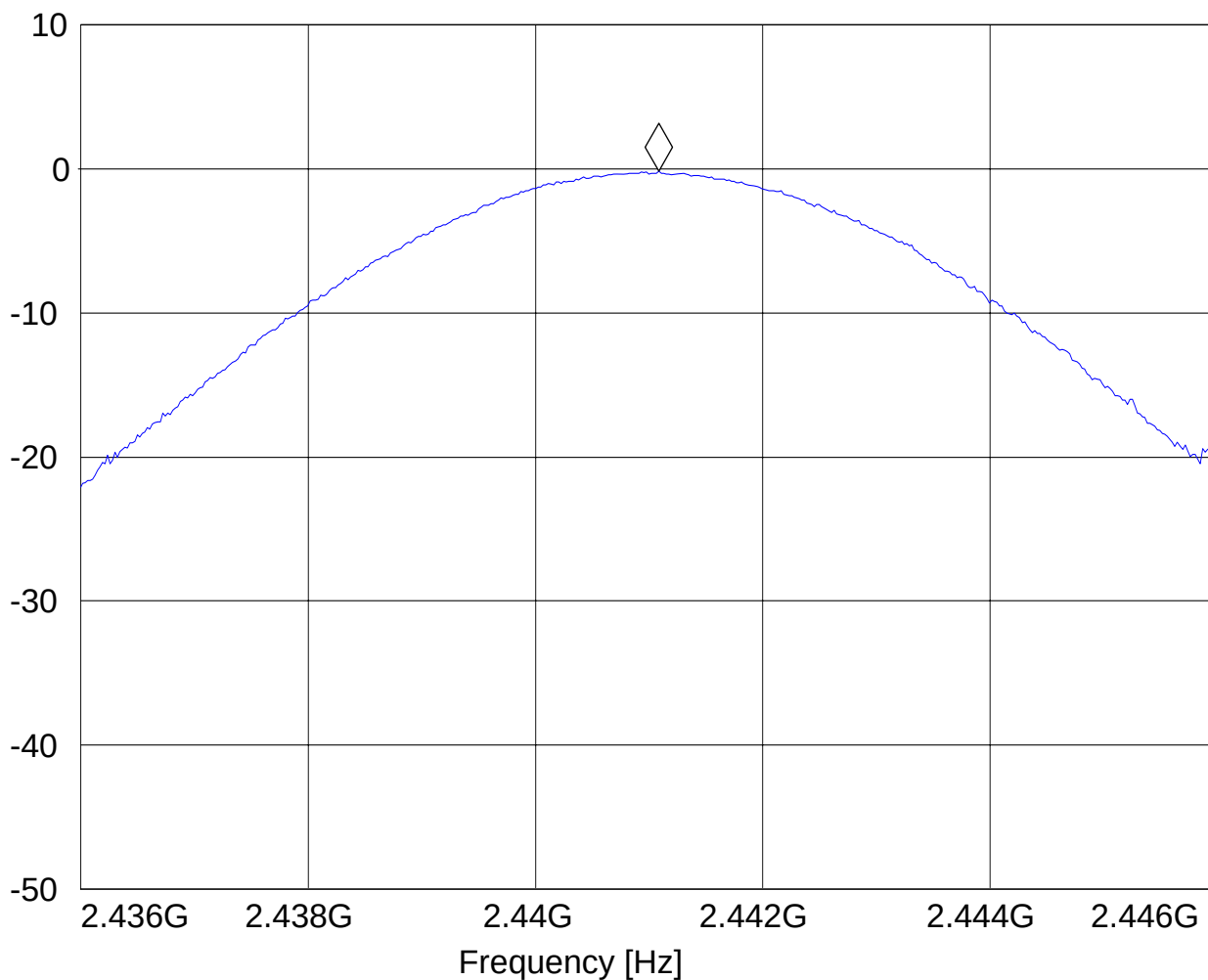
SWEEP TABLE: "EIRP BT mid channel"

Short Description: EIRP Bluetooth channel-2441MHz
Unit: dBm

Detector: Mode:

Marker: 2.441084168 GHz -0.18 dBm

Level [dBm]

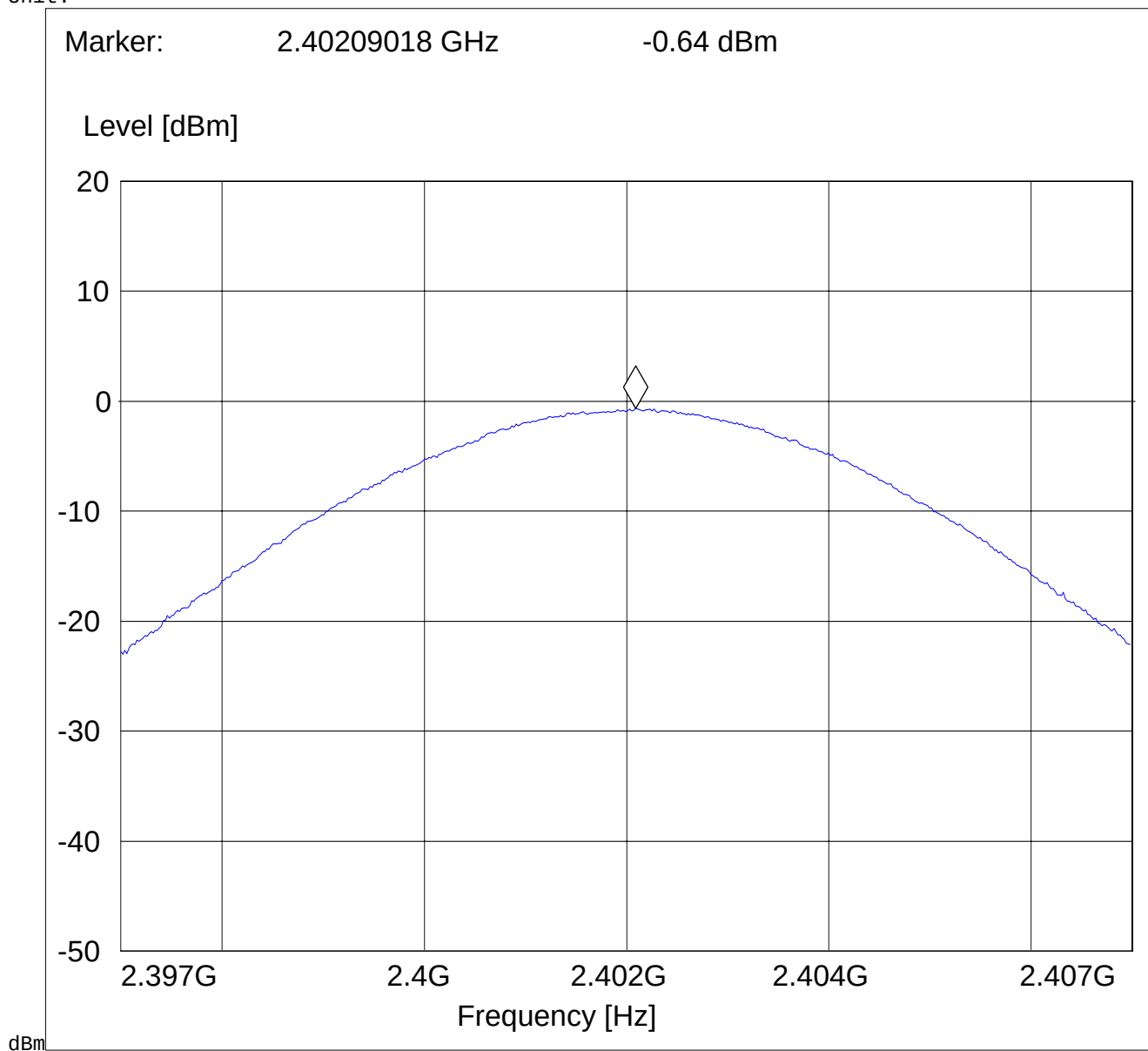


EIRP HIGH CHANNEL- 8DPSK

EUT: MX7
Customer: LXE
Test Mode: BT, TX ch 0, 8DPSK
ANT Orientation: V
EUT Orientation: V
Test Engineer: Ed
Power Supply:: AC Adapter
Comments:

SWEEP TABLE: "EIRP BT low channel"

Short Description: EIRP Bluetooth channel-2402MHz
Unit:



5.2 RESTRICTED BAND EDGE COMPLIANCE RADIATED §15.247/15.205

5.2.1 LIMITS

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)
13.36 - 13.41			

*PEAK LIMIT= 74dBuV/m

*AVG. LIMIT= 54dBuV/m

5.2.2 RESULTS: GFSK

(2402MHz) LOWER BAND EDGE PEAK -GFSK MODULATION

CETECOM Inc., 411 Dixon Landing Road, Milpitas CA 95035, USA

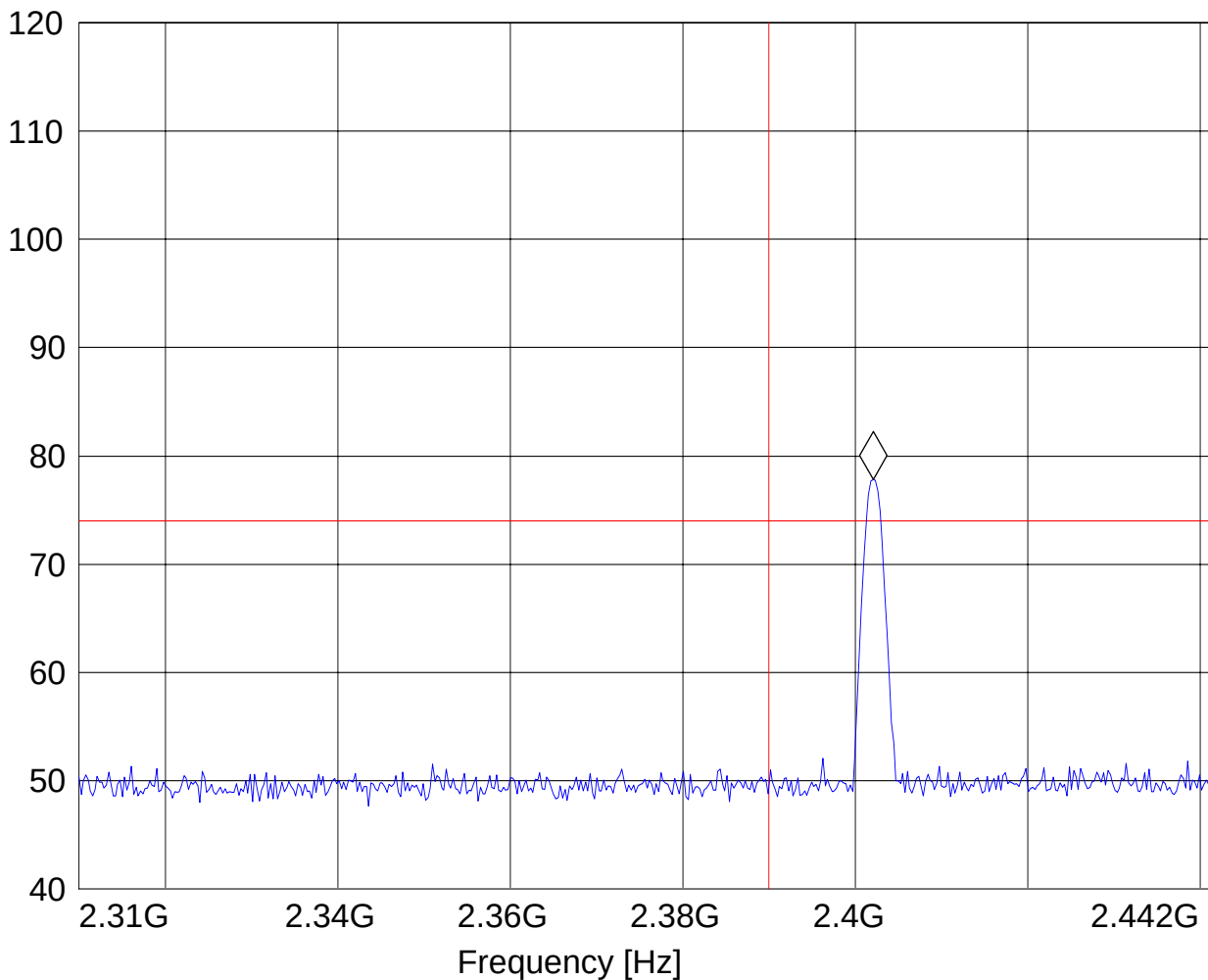
EUT: MX7
Customer: LXE
Test Mode: BT, TX ch 0
ANT Orientation: V
EUT Orientation: V
Test Engineer: Ed
Power Supply:: AC Adapter
Comments:

SWEEP TABLE: "FCC15.247 LBE_PK"

Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency		Time	Bandw.	
2.3 GHz	2.4 GHz	MaxPeak	Coupled	1 MHz	#326horn AF vert

Marker: 2.402056112 GHz 77.81 dBμV/m

Level [dBμV/m]





(2402MHz) LOWER BAND EDGE AVERAGE -GFSK MODULATION

CETECOM Inc., 411 Dixon Landing Road, Milpitas CA 95035, USA

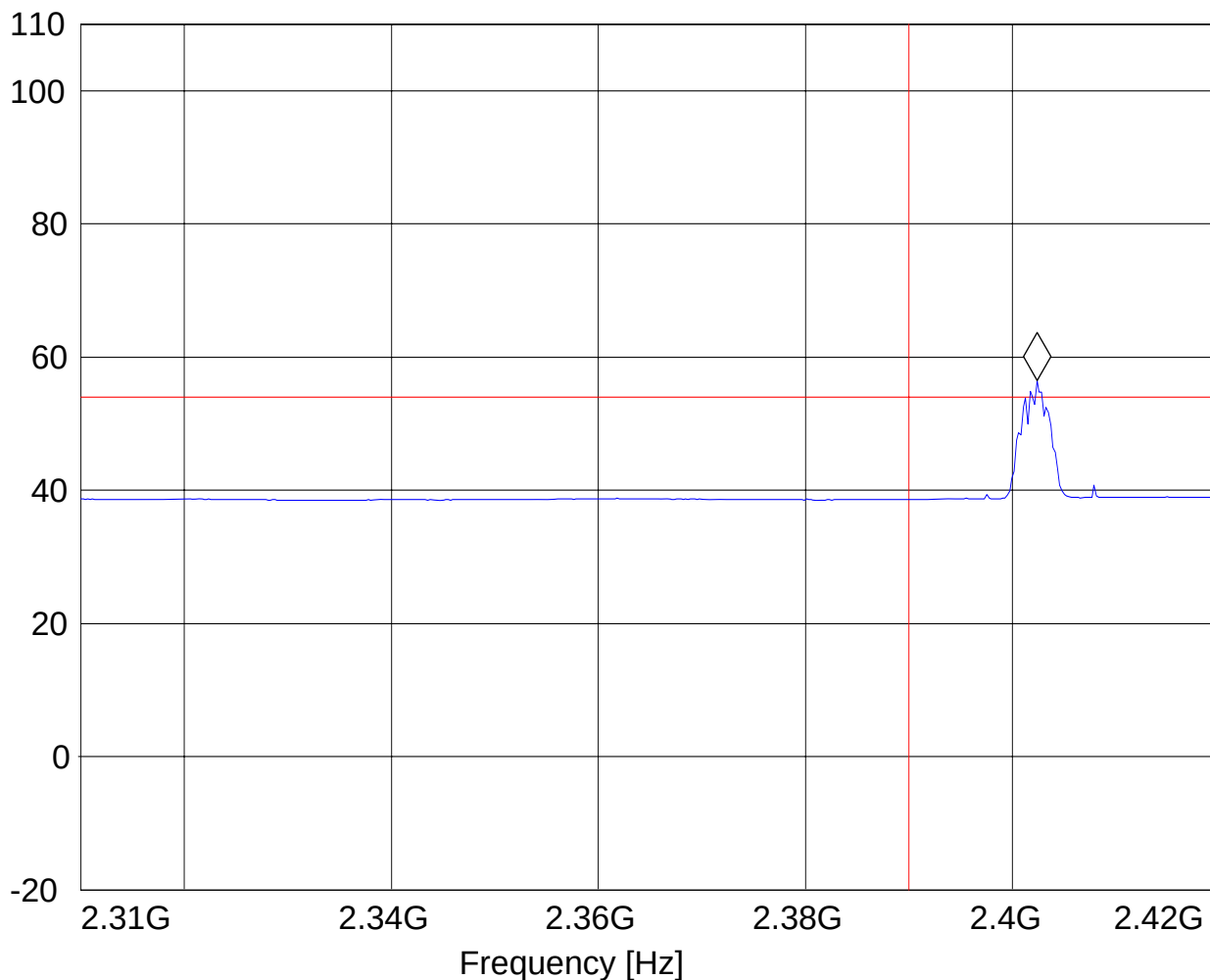
EUT: MX7
Customer: LXE
Test Mode: BT, TX ch 0
ANT Orientation: V
EUT Orientation: V
Test Engineer: Ed
Power Supply:: AC Adapter
Comments:

SWEEP TABLE: "FCC15.247 LBE_AVG"

Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency	Time	Bandw.		
2.3 GHz	2.4 GHz	MaxPeak	Coupled	1 MHz	#326horn AF vert

Marker: 2.402364729 GHz 56.48 dB μ V/m

Level [dB μ V/m]



(2480MHz) HIGHER BAND EDGE PEAK -GFSK MODULATION

CETECOM Inc., 411 Dixon Landing Road, Milpitas CA 95035, USA

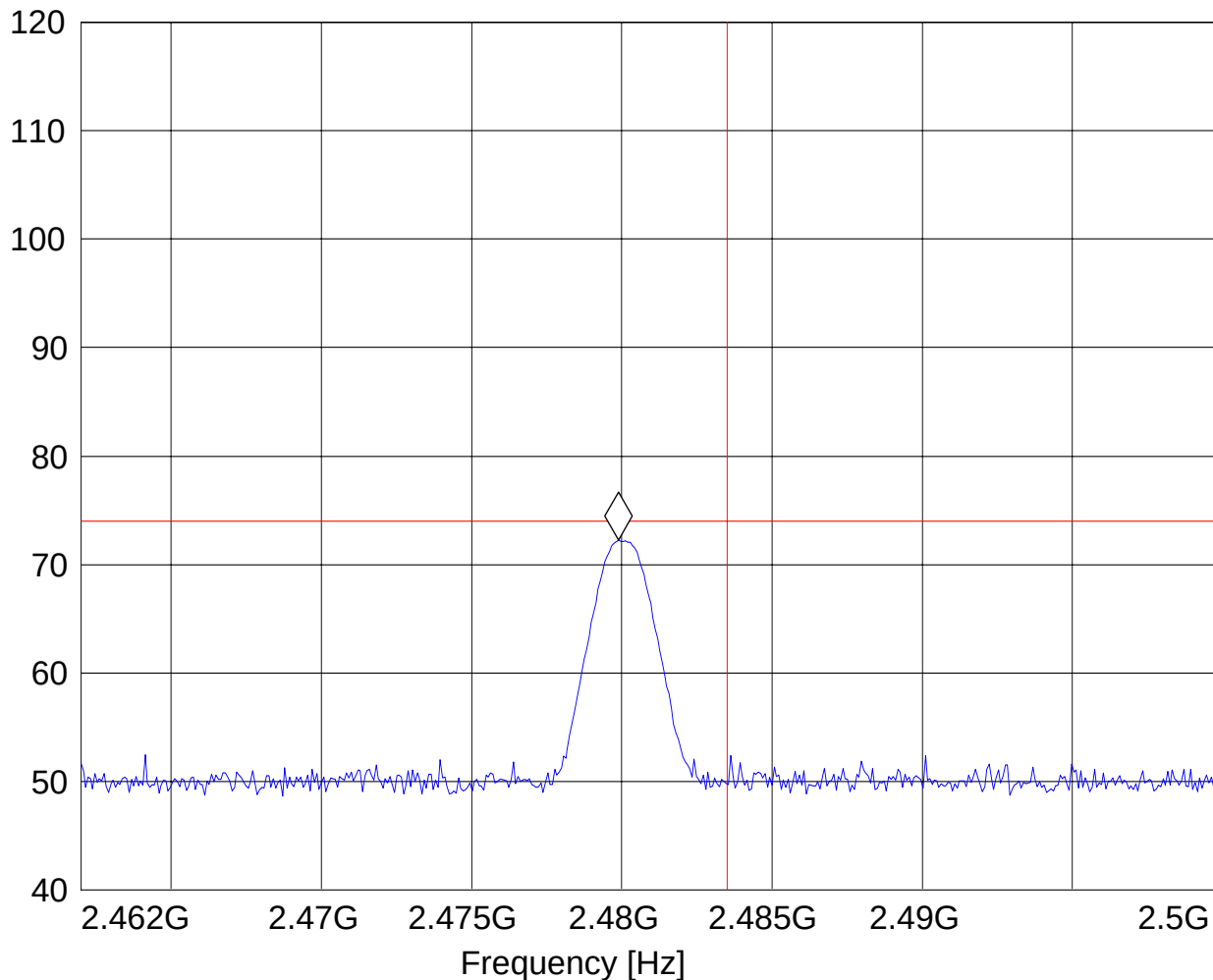
EUT: MX7
Customer: LXE
Test Mode: BT, TX ch 78
ANT Orientation: V
EUT Orientation: V
Test Engineer: Ed
Power Supply: AC Adapter
Comments:

SWEEP TABLE: "FCC15.247 HBE_PK"

Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency		Time	Bandw.	
2.5 GHz	2.5 GHz	MaxPeak	Coupled	1 MHz	#326horn AF vert

Marker: 2.479895792 GHz 72.24 dB μ V/m

Level [dB μ V/m]





HIGHER BAND EDGE AVERAGE-GFSK MODULATION

CETECOM Inc., 411 Dixon Landing Road, Milpitas CA 95035, USA

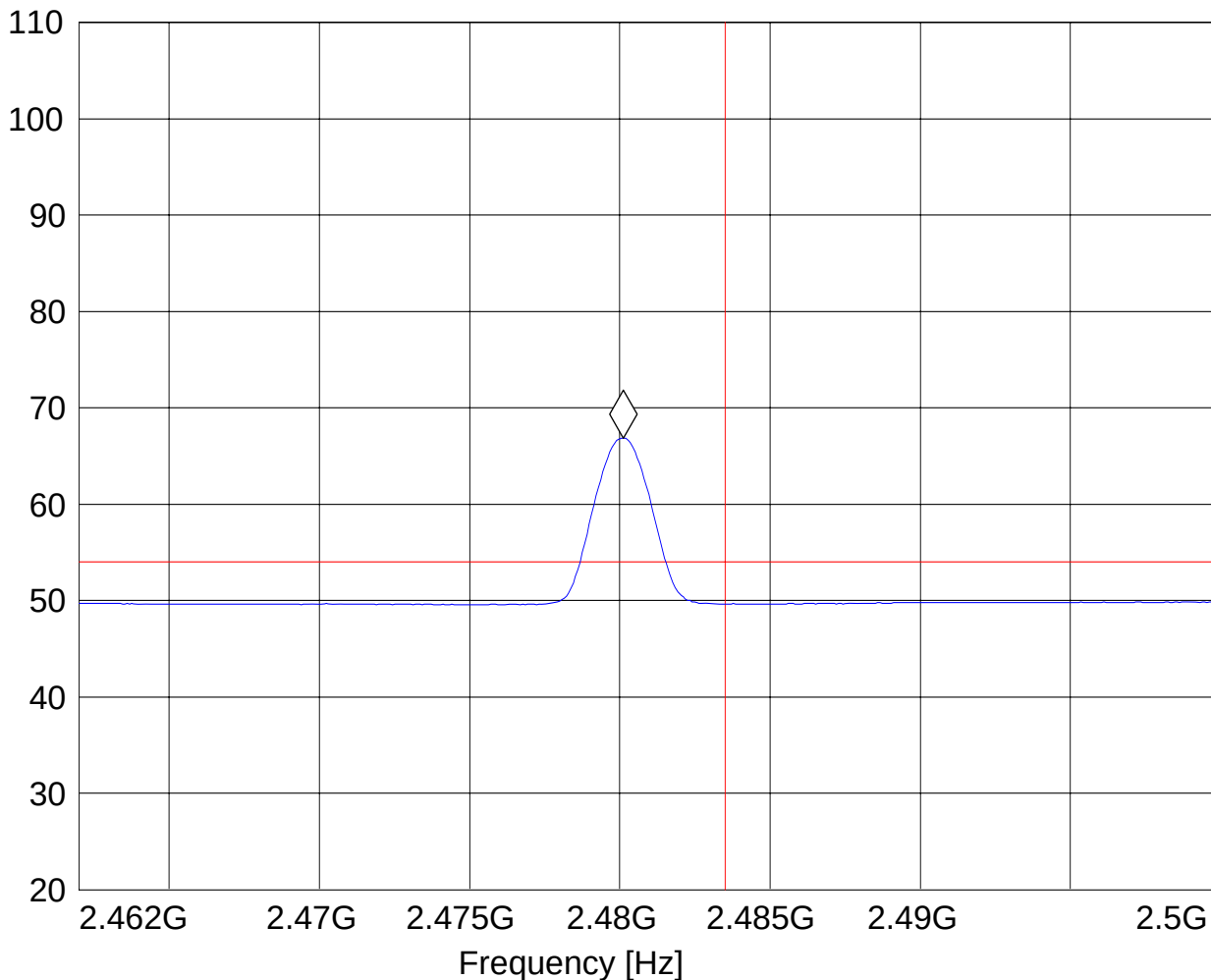
EUT: MX7
Customer: LXE
Test Mode: BT, TX ch 78
ANT Orientation: V
EUT Orientation: V
Test Engineer: Ed
Power Supply: AC Adapter
Comments:

SWEEP TABLE: "FCC15.247 HBE_AVG"

Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency		Time	Bandw.	
2.5 GHz	2.5 GHz	MaxPeak	Coupled	1 MHz	#326horn AF horz

Marker: 2.480124248 GHz 66.88 dB μ V/m

Level [dB μ V/m]



5.2.3 RESULTS: $\pi/4$ DQPSK

(2402MHz) LOWER BAND EDGE PEAK - $\pi/4$ DQPSK MODULATION

CETECOM Inc., 411 Dixon Landing Road, Milpitas CA 95035, USA

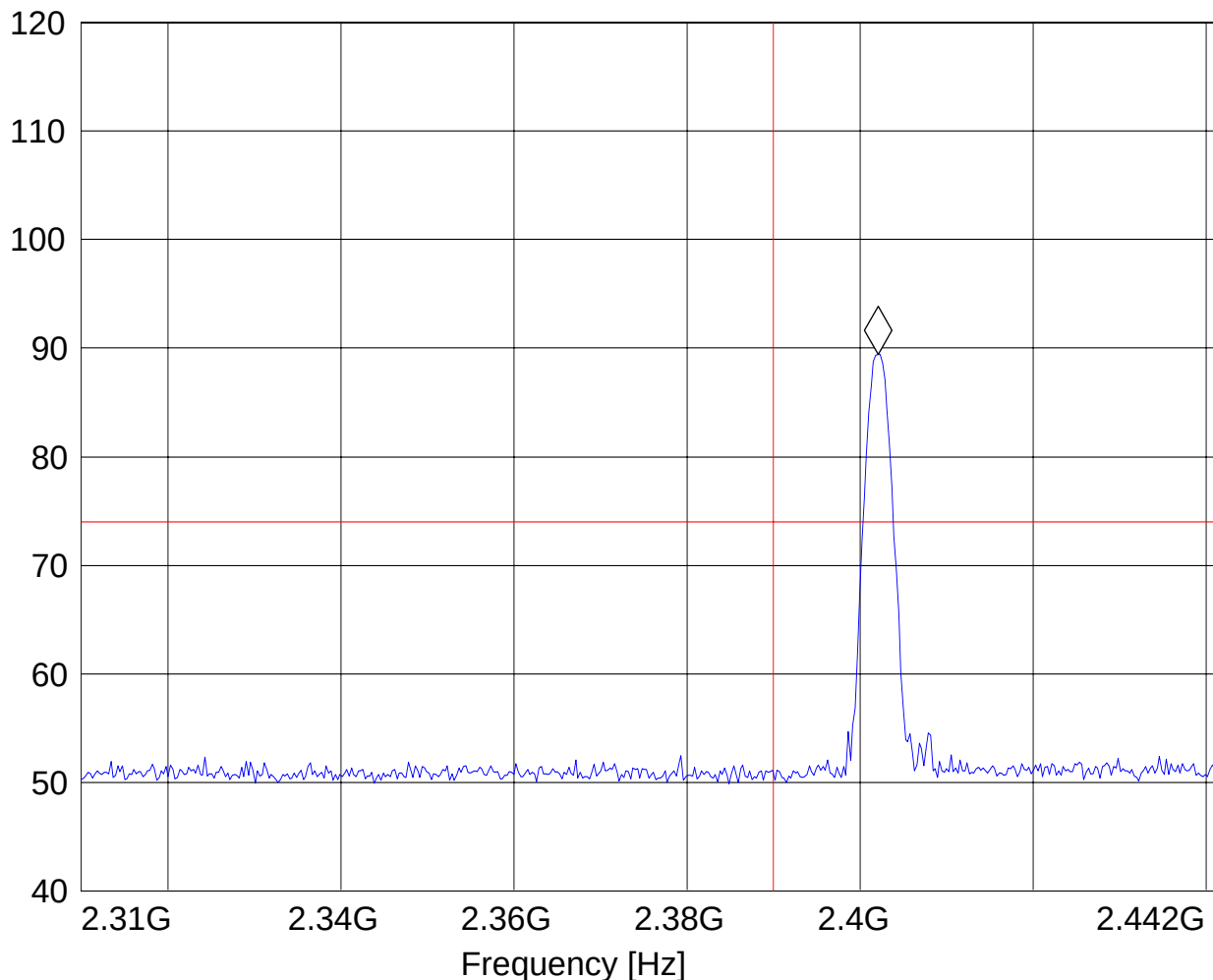
EUT: MX7
Customer: LXE
Test Mode: BT CH 0; Packet type: 2-DH5; Modulation: $\pi/4$ DQPSK
ANT Orientation: V
EUT Orientation: V
Test Engineer: Satya Radhakrishna
Power Supply:: AC Adapter
Comments: 360° rotation

SWEEP TABLE: "FCC15.247 LBE_PK"

Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency		Time	Bandw.	
2.3 GHz	2.4 GHz	MaxPeak	Coupled	1 MHz	#326horn AF_vert

Marker: 2.402056112 GHz 89.4 dB μ V/m

Level [dB μ V/m]



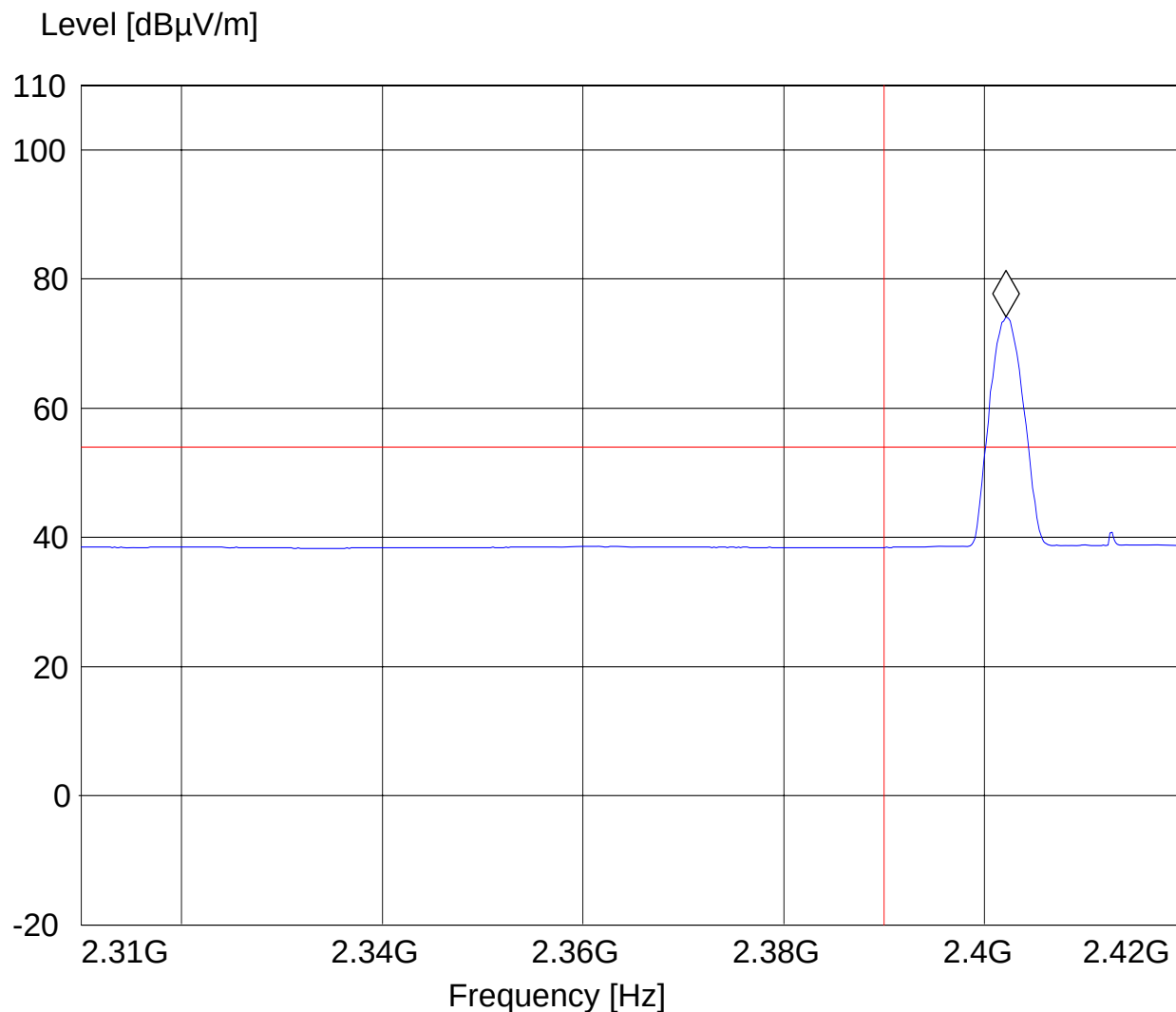
(2402MHz) LOWER BAND EDGE AVERAGE $-\pi/4$ DQPSK MODULATION

EUT: MX7
Customer: LXE
Test Mode: BT CH 0; Packet type: 2-DH5; Modulation: $\pi/4$ DQPSK
ANT Orientation: V
EUT Orientation: V
Test Engineer: Satya Radhakrishna
Power Supply:: AC Adapter
Comments: 360° rotation

SWEEP TABLE: "FCC15.247 LBE_AVG"

Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency		Time	Bandw.	
2.3 GHz	2.4 GHz	MaxPeak	Coupled	1 MHz	#326horn AF vert

Marker: 2.402144289 GHz 74.13 dB μ V/m



(2480MHz) HIGHER BAND EDGE PEAK - $\pi/4$ DQPSK MODULATION

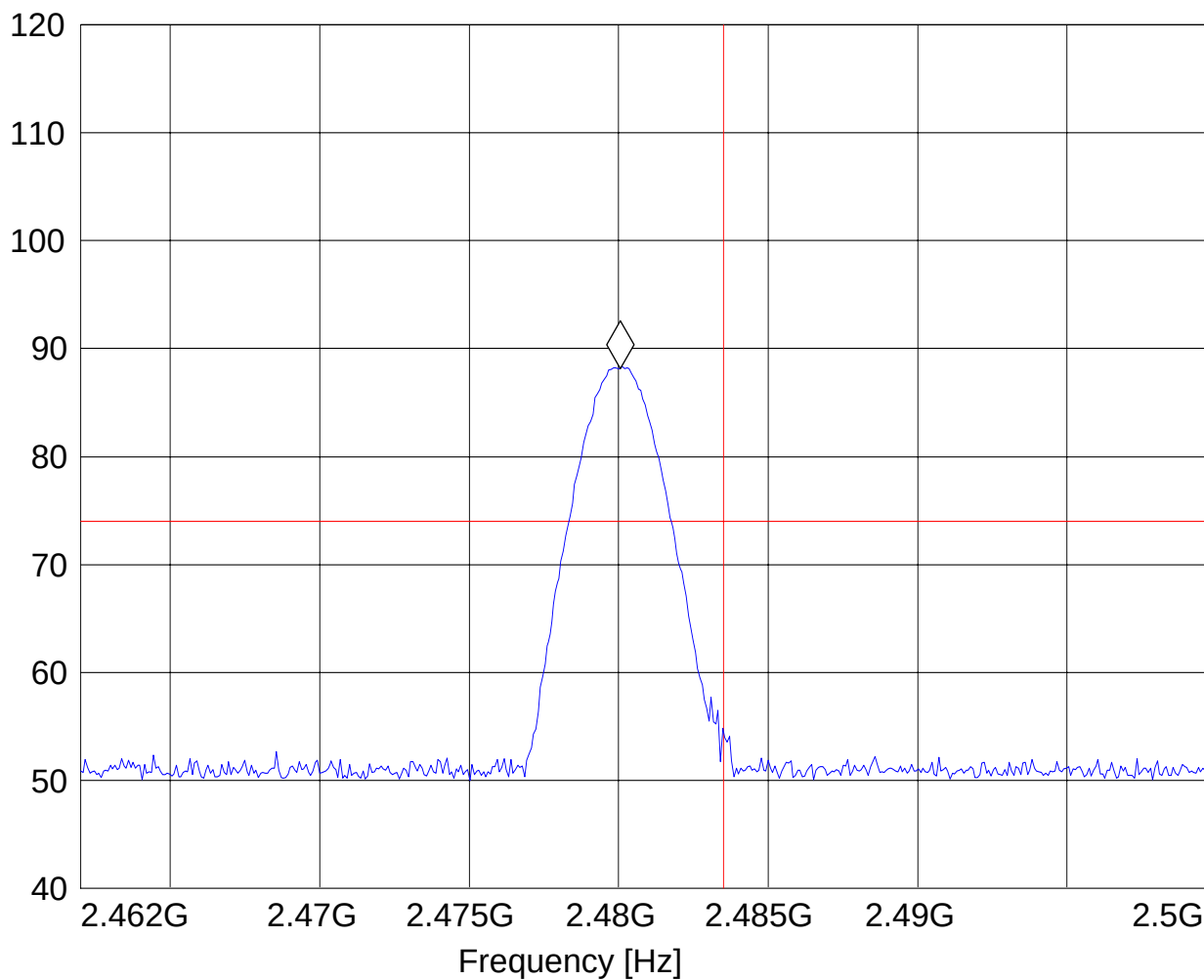
EUT: MX7
Customer: LXE
Test Mode: BT CH 78; Packet type: 2-DH5; Modulation: $\pi/4$ DQPSK
ANT Orientation: V
EUT Orientation: V
Test Engineer: Satya Radhakrishna
Power Supply: AC Adapter
Comments: 360° rotation

SWEEP TABLE: "FCC15.247 HBE_PK"

Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency		Time	Bandw.	
2.5 GHz	2.5 GHz	MaxPeak	Coupled	1 MHz	#326horn AF vert

Marker: 2.480048096 GHz 88.13 dB μ V/m

Level [dB μ V/m]



HIGHER BAND EDGE AVERAGE- $\pi/4$ DQPSK MODULATION

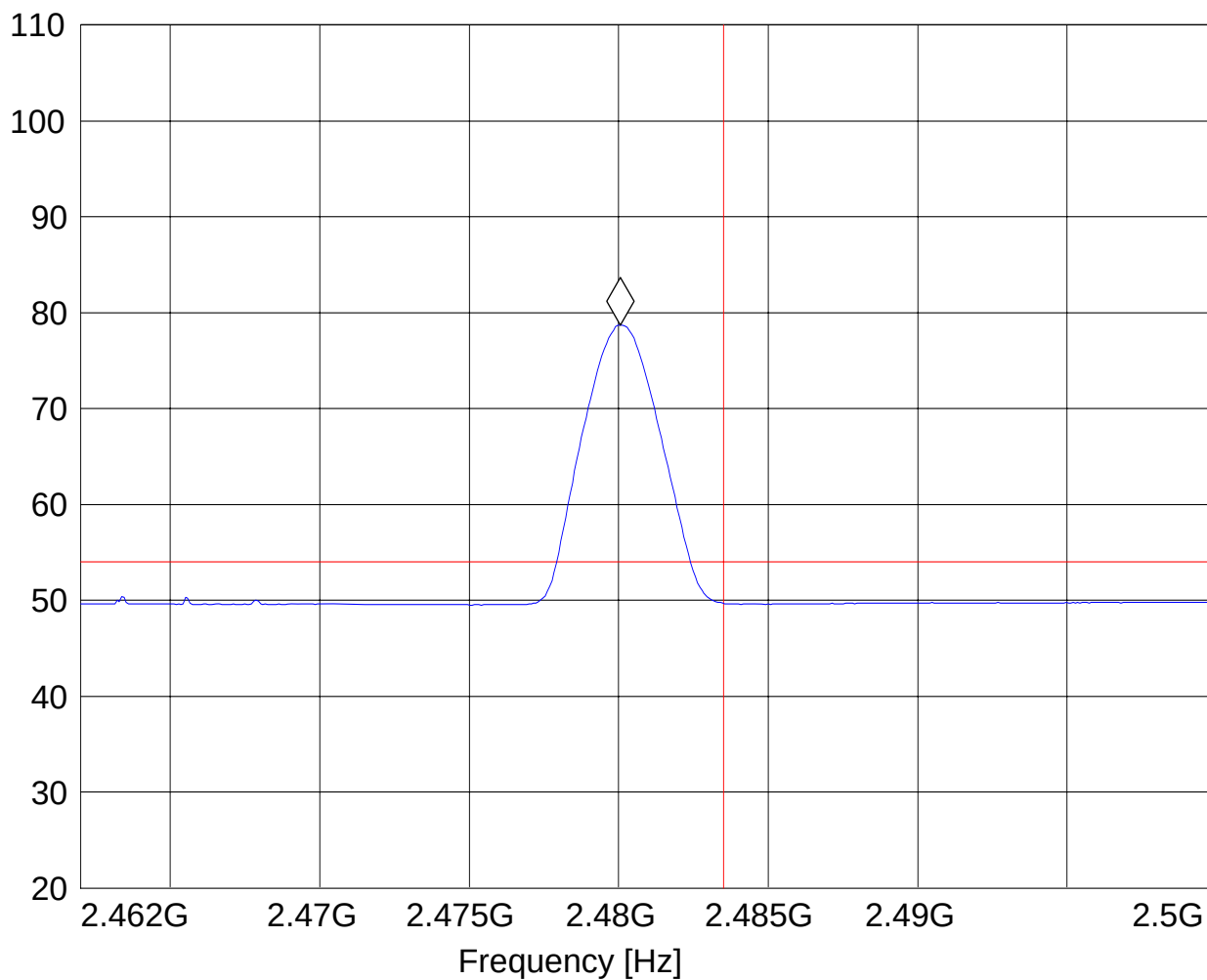
EUT: MX7
Customer: LXE
Test Mode: BT CH 78; Packet type: DH5; Modulation: GFSK
ANT Orientation: V
EUT Orientation: V
Test Engineer: Satya Radhakrishna
Power Supply: AC Adapter
Comments: 360° rotation

SWEEP TABLE: "FCC15.247 HBE_AVG"

Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency		Time	Bandw.	
2.5 GHz	2.5 GHz	MaxPeak	Coupled	1 MHz	#326horn AF horz

Marker: 2.480048096 GHz 78.72 dB μ V/m

Level [dB μ V/m]



5.2.4 RESULTS: 8DPSK

(2402MHz) LOWER BAND EDGE PEAK - 8DPSK MODULATION

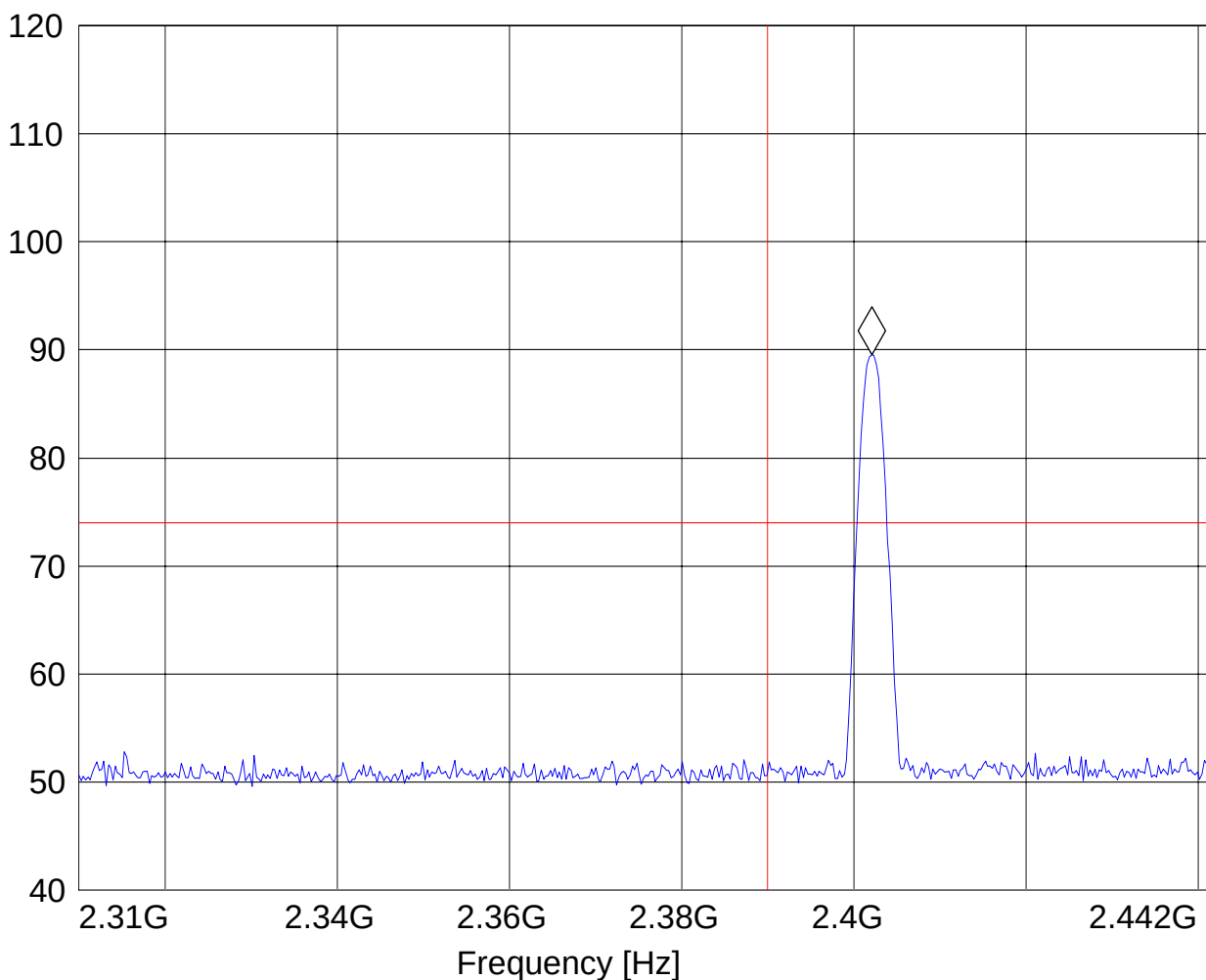
EUT: MX7
Customer: LXE
Test Mode: BT CH 0; Packet type: 3-DH5; Modulation: 8DPSK
ANT Orientation: V
EUT Orientation: V
Test Engineer: Satya Radhakrishna
Power Supply: AC Adapter
Comments: 360° rotation

SWEEP TABLE: "FCC15.247 LBE_PK"

Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency		Time	Bandw.	
2.3 GHz	2.4 GHz	MaxPeak	Coupled	1 MHz	#326horn AF_vert

Marker: 2.402056112 GHz 89.56 dBμV/m

Level [dBμV/m]



(2402MHz) LOWER BAND EDGE AVERAGE -8DPSK MODULATION



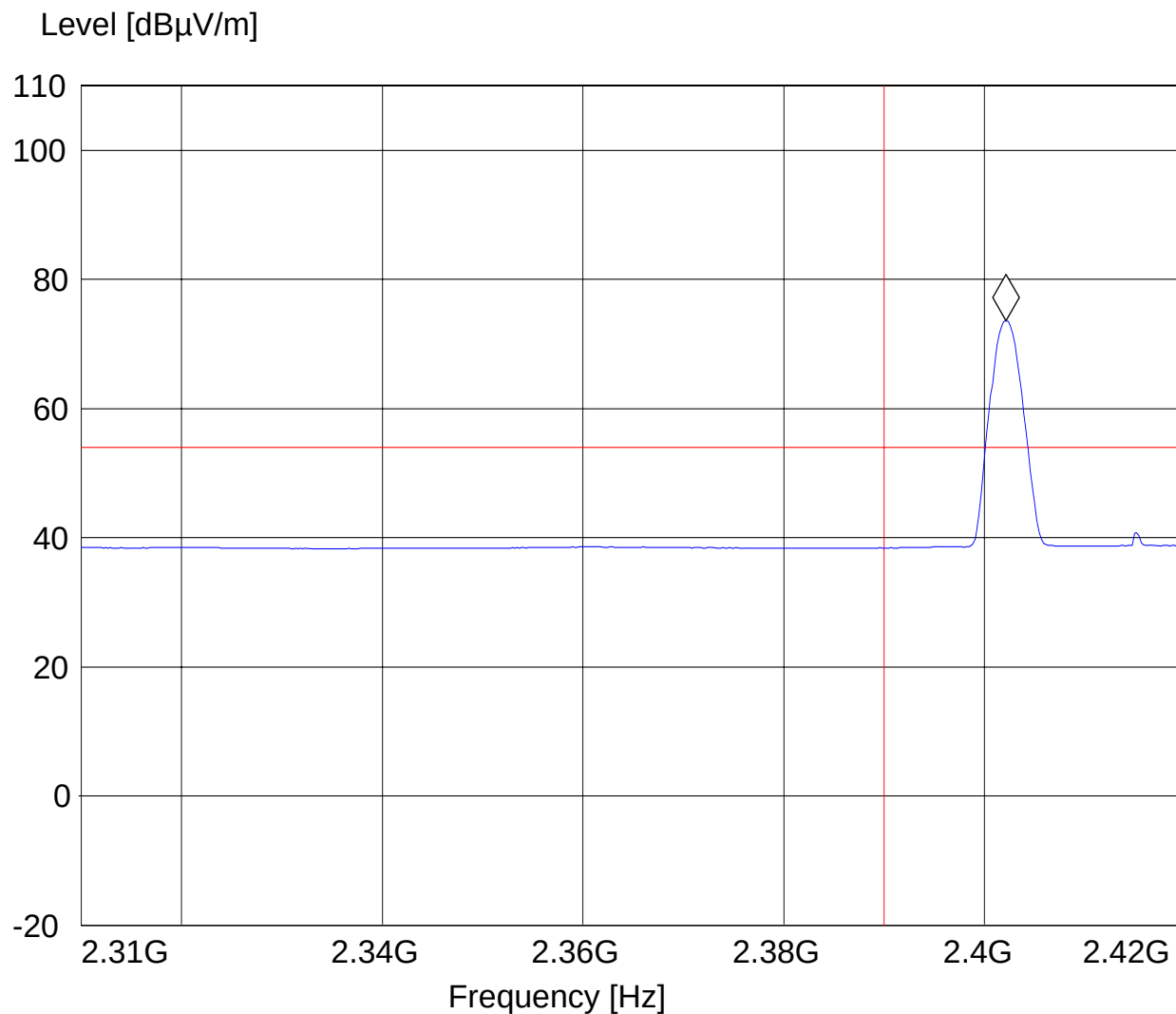
CETECOM Inc., 411 Dixon Landing Road, Milpitas CA 95035, USA

EUT: MX7
Customer: LXE
Test Mode: BT CH 0; Packet type: 3-DH5; Modulation: 8DPSK
ANT Orientation: V
EUT Orientation: V
Test Engineer: Satya Radhakrishna
Power Supply:: AC Adapter
Comments: 360° rotation

SWEEP TABLE: "FCC15.247 LBE_AVG"

Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency		Time	Bandw.	
2.3 GHz	2.4 GHz	MaxPeak	Coupled	1 MHz	#326horn AF vert

Marker: 2.402144289 GHz 73.58 dBμV/m



RESULTS (2480MHz) HIGHER BAND EDGE PEAK - 8DPSK MODULATION

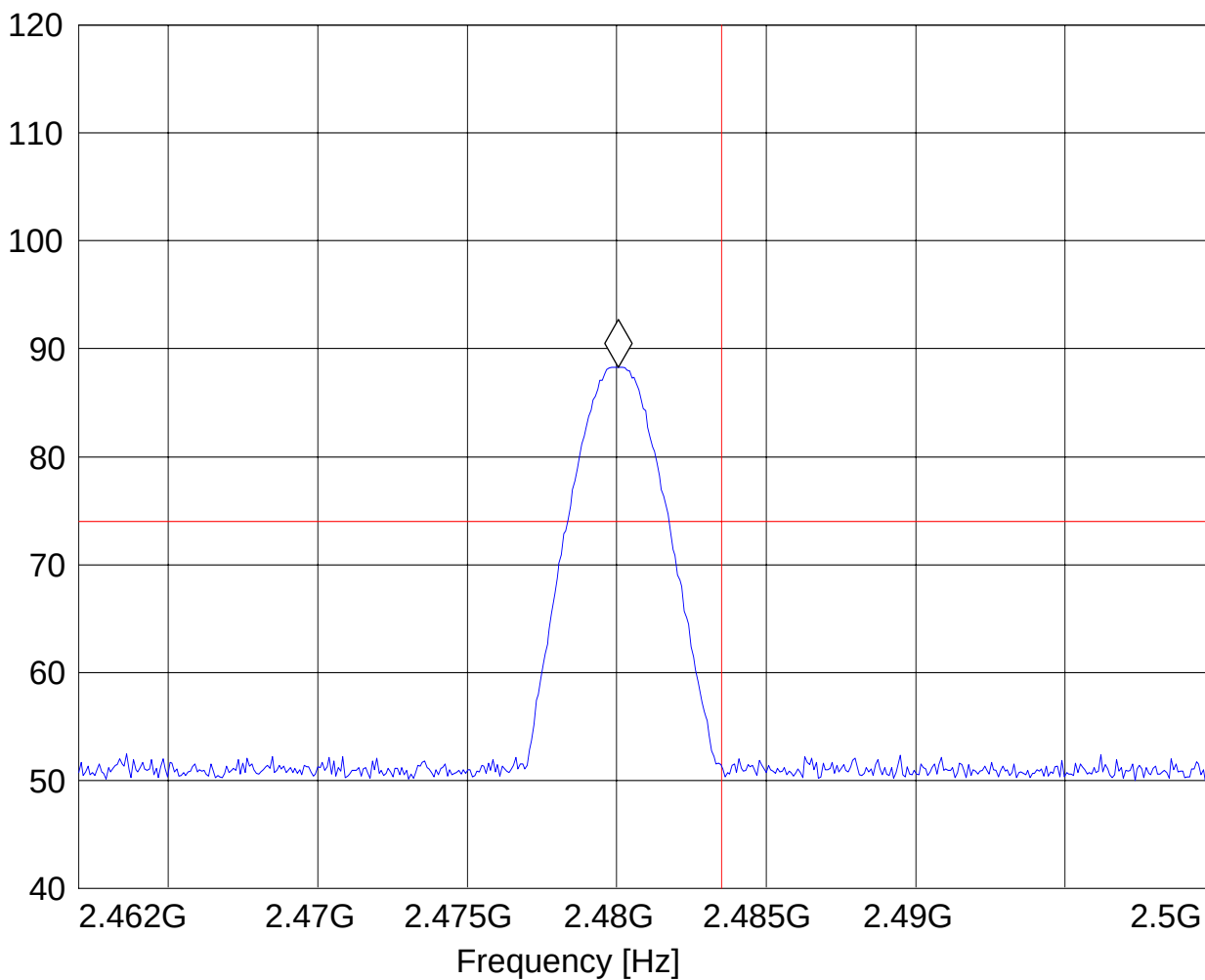
EUT: MX7
Customer: LXE
Test Mode: BT CH 78; Packet type: 3-DH5; Modulation: 8DPSK
ANT Orientation: V
EUT Orientation: V
Test Engineer: Satya Radhakrishna
Power Supply: AC Adapter
Comments: 360° rotation

SWEEP TABLE: "FCC15.247 HBE_PK"

Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency		Time	Bandw.	
2.5 GHz	2.5 GHz	MaxPeak	Coupled	1 MHz	#326horn AF vert

Marker: 2.480048096 GHz 88.26 dBμV/m

Level [dBμV/m]



HIGHER BAND EDGE AVERAGE-8DPSK MODULATION

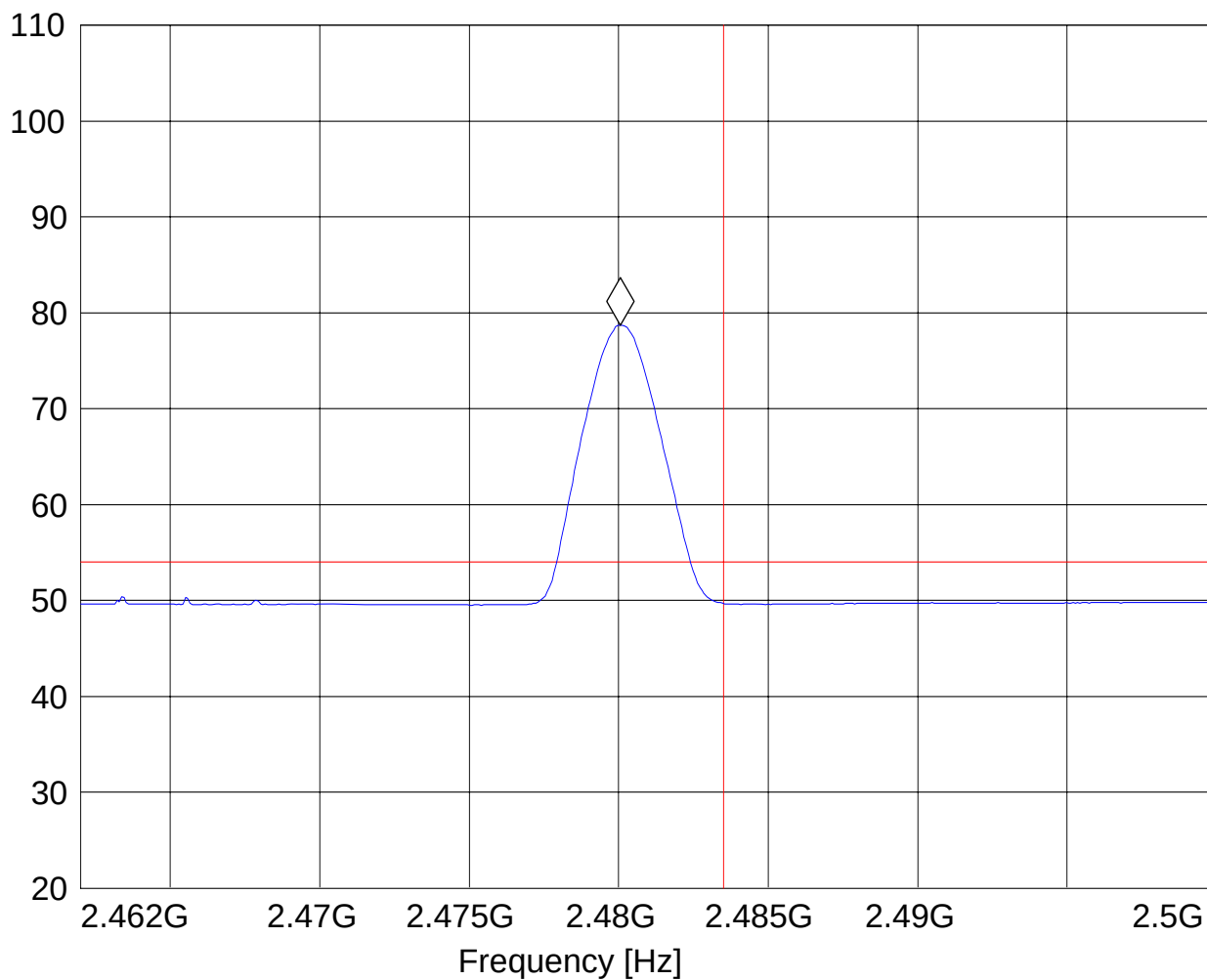
EUT: MX7
Customer: LXE
Test Mode: BT CH 78; Packet type: DH5; Modulation: GFSK
ANT Orientation: V
EUT Orientation: V
Test Engineer: Satya Radhakrishna
Power Supply: AC Adapter
Comments: 360° rotation

SWEEP TABLE: "FCC15.247 HBE_AVG"

Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency		Time	Bandw.	
2.5 GHz	2.5 GHz	MaxPeak	Coupled	1 MHz	#326horn AF horz

Marker: 2.480048096 GHz 78.72 dB μ V/m

Level [dB μ V/m]



5.3 TRANSMITTER SPURIOUS EMISSIONS RADIATED § 15.247/15.205/15.209

5.3.1 LIMITS

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)
13.36 - 13.41			

*PEAK LIMIT= 74dBuV/m

*AVG. LIMIT= 54dBuV/m

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 25 GHz very short cable connections to the antenna was used to minimize the noise level.

2. All measurements are done in peak mode using an average limit , unless specified with the 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

5.3.2 RESULTS, MX7

30MHz – 1GHz

Antenna: vertical

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

EUT: Bluetooth module MX7

Customer: LXE

Test Mode: BT, CH 0

ANT Orientation: V

EUT Orientation: V

Test Engineer: Ed

Power Supply: AC Adapter

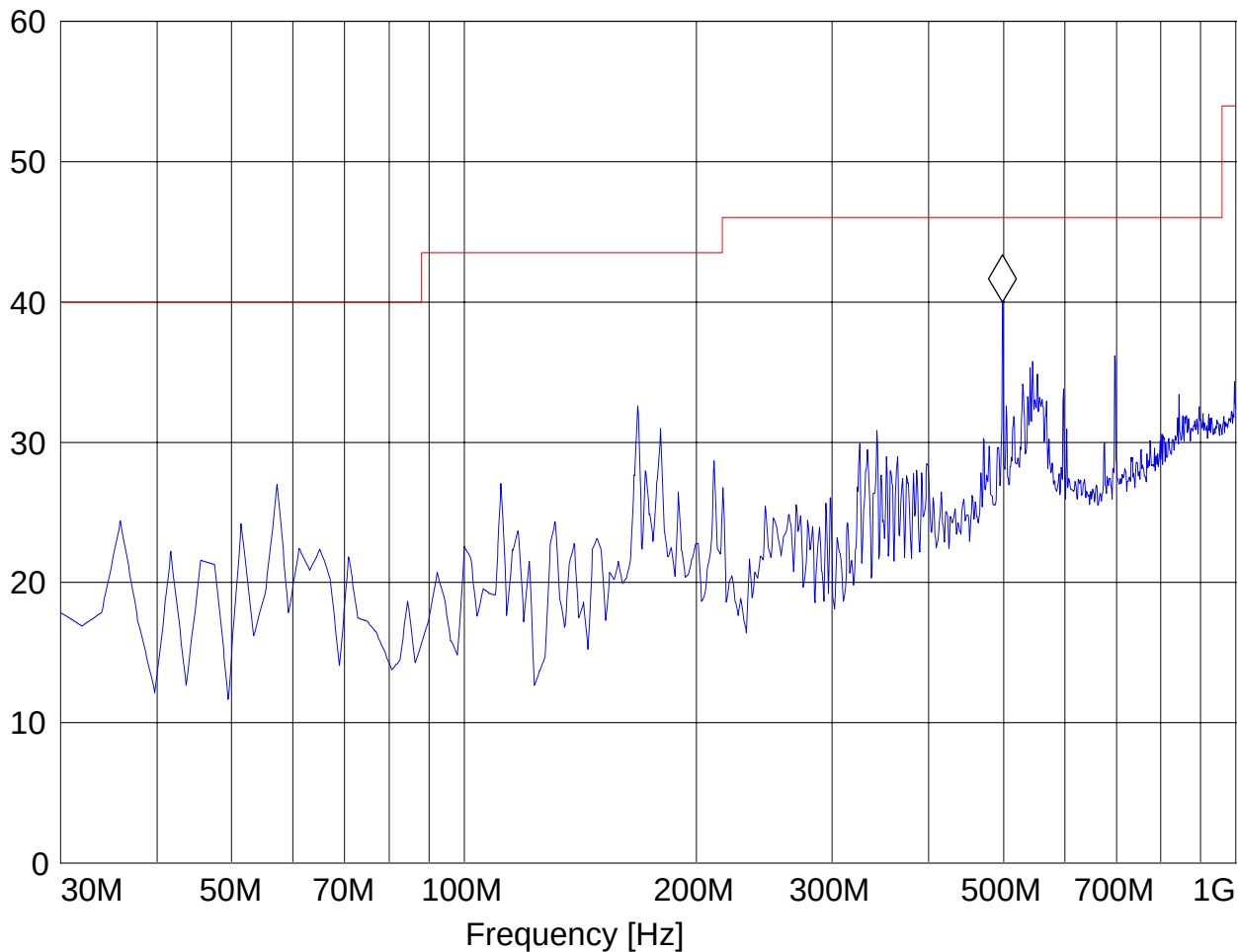
Comments:

SWEEP TABLE: "FCC15.247_30M-1G_Ver"

Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency		Time	Bandw.	
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	3141-#1186 Vert

Marker: 498.476954 MHz 39.97 dBμV/m

Level [dBμV/m]





30MHz – 1GHz

Antenna: horizontal

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

CETECOM Inc., 411 Dixon Landing Road, Milpitas CA 95035, USA

EUT: Bluetooth module MX7

Customer: LXE

Test Mode: BT, CH 39

ANT Orientation: H

EUT Orientation: H

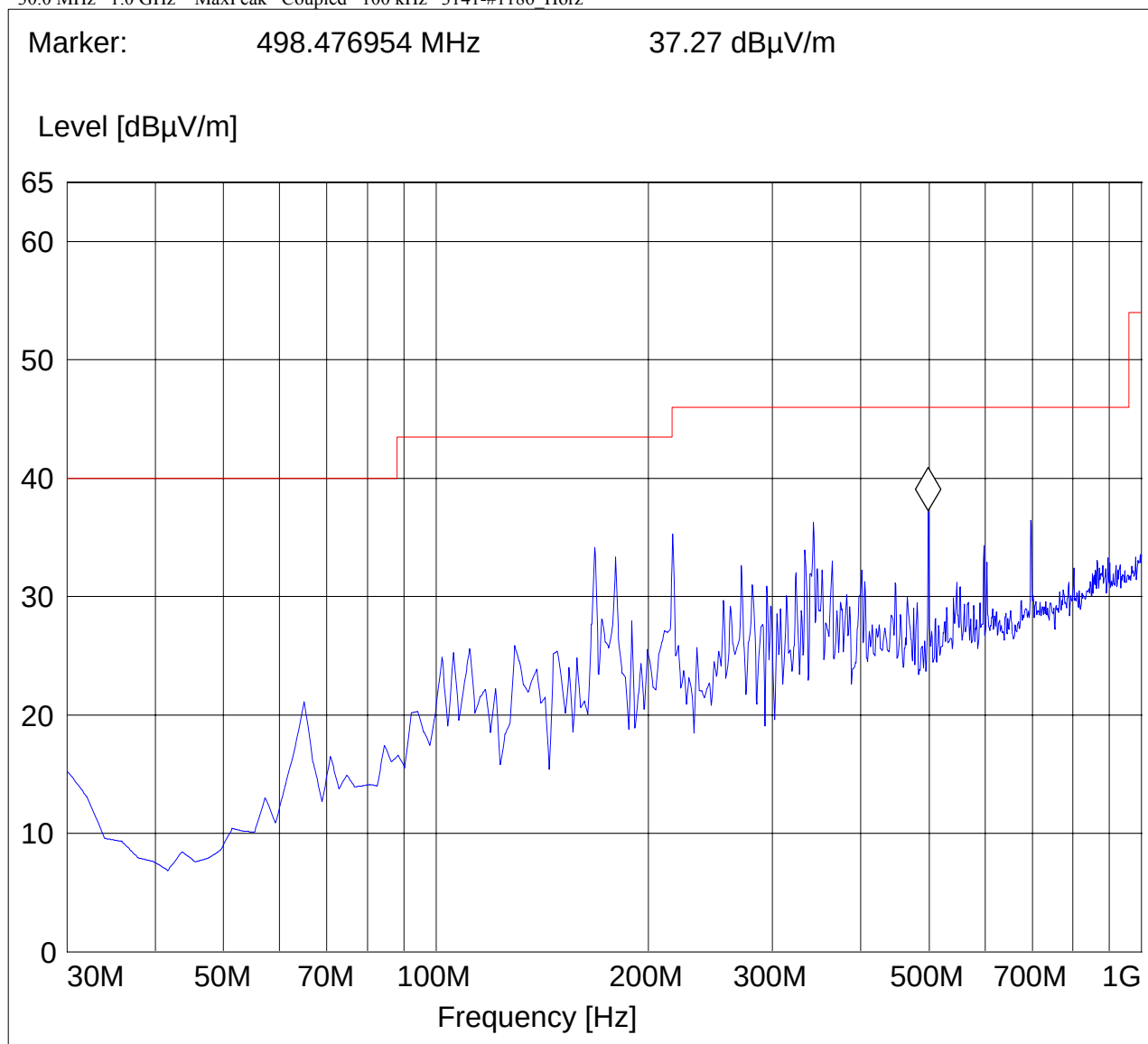
Test Engineer: Ed

Power Supply: AC Adapter

Comments:

SWEEP TABLE: "FCC15.247_30M-1G_Hor"

Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	3141-#1186 Horz





1-3GHz (2402MHz)

Note: The peak above the limit line is the carrier freq.

Note: Peak Reading vs. Average limit

CETECOM Inc., 411 Dixon Landing Road, Milpitas CA 95035, USA

EUT: Bluetooth module MX7

Customer: LXE

Test Mode: BT, CH 0

ANT Orientation: V

EUT Orientation: H

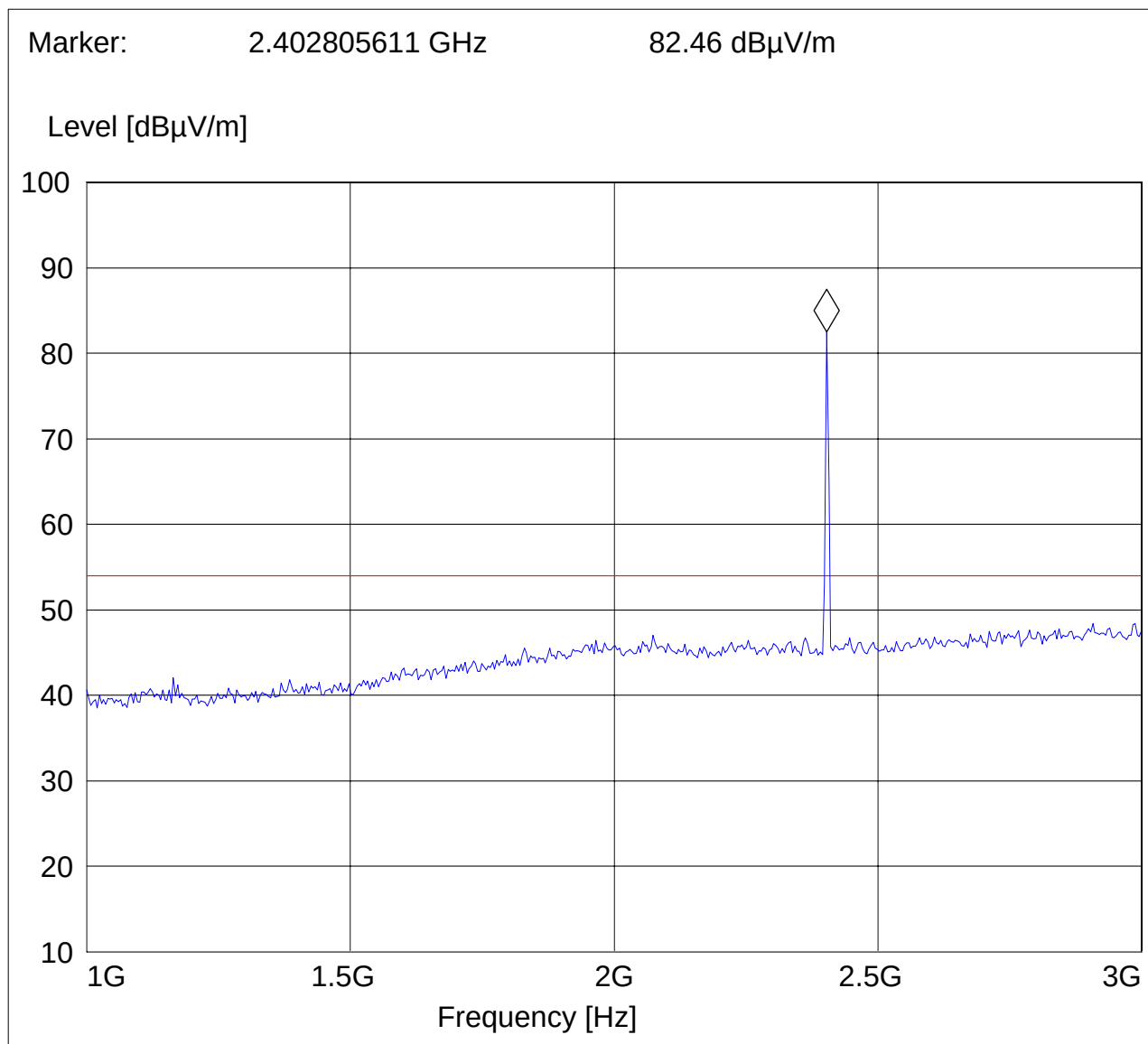
Test Engineer: Ed

Power Supply: AC Adapter

Comments:

SWEEP TABLE: "FCC15.247_1-3G"

Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency		Time	Bandw.	
1.0 GHz	3.0 GHz	MaxPeak	Coupled	1 MHz	#326horn_AF_vert





1-3GHz (2441MHz)

Note: The peaks above the limit line is the carrier freq.

Note: Peak Reading vs. Average limit

CETECOM Inc., 411 Dixon Landing Road, Milpitas CA 95035, USA

EUT: Bluetooth module MX7

Customer: LXE

Test Mode: BT, CH 39

ANT Orientation: V

EUT Orientation: H

Test Engineer: Ed

Power Supply: AC Adapter

Comments:

SWEEP TABLE: "FCC15.247_1-3G"

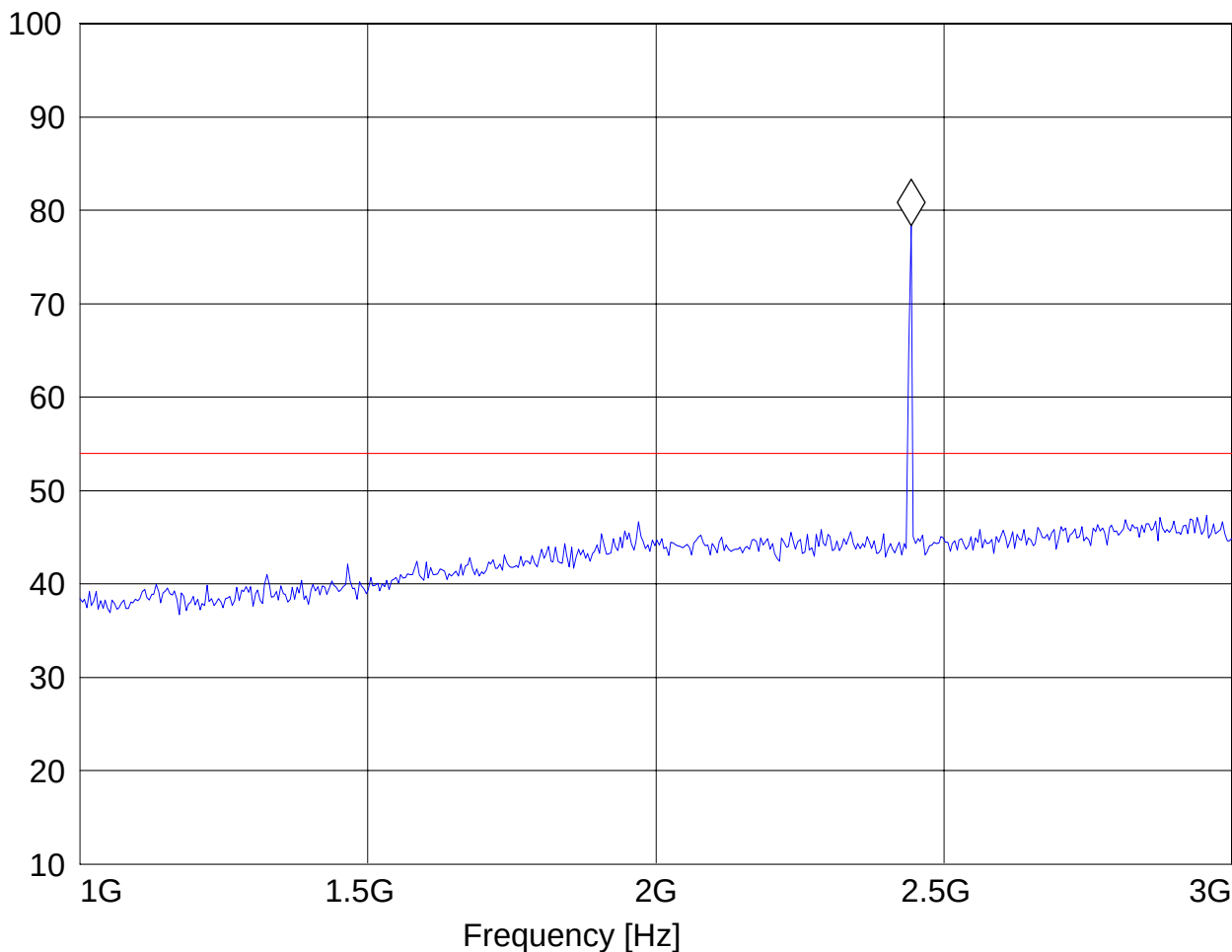
Start Stop Detector Meas. IF Transducer

Frequency Frequency Time Bandw.

1.0 GHz 3.0 GHz MaxPeak Coupled 1 MHz #326horn AF_vert

Marker: 2.442885772 GHz 78.33 dB μ V/m

Level [dB μ V/m]



1-3GHz (2480MHz)

Note: The peaks above the limit line is the carrier freq.

Note: Peak Reading vs. Average limit

CETECOM Inc., 411 Dixon Landing Road, Milpitas CA 95035, USA

EUT: Bluetooth module MX7

Customer: LXE

Test Mode: BT, CH 78

ANT Orientation: V

EUT Orientation: H

Test Engineer: Ed

Power Supply: AC Adapter

Comments:

SWEEP TABLE: "FCC15.247_1-3G"

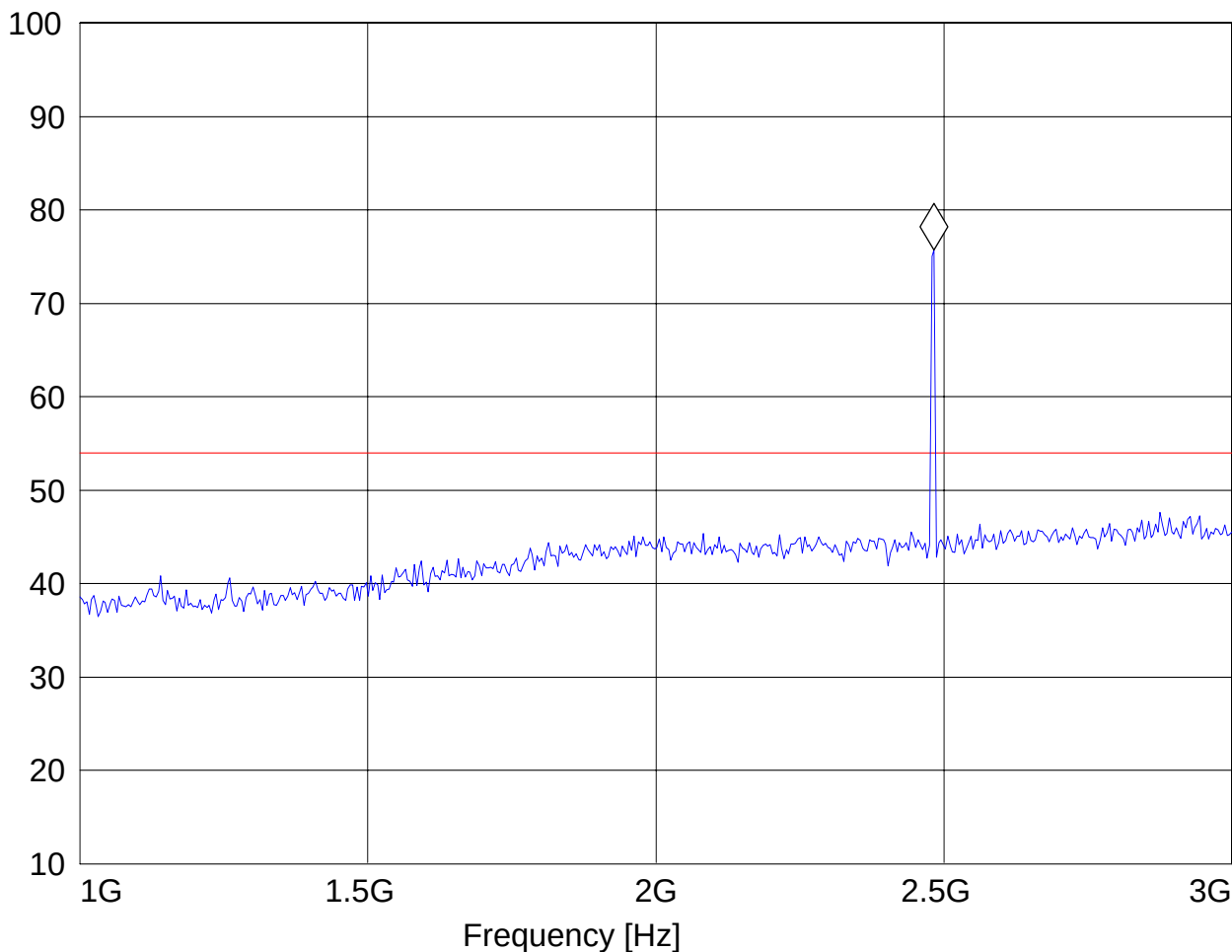
Start Stop Detector Meas. IF Transducer

Frequency Frequency Time Bandw.

1.0 GHz 3.0 GHz MaxPeak Coupled 1 MHz #326horn AF vert

Marker: 2.482965932 GHz 75.71 dBμV/m

Level [dBμV/m]



3-18GHz (2402MHz)

Note: Peak Reading vs. Average limit

CETECOM Inc., 411 Dixon Landing Road, Milpitas CA 95035, USA

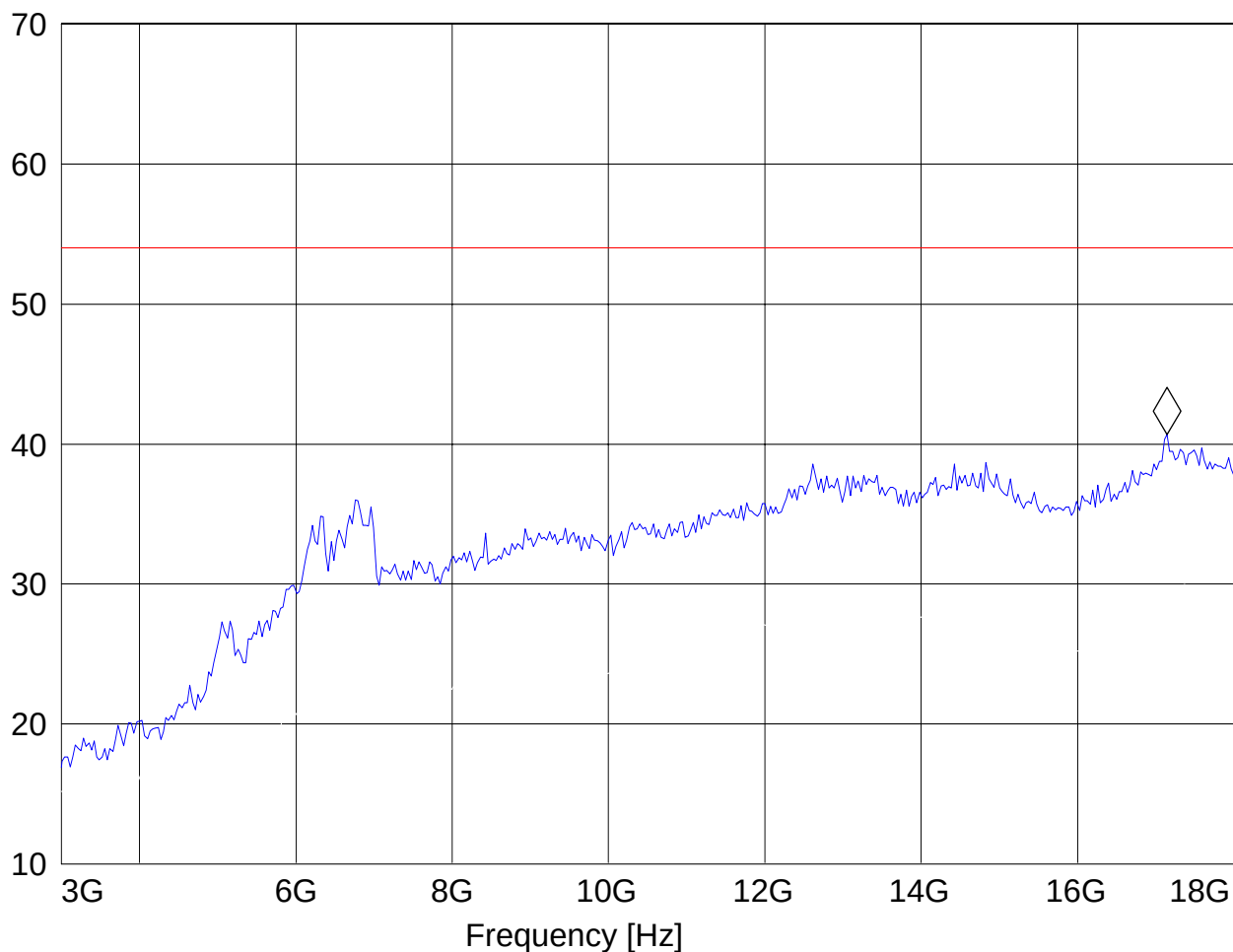
EUT: Bluetooth module MX7
Customer: LXE
Test Mode: BT, CH 0
ANT Orientation: V
EUT Orientation: H
Test Engineer: Ed
Power Supply: AC Adapter
Comments:

SWEEP TABLE: "FCC15.247_3-18G"

Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency		Time	Bandw.	
1.0 GHz	18.0 GHz	MaxPeak	Coupled	1 MHz	#326horn AF vert

Marker: 17.148296593 GHz 40.68 dBμV/m

Level [dBμV/m]



3-18GHz (2441MHz)

Note: Peak Reading vs. Average limit

CETECOM Inc., 411 Dixon Landing Road, Milpitas CA 95035, USA

EUT: Bluetooth module MX7

Customer: LXE

Test Mode: BT, CH 39

ANT Orientation: V

EUT Orientation: H

Test Engineer: Ed

Power Supply: AC Adapter

Comments: **SWEEP TABLE: "FCC15.247_3-18G"**

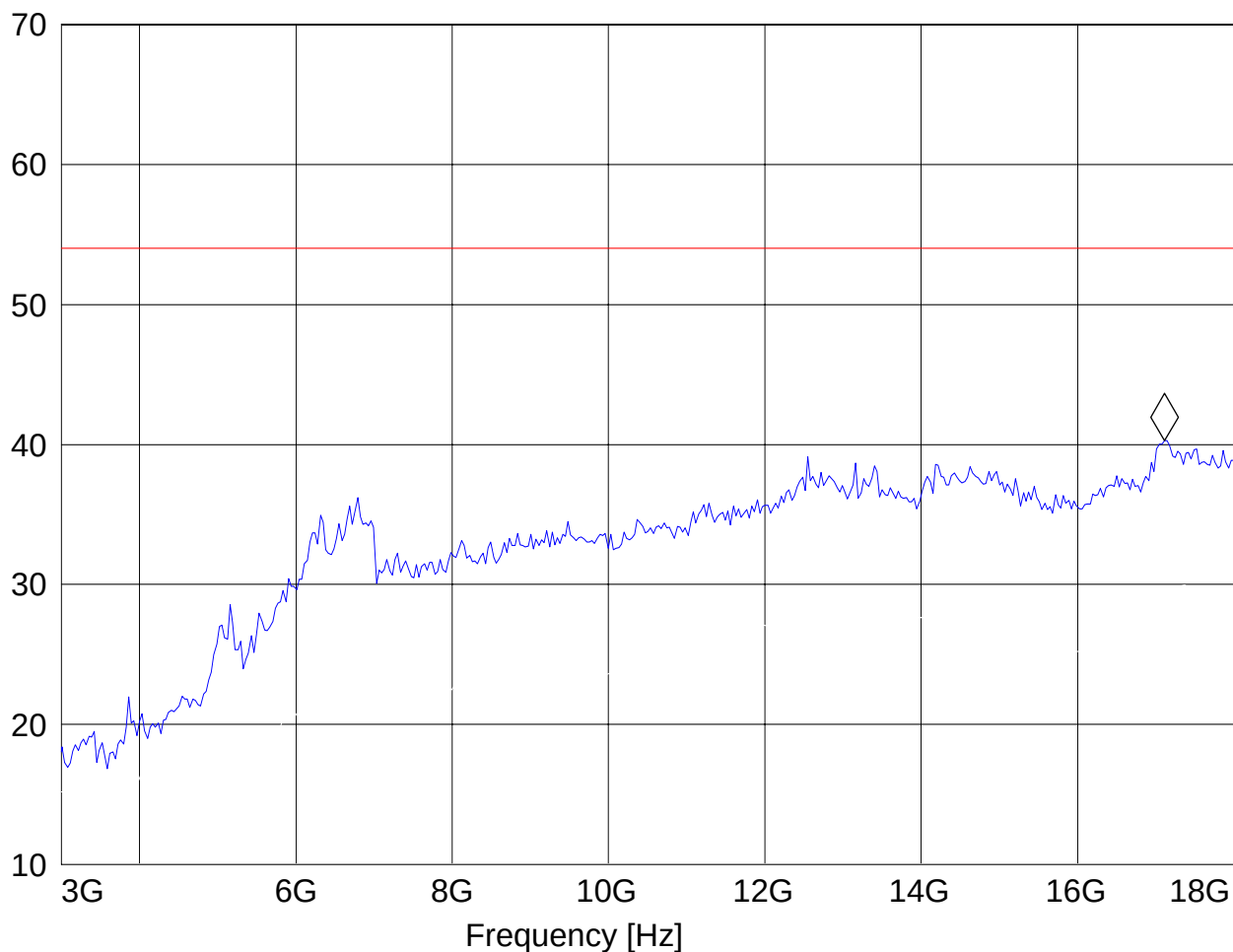
Start Stop Detector Meas. IF Transducer

Frequency Frequency Time Bandw.

1.0 GHz 18.0 GHz MaxPeak Coupled 1 MHz #326horn_AF_vert

Marker: 17.114228457 GHz 40.29 dBμV/m

Level [dBμV/m]



3-18GHz (2480MHz)

Note: Peak Reading vs. Average limit

CETECOM Inc., 411 Dixon Landing Road, Milpitas CA 95035, USA

EUT: Bluetooth module MX7

Customer: LXE

Test Mode: BT, CH 78

ANT Orientation: V

EUT Orientation: H

Test Engineer: Ed

Power Supply: AC Adapter

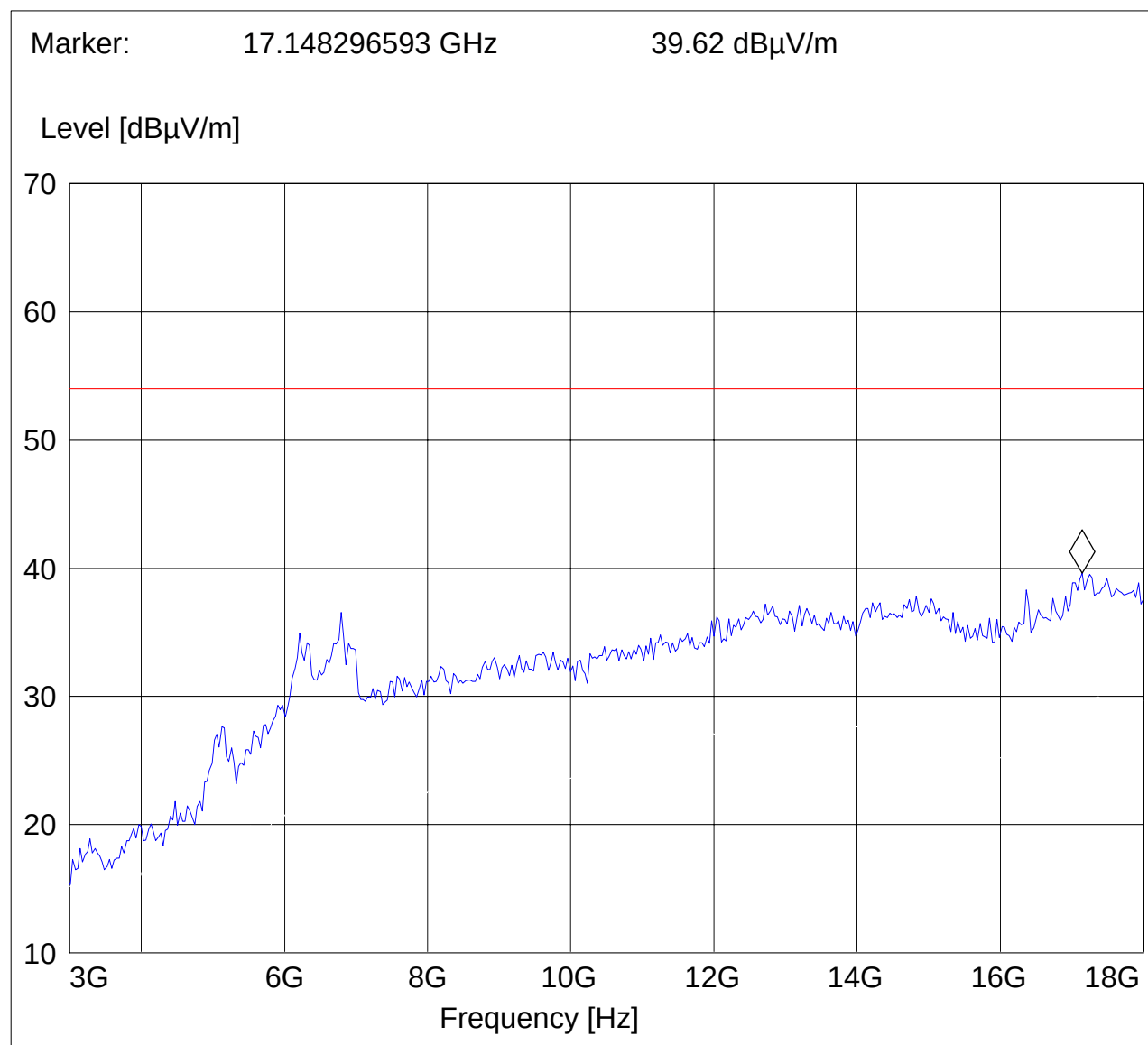
Comments:

SWEEP TABLE: "FCC15.247_3-18G"

Start	Stop	Detector	Meas.	IF	Transducer
-------	------	----------	-------	----	------------

Frequency	Frequency	Time	Bandw.
-----------	-----------	------	--------

1.0 GHz	18.0 GHz	MaxPeak	Coupled 1 MHz #326horn_AF_vert
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18-25GHz

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

Note: Peak Reading vs. Average limit

CETECOM Inc., 411 Dixon Landing Road, Milpitas CA 95035, USA

EUT: Bluetooth module MX7

Customer: LXE

Test Mode: BT, CH 0

ANT Orientation: H

EUT Orientation: H

Test Engineer: Ed

Power Supply: AC Adapter

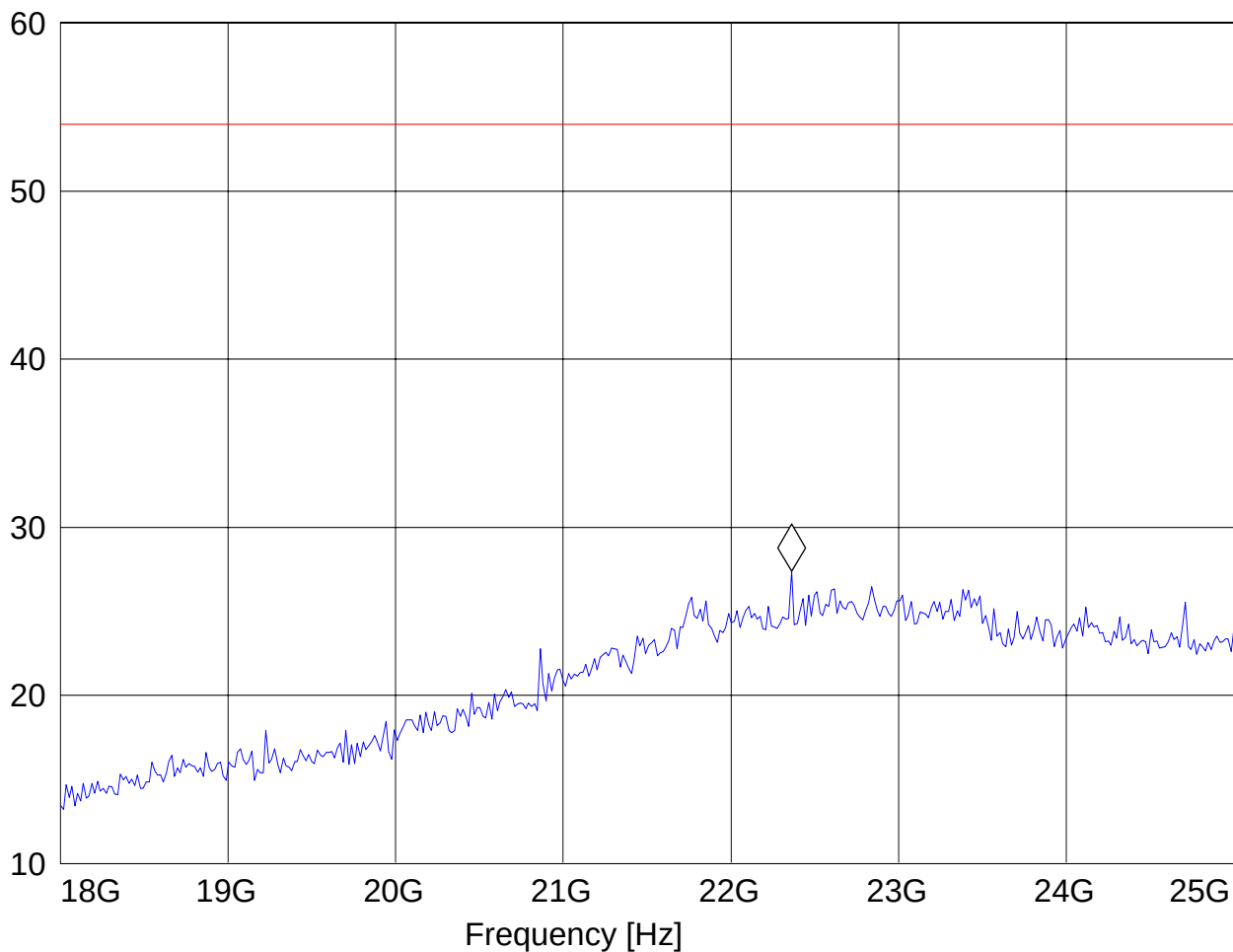
Comments:

SWEEP TABLE: "FCC15.247_18-26.5G"

Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
18.0 GHz	25.0 GHz	MaxPeak	Coupled	1 MHz	#572 horn AF

Marker: 22.360721443 GHz 27.4 dBμV/m

Level [dBμV/m]



5.3.3 RESULTS, HX2

30MHz – 1GHz

Antenna: vertical

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

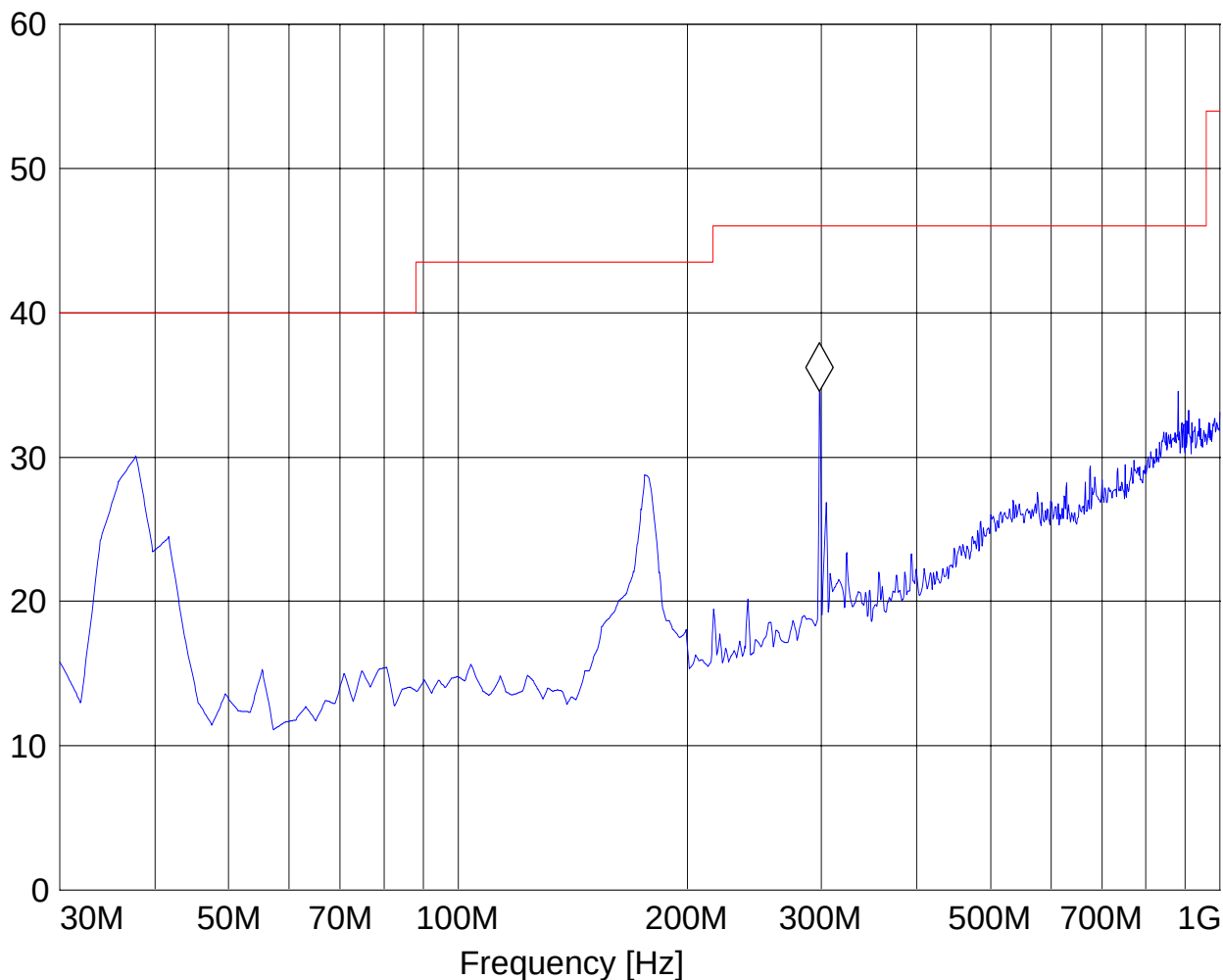
EUT: HX2
Customer: LXE
Test Mode: BT
ANT Orientation: V
EUT Orientation: H
Test Engineer: PETER MU
Power Supply: Battery
Comments:

SWEEP TABLE: "FCC15.247_30M-1G_Ver"

Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency		Time	Bandw.	
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	3141-#1186 Vert

Marker: 298.256513 MHz 34.57 dB μ V/m

Level [dB μ V/m]



30MHz – 1GHz

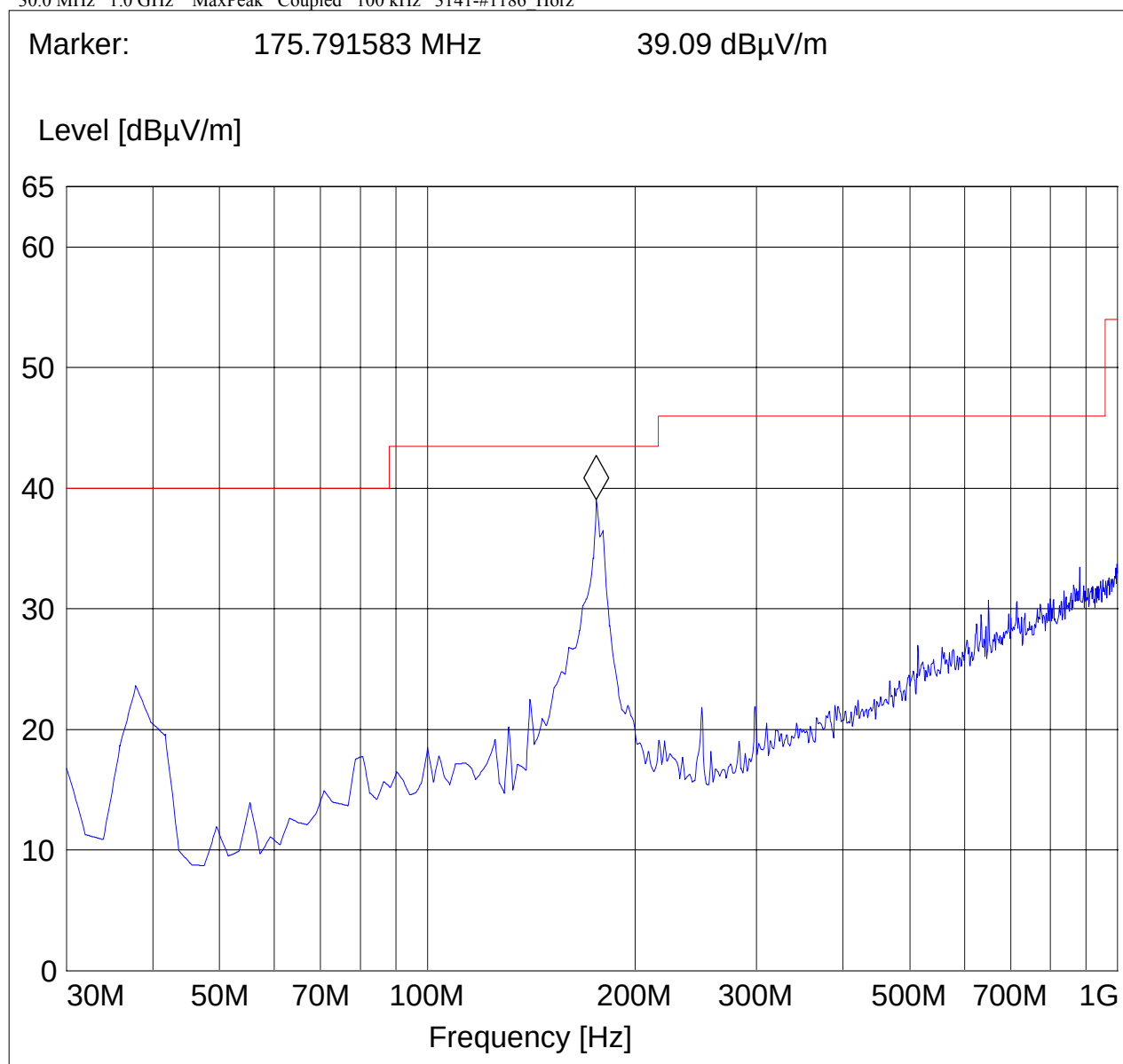
Antenna: horizontal

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

EUT: HX2
Customer: LXE
Test Mode: BT
ANT Orientation: H
EUT Orientation: H
Test Engineer: PETER MU
Power Supply:: Battery
Comments:

SWEEP TABLE: "FCC15.247_30M-1G_Hor"

Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency	Time	Bandw.		
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	3141-#1186 Horz



1-3GHz (2402MHz)

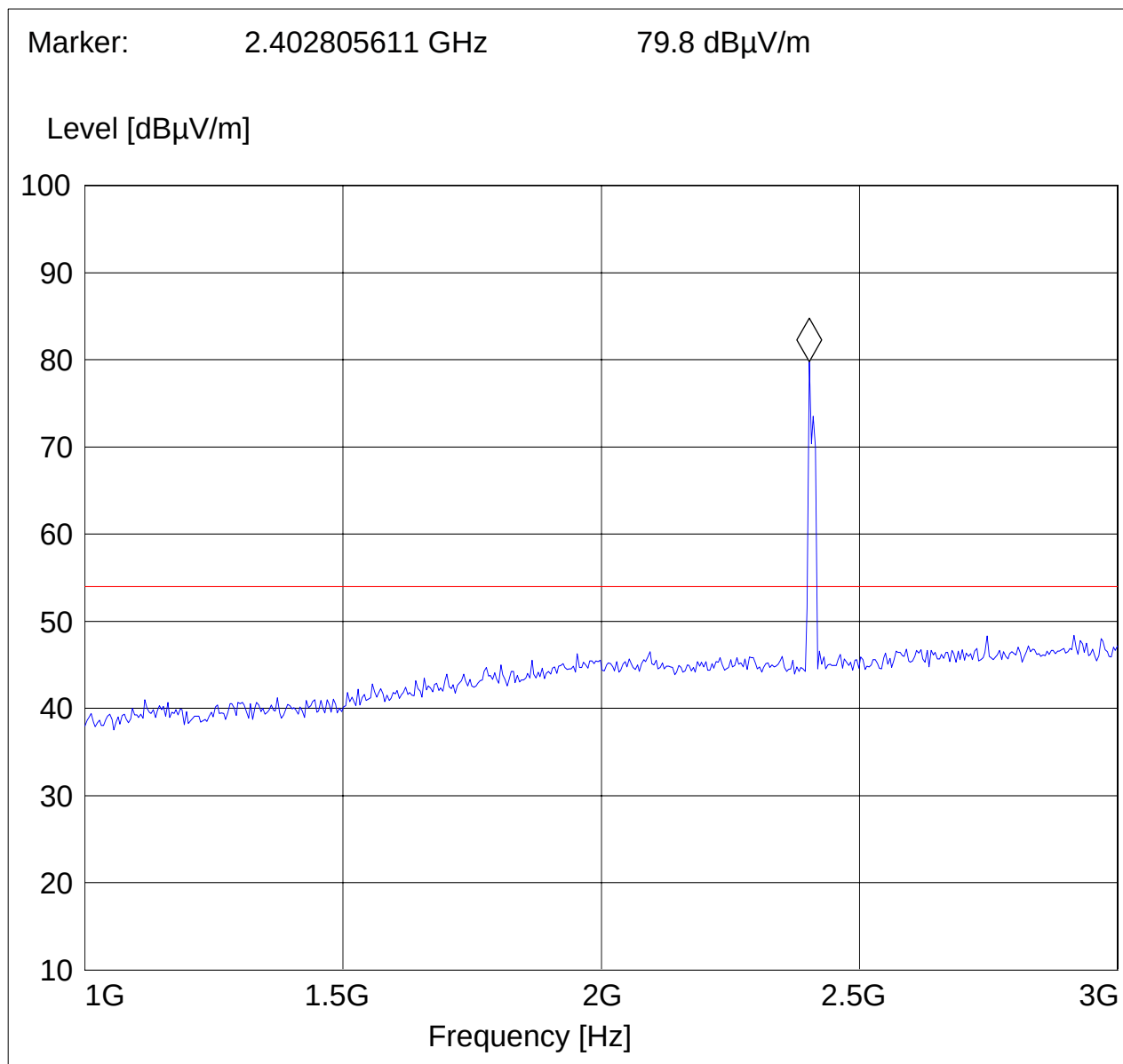
Note: The peak above the limit line is the carrier freq.

Note: Peak Reading vs. Average limit

EUT: HX2
Customer: LXE
Test Mode: BT, ch 0
ANT Orientation: H
EUT Orientation: H
Test Engineer: Ed
Power Supply:: Battery
Comments:

SWEEP TABLE: "FCC15.247_1-3G"

Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency		Time	Bandw.	
1.0 GHz	3.0 GHz	MaxPeak	Coupled	1 MHz	#326horn_AF_vert



1-3GHz (2441MHz)

Note: The peaks above the limit line is the carrier freq.

Note: Peak Reading vs. Average limit

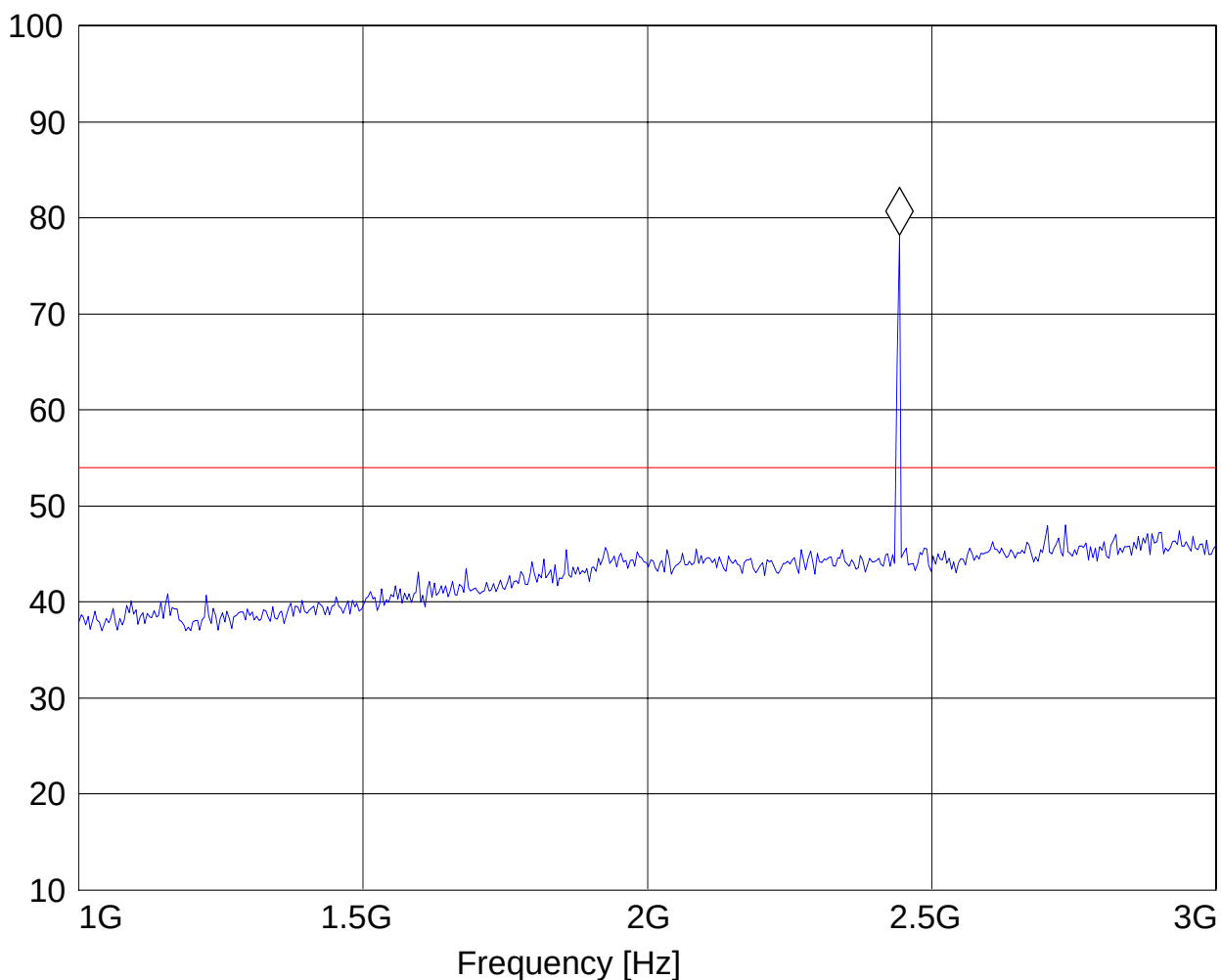
EUT: HX2
Customer: LXE
Test Mode: BT, ch 39
ANT Orientation: H
EUT Orientation: H
Test Engineer: Ed
Power Supply:: Battery
Comments:

SWEEP TABLE: "FCC15.247_1-3G"

Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency		Time	Bandw.	
1.0 GHz	3.0 GHz	MaxPeak	Coupled	1 MHz	#326horn_AF_vert

Marker: 2.442885772 GHz 78.23 dBμV/m

Level [dBμV/m]



1-3GHz (2480MHz)

Note: The peaks above the limit line is the carrier freq.

Note: Peak Reading vs. Average limit

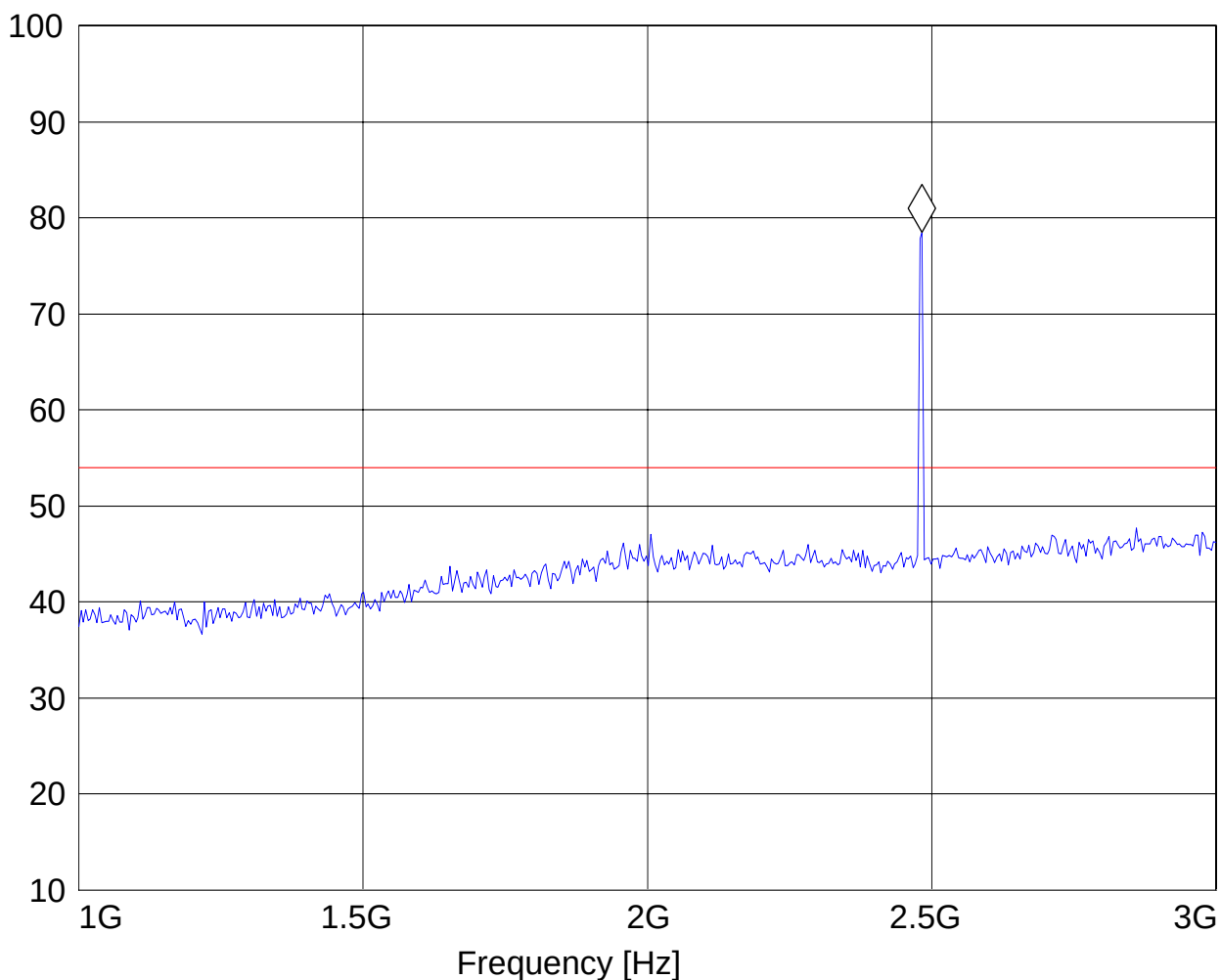
EUT: HX2
Customer: LXE
Test Mode: BT, ch 78
ANT Orientation: H
EUT Orientation: H
Test Engineer: Ed
Power Supply:: Battery
Comments:

SWEEP TABLE: "FCC15.247_1-3G"

Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency		Time	Bandw.	
1.0 GHz	3.0 GHz	MaxPeak	Coupled	1 MHz	#326horn_AF_vert

Marker: 2.482965932 GHz 78.5 dBμV/m

Level [dBμV/m]



3-18GHz (2402MHz)

Note: Peak Reading vs. Average limit

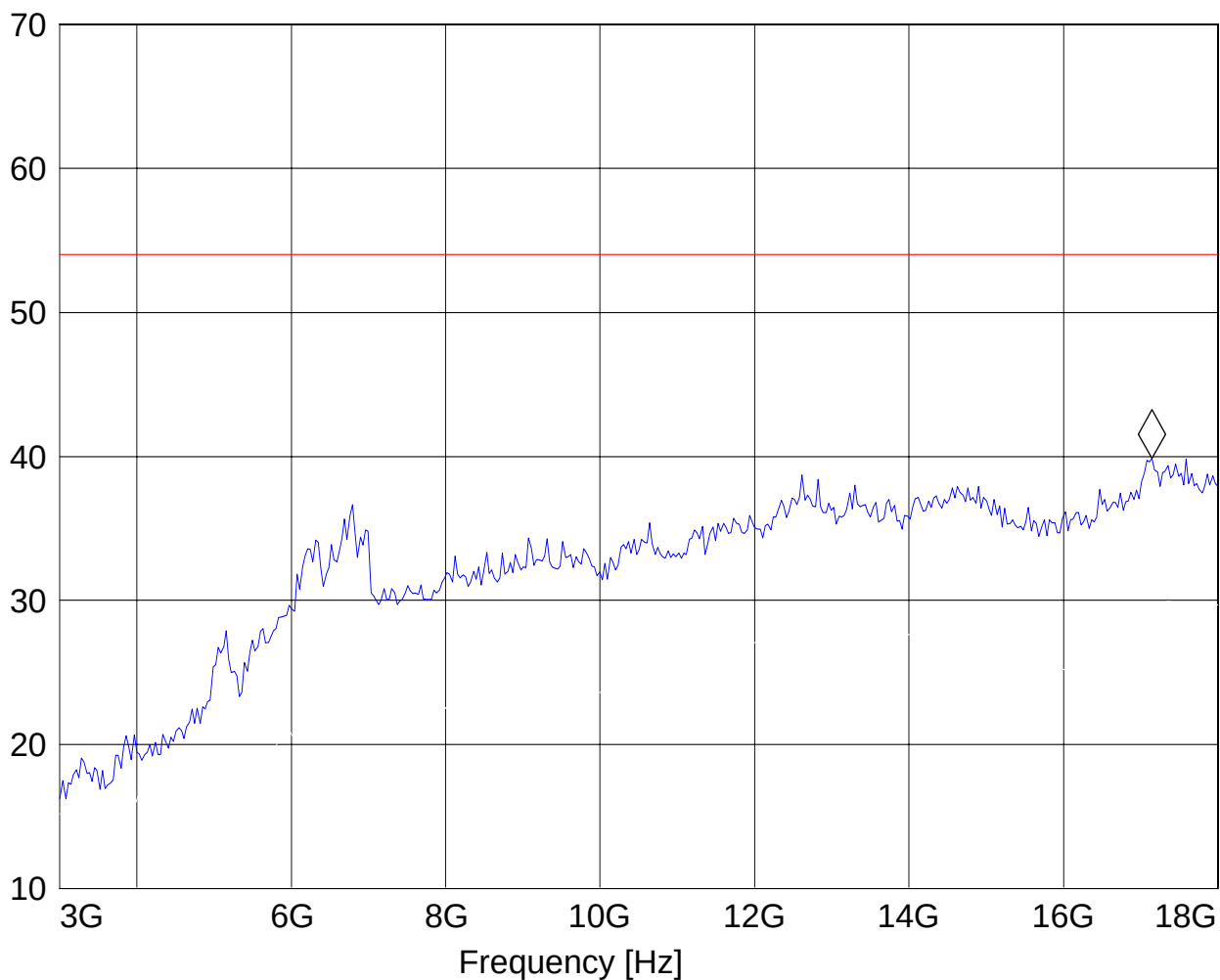
EUT: HX2
Customer: LXE
Test Mode: BT, ch 0
ANT Orientation: H
EUT Orientation: H
Test Engineer: Ed
Power Supply:: Battery
Comments:

SWEEP TABLE: "FCC15.247_3-18G"

Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency		Time	Bandw.	
1.0 GHz	18.0 GHz	MaxPeak	Coupled	1 MHz	#326horn AF vert

Marker: 17.148296593 GHz 39.86 dBμV/m

Level [dBμV/m]



3-18GHz (2441MHz)

Note: Peak Reading vs. Average limit

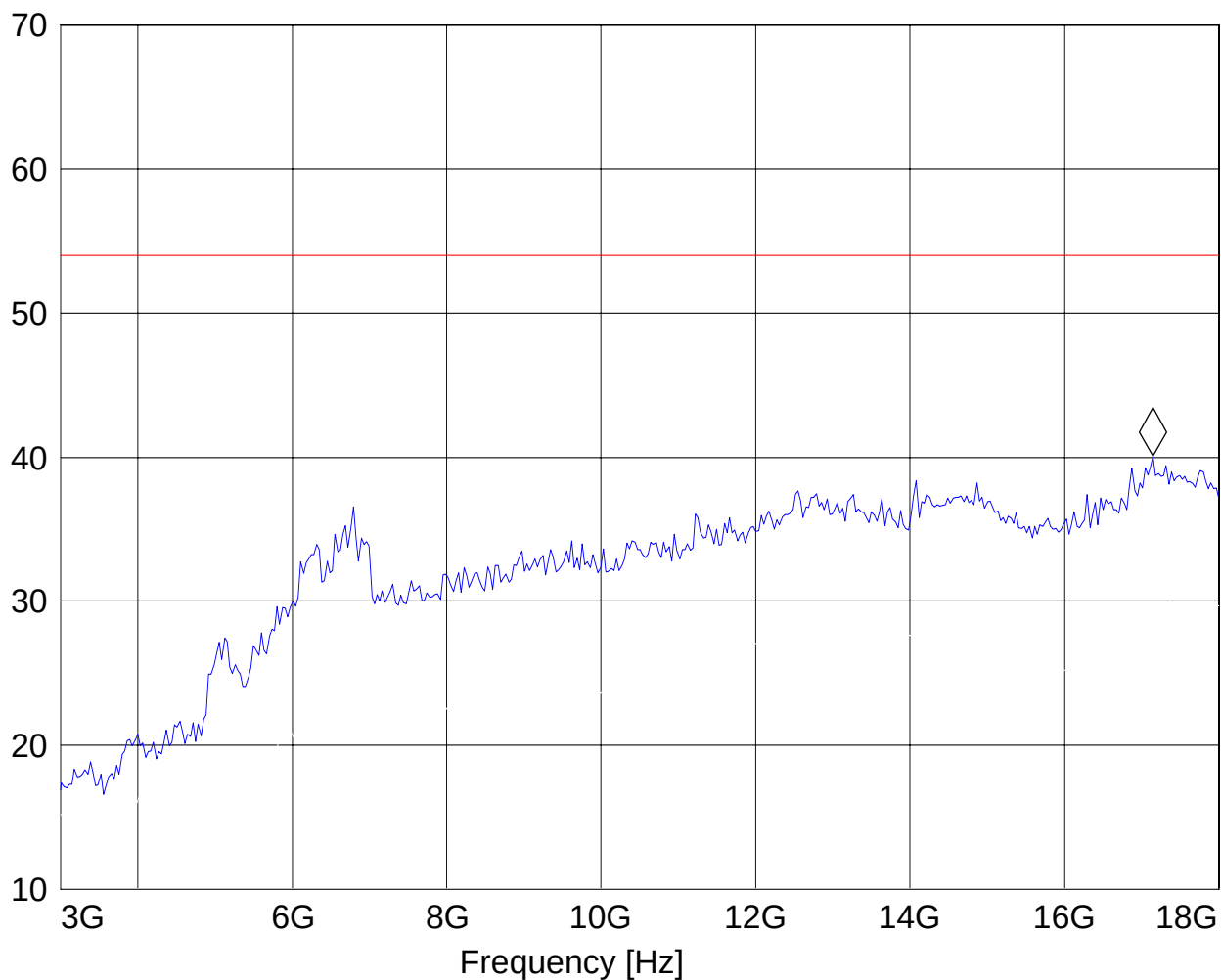
EUT: HX2
Customer: LXE
Test Mode: BT, ch 39
ANT Orientation: H
EUT Orientation: H
Test Engineer: Ed
Power Supply:: Battery
Comments:

SWEEP TABLE: "FCC15.247_3-18G"

Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency		Time	Bandw.	
1.0 GHz	18.0 GHz	MaxPeak	Coupled	1 MHz	#326horn AF_vert

Marker: 17.148296593 GHz 40.06 dBμV/m

Level [dBμV/m]



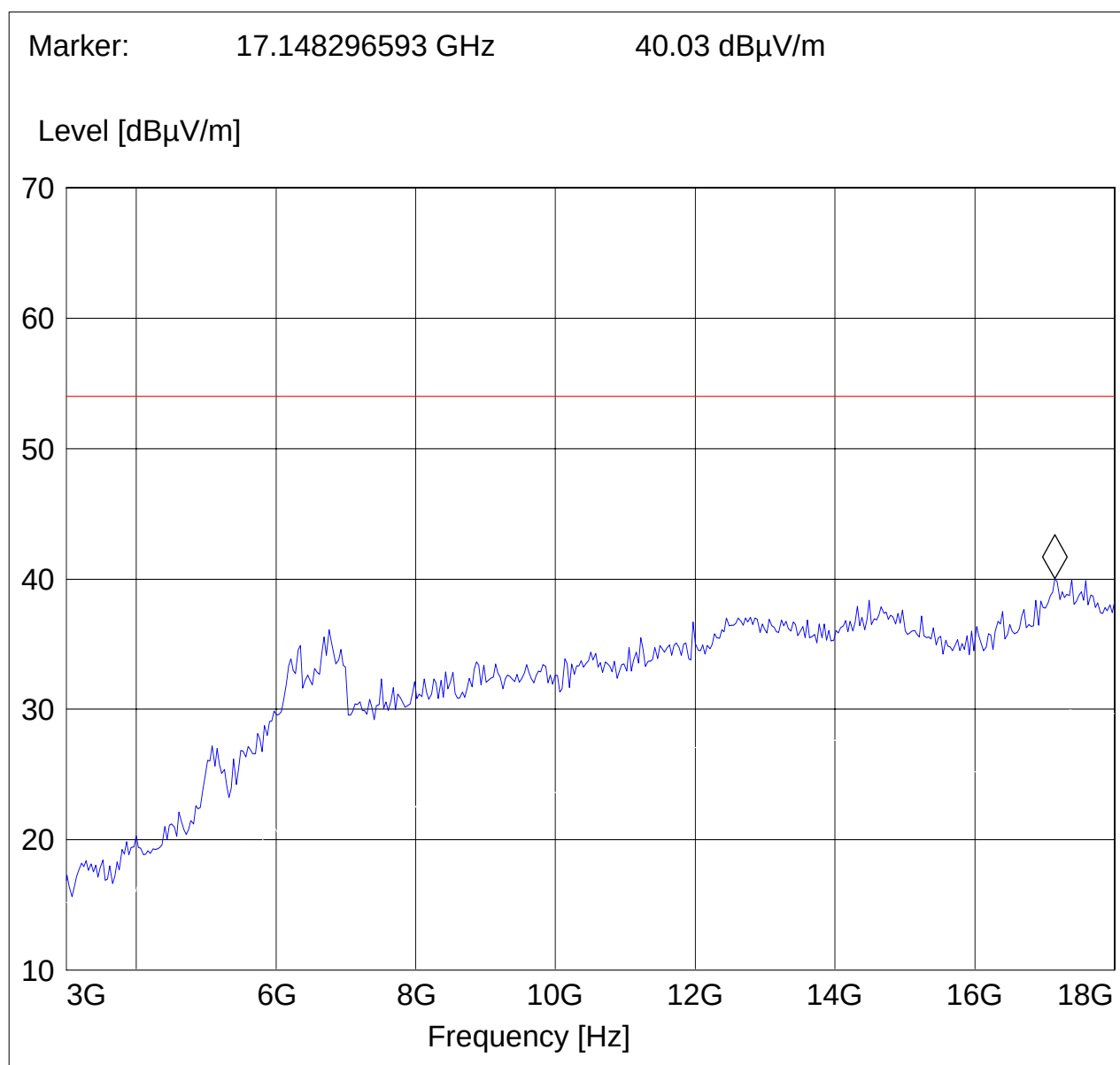
3-18GHz (2480MHz)

Note: Peak Reading vs. Average limit

EUT: HX2
Customer: LXE
Test Mode: BT, ch 78
ANT Orientation: H
EUT Orientation: H
Test Engineer: Ed
Power Supply:: Battery
Comments:

SWEEP TABLE: "FCC15.247_3-18G"

Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency		Time	Bandw.	
1.0 GHz	18.0 GHz	MaxPeak	Coupled	1 MHz	#326horn_AF_vert



18-25GHz

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



Note: Peak Reading vs. Average limit

CETECOM Inc., 411 Dixon Landing Road, Milpitas CA 95035, USA

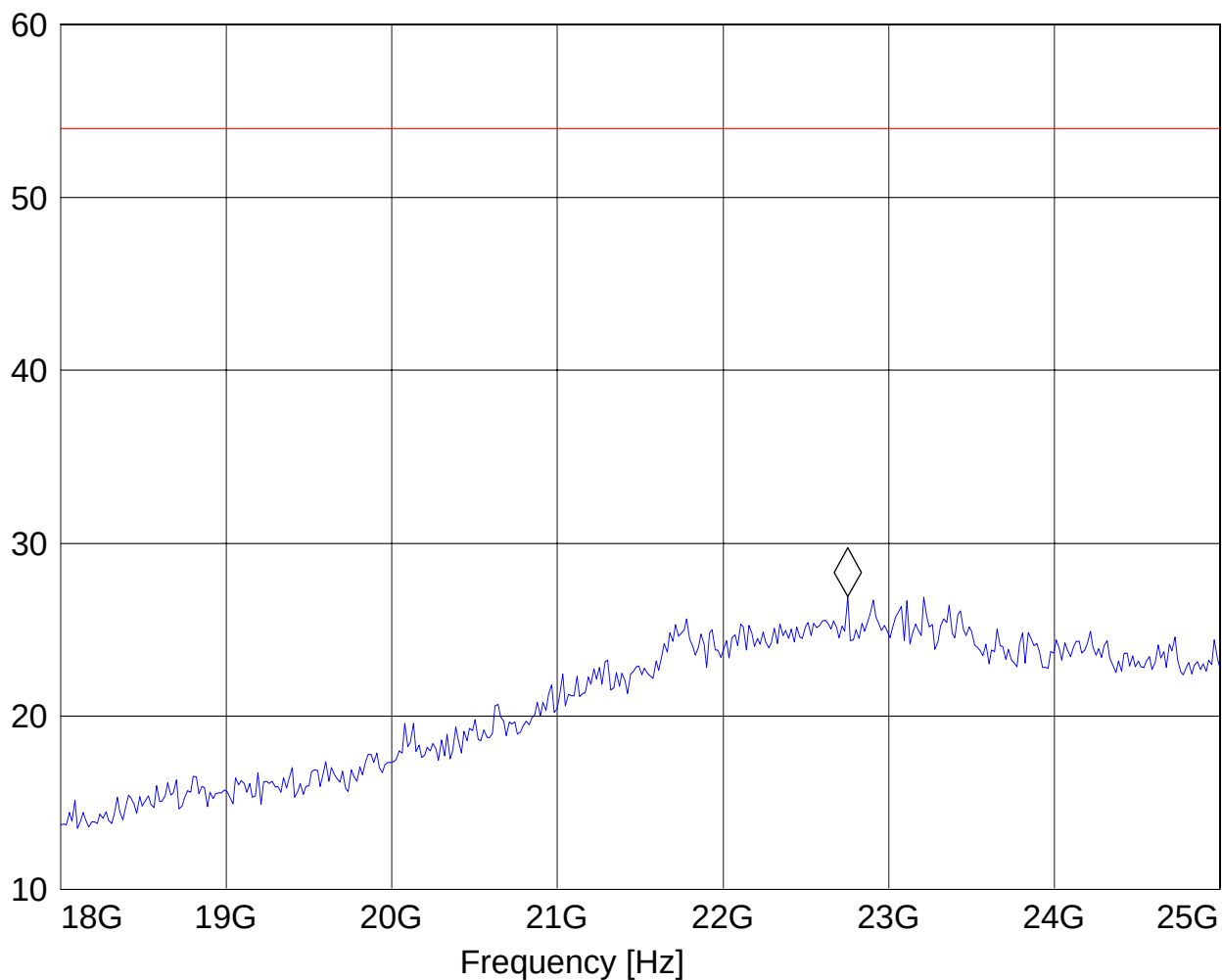
EUT: HX2
Customer: LXE
Test Mode: BT, ch 39
ANT Orientation: V
EUT Orientation: H
Test Engineer: Ed
Power Supply:: Battery
Comments:

SWEEP TABLE: "FCC15.247_18-26.5G"

Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency		Time	Bandw.	
18.0 GHz	25.0 GHz	MaxPeak	Coupled	1 MHz	#572 horn AF

Marker: 22.75250501 GHz 26.94 dBμV/m

Level [dBμV/m]



6 Measurements (Conducted)

6.1 MAXIMUM PEAK OUTPUT POWER § 15.247 (CONDUCTED)

6.1.1 LIMIT SUB CLAUSE § 15.247 (b) (1)

Frequency range	RF power output
2400-2483.5 MHz	30dBm

*limit is based upon antenna gain of less than or equal to 6dBi.

6.1.2 RESULTS: GFSK

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)		
Frequency (MHz)		2402 MHz	2441 MHz	2480 MHz
T _{nom} (23)°C	V _{nom} VDC	2.83	3.31	2.89

6.1.3 RESULTS: $\pi / 4$ DQPSK

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)		
Frequency (MHz)		2402 MHz	2441 MHz	2480 MHz
T _{nom} (23)°C	V _{nom} VDC	4.47	4.59	4.04

6.1.4 RESULTS: 8DPSK

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)		
Frequency (MHz)		2402 MHz	2441 MHz	2480 MHz
T _{nom} (23)°C	V _{nom} VDC	4.66	4.73	4.19

6.2 20dB BANDWIDTH

6.2.1 LIMIT SUB CLAUSE § 15.247 (a) (1) (i) (ii) (iii)

Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

6.2.2 RESULTS: GFSK

TEST CONDITIONS		BANDWIDTH (KHz)		
Frequency (MHz)		2402 MHz	2441 MHz	2480 MHz
T _{nom} (23)°C	V _{nom} VDC	925.85	921.84	917.84

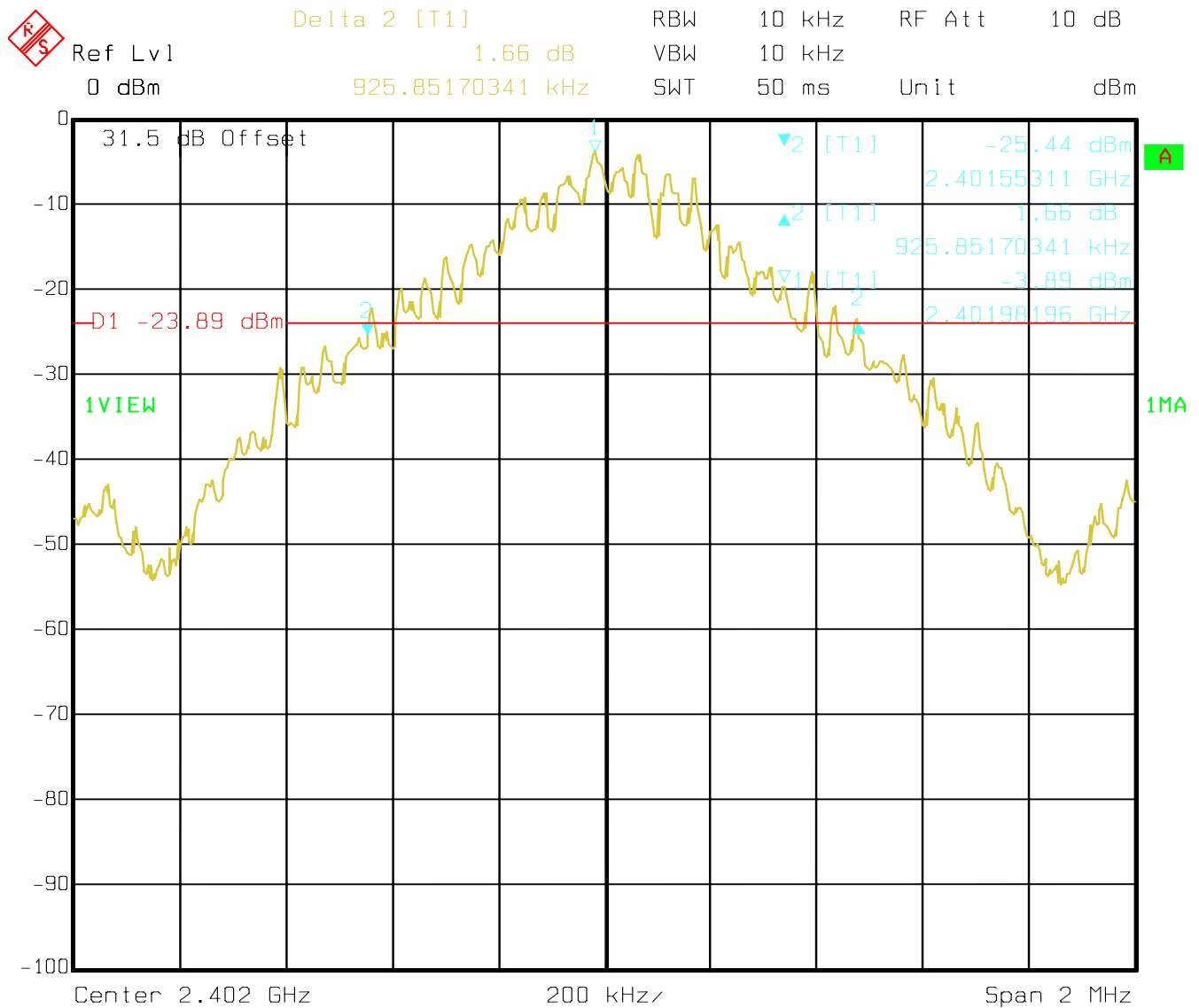
6.2.3 RESULTS: $\pi / 4$ DQPSK

TEST CONDITIONS		BANDWIDTH (KHz)		
Frequency (MHz)		2402 MHz	2441 MHz	2480 MHz
T _{nom} (23)°C	V _{nom} VDC	1318.64	1326.65	1326.65

6.2.4 RESULTS: 8DPSK

TEST CONDITIONS		BANDWIDTH (KHz)		
Frequency (MHz)		2402 MHz	2441 MHz	2480 MHz
T _{nom} (23)°C	V _{nom} VDC	1294.59	1298.60	1302.61

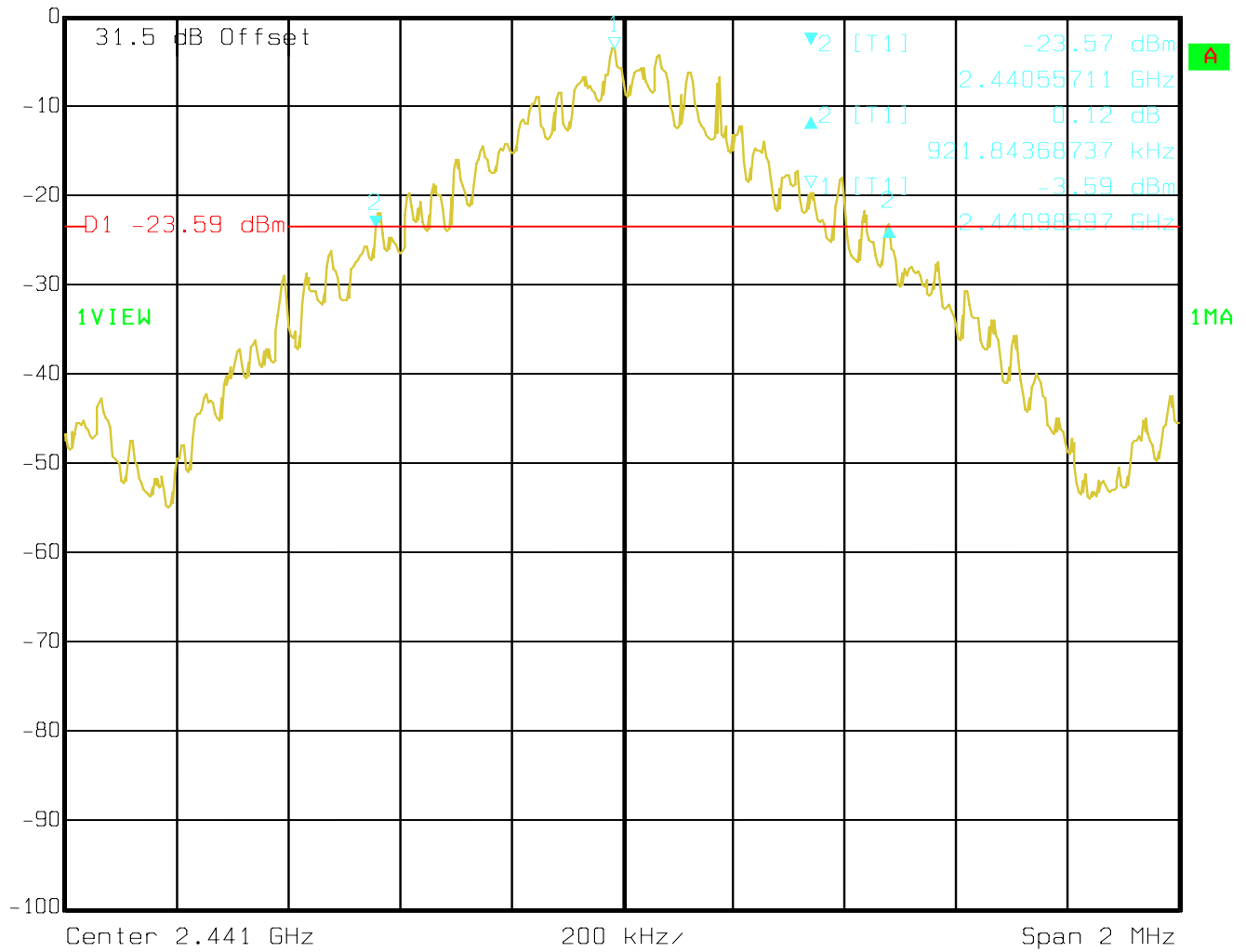
(2402 MHz) GFSK



Date: 27.APR.2007 17:02:36

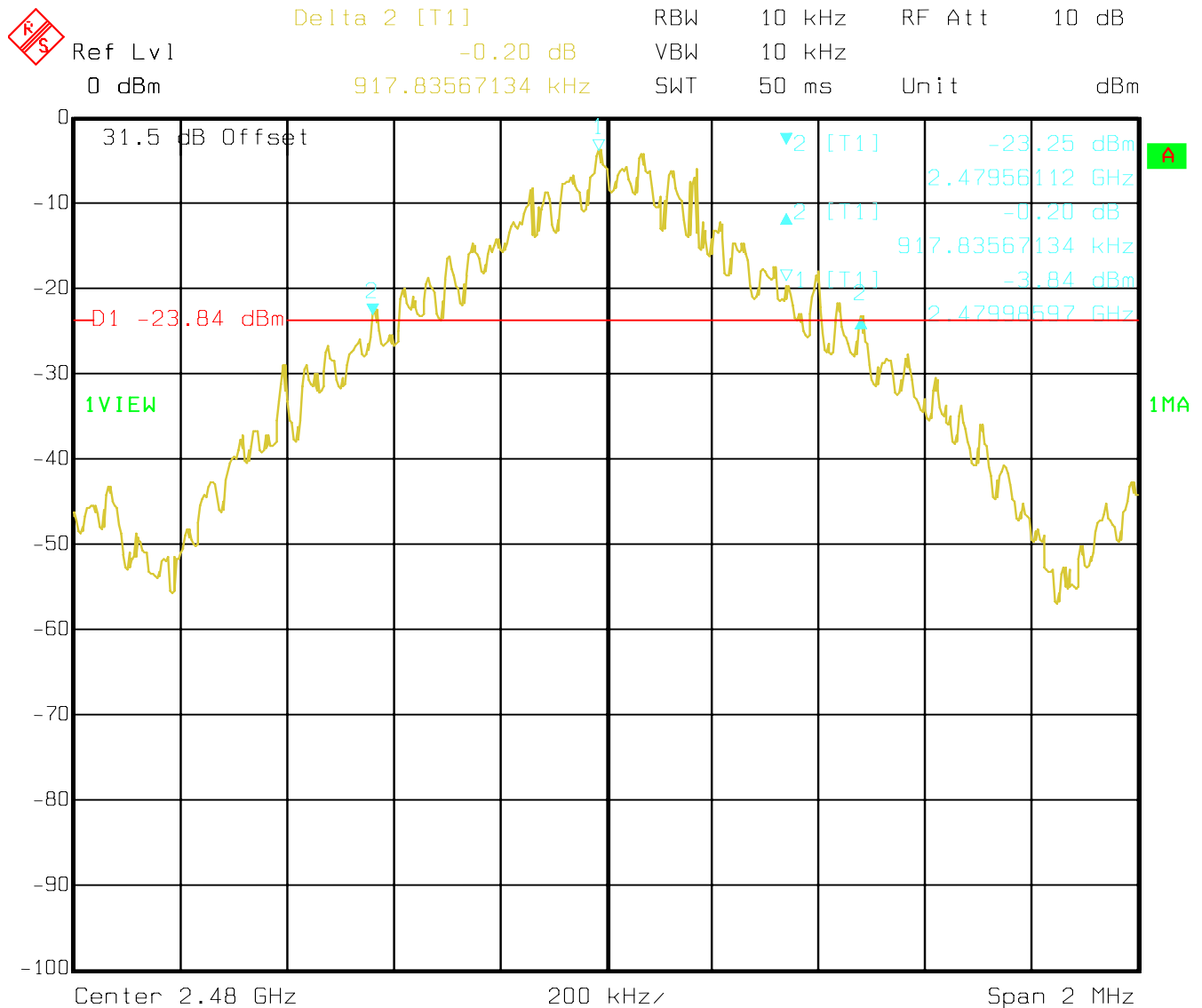
(2441 MHz) GFSK


 Ref Lvl 0 dBm
 Delta 2 [T1] 0.12 dB
 RBW 10 kHz
 VBW 10 kHz
 RF Att 10 dB
 921.84368737 kHz
 SWT 50 ms
 Unit dBm



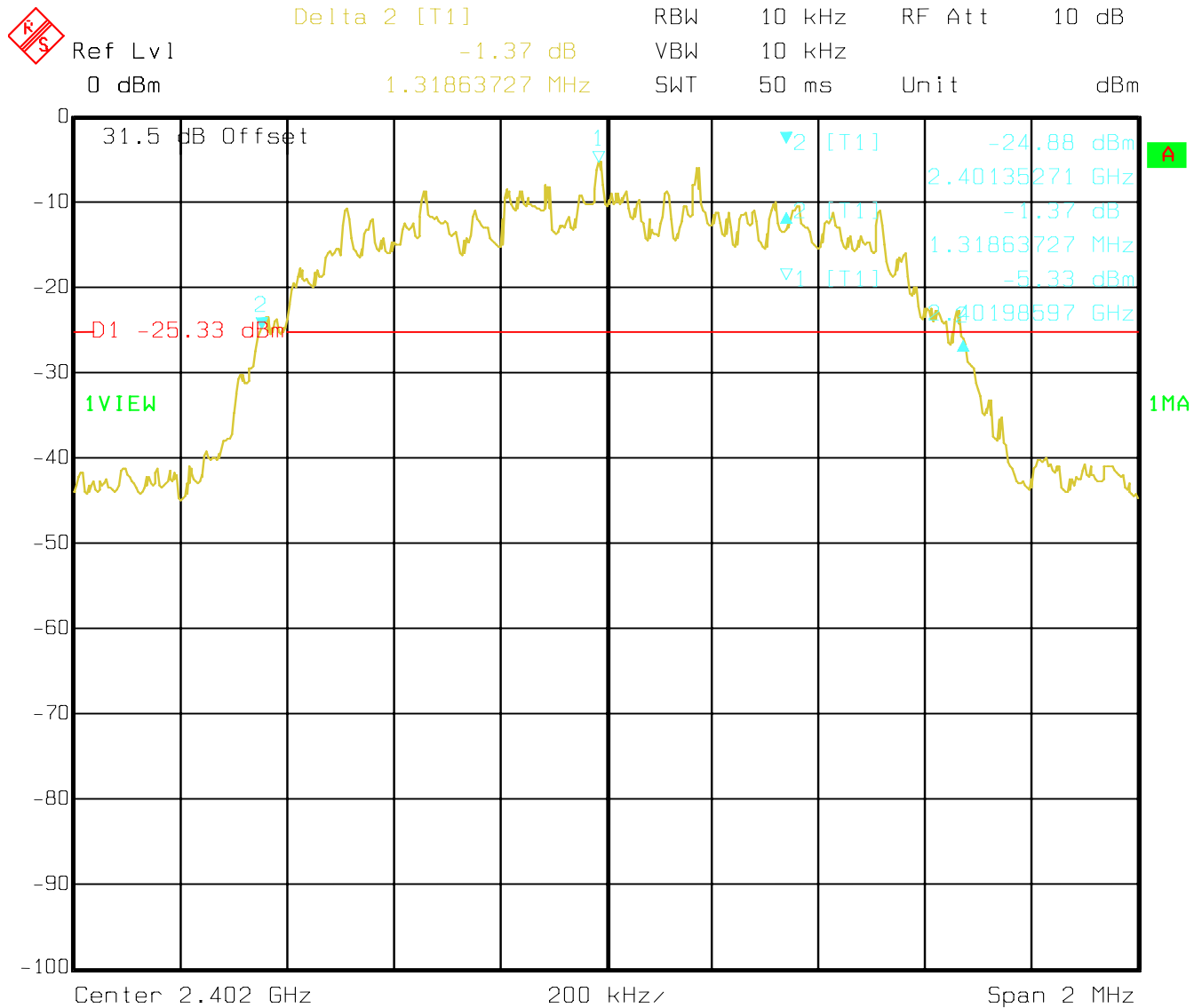
Date: 27.APR.2007 16:57:31

(2480 MHz) GFSK



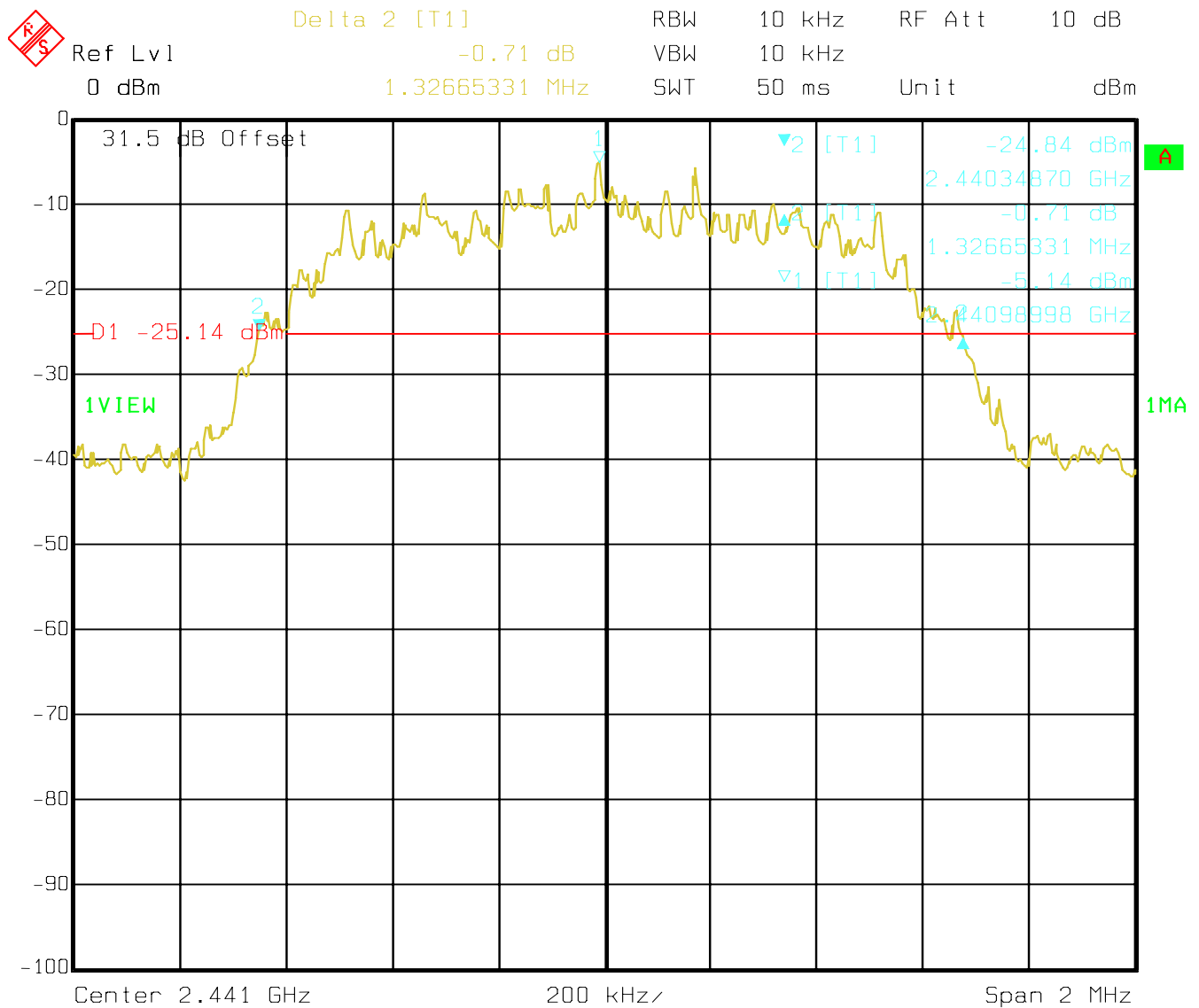
Date: 27.APR.2007 16:55:34

(2402 MHz) $\pi / 4$ DQPSK



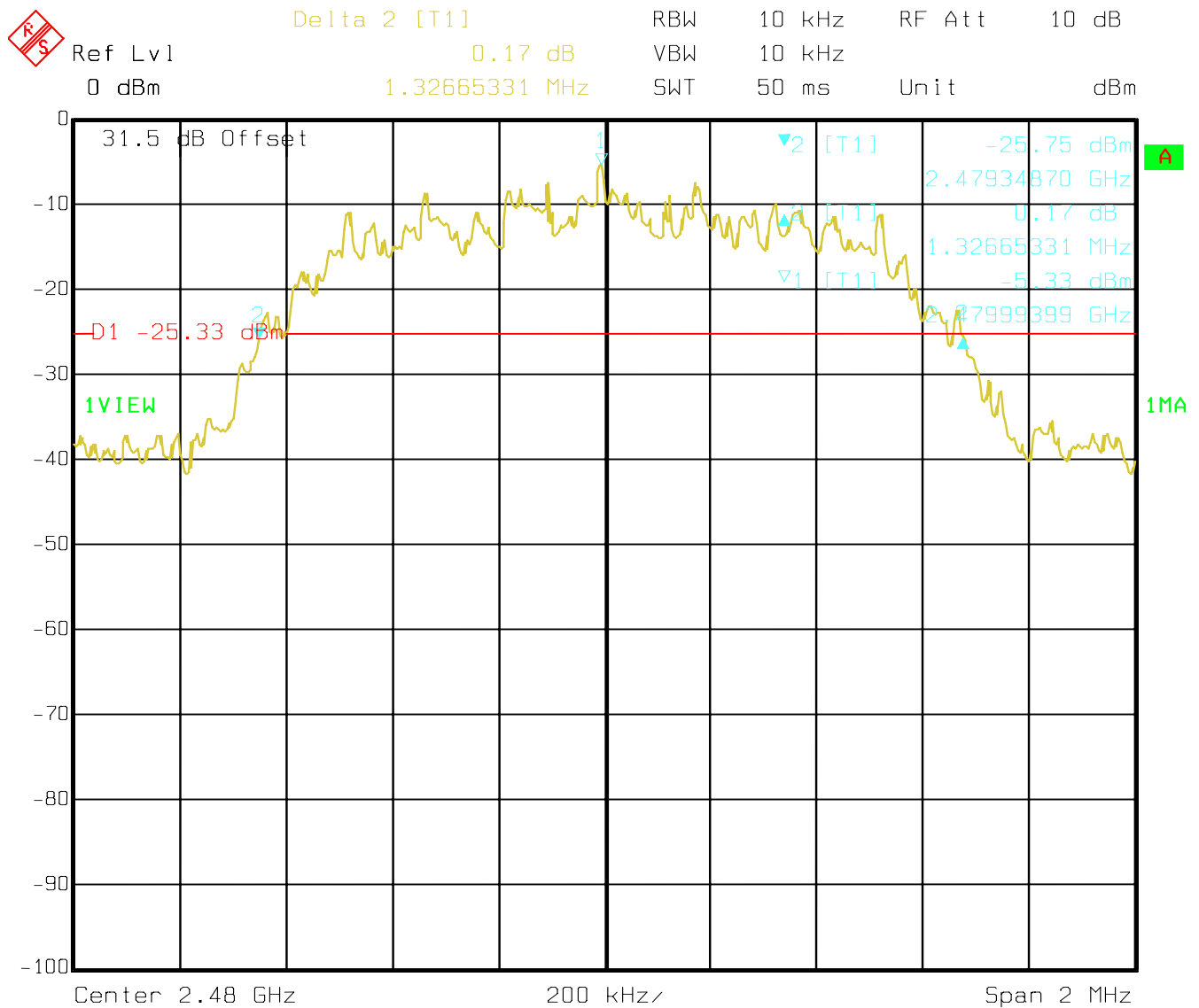
Date: 27.APR.2007 16:46:16

(2441 MHz) $\pi / 4$ DQPSK



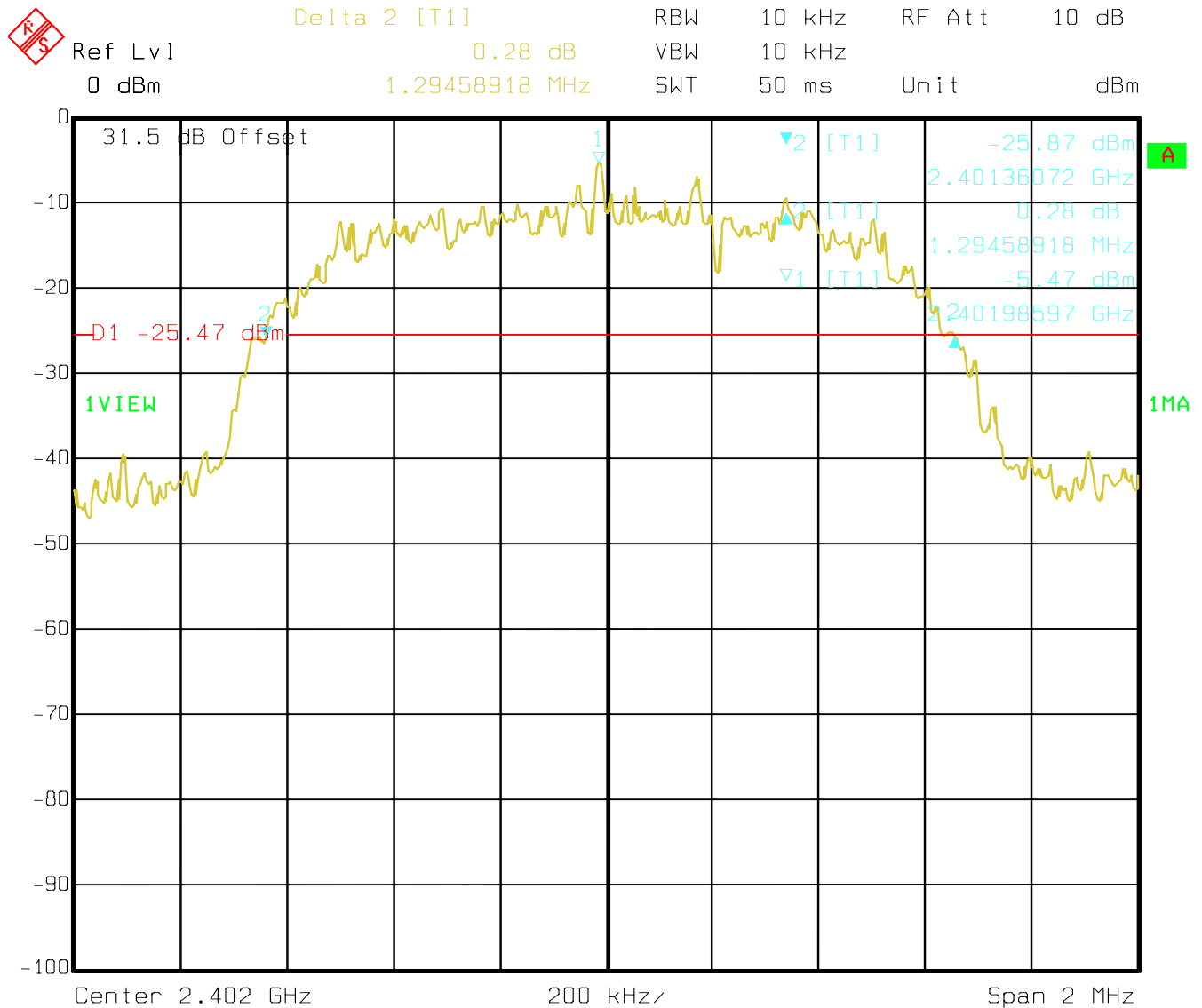
Date: 27.APR.2007 16:44:24

(2480 MHz) $\pi / 4$ DQPSK



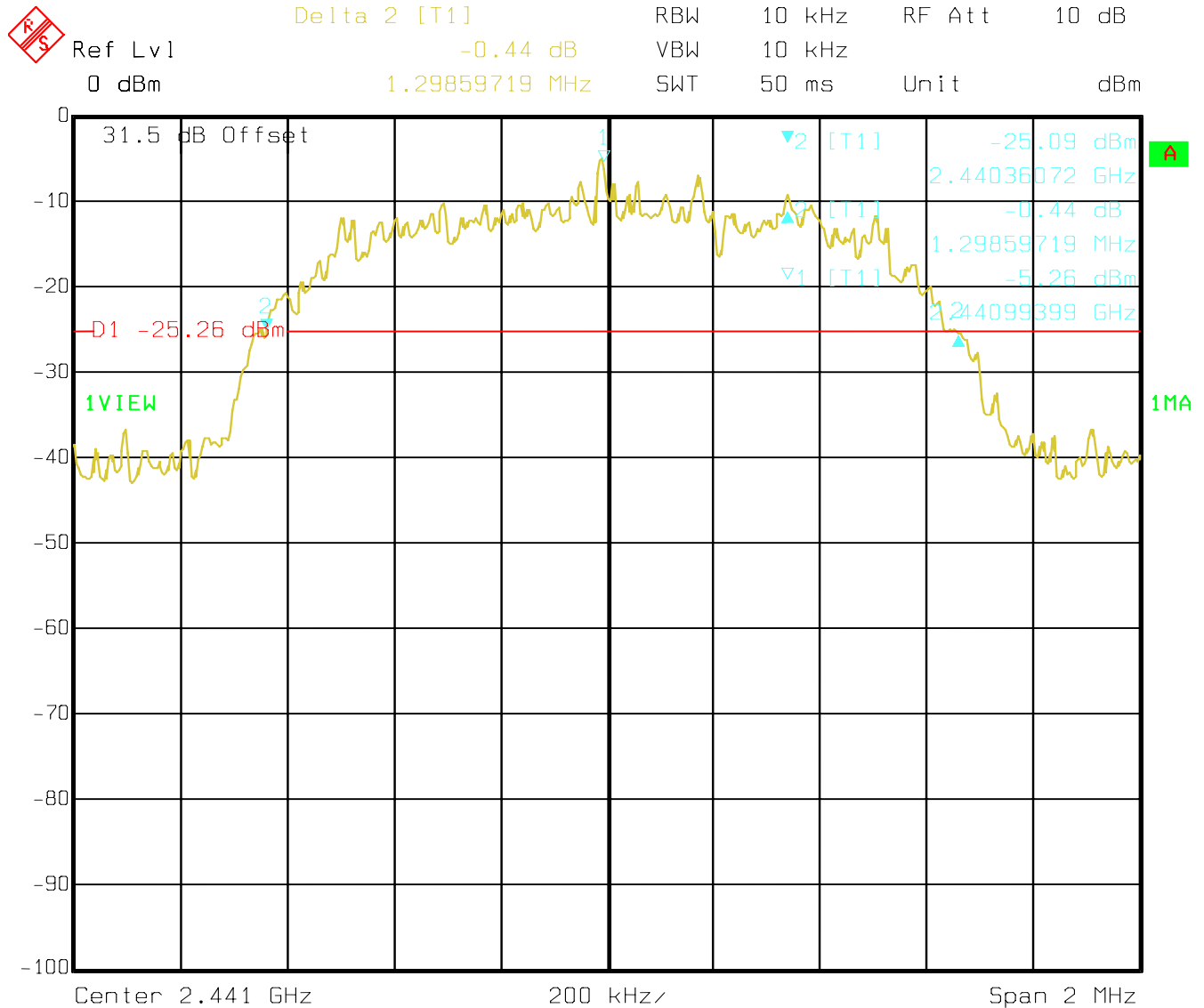
Date: 27.APR.2007 16:51:58

(2402 MHz) 8DPSK



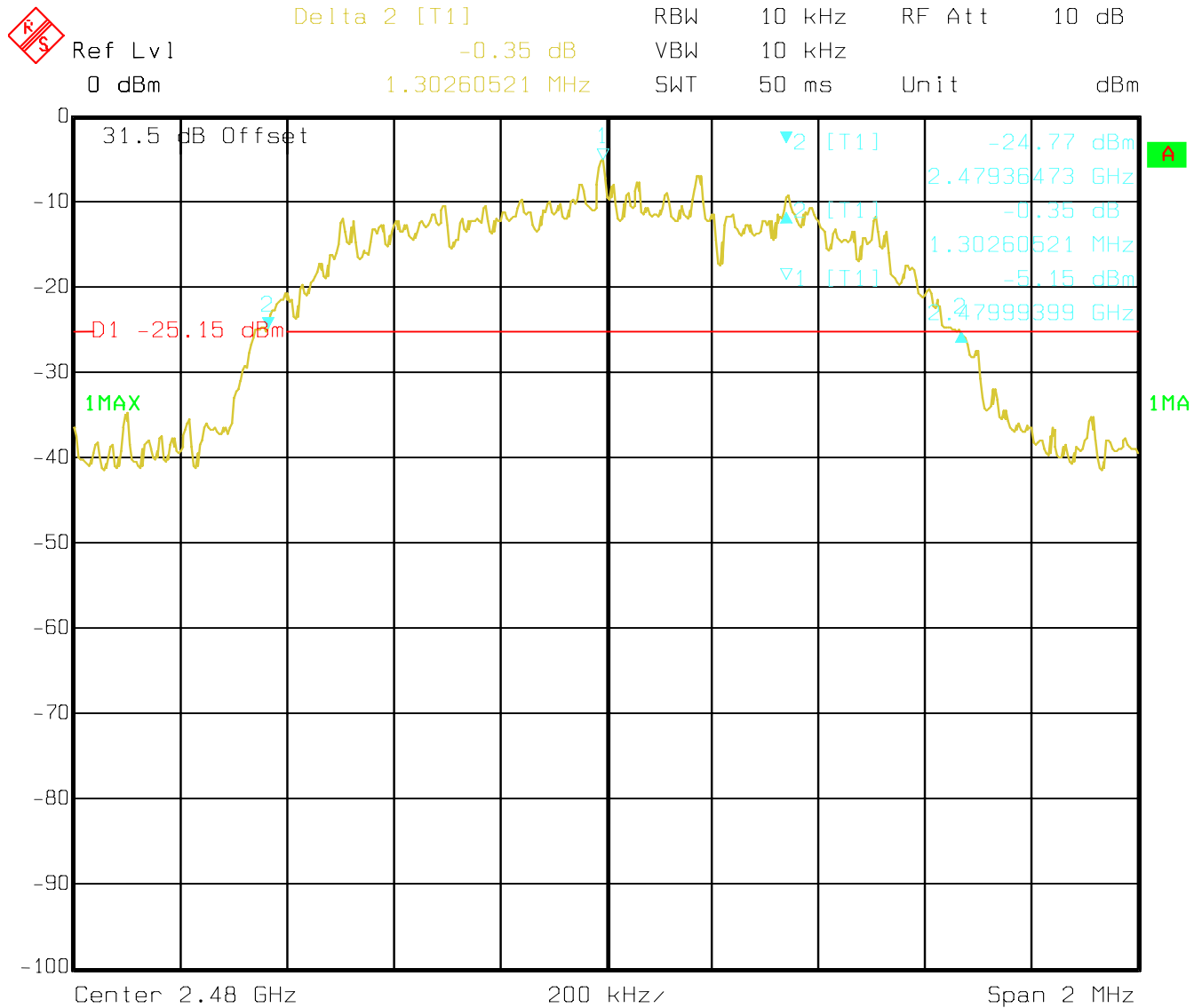
Date: 27.APR.2007 16:37:22

(2441 MHz) 8DPSK



Date: 27.APR.2007 16:33:14

(2480 MHz) 8DPSK



Date: 27.APR.2007 16:05:37

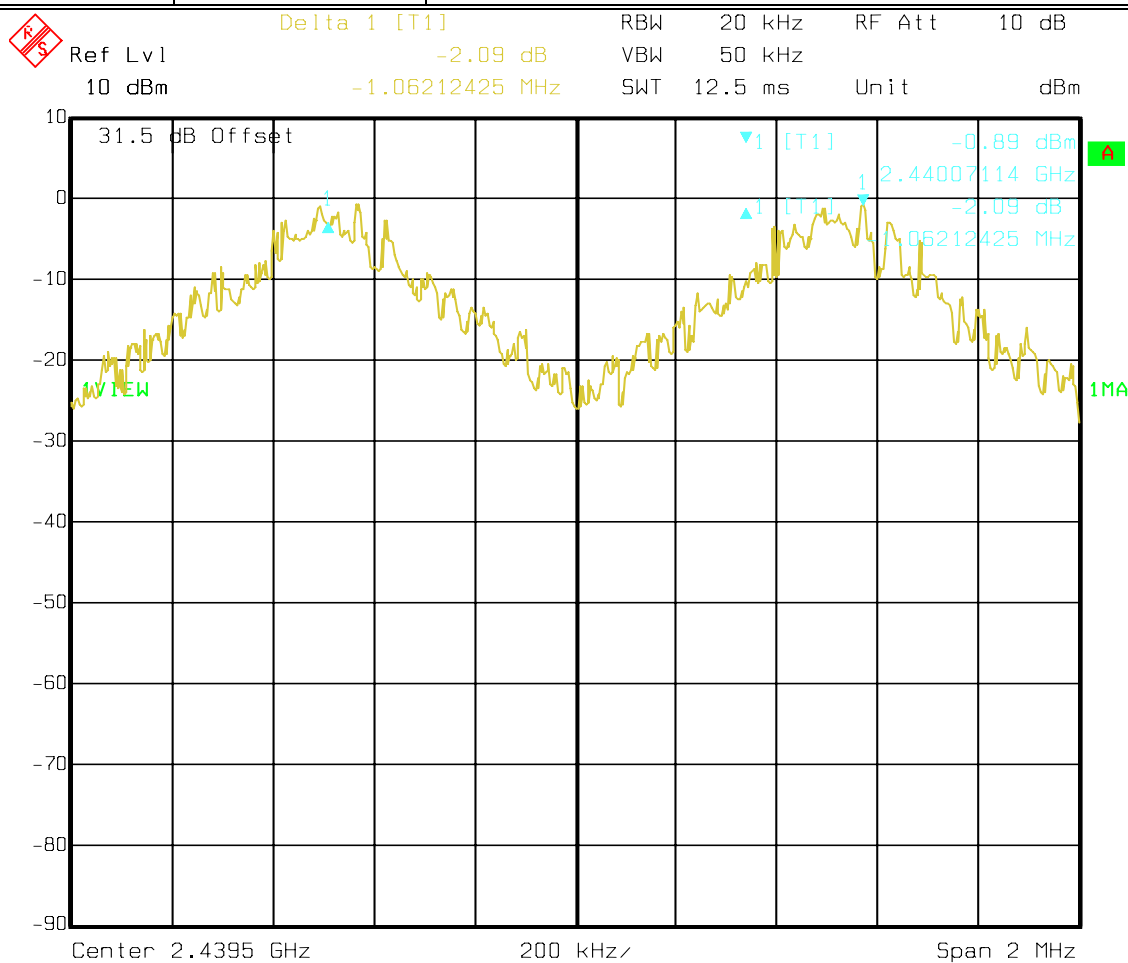
6.3 CARRIER FREQUENCY SEPARATION

6.3.1 LIMIT SUB CLAUSE § 15.247 (a) (1) (i) (ii) (iii)

SEPARATION
> 25 KHz or > 20 dB BANDWIDTH

6.3.2 RESULTS:

TEST CONDITIONS		SEPARATION (MHz)
T _{nom} (23)°C	V _{nom} VDC	1.062



Date: 27.APR.2007 17:16:05

6.4 NUMBER OF HOPPING CHANNELS

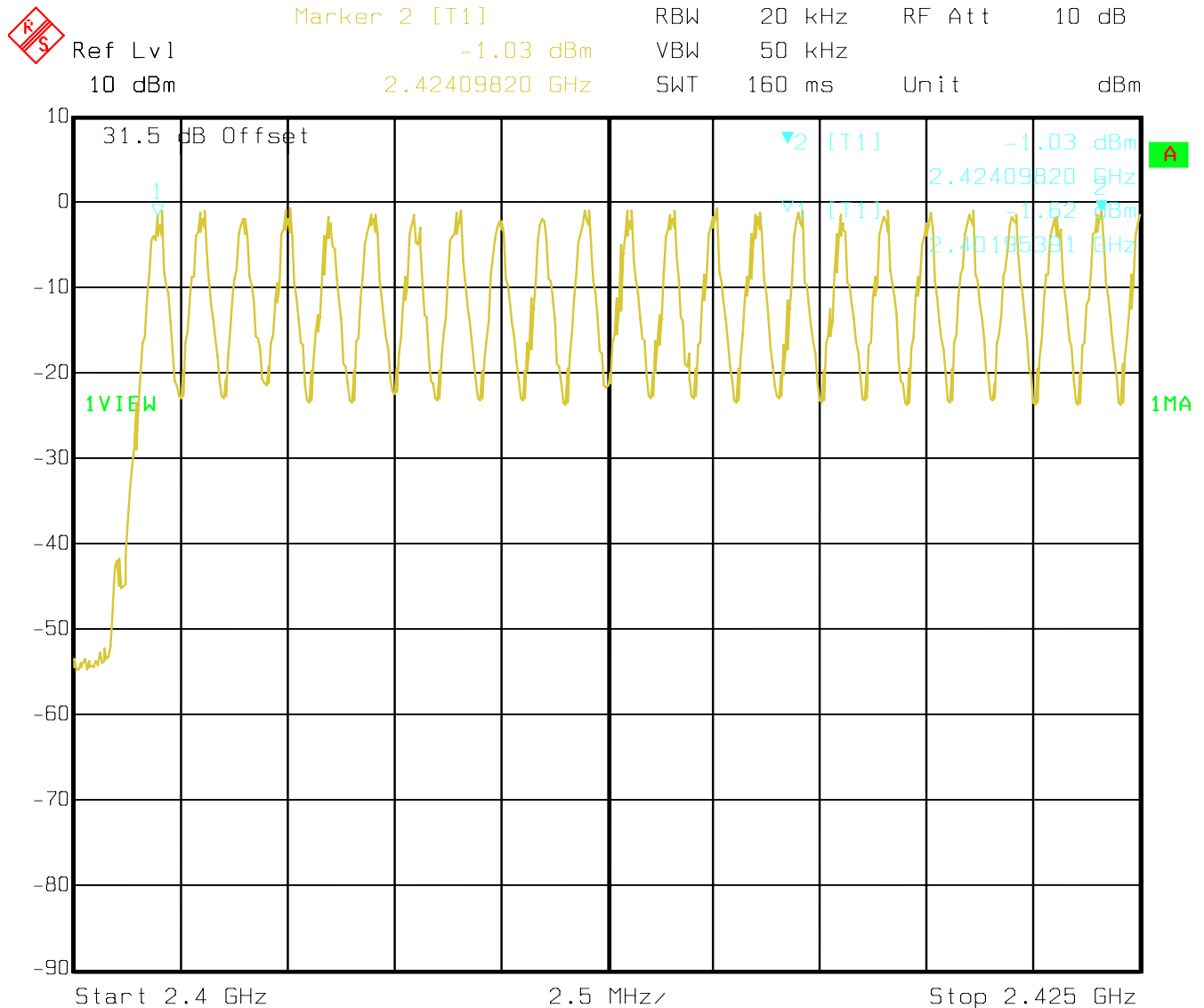
6.4.1 LIMIT SUB CLAUSE § 15.247 (a) (1) (iii)

NUMBER OF CHANNELS
> 15

6.4.2 RESULTS:

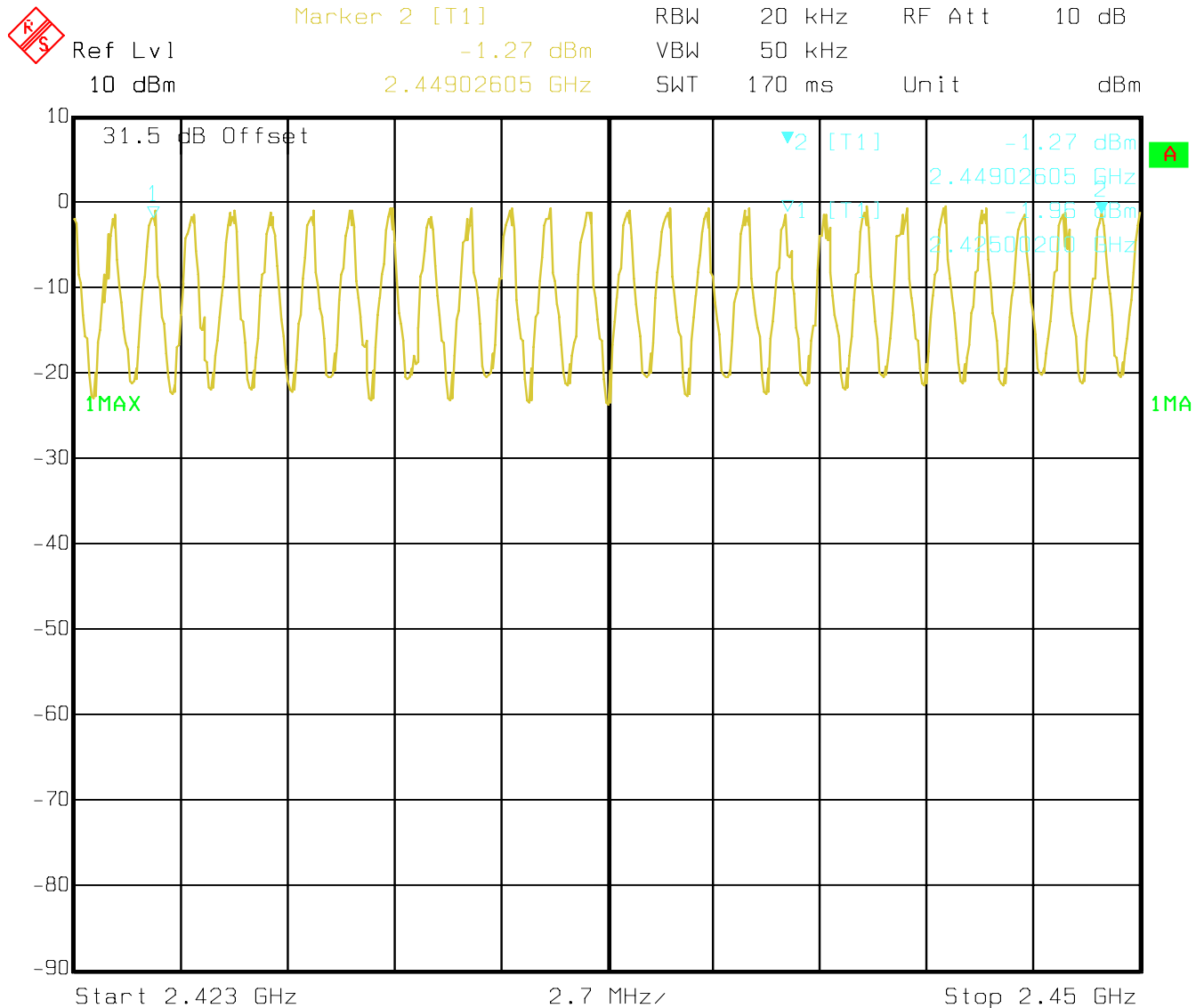
TEST CONDITIONS		NUMBER OF CHANNELS
T _{nom} (23)°C	V _{nom} VDC	79

PLOT 1



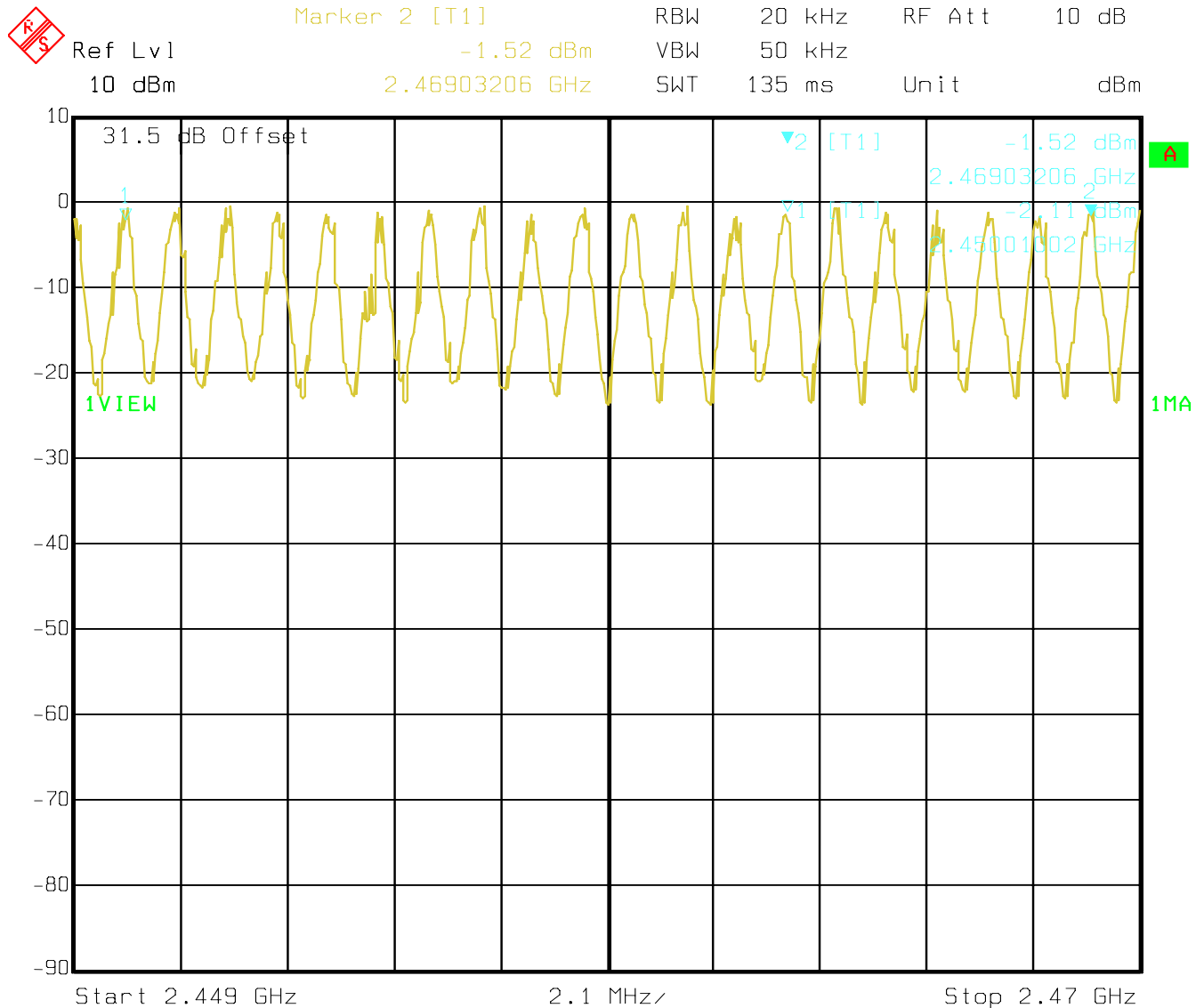
Date: 27.APR.2007 17:22:53

PLOT 2



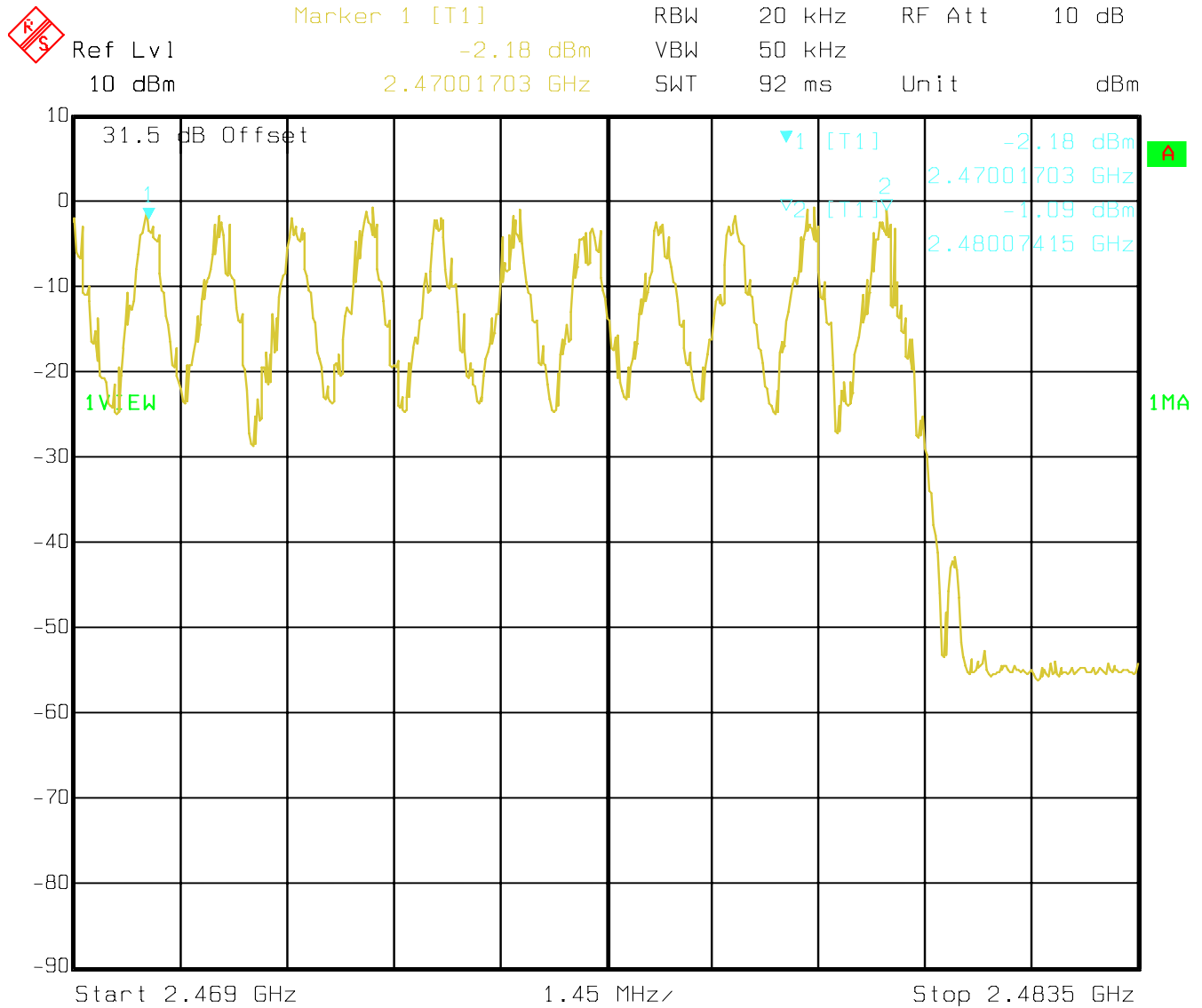
Date: 27.APR.2007 17:27:01

PLOT 3



Date: 27.APR.2007 17:31:49

PLOT 4



Date: 27.APR.2007 17:34:23

6.5 TIME OF OCCUPANCY (DWELL TIME)

6.5.1 LIMIT SUB CLAUSE § 15.247 (a) (1) (i) (ii) (iii)

FREQUENCY RANGE	AVERAGE TIME OF OCCUPANCY PER 31.6 SECONDS (LIMIT)
2400-2483.5	0.4 SECONDS

6.5.2 RESULTS:

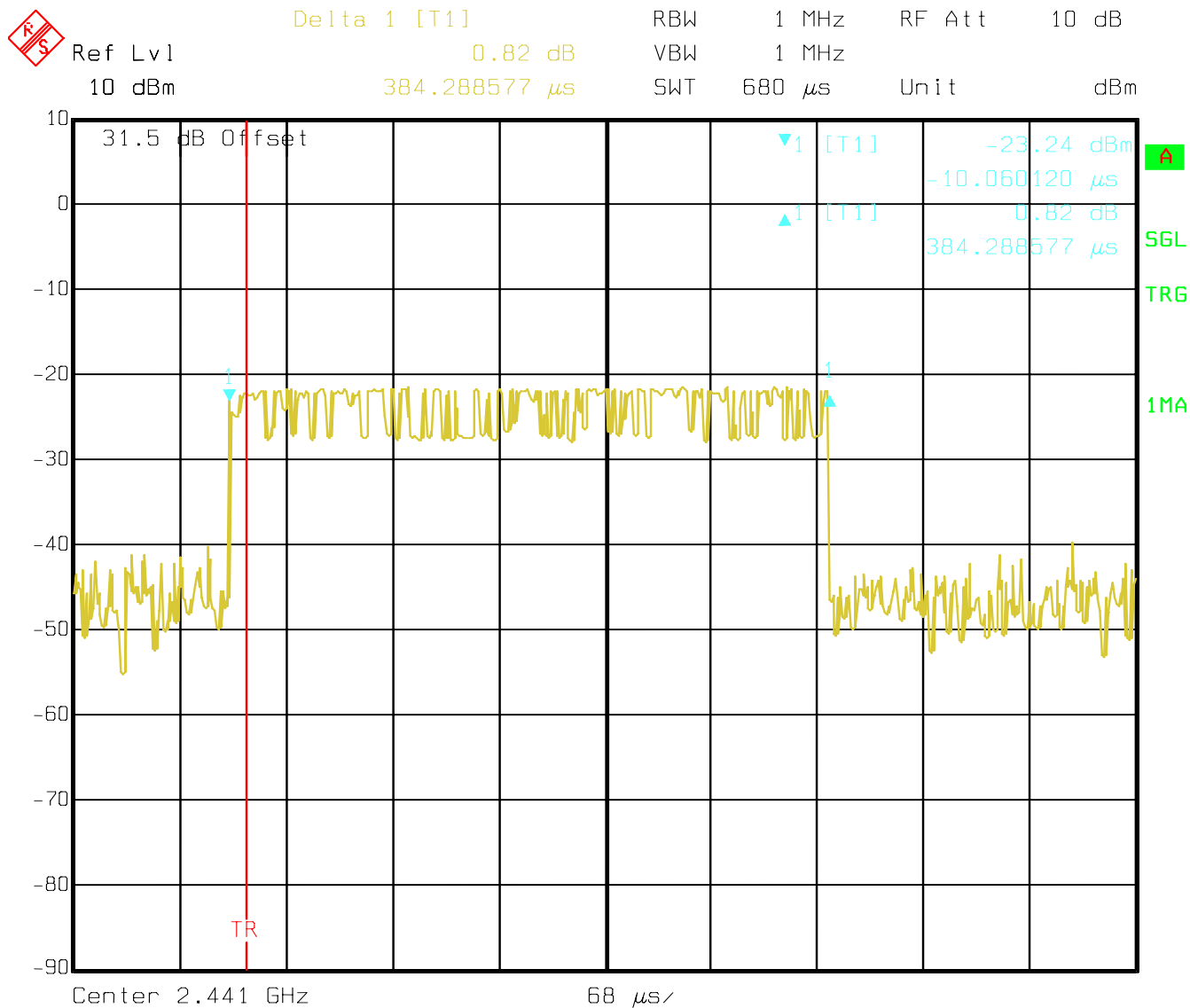
TEST CONDITIONS		TIME OF OCCUPANCY IN 31.6 SECONDS (ms)		
PACKET TYPE		DH1	DH3	DH5
T _{nom} (23)°C	V _{nom} VDC	112.266	261.61	307.46

(DH1)

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 384.29μs.

So we have $320.1 \times 384.29 \mu s = 123.01 \text{ ms}$ per 31.6 seconds.



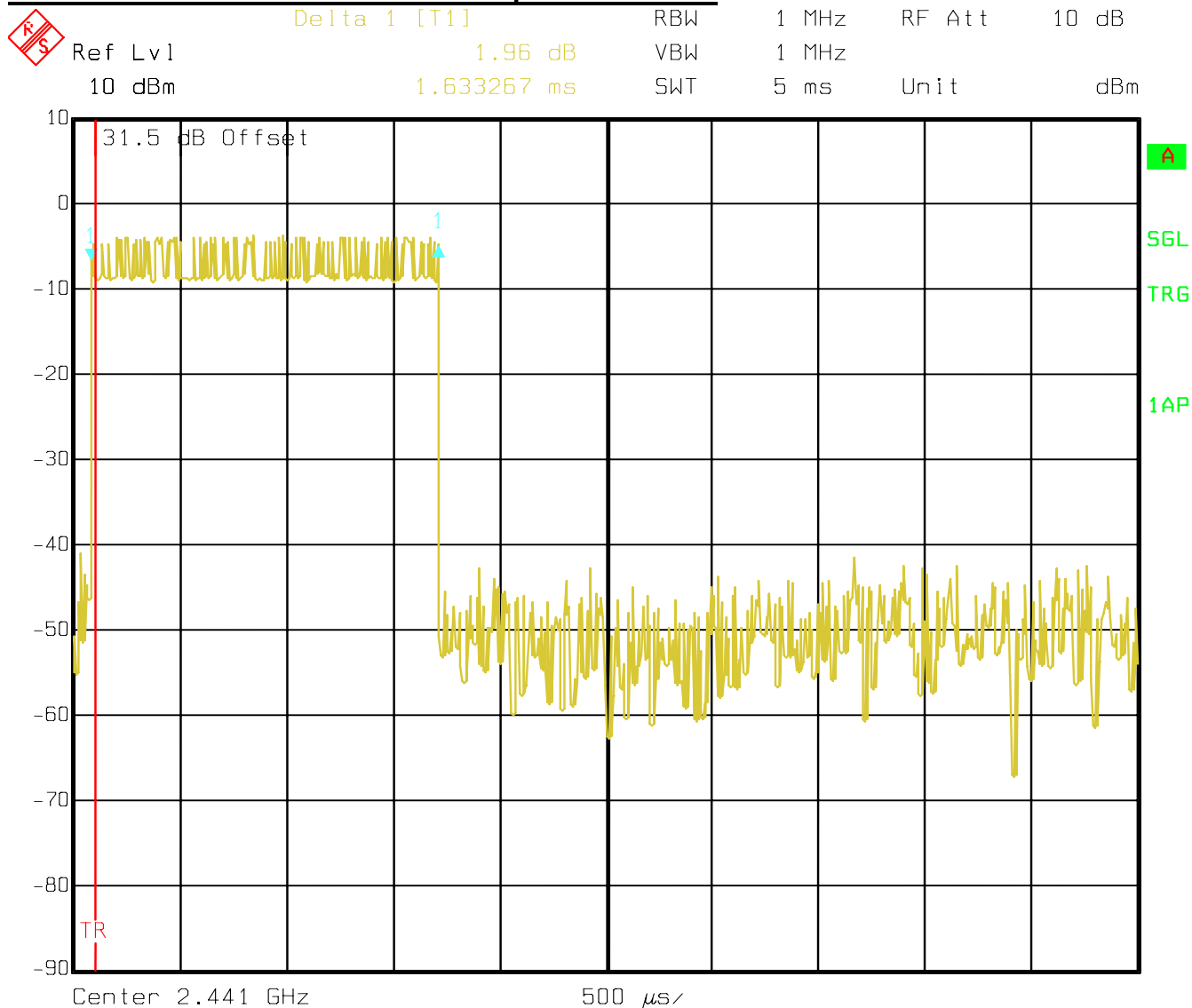
Date: 27.APR.2007 17:51:04

(DH3)

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 1.633ms.

So we have $161.16 * 1.633\text{ms} = 263.17\text{ ms}$ per 31.6 seconds.



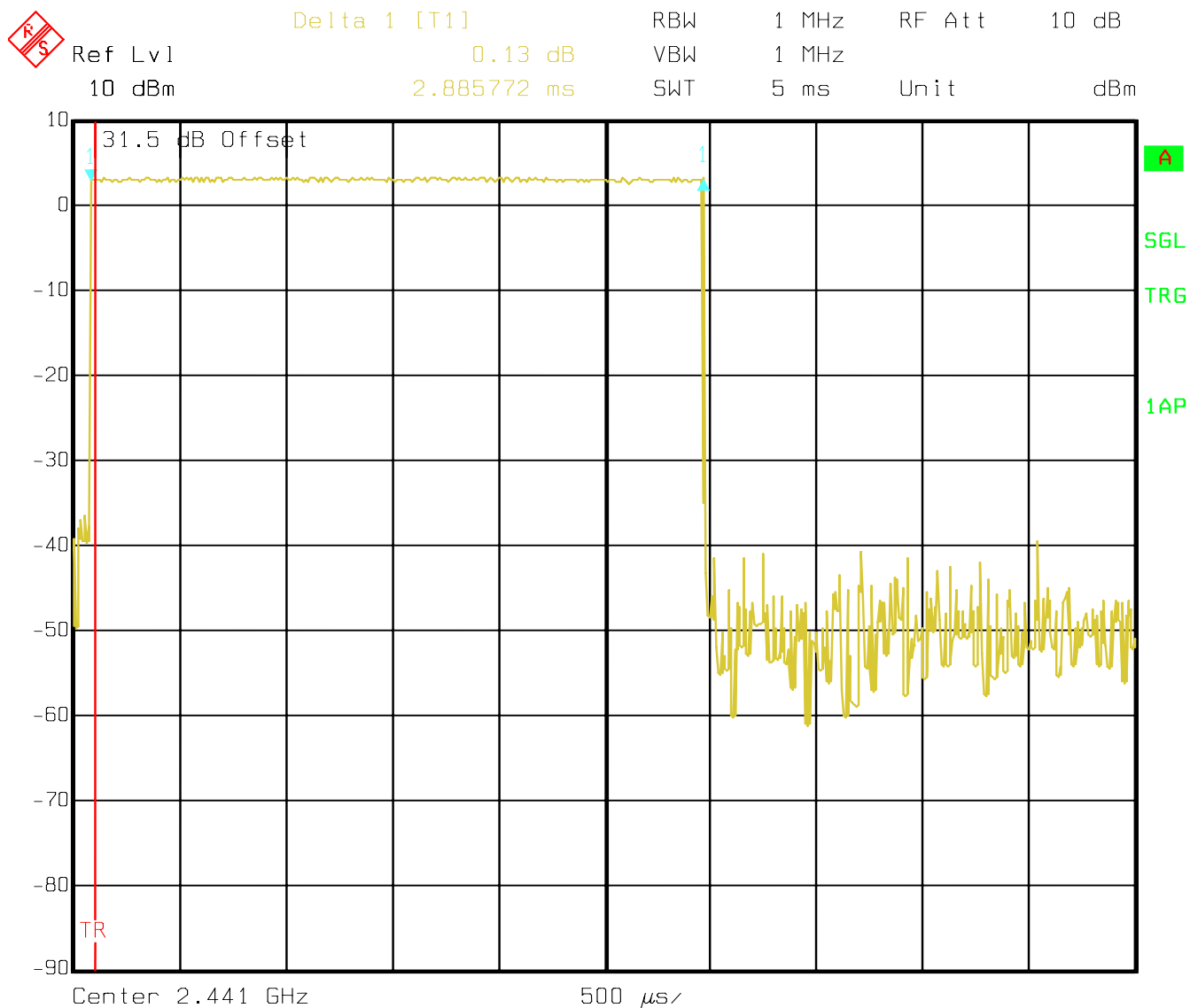
Date: 30.APR.2007 13:20:57

(DH5)

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 2.886ms.

So we have $106.176 * 2.886\text{ms} = 306.42\text{ms}$ per 31.6 seconds.



Date: 30.APR.2007 13:23:18

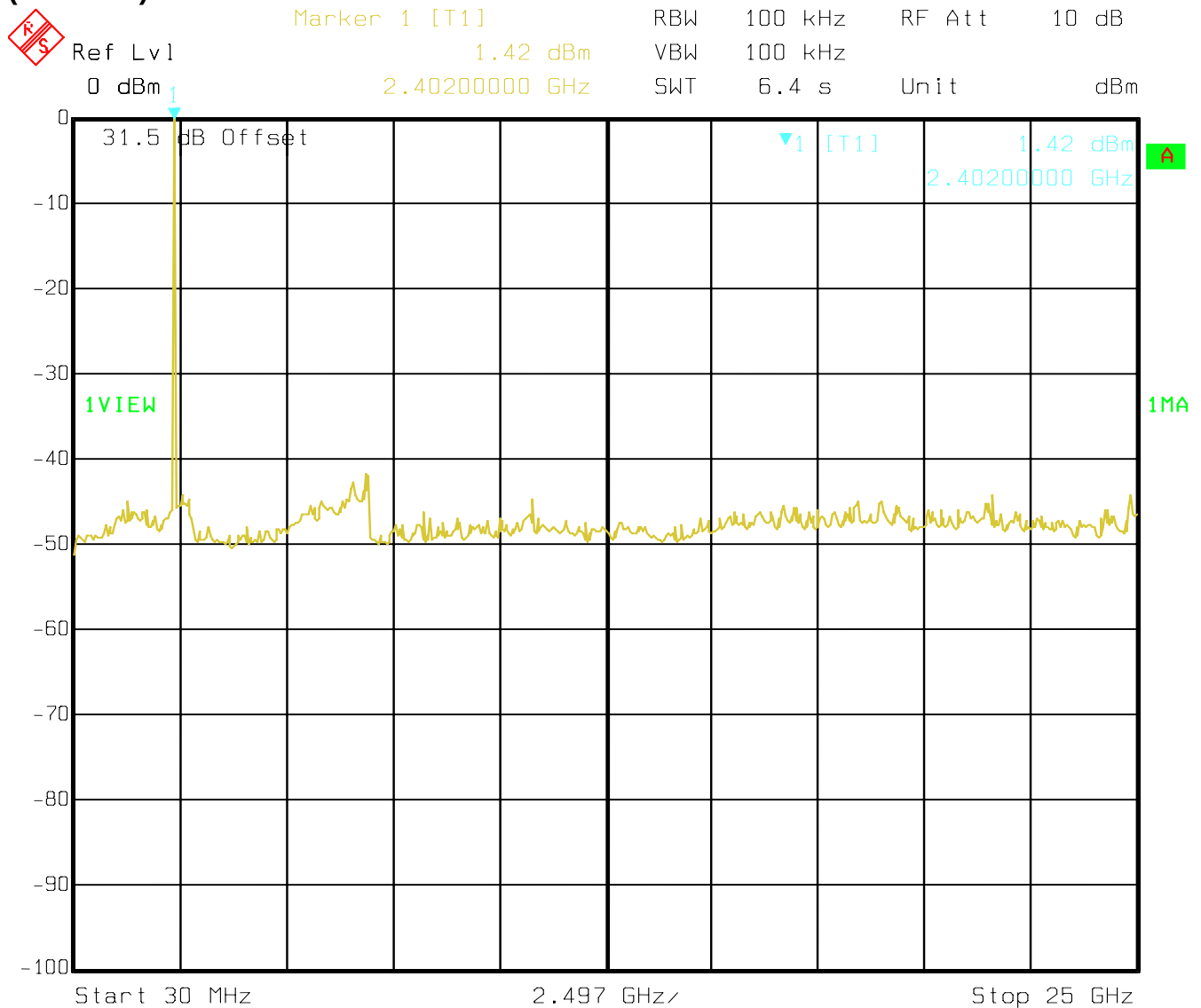
6.6 CONDUCTED SPURIOUS EMISSION

6.6.1 LIMIT SUB CLAUSE § 15.247 (d)

FREQUENCY RANGE	limit
30M-25GHz	-20dBc

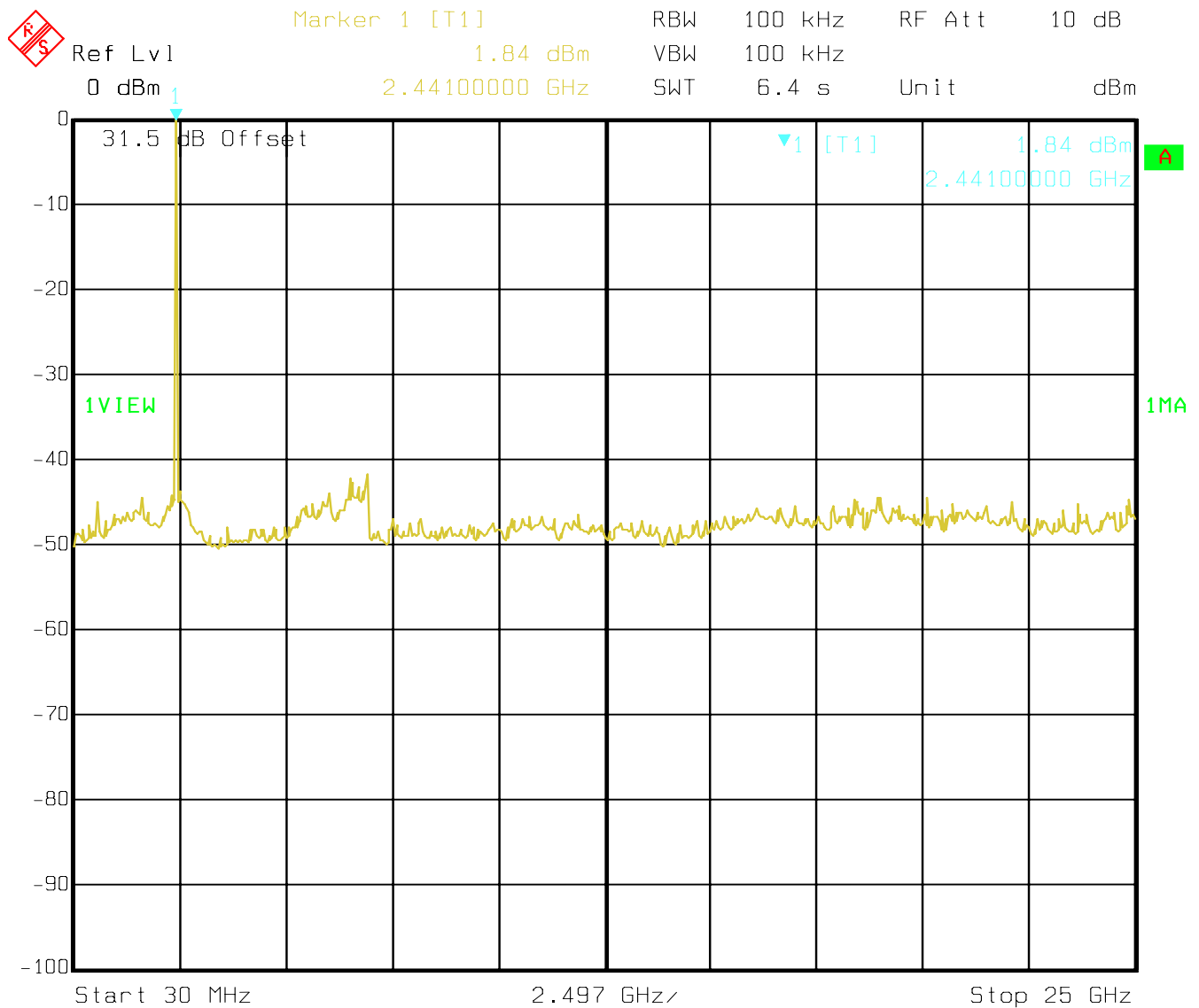
6.6.2 RESULTS: Tnom(23)°C VnomVDC

(2402MHz)



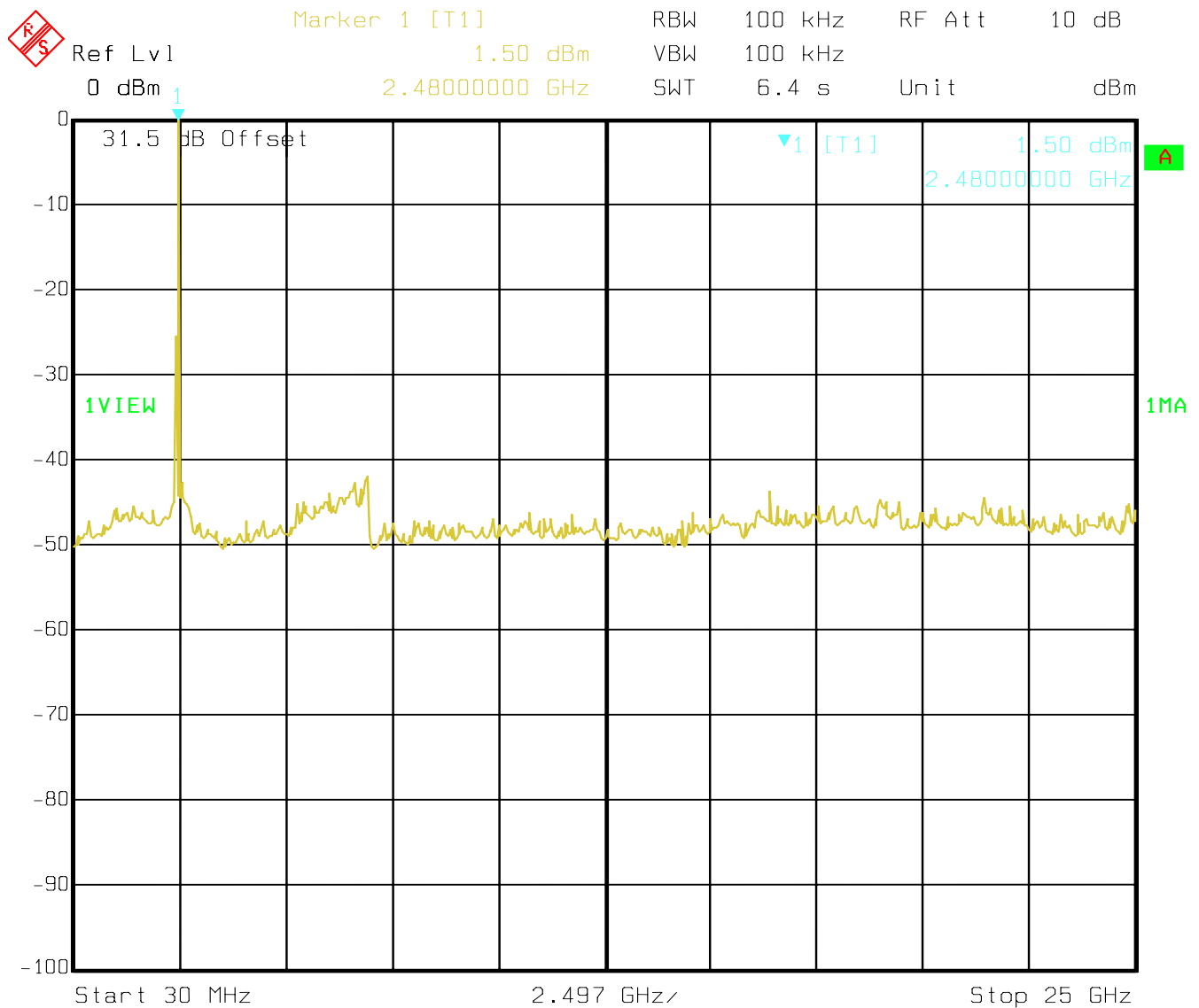
Date: 27.APR.2007 17:07:00

(2441MHz)



Date: 27.APR.2007 17:07:47

(2480MHz)



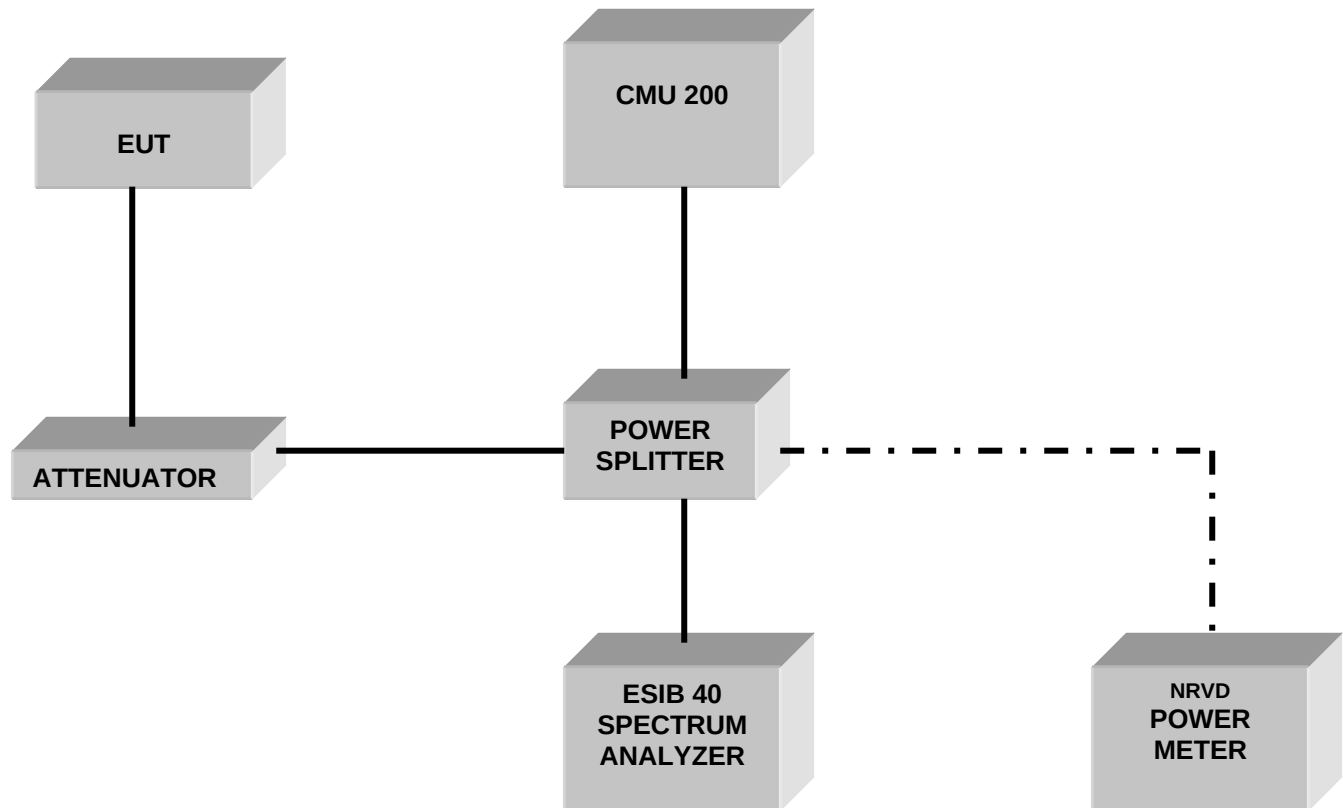
Date: 27.APR.2007 17:08:33

7 TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

No	Instrument/Ancillary	Type	Manufacturer	Serial No.	Cal Due	Interval
01	Spectrum Analyzer	ESIB 40	Rohde & Schwarz	100107	May 2007	1 year
02	Spectrum Analyzer	FSEM 30	Rohde & Schwarz	100017	August 2007	1 year
03	Signal Generator	SMY02	Rohde & Schwarz	836878/011	May 2007	1 year
04	Power-Meter	NRVD	Rohde & Schwarz	0857.8008.02	May 2007	1 year
05	Biconilog Antenna	3141	EMCO	0005-1186	June 2007	1 year
06	Horn Antenna (1-18GHz)	SAS-200/571	AH Systems	325	June 2007	1 year
07	Horn Antenna (18-26.5GHz)	3160-09	EMCO	1240	June 2007	1 year
08	Power Splitter	11667B	Hewlett Packard	645348	n/a	n/a
09	Climatic Chamber	VT4004	Voltsch	G1115	May 2007	1 year
10	High Pass Filter	5HC2700	Trilithic Inc.	9926013	n/a	n/a
11	High Pass Filter	4HC1600	Trilithic Inc.	9922307	n/a	n/a
12	Pre-Amplifier	JS4-00102600	Miteq	00616	May 2007	1 year
13	Power Sensor	URV5-Z2	Rohde & Schwarz	DE30807	May 2007	1 year
14	Digital Radio Comm. Tester	CMD-55	Rohde & Schwarz	847958/008	May 2007	1 year
15	Universal Radio Comm. Tester	CMU 200	Rohde & Schwarz	832221/06	May 2007	1 year
16	LISN	ESH3-Z5	Rohde & Schwarz	836679/003	May 2007	1 year
17	Loop Antenna	6512	EMCO	00049838	July 2007	2 years

8 BLOCK DIAGRAMS

Conducted Testing



Radiated Testing

ANECHOIC CHAMBER

