



# FCC Test Report

## FCC Part 15.247 & IC RSS-210, issue 7 for FHSS systems

for  
Hand Held Products, Inc.

**Barcode Scanner/Imager-I.T.E. equipment**

**Model Number: 3820, 4820 and 4820i**

**FCC ID: HD5MXTY3**

**IC-ID: 1693B-TY3B**

**TEST REPORT #: EMC\_HANDH\_049\_07002-01\_FCC-IC\_BT.**  
**DATE: January 02, 2008**



FCC listed  
A2LA certified  
IC recognized #  
3462B

**CETECOM Inc.**

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CETECOM Inc. is a Delaware Corporation with Corporation number: 2113686  
Board of Directors: Dr. Harald Ansorge, Dr. Klaus Matkey, Hans Peter May



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**Technical responsibility for area of testing:** **4**

EMC & Radio 4

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**This report is prepared by:** **4**

EMC & Radio 4

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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.

Company	Description	Model #
Hand Held Products, Inc.	Barcode Scanner/Imager-I.T.E. equipment	3820, 4820 and 4820i

Technical responsibility for area of testing:

**Lothar Schmidt**  
 (Director Antenna and  
 Regulatory Services)

**01/02/2008 EMC & Radio**

Date	Section	Name	Signature
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This report is prepared by:

**Val Tankov**  
 (Project Engineer)

**01/02/2008 EMC & Radio**

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.



## **2 Administrative Data**

### **2.1 Identification of the Testing Laboratory Issuing the SAR Assessment Report**

Company Name:	CETECOM Inc.
Department:	SAR
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

### **2.2 Identification of the Client**

Applicant's Name:	Hand Held Products, Inc.
Address:	700 Visions Dr. Skaneateles Falls / 13153-0208, USA
Contact Person:	Michaels Robinson
Phone No.	+1 315 554 6387
Fax:	+1 315 554 6393
e-mail:	Michael.robinson@handheld.coml

### **2.3 Identification of the Manufacturer**

Manufacturer's Name:	Same as an Applicant
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### 3 Equipment under Test (EUT)

#### 3.1 Specification of the Equipment under Test

Product Type	Barcode Scanner/Imager-I.T.E. equipment
Marketing Name:	Same as model numbers
Model No:	3820, 4820 and 4820i
FCC-ID:	HD5MXTY3
IC-ID :	1693B-TY3B
Frequency Range:	2400 – 2483.5 MHz
Number of Channels	79
Type(s) of Modulation:	GFSK, DQPSK, 8PSK
Antenna Type:	Integral SMD
Output Power:	-2.84 dBm (0.519mW) EIRP 2.79 dBm (1.90mW) Conducted

#### 3.2 Identification of the Equipment Under Test (EUT)

EUT #	TYPE	MANF.	MODEL	IMEI #
1	EUT	Hand Held Products Inc.	4820i	NA

#### 3.3 Identification of Accessory equipment

AE #	TYPE	MANF.	MODEL	SERIAL #
	NA	NA	NA	N/A



#### **4 Subject of Investigation**

All testing was performed on the product referred to in Section 3 as EUT.

All model numbers use identical electrical PCB and schematic, radio module, antenna, battery and housing construction. Difference is in optical engine package (camera chip, plastic chamber, lens and mounting bracket) that reads the image of the barcode. Model 4820i have more rugged style of the industrial housing.

Unless otherwise noted during the testing process the EUT was tested on a single channel using PRBS9 payload using DH5 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. The maximization of portable equipment is conducted in accordance with ANSI C63.4.



**5 Measurements (Radiated)**

**5.1 MAXIMUM PEAK OUTPUT POWER § 15.247 (RADIATED)**

**5.1.1 LIMIT SUB CLAUSE § 15.247 (b) (1) (2) (3) (4)**

Frequency range	RF power output
2400-2483.5 MHz	36dBm EIRP

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

**5.1.2 Test Results**

**EIRP: GFSK**

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)		
Frequency (MHz)		2402	2441	2480
<b>T<sub>nom</sub>(23)°C</b>	<b>V<sub>nom</sub>VDC</b>	-6.74	-4.31	-2.84
<b>Measurement uncertainty</b>		<b>±0.5dBm</b>		

**EIRP:  $\pi / 4$  DQPSK**

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)		
Frequency (MHz)		2402	2441	2480
<b>T<sub>nom</sub>(23)°C</b>	<b>V<sub>nom</sub>VDC</b>	-7.07	-5.36	-3.07
<b>Measurement uncertainty</b>		<b>±0.5dBm</b>		

**EIRP: 8DPSK**

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)		
Frequency (MHz)		2402	2441	2480
<b>T<sub>nom</sub>(23)°C</b>	<b>V<sub>nom</sub>VDC</b>	-7.37	-5.38	-3.15
<b>Measurement uncertainty</b>		<b>±0.5dBm</b>		



**EIRP BT low channel**

**411 Dixon Landing Road, Milpitas CA 95035, USA**

EUT: HHP 4820

Customer: Hand Held Products Inc.

Test Mode: BT CH0, GMSK,

ANT Orientation: H

EUT Orientation: V

Test Engineer: Chris

Voltage: Battery

**SWEEP TABLE: "EIRP BT low channel"**

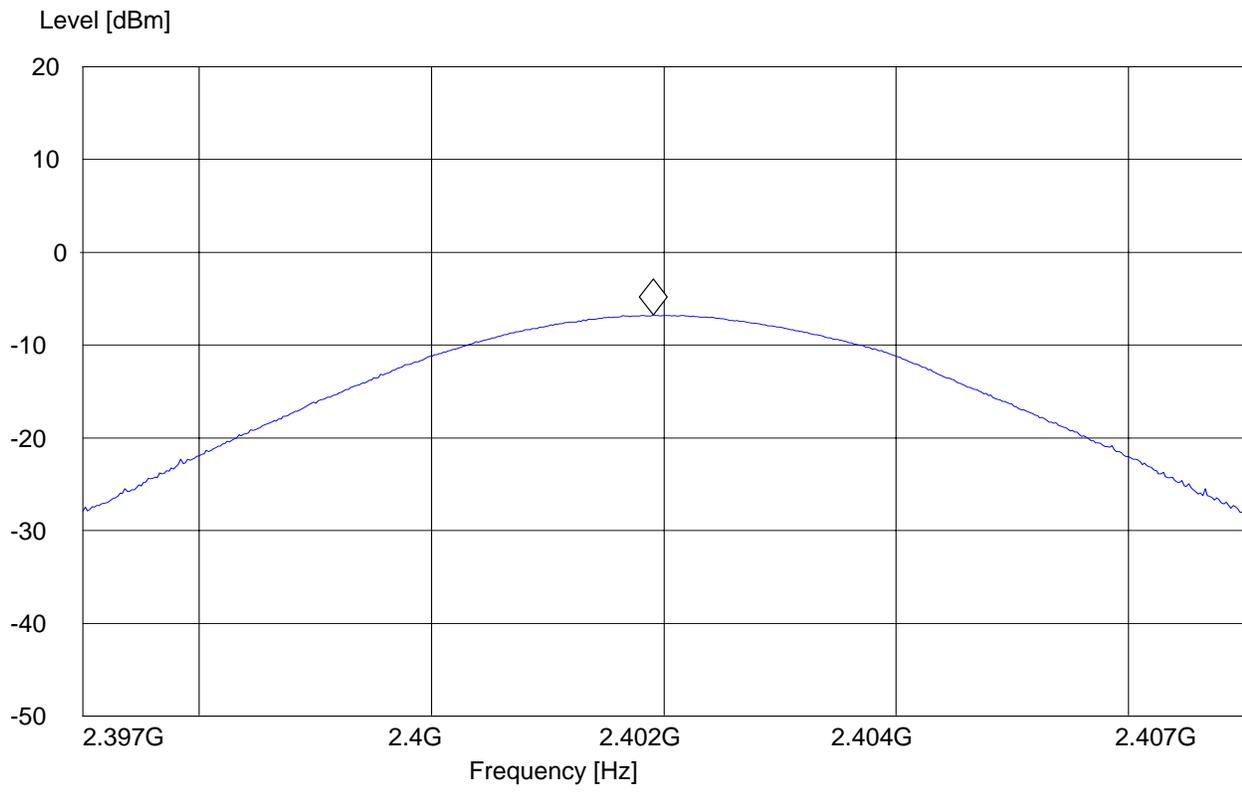
Short Description: EIRP Bluetooth channel-2402MHz

Start Stop Detector Meas. IF Transducer

Frequency Frequency Time Bandw.

2.4 GHz 2.4 GHz MaxPeak Coupled 3 MHz DUMMY-DBM

Marker: 2.40190982 GHz -6.74 dBm





**EIRP BT mid channel**

**411 Dixon Landing Road, Milpitas CA 95035, USA**

EUT: HHP 4820

Customer:: Hand Held Products Inc.

Test Mode: BT CH39, GMSK,

ANT Orientation: H

EUT Orientation: V

Test Engineer: Satya

Voltage: Battery

**SWEEP TABLE: "EIRP BT mid channel"**

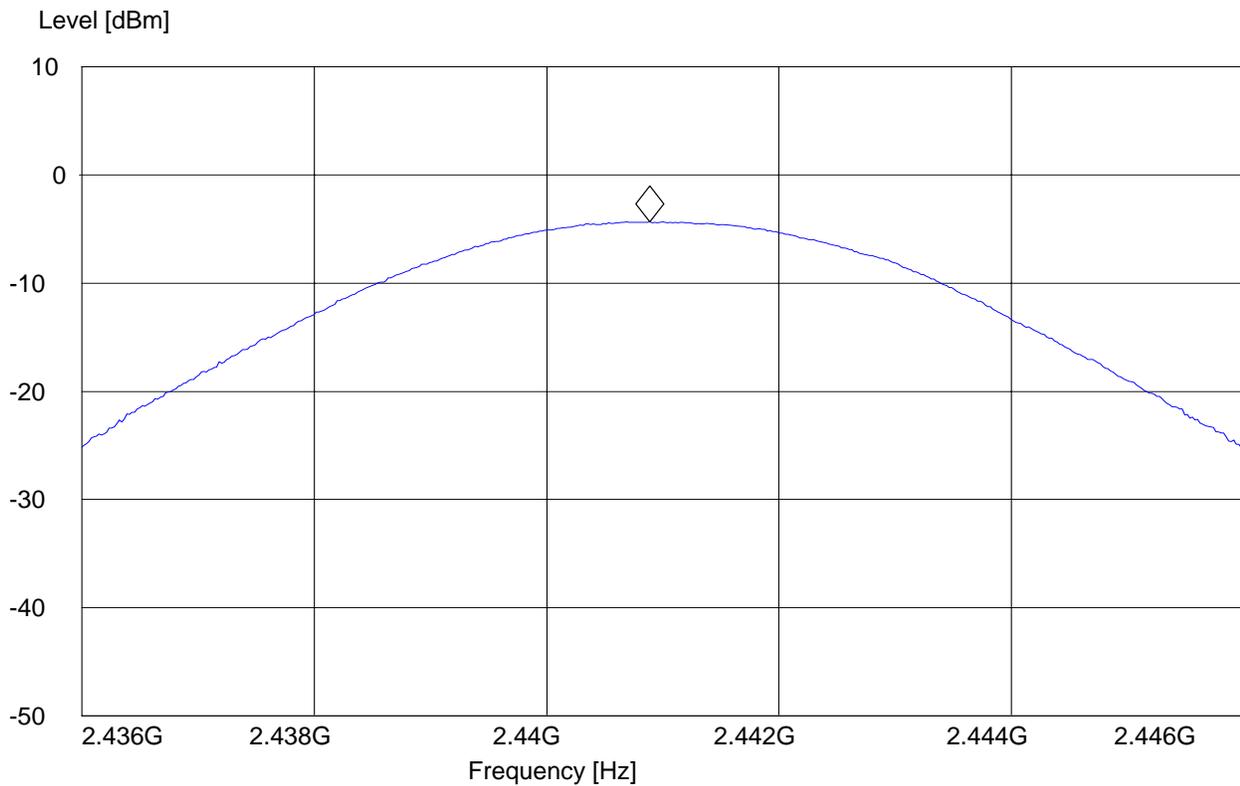
Short Description: EIRP Bluetooth channel-2441MHz

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

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

2.4 GHz	2.4 GHz	MaxPeak	Coupled 3 MHz	DUMMY-DBM
---------	---------	---------	---------------	-----------

Marker: 2.440885772 GHz -4.31 dBm





**EIRP BT high channel**

**411 Dixon Landing Road, Milpitas CA 95035, USA**

EUT: HHP 4820

Customer: Hand Held Products Inc.

Test Mode: BT CH78, GMSK,

ANT Orientation: H

EUT Orientation: V

Test Engineer: Chris

Voltage: Battery

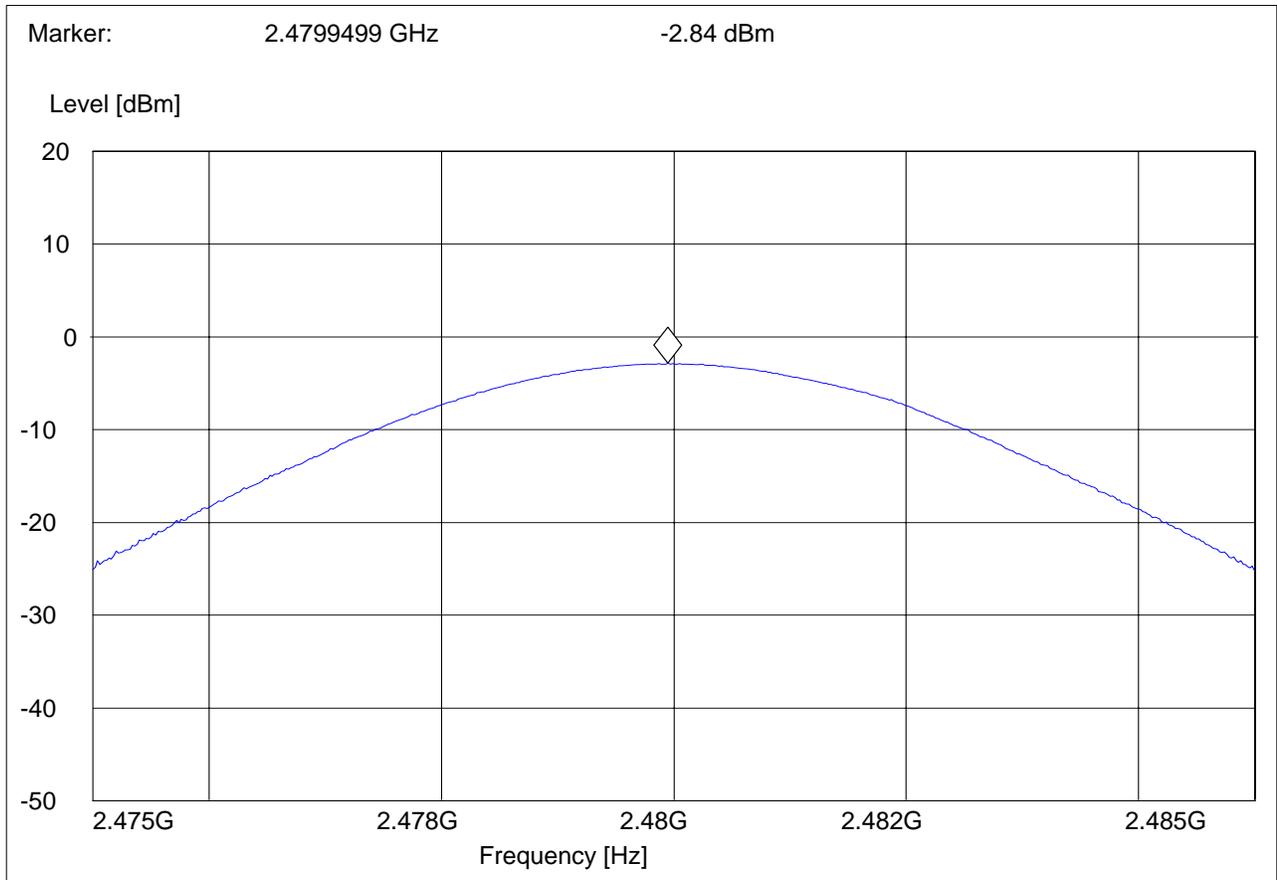
**SWEEP TABLE: "EIRP BT high channel"**

Short Description: EIRP Bluetooth channel-2480MHz

Start Stop Detector Meas. IF Transducer

Frequency Frequency Time Bandw.

2.5 GHz 2.5 GHz MaxPeak Coupled 3 MHz DUMMY-DBM





**EIRP BT low channel**

**411 Dixon Landing Road, Milpitas CA 95035, USA**

EUT: HHP 4820

Customer:: Hand Held Products Inc.

Test Mode: BT CH0, DQPSK,

ANT Orientation: H

EUT Orientation: V

Test Engineer: Chris

Voltage: Battery

**SWEEP TABLE: "EIRP BT low channel"**

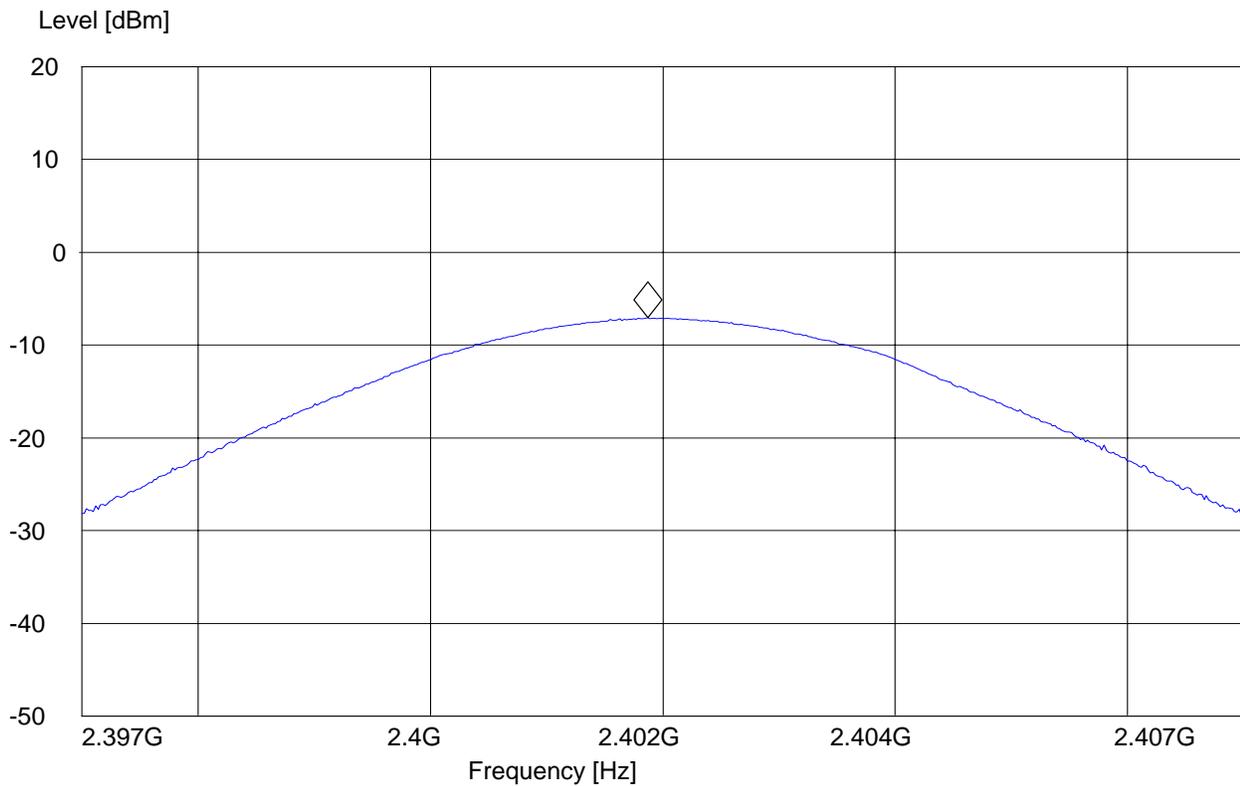
Short Description: EIRP Bluetooth channel-2402MHz

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

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

2.4 GHz	2.4 GHz	MaxPeak	Coupled 3 MHz	DUMMY-DBM
---------	---------	---------	---------------	-----------

Marker: 2.401869739 GHz -7.07 dBm





**EIRP BT mid channel**

**411 Dixon Landing Road, Milpitas CA 95035, USA**

EUT: HHP 4820

Customer: Hand Held Products Inc.

Test Mode: BT CH39, DQPSK,

ANT Orientation: H

EUT Orientation: V

Test Engineer: Chris

Voltage: Battery

**SWEEP TABLE: "EIRP BT mid channel"**

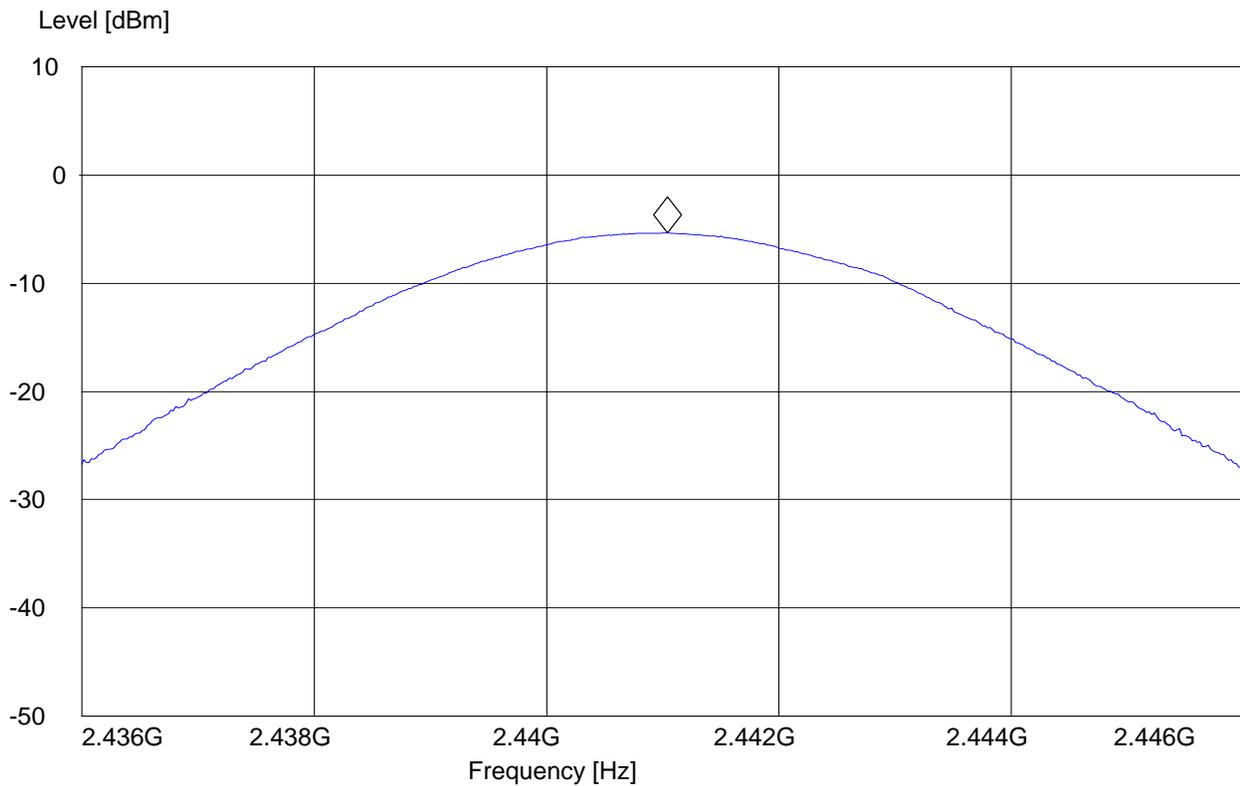
Short Description: EIRP Bluetooth channel-2441MHz

Start Stop Detector Meas. IF Transducer

Frequency Frequency Time Bandw.

2.4 GHz 2.4 GHz MaxPeak Coupled 3 MHz DUMMY-DBM

Marker: 2.44104008 GHz -5.36 dBm





**EIRP BT high channel**

**411 Dixon Landing Road, Milpitas CA 95035, USA**

EUT: HHP 4820

Customer: Hand Held Products Inc.

Test Mode: BT CH78, DQPSK,

ANT Orientation: H

EUT Orientation: V

Test Engineer: Chris

Voltage: Battery

**SWEEP TABLE: "EIRP BT high channel"**

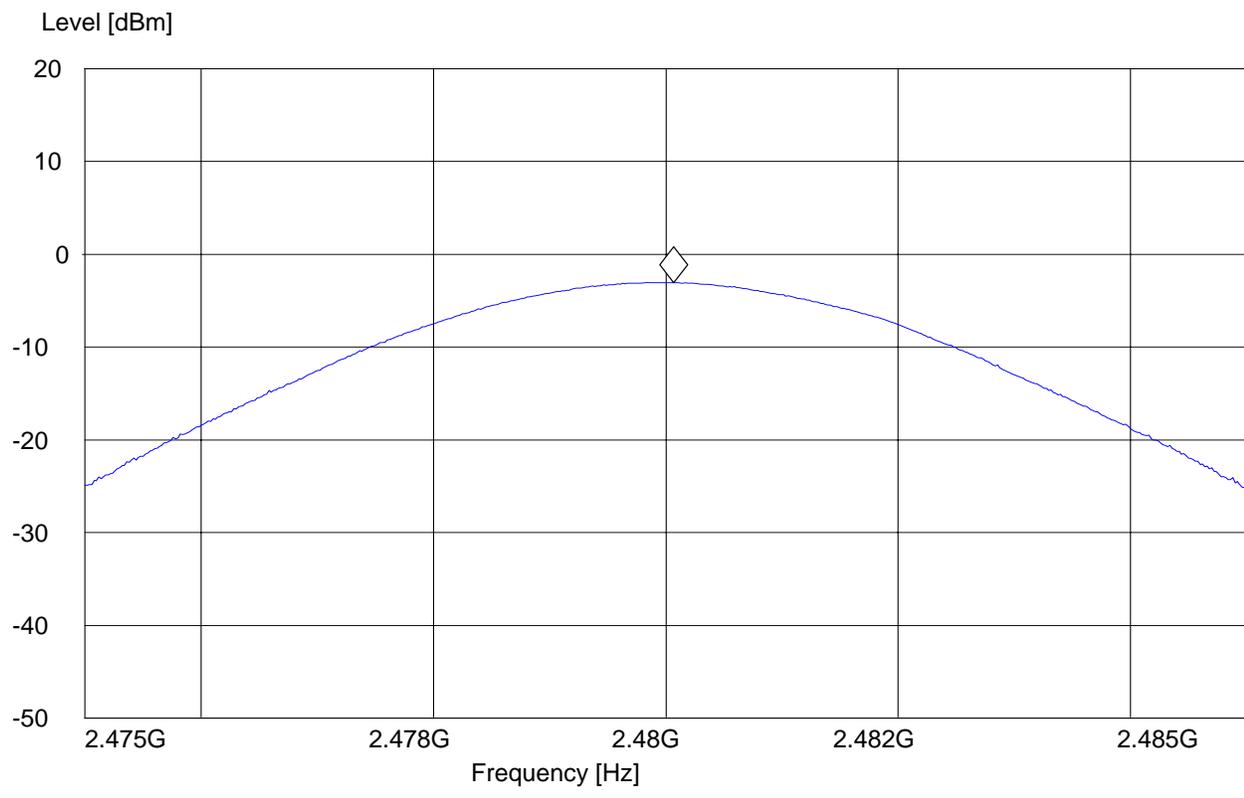
Short Description: EIRP Bluetooth channel-2480MHz

Start Stop Detector Meas. IF Transducer

Frequency Frequency Time Bandw.

2.5 GHz 2.5 GHz MaxPeak Coupled 3 MHz DUMMY-DBM

Marker: 2.48007014 GHz -3.07 dBm





**EIRP BT low channel**

**411 Dixon Landing Road, Milpitas CA 95035, USA**

EUT: HHP 4820

Customer: Hand Held Products Inc.

Test Mode: BT CH0, 8DPSK,

ANT Orientation: H

EUT Orientation: V

Test Engineer: Chris

Voltage: Battery

**SWEEP TABLE: "EIRP BT low channel"**

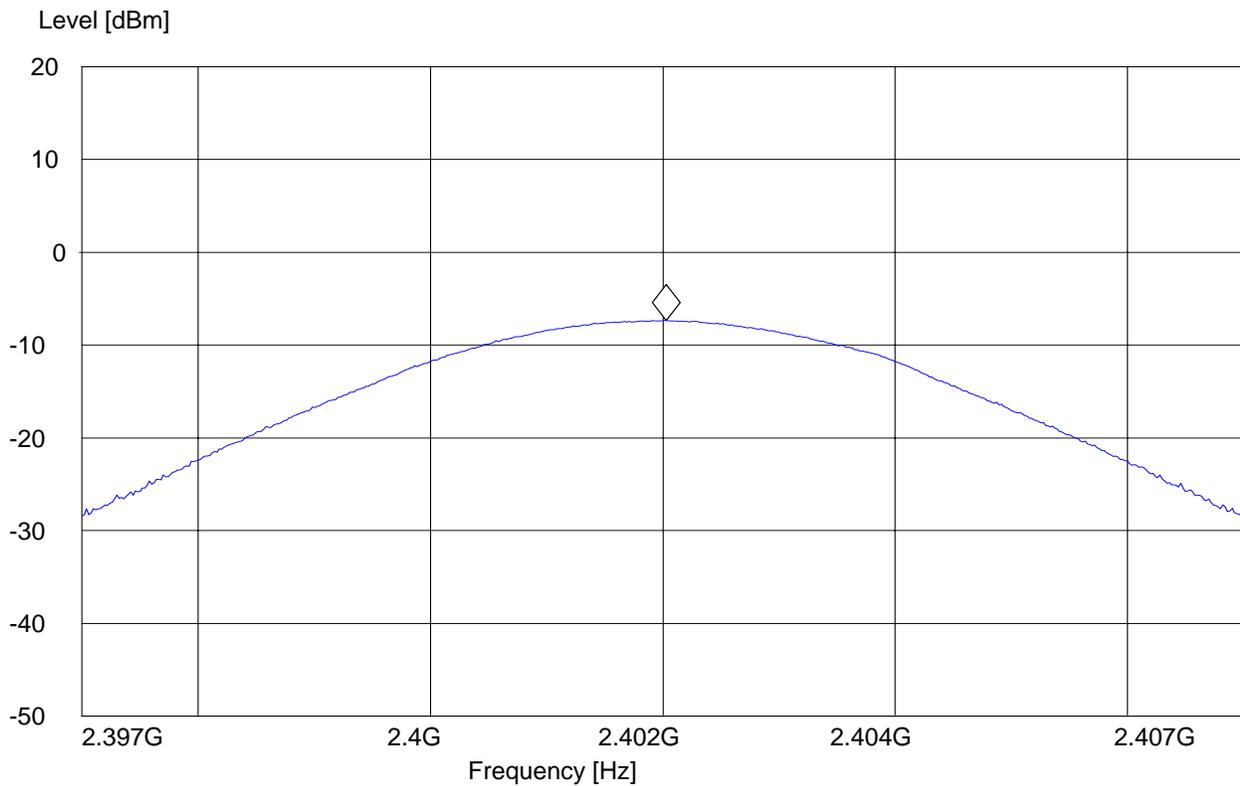
Short Description: EIRP Bluetooth channel-2402MHz

Start Stop Detector Meas. IF Transducer

Frequency Frequency Time Bandw.

2.4 GHz 2.4 GHz MaxPeak Coupled 3 MHz DUMMY-DBM

Marker: 2.40203006 GHz -7.37 dBm





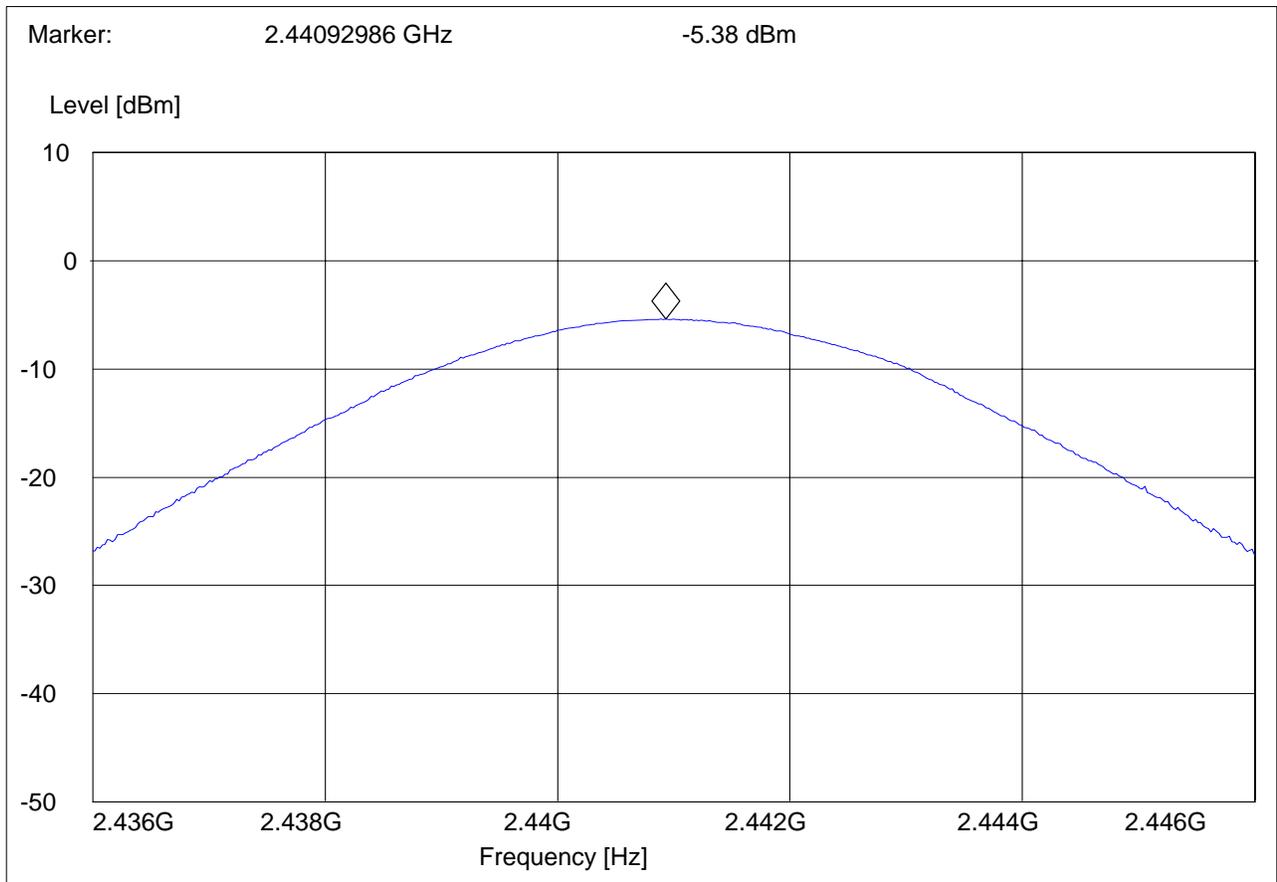
**EIRP BT mid channel**

**411 Dixon Landing Road, Milpitas CA 95035, USA**

EUT: HHP 4820  
Customer: Hand Held Products Inc.  
Test Mode: BT CH39, 8DPSK,  
ANT Orientation: H  
EUT Orientation: V  
Test Engineer: Chris  
Voltage: Battery

**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





**EIRP BT high channel**

**411 Dixon Landing Road, Milpitas CA 95035, USA**

EUT: HHP 4820

Customer: Hand Held Products Inc.

Test Mode: BT CH78, 8DPSK,

ANT Orientation: H

EUT Orientation: V

Test Engineer: Chris

Voltage: Battery

**SWEEP TABLE: "EIRP BT high channel"**

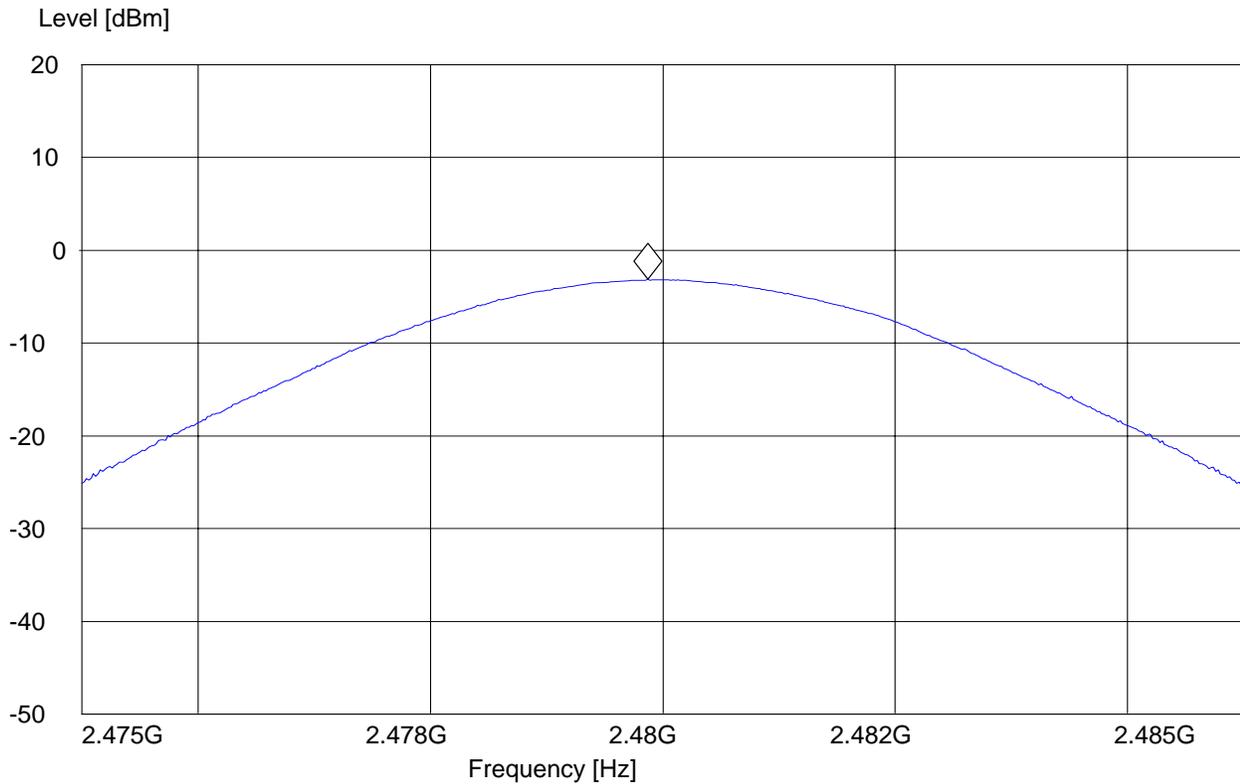
Short Description: EIRP Bluetooth channel-2480MHz

Start Stop Detector Meas. IF Transducer

Frequency Frequency Time Bandw.

2.5 GHz 2.5 GHz MaxPeak Coupled 3 MHz DUMMY-DBM

Marker: 2.479869739 GHz -3.15 dBm





**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
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	( <sup>2</sup> )
13.36 - 13.41			

**Notes:**

1. Radiated emissions are maximized by rotating the EUT 360° at 0.5 meter height increments between 1 and 4 meters.
2. Measurements were performed with the EUT in X, Y and Z orientations with the measurement antenna in both horizontal and vertical polarity. The plots below show the results of the worst case orientation and polarity.



**5.2.2 Results Lower Restricted Band 2310 MHz to 2390 MHz**

**GFSK (2402MHz) PEAK**

**411 Dixon Landing Road, Milpitas CA 95035, USA**

EUT: HHP 4820

Customer: Hand Held Products, Inc.

Test Mode: BT, CH 0

ANT Orientation: V

EUT Orientation: V

Test Engineer: SAM

Voltage: Battery

Comments: GFSK

**SWEEP TABLE: "FCC15.247 LBE\_PK"**

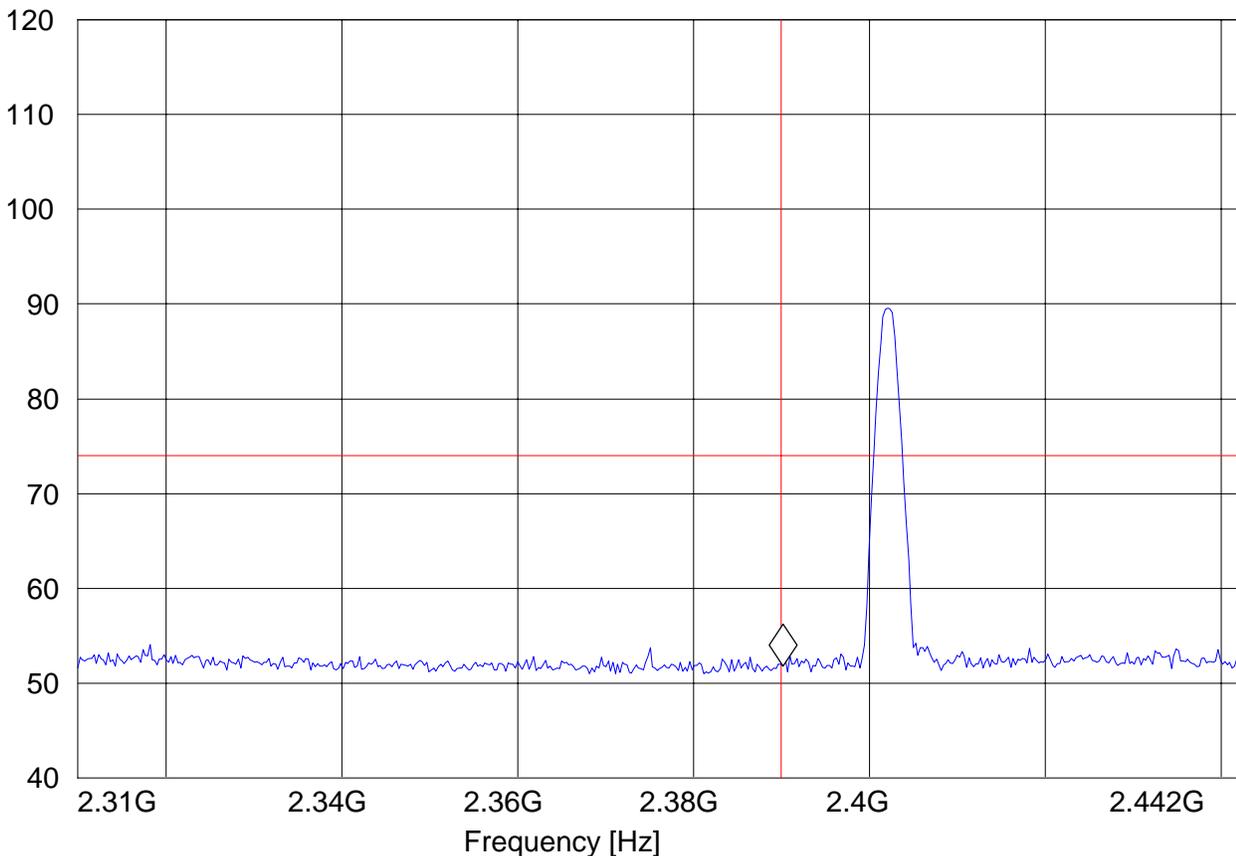
Start Stop Detector Meas. IF Transducer

Frequency Frequency Time Bandw.

2.3 GHz 2.4 GHz MaxPeak Coupled 1 MHz #326horn\_AF

Marker: 2.390152305 GHz 51.83 dB $\mu$ V/m

Level [dB $\mu$ V/m]





**GFSK (2402MHz) AVG**

**411 Dixon Landing Road, Milpitas CA 95035, USA**

EUT: HHP 4820

Customer: Hand Held Products, Inc.

Test Mode: BT, CH 0

ANT Orientation: V

EUT Orientation: V

Test Engineer: SAM

Voltage: Battery

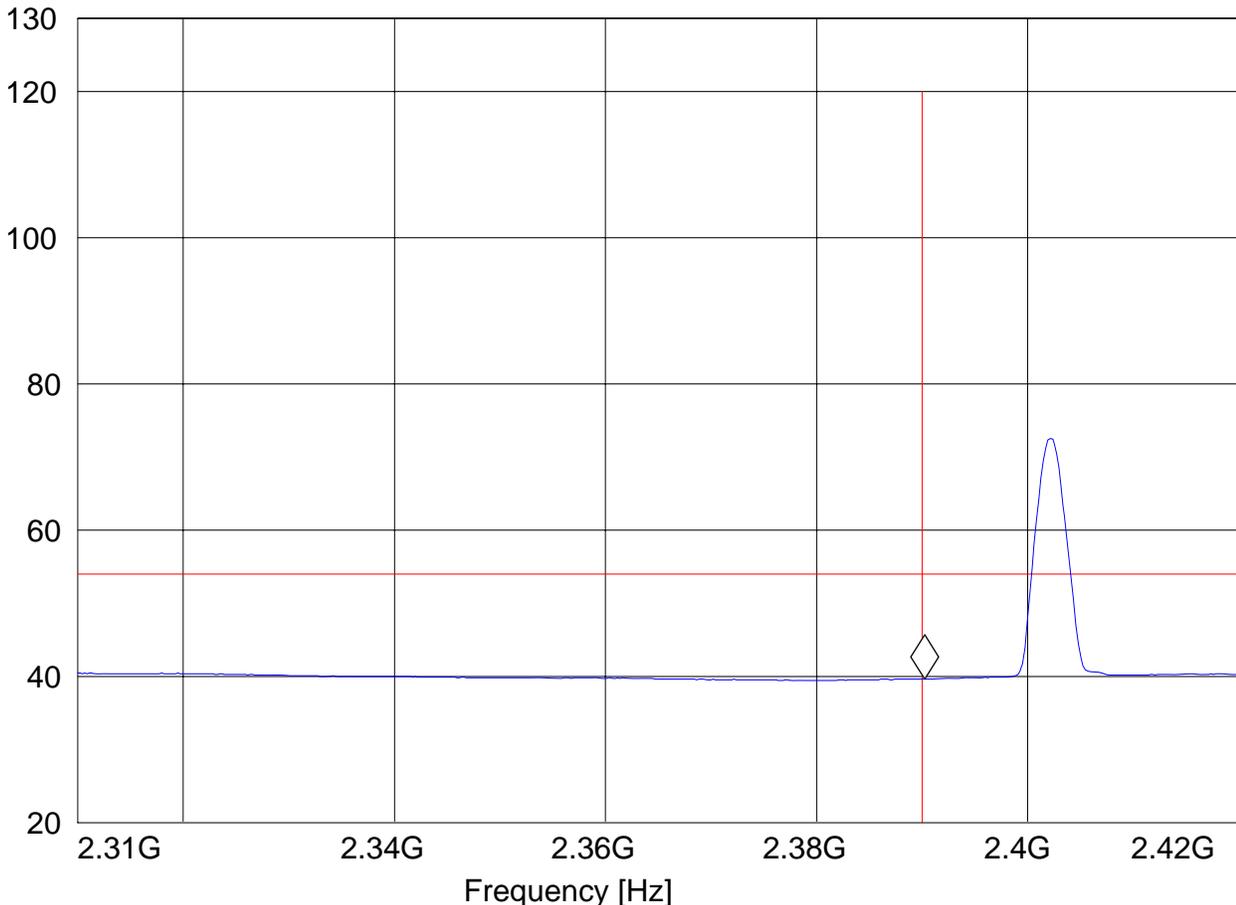
Comments: GFSK

**SWEEP TABLE: "FCC15.247 LBE\_AVG"**

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

Marker: 2.390240481 GHz 39.65 dBµV/m

Level [dBµV/m]





**Pi/4 DQPSK (2402MHz) PEAK**

**411 Dixon Landing Road, Milpitas CA 95035, USA**

EUT: HHP 4820

Customer: Hand Held Products, Inc.

Test Mode: BT, CH 0

ANT Orientation: V

EUT Orientation: V

Test Engineer: SAM

Voltage: Battery

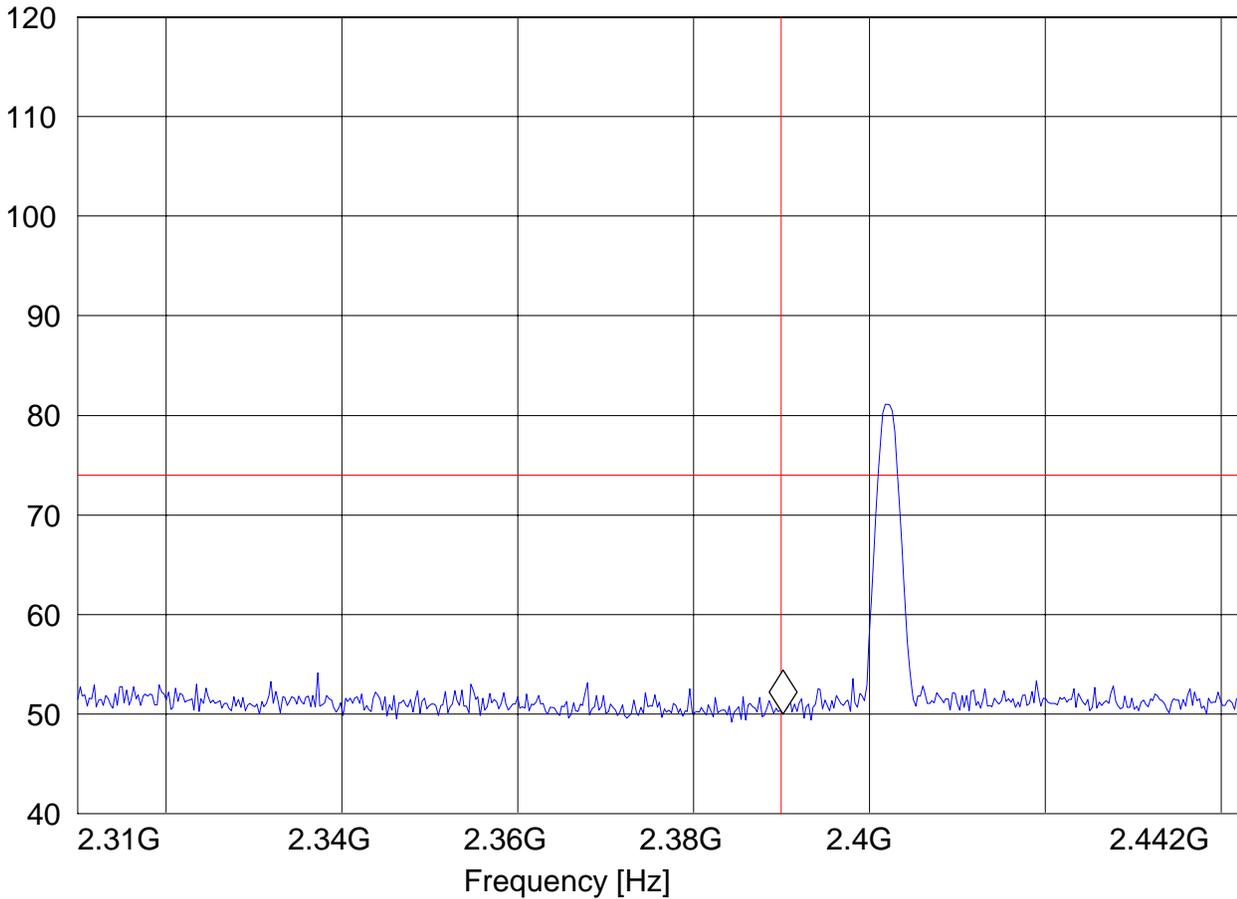
Comments: DQPSK

**SWEEP TABLE: "FCC15.247 LBE\_PK"**

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

Marker: 2.390152305 GHz 50.02 dBµV/m

Level [dBµV/m]





**Pi/4 DQPSK (2402MHz) AVG**

**411 Dixon Landing Road, Milpitas CA 95035, USA**

EUT: HHP 4820

Customer: Hand Held Products, Inc.

Test Mode: BT, CH 0

ANT Orientation: V

EUT Orientation: V

Test Engineer: SAM

Voltage: Battery

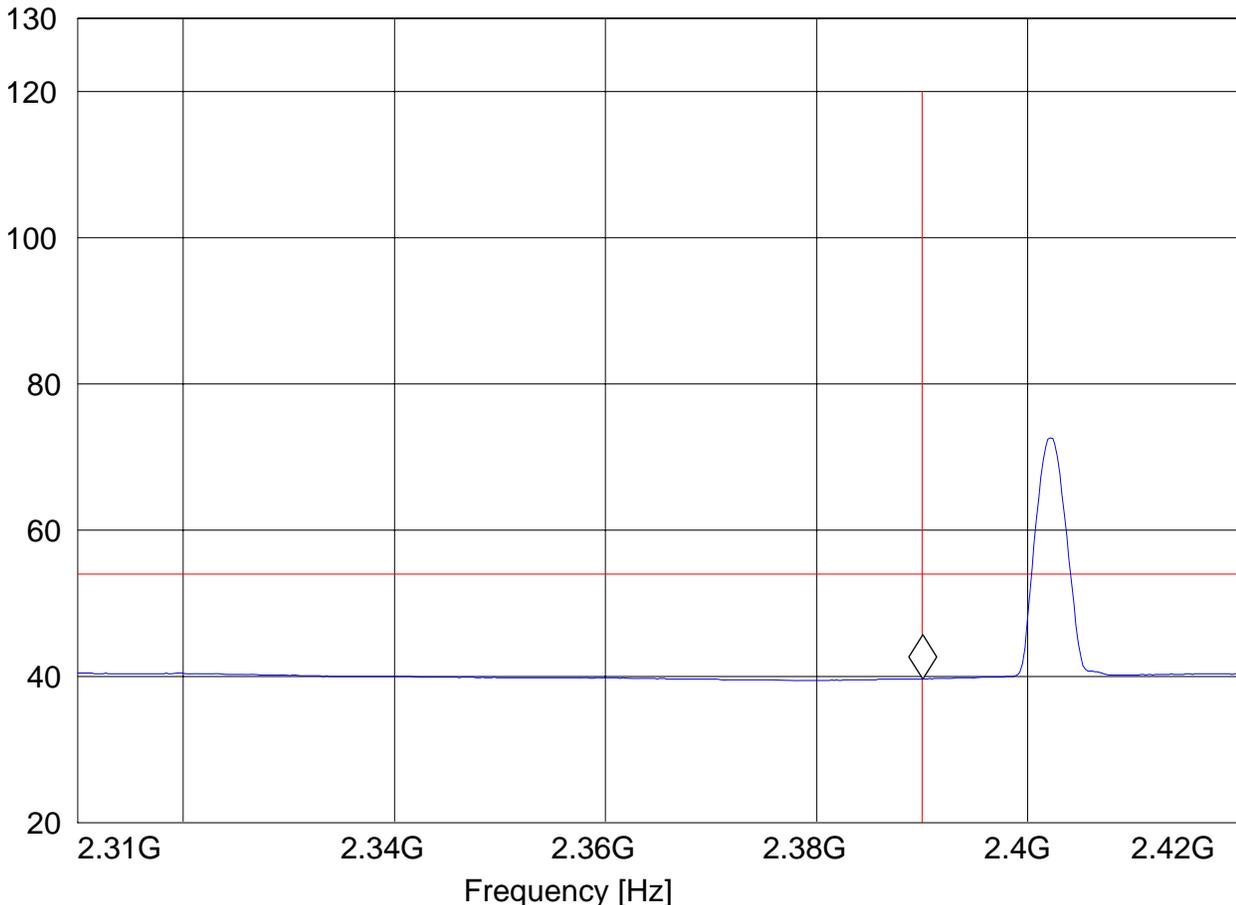
Comments: DQPSK

**SWEEP TABLE: "FCC15.247 LBE\_AVG"**

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

Marker: 2.39002004 GHz 39.67 dBμV/m

Level [dBμV/m]





**8DPSK (2402MHz) PEAK**

**411 Dixon Landing Road, Milpitas CA 95035, USA**

EUT: HHP 4820

Customer: Hand Held Products, Inc.

Test Mode: BT, CH 0

ANT Orientation: V

EUT Orientation: V

Test Engineer: SAM

Voltage: Battery

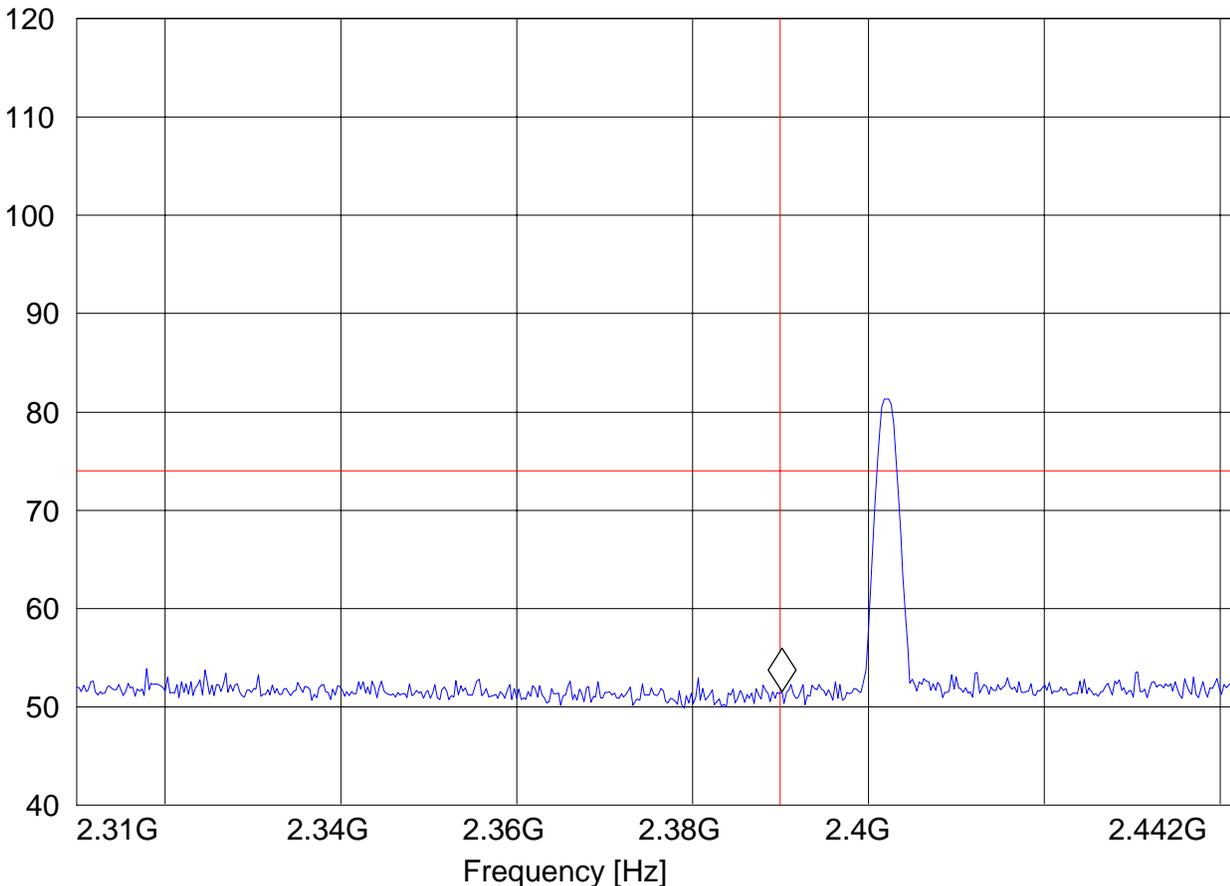
Comments: 8DPSK

**SWEEP TABLE: "FCC15.247 LBE\_PK"**

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

Marker: 2.390152305 GHz 51.53 dBµV/m

Level [dBµV/m]





**8DPSK (2402MHz) AVG**

**411 Dixon Landing Road, Milpitas CA 95035, USA**

EUT: HHP 4820

Customer: Hand Held Products, Inc.

Test Mode: BT, CH 0

ANT Orientation: V

EUT Orientation: V

Test Engineer: SAM

Voltage: Battery

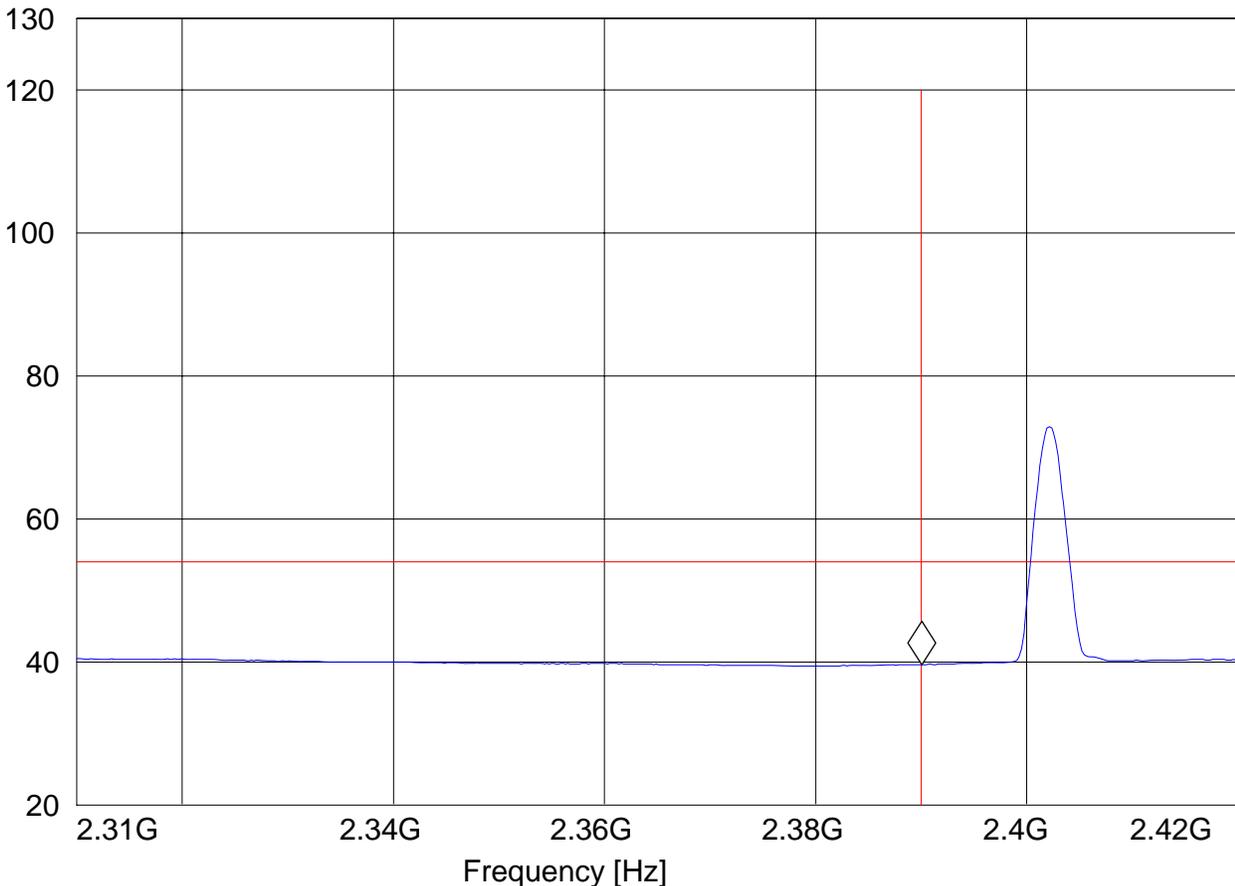
Comments: 8DPSK

**SWEEP TABLE: "FCC15.247 LBE\_AVG"**

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

Marker: 2.39002004 GHz 39.66 dB $\mu$ V/m

Level [dB $\mu$ V/m]





### 5.2.3 Results Upper Restricted Band 2483.5 MHz to 2500 MHz GFSK (2480MHz) PEAK

411 Dixon Landing Road, Milpitas CA 95035, USA

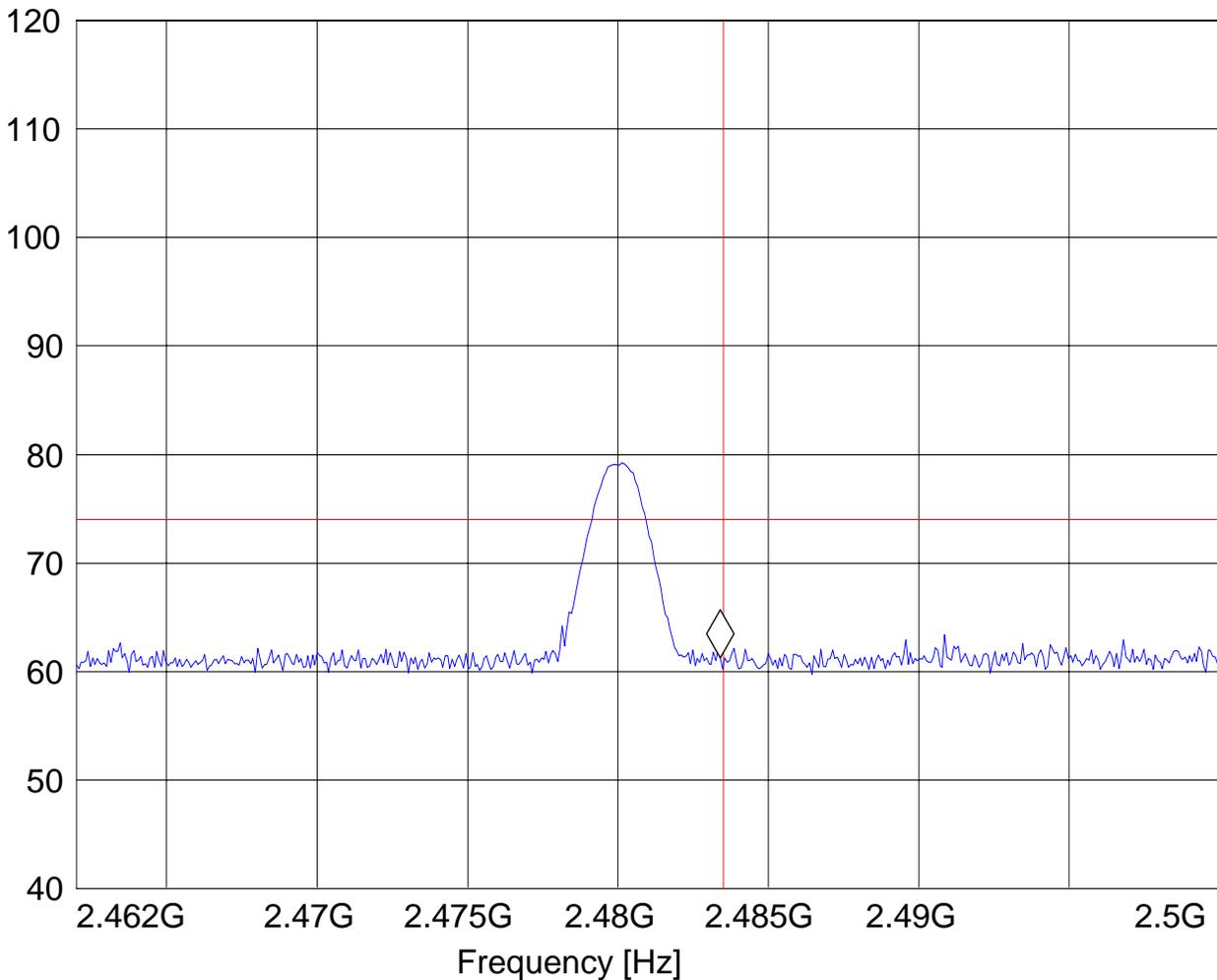
EUT: HHP 4820  
Customer: Hand Held Products, Inc.  
Test Mode: BT, CH 78  
ANT Orientation: V  
EUT Orientation: V  
Test Engineer: SAM  
Voltage: Battery  
Comments: GFSK

**SWEEP TABLE: "FCC15.247 HBE\_PK"**

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

Marker: 2.483398798 GHz 61.25 dB $\mu$ V/m

Level [dB $\mu$ V/m]





**GFSK (2480MHz) AVG**

411 Dixon Landing Road, Milpitas CA 95035, USA

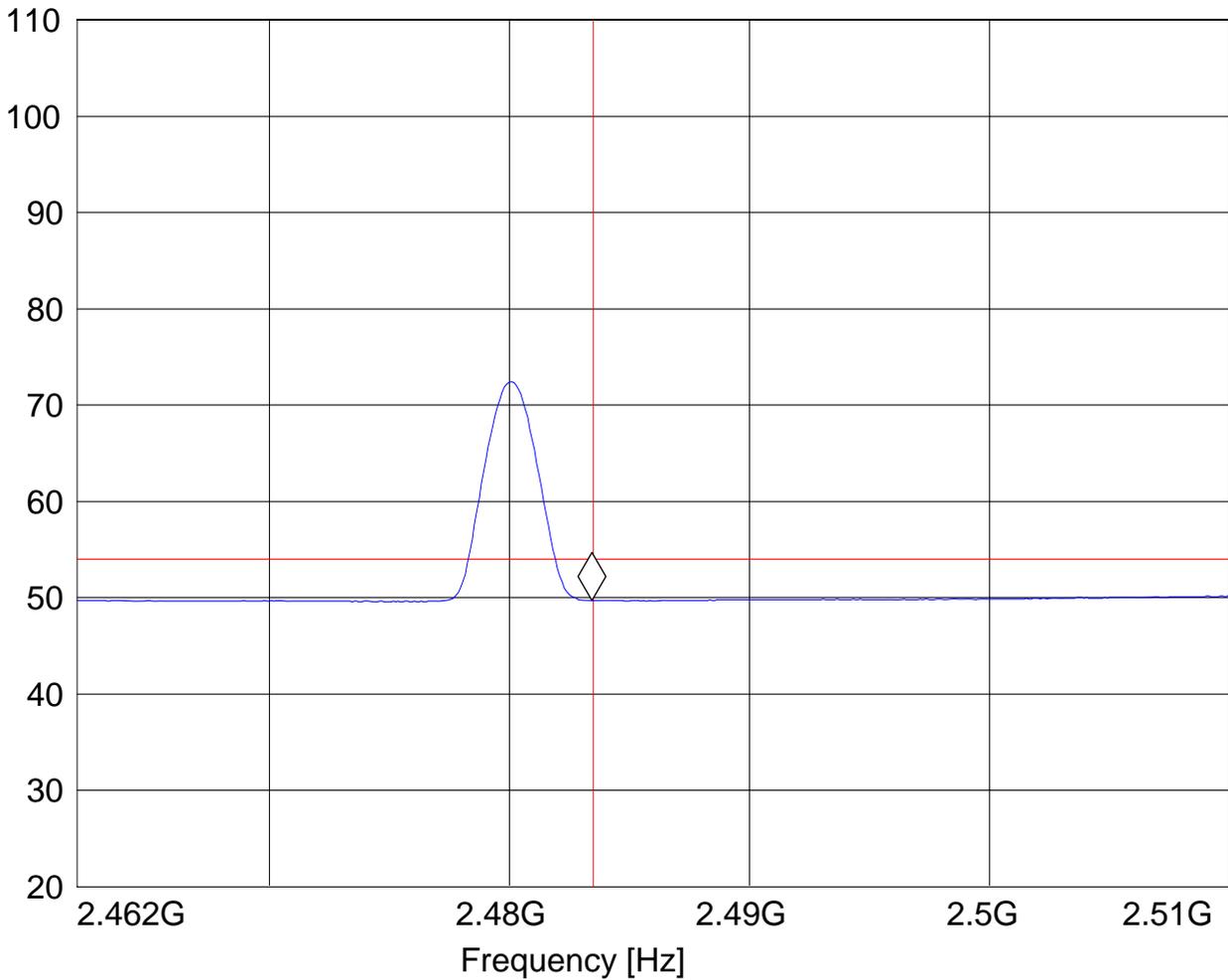
EUT: HHP 4820  
Customer: Hand Held Products, Inc.  
Test Mode: BT, CH 78  
ANT Orientation: V  
EUT Orientation: V  
Test Engineer: SAM  
Voltage: Battery  
Comments: GFSK

**SWEEP TABLE: "FCC15.247 HBE\_AVG"**

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

Marker: 2.483450902 GHz 49.71 dBμV/m

Level [dBμV/m]





**Pi/4 DQPSK (2480MHz) PEAK**

**411 Dixon Landing Road, Milpitas CA 95035, USA**

EUT: HHP 4820

Customer: Hand Held Products, Inc.

Test Mode: BT, CH 78

ANT Orientation: V

EUT Orientation: V

Test Engineer: SAM

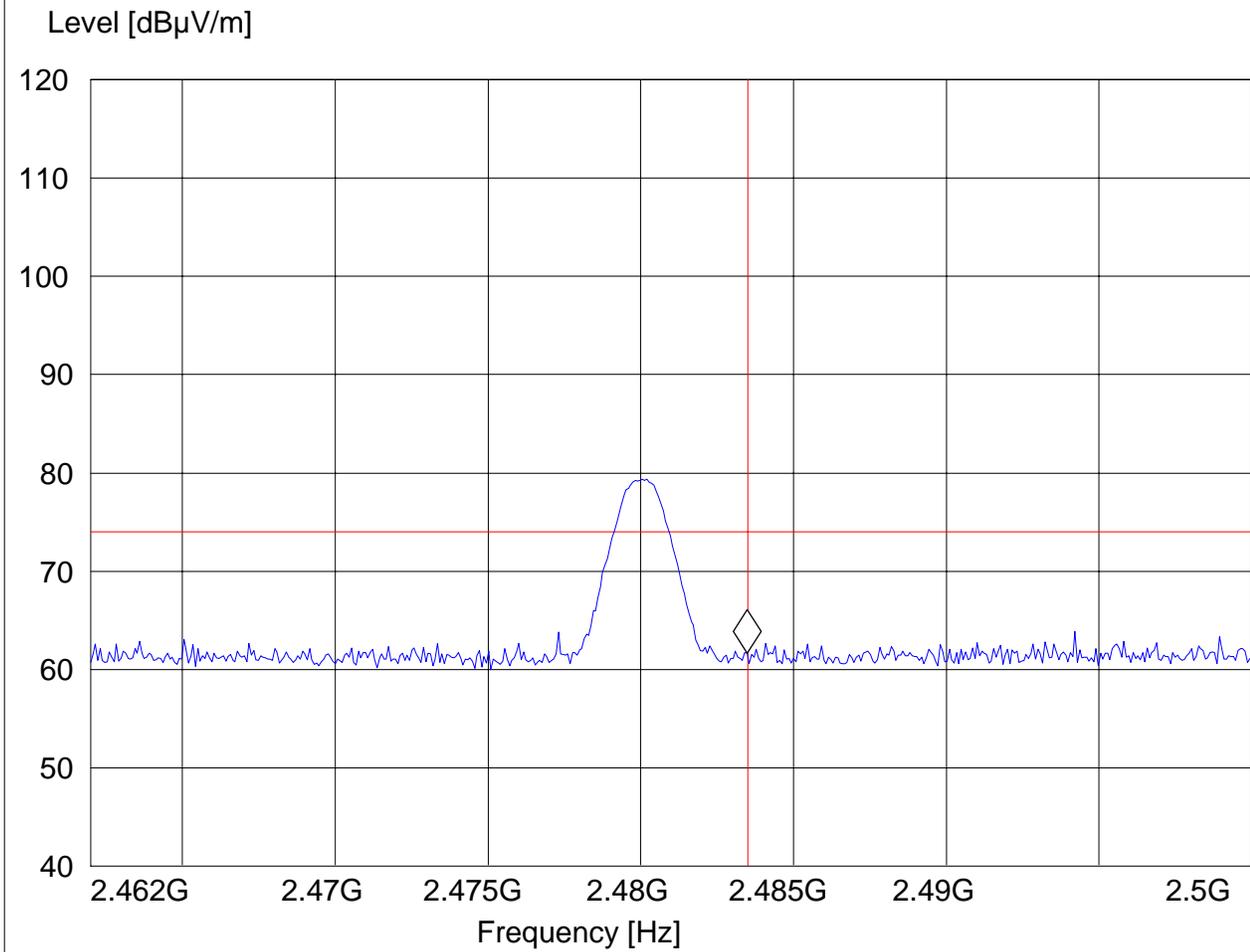
Voltage: Battery

Comments: DQPSK

**SWEEP TABLE: "FCC15.247 HBE\_PK"**

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

Marker: 2.48347495 GHz 61.69 dB $\mu$ V/m





**Pi/4 DQPSK (2480MHz) AVG**

**411 Dixon Landing Road, Milpitas CA 95035, USA**

EUT: HHP 4820

Customer: Hand Held Products, Inc.

Test Mode: BT, CH 78

ANT Orientation: V

EUT Orientation: V

Test Engineer: SAM

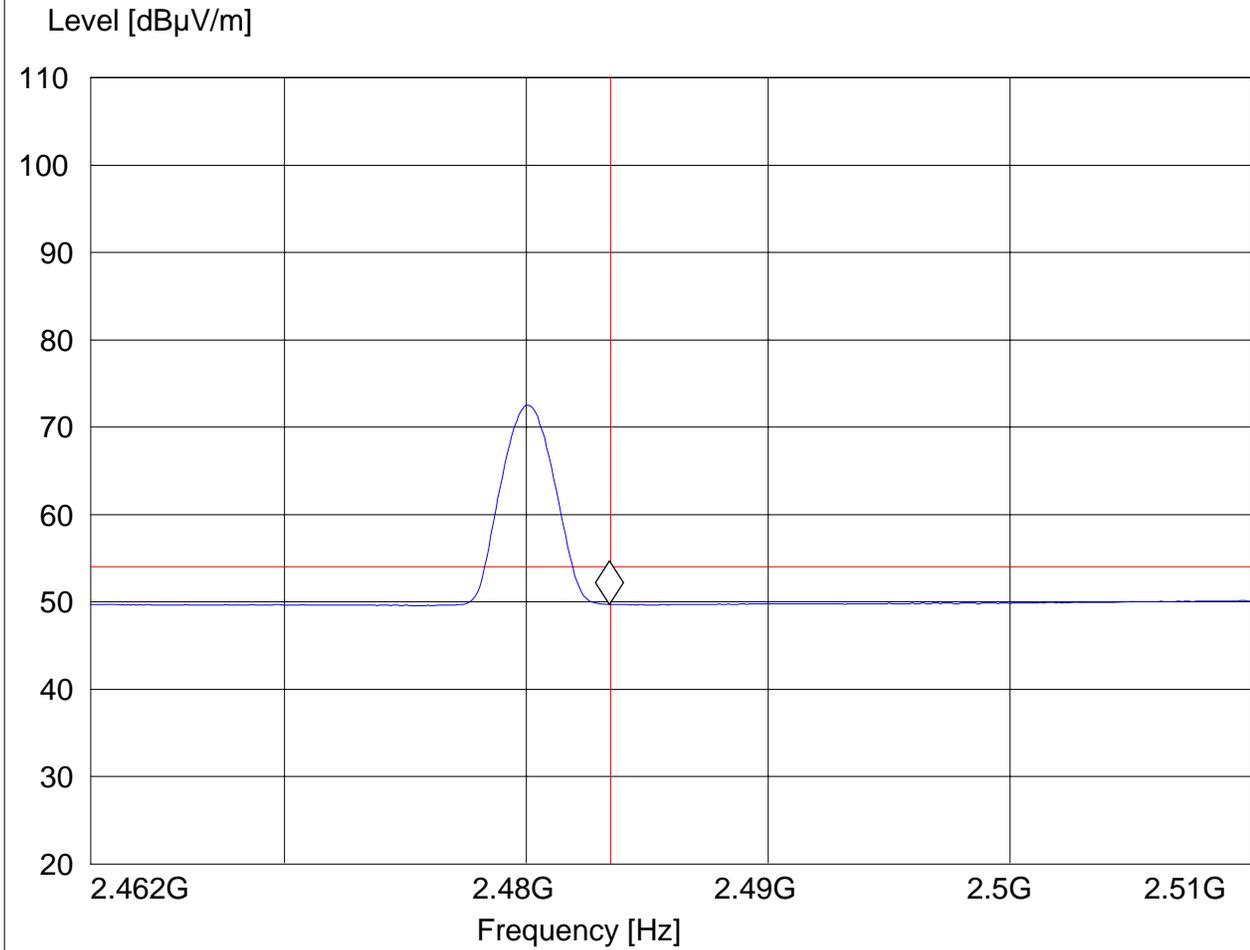
Voltage: Battery

Comments: DQPSK

**SWEEP TABLE: "FCC15.247 HBE\_AVG"**

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

Marker: 2.483450902 GHz 49.71 dB $\mu$ V/m





**8DPSK (2480MHz) PEAK**

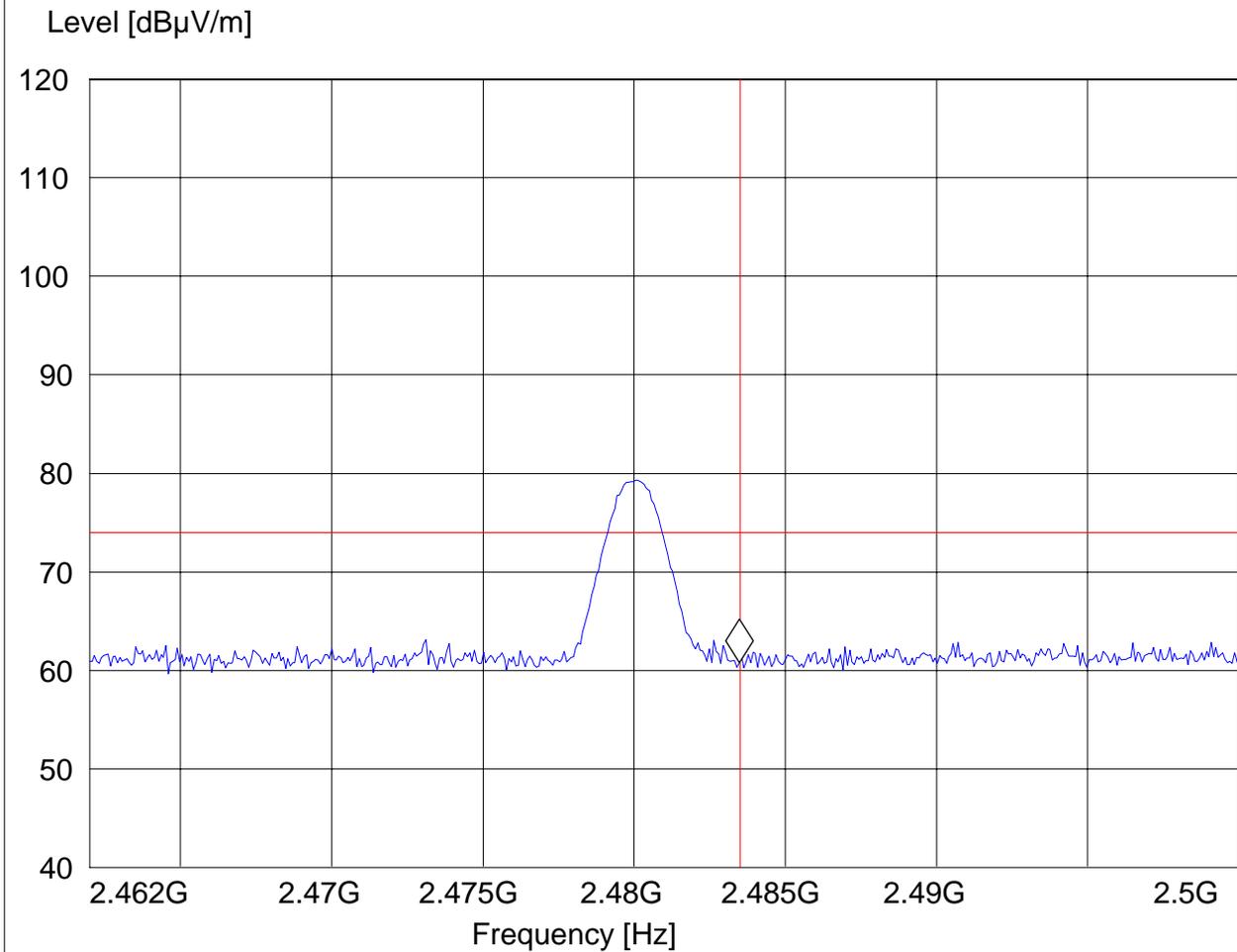
**411 Dixon Landing Road, Milpitas CA 95035, USA**

EUT: HHP 4820  
Customer: Hand Held Products, Inc.  
Test Mode: BT, CH 78  
ANT Orientation: V  
EUT Orientation: V  
Test Engineer: SAM  
Voltage: Battery  
Comments: 8DPSK

**SWEEP TABLE: "FCC15.247 HBE\_PK"**

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

Marker: 2.48347495 GHz 60.78 dB $\mu$ V/m





**8DPSK (2480MHz) AVG**

**411 Dixon Landing Road, Milpitas CA 95035, USA**

EUT: HHP 4820

Customer: Hand Held Products, Inc.

Test Mode: BT, CH 78

ANT Orientation: V

EUT Orientation: V

Test Engineer: SAM

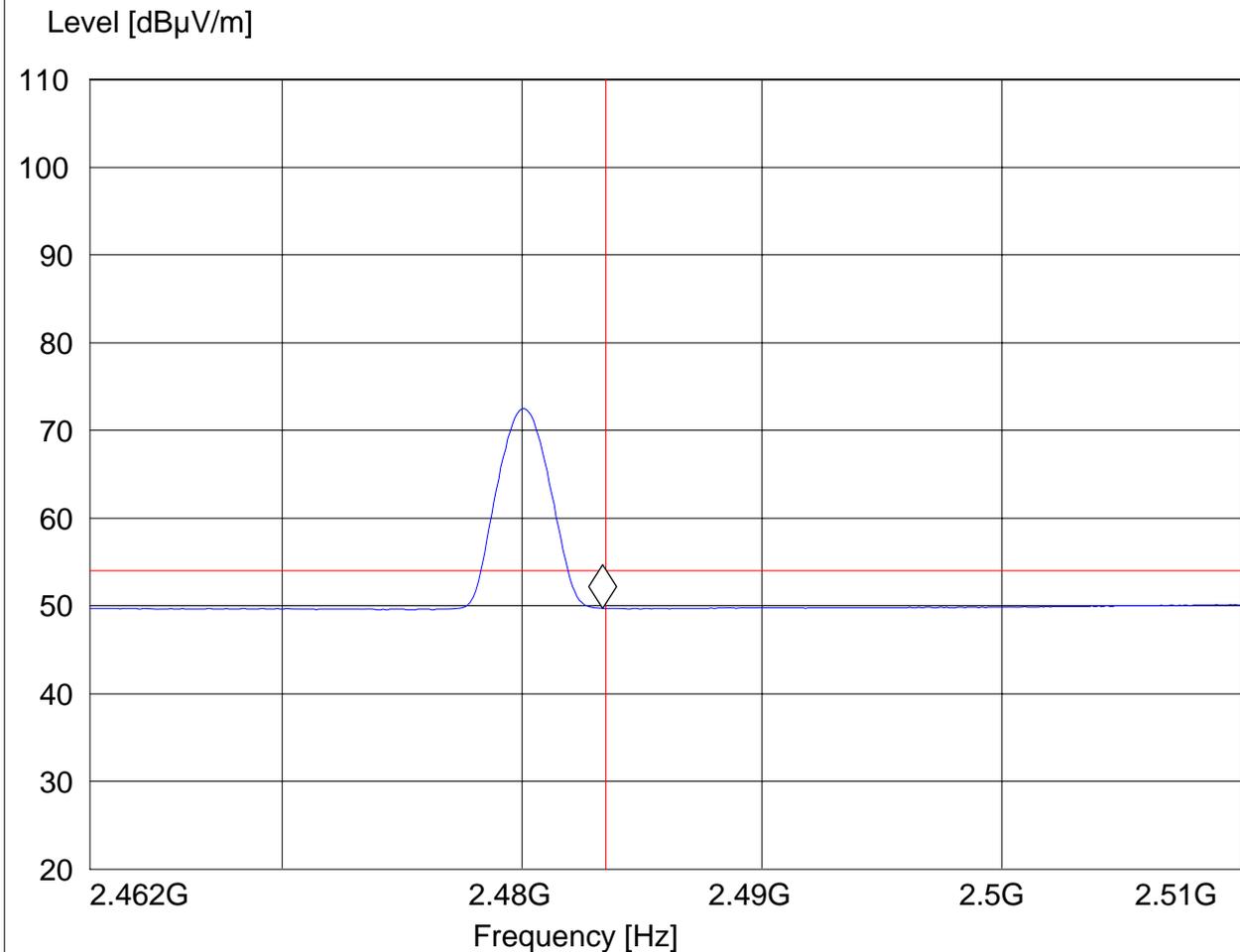
Voltage: Battery

Comments: 8DPSK

**SWEEP TABLE: "FCC15.247 HBE\_AVG"**

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

Marker: 2.483354709 GHz 49.7 dBμV/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
<sup>1</sup> 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	( <sup>2</sup> )
13.36 - 13.41			

**Notes:**

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.
3. Radiated emissions are maximized by rotating the EUT 360° at 0.5 meter height increments between 1 and 4 meters.
4. Measurements were performed with the EUT in X, Y and Z orientations with the measurement antenna in both horizontal and vertical polarity. The plots below show the results of the worst case orientation and polarity

**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

30MHz – 1GHz Antenna: vertical

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

411 Dixon Landing Road, Milpitas CA 95035, USA

EUT: 4820i

Customer: Hand Held Products, Inc.

Test Mode: BT, CH 78, Scanner on

ANT Orientation: V

EUT Orientation: H

Test Engineer: SAM

Voltage: Battery

**SWEEP TABLE: "FCC15.247\_30M-1G\_Ver"**

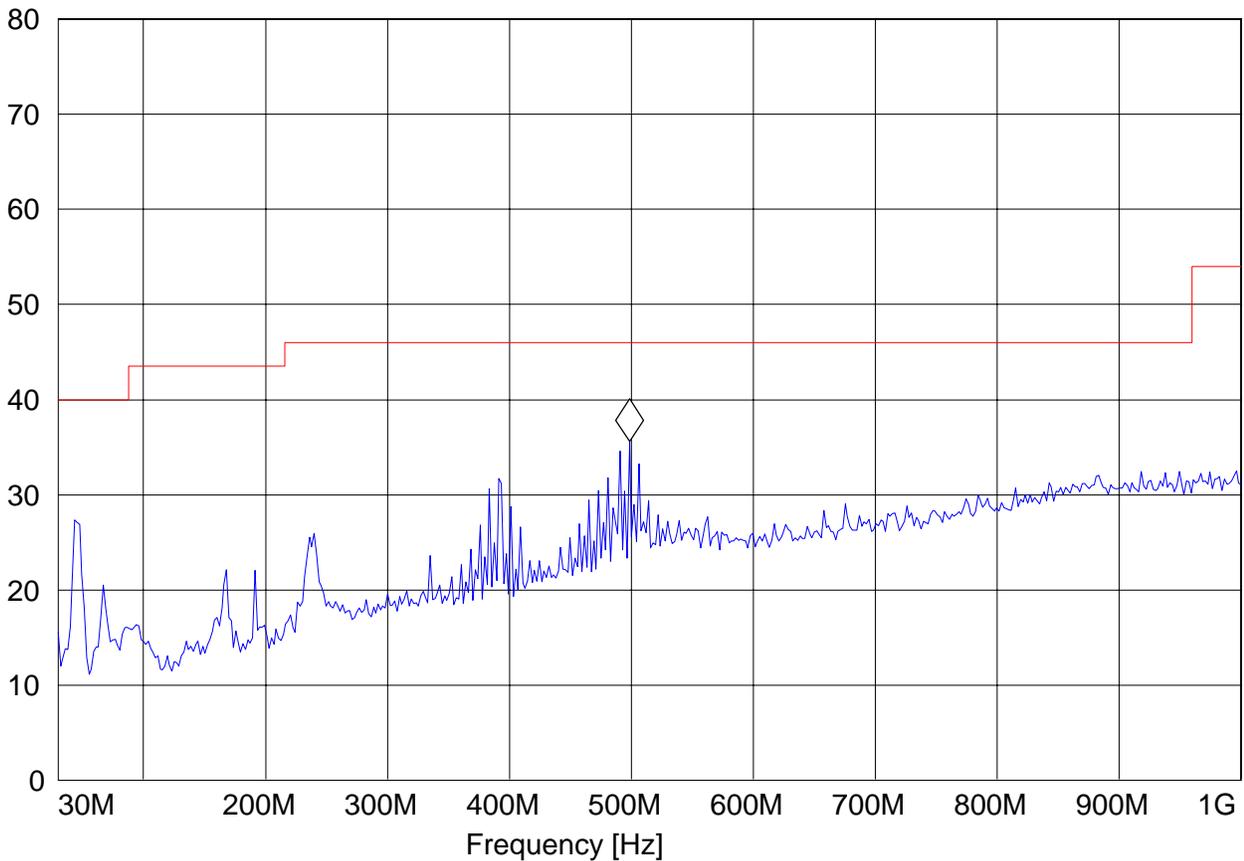
Start Stop Detector Meas. IF Transducer

Frequency Frequency Time Bandw.

30.0 MHz 1.0 GHz MaxPeak Coupled 100 kHz 3141-#1186\_Vert

Marker: 498.476954 MHz 35.61 dBµV/m

Level [dBµV/m]





**30MHz – 1GHz**

**Antenna: horizontal**

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

**411 Dixon Landing Road, Milpitas CA 95035, USA**

EUT: 4820i

Customer: Hand Held Products, Inc.

Test Mode: BT, CH 78, Scanner on

ANT Orientation: H

EUT Orientation: V

Test Engineer: SAM

Voltage: Battery

**SWEEP TABLE: "FCC15.247\_30M-1G\_Hor"**

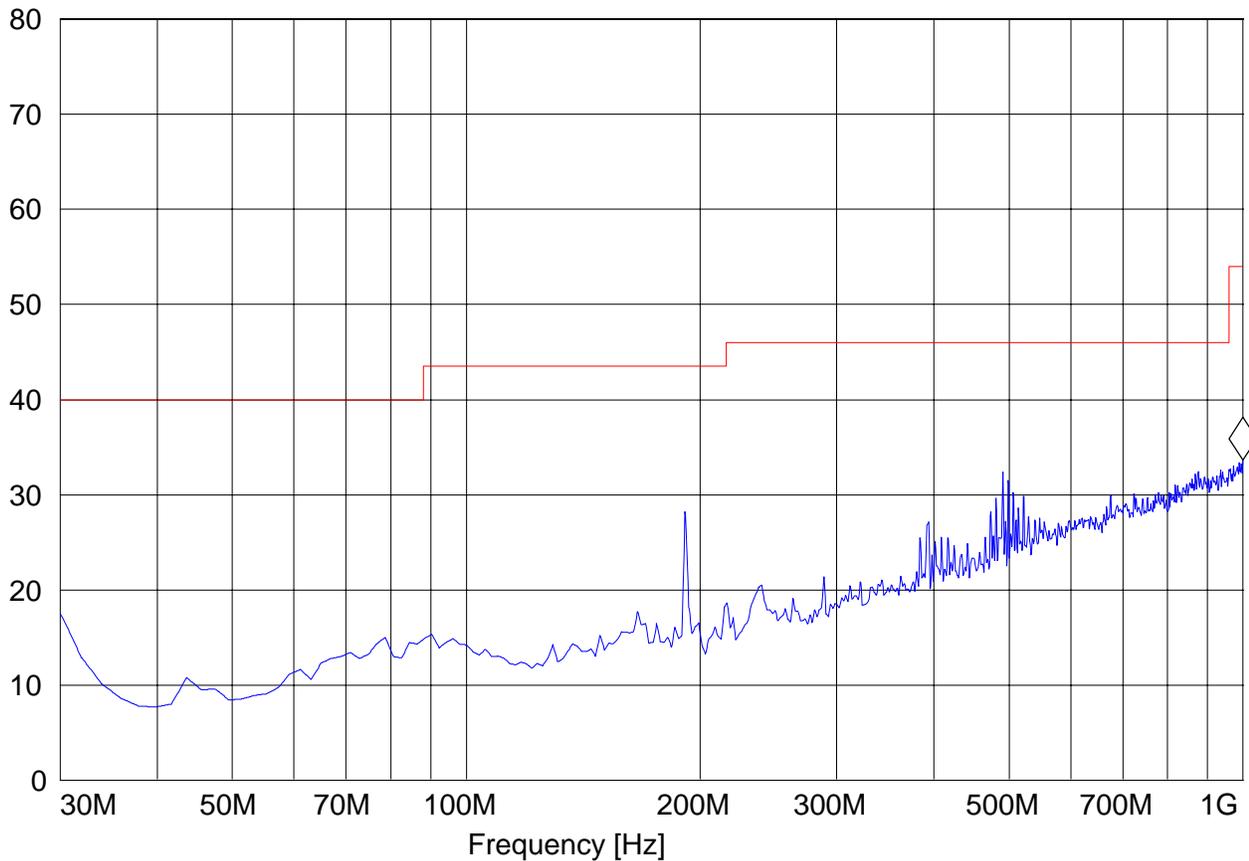
Start Stop Detector Meas. IF Transducer

Frequency Frequency Time Bandw.

30.0 MHz 1.0 GHz MaxPeak Coupled 100 kHz 3141-#1186\_Horz

Marker: 1 GHz 33.68 dB $\mu$ V/m

Level [dB $\mu$ V/m]





**1-3GHz (2402MHz)**

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

**Note: Peak Reading vs. Average limit**

**411 Dixon Landing Road, Milpitas CA 95035, USA**

EUT: 4820i

Customer: Hand Held Products, Inc.

Test Mode: BT; GFSK; CH 0, Scanner on

ANT Orientation: H

EUT Orientation: H

Test Engineer: SAM

Voltage: Battery

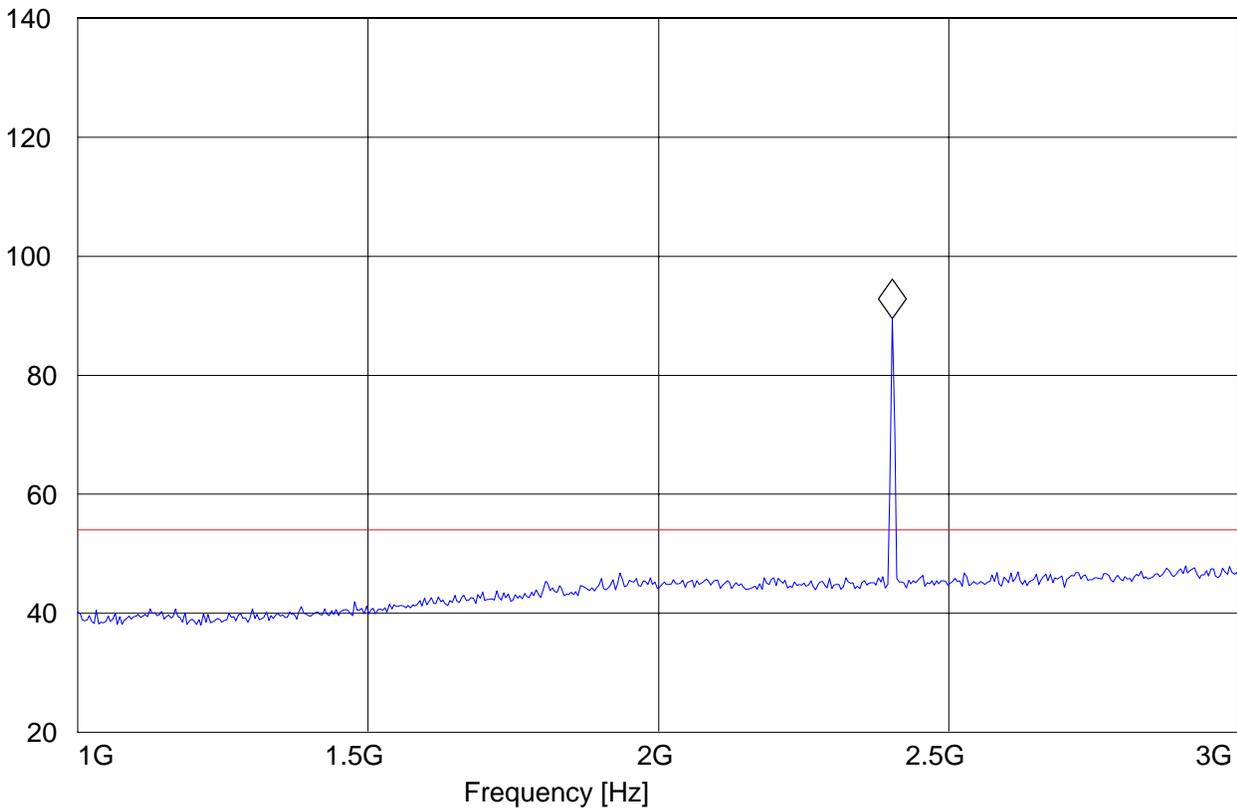
Comments: TT 253°

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

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

Marker: 2.402805611 GHz 89.53 dBμV/m

Level [dBμV/m]





**1-3GHz (2441MHz)**

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

**Note: Peak Reading vs. Average limit**

**411 Dixon Landing Road, Milpitas CA 95035, USA**

EUT: 4820i

Customer: Hand Held Products, Inc.

Test Mode: BT GFSK; CH 39, Scanner on

ANT Orientation: H

EUT Orientation: H

Test Engineer: SAM

Voltage: Battery

Comments: TT 253°

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

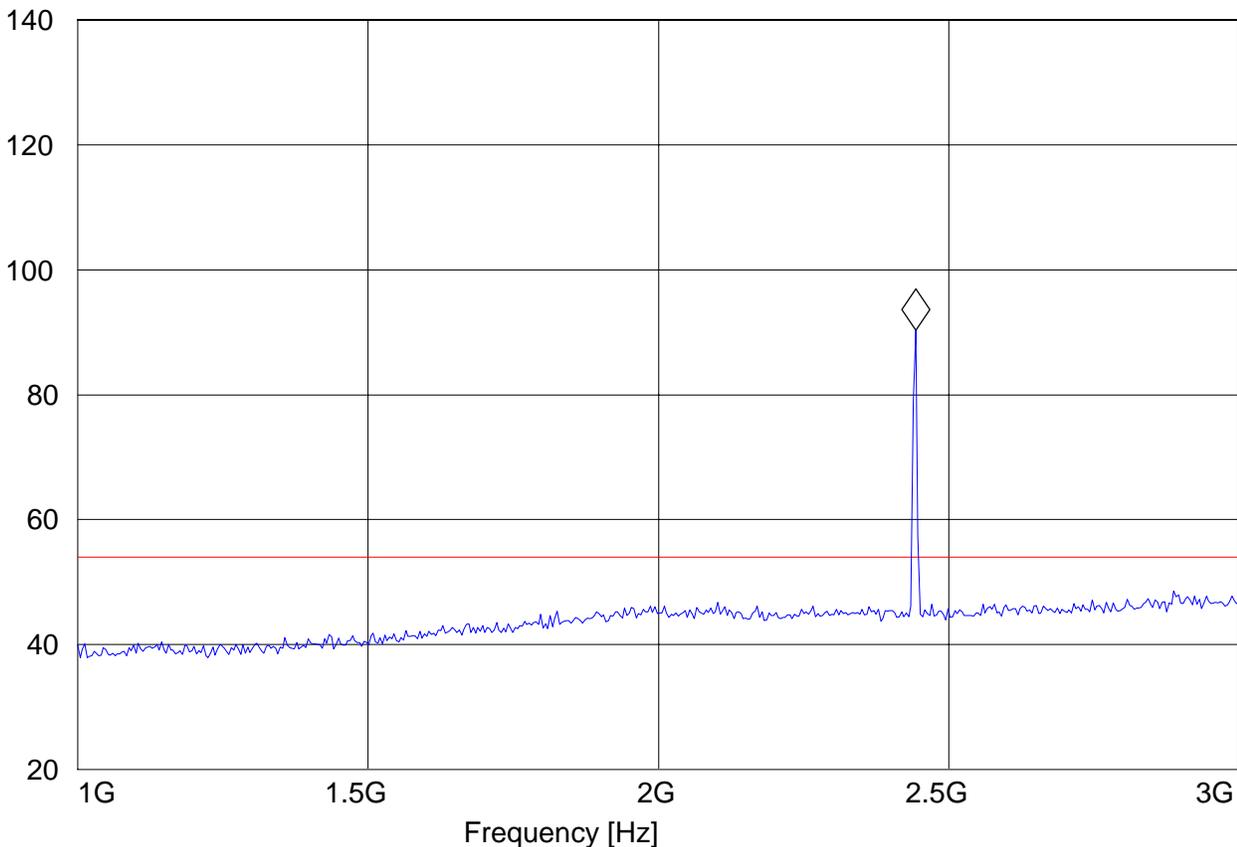
Start Stop Detector Meas. IF Transducer

Frequency Frequency Time Bandw.

1.0 GHz 3.0 GHz MaxPeak Coupled 1 MHz #326horn\_AF\_vert

Marker: 2.442885772 GHz 90.28 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**

**411 Dixon Landing Road, Milpitas CA 95035, USA**

EUT: 4820i

Customer: Hand Held Products, Inc.

Test Mode: BT, CH78, Scanner on

ANT Orientation: H

EUT Orientation: H

Test Engineer: SAM

Voltage: battery

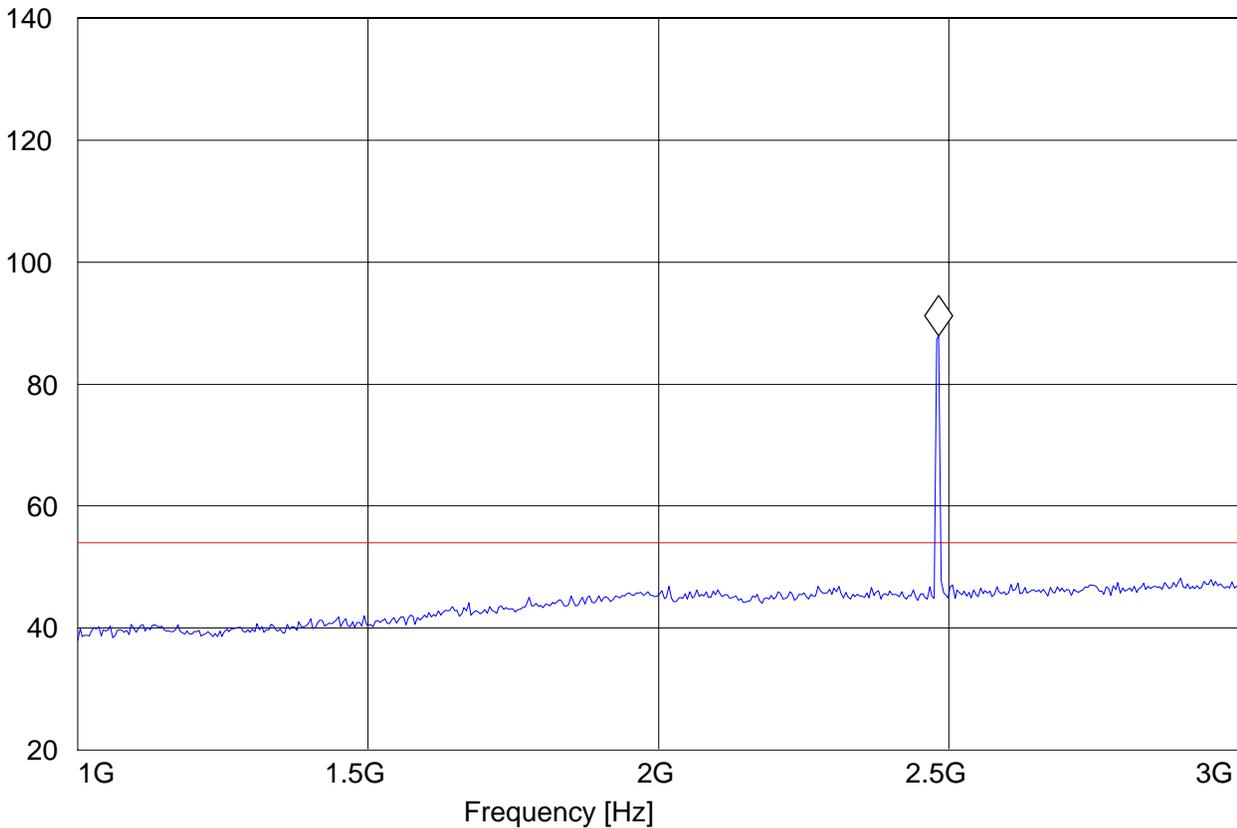
Comments: marker placed on uplink

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

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

Marker: 2.482965932 GHz 87.88 dB $\mu$ V/m

Level [dB $\mu$ V/m]





**3-18GHz (2402MHz)**

**Note: Peak Reading vs. Average limit**

**411 Dixon Landing Road, Milpitas CA 95035, USA**

EUT: 4820i

Customer: Hand Held Products, Inc.

Test Mode: BT CH0, Scanner on

ANT Orientation: H

EUT Orientation: H

Test Engineer: SAM

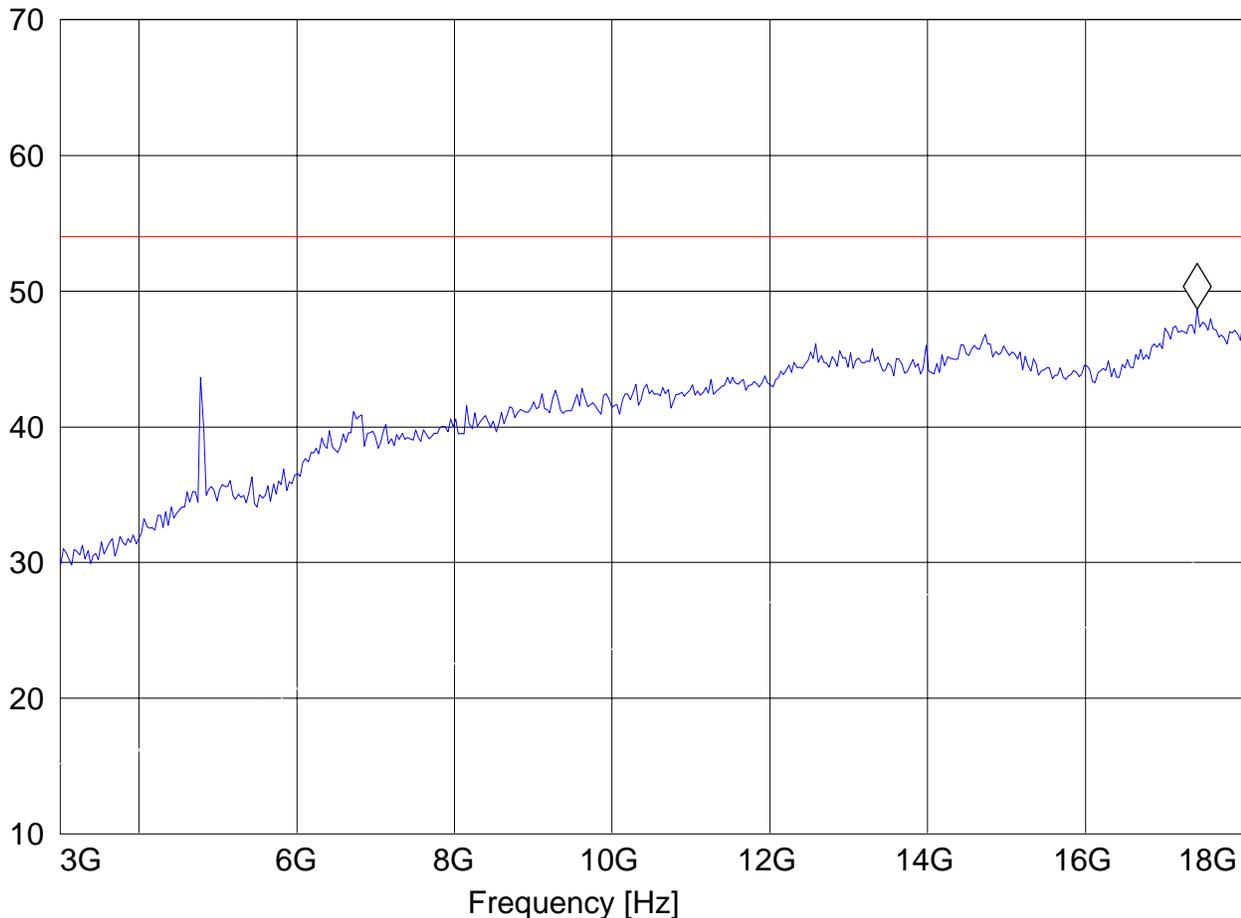
Voltage: Battery

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

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

Marker: 17.420841683 GHz 48.65 dBµV/m

Level [dBµV/m]





**411 Dixon Landing Road, Milpitas CA 95035, USA**

EUT: 4820i

Customer: Hand Held Products, Inc.

Test Mode: BT CH 0, Scanner on

ANT Orientation: V

EUT Orientation: H

Test Engineer: SAM

Voltage: Battery

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

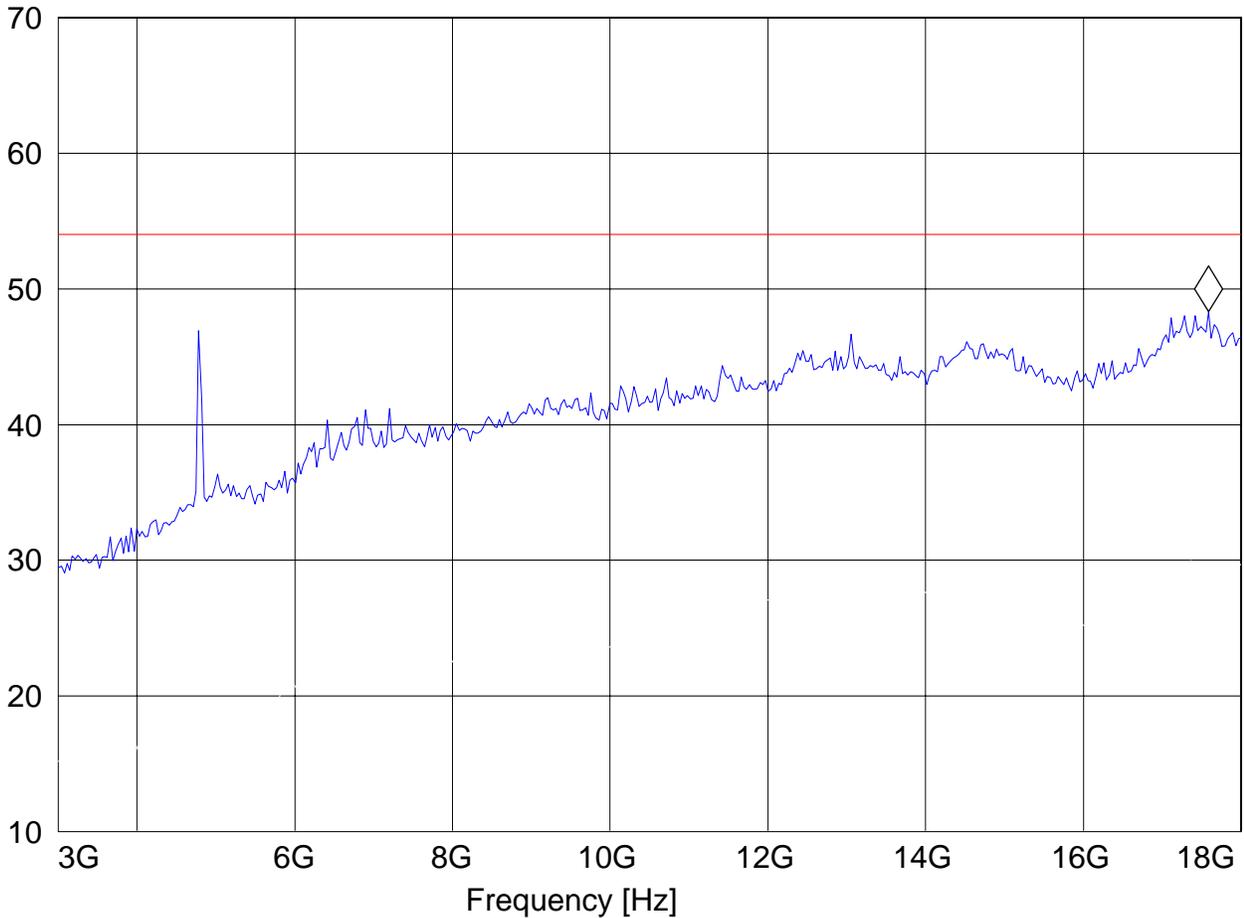
Start Stop Detector Meas. IF Transducer

Frequency Frequency Time Bandw.

1.0 GHz 18.0 GHz MaxPeak Coupled 1 MHz #326horn\_AF\_vert

Marker: 17.591182365 GHz 48.31 dB $\mu$ V/m

Level [dB $\mu$ V/m]





**3-18GHz (2441MHz)**

411 Dixon Landing Road, Milpitas CA 95035, USA

EUT: 4820i

Customer: Hand Held Products, Inc.

Test Mode: BT CH39, Scanner on

ANT Orientation: H

EUT Orientation: H

Test Engineer: SAM

Voltage: Battery

Comments:

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

Start Stop Detector Meas. IF Transducer

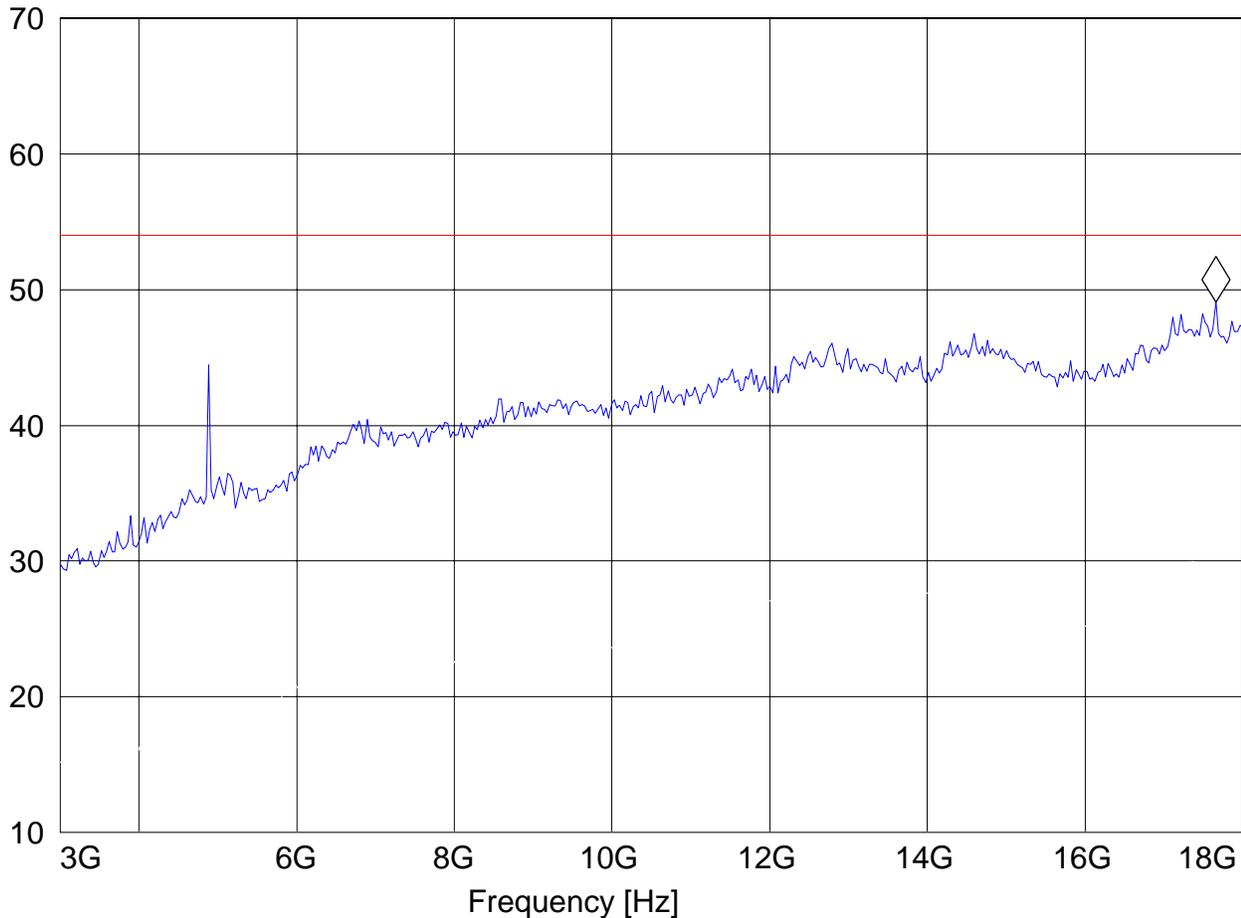
Frequency Frequency Time Bandw.

1.0 GHz 18.0 GHz MaxPeak Coupled 1 MHz

#326horn\_AF\_ve

Marker: 17.659318637 GHz 49.08 dB $\mu$ V/m

Level [dB $\mu$ V/m]





**411 Dixon Landing Road, Milpitas CA 95035, USA**

EUT: 4820i

Customer: Hand Held Products, Inc.

Test Mode: BT CH 39, Scanner on

ANT Orientation: V

EUT Orientation: H

Test Engineer: SAM

Voltage: Battery

Comments:

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

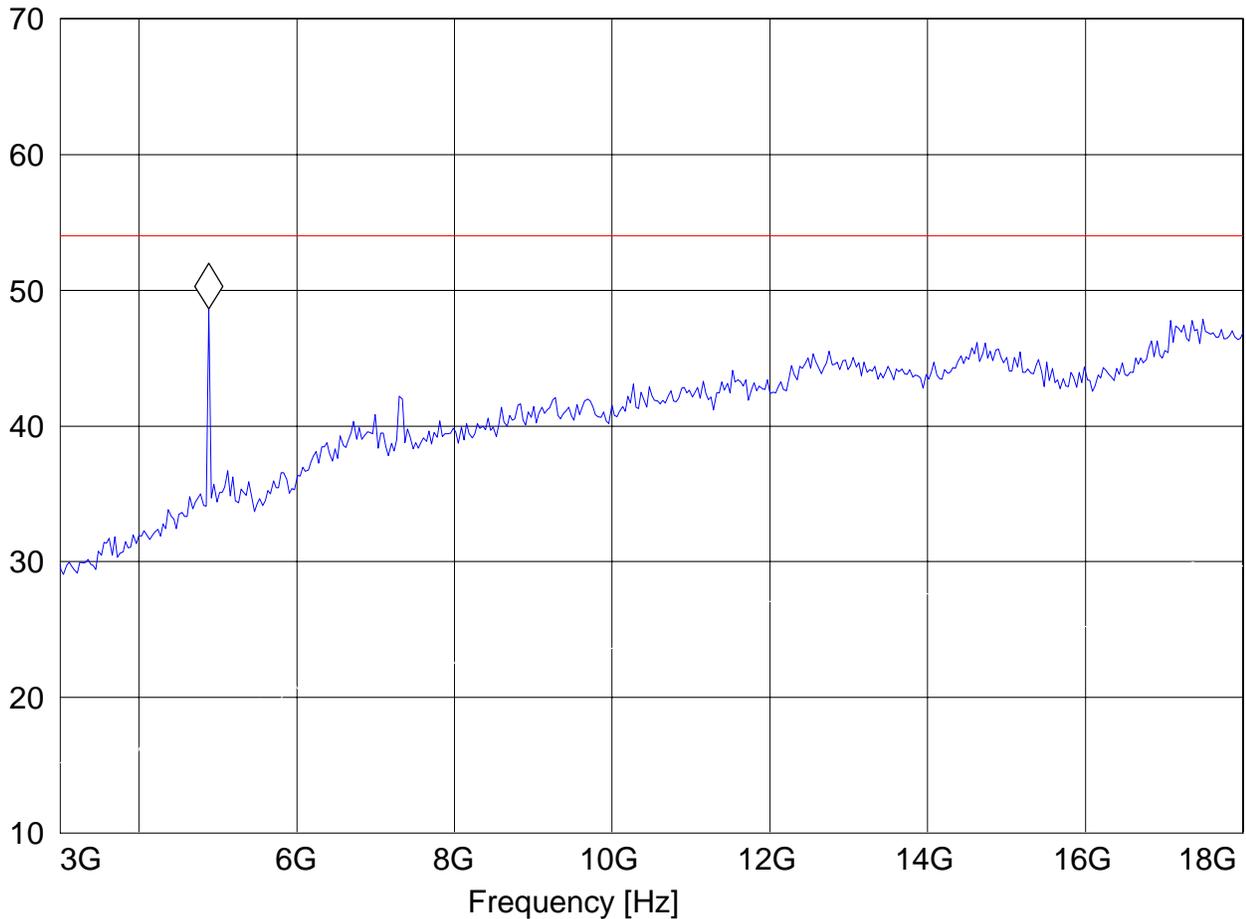
Start Stop Detector Meas. IF Transducer

Frequency Frequency Time Bandw.

1.0 GHz 18.0 GHz MaxPeak Coupled 1 MHz #326horn\_AF\_vert

Marker: 4.883767535 GHz 48.62 dB $\mu$ V/m

Level [dB $\mu$ V/m]





**3-18GHz (2480MHz)**

**Note: Peak Reading vs. Average limit**

**411 Dixon Landing Road, Milpitas CA 95035, USA**

EUT: 4820i

Customer: Hand Held Products, Inc.

Test Mode: BT CH78, Scanner on

ANT Orientation: H

EUT Orientation: H

Test Engineer: SAM

Voltage: Battery

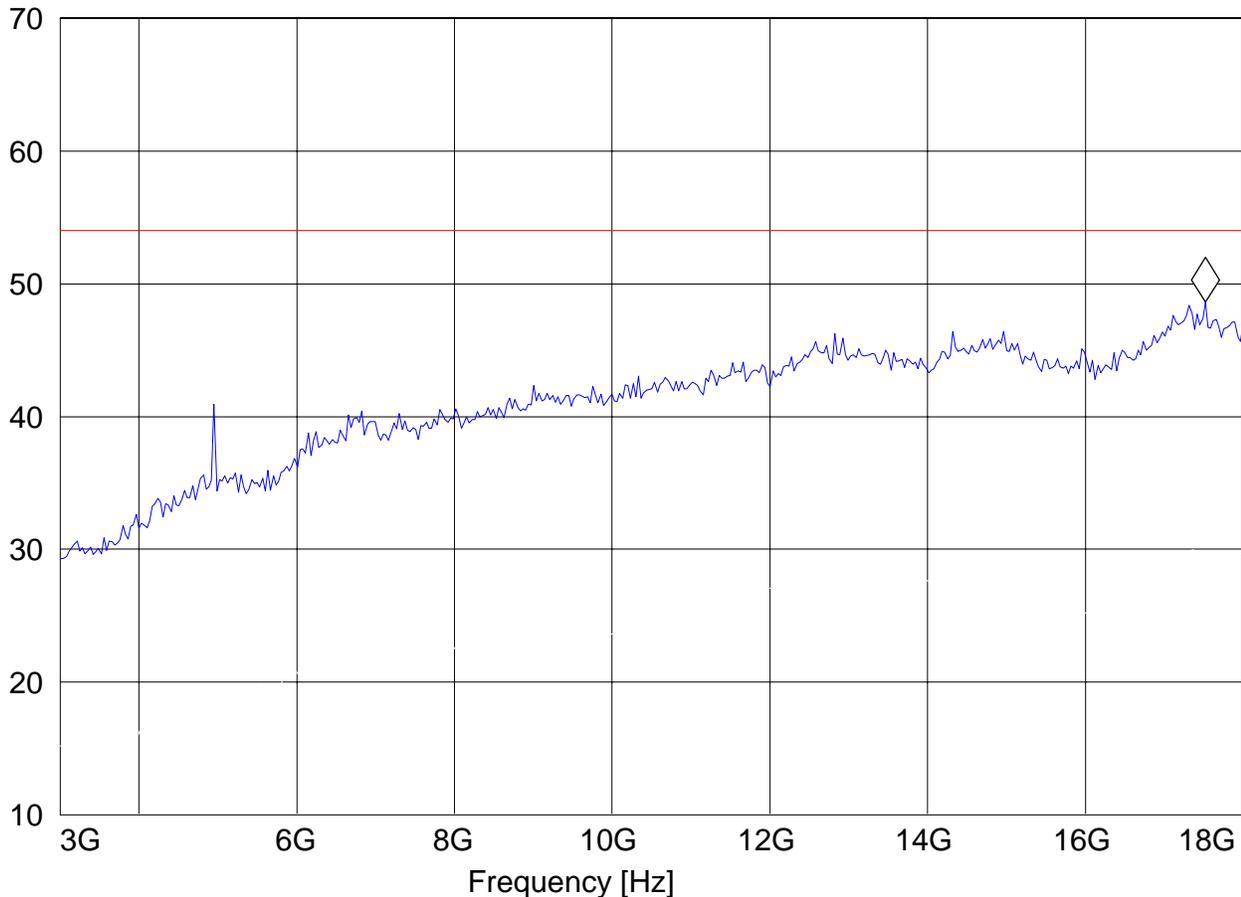
Comments:

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

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

Marker: 17.523046092 GHz 48.64 dBµV/m

Level [dBµV/m]





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

EUT: 4820i

Customer: Hand Held Products, Inc.

Test Mode: BT CH78, Scanner on

ANT Orientation: V

EUT Orientation: H

Test Engineer: Chris

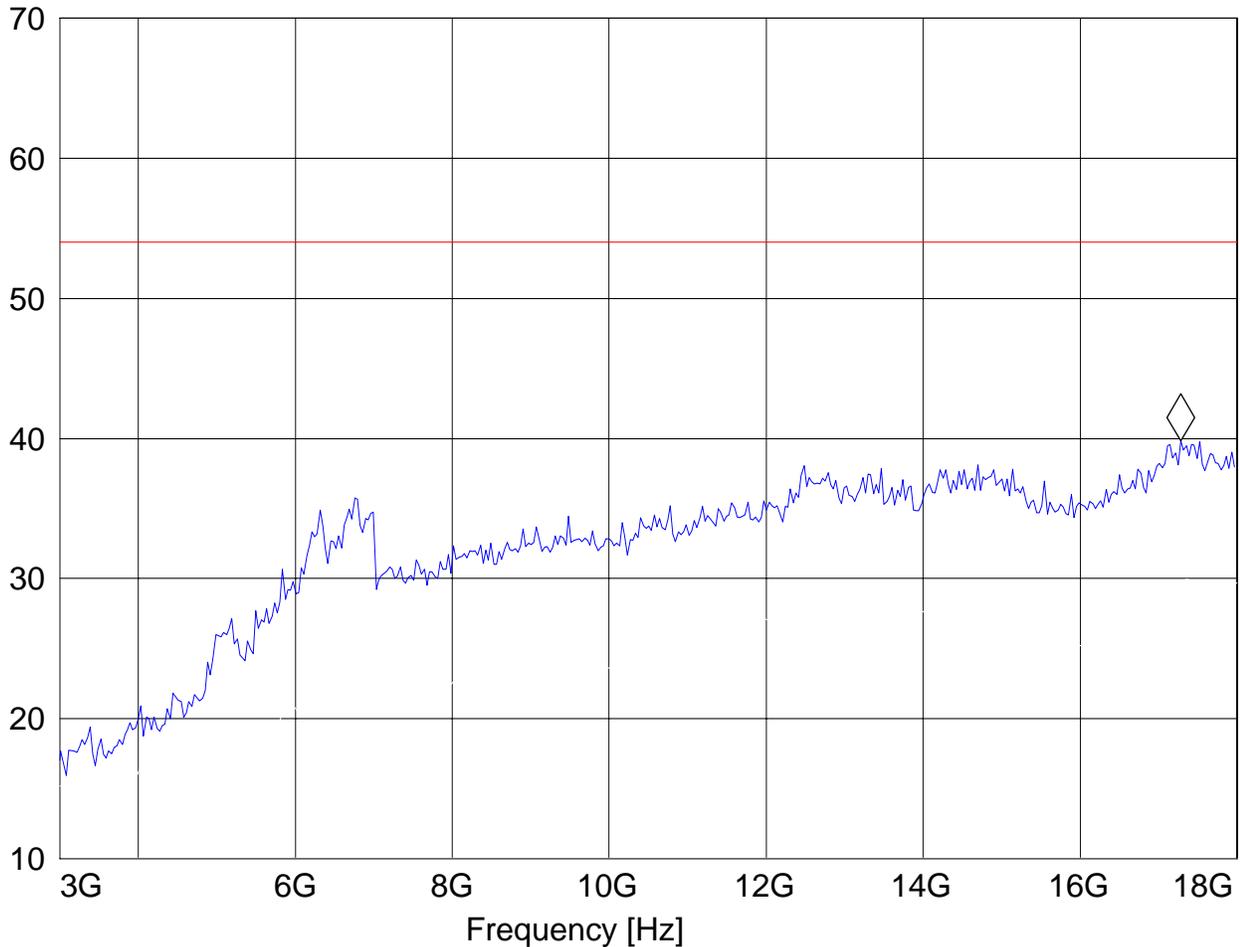
Voltage:: Battery

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

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

Marker: 17.284569138 GHz 39.81 dB $\mu$ V/m

Level [dB $\mu$ V/m]





**18-25GHz**

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

**Note: Peak Reading vs. Average limit**

**411 Dixon Landing Road, Milpitas CA 95035, USA**

EUT: 4820i

Customer: Hand Held Products, Inc.

Test Mode: BT CH39, Scanner on

ANT Orientation: V

EUT Orientation: V

Test Engineer: SAM

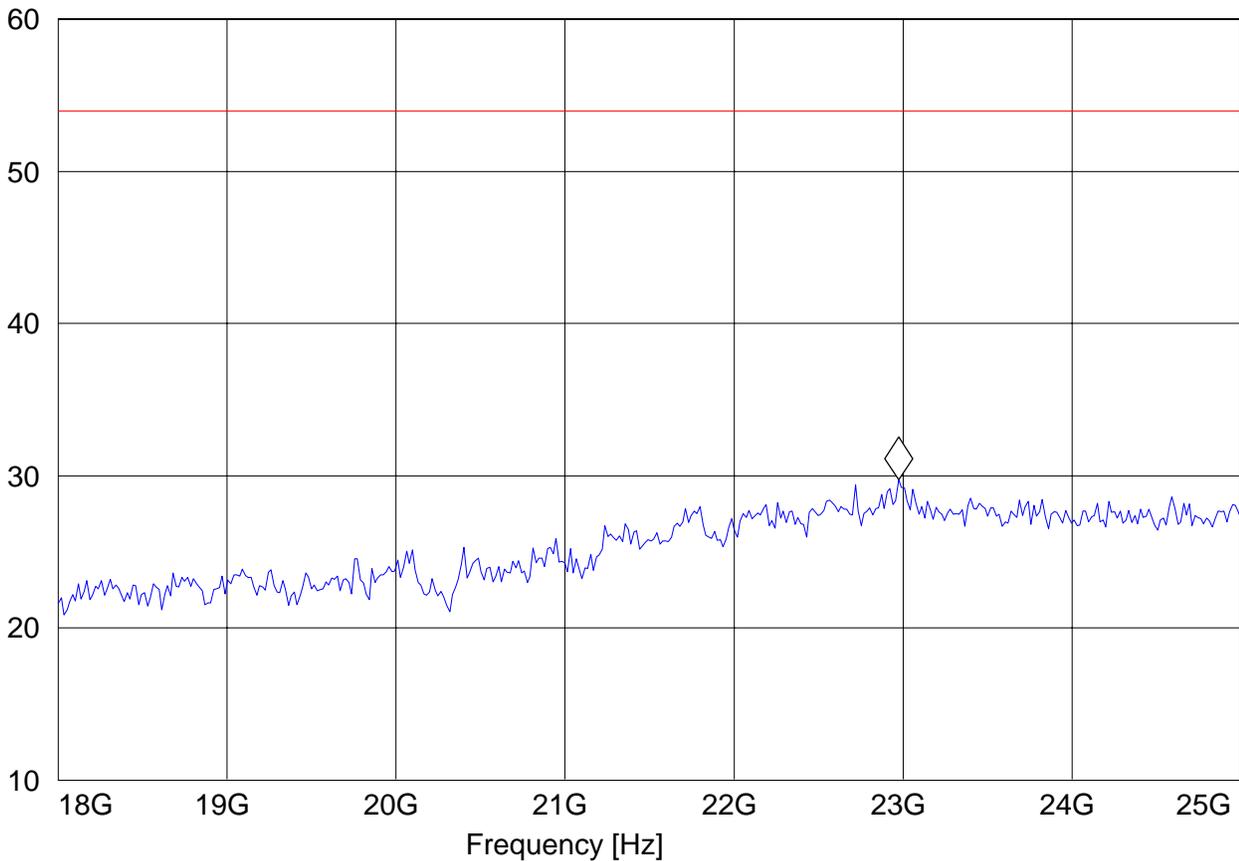
Voltage: Battery

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

Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
18.0 GHz	26.5 GHz	MaxPeak	Coupled	1 MHz	#572 horn AF

Marker: 22.973947896 GHz 29.75 dBµV/m

Level [dBµV/m]





#### 5.4 RECEIVER SPURIOUS EMISSIONS

Limits RSS-GEN (4.10) & (6):

Frequency (MHz)	Field strength (dB $\mu$ V/m)
30 - 88	40.00
88 - 216	43.52
216 - 960	46.02
above 960	53.97

**Limits are based on a 3 meter distance**

Note 1: Per FCC 15.101(b) receiver emissions are only required if the device operates between 30 – 960 MHz. Since the radio operated at 2.4GHz and 5GHz the receiver is exempt from FCC testing. But, receiver emissions are required by RSS-GEN (4.10) for all types of radios no matter where it operates.

Note 2: Per RSS-GEN (4.10) peak measurements above 1GHz are taken with a RBW=VBW= 1MHz and average measurements above 1GHz with a RBW=1MHz, VBW=10Hz or an average detector



**30MHz – 1GHz**

**Antenna: horizontal**

**411 Dixon Landing Road, Milpitas CA 95035, USA**

EUT: 4820i

Customer: Hand Held Products, Inc.

Test Mode: BT, Scanner On

ANT Orientation: H

EUT Orientation: V

Test Engineer: SAM

Voltage: Battery

Comments: Receive mode

**SWEEP TABLE: "FCC15.247\_30M-1G\_Hor"**

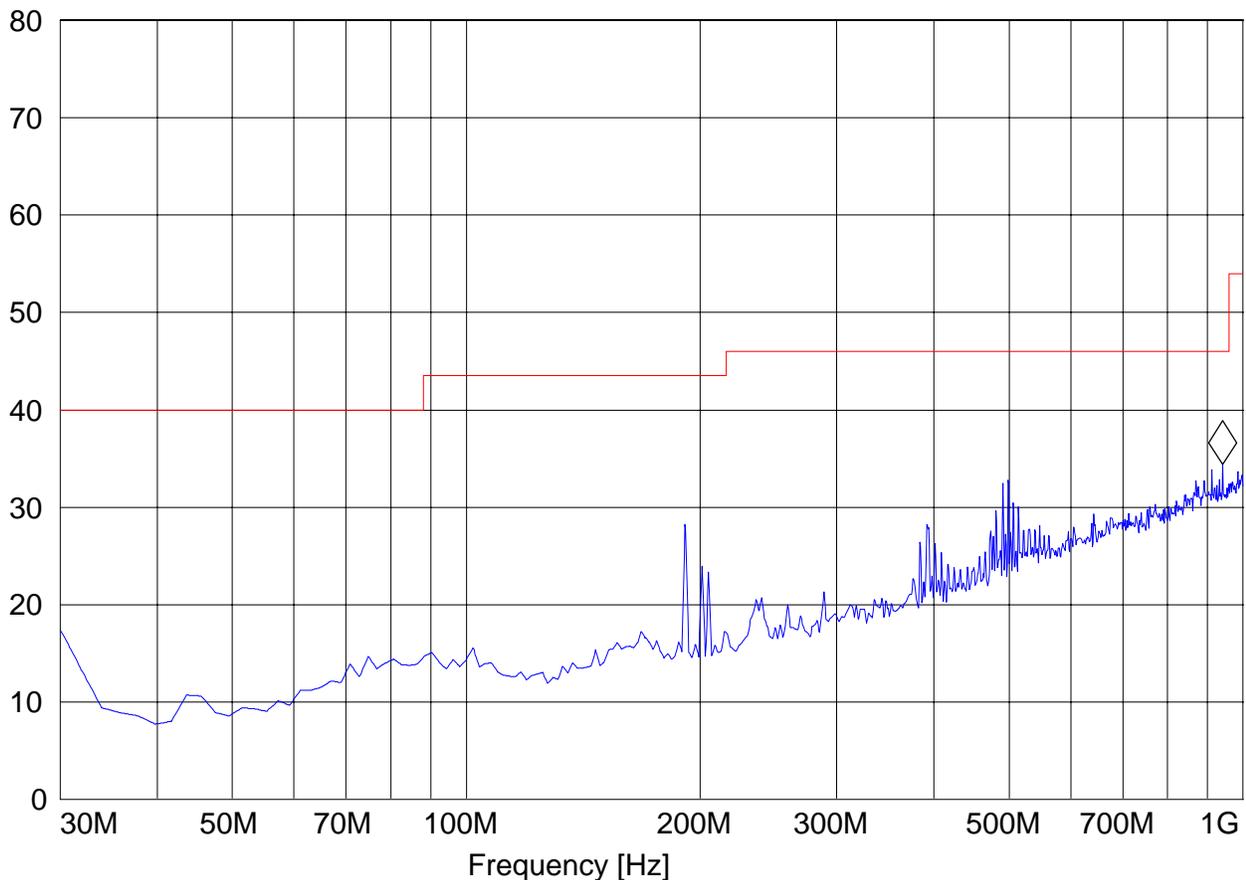
Start Stop Detector Meas. IF Transducer

Frequency Frequency Time Bandw.

30.0 MHz 1.0 GHz MaxPeak Coupled 100 kHz 3141-#1186\_Horz

Marker: 941.683367 MHz 34.39 dBμV/m

Level [dBμV/m]





**30MHz – 1GHz**

**Antenna: vertical**

**411 Dixon Landing Road, Milpitas CA 95035, USA**

EUT: 4820i

Customer: Hand Held Products, Inc.

Test Mode: BT, Scanner on

ANT Orientation: H

EUT Orientation: V

Test Engineer: SAM

Voltage: Battery

Comments: Receive mode

**SWEEP TABLE: "FCC15.247\_30M-1G\_Ver"**

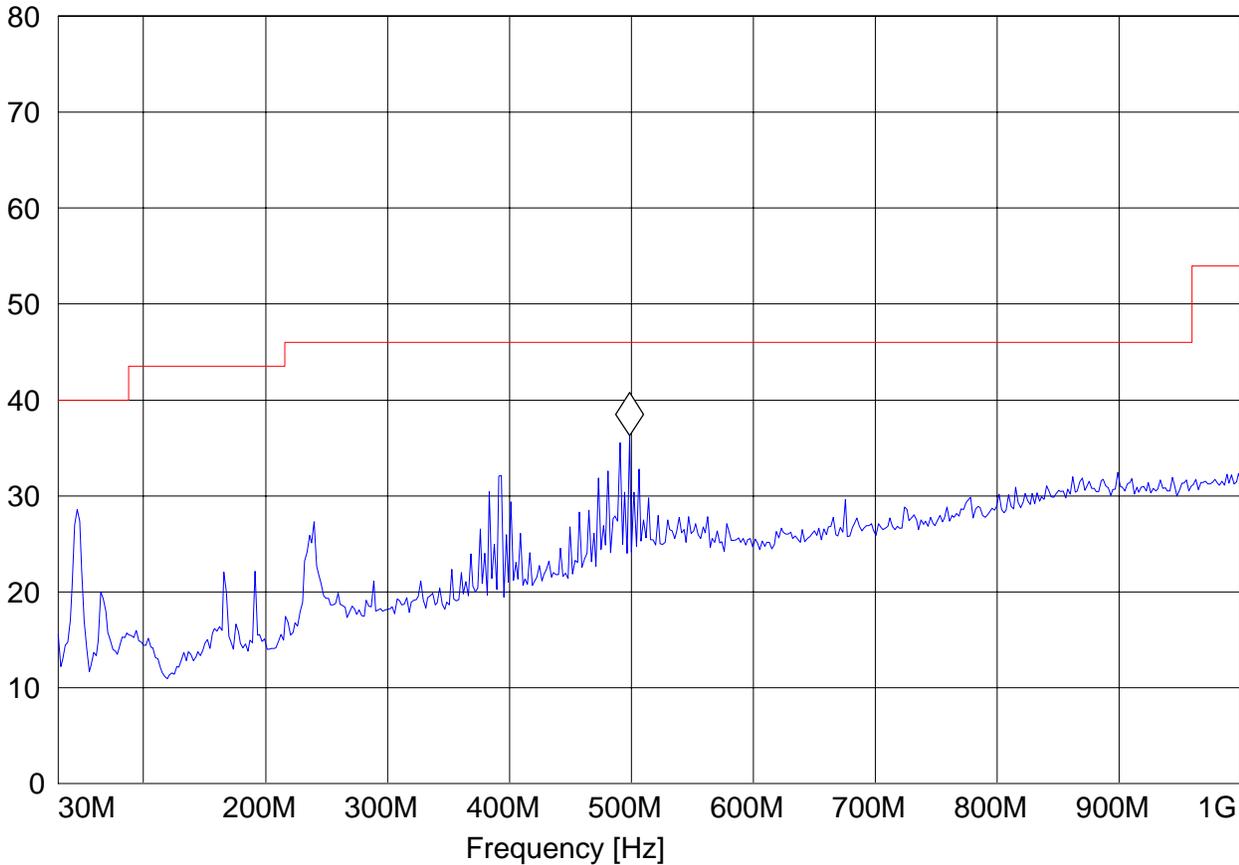
Start Stop Detector Meas. IF Transducer

Frequency Frequency Time Bandw.

30.0 MHz 1.0 GHz MaxPeak Coupled 100 kHz 3141-#1186\_Vert

Marker: 498.476954 MHz 36.25 dB $\mu$ V/m

Level [dB $\mu$ V/m]





**1-3GHz**

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

**411 Dixon Landing Road, Milpitas CA 95035, USA**

EUT: 4820i

Customer: Hand Held Products, Inc.

Test Mode: BT, Scanner on

ANT Orientation: H

EUT Orientation: V

Test Engineer: SAM

Voltage: Battery

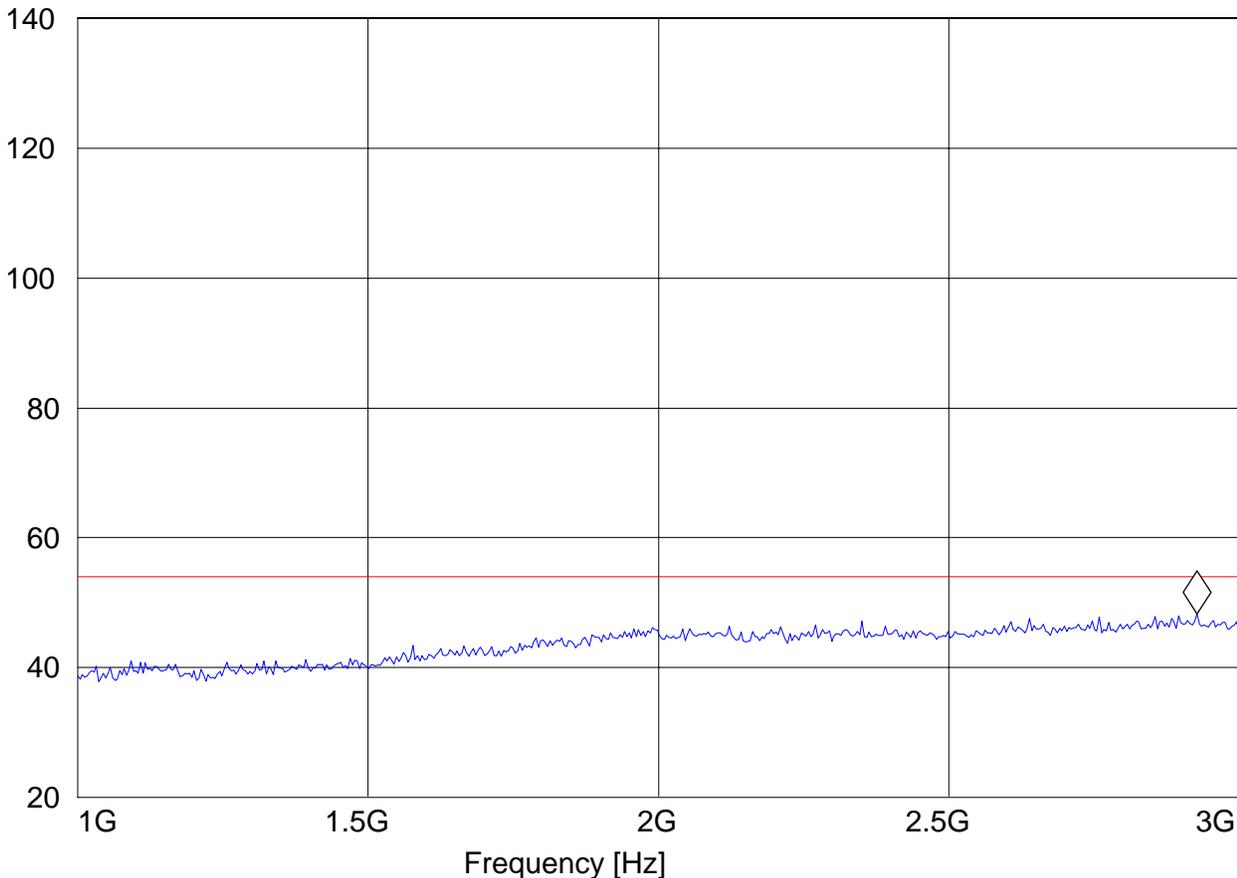
Comments: Receive mode

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

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

Marker: 2.927855711 GHz 48.3 dBμV/m

Level [dBμV/m]





**3-18GHz**

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

**411 Dixon Landing Road, Milpitas CA 95035, USA**

EUT: 4820i

Customer: Hand Held Products, Inc.

Test Mode: BT, CH39

ANT Orientation: H

EUT Orientation: V

Test Engineer: SAM

Voltage: Battery

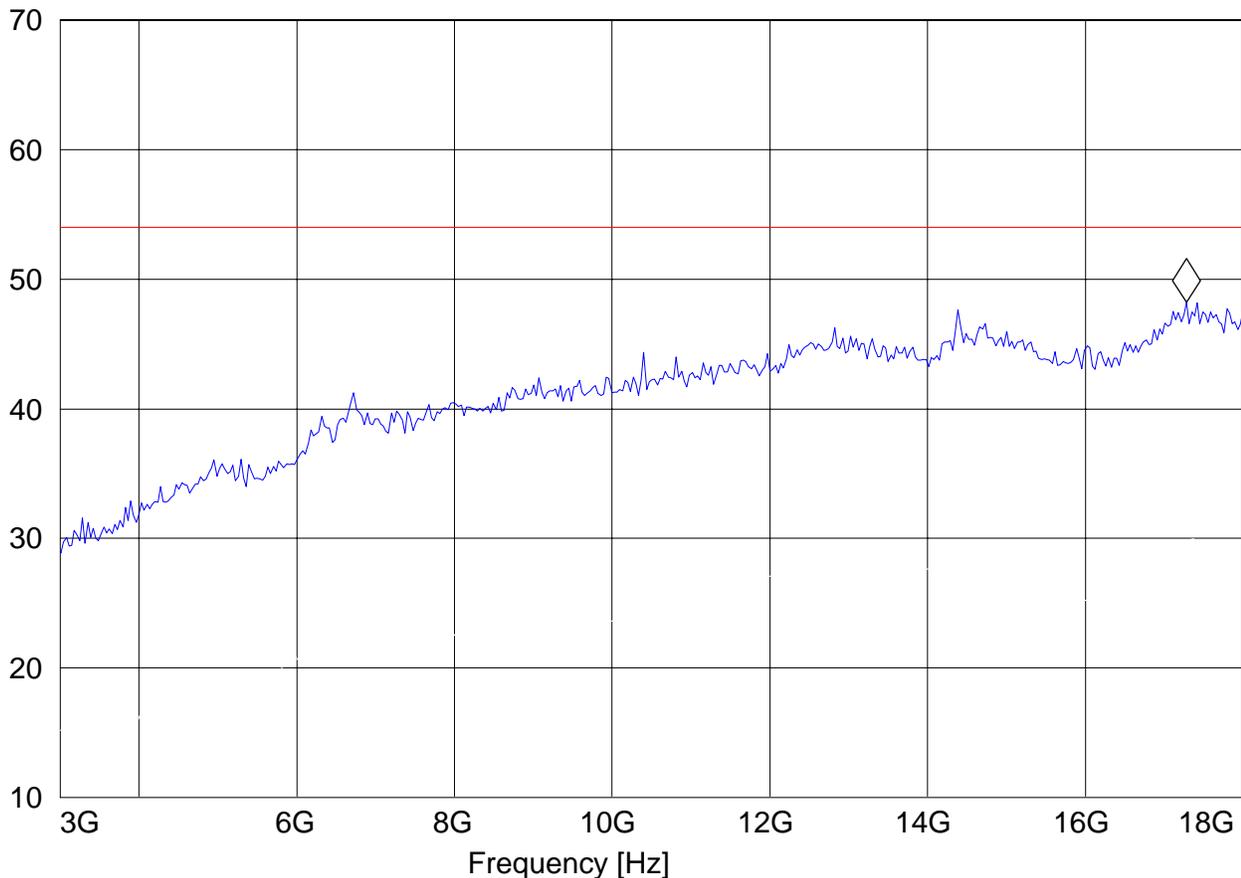
Comments: Receive mode

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

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

Marker: 17.284569138 GHz 48.2 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.

**Notes:**

1. Measurements were performed with a spectrum analyzer.
2. Measurements for all supported modulations (GFSK, Pi/4 DQPSK and 8DPSK) were performed with device controlled via software and connected directly to the spectrum analyzer.

**6.1.2 RESULTS:**

**GFSK**

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)		
Frequency (MHz)		2402 MHz	2441 MHz	2480 MHz
T <sub>nom</sub> (23)°C	V <sub>nom</sub> VDC	0.96	0.76	0.34

**Pi/4 DQPSK**

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)		
Frequency (MHz)		2402 MHz	2441 MHz	2480 MHz
T <sub>nom</sub> (23)°C	V <sub>nom</sub> VDC	2.42	2.31	1.96

**8DPSK**

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)		
Frequency (MHz)		2402 MHz	2441 MHz	2480 MHz
T <sub>nom</sub> (23)°C	V <sub>nom</sub> VDC	2.79	2.79	2.24



**GFSK (2402 MHz)**



Marker 1 [T1]

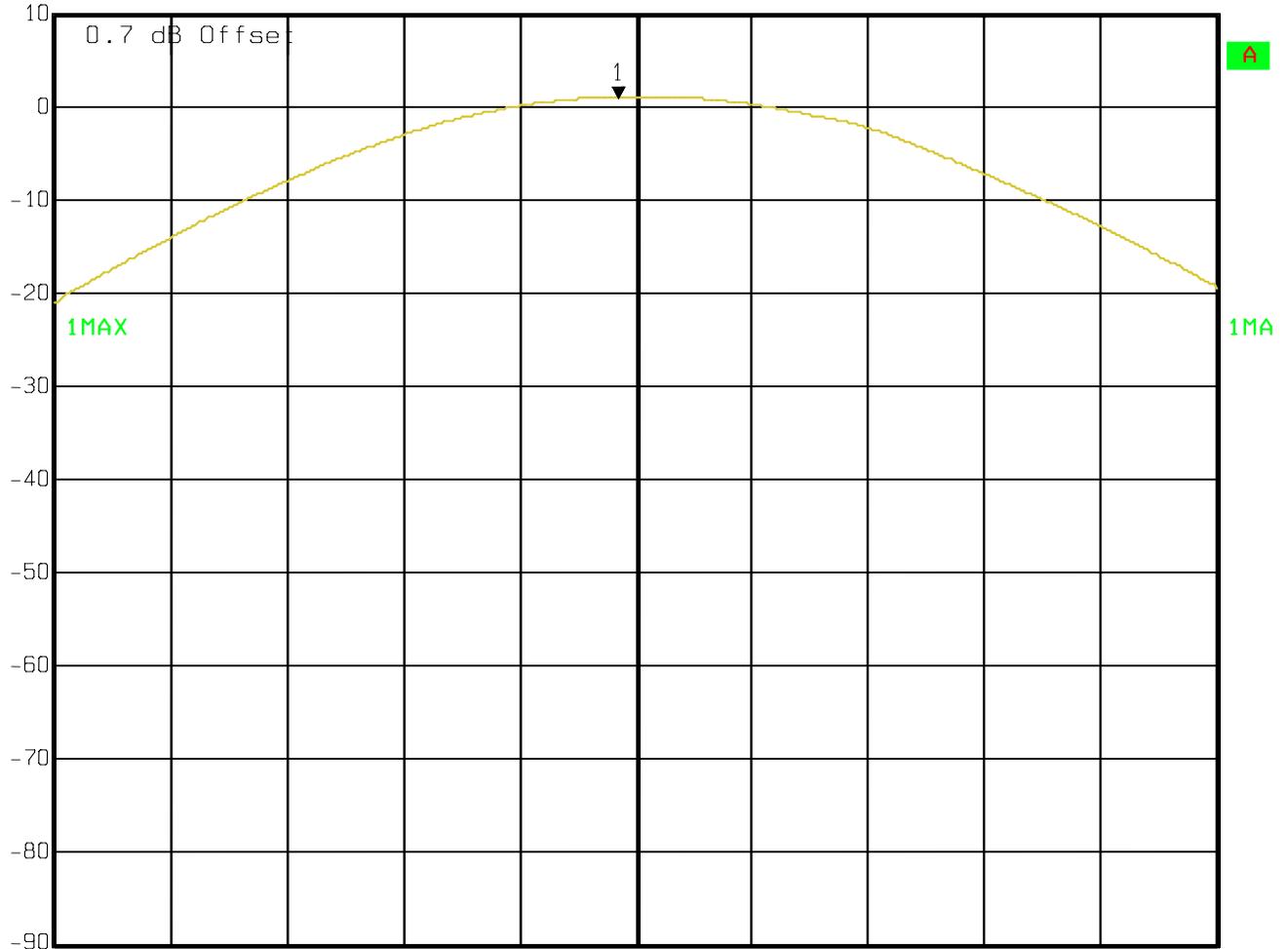
RBW 3 MHz RF Att 20 dB

Ref Lvl 0.96 dBm

VBW 3 MHz

10 dBm 2.40184970 GHz

SWT 5 ms Unit dBm



Center 2.402 GHz

1 MHz

Span 10 MHz

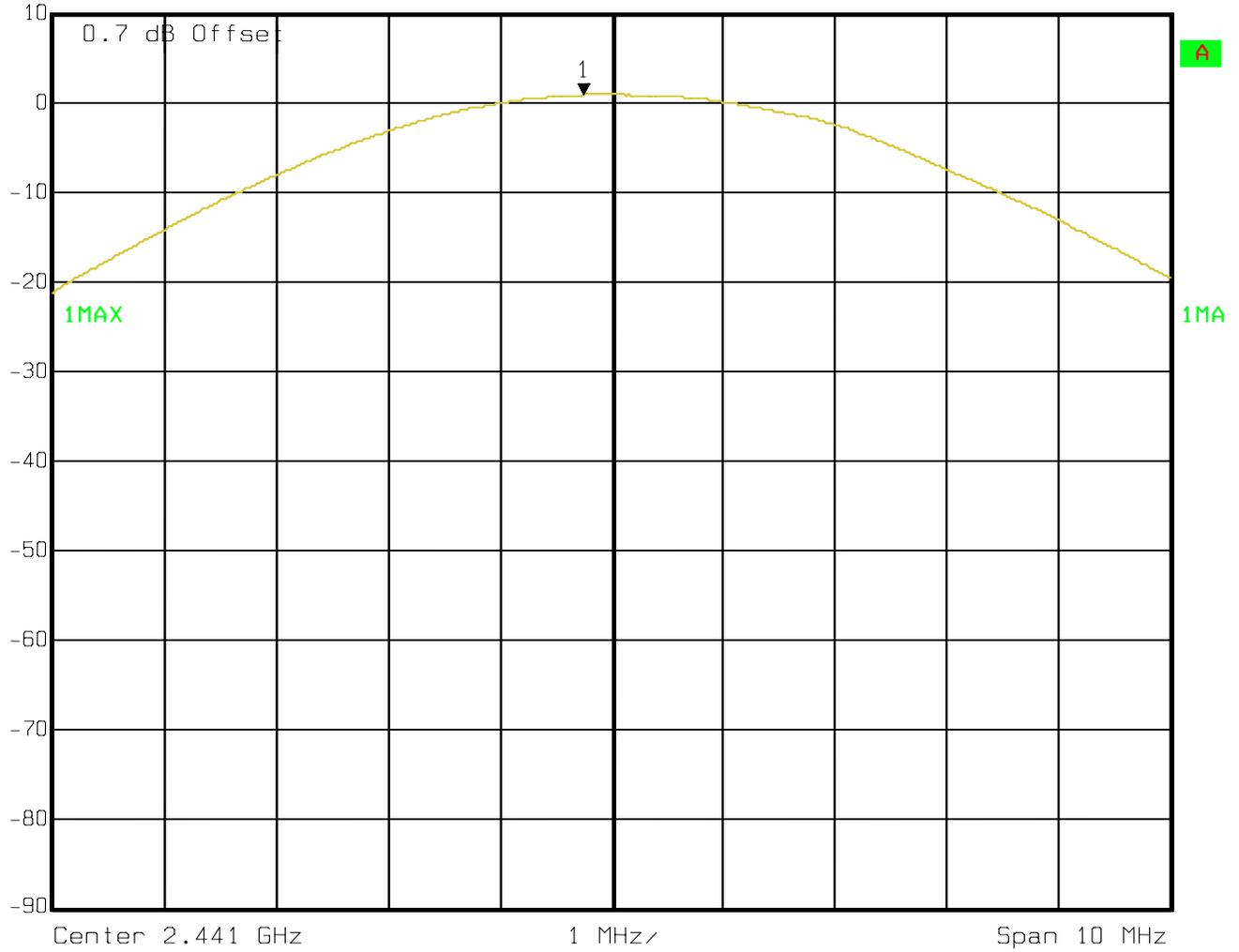
Date: 18.NOV.2007 16:01:44



**GFSK (2441 MHz)**



Ref Lvl 10 dBm  
Marker 1 [T1] 0.76 dBm  
2.44074950 GHz  
RBW 3 MHz  
RF Att 20 dB  
VBW 3 MHz  
SWT 5 ms  
Unit dBm



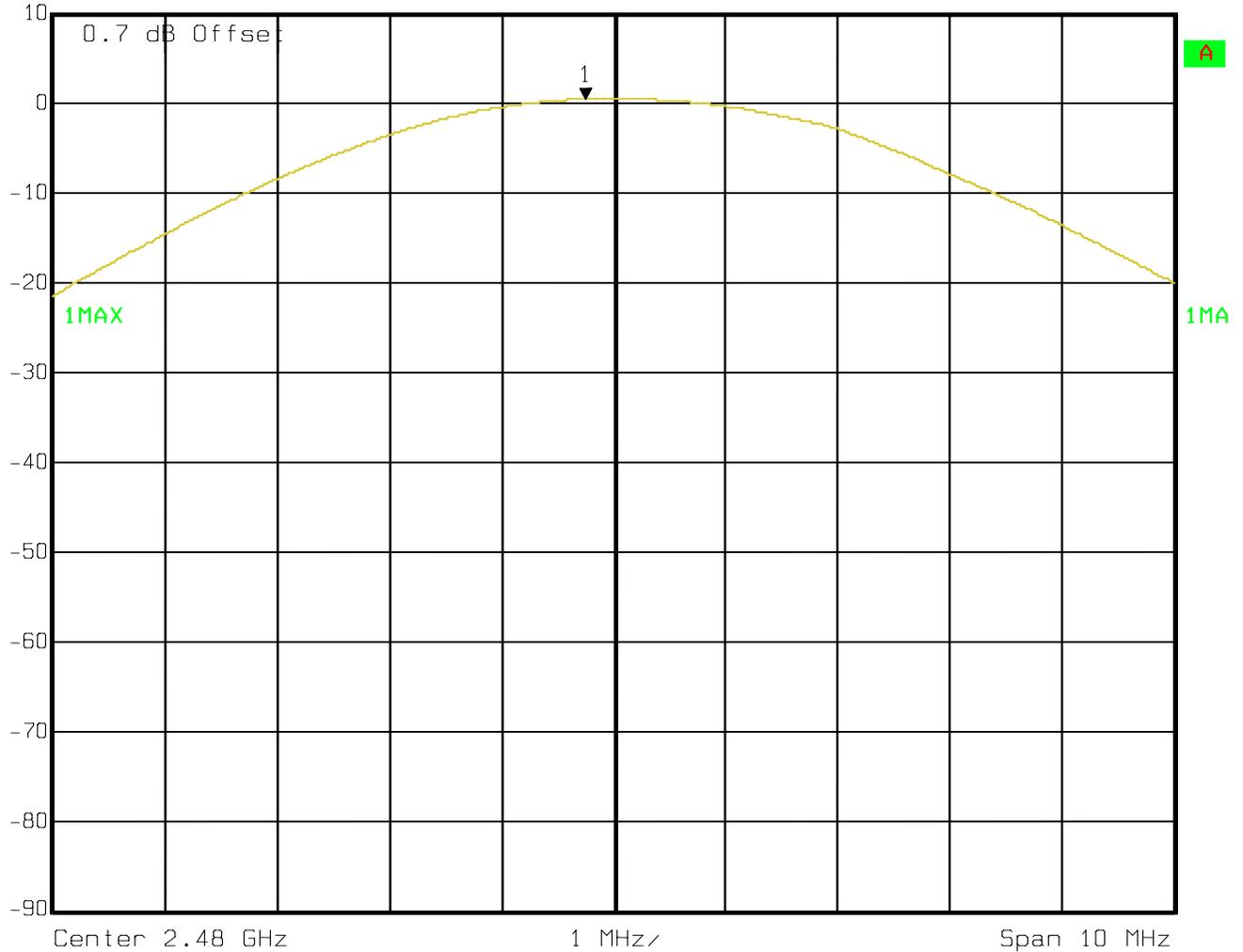
[



**GFSK (2480 MHz)**



Ref Lvl 10 dBm  
Marker 1 [T1] 0.34 dBm  
2.47974950 GHz  
RBW 3 MHz  
RF Att 20 dB  
VBW 3 MHz  
SWT 5 ms  
Unit dBm

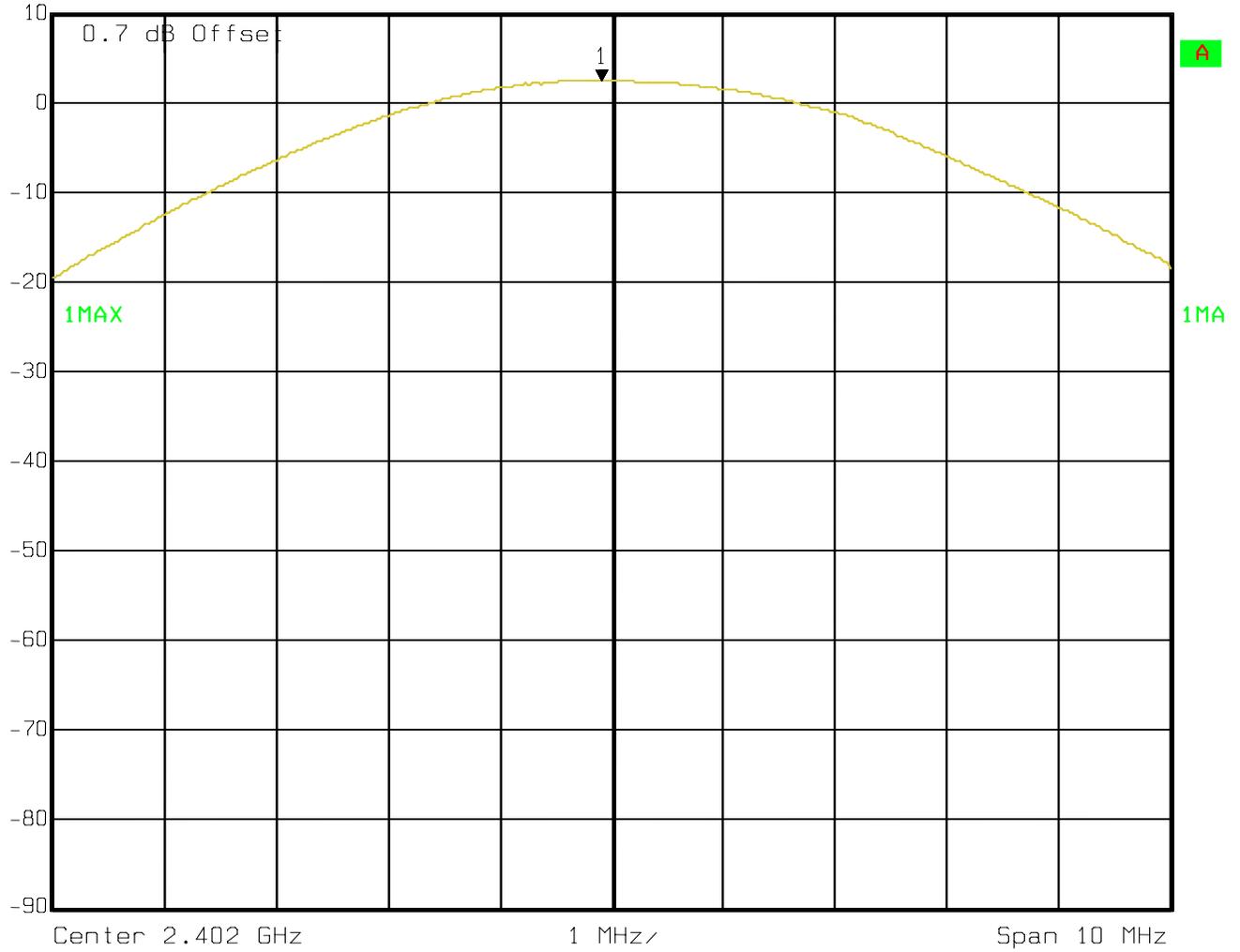


[



Pi/4 DQPSK (2402 MHz)

 Ref Lvl 10 dBm      Marker 1 [T1] 2.42 dBm      RBW 3 MHz      RF Att 20 dB  
2.40190982 GHz      VBW 3 MHz      Unit dBm  
SWT 5 ms

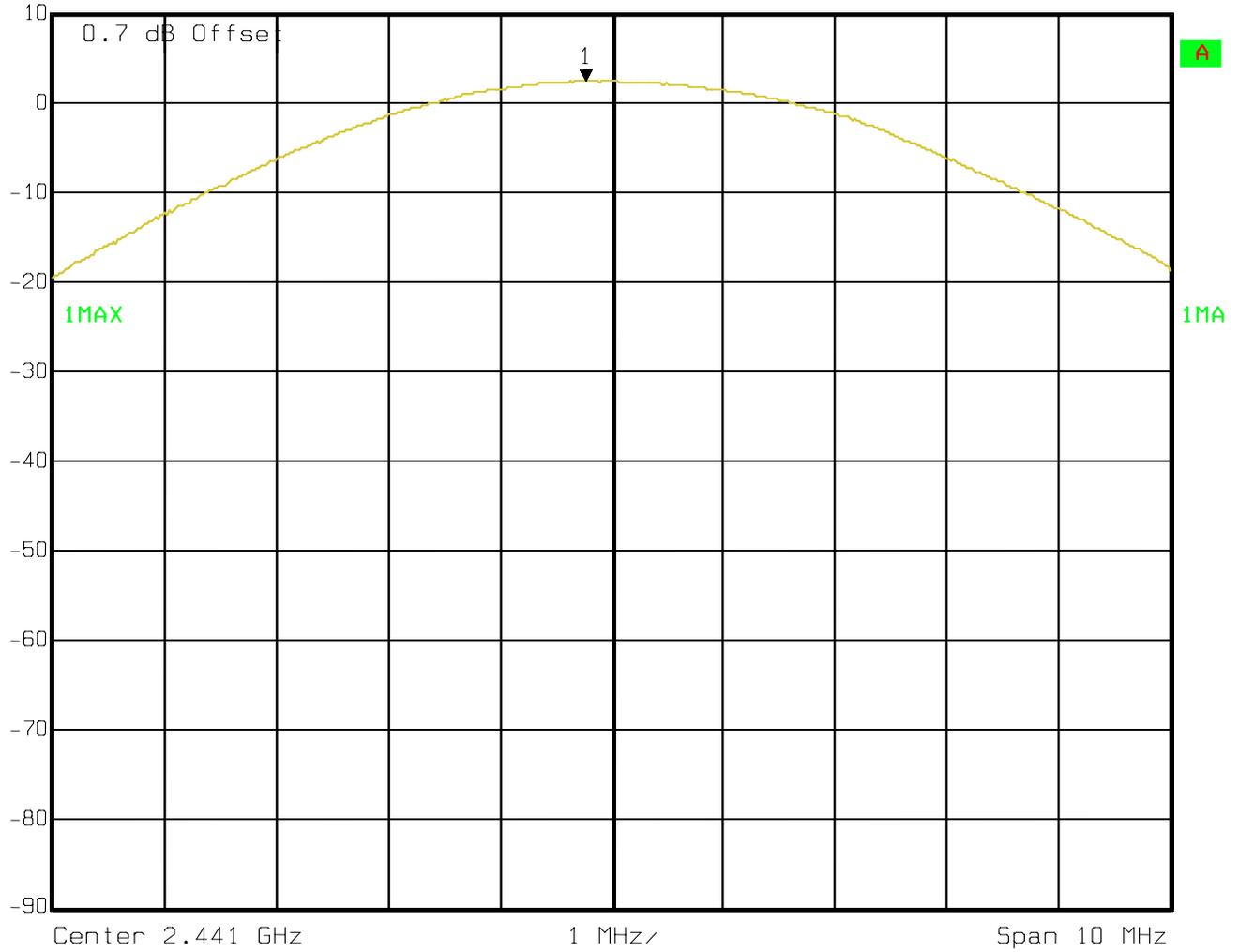


[



### Pi/4 DQPSK (2441 MHz)

 Ref Lvl 10 dBm      Marker 1 [T1] 2.31 dBm      RBW 3 MHz      RF Att 20 dB  
2.44076954 GHz      VBW 3 MHz      Unit dBm  
SWT 5 ms



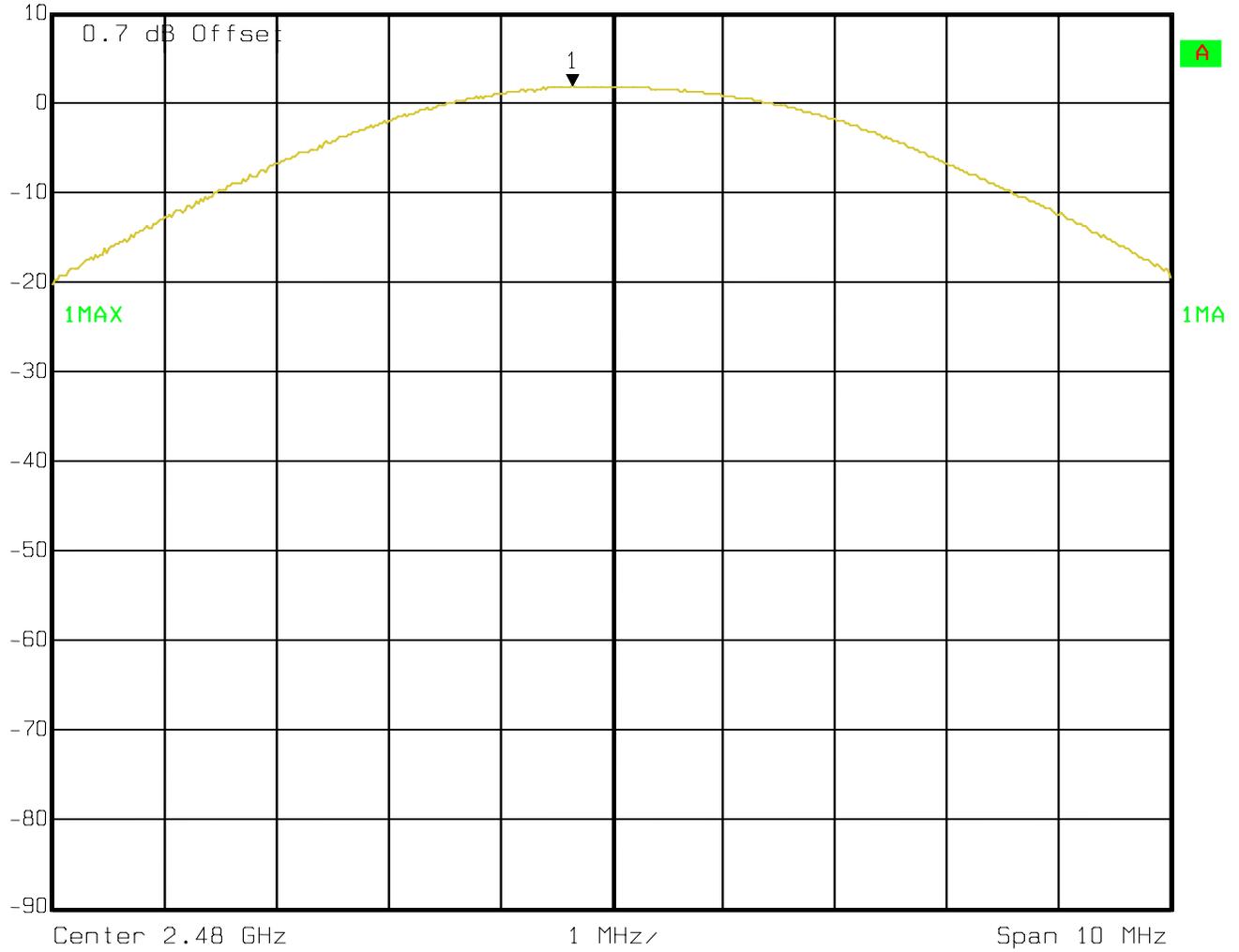
[



Pi/4 DQPSK (2480 MHz)



Ref Lvl 10 dBm  
Marker 1 [T1] 1.76 dBm  
2.47964930 GHz  
RBW 3 MHz  
RF Att 20 dB  
VBW 3 MHz  
SWT 5 ms  
Unit dBm



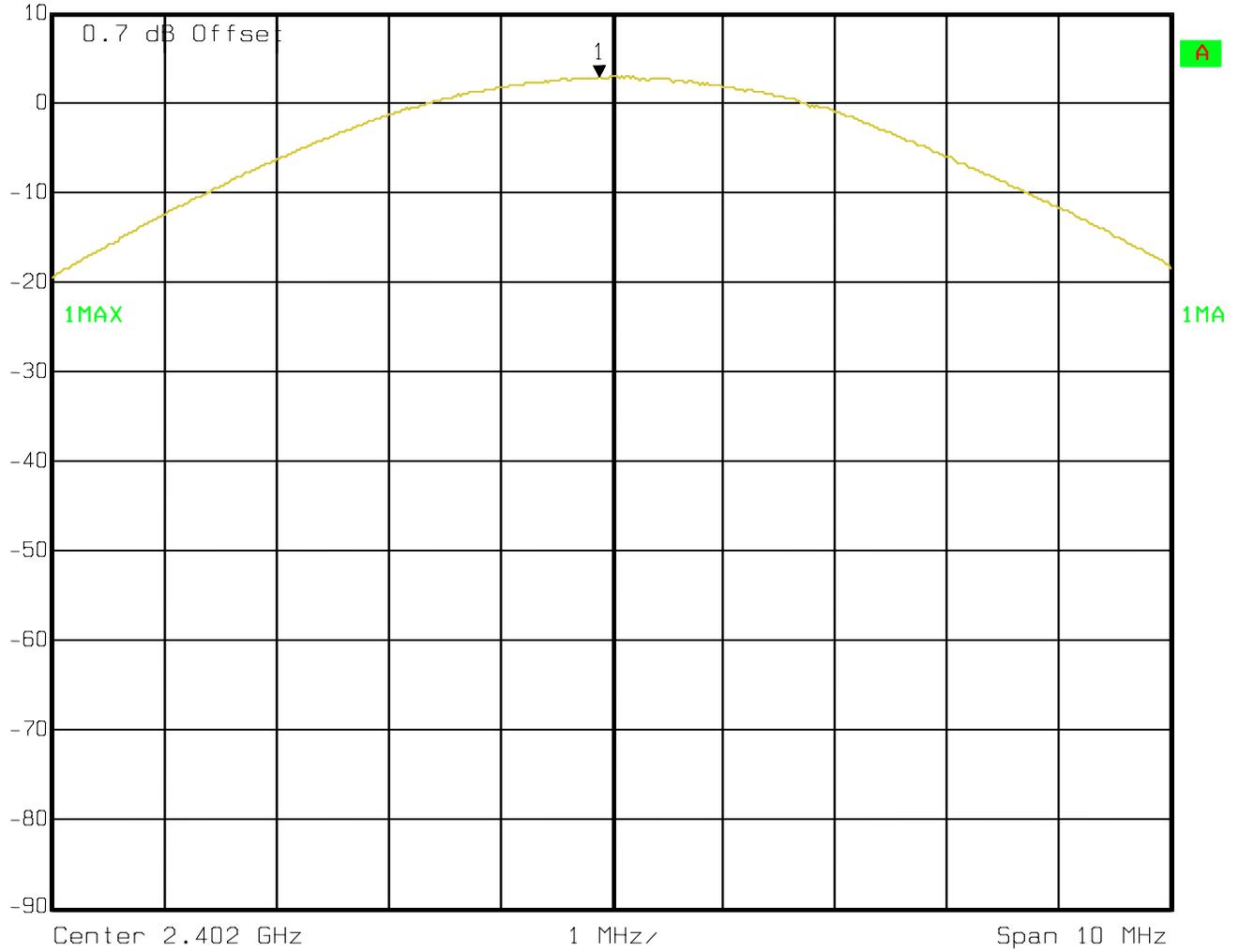
[



8DPSK (2402 MHz)



Ref Lvl 10 dBm  
Marker 1 [T1] 2.79 dBm  
2.40188978 GHz  
RBW 3 MHz  
RF Att 20 dB  
VBW 3 MHz  
SWT 5 ms  
Unit dBm



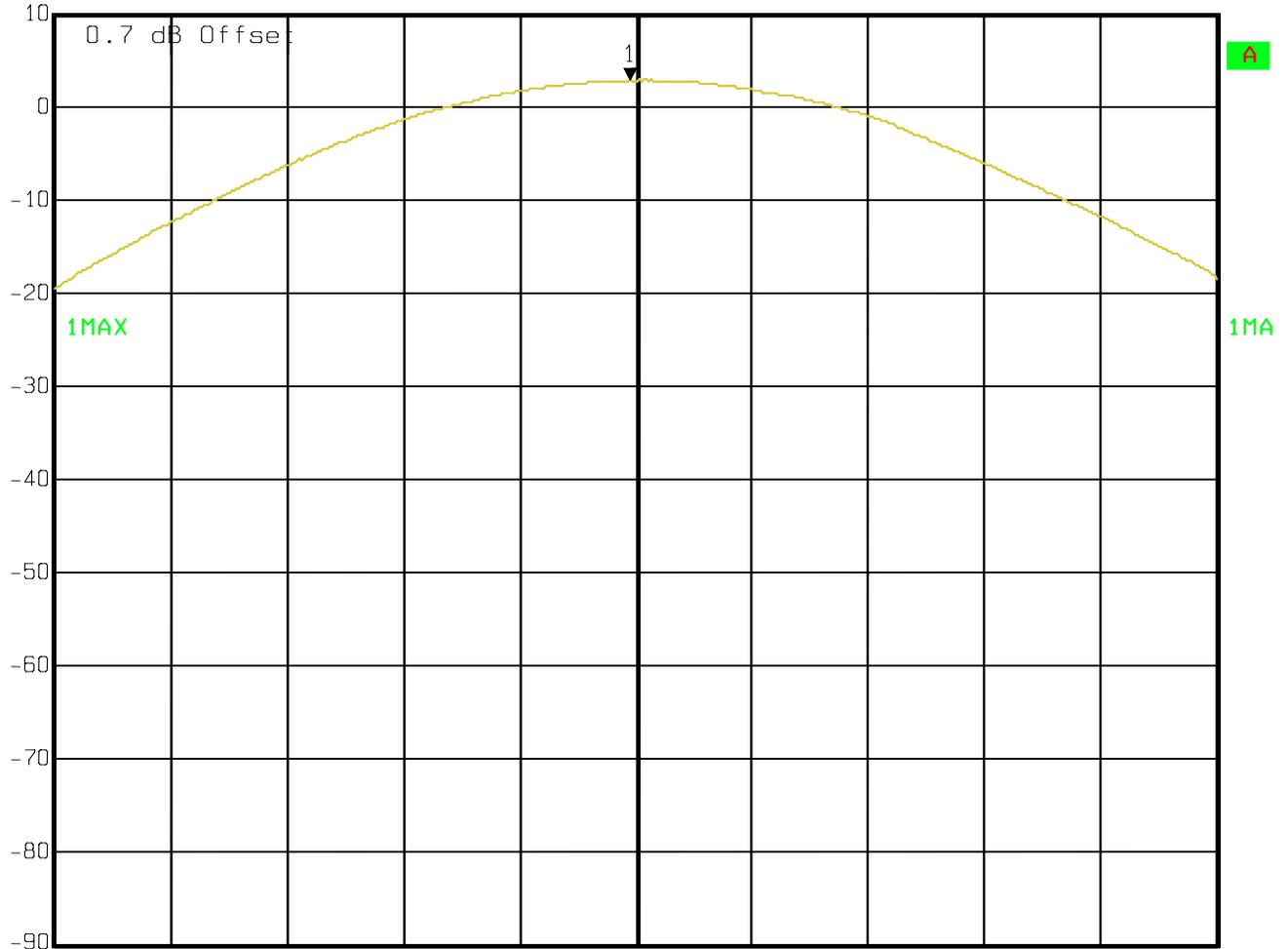
[



8DPSK (2441 MHz)



Ref Lvl 10 dBm  
Marker 1 [T1] 2.79 dBm  
2.44094990 GHz  
RBW 3 MHz RF Att 20 dB  
VBW 3 MHz  
SWT 5 ms Unit dBm



Center 2.441 GHz

1 MHz

Span 10 MHz





**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.

Notes:

1. Measurements were performed with a spectrum analyzer.
2. Measurements for all supported modulations (GFSK, Pi/4 DQPSK and 8DPSK) were performed with device controlled via software and connected directly to the spectrum analyzer.

**6.2.2 RESULTS:**

**GFSK**

TEST CONDITIONS		BANDWIDTH (MHz)		
		2402 MHz	2441 MHz	2480 MHz
Frequency (MHz)				
T <sub>nom</sub> (23)°C	V <sub>nom</sub> VDC	825.651	821.643	829.659

**Pi/4 DQPSK**

TEST CONDITIONS		BANDWIDTH (MHz)		
		2402 MHz	2441 MHz	2480 MHz
Frequency (MHz)				
T <sub>nom</sub> (23)°C	V <sub>nom</sub> VDC	1.130	1.110	1.110

**8DPSK**

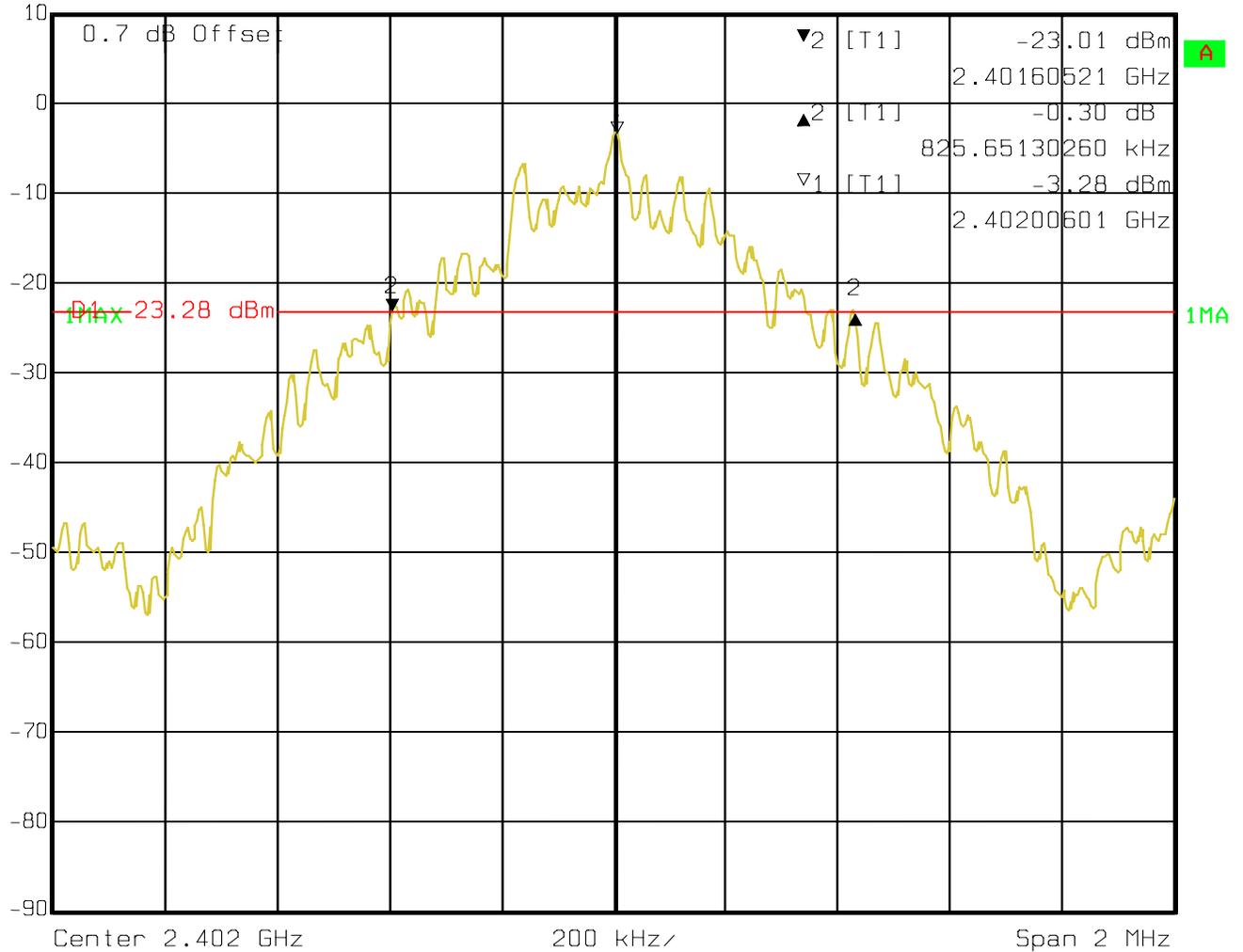
TEST CONDITIONS		BANDWIDTH (MHz)		
		2402 MHz	2441 MHz	2480 MHz
Frequency (MHz)				
T <sub>nom</sub> (23)°C	V <sub>nom</sub> VDC	1.158	1.154	1.162



**GFSK (2402 MHz)**



Delta 2 [T1] RBW 10 kHz RF Att 20 dB  
 Ref Lvl -0.30 dB VBW 10 kHz  
 10 dBm 825.65130260 kHz SWT 50 ms Unit dBm



[



**GFSK (2441 MHz)**



Delta 2 [T1]

RBW 10 kHz RF Att 20 dB

Ref Lvl -0.17 dB

VBW 10 kHz

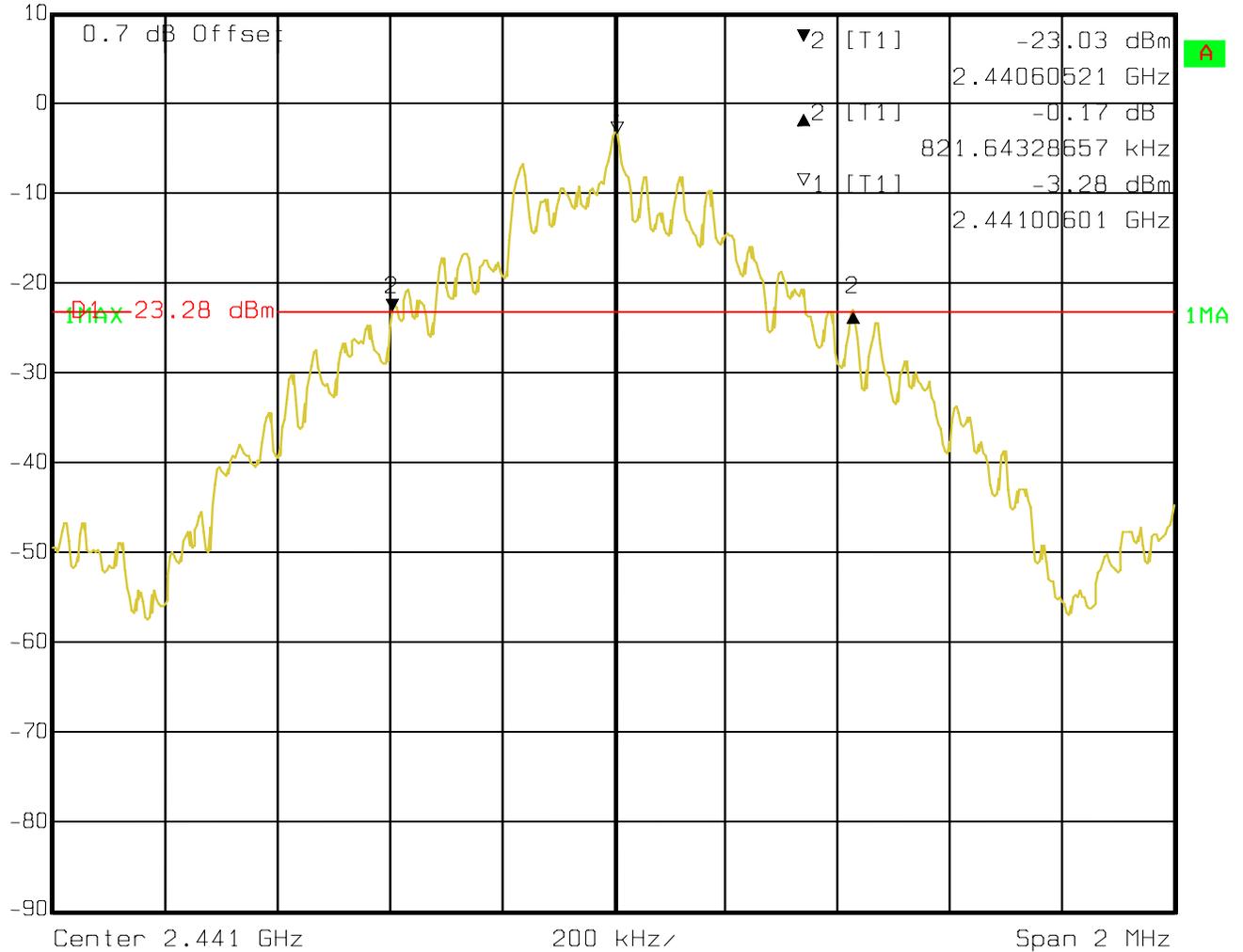
10 dBm

821.64328657 kHz

SWT 50 ms

Unit

dBm

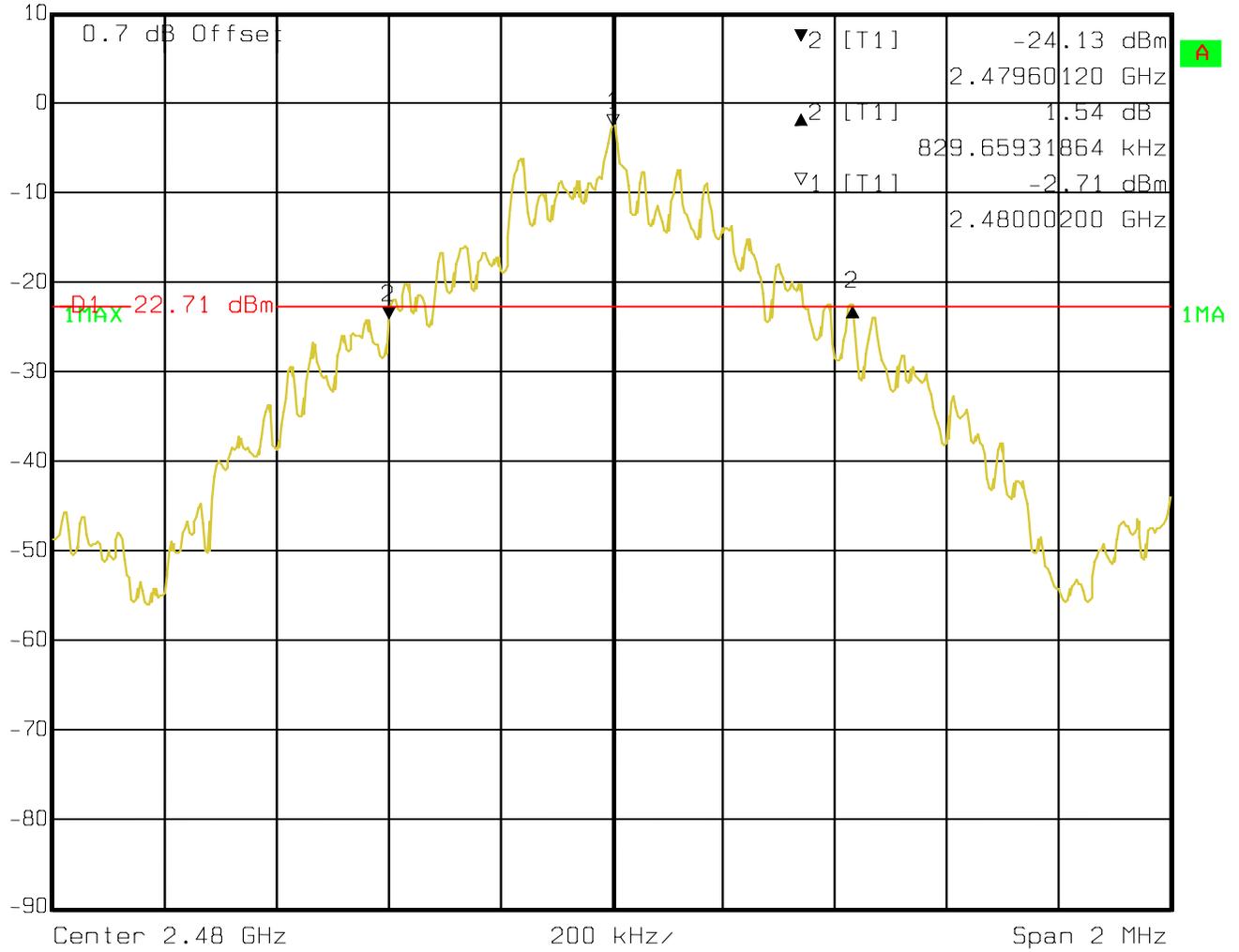


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**GFSK (2480 MHz)**

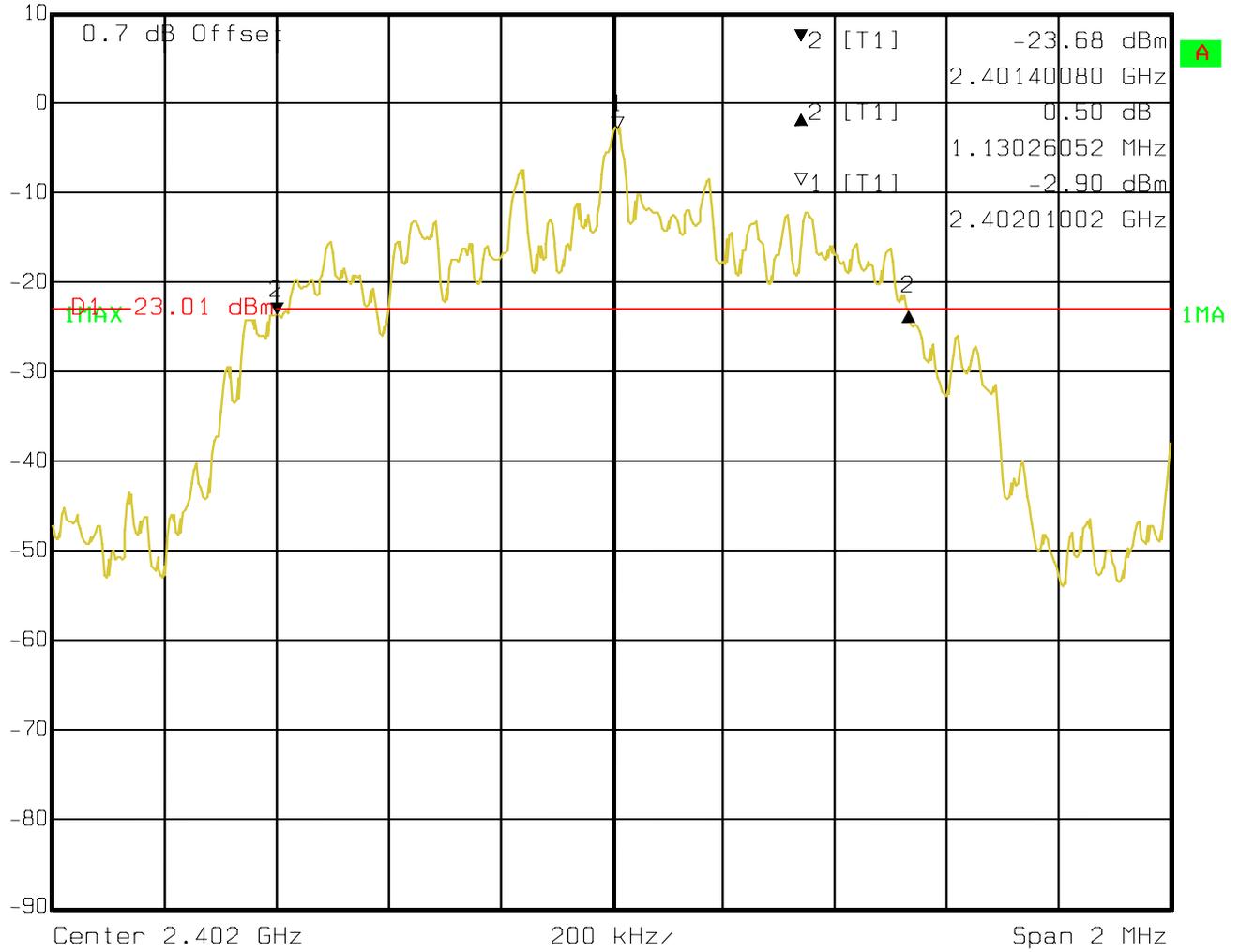
◆ F S Delta 2 [T1] RBW 10 kHz RF Att 20 dB  
 Ref Lvl 10 dB 1.54 dB VBW 10 kHz  
829.65931864 kHz SWT 50 ms Unit dBm





**Pi/4 DQPSK (2402 MHz)**

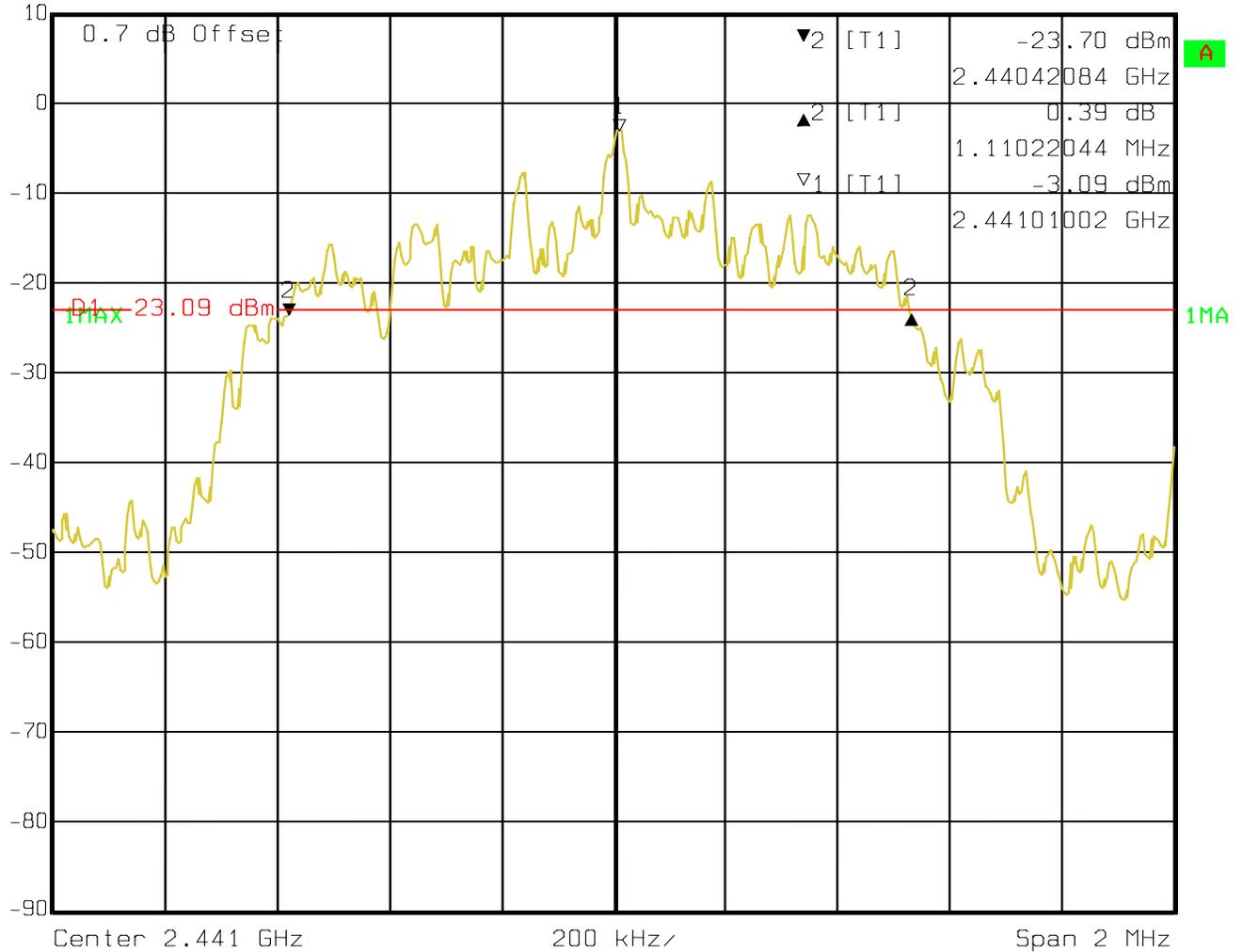
	Ref Lvl	Delta 2 [T1]	RBW	10 kHz	RF Att	20 dB
	10 dBm	0.50 dB	VBW	10 kHz		
		1.13026052 MHz	SWT	50 ms	Unit	dBm





**Pi/4 DQPSK (2441 MHz)**

	Delta 2 [T1]	RBW	10 kHz	RF Att	20 dB
	Ref Lvl	0.39 dB	VBW	10 kHz	
	10 dBm	1.11022044 MHz	SWT	50 ms	Unit

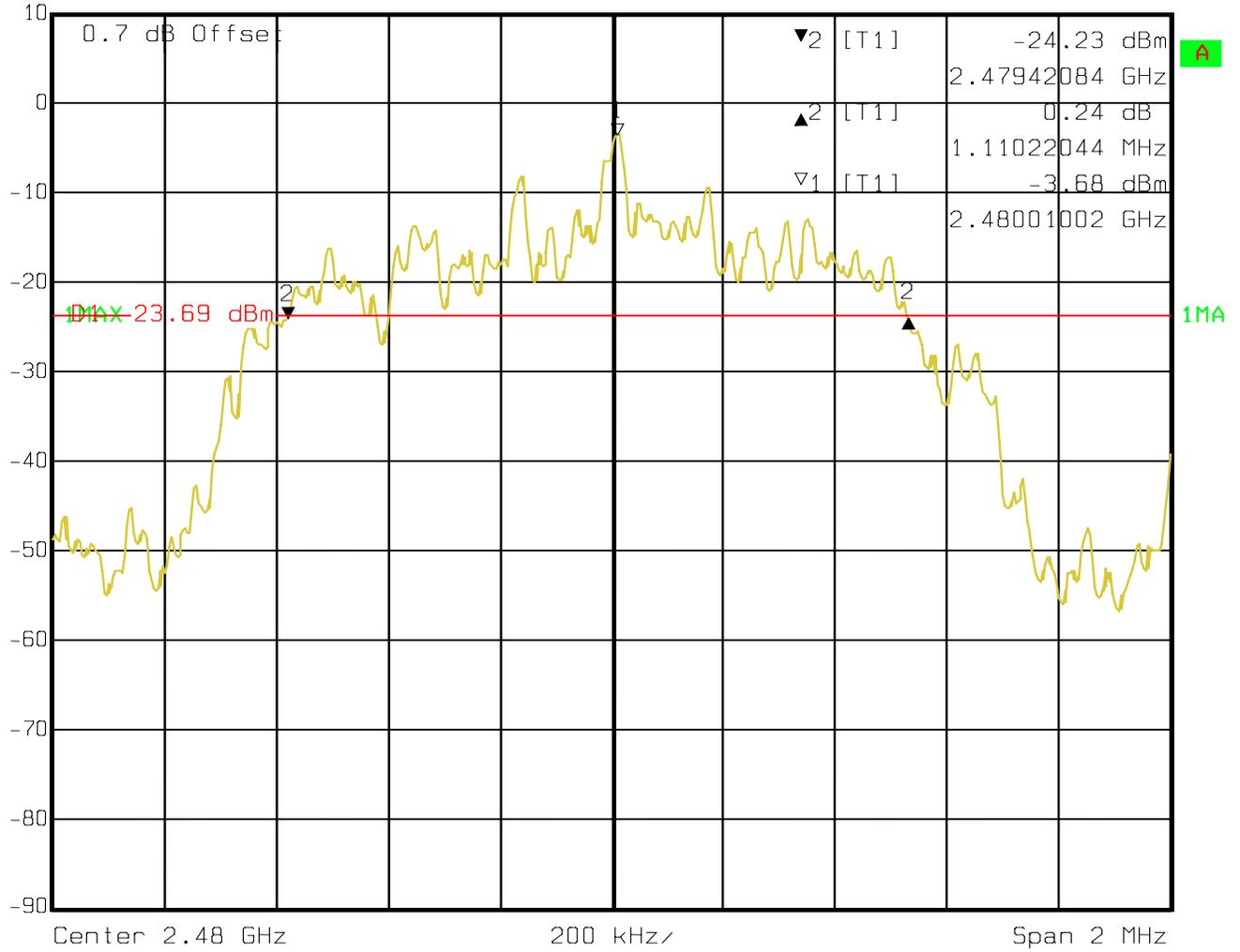




**Pi/4 DQPSK (2480 MHz)**



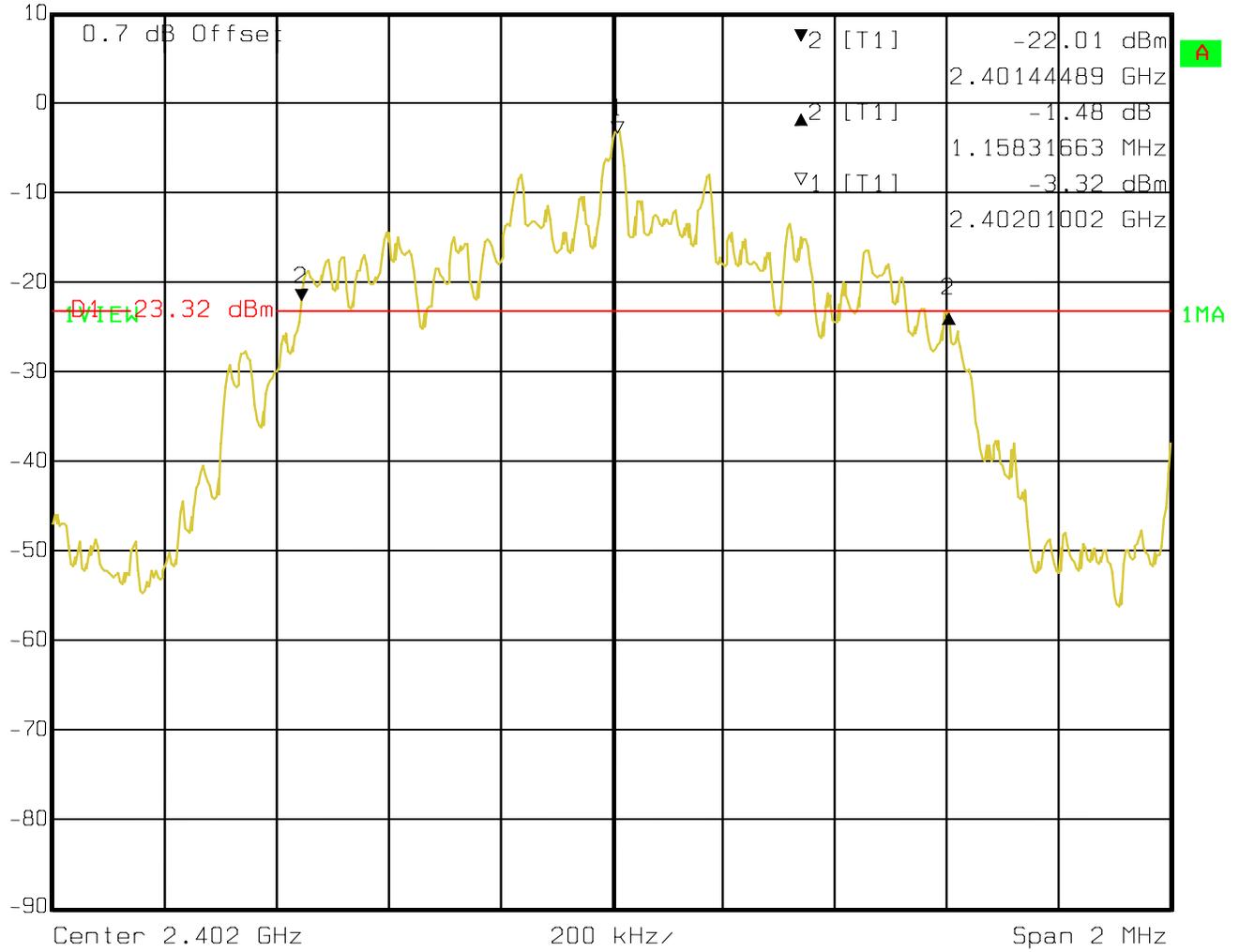
Ref Lvl	Delta 2 [T1]	RBW	10 kHz	RF Att	20 dB
10 dBm	0.24 dB	VBW	10 kHz	Unit	dBm
	1.11022044 MHz	SWT	50 ms		





8DPSK (2402 MHz)

 Delta 2 [T1] RBW 10 kHz RF Att 20 dB  
Ref Lvl -1.48 dB VBW 10 kHz  
10 dBm 1.15831663 MHz SWT 50 ms Unit dBm



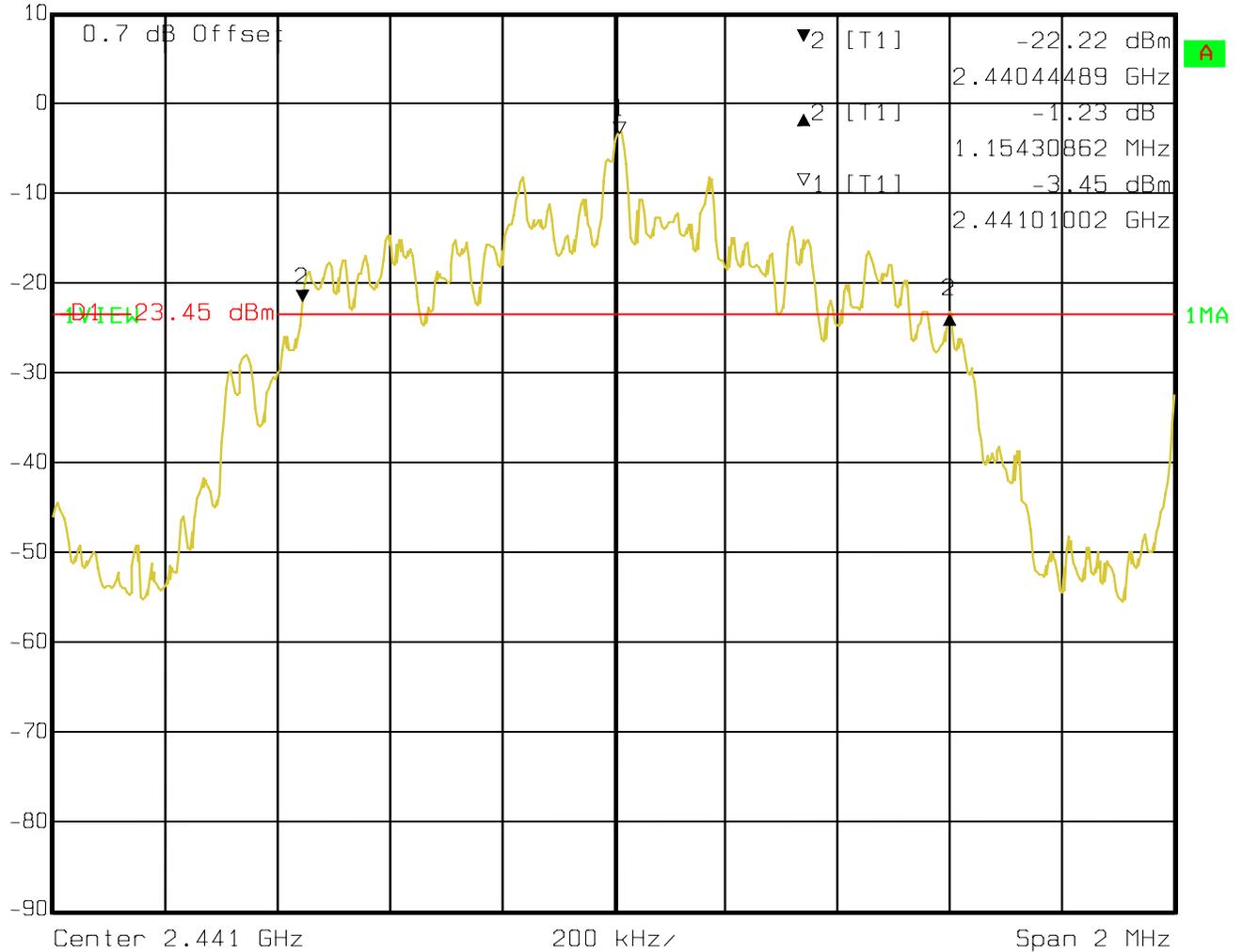
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8DPSK (2441 MHz)



Delta 2 [T1] RBW 10 kHz RF Att 20 dB  
 Ref Lvl -1.23 dB VBW 10 kHz  
 10 dBm 1.15430862 MHz SWT 50 ms Unit dBm

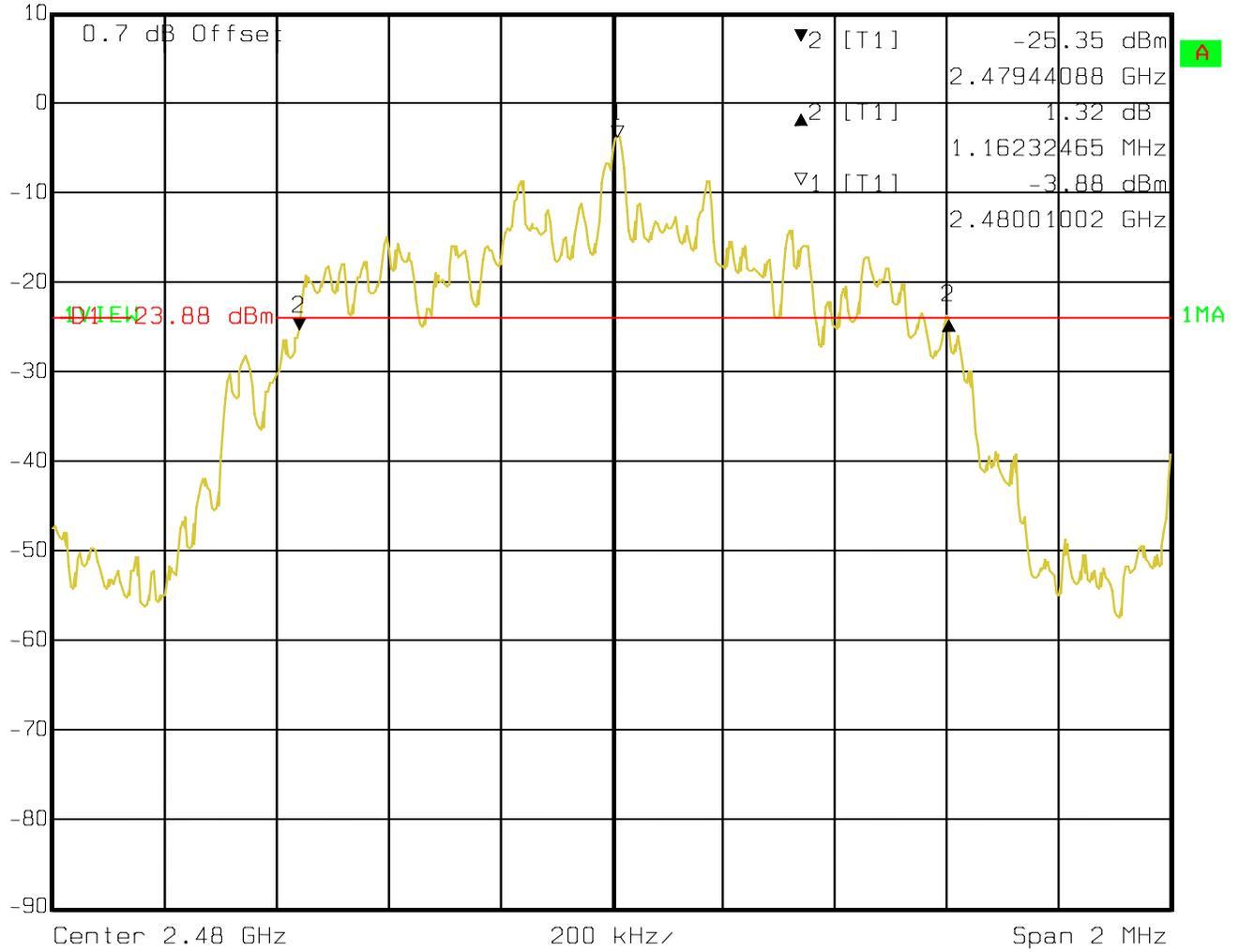


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8DPSK (2480 MHz)

◆ Delta 2 [T1] RBW 10 kHz RF Att 20 dB  
 Ref Lvl 1.32 dB VBW 10 kHz  
 10 dBm 1.16232465 MHz SWT 50 ms Unit dBm





### 6.3 EMISSION LIMITATIONS

§ 15.247 (c) (1)

#### Transmitter (Conducted)

#### 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, which 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)).**

#### Notes:

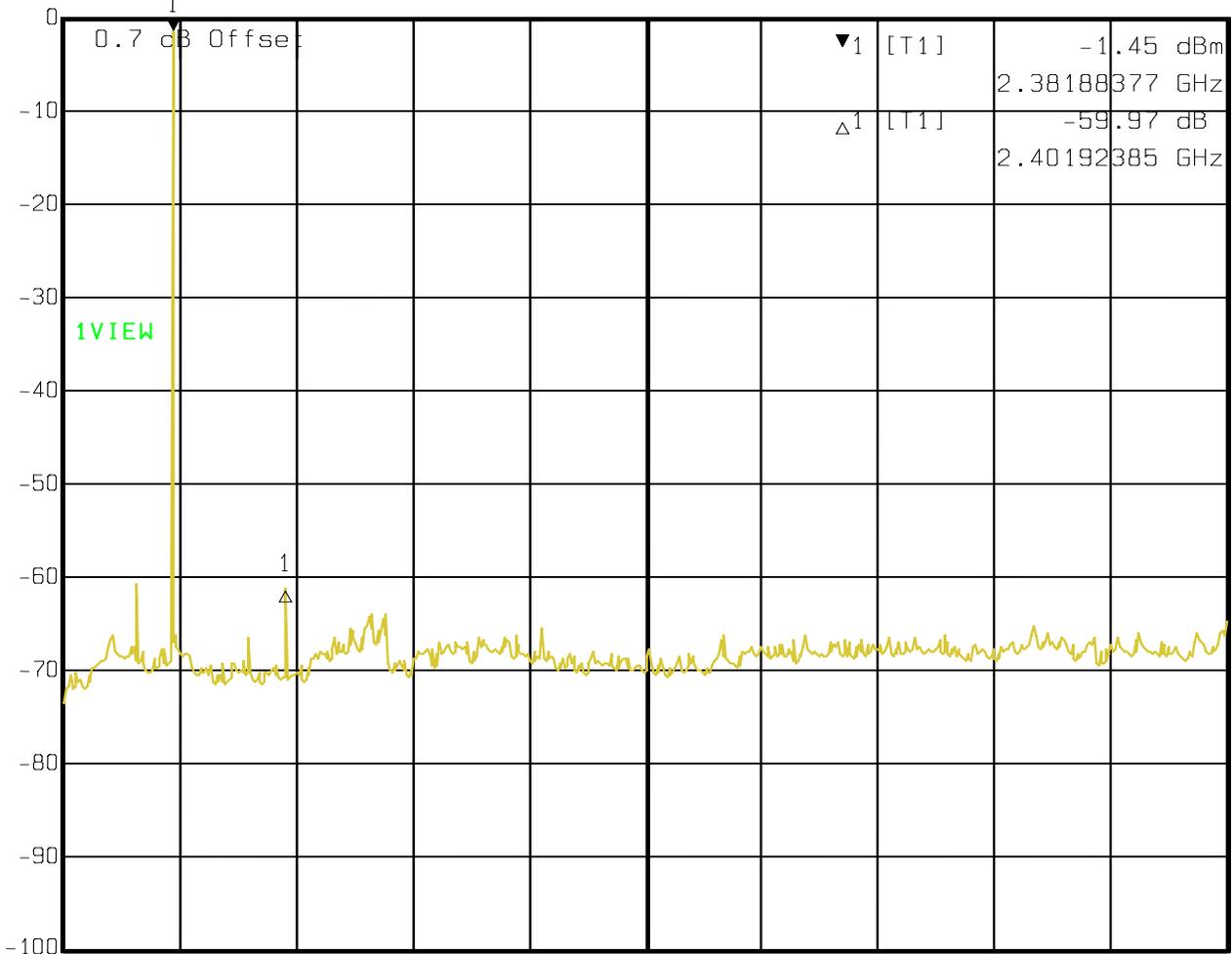
1. Measurements were performed with a spectrum analyzer.
2. During measurements the equipment was configured as shown in the block diagram of section 8 of this report.



(2402 MHz)



Ref Lvl 0 dBm  
Marker 1 [T1] -1.45 dBm  
2.38188377 GHz  
RBW 100 kHz  
RF Att 20 dB  
VBW 100 kHz  
SWT 6.4 s  
Unit dBm



Start 30 MHz

2.497 GHz

Stop 25 GHz



(2441 MHz)



Delta 1 [T1]

RBW 100 kHz RF Att 20 dB

Ref Lvl -59.15 dB

VBW 100 kHz

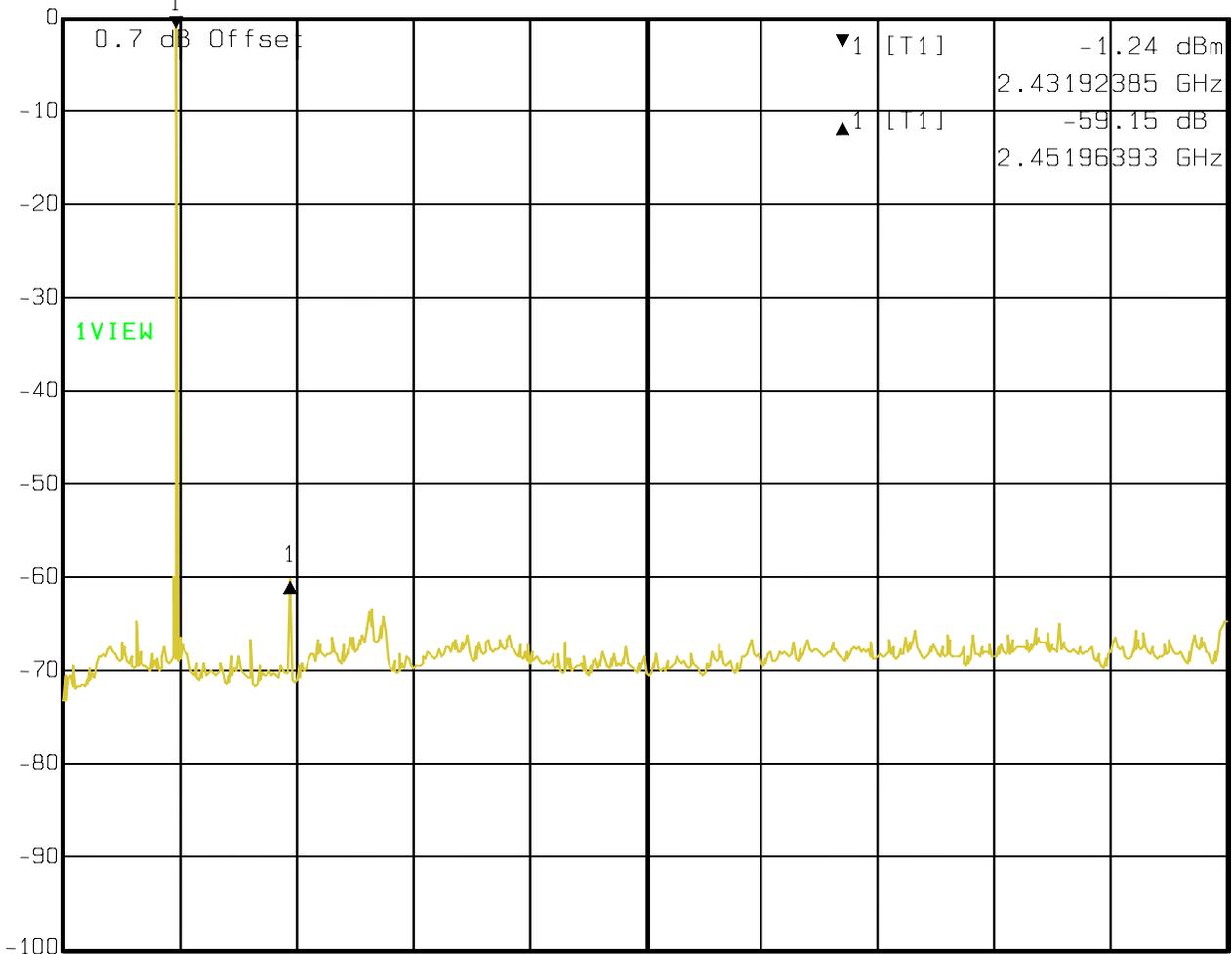
0 dBm

2.45196393 GHz

SWT 6.4 s

Unit

dBm



Start 30 MHz

2.497 GHz

Stop 25 GHz

Date: 19.NOV.2007 11:04:56



(2480 MHz)



Delta 1 [T1]

RBW 100 kHz RF Att 20 dB

Ref Lvl -57.67 dB

VBW 100 kHz

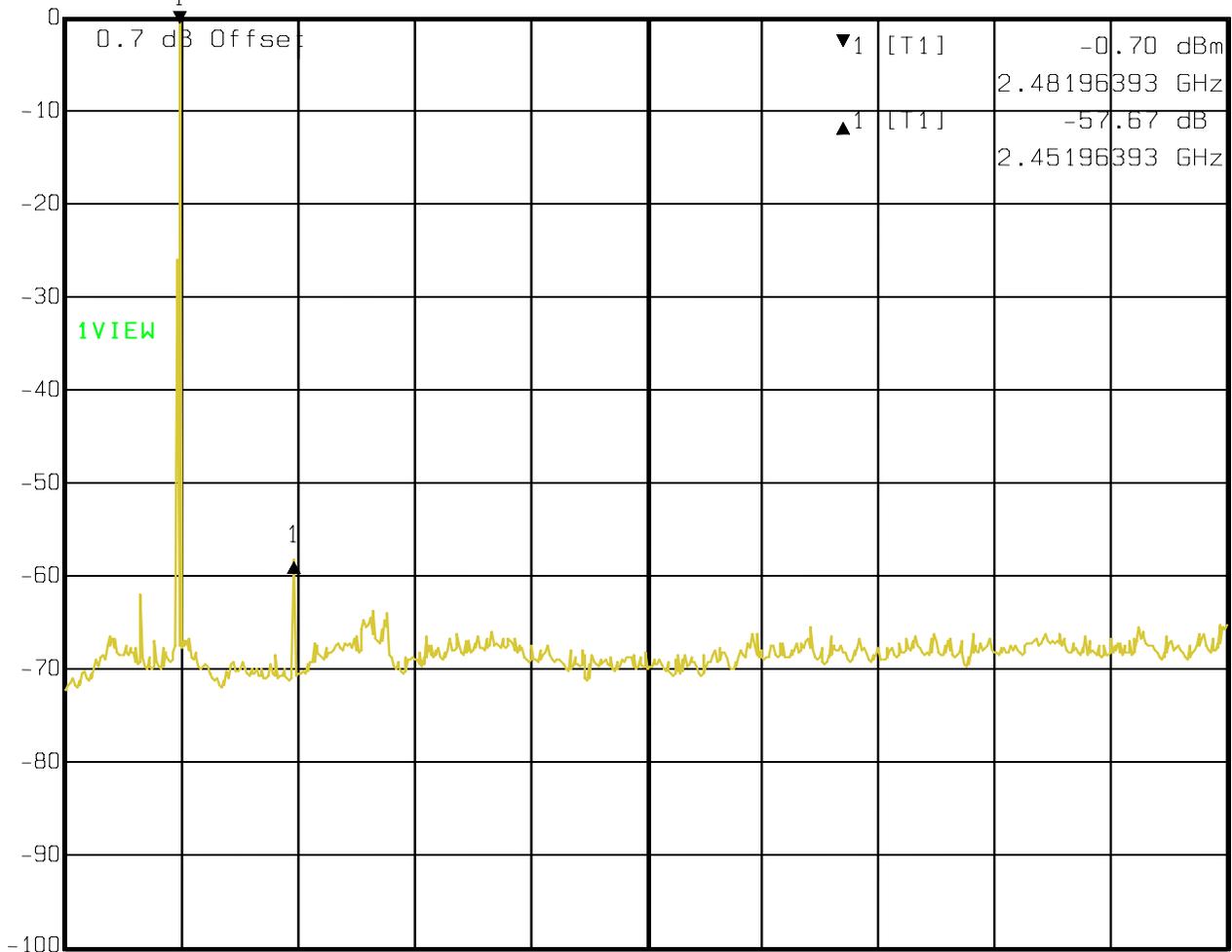
0 dBm

2.45196393 GHz

SWT 6.4 s

Unit

dBm



Start 30 MHz

2.497 GHz

Stop 25 GHz



**6.4 CARRIER FREQUENCY SEPARATION**

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

**(a)(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. 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.**

**Notes:**

1. Measurements were performed with a spectrum analyzer.

**6.4.2 RESULTS:**

TEST CONDITIONS		SEPARATION (MHz)
T <sub>nom</sub> (23)°C	V <sub>nom</sub> VDC	0.969





**6.5 NUMBER OF HOPPING CHANNELS**

**6.5.1 LIMIT SUB CLAUSE § 15.247 (a) (1) (iii)**

<b>NUMBER OF CHANNELS</b>
<b>&gt; 15</b>

**Notes:**

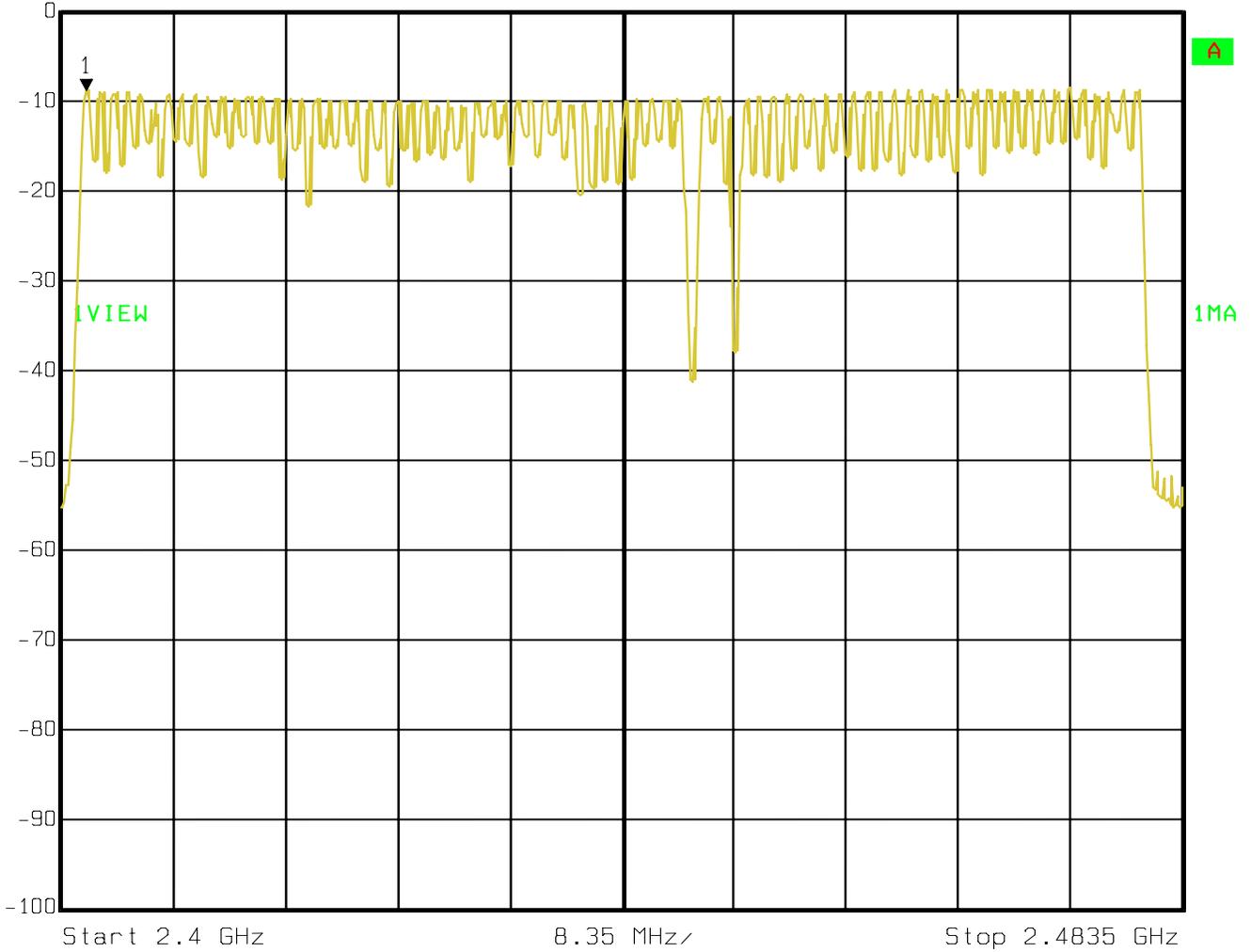
1. Measurements were performed with a spectrum analyzer.

**6.5.2 RESULTS:**

TEST CONDITIONS		NUMBER OF CHANNELS
$T_{nom}(23)^{\circ}C$	$V_{nom} VDC$	79



Marker 1 [T1] RBW 300 kHz RF Att 30 dB  
Ref Lvl -8.88 dBm VBW 300 kHz  
0 dBm 2.40184068 GHz SWT 5 ms Unit dBm



Date: 04.DEC.2007 10:39:48



**6.6 TIME OF OCCUPANCY (DWELL TIME)**

**6.6.1 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

**6.6.2 RESULTS:**

<b>TEST CONDITIONS</b>	
<b>PACKET TYPE</b>	
$T_{nom}(23)^{\circ}C$	$V_{nom} VDC$

**For Bluetooth devices:**

The dwell time of 0.4 s within a 31.6 second period in data mode is independent from the packet type (packet length). The calculation for a 31.6 second period is as follows:

**Dwell time = time slot length \* hop rate / number of hopping channels \* 31.6 s**

**Example for a DH1 packet (with a maximum length of one time slot)**

**Dwell time =  $625 \mu s * 1600 \text{ 1/s} / 79 * 31.6 \text{ s} = 0.4 \text{ s}$  (in a 31.6 s period)**

**For multi-slot packet the hopping is reduced according to the length of the packet.**

**Example for a DH5 packet (with a maximum length of five time slots)**

**Dwell time =  $5 * 625 \mu s * 1600 * 1/5 * 1/s / 79 * 31.6 \text{ s} = 0.4 \text{ s}$  (in a 31.6 s period)**

**This is the same for all BT devices and therefore all BT devices satisfy FCC requirement on time of occupancy (dwell time).**



**6.7 AC POWER LINE CONDUCTED EMISSIONS § 15.107/207**

**6.7.1 Limits**

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

§15.107 (a) Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

**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**

**OPERATING MODE**

The testing was not performed, the EUT is battery operated.



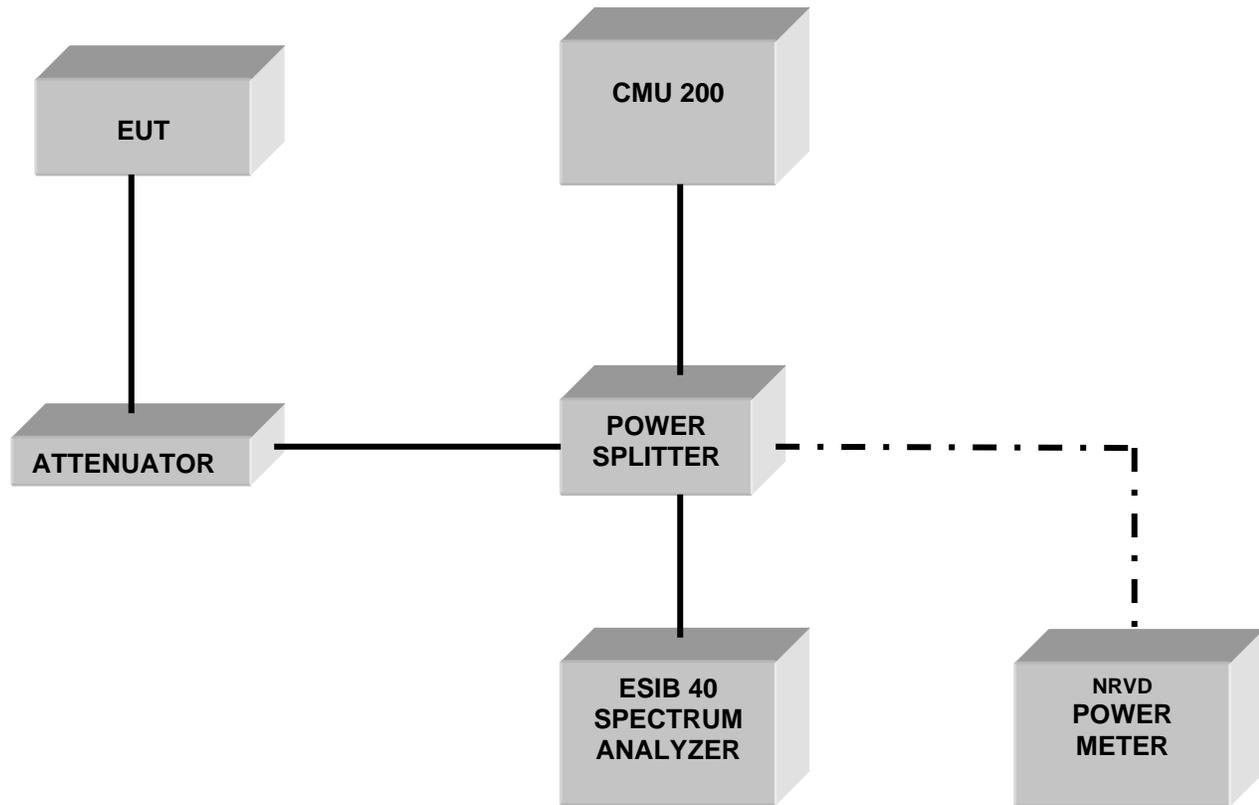
**7 TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS**

No	Instrument/Ancillary	Type	Manufacturer	Serial No.	Cal Due	Interval
01	Spectrum Analyzer	ESIB 40	Rohde & Schwarz	100107	May 2008	1 year
02	Spectrum Analyzer	FSEM 30	Rohde & Schwarz	100017	August 2008	1 year
03	Power-Meter	NRVD	Rohde & Schwarz	0857.8008.02	May 2008	1 year
04	Biconilog Antenna	3141	EMCO	0005-1186	June 2008	1 year
05	Horn Antenna (1-18GHz)	SAS-200/571	AH Systems	325	June 2008	1 year
06	Horn Antenna (18-26.5GHz)	3160-09	EMCO	1240	June 2008	1 year
07	Power Splitter	11667B	Hewlett Packard	645348	n/a	n/a
08	High Pass Filter	5HC2700	Trilithic Inc.	9926013	n/a	n/a
09	High Pass Filter	4HC1600	Trilithic Inc.	9922307	n/a	n/a
10	Pre-Amplifier	JS4-00102600	Miteq	00616	May 2008	1 year
11	Power Sensor	URV5-Z2	Rohde & Schwarz	DE30807	May 2008	1 year
12	LISN	ESH3-Z5	Rohde & Schwarz	836679/003	Aug. 2008	1 year



## 8 BLOCK DIAGRAMS

### Conducted Testing





## Radiated Testing

### ANECHOIC CHAMBER

