



FCC Test Report

FCC Part 15.247 for FHSS systems

Model #: V02B-V02B001
FCC ID: E2KV02B001

TEST REPORT #: EMC_FIHTD_001_09004_15.247FHSS_rev3
DATE: 2009-11-05



FCC listed:
A2LA
accredited

IC recognized #
3462B

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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 #
Dell Inc.	GSM/UMTS Mobile Phone	V02B-V02B001

Technical responsibility for area of testing:

2009-11-05	EMC & Radio	Marc Douat (Test Lab Manager)	Thomas Tam(Test Lab Manager) On Behalf of Marc Douat
Date	Section	Name	Signature

This report is prepared by:

2009-11-05	EMC & Radio	Satya Radhakrishna (EMC Project Engineer)	
Date	Section	Name	Signature

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 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 Director:	Heiko Strehlow
Responsible Project Leader:	Satya Radhakrishna

2.2 Identification of the Client

APPLICANT	
Applicant (Company Name)	Dell Inc.
Street Address	One Dell Way
City/Zip Code	Round Rock, TX 78682
Country	USA
Contact Person	Sushil Gour
Telephone	+1-512-723-7639
e-mail	Sushil_Gour@Dell.com

2.3 Identification of the Manufacturer

Manufacturer's Name:	Foxconn Precision Electronics(Tai Yuan) Co., Ltd.
Street Address:	No.1 Longfei Street, Economic-Technology Development Zone,
City/Zip Code	Taiyuan City, Shanxi Province/030032
Country	China
Contact Person:	Cosmos Yeh
Phone No.	+886-2-22685511
e-mail:	CosmosYeh@fintdc.com



3 Equipment Under Test (EUT)

3.1 Specification of the Equipment under Test

EUT	
Marketing Name of EUT (if not same as Model No.)	Mini 3iX
Description	GSM/UMTS Mobile Phone
Model No.	V02B-V02B001
HW Version:	EPR3.12
SW Version:	0905260350-FBW1.3-BLAZE-ox 1956355705450473032509419
FCC-ID:	E2KV02B001

Frequency Range:	2400MHz – 2483.5MHz
Type(s) of Modulation:	GFSK, DQPSK, 8PSK
Number of Channels:	79
Antenna Type/gain:	Internal / -4.5dBi
Output Power:	Peak Measured value Conducted GFSK: dBm @ 2480 MHz Conducted DQPSK: dBm @ 2480 MHz Conducted 8DPSK: dBm @ 2480 MHz

3.2 Identification of the Equipment under Test (EUT)

EUT #	TYPE	MANUFACTURER	MODEL	SERIAL#
1	GSM/UMTS Mobile Phone	Foxconn Precision Electronics(Tai Yuan) Co., Ltd.	V02B-V02B001	BLAEA000001823

3.3 Identification of Accessory equipment

AE #	TYPE	MANF.	MODEL
1	AC Adapter	Ktec Co. Ltd.	KSUFB0500100W1UV-1



4 Subject Of Investigation

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

During the testing process the EUT was tested on low, mid, and high channels using PRBS9 payload using DH5, 2DH5, and 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. The maximization of portable equipment is conducted in accordance with ANSI C63.4.



5 Measurements (RADIATED)

5.1 RESTRICTED BAND EDGE COMPLIANCE RADIATED §15.247/15.205

5.1.1 LIMITS

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



5.1.2 RESULTS: GFSK

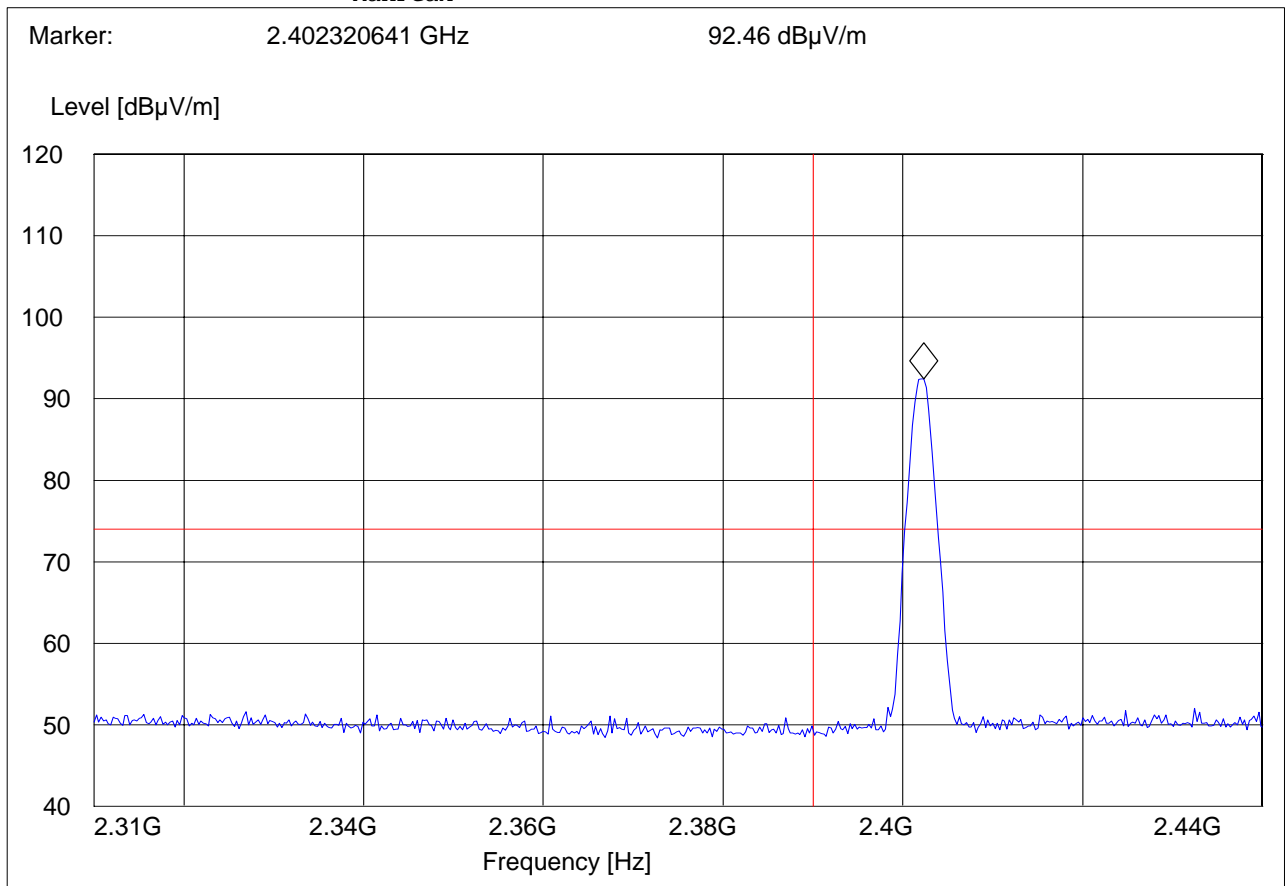
PLOT 5.1.2 A

(2402MHz) LOWER BAND EDGE PEAK –GFSK MODULATION

EUT: V02B-V02B001
Customer:: Dell Inc.
Test Mode: BT GFSK CH0
ANT Orientation: H
EUT Orientation: H
Test Engineer: Satya
Voltage: AC
Comments:

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_vert





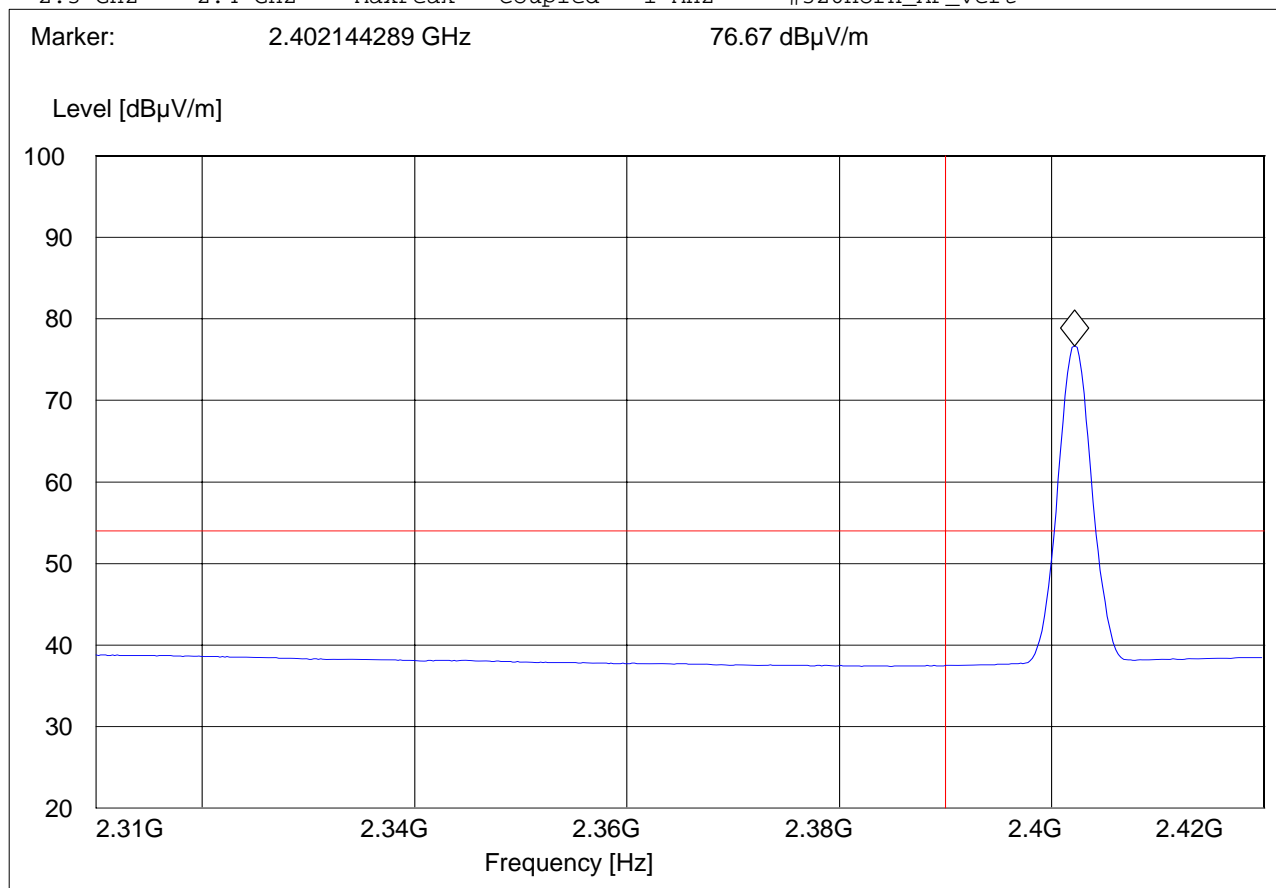
PLOT 5.1.2 B

(2402MHz) LOWER BAND EDGE AVERAGE –GFSK MODULATION

EUT: V02B-V02B001
 Customer:: Dell Inc.
 Test Mode: BT GFSK CH0
 ANT Orientation: H
 EUT Orientation: H
 Test Engineer: Satya
 Voltage: AC
 Comments:

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_vert



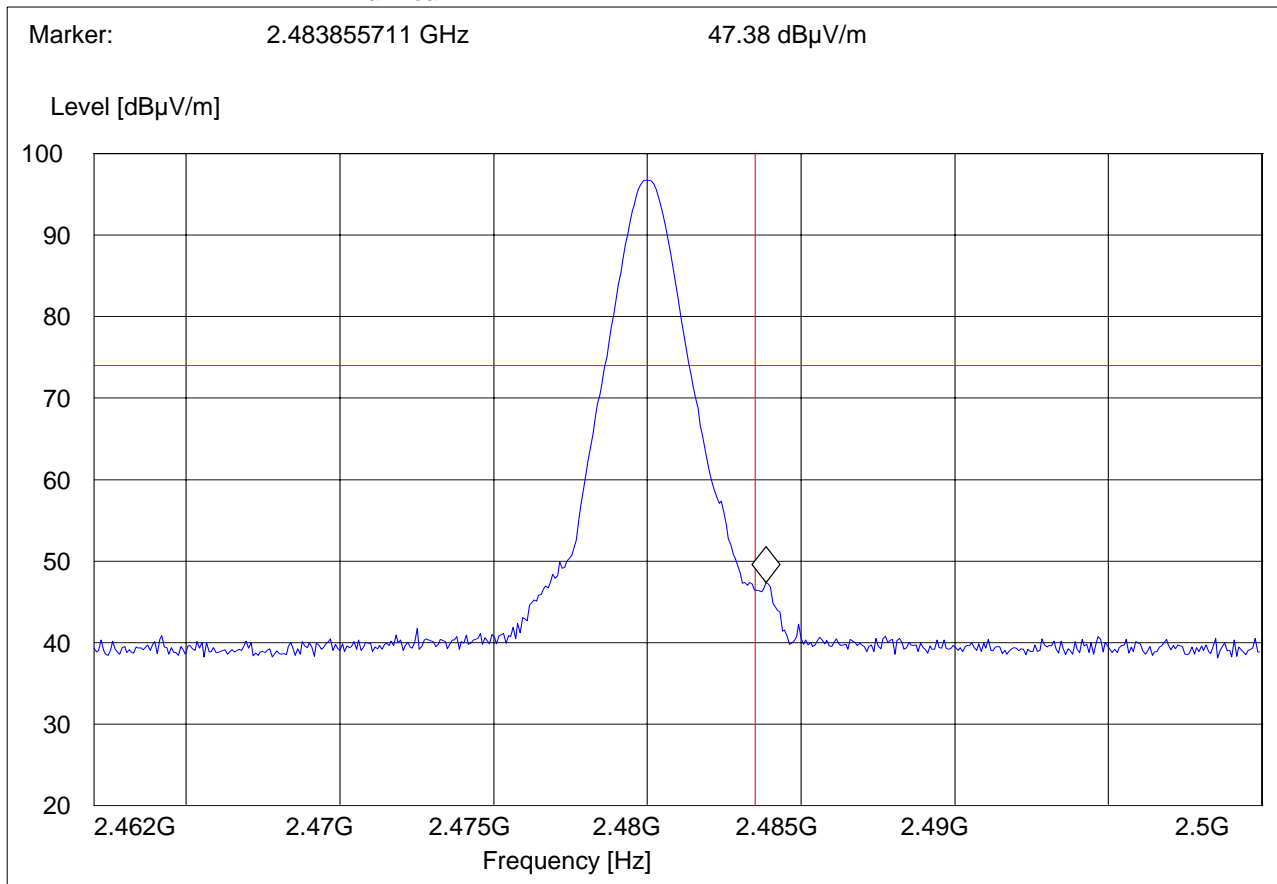


PLOT 5.1.2 C
(2480MHz) HIGHER BAND EDGE PEAK –GFSK MODULATION

EUT: V02B-V02B001
Customer:: Dell Inc.
Test Mode: BT GFSK CH78
ANT Orientation: H
EUT Orientation: H
Test Engineer: Satya
Voltage: AC
Comments:

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_vert
		MaxPeak			





PLOT 5.1.2 D

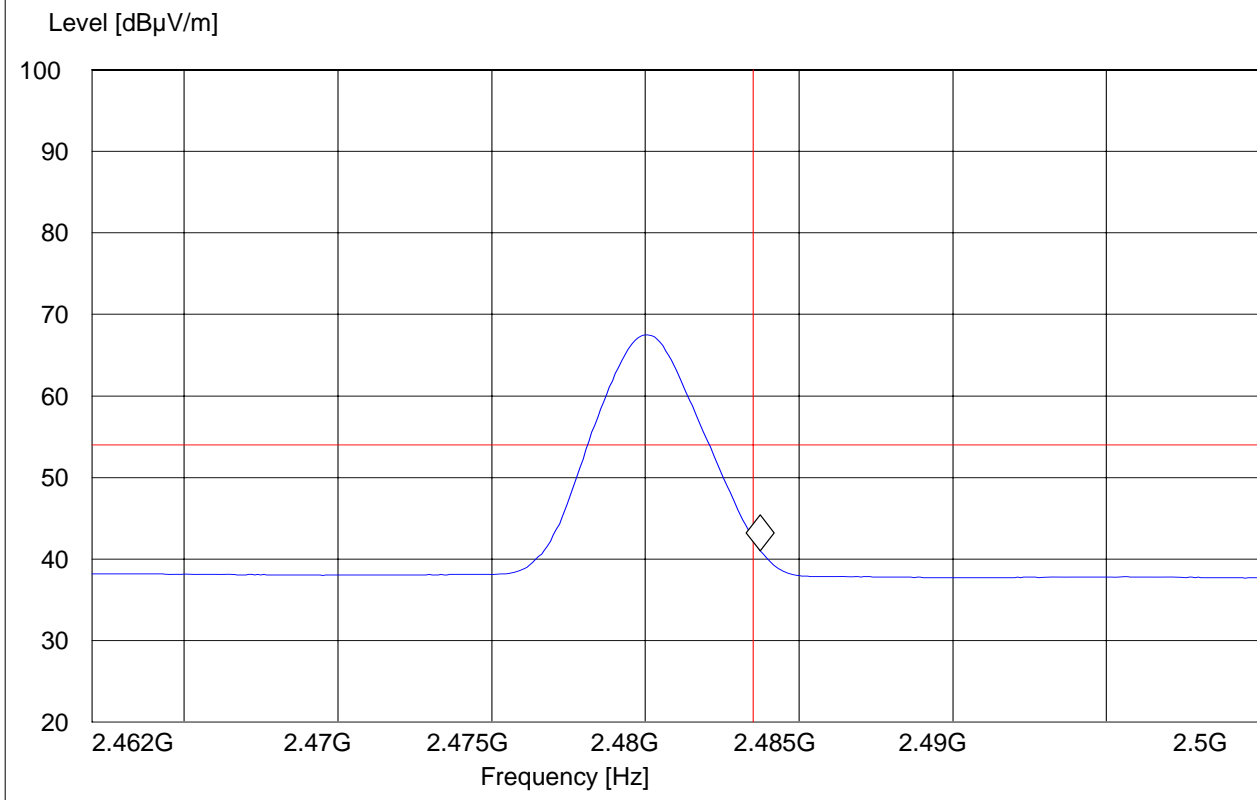
HIGHER BAND EDGE AVERAGE-GFSK MODULATION

EUT: V02B-V02B001
 Customer:: Dell Inc.
 Test Mode: BT GFSK CH78
 ANT Orientation: H
 EUT Orientation: H
 Test Engineer: Satya
 Voltage: AC
 Comments:

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_horz

Marker: 2.483739479 GHz 41.02 dBμV/m





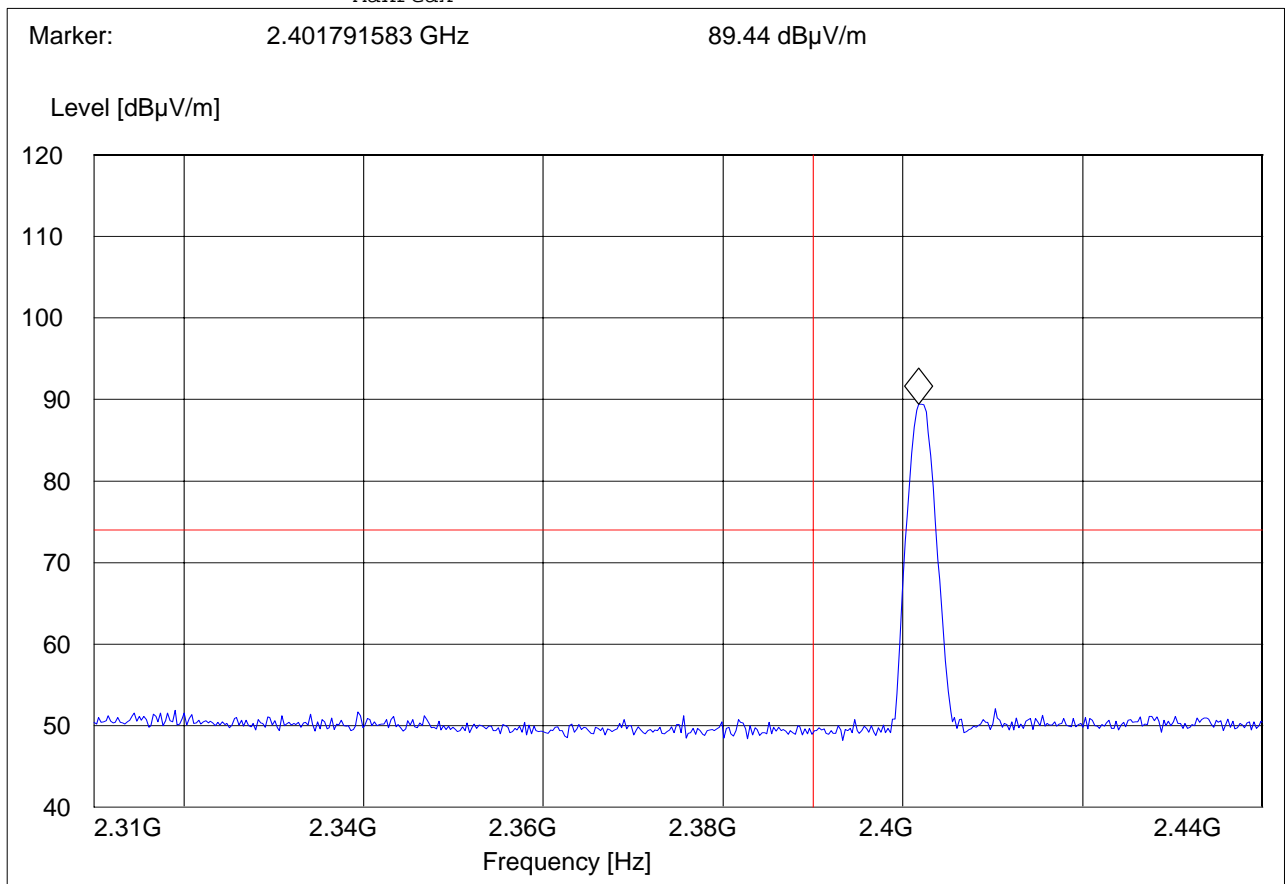
5.1.3 RESULTS: $\pi/4$ DQPSK
PLOT 5.1.3 A

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

EUT: V02B-V02B001
Customer:: Dell Inc.
Test Mode: BT pi/4 DQPSK CH0
ANT Orientation: H
EUT Orientation: H
Test Engineer: Satya
Voltage: AC
Comments:

SWEEP TABLE: "FCC15.247 LBE_PK"

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





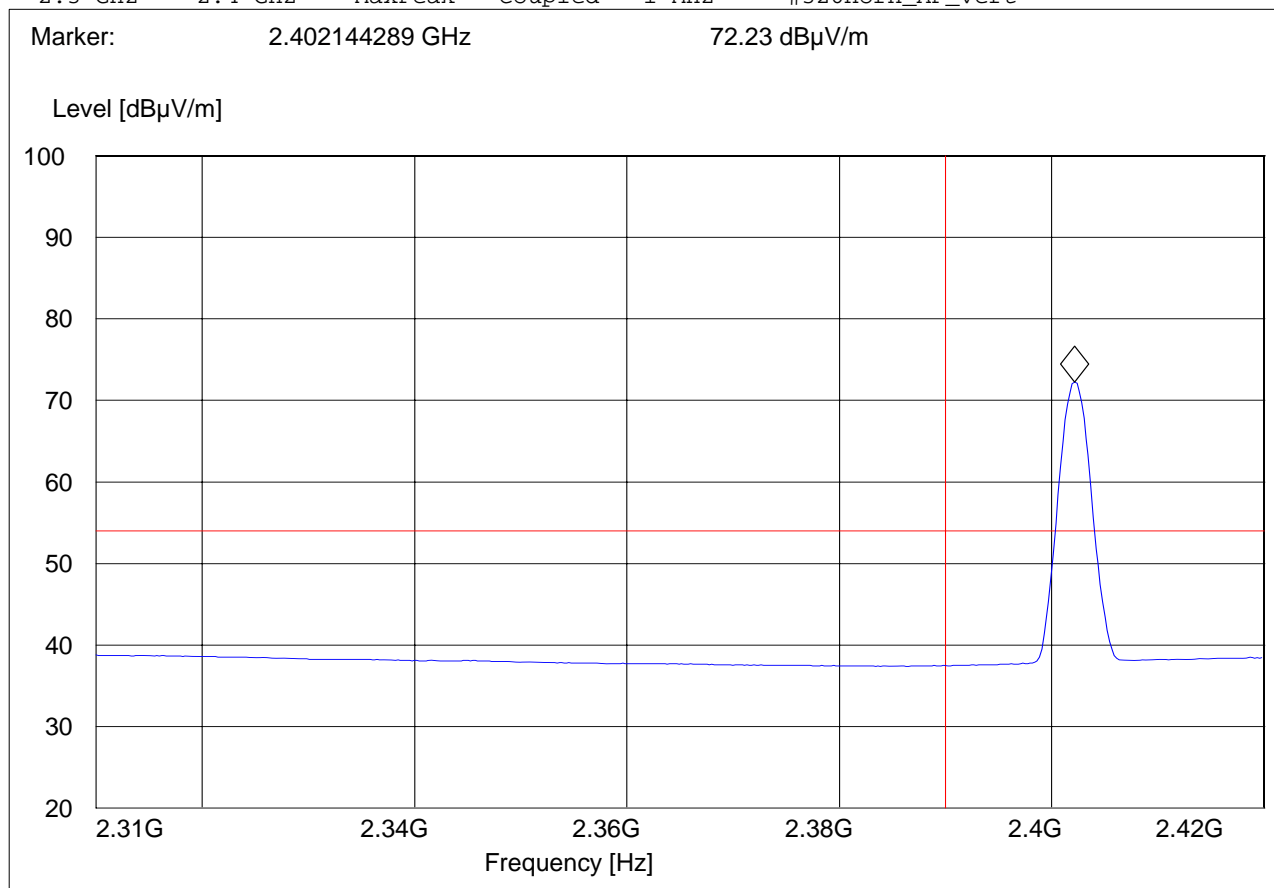
PLOT 5.1.3 B

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

EUT: V02B-V02B001
 Customer:: Dell Inc.
 Test Mode: BT pi/4 DPSK CH0
 ANT Orientation: H
 EUT Orientation: H
 Test Engineer: Satya
 Voltage: AC
 Comments:

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_vert





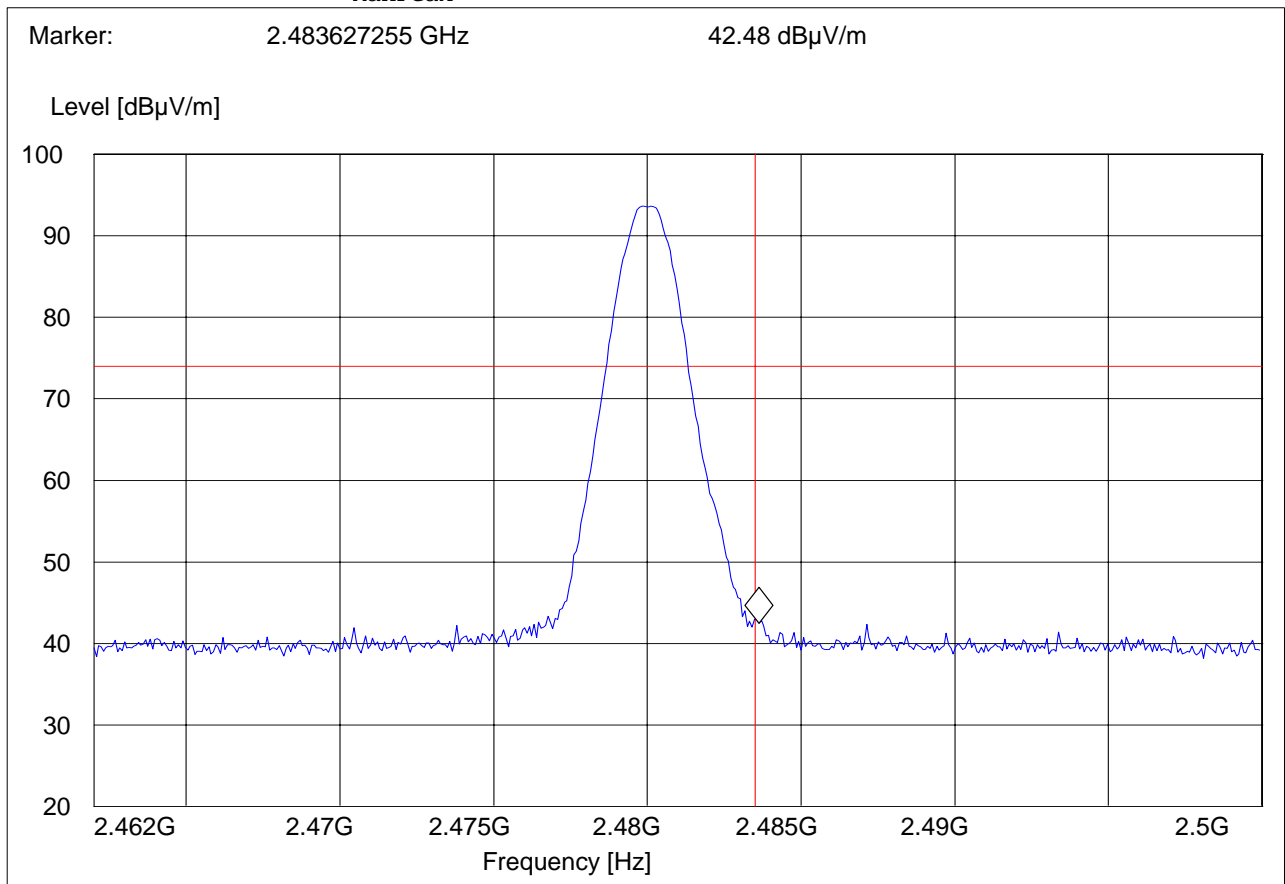
PLOT 5.1.3 C

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

EUT: V02B-V02B001
 Customer:: Dell Inc.
 Test Mode: BT pi/4 DQPSK CH78
 ANT Orientation: H
 EUT Orientation: H
 Test Engineer: Satya
 Voltage: AC
 Comments:

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_vert
		MaxPeak			



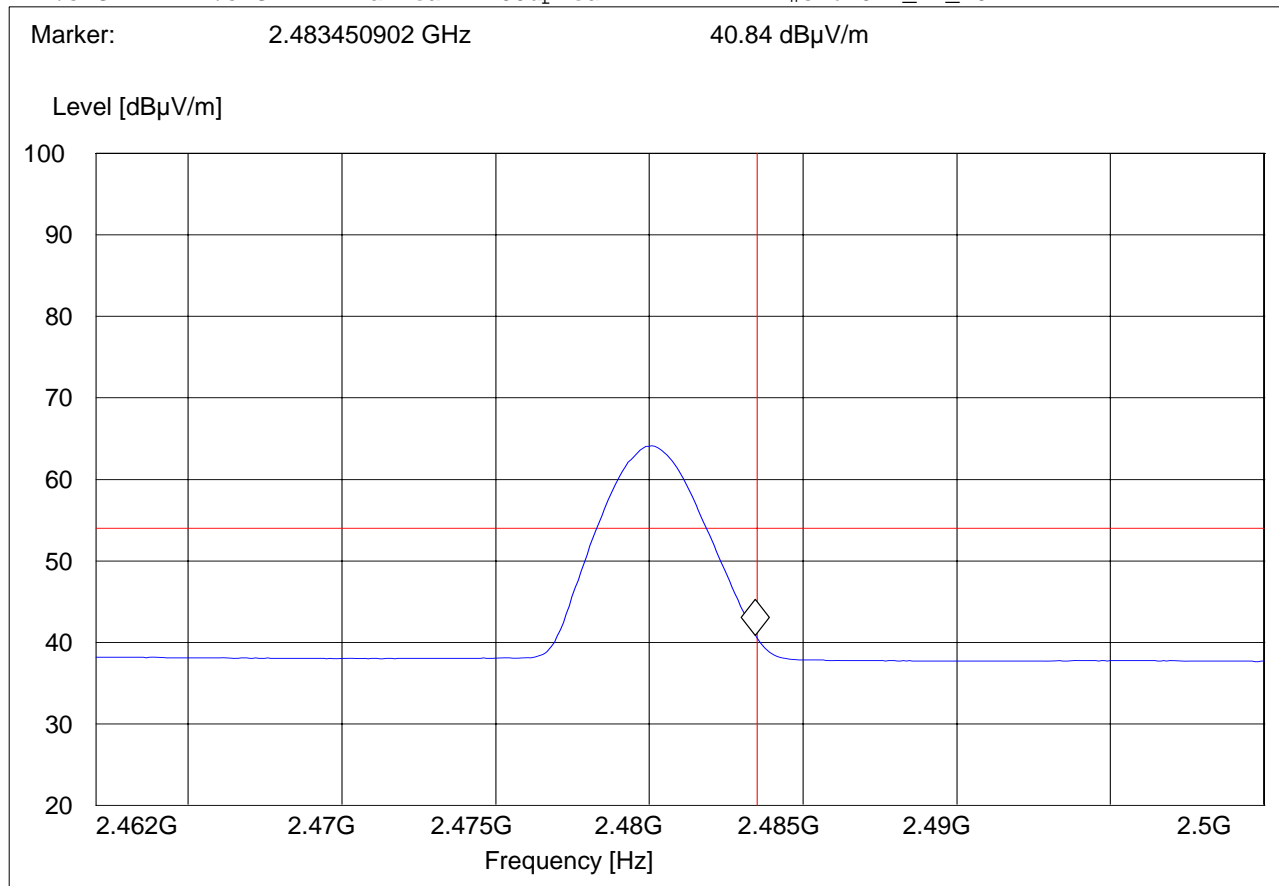


PLOT 5.1.3 D
HIGHER BAND EDGE AVERAGE- $\pi/4$ DQPSK MODULATION

EUT: V02B-V02B001
 Customer:: Dell Inc.
 Test Mode: BT pi/4 DQPSK CH78
 ANT Orientation: H
 EUT Orientation: H
 Test Engineer: Satya
 Voltage: AC
 Comments:

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_horz





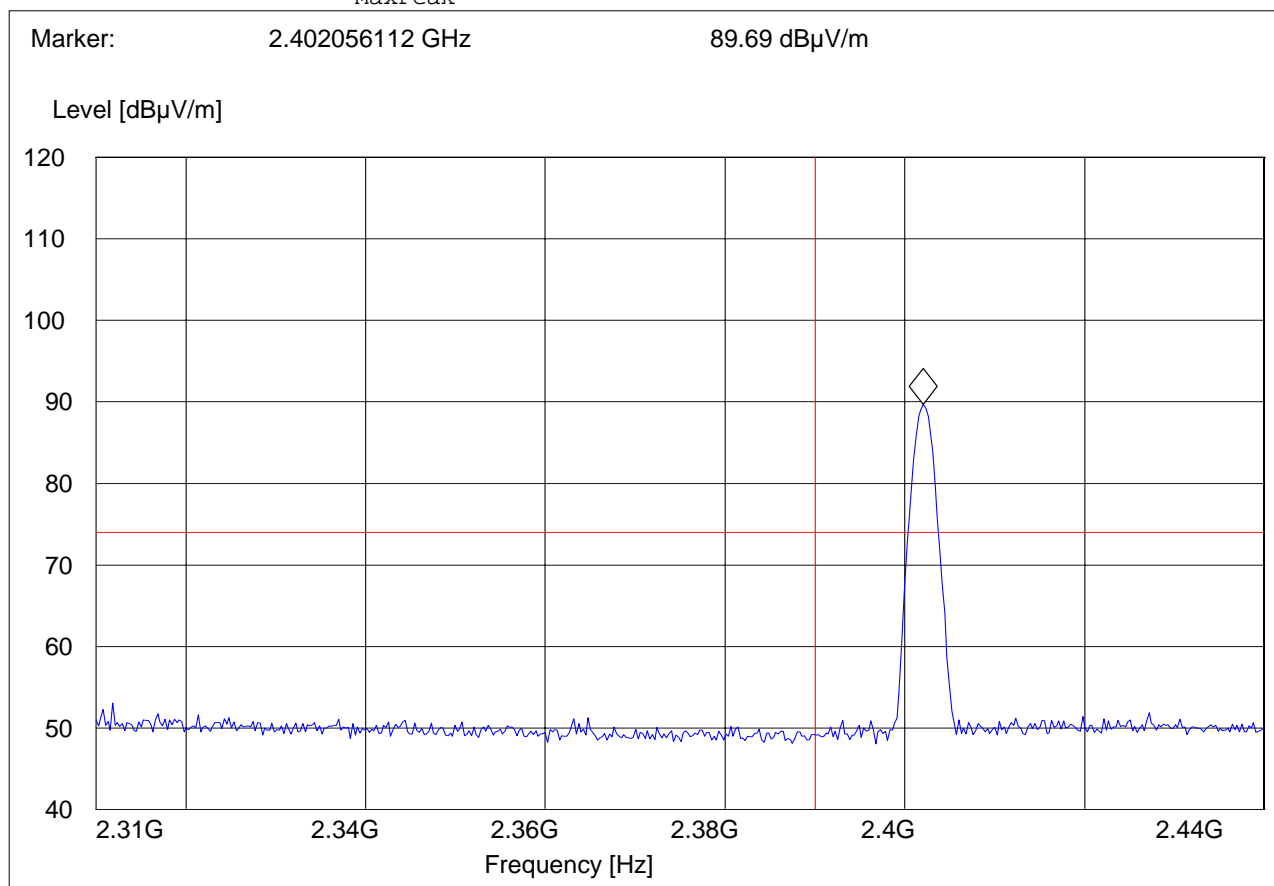
5.1.4 RESULTS: 8DPSK
PLOT 5.1.4 A

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

EUT: V02B-V02B001
Customer:: Dell Inc.
Test Mode: BT 8PSK CH0
ANT Orientation: H
EUT Orientation: H
Test Engineer: Satya
Voltage: AC
Comments:

SWEEP TABLE: "FCC15.247 LBE_PK"

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



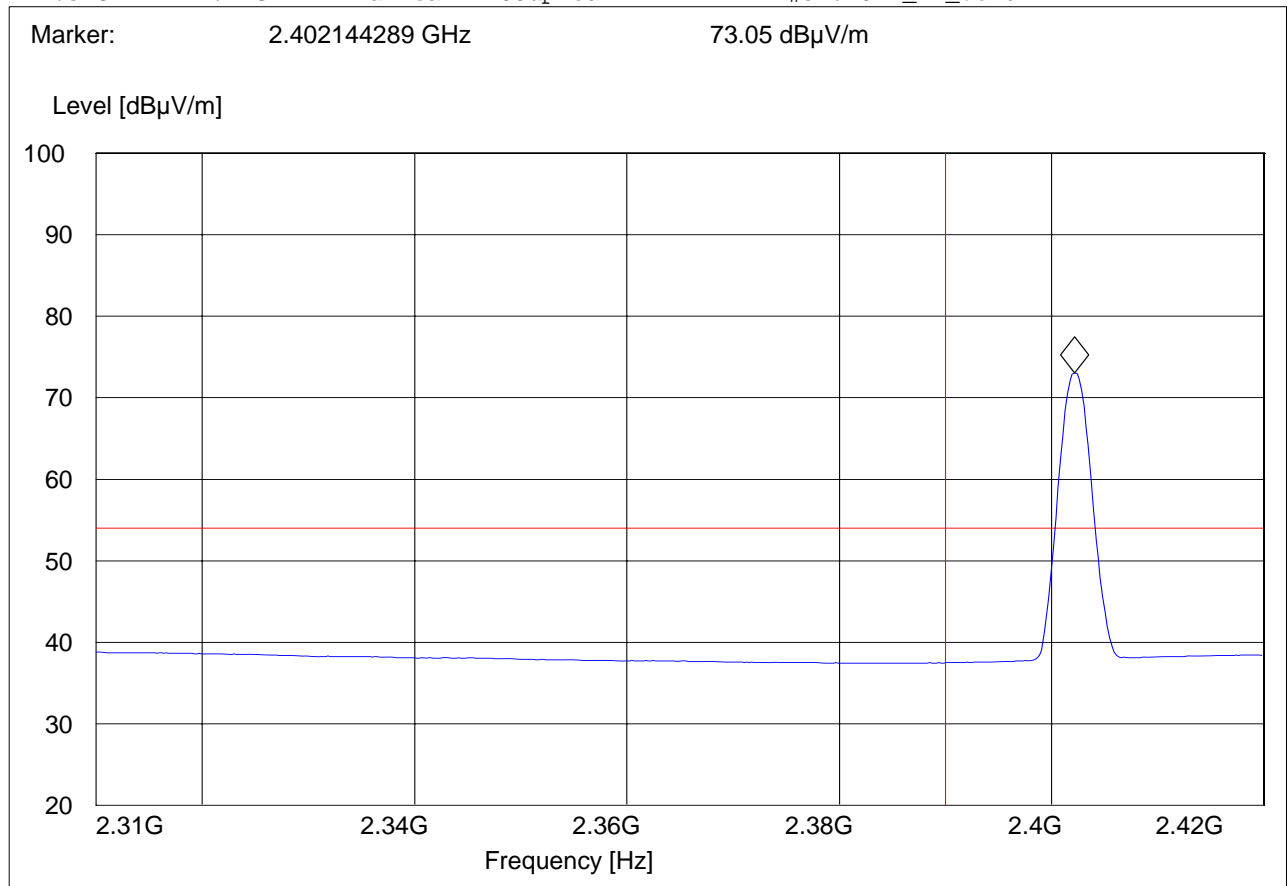


PLOT 5.1.4 B
(2402MHz) LOWER BAND EDGE AVERAGE -8DPSK MODULATION

EUT: V02B-V02B001
Customer:: Dell Inc.
Test Mode: BT 8PSK CH0
ANT Orientation: H
EUT Orientation: H
Test Engineer: Satya
Voltage: AC
Comments:

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_vert



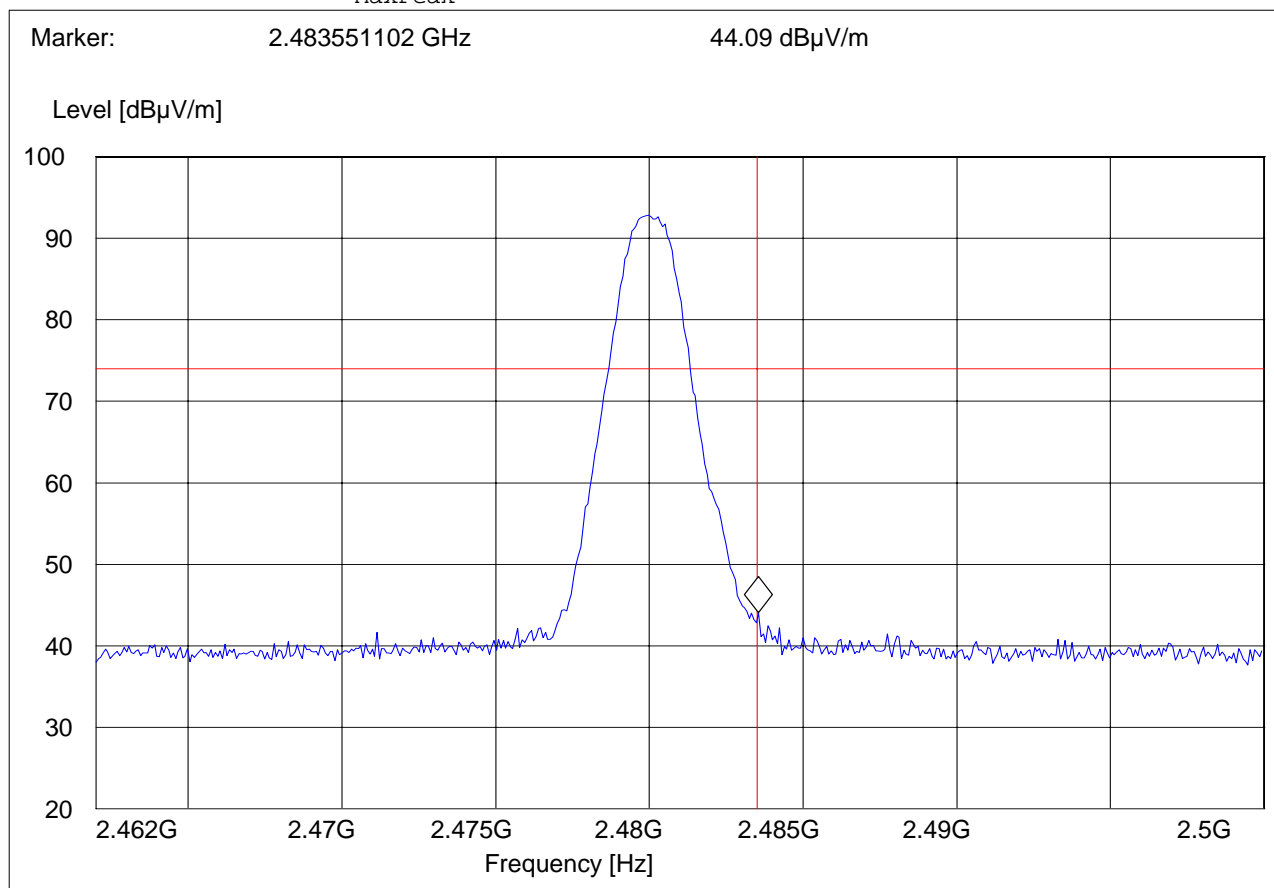


PLOT 5.1.4 C
(2480MHz) HIGHER BAND EDGE PEAK – 8DPSK MODULATION

EUT: V02B-V02B001
 Customer:: Dell Inc.
 Test Mode: BT 8PSK CH78
 ANT Orientation: H
 EUT Orientation: H
 Test Engineer: Satya
 Voltage: AC
 Comments:

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_vert
		MaxPeak			



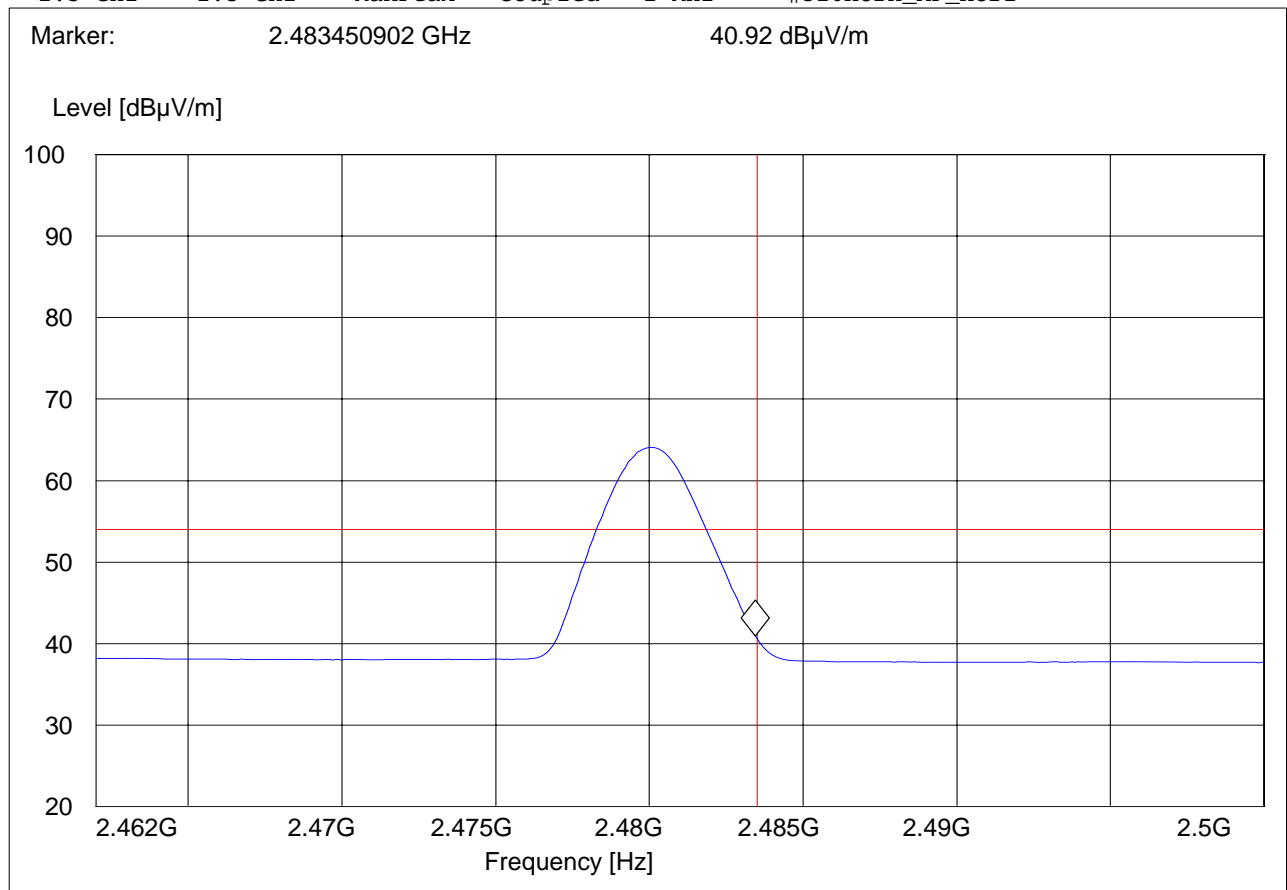


PLOT 5.1.4 D
HIGHER BAND EDGE AVERAGE-8DPSK MODULATION

EUT: V02B-V02B001
 Customer:: Dell Inc.
 Test Mode: BT 8PSK CH78
 ANT Orientation: H
 EUT Orientation: H
 Test Engineer: Satya
 Voltage: AC
 Comments:

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_horz





5.2 TRANSMITTER SPURIOUS EMISSIONS RADIATED § 15.247/15.205/15.209

5.2.1 LIMITS

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	(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

All Spurious Emission measurements are done in GFSK mode and represents the worse case emission from the device.



5.2.2 RESULTS

PLOT 5.2.2 A

30MHz – 1GHz Antenna

Channel 0: GFSK: Plot contains results of both horizontal and vertical polarizations

Test

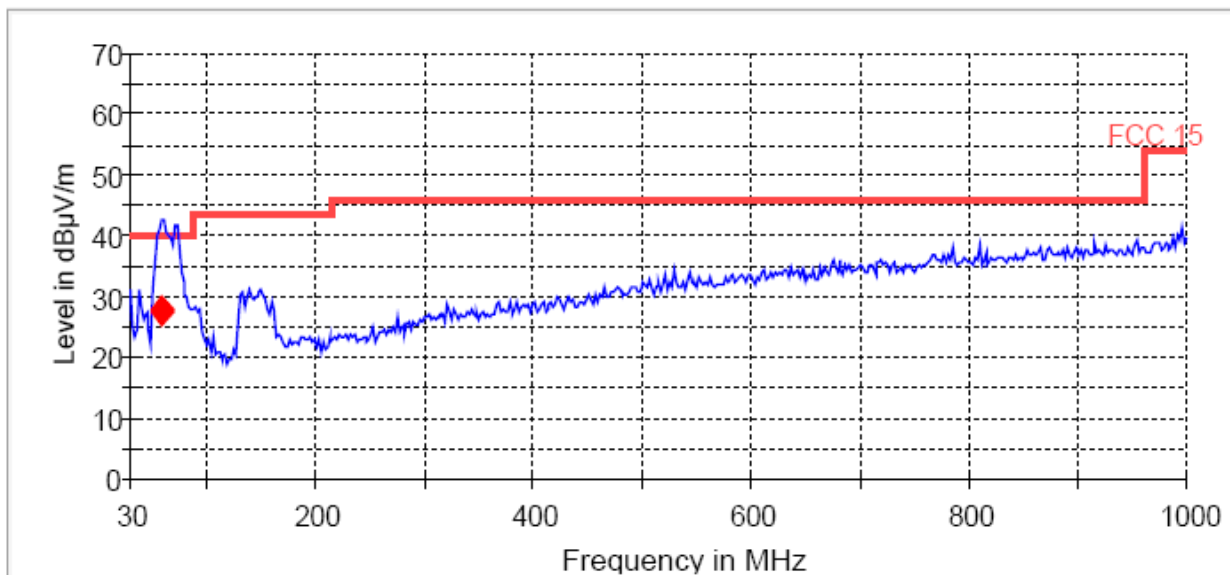
Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
59.288577	27.2	20.000	120.000	146.0	V	17.0	7.8	12.8	40.0
59.889780	27.8	20.000	120.000	120.0	V	22.0	7.9	12.2	40.0

(continuation of the "Final Result 1" table from column 10 ...)

Frequency (MHz)	Comment
59.288577	
59.889780	

FCC 15 30-1000MHz



— FCC 15.LimitLine
 — Preview Result 1
 ◆ Final Result 1



PLOT 5.2.2 B

30MHz – 1GHz

Channel 39: GFSK: Plot contains results of both horizontal and vertical polarizations

Test

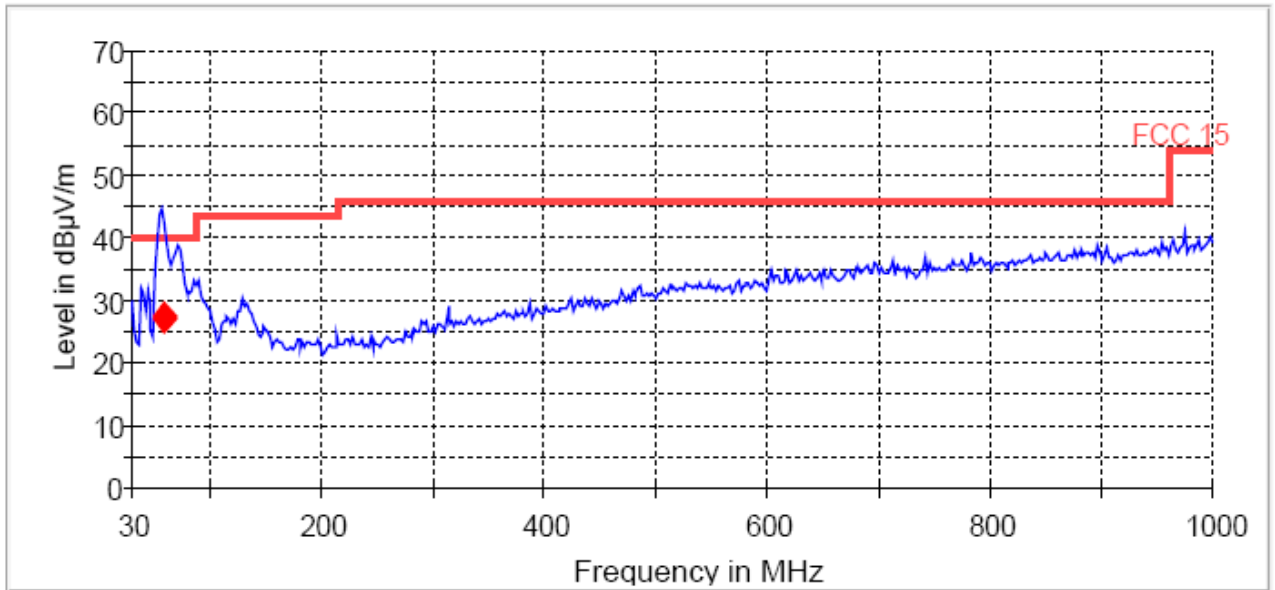
Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
58.226452	27.3	20.000	120.000	140.0	V	292.0	7.7	12.7	40.0
59.468938	27.1	20.000	120.000	120.0	V	198.0	7.9	12.9	40.0

(continuation of the "Final Result 1" table from column 10 ...)

Frequency (MHz)	Comment
58.226452	
59.468938	

FCC 15 30-1000MHz



— FCC 15.LimitLine
 — Preview Result 1
 ◆ Final Result 1



PLOT 5.2.2 C

30MHz – 1GHz

Channel 78: GFSK: Plot contains results of both horizontal and vertical polarizations

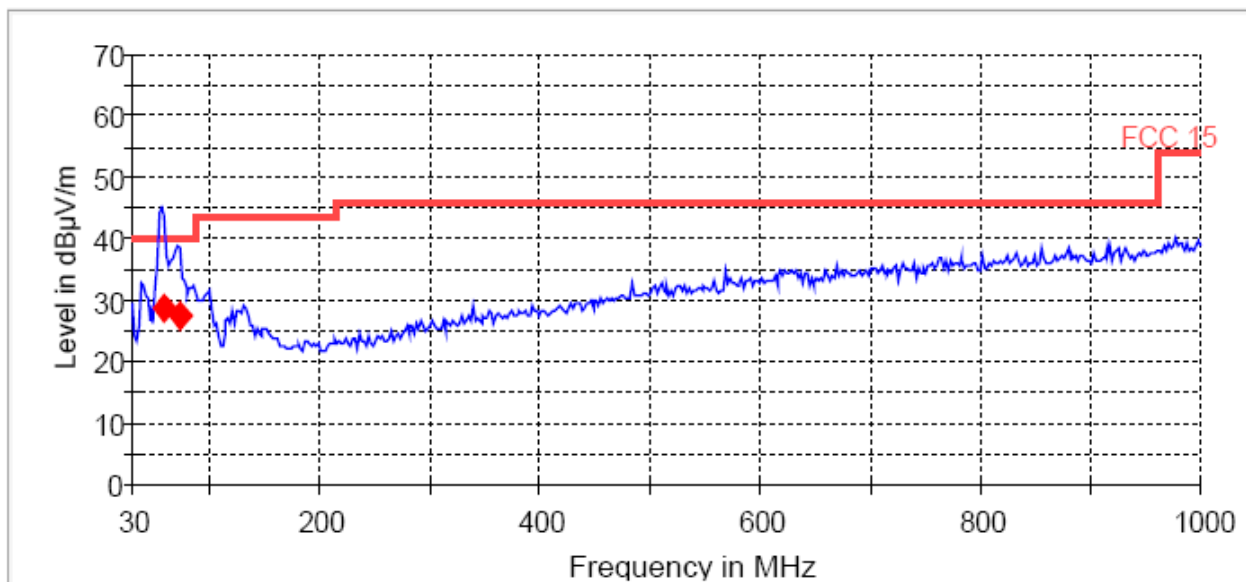
Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
57.945892	28.6	20.000	120.000	120.0	V	1.0	7.7	11.4	40.0
72.434869	27.3	20.000	120.000	120.0	V	267.0	9.2	12.7	40.0

(continuation of the "Final Result 1" table from column 10 ...)

Frequency (MHz)	Comment
57.945892	
72.434869	

FCC 15 30-1000MHz



— FCC 15.LimitLine — Preview Result 1 ◆ Final Result 1



PLOT 5.2.2 D

1-18GHz (2402MHz)

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

Plot contains results of both horizontal and vertical polarizations

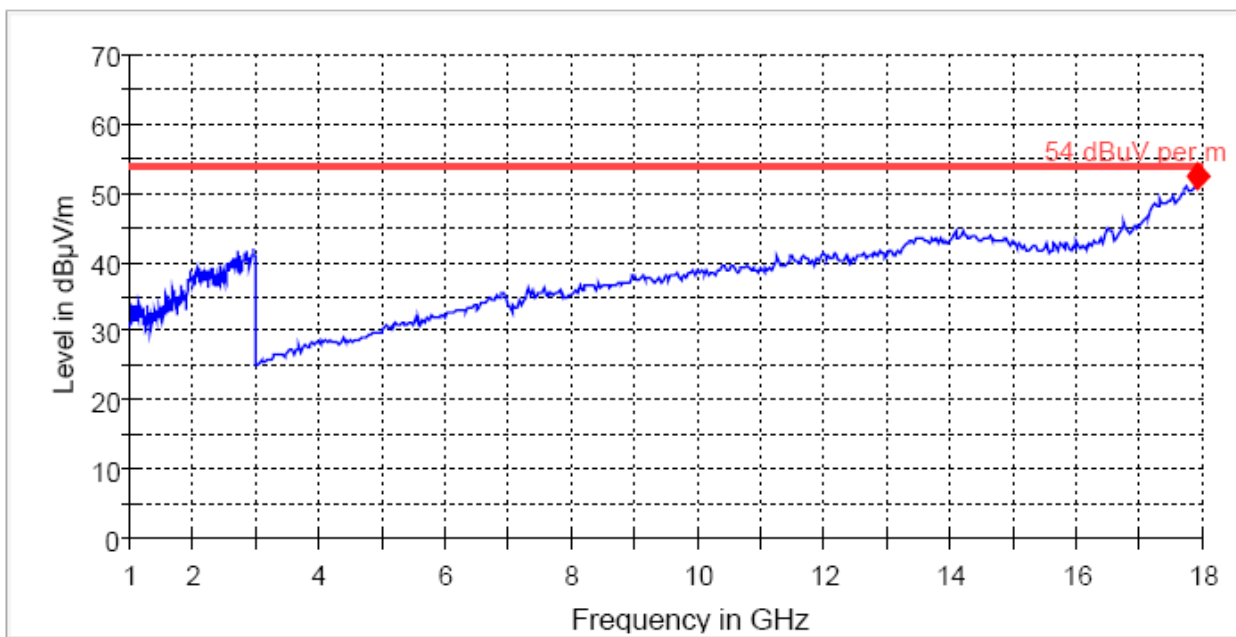
Final Result 1

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
17942.635271	52.5	20.000	1000.000	120.0	V	268.0	29.4	1.6	54.0

(continuation of the "Final Result 1" table from column 10 ...)

Frequency (MHz)	Comment
17942.635271	

FCC 15 1-18GHz



— 54 dBuV per m.LimitLine — Preview Result 1 ◆ Final Result 1



PLOT 5.2.2 E

1-18GHz (2441MHz)

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

Plot contains results of both horizontal and vertical polarizations

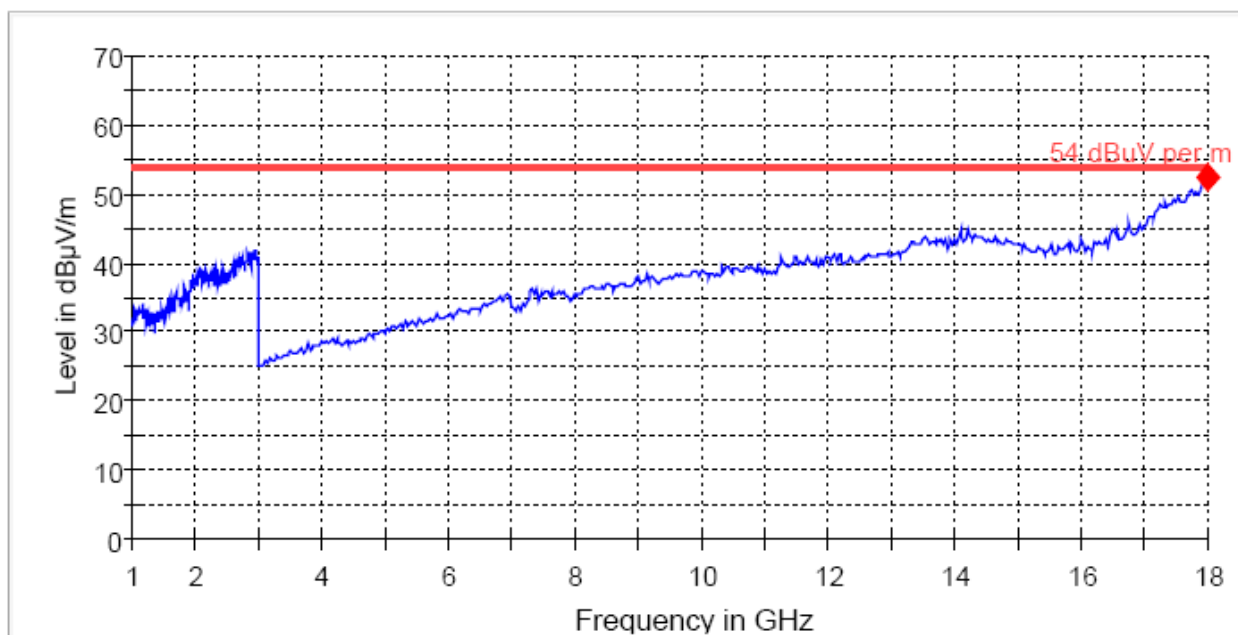
Final Result 1

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
17996.663327	52.3	20.000	1000.000	120.0	H	9.0	29.3	1.7	54.0

(continuation of the "Final Result 1" table from column 10 ...)

Frequency (MHz)	Comment
17996.663327	

FCC 15 1-18GHz



— 54 dBµV per m.LimitLine
 — Preview Result 1
 ◆ Final Result 1



PLOT 5.2.2 F

1-18GHz (2480MHz)

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

Note: Peak Reading vs. Average limit

Plot contains results of both horizontal and vertical polarizations

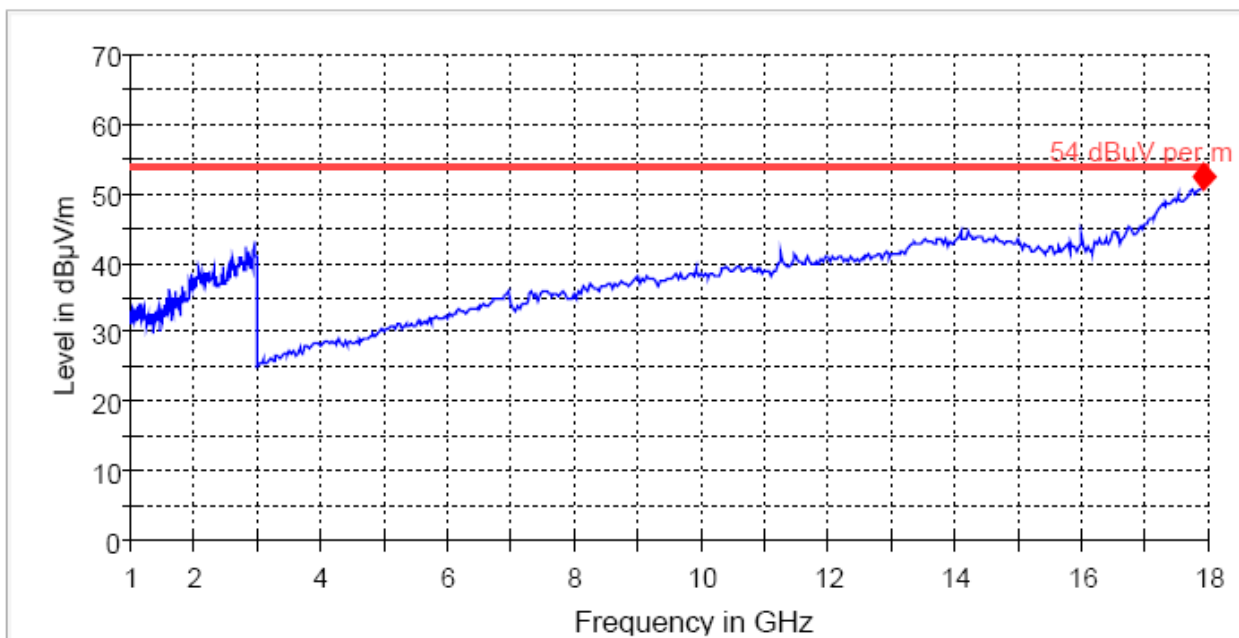
Final Result 1

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
17942.715431	52.5	20.000	1000.000	161.0	V	22.0	29.5	1.5	54.0

(continuation of the "Final Result 1" table from column 10 ...)

Frequency (MHz)	Comment
17942.715431	

FCC 15 1-18GHz



— 54 dBµV per m.LimitLine — Preview Result 1 ◆ Final Result 1



PLOT 5.2.2 G

18-25GHz

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

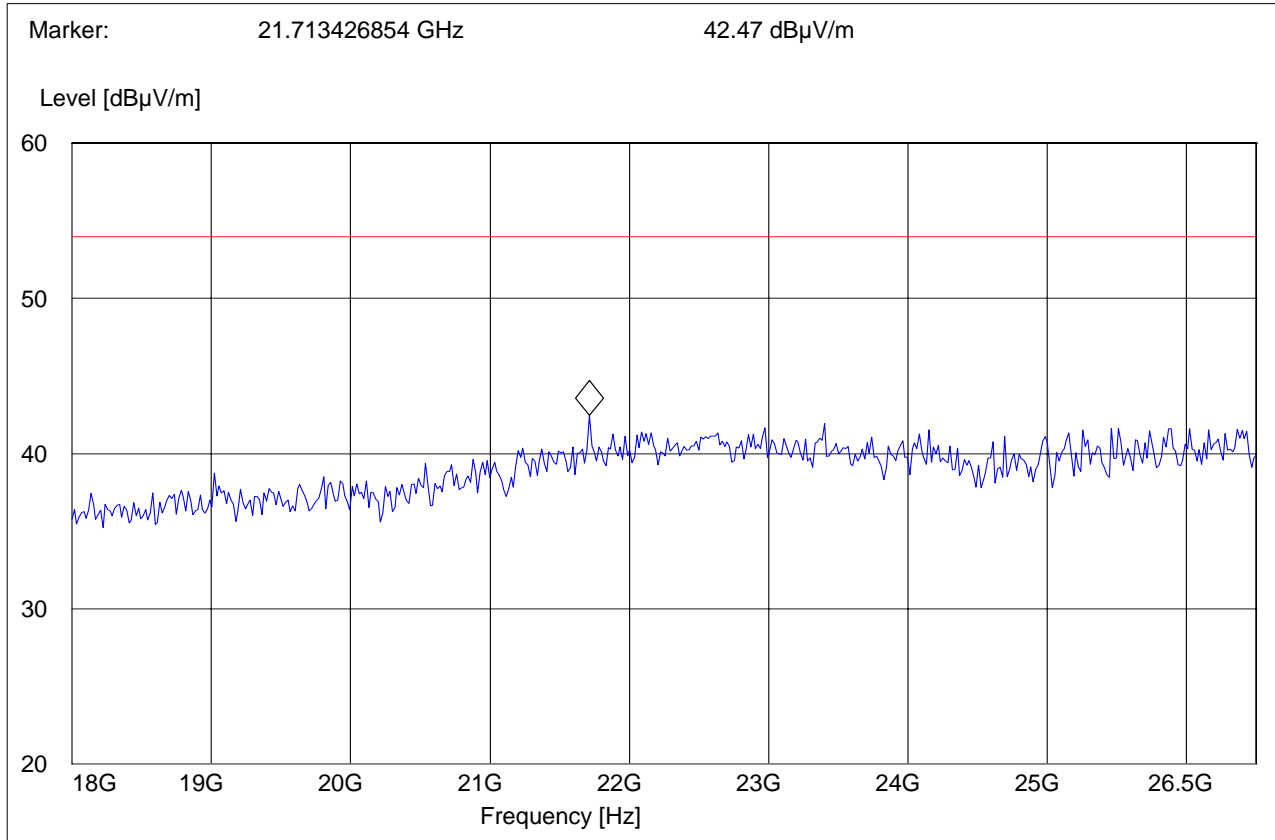
Note: Peak Reading vs. Average limit

Plot contains results of both horizontal and vertical polarizations

EUT: V02B-V02B001
 Customer:: Dell Inc.
 Test Mode: BT CH78
 ANT Orientation: H
 EUT Orientation: H
 Test Engineer: SAM
 Voltage: AC
 Comments:

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

Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
18.0 GHz	26.5 GHz	MaxPeak MaxPeak	Coupled	100 kHz	Horn # 3116_18-40G





5.3 RECEIVER SPURIOUS RADIATION RSS-Gen(4.10)

5.3.1 LIMITS

Frequency (MHz)	Field strength ($\mu\text{V/m}$)	Measurement distance (m)
0.009 - 0.490	2400/F (kHz)	300
0.490 - 1.705	24000/F (kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
above 960	500	3

NOTE:

1. The radiated emissions were done with different settings, using the relevant pre-amplifiers for the relevant frequency ranges. This is the reason that the graphs show different noise levels. In the range between 3 and 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.



5.3.2 Results

PLOT 5.3.2 A

30MHz – 1GHz Antenna: Vertical.

Note: This plot is valid for low, mid, high channels (worst-case plot)
 Plot contains results of both horizontal and vertical polarizations

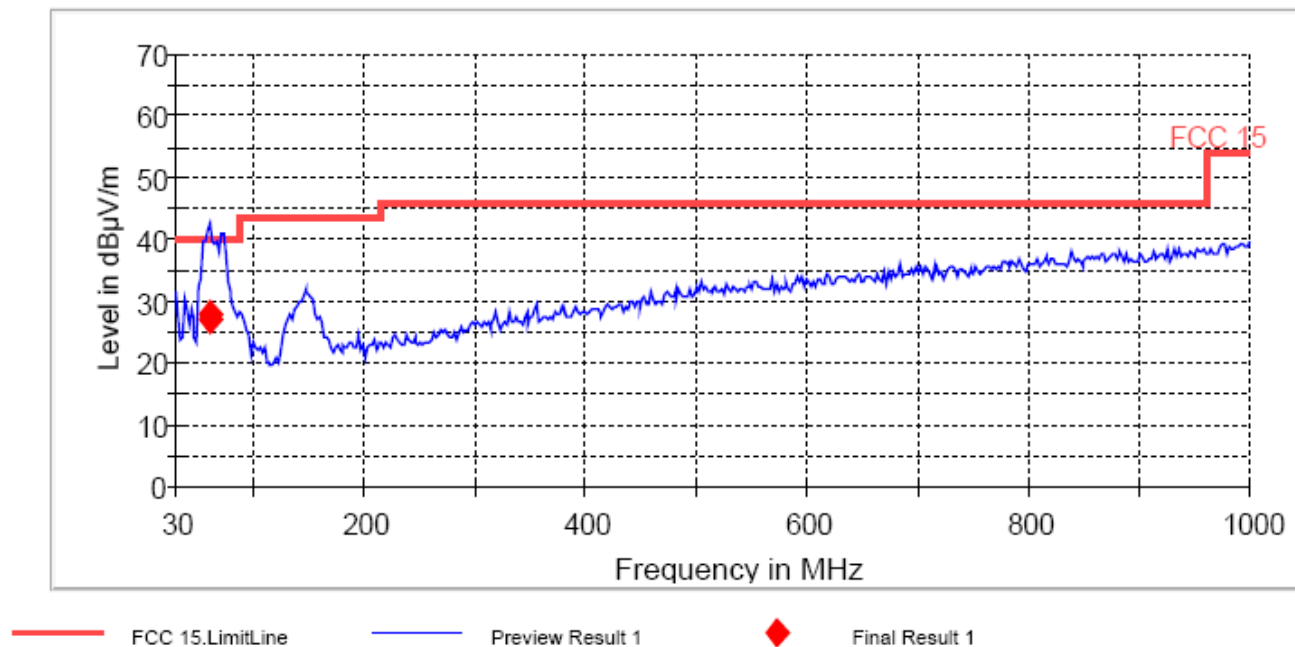
Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
60.150301	27.2	20.000	120.000	120.0	V	22.0	7.9	12.8	40.0
60.531062	27.7	20.000	120.000	140.0	V	1.0	8.0	12.3	40.0

(continuation of the "Final Result 1" table from column 10 ...)

Frequency (MHz)	Comment
60.150301	
60.531062	

FCC 15 30-1000MHz





PLOT 5.3.2 B

1-18GHz

Plot contains results of both horizontal and vertical polarizations

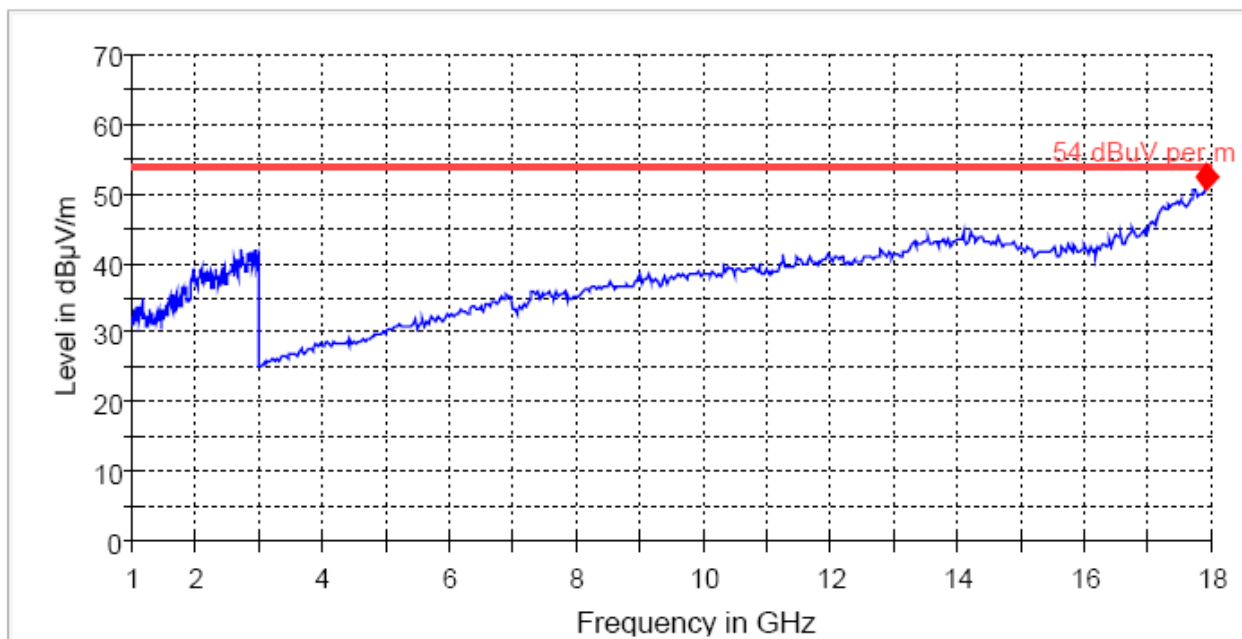
Final Result 1

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
17943.416834	52.6	20.000	1000.000	140.0	V	179.0	29.5	1.4	54.0

(continuation of the "Final Result 1" table from column 10 ...)

Frequency (MHz)	Comment
17943.416834	

FCC 15 1-18GHz



— 54 dBµV per m.LimitLine — Preview Result 1 ◆ Final Result 1



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	1.2	1.3	0.9

6.1.3 RESULTS: $\pi / 4$ DQPSK

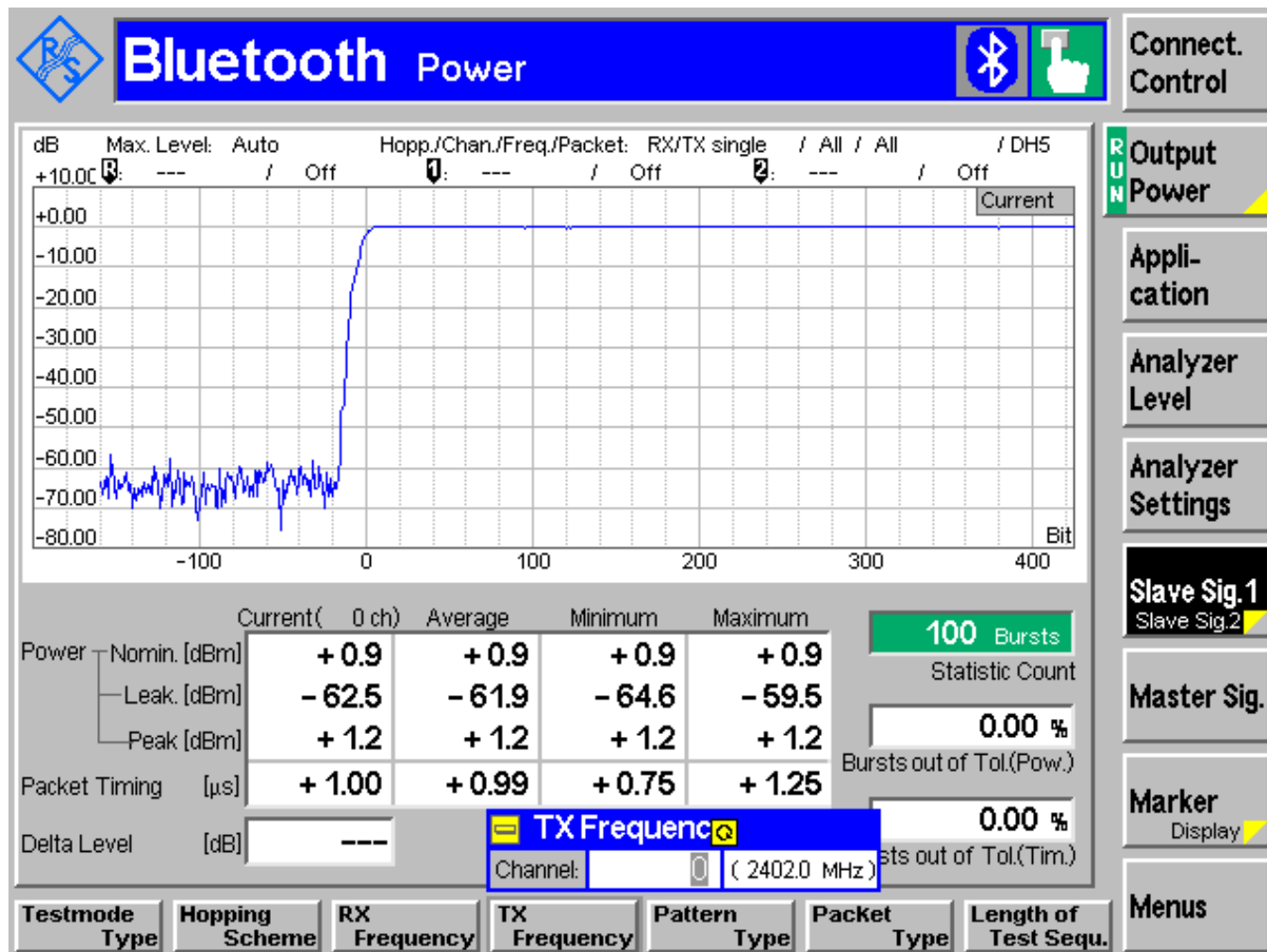
TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)		
Frequency (MHz)		2402 MHz	2441 MHz	2480 MHz
T _{nom} (23)°C	V _{nom} VDC	-0.7	-0.7	-1.0

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	-0.5	-0.5	-0.8



PLOT 6.1A





PLOT 6.1B

Bluetooth Power
📶
👆

dB Max. Level: Auto Hopp./Chan./Freq./Packet: RX/TX single / All / All / DH5
 +10.00 --- / Off 0: --- / Off 2: --- / Off Current

Bit

	Current (39 ch)	Average	Minimum	Maximum
Power Nomin. [dBm]	+ 0.9	+ 0.9	+ 0.8	+ 0.9
Leak. [dBm]	- 62.5	- 62.7	- 65.5	- 60.5
Peak [dBm]	+ 1.2	+ 1.2	+ 1.2	+ 1.3
Packet Timing [µs]	+ 1.00	+ 1.01	+ 0.75	+ 1.25
Delta Level [dB]	---			

100 Bursts

Statistic Count

0.00 %

Bursts out of Tol.(Pow.)

0.00 %

Bursts out of Tol.(Tim.)

TX Frequency
 Channel: 39 (2441.0 MHz)

Testmode Type
Hopping Scheme
RX Frequency
TX Frequency
Pattern Type
Packet Type
Length of Test Sequ.

Connect. Control

Output Power

Application

Analyzer Level

Analyzer Settings

Slave Sig. 1

Slave Sig. 2

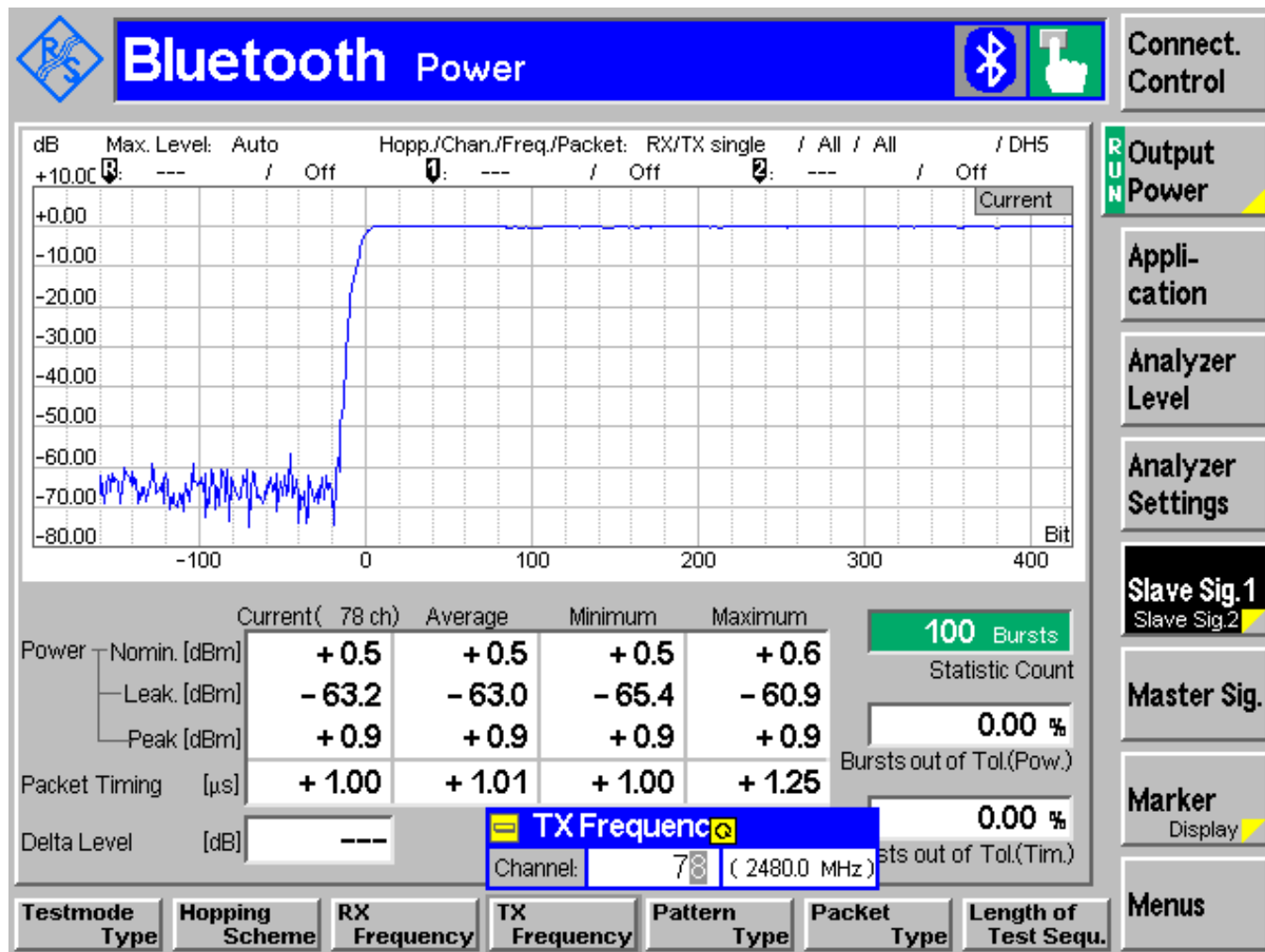
Master Sig.

Marker Display

Menus

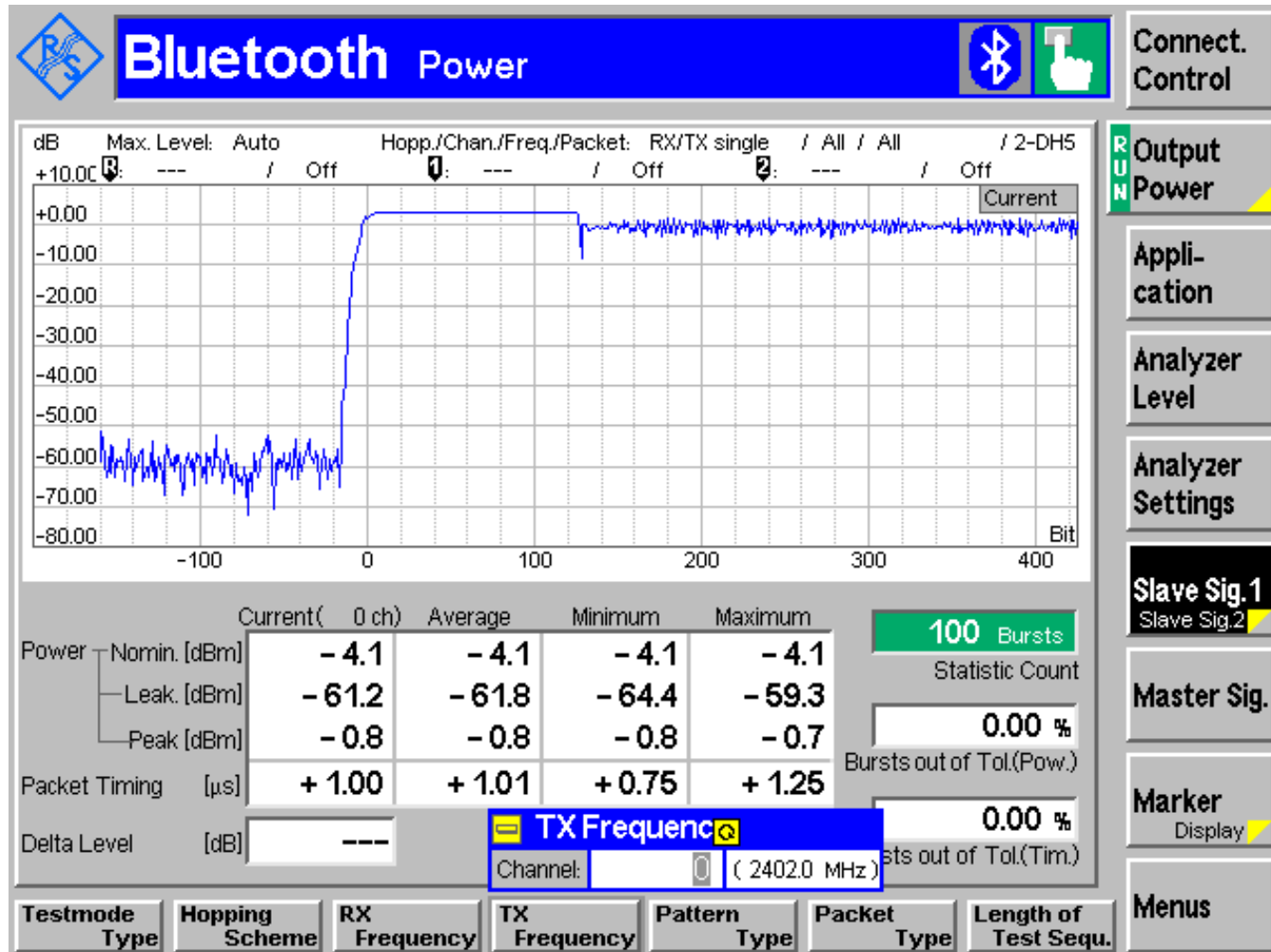


PLOT 6.1C



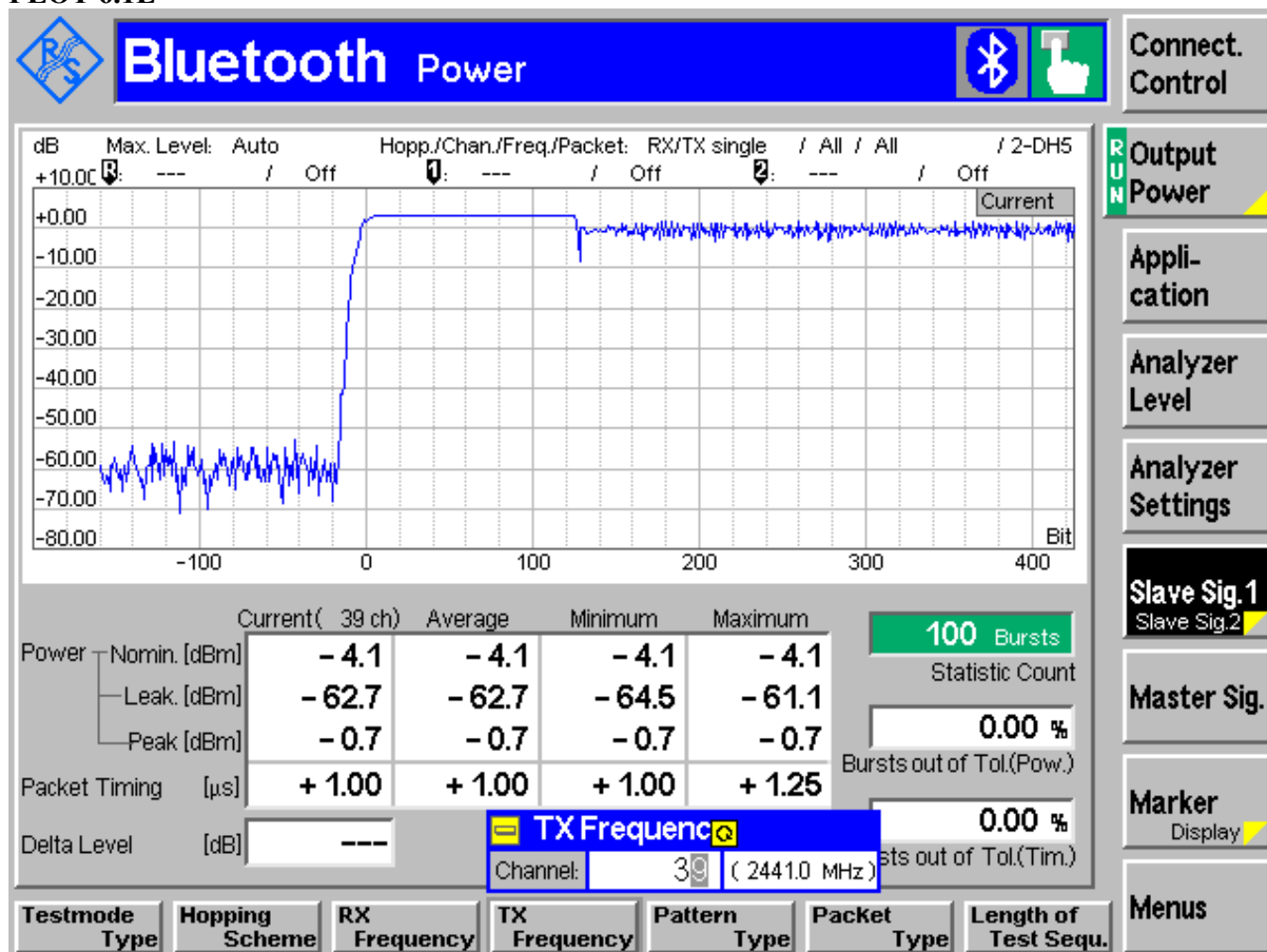


PLOT 6.1D



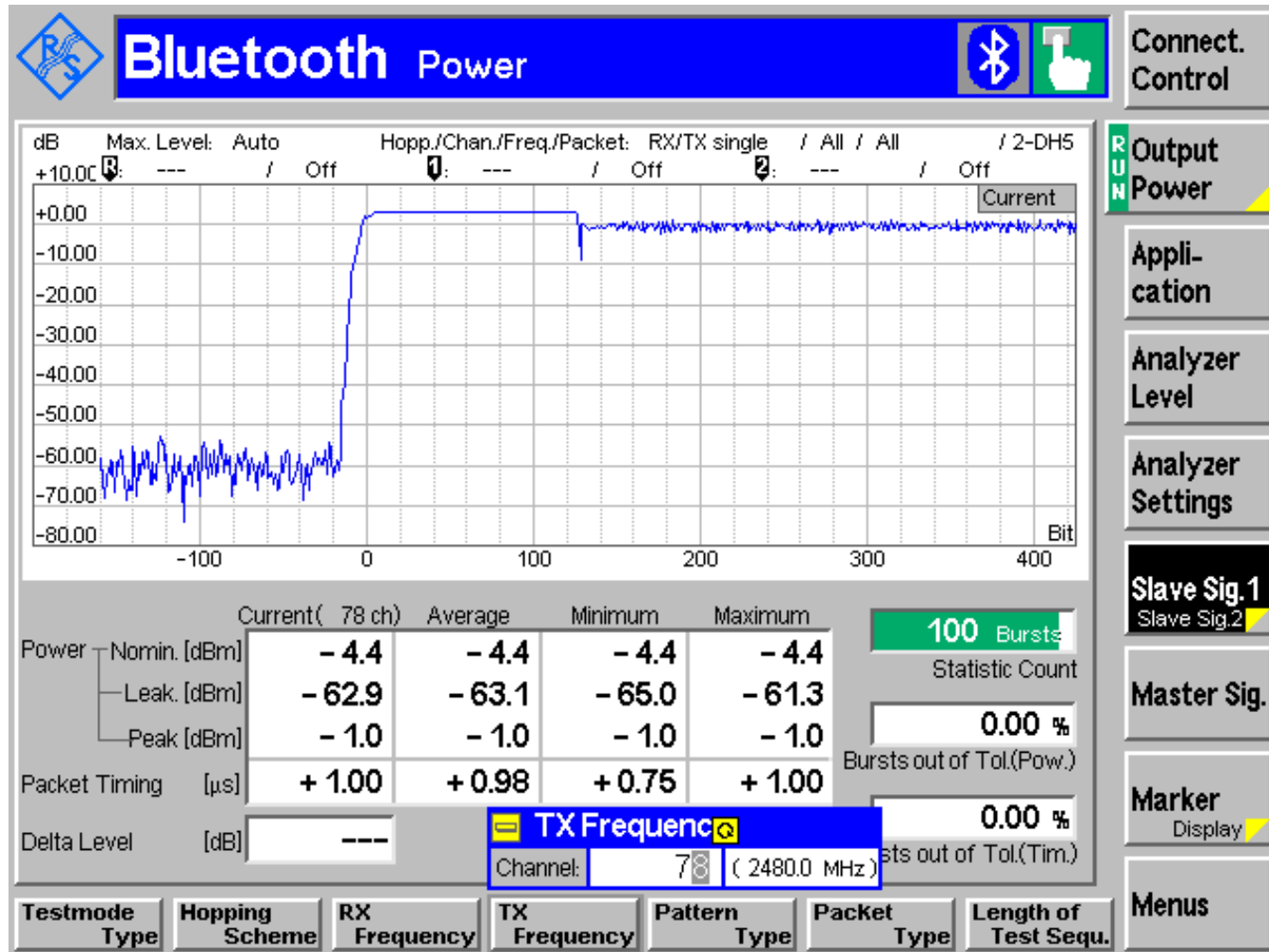


PLOT 6.1E



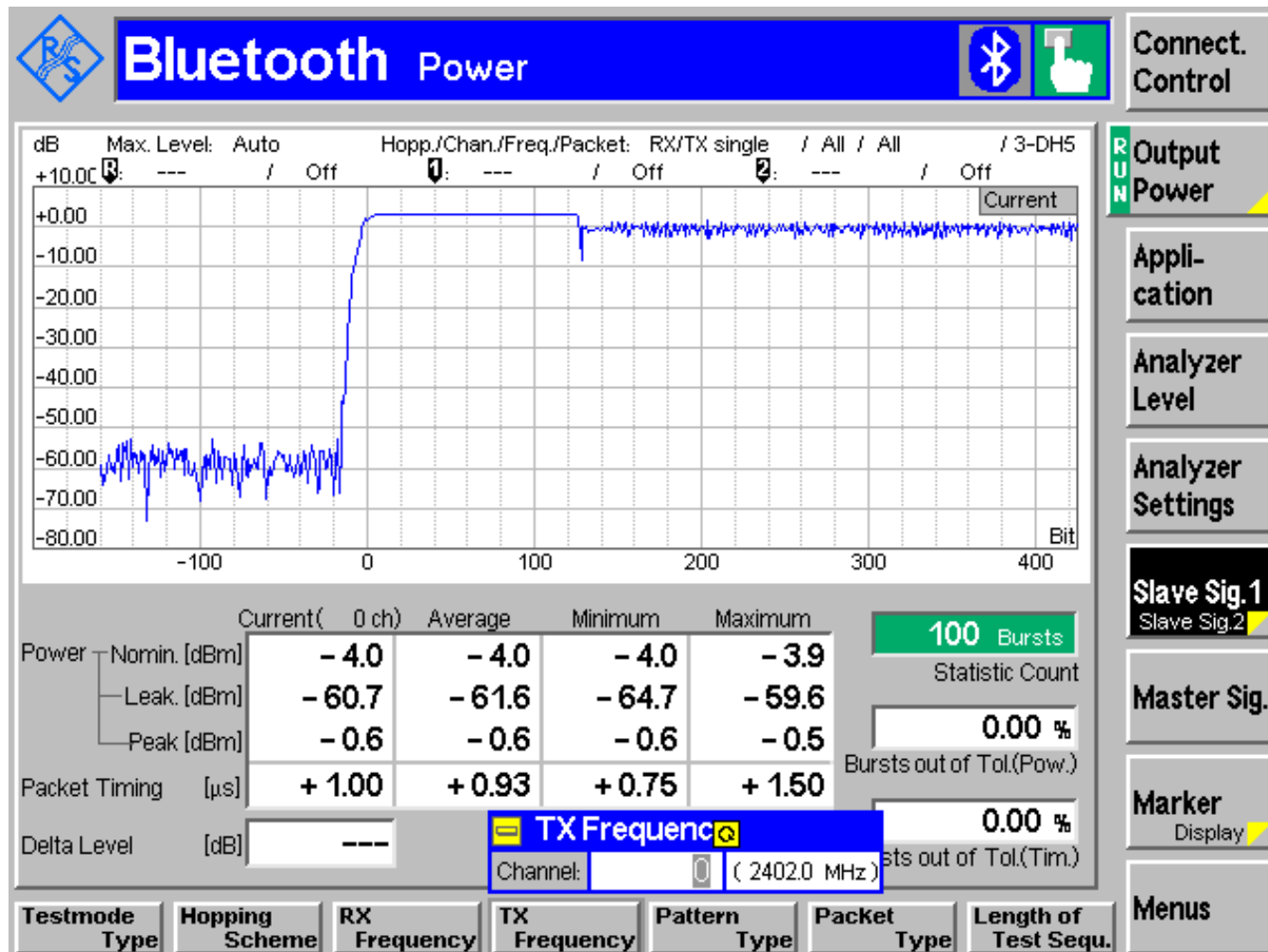


PLOT 6.1F





PLOT 6.1G





PLOT 6.1H

Bluetooth Power

dB Max. Level: Auto Hopp./Chan./Freq./Packet: RX/TX single / All / All / 3-DH5
 +10.00 --- / Off 0: --- / Off 2: --- / Off

Current

	Current (39 ch)	Average	Minimum	Maximum
Power Nomin. [dBm]	-3.9	-3.9	-4.0	-3.9
Leak. [dBm]	-65.0	-62.6	-65.0	-60.7
Peak [dBm]	-0.6	-0.6	-0.6	-0.5
Packet Timing [µs]	+1.00	+1.00	+0.75	+1.25
Delta Level [dB]	---			

100 Bursts

 Statistic Count
 0.00 %
 Bursts out of Tol.(Pow.)
 0.00 %
 Bursts out of Tol.(Tim.)

TX Frequency

Channel: 39 (2441.0 MHz)

Testmode Type

Hopping Scheme

RX Frequency

TX Frequency

Pattern Type

Packet Type

Length of Test Sequ.

Connect. Control

Output Power

Application

Analyzer Level

Analyzer Settings

Slave Sig. 1

Slave Sig. 2

Master Sig.

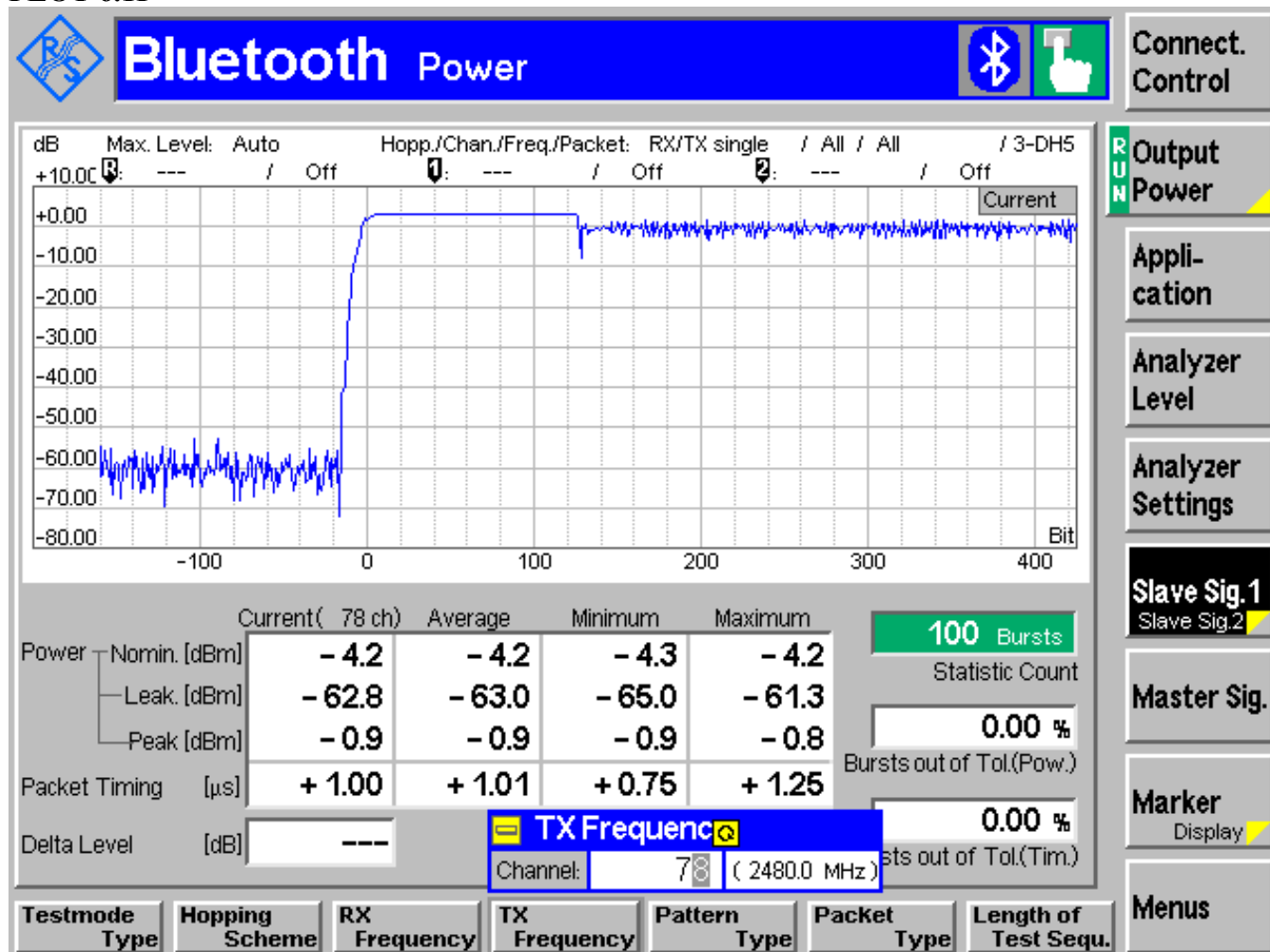
Marker

Display

Menus



PLOT 6.11





6.2 EIRP

6.2.1 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.

6.2.2 Test Results

EIRP = Conducted Peak Power + Antenna Gain (-4.5 dBi)

Conducted

EIRP: GFSK

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)		
Frequency (MHz)		2402	2441	2480
T _{nom} (23)°C	V _{nom} VDC	-3.3	-3.2	-3.6
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	-5.2	-5.2	-5.5
Measurement uncertainty		±0.5dBm		

EIRP: 8DPSK

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)		
Frequency (MHz)		2402	2441	2480
T _{nom} (23)°C	V _{nom} VDC	-5	-5	-5.3
Measurement uncertainty		±0.5dBm		



6.3 20dB BANDWIDTH

6.3.1 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.

6.3.2 RESULTS:

GFSK

Channel No.	Frequency (MHz)	20dB BW (kHz)	Result (Fail/Pass)
0	2402	855.769	PASS
39	2441	865.385	PASS
78	2480	862.18	PASS

Pi/4 DQPSK

Channel No.	Frequency (MHz)	20dB BW (MHz)	Result (Fail/Pass)
0	2402	1.141	PASS
39	2441	1.141	PASS
78	2480	1.138	PASS

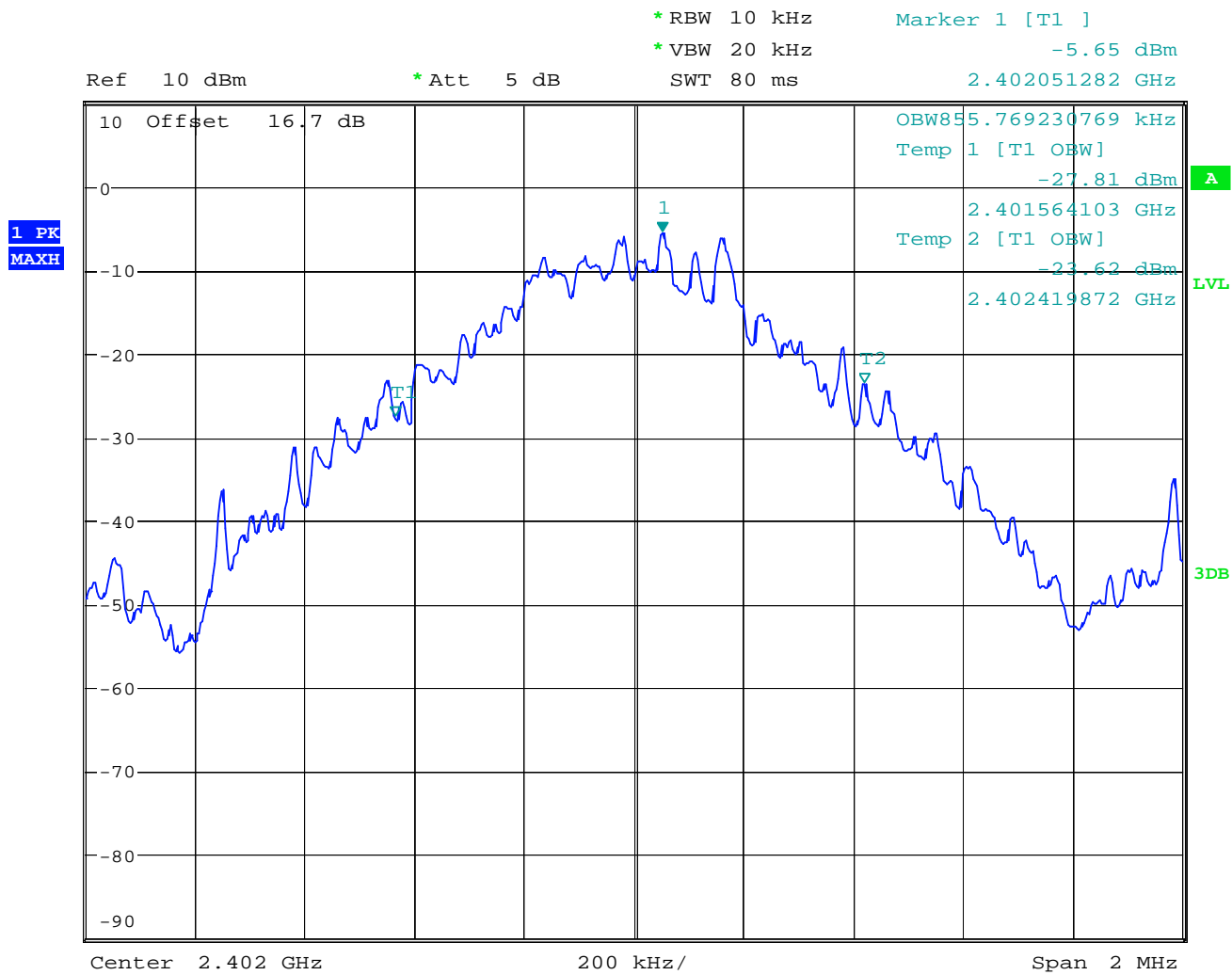
8DPSK

Channel No.	Frequency (MHz)	20dB BW (kHz)	Result (Fail/Pass)
0	2402	1.125	PASS
39	2441	1.138	PASS
78	2480	1.141	PASS



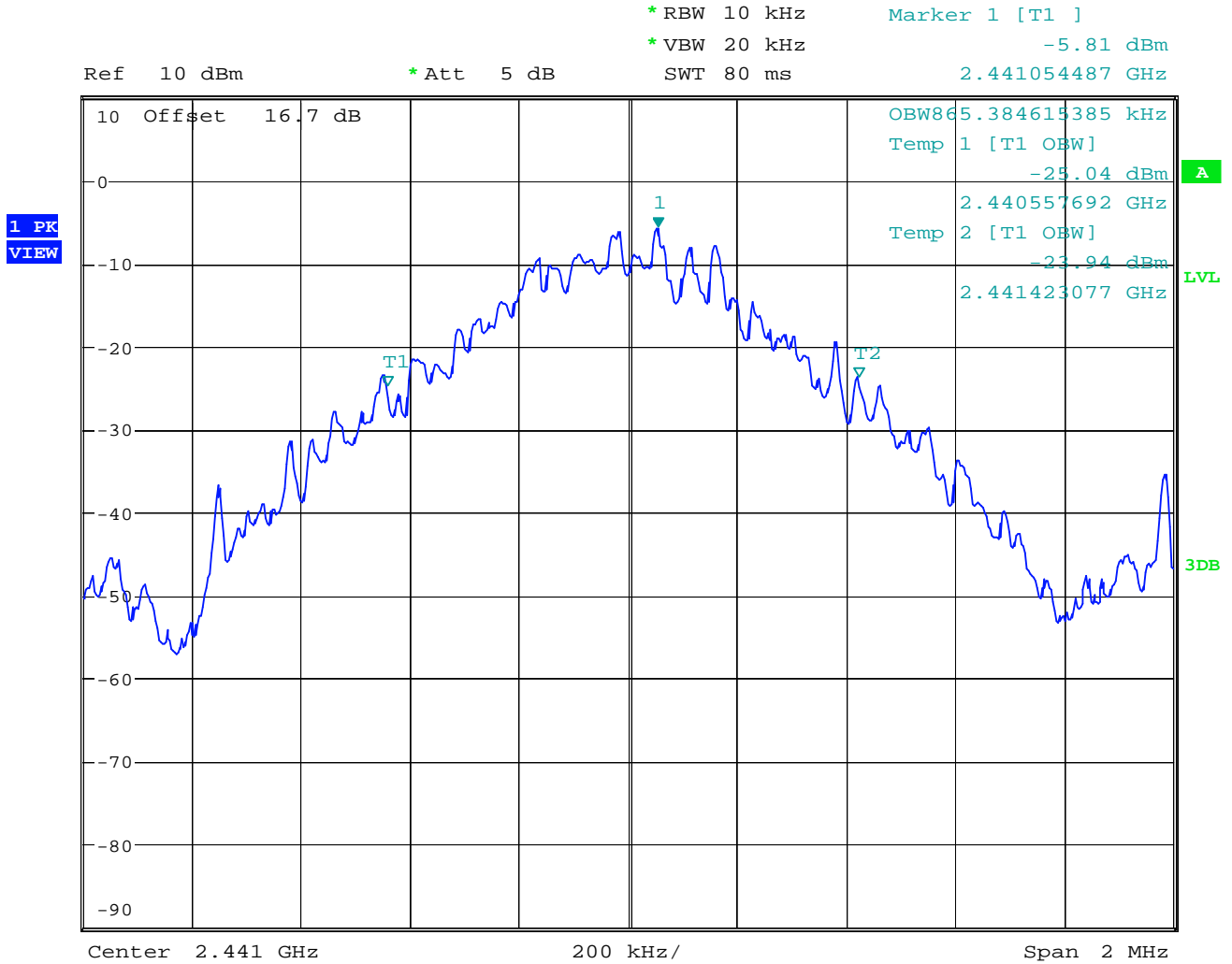
PLOT 6.3.2 A

(2402 MHz) GFSK



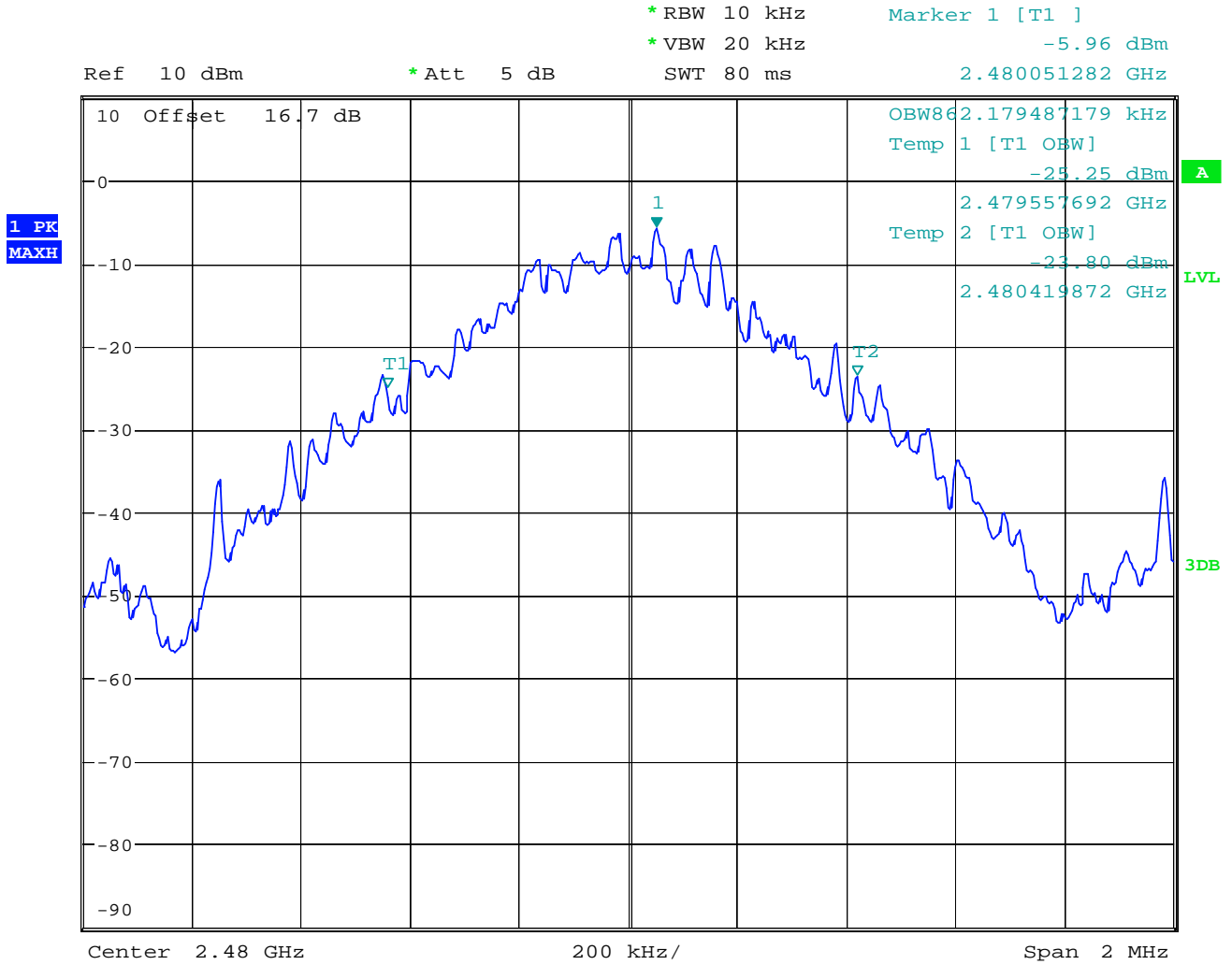


PLOT 6.3.2 B
(2441 MHz) GFSK



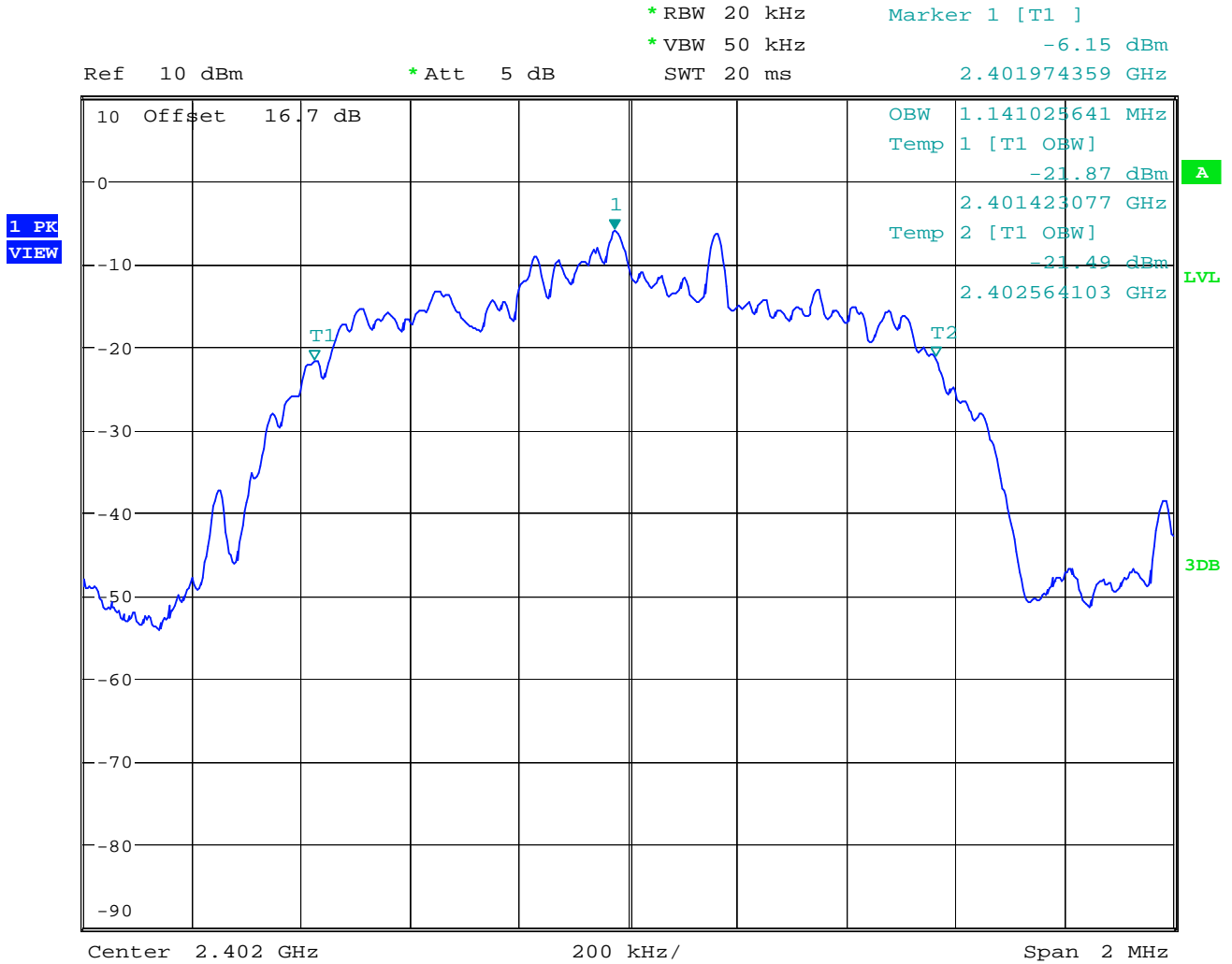


PLOT 6.3.2 C
(2480 MHz) GFSK





PLOT 6.3.2 D
(2402 MHz) $\pi / 4$ DQPSK



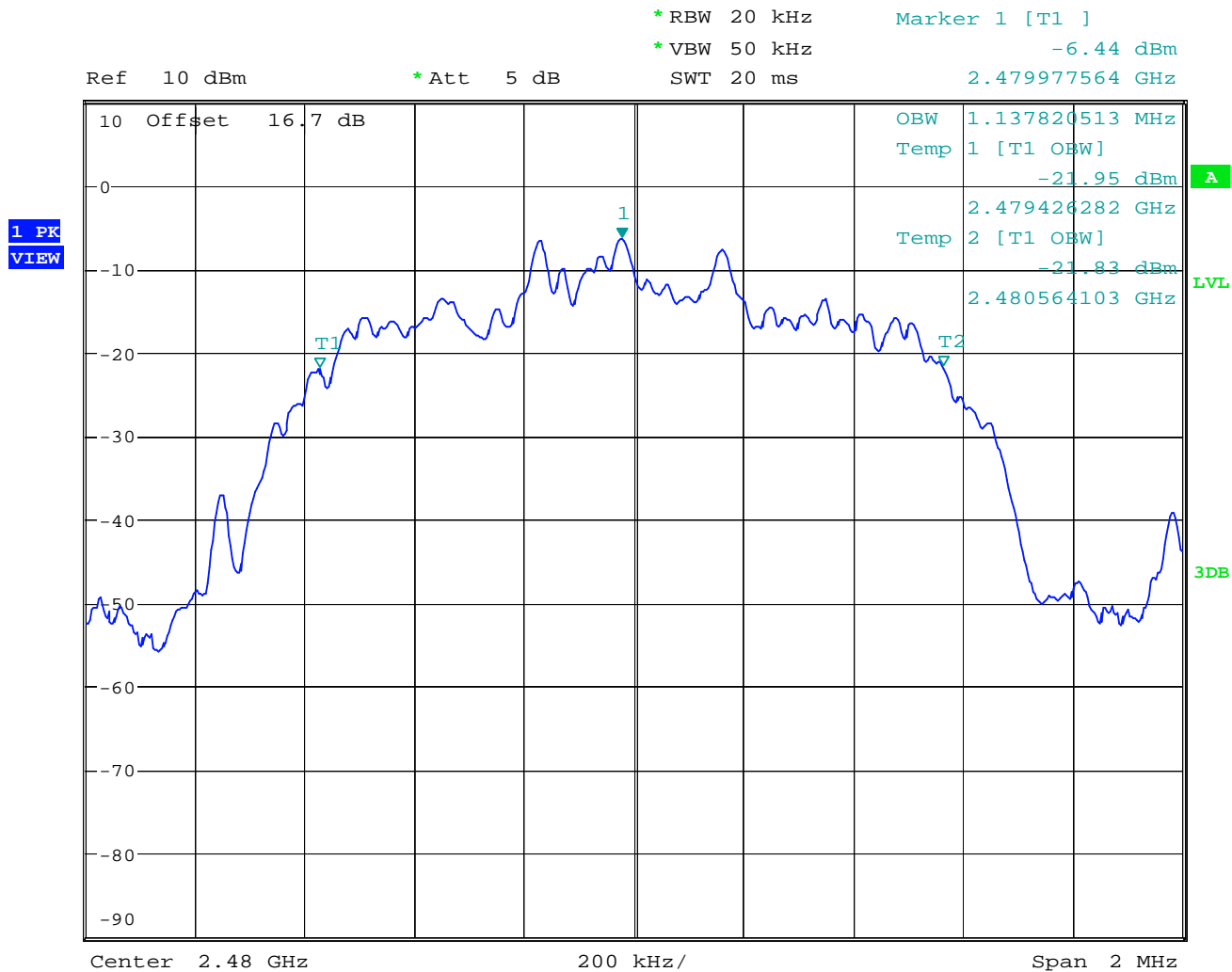


PLOT 6.3.2 E
(2441 MHz) $\pi / 4$ DQPSK



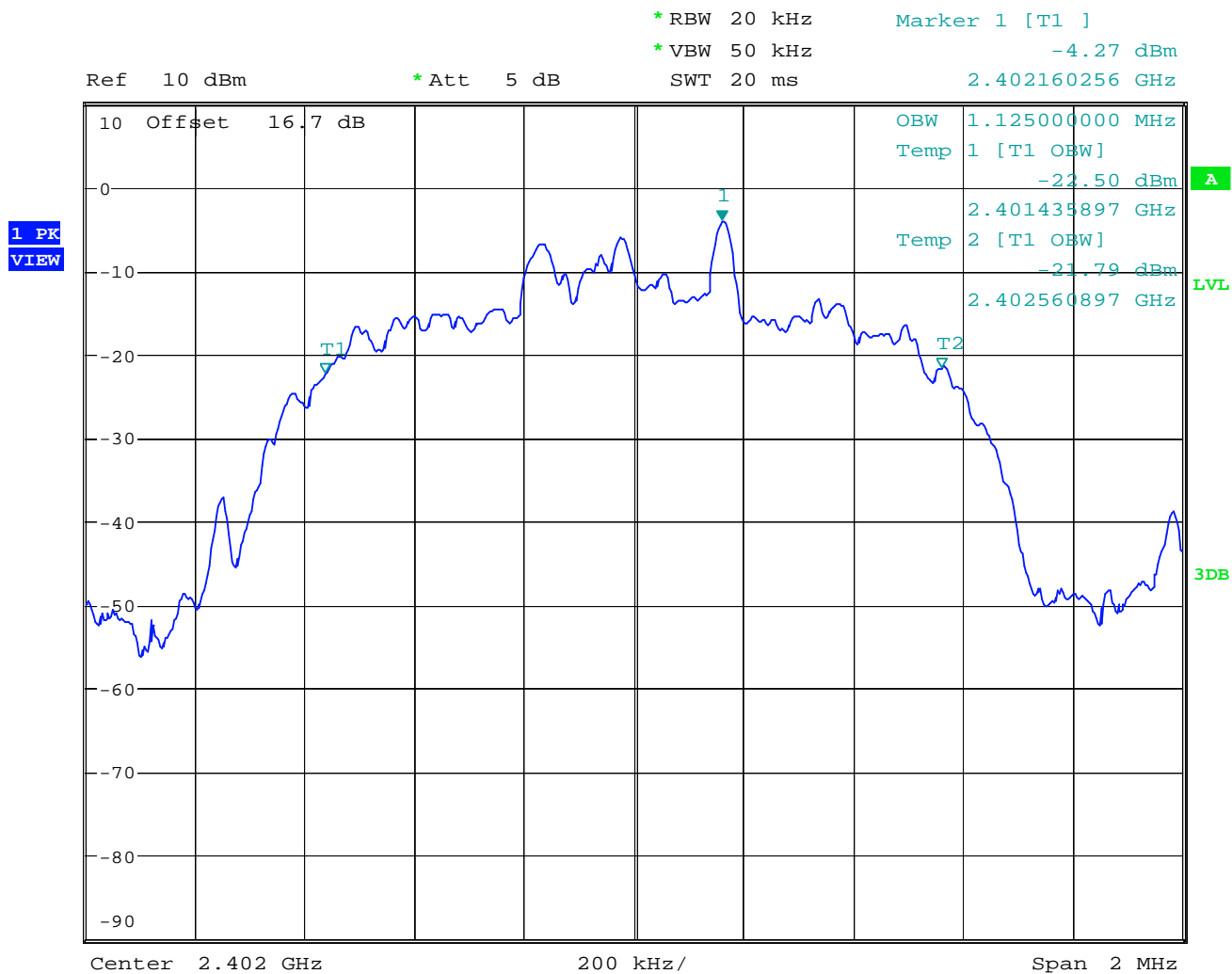


PLOT 6.3.2 F
(2480 MHz) $\pi / 4$ DQPSK



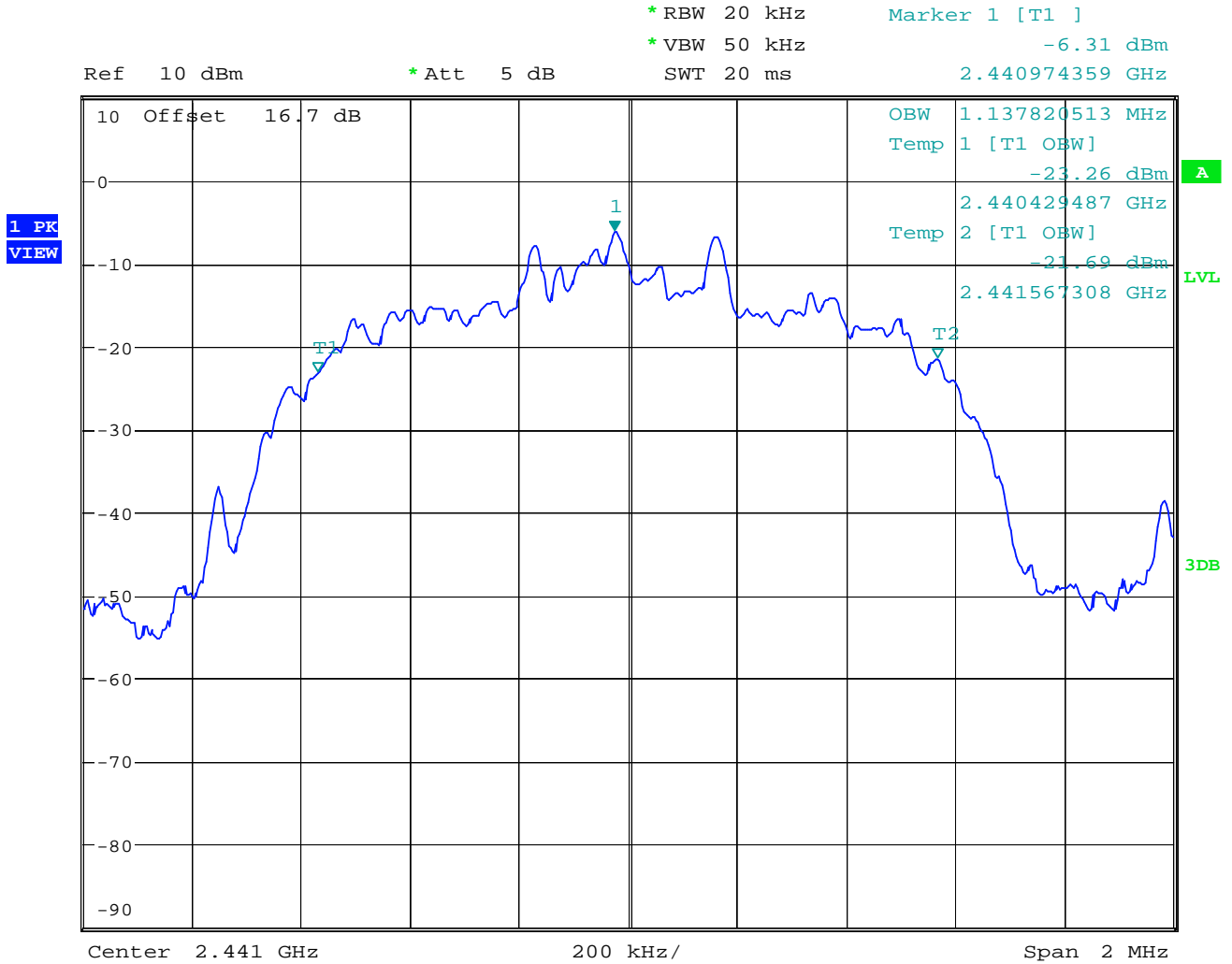


PLOT 6.3.2 G
(2402 MHz) 8DPSK



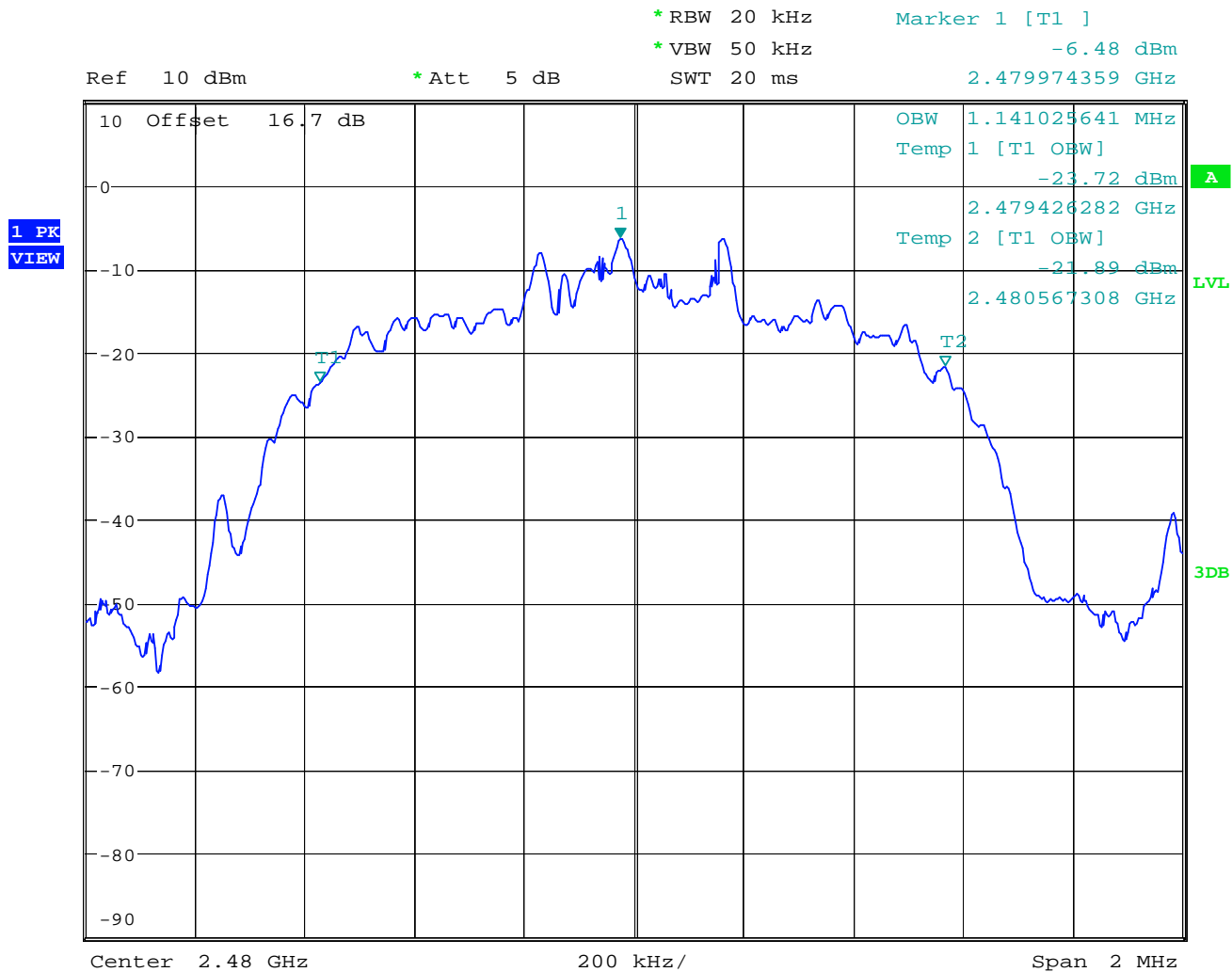


PLOT 6.3.2 H
(2441 MHz) 8DPSK





PLOT 6.3.2 I
(2480 MHz) 8DPSK





6.4 CARRIER FREQUENCY SEPARATION

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

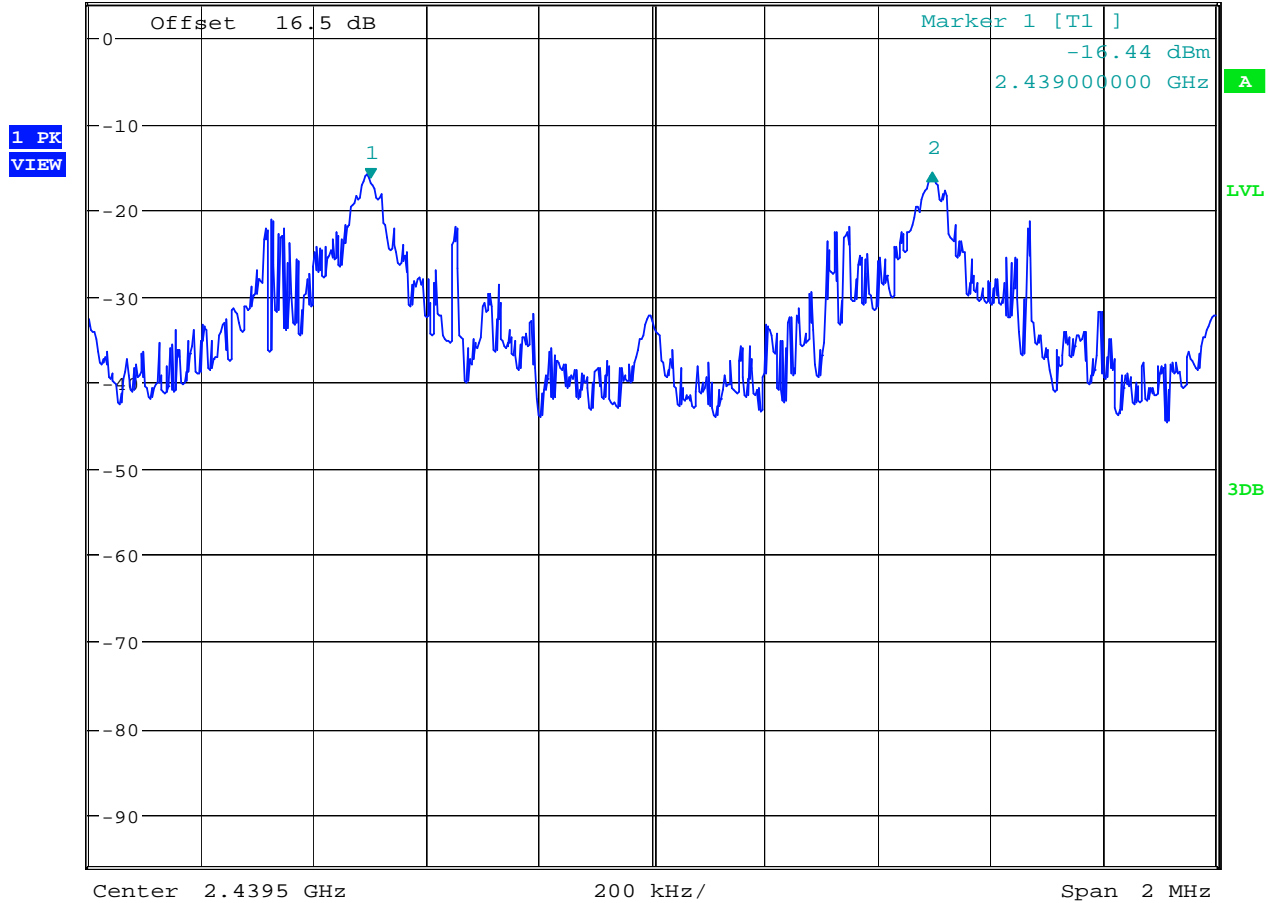
SEPARATION
> 25 KHz or > 20 dB BANDWIDTH

6.4.2 RESULTS:

TEST CONDITIONS		SEPARATION(MHz)
T_{nom}(23)°C	V_{nom}VDC	0.99679



Ref 4 dBm Att 15 dB *RBW 20 kHz Delta 2 [T1] 0.50 dB
 *VBW 50 kHz 996.794871796 kHz
 SWT 20 ms





6.5 NUMBER OF HOPPING CHANNELS

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

NUMBER OF CHANNELS
> 15

6.5.2 RESULTS:

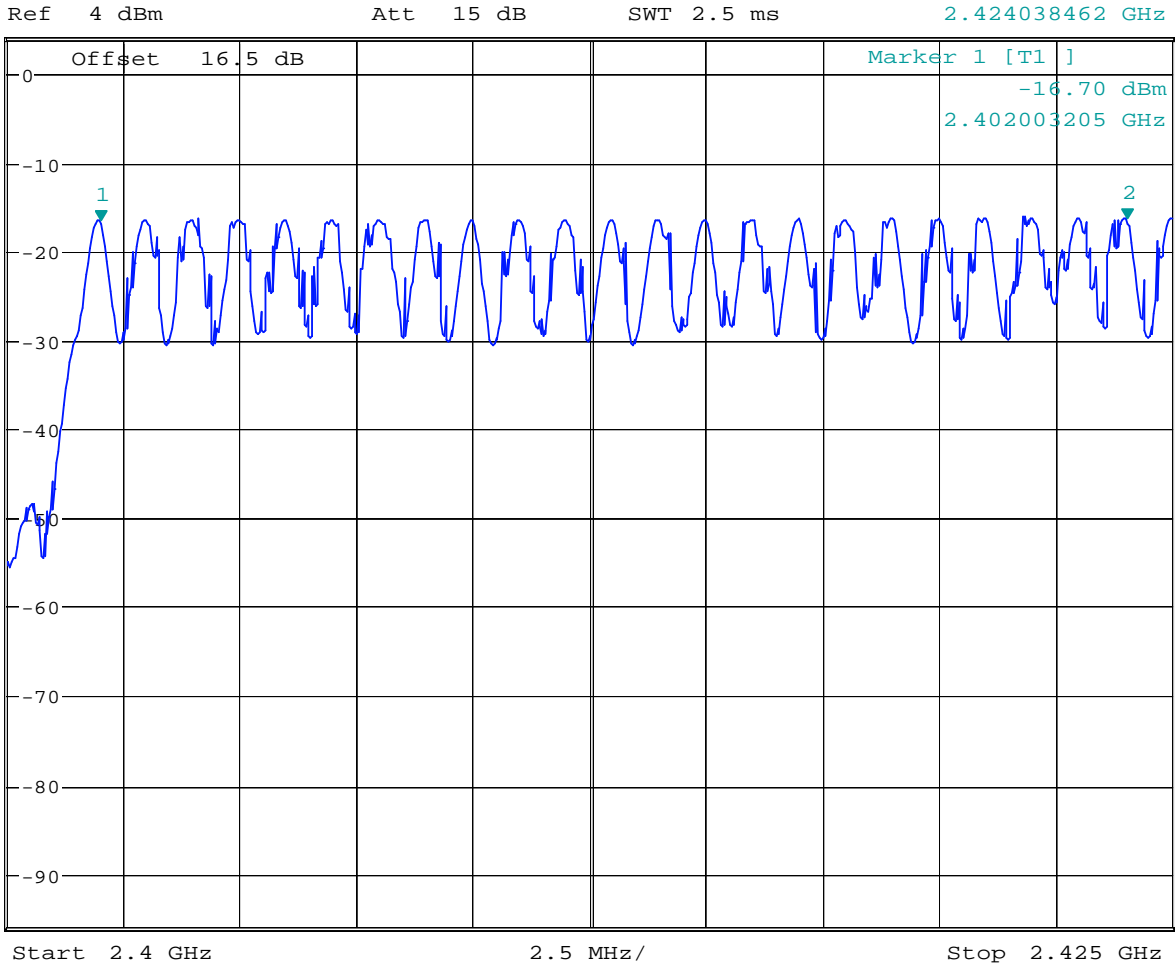
TEST CONDITIONS		NUMBER OF CHANNELS
T_{nom}(23)°C	V_{nom}VDC	79



PLOT 6.5.1A



*RBW 300 kHz Marker 2 [T1]
*VBW 300 kHz -16.50 dBm
SWT 2.5 ms 2.424038462 GHz





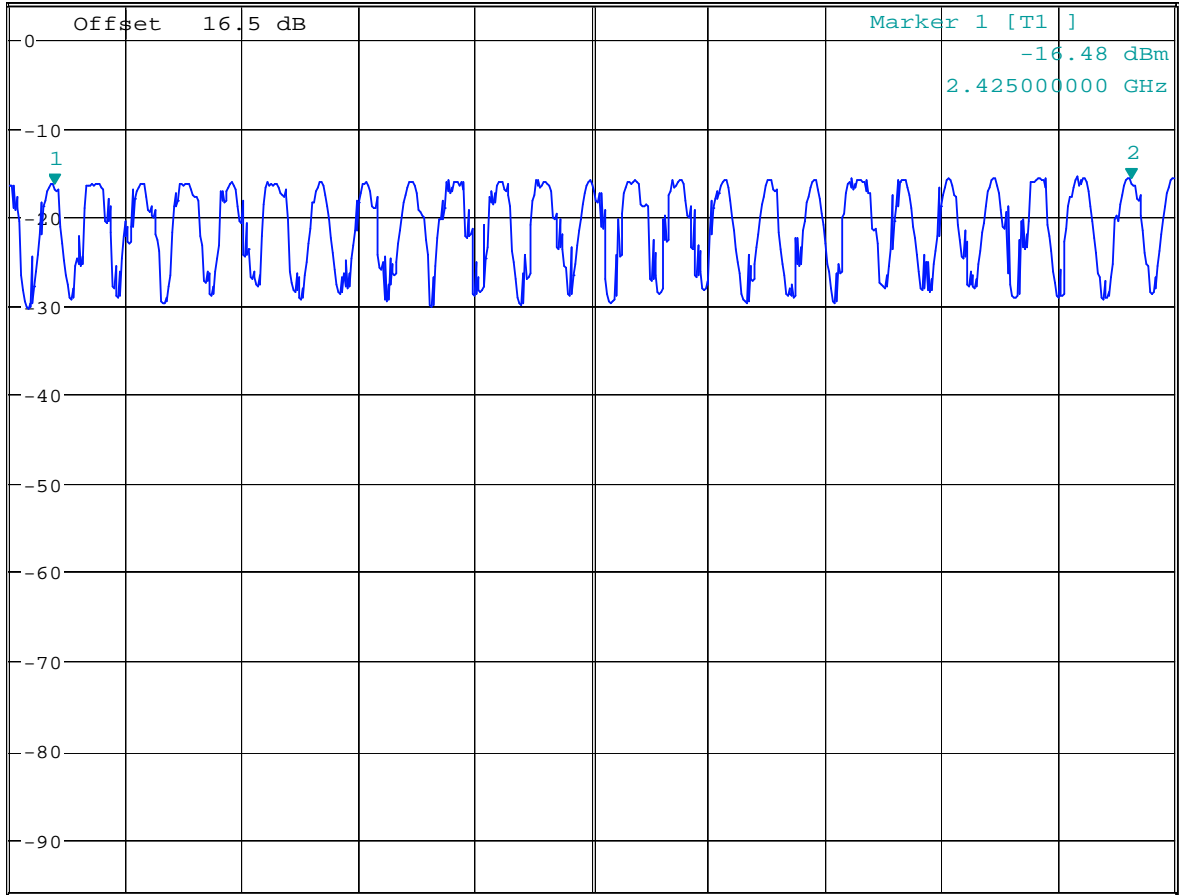
PLOT 6.5.2A



*RBW 300 kHz Marker 2 [T1]
*VBW 300 kHz -15.81 dBm
SWT 2.5 ms 2.449038462 GHz

Ref 4 dBm

Att 15 dB



Start 2.424 GHz

2.6 MHz/

Stop 2.45 GHz



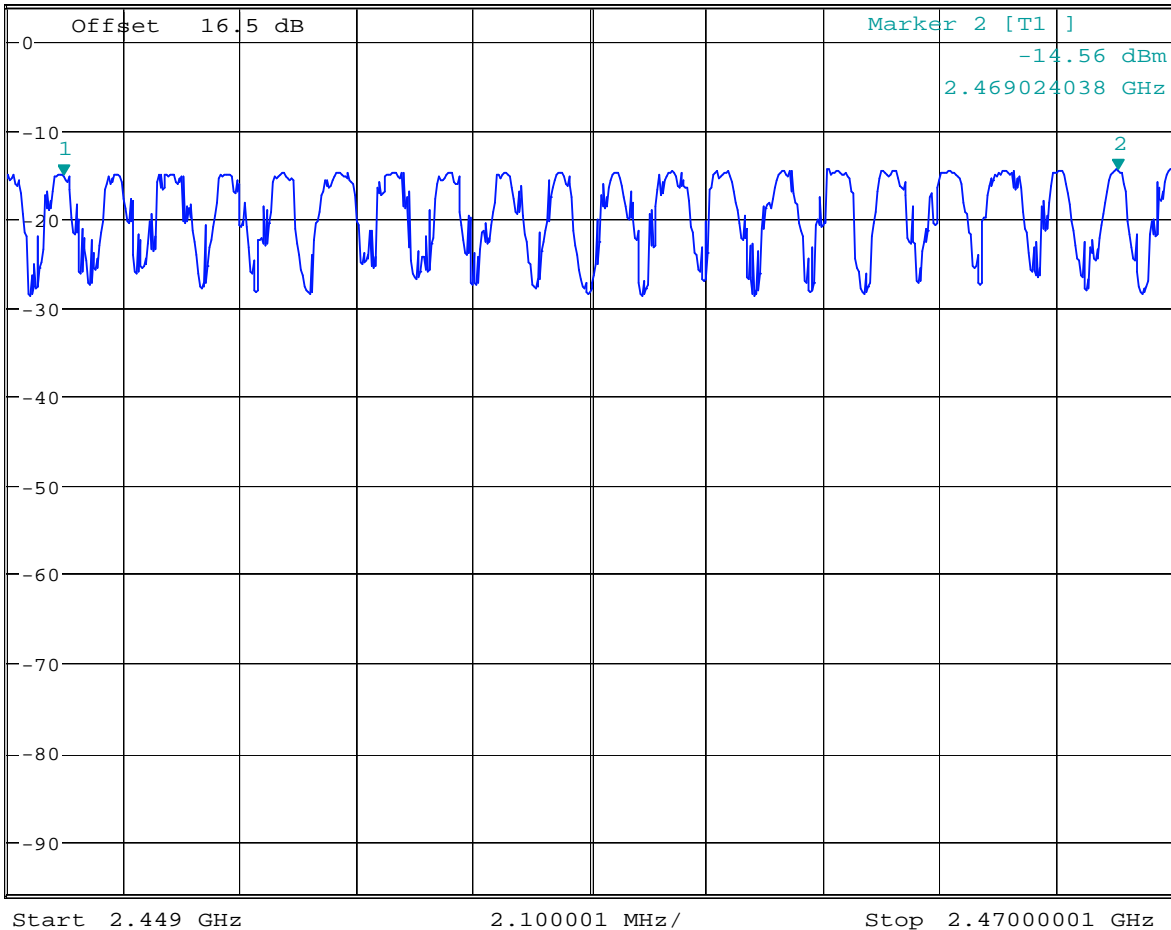
PLOT 6.5.3A



*RBW 300 kHz Marker 1 [T1]
*VBW 300 kHz -15.17 dBm
SWT 2.5 ms 2.450009616 GHz

Ref 4 dBm

Att 15 dB



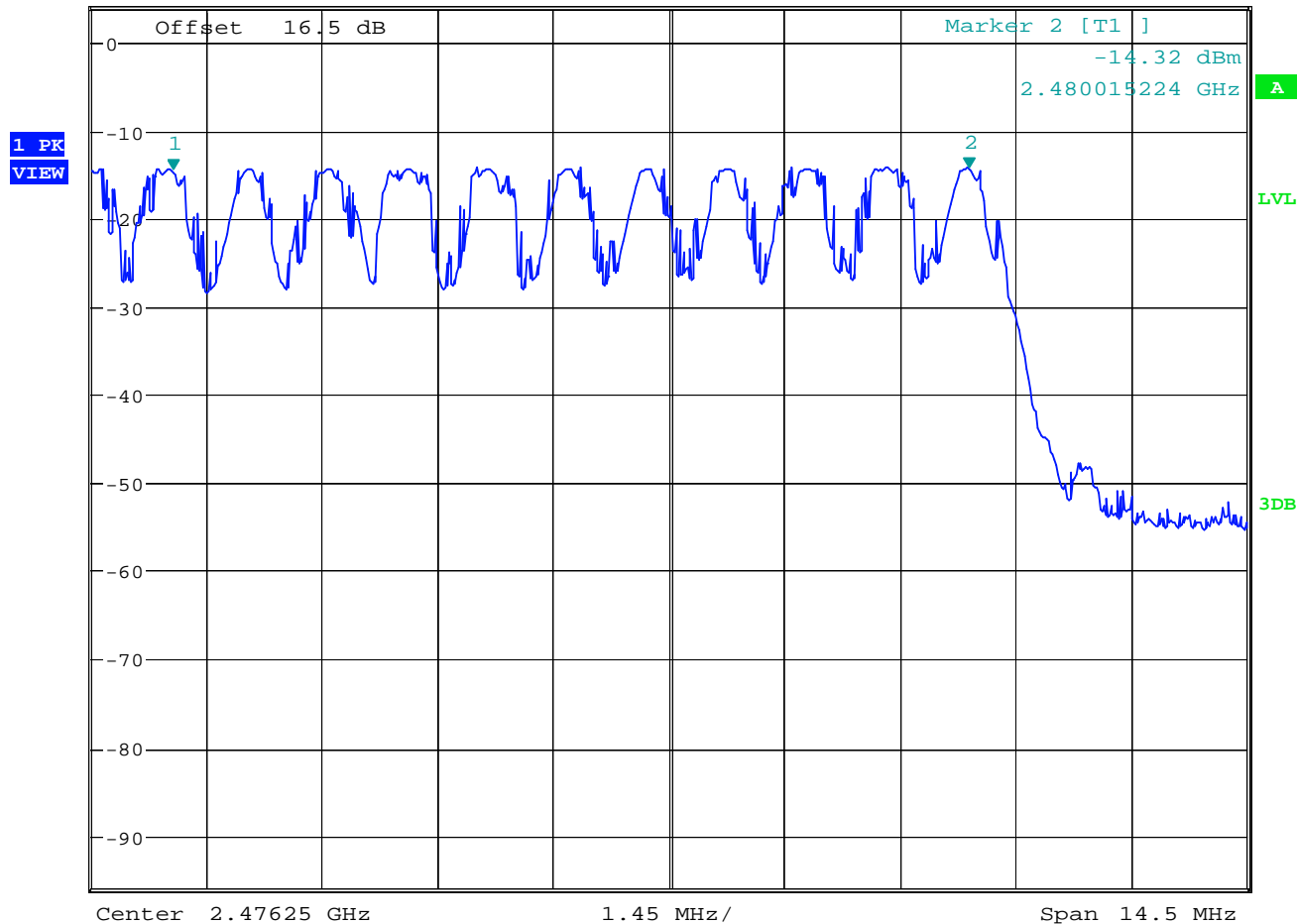


PLOT 6.5.4A



*RBW 300 kHz Marker 1 [T1]
*VBW 300 kHz -14.68 dBm

Ref 4 dBm Att 15 dB SWT 2.5 ms 2.470022436 GHz



Date: 7.JUL.2009 11:51:01



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:

$T_{nom}(23)^{\circ}C$	$V_{nom}VDC$
------------------------	--------------

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 CONDUCTED SPURIOUS EMISSION

6.7.1 LIMIT SUB CLAUSE § 15.247 (d)

FREQUENCY RANGE	limit
30MHz-25GHz	-20dBc

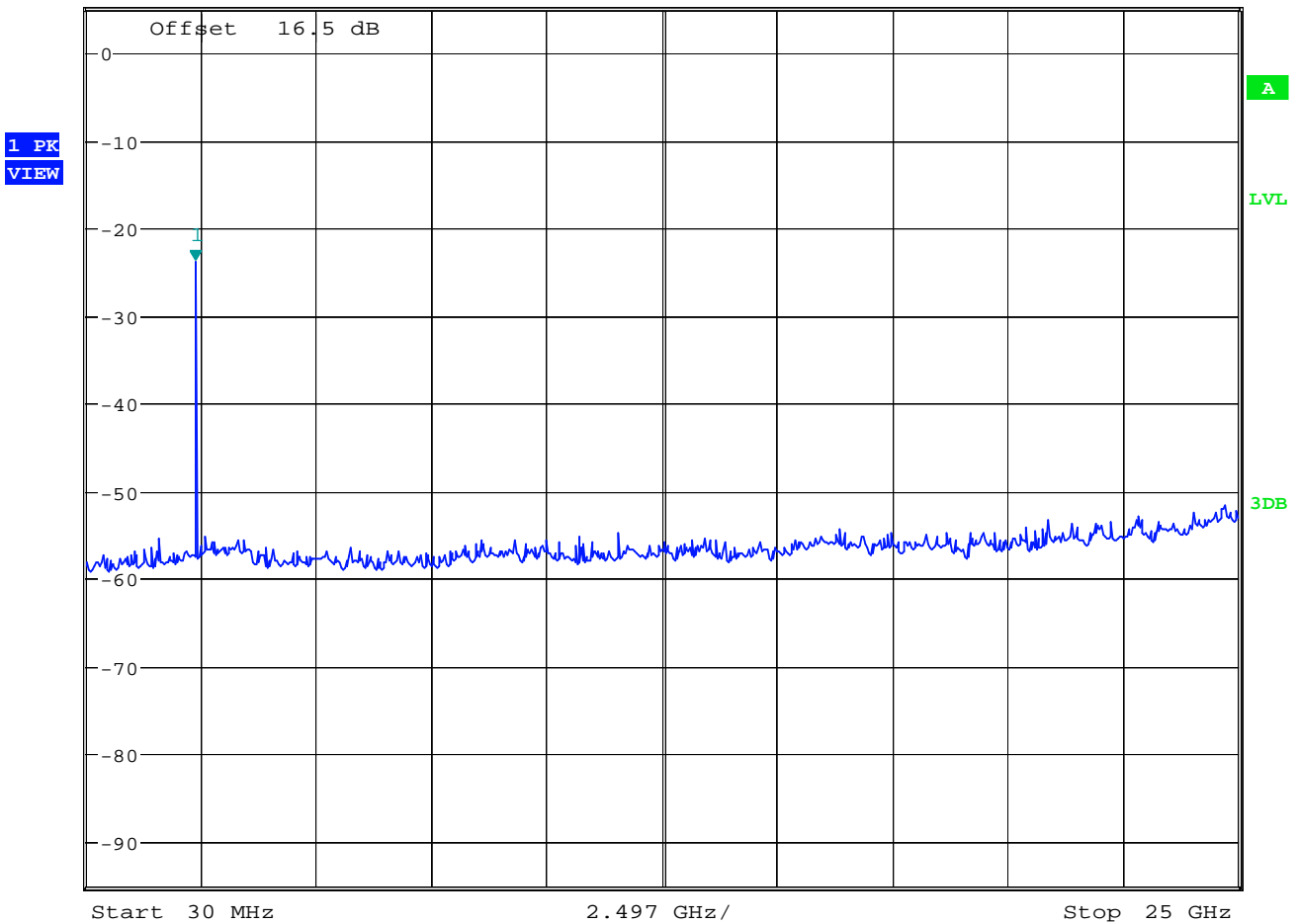
6.7.2 RESULTS: Tnom(23)°C VnomVDC

Plot shows worse case emission for all modulations on each channel.

PLOT 6.7.1A (2402MHz)



*RBW 100 kHz Marker 1 [T1]
 *VBW 300 kHz -23.86 dBm
 Ref 5 dBm Att 15 dB SWT 2.5 s 2.390945513 GHz





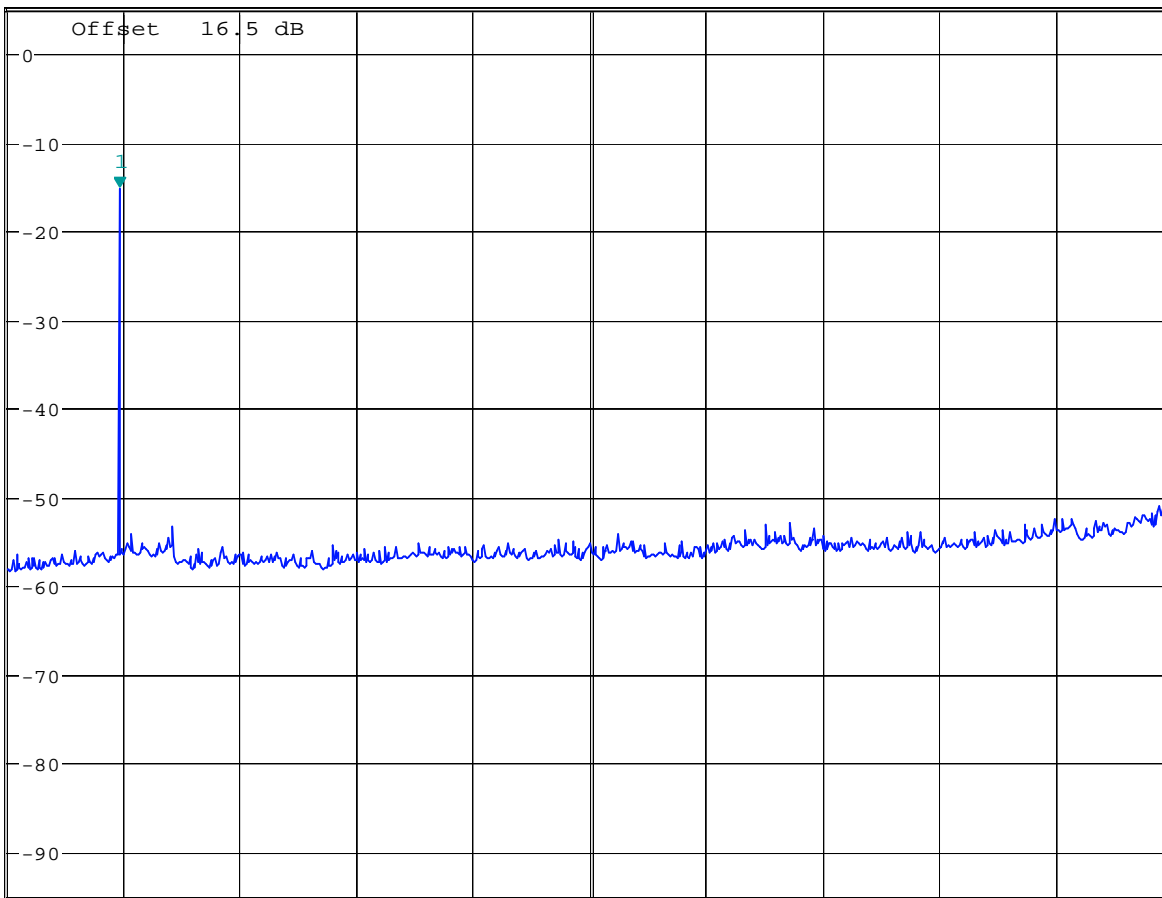
PLOT 6.7.1B
(2441MHz)



*RBW 100 kHz Marker 1 [T1]
*VBW 300 kHz -15.23 dBm
SWT 2.5 s 2.430961538 GHz

Ref 5 dBm

Att 15 dB



Start 30 MHz

2.497 GHz/

Stop 25 GHz



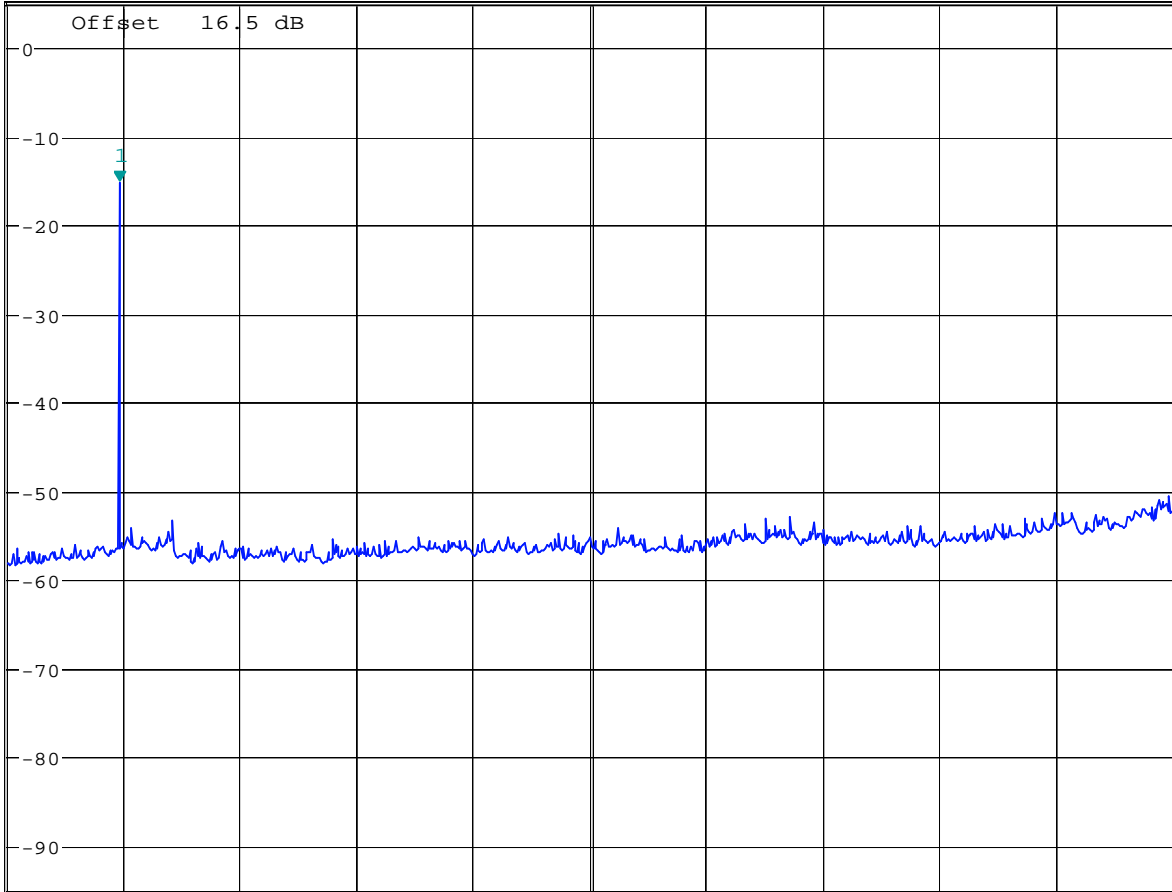
PLOT 6.7.1C
(2480MHz)



*RBW 100 kHz Marker 1 [T1]
*VBW 300 kHz -15.23 dBm
SWT 2.5 s 2.430961538 GHz

Ref 5 dBm

Att 15 dB



Start 30 MHz

2.497 GHz/

Stop 25 GHz

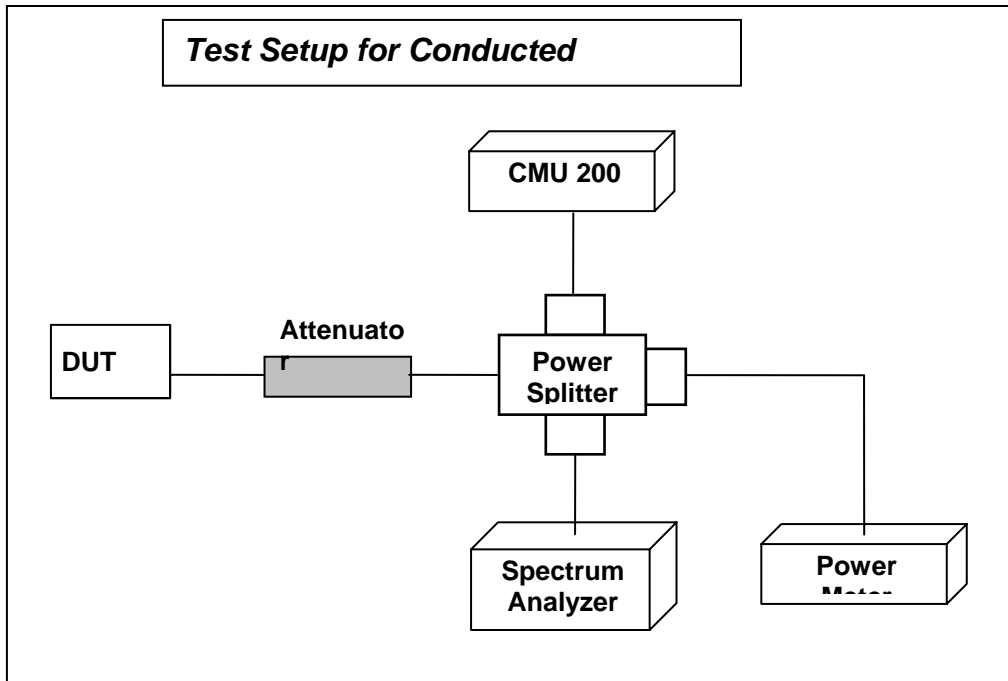


7 TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

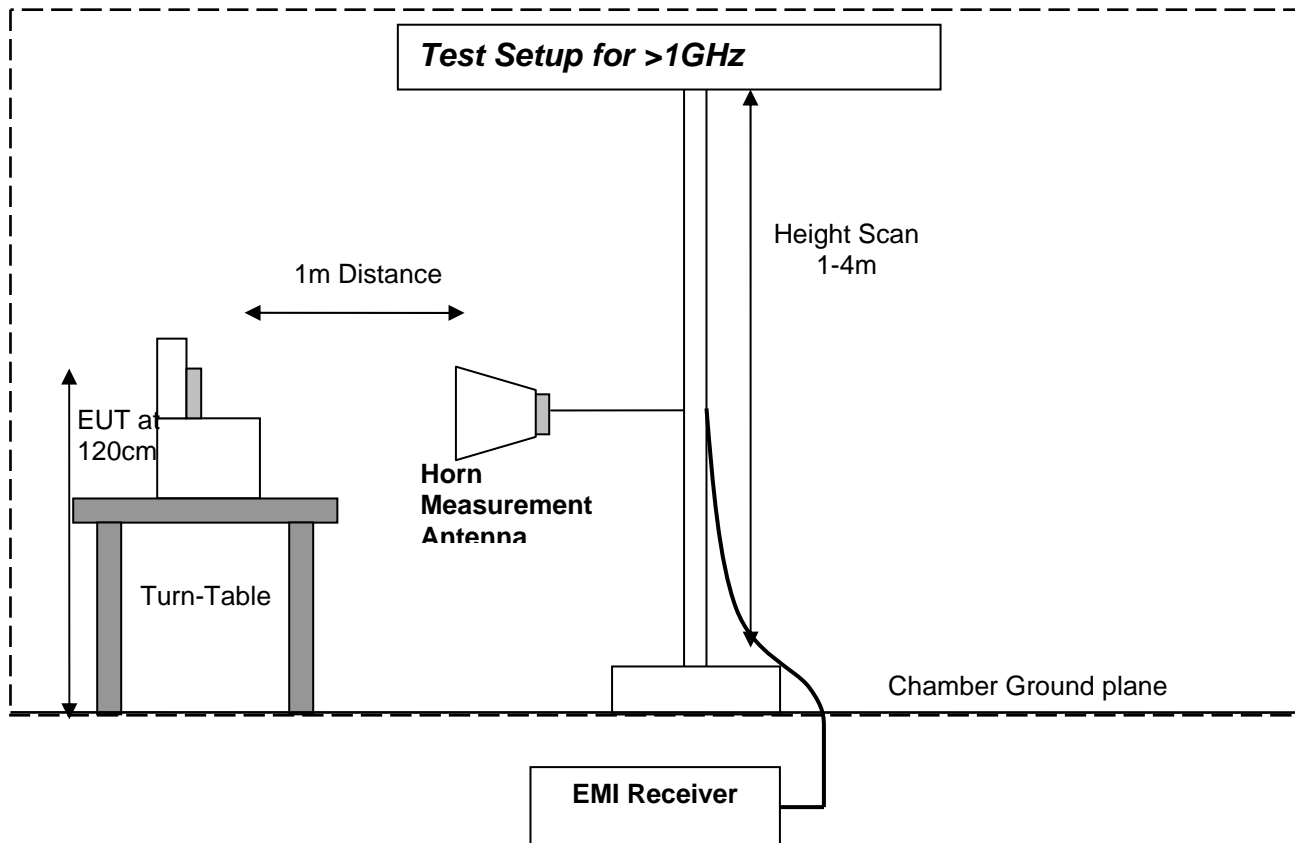
No	Instrument/Ancillary	Type	Manufacturer	Serial No.	Cal Due	Interval
01	Spectrum Analyzer	ESIB 40	Rohde & Schwarz	100107	May 2010	1 year
02	Spectrum Analyzer	FSEM 30	Rohde & Schwarz	100017	August 2010	1 year
03	Signal Generator	SMY02	Rohde & Schwarz	836878/011	May 2010	1 year
04	Power-Meter	NRVD	Rohde & Schwarz	0857.8008.02	May 2010	1 year
05	Biconilog Antenna	3141	EMCO	0005-1186	June 2010	1 year
06	Horn Antenna (1-18GHz)	SAS-200/571	AH Systems	325	June 2010	1 year
07	Horn Antenna (18-26.5GHz)	3160-09	EMCO	1240	June 2010	1 year
08	Power Splitter	11667B	Hewlett Packard	645348	n/a	n/a
09	Climatic Chamber	VT4004	Voltsch	G1115	May 2010	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 2010	1 year
13	Power Sensor	URV5-Z2	Rohde & Schwarz	DE30807	May 2010	1 year
14	Digital Radio Comm. Tester	CMD-55	Rohde & Schwarz	847958/008	May 2010	1 year
15	Universal Radio Comm. Tester	CMU 200	Rohde & Schwarz	832221/06	May 2010	1 year
16	LISN	ESH3-Z5	Rohde & Schwarz	836679/003	May 2010	1 year
17	Loop Antenna	6512	EMCO	00049838	July 2010	2 years

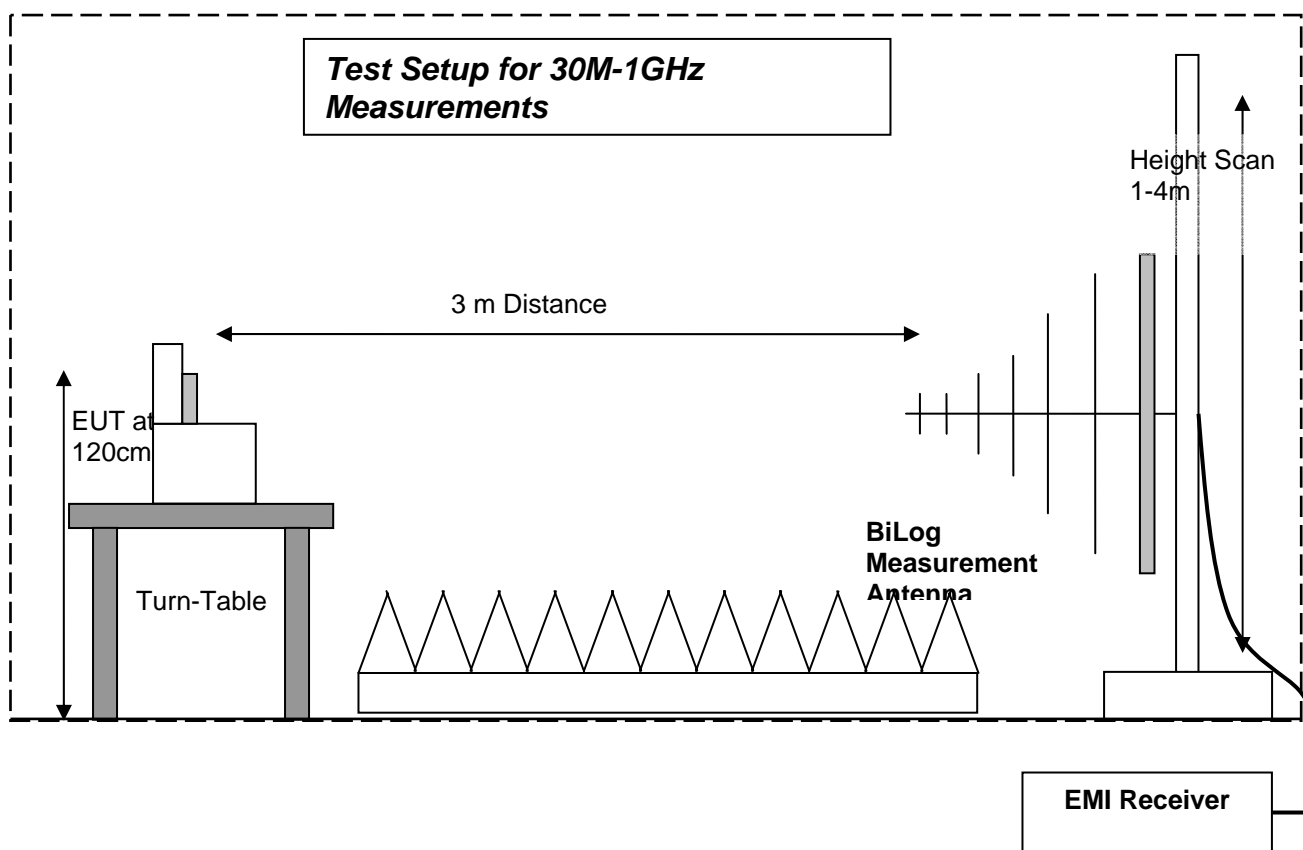
8 BLOCK DIAGRAMS

Conducted Testing



Radiated Testing







9 Revision History

2009-08-12:

EMC_FIHTD_001_09004_15.247FHSS: Original report

2009-09-01:

EMC_FIHTD_001_09004_15.247FHSS_rev1: (replaces report# EMC_FIHTD_001_09004_15.247FHSS) Model name changed from V02B to V02B-V02B001 and marketing name changed from V02B to Mini 3iX

2009-09-14:

EMC_FIHTD_001_09004_15.247FHSS_rev2: (replaces report# EMC_FIHTD_001_09004_15.247FHSS_rev1) Address and contact person information changed in section 2.2 Identification of Client.

2009-11-05:

EMC_FIHTD_001_09004_15.247FHSS_rev3: (replaces report# EMC_FIHTD_001_09004_15.247FHSS_rev2)

1. Output power conducted measurements redone to record result plots and values entered in tables in section 6.1.
2. Output power conducted measurements plots 6.1A to 6.1I added to report.
3. EIRP values calculated from new conducted out power values and entered in tables in section 6.2.