



# FCC Test Report

**FOR:**

**Dell Inc.**

**Model Name: V01B**

**FCC ID: E2KV01B001**

**47 CFR Part 15.247 for FHSS Systems**

**TEST REPORT #: EMC\_001\_09003\_15.247\_BT**

**DATE: 2010-04-07**



**FCC listed  
A2LA Accredited**

**IC recognized #  
3462B**

**CETECOM Inc.**

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

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**1 Assessment**

**The following is in compliance with the applicable criteria specified in FCC rules Parts 15.247 of Title 47 of the Code of Federal Regulations.**

| Company   | Description           | Model # |
|-----------|-----------------------|---------|
| Dell Inc. | GSM/UMTS Mobile Phone | V01B    |

**Responsible for Testing Laboratory:**

| Marc Douat |            |                    |           |
|------------|------------|--------------------|-----------|
| 2010-04-07 | Compliance | (Test Lab Manager) |           |
| Date       | Section    | Name               | Signature |

**Responsible for the Report:**

| Satya Radhakrishna |            |                        |           |
|--------------------|------------|------------------------|-----------|
| 2010-04-07         | Compliance | (EMC Project Engineer) |           |
| Date               | Section    | Name                   | Signature |

The test results of this test report relate exclusively to the test item specified in Section3.

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**

|                                      |                                                        |
|--------------------------------------|--------------------------------------------------------|
| <b>Company Name:</b>                 | CETECOM Inc.                                           |
| <b>Department:</b>                   | Compliance                                             |
| <b>Address:</b>                      | 411 Dixon Landing Road<br>Milpitas, CA 95035<br>U.S.A. |
| <b>Telephone:</b>                    | +1 (408) 586 6200                                      |
| <b>Fax:</b>                          | +1 (408) 586 6299                                      |
| <b>Responsible Test Lab Manager:</b> | Heiko Strehlow                                         |
| <b>Responsible Project Leader:</b>   | Satya Radhakrishna                                     |

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

|                          |                                                          |
|--------------------------|----------------------------------------------------------|
| <b>Applicant's Name:</b> | Dell Inc.                                                |
| <b>Street Address:</b>   | One Dell Way<br>Round Rock, TX 78682<br>Mail stop PS4-30 |
| <b>City/Zip Code</b>     | Round Rock, TX 78682                                     |
| <b>Country</b>           | USA                                                      |
| <b>Contact Person:</b>   | Richard Worley                                           |
| <b>Phone No.</b>         | +1-512-728-1081                                          |
| <b>Fax:</b>              | +1-512-728-5278                                          |
| <b>e-mail:</b>           | Richard_Worley@dell.com                                  |

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

Same as above

**3 Equipment under Test (EUT)****3.1 Specification of the Equipment under Test**

|                                  |                                                                                                                                                   |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Marketing Name:</b>           | Aero                                                                                                                                              |
| <b>Model No:</b>                 | V01B                                                                                                                                              |
| <b>Product Type:</b>             | Portable                                                                                                                                          |
| <b>Hardware Revision :</b>       | EPR2                                                                                                                                              |
| <b>Software Revision :</b>       | 1001210212ZEN_FBW1.4BENZ_WBD_512rabbit_318953310623<br>1764066729122                                                                              |
| <b>FCC-ID:</b>                   | E2KV01B001                                                                                                                                        |
| <b>Frequency:</b>                | 2400-2483.5 MHz                                                                                                                                   |
| <b>Type(s) of Modulation:</b>    | GFSK, $\pi/4$ DQPSK, 8- DPSK (FHSS)                                                                                                               |
| <b>Number of channels:</b>       | 79                                                                                                                                                |
| <b>Antenna Type/Gain:</b>        | Integral/-3.7 dBi                                                                                                                                 |
| <b>Equipment Classification:</b> | <input type="checkbox"/> Fixed <input type="checkbox"/> Vehicular <input checked="" type="checkbox"/> Portable<br><input type="checkbox"/> Module |
| <b>Power Supply:</b>             | AC, Battery                                                                                                                                       |
| <b>Temperature Range:</b>        | -10°C to 55°C                                                                                                                                     |

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

| <b>EUT #</b> | <b>Serial Number</b> | <b>HW Version</b> | <b>SW Version</b>                                                |
|--------------|----------------------|-------------------|------------------------------------------------------------------|
| <b>1</b>     | BZ3EA000002597       | EPR2              | 1001210212ZEN_FBW1.4BENZ_WBD_512rabbit_3189533106231764066729122 |

**3.3 Identification of Accessory equipment**

| <b>AE #</b> | <b>Type</b> | <b>Manufacturer</b> | <b>Model</b> | <b>Serial Number</b> |
|-------------|-------------|---------------------|--------------|----------------------|
| <b>1</b>    | USB Cable   | N/A                 | N/A          | N/A                  |
| <b>2</b>    | AC Adapter  | N/A                 | N/A          | N/A                  |



#### **4 Subject Of Investigation**

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.

This test report is to support a request for new equipment authorization under the FCC ID **E2KV01B001**.

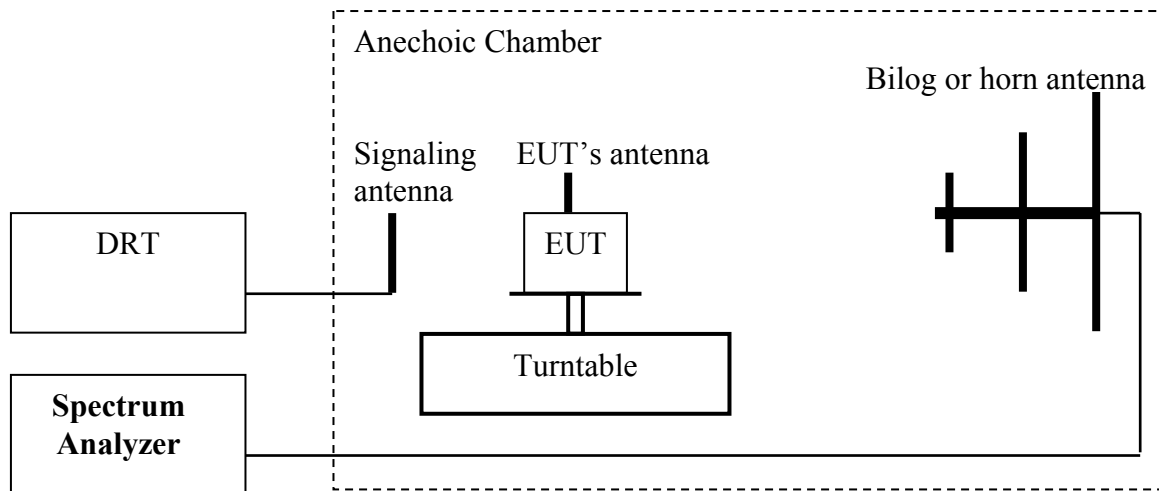
All testing was performed on the product referred to in Section 3 as EUT. This test report contains full radiated and conducted testing results as per FCC15.247.

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

## 5 Measurements

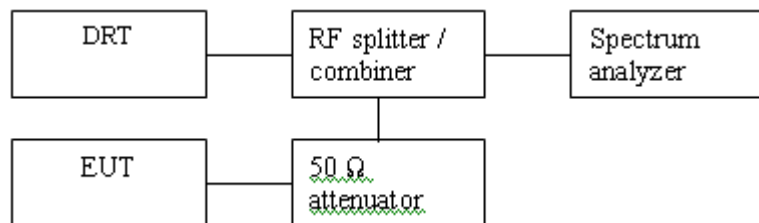
### 5.1 Radiated Measurement Procedure

Ref: TIA-603C 2004 -2.2.17.2 Effective Radiated Power (ERP) or Effective Isotropic Radiated Power (EIRP)



1. Connect the equipment as shown in the above diagram with the EUT's antenna in a vertical orientation.
  2. Adjust the settings of the Digital RadioCommunication Tester (DRT) to set the EUT to its maximum power at the required channel.
  3. Set the spectrum analyzer to the channel frequency. Set the analyzer to measure peak hold with the required settings.
  4. Rotate the EUT 360°. Record the peak level in dBm (**LVL**).
  5. Replace the EUT with a vertically polarized half wave dipole or known gain antenna. The center of the antenna should be at the same location as the center of the EUT's antenna.
  6. Connect the antenna to a signal generator with known output power and record the path loss in dB (**LOSS**). **LOSS** = Generator Output Power (dBm) – Analyzer reading (dBm).
  7. Determine the ERP using the following equation:  
**ERP (dBm) = LVL (dBm) + LOSS (dB)**
  8. Determine the EIRP using the following equation:  
**EIRP (dBm) = ERP (dBm) + 2.14 (dB)**
  9. Measurements are to be performed with the EUT set to the low, middle and high channels.
- Spectrum analyzer settings: RBW=VBW=3MHz**

## 5.2 Conducted Measurement Procedure



1. Connect the equipment as shown in the above diagram.
2. Adjust the settings of the Digital RadioCommunication Tester (DRT) to set the EUT to its maximum power at the required channel.
3. Measurements are to be performed with the EUT set to the low, middle and high channels.

### 5.3 Maximum Peak Output Power

#### 5.3.1 Limits: §15.247 (b)(1)

Nominal Peak Output Power < 30 dBm (1W)

#### 5.3.2 Test Conditions:

Tnom: 22°C; Vnom: AC

#### 5.3.3 Test Result:

| Max Peak Output Power- Conducted (dBm) |                 |      |      |
|----------------------------------------|-----------------|------|------|
| Modulation                             | Frequency (MHz) |      |      |
|                                        | 2402            | 2442 | 2480 |
| <b>GFSK</b>                            | 1.4             | 1.1  | 0.1  |
| <b><math>\pi/4</math> DQPSK</b>        | -0.5            | -0.6 | -1.6 |
| <b>8-DPSK</b>                          | -0.5            | -0.6 | -1.5 |
| Measurement Uncertainty: $\pm 0.5$ dB  |                 |      |      |

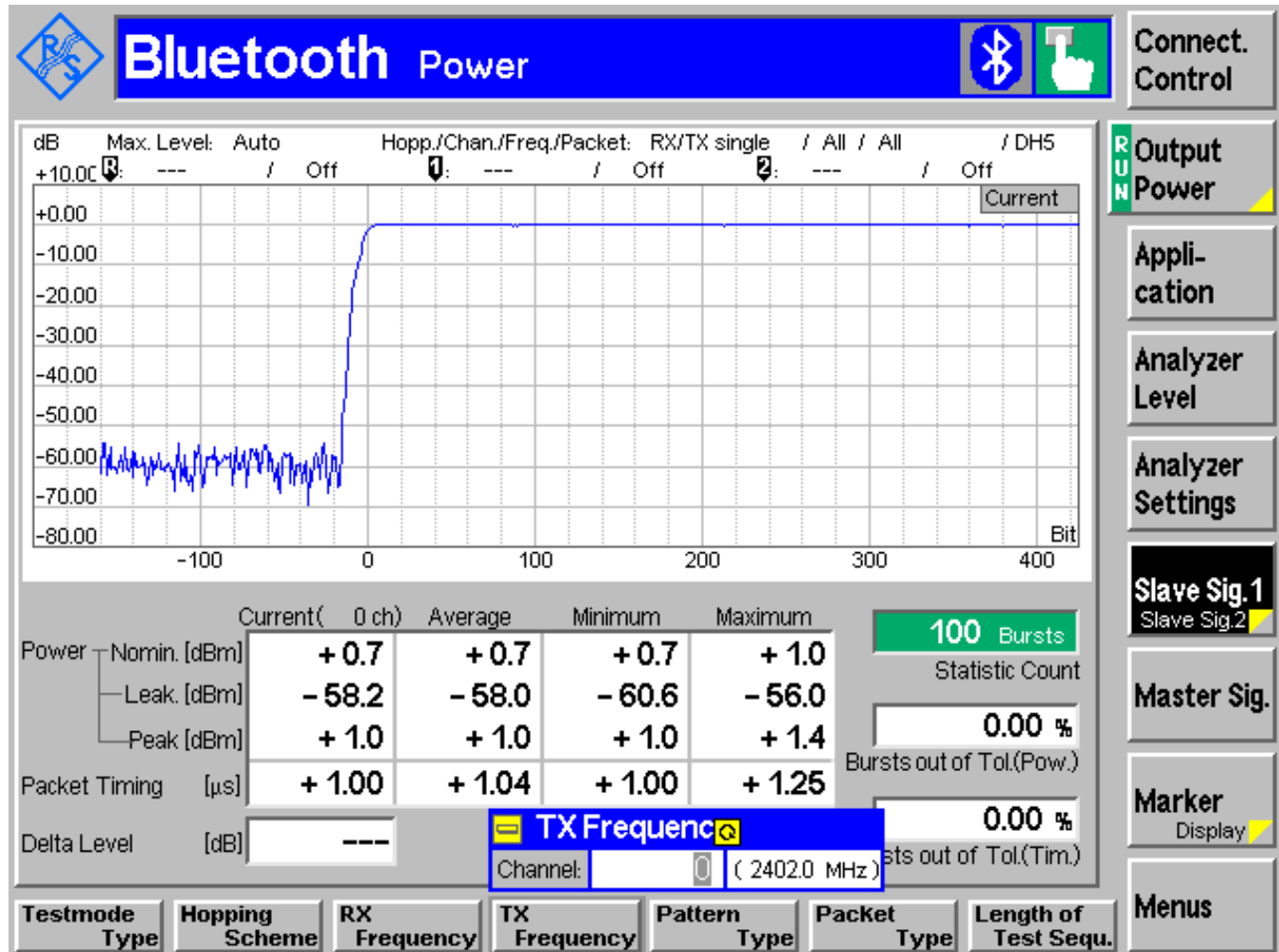
EIRP values are calculated by adding antenna gain to the Peak Conducted Power values.

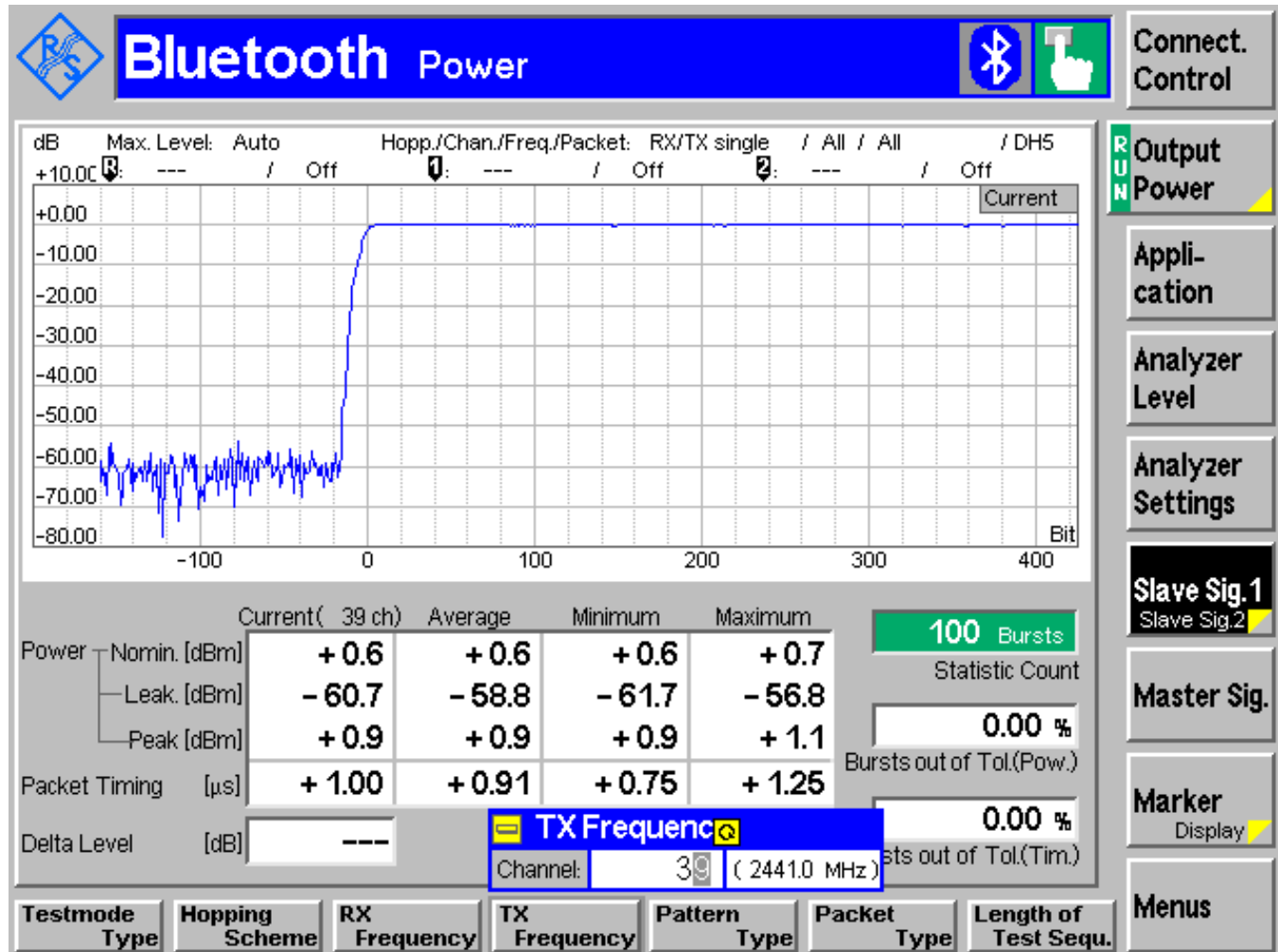
EIRP =Antenna Gain(dBi) + Conducted Peak Power(dBm) Antenna Gain=-3.7dBi

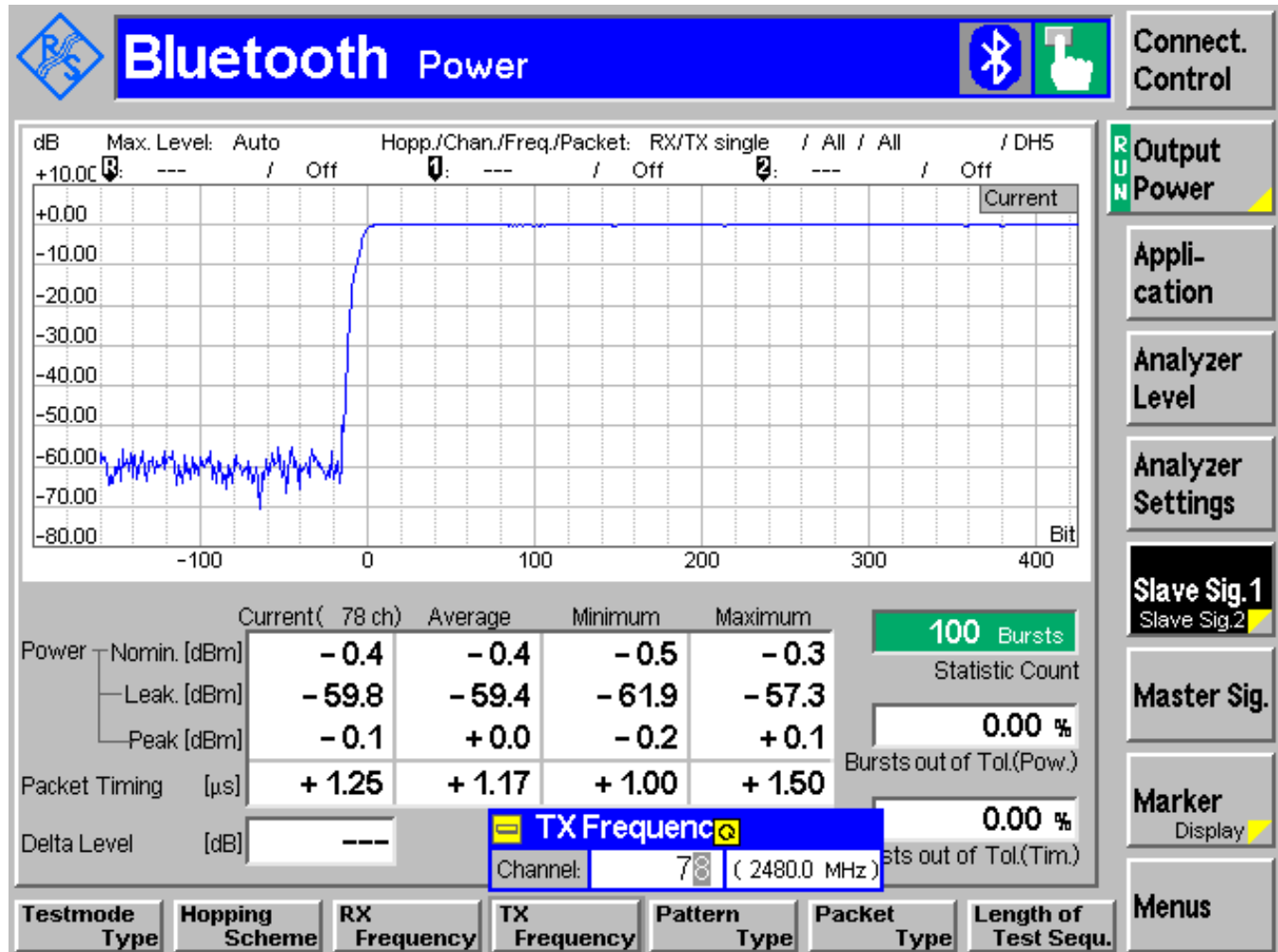
| Max Peak Output Power- Radiated (dBm) |                 |      |      |
|---------------------------------------|-----------------|------|------|
| Modulation                            | Frequency (MHz) |      |      |
|                                       | 2402            | 2442 | 2480 |
| <b>GFSK</b>                           | 2.3             | 2.6  | -3.6 |
| <b><math>\pi/4</math> DQPSK</b>       | -4.2            | -4.3 | -5.3 |
| <b>8-DPSK</b>                         | -4.2            | -4.3 | -5.2 |
| Measurement Uncertainty: $\pm 3$ dB   |                 |      |      |

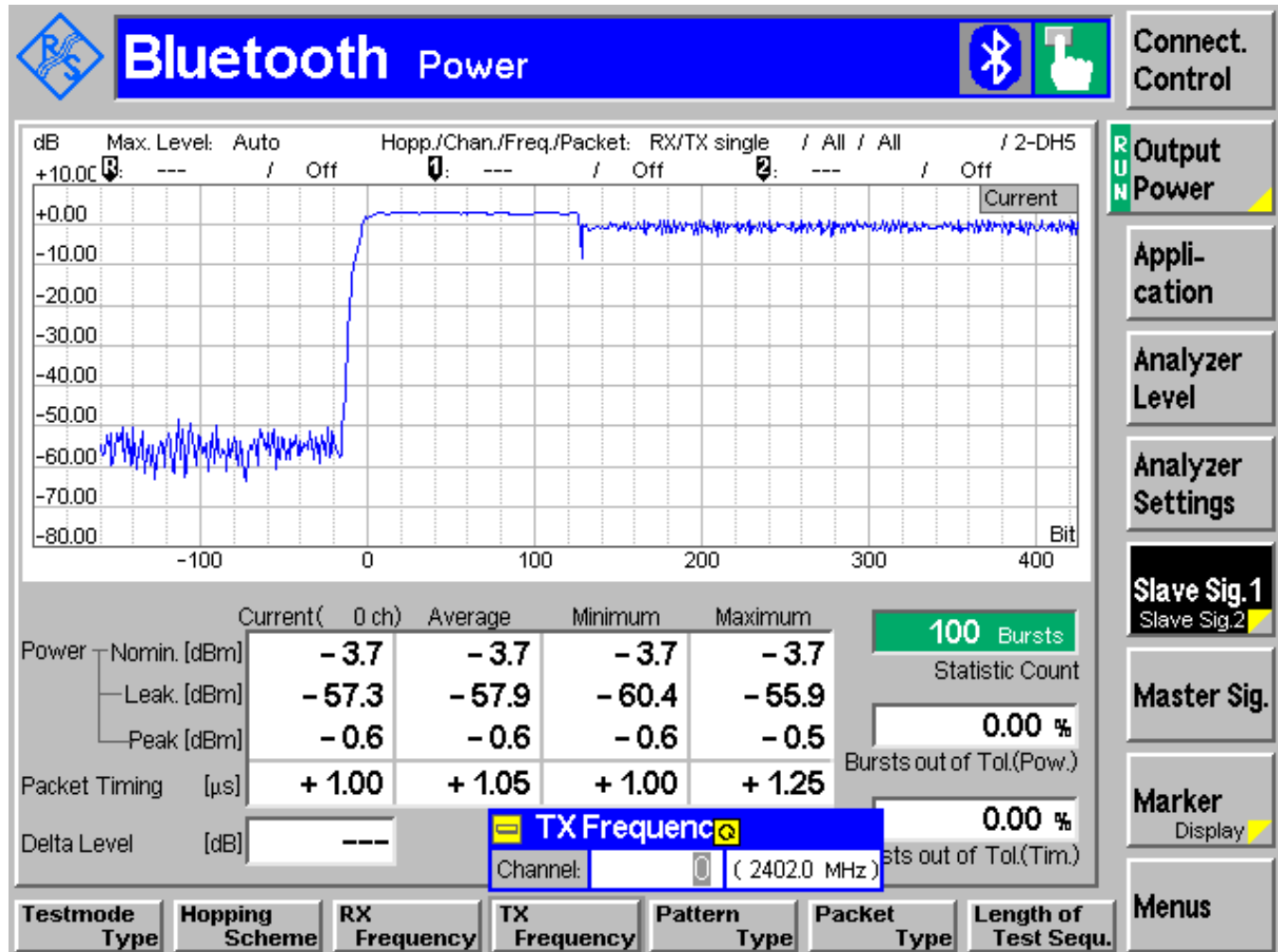
### 5.3.4 Test Data/plots:

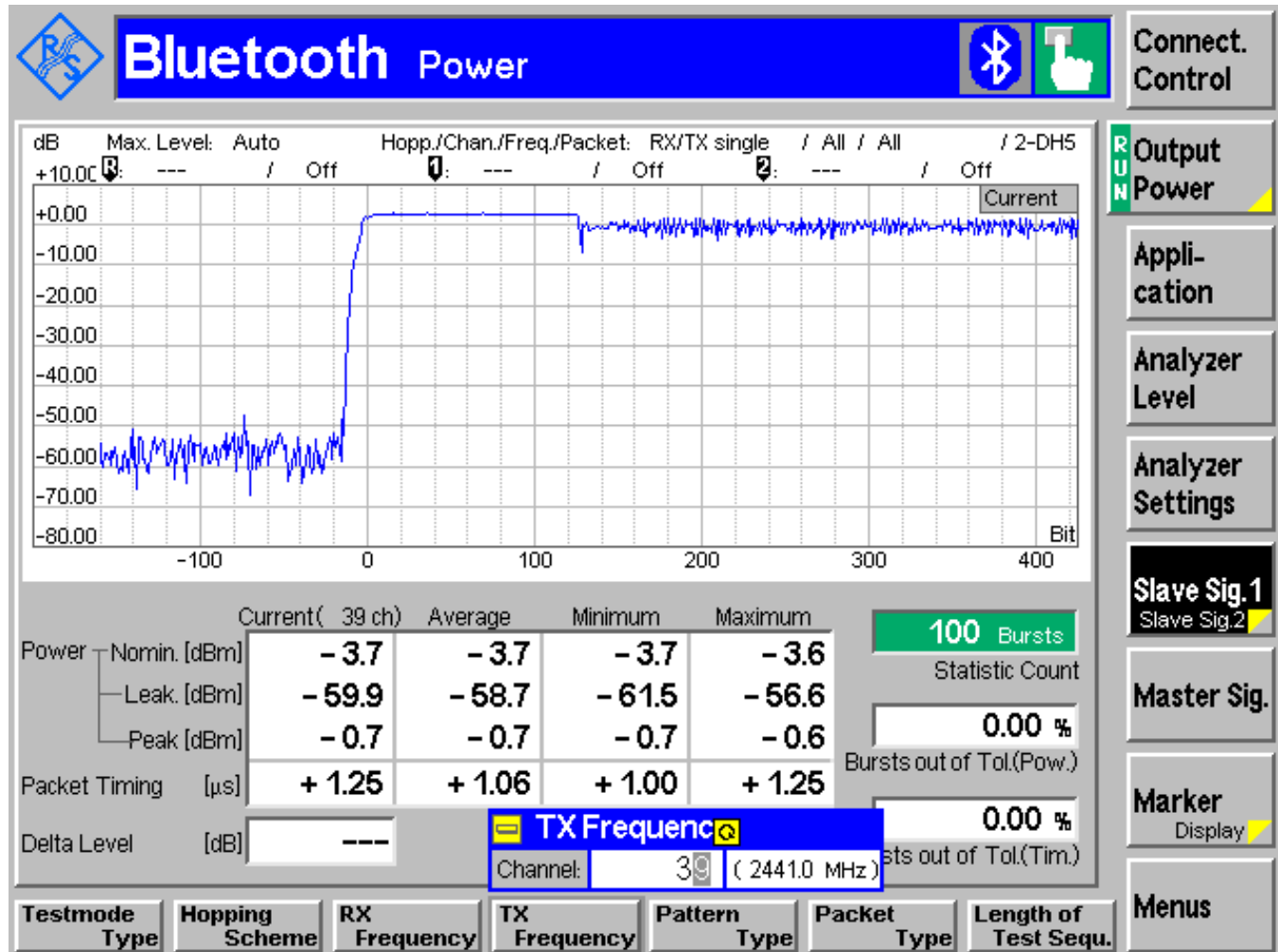
#### Conducted Peak Power GFSK 2402 MHz

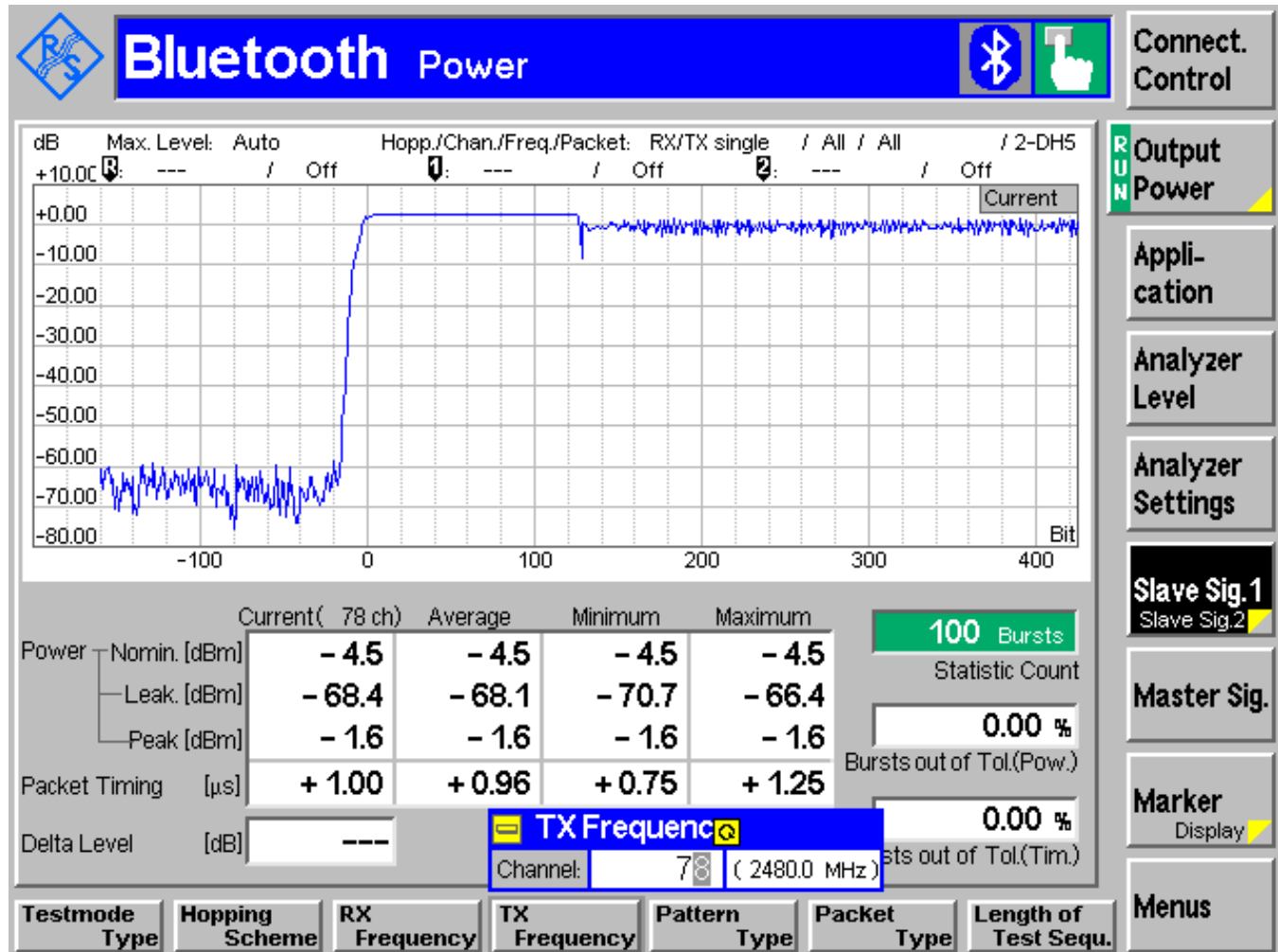


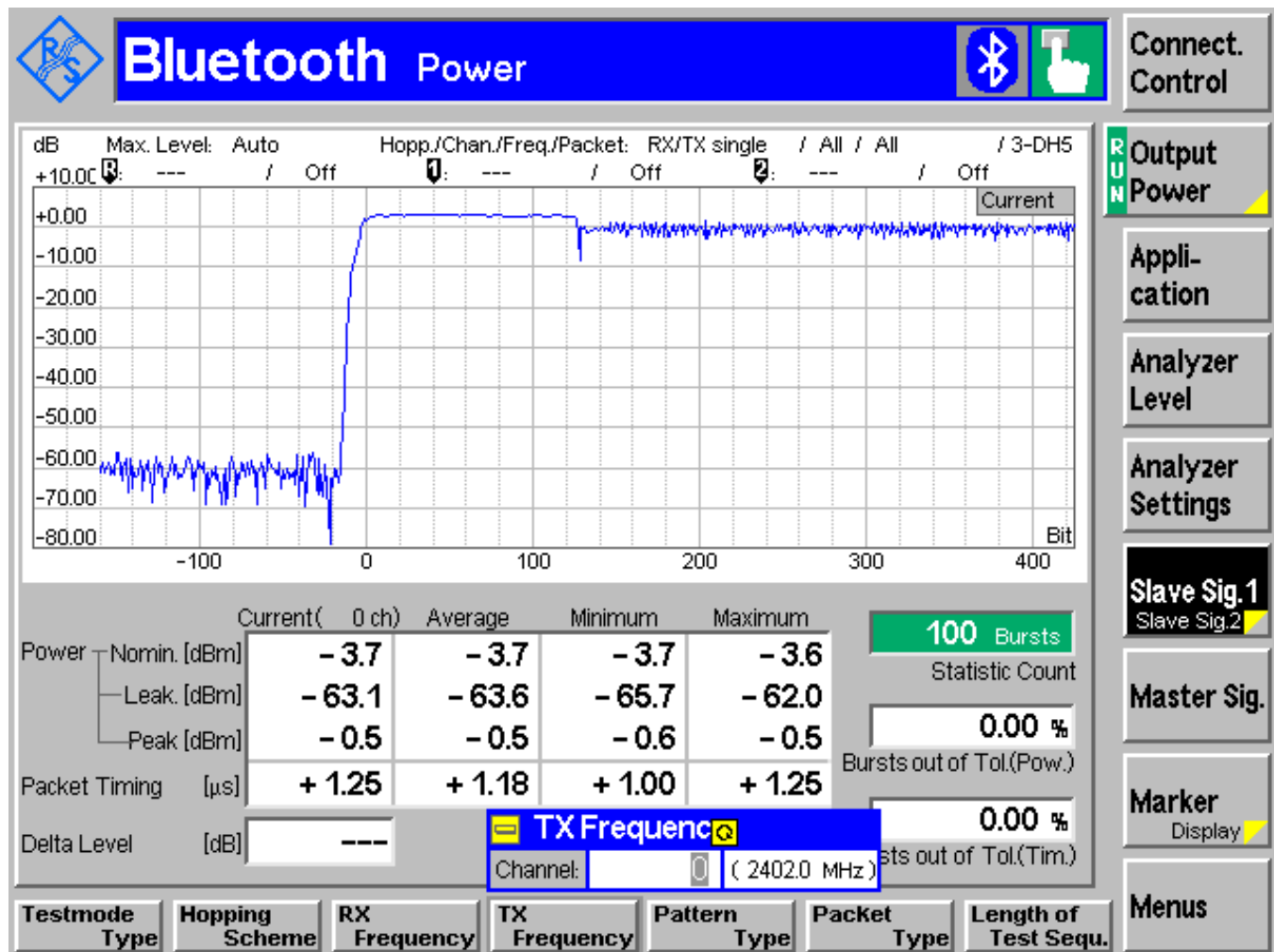
**Conducted Peak Power GFSK 2441 MHz**

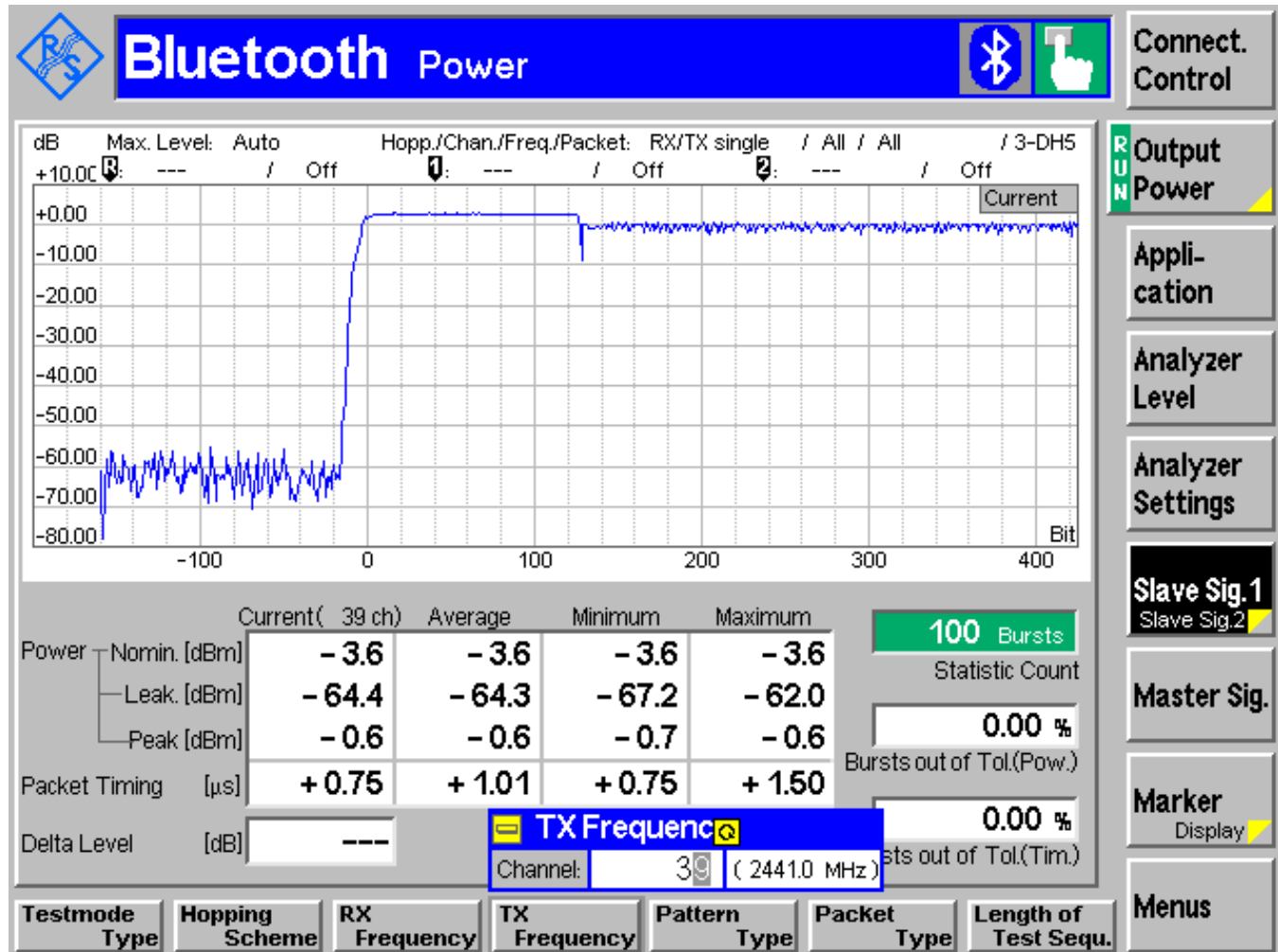
**Conducted Peak Power GFSK 2480 MHz**

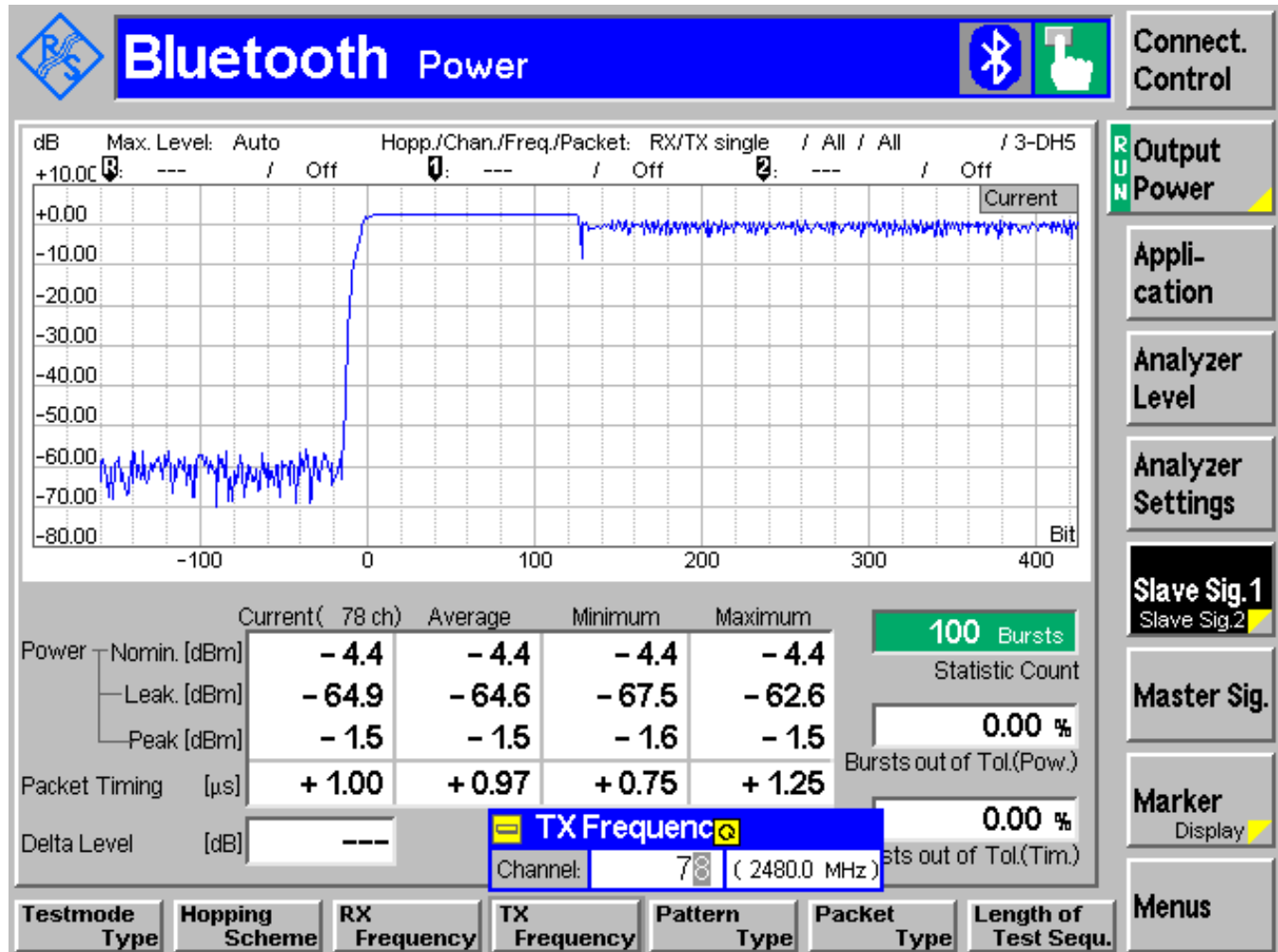
**Conducted Peak Power  $\pi$  / 4 DQPSK 2402 MHz**

**Conducted Peak Power  $\pi$  / 4 DQPSK 2441 MHz**

**Conducted Peak Power  $\pi / 4$  DQPSK 2480 MHz**

**Conducted Peak Power 8DPSK 2402 MHz**

**Conducted Peak Power 8DPSK 2441 MHz**

**Conducted Peak Power 8DPSK 2480 MHz**

## 5.4 Restricted Band Edge Compliance

### 5.4.1 Limits: §15.247/15.205

(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              |                       |                 |                  |

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. 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)).

\*PEAK LIMIT= 74dBμV/m

\*AVG. LIMIT= 54dBμV/m

## 5.4.2 Test Data/plots:

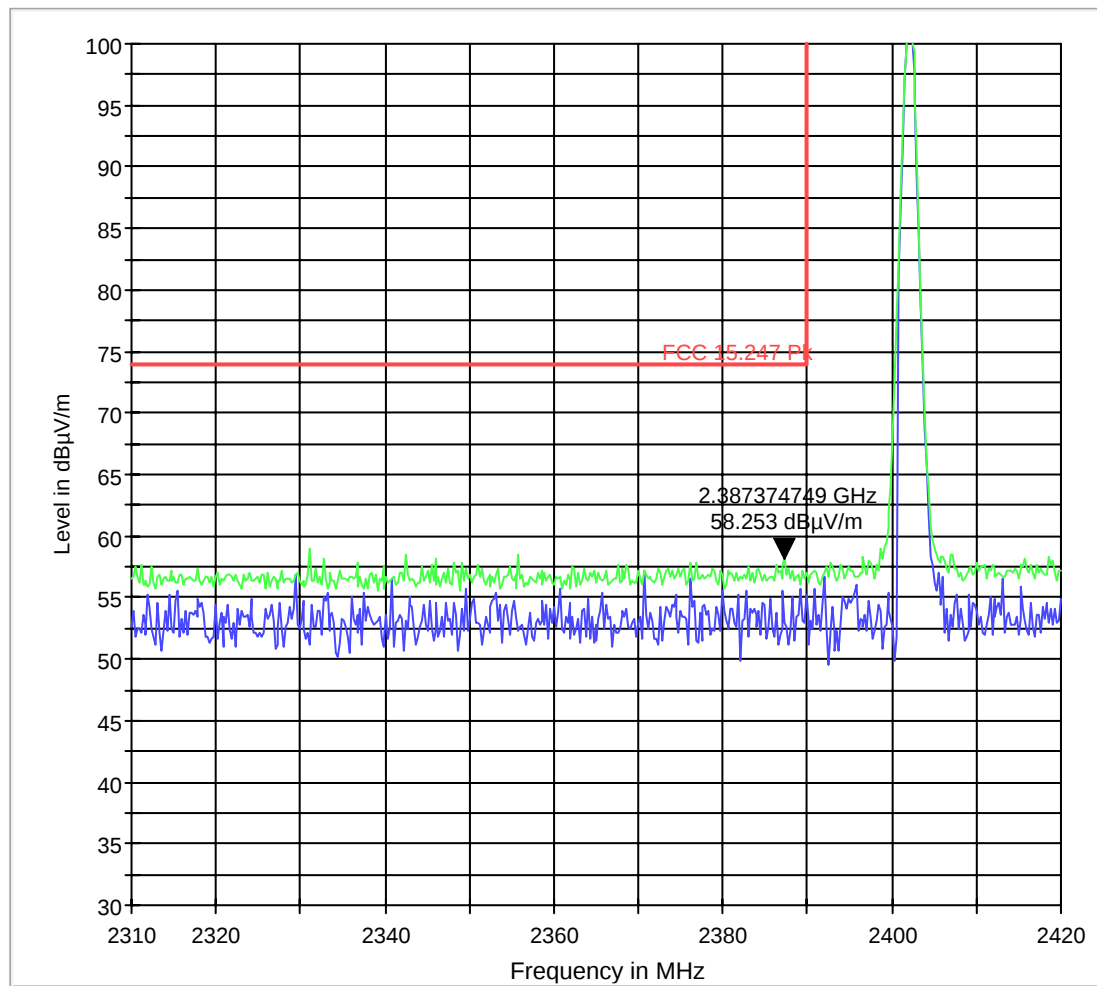
### Lower band edge peak -GFSK modulation

## EUT Information

#### Description:

EUT Name: V01B  
Manufacturer: Dell Inc.  
Serial Number:  
Test Mode: BT DH-5 CH 0  
Voltage: ac adapter  
EUT Orientation:  
Comment:

FCC 15.247 LBE Pk 3m



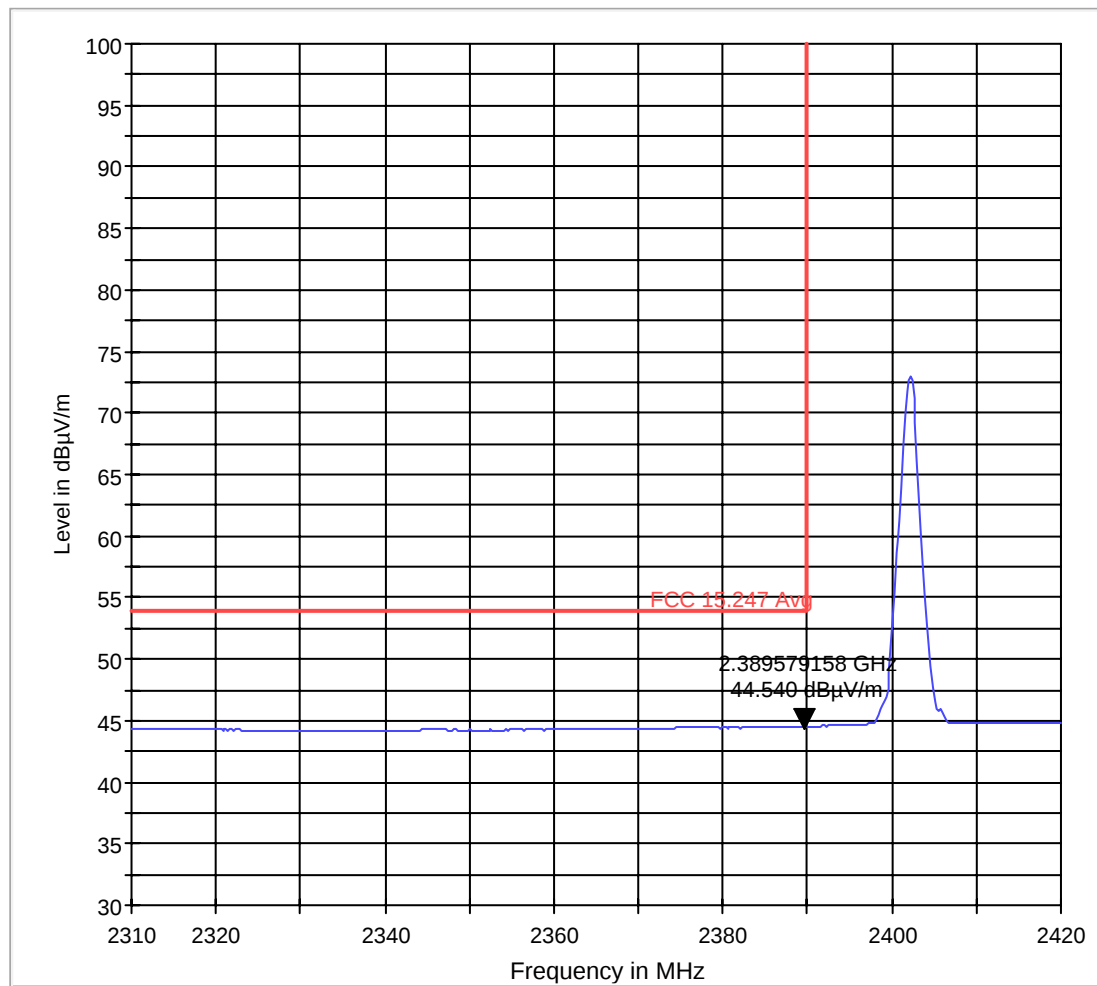
MaxPeak-ClearWrite      MaxPeak-MaxHold      FCC 15.247 Pk

**Lower band edge average -GFSK modulation****EUT Information**

## Description:

EUT Name: V01B  
Manufacturer: Dell Inc.  
Serial Number:  
Test Mode: BT DH-5 CH 0  
Voltage: ac adapter  
EUT Orientation:  
Comment:

FCC 15.247 LBE Avg 3m



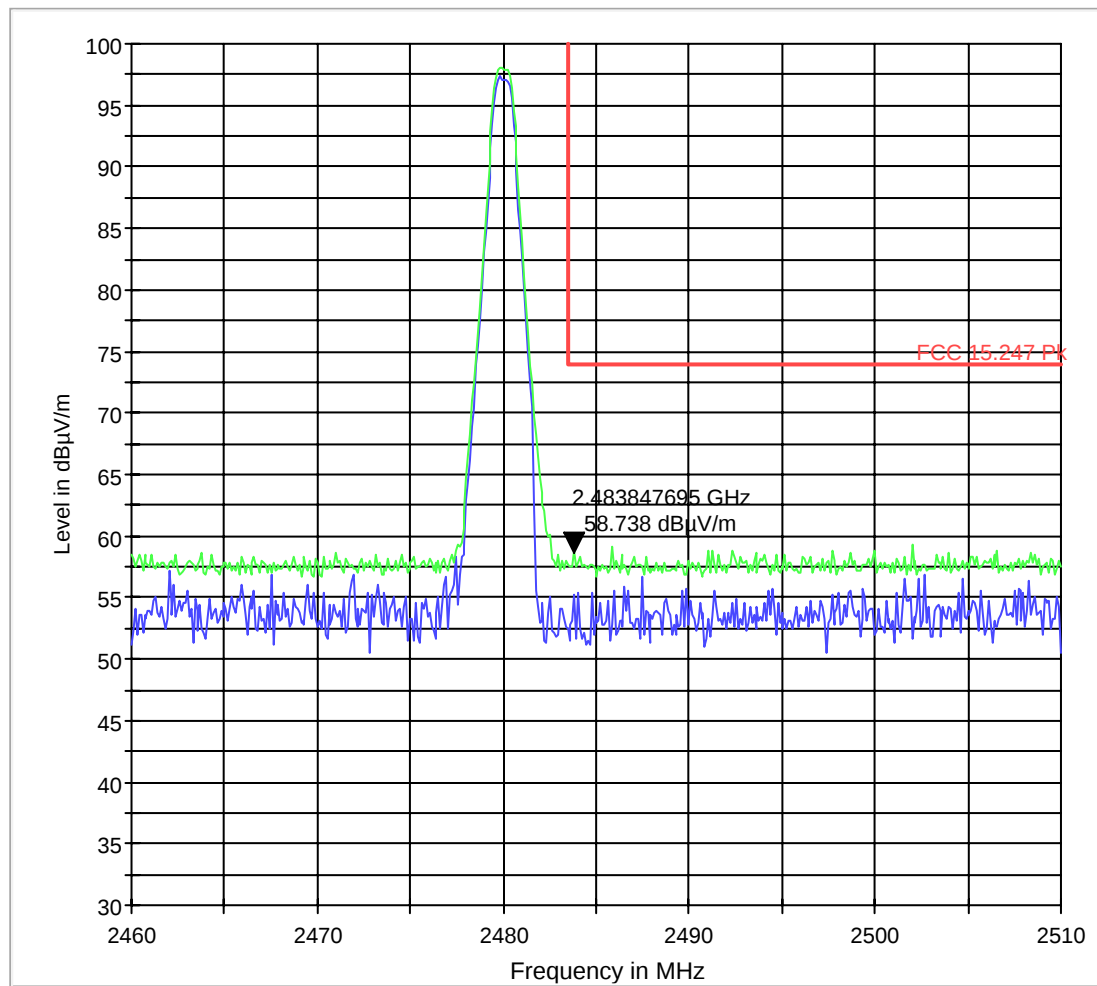
MaxPeak-MaxHold      Average-MaxHold      FCC 15.247 Avg

**Higher band edge peak -GFSK modulation****EUT Information**

## Description:

EUT Name: V01B  
Manufacturer: Dell Inc.  
Serial Number:  
Test Mode: BT DH-5 CH 78  
Voltage: ac adapter  
EUT Orientation:  
Comment:

FCC 15.247 HBE Pk 3m



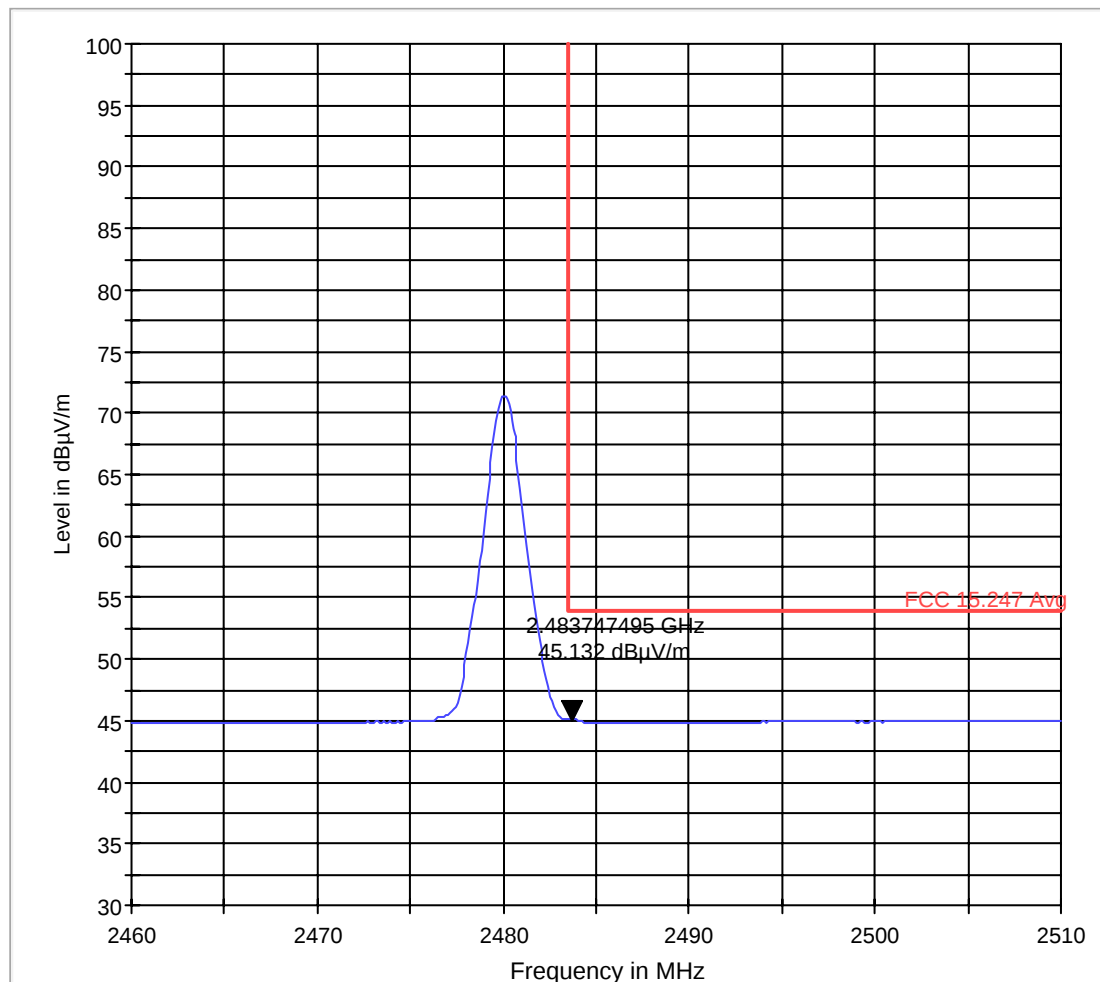
MaxPeak-ClearWrite      MaxPeak-MaxHold      FCC 15.247 Pk

**Higher band edge average-GFSK modulation****EUT Information**

## Description:

|                  |               |
|------------------|---------------|
| EUT Name:        | V01B          |
| Manufacturer:    | Dell Inc.     |
| Serial Number:   |               |
| Test Mode:       | BT DH-5 CH 78 |
| Voltage:         | ac adapter    |
| EUT Orientation: |               |
| Comment:         |               |

FCC 15.247 HBE Avg 3m

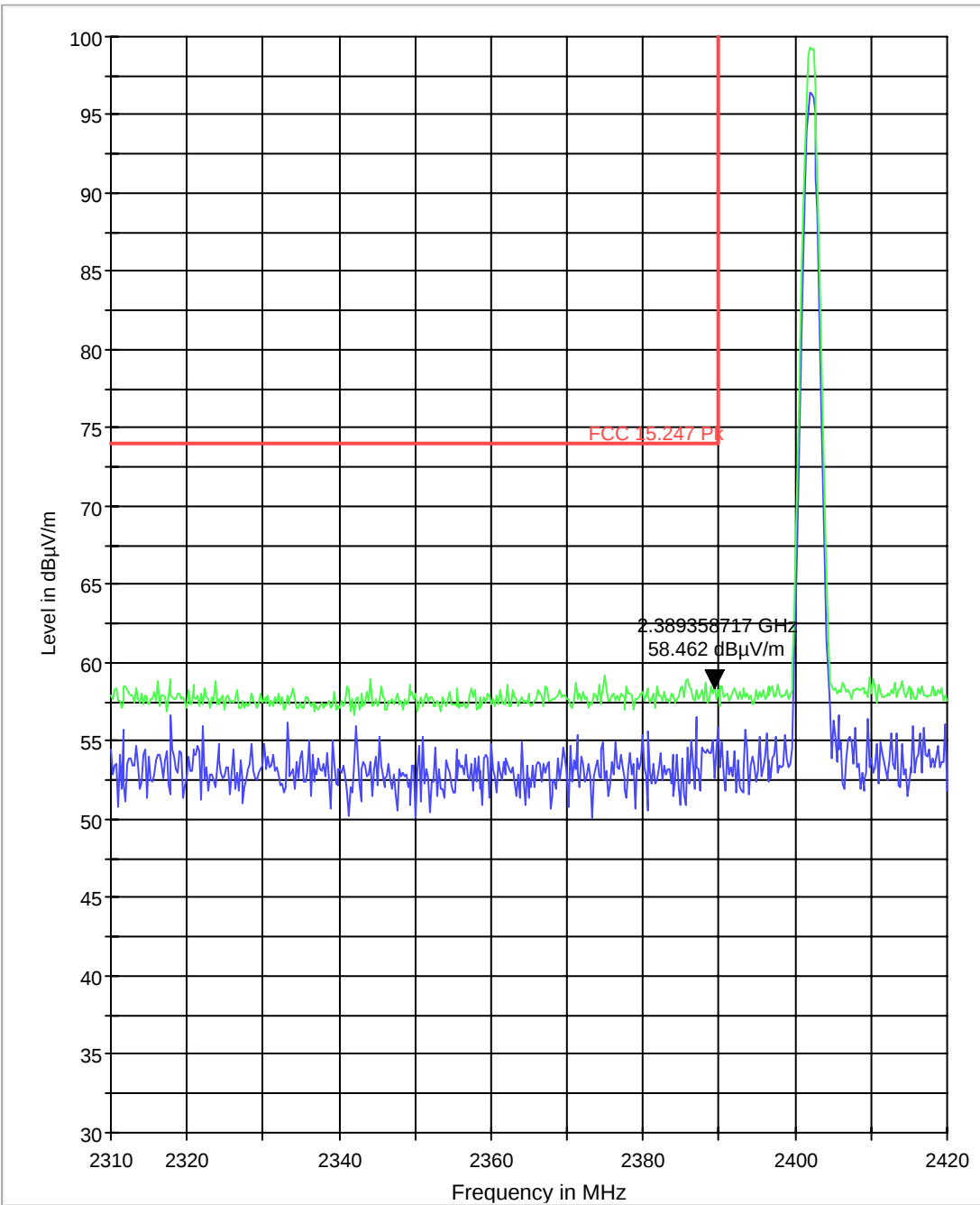


— MaxPeak-MaxHold

— FCC 15.247 Avg

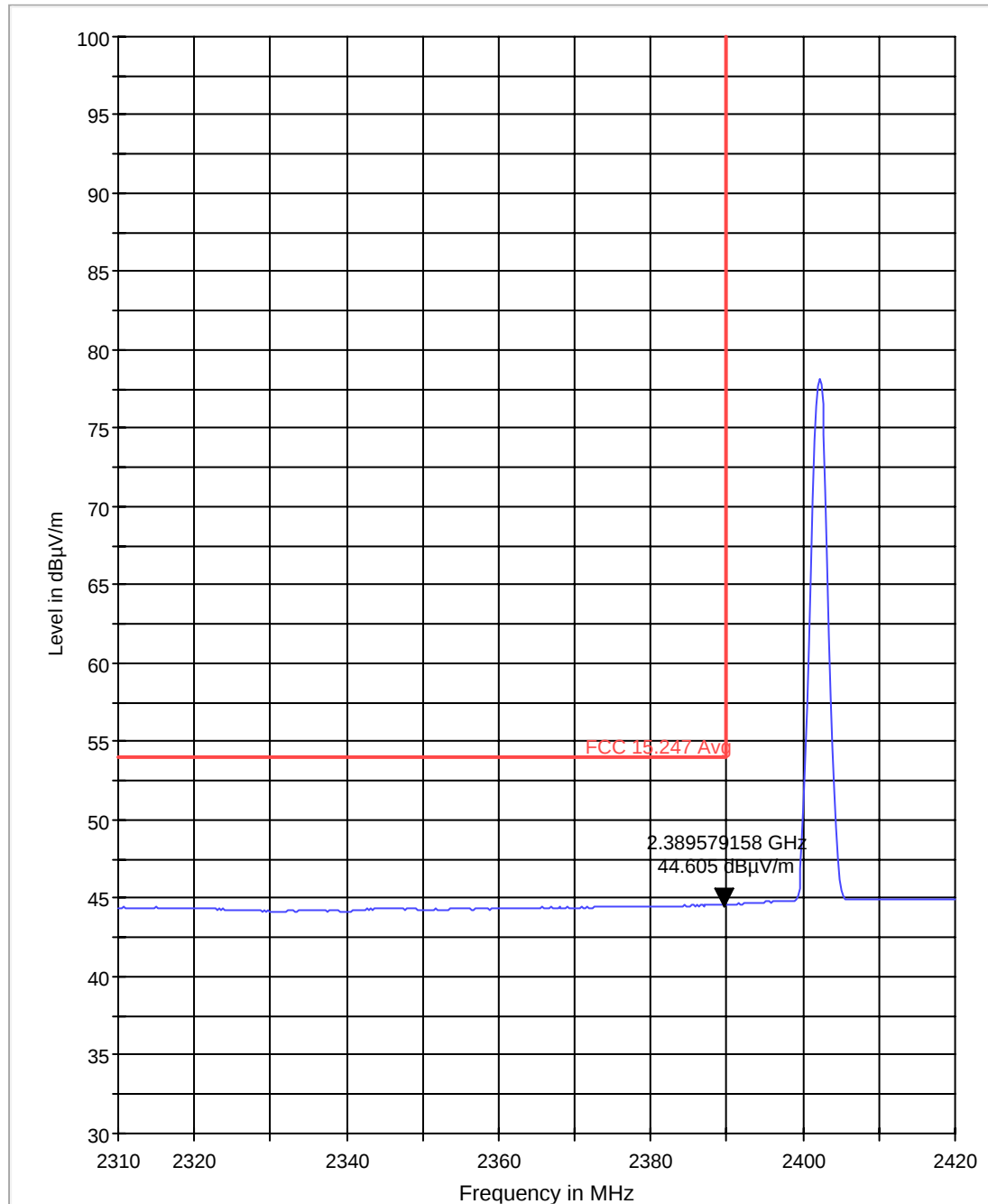
**Lower band edge peak -  $\pi/4$  DQPSK modulation**

FCC 15.247 LBE Pk 3m



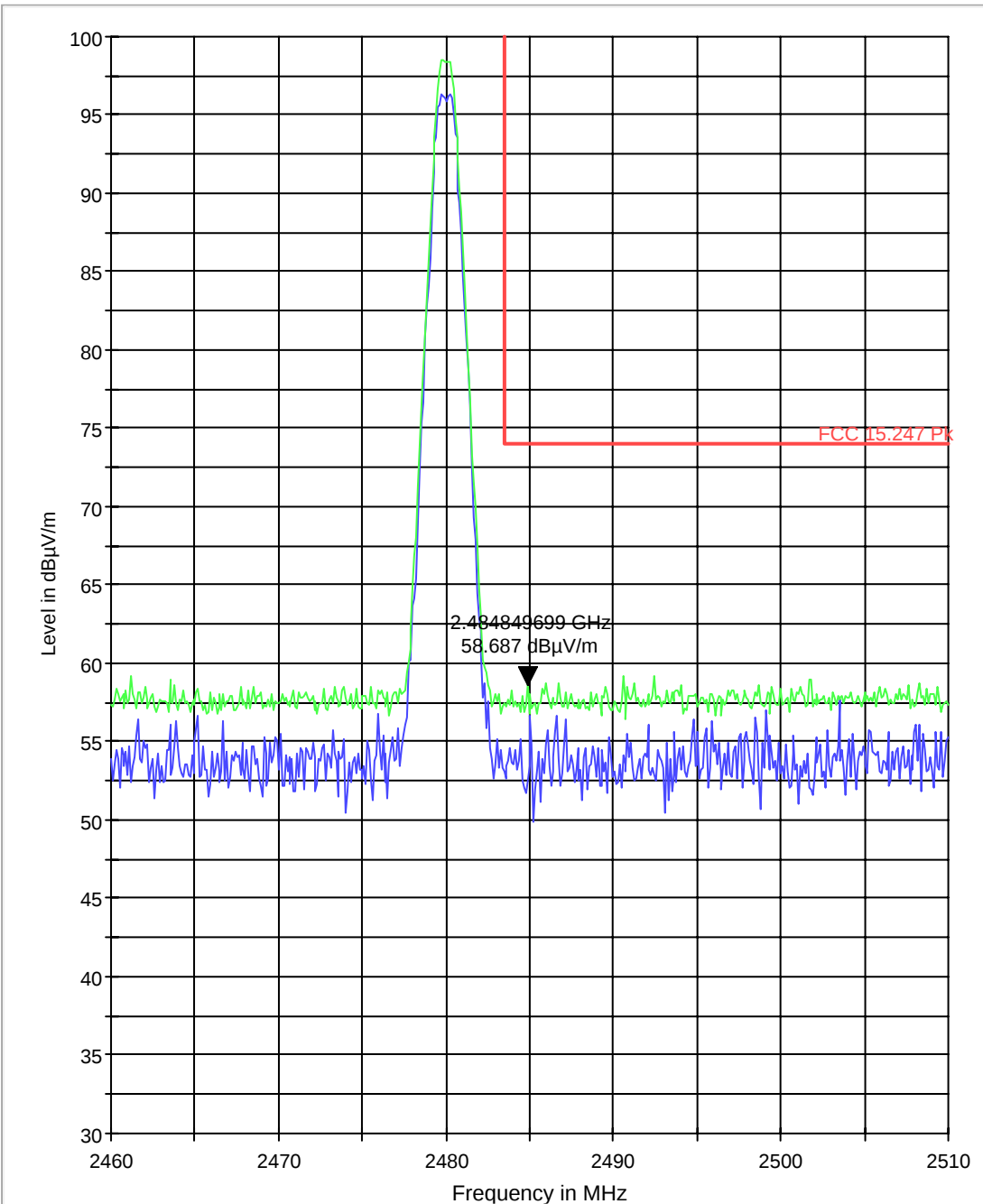
**Lower band edge average  $-\pi/4$  DQPSK modulation**

FCC 15.247 LBE Avg 3m



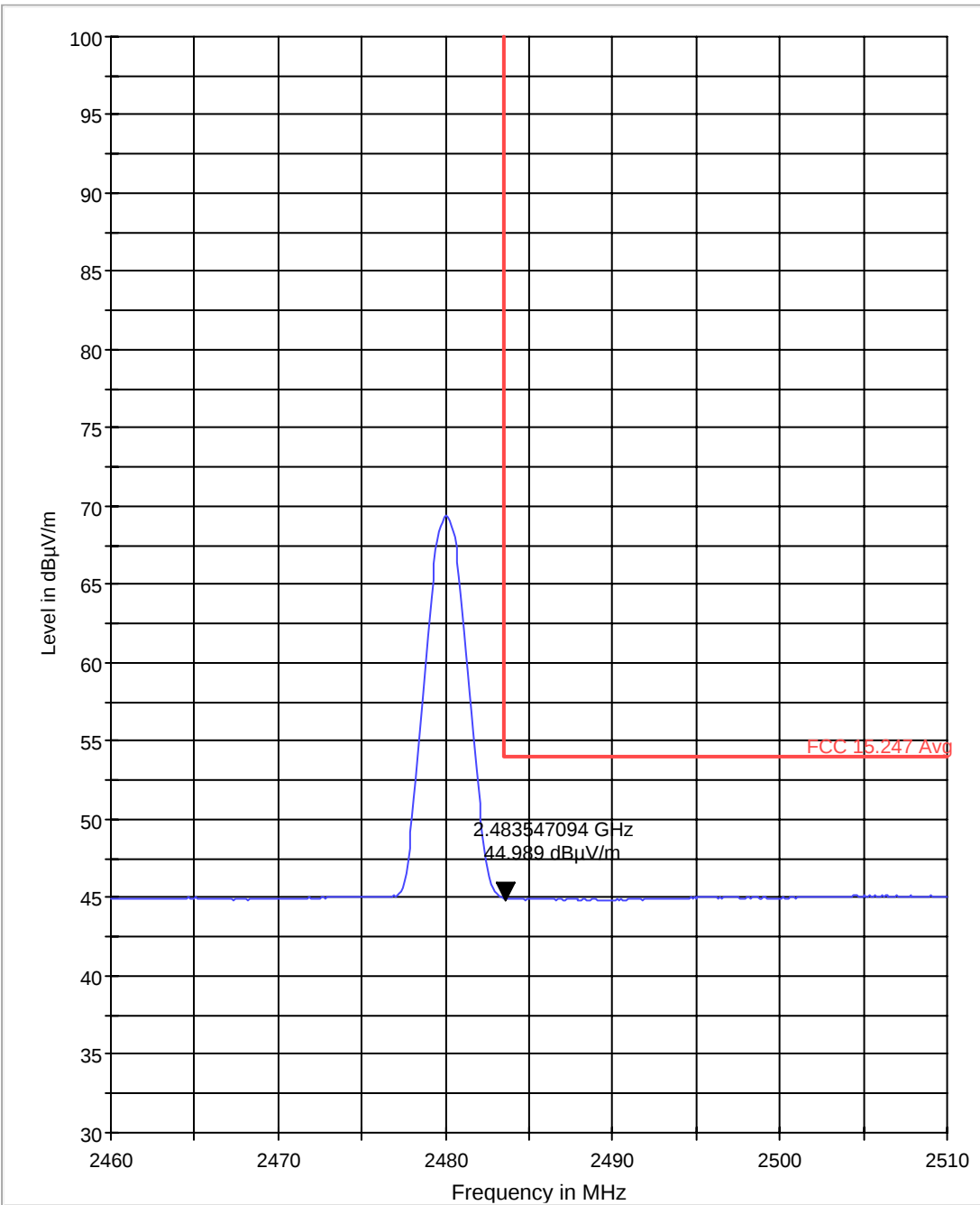
# Higher band edge peak $-\pi/4$ DQPSK modulation

FCC 15.247 HBE Pk 3m



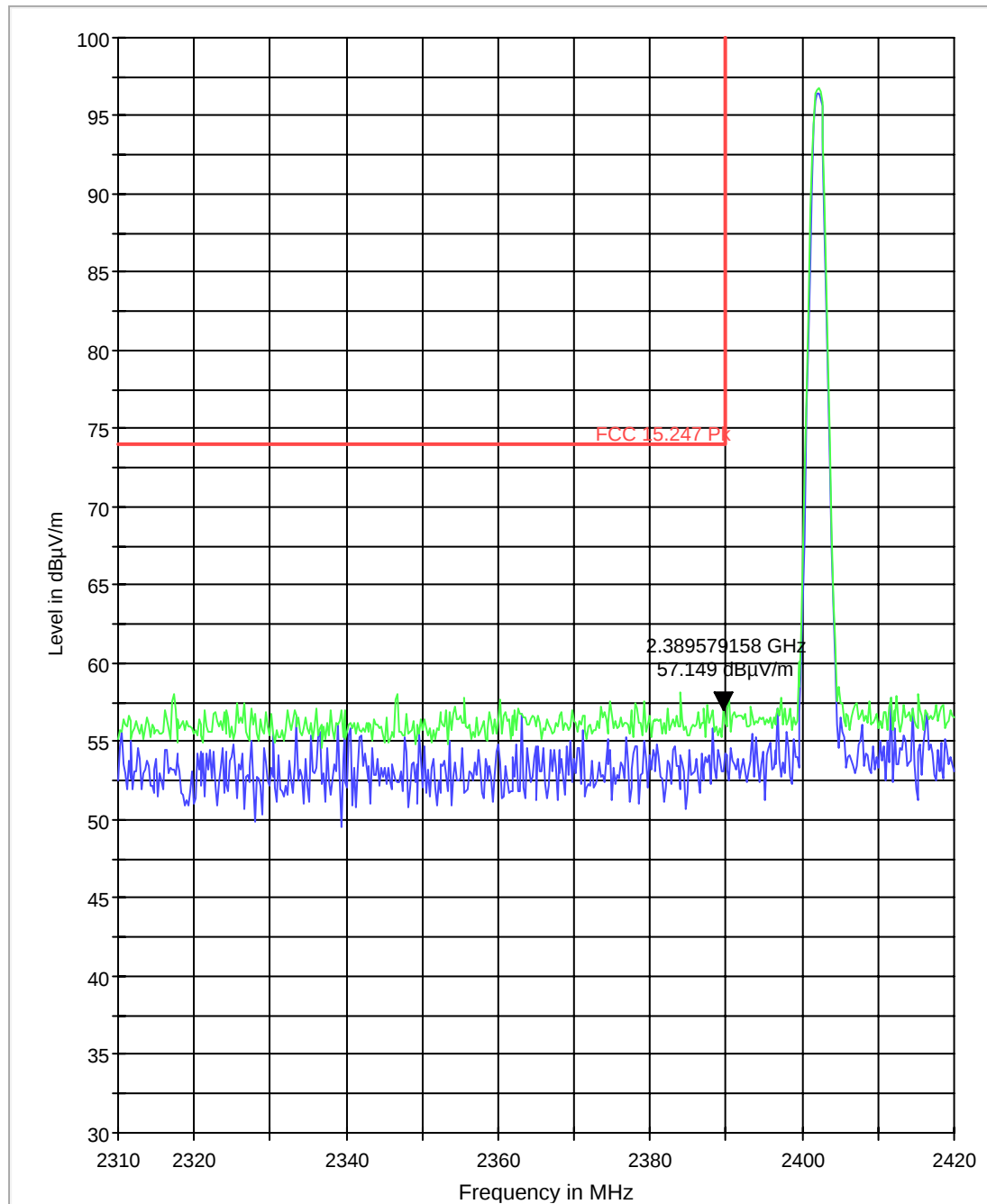
**Higher band edge average-  $\pi/4$  DQPSK modulation**

FCC 15.247 HBE Avg 3m



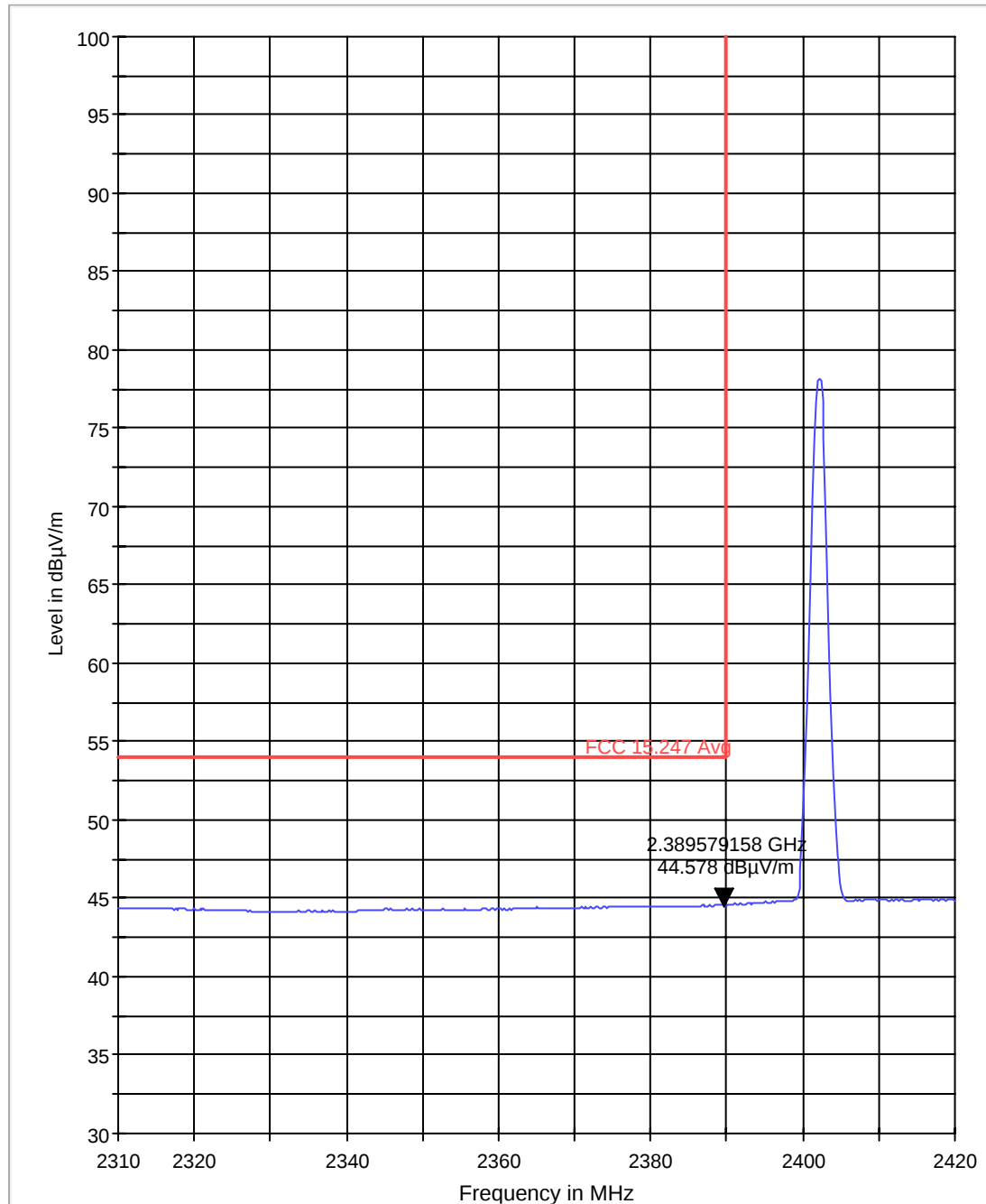
## Lower band edge peak - 8DPSK modulation

FCC 15.247 LBE Pk 3m



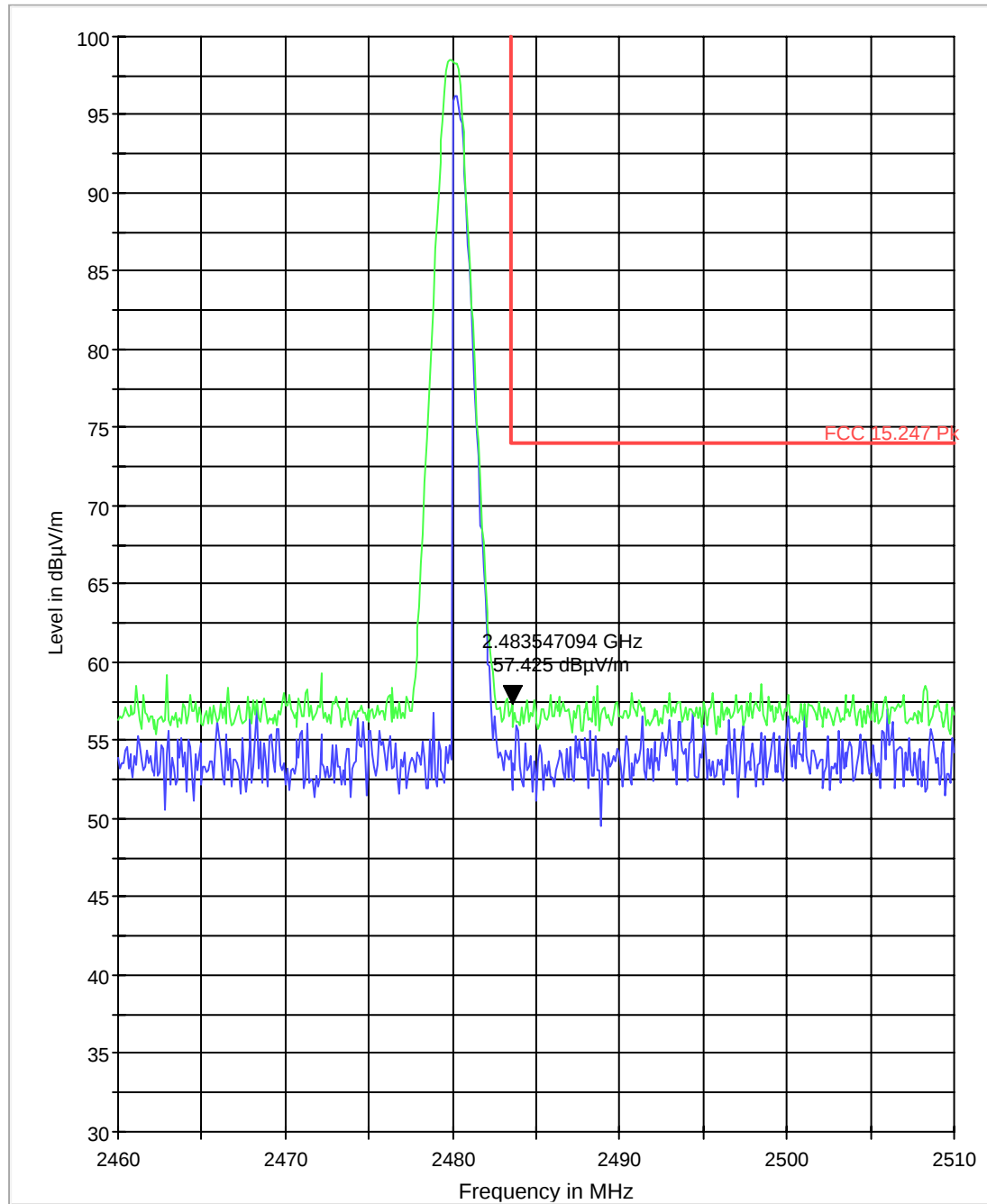
**Lower band edge average -8DPSK modulation**

FCC 15.247 LBE Avg 3m



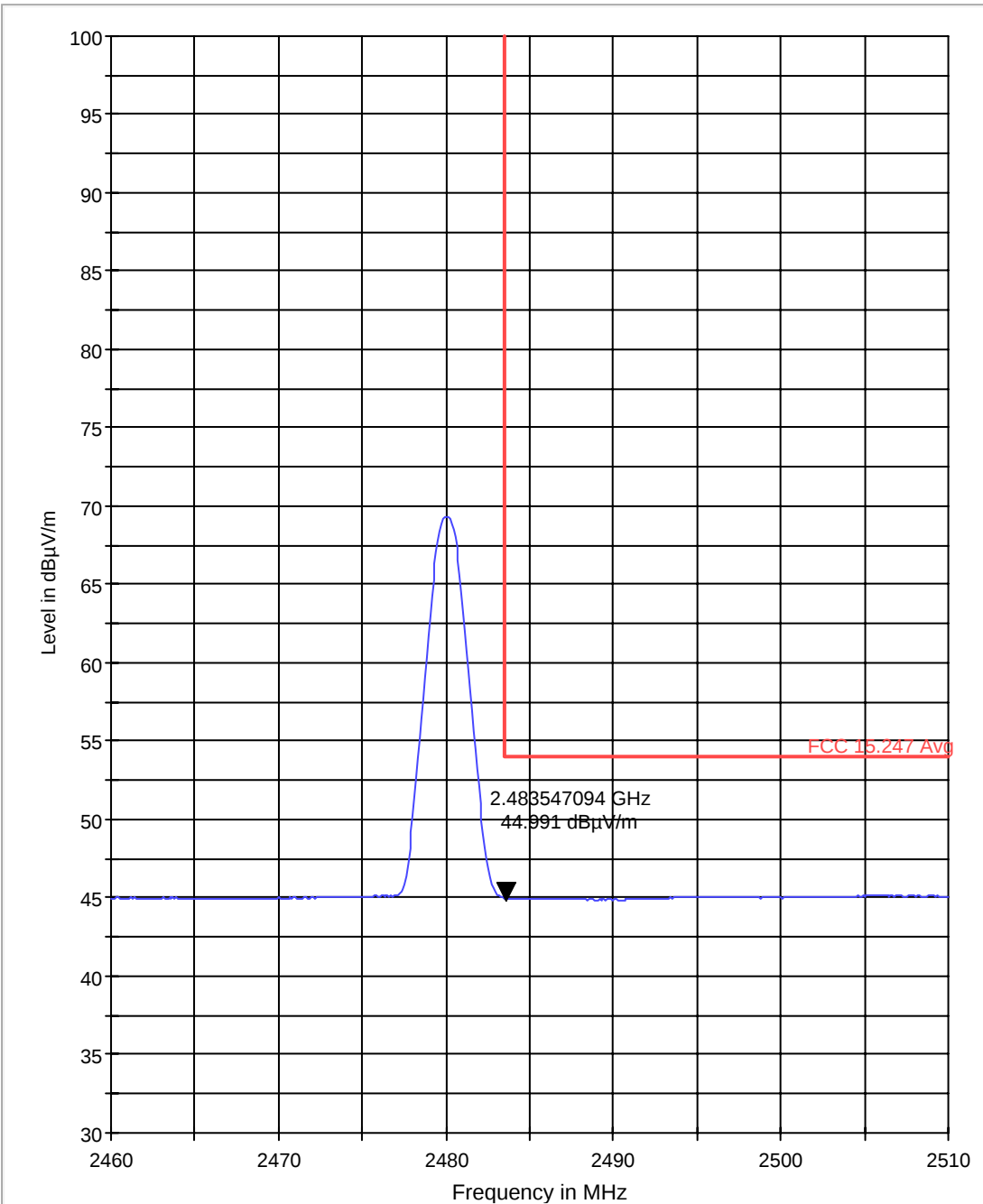
## Higher band edge peak - 8DPSK modulation

FCC 15.247 HBE Pk 3m



## Higher band edge average-8DPSK modulation

FCC 15.247 HBE Avg 3m



## 5.5 Spectrum Bandwidth/ 20dB Bandwidth

### 5.5.1 Limits: § 15.247 (a)(1)

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.

GFSK < 1000 kHz

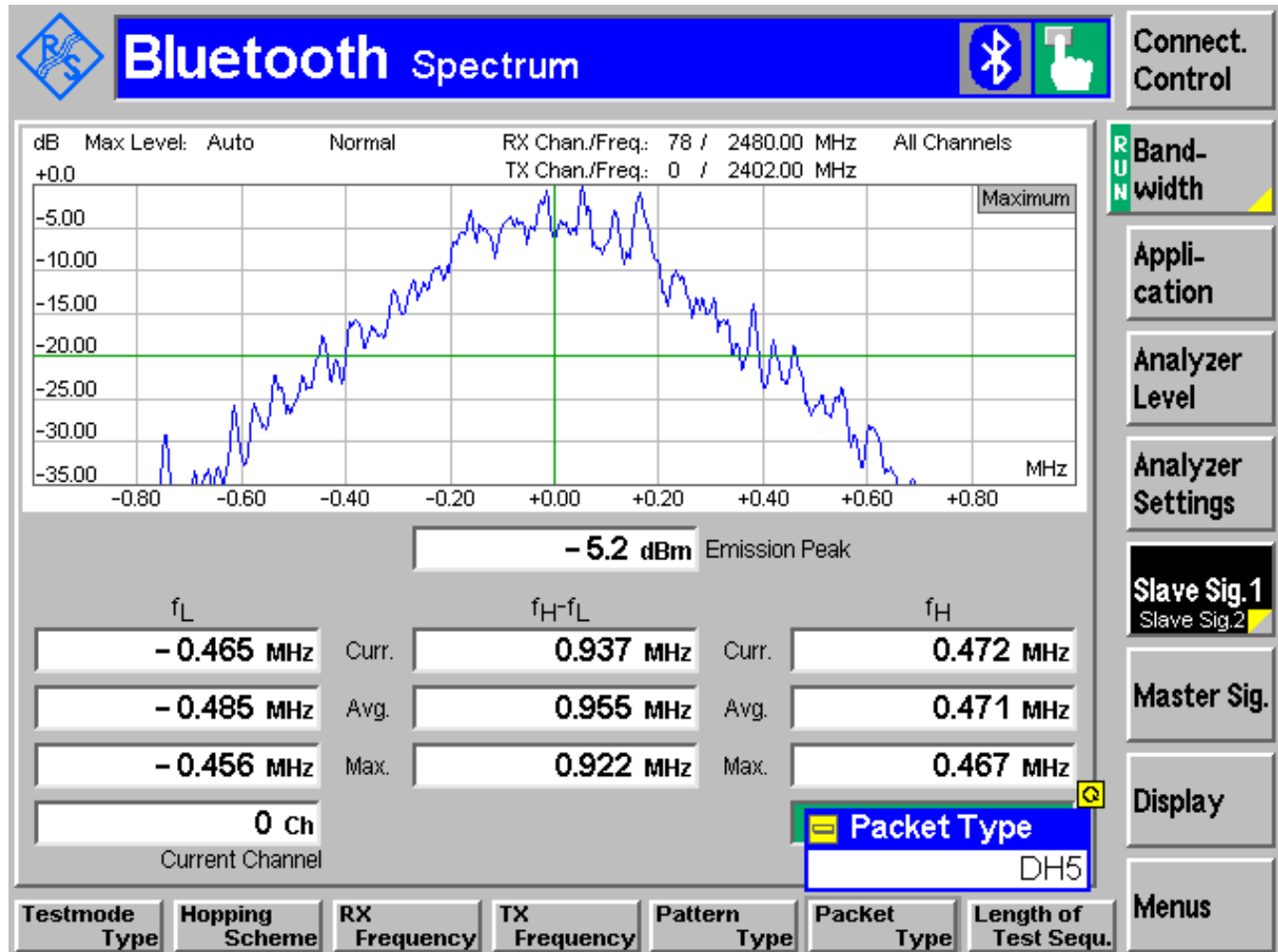
$\pi / 4$  DQPSK < 1500 kHz

8 dPSK < 1500kHz

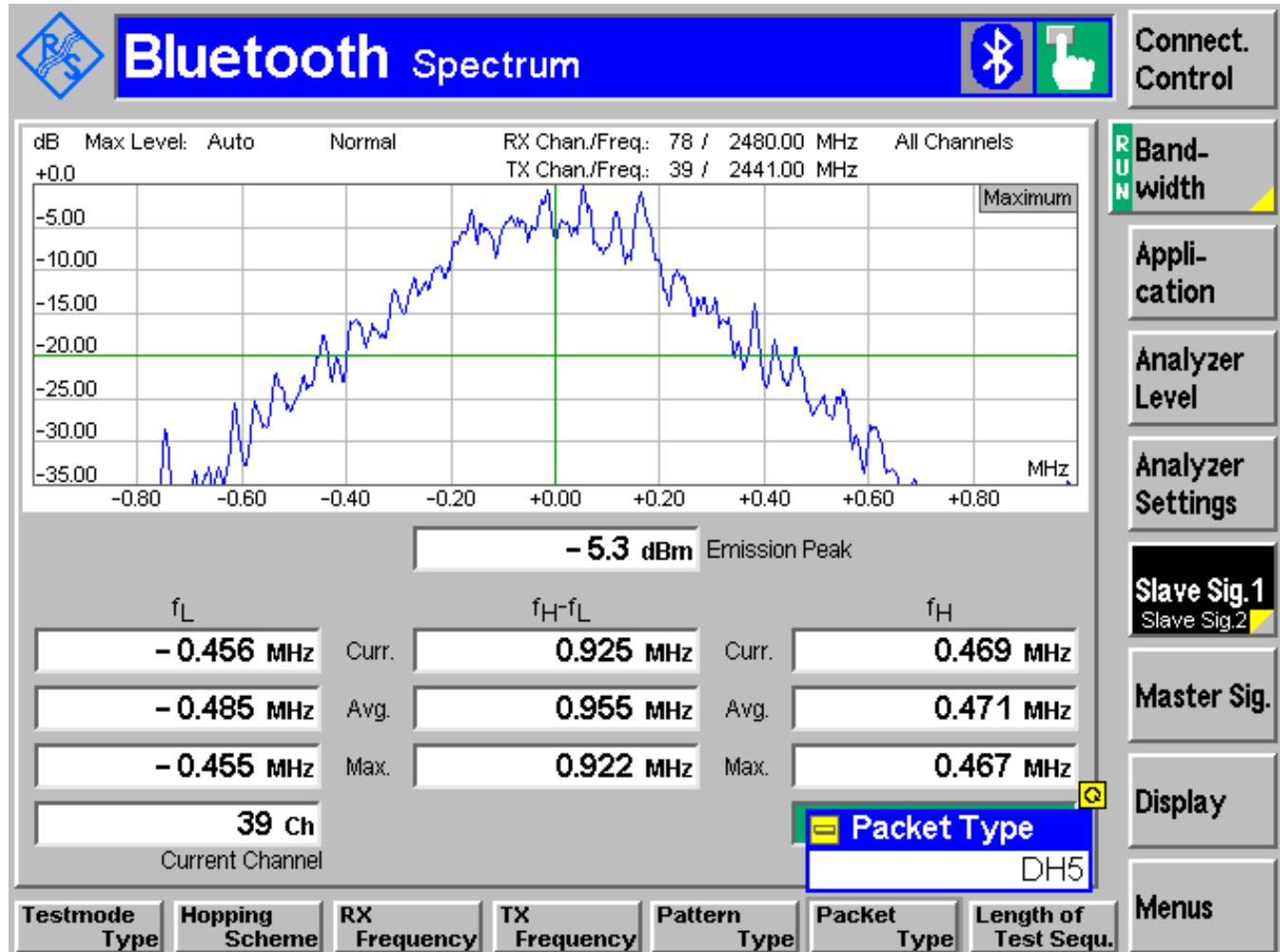
### 5.5.2 Test Result:

| 20dB Bandwidth (MHz)                 |                 |       |       |
|--------------------------------------|-----------------|-------|-------|
| Modulation                           | Frequency (MHz) |       |       |
|                                      | 2402            | 2442  | 2480  |
| <b>GFSK</b>                          | 0.922           | 0.922 | 0.855 |
| <b><math>\pi/4</math> DQPSK</b>      | 1.177           | 1.178 | 1.179 |
| <b>8-DPSK</b>                        | 1.220           | 1.222 | 1.222 |
| Measurement Uncertainty: $\pm 1$ kHz |                 |       |       |

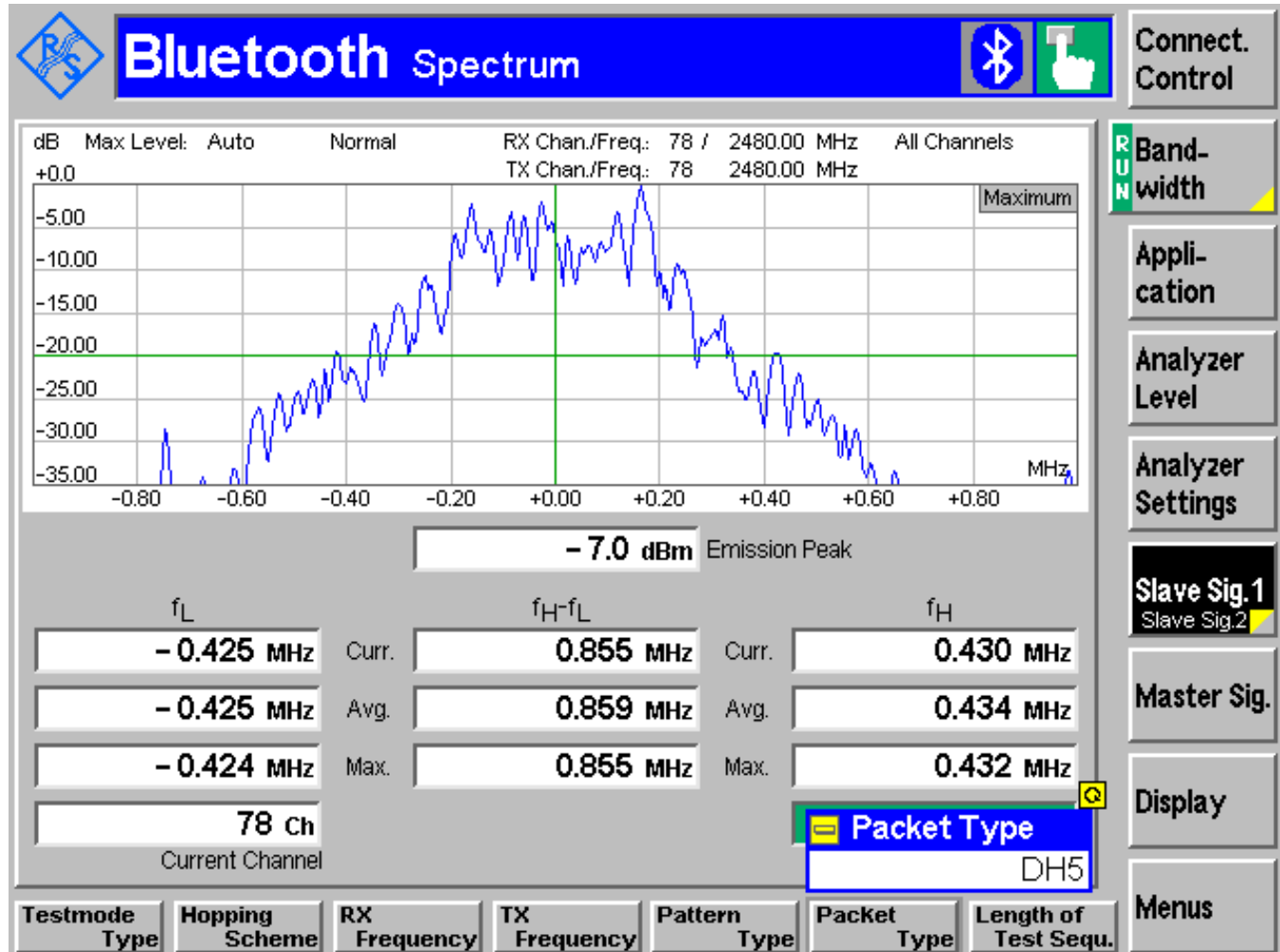
RBW=VBW=10 kHz

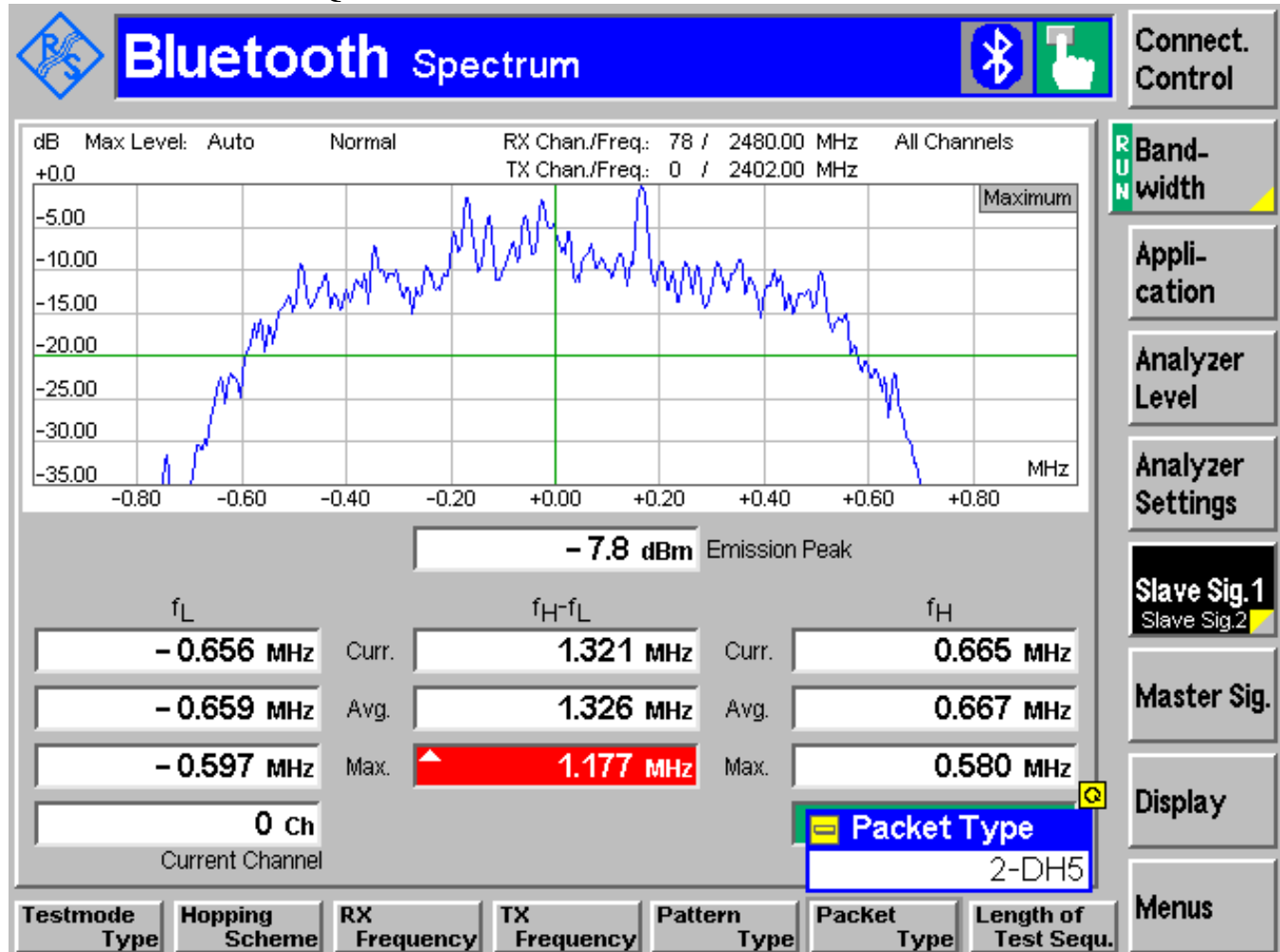
**5.5.3 Test Data/plots:****20dB Bandwidth GFSK 2402MHz**

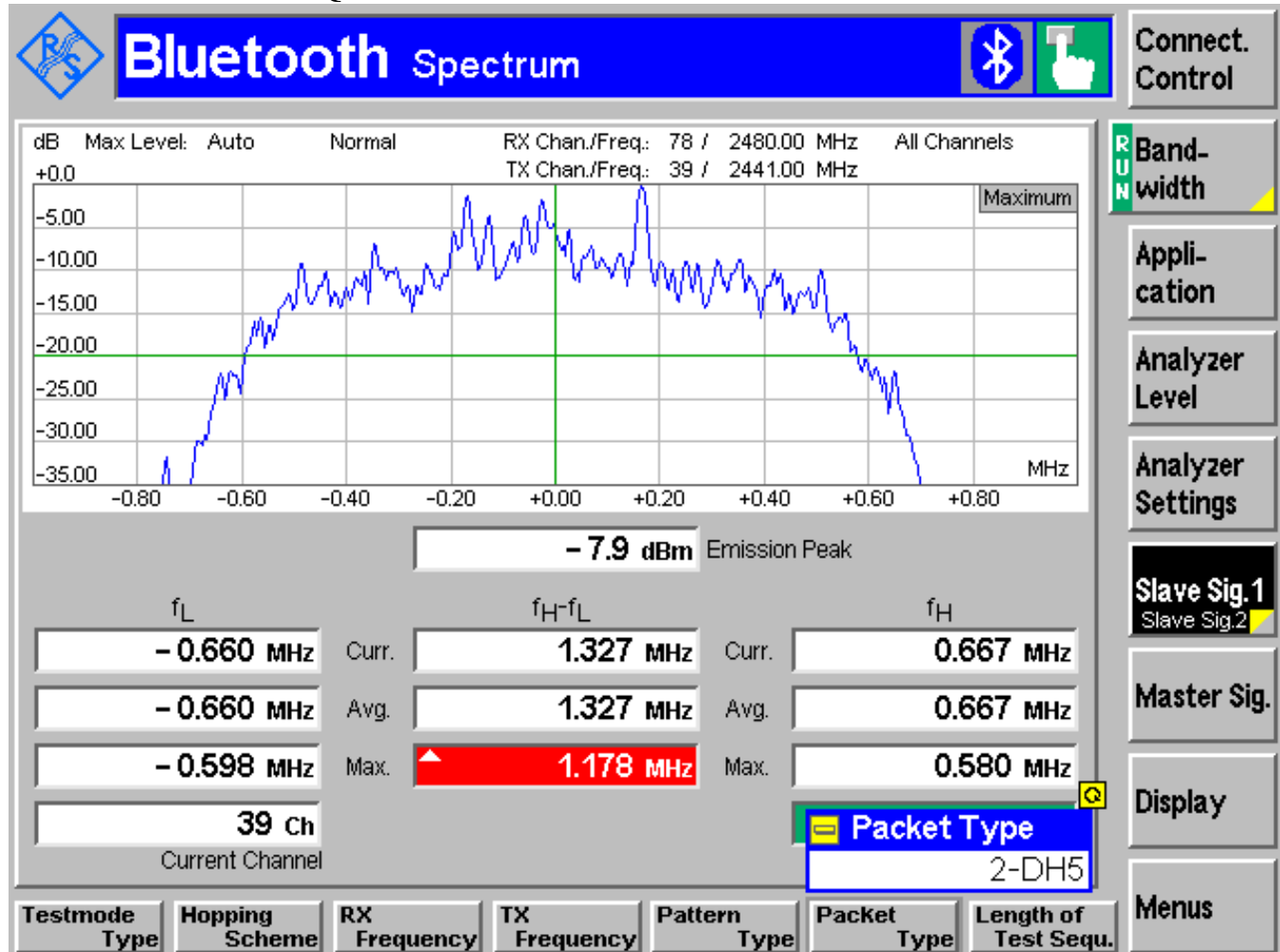
## 20dB Bandwidth GFSK 2441MHz

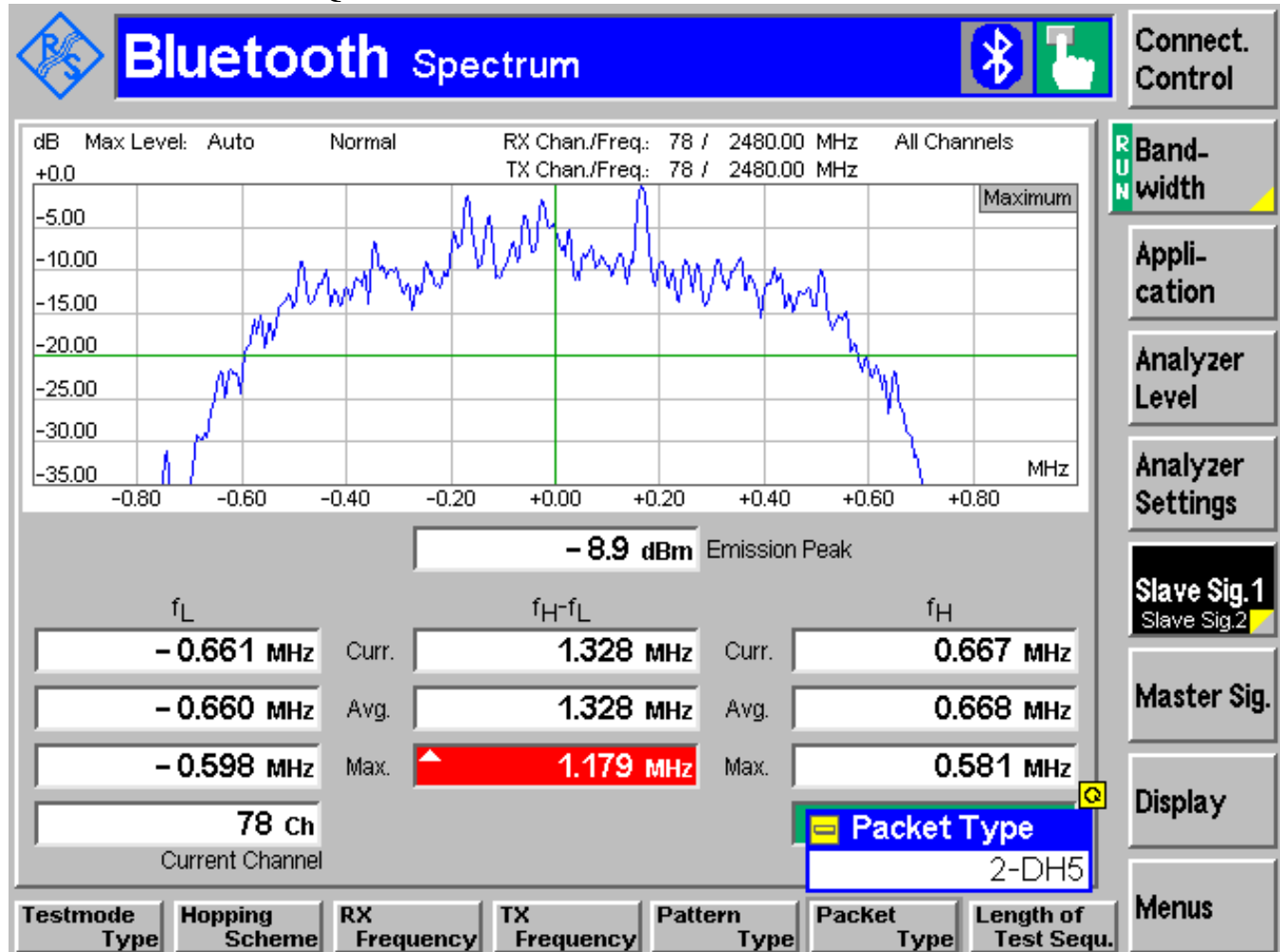


## 20dB Bandwidth GFSK 2480MHz

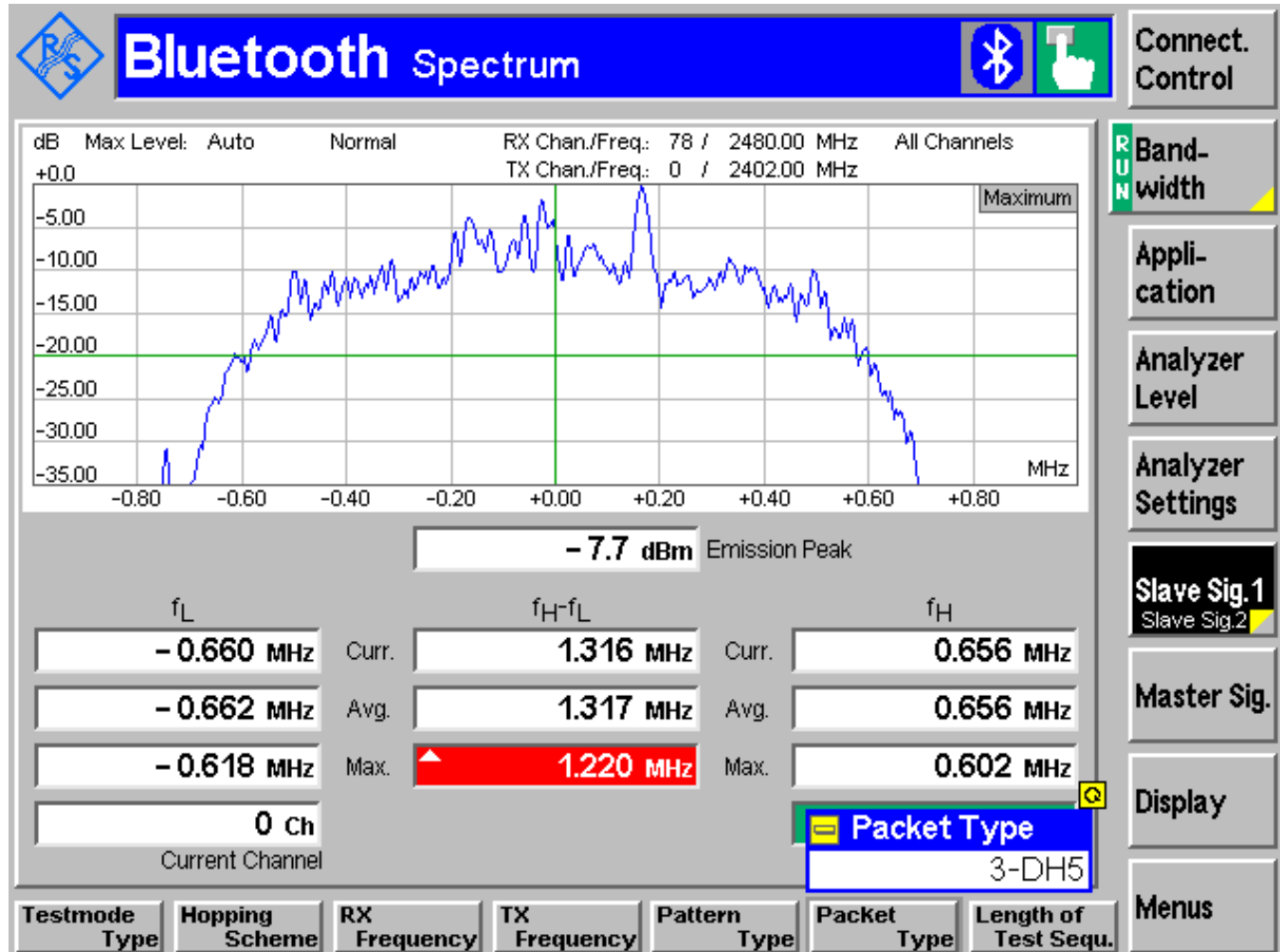


20dB Bandwidth  $\pi / 4$  DQPSK 2402MHz

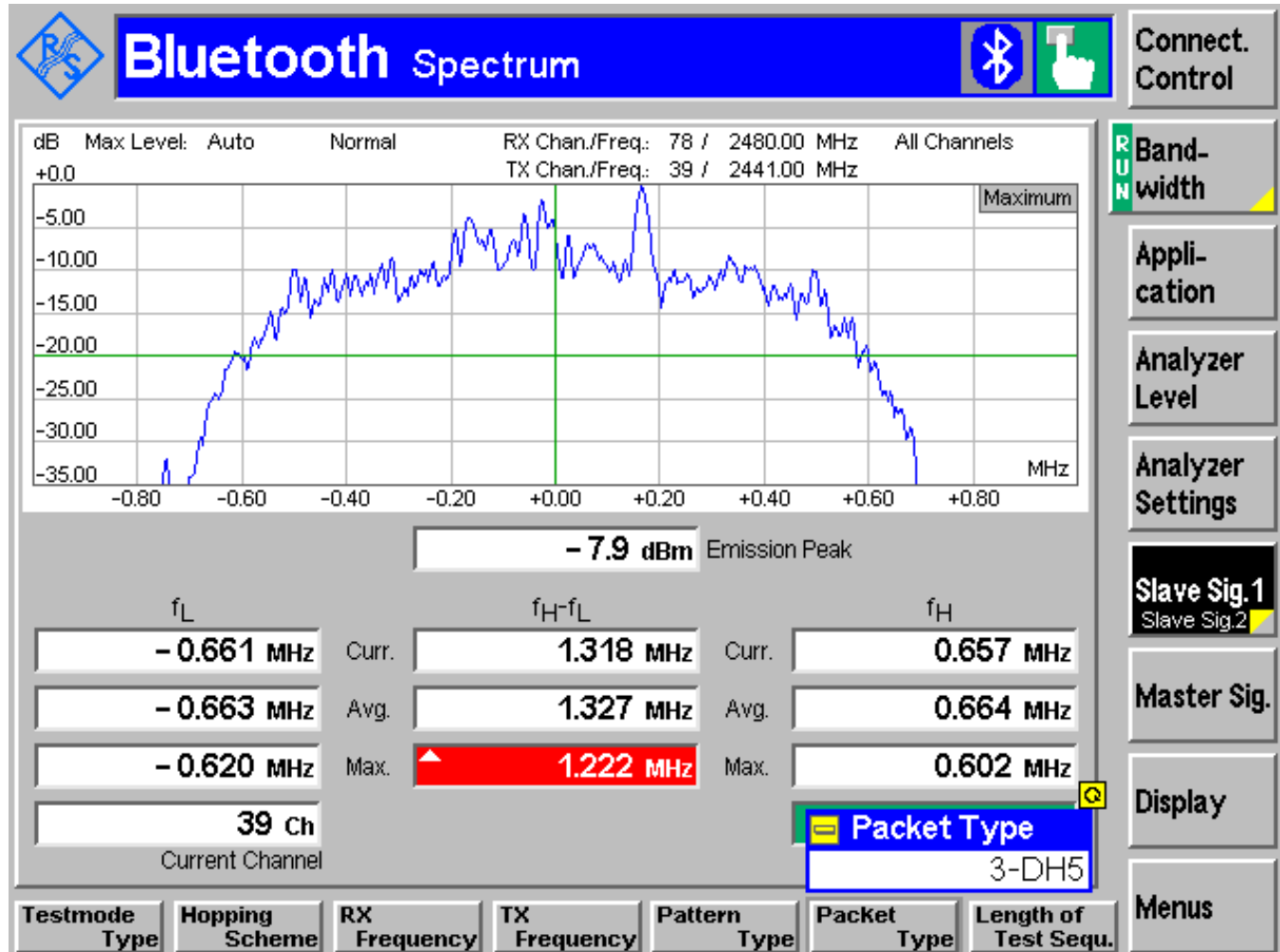
20dB Bandwidth  $\pi / 4$  DQPSK 2441MHz

20dB Bandwidth  $\pi / 4$  DQPSK 2480MHz

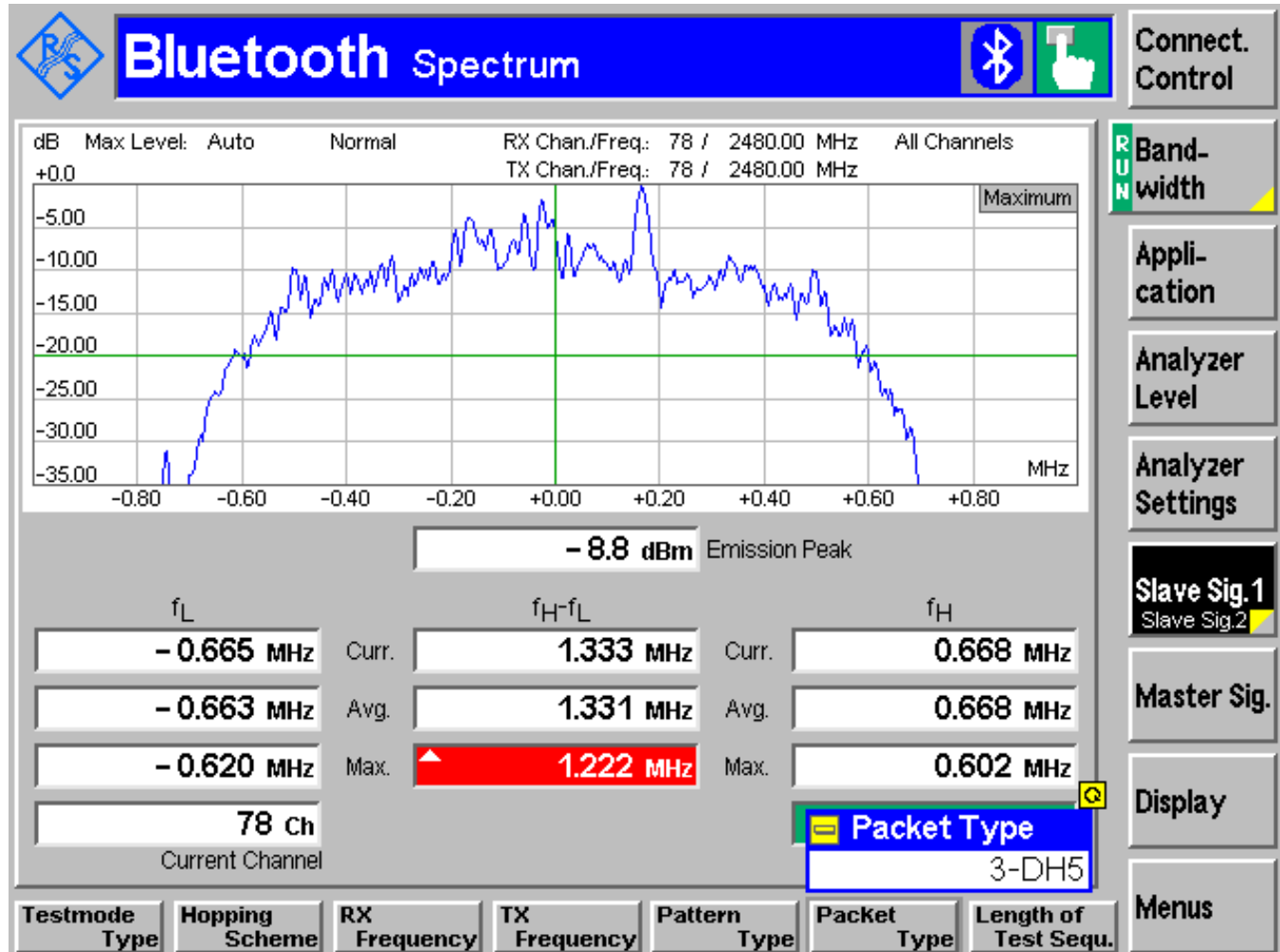
## 20dB Bandwidth 8PSK 2402MHz



## 20dB Bandwidth 8PSK 2441MHz



## 20dB Bandwidth 8PSK 2480MHz



## 5.6 Carrier Frequency Separation

### 5.6.1 Limits: § 15.247 (a) (1)

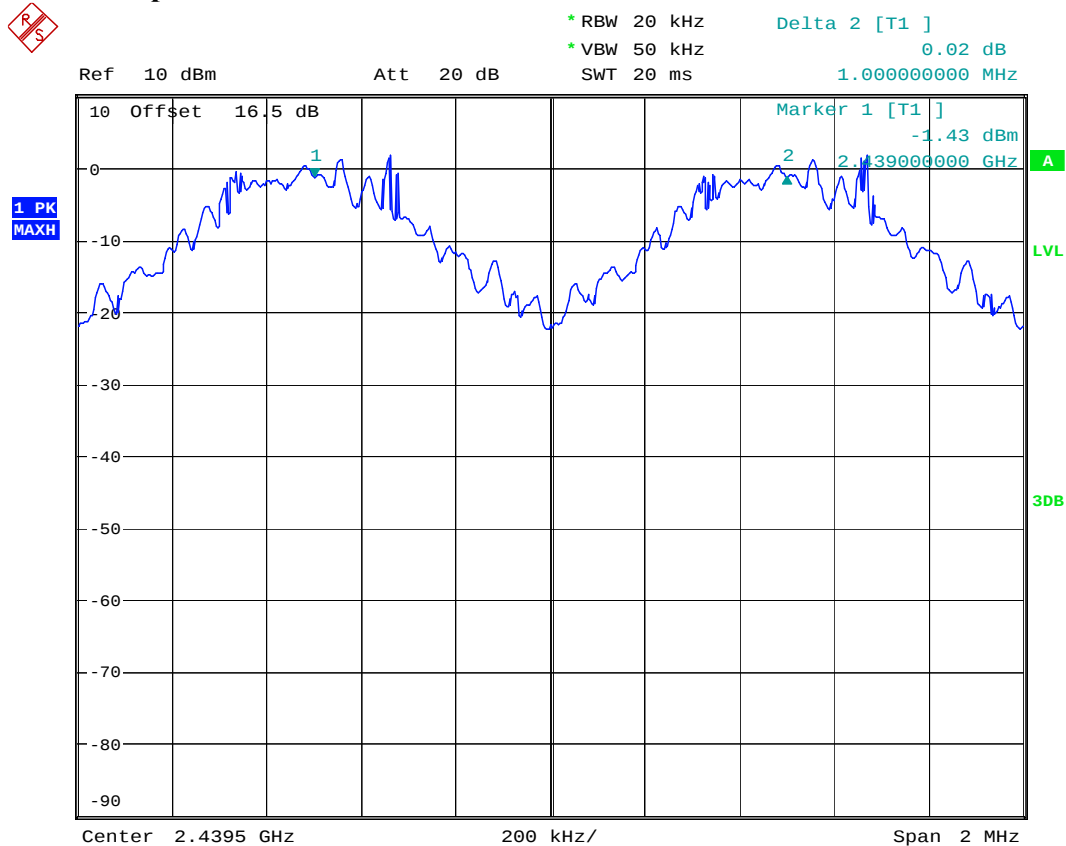
Minimum 25kHz or 2/3 of the 20dB bandwidth of the hopping system

### 5.6.2 Test Result:

Modulation: GFSK

Channel Separation: 1.0 MHz

### 5.6.3 Test Data/plot:



Date: 30.JAN.2010 14:33:06

## 5.7 Number of hopping channels

### 5.7.1 Limits: § 15.247 (a) (1)

Atleast 15 non-overlapping channels

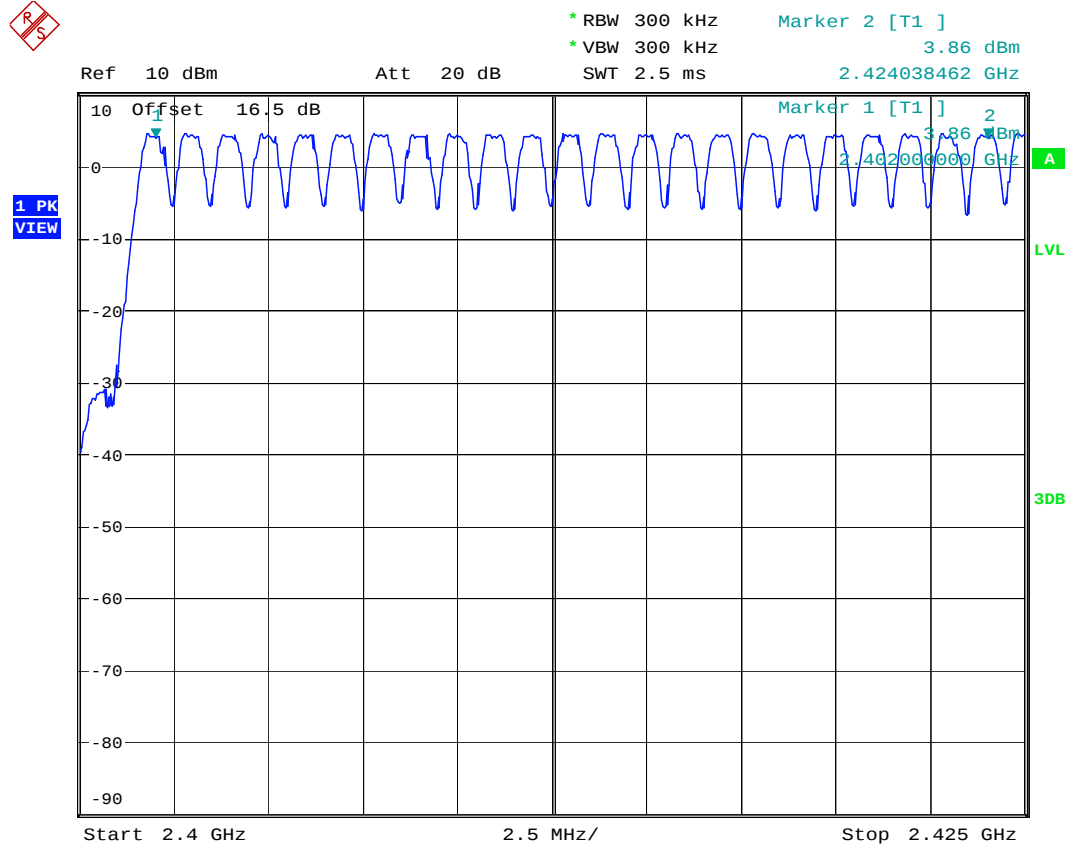
### 5.7.2 Test Result:

Modulation: GFSK

Number of hopping channels: 79

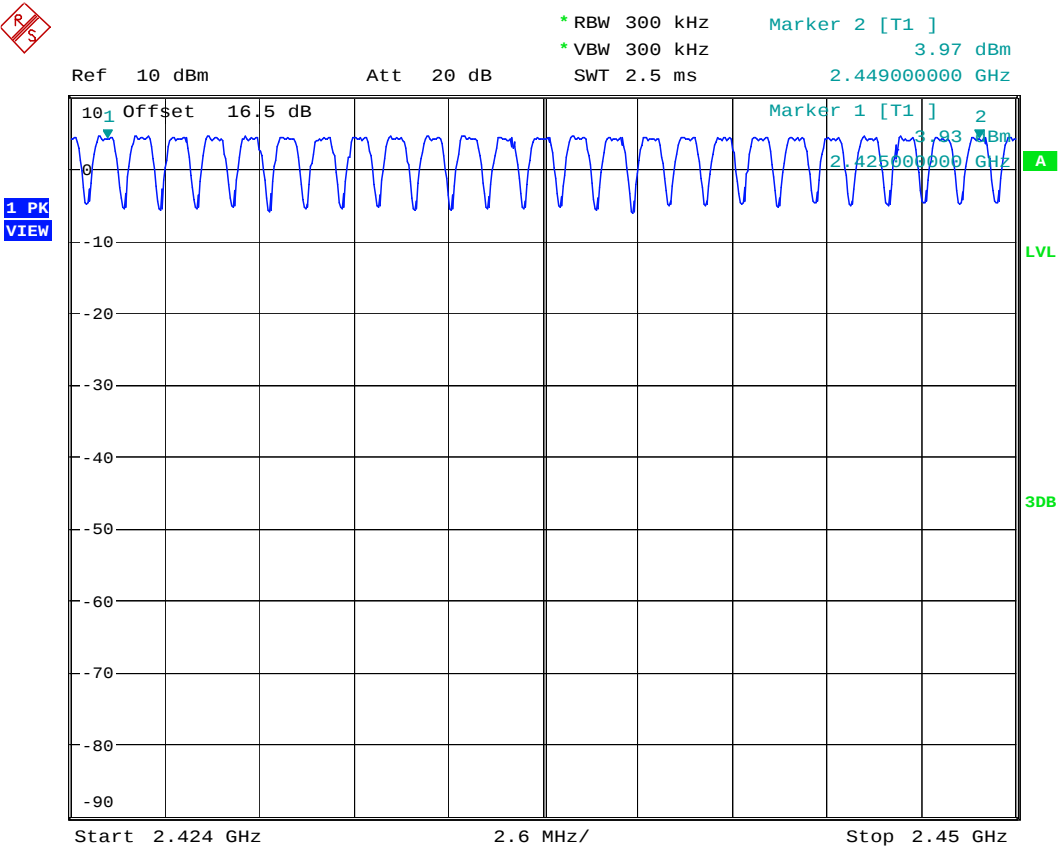
### 5.7.3 Test Data/plot:

2402 – 2424 MHz





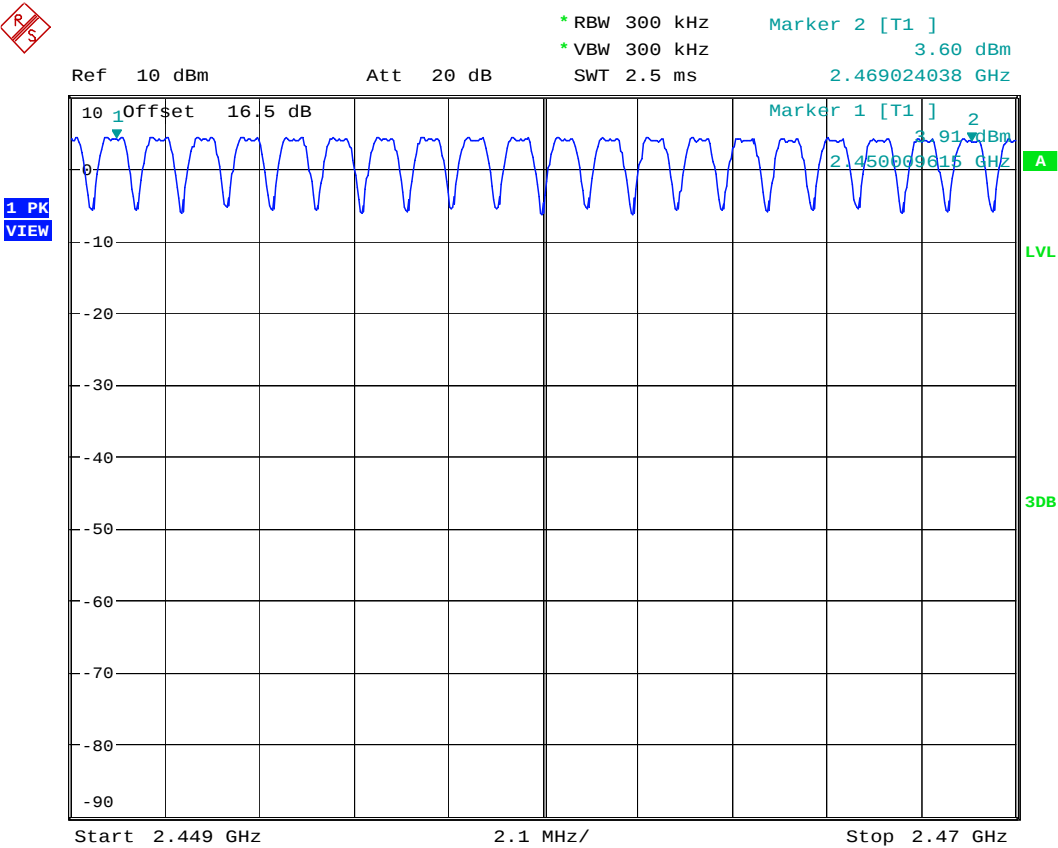
2425-2449 MHz



Date: 30.JAN.2010 12:46:10



2450-2469MHz



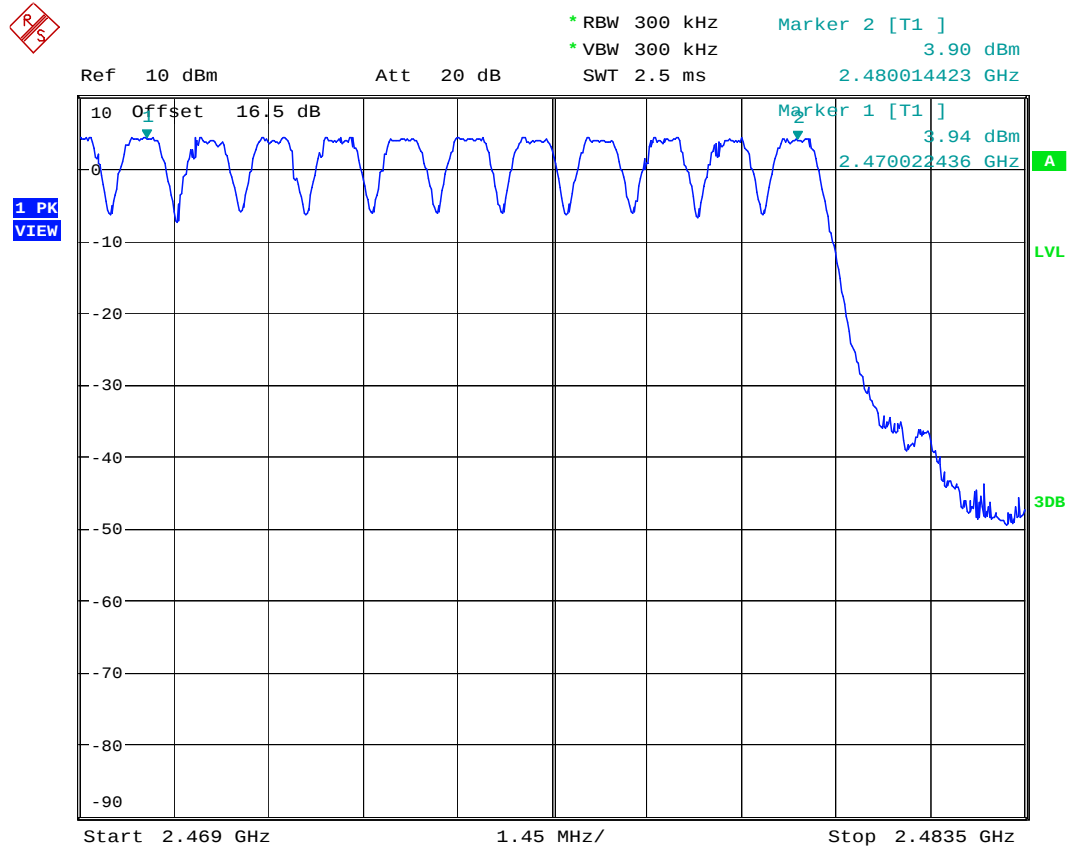
Test Report #: EMC\_001\_09003\_15.247\_BT

Date of Report : 2010-04-07

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## 2470-2480 MHz



Date: 30.JAN.2010 14:35:51

## 5.8 Time of occupancy (Dwell time)

### 5.8.1 Limits: § 15.247 (a) (1) (iii)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

### 5.8.2 Test Result:

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

This is according to Bluetooth Core Specification for all Bluetooth devices. Therefore all BT devices satisfy FCC requirement on time of occupancy (dwell time) in the data mode.

## 5.9 Power Spectral Density (Hybrid system in Inquiry mode/ Page scan)

### 5.9.1 Limits: § 15.247 (e)

For digitally modulated systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

### 5.9.2 Test Result:

Not Applicable.

**5.10 Transmitter Spurious Emissions- Conducted****5.10.1 Limits: § 15.247 (d)**

30dBm for the transmitter.

-20dBc in the frequency range 30MHz- 25GHz.

**5.10.2 Test Conditions:**

Modulation: GFSK

Analyzer settings: Frequency 9kHz-200kHz: RBW=3kHz, VBW=10 kHz

Frequency 200kHz-30MHz: RBW=VBW=100 kHz

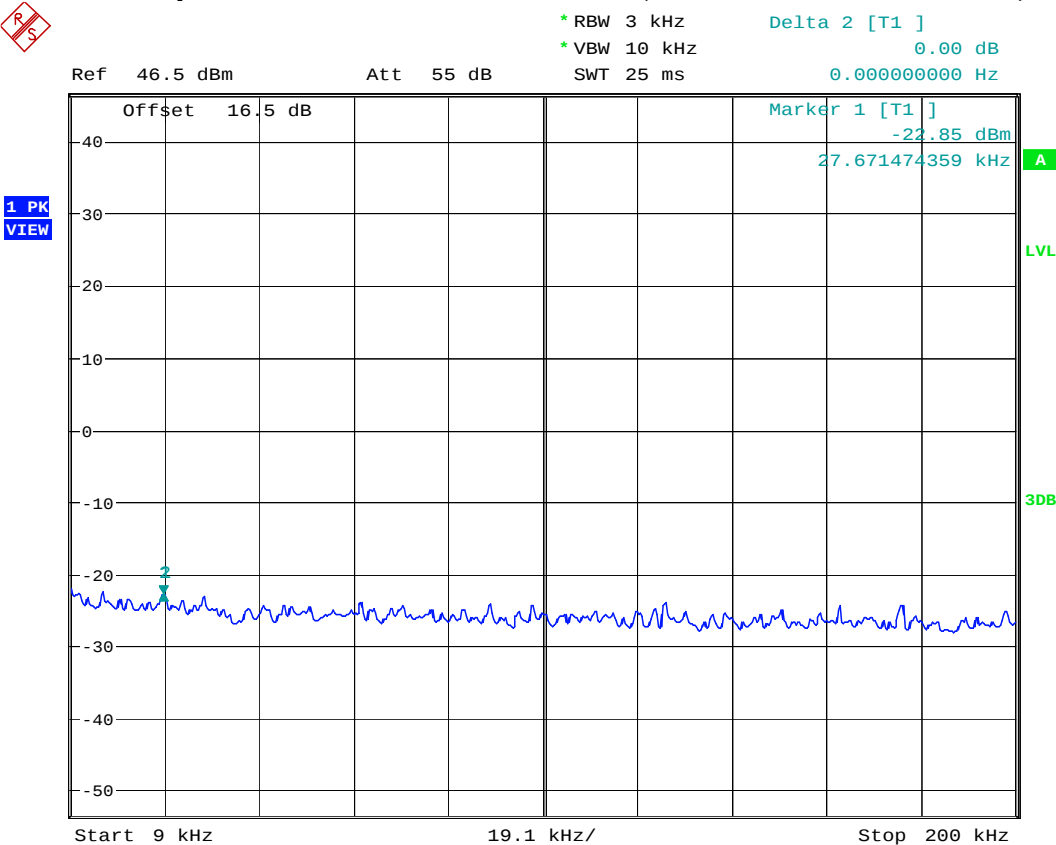
Frequency 30MHz-25GHz: RBW=100kHz, VBW=300kHz

**5.10.3 Test data/ plots:**

| Conducted Spurious Emissions   |                   |                 |        |
|--------------------------------|-------------------|-----------------|--------|
| Channel                        | Frequency (MHz)   | Amplitude (dBm) | Limits |
| Low                            | 2402              | 2.62            | 30dBm  |
|                                | No critical peaks |                 | -20dBc |
|                                |                   |                 |        |
| Mid                            | 2442              | 0.14            | 30 dBm |
|                                | No critical peaks |                 | -20dBc |
|                                |                   |                 |        |
| High                           | 2480              | 2.91            | 30 dBm |
|                                | No critical peaks |                 | -20dBc |
|                                |                   |                 |        |
| Measurement Uncertainty: ±1 dB |                   |                 |        |

5.10.4 Test data/ plots:

Conducted Spurious Emission 9kHz – 200kHz (Worst case for all channels)

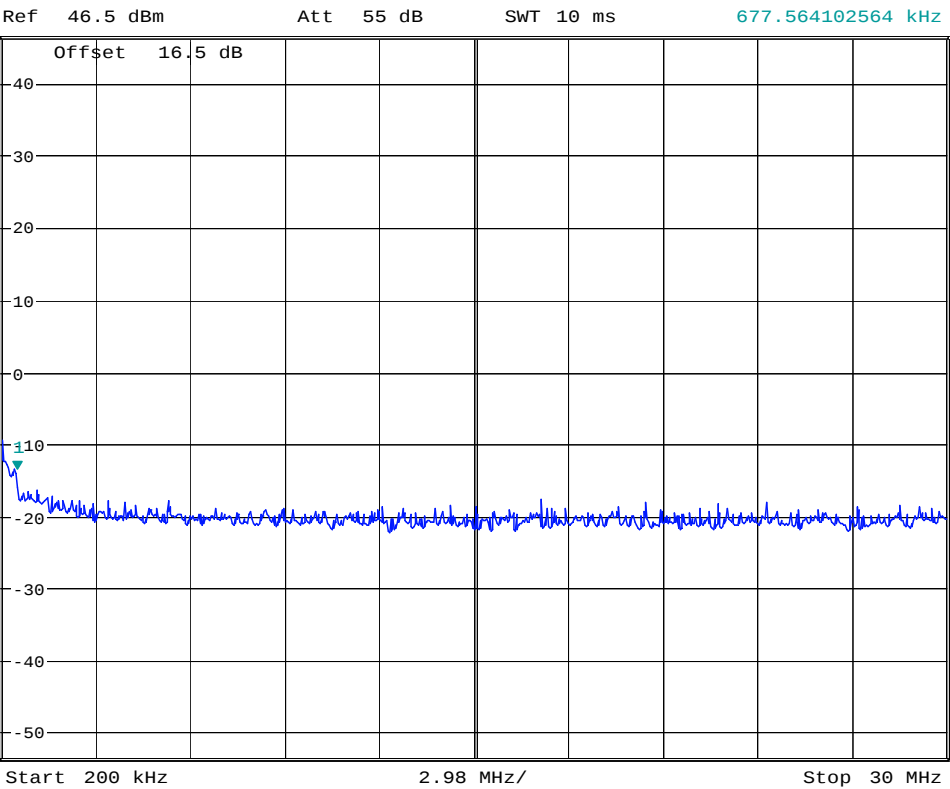




Conducted Spurious Emission 200kHz – 30MHz (Worst case for all channels)



\* RBW 100 kHz      Marker 1 [T1 ]  
\* VBW 100 kHz      -13.66 dBm  
SWT 10 ms      677.564102564 kHz



# Conducted Spurious Emission 30MHz – 25GHz Ch 0



\* RBW 100 kHz

Marker 1 [T1 ]

\* VBW 300 kHz

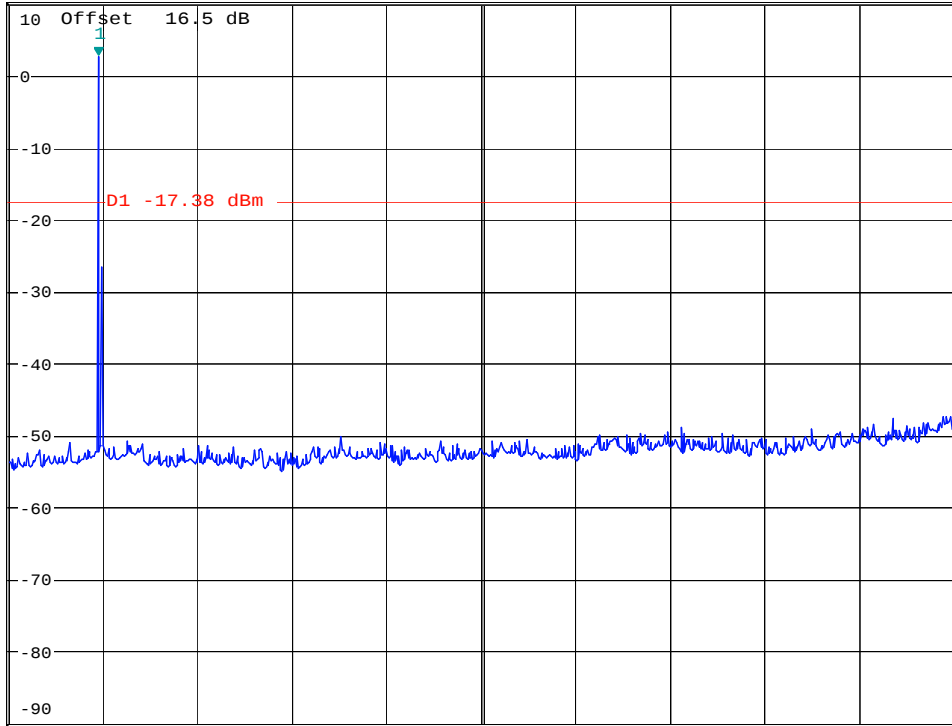
2.62 dBm

SWT 2.5 s

2.390945513 GHz

Ref 10 dBm

Att 20 dB



Start 30 MHz

2.497 GHz/

Stop 25 GHz

Date: 30.JAN.2010 14:39:40

Test Report #: EMC\_001\_09003\_15.247\_BT

Date of Report : 2010-04-07

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## Conducted Spurious Emission 30MHz – 25GHz Ch 39



\* RBW 100 kHz

Marker 1 [T1 ]

\* VBW 300 kHz

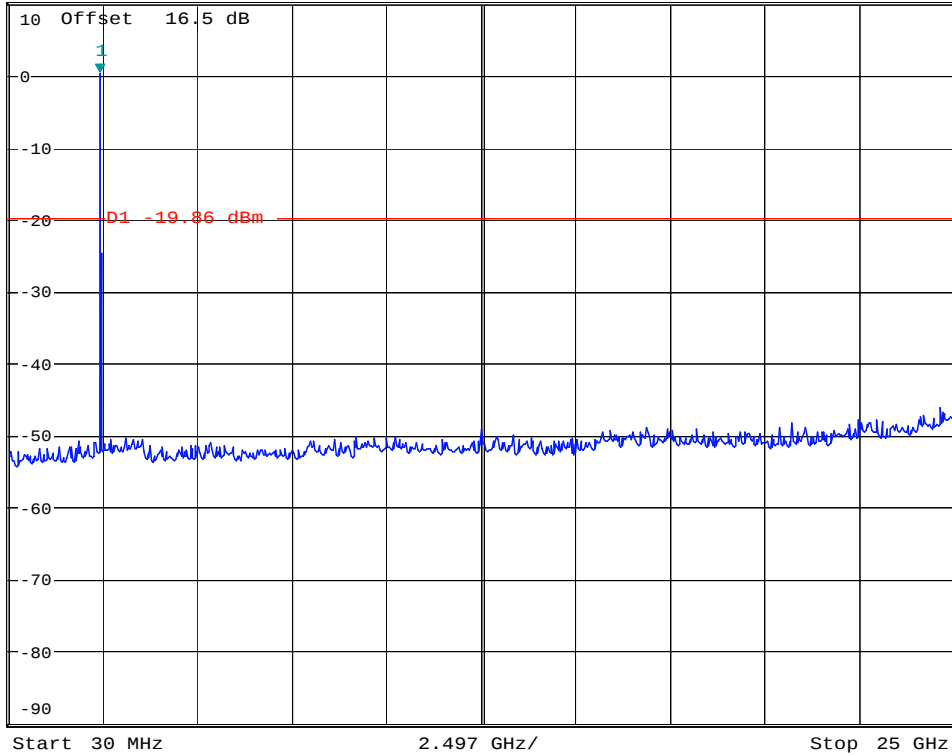
0.14 dBm

SWT 2.5 s

2.430961538 GHz

Ref 10 dBm

Att 20 dB

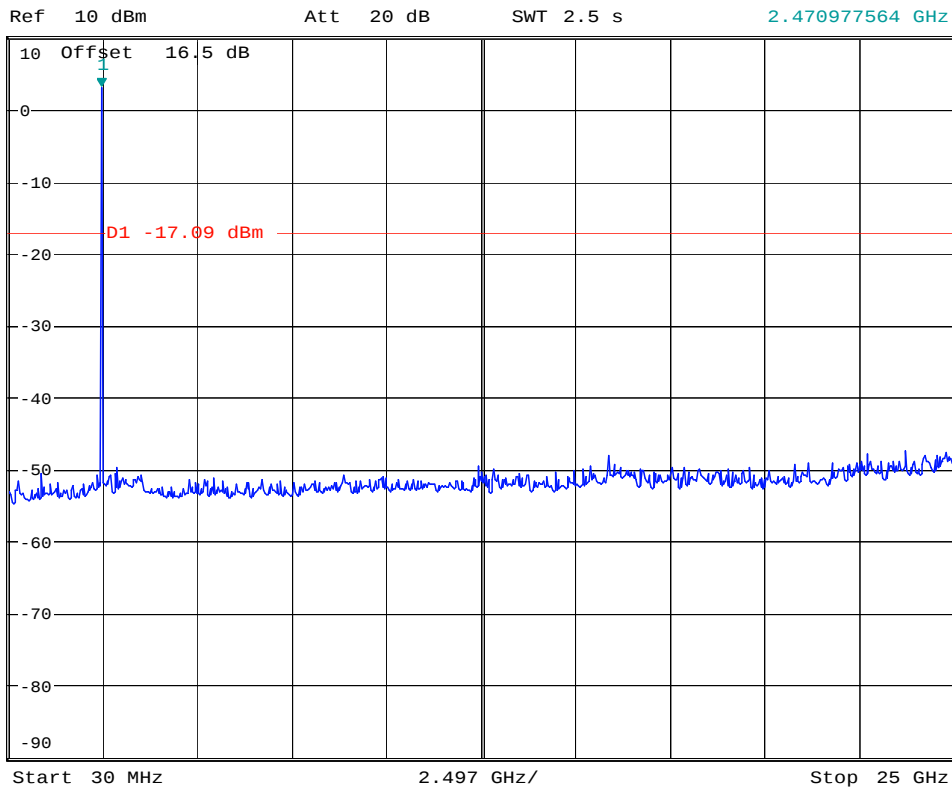


Date: 30.JAN.2010 14:41:20

# Conducted Spurious Emission 30MHz – 25GHz Ch 78



\* RBW 100 kHz  
 \* VBW 300 kHz  
 Marker 1 [T1 ]  
 2.91 dBm  
 2.470977564 GHz



Date: 30.JAN.2010 14:43:16

## 5.11 Transmitter Spurious Emissions- Radiated

### 5.11.1 Limits: §15.247/15.205

(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              |                       |                 |                  |

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. 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)).

\*PEAK LIMIT= 74dB $\mu$ V/m

\*AVG. LIMIT= 54dB $\mu$ V/m

### 5.11.2 Limits: §15.209

(For measurement distance of 3m)

| Frequency of emission (MHz) | Field strength ( $\mu$ V/m) |
|-----------------------------|-----------------------------|
| 30–88                       | 100 (40dB $\mu$ V/m)        |
| 88–216                      | 150 (43.5 dB $\mu$ V/m)     |
| 216–960                     | 200 (46 dB $\mu$ V/m)       |
| Above 960                   | 500 (54 dB $\mu$ V/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 within the plots.

**5.11.3 Limits: §15.209**

| Frequency of emission (MHz) | Field strength (μV/m) | Measurement Distance (m) |
|-----------------------------|-----------------------|--------------------------|
| 0.009–0.490                 | 2400/F(kHz)           | 300                      |
| 0.490–1.705                 | 24000/F(kHz)          | 30                       |
| 1.705–30.0                  | 30                    | 30                       |

**5.11.4 Test Result:**

No significant emissions measurable. Plots reported here represent the worse case emissions for all operating modes.

| Frequency of emission | Result                              |
|-----------------------|-------------------------------------|
| 9KHz – 30MHz          | No significant emissions measurable |

**5.11.5 Test data/ plots:****30MHz – 1GHz**

NOTE: Worst case for all channels

Description:

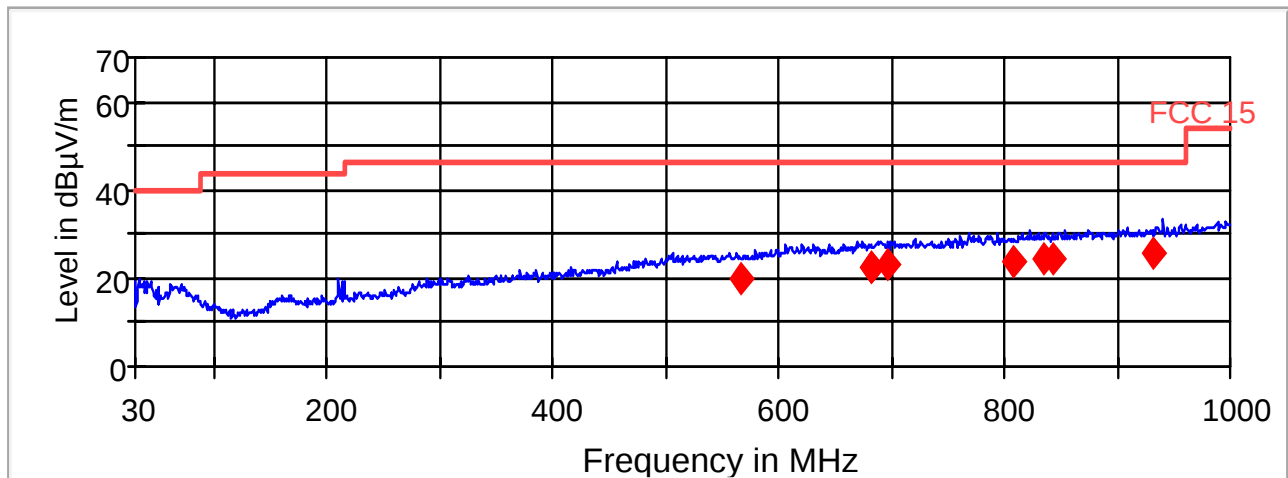
EUT Name: V01B  
Manufacturer: Dell Inc.

Test Mode: BT CH 39  
Voltage: ac adapter

**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) |
|-----------------|--------------------|-----------------|-----------------|---------------------|----------|--------------------------|------------|-------------|----------------|
| 567.290760      | 20.0               | 20.000          | 120.000         | 270.0               | H        | 210.0                    | 21.8       | 26.0        | 46.0           |
| 681.649410      | 22.5               | 20.000          | 120.000         | 186.0               | H        | 287.0                    | 24.3       | 23.5        | 46.0           |
| 682.919975      | 22.5               | 20.000          | 120.000         | 256.0               | H        | 45.0                     | 24.4       | 23.5        | 46.0           |
| 696.619380      | 22.9               | 20.000          | 120.000         | 143.0               | H        | 1.0                      | 24.7       | 23.1        | 46.0           |
| 807.303862      | 23.9               | 20.000          | 120.000         | 270.0               | H        | 309.0                    | 25.5       | 22.1        | 46.0           |
| 835.777081      | 24.3               | 20.000          | 120.000         | 153.0               | H        | 64.0                     | 25.9       | 21.7        | 46.0           |
| 842.716718      | 24.5               | 20.000          | 120.000         | 199.0               | H        | 315.0                    | 25.9       | 21.5        | 46.0           |
| 931.784077      | 25.6               | 20.000          | 120.000         | 120.0               | H        | 315.0                    | 26.8       | 20.4        | 46.0           |

FCC 15 30-1000MHz



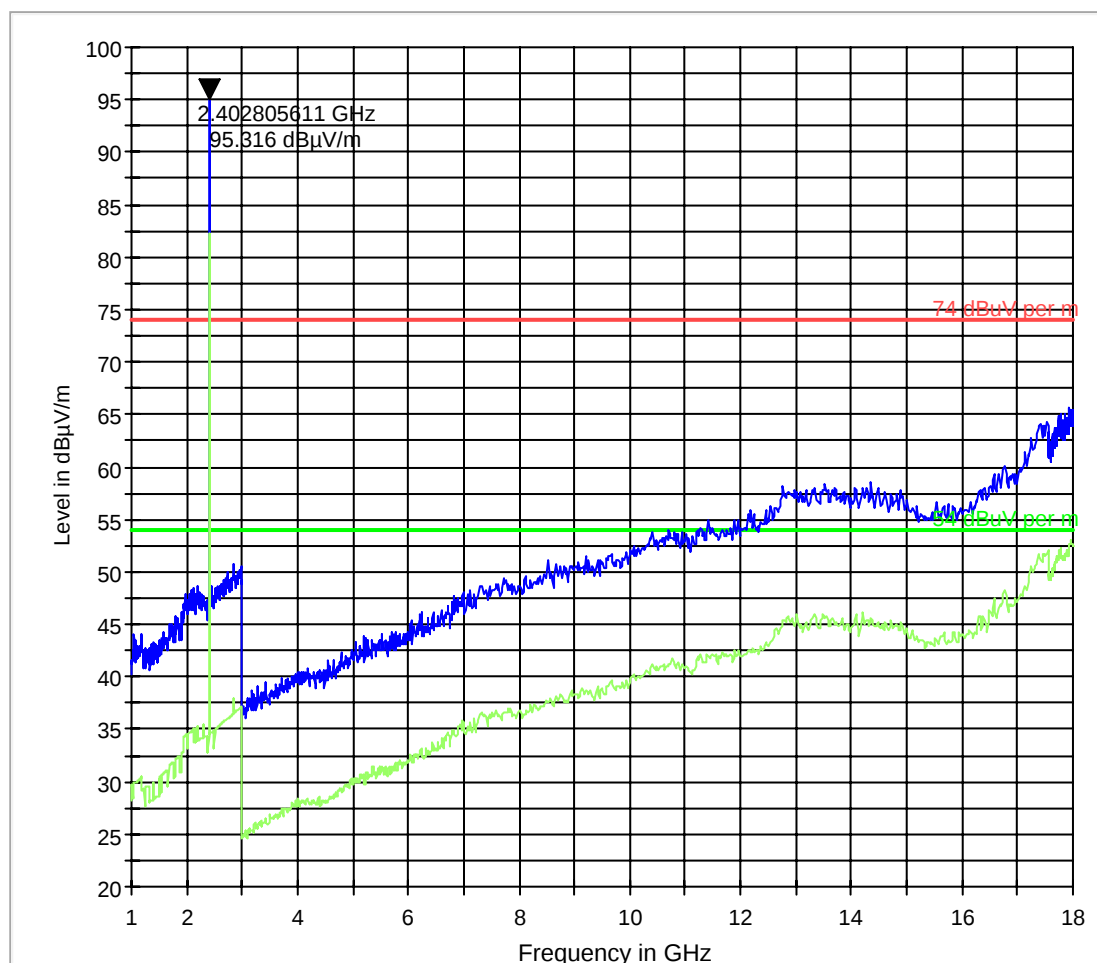
— FCC 15.LimitLine      — Preview Result 1      ♦ Final Result 1

# 1GHz – 18GHz Channel 0

**NOTE: Peak over the limit is the carrier frequency**

EUT Name: V01B  
 Manufacturer: Dell Inc.  
 Test Mode: BT CH 0  
 Voltage: ac adapter

FCC 15 1-18GHz



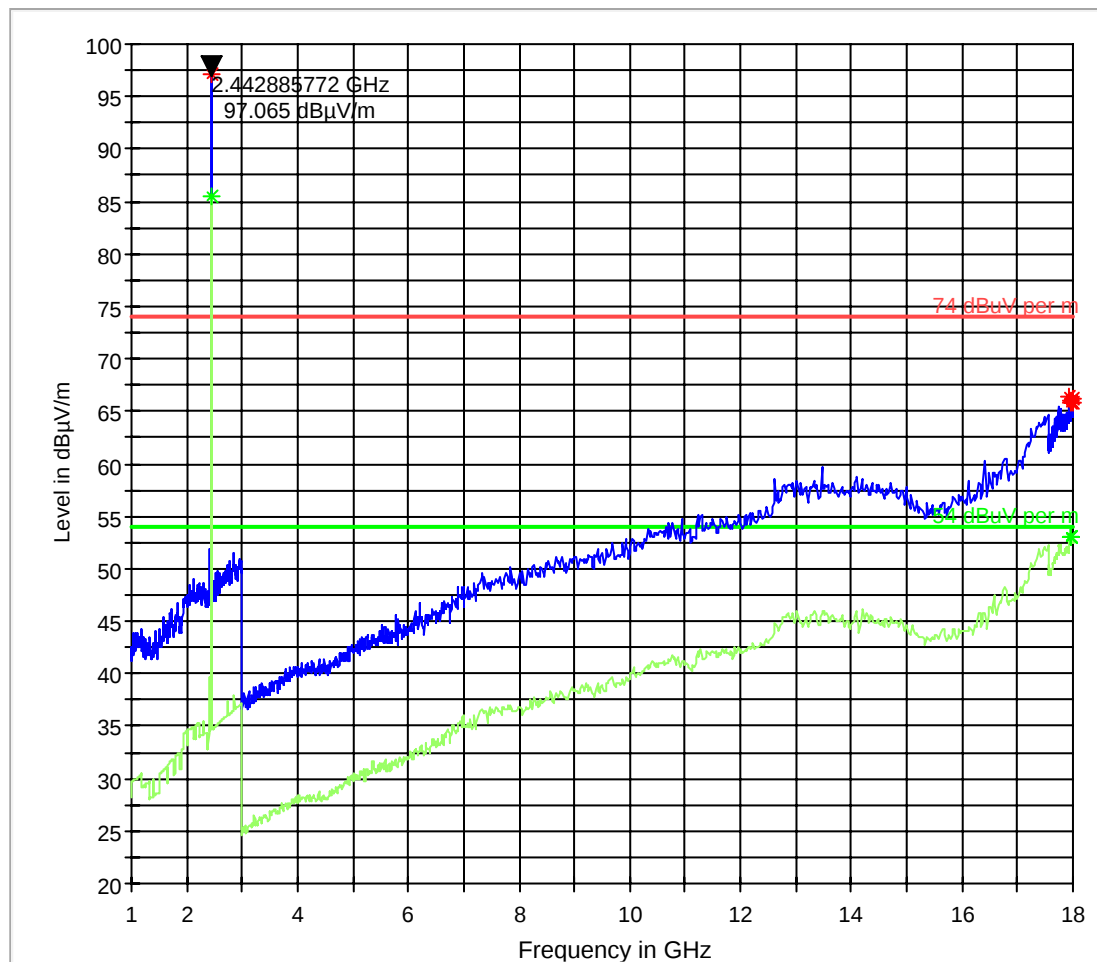
— 74 dBuV per m.LimitLine  
— Preview Result 1  
— 54 dBuV per m.LimitLine  
— Preview Result 2

**1GHz – 18GHz Channel 39**

NOTE: Peak over the limit is the carrier frequency

EUT Name: V01B  
Manufacturer: Dell Inc.  
  
Test Mode: BT CH 39  
Voltage: ac adapter

FCC 15 1-18GHz



74 dBμV per m.LimitLine  
Preview Result 2

54 dBμV per m.LimitLine  
\* Data Reduction 1 [2]

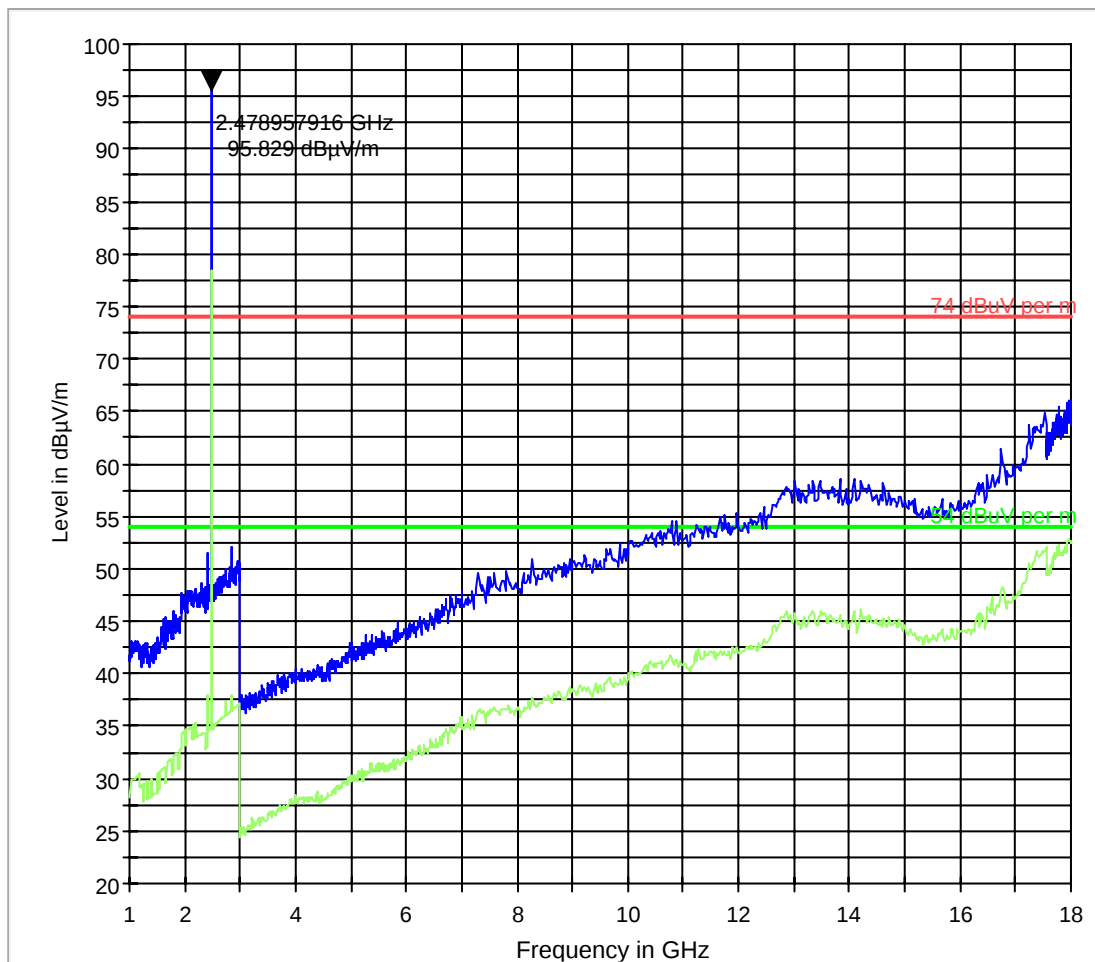
Preview Result 1  
\* Data Reduction 2 [2]

# 1GHz – 18GHz Channel 78

NOTE: Peak over the limit is the carrier frequency

EUT Name: V01B  
 Manufacturer: Dell Inc.  
 Test Mode: BT CH 78  
 Voltage: ac adapter

FCC 15 1-18GHz



74 dBuV per m.LimitLine  
 Preview Result 1

54 dBuV per m.LimitLine  
 Preview Result 2

18GHz – 26GHz

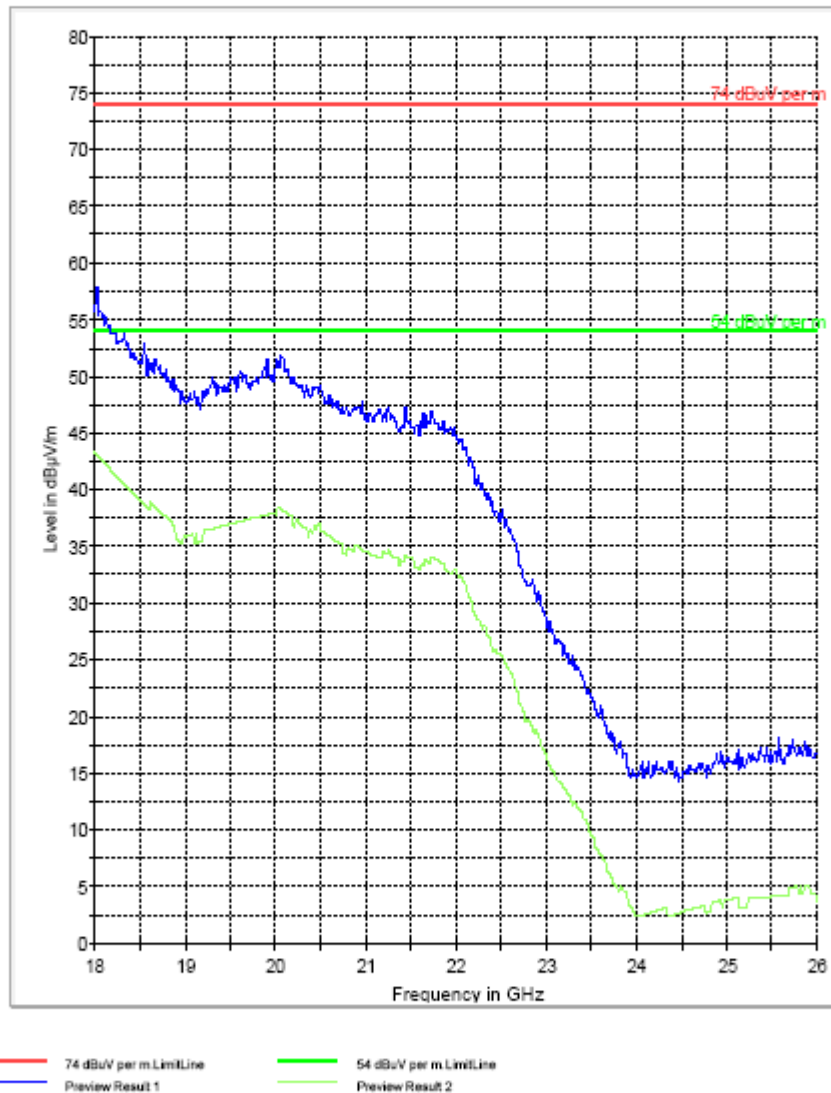
NOTE: Worst case for all channels

EMI Auto Test(1)

1 / 1

## EMI Auto Test(1)

FCC 15 18-26GHz



**5.12 Receiver Spurious Emissions- Radiated****5.12.1 Limits: §15.109**

| Frequency of emission (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 (40dB $\mu\text{V/m}$ )        | 3                        |
| 88–216                      | 150 (43.5 dB $\mu\text{V/m}$ )     | 3                        |
| 216–960                     | 200 (46 dB $\mu\text{V/m}$ )       | 3                        |
| Above 960                   | 500 (54 dB $\mu\text{V/m}$ )       | 3                        |

**5.12.2 Test Conditions:**

Modulation: GFSK

**5.12.3 Test Result:**

No significant emissions measurable. Plots reported here represent the worse case emissions for all operating modes and all channels.

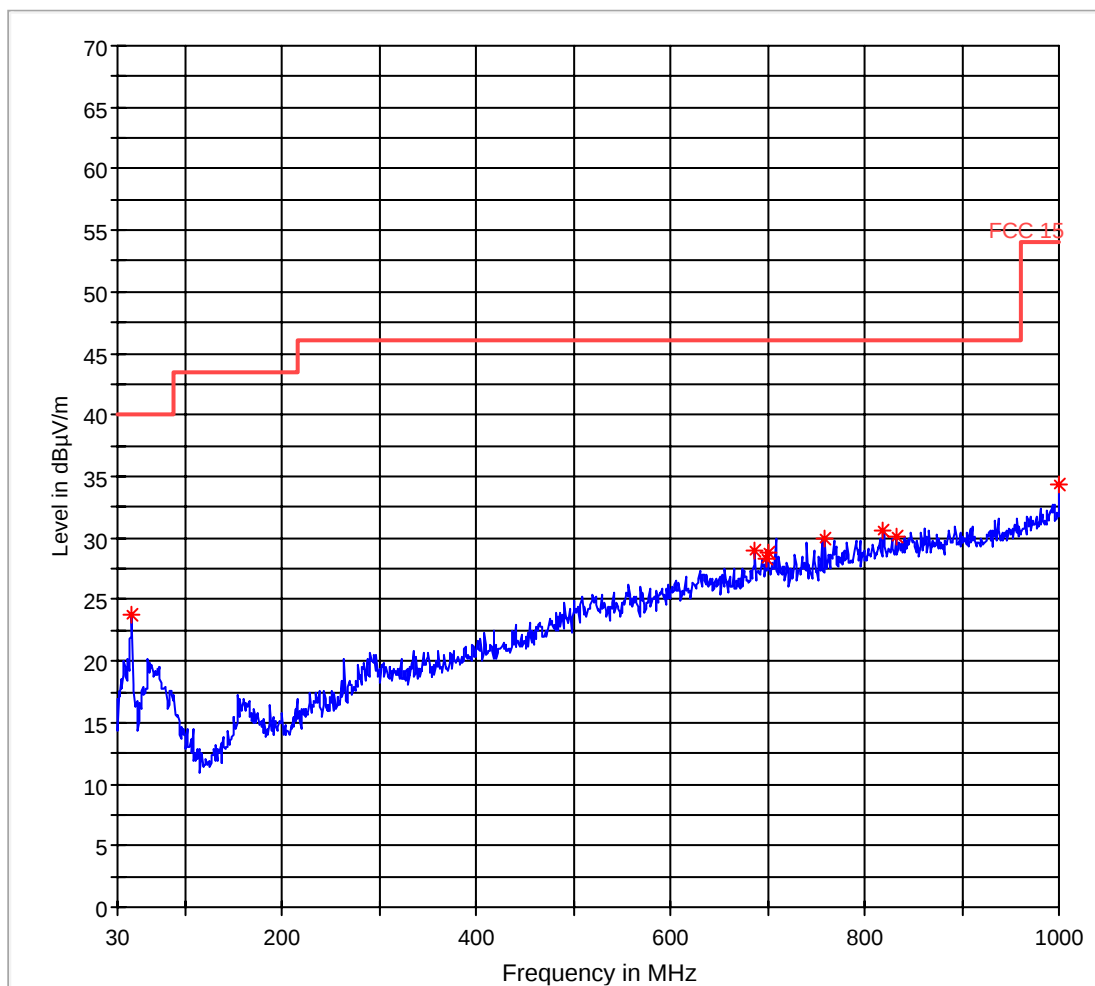
#### 5.12.4 Test data/ plots:

##### 30MHz – 1GHz

EUT Name: V01B  
 Manufacturer: Dell Inc.

Test Mode: BT RX  
 Voltage: ac adapter

FCC 15 30-1000MHz



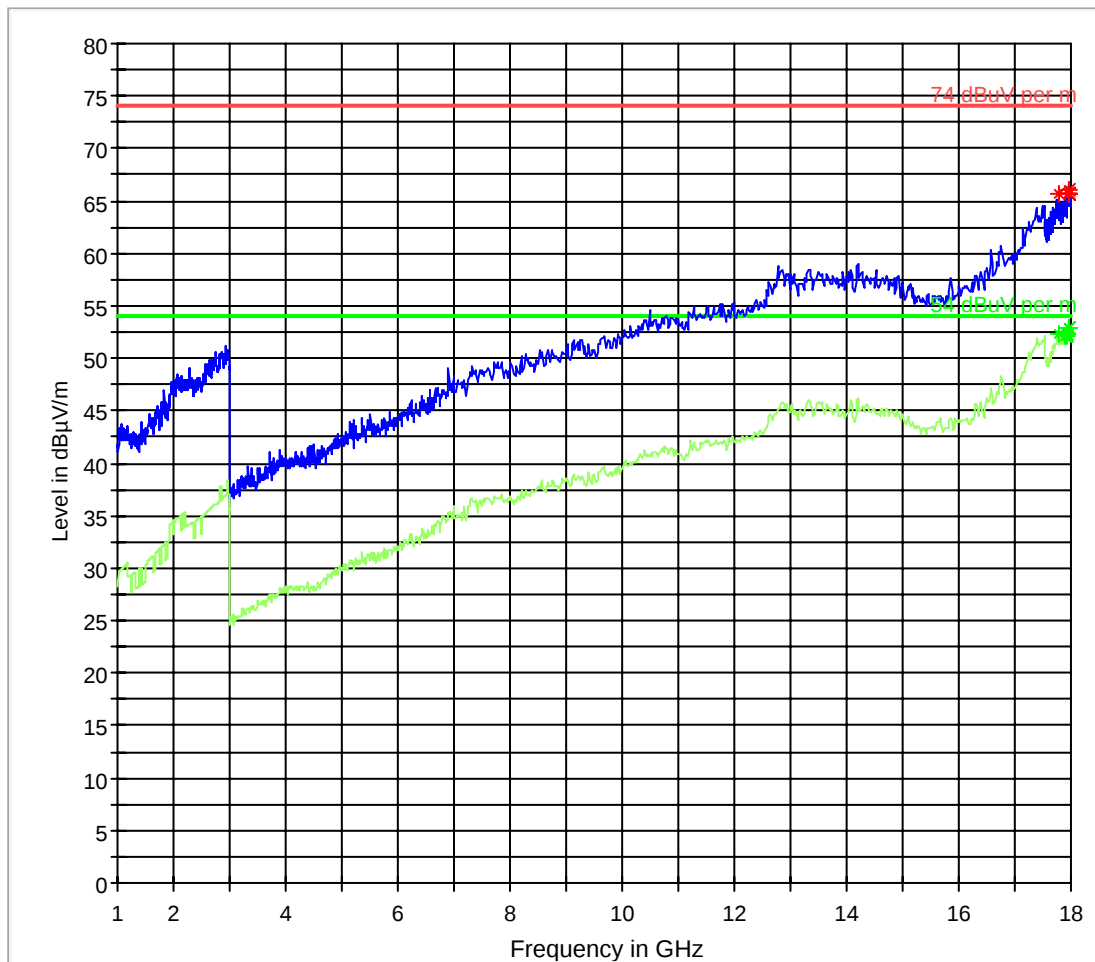
— FCC 15.LimitLine — Preview Result 1 \* Data Reduction 1 [1]

# 1GHz – 18GHz

EUT Name: V01B  
 Manufacturer: Dell Inc.

Test Mode: BT RX  
 Voltage: ac adapter

FCC 15 1-18GHz



— 74 dBuV per m.LimitLine  
— 54 dBuV per m.LimitLine  
— Preview Result 1  
— Preview Result 2  
\* Data Reduction 1 [2]  
\* Data Reduction 2 [2]

### 5.13 AC Power Line Conducted Emissions

#### 5.13.1 Limits: §15.107/15.207

(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator 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  $\mu$ H/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.

| Frequency of emission (MHz) | Conducted limit (dB $\mu$ V) |           |
|-----------------------------|------------------------------|-----------|
|                             | Quasi-peak                   | Average   |
| 0.15–0.5                    | 66 to 56*                    | 56 to 46* |
| 0.5–5                       | 56                           | 46        |
| 5–30                        | 60                           | 50        |

\*Decreases with the logarithm of the frequency.

Analyzer Settings: RBW = 10KHz; VBW = 10KHz

#### 5.13.2 Test Conditions:

Modulation: GFSK

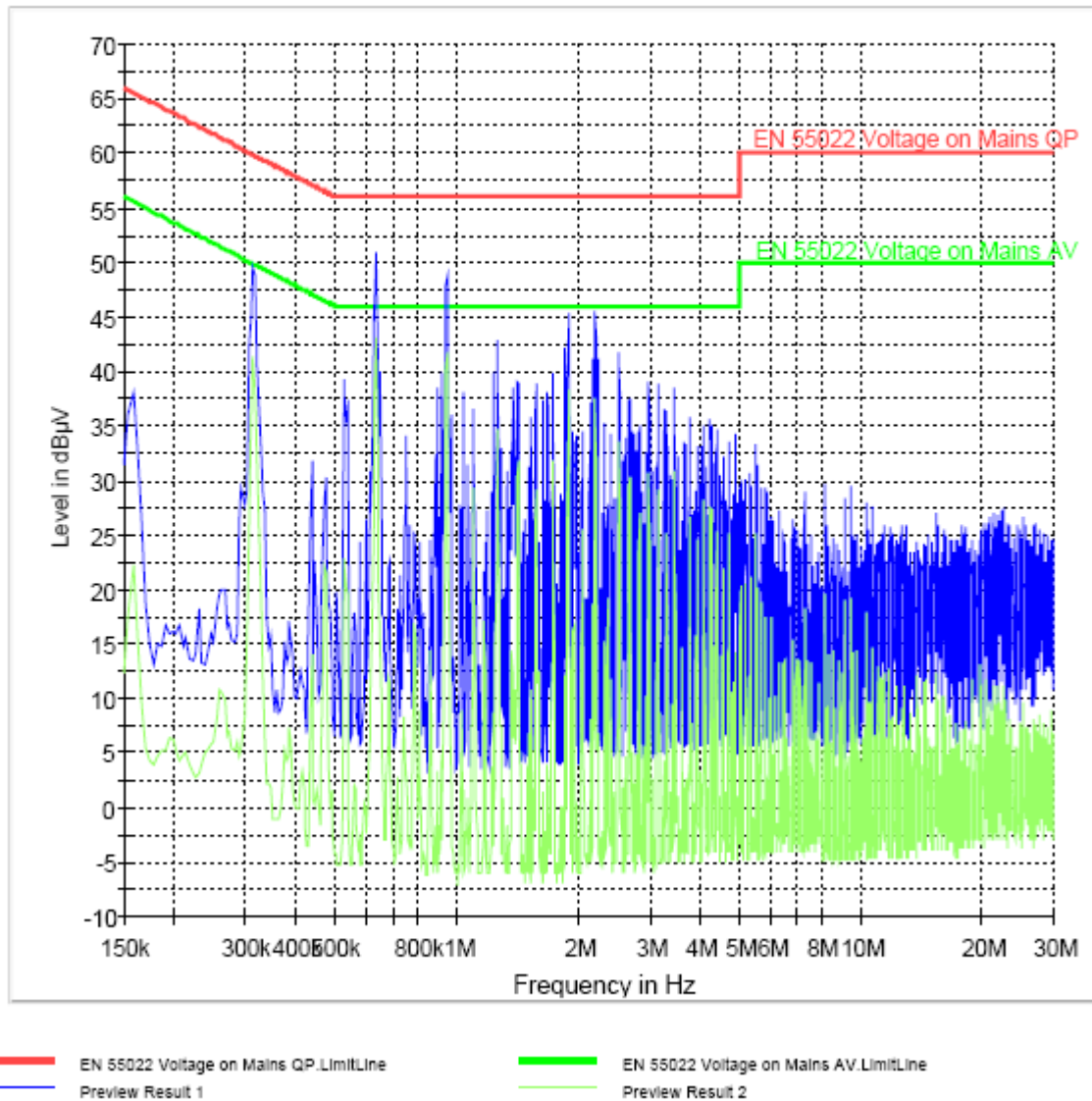
#### 5.13.3 Test Result:

No significant emissions measurable. Plots reported here represent the worse case emissions.

### 5.13.4 Test data/ plots:

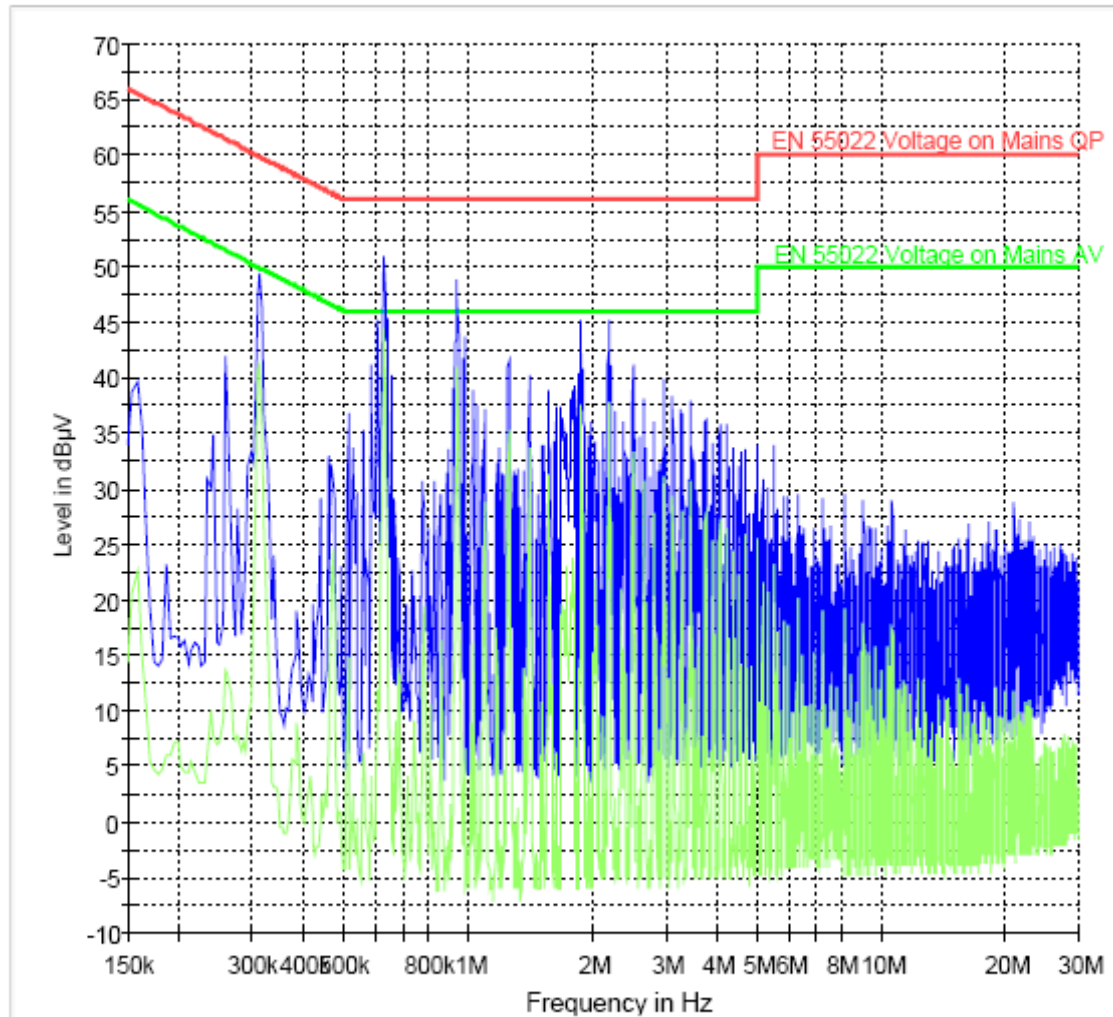
#### TX Mode

CISPR 22 Mains Conducted



## RX Mode

### CISPR 22 Mains Conducted



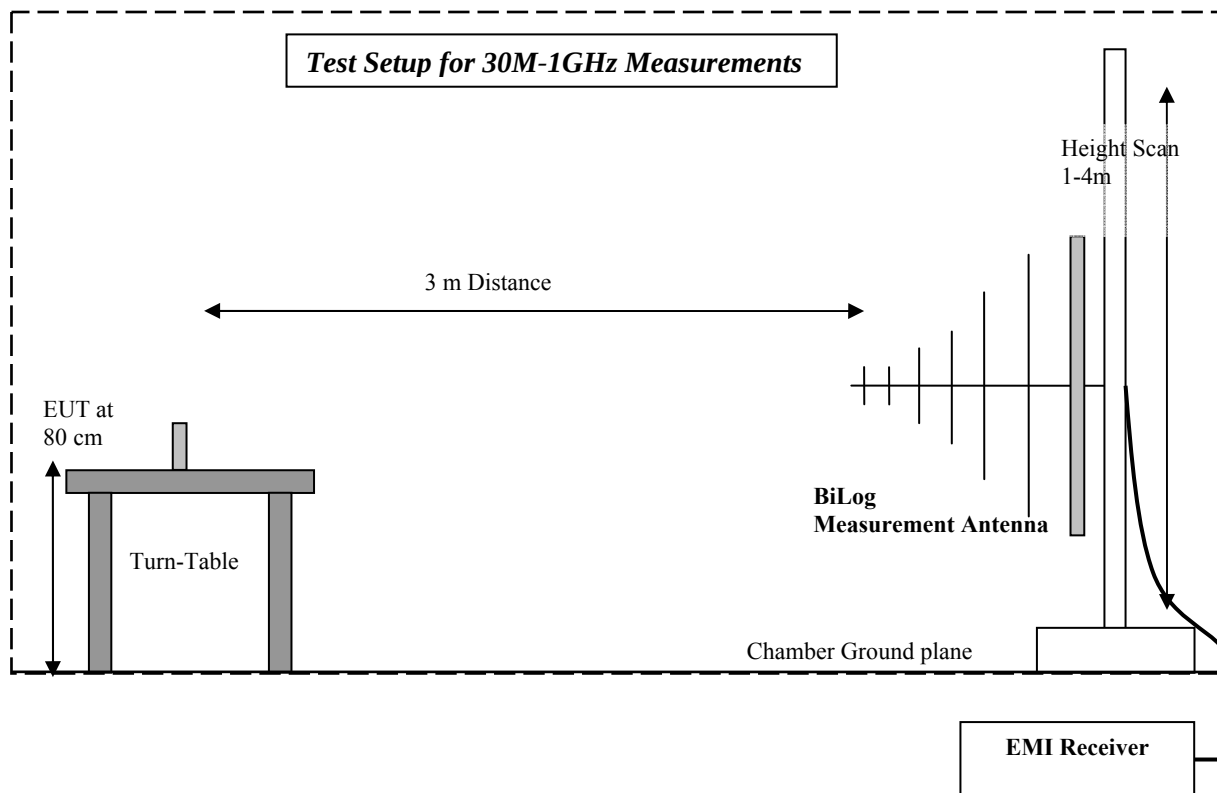
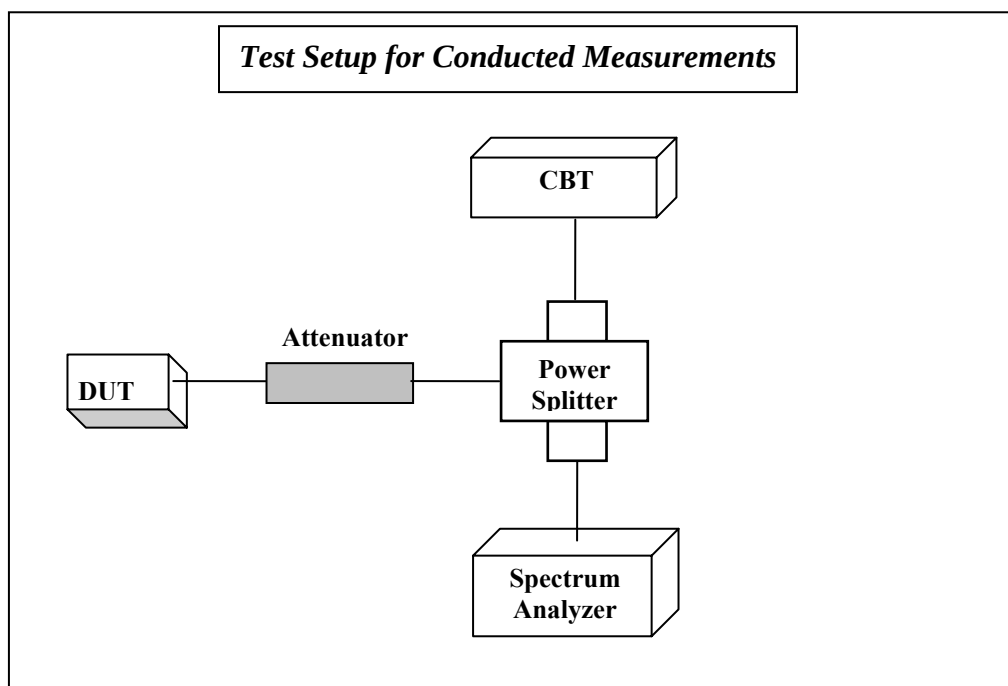
EN 55022 Voltage on Mains QP LimitLine  
Preview Result 1

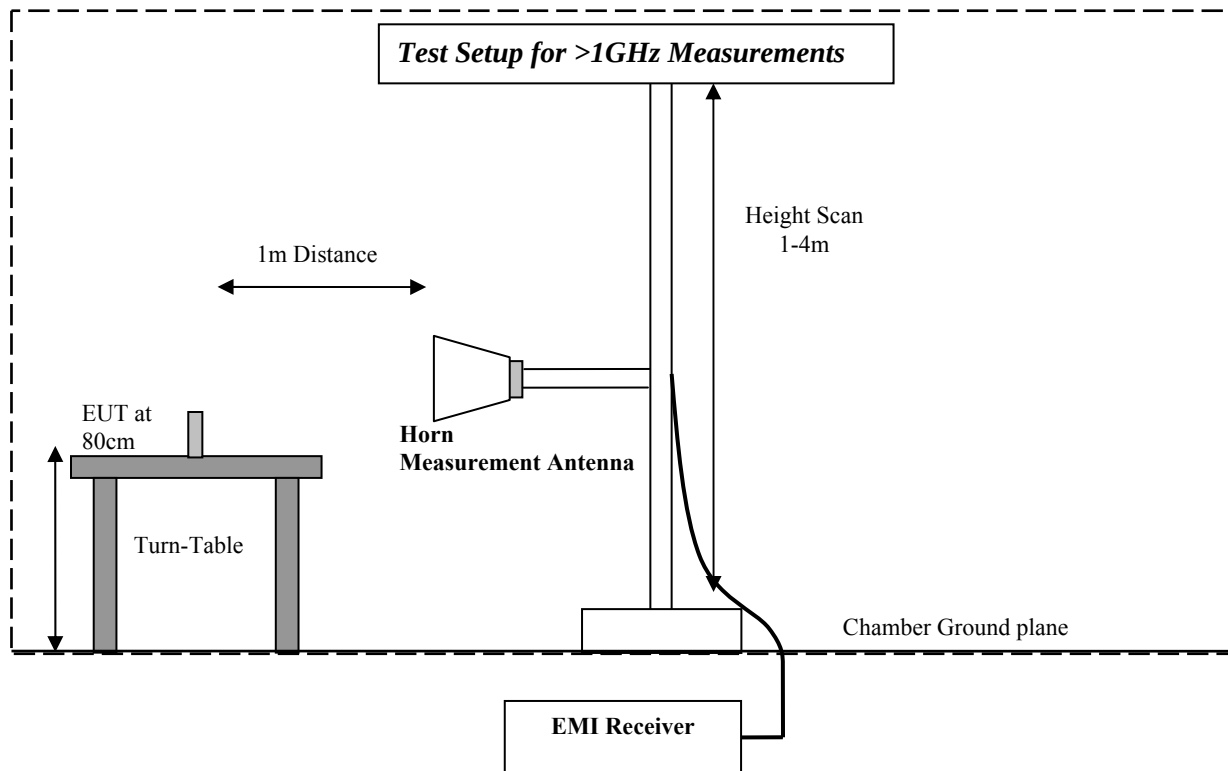
EN 55022 Voltage on Mains AV LimitLine  
Preview Result 2

## 6 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       | May 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  |

## 7 BLOCK DIAGRAMS





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## **8 Revision History**

| <b>Date</b>       | <b>Changes to report</b> | <b>Report prepared by</b> |
|-------------------|--------------------------|---------------------------|
| <b>2010-04-07</b> | <b>Original Report</b>   | <b>Satya Radhakrishna</b> |