



# FCC PART 15C TEST REPORT No. I14Z48855-SRD02

for

**TCL Communication Ltd**

**HSUPA/HSDPA/UMTS Dual band/GSM Quad band mobile phone**

**Model Name: 4013M**

**FCC ID: 2ACCJH007**

with

**Hardware Version: P10**

**Software Version: v5B4**

**Issued Date: 2014-12-10**



**Note:**

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of CTTL.

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## **REPORT HISTORY**

| Report Number   | Revision | Description | Issue Date |
|-----------------|----------|-------------|------------|
| I14Z48855-SRD02 | Rev.0    | 1st edition | 2014-12-10 |
|                 |          |             |            |

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## **1. Test Laboratory**

### **1.1. Testing Location**

Location 1:CTTL(huayuan North Road)

Address: No. 52, Huayuan North Road, Haidian District, Beijing,  
P. R. China100191

Location 2:CTTL(Shouxiang)

Address: No. 51 Shouxiang Science Building, Xueyuan Road,  
Haidian District, Beijing, P. R. China100191

### 1.1. Testing Environment

Normal Temperature: 15-35℃  
Extreme Temperature: -10/+55℃  
Relative Humidity: 20-75%

### 1.2. Project data

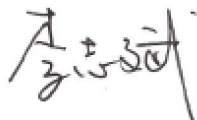
Testing Start Date: 2014-11-24  
Testing End Date: 2014-12-10

### 1.3. Signature



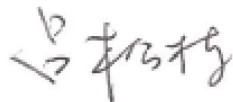
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Xu Zhongfei  
(Prepared this test report)



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Li Zhibin  
(Reviewed this test report)



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Lv Songdong  
(Approved this test report)

## **2. ClientInformation**

### **2.1. Applicant Information**

Company Name: TCL Communication Ltd  
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### **2.2. Manufacturer Information**

Company Name: TCL Communication Ltd  
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City: Shanghai  
Postal Code: 201203  
Country: China  
Telephone: 0086-21-61460890  
Fax: 0086-21-61460602

### **3. Equipment Under Test (EUT) and Ancillary Equipment (AE)**

#### **3.1. About EUT**

|                    |   |
|--------------------|---|
| Description        | HSUPA/HSDPA/UMTS Dual band/GSM Quad band mobile phone |
| Model Name         | 4013M   |
| FCC ID             | 2ACCJH007   |
| Frequency Band     | ISM 2400MHz~2483.5MHz                                 |
| Type of Modulation | GFSK/ $\pi/4$ DQPSK/8DPSK                             |
| Number of Channels | 79  |
| Power Supply       | 3.8v DC by Battery                                    |

#### **3.2. Internal Identification of EUT**

| EUT ID* | SN or IMEI      | HW Version | SW Version |
|---------|-----------------|------------|------------|
| EUT1    | 014265000000417 | PIO        | v5B4       |
| EUT2    | 014265000000532 | PIO        | v5B4       |

\*EUT ID: is used to identify the test sample in the lab internally.

#### **3.3. Internal Identification of AE**

| AE ID*          | Description  |           |
|-----------------|--------------|-----------|
| AE1             | Battery      | / Inbuilt |
| AE1             |              |           |
| Model           | CAB31P0000CB |           |
| Manufacturer    | OCEANSUN     |           |
| Capacitance     | 1300mAh      |           |
| Nominal voltage | 3.8v         |           |

\*AE ID: is used to identify the test sample in the lab internally.

### 3.4. Normal Accessory setting

Fully charged battery should be used during the test.

### 3.5. General Description

The Equipment Under Test (EUT) is a model of HSUPA/HSDPA/UMTS Dual band/GSM Quad band mobile phone with integrated antenna. It consists of normal options: lithium battery, charger. Manual and specifications of the EUT were provided to fulfil the test.

## 4. Reference Documents

### 4.1. Documents supplied by applicant

EUT feature information is supplied by the applicant or manufacturer, which is the basis of testing.

### 4.2. Reference Documents for testing

The following documents listed in this section are referred for testing.

| Reference   | Title  | Version   |
|-------------|--|-----------|
| FCC Part15  | FCC CFR 47, Part 15, Subpart C:  | June,2014 |
|             | 15.205 Restricted bands of operation;  |           |
|             | 15.209 Radiated emission limits, general requirements;                               |           |
| ANSI C63.10 | 15.247 Operation within the bands 902–928MHz,<br>2400–2483.5 MHz, and 5725–5850 MHz. | June,2013 |
|             | American National Standard for Testing Unlicensed<br>Wireless Devices                |           |
| FCC Part 2  | Frequency Allocations and Radio Treaty Matters;<br>General Rules and Regulations     | June,2014 |



## 5. Test Results

### 5.1. Summary of Test Results

Abbreviations used in this clause:

**P** Pass, The EUT complies with the essential requirements in the standard.

**F** Fail, The EUT does not comply with the essential requirements in the standard

**NA** Not Applicable, The test was not applicable

**NP** Not Performed, The test was not performed by CTTL

| SUMMARY OF MEASUREMENT RESULTS  | Sub-clause             | Verdict   |
|---------------------------------|------------------------|-----------|
| Peak Output Power - Conducted   | 15.247 (b)(1)          | <b>P</b>  |
| Frequency Band Edges            | 15.247 (d)             | <b>P</b>  |
| Conducted Emission              | 15.247 (d)             | <b>P</b>  |
| Radiated Emission               | 15.247, 15.205, 15.209 | <b>P</b>  |
| Time of Occupancy (Dwell Time)  | 15.247 (a) (1)(iii)    | <b>P</b>  |
| 20dB Bandwidth                  | 15.247 (a)(1)          | <b>NA</b> |
| Carrier Frequency Separation    | 15.247 (a)(1)          | <b>P</b>  |
| Number of hopping channels      | 15.247 (a)(b)(iii)     | <b>P</b>  |
| AC Powerline Conducted Emission | 15.107, 15.207         | <b>P</b>  |

Please refer to **ANNEX A** for detail.

The measurement is made according to ANSI C63.10.

### 5.2. Statements

CTTL has evaluated the test cases requested by the applicant /manufacturer as listed in section 5.1 of this report for the EUT specified in section 3 according to the standards or reference documents listed in section 4.2

## 1. Test Facilities Utilized

### Conducted test system

| No. | Equipment              | Model | Serial Number | Manufacturer    | Calibration Period | Calibration Due date |
|-----|------------------------|-------|---------------|-----------------|--------------------|----------------------|
| 1   | Vector Signal Analyzer | FSQ26 | 200136        | Rohde & Schwarz | 1 year             | 2016-01-06           |
| 2   | Bluetooth Tester       | CBT32 | 100649        | Rohde & Schwarz | 1 year             | 2015-02-09           |

### Radiated emission test system

| No. | Equipment                         | Model     | Serial Number  | Manufacturer    | Calibration Period | Calibration Due date |
|-----|-----------------------------------|-----------|----------------|-----------------|--------------------|----------------------|
| 1   | Test Receiver                     | ESU26     | 100376         | Rohde & Schwarz | 1 year             | 2015-11-05           |
| 2   | EMI Antenna                       | VULB 9163 | 9163 175       | Schwarzbeck     | 3 years            | 2015-07-13           |
| 3   | EMI Antenna                       | 3117      | 00119021       | ETS-Lindgren    | 3 years            | 2015-04-19           |
| 4   | Dual-Ridge Waveguide Horn Antenna | 3116      | 2663           | ETS-Lindgren    | 3 years            | 2015-06-30           |
| 5   | Dual-Ridge Waveguide Horn Antenna | 3116      | 2661           | ETS-Lindgren    | 3 years            | 2015-06-30           |
| 6   | Bluetooth Tester                  | CBT       | 100153         | Rohde & Schwarz | 1 year             | 2015-09-15           |
| 7   | LISN                              | ESH2-Z5   | 829991/01<br>2 | Rohde & Schwarz | 1 year             | 2015-04-14           |
| 8   | Loop Antenna                      | HFH2-Z2   | 829324/00<br>7 | Rohde & Schwarz | 3 years            | 2015-12-12           |
| 9   | Pre-amplifier(18GHz)              | SCU18     | 1005277        | Rohde & Schwarz | /                  | /                    |
| 10  | Pre-amplifier(26.5 GHz)           | SCU26     | 1006788        | Rohde & Schwarz | /                  | /                    |

### Anechoic chamber

Fully anechoic chamber by Frankonia German.

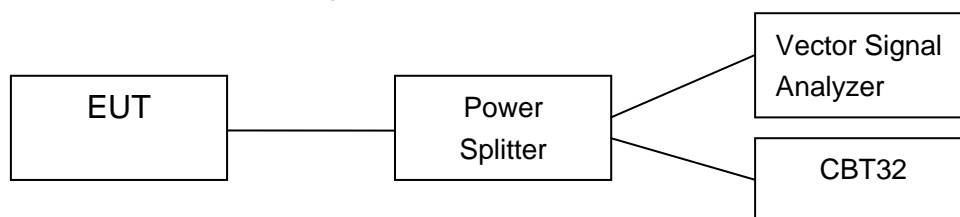
## **ANNEX A: Detailed Test Results**

### **A.1. Measurement Method**

#### **A.1.1. Conducted Measurements**

The measurement is made according to ANSI C63.10.

- 1). Connect the EUT to the test system correctly.
- 2). Set the EUT to the required work mode (Transmitter, receiver or transmitter & receiver).
- 3). Set the EUT to the required channel.
- 4). Set the EUT hopping mode (hopping or hopping off).
- 5). Set the spectrum analyzer to start measurement.
- 6). Record the values. Vector Signal Analyzer



#### **A.1.2. Radiated Emission Measurements**

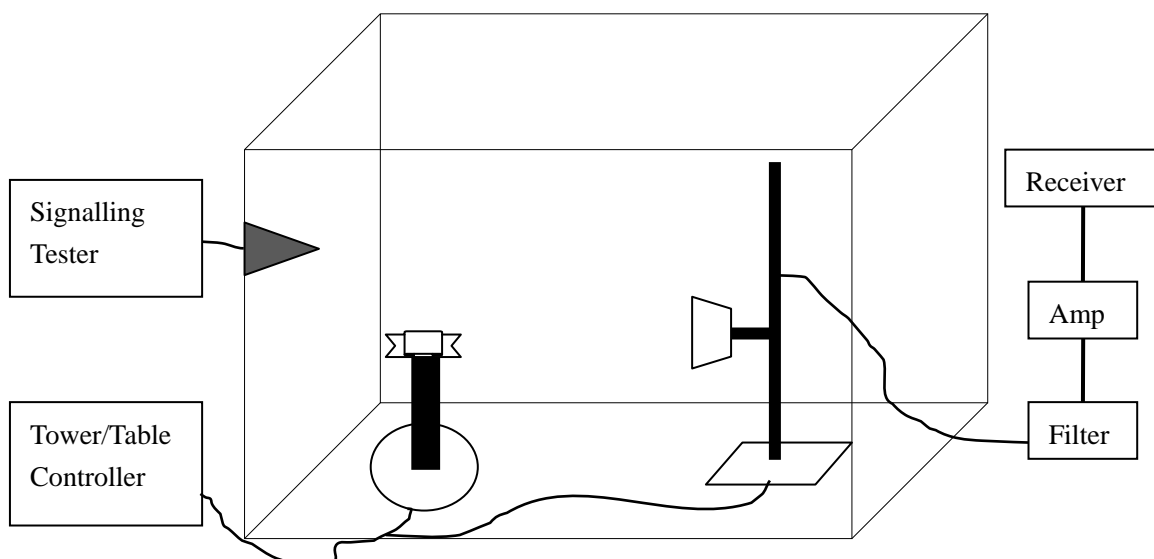
The measurement is made according to ANSI C63.10

The radiated emission test is performed in semi-anechoic chamber. The distance from the EUT to the reference point of measurement antenna is 3m. The test is carried out on both vertical and horizontal polarization and only maximization result of both polarizations is kept. During the test, the turntable is rotated 360° and the measurement antenna is moved from 1m to 4m to get the maximization result.

In the case of radiated emission, the used settings are as follows,

Sweep frequency from 30 MHz to 1GHz, RBW = 100 kHz, VBW = 300 kHz;

Sweep frequency from 1 GHz to 26GHz, RBW = 1MHz, VBW = 1MHz;



## A.2. Peak Output Power – Conducted

### Method of Measurement: See ANSI C63.10-clause 7.8.5

a) Use the following spectrum analyzer settings:

- Span: 6MHz
- RBW: 3MHz
- VBW: 3MHz
- Sweep time: 2.5ms
- Detector function: peak
- Trace: max hold

b) Allow trace to stabilize.

c) Use the marker-to-peak function to set the marker to the peak of the emission.

d) The indicated level is the peak output power.

e) A plot of the test results and setup description shall be included in the test report.

### Measurement Limit:

| Standard              | Limit (dBm) |
|-----------------------|-------------|
| FCC Part 15.247(b)(1) | < 30        |

### Measurement Results:

#### For GFSK

| Channel                                 | Ch 0<br>2402 MHz | Ch 39<br>2441 MHz | Ch 78<br>2480 MHz | Conclusion |
|---|------------------|-------------------|-------------------|------------|
| Peak Conducted<br>Output Power<br>(dBm) | 8.03             | 8.41              | 8.32              | P          |

#### For $\pi/4$ DQPSK

| Channel                                 | Ch 0<br>2402 MHz | Ch 39<br>2441 MHz | Ch 78<br>2480 MHz | Conclusion |
|---|------------------|-------------------|-------------------|------------|
| Peak Conducted<br>Output Power<br>(dBm) | 7.36             | 7.79              | 7.67              | P          |

#### For 8DPSK

| Channel                                 | Ch 0<br>2402 MHz | Ch 39<br>2441 MHz | Ch 78<br>2480 MHz | Conclusion |
|---|------------------|-------------------|-------------------|------------|
| Peak Conducted<br>Output Power<br>(dBm) | 7.50             | 7.92              | 7.82              | P          |

**Conclusion: PASS**

### A.3. Frequency Band Edges – Conducted

#### Method of Measurement: See ANSI C63.10-clause 7.8.6

Connect the spectrum analyzer to the EUT using an appropriate RF cable connected to the EUT output. Configure the spectrum analyzer settings as described below (be sure to enter all losses between the unlicensed wireless device output and the spectrum analyzer).

- Span: 10 MHz
- Resolution Bandwidth: 100 kHz
- Video Bandwidth: 300 kHz
- Sweep Time: 5ms
- Detector: Peak
- Trace: max hold

Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel.

Observe the stored trace and measure the amplitude delta between the peak of the fundamental and the peak of the band-edge emission. This is not an absolute field strength measurement; it is only a relative measurement to determine the amount by which the emission drops at the band edge relative to the highest fundamental emission level.

#### Measurement Limit:

| Standard                   | Limit (dBc) |
|----------------------------|-------------|
| FCC 47 CFR Part 15.247 (d) | > 20        |

#### Measurement Result:

##### For GFSK

| Channel | Hopping     | Band Edge Power ( dBc) |        | Conclusion |
|---------|-------------|------------------------|--------|------------|
| 0       | Hopping OFF | Fig.1                  | -56.72 | P          |
|         | Hopping ON  | Fig.2                  | -55.78 | P          |
| 78      | Hopping OFF | Fig.3                  | -62.13 | P          |
|         | Hopping ON  | Fig.4                  | -61.61 | P          |

##### For $\pi/4$ DQPSK

| Channel | Hopping     | Band Edge Power ( dBc) |        | Conclusion |
|---------|-------------|------------------------|--------|------------|
| 0       | Hopping OFF | Fig.5                  | -54.98 | P          |
|         | Hopping ON  | Fig.6                  | -51.60 | P          |
| 78      | Hopping OFF | Fig.7                  | -59.99 | P          |
|         | Hopping ON  | Fig.8                  | -60.16 | P          |

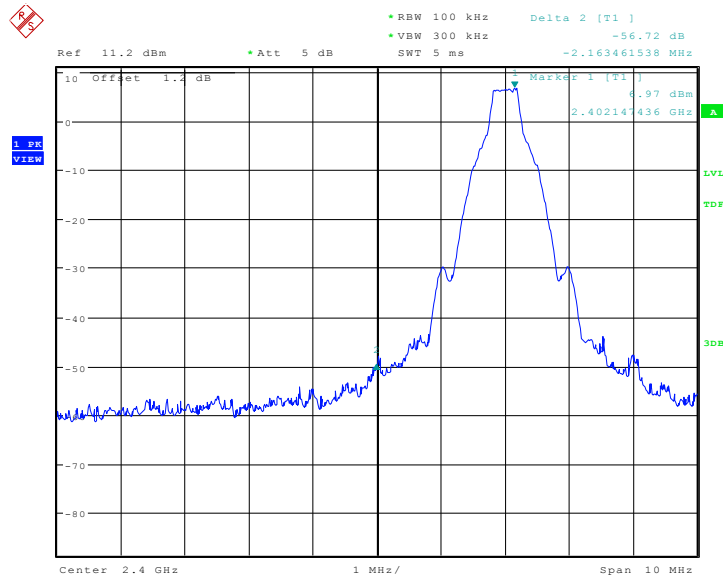
##### For 8DPSK

| Channel | Hopping     | Band Edge Power ( dBc) |        | Conclusion |
|---------|-------------|------------------------|--------|------------|
| 0       | Hopping OFF | Fig.9                  | -53.23 | P          |
|         | Hopping ON  | Fig.10                 | -57.73 | P          |

|    |             |        |        |   |
|----|-------------|--------|--------|---|
| 78 | Hopping OFF | Fig.11 | -60.07 | P |
|    | Hopping ON  | Fig.12 | -60.54 | P |

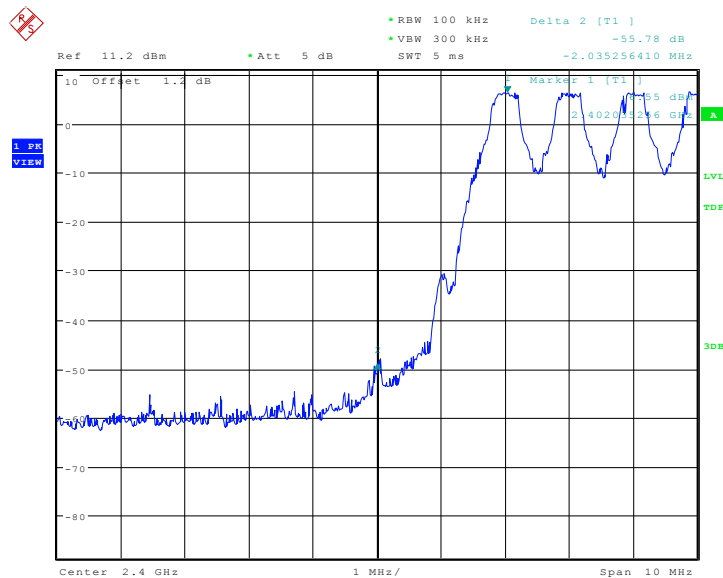
**Conclusion: PASS**

**Test graphs as below**



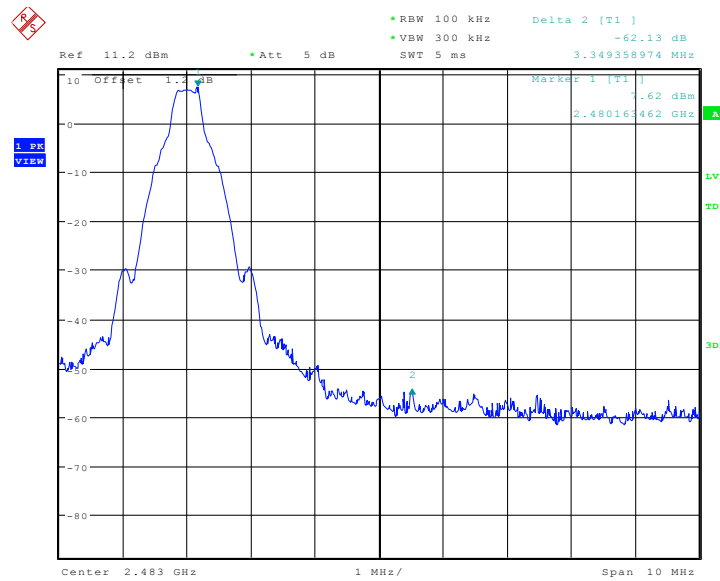
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Fig.1. Frequency Band Edges: GFSK, Channel 0, Hopping Off



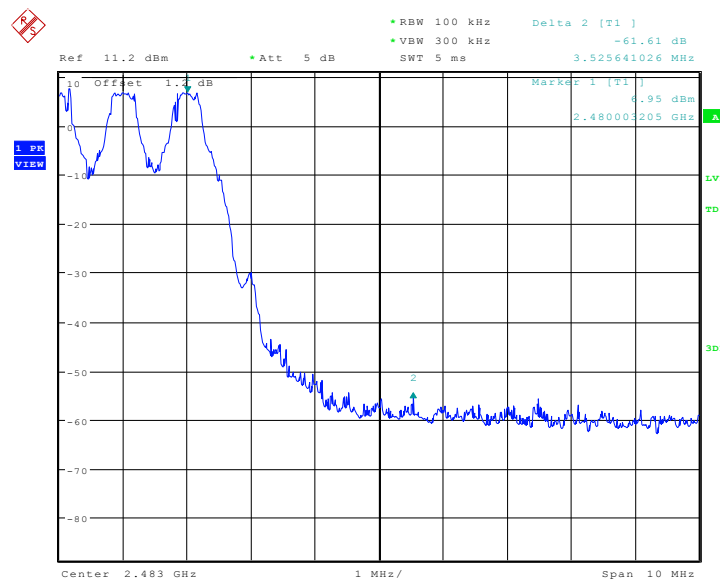
Date: 1.DEC.2014 13:10:50

Fig.2. Frequency Band Edges: GFSK, Channel 0, Hopping On



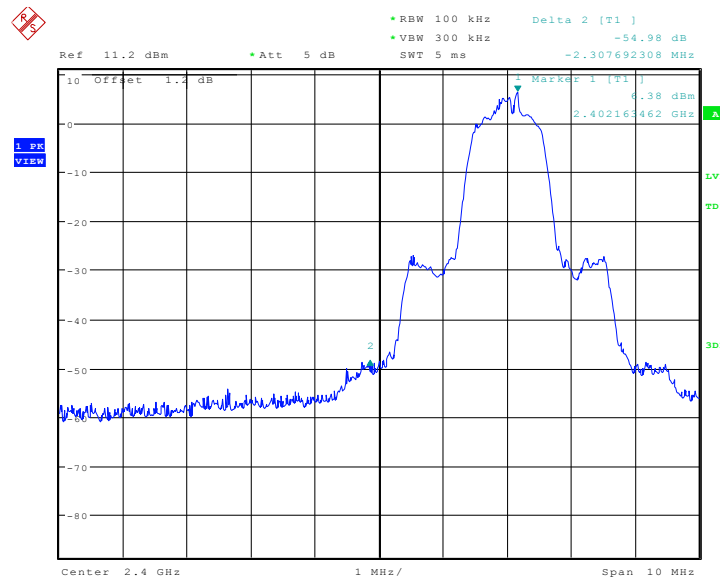
Date: 1.DEC.2014 13:08:48

Fig.3. Frequency Band Edges: GFSK, Channel 78, Hopping Off



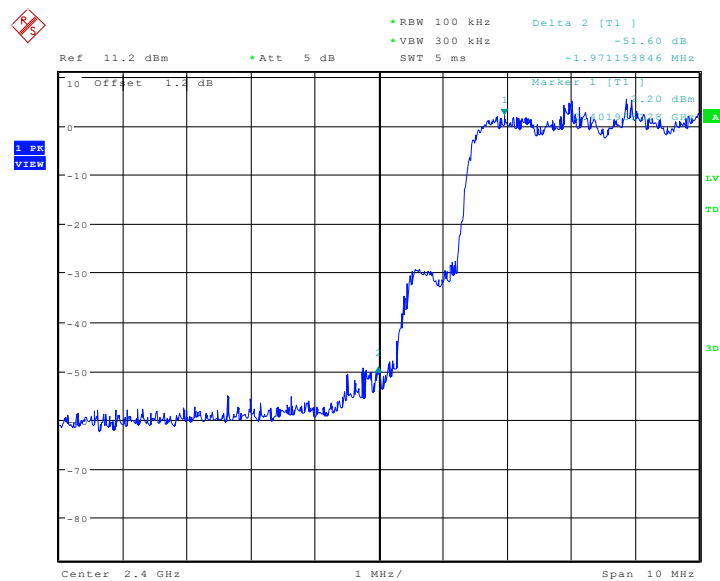
Date: 1.DEC.2014 13:12:53

Fig.4. Frequency Band Edges: GFSK, Channel 78, Hopping On



Date: 1.DEC.2014 13:30:32

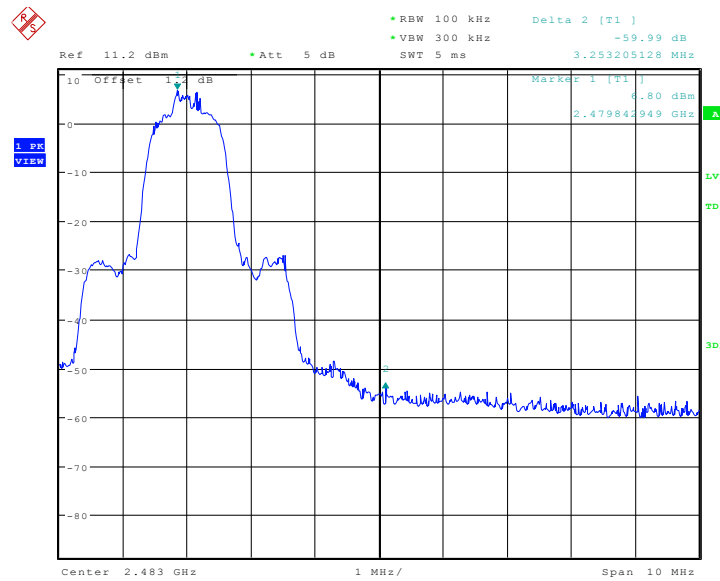
Fig.5. Frequency Band Edges:  $\pi/4$  DQPSK, Channel 0, Hopping Off



Date: 1.DEC.2014 13:32:52

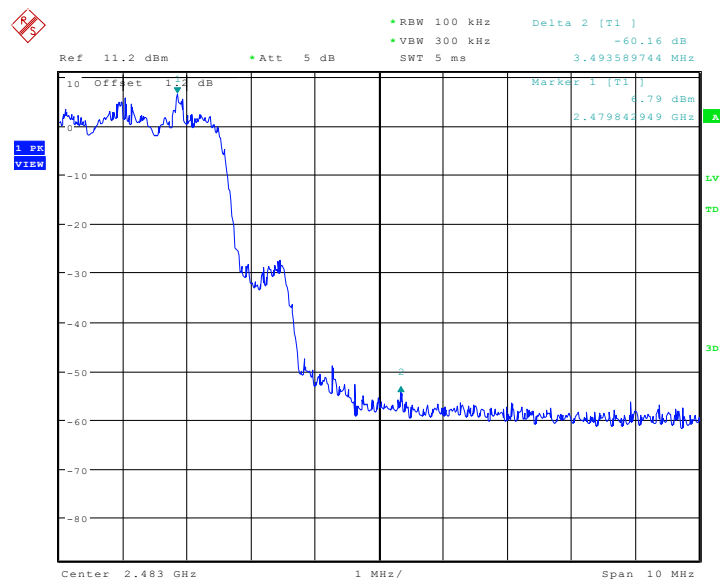
Fig.6. Frequency Band Edges:  $\pi/4$  DQPSK, Channel 0, Hopping On





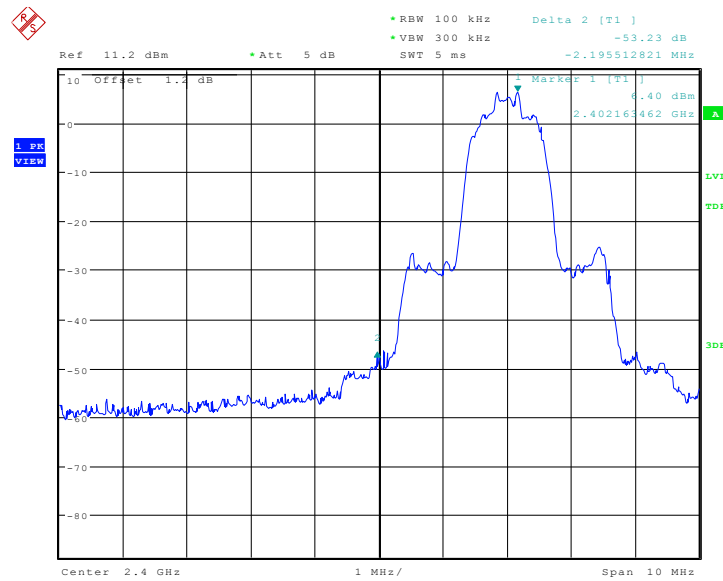
Date: 1.DEC.2014 13:30:49

Fig.7. Frequency Band Edges:  $\pi/4$  DQPSK, Channel 78, Hopping Off



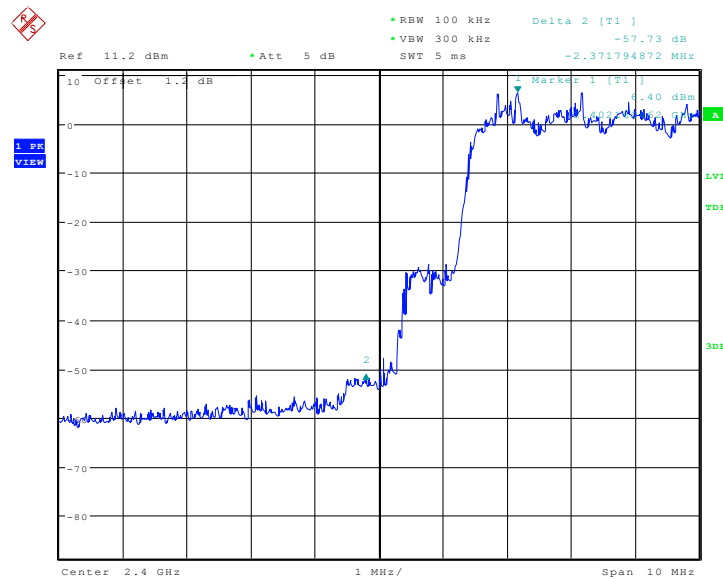
Date: 1.DEC.2014 13:34:54

Fig.8. Frequency Band Edges:  $\pi/4$  DQPSK, Channel 78, Hopping On



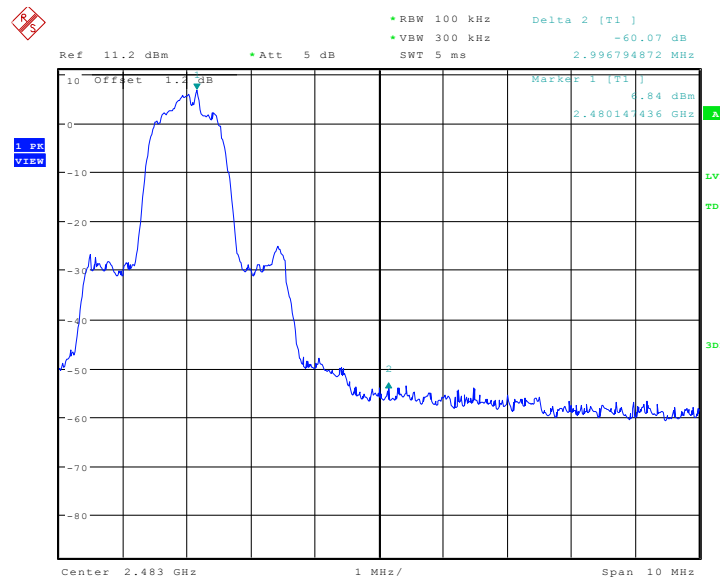
Date: 1.DEC.2014 13:52:33

Fig.9. Frequency Band Edges: 8DPSK, Channel 0, Hopping Off



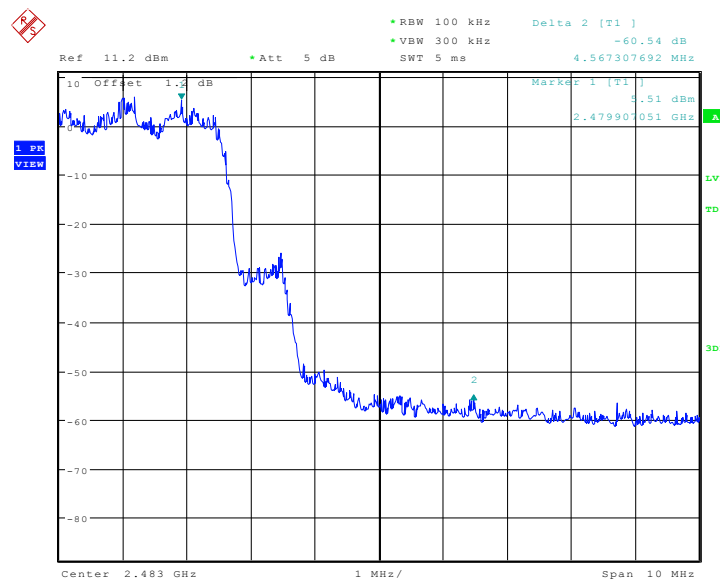
Date: 1.DEC.2014 13:54:53

Fig.10. Frequency Band Edges: 8DPSK, Channel 0, Hopping On



Date: 1.DEC.2014 13:52:51

Fig.11. Frequency Band Edges: 8DPSK, Channel 78, Hopping Off



Date: 1.DEC.2014 13:56:55

Fig.12. Frequency Band Edges: 8DPSK, Channel 78, Hopping On

#### A.4. Conducted Emission

##### Method of Measurement: See ANSI C63.10-clause 7.8.8

##### Measurement Procedure – Reference Level

1. Set the RBW = 100 kHz.
2. Set the VBW = 300 kHz.
3. Set the span to 5-30 % greater than the EBW.
4. Detector = peak.
5. Sweep time = auto couple.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW. Next, determine the power in 100 kHz band segments outside of the authorized frequency band using the following measurement:

##### Measurement Procedure - Unwanted Emissions

1. Set RBW = 100 kHz.
2. Set VBW = 300 kHz.
3. Set span to encompass the spectrum to be examined.
4. Detector = peak.
5. Trace Mode = max hold.
6. Sweep = auto couple.
7. Allow the trace to stabilize (this may take some time, depending on the extent of the span).

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) is attenuated by at least the minimum requirements specified above.

##### Measurement Limit:

| Standard                   | Limit   |
|----------------------------|---|
| FCC 47 CFR Part 15.247 (d) | 20dB below peak output power in 100 kHz bandwidth |

##### Measurement Results:

##### For GFSK

| Channel | Frequency Range  | Test Results | Conclusion |
|---------|------------------|--------------|------------|
| Ch 0    | Center Frequency | Fig.13       | P          |

|                   |                  |        |   |
|-------------------|------------------|--------|---|
| 2402 MHz          | 30 MHz ~ 1 GHz   | Fig.14 | P |
|                   | 1 GHz ~ 3 GHz    | Fig.15 | P |
|                   | 3 GHz ~ 10 GHz   | Fig.16 | P |
|                   | 10 GHz ~ 26 GHz  | Fig.17 | P |
| Ch 39<br>2441 MHz | Center Frequency | Fig.18 | P |
|                   | 30 MHz ~ 1 GHz   | Fig.19 | P |
|                   | 1 GHz ~ 3 GHz    | Fig.20 | P |
|                   | 3 GHz ~ 10 GHz   | Fig.21 | P |
|                   | 10 GHz ~ 26 GHz  | Fig.22 | P |
| Ch 78<br>2480 MHz | Center Frequency | Fig.23 | P |
|                   | 30 MHz ~ 1 GHz   | Fig.24 | P |
|                   | 1 GHz ~ 3 GHz    | Fig.25 | P |
|                   | 3 GHz ~ 10 GHz   | Fig.26 | P |
|                   | 10 GHz ~ 26 GHz  | Fig.27 | P |

#### For $\pi/4$ DQPSK

| Channel           | Frequency Range  | Test Results | Conclusion |
|-------------------|------------------|--------------|------------|
| Ch 0<br>2402 MHz  | Center Frequency | Fig.28       | P          |
|                   | 30 MHz ~ 1 GHz   | Fig.29       | P          |
|                   | 1 GHz ~ 3 GHz    | Fig.30       | P          |
|                   | 3 GHz ~ 10 GHz   | Fig.31       | P          |
|                   | 10 GHz ~ 26 GHz  | Fig.32       | P          |
| Ch 39<br>2441 MHz | Center Frequency | Fig.33       | P          |
|                   | 30 MHz ~ 1 GHz   | Fig.34       | P          |
|                   | 1 GHz ~ 3 GHz    | Fig.35       | P          |
|                   | 3 GHz ~ 10 GHz   | Fig.36       | P          |
|                   | 10 GHz ~ 26 GHz  | Fig.37       | P          |
| Ch 78<br>2480 MHz | Center Frequency | Fig.38       | P          |
|                   | 30 MHz ~ 1 GHz   | Fig.39       | P          |
|                   | 1 GHz ~ 3 GHz    | Fig.40       | P          |
|                   | 3 GHz ~ 10 GHz   | Fig.41       | P          |
|                   | 10 GHz ~ 26 GHz  | Fig.42       | P          |

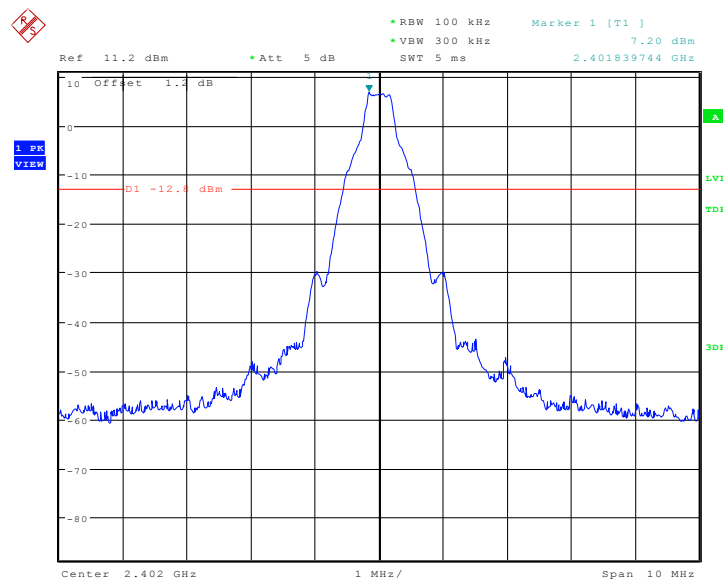
#### For 8DPSK

| Channel          | Frequency Range  | Test Results | Conclusion |
|------------------|------------------|--------------|------------|
| Ch 0<br>2402 MHz | Center Frequency | Fig.43       | P          |
|                  | 30 MHz ~ 1 GHz   | Fig.44       | P          |
|                  | 1 GHz ~ 3 GHz    | Fig.45       | P          |
|                  | 3 GHz ~ 10 GHz   | Fig.46       | P          |
|                  | 10 GHz ~ 26 GHz  | Fig.47       | P          |

|                   |                  |        |   |
|-------------------|------------------|--------|---|
| Ch 39<br>2441 MHz | Center Frequency | Fig.48 | P |
|                   | 30 MHz ~ 1 GHz   | Fig.49 | P |
|                   | 1 GHz ~ 3 GHz    | Fig.50 | P |
|                   | 3 GHz ~ 10 GHz   | Fig.51 | P |
|                   | 10 GHz ~ 26 GHz  | Fig.52 | P |
| Ch 78<br>2480 MHz | Center Frequency | Fig.53 | P |
|                   | 30 MHz ~ 1 GHz   | Fig.54 | P |
|                   | 1 GHz ~ 3 GHz    | Fig.55 | P |
|                   | 3 GHz ~ 10 GHz   | Fig.56 | P |
|                   | 10 GHz ~ 26 GHz  | Fig.57 | P |

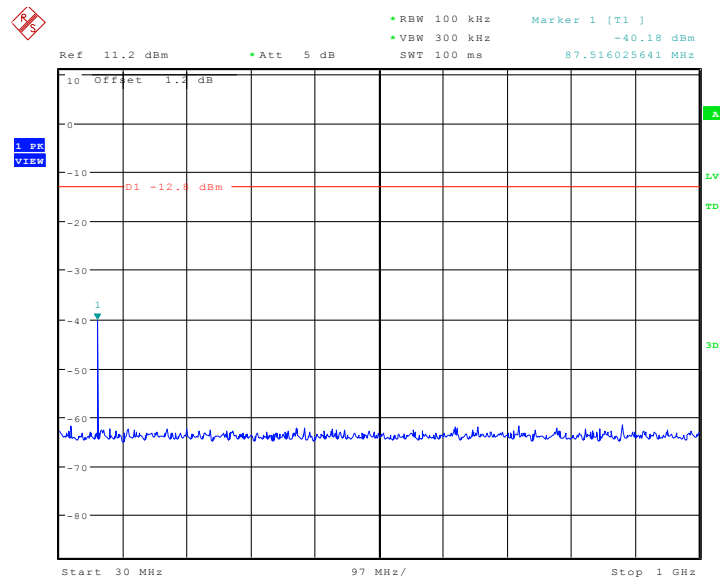
**Conclusion: PASS**

**Test graphs as below**



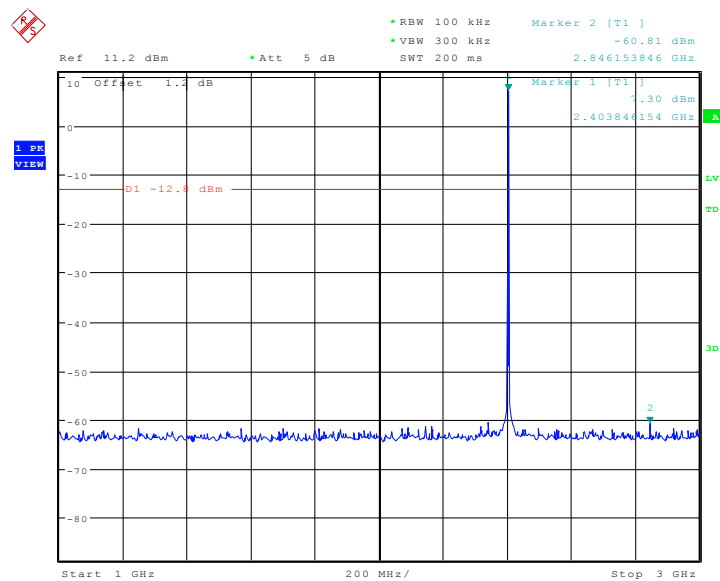
Date: 1.DEC.2014 13:13:12

Fig.13. Conducted spurious emission: GFSK, Channel 0,2402MHz



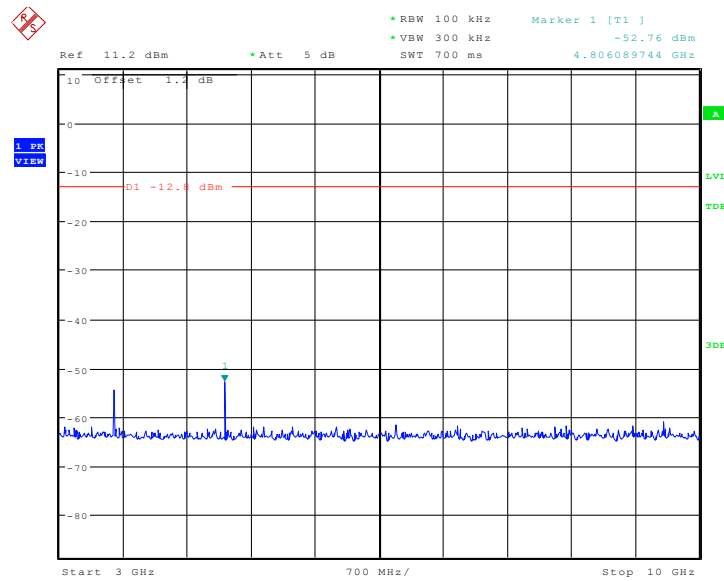
Date: 1.DEC.2014 13:13:29

Fig.14. Conducted spurious emission: GFSK, Channel 0, 30MHz - 1GHz



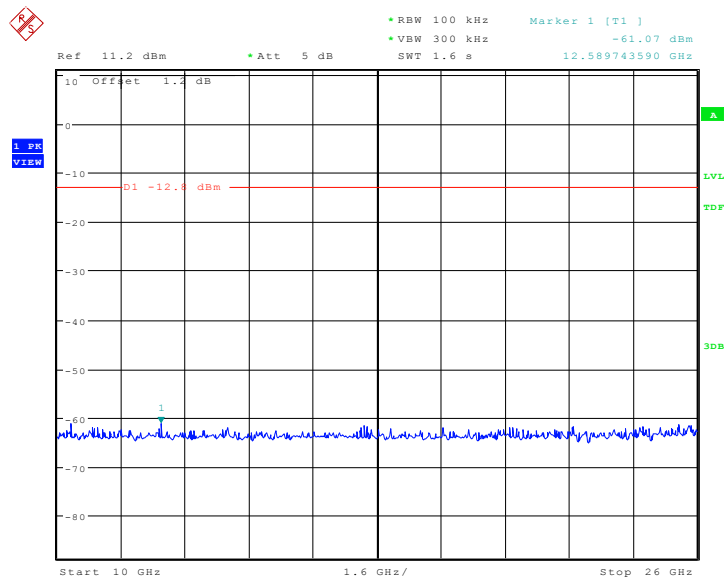
Date: 1.DEC.2014 13:14:00

Fig.15. Conducted spurious emission: GFSK, Channel 0, 1GHz - 3GHz



Date: 1.DEC.2014 13:14:17

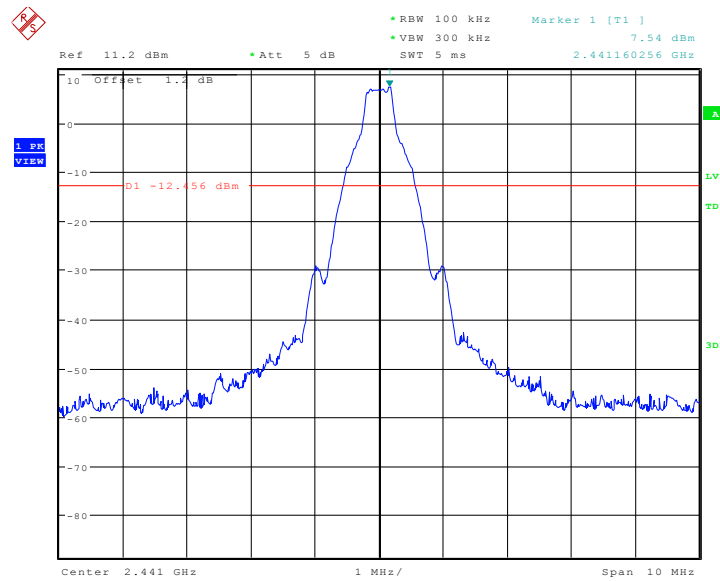
Fig.16. Conducted spurious emission: GFSK, Channel 0, 3GHz - 10GHz



Date: 1.DEC.2014 13:14:33

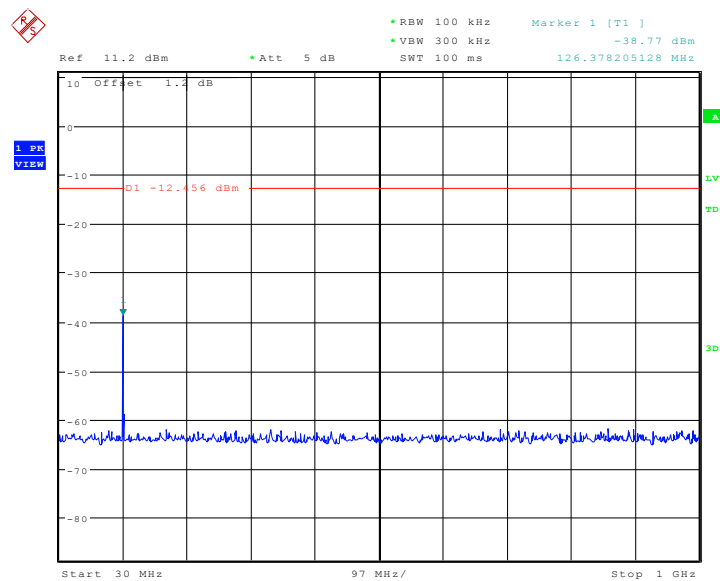
Fig.17. Conducted spurious emission: GFSK, Channel 0, 10GHz - 26GHz





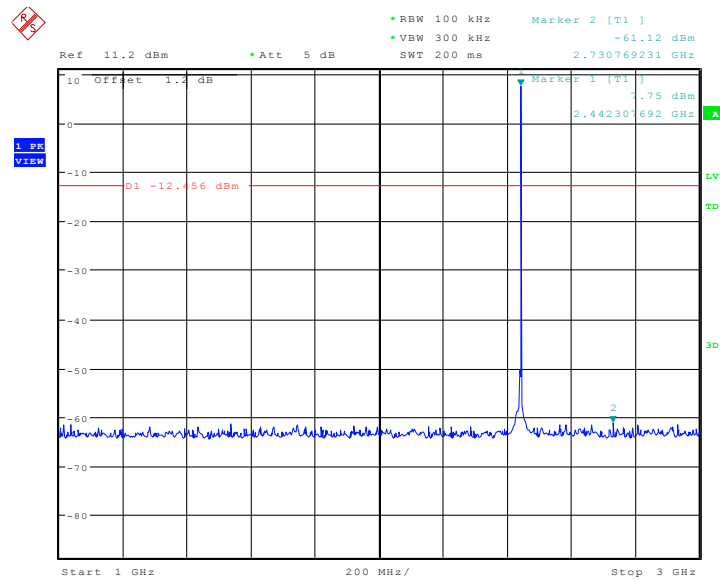
Date: 1.DEC.2014 13:14:50

Fig.18. Conducted spurious emission: GFSK, Channel 39, 2441MHz



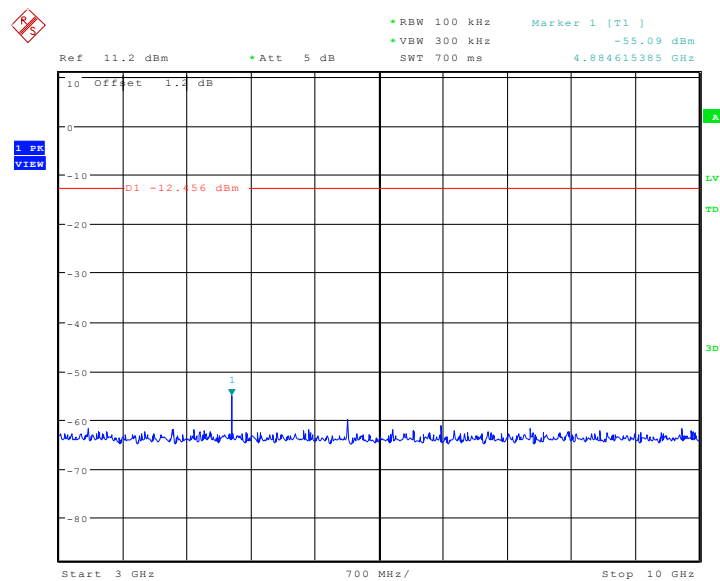
Date: 1.DEC.2014 13:15:06

Fig.19. Conducted spurious emission: GFSK, Channel 39, 30MHz - 1GHz



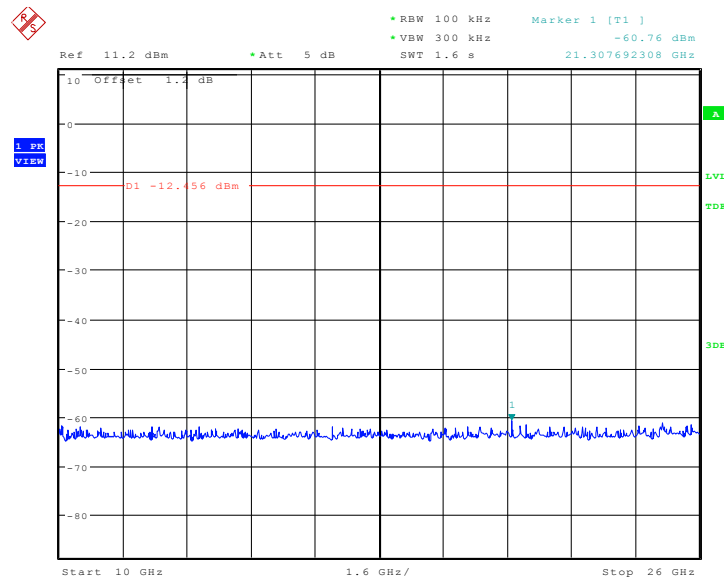
Date: 1.DEC.2014 13:15:38

Fig.20. Conducted spurious emission: GFSK, Channel 39, 1GHz – 3GHz



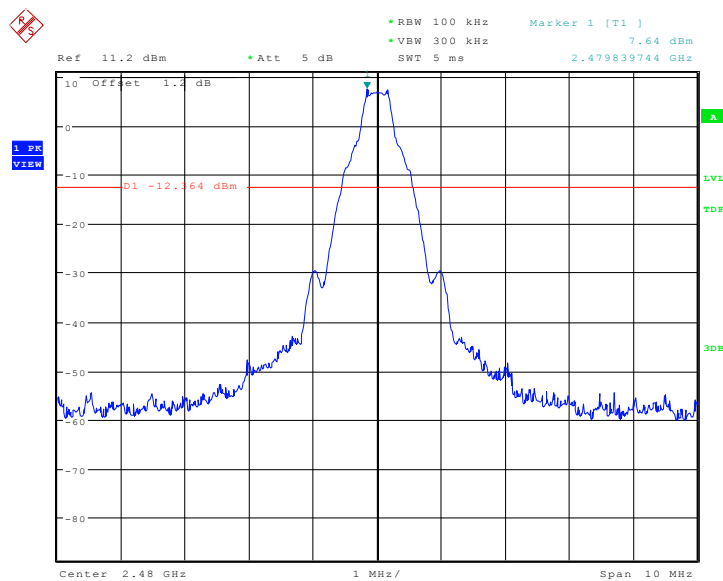
Date: 1.DEC.2014 13:15:55

Fig.21. Conducted spurious emission: GFSK, Channel 39, 3GHz – 10GHz



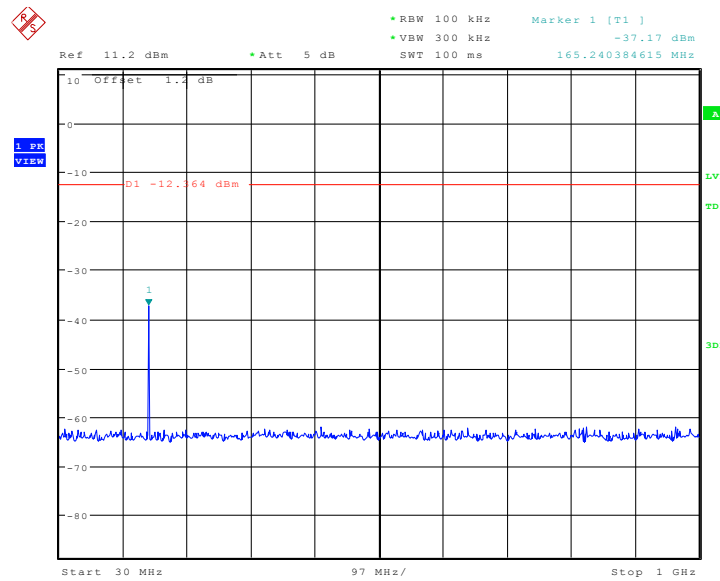
Date: 1.DEC.2014 13:16:11

Fig.22. Conducted spurious emission: GFSK, Channel 39, 10GHz – 26GHz



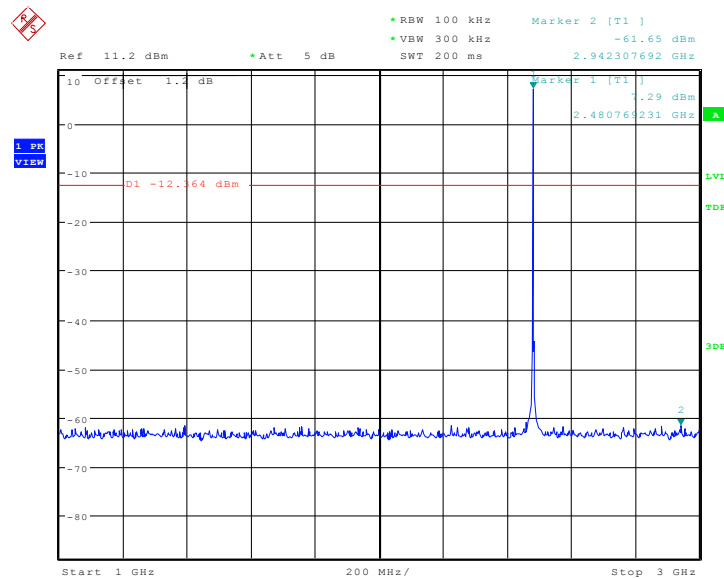
Date: 1.DEC.2014 13:16:28

Fig.23. Conducted spurious emission: GFSK, Channel 78, 2480MHz



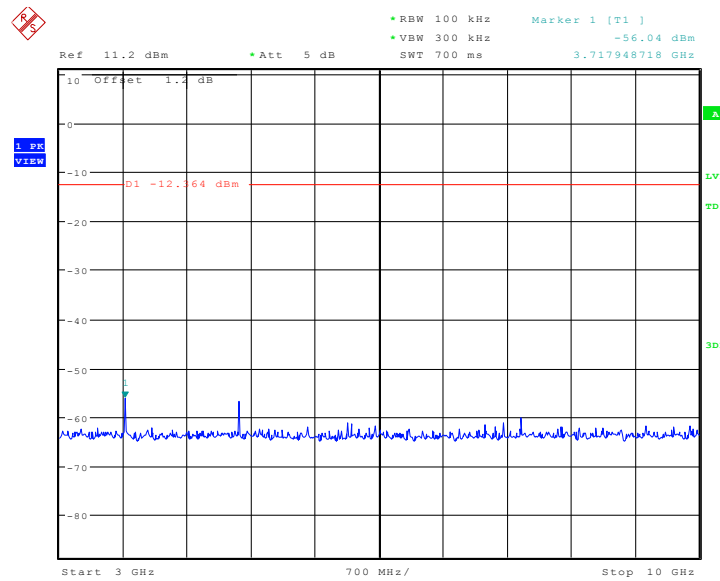
Date: 1.DEC.2014 13:16:44

Fig.24. Conducted spurious emission: GFSK, Channel 78, 30MHz - 1GHz



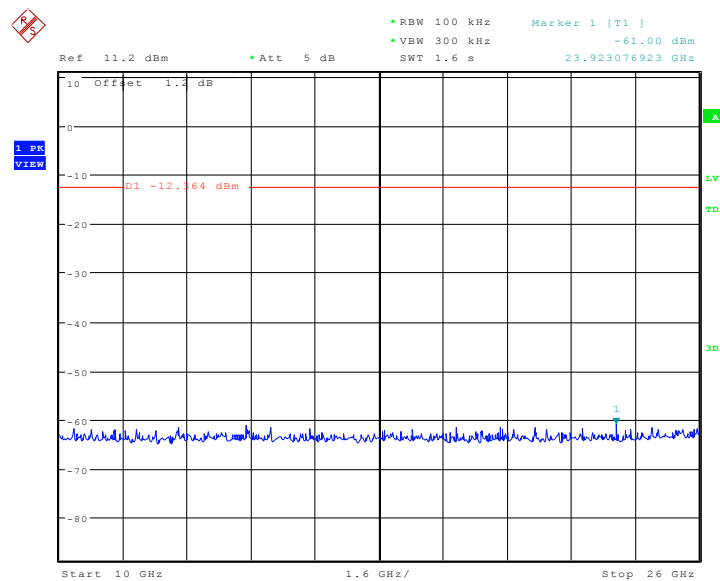
Date: 1.DEC.2014 13:17:16

Fig.25. Conducted spurious emission: GFSK, Channel 78, 1GHz - 3GHz



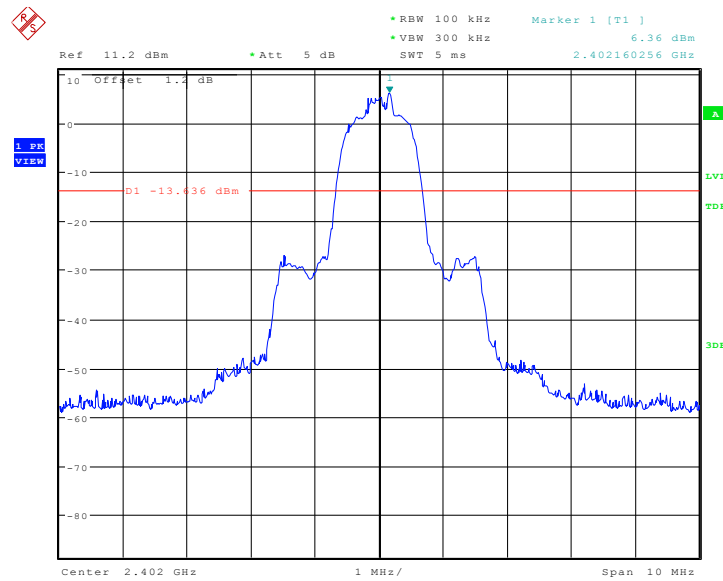
Date: 1.DEC.2014 13:17:33

Fig.26. Conducted spurious emission: GFSK, Channel 78, 3GHz - 10GHz



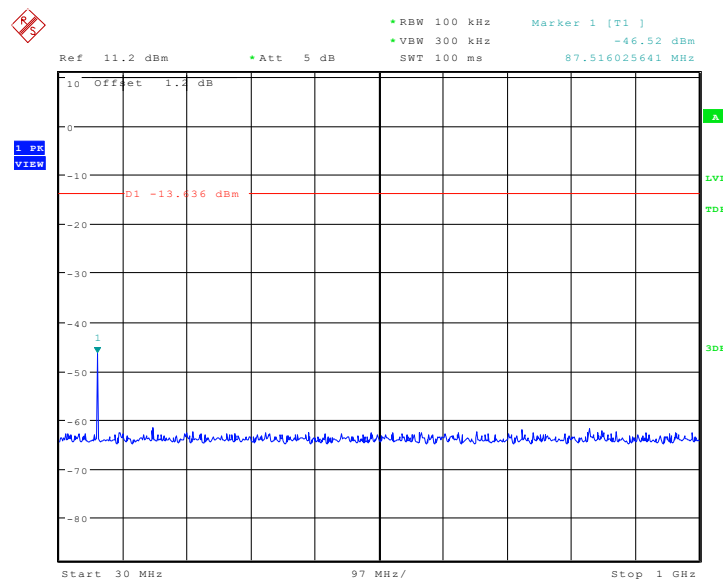
Date: 1.DEC.2014 13:17:49

Fig.27. Conducted spurious emission: GFSK, Channel 78, 10GHz - 26GHz



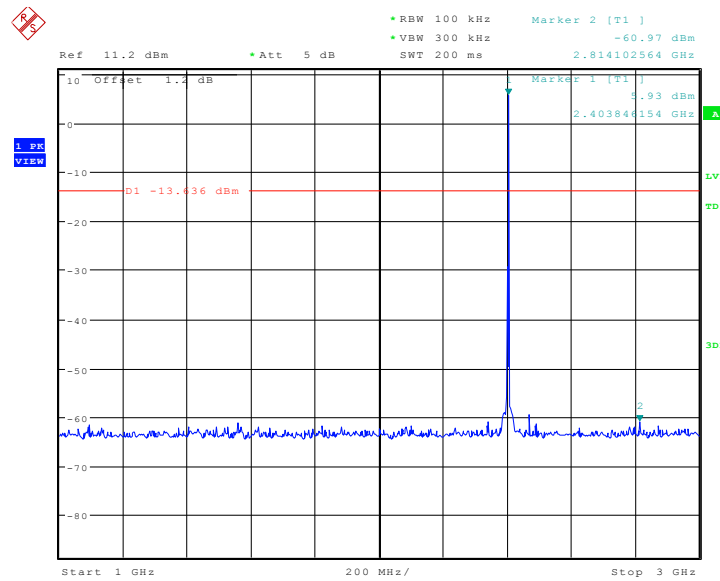
Date: 1.DEC.2014 13:35:14

Fig.28. Conducted spurious emission:  $\pi/4$  DQPSK, Channel 0,2402MHz



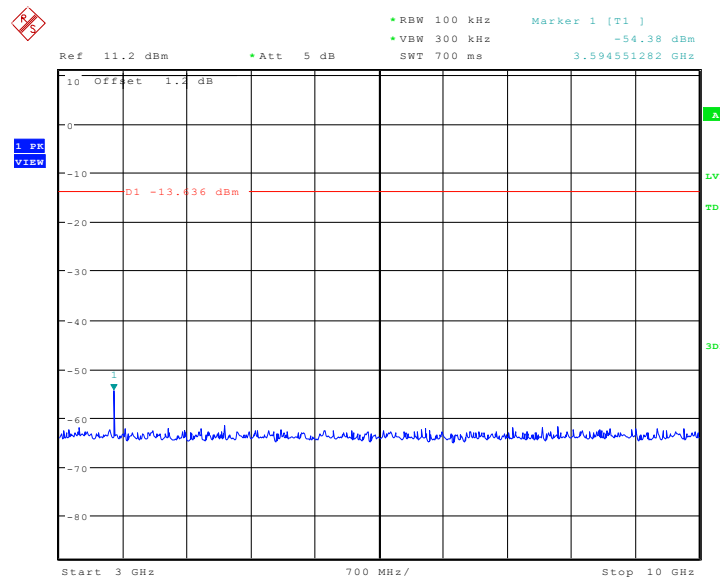
Date: 1.DEC.2014 13:35:30

Fig.29. Conducted spurious emission:  $\pi/4$  DQPSK, Channel 0, 30MHz - 1GHz



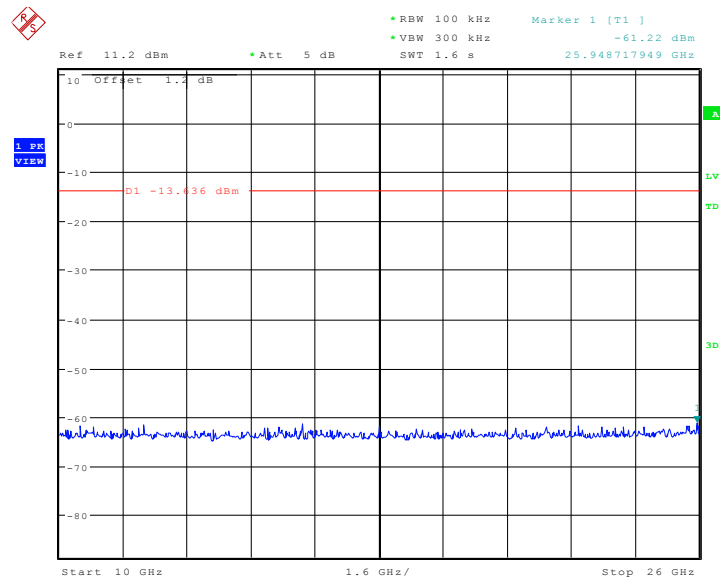
Date: 1.DEC.2014 13:36:02

Fig.30. Conducted spurious emission:  $\pi/4$  DQPSK, Channel 0, 1GHz - 3GHz



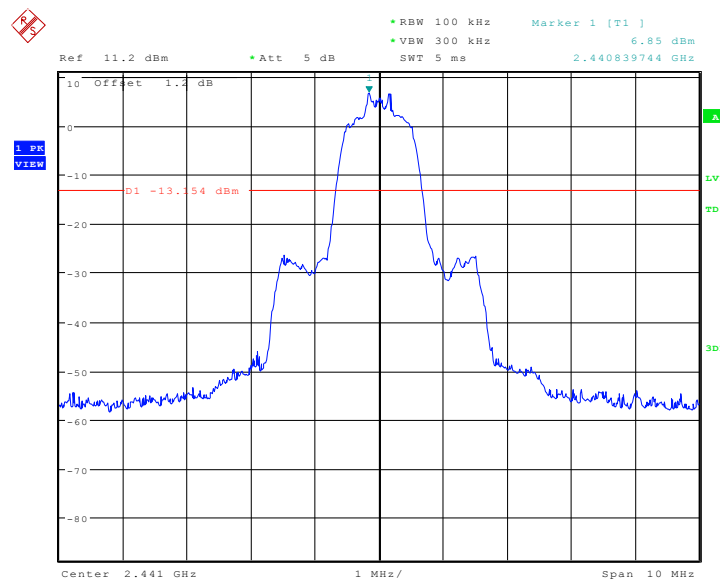
Date: 1.DEC.2014 13:36:18

Fig.31. Conducted spurious emission:  $\pi/4$  DQPSK, Channel 0, 3GHz - 10GHz



Date: 1.DEC.2014 13:36:35

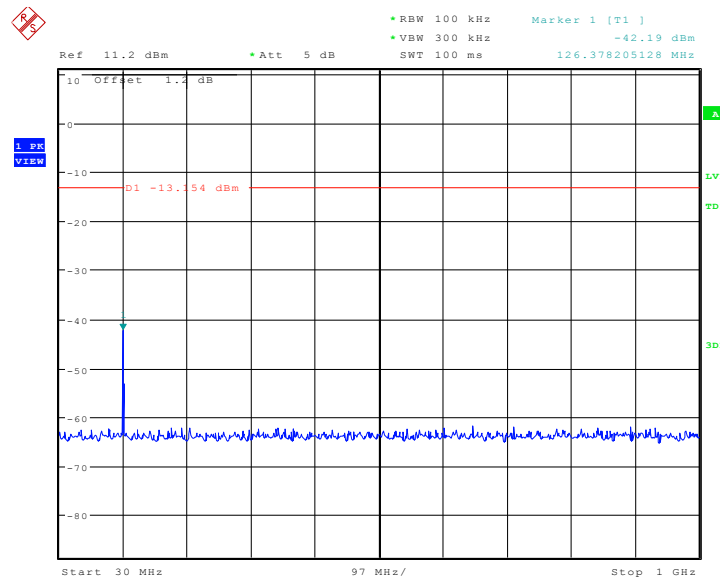
Fig.32. Conducted spurious emission:  $\pi/4$  DQPSK, Channel 0, 10GHz - 26GHz



Date: 1.DEC.2014 13:36:52

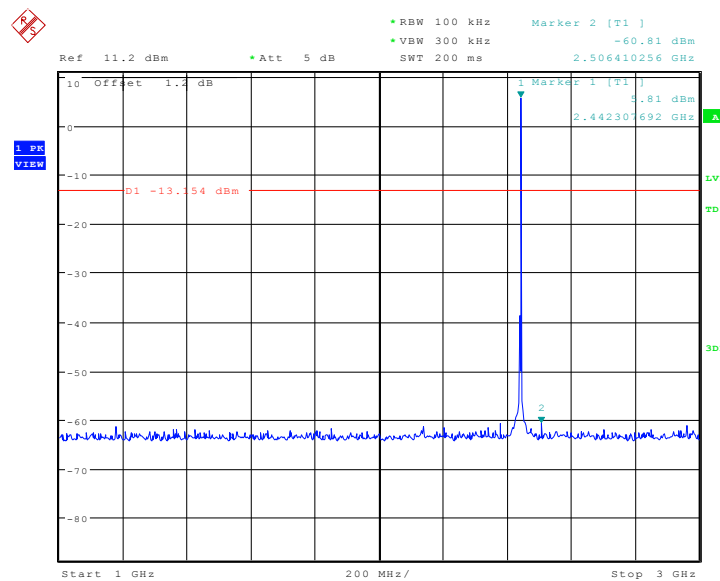
Fig.33. Conducted spurious emission:  $\pi/4$  DQPSK, Channel 39, 2441MHz





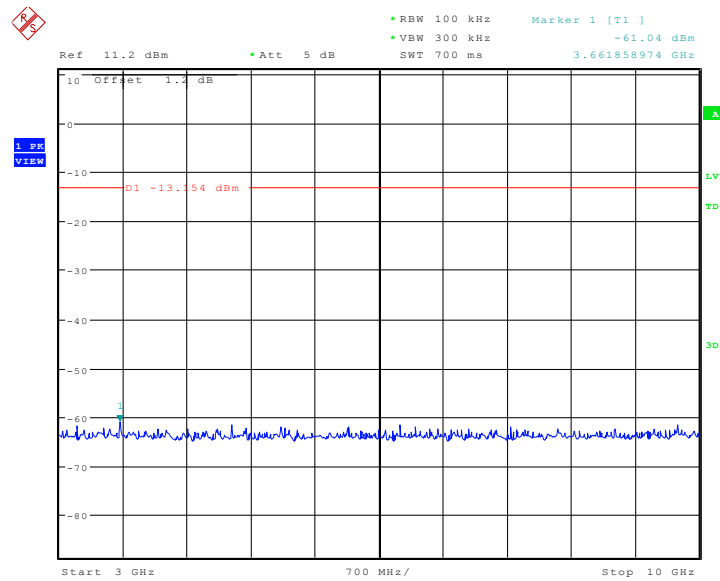
Date: 1.DEC.2014 13:37:08

Fig.34. Conducted spurious emission:  $\pi/4$  DQPSK, Channel 39, 30MHz - 1GHz



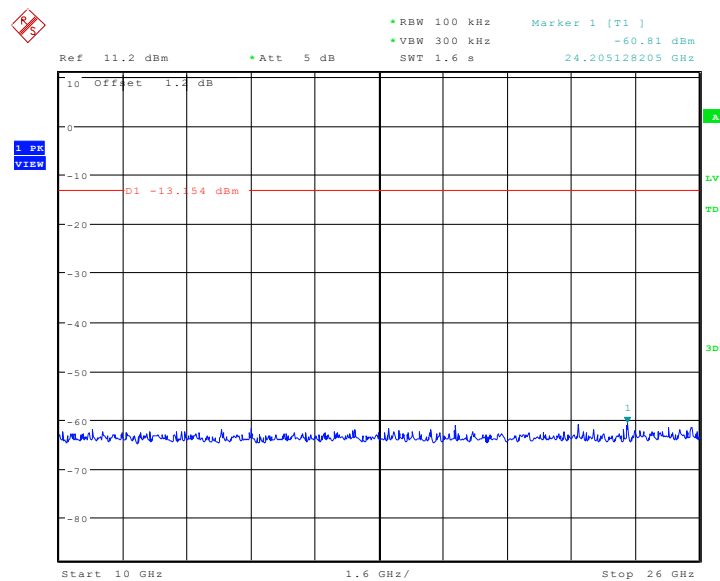
Date: 1.DEC.2014 13:37:40

Fig.35. Conducted spurious emission:  $\pi/4$  DQPSK, Channel 39, 1GHz - 3GHz



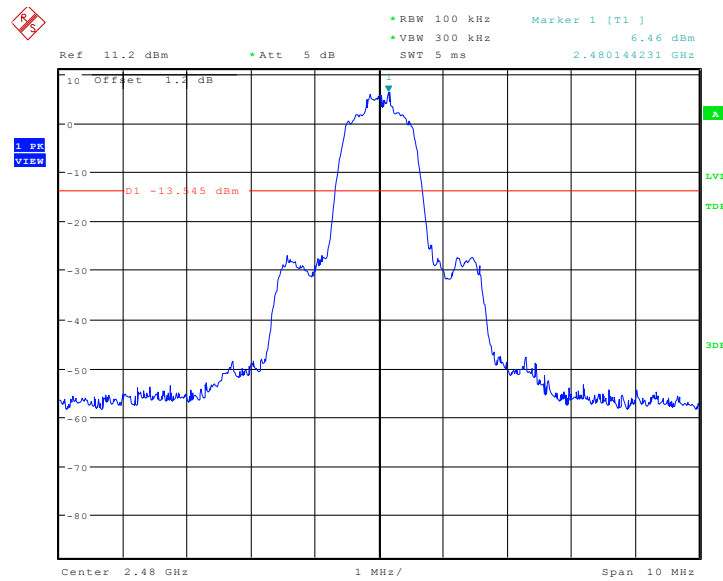
Date: 1.DEC.2014 13:37:56

Fig.36. Conducted spurious emission:  $\pi/4$  DQPSK, Channel 39, 3GHz - 10GHz



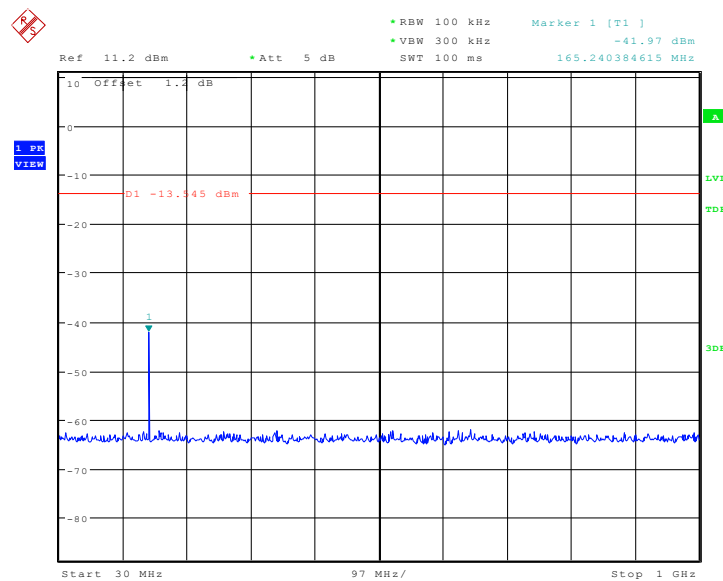
Date: 1.DEC.2014 13:38:13

Fig.37. Conducted spurious emission:  $\pi/4$  DQPSK, Channel 39, 10GHz – 26GHz



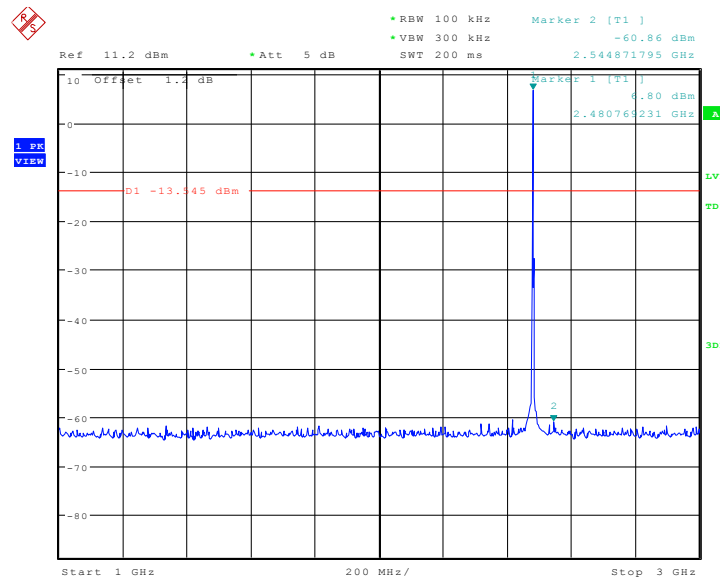
Date: 1.DEC.2014 13:38:29

Fig.38. Conducted spurious emission:  $\pi/4$  DQPSK, Channel 78, 2480MHz



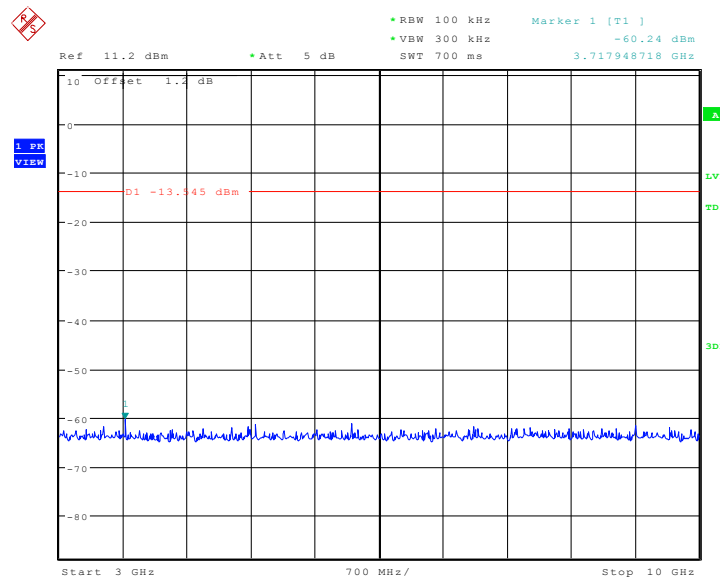
Date: 1.DEC.2014 13:38:46

Fig.39. Conducted spurious emission:  $\pi/4$  DQPSK, Channel 78, 30MHz - 1GHz



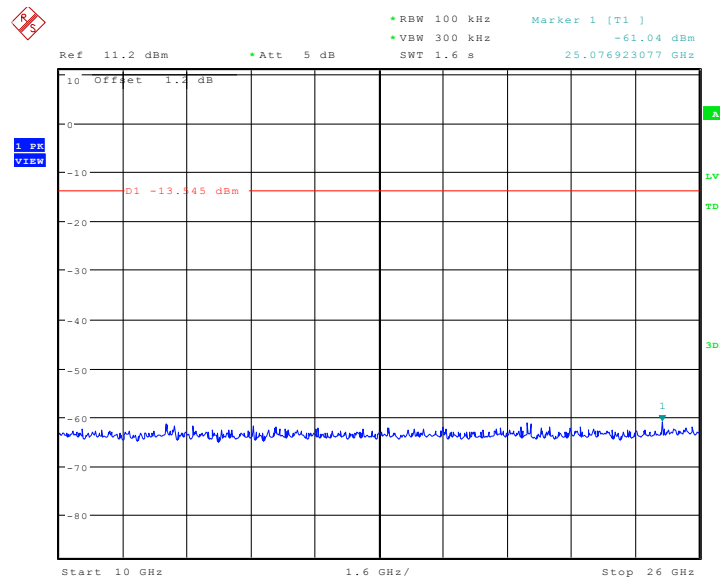
Date: 1.DEC.2014 13:39:18

Fig.40. Conducted spurious emission:  $\pi/4$  DQPSK, Channel 78, 1GHz - 3GHz



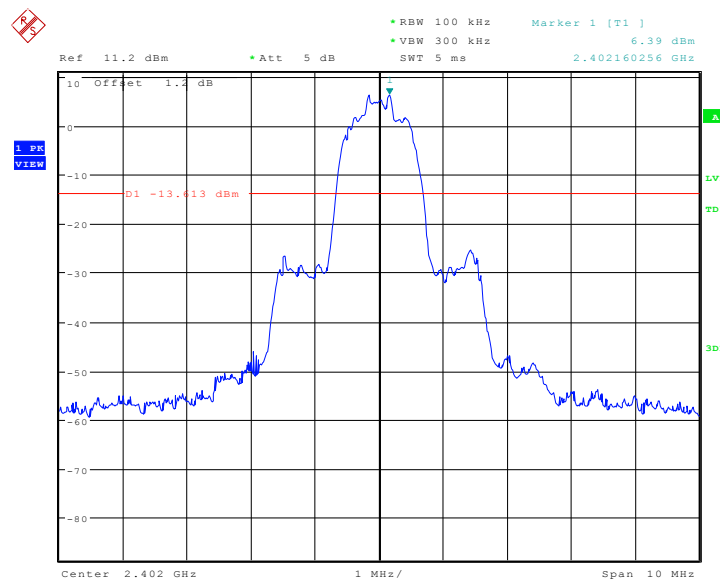
Date: 1.DEC.2014 13:39:34

Fig.41. Conducted spurious emission:  $\pi/4$  DQPSK, Channel 78, 3GHz - 10GHz



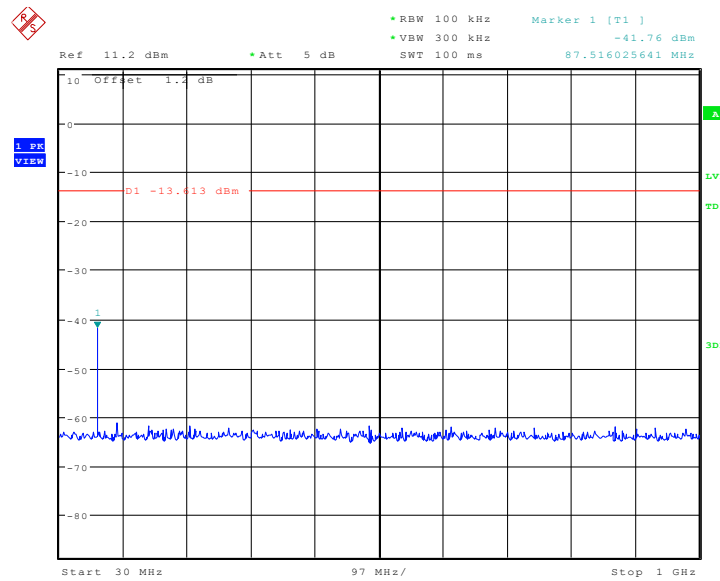
Date: 1.DEC.2014 13:39:51

Fig.42. Conducted spurious emission:  $\pi/4$  DQPSK, Channel 78, 10GHz - 26GHz



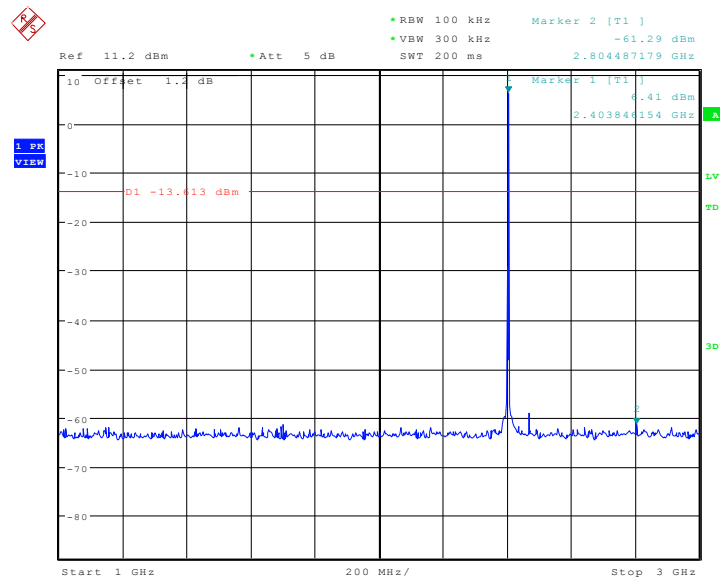
Date: 1.DEC.2014 13:57:15

Fig.43. Conducted spurious emission: 8DPSK, Channel 0, 2402MHz



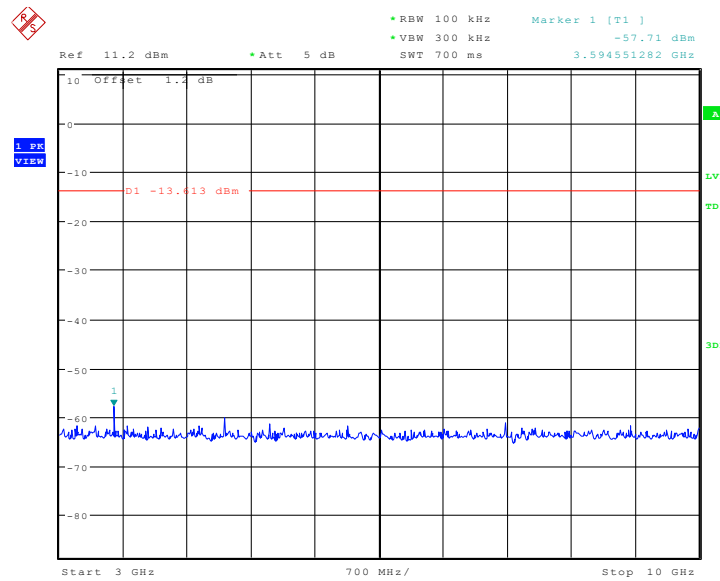
Date: 1.DEC.2014 13:57:31

Fig.44. Conducted spurious emission: 8DPSK, Channel 0, 30MHz - 1GHz



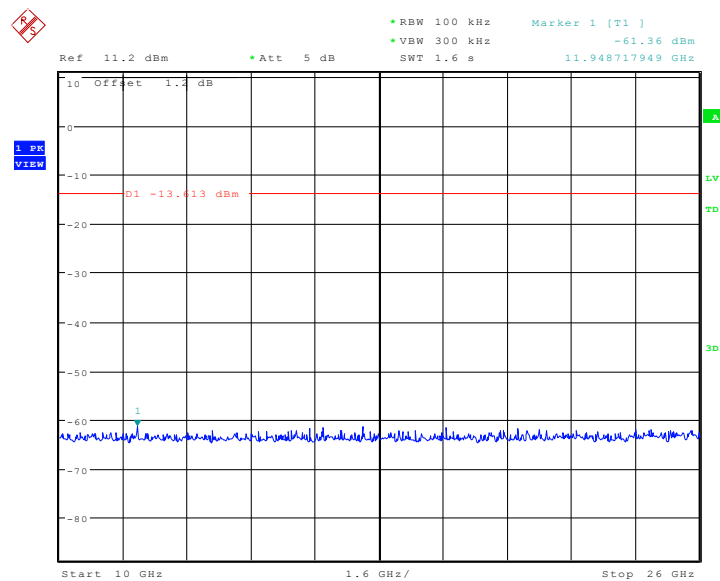
Date: 1.DEC.2014 13:58:03

Fig.45. Conducted spurious emission: 8DPSK, Channel 0, 1GHz - 3GHz



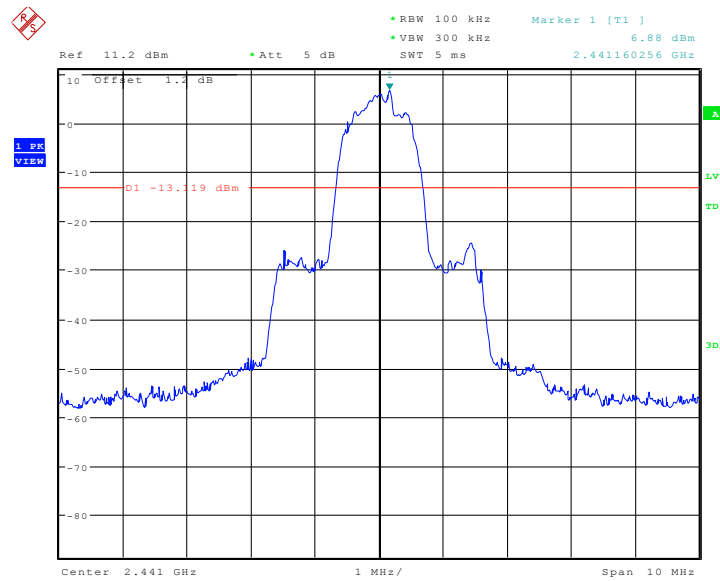
Date: 1.DEC.2014 13:58:19

Fig.46. Conducted spurious emission: 8DPSK, Channel 0, 3GHz - 10GHz



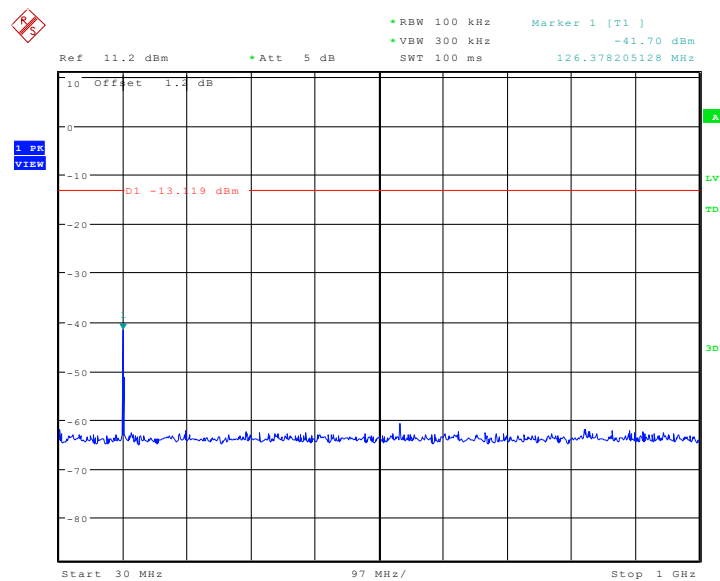
Date: 1.DEC.2014 13:58:36

Fig.47. Conducted spurious emission: 8DPSK, Channel 0, 10GHz - 26GHz



Date: 1.DEC.2014 13:58:52

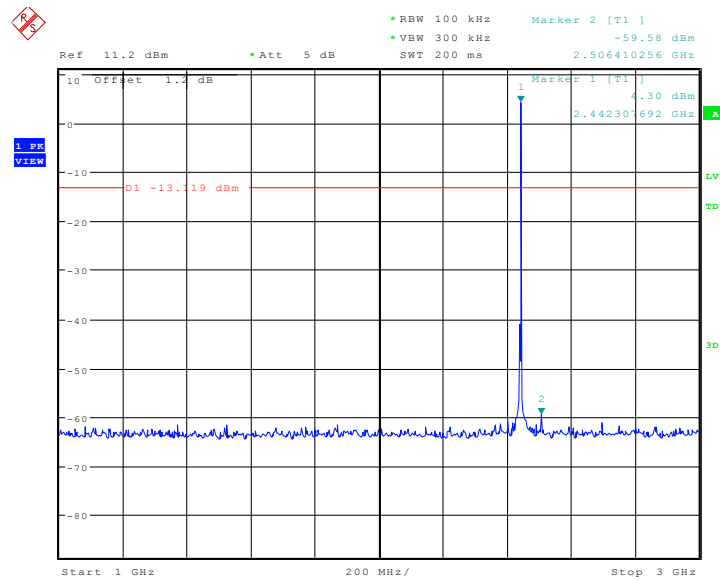
Fig.48. Conducted spurious emission: 8DPSK, Channel 39, 2441MHz



Date: 1.DEC.2014 13:59:09

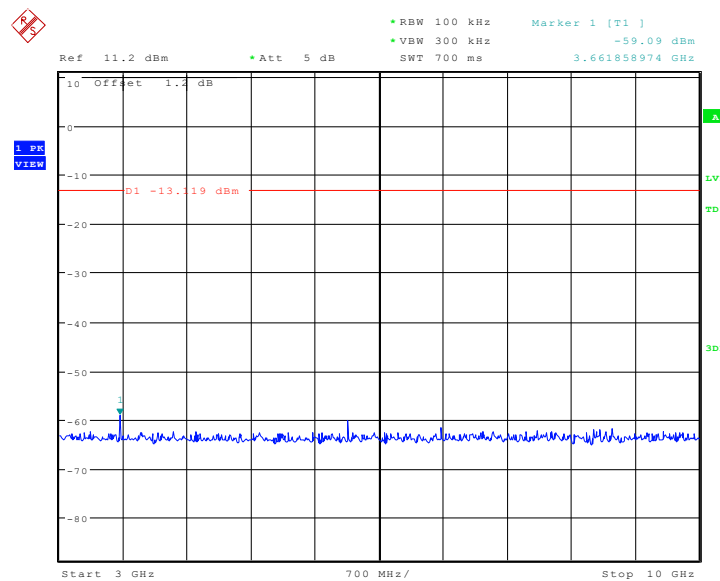
Fig.49. Conducted spurious emission: 8DPSK, Channel 39, 30MHz - 1GHz





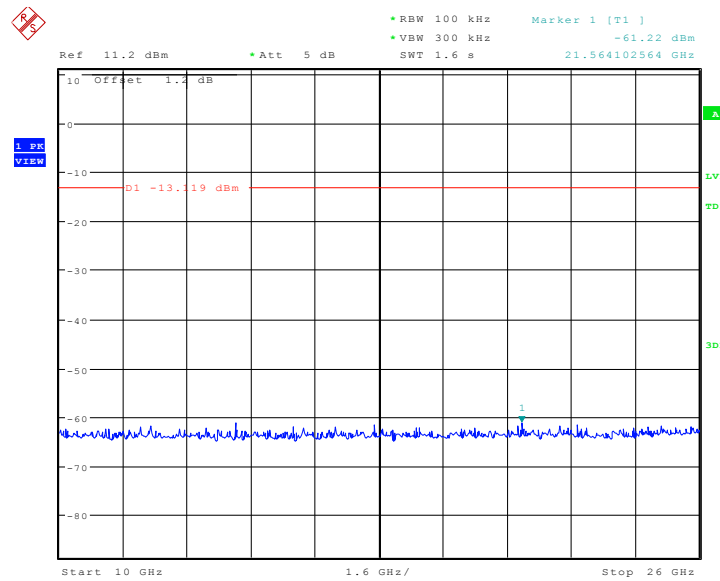
Date: 1.DEC.2014 13:59:41

Fig.50. Conducted spurious emission: 8DPSK, Channel 39, 1GHz - 3GHz



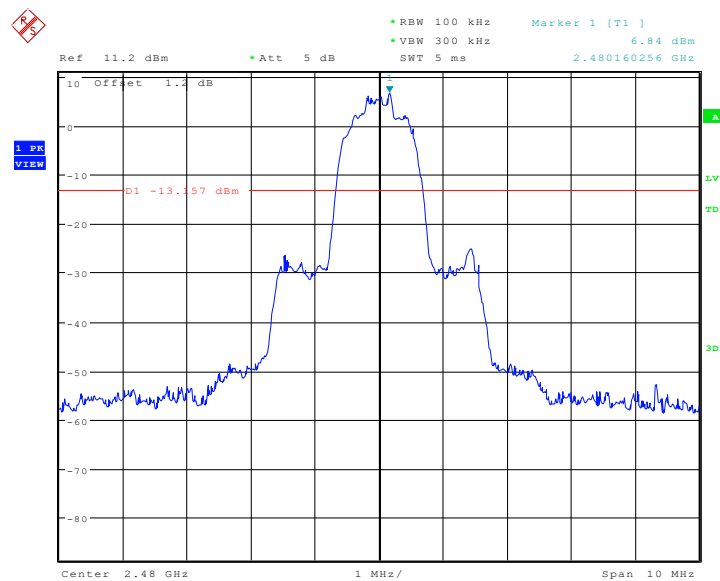
Date: 1.DEC.2014 13:59:57

Fig.51. Conducted spurious emission: 8DPSK, Channel 39, 3GHz - 10GHz



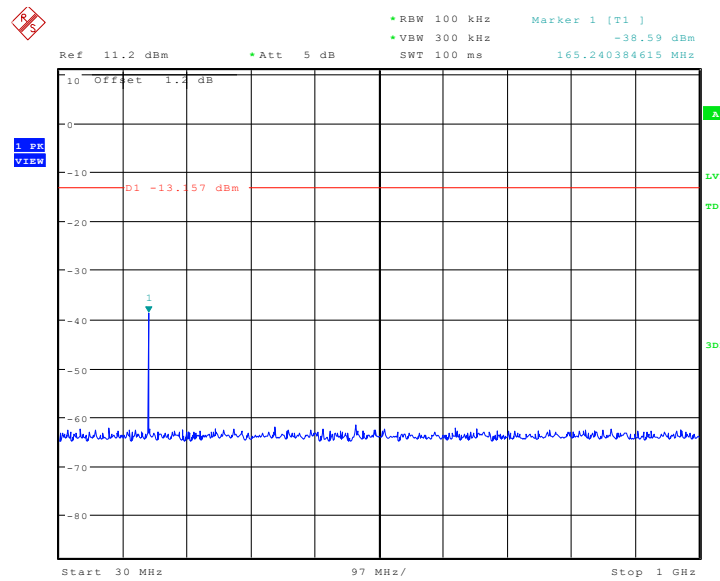
Date: 1.DEC.2014 14:00:14

Fig.52. Conducted spurious emission: 8DPSK, Channel 39, 10GHz – 26GHz



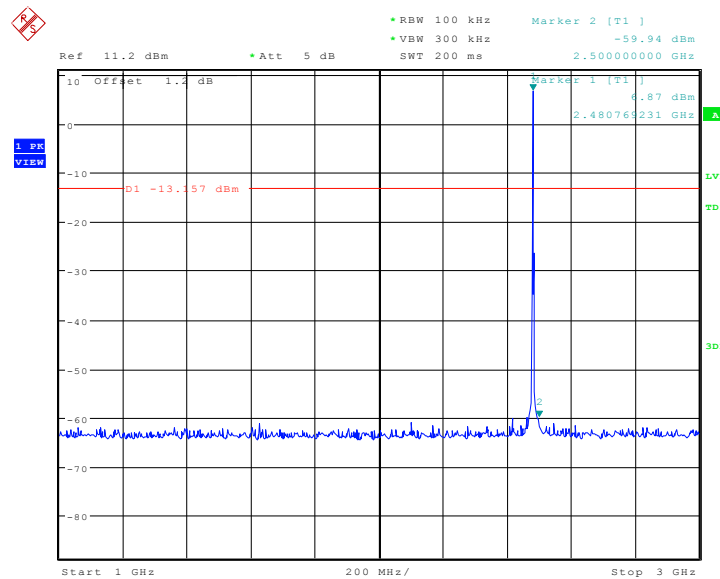
Date: 1.DEC.2014 14:00:30

Fig.53. Conducted spurious emission: 8DPSK, Channel 78, 2480MHz



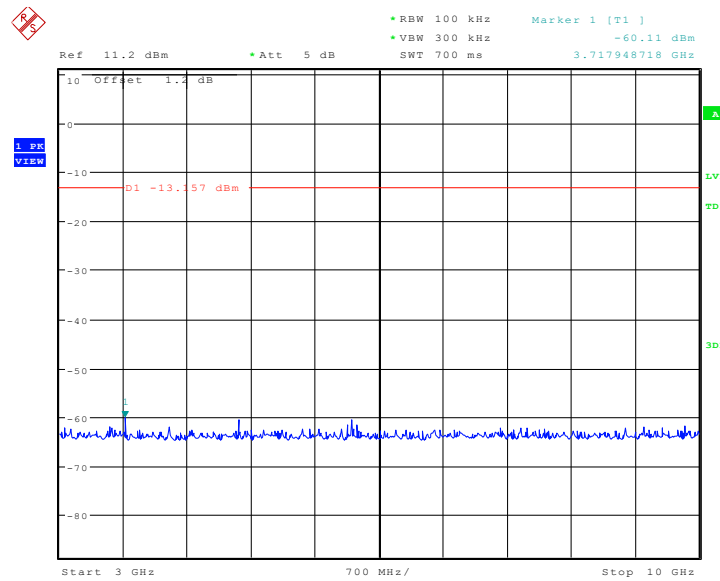
Date: 1.DEC.2014 14:00:47

Fig.54. Conducted spurious emission: 8DPSK, Channel 78, 30MHz - 1GHz



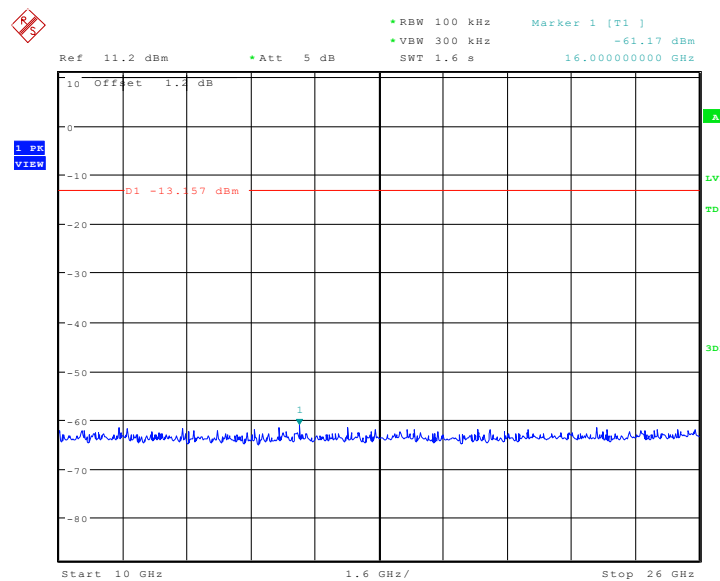
Date: 1.DEC.2014 14:01:19

Fig.55. Conducted spurious emission: 8DPSK, Channel 78, 1GHz - 3GHz



Date: 1.DEC.2014 14:01:35

Fig.56. Conducted spurious emission: 8DPSK, Channel 78, 3GHz - 10GHz



Date: 1.DEC.2014 14:01:52

Fig.57. Conducted spurious emission: 8DPSK, Channel 78, 10GHz - 26GHz

## A.5. Radiated Emission

### Measurement Limit:

| Standard                               | Limit                        |
|--|------------------------------|
| FCC 47 CFR Part 15.247, 15.205, 15.209 | 20dB below peak output 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)).

The measurement is made according to ANSI C63.10

### Limit in restricted band:

| Frequency of emission (MHz) | Field strength(uV/m) | Field strength(dBuV/m) |
|-----------------------------|----------------------|------------------------|
| 30-88                       | 100                  | 40                     |
| 88-216                      | 150                  | 43.5                   |
| 216-960                     | 200                  | 46                     |
| Above 960                   | 500                  | 54                     |

### Test Condition

The EUT was placed on a non-conductive table. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and the EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

| Frequency of emission (MHz) | RBW/VBW       | Sweep Time(s) |
|-----------------------------|---------------|---------------|
| 30-1000                     | 100KHz/300KHz | 5             |
| 1000-4000                   | 1MHz/1MHz     | 15            |
| 4000-18000                  | 1MHz/1MHz     | 40            |
| 18000-26500                 | 1MHz/1MHz     | 20            |

### Measurement Results:

Result= $P_{Mea}$ +ARPL

### For GFSK

| Channel           | Frequency Range    | Test Results | Conclusion |
|-------------------|--------------------|--------------|------------|
| Ch 0<br>2402 MHz  | 1 GHz ~ 3 GHz      | Fig.58       | P          |
|                   | 3 GHz ~ 18 GHz     | Fig.59       | P          |
| Ch 39<br>2441 MHz | 9 kHz ~ 30 MHz     | Fig.60       | P          |
|                   | 30 MHz ~ 1 GHz     | Fig.61       | P          |
|                   | 1 GHz ~ 3 GHz      | Fig.62       | P          |
|                   | 3 GHz ~ 18 GHz     | Fig.63       | P          |
| Ch 78<br>2480 MHz | 1 GHz ~ 3 GHz      | Fig.64       | P          |
|                   | 3 GHz ~ 18 GHz     | Fig.65       | P          |
| Power             | 2.38GHz~2.4GHz---L | Fig.66       | P          |
| Power             | 2.45GHz~2.5GHz---H | Fig.67       | P          |
| For all channels  | 18 GHz ~ 26 GHz    | Fig.68       | P          |

**For  $\pi/4$  DQPSK**

| Channel           | Frequency Range    | Test Results | Conclusion |
|-------------------|--------------------|--------------|------------|
| Ch 0<br>2402 MHz  | 1 GHz ~ 3 GHz      | Fig.69       | P          |
|                   | 3 GHz ~ 18 GHz     | Fig.70       | P          |
| Ch 39<br>2441 MHz | 30 MHz ~ 1 GHz     | Fig.71       | P          |
|                   | 1 GHz ~ 3 GHz      | Fig.72       | P          |
|                   | 3 GHz ~ 18 GHz     | Fig.73       | P          |
| Ch 78<br>2480 MHz | 1 GHz ~ 3 GHz      | Fig.74       | P          |
|                   | 3 GHz ~ 18 GHz     | Fig.75       | P          |
| Power             | 2.38GHz~2.4GHz---L | Fig.76       | P          |
| Power             | 2.45GHz~2.5GHz---H | Fig.77       | P          |
| For all channels  | 18 GHz ~ 26 GHz    | Fig.78       | P          |

**For 8DPSK**

| Channel           | Frequency Range    | Test Results | Conclusion |
|-------------------|--------------------|--------------|------------|
| Ch 0<br>2402 MHz  | 1 GHz ~ 3 GHz      | Fig.79       | P          |
|                   | 3 GHz ~ 18 GHz     | Fig.80       | P          |
| Ch 39<br>2441 MHz | 30 MHz ~ 1 GHz     | Fig.81       | P          |
|                   | 1 GHz ~ 3 GHz      | Fig.82       | P          |
|                   | 3 GHz ~ 18 GHz     | Fig.83       | P          |
| Ch 78<br>2480 MHz | 1 GHz ~ 3 GHz      | Fig.84       | P          |
|                   | 3 GHz ~ 18 GHz     | Fig.85       | P          |
| Power             | 2.38GHz~2.4GHz---L | Fig.86       | P          |
| Power             | 2.45GHz~2.5GHz---H | Fig.87       | P          |
| For all channels  | 18 GHz ~ 26 GHz    | Fig.88       | P          |

**GFSK Ch 0 - Average**

| Frequency(MHz) | Result(dBuv/m) | ARPL (dB) | PMea(dBuv/m) | Polarization |
|----------------|----------------|-----------|--------------|--------------|
| 2385.156       | 35.1           | -11.1     | 46.200       | H            |
| 17997.000      | 43.2           | 27.9      | 15.300       | H            |
| 17991.000      | 42.9           | 27.9      | 15.000       | V            |
| 17995.500      | 42.9           | 27.9      | 15.000       | V            |
| 17934.000      | 42.9           | 27.9      | 15.000       | V            |
| 17998.500      | 42.9           | 27.9      | 15.000       | V            |

**GFSK Ch 39 - Average**

| Frequency(MHz) | Result(dBuv/m) | ARPL (dB) | Pmea(dBuv/m) | Polarization |
|----------------|----------------|-----------|--------------|--------------|
| 17967.000      | 43.0           | 27.9      | 15.100       | H            |
| 17997.000      | 43.0           | 27.9      | 15.100       | V            |
| 17994.000      | 42.9           | 27.9      | 15.000       | V            |
| 17971.500      | 42.8           | 27.9      | 14.900       | V            |
| 17964.000      | 42.8           | 27.9      | 14.900       | H            |
| 17968.500      | 42.7           | 27.9      | 14.800       | H            |

**GFSK Ch 78 - Average**

| Frequency(MHz) | Result(dBuv/m) | ARPL (dB) | Pmea(dBuv/m) | Polarization |
|----------------|----------------|-----------|--------------|--------------|
| 2483.500       | 46.0           | -11.2     | 57.200       | H            |
| 17973.000      | 42.9           | 27.9      | 15.000       | V            |
| 18000.000      | 42.9           | -1.1      | 43.966       | V            |
| 17998.500      | 42.8           | 27.9      | 14.900       | H            |
| 17994.000      | 42.8           | 27.9      | 14.900       | H            |
| 17970.000      | 42.8           | 27.9      | 14.900       | V            |

**$\pi/4$  DQPSK Ch 0 - Average**

| Frequency(MHz) | Result(dBuv/m) | ARPL (dB) | Pmea(dBuv/m) | Polarization |
|----------------|----------------|-----------|--------------|--------------|
| 2390.000       | 35.2           | -11.1     | 46.300       | H            |
| 17997.000      | 43.2           | 27.9      | 15.300       | V            |
| 17998.500      | 43.0           | 27.9      | 15.100       | H            |
| 17994.000      | 43.0           | 27.9      | 15.100       | V            |
| 17922.000      | 42.7           | 27.9      | 14.800       | H            |
| 17931.000      | 42.7           | 27.9      | 14.800       | V            |

**$\pi/4$  DQPSK Ch 39 - Average**

| Frequency(MHz) | Result(dBuv/m) | ARPL (dB) | Pmea(dBuv/m) | Polarization |
|----------------|----------------|-----------|--------------|--------------|
| 17998.500      | 43.3           | 27.9      | 15.400       | V            |
| 17997.000      | 43.1           | 27.9      | 15.200       | V            |
| 18000.000      | 43.0           | -1.1      | 44.066       | V            |
| 17965.500      | 42.9           | 27.9      | 15.000       | H            |
| 17991.000      | 42.8           | 27.9      | 14.900       | V            |
| 17995.500      | 42.8           | 27.9      | 14.900       | V            |

**$\pi/4$  DQPSK Ch 78 - Average**

| Frequency(MHz) | Result(dBuv/m) | ARPL (dB) | Pmea(dBuv/m) | Polarization |
|----------------|----------------|-----------|--------------|--------------|
| 2483.500       | 44.7           | -11.2     | 55.900       | V            |
| 17998.500      | 43.0           | 27.9      | 15.100       | H            |
| 17997.000      | 42.9           | 27.9      | 15.000       | V            |
| 17994.000      | 42.8           | 27.9      | 14.900       | V            |
| 17964.000      | 42.8           | 27.9      | 14.900       | V            |
| 17932.500      | 42.8           | 27.9      | 14.900       | H            |

**8DPSK Ch 0 - Average**

| Frequency(MHz) | Result(dBuv/m) | ARPL (dB) | Pmea(dBuv/m) | Polarization |
|----------------|----------------|-----------|--------------|--------------|
| 2390.000       | 35.1           | -11.1     | 46.200       | V            |
| 17997.000      | 43.0           | 27.9      | 15.100       | H            |
| 17998.500      | 42.8           | 27.9      | 14.900       | V            |
| 17995.500      | 42.7           | 27.9      | 14.800       | V            |
| 17991.000      | 42.7           | 27.9      | 14.800       | H            |
| 17928.000      | 42.7           | 27.9      | 14.800       | V            |

**8DPSK Ch 39 - Average**

| Frequency(MHz) | Result(dBuv/m) | ARPL (dB) | Pmea(dBuv/m) | Polarization |
|----------------|----------------|-----------|--------------|--------------|
| 17994.000      | 43.0           | 27.9      | 15.100       | H            |
| 18000.000      | 42.9           | -1.1      | 43.966       | H            |
| 17998.500      | 42.7           | 27.9      | 14.800       | V            |
| 17997.000      | 42.7           | 27.9      | 14.800       | V            |
| 17968.500      | 42.7           | 27.9      | 14.800       | H            |
| 17932.500      | 42.7           | 27.9      | 14.800       | V            |

**8DPSK Ch 78 - Average**

| Frequency(MHz) | Result(dBuv/m) | ARPL (dB) | Pmea(dBuv/m) | Polarization |
|----------------|----------------|-----------|--------------|--------------|
| 2483.556       | 43.8           | -11.2     | 55.000       | H            |
| 17998.500      | 43.2           | 27.9      | 15.300       | V            |
| 17994.000      | 43.1           | 27.9      | 15.200       | V            |
| 18000.000      | 43.1           | -1.1      | 44.166       | V            |
| 17977.500      | 43.0           | 27.9      | 15.100       | V            |
| 17968.500      | 42.9           | 27.9      | 15.000       | H            |

**Conclusion: PASS**

**Test graphs as below:**

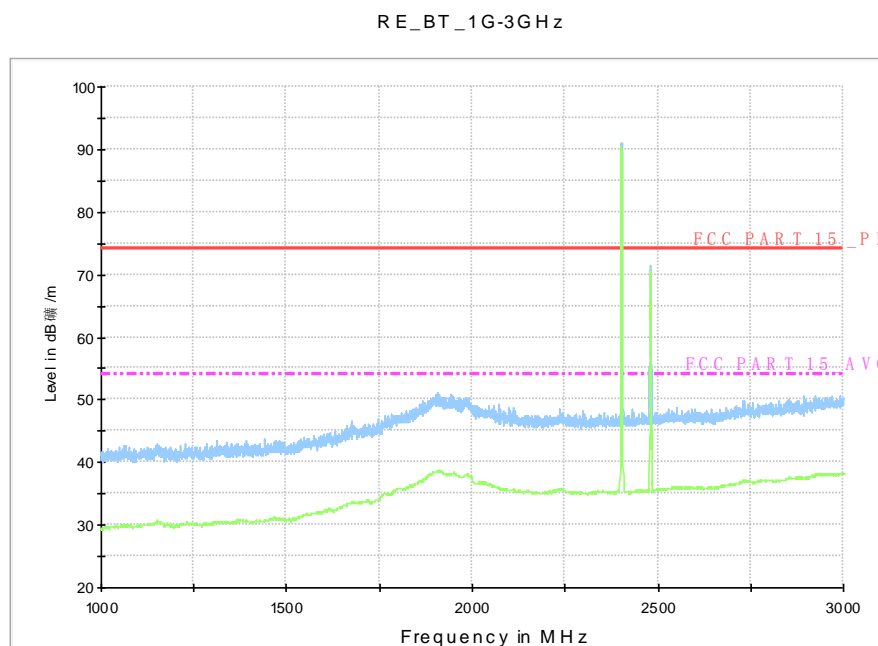


Fig.58. Radiated emission: GFSK, Channel 0, 1 GHz - 3 GHz



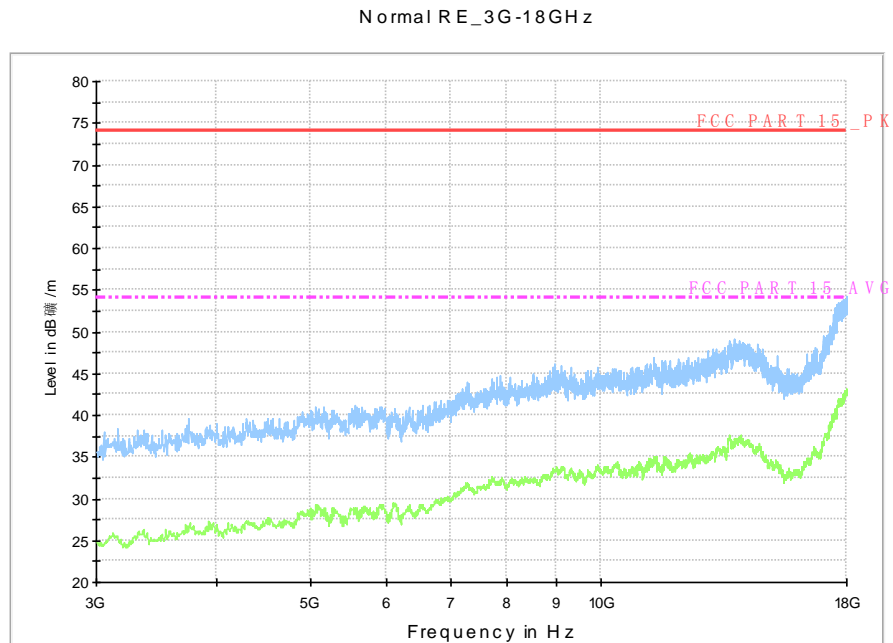


Fig.59. Radiated emission: GFSK, Channel 0, 3 GHz - 18 GHz

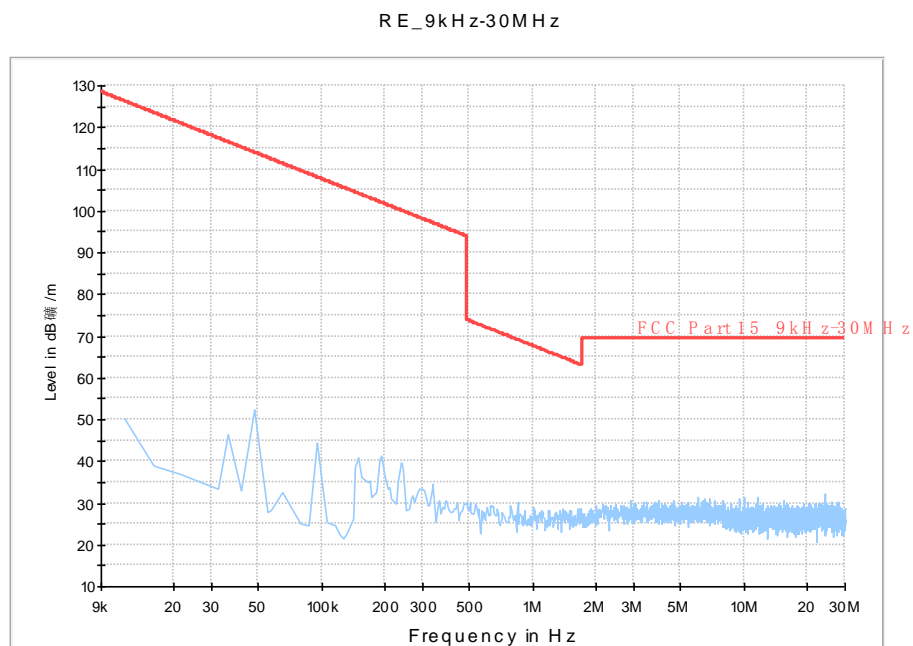


Fig.60. Radiated emission: GFSK, Channel 39, 9 kHz - 30 MHz

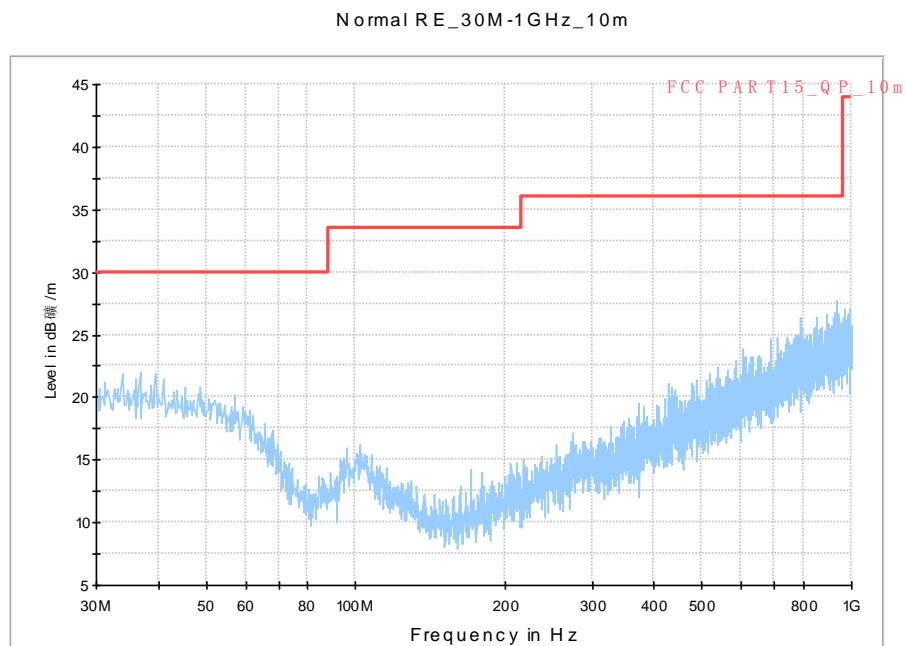


Fig.61. Radiated emission: GFSK, Channel 39, 30 MHz - 1 GHz

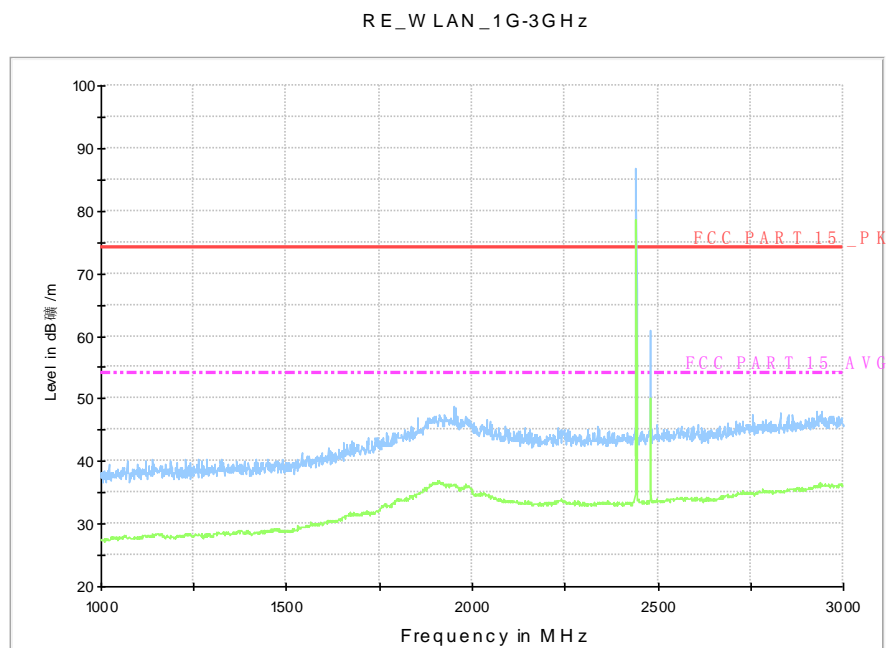


Fig.62. Radiated emission: GFSK, Channel 39, 1 GHz - 3 GHz

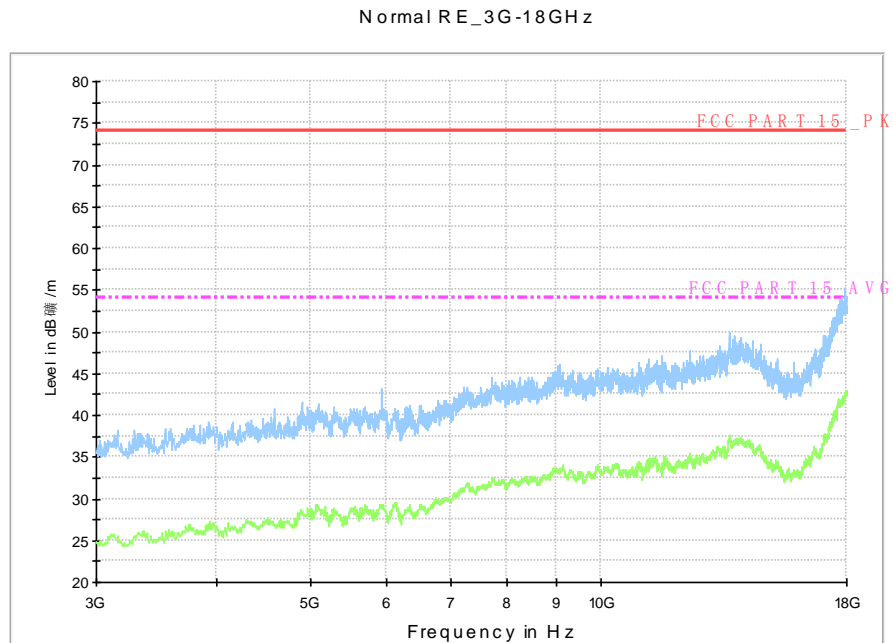


Fig.63. Radiated emission: GFSK, Channel 39, 3 GHz - 18 GHz

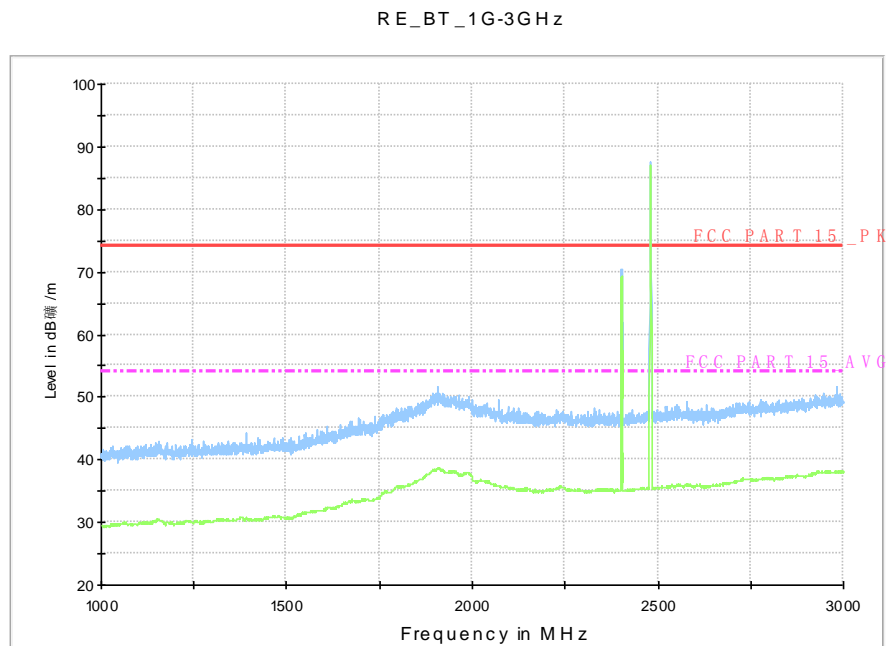


Fig.64. Radiated emission: GFSK, Channel 78, 1 GHz - 3 GHz

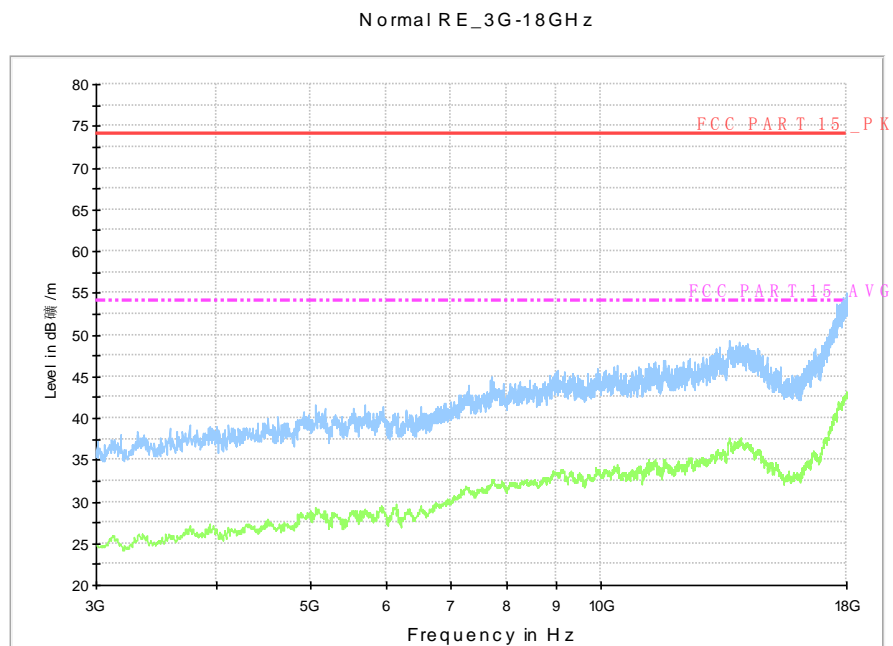


Fig.65. Radiated emission: GFSK, Channel 78, 3 GHz - 18 GHz

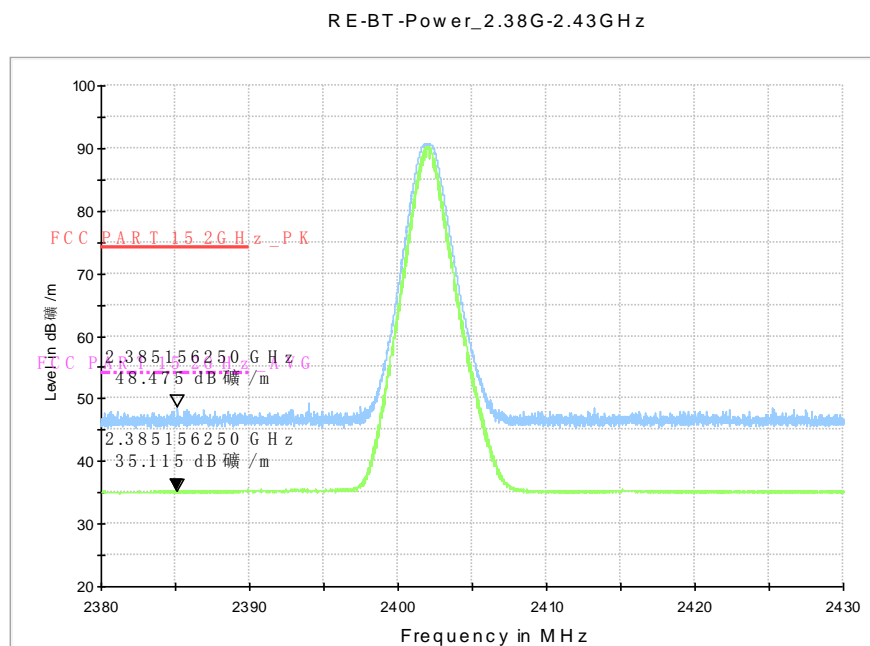


Fig.66. Radiated emission (Power): GFSK, low channel

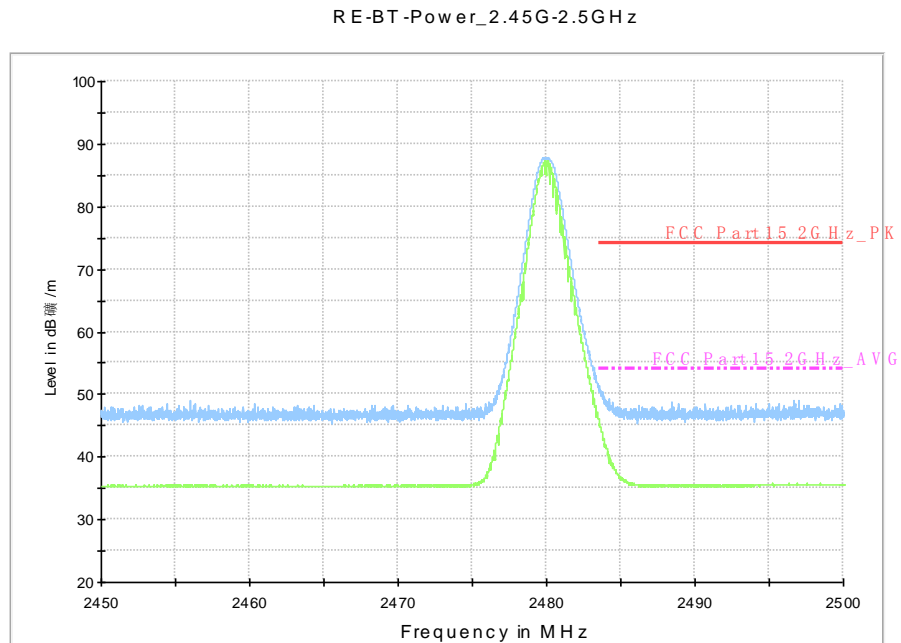


Fig.67. Radiated emission (Power) GFSK, high channel

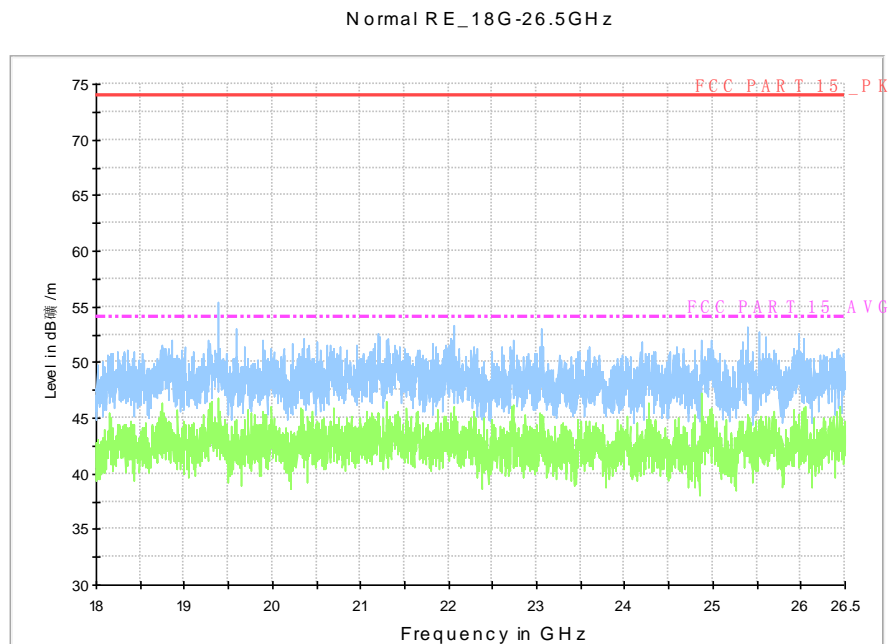


Fig.68. Radiated emission: GFSK, 18 GHz - 26 GHz

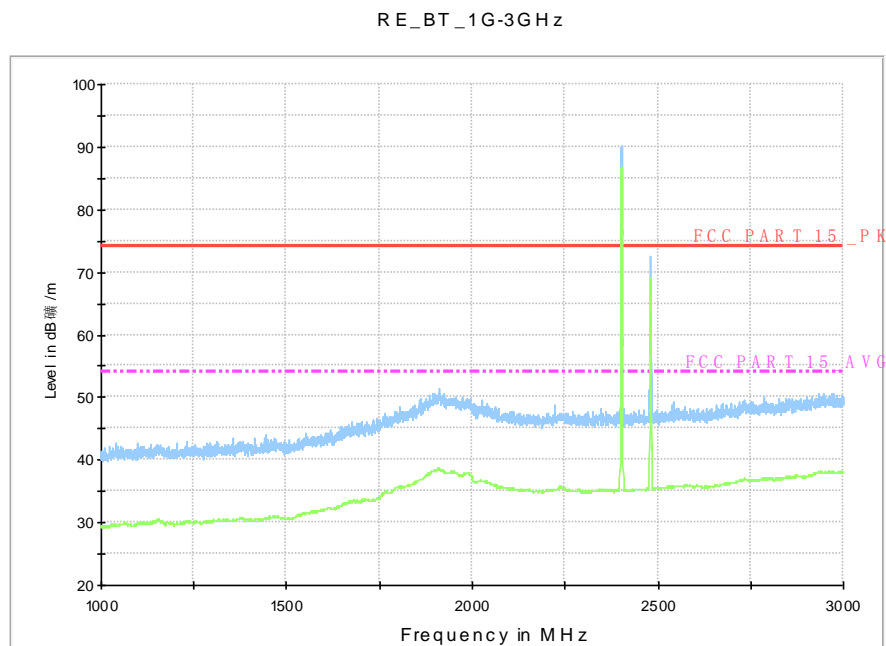


Fig.69. Radiated emission:  $\pi/4$  DQPSK, Channel 0, 1 GHz - 3 GHz

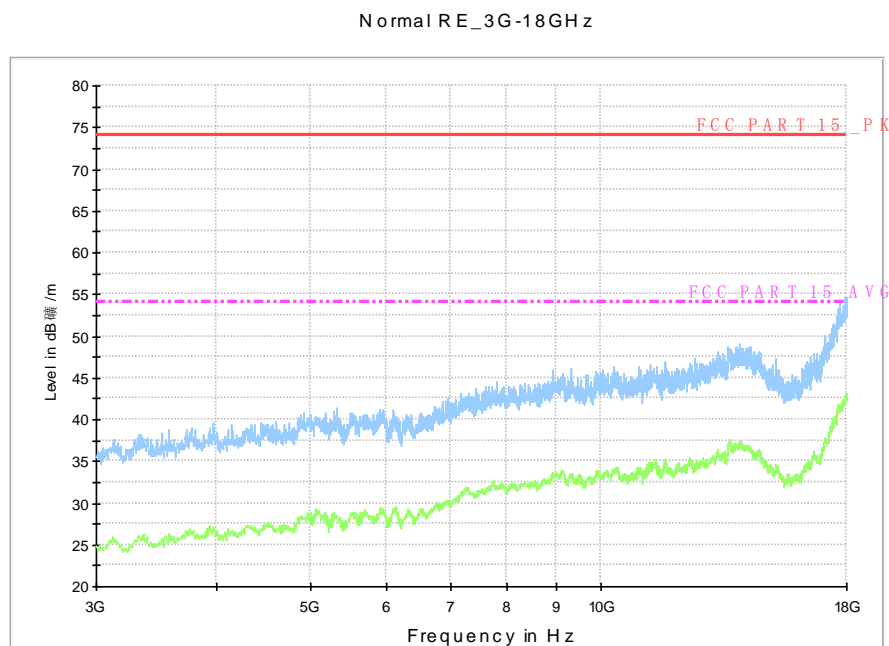


Fig.70. Radiated emission:  $\pi/4$  DQPSK, Channel 0, 3 GHz - 18 GHz

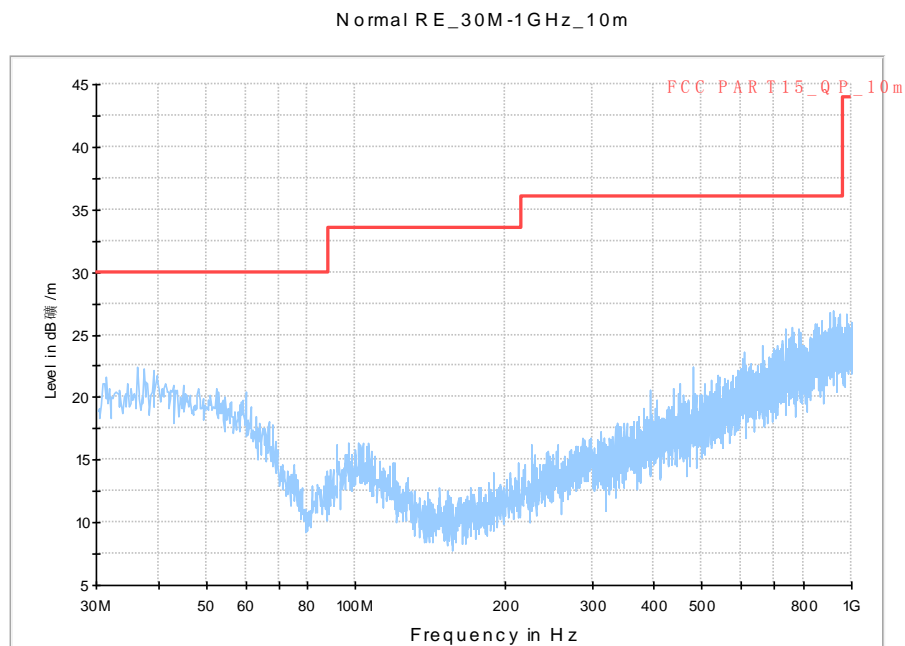


Fig.71. Radiated emission:  $\pi/4$  DQPSK, Channel 39, 30 MHz - 1 GHz

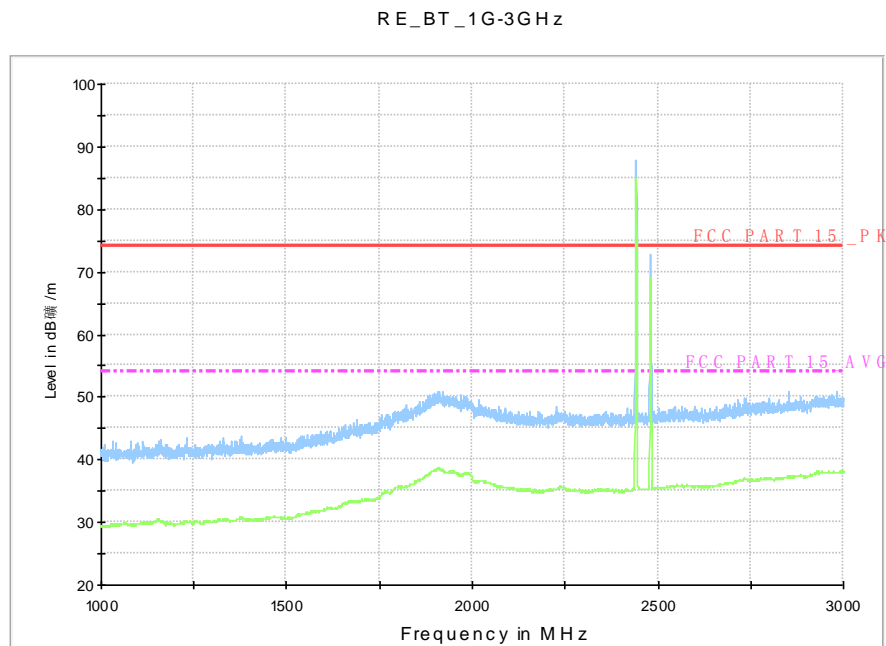


Fig.72. Radiated emission:  $\pi/4$  DQPSK, Channel 39, 1 GHz - 3 GHz

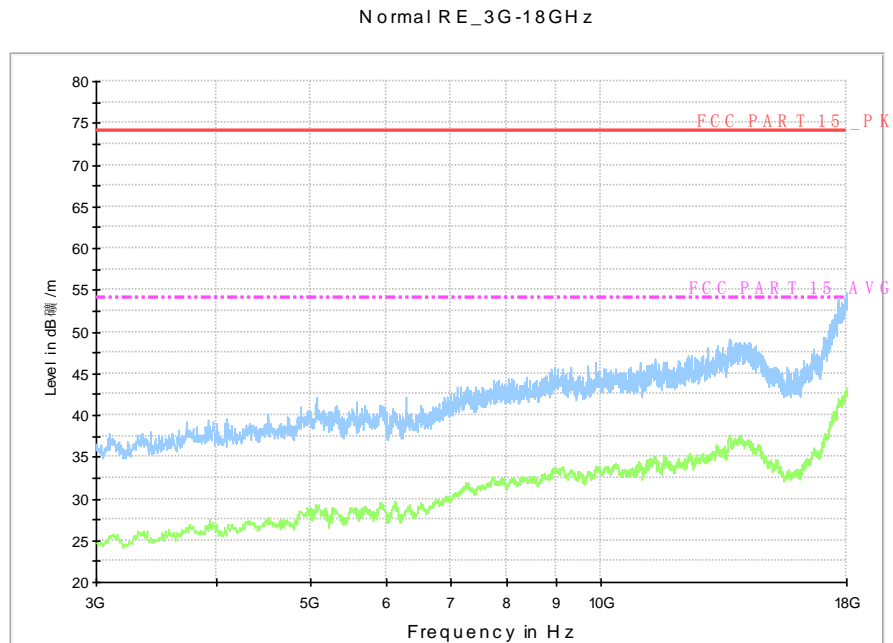


Fig.73. Radiated emission:  $\pi/4$  DQPSK, Channel 39, 3 GHz - 18 GHz

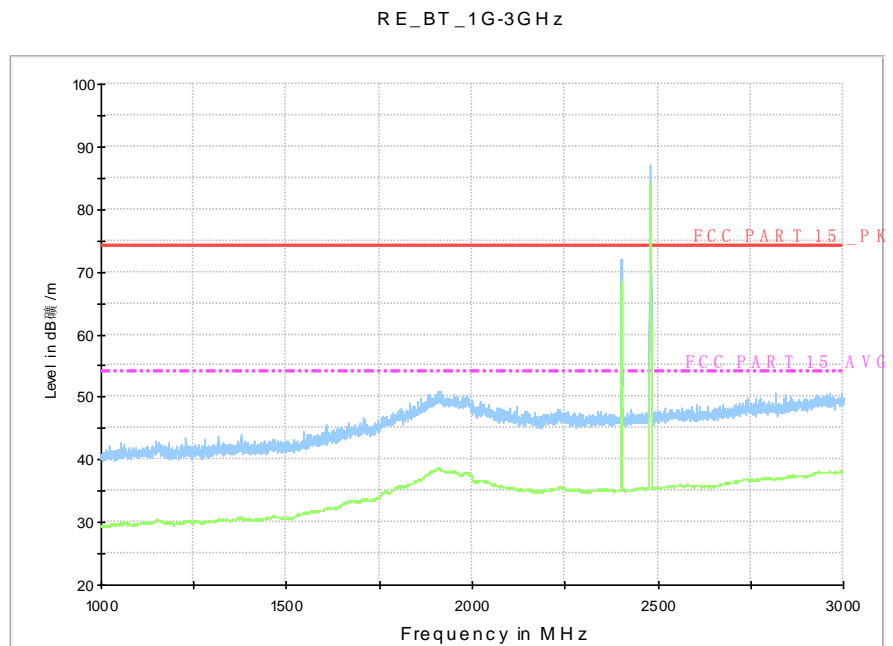


Fig.74. Radiated emission:  $\pi/4$  DQPSK, Channel 78, 1 GHz - 3 GHz



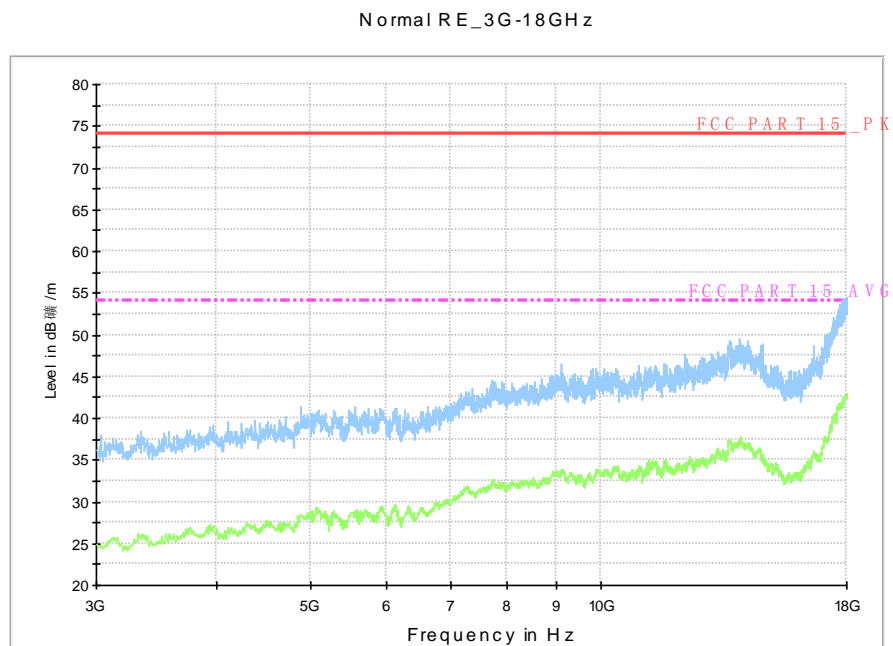


Fig.75. Radiated emission:  $\pi/4$  DQPSK, Channel 78, 3 GHz - 18 GHz

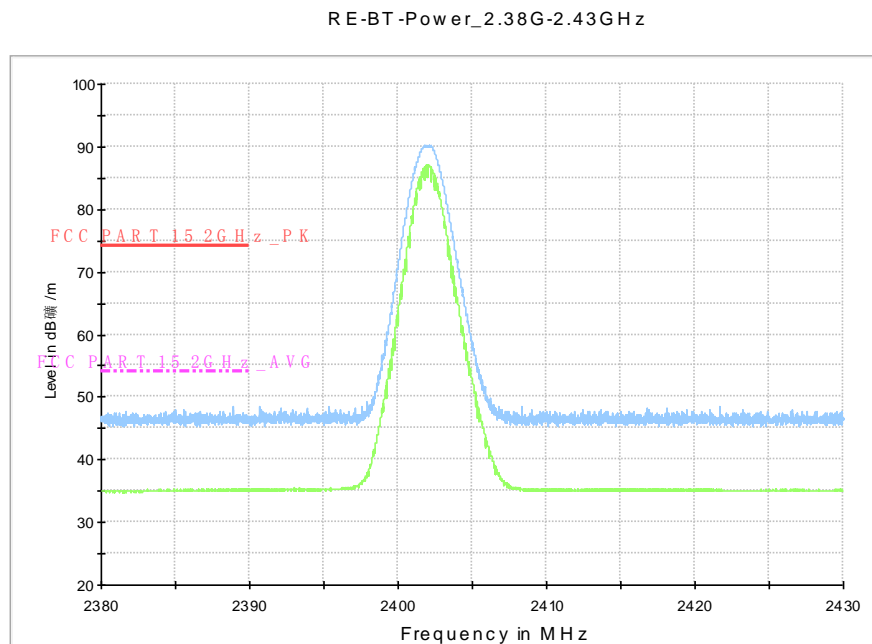


Fig.76. Radiated emission (Power):  $\pi/4$  DQPSK, low channel

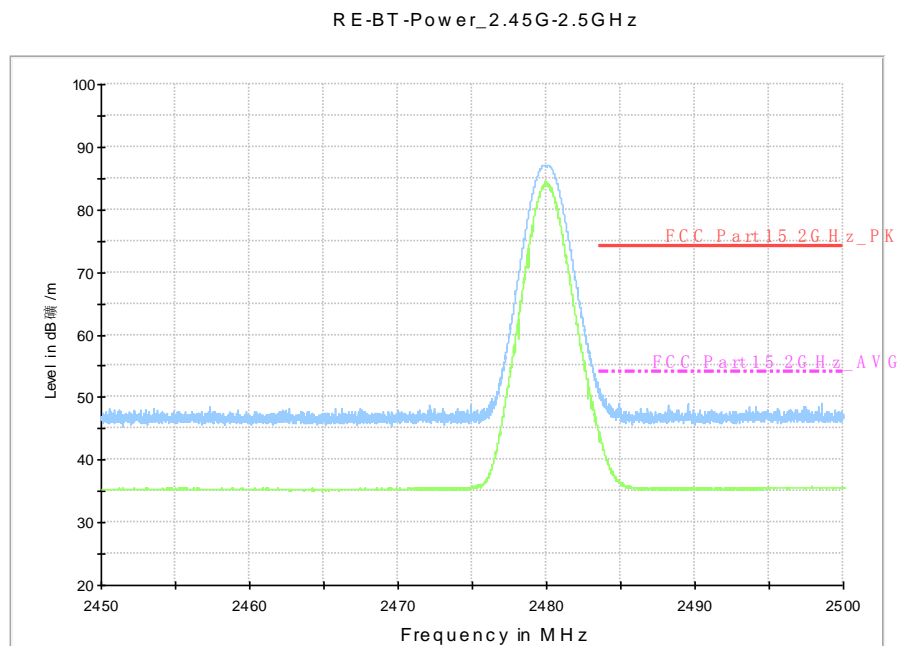


Fig.77. Radiated emission (Power):  $\pi/4$  DQPSK, high channel

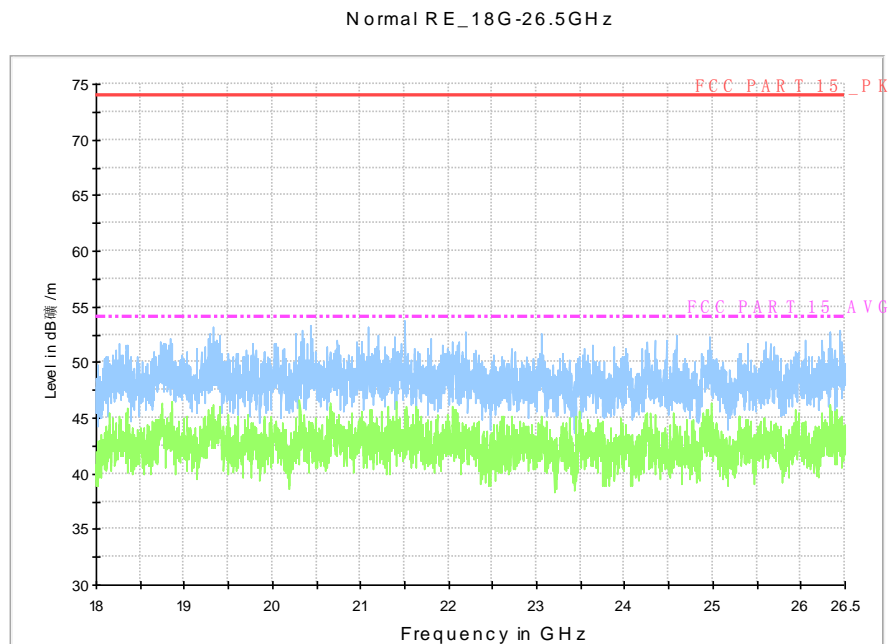


Fig.78. Radiated emission:  $\pi/4$  DQPSK, 18 GHz - 26 GHz

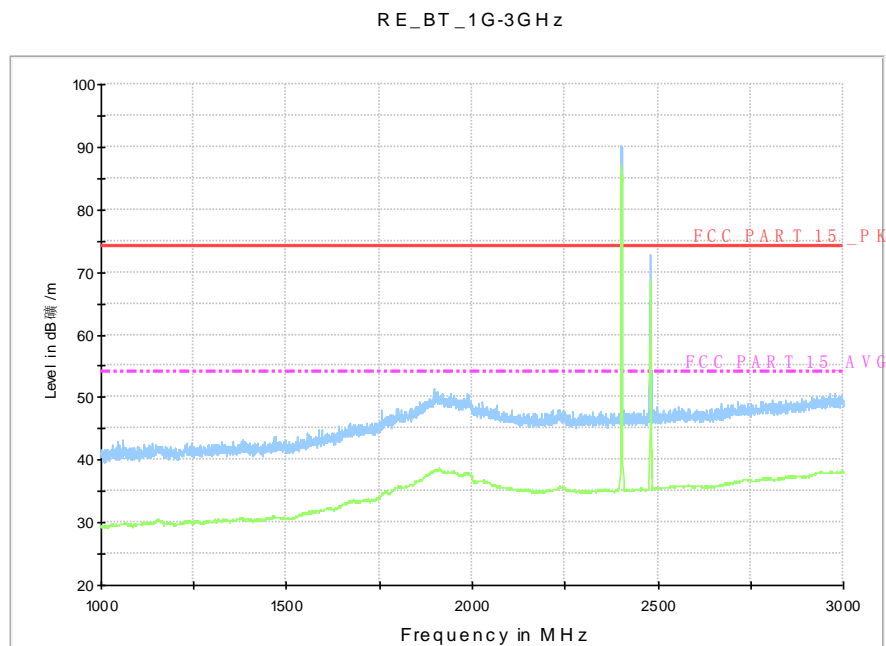


Fig.79. Radiated emission: 8DPSK, Channel 0, 1 GHz - 3 GHz

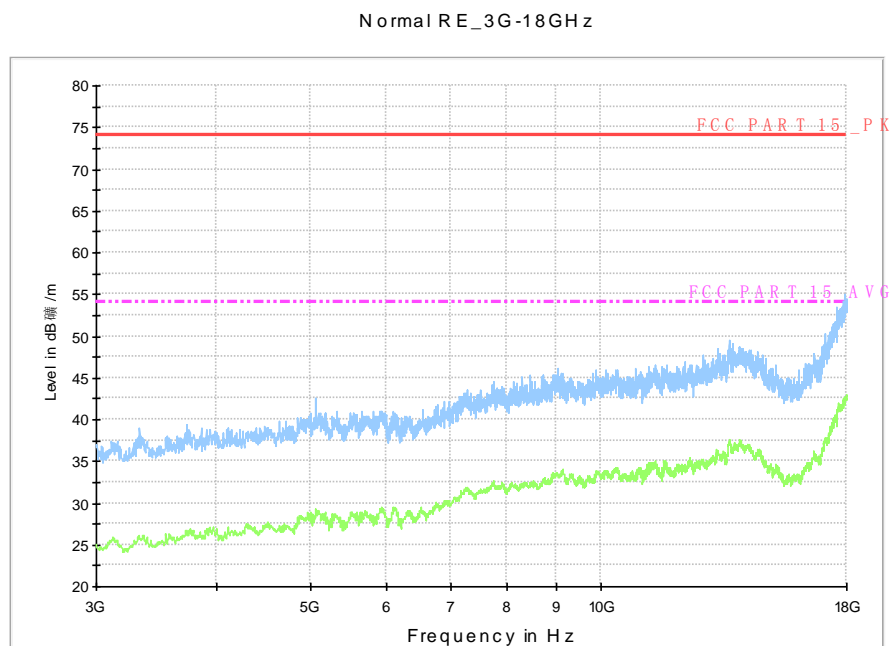


Fig.80. Radiated emission: 8DPSK, Channel 0, 3 GHz - 18 GHz

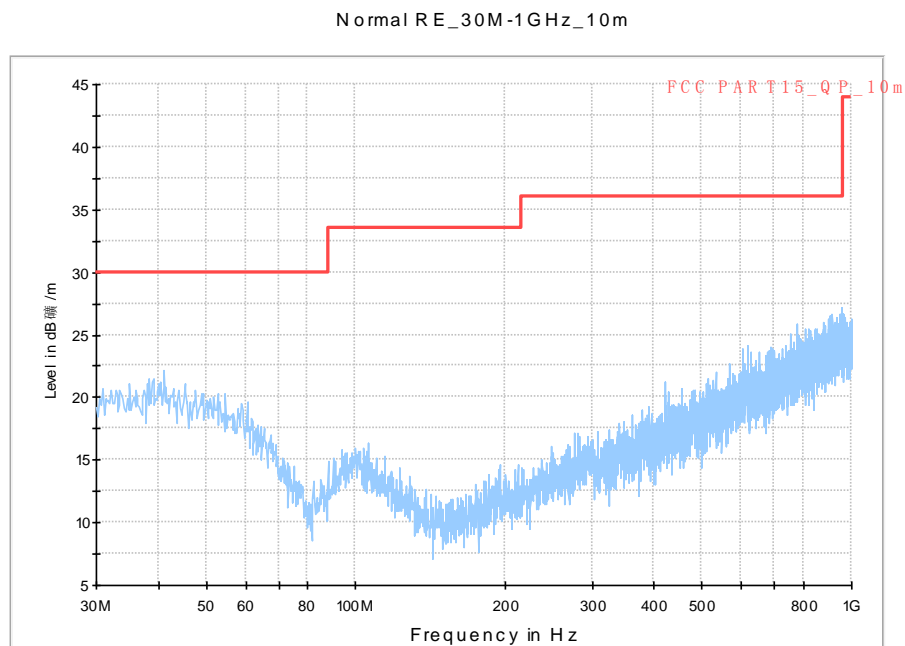


Fig.81. Radiated emission: 8DPSK, Channel 39, 30 MHz - 1 GHz

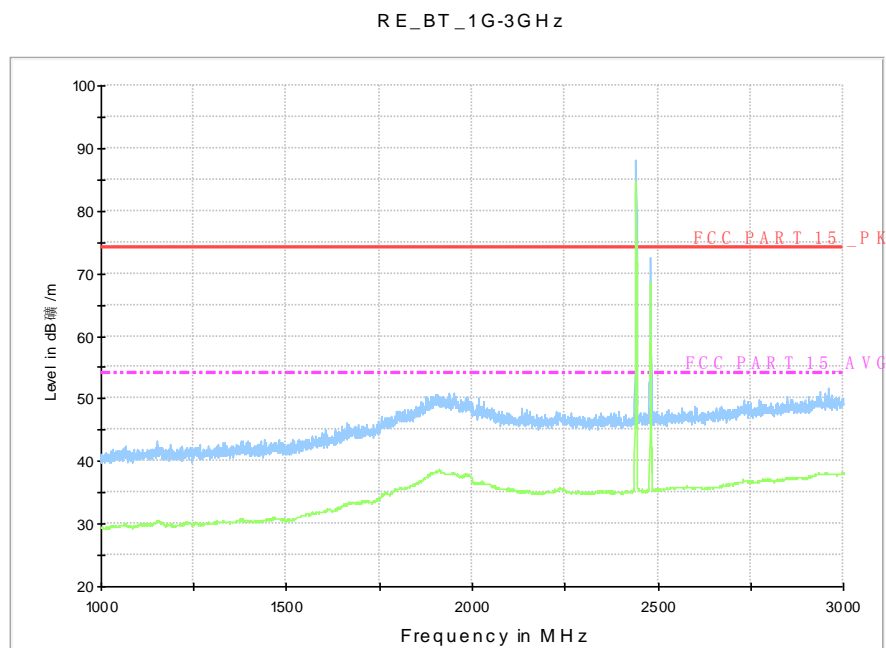


Fig.82. Radiated emission: 8DPSK, Channel 39, 1 GHz - 3 GHz

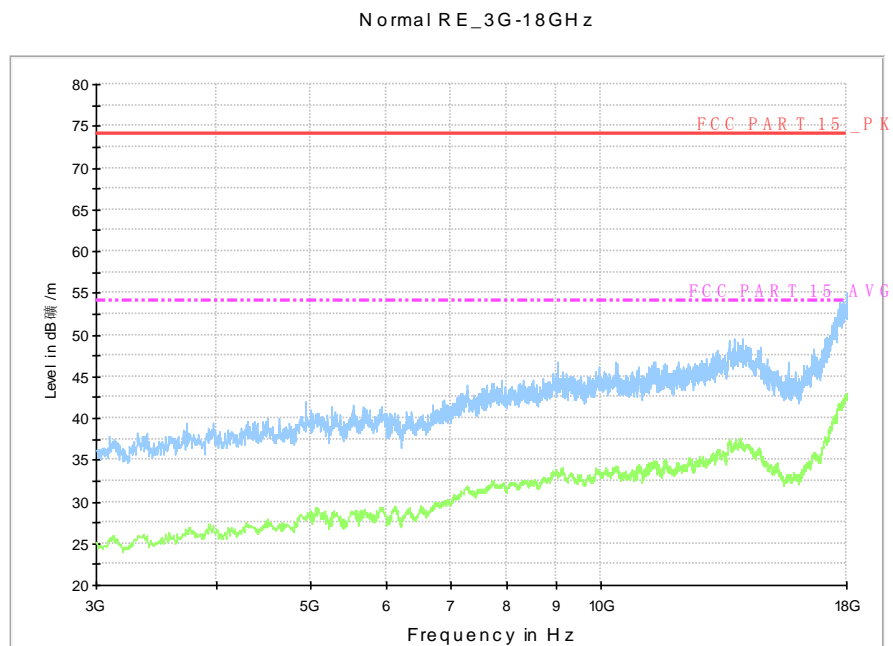


Fig.83. Radiated emission: 8DPSK, Channel 39, 3 GHz - 18 GHz

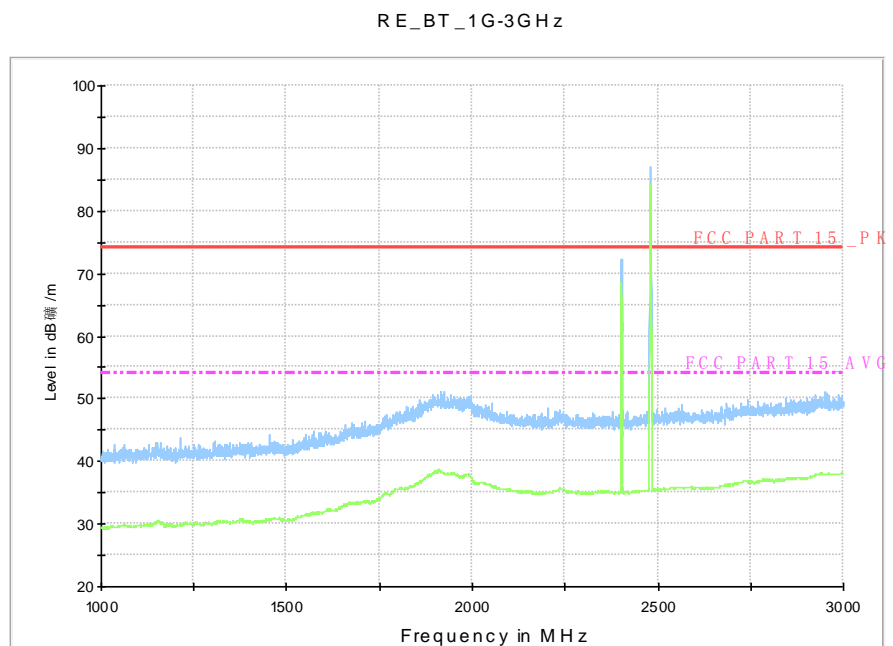


Fig.84. Radiated emission: 8DPSK, Channel 78, 1 GHz - 3 GHz

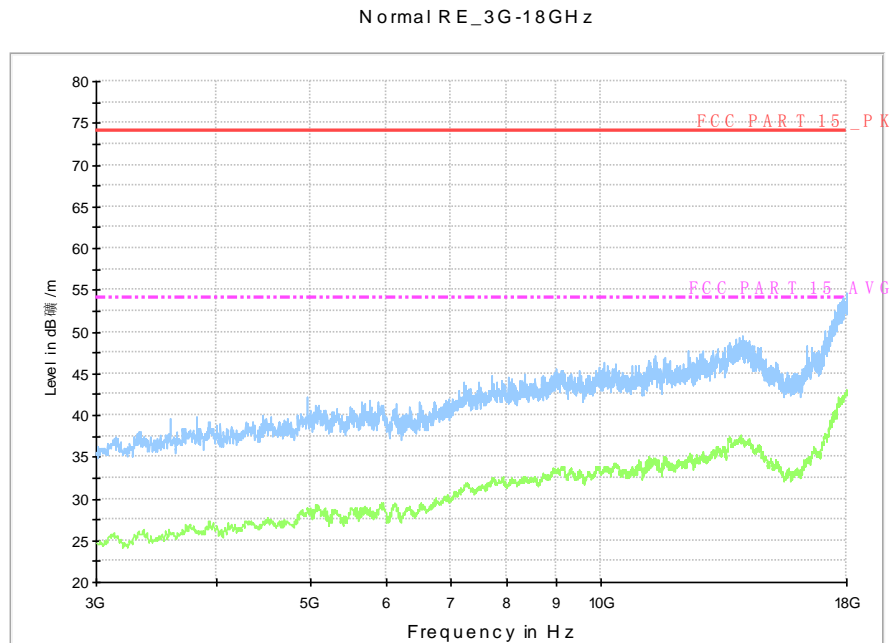


Fig.85. Radiated emission: 8DPSK, Channel 78, 3 GHz - 18 GHz

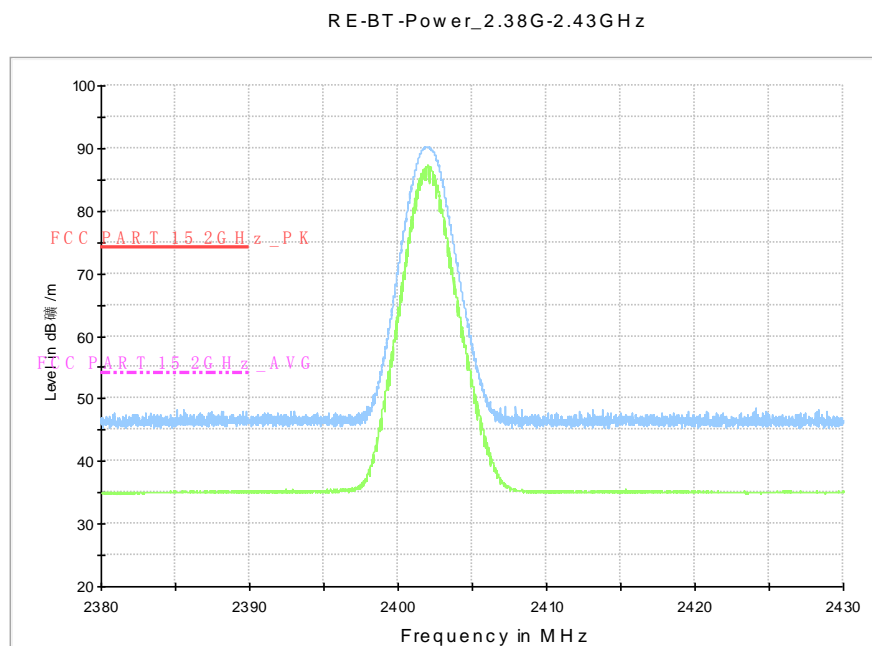


Fig.86. Radiated emission (Power): 8DPSK, low channel

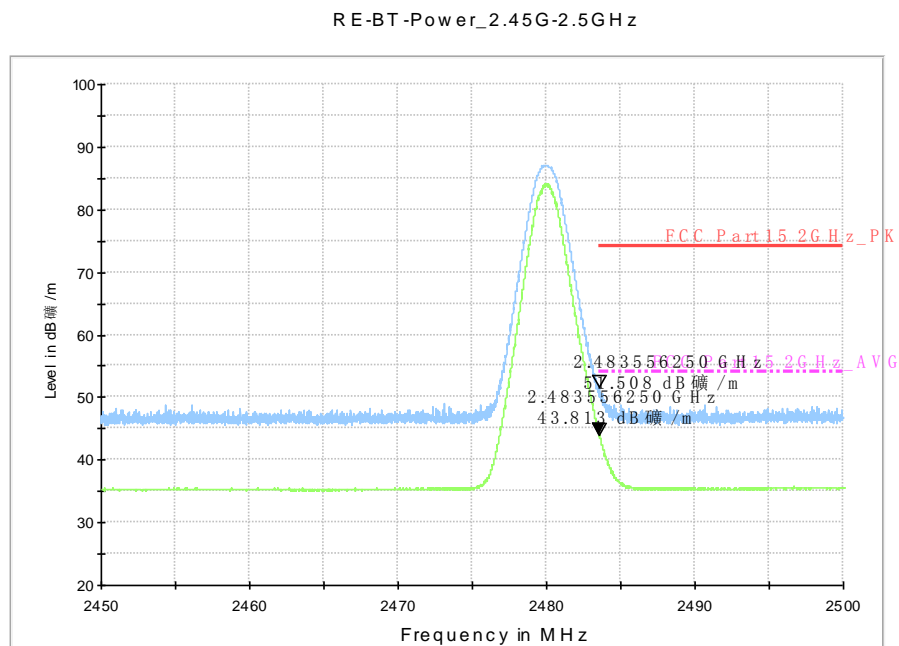


Fig.87. Radiated emission (Power): 8DPSK, high channel

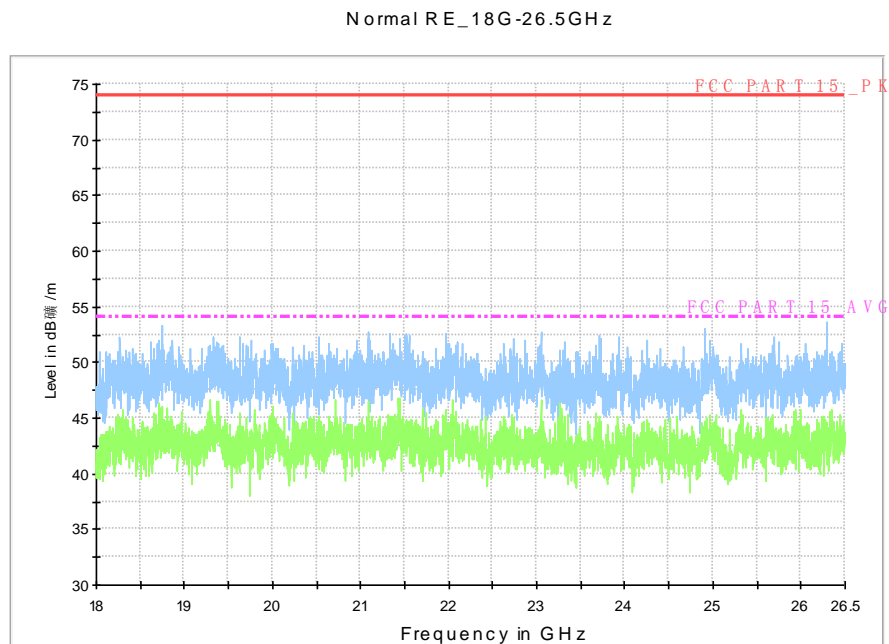


Fig.88. Radiated emission: 8DPSK, 18 GHz - 26 GHz

## A.6. Time of Occupancy (Dwell Time)

**Method of Measurement: See ANSI C63.10-clause 7.8.4**

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

- Span = zero span, centered on a hopping channel
- RBW = 1 MHz
- VBW  $\geq$  RBW
- Sweep = as necessary to capture the entire dwell time per hopping channel
- Detector function = peak
- Trace = max hold

Measure a pulse time in time domain at middle frequency and then count the hopping number in 31.6s(which equals with 0.4 multiply 79) of middle frequency ,then multiply the pulse time and hopping number and record them.

### Measurement Limit:

| Standard                           | Limit (ms) |
|------------------------------------|------------|
| FCC 47 CFR Part 15.247(a) (1)(iii) | < 400      |

### Measurement Result:

#### For GFSK

| Channel | Packet | Dwell Time (ms) |        | Conclusion |
|---------|--------|-----------------|--------|------------|
| 39      | DH1    | Fig.89          | 105.13 | P          |
|         |        | Fig.90          |        |            |
|         | DH3    | Fig.91          | 165.58 | P          |
|         |        | Fig.92          |        |            |
|         | DH5    | Fig.93          | 182.58 | P          |
|         |        | Fig.94          |        |            |

#### For $\pi/4$ DQPSK

| Channel | Packet | Dwell Time (ms) |        | Conclusion |
|---------|--------|-----------------|--------|------------|
| 39      | DH1    | Fig.95          | 104.33 | P          |
|         |        | Fig.96          |        |            |
|         | DH3    | Fig.97          | 150.83 | P          |
|         |        | Fig.98          |        |            |
|         | DH5    | Fig.99          | 191.27 | P          |
|         |        | Fig.100         |        |            |

#### For 8DPSK

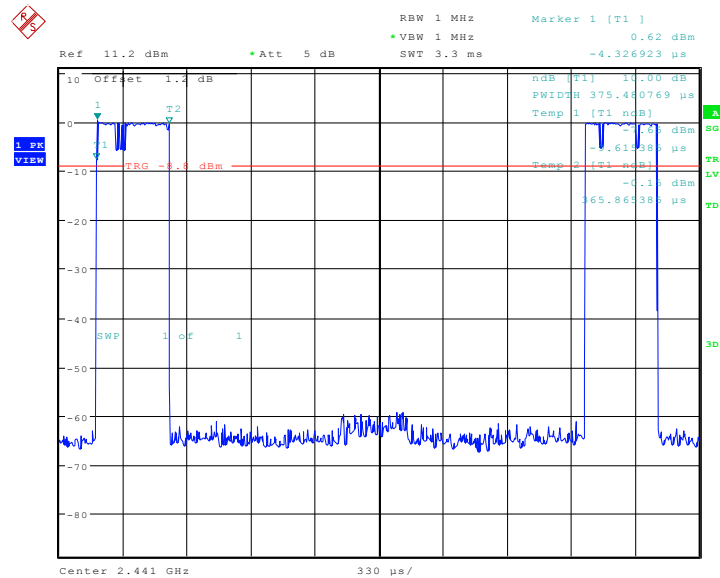
| Channel | Packet | Dwell Time (ms) |        | Conclusion |
|---------|--------|-----------------|--------|------------|
| 39      | DH1    | Fig.101         | 104.33 | P          |
|         |        | Fig.102         |        |            |
|         | DH3    | Fig.103         | 185.25 | P          |



|  |     |         |        |   |
|--|-----|---------|--------|---|
|  |     | Fig.104 | 231.85 | P |
|  | DH5 | Fig.105 |        |   |
|  |     | Fig.106 |        |   |

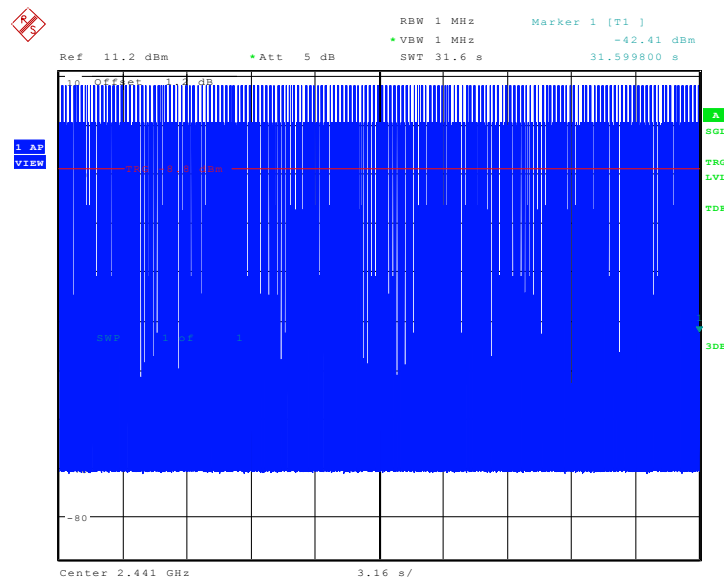
**Conclusion: PASS**

**Test graphs as below:**



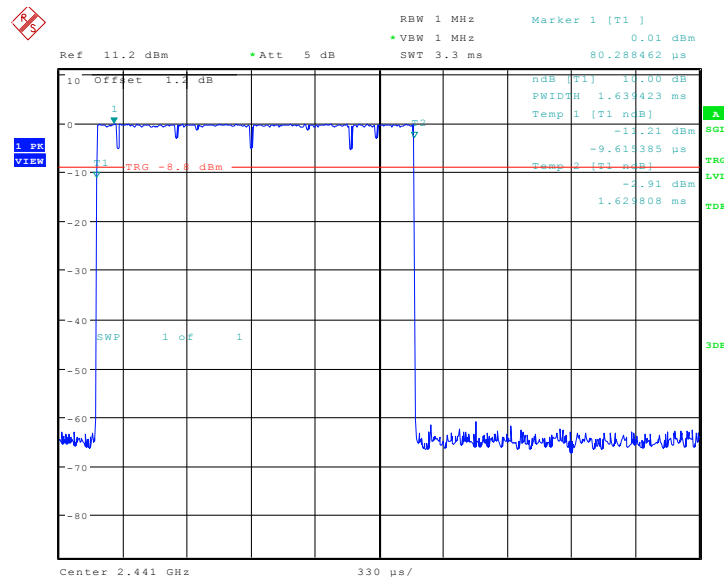
Date: 1.DEC.2014 13:19:12

Fig.89. Time of occupancy (Dwell Time): Channel 39, Packet DH1



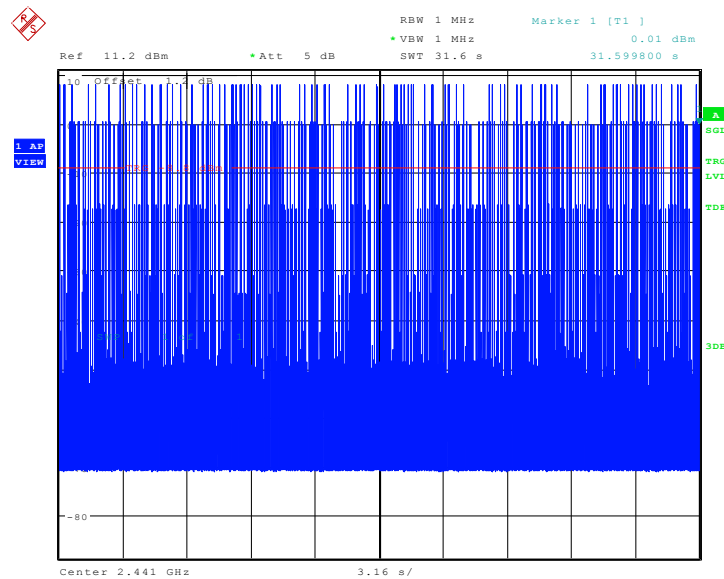
Date: 1.DEC.2014 13:19:01

Fig.90. Number of Transmissions Measurement:Channel 39,Packet DH1



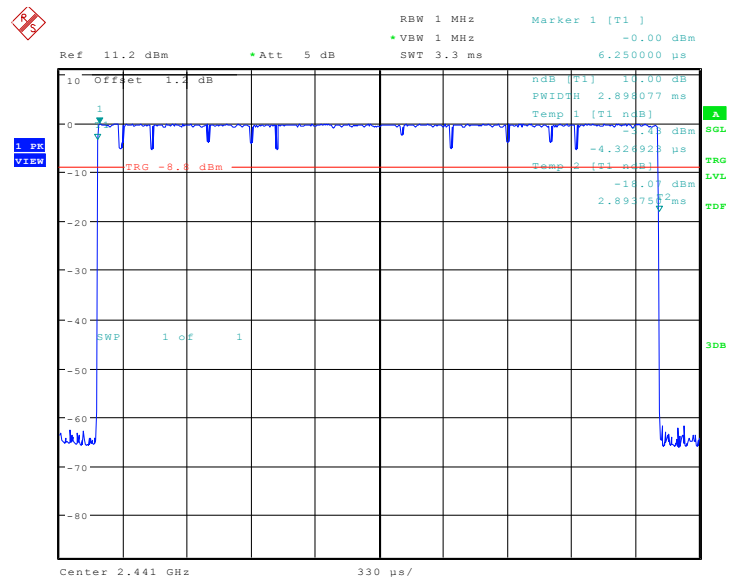
Date: 1.DEC.2014 13:20:31

Fig.91. Time of occupancy (Dwell Time): Channel 39, Packet DH3



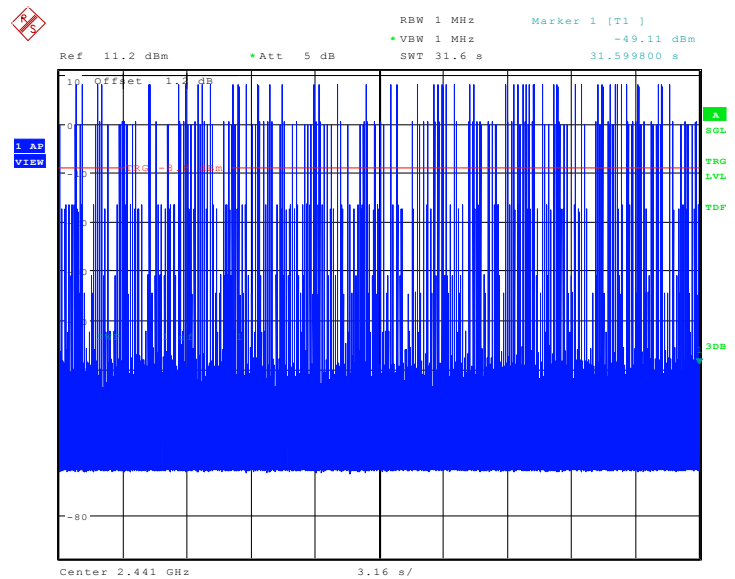
Date: 1.DEC.2014 13:20:20

Fig.92. Number of Transmissions Measurement:Channel 39,Packet DH3



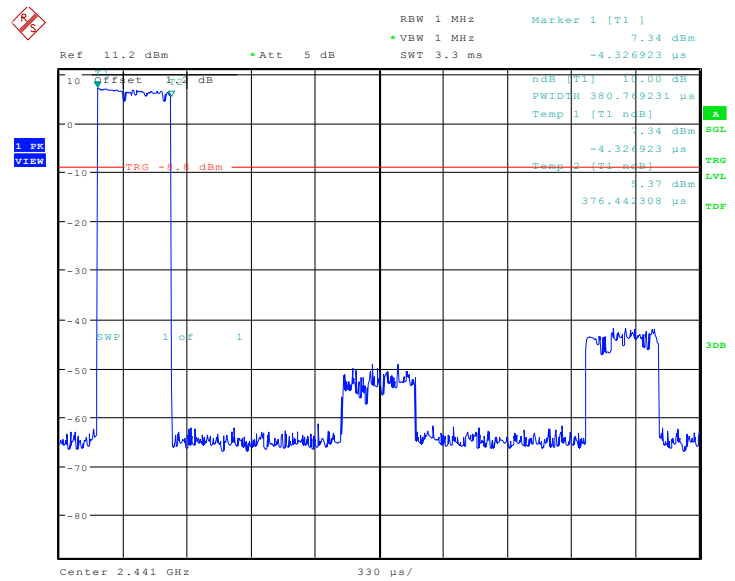
Date: 1.DEC.2014 13:21:46

Fig.93. Time of occupancy (Dwell Time): Channel 39, Packet DH5



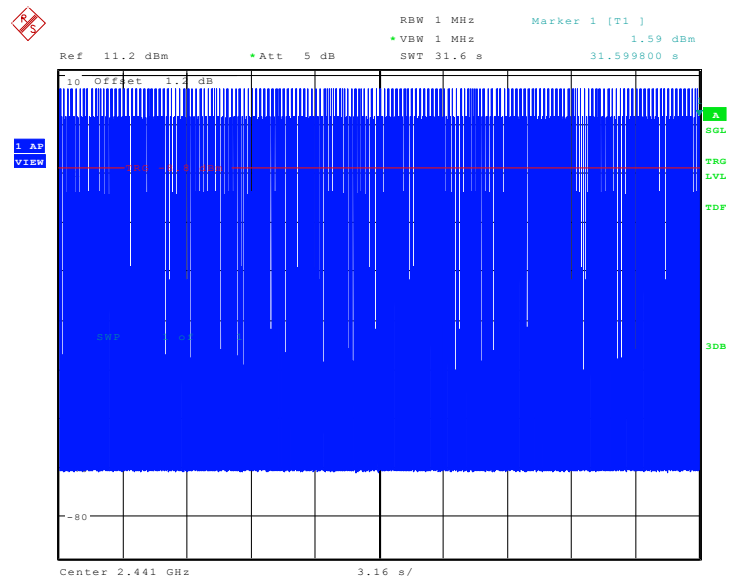
Date: 1.DEC.2014 13:21:34

Fig.94. Number of Transmissions Measurement:Channel 39,Packet DH5



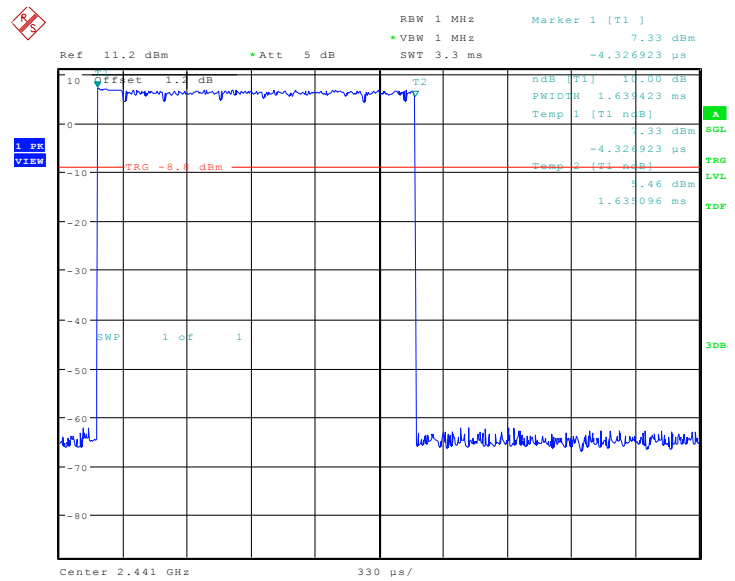
Date: 1.DEC.2014 13:41:16

Fig.95. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH1



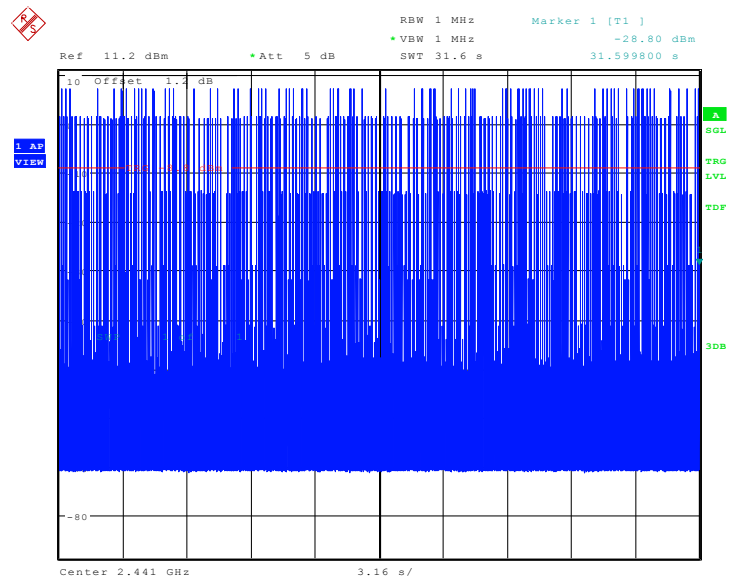
Date: 1.DEC.2014 13:41:05

Fig.96. Number of Transmissions Measurement:Channel 39,Packet 2-DH1



Date: 1.DEC.2014 13:42:33

Fig.97. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH3



Date: 1.DEC.2014 13:42:21

Fig.98. Number of Transmissions Measurement:Channel 39,Packet 2-DH3



Ref 11.2 dBm Att 5 dB

RBW 1 MHz Marker 1 [T1] -41.29 dBm

SWT 31.6 s 31.599800 s

10 Offset 1.2 dB

1 A3

VISM

SGL

TAG

LVL

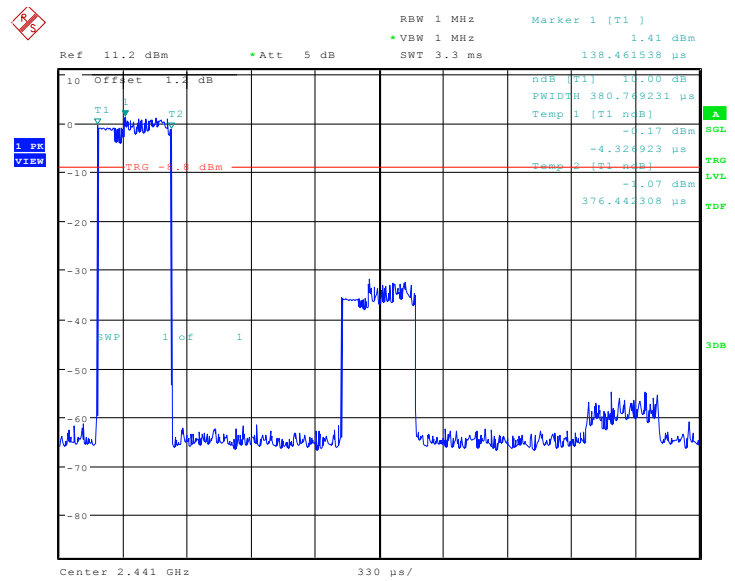
TDF

-80

Center 2.441 GHz 3.16 s/

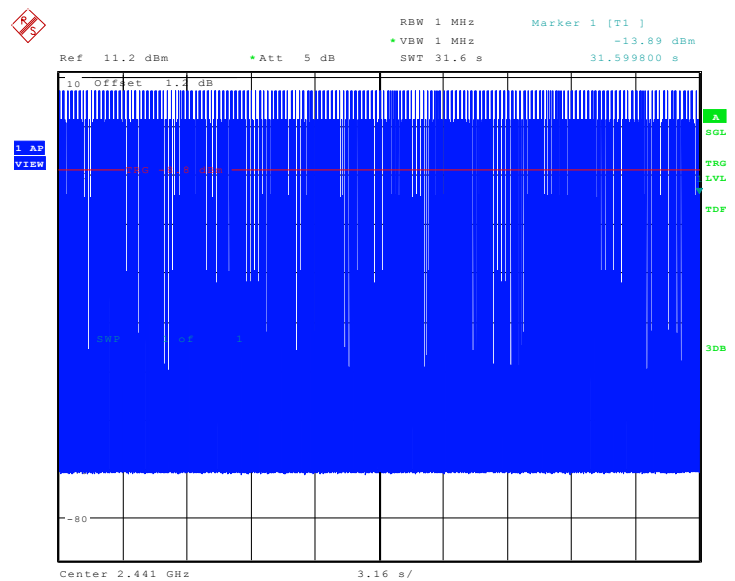
Date: 1.DEC.2014 13:43:36

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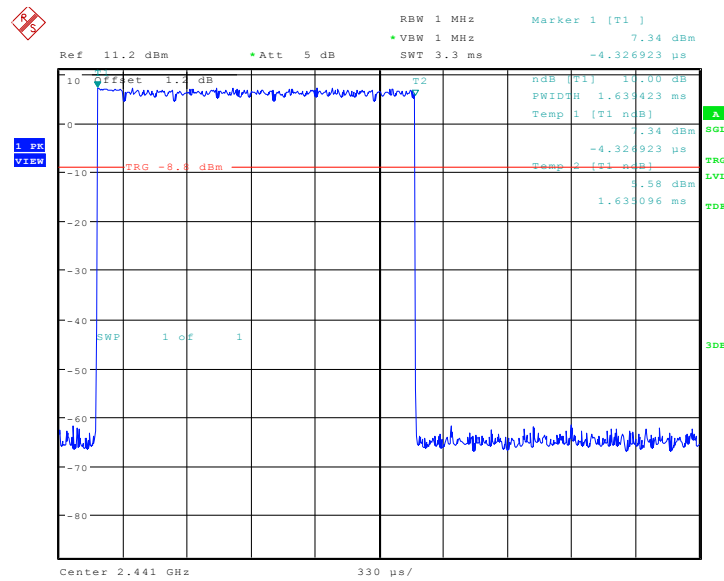
Date: 1.DEC.2014 14:03:15

Fig.101. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH1



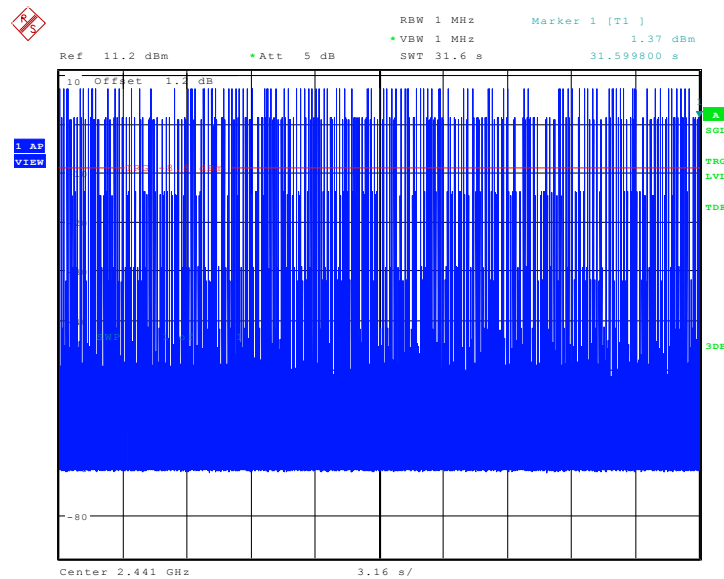
Date: 1.DEC.2014 14:03:04

Fig.102. Number of Transmissions Measurement:Channel 39,Packet 3-DH1



Date: 1.DEC.2014 14:04:34

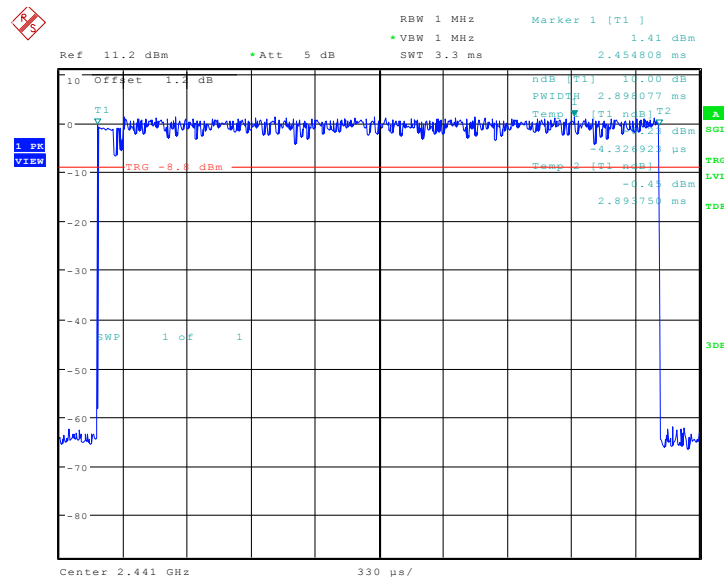
Fig.103. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH3



Date: 1.DEC.2014 14:04:23

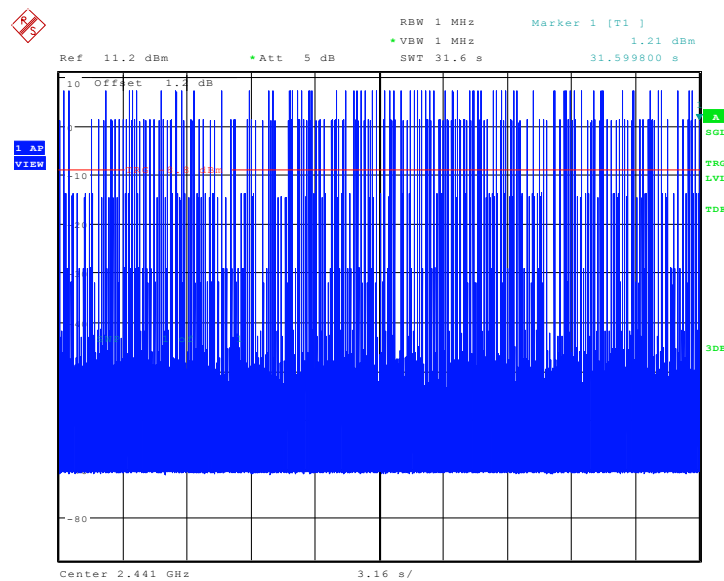
Fig.104. Number of Transmissions Measurement:Channel 39,Packet 3-DH3





Date: 1.DEC.2014 14:05:52

Fig.105. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH5



Date: 1.DEC.2014 14:05:40

Fig.106. Number of Transmissions Measurement:Channel 39,Packet 3-DH5

## A.7. 20dB Bandwidth

**Method of Measurement: See ANSI C63.10-clause 6.9.2**

Measurement Procedure - Unwanted Emissions

1. Set RBW = 20kHz.
2. Set VBW = 100 kHz.
3. Set span to 3MHz
4. Detector = peak.
5. Trace Mode = max hold.
6. Sweep = auto couple.
7. Allow the trace to stabilize (this may take some time, depending on the extent of the span).

### Measurement Limit:

| Standard                     | Limit |
|------------------------------|-------|
| FCC 47 CFR Part 15.247(a)(1) | NA *  |

Use NdB Down function of the SA to measure the 20dB Bandwidth

\* Comment: This test case is not required according to the latest FCC 47 CFR Part 15.247. But the test results are necessary for “carrier frequency separation” test case, in Annex A.8.

### Measurement Results:

#### For GFSK

| Channel | 20dB Bandwidth (kHz) |        | Conclusion |
|---------|----------------------|--------|------------|
| 0       | Fig.107              | 870.19 | NA         |
| 39      | Fig.108              | 870.19 | NA         |
| 78      | Fig.109              | 870.19 | NA         |

#### For $\pi/4$ DQPSK

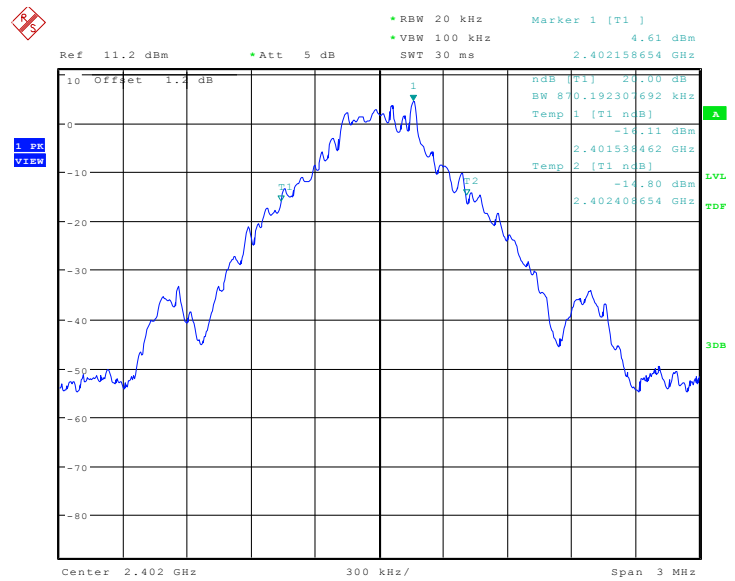
| Channel | 20dB Bandwidth (kHz) |         | Conclusion |
|---------|----------------------|---------|------------|
| 0       | Fig.110              | 1259.62 | NA         |
| 39      | Fig.111              | 1274.04 | NA         |
| 78      | Fig.112              | 1259.62 | NA         |

#### For 8DPSK

| Channel | 20dB Bandwidth (kHz) |         | Conclusion |
|---------|----------------------|---------|------------|
| 0       | Fig.113              | 1216.35 | NA         |
| 39      | Fig.114              | 1269.23 | NA         |
| 78      | Fig.115              | 1259.62 | NA         |

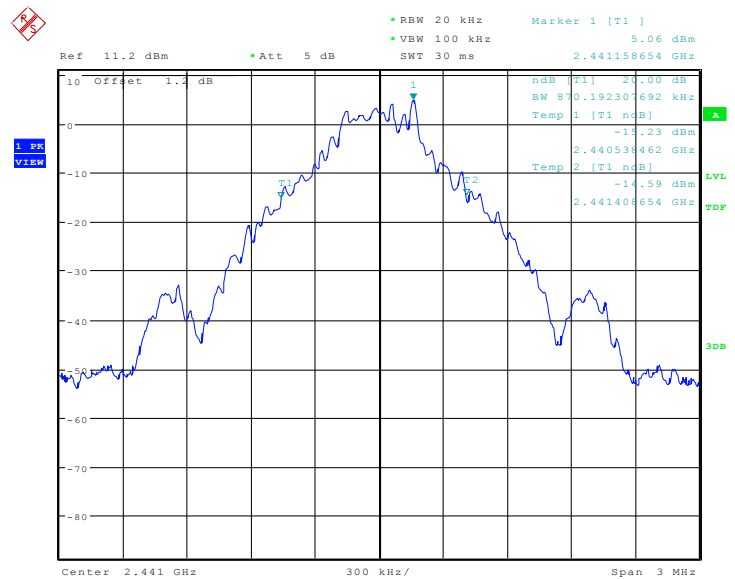
**Conclusion: NA**

**Test graphs as below:**



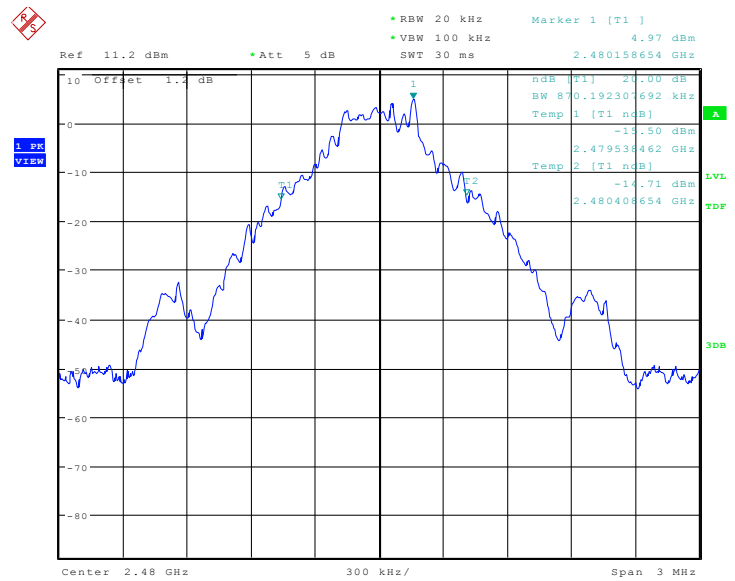
Date: 1.DEC.2014 13:22:20

Fig.107. 20dB Bandwidth: GFSK, Channel 0



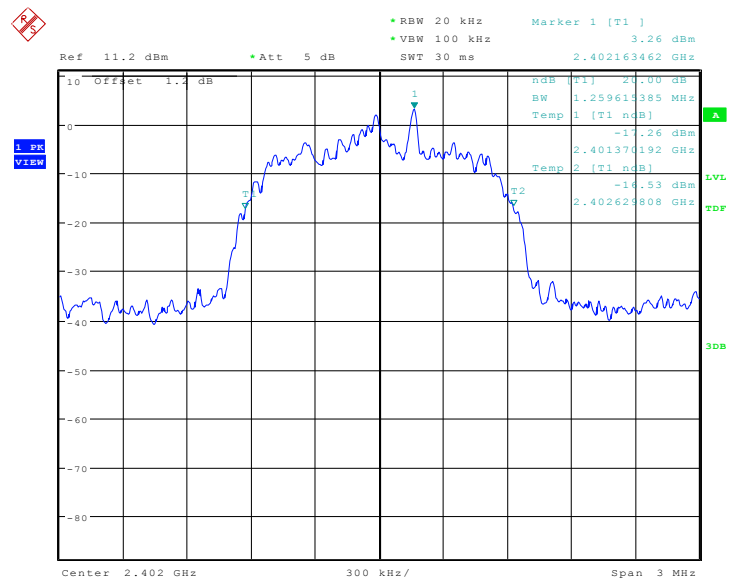
Date: 1.DEC.2014 13:22:51

Fig.108. 20dB Bandwidth: GFSK, Channel 39



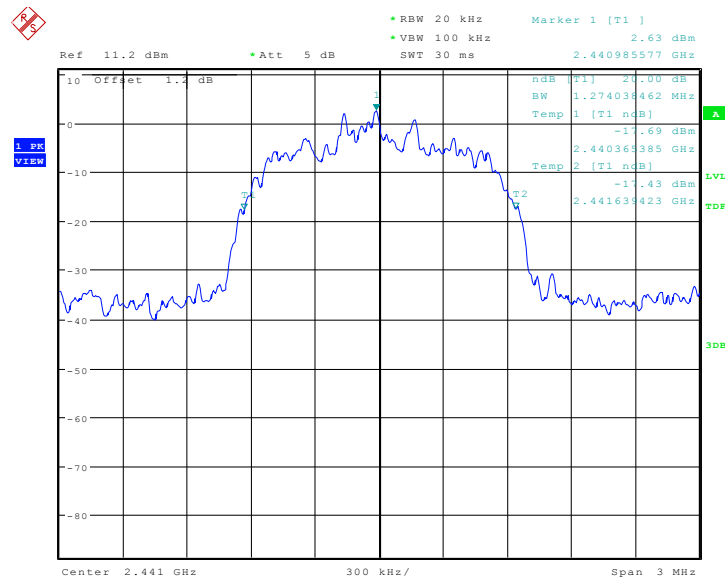
Date: 1.DEC.2014 13:23:23

Fig.109. 20dB Bandwidth: GFSK, Channel 78



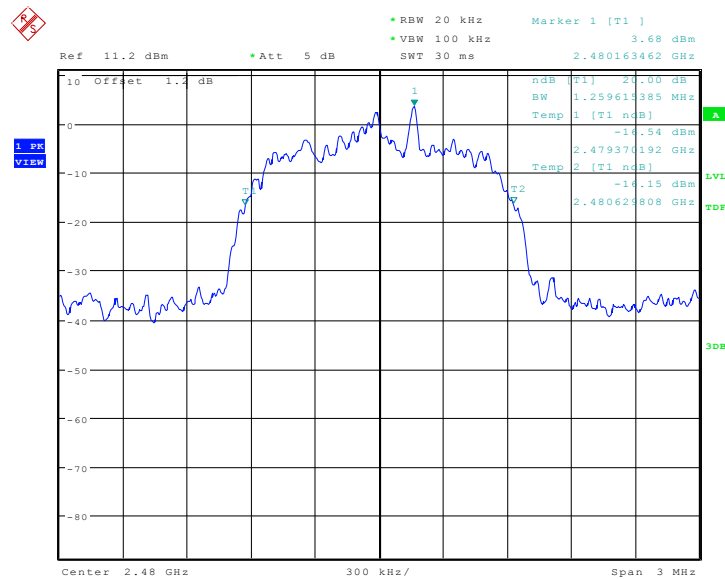
Date: 1.DEC.2014 13:44:22

Fig.110. 20dB Bandwidth:  $\pi/4$  DQPSK, Channel 0



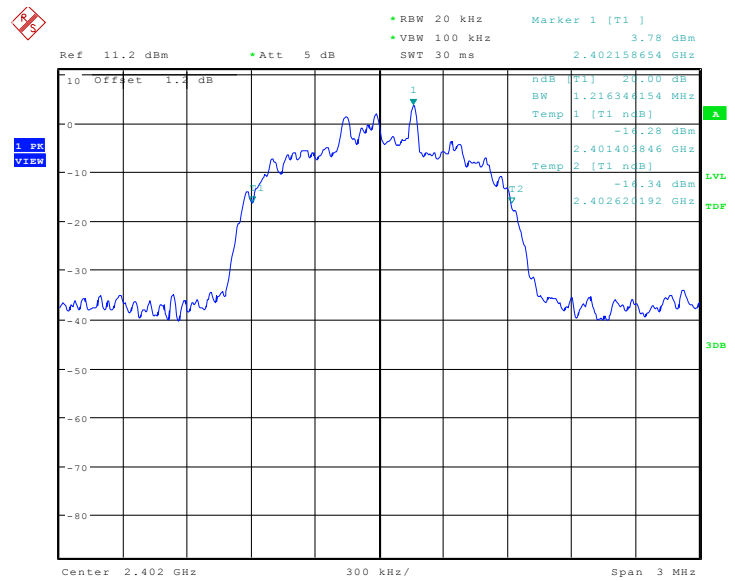
Date: 1.DEC.2014 13:44:54

Fig.111. 20dB Bandwidth:  $\pi/4$  DQPSK, Channel 39



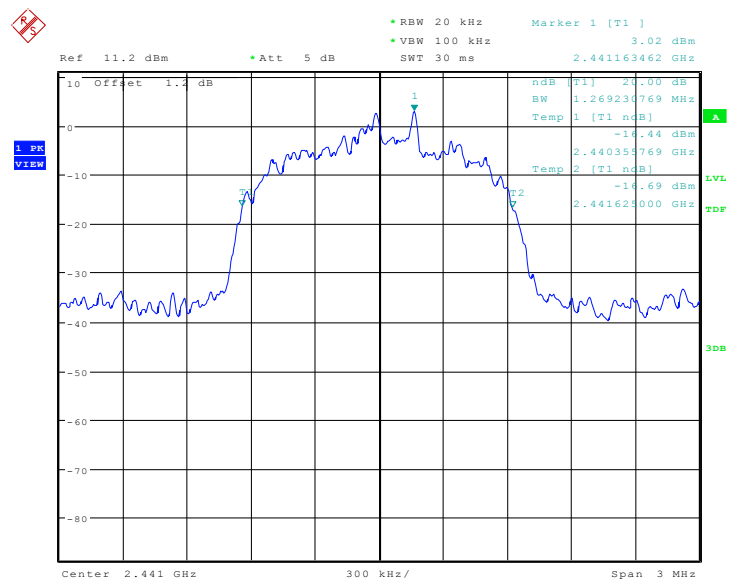
Date: 1.DEC.2014 13:45:26

Fig.112. 20dB Bandwidth:  $\pi/4$  DQPSK, Channel 78



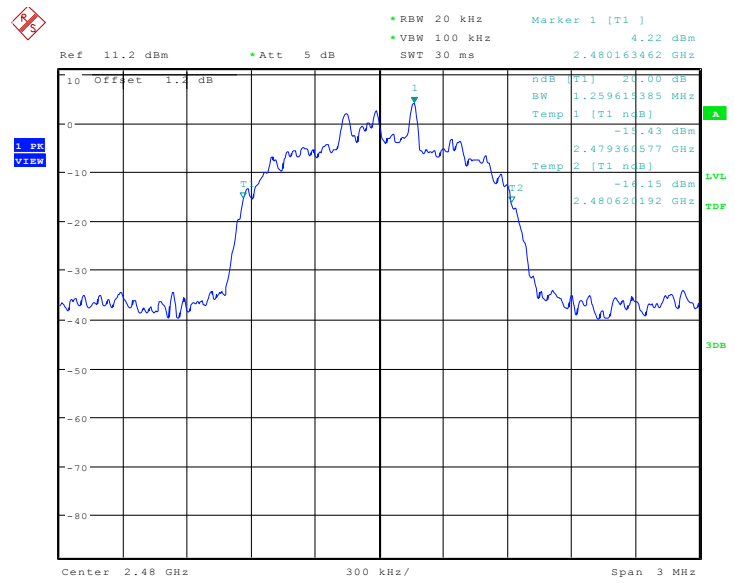
Date: 1.DEC.2014 14:06:26

Fig.113. 20dB Bandwidth: 8DPSK, Channel 0



Date: 1.DEC.2014 14:06:58

Fig.114. 20dB Bandwidth: 8DPSK, Channel 39



Date: 1.DEC.2014 14:07:30

Fig.115. 20dB Bandwidth: 8DPSK, Channel 78

## A.8. Carrier Frequency Separation

**Method of Measurement:** See ANSI C63.10-clause 7.8.2

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

- Span = 3MHz
- RBW=300kHz
- VBW=1MHz
- Sweep = auto
- Detector function = peak
- Trace = max hold
- Allow the trace to stabilize

Search the peak marks of the middle frequency and adjacent channel, then record the separation between them.

\* Comment: This limit should be over 25 kHz or  $(2/3) * 20\text{dB}$  bandwidth, whichever is greater.

### Measurement Limit:

| Standard                     | Limit(kHz)                                     |
|------------------------------|--|
| FCC 47 CFR Part 15.247(a)(1) | over 25 kHz or $(2/3) * 20\text{dB}$ bandwidth |

### Measurement Result:

#### For GFSK

| Channel | Carrier frequency separation (kHz) |         | Conclusion |
|---------|------------------------------------|---------|------------|
| 39      | Fig.116                            | 1283.65 | P          |

#### For $\pi/4$ DQPSK

| Channel | Carrier frequency separation (kHz) |         | Conclusion |
|---------|------------------------------------|---------|------------|
| 39      | Fig.117                            | 1038.46 | P          |

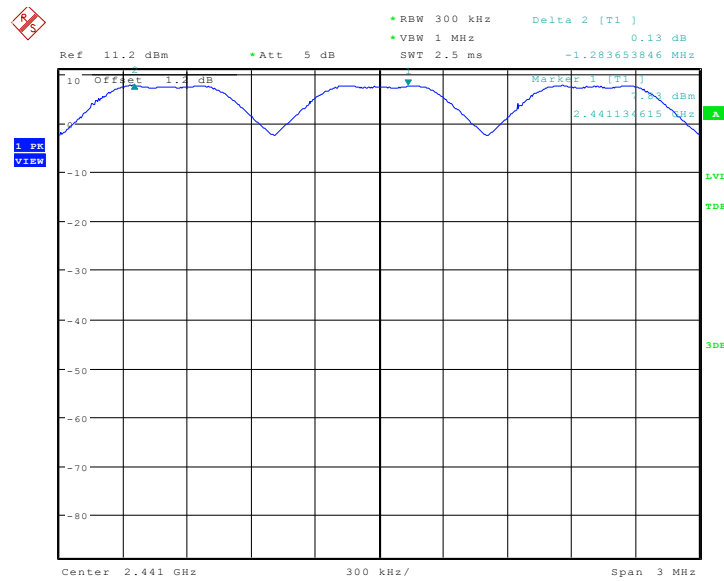
#### For 8DPSK

| Channel | Carrier frequency separation (kHz) |         | Conclusion |
|---------|------------------------------------|---------|------------|
| 39      | Fig.118                            | 1149.04 | P          |

**Conclusion: PASS**

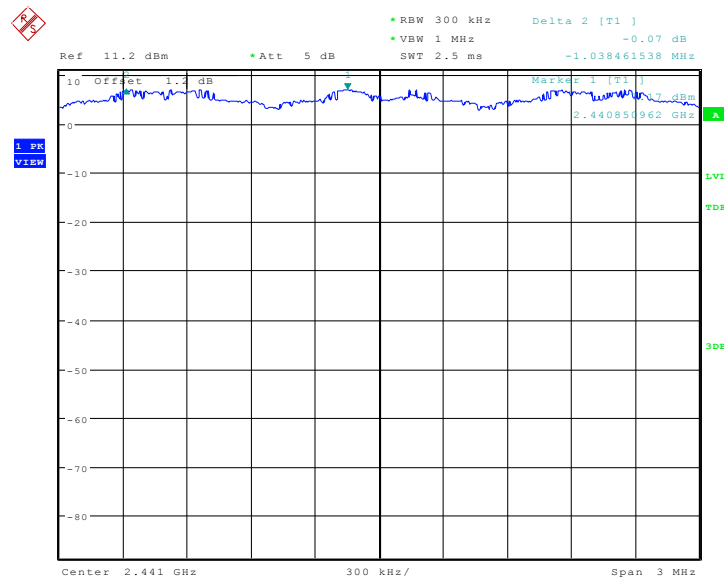
**Test graphs as below:**





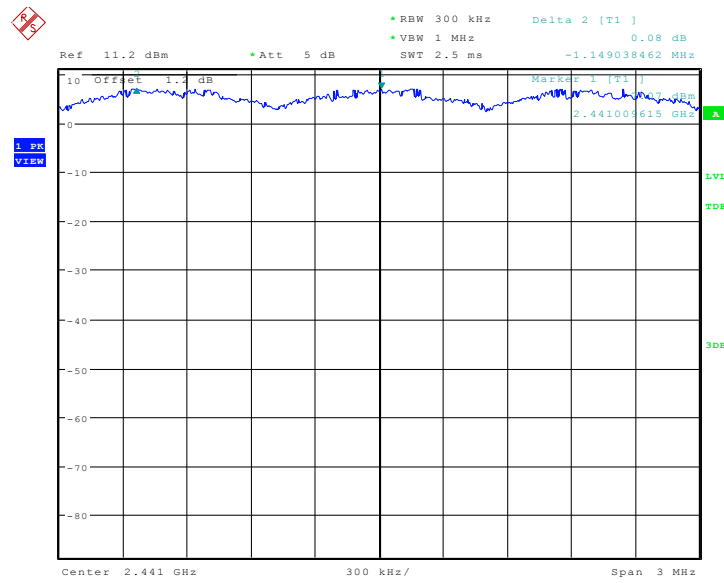
Date: 1.DEC.2014 13:25:28

Fig.116. Carrier frequency separation measurement: GFSK, Channel 39



Date: 1.DEC.2014 13:47:30

Fig.117. Carrier frequency separation measurement:  $\pi/4$  DQPSK, Channel 39



Date: 1.DEC.2014 14:09:34

Fig.118. Carrier frequency separation measurement: 8DPSK, Channel 39

## A.9. Number of Hopping Channels

**Method of Measurement: See ANSI C63.10-clause 7.8.3**

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

- Span = the frequency band of operation
- RBW = 500kHz
- VBW = 500kHz
- Sweep = auto
- Detector function = peak
- Trace = max hold
- Allow the trace to stabilize

It might prove necessary to break the span up into subranges to show clearly all of the hopping frequencies. Compliance of an EUT with the appropriate regulatory limit shall be determined for the number of hopping channels. A plot of the data shall be included in the test report.

### Measurement Limit:

| Standard                           | Limit                                |
|------------------------------------|--------------------------------------|
| FCC 47 CFR Part 15.247(a) (1)(iii) | At least 15 non-overlapping channels |

### Measurement Result:

#### For GFSK

| Channel | Number of hopping channels |    | Conclusion |
|---------|----------------------------|----|------------|
| 0~39    | Fig.119                    | 79 | P          |
| 40~78   | Fig.120                    |    |            |

#### For $\pi/4$ DQPSK

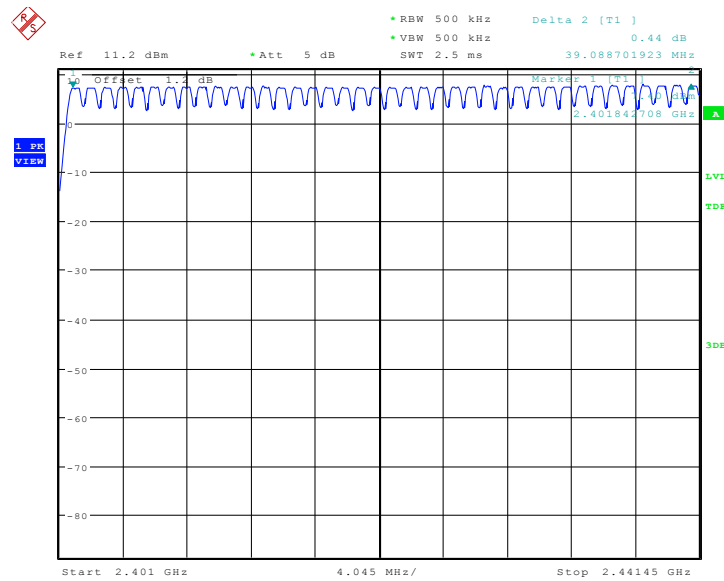
| Channel | Number of hopping channels |    | Conclusion |
|---------|----------------------------|----|------------|
| 0~39    | Fig.121                    | 79 | P          |
| 40~78   | Fig.122                    |    |            |

#### For 8DPSK

| Channel | Number of hopping channels |    | Conclusion |
|---------|----------------------------|----|------------|
| 0~39    | Fig.123                    | 79 | P          |
| 40~78   | Fig.124                    |    |            |

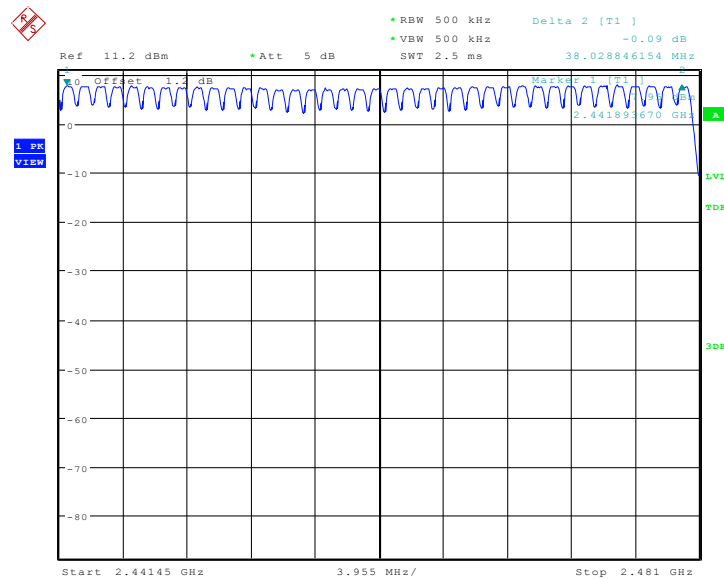
**Conclusion: PASS**

**Test graphs as below:**



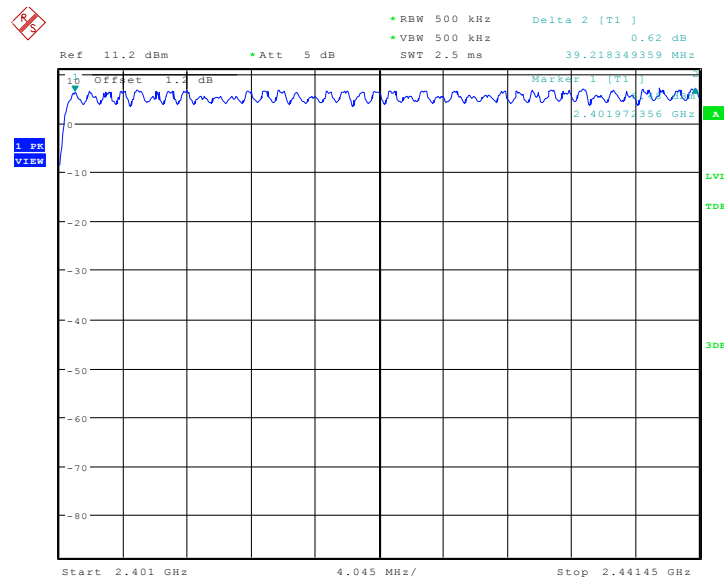
Date: 1.DEC.2014 13:27:33

Fig.119. Number of hopping frequencies: GFSK, Channel 0 - 39



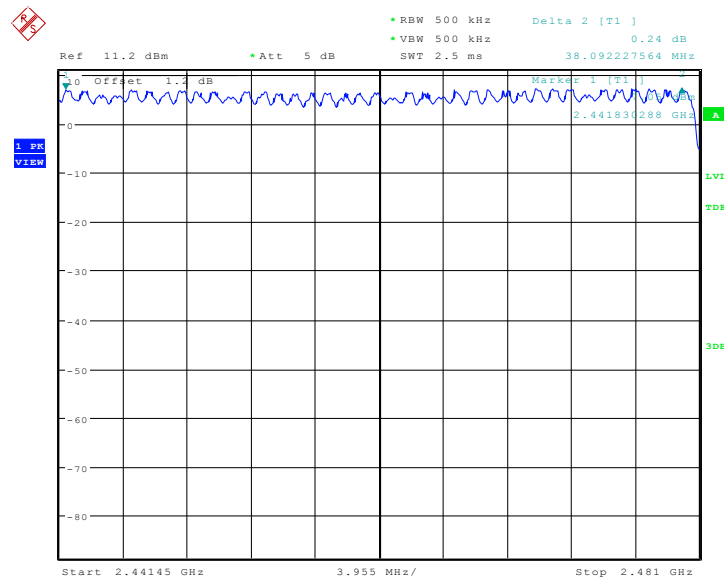
Date: 1.DEC.2014 13:29:35

Fig.120. Number of hopping frequencies: GFSK, Channel 40 - 78



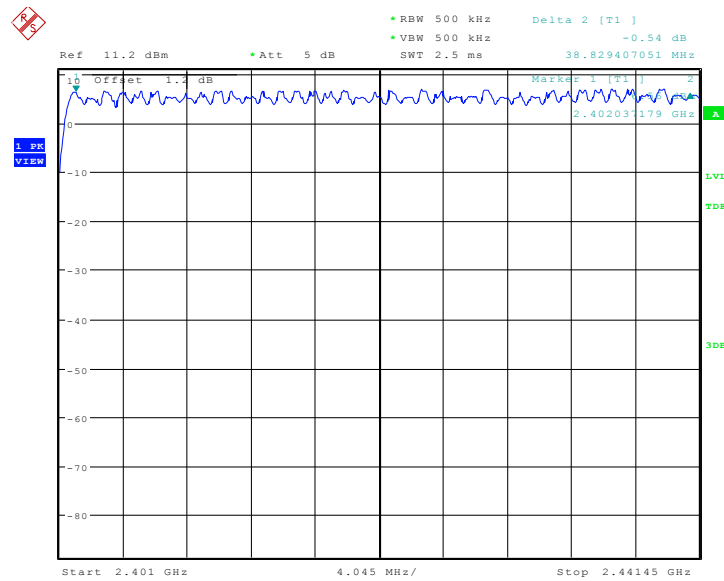
Date: 1.DEC.2014 13:49:34

Fig.121. Number of hopping frequencies:  $\pi/4$  DQPSK, Channel 0 - 39



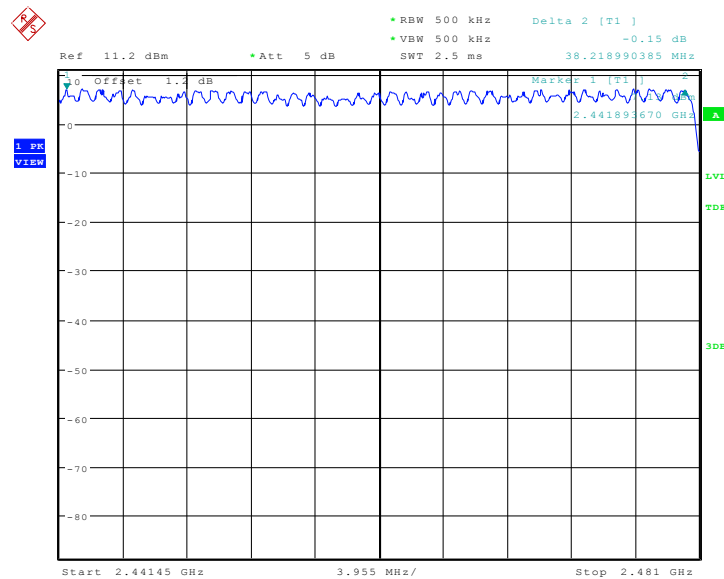
Date: 1.DEC.2014 13:51:36

Fig.122. Number of hopping frequencies:  $\pi/4$  DQPSK, Channel 40 - 78



Date: 1.DEC.2014 14:11:38

Fig.123. Number of hopping frequencies: 8DPSK, Channel 0 - 39



Date: 1.DEC.2014 14:13:40

Fig.124. Number of hopping frequencies: 8DPSK, Channel 40 - 78

**A.10. AC Powerline Conducted Emission****Test Condition**

| Voltage (V) | Frequency (Hz) |
|-------------|----------------|
| 120         | 60             |

**Measurement Result and limit:****Bluetooth (Quasi-peak Limit)**

| Frequency range (MHz) | Quasi-peak Limit (dB $\mu$ V) | Conclusion |
|-----------------------|-------------------------------|------------|
| 0.15 to 0.5           | 66 to 56                      | P          |
| 0.5 to 5              | 56                            |            |
| 5 to 30               | 60                            |            |

NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

**Bluetooth (Average Limit)**

| Frequency range (MHz) | Average Limit (dB $\mu$ V) | Conclusion |
|-----------------------|----------------------------|------------|
| 0.15 to 0.5           | 56 to 46                   | P          |
| 0.5 to 5              | 46                         |            |
| 5 to 30               | 50                         |            |

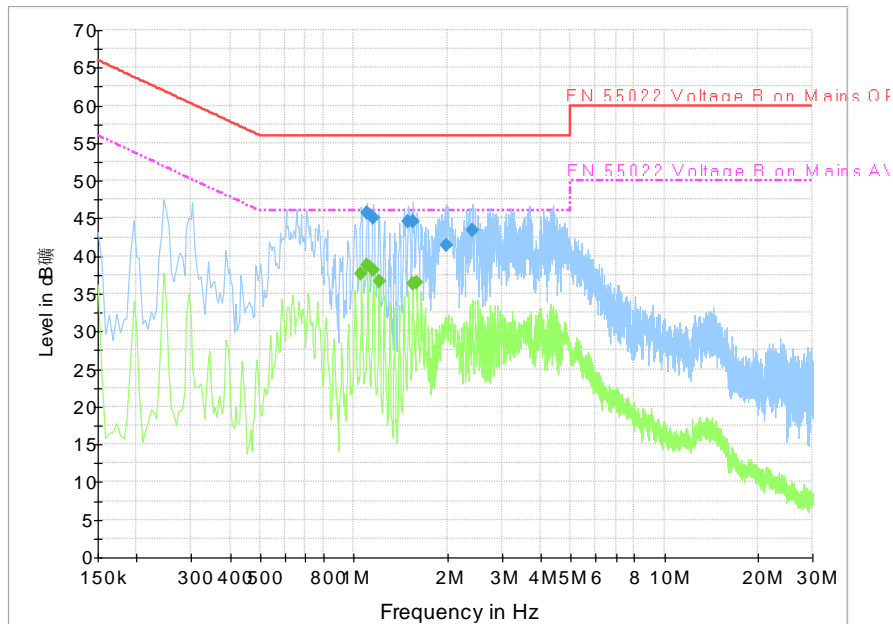
NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

The measurement is made according to ANSI C63.10

**Conclusion: PASS**

**Test graphs as below:**

### Traffic:



### Final Result 1

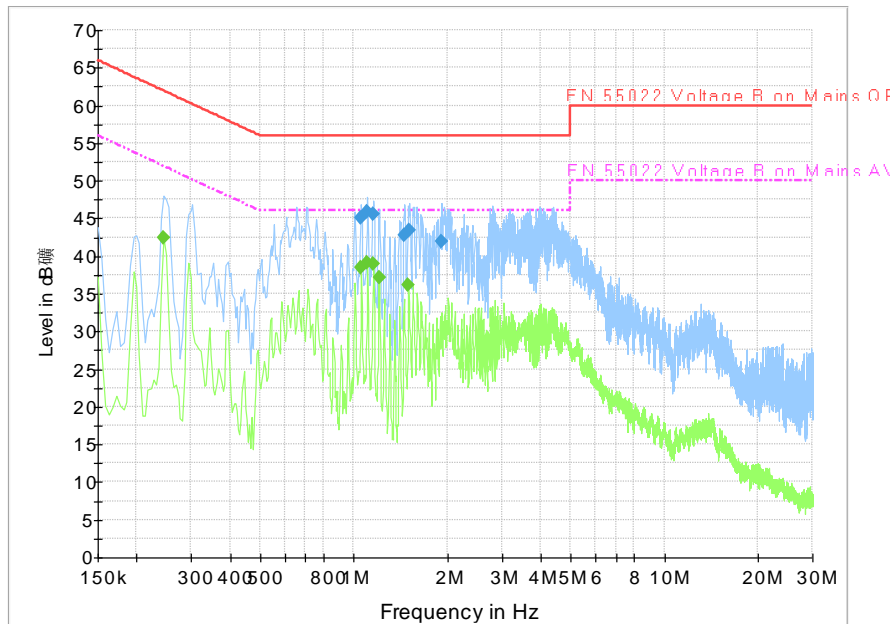
| Frequency (MHz) | QuasiPeak (dBμV) | Meas. Time (ms) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) | Comment |
|-----------------|------------------|-----------------|-----------------|--------|------|------------|-------------|--------------|---------|
| 1.104000        | 45.7             | 2000.0          | 9.000           | On     | L1   | 19.8       | 10.3        | 56.0         |         |
| 1.153500        | 45.1             | 2000.0          | 9.000           | On     | L1   | 19.7       | 10.9        | 56.0         |         |
| 1.500000        | 44.6             | 2000.0          | 9.000           | On     | L1   | 19.7       | 11.4        | 56.0         |         |
| 1.549500        | 44.6             | 2000.0          | 9.000           | On     | L1   | 19.7       | 11.4        | 56.0         |         |
| 1.981500        | 41.5             | 2000.0          | 9.000           | On     | L1   | 19.7       | 14.5        | 56.0         |         |
| 2.409000        | 43.4             | 2000.0          | 9.000           | On     | L1   | 19.7       | 12.6        | 56.0         |         |

### Final Result 2

| Frequency (MHz) | CAverage (dBμV) | Meas. Time (ms) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) | Comment |
|-----------------|-----------------|-----------------|-----------------|--------|------|------------|-------------|--------------|---------|
| 1.059000        | 37.7            | 2000.0          | 9.000           | On     | N    | 19.8       | 8.3         | 46.0         |         |
| 1.108500        | 38.7            | 2000.0          | 9.000           | On     | N    | 19.8       | 7.3         | 46.0         |         |
| 1.153500        | 38.1            | 2000.0          | 9.000           | On     | N    | 19.7       | 7.9         | 46.0         |         |
| 1.207500        | 36.7            | 2000.0          | 9.000           | On     | N    | 19.7       | 9.3         | 46.0         |         |
| 1.545000        | 36.2            | 2000.0          | 9.000           | On     | N    | 19.7       | 9.8         | 46.0         |         |
| 1.594500        | 36.5            | 2000.0          | 9.000           | On     | N    | 19.8       | 9.5         | 46.0         |         |



Idle:



## Final Result 1

| Frequency (MHz) | QuasiPeak (dBμV) | Meas. Time (ms) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) | Comment |
|-----------------|------------------|-----------------|-----------------|--------|------|------------|-------------|--------------|---------|
| 1.059000        | 45.0             | 2000.0          | 9.000           | On     | L1   | 19.8       | 11.0        | 56.0         |         |
| 1.108500        | 45.9             | 2000.0          | 9.000           | On     | L1   | 19.8       | 10.1        | 56.0         |         |
| 1.158000        | 45.5             | 2000.0          | 9.000           | On     | L1   | 19.7       | 10.5        | 56.0         |         |
| 1.459500        | 42.7             | 2000.0          | 9.000           | On     | L1   | 19.7       | 13.3        | 56.0         |         |
| 1.509000        | 43.5             | 2000.0          | 9.000           | On     | L1   | 19.7       | 12.5        | 56.0         |         |
| 1.918500        | 41.9             | 2000.0          | 9.000           | On     | L1   | 19.7       | 14.1        | 56.0         |         |

## Final Result 2

| Frequency (MHz) | CAverage (dBμV) | Meas. Time (ms) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) | Comment |
|-----------------|-----------------|-----------------|-----------------|--------|------|------------|-------------|--------------|---------|
| 0.244500        | 42.4            | 2000.0          | 9.000           | On     | N    | 19.9       | 9.5         | 51.9         |         |
| 1.059000        | 38.5            | 2000.0          | 9.000           | On     | N    | 19.8       | 7.5         | 46.0         |         |
| 1.108500        | 39.1            | 2000.0          | 9.000           | On     | N    | 19.8       | 6.9         | 46.0         |         |
| 1.158000        | 39.0            | 2000.0          | 9.000           | On     | N    | 19.7       | 7.0         | 46.0         |         |
| 1.207500        | 37.2            | 2000.0          | 9.000           | On     | N    | 19.7       | 8.8         | 46.0         |         |
| 1.500000        | 36.1            | 2000.0          | 9.000           | On     | N    | 19.7       | 9.9         | 46.0         |         |

## ANNEX B: Accreditation Certificate

|  |
|--|
| <div></div> <div><p><b>China National Accreditation Service for Conformity Assessment</b></p><p><b>LABORATORY ACCREDITATION CERTIFICATE</b></p><p><b>(Registration No. CNAS L0570 )</b></p><p><b>Telecommunication Technology Labs,</b><br/><b>Academy of Telecommunication Research, MIIT</b><br/><u>No.52, Huayuan North Road, Haidian District, Beijing, China</u></p><p><i>is accredited to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories(CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence of testing and calibration.</i></p><p><i>The scope of accreditation is detailed in the attached appendices bearing the same registration number as above. The appendices form an integral part of this certificate.</i></p><p>Date of Issue: 2014-06-20<br/>Date of Expiry: 2017-06-19<br/>Date of Initial Accreditation: 1998-07-03<br/>Date of Update: 2014-06-20</p><div></div><p>Signed on behalf of China National Accreditation Service<br/>for Conformity Assessment</p><p><small>China National Accreditation Service for Conformity Assessment (CNAS) is authorized by Certification and Accreditation Administration of the People's Republic of China (CNCA) to operate the national accreditation schemes for conformity assessment. CNAS is the signatory to International Laboratory Accreditation Cooperation Multilateral Recognition Arrangement (ILAC MRA) and Asia Pacific Laboratory Accreditation Cooperation Multilateral Recognition Arrangement (APLAC MRA).</small></p><div><div>No.CNAS AL 2</div><div>0010044</div></div></div> |
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