

TEST REPORT

For

Bluetooth Scanner

Model Number: SR5600, SR5660, SR5680, SR70

FCC ID: SWSSR5600

Report Number : WT218001601

Test Laboratory : Shenzhen Academy of Metrology and Quality Inspection
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TEST REPORT DECLARATION

Applicant : UROVO TECHNOLOGY CO.,LTD.
Address : 36F,High-Tech Zone Union Tower,No.63,Xuefu Road,Nanshan district,Shenzhen,Guangdong,China
Manufacturer : UROVO TECHNOLOGY CO.,LTD.
Address : 36F,High-Tech Zone Union Tower,No.63,Xuefu Road,Nanshan district,Shenzhen,Guangdong,China
EUT Description : Bluetooth Scanner
Model No. : SR5600,SR5660,SR5680,SR70
Trade mark : UROVO
Serial Number : /
FCC ID : SWSSR5600

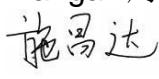
Test Standards:

FCC Part 15 Subpart C 15.247 (2020)

The EUT described above is tested by Shenzhen Academy of Metrology and Quality Inspection EMC Laboratory to determine the maximum emissions from the EUT. Shenzhen Academy of Metrology and Quality Inspection EMC Laboratory is assumed full responsibility for the accuracy of the test results.

The test report is valid for above tested sample only and shall not be reproduced in part without written approval of the laboratory.

Project Engineer:  Date: Jul.19, 2021
(Zhou Fangai 周芳媛)

Checked by:  Date: Jul.19, 2021
(Shi Changda 施昌达)

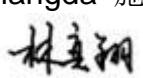
Approved by:  Date: Jul.19, 2021
(Lin Yixiang 林奕翔)

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1. TEST RESULTS SUMMARY

Table 1 Test Results Summary

| Test Items | FCC Rules | Test Results |
|---|------------------------------|--------------|
| 20dB bandwidth measurement | 15.247 (a) (1) | Pass |
| Carrier frequency separation measurement | 15.247 (a) (1) | Pass |
| Number of hopping channel | 15.247 (a) (1) III | Pass |
| Time of occupancy | 15.247 (a) (1) III | Pass |
| Maximum conducted output power | 15.247 (b) (1) | Pass |
| Band edge compliance measurement | 15.247 (d) | Pass |
| Radiated spurious emission & Radiated restricted band measurement | 15.247 (d) / 15.205 & 15.209 | Pass |
| Conducted spurious emission | 15.247 (d) | Pass |
| Conducted emission | 15.207 | Pass |
| Antenna requirements | 15.203 | Pass |

Remark: "N/A" means "Not applicable."

2. GENERAL INFORMATION

2.1. Report Information

This report is not a certificate of quality; it only applies to the sample of the specific product/equipment given at the time of its testing. The results are not used to indicate or imply that they are application to the similar items. In addition, such results must not be used to indicate or imply that SMQ approves recommends or endorses the manufacture, supplier or use of such product/equipment, or that SMQ in any way guarantees the later performance of the product/equipment.

The sample/s mentioned in this report is/are supplied by Applicant, SMQ therefore assumes no responsibility for the accuracy of information on the brand name, model number, origin of manufacture or any information supplied.

Additional copies of the report are available to the Applicant at an additional fee. No third part can obtain a copy of this report through SMQ, unless the applicant has authorized SMQ in writing to do so.

The lab will not be liable for any loss or damage resulting for false, inaccurate, inappropriate or incomplete product information provided by the applicant/manufacturer.

2.2. Laboratory Accreditation and Relationship to Customer

The testing report were performed by the Shenzhen Academy of Metrology and quality Inspection EMC Laboratory (Guangdong EMC compliance testing center), in their facilities located at NETC Building, No.4 Tongfa Rd., Xili, Nanshan, Shenzhen, China. At the time of testing, Laboratory is accredited by the following organizations:

China National Accreditation Service for Conformity Assessment (CNAS) accredits the Laboratory for conformance to FCC standards, EMC international standards and EN standards. The Registration Number is CNAS L0579.

The Laboratory is Accredited Testing Laboratory of FCC with Designation number CN1165 and Site registration number 582918.

The Laboratory is registered to perform emission tests with Innovation, Science and Economic Development (ISED), and the registration number is 11177A.

The Laboratory is registered to perform emission tests with VCCI, and the registration number are C-20048, G20076, R-20077, R-20078 and T-20047.

The Laboratory is Accredited Testing Laboratory of American Association for Laboratory Accreditation (A2LA) and certificate number is 3292.01.

2.3. Measurement Uncertainty

Conducted Emission

9 kHz~150 kHz 3.7dB

150 kHz~30MHz 3.3dB

Radiated Emission

30MHz~1000MHz 4.3dB

1GHz~6GHz 4.6 dB

6GHz~18GHz 5.1dB

18GHz~26.5GHz 5.1dB

3. PRODUCT DESCRIPTION

NOTE: The extreme test conditions for temperature and antenna gain were declared by the manufacturer.

3.1. EUT Description

Description : Bluetooth Scanner
Manufacturer : UROVO TECHNOLOGY CO.,LTD.
Model Number : SR5600,SR5660,SR5680,SR70
Operate Frequency : 2.402GHz~2.480GHz
Antenna : PIFA Antenna
Designation :
Operating voltage : DC3.3V (Low)/DC3.8V (Nominal)/DC4.35V (Max)
Software Version : SR5600_V1.0_210807
Hardware Version : SR5600_MB_V03

Remark: SR5660, SR5680, SR70 compared with SR5600, only have different model name. All of the model's circuit theory, electrical design and Critical Components are the same. Unless otherwise specified, the model SR5600 was chosen as the representative model to perform all the tests.

3.2. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: **SWSSR5600** filing to comply with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C .

3.3. Block Diagram of EUT Configuration



Figure 1 EUT setup

3.4. Operating Condition of EUT

The transmitter has a maximum peak conducted output power of Basic rate GFSK modulation and EDR mode 8DPSK modulation. Tests were performed with Basic rate GFSK modulation and EDR mode 8DPSK modulation.

3.5. Support Equipment List

Table 2 Support Equipment List

| Name | Model No | S/N | Manufacturer |
|---|----------------|-----|--|
| Adaptor for EUT | KP10D-050200CU | --- | STRONG POWER ELECTRONICS TECHNOLOGY CO.,LTD. |
| Rechargeable Li-Ion Polymer Battery for EUT | SR5600 | --- | Shenzhen Cholipower Technology Co.,LTD |

| | | | |
|-------------------|-------------------|-----|-----|
| USB Cable for EUT | --- | --- | --- |
| Notebook | HP ProBook 440 G6 | --- | HP |

3.6. Test Conditions

Date of test : Jun.24, 2021- Jul.12, 2021

Date of EUT Receive : Jun.03, 2021

Temperature: 23°C-25°C

Relative Humidity: 46%-55%

3.7. Special Accessories

Not available for this EUT intended for grant.

3.8. Equipment Modifications

Not available for this EUT intended for grant.

4. TEST EQUIPMENT USED

Table 3 Test Equipment

| No. | Equipment | Manufacturer | Model No. | Last Cal. | Cal. Interval |
|-----------|-------------------|--------------|-----------|--------------|---------------|
| SB3319 | Test Receiver | R&S | ESCS30 | Nov.05,2020 | 1 Year |
| SB8501/06 | AMN | R&S | ESH2-Z5 | Feb.05,2021 | 1 Year |
| SB17366 | Test Receiver | R&S | ESR26 | Jul.09,2020 | 1 Year |
| SB17366 | Test Receiver | R&S | ESR26 | Jul.08,2021 | 1 Year |
| SB3955 | Broadband Antenna | Schwarzbeck | VULB9163 | Jan.05,2021 | 1 Year |
| SB8501/09 | Test Receiver | R&S | ESU40 | Feb.05,2021 | 1 Year |
| SB3435 | Horn Antenna | R&S | HF906 | Dec.16,2020 | 1 Year |
| SB9054/08 | Broadband Antenna | Schwarzbeck | VULB 9163 | Jan.05,2021 | 1 Year |
| SB9058/03 | Pre-Amplifier | R&S | SCU 18 | Feb.05,2021 | 1 Year |
| SB8501/10 | Horn Antenna | R&S | 3160-09 | Mar.10,2020 | 3 Years |
| SB8501/11 | Horn Antenna | R&S | 3160-09 | Mar.09,2020 | 3 Years |
| SB8501/12 | Horn Antenna | R&S | 3160-10 | Mar.17,2020 | 3 Years |
| SB8501/13 | Horn Antenna | R&S | 3160-10 | Mar.10,2020 | 3 Years |
| SB8501/14 | Pre-Amplifier | R&S | SCU-03 | Feb.05,2021 | 1 Year |
| SB8501/15 | Pre-Amplifier | R&S | SCU-03 | Feb.05,2021 | 1 Year |
| SB8501/16 | Pre-Amplifier | R&S | SCU 26 | Feb.05,2021 | 1 Year |
| SB8501/17 | Pre-Amplifier | R&S | SCU-18 | Feb.05,2021 | 1 Year |
| SB9060 | Signal Analyzer | R&S | FSQ40 | May.17, 2021 | 1 Year |

Table 4 Test software

| Name | Manufacturer | Version |
|--------------------------------|------------------------------|-------------|
| Bluetooth and WiFi Test System | Shenzhen JS tonscend co.,ltd | 2.6.88.0330 |

5. CONDUCTED EMISSION TEST

5.1. Test Standard and Limit

5.1.1. Test Standard

FCC Part 15 15.207

5.1.2. Test Limit

Table 5 Conducted Emission Test Limit

| Frequency | Maximum RF Line Voltage (dB μ V) | |
|---------------|--------------------------------------|---------------|
| | Quasi-peak Level | Average Level |
| 150kHz~500kHz | 66 ~ 56 * | 56 ~ 46 * |
| 500kHz~5MHz | 56 | 46 |
| 5MHz~30MHz | 60 | 50 |

* Decreasing linearly with logarithm of the frequency

* The lower limit shall apply at the transition frequency.

5.2. Test Procedure

The EUT is put on a table of non-conducting material that is 80cm high. The vertical conducting wall of shielding is located 40cm to the rear of the EUT. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.). A EMI test receiver is used to test the emissions from both sides of AC line.

Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and average detector mode.

The bandwidth of EMI test receiver is set at 9 kHz.

5.3. Test Arrangement

The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application. The detailed information refers to test picture.

5.4. Test Data

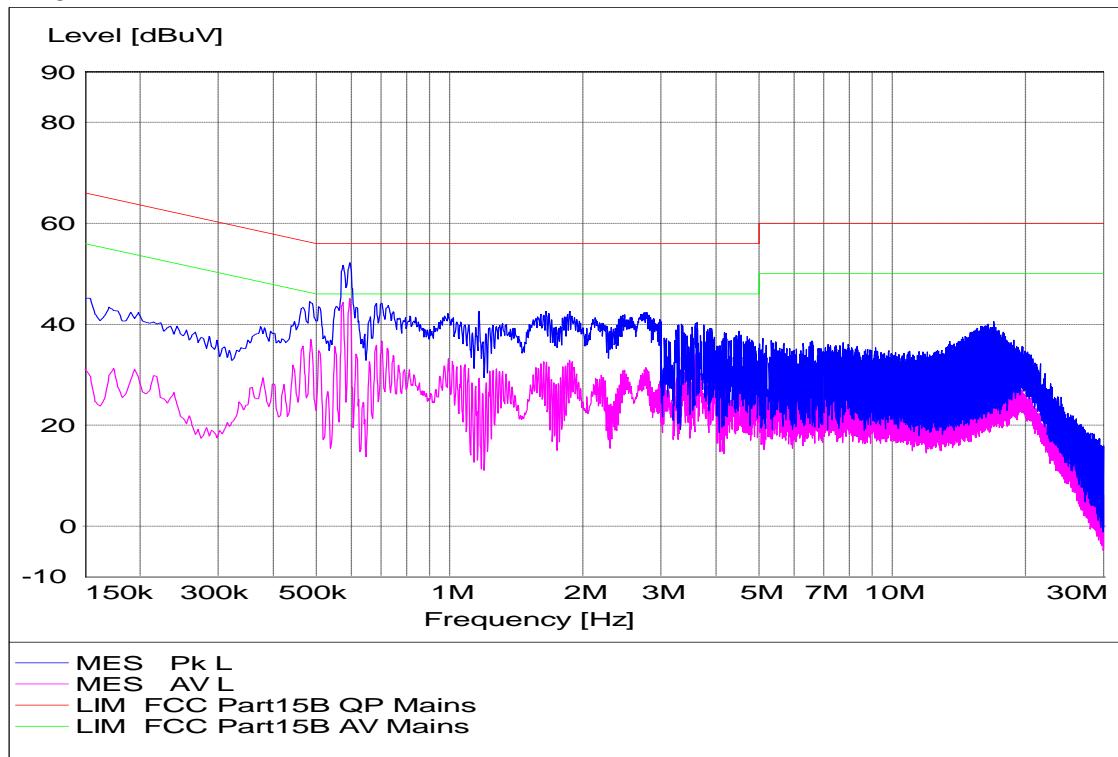
The emissions don't show in below are too low against the limits. Refer to the test curves.

Table 6 Conducted Emission Test Data

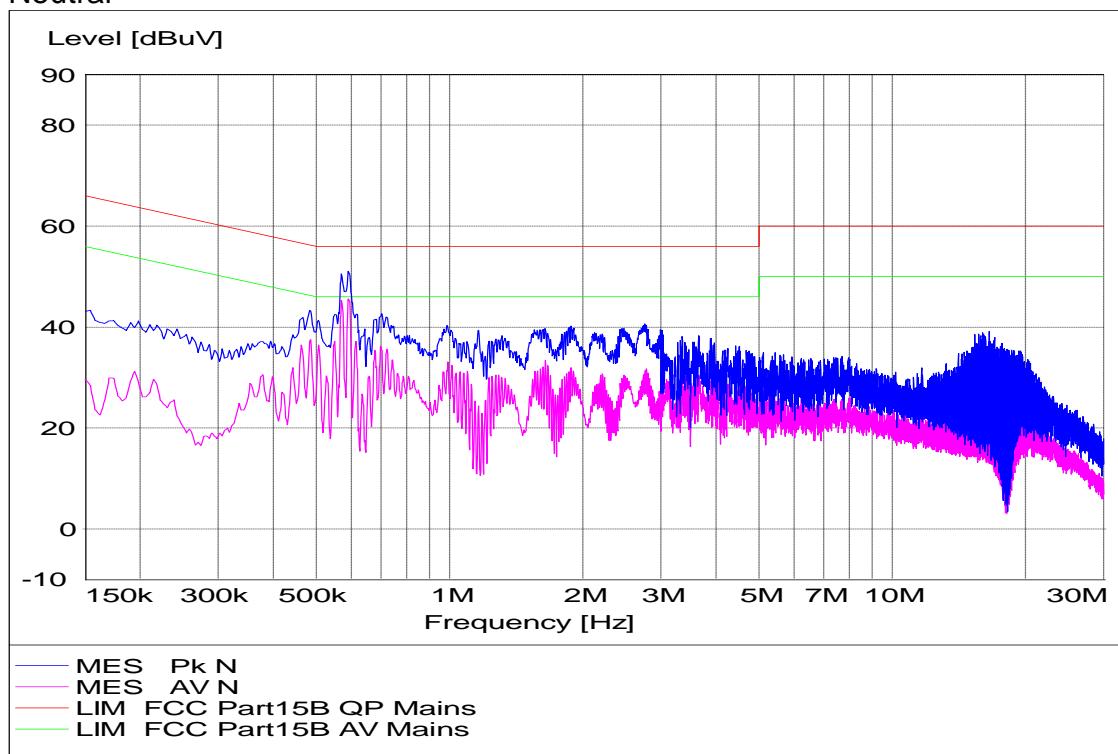
| Test mode: Charging and Transmitting | | | | | | | | |
|--------------------------------------|--------------------|------------------------------|-------------------------|-----------------------------------|-----------------------|-------------------------|-----------------------------------|-----------------------|
| | Frequency (MHz) | Correction Factor (dB) | Quasi-Peak | | | Average | | |
| | | | Reading (dB μ V) | Emission Level (dB μ V) | Limit (dB μ V) | Reading (dB μ V) | Emission Level (dB μ V) | Limit (dB μ V) |
| Line | 0.486 | 9.7 | 32.6 | 42.3 | 56.2 | 27.6 | 37.3 | 46.2 |
| | 0.576 | 9.8 | 36.0 | 45.8 | 56 | 30.5 | 40.3 | 46 |
| | 0.594 | 9.8 | 40.3 | 50.1 | 56 | 34.9 | 44.7 | 46 |
| | 0.702 | 9.8 | 32.2 | 42.0 | 56 | 26.3 | 36.1 | 46 |
| | 1.650 | 9.8 | 29.6 | 39.4 | 56 | 23.7 | 33.5 | 46 |
| | 2.766 | 9.9 | 26.2 | 36.1 | 56 | 18.6 | 28.5 | 46 |
| Neutral | 0.482 | 9.7 | 31.5 | 41.2 | 56.3 | 28.5 | 38.2 | 46.3 |
| | 0.570 | 9.8 | 39.1 | 48.9 | 56 | 36.0 | 45.8 | 46 |
| | 0.590 | 9.8 | 39.8 | 49.6 | 56 | 36.1 | 45.9 | 46 |
| | 0.702 | 9.8 | 29.7 | 39.5 | 56 | 25.9 | 35.7 | 46 |
| | 0.986 | 9.8 | 27.8 | 37.6 | 56 | 22.8 | 32.6 | 46 |
| | 1.882 | 9.8 | 27.7 | 37.5 | 56 | 22.8 | 32.6 | 46 |

REMARKS: 1. Emission level (dB μ V) =Read Value (dB μ V) + Correction Factor (dB)
 2. Correction Factor (dB) =LISN Factor (dB) + Cable Factor (dB) +Limiter Factor (dB)
 3. The other emission levels were very low against the limit.

Line



Neutral



6. RADIATED EMISSION TEST

6.1. Test Standard and Limit

6.1.1. Test Standard

FCC Part 15 15.209

6.1.2. Test Limit

Table 7 Radiation Emission Test Limit for FCC (Class B) (9 kHz-1GHz)

| Frequency (MHz) | Field Strength (microvolts/meter) | Measurement Distance (meters) |
|-----------------|-----------------------------------|-------------------------------|
| 0.009~0.490 | 2400/F(KHz) | 300 |
| 0.490~1.705 | 24000/F(KHz) | 30 |
| 1.705~30.0 | 30 | 30 |
| 30~88 | 100 | 3 |
| 88~216 | 150 | 3 |
| 216~960 | 200 | 3 |
| 960~1000 | 500 | 3 |

Table 8 Radiation Emission Test Limit for FCC (Class B) (Above 1G)

| Frequency (MHz) | (dBuV/m) (at 3 meters) | |
|-----------------|------------------------|---------|
| | PEAK | AVERAGE |
| Above 1000 | 74 | 54 |

* The lower limit shall apply at the transition frequency.

* The test distance is 3m.

6.2. Test Procedure

The EUT is placed on a non-conducting table 80 cm above the ground plane for measurement below 1GHz; 1.5 m above the ground plane for measurement above 1GHz. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10-2013. The EUT is set to transmit in a continuous mode. Radiated measurements were performed on the frequency range from 30MHz to 25GHz. All readings from 30 MHz to 1 GHz are quasi-peak values with a resolution bandwidth of 120 kHz, $VBW \geq RBW$. All readings above 1 GHz are AV and PK values. $RBW = 1\text{MHz}$ and $1/T (10\text{Hz})$ for AV value, $RBW = 1\text{MHz}$ and $VBW \geq RBW$ for peak value. Measurements were made at 3 meters.

6.3. Test Arrangement

The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application. The detailed information refers to test picture.

6.4. Test Data

The emissions don't show in following result tables are more than 20dB below the limits. Bluetooth basic rate and Bluetooth EDR mode were tested, below only shows worst case result of Bluetooth basic rate.

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

9 kHz-30MHz

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

Table 9 Radiated Emission Test Data 9k Hz-30MHz

| Frequency (MHz) | Cable Loss +preamp (dB) | Antenna Factor (dB) | Reading (dB μ V/m) | Level (dB μ V/m) | Polarity (H/V) | Limit (dB μ V/m) | Margin (dB) | Note |
|-----------------|-------------------------|---------------------|------------------------|----------------------|----------------|----------------------|-------------|------|
| -- | -- | -- | -- | -- | -- | -- | -- | -- |
| -- | -- | -- | -- | -- | -- | -- | -- | -- |
| -- | -- | -- | -- | -- | -- | -- | -- | -- |
| -- | -- | -- | -- | -- | -- | -- | -- | -- |
| -- | -- | -- | -- | -- | -- | -- | -- | -- |
| -- | -- | -- | -- | -- | -- | -- | -- | -- |
| -- | -- | -- | -- | -- | -- | -- | -- | -- |
| -- | -- | -- | -- | -- | -- | -- | -- | -- |
| -- | -- | -- | -- | -- | -- | -- | -- | -- |

30MHz-1GHz

Worst case is shown below for 30MHz-1GHz only.

The emissions don't show in following result tables are more than 20dB below the limits.

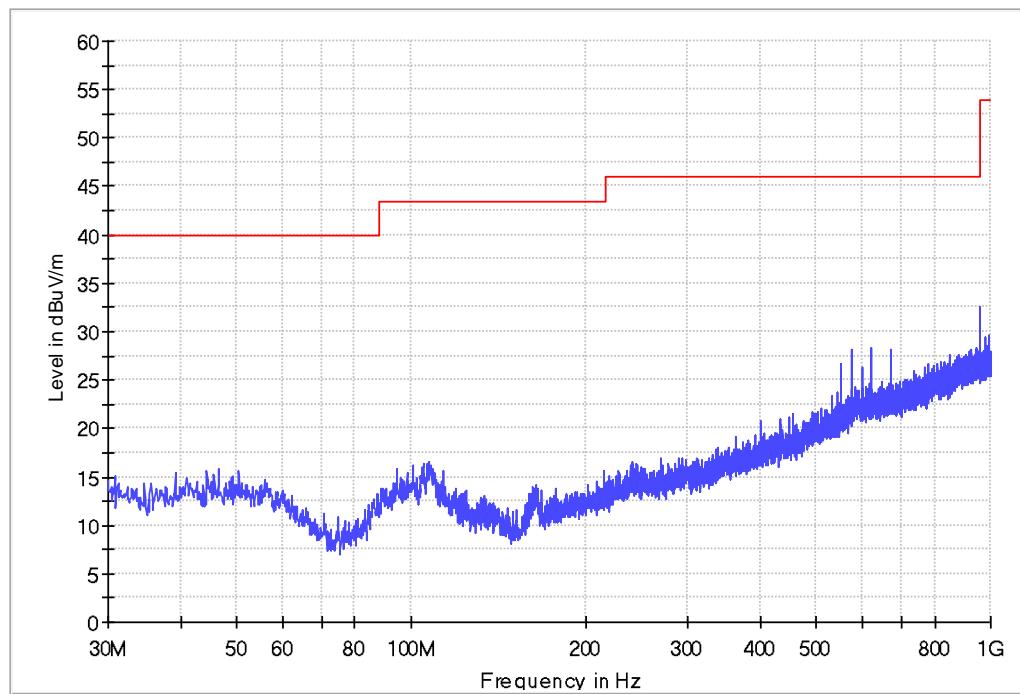
Table 10 Radiated Emission Test Data 30MHz-1GHz

| Frequency (MHz) | Cable Loss +preamp (dB) | Antenna Factor (dB) | Reading (dB μ V/m) | Level (dB μ V/m) | Polarity (Horizontal/ Vertical) | Limit (dB μ V/m) | Margin (dB) | Note |
|-----------------|-------------------------|---------------------|------------------------|----------------------|---------------------------------|----------------------|-------------|------|
| 33.007 | 0.7 | 12.3 | 5.5 | 18.5 | Vertical | 40 | 21.5 | QP |
| 39.215 | 0.6 | 12.3 | 6.4 | 19.3 | Vertical | 40 | 20.7 | QP |
| 56.093 | 0.9 | 13.0 | 2.5 | 16.4 | Vertical | 40 | 23.6 | QP |
| 240.005 | 1.9 | 12.1 | 4.9 | 18.9 | Vertical | 46 | 27.1 | QP |
| 624.028 | 3.2 | 18.5 | 4.8 | 26.5 | Vertical | 46 | 19.5 | QP |
| 960.036 | 3.9 | 21.1 | 3.7 | 28.7 | Vertical | 54 | 25.3 | QP |
| 44.259 | 0.7 | 13.6 | -0.9 | 13.4 | Horizontal | 40 | 26.6 | QP |
| 50.467 | 0.8 | 13.3 | -1.9 | 12.2 | Horizontal | 40 | 27.8 | QP |
| 94.408 | 1.1 | 11.9 | -0.9 | 12.1 | Horizontal | 43.5 | 31.4 | QP |
| 107.406 | 1.2 | 13.2 | -0.9 | 13.5 | Horizontal | 43.5 | 30.0 | QP |
| 624.028 | 3.2 | 18.5 | 3.7 | 25.4 | Horizontal | 46 | 20.6 | QP |
| 960.036 | 3.9 | 21.1 | 3.7 | 28.7 | Horizontal | 54 | 25.3 | QP |

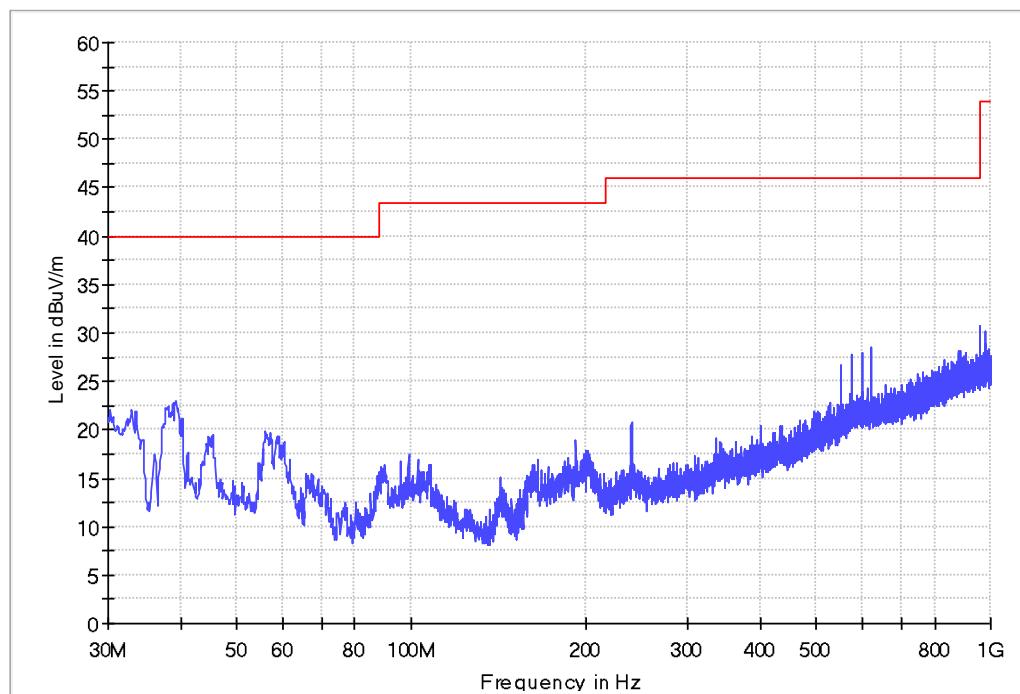
Remark: Emission level (dB μ V)=Read Value(dB μ V/m) + Antenna Factor(dB)+ Cable Loss +preamp(dB)

30MHz-1GHz

Horizontal

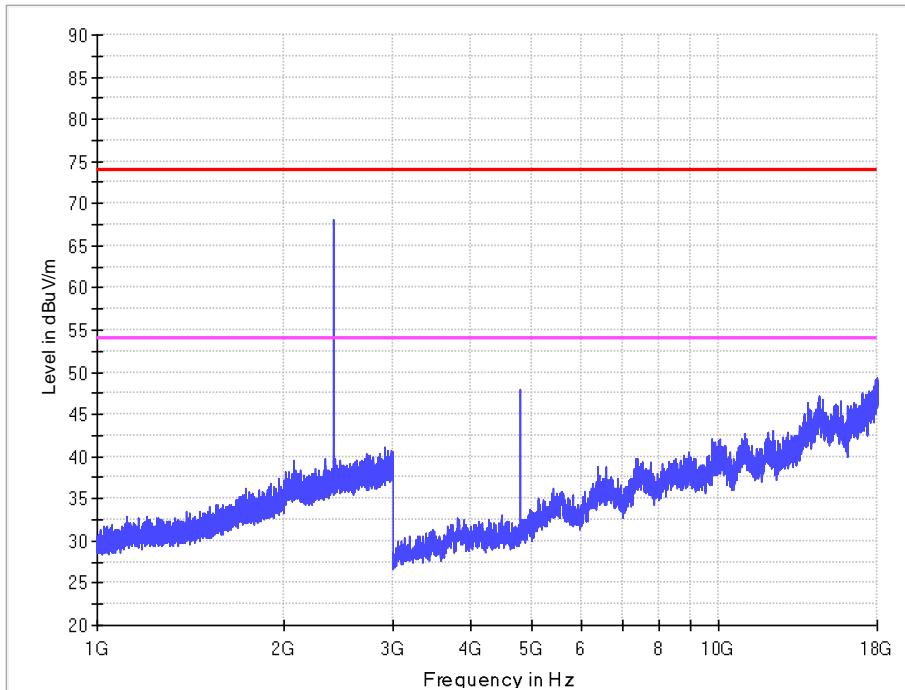


Vertical

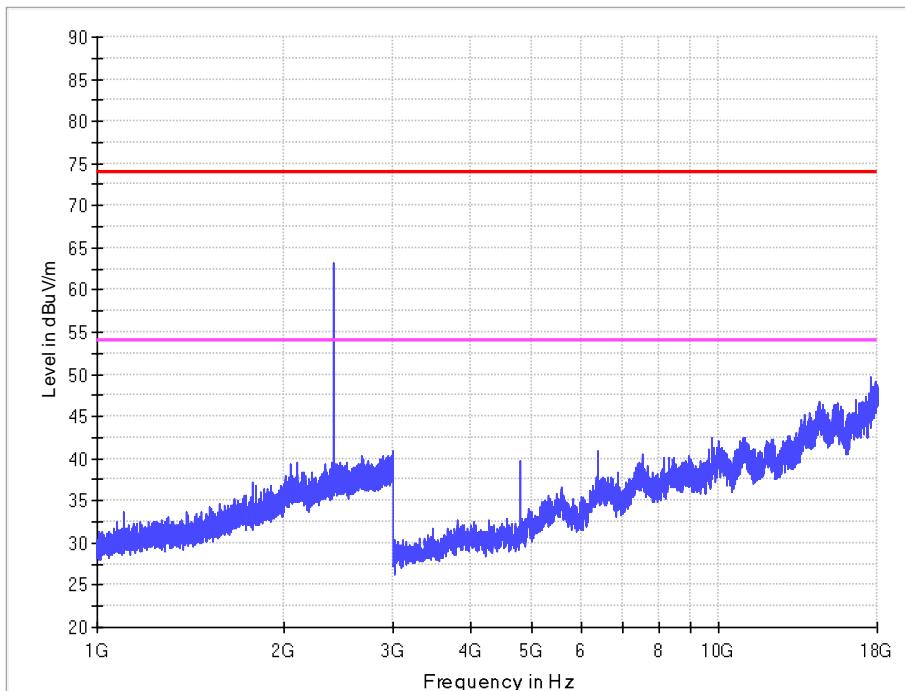


1GHz-18GHz

GFSK CH0
Horizontal

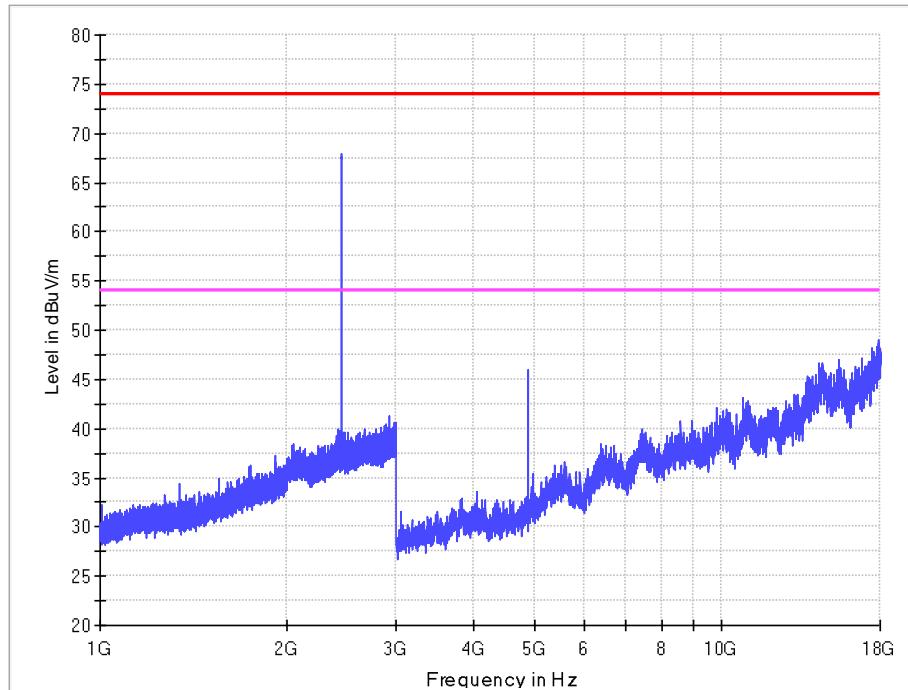


Vertical

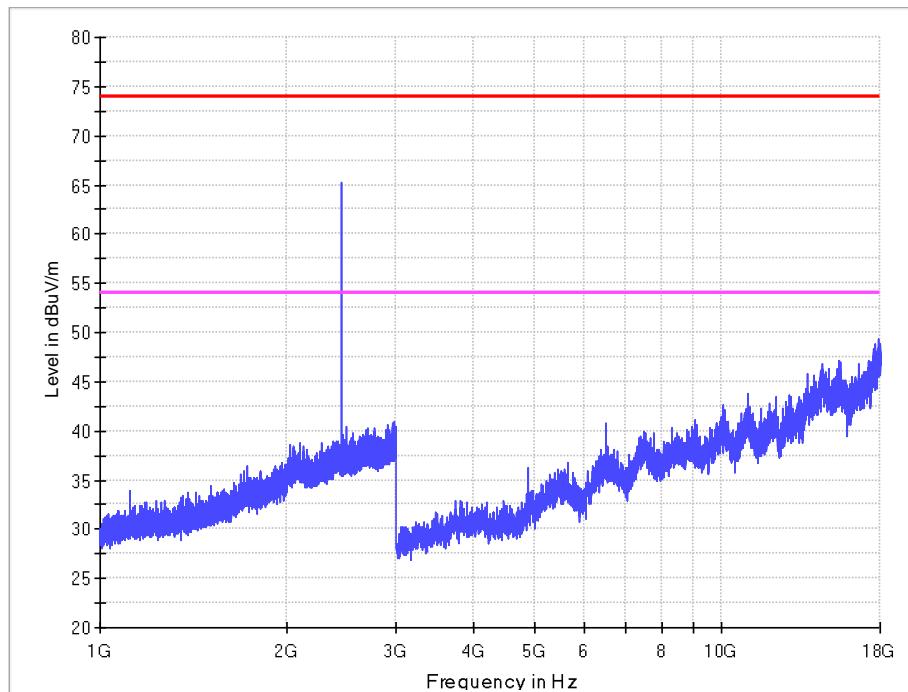


1GHz-18GHz

GFSK CH39
Horizontal

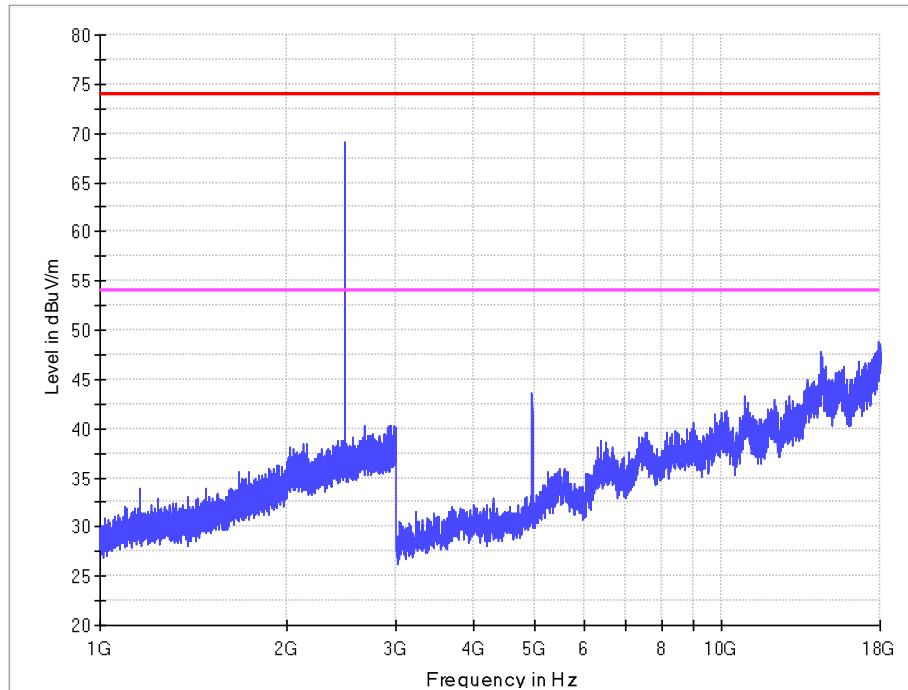


Vertical

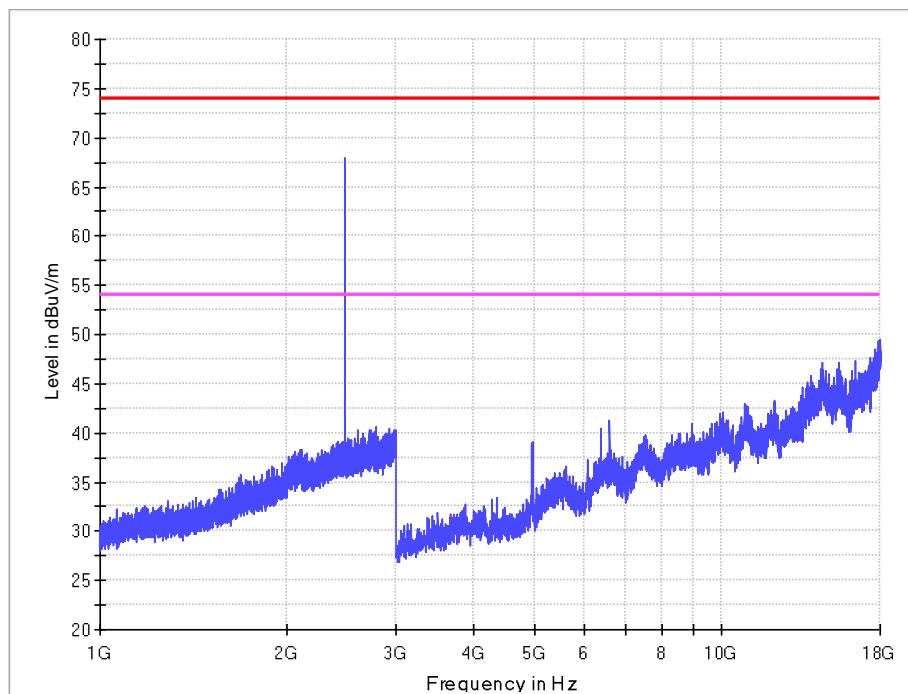


1GHz-18GHz

GFSK CH78
Horizontal

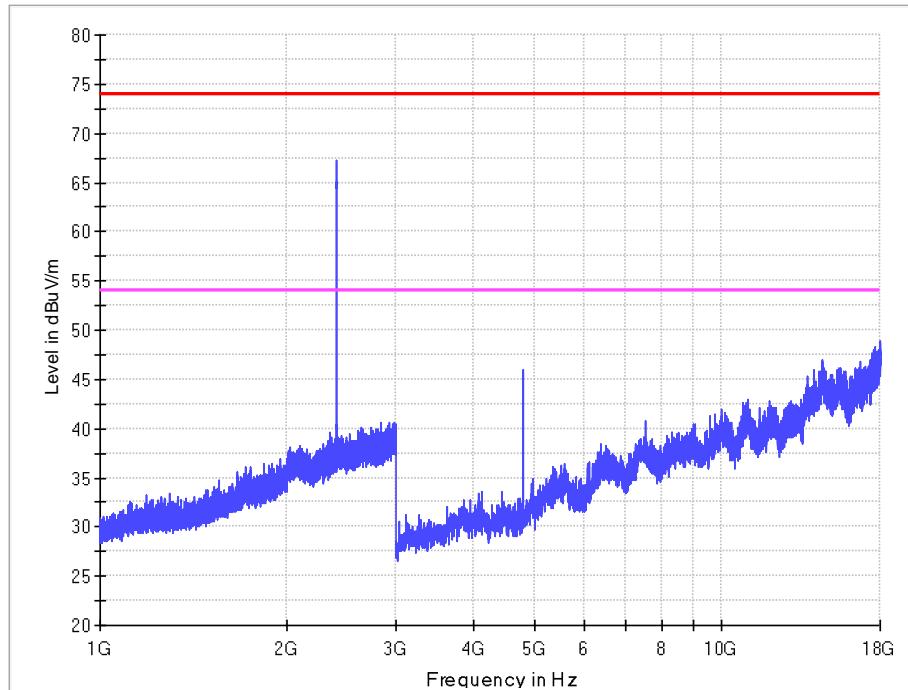


Vertical

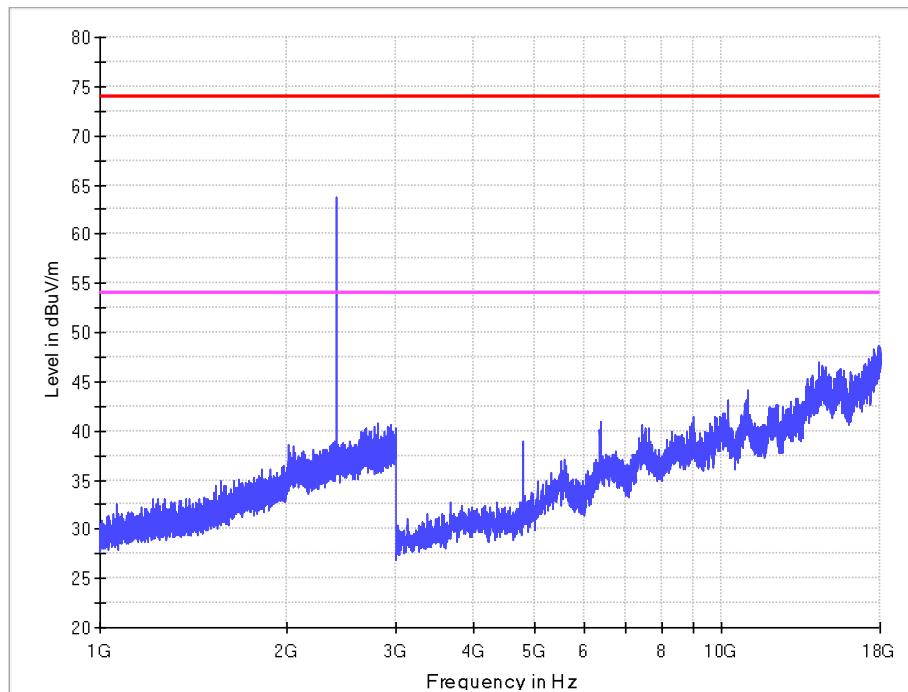


1GHz-18GHz

8PDSK CH0
Horizontal

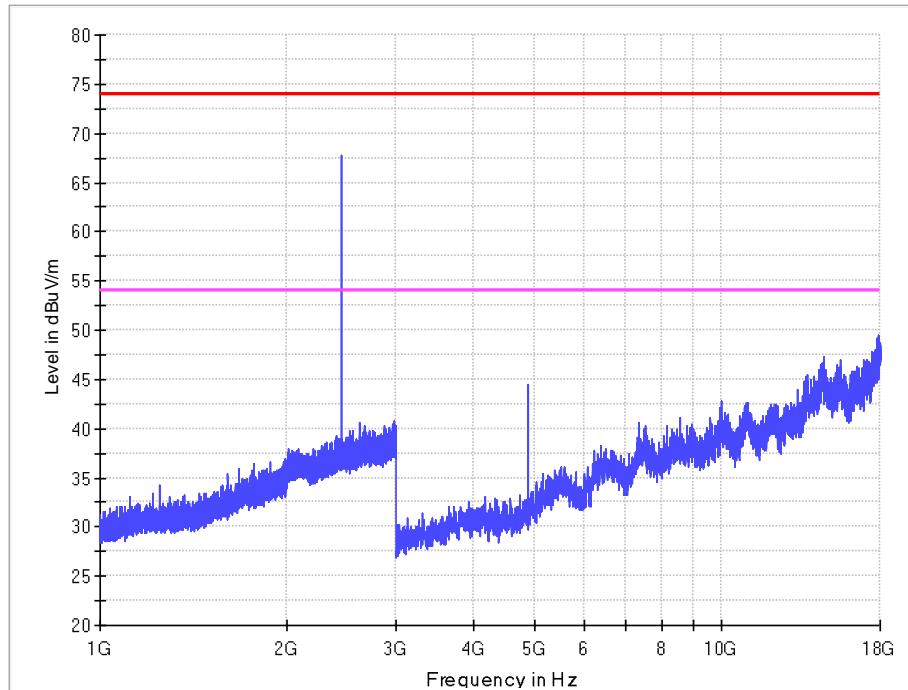


Vertical

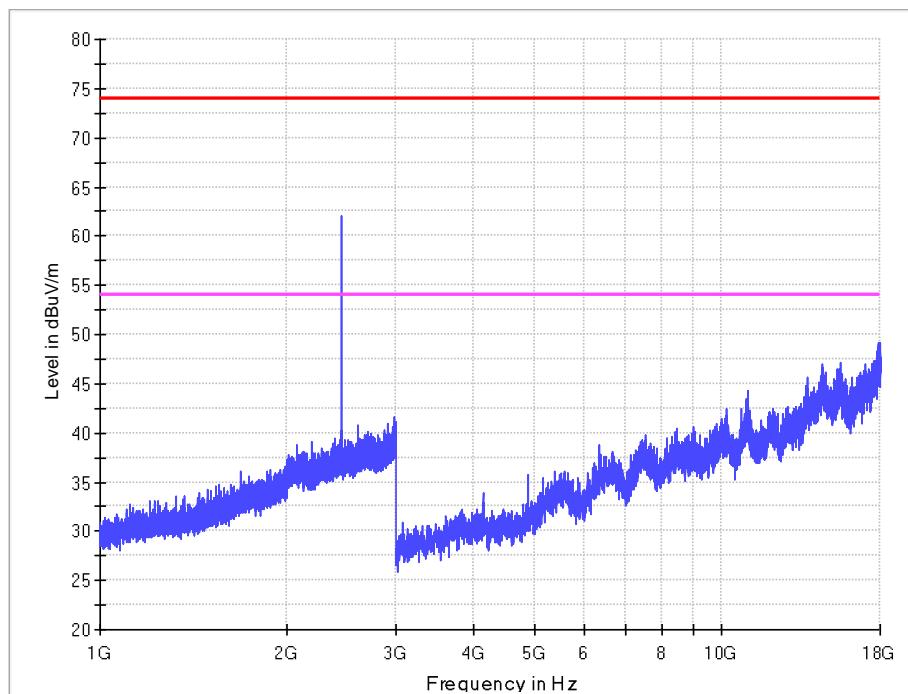


1GHz-18GHz

8PDSK CH39
Horizontal

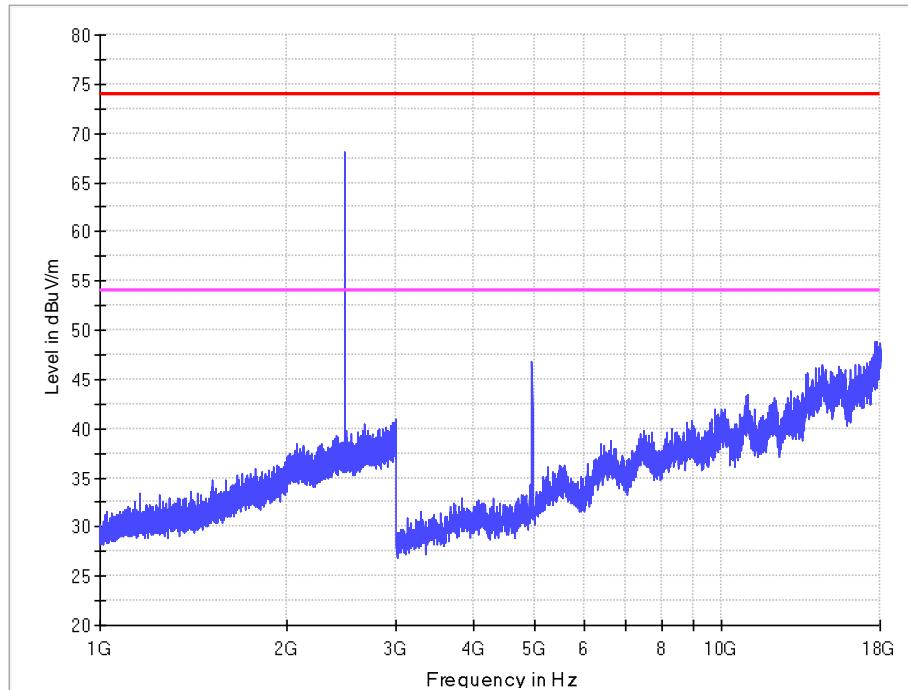


Vertical

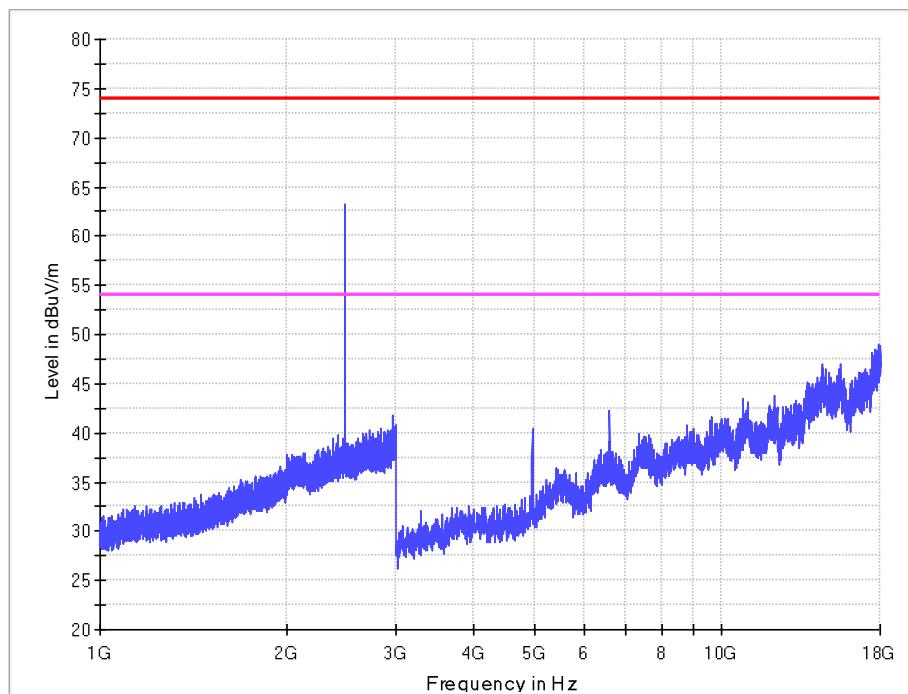


1GHz-18GHz

8PDSK CH78
Horizontal

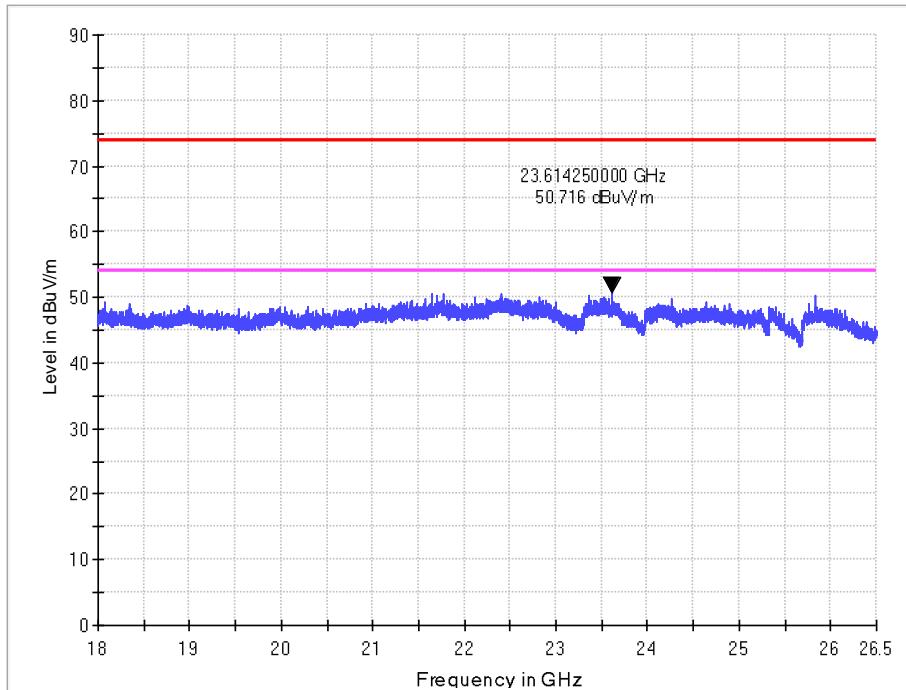


Vertical



18-26.5GHz

No Peak found in pre-scan, only worst case result is listed in this report.
Horizontal



Vertical

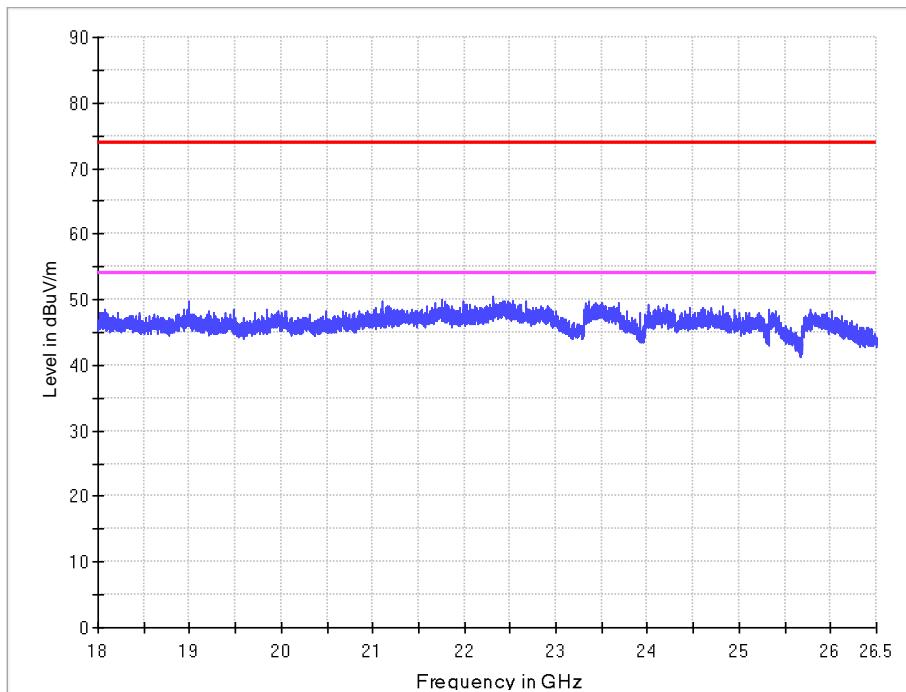


Table 11 Restricted Band Radiated Emission Data

| MHz | MHz | MHz | GHz |
|-----------------|---------------------|---------------|-------------|
| 0.090 - 0.110 | 16.42 - 16.423 | 399.9 - 410 | 4.5 - 5.15 |
| 0.495 - 0.505 | 16.69475 - 16.69525 | 608 - 614 | 5.35 - 5.46 |
| 2.1735 - 2.1905 | 16.80425 - 16.80475 | 960 - 1240 | 7.25 - 7.75 |
| 4.125 - 4.128 | 25.5 - 25.67 | 1300 - 1427 | 8.025 - 8.5 |
| 4.17725 | - 37.5 - 38.25 | 1435 - 1626.5 | 9.0 - 9.2 |
| 4.17775 | 73 - 74.6 | 1645.5 | - 9.3 - 9.5 |
| 4.20725 | - 74.8 - 75.2 | 1646.5 | |
| 4.20775 | 108 - 121.94 | 1660 - 1710 | |
| 6.215 - 6.218 | 123 - 138 | 1718.8 | - |
| 6.26775 | - 149.9 - 150.05 | 1722.2 | |
| 6.26825 | 156.52475 | 2200 - 2300 | |
| 6.31175 | - 156.52525 | 2310 - 2390 | |
| 6.31225 | 156.7 - 156.9 | 2483.5 - 2500 | |
| 8.291 - 8.294 | 162.0125 - 167.17 | 2655 - 2900 | |
| 8.362 - 8.366 | 167.72 - 173.2 | 3260 - 3267 | |
| 8.37625 | - 240 - 285 | 3332 - 3339 | |
| 8.38675 | 322 - 335.4 | 3345.8 - 3358 | |
| 8.41425 | - | 3600 - 4400 | |
| 8.41475 | | | |
| 12.29 - 12.293 | | | |
| 12.51975 | - | | |
| 12.52025 | | | |
| 12.57675 | - | | |
| 12.57725 | | | |
| 13.36 - 13.41 | | | |

Except as shown in table 9 to table 15, all other emission of the above band were less than the limit 20dB.

7. 20DB BANDWIDTH MEASUREMENT

7.1. Limits of 20dB Bandwidth Measurement

CFR 47 (FCC) part 15.247 (a) (1) and DA 00-705

7.2. Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 30kHz RBW and $VBW \geq RBW$. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

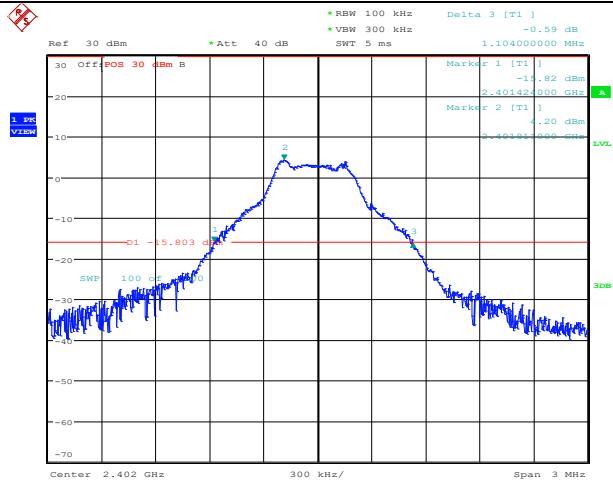
7.3. Test Setup



7.4. Test Data

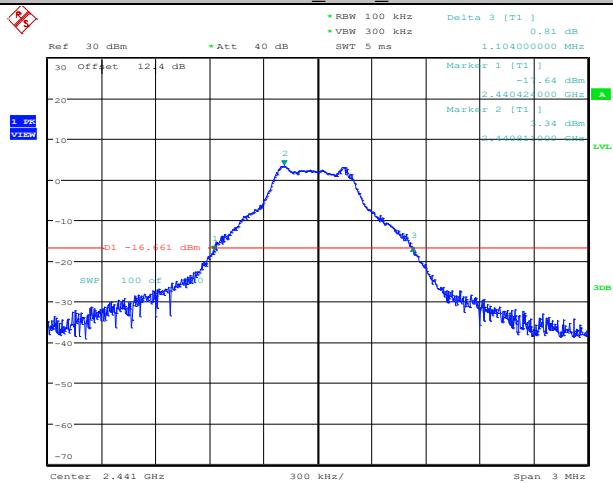
Table 12 20dB Bandwidth Test Data

| Test Mode | CHANNEL FREQUENCY (MHz) | Modulation | 20dB BANDWIDTH (MHz) | Result |
|-----------|-------------------------|------------|----------------------|--------|
| DH1 | 2402 | GFSK | 1.104 | Pass |
| | 2441 | | 1.104 | Pass |
| | 2480 | | 1.104 | Pass |
| 3DH1 | 2402 | 8DPSK | 1.362 | Pass |
| | 2441 | | 1.365 | Pass |
| | 2480 | | 1.371 | Pass |



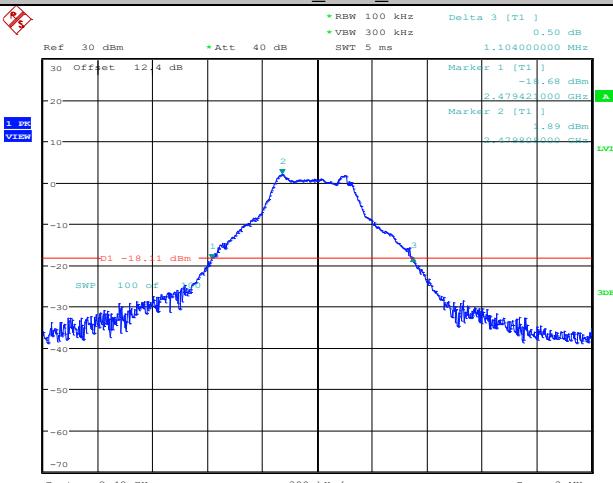
Date: 29.JUN.2021 10:01:38

DH1_Ant1_2402



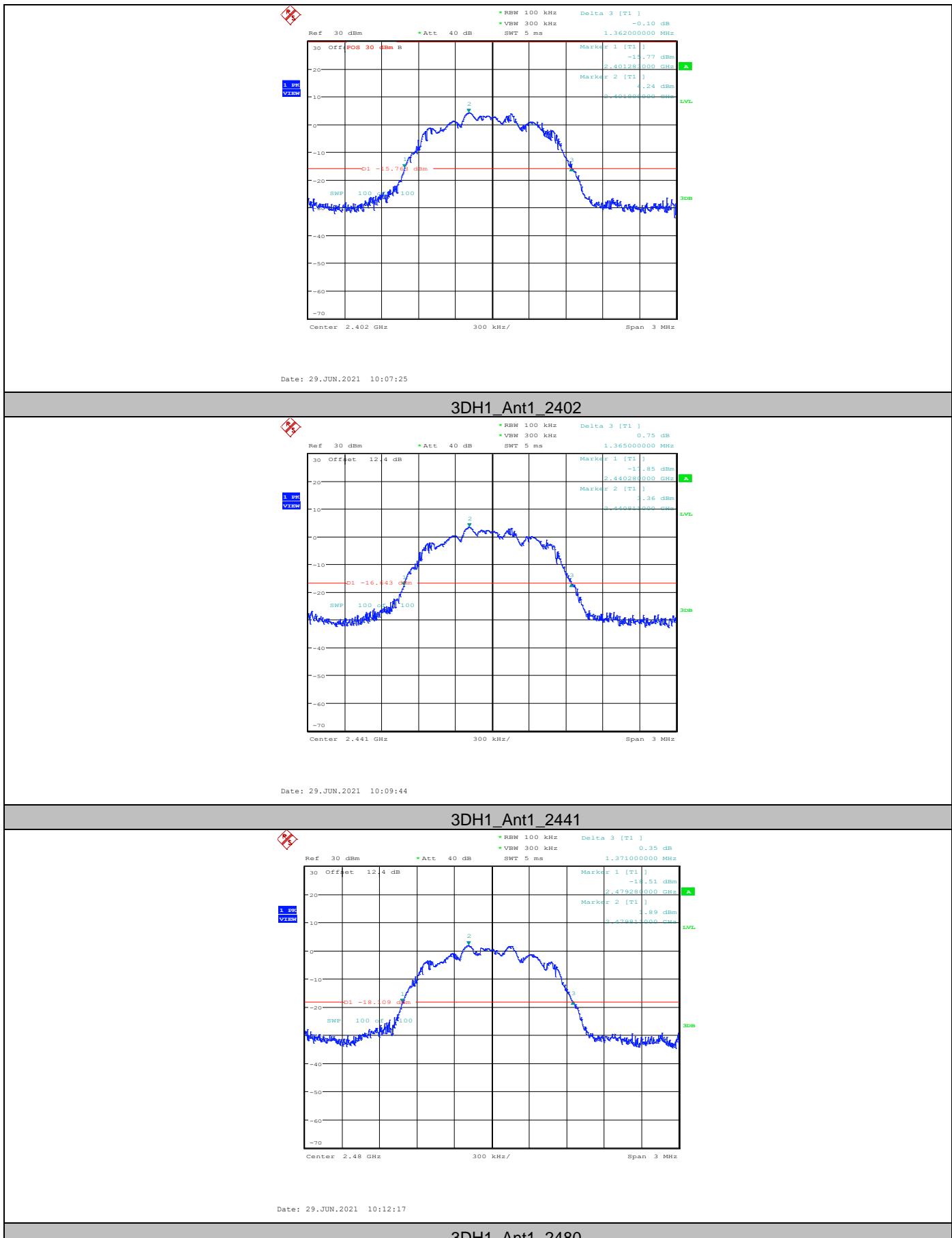
Date: 29.JUN.2021 10:03:28

DH1_Ant1_2441



Date: 29-JUN-2021 10:05:36

DH1 Ant1 2480



8. CARRIER FREQUENCY SEPARATION MEASUREMENT

8.1. Limits of Carrier Frequency Separation Measurement

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

8.2. Test Procedure

- Connect test port of EUT to spectrum analyzer and universal communication tester.
- Set the EUT to transmit maximum output power at 2.4GHz and switch off frequency hopping function, then set the measured frequency number to two adjacent channels separately and test the carrier frequency separation with spectrum analyzer.

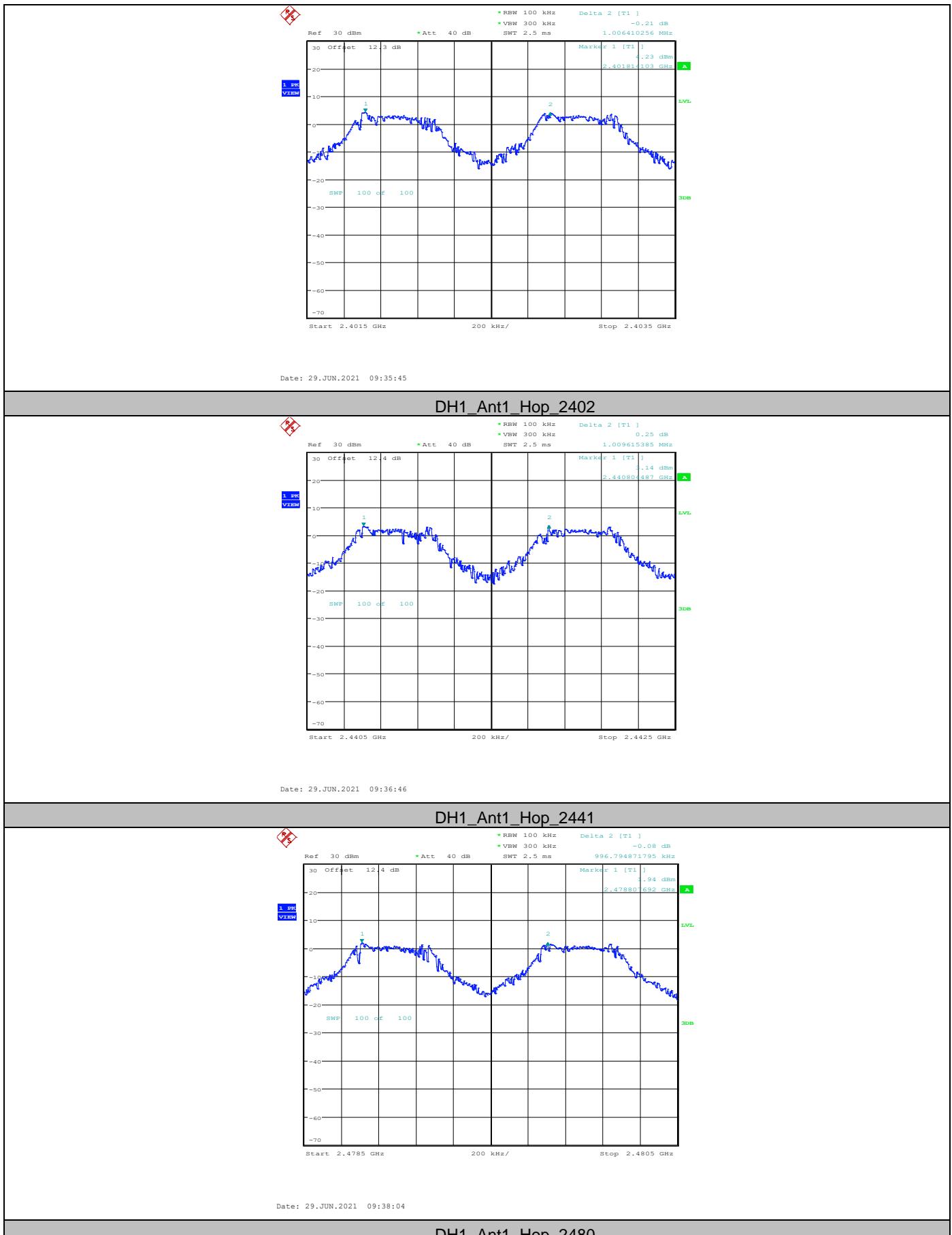
8.3. Test Setup

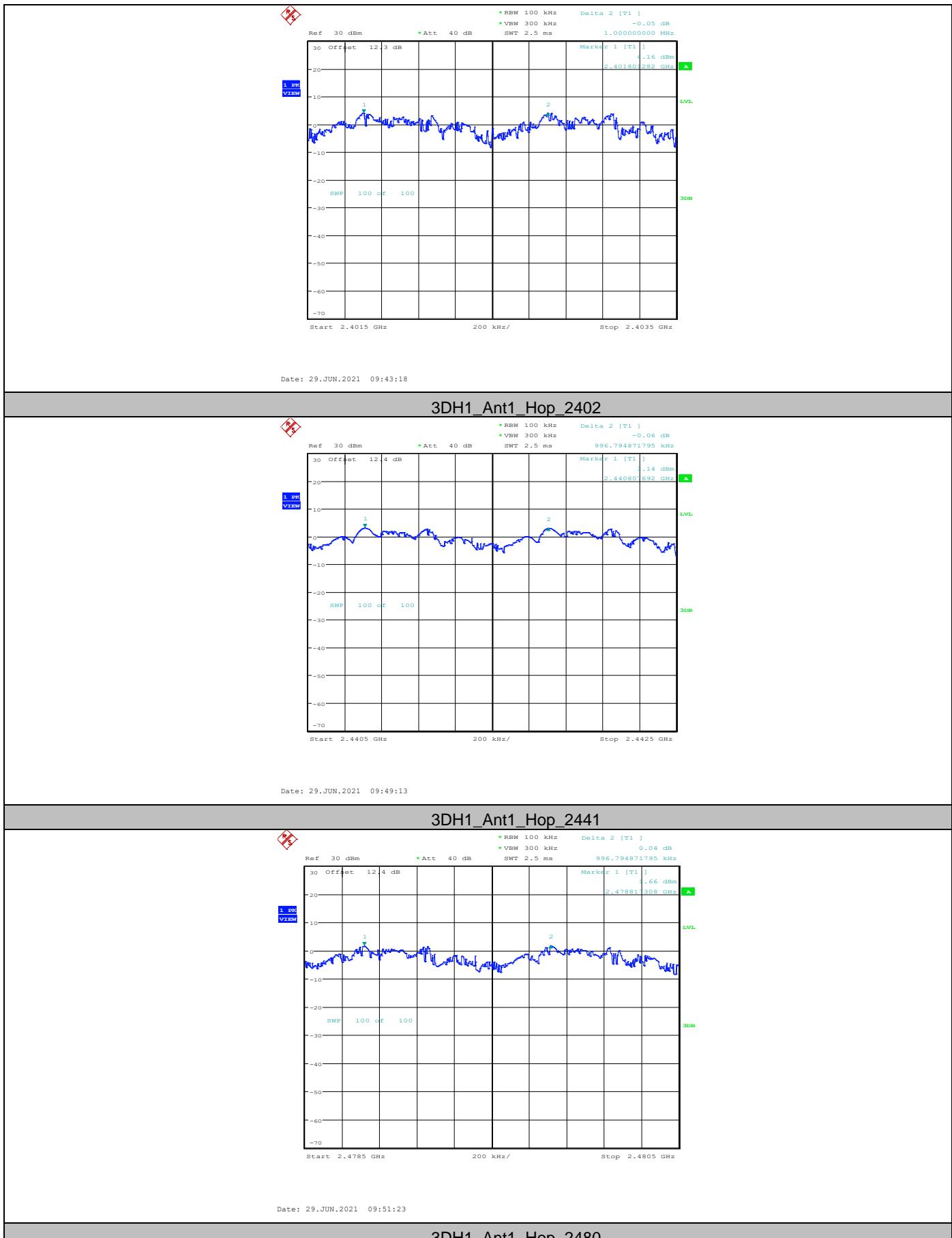


8.4. Test Data

Table 13 Carrier Frequencies Separation

| Test Mode | Frequency [MHz] | Frequency [MHz] | Modulation | Frequency separation [MHz] | Limit [MHz] | Result |
|-----------|-----------------|-----------------|------------|----------------------------|--------------|--------|
| DH1 | 2402 | 2403 | GFSK | 1.006 | ≥ 0.742 | Pass |
| | 2441 | 2442 | | 1.010 | ≥ 0.742 | Pass |
| | 2478 | 2479 | | 0.997 | ≥ 0.742 | Pass |
| 3DH1 | 2402 | 2403 | 8DPSK | 1.000 | ≥ 0.912 | Pass |
| | 2441 | 2442 | | 0.997 | ≥ 0.912 | Pass |
| | 2478 | 2479 | | 0.997 | ≥ 0.912 | Pass |





9. NUMBER OF HOPPING CHANNEL

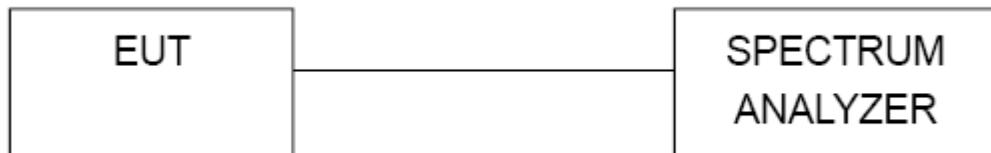
9.1. Limits of Number of Hopping Channel

Number of hopping channel should be compliance with the requirements in part15.247 (a) (1) III.

9.2. Test Procedure

- (a) Connect test port of EUT to spectrum analyzer.
- (b) Set the EUT to transmit maximum output power at 2.4GHz and switch on. Frequency hopping function, then set enough count time (larger than 5000 times) to get all the hopping frequency channel displayed on the screen of spectrum analyzer.
- (c) Count the quantity of peaks to get the number of hopping channels.

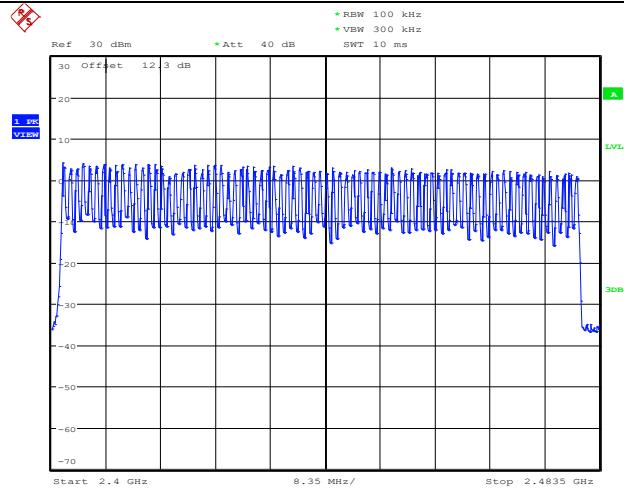
9.3. Test Setup



9.4. Test Data

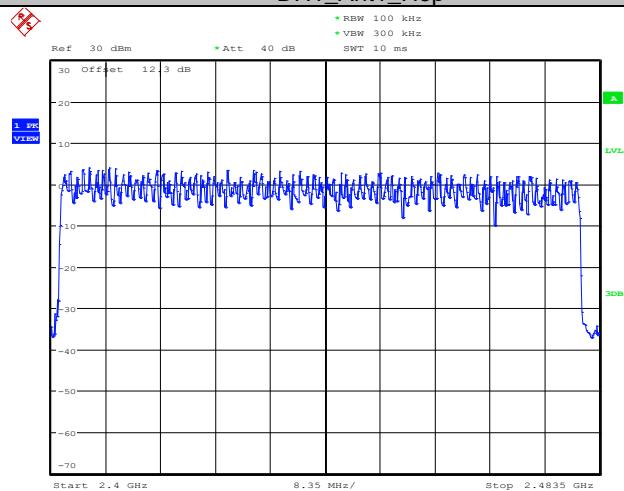
Table 14 Hopping Channel Number Test Data

| Test Mode | Hopping Numbers | Modulation | Limit | Result |
|-----------|-----------------|------------|-----------|--------|
| DH1 | 79 | GFSK | ≥ 15 | Pass |
| 3DH1 | 79 | 8DPSK | ≥ 15 | Pass |



Date: 29.JUN.2021 09:39:21

DH1_Ant1_Hop



Date: 29.JUN.2021 09:52:36

3DH1_Ant1_Hop

10. TIME OF OCCUPANCY

10.1. Limits of Time Occupancy

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.

10.2. Test Procedure

- (a) Connect test port of EUT to spectrum analyzer and universal communication tester.
- (b) Set the EUT to transmit maximum output power at 2.4GHz and switch on frequency hopping function.
- (c) Set the span of spectrum analyzer to 0 Hz, and set the resolution bandwidth to 1 MHz and the video bandwidth to 1 MHz, then get the time domain measured diagram. and set sweep time to 2 times of one burst occupancy time, and measure the time of occupancy of one burst.
- (d) Set the resolution bandwidth to 1 MHz and the video bandwidth to 3 MHz ,and set the sweep time to a period (0.4 seconds multiplied by the number of hopping channels employed), and count the number of the bursts.
- (e) Calculate the time of occupancy in a period with time occupancy of a burst and quantity of bursts.

DH1: Dwell time equal to Pluse time (ms)*(1600/2/79)*31.6ms

DH3: Dwell time equal to Pluse time (ms)*(1600/4/79)*31.6ms

DH5: Dwell time equal to Pluse time (ms)*(1600/6/79)*31.6ms

AFH Mode:

DH1: Dwell time equal to Pluse time (ms)*(800/2/20)*(0.4*20) ms

DH3: Dwell time equal to Pluse time (ms)*(800/4/20)*(0.4*20) ms

DH5: Dwell time equal to Pluse time (ms)*(800/6/20)*(0.4*20) ms

10.3. Test Data

GFSK

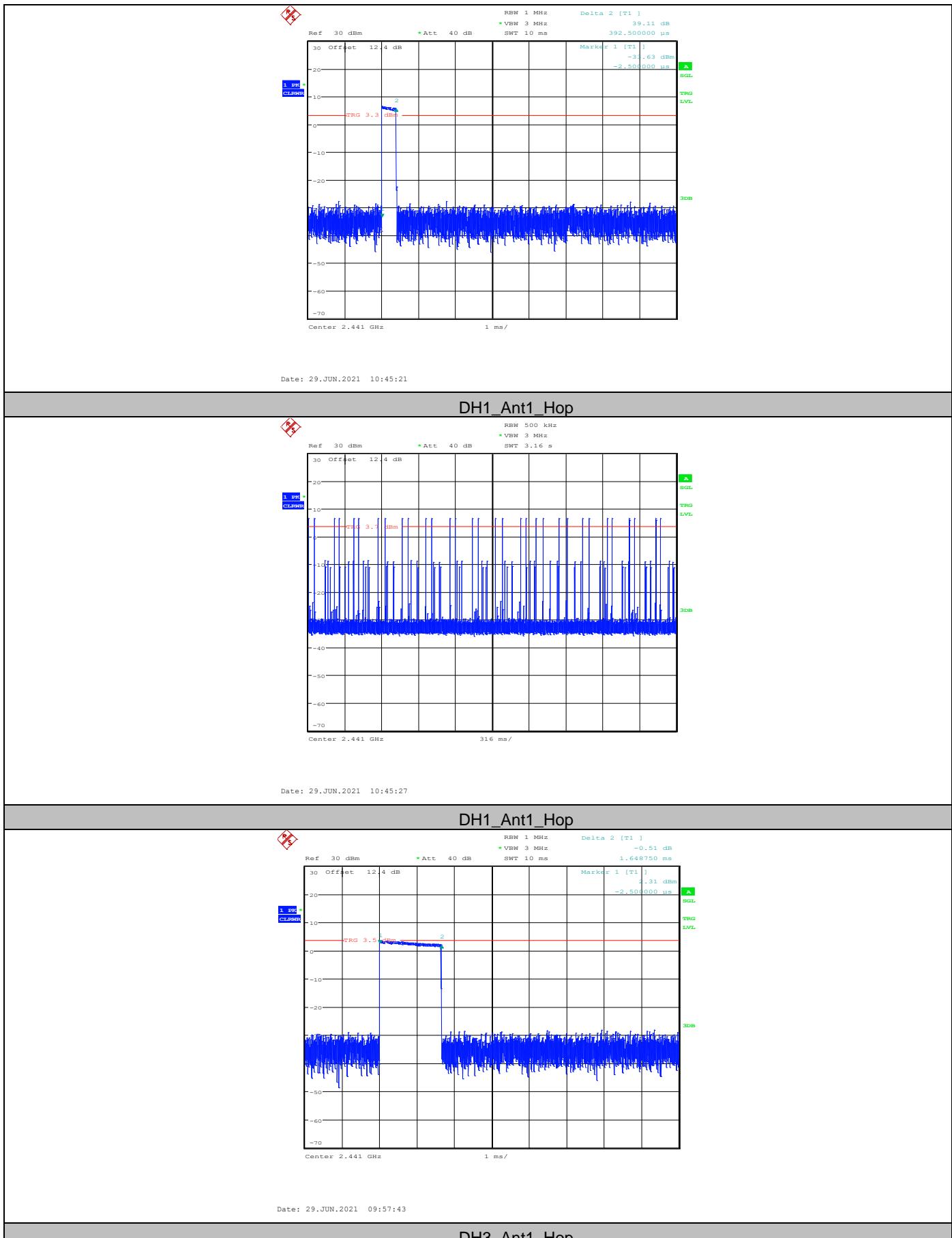
Table 15 Time of Occupancy

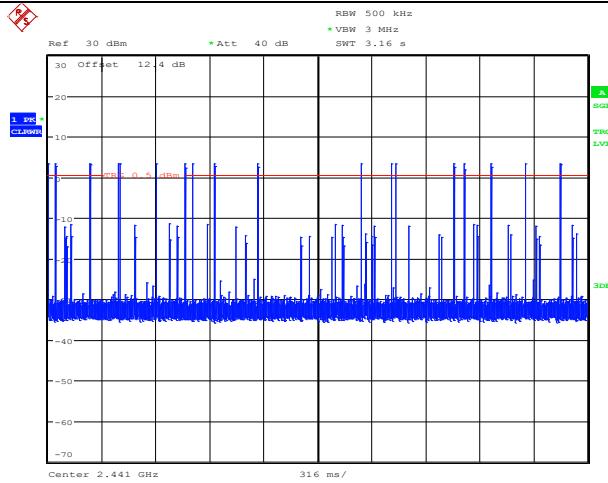
| Data Packet | Time of Single Slot [ms] | Numbers of Slots in a period | Time of Occupied in a period [s] | AFH Mode Time of occupied in a period [s] | Limit [s] | Results |
|-------------|--------------------------|------------------------------|----------------------------------|---|-----------|---------|
| DH1 | 0.39 | 320 | 0.126 | 0.063 | <= 0.40 | Pass |
| DH3 | 1.65 | 180 | 0.297 | 0.1485 | <= 0.40 | Pass |
| DH5 | 2.90 | 130 | 0.377 | 0.1885 | <= 0.40 | Pass |

8DPSK

Table 16 Time of Occupancy

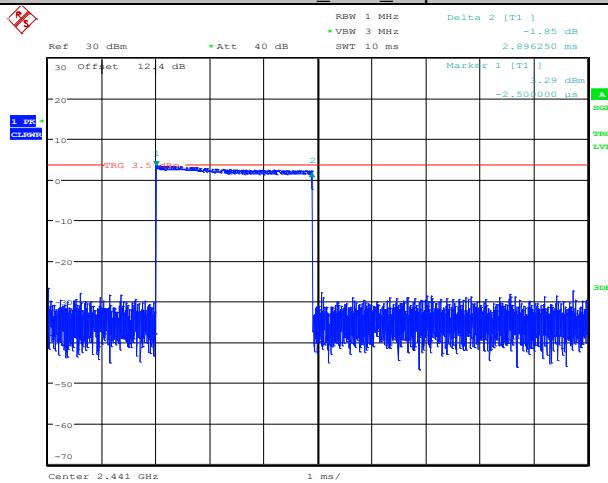
| Data Packet | Time of Single Slot [ms] | Numbers of Slots in a period | Time of Occupied in a period [s] | AFH Mode Time of occupied in a period [s] | Limit [s] | Result |
|-------------|--------------------------|------------------------------|----------------------------------|---|-------------|--------|
| 3DH1 | 0.40 | 320 | 0.129 | 0.0645 | ≤ 0.40 | Pass |
| 3DH3 | 1.65 | 180 | 0.297 | 0.1485 | ≤ 0.40 | Pass |
| 3DH5 | 2.90 | 110 | 0.319 | 0.1595 | ≤ 0.40 | Pass |





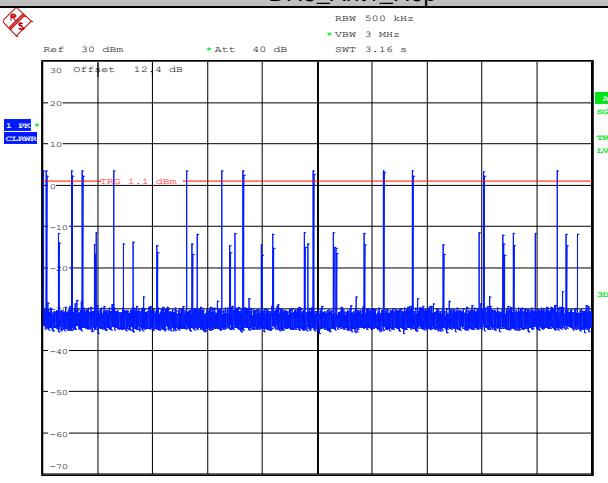
Date: 29.JUN.2021 09:57:58

DH3_Ant1_Hop



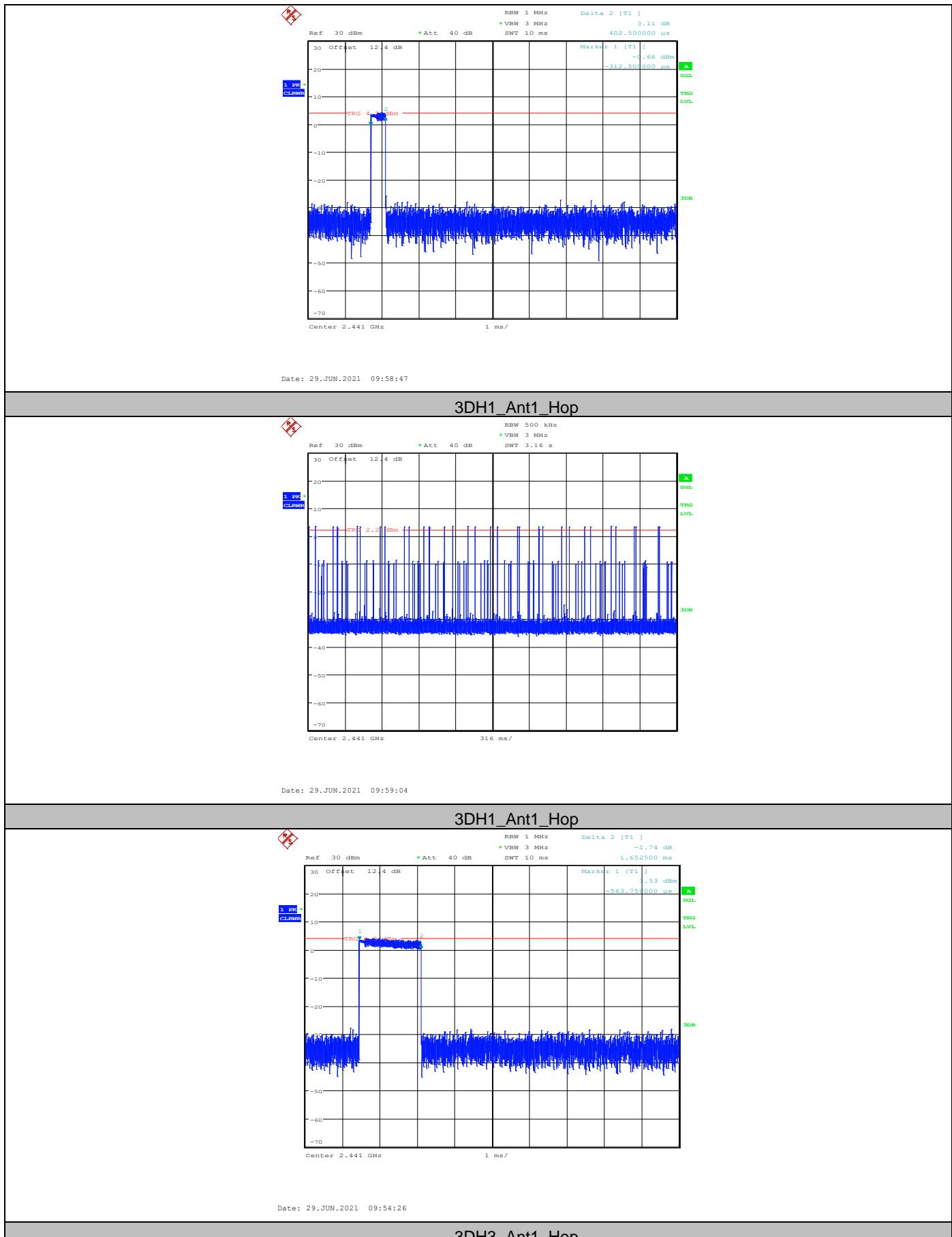
Date: 29.JUN.2021 09:55:26

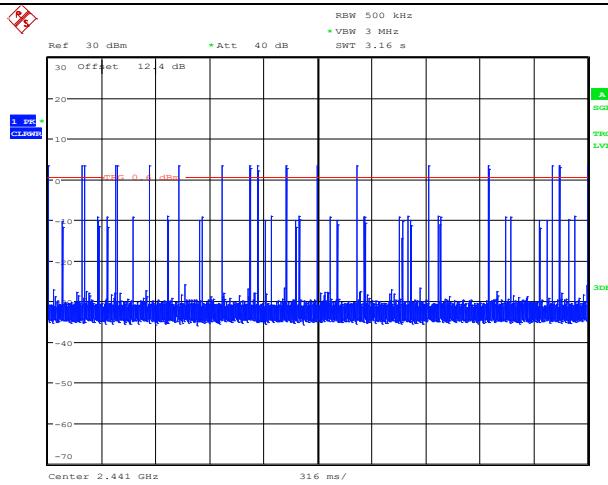
DH5_Ant1_Hop



Date: 29.JUN.2021 09:55:44

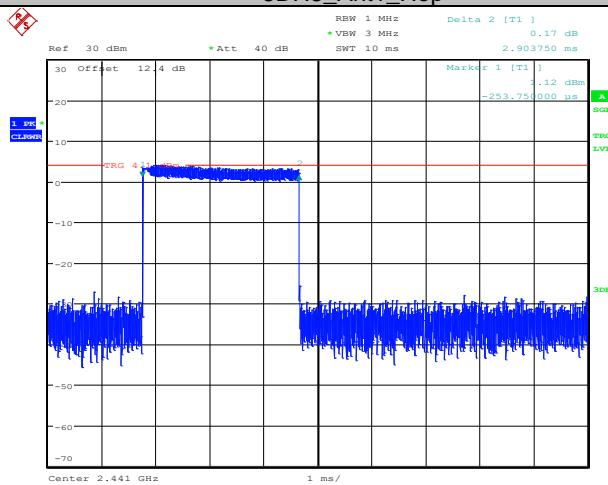
DH5_Ant1_Hop





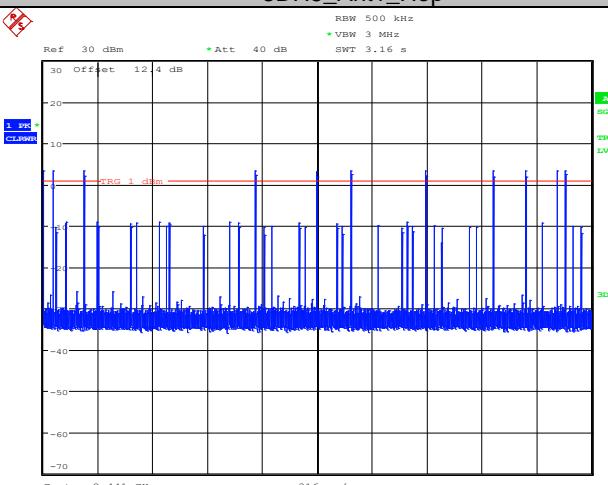
Date: 29.JUN.2021 09:54:52

3DH3_Ant1_Hop



Date: 29.JUN.2021 09:56:15

3DH5_Ant1_Hop



Date: 29.JUN.2021 09:56:38

3DH5_Ant1_Hop

11. MAXIMUM CONDUCTED OUTPUT POWER MEASUREMENT

11.1. Limits of Maximum Conducted Output Power Measurement

Compliance with part 15.247 (b) (1) & RSS-247 Clause 5.4(2), for frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt.

For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watt.

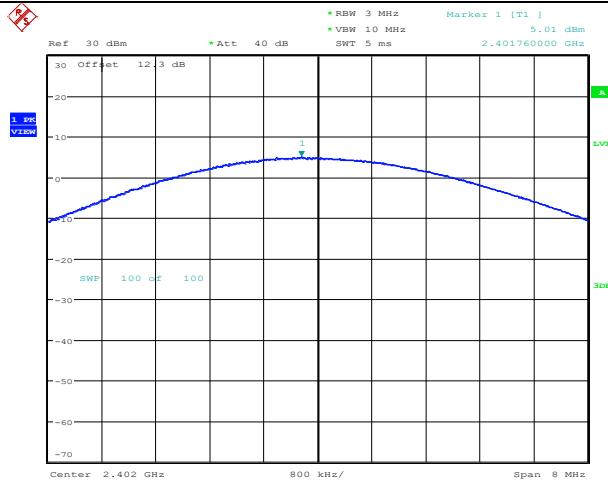
11.2. Test Procedure

- Connect test port of EUT to universal communication tester.
- Set the EUT to transmit maximum output power at 2.4GHz and switch off frequency hopping function.
- Then set the EUT to transmit at high, middle and low frequency and measure the conducted output power separately.

11.3. Test Data

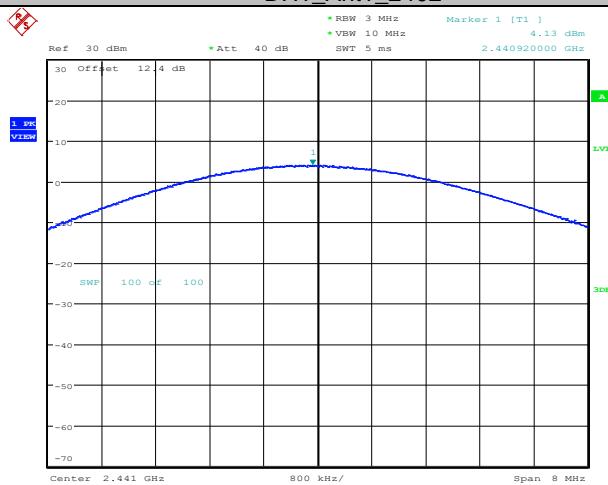
Table 17 Maximum Conducted Output Power Test Data

| Test Mode | Center Freq. [MHz] | Modulation | Meas. Level (Cond.) [dBm] | Limit [dBm] | Result |
|-----------|--------------------|------------|---------------------------|-------------|--------|
| DH1 | 2402 | GFSK | 5.01 | <=20.97 | Pass |
| | 2441 | | 4.13 | <=20.97 | Pass |
| | 2480 | | 2.86 | <=20.97 | Pass |
| 3DH1 | 2402 | 8DPSK | 5.82 | <=20.97 | Pass |
| | 2441 | | 5.07 | <=20.97 | Pass |
| | 2480 | | 3.65 | <=20.97 | Pass |



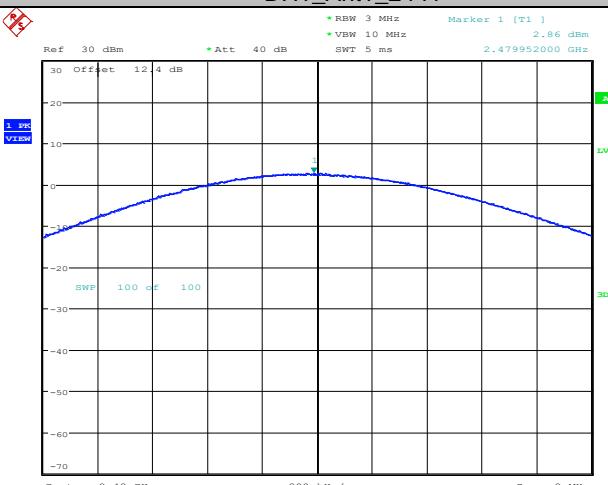
Date: 29.JUN.2021 10:01:48

DH1_Ant1_2402



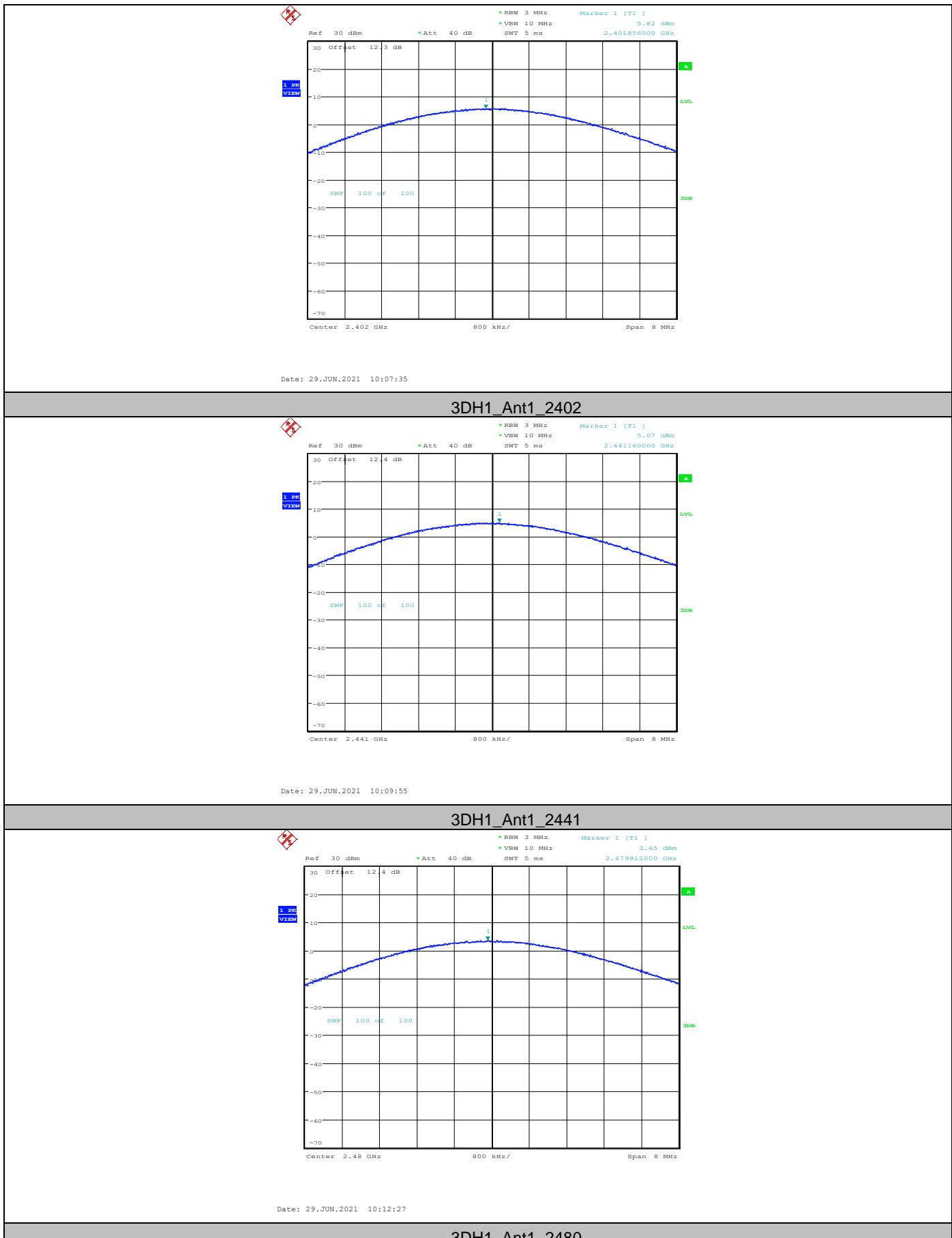
Date: 29.JUN.2021 10:03:39

DH1_Ant1_2441



Date: 29.JUN.2021 10:05:47

DH1_Ant1_2480



12. BAND EDGES MEASUREMENT

12.1. Limits of Band Edges Measurement

Below –20dB of the highest emission level of operating band (in 100kHz resolution bandwidth).

12.2. Test Procedure

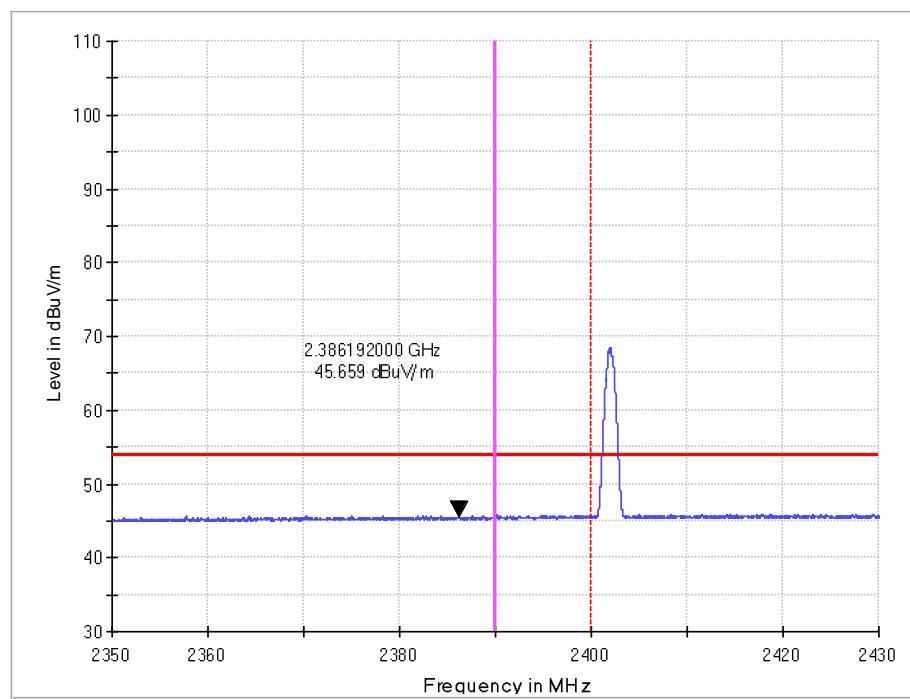
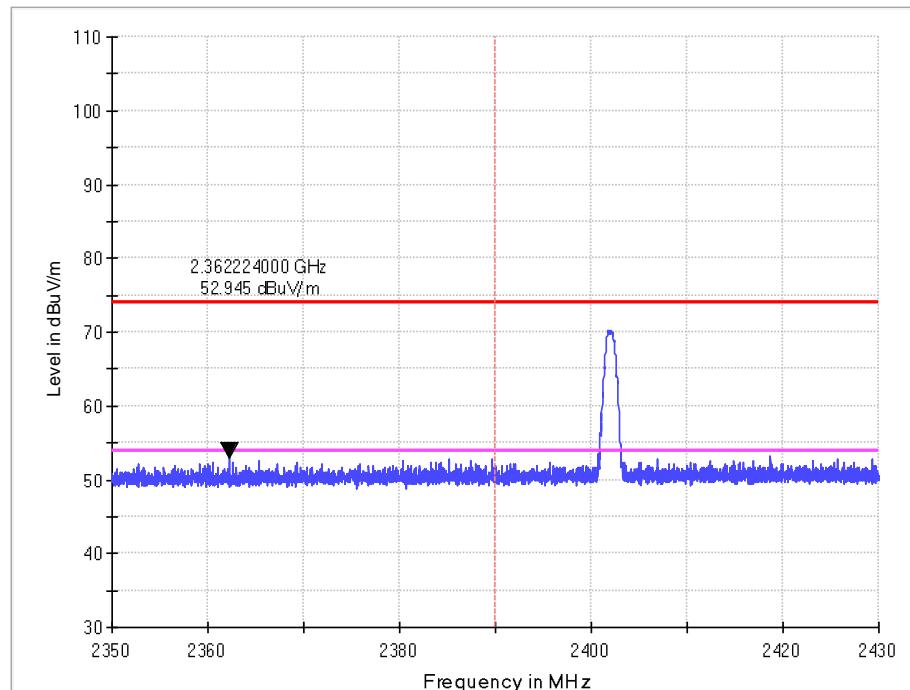
1. The EUT is placed on a turntable, which is 1.5m above the ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
 - (a) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO
 - (b) PEAK: RBW=VBW=1MHz / Sweep=AUTO
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.

12.3. Test Data

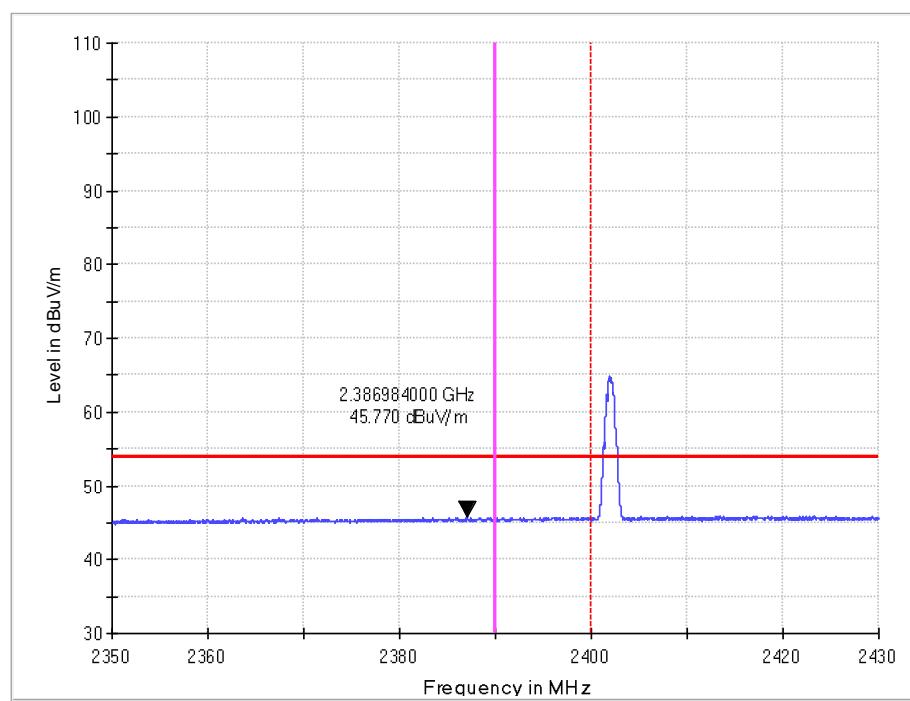
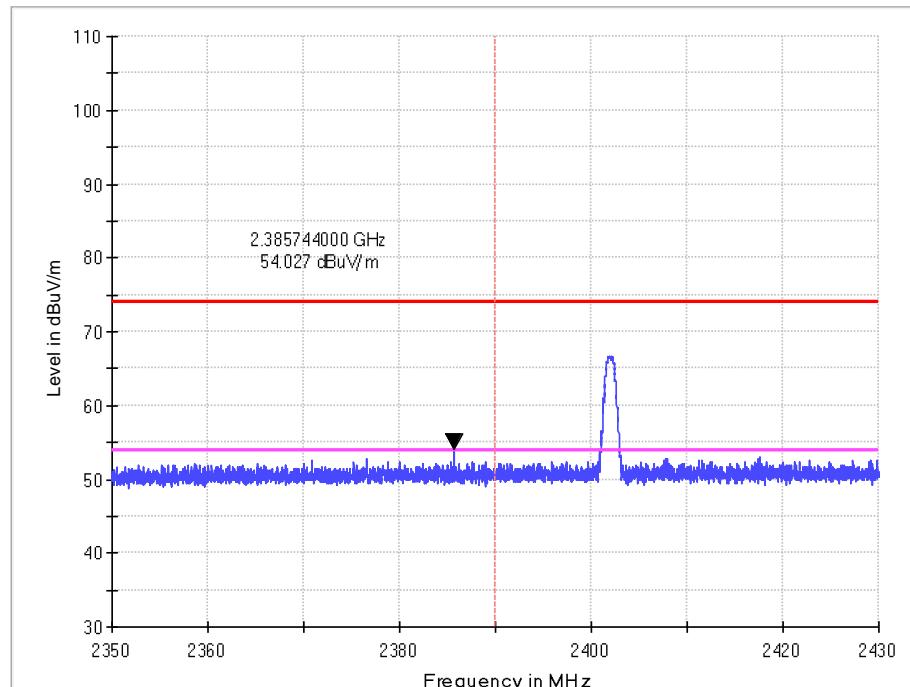
The measured plots are attached on the following. Test data shows compliance with the band edge requirement in part 15.247(d).

GFSK
Low edge

Horizontal

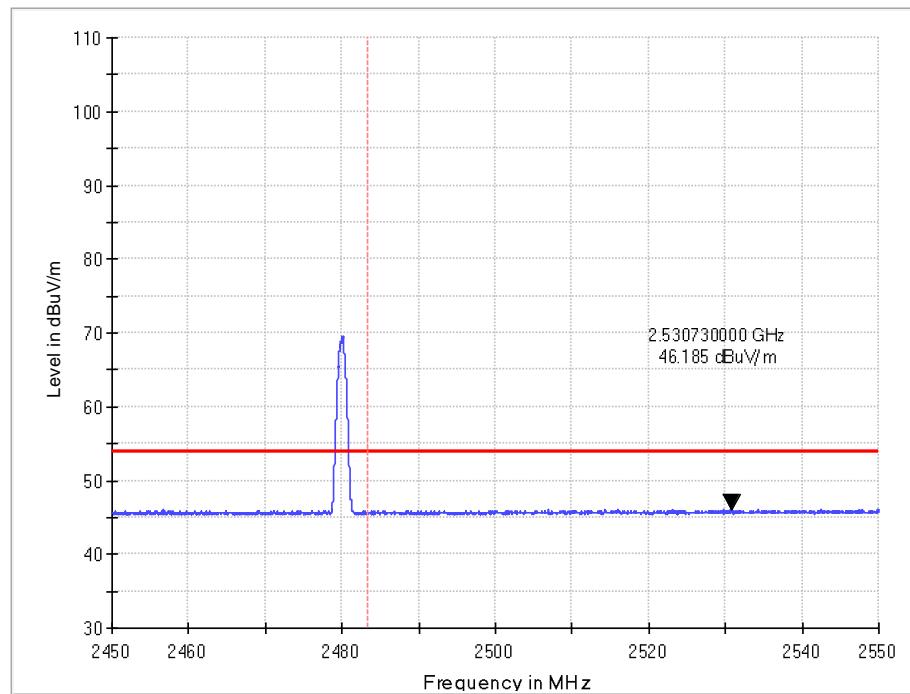
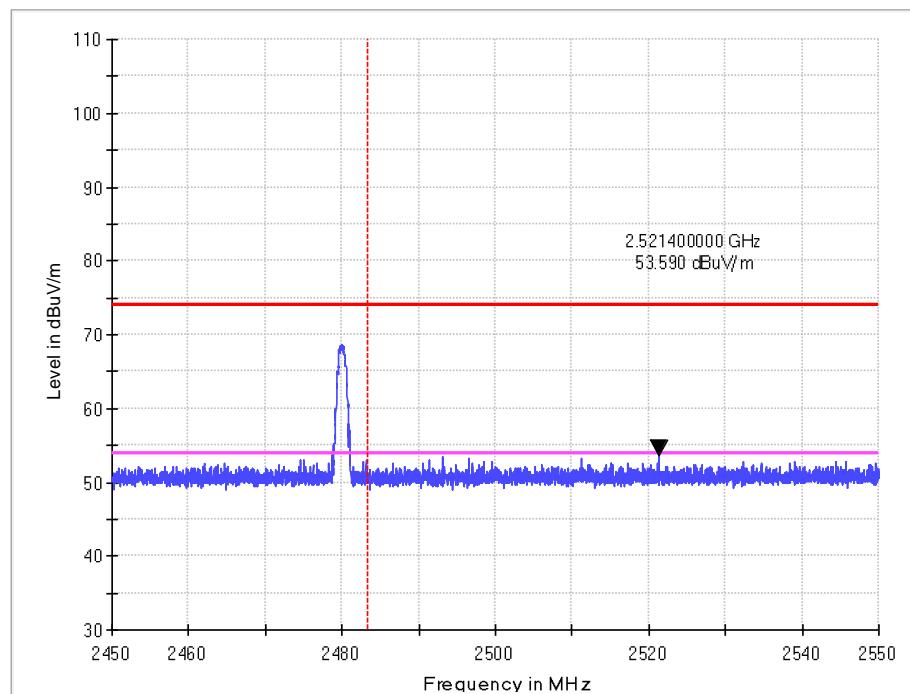


Vertical

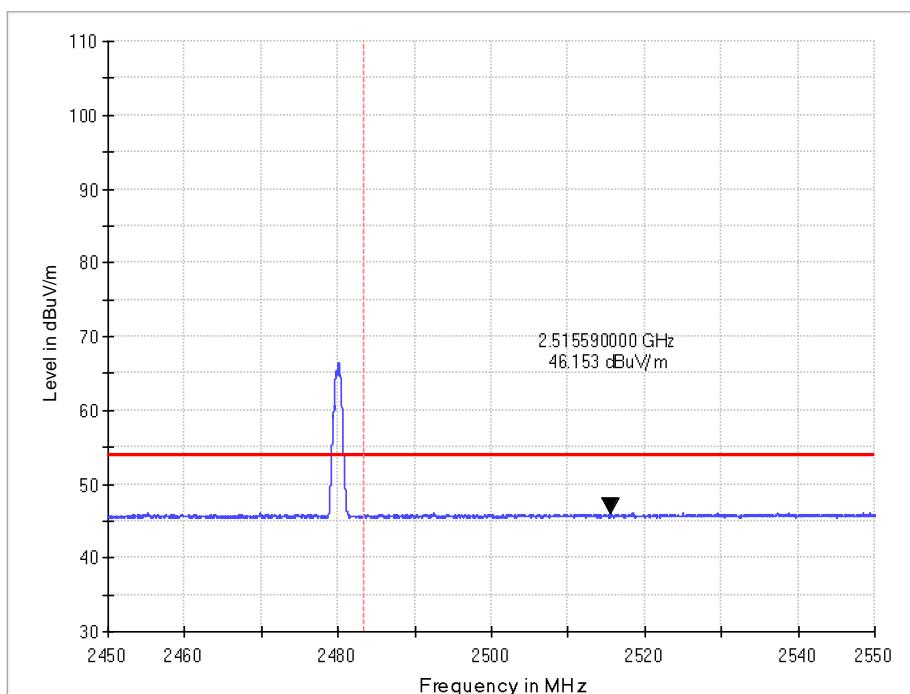
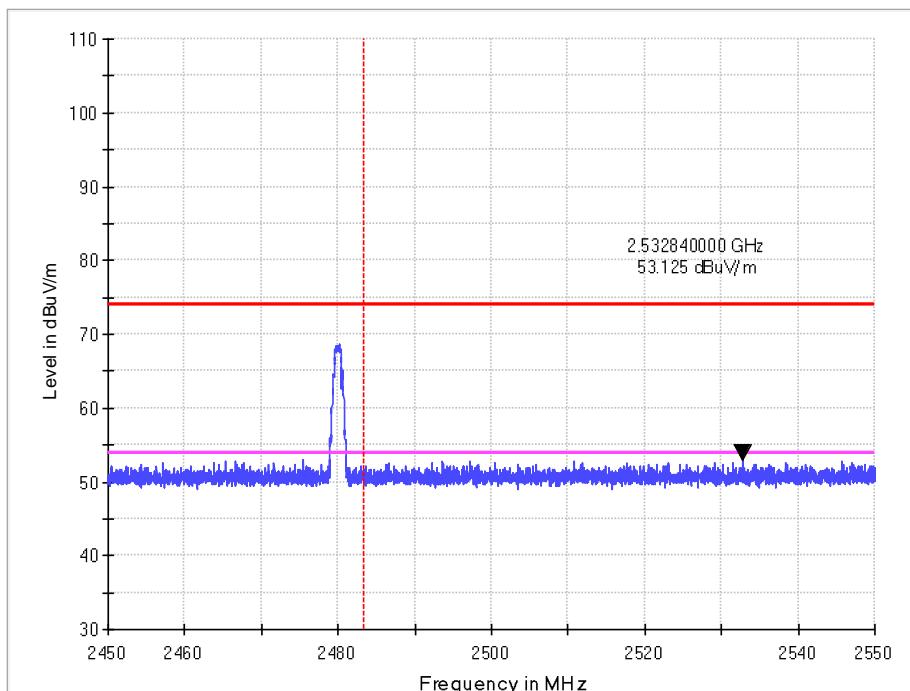


GFSK
Upper Edge

Horizontal

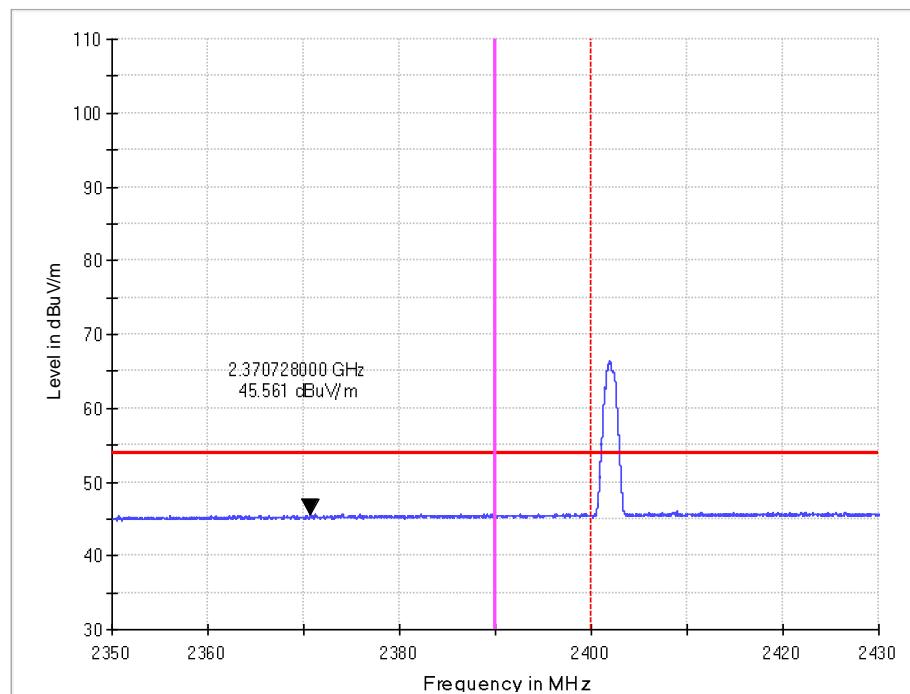
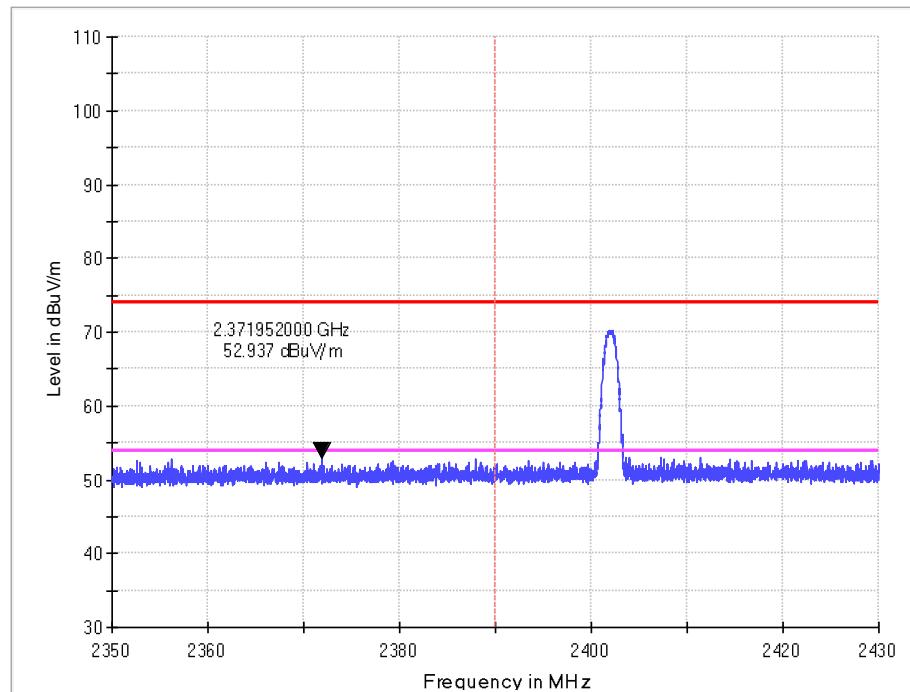


Vertical

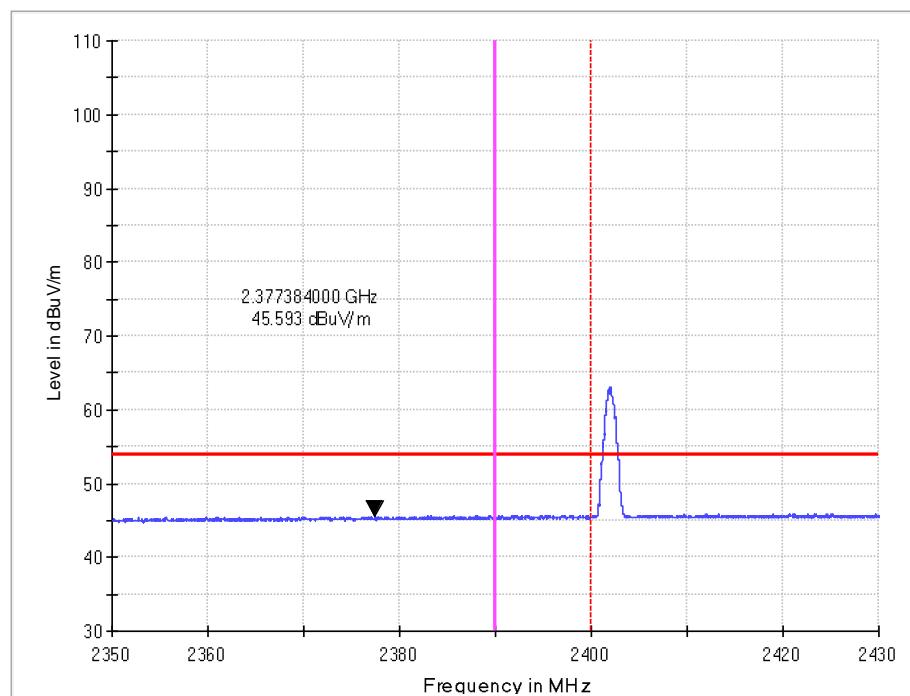
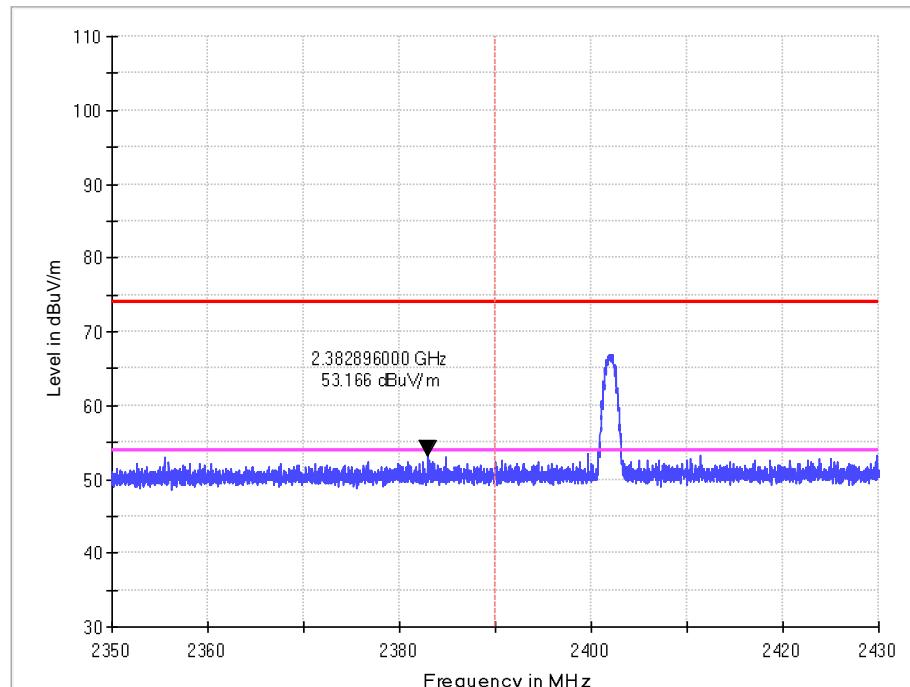


8DPSK
Low edge

Horizontal

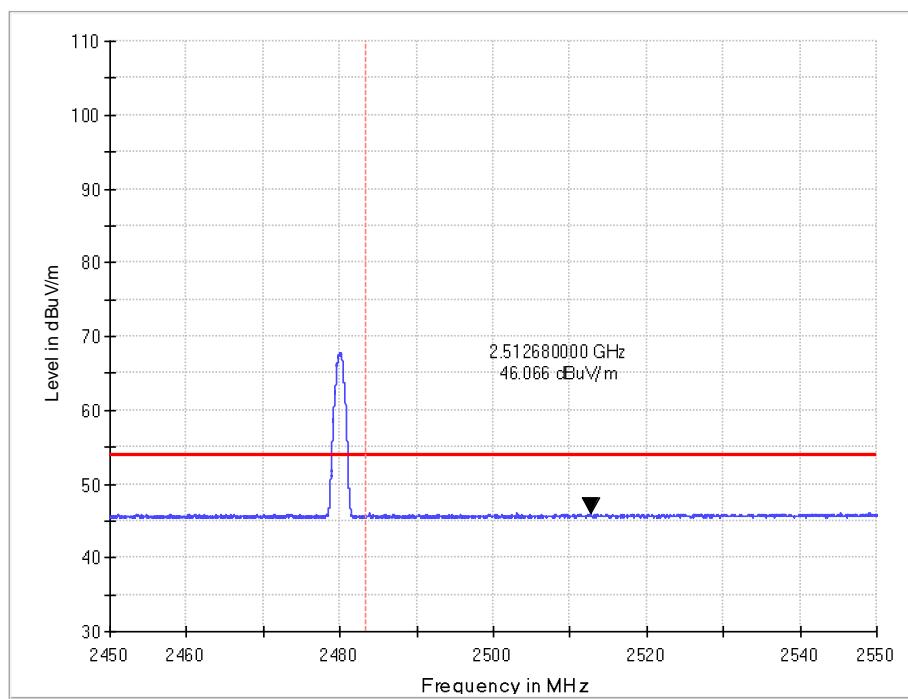
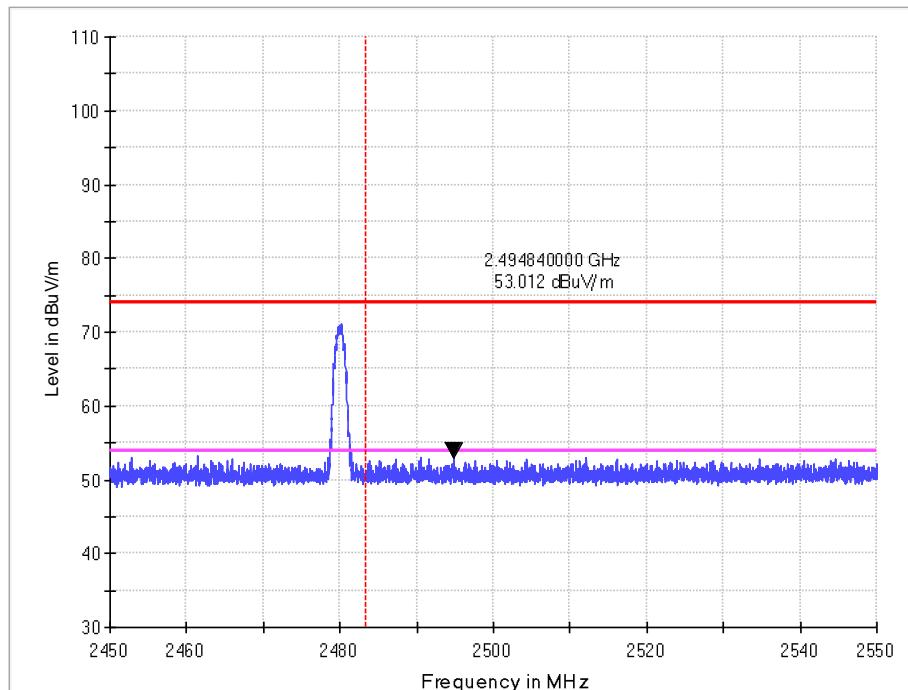


Vertical

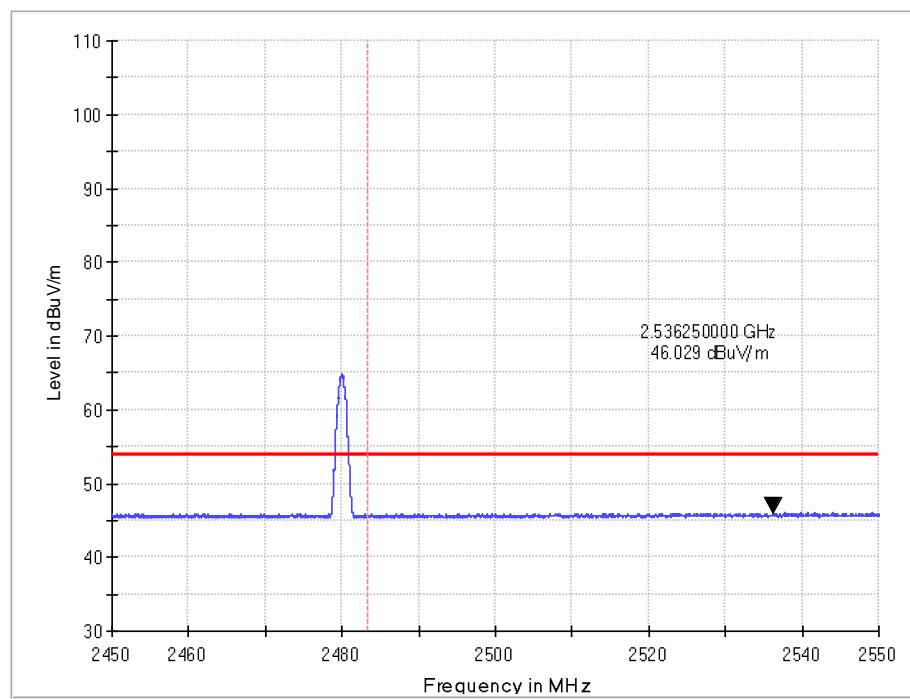
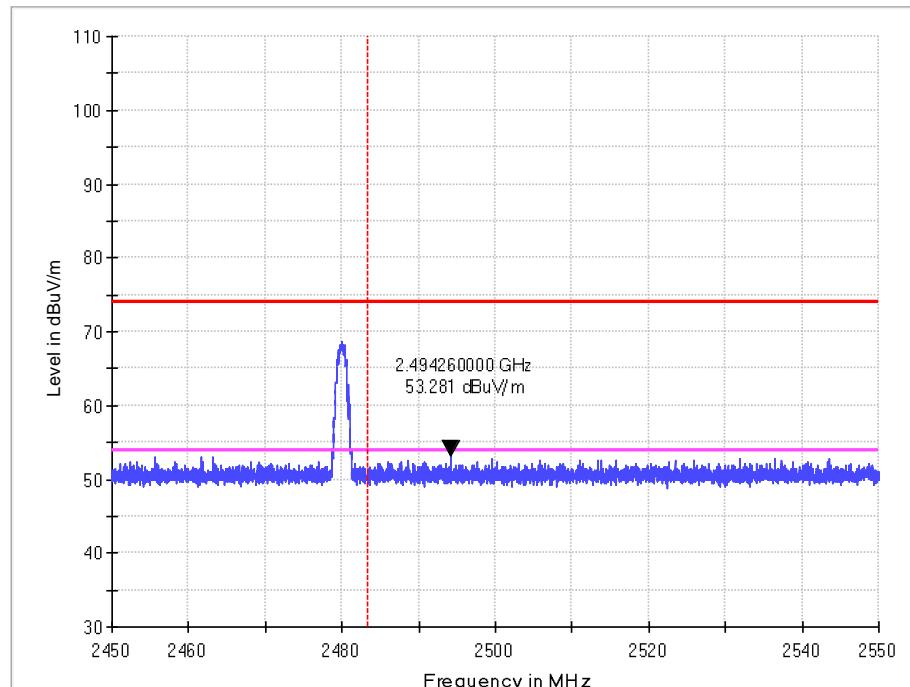


8DPSK
Upper edge

Horizontal



Vertical



13. CONDUCTED SPURIOUS EMISSION

13.1. Limits of Band Edges Measurement

Below –20dB of the highest emission level of operating band (in 100 kHz resolution bandwidth).

13.2. Test Procedure

The transmitter output was connected to the spectrum analyzer.

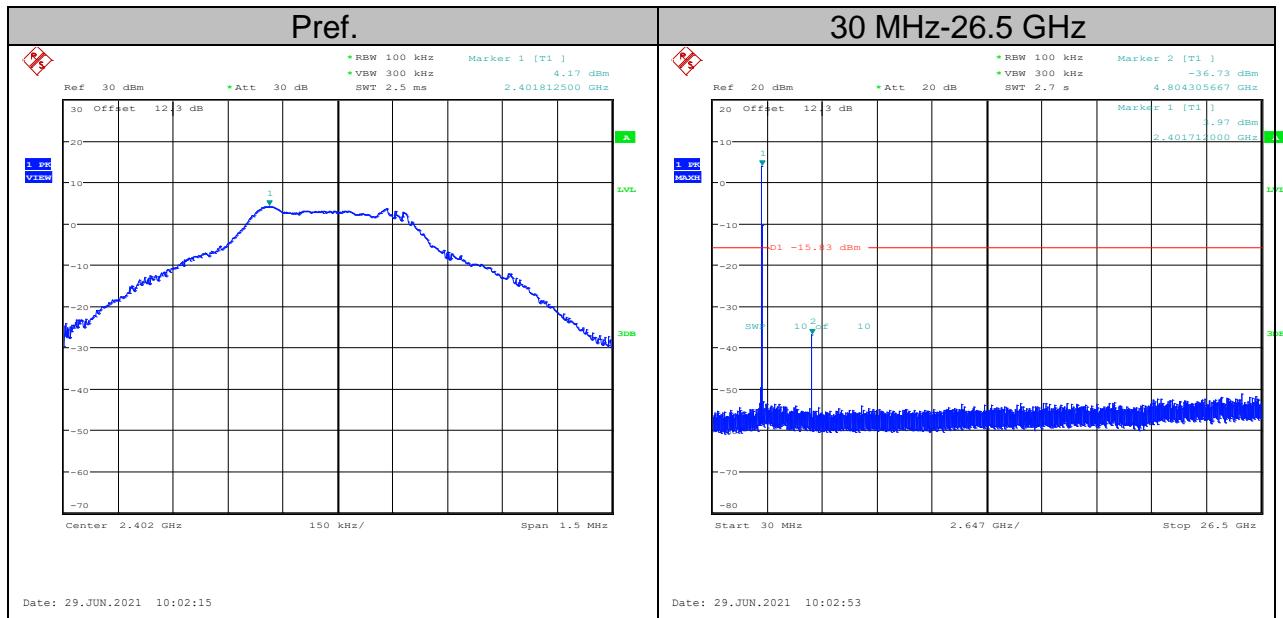
The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

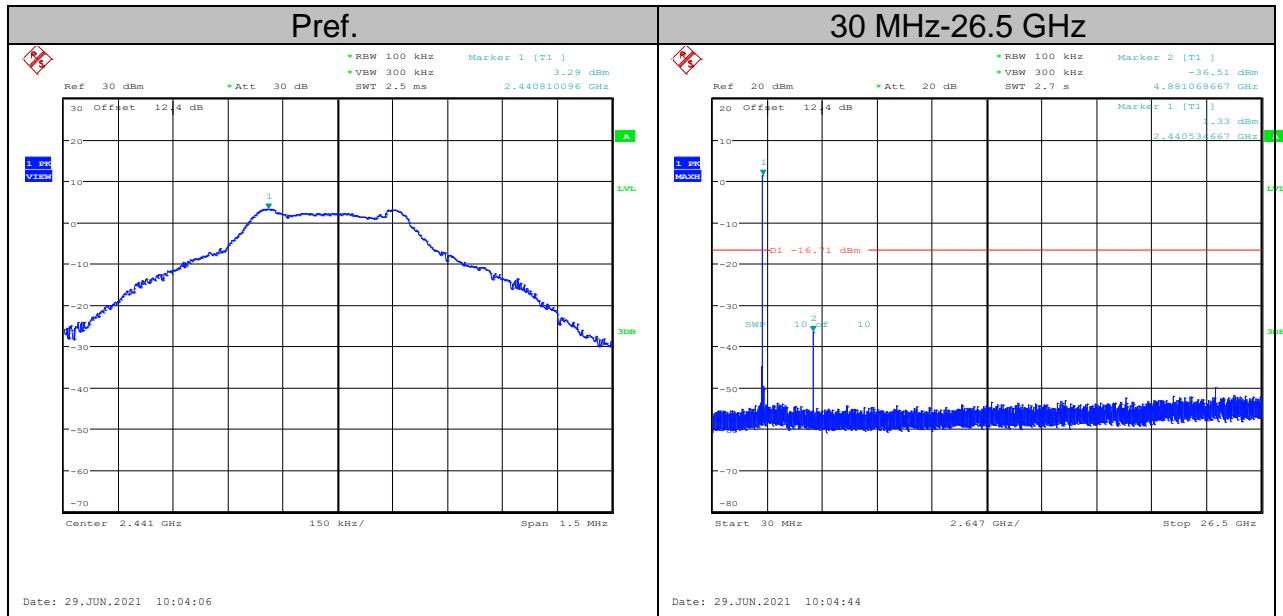
The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal

13.3. Test Data

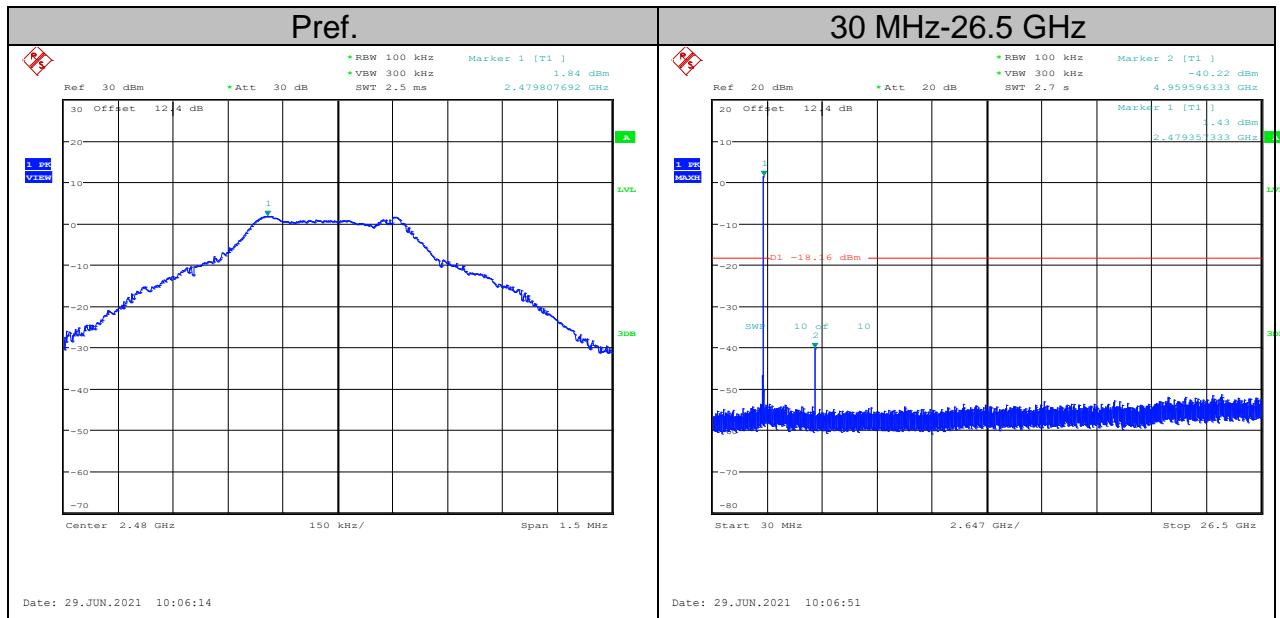
GFSK Low Channel



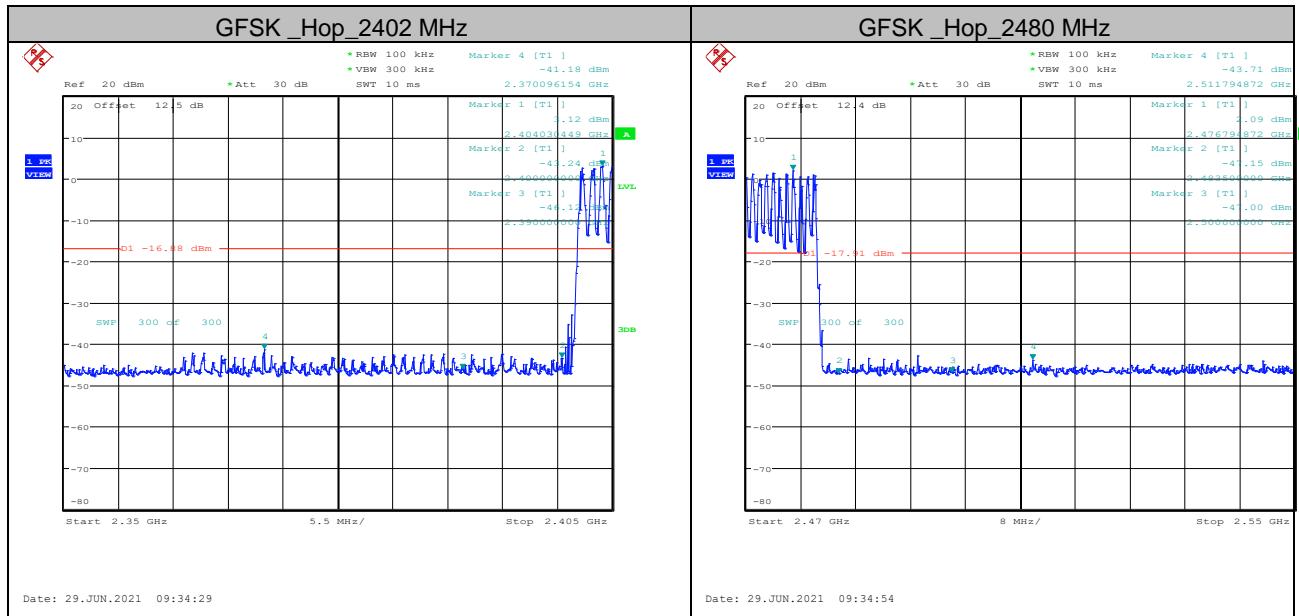
GFSK Mid Channel



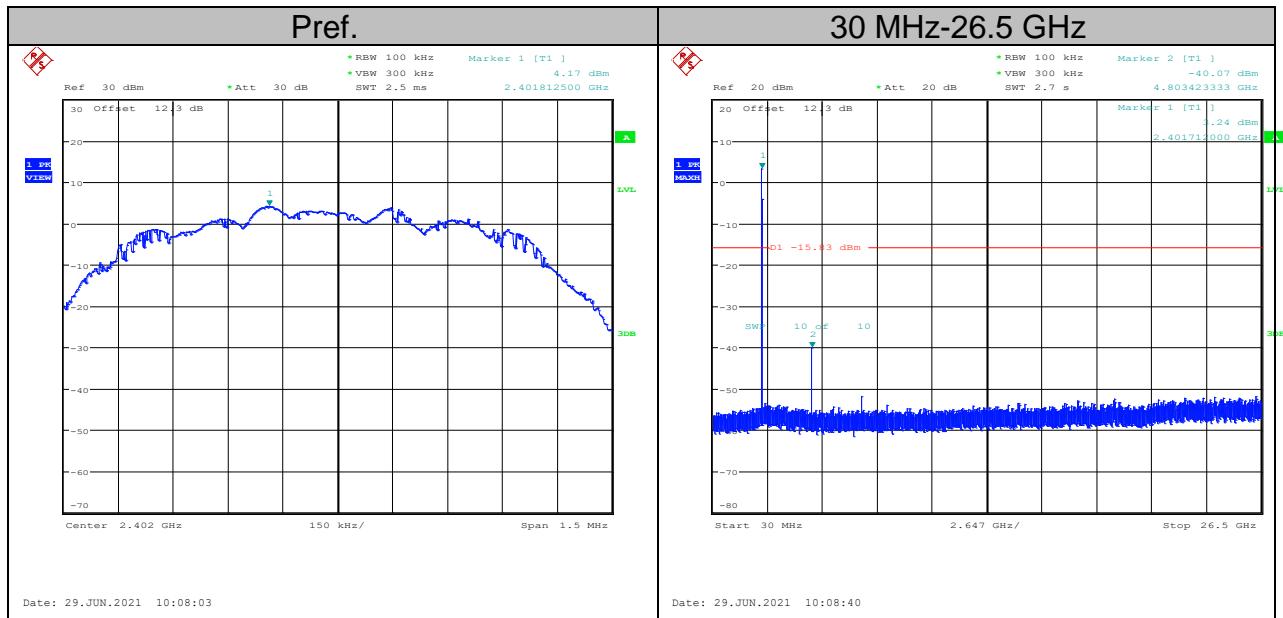
GFSK High Channel



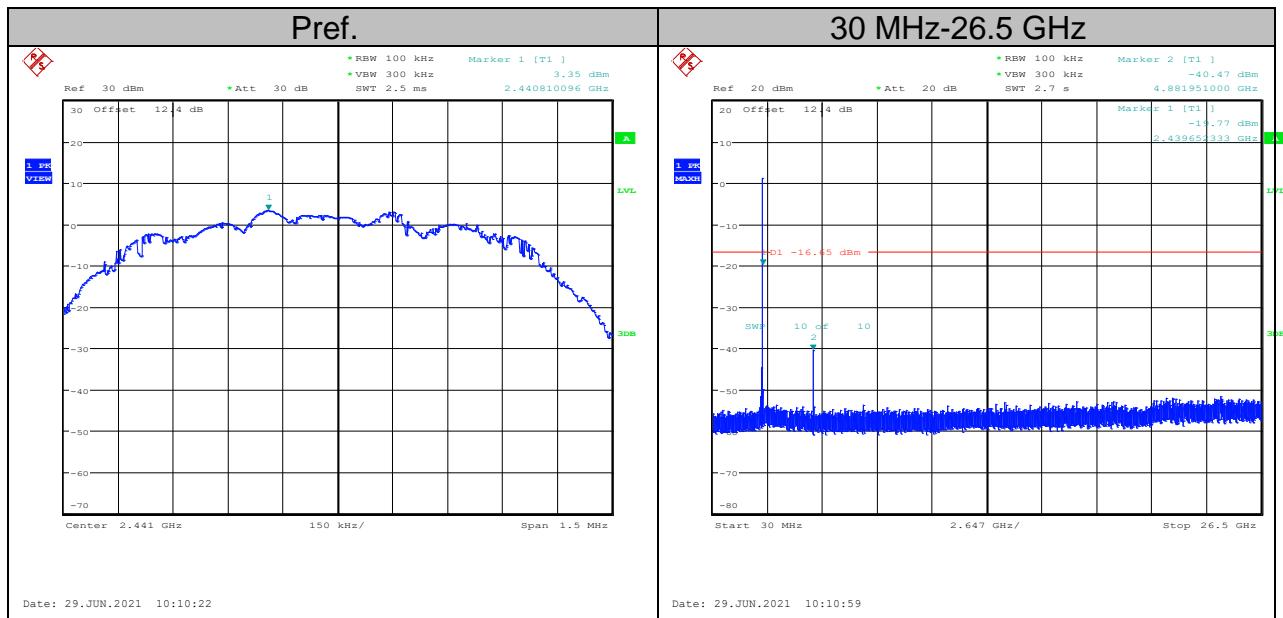
GFSK Band Edge Hopping on



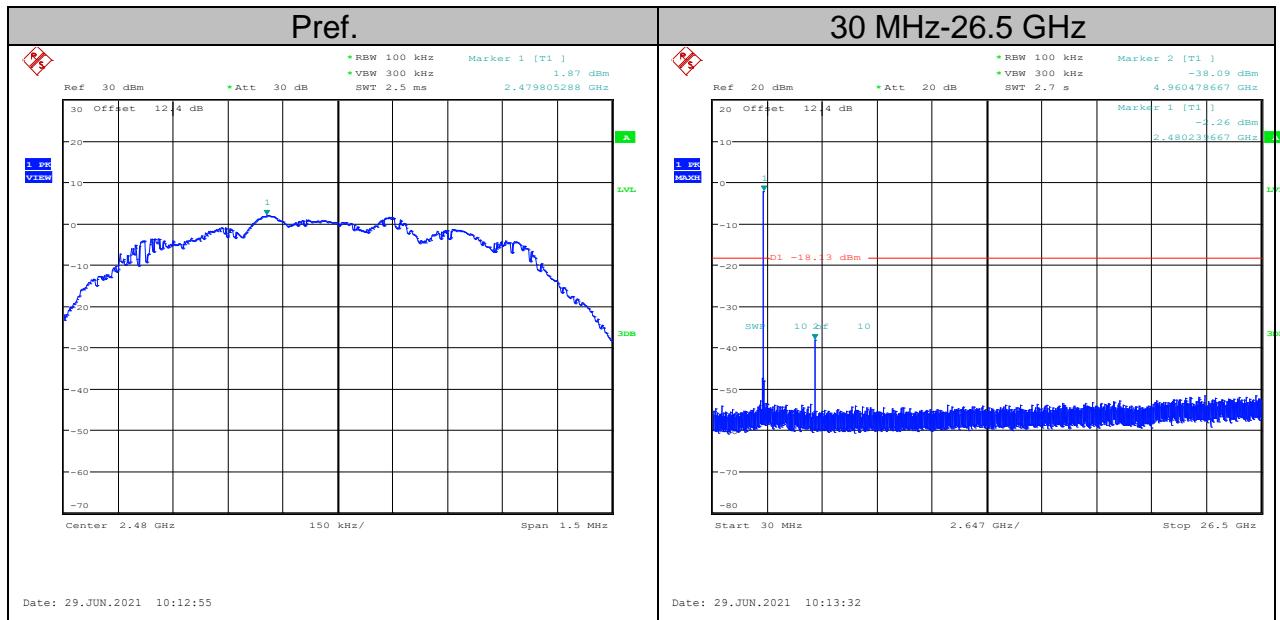
8DPSK Low Channel



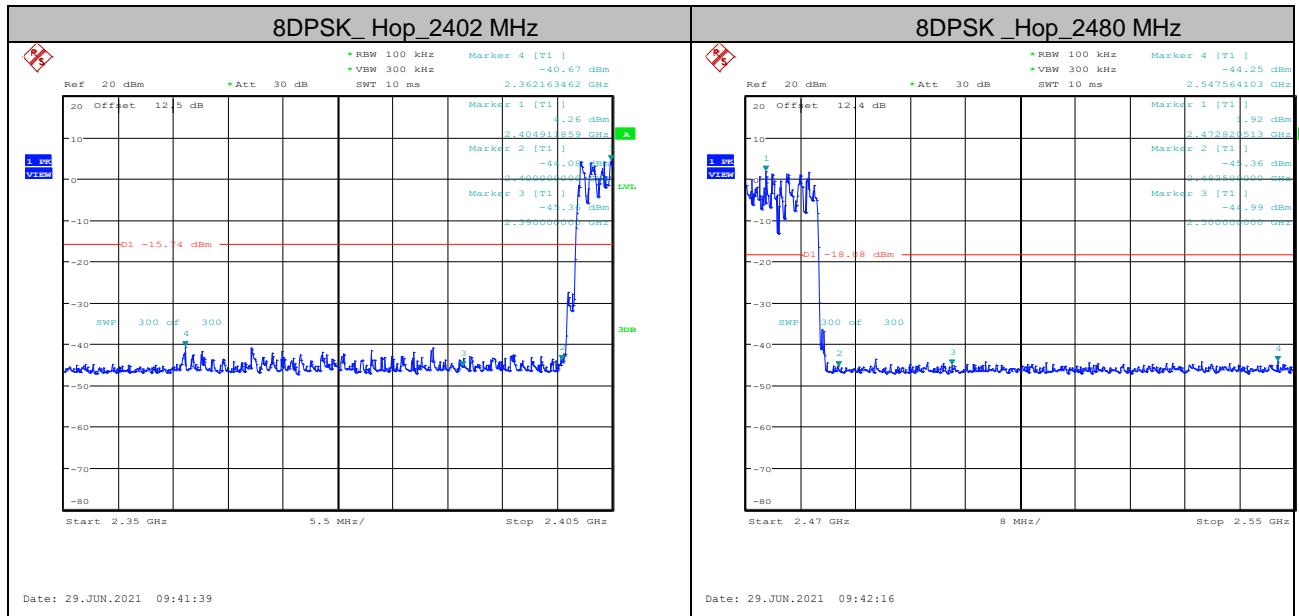
8DPSK Mid Channel



8DPSK High Channel



8DPSK Band Edge Hopping on



14. ANTENNA REQUIREMENTS

14.1.Applicable Requirements

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. For the fixed point-to-point operation, the power shall be reduced by one dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the FCC rule.

14.2.Antenna Connector

Antenna Connector is on the PCB within enclosure and not accessible to user.

14.3.Antenna Gain

The antenna gain of EUT is less than 6 dBi.

-----End of Report-----