

# FCC CERTIFICATION TEST REPORT

## FOR

|                             |   |                                                                                                                                   |
|-----------------------------|---|-----------------------------------------------------------------------------------------------------------------------------------|
| <b>Applicant</b>            | : | MOTREX CO., LTD.                                                                                                                  |
| <b>Address</b>              | : | Seoyoung Bldg. 25, Hwangsaеul-ro 258beon-gil,<br>Bundang-gu, Seongnam-si, Gyeonggi-do, South<br>Korea                             |
| <b>Equipment under Test</b> | : | Equipo de Audio y Video para Vehiculo                                                                                             |
| <b>Model No.</b>            | : | MTXMO430LAI3PE, MTXMO400LBDmFL,<br>MTXMO400LSCPE, MTXMO400LSP2i,<br>MTXMO400LSU2i, MTXMO400LSK3,<br>MTXMO400LMQ4a, MTXMO420LBR2PE |
| <b>Trade Mark</b>           | : | HYUNDAI/KIA                                                                                                                       |
| <b>FCC ID</b>               | : | BP9-MO430LAI3PE                                                                                                                   |
| <b>Manufacturer</b>         | : | Skypine Electronics(Shenzhen) Co.,Ltd                                                                                             |
| <b>Address</b>              | : | 3rd Floor of Building B, Jingang Technology Park,<br>Qiaotou Village, Fuhai Sub-District, Baoan,<br>Shenzhen, China               |

**Issued By: Dongguan Dongdian Testing Service Co., Ltd.**

**Add.:** No. 17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park,  
Dongguan City, Guangdong Province, China, 523808

**Tel.:** +86-0769-38826678, **E-mail:** ddt@dgddt.com, <http://www.dgddt.com>

# REPORT

## TABLE OF CONTENTS

|      |                                                   |    |
|------|---------------------------------------------------|----|
|      | Test report declares.....                         | 4  |
| 1.   | Summary of test results .....                     | 6  |
| 2.   | General test information .....                    | 7  |
| 2.1. | Description of EUT .....                          | 7  |
| 2.2. | Accessories of EUT .....                          | 7  |
| 2.3. | Assistant equipment used for test.....            | 7  |
| 2.4. | Block diagram of EUT configuration for test ..... | 8  |
| 2.5. | Deviations of test standard.....                  | 8  |
| 2.6. | Test environment conditions .....                 | 8  |
| 2.7. | Test laboratory .....                             | 9  |
| 2.8. | Measurement uncertainty.....                      | 9  |
| 3.   | Equipment used during test .....                  | 10 |
| 4.   | 6dB Bandwidth and 99% Bandwidth.....              | 11 |
| 4.1. | Block diagram of test setup.....                  | 11 |
| 4.2. | Limits .....                                      | 11 |
| 4.3. | Test Procedure .....                              | 11 |
| 4.4. | Test Result .....                                 | 12 |
| 4.5. | Original test data .....                          | 13 |
| 5.   | Duty Cycle .....                                  | 22 |
| 5.1. | Block diagram of test setup.....                  | 22 |
| 5.2. | Limit .....                                       | 22 |
| 5.3. | Test procedure .....                              | 22 |
| 5.4. | Test result.....                                  | 23 |
| 5.5. | Test Graphs.....                                  | 24 |
| 6.   | Conducted Output Power.....                       | 29 |
| 6.1. | Block diagram of test setup.....                  | 29 |
| 6.2. | Limits .....                                      | 29 |
| 6.3. | Test Procedure .....                              | 29 |
| 6.4. | Test Result .....                                 | 29 |
| 7.   | Power Spectral Density .....                      | 30 |
| 7.1. | Block diagram of test setup.....                  | 30 |
| 7.2. | Limits .....                                      | 30 |
| 7.3. | Test Procedure .....                              | 30 |
| 7.4. | Test Result .....                                 | 30 |
| 7.5. | Original test data .....                          | 31 |
| 8.   | Band Edge Compliance (Conducted Method) .....     | 36 |
| 8.1. | Block diagram of test setup.....                  | 36 |

|       |                                                       |    |
|-------|-------------------------------------------------------|----|
| 8.2.  | Limits .....                                          | 36 |
| 8.3.  | Test procedure .....                                  | 36 |
| 8.4.  | Test Result .....                                     | 36 |
| 8.5.  | Original test data .....                              | 37 |
| 9.    | Conducted Spurious Emissions (Conducted Method) ..... | 40 |
| 9.1.  | Block diagram of test setup .....                     | 40 |
| 9.2.  | Limits .....                                          | 40 |
| 9.3.  | Test procedure .....                                  | 40 |
| 9.4.  | Test Result .....                                     | 41 |
| 9.5.  | Original test data .....                              | 41 |
| 10.   | Radiated Spurious Emissions .....                     | 54 |
| 10.1. | Block diagram of test setup .....                     | 54 |
| 10.2. | Limit .....                                           | 55 |
| 10.3. | Test Procedure .....                                  | 56 |
| 10.4. | Test result .....                                     | 58 |
| 11.   | Radiated Band Edge Compliance .....                   | 73 |
| 11.1. | Block diagram of test setup .....                     | 73 |
| 11.2. | Limit .....                                           | 73 |
| 11.3. | Test Procedure .....                                  | 73 |
| 11.4. | Test result .....                                     | 73 |
| 12.   | Power Line Conducted Emission .....                   | 90 |
| 12.1. | Block diagram of test setup .....                     | 90 |
| 12.2. | Power Line Conducted Emission Limits (Class B) .....  | 90 |
| 12.3. | Test Procedure .....                                  | 90 |
| 12.4. | Test Result .....                                     | 91 |
| 13.   | Antenna Requirements .....                            | 92 |
| 13.1. | Limit .....                                           | 92 |
| 13.2. | Result .....                                          | 92 |
| 14.   | Test setup photograph .....                           | 93 |
| 15.   | Photos of the EUT .....                               | 95 |

## TEST REPORT DECLARE

|                             |   |                                                                                                                          |
|-----------------------------|---|--------------------------------------------------------------------------------------------------------------------------|
| <b>Applicant</b>            | : | MOTREX CO., LTD.                                                                                                         |
| <b>Address</b>              | : | Seoyoung Bldg. 25, Hwangsaoul-ro 258beon-gil, Bundang-gu, Seongnam-si, Gyeonggi-do, South Korea                          |
| <b>Equipment under Test</b> | : | Equipo de Audio y Video para Vehiculo                                                                                    |
| <b>Model No</b>             | : | MTXMO430LAI3PE, MTXMO400LBDmFL, MTXMO400LSCPE, MTXMO400LSP2i, MTXMO400LSU2i, MTXMO400LSK3, MTXMO400LMQ4a, MTXMO420LBR2PE |
| <b>Trade Mark</b>           | : | HYUNDAI/KIA                                                                                                              |
| <b>Manufacturer</b>         | : | Skypine Electronics(Shenzhen) Co.,Ltd                                                                                    |
| <b>Address</b>              | : | 3rd Floor of Building B, Jingang Technology Park, Qiaotou Village, Fuhai Sub-District, Baoan, Shenzhen, China            |

**Test Standard Used:**

FCC Rules and Regulations Part 15 Subpart C

**Test procedure used:**

ANSI C63.10:2013, 558074 D01 15.247 Meas Guidance v05r02

**We Declare:**

The equipment described above is tested by Dongguan Dongdian Testing Service Co., Ltd. and in the configuration tested the equipment complied with the standards specified above. The test results are contained in this test report and Dongguan Dongdian Testing Service Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

**After test and evaluation, our opinion is that the equipment provided for test compliance with the requirement of the above FCC standards.**

|                         |                    |                      |                               |
|-------------------------|--------------------|----------------------|-------------------------------|
| <b>Report No:</b>       | DDT-R22092815-4E02 |                      |                               |
| <b>Date of Receipt:</b> | Oct. 18, 2022      | <b>Date of Test:</b> | Oct. 18, 2022 ~ Nov. 29, 2022 |

**Prepared By:**

*Johnny Wang*

**Johnny Wang/Engineer**

**Approved By:**



**Damon Hu/EMC Manager**

Note: This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Dongguan Dongdian Testing Service Co., Ltd.

### Revision history

| Rev. | Revisions     | Issue Date    | Revised By |
|------|---------------|---------------|------------|
| ---  | Initial issue | Nov. 29, 2022 |            |
|      |               |               |            |

## 1. Summary of test results

| The EUT have been tested according to the applicable standards as referenced below. |                                                                 |         |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------|---------|
| Description of Test Item                                                            | Standard                                                        | Results |
| 6dB Bandwidth and 99% Bandwidth                                                     | FCC Part 15: 15.247<br>ANSI C63.10:2013                         | Pass    |
| Conducted Output Power                                                              | FCC Part 15: 15.247<br>ANSI C63.10:2013                         | Pass    |
| Power Spectral Density                                                              | FCC Part 15:15.247<br>ANSI C63.10:2013                          | Pass    |
| Band-edge and Spurious Emissions<br>(Conducted)                                     | FCC Part 15: 15.209<br>FCC Part 15: 15.247<br>ANSI C63.10: 2013 | Pass    |
| Radiated Spurious Emissions                                                         | FCC Part 15: 15.247<br>ANSI C63.10:2013                         | Pass    |
| Radiated Band Edge Compliance                                                       | FCC Part 15: 15.209<br>FCC Part 15: 15.247<br>ANSI C63.10: 2013 | Pass    |
| Power Line Conducted Emission                                                       | FCC Part 15: 15.207<br>ANSI C63.10: 2013                        | N/A     |
| Antenna requirement                                                                 | FCC Part 15: 15.203                                             | Pass    |
| Note: N/A is an abbreviation for Not Applicable                                     |                                                                 |         |

## 2. General test information

### 2.1. Description of EUT

|                          |                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EUT* Name                | : Equipo de Audio y Video para Vehiculo                                                                                                                                                                                                                                                                                                                                     |
| Model Number             | : MTXMO430LAI3PE, MTXMO400LBDmFL, MTXMO400LSCPE, MTXMO400LSP2i, MTXMO400LSU2i, MTXMO400LSK3, MTXMO400LMQ4a, MTXMO420LBR2PE                                                                                                                                                                                                                                                  |
| Difference of models     | : Their head unit electrical circuit design, layout, components used and internal wiring are identical, the shape and the material are also identical. Only the frontpanel and the packaging material size are different, but the frontpanel circuit design and principle are the same. Therefore the test performed on the model MTXMO430LAI3PE and record in this report. |
| EUT function description | : Please reference user manual of this device                                                                                                                                                                                                                                                                                                                               |
| Power supply             | : DC 12V                                                                                                                                                                                                                                                                                                                                                                    |
| Radio Technology         | : IEEE 802.11b/g/n                                                                                                                                                                                                                                                                                                                                                          |
| FCC Operation frequency  | : IEEE 802.11b: 2412MHz—2462MHz<br>IEEE 802.11g: 2412MHz—2462MHz<br>IEEE 802.11n HT20: 2412MHz—2462MHz<br>IEEE 802.11n HT40: 2422MHz—2452MHz                                                                                                                                                                                                                                |
| Modulation               | : IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK)<br>IEEE 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK)<br>IEEE 802.11n HT20, HT40: OFDM (64QAM, 16QAM, QPSK, BPSK)                                                                                                                                                                                                                       |
| Transmitter rate         | : IEEE 802.11b: 1, 2, 5.5, 11 Mbps<br>IEEE 802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps<br>IEEE 802.11n HT20: up to 72.2 Mbps<br>IEEE 802.11n HT40: up to 150 Mbps                                                                                                                                                                                                            |
| Antenna Gain             | : 4.52 dBi                                                                                                                                                                                                                                                                                                                                                                  |
| Sample Number            | : S22092815-02                                                                                                                                                                                                                                                                                                                                                              |

Note: EUT is the ab. of equipment under test.

| Channel information |                 |    |                 |    |                 |
|---------------------|-----------------|----|-----------------|----|-----------------|
| CH                  | Frequency (MHz) | CH | Frequency (MHz) | CH | Frequency (MHz) |
| 1                   | 2412            | 5  | 2432            | 9  | 2452            |
| 2                   | 2417            | 6  | 2437            | 10 | 2457            |
| 3                   | 2422            | 7  | 2442            | 11 | 2462            |
| 4                   | 2427            | 8  | 2447            | /  | /               |

### 2.2. Accessories of EUT

| Assistant equipment | Manufacturer | Model number | Other |
|---------------------|--------------|--------------|-------|
| N/A                 | N/A          | N/A          | N/A   |

### 2.3. Assistant equipment used for test

| Assistant equipment | Manufacturer | Model number | EMC Compliance | SN |
|---------------------|--------------|--------------|----------------|----|
|---------------------|--------------|--------------|----------------|----|

|     |     |     |     |     |
|-----|-----|-----|-----|-----|
| N/A | N/A | N/A | N/A | N/A |
|-----|-----|-----|-----|-----|

## 2.4. Block diagram of EUT configuration for test



Test software: Xshell.exe

The test software was used to control EUT work in Continuous Tx mode, and select test channel, wireless mode as below table:

The pathloss of external cable: 0.5dB (According to the manufacturer's claims)

Tested mode, channel, setting Tx power and rand data rate information

| Mode                    | Setting Tx Power | data rate (Mbps)<br>(see Note) | Channel   | Frequency<br>(MHz) |
|-------------------------|------------------|--------------------------------|-----------|--------------------|
|                         | ANT1             |                                |           |                    |
| Tx mode 802.11b         | 40               | 1                              | LCH: CH1  | 2412               |
|                         | 40               | 1                              | MCH: CH6  | 2437               |
|                         | 40               | 1                              | HCH: CH11 | 2462               |
| Tx mode 802.11g         | 40               | 6                              | LCH: CH1  | 2412               |
|                         | 40               | 6                              | MCH: CH6  | 2437               |
|                         | 40               | 6                              | HCH: CH11 | 2462               |
| Tx mode 802.11n<br>HT20 | 40               | MCS 0                          | LCH: CH1  | 2412               |
|                         | 40               | MCS 0                          | MCH: CH6  | 2437               |
|                         | 40               | MCS 0                          | HCH: CH11 | 2462               |
| Tx mode 802.11n<br>HT40 | 40               | MCS 0                          | LCH: CH3  | 2422               |
|                         | 40               | MCS 0                          | MCH: CH6  | 2437               |
|                         | 40               | MCS 0                          | HCH: CH9  | 2452               |

Note: According exploratory test, EUT will have maximum output power in those data rate, so those data rate were used for all test.

## 2.5. Deviations of test standard

No Deviation

## 2.6. Test environment conditions

During the measurement the environmental conditions were within the listed ranges:

|                    |                   |
|--------------------|-------------------|
| Temperature range: | +21 °C to +25 °C  |
| Humidity range:    | 40% to 75%        |
| Pressure range:    | 86 kPa to 106 kPa |

## 2.7. Test laboratory

Dongguan Dongdian Testing Service Co., Ltd.

Add.: No. 17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park, Dongguan City, Guangdong Province, China, 523808.

Tel.: +86-0769-38826678, <http://www.dgddt.com>, Email: [ddt@dgddt.com](mailto:ddt@dgddt.com).

CNAS Accreditation No. L6451; A2LA Accreditation Number: 3870.01

FCC Designation Number: CN1182, Test Firm Registration Number: 540522

Innovation, Science and Economic Development Canada Site Registration Number: 10288A

Conformity Assessment Body identifier: CN0048

VCCI facility registration number: C-20087, T-20088, R-20123, R-20155, G-20118

## 2.8. Measurement uncertainty

| Test Item                                                | Uncertainty                                            |
|----------------------------------------------------------|--------------------------------------------------------|
| Bandwidth                                                | 1.1%                                                   |
| Peak Output Power (Conducted) (Spectrum analyzer)        | 0.86 dB ( $10 \text{ MHz} \leq f < 3.6 \text{ GHz}$ ); |
|                                                          | 1.38 dB ( $3.6 \text{ GHz} \leq f < 8 \text{ GHz}$ )   |
| Peak Output Power (Conducted) (Power Sensor)             | 0.74 dB                                                |
| Power Spectral Density                                   | 0.74 dB ( $10 \text{ MHz} \leq f < 3.6 \text{ GHz}$ ); |
|                                                          | 1.38 dB ( $3.6 \text{ GHz} \leq f < 8 \text{ GHz}$ )   |
| Frequencies Stability                                    | $6.7 \times 10^{-8}$ (Antenna couple method)           |
|                                                          | $5.5 \times 10^{-8}$ (Conducted method)                |
| Conducted spurious emissions                             | 0.86 dB ( $10 \text{ MHz} \leq f < 3.6 \text{ GHz}$ ); |
|                                                          | 1.40 dB ( $3.6 \text{ GHz} \leq f < 8 \text{ GHz}$ )   |
|                                                          | 1.66 dB ( $8 \text{ GHz} \leq f < 26.5 \text{ GHz}$ )  |
| Uncertainty for radio frequency (RBW < 20 kHz)           | $3 \times 10^{-8}$                                     |
| Temperature                                              | 0.4 °C                                                 |
| Humidity                                                 | 2 %                                                    |
| Uncertainty for Radiation Emission test (9 kHz – 30 MHz) | 3.44 dB                                                |
| Uncertainty for Radiation Emission test (30 MHz - 1 GHz) | 4.70 dB (Antenna Polarize: V)                          |
|                                                          | 4.84 dB (Antenna Polarize: H)                          |
| Uncertainty for Radiation Emission test (1 GHz - 40 GHz) | 4.10 dB (1 - 6 GHz)                                    |
|                                                          | 4.40 dB (6 GHz - 18 GHz)                               |
|                                                          | 3.54 dB (18 GHz - 26 GHz)                              |
|                                                          | 4.30 dB (26 GHz - 40 GHz)                              |
| Uncertainty for Power line conduction emission test      | 3.34dB (150KHz-30MHz)                                  |
|                                                          | 3.72dB (9KHz-150KHz)                                   |

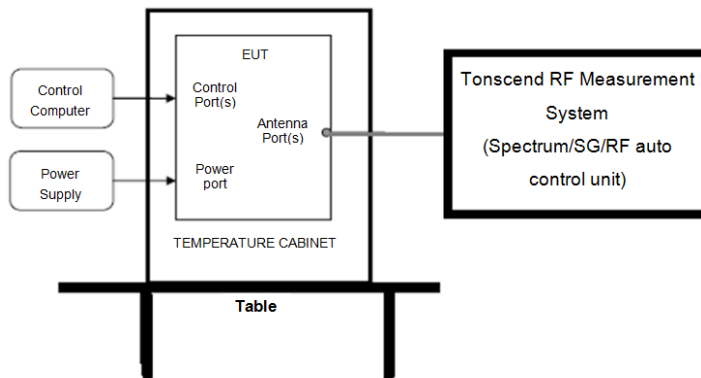
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

### 3. Equipment used during test

| Equipment                                                     | Manufacturer    | Model No.                                                                                  | Serial No.            | Last Cal.     | Cal. Interval |
|---------------------------------------------------------------|-----------------|--------------------------------------------------------------------------------------------|-----------------------|---------------|---------------|
| <b>☑RF Connected Test (Tonscend RF Measurement System 3#)</b> |                 |                                                                                            |                       |               |               |
| SPECTRUM ANALYZER                                             | R&S             | FSV40                                                                                      | 101407                | Jul. 21, 2022 | 1 Year        |
| Wideband Radio Communication tester                           | R&S             | CMW500                                                                                     | 117491                | May 18, 2022  | 1 Year        |
| Vector Signal Generator                                       | Agilent         | N5182A                                                                                     | MY19060405            | May 18, 2022  | 1 Year        |
| Vector Signal Generator                                       | Agilent         | N5182A                                                                                     | MY48180912            | May 18, 2022  | 1 Year        |
| RF Control Unit                                               | Tonsend         | JS0806-2                                                                                   | DDT-ZC01449           | May 18, 2022  | 1 Year        |
| Temp&Humi Programmable                                        | ZHIXIANG        | ZXGDJS-150L                                                                                | ZX170110-A            | May 26, 2022  | 1 Year        |
| Test Software                                                 | JS Tonscend     | JS1120-3                                                                                   | Ver.2.6.77.0518       | N/A           | N/A           |
| <b>☑Radiation 3#chamber</b>                                   |                 |                                                                                            |                       |               |               |
| EMI Test Receiver                                             | R&S             | ESU                                                                                        | 100472                | May 18, 2022  | 1 Year        |
| Spectrum analyzer                                             | Agilent         | E4447A                                                                                     | MY50180031            | May 18, 2022  | 1 Year        |
| Active Loop antenna                                           | Schwarzbeck     | FMZB-1519                                                                                  | 1519-038              | Sep. 29, 2022 | 1 Year        |
| Trilog Broadband Antenna                                      | Schwarzbeck     | VULB 9163                                                                                  | 01429                 | Jul. 22, 2022 | 1 Year        |
| Double Ridged Horn Antenna                                    | Schwarzbeck     | BBHA 9120 D                                                                                | 02468                 | Sep. 29, 2022 | 1 Year        |
| Broad Band Horn Antenna                                       | Schwarzbeck     | BBHA 9170                                                                                  | 790                   | May 06, 2022  | 1 Year        |
| Pre-amplifier                                                 | COM-POWER       | PAM-118A                                                                                   | 18040084              | Aug. 17, 2022 | 1 Year        |
| Pre-amplifier                                                 | COM-POWER       | PAM-840A                                                                                   | 461369                | Apr. 11, 2022 | 1 Year        |
| RE Cable                                                      | N/A             | W23.02<br>CP1-X2 +<br>W23.09<br>AP1-X8+<br>JCT26S-NJ-<br>NJ-1.5M+<br>JCT26S-NJ-<br>NJ-1.5M | 4.5M+8M+1.5M+<br>1.5M | Aug.17, 2022  | 1 Year        |
| RF Cable                                                      | Yuhu Technology | JCTB810-NJ-<br>NJ-9M                                                                       | 21123964              | May. 19,2022  | 1 Year        |
| Test software                                                 | Tonscend        | JS32-RE                                                                                    | V 5.0.0.1             | N/A           | N/A           |
| <b>☑Power Line Conducted Emissions Test 1#</b>                |                 |                                                                                            |                       |               |               |
| Test Receiver                                                 | R&S             | ESCI                                                                                       | 100551                | Aug. 26, 2022 | 1 Year        |
| LISN 1                                                        | R&S             | ENV216                                                                                     | 101109                | Aug. 26, 2022 | 1 Year        |
| LISN 2                                                        | R&S             | ESH2-Z5                                                                                    | 100309                | Aug. 26, 2022 | 1 Year        |
| Pulse Limiter                                                 | R&S             | ESH3-Z2                                                                                    | 101242                | Aug. 26, 2022 | 1 Year        |
| CE Cable 1                                                    | HUBSER          | N/A                                                                                        | W10.01                | Aug. 26, 2022 | 1 Year        |
| Test software                                                 | Tonscend        | JS32-RE                                                                                    | V 5.0.0.1             | N/A           | N/A           |

## 4. 6dB Bandwidth and 99% Bandwidth

### 4.1. Block diagram of test setup



### 4.2. Limits

For direct sequence systems, the minimum 6 dB bandwidth shall be at least 500 kHz

### 4.3. Test Procedure

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

(2) 99% Bandwidth set the spectrum analyzer as follows:

|                |                     |
|----------------|---------------------|
| RBW:           | 1% to 5% of the OBW |
| VBW:           | $\geq 3\text{RBW}$  |
| Detector Mode: | Peak                |
| Sweep time:    | auto                |
| Trace mode     | Max hold            |

(3) 6dB Bandwidth set the spectrum analyzer as follows:

|                |          |
|----------------|----------|
| RBW:           | 100 kHz  |
| VBW:           | 300 kHz  |
| Detector Mode: | Peak     |
| Sweep time:    | auto     |
| Trace mode     | Max hold |

(4) Allow the trace to stabilize, measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

**4.4. Test Result**

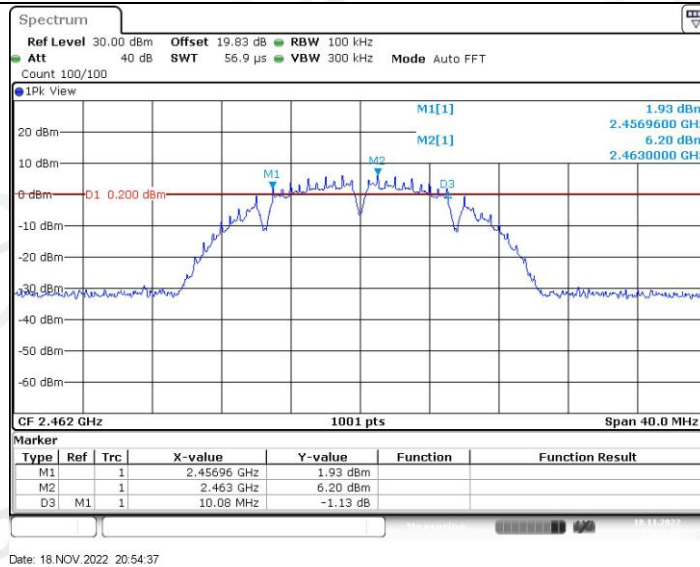
| Test Mode | Test | Ant  | 6dB Bandwidth [MHz] | Limit [MHz] | Verdict |
|-----------|------|------|---------------------|-------------|---------|
| 11B       | 2412 | Ant1 | 10.08               | 0.5         | Pass    |
| 11B       | 2437 | Ant1 | 10.08               | 0.5         | Pass    |
| 11B       | 2462 | Ant1 | 10.08               | 0.5         | Pass    |
| 11G       | 2412 | Ant1 | 16.32               | 0.5         | Pass    |
| 11G       | 2437 | Ant1 | 16.32               | 0.5         | Pass    |
| 11G       | 2462 | Ant1 | 16.32               | 0.5         | Pass    |
| 11N20SISO | 2412 | Ant1 | 17.56               | 0.5         | Pass    |
| 11N20SISO | 2437 | Ant1 | 17.56               | 0.5         | Pass    |
| 11N20SISO | 2462 | Ant1 | 17.52               | 0.5         | Pass    |
| 11N40SISO | 2422 | Ant1 | 35.68               | 0.5         | Pass    |
| 11N40SISO | 2437 | Ant1 | 35.52               | 0.5         | Pass    |
| 11N40SISO | 2452 | Ant1 | 36.08               | 0.5         | Pass    |

| Test Mode | Test | Ant  | 99% OBW [MHz] | Limit [MHz] | Verdict |
|-----------|------|------|---------------|-------------|---------|
| 11B       | 2412 | Ant1 | 15.664        | ---         | Pass    |
| 11B       | 2437 | Ant1 | 15.744        | ---         | Pass    |
| 11B       | 2462 | Ant1 | 15.744        | ---         | Pass    |
| 11G       | 2412 | Ant1 | 17.702        | ---         | Pass    |
| 11G       | 2437 | Ant1 | 17.902        | ---         | Pass    |
| 11G       | 2462 | Ant1 | 17.622        | ---         | Pass    |
| 11N20SISO | 2412 | Ant1 | 18.701        | ---         | Pass    |
| 11N20SISO | 2437 | Ant1 | 18.781        | ---         | Pass    |
| 11N20SISO | 2462 | Ant1 | 18.541        | ---         | Pass    |
| 11N40SISO | 2422 | Ant1 | 37.323        | ---         | Pass    |
| 11N40SISO | 2437 | Ant1 | 37.323        | ---         | Pass    |
| 11N40SISO | 2452 | Ant1 | 37.562        | ---         | Pass    |

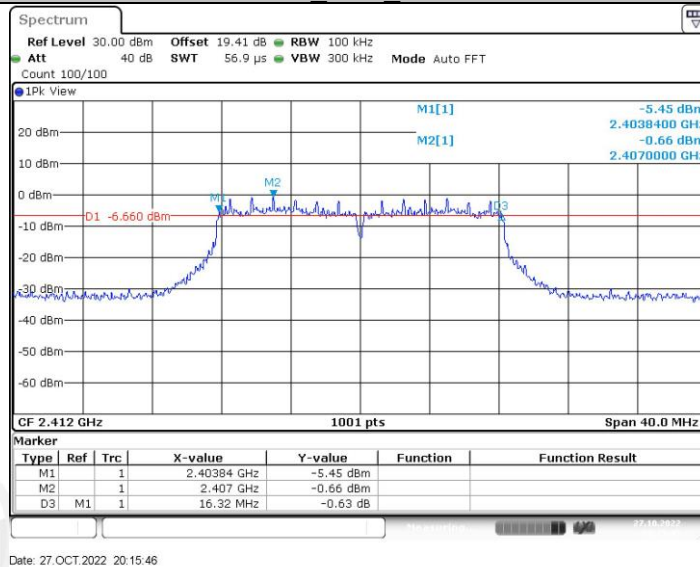
#### 4.5. Original test data

6 dB bandwidth:

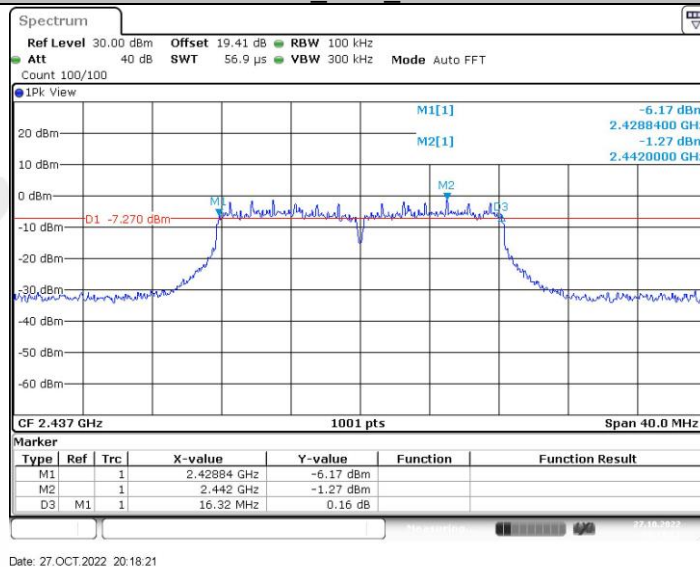




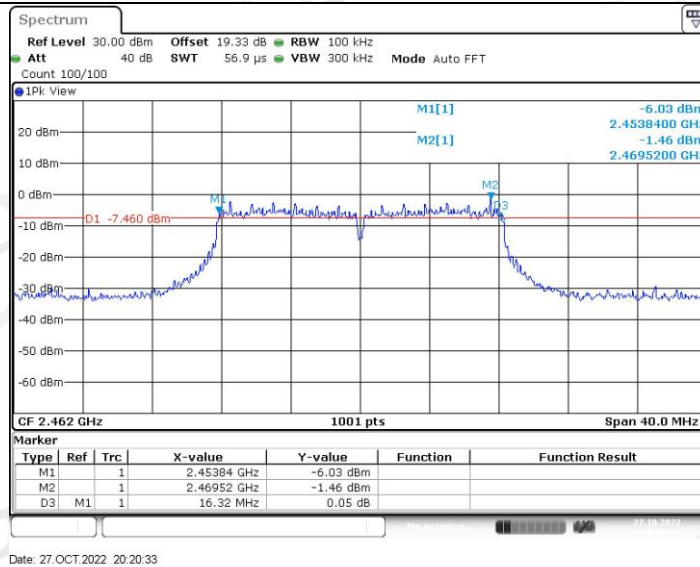
## 11G\_Ant1\_2412



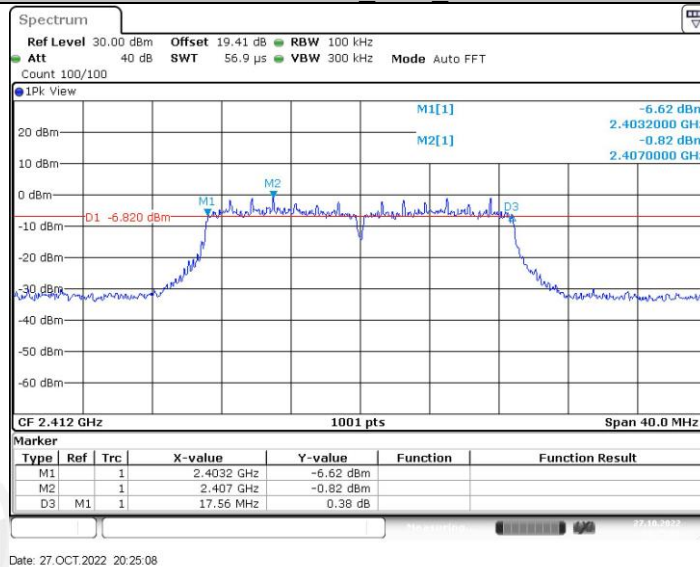
## 11G\_Ant1\_2437



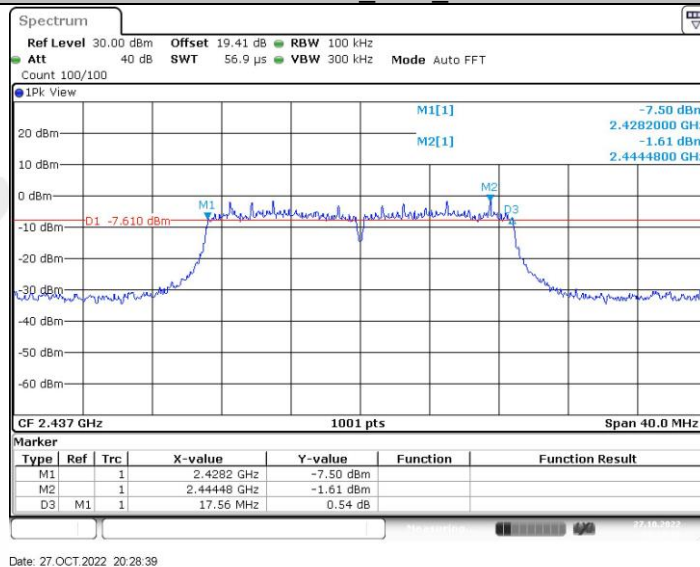
## 11G\_Ant1\_2462



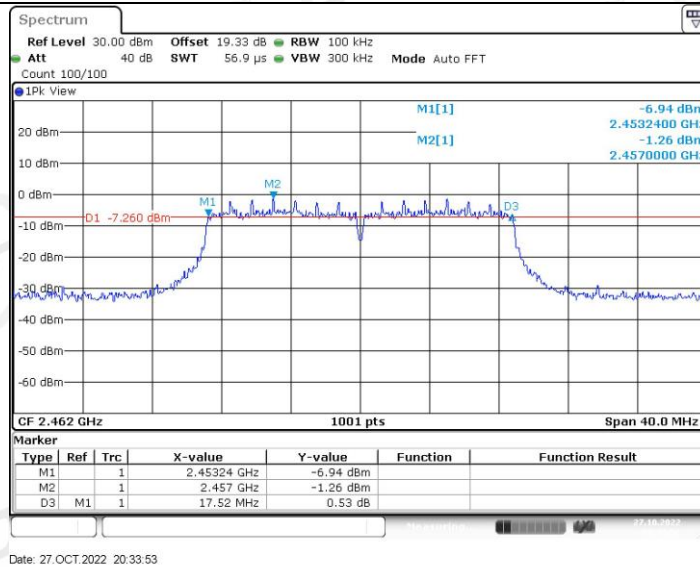
## 11N20SISO\_Ant1\_2412



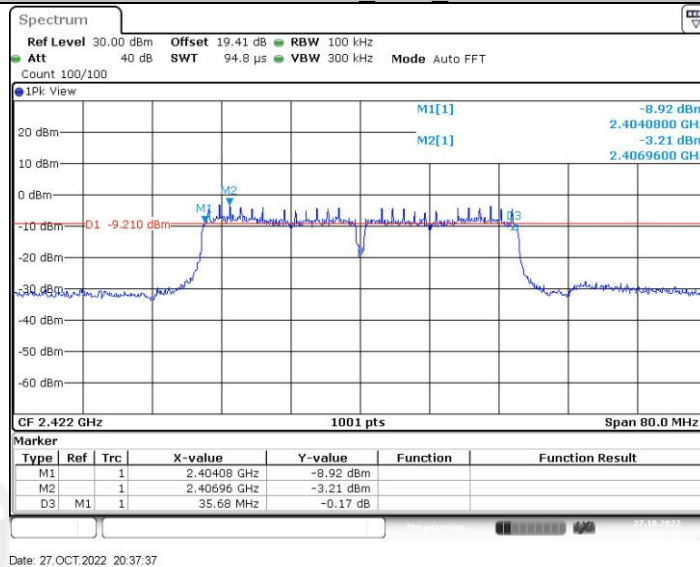
## 11N20SISO\_Ant1\_2437



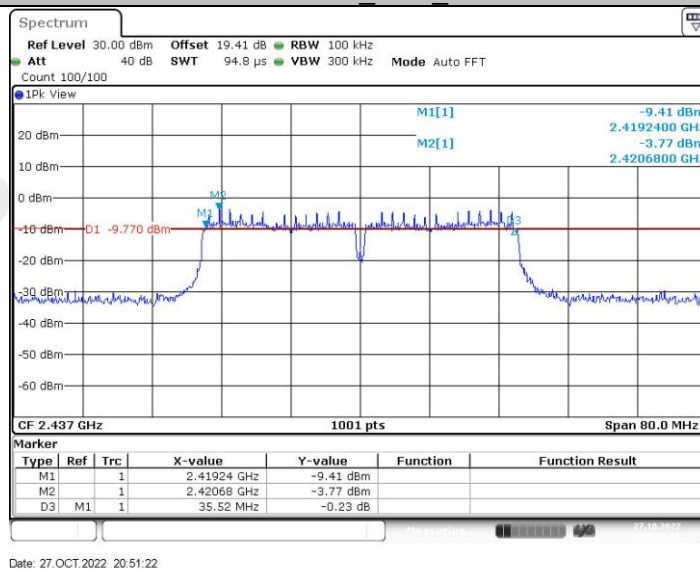
## 11N20SISO\_Ant1\_2462



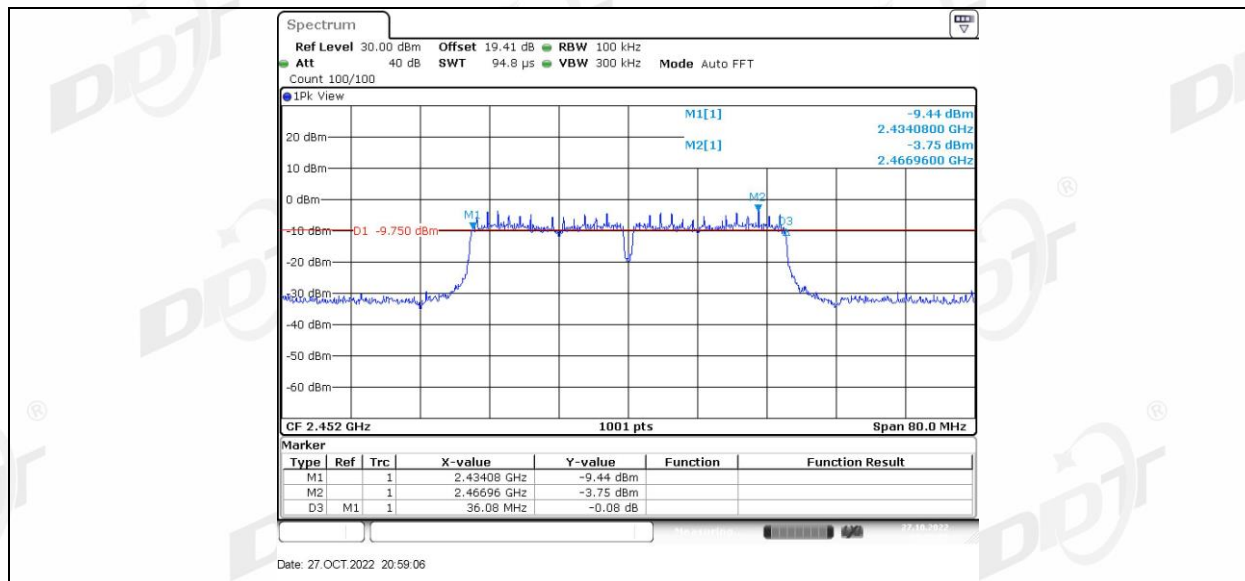
## 11N40SISO\_Ant1\_2422



## 11N40SISO\_Ant1\_2437

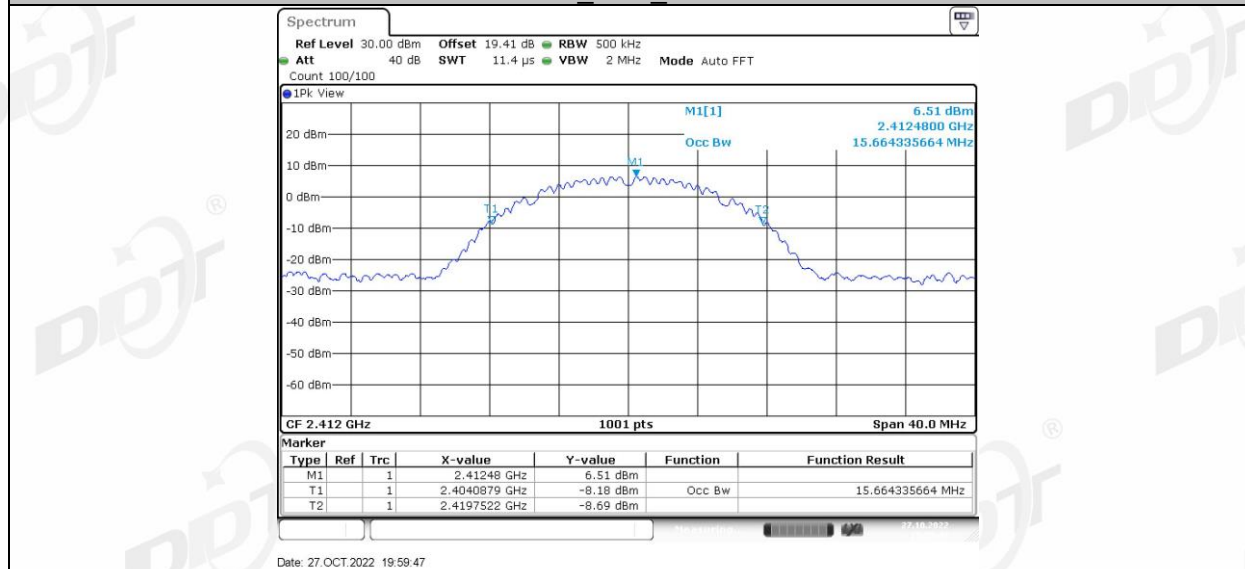


## 11N40SISO\_Ant1\_2452

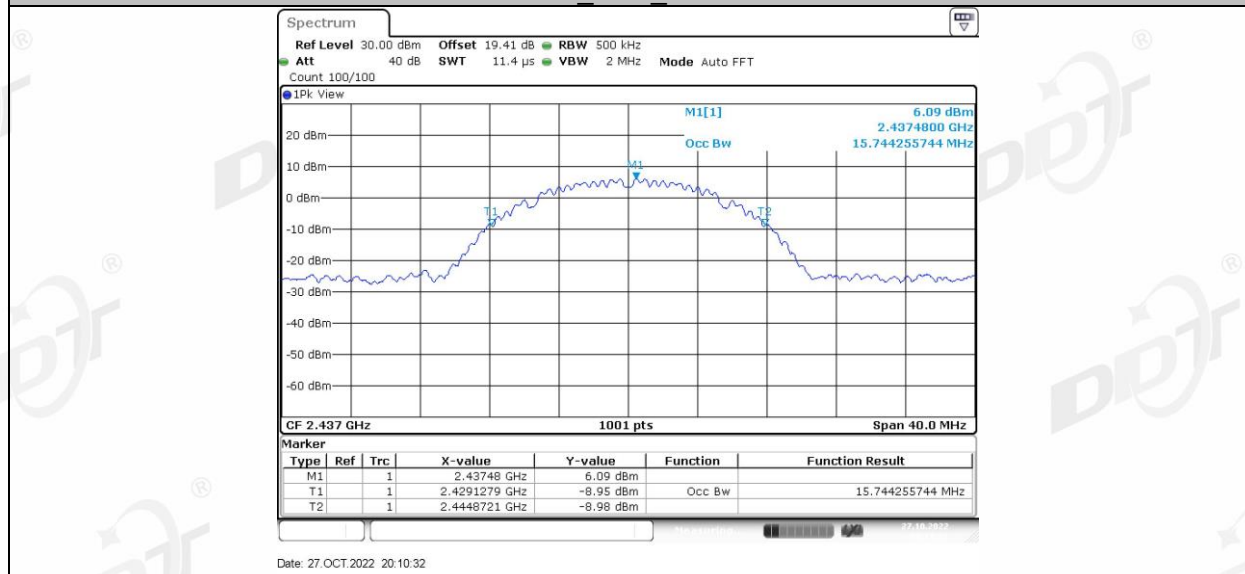


99% bandwidth:

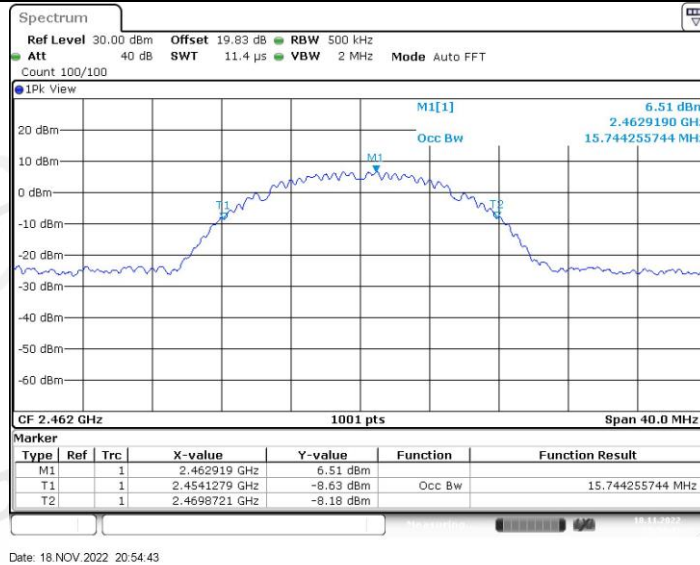
## 11B\_Ant1\_2412



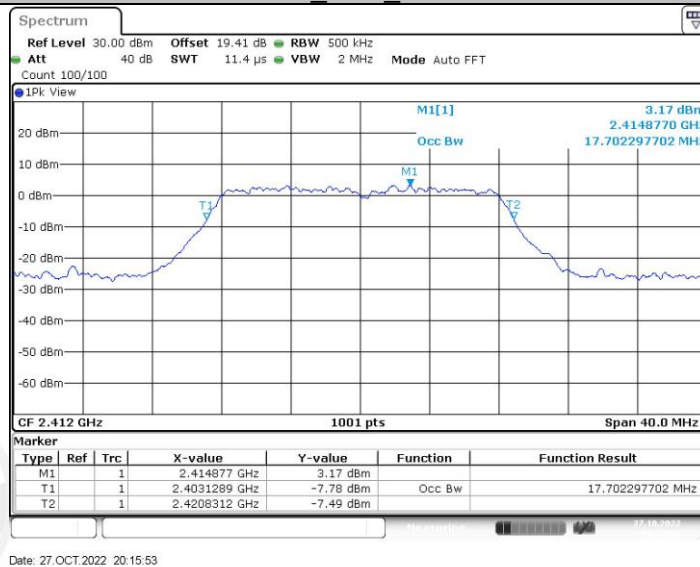
## 11B\_Ant1\_2437



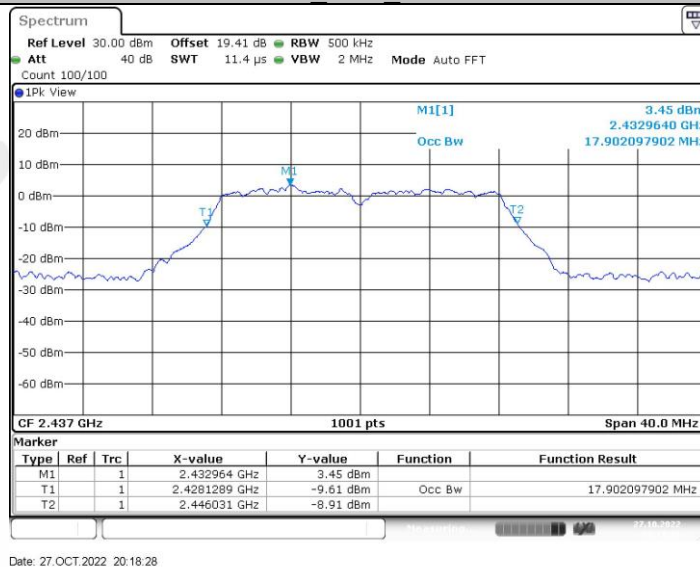
## 11B\_Ant1\_2462



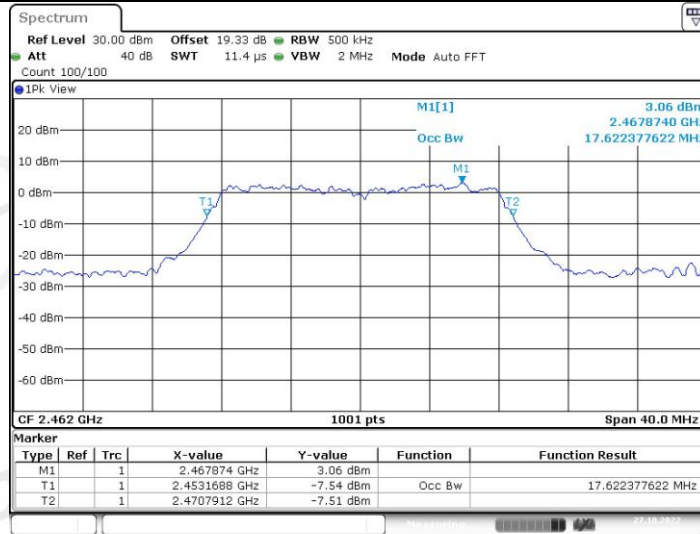
## 11G\_Ant1\_2412



## 11G\_Ant1\_2437

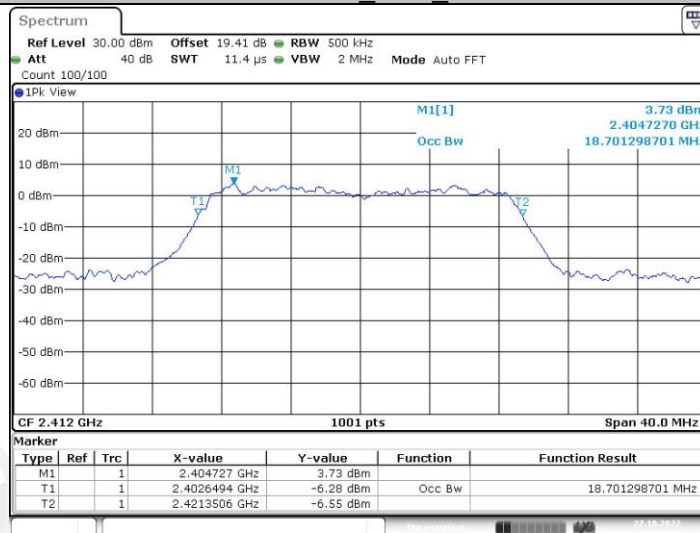


## 11G\_Ant1\_2462



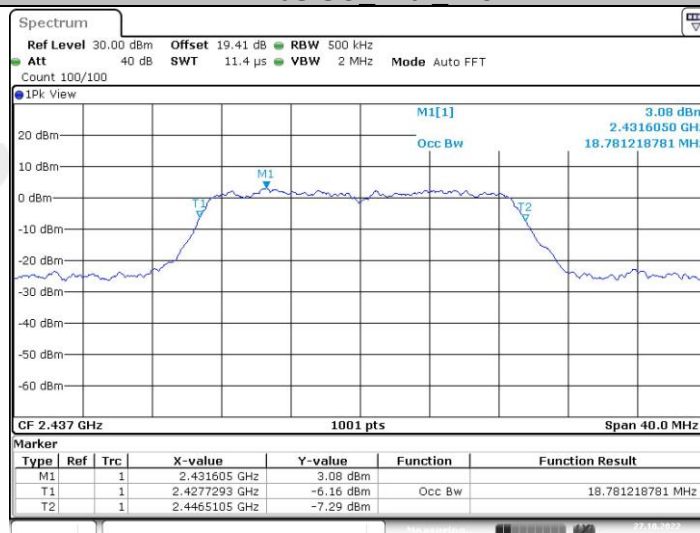
Date: 27.OCT.2022 20:20:40

## 11N20SISO\_Ant1\_2412

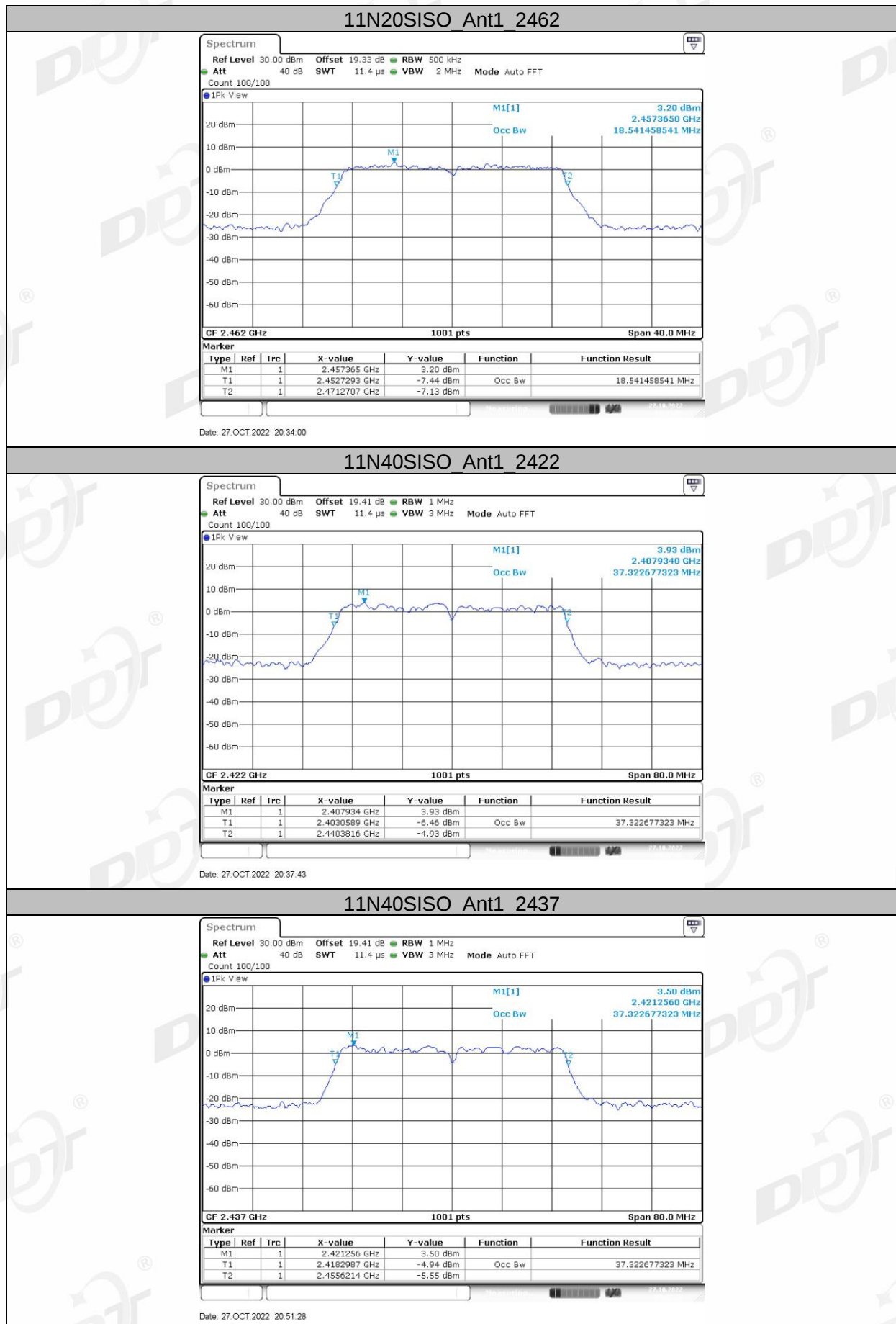


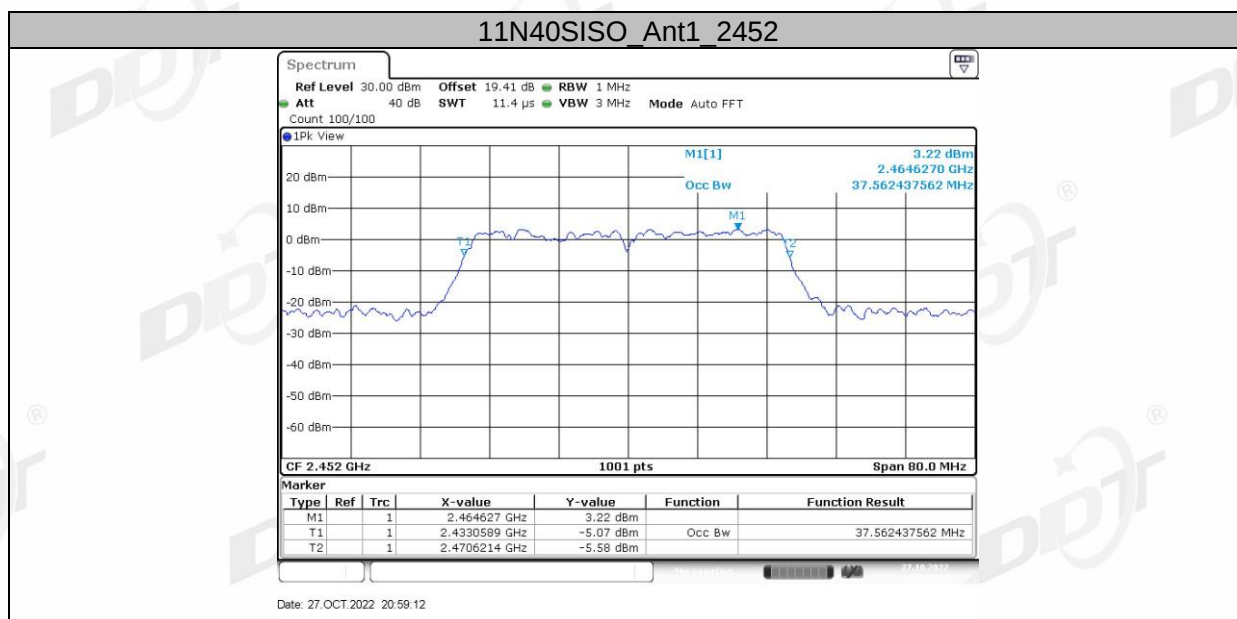
Date: 27.OCT.2022 20:25:14

## 11N20SISO\_Ant1\_2437



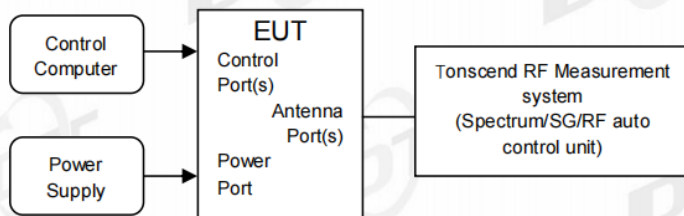
Date: 27.OCT.2022 20:28:51





## 5. Duty Cycle

### 5.1. Block diagram of test setup



### 5.2. Limit

Just for Report.

### 5.3. Test procedure

- (1) Connected the EUT's antenna port to the Spectrum Analyzer by suitable attenuator, The cable loss and attenuator loss have been put into spectrum analyzer as amplitude offset. set the Spectrum Analyzer as below:

Centre Frequency: The centre frequency of the middle hopping channel.

Resolution BW: 10 MHz.

Video BW: 10 MHz.

Span: Zero span.

Detector: Peak.

Trace Mode: Max Hold.

Sweep: Video Trigger

- (2) When the trace is complete, measure the sending time of 1 burst and the duty cycle of 1 burst cycle.

- (3) Calculate dwell time follow below formula:

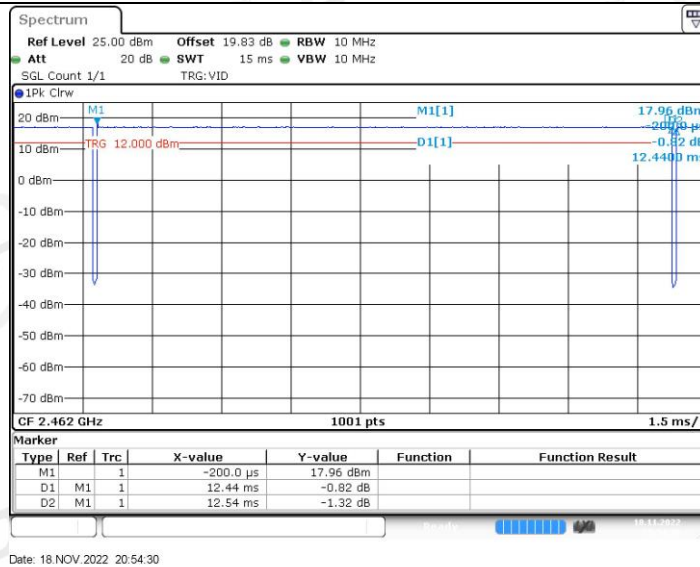
Duty cycle= Pulse's on time / Burst cycle

**5.4. Test result**

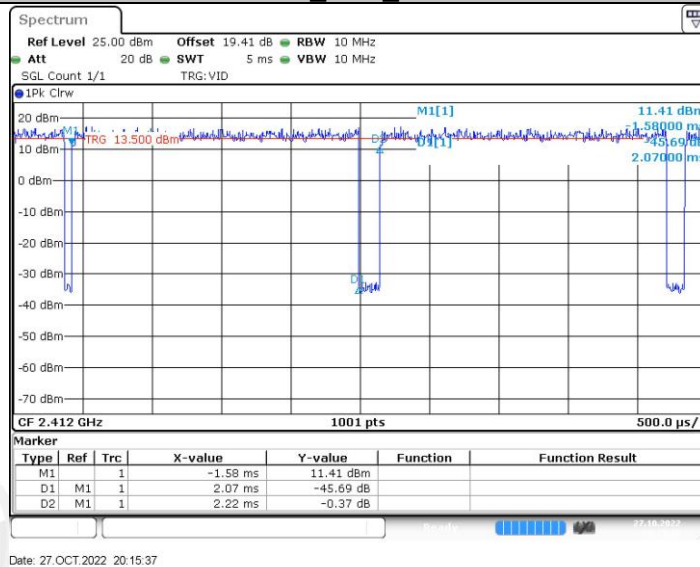
| Test Mode | Antenna | Frequency[MHz] | Transmission Duration [ms] | Transmission Period [ms] | Duty Cycle [%] |
|-----------|---------|----------------|----------------------------|--------------------------|----------------|
| 11B       | Ant1    | 2412           | 12.43                      | 12.51                    | 99.36          |
|           |         | 2437           | 12.44                      | 12.54                    | 99.20          |
|           |         | 2462           | 12.44                      | 12.54                    | 99.20          |
| 11G       | Ant1    | 2412           | 2.07                       | 2.22                     | 93.24          |
|           |         | 2437           | 2.06                       | 2.14                     | 96.26          |
|           |         | 2462           | 2.07                       | 2.19                     | 94.52          |
| 11N20SISO | Ant1    | 2412           | 1.92                       | 1.99                     | 96.48          |
|           |         | 2437           | 1.92                       | 1.97                     | 97.46          |
|           |         | 2462           | 1.93                       | 2.08                     | 92.79          |
| 11N40SISO | Ant1    | 2422           | 0.95                       | 1.09                     | 87.16          |
|           |         | 2437           | 0.95                       | 1.03                     | 92.23          |
|           |         | 2452           | 0.94                       | 1.07                     | 87.85          |

## 5.5. Test Graphs

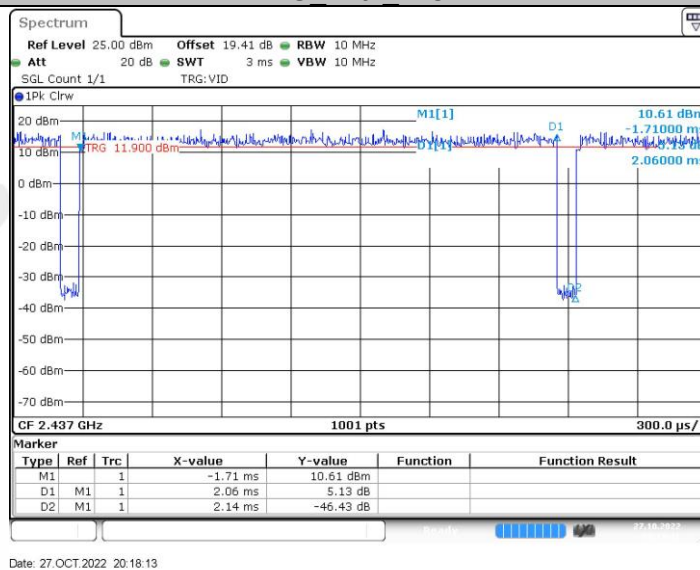




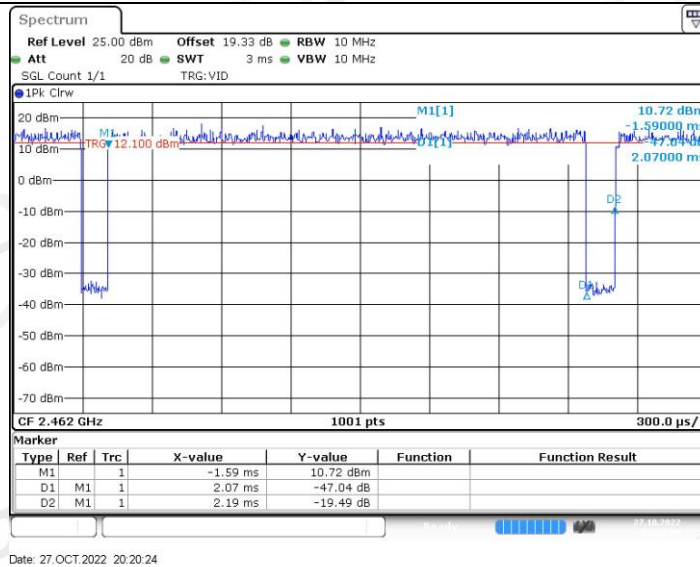
## 11G\_Ant1\_2412



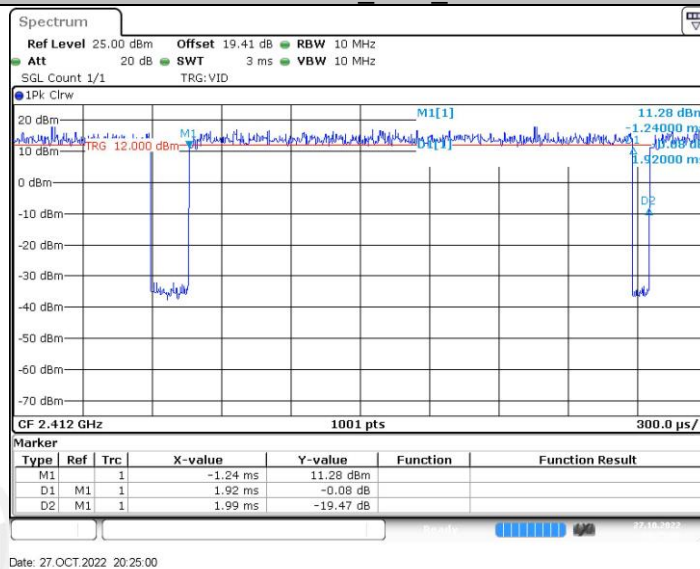
## 11G\_Ant1\_2437



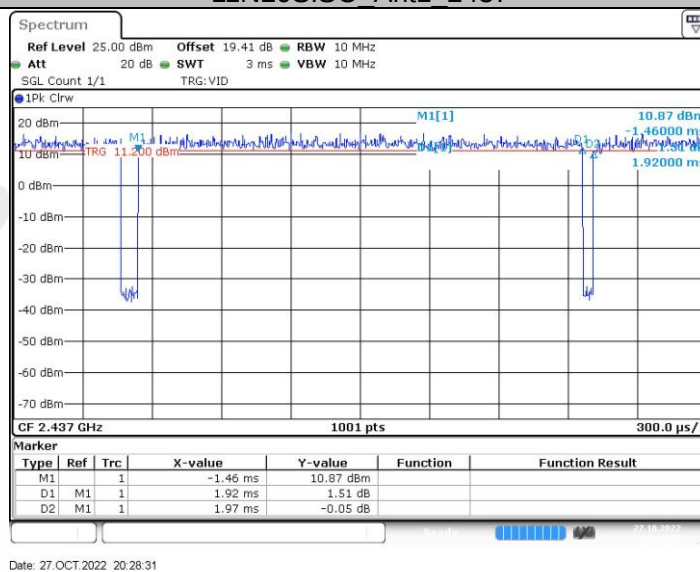
## 11G\_Ant1\_2462



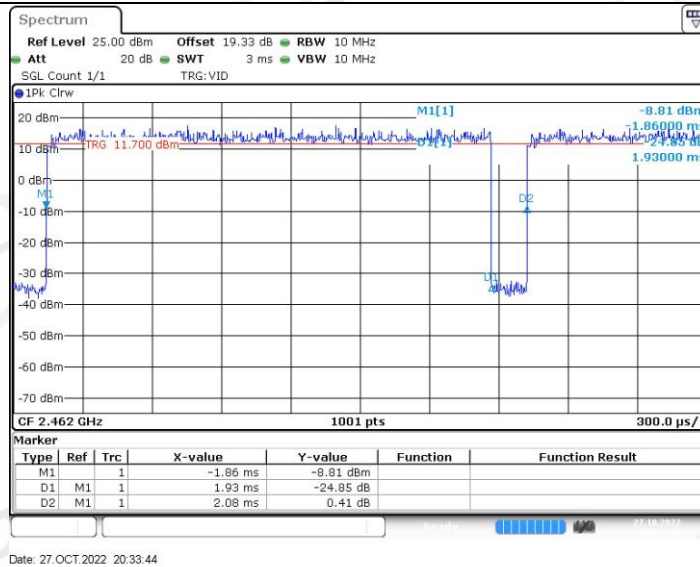
## 11N20SISO\_Ant1\_2412



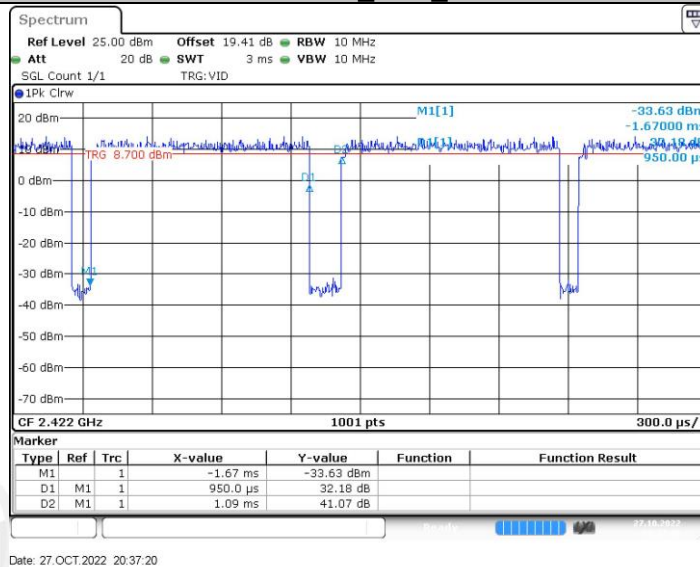
## 11N20SISO\_Ant1\_2437



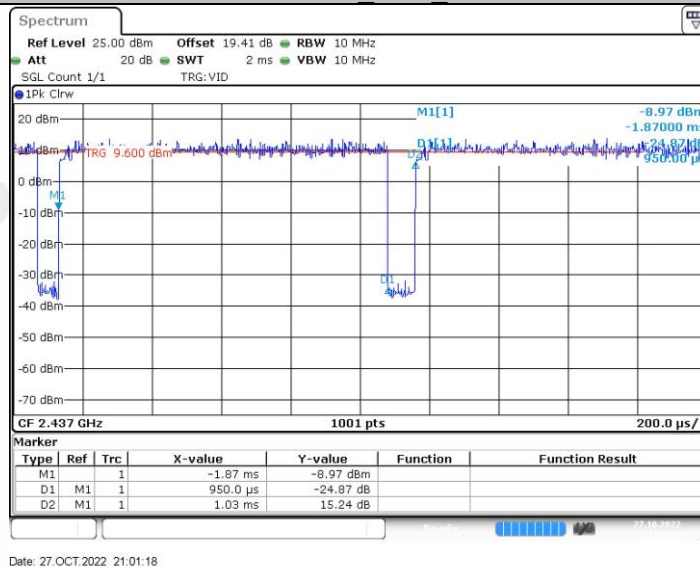
## 11N20SISO\_Ant1\_2462



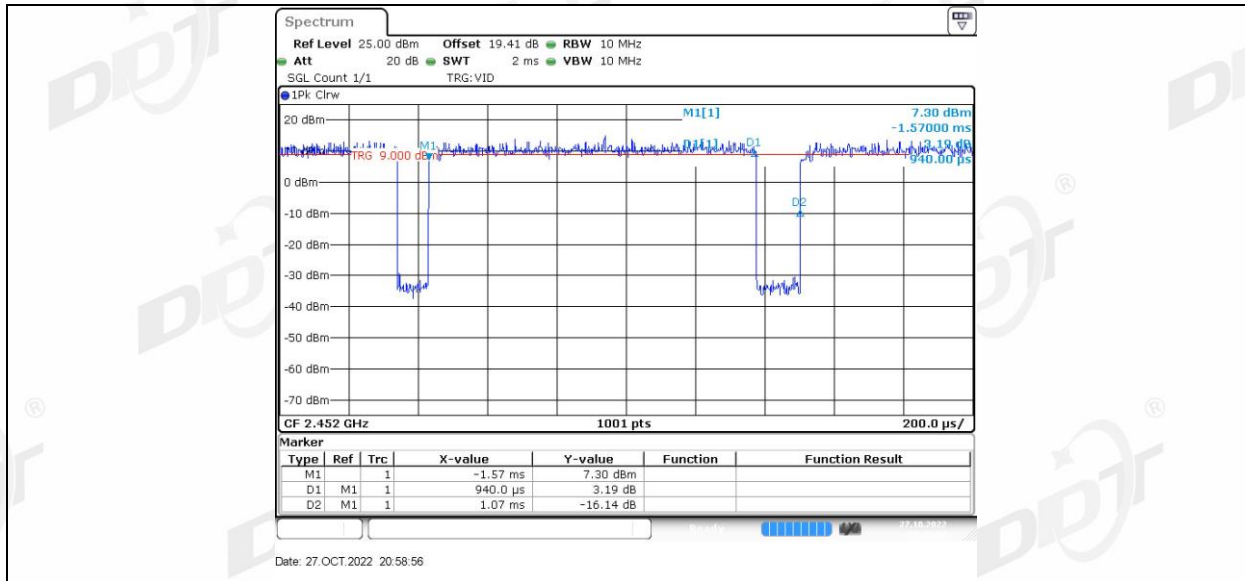
## 11N40SISO\_Ant1\_2422



## 11N40SISO\_Ant1\_2437



## 11N40SISO\_Ant1\_2452



## 6. Conducted Output Power

### 6.1. Block diagram of test setup

Same as section 4.1

### 6.2. Limits

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### 6.3. Test Procedure

Connect each EUT's antenna output to power sensor by RF cable and attenuator

Measure the output power of each antenna port by power meter.

### 6.4. Test Result

| Test Mode | Test Channel | Ant  | Average power [dBm] | Duty Cycle [%] | DC Factor [dBm] | Conducted Output Power (dBm) | Limit [dBm] | Verdict |
|-----------|--------------|------|---------------------|----------------|-----------------|------------------------------|-------------|---------|
| 11B       | 2412         | Ant1 | 15.52               | 99.36          | 0.03            | 15.55                        | 30          | Pass    |
| 11B       | 2437         | Ant1 | 14.99               | 99.20          | 0.03            | 15.02                        | 30          | Pass    |
| 11B       | 2462         | Ant1 | 15.56               | 99.20          | 0.03            | <b>15.59</b>                 | 30          | Pass    |
| 11G       | 2412         | Ant1 | 10.47               | 93.24          | 0.30            | 10.77                        | 30          | Pass    |
| 11G       | 2437         | Ant1 | 9.94                | 96.26          | 0.17            | 10.11                        | 30          | Pass    |
| 11G       | 2462         | Ant1 | 9.98                | 94.52          | 0.24            | 10.22                        | 30          | Pass    |
| 11N20SISO | 2412         | Ant1 | 10.44               | 96.48          | 0.16            | 10.60                        | 30          | Pass    |
| 11N20SISO | 2437         | Ant1 | 9.90                | 97.46          | 0.11            | 10.01                        | 30          | Pass    |
| 11N20SISO | 2462         | Ant1 | 10.01               | 92.79          | 0.32            | 10.33                        | 30          | Pass    |
| 11N40SISO | 2422         | Ant1 | 10.34               | 87.16          | 0.60            | 10.94                        | 30          | Pass    |
| 11N40SISO | 2437         | Ant1 | 10.04               | 92.23          | 0.35            | 10.39                        | 30          | Pass    |
| 11N40SISO | 2452         | Ant1 | 9.99                | 87.85          | 0.56            | 10.55                        | 30          | Pass    |

## 7. Power Spectral Density

### 7.1. Block diagram of test setup

Same as section 4.1

### 7.2. Limits

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

### 7.3. Test Procedure

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

(2) Set the spectrum analyzer as follows:

|                  |                                                      |
|------------------|------------------------------------------------------|
| Center frequency | DTS Channel center frequency                         |
| RBW:             | $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ |
| VBW:             | $\geq 3\text{RBW}$                                   |
| Span             | 1.5 times the DTS bandwidth                          |
| Detector Mode:   | RMS                                                  |
| Sweep time:      | auto                                                 |
| Trace mode       | Max hold                                             |

(3) Allow the trace to stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.

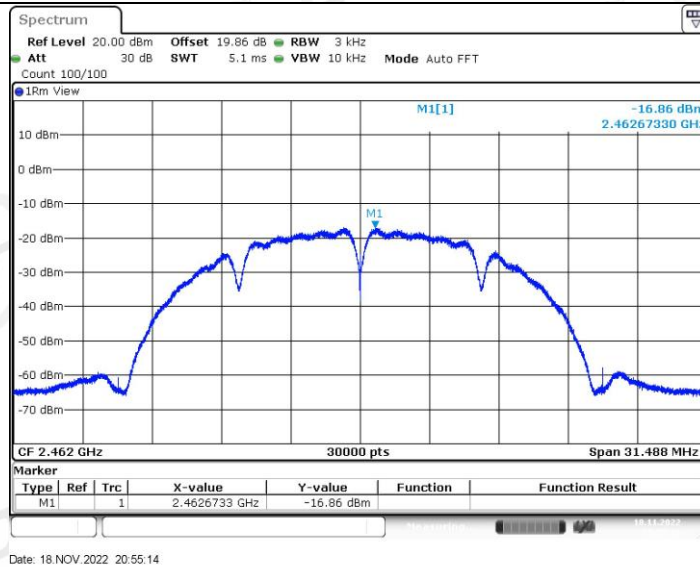
(4) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

### 7.4. Test Result

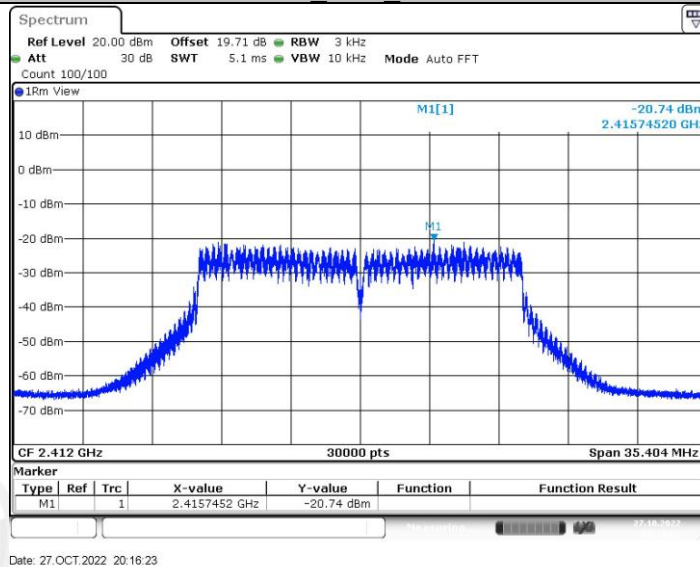
| Test Mode | Test Channel | Ant  | PSD [dBm] | Limit [dBm/3kHz] | Verdict |
|-----------|--------------|------|-----------|------------------|---------|
| 11B       | 2412         | Ant1 | -17.08    | 8.00             | Pass    |
| 11B       | 2437         | Ant1 | -17.79    | 8.00             | Pass    |
| 11B       | 2462         | Ant1 | -16.86    | 8.00             | Pass    |
| 11G       | 2412         | Ant1 | -20.74    | 8.00             | Pass    |
| 11G       | 2437         | Ant1 | -21.3     | 8.00             | Pass    |
| 11G       | 2462         | Ant1 | -21.35    | 8.00             | Pass    |
| 11N20SISO | 2412         | Ant1 | -20.47    | 8.00             | Pass    |
| 11N20SISO | 2437         | Ant1 | -21.74    | 8.00             | Pass    |
| 11N20SISO | 2462         | Ant1 | -21.92    | 8.00             | Pass    |
| 11N40SISO | 2422         | Ant1 | -22.39    | 8.00             | Pass    |
| 11N40SISO | 2437         | Ant1 | -21.95    | 8.00             | Pass    |
| 11N40SISO | 2452         | Ant1 | -22.91    | 8.00             | Pass    |

## 7.5. Original test data

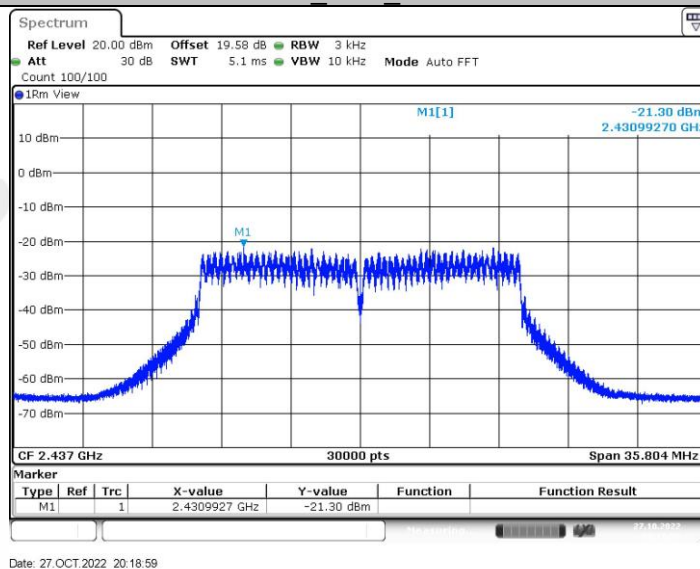




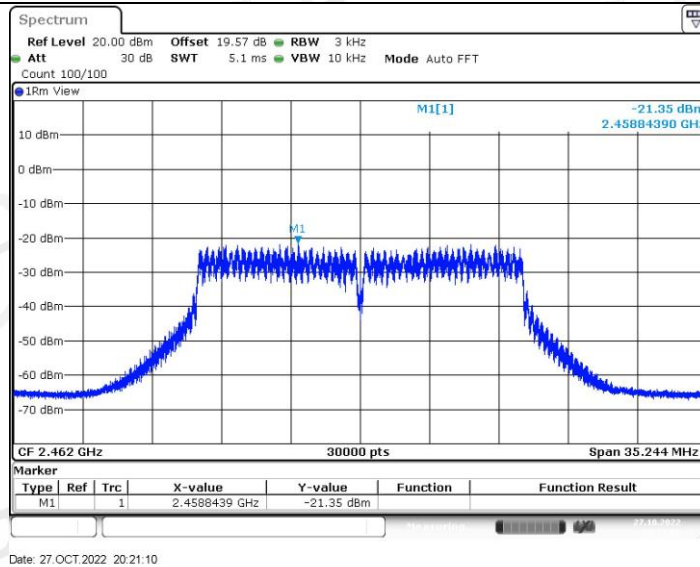
11G\_Ant1\_2412



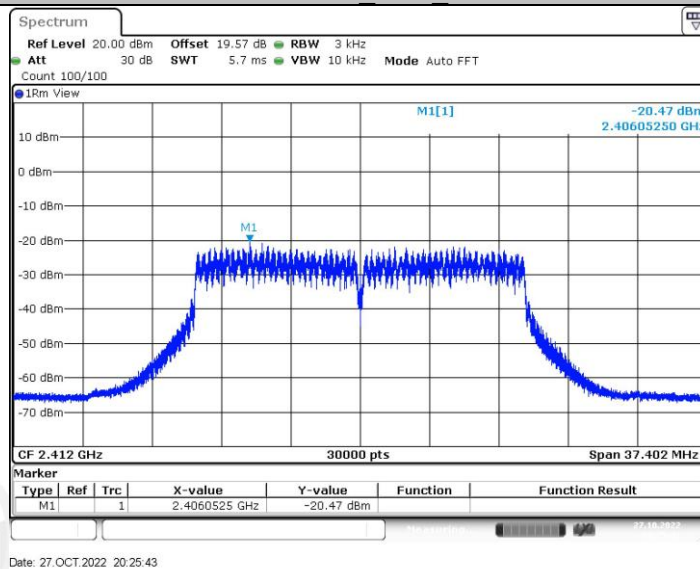
11G\_Ant1\_2437



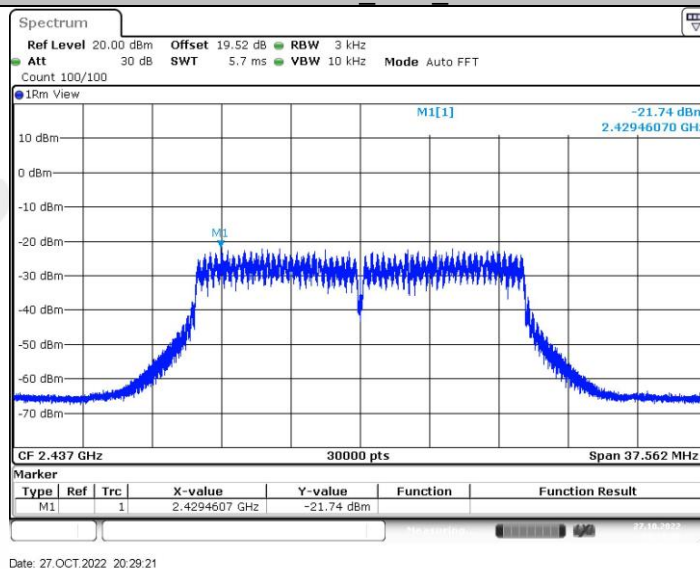
11G\_Ant1\_2462



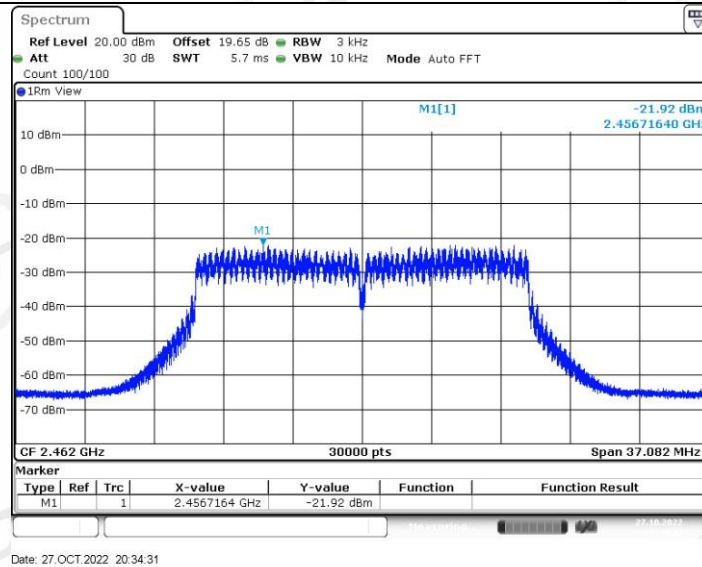
11N20SISO\_Ant1\_2412



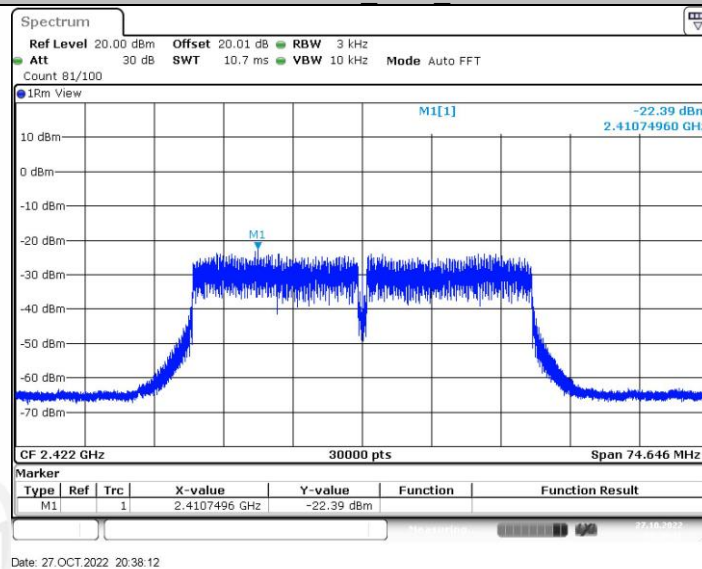
11N20SISO\_Ant1\_2437



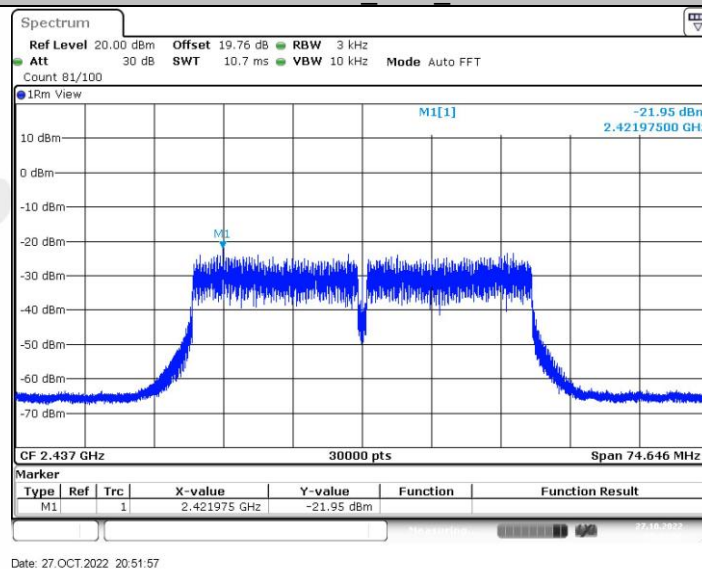
11N20SISO\_Ant1\_2462



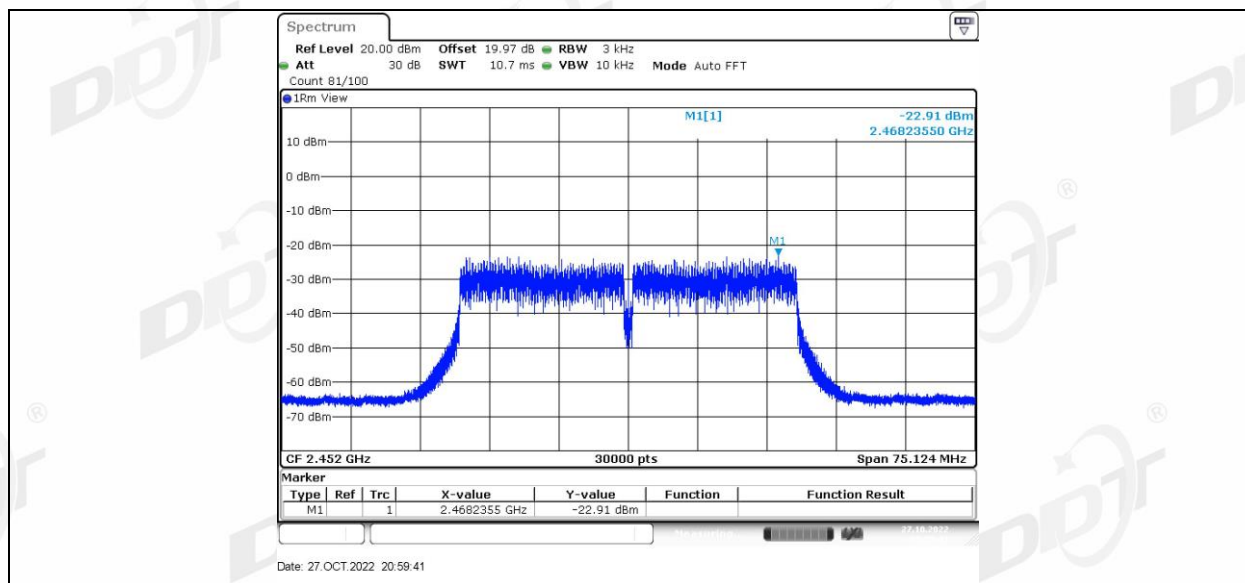
## 11N40SISO\_Ant1\_2422



## 11N40SISO\_Ant1\_2437



## 11N40SISO\_Ant1\_2452



Note: The Duty Cycle Factor is compensated in the graph.