# RADIO PERFORMANCE TEST REPORT

| | |
|---|---|
| **Test Report No.** | **: OT-218-RWD-070** |
| **Reception No.** | **: 2104003190** |
| **Applicant** | **: Geoplan Co., Ltd.** |
| **Address** | **: 622, Geumjeong SKV1, 142, LS-ro, Dongan-gu, Anyang-si, Gyeonggi-do, Republic of Korea** |
| **Manufacturer** | **: Geoplan Co., Ltd.** |
| **Address** | **: 622, Geumjeong SKV1, 142, LS-ro, Dongan-gu, Anyang-si, Gyeonggi-do, Republic of Korea** |
| **Type of Equipment** | **: Zigbee/BLE Module** |
| **FCC ID.** | **: 2ASPN-GEO-MB310** |
| **Model Name** | **: GEO-MB310** |
| **Multiple Model Name** | **: N/A** |
| **Serial number** | **: N/A** |
| **Total page of Report** | **: 34 pages (including this page)** |
| **Date of Incoming** | **: July 06, 2021** |
| **Date of issue** | **: August 19, 2021** |

## SUMMARY

The equipment complies with the regulation; ***FCC PART 15 SUBPART C Section 15.247***

This test report only contains the result of a single test of the sample supplied for the examination.

It is not a generally valid assessment of the features of the respective products of the mass-production.

| Tested by | Reviewed by | Approved by |
|---|---|---|
| / Sieon Lee / Assistant Manager | / Ha-Ram Lee / Manager | / Ki-Hong, Nam / General Manager |
| ONETECH Corp. | ONETECH Corp. | ONETECH Corp. |

 

**ONETECH Corp.**: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

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## Revision History

| Rev. No. | Issue Report No. | Issued Date | Revisions | Section Affected |
|---|---|---|---|---|
| 0 | OT-218-RWD-070 | August 19, 2021 | Initial Release | All |
| | | | | |
| | | | | |



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# 1. VERIFICATION OF COMPLIANCE

Applicant : Geoplan Co., Ltd.

Address : 622, Geumjeong SKV1, 142, LS-ro, Dongan-gu, Anyang-si, Gyeonggi-do, Republic of Korea

Contact Person : Youngha Shin / General Manager

Telephone No. : +82-31-689-5541

FCC ID : 2ASPN-GEO-MB310

Model Name : GEO-MB310

Brand Name : N/A

Serial Number : N/A

Date : August 19, 2021

| | |
|---|---|
| EQUIPMENT CLASS | DTS – DIGITAL TRNSMISSION SYSTEM |
| E.U.T. DESCRIPTION | Zigbee/BLE Module |
| THIS REPORT CONCERNS | Original Grant |
| MEASUREMENT PROCEDURES | ANSI C63.10: 2013 |
| TYPE OF EQUIPMENT TESTED | Pre-Production |
| KIND OF EQUIPMENT AUTHORIZATION REQUESTED | Certification |
| EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S) | FCC PART 15 SUBPART C Section 15.247<br>KDB 558074 D01 15.247 Meas Guidance v05r02 |
| Modifications on the Equipment to Achieve Compliance | None |
| Final Test was Conducted On | 3 m, Semi Anechoic Chamber |

-. The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

# 2. TEST SUMMARY

## 2.1 Test items and results

| SECTION | TEST ITEMS | RESULTS |
|---|---|---|
| 15.247 (a) (2) | Minimum 6 dB Bandwidth | Met the Limit / PASS |
| 15.247 (b) (3) | Maximum Peak Conducted Output Power | Met the Limit / PASS |
| 15.247 (d) | 100 kHz Bandwidth Outside the Frequency Band | Met the Limit / PASS |
| 15.247 (d) | Radiated Emission which fall in the Restricted Band | Met the Limit / PASS |
| 15.247 (e) | Peak Power Spectral Density | Met the Limit / PASS |
| 15.209 | Radiated Emission Limits | Met the Limit / PASS |
| 15.207 | Conducted Limits | Met the Limit / PASS |
| 15.203 | Antenna Requirement | Met requirement / PASS |

## 2.2 Additions, deviations, exclusions from standards

No additions, deviations or exclusions have been made from standard.

## 2.3 Related Submittal(s) / Grant(s)

Original submittal only

## 2.4 Purpose of the test

To determine whether the equipment under test fulfills the requirements of the regulation stated in FCC PART 15 SUBPART C Section 15.247.

## 2.5 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10: 2013. Radiated testing was performed at a distance of 3 m from EUT to the antenna.

## 2.6 Test Facility

The Onetech Corp. has been designated to perform equipment testing in compliance with ISO/IEC 17025.

The Electromagnetic compatibility measurement facilities are located at 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea.

-. Site Filing:

VCCI (Voluntary Control Council for Interference) – Registration No. R-20122/ C-14617/ G-10666/ T-11842

ISED (Innovation, Science and Economic Development Canada) – Registration No. Site# 3736A-3

KOLAS (Korea Laboratory Accreditation Scheme) - Accreditation NO. KT085

FCC (Federal Communications Commission) - Accreditation No. KR0013

RRA (Radio Research Agency) – Designation No. KR0013

# 3. GENERAL INFORMATION

## 3.1 Product Description

The Geoplan Co., Ltd., Model GEO-MB310 (referred to as the EUT in this report) is a Zigbee/BLE Module. The product specification described herein was obtained from product data sheet or user's manual.

| | | |
|---|---|---|
| Device Type | Zigbee/BLE Module | |
| Operating Frequency | Bluetooth LE | 2 402 MHz ~ 2 480 MHz |
| | Zigbee | 2 405 MHz ~ 2 480 MHz |
| RF Output Power | Bluetooth LE | 8.05 dBm |
| | Zigbee | -0.84 dBm |
| Number of Channel | Bluetooth LE | 40 Channels |
| | Zigbee | 16 Channels |
| Modulation Type | Bluetooth LE | GFSK |
| | Zigbee | |
| Antenna Type | PCB Antenna | |
| Antenna Gain | 0.79 dBi | |
| Rated Supply Voltage | DC 3.3 V | |
| List of each Osc. or crystal Freq.(Freq. >= 1 MHz) | 32 MHz | |

## 3.2 Alternative type(s)/model(s); also covered by this test report.

-. None

# 4. EUT MODIFICATIONS

-. None

# 5. SYSTEM TEST CONFIGURATION

## 5.1 Justification

This device was configured for testing in a typical way as a normal customer is supposed to be used. During the test, the following components were installed inside of the EUT.

| DEVICE TYPE | MANUFACTURER | MODEL/PART NUMBER | FCC ID |
|---|---|---|---|
| Main Board | Geoplan Co., Ltd. | N/A | N/A |

## 5.2 Peripheral equipment

Defined as equipment needed for correct operation of the EUT, but not considered as tested:

| Model | Manufacturer | Description | Connected to |
|---|---|---|---|
| GEO-MB310 | Geoplan Co., Ltd. | Zigbee/BLE Module (EUT) | - |
| PROBOOK | HP | Notebook PC | - |

## 5.3 Mode of operation during the test

For the testing, software used to control the EUT for staying in continuous transmitting is programmed.

For final testing, the EUT was set at 2 405 MHz, 2 440 MHz, and 2 480 MHz to get a maximum emission levels from the EUT. The EUT was moved throughout the XY, XZ, and YZ planes and the worst case is “XY” axis, but the worst data was recorded in this report.

-. Frequency / Channel Operations

| Channel | Frequency |
|---|---|
| 0 | 2 405 |
| 1 | 2 410 |
| 2 | 2 415 |
| 3 | 2 420 |
| 4 | 2 425 |
| 5 | 2 430 |
| 6 | 2 435 |
| 7 | 2 440 |
| 8 | 2 445 |
| 9 | 2 450 |
| 10 | 2 455 |
| 11 | 2 460 |
| 12 | 2 465 |
| 13 | 2 470 |
| 14 | 2 475 |
| 15 | 2 480 |

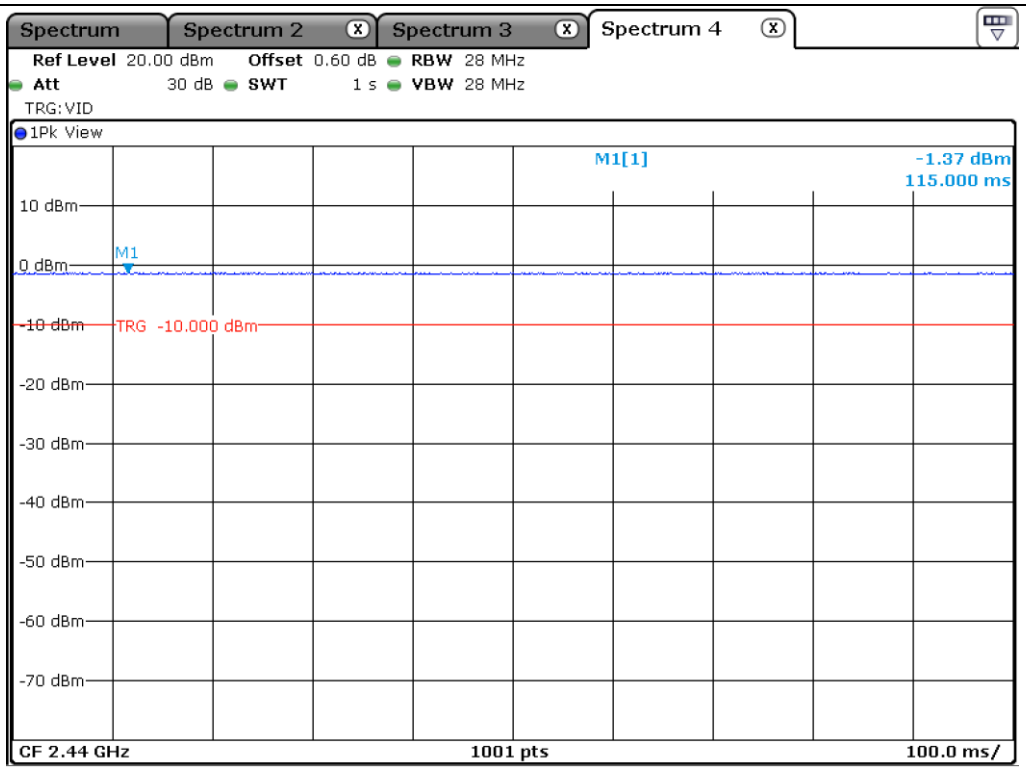
-. Duty Cycle

| Mode | Tx On Time [ ms ] | Tx Off Time [ ms ] | Duty Cycle [ % ] | Correction Factor [ dB ] |
|---|---|---|---|---|
| Zigbee | - | - | 100 | - |

Note – Duty Cycle : (Tx On Time / (Tx On Time + Tx Off Time)) * 100

Correction Factor : 10 * Log(1 / (Duty Cycle / 100))

-. Test Plot



### 5.4 Configuration of Test System

**Line Conducted Test**: The EUT was tested in the Transmitting mode. All supporting equipment were connected to another LISN. Preliminary Power line Conducted Emission test was performed by using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions.

**Radiated Emission Test**: Preliminary radiated emissions test were conducted using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions. Final radiated emission tests were conducted at 3 meter Semi Anechoic Chamber.

The turntable was rotated through 360 degrees and the EUT was tested by positioned three orthogonal planes to obtain the highest reading on the field strength meter. Once maximum reading was determined, the search antenna was raised and lowered in both vertical and horizontal polarization.

### 5.5 Antenna Requirement

For intentional device, according to section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

**Antenna Construction:**

The antenna of the EUT is PCB Antenna on the main board in the EUT, so no consideration of replacement by the user.

## 6. PRELIMINARY TEST

### 6.1 AC Power line Conducted Emissions Tests

During Preliminary Test, the following operating mode was investigated.

| Operation Mode | The Worse operating condition (Please check one only) |
|---|---|
| Transmitting Mode | X |

### 6.2 General Radiated Emissions Tests

During Preliminary Test, the following operating mode was investigated.

| Operation Mode | The Worse operating condition (Please check one only) |
|---|---|
| Transmitting Mode | X |

# 7. MINIMUM 6 dB BANDWIDTH

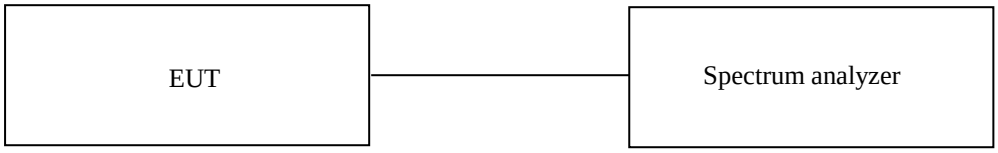
## 7.1 Operating environment

Temperature : 22 °C

Relative humidity : 46 % R.H.

## 7.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz, and peak detection was used. The 6 dB bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 6 dB.




## 7.3 Test Date

July 12, 2021 ~ August 03, 2021



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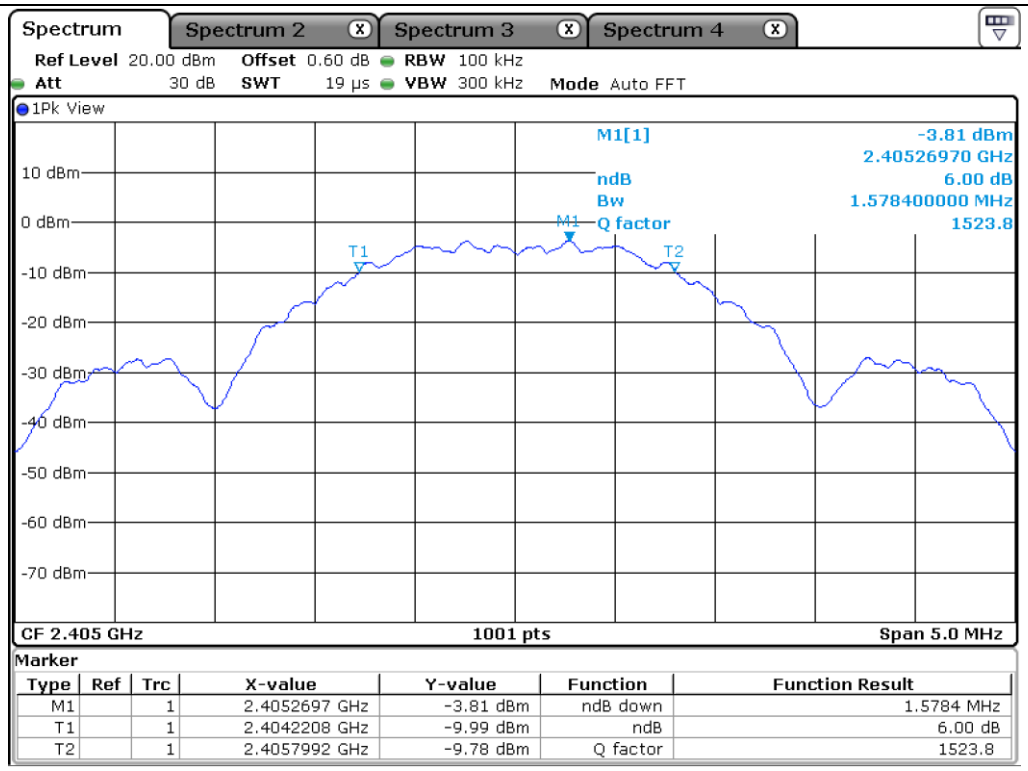
## 7.4 Test data

| Channel | Frequency (MHz) | Measured Value (kHz) | Limit (kHz) | Margin (kHz) |
|---|---|---|---|---|
| Low | 2 405.00 | 1 578.40 | 500.00 | 1078.40 |
| Middle | 2 440.00 | 1 573.40 | 500.00 | 1073.40 |
| High | 2 480.00 | 1 568.40 | 500.00 | 1068.40 |

Remark. Margin = Measured Value - Limit




Low Channel

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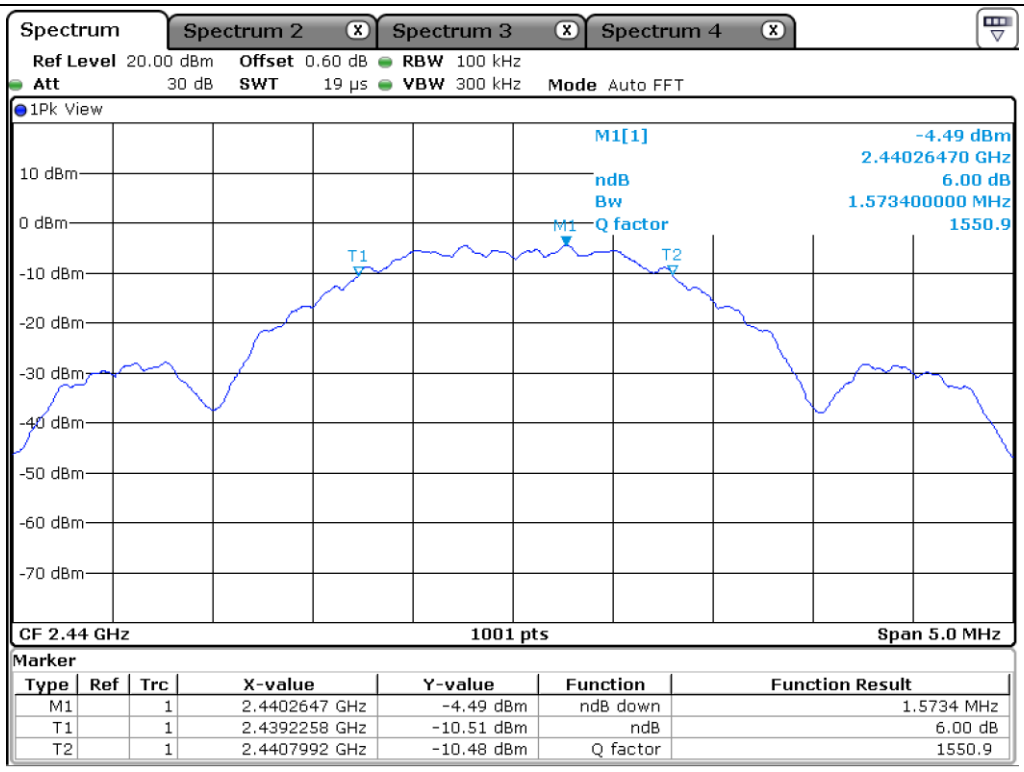
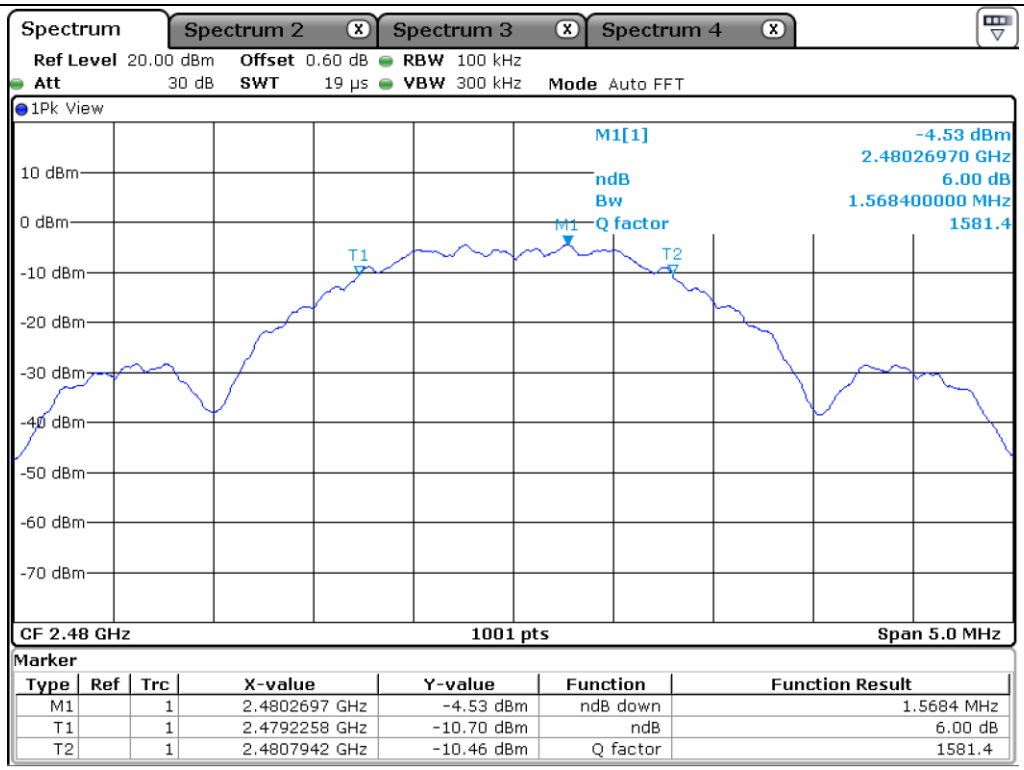



Middle Channel




High Channel

# 8. MAXIMUM PEAK OUTPUT POWER

## 8.1 Operating environment

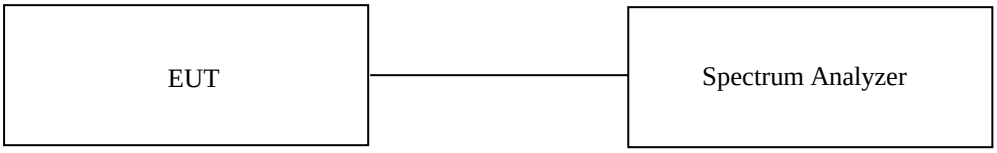
Temperature : 22 °C

Relative humidity : 46 % R.H.

## 8.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer.

The resolution bandwidth is set to ≥ DTS Bandwidth, the video bandwidth is set to 3 times the resolution bandwidth.




## 8.3 Test Date

July 12, 2021 ~ August 03, 2021



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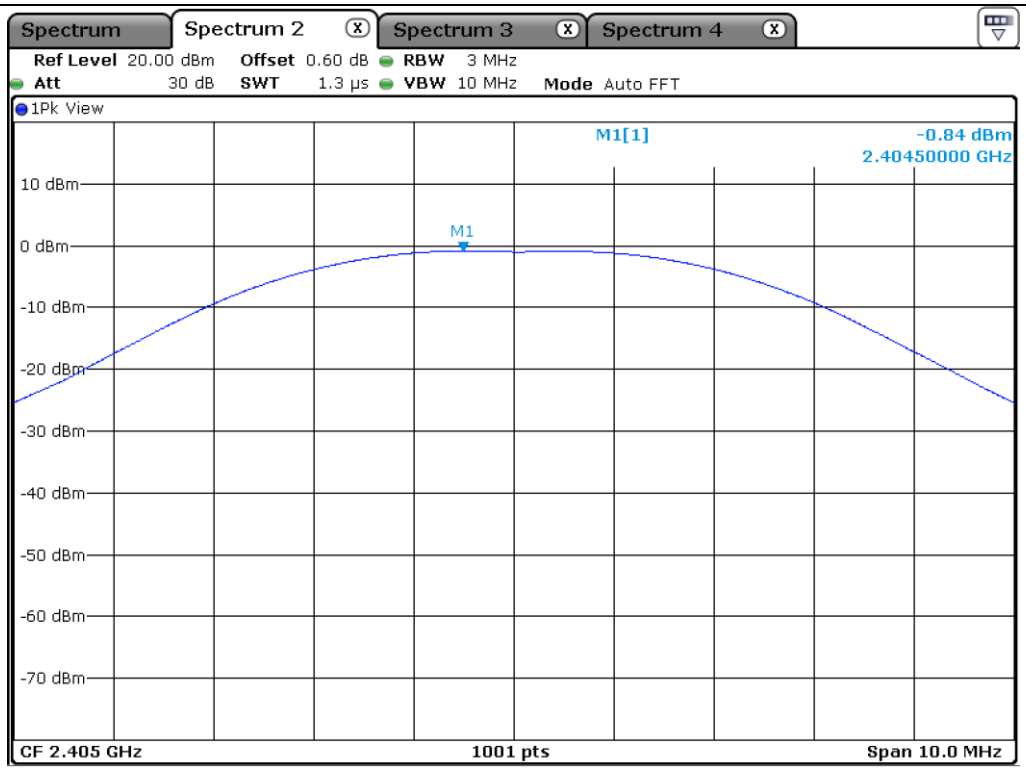
## 8.4 Test data

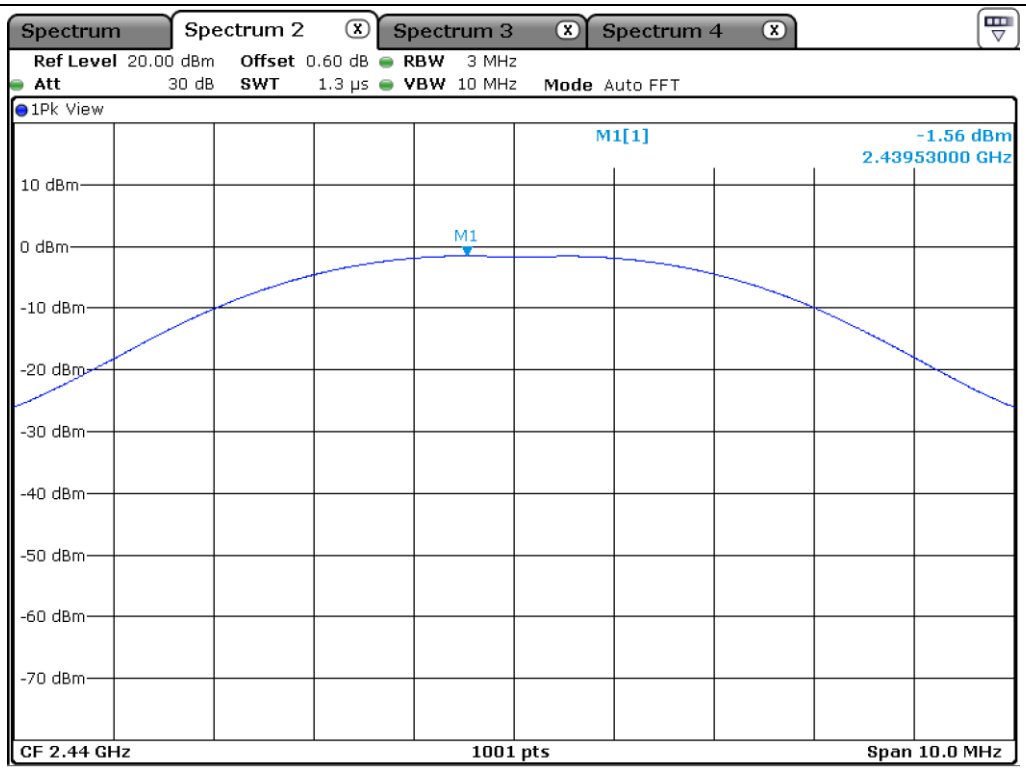
-. Test Result : Pass

| Channel | Frequency (MHz) | 6 dB Bandwidth (kHz) | Measured Value (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|
| Low | 2 405.00 | 1 578.40 | -0.84 | 30.00 | 30.84 |
| Middle | 2 440.00 | 1 573.40 | -1.56 | 30.00 | 31.56 |
| High | 2 480.00 | 1 568.40 | -1.62 | 30.00 | 31.62 |

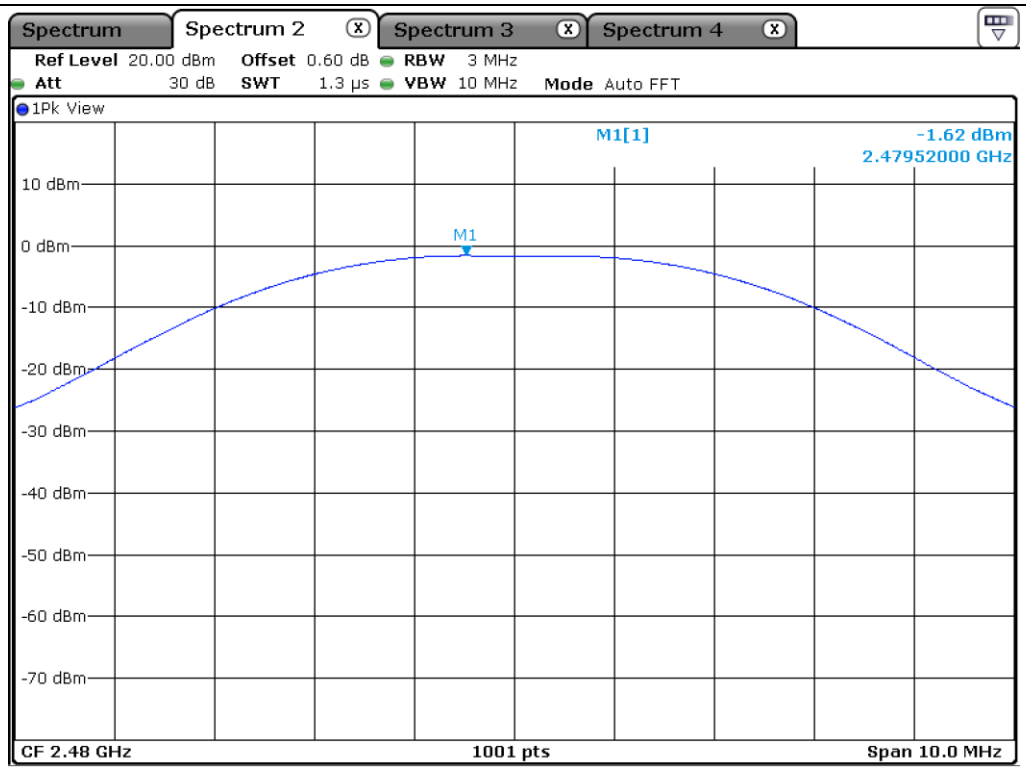
Remark. Margin = Limit – Measured value (=Receiver Reading + Cable Loss)




Low Channel




Middle Channel




High Channel

# 9. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

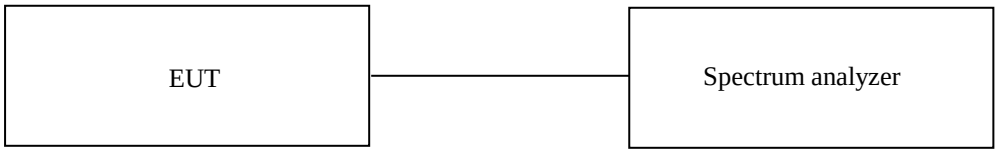
## 9.1 Operating environment

Temperature : 22 °C

Relative humidity : 46 % R.H.

## 9.2 Test set-up for conducted measurement

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz, the video bandwidth is set to 3 times the resolution bandwidth and peak detection was used.




## 9.3 Test set-up for radiated measurement

The radiated emissions measurements were performed on the 3 m semi anechoic chamber. The EUT was placed on turntable approximately 1.5 m above the ground plane.

The frequency spectrum from 30 MHz to 26.5 GHz was scanned and maximum emission levels at each frequency recorded. The system was rotated 360°, and the antenna was varied in the height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for horizontal and vertical polarization of the receiving antenna.

## 9.4 Test Date

July 12, 2021 ~ August 03, 2021



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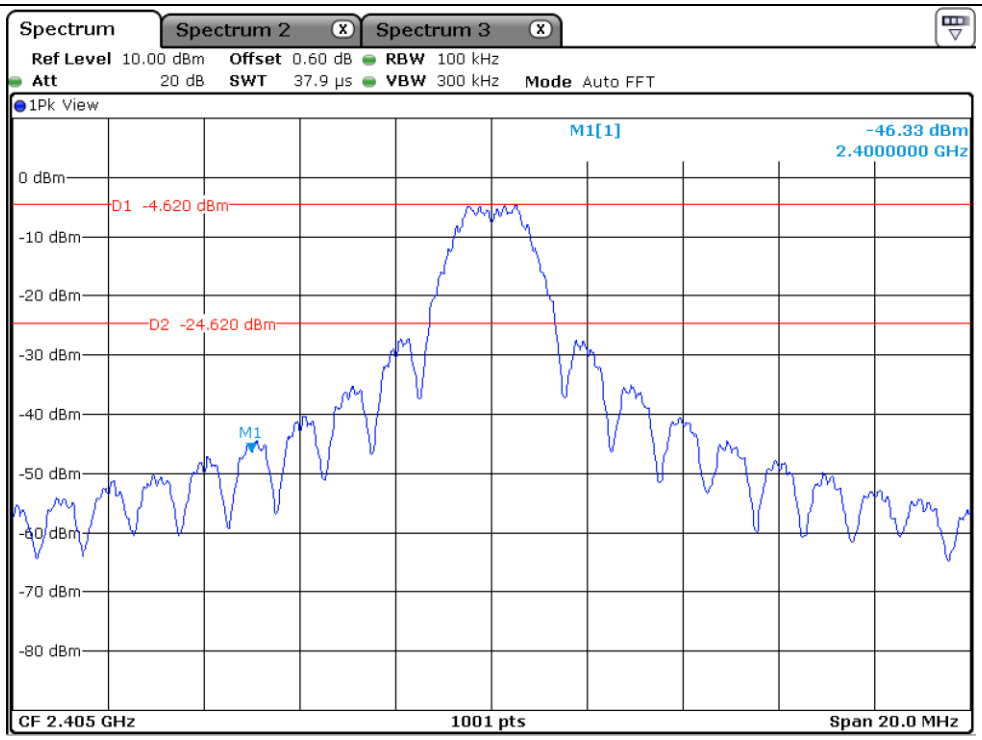
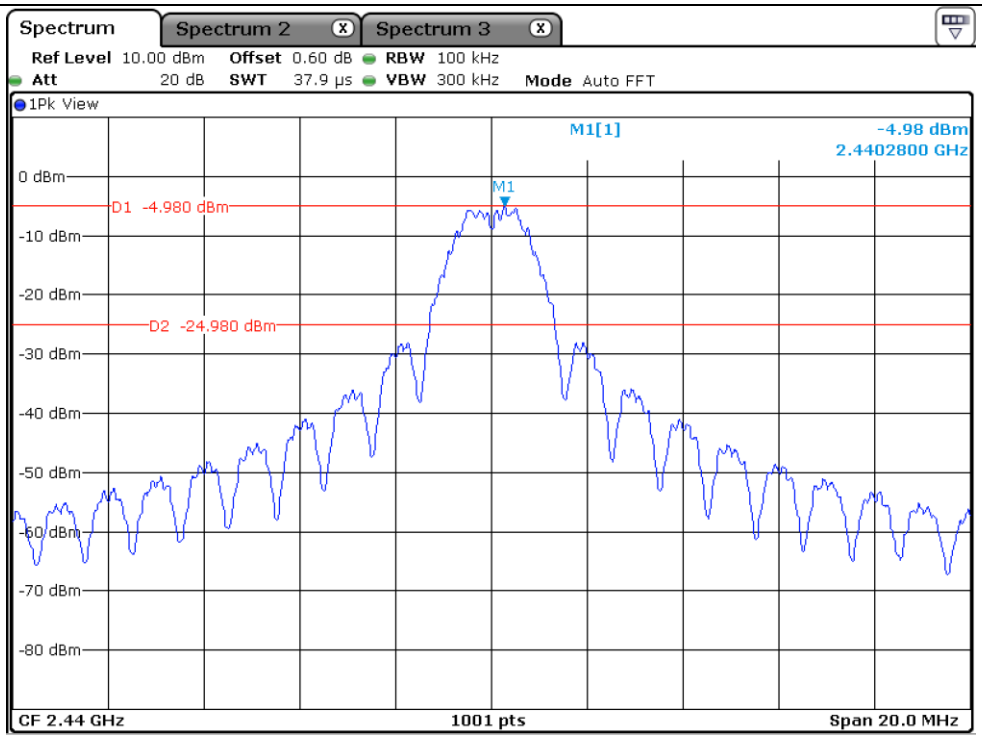
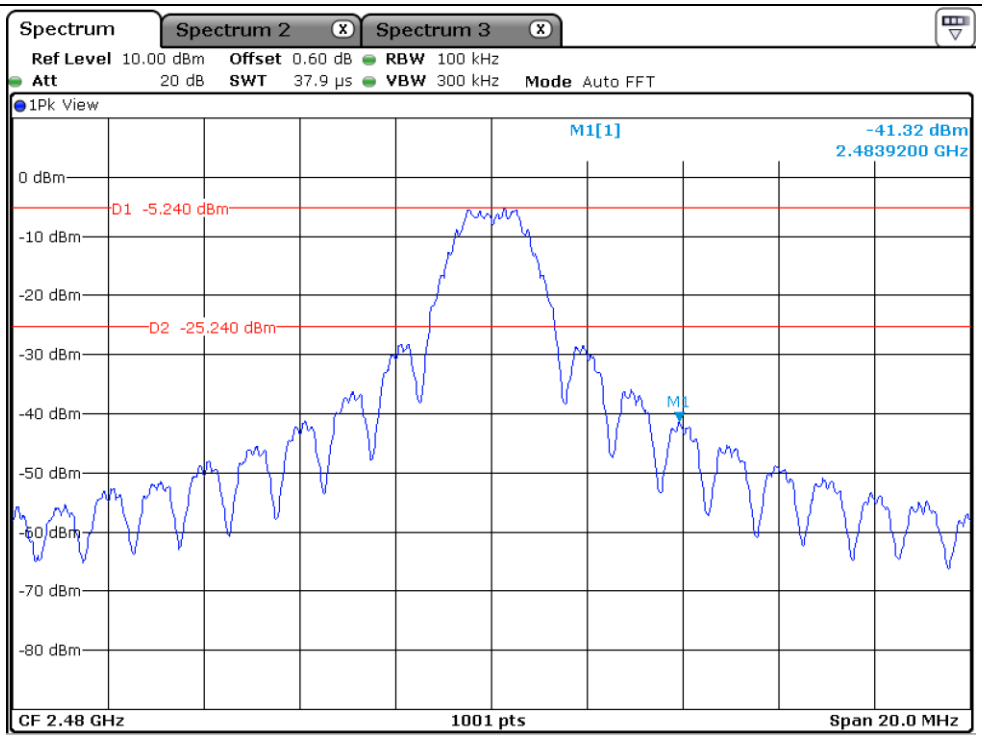
## 9.5 Test data for conducted emission



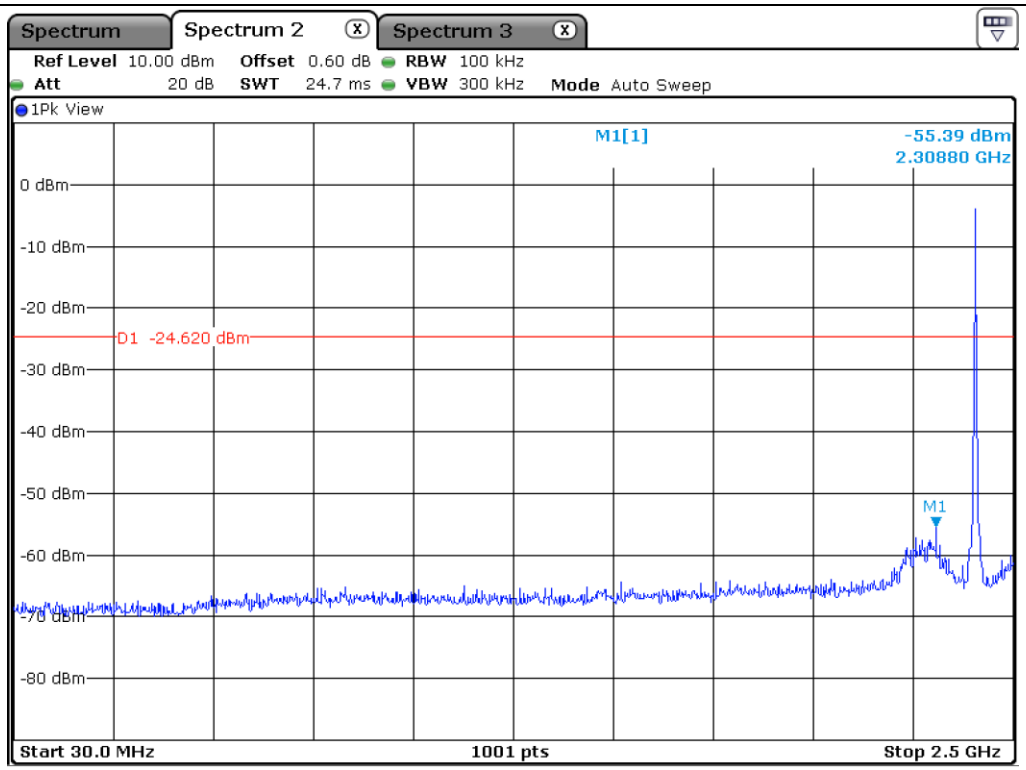

Low Channel



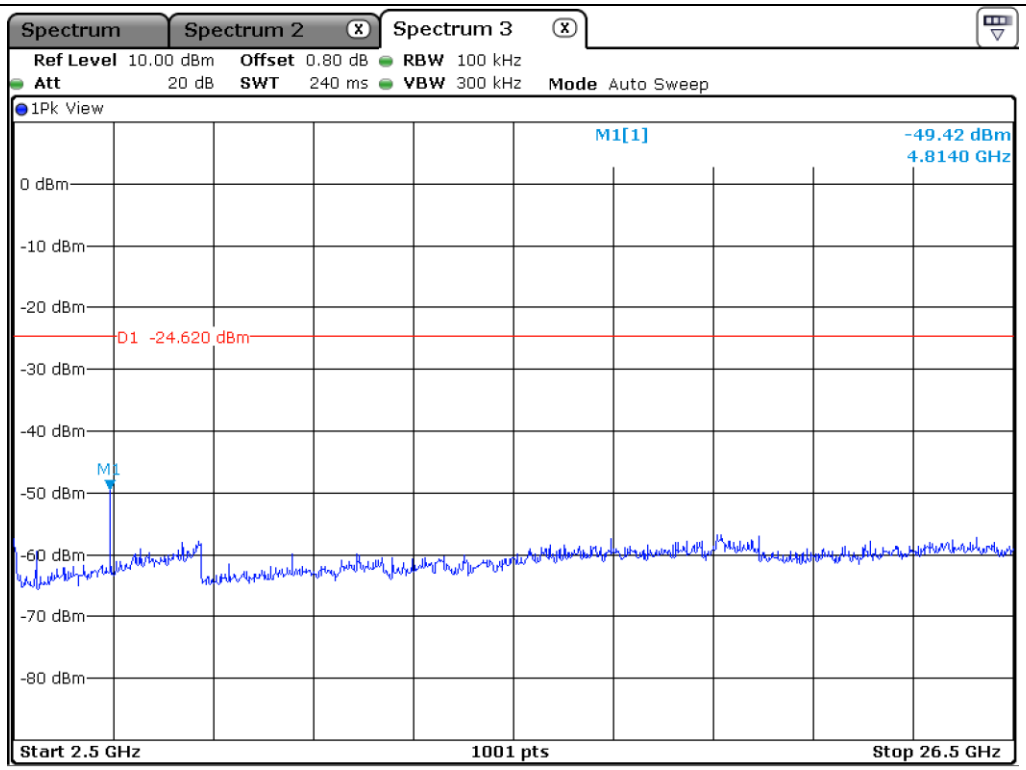

Middle Channel



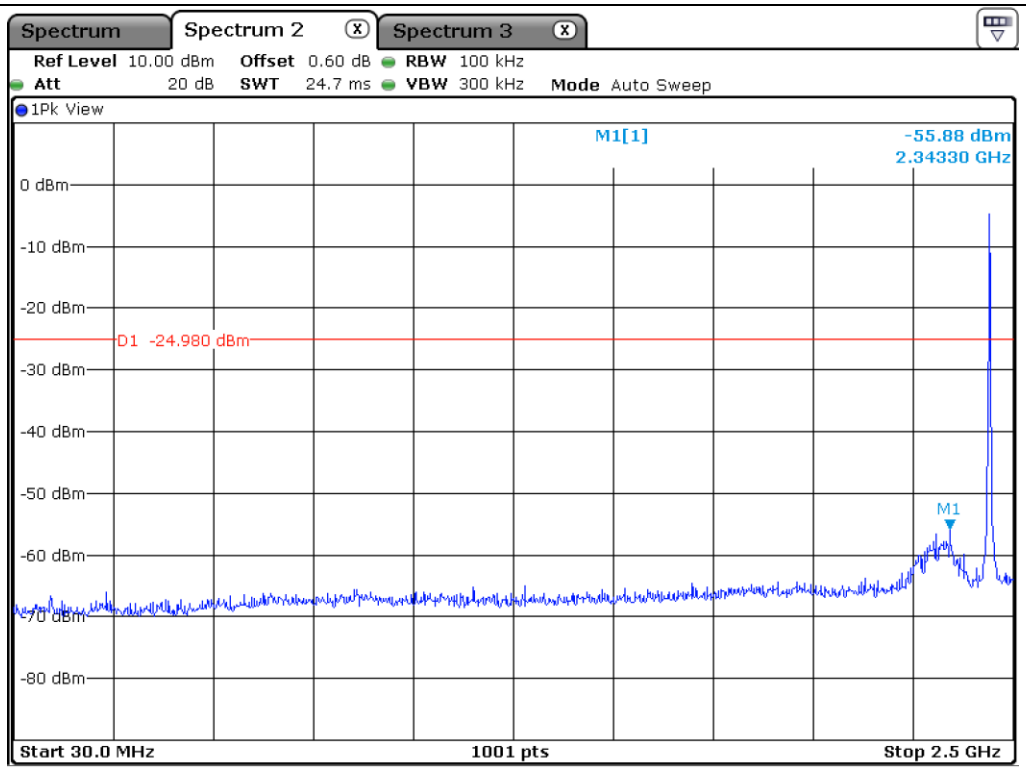

High Channel



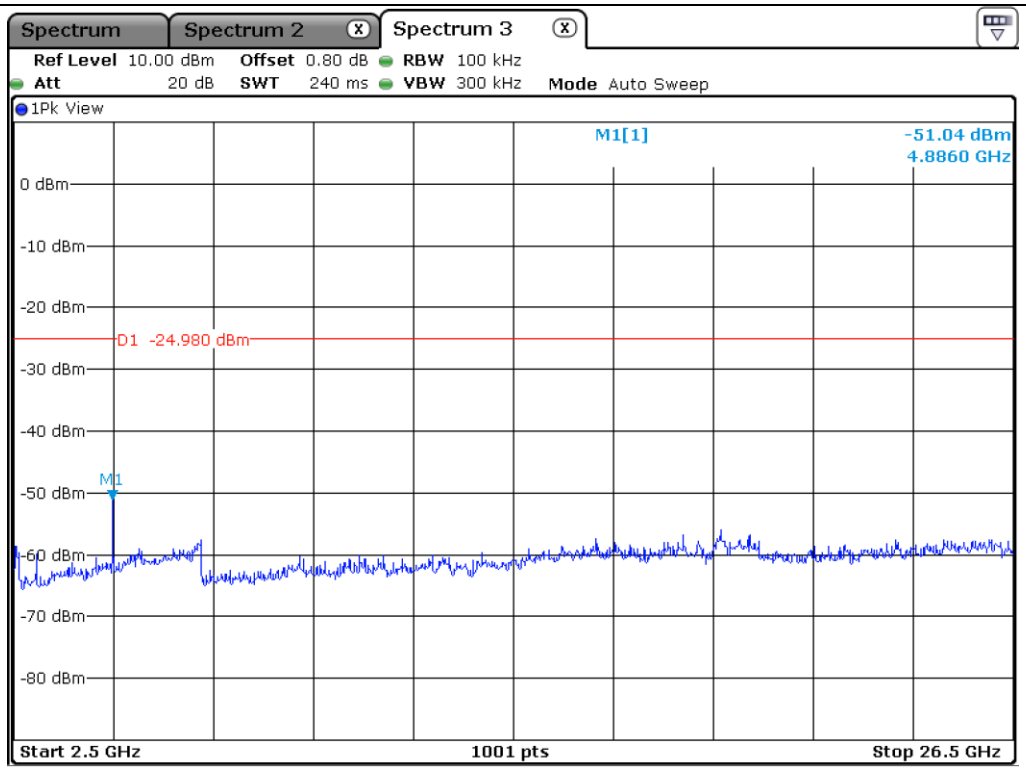

Low Channel



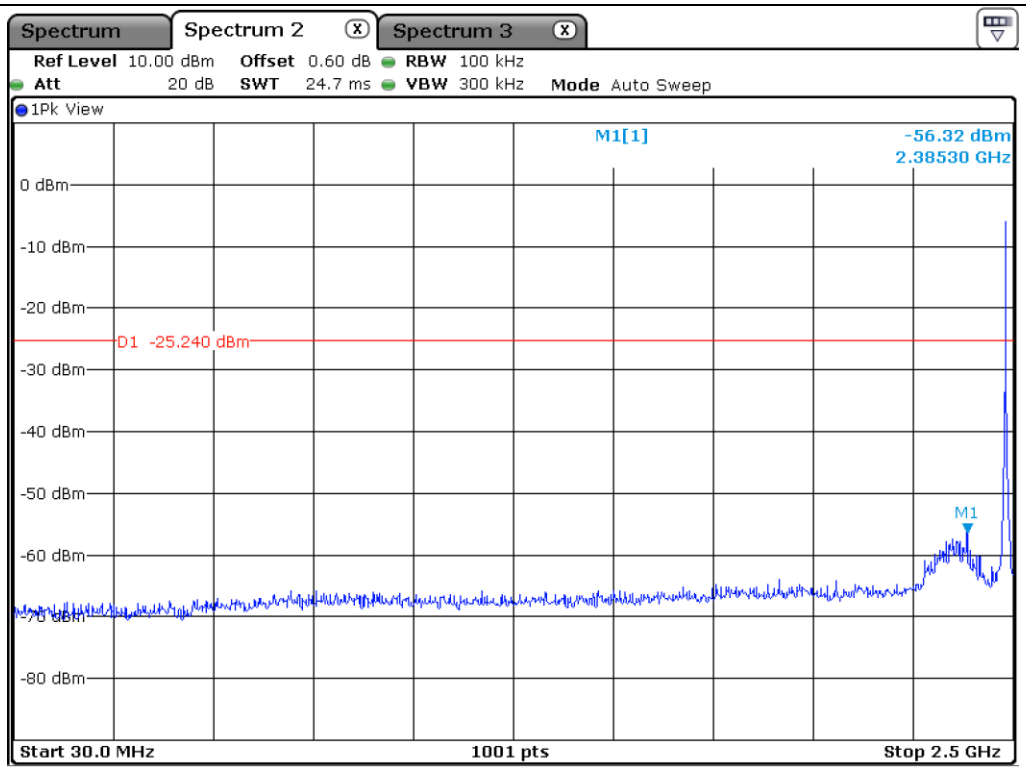

Low Channel



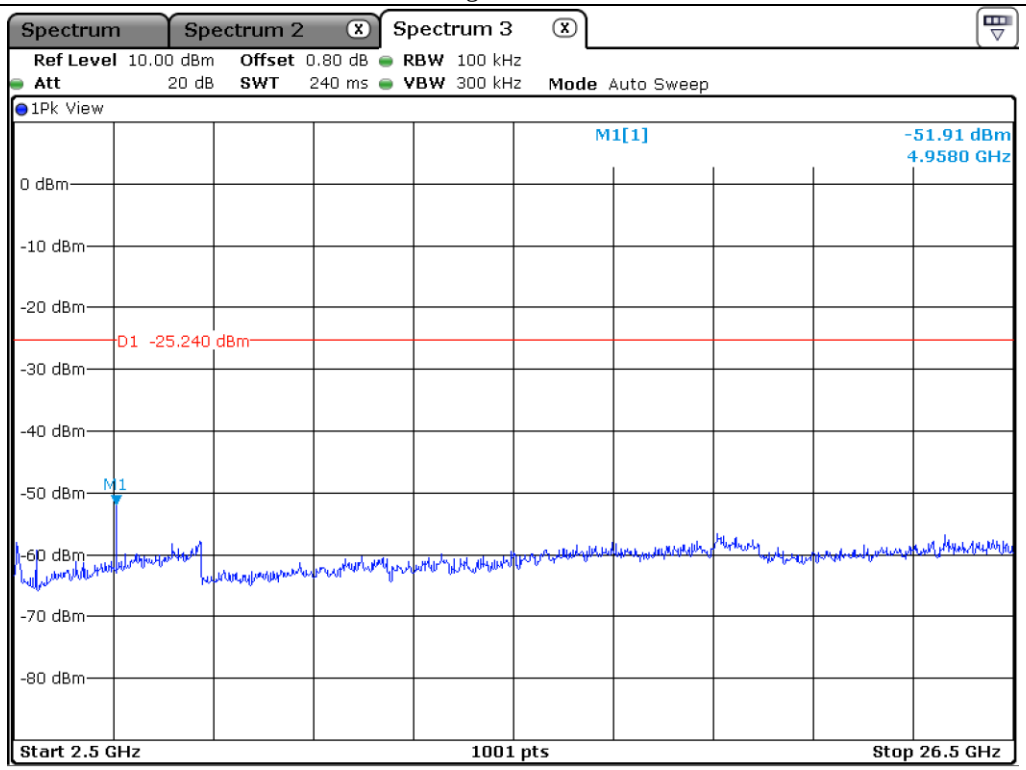

Middle Channel




Middle Channel




High Channel




High Channel

## 9.6 Test data for radiated emission

### 9.6.1 Radiated Emission which fall in the Restricted Band

-. Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode
1 MHz and RMS Detector for Average Mode

-. Video bandwidth : 3 MHz for Peak and Average Mode

-. Measurement distance : 3 m

-. Duty Cycle : 100 %

-. Result : PASSED

| Frequency (MHz) | Reading (dBµV) | Detector Mode | Ant. Pol. (H/V) | Ant. Factor | Cable Loss | AMP Gain | Duty Factor (dB) | Total (dBµV/m) | Limits (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Test Data for Low Channel** | | | | | | | | | | |
| 2 316.51 | 53.70 | Peak | H | 28.30 | 8.20 | 46.15 | - | 44.05 | 74.00 | 29.95 |
| 2 324.36 | 45.37 | Average | H | 28.30 | 8.20 | 46.15 | - | 35.72 | 54.00 | 18.28 |
| 2 339.80 | 53.42 | Peak | V | 28.30 | 8.20 | 46.15 | - | 43.77 | 74.00 | 30.23 |
| 2 340.10 | 44.09 | Average | V | 28.30 | 8.20 | 46.15 | - | 34.44 | 54.00 | 19.56 |
| **Test Data for High Channel** | | | | | | | | | | |
| 2 483.50 | 66.43 | Peak | H | 28.70 | 8.33 | 46.06 | - | 57.40 | 74.00 | 16.60 |
| 2 483.50 | 60.70 | Average | H | 28.70 | 8.33 | 46.06 | - | 51.67 | 54.00 | 2.33 |
| 2 483.50 | 64.30 | Peak | V | 28.70 | 8.33 | 46.06 | - | 55.27 | 74.00 | 18.73 |
| 2 483.50 | 58.65 | Average | V | 28.70 | 8.33 | 46.06 | - | 49.62 | 54.00 | 4.38 |

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBµV/m) - Total Level (dBµV/m)

Total Level = Reading + Antenna Factor + Cable Loss + Duty Factor - AMP Gain

### 9.6.2 Spurious & Harmonic Radiated Emission

-. Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
1 MHz for Peak Mode for the emissions outside restricted band

-. Video bandwidth : 3 MHz for Peak and Average Mode

-. Frequency range : 1 GHz ~ 26.5 GHz

-. Measurement distance : 3 m

-. Duty Cycle : 100 %

-. Result : PASSED

| Frequency (MHz) | Reading (dBμV) | Detector Mode | Ant. Pol. (H/V) | Ant. Factor | Cable Loss | AMP Gain | Duty Factor (dB) | Total (dBμV/m) | Limits (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Test Data for Low Channel** | | | | | | | | | | |
| 4 810.00 | 52.16 | Peak | H | 33.40 | 11.21 | 45.73 | - | 51.04 | 74.00 | 22.96 |
| 4 810.00 | 42.54 | Average | H | 33.40 | 11.21 | 45.73 | - | 41.42 | 54.00 | 12.58 |
| 4 810.00 | 51.95 | Peak | V | 33.40 | 11.21 | 45.73 | - | 50.83 | 74.00 | 23.17 |
| 4 810.00 | 42.16 | Average | V | 33.40 | 11.21 | 45.73 | - | 41.04 | 54.00 | 12.96 |
| **Test Data for Middle Channel** | | | | | | | | | | |
| 4 880.00 | 51.68 | Peak | H | 33.50 | 11.23 | 45.80 | - | 50.61 | 74.00 | 23.39 |
| 4 880.00 | 41.98 | Average | H | 33.50 | 11.23 | 45.80 | - | 40.91 | 54.00 | 13.09 |
| 4 880.00 | 51.33 | Peak | V | 33.50 | 11.23 | 45.80 | - | 50.26 | 74.00 | 23.74 |
| 4 880.00 | 41.53 | Average | V | 33.50 | 11.23 | 45.80 | - | 40.46 | 54.00 | 13.54 |
| **Test Data for High Channel** | | | | | | | | | | |
| 4 960.00 | 50.95 | Peak | H | 33.40 | 11.31 | 45.89 | - | 49.77 | 74.00 | 24.23 |
| 4 960.00 | 41.57 | Average | H | 33.40 | 11.31 | 45.89 | - | 40.39 | 54.00 | 13.61 |
| 4 960.00 | 50.89 | Peak | V | 33.40 | 11.31 | 45.89 | - | 49.71 | 74.00 | 24.29 |
| 4 960.00 | 41.15 | Average | V | 33.40 | 11.31 | 45.89 | - | 39.97 | 54.00 | 14.03 |

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBμV/m) - Total Level (dBμV/m)

Total Level = Reading + Antenna Factor + Cable Loss + Duty Factor - AMP Gain

# 10. PEAK POWER SPECTRAL DENSITY

## 10.1 Operating environment

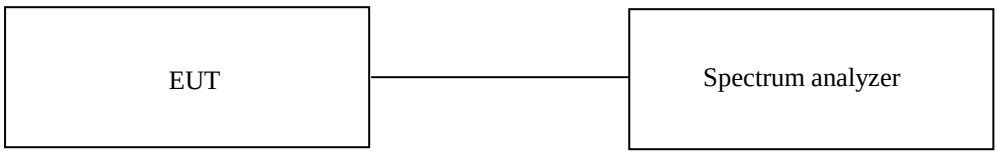
Temperature : 22 °C

Relative humidity : 46 % R.H.

## 10.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer.

The resolution bandwidth is set to 3 kHz ≤ RBW ≤100 kHz, the video bandwidth is set to 3 times the resolution bandwidth.




## 10.3 Test Date

July 12, 2021 ~ August 03, 2021



**ONETECH Corp.**: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

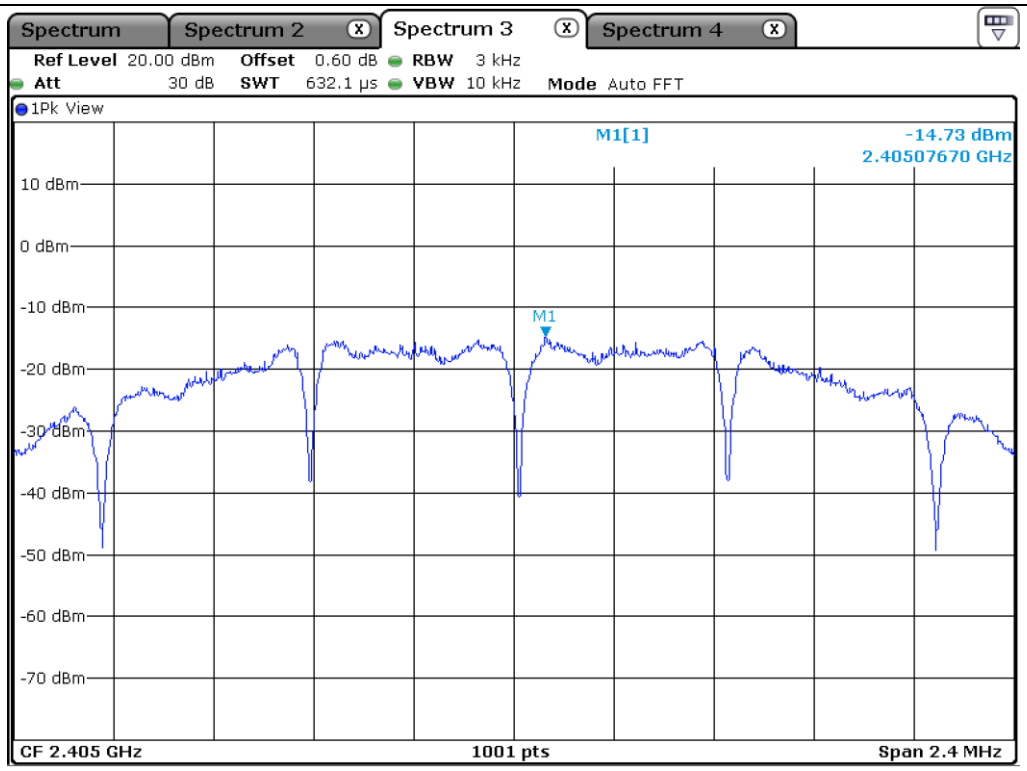
## 10.4 Test data

-. Test Result : Pass

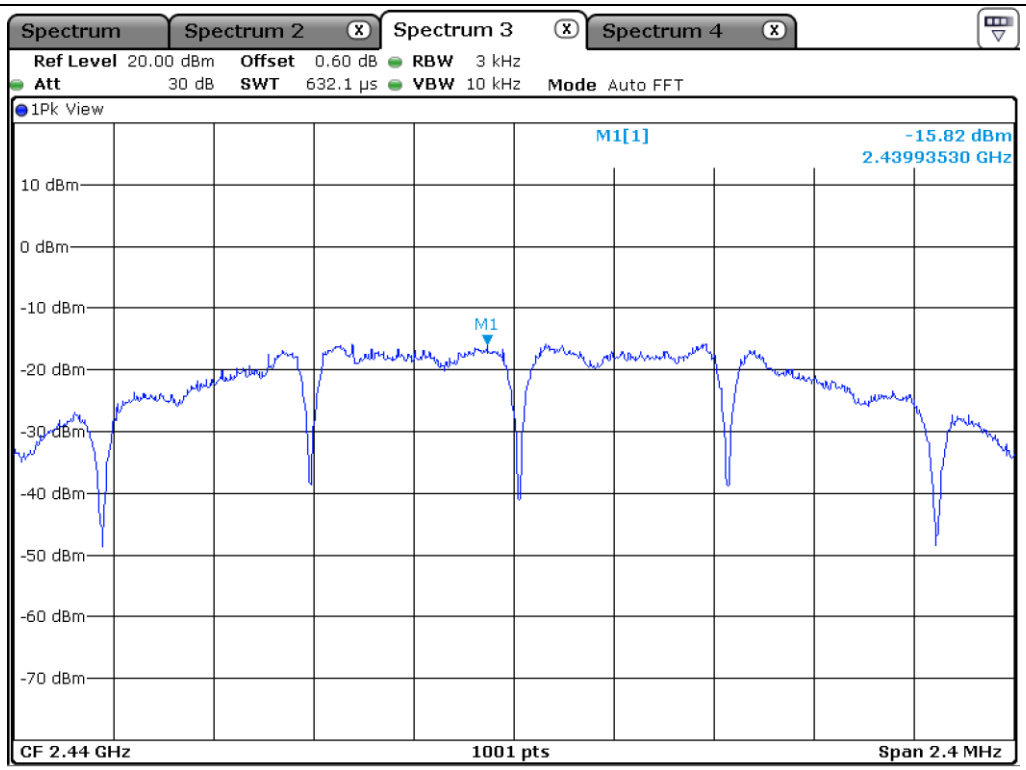
-. Operating Condition : Continuous transmitting mode

| Channel | Frequency (MHz) | Measured Value (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| Low | 2 405.00 | -14.73 | 8.00 | 22.73 |
| Middle | 2 440.00 | -15.82 | 8.00 | 23.82 |
| High | 2 480.00 | -16.01 | 8.00 | 24.01 |

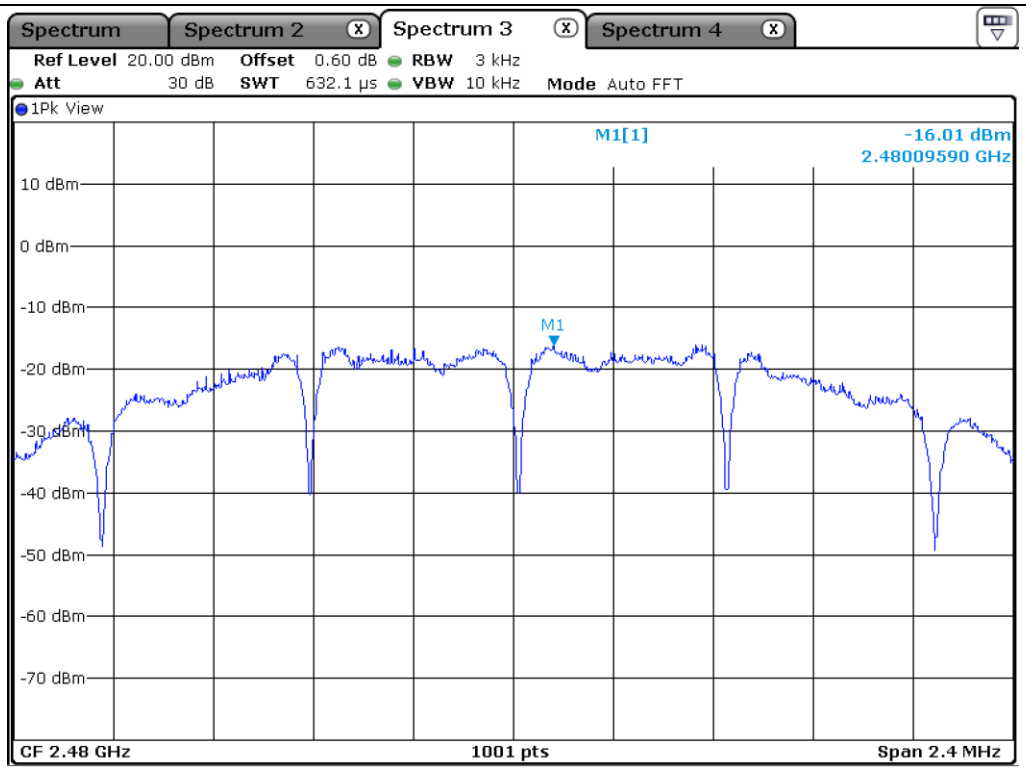
Remark. Margin = Limit – Measured value (=Receiver Reading + Cable Loss)




Low Channel




Middle Channel




High Channel

# 11. RADIATED EMISSION TEST

## 11.1 Operating environment

| | | |
|---|---|---|
| Temperature | : | 22 °C |
| Relative humidity | : | 46 % R.H. |

## 11.2 Test set-up

The radiated emissions measurements were on the 3 m semi anechoic chamber. The EUT and other support equipment were placed on a non-conductive turntable above the ground plane. The interconnecting cables from outside test site were inserted into ferrite clamps at the point where the cables reach the turntable.

The frequency spectrum from 30 MHz to 26.5 GHz was scanned and emission levels maximized at each frequency recorded. The system was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

## 11.3 Test Date

July 12, 2021 ~ August 03, 2021



**ONETECH Corp.**: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

### 11.4 Test data for 30 MHz ~ 1000 MHz

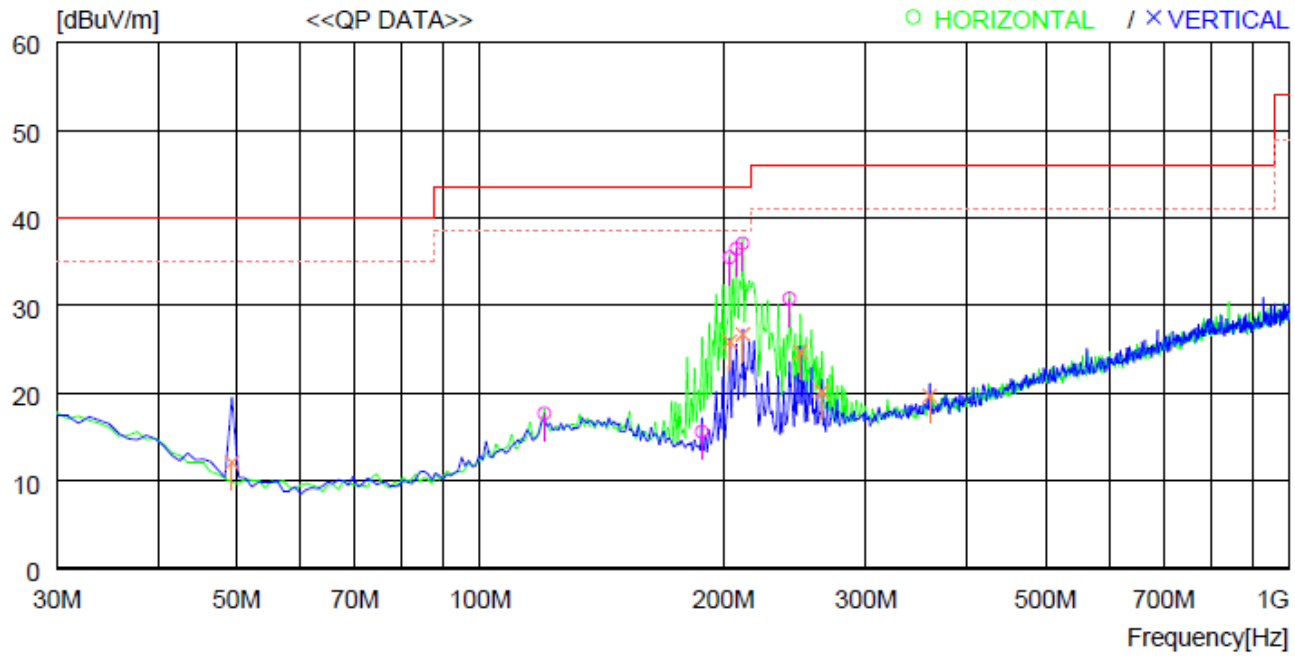
Humidity Level : 46 % R.H. Temperature: 22 °C

Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : Zigbee/BLE Module

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)




| No. | FREQ [MHz] | READING QP [dBuV] | ANT FACTOR [dB] | LOSS [dB] | GAIN [dB] | RESULT [dBuV/m] | LIMIT [dBuV/m] | MARGIN [dB] | ANTENNA [cm] | TABLE [DEG] |
|---|---|---|---|---|---|---|---|---|---|---|
| ----- Horizontal ------ | | | | | | | | | | |
| 1 | 120.210 | 29.1 | 18.6 | 2.0 | 32.0 | 17.7 | 43.5 | 25.8 | 100 | 254 |
| 2 | 188.110 | 29.0 | 16.2 | 2.4 | 32.0 | 15.6 | 43.5 | 27.9 | 200 | 0 |
| 3 | 203.630 | 49.2 | 15.8 | 2.5 | 32.0 | 35.5 | 43.5 | 8.0 | 200 | 0 |
| 4 | 207.510 | 50.1 | 15.9 | 2.5 | 32.0 | 36.5 | 43.5 | 7.0 | 200 | 0 |
| 5 | 211.390 | 50.5 | 16.1 | 2.5 | 32.0 | 37.1 | 43.5 | 6.4 | 200 | 0 |
| 6 | 241.460 | 42.7 | 17.4 | 2.7 | 32.0 | 30.8 | 46.0 | 15.2 | 200 | 358 |
| ----- Vertical ------ | | | | | | | | | | |
| 7 | 49.400 | 29.4 | 13.4 | 1.4 | 32.1 | 12.1 | 40.0 | 27.9 | 100 | 0 |
| 8 | 203.630 | 39.6 | 15.8 | 2.5 | 32.0 | 25.9 | 43.5 | 17.6 | 100 | 305 |
| 9 | 211.390 | 40.1 | 16.1 | 2.5 | 32.0 | 26.7 | 43.5 | 16.8 | 200 | 359 |
| 10 | 249.220 | 36.1 | 17.8 | 2.8 | 32.0 | 24.7 | 46.0 | 21.3 | 100 | 0 |
| 11 | 264.740 | 31.1 | 18.2 | 2.9 | 32.0 | 20.2 | 46.0 | 25.8 | 100 | 275 |
| 12 | 359.800 | 28.4 | 20.1 | 3.3 | 32.1 | 19.7 | 46.0 | 26.3 | 400 | 308 |



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### 11.5 Test data for Below 30 MHz

-. Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)

-. Frequency range : 9 kHz ~ 30 MHz

-. Measurement distance : 3 m

-.Operating mode : Transmitting mode

| Frequency (MHz) | Reading (dBµV) | Ant. Pol. (H/V) | Ant. Height (m) | Angle (°) | Ant. Factor (dB/m) | Cable Loss | Emission Level(dBµV/m) | Limits (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| Emission from the EUT more than 20 dB below the limit in each frequency range. | | | | | | | | | |

### 11.6 Test data for above 1 GHz

-. Resolution bandwidth : 1 MHz for Peak and Average Mode

-. Video bandwidth : 3 MHz for Peak and Average Mode

-. Frequency range : 1 GHz ~ 26.5 GHz

-. Measurement distance : 3 m

-.Operating mode : Transmitting mode

| Frequency (MHz) | Reading (dBµV) | Ant. Pol. (H/V) | Ant. Height (m) | Angle (°) | Ant. Factor (dB/m) | Cable Loss | Emission Level(dBµV/m) | Limits (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| Emission from the EUT more than 20 dB below the limit in each frequency range. | | | | | | | | | |

# 12. CONDUCTED EMISSION TEST

## 12.1 Operating environment

| | | |
|---|---|---|
| Temperature | : | 23 °C |
| Relative humidity | : | 48 % R.H. |

## 12.2 Test set-up

The EUT was placed on a wooden table, 0.8 m height above the floor. Power was fed to the EUT through a 50 Ω / 50 μH + 5 Ω Artificial Mains Network (AMN). The ground plane was electrically bonded to the reference ground system and all power lines were filtered from ambient.

## 12.3 Test Date

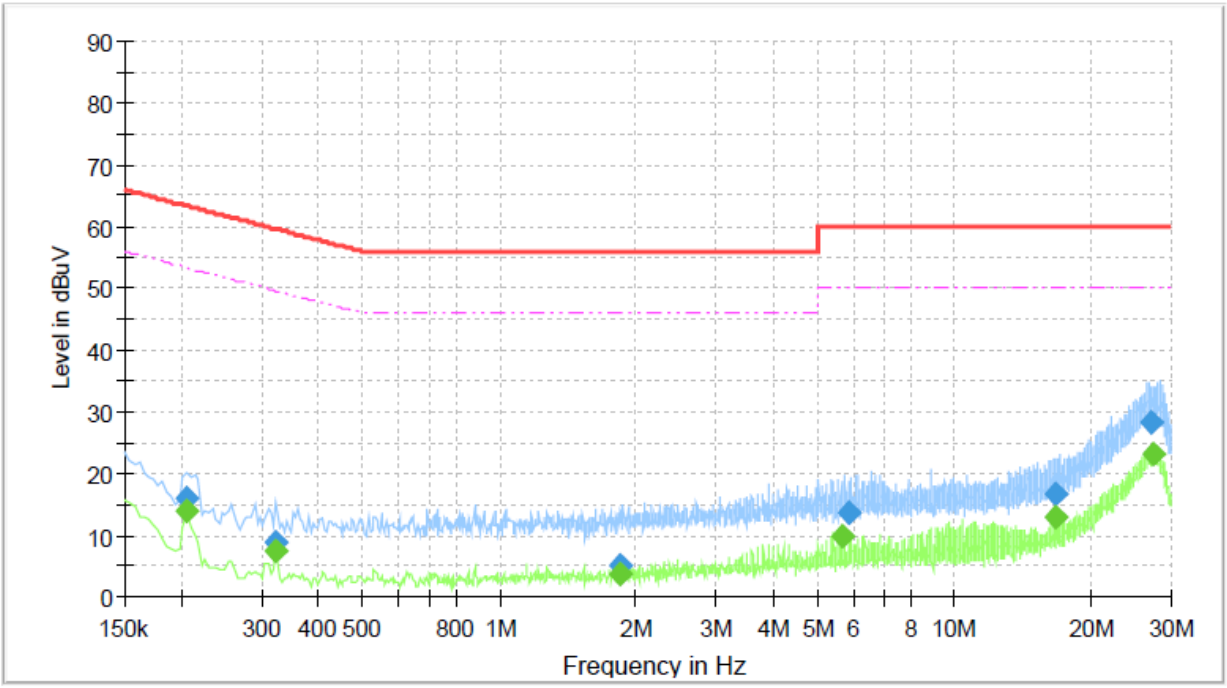
July 12, 2021 ~ August 03, 2021

### 12.4 Test data

-. Resolution bandwidth : 9 kHz

-. Frequency range : 0.15 MHz ~ 30 MHz

-. Tested Line : HOT LINE



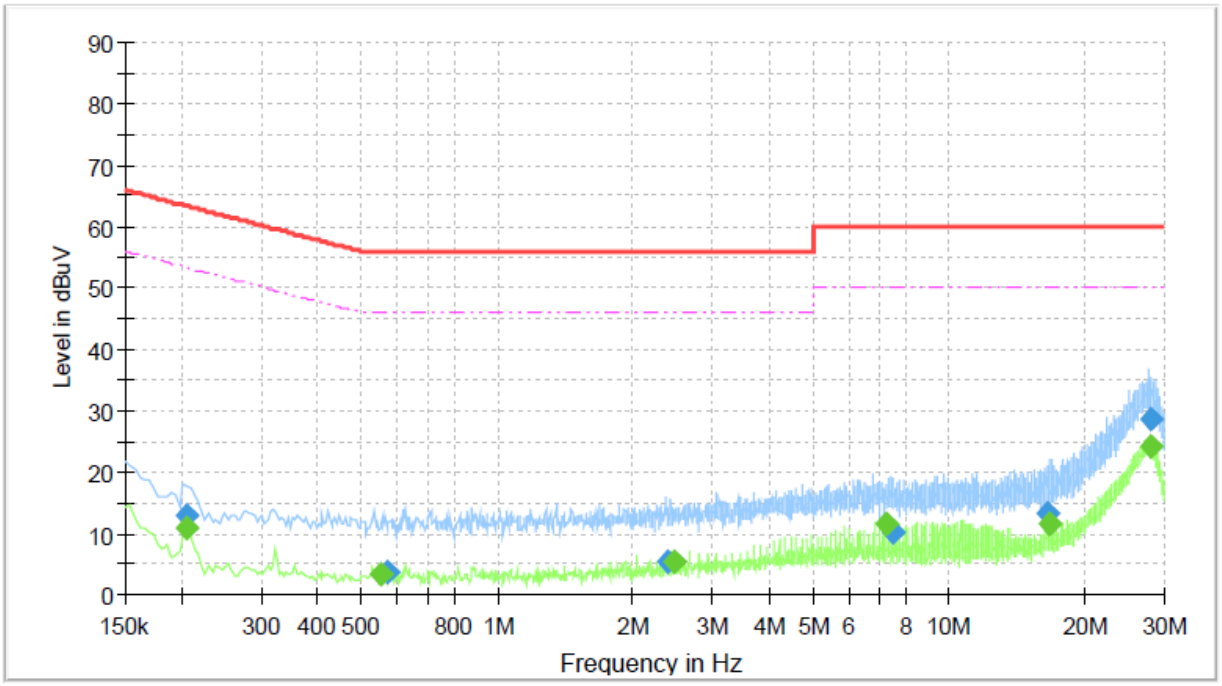

## Final_Result

| Frequency (MHz) | QuasiPeak (dBuV) | CAverage (dBuV) | Limit (dBuV) | Margin (dB) | Bandwidth (kHz) | Line | Corr. (dB) |
|---|---|---|---|---|---|---|---|
| 0.206 | --- | 13.89 | 53.39 | 39.49 | 9.0 | L1 | 9.92 |
| 0.206 | 15.98 | --- | 63.39 | 47.41 | 9.0 | L1 | 9.92 |
| 0.324 | --- | 7.42 | 49.62 | 42.20 | 9.0 | L1 | 9.93 |
| 0.324 | 8.77 | --- | 59.62 | 50.84 | 9.0 | L1 | 9.93 |
| 1.853 | --- | 3.75 | 46.00 | 42.25 | 9.0 | L1 | 10.01 |
| 1.853 | 5.23 | --- | 56.00 | 50.77 | 9.0 | L1 | 10.01 |
| 5.655 | --- | 9.91 | 50.00 | 40.09 | 9.0 | L1 | 10.10 |
| 5.855 | 13.76 | --- | 60.00 | 46.24 | 9.0 | L1 | 10.11 |
| 16.639 | 16.76 | --- | 60.00 | 43.24 | 9.0 | L1 | 10.56 |
| 16.755 | --- | 12.96 | 50.00 | 37.04 | 9.0 | L1 | 10.56 |
| 27.147 | 28.38 | --- | 60.00 | 31.62 | 9.0 | L1 | 10.73 |
| 27.326 | --- | 23.15 | 50.00 | 26.85 | 9.0 | L1 | 10.74 |



**ONETECH Corp.**: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

-. Tested Line : NEUTRAL LINE




## Final_Result

| Frequency (MHz) | QuasiPeak (dBuV) | CAverage (dBuV) | Limit (dBuV) | Margin (dB) | Bandwidth (kHz) | Line | Corr. (dB) |
|---|---|---|---|---|---|---|---|
| 0.206 | --- | 11.04 | 53.39 | 42.35 | 9.0 | N | 9.94 |
| 0.207 | 13.11 | --- | 63.35 | 50.23 | 9.0 | N | 9.94 |
| 0.555 | --- | 3.48 | 46.00 | 42.52 | 9.0 | N | 9.95 |
| 0.569 | 3.83 | --- | 56.00 | 52.17 | 9.0 | N | 9.95 |
| 2.381 | 5.59 | --- | 56.00 | 50.41 | 9.0 | N | 10.03 |
| 2.469 | --- | 5.42 | 46.00 | 40.58 | 9.0 | N | 10.03 |
| 7.278 | --- | 11.49 | 50.00 | 38.51 | 9.0 | N | 10.23 |
| 7.498 | 10.23 | --- | 60.00 | 49.77 | 9.0 | N | 10.24 |
| 16.543 | 13.30 | --- | 60.00 | 46.70 | 9.0 | N | 10.67 |
| 16.751 | --- | 11.58 | 50.00 | 38.42 | 9.0 | N | 10.68 |
| 28.051 | --- | 24.30 | 50.00 | 25.70 | 9.0 | N | 10.83 |
| 28.198 | 28.70 | --- | 60.00 | 31.30 | 9.0 | N | 10.83 |

Remark: Margin (dB) = Limit – Level (Result)

The emission level in above table is included the transducer factor that means insertion loss (LISN), cable loss and attenuator.

## 13 LIST OF TEST EQUIPMENT

| Model Number | Manufacturer | Description | Serial Number | Last Cal.(Interval) |
|---|---|---|---|---|
| FSV40-N | Rohde & Schwarz | Signal Analyzer | 101457 | Apr. 16, 2021 (1Y) |
| ESW 44 | Rohde & Schwarz | EMI Test Receiver | 101851 | Mar. 23, 2021 (1Y) |
| ESR3 | Rohde & Schwarz | EMI Test Receiver | 102602 | Mar. 15, 2021 (1Y) |
| 310N | Sonoma Instrument | Pre-Amplifier | 312544 | Mar. 16, 2021 (1Y) |
| GP-4303D | LG Precision Co.,Ltd | DC POWER SUPPLY | 5071069 | Jan. 06, 2021(1Y) |
| SCU40A | Rohde & Schwarz | Signal Conditioning unit | 100436 | Feb. 28, 2021 (1Y) |
| SCU18 | Rohde & Schwarz | Signal Conditioning unit | 102266 | Jul. 14, 2021 (1Y) |
| DT3000-3t | Innco System | Turn Table | DT3000/093 | N/A |
| CO3000 | Innco System | Controller | 1026/40960617/P | N/A |
| MA-4000XPET | Innco System | Antenna Master | MA4000/509 | N/A |
| HLP-2008 | TDK RF Solutions | Hybrid Antenna | 131316 | Feb. 27, 2020 (2Y) |
| AH-118 | Com-Power | Horn Antenna | 10050061 | Oct. 15, 2020 (1Y) |
| BBHA9170 | Schwarzbeck | Horn Antenna | BBHA9170178 | Jan. 07, 2021(1Y) |
| FMZB 1513 | Schwarzbeck | Loop Antenna | 1513-235 | Mar. 24, 2020 (2Y) |
| HPF 3GHz | Rohde & Schwarz | High Pass Filter | N/A | Feb. 08, 2021 (1Y) |
| NSLK8126 | Schwarzbeck | LISN | 8126479 | Mar. 15, 2021 (1Y) |
| ESH3Z2 | Rohde & Schwarz | PULSE LIMITER | 357.8810.52 | Mar. 15, 2021 (1Y) |