# TEST REPORT

**DT&C Co., Ltd.**
42, Yurim-ro, 154Beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea, 17042
Tel : 031-321-2664, Fax : 031-321-1664

1. Report No : DRTFCC2205-0115

2. Customer

- Name (FCC) : Wizbiosolutions Inc.
- Address (FCC) : A-802, 14, Sagimakgol-ro 45beon-gil, Jungwon-gu Seongnam-si, Gyeonggi-do South Korea 13209

3. Use of Report : FCC Original Grant

4. Product Name / Model Name : CLEO™ ONE / CL0001P
   FCC ID : 2A62W-CL0001P

5. FCC Regulation(s): Part 15.247
   Test Method used: KDB558074 D01v05r02, ANSI C63.10-2013

6. Date of Test : 2022.04.15 ~2022.05.10

7. Location of Test : ☒ Permanent Testing Lab ☐ On Site Testing

8. Testing Environment : See appended test report.

9. Test Result : Refer to the attached test result.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
This test report is not related to KOLAS accreditation.

| | | |
|---|---|---|
| Affirmation | Tested by<br>Name : ChangWon Lee (Signature) | Technical Manager<br>Name : JaeJin Lee (Signature) |

**2022 . 05 . 30 .**

**DT&C Co., Ltd.**

**If this report is required to confirmation of authenticity, please contact to report@dtnc.net**

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# Test Report Version

| Test Report No. | Date | Description | Revised by | Reviewed by |
|---|---|---|---|---|
| DRTFCC2205-0115 | May, 30. 2022 | Initial issue | ChangWon Lee | JaeJin Lee |
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# 1. General Information

## 1.1. Description of EUT

| | |
|---|---|
| **Equipment Class** | Digital Transmission System (DTS) |
| **Product Name** | CLEO™ ONE |
| **Model Name** | CL0001P |
| **Add Model Name** | - |
| **Firmware Version Identification Number** | COL103 v1.00.000b |
| **EUT Serial Number** | No specified |
| **Power Supply** | DC 12 V |
| **Frequency Range** | 2 402 MHz ~ 2 480 MHz |
| **Modulation Technique (Data rate)** | GFSK (1Mbps) |
| **Antenna Specification** | Antenna Type: PCB Antenna<br>Gain: -3.24 dBi (PK) |

## 1.2. Declaration by the applicant / manufacturer

N/A

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## 1.3. Testing Laboratory

| DT&C Co., Ltd. | | |
|---|---|---|
| The 3 m test site and conducted measurement facility used to collect the radiated data are located at the 42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 17042.<br>The test site complies with the requirements of Part 2.948 according to ANSI C63.4-2014.<br>**- FCC & IC MRA Designation No. : KR0034**<br>**- ISED#: 5740A** | | |
| www.dtnc.net | | |
| Telephone | : | + 82-31-321-2664 |
| FAX | : | + 82-31-321-1664 |

## 1.4. Testing Environment

| Ambient Condition | |
|---|---|
| ▪ Temperature | +20 ℃ ~ +25 ℃ |
| ▪ Relative Humidity | +35 % ~ +40 % |

## 1.5. Measurement Uncertainty

The measurement uncertainties shown below were calculated in accordance with requirements of ANSI C63.4-2014 and ANSI C63.10-2013. All measurement uncertainty values are shown with a coverage factor of *k* = 2 to indicate a 95 % level of confidence.

| Parameter | Measurement uncertainty |
|---|---|
| AC power-line conducted emission | 3.4 dB (The confidence level is about 95 %, k = 2) |
| Radiated emission (1 GHz Below) | 4.9 dB (The confidence level is about 95 %, k = 2) |
| Radiated emission (1 GHz ~ 18 GHz) | 5.0 dB (The confidence level is about 95 %, k = 2) |
| Radiated emission (18 GHz Above) | 5.3 dB (The confidence level is about 95 %, k = 2) |

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## 1.6. Test Equipment List

| Type | Manufacturer | Model | Cal.Date (yy/mm/dd) | Next.Cal.Date (yy/mm/dd) | S/N |
|---|---|---|---|---|---|
| Spectrum Analyzer | Agilent Technologies | N9020A | 21/12/16 | 22/12/16 | MY48011700 |
| Spectrum Analyzer | Agilent Technologies | N9020A | 21/06/24 | 22/06/24 | US47360812 |
| Multimeter | FLUKE | 17B+ | 21/12/16 | 22/12/16 | 36390701WS |
| Signal Generator | Rohde Schwarz | SMBV100A | 21/12/16 | 22/12/16 | 255571 |
| Signal Generator | ANRITSU | MG3695C | 21/12/16 | 22/12/16 | 173501 |
| Thermohygrometer | BODYCOM | BJ5478 | 21/12/16 | 22/12/16 | 120612-2 |
| Thermohygrometer | BODYCOM | BJ5478 | 21/06/24 | 22/06/24 | N/A |
| Thermohygrometer | BODYCOM | BJ5478 | 21/12/16 | 22/12/16 | 120612-1 |
| Loop Antenna | ETS-Lindgren | 6502 | 21/01/28 | 23/01/28 | 00226186 |
| BILOG ANTENNA | Schwarzbeck | VULB 9160 | 21/12/16 | 22/12/16 | 3362 |
| Horn Antenna | ETS-Lindgren | 3117 | 21/06/24 | 22/06/24 | 00143278 |
| Horn Antenna | A.H.Systems Inc. | SAS-574 | 21/06/24 | 22/06/24 | 155 |
| PreAmplifier | tsj | MLA-0118-B01-40 | 21/12/16 | 22/12/16 | 1852267 |
| PreAmplifier | tsj | MLA-1840-J02-45 | 21/06/24 | 22/06/24 | 16966-10728 |
| PreAmplifier | H.P | 8447D | 21/12/16 | 22/12/16 | 2944A07774 |
| High Pass Filter | Wainwright Instruments | WHKX12-935-1000-15000-40SS | 21/06/24 | 22/06/24 | 8 |
| High Pass Filter | Wainwright Instruments | WHKX10-2838-3300-18000-60SS | 21/06/24 | 22/06/24 | 1 |
| High Pass Filter | Wainwright Instruments | WHNX8.0/26.5-6SS | 21/06/24 | 22/06/24 | 3 |
| Attenuator | Hefei Shunze | SS5T2.92-10-40 | 21/06/24 | 22/06/24 | 16012202 |
| Attenuator | SRTechnology | F01-B0606-01 | 21/06/24 | 22/06/24 | 13092403 |
| Attenuator | Aeroflex/Weinschel | 56-3 | 21/06/24 | 22/06/24 | Y2370 |
| Attenuator | SMAJK | SMAJK-2-3 | 21/06/24 | 22/06/24 | 2 |
| Attenuator | Aeroflex/Weinschel | 86-10-11 | 21/06/24 | 22/06/24 | 408 |
| EMI Test Receiver | ROHDE&SCHWARZ | ESU | 21/11/12 | 22/11/12 | 100469 |
| PULSE LIMITER | Rohde Schwarz | ESH3-Z2 | 21/08/23 | 22/08/23 | 101333 |
| LISN | SCHWARZBECK | NSLK 8128 RC | 21/10/22 | 22/10/22 | 8128 RC-387 |
| HYGROMETER | TESTO | 608-H1 | 22/01/14 | 23/01/14 | 34862883 |
| Cable | DT&C | Cable | 22/01/04 | 23/01/04 | G-1 |
| Cable | DT&C | Cable | 22/01/04 | 23/01/04 | G-2 |
| Cable | HUBER+SUHNER | SUCOFLEX 100 | 22/01/04 | 23/01/04 | G-3 |
| Cable | DT&C | Cable | 22/01/04 | 23/01/04 | G-4 |
| Cable | Junkosha | MWX241 | 22/01/04 | 23/01/04 | mmW-1 |
| Cable | Junkosha | MWX241 | 22/01/04 | 23/01/04 | mmW-4 |
| Cable | HUBER+SUHNER | SUCOFLEX100 | 22/01/04 | 23/01/04 | M-01 |
| Cable | HUBER+SUHNER | SUCOFLEX100 | 22/01/04 | 23/01/04 | M-02 |
| Cable | JUNFLON | MWX241 | 22/01/04 | 23/01/04 | M-03 |
| Cable | JUNFLON | J12J101757-00 | 22/01/04 | 23/01/04 | M-07 |
| Cable | HUBER+SUHNER | SUCOFLEX106 | 22/01/04 | 23/01/04 | M-09 |
| Cable | DT&C | Cable | 22/01/04 | 23/01/04 | RFC-69 |
| Test Software | tsj | Noise Terminal Measurement | NA | NA | Version 2.00.0170 |
| Test Software | tsj | Radiated Emission Measurement | NA | NA | Version 2.00.0177 |

Note1: The measurement antennas were calibrated in accordance to the requirements of ANSI C63.5-2017.
Note2: The cable is not a regular calibration item, so it has been calibrated by DT & C itself.

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# 2. Test Methodology

The measurement procedures described in the ANSI C63.10-2013 and the guidance provided in KDB558074 D01v05r02 were used in measurement of the EUT.
The EUT was tested per the guidance of KDB558074 D01v05r02. And ANSI C63.10-2013 was used to reference appropriate EUT setup and maximizing procedures of radiated spurious emission and AC line conducted emission testing.

## 2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

## 2.2. EUT Exercise

The EUT was operated in the test mode to fix the TX frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

## 2.3. General Test Procedures

### Conducted Emissions

The power-line conducted emission test procedure is not described on the KDB558074 D01v05r02.
So this test was fulfilled with the requirements in Section 6.2 of ANSI C63.10-2013.
The EUT is placed on the wooden table, which is 0.8 m above ground plane and the conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-peak and Average detector.

### Radiated Emissions

Basically the radiated tests were performed with KDB558074 D01v05r02. But some requirements and procedures like test site requirements, EUT setup and maximizing procedure were fulfilled with the requirements in Section 5 and 6 of the ANSI C63.10-2013 as stated on section 12.1 of the KDB558074 D01v05r02.
The EUT is placed on a non-conductive table. For emission measurements at or below 1 GHz, the table height is 80 cm. For emission measurements above 1 GHz, the table height is 1.5 m. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

## 2.4. Instrument Calibration

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

## 2.5. Description of Test Modes

The EUT has been tested with the operating condition for maximizing the emission characteristics. A test program is used to control the EUT for staying in continuous transmitting. The Bluetooth low energy mode with below low, middle and high channels were tested and reported.

| Test Mode | Description | Tested Frequency (MHz) | | |
|---|---|---|---|---|
| | | Lowest Frequency | Middle Frequency | Highest Frequency |
| TM 1 | BT LE(1 Mbps) | 2 402 | 2 440 | 2 480 |

### EUT Operation test setup

- Test Software: nRF_Connect 3.6.1.16115_Direct Test Mode v1.1.7
- Power setting: 8

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# 3. Antenna Requirements

▣ **According to Part 15.203**

"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. 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 provisions of this section."

**The antenna is permanently attached on the device.**
**Therefore this E.U.T complies with the requirement of Part 15.203**

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# 4. Summary of Test Results

| FCC part section(s) | Test Description | Limit | Test Condition | Status Note 1 |
|---|---|---|---|---|
| 15.247(a) | 6 dB Bandwidth | > 500 kHz | Conducted | NT Note3 |
| 15.247(b) | Maximum Peak Output Power | < 1 Watt (conducted) | | NT Note3 |
| 15.247(d) | Unwanted Emissions(Conducted) | 20 dBc in any 100 kHz BW | | NT Note3 |
| 15.247(e) | Power Spectral Density | < 8 dBm / 3 kHz | | NT Note3 |
| 15.247(d) 15.205 15.209 | Unwanted Emissions(Radiated) | Part 15.209 limits (Refer to section 5.1) | Radiated | C |
| 15.207 | AC Power-Line Conducted Emissions | Part 15.207 limits (Refer to section 5.2) | AC Line Conducted | C |
| 15.203 | Antenna Requirements | Part 15.203 (Refer to section 3) | - | C |

Note 1: **C**=Comply **NC**=Not Comply **NT**=Not Tested **NA**=Not Applicable
Note 2: For radiated emission tests below 30 MHz were performed on semi-anechoic chamber which is correlated with OATS.
Note 3: These test items were not performed because this device uses the granted module.
(FCC ID: SH6MDBT50)
Please refer to the test report of the granted module

# 5. Test Result

## 5.1. Unwanted Emissions (Radiated)

▣ **Test Requirements and limit,**

**Part 15.247(d), Part 15.205, Part 15.209**

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of Part 15.247 the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

**- Part 15.209: General requirements**

| Frequency (MHz) | FCC Limit (uV/m) | Measurement Distance (m) |
|---|---|---|
| 0.009 – 0.490 | 2 400 / F (kHz) | 300 |
| 0.490 – 1.705 | 2 4000 / F (kHz) | 30 |
| 1.705 – 30.0 | 30 | 30 |

| Frequency (MHz) | FCC Limit (uV/m) | Measurement Distance (m) |
|---|---|---|
| 30 ~ 88 | 100 ** | 3 |
| 88 ~ 216 | 150 ** | 3 |
| 216 ~ 960 | 200 ** | 3 |
| Above 960 | 500 | 3 |

**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.

**- Part 15.205(a): Restricted band of operation**

| MHz | MHz | MHz | MHz | GHz | GHz |
|---|---|---|---|---|---|
| 0.009 ~ 0.110 | 8.414 25 ~ 8.414 75 | 108 ~ 121.94 | 1 300 ~ 1 427 | 4.5 ~ 5.15 | 14.47 ~ 14.5 |
| 0.495 ~ 0.505 | 12.29 ~ 12.293 | 123 ~ 138 | 1 435 ~ 1 626.5 | 5.35 ~ 5.46 | 15.35 ~ 16.2 |
| 2.173 5 ~ 2.190 5 | 12.519 75 ~ 12.520 25 | 149.9 ~ 150.05 | 1 645.5 ~ 1 646.5 | 7.25 ~ 7.75 | 17.7 ~ 21.4 |
| 4.125 ~ 4.128 | 12.576 75 ~ 12.577 25 | 156.524 75 ~ 156.525 25 | 1 660 ~ 1 710 | 8.025 ~ 8.5 | 22.01 ~ 23.12 |
| 4.177 25 ~ 4.177 75 | 13.36 ~ 13.41 | 156.7 ~ 156.9 | 1 718.8 ~ 1 722.2 | 9.0 ~ 9.2 | 23.6 ~ 24.0 |
| 4.207 25 ~ 4.207 75 | 16.42 ~ 16.423 | 162.012 5 ~ 167.17 | 2 200 ~ 2 300 | 9.3 ~ 9.5 | 31.2 ~ 31.8 |
| 6.215 ~ 6.218 | 16.694 75 ~ 16.695 25 | 167.72 ~ 173.2 | 2 310 ~ 2 390 | 10.6 ~ 12.7 | 36.43 ~ 36.5 |
| 6.267 75 ~ 6.268 25 | 16.804 25 ~ 16.804 75 | 240 ~ 285 | 2 483.5 ~ 2 500 | 13.25 ~ 13.4 | Above 38.6 |
| 6.311 75 ~ 6.312 25 | 25.5 ~ 25.67 | 322 ~ 335.4 | 2 655 ~ 2 900 | | |
| 8.291 ~ 8.294 | 37.5 ~ 38.25 | 399.90 ~ 410 | 3 260 ~ 3 267 | | |
| 8.362 ~ 8.366 | 73 ~ 74.6 | 608 ~ 614 | 3 332 ~ 3 339 | | |
| 8.376 25 ~ 8.386 75 | 74.8 ~ 75.2 | 960 ~ 1 240 | 3 345.8 ~ 3 358 | | |
| | | | 3 600 ~ 4 400 | | |

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### 5.1.1. Test Setup

Refer to the APPENDIX I.

### 5.1.2. Test Procedures

1. The EUT is placed on a non-conductive table. For emission measurements at or below 1 GHz, the table height is 80 cm. For emission measurements above 1 GHz, the table height is 1.5 m.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3 m away from the receiving antenna, which is varied from 1 m to 4 m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.

**Note: Measurement Instrument Setting for Radiated Emission Measurements.**

- **KDB558074 D01v05r02 - Section 8.6**
- **ANSI C63.10-2013 – Section 11.12**

**1. Frequency Range Below 1 GHz**

RBW = 100 or 120 kHz, VBW = 3 x RBW, Detector = Peak or Quasi Peak

**2. Frequency Range > 1 GHz**

Peak Measurement > 1 GHz

RBW = 1 MHz, VBW = 3 MHz, Detector = Peak, Sweep time = Auto, Trace mode = Max Hold until the trace stabilizes

Average Measurement > 1 GHz

1. RBW = 1 MHz (unless otherwise specified).
2. VBW ≥ 3 x RBW.
3. Detector = RMS (Number of points ≥ 2 x Span / RBW)
4. Averaging type = power (i.e., RMS).
5. Sweep time = auto.
6. Perform a trace average of at least 100 traces.
7. A correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle. The correction factor is computed as follows:

1) If power averaging (RMS) mode was used in step 4, then the applicable correction factor is 10 log(1 / D), where D is the duty cycle.
2) If linear voltage averaging mode was used in step 4, then the applicable correction factor is 20 log(1 / D), where D is the duty cycle.
3) If a specific emission is demonstrated to be continuous (≥ 98 percent duty cycle) rather than turning on and off with the transmit cycle, then no duty cycle correction is required for that emission.

| Test Mode | $T_{on}$ (ms) | $T_{on}$+ $T_{off}$ (ms) | D = $T_{on}$ / ($T_{on+off}$) | DCCF = 10 log(1 / D) (dB) |
|---|---|---|---|---|
| **TM 1** | 0.393 | 0.624 | 0.629 8 | 2.01 |

Note1: Where, T= Transmission duration / D= Duty cycle

Note2: Please refer to the appendix II for duty cycle plots.

### 5.1.3. Test Results

- **Test Notes**

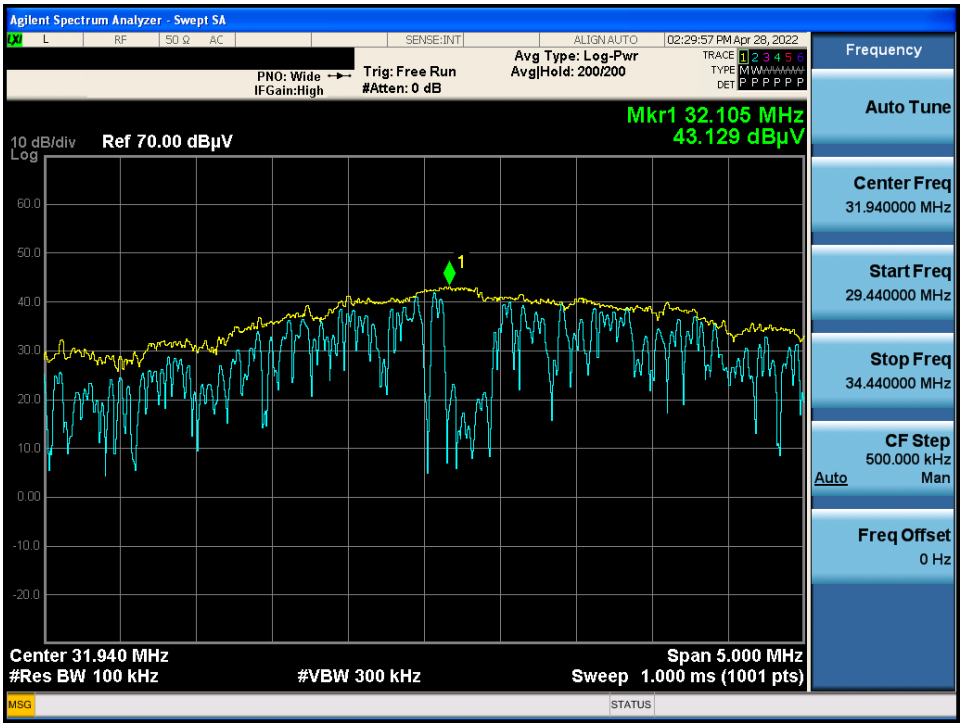
1. The radiated emissions were investigated 9 kHz to 1 GHz and the worst case data was reported.(GFSK & Lowest Channel)
2. Information of Distance Correction Factor
   For finding emissions, measurements may be performed at a distance closer than that specified in the regulations.
   In this case, the distance factor is applied to the result.
   - Calculation of distance correction factor
   At frequencies below 30 MHz = 40 log( tested distance / specified distance )
   At frequencies at or above 30 MHz = 20 log( tested distance / specified distance )
   When distance factor is "N/A", the measurements were performed at the specified distance and distance factor is not applied.
3. Sample Calculation.
   Margin = Limit – Result / Result = Reading + TF+ DCCF + DCF / TF = AF + CL + HL + AL – AG
   Where, TF = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain, HL = High pass filter Loss, AL = Attenuator Loss, DCCF = Duty Cycle Correction Factor, DCF = Distance Correction Factor

**9 kHz ~ 1 GHz Data (Modulation : *GFSK*)**

▪ Lowest Channel

| Frequency (MHz) | ANT Pol | EUT Position (Axis) | Detector Mode | Reading (dBuV) | TF (dB/m) | DCCF (dB) | DCF (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| 32.11 | V | X | PK | 43.13 | -9.60 | N/A | N/A | 33.53 | 40.00 | 6.47 |
| 768.02 | H | X | PK | 34.11 | 5.20 | N/A | N/A | 39.31 | 46.00 | 6.69 |

**GFSK & Lowest & X & Ver** **Detector Mode : PK**



- **Test Notes**

1. The radiated emissions were investigated 1 GHz to 25 GHz. And no other spurious and harmonic emissions were found below listed frequencies.
2. Information of Distance Correction Factor
   For finding emissions, measurements may be performed at a distance closer than that specified in the regulations.
   In this case, the distance factor is applied to the result.
   - Calculation of distance correction factor
   At frequencies below 30 MHz = 40 log( tested distance / specified distance )
   At frequencies at or above 30 MHz = 20 log( tested distance / specified distance )
   When distance factor is "N/A", the measurements were performed at the specified distance and distance factor is not applied.
3. Sample Calculation.
   Margin = Limit – Result / Result = Reading + TF+ DCCF + DCF / TF = AF + CL + HL + AL – AG
   Where, TF = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain, HL = High pass filter Loss, AL = Attenuator Loss, DCCF = Duty Cycle Correction Factor, DCF = Distance Correction Factor

## Frequency Range : 1 GHz ~ 25 GHz_TM 1

### ▪ Lowest Channel

| Frequency (MHz) | ANT Pol | EUT Position (Axis) | Detector Mode | Reading (dBuV) | TF (dB/m) | DCCF (dB) | DCF (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 389.38 | H | X | PK | 49.12 | 4.46 | N/A | N/A | 53.58 | 74.00 | 20.42 |
| 2 388.40 | H | X | AV | 39.50 | 4.46 | 2.01 | N/A | 45.97 | 54.00 | 8.03 |
| 4 803.67 | H | Z | PK | 54.09 | 2.40 | N/A | N/A | 56.49 | 74.00 | 17.51 |
| 4 803.92 | H | Z | AV | 45.52 | 2.40 | 2.01 | N/A | 49.93 | 54.00 | 4.07 |
| 7 206.43 | H | Z | PK | 49.03 | 7.29 | N/A | N/A | 56.32 | 74.00 | 17.68 |
| 7 206.46 | H | Z | AV | 38.80 | 7.29 | 2.01 | N/A | 48.10 | 54.00 | 5.90 |

### ▪ Middle Channel

| Frequency (MHz) | ANT Pol | EUT Position (Axis) | Detector Mode | Reading (dBuV) | TF (dB/m) | DCCF (dB) | DCF (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| 4 880.35 | H | Z | PK | 55.25 | 2.32 | N/A | N/A | 57.57 | 74.00 | 16.43 |
| 4 879.65 | H | Z | AV | 48.40 | 2.32 | 2.01 | N/A | 52.73 | 54.00 | 1.27 |
| 7 320.83 | H | Z | PK | 49.12 | 7.09 | N/A | N/A | 56.21 | 74.00 | 17.79 |
| 7 320.37 | H | Z | AV | 39.15 | 7.09 | 2.01 | N/A | 48.25 | 54.00 | 5.75 |

### ▪ Highest Channel

| Frequency (MHz) | ANT Pol | EUT Position (Axis) | Detector Mode | Reading (dBuV) | TF (dB/m) | DCCF (dB) | DCF (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 483.98 | H | X | PK | 49.39 | 5.40 | N/A | N/A | 54.79 | 74.00 | 19.21 |
| 2 484.03 | H | X | AV | 38.92 | 5.40 | 2.01 | N/A | 46.33 | 54.00 | 7.67 |
| 4 959.81 | H | Z | PK | 52.84 | 2.45 | N/A | N/A | 55.29 | 74.00 | 18.71 |
| 4 959.88 | H | Z | AV | 44.67 | 2.45 | 2.01 | N/A | 49.13 | 54.00 | 4.87 |
| 7 440.55 | H | Z | PK | 48.47 | 8.13 | N/A | N/A | 56.60 | 74.00 | 17.40 |
| 7 440.41 | H | Z | AV | 38.27 | 8.13 | 2.01 | N/A | 48.41 | 54.00 | 5.59 |

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## 5.2. AC Power-Line Conducted Emissions

▣ **Test Requirements and limit, Part 15.207**

An intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 uH/50 ohm line impedance stabilization network (LISN).

Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequency ranges.

| Frequency Range (MHz) | Conducted Limit (dBuV) | |
|---|---|---|
| | Quasi-Peak | Average |
| 0.15 ~ 0.5 | 66 to 56 * | 56 to 46 * |
| 0.5 ~ 5.0 | 56 | 46 |
| 5 ~ 30 | 60 | 50 |

* Decreases with the logarithm of the frequency

### 5.2.1. Test Setup

See test photographs for the actual connections between EUT and support equipment.

### 5.2.2. Test Procedures

Conducted emissions from the EUT were measured according to the ANSI C63.10-2013.

1. The test procedure is performed in a 6.5 m × 3.5 m × 3.5 m (L × W × H) shielded room. The EUT along with its peripherals were placed on a 1.0 m (W) × 1.5 m (L) and 0.8 m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.
2. The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room.
3. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room.
4. The excess power cable between the EUT and the LISN was bundled. The power cables of peripherals were unbundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.

### 5.2.3. Test Results

Refer to the next page. (The worst case data was reported. The worst data is TM 1 & Lowest)

## AC Power-Line Conducted Emissions (Graph)

# Results of Conducted Emission

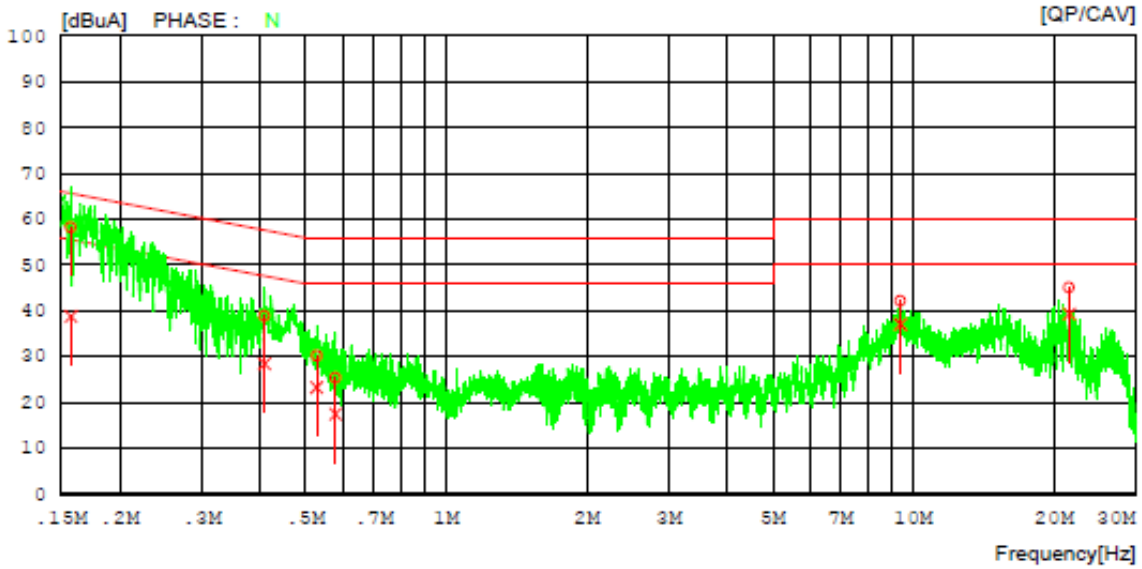
DTNC

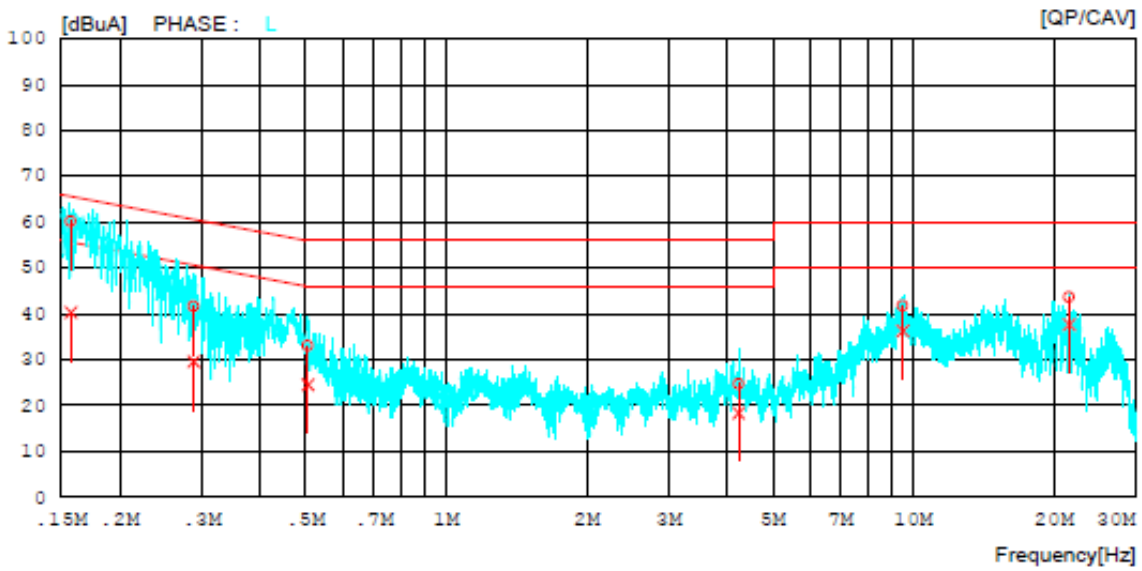
Date 2022-04-22

| | | | |
|---|---|---|---|
| Order No. | DTNC2204-02605 | Referrence No. | |
| Model No. | CL0001P | Power Supply | |
| Serial No. | | Temp/Humi. | 21 'C / 41 % |
| Test Condition | LE | Operator | C.W.Lee |

Memo

LIMIT : FCC P15.207 AV
FCC P15.207 QP



## AC Power-Line Conducted Emissions (List)

# Results of Conducted Emission

DTNC

Date 2022-04-22

| | | | |
|---|---|---|---|
| Order No. | DTNC2204-02605 | Referrence No. | |
| Model No. | CL0001P | Power Supply | |
| Serial No. | | Temp/Humi. | 21 'C / 41 % |
| Test Condition | LE | Operator | C.W.Lee |

Memo

LIMIT : FCC P15.207 AV
FCC P15.207 QP

| NO | FREQ [MHz] | READING QP [dBuA] | READING CAV [dBuA] | C.FACTOR [dB] | RESULT QP [dBuA] | RESULT CAV [dBuA] | LIMIT QP [dBuA] | LIMIT CAV [dBuA] | MARGIN QP [dBuA] | MARGIN CAV [dBuA] | PHASE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.15726 | 48.25 | 28.86 | 9.99 | 58.24 | 38.85 | 65.61 | 55.61 | 7.37 | 16.76 | N |
| 2 | 0.40781 | 28.94 | 18.49 | 10.01 | 38.95 | 28.50 | 57.69 | 47.69 | 18.74 | 19.19 | N |
| 3 | 0.52808 | 20.15 | 13.29 | 10.01 | 30.16 | 23.30 | 56.00 | 46.00 | 25.84 | 22.70 | N |
| 4 | 0.57914 | 15.38 | 7.52 | 10.01 | 25.39 | 17.53 | 56.00 | 46.00 | 30.61 | 28.47 | N |
| 5 | 9.38699 | 31.79 | 26.63 | 10.41 | 42.20 | 37.04 | 60.00 | 50.00 | 17.80 | 12.96 | N |
| 6 | 21.56312 | 34.57 | 28.92 | 10.46 | 45.03 | 39.38 | 60.00 | 50.00 | 14.97 | 10.62 | N |
| 7 | 0.15711 | 50.23 | 30.27 | 9.99 | 60.22 | 40.26 | 65.62 | 55.62 | 5.40 | 15.36 | L |
| 8 | 0.28790 | 31.67 | 19.54 | 10.00 | 41.67 | 29.54 | 60.58 | 50.58 | 18.91 | 21.04 | L |
| 9 | 0.50559 | 22.98 | 14.49 | 10.01 | 32.99 | 24.50 | 56.00 | 46.00 | 23.01 | 21.50 | L |
| 10 | 4.22673 | 14.49 | 8.18 | 10.20 | 24.69 | 18.38 | 56.00 | 46.00 | 31.31 | 27.62 | L |
| 11 | 9.49958 | 31.43 | 25.91 | 10.33 | 41.76 | 36.24 | 60.00 | 50.00 | 18.24 | 13.76 | L |
| 12 | 21.56482 | 33.14 | 27.23 | 10.46 | 43.60 | 37.69 | 60.00 | 50.00 | 16.40 | 12.31 | L |

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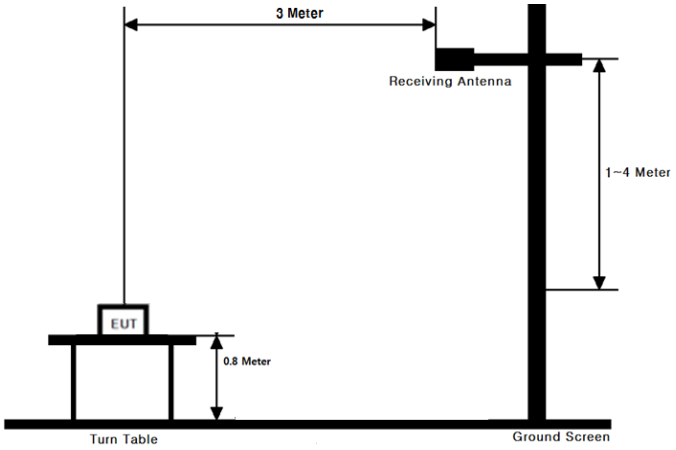
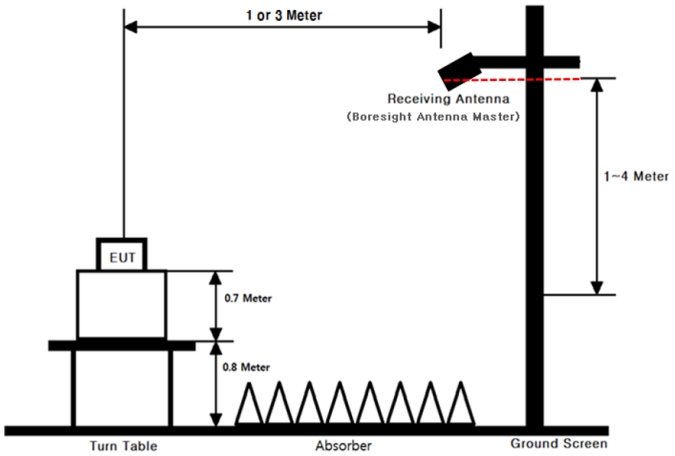
# APPENDIX I

## Test set up diagrams

- **Radiated Measurement**

| Below 1 GHz | Above 1 GHz |
|---|---|
|   |   |

# APPENDIX II

## Duty cycle plots

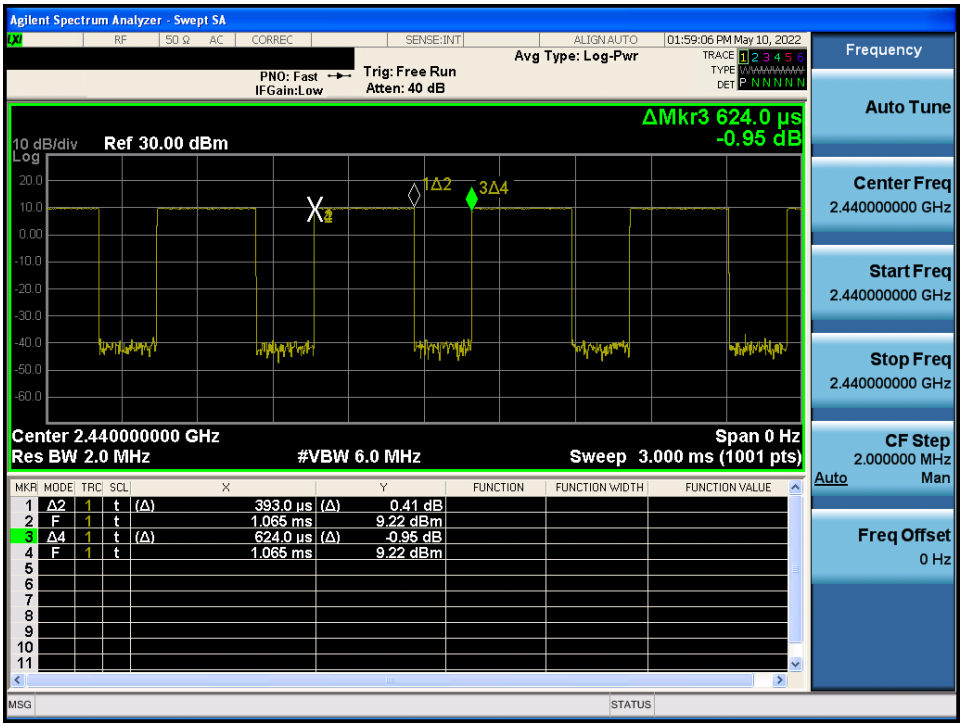
- **Test Procedures**

**- KDB558074 D01v05r02 – Section 6**

The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on and off times of the transmitted signal. Set the center frequency of the instrument to the center frequency of the transmission. Set RBW ≥ OBW if possible; otherwise, set RBW to the largest available value. Set VBW ≥ RBW. Set detector = peak or average.

The zero-span measurement method shall not be used unless both RBW and VBW are > 50 /T and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if T ≤ 16.7 microseconds.)

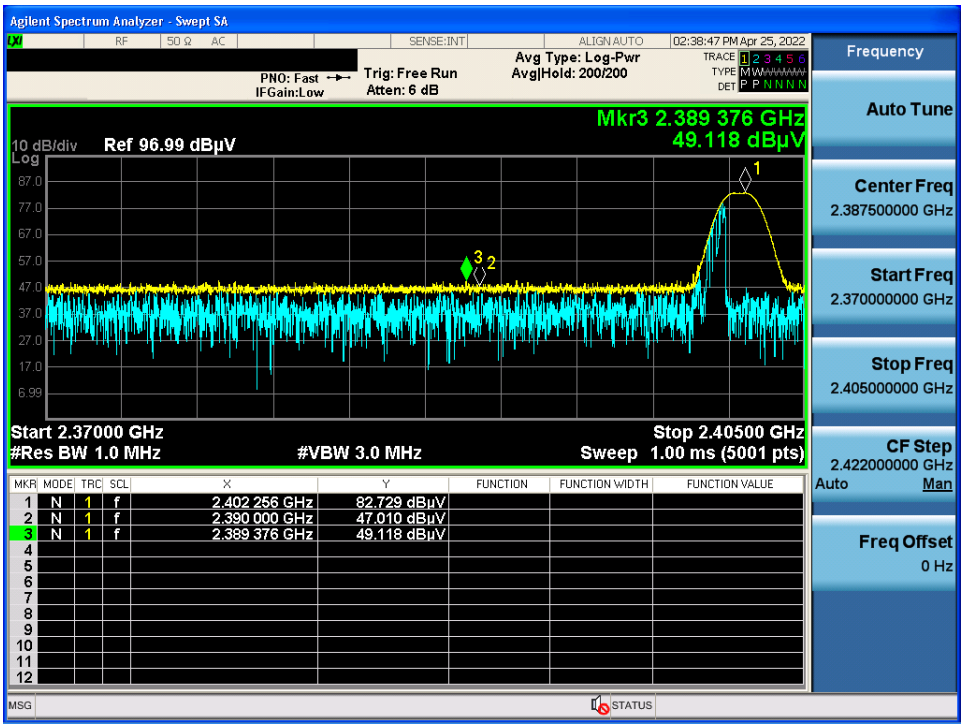
**Duty Cycle** **TM 1 Test Channel : Middle**



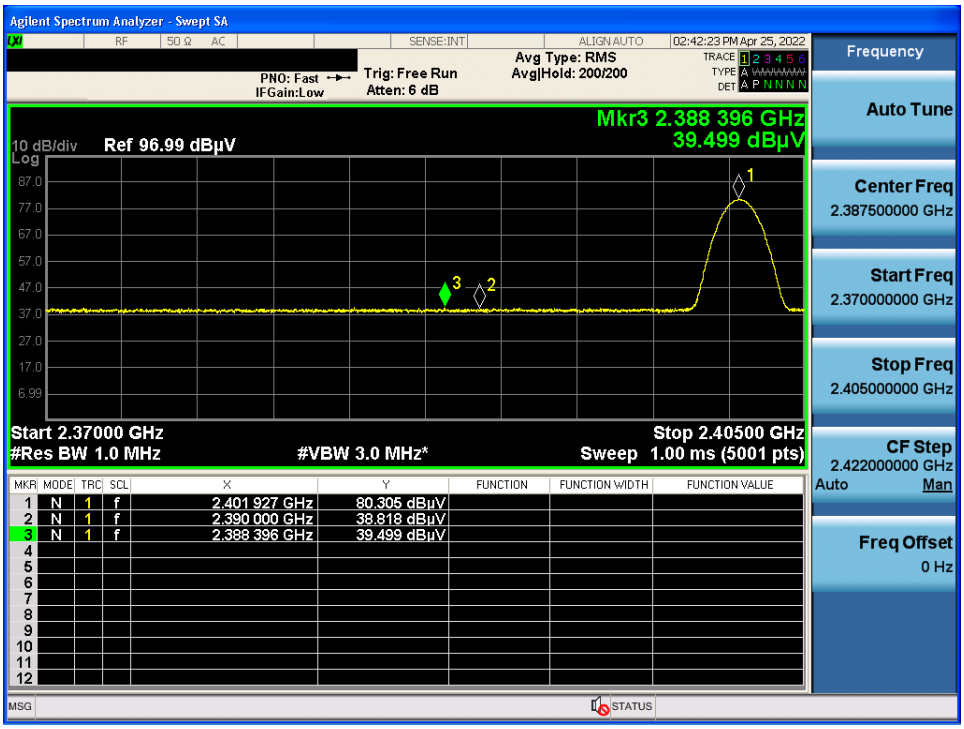
# APPENDIX III

## Unwanted Emissions (Radiated) Test Plot

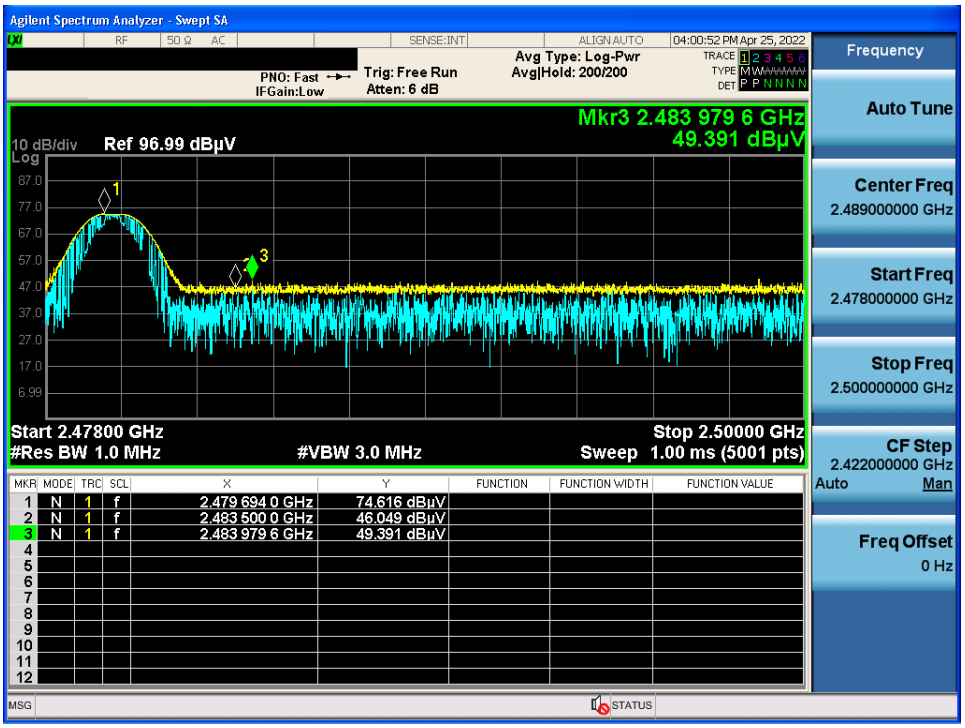
### TM1 & Lowest & X & Hor — Detector Mode : PK



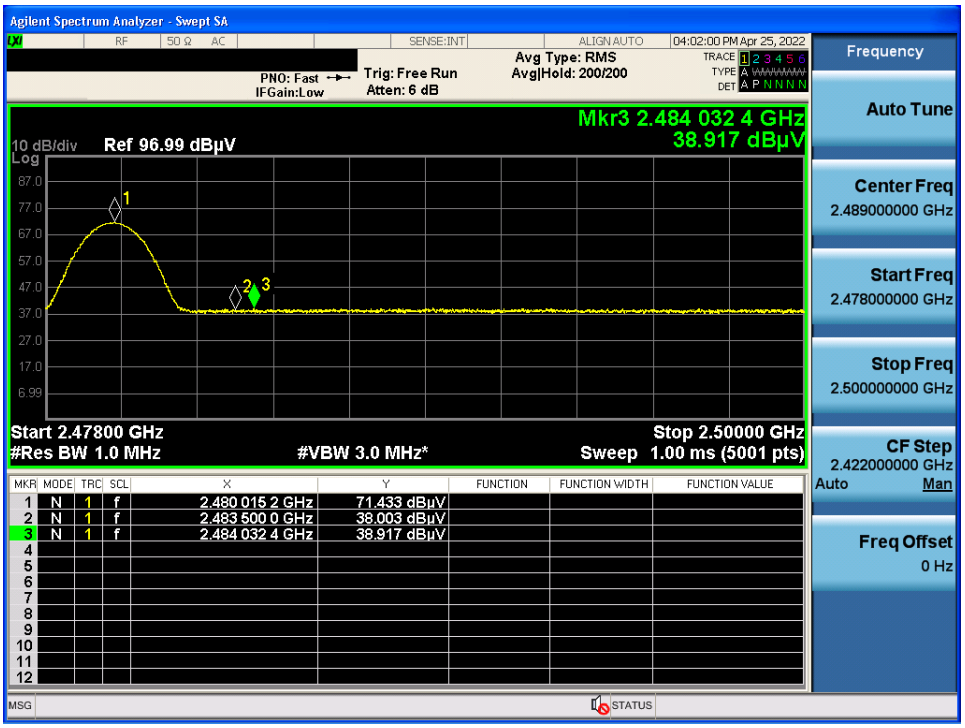
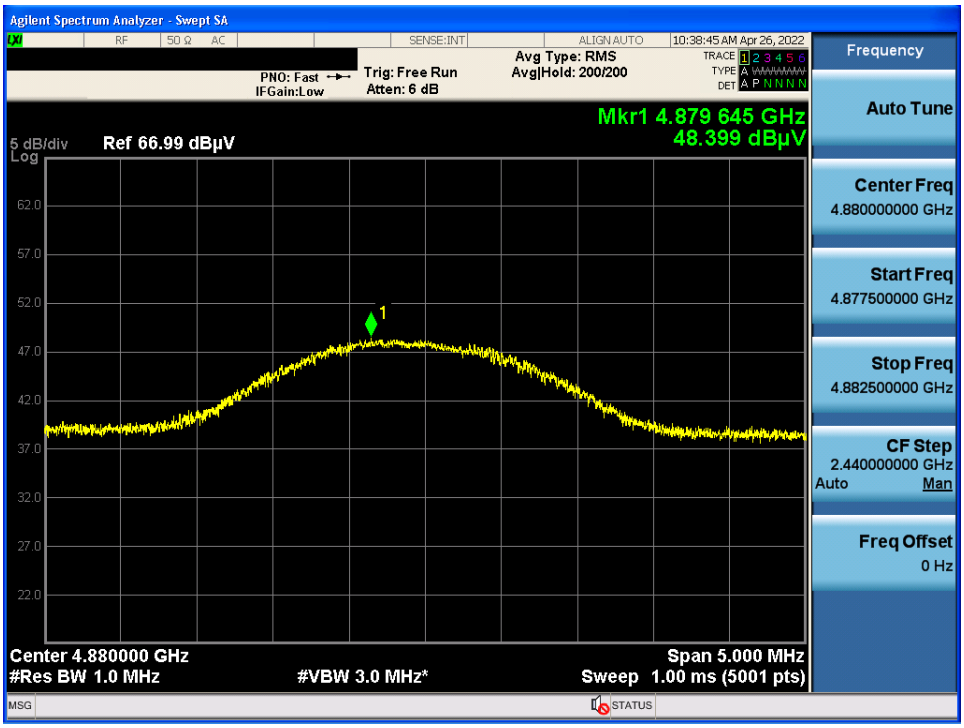

### TM1 & Lowest & X & Hor — Detector Mode : AV



**TM1 & Highest & X & Hor** **Detector Mode : PK**




**TM1 & Highest & X & Hor** **Detector Mode : AV**



**TM1 & Middle & Z & Hor** **Detector Mode : AV**