# FCC RADIO TEST REPORT

| | | |
|---|---|---|
| **FCC ID** | : | **KR5PPE1C** |
| **Equipment** | : | **Radio Frequency Bidirectional Key** |
| **Brand Name** | : | **Continental** |
| **Model Name** | : | **PPE1C** |
| **Applicant** | : | **Continental Automotive GmbH<br>Siemensstrasse 12, 93055, Regensburg, Germany** |
| **Manufacturer** | : | **Continental Automotive GmbH<br>Siemensstrasse 12, 93055, Regensburg, Germany** |
| **Factory** | : | **Continental Automotive Lithuania UAB<br>Davalgoniu str. 12, Sergeiciku I k., Karmelavos sen., Kaunas region 54462, Lithuania** |
| **Standard** | : | **Fcc Part 15 Subpart C §15.231** |

**The product was received on Oct. 12, 2021, and testing was started from Oct. 26, 2021 and completed on Dec. 21, 2021. We, Sporton International Inc. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.**

**The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.**

Louis Wu

**Approved by: Louis Wu**

***Sporton International Inc. EMC & Wireless Communications Laboratory***
*No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)*

# Table of Contents

# History of this test report

| Report No. | Version | Description | Issued Date |
|---|---|---|---|
| FR1O1258A | 01 | Initial issue of report | Jan. 04, 2022 |
| FR1O1258A | 02 | 1. Add Factory Information<br>2. Revise Product Specification of Equipment Under Test | Jan. 07, 2022 |
| FR1O1258A | 03 | 1. Revise Product Specification, EUT Operation Test Setup and Test Results of Conducted Test Items<br>2. Add description in Field Strength of Fundamental and Spurious Emissions | Feb. 08, 2022 |
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# Summary of The Result

| Report Clause | Ref Std. Clause | Test Items | Result (PASS/FAIL) | Remark |
|---|---|---|---|---|
| - | 15.207 | AC Power Line Conducted Emissions | Not required | - |
| 3.1 | 15.231(a) | Types of Momentary Signals | PASS | - |
| 3.2 | 15.231(c) | 20dB and 99% Occupied Bandwidth | PASS | - |
| 3.3 | 15.231(b) 15.231(e) | Field Strength of Fundamental and Spurious Emissions | PASS | 7.85 dB Under the limit at 866.940 MHz |
| **Note:** Not required means after assessing, test items are not necessary to carry out. | | | | |

| **Declaration of Conformity:** |
|---|
| The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers. |
| **Comments and Explanations:** |
| The product specifications of the EUT presented in the report are declared by the manufacturer who shall take full responsibility for the authenticity. |

**Reviewed by: Yun Huang**

**Report Producer: Vivian Hsu**

# 1. General Information

## 1.1 Product Feature of Equipment Under Test

| Product Feature | |
|---|---|
| **Equipment** | Radio Frequency Bidirectional Key |
| **Brand Name** | Continental |
| **Model Name** | PPE1C |
| **FCC ID** | KR5PPE1C |
| **Sample 1** | EUT with PANIC Button |
| **Sample 2** | EUT without PANIC Button |
| **EUT supports Radios application** | RFID/SRD/UWB |
| **EUT Stage** | Production Unit |

**Remark:**

1. The above EUT's information was declared by manufacturer.
2. All the tests were performed with sample 2.

## 1.2 Product Specification of Equipment Under Test

| Product Specification is subject to this standard | |
|---|---|
| **Tx/Rx Frequency Range** | 433MHz |
| **Antenna Type** | printed loop antenna (pcb) |
| **Antenna Gain** | -17 dBi |
| **Type of Modulation** | FSK |

**Remark:** The above EUT's information is declared by manufacturer. Please refer to Comments and Explanations in report summary.

## 1.3 Modification of EUT

No modifications are made to the EUT during all test items.

## 1.4 Testing Location

| | | |
|---|---|---|
| **Test Site** | Sporton International Inc. EMC & Wireless Communications Laboratory | |
| **Test Site Location** | No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)<br>TEL: +886-3-327-3456<br>FAX: +886-3-328-4978 | |
| **Test Site No.** | **Sporton Site No.** | |
| | DF02-HY | 03CH07-HY |
| **Test Engineer** | PH Yang | Jesse Wang |
| **Temperature (℃)** | 24.4 | 19.6 ~ 25.3 |
| **Relative Humidity (%)** | 53.0 | 48.8 ~ 64.7 |

**Note:** The test site complies with ANSI C63.4 2014 requirement.

FCC designation No.: TW1190

## 1.5 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart C §15.231
- ANSI C63.10-2013
- FCC KDB 414788 D01 Radiated Test Site v01r01

**Remark:**

1. All the test items were validated and recorded in accordance with the standards without any modification during the testing.
2. The TAF code is not including all the FCC KDB listed without accreditation.
3. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

# 2. Test Configuration of Equipment Under Test

## 2.1 Descriptions of Test Mode

Investigation has been done on all the possible configurations for searching the worst cases.

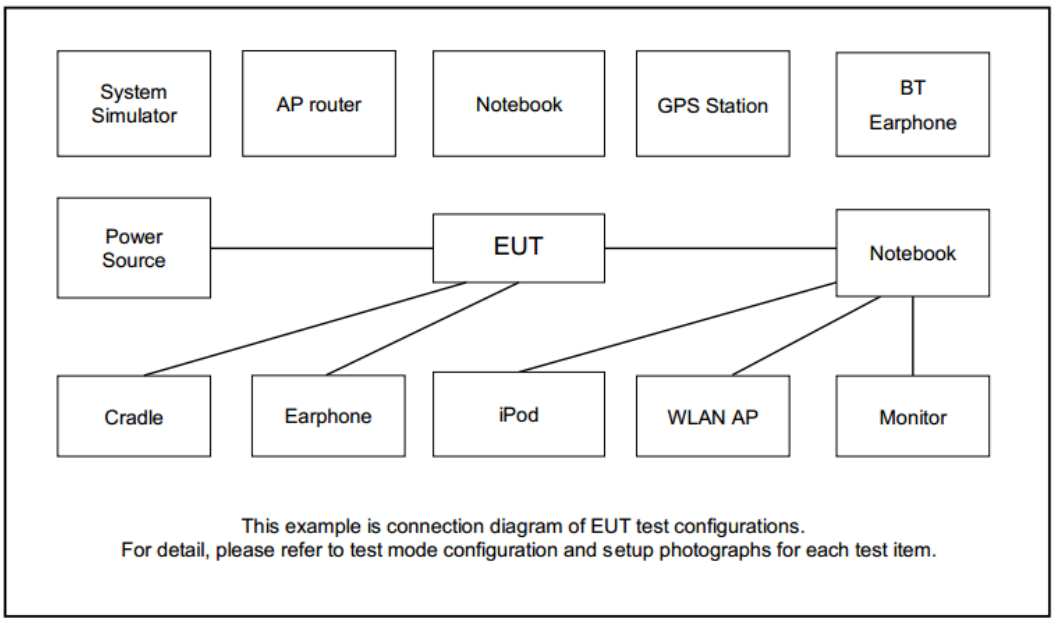
The following table is a list of the test modes shown in this test report.

The measured emission level of the EUT was maximized by rotating the EUT on a turntable, adjusting the orientation of the EUT and EUT antenna in three orthogonal axis (X: flat, Y: portrait, Z: landscape), and adjusting the measurement antenna orientation, following C63.10 exploratory test procedures and find X plane as worst plane.

| Test Items | |
|---|---|
| Test Result of transmission time | |
| 20dB and 99% occupied bandwidth | Field Strength of Fundamental and Spurious Emissions |

| Test Configuration | |
|---|---|
| **Mode** | **Frequency** |
| 1 | 433.47MHz |
| 2 | 433.92MHz |
| 3 | 434.37MHz |

## 2.2 Connection Diagram of Test System



## 2.3 Support Unit used in test configuration and system

| Item | Equipment | Brand Name | Model Name | FCC ID | Data Cable | Power Cord |
|---|---|---|---|---|---|---|
| 1. | Battery | Panasonic | CR2032 | N/A | N/A | N/A |

## 2.4 EUT Operation Test Setup

The RF test items, make the EUT (SW: SW0241) get into the engineering modes to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.

# 3. Test Results

## 3.1 Types of Momentarily Operated Devices

### 3.1.1 Limit

| | |
|---|---|
| ☒ | §15.231 (a)(1)<br>A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released. |

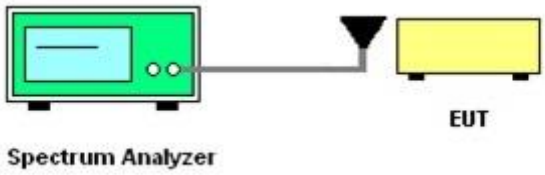
### 3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

### 3.1.3 Test Procedures

1. The spectrum analyzer connected via a receive antenna placed near the EUT in peak Max hold mode.
2. The resolution bandwidth of 100 kHz and the video bandwidth of 100 kHz were used.
3. Measured the spectrum width with power higher than 20dB below carrier.
4. Measured the transmission period of EUT under specified condition.

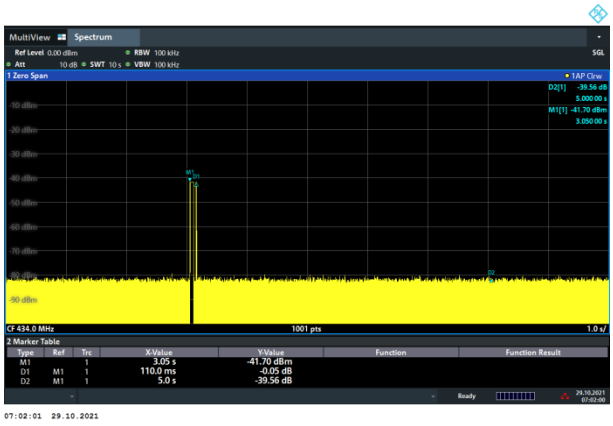
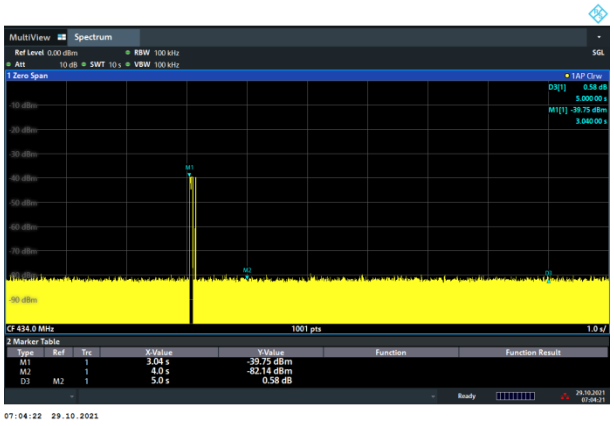
### 3.1.4 Test Setup




### 3.1.5 Test Result of transmission time

☒ §15.231 (a)(1)

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

| Condition 1 | Condition 2 |
|---|---|
|  |  |
| Button push and release @ M1 | Button push @ M1<br>Button release @ M2 |

## 3.2 20dB and 99% Occupied Bandwidth Measurement

### 3.2.1 Limit

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

The 99% bandwidth of momentarily operated devices shall be less or equal to 0.25% of the centre frequency for devices operating between 70 MHz and 900 MHz. For devices operating above 900 MHz, the 99% bandwidth shall be less or equal to 0.5% of the centre frequency.

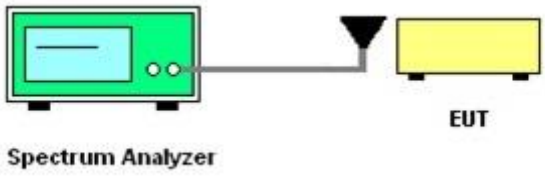
### 3.2.2 Measuring Instruments

See list of measuring instruments of this test report.

### 3.2.3 Test Procedures

1. The spectrum analyzer connected via a receive antenna placed near the EUT in peak Max hold mode.
2. The resolution bandwidth of 1 kHz and the video bandwidth of 3 kHz were used.
3. Measured the spectrum width with power higher than 20dB below carrier.
4. Measured the 99% OBW.

### 3.2.4 Test Setup




### 3.2.5 Test Result of Conducted Test Items

Please refer to Appendix A.

## 3.3 Field Strength of Fundamental and Spurious Emissions

### 3.3.1 Limit

☒ 15.231(b)

In addition to the provisions of §15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following

From 15.231(b)(3), the limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in § 15.209, whichever limit permits a higher field strength.

| Rules and specifications | FCC CFR 47 Part 15 section 15.231 | |
|---|---|---|
| Fundamental frequency (f) (MHz) | Field strength of fundamental (μV/m) at 3m | Field strength of spurious emissions (dBμV/m) at 3m |
| 40.66 ≤ f ≤ 40.70 | 2250 | 225 |
| 70 < f ≤ 130 | 1250 | 125 |
| 130 < f ≤ 174 | 1250 to 3750* | 125 to 375* |
| 174 < f ≤ 260 | 3750 | 375 |
| 260 < f ≤ 470 | 3750 to 12500* | 375 to 1250* |
| 470 < f | 12500 | 1250 |

* Linear interpolation with frequency, f, in MHz.

### 3.3.2 Measuring Instruments

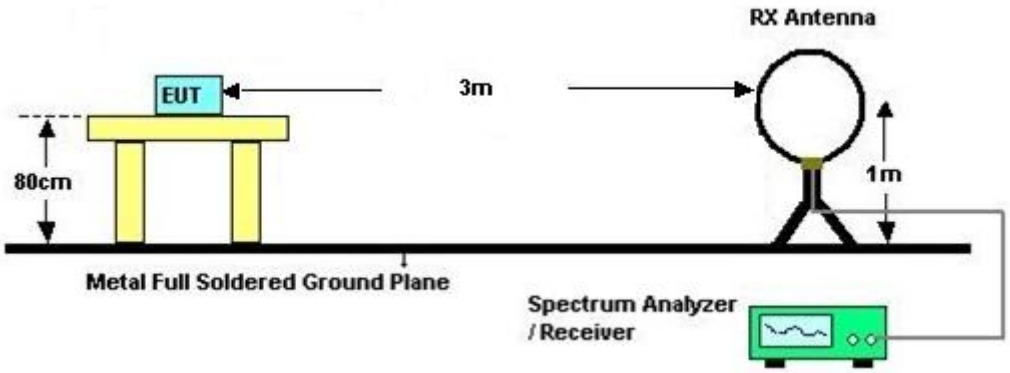
See list of measuring instruments of this test report.

### 3.3.3 Test Procedures

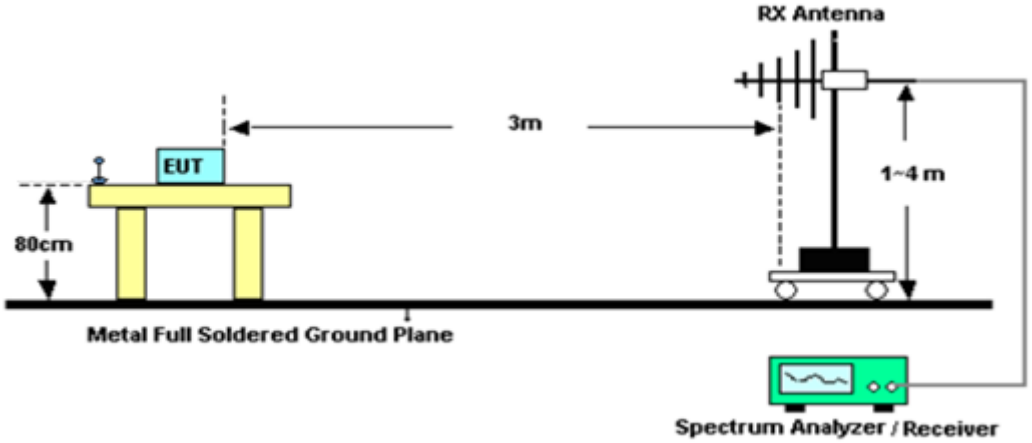
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the loop receiving antenna mounted antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the receiving antenna was fixed at one meter above ground to find the maximum emissions field strength.
4. For Fundamental emissions, use the receiver to measure Average reading.
5. For average measurement: use duty cycle correction factor method per 15.35(c).
   Duty cycle = On time/100 milliseconds
   On time = N1*L1+N2*L2+...+Nn-1*LNn-1+Nn*Ln
   Where N1 is number of type 1 pulses, L1 is length of type 1 pulses, etc.
   Average Emission Level = Peak Emission Level + 20*log(Duty cycle)
6. Radiated testing below 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading. When there is no suspected emission found and the emission level is with at least 6 dB margin against QP limit line, the position is marked as "-".
7. Radiated testing above 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading for scanning all frequencies. When there is no suspected emission found and the harmonic emission level is with at least 6 dB margin against average limit line, the position is marked as "-".

### 3.3.4 Test Setup

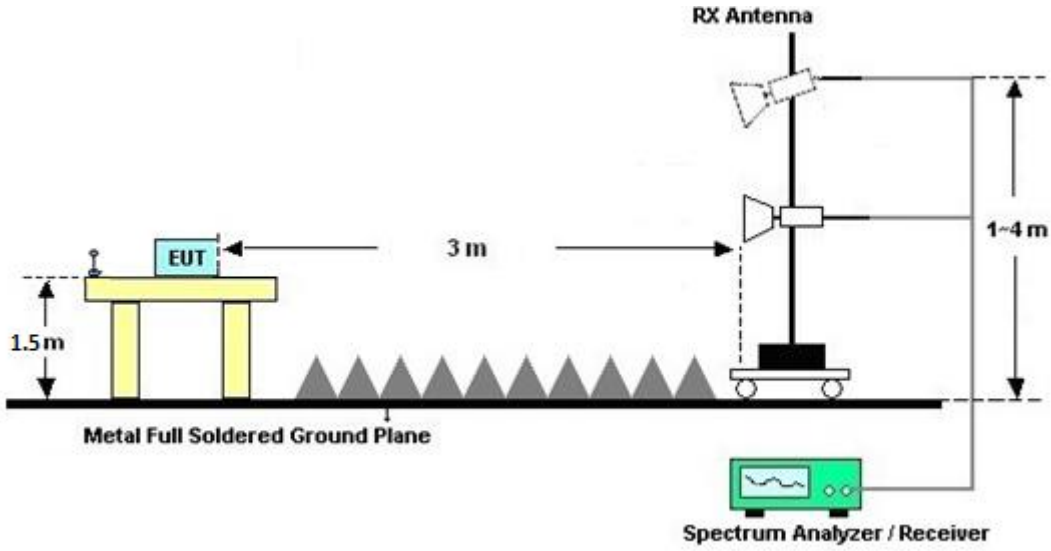
**For radiated emissions below 30MHz**




**For radiated emissions from 30MHz to 1GHz**




**For radiated emissions above 1GHz**



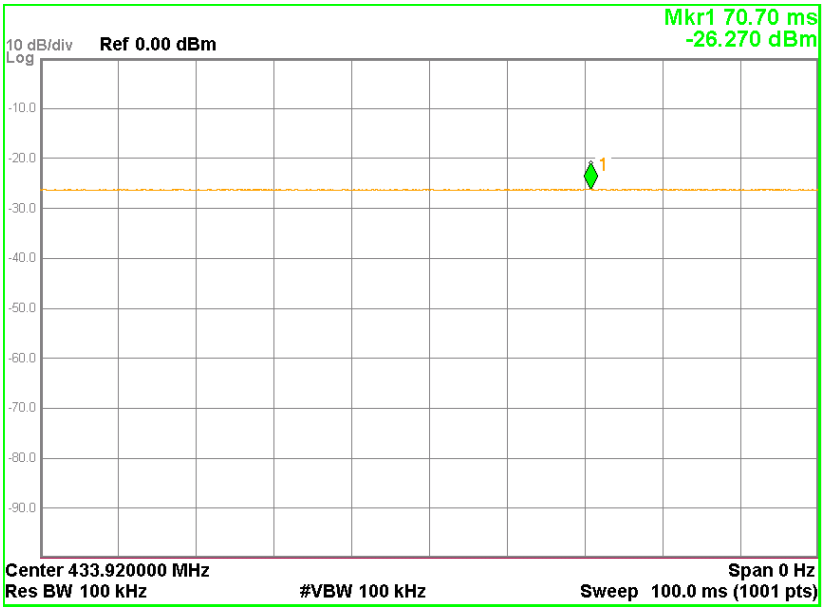
### 3.3.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

The low frequency, which starts from 9 kHz to 30 MHz, is pre-scanned and the result which is 20 dB lower than the limit line is not reported.

There is adequate comparison measurement of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result comes out very similar.

### 3.3.6 Duty Cycle

**433.92MHz on time Plot**




**Note:**

1. Worst case Duty cycle = on time/100 milliseconds = 100 %
2. Worst case Duty cycle correction factor = 20*log(Duty cycle) = 0 dB

### 3.3.7 Test Result of Fundamental and Spurious Emissions

Please refer to Appendix B.

# 4. List of Measuring Equipment

| Instrument | Brand Name | Model No. | Serial No. | Characteristics | Calibration Date | Test Date | Due Date | Remark |
|---|---|---|---|---|---|---|---|---|
| Bilog Antenna | TESEQ | CBL 6111D & 00800N1D01N -06 | 35419 & 03 | 30MHz~1GHz | Apr. 28, 2021 | Oct. 26, 2021~ Dec. 21, 2021 | Apr. 27, 2022 | Radiation (03CH07-HY) |
| Double Ridge Horn Antenna | ESCO | 3117 | 00075962 | 1GHz ~ 18GHz | Dec. 01, 2020 | Oct. 26, 2021~ Nov. 29, 2021 | Nov. 30, 2021 | Radiation (03CH07-HY) |
| Double Ridge Horn Antenna | ESCO | 3117 | 00066584 | 1GHz ~ 18GHz | Oct. 25, 2021 | Nov. 30, 2021~ Dec. 21, 2021 | Oct. 24, 2022 | Radiation (03CH07-HY) |
| SHF-EHF Horn Antenna | SCHWARZBECK | BBHA 9170 | BBHA9170576 | 18GHz~40GHz | May 21, 2021 | Oct. 26, 2021~ Nov. 29, 2021 | May 20, 2022 | Radiation (03CH07-HY) |
| SHF-EHF Horn Antenna | SCHWARZBECK | BBHA 9170 | BBHA9170251 | 18GHz~40GHz | Nov. 30, 2021 | Nov. 30, 2021~ Dec. 21, 2021 | Nov. 29, 2022 | Radiation (03CH07-HY) |
| Preamplifier | EMEC | EM18G40G | 0600789 | 18-40GHz | Jul. 23, 2021 | Oct. 26, 2021~ Dec. 21, 2021 | Jul. 22, 2022 | Radiation (03CH07-HY) |
| Loop Antenna | Rohde & Schwarz | HFH2-Z2 | 100315 | 9 kHz~30 MHz | Jan. 04, 2021 | Oct. 26, 2021~ Dec. 21, 2021 | Jan. 03, 2022 | Radiation (03CH07-HY) |
| Preamplifier | MITEQ | AMF-7D-00101800-30-10P | 1590075 | 1GHz~18GHz | Apr. 22, 2021 | Oct. 26, 2021~ Dec. 21, 2021 | Apr. 21, 2022 | Radiation (03CH07-HY) |
| Preamplifier | COM-POWER | PA-103A | 161241 | 10MHz~1GHz | Oct. 04, 2021 | Oct. 26, 2021~ Dec. 21, 2021 | Oct. 03, 2022 | Radiation (03CH07-HY) |
| Spectrum Analyzer | Agilent | N9030A | MY52350276 | 3Hz~44GHz | Jul. 22, 2021 | Oct. 26, 2021~ Dec. 21, 2021 | Jul. 21, 2022 | Radiation (03CH07-HY) |
| RF Cable | HUBER + SUHNER | SUCOFLEX 104 | MY15682-4 | 30MHz to 18GHz | Feb. 24, 2021 | Oct. 26, 2021~ Dec. 21, 2021 | Feb. 23, 2022 | Radiation (03CH07-HY) |
| RF Cable | HUBER + SUHNER | SUCOFLEX 104 | MY24971-4 | 9kHz to 18GHz | Feb. 24, 2021 | Oct. 26, 2021~ Dec. 21, 2021 | Feb. 23, 2022 | Radiation (03CH07-HY) |
| RF Cable | HUBER + SUHNER | SUCOFLEX 104 | MY28655-4 | 9kHz to 18GHz | Feb. 24, 2021 | Oct. 26, 2021~ Dec. 21, 2021 | Feb. 23, 2022 | Radiation (03CH07-HY) |
| RF Cable | HUBER + SUHNER | SUCOFLEX 126 | 532078/126E | 30MHz~18GHz | Sep. 17, 2021 | Oct. 26, 2021~ Dec. 21, 2021 | Sep. 16, 2022 | Radiation (03CH07-HY) |
| RF Cable | HUBER + SUHNER | SUCOFLEX 102 | MY2858/2,801606/2 | 18GHz~40GHz | Sep. 17, 2021 | Oct. 26, 2021~ Dec. 21, 2021 | Sep. 16, 2022 | Radiation (03CH07-HY) |
| Controller | EMEC | EM1000 | N/A | Control Ant Mast | N/A | Oct. 26, 2021~ Dec. 21, 2021 | N/A | Radiation (03CH07-HY) |
| Controller | MF | MF-7802 | N/A | Control Turn table | N/A | Oct. 26, 2021~ Dec. 21, 2021 | N/A | Radiation (03CH07-HY) |
| Antenna Mast | EMEC | AM-BS-4500E | N/A | Boresight mast 1M~4M | N/A | Oct. 26, 2021~ Dec. 21, 2021 | N/A | Radiation (03CH07-HY) |
| Turn Table | ChainTek | Chaintek 3000 | N/A | 0~360 Degree | N/A | Oct. 26, 2021~ Dec. 21, 2021 | N/A | Radiation (03CH07-HY) |
| Software | Audix | E3 6.2009-8-24 | N/A | N/A | N/A | Oct. 26, 2021~ Dec. 21, 2021 | N/A | Radiation (03CH07-HY) |
| USB Data Logger | TECPEL | TR-32 | HE17XB2495 | N/A | Mar. 09, 2021 | Oct. 26, 2021~ Dec. 21, 2021 | Mar. 08, 2022 | Radiation (03CH07-HY) |
| Spectrum Analyzer | Rohde & Schwarz | FSV3044 | 101048 | 10Hz~44GHz | Apr. 20, 2021 | Oct. 29, 2021 | Apr. 19, 2022 | Duty Cycle (DF02-HY) |

# 5. Uncertainty of Evaluation

**Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)**

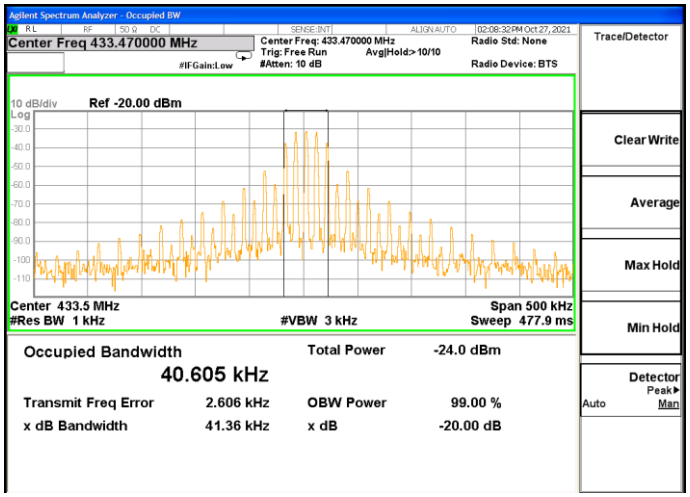
| | |
|---|---|
| **Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))** | **5.1 dB** |

**Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)**

| | |
|---|---|
| **Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))** | **5.8 dB** |

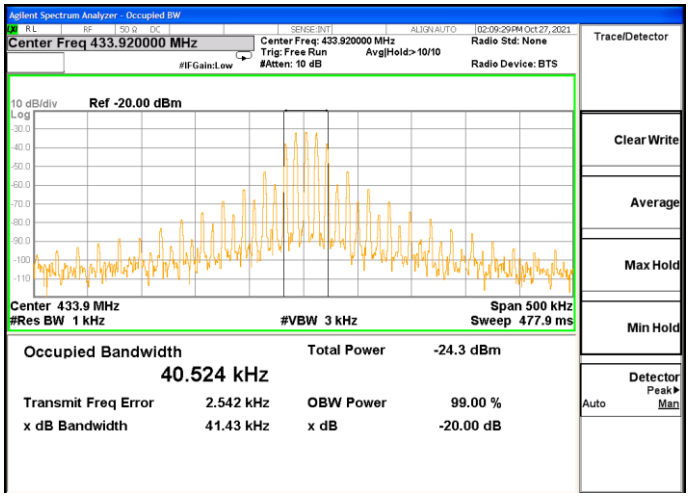
# Appendix A. Test Results of Conducted Test Items

| Test Mode | Mode 1 | Test Frequency (MHz) | 433.47MHz Tx |
|---|---|---|---|
| 20dB Bandwidth (kHz) | 41.36 | 99% Occupied BW (kHz) | 46.605 |



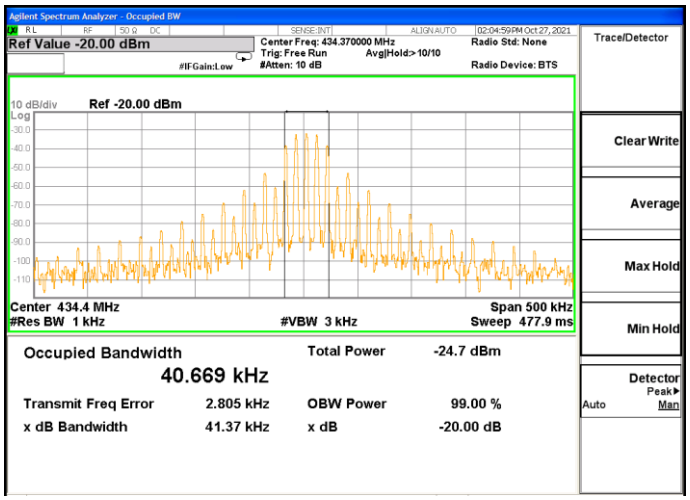

| Bandwidth Limit | Shall be less than 0.25% of 433.47MHz |
|---|---|
| | < 1083.68kHz |
| Test Result | Complies |

| Test Mode | Mode 2 | Test Frequency (MHz) | 433.92MHz Tx |
|---|---|---|---|
| 20dB Bandwidth (kHz) | 41.43 | 99% Occupied BW (kHz) | 40.524 |




| Bandwidth Limit | Shall be less than 0.25% of 433.92MHz |
|---|---|
| | < 1084.8kHz |
| Test Result | Complies |

| Test Mode | Mode 3 | Test Frequency (MHz) | 434.37MHz Tx |
|---|---|---|---|
| 20dB Bandwidth (kHz) | 41.37 | 99% Occupied BW (kHz) | 40.669 |



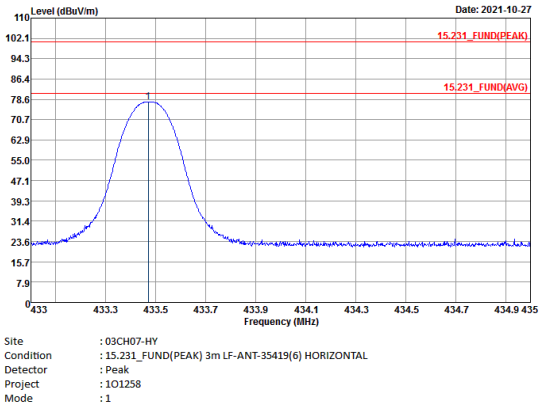

| Bandwidth Limit | Shall be less than 0.25% of 434.37MHz |
|---|---|
| | < 1085.93kHz |
| Test Result | Complies |

# Appendix B. Test Results of Radiated Test Items

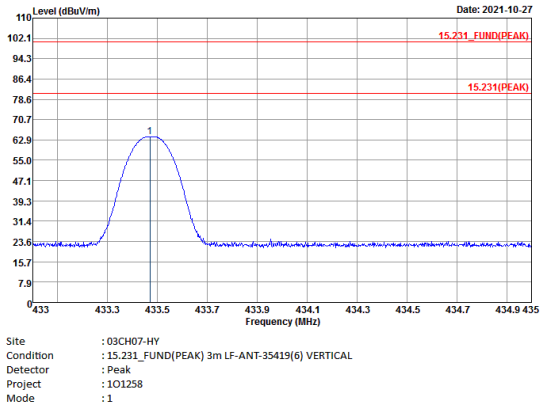
## B1. Test Result of Field Strength of Fundamental Emissions

| Test Mode | Mode 1 | Test Frequency (MHz) | 433.47MHz Tx |
|---|---|---|---|

**Polarization: H**




**Polarization: V**



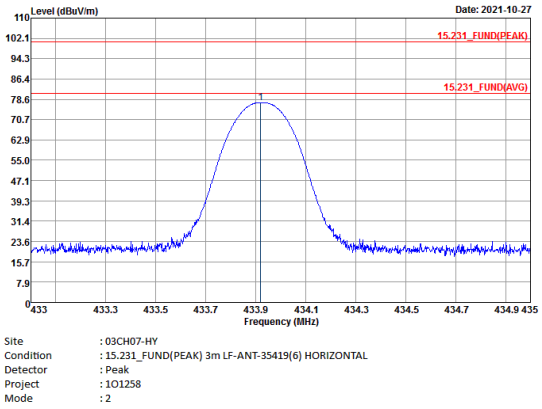

| | Frequency (MHz) | Level (dBµV/m) | Over Limit (dB) | Limit Line (dBµV/m) | Read Level (dBµV) | Antenna Factor (dB/m) | Path Loss (dB) | Preamp Factor (dB) | Ant Pos (cm) | Table Pos (deg) | Peak Avg. (P/A) | Pol. (H/V) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 433.47 | 77.51 | -23.32 | 100.83 | 81.27 | 22.86 | 3.32 | 29.94 | 234 | 0 | P | H |
| | 433.47 | 77.51 | -3.32 | 80.83 | - | - | - | - | - | - | A | H |
| | 433.47 | 64.11 | -36.72 | 100.83 | 67.87 | 22.86 | 3.32 | 29.94 | 200 | 251 | P | V |
| | 433.47 | 64.11 | -16.72 | 80.83 | - | - | - | - | - | - | A | V |

**Note:**

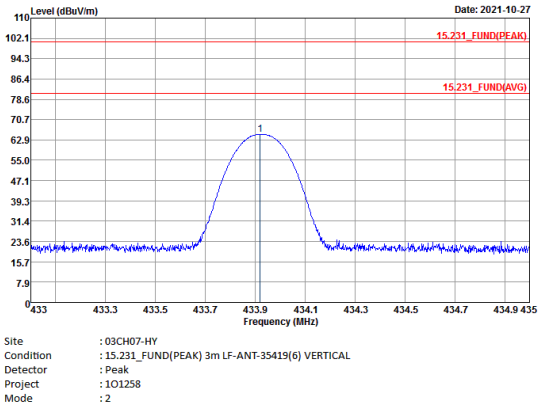
- Path Loss (dB) = Cable Loss (dB) + Filter Loss (dB) + Attenuator Loss (dB)
- Level (dBuV/m) = Antenna Factor (dB/m) + Path Loss (dB) + Read Level (dBuV) - Preamp Factor (dB)
- Over Limit (dB) = Level (dBuV/m) – Limit Line (dBuV/m)

| Test Mode | Mode 2 | Test Frequency (MHz) | 433.92MHz Tx |
|---|---|---|---|

**Polarization: H**




**Polarization: V**



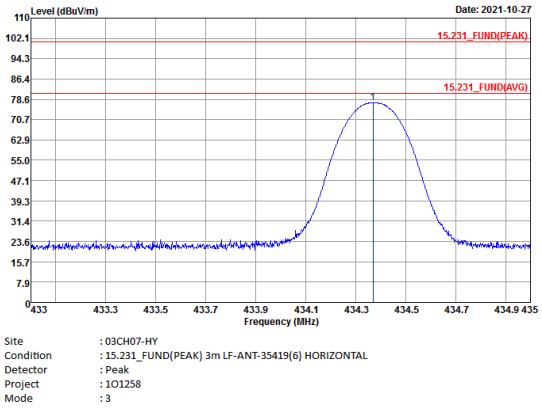

| | Frequency (MHz) | Level (dBµV/m) | Over Limit (dB) | Limit Line (dBµV/m) | Read Level (dBµV) | Antenna Factor (dB/m) | Path Loss (dB) | Preamp Factor (dB) | Ant Pos (cm) | Table Pos (deg) | Peak Avg. (P/A) | Pol. (H/V) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 433.92 | 77.2 | -23.63 | 100.83 | 80.96 | 22.86 | 3.32 | 29.94 | 234 | 0 | P | H |
| | 433.92 | 77.2 | -3.63 | 80.83 | - | - | - | - | - | - | A | H |
| | 433.92 | 64.88 | -35.95 | 100.83 | 68.64 | 22.86 | 3.32 | 29.94 | 226 | 260 | P | V |
| | 433.92 | 64.88 | -15.95 | 80.83 | - | - | - | - | - | - | A | V |

**Note:**

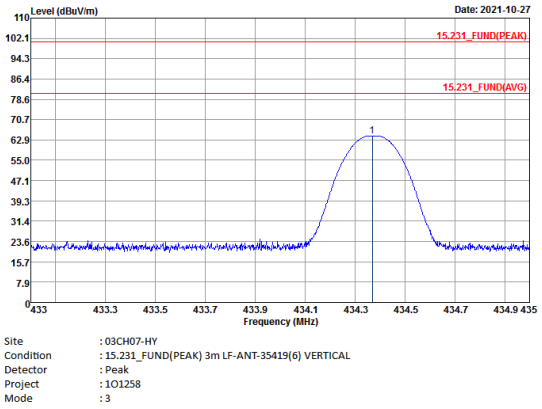
- Path Loss (dB) = Cable Loss (dB) + Filter Loss (dB) + Attenuator Loss (dB)
- Level (dBuV/m) = Antenna Factor (dB/m) + Path Loss (dB) + Read Level (dBuV) - Preamp Factor (dB)
- Over Limit (dB) = Level (dBuV/m) – Limit Line (dBuV/m)

| Test Mode | Mode 3 | Test Frequency (MHz) | 434.37MHz Tx |
|---|---|---|---|

**Polarization: H**




**Polarization: V**




| | Frequency (MHz) | Level (dBµV/m) | Over Limit (dB) | Limit Line (dBµV/m) | Read Level (dBµV) | Antenna Factor (dB/m) | Path Loss (dB) | Preamp Factor (dB) | Ant Pos (cm) | Table Pos (deg) | Peak Avg. (P/A) | Pol. (H/V) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 434.37 | 77.12 | -23.71 | 100.83 | 80.87 | 22.87 | 3.32 | 29.94 | 229 | 0 | P | H |
| | 434.37 | 77.12 | -3.71 | 80.83 | - | - | - | - | - | - | A | H |
| | 434.37 | 64.47 | -36.36 | 100.83 | 68.22 | 22.87 | 3.32 | 29.94 | 224 | 259 | P | V |
| | 434.37 | 64.47 | -16.36 | 80.83 | - | - | - | - | - | - | A | V |

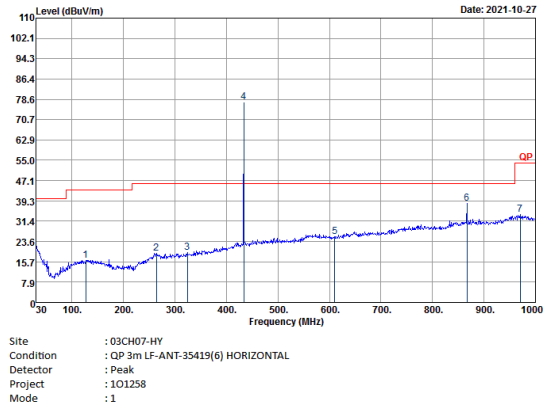
**Note:**

- Path Loss (dB) = Cable Loss (dB) + Filter Loss (dB) + Attenuator Loss (dB)
- Level (dBuV/m) = Antenna Factor (dB/m) + Path Loss (dB) + Read Level (dBuV) - Preamp Factor (dB)
- Over Limit (dB) = Level (dBuV/m) – Limit Line (dBuV/m)

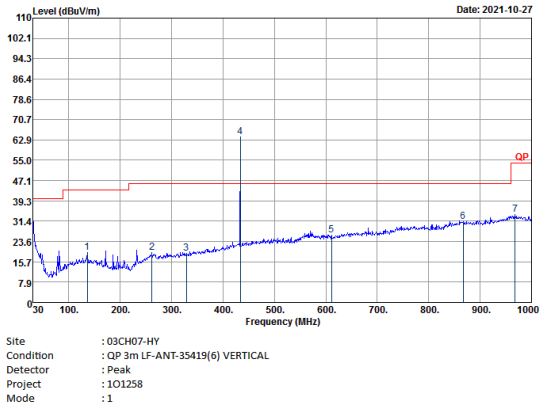
## B2. Test Result of Radiated Spurious Emissions (30MHz~1GHz)

| Test Mode | Mode 1 | Test Frequency (MHz) | 433.47MHz Tx |
|---|---|---|---|

**Polarization: H**




**Polarization: V**



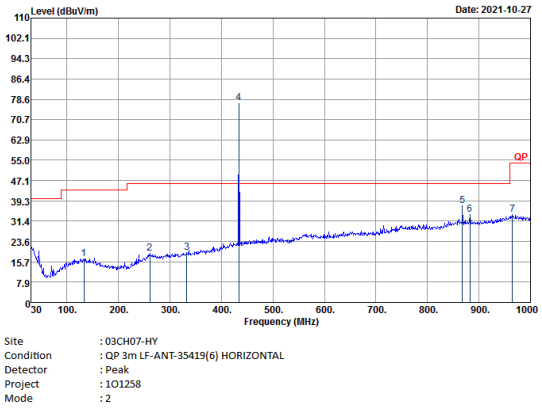

| | Frequency (MHz) | Level (dBµV/m) | Over Limit (dB) | Limit Line (dBµV/m) | Read Level (dBµV) | Antenna Factor (dB/m) | Path Loss (dB) | Preamp Factor (dB) | Ant Pos (cm) | Table Pos (deg) | Peak Avg. (P/A) | Pol. (H/V) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 127 | 16.3 | -27.2 | 43.5 | 26.75 | 17.61 | 1.92 | 29.98 | - | - | P | H |
| | 263.77 | 18.94 | -27.06 | 46 | 26.56 | 19.71 | 2.65 | 29.98 | - | - | P | H |
| | 323.91 | 19.32 | -26.68 | 46 | 26.89 | 19.51 | 2.9 | 29.98 | - | - | P | H |
| * | 433.47 | 77.51 | - | - | 81.27 | 22.86 | 3.32 | 29.94 | - | - | P | H |
| | 610.06 | 25.48 | -20.52 | 46 | 26.4 | 25.11 | 3.88 | 29.91 | - | - | P | H |
| | 866.94 | 38.15 | -7.85 | 46 | 33.79 | 28.86 | 4.63 | 29.13 | - | - | P | H |
| | 969.93 | 34.07 | -19.93 | 54 | 26.82 | 30.93 | 4.95 | 28.63 | - | - | P | H |
| | 135.73 | 19.21 | -24.29 | 43.5 | 29.72 | 17.49 | 1.98 | 29.98 | - | - | P | V |
| | 261.83 | 19.28 | -26.72 | 46 | 26.98 | 19.64 | 2.64 | 29.98 | - | - | P | V |
| | 328.76 | 18.98 | -27.02 | 46 | 26.4 | 19.65 | 2.91 | 29.98 | - | - | P | V |
| * | 433.47 | 64.11 | - | - | 67.87 | 22.86 | 3.32 | 29.94 | - | - | P | V |
| | 611.03 | 25.94 | -20.06 | 46 | 26.83 | 25.12 | 3.89 | 29.9 | - | - | P | V |
| | 866.94 | 31.4 | -14.6 | 46 | 27.04 | 28.86 | 4.63 | 29.13 | - | - | P | V |
| | 967.99 | 34.13 | -19.87 | 54 | 26.92 | 30.91 | 4.94 | 28.64 | - | - | P | V |

**Note:**

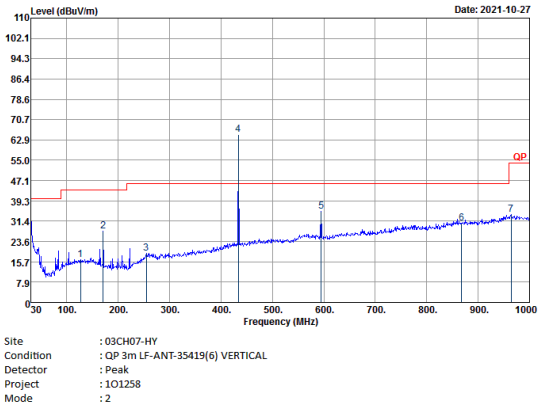
- Distance extrapolation factor = 20 log (test distance [X m]/specific distance [3 m]) (dB)
- 433.47MHz is fundamental signal which can be ignored
- Path Loss (dB) = Cable Loss (dB) + Filter Loss (dB) + Attenuator Loss (dB)
- Level (dBuV/m) = Antenna Factor (dB/m) + Path Loss (dB) + Read Level (dBuV) - Preamp Factor (dB)
- Over Limit (dB) = Level (dBuV/m) – Limit Line (dBuV/m)

| Test Mode | Mode 2 | Test Frequency (MHz) | 433.92MHz Tx |
|---|---|---|---|

**Polarization: H**




**Polarization: V**



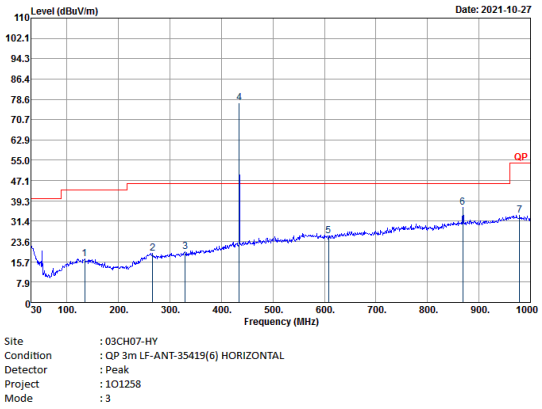

| | Frequency (MHz) | Level (dBµV/m) | Over Limit (dB) | Limit Line (dBµV/m) | Read Level (dBµV) | Antenna Factor (dB/m) | Path Loss (dB) | Preamp Factor (dB) | Ant Pos (cm) | Table Pos (deg) | Peak Avg. (P/A) | Pol. (H/V) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 132.82 | 16.91 | -26.59 | 43.5 | 27.41 | 17.52 | 1.96 | 29.98 | - | - | P | H |
| | 260.86 | 18.85 | -27.15 | 46 | 26.59 | 19.6 | 2.64 | 29.98 | - | - | P | H |
| | 332.64 | 19.18 | -26.82 | 46 | 26.47 | 19.77 | 2.92 | 29.98 | - | - | P | H |
| * | 433.92 | 77.2 | - | - | 80.96 | 22.86 | 3.32 | 29.94 | - | - | P | H |
| | 867.84 | 37.41 | -8.59 | 46 | 33.08 | 28.83 | 4.63 | 29.13 | - | - | P | H |
| | 882.63 | 34.07 | -11.93 | 46 | 29.79 | 28.67 | 4.64 | 29.03 | - | - | P | H |
| | 965.08 | 33.91 | -20.09 | 54 | 26.75 | 30.88 | 4.93 | 28.65 | - | - | P | H |
| | 127 | 16.44 | -27.06 | 43.5 | 26.89 | 17.61 | 1.92 | 29.98 | - | - | P | V |
| | 170.65 | 27.46 | -16.04 | 43.5 | 39.7 | 15.56 | 2.18 | 29.98 | - | - | P | V |
| | 255.04 | 19.13 | -26.87 | 46 | 27.63 | 18.87 | 2.61 | 29.98 | - | - | P | V |
| * | 433.92 | 64.88 | - | - | 68.64 | 22.86 | 3.32 | 29.94 | - | - | P | V |
| | 594.54 | 35.2 | -10.8 | 46 | 35.88 | 25.41 | 3.83 | 29.92 | - | - | P | V |
| | 867.84 | 30.54 | -15.46 | 46 | 26.21 | 28.83 | 4.63 | 29.13 | - | - | P | V |
| | 964.11 | 34.13 | -19.87 | 54 | 26.98 | 30.87 | 4.93 | 28.65 | - | - | P | V |

**Note:**

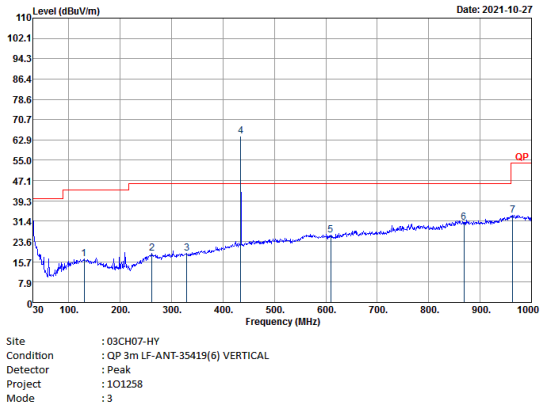
- Distance extrapolation factor = 20 log (test distance [X m]/specific distance [3 m]) (dB)
- 433.92MHz is fundamental signal which can be ignored
- Path Loss (dB) = Cable Loss (dB) + Filter Loss (dB) + Attenuator Loss (dB)
- Level (dBuV/m) = Antenna Factor (dB/m) + Path Loss (dB) + Read Level (dBuV) - Preamp Factor (dB)
- Over Limit (dB) = Level (dBuV/m) – Limit Line (dBuV/m)

| Test Mode | Mode 3 | Test Frequency (MHz) | 434.37MHz Tx |
|---|---|---|---|

**Polarization: H**




**Polarization: V**




| | Frequency (MHz) | Level (dBµV/m) | Over Limit (dB) | Limit Line (dBµV/m) | Read Level (dBµV) | Antenna Factor (dB/m) | Path Loss (dB) | Preamp Factor (dB) | Ant Pos (cm) | Table Pos (deg) | Peak Avg. (P/A) | Pol. (H/V) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 134.76 | 16.81 | -26.69 | 43.5 | 27.32 | 17.5 | 1.97 | 29.98 | - | - | P | H |
| | 266.68 | 18.95 | -27.05 | 46 | 26.75 | 19.51 | 2.67 | 29.98 | - | - | P | H |
| | 329.73 | 19.6 | -26.4 | 46 | 26.98 | 19.68 | 2.92 | 29.98 | - | - | P | H |
| * | 434.37 | 77.12 | - | - | 80.87 | 22.87 | 3.32 | 29.94 | - | - | P | H |
| | 608.12 | 25.8 | -20.2 | 46 | 26.69 | 25.14 | 3.88 | 29.91 | - | - | P | H |
| | 868.74 | 36.74 | -9.26 | 46 | 32.44 | 28.8 | 4.63 | 29.13 | - | - | P | H |
| | 978.66 | 33.8 | -20.2 | 54 | 26.78 | 30.64 | 4.98 | 28.6 | - | - | P | H |
| | 129.91 | 16.71 | -26.79 | 43.5 | 27.28 | 17.47 | 1.94 | 29.98 | - | - | P | V |
| | 261.83 | 18.85 | -27.15 | 46 | 26.55 | 19.64 | 2.64 | 29.98 | - | - | P | V |
| | 329.73 | 18.91 | -27.09 | 46 | 26.29 | 19.68 | 2.92 | 29.98 | - | - | P | V |
| * | 434.37 | 64.47 | - | - | 68.22 | 22.87 | 3.32 | 29.94 | - | - | P | V |
| | 609.09 | 26.08 | -19.92 | 46 | 26.99 | 25.12 | 3.88 | 29.91 | - | - | P | V |
| | 868.74 | 31.01 | -14.99 | 46 | 26.71 | 28.8 | 4.63 | 29.13 | - | - | P | V |
| | 963.14 | 33.69 | -20.31 | 54 | 26.57 | 30.86 | 4.92 | 28.66 | - | - | P | V |

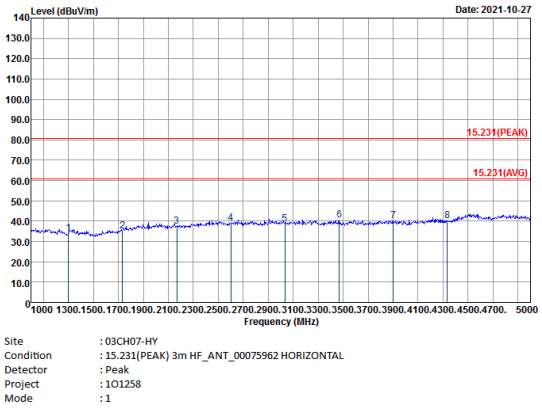
**Note:**

- Distance extrapolation factor = 20 log (test distance [X m]/specific distance [3 m]) (dB)
- 434.37MHz is fundamental signal which can be ignored
- Path Loss (dB) = Cable Loss (dB) + Filter Loss (dB) + Attenuator Loss (dB)
- Level (dBuV/m) = Antenna Factor (dB/m) + Path Loss (dB) + Read Level (dBuV) - Preamp Factor (dB)
- Over Limit (dB) = Level (dBuV/m) – Limit Line (dBuV/m)

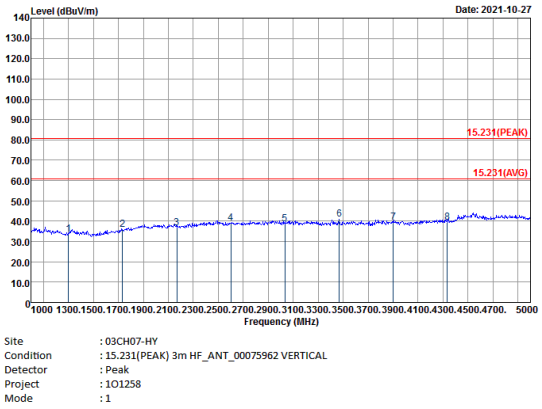
## B3. Test Result of Field Radiated Spurious Emissions (1GHz~5GHz)

| Test Mode | Mode 1 | Test Frequency (MHz) | 433.47MHz Tx |
|---|---|---|---|

**Polarization: H**




**Polarization: V**



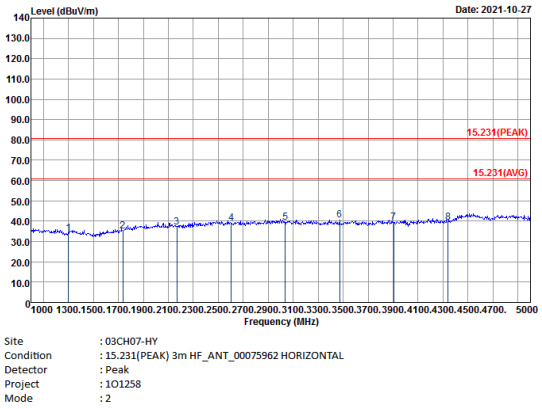

| | Frequency (MHz) | Level (dBµV/m) | Over Limit (dB) | Limit Line (dBµV/m) | Read Level (dBµV) | Antenna Factor (dB/m) | Path Loss (dB) | Preamp Factor (dB) | Ant Pos (cm) | Table Pos (deg) | Peak Avg. (P/A) | Pol. (H/V) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1300.41 | 33.97 | -46.86 | 80.83 | 58.8 | 28.7 | 6.1 | 59.63 | - | - | P | H |
| | 1733.88 | 35.22 | -45.61 | 80.83 | 58.08 | 29.63 | 6.9 | 59.39 | - | - | P | H |
| | 2167.35 | 37.54 | -43.29 | 80.83 | 57.47 | 31.57 | 7.8 | 59.3 | - | - | P | H |
| | 2600.82 | 39.06 | -41.77 | 80.83 | 57.12 | 32.5 | 8.77 | 59.33 | - | - | P | H |
| | 3034.29 | 38.48 | -42.35 | 80.83 | 55.47 | 32.8 | 9.68 | 59.47 | - | - | P | H |
| | 3467.76 | 40.39 | -40.44 | 80.83 | 57.41 | 32.7 | 10.37 | 60.09 | - | - | P | H |
| | 3901.23 | 40.13 | -40.7 | 80.83 | 56.12 | 33.3 | 11.18 | 60.47 | - | - | P | H |
| | 4334.7 | 40.25 | -40.58 | 80.83 | 53.94 | 33.77 | 11.62 | 59.08 | - | - | P | H |
| | 1300.41 | 33.36 | -47.47 | 80.83 | 58.19 | 28.7 | 6.1 | 59.63 | - | - | P | V |
| | 1733.88 | 35.71 | -45.12 | 80.83 | 58.57 | 29.63 | 6.9 | 59.39 | - | - | P | V |
| | 2167.35 | 36.84 | -43.99 | 80.83 | 56.77 | 31.57 | 7.8 | 59.3 | - | - | P | V |
| | 2600.82 | 38.8 | -42.03 | 80.83 | 56.86 | 32.5 | 8.77 | 59.33 | - | - | P | V |
| | 3034.29 | 38.59 | -42.24 | 80.83 | 55.58 | 32.8 | 9.68 | 59.47 | - | - | P | V |
| | 3467.76 | 40.77 | -40.06 | 80.83 | 57.79 | 32.7 | 10.37 | 60.09 | - | - | P | V |
| | 3901.23 | 39.33 | -41.5 | 80.83 | 55.32 | 33.3 | 11.18 | 60.47 | - | - | P | V |
| | 4334.7 | 39.48 | -41.35 | 80.83 | 53.17 | 33.77 | 11.62 | 59.08 | - | - | P | V |

**Note:**

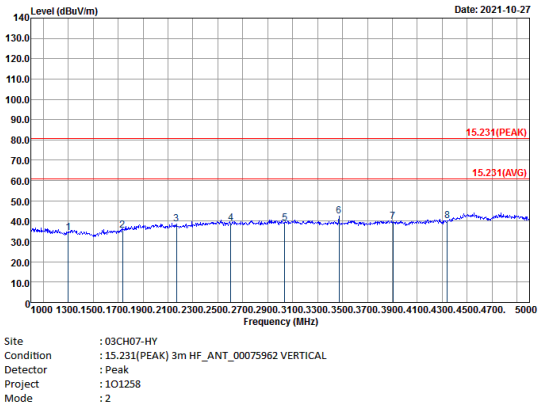
- Distance extrapolation factor = 20 log (test distance [X m]/specific distance [3 m]) (dB)
- Path Loss (dB) = Cable Loss (dB) + Filter Loss (dB) + Attenuator Loss (dB)
- Level (dBuV/m) = Antenna Factor (dB/m) + Path Loss (dB) + Read Level (dBuV) - Preamp Factor (dB)
- Over Limit (dB) = Level (dBuV/m) – Limit Line (dBuV/m)

| Test Mode | Mode 2 | Test Frequency (MHz) | 433.92MHz Tx |
|---|---|---|---|

**Polarization: H**




**Polarization: V**



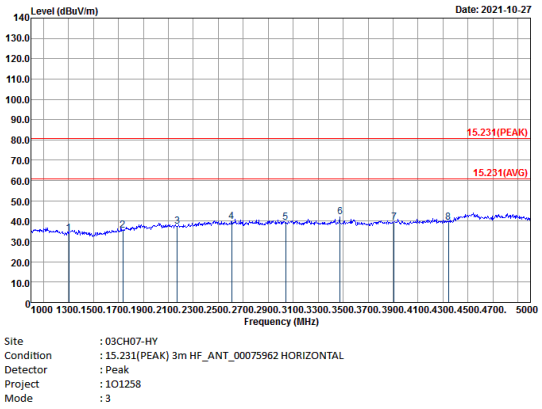

| | Frequency (MHz) | Level (dBµV/m) | Over Limit (dB) | Limit Line (dBµV/m) | Read Level (dBµV) | Antenna Factor (dB/m) | Path Loss (dB) | Preamp Factor (dB) | Ant Pos (cm) | Table Pos (deg) | Peak Avg. (P/A) | Pol. (H/V) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1301.76 | 33.97 | -46.86 | 80.83 | 58.79 | 28.7 | 6.1 | 59.62 | - | - | P | H |
| | 1735.68 | 35.04 | -45.79 | 80.83 | 57.89 | 29.63 | 6.91 | 59.39 | - | - | P | H |
| | 2169.6 | 37.1 | -43.73 | 80.83 | 57.02 | 31.57 | 7.81 | 59.3 | - | - | P | H |
| | 2603.52 | 39.17 | -41.66 | 80.83 | 57.22 | 32.5 | 8.78 | 59.33 | - | - | P | H |
| | 3037.44 | 39.21 | -41.62 | 80.83 | 56.19 | 32.8 | 9.69 | 59.47 | - | - | P | H |
| | 3471.36 | 40.7 | -40.13 | 80.83 | 57.72 | 32.7 | 10.38 | 60.1 | - | - | P | H |
| | 3905.28 | 39.32 | -41.51 | 80.83 | 55.49 | 33.3 | 11 | 60.47 | - | - | P | H |
| | 4339.2 | 39.26 | -41.57 | 80.83 | 53.04 | 33.77 | 11.51 | 59.06 | - | - | P | H |
| | 1301.76 | 34.4 | -46.43 | 80.83 | 59.22 | 28.7 | 6.1 | 59.62 | - | - | P | V |
| | 1735.68 | 35.54 | -45.29 | 80.83 | 58.39 | 29.63 | 6.91 | 59.39 | - | - | P | V |
| | 2169.6 | 38.45 | -42.38 | 80.83 | 58.37 | 31.57 | 7.81 | 59.3 | - | - | P | V |
| | 2603.52 | 39.16 | -41.67 | 80.83 | 57.21 | 32.5 | 8.78 | 59.33 | - | - | P | V |
| | 3037.44 | 38.97 | -41.86 | 80.83 | 55.95 | 32.8 | 9.69 | 59.47 | - | - | P | V |
| | 3471.36 | 42.66 | -38.17 | 80.83 | 59.68 | 32.7 | 10.38 | 60.1 | - | - | P | V |
| | 3905.28 | 39.93 | -40.9 | 80.83 | 56.1 | 33.3 | 11 | 60.47 | - | - | P | V |
| | 4339.2 | 40.31 | -40.52 | 80.83 | 54.09 | 33.77 | 11.51 | 59.06 | - | - | P | V |

**Note:**

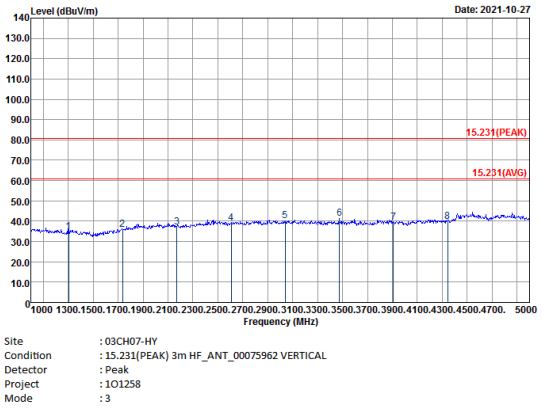
- Distance extrapolation factor = 20 log (test distance [X m]/specific distance [3 m]) (dB)
- Path Loss (dB) = Cable Loss (dB) + Filter Loss (dB) + Attenuator Loss (dB)
- Level (dBuV/m) = Antenna Factor (dB/m) + Path Loss (dB) + Read Level (dBuV) - Preamp Factor (dB)
- Over Limit (dB) = Level (dBuV/m) – Limit Line (dBuV/m)

| Test Mode | Mode 3 | Test Frequency (MHz) | 434.37MHz Tx |
|---|---|---|---|

**Polarization: H**




**Polarization: V**




| | Frequency (MHz) | Level (dBµV/m) | Over Limit (dB) | Limit Line (dBµV/m) | Read Level (dBµV) | Antenna Factor (dB/m) | Path Loss (dB) | Preamp Factor (dB) | Ant Pos (cm) | Table Pos (deg) | Peak Avg. (P/A) | Pol. (H/V) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1303.11 | 34.11 | -46.72 | 80.83 | 58.93 | 28.7 | 6.1 | 59.62 | - | - | P | H |
| | 1737.48 | 35.63 | -45.2 | 80.83 | 58.47 | 29.63 | 6.91 | 59.38 | - | - | P | H |
| | 2171.85 | 37.36 | -43.47 | 80.83 | 57.28 | 31.57 | 7.81 | 59.3 | - | - | P | H |
| | 2606.22 | 39.86 | -40.97 | 80.83 | 57.91 | 32.5 | 8.78 | 59.33 | - | - | P | H |
| | 3040.59 | 39.42 | -41.41 | 80.83 | 56.41 | 32.8 | 9.69 | 59.48 | - | - | P | H |
| | 3474.96 | 42.24 | -38.59 | 80.83 | 59.24 | 32.7 | 10.4 | 60.1 | - | - | P | H |
| | 3909.33 | 39.27 | -41.56 | 80.83 | 55.25 | 33.3 | 11.2 | 60.48 | - | - | P | H |
| | 4343.7 | 39.27 | -41.56 | 80.83 | 52.88 | 33.8 | 11.63 | 59.04 | - | - | P | H |
| | 1303.11 | 34.72 | -46.11 | 80.83 | 59.54 | 28.7 | 6.1 | 59.62 | - | - | P | V |
| | 1737.48 | 35.91 | -44.92 | 80.83 | 58.75 | 29.63 | 6.91 | 59.38 | - | - | P | V |
| | 2171.85 | 37.24 | -43.59 | 80.83 | 57.16 | 31.57 | 7.81 | 59.3 | - | - | P | V |
| | 2606.22 | 39.09 | -41.74 | 80.83 | 57.14 | 32.5 | 8.78 | 59.33 | - | - | P | V |
| | 3040.59 | 40.16 | -40.67 | 80.83 | 57.15 | 32.8 | 9.69 | 59.48 | - | - | P | V |
| | 3474.96 | 41.42 | -39.41 | 80.83 | 58.42 | 32.7 | 10.4 | 60.1 | - | - | P | V |
| | 3909.33 | 39.58 | -41.25 | 80.83 | 55.56 | 33.3 | 11.2 | 60.48 | - | - | P | V |
| | 4343.7 | 39.96 | -40.87 | 80.83 | 53.57 | 33.8 | 11.63 | 59.04 | - | - | P | V |

**Note:**

- Distance extrapolation factor = 20 log (test distance [X m]/specific distance [3 m]) (dB)
- Path Loss (dB) = Cable Loss (dB) + Filter Loss (dB) + Attenuator Loss (dB)
- Level (dBuV/m) = Antenna Factor (dB/m) + Path Loss (dB) + Read Level (dBuV) - Preamp Factor (dB)
- Over Limit (dB) = Level (dBuV/m) – Limit Line (dBuV/m)