

RF TEST REPORT

FCC

APPLICANT

SPRINGCARD SAS

MODEL NAME

PUCK Blue

FCC ID

TYQ-PUCKBLUE01

REPORT NUMBER

HA191215-SPR-002-R02

TEST REPORT

Date of Issue

Oct 24, 2020

Test Site

Hyundai C-Tech, Inc. dba HCT America, Inc.
1726 Ringwood Ave, San Jose, CA 95131, USA

| | |
|---------------------------|---|
| Applicant | SPRINGCARD SAS |
| Applicant Address | 2 voie la Cardon Parc Gutenberg 91120 Palaiseau, France |
| FCC ID | TYQ-PUCKBLUE01 |
| Model Name | PUCK Blue |
| EUT Type | 13.56 MHz RFID/NFC USB Coupler with Bluetooth |
| Modulation Type | 13.56 MHz (ASK) / Bluetooth v4.2 LE (GFSK) |
| FCC Classification | Digital Transmission System (DTS) |
| FCC Rule Part(s) | Part 15.209 |
| Test Procedure | ANSI C63.10-2013 |

The device bearing the trade name and model specified above, has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures required. The results of testing in this report apply only to the product which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Hyundai C-Tech, Inc. dba HCT America, Inc. certifies that no party to application has been denied the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C 862

Tested By

Billy Kim

Test Engineer

Reviewed By

Sunwoo Kim

Technical Manager

REVISION HISTORY

The revision history for this document is shown in table.

| TEST REPORT NO. | DATE | DESCRIPTION |
|----------------------|--------------|---------------|
| HA191215-SPR-002-R02 | Oct 24, 2020 | Initial Issue |
| | | |
| | | |
| | | |

TABLE OF CONTENTS

| | |
|---------------------------------------|----|
| 1. GENERAL INFORMATION | 4 |
| 2. METHODOLOGY | 5 |
| 3. INSTRUMENT CALIBRATION | 5 |
| 4. FACILITIES AND ACCREDITATIONS..... | 6 |
| 5. ANTENNA REQUIREMENTS | 7 |
| 6. MEASUREMENT UNCERTAINTY | 8 |
| 7. DESCRIPTION OF TESTS | 9 |
| 7.1 RADIATED TEST | 9 |
| 7.2 TEST CONFIGURATION | 15 |
| 8. LIST OF TEST EQUIPMENT | 22 |
| APPENDIX A. TEST SETUP PHOTOS | 23 |

1. GENERAL INFORMATION

EUT DESCRIPTION

| | |
|--------------------------------------|--|
| Model | PUCK Blue |
| S/N | 15408E5A |
| EUT Type | 13.56 MHz RFID/NFC USB Coupler with Bluetooth |
| Power Supply | DC 5V |
| RF Specification | 13.56 MHz : ASK Bluetooth LE v4.2 (1 Mbps) : GFSK |
| Operating Environment | Indoor |
| Operating Temperature ⁽¹⁾ | -20 °C ~ +70°C |

RF SPECIFICATION SUBJECT TO THE REPORT

| | | |
|--------------------------------------|------------------------------|---|
| Operating Frequency Range | RFID | 13.56 MHz |
| | BLE | 2402 – 2480 MHz |
| RF Specification (Modulation) | 13.56 MHz (ASK) / BLE (GFSK) | |
| Number of Channels | RFID | 1 Channel |
| | BLE | 40 Channels |
| Antenna Specification ⁽¹⁾ | RFID | Antenna Type : Loop Antenna |
| | BLE | Antenna Type : Chip Antenna (Peak Gain : 1 dBi) |
| Firmware Version ⁽²⁾ | 1.15 | |
| Hardware Version ⁽²⁾ | FPF20201-AE | |
| Date(s) of Tests | Oct 5, 2020 ~ Oct 9, 2020 | |

Note :

1. Antenna information is based on the document provided by the applicant
2. Firmware and Hardware Version are as received by the applicant.

2. METHODOLOGY

The measurement procedure described in FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01 dated December 14, 2017 entitled "Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (UNII) Devices Part 15, Subpart E" and ANSI C63.10 (Version : 2013) 'the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices' were used in the measurement.

EUT CONFIGURATION

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

EUT EXERCISE

The EUT was operated in the engineering 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, 15.225 and 15.247 under the FCC Rules Part 15 Subpart C.

GENERAL TEST PROCEDURES

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2 of ANSI C63.10. (Version : 2013) Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-peak and average detector modes.

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane below 1 GHz. Above 1 GHz with 1.5 m using absorbers between the EUT and receive antenna. 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. Also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 8 of ANSI C63.10. (Version: 2013)

DESCRIPTION OF TEST MODES

EUT was set to transmit HF and BLE simultaneously using test software provided. The channels, output power setting, continuous TX for BLE (1M) were controlled on the command line using 'SpringCoreControl'. In addition, HF was set to transmit, running 'SpringCoreRDR' with contactless card.

3. 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's, which is traceable to recognized national standards. Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5 (Version : 2017).

4. FACILITIES AND ACCREDITATIONS

FACILITIES

The SAC (Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at 1726 Ringwood Avenue, San Jose, California 95131, USA.

The site is constructed in conformance with the requirements of ANSI C63.4. (Version :2014) and CISPR Publication 22.



EQUIPMENT

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

5. ANTENNA REQUIREMENTS

According to FCC 47 CFR §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.”

- (1) The antenna of this E.U.T is permanently attached and there is no provision for connection to an external antenna.
- (2) The E.U.T Complies with the requirement of §15.203

6. MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013.

All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95 % level of confidence. The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

| Parameter | Expanded Uncertainty (\pm dB) |
|--|----------------------------------|
| Radiated Disturbance (9 kHz ~ 30 MHz) | 3.20 |
| Radiated Disturbance (30 MHz ~ 1 GHz) | 4.73 |
| Radiated Disturbance (1 GHz ~ 18 GHz) | 5.21 |
| Radiated Disturbance (18 GHz ~ 40 GHz) | 5.18 |

7. DESCRIPTION OF TESTS

7.1 RADIATED TEST

Radiated Emission Limits

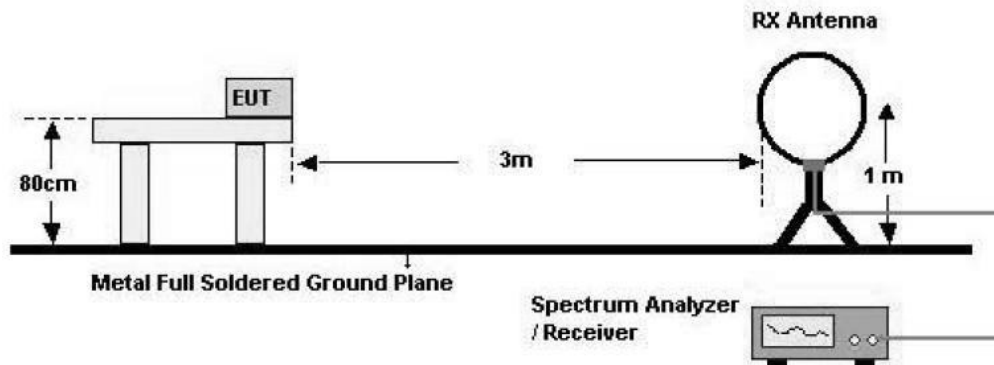
| FCC : 47 CFR § 15.209 | | |
|-----------------------|-----------------------|--------------------------|
| Frequency (MHz) | Field Strength (uV/m) | Measurement Distance (m) |
| 0.009 – 0.490 | 2400/F(kHz) | 300 |
| 0.490 – 1.705 | 24000/F(kHz) | 30 |
| 1.705 – 30 | 30 | 30 |
| 30-88 | 100 | 3 |
| 88-216 | 150 | 3 |
| 216-960 | 200 | 3 |
| Above 960 | 500 | 3 |

Restricted Bands of Operation

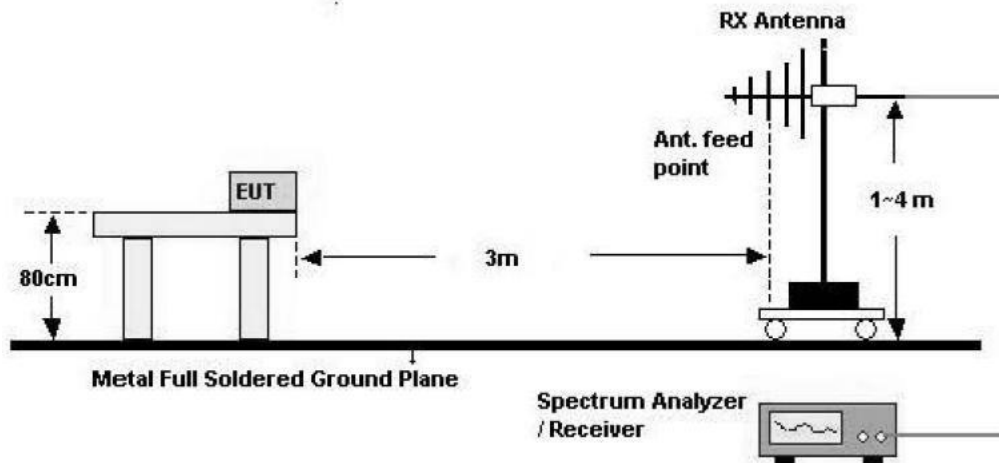
| FCC : 47 CFR § 15.205(a) | | | | |
|--------------------------|-------------------|-----------------------|-----------------|-----------------|
| Frequency (MHz) | Frequency (MHz) | Frequency (MHz) | Frequency (MHz) | Frequency (MHz) |
| 0.090 – 0.110 | 12.29-12.293 | 149.9 - 150.05 | 1660.0 - 1710.0 | 8025 – 8500 |
| 0.495 - 0.505 | 12.51975-12.52025 | 156.52475 - 156.52525 | 1718.8 - 1722.2 | 9000 – 9200 |
| 2.1735 – 2.1905 | 12.57675-12.57725 | 156.7 - 156.9 | 2200.0 - 2300.0 | 9300 – 9500 |
| 4.125 - 4.128 | 13.36-13.41 | 162.0125 - 167.17 | 2310.0 - 2390.0 | 10600 - 12700 |
| 4.17725-4.17775 | 16.42-16.423 | 167.72 - 173.2 | 2483.5 – 2500.0 | 13250 – 13400 |
| 4.20725-4.20775 | 16.69475-16.69525 | 240.0 - 285.0 | 2690.0 - 2900.0 | 14470 – 14500 |
| 6.215-6.218 | 16.80425-16.80475 | 322.0 - 335.4 | 3260.0 – 3267.0 | 15350 – 16200 |
| 6.26775-6.26825 | 25.5-25.67 | 399.9 - 410.0 | 3332.0 – 3339.0 | 17700 – 21400 |
| 6.31175-6.31225 | 37.5-38.25 | 608.0 - 614.0 | 3345.8 – 3358.0 | 22010 – 23120 |
| 8.291-8.294 | 73 - 74.6 | 960.0 - 1240.0 | 3600.0 – 4400.0 | 23600 – 24000 |
| 8.362-8.366 | 74.8 - 75.2 | 1300.0 - 1427.0 | 4500.0 – 5150.0 | 31200 – 31800 |
| 8.37625-8.38675 | 108 - 121.94 | 1435.0 - 1626.5 | 5350.0 – 5460.0 | 36430 – 36500 |
| 8.41425-8.41475 | 123 - 138 | 1645.5 - 1646.5 | 7250.0 – 7750.0 | Above 38600 |

Test Configuration

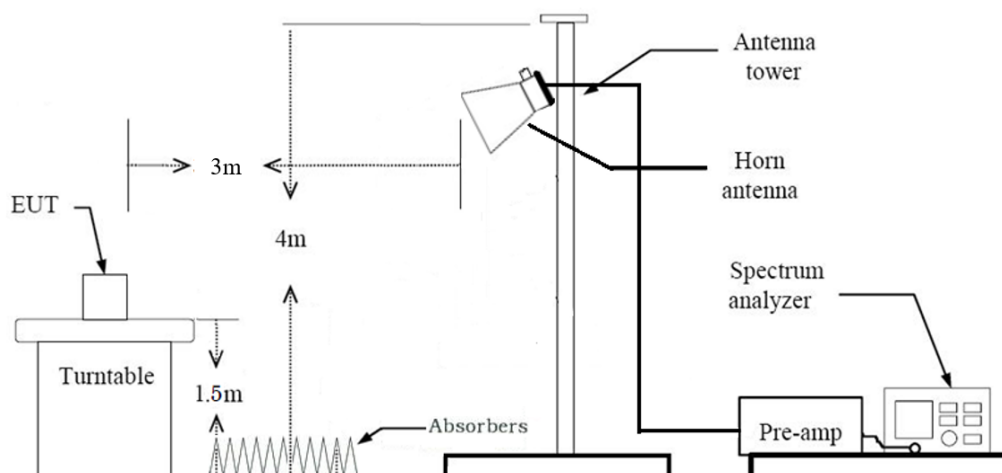
Below 30 MHz



30 MHz - 1 GHz



Above 1 GHz



Test Procedure of Radiated spurious emissions (Below 30 MHz)

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The loop antenna was placed at a location 3m from the EUT
3. The EUT is placed on a turntable, which is 0.8m above ground plane.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
6. Distance Correction Factor (0.009 MHz – 0.490 MHz) = $40 \cdot \log(3 \text{ m}/300 \text{ m}) = -80 \text{ dB}$
Measurement Distance: 3 m
7. Distance Correction Factor (0.490 MHz – 30 MHz) = $40 \cdot \log(3 \text{ m}/30 \text{ m}) = -40 \text{ dB}$
Measurement Distance: 3 m
8. Spectrum Setting

- Frequency Range = 9 kHz ~ 30 MHz
- Detector = Peak
- Trace = Max hold
- RBW = 9 kHz
- VBW $\geq 3 \cdot \text{RBW}$

9. Total = Reading Value + Antenna Factor (A.F) + Cable Loss (C.L)

Adequate comparison measurements were confirmed against an open field site since the test was performed at alternative site (3m SAC) other than the open area test site. Sufficient test was made to demonstrate that the alternative site produces result that correlate with the one of test made at the open field site based on KDB 414788.

Test Procedure of Radiated spurious emissions (Below 1GHz)

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The EUT is placed on a turntable, which is 0.8 m above ground plane.
3. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
4. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
5. Spectrum Setting

(1) Measurement Type (Peak):

- Measured Frequency Range: 30 MHz – 1 GHz
- Detector = Peak
- Trace = Max hold
- RBW = 100 kHz
- VBW $\geq 3 \times$ RBW

(2) Measurement Type(Quasi-peak):

- Measured Frequency Range: 30 MHz – 1 GHz
- Detector = Quasi-Peak
- RBW = 120 kHz

In general, the method (1) is mainly used

6. Total = Reading Value + Antenna Factor (A.F) + Cable Loss (C.L)

Test Procedure of Radiated spurious emissions (Above 1 GHz)

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
4. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. The unit was tested with its standard battery.
8. Spectrum Setting

(1) Measurement Type(Peak):

- Measured Frequency Range : 1 GHz – 25 GHz
- Detector = Peak
- Trace = Max hold
- RBW = 1 MHz
- VBW $\geq 3 \times$ RBW

(2) Measurement Type(Average): Duty cycle $\geq 98\%$

- Measured Frequency Range : 1 GHz – 25 GHz
- Detector = RMS
- Averaging type = power (*i.e.*, RMS)
- RBW = 1 MHz
- VBW $\geq 3 \times$ RBW
- Sweep time = auto.
- Trace mode = average (at least 100 traces).

(3) Measurement Type(Average): Duty cycle $< 98\%$, duty cycle variations are less than $\pm 2\%$

- Measured Frequency Range : 1 GHz – 25 GHz
- Detector = RMS
- Averaging type = power (*i.e.*, RMS)
- RBW = 1 MHz
- VBW $\geq 3 \times$ RBW
- Sweep time = auto.
- Trace mode = average (at least 100 traces).
- Correction factor shall be added to the measurement results prior to comparing to the emission limit to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle.
- Duty Cycle Factor (dB) : Please refer to the please refer to section 9.1.

10. Measurement value only up to 6 maximum emissions noted or would be lesser if no specific emissions from the EUT are recorded (*i.e.*: margin > 20 dB from the applicable limit) and considered that is already beyond the background noise floor.

11. Sample Calculation

- (1) Total (Peak) = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(G)
- (2) Total (Average, Duty $\geq 98\%$) = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(G)
- (3) Total (Average, Duty $< 98\%$) = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(G) + Duty Cycle Factor

Test Procedure of Radiated Restricted Band Edge

1. Radiated test is performed with hopping off.
2. The EUT is placed on a turntable, which is 1.5 m above ground plane.
3. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
4. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
5. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
6. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. The unit was tested with its standard battery.
8. Spectrum Setting

(1) Measurement Type(Peak):

- Measured Frequency Range : 2310 MHz – 2390 MHz / 2483.5 MHz – 2500 MHz
- Detector = Peak
- Trace = Max hold
- RBW = 1 MHz
- VBW $\geq 3 \times$ RBW

(2) Measurement Type(Average): Duty cycle $\geq 98\%$,

- Measured Frequency Range : 2310 MHz – 2390 MHz / 2483.5 MHz – 2500 MHz
- Detector = RMS
- Averaging type = power (*i.e.*, RMS)
- RBW = 1 MHz
- VBW $\geq 3 \times$ RBW
- Sweep time = auto.
- Trace mode = average (at least 100 traces).

(3) Measurement Type(Average): Duty cycle $< 98\%$, duty cycle variations are less than $\pm 2\%$

- Measured Frequency Range : 2310 MHz – 2390 MHz / 2483.5 MHz – 2500 MHz
- Detector = RMS
- Averaging type = power (*i.e.*, RMS)
- RBW = 1 MHz
- VBW $\geq 3 \times$ RBW
- Sweep time = auto.
- Trace mode = average (at least 100 traces).
- 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.
- Duty Cycle Factor (dB) : Please refer to the please refer to section 9.1.

9. Measurement value only up to 6 maximum emissions noted or would be lesser if no specific emissions from the EUT are recorded (*i.e.*: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

10. Sample Calculation

(1) Total (Peak) = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L)

(2) Total (Average, Duty $\geq 98\%$) = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(G)

(3) Total (Average, Duty $< 98\%$) = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(G) + Duty Cycle Factor

7.2 TEST CONFIGURATION

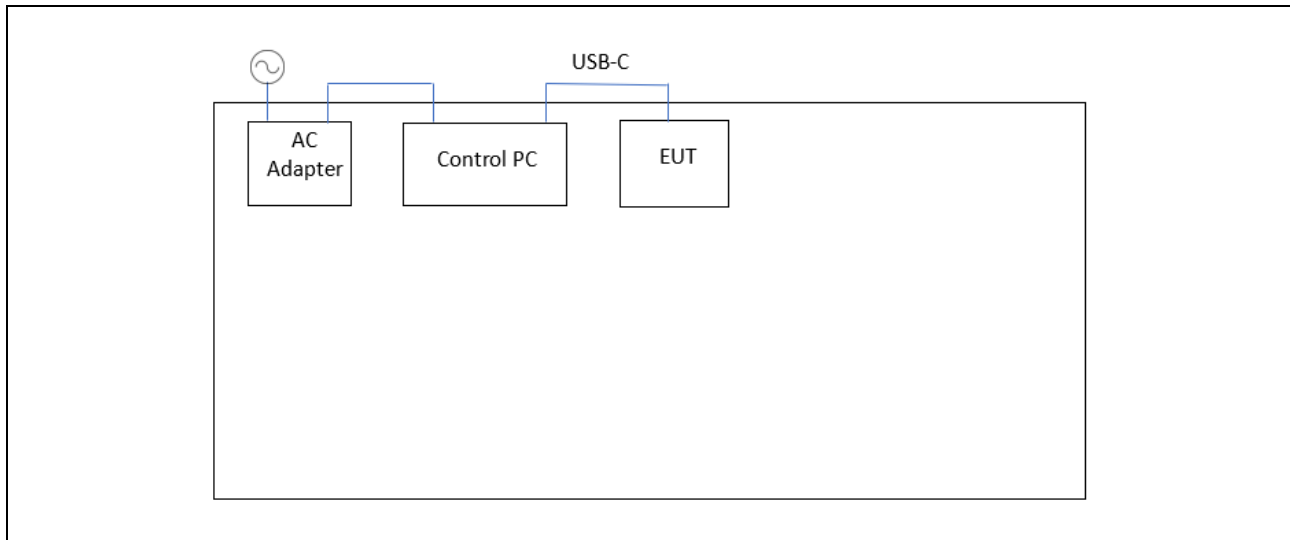
Worst Case Test Mode

Since RFID (13.56 MHz) and Bluetooth LE (2.4 GHz) can co-transmit, Radiated Spurious Emission was measured with both radio frequency 'ON'

After investigation of each channels, Low channel (2402 MHz) was picked for BLE as the worst case due to its highest output power.

| Test item | Modulation Mode | Frequency | PLS |
|----------------------------|-----------------|-----------|-----|
| Radiated Spurious emission | Bluetooth LE | 2402 MHz | 8 |
| | RFID | 13.56 MHz | - |

Test Configuration



Note :

BLE is continuously transmitting using the software provided by the manufacturer, and the contactless card was placed next to the EUT for HF output during testing.

List of Support Equipment

| Equipment Type | Model No. | Serial Number | Manufacturer | Qty | Note |
|-----------------|-------------|---------------|--------------|-----|-----------------------------------|
| Laptop | T440 | TP00050A | Lenovo | 1 | - |
| AC Adapter | ADLX65SDC2A | 36200350 | Delta | 1 | 100-240 VAC, 1.5A 50-60Hz |
| USB type C (2m) | - | - | - | 1 | Not shielded No choke attached |

Frequency Range : 9 kHz – 30MHz

| Frequency (MHz) | Polarization | Reading (dBuV) | Corr. ¹⁾ (dB) | Total (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Measurement Type |
|-----------------|--------------|----------------|--------------------------|----------------|----------------|-------------|------------------|
| 0.023 | H | 37.3 | 15.0 | 52.3 | 120.4 | 68.1 | QP |
| 0.032 | V | 35.5 | 14.8 | 50.3 | 117.5 | 67.2 | QP |
| 0.032 | H | 34.7 | 14.8 | 49.5 | 117.5 | 68.0 | QP |
| 11.065 | V | 17.2 | 14.9 | 32.1 | 69.5 | 37.4 | QP |
| 11.065 | H | 20.0 | 14.9 | 34.9 | 69.5 | 34.6 | QP |
| 22.114 | V | 13.1 | 13.2 | 26.3 | 69.5 | 43.2 | QP |
| 22.114 | H | 16.6 | 13.2 | 29.8 | 69.5 | 39.7 | QP |
| 27.669 | V | 9.7 | 11.9 | 21.6 | 69.5 | 47.9 | QP |
| 27.669 | H | 9.7 | 11.9 | 21.6 | 69.5 | 47.9 | QP |

Notes:

1. Correction Factor: Antenna Factor + Cable loss
2. Limit line = Specific Limits (dBuV) + Distance extrapolation factor
3. Distance extrapolation factor = 40 log (specific distance / test distance) (dB)
4. The measurement distance is 3 meters.
5. The worst-case result is included in this report.

Frequency Range : 30 MHz – 1 GHz

| Frequency (MHz) | Polarization | Reading (dBuV) | Corr. ¹⁾ (dB) | Total (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Measurement Type |
|-----------------|--------------|----------------|--------------------------|----------------|----------------|-------------|------------------|
| 45.583 | H | 38.1 | -10.9 | 27.2 | 40 | 12.8 | QP |
| 45.597 | V | 43.3 | -10.9 | 32.4 | 40 | 7.6 | QP |
| 50.189 | V | 40.1 | -13.0 | 27.1 | 40 | 12.9 | QP |
| 50.835 | H | 35.7 | -13.3 | 22.4 | 40 | 17.6 | QP |
| 119.872 | V | 31.6 | -6.8 | 24.8 | 43.5 | 18.7 | QP |
| 162.729 | V | 39.8 | -8.5 | 31.3 | 43.5 | 12.2 | QP |

Notes:

1. Correction Factor: Antenna Factor + Cable loss + Preamplifier Gain

Frequency Range : Above 1 GHz

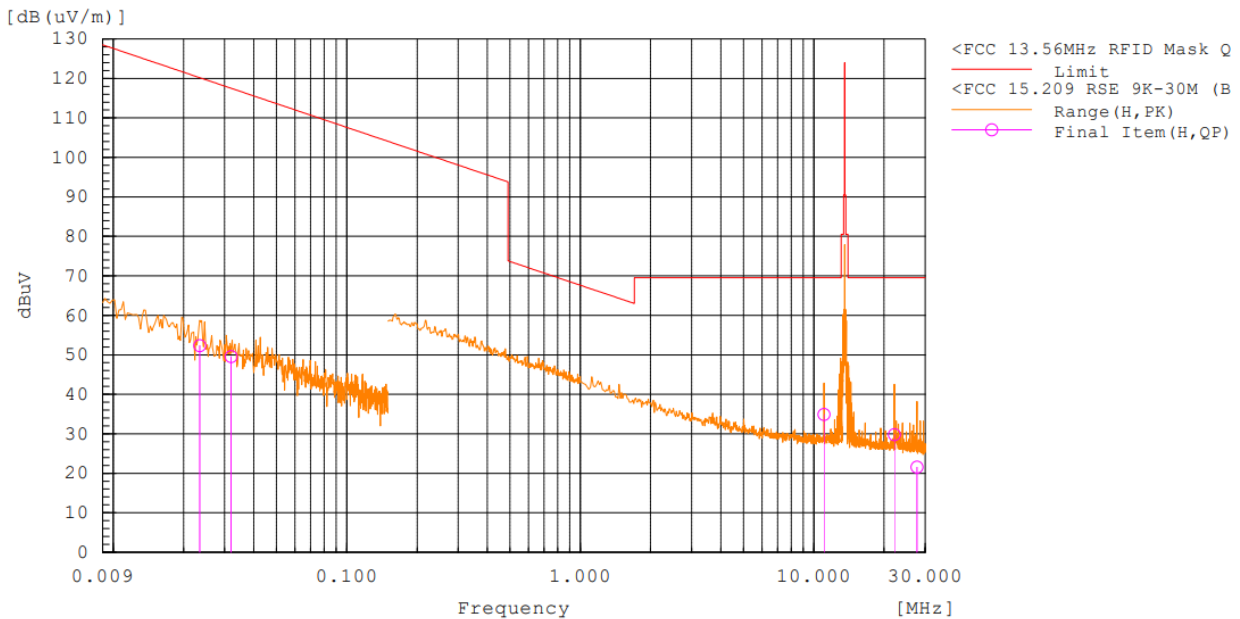
| Frequency (MHz) | Polarization | Reading (dBuV) | | Factor (dB) | Level (dBuV/m) | | Limit (dBuV/m) | | Margin (dB) | |
|-----------------|--------------|----------------|------|---------------------|----------------|------|----------------|----|-------------|------|
| | | AV | PK | Corr. ¹⁾ | AV | PK | AV | PK | AV | PK |
| 1196.048 | V | 35.8 | 61.5 | -14.8 | 21.0 | 46.7 | 54 | 74 | 33.0 | 27.3 |
| 1198.546 | H | 34.8 | 57.6 | -14.8 | 20.0 | 42.8 | 54 | 74 | 34.0 | 31.2 |
| 1595.396 | V | 36.0 | 57.8 | -14.3 | 21.7 | 43.5 | 54 | 74 | 32.3 | 30.5 |
| 1596.761 | H | 34.3 | 54.8 | -14.2 | 20.1 | 40.6 | 54 | 74 | 33.9 | 33.4 |
| 5989.880 | V | 43.4 | 57.2 | -3.0 | 40.4 | 54.2 | 54 | 74 | 13.6 | 19.8 |
| 5995.484 | H | 40.8 | 54.6 | -3.0 | 37.8 | 51.6 | 54 | 74 | 16.2 | 22.4 |
| 17654.950 | H | 27.7 | 41.1 | 15.1 | 42.8 | 56.2 | 54 | 74 | 11.2 | 17.8 |
| 17695.060 | V | 28.7 | 41.7 | 15.5 | 44.2 | 57.2 | 54 | 74 | 9.8 | 16.8 |

Notes:

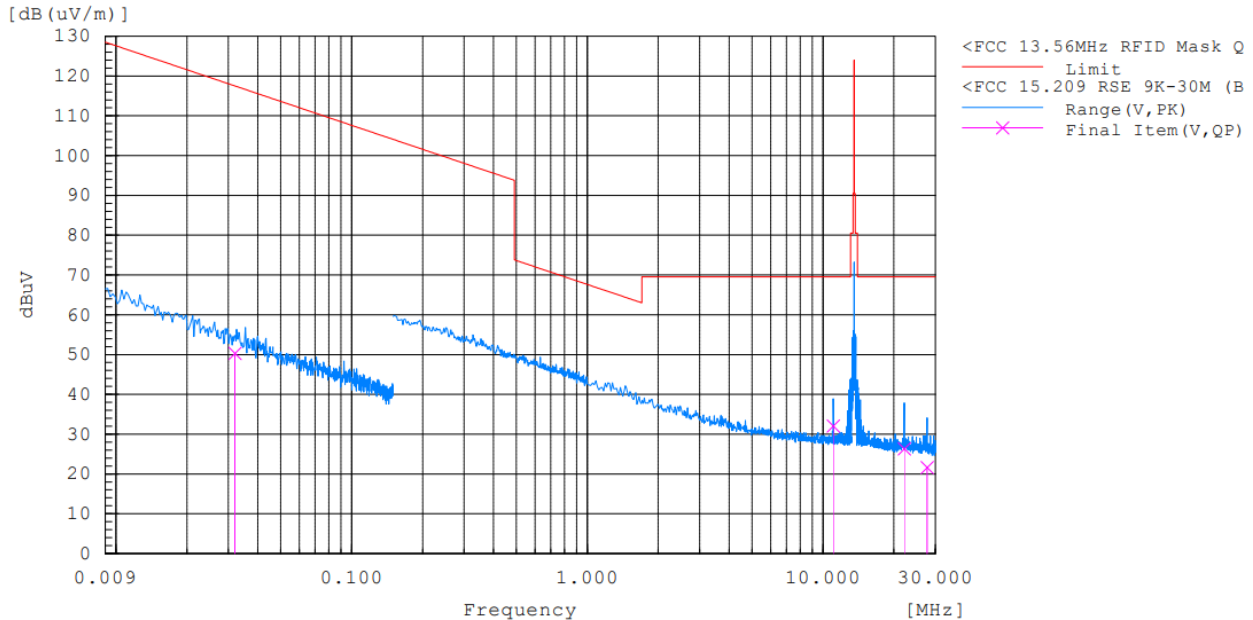
1. Correction Factor: Antenna Factor + Cable loss + Preamplifier Gain

■ TEST PLOTS

Radiated Spurious Emission 9 kHz – 30 MHz (Antenna Position 90°) : BLE + HF



Radiated Spurious Emission 9 kHz – 30 MHz (Antenna Position 180°) : BLE + HF

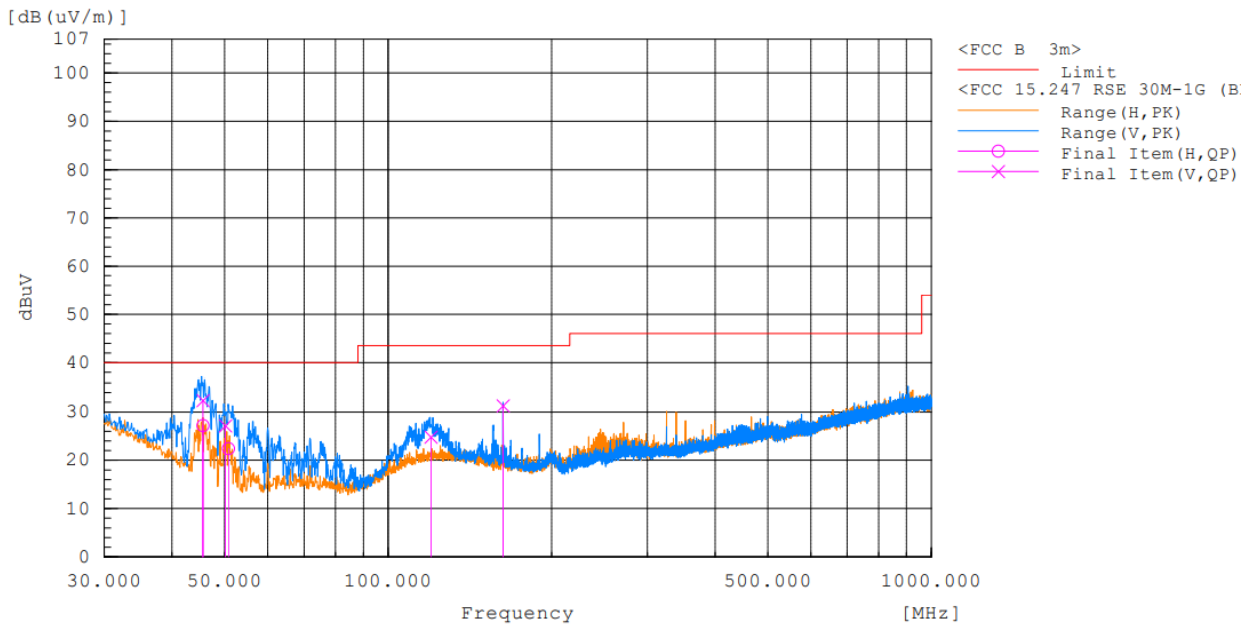


Note:

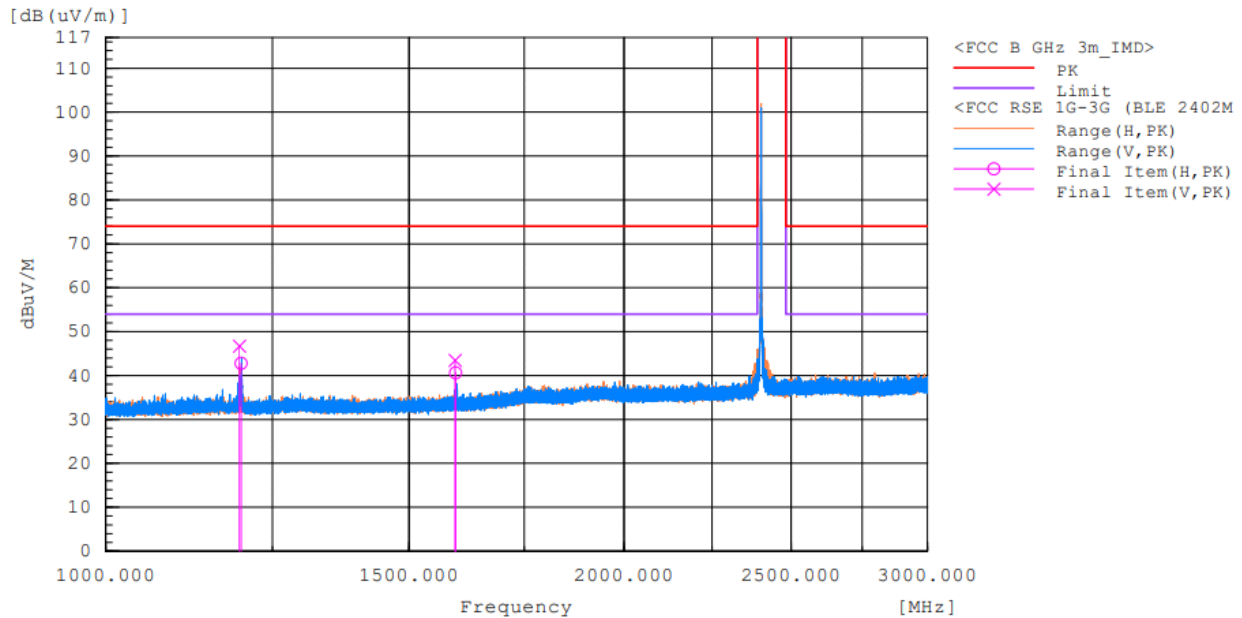
The worst-case plots are included in this report.

■ TEST PLOTS

Radiated Spurious Emission 30 MHz – 1 GHz : BLE + HF



Radiated Spurious Emission 1 GHz - 3 GHz : BLE + HF

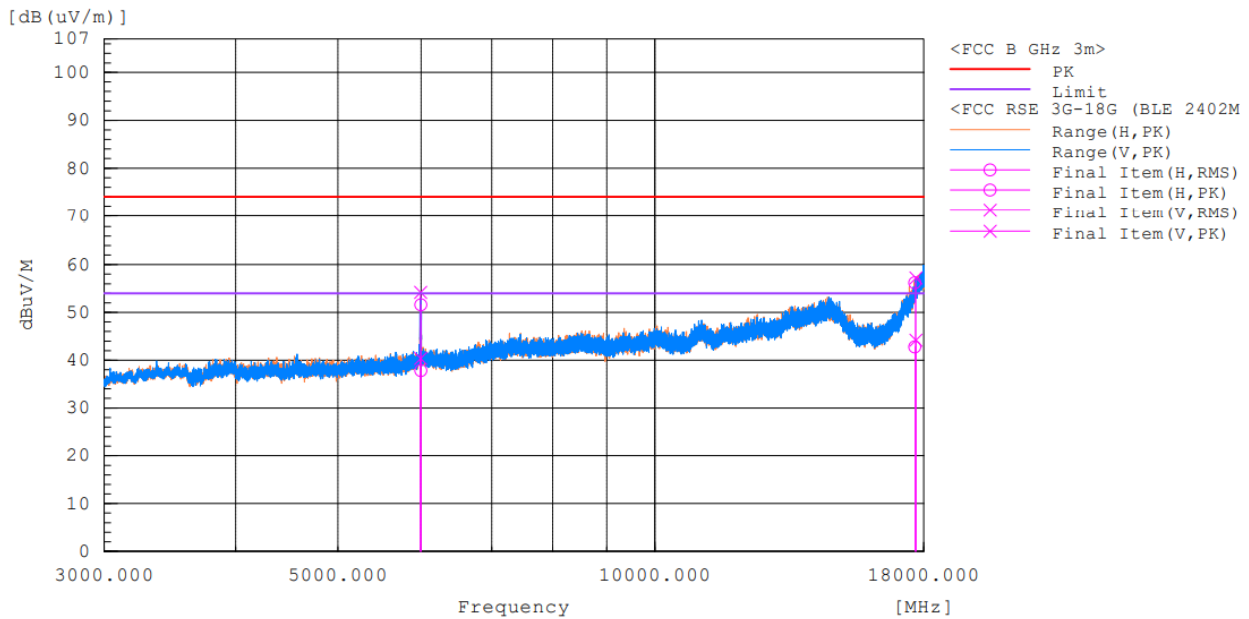


Note:

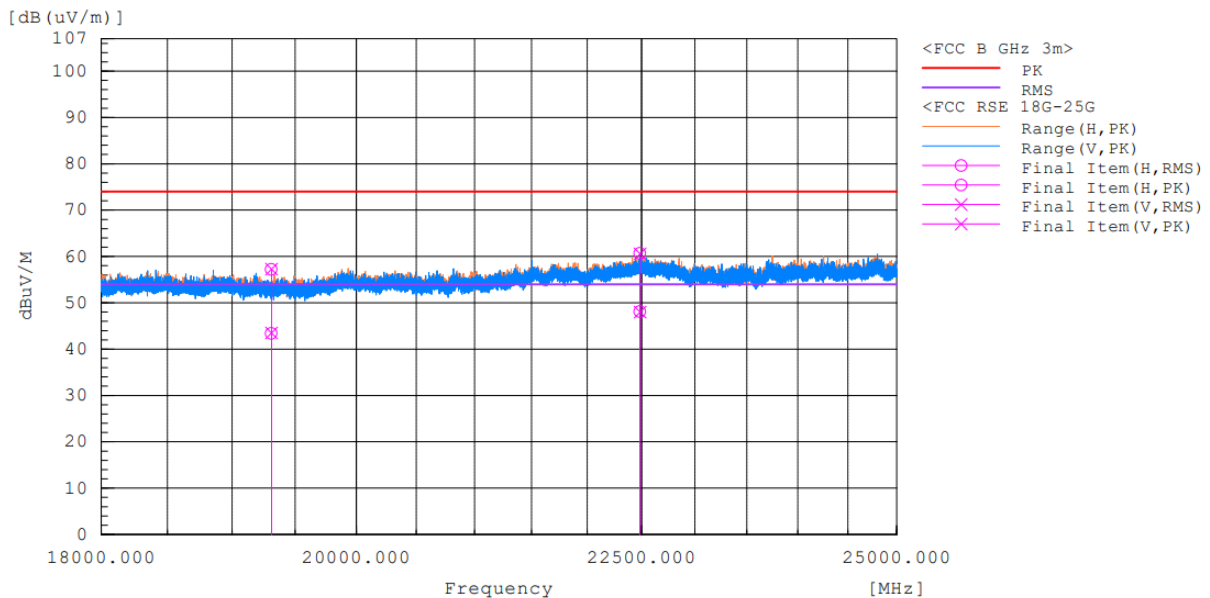
The worst-case plots are included in this report.

TEST PLOTS

Radiated Spurious Emission 3 GHz - 18 GHz : BLE + HF



Radiated Spurious Emission 18 GHz – 25 GHz



Note:

The worst-case plots are included in this report.

8. LIST OF TEST EQUIPMENT

| No. | Instrument | Model No. | Calibration Due (mm/dd/yy) | Manufacture | Serial No. |
|-------------------------------------|---|--------------------------------|----------------------------|-----------------------|------------|
| <input checked="" type="checkbox"/> | Signal Analyzer (20 Hz ~ 40.0 GHz) | ESU40 | 12/20/2020 | ROHDE & SCHWARZ | 100529 |
| <input checked="" type="checkbox"/> | BI-LOG Antenna (30 MHz ~ 1 GHz) | JB1 | 03/27/2021 | Sunol | A061416 |
| <input type="checkbox"/> | Attenuator (20 dB, DC ~ 26.5 GHz) | 8493C | 12/13/2020 | HP | 09072 |
| <input checked="" type="checkbox"/> | POWER AMP (1 GHz ~ 18 GHz) | PAM-118A | 07/09/2021 | Com-Power Corporation | 18040074 |
| <input checked="" type="checkbox"/> | POWER AMP (0.3GHz ~ 1GHz) | 8447D | 08/06/2021 | HP | 2443A03587 |
| <input checked="" type="checkbox"/> | Horn Antenna (1 GHz ~ 18 GHz) | DRH-118 | 11/29/2020 | Sunol | A061616 |
| <input checked="" type="checkbox"/> | Loop Antenna (0.009 ~ 30 MHz) | AL-130R | 04/05/2021 | Com-Power | 121082 |
| <input checked="" type="checkbox"/> | Horn Antenna (18 GHz ~ 40 GHz) | DRH-1840 | 02/20/2021 | Sunol | 17120 |
| <input checked="" type="checkbox"/> | POWER AMP (18 GHz ~ 40 GHz) | CBL184050-45-01 | 02/04/2021 | CERNEX, Inc. | 43964 |
| <input type="checkbox"/> | ISM Band Reject filter (2370 ~ 2400 - 2483.5 ~2520 MHz) | WRCJV12 | 01/18/2021 | Wainwright | 4 |
| <input checked="" type="checkbox"/> | High Pass Filter | WHK10-2520- 3000-18000-40EF | 01/18/2021 | Wainwright | 9 |

Note:

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date

APPENDIX A. TEST SETUP PHOTOS

The setup photos are provided as a separate document

END OF TEST REPORT