

# 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

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

## 1. GENERAL INFORMATION

### EUT DESCRIPTION

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

### RF SPECIFICATION SUBJECT TO THE REPORT

<b>Operating Frequency Range</b>	RFID	13.56 MHz
	BLE	2402 – 2480 MHz
<b>RF Specification (Modulation)</b>	13.56 MHz (ASK) / BLE (GFSK)	
<b>Number of Channels</b>	RFID	1 Channel
	BLE	40 Channels
<b>Antenna Specification <sup>(1)</sup></b>	RFID	Antenna Type : Loop Antenna
	BLE	Antenna Type : Chip Antenna (Peak Gain : 1 dBi)
<b>Firmware Version <sup>(2)</sup></b>	1.15	
<b>Hardware Version <sup>(2)</sup></b>	FPF20201-AE	
<b>Date(s) of Tests</b>	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 (U-NII) Devices Part15, 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 Commissions 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 30MHz 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 1GHz. Above 1GHz with 1.5m 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  $U_{\text{CISPR}}$  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

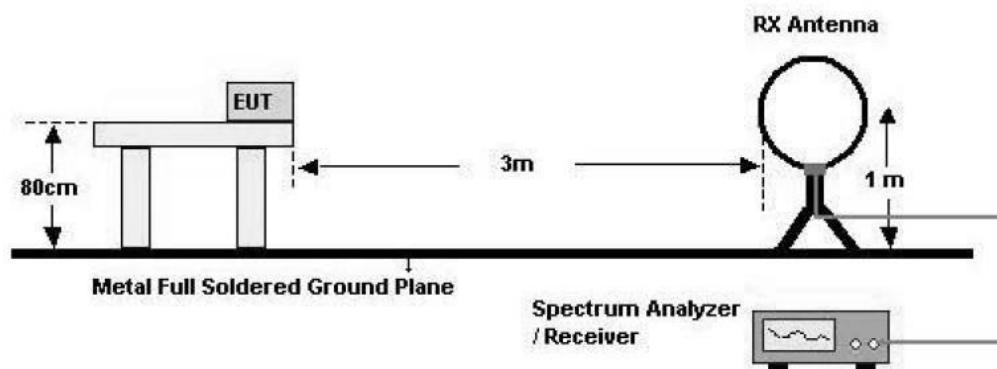
FCC : 47 CFR § 15.209		
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

#### Restricted Bands of Operation

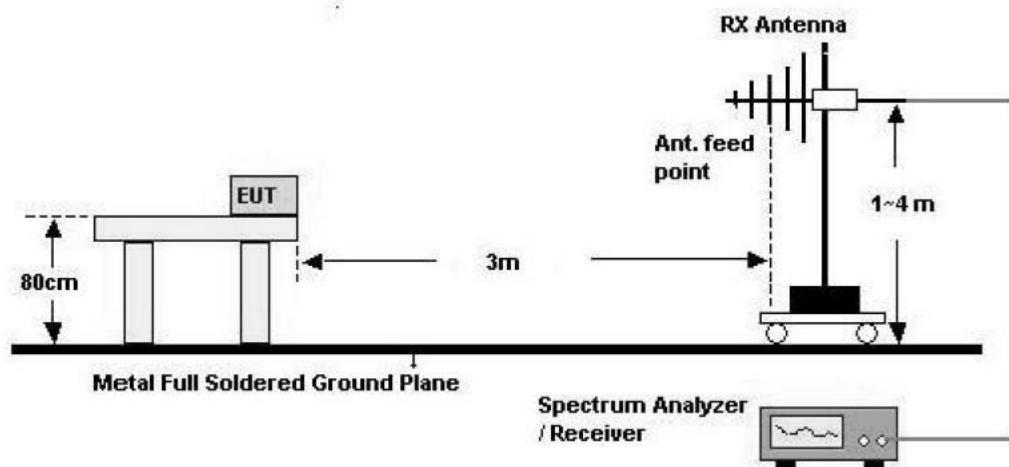
FCC : 47 CFR § 15.205(a)				
Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (MHz)
0.090 – 0.110	12.29-12.293	149.9 - 150.05	1660.0 - 1710.0	8025 – 8500
0.495 - 0.505	12.51975-12.52025	156.52475 - 156.52525	1718.8 - 1722.2	9000 – 9200
2.1735 – 2.1905	12.57675-12.57725	156.7 - 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

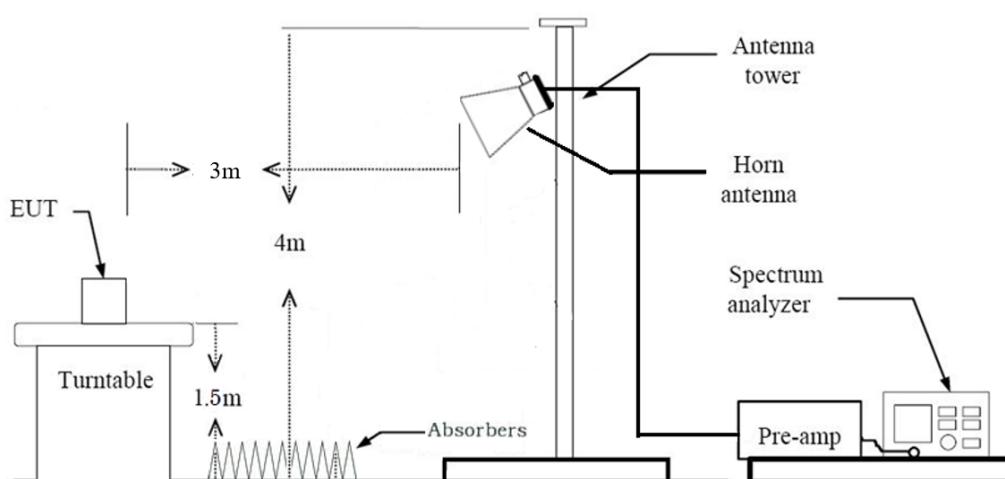
**Below 30 MHz**



**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) =  $40 * \log(3 \text{ m}/300 \text{ m}) = -80 \text{ dB}$   
Measurement Distance: 3 m
7. Distance Correction Factor (0.490 MHz – 30 MHz) =  $40 * \log(3 \text{ m}/30 \text{ m}) = -40 \text{ dB}$   
Measurement Distance: 3 m
8. Spectrum Setting
  - Frequency Range = 9 kHz ~ 30 MHz
  - Detector = Peak
  - Trace = Max hold
  - RBW = 9 kHz
  - VBW  $\geq 3 * \text{RBW}$
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\*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\*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\*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\*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\*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\*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

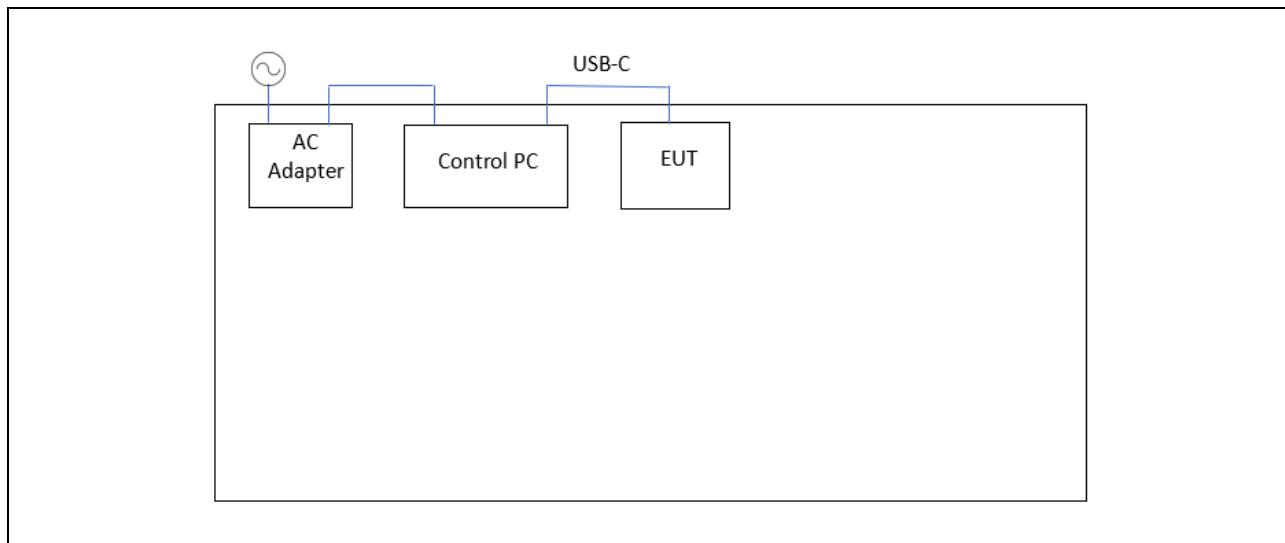
### Worst Case Test Mode

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. <sup>1)</sup> (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 =  $40 \log(\text{specific distance} / \text{test distance})$  (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. <sup>1)</sup> (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**

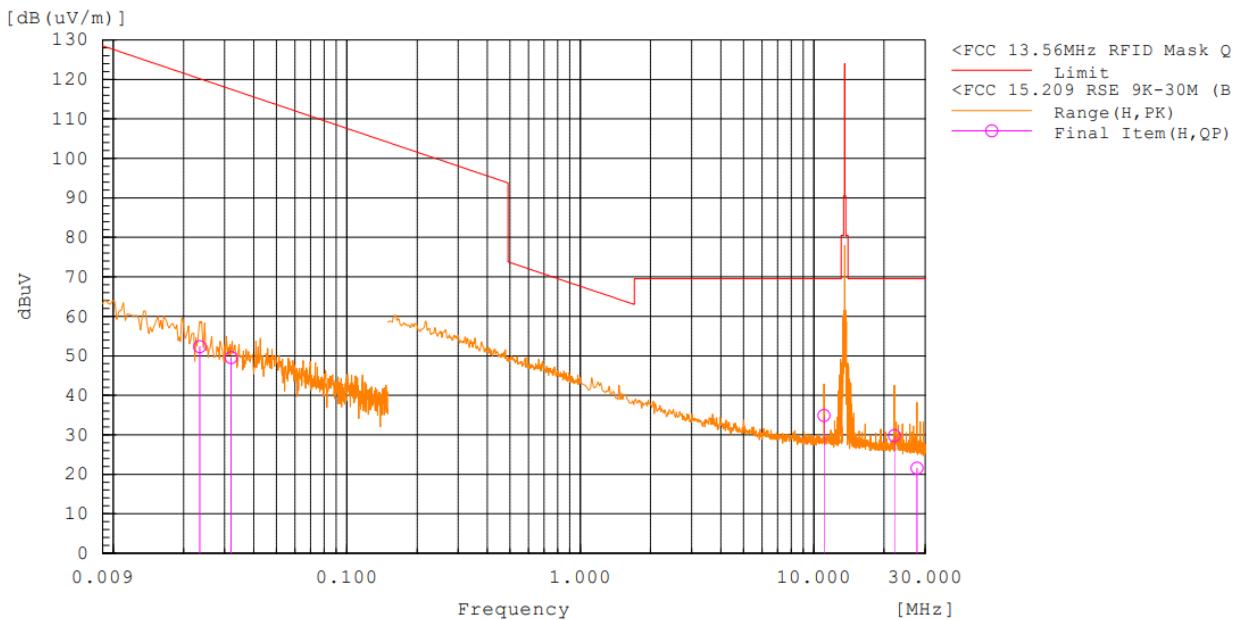
Frequency (MHz)	Polarization	Reading (dBuV)		Factor (dB)	Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
		AV	PK		AV	PK	AV	PK	AV	PK
1196.048	V	35.8	61.5	-14.8	21.0	46.7	54	74	33.0	27.3
1198.546	H	34.8	57.6	-14.8	20.0	42.8	54	74	34.0	31.2
1595.396	V	36.0	57.8	-14.3	21.7	43.5	54	74	32.3	30.5
1596.761	H	34.3	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:**

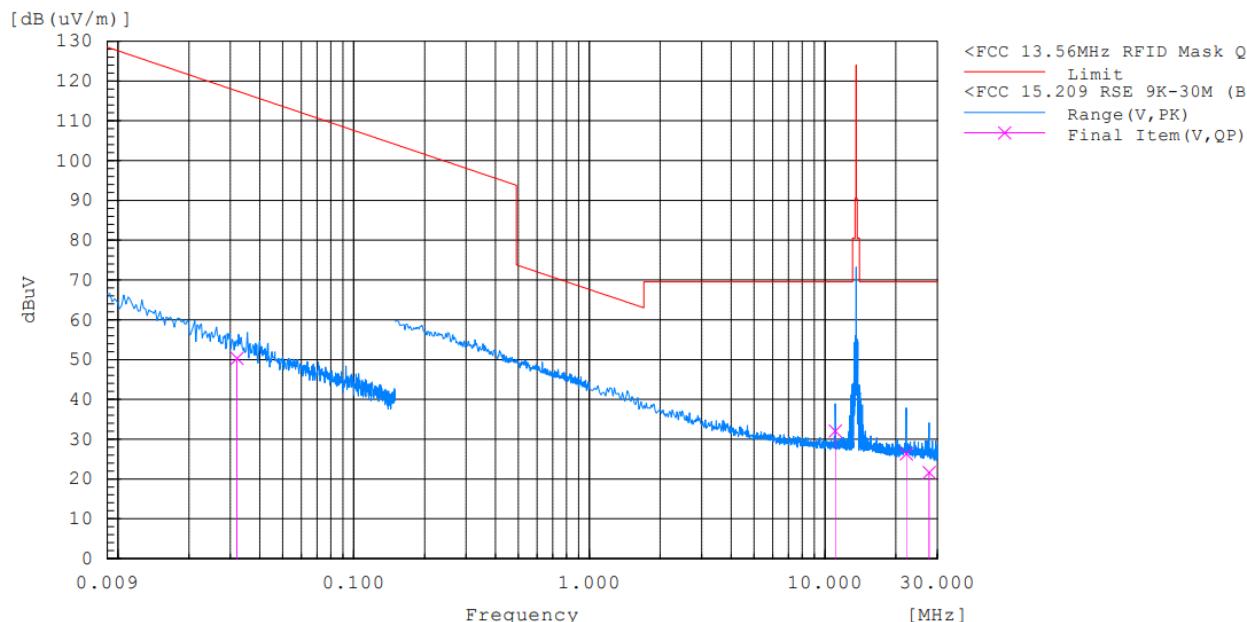
1. Correction Factor: Antenna Factor + Cable loss + Preamplifier Gain

## TEST PLOTS

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



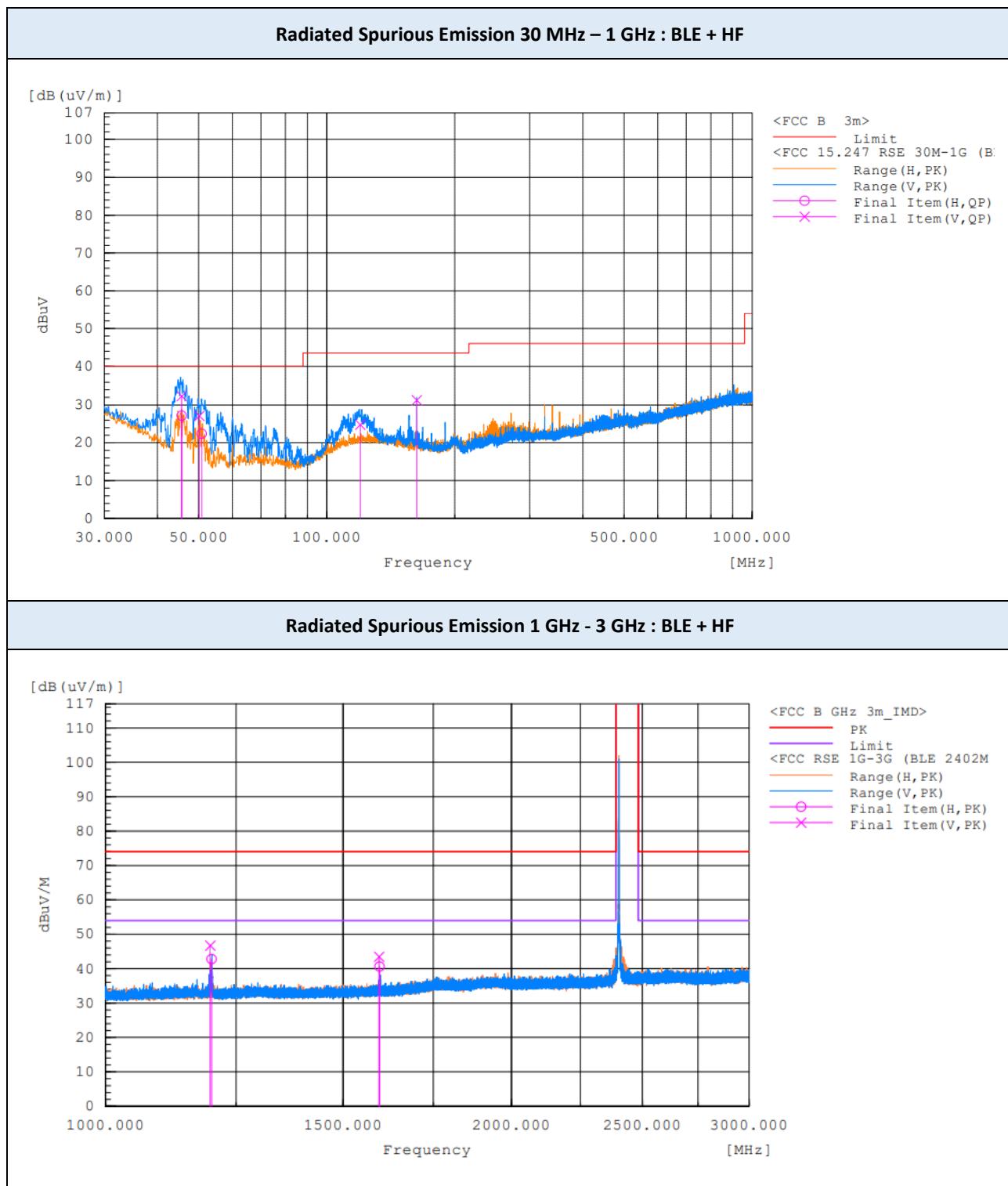
### Radiated Spurious Emission 9 kHz – 30 MHz (Antenna Position 180°) : BLE + HF



#### Note:

The worst-case plots are included in this report.

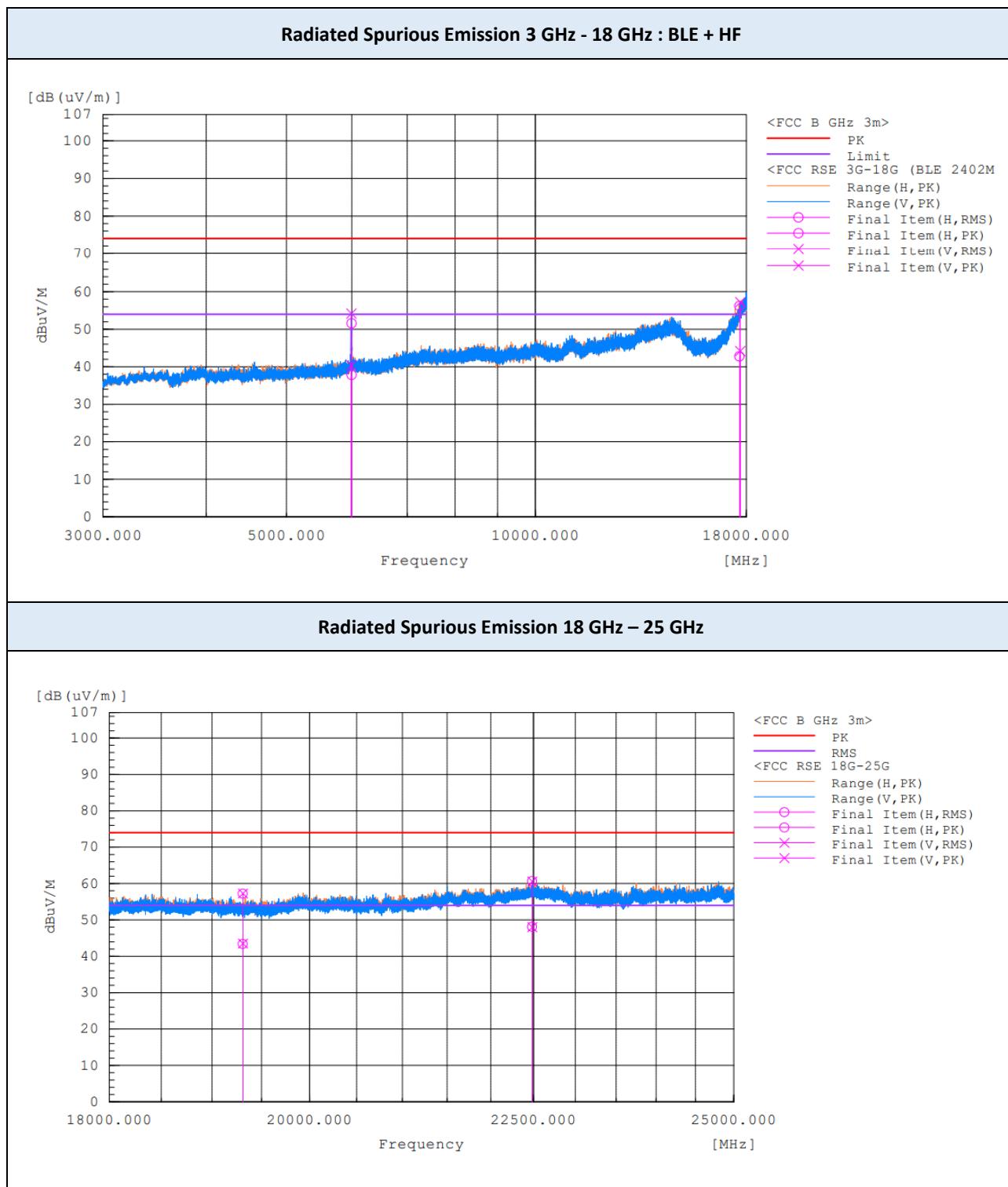
TEST PLOTS



**Note:**

The worst-case plots are included in this report.

TEST PLOTS



**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***