

# FCC Test Report

|              |                                   |
|--------------|-----------------------------------|
| Product Name | WC Subsystem Qi. 1.3 Gen.4 3-Coil |
| Model No.    | 240000-01-200; 240000-01-201      |
| FCC ID       | 2AQWT24000001200                  |

|           |  |
|-----------|--|
| Applicant | acv GmbH   |
| Address   | Strassburger Allee 10-12, Erkelenz 41812 Germany |

|                 |                       |
|-----------------|-----------------------|
| Date of Receipt | May 16, 2022          |
| Issued Date     | Aug. 19, 2022         |
| Report No.      | 2250430R-RFUSOTHV03-A |
| Report Version  | V1.0                  |



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration of the equipment and evaluated measurement uncertainty herein.

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Measurement uncertainties evaluated for each testing system and associated connections are given here to provide the system information for reference. Compliance determinations do not take into account measurement uncertainties for each testing system, but are based on the results of the compliance measurement.

# Test Report

Issued Date: Aug. 19, 2022

Report No.: 2250430R-RFUSOTHV03-A



|                     |   |
|---------------------|---|
| Product Name        | WC Subsystem Qi. 1.3 Gen.4 3-Coil   |
| Applicant           | acv GmbH  |
| Address             | Strassburger Allee 10-12, Erkelenz 41812 Germany                          |
| Manufacturer        | Santek Overseas Corp.   |
| Model No.           | 240000-01-200; 240000-01-201  |
| FCC ID.             | 2AQWT24000001200  |
| EUT Rated Voltage   | DC 12V by battery   |
| EUT Test Voltage    | DC 12V by battery   |
| Trade Name          | Inbay   |
| Applicable Standard | FCC CFR Title 47 Part 15 Subpart C<br>ANSI C63.4: 2014, ANSI C63.10: 2013 |
| Test Result         | Complied  |

Documented By

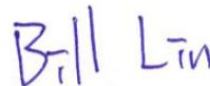
:



( Senior Project Specialist / Genie Chang )

Tested By

:



( Senior Engineer / Bill Lin )

Approved By

:



( Senior Engineer / Jack Hsu )

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## Revision History

| Report No.            | Version | Description              | Issued Date   |
|-----------------------|---------|--------------------------|---------------|
| 2250430R-RFUSOTHV03-A | V1.0    | Initial issue of report. | Aug. 19, 2022 |

## 1. GENERAL INFORMATION

### 1.1. EUT Description

|                 |                                   |
|-----------------|-----------------------------------|
| Product Name    | WC Subsystem Qi. 1.3 Gen.4 3-Coil |
| Trade Name      | Inbay                             |
| Model No.       | 240000-01-200; 240000-01-201      |
| FCC ID          | 2AQWT24000001200                  |
| Frequency Range | 13.56MHz                          |
| Modulation      | FSK                               |
| Antenna Type    | Loop                              |

#### Antenna List

| No. | Manufacturer          | Part No.      | Antenna Type |
|-----|-----------------------|---------------|--------------|
| 1   | Santek Overseas Corp. | LB91902-4TH-3 | Loop         |

Frequency of Each Channel:

|         |           |
|---------|-----------|
| Channel | Frequency |
|---------|-----------|

|            |           |
|------------|-----------|
| Channel 1: | 13.56 MHz |
|------------|-----------|

Note:

1. This device is a WC Subsystem Qi. 1.3 Gen.4 3-Coil with a built-in 13.56MHz transceiver.
2. The different of each model is shown as below:

| Model Name    | Description                     |
|---------------|---------------------------------|
| 240000-01-200 | Subsystem With Can/NFC Function |
| 240000-01-201 | Subsystem With NFC Function     |

3. These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15 Subpart C Paragraph 15.225.
4. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

|           |                  |
|-----------|------------------|
| Test Mode | Mode 1: Transmit |
|-----------|------------------|

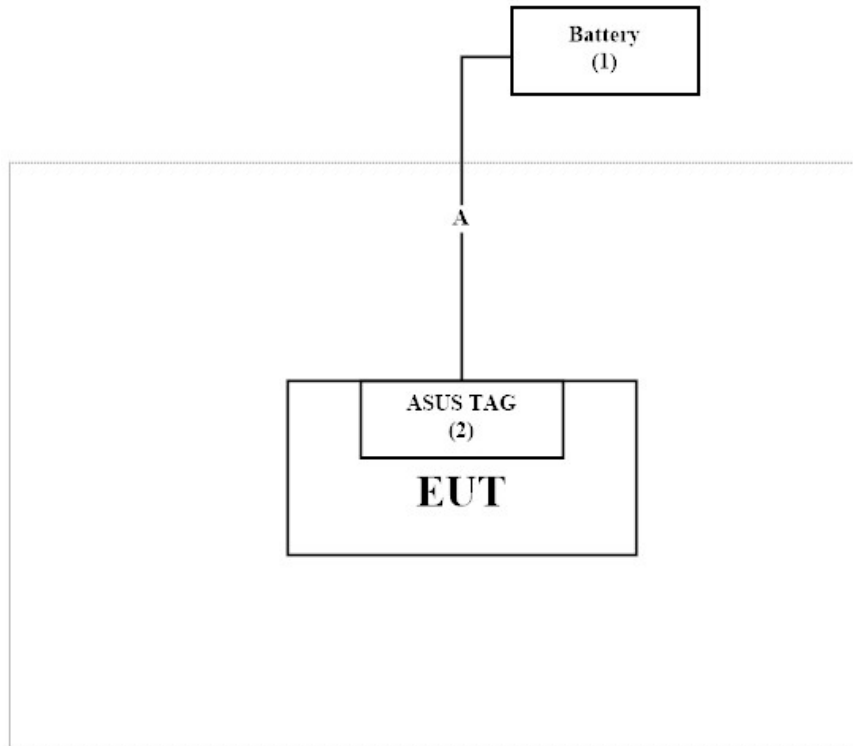
### 1.2. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

| Product    | Manufacturer | Model No.     | Serial No. | Power Cord |
|------------|--------------|---------------|------------|------------|
| 1 Battery  | YUASA        | 55B24L-CMF II | N/A        | N/A        |
| 2 ASUS TAG | ASUS         | TAG           | N/A        | N/A        |

| Signal Cable Type | Signal cable Description |
|-------------------|--------------------------|
| A Power Cable     | Shielded, 1.8m           |

### 1.3. Configuration of tested System



### 1.4. EUT Exercise Software

- (1) Setup the EUT as shown in Section 1.3.
- (2) Turn on the power of all equipment.
- (3) Start the continuous receiver.
- (4) Verify that the EUT works properly.

## 1.5. Test Facility

Ambient conditions in the laboratory:

| Performed Item    | Items            | Required | Actual  |
|-------------------|------------------|----------|---------|
| Radiated Emission | Temperature (°C) | 10~40 °C | 23.5 °C |
|                   | Humidity (%RH)   | 10~90 %  | 55.1 %  |
| Conductive        | Temperature (°C) | 10~40 °C | 25°C    |
|                   | Humidity (%RH)   | 10~90 %  | 50%     |

**USA : FCC Registration Number: TW0023**

**Canada : IC Registration Number: 25880**

Site Description : Accredited by TAF  
Accredited Number: 3023

Test Laboratory : DEKRA Testing and Certification Co., Ltd  
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Email address : [info.tw@dekra.com](mailto:info.tw@dekra.com)

Website : <http://www.dekra.com.tw>

## 1.6. List of Test Equipment

### For Conduction measurements / HY-SR01

|   | Equipment          | Manufacturer | Model No. | Serial No. | Cal. Date  | Due. Date  |
|---|--------------------|--------------|-----------|------------|------------|------------|
| X | EMI Test Receiver  | R&S          | ESR7      | 101601     | 2022.06.23 | 2023.06.22 |
| X | Two-Line V-Network | R&S          | ENV216    | 101306     | 2022.05.23 | 2023.05.22 |
| X | Two-Line V-Network | R&S          | ENV216    | 101307     | 2022.07.04 | 2023.07.03 |
| X | Coaxial Cable      | SUHNER       | RG400 BNC | RF001      | 2022.05.24 | 2023.05.23 |

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with “X” are used to measure the final test results.
3. Test Software version : E3 210616 dekra V9.

### For Radiated measurements /HY-CB03

|   | Equipment         | Manufacturer  | Model No.         | Serial No.   | Cal. Date  | Due. Date  |
|---|-------------------|---------------|-------------------|--------------|------------|------------|
| X | Loop Antenna      | AMETEK        | HLA6121           | 49611        | 2022.03.18 | 2023.03.17 |
| X | Bi-Log Antenna    | SCHWARZBECK   | VULB9168          | 9168-675     | 2021.08.11 | 2023.08.10 |
|   | Horn Antenna      | ETS-Lindgren  | 3117              | 00201259     | 2021.11.09 | 2022.11.08 |
|   | Horn Antenna      | Com-Power     | AH-840            | 101087       | 2022.06.16 | 2023.06.15 |
| X | Pre-Amplifier     | SGH           | SGH0301-9         | 20211007-10  | 2022.02.22 | 2023.02.21 |
|   | Pre-Amplifier     | EMCI          | EMC051835SE       | 980313       | 2021.11.24 | 2022.11.23 |
|   | Pre-Amplifier     | EMCI          | EMC05820SE        | 980310       | 2021.07.07 | 2022.07.06 |
|   | Pre-Amplifier     | EMCI          | EMC184045SE       | 980369       |            |            |
|   | Coaxial Cable     | EMCI          | EMC102-KM-KM-600  | 1160314      | 2022.05.12 | 2023.05.11 |
|   | Coaxial Cable     | EMCI          | EMC102-KM-KM-7000 | 170242       |            |            |
|   | Filter            | MICRO TRONICS | BRM50702          | G251         | 2021.09.16 | 2022.09.15 |
|   | Filter            | MICRO TRONICS | BRM50716          | G188         | 2021.09.16 | 2022.09.15 |
| X | EMI Test Receiver | R&S           | ESR               | 102793       | 2021.12.15 | 2022.12.14 |
| X | Spectrum Analyzer | R&S           | FSV3044           | 101113       | 2022.01.25 | 2023.02.24 |
| X | Coaxial Cable     | SGH           | SGH18             | 2021005-1    | 2022.03.18 | 2023.03.17 |
|   | Coaxial Cable     | SGH           | SGH18             | 202108-4     |            |            |
|   | Coaxial Cable     | SGH           | SGH18             | GD20110223-1 |            |            |
|   | Coaxial Cable     | SGH           | HA800             | GD20110222-3 |            |            |

Note:

1. Bi-Log Antenna is calibrated every two years, the other equipments are calibrated every one year.
2. The test instruments marked with “X” are used to measure the final test results.
3. Test Software version : E3 210616 dekra V9.



## 1.7. Uncertainty

Uncertainties have been calculated according to the DEKRA internal document, and is described in each test chapter of this report.

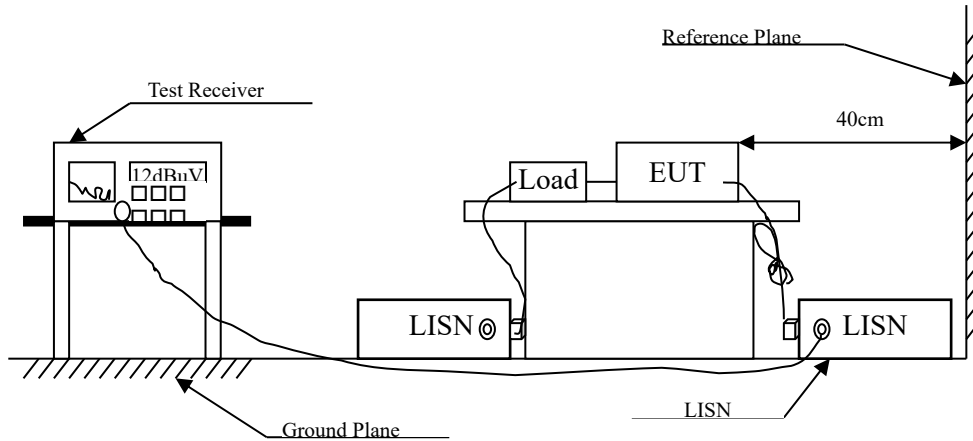
The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately 95%.

Measurement uncertainties evaluated for each testing system and associated connections are given here to provide the system information for reference. Compliance determinations do not take into account measurement uncertainties for each testing system, but are based on the results of the compliance measurement.

| Test item           | Uncertainty                 |                             |
|---------------------|-----------------------------|-----------------------------|
| Radiated Emission   | Under 1GHz<br>$\pm 4.05$ dB | Above 1GHz<br>$\pm 4.10$ dB |
| Band Edge           | Under 1GHz<br>$\pm 4.05$ dB | Above 1GHz<br>$\pm 4.10$ dB |
| Frequency Tolerance | $\pm 1544.74$ Hz            |                             |

## 2. Conducted Emission

### 2.1. Test Setup



### 2.2. Limits

| FCC Part 15 Subpart C Paragraph 15.207 (dBuV) Limit |                      |                      |
|---|----------------------|----------------------|
| Frequency<br>MHz                                    | Limits               |                      |
|   | QP                   | AV                   |
| 0.15 - 0.50   | 66-56 <sup>(註)</sup> | 56-46 <sup>(註)</sup> |
| 0.50-5.0  | 56                   | 46                   |
| 5.0 - 30  | 60                   | 50                   |

### 2.3. Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.

Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

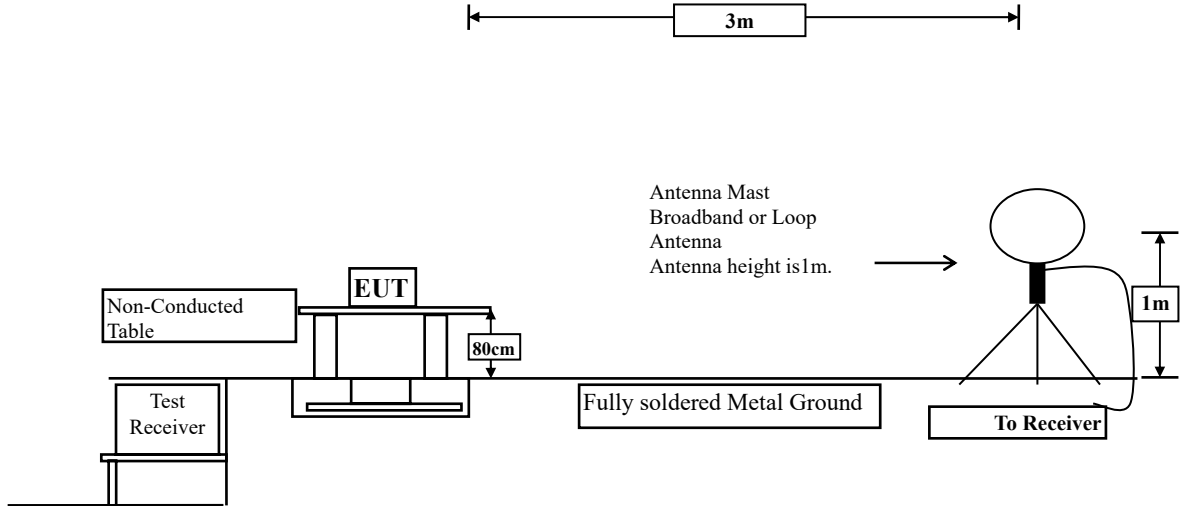
## **2.4. Test Result of Conducted Emission**

Owing to the EUT use battery supply voltage, this test item is not performed.

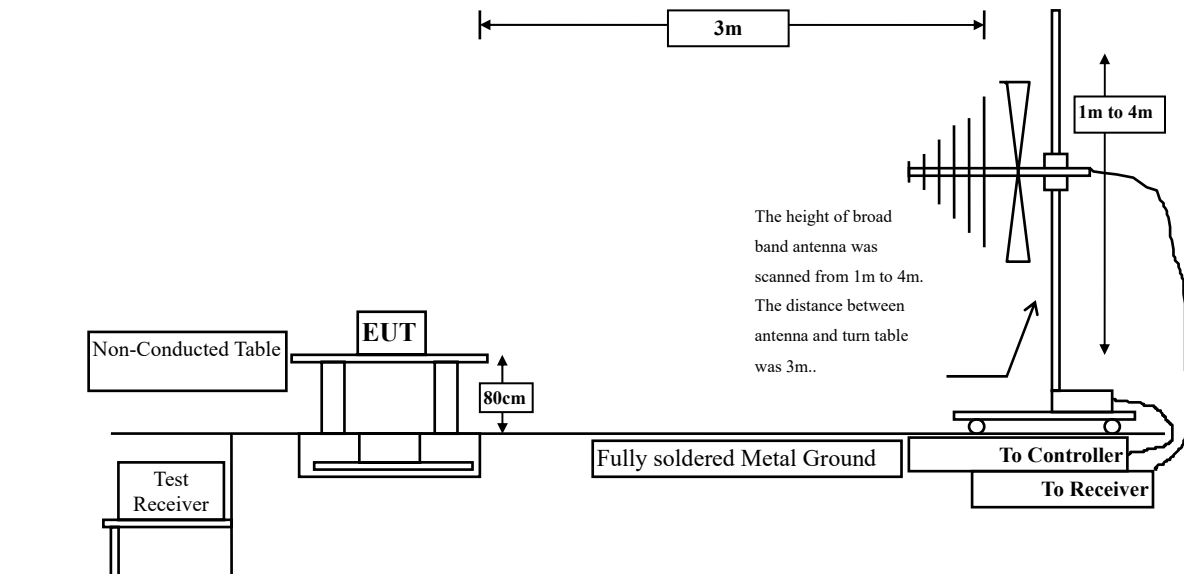
### 3. Radiated Emission

#### 3.1. Test Setup

Radiated Emission Under 30MHz



Radiated Emission Below 1GHz



### 3.2. Limits

➤ Fundamental electric field strength Limit

| <b>FCC Part 15 Subpart C Paragraph 15.225 Limits</b> |                               |                     |        |                     |
|--|-------------------------------|---------------------|--------|---------------------|
| Fundamental Frequency<br>MHz                         | Field strength of fundamental |                     |        |                     |
|  | uV/m                          | Distance<br>(meter) | dBuV/m | Distance<br>(meter) |
| 13.553 – 13.567                                      | 15848                         | 30                  | 124    | 3                   |
| 13.410 – 13.553 and 13.567 – 13.710                  | 334                           | 30                  | 90.47  | 3                   |
| 13.110 – 13.410 and 13.710 – 14.010                  | 106                           | 30                  | 80.50  | 3                   |
| Outside of the 13.110 – 14.010                       | See 15.209 Limits             |                     |        |                     |

Remarks :

1. RF Voltage (dBuV) = 20 log RF Voltage (uV)
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
3. The emission limit in this paragraph is based on measurement instrumentation employing an quasi-peak detector.

➤ Spurious electric field strength Limit

| <b>FCC Part 15 Subpart C Paragraph 15.209 Limits</b> |                                      |                                 |
|--|--------------------------------------|---------------------------------|
| Frequency<br>MHz                                     | Field strength<br>(microvolts/meter) | Measurement distance<br>(meter) |
| 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                               |

Remarks :

1. RF Voltage (dBuV) = 20 log RF Voltage (uV)
2. In the Above Table, the tighter limit applies at the band edges.
3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

### 3.3. Test Procedure

Fundamental electric field strength:

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum electric field strength.

The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna which is 1 meter above ground. All X-axis, Y-axis and Z-axis polarization of the antenna are set on measurement.

Spurious electric field strength:

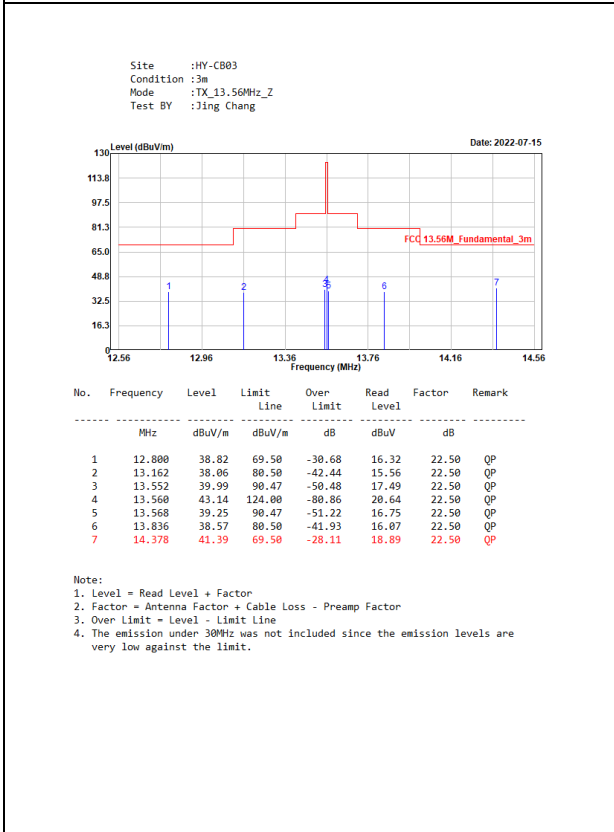
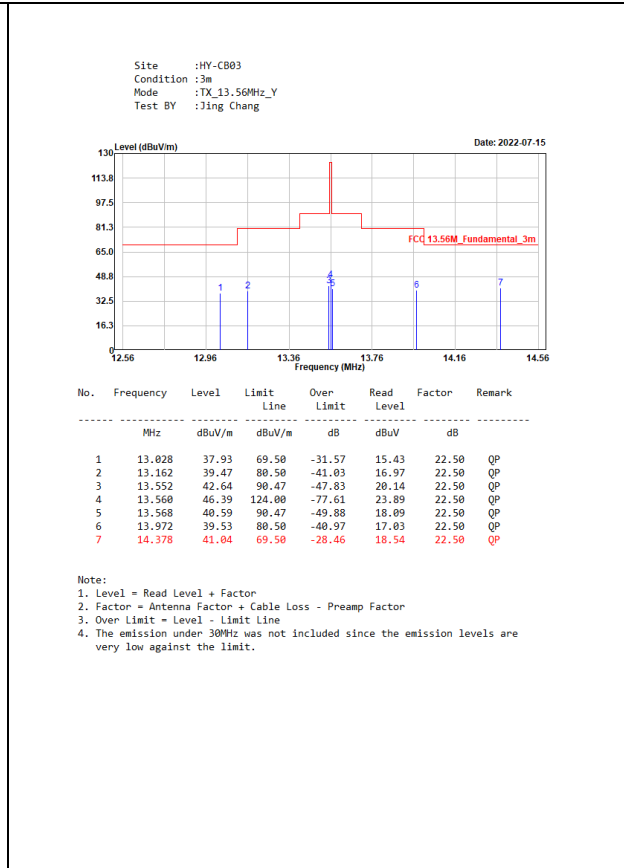
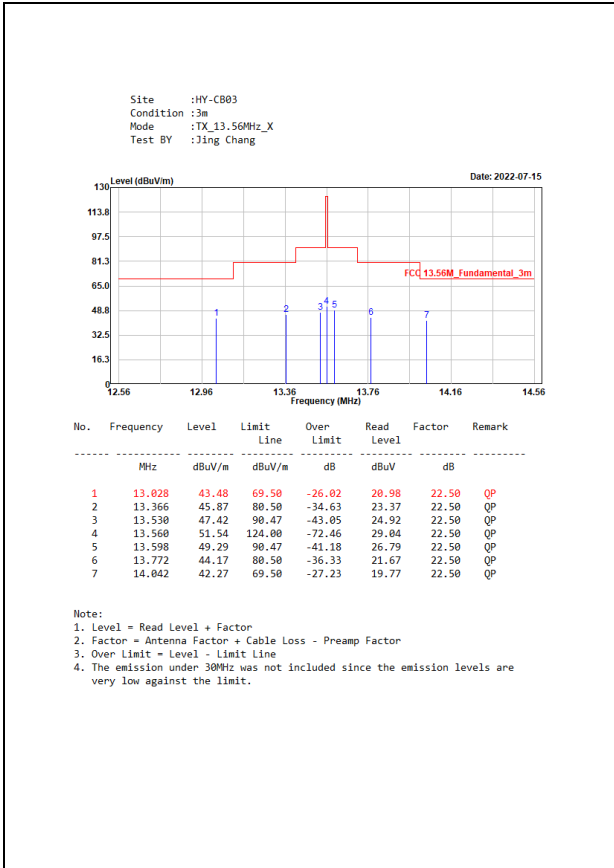
The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level.

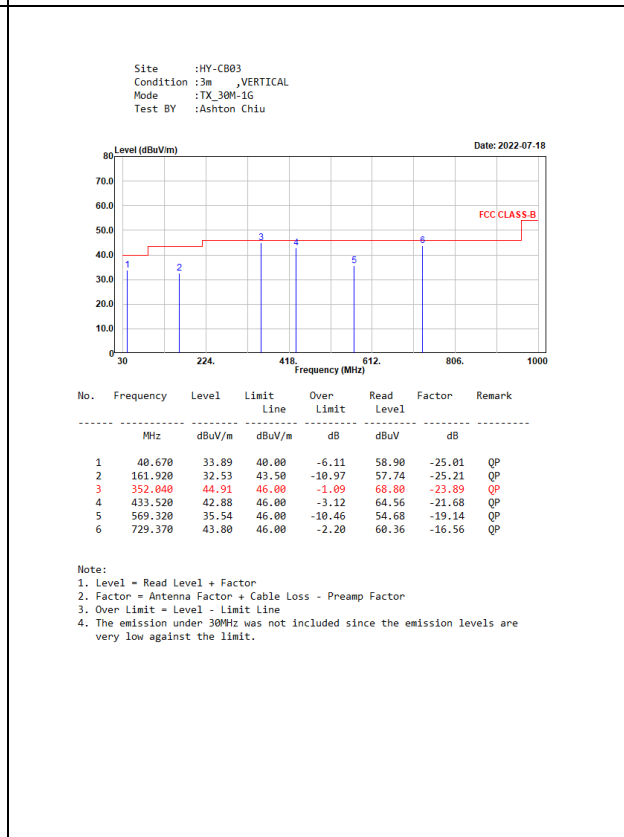
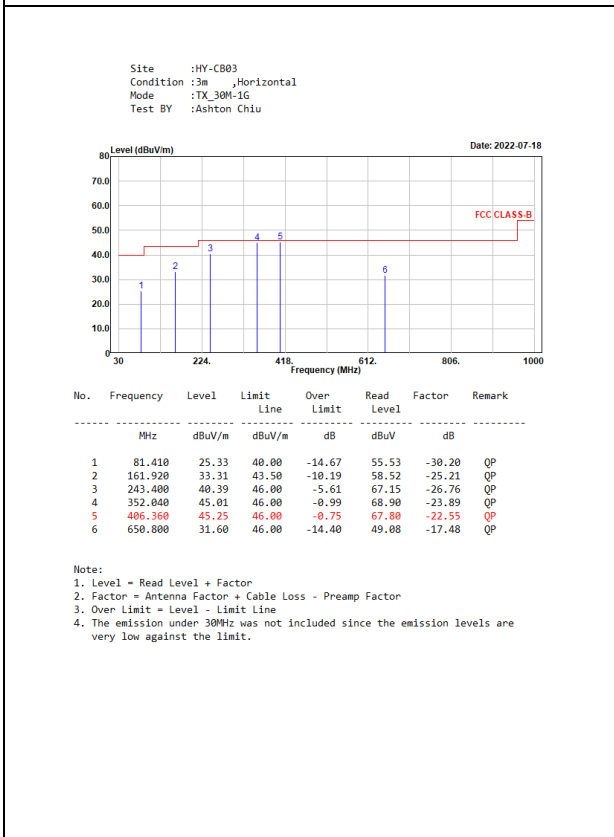
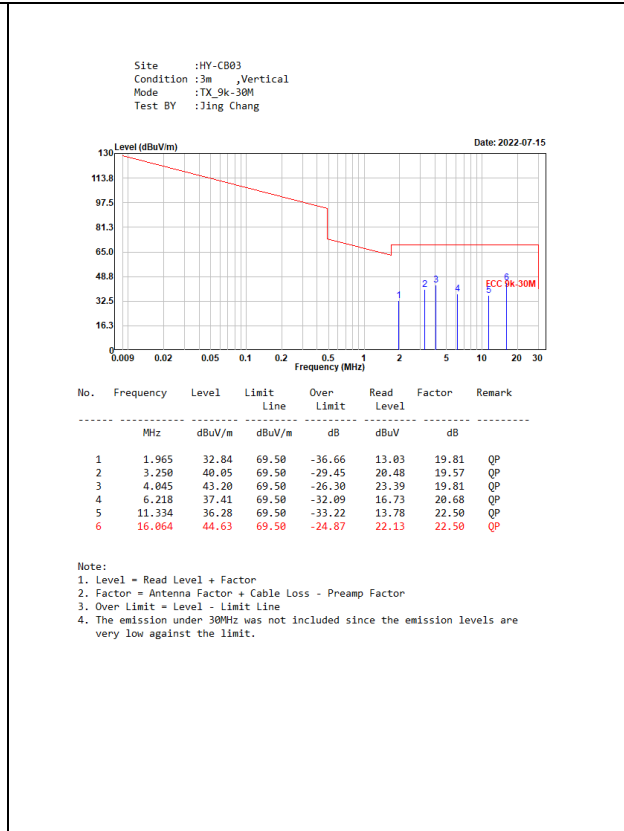
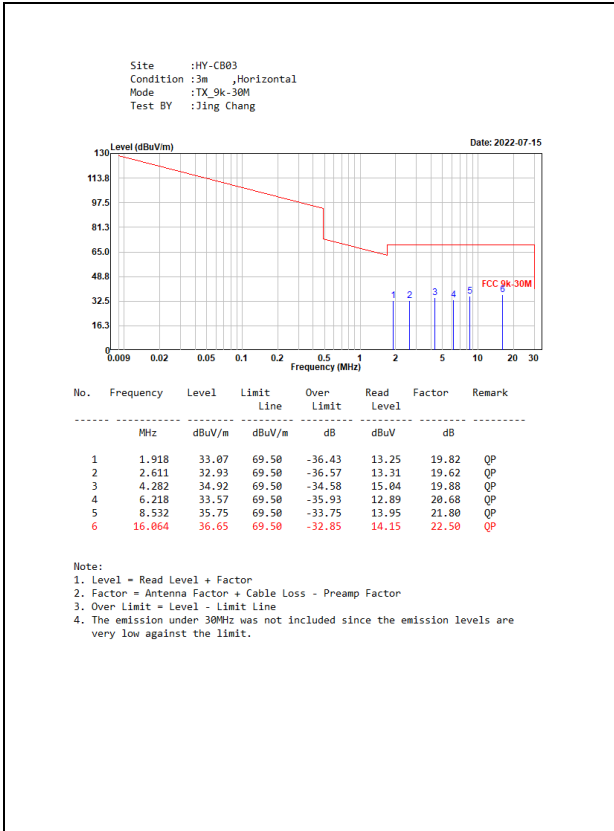
The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10: 2013 on radiated measurement.

The bandwidth below 30MHz setting on the field strength meter is 9kHz and above 30MHz is 120kHz. The frequency range from 9kHz to 10th harmonics is checked.

### 3.4. Test Result of Radiated Emission



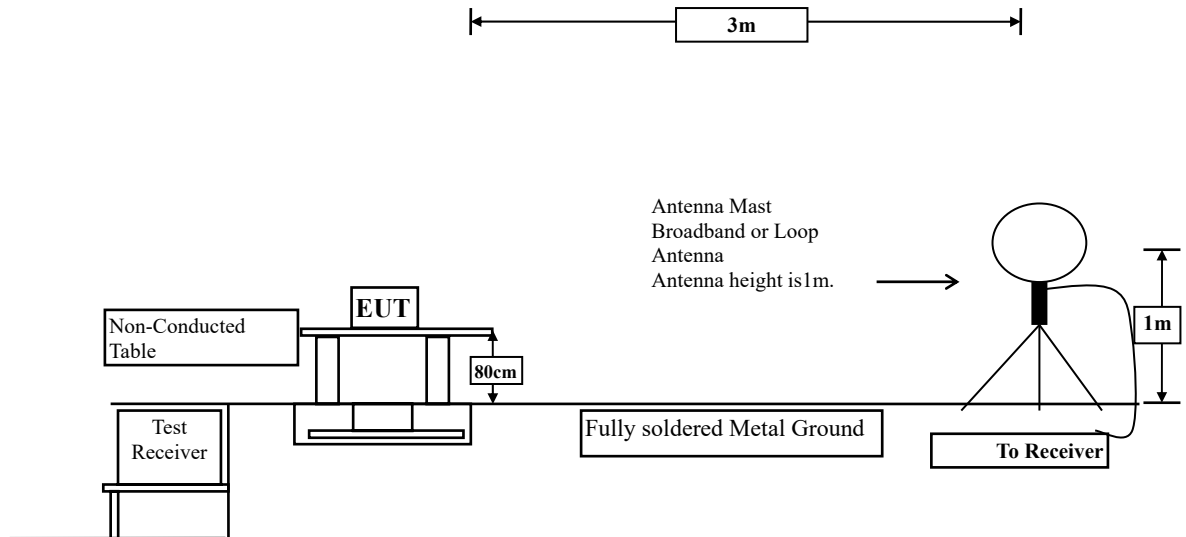




## 4. Band Edge

### 4.1. Test Setup

Radiated Emission Under 30MHz



### 4.2. Limits

The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in Section 15.209. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205, must also comply with the radiated emission limits specified in Section 15.209

### 4.3. Test Procedure

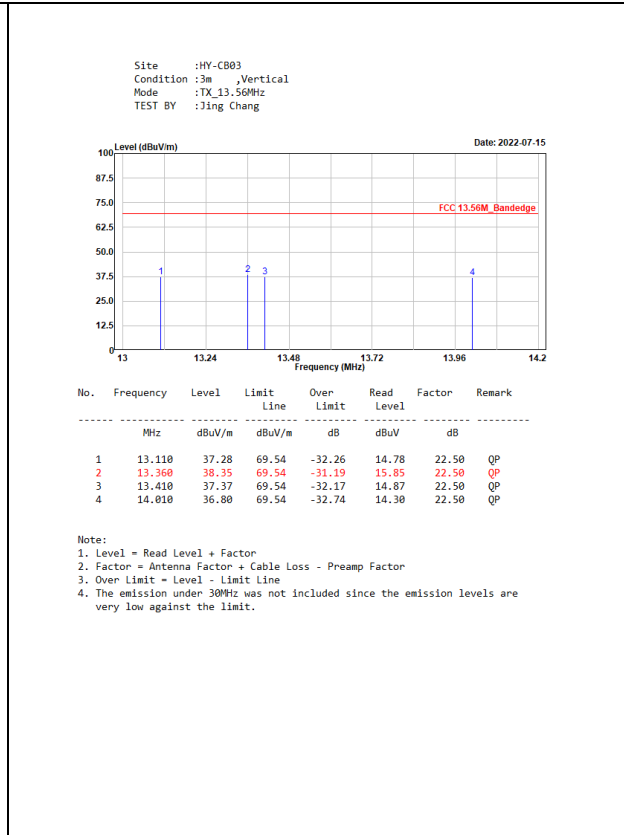
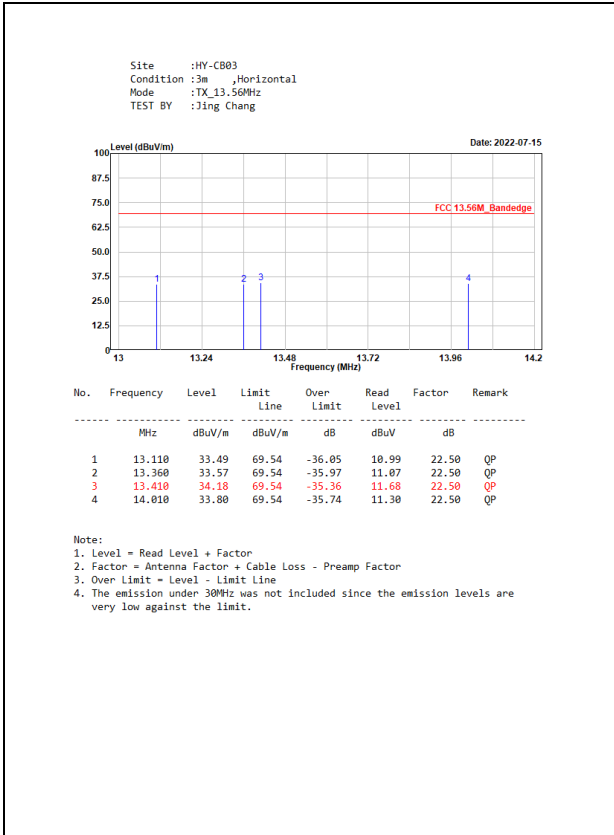
The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10: 2013 on radiated measurement.

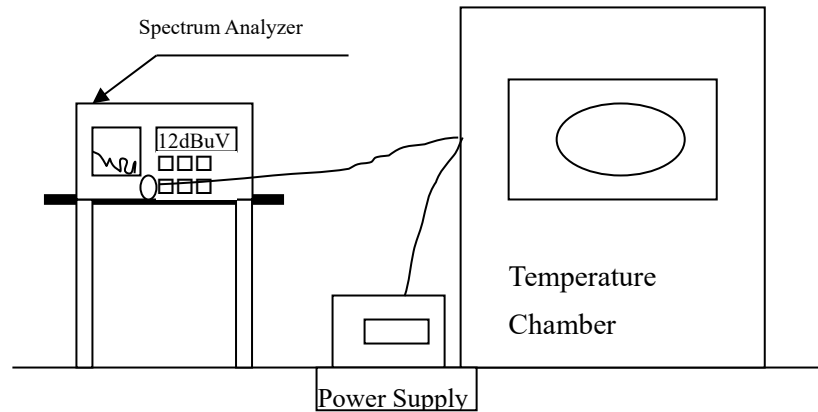
The bandwidth below 30MHz setting on the field strength meter is 9kHz and above 30MHz is 120kHz.

### 4.4. Test Result of Band Edge



## 5. Frequency Tolerance

### 5.1. Test Setup



### 5.2. Limits

The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01\%$  of the operating frequency.

### 5.3. Test Procedure

The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01\%$  of the operating frequency over a temperature variation of  $-20$  degrees to  $+ 50$  degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

#### 5.4. Test Result of Frequency Stability

Product : WC Subsystem Qi. 1.3 Gen.4 3-Coil  
 Test Item : Frequency Tolerance  
 Test Mode : Mode 1: Transmit  
 Test date : 2022/07/12

| Temperature (°C) | Voltage (V) | Observe Time | Declared Frequency (MHz) | Read Frequency (MHz) | Tolerance (%) | Limit (%) |
|------------------|-------------|--------------|--------------------------|----------------------|---------------|-----------|
| 20               | 12          | start        | 13.56                    | 13.55970             | -0.002212     | ±0.01%    |
|                  |             | 2mins        | 13.56                    | 13.55970             | -0.002212     |           |
|                  |             | 5mins        | 13.56                    | 13.55970             | -0.002212     |           |
|                  |             | 10mins       | 13.56                    | 13.55970             | -0.002212     |           |
| 20               | 13.2        | start        | 13.56                    | 13.55968             | -0.002360     | ±0.01%    |
|                  |             | 2mins        | 13.56                    | 13.55968             | -0.002360     |           |
|                  |             | 5mins        | 13.56                    | 13.55968             | -0.002360     |           |
|                  |             | 10mins       | 13.56                    | 13.55968             | -0.002360     |           |
| 20               | 10.8        | start        | 13.56                    | 13.55968             | -0.002360     | ±0.01%    |
|                  |             | 2mins        | 13.56                    | 13.55968             | -0.002360     |           |
|                  |             | 5mins        | 13.56                    | 13.55968             | -0.002360     |           |
|                  |             | 10mins       | 13.56                    | 13.55968             | -0.002360     |           |
| 50               | 12          | start        | 13.56                    | 13.55968             | -0.002360     | ±0.01%    |
|                  |             | 2mins        | 13.56                    | 13.55968             | -0.002360     |           |
|                  |             | 5mins        | 13.56                    | 13.55967             | -0.002434     |           |
|                  |             | 10mins       | 13.56                    | 13.55967             | -0.002434     |           |
| 40               | 12          | start        | 13.56                    | 13.55968             | -0.002360     | ±0.01%    |
|                  |             | 2mins        | 13.56                    | 13.55968             | -0.002360     |           |
|                  |             | 5mins        | 13.56                    | 13.55968             | -0.002360     |           |
|                  |             | 10mins       | 13.56                    | 13.55967             | -0.002434     |           |
| 30               | 12          | start        | 13.56                    | 13.55969             | -0.002286     | ±0.01%    |
|                  |             | 2mins        | 13.56                    | 13.55969             | -0.002286     |           |
|                  |             | 5mins        | 13.56                    | 13.55969             | -0.002286     |           |
|                  |             | 10mins       | 13.56                    | 13.55968             | -0.002360     |           |

|     |    |        |       |          |           |         |
|-----|----|--------|-------|----------|-----------|---------|
| 10  | 12 | start  | 13.56 | 13.55970 | -0.002212 | ±0.01 % |
|     |    | 2mins  | 13.56 | 13.55970 | -0.002212 |         |
|     |    | 5mins  | 13.56 | 13.55970 | -0.002212 |         |
|     |    | 10mins | 13.56 | 13.55970 | -0.002212 |         |
| 0   | 12 | start  | 13.56 | 13.55970 | -0.002212 | ±0.01 % |
|     |    | 2mins  | 13.56 | 13.55970 | -0.002212 |         |
|     |    | 5mins  | 13.56 | 13.55969 | -0.002286 |         |
|     |    | 10mins | 13.56 | 13.55969 | -0.002286 |         |
| -10 | 12 | start  | 13.56 | 13.55969 | -0.002286 | ±0.01 % |
|     |    | 2mins  | 13.56 | 13.55968 | -0.002360 |         |
|     |    | 5mins  | 13.56 | 13.55968 | -0.002360 |         |
|     |    | 10mins | 13.56 | 13.55968 | -0.002360 |         |
| -20 | 12 | start  | 13.56 | 13.55968 | -0.002360 | ±0.01 % |
|     |    | 2mins  | 13.56 | 13.55968 | -0.002360 |         |
|     |    | 5mins  | 13.56 | 13.55968 | -0.002360 |         |
|     |    | 10mins | 13.56 | 13.55967 | -0.002434 |         |