

## FCC AND ISCED CERTIFICATION TEST REPORT

### FOR

|                             |   |  |
|-----------------------------|---|--|
| <b>Applicant</b>            | : | Shenzhen Cnstar Electronic CO., LTD  |
| <b>Address</b>              | : | F2806, 28 / F, Xinghe World F building, No. 1<br>Yabao Road, Longgang District, Shenzhen |
| <b>Equipment under Test</b> | : | Wireless Transceiver Module  |
| <b>Model No.</b>            | : | HC03RFM  |
| <b>Trade Mark</b>           | : | N/A  |
| <b>FCC ID</b>               | : | 2A718HC03RFM   |
| <b>IC</b>                   | : | 28699-HC03RFM  |
| <b>Manufacturer</b>         | : | Shenzhen Cnstar Electronic CO., LTD  |
| <b>Address</b>              | : | F2806, 28 / F, Xinghe World F Building, No. 1<br>Yabao Road, Longgang District, Shenzhen |

**Issued By: Dongguan Dongdian Testing Service Co., Ltd.**

**Add:** No. 17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park, Dongguan  
City, Guangdong Province, China, 523808

**Tel:** +86-0769-38826678, **E-mail:** ddt@dgddt.com, <http://www.dgddt.com>

# REPORT

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## Test Report Declare

|                             |   |   |
|-----------------------------|---|---|
| <b>Applicant</b>            | : | Shenzhen Cnstar Electronic CO., LTD   |
| <b>Address</b>              | : | F2806, 28 / F, Xinghe World F building, No. 1 Yabao Road, Longgang District, Shenzhen |
| <b>Equipment under Test</b> | : | Wireless Transceiver Module   |
| <b>Model No.</b>            | : | HC03RFM   |
| <b>Trade mark</b>           | : | N/A   |
| <b>Manufacturer</b>         | : | Shenzhen Cnstar Electronic CO., LTD   |
| <b>Address</b>              | : | F2806, 28 / F, Xinghe World F building, No. 1 Yabao Road, Longgang District, Shenzhen |

### Test Standard Used:

FCC Rules and Regulations Part 15 Subpart C, RSS-210 Issue 10 December 2019

### Test procedure used:

ANSI C63.10:2013, RSS-Gen Issue 5, Apr. 2018, Amendment 2 (February 2021)

### We Declare:

The equipment described above is tested by Dongguan Dongdian Testing Service Co., Ltd. and in the configuration tested the equipment complied with the standards specified above. The test results are contained in this test report and Dongguan Dongdian Testing Service Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

**After test and evaluation, our opinion is that the equipment provided for test compliance with the requirement of the above FCC and ISED standards.**

|                         |                    |                      |                               |
|-------------------------|--------------------|----------------------|-------------------------------|
| <b>Report No.:</b>      | DDT-R22052702-2E01 |                      |                               |
| <b>Date of Receipt:</b> | Jun. 17, 2022      | <b>Date of Test:</b> | Jun. 06, 2022 ~ Jul. 15, 2022 |

**Prepared By:**

*Ella Gong*

**Ella Gong/Engineer**

**Approved By:**



**Damon Hu/EMC Manager**

Note: This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Dongguan Dongdian Testing Service Co., Ltd.

## Revision History

| Rev. | Revisions     | Issue Date    | Revised By |
|------|---------------|---------------|------------|
| ---  | Initial issue | Jul. 15, 2022 |            |
|      |               |               |            |

## 1 Summary of test results

| Description of Test Item                         | Standard   | Results |
|--|--|---------|
| 20dB Bandwidth and 99% Bandwidth                 | FCC Part 15: 15.231(c)<br>ANSI C63.10:2013<br>RSS-210 Issue 10<br>RSS-Gen Issue 5                        | PASS    |
| Stop Transmitting Time Test                      | FCC Part 15C: 15.231(e)<br>RSS-210 Issue 10  | PASS    |
| Radiated Emission                                | FCC Part 15: 15.209<br>FCC Part 15: 15.231(e)<br>ANSI C63.10:2013<br>RSS-210 Issue 10<br>RSS-Gen Issue 5 | PASS    |
| Power Line Conducted Emissions                   | FCC Part 15: 15.207<br>ANSI C63.10:2013<br>RSS-210 Issue 10<br>RSS-Gen Issue 5                           | N/A     |
| Antenna requirement                              | FCC Part 15: 15.203<br>RSS-210 Issue 10<br>RSS-Gen Issue 5   | PASS    |
| Note: N/A is an abbreviation for Not Applicable. |  |         |

## 2 General test information

### 2.1. Description of EUT

|                          |   |
|--------------------------|---|
| EUT* Name                | : Wireless Transceiver Module                 |
| Model Number             | : HC03RFM                                     |
| EUT function description | : Please reference user manual of this device |
| Power supply             | : 1.8-3.6V                                    |
| Operation frequency      | : 433.92MHz                                   |
| Modulation               | : FSK   |
| Antenna Type             | : RP-SMA antenna, Peak Gain: 3 dBi.           |
| Sample Number            | : S22052702-05                                |

Note: EUT is the ab. of equipment under test.

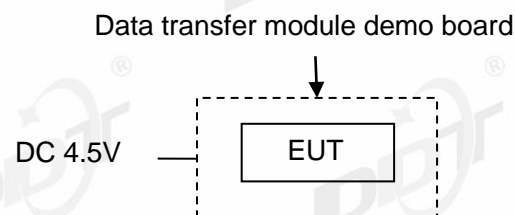
### 2.2. Accessories of EUT

| Description of Accessories | Manufacturer | Model number | Serial No. | Other |
|----------------------------|--------------|--------------|------------|-------|
| N/A                        | N/A          | N/A          | N/A        | N/A   |

### 2.3. Assistant equipment used for test

| Assistant equipment             | Manufacturer       | Model number | Serial No. | Other |
|---------------------------------|--------------------|--------------|------------|-------|
| Data transfer module demo board | HOPE RF ELECTRONIC | RFM300       | N/A        | N/A   |

### 2.4. Block diagram of EUT configuration for test



| Tested mode, channel, information |         |                 |
|-----------------------------------|---------|-----------------|
| Mode                              | Channel | Frequency (MHz) |
| TX mode                           | /       | 433.92          |

Note : New battery is used during all test

### 2.5. Deviations of test standard

No Deviation.

## 2.6. Test environment conditions

During the measurement the environmental conditions were within the listed ranges:

|                    |           |
|--------------------|-----------|
| Temperature range: | 21-25°C   |
| Humidity range:    | 40-75%    |
| Pressure range:    | 86-106kPa |

## 2.7. Test laboratory

Dongguan Dongdian Testing Service Co., Ltd.

Add.: No. 17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park, Dongguan City, Guangdong Province, China, 523808.

Tel.: +86-0769-38826678, <http://www.dgddt.com>, Email: [ddt@dgddt.com](mailto:ddt@dgddt.com).

CNAS Accreditation No. L6451; A2LA Accreditation Number: 3870.01

FCC Designation Number: CN1182, Test Firm Registration Number: 540522

Innovation, Science and Economic Development Canada Site Registration Number: 10288A

Conformity Assessment Body identifier: CN0048

VCCI facility registration number: C-20087, T-20088, R-20123, G-20118

## 2.8. Measurement uncertainty

| Test Item   | Uncertainty   |
|---|---|
| Bandwidth   | 1.1%  |
| Peak Output Power(Conducted)(Spectrum analyzer)   | 0.86dB (10 MHz ≤ f < 3.6GHz);<br>1.38dB (3.6GHz ≤ f < 8GHz)                                 |
| Peak Output Power(Conducted)(Power Sensor)  | 0.74dB  |
| Power Spectral Density  | 0.74dB (10 MHz ≤ f < 3.6GHz);<br>1.38dB (3.6GHz ≤ f < 8GHz)                                 |
| Frequencies Stability   | 6.7 × 10 <sup>-8</sup> (Antenna couple method)<br>5.5 × 10 <sup>-8</sup> (Conducted method) |
| Conducted spurious emissions  | 0.86dB (10 MHz ≤ f < 3.6GHz);<br>1.40dB (3.6GHz ≤ f < 8GHz)<br>1.66dB (8GHz ≤ f < 22GHz)    |
| Uncertainty for radio frequency (RBW<20kHz)   | 3×10 <sup>-8</sup>  |
| Temperature   | 0.4℃  |
| Humidity  | 2%  |
| Uncertainty for Radiation Emission test<br>(9 kHz-30 MHz)   | 3.44 dB   |
| Uncertainty for Radiation Emission test<br>(30MHz-1GHz)   | 4.70 dB (Antenna Polarize: V)<br>4.84 dB (Antenna Polarize: H)                              |
| Uncertainty for Radiation Emission test<br>(1GHz-40GHz)   | 4.10dB (1-6GHz)<br>4.40dB (6GHz-18GHz)<br>3.54dB (18GHz-26GHz)<br>4.30dB (26GHz-40GHz)      |
| Uncertainty for Power line conduction emission test   | 3.32dB (150kHz-30MHz)   |
| Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2. |   |

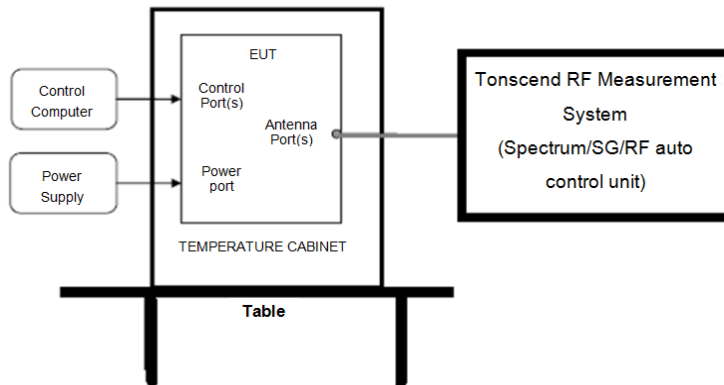


### 3 Equipment Used During Test

| Equipment   | Manufacturer | Model No.   | Serial No.      | Last Cal.     | Cal. Interval |
|---|--------------|-------------|-----------------|---------------|---------------|
| <b>☑RF Connected Test (Tonscend RF Measurement System 3#)</b> |              |             |                 |               |               |
| Spectrum analyzer   | R&S          | FSU26       | 200071          | Sep. 02, 2021 | 1 Year        |
| Wideband Radio Communication tester                           | R&S          | CMW500      | 117491          | May 18, 2022  | 1 Year        |
| Vector Signal Generator                                       | Agilent      | N5182A      | MY19060405      | May 18, 2022  | 1 Year        |
| Vector Signal Generator                                       | Agilent      | N5182A      | MY48180912      | May 18, 2022  | 1 Year        |
| RF Control Unit   | Tonsend      | JS0806-2    | DDT-ZC01449     | May 18, 2022  | 1 Year        |
| Temp&Humi Programmable  | ZHIXIANG     | ZXGDJS-150L | ZX170110-A      | May 26, 2022  | 1 Year        |
| Test Software   | JS Tonscend  | JS1120-3    | Ver.2.6.77.0518 | N/A           | N/A           |
| <b>☑Radiation 3#chamber</b>                                   |              |             |                 |               |               |
| EMI Test Receiver   | R&S          | ESU         | 100472          | May 18, 2022  | 1 Year        |
| Spectrum analyzer   | Agilent      | E4447A      | MY50180031      | May 18, 2022  | 1 Year        |
| Active Loop antenna   | Schwarzbeck  | FMZB-1519   | 1519-038        | Sep. 19, 2021 | 1 Year        |
| Trilog Broadband Antenna                                      | Schwarzbeck  | VULB 9163   | 01429           | Aug. 07, 2021 | 1 Year        |
| Double Ridged Horn Antenna                                    | Schwarzbeck  | BBHA9120    | 02468           | Nov. 17, 2021 | 1 Year        |
| Broad Band Horn Antenna                                       | Schwarzbeck  | BBHA 9170   | 790             | May 06, 2022  | 1 Year        |
| Pre-amplifier   | COM-POWER    | PAM-118A    | 18040084        | Sep. 02, 2021 | 1 Year        |
| Pre-amplifier   | COM-POWER    | PAM-840A    | 461369          | Apr. 11, 2022 | 1 Year        |
| Test software   | Audix        | E3          | V 6.1.1.1       | N/A           | N/A           |

## 4. On Time and Duty Cycle

### 4.1. Block diagram of test setup



### 4.2. Limits

None: for reporting purposes only.

### 4.3. Test Procedure

Set the Centre frequency of the spectrum analyzer to the transmitting frequency;

Set the span=0MHz, RBW=10MHz, VBW=10MHz, Sweep time=5s;

Trace mode = Single hold.

### 4.4. Test Result

| Test Channel | Duty Cycle[%] | 20 log(duty cycle ) |
|--------------|---------------|---------------------|
| 433.92       | 100           | 0                   |

Note 1: The transmitter duty cycle was measured using a spectrum analyser in the time domain and calculated by below Equation:

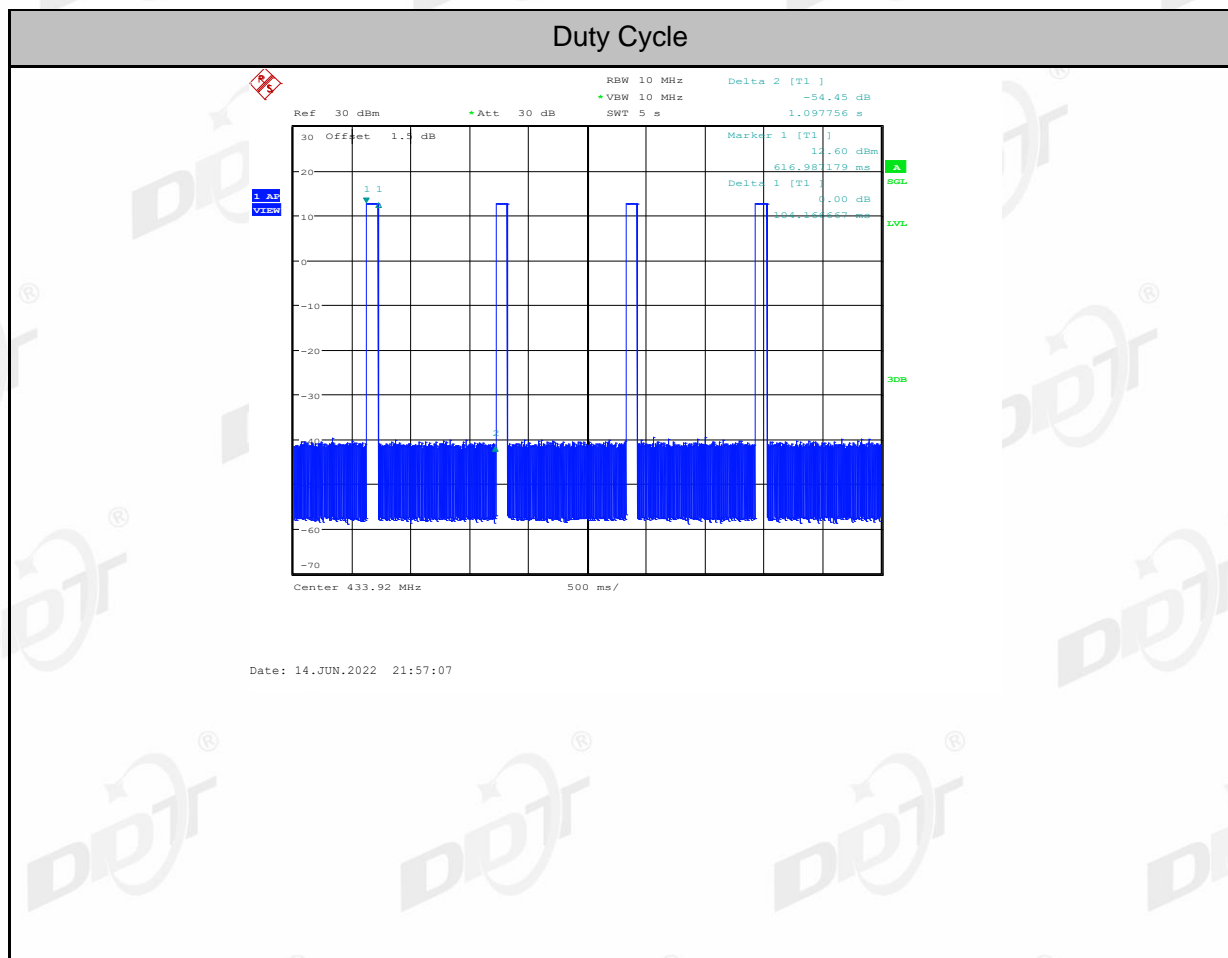
$$\delta(\text{dB}) = 20\log(\Delta) = 20\log(100/100) = 0 \text{ dB}$$

$\delta$  is the duty cycle correction factor (dB)

$\Delta$  is the duty cycle (dimensionless)

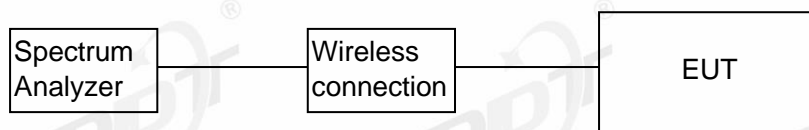
Note 2: In cases where the pulse train exceeds 0.1 s, the measured field strength shall be determined during a 0.1 s interval

#### 4.5. Original test data



## 5. 20dB Bandwidth and 99% Bandwidth

### 5.1. Block diagram of test setup



### 5.2. Limits

The bandwidth of the emission shall be no wider than 0.25% of the center frequency of devices operation above 70MHz and below 900MHz.

### 5.3. Test Procedure

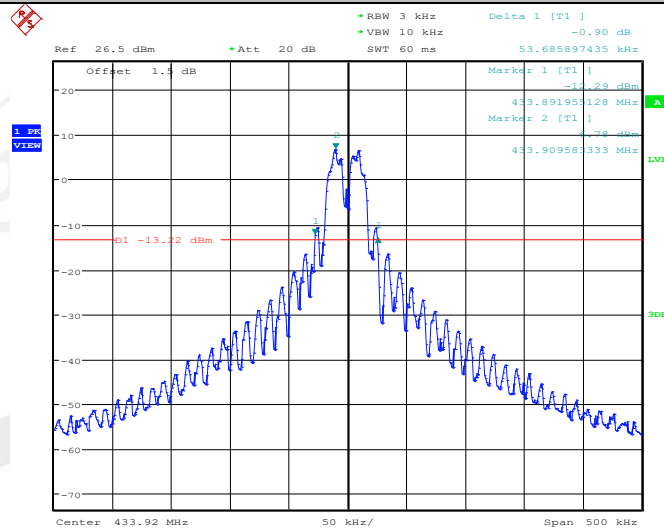
- (1) Connect EUT's antenna output to spectrum analyzer by RF cable.
- (2) The bandwidth of the fundamental frequency was measured by spectrum analyzer with 1kHz RBW and 3kHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

### 5.4. Test Result

| Frequency (MHz) | 20 dB Bandwidth (kHz) | 99% Bandwidth (kHz) | Limit (MHz): No wider than 0.25% of the center frequency | Conclusion |
|-----------------|-----------------------|---------------------|--|------------|
| FSK             | 53.686                | 49.679              | $433.92 \times 0.25\% = 1.0848\text{MHz}$                | PASS       |

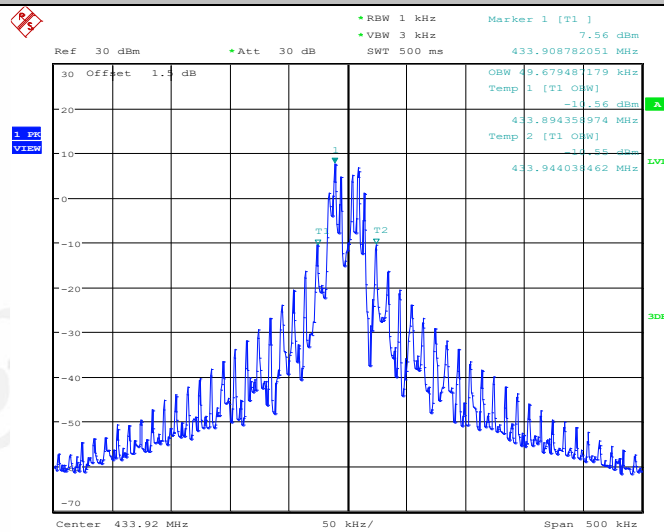
### 5.5. Original test data

## 20 dB Bandwidth



Date: 14.JUN.2022 23:11:07

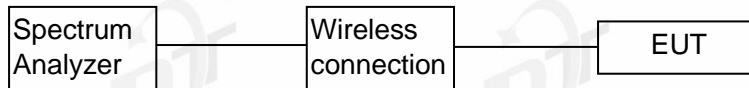
## 99% Bandwidth



Date: 14.JUN.2022 20:07:00

## 6 Stop transmitting time test

### 6.1. Block diagram of test setup



### 6.2. Limits

15.231(e), periodic transmissions: each transmission is not greater than 1 sec and silent period between transmissions is at least 30 times the duration of the transmission but in no case less than 10 sec.

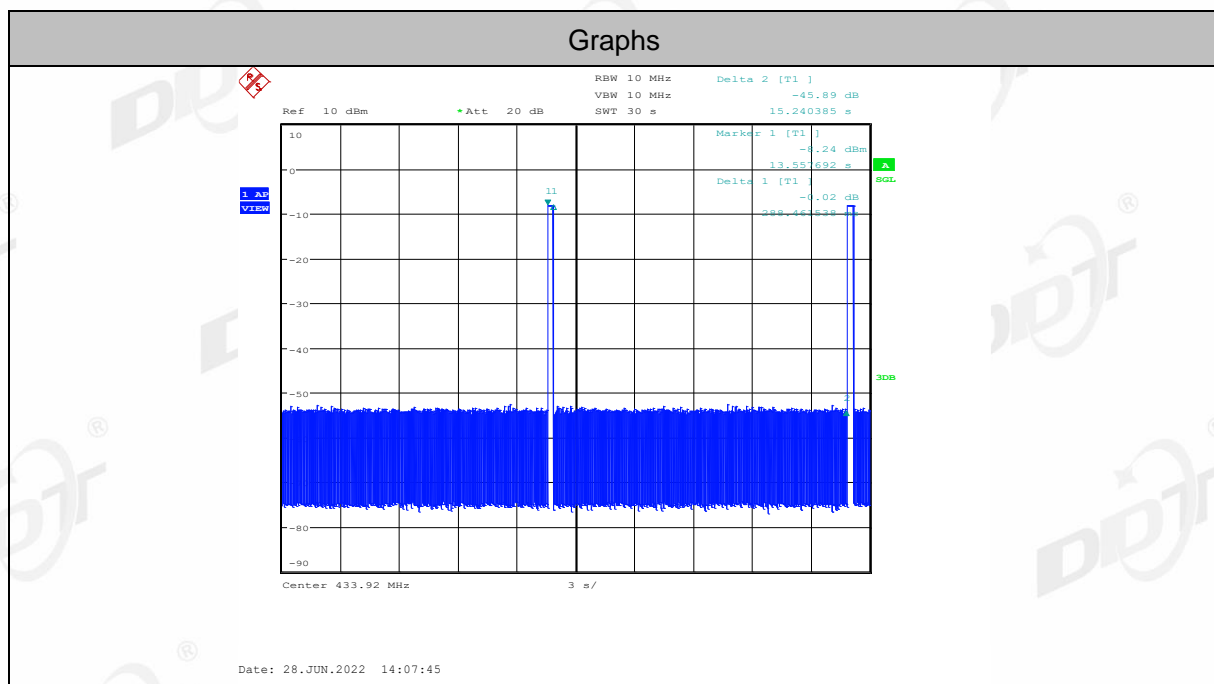
### 6.3. Test Procedure

- (1) The EUT's RF signal was coupled to spectrum analyzer by antenna connected to spectrum analyzer.
- (2) Set the spectrum to zero span mode, and centered of EUT frequency.
- (3) Measure the stop transmitting time after release EUT button.

### 6.4. Test Result

| Frequency (MHz) | Burst Duration (ms) | Limit | Silent Period | Limit                      |
|-----------------|---------------------|-------|---------------|----------------------------|
| 433.92          | 288.462             | ≤1s   | 14.952s       | >10s & >30* Burst Duration |

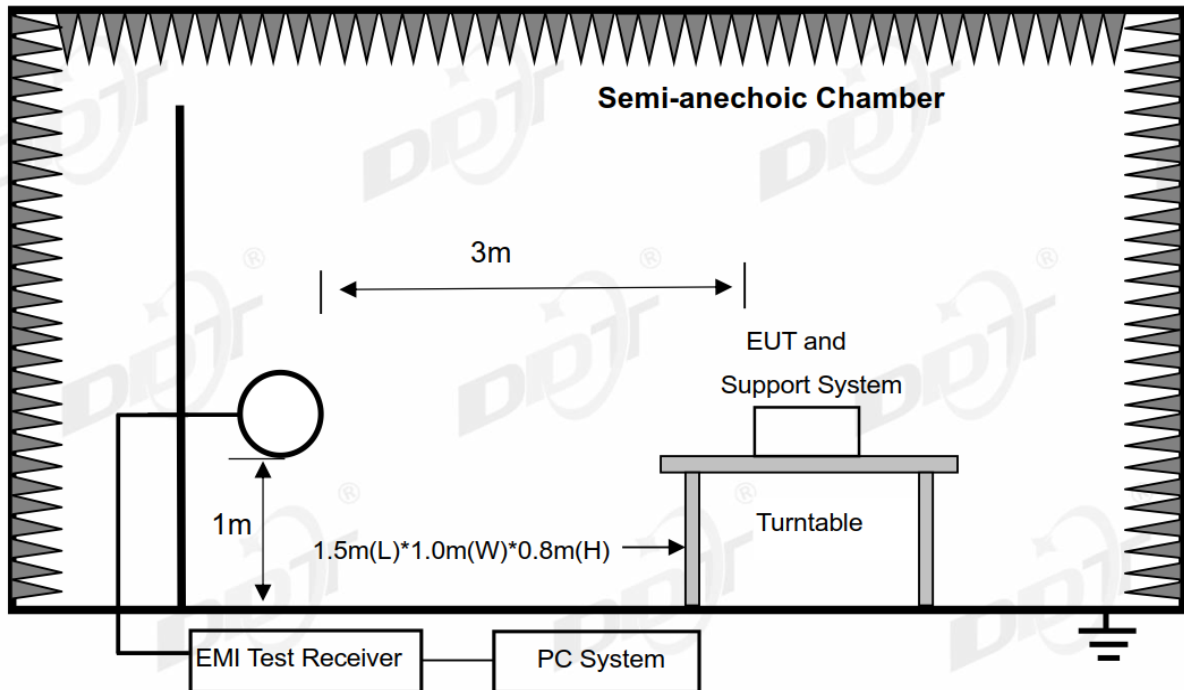
### 6.5. Original test data



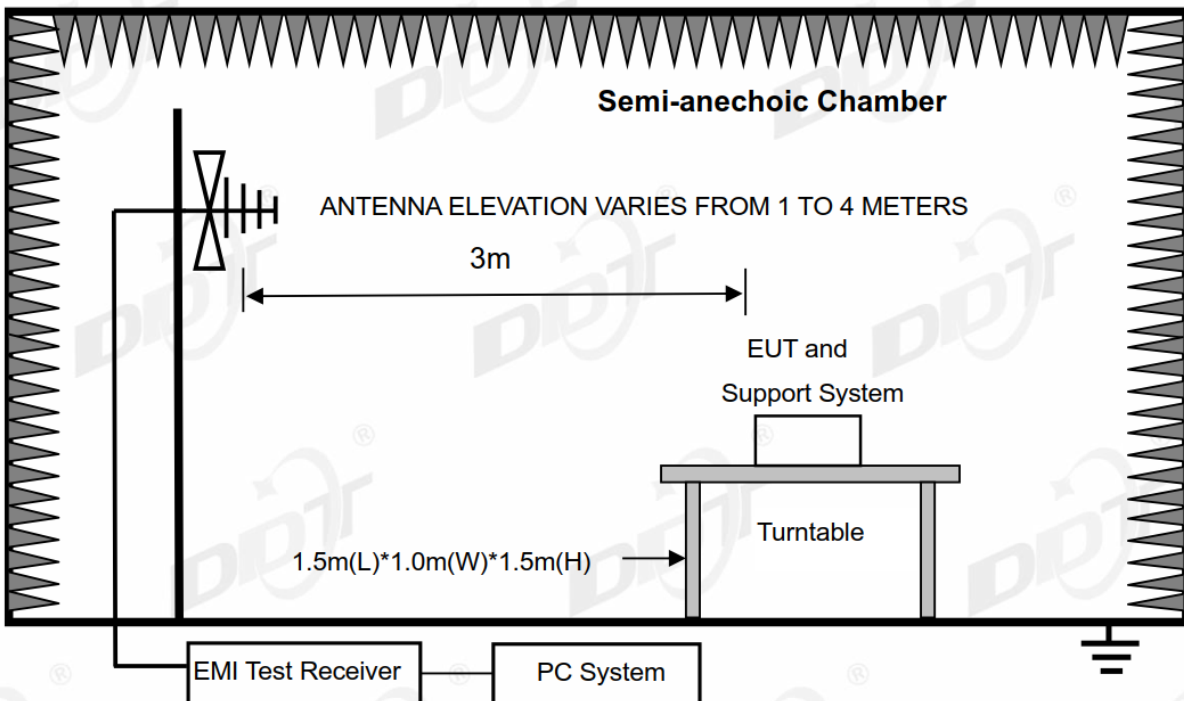
## 7 Radiated emission

### 7.1. Block diagram of test setup

In 3m Anechoic Chamber Test Setup Diagram for 9kHz-30MHz

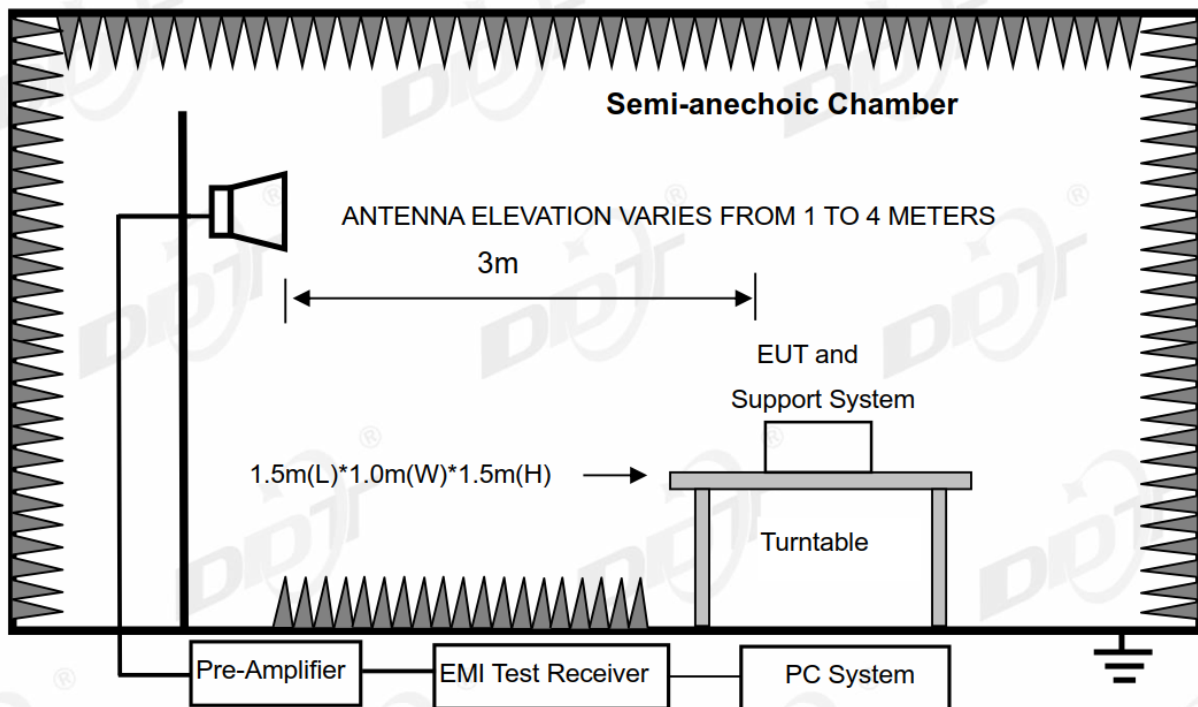


In 3m Anechoic Chamber Test Setup Diagram for below 1GHz



In 3m Anechoic Chamber Test Setup Diagram for frequency above 1GHz





Note: For harmonic emissions test a appropriate high pass filter was inserted in the input port of AMP.

## 7.2. Limit

(1) FCC 15.205 Restricted frequency band

| MHz               | MHz                 | MHz           | GHz              |
|-------------------|---------------------|---------------|------------------|
| 0.090-0.110       | 16.42-16.423        | 399.9-410     | 4.5-5.15         |
| 10.495-0.505      | 16.69475-16.69525   | 608-614       | 5.35-5.46        |
| 2.1735-2.1905     | 16.80425-16.80475   | 960-1240      | 7.25-7.75        |
| 4.125-4.128       | 25.5-25.67          | 1300-1427     | 8.025-8.5        |
| 4.1772&4.17775    | 37.5-38.25          | 1435-1626.5   | 9.0-9.2          |
| 4.2072&4.20775    | 73-74.6             | 1645.5-1646.5 | 9.3-9.5          |
| 6.215-6.218       | 74.8-75.2           | 1660-1710     | 10.6-12.7        |
| 6.26775-6.26825   | 108-121.94          | 1718.8-1722.2 | 13.25-13.4       |
| 6.31175-6.31225   | 123-138             | 2200-2300     | 14.47-14.5       |
| 8.291-8.294       | 149.9-150.05        | 2310-2390     | 15.35-16.2       |
| 8.362-8.366       | 156.52475-156.52525 | 2483.5-2500   | 17.7-21.4        |
| 8.37625-8.38675   | 156.7-156.9         | 2690-2900     | 22.01-23.12      |
| 8.41425-8.41475   | 162.0125-167.17     | 3260-3267     | 23.6-24.G        |
| 12.29-12.293      | 167.72-173.2        | 3332-3339     | 31.2-31.8        |
| 12.51975-12.52025 | 240-285             | 3345.8-3358   | 36.43-36.5       |
| 12.57675-12.57725 | 322-335.4           | 3600-4400     | ( <sup>2</sup> ) |
| 13.36-13.41       |                     |               |                  |



## RSS-Gen section 8.10 Restricted frequency bands\*

| MHz             | MHz                 | MHz           | GHz         |
|-----------------|---------------------|---------------|-------------|
| 0.090-0.110     | 12.51975-12.52025   | 240-285       | 3.5-4.4     |
| 0.495-0.505     | 12.57675-12.57725   | 322-335.4     | 4.5-5.15    |
| 2.1735-2.1905   | 13.36-13.41         | 399.9-410     | 5.35-5.46   |
| 3.020-3.026     | 16.42-16.423        | 608-614       | 7.25-7.75   |
| 4.125-4.128     | 16.69475-16.69525   | 960-1427      | 8.025-8.5   |
| 4.1772&4.17775  | 16.80425-16.80475   | 1435-1626.5   | 9.0-9.2     |
| 4.2072&4.20775  | 25.5-25.67          | 1645.5-1646.5 | 9.3-9.5     |
| 5.677-5.683     | 37.5-38.25          | 1660-1710     | 10.6-12.7   |
| 6.215-6.218     | 73-74.6             | 1718.8-1722.2 | 13.25-13.4  |
| 6.26775-6.26825 | 74.8-75.2           | 2200-2300     | 14.47-14.5  |
| 6.31175-6.31225 | 108-138             | 2310-2390     | 15.35-16.2  |
| 8.291-8.294     | 149.9-150.05        | 2483.5-2500   | 17.7-21.4   |
| 8.362-8.366     | 156.52475-156.52525 | 2655-2900     | 22.01-23.12 |
| 8.37625-8.38675 | 156.7-156.9         | 3260-3267     | 23.6-24.0   |
| 8.41425-8.41475 | 162.0125-167.17     | 3332-3339     | 31.2-31.8   |
| 12.29-12.293    | 167.72-173.2        | 3345.8-3358   | 36.43-36.5  |
|                 |                     |               | Above 38.6  |

\* Certain frequency bands listed in table and in bands above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.

## (2) FCC 15.209 Limit.

| FREQUENCY<br>MHz | DISTANCE<br>Meters | FIELD STRENGTHS LIMIT   |                                   |
|------------------|--------------------|---|-----------------------------------|
|                  |                    | $\mu\text{V/m}$   | $\text{dB}(\mu\text{V})/\text{m}$ |
| 0.009 ~ 0.490    | 300                | 2400/F(kHz)   | 67.6-20log(F)                     |
| 0.490 ~ 1.705    | 30                 | 24000/F(kHz)  | 87.6-20log(F)                     |
| 1.705 ~ 30.0     | 30                 | 30  | 29.54                             |
| 30 ~ 88          | 3                  | 100   | 40.0                              |
| 88 ~ 216         | 3                  | 150   | 43.5                              |
| 216 ~ 960        | 3                  | 200   | 46.0                              |
| 960 ~ 1000       | 3                  | 500   | 54.0                              |
| Above 1000       | 3                  | 74.0 $\text{dB}(\mu\text{V})/\text{m}$ (Peak)<br>54.0 $\text{dB}(\mu\text{V})/\text{m}$ (Average) |                                   |

## (3) FCC 15.231 section (e) limit

| Fundamental Frequency<br>(MHz) | Field Strength of Fundamental            |
|--------------------------------|--|
| 433.92                         | AV:72.87dBuV/m @3m<br>PK:92.87dBuV/m @3m |

Note:

(1) The emission limits shown in the above table are based on measurements employing a CISPR QP detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000MHz. Radiated emissions limits in these three bands are based on measurements employing an average detector.

(2) At frequencies below 30MHz, measurement may be performed at a distance closer than that specified, and the limit at closer measurement distance can be extrapolated by below formula:

$$\text{Limit}_{3\text{m}}(\text{dBuV/m}) = \text{Limit}_{300\text{m}}(\text{dBuV/m}) + 40\text{Log}(300\text{m}/3\text{m}) = \text{Limit}_{300\text{m}}(\text{dBuV/m}) + 80$$

$$\text{Limit}_{3\text{m}}(\text{dBuV/m}) = \text{Limit}_{30\text{m}}(\text{dBuV/m}) + 40\text{Log}(30\text{m}/3\text{m}) = \text{Limit}_{30\text{m}}(\text{dBuV/m}) + 40$$

(3) Limit for this EUT

All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions include fundamental emission shall not exceed FCC 15.231 section (e) limit of comply with FCC 15.209 limit which permit higher emission level.

RSS-210 Issue 10 Annex D

(b) exceed 11,000  $\mu\text{V/m}$  measured at 3 m with an average detector. The peak level of any emission within this specified frequency band shall not exceed 55,000  $\mu\text{V/m}$  measured at 3 m; and

(c) The field strength of emissions on any frequencies outside this specified band shall not exceed the general field strength limits specified in RSS-Gen.

### 7.3. Test Procedure

- (1) EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber for below 1GHz and 150 cm above the ground plane inside a semi-anechoic chamber for above 1GHz.
- (2) Test antenna was located 3m from the EUT on an adjustable mast, and the antenna used as below table.

| Test frequency range | Test antenna used                      | Test antenna distance |
|----------------------|--|-----------------------|
| 9kHz-30MHz           | Active Loop antenna                    | 3m                    |
| 30MHz-1GHz           | Trilog Broadband Antenna               | 3m                    |
| 1GHz-18GHz           | Double Ridged Horn Antenna(1GHz-18GHz) | 3m                    |
| 18GHz-40GHz          | Horn Antenna(18GHz-40GHz)              | 1m                    |

According ANSI C63.10:2013 clause 6.4.6 and 6.5.3, for measurements below 30 MHz, Antenna was located 3 m from EUT, the loop antenna was positioned in three antenna orientations (parallel, perpendicular, and round-parallel), for each measurement antenna alignment, the EUT shall be rotated through 0° to 360° on a turntable, and the lowest height of the magnetic antenna shall be 1 m above the ground. For measurement above 30MHz, the Trilog Broadband Antenna or Horn Antenna was located 3m from EUT, Measurements were made with the antenna positioned in both the horizontal and vertical planes of Polarization, and the measurement antenna was varied from 1 m to 4 m. in height above the reference ground plane to obtain the maximum signal strength.

- (3) Below pre-scan procedure was first performed in order to find prominent frequency spectrum

radiated emissions from 9kHz to 5GHz (tenth harmonic of fundamental frequency):

(a) Scanning the peak frequency spectrum with the antenna specified in step (3), and the EUT was rotated 360 degree, the antenna height was varied from 1m to 4m(Except loop antenna, it's fixed 1m above ground.)

(b) Change work frequency or channel of device if practicable.

(c) Change modulation type of device if practicable.

(d) Change power supply range from 85% to 115% of the rated supply voltage

(e) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions.

(4) For final emissions measurements at each frequency of interest, the EUT was rotated and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10 2013 on Radiated Emission test.

(5) The emissions from 9kHz to 1GHz were measured based on CISPR QP detector except for the frequency bands 9-90kHz, 110-490kHz, for emissions from 9kHz-90kHz,110kHz-490kHz and above 1GHz were measured based on average detector, for emissions above 1GHz, peak emissions also be measured and need comply with Peak limit.

(6) The emissions from 9kHz to 1GHz, QP or average values were measured with EMI receiver with below RBW.

| Frequency band | RBW    |
|----------------|--------|
| 9kHz-150kHz    | 200Hz  |
| 150kHz-30MHz   | 9kHz   |
| 30MHz-1GHz     | 120kHz |

(7) For emissions above 1GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1MHz, VBW is set at 3MHz for Peak measure; RMS detector RBW 1MHz VBW 3MHz for Average measure(according ANSI C63.10:2013 clause 4.2.3.2.3 procedure for average measure).

(8) X axis, Y axis, Z axis are tested, and worse setup X axis is reported.

#### 7.4. Test result

##### **PASS. (See below detailed test result)**

Note1: According exploratory test no any obvious emission were detected from 9kHz to 30MHz.

Note2: For emissions above 1GHz. If peak results comply with AV limit, AV Result is deemed to comply with AV limit.

## Radiated Emission test (below 1GHz)

## TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\E3 6.111\2022 Report Data\Q22052702-2E  
HC03REM\New\FCC BELOW 1G.EM6

Test Date : 2022-07-15

Tested By : James Gan

EUT : Wireless Transceiver Module

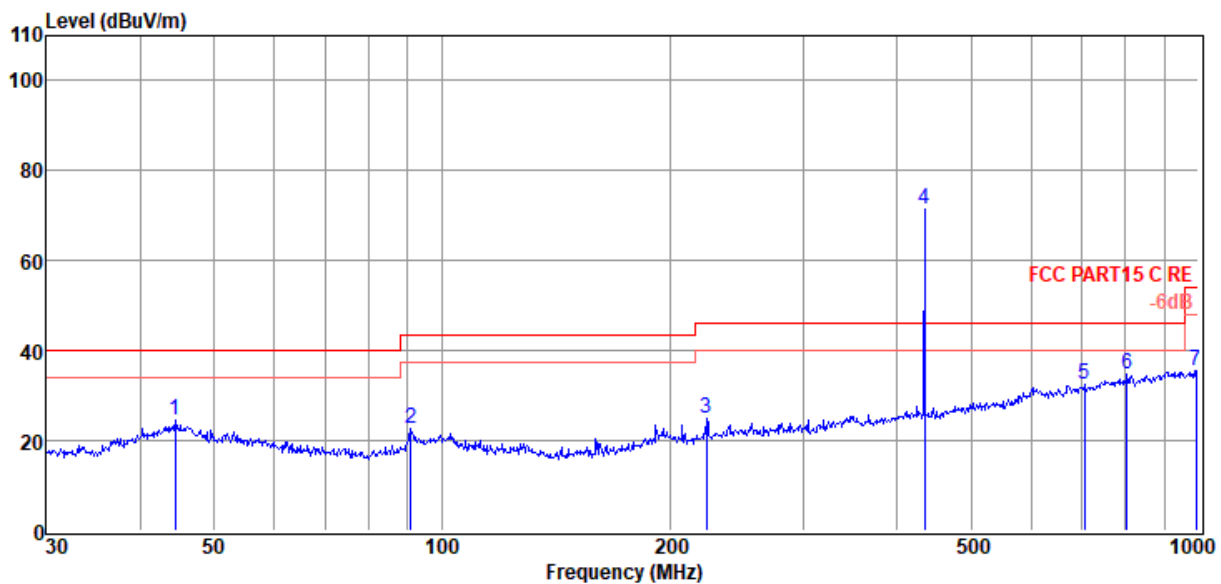
Model Number : HC03RFM

Power Supply : Battery

Test Mode : Tx Mode

Condition : Temp:23.2°C,Humi:58.8%,Press:100.3kPa Antenna/Distance : 2021 VLUB 9163 #3/3m/VERTICAL

Memo : 433.92MHz

Data:  
15

| Item<br>(Mark) | Freq.<br>(MHz) | Read Level<br>(dBuV) | Antenna Factor<br>(dB/m) | Cable Loss<br>dB | Result Level<br>(dBuV/m) | Limit Line<br>(dBuV/m) | Over Limit<br>(dB) | Detector | Polarization |
|----------------|----------------|----------------------|--------------------------|------------------|--------------------------|------------------------|--------------------|----------|--------------|
| 1              | 44.43          | 5.83                 | 15.04                    | 3.64             | 24.51                    | 40.00                  | -15.49             | Peak     | VERTICAL     |
| 2              | 90.86          | 8.49                 | 10.14                    | 3.94             | 22.57                    | 43.50                  | -20.93             | Peak     | VERTICAL     |
| 3              | 223.73         | 8.86                 | 11.70                    | 4.55             | 25.11                    | 46.00                  | -20.89             | Peak     | VERTICAL     |
| 4              | 433.92         | 49.88                | 16.18                    | 5.27             | 71.33                    | /                      | /                  | Peak     | VERTICAL     |
| 5              | 706.70         | 7.09                 | 19.57                    | 6.01             | 32.67                    | 46.00                  | -13.33             | Peak     | VERTICAL     |
| 6              | 804.60         | 7.59                 | 20.79                    | 6.23             | 34.61                    | 46.00                  | -11.39             | Peak     | VERTICAL     |
| 7              | 993.01         | 6.49                 | 22.40                    | 6.80             | 35.69                    | 54.00                  | -18.31             | Peak     | VERTICAL     |

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

## TR-4-E-009 Radiated Emission Test Result

**Test Site** : DDT 3m Chamber 3#

D:\E3 6.111\2022 Report Data\Q22052702-2E  
HC03REM\New\FCC BELOW 1G.EM6

**Test Date** : 2022-07-15

**Tested By** : James Gan

**EUT** : Wireless Transceiver Module

**Model Number** : HC03RFM

**Power Supply** : Battery

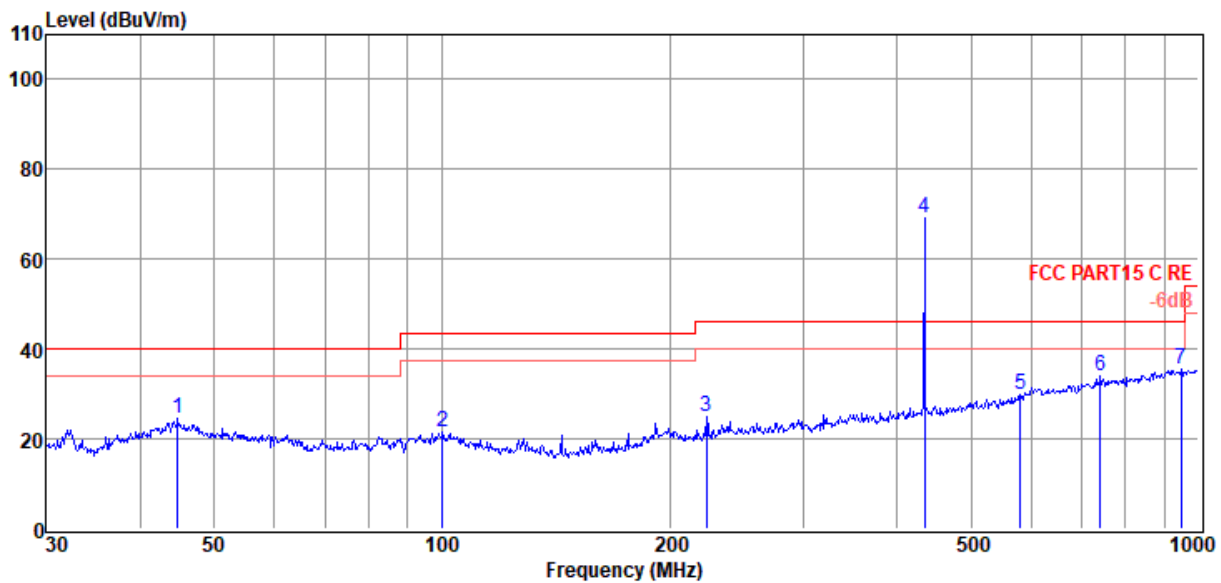
**Test Mode** : Tx Mode

**Condition** : Temp:23.2°C,Humi:58.8%,Press:100.3kPa

**Antenna/Distance** : 2021 VLUB 9163 #3/3m/HORIZONTAL

**Memo** : 433.92MHz

Data:  
16



| Item<br>(Mark) | Freq.<br>(MHz) | Read<br>Level<br>(dBuV) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss<br>dB | Result<br>Level<br>(dBuV/m) | Limit<br>Line<br>(dBuV/m) | Over<br>Limit<br>(dB) | Detector | Polarization |
|----------------|----------------|-------------------------|-----------------------------|---------------------|-----------------------------|---------------------------|-----------------------|----------|--------------|
| 1              | 44.74          | 5.85                    | 15.07                       | 3.64                | 24.56                       | 40.00                     | -15.44                | Peak     | HORIZONTAL   |
| 2              | 100.23         | 6.16                    | 11.52                       | 3.98                | 21.66                       | 43.50                     | -21.84                | Peak     | HORIZONTAL   |
| 3              | 223.73         | 8.58                    | 11.70                       | 4.55                | 24.83                       | 46.00                     | -21.17                | Peak     | HORIZONTAL   |
| 4              | 433.92         | 47.61                   | 16.18                       | 5.27                | 69.06                       | /                         | /                     | Peak     | HORIZONTAL   |
| 5              | 580.70         | 6.05                    | 18.24                       | 5.68                | 29.97                       | 46.00                     | -16.03                | Peak     | HORIZONTAL   |
| 6              | 742.26         | 7.47                    | 20.45                       | 6.08                | 34.00                       | 46.00                     | -12.00                | Peak     | HORIZONTAL   |
| 7              | 948.76         | 6.82                    | 22.20                       | 6.57                | 35.59                       | 46.00                     | -10.41                | Peak     | HORIZONTAL   |

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

**Field Strength Of The Fundamental Signal**

| Frequency (MHz) | PK Level (dBuV/m) | PK Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|-------------------|------------------------|-----------------|--------------|
| 433.92          | 69.06             | 92.87                  | -23.81          | Horizontal   |
| 433.92          | 71.33             | 92.87                  | -21.54          | Vertical     |

| Frequency (MHz) | AV Level (dBuV/m) | AV Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|-------------------|------------------------|-----------------|--------------|
| 433.92          | 69.06             | 72.87                  | -3.81           | Horizontal   |
| 433.92          | 71.33             | 72.87                  | -1.54           | Vertical     |

Note: AV Level= PK Level+ Duty factor

## Radiated Emission test (above 1GHz)

## TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\E3 6.111\2022 Report Data\Q22052702-2E  
HC03REM\New\FCC ABOVE 1G .EM6

Test Date : 2022-06-11

Tested By : James Gan

EUT : Wireless Transceiver Module

Model Number : HC03RFM

Power Supply : Battery

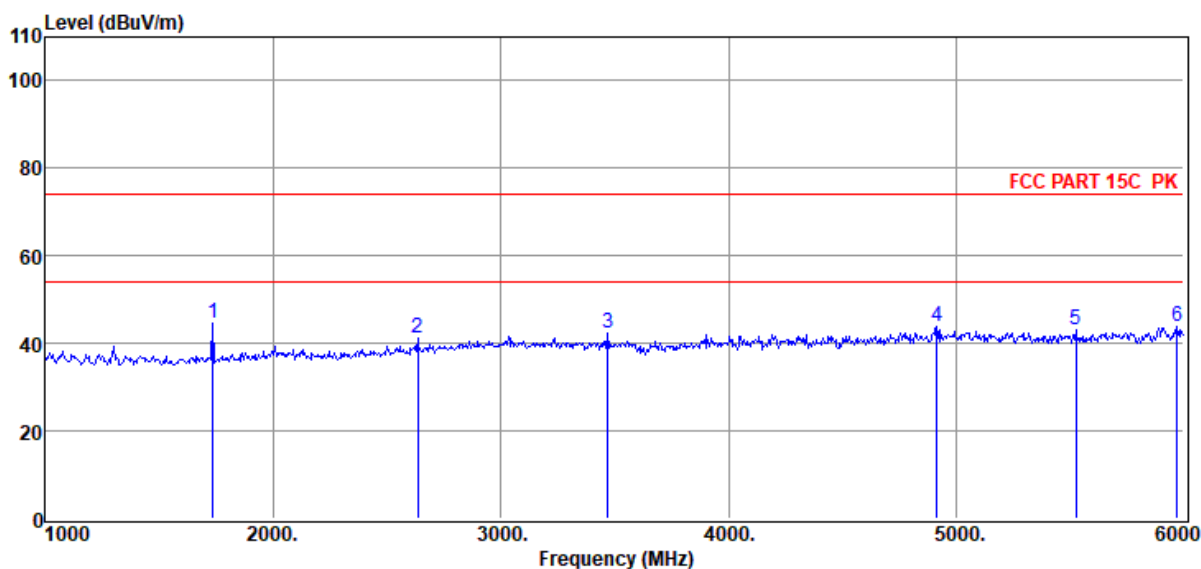
Test Mode : Tx Mode

Condition : Temp:23.2°C,Humi:58.8%,Press:100.3kPa

Antenna/Distance : 2021 BBHA 9120D  
3#/3m/HORIZONTAL

Memo : 433.92MHz

Data: 3



| Item<br>(Mark) | Freq.<br>(MHz) | Read Level<br>(dBuV) | Antenna Factor<br>(dB/m) | PRM Factor<br>dB | Cable Loss<br>dB | Filter Factor<br>dB | Result Level<br>(dBuV/m) | Limit Line<br>(dBuV/m) | Over Limit<br>(dB) | Detector | Polarization |
|----------------|----------------|----------------------|--------------------------|------------------|------------------|---------------------|--------------------------|------------------------|--------------------|----------|--------------|
| 1              | 1735.00        | 55.47                | 26.01                    | 39.00            | 1.48             | 0.63                | 44.59                    | 74.00                  | -29.41             | Peak     | HORIZONTAL   |
| 2              | 2635.00        | 50.16                | 28.11                    | 39.72            | 1.78             | 0.75                | 41.08                    | 74.00                  | -32.92             | Peak     | HORIZONTAL   |
| 3              | 3470.00        | 50.37                | 29.41                    | 40.04            | 1.70             | 0.82                | 42.26                    | 74.00                  | -31.74             | Peak     | HORIZONTAL   |
| 4              | 4915.00        | 48.01                | 32.83                    | 40.38            | 2.51             | 0.91                | 43.88                    | 74.00                  | -30.12             | Peak     | HORIZONTAL   |
| 5              | 5525.00        | 47.04                | 32.86                    | 40.45            | 2.59             | 1.03                | 43.07                    | 74.00                  | -30.93             | Peak     | HORIZONTAL   |
| 6              | 5970.00        | 46.16                | 33.93                    | 40.50            | 3.00             | 1.13                | 43.72                    | 74.00                  | -30.28             | Peak     | HORIZONTAL   |

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss + Filter Factor - PRM Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.



## TR-4-E-009 Radiated Emission Test Result

**Test Site** : DDT 3m Chamber 3#

D:\E3 6.111\2022 Report Data\Q22052702-2E  
HC03REM\New\FCC ABOVE 1G .EM6

**Test Date** : 2022-06-11

**Tested By** : James Gan

**EUT** : Wireless Transceiver Module

**Model Number** : HC03RFM

**Power Supply** : Battery

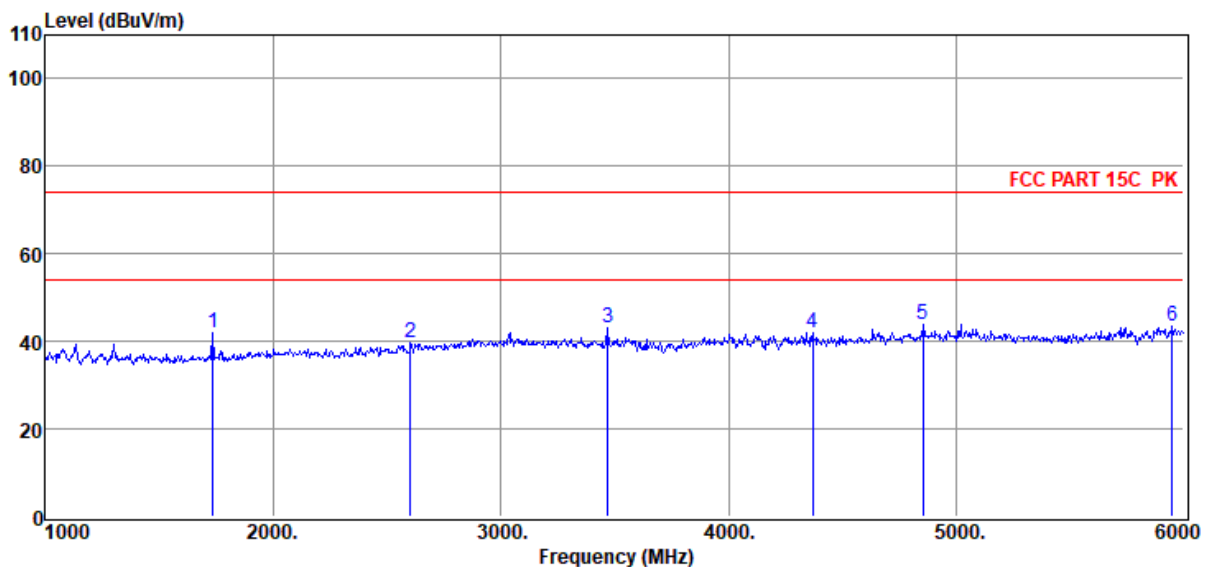
**Test Mode** : Tx Mode

**Condition** : Temp:23.2°C,Humi:58.8%,Press:100.3kPa

**Antenna/Distance** : 2021 BBHA 9120D 3#/3m/VERTICAL

**Memo** : 433.92MHz

Data: 4



| Item<br>(Mark) | Freq.<br>(MHz) | Read Level<br>(dBuV) | Antenna Factor<br>(dB/m) | PRM Factor<br>dB | Cable Loss<br>dB | Filter Factor<br>dB | Result Level<br>(dBuV/m) | Limit Line<br>(dBuV/m) | Over Limit<br>(dB) | Detector | Polarization |
|----------------|----------------|----------------------|--------------------------|------------------|------------------|---------------------|--------------------------|------------------------|--------------------|----------|--------------|
| 1              | 1735.00        | 52.77                | 26.01                    | 39.00            | 1.48             | 0.63                | 41.89                    | 74.00                  | -32.11             | Peak     | VERTICAL     |
| 2              | 2605.00        | 49.03                | 28.00                    | 39.70            | 1.77             | 0.75                | 39.85                    | 74.00                  | -34.15             | Peak     | VERTICAL     |
| 3              | 3470.00        | 51.27                | 29.41                    | 40.04            | 1.70             | 0.82                | 43.16                    | 74.00                  | -30.84             | Peak     | VERTICAL     |
| 4              | 4370.00        | 47.70                | 31.40                    | 40.27            | 2.29             | 0.88                | 42.00                    | 74.00                  | -32.00             | Peak     | VERTICAL     |
| 5              | 4855.00        | 48.31                | 32.64                    | 40.37            | 2.49             | 0.90                | 43.97                    | 74.00                  | -30.03             | Peak     | VERTICAL     |
| 6              | 5950.00        | 46.03                | 33.88                    | 40.49            | 2.98             | 1.13                | 43.53                    | 74.00                  | -30.47             | Peak     | VERTICAL     |

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss + Filter Factor - PRM Factor.

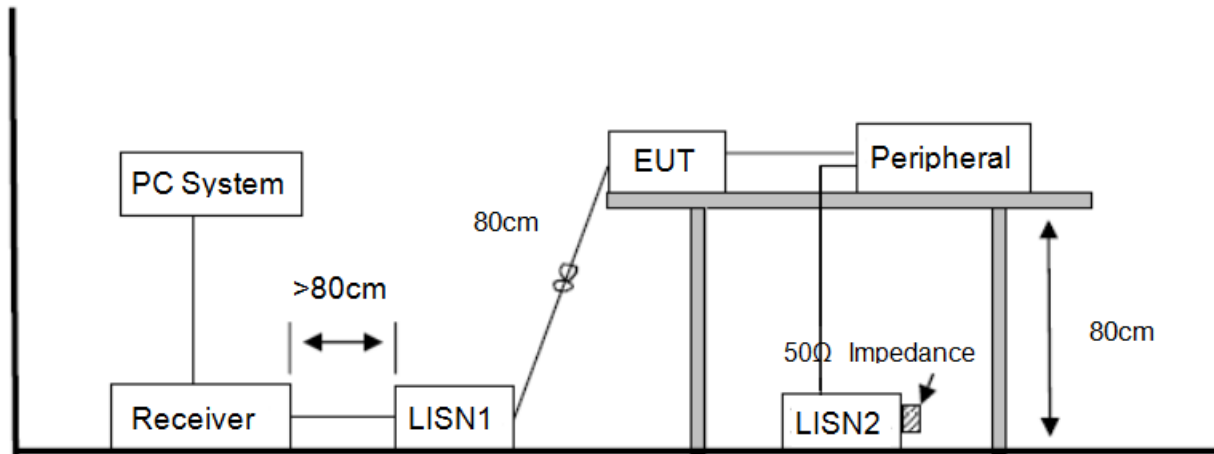
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.



## 8 Power Line Conducted Emission

### 8.1. Block diagram of test setup



### 8.2. Power Line Conducted Emission Limits

| Frequency       | Quasi-Peak Level<br>dB(μV) | Average Level<br>dB(μV) |
|-----------------|----------------------------|-------------------------|
| 150kHz ~ 500kHz | 66 ~ 56*                   | 56 ~ 46*                |
| 500kHz ~ 5MHz   | 56                         | 46                      |
| 5MHz ~ 30MHz    | 60                         | 50                      |

Note 1: \* Decreasing linearly with logarithm of frequency.

Note 2: The lower limit shall apply at the transition frequencies.

### 8.3. Test Procedure

The EUT and Support equipment, if needed, were put placed on a non-metallic table, 80cm above the ground plane.

Configuration EUT to simulate typical usage as described in clause 2.4 and test equipment as described in clause 8.2 of this report.

All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.

All support equipment power received from a second LISN.

Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.

The Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.

During the above scans, the emissions were maximized by cable manipulation.

The test mode(s) described in clause 2.4 were scanned during the preliminary test.

After the preliminary scan, we found the test mode producing the highest emission level.

The EUT configuration and worse cable configuration of the above highest emission levels were recorded for reference of the final test.

EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test.

A scan was taken on both power lines, Neutral and Line, recording at least the six highest emissions.

Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.

The test data of the worst-case condition(s) was recorded.

The bandwidth of test receiver is set at 9 kHz.

#### **8.4. Test Result**

Not Applicable

Measurements to demonstrate compliance with the conducted limits are not required for devices which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines according to 15.207(C).

## 9 Antenna Requirements

For intentional device, according to FCC 47 CFR Section 15.203, An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

For intentional device, according to RSS-Gen issue 5 section 6.8.

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna.

The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

### 9.1. Result

The product is PR-SMA antenna and that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain is 3 dBi