



Test report No.: 2320693R-RFUSV07S-A

# TEST REPORT

|   |  |
|---|--|
| Product Name  | Booking Device   |
| Trademark   | Humly, GOBRIGHT  |
| Model and /or type reference                              | HUM1020, INT1  |
| FCC ID  | 2BAZS-HUM1020  |
| Applicant's name / address                                | Humly Solutions AB<br>Sveav. 124, 113 50 Stockholm, Sweden                           |
| Manufacturer's name                                       | Humly Solutions AB   |
| Test method requested, standard                           | FCC CFR Title 47 Part 15 Subpart C<br>ANSI C63.4: 2014, ANSI C63.10: 2013            |
| Verdict Summary   | IN COMPLIANCE  |
| Documented By<br>(Senior Project Specialist / April Chen) |   |
| Tested By<br>(Senior Engineer / Ivan Chuang)              |   |
| Approved By<br>(Senior Engineer / Jack Hsu)               |  |
| Date of Receipt   | 2023/02/23   |
| Date of Issue   | 2023/06/02   |
| Report Version  | V1.0   |

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Appendix 1: EUT Test Photographs

Appendix 2: Product Photos-Please refer to the file: 2320693R-Product Photos

## Competences and Guarantees

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DEKRA is a testing laboratory competent to carry out the tests described in this report.

In order to assure the traceability to other national and international laboratories, DEKRA has a calibration and maintenance program for its measurement equipment.

DEKRA guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated in the report and it is based on the knowledge and technical facilities available at DEKRA at the time of performance of the test.

DEKRA is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

**IMPORTANT:** No parts of this report may be reproduced or quoted out of context, in any form or by any means, except in full, without the previous written permission of DEKRA.

## General conditions

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1. The test results relate only to the samples tested.
2. The test results shown in the test report are traceable to the national/international standard through the calibration report of the equipment and evaluated measurement uncertainty herein.
3. This report must not be used to claim product endorsement by TAF or any agency of the government.
4. The test report shall not be reproduced without the written approval of DEKRA Testing and Certification Co., Ltd.
5. 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.

## Revision History

| Report No.          | Version | Description              | Issued Date |
|---------------------|---------|--------------------------|-------------|
| 2320693R-RFUSV07S-A | V1.0    | Initial issue of report. | 2023/06/02  |

## 1. General Information

### 1.1. EUT Description

|                              |                      |
|------------------------------|----------------------|
| Product Name                 | Booking Device       |
| Trademark                    | Humly, GOBRIGHT      |
| Model and /or type reference | HUM1020, INT1        |
| EUT Rated Voltage            | AC 100-240V, 50-60Hz |
| EUT Test Voltage             | AC 120V, 60Hz        |
| Frequency Range              | 13.56 MHz            |
| Modulation                   | ASK                  |

### Antenna List

| No. | Manufacturer | Part No.            | Antenna Type |
|-----|--------------|---------------------|--------------|
| 1   | AWAN         | 2320693R-RFNAV03S-2 | Loop         |

### Frequency of Each Channel:

| Channel | Frequency<br>(MHz) |
|---------|--------------------|
| 1       | 13.56              |

### Note:

1. This device is a Booking Device with a built-in 13.56 MHz transceiver.
2. The different of each model is shown as below:
 

|           |          |
|-----------|----------|
| Model No. | Brand    |
| HUM1020   | Humly    |
| INT1      | GOBRIGHT |
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 |
|-----------|--------|----------|

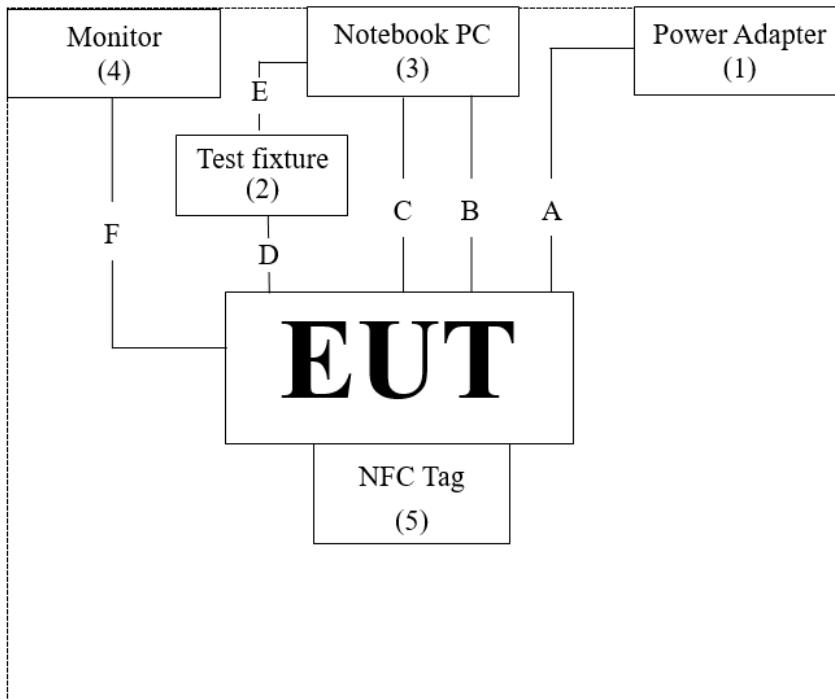
## 1.2. Tested System Details

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 Power Adapter | EDACPOWER ELEC | EA1019AVRS-050 | N/A                              | N/A                |
| 2 Test fixture  | N/A            | N/A            | N/A                              | N/A                |
| 3 Notebook PC   | ASUS           | P2438U         | H1NXCV11U083<br>025              | N/A                |
| 4 Monitor       | DELL           | U2415          | CN-01RMGX-7426<br>1-63H-09UL-A02 | Non-Shielded, 1.8m |
| 5 NFC Tag       | ASUS           | N/A            | N/A                              | N/A                |

| Cable Type               | Cable Description                               |
|--------------------------|---|
| A Power Cable            | Non-shielded, 2m, with one ferrite core bonded. |
| B USB Cable              | Shielded, 1m                                    |
| C USB Cable              | Shielded, 1.8m                                  |
| D Signal Cable           | Non-shielded, 0.15m                             |
| E USB Cable              | Shielded, 0.9m                                  |
| F Mini DisplayPort 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 | Using NFC TAG to trigger NFC continuous transmission. |
| 4 | Verify that the EUT works properly.                   |

## 1.5. Test Facility

Ambient conditions in the laboratory:

| Performed Item     | Items            | Required | Actual  |
|--------------------|------------------|----------|---------|
| Conducted Emission | Temperature (°C) | 10~40 °C | 23.0 °C |
|                    | Humidity (%RH)   | 10~90 %  | 54.2 %  |
| Radiated Emission  | Temperature (°C) | 10~40 °C | 21.0 °C |
|                    | Humidity (%RH)   | 10~90 %  | 60.0 %  |
| Conductive         | Temperature (°C) | 10~40 °C | 25.0 °C |
|                    | Humidity (%RH)   | 10~90 %  | 50.0 %  |

|        |   |
|--------|---|
| USA    | FCC Registration Number: TW0033                       |
| Canada | CAB Identifier Number: TW3023 / Company Number: 26930 |

|                  |                         |
|------------------|-------------------------|
| Site Description | Accredited by TAF       |
|                  | Accredited Number: 3023 |

|                    |   |
|--------------------|---|
| Test Laboratory    | DEKRA Testing and Certification Co., Ltd.                                   |
|                    | Linkou Laboratory   |
| Address            | No.5-22, Ruishukeng Linkou District, New Taipei City, 24451, Taiwan, R.O.C. |
| Performed Location | No. 26, Huaya 1st Rd., Guishan Dist., Taoyuan City 333411, Taiwan, R.O.C.   |
| Phone Number       | +886-3-275-7255   |
| Fax Number         | +886-3-327-8031   |

## 1.6. List of Test Equipment

### For Conduction Measurements /HY-SR01

|   | Equipment          | Manufacturer | Model No. | Serial No. | Cal. Date  | Due Date   |
|---|--------------------|--------------|-----------|------------|------------|------------|
| V | EMI Test Receiver  | R&S          | ESR7      | 101601     | 2022/06/23 | 2023/06/22 |
| V | Two-Line V-Network | R&S          | ENV216    | 101306     | 2022/05/23 | 2023/05/22 |
| V | Two-Line V-Network | R&S          | ENV216    | 101307     | 2022/07/04 | 2023/07/03 |
| V | 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 "V" are used to measure the final test results.
3. Test Software Version: e3 230303 dekra V9.

### For Conduction Measurements /HY-SR03

|   | Equipment           | Manufacturer | Model No.   | Serial No. | Cal. Date  | Due Date   |
|---|---------------------|--------------|-------------|------------|------------|------------|
| V | Temperature Chamber | KSON         | THS-D4T-100 | A0606      | 2022/08/23 | 2023/08/22 |
| V | Spectrum Analyzer   | R&S          | FSV40       | 101149     | 2023/05/04 | 2024/05/03 |
| V | AC Power Source     | eeC          | 6605        | 1570547    | 2023/01/17 | 2024/01/16 |

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with "V" are used to measure the final test results.

### For Radiated measurements /HY-CB01

|   | Equipment         | Manufacturer  | Model No.    | Serial No.   | Cal. Date  | Due Date   |
|---|-------------------|---------------|--------------|--------------|------------|------------|
| V | Loop Antenna      | AMETEK        | HLA6121      | 56736        | 2022/05/14 | 2023/05/13 |
| V | Bi-Log Antenna    | SCHWARZBECK   | VULB9168     | 9168-675     | 2021/08/11 | 2023/08/10 |
|   | Horn Antenna      | RF SPIN       | DRH18-E      | 210802A18ES  | 2023/03/23 | 2024/03/22 |
|   | Horn Antenna      | Com-Power     | AH-840       | 101101       | 2021/11/30 | 2023/11/29 |
| V | Pre-AsmAmplifier  | SGH           | 0301         | 20211007-7   | 2023/01/10 | 2024/01/09 |
|   | Pre-Amplifier     | EMCI          | EMC051845SE  | 980632       | 2023/01/10 | 2024/01/09 |
|   | Pre-Amplifier     | EMCI          | EMC05820SE   | 980361       | 2023/01/10 | 2024/01/09 |
|   | Pre-Amplifier     | EMCI          | EMC184045SE  | 980369       | 2023/01/10 | 2024/01/09 |
|   | Coaxial Cable     | EMCI          | EMC102-KM-K  | 1160314      |            |            |
|   | Coaxial Cable     | EMCI          | M-600        |              |            |            |
|   | Coaxial Cable     | EMCI          | EMC102-KM-K  | 170242       |            |            |
|   | Coaxial Cable     | EMCI          | M-7000       |              |            |            |
|   | Filter            | MICRO TRONICS | BRM50702     | G251         | 2023/01/05 | 2024/01/04 |
|   | Filter            | MICRO TRONICS | BRM50716     | 067          | 2023/01/05 | 2024/01/04 |
| V | EMI Test Receiver | R&S           | ESR3         | 102792       | 2022/12/29 | 2023/12/28 |
| V | Spectrum Analyzer | R&S           | FSV3044      | 101115       | 2023/01/06 | 2024/01/05 |
| V | Coaxial Cable     | SUHNER        | SUCOFLEX 106 | 25450/6      | 2023/01/10 | 2024/01/09 |
|   | Coaxial Cable     | SGH           | HA800        | GD20110222-8 |            |            |
|   | Coaxial Cable     | SGH           | SGH18        | 2021003-8    |            |            |
|   | Coaxial Cable     | EMCI          | EMC106       | 151113       |            |            |

Note:

1. Bi-Log Antenna and Horn Antenna(AH-840) is calibrated every two years, the other equipments are calibrated every one year.
2. The test instruments marked with "V" are used to measure the final test results.
3. Test Software Version : e3 230303 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.

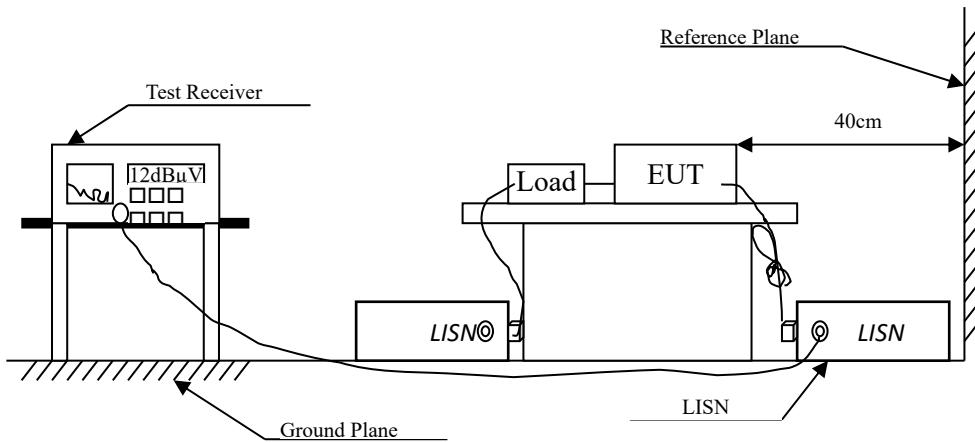
The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately 95%.

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   |
|---------------------|---|
| Conducted Emission  | $\pm 3.50$ dB   |
| Radiated Emission   | 9 kHz~30 MHz: $\pm 3.88$ dB<br>30 MHz~1 GHz: $\pm 4.42$ dB<br>1 GHz~18 GHz: $\pm 4.28$ dB<br>18 GHz~40 GHz: $\pm 3.90$ dB |
| Band Edge           | 9 kHz~30 MHz: $\pm 3.88$ dB<br>30 MHz~1 GHz: $\pm 4.42$ dB<br>1 GHz~18 GHz: $\pm 4.28$ dB<br>18 GHz~40 GHz: $\pm 3.90$ dB |
| Frequency Tolerance | $\pm 1580.61$ Hz  |

## 2. Conducted Emission

### 2.1. Test Setup



### 2.2. Limits

| FCC Part 15 Subpart C Paragraph 15.207 (dB $\mu$ V) Limit |        |       |
|---|--------|-------|
| Frequency<br>MHz  | Limits |       |
|   | QP     | AV    |
| 0.15 - 0.50   | 66-56  | 56-46 |
| 0.50 - 5.0  | 56     | 46    |
| 5.0 - 30  | 60     | 50    |

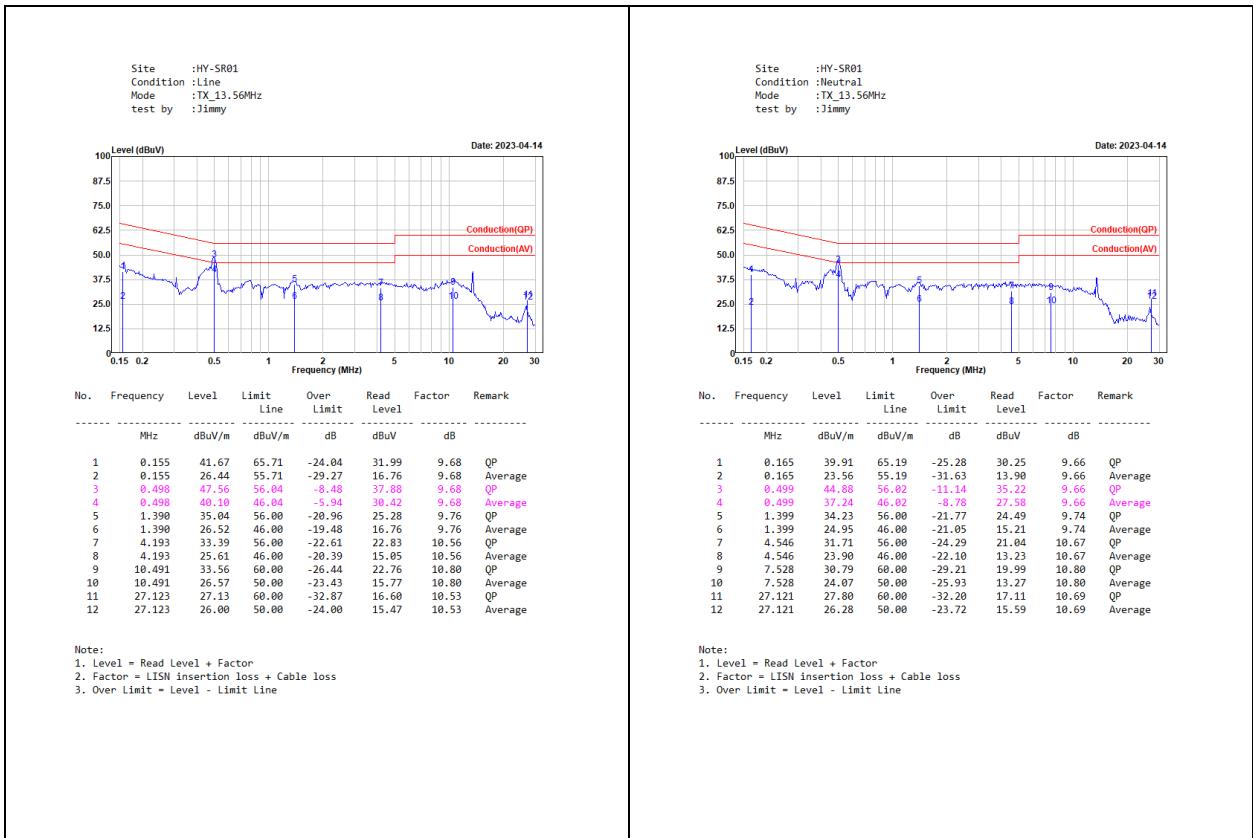
### 2.3. Test Procedure

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 invested over the frequency range from 0.15 MHz to 30 MHz using a receiver bandwidth of 9 kHz.

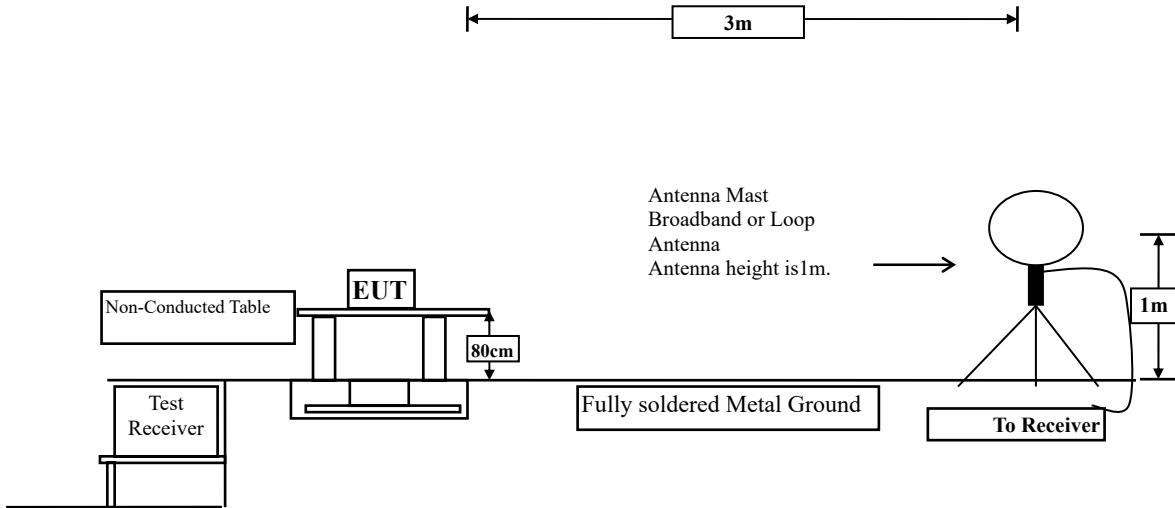
## 2.4. Test Result of Conducted Emission



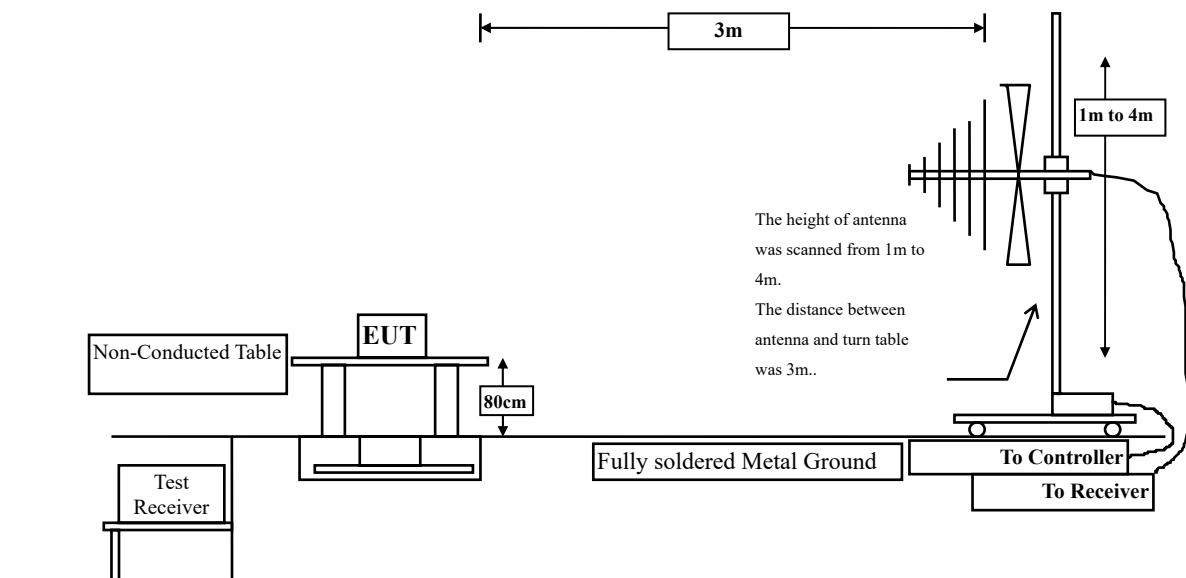
### 3. Radiated Emission

#### 3.1. Test Setup

##### Radiated Emission Under 30 MHz



##### Radiated Emission Below 1 GHz



### 3.2. Limits

#### ➤ Fundamental electric field strength Limit

| FCC Part 15 Subpart C Paragraph 15.225 Limits |                               |                     |        |                     |
|---|-------------------------------|---------------------|--------|---------------------|
| Fundamental Frequency<br>MHz                  | Field strength of fundamental |                     |        |                     |
|   | µV/m                          | Distance<br>(meter) | dBµV/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 (dBµV) = 20 log RF Voltage (µV).
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

| FCC Part 15 Subpart C Paragraph 15.209 Limits |                                      |                                 |
|---|--------------------------------------|---------------------------------|
| 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 (dBµV) = 20 log RF Voltage (µV).
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.

### 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:

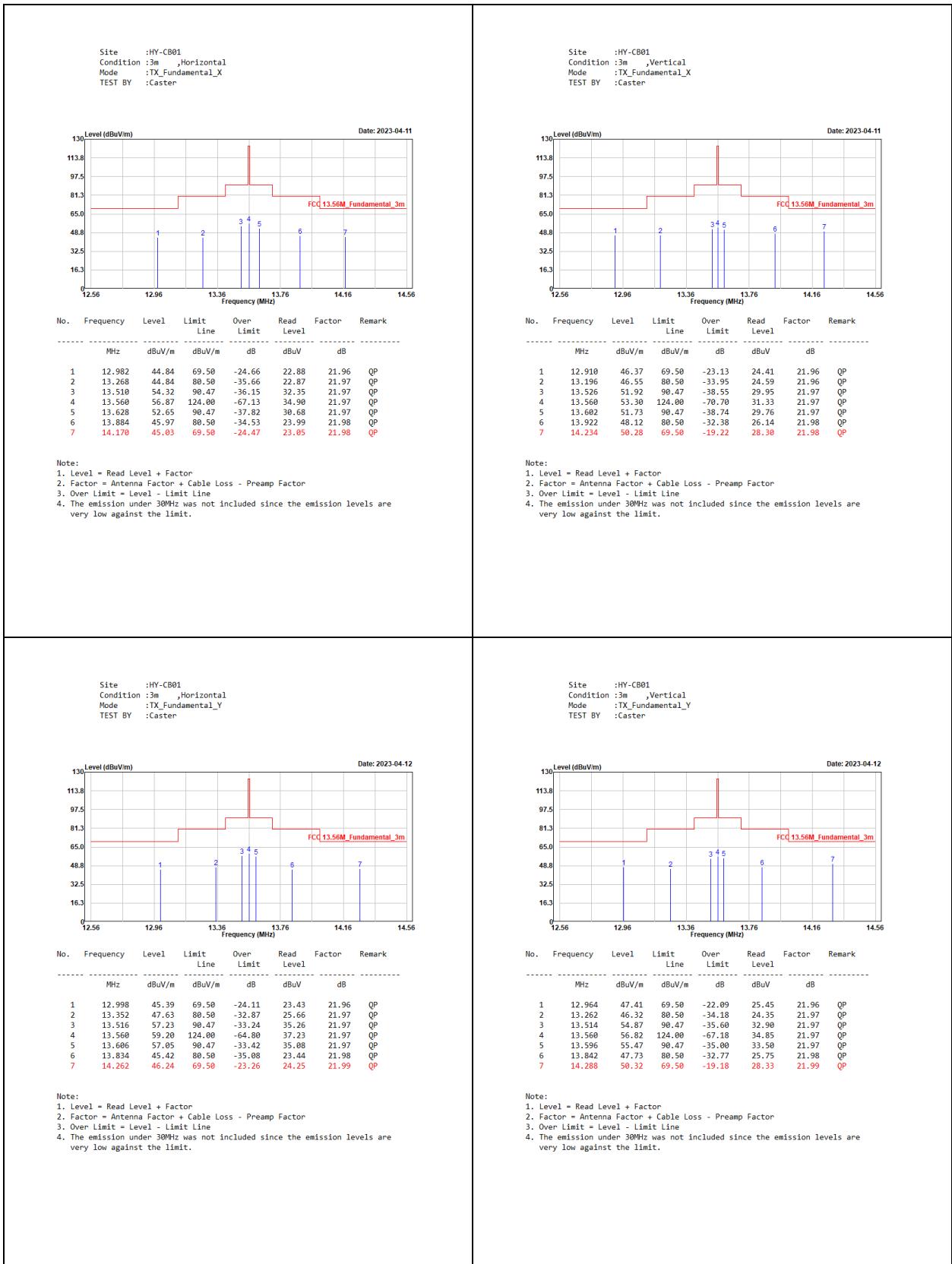
The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level.

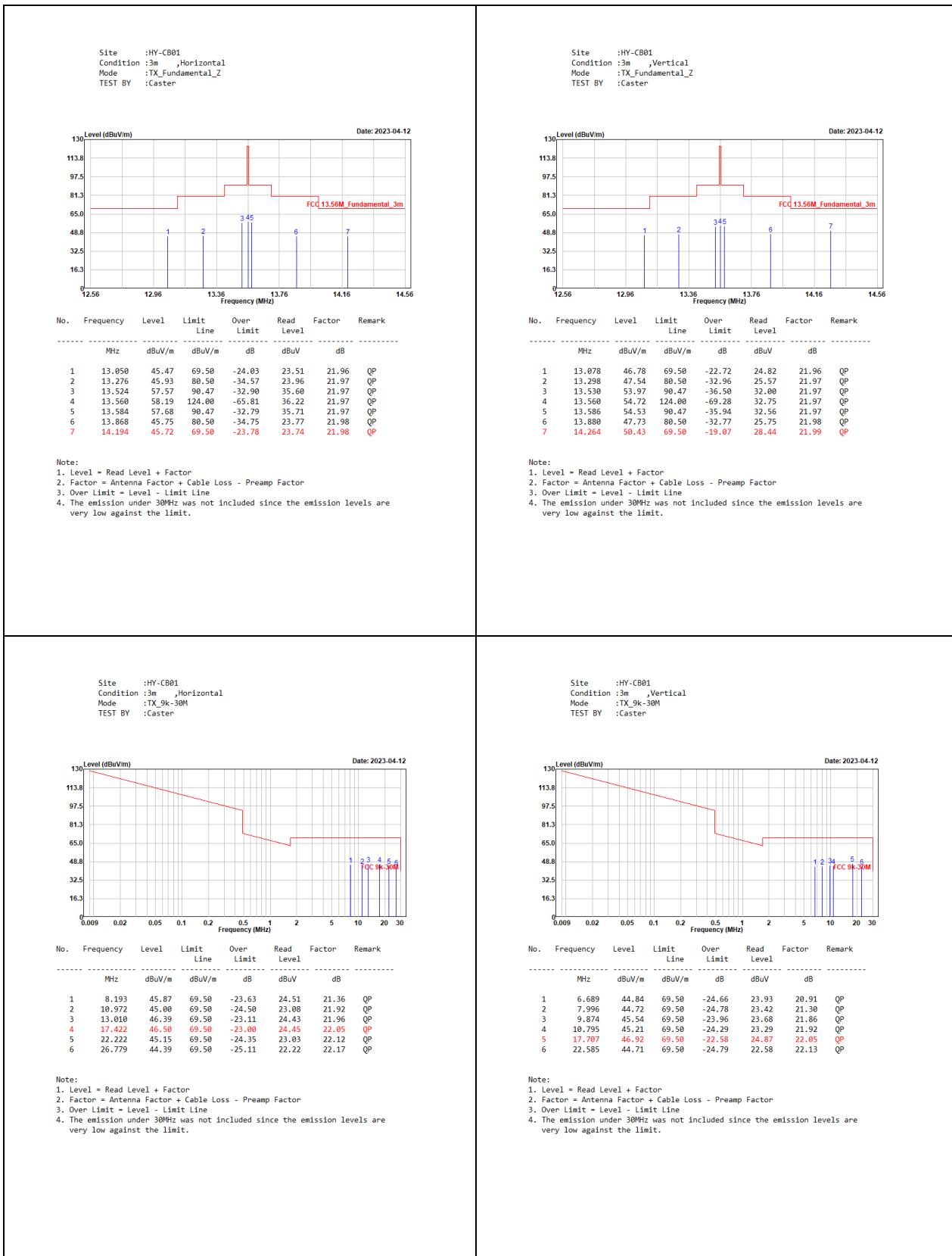
The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

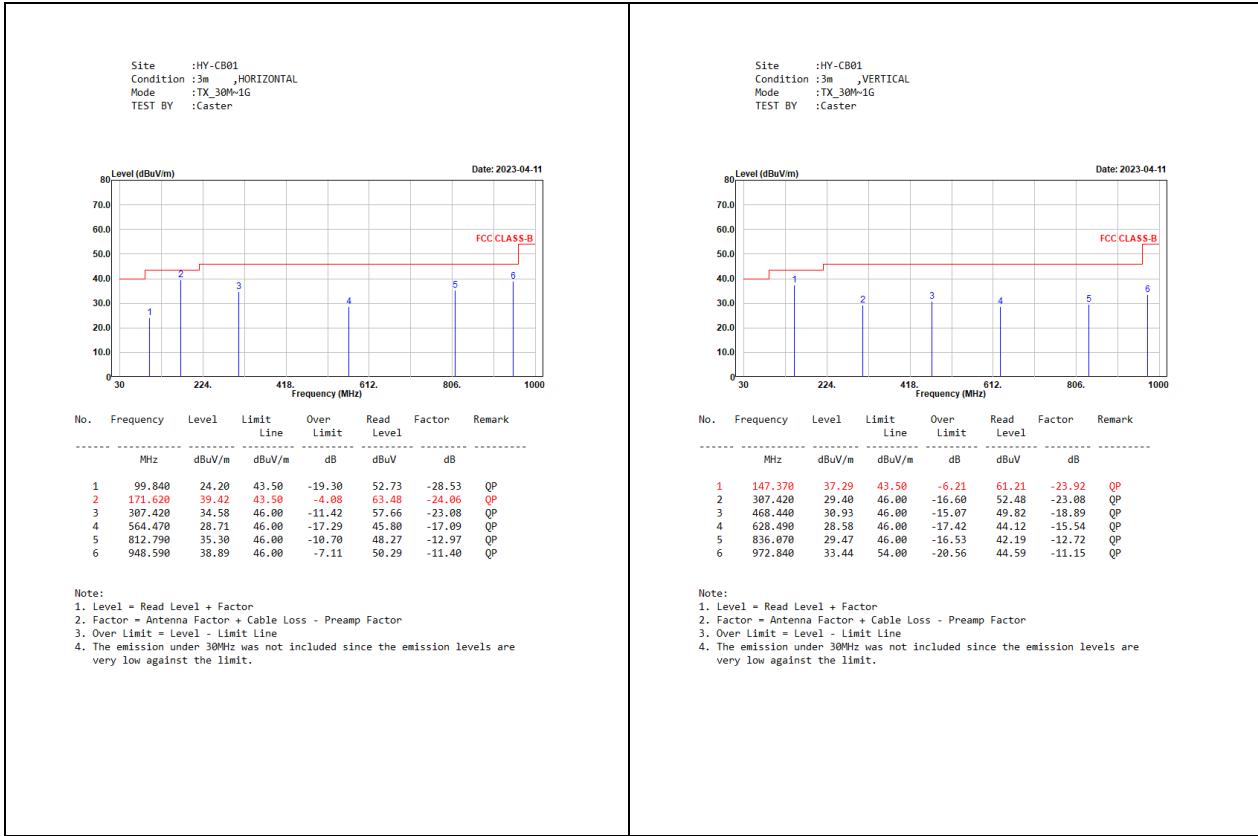
Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10: 2013 on radiated measurement.

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

### 3.4. Test Result of Radiated Emission



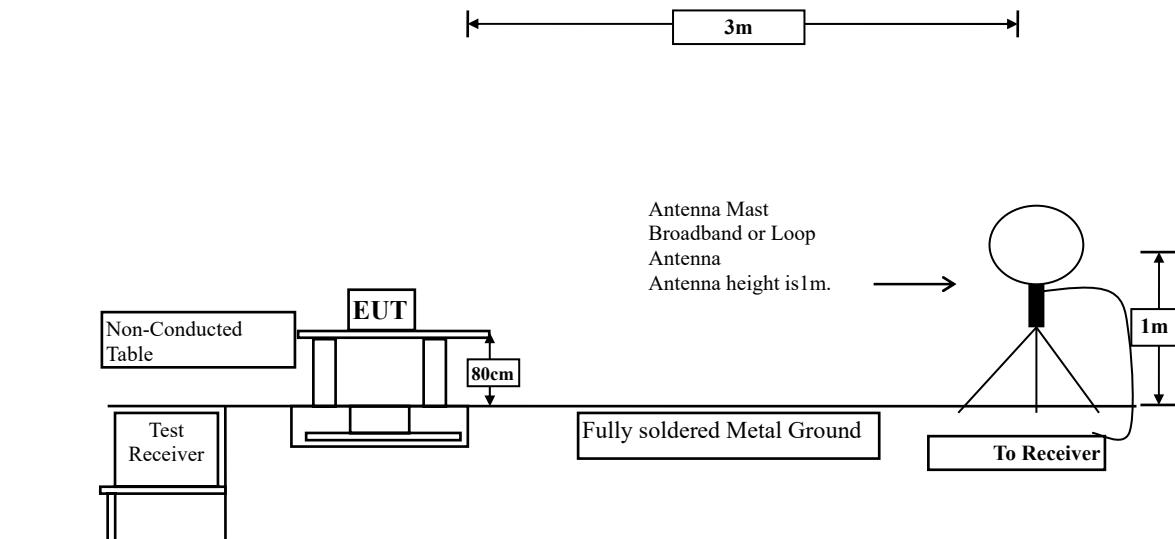




## 4. Band Edge

### 4.1. Test Setup

Radiated Emission Under 30 MHz



### 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

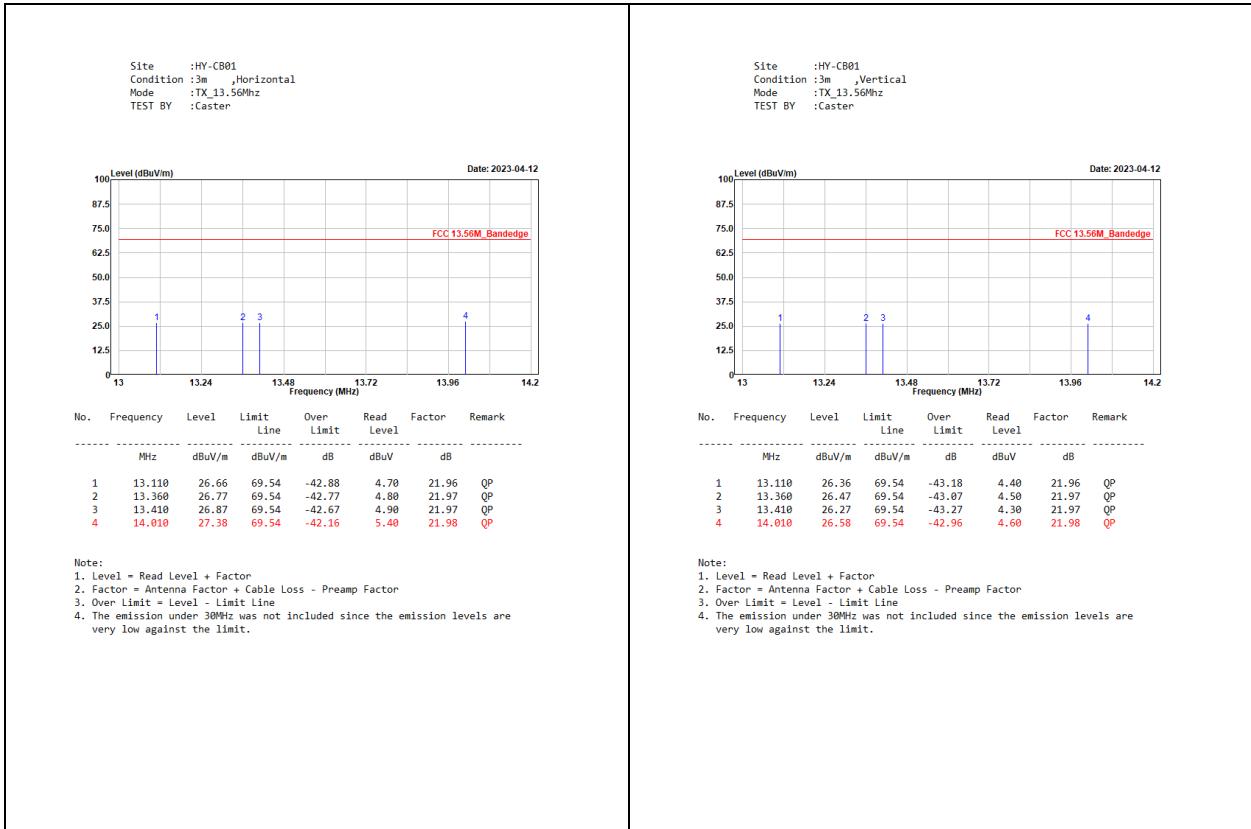
The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level.

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.

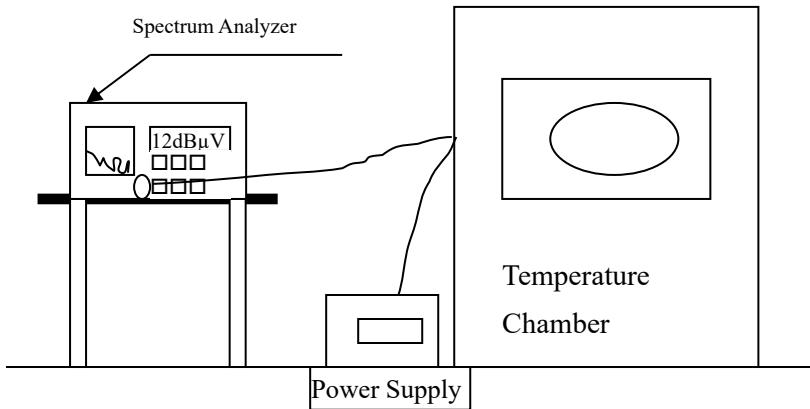
The bandwidth below 30 MHz setting on the field strength meter is 9 kHz and above 30 MHz is 120 kHz.

#### 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

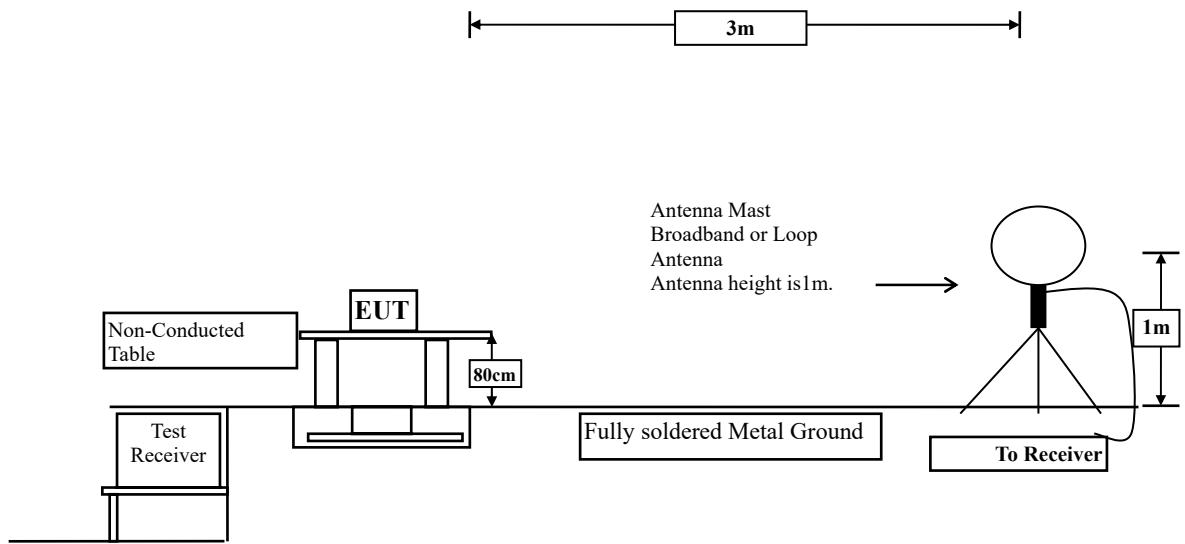
Product : Booking Device  
 Test Item : Frequency Tolerance  
 Test Mode : Transmit  
 Test date : 2023/04/13

| Temperature<br>(°C) | Voltage<br>(V) | Observe Time | Declared<br>Frequency<br>(MHz) | Read<br>Frequency<br>(MHz) | Tolerance<br>(%) | Limit<br>(%) |
|---------------------|----------------|--------------|--------------------------------|----------------------------|------------------|--------------|
| 20                  | 120            | start        | 13.56                          | 13.56112                   | 0.008260         | ± 0.01 %     |
|                     |                | 2mins        | 13.56                          | 13.56112                   | 0.008260         |              |
|                     |                | 5mins        | 13.56                          | 13.56112                   | 0.008260         |              |
|                     |                | 10mins       | 13.56                          | 13.56112                   | 0.008260         |              |
| 20                  | 138            | start        | 13.56                          | 13.56112                   | 0.008260         | ± 0.01 %     |
|                     |                | 2mins        | 13.56                          | 13.56112                   | 0.008260         |              |
|                     |                | 5mins        | 13.56                          | 13.56112                   | 0.008260         |              |
|                     |                | 10mins       | 13.56                          | 13.56112                   | 0.008260         |              |
| 20                  | 102            | start        | 13.56                          | 13.56112                   | 0.008260         | ± 0.01 %     |
|                     |                | 2mins        | 13.56                          | 13.56112                   | 0.008260         |              |
|                     |                | 5mins        | 13.56                          | 13.56112                   | 0.008260         |              |
|                     |                | 10mins       | 13.56                          | 13.56112                   | 0.008260         |              |
| 50                  | 120            | start        | 13.56                          | 13.56110                   | 0.008112         | ± 0.01 %     |
|                     |                | 2mins        | 13.56                          | 13.56110                   | 0.008112         |              |
|                     |                | 5mins        | 13.56                          | 13.56110                   | 0.008112         |              |
|                     |                | 10mins       | 13.56                          | 13.56110                   | 0.008112         |              |
| 40                  | 120            | start        | 13.56                          | 13.56110                   | 0.008112         | ± 0.01 %     |
|                     |                | 2mins        | 13.56                          | 13.56110                   | 0.008112         |              |
|                     |                | 5mins        | 13.56                          | 13.56110                   | 0.008112         |              |
|                     |                | 10mins       | 13.56                          | 13.56110                   | 0.008112         |              |
| 30                  | 120            | start        | 13.56                          | 13.56117                   | 0.008628         | ± 0.01 %     |
|                     |                | 2mins        | 13.56                          | 13.56117                   | 0.008628         |              |
|                     |                | 5mins        | 13.56                          | 13.56117                   | 0.008628         |              |
|                     |                | 10mins       | 13.56                          | 13.56117                   | 0.008628         |              |

|     |     |        |       |          |          |          |
|-----|-----|--------|-------|----------|----------|----------|
| 10  | 120 | start  | 13.56 | 13.56113 | 0.008333 | ± 0.01 % |
|     |     | 2mins  | 13.56 | 13.56113 | 0.008333 |          |
|     |     | 5mins  | 13.56 | 13.56113 | 0.008333 |          |
|     |     | 10mins | 13.56 | 13.56113 | 0.008333 |          |
| 0   | 120 | start  | 13.56 | 13.56119 | 0.008776 | ± 0.01 % |
|     |     | 2mins  | 13.56 | 13.56119 | 0.008776 |          |
|     |     | 5mins  | 13.56 | 13.56119 | 0.008776 |          |
|     |     | 10mins | 13.56 | 13.56119 | 0.008776 |          |
| -10 | 120 | start  | 13.56 | 13.56121 | 0.008923 | ± 0.01 % |
|     |     | 2mins  | 13.56 | 13.56121 | 0.008923 |          |
|     |     | 5mins  | 13.56 | 13.56121 | 0.008923 |          |
|     |     | 10mins | 13.56 | 13.56121 | 0.008923 |          |
| -20 | 120 | start  | 13.56 | 13.56125 | 0.009218 | ± 0.01 % |
|     |     | 2mins  | 13.56 | 13.56125 | 0.009218 |          |
|     |     | 5mins  | 13.56 | 13.56125 | 0.009218 |          |
|     |     | 10mins | 13.56 | 13.56125 | 0.009218 |          |

## 6. 20dB Bandwidth

### 6.1. Test Setup



### 6.2. Limits

The 20dB Bandwidth must be specified in operating frequency band (13.11-14.01 MHz).

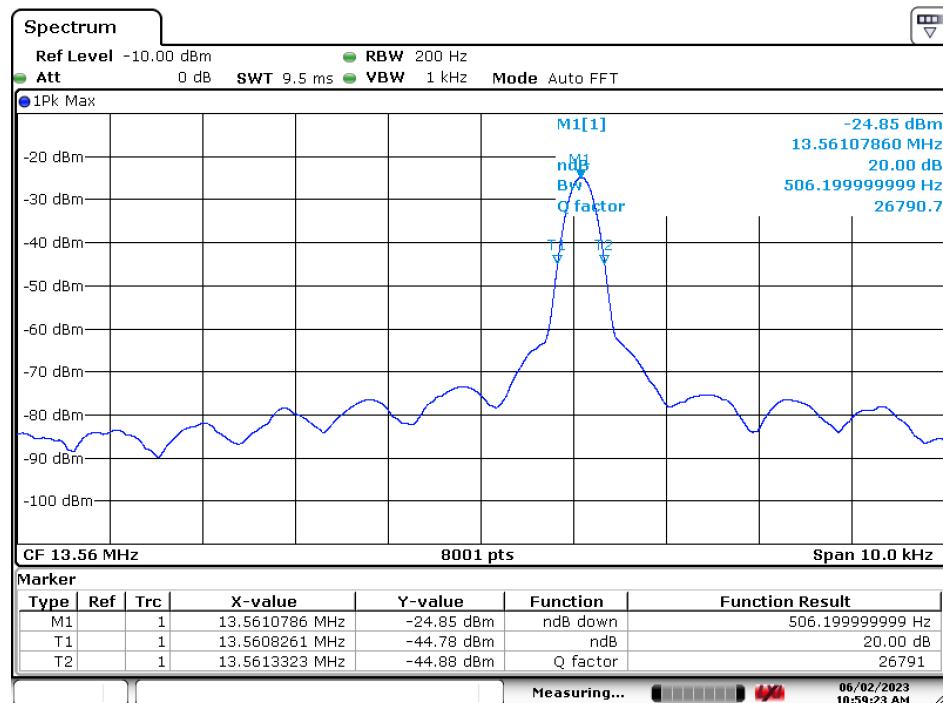
### 6.3. Test Procedure

The EUT was setup according to ANSI C63.4, 2014; tested according to ANSI C63.10 Section 6.9.2 for compliance to FCC 47CFR 15.215 requirements.

#### 6.4. Test Result of 20dB Bandwidth

Product : Booking Device  
 Test Item : 20dB Bandwidth  
 Test Mode : Transmit  
 Test date : 2023/03/22

| Frequency (MHz) | 20dB Bandwidth (kHz) | Measurement Level (MHz) | Required Limit (MHz) | Result |
|-----------------|----------------------|-------------------------|----------------------|--------|
| 13.56           | 26.7907              | 13.5608                 | >13.11               | Pass   |
|                 |                      | 13.5613                 | <14.01               | Pass   |



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