



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 Sveav. 124, 113 50 Stockholm, Sweden
Manufacturer's name	Humly Solutions AB
Test method requested, standard	FCC CFR Title 47 Part 15 Subpart C ANSI C63.4: 2014, ANSI C63.10: 2013
Verdict Summary	IN COMPLIANCE
Documented By (Senior Project Specialist / April Chen)	<i>April Chen</i>
Tested By (Senior Engineer / Ivan Chuang)	<i>Ivan Chuang</i>
Approved By (Senior Engineer / Jack Hsu)	<i>Jack Hsu</i>
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 (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
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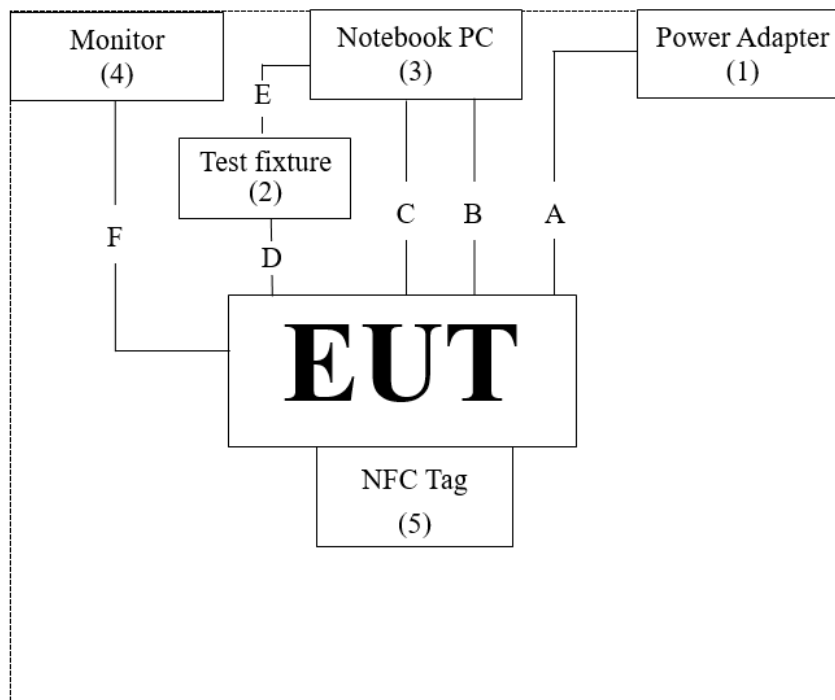
## 1.2. Tested System Details

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	H1NXCV11U083025	N/A
4 Monitor	DELL	U2415	CN-01RMGX-74261-63H-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-Amplifier	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 M-600	1160314		
	Coaxial Cable	EMCI	EMC102-KM-K M-7000	170242		
	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
	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.

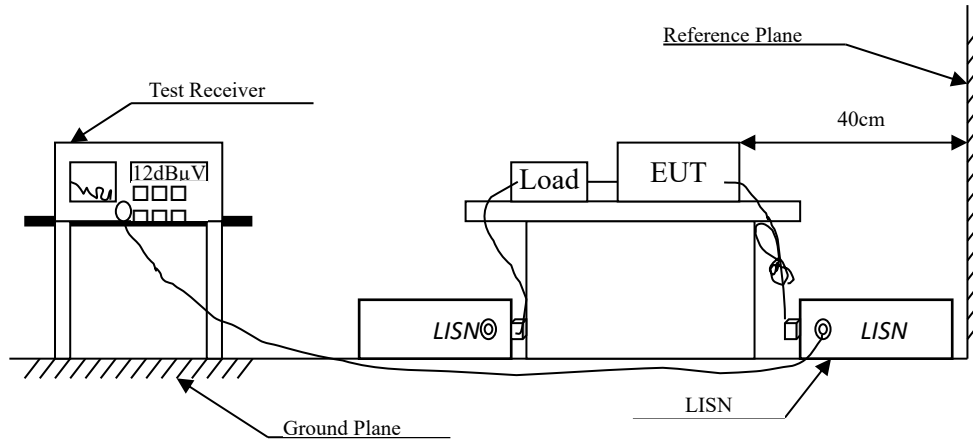
The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately 95%.

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 30 MHz~1 GHz: $\pm 4.42$ dB 1 GHz~18 GHz: $\pm 4.28$ dB 18 GHz~40 GHz: $\pm 3.90$ dB
Band Edge	9 kHz~30 MHz: $\pm 3.88$ dB 30 MHz~1 GHz: $\pm 4.42$ dB 1 GHz~18 GHz: $\pm 4.28$ dB 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 (dBμV) Limit		
Frequency MHz	Limits	
	QP	AV
0.15 - 0.50	66-56	56-46
0.50 - 5.0	56	46
5.0 - 30	60	50

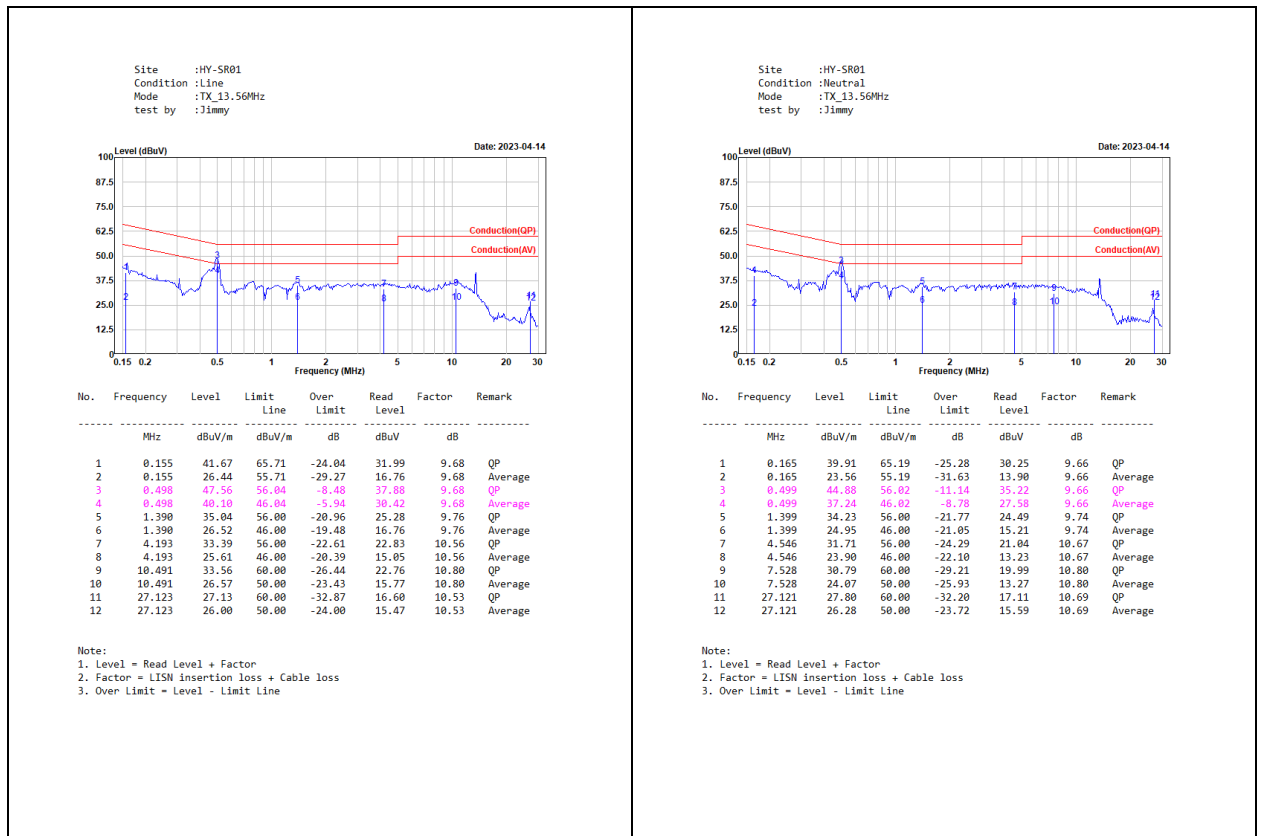
### 2.3. Test Procedure

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

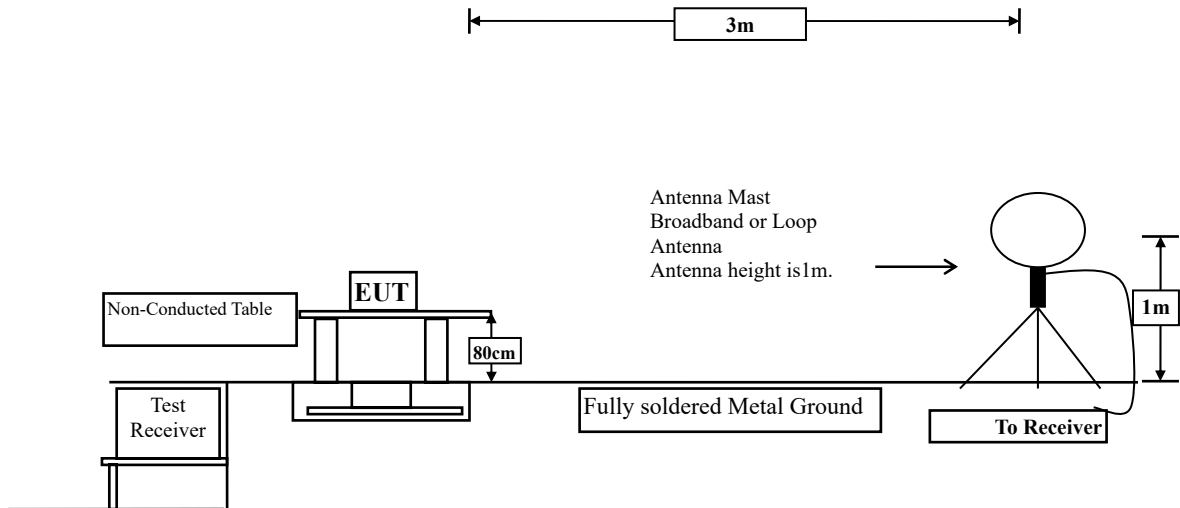
## 2.4. Test Result of Conducted Emission



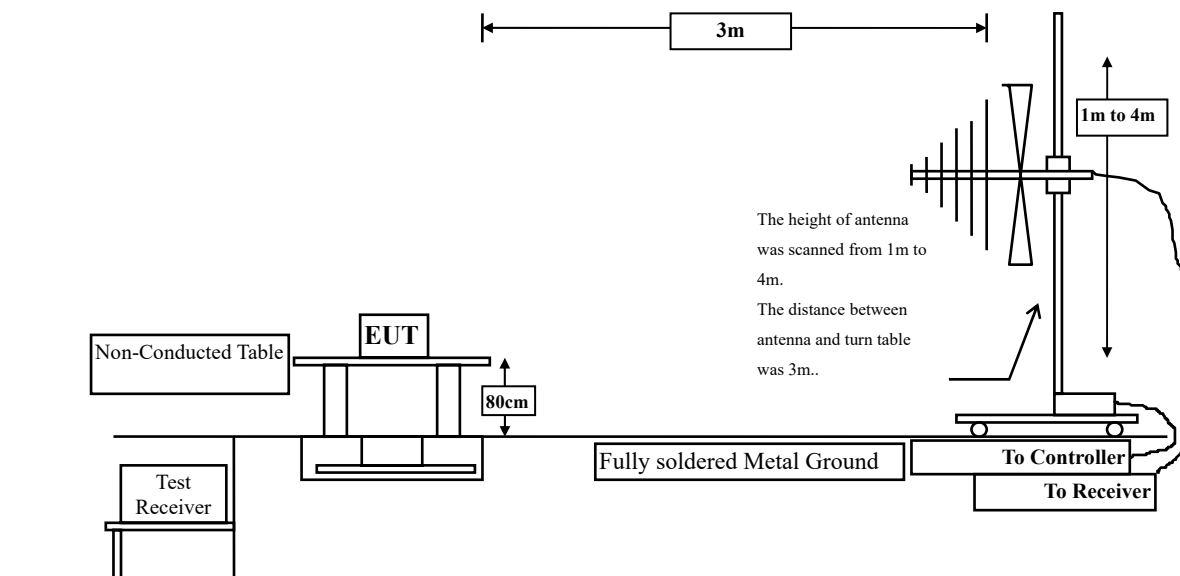
### 3. Radiated Emission

#### 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 MHz	Field strength of fundamental			
	μV/m	Distance (meter)	dBμV/m	Distance (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 MHz	Field strength (microvolts/meter)	Measurement distance (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.

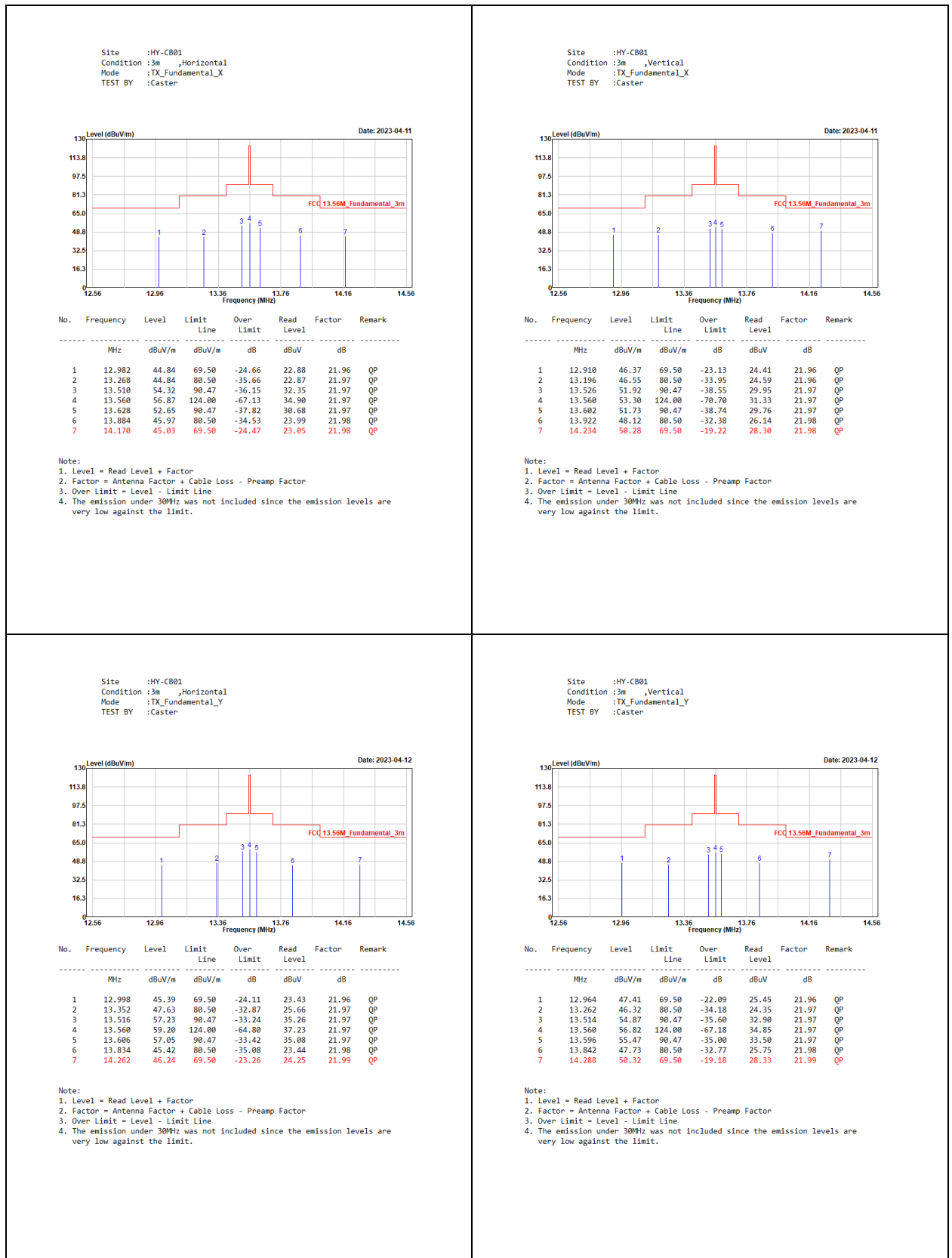
The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

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.

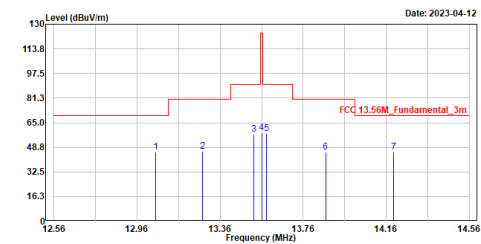
The bandwidth below 30 MHz setting on the field strength meter is 9 kHz and above 30 MHz is 120 kHz.

The frequency range from 9 kHz to 10 th harmonics is checked.

## 3.4. Test Result of Radiated Emission



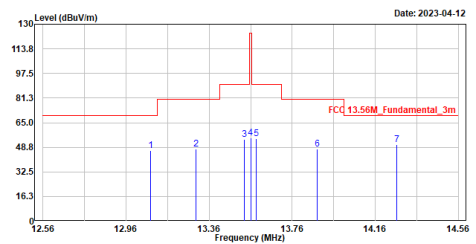
Site :HY-CB01  
Condition :3m ,Horizontal  
Mode :TX\_Fundamental\_Z  
TEST BY :Caster



No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	13.050	45.47	69.50	-24.03	23.51	21.96	QP
2	13.276	45.93	80.50	-34.57	23.96	21.97	QP
3	13.524	57.57	90.47	-32.90	35.60	21.97	QP
4	13.560	58.19	124.00	-65.81	36.22	21.97	QP
5	13.584	57.68	90.47	-32.79	35.71	21.97	QP
6	13.868	45.75	80.50	-34.75	23.77	21.98	QP
7	14.194	45.72	69.50	-23.78	23.74	21.98	QP

Note:  
1. Level = Read Level + Factor  
2. Factor = Antenna Factor + Cable Loss - Preamp Factor  
3. Over Limit = Level - Limit Line  
4. The emission under 30MHz was not included since the emission levels are very low against the limit.

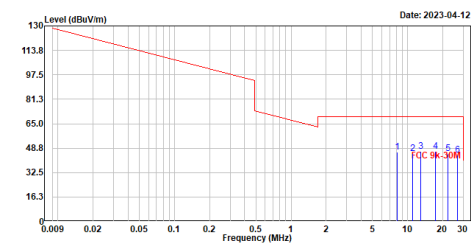
Site :HY-CB01  
Condition :3m ,Vertical  
Mode :TX\_Fundamental\_Z  
TEST BY :Caster



No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	13.078	46.78	69.50	-22.72	24.82	21.96	QP
2	13.298	47.54	80.50	-32.96	25.57	21.97	QP
3	13.530	53.97	90.47	-36.50	32.00	21.97	QP
4	13.560	54.72	124.00	-69.28	32.75	21.97	QP
5	13.586	54.53	90.47	-35.94	32.56	21.97	QP
6	13.880	47.73	80.50	-32.77	25.75	21.98	QP
7	14.264	50.43	69.50	-19.07	28.44	21.99	QP

Note:  
1. Level = Read Level + Factor  
2. Factor = Antenna Factor + Cable Loss - Preamp Factor  
3. Over Limit = Level - Limit Line  
4. The emission under 30MHz was not included since the emission levels are very low against the limit.

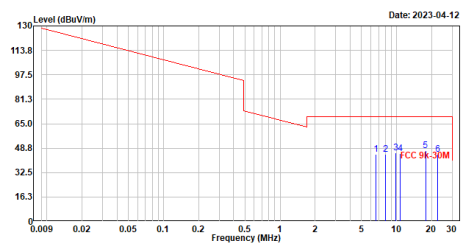
Site :HY-CB01  
Condition :3m ,Horizontal  
Mode :TX\_9k-30M  
TEST BY :Caster



No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	8.193	45.87	69.50	-23.63	24.51	21.36	QP
2	10.972	45.00	69.50	-24.50	23.08	21.92	QP
3	13.010	46.39	69.50	-23.11	24.43	21.96	QP
4	17.422	46.50	69.50	-23.00	24.45	22.05	QP
5	22.222	45.15	69.50	-24.35	23.03	22.12	QP
6	26.779	44.39	69.50	-25.11	22.22	22.17	QP

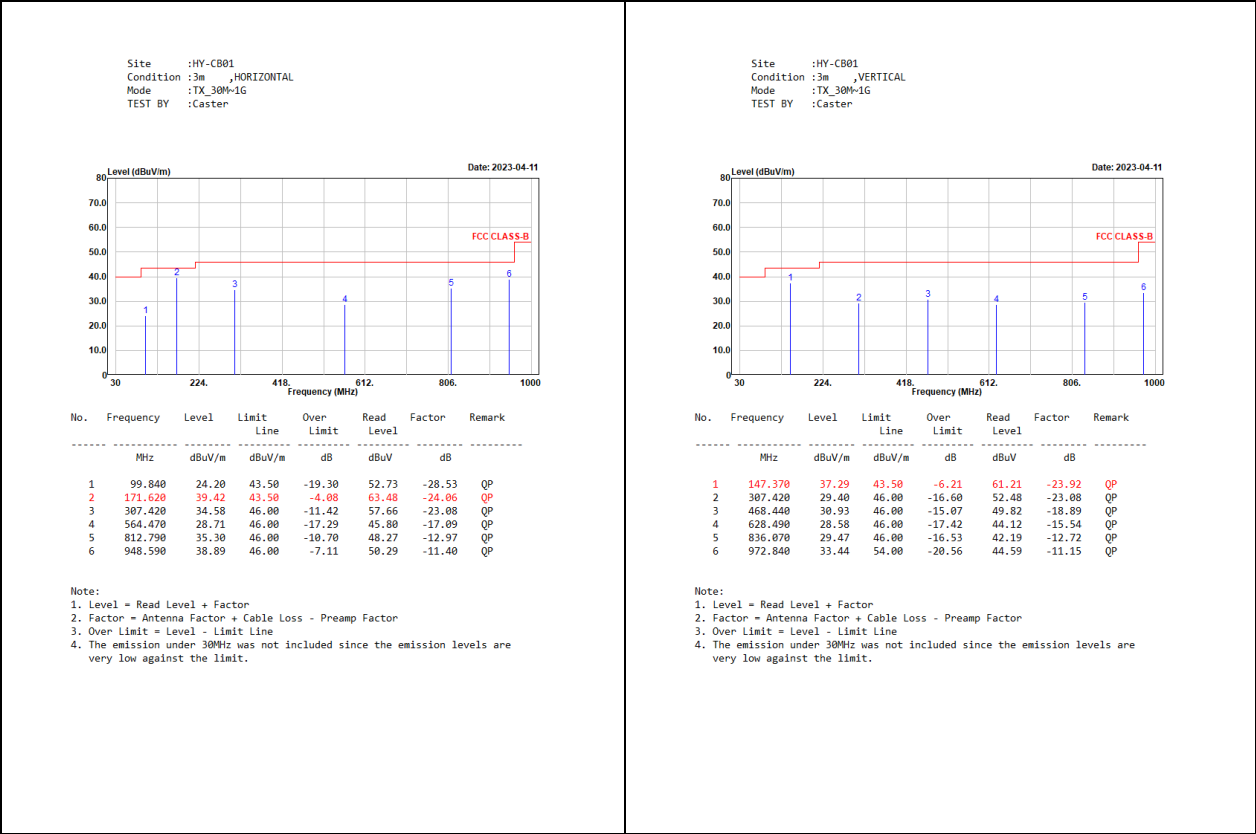
Note:  
1. Level = Read Level + Factor  
2. Factor = Antenna Factor + Cable Loss - Preamp Factor  
3. Over Limit = Level - Limit Line  
4. The emission under 30MHz was not included since the emission levels are very low against the limit.

Site :HY-CB01  
Condition :3m ,Vertical  
Mode :TX\_9k-30M  
TEST BY :Caster



No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	6.689	44.84	69.50	-24.66	23.93	20.91	QP
2	7.996	44.72	69.50	-24.78	23.42	21.30	QP
3	9.874	45.54	69.50	-23.96	23.68	21.86	QP
4	10.795	45.21	69.50	-24.29	23.29	21.92	QP
5	17.707	46.92	69.50	-22.58	24.87	22.05	QP
6	22.585	44.71	69.50	-24.79	22.58	22.13	QP

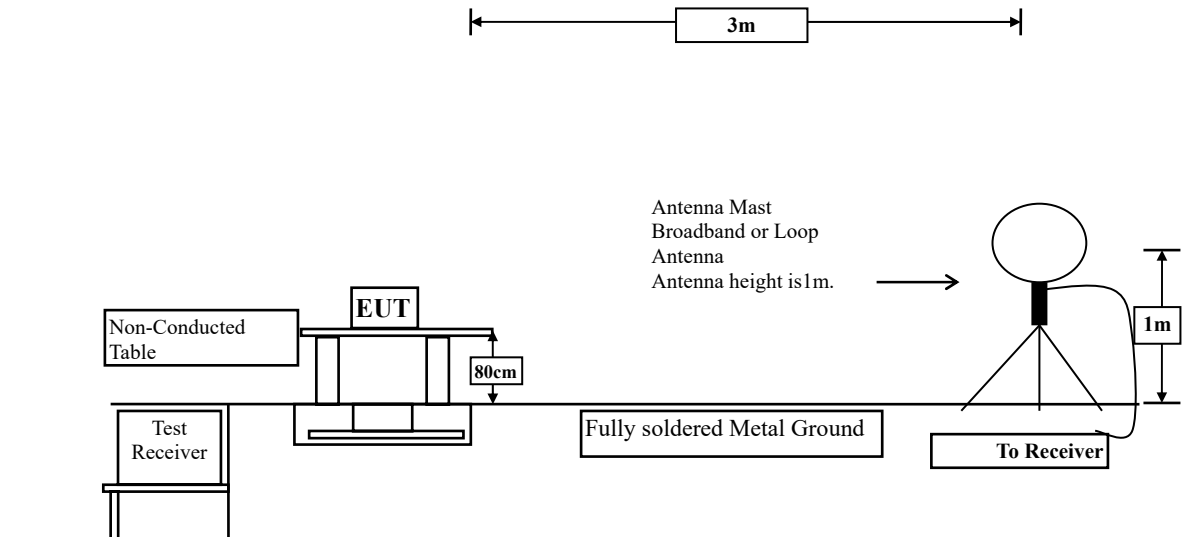
Note:  
1. Level = Read Level + Factor  
2. Factor = Antenna Factor + Cable Loss - Preamp Factor  
3. Over Limit = Level - Limit Line  
4. The emission under 30MHz was not included since the emission levels are very low against the limit.



## 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

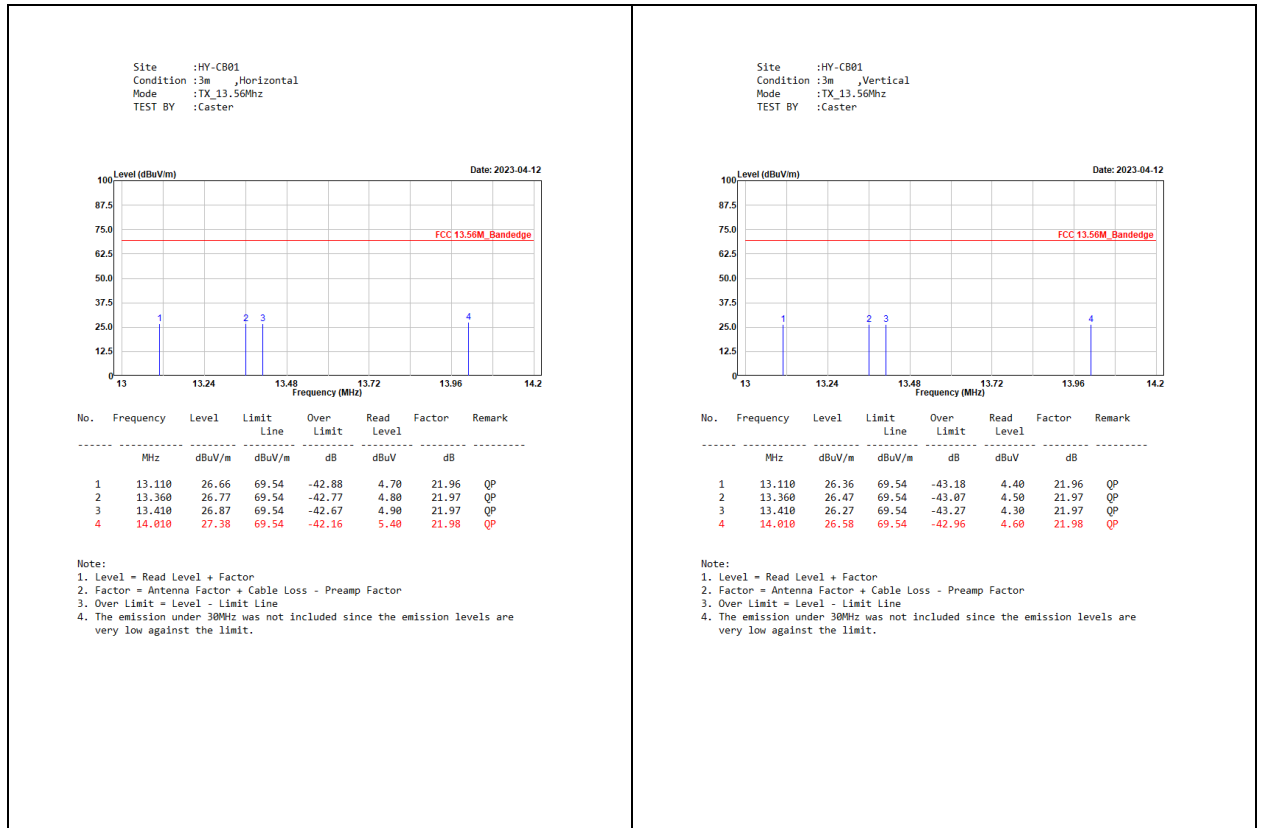
The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level.

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.

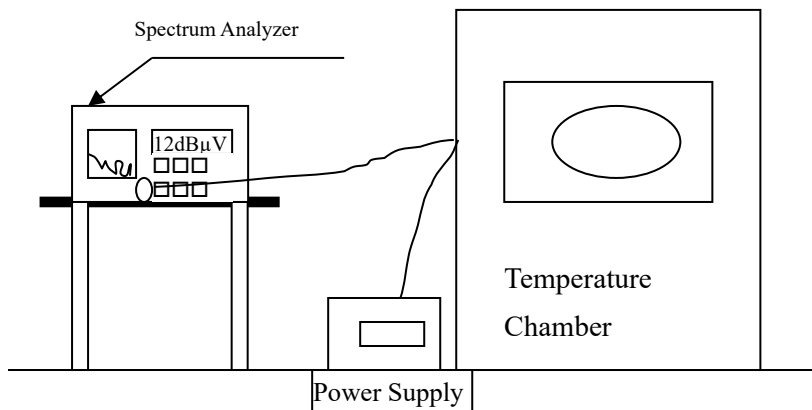
The bandwidth below 30 MHz setting on the field strength meter is 9 kHz and above 30 MHz is 120 kHz.

## 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

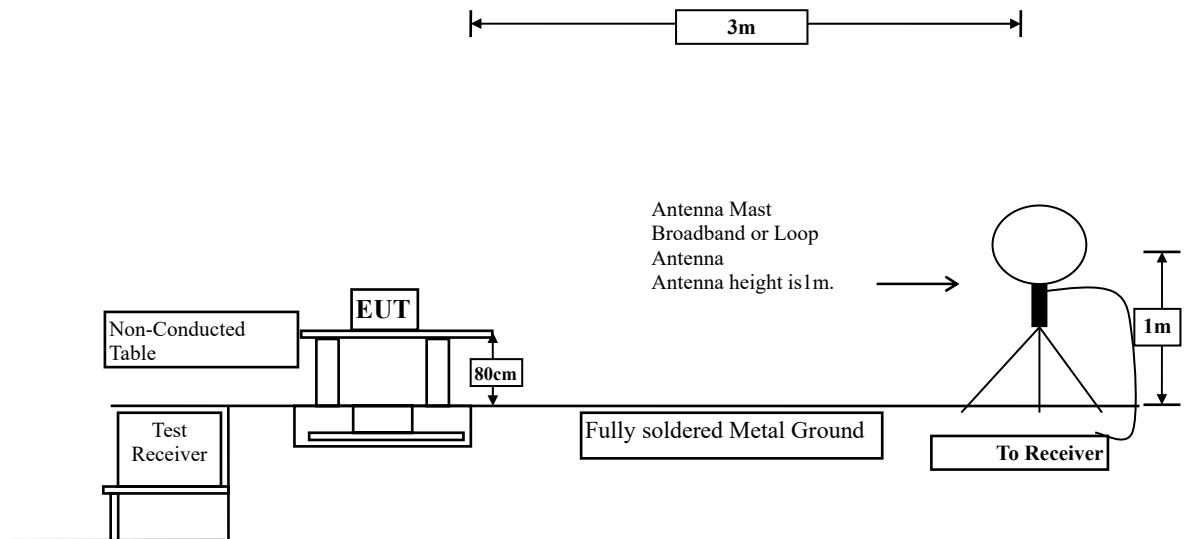
Product : Booking Device  
 Test Item : Frequency Tolerance  
 Test Mode : Transmit  
 Test date : 2023/04/13

Temperature (°C)	Voltage (V)	Observe Time	Declared Frequency (MHz)	Read Frequency (MHz)	Tolerance (%)	Limit (%)
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).

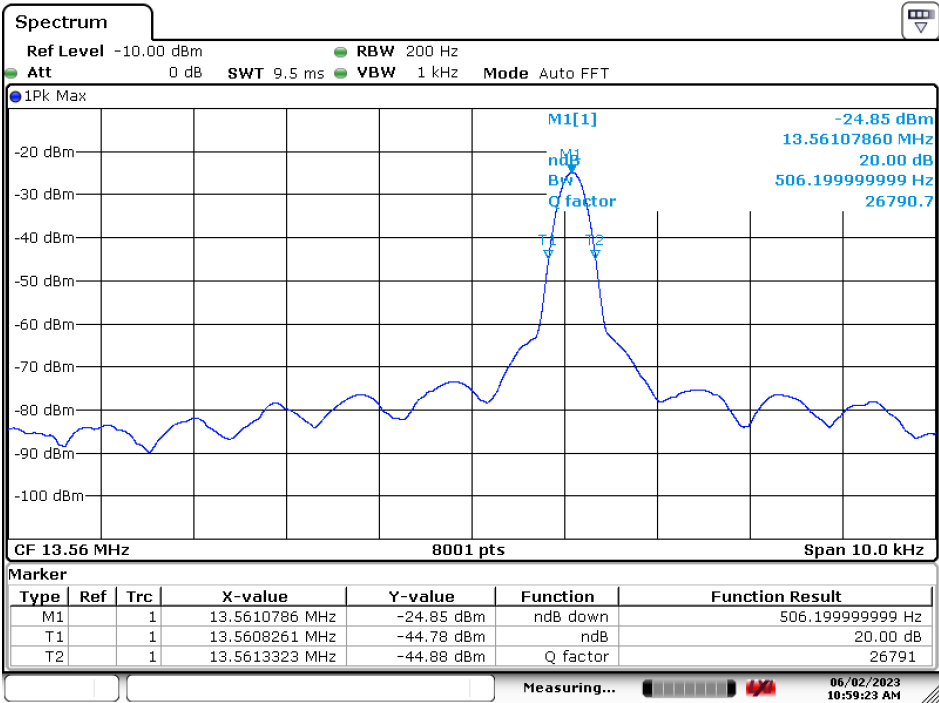
### 6.3. Test Procedure

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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