

# RADIO PERFORMANCE TEST REPORT

**Test Report No.** : OT-22N-RWD-098

**Reception No.** : 2209003084

**Applicant** : UNION COMMUNITY

**Address** : 12F, Munjeong Daemyeong Valeon bldg, 127 Beobwon-ro Songpa-gu, Seoul, South Korea

**Manufacturer** : UNION COMMUNITY

**Address** : 12F, Munjeong Daemyeong Valeon bldg, 127 Beobwon-ro Songpa-gu, Seoul, South Korea

**Type of Equipment** : Access controller

**FCC ID** : XX2-UBIO-X-PRO2

**Model Name** : UBio-X Pro2

**Multiple Model Name** : N/A

**Serial number** : N/A

**Total page of Report** : 20 pages (including this page)

**Date of Incoming** : October 06, 2022

**Date of Issuing** : November 29, 2022

## SUMMARY

The equipment complies with the requirements of *FCC CFR 47 PART 15 SUBPART C Section 15.225*

This test report contains only the result of a single test of the sample supplied for the examination.

It is not a general valid assessment of the features of the respective products of the mass-production.

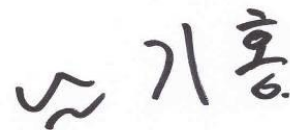
This report is not correlated with the "KS Q ISO/IEC 17025 and KOLAS accreditation" of Korean Laboratory Accreditation Scheme.



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**Revision History**

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-22N-RWD-098	November 29, 2022	Initial Release	All

**1. VERIFICATION OF COMPLIANCE**

- . APPLICANT : UNION COMMUNITY
- . ADDRESS : 12F, Munjeong Daemyeong Valeon bldg, 127 Beobwon-ro Songpa-gu, Seoul, South Korea
- . CONTACT PERSON : Dong Ho, Lee
- . TELEPHONE NO : +82-2-6488-3054
- . FCC ID : XX2-UBIO-X-PRO2
- . MODEL NO/NAME : UBio-X Pro2
- . SERIAL NUMBER : N/A
- . DATE : November 29, 2022

DEVICE TYPE	DXX – Low Power Communication Device Transmitter
E.U.T. DESCRIPTION	Access controller
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.10: 2013
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC CFR47 Part 15 Subpart C Section 15.225
MODIFICATIONS ON THE EQUIPMENT TO ACHIEVE COMPLIANCE	None
FINAL TEST WAS CONDUCTED ON	10 m Semi Anechoic Chamber

-. The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

## 2. GENERAL INFORMATION

### 2.1 Product Description

The UNION COMMUNITY, Model UBio-X Pro2 (referred to as the EUT in this report) is an Access controller, Product specification information described herein was obtained from product data sheet or user’s manual.

DEVICE TYPE	Access controller
TRANSMITTING FREQUENCY	125 kHz, 13.56 MHz, 2 402 MHz ~ 2 480 MHz
MODULATION	ASK
ANTENNA TYPE	Coil Antenna, PCB Antenna
LIST OF EACH OSC. or CRY. FREQ.(FREQ. >= 1 MHz)	8 MHz, 24 MHz, 27.12 MHz
USED AC/DC ADAPTER	Output : DC 15 V, 4.0 A Model No : KPL-060H-VI Manufacturer : Channel Well Technology (Guangzhou)Co., LTd.

### 2.2 Model Differences

-. None

### 2.3 Related Submittal(s) / Grant(s)

Original submittal only

### 2.4 Purpose of the test

To determine whether the equipment under test fulfills the requirements of the regulation stated in FCC PART 15 SUBPART C Section 15.225.

### 2.5 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10: 2013. Radiated testing was performed at a distance of 3 m from EUT to the antenna.

### 2.6 Test Facility

The Onetech Corp. has been designated to perform equipment testing in compliance with ISO/IEC 17025.

The Electromagnetic compatibility measurement facilities are located at 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea.

-. Site Filing:

VCCI (Voluntary Control Council for Interference) – Registration No. R-20122/ C-14617/ G-10666/ T-11842

ISED (Innovation, Science and Economic Development Canada) – Registration No. Site# 3736A-3

KOLAS (Korea Laboratory Accreditation Scheme) - Accreditation NO. KT085

FCC (Federal Communications Commission) - Accreditation No. KR0013

RRA (Radio Research Agency) – Designation No. KR0013

### 3. SYSTEM TEST CONFIGURATION

#### 3.1 Justification

This device was configured for testing in a typical way as a normal customer is supposed to be used. During the test, the following components were installed inside of the EUT.

DEVICE TYPE	MANUFACTURER	MODEL/PART NUMBER	FCC ID
MAIN BOARD	N/A	PUBXP2MA01 V14	N/A
FINGERPRINT BOARD(1)	N/A	RFAS06MA01 V20	N/A
FINGERPRINT BOARD(2)	N/A	RFAS06SE01 V10	N/A
CAMERA BOARD	N/A	M20	N/A
DISPLAY	N/A	BL500P10-1409-V1	N/A
TOUCH BOARD	N/A	PAC7000PLC01 V11	N/A
SD CARD BOARD	N/A	PAC7000SD01 V10	N/A
125 kHz RF BOARD	N/A	PAC7000RF01 V10	N/A
13.56 MHz ANTENNA BOARD	N/A	PAC7000SA01 NJA24	N/A
Speaker	N/A	N/A	N/A
Bluetooth LE Module	Union Community	F1DC2706-A	XX2-F1DC2706-A
ADAPTER	Channel Well Technology (Guangzhou)Co., LTd.	KPL-060H-VI	N/A

#### 3.2 Peripheral equipment

Defined as equipment needed for correct operation of the EUT, but not considered as tested:

Model	Manufacturer	Description	Connected to
UBio-X Pro2	UNION COMMUNITY	Access controller (EUT)	-
KPL-060H-VI	Channel Well Technology (Guangzhou)Co., LTd.	ADAPTER	EUT
N/A	N/A	Door Open Switch	EUT
BHL-700C	ELECTRIC BOLT	Door lock	EUT
N/A	N/A	13.56 MHz Card	EUT

#### 3.3 Mode of operation during the test

-. The EUT has 13.56 MHz RF boards for reading Card and program was used for making continuous transmission mode during the test.

#### 3.4 Equipment Modifications

-. None

### 3.5 Configuration of Test System

**Line Conducted Test :** The EUT was connected to adaptor and the power of adaptor was connected to LISN. All supporting equipments were connected to another LISN. Preliminary Power line Conducted Emission test was performed by using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions.

**Radiated Emission Test :** Preliminary radiated emissions test were conducted using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions. The radiated emissions measurements were performed on the 10 m Semi Anechoic Chamber.  
 For frequencies from 150 kHz to 30 MHz measurements were made of the magnetic H field. The measuring antenna is an electrically screened loop antenna.  
 The frequency spectrum from 30 MHz to 1 000 MHz was scanned and maximum emission levels maximized at each frequency recorded. The system was rotated 360°, and the antenna was varied in the height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

### 3.6 Antenna Requirement

For intentional device, according to 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.

**Antenna Construction:**

The transmitter antenna of the EUT is a Coil Antenna, PCB Antenna so there is no consideration of replacement by the user.

## 4. PRELIMINARY TEST

### 4.1 AC Power line Conducted Emissions Tests

During Preliminary Tests, the following operating mode was investigated

Operation Mode	The Worse operating condition (Please check one only)
Transmitting Mode	X

### 4.2 Radiated Emissions Tests

During Preliminary Tests, the following operating modes were investigated

Operation Mode	The Worse operating condition (Please check one only)
Transmitting Mode	X



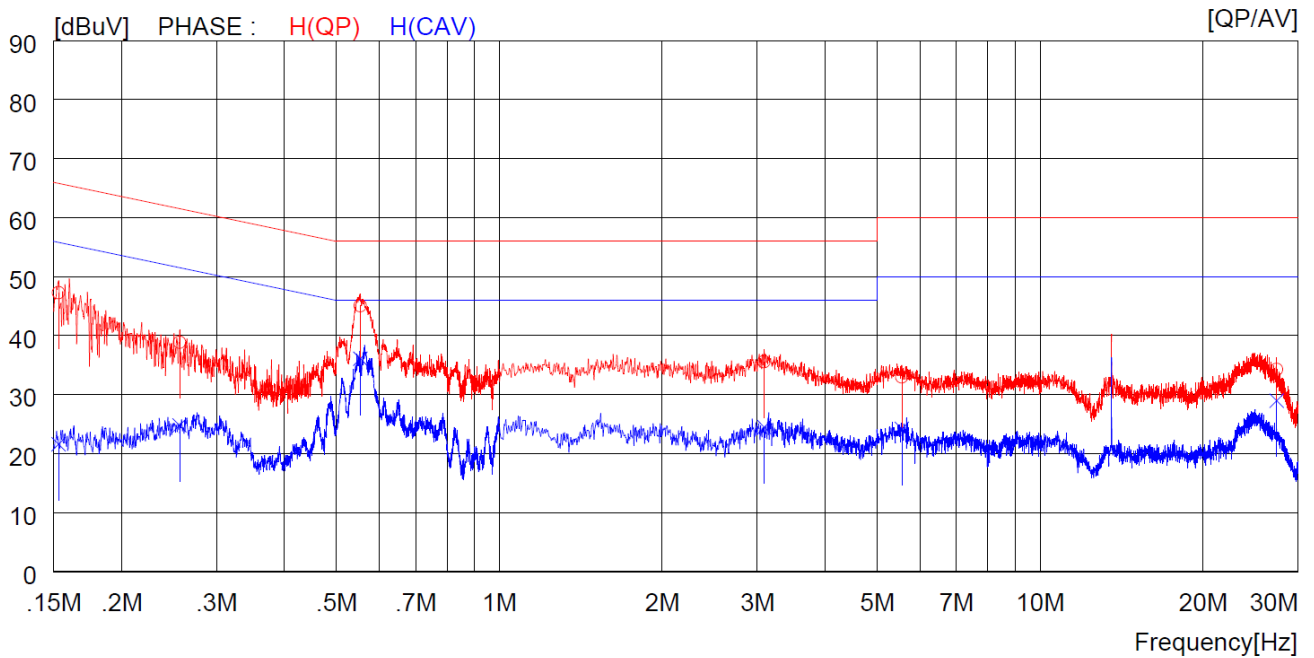
### 5. FINAL RESULT OF MEASUREMENT

Preliminary test was done in normal operation mode. And the final measurement was selected for the maximized emission level.

#### 5.1 Conducted Emission Test

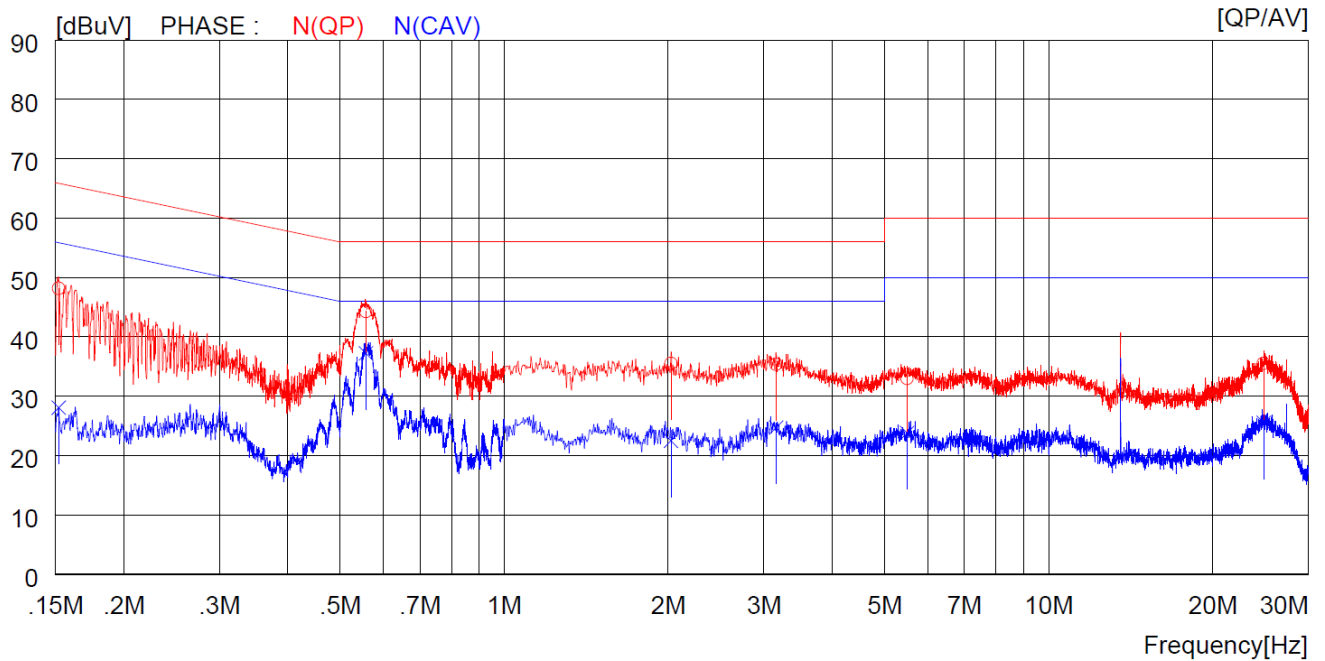
Humidity Level : 52.6 % R.H. Temperature: 22.5 °C  
 Limits apply to : FCC CFR 47, PART 15, SUBPART B, SECTION 15.207(a)  
 Result : PASSED

EUT : Access controller Date: October 06, 2022  
 Detector : CISPR Quasi-Peak (6 dB Bandwidth: 9 kHz)  
 Tested Line : HOT LINE



NO	FREQ [MHz]	READING		C. FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.15300	37.3	----	10.0	47.3	----	65.8	----	18.5	----	H (QP)
2	0.25600	28.9	----	10.0	38.9	----	61.6	----	22.7	----	H (QP)
3	0.55300	35.1	----	10.0	45.1	----	56.0	----	10.9	----	H (QP)
4	3.08800	25.5	----	10.1	35.6	----	56.0	----	20.4	----	H (QP)
5	5.55000	22.8	----	10.2	33.0	----	60.0	----	27.0	----	H (QP)
6	27.37000	23.7	----	10.6	34.3	----	60.0	----	25.7	----	H (QP)
7	0.15300	----	11.6	10.0	----	21.6	----	55.8	----	34.2	H (CAV)
8	0.25600	----	14.8	10.0	----	24.8	----	51.6	----	26.8	H (CAV)
9	0.55300	----	26.1	10.0	----	36.1	----	46.0	----	9.9	H (CAV)
10	3.08800	----	14.4	10.1	----	24.5	----	46.0	----	21.5	H (CAV)
11	5.55000	----	14.0	10.2	----	24.2	----	50.0	----	25.8	H (CAV)
12	27.37000	----	18.4	10.6	----	29.0	----	50.0	----	21.0	H (CAV)

Tested Line : NEUTRAL LINE



NO	FREQ [MHz]	READING		C. FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.15200	38.2	----	10.0	48.2	----	65.9	----	17.7	----	N (QP)
2	0.55700	34.3	----	10.0	44.3	----	56.0	----	11.7	----	N (QP)
3	2.02400	25.4	----	10.1	35.5	----	56.0	----	20.5	----	N (QP)
4	3.15600	25.3	----	10.1	35.4	----	56.0	----	20.6	----	N (QP)
5	5.49000	22.8	----	10.2	33.0	----	60.0	----	27.0	----	N (QP)
6	24.81000	24.9	----	10.6	35.5	----	60.0	----	24.5	----	N (QP)
7	0.15200	----	18.1	10.0	----	28.1	----	55.9	----	27.8	N (CAV)
8	0.55700	----	27.2	10.0	----	37.2	----	46.0	----	8.8	N (CAV)
9	2.02400	----	12.4	10.1	----	22.5	----	46.0	----	23.5	N (CAV)
10	3.15600	----	14.6	10.1	----	24.7	----	46.0	----	21.3	N (CAV)
11	5.49000	----	13.6	10.2	----	23.8	----	50.0	----	26.2	N (CAV)
12	24.81000	----	14.9	10.6	----	25.5	----	50.0	----	24.5	N (CAV)

Remark: Margin (dB) = Limit – Level (Result)

The emission level in above table is included the transducer factor that means insertion loss (LISN), cable loss and attenuator.

## 5.2 RADIATED EMISSION TEST

### 5.2.1 Operation frequency band: (13.553 ~ 13.567) MHz

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

Humidity Level : 48 % R.H. Temperature: 22 °C

Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.225

Type of Test : Low Power Communication Device Transmitter

Result : PASSED

EUT : Access controller

Date: October 06, 2022 ~ October 12, 2022

Operating Condition : Transmitting Mode

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 9 kHz)

Distance : 3 m

Frequency (MHz)	Reading (dB $\mu$ V)	Ant. Pol. (H/V)	Ant. Height (m)	Ant. Factor (dB/m)	Cable Loss	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)
13.56	30.15	H	1	21.3	0.9	52.35	124	71.65
13.56	25.19	V	1	21.3	0.9	47.39	124	76.61

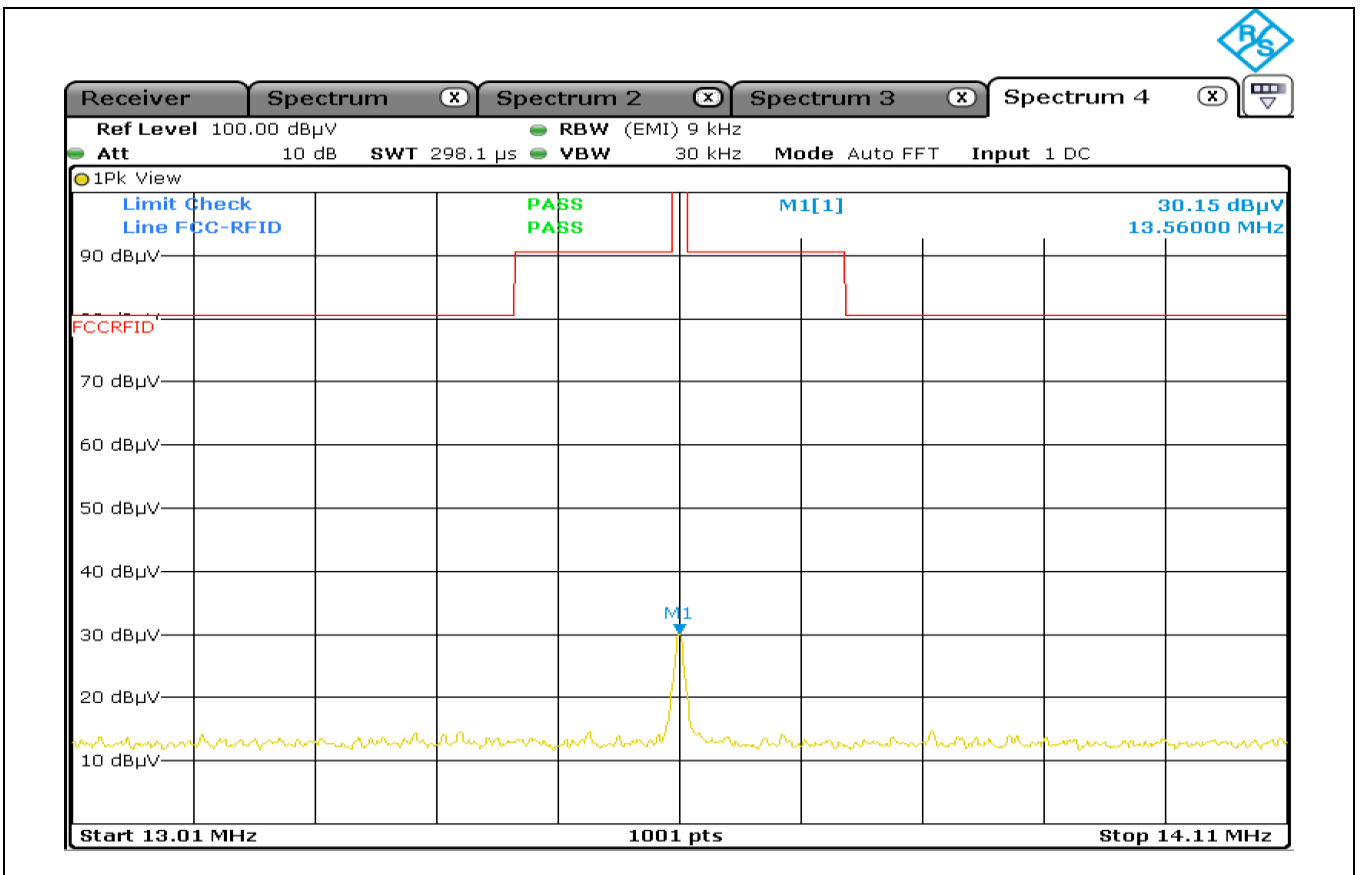
Remark. The EUT was tested at 3 m, so conversation factor was included at above limit.

**5.2.2 Operation frequency band: Below 13.553 MHz and above 13.567 MHz**

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

Humidity Level : 48 % R.H. Temperature: 22 °C  
 Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.225  
 Type of Test : Low Power Communication Device Transmitter  
 Result : PASSED

EUT : Access controller Date: October 06, 2022 ~ October 12, 2022  
 Operating Condition : Transmitting Mode



cc. to above test data, the field strength level of 13.56 MHz is 30.15 dBuV/m and the worst limit subject to 15.225 (b) and (c) is 80.5 dBuV/m, so the EUT meets the requirement.

### 5.3 SPURIOUS EMISSION TEST

#### 5.3.1 Spurious Radiated Emission Below 30 MHz

Humidity Level : 48 % R.H. Temperature: 22 °C  
 Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.209  
 Type of Test : Low Power Communication Device Transmitter  
 Frequency Range : 9 kHz ~ 30 MHz  
 Result : PASSED

EUT : Access controller Date: October 06, 2022 ~ October 12, 2022  
 Operating Condition : Transmitting Mode  
 Distance : 3 m

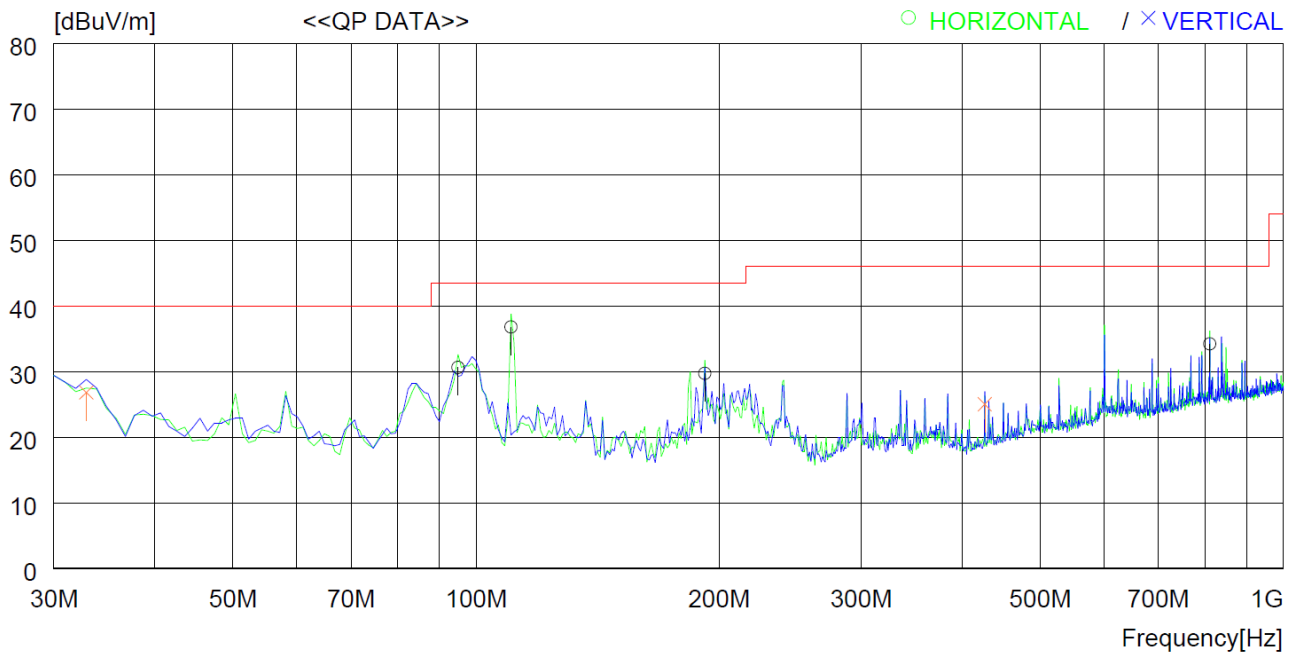
Frequency (MHz)	Reading (dB $\mu$ V)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)
It was not observed any emissions from the EUT.									

**5.3.2 Spurious Radiated Emission below 1 GHz**

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

Humidity Level : 48 % R.H. Temperature: 22 °C  
 Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.209  
 Type of Test : Low Power Communication Device Transmitter  
 Frequency range : 30 MHz ~ 960 MHz  
 Result : PASSED

EUT : Access controller Date: October 06, 2022 ~ October 12, 2022  
 Operating Condition : Transmitting Mode  
 Distance : 3 m



No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	94.990	47.0	14.4	1.2	32.0	30.6	43.5	12.9	100	41
2	110.510	50.6	17.0	1.3	32.1	36.8	43.5	6.7	100	27
3	191.990	44.2	15.8	1.8	32.1	29.7	43.5	13.8	100	233
4	810.842	35.7	27.1	3.7	32.3	34.2	46.0	11.8	100	359
----- Vertical -----										
5	32.910	38.0	20.2	0.7	32.1	26.8	40.0	13.2	100	190
6	426.731	33.2	21.3	2.7	32.2	25.0	46.0	21.0	200	359

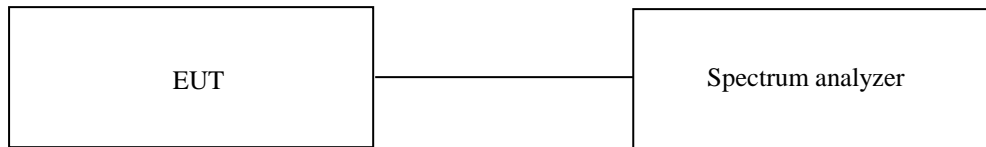
## 5.4 20 dB BANDWIDTH

### 5.4.1 Operating environment

Temperature : 22 °C  
 Relative humidity : 48 % R.H.

### 5.4.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1 % to 5 % of the OBW and video bandwidth (VBW) shall be approximately three times RBW. The 20 dB bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 20 dB.



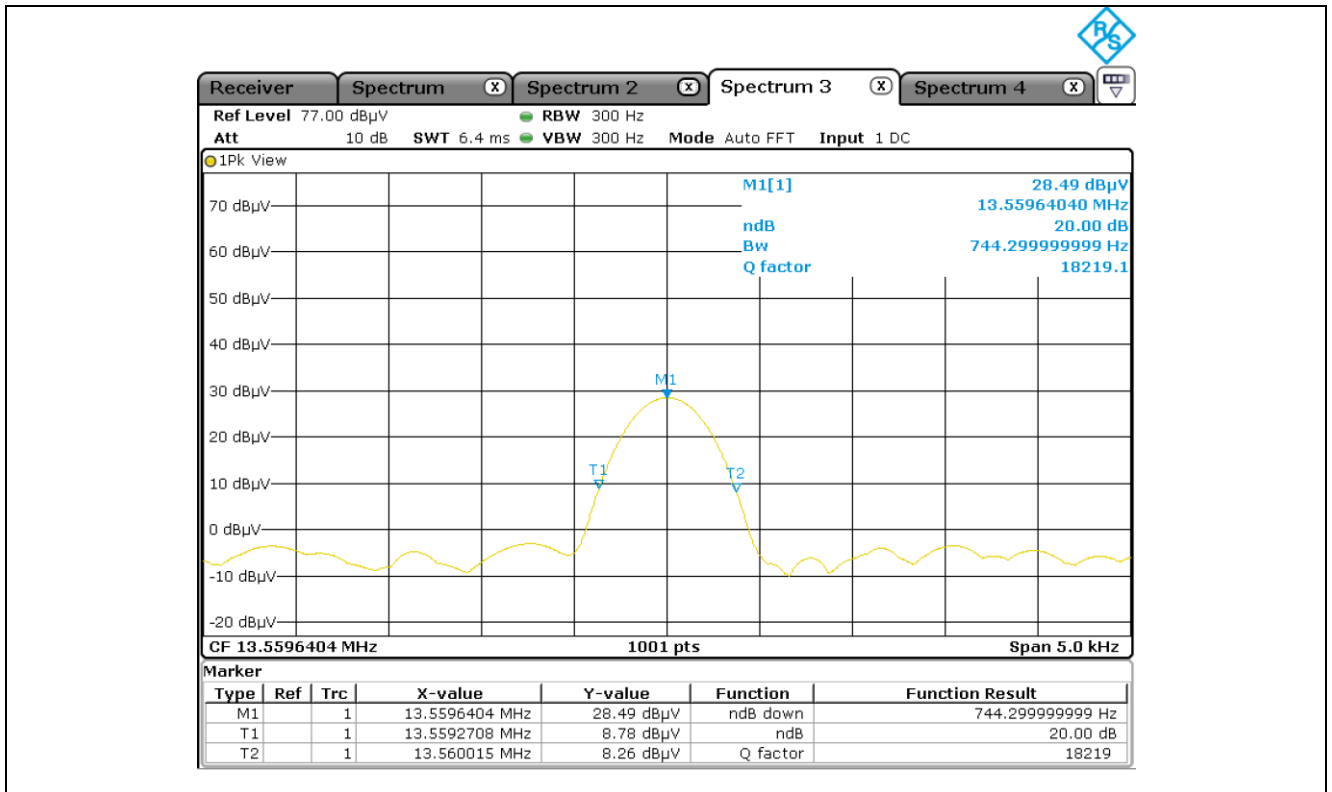
### 5.4.3 Test date

October 06, 2022 ~ October 12, 2022

5.4.4 Test data

-. Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.215

FREQUENCY (MHz)	MEASURED VALUE (kHz)	Result
13.559 6	744.3	PASS





## 5.5 FREQUENCY STABILITY WITH TEMPERATURE VARIATION

### 5.5.1 Operating environment

Temperature : 22 °C  
 Relative humidity : 48 % R.H.

### 5.5.2 Test set-up

Turn EUT off and set chamber temperature to -20 °C and then allow sufficient time (approximately 20 to 30 minutes after chamber reach the assigned temperature) for EUT to stabilize. Turn ON EUT and measure the EUT operating frequency and then turn off the EUT after the measurement. The temperature in the chamber was raised 10 °C step from -20 °C to +50°C. Repeat above method for frequency measurements every 10 °C step and then record all measured frequencies on each temperature step.

### 5.5.3 Test date

October 06, 2022 ~ October 12, 2022

### 5.5.4 Test data

-. Result : PASSED

Temperature (°C)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Margin (Hz)	Limit (Hz)
-20	13,559,674	13,559,417	-257	± 1 355.96
-10		13,559,365	-309	
0		13,559,677	3	
10		13,559,689	15	
20		13,559,733	59	
30		13,559,903	229	
40		13,559,915	241	
50		13,559,978	304	

## 5.6 FREQUENCY STABILITY WITH VOLTAGE VARIATION

### 5.6.1 Operating environment

Temperature : 22 °C  
 Relative humidity : 48 % R.H.

### 5.6.2 Test set-up

An external DC power supply was connected to the input of the EUT. The voltage of EUT set to 115 % of the nominal value and then was reduced to 85 % of nominal voltage. The output frequency was recorded at each step.

### 5.6.3 Test date

October 06, 2022 ~ October 12, 2022

### 5.6.4 Test data

-. Result : PASSED

Voltage (Vdc)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Margin (Hz)	Limit (Hz)
17.25(115 %)	13,559,675	13,559,447	-227	± 1 355.89
15.0(100 %)		13,559,677	3	
12.75(85 %)		13,559,580	-94	

## 6. FIELD STRENGTH CALCULATION

Meter readings are compared to the specification limit correcting for antenna and cable losses.

+ Meter reading	(dB $\mu$ V)
- Amplifier Gain	(dB)
+ Cable Loss	(dB)
- Antenna Factor	(dB/m)
<hr/>	
= Corrected Result	(dB $\mu$ V/m)

Margin (dB)

Specification Limit	(dB $\mu$ V/m)
- Corrected Result	(dB $\mu$ V/m)
<hr/>	
= dB Relative to Spec	( $\pm$ dB)

### 7. LIST OF TEST EQUIPMENT

Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
FSV40-N	Rohde & Schwarz	SIGNAL ANALYZER	101372	Jul. 14, 2022 (1Y)
ESR	Rohde & Schwarz	EMI Test Receiver	101615	Fed. 24, 2022 (1Y)
310N	Sonoma Instrument	AMPLIFIER	392756	Oct. 14, 2022 (1Y)
HLP-2008	TDK	Hybrid Antenna	131316	Mar. 07, 2022 (2Y)
DT2000-2t	Innco System	Turn Table	N/A	N/A
CO3000	Innco Systems GmbH	Controller	1026/40960617/P	N/A
MA-4640-XPET	Innco Systems GmbH	Antenna Master	MA4640/652/ 43100318/P/-	N/A
HLA 6121	TESEQ	Loop Antenna	50841	Apr. 13, 2022 (2Y)
ESCI	Rohde & Schwarz	Test Receiver	101012	Fed. 24, 2022 (1Y)
NSLK8128	Schwarzbeck	V - LISN ( 4*32/50A)	8128216	Mar. 14, 2022 (1Y)
ESH3-Z2	Rohde & Schwarz	Pulse Limiter	100655	Mar. 14, 2022 (1Y)
SH-242	ESPEC	Temperature & Humidity Chamber	00931001589	Jan. 18, 2022 (1Y)
GP-4303D	LG Precision Co.,Ltd	DC Power Supply	5071069	Jan. 03, 2022 (1Y)