

RADIO PERFORMANCE TEST REPORT

Test Report No. : OT-22N-RWD-041

Reception No. : 2209003085

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-FACESC

Model Name : UBio-X Face SC

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 21, 2022

SUMMARY

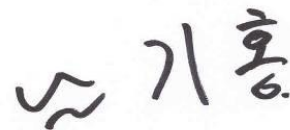
The equipment complies with the requirements of *FCC CFR 47 PART 15 SUBPART C Section 15.225*

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-041	November 21, 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-FACESC
- MODEL NO/NAME : UBio-X Face SC
- SERIAL NUMBER : N/A
- DATE : November 21, 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 Face SC (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	13.56 MHz, 2 402 MHz ~ 2 480 MHz
MODULATION	ASK
ANTENNA TYPE	PCB Antenna
LIST OF EACH OSC. or CRY. FREQ.(FREQ. >= 1 MHz)	13.559 1 MHz
USED AC/DC ADAPTER	Output : DC 15 V, 4 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	FR-910B_V1.4	N/A
SUB BOARD	N/A	PFR910BSC01 V11	N/A
LED BOARD	N/A	PFR910BLD01 V10	N/A
DISPLAY	N/A	N/A	N/A
SUB FPCD BOARD	N/A	N/A	N/A
CAMERA	N/A	N/A	N/A
AI CAMERA	N/A	M20	N/A
CAMERA BOARD	N/A	M20_MB_V3	N/A
SPEAKER	N/A	N/A	N/A
Bluetooth Module	Union Community	F1DC2706-A	XX2-F1DC2706-A
13.56 MHz ANTENNA	N/A	PFR910BSA01 V11	N/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 Face SC	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 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)

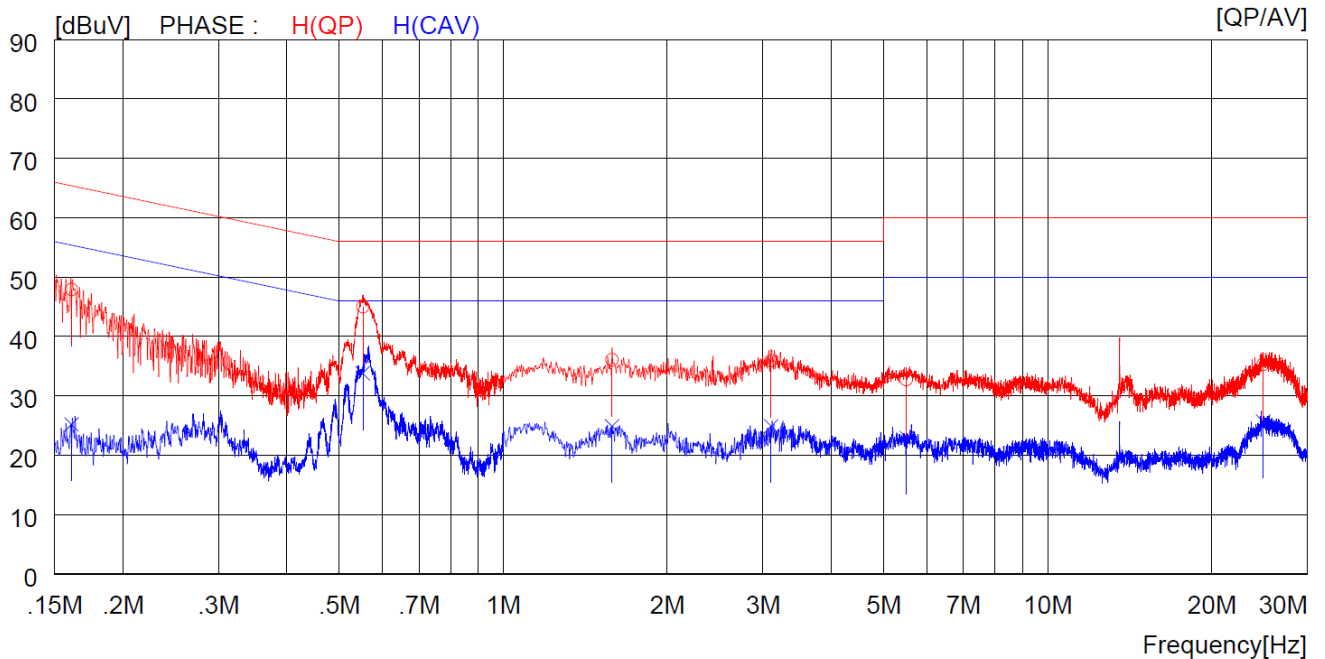
Result : PASSED

EUT : Access controller

Date: October 06, 2022

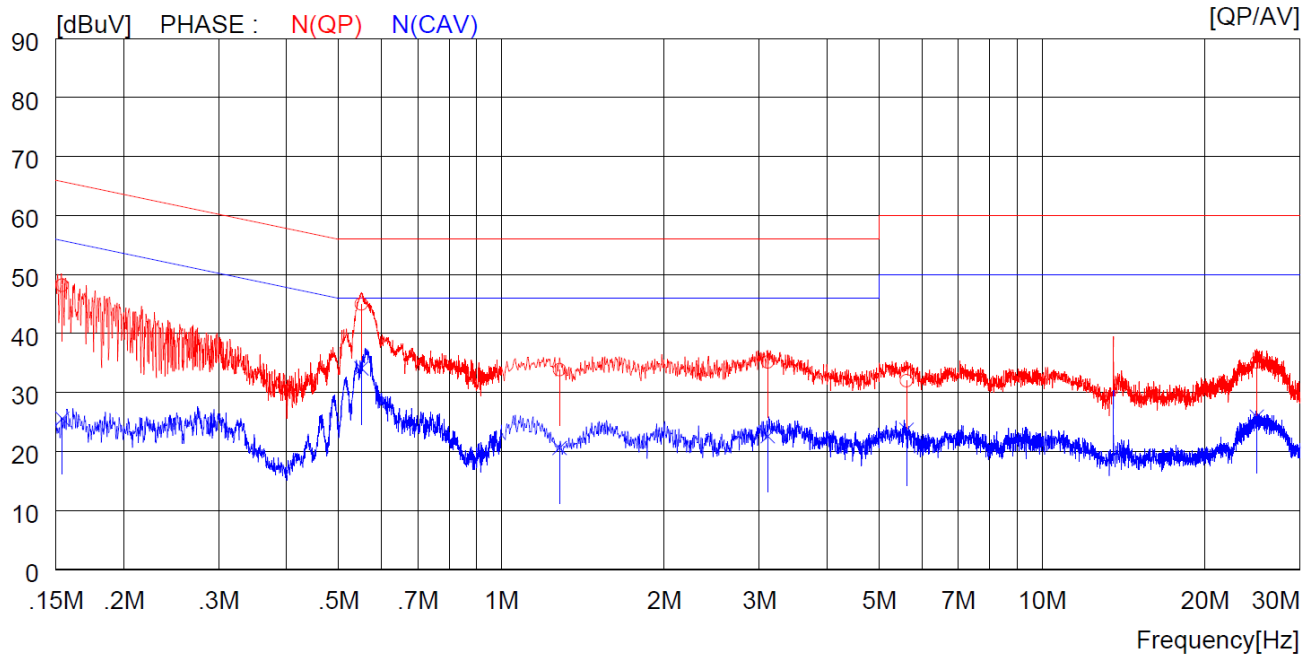
Detector : CISPR Quasi-Peak (6 dB Bandwidth: 9 kHz)

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	0.16100	37.9	----	10.0	47.9	----	65.4	----	17.5	----	H (QP)
2	0.55200	35.0	----	10.0	45.0	----	56.0	----	11.0	----	H (QP)
3	1.58400	26.0	----	10.1	36.1	----	56.0	----	19.9	----	H (QP)
4	3.10400	25.8	----	10.1	35.9	----	56.0	----	20.1	----	H (QP)
5	24.88000	24.7	----	10.6	35.3	----	60.0	----	24.7	----	H (QP)
6	5.50500	22.5	----	10.2	32.7	----	60.0	----	27.3	----	H (QP)
7	0.16100	----	15.2	10.0	----	25.2	----	55.4	----	30.2	H (CAV)
8	0.55200	----	23.8	10.0	----	33.8	----	46.0	----	12.2	H (CAV)
9	1.58400	----	14.8	10.1	----	24.9	----	46.0	----	21.1	H (CAV)
10	3.10400	----	14.8	10.1	----	24.9	----	46.0	----	21.1	H (CAV)
11	24.88000	----	15.1	10.6	----	25.7	----	50.0	----	24.3	H (CAV)
12	5.50500	----	12.7	10.2	----	22.9	----	50.0	----	27.1	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	0.15400	38.2	----	10.0	48.2	----	65.8	----	17.6	----	N (QP)
2	0.55100	35.0	----	10.0	45.0	----	56.0	----	11.0	----	N (QP)
3	1.28000	23.8	----	10.1	33.9	----	56.0	----	22.1	----	N (QP)
4	3.10800	25.1	----	10.1	35.2	----	56.0	----	20.8	----	N (QP)
5	24.96000	24.6	----	10.6	35.2	----	60.0	----	24.8	----	N (QP)
6	5.61000	21.8	----	10.2	32.0	----	60.0	----	28.0	----	N (QP)
7	0.15400	----	15.6	10.0	----	25.6	----	55.8	----	30.2	N (CAV)
8	0.55100	----	24.1	10.0	----	34.1	----	46.0	----	11.9	N (CAV)
9	1.28000	----	10.5	10.1	----	20.6	----	46.0	----	25.4	N (CAV)
10	3.10800	----	12.5	10.1	----	22.6	----	46.0	----	23.4	N (CAV)
11	24.96000	----	15.3	10.6	----	25.9	----	50.0	----	24.1	N (CAV)
12	5.61000	----	13.5	10.2	----	23.7	----	50.0	----	26.3	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 μ V)	Ant. Pol. (H/V)	Ant. Height (m)	Ant. Factor (dB/m)	Cable Loss	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
13.56	23.86	H	1	21.30	0.75	45.91	124	78.09
13.56	16.67	V	1	21.30	0.75	38.72	124	85.28

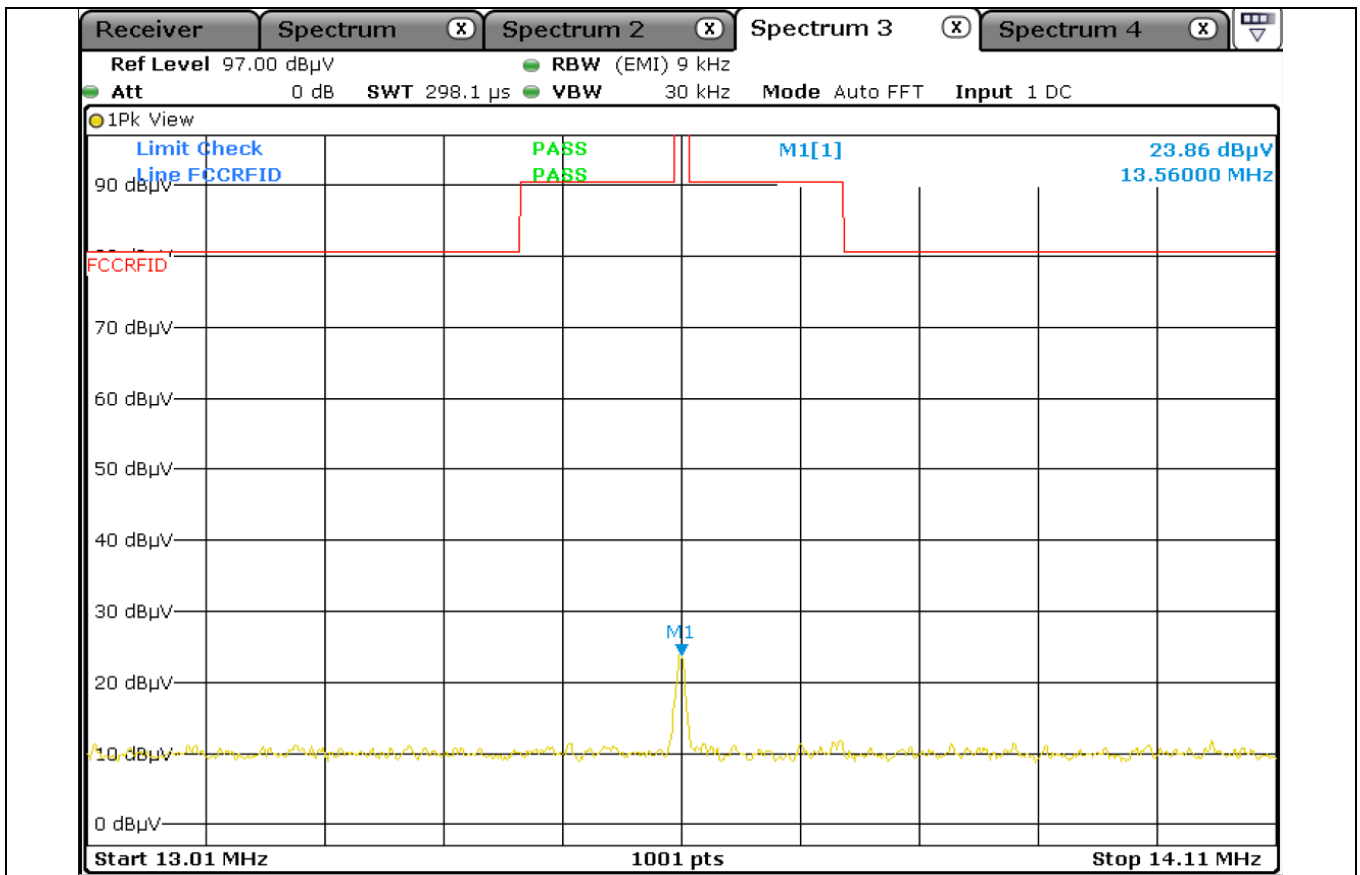
Remark. The EUT was tested at 3 m, so conversation factor was included at above limit.

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 23.86 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

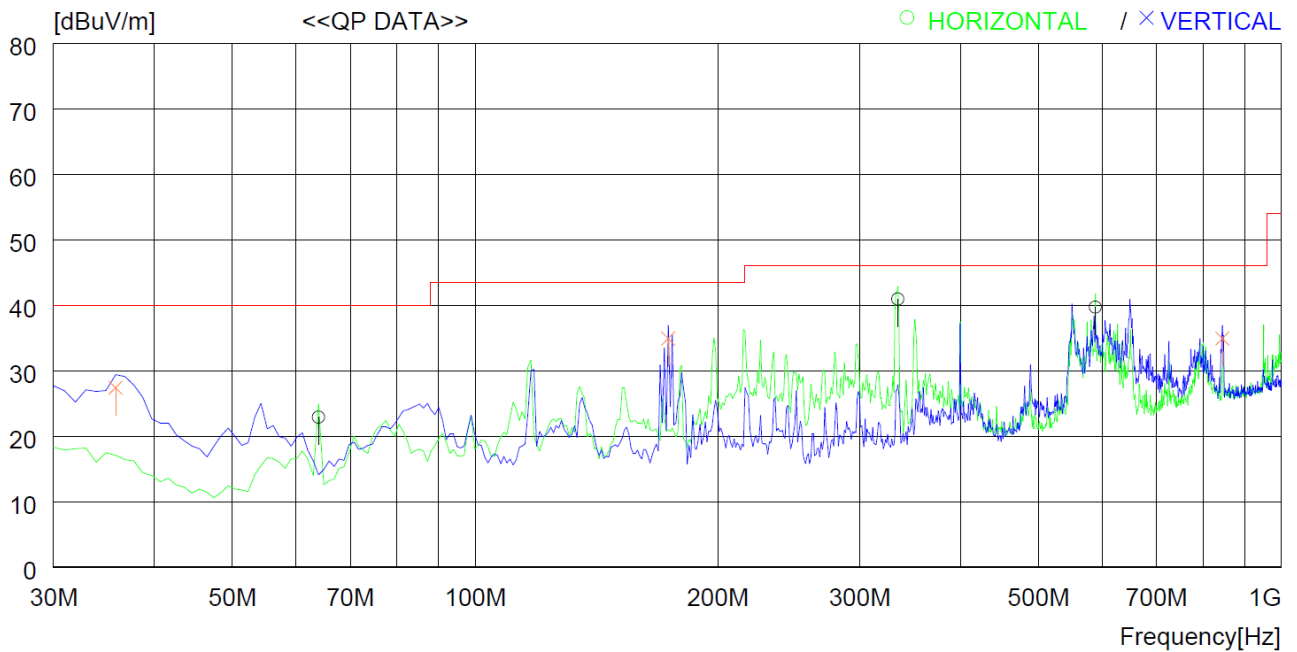
Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
It was not observed any emissions from the EUT.									

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	63.950	41.4	12.5	1.0	32.0	22.9	40.0	17.1	400	172
2	334.580	51.0	19.7	2.4	32.2	40.9	46.0	5.1	100	0
3	587.748	45.0	24.0	3.1	32.4	39.7	46.0	6.3	200	178
----- Vertical -----										
4	35.820	39.8	18.8	0.8	32.0	27.4	40.0	12.6	100	202
5	173.560	48.4	16.9	1.7	32.1	34.9	43.5	8.6	400	324
6	844.791	36.1	27.2	3.8	32.2	34.9	46.0	11.1	100	0

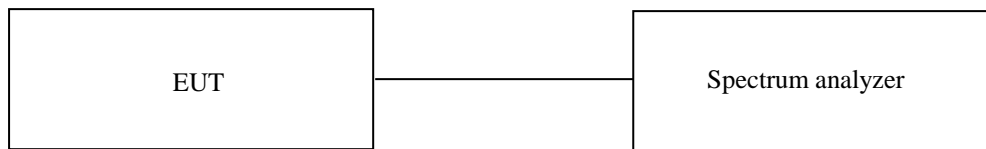
5.4 20 dB BANDWIDTH

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.



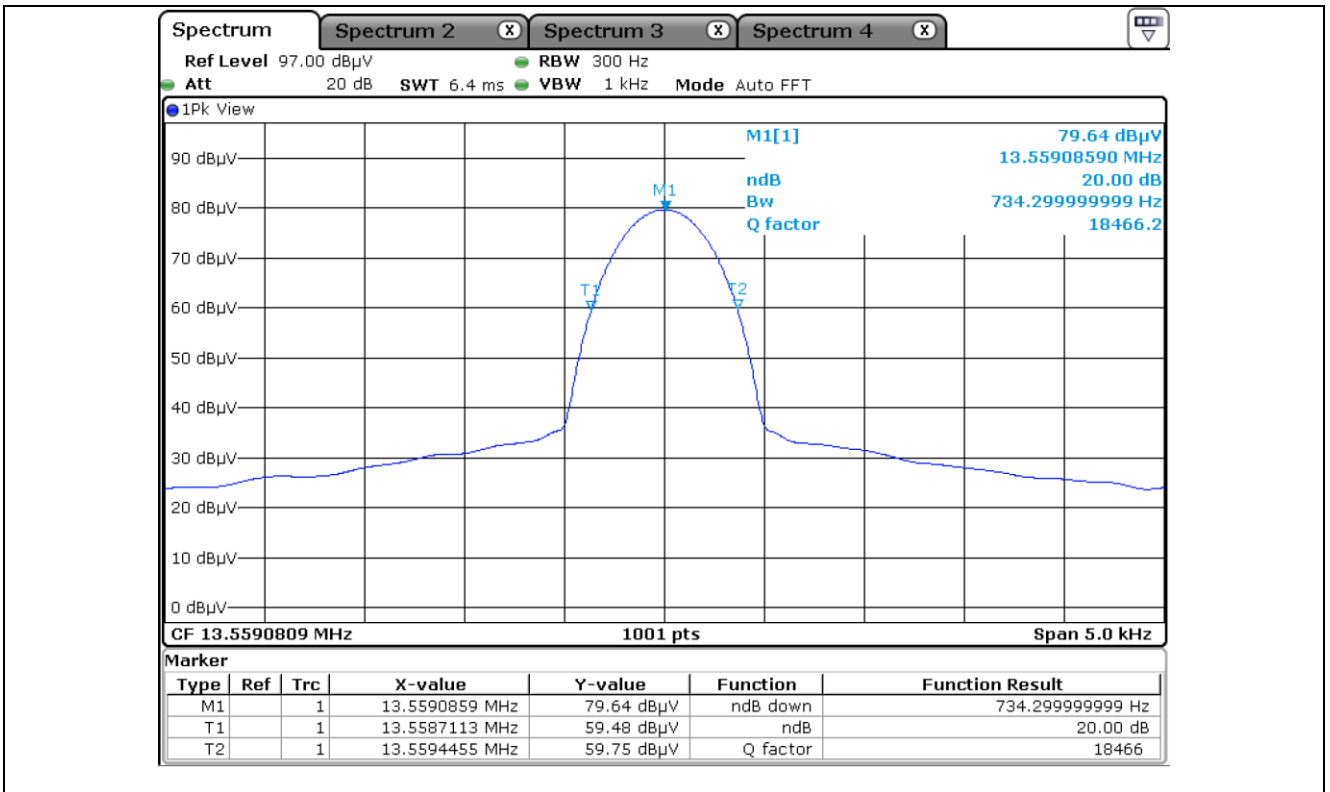
5.4.3 Test date

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 1	0.734 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	13,559,086	13,559,435	349	± 1 355.90
-10		13,559,434	348	
0		13,559,277	191	
10		13,559,050	-36	
20		13,559,210	124	
30		13,559,335	249	
40		13,559,388	302	
50		13,559,627	541	

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 %)	13,559,086	13,559,483	397	± 1 355.90
15.0(100 %)		13,559,403	317	
12.75(85 %)		13,559,671	585	

6. FIELD STRENGTH CALCULATION

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

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

Margin (dB)	
Specification Limit	(dB μ V/m)
- Corrected Result	(dB μ 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, 2021 (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)