

RADIO PERFORMANCE TEST REPORT

Test Report No. : OT-24N-RWD-046
Reception No. : 2410003622
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-UBIOFACEPRMR
Model Name : UBio-X Face Premium
Multiple Model Name : N/A
Serial number : N/A
Total page of Report : 21 pages (including this page)
Date of Incoming : October 17, 2024
Date of Issuing : November 28, 2024

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.

한동연





Tested by
Dong-Yeon, Han / Engineer
ONETECH Corp.

Reviewed by
Tae-Ho, Kim / Chief Engineer
ONETECH Corp.

Approved by
Jae-Ho, Lee / Chief Engineer
ONETECH Corp.

CONTENTS

Page

1. VERIFICATION OF COMPLIANCE	5
2. GENERAL INFORMATION	6
2.1 TEST ITEMS AND RESULTS	6
2.2 PRODUCT DESCRIPTION.....	6
2.3 MODEL DIFFERENCES.....	6
2.4 RELATED SUBMITTAL(S) / GRANT(S)	6
2.5 PURPOSE OF THE TEST	7
2.6 TEST METHODOLOGY.....	7
2.7 TEST FACILITY.....	7
3. SYSTEM TEST CONFIGURATION	8
3.1 JUSTIFICATION.....	8
3.2 PERIPHERAL EQUIPMENT	8
3.3 MODE OF OPERATION DURING THE TEST	8
3.4 EQUIPMENT MODIFICATIONS.....	8
3.5 CONFIGURATION OF TEST SYSTEM.....	9
3.6 ANTENNA REQUIREMENT	9
4. PRELIMINARY TEST	9
4.1 AC POWER LINE CONDUCTED EMISSIONS TESTS.....	9
4.2 RADIATED EMISSIONS TESTS.....	9
5. FINAL RESULT OF MEASUREMENT.....	10
5.1 CONDUCTED EMISSION TEST.....	10
5.2 RADIATED EMISSION TEST.....	12
5.2.1 Operation frequency band: (13.553 ~ 13.567) MHz.....	12
5.2.2 Operation frequency band: Below 13.553 MHz and above 13.567 MHz.....	13
5.3 SPURIOUS EMISSION TEST	14
5.3.1 Spurious Radiated Emission Below 30 MHz	14
5.3.2 Spurious Radiated Emission below 1 GHz.....	15
5.4 20 dB BANDWIDTH	16
5.4.1 Operating environment.....	16
5.4.2 Test set-up	16
5.4.3 Test date	16

5.4.4 Test data	17
5.5 FREQUENCY STABILITY WITH TEMPERATURE VARIATION.....	18
5.5.1 Operating environment.....	18
5.5.2 Test set-up	18
5.5.3 Test date	18
5.5.4 Test data	18
5.6 FREQUENCY STABILITY WITH VOLTAGE VARIATION.....	19
5.6.1 Operating environment.....	19
5.6.2 Test set-up	19
5.6.3 Test date	19
5.6.4 Test data	19
6. FIELD STRENGTH CALCULATION	20
7. LIST OF TEST EQUIPMENT	21

Revision History

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-24N-RWD-046	November 28, 2024	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-UBIOFACEPRMR

Model Name : UBio-X Face Premium

Brand Name : -

Serial Number : N/A

Date : November 28, 2024

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 Test items and results

SECTION	TEST ITEMS	RESULTS
15.225 (a) (b) (c)	Field Strength of Fundamental Emissions	Met the Limit / PASS
15.225 (d) & 15.209	Radiated Emission Limits	Met the Limit / PASS
2.1049	20 dB Bandwidth	Met the Limit / PASS
15.225(e)	FREQUENCY STABILITY WITH TEMPERATURE VARIATION / FREQUENCY STABILITY WITH VOLTAGE VARIATION	Met the Limit / PASS
15.207	Conducted Limits	Met requirement / PASS
15.203	Antenna Requirement	Met requirement / PASS

2.2 Product Description

The UNION COMMUNITY, Model UBio-X Face Premium (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	127.04 kHz, 13.56 MHz 2 412 MHz ~ 2 462 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)	32.768 kHz, 24 MHz, 48 MHz

2.3 Model Differences

-. None

2.4 Related Submittal(s) / Grant(s)

Original submittal only

2.5 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.

2.6 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.

2.7 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	PUBXFPMA01_V20	N/A
SUB Board 1	N/A	PUBXFUSB01_V20	N/A
SUB Board 2	N/A	PFacelCammera01_V20	N/A
SUB Board 3	N/A	PUBXFPLD01_V20	N/A
SUB Board 4	N/A	PFacelRLED01_V20	N/A
Wi-Fi & Bluetooth Module	FN-LINK TECHNOLOGY LIMITED	H158A-SM	2AATL-H158ASM
125 kHz Antenna Board	N/A	N/A	N/A
13.56 MHz Antenna Board	N/A	PC10SR01	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 Premium	UNION COMMUNITY	Access controller (EUT)	-
DC Power Supply	TDK-Lambda	DC Power Supply	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 DC Power Supply and the power of DC Power Supply 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 and 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 : 56 % R.H.

Temperature: 23 °C

Limits apply to : FCC CFR 47, PART 15, SUBPART B, SECTION 15.207(a)

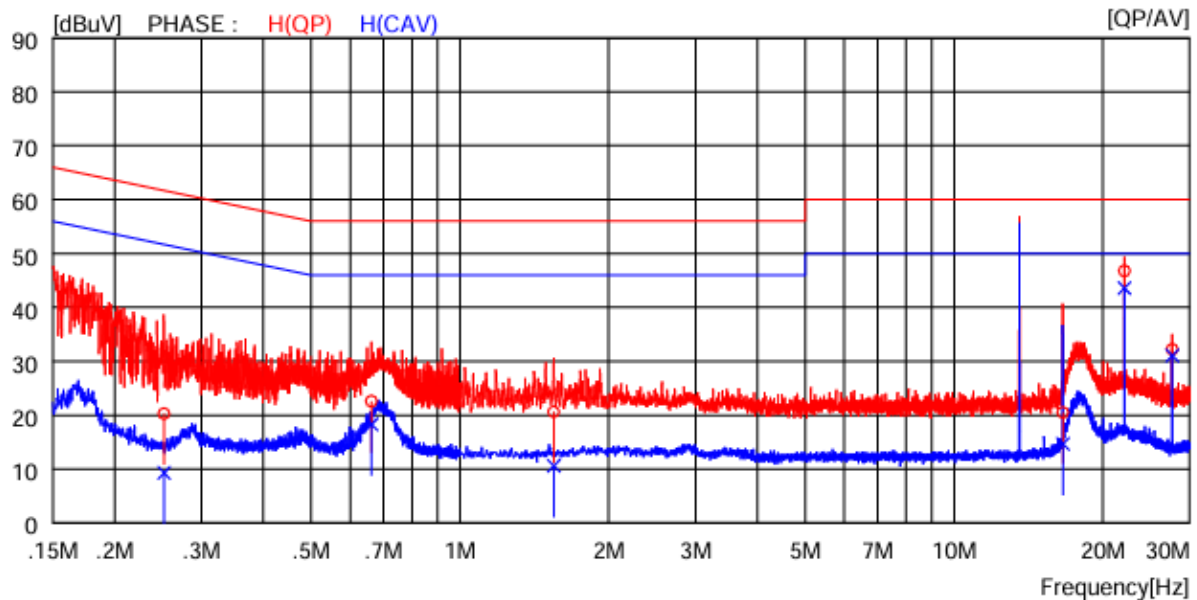
Result : PASSED

EUT : Access controller

Date: November 05, 2024 ~ November 08, 2024

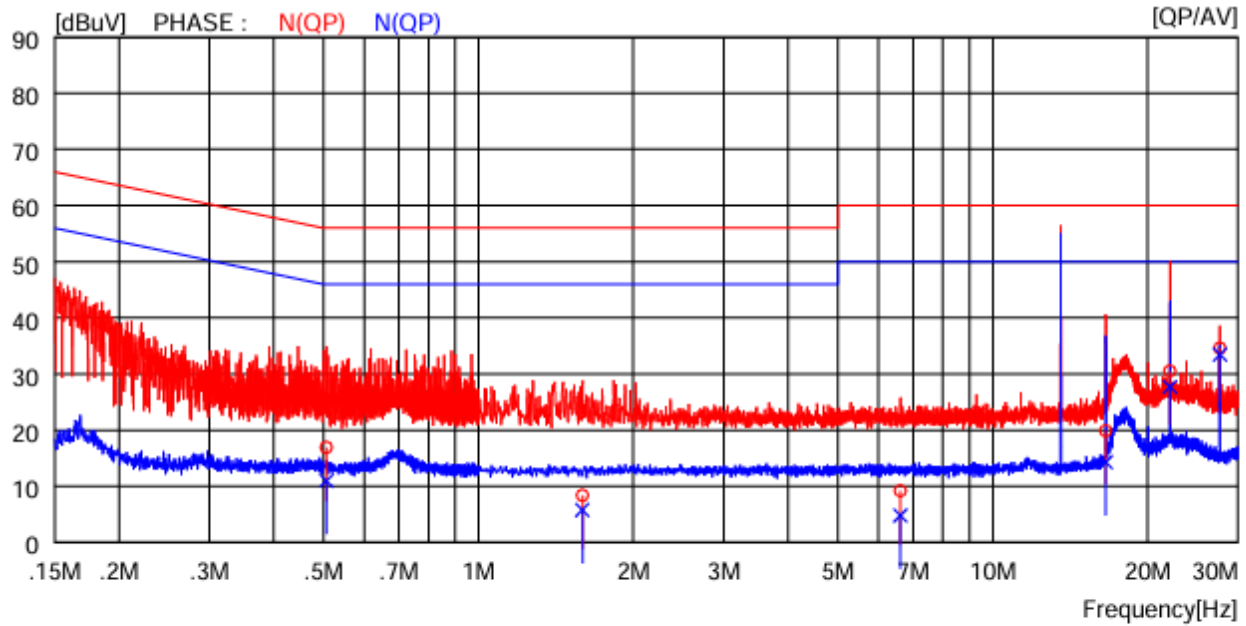
Detector : CISPR Quasi-Peak (6 dB Bandwidth: 9 kHz)

Tested Line : HOT LINE



NO	FREQ		READING		C.FACTOR		RESULT		LIMIT		MARGIN		PHASE
	QP	AV	QP	AV	QP	AV	QP	AV	QP	AV	QP	AV	
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	
1	0.25200	10.3	----	10.0	20.3	----	61.7	----	41.4	----	H(QP)		
2	0.66200	12.5	----	10.1	22.6	----	56.0	----	33.4	----	H(QP)		
3	1.54800	10.5	----	10.1	20.6	----	56.0	----	35.4	----	H(QP)		
4	16.60000	9.9	----	10.6	20.5	----	60.0	----	39.5	----	H(QP)		
5	22.12000	36.1	----	10.7	46.8	----	60.0	----	13.2	----	H(QP)		
6	27.65000	21.4	----	10.8	32.2	----	60.0	----	27.8	----	H(QP)		
7	0.25200	----	-0.7	10.0	----	9.3	----	51.7	----	42.4	H(CAV)		
8	0.66200	----	8.2	10.1	----	18.3	----	46.0	----	27.7	H(CAV)		
9	1.54800	----	0.5	10.1	----	10.6	----	46.0	----	35.4	H(CAV)		
10	16.60000	----	4.1	10.6	----	14.7	----	50.0	----	35.3	H(CAV)		
11	22.12000	----	32.9	10.7	----	43.6	----	50.0	----	6.4	H(CAV)		
12	27.65000	----	20.3	10.8	----	31.1	----	50.0	----	18.9	H(CAV)		

Tested Line : NEUTRAL LINE



NO	FREQ		READING		C.FACTOR		RESULT		LIMIT		MARGIN		PHASE
	QP	AV	QP	AV	QP	AV	QP	AV	QP	AV	QP	AV	
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	
1	0.50600	6.8	---	---	10.1	---	16.9	---	56.0	---	39.1	---	N(QP)
2	1.59200	-1.7	---	---	10.1	---	8.4	---	56.0	---	47.6	---	N(QP)
3	6.61500	-1.1	---	---	10.3	---	9.2	---	60.0	---	50.8	---	N(QP)
4	16.59000	9.3	---	---	10.6	---	19.9	---	60.0	---	40.1	---	N(QP)
5	22.11000	19.8	---	---	10.7	---	30.5	---	60.0	---	29.5	---	N(QP)
6	27.65000	23.8	---	---	10.8	---	34.6	---	60.0	---	25.4	---	N(QP)
7	0.50600	---	0.9	---	10.1	---	---	11.0	---	46.0	---	35.0	N(CAV)
8	1.59200	---	-4.3	---	10.1	---	---	5.8	---	46.0	---	40.2	N(CAV)
9	6.61500	---	-5.5	---	10.3	---	---	4.8	---	50.0	---	45.2	N(CAV)
10	16.59000	---	3.7	---	10.6	---	---	14.3	---	50.0	---	35.7	N(CAV)
11	22.11000	---	17.0	---	10.7	---	---	27.7	---	50.0	---	22.3	N(CAV)
12	27.65000	---	22.7	---	10.8	---	---	33.5	---	50.0	---	16.5	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 : 56 % R.H. Temperature: 23 °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: November 05, 2024 ~ November 08, 2024

Operating Condition : Transmitting Mode

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

Distance : 3 m

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Ant. Factor (dB/m)	Cable Loss	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)
13.56	40.09	H	1	19.6	0.87	60.56	124	63.44
13.56	32.6	V	1	19.6	0.87	53.07	124	70.93

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

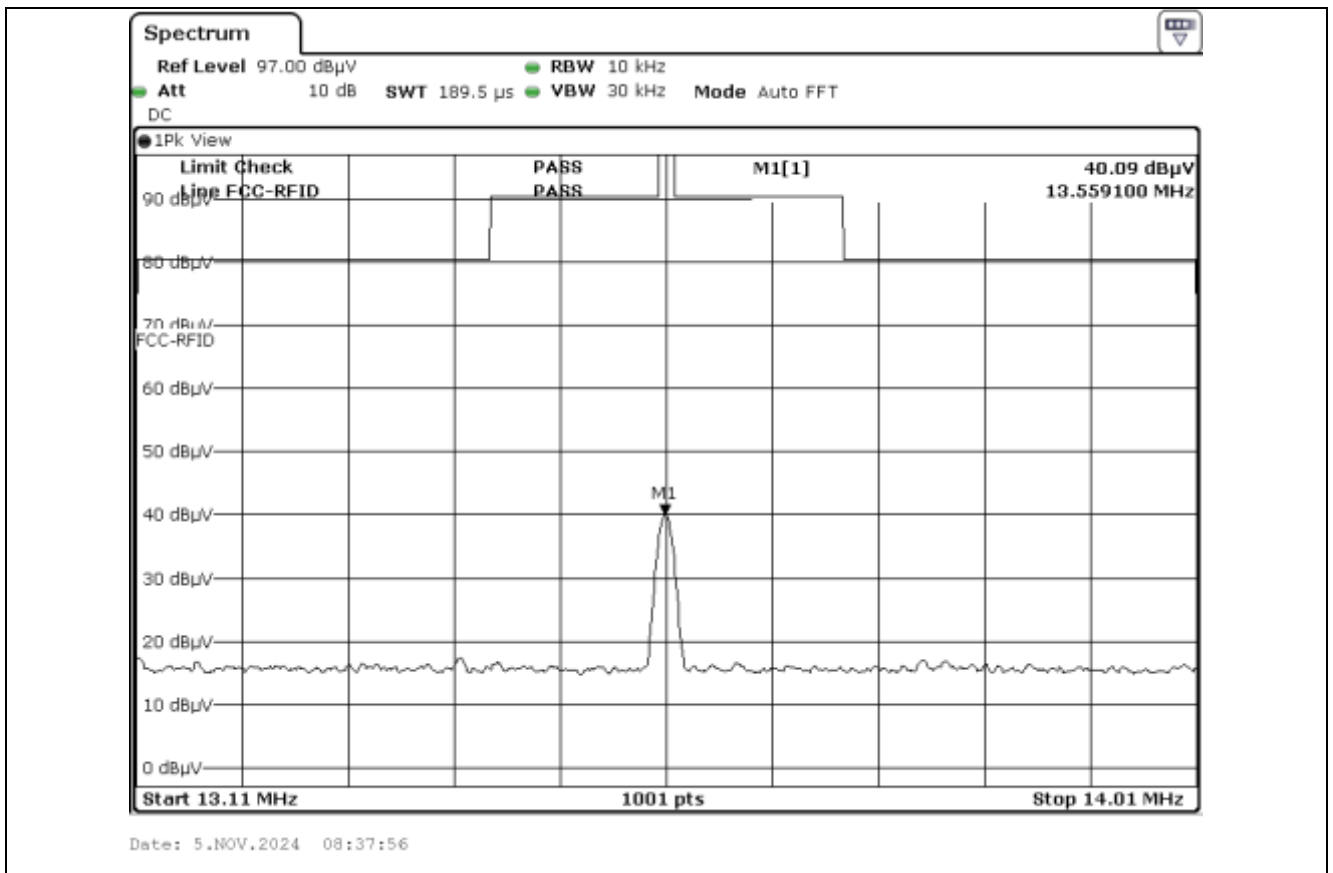
The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

Humidity Level : 56 % R.H. Temperature: 23 °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: November 05, 2024 ~ November 08, 2024

Operating Condition : Transmitting Mode



cc. to above test data, the field strength level of 13.56 MHz is 40.09 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 : 56 % R.H. Temperature: 23 °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: November 05, 2024 ~ November 08, 2024
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

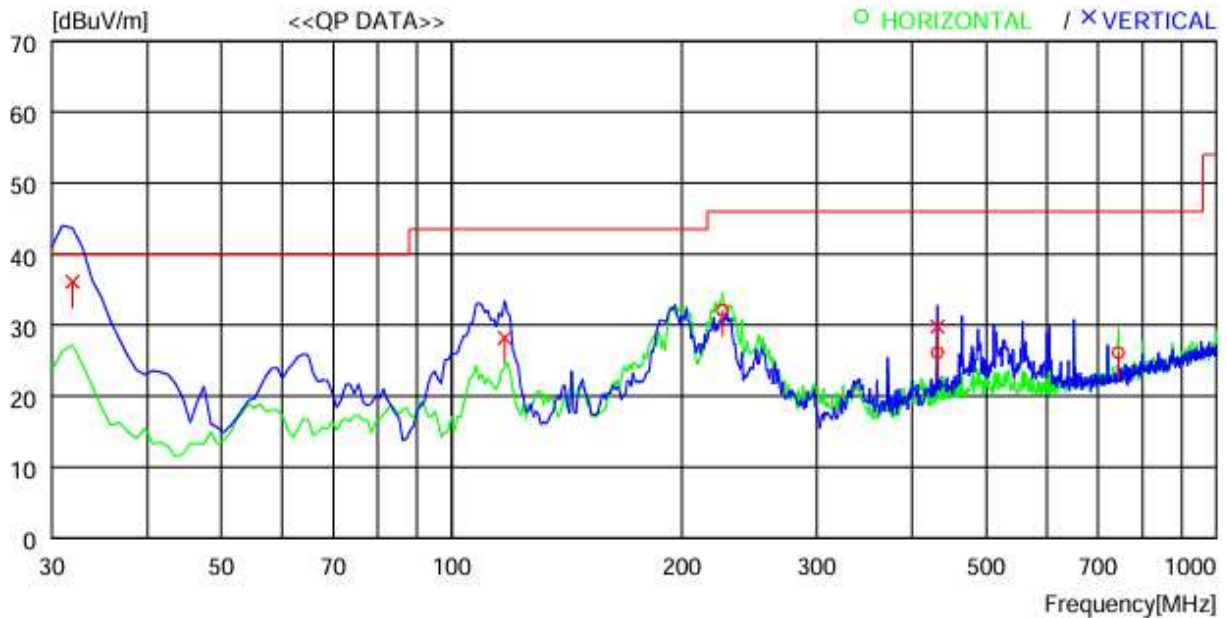
The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

Humidity Level : 56 % R.H. Temperature: 23 °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: November 05, 2024 ~ November 08, 2024

Operating Condition : Transmitting Mode

Distance : 3 m



No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	[dBuV]	FACTOR	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	225.940	46.7	16.5	1.9	33.0	32.1	46.0	13.9	200	359
2	431.581	34.6	22.0	2.6	33.1	26.1	46.0	19.9	200	13
3	743.914	29.8	26.0	3.5	33.2	26.1	46.0	19.9	100	0
----- Vertical -----										
4	31.940	47.8	20.6	0.7	33.0	36.1	40.0	3.9	100	89
5	117.300	41.5	18.3	1.4	33.0	28.2	43.5	15.3	100	268
6	431.581	38.3	22.0	2.6	33.1	29.8	46.0	16.2	100	359

5.4 20 dB BANDWIDTH

5.4.1 Operating environment

Temperature : 23 °C
Relative humidity : 56 % 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.



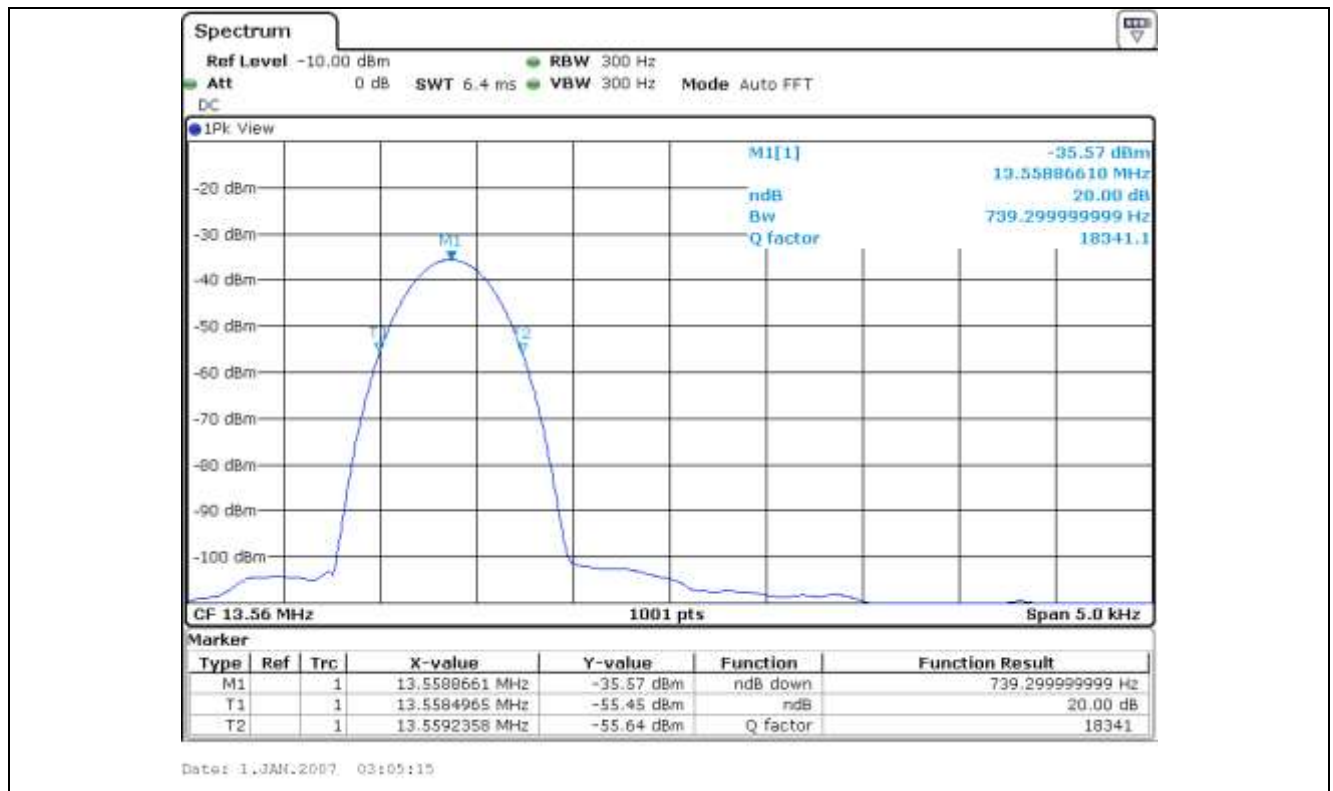
5.4.3 Test date

November 05, 2024 ~ November 08, 2024

5.4.4 Test data

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

FREQUENCY (MHz)	MEASURED VALUE (kHz)	Result
13.560 0	0.739	PASS



5.5 FREQUENCY STABILITY WITH TEMPERATURE VARIATION

5.5.1 Operating environment

Temperature : 23 °C
Relative humidity : 56 % 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

November 05, 2024 ~ November 08, 2024

5.5.4 Test data

-. Result : PASSED

Temperature (°C)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Margin (Hz)	Limit (Hz)
-20	13,560,000	13,558,998	-1,002	± 1 356.00
-10		13,558,925	-1,075	
0		13,558,873	-1,127	
10		13,558,835	-1,165	
20		13,558,801	-1,199	
30		13,558,771	-1,229	
40		13,558,765	-1,235	
50		13,558,761	-1,239	

5.6 FREQUENCY STABILITY WITH VOLTAGE VARIATION

5.6.1 Operating environment

Temperature : 23 °C
Relative humidity : 56 % 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

November 05, 2024 ~ November 08, 2024

5.6.4 Test data

-. Result : PASSED

Voltage (Vdc)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Margin (Hz)	Limit (Hz)
27.6(115 %)	13,560,000	13,558,852	-1,148	± 1 356.00
24.0(100 %)		13,558,853	-1,147	
20.4(85 %)		13,558,844	-1,156	

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)
=	Corrected Result	(dB μ V/m)

Margin (dB)

	Specification Limit	(dBuV/m)
-	Corrected Result	(dBuV/m)
=	dB Relative to Spec	($\pm$ dB)

7. LIST OF TEST EQUIPMENT

Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
FSV30	Rohde & Schwarz	SIGNAL ANALYZER	101372	Jul. 04, 2024 (1Y)
ESCI	Rohde & Schwarz	Test Receiver	101013	Mar. 12, 2024 (1Y)
310N	Sonoma Instrument	AMPLIFIER	312544	Mar. 11, 2024 (1Y)
HLP-2008	TDK	Hybrid Antenna	131313	Apr. 05, 2023 (2Y)
DT3000	Innco System	Turn Table	DT3000/093	N/A
CO3000	Innco Systems GmbH	Controller	CO3000/904	N/A
MA4000-EP	Innco Systems GmbH	Antenna Master	MA4000/332	N/A
AFC-3030	AC POWER KOREA CO., LTD	AC POWER SOURCE	150121	N/A
FMZB 1513	Schwarzbeck	Loop Antenna	1513-235	Mar. 20, 2024 (2Y)
ESCI	Rohde & Schwarz	Test Receiver	101012	Sep. 26, 2024 (1Y)
NSLK8128	Schwarzbeck	V - LISN (4*32/50A)	8128216	Mar. 12, 2024 (1Y)
ESH3-Z2	Rohde & Schwarz	Pulse Limiter	100655	Mar. 12, 2024 (1Y)
SH-242	ESPEC	Environmental Test chamber	0093011138	Jan. 16, 2024 (1Y)
ZUP36-6	TDK-Lambda	DC Power Supply	6MJ-850Z16-0014	Jan. 16, 2024 (1Y)
OPM-303D	ODA	DC Power Supply	oda-01-0923-07199	Jan. 16, 2024 (1Y)