

RADIO PERFORMANCE TEST REPORT

Test Report No. : OT-23O-RWD-011
Reception No. : 2309003002
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-AC1100SC
Model Name : AC1100 SC
Multiple Model Name : N/A
Serial number : N/A
Total page of Report : 20 pages (including this page)
Date of Incoming : September 14, 2023
Date of Issuing : October 05, 2023

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.





Tested by
 Soon-Ki, Choi / Prj. 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 PRODUCT DESCRIPTION.....	6
2.2 MODEL DIFFERENCES.....	6
2.3 RELATED SUBMITTAL(S) / GRANT(S)	6
2.4 PURPOSE OF THE TEST	6
2.5 TEST METHODOLOGY.....	6
2.6 TEST FACILITY.....	6
3. SYSTEM TEST CONFIGURATION	7
3.1 JUSTIFICATION.....	7
3.2 PERIPHERAL EQUIPMENT	7
3.3 MODE OF OPERATION DURING THE TEST	7
3.4 EQUIPMENT MODIFICATIONS.....	7
3.5 CONFIGURATION OF TEST SYSTEM.....	8
3.6 ANTENNA REQUIREMENT	8
4. PRELIMINARY TEST	8
4.1 AC POWER LINE CONDUCTED EMISSIONS TESTS.....	8
4.2 RADIATED EMISSIONS TESTS.....	8
5. FINAL RESULT OF MEASUREMENT.....	9
5.1 CONDUCTED EMISSION TEST.....	9
5.2 RADIATED EMISSION TEST.....	11
5.2.1 Operation frequency band: (13.553 ~ 13.567) MHz.....	11
5.2.2 Operation frequency band: Below 13.553 MHz and above 13.567 MHz.....	12
5.3 SPURIOUS EMISSION TEST.....	13
5.3.1 Spurious Radiated Emission Below 30 MHz	13
5.3.2 Spurious Radiated Emission below 1 GHz.....	14
5.4 20 dB BANDWIDTH	15
5.4.1 Operating environment.....	15
5.4.2 Test set-up	15
5.4.3 Test date	15
5.4.4 Test data	16

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

Revision History

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-23O-RWD-011	October 05, 2023	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-AC1100SC
 -. MODEL NO/NAME : AC1100 SC
 -. SERIAL NUMBER : N/A
 -. DATE : October 05, 2023

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 AC1100 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	13.559 1 MHz, 2 402 MHz ~ 2 480 MHz
MODULATION	ASK
ANTENNA TYPE	Coil Antenna, Chip Antenna
LIST OF EACH OSC. or CRY. FREQ.(FREQ. >= 1 MHz)	13.559 1 MHz
USED AC/DC ADAPTER	Output: DC 12 V, 3.5 A Model No: DSA-42PFB-12 Manufacturer: Dee Van Electronics(Longchuan) 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	PCMKC1MA01 V10	N/A
SUB Board	N/A	PCMKC1SC01 V11	N/A
Display Board	KJC Display Corp	RT040TR101-C12-V02	N/A
13.56 MHz Antenna Board	N/A	PCMKC1SA01_V10	N/A
Bluetooth LE Module	PROCHILD INC.	PBLN51822m	2AEEY-PBLN51822M
ADAPTER	Dee Van Electronics (Longchuan) Co., Ltd..	DSA-42PFB-12	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
AC1100 SC	UNION COMMUNITY	Access controller (EUT)	-
DSA-42PFB-12	Dee Van Electronics(Longchuan) Co., Ltd..	ADAPTER	EUT
N/A	N/A	Door Open Switch	EUT
N/A	N/A	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 and Chip 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 : 48 % R.H.

Temperature: 23 °C

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

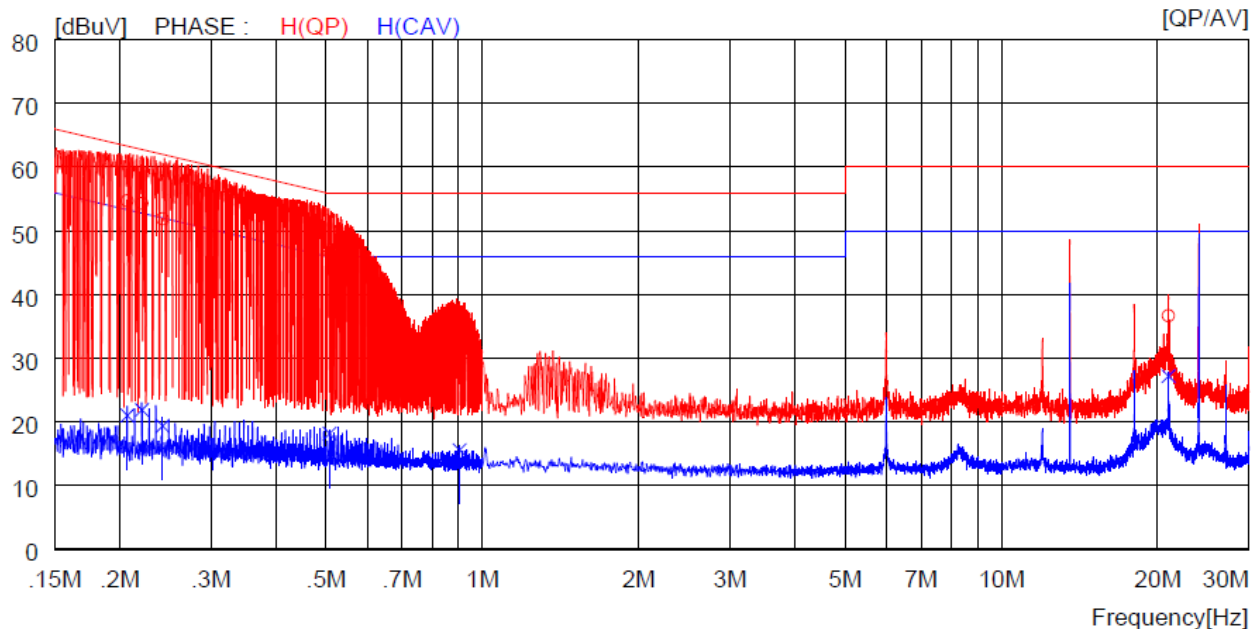
Result : PASSED

EUT : Access controller

Date: September 14, 2023 ~ September 21, 2023

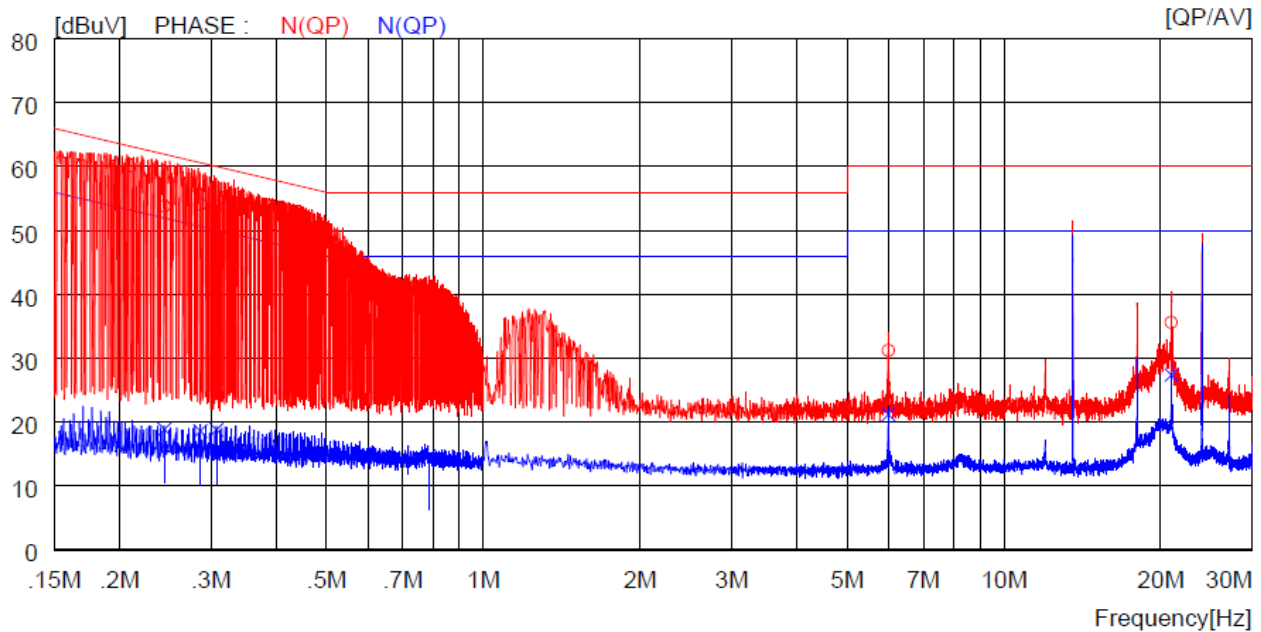
Detector : CISPR Quasi-Peak (6 dB Bandwidth: 9 kHz)

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	0.20700	44.6	----	10.1	54.7	----	63.3	----	8.6	----	H (QP)
2	0.22100	44.2	----	10.1	54.3	----	62.8	----	8.5	----	H (QP)
3	0.24200	41.8	----	10.1	51.9	----	62.0	----	10.1	----	H (QP)
4	0.50800	36.4	----	10.1	46.5	----	56.0	----	9.5	----	H (QP)
5	0.90400	24.3	----	10.1	34.4	----	56.0	----	21.6	----	H (QP)
6	20.99000	26.2	----	10.5	36.7	----	60.0	----	23.3	----	H (QP)
7	0.20700	----	10.9	10.1	----	21.0	----	53.3	----	32.3	H (CAV)
8	0.22100	----	11.8	10.1	----	21.9	----	52.8	----	30.9	H (CAV)
9	0.24200	----	9.3	10.1	----	19.4	----	52.0	----	32.6	H (CAV)
10	0.50800	----	8.1	10.1	----	18.2	----	46.0	----	27.8	H (CAV)
11	0.90400	----	5.5	10.1	----	15.6	----	46.0	----	30.4	H (CAV)
12	20.99000	----	16.7	10.5	----	27.2	----	50.0	----	22.8	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	0.24400	43.7	----	10.1	53.8	----	62.0	----	8.2	----	N (QP)
2	0.28600	44.0	----	10.1	54.1	----	60.6	----	6.5	----	N (QP)
3	0.30700	43.6	----	10.1	53.7	----	60.1	----	6.4	----	N (QP)
4	0.78600	30.1	----	10.1	40.2	----	56.0	----	15.8	----	N (QP)
5	6.00000	20.9	----	10.3	31.2	----	60.0	----	28.8	----	N (QP)
6	20.98000	25.1	----	10.5	35.6	----	60.0	----	24.4	----	N (QP)
7	0.24400	----	8.8	10.1	----	18.9	----	52.0	----	33.1	N (CAV)
8	0.28600	----	8.5	10.1	----	18.6	----	50.6	----	32.0	N (CAV)
9	0.30700	----	8.7	10.1	----	18.8	----	50.1	----	31.3	N (CAV)
10	0.78600	----	4.6	10.1	----	14.7	----	46.0	----	31.3	N (CAV)
11	6.00000	----	10.9	10.3	----	21.2	----	50.0	----	28.8	N (CAV)
12	20.98000	----	16.9	10.5	----	27.4	----	50.0	----	22.6	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: 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: September 14, 2023 ~ September 21, 2023

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)
13.559 1	43.56	-	1.00	19.30	0.87	63.73	124.00	60.27

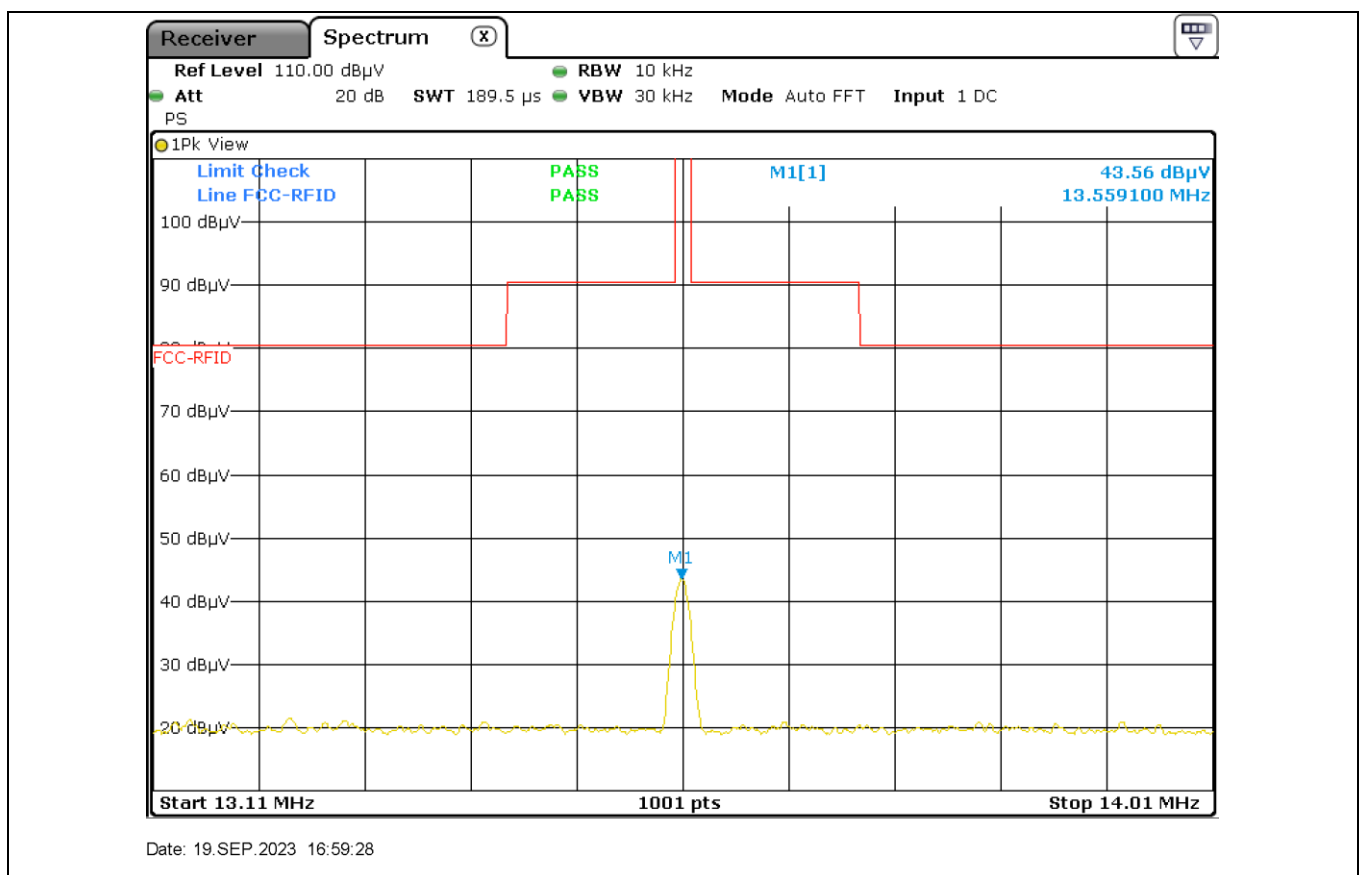
Remark. The EUT was tested at 3 m, so conversation factor was included at above limit.

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: 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: September 14, 2023 ~ September 21, 2023
 Operating Condition : Transmitting Mode



cc. to above test data, the field strength level of 13.559 1 MHz is 43.56 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: 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: September 14, 2023 ~ September 21, 2023
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

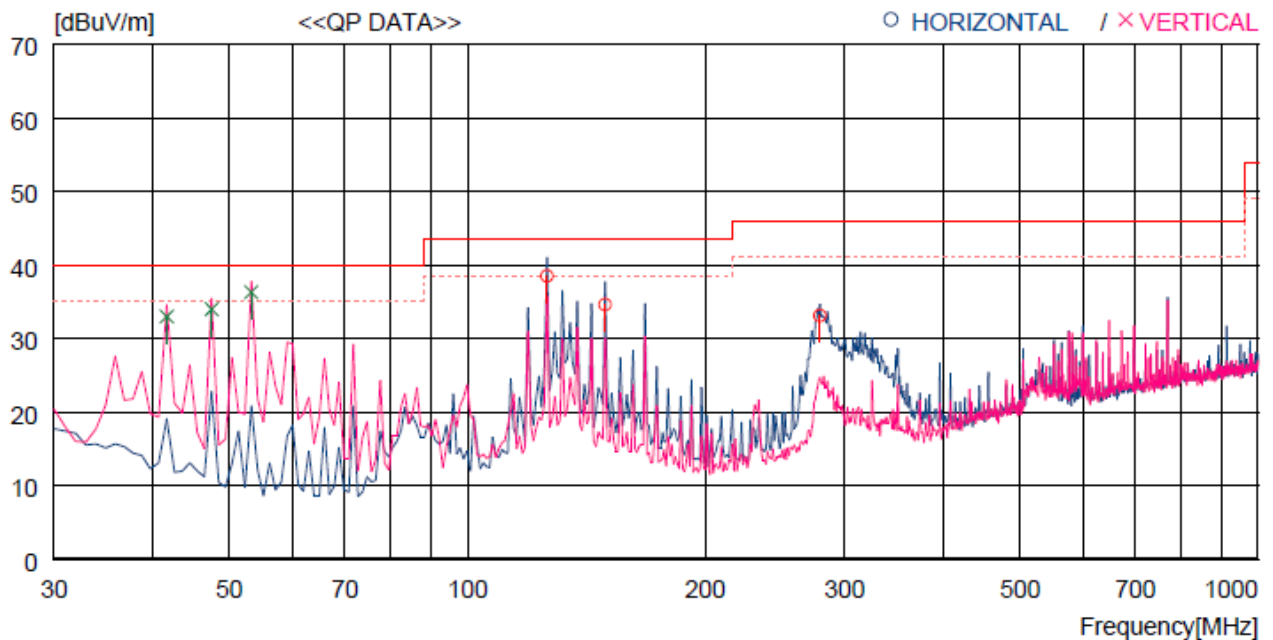
The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

Humidity Level : 48 % R.H. Temperature: 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 ~ 1 000 MHz
Result : PASSED

EUT : Access controller Date: September 14, 2023 ~ September 21, 2023

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	126.030	50.4	19.0	2.2	33.1	38.5	43.5	5.0	400	0
2	149.310	46.5	18.8	2.4	33.1	34.6	43.5	8.9	200	138
3	279.290	44.6	18.4	3.3	33.2	33.1	46.0	12.9	100	125
---- Vertical ----										
4	41.640	48.5	16.3	1.3	33.1	33.0	40.0	7.0	100	94
5	47.460	51.7	14.0	1.4	33.1	34.0	40.0	6.0	100	0
6	53.280	55.5	12.5	1.4	33.1	36.3	40.0	3.7	100	0

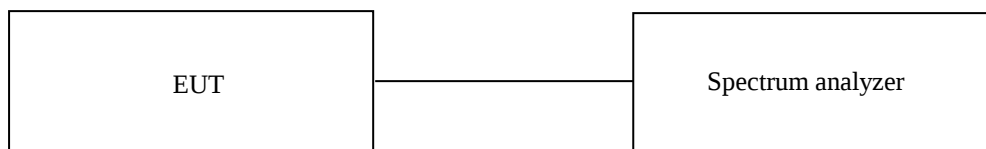
5.4 20 dB BANDWIDTH

5.4.1 Operating environment

Temperature : 24 °C
Relative humidity : 49 % 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.



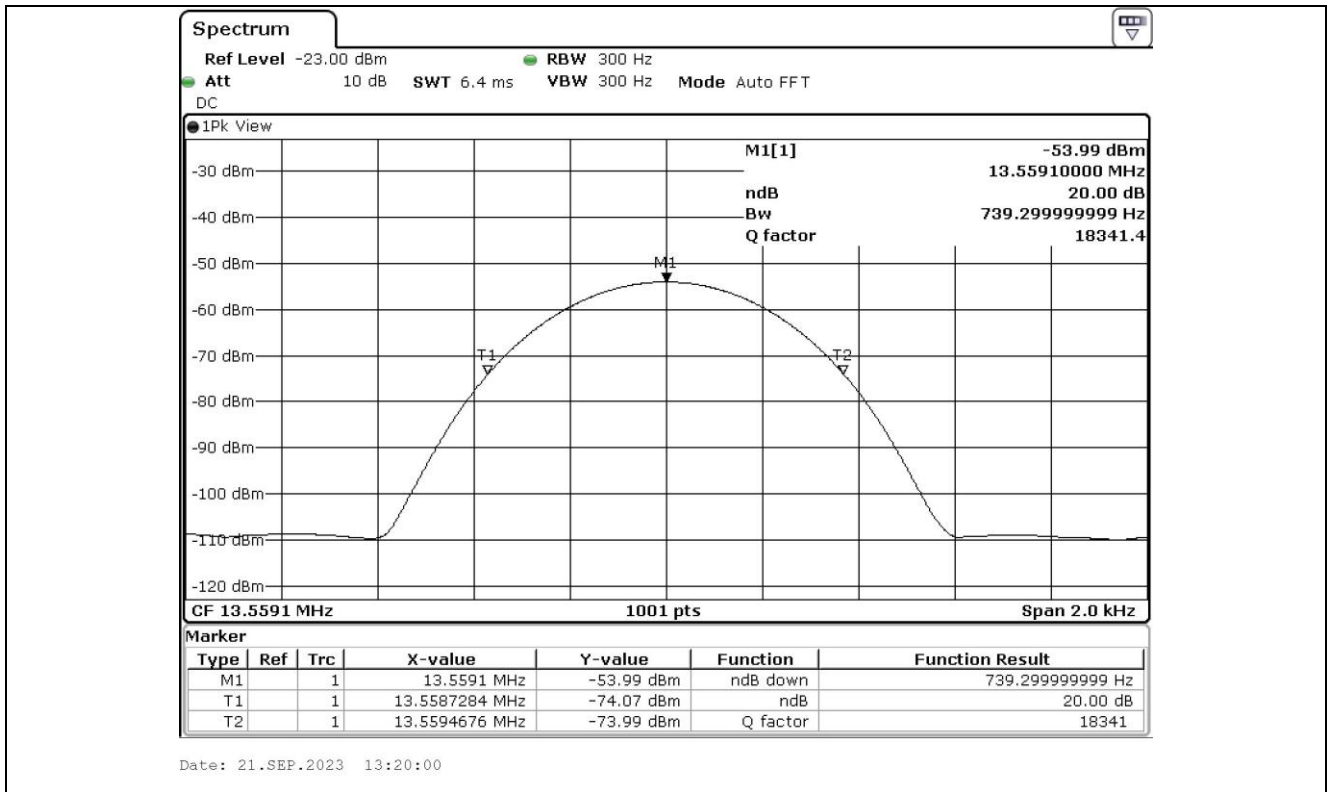
5.4.3 Test date

September 14, 2023 ~ September 21, 2023

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	0.739 2	PASS



5.5 FREQUENCY STABILITY WITH TEMPERATURE VARIATION

5.5.1 Operating environment

Temperature : 23 °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

September 14, 2023 ~ September 21, 2023

5.5.4 Test data

-. Result : PASSED

Temperature (°C)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Margin (Hz)	Limit (Hz)
-20	13,559,100	13,560,071	971	± 1 355.91
-10		13,559,861	761	
0		13,559,633	533	
10		13,559,305	205	
20		13,559,101	1	
30		13,558,917	-183	
40		13,558,761	-339	
50		13,558,630	-470	

5.6 FREQUENCY STABILITY WITH VOLTAGE VARIATION

5.6.1 Operating environment

Temperature : 23 °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

September 14, 2023 ~ September 21, 2023

5.6.4 Test data

-. Result : PASSED

Voltage (Vdc)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Margin (Hz)	Limit (Hz)
13.8(115 %)	13,559,100	13,559,114	14	± 1 355.91
12.0(100 %)		13,559,087	-13	
10.2(85 %)		13,559,030	-70	

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)
=	Corrected Result	(dB μ V/m)

Margin (dB)

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

7. LIST OF TEST EQUIPMENT

Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
ESR	Rohde & Schwarz	EMI Test Receiver	101470	Jun. 16, 2023 (1Y)
ESR	Rohde & Schwarz	EMI Test Receiver	102602	Mar. 15, 2023 (1Y)
FSV30	Rohde & Schwarz	SIGNAL ANALYZER	101372	Jul. 10, 2023 (1Y)
310N	Sonoma Instrument	AMPLIFIER	312544	Mar. 14, 2023 (1Y)
HLP-2008	TDK	Hybrid Antenna	131313	Apr. 05, 2023 (2Y)
NSLK8128	Schwarzbeck	V-LISN (4 * 16/25A)	8126404	Mar. 14, 2023 (1Y)
ESH3-Z2	Rohde & Schwarz	Pulse Limiter	100655	Mar. 13, 2023 (1Y)
DT3000	Innco System	Turn Table	930611	N/A
MA-4000XPET	Innco Systems GmbH	Antenna Master	MA4640/592/ 40700517/-	N/A
FMZB 1513	Schwarzbeck	Loop Antenna	1513-235	Mar. 24, 2022 (2Y)
SSE-43CI-A	Samkun Tech	Environmental Test chamber	60712	Jan. 18, 2023 (1Y)
CO3000	Innco Systems GmbH	Controller	1026/40960617/P	N/A
DT2000-2t	Innco Systems GmbH	Turn Table	N/A	N/A
GP-4303D	LG Precision Co.,Ltd	DC Power Supply	5071069	Jan. 04, 2023 (1Y)