

ELECTROMAGNETIC EMISSION COMPLIANCE REPORT

Test Report No. : OT-18D-RED-168
AGR No. : A18NA-378
Applicant : COSMO Information Technology Co., Ltd.
Address : 14fl., ACE Twin Tower II , 212-30, Guro-Dong, Guro-Gu, Seoul, 152-848, KOREA
Manufacturer : COSMO Information Technology Co., Ltd.
Address : 14fl., ACE Twin Tower II , 212-30, Guro-Dong, Guro-Gu, Seoul, 152-848, KOREA
FCC ID. : 2ATXLLAUREL-X8001
Type of Equipment : Currency Sorter
Model Name : X8
Multiple Model Name : N/A
Serial number : N/A
Total page of Report : 37 pages (including this page)
Date of Incoming : December 03, 2018
Date of Issuing : December 27, 2018

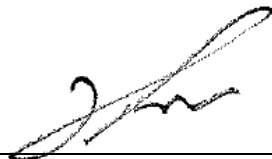
SUMMARY

The equipment complies with the requirement of *FCC CFR 47 PART 15 SUBPART B Class A, Section 15.101*.


This test report contains only the results 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.

Reviewed by:


 Young-Ki, Kim / Senior Engineer
 ONETECH Corp.

Approved by:


 Eung-Chan, Kim / Chief Engineer
 ONETECH Corp.

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Revision History

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-18D-RED-168	December 27, 2018	Initial Release	All

1. VERIFICATION OF COMPLIANCE

-. Applicant : COSMO Information Technology Co., Ltd.
-. Address : 14fl., ACE Twin Tower II , 212-30, Guro-Dong, Guro-Gu, Seoul, 152-848, KOREA
-. Manufacturer : COSMO Information Technology Co., Ltd.
-. Address : 14fl., ACE Twin Tower II , 212-30, Guro-Dong, Guro-Gu, Seoul, 152-848, KOREA
-. Factory : COSMO Information Technology Co., Ltd.
-. Address : 14fl., ACE Twin Tower II , 212-30, Guro-Dong, Guro-Gu, Seoul, 152-848, KOREA
-. Model Name : X8
-. Serial Number : N/A
-. Brand/Trade Name : N/A
-. Date : December 27, 2018

EQUIPMENT CLASS	Part 15 Class A Digital Device
E.U.T. DESCRIPTION	Currency Sorter
MEASUREMENT PROCEDURES	ANSI C63.4: 2014
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification
STANDARDS	FCC Part 15, Section 15.101 (CLASS A)
MODIFICATIONS ON THE EQUIPMENT TO ACHIEVE COMPLIANCE	None
FINAL TEST WAS CONDUCTED ON	10 m Semi anechoic chamber

ONETECH Corp. tested the above equipment in accordance with the requirements set forth in the above standard. The test results show that equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

2. TEST SUMMARY

2.1 Test items and results

SECTION	TEST ITEMS	RESULTS
15.107	Conducted Emission Limits	Met the Limit / PASS
15.109	Radiated Emission Limits	Met the Limit / PASS

3. GENERAL INFORMATION

3.1 Product Description

The COSMO Information Technology Co., Ltd., Model X8 (referred to as the EUT in this report) is a Currency Sorter. Product specification described herein was obtained from product data sheet or user's manual.

CHASSIS TYPE	Metal & Plastic
LIST OF EACH OSC. OR CRY. FREQ.(FREQ.>=1 MHz)	100 MHz
ELECTRICAL RATING	120 V, 60 Hz
EXTERNAL CONNECTOR	AC IN, CD

3.2 Model Differences

-. The following lists consist of the added model and their differences.: None

3.3 Related Submittal(s) / Grant(s)

Original submittal only

3.4 Test System Details

The model numbers for all the equipments, which were used in the tested system, is:

Model	Manufacturer	Description	Connected to
X8	COSMO Information Technology Co., Ltd.	Currency Sorter	-
N/A	N/A	Counter	EUT

3.5 Test Methodology

The radiated testing was performed according to the procedures in ANSI C63.4: 2014. Radiated testing was performed at a distance of 10 m from EUT to the antenna.

3.6 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:

- 1) 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea
- 2) 12-5, Jinsaegol-gil 75 beon-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea

-. Site Filing:

VCCI (Voluntary Control Council for Interference) – Registration No. R-4112/ C-14617/ G-10666/ T-1842

IC (Industry Canada) – Registration No. Site# 3736A-3

-. Site Accreditation:

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

FCC (Federal Communications Commission) - Accreditation No. KR0013

RRA (Radio Research Agency) – Designation No. KR0013

4. SYSTEM TEST CONFIGURATION

4.1 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	N/A	N/A

4.2 Mode of operation during the test

- . The EUT was operated with the normal operating mode continuously during the test.
- . Input power condition during the measurements was AC 120 V / 60 Hz.

4.3 Cable Description

Ports Name	Shielded	Ferrite Bead	Metal Shell	Length (m)	Connected to
AC IN	N	N	N	1.5	LISN
CD	N	N	N	1.0	Counter

4.4 Equipment Modifications

- . None.

4.5 Configuration of Test System

- Line Conducted Test: The EUT was connected to LISN. Preliminary Power line Conducted Emission test was performed by using the procedure in ANSI C63.4: 2014 7.3.3 to determine the worse operating conditions.
- Radiated Emission Test: Preliminary radiated emission test was conducted using the procedure in ANSI C63.4: 2014 8.3.1.1 to determine the worse operating conditions. Final radiated emission test was conducted at 10 m semi anechoic chamber.

5. PRELIMINARY TEST

5.1 AC Power line Conducted Emission Test

During Preliminary Test, the following operating mode was investigated.

Operation Mode	The Worst operating condition (Please check one only)
Normal operating	X

5.2 Radiated Emission Test

During Preliminary Test, the following operating mode was investigated.

Operation Mode	The Worst operating condition (Please check one only)
Normal operating	X

6. FINAL RESULT OF MEASUREMENT

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

6.1 Conducted Emission Test

6.1.1 Operating Environment

Temperature : 21.8 °C
Relative humidity : 50.4 % R.H.

6.1.2 Test Setup

The photocopier that the EUT has been inserted in was placed on an insulator above the reference ground plane. The power of photocopier was fed through a 50 Ω / 50 μ H + 5 Ω LISN. The ground plane was electrically bonded to the reference ground system and all power lines were filtered from ambient.

6.1.3 Measurement uncertainty

Conducted emission, quasi-peak detection : ± 2.14 dB
Conducted emission, CISPR-average detection : ± 2.14 dB

Measurement uncertainty is calculated in accordance with CISPR 16-4-2. The measurement uncertainty is given with a confidence of 95 % with the coverage factor, $k = 2$.

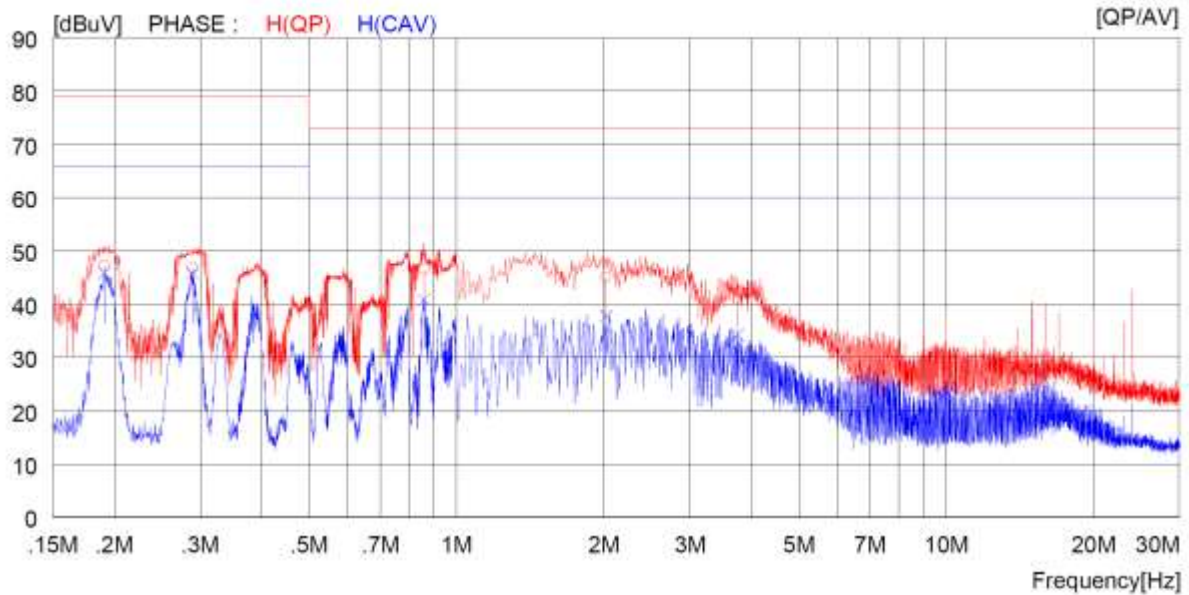
5.1.4 Limit

Frequency of Emission (MHz)	Conducted Limit (dB μ V)	
	Quasi-peak	CISPR Average
0.15 ~ 0.5	79	66
0.5 ~ 30	73	60
* Decreases with the logarithm of the frequency		

5.1.5 Test data

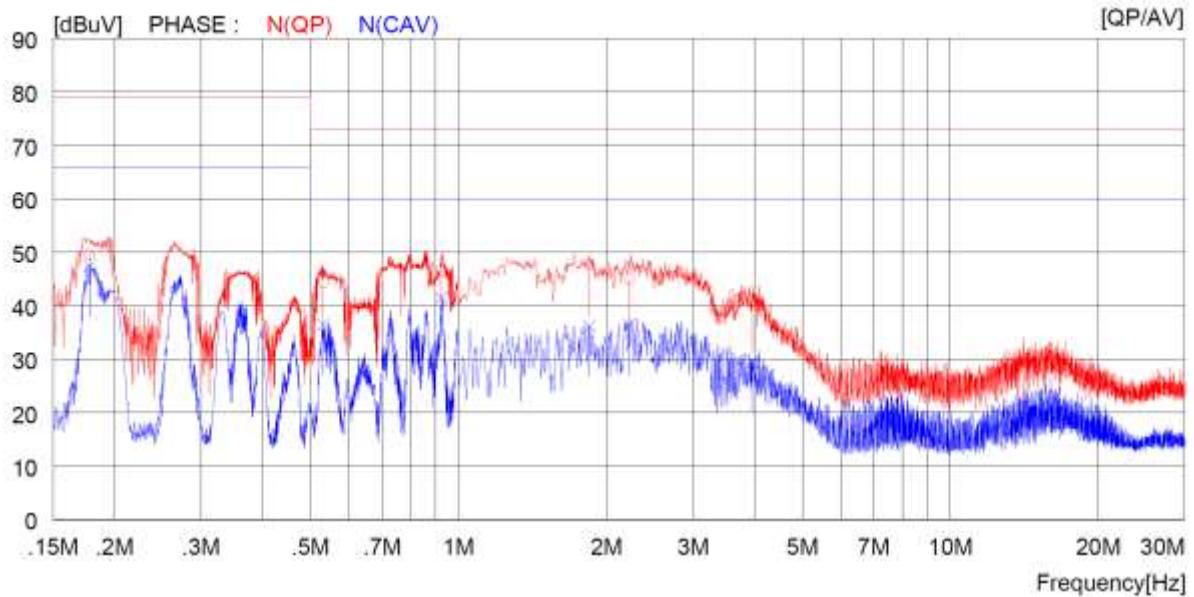
Limits apply to : FCC CFR 47, PART 15, SUBPART B, SECTION 15.107 (a)
Type of Test : CLASS A
Result : PASSED BY 5.7 dB at 1.67200 MHz under CISPR-Average detector mode on HOT Line

EUT : X8 Date: December 13, 2018
Detector : Q.P (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 [dB]	AV [dB]	
1	0.19100	37.3	----	10.0	47.3	----	79.0	----	31.7	----	H (QP)
2	0.28900	36.9	----	9.9	46.8	----	79.0	----	32.2	----	H (QP)
3	0.85800	36.6	----	10.0	46.6	----	73.0	----	26.4	----	H (QP)
4	2.02000	35.0	----	10.0	45.0	----	73.0	----	28.0	----	H (QP)
5	3.75200	30.9	----	10.1	41.0	----	73.0	----	32.0	----	H (QP)
6	10.01000	18.4	----	10.2	28.6	----	73.0	----	44.4	----	H (QP)
7	0.19100	----	35.8	10.0	----	45.8	----	66.0	----	20.2	H (CAV)
8	0.28900	----	35.9	9.9	----	45.8	----	66.0	----	20.2	H (CAV)
9	0.85800	----	30.9	10.0	----	40.9	----	60.0	----	19.1	H (CAV)
10	2.02000	----	27.8	10.0	----	37.8	----	60.0	----	22.2	H (CAV)
11	3.75200	----	24.2	10.1	----	34.3	----	60.0	----	25.7	H (CAV)
12	10.01000	----	13.3	10.2	----	23.5	----	60.0	----	36.5	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 [dB]	AV [dB]	
1	0.17800	39.4	----	10.0	49.4	----	79.0	----	29.6	----	N(QP)
2	0.53100	34.2	----	10.0	44.2	----	73.0	----	28.8	----	N(QP)
3	0.92500	36.6	----	10.0	46.6	----	73.0	----	26.4	----	N(QP)
4	1.84800	37.6	----	10.0	47.6	----	73.0	----	25.4	----	N(QP)
5	2.22800	34.9	----	10.0	44.9	----	73.0	----	28.1	----	N(QP)
6	3.96000	30.9	----	10.1	41.0	----	73.0	----	32.0	----	N(QP)
7	0.17800	----	37.4	10.0	----	47.4	----	66.0	----	18.6	N(CAV)
8	0.53100	----	26.4	10.0	----	36.4	----	60.0	----	23.6	N(CAV)
9	0.92500	----	31.5	10.0	----	41.5	----	60.0	----	18.5	N(CAV)
10	1.84800	----	26.2	10.0	----	36.2	----	60.0	----	23.8	N(CAV)
11	2.22800	----	26.4	10.0	----	36.4	----	60.0	----	23.6	N(CAV)
12	3.96000	----	19.4	10.1	----	29.5	----	60.0	----	30.5	N(CAV)

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

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

Tested by: Young-Jae, Kim / Engineer

6.2 Radiated Emission Test

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

6.1.1 Operating Environment

Temperature : 22.9 °C
Relative humidity : 51.3 % R.H.

6.1.2 Test Setup

The radiated emissions measurements were on the 10 m, in 10 m semi anechoic chamber. The photocopier that the EUT has been inserted in was placed on an insulator above the ground plane.

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.

6.1.3 Measurement uncertainty

Radiated emission electric field intensity, 30 MHz ~ 1 000 MHz : 4.06 dB

Measurement uncertainty is calculated in accordance with CISPR 16-4-2. The measurement uncertainty is given with a confidence of 95 % with the coverage factor, $k = 2$.

6.1.4 Limit (Class A)

Frequency of Emission (MHz)	Resolution bandwidth	Field strength @ 3 m (dBμV/m)	
30 ~ 88 88 ~ 216 216 ~ 960 960 ~ 1 000	120 kHz	Quasi-peak	
		40.0	
		43.5	
		46.0	
		54.0	
> 1 000	1 MHz	Peak Limit	CISPR Average Limit
		74.0	54.0

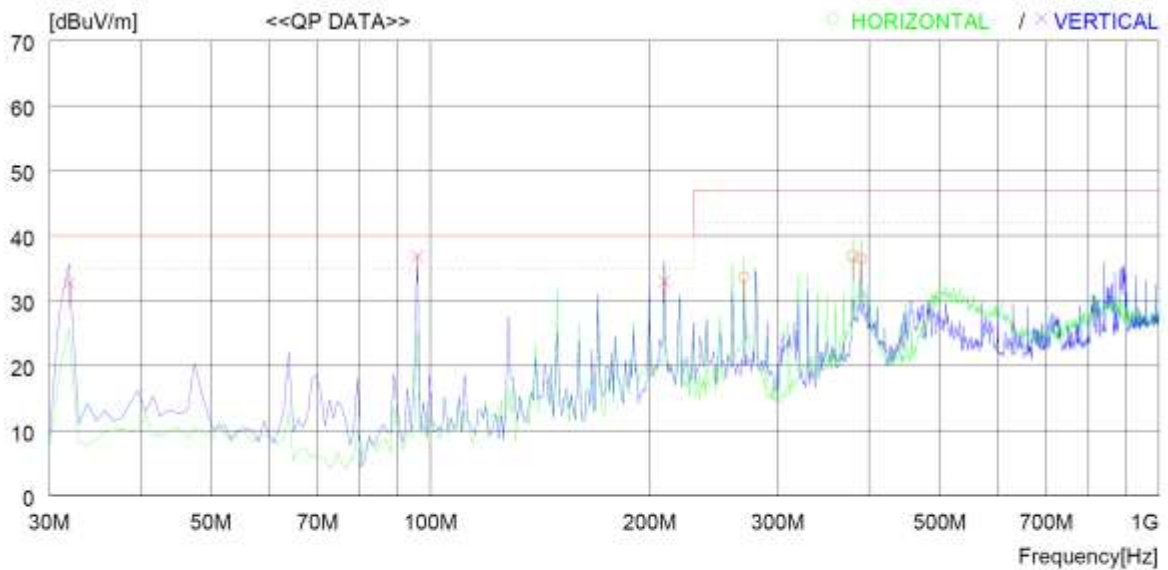
*Alternative to Limits for radiated disturbance of CISPR22 class A ITE at a measuring distance of 10 m

Frequency of Emission (MHz)	Resolution bandwidth	Field strength @ 10 m (dB μ V/m)
30 ~ 230 230 ~ 1 000	120 kHz	Quasi-peak
		40.0
		47.0

6.1.5 Test data

Limits apply to : FCC CFR 47, PART 15, SUBPART B, SECTION 15.109 (b)
Type of Test : CLASS A
Result : PASSED BY 3.2 dB at 95.960 MHz

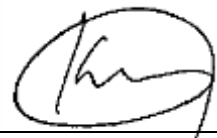
EUT : X8 Date: December 14, 2018
Frequency Range : 30 MHz ~ 1 000 MHz
Detector : Q.P (6 dB Bandwidth: 120 kHz)
Distance : 10 m



No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	QP	FACTOR	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
---- Horizontal ----										
1	269.590	49.8	13.0	3.8	33.0	33.6	47.0	13.4	300	167
2	380.170	49.9	15.4	4.5	33.0	36.8	47.0	10.2	200	359
3	389.870	49.5	15.6	4.5	33.1	36.5	47.0	10.5	200	359
---- Vertical ----										
4	31.940	51.8	12.7	1.3	33.1	32.7	40.0	7.3	100	7
5	95.960	55.6	12.0	2.2	33.0	36.8	40.0	3.2	100	359
6	209.450	51.6	11.1	3.3	33.0	33.0	40.0	7.0	100	284

Remark: Margin (dB) = Limit – Result and Result = Reading Quasi-Peak + Antenna Factor + Loss – Gain

Loss and Gain in above table means Cable Loss and Pre-amplifier gain.



Tested by: Young-Jae, Kim / Engineer

7. FIELD STRENGTH CALCULATION

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

+	Meter reading	(dB μ V)
+	Cable Loss	(dB)
+	Antenna Factor	(dB/m)
		<hr/>
=	Corrected Reading	(dB μ V/m)
Margin (dB)		
	Specification Limit	(dB μ V/m)
-	Corrected Reading	(dB μ V/m)
		<hr/>
=	dB Relative to Spec	(\pm dB)

8. LIST OF TEST EQUIPMENT

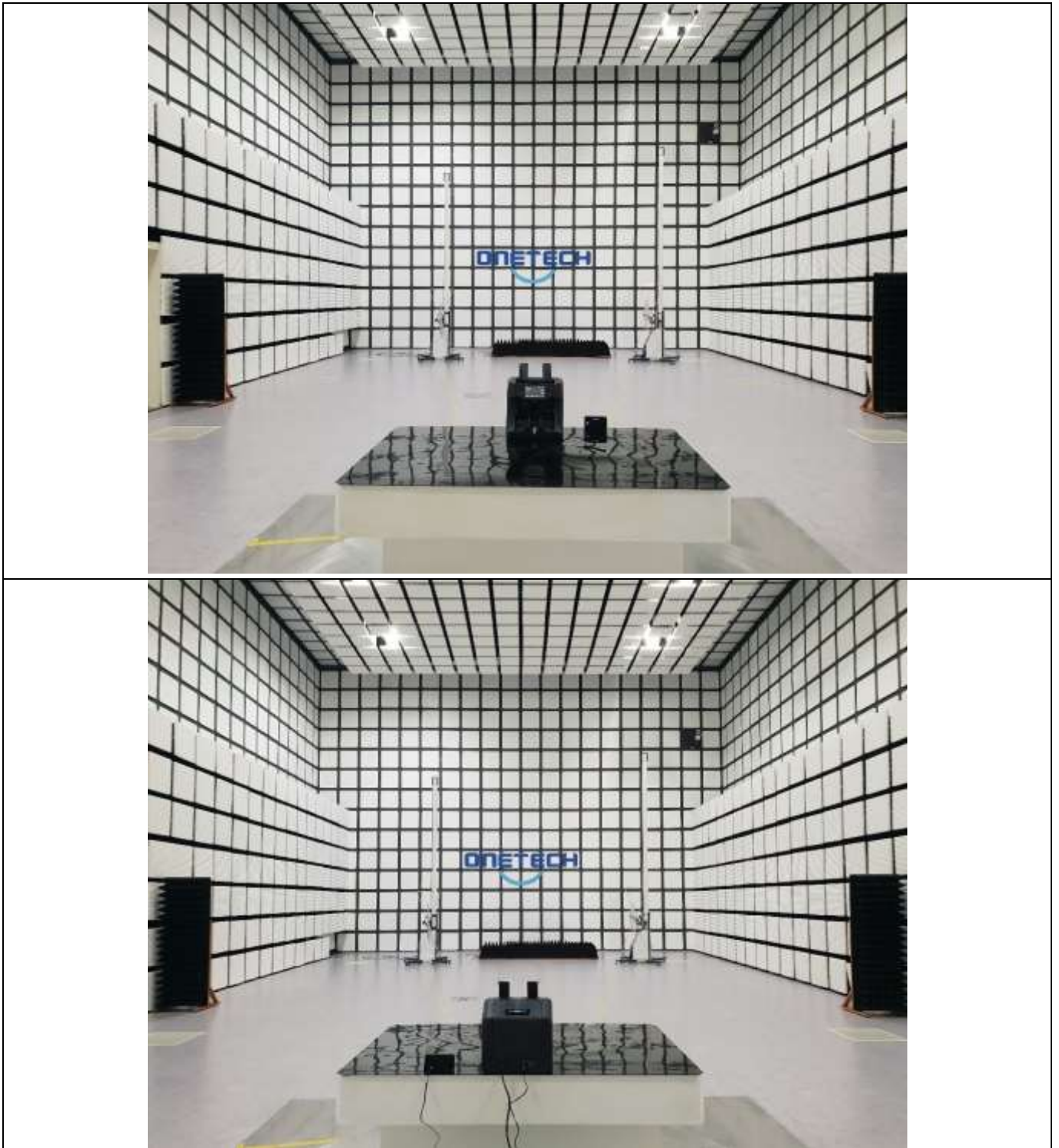
No.	EQUIPMENTS	MFR.	MODEL	SER. NO.	LAST CAL	DUE CAL	USE
1.	Test receiver	R & S	ESCI	101012	Oct. 22, 2018	One Year	■
2.			ESCI	101013	Mar. 28, 2018	One Year	□
3.			ESR	101470	Oct. 22, 2018	One Year	■
4.	Amplifier	Sonoma	310N	312544	Mar. 28, 2018	One Year	■
5.		Instrument	310N	312545	Mar. 28, 2018	One Year	□
6.		Hewlett Packard	8447D	2944A07777	Mar. 29, 2018	One Year	□
7.	TRILOG Broadband Antenna	Schwarzbeck	VULB9163	9163-419	Aug. 09, 2018	Two Years	■
8.			VULB9163	9163-255	Jun. 05, 2018	Two Years	□
9.	Horn Antenna	Schwarzbeck	BBHA9120D	BBHA9120D295	Aug 16, 2017	Two Years	□
10.	Amplifier	Schwarzbeck	BBV9718	310	Mar. 30, 2018	One Year	□
11.	LISN	EMCO	3825/2	9109-1867	Mar. 28, 2018	One Year	□
12.				9109-1869	Apr. 11, 2018	One Year	□
13.		Schwarzbeck	NSLK 8128	8128-216	Mar. 28, 2018	One Year	■
14.			NSLK 8126	8126-404	Apr. 04, 2018	One Year	□
15.	Pulse Limiter	Rohde & Schwarz	ESH3Z2	100655	Mar. 28, 2018	One Year	■
16.	Controller	Innco System	CO3000	CO3000/904 /37211215/L	N/A	N/A	■
17.			CO3000	N/A	N/A	N/A	□
18.	Turn Table	Innco System	DT3000	930611	N/A	N/A	■
19.			DT5000-3t- Teagplatten	N/A	N/A	N/A	□
20.	Antenna Master	Innco System	MA-4000XPET	MA4000/509 /37211215/L	N/A	N/A	■
21.			MA4000-EP	N/A	N/A	N/A	□

Remark: Mark ■ mean used equipment.

APPENDIX I - TEST SET-UP PHOTOS: (Conducted emission)



APPENDIX II - TEST SET-UP PHOTOS: (Radiated emission)



APPENDIX III - PHOTOGRAPHS REPORT

