

# ELECTROMAGNETIC EMISSION COMPLIANCE REPORT

Test Report No. : OT-192-RED-118

AGR No. : A191A-341

Applicant : USOL Co., Ltd.

Address : Radio center #301, 35, Techno 9-ro, Yuseong-gu, Daejeon, Republic of Korea

Manufacturer : USOL Co., Ltd.

Address : Radio center #301, 35, Techno 9-ro, Yuseong-gu, Daejeon, Republic of Korea

FCC ID. : 2ASL6ULD-3G001

Type of Equipment : Leak Detection Sensor

Model Name : ULD-3G001

Multiple Model Name : N/A

Serial number : N/A

Total page of Report : 16 pages (including this page)

Date of Incoming : January 31, 2019

Date of Issuing : February 25, 2019

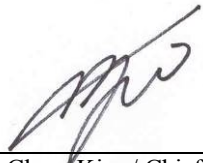
## SUMMARY

The equipment complies with the requirement of *FCC CFR 47 PART 15 SUBPART B Class B, 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:

  
Eung-Chan, Kim / Chief Engineer  
ONETECH Corp.

Approved by:

  
Gea-Won, Lee / Exe. Managing Director  
ONETECH Corp.

## CONTENTS

	PAGE
<b>1. VERIFICATION OF COMPLIANCE .....</b>	<b>4</b>
<b>2. TEST SUMMARY.....</b>	<b>5</b>
2.1 TEST ITEMS AND RESULTS.....	5
<b>3. GENERAL INFORMATION.....</b>	<b>5</b>
3.1 PRODUCT DESCRIPTION.....	5
3.2 MODEL DIFFERENCES.....	5
3.3 RELATED SUBMITTAL(S)/ GRANT(S) .....	5
3.4 TEST SYSTEM DETAILS .....	5
3.5 TEST METHODOLOGY .....	5
3.6 TEST FACILITY .....	6
<b>4. SYSTEM TEST CONFIGURATION.....</b>	<b>7</b>
4.1 JUSTIFICATION .....	7
4.2 MODE OF OPERATION DURING THE TEST.....	7
4.3 CABLE DESCRIPTION .....	7
4.4 EQUIPMENT MODIFICATIONS .....	7
4.5 CONFIGURATION OF TEST SYSTEM .....	7
<b>5. PRELIMINARY TEST .....</b>	<b>8</b>
5.1 RADIATED EMISSION TEST .....	8
<b>6. FINAL RESULT OF MEASUREMENT .....</b>	<b>9</b>
6.1 RADIATED EMISSION TEST .....	9
6.1.1 <i>Operating Environment</i> .....	9
6.1.2 <i>Test Setup</i> .....	9
6.1.3 <i>Measurement uncertainty</i> .....	9
6.1.4 <i>Limit (Class B)</i> .....	9
6.1.5 <i>Test data</i> .....	10
<b>7. FIELD STRENGTH CALCULATION .....</b>	<b>11</b>
<b>8. LIST OF TEST EQUIPMENT .....</b>	<b>12</b>
<b>APPENDIX I - TEST SET-UP PHOTOS: (RADIATED EMISSION).....</b>	<b>13</b>
<b>APPENDIX II - PHOTOGRAPHS REPORT .....</b>	<b>14</b>

**Revision History**

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-192-RED-118	February 25, 2019	Initial Release	All

## 1. VERIFICATION OF COMPLIANCE

-. APPLICANT : USOL Co., Ltd.  
 -. ADDRESS : Radio center #301, 35, Techno 9-ro, Yuseong-gu, Daejeon, Republic of Korea  
 -. Manufacturer : USOL Co., Ltd.  
 -. ADDRESS : Radio center #301, 35, Techno 9-ro, Yuseong-gu, Daejeon, Republic of Korea  
 -. Factory : USOL Co., Ltd.  
 -. ADDRESS : Radio center #301, 35, Techno 9-ro, Yuseong-gu, Daejeon, Republic of Korea  
 -. MODEL NAME : ULD-3G001  
 -. SERIAL NUMBER : N/A  
 -. BRAND/TRADE NAME : N/A  
 -. DATE : February 25, 2019

EQUIPMENT CLASS	Class B digital devices
E.U.T. DESCRIPTION	Leak Detection Sensor
THIS REPORT CONCERNS	Original Grant
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 B)
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	N/A (Note.1)
15.109	Radiated Emission Limits	Met the Limit / PASS

Note 1. This test was not performed the because of the EUT is DC(battery) product.

## 3. GENERAL INFORMATION

### 3.1 Product Description

The USOL Co., Ltd., Model ULD-3G001 (referred to as the EUT in this report) is a Leak Detection Sensor. Product specification described herein was obtained from product data sheet or user's manual.

CHASSIS TYPE	Plastic
LIST OF EACH OSC. OR CRY. FREQ.(FREQ.>=1 MHz)	N/A
ELECTRICAL RATING	Battery 3.9 V
NUMBER OF PCB LAYERS (P. C. BOARD NAME)	N/A
EXTERNAL CONNECTOR	Signal out

### 3.2 Model 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
HDNS AVM	USOL Co., Ltd.	ULD-3G001	-
N/A	LENOVO	Notebook PC	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
Sub COMM BOARD	Sierra Wireless Inc.	N/A	N7NHL8548

### 4.2 Mode of operation during the test

- Checked the sensor detection mode after the EUT was connected to notebook PC.
- 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
Signal out	N	N	N	1.5	Notebook PC

### 4.4 Equipment Modifications

- None.

### 4.5 Configuration of Test System

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 Radiated Emission Test

During Preliminary Test, the following operating mode was investigated.

Operation Mode	The Worst operating condition (Please check one only)
Sensor detection mode	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 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 : 21.4 °C  
Relative humidity : 50.1 % 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 : 4.50 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 B)

Frequency of Emission (MHz)	Resolution bandwidth	Field strength @ 3 m (dBμV/m)	
30 ~ 88 88 ~ 216 216 ~ 230 230 ~ 960 960 ~ 1 000	120 kHz	Quasi-peak	
		40.0	
		43.5	
		46.0	
		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 B ITE at a measuring distance of 10 m

Frequency of Emission (MHz)	Resolution bandwidth	Field strength @ 10 m (dB $\mu$ V/m)
30 ~ 230 230 ~ 1 000	120 kHz	Quasi-peak
		30.0 37.0

### 6.1.5 Test data

Limits apply to : FCC CFR 47, PART 15, SUBPART B, SECTION 15.109 (g)

Type of Test : CLASS B

Result : PASSED BY 2.6 dB at 155.130 MHz

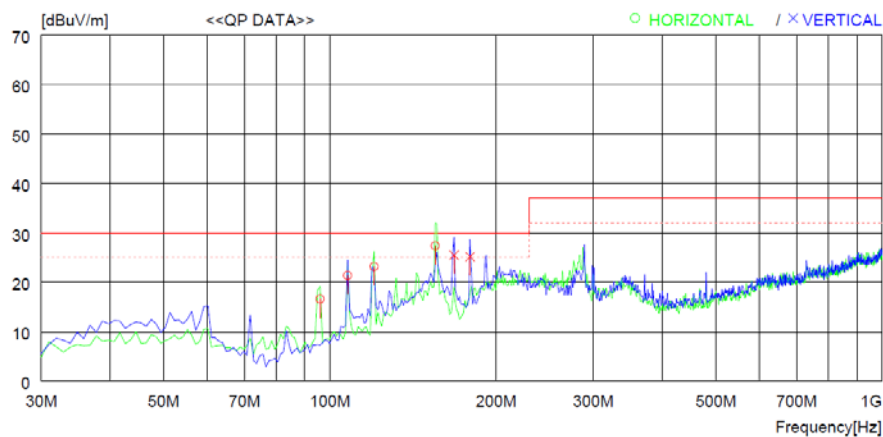
EUT : ULD-3G001

Date: February 01, 2019

Frequency Range : 30 MHz ~ 1 000 MHz

Detector : Q.P (6 dB Bandwidth: 120 kHz)

Distance : 10 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	95.960	35.9	11.5	2.2	33.0	16.6	30.0	13.4	400	0
2	107.600	40.1	11.9	2.4	33.0	21.4	30.0	8.6	400	0
3	120.210	43.3	10.4	2.5	33.0	23.2	30.0	6.8	400	0
4	155.130	49.1	8.3	3.0	33.0	27.4	30.0	2.6	400	47
----- Vertical -----										
5	167.740	46.7	8.8	3.0	33.0	25.5	30.0	4.5	100	37
6	179.380	45.6	9.5	3.1	33.0	25.2	30.0	4.8	100	37

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: Sun-Teak, Oh / Engineer

## 7. FIELD STRENGTH CALCULATION

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

+	Meter reading	(dB $\mu$ V)
+	Cable Loss	(dB)
+	Antenna Factor	(dB/m)
		<hr/>
=	Corrected Reading	(dB $\mu$ V/m)
Margin (dB)		
	Specification Limit	(dB $\mu$ V/m)
-	Corrected Reading	(dB $\mu$ 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	<input type="checkbox"/>
2.			ESCI	101013	Mar. 28, 2018	One Year	<input type="checkbox"/>
3.			ESR	101470	Oct. 22, 2018	One Year	<input checked="" type="checkbox"/>
4.	Amplifier	Sonoma	310N	312544	Mar. 28, 2018	One Year	<input checked="" type="checkbox"/>
5.		Instrument	310N	312545	Mar. 28, 2018	One Year	<input type="checkbox"/>
6.		Hewlett Packard	8447D	2944A07777	Mar. 29, 2018	One Year	<input type="checkbox"/>
7.	TRILOG Broadband Antenna	Schwarzbeck	VULB9163	9163-419	Aug. 14, 2018	Two Years	<input checked="" type="checkbox"/>
8.			VULB9163	9163-255	Jun. 05, 2018	Two Years	<input type="checkbox"/>
9.	Horn Antenna	Schwarzbeck	BBHA9120D	BBHA9120D295	Aug 16, 2017	Two Years	<input type="checkbox"/>
10.	Amplifier	Schwarzbeck	BBV9718	310	Mar. 30, 2018	One Year	<input type="checkbox"/>
11.	LISN	EMCO	3825/2	9109-1867	Mar. 28, 2018	One Year	<input type="checkbox"/>
12.				9109-1869	Apr. 11, 2018	One Year	<input type="checkbox"/>
13.		Schwarzbeck	NSLK 8128	8128-216	Mar. 28, 2018	One Year	<input type="checkbox"/>
14.			NSLK 8126	8126-404	Apr. 04, 2018	One Year	<input type="checkbox"/>
15.			NSLK 8126	8126-479	Oct. 22, 2018	One Year	<input type="checkbox"/>
16.	Pulse Limiter	Rohde & Schwarz	100655	ESH3Z2	Mar. 28, 2018	One Year	<input type="checkbox"/>
17.	Controller	Innco System	CO3000	CO3000/904 /37211215/L	N/A	N/A	<input checked="" type="checkbox"/>
18.			CO3000	N/A	N/A	N/A	<input type="checkbox"/>
19.	Turn Table	Innco System	DT3000	930611	N/A	N/A	<input checked="" type="checkbox"/>
20.			DT5000-3t-Teagplatten	N/A	N/A	N/A	<input type="checkbox"/>
21.	Antenna Master	Innco System	MA-4000XPET	MA4000/509 /37211215/L	N/A	N/A	<input checked="" type="checkbox"/>
22.			MA4000-EP	N/A	N/A	N/A	<input type="checkbox"/>

Remark: Mark ☒ mean used equipment.

**APPENDIX I - TEST SET-UP PHOTOS: (Radiated emission)**





## APPENDIX II - PHOTOGRAPHS REPORT

