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Project No.: 12CA38794  
File No.: MC17119  
Report No.: 12CA38794-FCC-2  
Date: August 07, 2012  
Model No.: IRES-700 10W  
FCC ID.: WYFIRES-70010W

## **FCC Maximum Permissible Exposure Report**

**in accordance with  
FCC Part 27 Subpart C §27.52**

**for**

### **700MHz ICS Repeater System**

**AIRPOINT CO., LTD.**

**MIGUN TECHNO WORLD 2-CHA, 533-1, YONGSAN-DONG,  
YUSEONG-GU, DAEJEON, 305-500**

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to public safety and committed to  
quality service for over 100 years*

### **Summary of Test Results:**

The following tests were performed on a sample submitted for evaluation of compliance with FCC Part 27 Subpart C.

No	Reference Clause No.	FCC Part 27 Subpart C Conformance Requirements	Result	Verdict	Remark
1	§2.1093 §27.52	RF Safety	Complied		See Note


Note : End users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance, because the applicant does not provide an antenna for sale with the EUT

### **Conclusion:**

The tests listed in the Summary of Testing section of this report have been performed and the results recorded by UL Korea Ltd. in accordance with the procedures stated in each test requirement and specification. The test list was determined by the Applicant as being applicable to the Equipment Under Test. As a result, the subject product has been verified to comply or not comply as noted in the Summary of Testing with each test specification. The test results relate only to the items tested.



Tested by  
Kyung Duk Ko, WiSE Project Engineer  
UL Verification Services- 3014ASEO  
UL Korea Ltd.  
August 07, 2012



Tested by  
Jeawoon, Choi, WiSE Engineering Leader  
UL Verification Services- 3014ASEO  
UL Korea Ltd.  
August 07, 2012

### **Test Report Details**

Tests Performed By: UL Korea Ltd.  
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Test Site: ONETECH Corp.  
301-14 Daessangryeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do,  
464-862 Korea

Applicant: AIRPOINT CO., LTD.  
MIGUN TECHNO WORLD 2-CHA, 533-1, Yongsan-dong, Yuseong-gu,  
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Product Type: 700MHz ICS Repeater System

Model Number: IRES-700 10W

Trademark: N/A

Sample Serial Number: N/A

Test standards: FCC Part 27 Subpart C Section 27.52  
RF Safety

Sample Serial Number: N / A

Sample Receive Date: July 18, 2012

Testing Start Date: July 23, 2012

Testing Date: August 03, 2012

**Overall Results:** **Pass**

UL Korea Ltd. reports apply only to the specific test samples and test results submitted for UL's review. All samples tested were in good operating condition throughout the entire test program. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. UL Korea Ltd. shall have no liability for any deductions, inferences or generalizations drawn by the client or others from UL Korea Ltd. issued reports. This report shall not be used to claim, constitute or imply product certification, approval, or any agency of the National Authorities. This report may contain test results that are not covered by the NVLAP or KOLAS accreditation.

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## 1. General Product Information

### 1.1. Equipment Description

IRES-700 10W is the module that integrates PCS Licensed Transmitter.

### 1.2. Details of Test Equipment (EUT)

- Equipment Type : 700MHz ICS Repeater System
- Model No. : IRES-700 10W
- Trade name : AirPoint
- Type of test Equipment : Fixed type
- Operating characteristic : Miscellaneous Wireless Communications Services
- Manufacturer : AIRPOINT CO., LTD.  
MIGUN TECHNO WORLD 2-CHA, 533-1, Yongsan-dong, Yuseong-gu,  
Daejeon, 305-500 Korea

### 1.3. Equipment Configuration

The EUT is consisted of the following component provided by the manufacturer.

Use*	Product Type	Manufacturer	Model	Comments
EUT	700MHz ICS Repeater System	AIRPOINT CO., LTD.	IRES-700 10W	-
<b>Note:</b> Use = EUT - Equipment Under Test, AE - Auxiliary/Associated Equipment. SIM - Simulator (Not Subjected to Test)				

#### 1.4. Technical Data

Item	Type of WiFi module
Frequency Ranges	Downlink : 746 – 757 MHz Uplink : 776 – 787 MHz
Output power	Downlink : 40 dBm Uplink : 27 dBm
Kind of modulation (s)	Downlink : QPSK, 16QAM, 64QAM Uplink : QPSK, 16QAM
Emission Designator	G7D(QPSK), D7W(16QAM, 64QAM)
Channel	Downlink : 751 MHz (1 channel) Uplink : 782 MHz (1 channel)
Antenna Gain	Service Antenna (Downlink Tx / Uplink Rx) : 20 dBi (See Note 2) Donor Antenna (Downlink Rx / Uplink Tx) : 20 dBi (See Note 2)
Antenna Type	Service Antenna (Downlink Tx / Uplink Rx) : Omni, Panel Donor Antenna (Downlink Rx / Uplink Tx) : Panel
Working temperature	-20 ~ 50 °C
Supply Voltage	DC -48 V

Note ;

1. All the technical data described above were provided by the manufacturer.
2. End users and/or installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance, because the applicant does not provide an antenna for sale with the EUT. The Antenna gain will be same or less than 20 dBi.

#### 1.5. Equipment Type :

- ☒ Radio and ancillary equipment for fixed or semi-fixed use  
☐ Radio and ancillary equipment for vehicular mounted use  
☐ Radio and ancillary equipment for portable or handheld use
- ☒ Stand alone    ☐ Host connected    ☐ Host connected
- ☒ Self contained single unit    ☐ Module with associated connection or interface

#### 1.6. Technical descriptions and documents

The following documents was provided by the manufacturer.

No.	Document Title and Description
1	User Manual

#### 1.7. Description of additional model name

Model name	Model name Designation	Description of design
IRES-700 10W	Basic model	-

## **2. Test Specification**

The following test specifications and standards have been applied and used for testing.

1) FCC Part 27 Subpart C

Miscellaneous Wireless Communications Services

2) ANSI C63.4:2009

American National Standard for Methods of Measurement of Radio- Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

### 3. Test Conditions

#### 3.1. Equipment Used During Test

Use*	Product Type	Manufacturer	Model	Comments
EUT	700MHz ICS Repeater System	AIRPOINT CO., LTD.	IRES-700 10W	-
AE	Vector Signal Generator	Rohde & Schwarz	SMJ100A	-
AE	Note PC	LG Electronics Co., Ltd.	LGR51	-
<b>Note:</b> Use = EUT - Equipment Under Test, AE - Auxiliary/Associated Equipment. SIM - Simulator (Not Subjected to Test)				

#### 3.2. Input/Output Ports

No	Port Name	Type*	Cable Max. >3m (Y/N)	Cable Shielded (Y/N)	Comments
1	Power Input	DC	N	N	Connected to DC Power supply
2	Radio Antenna	I/O	N	Y	-
<b>Note:</b> *AC = AC Power Port      DC = DC Power Port      N/E = Non-Electrical I/O = Signal Input or Output Port (Not Involved in Process Control) TP = Telecommunication Ports					

#### 3.3. Power Interface

Mode #	Voltage (V)	Current (A)	Power (W)	Frequency (DC/AC-Hz)	Phases (#)	Comments
Rated	-42.0 V	-	-	DC	-	Normal operating voltage
1	-48.3 V	-	-	DC	-	V <sub>MIN</sub>
2	-35.7 V	-	-	DC	-	V <sub>MAX</sub>

#### 3.4. Operating Frequencies

Mode #	Frequency tested
1	Operating frequency range Downlink : 746 – 757 MHz Uplink : 776 – 787 MHz  2 channels in the Transmitter modes of Downlink and Uplink. - Downlink : 751 MHz - Uplink : 782 MHz
2	Receiving mode



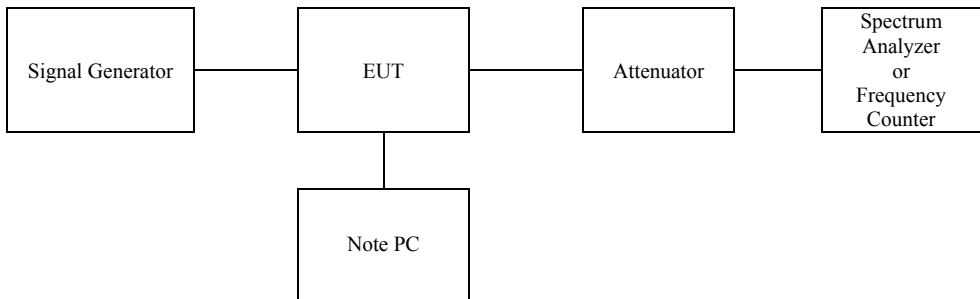
### 3.5. Operation Modes

Mode #	Description
1	Carrier on mode: Signal from the RF module was generated continuously for the representative channels (Downlink, Uplink) by the test program incorporated
2	Carrier off (Idle) mode: RF carrier was not activated by the RF module
Note : 1. The measurements of the spurious emissions for transmitter on stand-by mode were performed as the receiver spurious emissions.  2. As a result of preliminary testing, the formal test was performed with the maximum payload mode of worst cases for each mode as below: - <b>Downlink:</b> 64QAM among QPSK, 16QAM and 64QAM. - <b>Uplink:</b> 16QAM between QPSK and 16QAM.	

### 3.6. Environment Conditions

Parameters	Normal condition	Extreme condition
Temperature	+ 15 °C ~ +35 °C	-20 °C / +50 °C
Humidity	20% ~ 75%	No excessive condensation occur
Supply voltage	-42 Vdc (Rated nominal voltage)	-48.3 Vdc / -35.7 Vdc
Note ; - The extreme condition is applied to the boundary limits of the declared operational environmental condition by the manufacturer. - The operating condition for humidity requirement has not been declared in the manufacturer's specification. - Test has been carried out for two frequencies specified above under the normal condition and for the extreme condition, minimum and maximum frequencies has been tested.		

### 3.7. Test Configurations

Mode #	Description
1	 <pre> graph LR     SG[Signal Generator] --- EUT[EUT]     EUT --- NP[Note PC]     EUT --- ATT[Attenuator]     ATT --- SFC[Spectrum Analyzer or Frequency Counter]           </pre>

### 3.8. List of Test Equipment

No	Description	Manufacturer	Model	Identifier	Cal. Due
1	Spectrum Analyzer	R/S	FSV30	101372	May 31, 2013
2	Signal Generator	R/S	SMJ100A	101038	Feb. 01, 2013
3	Power Attenuator	Aeroflex Weinschel	67-30-43	CA5760	Nov. 30, 2012

#### 4. Overview of Technical requirements

The following essential requirements and test specifications are relevant to the presumption of conformity FCC Part 27 Subpart C.			Reported
Reference Clause No.	Essential technical requirements	Test method	
§2.1093 §27.52	RF Safety	KDB 447498	[ X ]

## 5. Test Results of RF Safety

TEST: RF Safety		
Method	<p>RF Exposure Evaluation of the EUT were measured according to the dictates in KDB 447498</p> <p>According to the FCC rule 1.1310 table 1B, the limit for the maximum permissible RF exposure for an uncontrolled environment is <math>f/1500</math> mW/cm<sup>2</sup> for the frequency range between 300 MHz and 1500 MHz.</p> <p>The electric field generated for a 1mW/cm<sup>2</sup> exposure is calculated as follows:</p> $E = \sqrt{(30 * P * G) / d}, \text{ and } S = E^2 / Z = E^2 / 377, \text{ because } 1\text{mW/cm}^2 = 10\text{W/m}^2$ <p>Where</p> <p>S = Power density in mW/cm<sup>2</sup>, Z = Impedance of free space, 377Ω E = Electric field strength in Volts/m, G = Numeric antenna gain, and d = distance in meter</p> <p>Combining equations and rearranging the terms to express the distance as a function of the remaining variable</p> $d = \sqrt{(30 * P * G) / (377 * S)}$ <p>Changing to units of mW and cm, using P (mW) = P (W) / 1000, d (cm) = 100 * d (m)</p> $d = 0.282 * \sqrt{(P * G) / S}$ <p>Where</p> <p>d = distance in cm, P = Power in mW, G = Numeric antenna gain, and S = Power density in mW/cm<sup>2</sup></p> <p><b>Friis transmission formula: <math>P_d = (P_{out} * G) / (4 * \pi * R^2)</math></b></p> <p>Where <math>P_d</math> = power density in mW/cm<sup>2</sup> P<sub>out</sub> = output power to antenna in mW G = gain of antenna in linear scale Pi = 3.1416 R = distance between observation point and center of the radiator in cm</p>	
Reference Clause	Part27 Subpart C Section 27.54	
Parameters recorded during the test	Laboratory Ambient Temperature	25 °C
	Relative Humidity	55 %
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	Downlink : 746 – 757 MHz Uplink : 776 – 787 MHz	Antenna port

### Configuration Settings

Power Interface Mode # (See Section 3.3)	EUT Operation Mode # (See Section 3.5)	Test Configurations Mode # (See Section 3.7)
Rated	1	1
Supplementary information: None		

## Limits

### Environmental evaluation and exposure limit according to FCC CFR 47 part 1, 1.1307(b), 1.1310

According to FCC 1.1310 : The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in §1.1307(b)

Frequency Range (MHz)	Electric Field Strength(V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Average Time
(A) Limits for Occupational /Control Exposures				
300 – 1 500	--	--	F/300	6
1 500 – 100 000	--	--	5	6
(B) Limits for General Population/Uncontrol Exposures				
<b>300 – 1 500</b>	<b>--</b>	<b>--</b>	<b>F/1500</b>	<b>6</b>
1 500 – 100 000	--	--	1	30

### Output Power into Antenna & RF Exposure Evaluation Distance

Operation Mode	Frequency (MHz)	Peak Output Power		Antenna Gain		Duty Cycle (%)	Safe Distance (cm)	Power Density at 410 cm (mW/cm <sup>2</sup> )	LIMITS (mW/cm <sup>2</sup> )
		(dBm)	(mW)	Log	Linear				
Down link	751	40.06	10 139	20	100	100	399.88	0.48	0.50

According to above table, safe distance,  $D = 0.282 * \sqrt{(10\ 000 * 100) / 0.50} = 399.88$  cm.

For getting power density at 410 cm separation in above table, following formula was used.

$$S = P * G / (4\pi * R^2) = 10\ 139 * 100 / (4 * 3.14 * 410^2) = 0.47$$

Note :

End users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance, because the applicant does not provide an antenna for sale with the EUT.

## APPENDIX A. Accreditations and Authorizations

ONETECH Corp. has been accredited / filed / authorized by the agencies listed in the following table;

Certificate	Nation	Agency	Code	Mark
Accreditation	Korea	KOLAS	No. 85	ISO/IEC 17025
Site Filing	USA	FCC	340658	Test Facility list & NSA Data
	Japan	VCCI	C-940 R-906 T-1842	Test Facility list & NSA Data
Certification	Korea	KC	KR0019	Test Facility list & NSA Data

Quality control in the testing laboratory is implemented as per ISO/IEC 17025 which is the “General requirements for the competent of calibration and testing laboratory”.