

# ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR LICENSED TRANSMITTER

**Test Report No.** : W152R-D017  
**AGR No.** : A14DA-155  
**Applicant** : Airpoint Co., Ltd.  
**Address** : MIGUN TECHNO WORLD 2-CHA, 533-1, Yongsan-dong, Yuseong-gu, Daejeon,  
305-500, South Korea  
**Manufacturer** : Airpoint Co., Ltd.  
**Address** : MIGUN TECHNO WORLD 2-CHA, 533-1, Yongsan-dong, Yuseong-gu, Daejeon,  
305-500, South Korea  
**Type of Equipment** : ICS Repeater System  
**FCC ID.** : WYFIRES7002010  
**Model Name** : IRES-700US10-20  
**Serial number** : N/A  
**Total page of Report** : 8 pages (including this page)  
**Date of Incoming** : December 10, 2014  
**Date of issue** : February 27, 2015

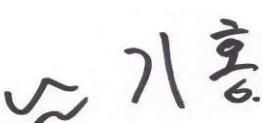
## SUMMARY

The equipment complies with the regulation; **FCC Part 90 Subpart R, B9B Industrial Booster.**

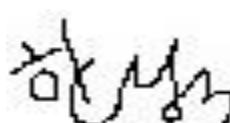
This test report only contains the result of a single test of the sample supplied for the examination.

It is not a generally valid assessment of the features of the respective products of the mass-production.

Reviewed by:

  
Ki-Hong, Nam / Asst, Chief Engineer  
ONETECH Corp.

Approved by:

  
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### Revision History

Issued Report No.	Issued Date	Revisions	Effect Section
W152R-D017	February 27, 2015	Initial Issue	All

## 1. VERIFICATION OF COMPLIANCE

APPLICANT : Airpoint Co., Ltd.  
ADDRESS : MIGUN TECHNO WORLD 2-CHA, 533-1, Yongsan-dong, Yuseong-gu, Daejeon, 305-500, South Korea  
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FCC ID : WYFIRES7002010  
MODEL NAME : IRES-700US10-20  
SERIAL NUMBER : N/A  
DATE : February 27, 2015

EQUIPMENT CLASS	<b>B9B- Part 90 Subpart R, Industrial Booster</b>
EQUIPMENT DESCRIPTION	ICS Repeater System
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C95.1 Or KDB 447498
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC Part 90
MODIFICATIONS ON THE EQUIPMENT TO ACHIEVE COMPLIANCE	No
FINAL TEST WAS CONDUCTED ON	3 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 Airpoint Co., Ltd., Models IRES-700US10-20 (referred to as the EUT in this report) are ICS Repeater System. The product specification described herein was obtained from product data sheet or user's manual.

DEVICE TYPE		ICS Repeater System		
LIST OF EACH OSC. or CRY. FREQ.(FREQ. >= 1 MHz)		38.4 MHz		
EMISSION DESIGNATOR		G7D(LTE:QPSK), D7W(LTE:16QAM, 64QAM)		
OPERATING FREQUENCY	LTE 5M - Low	Downlink	758 MHz ~ 763 MHz	
		Uplink	788 MHz ~ 793 MHz	
	LTE 5M - High	Downlink	763 MHz ~ 768 MHz	
		Uplink	793 MHz ~ 798 MHz	
	LTE 10M (LTE 5 M x2)	Downlink	758 MHz ~ 768 MHz	
		Uplink	788 MHz ~ 798 MHz	
CHANNEL SEPARATION		LTE (5 MHz, 10 MHz)		
RF OUTPUT POWER	LTE 5M - Low	Downlink	43.03 dBm	
		Uplink	30.07 dBm	
	LTE 5M - High	Downlink	43.05 dBm	
		Uplink	30.03 dBm	
	LTE 10M (LTE 5 M x2)	Downlink	43.04 dBm	
		Uplink	30.04 dBm	
ELECTRICAL RATING		DC -48 V		
OPERATING TEMPERATURE		-10 °C ~ 50 °C		

### 2.2 Alternative type(s)/model(s); also covered by this test report.

- None

## 4. MAXIMUM PERMISSIBLE EXPOSURE

### 4.1 RF Exposure Calculation

According to the FCC rule 1.1310 table 1B, the limit for the maximum permissible RF exposure for an uncontrolled environment are  $f/1500 \text{ mW/cm}^2$  the frequency range between 300 MHz and 1 500 MHz and  $1.0 \text{ mW/cm}^2$  the frequency range between 1 500 MHz and 100 000 MHz.

The electric field generated for a  $1 \text{ mW/cm}^2$  exposure is calculated as follows:

$$E = \sqrt{(30 * P * G) / d}, \text{ and } S = E^2 / Z = E^2 / 377, \text{ because } 1 \text{ mW/cm}^2 = 10 \text{ W/m}^2$$

Where

$S$  = Power density in  $\text{mW/cm}^2$ ,  $Z$  = Impedance of free space,  $377 \Omega$

$E$  = Electric field strength in  $\text{V/m}$ ,  $G$  = Numeric antenna gain, and  $d$  = distance in meter

Combining equations and rearranging the terms to express the distance as a function of the remaining variable

$$d = \sqrt{(30 * P * G) / (377 * S)}$$

Changing to units of  $\text{mW}$  and  $\text{cm}$ , using  $P (\text{mW}) = P (\text{W}) / 1 000$ ,  $d (\text{cm}) = 100 * d (\text{m})$

$$d = 0.282 * \sqrt{(P * G) / S}$$

Where

$d$  = distance in  $\text{cm}$ ,  $P$  = Power in  $\text{mW}$ ,  $G$  = Numeric antenna gain, and  $S$  = Power density in  $\text{mW/cm}^2$

## 4.2 Calculated MPE Safe Distance

### 4.2.1 TEST Result(Downlink/LTE 5 M - Low)

According to above equation, the following result was obtained.

Peak Output Power		Antenna Gain (dBi)		Safe Distance	Power Density (mW/cm <sup>2</sup> )	FCC Limit
(dBm)	(mW)	Log	Linear	(cm)	@ 400 cm Separation	(mW/cm <sup>2</sup> )
43.03	20 090.9	15.0	31.62	224.776	0.316	0.507

According to above table, safe distance,  $D = 0.282 * \sqrt{20 090.9 * 31.62} = 224.776$  cm.

For getting power density at 300 cm separation in above table, following formula was used.

$$S = P * G / (4\pi * R^2) = 20 090.9 * 31.62 / (4 * 3.14 * 400^2) = 0.316$$

Where:

S = Power Density,

P = Power input to the external antenna (Output power from the EUT antenna port (dBm) – cable loss (dB)),

G = Gain of Transmit Antenna (linear gain), R = Distance from Transmitting Antenna

### 4.2.2 TEST Result(Downlink/LTE 5 M - High)

According to above equation, the following result was obtained.

Peak Output Power		Antenna Gain (dBi)		Safe Distance	Power Density (mW/cm <sup>2</sup> )	FCC Limit
(dBm)	(mW)	Log	Linear	(cm)	@ 400 cm Separation	(mW/cm <sup>2</sup> )
43.05	20 183.7	15.0	31.62	225.294	0.318	0.510

According to above table, safe distance,  $D = 0.282 * \sqrt{20 183.7 * 31.62} = 225.294$  cm.

For getting power density at 300 cm separation in above table, following formula was used.

$$S = P * G / (4\pi * R^2) = 20 183.7 * 31.62 / (4 * 3.14 * 400^2) = 0.318$$

Where:

S = Power Density,

P = Power input to the external antenna (Output power from the EUT antenna port (dBm) – cable loss (dB)),

G = Gain of Transmit Antenna (linear gain), R = Distance from Transmitting Antenna

### 4.2.3 TEST Result(Downlink/LTE 10 MHz)

According to above equation, the following result was obtained.

Peak Output Power		Antenna Gain (dBi)		Safe Distance	Power Density (mW/cm <sup>2</sup> )	FCC Limit
(dBm)	(mW)	Log	Linear	(cm)	@ 400 cm Separation	(mW/cm <sup>2</sup> )
43.04	20 137.2	15.0	31.62	225.035	0.317	0.509

According to above table, safe distance,  $D = 0.282 * \sqrt{20 137.2 * 31.62} = 225.035$  cm.

For getting power density at 300 cm separation in above table, following formula was used.

$$S = P * G / (4\pi * R^2) = 20 137.2 * 31.62 / (4 * 3.14 * 400^2) = 0.317$$

Where:

S = Power Density,

P = Power input to the external antenna (Output power from the EUT antenna port (dBm) – cable loss (dB)),

G = Gain of Transmit Antenna (linear gain), R = Distance from Transmitting Antenna

#### 4.2.4 TEST Result(Uplink/LTE 5 M - Low)

According to above equation, the following result was obtained.

Peak Output Power		Antenna Gain (dBi)		Safe Distance	Power Density (mW/cm <sup>2</sup> )	FCC Limit
(dBm)	(mW)	Log	Linear	(cm)	@ 400 cm Separation	(mW/cm <sup>2</sup> )
30.07	1 016.2	15.0	31.62	50.553	0.016	0.527

According to above table, safe distance,  $D = 0.282 * \sqrt{1 016.2 * 31.62} = 50.553$  cm.

For getting power density at 300 cm separation in above table, following formula was used.

$$S = P * G / (4\pi * R^2) = 1 016.2 * 31.62 / (4 * 3.14 * 400^2) = 0.016$$

Where:

S = Power Density,

P = Power input to the external antenna (Output power from the EUT antenna port (dBm) – cable loss (dB)),

G = Gain of Transmit Antenna (linear gain), R = Distance from Transmitting Antenna

#### 4.2.5 TEST Result(Uplink/LTE 5 M - High)

According to above equation, the following result was obtained.

Peak Output Power		Antenna Gain (dBi)		Safe Distance	Power Density (mW/cm <sup>2</sup> )	FCC Limit
(dBm)	(mW)	Log	Linear	(cm)	@ 400 cm Separation	(mW/cm <sup>2</sup> )
30.03	1 006.9	15.0	31.62	50.321	0.016	0.530

According to above table, safe distance,  $D = 0.282 * \sqrt{1 006.9 * 31.62} = 50.321$  cm.

For getting power density at 300 cm separation in above table, following formula was used.

$$S = P * G / (4\pi * R^2) = 1 006.9 * 31.62 / (4 * 3.14 * 400^2) = 0.016$$

Where:

S = Power Density,

P = Power input to the external antenna (Output power from the EUT antenna port (dBm) – cable loss (dB)),

G = Gain of Transmit Antenna (linear gain), R = Distance from Transmitting Antenna

#### 4.2.6 TEST Result(Uplink/LTE 10 MHz)

According to above equation, the following result was obtained.

Peak Output Power		Antenna Gain (dBi)		Safe Distance	Power Density (mW/cm <sup>2</sup> )	FCC Limit
(dBm)	(mW)	Log	Linear	(cm)	@ 400 cm Separation	(mW/cm <sup>2</sup> )
30.03	1 006.9	15.0	31.62	50.321	0.016	0.529

According to above table, safe distance,  $D = 0.282 * \sqrt{1 006.9 * 31.62} = 50.321$  cm.

For getting power density at 300 cm separation in above table, following formula was used.

$$S = P * G / (4\pi * R^2) = 1 006.9 * 31.62 / (4 * 3.14 * 400^2) = 0.016$$

Where:

S = Power Density,

P = Power input to the external antenna (Output power from the EUT antenna port (dBm) – cable loss (dB)),

G = Gain of Transmit Antenna (linear gain), R = Distance from Transmitting Antenna