ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR LICENSED TRANSMITTER

Test Report No.	**: E14NR-085**
AGR No.	**: A148A-124**
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.	**: WYFAWE43LC15A**
Model Name	**: IRES-1900US20-20 A-Prototype**
Serial number	**: N/A**
Total page of Report	**: 9 pages (including this page)**
Date of Incoming	**: October 16, 2014**
Date of issue	**: November 14, 2014**

SUMMARY

The equipment complies with the regulation; **FCC Part 24 Subpart E, B2I Part 20 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.

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EMC Testing Dept : 307-51 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-765-8289, FAX: 82-31-766-2904)

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Revision History

Issued Report No.	Issued Date	Revisions	Effect Section
E14NR-085	November 14, 2014	Initial Issue	All

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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
CONTACT PERSON	: Jung-nam, Lim / Research Manager
TELEPHONE NO	: +82-42-484-5460
FCC ID	: WYFAWE43LC15A
MODEL NAME	: IRES-1900US20-20 A-Prototype
SERIAL NUMBER	: N/A
DATE	: November 14, 2014

EQUIPMENT CLASS	**B2I- Part 20 Industrial Booster**
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 24 Subpart E
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.

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2 GENERAL INFORMATION

2.1 Product Description

The Airpoint Co., Ltd., Models IRES-1900US20-20 A-Prototype (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		F9W(CDMA 2000, 1xEVDO), G7D(LTE:QPSK), D7W(LTE:16QAM, 64QAM)
OPERATING FREQUENCY	Downlink	1 930 MHz ~ 1 945 MHz
	Uplink	1 850 MHz ~ 1 865 MHz
CHANNEL SEPARATION		CDMA 2000 (1.25 MHz), 1xEVDO (1.25 MHz), LTE (5 MHz, 10 MHz, 15 MHz)
RF OUTPUT POWER		43 dBm (Downlink), 30 dBm (Uplink)
ELECTRICAL RATING		DC -48 V
OPERATING TEMPERATURE		-10 ℃ ~ 50 ℃

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

-. None

3. EUT MODIFICATIONS

-. None

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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 mW/cm² the frequency range between 300 MHz and 1 500 MHz and 1.0 mW/cm² the frequency range between 1 500 MHz and 100 000 MHz.

The electric field generated for a 1 mW/cm² exposure is calculated as follows:

$E = \sqrt{(30 * P * G)} / d$, and $S = E^2 / Z = E^2 / 377$, because 1 mW/cm² = 10 W/m²

Where

S = Power density in mW/cm², Z = Impedance of free space, 377 Ω

E = Electric filed strength in V/m, G = Numeric antenna gain, and d = distance in meter

Combing 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 mW and cm, using P (mW) = P (W) / 1 000, d (cm) = 100 * d (m)

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

Where

d = distance in cm, P = Power in mW, G = Numeric antenna gain, and S = Power density in mW/cm²

4.2 Calculated MPE Safe Distance

4.2.1 TEST Result(Downlink/CDMA)

According to above equation, the following result was obtained.

Peak Output Power		Antenna Gain (dBi)		Safe Distance	Power Density (mW/cm²)	FCC Limit
(dBm)	(mW)	Log	Linear	(cm)	@ 300 cm Separation	(mW/cm²)
43.05	20 183.7	17.0	50.12	283.628	0.895	1

According to above table, safe distance, $D = 0.282 * \sqrt{20\ 183.7 * 50.12} = 283.628$ cm.

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

$S = P * G / (4\pi * R^2) = 20\ 183.7 * 50.12 / (4 * 3.14 * 300\text{^}2) = 0.895$

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

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4.2.2 TEST Result(Downlink/LTE 5 MHz)

According to above equation, the following result was obtained.

Peak Output Power		Antenna Gain (dBi)		Safe Distance	Power Density (mW/cm²)	FCC Limit
(dBm)	(mW)	Log	Linear	(cm)	@ 300 cm Separation	(mW/cm²)
43.07	20 276.8	17.0	50.12	284.282	0.899	1

According to above table, safe distance, D = 0.282 * $\sqrt{20\ 276.8 * 50.12}$ = 284.282 cm.

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

S = P * G / (4π * R²) = 20 276.8 * 50.12 / (4 * 3.14 * 300^2) = 0.899

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/cm²)	FCC Limit
(dBm)	(mW)	Log	Linear	(cm)	@ 300 cm Separation	(mW/cm²)
43.07	20 276.8	17.0	50.12	284.282	0.899	1

According to above table, safe distance, D = 0.282 * $\sqrt{20\ 276.8 * 50.12}$ = 284.282 cm.

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

S = P * G / (4π * R²) = 20 276.8 * 50.12 / (4 * 3.14 * 300^2) = 0.899

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(Downlink/LTE 15 MHz)

According to above equation, the following result was obtained.

Peak Output Power		Antenna Gain (dBi)		Safe Distance	Power Density (mW/cm²)	FCC Limit
(dBm)	(mW)	Log	Linear	(cm)	@ 300 cm Separation	(mW/cm²)
43.06	20 230.2	17.0	50.12	283.955	0.897	1

According to above table, safe distance, D = 0.282 * $\sqrt{20\ 230.2 * 50.12}$ = 283.955 cm.

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

S = P * G / (4π * R²) = 20 230.2 * 50.12 / (4 * 3.14 * 300^2) = 0.897

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

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4.2.5 TEST Result(Uplink/CDMA)

According to above equation, the following result was obtained.

Peak Output Power		Antenna Gain (dBi)		Safe Distance	Power Density (mW/cm²)	FCC Limit
(dBm)	(mW)	Log	Linear	(cm)	@ 300 cm Separation	(mW/cm²)
30.05	1 011.6	17.0	50.12	63.496	0.045	1

According to above table, safe distance, D = 0.282 * $\sqrt{1\ 011.6 * 50.12}$ = 63.496 cm.

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

$S = P * G / (4\pi * R^2) = 1\ 011.6 * 50.12 / (4 * 3.14 * 300\text{^}2) = 0.045$

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 5 MHz)

According to above equation, the following result was obtained.

Peak Output Power		Antenna Gain (dBi)		Safe Distance	Power Density (mW/cm²)	FCC Limit
(dBm)	(mW)	Log	Linear	(cm)	@ 300 cm Separation	(mW/cm²)
30.07	1 016.2	17.0	50.12	63.643	0.045	1

According to above table, safe distance, D = 0.282 * $\sqrt{1\ 016.2 * 50.12}$ = 63.643 cm.

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

$S = P * G / (4\pi * R^2) = 1\ 016.2 * 50.12 / (4 * 3.14 * 300\text{^}2) = 0.045$

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

4.2.7 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/cm²)	FCC Limit
(dBm)	(mW)	Log	Linear	(cm)	@ 300 cm Separation	(mW/cm²)
30.07	1 016.2	17.0	50.12	63.643	0.045	1

According to above table, safe distance, D = 0.282 * $\sqrt{1\ 016.2 * 50.12}$ = 63.643 cm.

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

$S = P * G / (4\pi * R^2) = 1\ 016.2 * 20.12 / (4 * 3.14 * 300\text{^}2) = 0.045$

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

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4.2.8 TEST Result(Uplink/LTE 15 MHz)

According to above equation, the following result was obtained.

Peak Output Power		Antenna Gain (dBi)		Safe Distance	Power Density (mW/cm²)	FCC Limit
(dBm)	(mW)	Log	Linear	(cm)	@ 300 cm Separation	(mW/cm²)
30.06	1 013.9	17.0	50.12	63.570	0.045	1

According to above table, safe distance, D = 0.282 * $\sqrt{1\ 013.9 * 50.12}$ = 63.570 cm.

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

$S = P * G / (4\pi * R^2) = 1\ 013.9 * 50.12 / (4 * 3.14 * 300\text{^}2) = 0.045$

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

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