

ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR LOW-POWER, NON-LICENSED TRANSMITTER

Test Report No. : W154R-D014
AGR No. : A153A-151
Applicant : LG Innotek Co., Ltd.
Address : 978-1, Jangduk-dong, Gwangsan-gu, Gwangju, 506-731 Korea
Manufacturer : LG Innotek Co., Ltd.
Address : 978-1, Jangduk-dong, Gwangsan-gu, Gwangju, 506-731 Korea
Type of Equipment : ESL Gateway
FCC ID. : YZP-REGXXOXXA
Model Name : REGX-XOXXA
Serial number : N/A
Total page of Report : 9 pages (including this page)
Date of Incoming : April 08, 2015
Date of issue : April 22, 2015

SUMMARY

The equipment complies with the regulation; *FCC PART 15 SUBPART C Section 15.247*
 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.

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Revision History

Issued Report No.	Issued Date	Revisions	Effect Section
W154R-D014	April 22, 2015	Initial Issue	All

1. VERIFICATION OF COMPLIANCE

Applicant : LG Innotek Co., Ltd.
 Address : 978-1, Jangduk-dong, Gwangsan-gu, Gwangju, 506-731 Korea
 Contact Person : Inchang, Jeong / Senior engineer
 Telephone No. : +82-62-950-0332
 FCC ID : YZP-REGXXOXXA
 Model Name : REGX-XOXXA
 Serial Number : N/A
 Date : April 22, 2015

EQUIPMENT CLASS	DTS – DIGITAL TRNSMISSION SYSTEM
E.U.T. DESCRIPTION	ESL Gateway
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.10: 2013
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC PART 15 SUBPART C Section 15.247
Modifications on the Equipment to Achieve Compliance	None
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 LG Innotek Co., Ltd., Model REGX-XOXXA (referred to as the EUT in this report) is a ESL Gateway. The product specification described herein was obtained from product data sheet or user’s manual.

Device Type	ESL Gateway	
Temperature Range	-10 °C ~ +60 °C	
Operating Frequency	WLAN	2 412 MHz ~ 2 462 MHz
	Zigbee	2 405 MHz ~ 2 480 MHz
RF Output Power	WLAN	802.11b: 12.98 dBm, 802.11 g: 11.79 dBm, 802.11n_HT20: 8.71 dBm
	Zigbee 1	6.49 dBm
	Zigbee 2	8.21 dBm
	Zigbee 3	7.80 dBm
Number of Channel	WLAN	13 Channel
	Zigbee	16 Channel
Modulation Type	WLAN	802.11b: DSSS Modulation(DBPSK/DQPSK/CCK) 802.11g/n(HT20): OFDM Modulation(BPSK/QPSK/16QAM/64QAM)
	Zigbee	DSSS Modulation(QPSK)
+Antenna Gain	WLAN	2.51 dBi
	Zigbee 1	2.55 dBi
	Zigbee 2	3.20 dBi
	Zigbee 3	3.81 dBi
Antenna Type	WLAN	PCB Pattern Antenna
	Zigbee	Press Antenna
List of each Osc.or crystal Freq.(Freq. >= 1 MHz)	32 MHz, 24 MHz, 32.768 kHz	
Used AC/DC Adapter	Adapter	Output: DC 12 V, 1 A Model No: WA-12L12FS
	PoE Adapter	Output: DC 48 V, 1 A Model No: NEXT-POE160F
Electrical Rating	Adapter : AC 100 ~ 240 V, 50 ~ 60 Hz PoE Adapter: AC 90 ~ 260 V, 50 ~ 60 Hz	

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

-. None

3. MAXIMUM PERMISSIBLE EXPOSURE (WLAN Mode)

3.1 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 for the frequency range between 300 MHz and 1 500 MHz and 1.0 mW/cm² for 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:

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

Where

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

E = Electric field strength in 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

$$d = \sqrt{(30 * P * G) / (377 * 10 S)}$$

Changing to units of mW and cm, using $P \text{ (mW)} = P \text{ (W)} / 1\,000$, $d \text{ (cm)} = 0.01 * d \text{ (m)}$

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

Where

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

3.2 EUT Description

Kind of EUT	ESL Gateway
Operating Frequency Band	<input type="checkbox"/> Wireless Microphone: 494.000 MHz ~ 501.000 MHz and 498.200 MHz ~ 505.200 MHz <input checked="" type="checkbox"/> WLAN: 2 412 MHz ~ 2 462 MHz <input type="checkbox"/> Bluetooth: 2 402 MHz ~ 2 480 MHz <input type="checkbox"/> GFSK Modulation: 2403 MHz , 2443 MHz , 2478 MHz
Device Category	<input type="checkbox"/> Portable (< 20 cm separation) <input type="checkbox"/> Mobile (> 20 cm separation) <input checked="" type="checkbox"/> Others
Max. Output Power	802.11b: 12.98 dBm, 802.11 g: 11.79 dBm, 802.11n_HT20: 8.71 dBm
Used Antenna	PCB Pattern Antenna
Used Antenna Gain	2.51 dBi
Exposure Evaluation Applied	<input checked="" type="checkbox"/> MPE <input type="checkbox"/> SAR <input type="checkbox"/> N/A

3.2 Calculated MPE Safe Distance

According to above equation, the following result was obtained.

Operating Freq. Band (MHz)	Operating Mode		Target Power W/tolerance	Max tune up power		Antenna Gain		Safe Distance (cm)	Power Density (mW/cm ²) @ 20 cm Separation	Limit (mW/cm ²)
			(dBm)	(dBm)	(mW)	Log	Linear			
2 400 ~ 2 483.5	802.11b	LOW	12.98 ± 0.5	13.48	22.28	2.51	1.782	1.78	0.007 91	1.00
		MIDDLE	11.84 ± 0.5	12.34	17.14			1.56	0.006 08	1.00
		HIGH	10.92 ± 0.5	11.42	13.87			1.40	0.004 92	1.00
	802.11g		10.8 ± 1.0	11.8	15.14			1.46	0.005 37	1.00
	802.11n_HT20		7.8 ± 1.0	8.8	7.59			1.04	0.002 69	1.00

4.2 Calculated MPE Safe Distance

According to above equation, the following result was obtained.

Operating Mode		Target Power W/tolerance (dBm)	Max tune up power		Antenna Gain		Safe Distance (cm)	Power Density (mW/cm ²) @ 20 cm Separation	Limit (mW/cm ²)
			(dBm)	(mW)	Log	Linear			
Zigbee 1	LOW	4.01 ± 0.5	4.51	2.82	2.55	1.80	0.64	0.001 01	1.00
	MIDDLE	5.94 ± 0.5	6.44	4.41			0.79	0.001 58	1.00
	HIGH	6.49 ± 0.5	6.99	5.00			0.85	0.001 79	1.00
Zigbee 2	LOW	5.25 ± 0.5	5.75	3.76	3.20	2.09	0.79	0.001 56	1.00
	MIDDLE	7.18 ± 0.5	7.68	5.86			0.99	0.002 44	1.00
	HIGH	8.21 ± 0.5	8.71	7.43			1.11	0.003 09	1.00
Zigbee 3	LOW	4.34 ± 0.5	4.84	3.05	3.81	2.40	0.76	0.001 46	1.00
	MIDDLE	7.68 ± 0.5	8.18	6.58			1.12	0.003 15	1.00
	HIGH	7.80 ± 0.5	8.30	6.76			1.14	0.003 24	1.00