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

Test Report No.	**: W159R-D027**
AGR No.	**: A158A-145**
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	**: Bluetooth/WLAN Combo Module for Automotive**
FCC ID.	**: YZP-RBHAC213B**
Model Name	**: RBHA-C213B**
Serial number	**: N/A**
Total page of Report	**: 7 pages (including this page)**
Date of Incoming	**: August 27, 2015**
Date of issue	**: September 14, 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.

Approved by: Sung-Ik, Han/ Managing Director, ONETECH Corp.

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Revision History

Issued Report No.	Issued Date	Revisions	Effect Section
W159R-D027	September 14, 2015	Initial Issue	All

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1. VERIFICATION OF COMPLIANCE

Applicant	: LG Innotek Co., Ltd.
Address	: 978-1, Jangduk-dong, Gwangsan-gu, Gwangju, 506-731 Korea
Contact Person	: Inchang, Jeong / Director
Telephone No.	: +82-62-950-0332
FCC ID	: YZP-RBHAC213B
Model Name	: RBHA-C213B
Serial Number	: N/A
Date	: September 14, 2015

EQUIPMENT CLASS	DTS – PART 15 SPREAD SPECTRUM TRANSMITTER
E.U.T. DESCRIPTION	Modular Transmitter, Bluetooth/WLAN Combo Module for Automotive
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.10: 2013
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification, Modular Approval
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.

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2. GENERAL INFORMATION

2.1 Product Description

The LG Innotek Co., Ltd., Model RBHA-C213B (referred to as the EUT in this report) is a Bluetooth/WLAN Combo Module for Automotive. Product specification information described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	Bluetooth/WLAN Combo Module for Automotive		
OPERATING FREQUENCY	WLAN	2 412 MHz ~ 2 462 MHz (802.11b/g/n(HT20))	
	Bluetooth	2 402 MHz ~ 2 480 MHz	
	Bluetooth LE	2 402 MHz ~ 2 480 MHz	
MAX. RF OUTPUT POWER	WLAN	Wi-Fi 802.11b (11.25 dBm)	
		Wi-Fi 802.11g (10.31 dBm)	
		Wi-Fi 802.11n_20 MHz (10.20 dBm)	
	Bluetooth	1 Mbps	6.70 dBm
		2 Mbps	5.15 dBm
		3 Mbps	5.43 dBm
	Bluetooth LE	2.63 dBm	
MODULATION TYPE	WLAN	DSSS Modulation(DBPSK/DQPSK/CCK)	
	Bluetooth	GFSK for 1 Mbps, DQPSK for 2 Mbps, 8-DPSK for 3 Mbps	
	Bluetooth LE	GFSK	
ANTENNA TYPE	Dipole Antenna		
ANTENNA GAIN	2.41 dBi		
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)	26 MHz		

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 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:

$E = \sqrt{(30 * P * G)} / d$, 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

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

Changing to units of mW and cm, using P (mW) = P (W) / 1 000, d (cm) = 0.01 * 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

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4.2 EUT Description

Kind of EUT	Bluetooth/WLAN Combo Module for Automotive		
Operating Frequency Band	☐ Wireless Microphone: 494.000 MHz ~ 501.000 MHz and 498.200 MHz ~ 505.200 MHz ■ WLAN: 2 412 MHz ~ 2 462 MHz ■ Bluetooth: 2 402 MHz ~ 2 480 MHz ■ Bluetooth BLE: 2 402 MHz ~ 2 480 MHz		
Device Category	☐ Portable (< 20 cm separation) ☐ Mobile (> 20 cm separation) ■ Others		
MAX. RF OUTPUT POWER	WLAN	Wi-Fi 802.11b (11.25 dBm)	
		Wi-Fi 802.11g (10.31 dBm)	
		Wi-Fi 802.11n_20 MHz (10.20 dBm)	
	Bluetooth	1 Mbps	6.70 dBm
		2 Mbps	5.15 dBm
		3 Mbps	5.43 dBm
	Bluetooth LE	2.63 dBm	
Used Antenna Gain	2.41 dBi		
Exposure Evaluation Applied	■ MPE ☐ SAR ☐ N/A		

2.4GHz can not transmit at the same time.

4.3 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/cm²) @ 20 cm Separation	Limit (mW/cm²)
		(dBm)	(dBm)	(mW)	Log	Linear			
2 402 ~ 2 480	LE	2.0 ± 1.0	3.00	2.00	2.41	1.74	0.53	0.0007	1.00

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