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

Test Report No.	: OT-18D-RWD-016
AGR No.	: A18NA-357
Applicant	: LG Innotek Co., Ltd.
Address	: 26, Hanamsandan 5beon-ro, Gwangsan-gu,Gwangju, 62229, Korea
Manufacturer	: PT. LG innotek Indonesia
Address	: Bekasi International Industrial Estate, Block C8 No.12&12A Desa Cibatu, Cikarang Selatan, Bekasi 17750, Indonesia
Type of Equipment	: WiSA usb Wireless Audio Dongle
FCC ID.	: YZP-TWFDS001T
Model Name	: TWFD-S001T
Serial number	: N/A
Total page of Report	: 7 pages (including this page)
Date of Incoming	: November 28, 2018
Date of issue	: December 10, 2018

SUMMARY

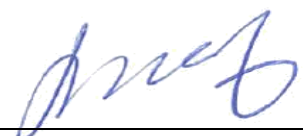The equipment complies with the regulation; *FCC PART 15 SUBPART E Section 15.407*

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: _____   Approved by: _____
Ki-Hong, Nam / Chief Engineer   Keun-Young, Choi / Vice President
ONETECH Corp.   ONETECH Corp.

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Revision History

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-18D-RWD-016	2018.12.10	Initial Release	All

1. VERIFICATION OF COMPLIANCE

Applicant   : LG Innotek Co., Ltd.

Address   : 26, Hanamsandan 5beon-ro, Gwangsan-gu,Gwangju, 62229, Korea

Contact Person : Inchang Jeong / Chief Research Engineer

Telephone No.   : +82-10-2326-9972

FCC ID   : YZP-TWFDS001T

Model Name   : TWFD-S001T

Brand Name   : LG Innotek

Serial Number   : N/A

Date   : December 10, 2018

EQUIPMENT CLASS	Unlicensed National Information infrastructure(UNII)
E.U.T. DESCRIPTION	WiSA usb Wireless Audio Dongle
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 E Section 15.407 KDB 789033 D02 General UNII Test Procedures New Rules V02r01
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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ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

2. GENERAL INFORMATION

2.1 Product Description

The LG Innotek Co., Ltd., Model TWFD-S001T (referred to as the EUT in this report) is a WiSA usb Wireless Audio Dongle. The product specification described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	WiSA usb Wireless Audio Dongle	
Temperature Range	0 ℃ ~ 50 ℃	
OPERATING FREQUENCY	5 150 MHz ~ 5 250 MHz Band	5 180 MHz ~ 5 240 MHz
	5 250 MHz ~ 5 350 MHz Band	5 260 MHz ~ 5 320 MHz
	5 470 MHz ~ 5 725 MHz Band	5 500 MHz ~ 5 700 MHz
	5 725 MHz ~ 5 850 MHz Band	5 745 MHz ~ 5 825 MHz
MODULATION TYPE	WLAN 5 GHz	OFDM Modulation(BPSK/QPSK/16QAM/64QAM)
RF OUTPUT POWER	5 150 MHz ~ 5 250 MHz Band	4.84 dBm(802.11a)
	5 250 MHz ~ 5 350 MHz Band	5.02 dBm(802.11a)
	5 470 MHz ~ 5 725 MHz Band	5.41 dBm(802.11a)
	5 725 MHz ~ 5 850 MHz Band	5.61 dBm(802.11a)
MODULATION TYPE	WLAN 5 G	OFDM Modulation(BPSK/QPSK/16QAM/64QAM)
ANTENNA TYPE		PCB Antenna
ANTENNA GAIN	5 150 MHz ~ 5 250 MHz Band	0.97 dBi
	5 250 MHz ~ 5 350 MHz Band	0.91 dBi
	5 470 MHz ~ 5 725 MHz Band	1.44 dBi
	5 725 MHz ~ 5 850 MHz Band	1.56 dBi
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)		40 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:

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

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

4.2 EUT Description

Kind of EUT	WiSA usb Wireless Audio Dongle
Device Category	☐ Portable (< 20 cm separation) ☐ Mobile (> 20 cm separation) ■ Others
Exposure Evaluation Applied	■ MPE ☐ SAR ☐ N/A

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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			
5 150 ~ 5 250	802.11a	5.0 ± 0.5	5.50	3.55	0.97	1.25	0.59	0.000 9	1.00
5 250 ~ 5 350	802.11a	5.0 ± 0.5	5.50	3.55	0.91	1.23	0.59	0.000 9	1.00
5 470 ~ 5 725	802.11a	5.5 ± 0.5	6.00	3.98	1.44	1.39	0.66	0.001 1	1.00
5 725 ~ 5 850	802.11a	5.5 ± 0.5	6.00	3.98	1.56	1.43	0.67	0.001 1	1.00

According to above table, for 5 725 ~ 5 850 MHz Band, safe distance,

D = 0.282 * $\sqrt{(3.98 * 1.43)/1.00}$ = 0.67 cm.

For getting power density at 20 cm separation in above table, following formula was used.

$$S = P * G / (4\pi * R^2) = 3.98 * 1.43 / (4 * 3.14 * 20^2) = 0.001\ 1$$

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

Tested by: Hyung-Kwon, Oh / Assistant Manager

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