

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


Test Report No. : OT-201-RWD-045
AGR No. : A19DA-403
Applicant : Homecast CO., LTD.
Address : 14F, Doosan Bldg, Eonju-ro, Gangnam-gu, Seoul, South Korea
Manufacturer : Homecast CO., LTD.
Address : 14F, Doosan Bldg, Eonju-ro, Gangnam-gu, Seoul, South Korea
Type of Equipment : OTT BOX
FCC ID. : 2AVNC-NUI-7050
Model Name : NUI-7050
Multiple Model Name : N/A
Serial number : N/A
Total page of Report : 9 pages (including this page)
Date of Incoming : January 03, 2020
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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: 
 Tae-Ho, Kim / Senior Manager
 ONETECH Corp.

Approved by: 
 Ki-Hong, Nam / General Manager
 ONETECH Corp.

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Revision History

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-201-RWD-045	January 31, 2020	Initial Release	All

1. VERIFICATION OF COMPLIANCE

Applicant : Homecast CO., LTD.
Address : 14F, Doosan Bldg, Eonju-ro, Gangnam-gu, Seoul, South Korea
Contact Person : Seoung-Hyun LEE / Deputy General Manager
Telephone No. : +82-2-3400-8475
FCC ID : 2AVNC-NUI-7050
Model Name : NUI-7050
Serial Number : N/A
Date : January 31, 2020

EQUIPMENT CLASS	DTS – DIGITAL TRNSMISSION SYSTEM
E.U.T. DESCRIPTION	OTT BOX
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 558074 D01 15.247 Meas Guidance v05r02 662911 D01 Multiple Transmitter Output 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.

2. GENERAL INFORMATION

2.1 Product Description

The Homecast CO., LTD., Model NUI-7050 (referred to as the EUT in this report) is a OTT BOX. Product specification information described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	OTT BOX	
Operating Frequency	2 412 MHz ~ 2 462 MHz (802.11b/g/n(HT20)) 2 422 MHz ~ 2 452 MHz (802.11n(HT40))	
RF Output Power	Antenna 0	Wi-Fi 802.11b (12.91 dBm) Wi-Fi 802.11g (11.46 dBm) Wi-Fi 802.11n(HT20) (5.62 dBm) Wi-Fi 802.11n(HT40) (2.85 dBm)
	Antenna 1	Wi-Fi 802.11b (13.10 dBm) Wi-Fi 802.11g (11.83 dBm) Wi-Fi 802.11n(HT20) (5.75 dBm) Wi-Fi 802.11n(HT40) (3.74 dBm)
	Antenna 0 + Antenna 1	Wi-Fi 802.11n(HT20) (8.70 dBm) Wi-Fi 802.11n(HT40) (6.33 dBm)
Modulation Type	DSSS Modulation(DBPSK/DQPSK/CCK) OFDM Modulation(BPSK/QPSK/16QAM/64QAM)	
Temperature Range	0 °C ~ 50 °C	
Antenna Type	PCB Antenna	
Antenna Gain	3.50 dBi	
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)	40 MHz, 54 MHz	

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

-. None

3. EUT MODIFICATIONS

-. 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 $f/1500$ 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 (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	OTT BOX
Device Category	<input type="checkbox"/> Portable (< 20 cm separation) <input type="checkbox"/> Mobile (> 20 cm separation) <input checked="" type="checkbox"/> Others
Exposure Evaluation Applied	<input checked="" type="checkbox"/> MPE <input type="checkbox"/> SAR <input type="checkbox"/> N/A

4.3 Test data

4.3.1 Calculated MPE Safe Distance for Antenna 0

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	13.0 ± 1.0	14.00	25.12	3.50	2.24	2.11	0.011 2	1.00
	802.11g	11.0 ± 1.0	12.00	15.85			1.68	0.007 1	1.00
	802.11n_HT20	5.0 ± 1.0	6.00	3.98			0.84	0.001 8	1.00
	802.11n_HT40	2.5 ± 1.0	3.50	2.24			0.63	0.001 0	1.00

According to above table, for 2 400 ~ 2 483.5 MHz Band(802.11b), safe distance,

$$D = 0.282 * \sqrt{(25.12 * 2.24)/1.00} = 2.11 \text{ cm}$$

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

$$S = P * G / (4\pi * R^2) = 25.12 * 2.24 / (4 * 3.14 * 20^2) = 0.011 2$$

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

4.3.2 Calculated MPE Safe Distance for Antenna 1

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	13.0 ± 1.0	14.00	25.12	3.50	2.24	2.11	0.011 2	1.00
	802.11g	12.0 ± 1.0	13.00	19.95			1.88	0.008 9	1.00
	802.11n_HT20	5.5 ± 1.0	6.50	4.47			0.89	0.002 0	1.00
	802.11n_HT40	3.5 ± 1.0	4.50	2.82			0.71	0.001 3	1.00

According to above table, for 2 400 ~ 2 483.5 MHz Band(802.11b), safe distance,

$$D = 0.282 * \sqrt{(25.12 * 2.24)/1.00} = 2.11 \text{ cm}$$

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

$$S = P * G / (4\pi * R^2) = 25.12 * 2.24 / (4 * 3.14 * 20^2) = 0.011 2$$

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

4.3.3 Calculated MPE Safe Distance for Multiple Transmit

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	Power Density (mW/cm ²) @ 20 cm Separation	Combined Power Density (mW/cm ²) @ 20 cm Separation	Limit (mW/cm ²)
		(dBm)	(dBm)	(mW)	Log	Linear	(cm)			
2 400 ~ 2 483.5	802.11n_ HT20 Antenna 0	5.0 ± 1.0	6.00	3.98	3.50	2.24	0.84	0.001 8	0.003 8	1.00
	802.11n_ HT20 Antenna 1	5.5 ± 1.0	6.50	4.47			0.89	0.002 0		1.00
	802.11n_ HT40 Antenna 0	5.0 ± 1.0	6.00	3.98			0.63	0.001 0	0.002 3	1.00
	802.11n_ HT40 Antenna 1	3.5 ± 1.0	4.50	2.82			0.71	0.001 3		1.00


Tested by: Hyung-Kwon, Oh / Assistant Manager