

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

Test Report No. : W16NR-D016
AGR No. : A16OA-174
Applicant : CREMOTECH Co., Ltd.
Address : 401 202 Yemiji Bldg, 31, Hwangsaoul-ro 258beon-gil, Bundang-gu, Gyeonggi-do, Seongnam-si, South Korea
Manufacturer : CREMOTECH Co., Ltd.
Address : 401 202 Yemiji Bldg, 31, Hwangsaoul-ro 258beon-gil, Bundang-gu, Gyeonggi-do, Seongnam-si, South Korea
Type of Equipment : Laser Beam Pro
FCC ID. : 2AEQF-CLB2-UHXW
Model Name : CLB2-UHXW
Serial number : N/A
Total page of Report : 9 pages (including this page)
Date of Incoming : October 31, 2016
Date of issue : November 18, 2016

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: 
 Keun-Young, Choi / Vice President
 ONETECH Corp.

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Revision History

Issued Report No.	Issued Date	Revisions	Effect Section
W16NR-D016	November 18, 2016	Initial Issue	All

1. VERIFICATION OF COMPLIANCE

Applicant : CREMOTECH Co., Ltd.
 Address : 401 202 Yemiji Bldg, 31, Hwangsaeul-ro 258beon-gil, Bundang-gu, Gyeonggi-do, Seongnam-si,
 South Korea
 Contact Person : Yoon-Ho, Lee / Director
 Telephone No. : +82-10-8650-9543
 FCC ID : 2AEQF-CLB2-UHXW
 Model Name : CLB2-UHXW
 Serial Number : N/A
 Date : November 18, 2016

EQUIPMENT CLASS	DSS – PART 15 SPREAD SPECTRUM TRANSMITTER
E.U.T. DESCRIPTION	Laser Beam Pro
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 CREMOTECH Co., Ltd., Model CLB2-UHXW (referred to as the EUT in this report) is a Laser Beam Pro. Product specification information described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	Laser Beam Pro		
FREQUENCY RANGE	Bluetooth LE	2 402 MHz ~ 2 480 MHz	
	Bluetooth	2 402 MHz ~ 2 480 MHz	
	WLAN 2.4 GHz Band	2 412 MHz ~ 2 462 MHz (802.11b/g/n(HT20))	
	WLAN 5 GHz Band	5 150 MHz ~ 5 250 MHz Band	5 180 MHz ~ 5 240 MHz (802.11n(HT20))
		5 725 MHz ~ 5 850 MHz Band	5 745 MHz ~ 5 825 MHz (802.11n(HT20))
MAX. RF OUTPUT POWER	Bluetooth LE	7.62 dBm	
	Bluetooth	1 Mbps	11.62 dBm
		2 Mbps	10.75 dBm
		3 Mbps	11.11 dBm
	WLAN 2.4 GHz Band	Wi-Fi 802.11b (15.39 dBm) Wi-Fi 802.11g (14.75 dBm) Wi-Fi 802.11n_20 MHz (13.86 dBm)	
	WLAN 5 GHz Band	5 150 MHz ~ 5 250 MHz Band	Wi-Fi 802.11a (9.96 dBm) Wi-Fi 802.11n_20 MHz (8.67 dBm)
		5 725 MHz ~ 5 850 MHz Band	Wi-Fi 802.11a (10.02 dBm) Wi-Fi 802.11n_20 MHz (8.70 dBm)
MODULATION TYPE	Bluetooth	GFSK for 1 Mbps, DQPSK for 2 Mbps, 8-DPSK for 3 Mbps	
	Bluetooth LE	GFSK	
	WLAN 2.4 GHz Band	DSSS Modulation(DBPSK/DQPSK/CCK)	
	WLAN 5 GHz Band	OFDM Modulation(BPSK/QPSK/16QAM/64QAM)	
Antenna Gain	Bluetooth Bluetooth LE WLAN 2.4 GHz Band	1.28 dBi	
	WLAN 5 GHz Band	5 150 MHz ~ 5 250 MHz Band	3.59 dBi
		5 725 MHz ~ 5 850 MHz Band	-0.1 dBi
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)	32.768 kHz, 12 MHz, 24 MHz, 26 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 $f/1500 \text{ mW/cm}^2$ for the frequency range between 300 MHz and 1 500 MHz and 1.0 mW/cm^2 for the frequency range between 1 500 MHz and 100 000 MHz.

The electric field generated for a 1 mW/cm^2 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/cm^2 , Z = Impedance of free space, 377Ω

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/cm^2

4.2 EUT Description

Kind of EUT	Laser Beam Pro		
Operating Frequency Band	<div><input type="checkbox"/> Wireless Microphone: 494.000 MHz ~ 501.000 MHz and 498.200 MHz ~ 505.200 MHz</div> <div><input checked="" type="checkbox"/> WLAN: 2 412 MHz ~ 2 462 MHz</div> <div><input checked="" type="checkbox"/> WLAN: 5 180 MHz ~ 5 240 MHz</div> <div><input checked="" type="checkbox"/> WLAN: 5 745 MHz ~ 5 825 MHz</div> <div><input checked="" type="checkbox"/> Bluetooth: 2 402 MHz ~ 2 480 MHz</div> <div><input checked="" type="checkbox"/> Bluetooth BLE: 2 402 MHz ~ 2 480 MHz</div>		
MAX. RF OUTPUT POWER	Bluetooth LE	7.62 dBm	
	Bluetooth	1 Mbps	11.62 dBm
		2 Mbps	10.75 dBm
		3 Mbps	11.11 dBm
	WLAN 2.4 GHz Band	Wi-Fi 802.11b (15.39 dBm) Wi-Fi 802.11g (14.75 dBm) Wi-Fi 802.11n_20 MHz (13.86 dBm)	
	WLAN 5 GHz Band	5 150 MHz ~ 5 250 MHz Band	Wi-Fi 802.11a (9.96 dBm) Wi-Fi 802.11n_20 MHz (8.67 dBm)
		5 725 MHz ~ 5 850 MHz Band	Wi-Fi 802.11a (10.02 dBm) Wi-Fi 802.11n_20 MHz (8.70 dBm)
Antenna Gain	Bluetooth Bluetooth LE WLAN 2.4 GHz Band	1.28 dBi	
	WLAN 5 GHz Band	5 150 MHz ~ 5 250 MHz Band	3.59 dBi
		5 725 MHz ~ 5 850 MHz Band	-0.1 dBi
Exposure Evaluation Applied	<div><input checked="" type="checkbox"/> MPE</div> <div><input type="checkbox"/> SAR</div> <div><input type="checkbox"/> N/A</div>		

* 2.4 GHz & 5 GHz 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		Power Density (mW/cm ²) @ 20 cm Separation	Limit (mW/cm ²)
		(dBm)	(dBm)	(mW)	Log	Linear		
2 402 ~ 2 480	1 Mbps	11.2 ± 0.5	11.7	14.79	1.28	1.34	0.0040	1.00
	2 Mbps	10.5 ± 0.5	11.0	12.59			0.0034	1.00
	3 Mbps	11.0 ± 0.5	11.5	14.13			0.0038	1.00