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Revision History

Issued Report No.	Issued Date	Revisions	Effect Section
ICRT-TR-E231070-0A	2023.05.16	Initial Issue	All



1. Applicant & Manufacturer & Test Laboratory Information

1.1 Applicant information

Applicant	HANMI MICRONICS INC.
Address	72, Samdo-ro 48beon-gil, Yangchon-eup, Gimpo-si, Gyeonggi-do, Korea.
Contact Person	Jin Chul Kim
Telephone No.	82-10-4023-7851
Fax No.	-
E-mail	jckim@micronics.co.kr

1.2 Manufacturer Information

Manufacturer	HANMI MICRONICS INC.
Address	72, Samdo-ro 48beon-gil, Yangchon-eup, Gimpo-si, Gyeonggi-do, Korea.

1.3 Test Laboratory Information

Laboratory	ICR Co., Ltd.
Address	112, Hwanggeum 3-ro 7beon-gil, Hagun-ri, Yangchon-eup, Gimpo-si, Gyeonggi-do, Korea
Telephone No.	+82-2-6351-9002
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RRA No.	KR0165
KOLAS No.	KT652



2. Equipment under Test(EUT) Information

2.1 General Information

Product Name	RECEIVER
Brand Name	-
Model Name	CaluXReceiver
Additional Model Name	-
FCC ID	2A3QW-CALUXRECEIVER
Power Supply	DC 5 V

2.2 Additional Information

Equipment Class	FHSS - Frequency Hopping Spread Spectrum system
Device Type	Stand-alone
Operating Frequency	2 402 MHz ~ 2 479 MHz
RF Output Power	-1.12 dBm
Number of Channel	78
Modulation Type	FHSS
Antenna Type	PCB Antenna
Antenna Gain	-21.51 dBi
Antenna Operating Mode	Single Antenna Equipment with only one antenna

2.3 Mode of operation during the test

- The EUT is continuous transmission mode during the test with set at Low Channel, Middle Channel, and High Channel.
To get a maximum radiated emission levels from the EUT, the EUT was moved throughout the XY, YZ, XZ planes.

2.4 Modifications of EUT

- None



3. Maximum Permissible Exposure

3.1 RF Exposure calculation

According to the FCC rule §1.1310 the limit for General Population/Uncontrolled exposure is 1 mW/cm² for the device operating 1 500 MHz ~ 100 000 MHz.

The electric field generated for a 1 mW/cm² exposure is calculated as follows:

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

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

P = Power input to the external antenna

(Output power from the EUT antenna port (dBm) – cable loss (dB)),

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)

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



3.2 Result

According to above equation, the following result was obtained.

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)	(mW)	Log	Linear			
FHSS	-1.12 ± 1.0	-0.12	0.97	-20.55	0.007	0.02	0.000 001	1.00

According to above table, for Band(FHSS), safe distance,

$$D = 0.282 * \sqrt{(0.97 * 0.007)/1.00} = 0.02 \text{ cm.}$$

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

$$S = P * G / (4\pi * R^2) = (0.97 * 0.007 / (4 * \pi * 20^2)) = 0.000 001$$

End of Report