

EMF TEST REPORT

Test Report No.

: OT-21N-RWD-054

Reception No.

: 2110004459

Applicant

: Hitachi-LG Data Storage Korea, Inc.

Address

: (Gasan-dong), 189, Gasandigital1-ro, Geumcheon-gu, Seoul, Korea

Manufacturer

: Hitachi-LG Data Storage Korea, Inc.

Address

: (Gasan-dong), 189, Gasandigital1-ro, Geumcheon-gu, Seoul, Korea

Type of Equipment

: Thermal Sensing Terminal

FCC ID.

: 2AQ9F-HLT-SDBF1

Model Name

: HLT-SDBF1

Multiple Model Name : 29KC5P2J-W

Serial number

: N/A

Total page of Report

: 9 pages (including this page)

Date of Incoming

: October 11, 2021

Date of issue

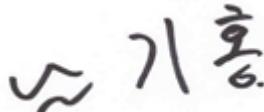
: November 29, 2021

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.



Tested by

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ONETECH Corp.

Reviewed by

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Approved by

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OTC-TRF-RF-001(0)

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

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Revision History

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-21N-RWD-054	November 29, 2021	Initial Release	All

1. VERIFICATION OF COMPLIANCE

Applicant : Hitachi-LG Data Storage Korea, Inc.
Address : (Gasan-dong), 189, Gasandigital1-ro, Geumcheon-gu, Seoul, Korea
Contact Person : Young-Jae Lee / Chief research engineer
Telephone No. : +82-10-5295-2800
FCC ID : 2AQ9F-HLT-SDBF1
Model Name : HLT-SDBF1
Brand Name : LG Electronics USA
Serial Number : N/A
Date : November 29, 2021

EQUIPMENT CLASS	DSS – PART 15 SPREAD SPECTRUM TRANSMITTER
E.U.T. DESCRIPTION	Thermal Sensing Terminal
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.10: 2020
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT	Certification
AUTHORIZATION REQUESTED	
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC PART 15 SUBPART C Section 15.247 KDB 558074 D01 15.247 Meas Guidance v05r02
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 Hitachi-LG Data Storage Korea, Inc., Model HLT-SDBF1 (referred to as the EUT in this report) is a Thermal Sensing Terminal. The product specification described herein was obtained from product data sheet or user's manual.

Device Type	Thermal Sensing Terminal	
Operating Frequency	Bluetooth	2 402 MHz ~ 2 480 MHz
	Bluetooth LE	2 402 MHz ~ 2 480 MHz
	WLAN 2.4 GHz	2 412 MHz ~ 2 462 MHz (802.11b/g/n(HT20))
		2 422 MHz ~ 2 452 MHz (802.11n(HT40))
RF Output Power	Bluetooth	7.86 dBm
	Bluetooth LE	2.31 dBm
	WLAN 2.4 GHz	9.17 dBm(802.11b)
		5.30 dBm(802.11g)
		4.74 dBm(802.11n_HT20)
		2.66 dBm(802.11n_HT40)
Modulation Type	Bluetooth	GFSK for 1 Mbps, $\pi/4$ -DQPSK for 2 Mbps, 8-DPSK for 3 Mbps
	Bluetooth LE	GFSK
	WLAN 2.4 GHz	802.11b: DSSS Modulation(DBPSK/DQPSK/CCK)
		802.11g/n(HT20)/n(HT40): OFDM Modulation(BPSK/QPSK/16QAM/64QAM)
Antenna Type	PCB Antenna	
Antenna Gain	1.16 dBi	
Rated Supply Voltage	DC 12 V	
List of each Osc. or crystal Freq.(Freq. \geq 1 MHz)	24 MHz	

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

- The following lists consist of the added model and their differences.

Model Name	Differences	Tested
HLT-SDBF1	Basic Model	<input checked="" type="checkbox"/>
29KC5P2J-W	This model is identical to the basic model except for the difference of the Vendor (LG) [See Note 3]	<input type="checkbox"/>

Note: 1. Applicant consigns only basic model to test. Therefore this test report just guarantees the units, which have been tested.

2. The Applicant/manufacturer is responsible for the compliance of all variants.

3. General product information and other remarks:

This product also included the stand as optional as follows;

- 1) Floor Stand(HLT-USBL2) for brand Hitachi-LG Data Storage
- 2) Floor Stand(ST-290FL(Stand Pole) & ST-290FP(Stand Plate)) for brand LG.

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 $P (\text{mW}) = P (\text{W}) / 1000$, $d (\text{cm}) = 0.01 * d (\text{m})$

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

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	Thermal Sensing Terminal
Device Category	<input type="checkbox"/> Portable (< 20 cm separation) <input type="checkbox"/> Mobile (> 20 cm separation) <input checked="" type="checkbox"/> Others
Exposure	<input checked="" type="checkbox"/> MPE
Evaluation Applied	<input type="checkbox"/> SAR <input type="checkbox"/> N/A

4.3 Calculated MPE Safe Distance

4.3.1 Bluetooth

According to above equation, the following result was obtained.

Operating Freq. Band (MHz)	Operating Mode	Target Power W/tolerance (dBm)	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			
2 402 ~ 2 480	1 Mbps	5.28 ± 1.0	6.28	4.25	-0.85	1.16	0.63	0.001 0	1.00
	2 Mbps	7.30 ± 1.0	8.30	6.76			0.79	0.001 6	1.00
	3 Mbps	7.86 ± 1.0	8.86	7.69			0.84	0.001 8	1.00

According to above table, for 2 402 ~ 2480 MHz Band(1 Mbps), safe distance,

$$D = 0.282 * \sqrt{(4.25 * 1.16) / 1.00} = 0.86 \text{ cm.}$$

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

$$S = P * G / (4\pi * R^2) = 4.25 * 1.16 / (4 * \pi * 20^2) = 0.001 0$$

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

4.3.2 Bluetooth LE

According to above equation, the following result was obtained.

Operating Freq. Band (MHz)	Operating Mode	Target Power W/tolerance (dBm)	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			
2 402 ~ 2 480	1 Mbps	2.31 ± 1.0	3.31	2.14	-0.85	1.16	0.44	0.000 5	1.00

According to above table, for 2 402 ~ 2480 MHz Band(1 Mbps), safe distance,

$$D = 0.282 * \sqrt{(2.14 * 1.16) / 1.00} = 0.44 \text{ cm.}$$

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

$$S = P * G / (4\pi * R^2) = 2.14 * 1.16 / (4 * \pi * 20^2) = 0.000 5$$

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

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4.3.3 WLAN 2.4 GHz

According to above equation, the following result was obtained.

Operating Freq. Band (MHz)	Operating Mode	Target Power W/tolerance (dBm)	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			
2 400 ~ 2 483.5	802.11b	9.17 ± 2.0	11.17	13.09	-0.85	1.16	1.10	0.003 0	1
	802.11g	5.30 ± 2.0	7.30	5.37			0.70	0.001 2	1
	802.11n_ HT20	4.74 ± 2.0	6.74	4.72			0.66	0.001 1	1
	802.11n_ HT40	2.66 ± 2.0	4.66	2.92			0.52	0.000 7	1

According to above table, for 2 412 ~ 2 462 MHz Band(802.11 b), safe distance,

$$D = 0.282 * \sqrt{(13.09 * 1.16) / 1.00} = 1.10 \text{ cm.}$$

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

$$S = P * G / (4\pi * R^2) = 13.09 * 1.16 / (4 * \pi * 20^2) = 0.003 0$$

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