RF Exposure Evaluation Report

APPLICANT	:	**Lenovo (Shanghai) Electronics Technology Co., Ltd.**
EQUIPMENT	:	**Lenovo Smart Clock**
BRAND NAME	:	**Lenovo**
MODEL NAME	:	**Lenovo CD-24501F**
FCC ID	:	**O57CD24501F**
STANDARD	:	**47 CFR Part 2.1091** **FCC KDB 447498 D01 v06**

We, Sporton International (Kunshan) Inc., would like to declare that the device has been evaluated in accordance with 47 CFR Part 2.1091 and FCC KDB 447498 D01 v06, and pass the limit. Without written approval of Sporton International (Kunshan) Inc., the test report shall not be reproduced except in full.

Mark Qu

TESTING
NVLAP LAB CODE 600155-0

Approved by: Mark Qu / Manager

Sporton International (Kunshan) Inc.
No. 1098, Pengxi North Road, Kunshan Economic Development Zone,
Jiangsu Province 215335, China

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History of this test report

Report No.	Version	Description	Issued Date
FA8N2702	Rev. 01	Initial issue of report	Feb. 25, 2019

1. Administration Data

1.1. Testing Laboratory

Testing Laboratory	
Test Site	Sporton International (Kunshan) Inc.
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone, Jiangsu Province 215335, China TEL : 86-512-57900158 FAX : 86-512-57900958

Applicant	
Company Name	Lenovo (Shanghai) Electronics Technology Co., Ltd.
Address	NO.68 BUILDING, 199 FENJU RD, China （Shanghai）Pilot Free Trade Zone, 200131, China

Manufacturer	
Company Name	Lenovo PC HK Limited
Address	23/F, Lincoln House, Taikoo Place 979 King's Road, Quarry Bay, Hong Kong

2. Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	Lenovo Smart Clock
Brand Name	Lenovo
Model Name	Lenovo CD-24501F
FCC ID	O57CD24501F
Wireless Technology and Frequency Range	WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz WLAN 5.5GHz Band: 5500 MHz ~ 5700 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Mode	WLAN 2.4GHz 802.11b/g/n HT20 WLAN 5GHz 802.11a/n/ac HT20/HT40/VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE
HW Version	LGAM400
SW Version	0.92.0+Prod.1.1.0.5237188
EUT Stage	Identical Prototype
Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.	

3. Maximum RF average output power among production units

<Bluetooth>

Band / Mode	Average Power (dBm)			
	BR / EDR			LE
	1M	2M	3M	GFSK
Bluetooth	9.00	9.00	9.00	0.50

<WLAN 2.4GHz>

Mode		Maximum Average Power (dBm)
2.4GHz	802.11b	19.50
	802.11g	12.50
	802.11n-HT20	14.50

<WLAN 5GHz>

Mode		Maximum Average Power (dBm)
5.2GHz	802.11a	18.00
	802.11n-HT20	17.00
	802.11n-HT40	15.00
	802.11ac-VHT20	17.00
	802.11ac-VHT40	15.00
	802.11ac-VHT80	8.50
5.3GHz	802.11a	18.50
	802.11n-HT20	17.50
	802.11n-HT40	15.50
	802.11ac-VHT20	17.50
	802.11ac-VHT40	15.50
	802.11ac-VHT80	10.00
5.5GHz	802.11a	17.50
	802.11n-HT20	16.50
	802.11n-HT40	14.50
	802.11ac-VHT20	16.50
	802.11ac-VHT40	14.50
	802.11ac-VHT80	9.00
5.8GHz	802.11a	17.50
	802.11n-HT20	16.50
	802.11n-HT40	14.50
	802.11ac-VHT20	16.50
	802.11ac-VHT40	14.50
	802.11ac-VHT80	14.00

4. RF Exposure Limit Introduction

According to ANSI/IEEE C95.1-1992, the criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §1.1310.

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0	614	1.63	*(100)	6
3.0-30	1842/f	4.89/f	*(900/f2)	6
30-300	61.4	0.163	1.0	6
300-1500			f/300	6
1500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f2)	30
30-300	27.5	0.073	0.2	30
300-1500			f/1500	30
1500-100,000			1.0	30

The MPE was calculated at 20 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$S = \frac{PG}{4\pi R^2}$$

Where:
S = Power Density
P = Output Power at Antenna Terminals
G = Gain of Transmit Antenna (linear gain)
R = Distance from Transmitting Antenna

5. Radio Frequency Radiation Exposure Evaluation

5.1. Standalone Power Density Calculation

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 20cm (mW/cm^2)	Limit (mW/cm^2)	Power Density / Limit
WLAN2.4GHz 802.11b	2412	-1.50	19.50	18.000	0.063	63.096	0.013	1.000	**0.013**
WLAN2.4GHz 802.11g	2412	-1.50	12.50	11.000	0.013	12.589	0.003	1.000	0.003
WLAN2.4GHz 802.11n-HT20	2412	-1.50	14.50	13.000	0.020	19.953	0.004	1.000	0.004
WLAN5.2GHz 802.11a	5180	-0.68	18.00	17.320	0.054	53.951	0.011	1.000	0.011
WLAN5.2GHz 802.11n-HT20	5180	-0.68	17.00	16.320	0.043	42.855	0.009	1.000	0.009
WLAN5.2GHz 802.11n-HT40	5190	-0.68	15.00	14.320	0.027	27.040	0.005	1.000	0.005
WLAN5.2GHz 802.11ac-VHT20	5180	-0.68	17.00	16.320	0.043	42.855	0.009	1.000	0.009
WLAN5.2GHz 802.11ac-VHT40	5190	-0.68	15.00	14.320	0.027	27.040	0.005	1.000	0.005
WLAN5.2GHz 802.11ac-VHT80	5210	-0.68	8.50	7.820	0.006	6.053	0.001	1.000	0.001
WLAN5.3GHz 802.11a	5260	-0.48	18.50	18.020	0.063	63.387	0.013	1.000	**0.013**
WLAN5.3GHz 802.11n-HT20	5260	-0.48	17.50	17.020	0.050	50.350	0.010	1.000	0.010
WLAN5.3GHz 802.11n-HT40	5270	-0.48	15.50	15.020	0.032	31.769	0.006	1.000	0.006
WLAN5.3GHz 802.11ac-VHT20	5260	-0.48	17.50	17.020	0.050	50.350	0.010	1.000	0.010
WLAN5.3GHz 802.11ac-VHT40	5270	-0.48	15.50	15.020	0.032	31.769	0.006	1.000	0.006
WLAN5.3GHz 802.11ac-VHT80	5290	-0.48	10.00	9.520	0.009	8.954	0.002	1.000	0.002
WLAN5.5GHz 802.11a	5500	-0.15	17.50	17.350	0.054	54.325	0.011	1.000	0.011
WLAN5.5GHz 802.11n-HT20	5500	-0.15	16.50	16.350	0.043	43.152	0.009	1.000	0.009
WLAN5.5GHz 802.11n-HT40	5510	-0.15	14.50	14.350	0.027	27.227	0.005	1.000	0.005
WLAN5.5GHz 802.11ac-VHT20	5500	-0.15	16.50	16.350	0.043	43.152	0.009	1.000	0.009
WLAN5.5GHz 802.11ac-VHT40	5510	-0.15	14.50	14.350	0.027	27.227	0.005	1.000	0.005
WLAN5.5GHz 802.11ac-VHT80	5530	-0.15	9.00	8.850	0.008	7.674	0.002	1.000	0.002
WLAN5.8GHz 802.11a	5745	-0.30	17.50	17.200	0.052	52.481	0.010	1.000	0.010
WLAN5.8GHz 802.11n-HT20	5745	-0.30	16.50	16.200	0.042	41.687	0.008	1.000	0.008
WLAN5.8GHz 802.11n-HT40	5755	-0.30	14.50	14.200	0.026	26.303	0.005	1.000	0.005
WLAN5.8GHz 802.11ac-VHT20	5745	-0.30	16.50	16.200	0.042	41.687	0.008	1.000	0.008
WLAN5.8GHz 802.11ac-VHT40	5755	-0.30	14.50	14.200	0.026	26.303	0.005	1.000	0.005
WLAN5.8GHz 802.11ac-VHT80	5775	-0.30	14.00	13.700	0.023	23.442	0.005	1.000	0.005
Bluetooth	2402	-1.58	9.00	7.420	0.006	5.521	0.001	1.000	**0.001**

Note: For conservativeness, the lowest frequency of each band is used to determine the MPE limit of that band

5.2. Collocated Power Density Calculation

WLAN2.4GHz Power Density / Limit	Bluetooth Power Density / Limit	Σ(Power Density / Limit) of WLAN2.4GHz+Bluetooth
0.013	0.001	0.014
WLAN5GHz Power Density / Limit	**Bluetooth Power Density / Limit**	**Σ(Power Density / Limit) of WLAN5GHz+Bluetooth**
0.013	0.001	0.014

Note:

1. Σ(Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)], for WLAN2.4GHz + Bluetooth or WLAN5GHz + Bluetooth.
2. Considering the WLAN and Bluetooth transmitter of the EIRP performance listed in the table above, the aggregated (power density /limit) is smaller than 1.

Conclusion:

According to 47 CFR §2.1091, the RF exposure analysis concludes that the RF Exposure is FCC compliant.