



RF Exposure Evaluation Report

APPLICANT : Lenovo(Shanghai) Electronics Technology Co., Ltd.

EQUIPMENT : Portable Tablet Computer

BRAND NAME : Lenovo

MODEL NAME : Lenovo TB-X505F

FCC ID : O57TBX505F

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 pass the limit. Without written approval of Sporton International (Kunshan) Inc., the test report shall not be reproduced except in full.

Mark Qu

Approved by: Mark Qu / Manager



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Table of Contents

1. ADMINISTRATION DATA	4
1.1. Testing Laboratory	4
2. DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)	5
2.1. General Information	5
3. MAXIMUM RF AVERAGE OUTPUT POWER AMONG PRODUCTION UNITS	6
4. RF EXPOSURE LIMIT INTRODUCTION	11
5. RADIO FREQUENCY RADIATION EXPOSURE EVALUATION	12
5.1. Standalone Power Density Calculation	12
5.2. Collocated Power Density Calculation.....	13

**Revision History**

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA912606B	Rev. 01	Initial issue of report	Apr. 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, 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)

2.1. General Information

Product Feature & Specification for Portable Tablet Computer	
Equipment Name	Portable Tablet Computer
Brand Name	Lenovo
Model Name	Lenovo TB-X505F
FCC ID	O57TBX505F
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 ~ 5720 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 HT20/HT40 WLAN 5GHz 802.11ac VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE
HW Version	Lenovo Tablet TB-X505F
SW Version	TB-X505F_RF01_190117
EUT Stage	Identical Prototype
Remark: 1. This device has no voice function. 2. This device implanted proximity sensor function at bottom face and edge 1, power reduction will be implemented immediately at all WLAN bands. 3. There are seven samples and two type batteries that the differences of them described on product equality declaration separately.	

**3. Maximum RF average output power among production units****For Portable Tablet Computer****<2.4GHz WLAN>**

2.4GHz WLAN	Mode	Channel	Frequency (MHz)	Tune-Up Limit
	802.11b 1Mbps	1	2412	17.00
		6	2437	17.00
		11	2462	17.00
	802.11g 6Mbps	1	2412	17.00
		6	2437	17.00
		11	2462	17.00
	802.11n-HT20 MCS0	1	2412	17.00
		6	2437	17.00
		11	2462	17.00

**<5GHz WLAN>**

5.2GHz WLAN	Mode	Channel	Frequency (MHz)	Tune-Up Limit
	802.11a 6Mbps	36	5180	16.00
		40	5200	16.00
		44	5220	16.00
		48	5240	16.00
	802.11n-HT20 MCS0	36	5180	16.00
		40	5200	16.00
		44	5220	16.00
		48	5240	16.00
	802.11n-HT40 MCS0	38	5190	15.50
		46	5230	15.50
	802.11ac-VHT20 MCS0	36	5180	16.00
		40	5200	16.00
		44	5220	16.00
		48	5240	16.00
	802.11ac-VHT40 MCS0	38	5190	15.50
		46	5230	15.50
	802.11ac-VHT80 MCS0	42	5210	15.50



5.3GHz WLAN	Mode	Channel	Frequency (MHz)	Tune-Up Limit
	802.11a 6Mbps	52	5260	15.50
		56	5280	15.50
		60	5300	15.50
		64	5320	15.50
	802.11n-HT20 MCS0	52	5260	15.50
		56	5280	15.50
		60	5300	15.50
		64	5320	15.50
	802.11n-HT40 MCS0	54	5270	15.50
		62	5310	15.50
	802.11ac-VHT20 MCS0	52	5260	15.50
		56	5280	15.50
		60	5300	15.50
		64	5320	15.50
	802.11ac-VHT40 MCS0	54	5270	15.50
		62	5310	15.50
	802.11ac-VHT80 MCS0	58	5290	15.50



5.5GHz WLAN	Mode	Channel	Frequency (MHz)	Tune-Up Limit
	802.11a 6Mbps	100	5500	16.00
		116	5580	16.00
		124	5620	16.00
		132	5660	16.00
		140	5700	16.00
		144	5720	16.00
	802.11n-HT20 MCS0	100	5500	16.00
		116	5580	16.00
		124	5620	16.00
		132	5660	16.00
		140	5700	16.00
		144	5720	16.00
	802.11n-HT40 MCS0	102	5510	15.50
		110	5550	15.50
		126	5630	15.50
		134	5670	15.50
		142	5710	15.50
	802.11ac-VHT20 MCS0	100	5500	16.00
		116	5580	16.00
		124	5620	16.00
		132	5660	16.00
		140	5700	16.00
		144	5720	16.00
	802.11ac-VHT40 MCS0	102	5510	15.50
		110	5550	15.50
		126	5630	15.50
		134	5670	15.50
		142	5710	15.50
	802.11ac-VHT80 MCS0	106	5530	15.50
		122	5610	15.50
		138	5690	15.50

5.8GHz WLAN	Mode	Channel	Frequency (MHz)	Tune-Up Limit
	802.11a MCS0	149	5745	16.00
		157	5785	16.00
		165	5825	15.50
	802.11n-HT20 MCS0	149	5745	16.00
		157	5785	16.00
		165	5825	15.50
	802.11n-HT40 MCS0	151	5755	15.50
		159	5795	15.50
	802.11ac-VHT20 MCS0	149	5745	16.00
		157	5785	16.00
		165	5825	16.00
	802.11ac-VHT40 MCS0	151	5755	15.50
		159	5795	15.50
	802.11ac-VHT80 MCS0	155	5775	15.50

<Bluetooth>

Bluetooth	Mode	Maximum Average Power (dBm)
	BR/EDR	9.5
	LE	0

For Docking
<Bluetooth for Docking>

Mode	Maximum Average Power (dBm)
Bluetooth LE	8.0



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/f ²)	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/f ²)	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)	Average EIRP (mW)	Power Density at 20cm (mW/mW ²)	Limit (mW/mW ²)	Power Density / Limit
Bluetooth for Docking	2402.0	2.00	8.00	10.00	10.00	0.002	1.000	0.002
Bluetooth for Portable Tablet Computer	2402.0	1.30	9.50	10.80	12.02	0.002	1.000	0.002
2.4GHz WLAN	2412.0	1.30	17.00	18.30	67.61	0.013	1.000	0.013
5.2GHz WLAN	5180.0	1.43	16.00	17.43	55.34	0.011	1.000	0.011
5.3GHz WLAN	5260.0	1.16	15.50	16.66	46.34	0.009	1.000	0.009
5.5GHz WLAN	5500.0	1.39	16.00	17.39	54.83	0.011	1.000	0.011
5.8GHz WLAN	5745.0	1.83	16.00	17.83	60.67	0.012	1.000	0.012

Note:

1. For conservativeness, the lowest uplink frequency of each band is used to determine the MPE limit of that band.
2. In the above table have assessed WLAN 2.4GHz, WLAN 5GHz and Bluetooth by referring to their maximum antenna gain and maximum output power.

**5.2. Collocated Power Density Calculation**

Power Density / Limit			Σ (Power Density / Limit) of
1	2	3	1+2+3
Bluetooth for Portable Tablet Computer	Bluetooth for Docking	5GHz WLAN	
0.002	0.002	0.012	0.016

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 WLAN + Bluetooth.
2. Portable Tablet Computer can work with a docking device via Bluetooth, so MPE is performed to evaluate this using state.
3. For Portable Tablet Computer will choose either WLAN 2.4GHz or WLAN 5GHz according to the network signal condition; therefore, 2.4GHz WLAN and 5GHz WLAN will not operate simultaneously at any moment.
4. For Portable Tablet Computer, WLAN 2.4GHz and Bluetooth share the same antenna, and they can't transmit simultaneously.

Conclusion:

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