

FCC ID: 2ACEY-CEM-7000

# FCC RF Exposure Evaluation

# 1. Product Information

Product name	TS Smart Cylindrical Lock			
Test Model	e-Elite-7000-OS			
Power Supply	DC 6.0V by 4*AA Batteries			
Hardware Version	MTBL-KONE-AF-T2 V1			
Software Version	01000933			
Bluetooth				
Frequency Range	2402MHz~2480MHz			
Channel Number	40 channels for Bluetooth V5.0 (DTS)			
Channel Spacing	2MHz for Bluetooth V5.0 (DTS)			
Modulation Type	GFSK for Bluetooth V5.0 (DTS)			
Bluetooth Version	V5.0			
Antenna Description	Internal Antenna, 4.93dBi(Max.)			
RF ID				
Operating Frequency	13.56MHz			
Modulation Type	ASK 10 Lab			
Antenna Description	Internal Antenna, 0dBi(Max.)			
Z-Wave				
Frequency Range	910MHz~920MHz			
Channel Spacing	1MHz			
Channel Number	11 channels			
Modulation Type	GFSK			
Antenna Description Internal Antenna, 2.50dBi(Max.)				
Exposure category	General population/uncontrolled environment			
EUT Type	Production Unit			
Device Type	Mobile Devices			













#### 2. Evaluation method and Limit

Systems operating under the provisions of FCC 47 CFR section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as mobile device whereby a distance of 0.2m normally can be maintained between the user and the device, and below RF Permissible Exposure limit shall comply with.

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In accordance with KDB447498D01 for Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modelled or measured field strengths or power density, is ≤ 1.0. The MPE ratio of each antenna is determined at the minimum test separation distance required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power density to MPE limit, at the test frequency. Either the maximum peak or spatially averaged results from measurements or numerical simulations may be used to determine the MPE ratios. Spatial averaging does not apply when MPE is estimated using simple calculations based on far-field plane-wave equivalent conditions. The antenna installation and operating requirements for the host device must meet the minimum test separation distances required by all antennas, in both standalone and simultaneous transmission operations, to satisfy compliance.

#### 3. Limit

#### 3. 1 Refer Evaluation Method

ANSI C95.1–2019: IEEE Standard for Safety Levels with Respect to Human Exposure to Electric, Magnetic, and Electromagnetic Fields, 0 Hz to 300 GHz

FCC KDB publication 447498 D01 General 1 RF Exposure Guidance v06: Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.

FCC CFR 47 part1 1.1310: Radiofrequency radiation exposure limits.

FCC CFR 47 part2 2.1091: Radiofrequency radiation exposure evaluation: mobile devices.

#### 3. 2 Limit

Limits for Maximum Permissible Exposure (MPE)/Controlled Exposure

Elitile for Maximum Formiodisio Expeditio (Mi E) Controlled Expeditio							
Frequency	Frequency Electric Field		Power Density	Averaging Time			
Range(MHz)	Strength(V/m)	Strength(A/m)	(mW/cm²)	(minute)			
	led Exposure						
0.3 - 3.0	614	1.63	(100) *	6			
3.0 - 30	1842/f	4.89/f	(900/f <sup>2</sup> )*	6			
30 – 300	61.4	0.163	1.0	6			
300 – 1500	/	/	f/300	6			
1500 – 100,000	/	/	5	6			

Limits for Maximum Permissible Exposure (MPE)/Uncontrolled Exposure

Frequency	Frequency Electric Field		Power Density	Averaging Time		
Range(MHz)	Strength(V/m)	Strength(A/m)	(mW/cm²)	(minute)		
Thursday	Limits for Occupational/Uncontrolled Exposure					
0.3 - 3.0	614	1.63	(100) *	30		
3.0 - 30	824/f	2.19/f	(180/f <sup>2</sup> )*	30		
30 – 300	27.5	0.073	0.2	30		
300 – 1500	/	/	f/1500	30		
1500 – 100,000	/	/	1.0	30		

F=frequency in MHz



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<sup>\*=</sup>Plane-wave equivalent power density

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## 4. MPE Calculation Method

Predication of MPE limit at a given distance Equation from page 18 of OET Bulletin 65, Edition 97-01

S=PG/4πR<sup>2</sup>

Where: S=power density

P=power input to antenna

G=power gain of the antenna in the direction of interest relative to an isotropic radiator

R=distance to the center of radiation of the antenna

#### 5. Conducted Power

[BT LE 1M]

Mode	Channel	Frequency (MHz)	Peak Conducted Output Power (dBm)
1/20 res	0	2402	0.28
BLE 1M	19	2440	0.76
	39	2480	-0.29

[BT LE 2M]

Mode	Channel	Frequency (MHz)	Peak Conducted Output	
Wiodo	Ond in or	r requeries (ivii iz)	Power (dBm)	
	0	2402	0.18	
BLE 2M	19	2440	0.55	
Testing Lab	39	2480	-0.47	

#### **Test Procedure**

TX frequency range: 13.56MHz, Limit: 824/13.56=60.77V/m

Device category: Mobile device (Distance: 20cm)

Max. Field Strength: 43.09dBuV/m @3m @20cm=@3m+40\*log(3/0.2)= 90.134dBuV/m

For 13.56MHz: 90.134dBuV/m=10^(90.134/20)/10^6=0.032V/m< 60.77V/m

# **Test Procedure**

TX frequency range: 920MHz(Worst result), Limit: 910/1500=0.6067V/m

Device category: Mobile device (Distance: 20cm)

Max. Field Strength: 85.83dBuV/m @3m

EIRP=E-104.8+20logD=85.83-104.8+20log3=-9.43dBm

Maximum Conducted Output Power: -9.43dBm

Turn-up: -9±1dBm



LCS Tosting Lab





# 6. Manufacturing Tolerance

[BT LE 1M]

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BT LE (Peak)							
Channel	Channel 39						
Target (dBm)	0	0	0				
Tolerance ±(dB)	1.0	1.0	1.0				

[BT LE 2M]

BT 2LE (Peak)						
Channel Channel 0 Channel 19 Channel 39						
Target (dBm)	0	0	0			
Tolerance ±(dB) 1.0 1.0 1.0						

#### 7. Evaluation Results

As declared by the Applicant, the EUT is a wireless device used in a fix application, at least 20 cm from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum separation distance, r =20cm, as well as the gain of the used antenna refer to antenna information, the RF power density can be obtained.

[BT LE 1M]

	Outp	ut power	Antenna	Antenna	MPE	MPE
Modulation Type	dBm	mW	Gain (dBi)	Gain (linear)	(mW/cm2)	Limits (mW/cm2)
GFSK	1.0	1.2589	4.93	3.1117	0.0008	1.0000

[BT LE 2M]

1.00. 4.600	Outpu	ut power	Antenna	Antenna Gain	MPE	MPE
Modulation Type	dBm	mW	Gain (dBi)	(linear)	(mW/cm2)	Limits (mW/cm2)
GFSK	1.0	1.2589	4.93	3.1117	0.0008	1.0000

[Z-Wave]

	Outp	ut power	Antenna	Antenna	MPE	MPE
Modulation Type	dD.vo	ma\A/	Gain	Gain	(mW/cm2)	Limits
	dBm	mW	(dBi)	(linear)	(mvv/cmz)	(mW/cm2)
GFSK	-8.0	0.1585	2.50	1.7783	0.0001	0.6067

# Remark:

- 1. Output power including tune up tolerance;
- 2. Output power was adjust to duty cycle at 100% if measured duty cycle less than 98%:
- 3. MPE evaluate distance is 20cm from user manual provide by manufacturer.

## **Simultaneous Transmission MPE**

BLE Max MPE (Ratio)	NFC Max MPE (Ratio)	simultaneous MPE (Ratio)	MPE Limits (Ratio)
0.0008	0.0005	0.0013	1.0000

#### 8. Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.

.....THE END OF REPORT......

