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RF Exposure and Transmitter Power Considerations for the Tosibox Oy Lock 500iC

FCC ID: 2AHCNLOCK500I

Contains FCC ID: N7NEM7455

For mobile product operation the FCC requires that the calculated MPE be equal to or less than a given limit dependent on frequency at a distance of 20 cm from a device to the body of a user.

The transmitter operation for the Tosibox Lock 500iC utilizes 2.4GHz WLAN. It also contains certified cellular module FCC ID: N7NEM7455. This has been certified for the following operating bands:

CDMA850/ LTE B5: 824-849MHz

CDMA1900/ LTE B2: 1850-1910MHz

LTE B4: 1710 – 1755MHz

LTE B7: 2500 – 2570MHz

LTE B12: 698 - 716MHz

LTE B13: 777 – 787MHz

LTE B25: 1850 – 1915MHz

LTE B26: 814 - 849MHz

LTE B30: 2305 – 2315MHz

LTE B41: 2496 – 2690MHz

NOTE:
The Tosibox Oy model: Lock 500 only contains the 2.4GHz WLAN functionality

The following FCC Rule Parts and procedures are applicable:

Part 1.1310 – Radiofrequency radiation exposure limits
Part 2.1091 – Radiofrequency radiation exposure evaluation: mobile devices

KDB447498 D01 v06
Mobile and Portable Devices RF Exposure Procedures and Equipment Authorisation Policies

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MPE CALCULATIONS

The MPE calculation used to calculate the safe operating distance for the user is:

$$S = EIRP/4 \pi R^2$$

Where S = Power density

EIRP = Effective Isotropic Radiated Power (EIRP = P x G)

P = Conducted Transmitter Power

G = Antenna Gain (relative to an isotropic radiator)

R = distance to the centre of radiation of the antenna (safe operating distance)

Power Density Requirement

From table 1 (b) - Limits for General Population/ Uncontrolled Exposure of

FCC §1.1310 (e) **for f >1500MHz** , S_{req} **= 1.0 mW/cm^2**

From table 1 (b) - Limits for General Population/ Uncontrolled Exposure of

FCC §1.1310 (e) **for f <1500MHz**, S_{req} **= f/1500 mW/cm^2**

(f = operating frequency)

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VALUES

CDMA and LTE conducted power values are taken from module grant FCC ID:N7NEM7455

Frequency Range (MHz)	Operating Band	TX Conducted Power Average (dBm)	Antenna Gain (dBi)	EIRP (mW)	Calculated Distance R @ S_{req} (cm)	Power Density S mw/ cm^2		
						Limit S_{req}	Calculated S_n @ 20cm	S_n/S_{req}
2412 - 2462	WLAN	20.0	+2.0	158	3.55	1.0	0.03	0.03
824 - 849	CDMA V LTE 5	24.0	+3.0	500	8.35	0.57	0.1	0.18
1850 - 1910	CDMA II LTE 2	24.0	+3.0	500	6.3	1.0	0.1	0.1
1710 - 1755	CDMA IV LTE 4	24.0	+3.0	500	6.3	1.0	0.1	0.1
2500 - 2570	LTE 7	23.0	+3.0	398	5.62	1.0	0.08	0.08
699 - 716	LTE 12	24.0	+3.0	500	9.2	0.47	0.1	0.21
777 - 787	LTE 13	24.0	+3.0	500	8.74	0.52	0.1	0.19
1850 - 1950	LTE 25	24.0	+3.0	500	6.3	1.0	0.1	0.1
814 - 849	LTE 26	24.0	+3.0	500	8.58	0.54	0.1	0.19
2305 - 2315	LTE 30	23.0	+3.0	398	5.62	1.0	0.08	0.08
2496 - 2690	LTE 41	23.0	+3.0	398	5.62	1.0	0.08	0.08

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KDB447498 D01 v05 Section 7.2 SIMULTANEOUS TRANSMISSION CONSIDERATIONS

(This is for the Lock 500iC)

Worst case summation of calculated MPE ratios S_n/S_{req}.

WCDMA and WiFi operation:

ie: $\Sigma MPE_{ratios} = (S_1/ S_{req1}) + (S_2/ S_{req2})$

= 0.03 + 0.18

= 0.21

LTE and WiFi operation:

ie: $\Sigma MPE_{ratios} = (S_1/ S_{req1}) + (S_6/ S_{req6})$

= 0.03 + 0.21

= 0.24

Σ of MPE ratios<1.0, so in accordance with KDB447498 Section 7.2, simultaneous transmission test exclusion applies for the WiFi +CDMA and WiFi + LTE transmitters.

Conclusion

The required 20cm RF exposure limits for General Population/ Uncontrolled Exposure will not be exceeded for the Lock 500 using antennas that have a maximum gain of 2.0dBi for Wi-Fi.

The required 20cm RF exposure limits for General Population/ Uncontrolled Exposure will not be exceeded for the Lock 500iC using antennas having a maximum gain of 2.0dBi for Wi-Fi and 3.0 dBi for CDMA/ LTE operation respectively.

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