

5. RF EXPOSURE EVALUATION

5.1 Applicable Standard

According to subpart 15.247(i) and subpart §1.1310, systems operating under the provisions of this 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.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (minutes)
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

f = frequency in MHz; * = Plane-wave equivalent power density;

According to §1.1310 and §2.1091 RF exposure is calculated.

5.2 Calculation formula:

Prediction of power density at the distance of the applicable MPE limit

$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm²);

P = power input to the antenna (in appropriate units, e.g., mW);

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

5.3 EUT Information ▲ :

Operation Modes	Operation Frequency (MHz)	Max Conducted output power including Tune-up Tolerance (dBm)	Maximum Antenna Gain (dBi)
NFC(13.56MHz)	13.56	-24.24	0
125kHz	0.125	1.43	0

Note:

1. The Above Parameters were provided by the manufacturer.
2. *NFC field strength is 70.96dB μ V/m @ 3m = -24.24 dBm(0.0038mW) EIRP. That equal to antenna gain is 0dBi and used the EIRP value as conducted power.
3. *125kHz field strength is 96.63dB μ V/m @ 3m = 1.43 dBm(1.39mW) EIRP. That equal to antenna gain is 0dBi and used the EIRP value as conducted power.

5.4 Calculated Data:

Operation Modes	Frequency (MHz)	Antenna Gain		Conducted output power including Tune-up Tolerance		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
		(dBi)	(numeric)	(dBm)	(mW)			
NFC(13.56MHz)	13.56	0	1.00	-24.24	0.0039	20	<<0.001	0.98
125kHz	0.125	0	1.00	1.43	1.39	20	<<0.001	/

The NFC and 125kHz can transmit simultaneously:

Note: the power Density of 13.56MHz and 125 kHz too low to calculate the MPE

Result: The device meet FCC MPE at 20 cm distance

Result: Compliant.

===== END OF REPORT =====