

5. RF EXPOSURE EVALUATION

5.1 Applicable Standard

According to 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.

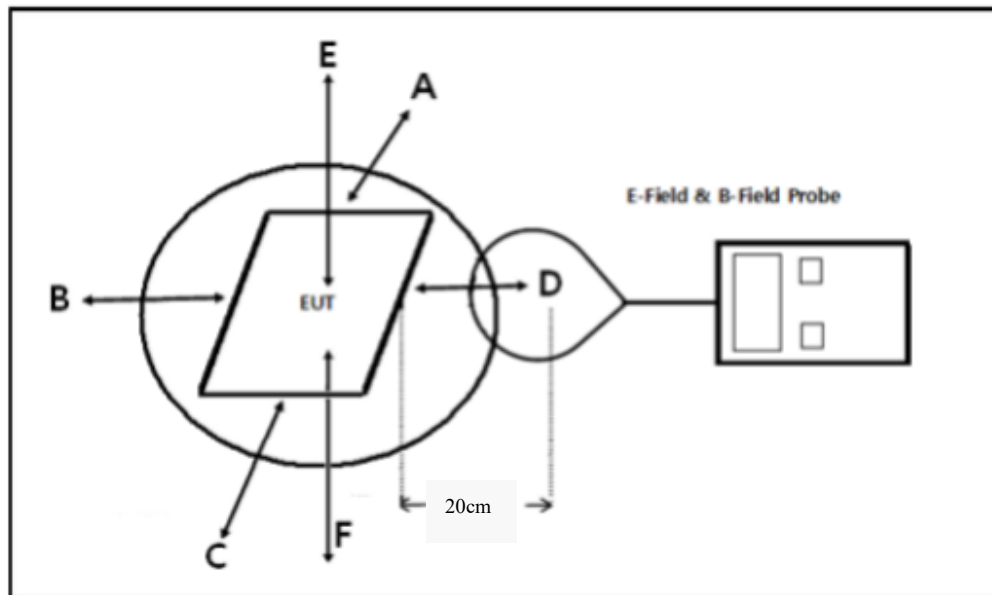
Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(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.

5.1.1 Block Diagram of Test Setup For RFID



5.1.2 Test Procedure:

H-Field & E-Field Probe instrument was used to test and record magnetic and electric fields in five directions A, B, C, D and E at a distance of 20cm from EUT.

5.1.3 Calculation formula For Power Density:

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);

5.2 Test Data For 128kHz RFID:

Serial Number:	28EW-1	Test Date:	2024/1/2
Test Site:	RF	Test Mode:	Transmitting
Tester:	Carl Xue	Test Result:	Pass

Environmental Conditions:

Temperature: (°C)	25	Relative Humidity: (%)	47	ATM Pressure: (kPa)	101.3
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Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Narda	Electric and Magnetic Field Probe-Analyzer	EHP-200AC	180ZX10204	2021/06/07	2024/06/06

** Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).*

Test Data:**H-Field Strength:**

Frequency Range (kHz)	Position A (A/m)	Position B (A/m)	Position C (A/m)	Position D (A/m)	Position E (A/m)	Limit (A/m)
128	0.1532	0.1647	0.1482	0.1653	0.1712	1.63

E-Field Strength:

Frequency Range (kHz)	Position A (V/m)	Position B (V/m)	Position C (V/m)	Position D (V/m)	Position E (V/m)	Limit (V/m)
128	0.6365	0.6825	0.7433	0.6013	0.5869	614

Note: Test with 15cm distance from the center of the probe(s) to the edge of the device, 20 cm for top test.

Note: according to KDB 680106 D01 Wireless Power Transfer v04 clause 3.2, for all RF devices, the MPE limits between 100 kHz to 300 kHz are to be considered the same as those at 300 kHz in Table 1 of § 1.1310, that is, 614V/m and 1.63 A/m, for the electric field and magnetic field, respectively.

5.3 Calculated Data:

Operation Modes	Frequency (MHz)	Antenna Gain		EIRP 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	/	/	-28.45	0.0014	20	<<0.0001	0.98
Note: 1. The Above Parameters were provided by the manufacturer. 2. *NFC field strength is 66.75dBμV/m @ 3m = -28.45dBm(0.0014mW) EIRP.								

Simultaneous transmission:

The NFC and 128kHz RFID can transmit simultaneously:

$$S_{\text{NFC}}/S_{\text{limit-NFC}} + H_{\text{RFID}}/H_{\text{limit-RFID}}$$

$$=0.0001/0.98+0.1712/1.63$$

$$=0.105$$

$$< 1.0$$

Result: The device meet FCC MPE at 20 cm distance