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/f²)	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/cm^2);
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 Calculated Data:

Operation Mode	Frequency (MHz)	Antenna Gain (dBi)	Conducted output power including Tune-up Tolerance (dBm)	EIRP (dBm)	Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
WLAN	2412-2462	1.7	18	19.70	20.00	0.0186	1.0
BLE	2402-2480	-2	4	2.0	20.00	0.0003	1.0
NFC	13.56	/	/	-36	20.00	<0.0001	4.88

Note: the Conducted output power including Tune-up Tolerance was declared by manufacturer.
The manufacturer declared NFC EIRP power is -36dBm(=59.2dBμV/m@3m)

The NFC, WLAN and BLE can transmit simultaneously:

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

$=S_{WLAN}/S_{limit\text{-}WLAN}+ S_{BLE}/S_{limit\text{-}BLE}+ S_{NFC}/S_{limit\text{-}NFC}$

=0.019

< 1.0

Result: The device meet FCC MPE at 20 cm distance

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