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Maximum Permissible Exposure Evaluation

FCC ID: QCI-IDNMOD1

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) Radiation as specified in §1.1307(b)

EUT Specification

Product Name:	SMART QX/V4 NFC Module
Trade Mark:	SMART
Model/Type reference:	IDNMOD1
Listed Model(s):	/
Host Device Model:	IDX55-5, IDX65-5, IDQR65-A, IDX75-5, IDQR75-A, IDX86-5, IDQR86-A
Frequency band (Operating)	NFC: 13.56MHz BT: 2.402GHz ~ 2.480GHz 2.4G WIFI: 2.412GHz ~ 2.462GHz 5G WIFI: 5.150GHz ~ 5.350GHz, 5.470GHz ~ 5.850GHz 6G WIFI: 5.925GHz ~ 6.525GHz
Device category	<input type="checkbox"/> Portable (<5mm separation) <input type="checkbox"/> Mobile (>20cm separation) <input checked="" type="checkbox"/> Fixed (>20cm separation) <input type="checkbox"/> Others ____
Exposure classification	<input type="checkbox"/> Occupational/Controlled exposure (S=5mW/cm ²) <input checked="" type="checkbox"/> General Population/Uncontrolled exposure (S=1mW/cm ²)
Antenna diversity	<input type="checkbox"/> Single antenna <input checked="" type="checkbox"/> Multiple antenna <input type="checkbox"/> TX diversity <input type="checkbox"/> RX diversity <input type="checkbox"/> TX/RX diversity
Antenna gain (Max)	NFC ANT: 0dBi BT ANT: 3.57dBi 2.4G WIFI ANT1&ANT2: 3.57dBi, Directional gain: 3.57dBi 5G WIFI ANT1&ANT2: 3.64dBi, Directional gain: 3.64dBi 6G WIFI ANT1&ANT2: 3.99dBi, Directional gain: 3.99dBi
Evaluation applied	<input checked="" type="checkbox"/> MPE Evaluation <input type="checkbox"/> SAR Evaluation

Note: Directional gain = $G_{ANT} + \text{Array gain}$

G_{ANT} : equal to the gain of the antenna having the highest gain

Array gain = 0dB (i.e., no array gain) for $N_{ANT} \leq 4$

**Limits for Maximum Permissible Exposure (MPE)**

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density(mW/cm ²)	Average Time
(A) Limits for Occupational/Controlled Exposures				
300-1500	--	--	F/300	6
1500-100000	--	--	5	6
(B) Limits for General Population/Uncontrolled Exposures				
300-1500	--	--	F/1500	6
1500-100000	--	--	1	30

Friis transmission formula: $P_d = (P_{out} * G) / (4 * \pi * R^2)$

Where

P_d = Power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

R = distance between observation point and center of the radiator in cm

P_d the limit of MPE 1mW/cm². If we know the maximum gain of the antenna and total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

$$e_{irp} = p_t \times g_t = (E \times d)^2 / 30$$

where:

p_t = transmitter output power in watts,

g_t = numeric gain of the transmitting antenna (unitless),

E = electric field strength in V/m, --- $10^{((dBuV/m)/20)} / 10^6$

d = measurement distance in meters (m), --- 3m

$$\text{So } p_t = (E \times d)^2 / (30 \times g_t)$$

NFC 13.56MHz Field strength = 60.19 dBuV/m @3m

Ant gain 0dBi, Ant numeric gain = 1

$$\text{So } p_t = \{ [10^{(60.19/20)} / 10^6 \times 3]^2 / (30 \times 1) \} \times 1000 \text{ mW} = 0.0003 \text{ mW}$$



Measurement Result

Only show the value of the worst antenna.

Type	Channel Frequency (MHz)	Max. Measured Power (dBm)	Max. Tune up Power (dBm)	Antenna Gain (dBi)	Power density at 20cm (mW/cm ²)	Power density Limits (mW/cm ²)
NFC	13.56	-35.23	-34.50	0	0.00000007	1
BLE	2440	7.79	8.50	3.57	0.0032	1
BR/EDR	2402	8.47	9.00	3.57	0.0036	1
2.4G WLAN	2462	18.49	18.00	3.57	0.0286	1
5G WLAN	5580	16.55	17.00	3.64	0.0231	1
6G WLAN	6145	5.33	6.00	3.99	0.0020	1

The NFC and WIFI can transmit simultaneously.

NFC Power density at 20cm (mW/cm ²)	2.4G WLAN Power density at 20cm (mW/cm ²)	Total Power density at 20cm (mW/cm ²)	Power density Limit (mW/cm ²)
0.00000007	0.0286	0.02860007	1

Note:

1. Calculate by Worst-case mode.
2. BT, 2.4GHz WLAN, 5GHz WLAN and 6GHz WLAN can't transmit simultaneously.
2. Max. Tune Up Power by Manufacturer's Declaration, and Max. Tune Up Power is used to calculate.
3. For a more detailed features description, please refer to the RF Test Report.

*****THE END*****