Appendix B. Maximum Permissible Exposure

1. Maximum Permissible Exposure

1.1. Applicable Standard

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 levels in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby that distance of at least 0.2 m is normally maintained between the user and the device.

(A) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm²)	Averaging Time |E|², |H|² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842 / f	4.89 / f	(900 / f)*	6
30-300	61.4	0.163	1.0	6
300-1500			F/300	6
1500-100,000			5	6

(B) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm²)	Averaging Time |E|², |H|² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-100,000			1.0	30

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

1.2. MPE Calculation Method

E (V/m) = $\frac{\sqrt{30 \times P \times G}}{d}$ Power Density: *Pd* (W/m²) = $\frac{E^2}{377}$

E = Electric field (V/m)

P = Average RF output power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

Pd = $\frac{30 \times P \times G}{377 \times d^2}$

From the EUT RF output power, the minimum mobile separation distance, d=0.35m, as well as the gain of the used antenna, the RF power density can be obtained.

1.3. Calculated Result and Limit

Exposure Environment: General Population / Uncontrolled Exposure

For EUT (FCC ID: UXX-S4A525A):

For 5GHz Band (NII):

Antenna Type : Dipole Antenna

Conducted Power for IEEE 802.11ac VHT20Hz : 26.34dBm

Distance (m)	Directional Gain (dBi)	Antenna Gain (numeric)	The maximum combined Average Output Power		Power Density (S) (mW/cm²)	Limit of Power Density (S) (mW/cm²)	Test Result
			(dBm)	(mW)			
0.35	7.61	5.7688	26.3359	430.1212	0.161269	1	Complies

Note: $$DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$$

For 2.4GHz Band:

Antenna Type : Dipole Antenna

Conducted Power for IEEE 802.11 HT20MHz: 29.82 dBm

Distance (m)	Antenna Gain (dBi)	Antenna Gain (numeric)	The maximum combined Average Output Power		Power Density (S) (mW/cm²)	Limit of Power Density (S) (mW/cm²)	Test Result
			(dBm)	(mW)			
0.35	3.30	2.1380	29.8226	959.9656	0.133392	1	Complies

For WWAN Module(FCC ID:N7NMC7355):

Frequency (MHz)	Average EIRP (dBm)	Power Density (S) (mW/cm^2)	Limit of Power Density (S) (mW/cm^2)	Test Result
824-849	33.48	0.1448	0.549	Complies
824-849	28.48	0.0458	0.549	Complies
824-849	28.44	0.0454	0.549	Complies
824-849	28.49	0.0459	0.549	Complies
1850-1910	26.98	0.0324	1.000	Complies
1850-1910	23.98	0.0163	1.000	Complies
1850-1910	23.94	0.0161	1.000	Complies
1850-1910	23.99	0.0163	1.000	Complies
824-849	31.50	0.0918	0.549	Complies
1850-1910	28.00	0.0410	1.000	Complies
816.0-823.975	31.50	0.0918	0.544	Complies
824-849	30.50	0.0729	0.549	Complies
1710-1755	30.00	0.0650	1.000	Complies
1850-1910	27.00	0.0326	1.000	Complies
704-716	33.00	0.1297	0.469	Complies
777-787	33.00	0.1297	0.518	Complies
824-849	30.50	0.0729	0.549	Complies
1710-1755	30.00	0.0650	1.000	Complies
1850-1910	27.00	0.0326	1.000	Complies
1850-1915	27.00	0.0326	1.000	Complies

Conclusion:

Both of the WLAN function WLAN 2.4GHz, WLAN 5GHz, WWAN (slot 1) and WWAN (slot 2) can transmit simultaneously, the formula of calculated the MPE is:

CPD1 / LPD1 + CPD2 / LPD2 + ...etc. < 1

CPD = Calculation power density

LPD = Limit of power density

Therefore, the worst-case situation is 0.161269 / 1 + 0.133392 / 1 + 0.1297 / 0.469 + 0.1297 / 0.469 = 0.847753, which is less than "1". This confirmed that the device complies.