APPENDIX C - RF EXPOSURE EVALUATION

Maximum Permissible Exposure (MPE)

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.

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:

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

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)			
Bluetooth BDR/EDR	2402-2480	-1.48	0.71	10	10.00	20.00	0.001	1.0
WiFi 2.4G	2412-2462	-1.48	0.71	19.5	89.13	20.00	0.013	1.0
WiFi 5G	5150-5850	1.51	1.42	18.5	70.79	20.00	0.020	1.0
LTE Band 2	1850-1910	0.29	1.07	25	316.23	20.00	0.067	1.0
LTE Band 4	1710-1755	0.99	1.26	25	316.23	20.00	0.079	1.0
LTE Band 5	824-849	0.26	1.06	25	316.23	20.00	0.067	0.55
LTE Band 7	2500-2570	-2.56	0.55	25	316.23	20.00	0.035	1.0
LTE Band 12	699-716	0.37	1.09	25	316.23	20.00	0.069	0.47
LTE Band 13	777-787	-0.07	0.98	25	316.23	20.00	0.062	0.52
LTE Band 14	788-798	0.19	1.04	25	316.23	20.00	0.066	0.52
LTE Band 17	704-716	0.37	1.09	25	316.23	20.00	0.069	0.47
LTE Band 25	1850-1915	0.29	1.07	25	316.23	20.00	0.067	1.0
LTE B26	814-824	0.19	1.04	25	316.23	20.00	0.066	0.54
LTE B26	824-849	0.26	1.06	25	316.23	20.00	0.067	0.55
LTE B41	2496-2690	-0.72	0.85	25	316.23	20.00	0.053	1.0
LTE B66	1710-1780	0.99	1.26	25	316.23	20.00	0.079	1.0
LTE B71	663-698	0.37	1.09	25	316.23	20.00	0.069	0.44
NFC	13.56	/	/	-23.52	0.004	20.00	<<0.001	0.98
Note: NFC field strength is 71.68dBμV/m @ 3m = -23.52 dBm(0.004mW) EIRP. That equal to antenna gain is 0dBi and used the EIRP value as conducted power. The device built in a certified Bluetooth/WiFi/WWAN module， FCC ID:2AM6U-SC200ENA.								

Note:
The Conducted output power including Tune-up Tolerance provided by manufacturer.

For Simultaneous transmission:

Bluetooth BDR/EDR,2.4G Wifi and 5G Wifi can`t transmit simultaneously,
But Bluetooth BDR/EDR/2.4G Wifi/5G Wifi can transmit simultaneously with WWAN/NFC:

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

$= S_{5G\ Wifi} / S_{limit\text{-}5G\ Wifi} + S_{WWAN} / S_{limit\text{-}\ WWAN} + S_{NFC} / S_{limit\text{-}\ NFC}$

=0.020/1.0+0.069/0.44+0.001/0.98

=0.178

<1

Result: Compliant. The device compliant Simultaneous transmission at 20cm distances.

******* END OF REPORT *******