RF EXPOSURE EVALUATION METHOD

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

EUT	Wireless Data Terminal
Frequency band (Operating)	LTE Band 2: 1850.70MHz-1909.30MHz LTE Band 4: 1710.70MHz-1754.30MHz LTE Band 5: 824.7MHz-848.3MHz LTE Band 12: 699.70MHz-715.30MHz LTE Band 13: 779.50MHz-784.50MHz LTE Band 17: 806.5MHz -712.5MHz LTE Band 25: 1850.7MHz-1914.3MHz LTE Band 26 : 824.7MHz-848.3MHz LTE Band 41: 2557.5MHz ~2625MHz LTE Band 66: 1710.7MHz-1779.3MHz RX LTE Band 2: 1930MHz ~ 1990 MHz RX LTE Band 4: 2110 MHz ~ 2155 MHz RX LTE Band 5: 869 MHz ~ 894 MHz RX LTE Band 12: 729 MHz ~ 746 MHz RX LTE Band 13: 746 MHz ~ 756 MHz RX LTE Band 17: 734 MHz ~ 746 MHz RX LTE Band 25: 1930 MHz ~ 1995 MHz RX LTE Band 26: 859 MHz ~ 894 MHz RX LTE Band 41: 2496 MHz ~ 2690 MHz RX LTE Band 66: 5150 MHz ~ 5925 MHz
Device category	☐ Portable (<20cm separation) ☒ Mobile (>20cm separation) ☐ Others
Exposure classification	☐ Occupational/Controlled exposure (S = 5mW/cm2) ☒ General Population/Uncontrolled exposure (S=1mW/cm2)
Antenna diversity	☒ Single antenna ☐ Multiple antennas ☐ Tx diversity ☐ Rx diversity ☐ Tx/Rx diversity
Max. output power	LTE Band 2: 23.04dBm LTE Band 4: 23.15dBm LTE Band 5: 23.57dBm LTE Band 12: 23.49dBm LTE Band 13: 23.53dBm LTE Band 17: 23.56dBm LTE Band 25: 23.28dBm LTE Band 26 : 23.52dBm LTE Band 41: 23.88dBm

	LTE Band 66: 23.00dBm
Antenna gain (Max)	Band 2: 1.27dBi Band 4: 1.38dBi Band 5: -4.02dBi Band 12: -4.29dBi Band 13: -4.27dBi Band 17: -4.36dBi Band 25: 1.31dBi Band 26: -4.07dBi Band 41: 1.57dBi Band 66: 1.62dBi
Evaluation applied	☒ MPE Evaluation ☐ SAR Evaluation

Limits for Maximum Permissible Exposure(MPE)

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density(mW/cm2)	Average Time
(A) Limits for Occupational/Control Exposures				
300-1500	--	--	F/300	6
1500-100000	--	--	5	6
(B) Limits for General Population/Uncontrol Exposures				
300-1500	--	--	F/1500	6
1500-100000	--	--	1	30

transmission formula: Pd=(Pout*G)\(4*pi*R^2)

Where

Pd= Power density in mW/cm^2

Pout=output power to antenna in mW

G= gain of antenna in linear scale

Pi=3.1415

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

Pd 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.

SAR Test Exclusion Thresholds for 100 MHz – 6 GHz and ⩽ 50 mm

Approximate SAR Test Exclusion Power Thresholds at Selected Frequencies and Test Separation Distances are illustrated in the following Table.

MHz	5	10	15	20	25	mm
150	39	77	116	155	194	SAR Test Exclusion Threshold (mW)
300	27	55	82	110	137	
450	22	45	67	89	112	
835	16	33	49	66	82	
900	16	32	47	63	79	
1500	12	24	37	49	61	
1900	11	22	33	44	54	
2450	10	19	29	38	48	
3600	8	16	24	32	40	
5200	7	13	20	26	33	
5400	6	13	19	26	32	
5800	6	12	19	25	31	

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] • [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR,where
f(GHz) is the RF channel transmit frequency in GHz
Power and distance are rounded to the nearest mW and mm before calculation
The result is rounded to one decimal place for comparison
The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

Measurement Result

Operating Mode	Tune up tolerance	Max. Tune up Power	Antenna Gain	Power density at 20cm	Power density Limits
	(dBm)	(dBm)	(dBi)	(mW/ cm2)	(mW/ cm2)
LTE Band 2	22±2	24.00	1.27	0.067	1
	22±2	24.00	1.27	0.067	1
	22±2	24.00	1.27	0.067	1
LTE Band 4	22±2	24.00	1.38	0.069	1
	22±2	24.00	1.38	0.069	1
	22±2	24.00	1.38	0.069	1
LTE Band 5	22±2	24.00	-4.02	0.020	1
	22±2	24.00	-4.02	0.020	1
	22±2	24.00	-4.02	0.020	1
LTE Band 12	22±2	24.00	-4.29	0.019	1
	22±2	24.00	-4.29	0.019	1
	22±2	24.00	-4.29	0.019	1
LTE Band 13	22±2	24.00	-4.27	0.019	1
	22±2	24.00	-4.27	0.019	1
	22±2	24.00	-4.27	0.019	1
LTE Band 17	22±2	24.00	-4.36	0.018	1
	22±2	24.00	-4.36	0.018	1
	22±2	24.00	-4.36	0.018	1
LTE Band 25	22±2	24.00	1.37	0.069	1
	22±2	24.00	1.37	0.069	1
	22±2	24.00	1.37	0.069	1
LTE Band 26	22±2	24.00	-4.07	0.020	1
	22±2	24.00	-4.07	0.020	1
	22±2	24.00	-4.07	0.020	1
LTE Band 41	22±2	24.00	1.57	0.072	1
	22±2	24.00	1.57	0.072	1
	22±2	24.00	1.57	0.072	1
LTE Band 66	22±2	24.00	1.62	0.073	1
	22±2	24.00	1.62	0.073	1
	22±2	24.00	1.62	0.073	1

Note: The estimation distance is 20cm(This 20cm should come from the extension line)

Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device