

MPE Calculation

Regulation(s): Part 1.1310, Part 2.1091

Method: KDB447498 D01v06

RF feature(Mode)	Antenna Configuration	Frequency range (MHz)			Max Target Power (dBm)	ANT Gain (dBi)	Maximum EIRP (dBm)	Maximum EIRP (mW)	Maximum power density (mW/cm ²)	Requirement (mW/cm ²)
Bluetooth LE(1 Mbps)	-	2402.0	~	2480.0	5.0	3.9	8.91	7.781	0.001 6	1.000 0
802.11g	ANT1	2412.0	~	2462.0	26.0	4.0	29.96	990.832	0.197 2	1.000 0
802.11n(HT20)	ANT1+ANT2	2412.0	~	2462.0	27.0	4.0	30.96	1247.384	0.248 2	1.000 0
802.11a	ANT1	5180.0	~	5240.0	17.0	4.2	21.19	131.523	0.026 2	1.000 0
802.11n(HT20)	ANT1+ANT2	5180.0	~	5240.0	19.0	4.2	23.19	208.450	0.041 5	1.000 0
802.11a	ANT1	5260.0	~	5320.0	18.0	5.8	23.79	239.332	0.047 7	1.000 0
802.11n(HT20)	ANT1+ANT2	5260.0	~	5320.0	20.0	6.2	26.22	418.794	0.083 4	1.000 0
802.11a	ANT2	5500.0	~	5720.0	20.0	2.9	22.90	194.985	0.038 8	1.000 0
802.11n(HT20)	ANT1+ANT2	5500.0	~	5720.0	21.0	3.8	24.78	300.608	0.059 9	1.000 0
802.11a	ANT2	5745.0	~	5825.0	19.0	4.1	23.09	203.705	0.040 6	1.000 0
802.11n(HT20)	ANT1+ANT2	5745.0	~	5825.0	21.0	4.3	25.30	338.845	0.067 5	1.000 0
WCDMA 850	External Antenna 1	826.4	~	846.6	25.0	0.7	25.70	371.536	0.074 0	0.550 0
WCDMA 1700	Internal Antenna 1	1712.4	~	1752.6	25.0	2.6	27.60	575.440	0.114 5	1.000 0
WCDMA 1900	Internal Antenna 1	1852.4	~	1907.6	25.0	4.4	29.40	870.964	0.173 3	1.000 0
LTE B2, CA_2C, n2	Internal Antenna 1	1850.0	~	1910.0	25.0	4.4	29.40	870.964	0.173 3	1.000 0
LTE B4	Internal Antenna 1	1710.0	~	1755.0	25.0	2.6	27.60	575.440	0.114 5	1.000 0
LTE B5, CA_5B, n5	External Antenna 1	824.0	~	849.0	25.0	0.7	25.70	371.536	0.074 0	0.549 0
LTE B7, CA_7C, n7	Internal Antenna 1	2500.0	~	2570.0	25.0	3.7	28.70	741.311	0.147 5	1.000 0
LTE B12, n12	External Antenna 1	699.0	~	716.0	25.0	1.8	26.80	478.631	0.095 3	0.466 0
LTE B13, n13	External Antenna 1	777.0	~	787.0	25.0	0.1	25.10	323.594	0.064 4	0.518 0
LTE B14, n14	External Antenna 1	788.0	~	798.0	25.0	0.0	25.00	316.228	0.063 0	0.525 0
LTE B17	External Antenna 1	704.0	~	716.0	25.0	1.8	26.80	478.631	0.095 3	0.469 0
LTE B25, n25	Internal Antenna 1	1850.0	~	1915.0	25.0	4.4	29.40	870.964	0.173 3	1.000 0
LTE B26, n26	External Antenna 1	814.0	~	824.0	25.0	0.7	25.70	371.536	0.074 0	0.542 0
LTE B26, n26	External Antenna 1	824.0	~	849.0	25.0	0.7	25.70	371.536	0.074 0	0.549 0
LTE B30, n30	Internal Antenna 1	2305.0	~	2315.0	19.0	2.4	21.40	138.039	0.027 5	1.000 0
LTE B38, CA_38C, n38	Internal Antenna 1	2570.0	~	2620.0	26.0	3.1	29.10	812.831	0.161 8	1.000 0
LTE B48, CA_48C	External Antenna 2	3550.0	~	3700.0	19.0	3.9	22.90	194.985	0.038 8	1.000 0
NR Band n48	External Antenna 2	3550.0	~	3700.0	18.0	3.9	21.90	154.882	0.030 9	1.000 0
LTE B41, CA_41C, n41	Internal Antenna 1	2496.0	~	2690.0	26.0	3.7	29.70	933.255	0.185 7	1.000 0
LTE B42, CA_42C	External Antenna 2	3450.0	~	3550.0	26.0	3.2	29.20	831.764	0.165 5	1.000 0
LTE B43	External Antenna 2	3700.0	~	3800.0	26.0	3.9	29.90	977.238	0.194 5	1.000 0
LTE B66, n66	Internal Antenna 1	1710.0	~	1780.0	25.0	2.6	27.60	575.440	0.114 5	1.000 0
NR Band n70	Internal Antenna 2	1695.0	~	1710.0	25.0	1.6	26.60	457.089	0.091 0	1.000 0
LTE B71, n71	Internal Antenna 1	663.0	~	698.0	25.0	1.9	26.90	489.779	0.097 5	0.442 0
NR Band n77, 78	External Antenna 2	3450.0	~	3550.0	26.5	3.2	29.70	933.255	0.185 7	1.000 0
NR Band n77	External Antenna 2	3700.0	~	3980.0	26.5	3.9	30.40	1096.479	0.218 2	1.000 0
NR Band n78	External Antenna 2	3700.0	~	3800.0	26.5	3.9	30.40	1096.479	0.218 2	1.000 0
			~							
			~							
			~							

Note: Please refer to the tune-up procedure for Max tune-up power.

The EUT will only be used with a separation of 20 centimeters or greater between the antenna and the body of the user.

The MPE sample calculation for this exposure is shown below.

$$S = \text{EIRP} / (4 R^2 \pi)$$

$$= 7.781 / (4 \times 20^2 \times \pi)$$

$$= 0.002 \text{ mW/cm}^2$$

- Note

S= Maximum power density(mW/cm²)

EIRP= Equivalent Isotropic Radiated Power(mW)

R= Distance to the center of the radiation of the antenna(20cm)

Part 1.1310

Limits for Maximum Permissible Exposure (MPE)

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 ~ 1,500			f / 1500	30
1,500 ~ 100,000			1.0	30

Conclusion : The exposure condition of this device is compliant with FCC

RF Exposure Compliance for simultaneous operations

- **Worst case for simultaneous operations**

- WLAN(2.4GHz) + WWAN

RF feature or mode	WLAN 2.4GHz	LTE			-	-	-	Σ of MPE ratios
Band(Worst case)	802.11n(HT20)	Band 71			-	-	-	
Power Density (mW/cm ²)	0.248 2	0.220 6			-	-	-	
Requirement (mW/cm ²)	1.000 0	0.442 0			-	-	-	
MPE ratio (Power Density/Requirement)	0.248 2	0.499 1			-	-	-	
Worst case(MPE ratio)	0.248 2	0.499 1			-	-	-	0.747 3

- Requirement = Σ of MPE ratios ≤ 1

Conclusion : The exposure condition of this device is compliant with FCC rules.