

MPE Calculations

The exposure condition of this device is compliant with FCC Rule.

Specification: Part 2.1091, Part 1.1310

Table 1—Limits for Maximum Permissible Exposure (MPE)

(A) Limits for Occupational/Controlled Exposure				
Frequency range (MHz)	Electric Field strength (V/m)	Magnetic field strength (A/m)	Power Density (mW/cm ²)	Averageing time (minutes)
0.3 ~ 3.0	614	1.63	*100	6
3.0 ~ 30	1842/f	4.89/ f	*900/f ²	6
30 ~ 300	61.4	0.163	1.0	6
300 ~ 1,500	-	-	f/300	6
1,500 ~ 100,000	-	-	5.0	6
(B) Limits for General Population/Uncontrolled Exposure				
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

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

● EUT Description

FCC ID : BEJTM12ANNAGM1
EUT Type : Module

Capabilities

LTE Single transmitting for band 2/4/5/13, LTE up-link carrier aggregation for band 2 + 13 / band 4 + 13
And the supporting UL-CA combination are as below.

Inter band UL CA	Band	Band width(MHz)					
		1.4	3	5	10	15	20
Band 2 + Band 13	2	-	-	O	O	O	O
	13	-	-	-	O	-	-
Band 4 + Band 13	4	-	-	O	O	O	O
	13	-	-	-	O	-	-

● MPE Calculation

The MPE calculation for this exposure is shown below.

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

Where,

S= Maximum power density(mW/cm²)

EIRP= Equivalent Isotropic Radiated Power(mW)

R= Distance to the center of the radiation of the antenna

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

● Result

Transmitting Configuration	Band	Mode	Frequency range (MHz)	Measured EIRP(dBm)	Distance (Cm)	Power density (mW/cm ²)	Requirement (mW/cm ²)	MPE ratio (Power Density/ Requirement)
Single transmission	LTE Band 13	QPSK	779.5 ~ 784.5	21.62	20.00	0.029	0.519	0.056
	LTE Band 13	16QAM	779.5 ~ 784.5	20.80	20.00	0.024	0.519	0.046
	LTE Band 5	QPSK	824.7 ~ 848.3	21.23	20.00	0.027	0.549	0.048
	LTE Band 5	16QAM	824.7 ~ 848.3	20.35	20.00	0.022	0.549	0.039
	LTE Band 4	QPSK	1710.7 ~ 1754.3	22.23	20.00	0.033	1.000	0.033
	LTE Band 4	16QAM	1710.7 ~ 1754.3	22.16	20.00	0.033	1.000	0.033
	LTE Band 2	QPSK	1850.7 ~ 1909.3	22.26	20.00	0.034	1.000	0.034
	LTE Band 2	16QAM	1850.7 ~ 1909.3	20.56	20.00	0.023	1.000	0.023
Carrier Aggregation	LTE Band 2(PCC)	QPSK	1852.5 ~ 1907.5	19.41	20.00	0.017	1.000	0.017
	LTE Band 13(SCC)	QPSK	782.0 ~ 782.0	16.67	20.00	0.009	0.521	0.018
Carrier Aggregation	LTE Band 2(PCC)	16QAM	1852.5 ~ 1907.5	19.52	20.00	0.018	1.000	0.018
	LTE Band 13(SCC)	16QAM	782.0 ~ 782.0	16.80	20.00	0.010	0.521	0.018
Carrier Aggregation	LTE Band 13(PCC)	QPSK	782.0 ~ 782.0	16.58	20.00	0.009	0.521	0.018
	LTE Band 2(SCC)	QPSK	1880.0 ~ 1880.0	19.35	20.00	0.017	1.000	0.017
Carrier Aggregation	LTE Band 13(PCC)	16QAM	782.0 ~ 782.0	16.65	20.00	0.009	0.521	0.018
	LTE Band 2(SCC)	16QAM	1880.0 ~ 1880.0	19.51	20.00	0.018	1.000	0.018
Carrier Aggregation	LTE Band 4(PCC)	QPSK	1712.5 ~ 1752.5	20.32	20.00	0.022	1.000	0.022
	LTE Band 13(SCC)	QPSK	782.0 ~ 782.0	16.06	20.00	0.008	0.521	0.016
Carrier Aggregation	LTE Band 4(PCC)	16QAM	1712.5 ~ 1752.5	20.72	20.00	0.024	1.000	0.024
	LTE Band 13(SCC)	16QAM	782.0 ~ 782.0	16.32	20.00	0.009	0.521	0.017
Carrier Aggregation	LTE Band 13(PCC)	QPSK	782.0 ~ 782.0	16.77	20.00	0.010	0.521	0.018
	LTE Band 4(SCC)	QPSK	1732.5 ~ 1732.5	18.97	20.00	0.016	1.000	0.016
Carrier Aggregation	LTE Band 13(PCC)	16QAM	782.0 ~ 782.0	16.72	20.00	0.009	0.521	0.018
	LTE Band 4(SCC)	16QAM	1732.5 ~ 1732.5	19.04	20.00	0.016	1.000	0.016

● Result (simultaneous operations)

Case of Simultaneous operations	Transmitting Configuration	Band	Mode	Frequency range (MHz)	MPE ratio (Power Density/ Requirement)	Σ of MPE ratios	Requirement (Σ of MPE ratios ≤ 1)
1	Carrier Aggregation	LTE Band 2(PCC)	QPSK	1852.5 ~ 1907.5	0.017	0.035	1
		LTE Band 13(SCC)	QPSK	782.0 ~ 782.0	0.018		
2	Carrier Aggregation	LTE Band 2(PCC)	16QAM	1852.5 ~ 1907.5	0.018	0.036	1
		LTE Band 13(SCC)	16QAM	782.0 ~ 782.0	0.018		
3	Carrier Aggregation	LTE Band 13(PCC)	QPSK	782.0 ~ 782.0	0.018	0.034	1
		LTE Band 2(SCC)	QPSK	1880.0 ~ 1880.0	0.017		
4	Carrier Aggregation	LTE Band 13(PCC)	16QAM	782.0 ~ 782.0	0.018	0.036	1
		LTE Band 2(SCC)	16QAM	1880.0 ~ 1880.0	0.018		
5	Carrier Aggregation	LTE Band 4(PCC)	QPSK	1712.5 ~ 1752.5	0.022	0.038	1
		LTE Band 13(SCC)	QPSK	782.0 ~ 782.0	0.016		
6	Carrier Aggregation	LTE Band 4(PCC)	16QAM	1712.5 ~ 1752.5	0.024	0.041	1
		LTE Band 13(SCC)	16QAM	782.0 ~ 782.0	0.017		
7	Carrier Aggregation	LTE Band 13(PCC)	QPSK	782.0 ~ 782.0	0.018	0.034	1
		LTE Band 4(SCC)	QPSK	1732.5 ~ 1732.5	0.016		
8	Carrier Aggregation	LTE Band 13(PCC)	16QAM	782.0 ~ 782.0	0.018	0.034	1
		LTE Band 4(SCC)	16QAM	1732.5 ~ 1732.5	0.016		

Note: Sample calculation for simultaneous operations

Σ of MPE ratios of Case 1: LTE Band 2(PCC/QPSK) + LTE Band 13(SCC/QPSK)
= 0.017 + 0.018 = 0.035