

MPE Calculation : Bluetooth LE

RF function or Mode	Frequency range (MHz)		Max Target Power (dBm)	ANT Gain (dBi)	Maximum EIRP (dBm)	Maximum EIRP (mW)	Requirement Power Threshold (mW)
BLE	2402.00	~ 2480.00	1.00	1.69	2.69	1.858	3060.000
		~					
		~					
		~					
		~					
		~					
		~					
		~					
		~					

Note1: Please refer to the operation description for Max tune-up power.

Note2: EIRP is worst case as it's greater than ERP

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.

KDB 447498 D04 Interim General RF Exposure Guidance v01.

Appendix B

B.3 MPE-based Exemption

$$P_{th} \text{ (mW)} = ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases} \quad (\text{B.1})$$

B.4 SAR-based Exemption

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases} \quad (\text{B.2})$$

where

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right)$$

and f is in GHz, d is the separation distance (cm), and $ERP_{20 \text{ cm}}$ is per Formula (B.1). The example values shown in Table B.2 are for illustration only.

Table B.2—Example Power Thresholds (mW)

Frequency (MHz)	Distance (mm)									
	5	10	15	20	25	30	35	40	45	50
300	39	65	88	110	129	148	166	184	201	217
450	22	44	67	89	112	135	158	180	203	226
835	9	25	44	66	90	116	145	175	207	240
1900	3	12	26	44	66	92	122	157	195	236
2450	3	10	22	38	59	83	111	143	179	219
3600	2	8	18	32	49	71	96	125	158	195
5800	1	6	14	25	40	58	80	106	136	169

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

MPE Calculation : LTE

RF function or Mode	Frequency range (MHz)			Max Target Power (dBm)	ANT Gain (dBi)	Maximum EIRP (dBm)	Maximum EIRP (mW)	Requirement Power Threshold (mW)
LTE(Band 2)	1850.00	~	1910.00	22.70	1.18	23.88	244.344	3060.000
LTE(Band 4)	1710.00	~	1755.00	22.70	0.69	23.39	218.273	3060.000
LTE(Band 12)	699.00	~	716.00	22.70	-0.83	21.87	153.816	1425.960
LTE(Band 13)	777.00	~	787.00	22.70	-2.34	20.36	108.643	1585.080
		~						
		~						
		~						
		~						

Note1: The tolerance has been considered

Note2: EIRP is worst case as it's greater than ERP

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.

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B.3 MPE-based Exemption

$$P_{th} \text{ (mW)} = ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases} \quad (\text{B.1})$$

B.4 SAR-based Exemption

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases} \quad (\text{B.2})$$

where

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and f is in GHz, d is the separation distance (cm), and $ERP_{20 \text{ cm}}$ is per Formula (B.1).
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Conclusion : The exposure condition of this device is compliant with FCC

RF Exposure Compliance for simultaneous operations

- Worst case for simultaneous operations
- BLE+LTE

RF function or mode	BLE	LTE	LTE	LTE	LTE	-	Σ of MPE ratios
Band(Worst case)	2.4GHz	Band 2	Band 4	Band 12	Band 13	-	
Maximum EIRP (mW)	1.8580	244.3440	218.2730	153.8160	108.6430	-	
Requirement Power Threshold (mW)	3060.0000	3060.0000	3060.0000	1425.9600	1585.0800	-	
MPE ratio (Power Density/Requirement)	0.0006	0.0799	0.0713	0.1079	0.0685	-	
Configuration 1 (MPE ratio)	0.0006	0.0799					0.0805
Configuration 2 (MPE ratio)	0.0006		0.0713				0.0719
Configuration 3 (MPE ratio)	0.0006			0.1079			0.1085
Configuration 4 (MPE ratio)	0.0006				0.0685		0.0691

Note1: The maximum power density in each RF function was used for above table.

Note2: EIRP is worst case as it's greater than ERP

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- Requirement = Σ of MPE ratios ≤ 1

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