

## RF Exposure Evaluation

According to KDB 447498 D01 General RF Exposure Guidance v06 and part 2.1091, Unless specifically required by the published RF exposure KDB procedures, standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding SAR Test Exclusion Threshold condition(s), listed below, is (are) satisfied.

### Limits

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)

#### Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f <sup>2</sup> )	6
30–300	61.4	0.163	1.0	6
300–1500			f/300	6
1500–100,000			5	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 <sup>2</sup> )	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

Friis transmission formula:  $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot r^2)$

Where

**Pd** = power density in mW/cm<sup>2</sup>, **Pout** = output power to antenna in mW;

**G** = gain of antenna in linear scale, **Pi** = 3.1416;

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

Pd is the limit of MPE, 1 mW/cm<sup>2</sup>. If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

### Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

### Test Result of RF Exposure Evaluation

	Modulation	Frequency MHz	Output power to antenna (dBm)	Target power W/tolerance (dBm)	Max Output power to antenna (dBm)	Max Output power to antenna (mW)	Power Density at R=20cm (mW/cm2)	Limit (mW/cm2)	Result
BLE-1M	GFSK	2402	7.25	7±1	8	6.310	0.002196	1.0	PASS
		2440	7.11	7±1	8	6.310	0.002196	1.0	PASS
		2480	9.12	9±1	10	10.000	0.003481	1.0	PASS
		2402	7.00	7±1	8	6.310	0.002196	1.0	PASS
		2440	7.11	7±1	8	6.310	0.002196	1.0	PASS
		2480	8.85	9±1	10	10.000	0.003481	1.0	PASS

	Modulation	Frequency MHz	Output power to antenna (dBm)	Target power W/tolerance (dBm)	Max Output power to antenna (dBm)	Max Output power to antenna (mW)	Power Density at R=20cm (mW/cm2)	Limit (mW/cm2)	Result
2.4G	GFSK	2402	13.17	13±1.0	14	25.119	0.008744	1.0	PASS
		2440	13.82	13±1.0	14	25.119	0.008744	1.0	PASS
		2478	13.55	13±1.0	14	25.119	0.008744	1.0	PASS

Remark: 1. BT Antenna gain is 5dBi, 2.4G-RF Antenna gain is 2.47dBi  
 2. BT and 2.4G-RF can transmit at the same time  
 3. In the case of simultaneous launches for 2.4G-RF and BT:  
 The Max Calc. Thresholds : BT: 0.003481, Wifi: 0.008744

BT and Wifi:  $0.003481 + 0.008744 = 0.012225 \leq 1$

So a SAR test is not required