



RF Exposure evaluation

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 ²)	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 ²)	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 ²)	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: $P_d = (P_{out} * G) / (4 * \pi * r^2)$

Where

P_d = power density in mW/cm², **P_{out}** = output power to antenna in mW;

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

R = Separation distance to the centre of radiation of the antenna (25cm)

P_d is the limit of MPE, 1 mW/cm². 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

Mode	Max Output power(dBm)	Output power (mW)	Power Density at R=25cm (mW/cm2)	Limit (mW/cm2)	Result
BLE	-2.34	0.58	0.0001	1.0	PASS
BT	-2.46	0.57	0.0001	1.0	PASS
2.4G WIFI	16.19	41.59	0.0067	1.0	PASS
4G	23.90	245.47	0.0351	1.0	PASS
4G	23.76	237.68	0.0340	0.5498	PASS
NFC	-37.98	0.0002	0.00000002	1.0	PASS
Radio	29.05	803.53	0.2570	0.3000	PASS

Remark: BT, BLE 2.4GWIFI antenna gain=1dBi, Radio antenna gain=4dBi, NFC antenna gain=0dBi, 4G antenna gain=0.5dBi

Remark: BT, BLE, 2.4GWIFI, NFC, Radio, 4G can transmit at the same time.

NFC EIRP=57.22-95.2=-37.98dBm

Simultaneous Transmitting:

BT+BLE+2.4GWIFI+NFC+4G:

$0.0001/1+0.0001/1+0.0067/1+0.00000003/1+0.0340/0.5498=0.069\leq 1$

BT+BLE+2.4GWIFI+NFC+Radio:

$0.0001/1+0.0001/1+0.0067/1+0.00000003/1+0.2570/0.3=0.864\leq 1$

So a SAR test is not required.