

RF Exposure Evaluation

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: $Pd = (Pout \cdot G) / (4 \cdot \pi \cdot r^2)$

Where

Pd = power density in mW/cm², **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, 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

Band	Frequency (MHz)	Output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=30cm (mW/cm ²)	Limit (mW/cm ²)	Result
LTE Band 2	1851.5	22.09	161.81	0.03	1.00	PASS
LTE Band 4	1732.5	22.13	163.31	0.03	1.00	PASS
LTE Band 12	715.3	21.86	153.46	0.03	0.47	PASS
WCDMA Band II	1852.4	22.25	167.88	0.03	1.00	PASS
WCDMA Band IV	1712.4	22.17	164.82	0.03	1.00	PASS
WCDMA Band V	826.4	22.17	164.82	0.03	0.55	PASS
GSM 850	848.8	33.39	2182.73	0.43	0.57	PASS
GSM 1900	1880	28.99	792.5	0.16	1.00	PASS

Tune-up								
Band	Bandwidth	Mode	Output power to antenna (dBm)	Output power to antenna Max (mW)	Power Density at R=30cm (mW/cm ²)	Limit (mW/cm ²)	Result	
LTE Band 2	1.4MHz	QPSK	21.0 ±1.0	158.49	0.0314	1.00	PASS	
		16QAM	21.0 ±1.0	158.49	0.0314	1.00	PASS	
	3.0MHz	QPSK	21.5 ±1.0	177.83	0.0352	1.00	PASS	
		16QAM	21.0 ±1.0	158.49	0.0314	1.00	PASS	
	5.0MHz	QPSK	21.0 ±1.0	158.49	0.0314	1.00	PASS	
		16QAM	21.0 ±1.0	158.49	0.0314	1.00	PASS	
	10.0MHz	QPSK	21.0 ±1.0	158.49	0.0314	1.00	PASS	
		16QAM	21.0 ±1.0	158.49	0.0314	1.00	PASS	
	15.0MHz	QPSK	21.0 ±1.0	158.49	0.0314	1.00	PASS	
		16QAM	21.0 ±1.0	158.49	0.0314	1.00	PASS	
	20.0MHz	QPSK	21.0 ±1.0	158.49	0.0314	1.00	PASS	
		16QAM	21.0 ±1.0	158.49	0.0314	1.00	PASS	
	LTE Band 4	1.4MHz	QPSK	22.0 ±1.0	199.53	0.0395	1.00	PASS
			16QAM	22.0 ±1.0	199.53	0.0395	1.00	PASS
3.0MHz		QPSK	21.0 ±1.0	158.49	0.0314	1.00	PASS	
		16QAM	21.0 ±1.0	158.49	0.0314	1.00	PASS	
5.0MHz		QPSK	21.0 ±1.0	158.49	0.0314	1.00	PASS	
		16QAM	21.0 ±1.0	158.49	0.0314	1.00	PASS	
10.0MHz		QPSK	21.0 ±1.0	158.49	0.0314	1.00	PASS	
		16QAM	21.0 ±1.0	158.49	0.0314	1.00	PASS	
15.0MHz		QPSK	21.0 ±1.0	158.49	0.0314	1.00	PASS	
		16QAM	21.0 ±1.0	158.49	0.0314	1.00	PASS	
20.0MHz		QPSK	21.0 ±1.0	158.49	0.0314	1.00	PASS	
		16QAM	21.0 ±1.0	158.49	0.0314	1.00	PASS	

LTE Band 12	1.4MHz	QPSK	21.0 ±1.0	158.49	0.0314	0.47	PASS
		16QAM	21.0 ±1.0	158.49	0.0314	0.47	PASS
	3.0MHz	QPSK	21.0 ±1.0	158.49	0.0314	0.47	PASS
		16QAM	21.0 ±1.0	158.49	0.0314	0.47	PASS
	5.0MHz	QPSK	21.0 ±1.0	158.49	0.0314	0.47	PASS
		16QAM	21.0 ±1.0	158.49	0.0314	0.47	PASS
	10.0MHz	QPSK	21.0 ±1.0	158.49	0.0314	0.47	PASS
		16QAM	21.0 ±1.0	158.49	0.0314	0.47	PASS

Band	Output power toantenna (dBm)	Output power toantenna (mW)	Power Density at R=30cm (mW/cm ²)	Limit (mW/cm ²)	Result
WCDMA Band II	22.0 ±1.0	199.53 (Max)	0.04	1.00	PASS
WCDMA Band IV	22.0 ±1.0	199.53 (Max)	0.04	1.00	PASS
WCDMA Band V	22.0 ±1.0	199.53 (Max)	0.04	0.55	PASS
GSM 850(GSM)	33.0 ±1.0	2511.89(Max)	0.497	0.57	PASS
GSM 850(GPRS)	32.5 ±1.0	2238.72(Max)	0.443	0.57	PASS
GSM 850(EGPRS) (8PSK, 1 TX slot) (8PSK, 2 TX slot) (8PSK, 3 TX slot)	33.0 ±1.0	2511.89(Max)	0.497	0.57	PASS
GSM 850(EGPRS) (8PSK, 4 TX slot)	31.0 ±1.0	1584.89(Max)	0.313	0.57	PASS
GSM 1900(GSM)	28.0 ±1.0	794.33 (Max)	0.125	1.00	PASS
GSM 1900(GPRS)	28.0 ±1.0	794.33 (Max)	0.125	1.00	PASS
GSM 1900(EGPRS)	28.0 ±1.0	794.33 (Max)	0.125	1.00	PASS

Remark: antenna gain=3.5dBi