

## 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 <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:  $Pd = (Pout * G) / (4 * pi * r^2)$

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**  
**FHSS**

Channel	Output power to antenna (mW)	Power Density at R=20cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Result
Lowest	8.375	0.003	0.6	PASS
Middle	7.379	0.003	0.61	PASS
Highest	6.730	0.002	0.62	PASS

Remark: antenna gain=2.4dBi

**DTS**

Channel	Output power to antenna (mW)	Power Density at R=20cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Result
Lowest	35.156	0.01	0.6	PASS
Middle	31.989	0.01	0.61	PASS
Highest	33.497	0.01	0.62	PASS

Remark: antenna gain=2.4dBi

Band	Output power (dbm)	Power Density at R=20cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Result
GSM 850	25.97	0.10	0.566	PASS
GSM 1900	22.97	0.07	1.0	PASS
LTE band 2	22.00	0.06	1.0	PASS
LTE band 4	22.00	0.06	1.0	PASS
LTE band 5	22.00	0.04	0.566	PASS
LTE band 12	22.00	0.04	0.477	PASS
LTE band 13	22.00	0.04	0.525	PASS
LTE band 25	22.00	0.06	1.0	PASS
LTE band 26	22.00	0.04	0.566	PASS
LTE band 66	22.00	0.06	1.0	PASS
LTE band 85	22.00	0.04	0.477	PASS
NB-IOT band 2	22.00	0.06	1.0	PASS
NB-IOT band 4	22.00	0.06	1.0	PASS
NB-IOT band 5	22.00	0.04	0.566	PASS
NB-IOT band 12	22.00	0.04	0.477	PASS
NB-IOT band 13	22.00	0.04	0.525	PASS
NB-IOT band 25	22.00	0.06	1.0	PASS
NB-IOT band 66	22.00	0.06	1.0	PASS

NB-IOT band 71	22.00	0.04	0.465	PASS
NB-IOT band 85	22.00	0.04	0.477	PASS

The maximum simultaneously transmitting were as below

DTS+GSM: 0.19<1

DTS+LTE: 0.1<1

DTS+NB-IOT: 0.1<1