1 RF Exposure Evaluation

1.1 RF Exposure Compliance Requirement

1.1.1 Limits

According to FCC Part1.1310: 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 part1.1307(b)

TABLE 1—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 Formula

Friis transmission formula: $Pd = (Pout*G)/(4* Pi * R^2)$

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 id 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.

1.1.2 Test Procedure

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

1.1.3 EUT RF Exposure Evaluation

1) For BT

Antenna Gain: 1.0dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.26 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Measurement Data

GFSK mode	
Test channel	Peak Output Power (dBm)
Lowest(2402MHz)	2.24
Middle(2441MHz)	3.12
Highest(2480MHz)	3.21
π/4DQPSK mode	
Test channel	Peak Output Power (dBm)
Lowest(2402MHz)	0.62
Middle(2441MHz)	1.72
Highest(2480MHz)	1.94
8DPSK mode	
Test channel	Peak Output Power (dBm)
Lowest(2402MHz)	0.98
Middle(2441MHz)	2.05
Highest(2480MHz)	2.20

GFSK mode(worst case)

Channel	Frequency (MHz)	Max Conducted average Output Power (dBm)	Output Power to Antenna (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm^2)	Limit	Result
Highest	2480	3.21	2.09	1.0	0.0005	1.0	PASS

Note: 1) Refer to report No. CQASZ170601302E-01 for EUT test Max Conducted Peak Output Power value.

2) $Pd = (Pout*G)/(4* Pi * R^2)=(2.09*1.26)/(4*3.1416*20^2)=0.0005$

2) For WIFI

Antenna Gain: 3.23dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 2.1 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Measurement Data

802.11b mode	
Test channel	Average Output Power (dBm)
Lowest(2412MHz)	11.32
Middle(2437MHz)	11.43
Highest(2462MHz)	11.51
802.11g mode	
Test channel	Average Output Power (dBm)
Lowest(2412MHz)	7.76
Middle(2437MHz)	7.81
Highest(2462MHz)	7.86
802.11n(HT20)mode	
Test channel	Average Output Power (dBm)
Lowest(2412MHz)	7.43
Middle(2437MHz)	7.49
Highest(2462MHz)	7.53
802.11n(HT40)mode	
Test channel	Average Output Power (dBm)
Lowest(2422MHz)	6.76
Middle(2437MHz)	6.83
Highest(2452MHz)	6.88

802.11b(worst case)

Channel	Frequency (MHz)	Max Conducted average Output Power (dBm)	Output Power to Antenna (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm^2)	Limit	Result
Highest	2462	11.51	14.16	3.23	0.0048	1.0	PASS

Note: 1) Refer to report No. CQASZ170601302E-02 for EUT test Max Conducted average Output Power value.

2) $Pd = (Pout*G)/(4* Pi * R^2)=(11.51*2.1)/(4*3.1416*20^2)=0.0048$