

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

Where

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

G = gain of antenna in linear scale, $\pi = 3.1416$;

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

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

Module 1 ANT1

2.4G Wi-Fi

Mode	Output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
802.11b	12.54	17.95	0.006	1.0	PASS

5.2G Wi-Fi

Mode	Output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
802.11b	12.12	16.29	0.0056	1.0	PASS

Module 2 ANT1

2.4G Wi-Fi

Mode	Output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
802.11b	11.92	15.56	0.0052	1.0	PASS

5.2G Wi-Fi

Mode	Output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
802.11ax	7	5.01	0.0017	1.0	PASS

Note: 2.4GANT Gain=2.24dbi, 5GANT Gain=2.37dbi



Module 2 ANT2

BT

Mode	Output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
8DPSK	0.01	1	0.0003	1.0	PASS

BLE

Mode	Output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
GFSK	7.54	5.68	0.0019	1.0	PASS

2.4G Wi-Fi

Mode	Output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
802.11b	10.84	12.13	0.004	1.0	PASS

5.2G Wi-Fi

Mode	Output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
802.11a	10	10	0.0034	1.0	PASS

Module 2 MIMO

2.4G Wi-Fi

Mode	Output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
802.11ax	13.72	23.55	0.0078	1.0	PASS

5.2G Wi-Fi

Mode	Output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
802.11n	11.70	14.79	0.0051	1.0	PASS

Note: 2.4GANT Gain=2.24dbi, 5GANT Gain=2.37dbi

Calculations for simultaneously transmit(Show only the worst mode)

Module 2

Mode	Ratios	Result	Limit	Result
BR+EDR	0.0003	0.01	1	PASS
BLE	0.0019			
2.4G Wi-Fi	0.0078			

Mode	Ratios	Result	Limit	Result
BR+EDR	0.0003	0.0073	1	PASS
BLE	0.0019			
5.2G Wi-Fi	0.0051			

Module 1 with Module 2

Mode	Ratios	Result	Limit	Result
Module 1 2.4GWIFI	0.006	0.016	1	PASS
Module 2	0.01			

Note1: The 2.4G WiFi and 5G WiFi in the same module cannot transmit simultaneously.

Note2: Ratios = Power Density / Power density Limit

So a SAR test is not required