

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 part 1.1307(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: $P_d = (P_{out} * G) / (4 * \pi * R^2)$

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 = 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.

If we know the maximum Gain of the antenna and the total power input to the antenna, through the calculation, we will know the MPE value at distance 20cm.

1.1.2 EUT Operating condition

The software provided by Manufacturer enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

1.1.3 Test Results

(1)For BT Module

Antenna Gain: The maximum Gain measured in Fully Anechoic Chamber is 2.81 dBi.

Classic mode

Channel	Frequency (MHz)	Max Conducted Peak Output Power (dBm)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/ cm ²)	Limit	Result
Highest	2480	8.93	7.816	0.00297	1.0	Pass

Note: EUT test Max Conducted Peak Output Power value.

BLE mode

Channel	Frequency (MHz)	Max Conducted Peak Output Power (dBm)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/ cm ²)	Limit	Result
Highest	2480	7.54	5.675	0.002156	1.0	Pass

Note: EUT test Max Conducted Peak Output Power value.

(2)For Wisa Module

Antenna Gain: The maximum Gain measured in Fully Anechoic Chamber is 1 dBi.

Radio	Antenna Type	Antenna Manufacturer	Antenna Part No.	Transmit Frequency (MHz)	Max Peak Conducted Output Power (mW)	Duty Cycle	Duty Cycle Corrected Output Power (mW)	Antenna Gain (dBi)	Minimum Antenna Cable Loss (dB)	Power Density @ 20 Cm (mW/ cm ²)	General Population Exposure Limit from 1.1310 (mW/ cm ²)
802.11a UNII	Embedded PCB Trace	Summit Semiconductor	None	5180	15.26	1	15.26	1.0	0	0.0038	1.0
				5320	15.02	1	15.02	1.0	0	0.0038	1.0
				5500	18.80	1	18.80	1.0	0	0.0047	1.0
				5700	12.80	1	12.80	1.0	0	0.0032	1.0
				5825	11.79	1	11.79	1.0	0	0.0030	1.0

Note: EUT test Max Conducted Peak Output Power value.

$$\text{BT Module} + \text{Wisa Module} = 0.00297 + 0.0047 = 0.00767 < 1.0$$

Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneously transmitting antennas incorporated in a host device is ≤ 1.0