

RF EXPOSURE EVALUATION

EUT Specification

EUT	Label Printer
Frequency band (Operating)	<input checked="" type="checkbox"/> WLAN: 2.412GHz ~ 2.462GHz <input type="checkbox"/> WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz <input type="checkbox"/> WLAN: 5.745GHz ~ 5825GHz <input checked="" type="checkbox"/> Others(Bluetooth: 2.402GHz ~ 2.480GHz; RFID: 902.25-927.75MHz)
Device category	<input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation) <input type="checkbox"/> Others ____
Antenna diversity	<input checked="" type="checkbox"/> Single antenna <input type="checkbox"/> Multiple antennas <input type="checkbox"/> Tx diversity <input type="checkbox"/> Rx diversity <input type="checkbox"/> Tx/Rx diversity
Max. output power	For Wifi: 12.96dBm(19.79mW) For BT: 4.362dBm(2.730mW) For BLE: -1.96dBm(0.637mW) For RFID: -5.99dBm(0.252mW)
Antenna gain	For Wifi &BT: 2dBi For RFID: 0.8dBi
Evaluation applied	<input checked="" type="checkbox"/> MPE Evaluation <input type="checkbox"/> SAR Evaluation

Limits for Maximum Permissible Exposure (MPE)

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density(mW/cm ²)	Average Time
(A) Limits for Occupational/Control Exposures				
300-1500	--	--	F/300	6
1500-100000	--	--	5	6
(B) Limits for General Population/Uncontrol Exposures				
300-1500	--	--	F/1500	6
1500-100000	--	--	1	30

Friis transmission formula: $P_d = \frac{P_{out} * G}{4 * \pi * R^2}$

Where

P_d = Power density in mW/cm^2

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 the limit of MPE, $1mW/cm^2$. If we know the maximum gain of the antenna and total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

Measurement Result

BT & WIFI

Channel	Channel Frequency (MHz)	Max Output power (dBm)	Tolerance	Max Tune-UP power (mW)	Power density at 20cm (mW/cm^2)	Power density Limits (mW/cm^2)
Test Mode: 802.11b						
Low	2412	12.93	± 0.5	22.03	0.007	1
Middle	2437	12.20	± 0.5	18.62	0.006	1
High	2462	11.23	± 0.5	14.89	0.005	1
Test Mode: 802.11g						
Low	2412	12.96	± 0.5	22.18	0.007	1
Middle	2437	12.43	± 0.5	19.63	0.006	1
High	2462	11.44	± 0.5	15.63	0.005	1
Test Mode: 802.11n(HT20)						
Low	2412	13.03	± 0.5	22.54	0.007	1
Middle	2437	12.15	± 0.5	18.41	0.006	1
High	2462	11.53	± 0.5	15.96	0.005	1
Test Mode: 802.11n(HT40)						
Low	2422	9.87	± 0.5	10.89	0.003	1
Middle	2437	10.32	± 0.5	12.08	0.004	1
High	2452	10.71	± 0.5	13.21	0.004	1
Test Mode: GFSK (BLE)						
Low	2402	-1.960	± 0.5	0.71	$2.24e-4$	1
Middle	2440	-2.345	± 0.5	0.65	$2.05e-4$	1
High	2480	-2.590	± 0.5	0.62	$1.96e-4$	1

Channel	Channel Frequency (MHz)	Max Output power (dBm)	Tolerance	Max Tune-UP power (mW)	Power density at 20cm (mW/cm ²)	Power density Limits (mW/cm ²)
Test Mode: GFSK						
Low	2402	1.679	±0.5	1.65	5.20e-4	1
Middle	2441	0.798	±0.5	1.35	4.26e-4	1
High	2480	-0.232	±0.5	1.06	3.34e-4	1
Test Mode: π/4-DQPSK						
Low	2402	3.957	±0.5	2.79	8.80e-4	1
Middle	2441	3.148	±0.5	2.32	7.32e-4	1
High	2480	2.068	±0.5	1.81	5.71e-4	1
Test Mode: 8DPSK						
Low	2402	4.362	±0.5	3.06	9.65e-4	1
Middle	2441	3.555	±0.5	2.54	8.01e-4	1
High	2480	2.518	±0.5	2.00	6.31e-4	1

RFID

Channel	Channel Frequency (MHz)	Max Output power (dBuV/m)	Max Output power (dBm)	Tolerance	Max Tune-UP power (mW)	Power density at 20cm (mW/cm ²)	Power density Limits (mW/cm ²)
Test Mode: RFID							
Low	902.25	82.81	-12.45	±0.5	0.06	1.435e-5	1
Middle	915.25	85.07	-10.19	±0.5	0.11	2.631e-5	1
High	925.75	89.27	-5.99	±0.5	0.28	6.697e-5	1

$$E = \text{EIRP} - 20\log D + 104.8$$

where:

E = electric field strength in dB μ V/m,

EIRP = equivalent isotropic radiated power in dBm

D = specified measurement distance in meters.

$$\text{EIRP} = E - 104.8 + 20\log D = 89.27 - 104.8 + 20\log 3 = -5.99 \text{ dBm}$$

Note: The bluetooth, wifi and RFID functions do not work at the same time.