

RF EXPOSURE EVALUATION

EUT Specification

EUT	WIFI+BT Module with host SUNLIGHT KnoWi
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 ~ 5.825GHz <input checked="" type="checkbox"/> Bluetooth(2.402GHz ~ 2.480GHz)
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	19.45dBm(88.10mW)
Antenna gain	2.99dBi
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

$\pi = 3.1416$

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

WIFI+BT Module within the host:

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	19.45	± 0.5	98.86	0.03915	1
Middle	2437	18.83	± 0.5	85.70	0.03394	1
High	2462	18.30	± 0.5	75.86	0.03004	1
Test Mode: 802.11g						
Low	2412	18.75	± 0.5	84.14	0.03332	1
Middle	2437	18.57	± 0.5	80.72	0.03197	1
High	2462	18.11	± 0.5	72.61	0.02876	1
Test Mode: 802.11n(HT20)						
Low	2412	17.23	± 0.5	59.29	0.02348	1
Middle	2437	17.10	± 0.5	57.54	0.02279	1
High	2462	16.95	± 0.5	55.59	0.02202	1
Test Mode: 802.11n(HT40)						
Low	2422	16.62	± 0.5	51.52	0.02040	1
Middle	2437	16.23	± 0.5	47.10	0.01865	1
High	2452	16.08	± 0.5	45.50	0.01802	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: BLE						
Low	2402	6.99	±0.5	5.61	0.00222	1
Middle	2440	6.97	±0.5	5.59	0.00221	1
High	2480	7.14	±0.5	5.81	0.00230	1
Test Mode: GFSK						
Low	2402	4.61	±0.5	3.24	0.00128	1
Middle	2441	4.66	±0.5	3.28	0.00130	1
High	2480	5.29	±0.5	3.79	0.00150	1
Test Mode: π4/-DQPSK						
Low	2402	5.94	±0.5	4.41	0.00175	1
Middle	2441	5.94	±0.5	4.41	0.00175	1
High	2480	6.60	±0.5	5.13	0.00203	1
Test Mode: 8DPSK						
Low	2402	6.26	±0.5	4.74	0.00188	1
Middle	2441	6.28	±0.5	4.76	0.00189	1
High	2480	6.90	±0.5	5.50	0.00218	1

LTE Module (FCC ID: XMR201909EG91NAX) within the host:

Band	PG(mW)	Test Result (mW/cm ²)	Limit Value (mW/cm ²)
WCDMA Band II	1995.262	0.397	1.0
WCDMA Band IV	1000.000	0.199	1.0
WCDMA Band V	2764.394	0.550	0.55
LTE Band 2	1995.262	0.397	1.0
LTE Band 4	1000.000	0.199	1.0
LTE Band 5	2764.394	0.550	0.55
LTE Band 12	2362.653	0.470	0.47
LTE Band 13	2613.966	0.520	0.52
LTE Band 25	1995.262	0.397	1.0
LTE Band 26	2764.394	0.550	0.550

Collocated Transmission:

Note: For the device consider simultaneous transmission of 2.4G WIFI, BT and WCDMA or LTE , the worst MPE evaluation = 0.03915 + 0.00230 + 0.550 = 0.59145 < 1.0