

RF EXPOSURE EVALUATION

EUT Specification

EUT	Canopy Protect Outdoor
Model Number	GWL1
FCC ID	2BGX6- GWL1
Antenna gain (Max)	BLE: 1.2dBi; WIFI:1.2dBi LoRa :4.55dBi
Operation Frequency	2402-2480MHz, 2412-2462MHz, 915MHz
Input Rating	DC 6.4V
Standard	47 CFR Part 1.1307 47 CFR Part 1.1310 KDB447498D01 General RF Exposure Guidance v06
Modulation	BLE(GFSK), DSSS with DBPSK/DQPSK/CCK for 802.11b; OFDM with BPSK/QPSK/16QAM/64QAM for 802.11g/n; LoRa

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

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.

Test Procedure:

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

Calculated Result and Limit

Mode	Frequency (MHz)	Peak output power (dBm)	Peak output power (mW)	Target power (dBm)	Maximum tune-up Power (mW)	Antenna gain		Power Density (S) (mW /cm ²)	Limited of Power Density (S) (mW /cm ²)	Test Result
						(dBi)	(Linear)			
BLE-GFSK	2402	2.05	1.60	1±1	1.58	1.2	1.32	0.0042	1	Complies
	2440	2.11	1.63	1±1	1.58	1.2	1.32	0.0042	1	Complies
	2480	2.16	1.64	1±1	1.58	1.2	1.32	0.0042	1	Complies

Mode	Frequency (MHz)	output power (dBm)	output power (mW)	Target power (dBm)	Maximum tune-up Power (mW)	Antenna gain		Power Density (S) (mW /cm ²)	Limited of Power Density (S) (mW /cm ²)	Test Result
						(dBi)	(Linear)			
IEEE 802.11b	2412	15.23	33.34	15±1	39.81	1.2	1.32	0.105	1	Compiles
	2437	14.68	29.37	15±1	39.81	1.2	1.32	0.105	1	Compiles
	2462	14.91	30.97	15±1	39.81	1.2	1.32	0.105	1	Compiles
IEEE 802.11g	2412	16.43	43.95	16±1	50.11	1.2	1.32	0.132	1	Compiles
	2437	16.09	40.64	16±1	50.11	1.2	1.32	0.132	1	Compiles
	2462	17.15	51.88	17±1	63.09	1.2	1.32	0.167	1	Compiles
IEEE 802.11n HT20	2412	17.48	55.97	17±1	63.09	1.2	1.32	0.167	1	Compiles
	2437	17.52	56.49	17±1	63.09	1.2	1.32	0.167	1	Compiles
	2462	17.89	61.51	17±1	63.09	1.2	1.32	0.167	1	Compiles

WIFI cannot transmit simultaneously with BLE RF function.

For 915MHz :

Ant gain=4.55dBi

Ant numeric gain= 2.85

Field strength = 88.28dBuV/m@3m

EIRP=E-104.7+20logD=88.28-104.7+20log3=-6.88dBm

Maximum Conducted Output Power: -1.65dBm

Mode	Frequency (MHz)	output power (dBm)	output power (mW)	Target power (dBm)	Maximum tune-up Power (mW)	Antenna gain		Power Density (S) (mW /cm2)	Limited of Power Density (S) (mW /cm2)	Test Result
						(dBi)	(Linear)			
LoRa	915	-1.65	0.68	1±0	1	4.55	2.85	0.0057	1	Compiles

BLE and LoRa can be launched simultaneously. Simultaneous evaluation of compliant RF exposur:

Sum of Maximum Ratios: 0.0042+0.057=0.0612<1

WIFI and LoRa can be launched simultaneously. Simultaneous evaluation of compliant RF exposur:

Sum of Maximum Ratios: 0.167+0.057=0.224<1

Remark: The Max Conducted Peak Output Power data refer to report Report No.:

90657-24-72-24-PP001, 90657-24-72-24-PP002, 90657-24-72-24-PP003

The Maximum power is less than the limit, complies with the exemption requirements, SAR is exempted.