FCC ID : 2AWE8-S1-W4G

1. RF EXPOSURE EVALUATION

According to FCC 1.1310: 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 §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)	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: Pd= (Pout*G)\ ($4*pi*R^2$)

Where

Pd= Power density in mW/cm^2.

Pout=output power to antenna in mW.

G= Numeric gain of the antenna relative to isotropic antenna.

Pi=3.1416.

R= distance between observation point and center of the radiator in 20cm.

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

2. EUT TECHNICAL DESCRIPTION

Characteristics	Description
Product	W4G Stick
Model Number	G1-W4G-ST, S1-W4G-ST (Note: The only difference in models is the model's name, all other information is the same. The main test model applied for this report is G1-W4G-ST)
Power Supply	DC 5V
Temperature Range	-30°C ~ 65°C

Device Type	BLE V4.2
Data Rate	1Mbps
Modulation	GFSK
Operating Frequency Range	2402-2480MHz
Number of Channels	40 Channels
Antenna Type	PCB Antenna
Antenna Gain	3.42 dBi

IEEE 802.11 WLAN Mode Supported	☒ 802.11b ☒ 802.11g ☒ 802.11n(20MHz channel bandwidth) ☒ 802.11n(40MHz channel bandwidth)
Modulation	DSSS with DBPSK/DQPSK/CCK for 802.11b OFDM with BPSK/QPSK/16QAM/64QAM for 802.11g/n
Operating Frequency Range	☒ 2412-2462MHz for 802.11b/g/n(HT20) ☒ 2422-2452MHz for 802.11n(HT40)
Number of Channels	☒ 11 channels for 802.11b/g/n(HT20) ☒ 7 Channels for 802.11n(HT40)
Antenna Type	PCB Antenna
Antenna Gain	3.42dBi

Operation Band:	WCDMA B2/B4/B5
Modulation:	QPSK for WCDMA/HSUPA/HSDPA
Operating Frequency Range(s):	WCDMA Band 2: Tx 1850-1910MHz/Rx 1930-1990MHz WCDMA Band 4: Tx 1710-1755MHz/Rx 2110-2155MHz WCDMA Band 5: Tx 824-849MHz/Rx 869-894MHz
Supported Channel Bandwidth:	5 MHz
Antenna Type:	FPC Antenna
Antenna Gain:	WCDMA Band 2: 2.56dBi WCDMA Band 4: 2.56dBi WCDMA Band 5: 2.56dBi

Operation Band:	LTE B2/B4/B5/B12/B13/B14/B66/B71	
Modulation:	QPSK/16QAM for LTE	
Operating Frequency Range(s):	LTE Band 2: Tx: 1850-1910MHz, Rx: 1930-1990MHz LTE Band 4: Tx:1710-1755MHz, Rx: 2110-2155MHz LTE Band 5: Tx: 824-849MHz, Rx: 875-885MHz LTE Band 12: Tx: 699-716MHz, Rx: 729-746MHz LTE Band 13: Tx: 777-787MHz, Rx: 746-756MHz LTE Band 14: Tx: 788-798MHz, Rx: 758-768MHz LTE Band 66: Tx/Rx: 1710-1780MHz LTE Band 71: Tx/Rx: 663-698MHz	
Supported Channel Bandwidth:	LTE Band2	☒1.4MHz, ☒3MHz, ☒5MHz, ☒10MHz, ☒15MHz, ☒20MHz
	LTE Band4	☒1.4MHz, ☒3MHz, ☒5MHz, ☒10MHz, ☒15MHz, ☒20MHz
	LTE Band5	☒1.4MHz, ☒3MHz, ☒5MHz, ☒10MHz
	LTE Band12	☒1.4MHz, ☒3MHz, ☒5MHz, ☒10MHz
	LTE Band13	☒5MHz, ☒10MHz
	LTE Band14	☒5MHz, ☒10MHz
	LTE Band66	☒1.4MHz, ☒3MHz, ☒5MHz, ☒10MHz, ☒15MHz, ☒20MHz
	LTE Band71	☒5MHz, ☒10MHz, ☒15MHz, ☒20MHz
Antenna Type:	FPC Antenna	
Antenna Gain:	LTE Band 2: 2.56dBi LTE Band 4: 2.56dBi LTE Band 5: 2.56dBi LTE Band 12: 2.56dBi LTE Band 13: 2.56dBi LTE Band 14: 2.56dBi LTE Band 66: 2.56dBi LTE Band 71: 2.56dBi	

3. Measurement Result

Mode	Max Conducted Power (dBm)	Antenna gain (dBi)	Antenna Gain Numeric	R (cm)	Evaluation result (mW/cm2)	Power density Limits (mW/cm2)
BLE	6.19	3.42	2.198	20	0.0018	1
2.4G WIFI	14.52	3.42	2.198	20	0.0124	1
WCDMA B2	23.24	2.56	1.803	20	0.0756	1
WCDMA B4	23.17	2.56	1.803	20	0.0744	1
WCDMA B5	22.89	2.56	1.803	20	0.0698	0.5509
LTE B2	23.01	2.56	1.803	20	0.0717	1
LTE B4	23.16	2.56	1.803	20	0.0743	1
LTE B5	23.70	2.56	1.803	20	0.0841	0.5498
LTE B12	23.62	2.56	1.803	20	0.0826	0.4665
LTE B13	23.52	2.56	1.803	20	0.0807	0.5197
LTE B14	23.51	2.56	1.803	20	0.0805	0.5270
LTE B66	23.16	2.56	1.803	20	0.0743	1
LTE B71	23.61	2.56	1.803	20	0.0824	0.4437

Note: All the modes are tested, only the worst data are described in the table.

Conclusion of simultaneous transmitter:
Both of the module 1 and module 2 can transmit simultaneously, the formula of calculated the MPE is:

CPD1/LPD1+CPD2/LPD2+……etc. < 1
CPD = Calculation power density
LPD = Limit of power density

Therefore the worst-case situation is 0.0124/1+0.0841/0.5498= 0.1654, which is less than 1, this confirmed that the device comply with FCC 1.1310 MPE limit.

----- The End -----