

MPE Evaluation

Applicant: Aurodi Corporation
FCC ID: 2BBTA-VGW12W0X900
Model: VGW12W0X-EC25-900

MPE Evaluation

RF Exposure Compliance Requirement

Standard Requirement

According to KDB447498D01 General RF Exposure Guidance v06 and FCC 1.1310 Radio frequency radiation exposure limits for General Population/Uncontrolled Exposure.

Limit For 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)
(i) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*(100)	< 6
3.0-30	1824/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
(ii) 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
Note: f = frequency in MHz. * = Plane-wave equivalent power density.				

EUT RF Exposure

$$P_d = PG/4\pi R^2$$

P_d = power density in mW/cm²

P = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.14

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

For 2.4G WIFI

The Max Output Power is 14.667 dBm in 802.11b 2462 MHz;

Antenna gain: -3.08 dBi, gain of antenna in linear scale: 0.49

$R=20\text{cm}$

$$P_d = PG/(4\pi R^2) = 0.0029 \text{ mW/cm}^2 < 1 (\text{limits}) \text{ mW/cm}^2$$

For 5G WIFI Band I

The Max Output Power is 11.58 dBm 802.11ax (HE40) in 5190 MHz;

Antenna gain: 2.59 dBi, gain of antenna in linear scale: 1.82

$R=20\text{cm}$

$$P_d = PG/(4\pi R^2) = 0.0052 \text{ mW/cm}^2 < 1 (\text{limits}) \text{ mW/cm}^2$$

For 5G WIFI Band II

The Max Output Power is 9.77 dBm in 802.11ax (HE40) 5310 MHz;

Antenna gain: 2.59 dBi, gain of antenna in linear scale: 1.82

$R=20\text{cm}$

$$P_d = PG/(4\pi R^2) = 0.0034 \text{ mW/cm}^2 < 1 (\text{limits}) \text{ mW/cm}^2$$

For 5G WIFI Band III

The Max Output Power is 11.38 dBm in 802.11ac (VHT40) 5510 MHz;

Antenna gain: 2.59 dBi, gain of antenna in linear scale: 1.82

$R=20\text{cm}$

$$P_d = PG/(4\pi R^2) = 0.005 \text{ mW/cm}^2 < 1 (\text{limits}) \text{ mW/cm}^2$$

For 5G WIFI Band IV

The Max Output Power is 9.82 dBm in 802.11ax (HE40) 5755 MHz;

Antenna gain: 2.59 dBi, gain of antenna in linear scale: 1.82

$R=20\text{cm}$

$$P_d = PG/(4\pi R^2) = 0.0035 \text{ mW/cm}^2 < 1 (\text{limits}) \text{ mW/cm}^2$$

For 2.4G BLE

The Max Output Power is 2.364 dBm in BLE 2M 2402 MHz;

Antenna gain: -2.94 dBi, gain of antenna in linear scale: 0.51

R=20cm

$$P_d = PG/(4\pi R^2) = 0.0002 \text{ mW/cm}^2 < 1 (\text{limits}) \text{ mW/cm}^2$$

For 2.4G BT

The Max Output Power is 2.17 dBm in 2DH5 2402 MHz;

Antenna gain: -2.94 dBi, gain of antenna in linear scale: 0.51

R=20cm

$$P_d = PG/(4\pi R^2) = 0.0002 \text{ mW/cm}^2 < 1 (\text{limits}) \text{ mW/cm}^2$$

For 2.4G ZIGBEE

The Max Output Power is 16.72 dBm in O-QPSK 2440 MHz;

Antenna gain: 0.35 dBi, gain of antenna in linear scale: 1.08

R=20cm

$$P_d = PG/(4\pi R^2) = 0.0101 \text{ mW/cm}^2 < 1 (\text{limits}) \text{ mW/cm}^2$$

For NFC

The Max Output Power is -21 dBm

R=20cm

$$P_d = PG/(4\pi R^2) = 0.000002 \text{ mW/cm}^2 < 1 (\text{limits}) \text{ mW/cm}^2$$

For 905M LORA

The Max Output Power is 16.171 dBm in CSS 905 MHz;

Antenna gain: 3.0 dBi, gain of antenna in linear scale: 2.0

R=20cm

$$P_d = PG/(4\pi R^2) = 0.0165 \text{ mW/cm}^2 < 1 (\text{limits}) \text{ mW/cm}^2$$

For WCDMA<E

Band	Antenna Gain (dBi)	Antenna Gain (numeric)	Distance (cm)	Result (dBm)	Result (mW)	Result (mW/cm ²)	Power Density (mW/cm ²)	Ratio
WCDMA II	4.0	2.51	20	25.49	630.96	0.126	1.000	0.126
WCDMA IV	4.0	2.51	20	25.62	650.13	0.129	1.000	0.129
WCDMA V	4.0	2.51	20	23.22	374.11	0.074	1.000	0.074
LTE BAND 2	4.0	2.51	20	25.75	669.88	0.133	1.000	0.133
LTE BAND 4	4.0	2.51	20	26.08	722.77	0.144	1.000	0.144
LTE BAND 5	4.0	2.51	20	22.71	332.66	0.066	1.000	0.066
LTE BAND 12	4.0	2.51	20	20.48	199.07	0.040	1.000	0.040
LTE BAND 13	4.0	2.51	20	23.63	411.15	0.082	1.000	0.082
LTE BAND 14	4.0	2.51	20	23.48	397.19	0.079	1.000	0.079
LTE BAND 66	4.0	2.51	20	27.51	1004.62	0.200	1.000	0.200
LTE BAND 71	4.0	2.51	20	22.72	333.43	0.066	1.000	0.066

For simultaneously transmission

Band	Antenna Gain (dBi)	Antenna Gain (numeric)	Distance (cm)	Result (dBm)	Result (mW)	Result (mW/cm ²)	Power Density (mW/cm ²)	Ratio
BT	-2.94	0.51	20	2.17	0.84	0.001	1.000	0.001
BLE	-2.94	0.51	20	2.364	0.88	0.001	1.000	0.001
2.4G WIFI	-3.08	0.49	20	14.667	14.41	0.003	1.000	0.003
905 LORA	3	2	20	16.171	82.62	0.016	1.000	0.016
2.4G ZIGBEE	0.35	1.08	20	16.72	50.93	0.010	1.000	0.010
5G WIFI BAND I	2.59	1.82	20	11.58	26.12	0.005	1.000	0.005
5G WIFI BAND II	2.59	1.82	20	9.77	17.22	0.003	1.000	0.003
5G WIFI BAND III	2.59	1.82	20	11.38	24.95	0.005	1.000	0.005
5G WIFI BAND IV	2.59	1.82	20	9.82	17.42	0.003	1.000	0.003
NFC	0	1	20	-21	0.01	0.000002	0.979	0.000002
WCDMA II	4.0	2.51	20	25.49	630.96	0.126	1.000	0.126
WCDMA IV	4.0	2.51	20	25.62	650.13	0.129	1.000	0.129
WCDMA V	4.0	2.51	20	23.22	374.11	0.074	1.000	0.074
LTE BAND 2	4.0	2.51	20	25.75	669.88	0.133	1.000	0.133
LTE BAND 4	4.0	2.51	20	26.08	722.77	0.144	1.000	0.144
LTE BAND 5	4.0	2.51	20	22.71	332.66	0.066	1.000	0.066
LTE BAND 12	4.0	2.51	20	20.48	199.07	0.040	1.000	0.040
LTE BAND 13	4.0	2.51	20	23.63	411.15	0.082	1.000	0.082
LTE BAND 14	4.0	2.51	20	23.48	397.19	0.079	1.000	0.079
LTE BAND 66	4.0	2.51	20	27.51	1004.62	0.200	1.000	0.200
LTE BAND 71	4.0	2.51	20	22.72	333.43	0.066	1.000	0.066

Simultaneous Transmission Calculation (Worst-case mode)

No.	Transmitter Combination	MPE Ratio	Limit	Result
1	BT+2.4G WIFI+2.4G ZIGBEE+LTE BAND 13	0.102	≤1.0	Pass

Note: MPE Ratio = 0.001+0.003+0.016+0.082 = 0.102

--END--