



# RF Exposure Evaluation Report

**Application No.:** SZEM2102002038CR  
**Applicant:** Winegard Company  
**Address of Applicant:** 3000 Kirkwood Street, Burlington, Iowa 52601, United States  
**Manufacturer:** Winegard Company  
**Address of Manufacturer:** 3000 Kirkwood Street, Burlington, Iowa 52601, United States  
**Factory:**  
 1. Aztech Communication Device (DG) Ltd  
 2. IOT Manufacturing SDN.BHD.  
**Address of Factory:**  
 1. Jiu Jiang Shui Village, Chang Ping Town, Dong Guan City, Guang Dong Province, China  
 2. No. 8 & 10, Setia Business Park, Jalan Laman Setia 7/4, Taman Laman Setia, 81550 Gelang Patah, Johor Bahru, Malaysia  
**Product Name:**  
 1. Gateway PRO  
 2. WiFi Access Point/Extender with Bridge Mode 2.4/5Ghz  
**Model No.:** WG04, WG02 ♣  
 ♣ Please refer to section 3 of this report which indicates which model was actually tested and which were electrically identical.  
**Trade Mark:** Winegard  
**FCC ID:** C3D-AZ1333300  
**Standards:** 47 CFR Part 1.1307, 47 CFR Part 1.1310, 47 CFR Part 2.1091  
**Date of Receipt:** 2021-02-24  
**Date of Test:** 2021-04-07 to 2021-04-28  
**Date of Issue:** 2021-04-29

<b>Test Result :</b>	<b>PASS*</b>
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\* In the configuration tested, the EUT complied with the standards specified above.

Keny Xu  
 EMC Laboratory Manager




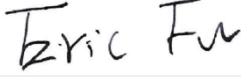
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 Shenzhen Branch EMC Laboratory

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## 1 Version

Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2021-04-29		Original

Authorized for issue by:			
		 <hr/> <b>Edison Li /Project Engineer</b>	
		 <hr/> <b>Eric Fu /Reviewer</b>	





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### 3 General Information

#### 3.1 General Description of WG04

Power supply:	DC 12V			
Internal source:	More than 108MHz			
For 2.4G WiFi				
Type of Modulation:	802.11b: DSSS (CCK, DQPSK, DBPSK) 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK) 802.11n (HT20/HT40): OFDM (64QAM, 16QAM, QPSK, BPSK)			
Operating Frequency:	802.11b/g/n(HT20): 2412MHz to 2462MHz 802.11n(HT40): 2422MHz to 2452MHz			
Channel Number:	802.11b/g/11n(HT20): 11 Channels 802.11n(HT40): 7 Channels			
Channels Step:	Channels with 5MHz step			
Sample Type:	Fixed devices			
Antenna Type:	PCB antenna			
Antenna Gain:	Antenna1/Antenna2/Antenna3: 3.2dBi Note: Three antennas can simultaneous transmission.			
For 5G WiFi				
Operation Frequency:	Band	Mode	Frequency Range(MHz)	Number of channels
	UNII Band I	802.11a/n(HT20)/ac(HT20)	5180-5240	4
		802.11n(HT40)/ac(HT40)	5190-5230	2
		802.11ac(HT80)	5210	1
	UNII Band II-A	802.11a/n(HT20)/ac(HT20)	5260-5320	4
		802.11n(HT40)/ac(HT40)	5270-5310	2
		802.11ac(HT80)	5290	1
	UNII Band II-C	802.11a/n(HT20)/ac(HT20)	5500-5700	8
		802.11n(HT40)/ac(HT40)	5510-5670	5
		802.11ac(HT80)	5530,5610	2
	UNII Band III	802.11a/n(HT20)/ac(HT20)	5745-5825	5
		802.11n(HT40)/ac(HT40)	5755-5795	2
802.11ac(HT80)		5775	1	
Modulation Type:	802.11a: OFDM(64QAM, 16QAM, QPSK, BPSK) 802.11n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)			





Sample Type:	Fixed devices
Antenna Type:	PCB antenna
Antenna Gain:	Antenna1/Antenna2/Antenna3: 4.6dBi Note: three antennas can simultaneous transmission.

Details of WCDMA/LTE module*:		
Operation Frequency Band:	WCDMA Band II,IV,V; LTE FDD Band 2,4,5,12,13,14,66,71	
Modulation Type:	WCDMA: QPSK LTE: QPSK, 16QAM	
HSDPA UE Category:	24	
HSUPA UE Category:	6	
LTE Category:	4	
Antenna Type:	PCB Antenna	
Antenna Ports:	Tx & Rx Port	1
	Rx-only Port	1
Antenna Gain:	2dBi	

\*: The WCDMA/LTE single module approval by TCB(FCC ID:C3D-201808EC25AF), Grant at 05/18/2021.



### 3.2 General Description of WG02

Power supply:	POE Adapter Model: WM024SP-240-A REV 1MM Input: AC 100-240V, 50/60Hz, 0.8A Output: DC 24V, 1.0A 10/100/1000Mbps			
Internal source:	More than 108MHz			
For 2.4G WiFi				
Type of Modulation:	802.11b: DSSS (CCK, DQPSK, DBPSK) 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK) 802.11n (HT20/HT40): OFDM (64QAM, 16QAM, QPSK, BPSK)			
Operating Frequency:	802.11b/g/n(HT20): 2412MHz to 2462MHz 802.11n(HT40): 2422MHz to 2452MHz			
Channel Number:	802.11b/g/11n(HT20): 11 Channels 802.11n(HT40): 7 Channels			
Channels Step:	Channels with 5MHz step			
Sample Type:	Fixed devices			
Antenna Type:	PCB antenna			
Antenna Gain:	Antenna1/Antenna2/Antenna3: 3.2dBi Note: Three antennas can simultaneous transmission.			
For 5G WiFi				
Operation Frequency:	Band	Mode	Frequency Range(MHz)	Number of channels
	UNII Band I	802.11a/n(HT20)/ac(HT20)	5180-5240	4
		802.11n(HT40)/ac(HT40)	5190-5230	2
		802.11ac(HT80)	5210	1
	UNII Band II-A	802.11a/n(HT20)/ac(HT20)	5260-5320	4
		802.11n(HT40)/ac(HT40)	5270-5310	2
		802.11ac(HT80)	5290	1
	UNII Band II-C	802.11a/n(HT20)/ac(HT20)	5500-5700	8
		802.11n(HT40)/ac(HT40)	5510-5670	5
		802.11ac(HT80)	5530,5610	2
UNII Band III	802.11a/n(HT20)/ac(HT20)	5745-5825	5	
	802.11n(HT40)/ac(HT40)	5755-5795	2	
	802.11ac(HT80)	5775	1	
Modulation Type:	802.11a: OFDM(64QAM, 16QAM, QPSK, BPSK) 802.11n: OFDM (BPSK, QPSK, 16QAM, 64QAM)			



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	802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)
Sample Type:	Fixed devices
Antenna Type:	PCB antenna
Antenna Gain:	Antenna1/Antenna2/Antenna3: 4.6dBi Note: three antennas can simultaneous transmission.

**Remark:**

Model No.: WG04, WG02

Since according to the declaration from the applicant, the electrical circuit design, layout, components used, internal wiring and functions were identical for all the above models, only the difference as below:

	WG02	WG04
Product Board Configuration Name:	WiFi Access Point/Extender with Bridge Mode 2.4/5Ghz	Gateway PRO
5G 3x3 WiFi	Yes	Yes
2.4G 3x3 WiFi	Yes	Yes
LTE Module	No	Yes
mPCIE Slot	Yes	Yes
MicroSD Slot	No	Yes
Accelerometer and Temp Sensor	No	Yes
GE WAN port	Yes	No
POE Sink	Yes	No
POE Source	No	No
GE LAN port	No	Yes
Spare connectors	No	Yes
Power Analysis MCU	No	Yes
USB Ports	None, 0	Yes, 1 USB A
SIM Card Slot	/	1 through Dual SIM connector
	/	1 through flat flex selectable
Mains Power	Through WAN/PPOE only	12V vehicle power path.



### 3.3 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch

No. 1 Workshop, M-10, Middle section, Science & Technology Park, Shenzhen, Guangdong, China 518057

Telephone: +86 (0) 755 2601 2053 Fax: +86 (0) 755 2671 0594

No tests were sub-contracted.

### 3.4 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **CNAS (No. CNAS L2929)**

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

- **A2LA (Certificate No. 3816.01)**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

- **VCCI**

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

- **FCC –Designation Number: CN1178**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1178. Test Firm Registration Number: 406779.

- **Innovation, Science and Economic Development Canada**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.

### 3.5 Deviation from Standards

None.

### 3.6 Abnormalities from Standard Conditions

None.

### 3.7 Other Information Requested by the Customer

None.





## 4 RF Exposure Evaluation

### 4.1 RF Exposure Compliance Requirement

#### 4.1.1 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 <sup>2</sup> )	Averaging time (minutes)
<b>(A) Limits for Occupational/Controlled Exposures</b>				
0.3–3.0 .....	614	1.63	*(100)	6
3.0–30 .....	1842/f	4.89/f	*(900/f <sup>2</sup> )	6
30–300 .....	61.4	0.163	1.0	6
300–1500 .....	.....	.....	f/300	6
1500–100,000 .....	.....	.....	5	6
<b>(B) Limits for General Population/Uncontrolled Exposure</b>				
0.3–1.34 .....	614	1.63	*(100)	30
1.34–30 .....	824/f	2.19/f	*(180/f <sup>2</sup> )	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:  $Pd = (Pout * G) / (4 * Pi * R^2)$

Where

Pd = power density in mW/cm<sup>2</sup>

Pout = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

For Uncontrolled Environment, the MPE limit of 300MHz to 1500MHz is f/1500 mW/cm<sup>2</sup>, the MPE limit of 1500MHz to 100000MHz is 1.0 mW/cm<sup>2</sup>. 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.

#### 4.1.2 Test Procedure

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



### 4.1.3 EUT RF Exposure Evaluation

#### 1) Test Results for WG04

Note: the WLAN antenna and WCDMA/LTE antenna can synchronous transmission at the same time.  
 the 2.4G WLAN antenna and 5G WLAN antenna cannot synchronous transmission at the same time.

#### 2.4G WiFi

The max tune-up tolerance power Into Antenna & RF Exposure Evaluation Distance:

Antenna	Max Antenna Gain (dBi)	Max Antenna Gain (Numeric)	Max tune-up tolerance power (dBm)	Max tune-up Tolerance power to Antenna (mW)	Power Density at R = 20 cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	MPE Ratios	Result
MIMO	3.2	2.09	26.24	420.73	0.1749	1	0.1749	PASS

Note: Refer to report No. SZEM210200203802 or EUT test Max Conducted Peak Output Power value.

The distancer (4th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement, the MPE limit of 1500MHz to 100000MHz is 1.0 mW/cm<sup>2</sup>.

#### For 5G WiFi

The max tune-up tolerance power Into Antenna & RF Exposure Evaluation Distance:

Antenna	Max Antenna Gain (dBi)	Max Antenna Gain (Numeric)	Max tune-up tolerance power (dBm)	Max tune-up Tolerance power to Antenna (mW)	Power Density at R = 20 cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	MPE Ratios	Result
MIMO	4.6	2.88	23.14	206.06	0.1182	1	0.1182	PASS

Note: Refer to report No. SZEM210200203803 or EUT test Max Conducted Peak Output Power value.

The distancer (4th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement, the MPE limit of 1500MHz to 100000MHz is 1.0 mW/cm<sup>2</sup>.



**For WCDMA/LTE module:**

The max tune-up tolerance power Into Antenna & RF Exposure Evaluation Distance:

Type	Test Freq. (MHz)	Max Antenna Gain (dBi)	Max Antenna Gain (Numeric)	Max tune-up tolerance power (dBm)	Max tune-up Tolerance power to Antenna (mW)	Power Density at R=20cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	MPE Ratios	Result
WCDMA Band II	1852.4	2	1.58	25	316.23	0.0997	1	0.0997	PASS
WCDMA Band IV	1712.4	2	1.58	25	316.23	0.0997	1	0.0997	PASS
WCDMA Band V	826.4	2	1.58	25	316.23	0.0997	0.5509	0.1810	PASS
LTE Band2	1850.7	2	1.58	25	316.23	0.0997	1	0.0997	PASS
LTE Band4	1710.7	2	1.58	25	316.23	0.0997	1	0.0997	PASS
LTE Band5	824.7	2	1.58	25	316.23	0.0997	0.5498	0.1814	PASS
LTE Band12	699.7	2	1.58	25	316.23	0.0997	0.4665	0.2138	PASS
LTE Band13	779.5	2	1.58	25	316.23	0.0997	0.5197	0.1919	PASS
LTE Band14	790.5	2	1.58	25	316.23	0.0997	0.5270	0.1892	PASS
LTE Band66	1710.7	2	1.58	25	316.23	0.0997	1.0000	0.0997	PASS
LTE Band71	665.5	2	1.58	25	316.23	0.0997	0.4437	<b>0.2247</b>	PASS

Note: Refer to report No. R1806A0301 or EUT test Max Conducted Peak Output Power value.

The distancer (4th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement.

the MPE limit of 300MHz to 1500MHz is f/1500 mW/cm<sup>2</sup>, the MPE limit of 1500MHz to 100000MHz is 1.0 mW/cm<sup>2</sup>.

The simultaneous transmission result between of WLAN and WCDMA/LTE module:

The SAR Exclusion Threshold Level:

$$= \text{CPD1} / \text{LPD1} + \text{CPD2} / \text{LPD2}$$

(CPD = Calculation power density, LPD = Limit of power density)

$$= (0.1749/1) + (0.0997/0.4437) = 0.3996 < 1$$

Since the SAR Exclusion Threshold Level is well below the SAR low threshold level, so the EUT is considered to comply with SAR requirement without testing.



**2) Test Results for WG02**

Note: the 2.4G WLAN antenna and 5G WLAN antenna cannot synchronous transmission at the same time.

**2.4G WiFi**

The max tune-up tolerance power Into Antenna & RF Exposure Evaluation Distance:

Antenna	Max Antenna Gain (dBi)	Max Antenna Gain (Numeric)	Max tune-up tolerance power (dBm)	Max tune-up Tolerance power to Antenna (mW)	Power Density at R = 20 cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	MPE Ratios	Result
MIMO	3.2	2.09	26.24	420.73	0.1749	1	0.1749	PASS

Note: Refer to report No. SZEM210200203802 or EUT test Max Conducted Peak Output Power value.

The distancer (4th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement, the MPE limit of 1500MHz to 100000MHz is 1.0 mW/cm<sup>2</sup>.

**For 5G WiFi**

The max tune-up tolerance power Into Antenna & RF Exposure Evaluation Distance:

Antenna	Max Antenna Gain (dBi)	Max Antenna Gain (Numeric)	Max tune-up tolerance power (dBm)	Max tune-up Tolerance power to Antenna (mW)	Power Density at R = 20 cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	MPE Ratios	Result
MIMO	4.6	2.88	23.14	206.06	0.1182	1	0.1182	PASS

Note: Refer to report No. SZEM210200203803 or EUT test Max Conducted Peak Output Power value.

The distancer (4th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement, the MPE limit of 1500MHz to 100000MHz is 1.0 mW/cm<sup>2</sup>.

-End of Report-

