



RF EXPOSURE EVALUATION REPORT

Application No.: GZCR2206000724AT
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.
 1. Jiu Jiang Shui Village, Chang Ping Town, Dong Guan City, Guang Dong Province, China
Address of Factory:
 2. No. 8 & 10, Setia Business Park, Jalan Laman Setia 7/4, Taman Laman Setia, 81550 Gelang Patah, Johor Bahru, Malaysia

Equipment Under Test (EUT):
EUT Name: Gateway PRO 2x2
Model No.: WF2-5G1, GW-5G01 ♣
 ♣ Please refer to section 2 of this report which indicates which model was actually tested and which were electrically identical.
Trade Mark: Winegard
Standard(s) : 47 CFR Part 2.1091
 47 CFR Part 1.1310
 47 CFR Part 1.1307
Date of Receipt: 2022-05-17
Date of Evaluation: 2022-05-18 to 2022-06-13
Date of Issue: 2022-06-16

Test Result:	Pass*
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* In the configuration tested, the EUT complied with the standards specified above.

Kobe Jian
 EMC Laboratory Manager



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Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2022-06-16		Original

Authorized for issue by:			
			
		<hr/> Curry Wu/Project Engineer	
			
		<hr/> Ricky Liu/Reviewer	



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2 Evaluation Summary

Radio Spectrum Technical Requirement				
Item	Standard	Requirement	Method	Result
RF Exposure	47 CFR Part 2.1091 47 CFR Part 1.1310 47 CFR Part 1.1307	47 CFR Part 1.1310	47 CFR Part 1.1310	PASS

Note:

E.U.T./EUT means Equipment Under Test.

Pass means the test result passed the test standard requirement, please find the detailed decision rule in the report relative section.



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4 General Information

4.1 Details of E.U.T.

Power supply:	DC 12V			
Internal source:	More than 108MHz			
For 2.4G				
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			
WF2-5G1's Antenna Type:	PCB antenna			
WF2-5G1's Antenna Gain:	Antenna1/Antenna2: 3.2dBi Note: MIMO for 802.11n.			
GW-5G01's Antenna Type:	PCB antenna			
GW-5G01's Antenna Gain:	Antenna1: 3.2dBi, Antenna2:3.0dBi Note: MIMO for 802.11n.			
For 5G				
Operation Frequency:	Band	Mode	Frequency Range(MHz)	Number of channels
	UNII	802.11a/n(HT20)/ac(HT20)	5180-5240	4
	Band I	802.11n(HT40)/ac(HT40)	5190-5230	2
		802.11ac(HT80)	5210	1
	UNII	802.11a/n(HT20)/ac(HT20)	5260-5320	4
		802.11n(HT40)/ac(HT40)	5270-5310	2
	Band II-A	802.11ac(HT80)	5290	1
		802.11a/n(HT20)/ac(HT20)	5500-5700	11
	Band II-	802.11n(HT40)/ac(HT40)	5510-5670	5



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	C	802.11ac(HT80)	5530,5610	2
	UNII	802.11a/n(HT20)/ac(HT20)	5745-5825	5
	Band III	802.11n(HT40)/ac(HT40)	5755-5795	2
		802.11ac(HT80)	5775	1
	* The 5600-5650MHz cannot be used.			
Modulation Type:	802.11a: OFDM(64QAM, 16QAM, QPSK, BPSK) 802.11n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)			
DFS Function:	Master			
TPC Function:	Support			
Sample Type:	Fixed devices			
WF2-5G1's Antenna Type:	PCB antenna			
WF2-5G1's Antenna Gain:	Antenna1/Antenna2: 4.6dBi Note: MIMO for 802.11n/ac.			
GW-5G01's Antenna Type:	PCB antenna			
GW-5G01's Antenna Gain:	Antenna1: 4.6dBi, Antenna2:4.0dBi Note: MIMO for 802.11n/ac.			

4.2 Details of 5G Sub-6 GHz M.2 Module*:

Operation Frequency Band:	WCDMA Band II, IV, V. E-UTRA in Bands 2/4/5/7/12/13/14/17/25/26/30/38/41/48/66/71. E-UTRA with CA uplink in Bands 2/5/7/38/41/66. 5G NR protocol contains SA and NSA(EN-DC) features in the Bands n2/n5/n7/n12/n25/n41/n66/n71, with some bandwidths according to 3GPP applicable standards. 5G NR Band n77 supports SA only, with some bandwidths according to 3GPP applicable standards and is only applicable in the range of 3450-3650 MHz.
Modulation Type:	WCDMA: QPSK LTE: QPSK, 16QAM
HSDPA UE Category:	24
HSUPA UE Category:	6



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EMC-TRF-03 Rev 1.0

LTE Category:	18
HPUE Band:	n41, n77(SA & UL MIMO)
SCS for NR cell:	FDD Band: 15KHz; TDD Band: 30KHz
Antenna Type:	PCB Antenna
Antenna Gain:	Max 8dBi

*: The 5G Sub-6 GHz M.2 module approval by TCB(FCC:C3D-2020RM502QAE), Grant at 06/13/2022.

4.3 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou Branch EMC Laboratory,
 198 Kezhu Road, Sciencetech Park, Guangzhou Economic & Technology Development District,
 Guangzhou, China 510663

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4.4 Test Facility

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

- **NVLAP (Lab Code: 200611-0)**

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou EMC Laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 200611-0.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

- **ACMA**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our NVLAP accreditation.

- **SGS UK(Certificate No.: 32), SGS-TUV SAARLAND and SGS-FIMKO**

Have approved SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory as a supplier of EMC TESTING SERVICES and SAFETY TESTING SERVICES.

- **CNAS (Lab Code: L0167)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been assessed and in compliance with CNAS-CL01:2018 accreditation criteria for testing laboratories (identical to ISO/IEC 17025:2017 General Requirements) for the Competence of Testing Laboratories.

- **FCC Recognized 2.948 Listed Test Firm(Registration No.: 282399)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 282399, May 31, 2002.

- **FCC Recognized Accredited Test Firm(Registration No.: 486818)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been accredited and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Designation Number: CN5016, Test Firm Registration Number: 486818, Jul 13, 2017.

- **Industry Canada (Registration No.: 4620B, CAB identifier: CN0052)**

SGS-CSTC Standards Technical Services Co., Ltd., has been registered by Innovation Science and Economic Development Canada for Wireless Device Testing laboratories to test to Canadian radio equipment requirements. Registration No. 4620B, CAB identifier: CN0052.

- **VCCI (Registration No.: R-12460, C-12584, G-10449 and T-11179)**

The 10m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-12460, C-12584, G-10449 and T-11179 respectively.

- **CBTL (Lab Code: TL129)**

SGS-CSTC Standards Technical Services Co., Ltd., E&E Laboratory has been assessed and fully comply with the requirements of ISO/IEC 17025:2005, the Basic Rules, IECEE 01 and Rules of procedure IECEE 02, and the relevant IECEE CB-Scheme Operational documents.



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4.5 Deviation from Standards

None

4.6 Abnormalities from Standard Conditions

None



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5 Radio Spectrum Technical Requirement

5.1 RF Exposure

5.1.1 Requirement

In accordance with 47 CFR FCC Part 2.1091, this device has been defined as a mobile device whereby a distance of 0.2m normally can be maintained between the user and the device.

According to 47 CFR FCC Part 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 TO §1.1310(E)(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)
(i) Limits for Occupational/Controlled Exposure				
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
300-1,500			f/300	<6
1,500-100,000			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
300-1,500			f/1500	<30
1,500-100,000			1.0	<30

f = frequency in MHz. * = Plane-wave equivalent power density



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5.1.2 Method

According to IEEE C95.3:2002 section 5.5.1.1, the power density S at a point on the axis at a distance d from a transmitting antenna is given by the Friis free-space transmission formula:

$$S = \frac{PG}{4\pi d^2}$$

S = power density (mW/cm²)
P = the net power delivered to the antenna (mW)
G = gain of the antenna in linear scale
d = distance between observation point and center of the radiator (cm)

From the maximum EUT RF output power, as well as the gain of the used antenna, according to the RF power density limit stated in above table, the minimum distance between the antenna and human body will be calculated.

5.1.3 Conclusion for WF2-5G1

For 2.4G WiFi

1. According to the the test report GZCR220600072401, the tested maximum conducted power is 22.45dBm = 0.1758W = 175.8mW.
2. According to the declaration from the applicant, the permitted maximum antenna gain is 3.2dBi for single antenna, the Directional gain is 6.21dBi.
3. The limit of Power Density (S)(mW/cm²) = 1mW/cm²

Maximum Antenna Gain (Numeric)	Total conducted power (mW)	Limit of Power Density (S) (mW/cm ²)	Power Density at R=20cm (mW/cm ²)	MPE Ratios
2.09	175.79	0.0731	1.0000	0.0731

For 5G WiFi

1. According to the the test report GZCR220600072402, the tested maximum conducted power is 21.71dBm = 0.14825W = 148.25mW.
2. According to the declaration from the applicant, the permitted maximum antenna gain is 4.6dBi for single antenna, the Directional gain is 7.61dBi.
3. The limit of Power Density (S)(mW/cm²) = 1mW/cm²

Maximum Antenna Gain (Numeric)	Total conducted power (mW)	Limit of Power Density (S) (mW/cm ²)	Power Density at R=20cm (mW/cm ²)	MPE Ratios
5.77	148.25	0.1701	1.0000	0.1701



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5.1.4 Conclusion for GW-5G01
For 2.4G WiFi

1. According to the the test report GZCR220600072401, the tested maximum conducted power is 22.45dBm = 0.1758W = 175.8mW.
2. According to the declaration from the applicant, the best case gain of the Antenna1 is 3.2dBi, Antenna2 is 3.0dBi for single antenna, the Directional gain is 6.11dBi.
3. The limit of Power Density (S)(mW/cm²) = 1mW/cm²

Maximum Antenna Gain (Numeric)	Total conducted power (mW)	Limit of Power Density (S) (mW/cm ²)	Power Density at R=20cm (mW/cm ²)	MPE Ratios
2.09	175.79	0.0731	1.0000	0.0731

For 5G WiFi

1. According to the the test report GZCR220600072402, the tested maximum conducted power is 21.71dBm = 0.14825W = 148.25mW.
2. According to the declaration from the applicant, the best case gain of the Antenna1 is 4.6dBi, Antenna2 is 4.0dBi for single antenna, the Directional gain is 7.32dBi.
3. The limit of Power Density (S)(mW/cm²) = 1mW/cm²

Maximum Antenna Gain (Numeric)	Total conducted power (mW)	Limit of Power Density (S) (mW/cm ²)	Power Density at R=20cm (mW/cm ²)	MPE Ratios
5.40	148.25	0.1591	1.0000	0.1591

For 5G Sub-6 GHz M.2 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 ²)	Limit (mW/cm ²)	MPE Ratios	Result
WCDMA B2	1852.4	0.98	1.25	25	316.2278	0.0788	1.0000	0.0788	PASS
WCDMA B4	1712.4	1.23	1.33	25	316.2278	0.0835	1.0000	0.0835	PASS
WCDMA B5	826.4	0.51	1.12	25	316.2278	0.0708	0.5509	0.1284	PASS
LTE B2	1850.7	0.98	1.25	25	316.2278	0.0788	1.0000	0.0788	PASS
LTE B4	1710.7	1.23	1.33	25	316.2278	0.0835	1.0000	0.0835	PASS



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LTE B5	824.7	0.51	1.12	25	316.2278	0.0708	0.5498	0.1287	PASS
LTE B7	2502.5	1.19	1.32	25	316.2278	0.0827	1.0000	0.0827	PASS
LTE B12	699.7	2.18	1.65	25	316.2278	0.1039	0.4665	0.2228	PASS
LTE B13	779.5	0.51	1.12	25	316.2278	0.0708	0.5197	0.1361	PASS
LTE B14	790.5	0.51	1.12	25	316.2278	0.0708	0.5270	0.1343	PASS
LTE B17	706.5	0.51	1.12	25	316.2278	0.0708	0.4710	0.1502	PASS
LTE B25	1850.7	0.98	1.25	25	316.2278	0.0788	1.0000	0.0788	PASS
LTE B26	814.7	0.51	1.12	25	316.2278	0.0708	0.5431	0.1303	PASS
LTE B30	2307.5	-0.46	0.90	25	316.2278	0.0566	1.0000	0.0566	PASS
LTE B38	2572.5	1.19	1.32	28	630.9573	0.1651	1.0000	0.1651	PASS
LTE B41	2498.5	1.19	1.32	28	630.9573	0.1651	1.0000	0.1651	PASS
LTE B48	3552.5	0.23	1.05	25	316.2278	0.0663	1.0000	0.0663	PASS
LTE B66	1710.7	1.23	1.33	25	316.2278	0.0835	1.0000	0.0835	PASS
LTE B71	665.0	2.18	1.65	25	316.2278	0.1039	0.4433	0.2344	PASS
n2	1852.5	0.98	1.25	25	316.2278	0.0788	1.0000	0.0788	PASS
n5	826.6	0.51	1.12	25	316.2278	0.0708	0.5511	0.1284	PASS
n7	2502.5	1.19	1.32	25	316.2278	0.0827	1.0000	0.0827	PASS
n12	701.5	2.18	1.65	25	316.2278	0.1039	0.4677	0.2222	PASS
n25	1852.5	0.98	1.25	25	316.2278	0.0788	1.0000	0.0788	PASS
n41	2506.0	1.19	1.32	28	630.9573	0.1651	1.0000	0.1651	PASS
n66	1712.5	1.23	1.33	25	316.2278	0.0835	1.0000	0.0835	PASS
n71	619.5	2.18	1.65	25	316.2278	0.1039	0.4130	0.2516	PASS
n77	3750	-0.19	0.96	27	501.1872	0.0954	1.0000	0.0954	PASS

Note: Refer to report No. 2010RSU005 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/cm², the MPE limit of 1500MHz to 10000MHz is 1.0 mW/cm².



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

The simultaneous transmission result between of WiFi and 5G Sub-6 GHz M.2 module:

The SAR Exclusion Threshold Level:

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

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

$$= (0.1701/1) + (0.1039/0.4130) = 0.4217 < 1$$

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.

5.2 EUT Constructional Details

Refer to Appendix - external and internal photos for GZCR220600724AT.

- End of the Report -



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