



RF Exposure Evaluation Report

Application No.: SZEM2012012955CR
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
EUT Name: 1. WG01-LTE-WiFi Router
2. Gateway PRO XL
Model No.: WG01, WG05
♣ Please refer to section 4 of this report which indicates which model was actually tested and which were electrically identical.
Trade Mark: Winegard
FCC ID: C3D-AZ1333322
Standards: 47 CFR Part 1.1307, 47 CFR Part 1.1310, 47 CFR Part 2.1091
Date of Receipt: 2020-12-16
Date of Test: 2021-04-09 to 2021-04-28
Date of Issue: 2021-04-29

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

Keny Xu

Keny Xu
EMC Laboratory Manager



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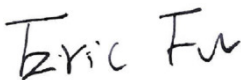


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Shenzhen Branch

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1 Version

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

Authorized for issue by:				
				
		Edison Li /Project Engineer		
				
		Eric Fu /Reviewer		



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Shenzhen Branch Testing Center, CCC Laboratory

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3 General Information

3.1 General Description of EUT

Power supply:	DC 12V
Internal source:	More than 108MHz
Environment:	Uncontrolled environment

3.2 Details of MT7603EN Chip

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: 3.0dBi Note: MIMO for 802.11n

3.3 Details of MT7615N Chip

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: MIMO for 802.11n

3.4 Details of MT7615N Chip

Power supply:	DC 12V			
Internal source:	More than 108MHz			
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)			
DFS Function:	Master			
TPC Function:	Not support			
Sample Type:	Fixed devices			
Antenna Type:	PCB antenna			
Antenna Gain:	Antenna1/Antenna2/Antenna3: 4.6dBi Note: MIMO for 802.11n/ac			





3.5 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.





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Remark:

Model No.: WG01, WG05

Only the model WG01 was tested, 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:

	WG01	WG05
Product Board Configuration Name:	WG01-LTE-WiFi Router	Gateway PRO XL
5G 3x3 WiFi	Yes	Yes
2.4G 3x3 WiFi	Yes	Yes
2.4G 2x2 WiFi	Yes	Yes
LTE module	Yes	Yes
mPCIe Slot	Yes	Yes
MicroSD Slot	Yes	Yes
Accelerometer and Temp Sensor	Yes	Yes
GE WAN port	Yes	No
POE Sink	Yes	No
POE Source	Yes	No
GE LAN port	Yes	Yes
Spare connectors	Yes	Yes
Power Analysis MCU	Yes	Yes
USB Ports	Yes, 1 USB A	Yes, 1 USB A
SIM Card Slot	1 through Dual SIM Connector	1 through Dual SIM Connector
	1 Through flat flex selectable	1 Through flat flex selectable
Mains Power	DC 12V	DC 12V



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3.6 Test Location

All tests were performed at:

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No tests were sub-contracted.

3.7 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.

3.8 Deviation from Standards

None.

3.9 Abnormalities from Standard Conditions

None.

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

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

For Uncontrolled Environment, the MPE limit of 300MHz to 1500MHz is f/1500 mW/cm², the MPE limit of 1500MHz to 100000MHz is 1.0 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.

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

2.4G WiFi(MT7603EN)

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 ²)	Limit (mW/cm ²)	MPE Ratios	Result
MIMO	3.0	2.00	18.72	74.47	0.0296	1.0000	0.0296	PASS

Note: Refer to report No. SZEM201201295502 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/cm².

2.4G WiFi(MT7615N)

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 ²)	Limit (mW/cm ²)	MPE Ratios	Result
MIMO	3.2	2.09	16.5	44.67	0.0186	1.0000	0.0186	PASS

Note: Refer to report No. SZEM201201295502 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/cm².





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For 5G WiFi(MT7615N)

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 ²)	Limit (mW/cm ²)	MPE Ratios	Result
MIMO	4.6	2.88	26.16	413.05	0.2370	1.0000	0.2370	PASS

Note: Refer to report No. SZEM201201295503 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/cm².

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 ²)	Limit (mW/cm ²)	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	0.2247	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/cm², the MPE limit of 1500MHz to 100000MHz is 1.0 mW/cm².



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Note: the MT7603EN's antenna, MT7615N's antenna and WCDMA/LTE's antenna can synchronous transmission at the same time.

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

The SAR Exclusion Threshold Level:

$$= \text{CPD1} / \text{LPD1} + \text{CPD2} / \text{LPD2} + \text{CPD3} / \text{LPD3}$$

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

$$= (0.0296/1) + (0.2370/1) + (0.0997/0.4437) = 0.4913 < 1$$

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.

-End of Report-



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