

FCC RF Exposure Exemption report
for

Radar rear light

Model No.: Gardia R300

FCC ID: YDM-DE2201

of

Applicant: Bryton Inc.

Address: 3F-1., No.79-1, Zhouzi St., Neihu Dist., Taipei City 114, Taiwan

Tested and Prepared

by

Worldwide Testing Services (Taiwan) Co., Ltd.

FCC Registration No.: TW1477, TW1072

Industry Canada filed test laboratory Reg. No.: 20037, 5107A



Report No.: W6M22206-21912-EE

6F, NO. 58, LANE 188, RUEY-KUANG RD., NEIHU TAIPEI 114, TAIWAN, R.O.C.
TEL: 886-2-66068877 FAX: 886-2-66068879 E-mail: wts@wts-lab.com

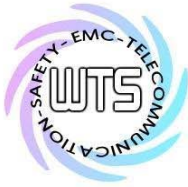
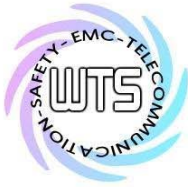


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Worldwide Testing Services(Taiwan) Co., Ltd.

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1 General Information

1.1 Notes

The purpose of conformity testing is to increase the probability of adherence to the essential requirements or conformity specifications, as appropriate.

The complexity of the technical specifications, however, means that full and thorough testing is impractical for both technical and economic reasons.

Furthermore, there is no guarantee that a test sample which has passed all the relevant tests conforms to a specification.

Neither is there any guarantee that such a test sample will interwork with other genuinely open systems.

The existence of the tests nevertheless provides the confidence that the test sample possesses the qualities as maintained and that its performance generally conforms to representative cases of communications equipment.

Laboratory disclaimer-

1. The test results of this test report relate exclusively to the item tested as specified in 1.5.
2. The test report may only be reproduced or published in full.
3. Reproduction or publication of extracts from the report requires the prior written approval of the Worldwide Testing Services(Taiwan) Co., Ltd.
4. Antenna gain is provided by applicant and laboratory issue relevant data and results.

Tester:

February 22, 2023

Ken Kang

Date

WTS-Lab.

Name

Signature

Technical responsibility for area of testing:

February 22, 2023

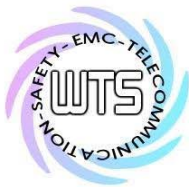
Kevin Wang

Date

WTS

Name

Signature



Worldwide Testing Services(Taiwan) Co., Ltd.

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1.2 Testing laboratory

1.2.1 Location

10m OATS

No.5-1, Lishui, Shuang Sing Village, Wanli Dist.,
New Taipei City 207, Taiwan (R.O.C.)

3 meter semi-anechoic chamber

No.35, Aly. 21, Ln. 228, Ankang Rd., Neihu Dist.,
Taipei City 114, Taiwan (R.O.C.)

Tel: 886-2-6613-0228

Worldwide Testing Services (Taiwan) Co., Ltd.

6F., No. 58, Ln. 188, Ruiguang Rd., Neihu Dist.,
Taipei City 114, Taiwan (R.O.C.)

Tel: 886-2-6606-8877

1.2.2 Details of accreditation status

Accredited testing laboratory

FCC filed test laboratory Reg. No.: TW1477, TW1072

Industry Canada filed test laboratory Reg. No.: 20037, 5107A

Test location, where different from Worldwide Testing Services (Taiwan) Co., Ltd. :

Name: ./.

Accredited no.: ./.

Street: ./.

Town: ./.

Country: ./.

1.3 Application details

Approval holder

Name: Bryton Inc.

Street: 3F-1., No.79-1, Zhouzi St., Neihu Dist.,

Town: Taipei City 114,

Country: Taiwan

Manufacturer: (if applicable)

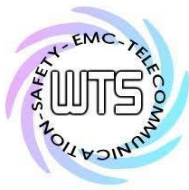
1.

Name: Pan-international Precision Electronic Co.,Ltd

Street: Xinlian Indl. Area , Hu-men ,

Town: Dongguan ,Guangdong ,

Country: China



Worldwide Testing Services(Taiwan) Co., Ltd.

Registration number: W6M22206-21912-EE

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2.

Name: Q.S.C INDUSTRY CO.LTD
Street: 5F., No. 193-2, Zhongxing N. St., Sanchong Dist.,
Town: New Taipei City
Country: Taiwan

Date of receipt of test item: June 17, 2022

Date of test: from June 20, 2022 to December 19, 2022

1.4 General information of Test item

Type of test item: Radar rear light
Model no.: Gardia R300
Multi-listing model no.: ./.
Brand name: Bryton
Power supply: Battery: 3.7V, 1000mAh, 3.7Wh
USB 5Vd.c.
Type of antenna: PCB antenna
Antenna gain: 0 dBi (for BLE, ANT+) 、 8 dBi (for 24 GHz)

Technical data

Mode	Channel(Frequency)	Conducted Power (dBm)
BLE	Ch 0 : 2402 MHz	-0.10
	Ch 19 : 2440 MHz	-0.18
	Ch 39 : 2480 MHz	-0.10
ANT+	2457 MHz	-0.43

Mode	Frequency	Field Strength (dBuV/m)
24 GHz	24.2 GHz	99.8

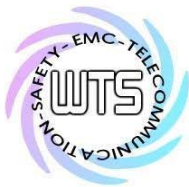
Operation modes: Duplex
Modulation type: GFSK (for BLE, ANT+)
FMCW (for 24 GHz)

Sample no.: #01

Special statement: ./.

Classification:

Fixed Device	☐
Mobile Device (Human Body distance > 20cm)	☒
Portable Device (Human Body distance < 20cm)	☐



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1.5 Power setting

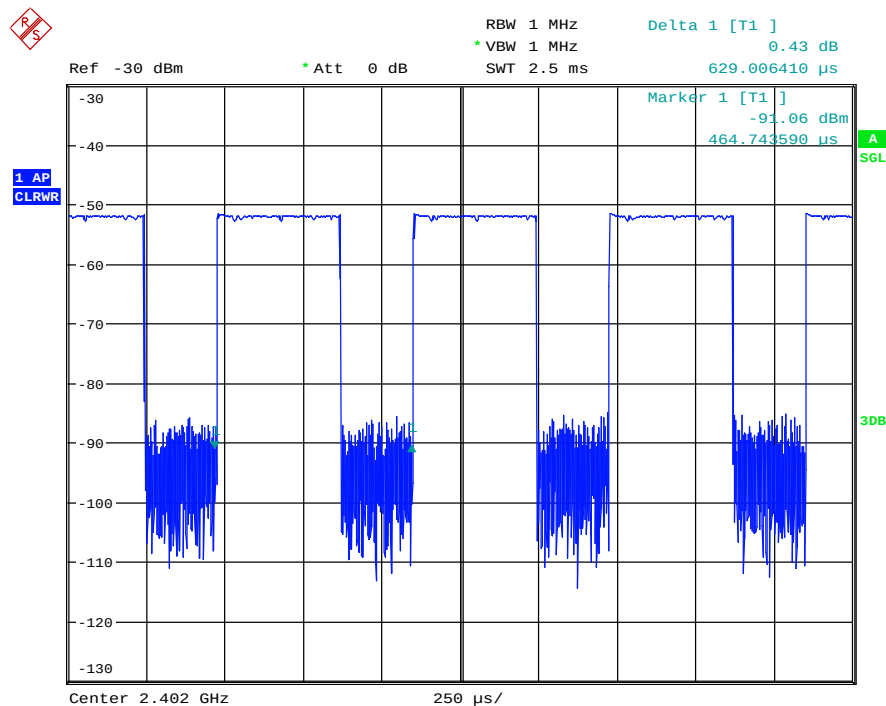
Modulation mode	Channel		
	Ch 0 : 2402 MHz	Ch 19 : 2440 MHz	Ch 39 : 2480 MHz
1Mbps	0	0	0

1.6 Duty cycle and factor

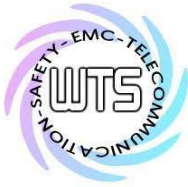
The duty factor is computed as $[10 \log (1 / D)]$, where D is the duty cycle.

Mode	T _{on} (ms)	T _{on} +T _{off} (ms)	Duty cycle (%)	1/T - VBW (kHz)
BLE	0.413	0.629	65.66%	2.42
ANT+	1.091	1.181	92.38%	0.92

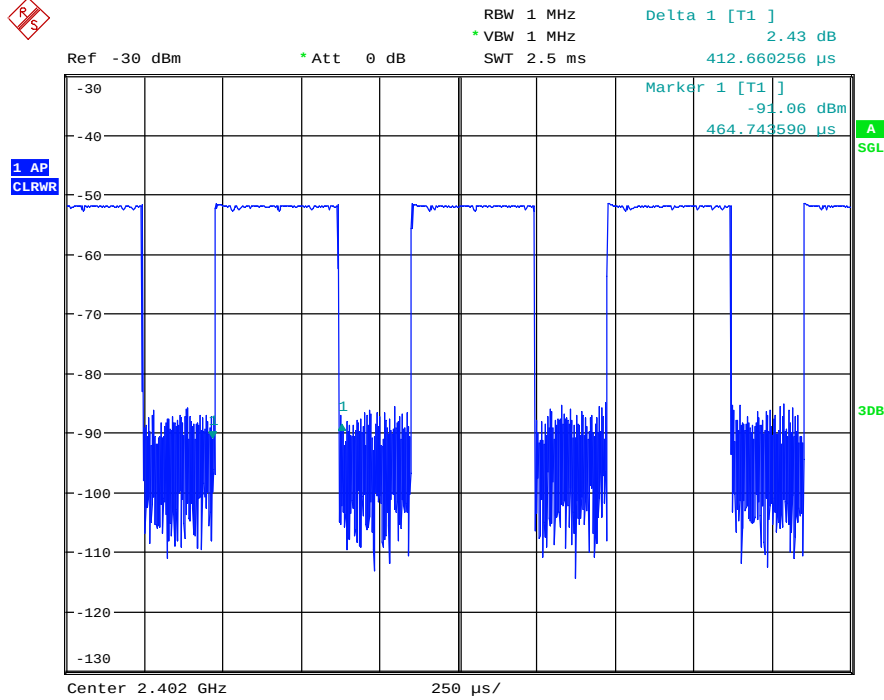
Duty cycle plot
BLE



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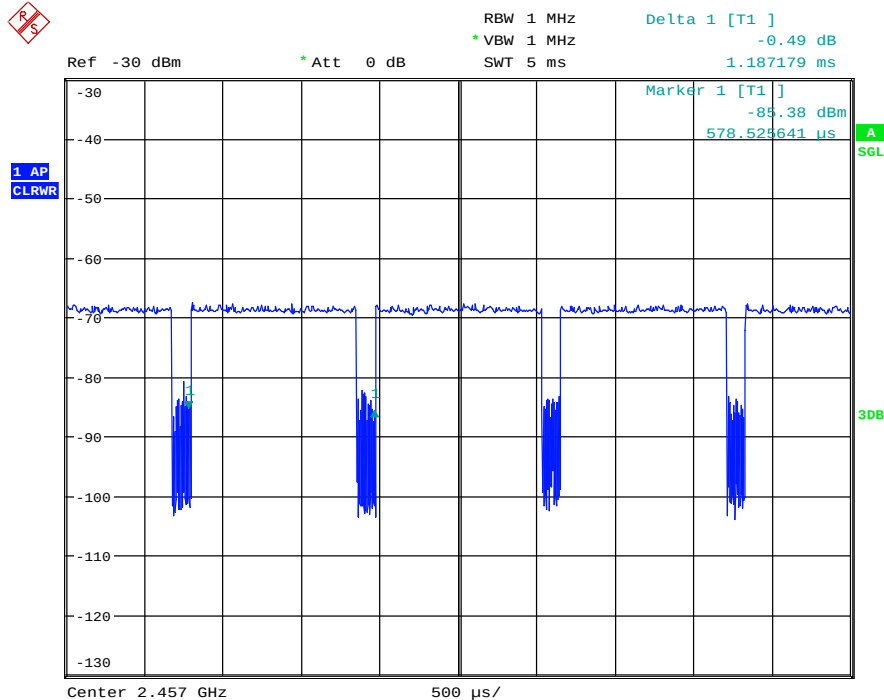


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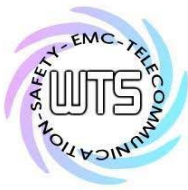


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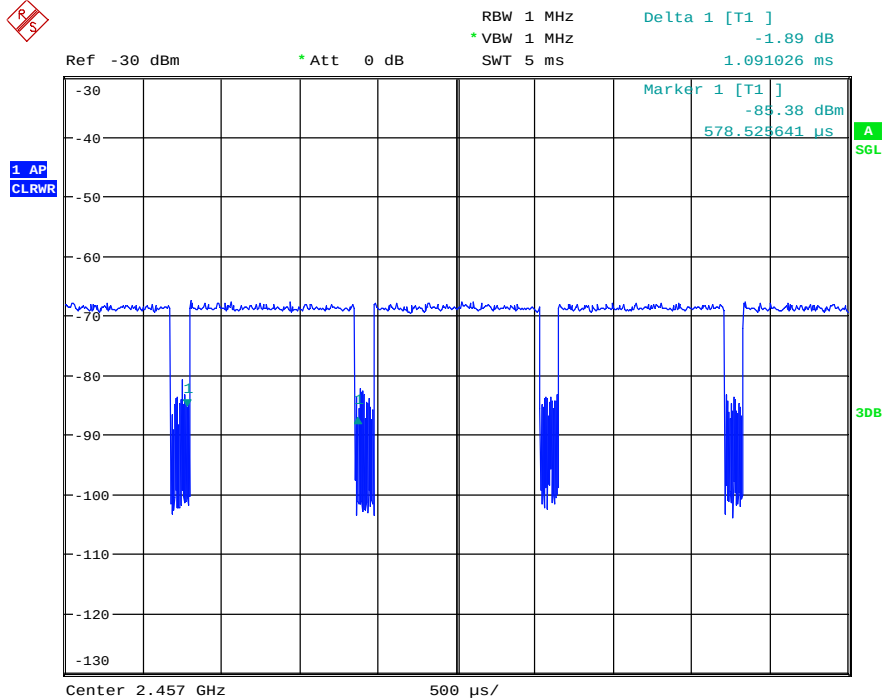
ANT+



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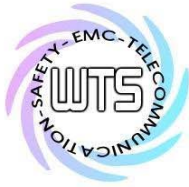
Registration number: W6M22206-21912-EE
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1.7 Test standards

47 CFR PART 15 SUBPART C § 15.247 (2021-10)



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2 Test configuration

2.1 Test environment

Relative humidity content: 20 ... 75 %

Air pressure: 86 ... 103 kPa

Extreme conditions parameters: ./.

2.2 Measurement uncertainty

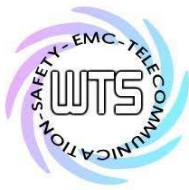
Test item Name	Uncertainty
Estimation Result of Uncertainty of Conducted Output Power Measurement (Peak Output Power (transmitter))	Expanded Uncertainty : 1.48 dB

The decision rule is: Measurement uncertainty is not included in the calculation of test results.

2.3 Test Equipment List

RF Conducted

No.	Test equipment	Type	Serial No.	Manufacturer	Cal. Date	Next Cal. Date
ETSTW-CE 009	TEMP.&HUMIDITY CHAMBER	GTH-225-40-1P-U	MAA0305-009	GIANT FORCE	2022/8/3	2023/8/2
ETSTW-RE 050	Attenuator 10dB	50HF-010-1	None	JFW	2022/2/18	2023/2/17
ETSTW-RE 051	Attenuator 6dB	50HF-006-1	None	JFW	2022/2/18	2023/2/17
ETSTW-RE 053	Attenuator 3dB	50HF-003-1	None	JFW	2022/2/18	2023/2/17
ETSTW-RE 055	SPECTRUM ANALYZER	FSU 26	200074	R&S	2022/3/28	2023/3/27
ETSTW-RE 060	Attenuator 30dB	5015-30	F651012z-01	ATM	2022/2/18	2023/2/17
ETSTW-RE 099	DC Block	50DB-007-1	None	JFW	2022/2/18	2023/2/17
ETSTW-RE 112	AC POWER SOURCE	TFC-1005	T-0A023536	T-Power	Function test	
ETSTW-RE 127	RF Switch Box	RFS-01	None	WTS	2022/2/18	2023/2/17
ETSTW-RE 153	Signal Analyzer	FSV40	101929	R&S	2022/10/3	2023/10/2
ETSTW-GSM 023	Power Divider	4901.19.A	None	SUHNER	2022/9/2	2023/9/1
ETSTW-Cable 027	Microwave Cable	SUCOFLEX 104	279083	HUBER+SUHNER	2022/5/6	2023/5/5
ETSTW-Cable 030	Microwave Cable	SUCOFLEX 104 (S_Cable 9)	279067	HUBER+SUHNER	2022/2/18	2023/2/17
ETSTW-Cable 045	Microwave Cable	SUCOFLEX 104	325536	HUBER+SUHNER	2022/10/21	2023/10/20
ETSTW-Cable 058	Microwave Cable	SUCOFLEX 104	none	HUBER+SUHNER	2022/5/27	2023/5/26
WTSTW-SW 008	Signal studio	Agilent	None	AUDIX	Version 2.0.0.1	



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3 Equivalent Isotropic Radiated Power (EIRP)

FCC Rule: 15.247

EIRP = max. conducted output power + antenna gain

BLE

EIRP = -0.10 dBm+ (0 dBi [antenna gain claimed by manufacturer]) = -0.10 dBm = 0.9772 mW

ANT+

EIRP = -0.43 dBm+ (0 dBi [antenna gain claimed by manufacturer]) = -0.43 dBm = 0.9057 mW

24G

EIRP = 99.8 dBuV/m (= -7.2 dBm)+ (8 dBi [antenna gain claimed by manufacturer]) = 0.8 dBm
= 1.2023 mW

3.1 Exemption Limits for Routine Evaluation

according to 47 CFR FCC Part 2 Subpart J, section 2.1091

FCC OET Bulletin 65 Edition 97.01 determines the equations for predicting RF fields and applicable limits.

The prediction for power density in the far-field but will over-predict power density in the near field, where it could be used for walking a “worst case” or conservative prediction.

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 20 cm normally can be maintained between the user and the device.

MPE Calculation Method

(A) Limits for Occupational/Controlled Exposure

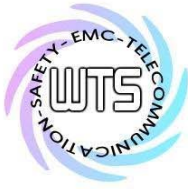
Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f ²)*	6
30-300	61.4	0.163	1.0	6
300-1500	--	--	f/300	6
1500-100,000	--	--	5	6

(B) Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time E ² , H ² or S (minutes)
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

*Plane-wave equivalent power density



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E = Electric field (V/m) P = output power (W) G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

$$Pd = \frac{30 \times P \times G}{377 \times d^2}$$

mW/cm².

BLE

Established separation distance is 20 cm.

Operating frequency band: 2402-2480 MHz

The product meets RF exposure requirement.

Because the power density of 0.0002 mW/cm² at 2480 MHz is below the power density limit of 1 mW/cm².

ANT+

Established separation distance is 20 cm.

Operating frequency band: 2402-2480 MHz

The product meets RF exposure requirement.

Because the power density of 0.0002 mW/cm² at 2457 MHz is below the power density limit of 1 mW/cm².

24G

Established separation distance is 20 cm.

Operating frequency band: 24.15-24.25 GHz

The product meets RF exposure requirement.

Because the power density of 0.0003 mW/cm² at 24.2 GHz is below the power density limit of 1 mW/cm².