

### May Cheong Toy Products Fty. Ltd.

# **TEST REPORT**

SCOPE OF WORK FCC TESTING- MODEL:82638/19160

REPORTNUMBER GZHH00496239-001

**ISSUE DATE** JUN 13, 2023

### PAGES

24

DOCUMENT CONTROL NUMBER FCC ID 249\_C © 2017 INTERTEK





#### May Cheong Toy Products Fty. Ltd.

#### Application for Certification

#### FCC ID: PKG82638RC

#### 1:16 Flash Off-Road R/C(2.4GHz) ~ Dirt Demon

#### Model: 82638/19160

2.4GHz Transmitter

Report No.: GZHH00496239-001

We hereby certify that the sample of the above item is considered to comply with the requirements of FCC Part 15, Subpart C for Intentional Radiator, mention 47 CFR [10-1-21]

Prepared and Checked by:

Approved by:

Sign on file

Terry Tang Assistant Supervisor Ryan Chen Project Engineer Date: Jun 13, 2023

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.

#### Intertek Testing Service Shenzhen Ltd. Longhua Branch

101, 201, Building B, No. 308 Wuhe Avenue, Zhangkengjing Community GuanHu Subdistrict, LongHua District, Shenzhen, People's Republic of China Tel: (86 755) 8601 6288 Fax: (86 755) 8601 6751



#### **MEASUREMENT/TECHNICAL REPORT**

This report concerns (che	eck one:)	Original Grant <u>X</u>	Class	II Change
Equipment Type: <u>DXX - F</u>	Part 15 Low Po	ower Communicati	on Device Trans	mitter
Deferred grant requested	per 47 CFR (		Yes	
Company Name agrees t	o notify the Co	ommission by:	date	
of the intended date of an date.	Inouncement	of the product so t	hat the grant car	ו be issued on tha
Transition Rules Request	per 15.37?		Yes	No <u>X</u>
If no, assumed Part 15, S provision.	ubpart C for ir	ntentional radiator	- the new 47 CFI	R [10-1-21 Edition
Report prepared by:				
	101, 201, E Community People's Re	ting Services Sher Building B, No. 3 GuanHu Subdist public of China 6-755-86016288/86	08 Wuhe Avent rict, LongHua [	ue, Zhangkengjing



#### **Table of Contents**

1.0 Summary of Test Result	4
2.0 General Description	5
2.1Product Description	5 5
3.0 System Test Configuration	3
3.1 Justification 6   3.2EUT Exercising Software 6   3.3Special Accessories 6   3.4Equipment Modification 6   3.5 Measurement Uncertainty 6   3.6 Support Equipment List and Description 6	6 6 6 6
4.0Emission Results	7
4.1 Radiated Test Results 1   4.1.1 Field Strength Calculation 1   4.1.2 Radiated Emission Configuration Photograph 1   4.1.3Radiated Emissions 1   4.1.4 Transmitter Spurious Emissions 1	7 8 8
5.0 Equipment Photographs 18	5
6.0Product Labelling	5
7.0Technical Specifications	5
8.0Instruction Manual	5
9.0Miscellaneous Information	
9.1 Bandedge Plot169.220dB Bandwidth189.3Discussion of Pulse Desensitization199.4Calculation of Average Factor199.5 Emissions Test Procedures22	8 9 9 2
10.0 Test Equipment List	4



#### 1.0 <u>Summary of Test Result</u>

Applicant: May Cheong Toy Products Fty. Ltd. Applicant Address: Unit 901-2, 9/F., East Ocean Centre, 98 Granville Road, Tsimshatsui East Kowloon Hong Kong

Manufacturer: May Cheong Toy Products Fty. Ltd. Manufacturer Address: Unit 901-2, 9/F., East Ocean Centre, 98 Granville Road, Tsimshatsui East Kowloon Hong Kong

MODEL:82638/19160

FCC ID: PKG82638RC

Test Specification	Reference	Results
Transmitter Radiated Emission	15.249 &15.209 &15.205	Pass
Bandedge		
20dB Bandwidth	15.215(c)	Pass

Notes: The EUT uses an Integral Antenna which in accordance to Section 15.203 is considered sufficient to comply with the provisions of this section.





#### 2.0 General Description

#### 2.1 Product Description

The equipment under test (EUT) is a 1:16 Flash Off-Road R/C(2.4GHz) ~ Dirt Demon operating at 2.4G Band. The EUT can be powered by DC 6.0V ( $4 \times 1.5V$  AA batteries).For more detail information pls. refer to the user manual.

Antenna Type: Integral antenna Modulation Type: GFSK Antenna Gain: 0dBi

For electronic filing, the brief circuit description is saved with filename: descri.pdf.

2.2 Related Submittal(s) Grants

This is an application for certification of car unit for the 1:16 Flash Off-Road  $R/C(2.4GHz) \sim Dirt Demon$ , and there is no related application.

#### 2.3 Test Methodology

Radiated emission measurements were performed according to the procedures in ANSI C63.10 (2013). Radiated emission measurement was performed in Semi-anechoic chamber. For radiated emission measurement, preliminary scans were performed in the semi-anechoic chamber only to determine the worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section**" of this Application. All other measurements were made in accordance with the procedures in part 2 of CFR 47.

#### 2.4 Test Facility

The Semi-anechoic chamber used to collect the radiated data is **Intertek Testing Services Shenzhen Ltd. Longhua Branch**and located at101, 201, Building B, No. 308 Wuhe Avenue, Zhangkengjing Community GuanHu Subdistrict, LongHua District, Shenzhen, People's Republic of China. This test facility and site measurement data have been fully placed on file with the FCC (Registration Number: CN1188).



#### 3.0 System Test Configuration

#### 3.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in ANSI C63.10 (2013).

The EUT was powered by DC 6.0V (4 x 1.5V AA batteries)during the test, only the worst data was reported in this report.

For maximizing emissions below 30 MHz, the EUT was rotated through 360°, the bottom of the loop antenna was placed 1 meter above the ground, and the antenna polarization was changed. For maximizing emissions, the EUT was rotated through 360°, the antenna height was varied from 1 meter to 4 meters above the ground plane, and the antenna polarization was changed. This step by step procedure for maximizing emissions led to the data reported in Section4.

The EUT was operated standalone and placed in the central of the turntable.

The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). The EUT was placed on a turn table, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes.

3.2 EUT Exercising Software

There was no special software to exercise the device.

3.3 Special Accessories

No special accessories used.

3.4 Equipment Modification

Any modifications installed previous to testing by May Cheong Toy Products Fty. Ltd. will be incorporated in each production model sold/leased in the United States.

No modifications were installed by Intertek Testing Services Shenzhen Ltd Longhua Branch.

- 3.5 Measurement Uncertainty When determining the test conclusion, the Measurement Uncertainty of test has been considered.
- 3.6 Support Equipment List and Description

Description	Manufacturer	Model No.
//	//	//



#### 4.0 Emission Results

Data is included worst-case configuration (the configuration which resulted in the highest emission levels).

4.1 Radiated Test Results

A sample calculation, configuration photographs and data tables of the emissions are included.

4.1.1 Field Strength Calculation

The field strength is calculated by adding the reading on the Spectrum Analyzer to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitization and average factors (when specified limit is in average and measurements are made with peak detectors). A sample calculation is included below.

FS = RA + AF + CF - AG + PD + AV

Where  $FS = Field Strength in dB\mu V/m$   $RA = Receiver Amplitude (including preamplifier) in dB\mu V$  CF = Cable Attenuation Factor in dB AF = Antenna Factor in dB/m AG = Amplifier Gain in dB PD = Pulse Desensitization in dBAV = Average Factor in -dB

In the radiated emission table which follows, the reading shown on the data table may reflect the preamplifier gain. An example of the calculations, where the reading does not reflect the preamplifier gain, follows:

FS = RA + AF + CF - AG + PD + AV

Assume a receiver reading of 62.0 dB $\mu$ V is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted. The pulse desensitization factor of the spectrum analyzer was 0 dB, and the resultant average factor was -10 dB. The net field strength for comparison to the appropriate emission limit is 32 dB $\mu$ V/m. This value in dB $\mu$ V/m was converted to its corresponding level in  $\mu$ V/m.

RA =  $62.0 \text{ dB}\mu\text{V}$ AF = 7.4 dB/m CF = 1.6 dB AG = 29.0 dB PD = 0 dB AV = -10 dB FS =  $62 + 7.4 + 1.6 - 29 + 0 = 42 \text{ dB}\mu\text{V/m}$ 

Level in  $\mu$ V/m = Common Antilogarithm [(42 dB $\mu$ V/m)/20] = 125.9  $\mu$ V/m



#### 4.1.2 Radiated Emission Configuration Photograph

For electronic filing, the worst case radiated emission configuration photograph is saved with filename: radiated photos. pdf.

#### 4.1.3 Radiated Emissions

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

Worst Case Radiated Emission at 826.620000 MHz

Judgement: Passed by 13.7 dB

#### TEST PERSONNEL:

Sign on file

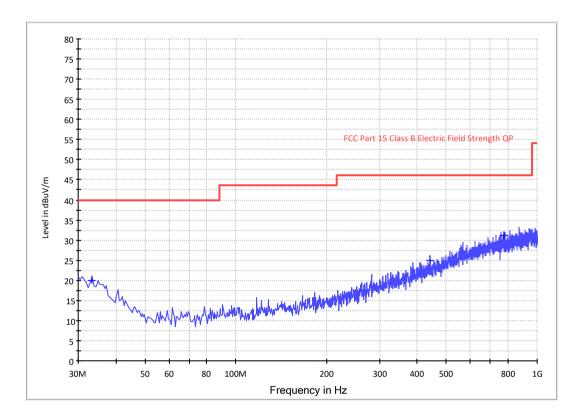
Terry Tang, Assistant Supervisor Typed/Printed Name

Jun 7, 2023 Date



### Applicant: May Cheong Toy Products Fty. Ltd.Date of Test: Jun 7, 2023Model:82638/19160Worst Case Operating Mode:Transmitting(2408.000MHz)

#### ANT Polarity: Horizontal



Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Polarization	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
32.155000	19.2	1000.0	120.000	Н	17.3	20.8	40.0
442.225000	25.3	1000.0	120.000	Н	9.8	20.7	46.0
781.155000	31.4	1000.0	120.000	Н	24.4	14.6	46.0

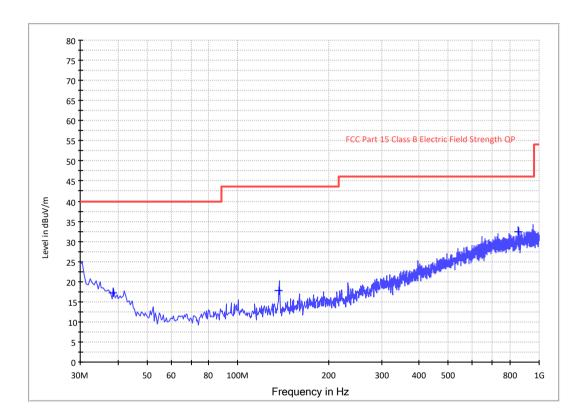
Remark:

- 1. Corr.(dB/m) = Antenna Factor (dB/m) + Cable Loss (dB)
- 2. QuasiPeak ( $dB\mu V/m$ )= Corr. (dB/m)+ Read Level ( $dB\mu V$ )
- 3. Margin (dB) = Limit Line(dB $\mu$ V/m) Level (dB $\mu$ V/m)



### Applicant: May Cheong Toy Products Fty. Ltd.Date of Test: Jun 7, 2023Model:82638/19160Worst Case Operating Mode:Transmitting(2408.000MHz)

#### ANT Polarity: Vertical



Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Polarization	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
38.180000	17.2	1000.0	120.000	V	16.1	22.8	40.0
143.420000	17.7	1000.0	120.000	V	15.4	25.3	43.5
826.620000	32.3	1000.0	120.000	v	22.1	13.7	46.0

Remark:

- 1. Corr.(dB/m) = Antenna Factor (dB/m) + Cable Loss (dB)
- 2. QuasiPeak (dBµV/m)= Corr. (dB/m)+ Read Level (dBµV)
- 3. Margin (dB) = Limit Line(dB $\mu$ V/m) Level (dB $\mu$ V/m)



#### 4.1.4 Transmitter Spurious Emissions (Radiated)

#### Worst Case Radiated Emission at 2483.500 MHz

For electronic filing, the worst case radiated emission configuration photograph is saved with filename: radiated photos. pdf.

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

Judgement: Passed by 4.9 dB

#### TEST PERSONNEL:

Sign on file

Terry Tang, Assistant Supervisor Typed/Printed Name

Jun 7, 2023 Date



#### Applicant: May Cheong Toy Products Fty. Ltd. Date of Test: Jun 7, 2023 Mod Worst Case Operating Mode: Tran

Model:82638/19160 Transmitting

#### Table 1

Contraction Contraction (2408 MHz)										
Polarization	Frequency (MHz)	Reading (dBµV)	Pre- Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)			
Horizontal	2408.000	89.9	36.7	28.1	81.3	114.0	-32.7			
Horizontal	4816.000	42.9	36.7	35.5	41.7	74.0	-32.3			

Polarization	Frequency (MHz)	Reading (dBµV)	Pre- Amp Gain (dB)	Antenna Factor (dB)	Average Factor (-dB)	Netat 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	2408.000	89.9	36.7	28.1	26.0	55.3	94.0	-38.7
Horizontal	4816.000	42.9	36.7	35.5	26.0	15.7	54.0	-38.3

Notes: 1. Peak Detector Data unless otherwise stated.

- 2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.
- 3. Negative value in the margin column shows emission below limit.
- 4. Horn antenna is used for the emission over 1000MHz.



#### Applicant: May Cheong Toy Products Fty. Ltd. Date of Test: Jun 7, 2023 Worst Case Operating Mode:

Model:82638/19160 Transmitting

#### Table 2

Radiated Emissions (2440 MHz)										
PolarizationFrequency (MHz)Reading (dBμV)Pre- Amp 										
Horizontal	2440.000	89.1	36.7	28.1	80.5	114.0	-33.5			
Horizontal	4880.000	40.3	36.7	35.5	39.1	74.0	-34.9			
rionzontai	4000.000	40.3	50.7	55.5	59.1	74.0	-34.9			

Polarization	Frequency (MHz)	Reading (dBµV)	Pre- Amp Gain (dB)	Antenna Factor (dB)	Average Factor (-dB)	Netat 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	2440.000	89.1	36.7	28.1	26.0	54.5	94.0	-39.5
Horizontal	4880.000	40.3	36.7	35.5	26.0	13.1	54.0	-40.9

Notes: 1. Peak Detector Data unless otherwise stated.

- 2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.
- 3. Negative value in the margin column shows emission below limit.
- 4. Horn antenna is used for the emission over 1000MHz.



## Applicant: May Cheong Toy Products Fty. Ltd.Date of Test: Jun 7, 2023ModeWorst Case Operating Mode:Trans

Model:82638**/19160** Transmitting

#### Table 3

Radiated Emissions (2472 MHz)										
PolarizationFrequency (MHz)Reading (dBµV)Pre- Amp 										
Horizontal	2472.000	90.3	36.7	28.1	81.7	114.0	-32.3			
Horizontal	4944.000	41.5	36.7	35.5	40.3	74.0	-33.7			

Polarization	Frequency (MHz)	Reading (dBµV)	Pre- Amp Gain (dB)	Antenna Factor (dB)	Average Factor (-dB)	Netat 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	2472.000	90.3	36.7	28.1	26.0	55.7	94.0	-38.3
Horizontal	4944.000	41.5	36.7	35.5	26.0	14.3	54.0	-39.7

Notes: 1. Peak Detector Data unless otherwise stated.

- 2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.
- 3. Negative value in the margin column shows emission below limit.
- 4. Horn antenna is used for the emission over 1000MHz.



#### 5.0 Equipment Photographs

For electronic filing, the photographs of the tested EUT are saved with filename: external photos.pdf& internal photos.pdf.

#### 6.0 **Product Labelling**

For electronic filing, the FCC ID label artwork and the label location are saved with filename: label.pdf.

#### 7.0 <u>Technical Specifications</u>

For electronic filing, the block diagram and schematics of the tested EUT are saved with filename: block.pdf and circuit.pdf respectively.

#### 8.0 Instruction Manual

For electronic filing, a preliminary copy of the Instruction Manual is saved with filename: manual.pdf.

This manual will be provided to the end-user with each unit sold/leased in the United States.



#### 9.0 Miscellaneous Information

This miscellaneous information includes details of the measured bandedge, 20dB Bandwidth, the test procedure and calculation of factor such as pulse desensitization.

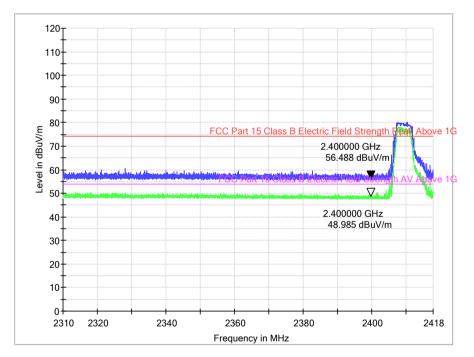
#### 9.1Bandedge Plot

The test plots are attached as below. From the plot, the field strength of any emissions outside of the specified frequency band are attenuated to the general radiated emission limits in section 15.209. It fulfils the requirement of 15.249(d).

#### Peak Measurement

Restricted-band band-edge tests shall be performed as radiated measurements, i.e(Band-edge Plot).

#### (i) Lower channel 2408.000MHz:



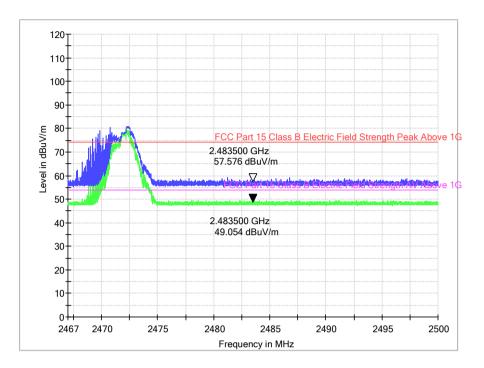
Polarization	Frequency (MHz)	Reading (dBµV)	Pre- Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	2400.000	65.1	36.7	28.1	56.5	74.0	-17.5

Polarization	Frequency (MHz)	Reading (dBµV)	Pre- Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m	Margin (dB)
Horizontal	2400.000	57.6	36.7	28.1	49.0	54.0	-5.0

The resultant field strength meets the general radiated emission limit in section 15.209, which does not exceed  $74dB\mu\nu/m$  (Peak Limit) and  $54dB\mu\nu/m$  (Average Limit).



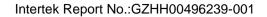
#### (ii) Upper channel 2472.000MHz:



Polarization	Frequency (MHz)	Reading (dBµV)	Pre- Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	2483.500	65.3	36.8	29.1	57.6	74.0	-16.4

Polarization	Frequency (MHz)	Reading (dBµV)	Pre- Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m	Margin (dB)
Horizontal	2483.500	56.8	36.8	29.1	49.1	54.0	-4.9

The resultant field strength meets the general radiated emission limit in section 15.209, which does not exceed 74dB $\mu$ v/m (Peak Limit) and 54dB $\mu$ v/m (Average Limit).





#### 9.2 20dB Bandwidth

Pursuant to FCC part 15 Section 15.215(c), the 20dB bandwidth of the emission was contained within the frequency band designated (mentioned as above) which the EUT operated. The effects, if any, from frequency sweeping, frequency hopping, other modulation techniques and frequency stability over excepted variations in temperature and supply voltage were considered. The test plots are reported as below.

Spectrum	'n								
Ref Level Att	97.00 dBµ∖ 10 dE			RBW 30 kHz VBW 100 kHz	Mode Au	to FFT			
∋1Pk View		1	1						
90 dBµV					M:	2[1]			71.47 dBµ\ 76122 GH:
50 GDDV					M	1[1]			51.13 dBµ\
80 dBµV—							1	2.407	47900 GH:
				M2					
70 dBµV									
60 dBµV				M	m	$\Delta \sim$			
				ML			01		
50 dBµV	D1 51.470	dBµV		-					
							m		
40 dBµV									
30 dвµV—							<u>`</u>	<u> </u>	
~~~~	~~~~							L.	
20 dBµV				_				- V~-	mm
10 10.11									
10 dBµV									
0 dBµV									
CF 2.408 G	Hz	1	I	691	pts			Spa	n 5.0 MHz
larker									
Type Ref	f Trc 1	2 4074	9 79 GHz	<u>Y-value</u> 51.13 dBµ	Funct	tion	Fund	tion Result	:
D1 M			58 MHz	0.00 c					
M2	1	2.407761	22 GHz						
Spectrum Ref Level		,		71.47 dBµ <b>RBW</b> 30 kHz					
Ref Level Att			•		Mode Au				
Ref Level Att 1Pk View	97.00 dBµ√		•	RBW 30 kHz	Mode Au	L[1]			-0.09 d 32420 MH
Ref Level Att 1Pk View 90 dBµV	97.00 dBµ√		•	RBW 30 kHz	Mode Au				-0.09 di 32420 MH 50.53 dBµ'
Ref Level Att 1Pk View 90 dBµV	97.00 dBµ√		•	RBW 30 kHz VBW 100 kHz	Mode Au	L[1]			-0.09 di 32420 MH 50.53 dBµ'
Ref Level Att 1Pk View 90 dBµV 80 dBµV	97.00 dBµ√		•	RBW 30 kHz	Mode Au	L[1]			-0.09 d 32420 MH 50.53 dBµ
Ref Level Att 1Pk View 90 dBµV 80 dBµV	97.00 dBµ√		•	RBW 30 kHz VBW 100 kHz	Mode Au Di M	L[1]			-0.09 d 32420 MH 50.53 dBµ
Ref Level     Att     1Pk View     90 dBµV     80 dBµV     70 dBµV	97.00 dBµ√		•	RBW 30 kHz VBW 100 kHz	Mode Au	L[1]			-0.09 di 32420 MH 50.53 dBµ'
Ref Level     Att     ) 1Pk View     90 dBµV     80 dBµV     70 dBµV     60 dBµV	97.00 dBµ\ 10 dE	3 SWT 63	.2 µs • '	RBW 30 kHz VBW 100 kHz	Mode Au Di M	L[1]			-0.09 di 32420 MH 50.53 dBµ'
Ref Level     Att     ) 1Pk View     90 dBµV     80 dBµV     70 dBµV     60 dBµV	97.00 dBµ\ 10 dE	3 SWT 63	.2 µs • '	RBW 30 kHz VBW 100 kHz M2	Mode Au Di M	u[1] 1[1]			-0.09 di 32420 MH 50.53 dBµ'
Ref Level     Att     1Pk View     90 dBµV     80 dBµV     70 dBµV     60 dBµV     50 dBµV	97.00 dBµ\ 10 dE	3 SWT 63	.2 µs • '	RBW 30 kHz VBW 100 kHz M2	Mode Au Di M	u[1] 1[1]			-0.09 di 32420 MH 50.53 dBµ'
Ref Level     Att     ) 1Pk View     90 dBµV     80 dBµV     70 dBµV     60 dBµV     50 dBµV     40 dBµV	97.00 dBµ\ 10 dE	3 SWT 63	.2 µs • '	RBW 30 kHz VBW 100 kHz M2	Mode Au Di M	u[1] 1[1]		2.472	-0.09 di 32420 MH 50.53 dBµ'
Ref Level     Att     ) 1Pk View     90 dBµV     80 dBµV     70 dBµV     60 dBµV     50 dBµV     40 dBµV	97.00 dBµ\ 10 dE	3 SWT 63	.2 µs • '	RBW 30 kHz VBW 100 kHz M2	Mode Au Di M	u[1] 1[1]			-0.09 di 32420 MH 50.53 dBµ'
Ref Level     Att     ) 1Pk View     90 dBµV     80 dBµV     70 dBµV     60 dBµV     50 dBµV     40 dBµV     30 dBµV	97.00 dBµ\ 10 dE	3 SWT 63	.2 µs • '	RBW 30 kHz VBW 100 kHz M2	Mode Au Di M	u[1] 1[1]		2.472	-0.09 di 32420 MH 50.53 dBµ'
Ref Level     Att     IPk View     90 dBµV     80 dBµV     70 dBµV     60 dBµV     50 dBµV     40 dBµV     30 dBµV	97.00 dBµ\ 10 dE	3 SWT 63	.2 µs • '	RBW 30 kHz VBW 100 kHz M2	Mode Au Di M	u[1] 1[1]		2.472	-0.09 di 32420 MH 50.53 dBµ'
Ref Level     Att     1Pk View     90 dBµV     80 dBµV     70 dBµV     60 dBµV     50 dBµV     40 dBµV     30 dBµV     20 dBµV	97.00 dBµ\ 10 dE	3 SWT 63	.2 µs • '	RBW 30 kHz VBW 100 kHz M2	Mode Au Di M	u[1] 1[1]		2.472	-0.09 dl 32420 MH 50.53 dBµ'
Ref Level     Att     1Pk View     90 dBµV     80 dBµV     70 dBµV     60 dBµV     60 dBµV     30 dBµV     20 dBµV     10 dBµV	97.00 dBµ\ 10 dE	3 SWT 63	.2 µs • '	RBW 30 kHz VBW 100 kHz M2	Mode Au Di M	u[1] 1[1]		2.472	-0.09 di 32420 MH 50.53 dBµ'
Ref Level     Att     1Pk View     90 dBµV     80 dBµV     70 dBµV     60 dBµV     60 dBµV     30 dBµV     40 dBµV     20 dBµV     10 dBµV     10 dBµV	97.00 dBµV 10 dE	3 SWT 63	.2 µs • '	RBW 30 kHz VBW 100 kHz		u[1] 1[1]		2.472	-0.09 di 32420 MH 50.53 dBµ' 73080 GH
Ref Level     Att     1Pk View     90 dBµV     80 dBµV     70 dBµV     60 dBµV     50 dBµV     40 dBµV     20 dBµV     10 dBµV     10 dBµV     60 dBµV	97.00 dBµV 10 dE	3 SWT 63	.2 µs • '	RBW 30 kHz VBW 100 kHz M2		u[1] 1[1]		2.472	-0.09 di 32420 MH 50.53 dBµ' 73080 GH
	97.00 dBµV 10 dE	3 SWT 63	.2 µs • '	RBW 30 kHz VBW 100 kHz				2.472	-0.09 di 32420 MH: 50.53 dBµ' 73080 GH:
Ref Level     Att     1Pk View     90 dBµV     80 dBµV     70 dBµV     60 dBµV     60 dBµV     30 dBµV     40 dBµV     30 dBµV     10 dBµV     0 dBµV	97.00 dBµ\ 10 dE	3 SWT 63	.2 µs	RBW 30 kHz VBW 100 kHz	Mode Au Di Mi Mi V V V		Func	2.472	-0.09 dt 32420 MH 73080 GH
Ref Level     Att     1Pk View     90 dBµV     80 dBµV     70 dBµV     60 dBµV     50 dBµV     40 dBµV     30 dBµV     10 dBµV     10 dBµV     0 dBµV     50 dBµV     40 dBµV     50 dBµV     10 dBµV     10 dBµV     0 dBµV	97.00 dBµ\ 10 dE	3 SWT 63	2 µs • 1	RBW 30 kHz VBW 100 kHz M2 M2 M2 M2 M2 M2 M2 M2 M2 M2 M2 M2 M2	Mode Au D: M. M. V V V Pts Funcl		Func	2.472	-0.09 dl 32420 MH 50.53 dBµ' 73080 GH



#### 9.3 Discussion of Pulse Desensitization

Pulse desensitivity is not applicable for this device. The effective period ( $T_{eff}$ ) is approximately 1.000ms for a digital "1" bit, as shown in the plots of Section9.4 With a resolution bandwidth (3 dB) of 100 kHz, the pulse desensitivity factor was 0 dB

9.4 Calculation of Average Factor

Averaging factor in  $dB = 20 \log (duty cycle)$ 

The specification for output field strengths in accordance with the FCC rules specify measurements with an average detector. During testing, a spectrum analyzer incorporating a peak detector was used. Therefore, a reduction factor can be applied to the resultant peak signal level and compared to the limit for measurement instrumentation incorporating an average detector.

The time period over which the duty cycle is measured is 100 milliseconds, or the repetition cycle, whichever is a shorter time frame. The worst case (highest percentage on) duty cycle is used for the calculation. The duty cycle is measured by placing the spectrum analyzer in zero scan (receiver mode) and linear mode at maximum bandwidth (3 MHz at 3 dB down) and viewing the resulting time domain signal output from the analyzer on a Tektronix oscilloscope. The oscilloscope is used because of its superior time base and triggering facilities.

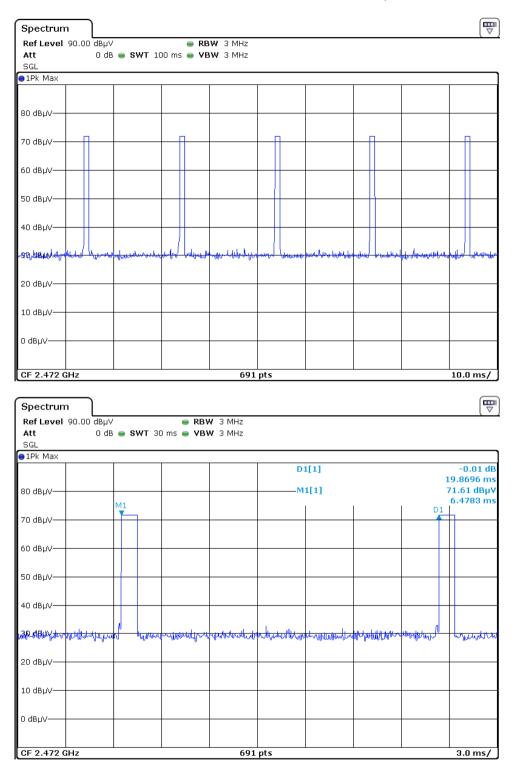
The duty cycle is simply the on-time divided by the period:

The duration of one cycle = 19.8696ms Effective period of the cycle = 1.000ms DC =1.000ms / 19.8696ms =0.0503 or 5.03%

Therefore, the averaging factor is found by 20 log<sub>10</sub>(0.0503) =-26.0dB

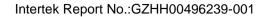
The test plots are attached as below.







Spectrun	n								
Ref Level Att	90.00 dBµ\	/ 3 <b>e swr</b> 30		V 3 MHz V 3 MHz					
SGL	0 46	o 🖶 awri at	) IIIS 🖶 ¥04	N JMHZ					
⊖1Pk Max				_					
					D	1[1]			-0.01 dB
80 dBµV—					м	1[1]		-	1.0000 ms 71.61 dBµ¥
		M1 D1				1	I	I	6.4783 ms
70 dBµV									
60 dBµV—									
50 dBµV—									
40 dBµV									
13R-ABWY.trv	mighted	n human	-	yununulut	n the west to the	announder	horadid to the second	pubriliphur /	www.
20 dBµV—									
10 dBµV—									
0 dBµV									
CF 2.472 (	GHz			691	pts				3.0 ms/





#### 9.5 Emissions Test Procedures

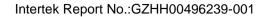
The following is a description of the test procedure used by Intertek Testing Services in the measurements of transmitters operating under Part 15, Subpart C rules.

The test set-up and procedures described below are designed to meet the requirements of ANSI C63.10 - 2013.

The transmitting equipment under test (EUT) is placed on a styrene turntable which is four feet in diameter and approximately 0.8 meter up to 1GHz and 1.5 meter above 1GHz in height above the ground plane. During the radiated emissions test, the turntable is rotated and any cables leaving the EUT are manipulated to find the configuration resulting in maximum emissions. The EUT is adjusted through all three orthogonal axes to obtain maximum emission levels. The antenna height and polarization are varied during the testing to search for maximum signal levels.

Detector function for radiated emissions is in peak mode. Average readings, when required, are taken by measuring the duty cycle of the equipment under test and subtracting the corresponding amount in dB from the measured peak readings. A detailed description for the calculation of the average factor can be found in Section9.4.

The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower.





#### 9.5 Emissions Test Procedures (cont'd)

The EUT is warmed up for 15 minutes prior to the test.

AC power to the unit is varied from 85% to 115% nominal and variation in the fundamental emission field strength is recorded. If battery powered, a new, fully charged battery is used.

The IF bandwidth used for measurement of radiated signal strength was 10 kHz for emission below 30 MHz and 120 kHz for emission from 30 MHz to 1000 MHz. Where pulsed transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2. A discussion of whether pulse desensitivity is applicable to this unit is included in this report (See Section9.2). Above 1000 MHz, a resolution bandwidth of 1 MHz is used, RBW 3 MHz used for fundamental emission.

Transmitter measurements are normally conducted at a measurement distance of three meters. However, to assure low enough noise floor in the restricted bands and above 1 GHz, signals are acquired at a distance of one meter or less. All measurements are extrapolated to three meters using inverse scaling, but those measurements taken at a closer distance are so marked.



#### 10.0 Test Equipment List

Equipment No.	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
SZ061-12	BiConiLog Antenna	ETS	3142E	00166158	4-Aug-2021	4-Aug-2024
SZ185-04	EMI Receiver	R & S	ESR7	102466	14-Nov-2022	14-Nov-2023
SZ061-08	Horn Antenna	ETS	3115	00092346	5-Sep-2021	5-Sep-2024
SZ061-06	Active Loop Antenna	Electro- Metrics	EM-6876	217	18-May-2021	18-May-2024
SZ061-15	Double- Ridged Waveguide Horn Antenna	ETS	3116C-PA	00224718	6-Jul-2021	6-Jul-2024
SZ056-06	Spectrum Analyzer	R&S	FSV40	101101	19-Dec-2022	19-Dec-2023
SZ181-04	Preamplifier	Agilent	8449B	3008A024 74	27-Apr-2023	27-Apr-2024
SZ188-01	Anechoic Chamber	ETS	RFD-F/A- 100	4102	12-Dec-2021	12-Dec-2024
SZ062-02	RF Cable	RADIALL	RG 213U		15-May -2023	15-Nov-2023
SZ062-05	RF Cable	RADIALL	0.04- 26.5GHz		15-May -2023	15-Nov-2023
SZ062-12	RF Cable	RADIALL	0.04- 26.5GHz		15-May -2023	15-Nov-2023
SZ067-04	Notch Filter	Micro-Tronics	BRM5070 2-02		27-Apr-2023	27-Apr-2024