

FCC AND ISED CERTIFICATION TEST REPORT

FOR

Applicant	:	Globe Electric Company Inc.
Address	:	150 Oneida, Montreal, Quebec, Canada, H9R 1A8
Equipment under Test	:	Remote control
Model No.	:	GL031TX
Trade Mark	:	Globe
FCC ID	:	2AQUQGL031TX
IC	:	8290A-GL031TX
Manufacturer	:	Globe Electric Company Inc.
Address	:	150 Oneida, Montreal, Quebec, Canada, H9R 1A8

Issued By: Dongguan Dongdian Testing Service Co., Ltd.

Add.: No. 17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park,
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REPORT

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Test Report Declare

Applicant	:	Globe Electric Company Inc.
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Trade mark	:	Globe
Manufacturer	:	Globe Electric Company Inc.
Address	:	150 Oneida, Montreal, Quebec, Canada, H9R 1A8

Test Standard Used:

FCC Rules and Regulations Part 15 Subpart C, RSS-210 Issue 10 December 2019, Amendment (April 2020).

Test procedure used:

ANSI C63.10:2013, RSS-Gen Issue 5, Apr. 2018, Amendment 2 (February 2021).

We Declare:

The equipment described above is tested by Dongguan Dongdian Testing Service Co., Ltd. and in the configuration tested the equipment complied with the standards specified above. The test results are contained in this test report and Dongguan Dongdian Testing Service Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

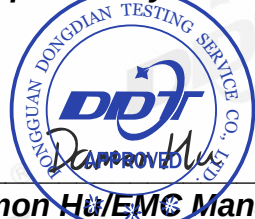
After test and evaluation, our opinion is that the equipment provided for test compliance with the requirement of the above FCC&ISED standards.

Report No:	DDT-R23013005-2E01		
Date of Receipt:	Mar. 20, 2023	Date of Test:	Mar. 20, 2023 ~ Mar. 22, 2023

Prepared By:

Bobo Chen
Bobo Chen/Engineer

Approved By:


Damon Hu/EMC Manager

Note: This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Dongguan Dongdian Testing Service Co., Ltd.

Revision History

Rev.	Revisions	Issue Date	Revised By
---	Initial issue	Mar. 22, 2023	

1. Summary of Test Results

The EUT have been tested according to the applicable standards as referenced below.		
Description of Test Item	Standard	Results
20 dB Bandwidth and 99% Bandwidth	FCC Part 15: 15.215 ANSI C63.10:2013 RSS-210 Issue 10 RSS-Gen Issue 5	Pass
Radiated Emission	FCC Part 15: 15.209 FCC Part 15: 15.249 ANSI C63.10:2013 RSS-210 Issue 10 RSS-Gen Issue 5	Pass
Band Edge Compliance	FCC Part 15: 15.205 FCC Part 15: 15.249 ANSI C63.10:2013 RSS-210 Issue 10 RSS-Gen Issue 5	Pass
Power Line Conducted Emission	FCC Part 15: 15.207 ANSI C63.10:2013 RSS-Gen Issue 5	N/A
Antenna Requirement	FCC Part 15: 15.203 RSS-Gen Issue 5 clause 6.8	Pass

2. General Test Information

2.1. Description of EUT

EUT Name	: Remote control
Model Number	: GL031TX
EUT function description	: Please reference user manual of this device
Power Supply	: DC 3.0V
Radio Specification	: 2.4GHz Wireless
Operation Frequency	: 2420 MHz - 2470 MHz
Modulation	: GFSK
Antenna	: -0.58 dBi
Sample Number	: S23013005-01

Note: EUT is the abbreviation of equipment under test.

Operation Frequency 2420 - 2470MHz					
Frequency	2420 MHz	Frequency	2450 MHz	Frequency	2470 MHz
Note.					
In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency and the highest frequency were selected to perform the test.					

Tested mode, information		
Mode	Setting Tx Power	Frequency (MHz)
GFSK Tx mode	/	2420
	/	2450
	/	2470

2.2. Accessories of EUT

Accessories	Manufacturer	Model number	Description
4-light LED track	Globe	N/A	N/A

2.3. Assistant equipment used for test

Assistant equipment	Manufacturer	Model number	EMC Compliance	SN
N/A	N/A	N/A	N/A	N/A

2.4. Block diagram of EUT configuration for test



2.5. Test environment conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature range:	21-25 °C
Humidity range:	40-75%
Pressure range:	86-106 kPa

2.6. Deviations of test standard

No deviation.

2.7. Test laboratory

Dongguan Dongdian Testing Service Co., Ltd.

Add.: No. 17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park, Dongguan City, Guangdong Province, China, 523808.

Tel.: +86-0769-38826678, <http://www.dgddt.com>, Email: ddt@dgddt.com.

CNAS Accreditation No. L6451; A2LA Accreditation Number: 3870.01

FCC Designation Number: CN1182, Test Firm Registration Number: 540522

Innovation, Science and Economic Development Canada Site Registration Number: 10288A

Conformity Assessment Body identifier: CN0048

VCCI facility registration number: C-20087, T-20088, R-20123, R-20155, G-20118

2.8. Measurement uncertainty

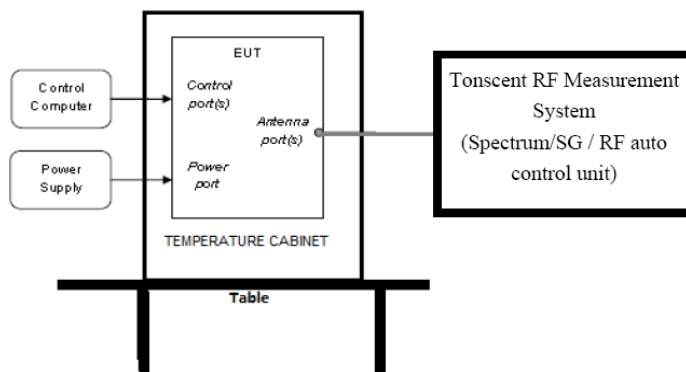
Test Item	Uncertainty
Bandwidth	1.1%
Peak Output Power (Conducted) (Spectrum analyzer)	0.86 dB (10 MHz ≤ f < 3.6 GHz); 1.38 dB (3.6 GHz ≤ f < 8 GHz)
Peak Output Power (Conducted) (Power Sensor)	0.74 dB
Power Spectral Density	0.74 dB (10 MHz ≤ f < 3.6 GHz); 1.38 dB (3.6 GHz ≤ f < 8 GHz)
Frequencies Stability	6.7 × 10 ⁻⁸ (Antenna couple method) 5.5 × 10 ⁻⁸ (Conducted method)
Conducted spurious emissions	0.86 dB (10 MHz ≤ f < 3.6 GHz); 1.40 dB (3.6 GHz ≤ f < 8 GHz) 1.66 dB (8 GHz ≤ f < 26.5 GHz)
Uncertainty for radio frequency (RBW < 20 kHz)	3×10 ⁻⁸
Temperature	0.4 °C
Humidity	2 %
Uncertainty for Radiation Emission test (9 kHz – 30 MHz)	3.44 dB
Uncertainty for Radiation Emission test (30 MHz - 1 GHz)	4.70 dB (Antenna Polarize: V) 4.84 dB (Antenna Polarize: H)
Uncertainty for Radiation Emission test (1 GHz - 40 GHz)	4.10 dB (1 - 6 GHz) 4.40 dB (6 GHz - 18 GHz) 3.54 dB (18 GHz - 26 GHz) 4.30 dB (26 GHz - 40 GHz)
Uncertainty for Power line conduction emission test	3.34dB (150KHz-30MHz) 3.72dB (9KHz-150KHz)
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

3. Equipment Used During Test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
☑RF Connected Test (Tonscend RF Measurement System 3#)					
Signal & Spectrum analyzer	R&S	FSV3044	101173	Apr. 13, 2022	1 Year
☑Radiation 3#chamber					
EMI Test Receiver	R&S	ESU26	100472	May 19, 2022	1 Year
Spectrum analyzer	Agilent	E4447A	MY50180031	May 17, 2022	1 Year
Active Loop antenna	Schwarzbeck	FMZB-1519	1519-038	Sep. 29, 2022	1 Year
Trilog Broadband Antenna	Schwarzbeck	VULB 9163	01429	Jul. 22, 2022	1 Year
Double Ridged Horn Antenna	Schwarzbeck	BBHA9120 D	02468	Sep. 29, 2022	1 Year
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	790	May 06, 2022	1 Year
Pre-amplifier	COM-POWER	PAM-118A	18040084	Aug.17, 2022	1 Year
Pre-amplifier	COM-POWER	PAM-840A	461369	Apr. 11, 2022	1 Year
RE Cable	N/A	W23.02 CP1-X2 + W23.09 AP1-X8+ JCT26S-NJ- NJ-1.5M+ JCT26S-NJ- NJ-1.5M	4.5M+8M+1.5M+1.5M	Aug.17, 2022	1 Year
RF Cable	Yuhu Technology	JCTB810-NJ-NJ-9M	21123964	May. 19, 2022	1 Year
RF Cable	Yuhu Technology	ZT26S-SMAJ-SMAJ-1M	21073466	Aug.17, 2022	1 Year
Test software	Tonscend	JS32-RE	V 5.0.0.1	N/A	N/A
Test software	Audix	E3	V 6.1.1.1	N/A	N/A

4. 20 dB Bandwidth and 99% Bandwidth

4.1. Block diagram of test setup



4.2. Limits

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in § 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

4.3. Test procedure

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

(2) Set the spectrum analyzer as follows:

RBW:	1%-5% of the OBW
VBW:	approximately three times RBW
Detector Mode:	Peak
Sweep time:	auto
Trace mode	Max hold

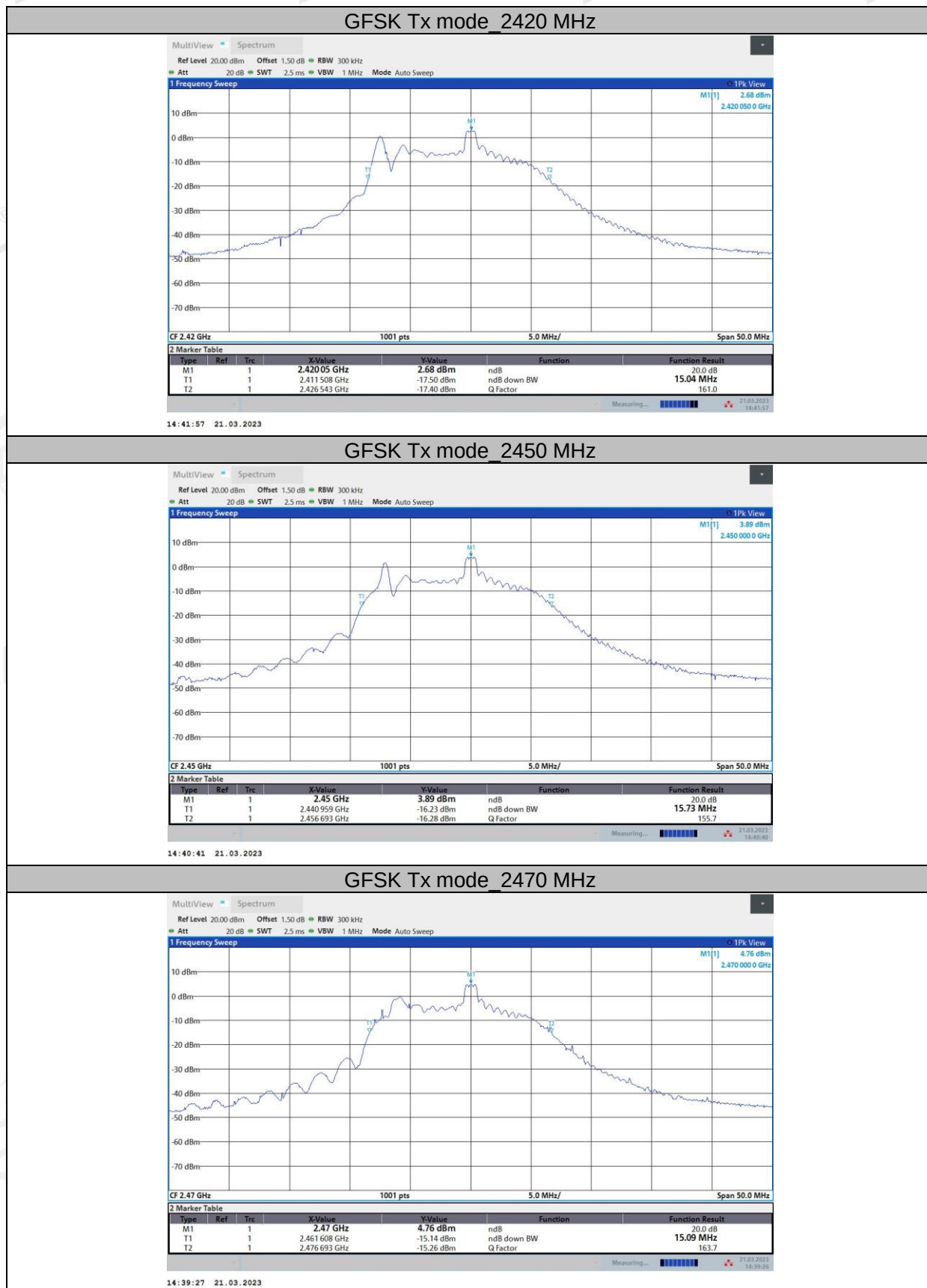
(3) Allow the trace to stabilize, measure the 20 dB and 99% bandwidth of signal.

4.4. Test result

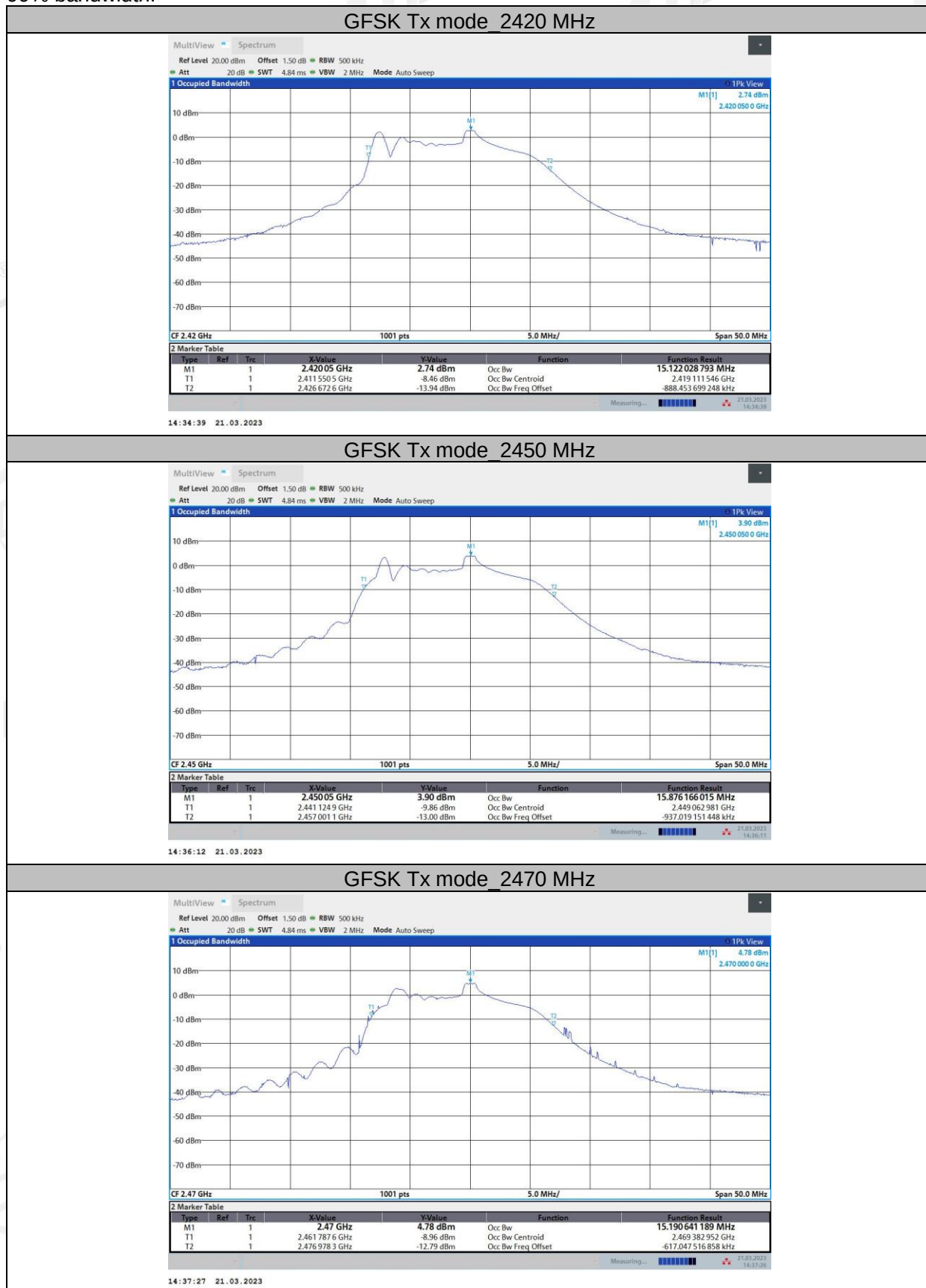
Test Mode	Freq. (MHz)	20 dB bandwidth Result (MHz)	99% bandwidth Result (MHz)	Verdict
GFSK Tx mode	2420	15.04	15.12	Pass
	2450	15.73	15.88	Pass
	2470	15.09	15.19	Pass

4.5. Original test data

20dB bandwidth:



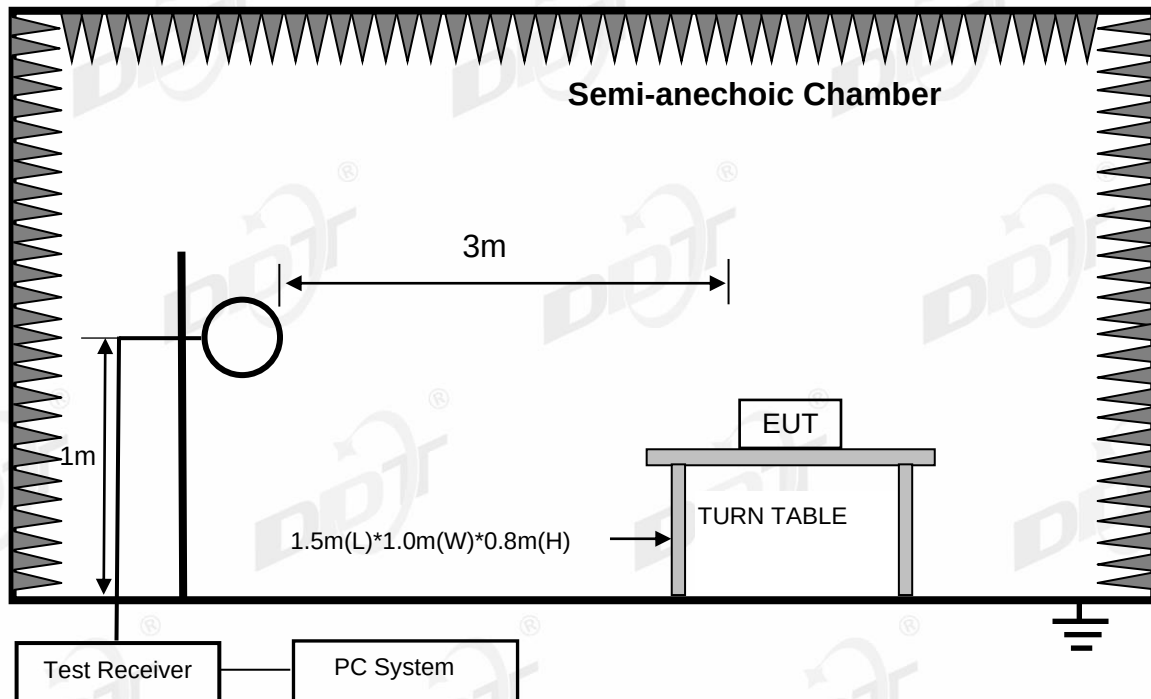
99% bandwidth:



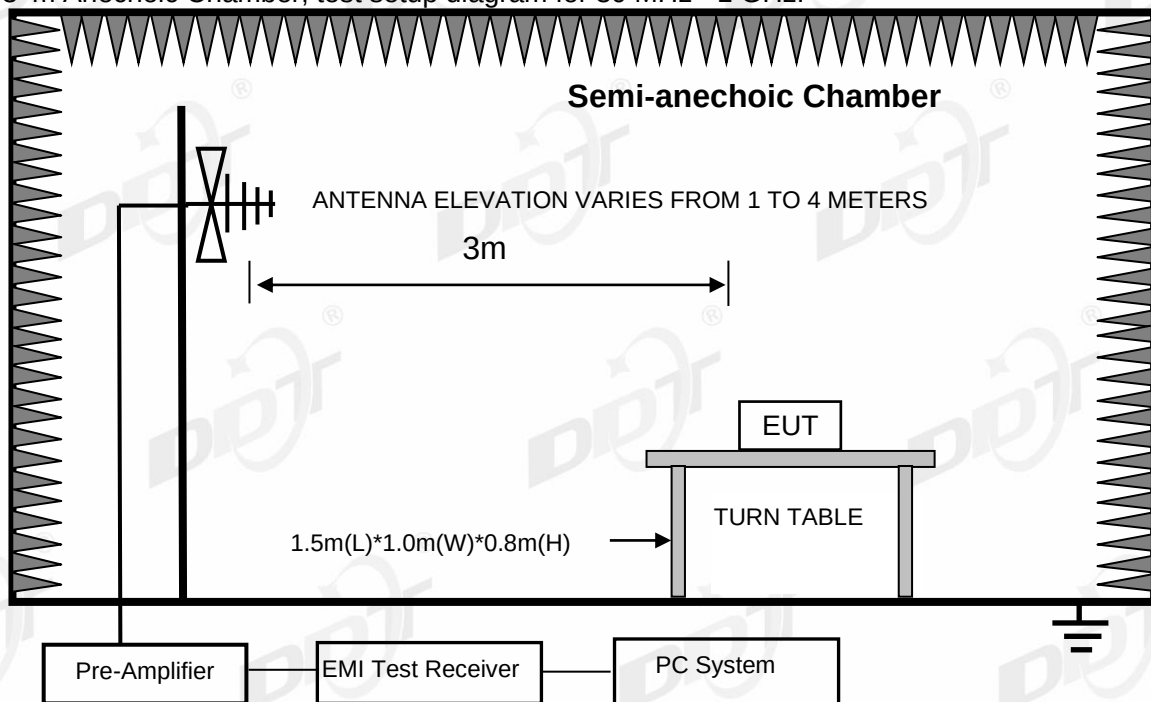
5. Radiated Emission

5.1. Block diagram of test setup

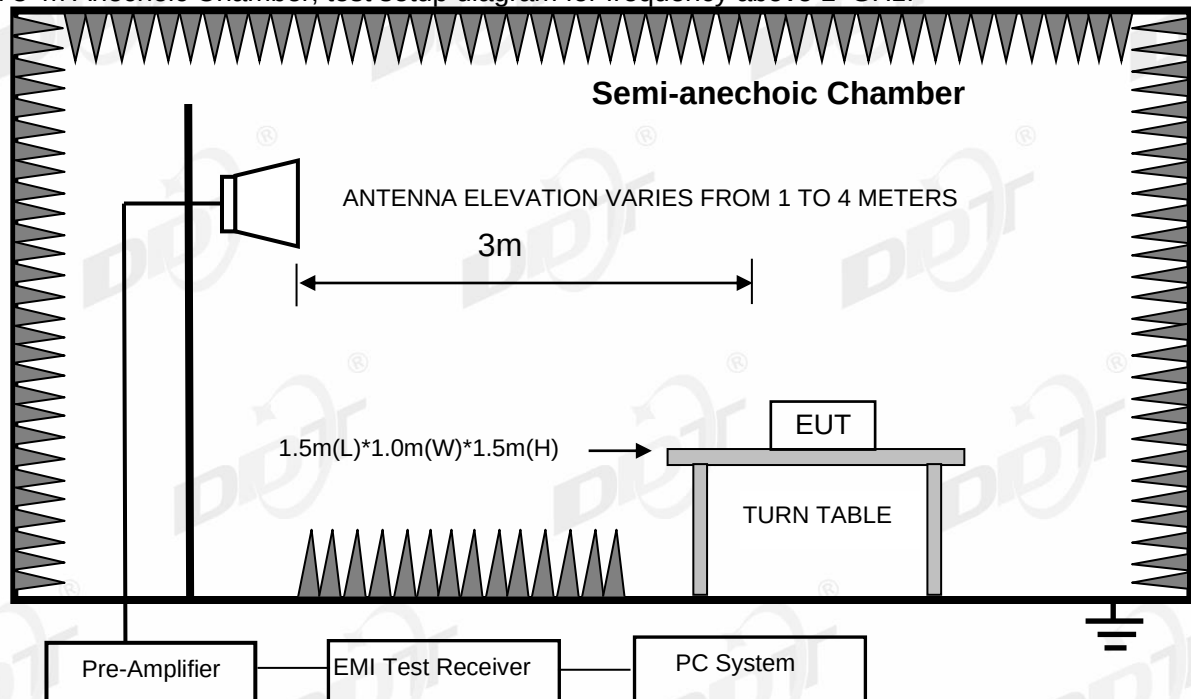
In 3 m Anechoic Chamber, test setup diagram for 9 kHz - 30 MHz:



In 3 m Anechoic Chamber, test setup diagram for 30 MHz - 1 GHz:



In 3 m Anechoic Chamber, test setup diagram for frequency above 1 GHz:



Note: For harmonic emissions test an appropriate high pass filter was inserted in the input port of AMP.

5.2. Limit

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		$\mu\text{V/m}$	$\text{dB}(\mu\text{V})/\text{m}$
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000 MHz	3	74.0 $\text{dB}(\mu\text{V})/\text{m}$ (Peak) 54.0 $\text{dB}(\mu\text{V})/\text{m}$ (Average)	
Field Strength of Fundamental emission for 2.4GHz -2.4835GHz	3	94.0 $\text{dB}(\mu\text{V})/\text{m}$ (Average) 114.0 $\text{dB}(\mu\text{V})/\text{m}$ (Peak)	
Field Strength of Harmonics	3	74.0 $\text{dB}(\mu\text{V})/\text{m}$ (Peak) 54.0 $\text{dB}(\mu\text{V})/\text{m}$ (Average)	

Remark:

- (1) Emission level $\text{dB}\mu\text{V} = 20 \log \text{Emission level } \mu\text{V/m}$
- (2) The smaller limit shall apply at the cross point between two frequency bands.
- (3) Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.
- (4) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz, radiated emission limits in these three bands are based on measurements employing an average detector.

5.3. Test procedure

- (1) EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber.
- (2) Setup EUT and assistant system according clause 2.3
- (3) Test antenna was located 3 m from the EUT on an adjustable mast. Below pre-scan procedure was first performed in order to find prominent radiated emissions.
 - (a) Change work frequency or channel of device if practicable.
 - (b) Change modulation type of device if practicable.
 - (c) Change power supply range from 85% to 115% of the rated supply voltage
 - (d) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions
- (4) Spectrum frequency from 9 kHz to 40 GHz (tenth harmonic of fundamental frequency) was investigated, and no any obvious emission were detected from 9 kHz to 30 MHz and 18 GHz to 40 GHz, so below final test was performed with frequency range from 30 MHz to 18 GHz.
- (5) For final emissions measurements at each frequency of interest, the EUT were rotated and the antenna height was varied between 1 m and 4 m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10:2013 on Radiated Emission test.
- (6) For emissions from 30 MHz to 1 GHz, Quasi-Peak values were measured with EMI Receiver and the bandwidth of Receiver is 120 kHz.
- (7) For emissions above 1 GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1 MHz, VBW is set at 3 MHz for Peak measure; according ANSI C63.10:2013 clause 4.1.4.2.2 procedure for average measure.
- (8) For fundamental frequency test, set spectrum analyzer's RBW = 3 MHz, VBW = 10 MHz. Peak detector for PK, according ANSI C63.10:2013 clause 4.1.4.2.2 procedure for average measure.

5.4. Test result

Pass. (See below detailed test result)

All the emissions except fundamental emission from 9 kHz to 40 GHz were comply with 15.209 limit.

Note1: According exploratory test no any obvious emission was detected from 9 kHz to 30 MHz and 18 GHz to 40 GHz, so the final test was performed with frequency range from 30 MHz to 18 GHz and recorded in below.

Note2: For emissions above 1 GHz. If peak results comply with AV limit, AV Result is deemed to comply with AV limit.

Field Strength of the Fundamental Signal

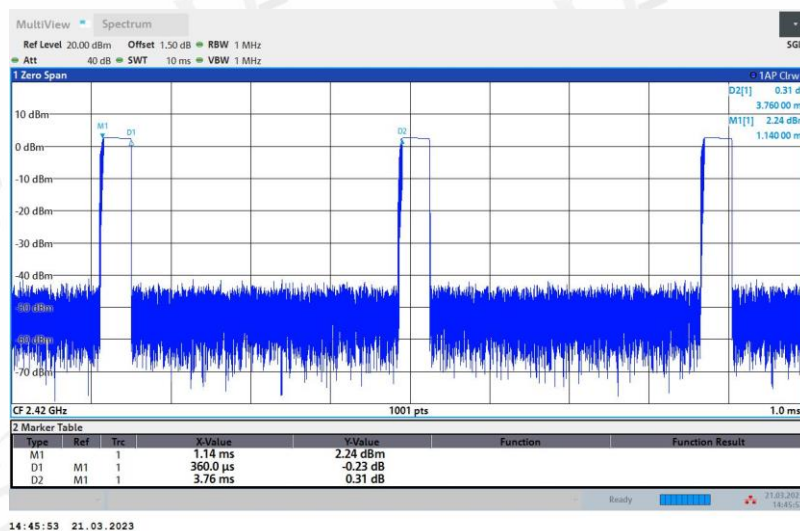
Frequency (MHz)	PK Level (dBuV/m)	PK Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2420	107.34	114.00	-6.66	Horizontal
2450	108.84	114.00	-5.16	Horizontal
2470	108.95	114.00	-5.05	Horizontal
2420	92.63	114.00	-21.37	Vertical
2450	91.94	114.00	-22.06	Vertical
2470	92.09	114.00	-21.91	Vertical

Frequency (MHz)	AV Level (dBuV/m)	AV Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2420	88.01	94.00	-5.99	Horizontal
2450	89.51	94.00	-4.49	Horizontal
2470	89.62	94.00	-4.38	Horizontal
2420	73.30	94.00	-20.7	Vertical
2450	72.61	94.00	-21.39	Vertical
2470	72.76	94.00	-21.24	Vertical

Note 1: Final level = Reading + Cable Loss + Antenna Factor + AMP

Note 2: Average value=Peak value + PDCF, since the PDCF<-20dB, so the Average value is complied with the AV limit.

Average value:	
Calculate Formula:	Average value=Peak value + PDCF
	PDCF=20 log(Duty cycle)
	Duty cycle= T on time / T period
Test data:	T on time =0.36*30ms
	T period =100ms
	PDCF=-19.33



Radiated Emission test (below 1 GHz)

TR-4-E-009 Radiated Emission Test Result

Test Date: 2023-03-20

Tested By: Bairong

EUT: Remote control

Model Number: GL031TX

Test Mode: Tx mode

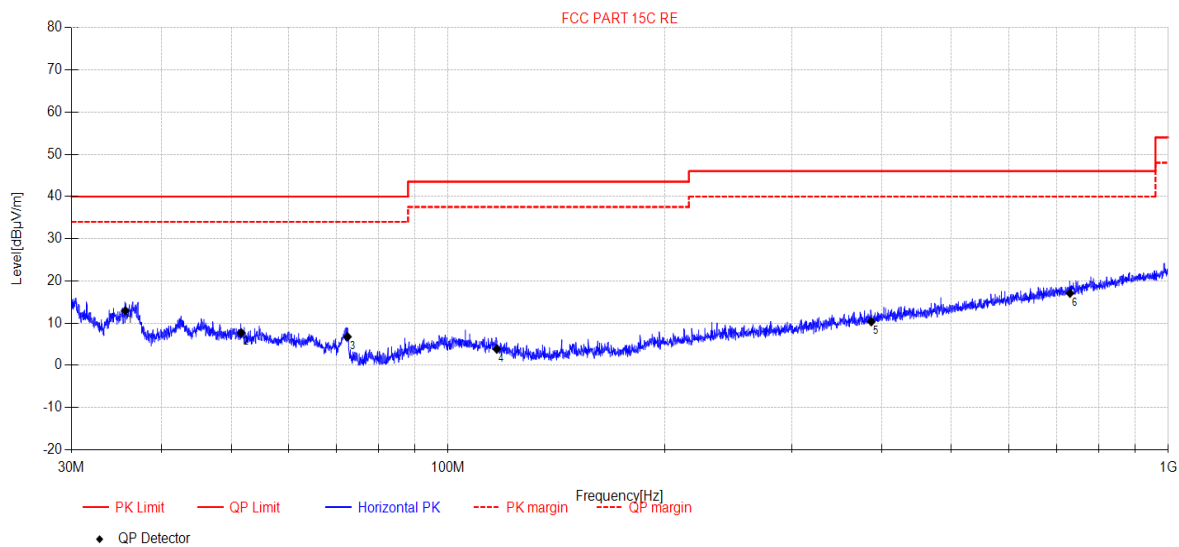
Power Supply: Battery

Condition: Temp:22.2°C;Humi:53.0%

Test Site: DDT 3# Chamber

File Path: d:\ts\2023 report date\Q23013005-1E GL031TX\FCC BELOW 1G\20230320-194844_H

Memo: 2420MHz

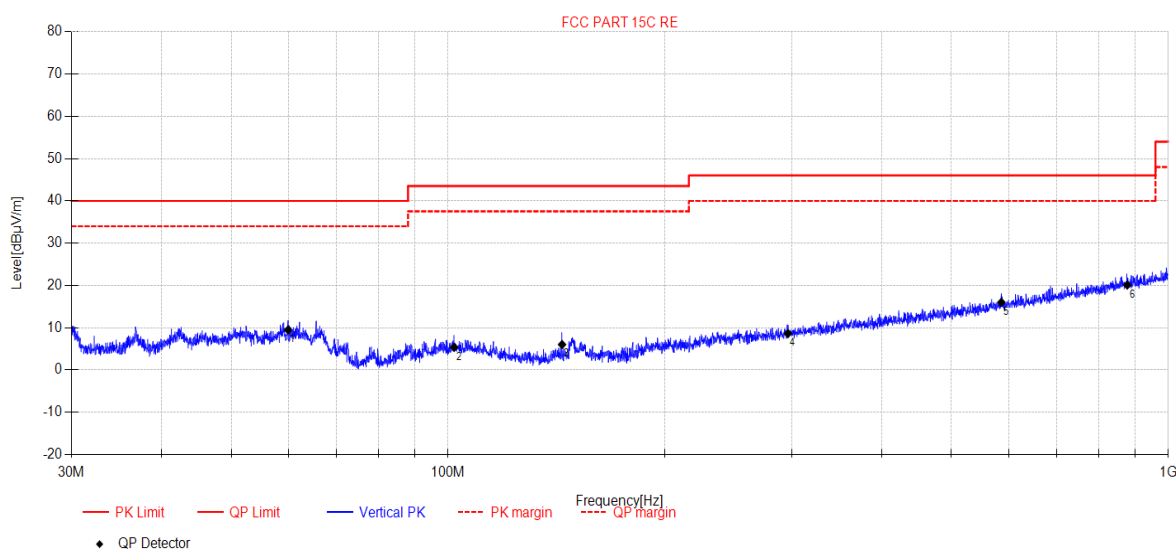


Final Data List										
NO.	Freq. [MHz]	Reading [dBμV/m]	Antenna Factor [dB]	Cable Loss [dB]	AMP [dB]	Result [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Polarity
1	35.65	33.49	11.09	0.66	-32.29	12.95	40.00	27.05	QP	Horizontal
2	51.62	26.15	13.04	0.83	-32.28	7.74	40.00	32.26	QP	Horizontal
3	72.53	30.22	7.74	1.08	-32.26	6.78	40.00	33.22	QP	Horizontal
4	116.84	25.23	9.33	1.50	-32.22	3.84	43.50	39.66	QP	Horizontal
5	386.98	24.74	15.14	2.81	-32.35	10.34	46.00	35.66	QP	Horizontal
6	730.43	25.59	20.41	3.92	-32.84	17.08	46.00	28.92	QP	Horizontal

Note:

1. Result Level = Reading + Cable loss + Antenna Factor + AMP
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.
3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

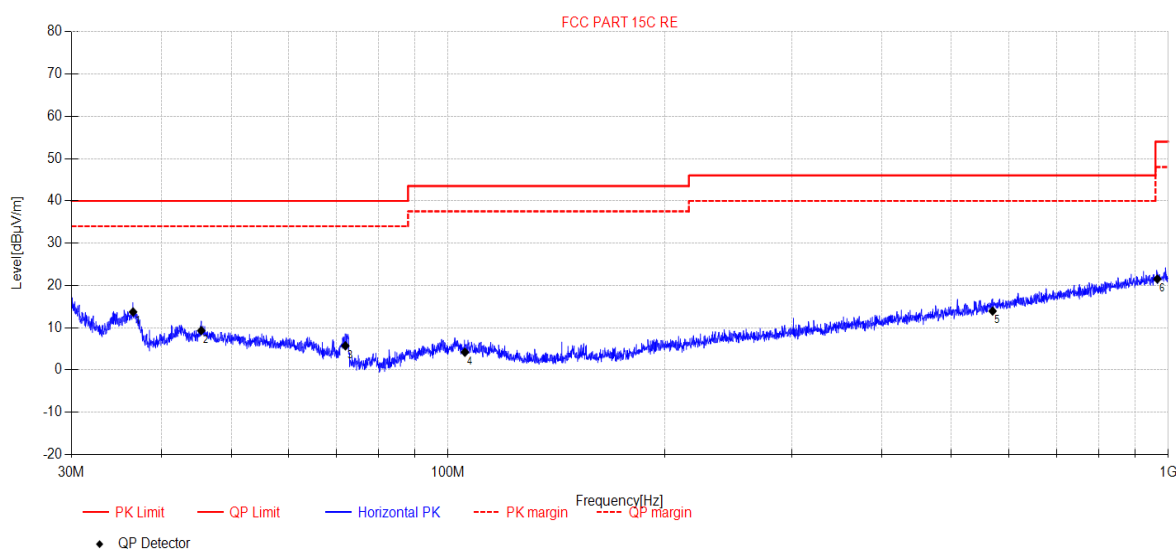
Test Date: 2023-03-20**Tested By:** Bairong**EUT:** Remote control**Model Number:** GL031TX**Test Mode:** Tx mode**Power Supply:** Battery**Condition:** Temp:22.2°C;Humi:53.0%**Test Site:** DDT 3# Chamber**File Path:** d:\ts\2023 report date\Q23013005-1E GL031TX\FCC BELOW 1G\20230320-194931_V**Memo:** 2420MHz

Final Data List										
NO.	Freq. [MHz]	Reading [dBμV/m]	Antenna Factor [dB]	Cable Loss [dB]	AMP [dB]	Result [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Polarity
1	59.98	28.94	11.90	0.93	-32.27	9.50	40.00	30.50	QP	Vertical
2	101.98	25.2	11.00	1.41	-32.24	5.37	43.50	38.13	QP	Vertical
3	143.99	29.15	7.40	1.66	-32.19	6.02	43.50	37.48	QP	Vertical
4	296.46	25.36	13.16	2.42	-32.31	8.63	46.00	37.37	QP	Vertical
5	586.49	26.79	18.43	3.49	-32.69	16.02	46.00	29.98	QP	Vertical
6	877.11	25.79	22.30	4.37	-32.36	20.10	46.00	25.90	QP	Vertical

Note:

1. Result Level = Reading + Cable loss + Antenna Factor + AMP
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.
3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Date: 2023-03-20**Tested By:** Bairong**EUT:** Remote control**Model Number:** GL031TX**Test Mode:** Tx mode**Power Supply:** Battery**Condition:** Temp:22.2°C;Humi:53.0%**Test Site:** DDT 3# Chamber**File Path:** d:\ts\2023 report date\Q23013005-1E GL031TX\FCC BELOW 1G\20230320-195037_H**Memo:** 2450MHz

Final Data List										
NO.	Freq. [MHz]	Reading [dBμV/m]	Antenna Factor [dB]	Cable Loss [dB]	AMP [dB]	Result [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Polarity
1	36.53	33.99	11.36	0.67	-32.29	13.73	40.00	26.27	QP	Horizontal
2	45.44	27.8	13.04	0.76	-32.28	9.32	40.00	30.68	QP	Horizontal
3	72.02	29.01	7.89	1.07	-32.26	5.71	40.00	34.29	QP	Horizontal
4	105.54	24.11	10.90	1.43	-32.23	4.21	43.50	39.29	QP	Horizontal
5	570.27	24.98	18.20	3.42	-32.66	13.94	46.00	32.06	QP	Horizontal
6	965.55	25.59	22.80	4.59	-31.46	21.52	54.00	32.48	QP	Horizontal

Note:

1. Result Level = Reading + Cable loss + Antenna Factor + AMP
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.
3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Date: 2023-03-20

Tested By: Bairong

EUT: Remote control

Model Number: GL031TX

Test Mode: Tx mode

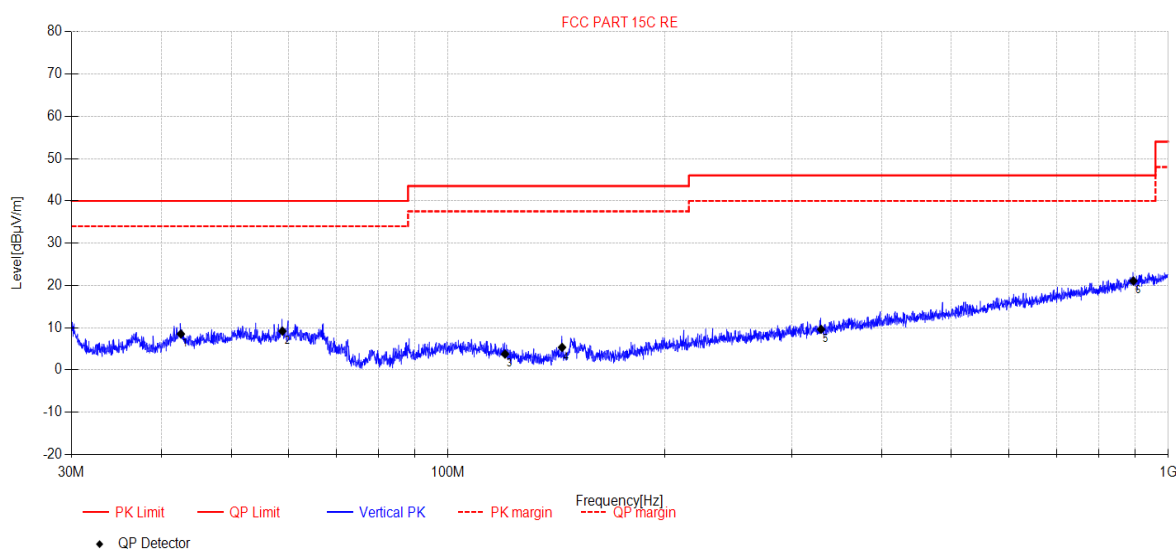
Power Supply: Battery

Condition: Temp:22.2°C;Humi:53.0%

Test Site: DDT 3# Chamber

File Path: d:\ts\2023 report date\Q23013005-1E GL031TX\FCC BELOW 1G\20230320-195124_V

Memo: 2450MHz

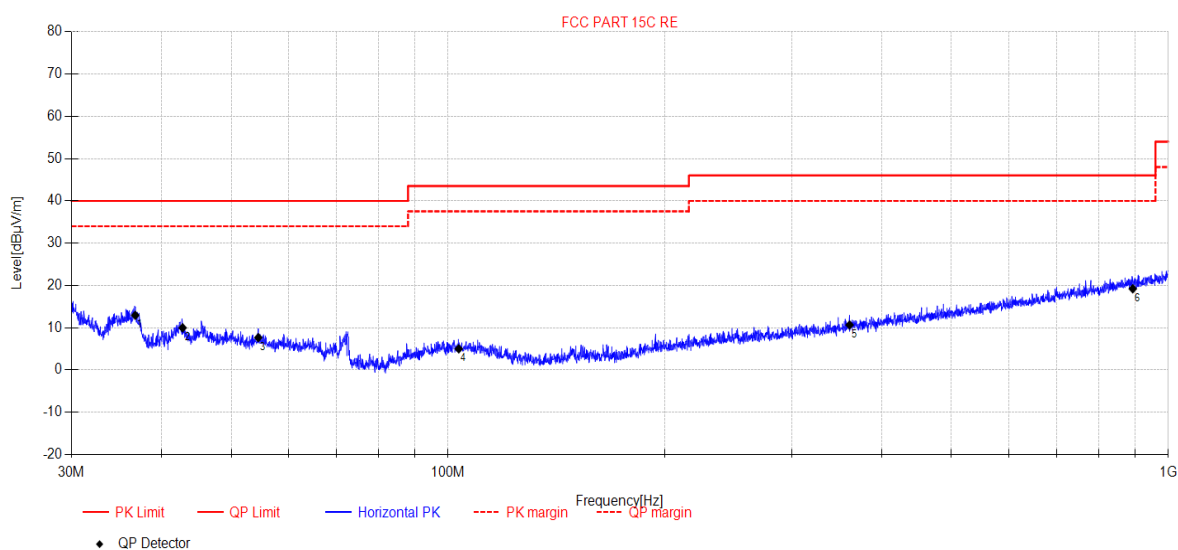


Final Data List										
NO.	Freq. [MHz]	Reading [dBμV/m]	Antenna Factor [dB]	Cable Loss [dB]	AMP [dB]	Result [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Polarity
1	42.57	27.46	12.61	0.73	-32.28	8.52	40.00	31.48	QP	Vertical
2	58.89	28.45	12.11	0.91	-32.27	9.20	40.00	30.80	QP	Vertical
3	119.99	25.77	8.70	1.52	-32.22	3.77	43.50	39.73	QP	Vertical
4	143.99	28.48	7.40	1.66	-32.19	5.35	43.50	38.15	QP	Vertical
5	329.57	25.31	14.09	2.56	-32.33	9.63	46.00	36.37	QP	Vertical
6	894.50	26.51	22.40	4.41	-32.26	21.06	46.00	24.94	QP	Vertical

Note:

1. Result Level = Reading + Cable loss + Antenna Factor + AMP
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.
3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

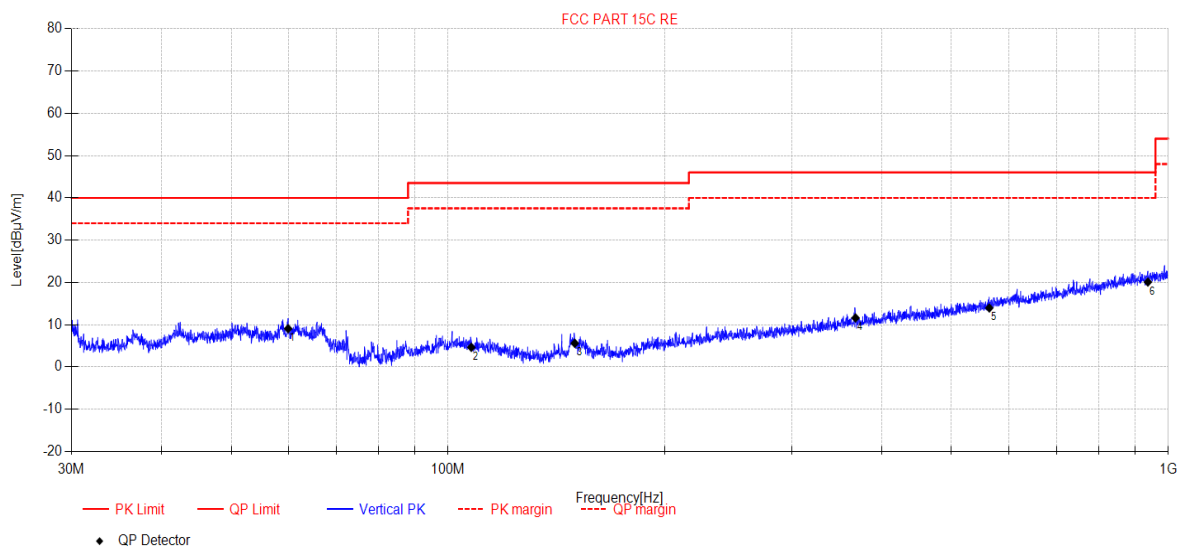
Test Date: 2023-03-20**Tested By:** Bairong**EUT:** Remote control**Model Number:** GL031TX**Test Mode:** Tx mode**Power Supply:** Battery**Condition:** Temp:22.2°C;Humi:53.0%**Test Site:** DDT 3# Chamber**File Path:** d:\ts\2023 report date\Q23013005-1E GL031TX\FCC BELOW 1G\20230320-194651_H**Memo:** 2470MHz

Final Data List										
NO.	Freq. [MHz]	Reading [dBμV/m]	Antenna Factor [dB]	Cable Loss [dB]	AMP [dB]	Result [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Polarity
1	36.79	33.12	11.44	0.67	-32.29	12.94	40.00	27.06	QP	Horizontal
2	42.81	28.86	12.66	0.74	-32.28	9.98	40.00	30.02	QP	Horizontal
3	54.52	26.33	12.75	0.86	-32.28	7.66	40.00	32.34	QP	Horizontal
4	103.49	24.83	11.00	1.42	-32.24	5.01	43.50	38.49	QP	Horizontal
5	361.03	25.5	14.80	2.70	-32.34	10.66	46.00	35.34	QP	Horizontal
6	892.62	24.67	22.40	4.41	-32.27	19.21	46.00	26.79	QP	Horizontal

Note:

1. Result Level = Reading + Cable loss + Antenna Factor + AMP
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.
3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Date: 2023-03-20**Tested By:** Bairong**EUT:** Remote control**Model Number:** GL031TX**Test Mode:** Tx mode**Power Supply:** Battery**Condition:** Temp:22.2°C;Humi:53.0%**Test Site:** DDT 3# Chamber**File Path:** d:\ts\2023 report date\Q23013005-1E 64000032\FCC BELOW 1G\20230320-194751_V**Memo:** 2470MHz

Final Data List										
NO.	Freq. [MHz]	Reading [dBμV/m]	Antenna Factor [dB]	Cable Loss [dB]	AMP [dB]	Result [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Polarity
1	59.98	28.51	11.90	0.93	-32.27	9.07	40.00	30.93	QP	Vertical
2	107.71	24.7	10.73	1.45	-32.23	4.65	43.50	38.85	QP	Vertical
3	149.96	28.59	7.50	1.70	-32.18	5.61	43.50	37.89	QP	Vertical
4	367.93	26.37	14.86	2.73	-32.35	11.61	46.00	34.39	QP	Vertical
5	564.31	25.22	17.99	3.40	-32.65	13.96	46.00	32.04	QP	Vertical
6	936.87	24.77	22.60	4.53	-31.80	20.10	46.00	25.90	QP	Vertical

Note:

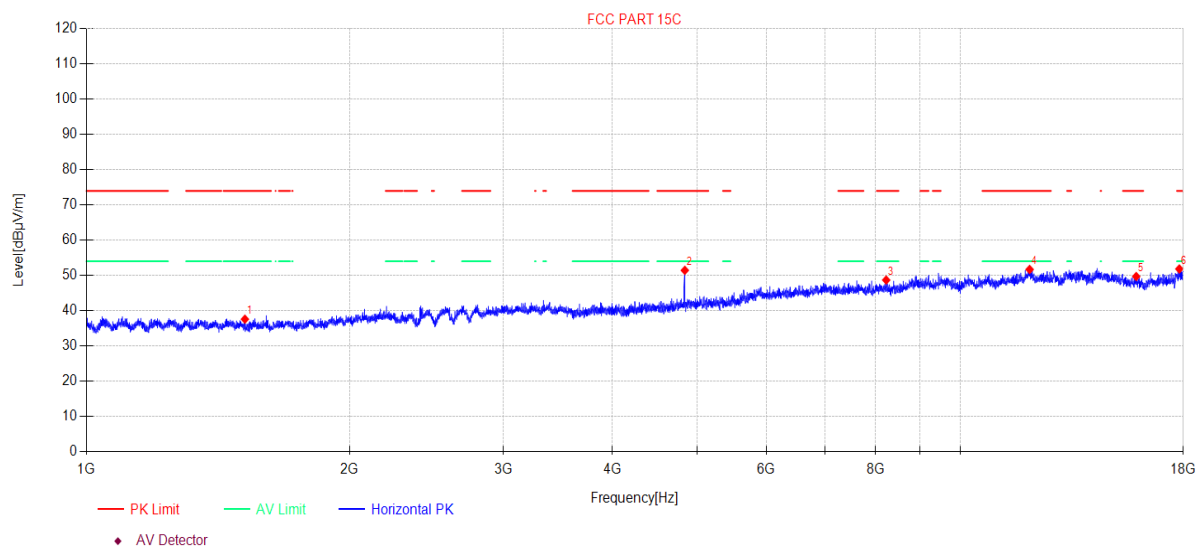
1. Result Level = Reading + Cable loss + Antenna Factor + AMP
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.
3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

Radiated Emission test (above 1 GHz)

TR-4-E-009 Radiated Emission Test Result

Test Date: 2023-03-20 **Tested By:** Bairong
EUT: Remote control **Model Number:** GL031TX
Test Mode: Tx mode **Power Supply:** Battery
Condition: Temp:22.2°C;Humi:53.0% **Test Site:** DDT 3# Chamber
File Path: d:\ts\2023 report date\Q23013005-1E GL031TX\FCC ABOVE 1G\7
Memo: 2420MHz

Test Graph



Suspected Data List										
NO	Freq. [MHz]	Reading [dBμV]	Cable Loss [dB]	Antenna Factor [dB]	AMP [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Polarity
1	1518.34	47.50	3.60	25.46	-38.98	37.58	74.00	36.42	PK	Horizontal
2	4839.59	54.13	6.00	32.46	-41.15	51.44	74.00	22.56	PK	Horizontal
3	8227.22	45.15	7.07	37.10	-40.64	48.68	74.00	25.32	PK	Horizontal
4	12006.78	43.30	8.39	38.91	-38.91	51.69	74.00	22.31	PK	Horizontal
5	15901.08	41.70	10.22	38.10	-40.33	49.69	74.00	24.31	PK	Horizontal
6	17813.69	40.11	11.75	40.60	-40.63	51.83	74.00	22.17	PK	Horizontal

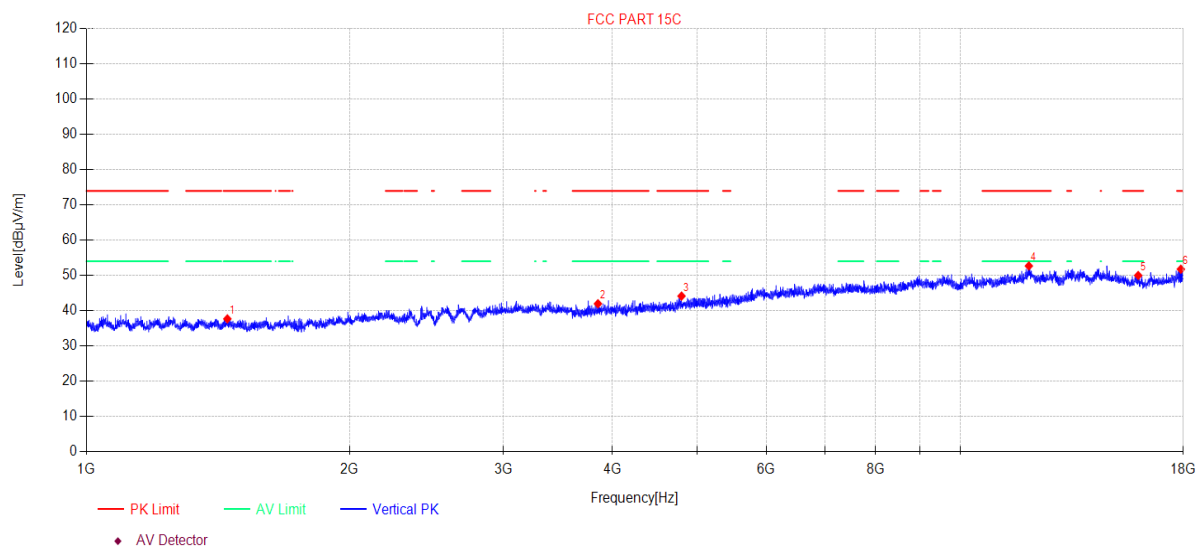
Note:

1. Level = Reading + Cable Loss + Antenna Factor + AMP
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Date: 2023-03-20 **Tested By:** Bairong
EUT: Remote control **Model Number:** GL031TX
Test Mode: Tx mode **Power Supply:** Battery
Condition: Temp:22.2°C;Humi:53.0% **Test Site:** DDT 3# Chamber
File Path: d:\ts\2023 report date\Q23013005-1E GL031TX\FCC ABOVE 1G\8
Memo: 2420MHz

Test Graph



Suspected Data List										
NO.	Freq. [MHz]	Reading [dBμV]	Cable Loss [dB]	Antenna Factor [dB]	AMP [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Polarity
1	1449.73	47.45	3.49	25.60	-38.87	37.67	74.00	36.33	PK	Vertical
2	3849.47	47.22	5.65	30.40	-41.31	41.96	74.00	32.04	PK	Vertical
3	4797.81	47.01	5.99	32.29	-41.16	44.13	74.00	29.87	PK	Vertical
4	11982.51	44.36	8.37	38.88	-38.93	52.68	74.00	21.32	PK	Vertical
5	15984.02	42.19	10.25	37.93	-40.39	49.98	74.00	24.02	PK	Vertical
6	17885.92	39.46	11.85	41.10	-40.65	51.76	74.00	22.24	PK	Vertical

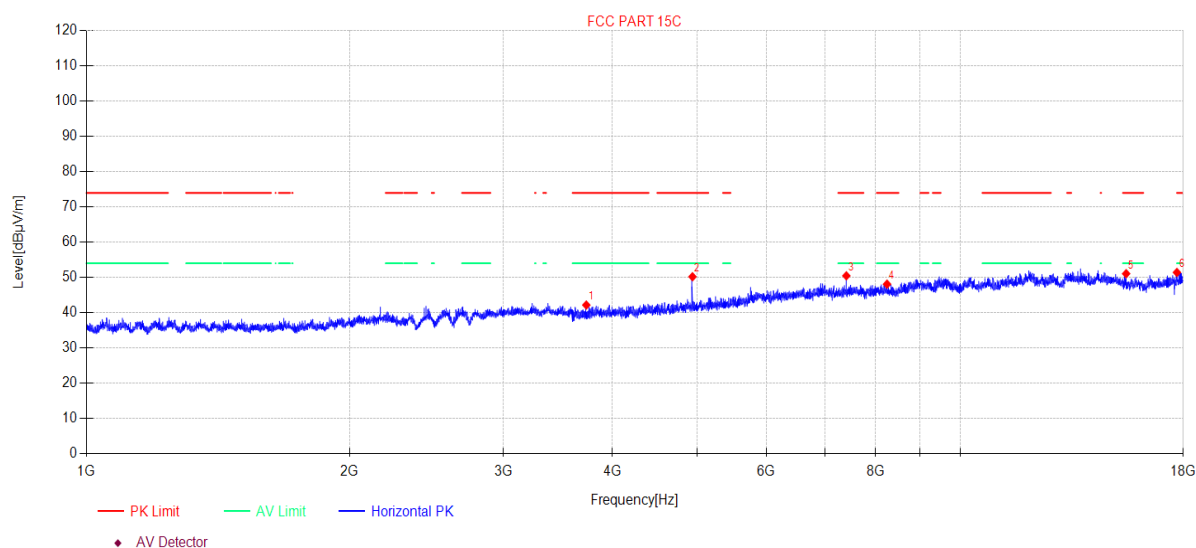
Note:

- Level = Reading + Cable Loss + Antenna Factor + AMP
- If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
- Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Date: 2023-03-20 **Tested By:** Bairong
EUT: Remote control **Model Number:** GL031TX
Test Mode: Tx mode **Power Supply:** Battery
Condition: Temp:22.2°C;Humi:53.0% **Test Site:** DDT 3# Chamber
File Path: d:\ts\2023 report date\Q23013005-1E GL031TX\FCC ABOVE 1G\9
Memo: 2450MHz

Test Graph



Suspected Data List										
NO.	Freq. [MHz]	Reading [dBμV]	Cable Loss [dB]	Antenna Factor [dB]	AMP [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Polarity
1	3733.33	47.73	5.59	30.07	-41.24	42.15	74.00	31.85	PK	Horizontal
2	4938.49	52.53	6.03	32.75	-41.12	50.19	74.00	23.81	PK	Horizontal
3	7407.84	47.78	7.17	36.50	-41.00	50.45	74.00	23.55	PK	Horizontal
4	8246.27	44.52	7.07	37.10	-40.61	48.08	74.00	25.92	PK	Horizontal
5	15483.86	42.45	10.03	38.62	-40.04	51.06	74.00	22.94	PK	Horizontal
6	17700.79	40.58	11.60	39.81	-40.58	51.41	74.00	22.59	PK	Horizontal

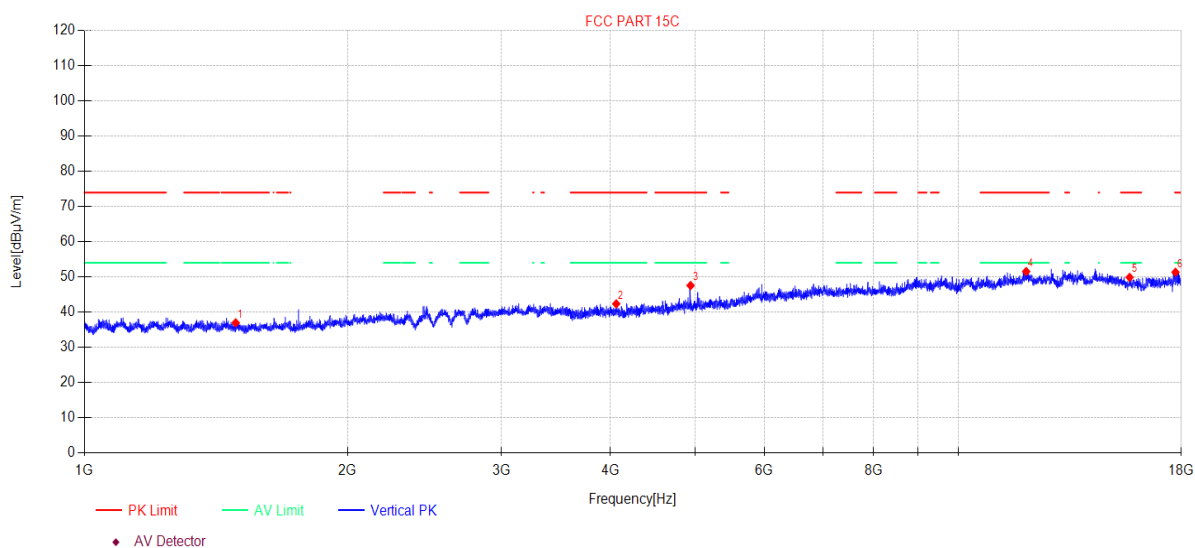
Note:

- Level = Reading + Cable Loss + Antenna Factor + AMP
- If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
- Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Date: 2023-03-20 **Tested By:** Bairong
EUT: Remote control **Model Number:** GL031TX
Test Mode: Tx mode **Power Supply:** Battery
Condition: Temp:22.2°C;Humi:53.0% **Test Site:** DDT 3# Chamber
File Path: d:\ts\2023 report date\Q23013005-1E GL031TX\FCC ABOVE 1G\10
Memo: 2450MHz

Test Graph



Suspected Data List

NO	Freq. [MHz]	Reading [dBμV]	Cable Loss [dB]	Antenna Factor [dB]	AMP [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Polarity
1	1489.65	46.82	3.55	25.52	-38.93	36.96	74.00	37.04	PK	Vertical
2	4060.89	47.16	5.75	30.82	-41.38	42.35	74.00	31.65	PK	Vertical
3	4939.92	49.88	6.03	32.76	-41.12	47.55	74.00	26.45	PK	Vertical
4	11961.75	43.27	8.37	38.86	-38.96	51.54	74.00	22.46	PK	Vertical
5	15709.24	41.65	10.13	38.29	-40.20	49.87	74.00	24.13	PK	Vertical
6	17726.39	40.31	11.63	39.98	-40.59	51.33	74.00	22.67	PK	Vertical

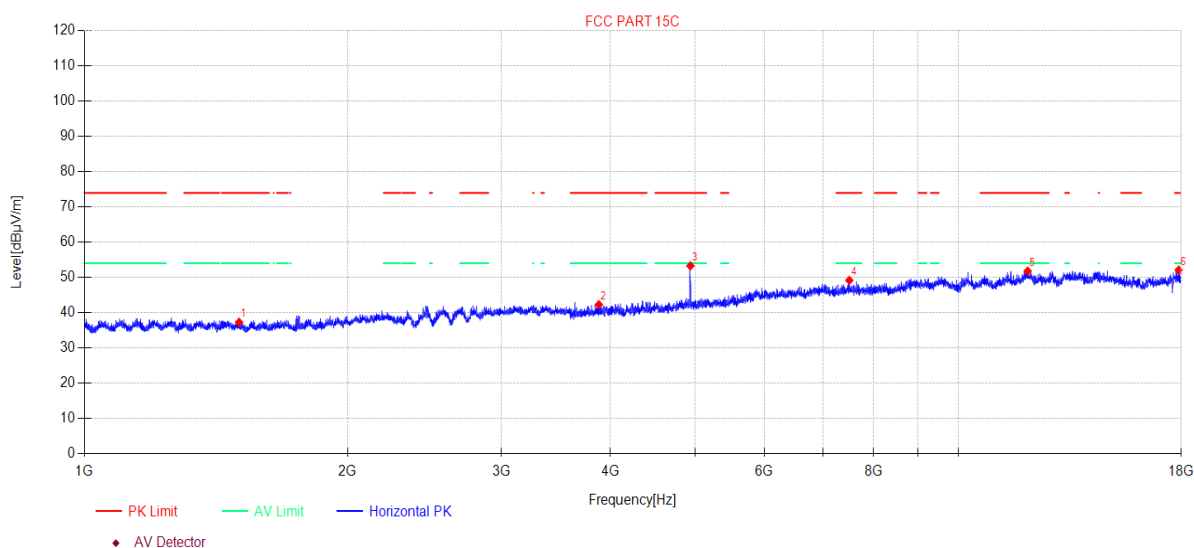
Note:

- Level = Reading + Cable Loss + Antenna Factor + AMP
- If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
- Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Date: 2023-03-20 **Tested By:** Bairong
EUT: Remote control **Model Number:** GL031TX
Test Mode: Tx mode **Power Supply:** Battery
Condition: Temp:22.2°C;Humi:53.0% **Test Site:** DDT 3# Chamber
File Path: d:\ts\2023 report date\Q23013005-1E GL031TX\FCC ABOVE 1G\5
Memo: 2470MHz

Test Graph



Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV]	Cable Loss [dB]	Antenna Factor [dB]	AMP [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Polarity
1	1503.06	47.15	3.58	25.49	-38.95	37.27	74.00	36.73	PK	Horizontal
2	3879.62	47.47	5.66	30.46	-41.33	42.26	74.00	31.74	PK	Horizontal
3	4937.06	55.63	6.03	32.75	-41.12	53.29	74.00	20.71	PK	Horizontal
4	7504.81	46.62	7.15	36.40	-41.00	49.17	74.00	24.83	PK	Horizontal
5	12006.78	43.40	8.39	38.91	-38.91	51.79	74.00	22.21	PK	Horizontal
6	17875.58	39.86	11.83	41.03	-40.65	52.07	74.00	21.93	PK	Horizontal

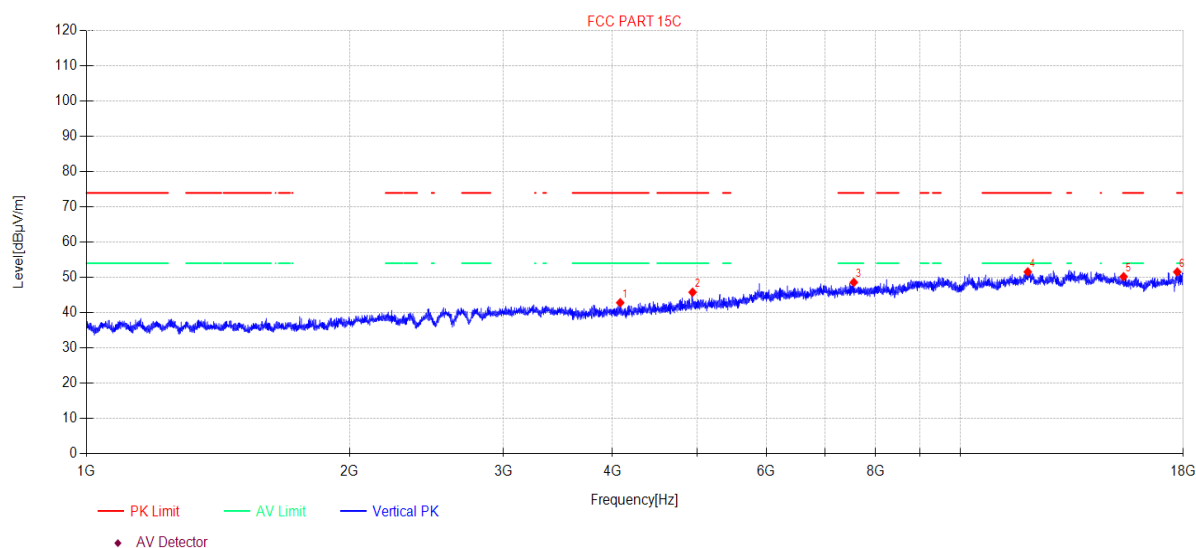
Note:

- Level = Reading + Cable Loss + Antenna Factor + AMP
- If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
- Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Date: 2023-03-20 **Tested By:** Bairong
EUT: Remote control **Model Number:** GL031TX
Test Mode: Tx mode **Power Supply:** Battery
Condition: Temp:22.2°C;Humi:53.0% **Test Site:** DDT 3# Chamber
File Path: d:\ts\2023 report date\Q23013005-1E GL031TX\FCC ABOVE 1G\6
Memo: 2470MHz

Test Graph



Suspected Data List

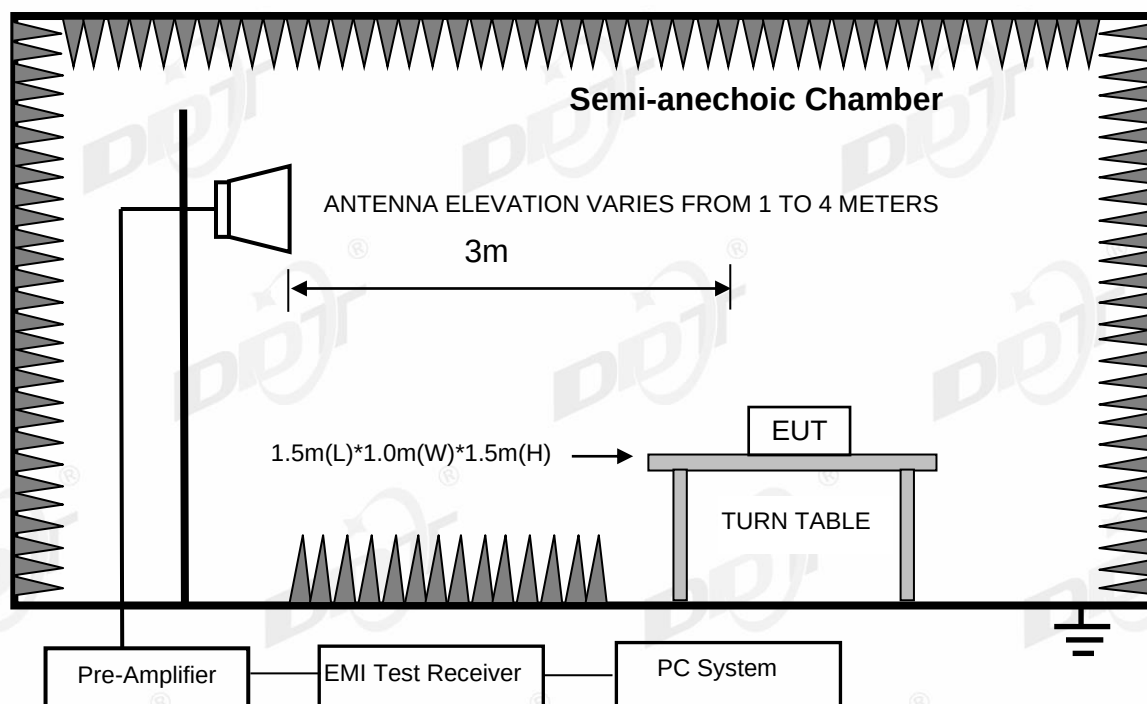
NO.	Freq. [MHz]	Reading [dBμV]	Cable Loss [dB]	Antenna Factor [dB]	AMP [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Polarity
1	4082.07	47.58	5.76	30.86	-41.38	42.82	74.00	31.18	PK	Vertical
2	4939.92	48.12	6.03	32.76	-41.12	45.79	74.00	28.21	PK	Vertical
3	7554.86	46.05	7.14	36.40	-41.00	48.59	74.00	25.41	PK	Vertical
4	11947.93	43.33	8.36	38.85	-38.98	51.56	74.00	22.44	PK	Vertical
5	15381.28	41.47	9.99	38.72	-39.97	50.21	74.00	23.79	PK	Vertical
6	17716.14	40.60	11.62	39.91	-40.59	51.54	74.00	22.46	PK	Vertical

Note:

- Level = Reading + Cable Loss + Antenna Factor + AMP
- If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
- Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

6. Band Edge Compliance

6.1. Block diagram of test setup



6.2. Limit

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

6.3. Test procedure

Same with clause 8.3 except change investigated frequency range from 2310MHz to 2430MHz and 2460MHz to 2500MHz.

Remark: All restriction band have been tested, and only the worst case is shown in report.

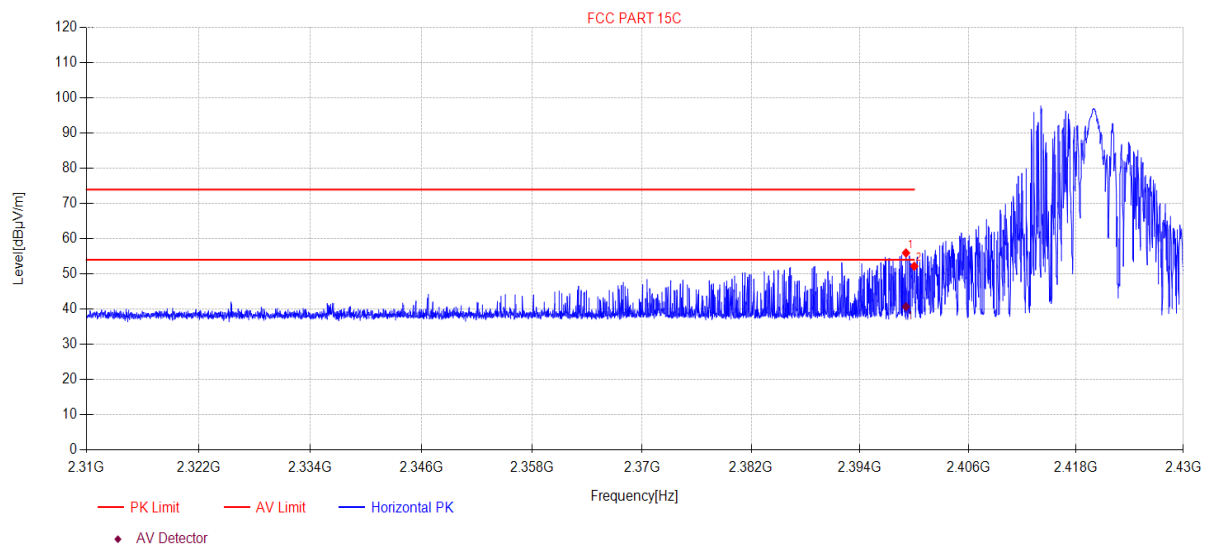
6.4. Test result

Pass. (See below detailed test result)

TR-4-E-009 Radiated Emission Test Result

Test Date: 2023-03-20 **Tested By:** Bairong
EUT: Remote control **Model Number:** GL031TX
Test Mode: Tx mode **Power Supply:** Battery
Condition: Temp:22.2°C;Humi:53.0% **Test Site:** DDT 3# Chamber
File Path: d:\ts\2023 report date\Q23013005-1E GL031TX\FCC ABOVE 1G\1
Memo: 2420MHz

Test Graph



Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV]	Cable Loss [dB]	Antenna Factor [dB]	AMP [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Polarity
1	2399.09	64.81	3.79	27.50	-40.14	55.96	74.00	18.04	PK	Horizontal
2	2400.00	61.04	3.79	27.50	-40.14	52.19	74.00	21.81	PK	Horizontal

Final Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Cable Loss [dB]	Antenna Factor [dB]	AMP [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Polarity
1	2399.09	49.51	3.79	27.50	-40.14	40.66	54.00	13.34	AV	Horizontal

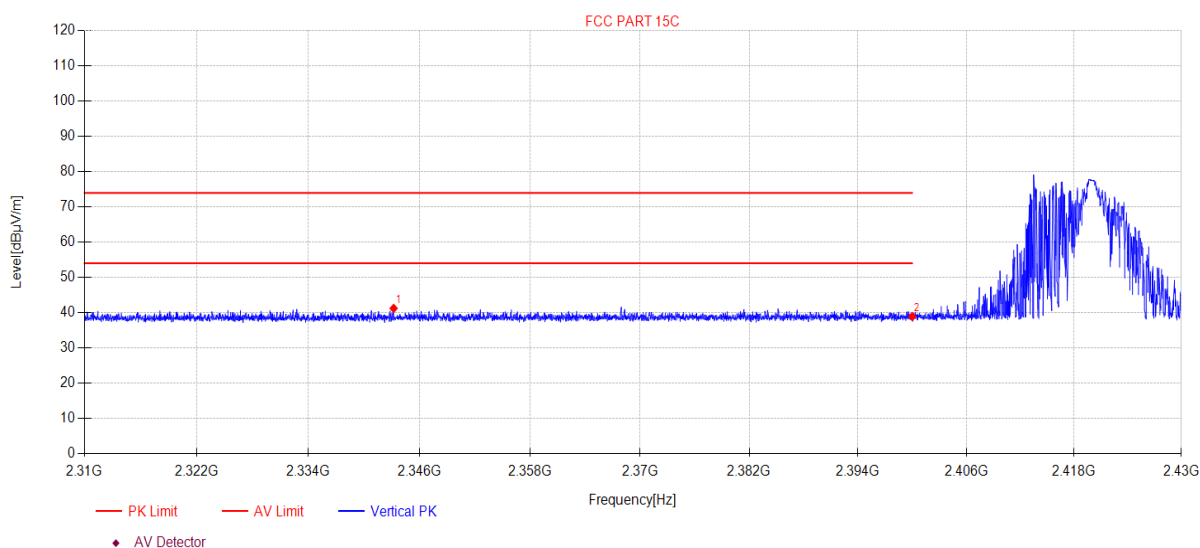
Note:

1. Level = Reading + Cable Loss + Antenna Factor + AMP
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Date: 2023-03-20 **Tested By:** Bairong
EUT: Remote control **Model Number:** GL031TX
Test Mode: Tx mode **Power Supply:** Battery
Condition: Temp:22.2°C;Humi:53.0% **Test Site:** DDT 3# Chamber
File Path: d:\ts\2023 report date\Q23013005-1E GL031TX\FCC ABOVE 1G\2
Memo: 2420MHz

Test Graph



Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV]	Cable Loss [dB]	Antenna Factor [dB]	AMP [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Polarity
1	2343.22	50.18	3.73	27.39	-40.08	41.22	74.00	32.78	PK	Vertical
2	2400.00	47.76	3.79	27.50	-40.14	38.91	74.00	35.09	PK	Vertical

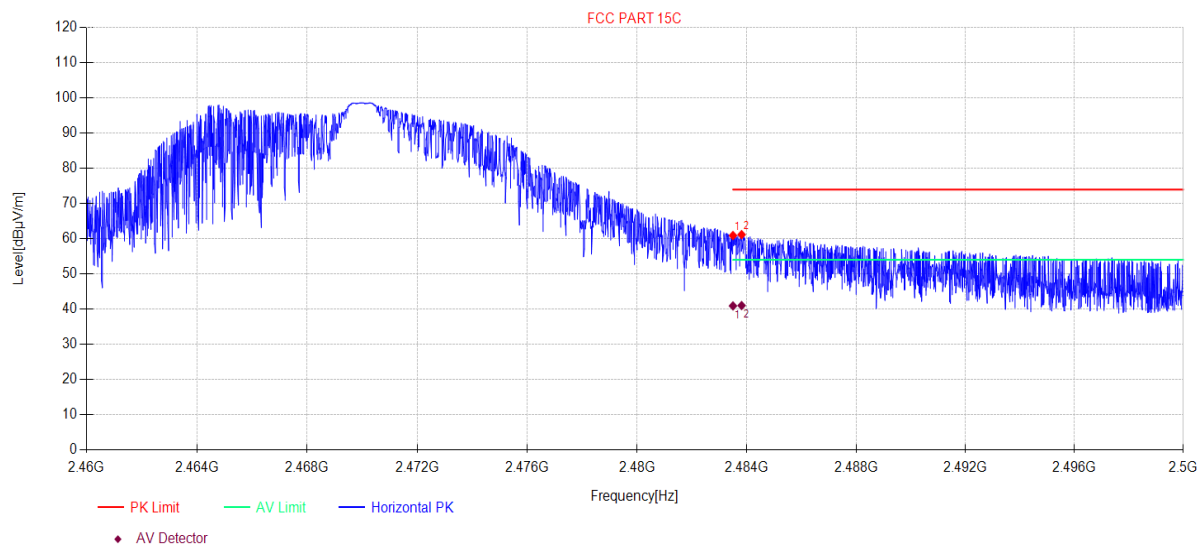
Note:

1. Level = Reading + Cable Loss + Antenna Factor + AMP
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Date: 2023-03-20 **Tested By:** Bairong
EUT: Remote control **Model Number:** GL031TX
Test Mode: Tx mode **Power Supply:** Battery
Condition: Temp:22.2°C;Humi:53.0% **Test Site:** DDT 3# Chamber
File Path: d:\ts\2023 report date\Q23013005-1E GL031TX\FCC ABOVE 1G\3
Memo: 2470MHz

Test Graph



Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV]	Cable Loss [dB]	Antenna Factor [dB]	AMP [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Polarity
1	2483.50	69.53	3.88	27.73	-40.23	60.91	74.00	13.09	PK	Horizontal
2	2483.82	69.77	3.88	27.74	-40.23	61.16	74.00	12.84	PK	Horizontal

Final Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Cable Loss [dB]	Antenna Factor [dB]	AMP [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Polarity
1	2483.50	48.63	3.88	27.73	-40.23	40.91	54.00	13.09	AV	Horizontal
2	2483.82	49.62	3.88	27.74	-40.23	41.01	54.00	12.99	AV	Horizontal

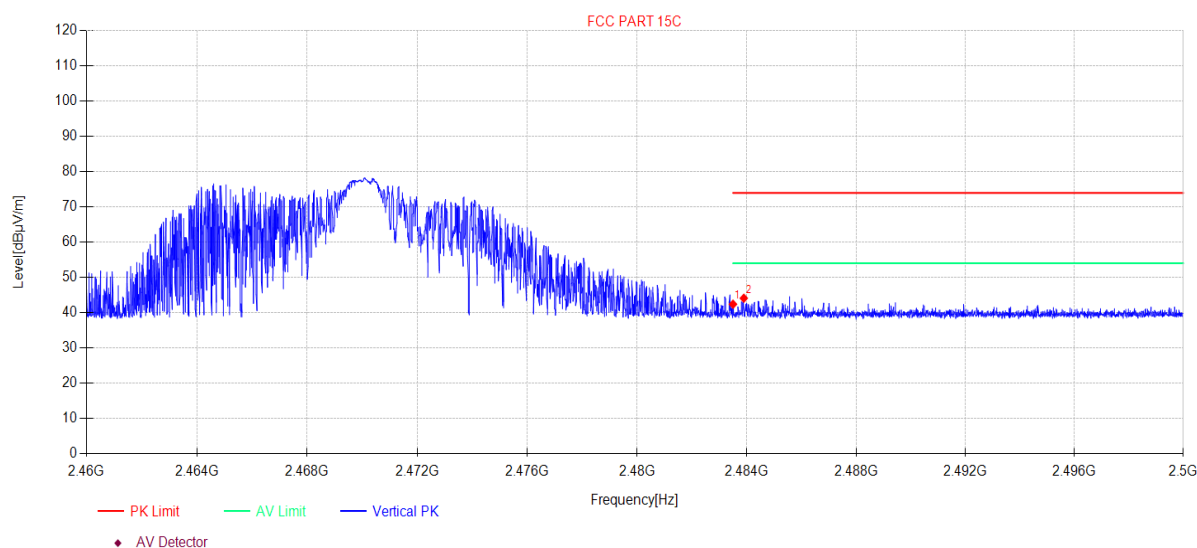
Note:

1. Level = Reading + Cable Loss + Antenna Factor + AMP
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Date: 2023-03-20 **Tested By:** Bairong
EUT: Remote control **Model Number:** GL031TX
Test Mode: Tx mode **Power Supply:** Battery
Condition: Temp:22.2°C;Humi:53.0% **Test Site:** DDT 3# Chamber
File Path: d:\ts\2023 report date\Q23013005-1E GL031TX\FCC ABOVE 1G\4
Memo: 2470MHz

Test Graph



Suspected Data List

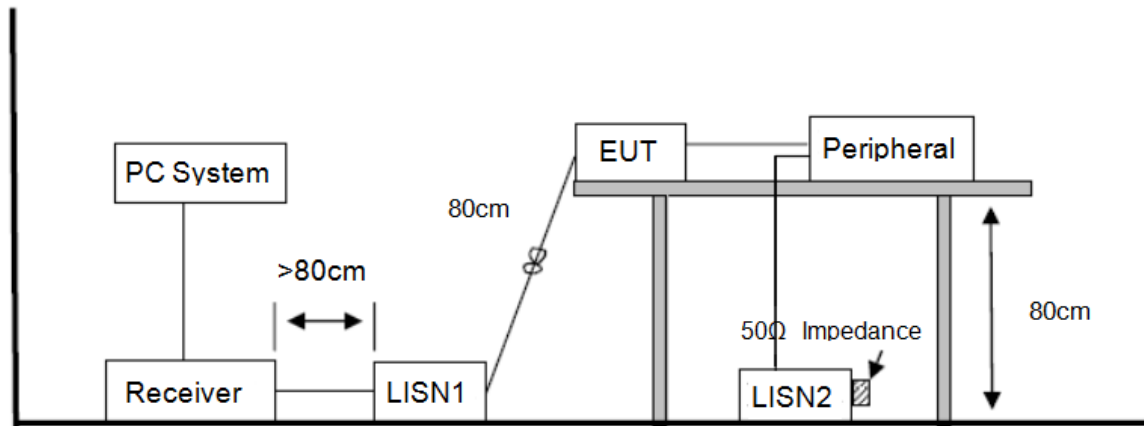
NO.	Freq. [MHz]	Reading [dBμV]	Cable Loss [dB]	Antenna Factor [dB]	AMP [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Polarity
1	2483.50	51.01	3.88	27.73	-40.23	42.39	74.00	31.61	PK	Vertical
2	2483.90	52.71	3.88	27.74	-40.23	44.10	74.00	29.90	PK	Vertical

Note:

1. Level = Reading + Cable Loss + Antenna Factor + AMP
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

7. Power Line Conducted Emission

7.1. Block diagram of test setup



7.2. Power line conducted emission limits

Frequency	Quasi-Peak Level dB(μV)	Average Level dB(μV)
150 kHz ~ 500 kHz	66 ~ 56*	56 ~ 46*
500 kHz ~ 5 MHz	56	46
5 MHz ~ 30 MHz	60	50

Note 1: * Decreasing linearly with logarithm of frequency.

Note 2: The lower limit shall apply at the transition frequencies.

7.3. Test procedure

The EUT and Support equipment, if needed, were put placed on a non-metallic table, 80 cm above the ground plane.

Configuration EUT to simulate typical usage as described in clause 2.4 and test equipment as described in clause 7.1 of this report.

All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.

All support equipment power received from a second LISN.

Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.

The Receiver scanned from 150 kHz to 30 MHz for emissions in each of the test modes.

During the above scans, the emissions were maximized by cable manipulation.

The test mode(s) described in clause 2.4 were scanned during the preliminary test.

After the preliminary scan, we found the test mode producing the highest emission level. The EUT configuration and worse cable configuration of the above highest emission levels were recorded for reference of the final test.

EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test.

A scan was taken on both power lines, Neutral and Line, recording at least the six highest emissions.

Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.

The test data of the worst-case condition(s) was recorded.

The bandwidth of test receiver is set at 9 kHz.

7.4. Test result

Not Applicable, since the EUT is only battery-operated device.

8. Antenna Requirements

8.1. Limit

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For intentional device, according to RSS-Gen issue 5 section 6.8.

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna.

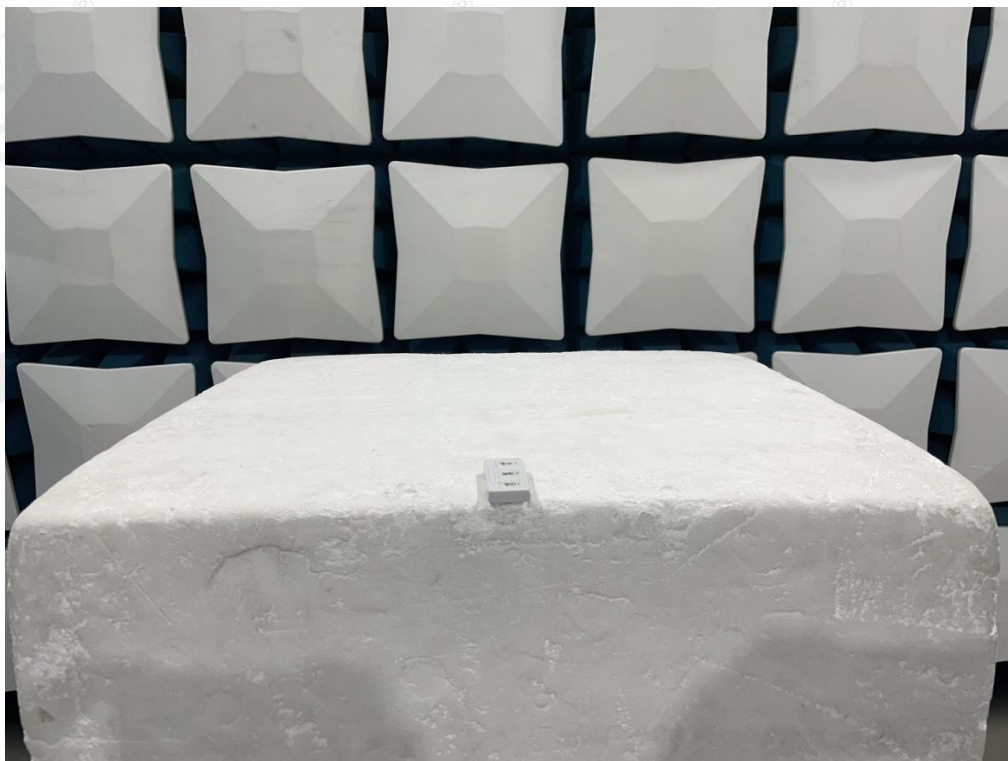
The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

8.2. Result

The antenna used for this product is PCB antenna and that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is -0.58 dBi.

9. Test Setup Photograph





10. Photos of the EUT

Please refer to appendix I.

END OF REPORT