

FCC TEST REPORT

FCC ID: 2AORA-0021

Product	:	B/O Walkie Talkie
Model Name	:	BO0021
Brand	:	N/A
Report No.	:	PTC18010211301E-FC01
Prepared for		
Frenzy Toys Ltd.		
Rm.1108, Goodluck Industrial Centre, 808 Lai Chi Kok Rd., Kowloon, HK		
Prepared by		
Dongguan Precise Testing & Certification Corp., Ltd.		
Building D, Baoding Technology Park, Guangming Road 2, Guangming Community, Dongcheng District, Dongguan, Guangdong, China		

1 TEST RESULT CERTIFICATION

Applicant's name : Frenzy Toys Ltd.

Address : Rm.1108, Goodluck Industrial Centre, 808 Lai Chi Kok Rd., Kowloon, HK

Manufacture's name : CHENGHAI JINGWEI INDUSTRIAL CO LTD

Address : NANWAN IND AREA, LIANNAN ROAD, LIANXIA TOWN, CHENGHAI DISTRICT, SHANTOU CITY, GUANGDONG, CHINA.

Product name : B/O Walkie Talkie

Model name : BO0021

Standards : FCC Part 15, Subpart C, Section 15.235: 2017

Test procedure : ANSI C63.10:2013

Test Date : January 03, 2018 to January 11, 2018

Date of Issue : January 11, 2018

Test Result : Pass

This device described above has been tested by PTC, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

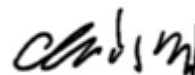
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Test Engineer:



Leo Yang / Engineer

Technical Manager:



Chris Du / Manager

Contents

	Page
1 TEST RESULT CERTIFICATION.....	2
2 TEST SUMMARY	5
3 GENERAL INFORMATION	6
3.1 GENERAL DESCRIPTION OF E.U.T.	6
3.2 TEST SITE	7
4 EQUIPMENT DURING TEST	8
4.1 EQUIPMENTS LIST	8
4.2 MEASUREMENT UNCERTAINTY	9
4.3 DESCRIPTION OF SUPPORT UNITS	10
5 CONDUCTED EMISSION	11
5.1 E.U.T. OPERATION	11
5.2 EUT SETUP	11
5.3 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	12
5.4 MEASUREMENT PROCEDURE	12
5.5 CONDUCTED EMISSION LIMIT	12
5.6 MEASUREMENT DESCRIPTION	12
5.7 CONDUCTED EMISSION TEST RESULT	12
6 RADIATED SPURIOUS EMISSIONS	13
6.1 EUT OPERATION	13
6.2 TEST SETUP	14
6.3 SPECTRUM ANALYZER SETUP	15
6.4 TEST PROCEDURE	16
6.5 SUMMARY OF TEST RESULTS	17
7 BANDWIDTH MEASUREMENT.....	25
7.1 LIMIT OF BANDWIDTH MEASUREMENT	25
7.2 TEST PROCEDURE	25
7.3 TEST RESULTS	25
8 ANTENNA APPLICATION	26
8.1 ANTENNA REQUIREMENT	26



8.2	RESULT	26
9	TEST SETUP	27
10	EUT PHOTOS.....	28

2 Test Summary

Test Items	Test Requirement	Result
Conduct Emission	15.207(a)	N/A
Radiated Spurious Emissions	15.209 15.235(a)	PASS
Measured Bandwidth	15.235(b)	PASS
Antenna Requirement	15.203	PASS

Remark:

N/A: Not Applicable

1. The EUT only powered by battery, no need to evaluate AC Power Conducted Emission.

3 General Information

3.1 General Description of E.U.T.

Product Name	:	B/O Walkie Talkie
Model Name	:	BO0021
Operation Frequency	:	49.86MHz
Number of Channel	:	1
Type of Modulation	:	AM
Antenna installation	:	External Antenna
Antenna Gain	:	1 dBi
Power supply	:	DC 3*1.5V Battery
Hardware Version	:	V1.0
Software Version	:	V1.0



PRECISE TESTING

Report No.: PTC18010211301E-FC01

3.2 Test Site

Dongguan Precise Testing & Certification Corp., Ltd.

Building D, Baoding Technology Park, Guangming Road2, Dongcheng District, Dongguan, Guangdong,
China

FCC Registration Number: 790290

A2LA Certificate No.: 4408.01

IC Registration Number: 12191A-1

4 Equipment During Test

4.1 Equipments List

RF Conducted Test

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due
MXG Signal Analyzer	Agilent	N9020A	MY56070279	10Hz-30GHz	Apr 07, 2018
Coaxial Cable	CDS	79254	46107086	10Hz-30GHz	Oct 09, 2018

Remark: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

Radiated Emissions(Test Frequency from 9KHz-18GHz)

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due
EMI Test Receiver	Rohde&Schwarz	ESCI	101417	9KHz-3GHz	Sep. 03, 2018
Loop Antenna	Schwarzbeck	FMZB 1519	012	9 KHz -30MHz	Aug 31, 2018
Bilog Antenna	SCHWARZBECK	VULB9160	9160-3355	25MHz-2GHz	Aug 31, 2018
Preamplifier (low frequency)	SCHWARZBECK	BBV 9475	9745-0013	1MHz-1GHz	Sep. 03, 2018
Cable	Schwarzbeck	PLF-100	549489	9KHz-3GHz	Sep. 03, 2018
Spectrum Analyzer	Agilent	E4407B	MY45109572	9KHz-40GHz	Oct. 13, 2018
Horn Antenna	SCHWARZBECK	9120D	9120D-1246	1GHz-18GHz	Aug. 31, 2018
Power Amplifier	LUNAR EM	LNA1G18-40	J10100000081	1GHz-26.5GHz	Aug. 31, 2018
Cable	H+S	CBL-26	N/A	1GHz-26.5GHz	Sep. 03, 2018

Conducted Emissions

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due
EMI Test Receiver	Rohde&Schwarz	ESCI	101417	9KHz-3GHz	Sep. 03, 2018
Artificial Mains Network	Rohde&Schwarz	L2-16B	000WX31025	9KHz-300MHz	Sep. 03, 2018
Artificial Mains Network	Rohde&Schwarz	ENV216	101342	9KHz-300MHz	Sep. 03, 2018

4.2 Measurement Uncertainty

Parameter	Uncertainty
RF output power, conducted	±1.0dB
Power Spectral Density, conducted	±2.2dB
Radio Frequency	± 1 x 10 ⁻⁶
Bandwidth	± 1.5 x 10 ⁻⁶
Time	±2%
Duty Cycle	±2%
Temperature	±1 °C
Humidity	±5%
DC and low frequency voltages	±3%
Conducted Emissions (150kHz~30MHz)	±3.64dB
Radiated Emission(30MHz~1GHz)	±5.03dB
Radiated Emission(1GHz~25GHz)	±4.74dB



PRECISE TESTING

Report No.: PTC18010211301E-FC01

4.3 Description of Support Units

Equipment	Model No.	Series No.
N/A		



5 Conducted Emission

Test Requirement: : FCC CFR 47 Part 15 Section 15.207

Test Method: : ANSI C63.10: 2013

Test Result: : PASS

Frequency Range: : 150kHz to 30MHz

Class/Severity: : Class B

5.1 E.U.T. Operation

Operating Environment :

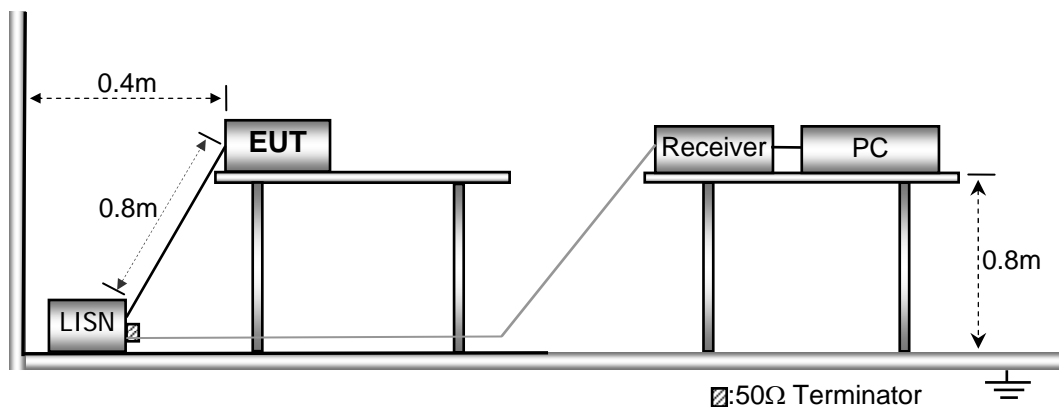
Temperature: : 25.5 °C

Humidity: : 51 % RH

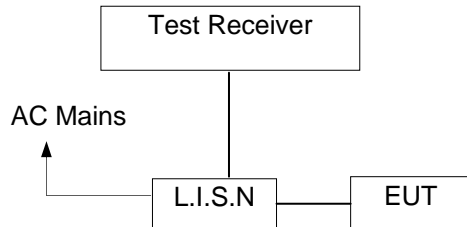
Atmospheric Pressure: : 101.2kPa

5.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.10:2013.



5.3 Test SET-UP (Block Diagram of Configuration)



5.4 Measurement Procedure

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured was complete.

5.5 Conducted Emission Limit

Conducted Emission

Frequency(MHz)	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.5-5.0	56	46
5.0-30.0	60	50

Note:

1. The lower limit shall apply at the transition frequencies
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

5.6 Measurement Description

The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

5.7 Conducted Emission Test Result

N/A.



6 Radiated Spurious Emissions

Test Requirement: : FCC CFR47 Part 15 Section 15.209 & 15.235(a)
 Test Method: : ANSI C63.10:2013
 Test Result: : PASS
 Measurement Distance: : 3m
 Limit: : See the follow table

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	$2400/F(\text{kHz})$	300	$10000 * 2400/F(\text{kHz})$	$20\log^{(2400/F(\text{kHz}))} + 80$
0.490 ~ 1.705	$24000/F(\text{kHz})$	30	$100 * 24000/F(\text{kHz})$	$20\log^{(24000/F(\text{kHz}))} + 40$
1.705 ~ 30	30	30	$100 * 30$	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

According to 15.235(a), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Frequency Range of Fundamental (MHz)	Field Strength of Fundamental Emission (Peak) (uV/m)	Field Strength of Fundamental Emission (Average) (uV/m)
49.82-49.90	100, 000 (100 dBuV/m)	10, 000 (80 dBuV/m)

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission Level (dBuV/m) = $20 \log$ Emission level (uV/m).
3. As shown in 15.32 (b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

6.1 EUT Operation

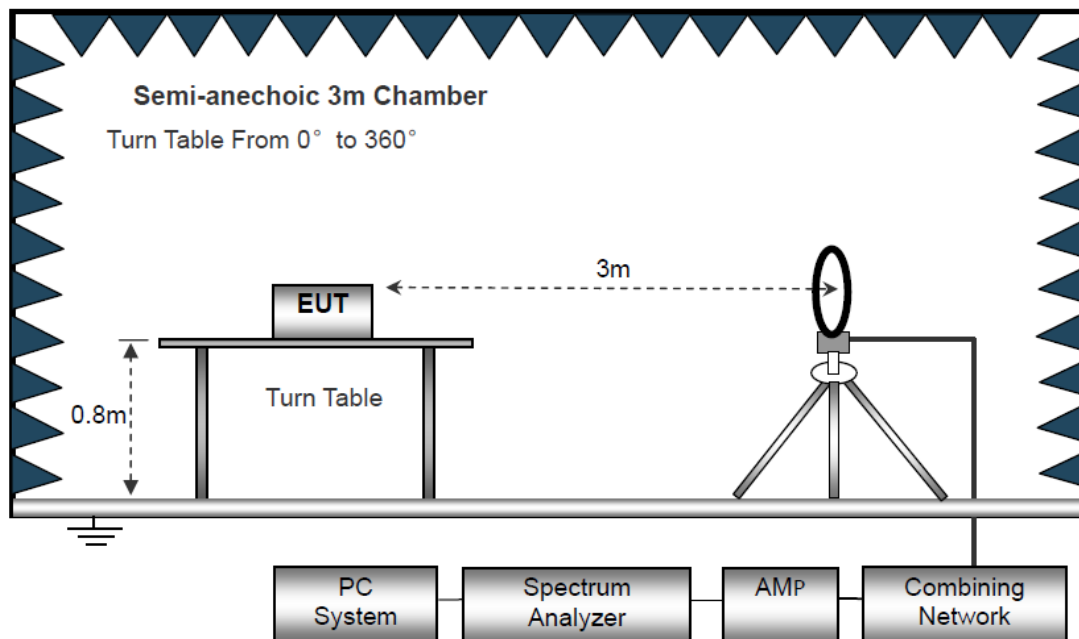
Operating Environment :

Temperature: : 23.5 °C
 Humidity: : 51.1 % RH
 Atmospheric Pressure: : 101.2kPa

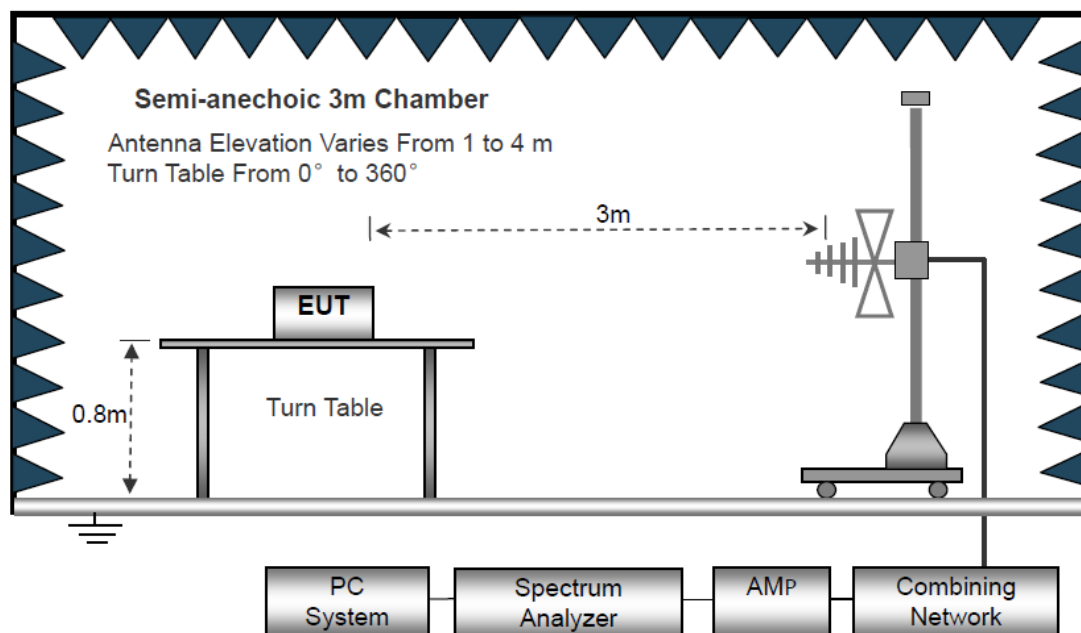
6.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site

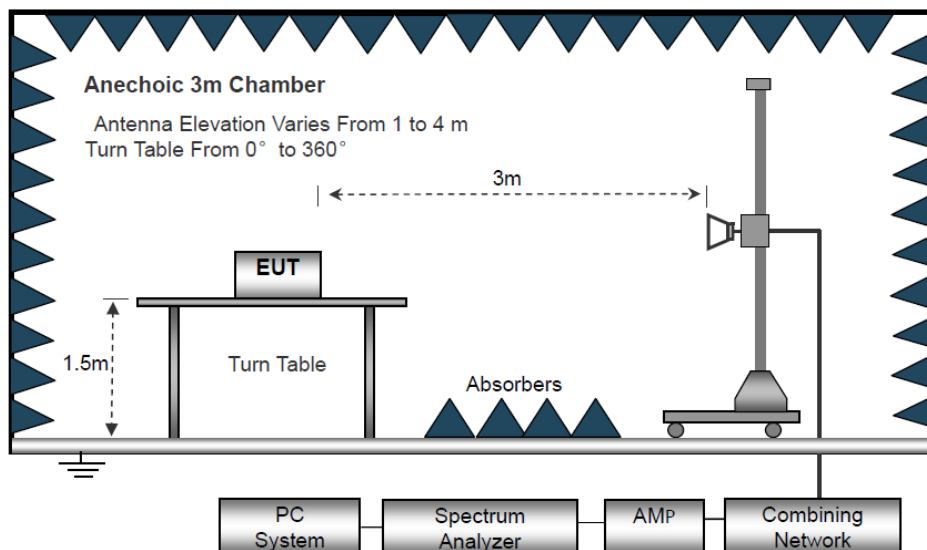
The test setup for emission measurement below 30MHz



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz



6.3 Spectrum Analyzer Setup

Below 30MHz			
IF Bandwidth	:	10kHz	
Resolution Bandwidth	:	10kHz	
Video Bandwidth	:	10kHz	
30MHz ~ 1GHz			
Detector	:	PK	QP
Resolution Bandwidth	:	100kHz	120kHz
Video Bandwidth	:	300kHz	300kHz
Above 1GHz			
Detector	:	PK	AV
Resolution Bandwidth	:	1MHz	1MHz
Video Bandwidth	:	3MHz	10Hz



6.4 Test Procedure

1. Below 1000MHz, The EUT was placed on a turn table which is 0.8m above ground plane, And above 1000MHz, The EUT was placed on a styrofoam table which is 1.5m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions. The spectrum was investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.
8. The test above 1GHz must be use the fully anechoic room, and the test below 1GHz use the half anechoic room



6.5 Summary of Test Results

Test Frequency: 9KHz-30MHz

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)	Limit 3m (dBuV/m)	Over (dB)
--	--	--	--	>20

Note:

The amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

Distance extrapolation factor = $40\log(\text{Specific distance} / \text{test distance})$ (dB);

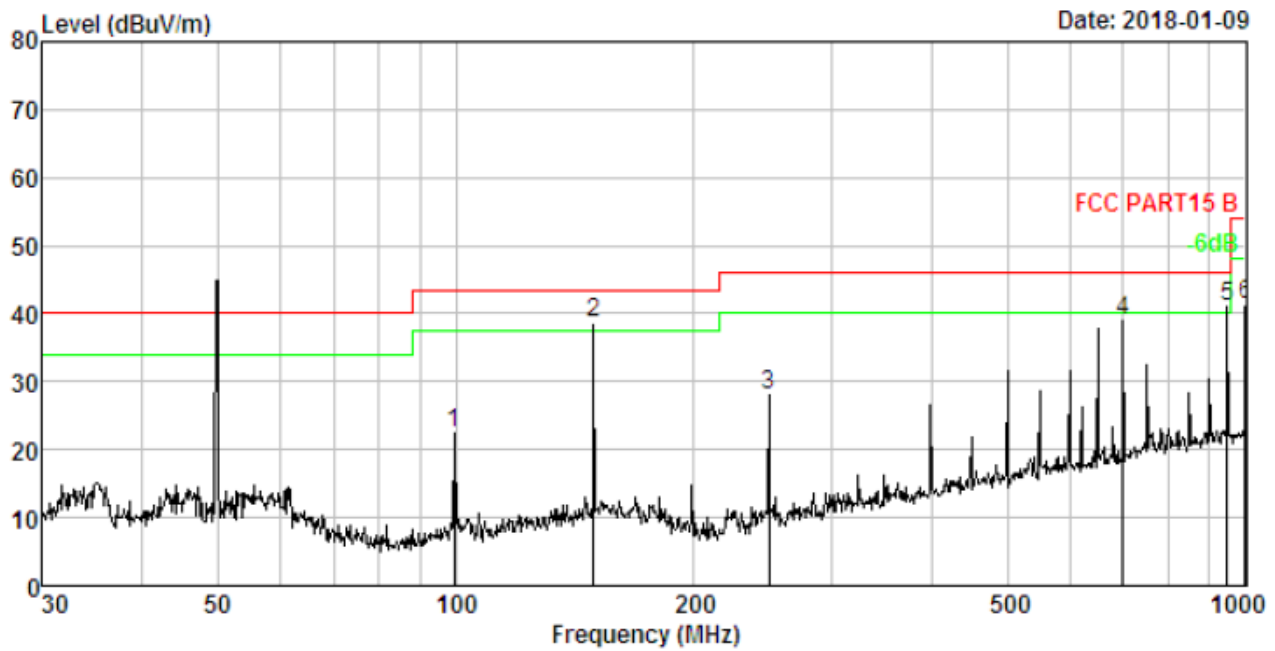
Limit line = Specific limits (dBuV) + distance extrapolation factor.

Test Frequency: 30MHz ~ 1GHz

Please refer to the following test plots:



Antenna Polarization: Horizontal

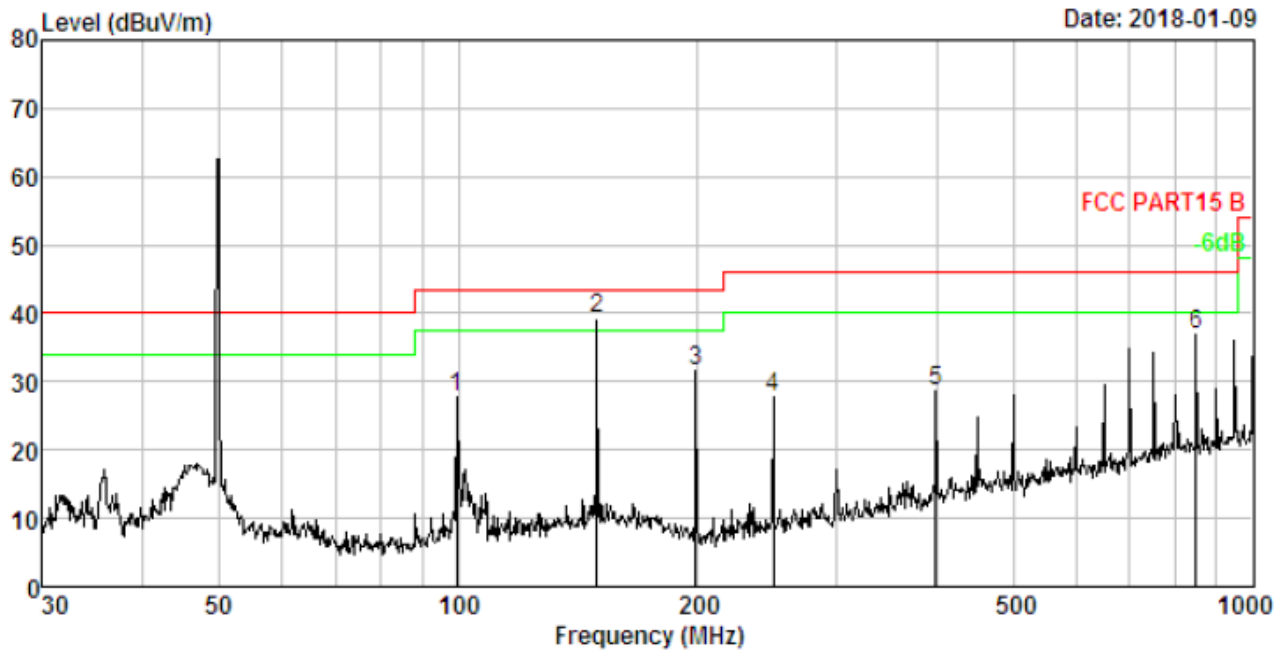


No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Receiver Reading dBuV	Preamp Factor dB	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	99.528	2.14	10.19	40.55	30.39	22.49	43.50	-21.01	QP
2.	149.486	2.51	13.87	52.72	30.53	38.57	43.50	-4.93	QP
3.	249.425	2.97	11.91	43.79	30.71	27.96	46.00	-18.04	QP
4.	699.305	3.91	20.13	45.97	31.07	38.94	46.00	-7.06	QP
5.	948.761	4.18	23.41	44.65	31.17	41.07	46.00	-4.93	QP
6.	1000.000	4.23	23.44	44.87	31.19	41.35	54.00	-12.65	QP

Remark: Emission Level = Reading + Cable Loss + ANT Factor - AMP Factor



Antenna Polarization: Vertical



No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Receiver Reading dBuV	Preamp Factor dB	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	99.528	2.14	10.19	45.86	30.39	27.80	43.50	-15.70	QP
2.	149.486	2.51	13.87	53.50	30.53	39.35	43.50	-4.15	QP
3.	199.286	2.77	10.43	49.13	30.63	31.70	43.50	-11.80	QP
4.	249.425	2.97	11.91	43.70	30.71	27.87	46.00	-18.13	QP
5.	399.030	3.40	15.30	40.76	30.87	28.59	46.00	-17.41	QP
6.	848.056	4.08	22.05	41.97	31.13	36.97	46.00	-9.03	QP

Remark: Emission Level = Reading + Cable Loss + ANT Factor - AMP Factor

Field Strength of Fundamental Emission

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading.

$$FS = RA + AF + CL - AG$$

Where

FS= Field Strength

RA= Reading Amplitude

AF=Antenna Factor

CL=Cable Attenuation Factor (Cable Loss)

AG=Amplifier Gain

Calculation for Duty Cycle:

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

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 millisecond, 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 (3MHz at 3dB down) and viewing the resulting time domain signal output from the analyzer.

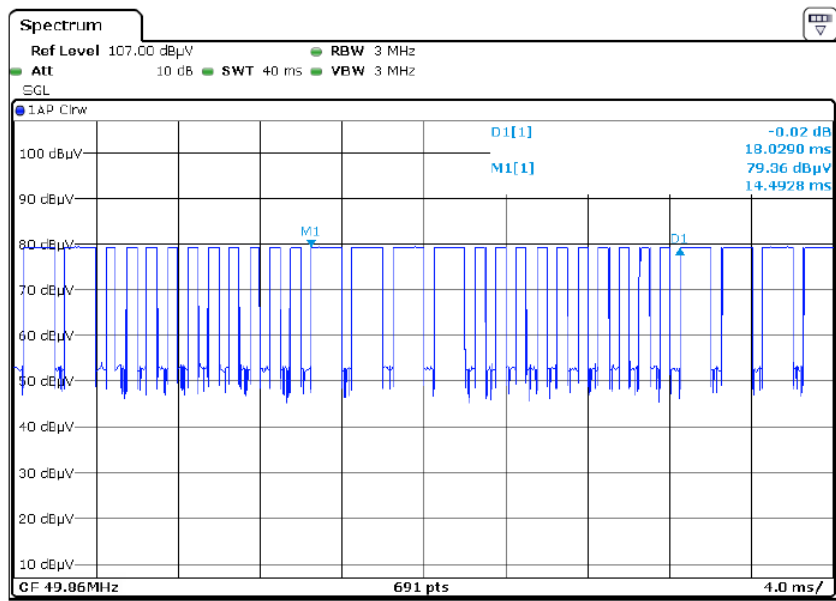
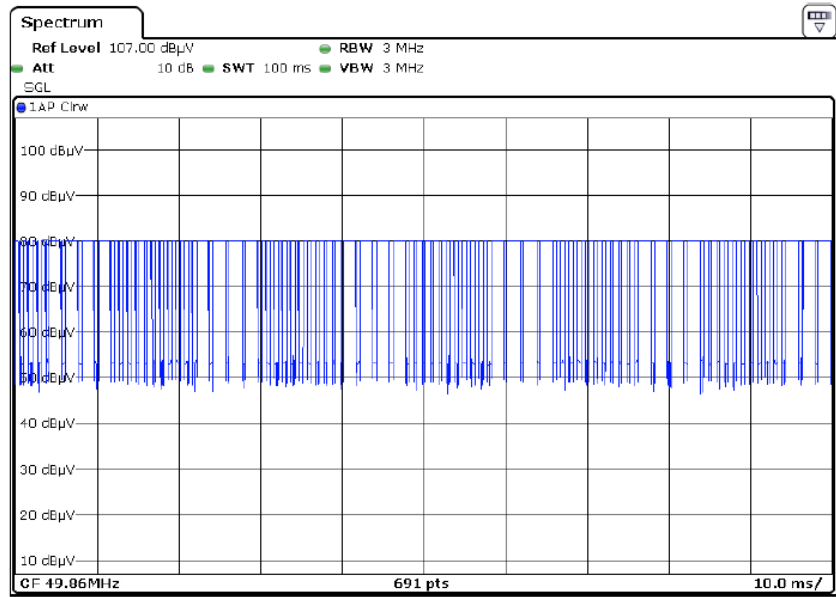
The duty cycle is simply the on-time divided by the period:

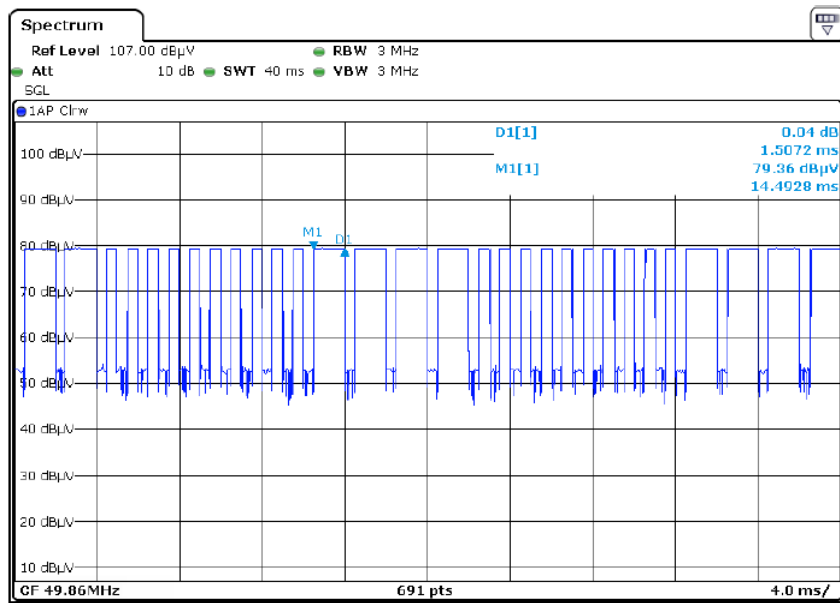
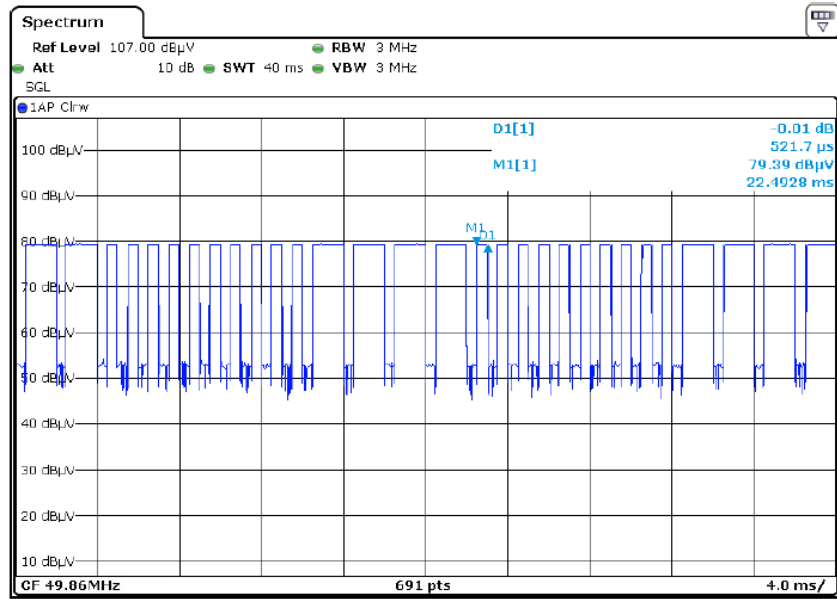
The duration of one cycle=18.029ms

Effective period of the cycle= $521.7\mu s \times 10 + 1.5072ms \times 4 = 11.2458ms$

Duty Cycle = $11.2458ms / 18.029ms = 0.6238$ or 62.38%

Therefore, the averaging factor is found by $20 \log (0.6238) = -4.1dB$





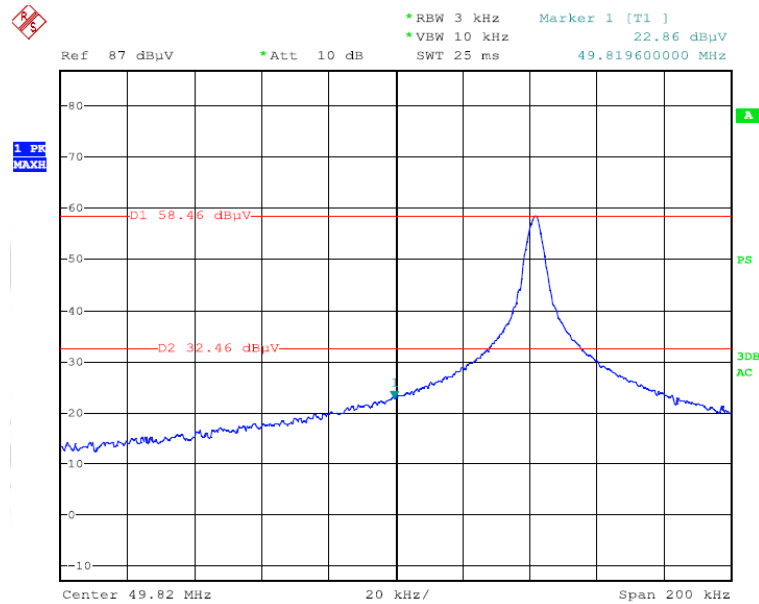
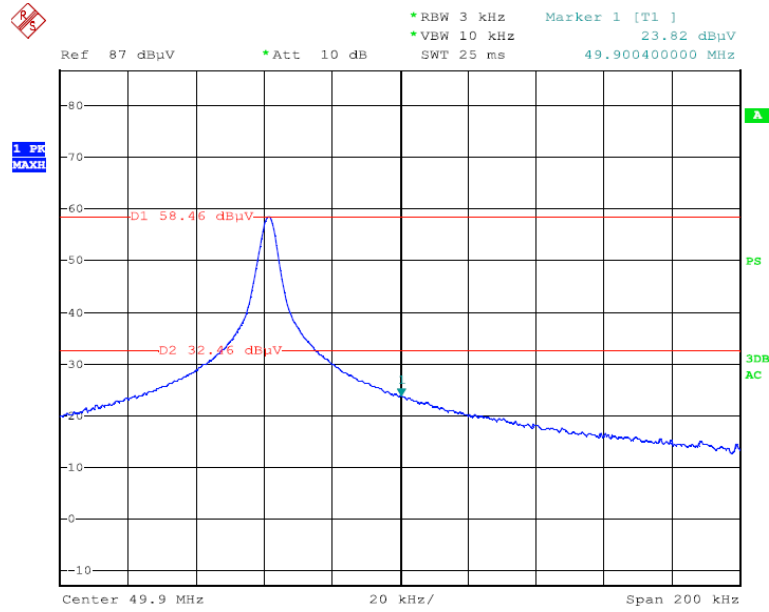
Measurement Data

Frequency	Ant.Pol.	Reading (dBuV)		Antenna Factor	Cable Loss	Test Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
(MHz)	H/V	PK	AV	(dB/m)	(dB)	PK	AV	PK	AV	PK	AV
49.86(F)	V	66.29	62.19	10.33	0.58	77.20	73.10	100.00	80.00	-22.80	-6.90
99.72	V	46.15	42.05	10.33	0.58	57.06	52.96	80.00	60.00	-22.94	-7.04
149.58	V	44.27	40.17	10.33	0.58	55.18	51.08	80.00	60.00	-24.82	-8.92
199.44	V	43.21	39.11	10.33	0.58	54.12	50.02	80.00	60.00	-25.88	-9.98
249.30	V	42.85	38.75	10.33	0.58	53.76	49.66	80.00	60.00	-26.24	-10.34
49.86(F)	H	64.18	60.08	10.33	0.58	75.09	70.99	100.00	80.00	-24.91	-9.01
99.72	H	44.73	40.63	10.33	0.58	55.64	51.54	80.00	60.00	-24.36	-8.46
149.58	H	43.62	39.52	10.33	0.58	54.53	50.43	80.00	60.00	-25.47	-9.57
199.44	H	42.05	37.95	10.33	0.58	52.96	48.86	80.00	60.00	-27.04	-11.14
249.30	H	40.69	36.59	10.33	0.58	51.60	47.50	80.00	60.00	-28.40	-12.50

Test Level= Receiver Reading + Antenna Factor + Cable Loss

Margin=Test Level-Limit

Band Edge



7 Bandwidth Measurement

7.1 Limit of Bandwidth Measurement

15.215 (c), 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 20dB bandwidth of the emission is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the 20 dB bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation. Operation within the band 49.82-49.80MHz.

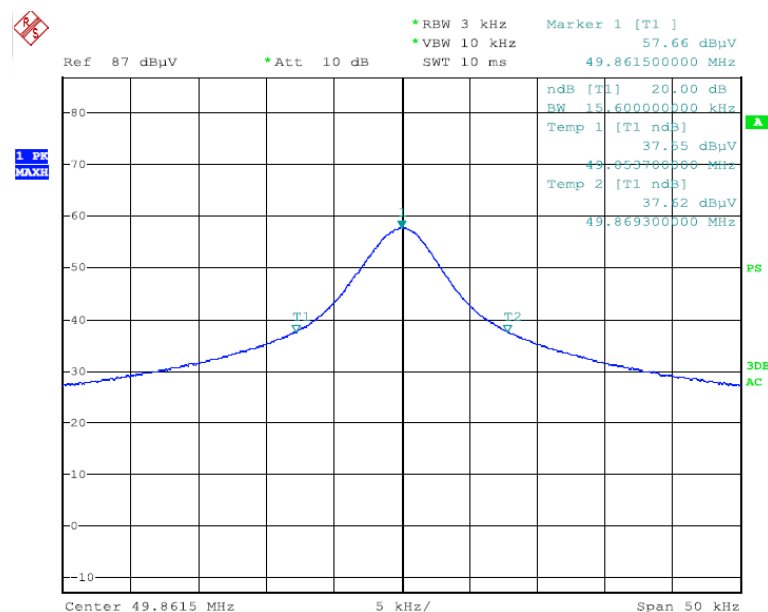
7.2 Test Procedure

The 20dB bandwidth is measured with a spectrum analyzer connected via a receive antenna placed near the EUT while the EUT is operating in transmission mode.

The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

7.3 Test Results

Lower & Upper Test Frequency Point (MHz)	Test Frequency (MHz)	Pass/Fail
Lower	49.083	Pass
Upper	49.869	Pass



8 Antenna Application

8.1 Antenna Requirement

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 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

8.2 Result

The EUT'S antenna, permanent attached antenna, is external antenna. The antenna's gain is 1dBi and meets the requirement.

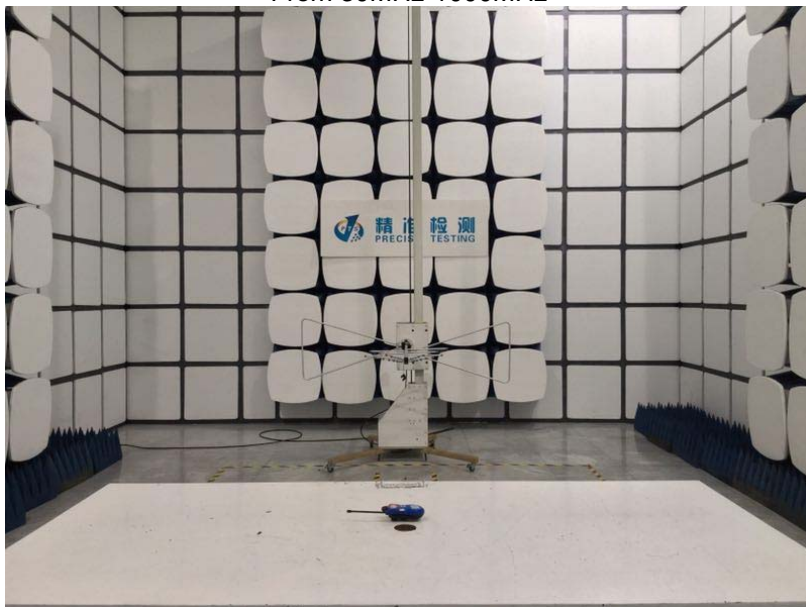


PRECISE TESTING

Report No.: PTC18010211301E-FC01

9 Test Setup

Radiated Spurious Emissions
From 30MHz-1000MHz

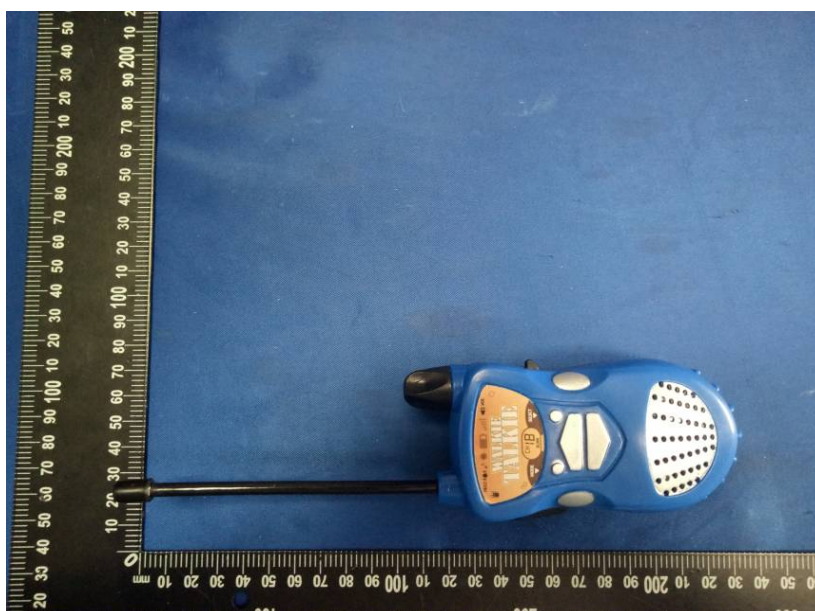




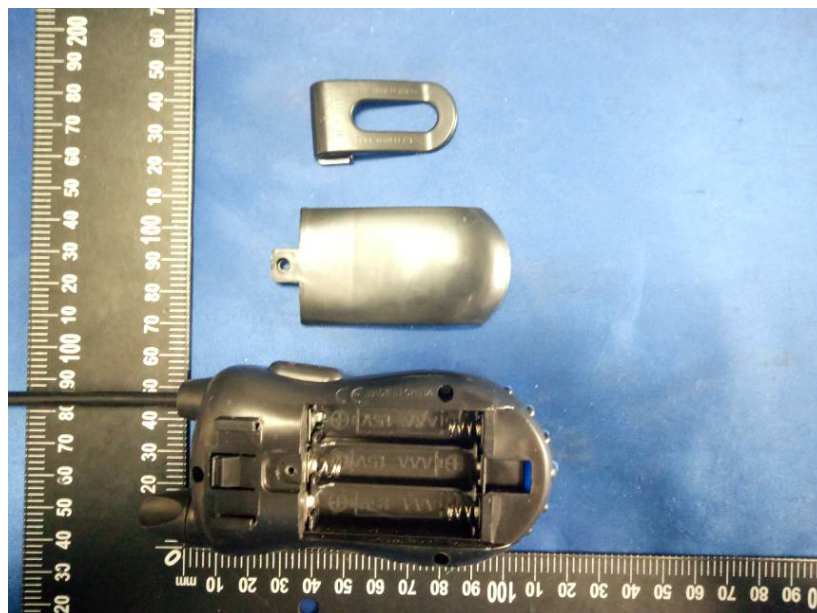
PRECISE TESTING

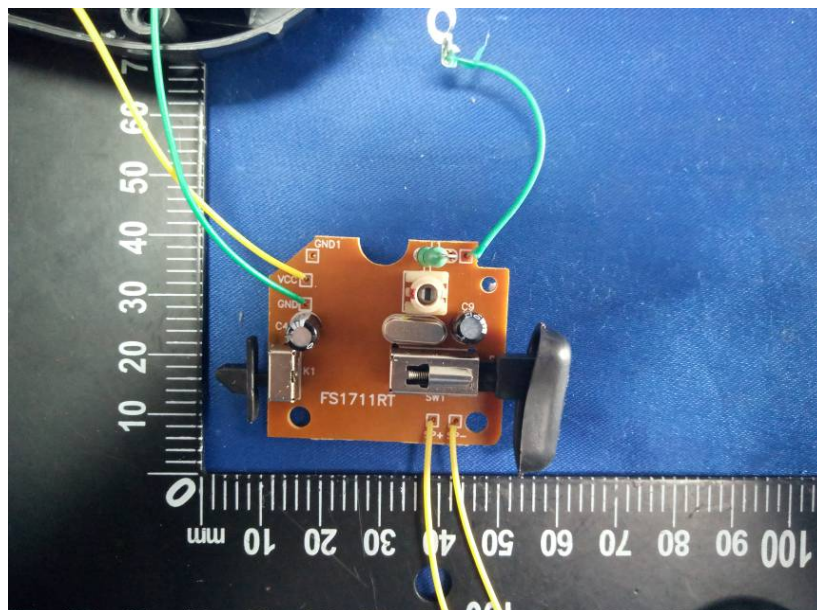
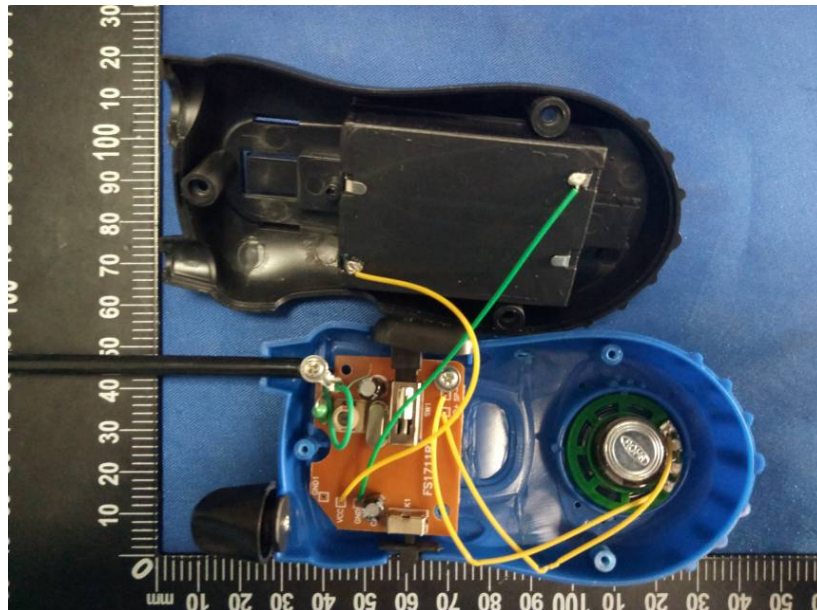
Report No.: PTC18010211301E-FC01

10 EUT Photos





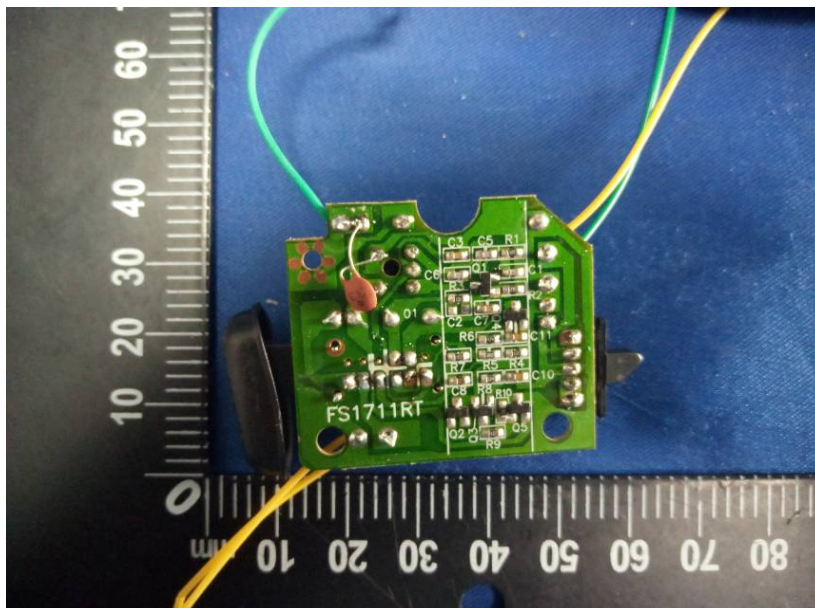






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Report No.: PTC18010211301E-FC01



*****THE END REPORT*****