



TEST REPORT

FCC PART 15.227

Report Reference No.: **CTL1702072401-WF**

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Tracy Qi

Product Name.....: RC Excavator

Model/Type reference: TG643

Trade Mark.....: ThinkGizmos

FCC ID.....: 2AKBL-TG643

Applicant's name: **STORMFORWARD RETAIL LTD**

Address of applicant: Unit 19, Lawson Hunt Industrial Park, Horsham, RH12 3 JR,
United KingDom

Test Firm: **Shenzhen CTL Testing Technology Co., Ltd.**

Address of Test Firm: Floor 1-A, Baisha Technology Park, No.3011, ShaheXi Road,
Nanshan District, Shenzhen, China 518055

Test specification.....:

Standard.....: **FCC Rules Part 15.227**: Operation within the band 26.96-27.28
MHz.

TRF Originator: Shenzhen CTL Testing Technology Co., Ltd.

Master TRF: Dated 2011-01

Date of Receipt.....: Feb. 22, 2017

Date of Test Date.....: Feb. 22, 2017–Mar. 06, 2017

Data of Issue.....: Mar. 06, 2017

Result.....: Pass

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TEST REPORT

Test Report No. :	CTL1702072401-WF	Mar. 06, 2017 Date of issue
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Equipment under Test : RC Excavator

Model /Type : TG643

Applicant : **STORMFORWARD RETAIL LTD**

Address : Unit 19, Lawson Hunt Industrial Park, Horsham,
RH12 3 JR, United KingDom

Manufacturer : **STORMFORWARD RETAIL LTD**

Address : Unit 19, Lawson Hunt Industrial Park, Horsham,
RH12 3 JR, United KingDom

Test result	Pass *
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* In the configuration tested, the EUT complied with the standards specified page 5.

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

**** Modified History ****

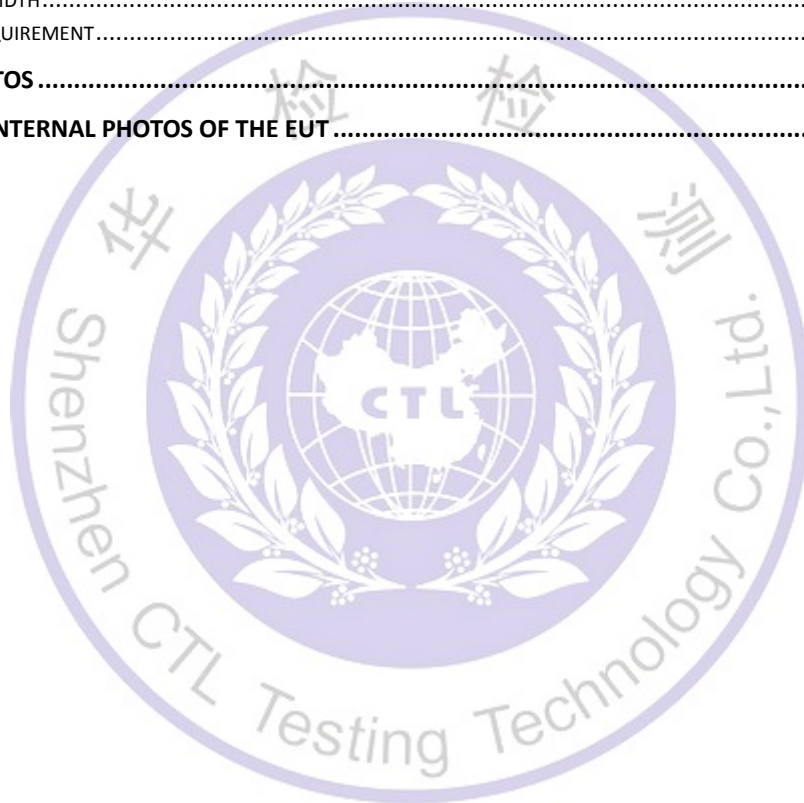
Version	Description	Issued Data	Report No.	Remark
Version 1.0	Initial Test Report Release	2017-03-06	CTL1702072401-WF	Tracy Qi



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1. SUMMARY

1.1. Test Standards

The tests were performed according to following standards:

[FCC Rules Part 15.227](#): Operation within the band 26.96-27.28 MHz.

[ANSI C63.10:2013](#) : American National Standard for Testing Unlicensed Wireless Devices

[ANSI C63.4: 2014](#): –American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40GHz

1.2. Test Description

FCC PART 15 .227		
FCC Part 15.227	Transmitter Field Strength	PASS
FCC Part 2.1049/15.215	20dB Bandwidth	PASS

Remark: The measurement uncertainty is not included in the test result.



1.3. Test Facility

1.3.1 Address of the test laboratory

Shenzhen CTL Testing Technology Co., Ltd.

Floor 1-A, Baisha Technology Park, No. 3011, Shahexi Road, Nanshan, Shenzhen 518055 China

There is one 3m semi-anechoic chamber and two line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.4 and CISPR 22/EN 55022 requirements.

1.3.2 Laboratory accreditation

The test facility is recognized, certified, or accredited by the following organizations:

IC Registration No.: 9618B

The 3m alternate test site of Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration No.: 9618B on November 13, 2013.

FCC-Registration No.: 970318

Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 970318, December 19, 2013.

1.4. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements" and is documented in the Shenzhen CTL Testing Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for CTL laboratory is reported:

Test	Measurement Uncertainty	Notes
Transmitter power conducted	±0.57 dB	(1)
Transmitter power Radiated	±2.20 dB	(1)
Conducted spurious emission 9KHz-40 GHz	±2.20 dB	(1)
Occupied Bandwidth	±0.01ppm	(1)
Radiated Emission 30~1000MHz	±4.10dB	(1)
Radiated Emission Above 1GHz	±4.32dB	(1)
Conducted Disturbance0.15~30MHz	±3.20dB	(1)

- (1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

2. GENERAL INFORMATION

2.1. Environmental conditions

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

Normal Temperature:	25°C
Relative Humidity:	55 %
Air Pressure:	101 kPa

2.2. General Description of EUT

Product Name:	RC Excavator
Model/Type reference:	TG643
Power supply:	DC 3.0V from battery
Operation frequency:	27.145MHz
Modulation :	ASK
No. of Channel :	1
Antenna type:	Internal Antenna

Note: For more details, please refer to the user's manual of the EUT.

2.3. Equipments Used during the Test

Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
LISN	R&S	ENV216	3560.6550.1 2	2016/06/02	2017/06/01
LISN	R&S	ESH2-Z5	860014/010	2016/06/02	2017/06/01
Bilog Antenna	Sunol Sciences Corp.	JB1	A061713	2016/06/02	2017/06/01
EMI Test Receiver	R&S	ESCI	103710	2016/06/02	2017/06/01
Spectrum Analyzer	Agilent	N9020	US46220290	2016/01/17	2017/01/16
Controller	EM Electronics	Controller EM 1000	N/A	2016/05/21	2017/05/20
Horn Antenna	Sunol Sciences Corp.	DRH-118	A062013	2016/05/19	2017/05/18
Active Loop Antenna	SCHWARZBECK	FMZB1519	1519-037	2016/05/19	2017/05/18
Amplifier	Agilent	8349B	3008A02306	2016/05/19	2017/05/18
Amplifier	Agilent	8447D	2944A10176	2016/05/19	2017/05/18
Temperature/Humidity Meter	Gangxing	CTH-608	02	2016/05/20	2017/05/19
High-Pass Filter	K&L	9SH10-2700/X1 2750-O/O	N/A	2016/05/20	2017/05/19
High-Pass Filter	K&L	41H10-1375/U1 2750-O/O	N/A	2016/05/20	2017/05/19

Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-10M	10m	2016/06/02	2017/06/01
Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	2016/06/02	2017/06/01
Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	2016/06/02	2017/06/01
RF Cable	Megalon	RF-A303	N/A	2016/06/02	2017/06/01

The calibration interval was one year

2.4. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: 2AKBL-TG643 filing to comply with Section 15.227 of the FCC Part 15, Subpart C Rules.

2.5. Modifications

No modifications were implemented to meet testing criteria.



3. TEST CONDITIONS AND RESULTS

3.1. Radiated Emission

Limit

the field strength of emissions from intentional radiators operated under this Section shall not exceed the following:

15.227(a):The field strength of any emission within this band shall not exceed 10,000 microvolts/meter at 3 meters. The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in Section 15.35 for limiting peak emissions apply.

15.227(b) :The field strength of any emissions which appear outside of this band shall not exceed the general radiated emission limits in Section 15.209.

Frequency (MHz)	Distance (Meters)	Radiated (dBuV/m)	Radiated (µV/m)
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

Test Procedure

1) 9 kHz to 30 MHz emissions: For testing performed with the loop antenna. The center of the loop was positioned 1 m above the ground and positioned with its plane vertical at the specied distance from the EUT. During testing the loop was rotated about its vertical axis for maximum response at each azimuth and also investigated with the loop positioned in the horizontal plane.

2) 30 MHz to 1 GHz emissions: For testing performed with the bi-log type antenna. The measurement is performed with the EUT rotated 360°, the antenna height scanned between 1m and 4m, and the antenna rotated to repeat the measurement for both the horizontal and vertical antenna polarizations.

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. The basic equation with a sample calculation is as follows:

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

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

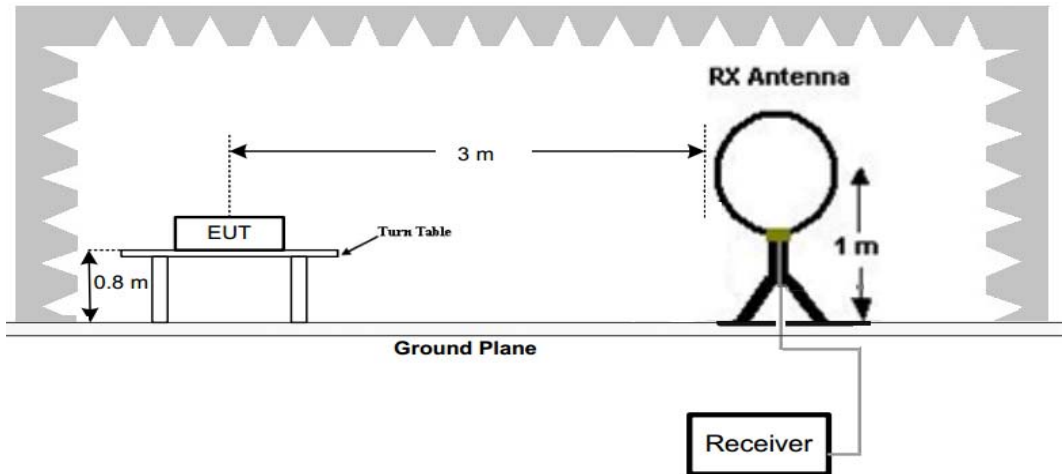
For example

Frequency (MHz)	FS (dBuV/m)	RA (dBuV/m)	AF (dB)	CL (dB)	AG (dB)	Transd (dB)
150.00	40	58.1	12.2	1.6	31.90	-18.1

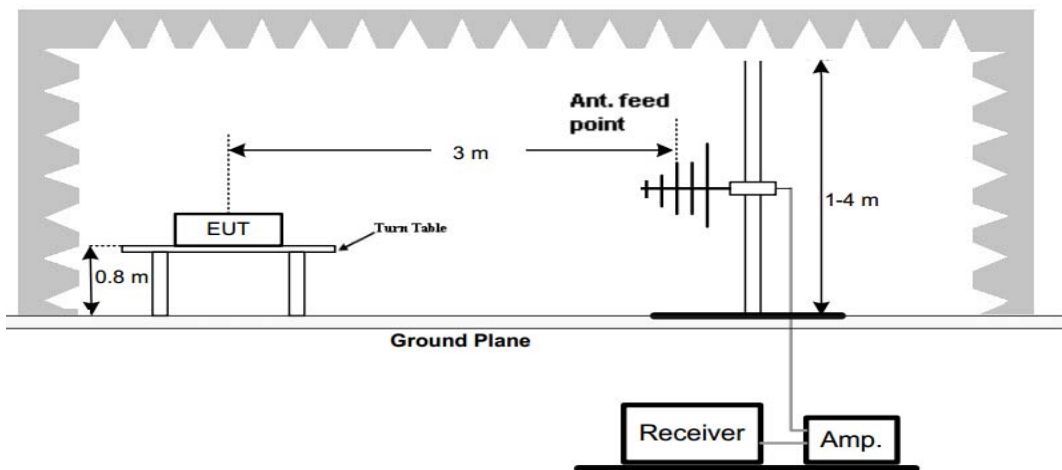
Transd=AF +CL-AG

Test Configuration

(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency below 1000MHz



Test Results**Fundamental emission:**

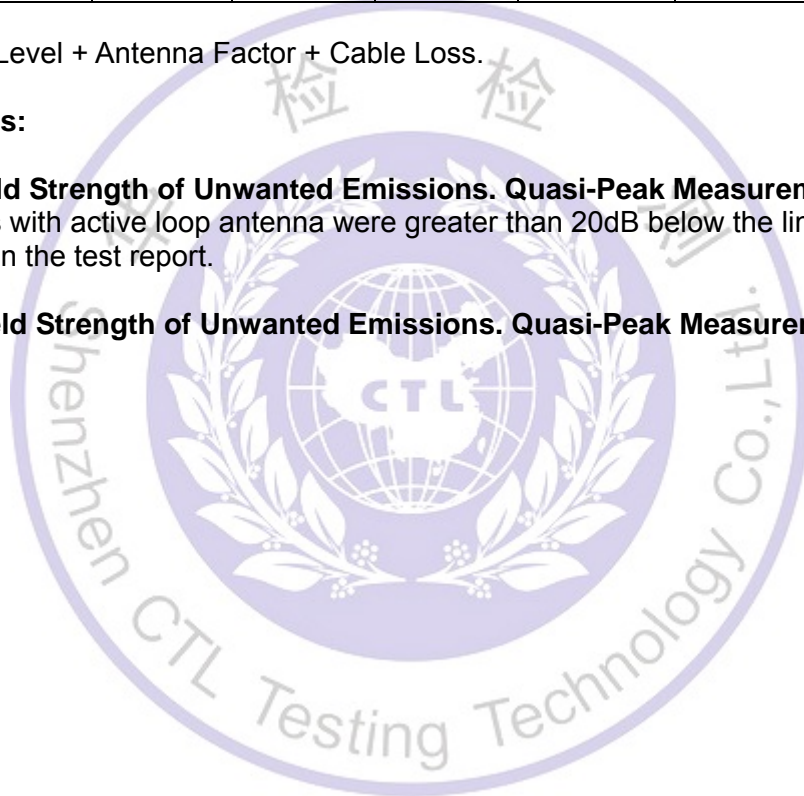
Frequency (MHz)	Polarization	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Remark
27.145	H	67.15	9.48	0.66	78.06	100.00	-21.94	PK
27.145	H	61.28	9.48	0.66	72.19	80.00	-7.81	AV
26.96	H	49.01	9.46	0.65	59.12	69.50	-10.38	QP
27.28	H	48.25	9.48	0.66	58.39	69.50	-11.11	QP

Frequency (MHz)	Polarization	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Remark
27.145	V	68.39	9.48	0.66	79.30	100.00	-20.70	PK
27.145	V	62.54	9.48	0.66	73.45	80.00	-6.55	AV
26.96	V	49.43	9.46	0.65	59.54	69.50	-9.96	QP
27.28	V	48.80	9.48	0.66	58.94	69.50	-10.56	QP

Test Level = Read Level + Antenna Factor + Cable Loss.

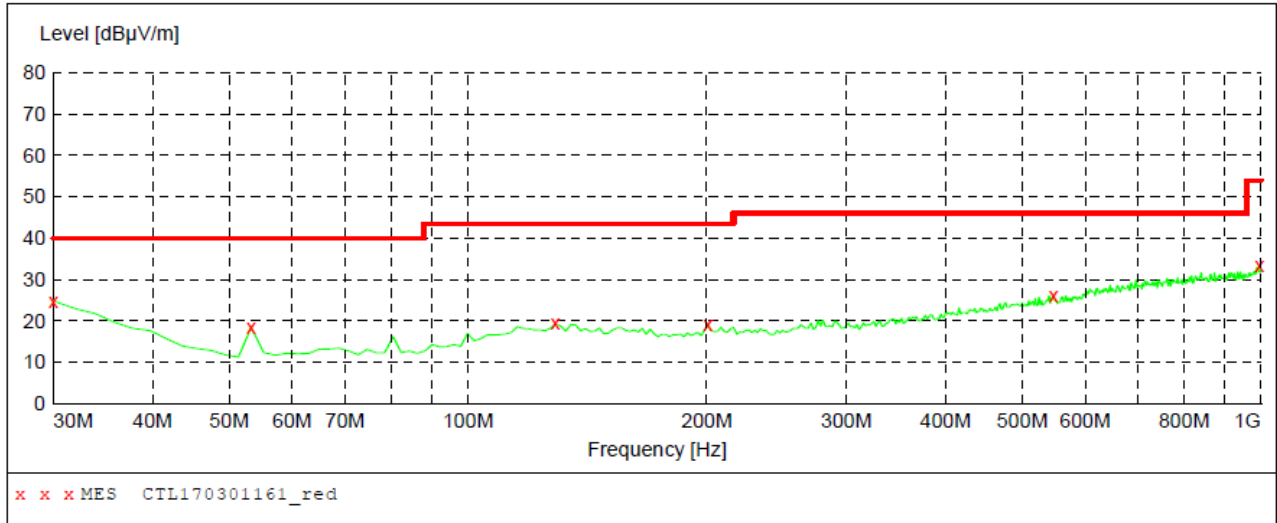
2) Other Emissions:**9 kHz~30 MHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement:**

The measurements with active loop antenna were greater than 20dB below the limit, so the test data were not recorded in the test report.

30 MHz~1 GHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement:

SWEEP TABLE: "test (30M-1G)"

Short Description:		Field Strength			
Start	Stop	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	MaxPeak	300.0 ms	120 kHz	JB1



MEASUREMENT RESULT: "CTL170301161_red"

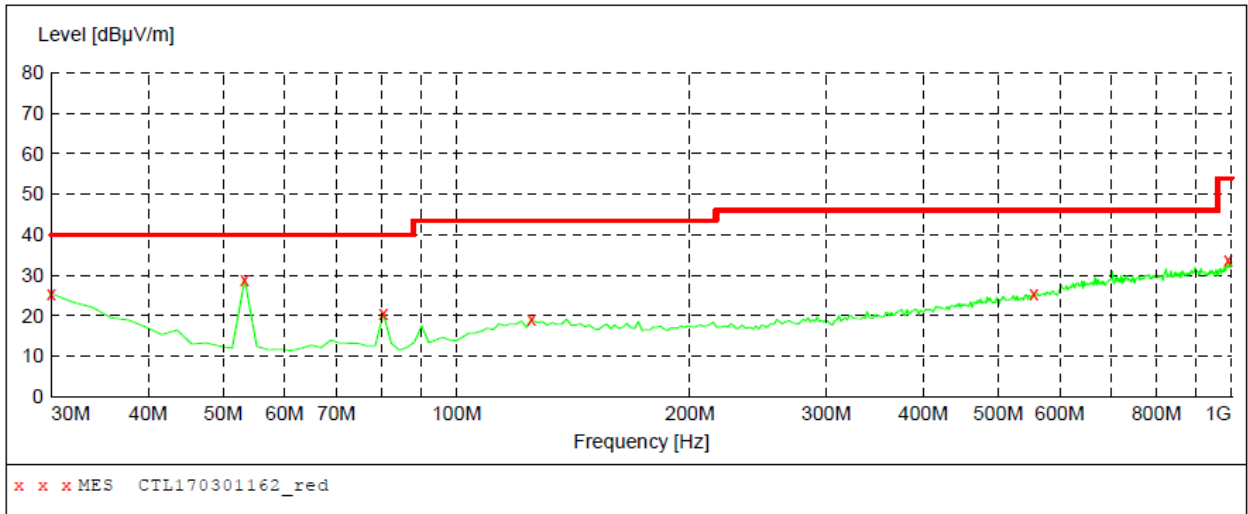
3/2/2017 8:46AM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
30.000000	24.80	20.8	40.0	15.2	---	0.0	0.00	HORIZONTAL
53.280000	18.50	8.0	40.0	21.5	---	0.0	0.00	HORIZONTAL
128.940000	19.30	14.5	43.5	24.2	---	0.0	0.00	HORIZONTAL
200.720000	19.20	14.1	43.5	24.3	---	0.0	0.00	HORIZONTAL
547.980000	26.10	20.9	46.0	19.9	---	0.0	0.00	HORIZONTAL
996.120000	33.40	27.2	54.0	20.6	---	0.0	0.00	HORIZONTAL



SWEEP TABLE: "test (30M-1G)"

Short Description:		Field Strength			
Start	Stop	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	MaxPeak	300.0 ms	120 kHz	JB1



MEASUREMENT RESULT: "CTL170301162_red"

3/2/2017 8:48AM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
30.000000	25.40	20.8	40.0	14.6	---	0.0	0.00	VERTICAL
53.280000	29.00	8.0	40.0	11.0	---	0.0	0.00	VERTICAL
80.440000	20.40	8.5	40.0	19.6	---	0.0	0.00	VERTICAL
125.060000	19.20	14.6	43.5	24.3	---	0.0	0.00	VERTICAL
555.740000	25.50	21.1	46.0	20.5	---	0.0	0.00	VERTICAL
990.300000	33.70	27.1	54.0	20.3	---	0.0	0.00	VERTICAL



3.2. 20dB Bandwidth

Limit

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 20 dB 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: 26.96 – 27.28 MHz.

Test Procedure

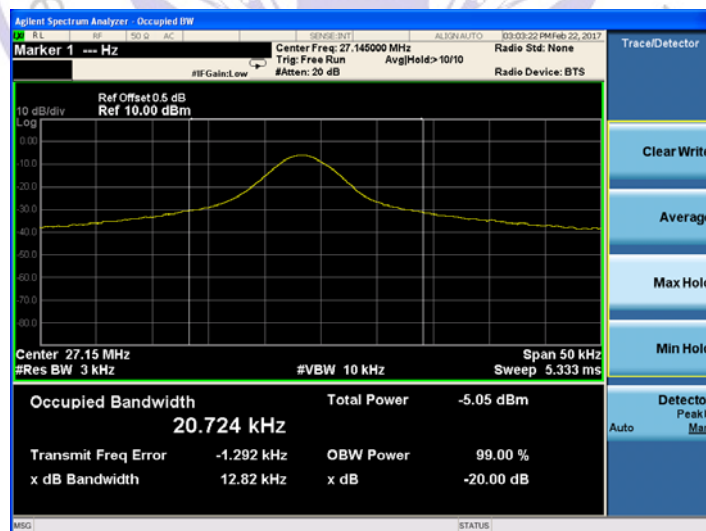
The 20dB bandwidth is measured with a spectrum analyzer connected via a receive antenna placed near the EUT while the EUT is operating in transmission mode.

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

Test Configuration



Test Results



3.3. Antenna Requirement

Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203:

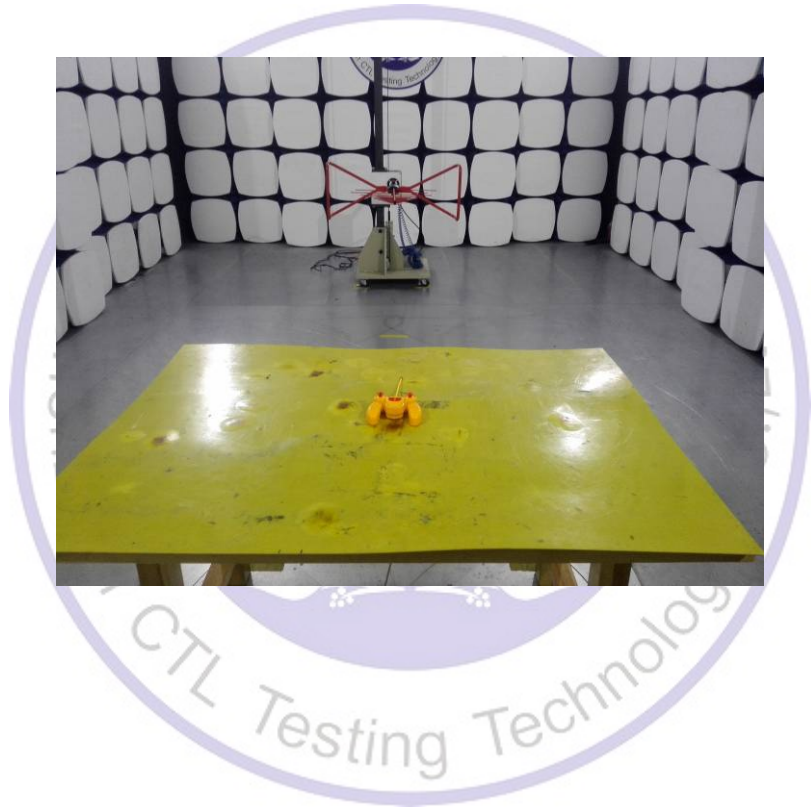
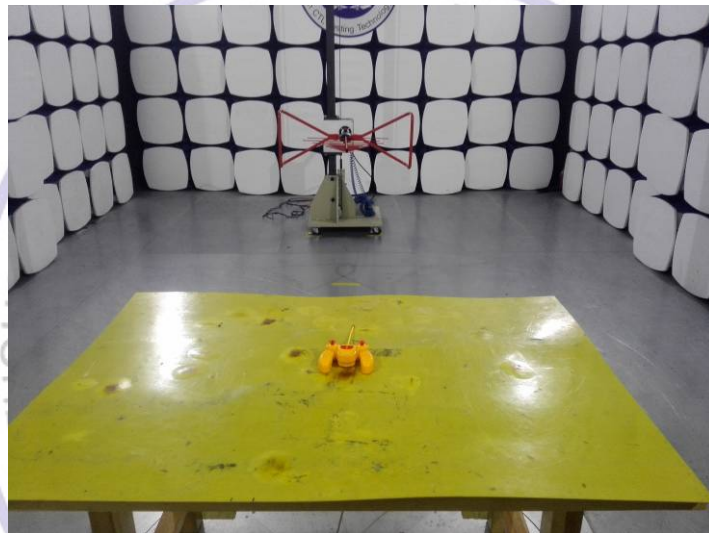
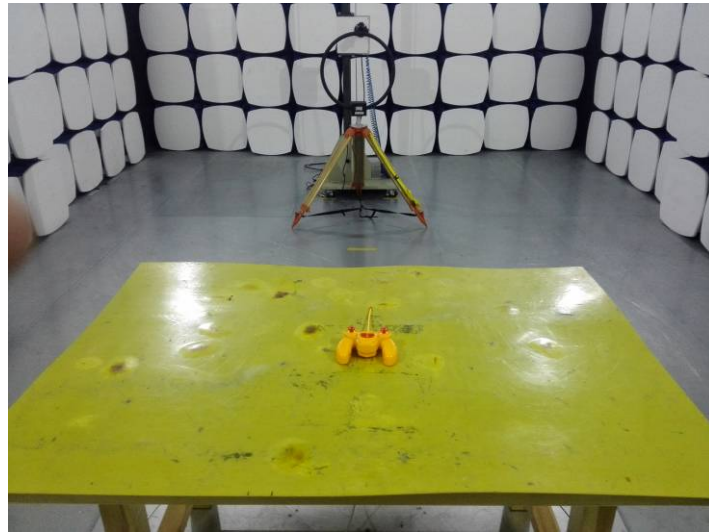
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited

Test Result:

Compliance. The maximum gain of antenna was 2.0dBi.

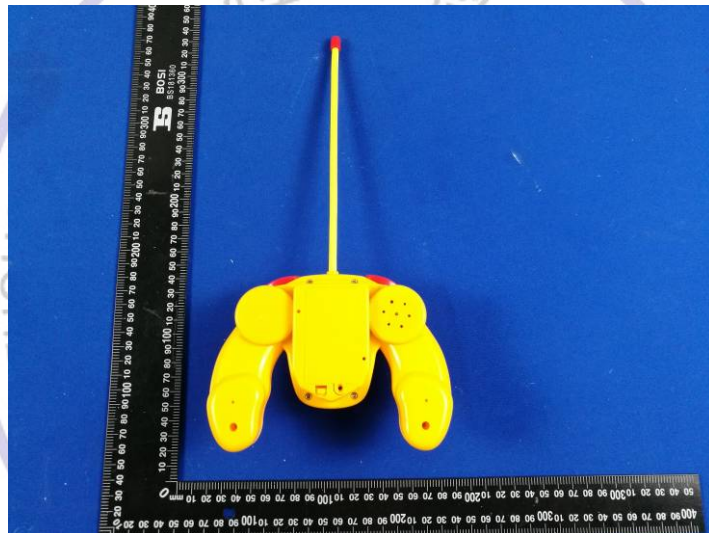


4. TEST SETUP PHOTOS



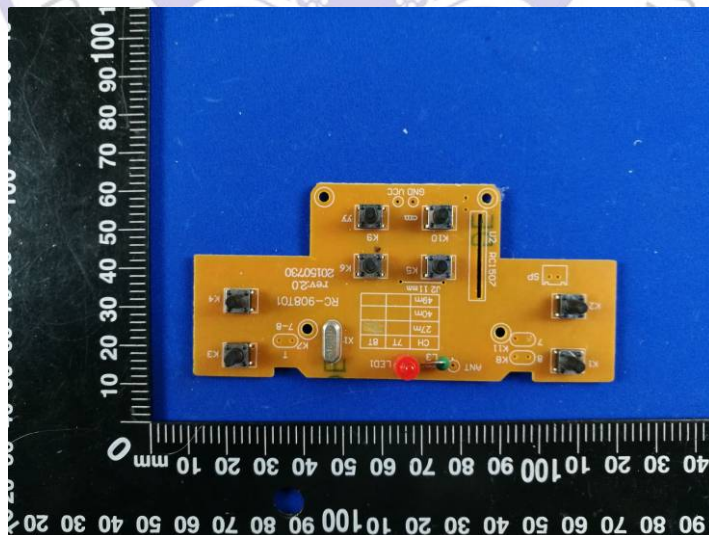
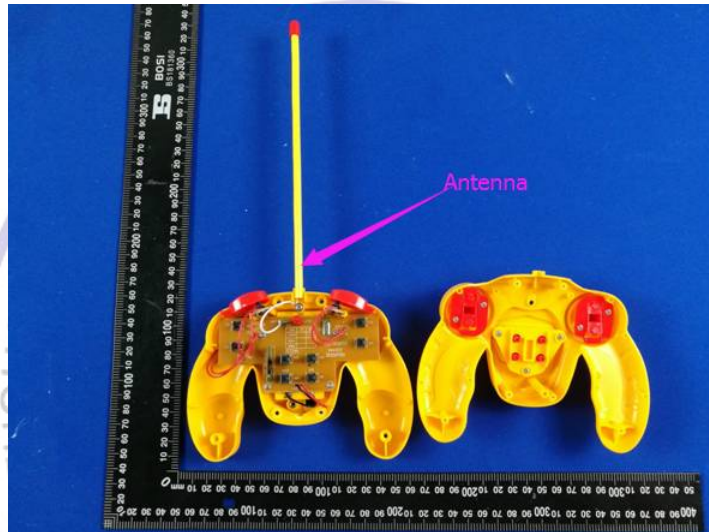
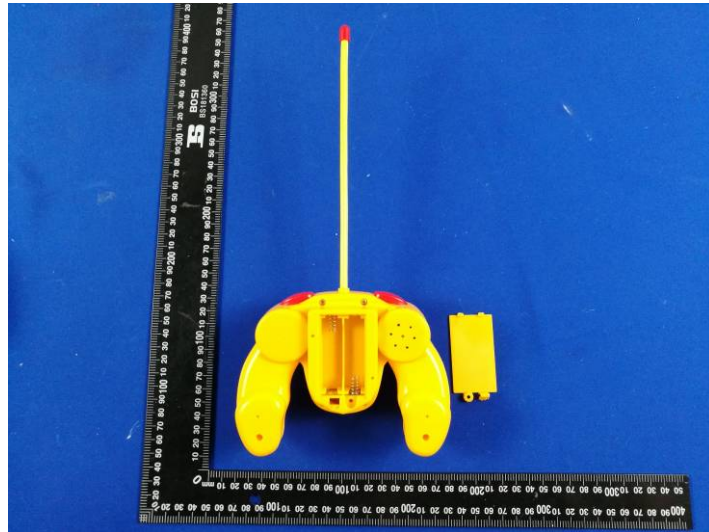
5. External and Internal Photos of the EUT

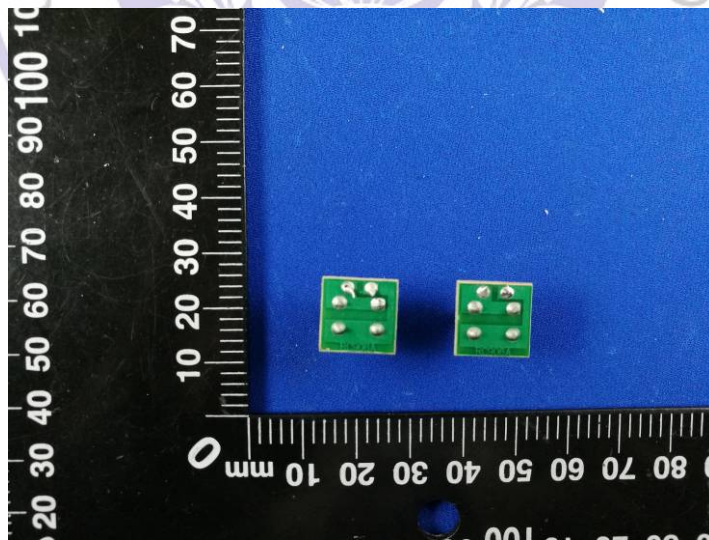
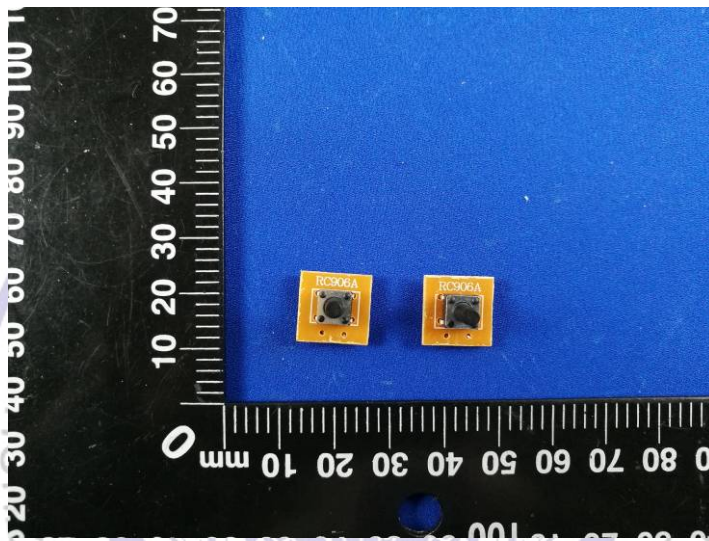
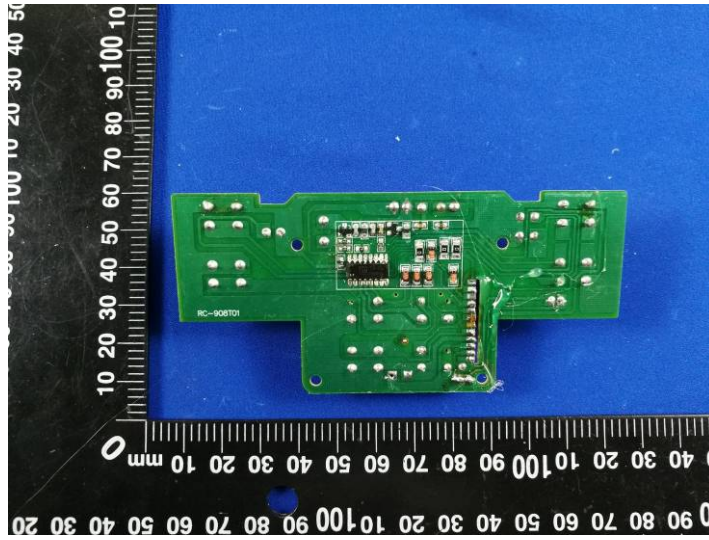
External Photos of EUT

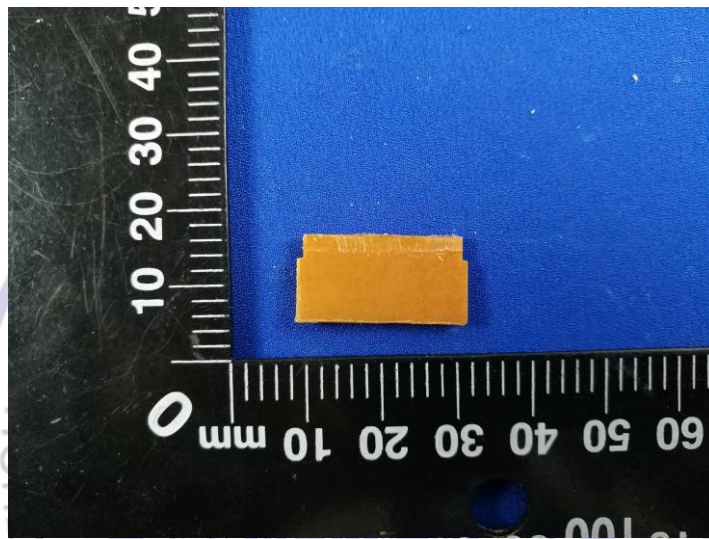
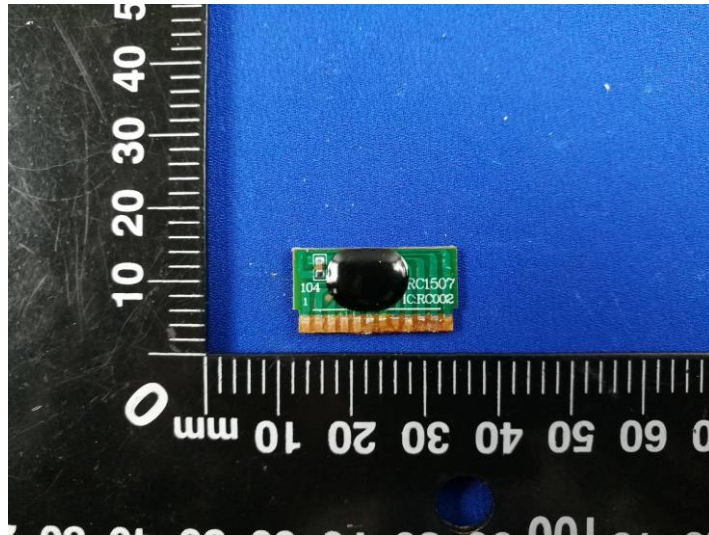




Internal Photos of EUT







***** End of Report *****

