

Date: 2001-09-08

TEST REPORT

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No.: HM105684

FCC PART 15 SUBPART C CERTIFICATION REPORT

FOR LOW POWER TRANSMITTER

TEST REPORT No.: HM105684

Equipment Under Test [EUT]:

Model Number:

Applicant:

FCC ID :

Dish IR-RF 443MHz Transmitter

LF-DISH TX

Terk Technologies Corp.

PV6LF-DISHTX

Date: 2001-09-08

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CONCLUSION

The submitted product was deemed to have COMPLIED with the requirements of Federal Communications Commission [FCC] Rules and Regulations Part 15. The tests were performed in accordance with the standards described above and on Section 2.2 in this Test Report.

Law Man Kit

Verify by

Patrick Wong

Patrick Wong
for Managing Director

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1.0 General Details

1.1 Test Laboratory

The Hong Kong Standards and Testing Centre Ltd.
EMC Laboratory
10 Dai Wang Street, Taipo Industrial Estate
New Territories, Hong Kong

Telephone: 852 2666 1888
Fax: 852 2664 4353

1.2 Applicant Details **Applicant**

TERK TECHNOLOGIES CORP.
Terk Technologies Corp. 63 Mall Drive Commack,
NY 11725

Telephone: 631.543.1900 (ext. 139)
Fax: 631 543 8088

HKSTC Code Number for Applicant

EWI001

Manufacturer

EWIG INDUSTRIES CO., LTD.
13/F., Houtex Ind'l Bldg., 16 Hung To Road, Kwun Tong,
Kowloon, Hong

Telephone: 852 2951 6879
Fax: 852 2343 5799

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1.3 Equipment Under Test [EUT]

Description of Sample

Product: Dish IR-RF 433MHz Transmitter
Manufacturer: Ewig Industries Co., Ltd.
Brand Name: Terk Technologies Corp.
Model Number: LF-DISH TX
Input Voltage: 12Vd.c. ("A23" size battery x 1)

1.3.1 Description of EUT Operation

The Equipment Under Test (EUT) is a Terk Technologies Corp., 444.36MHz RF wireless remote control. The EUT is to transmit RF signal while each button is be pressed Modulation by Data Code. Tape is pulses modulation.

1.4 Date of Order

2000-08-20

1.5 Submitted Sample(s):

1 Set per model

1.6 Test Duration

2001-09-05

1.7 Country of Origin

US

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1.8 Additional Information of EUT

	Submitted	Not Available
User Manual	☒	☐
Part List	☒	☐
Circuit Diagram	☒	☐
Printed Circuit Board [PCB] Layout	☒	☐
Block diagram	☒	☐
FCC ID Label	☒	☐

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2.0 Technical Details

2.1 Investigations Requested

Perform ElectroMagnetic Interference measurement in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15 and ANSI C63.4:1992 for FCC Certification.

2.2 Test Standards and Results Summary Tables

EMISSION Results Summary						
Test Condition	Test Requirement	Test Method	Class / Severity	Test Result		
				Pass	Failed	N/A
Field Strength of Fundamental Emissions & Spurious Emissions	FCC 47CFR 15.231a	ANSI C63.4:1992	N/A	☒	☐	☐
Radiated Emissions, 30MHz to 1GHz	FCC 47CFR 15.209	ANSI C63.4:1992	Class B	☒	☐	☐
Conducted Emissions on AC, 0.45MHz to 30MHz	FCC 47CFR 15.207	ANSI C63.4:1992	Class B	☐	☐	☒

Note: N/A - Not Applicable

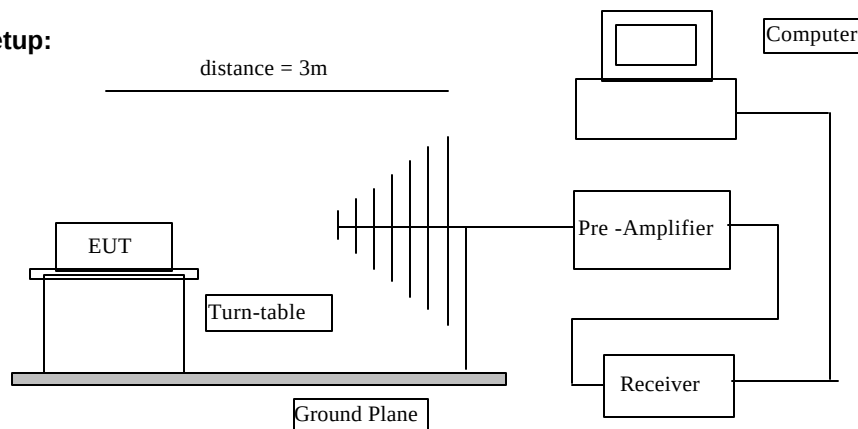
3.0 Test Results**3.1 Emission****3.1.1 Radiated Emissions**

Test Requirement:	FCC 47CFR 15.231a
Test Method:	ANSI C63.4:1992
Test Date:	2001-09-05
Mode of Operation:	On mode

Test Method:

The sample was placed 0.8m above the ground plane on the OATS *. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigate all operating modes, rotated about all 3 axis (X, Y & Z) to obtain worst position, manipulating interconnecting cables, rotating turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

*: OATS [Open Area Test Site] located at HKSTC with a metal ground plane on filed with the FCC pursuant to section 2.948 of the FCC rules, with Registration Number: 90657.

Test Setup:

Limits for Field Strength of Fundamental Emissions [FCC 47CFR 15.231a]:

Frequency Range of Fundamental	Field Strength of Fundamental Emissions	Field Strength of Spurious Emissions
[MHz]	[$\mu\text{V/m}$]	[$\mu\text{V/m}$]
40.66-40.70	2,250	225
70-130	1,250	125
130-174	1250 to 3,750 *	125 to 375 *
174-260	3,750	75
260-470	3,750 to 12,500 *	375 to 1250 *
Above 470	12,500	1250

** Linear interpolations

Where F is the frequency in MHz, the formula for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, $\mu\text{V/m}$ at meters=56.81818(F)-6136.3636; for the band 260-470 MHz, $\mu\text{V/m}$ at 3 meters =41.6667(F)-7083.3333. The maximum permissible unwanted emission level is 20dB below the maximum fundamental level.

Results:

Field Strength of Fundamental Emissions						
Peak Value						
Frequency	Level @3m	Correction Factor	Field Strength	Field Strength	Limit ** @3m	Antenna Polarity
MHz	dB μV	dB/m	dB $\mu\text{V/m}$	$\mu\text{V/m}$	$\mu\text{V/m}$	
444.36	67.5	22.4	89.9	31,260.79	114,316.81	Horizontal

Field Strength of Spurious Emissions						
Peak Value						
Frequency	Level @3m	Correction Factor	Field Strength	Field Strength	Limit @3m	Antenna Polarity
MHz	dB μV	dB/m	dB $\mu\text{V/m}$	$\mu\text{V/m}$	$\mu\text{V/m}$	
888.7	31.4	34.6	66.0	1,995.3	11,431.68	Horizontal
+1333.1	23.5	35.2	58.7	861.0	5000.0	Horizontal
1777.4	<1.0	30.9	31.9	39.4	11,431.68	Vertical
+2221.8	<1.0	26.2	27.2	22.9	5000.0	Vertical
+2666.2	<1.0	28.0	29.0	28.2	5000.0	Vertical
3110.5	<1.0	28.5	29.5	29.9	11,431.68	Vertical
3554.9	<1.0	30.6	31.6	38.0	11,431.68	Vertical
+3999.2	<1.0	32.0	33.0	44.7	5000.0	Vertical
+4443.6	<1.0	34.0	35.0	56.2	5000.0	Vertical

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Results:

Field Strength of Fundamental Emissions Average Value *						
Frequency MHz	Level @3m dB μ V	Correction Factor dB/m	Field Strength dB μ V/m	Field Strength μ V/m	Limit ** @3m μ V/m	Antenna Polarity
444.36	47.5	22.4	69.9	3,126.1	11,431.68	Horizontal

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Level @3m dB μ V	Correction Factor dB/m	Field Strength dB μ V/m	Field Strength μ V/m	Limit @3m μ V/m	Antenna Polarity
888.7	11.4	34.6	46.0	199.5	1,143.16	Horizontal
+1333.1	3.5	35.2	38.7	86.1	500.0	Horizontal
1777.4	<1.0	30.9	31.9	39.4	1,143.16	Horizontal
+2221.8	<1.0	26.2	27.2	22.9	500.0	Vertical
+2666.2	<1.0	28.0	29.0	28.2	500.0	Vertical
3110.5	<1.0	28.5	29.5	29.9	1,143.16	Vertical
3554.9	<1.0	30.6	31.6	38.0	1,143.16	Vertical
+3999.2	<1.0	32.0	33.0	44.7	500.0	Vertical
+4443.6	<1.0	34.0	35.0	56.2	500.0	Vertical

Remarks:

*: Adjusted by Duty Cycle = -20dB

**: According to FCC C47CFR 15.231a,
FCC Limit for Average Measurement = $41.6667(444.36\text{MHz}) - 7083.3333 = 11,431.68151\mu\text{V/m}$

+: Denotes restricted band of operation.
Measurement were made using a peak detector. Any emission less than 1000 MHz and falling within the restricted bands of FCC Rules Part 15 Section 15.205 were not adjusted for averaging and the limit of FCC Rules Part 15 Section 15.209 were applied

Correction Factor included Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty = 30MHz to 300MHz $\pm 3.7\text{dB}$
300MHz to 1GHz $+3.0\text{dB} / -2.7\text{dB}$

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Limited for Radiated Emissions [FCC 47 CFR 15.209 Class B]:

Frequency Range	Quasi-Peak Limits
[MHz]	[μV/m]
30-88	100
88-216	150
216-960	200
Above960	500

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

Results:

Radiated Emissions						
Quasi-Peak						
Frequency	Level	Correction	Field	Field	Limit	Antenna
MHz	@3m	Factor	Strength	Strength	@3m	Polarity
	dBμV	dB/m	dBμV/m	μV/m	μV/m	
NO EMISSION DETECTED WITHIN 20dB OF THE FCC LIMITS						

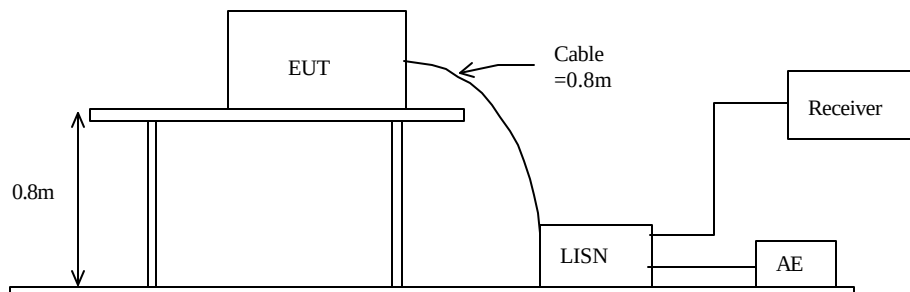
3.1.1 Conducted Emissions (0.45MHz to 30MHz)

Test Requirement:	FCC 47CFR 15.207
Test Method:	ANSI C63.4:1992
Test Date:	2001-09-05
Mode of Operation:	Not Applicable

Test Method:

The test was performed in accordance with ANSI C63.4:1992, with the following: an initial measurement was performed in peak and average detection mode on the live line. Any emissions recorded within 30dB of the relevant limit line were re-measured using quasi-peak and average detection on the live and neutral lines with the worst case recorded in the table of results.

Test Setup:



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Limit for Conducted Emissions (FCC 47 CFR 15.207):

Frequency Range [MHz]	Quasi-Peak Limits [μV/m]
0.45-30	250

Limits for Conducted Emissions Test, please refer to limit lines (Quasi-Peak) in the following diagram labelled as (QP).

Results:

The EUT is operated by a single source of internal battery power [located in the battery compartment], therefore power line conducted emission was deemed unnecessary.

Remarks:

Calculated measurement uncertainty = $\pm 2.3\text{dB}$

3.2 20dB Bandwidth of Fundamental Emission

Test Requirement:	FCC 47 CFR 15.231
Test Method:	ANSI C63.4:1992 (Section 13.1.7)
Test Date:	2001-09-05
Mode of Operation:	On mode

Test Method:

The bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst-case (i.e. the widest) bandwidth.

Test Setup:

As Test Setup of clause 3.1.1 in this test report.

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Limits for 20 dB Bandwidth of Fundamental Emission:

Frequency Range [MHz]	20dB Bandwidth [KHz]	FCC Limits * [KHz]
433.6	620.0	1084

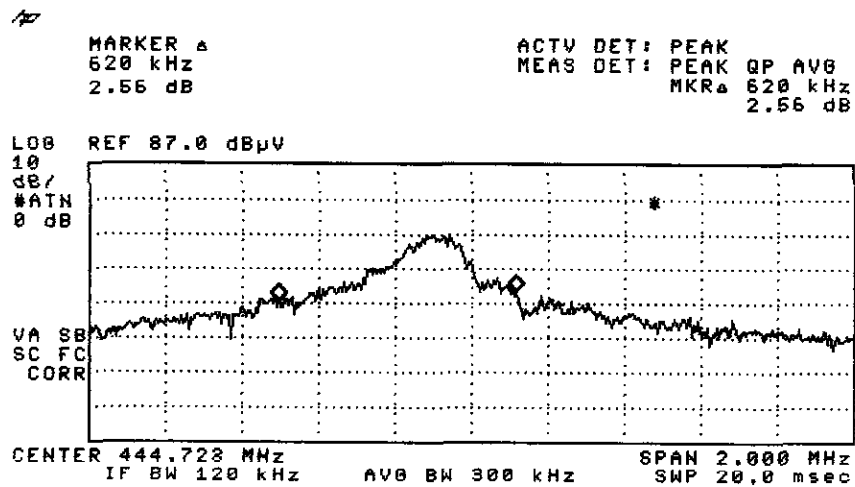
Remarks:

*: FCC Limit for Bandwidth measurement = (0.25%)(Center Frequency)
=(0.0025)(444.36)
=620KHz

Results:

The following figure is the measured bandwidth of Fundamental Emission.

20dB Bandwidth of Fundamental Emission



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Appendix A

Test Equipment Audit

Radiated Emission

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL.
EM007	SPECTRUM ANALYZER	HEWLETT PACKARD	HP85660B	3144A21192	07/09/01
EM008	SPECTRUM ANALYZER DISPLAY	HEWLETT PACKARD	HP85662A	3144A20514	07/09/01
EM009	QUASI PEAK ADAPTOR	HEWLETT PACKARD	HP85650A	3303A01702	07/09/01
EM010	RF PRESELECTOR	HEWLETT PACKARD	HP85685A	3221A01410	07/09/01
EM011	ATTENUATOR/SWITCH	HEWLETT PACKARD	HP11713A	2508A10595	07/09/01
EM012	PRE-AMPLIFIER	HEWLETT PACKARD	HP8449B	3008A00262	07/09/01
EM013	CONTROLLER (COMPUTER), COLOR MONITOR, KEYBOARD & MOUSE FLOPPY DRIVE	HEWLETT PACKARD HEWLETT PACKARD HEWLETT PACKARD	HP9000 HP A1097C HP9133L	6226A60314 3151J39517 2623A02468	CM
EM131	PORTABLE SPECTRUM ANALYSER	HEWLETT PACKARD	8595EM	3710A00155	10/07/00
EM017	ANTENNA	ARA INC.	LPB-2513/A	1069	17/02/00
EM020	HORN ANTENNA	EMCO	3115	4032	09/08/00
EM072	SIGNAL GENERATOR	HEWLETT PACKARD	8640B	1948A11892	30/03/98
EM083	HKSTC OPEN AREA TEST SITE	HKSTC	N/A	N/A	15/02/01
EM145	EMI TEST RECEIVER	R & S	ESCS 30	830245/021	31/05/00

Conducted Emission

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL.
EM078	VARIAC	SHANGHAI VOLTAGE	TDGC-3/0.5	N/A	CM
EM081	SMALL SCREENED ROOM	MIKO INST HK	N/A	N/A	10/09/00
EM002	LISN	EMCO	3825-2	9005-1657	27/07/99
EM119	LISN	R & S	ESH3-Z5	0831.5518.52	31/08/00
EM145	EMI TEST RECEIVER	R & S	ESCS 30	830245/021	31/05/00
EM120	EMI TEST RECEIVER	R&S	ESHS10	1004.0401.10	04/09/00
EM127	ISOLATION TRANSFORMER 220 TO 300	WING SUN	N/A	N/A	N/A
EM142	PLUSE LIMITER	R & S	ESH3Z2	357.8810.52	29/01/00

Remarks:

CM Corrective Maintenance
N/A Not Applicable or Not Available
TBD To Be Determined

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Appendix B**Duty Cycle Correction During 100msec**

Each function key sends a different series of characters, but each packet period (63.5msec) never exceeds a series of 14 long (450 μ sec) and short (375 μ sec) pulses. Assuming any combination of short and long pulses may be obtained due to encoding the worse case transmit duty cycle would be considered $14 \times 450\mu\text{sec}$ per 63.5msec = 10% duty cycle. Figure A through C show the characteristics of the pulse train for one of these function.

Remarks:

Duty Cycle Correction = $20\text{Log}(0.1) = -20\text{dB}$

The following figures [Figure A to Figure C] showed the characteristics of the pulse train for one of these functions.

Figure A [Pulse Train]

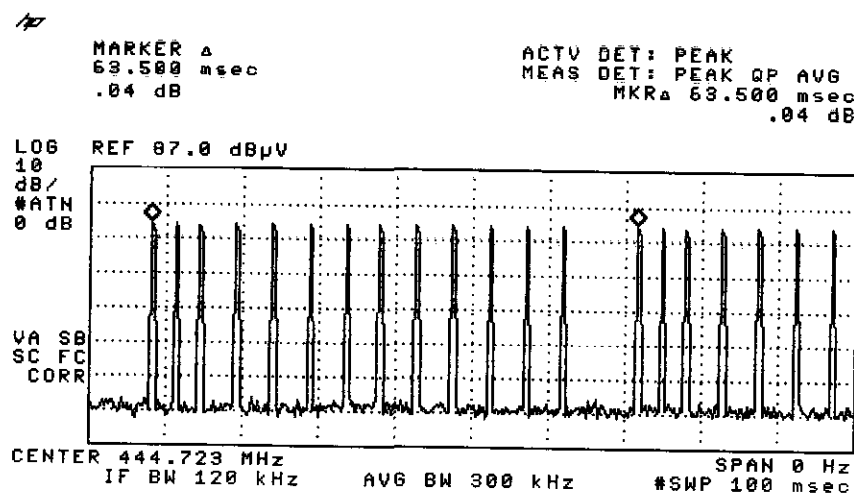


Figure B [Long Pulse]

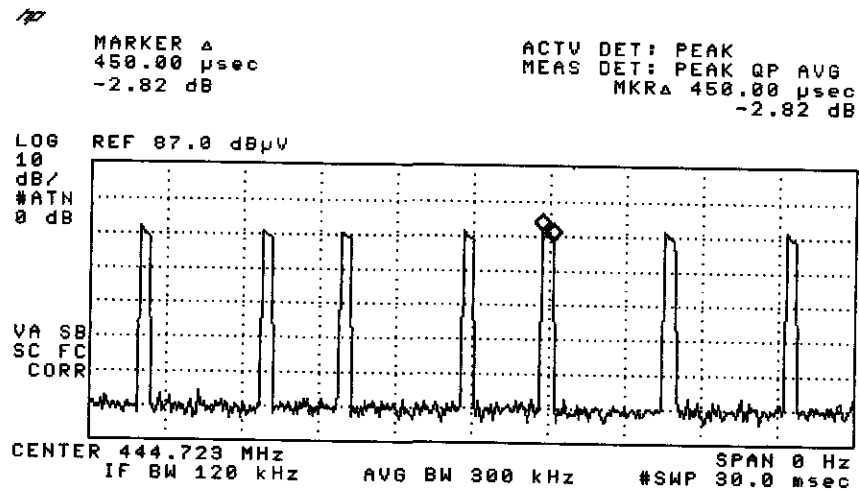
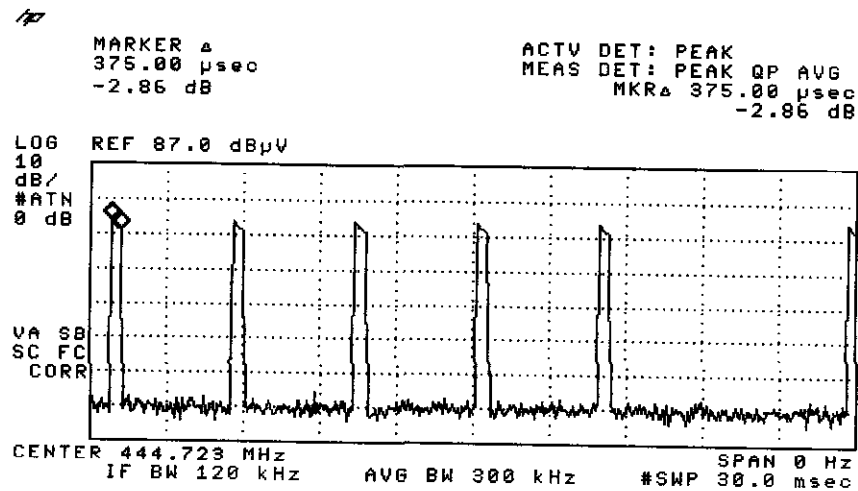


Figure C [Short Pulse]



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Appendix C

Periodic Operation [FCC 47CFR 15.231a]

According to FCC 47CFR15.231a. A transmitter manually activated must automatically deactivate within not more than 5 seconds of being released. The transmitter is convert seconds of being released. The EUT continues to transmit while receiving the IR signal from controller. The EUT ceases transmission almost immediately upon being released controller.

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Appendix D

Photographs of EUT

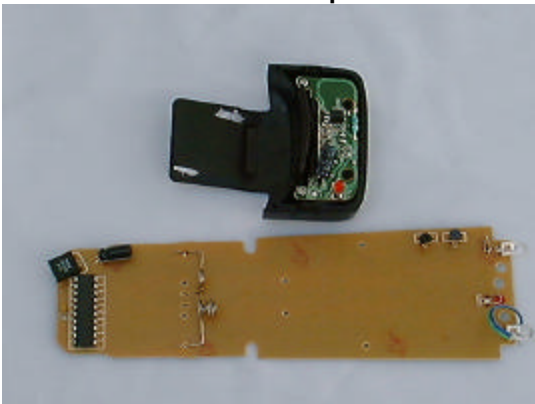
Front View of the product



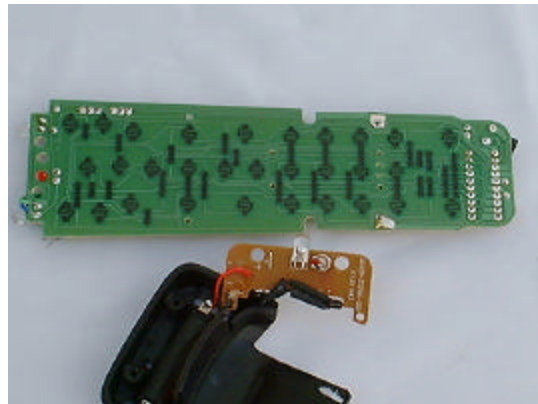
Rear View of the product



Inner Circuit Top View



Inner Circuit Bottom View



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Photographs of EUT

Measurement of Radiated Emission Test Set Up



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