

Date: 2002-04-26

No.: HM107420

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FCC PART 15 SUBPART C CERTIFICATION REPORT

FOR LOW POWER TRANSMITTER

TEST REPORT No.: HM107420

Equipment Under Test [EUT]:

1/72 RC Tank

Model Number:

DR0001

Applicant:

Dragon Models Limited.

FCC ID :

QHZDR001

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CONCLUSION

The submitted product was deemed to have COMPLIED after modification 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.

Verify by

Patrick Wong
for Chief Executive

Date: 2002-04-26

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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

DRAGON MODELS LIMITED.
10/F., B1., Kong Nam Ind. Bldg.,
603-609 Castle Peak Road, Tsuen Wan, N.T., Hong Kong.

Telephone: 852 2493 0215
Fax: 852 2411 0587

HKSTC Code Number for Applicant

DRM001

Manufacturer

DRAGON MODELS LIMITED.
10/F., B1., Kong Nam Ind. Bldg.,
603-609 Castle Peak Road, Tsuen Wan, N.T., Hong Kong.

Telephone: 852 2493 0215
Fax: 852 2411 0587

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1.3 Equipment Under Test [EUT]

Description of Sample

Product: 1/72 RC Tank
Manufacturer: Dragon Models Limited.
Brand Name: Dragon Models Limited.
Model Number: DR0001
Input Voltage: 9Vd.c ("6F22" size battery x 1)

1.3.1 Description of EUT Operation

The Equipment Under Test(EUT) is an Dragon Models Limited., 1/72 RC Tank. The transmitter is a 2 button transmitter. The EUT continues to transmit while button is being pressed. It is voice transmission, Modulation by Mic. and tape is frequency modulation.

1.4 Date of Order

2002-04-04

1.5 Submitted Sample(s):

1 Sample per model

1.6 Test Duration

2002-04-25

1.7 Country of Origin

China

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1.8 Additional Information of EUT

| | Submitted | Not Available |
|------------------------------------|-------------------------------------|--------------------------|
| User Manual | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Part List | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Circuit Diagram | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Printed Circuit Board [PCB] Layout | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Block diagram | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| FCC ID Label | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

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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 C63.4:2000 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 15.227 | ANSI C63.4:2000 | N/A | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Radiated Emissions, 30MHz to 1GHz | FCC 47CFR 15.209 | ANSI C63.4:2000 | Class B | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Conducted Emissions on AC, 0.45MHz to 30MHz | FCC 47CFR 15.207 | ANSI C63.4:2000 | Class B | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |

Note: N/A - Not Applicable

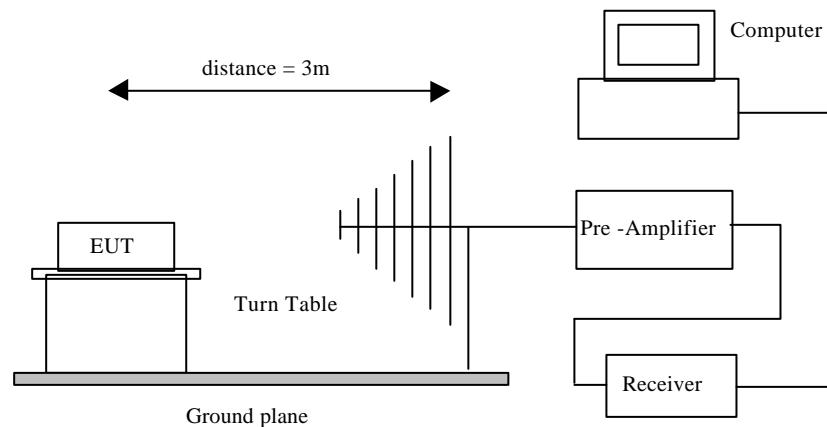
3.0 Test Results**3.1 Emission****3.1.1 Radiated Emissions**

| | |
|--------------------|------------------|
| Test Requirement: | FCC 47CFR 15.227 |
| Test Method: | ANSI C63.4:2000 |
| Test Date: | 2002-04-25 |
| 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:

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Limits for Field Strength of Fundamental Emissions [FCC 47CFR 15.227]:

| Frequency Range of Fundamental [MHz] | Field Strength of Fundamental Emission [Peak] [μ V/m] | Field Strength of Fundamental Emission [Average] [μ V/m] |
|---|--|---|
| 26.96-27.28 | 100,000 | 10,000 |

Results:

| Field Strength of Fundamental Emissions Peak Value | | | | | | |
|---|---------------------------------------|--------------------------------------|-----------------------------------|--------------------------------|------------------------|---------------------|
| Frequency MHz | Measured Level @3m dB μ V/m | Correction Factor dB μ V/m | Field Strength dB μ V/m | Field Strength μ V/m | Limit @3m μ V/m | Antenna Polarity |
| 27.15 | 60.5 | 18.2 | 78.7 | 8,609.9 | 100,000 | Vertical |

| Field Strength of Fundamental Emissions Average | | | | | | |
|--|---------------------------------------|--------------------------------------|-----------------------------------|--------------------------------|------------------------|---------------------|
| Frequency MHz | Measured Level @3m dB μ V/m | Correction Factor dB μ V/m | Field Strength dB μ V/m | Field Strength μ V/m | Limit @3m μ V/m | Antenna Polarity |
| 27.15 | 54.0 | 18.2 | 72.2 | 4,073.8 | 100,00 | Vertical |

According to FCC 47CFR15.35, the limit on the radio frequency emissions as measured using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit for the frequency being investigated unless a different peak emission limit is otherwise specified in the rules.

Remarks:

*: Adjusted by Duty Cycle = -6.5dB

*: Linear interpolations

Correction Factor included Antenna Factor and Cable Attenuation.

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

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

| Frequency Range [MHz] | Quasi-Peak Limits [μ V/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 MHz | Measured Level @3m dB μ V/m | Correction Factor dB μ V/m | Field Strength dB μ V/m | Field Strength μ V/m | Limit @3m μ V/m | Antenna Polarity |
| 54.29 | 20.1 | 16.8 | 36.9 | 70.0 | 150 | Vertical |
| 81.44 | < 1.0 | 9.8 | < 10.8 | < 3.5 | 150 | Vertical |
| 108.59 | < 1.0 | 11.5 | < 12.5 | < 4.2 | 150 | Vertical |
| 135.74 | < 1.0 | 15.9 | < 16.9 | < 7.0 | 200 | Vertical |
| 162.88 | < 1.0 | 17.4 | < 18.4 | < 8.3 | 200 | Vertical |
| 190.03 | < 1.0 | 17.2 | < 18.2 | < 8.1 | 200 | Vertical |
| 217.18 | < 1.0 | 18.8 | < 19.8 | < 9.8 | 200 | Vertical |
| 244.32 | < 1.0 | 19.7 | < 20.7 | < 10.8 | 200 | Vertical |
| 271.47 | < 1.0 | 20.6 | < 21.6 | < 12.0 | 200 | Vertical |

Remarks:

*: Linear interpolations

Correction Factor included Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty = 30MHz to 300MHz ± 3.7 dB
300MHz to 1GHz $+3.0$ dB / -2.7 dB

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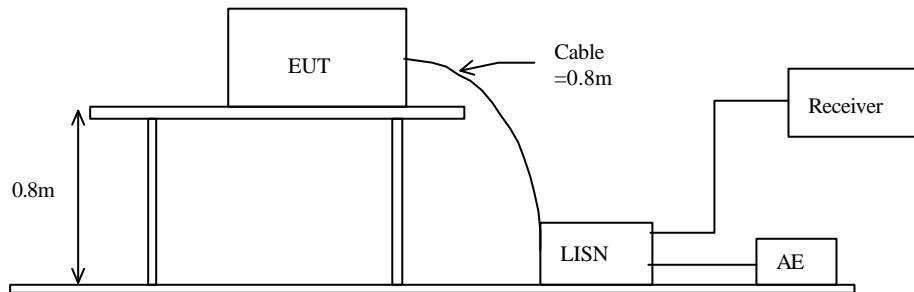
3.1.1 Conducted Emissions (0.45MHz to 30MHz)

| | |
|--------------------|------------------|
| Test Requirement: | FCC 47CFR 15.207 |
| Test Method: | ANSI C63.4:2000 |
| Test Date: | 2002-04-25 |
| Mode of Operation: | On mode |

Test Method:

The test was performed in accordance with ANSI C63.4:2000, 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 [μ V/m] |
|--------------------------|-----------------------------------|
| 0.45-30 | 250 |

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

Results: N/A

The EUT is operated by internal battery power only, therefore power line conducted emission was deemed unnecessary.

Remarks:

Calculated measurement uncertainty = ± 2.3 dB

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3.2 26dB Bandwidth of Fundamental Emission

Test Requirement:

FCC 47 CFR 15.227

Test Method:

ANSI C63.4:2000 (Section 13.1.7)

Test Date:

2002-04-25

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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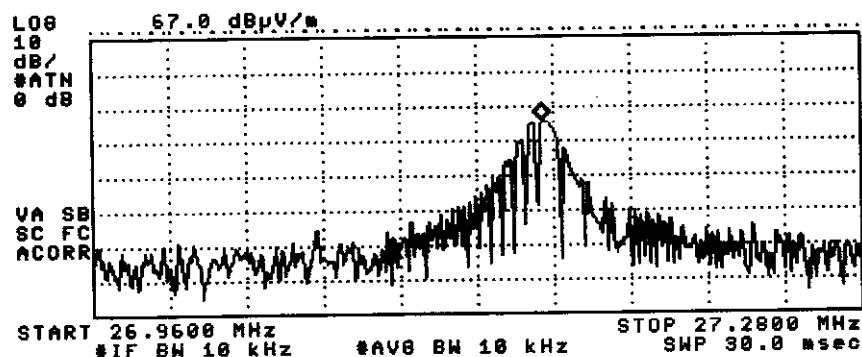
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Limits for 26 dB Bandwidth of Fundamental Emission:

| Frequency Range [MHz] | 26dB Bandwidth [KHz] | FCC Limits * [KHz] |
|--------------------------|-------------------------|-----------------------|
| 27.147 | 32.2 | within 26.96-27.28 |

26dB Bandwidth of Fundamental Emission

09:11:24 JAN 16, 1995 28:49:37 NOV 12, 1997
REF LEVEL ACTV DET: PEAK
67.0 dB μ V/m MKR 27.1472 MHz
42.82 dB μ V/m



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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 | 18/12/01 |
| 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 | N/A |
| EM083 | HKSTC OPEN AREA TEST SITE | HKSTC | N/A | N/A | 14/02/02 |
| EM145 | EMI TEST RECEIVER | R & S | ESCS 30 | 830245/021 | 21/06/01 |

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 | 04/10/01 |
| EM002 | LISN | EMCO | 3825-2 | 9005-1657 | 22/08/01 |
| EM119 | LISN | R & S | ESH3-Z5 | 0831.5518.52 | 31/08/00 |
| EM127 | ISOLATION TRANSFORMER 220 TO 300 | WING SUN | N/A | N/A | CM |
| EM142 | PLUSE LIMITER | R & S | ESH3Z2 | 357.8810.52 | 04/07/01 |
| EM181 | EMI TEST RECEIVER | R & S | ESIB7 | 100072 | 28/11/01 |

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

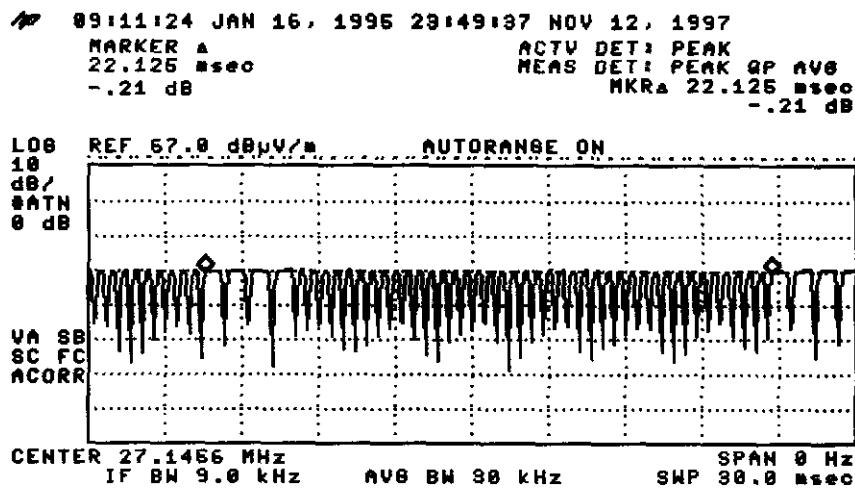
Each function key sends a different series of characters, but each packet period (22.12msec) never exceeds a series of 4 long (600 μ sec) and 40 short (200 μ sec) pulses. Assuming any combination of short and long pulses may be obtained due to encoding the worse case transmit duty cycle would be considered $4 \times 600\mu\text{sec} + 40 \times 200\mu\text{sec}$ per 22.12msec=47% duty cycle. Figure A through C show the characteristics of the pulse train for one of these functions.

Remarks:

Duty Cycle Correction = $20\log(0.47) = -6.5\text{dB}$

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

Figure A [Pulse Train]



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Figure B [Long Pulse]

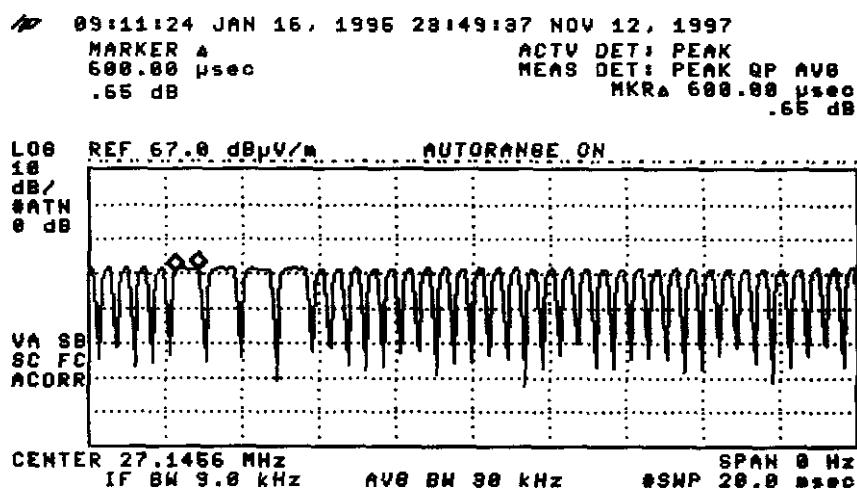
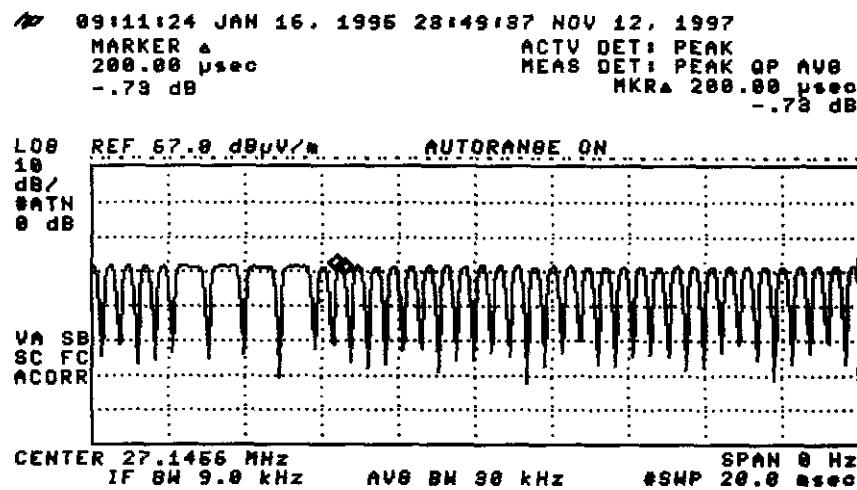


Figure C [Short Pulse]



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Appendix C

Modification Method

1. Added a capacitor 56pF between C pole of Q2 and ground.
2. Change the resistance of R2 from 18k ohm to 100k ohm.

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Appendix D

Photographs of EUT

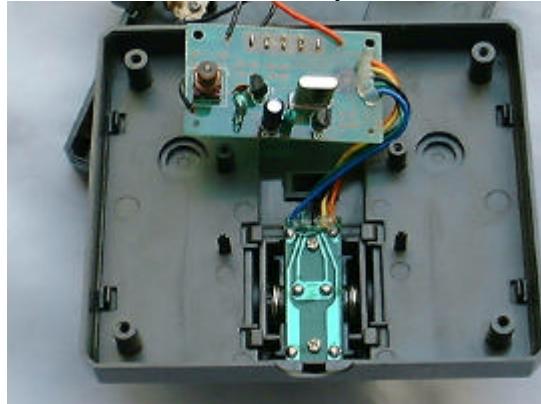
Front View of the product



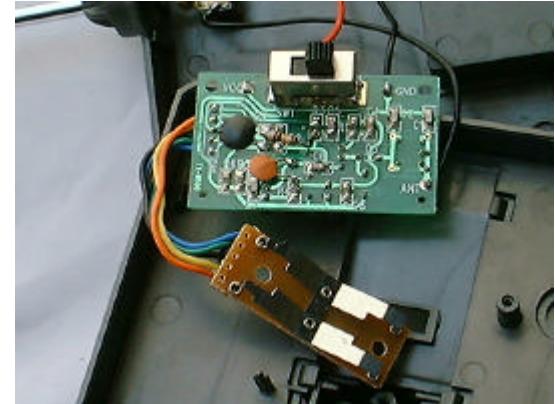
Rear View of the product



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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