

Date: 2003-08-01

TEST REPORT

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No.: HM110845

FCC PART 15 SUBPART C CERTIFICATION REPORT

FOR LOW POWER TRANSMITTER

TEST REPORT No.: HM110845

Equipment Under Test [EUT]:
Model Number:
Applicant:
FCC ID :

Mini Radio Control Mouse Gray
20706
SENARIO LLC
RCM0887620706

Date: 2003-08-01

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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.

Verified by

K C Lee
for Chief Executive

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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

1.2 Applicant Details Applicant

SENARIO LLC.
774 Ridgeview Drive, Mchenry, IL60050, USA

HKSTC Code Number for Applicant

DAR001

Manufacturer

DAILY RANK ELECTRONICS CO., LTD.
Flat S, 9/F., Valiant Industrial Centre,
2-12 Au Pui Wan Street, Fotan, N.T., Hong Kong.

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1.3 Equipment Under Test [EUT] Description of Sample

Product: Mini Radio Control Mouse Gray
Manufacturer: Daily Rank Electronics Co., Ltd.
Brand Name: N/A
Model Number: 20706
Input Voltage: 3Vd.c ("AA" size battery x 2)

1.3.1 Description of EUT Operation

The Equipment Under Test (EUT) is an Senario LLC. Mini Radio Control Mouse Gray. The transmitter is a 2 button transmitter. The EUT continues to transmit while button is being pressed, Modulation by IC. and tape is pulse modulation.

1.4 Date of Order

2003-6-12

1.5 Submitted Sample(s):

2 Samples per model

1.6 Test Duration

2003-07-14

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 15.235 | 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, 0.15MHz 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

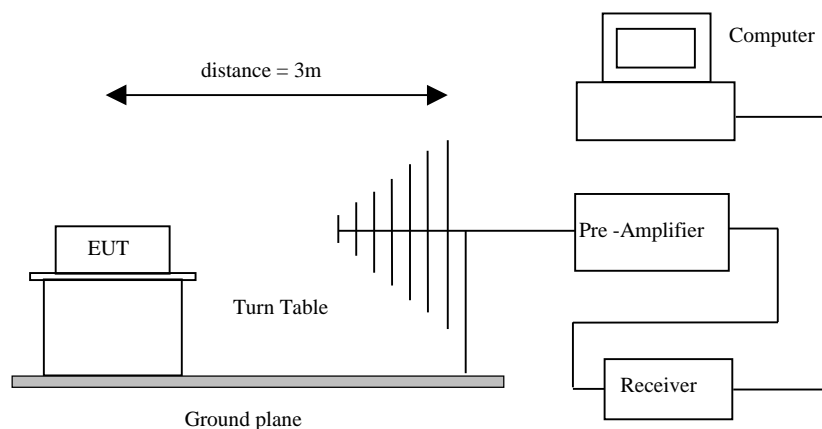
3.0 Test Results**3.1 Emission****3.1.1 Radiated Emissions**

| | |
|--------------------|------------------|
| Test Requirement: | FCC 47CFR 15.235 |
| Test Method: | ANSI C63.4:2000 |
| Test Date: | 2003-07-14 |
| 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 15.235]:

| Frequency Range of Fundamental [MHz] | Field Strength of Fundamental Emission [Peak] [μV/m] | Field Strength of Fundamental Emission [Average] [μV/m] |
|--|---|--|
| 49.82-49.90 | 100,000 | 10,000 |

Results:

| Field Strength of Fundamental Emissions | | | | | | |
|--|---------------------------------|--------------------------------|-----------------------------|---------------------------|-------------------|---------------------|
| Peak Value | | | | | | |
| Frequency MHz | Measured Level @3m dBμV/m | Correction Factor dBμV/m | Field Strength dBμV/m | Field Strength μV/m | Limit @3m μV/m | Antenna Polarity |
| 49.86 | 54.6 | 10.0 | 64.6 | 1,698.2 | 100,000 | Vertical |

| Field Strength of Fundamental Emissions | | | | | | |
|--|---------------------------------|--------------------------------|-----------------------------|---------------------------|-------------------|---------------------|
| Average | | | | | | |
| Frequency MHz | Measured Level @3m dBμV/m | Correction Factor dBμV/m | Field Strength dBμV/m | Field Strength μV/m | Limit @3m μV/m | Antenna Polarity |
| 49.86 | 50.5 | 10.0 | 60.5 | 1,059.3 | 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 = -4.1dB

*: Linear interpolations

Correction Factor included Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty = 30MHz to 300MHz ±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 [μV/m] |
|--------------------------|-----------------------------|
| 30-88 | 100 |
| 88-216 | 150 |
| 216-960 | 200 |
| Above 960 | 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 dBμV/m | Correction Factor dBμV/m | Field Strength dBμV/m | Field Strength μV/m | Limit @3m μV/m | Antenna Polarity |
| 99.72 | < 1.0 | 10.8 | < 11.8 | < 3.9 | 150 | Vertical |
| 149.58 | < 1.0 | 9.8 | < 10.8 | < 3.5 | 150 | Vertical |
| 199.44 | < 1.0 | 11.5 | < 12.5 | < 4.2 | 150 | Vertical |
| 249.30 | 16.5 | 14.9 | 31.4 | 37.2 | 200 | Horizontal |
| 299.16 | 16.8 | 16.6 | 33.4 | 46.8 | 200 | Horizontal |
| 349.02 | 18.1 | 18.7 | 36.8 | 69.2 | 200 | Horizontal |
| 398.88 | < 1.0 | 18.8 | < 19.8 | < 9.8 | 200 | Vertical |
| 448.74 | < 1.0 | 19.7 | < 20.7 | < 10.8 | 200 | Vertical |
| 498.60 | < 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 ±3.7dB
300MHz to 1GHz +3.0dB / -2.7dB

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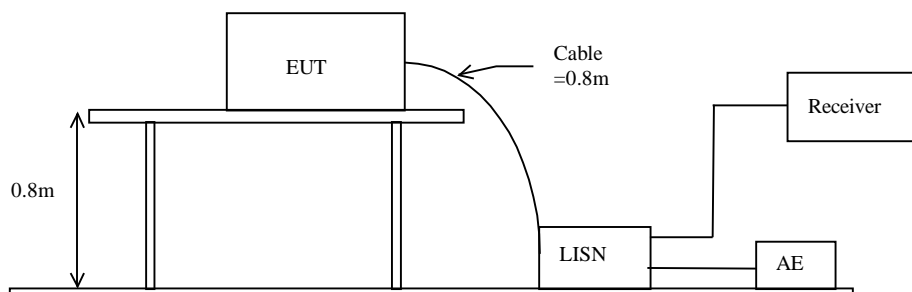
3.1.1 Conducted Emissions (0.15MHz to 30MHz)

| | |
|--------------------|------------------|
| Test Requirement: | FCC 47CFR 15.207 |
| Test Method: | ANSI C63.4:2000 |
| Test Date: | 2003-07-14 |
| 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 15.107):

| Frequency Range [MHz] | Quasi-Peak Limits [dBμV] | Average [dBμV] |
|--------------------------|-----------------------------|-------------------|
| 0.15-0.5 | 66 to 56* | 56 to 46* |
| 0.5-5.0 | 56 | 46 |
| 5.0-30.0 | 60 | 50 |

* Decreases with the logarithm of the frequency.

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 = $\pm 2.3\text{dB}$

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3.2 26dB Bandwidth of Fundamental Emission

| | |
|--------------------|----------------------------------|
| Test Requirement: | FCC 47 CFR 15.235 |
| Test Method: | ANSI C63.4:2000 (Section 13.1.7) |
| Test Date: | 2003-07-14 |
| 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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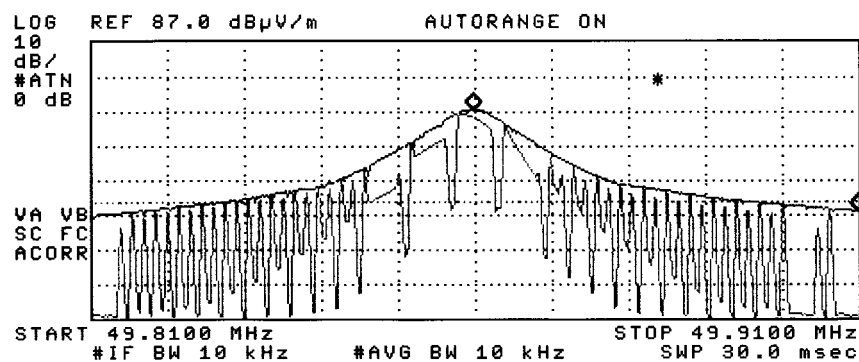
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Limits for 26 dB Bandwidth of Fundamental Emission:

| Frequency Range [MHz] | 26dB Bandwidth [KHz] | FCC Limits * [MHz] |
|--------------------------|-------------------------|-----------------------|
| 49.86 | 44.6 | within 49.82-49.90 |

26dB Bandwidth of Fundamental Emission

09:11:24 JAN 16, 1995 23:49:37 NOV 12, 1997
MARKER Δ ACTV DET: PEAK
50.0 kHz MEAS DET: PEAK QP AVG
-29.73 dB MKRΔ 50.0 kHz
-29.73 dB



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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 | 14/03/03 |
| EM008 | SPECTRUM ANALYZER DISPLAY | HEWLETT PACKARD | HP85662A | 3144A20514 | 14/03/03 |
| EM009 | QUASI PEAK ADAPTOR | HEWLETT PACKARD | HP85650A | 3303A01702 | 14/03/03 |
| EM010 | RF PRESELECTOR | HEWLETT PACKARD | HP85685A | 3221A01410 | 14/03/03 |
| EM011 | ATTENUATOR/SWITCH | HEWLETT PACKARD | HP11713A | 2508A10595 | 14/03/03 |
| EM012 | PRE-AMPLIFIER | HEWLETT PACKARD | HP8449B | 3008A00262 | 14/03/03 |
| EM013 | CONTROLLER (COMPUTER), COLOR MONITOR, KEYBOARD & MOUSE FLOPPY DRIVE | HEWLETT PACKARD HEWLETT PACKARD HEWLETT PACKARD | HP9000 HP A1097C HP9133L | 6226A60314 3151J39517 2623A02468 | CM |
| EM020 | HORN ANTENNA | EMCO | 3115 | 4032 | 19/07/00 |
| EM022 | LOOP ANTENNA | EMCO | 6502 | 1189-2424 | 04/08/00 |
| EM072 | SIGNAL GENERATOR | HEWLETT PACKARD | 8640B | 1948A11892 | N/A |
| EM083 | HKSTC OPEN AREA TEST SITE | HKSTC | N/A | N/A | 08/11/02 |
| EM131 | PORTABLE SPECTRUM ANALYSER | HEWLETT PACKARD | 8595EM | 3710A00155 | 18/12/01 |
| EM145 | EMI TEST RECEIVER | R & S | ESCS 30 | 830245/021 | 22/07/02 |
| EM194 | BICONILOG ANTENNA | EMCO | 3142B | 1795 | 14/05/02 |
| EM195 | ANTENNA POSITIONING MAST | EMCO | 2075 | 2368 | N/A |
| EM196 | MULTI-DEVICE CONTROLLER | EMCO | 2090 | 1662 | N/A |

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 | 18/10/02 |
| EM119 | LISN | R & S | ESH3-Z5 | 0831.5518.52 | 01/10/02 |
| EM127 | ISOLATION TRANSFORMER 220 TO 300 | WING SUN | N/A | N/A | CM |
| EM142 | PULSES LIMITER | R & S | ESH3Z2 | 357.8810.52 | 03/07/02 |
| EM181 | EMI TEST RECEIVER | R & S | ESIB7 | 100072 | 28/11/01 |
| EM154 | SHIELDING ROOM | SIEMENA MATSUSHITA COMPONENTS | N/A | 803-740-057- 99A | 18/10/02 |
| EM197 | LISN | EMCO | 4825/2 | 1193 | 08/04/03 |

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

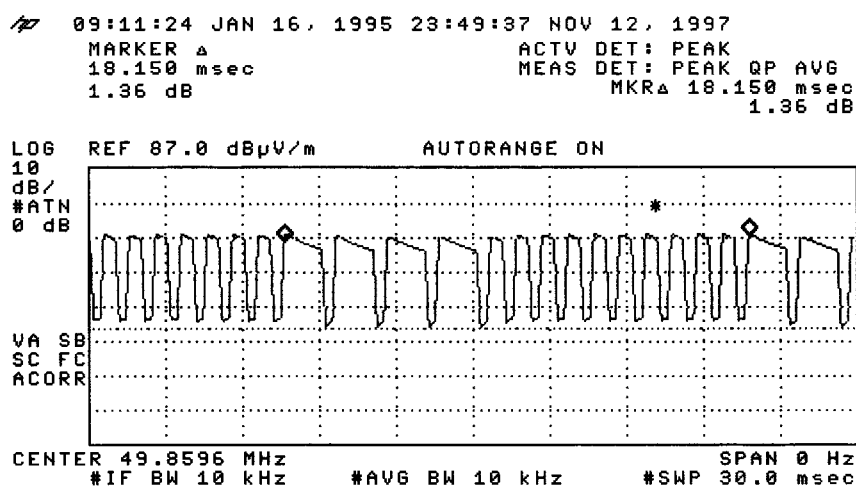
Each function key sends a different series of characters, but each packet period (18.15msec) never exceeds a series of 4 long (1.5msec) and 10 short (525µsec) pulse. Assuming any combination of short and long pulse may be obtained due to encoding the worse case transmit duty cycle would be considered $4 \times 1.5\mu\text{sec} + 10 \times 525\mu\text{sec}$ per 18.15msec = 61.9% duty cycle. Figure A through C show the characteristics of the pulse train for one of these functions.

Remarks:

Duty Cycle Correction = $20\text{Log}(0.619) = -4.1\text{dB}$

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

Figure A [Pulse Train]



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Figure B [Long Pulse]

09:11:24 JAN 16, 1995 23:49:37 NOV 12, 1997
MARKER Δ ACTV DET: PEAK
1.5000 msec MEAS DET: PEAK QP AVG
-2.11 dB MKR Δ 1.5000 msec
-2.11 dB

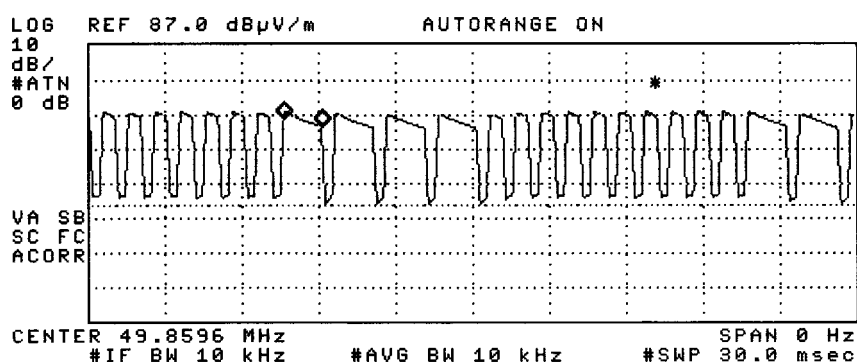
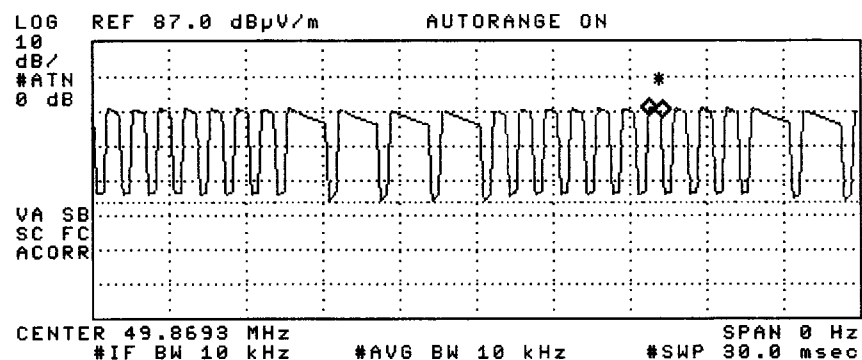


Figure C [Short Pulse]

09:11:24 JAN 16, 1995 23:49:37 NOV 12, 1997
MARKER Δ ACTV DET: PEAK
525.00 μ sec MEAS DET: PEAK QP AVG
-.91 dB MKR Δ 525.00 μ sec
-.91 dB



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Appendix C

Photographs of EUT

Front View of the product



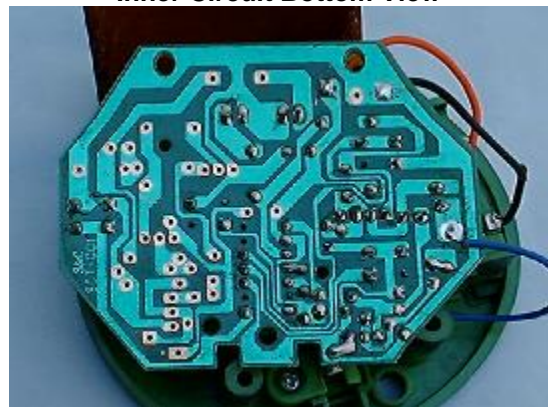
Rear View of the product



Inner Circuit Top View



Inner Circuit Bottom View



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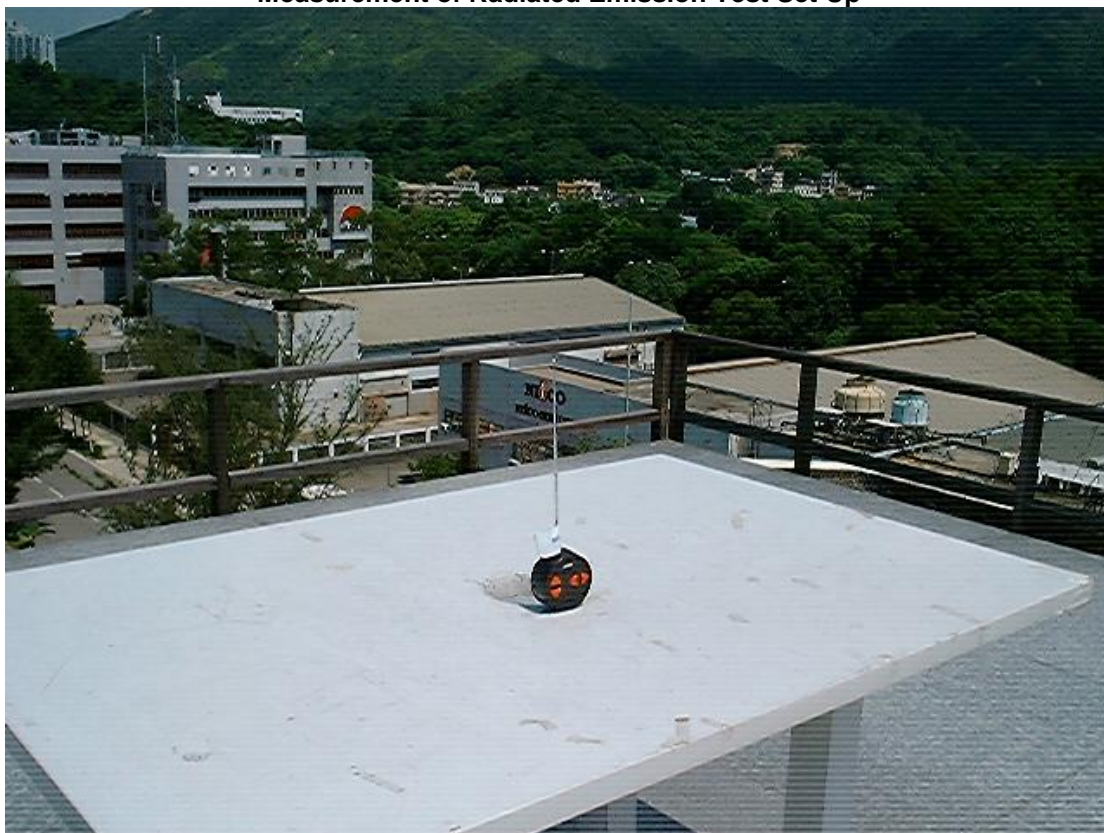
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Photographs of EUT

Measurement of Radiated Emission Test Set Up



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