

Date: 2001-08-15

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FCC PART 15 SUBPART C CERTIFICATION REPORT

FOR LOW POWER TRANSMITTER

TEST REPORT No.: HM105553

Equipment Under Test [EUT]:

Model Number:

Applicant:

FCC ID :

Radio Control Toy Car

608

Hitari Ltd.

NF260827

Date: 2001-08-15

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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

HITARI LTD.
Braeside House, 43, Broomfield, Adel,
LEEDS LS16 6AE, UK

Telephone: 852 2312 2800
Fax: 852 2312 6750

HKSTC Code Number for Applicant

HIL002

Manufacturer

WAVECON ELECTRONICS LTD.
4/F., Blk. B Wo Fung Ind. Bldg.,
20 Yip Wo St., On Lok Tsuen, Fanling, N.T., Hong Kong.

Telephone: 852 2312 2800
Fax: 852 2312 6750

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1.3 Equipment Under Test [EUT]

Description of Sample

Product:	Radio Control Toy Car
Manufacturer:	Wavecon Electronics Ltd.
Brand Name:	N/A
Model Number:	608
Input Voltage:	9Vd.c ("6F22" size battery x 1)

1.3.1 Description of EUT Operation

The Equipment Under Test (EUT) is an Hitari Ltd., 27.144 MHz Transmitter. The transmitter is a 2 button transmitter. The EUT continues to transmit while button is being pressed. It is voice transmission & remote control toy, Modulation by IC and tape is frequency modulation.

1.4 Date of Order

2001-08-06

1.5 Submitted Sample(s):

1 Sample per model

1.6 Test Duration

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1.7 Country of Origin

China

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1.8 Additional Information of EUT

	Submitted	Not Available
User Manual	☒	☐
Part List	☒	☐
Circuit Diagram	☒	☐
Printed Circuit Board [PCB] Layout	☒	☐
Rating Label	☒	☐
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 15.227	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

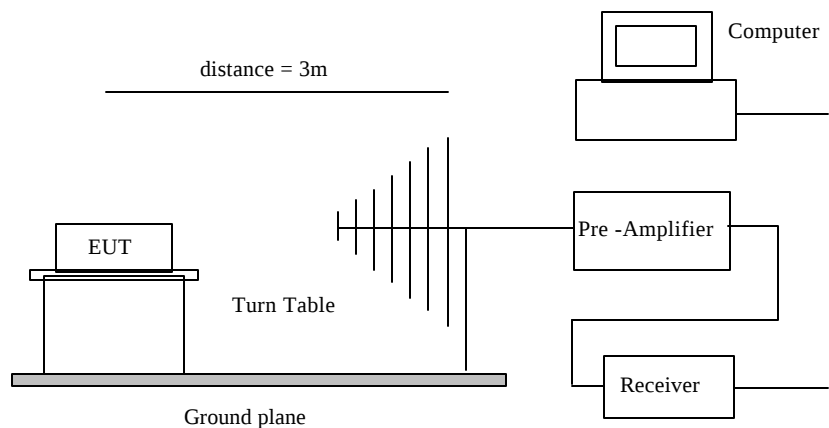
Test Requirement:	FCC 47CFR 15.227
Test Method:	ANSI C63.4:1992
Test Date:	2001-08-13
Mode of Operation:	On mode

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.

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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] [μV/m]	Field Strength of Fundamental Emission [Average] [μV/m]
26.96-27.28	100,000	10,000

Results:

Field Strength of Fundamental Emissions Peak Value						
Frequency MHz	Level @3m dBμV	Correction Factor dB/m	Field Strength dBμV/m	Field Strength μV/m	Limit ** @3m μV/m	Antenna Polarity
27.144	51.3	18.5	69.8	3,090.3	100,000	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:

*: 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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Results:

Field Strength of Fundamental Emissions Average Value *						
Frequency	Level @3m	Correction Factor	Field Strength	Field Strength	Limit ** @3m	Antenna Polarity
MHz	dBμV	dB/m	dBμV/m	μV/m	μV/m	
27.144	44.0	18.5	62.5	1,333.5	100,00	Vertical

Remark:

*: Adjusted by Duty Cycle = -7.3dB

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 [$\mu\text{V/m}$]
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 :Transmitter

Radiated Emissions Quasi-Peak						
Frequency MHz	Level @3m dB μV	Correction Factor dB/m	Field Strength dB $\mu\text{V/m}$	Field Strength $\mu\text{V/m}$	Limit @3m $\mu\text{V/m}$	Antenna Polarity
54.3	<1.0	12.9	<13.9	<4.9	100	Vertical
81.4	<1.0	8.9	<10.8	<3.5	100	Vertical
108.6	<1.0	12.2	<12.5	<4.2	150	Vertical
135.7	<1.0	10.8	<16.9	<7.0	150	Vertical
162.9	<1.0	9.5	<18.0	<7.9	150	Vertical
190.0	<1.0	11.1	<18.2	<8.1	150	Vertical
217.2	<1.0	12.2	<19.8	<9.8	200	Vertical
244.3	<1.0	13.5	<20.7	<10.8	200	Vertical
271.4	<1.0	16.0	<21.6	<12.0	200	Vertical

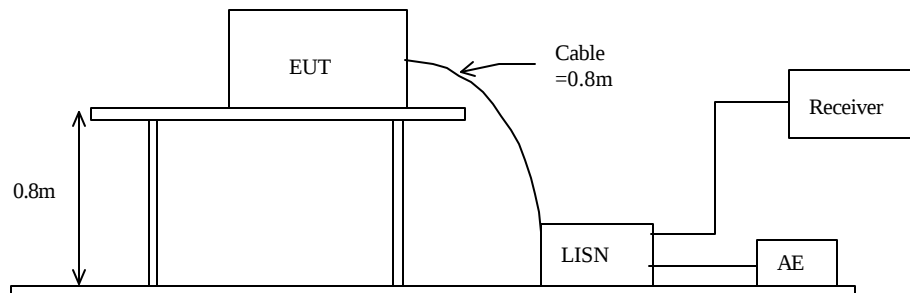
3.1.1 Conducted Emissions (0.45MHz to 30MHz)

Test Requirement:	FCC 47CFR 15.207
Test Method:	ANSI C63.4:1992
Test Date:	2001-08-13
Mode of Operation:	On mode

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 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 = $\pm 2.3\text{dB}$

3.2 26dB Bandwidth of Fundamental Emission

Test Requirement:	FCC 47 CFR 15.227
Test Method:	ANSI C63.4:1992 (Section 13.1.7)
Test Date:	2001-08-13
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 26 dB Bandwidth of Fundamental Emission:

Frequency Range [MHz]	26dB Bandwidth [KHz]	FCC Limits * [KHz]
27.144	9.2	within 26.96-27.28

26dB Bandwidth of Fundamental Emission

09:11:24 JAN 16, 1995 23:49:37 NOV 12, 1997

ACTV DET: PEAK

MEAS DET: PEAK QP AVG

MKR 27.1448 MHz

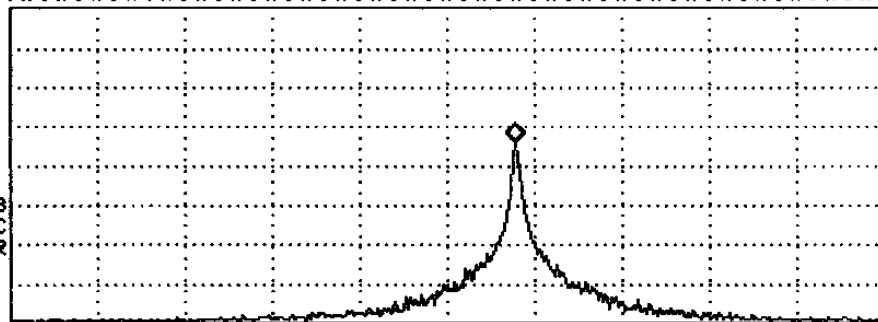
52.95 dB μ V/m

LOG REF 87.0 dB μ V/m AUTORANGE ON

10
dB/
#ATH
0 dB

VA SB
SC FC
ACORR

START 26.9600 MHz STOP 27.2800 MHz
#IF BW 1.0 kHz #AVG BW 10 kHz SWP 960 msec



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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	18/07/00
EM008	SPECTRUM ANALYZER DISPLAY	HEWLETT PACKARD	HP85662A	3144A20514	18/07/00
EM009	QUASI PEAK ADAPTOR	HEWLETT PACKARD	HP85650A	3303A01702	18/07/00
EM010	RF PRESELECTOR	HEWLETT PACKARD	HP85685A	3221A01410	18/07/00
EM011	ATTENUATOR/SWITCH	HEWLETT PACKARD	HP11713A	2508A10595	18/07/00
EM012	PRE-AMPLIFIER	HEWLETT PACKARD	HP8449B	3008A00262	18/07/00
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 (32.5msec) never exceeds a series of 6 long (1.5msec) and 10 short (500µsec) pulses. Assuming any combination of short and long pulses may be obtained due to encoding the worse case transmit duty cycle would be considered $6 \times 1.5\text{msec} + 10 \times 500\mu\text{sec}$ per 32.5msec = 43% duty cycle. Figure A through C show the characteristics of the pulse train for one of these functions.

Remarks:

Duty Cycle Correction = $20\text{Log}(0.43) = -7.3\text{dB}$

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

Figure A [Pulse Train]

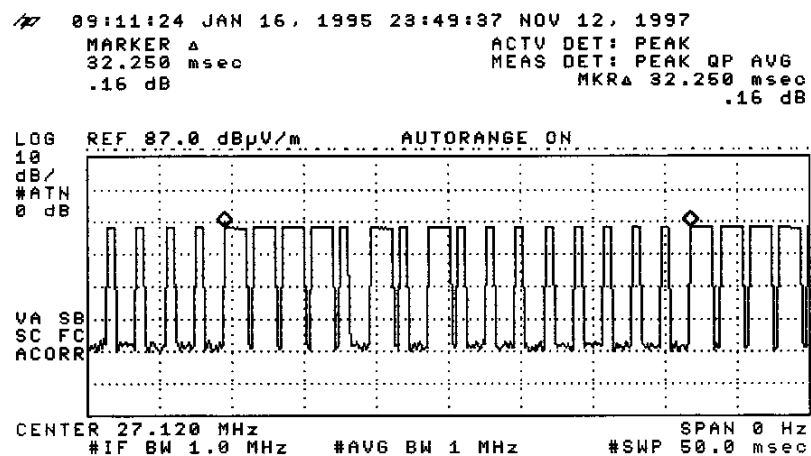


Figure B [Long Pulse]

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
-.24 dB MKR Δ 1.5000 msec
-.24 dB

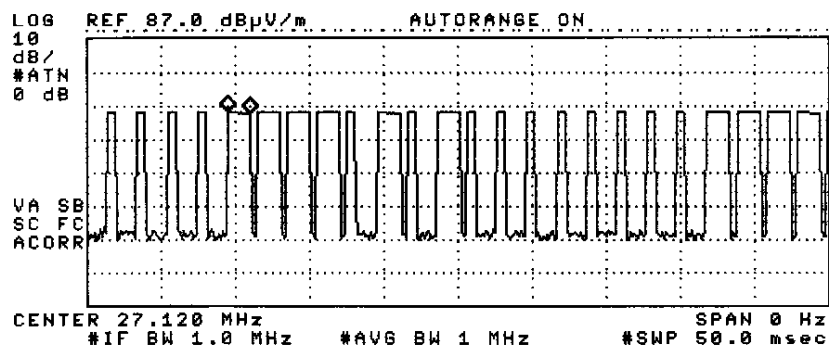
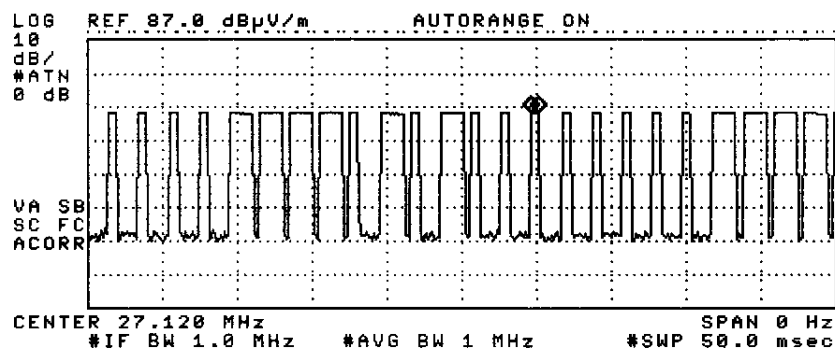


Figure C [Short Pulse]

09:11:24 JAN 16, 1995 23:49:37 NOV 12, 1997
MARKER Δ ACTV DET: PEAK
500.00 μ sec MEAS DET: PEAK QP AVG
-.02 dB MKR Δ 500.00 μ sec
-.02 dB



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Appendix C

Photographs of EUT

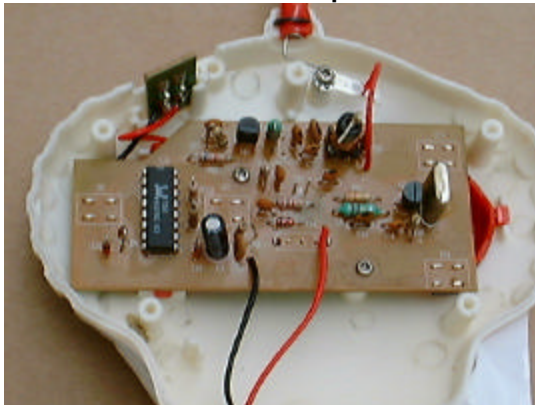
Front View of the product



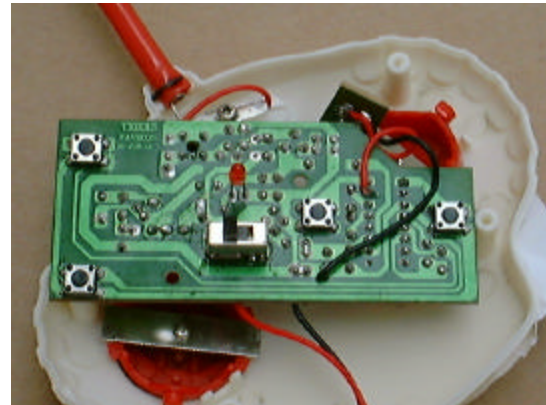
Rear View of the product



Inner Circuit Top View



Inner Circuit Bottom View



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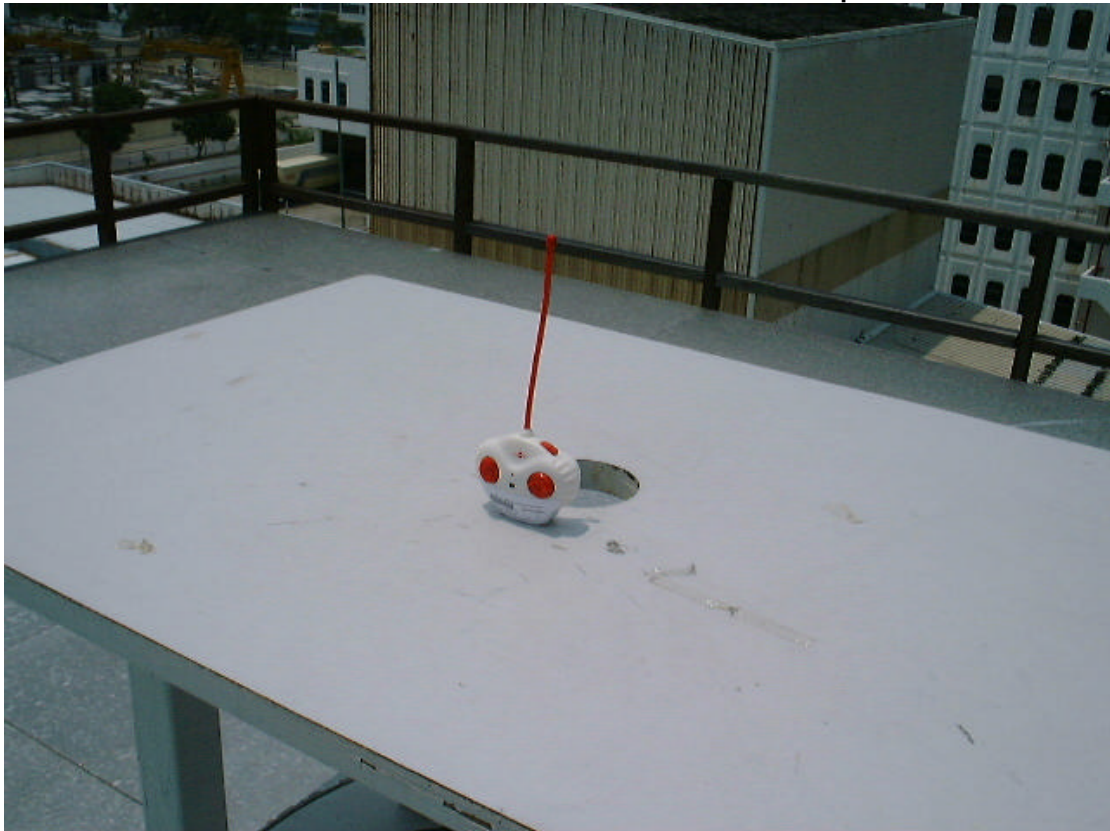
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Photographs of EUT

Measurement of Radiated Emission Test Set Up



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