

The FCC logo, consisting of the letters 'F' and 'C' in a stylized, bold, black font, with a small circle around the 'C'.

Test Report

Product Name : IR RF Remote Control Extender TX
Model No. : AWX701TX, AWX701-A, AWX701-B, AWX701-C
FCC ID.: NGVAWX701TX

Applicant : AIRWAVE TECHNOLOGIES INC.

Address : 3F, NO.9,INDUSTRY E. RD. IX, SCIENCE-BASED
INDUSTRIAL PARK, HSINCHU, TAIWAN, R.O.C

Date of Receipt : Mar 13, 2003

Date of Test : Apr 08, 2003

Report No. : 033H057FI

The Test Results relate only to the samples tested.

The test report shall not be reproduced except in full without the written approval of QuieTek Corporation.

This report must not be used to claim product endorsement by NVLAP any agency of the U.S. Government

Test Report Certification

Test Date : Apr 08, 2003

Report No. : 033H057FI



Accredited by NIST (NVLAP)

NVLAP Lab Code: 200347-0

Product Name : IR RF Remote Control Extender TX

Applicant : AIRWAVE TECHNOLOGIES INC.

Address : 3F, NO.9,INDUSTRY E. RD. IX, SCIENCE-BASED INDUSTRIAL
PARK, HSINCHU, TAIWAN, R.O.C

Manufacturer : AIRWAVE TECHNOLOGIES INC.

Model No. : AWX701TX, AWX701-A, AWX701-B, AWX701-C

FCC ID. : NGVAWX701TX

Rated Voltage : AC 120V/60Hz

Trade Name : AIRWAVE

Measurement Standard : FCC Part 15 Subpart C Paragraph 15.231

Measurement Procedure : ANSI C63.4:1992

Test Result : Complied

The Test Results relate only to the samples tested.

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Documented By :

(Lydia Tsai)

Tested By :

(Jim Wu)

Approved By :

(Kevin Wang)

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1. GENERAL INFORMATION

1.1. EUT Description

Product Name	: IR RF Remote Control Extender TX
Trade Name	: AIRWAVE
FCC ID.	: NGVAWX701TX
Model No.	: AWX701TX, AWX701-A, AWX701-B, AWX701-C
Type of Modulation	: ASK
Antenna type	: Soldered on PCB
Operating Frequency	: 418 MHz
Operator Selection of	: Not Applied
Operating Frequency	
IR (Rx)	: 1 Set, Non-Shielded, 3m
Power Adapter	: DVE, DV-9100S, 2Pcs Cable Out: Non-Shielded, 1.7m

Note:

1. This device is a 418MHz IR RF Remote Control Extender TX included a 418MHz transmitting function.
2. The variation of model number is for different outlook. The circuit of each model is identical.
3. These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15 Subpart C Paragraph 15.231.
4. This device is a composite device in accordance with part 15 regulations. The function for the receiver was measured and made a test report that the report number is 033H057F, certified under Declaration of Conformity.
5. Quietek had verified the construction and function in typical operation, then shown in this test report.

1.2. Operation Description

The EUT is a 418MHz transmitter. The infrared remote control signal can be transferred to 418MHz radio frequency in ASK modulation. The transmission antenna is soldered on the EUT.

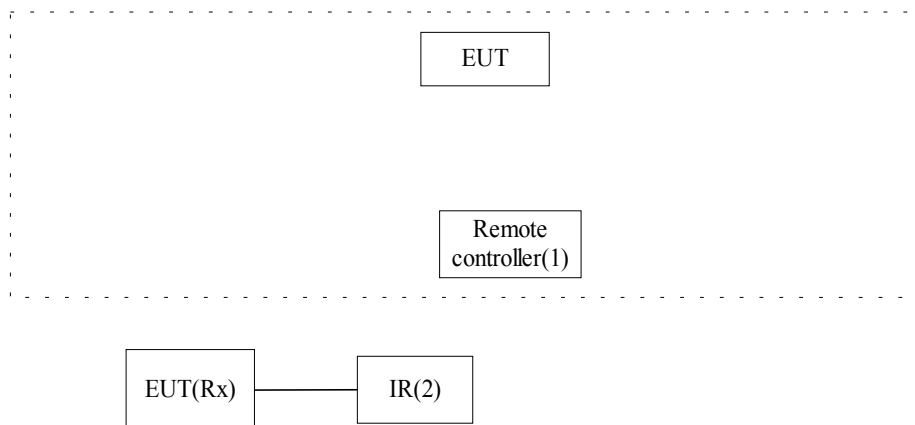
1.3. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

	Product	Manufacturer	Model No.	Serial No.	Power Cord
(1)	Remote controller	Toshiba	CT-9952	N/A	--
(2)	IR	AIRWAVE	N/A	N/A	--

Signal Cable Type	Signal cable Description
A. IR Cable	Non-shielded, 3m

1.4. Configuration of Tested System



1.5. EUT Exercise Software

- 1.5.1 Setup the EUT and simulators as shown on 1.4.
- 1.5.2 Turn on the power of all equipment.
- 1.5.3 The EUT will transmit the signal.
- 1.5.4 Repeat the above procedure 1.5.2 to 1.5.3

1.6. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	50-65
Barometric pressure (mbar)	860-1060	950-1000

Site Description: November 3, 1998 File on
Federal Communications Commission
FCC Engineering Laboratory
7435 Oakland Mills Road
Columbia, MD 21046
Reference 31040/SIT1300F2
August 30, 2001 Accreditation on NVLAP
NVLAP Lab Code: 200347-0



Site Name: Quietek Corporation

Site Address: No.75-1, Wang-Yeh Valley, Yung-Hsing,
Chiung-Lin, Hsin-Chu County,
Taiwan, R.O.C.
TEL : 886-3-592-8858 / FAX : 886-3-592-8859
E-Mail: service@quietek.com

2. Conducted Emission

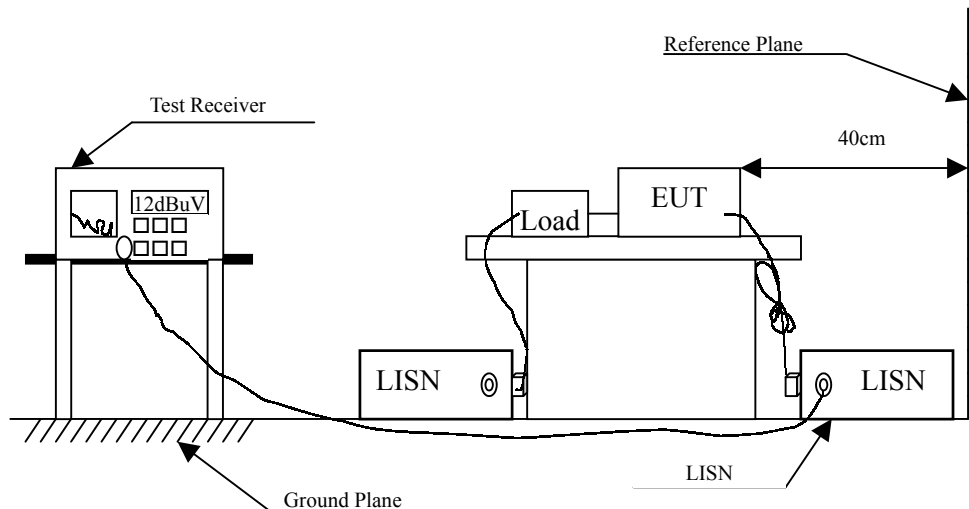
2.1. Test Equipment

The following test equipment are used during the conducted emission test:

Item	Instrument	Manufacturer	Type No./Serial No	Last Cal.	Remark
1	Test Receiver	R & S	ESCS 30/825442/17	May, 2002	
2	L.I.S.N.	R & S	ESH3-Z5/825016/6	May, 2002	EUT
3	L.I.S.N.	Kyoritsu	KNW-407/8-1420-3	May, 2002	Peripherals
4	Pulse Limiter	R & S	ESH3-Z2	N/A	
5	No.2 Shielded Room			N/A	

Note: All equipment upon which need to calibrated are with calibration period of 1 year.

2.2. Test Setup



2.3. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dBuV) Limit		
Frequency MHz	Limits	
	QP	AV
0.15 - 0.50	66-56	56-46
0.50-5.0	56	46
5.0 - 30	60	50

Remarks : In the above table, the tighter limit applies at the band edges.

2.4. Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4:1992 on conducted measurement.

Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

2.5. Test Result of Conducted Emission

Product : IR RF Remote Control Extender TX
 Test Item : Conducted Emission
 Power Line : Line 1
 Test Mode : Normal Operation

Frequency	Cable	Probe	Reading	Emission	Limits
	Loss	Factor	Level	Level	
MHz	dB	dB	dBuV	dBuV	dBuV
Quasi-Peak					
0.189	0.05	0.12	8.93	9.10	64.08
0.221	-0.03	0.14	6.83	6.94	62.79
0.282	0.02	0.16	1.79	1.97	60.76
1.502	0.09	0.32	0.32	0.72	56.00
7.278	0.28	0.47	2.07	2.82	60.00
*16.002	0.18	0.54	8.35	9.07	60.00
Average					
0.189	0.05	0.12	5.40	5.57	54.08
0.221	-0.03	0.14	4.10	4.21	52.78
0.282	0.02	0.16	1.20	1.38	50.76
1.502	0.09	0.32	1.40	1.80	46.00
7.278	0.28	0.47	1.20	1.95	50.00
16.002	0.18	0.54	5.30	6.02	50.00

Note:

1. All Reading Levels are Quasi-Peak and Average value.
2. “ * ”, means this data is the worst emission level.
3. Emission Level = Reading Level + LISN Factor + Cable Loss.

Product : IR RF Remote Control Extender TX
 Test Item : Conducted Emission
 Power Line : Line 2
 Test Mode : Normal Operation

Frequency	Cable	Probe	Reading	Emission	Limits
	Loss	Factor	Level	Level	
MHz	dB	dB	dBuV	dBuV	dBuV
Quasi-Peak					
*0.157	-0.01	0.10	12.28	12.37	65.61
0.187	0.05	0.12	6.53	6.70	64.19
0.389	0.01	0.19	-0.62	-0.42	58.09
0.869	0.04	0.27	-0.63	-0.32	56.00
7.771	0.24	0.47	2.45	3.17	60.00
12.725	-0.03	0.52	1.39	1.88	60.00
Average					
0.157	-0.01	0.10	11.50	11.59	55.62
0.187	0.05	0.12	3.60	3.77	54.17
0.389	0.01	0.19	1.50	1.70	48.09
0.869	0.04	0.27	1.20	1.51	46.00
7.771	0.24	0.47	1.70	2.42	50.00
12.725	-0.03	0.52	1.50	1.99	50.00

Note:

1. All Reading Levels are Quasi-Peak and Average value.
2. “ * ”, means this data is the worst emission level.
3. Emission Level = Reading Level + LISN Factor + Cable Loss.

3. Radiated Emission

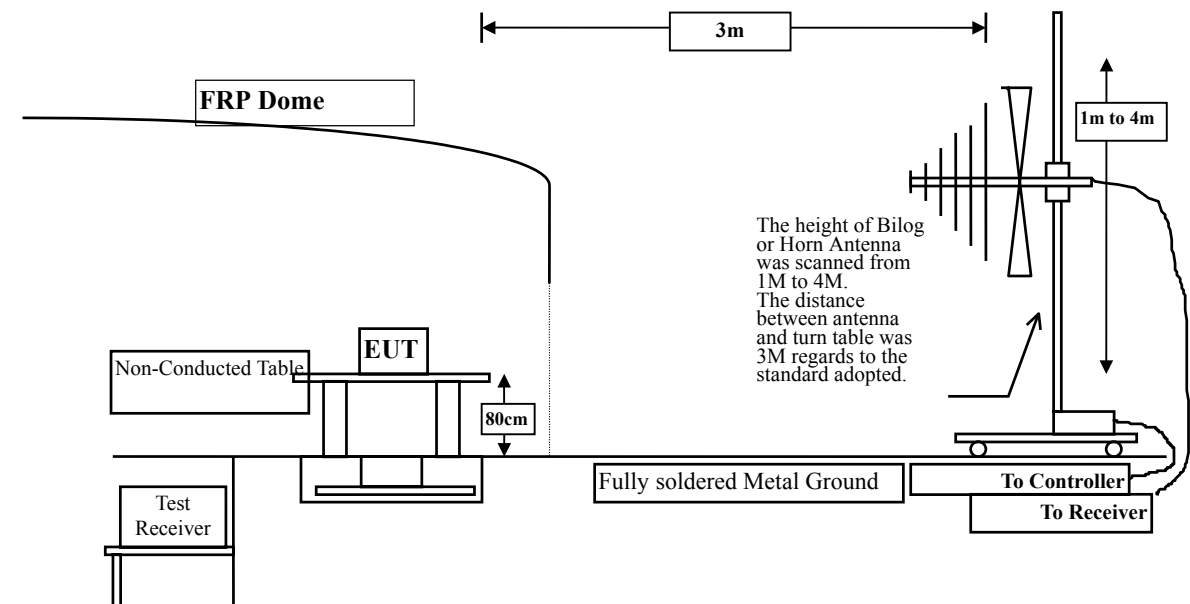
3.1. Test Equipment

The following test equipment are used during the radiated emission test:

Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.
Site # 1	X	Test Receiver	R & S	ESCS 30 / 825442/14	May, 2002
	X	Spectrum Analyzer	Advantest	R3261C / 71720140	May, 2002
	X	Pre-Amplifier	HP	8447D/3307A01812	May, 2002
	X	Bilog Antenna	Chase	CBL6112B / 12452	Sep., 2002
	X	Horn Antenna	EM	EM6917 / 103325	May, 2002
Site # 2		Test Receiver	R & S	ESCS 30 / 825442/17	May, 2002
		Spectrum Analyzer	Advantest	R3261C / 71720609	May, 2002
		Pre-Amplifier	HP	8447D/3307A01814	May, 2002
		Bilog Antenna	Chase	CBL6112B / 2455	Sep., 2002
		Horn Antenna	EM	EM6917 / 103325	May, 2002

- Note:
1. All equipments that need to calibrate are with calibration period of 1 year.
 2. Mark "X" test instruments are used to measure the final test results.

3.2. Test Setup



3.3. Limits

➤ FCC Part 15 Subpart C Paragraph 15.231 Limit

FCC Part 15 Subpart C Paragraph 15.231 Limits				
Fundamental Frequency MHz	Field strength of fundamental		Field Strength of spurious emissions	
	uV/m	dBuV/m	uV/m	dBuV/m
40.66-40.70	2250	67.0	225	47.0
70-130	1250	61.9	125	41.9
130-174	1250-3750 ¹	61.9 – 71.5	125-375 ¹	41.9 – 51.5
174-260	3750	71.5	375	51.5
260-470	3750-12500 ¹	71.5 – 81.9	375-1250 ¹	51.5 – 61.9
above 470	12500	82.0	1250	62.0

Remarks :

1. RF Voltage (dBuV/m) = 20 log RF Voltage (uV/m)
2. In the Above Table, the tighter limit applies at the band edges.
3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

➤ Frequencies in restricted band are complied to limits on Paragraph 15.209.

FCC Part 15 Subpart C Paragraph 15.209 Limits		
Frequency (MHz)	uV/m @3m	dBuV/m@3m
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Remarks :

1. RF Voltage (dBuV/m) = 20 log RF Voltage (uV/m)
2. In the Above Table, the tighter limit applies at the band edges.
3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

3.4. Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.4:1992 on radiated measurement.

The bandwidth below 1GHz setting on the field strength meter (R&S Test Receiver ESCS 30) is 120 kHz and above 1GHz is 1MHz.

3.5. Test Result of Radiated Emission

Product : IR RF Remote Control Extender TX
 Test Item : Fundamental Radiated Emission
 Test Site : No.1 OATS
 Test Mode : Normal Operation

Freq.	Cable	Probe	PreAMP	Reading	Emission	Margin	Limit
	Loss	Factor		Level			
MHz	dB	dB/m	dB	dBuV	dBuV/m	dB	dBuV/m

Horizontal

Peak Detector:

418.000	1.48	21.77	0.00	51.22	74.46	25.82	100.28
---------	------	-------	------	-------	-------	-------	--------

Peak = 74.46dBuV/m; Duty Cycle= 20 Log (0.454);

Average = Peak +Duty Cycle= 67.6 dBuV/m

Average Limit = 41.6667* (418.000 MHz)-7083.3333=11000.015uV/m = 80.28dBuV/m

Peak Limit = 80.28 + 20dB = 100.28 dBuV/m

Vertical

Peak Detector:

418.000	1.48	22.33	0.00	58.52	82.33	17.95	100.28
---------	------	-------	------	-------	-------	-------	--------

Peak = 82.33dBuV/m; Duty Cycle= 20 Log (0.454);

Average = Peak +Duty Cycle= 75.47 dBuV/m

Average Limit = 41.6667* (418.000 MHz)-7083.3333=11000.015uV/m = 80.28dBuV/m

Peak Limit = 80.28 + 20dB = 100.28 dBuV/m

Note:

1. All Reading Levels are performed with peak and/or average measurements as necessary.
2. Emission Level = Reading Level + Probe Factor + Cable Loss.

Product : IR RF Remote Control Extender TX
Test Item : Harmonic Radiated Emission
Test Site : No.1 OATS
Test Mode : Normal Operation

Freq.	Cable	Probe	PreAMP	Reading	Emission	Margin	Limit
MHz	Loss	Factor	dB	Level	dBuV/m	dB	dBuV/m
	dB	dB/m		dBuV			

Horizontal

Peak Detector:

833.160	4.32	24.65	26.11	40.40	43.26	18.74	62.00
1254.413	2.20	24.76	35.11	45.85	37.70	24.30	62.00
1672.212	2.44	24.76	35.09	50.73	42.83	19.17	62.00
2090.338	2.67	27.03	34.99	54.02	48.73	13.27	62.00
2508.338	2.92	27.58	34.54	53.06	49.01	12.99	62.00
2926.237	3.15	28.09	34.12	44.57	41.69	20.31	62.00
3344.588	3.40	27.81	34.20	44.38	41.38	20.62	62.00
3762.588	3.64	29.00	34.40	44.31	42.55	19.45	62.00
4180.656	3.87	29.95	34.49	41.52	40.86	21.14	62.00

Vertical

Peak Detector:

833.160	4.32	24.62	26.11	40.60	43.42	18.58	62.00
1253.937	2.20	24.76	35.11	47.42	39.27	22.73	62.00
1672.237	2.44	24.76	35.09	57.46	49.56	12.44	62.00
2090.313	2.67	27.03	34.99	59.04	53.75	8.25	62.00
2508.438	2.92	27.58	34.54	57.17	53.12	8.88	62.00
2926.237	3.15	28.09	34.12	46.03	43.15	18.85	62.00
3344.000	3.40	27.81	34.20	43.05	40.05	21.95	62.00
3762.538	3.64	29.00	34.40	44.33	42.57	19.43	62.00
4180.789	3.87	29.95	34.49	43.28	42.62	19.38	62.00

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. Emission Level = Reading Level + Probe Factor + Cable Loss – PreAMP.
3. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : IR RF Remote Control Extender TX
Test Item : General Radiated Emission
Test Site : No.1 OATS
Test Mode : Normal Operation

Freq.	Cable	Probe	PreAMP	Reading	Emission	Margin	Limit
MHz	Loss	Factor	dB	Level	dBuV/m	dB	dBuV/m
	dB	dB/m		dBuV			

Horizontal:

159.980	1.55	9.60	26.90	39.80	24.05	19.45	43.50
182.290	1.64	9.34	26.91	37.40	21.47	22.03	43.50
313.240	2.18	14.03	26.93	36.20	25.48	20.52	46.00
418.000	2.61	15.22	26.76	29.80	20.86	25.14	46.00
648.860	3.56	18.66	26.40	30.00	25.82	20.18	46.00
*817.000	1.50	24.74	22.60	38.56	42.20	3.80	46.00

Vertical:

76.560	1.21	10.09	26.87	45.60	30.03	9.97	40.00
*174.530	1.61	17.70	26.90	42.00	34.40	9.10	43.50
275.410	2.02	14.80	26.94	34.80	24.68	21.32	46.00
322.940	2.22	16.26	26.91	32.20	23.77	22.23	46.00
553.800	3.17	20.48	26.55	29.20	26.30	19.70	46.00
736.260	1.38	21.54	22.60	35.49	35.81	10.19	46.00

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. “ * ”, means this data is the worst emission level.
3. Emission Level = Reading Level + Probe Factor + Cable Loss – PreAMP.

4. Occupied Bandwidth

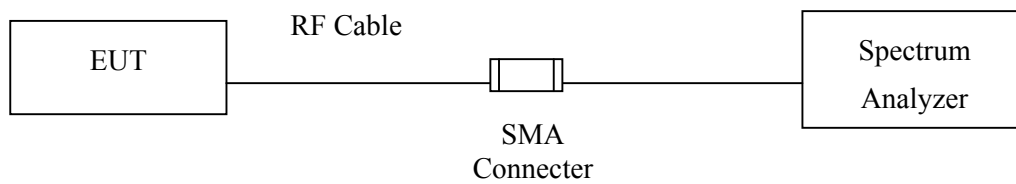
4.1. Test Equipment

The following test equipments are used during the radiated emission tests:

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Spectrum Analyzer	Advantest	R3272 / 72421194	May, 2002

Note: 1. All equipment upon which need to calibrated are with calibration period of 1 year.
2. Mark "X" test instruments are used to measure the final test results.

4.2. Test Setup



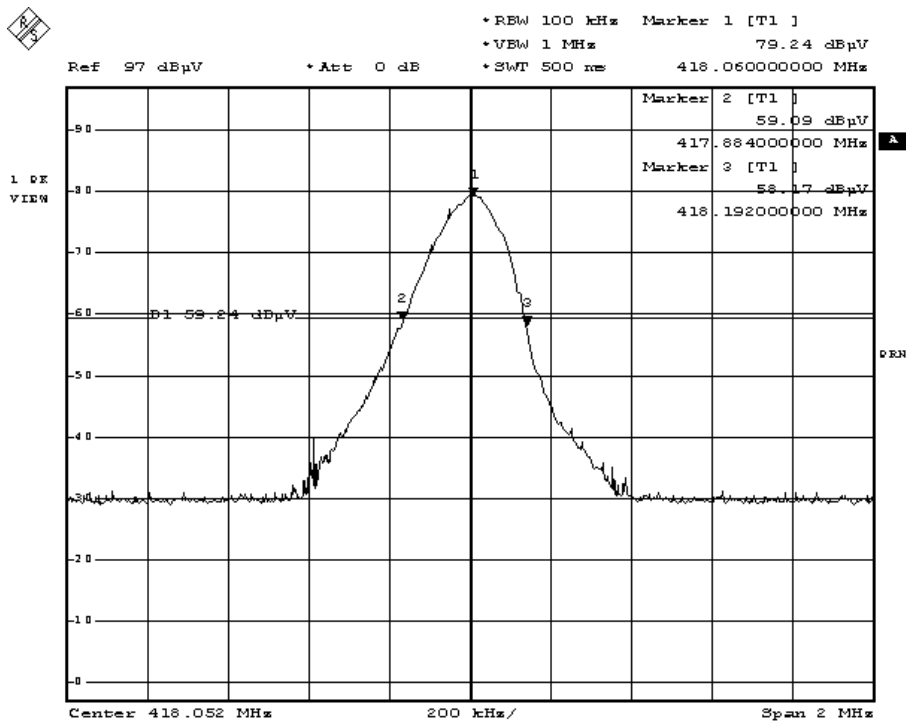
4.3. Limits

- (1) The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70MHz and below 900MHz.
- (2) The bandwidth of the emission shall be no wider than 0.5% of the center frequency for devices operating above 900MHz.

4.4. Test Result of Occupied Bandwidth

Product : IR RF Remote Control Extender TX
 Test Item : Occupied Bandwidth
 Test Site : No.1 OATS
 Test Mode : Normal Operation

Center Frequency	418	MHz
Allowable Bandwidth (70-900 MHz:0.25%, Above 900MHz: 0.5%)	1.045	kHz
Bandwidth at 20dB down (Max)	308	kHz
Result	Complied with regulation	



Date: 18.MAR.2003 14:16:08

5. Duty Cycle

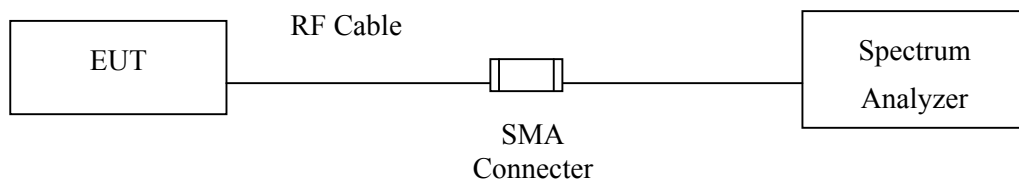
5.1. Test Equipment

The following test equipments are used during the radiated emission tests:

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Spectrum Analyzer	Advantest	R3272 / 72421194	May, 2002

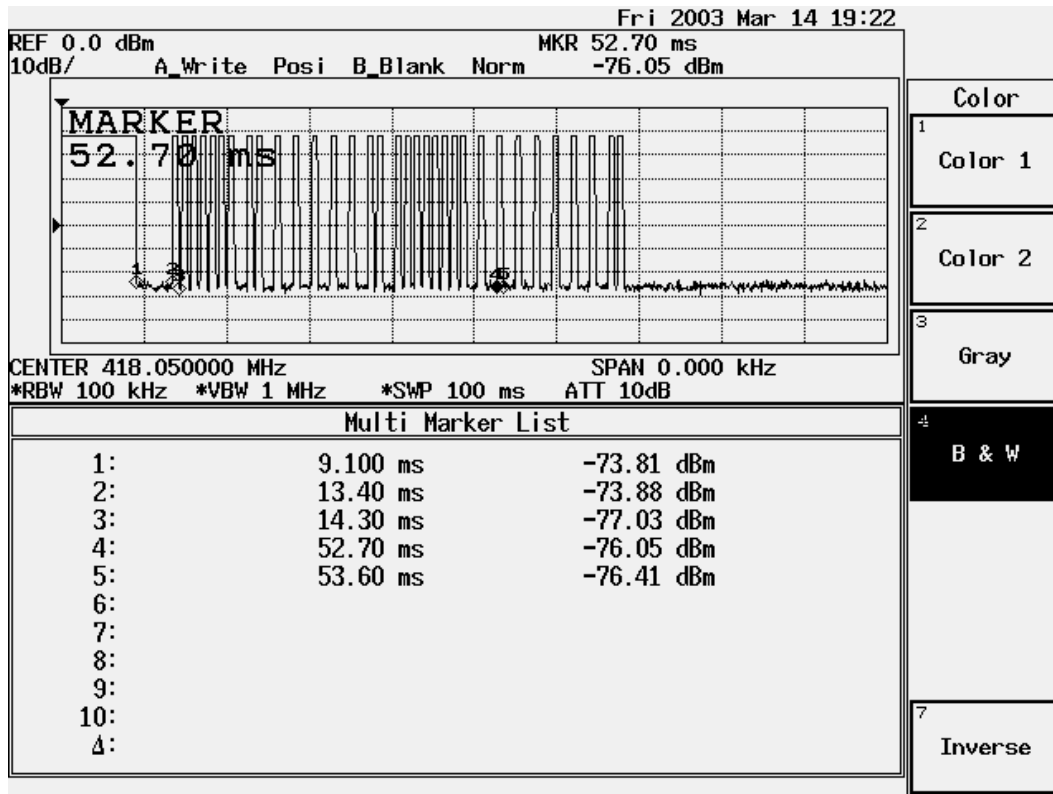
Note: 1. All equipment upon which need to calibrated are with calibration period of 1 year.
2. Mark "X" test instruments are used to measure the final test results.

5.2. Test Setup



5.3. Test Result of Duty Cycle

Product : IR RF Remote Control Extender TX
 Test Item : Duty Cycle
 Test Site : No.1 OATS
 Test Mode : Normal Operation



Duty Cycle:

$$(9.1+1.1*33)/100=0.454$$

$$20 \log 0.454=-6.86$$

$$\text{Duty Cycle} = -6.86\text{dB}$$

6. EMI Reduction Method During Compliance Testing

No modification was made during testing.

Attachment 1 : EUT Test Photographs

Attachment 1: EUT Test Setup Photographs

Front View of Conducted Test



Back View of Conducted Test



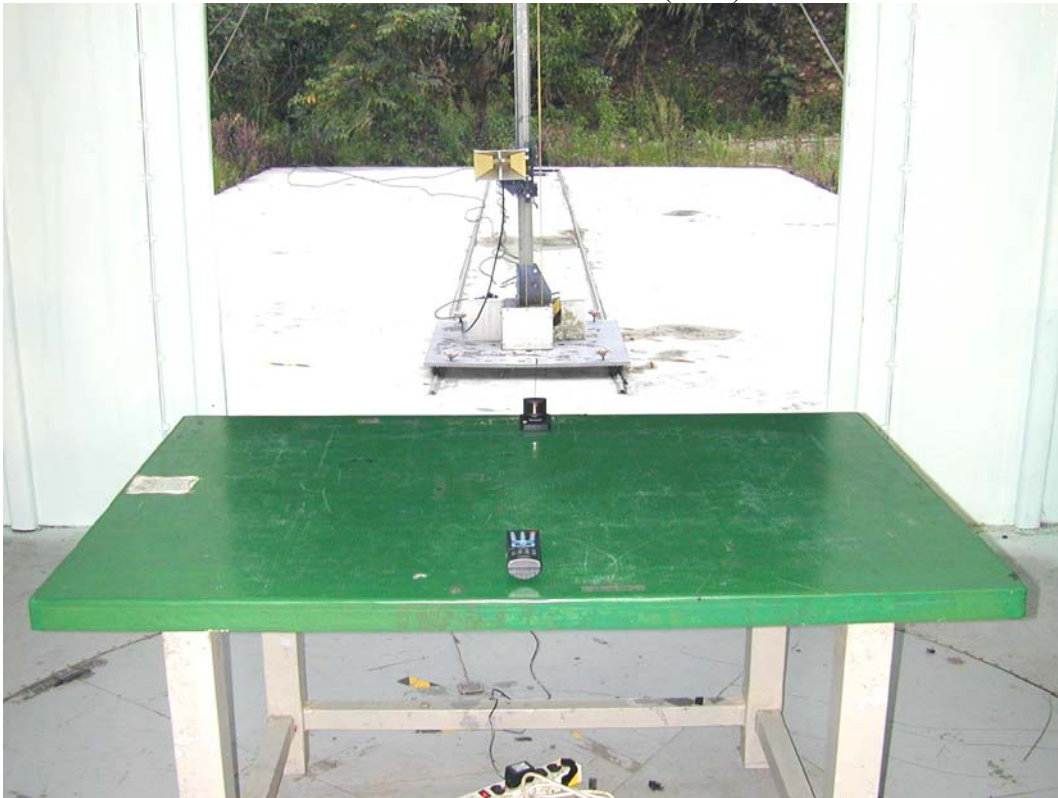
Front View of Radiated Test



Back View of Radiated Test



Front View of Radiated Test (Horn)



Attachment 2 : EUT Detailed Photographs

Attachment 2 : EUT Detailed Photographs

Tx:

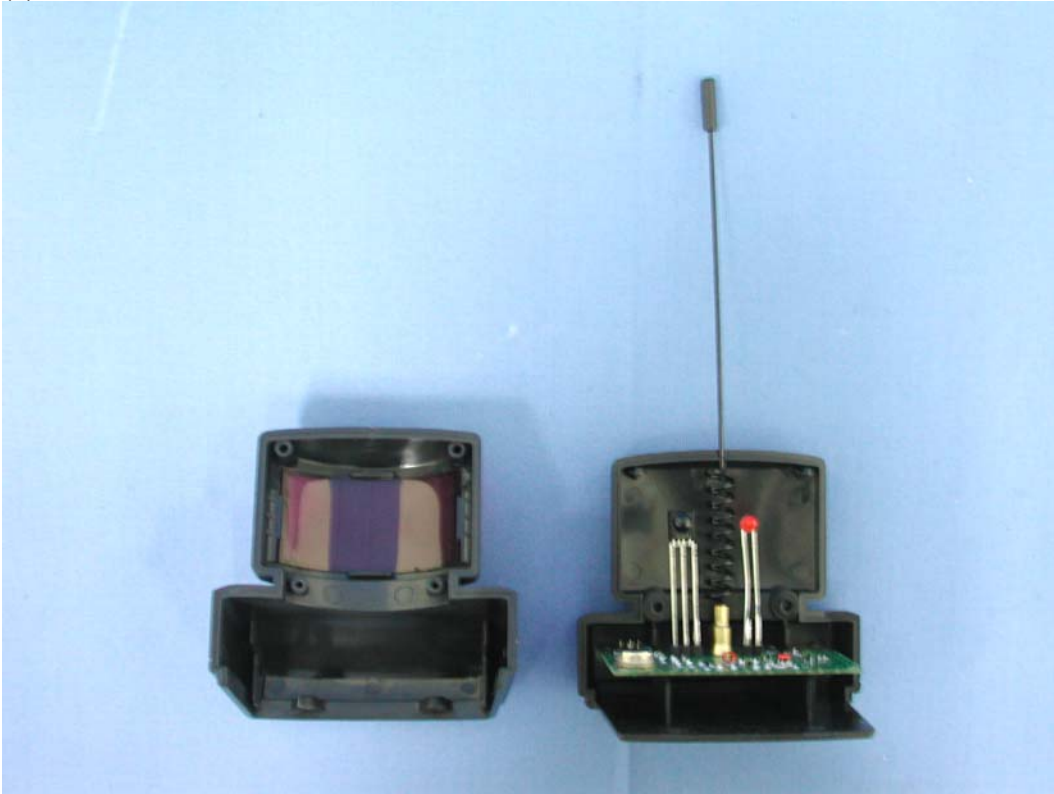
(1) EUT Photo



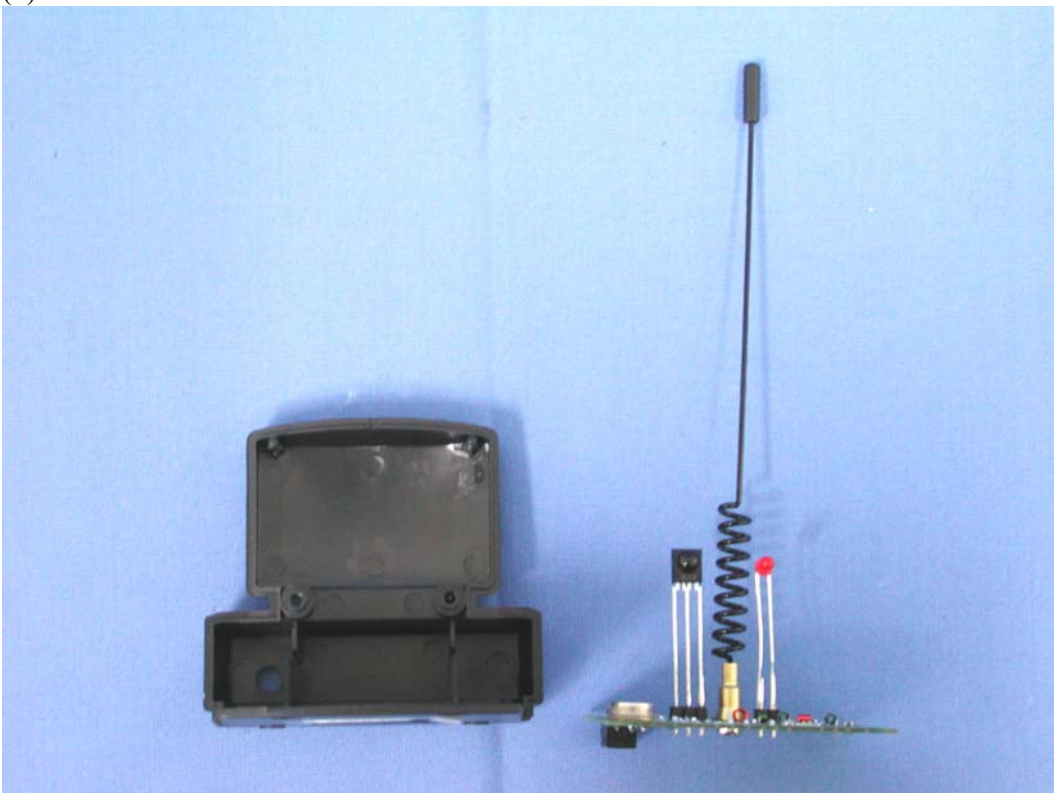
(2) EUT Photo



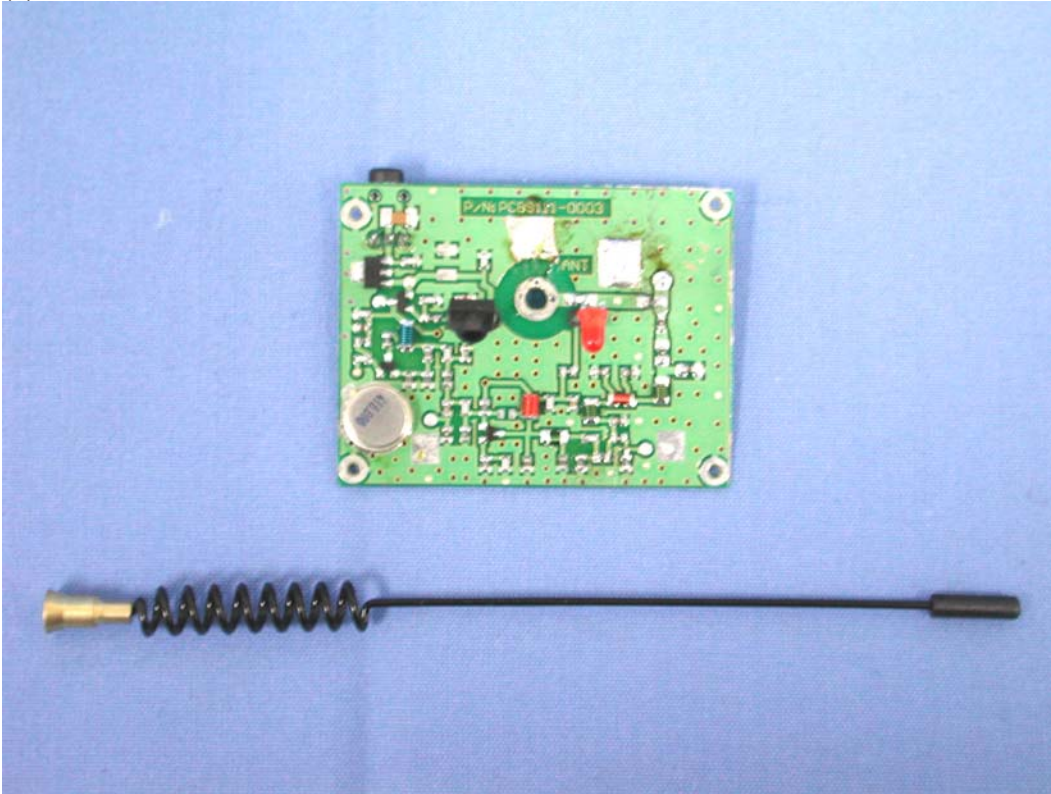
(3) EUT Photo



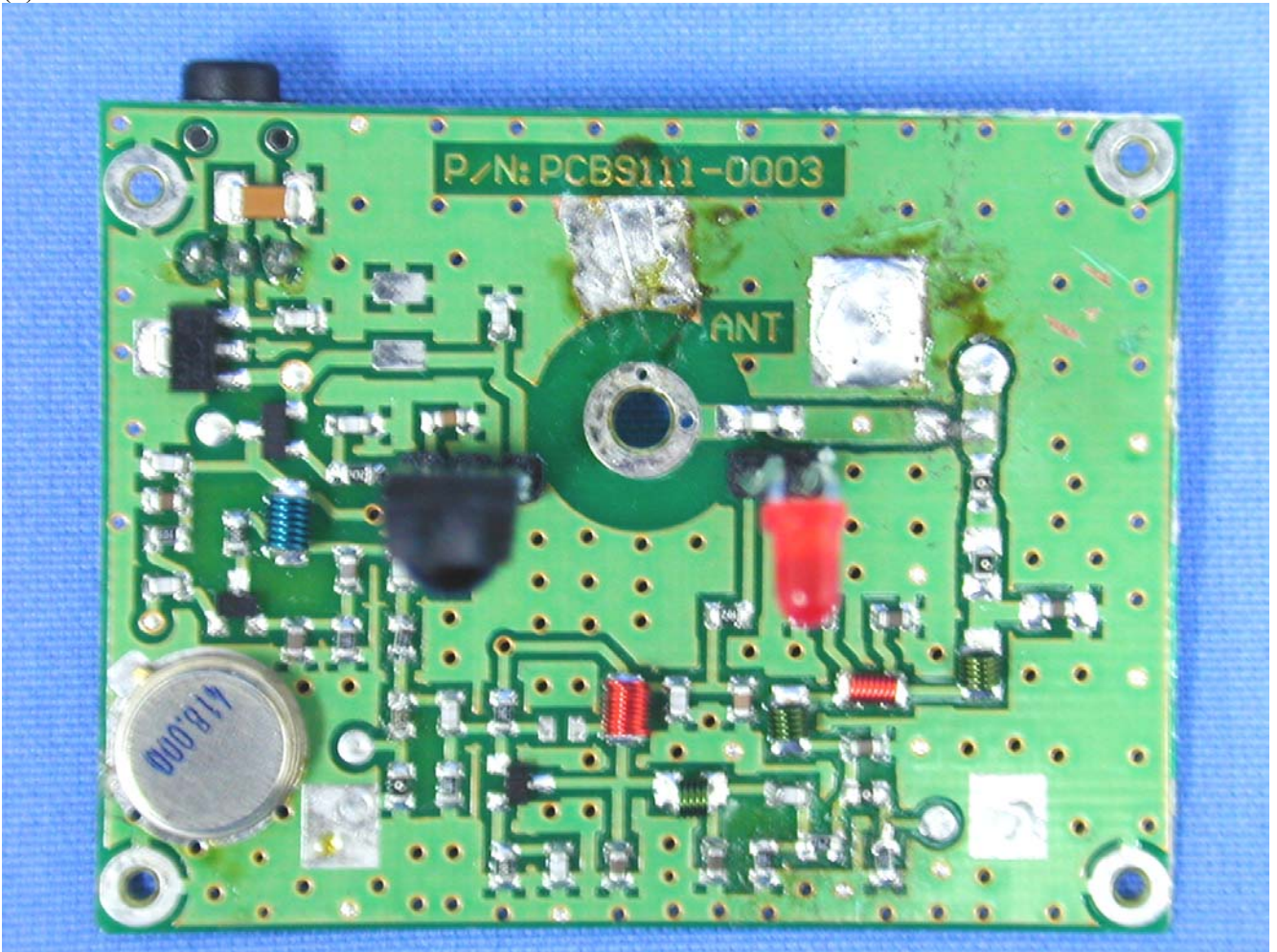
(4) EUT Photo



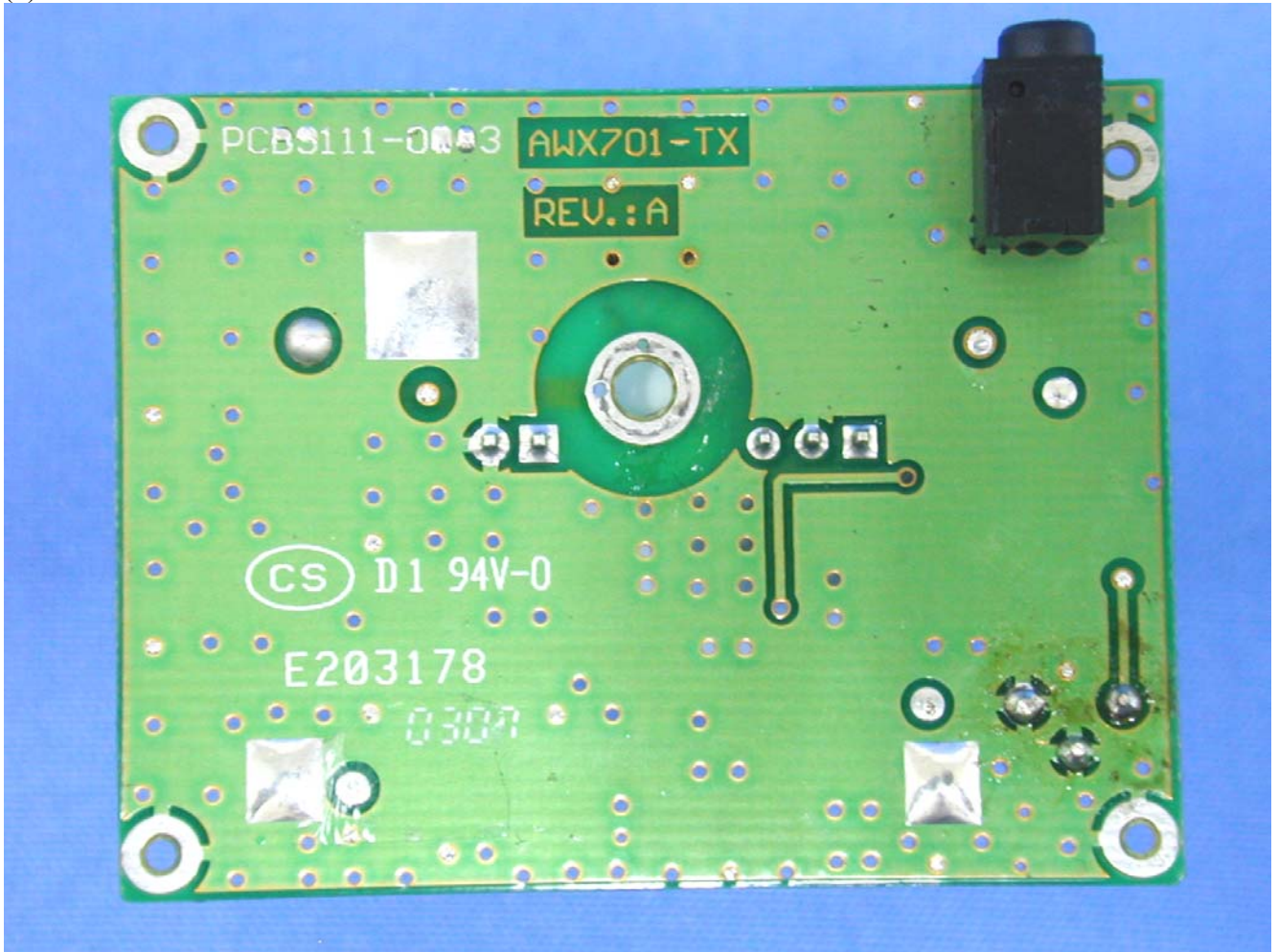
(5) EUT Photo



(6) EUT Photo



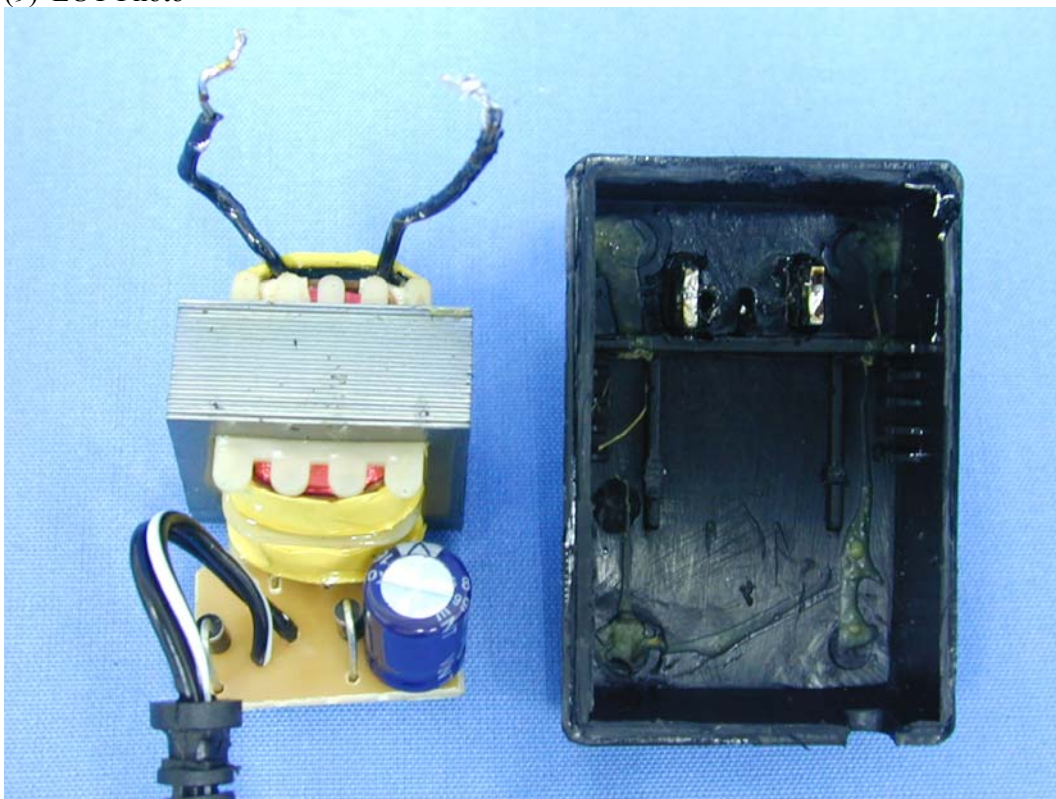
(7) EUT Photo



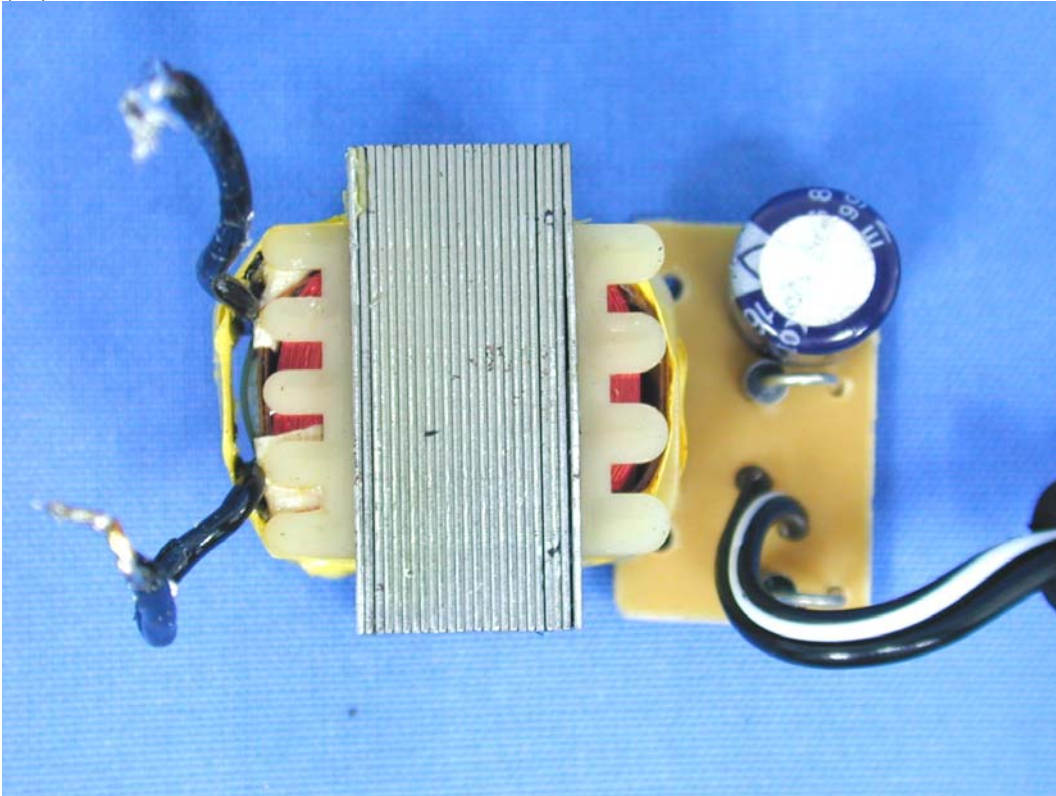
(8) EUT Photo



(9) EUT Photo



(10) EUT Photo



(11) EUT Photo

