STC Test Report

Date : 2007-07-19
No. : HM159282

Applicant (BEE008): Bedford Electronics Ltd.
Unit 1, 16/Fl., Wah Sing Industrial Bldg.,
12-14 Wah Sing Street, Kwai Chung, N.T., Hong Kong

Description of Samples:

Model Name:	433mhz remote temperature sensor
Brand Name:	Waterloo Industries Inc.
Model Number:	100342
FCC ID:	VHM80016699167

Date Samples Received: 2007-06-25

Date Tested: 2007-06-29 to 2007-07-10

Investigation Requested: FCC Part 15 Subpart C

Conclusions: 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.

Remarks: ----

LEE Kam Chuen,
ElectroMagnetic Compatibility Department
For and on behalf of
The Hong Kong Standards and Testing Centre Ltd.

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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

Bedford Electronics Ltd.
Unit 1, 16/Fl., Wah Sing Industrial Bldg.,
12-14 Wah Sing Street, Kwai Chung, N.T., Hong Kong

HKSTC Code Number for Applicant

Manufacturer

Bedford Electronics Ltd., China.
Xiang Jiao Tang Chun, Xue Xiang, Buji, Long Gang,
Shenzhen, Guang Dong, China.

1.3 Equipment Under Test [EUT]

Description of Sample

Product:	433mhz remote temperature sensor
Manufacturer:	Bedford Electronics Ltd., China.
Brand Name:	Waterloo Industries Inc.
Model Number:	100342
Rating:	4.5Vd.c ("AAA" size battery x 3)

1.3.1 Description of EUT Operation

The Equipment Under Test (EUT) is a Bedford Electronics Ltd., 433m remote temperature sensor. The EUT continues to transmit while button is being pressing. It is button transmitter, Modulation by Data Code. Type is pulses modulation.

1.4 Date of Order

2007-06-25

1.5 Submitted Sample(s):

1 Sample

1.6 Test Duration

2007-06-29 to 2007-07-10

1.7 Country of Origin

China

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 C63.4:2003 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
Field Strength of Fundamental Emissions & Spurious Emissions	FCC 47CFR 15.231e	ANSI C63.4:2003	N/A	☒	☐
Radiated Emissions, 30MHz to 1GHz	FCC 47CFR 15.209	ANSI C63.4:2003	N/A	☒	☐

Note: N/A - Not Applicable

3.0 Test Results

3.1 Emission

3.1.1 Radiated Emissions

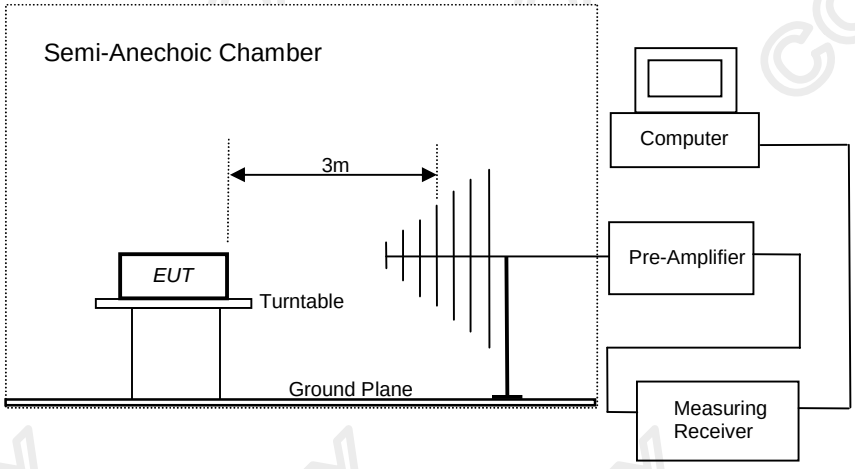
Test Requirement:	FCC 47CFR 15.231e
Test Method:	ANSI C63.4:2003
Test Date:	2007-07-10
Mode of Operation:	Tx mode

Test Method:

The sample was placed 0.8m above the ground plane of semi-anechoic Chamber*. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration 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.

*: Semi-anechoic chamber located on the G/F of HKSTC with a metal ground plane filed with the FCC pursuant to section 2.948 of the FCC rules, with Registration Number: 607756.

Test Setup:



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

Frequency Range of Fundamental [MHz]	Field Strength of Fundamental Emission [Average] [μV/m]	Field Strength of Spurious Emission [Average] [μV/m]
40.66-40.70	1,000	100
70-130	500	50
130-174	500 to 1,500 *	50 to 150 *
174-260	1,500	150
260-470	1,500 to 5,000 *	150 to 500 *
Above 470	5,000	500

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

Results:

Field Strength of Fundamental Emissions Peak Value						
Frequency MHz	Measured Level @3m dBμV	Correction Factor dB/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	Antenna Polarity
433.9	54.0	18.5	72.5	4217.0	43,983.5	Horizontal

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBμV	Correction Factor dB/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	Antenna Polarity
867.8	31.0	25.8	56.8	691.8	4398.3	Horizontal
+ 1301.7	< 1.0	29.4	< 30.4	< 33.1	5,000.0	Vertical
1735.6	< 1.0	32.2	< 33.2	< 45.7	4,398.3	Vertical
2169.5	< 1.0	15.9	< 16.9	< 7.0	4,398.3	Vertical
2603.4	< 1.0	17.4	< 18.4	< 8.3	4,398.3	Vertical
3037.3	< 1.0	17.2	< 18.2	< 8.1	4,398.3	Vertical
3471.2	< 1.0	18.8	< 19.8	< 9.8	4,398.3	Vertical
+ 3905.1	< 1.0	19.7	< 20.7	< 10.8	5,000.0	Vertical
+ 4339.0	< 1.0	20.6	< 21.6	< 12.0	5,000.0	Vertical

Results:

Field Strength of Fundamental Emissions Average Value						
Frequency MHz	Measured Level @3m dBµV *	Correction Factor dB/m	Field Strength dBµV/m	Field Strength µV/m	Limit ** @3m µV/m	Antenna Polarity
* 433.9	48.3	18.5	66.8	2187.8	4,398.3	Horizontal

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Field Strength µV/m	Limit @3m µV/m	Antenna Polarity
867.8	25.3	0.8	26.1	20.2	439.8	Horizontal
+ 1301.7	< 1.0	29.4	< 30.4	< 33.1	500.0	Vertical
1735.6	< 1.0	32.2	< 33.2	< 45.7	439.8	Vertical
2169.5	< 1.0	15.9	< 16.9	< 7.0	439.8	Vertical
2603.4	< 1.0	17.4	< 18.4	< 8.3	439.8	Vertical
3037.3	< 1.0	17.2	< 18.2	< 8.1	439.8	Vertical
3471.2	< 1.0	18.8	< 19.8	< 9.8	439.8	Vertical
+ 3905.1	< 1.0	19.7	< 20.7	< 10.8	500.0	Vertical
+ 4339.0	< 1.0	20.6	< 21.6	< 12.0	500.0	Vertical

Remarks:

*: Adjusted by Duty Cycle = -5.7dB

**: According to FCC C47CFR 15.231e,
FCC Limit for Average Measurement = 16.6667(433.9MHz)-2833.3333=4,398.3µV/m

+: Denotes restricted band of operation.
Measurements were made using a peak detector. For emissions falling within the restricted bands of FCC Rules Part 15 Section 15.205, the limits of FCC Rules Part 15 Section 15.209 were applied.

Correction Factor includes Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty = 30MHz to 1GHz ±5.2dB

Limited for Radiated Emissions [FCC 47 CFR 15.209]:

Frequency Range [MHz]	Quasi-Peak Limits [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 MHz	Measured Level @3m dBμV	Correction Factor dB/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	Antenna Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Remarks:

Correction Factor includes Antenna Factor and Cable Attenuation.
Calculated measurement uncertainty = 30MHz to 1GHz ±5.2dB

3.2 20dB Bandwidth of Fundamental Emission

Test Requirement:	FCC 47 CFR 15.231e
Test Method:	ANSI C63.4:2003 (Section 13.1.7)
Test Date:	2007-07-10
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:

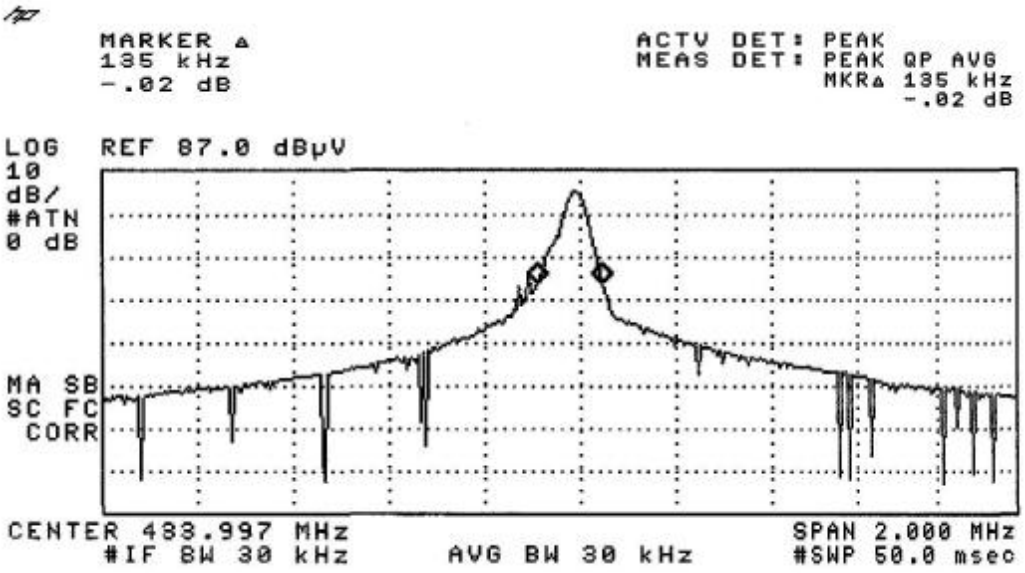
As Test Setup of clause 3.1.1 in this test report.

Limits for 20dB Bandwidth of Fundamental Emission:

Frequency Range [MHz]	20dB Bandwidth [KHz]	FCC Limits * [KHz]
433.982	135	1085

*: FCC Limit for Bandwidth measurement = (0.25%)(Center Frequency)
=(0.0025)(433.9)
=1085KHz

20dB Bandwidth of Fundamental Emission



Appendix A

List of Measurement Equipment

Radiated Emission

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EM007	SPECTRUM ANALYZER	HEWLETT PACKARD	HP85660B	3144A21192	2006/12/29	2007/12/29
EM008	SPECTRUM ANALYZER DISPLAY	HEWLETT PACKARD	HP85662A	3144A20514	2006/12/29	2007/12/29
EM009	QUASIPEAK ADAPTOR	HEWLETT PACKARD	HP85650A	3303A01702	2006/12/29	2007/12/29
EM010	RF PRESELECTOR	HEWLETT PACKARD	HP85685A	3221A01410	2006/12/29	2007/12/29
EM011	ATTENUATOR/SWITCH	HEWLETT PACKARD	HP11713A	2508A10595	2006/12/29	2007/12/29
EM012	PRE-AMPLIFIER	HEWLETT PACKARD	HP8449B	3008A00262	2006/12/29	2007/12/29
EM020	HORN ANTENNA	ETS-LINGGREN	3115	4032	2006/07/11	2008/07/11
EM022	LOOP ANTENNA	ETS-LINGGREN	6502	1189-2424	2006/07/26	2008/07/26
EM181	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESIB 7	100072	22007/06/08	2008/06/08
EM215	MULTIDEVICE CONTROLER	ETS-LINGGREN	2090	00024676	N/A	N/A
EM216	MINI MAST SYSTEM	ETS-LINGGREN	2075	00026842	N/A	N/A
EM217	ELECTRIC POWERED TURNTABLE	ETS-LINGGREN	2088	00029144	N/A	N/A
EM218	ANECHOIC CHAMBER	ETS-LINGGREN	FACT-3	--	2007/05/02	2008/05/02
EM219	BICONILOG ANTENNA	ETS-LINGGREN	3142C	00029071	2006/02/01	2008/02/01
EM229	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESIB 40	100248	2007/07/11	2008/07/11

Line Conducted

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EM119	LISN	ROHDE & SCHWARZ	ESH3-Z5	0831.5518.52	2006/07/15	2007/07/15
EM181	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESIB 7	100072	22007/06/08	2008/06/08
EM197	LISN	ETS-LINGGREN	4825/3	1193	2006/09/25	2007/09/25
EM154	SHIELDING ROOM	SIEMENA MATSUSHITA COMPONENTS	N/A	803-740-057-99A	2006/01/12	2008/01/12

Remarks:-

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

Appendix B

Duty Cycle Correction During 100msec

Each function key sends a different series of characters, but each packet period (93.5msec) never exceeds a series of 7 long (4.75msec) and 6 short (2.5msec) pulses. Assuming any combination of short and long pulses may be obtained due to encoding the worse case transmit duty cycle would be considered 7x4.75msecx6x2.5msec per 93.5msec=51.6% duty cycle. Figure A through C show the characteristics of the pulse train for one of these functions.

Remarks:

Duty Cycle Correction = 20Log(0.516) =-5.7dB

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

Figure A [Pulse Train]

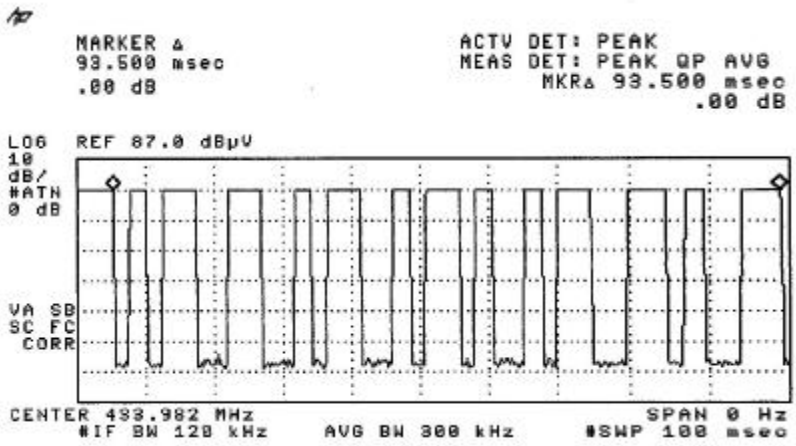


Figure B [Long Pulse]

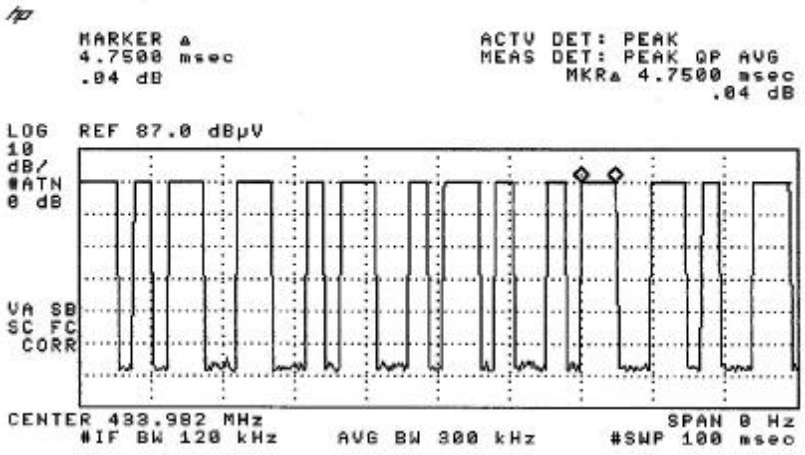
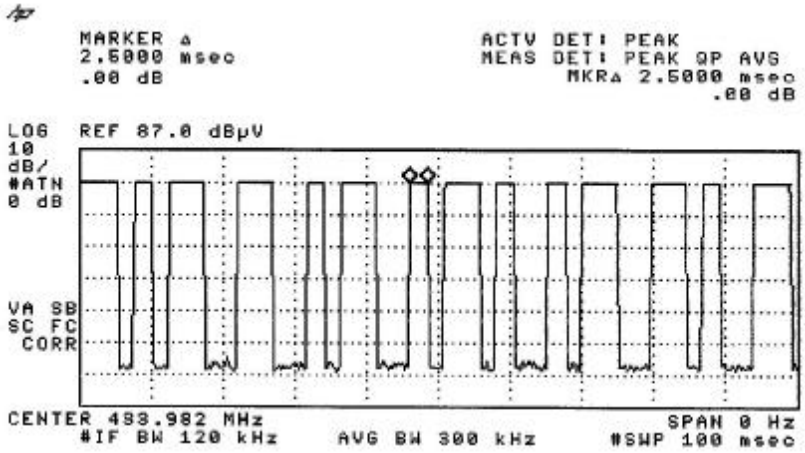


Figure C [Short Pulse]



Appendix C

Periodic Operation [FCC 47CFR 15.231e]

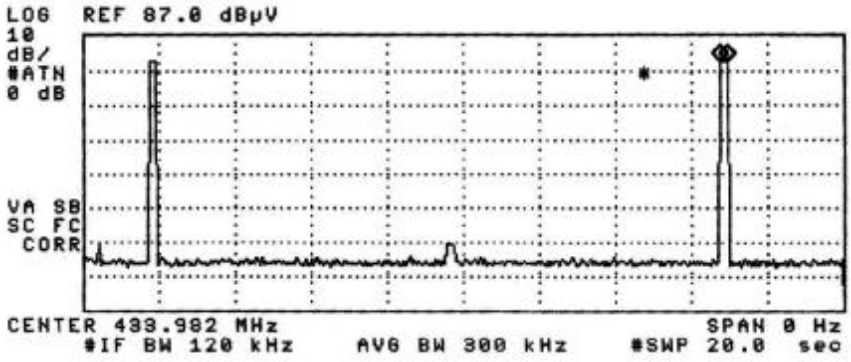
According to FCC 47CFR15.231e. The EUT shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

Results:

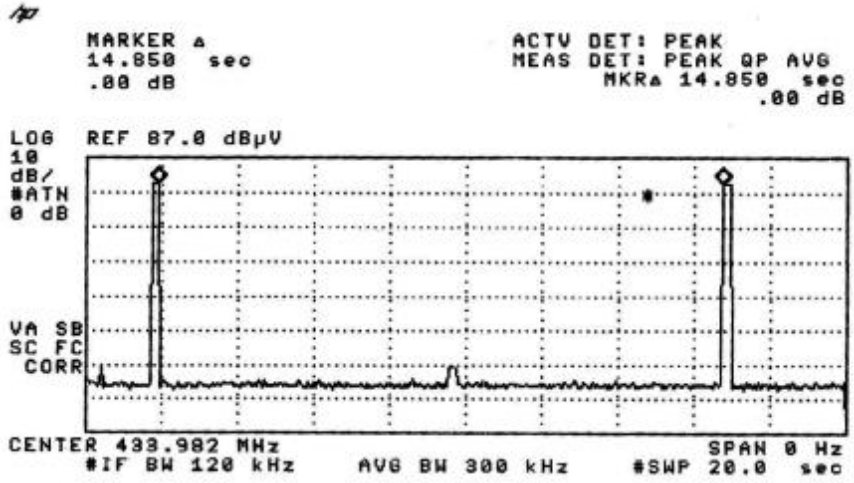
Since the EUT of each transmission is 600msec, so the silent period must not less than 10 seconds (200msec x 30).

The following figures [Figure D to Figure E] showed the duration of each transmission and silent period.

Figure D [Each transmission]



Periodic operation [FCC 47CFR15.231e]
Figure E [Silent Period]



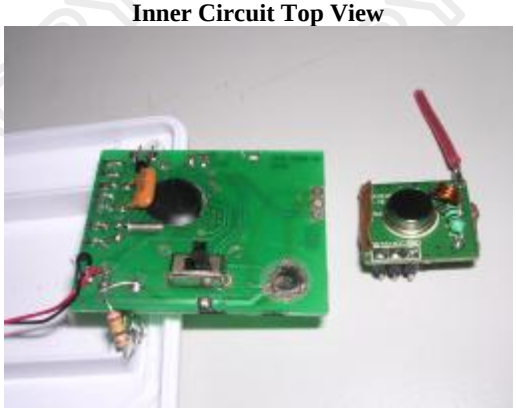
Appendix D

Photographs of EUT

Front View of the product

Rear View of the product

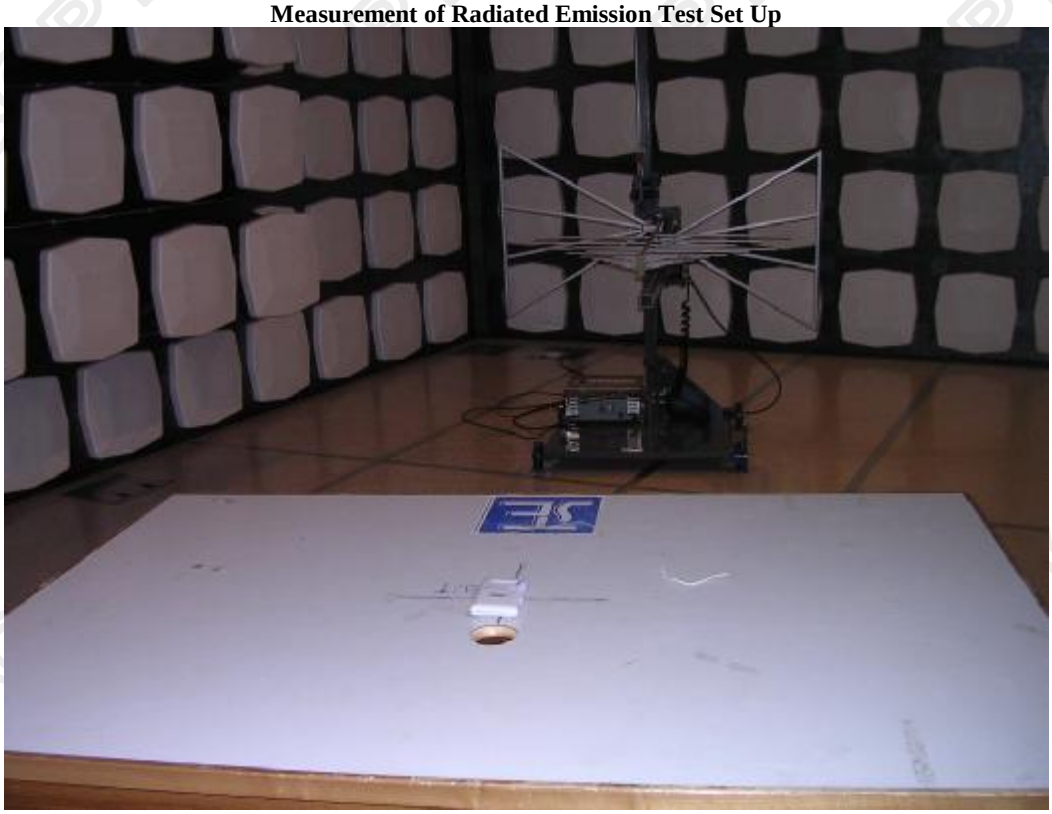
Inner Circuit Top View



Inner Circuit Bottom View

Photographs of EUT,

Measurement of Radiated Emission Test Set Up



******* End of Test Report *******