STC Test Report

Date: 2014-05-30

No.: MH190266

Applicant (SPM001): Spin Master Toys Far East Ltd.
1113A, 11/F., Chinachem Golden Plaza, 77 Mody Road,
Tsim Sha Tsui East, Kowloon, Hong Kong

Manufacturer: Spin Master Toys Far East Ltd.
1113A, 11/F., Chinachem Golden Plaza, 77 Mody Road,
Tsim Sha Tsui East, Kowloon, Hong Kong

Description of Sample(s): Submitted sample(s) said to be

Product:	ARH FIRE WING
Brand Name:	Air Hogs
Model Number:	44498RX
FCC ID:	PQN44498RX2G4

Date Sample(s) Received: 2014-05-26

Date Tested: 2014-05-27

Investigation Requested: Perform ElectroMagnetic Interference measurement in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15: 2013 and ANSI C63.4: 2009 for FCC Certification.

Conclusion(s): The submitted product 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.

Remark(s): ---

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

CONTENT:

1.0 General Details

1.1 Equipment Under Test [EUT]
Description of Sample(s)

Product:	ARH FIRE WING
Manufacturer:	Spin Master Toys Far East Ltd.
Brand Name:	Air Hogs
Model Number:	44498RX
Rating:	3.7Vd.c. (LiPo rechargeable battery pack x 1)

1.2 Description of EUT Operation

The Equipment Under Test (EUT) is a remote control model of Spin Master Toys. The transceiver operating in the 2.4GHz ISM frequency band. The RF signal was modulated by IC, the type of modulation used is FSK.

1.3 Date of Order

2014-05-26

1.4 Submitted Sample(s):

1 Sample

1.5 Test Duration

2014-05-27

1.6 Country of Origin

China

2.0 Technical Details

2.1 Investigations Requested

Perform Electromagnetic Interference measurements in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15: 2013 Regulations and ANSI C63.4:2009 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	Fail	N/A
Field Strength of Fundamental & Harmonics Emissions	FCC 47CFR 15.249	ANSI C63.4:2009	N/A	☒	☐	☐
Radiated Emissions	FCC 47CFR 15.209	ANSI C63.4:2009	N/A	☒	☐	☐

Note: N/A - Not Applicable

3.0 Test Results

3.1 Emission

3.1.1 Radiated Emissions

Test Requirement:	FCC 47CFR 15.249 & FCC 47CFR 15.209
Test Method:	ANSI C63.4:2009
Test Date:	2014-05-27
Mode of Operation:	Tx mode and Rx mode

Test Method:

The sample was placed 0.8m above the ground plane on a standard radiated emission test site. 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. In the frequency range of 9kHz to 30MHz, The center of the loop antenna shall be 1 meter above the ground and rotated loop axis for maximum reading. The emissions worst-case are shown in Test Results of the following pages.

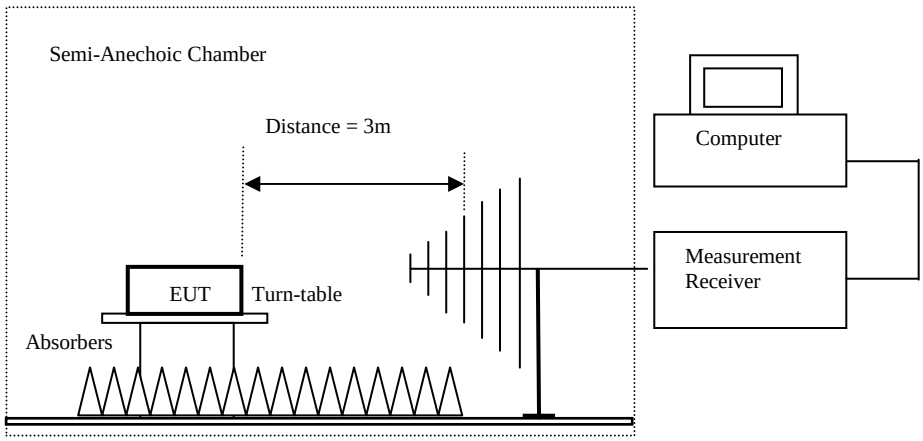
Remark: 3 orthogonal axis apply to hand-held device only.

*: Semi-Anechoic chamber located on the G/F of The Hong Kong Standards and Testing Centre Ltd. with a metal ground plane filed with the FCC pursuant to section 2.948 of the FCC rules, with Registration Number: 607756.

Spectrum Analyzer Setting:

9KHz – 30MHz (Pk & Av)	RBW:	10kHz
	VBW:	30kHz
	Sweep:	Auto
	Span:	Fully capture the emissions being measured
	Trace:	Max. hold
30MHz – 1GHz (QP)	RBW:	120kHz
	VBW:	120kHz
	Sweep:	Auto
	Span:	Fully capture the emissions being measured
	Trace:	Max. hold
Above 1GHz (Pk & Av)	RBW:	3MHz
	VBW:	3MHz
	Sweep:	Auto
	Span:	Fully capture the emissions being measured
	Trace:	Max. hold

Test Setup:



Ground Plane

Absorbers placed on top of the ground plane are for measurements above 1000MHz only.

Limits for Field Strength of Fundamental & Harmonics Emissions [FCC 47CFR 15.249]:

Frequency Range of Fundamental [MHz]	Field Strength of Fundamental Emission [microvolts/meter]	Field Strength of Harmonics Emission [microvolts/meter]
902-928	500,000 [Quasi-Peak]	500 [Average]
2400-2483.5	50,000 [Average]	500 [Average]

Results of Tx mode (Lowest Frequency Channel): Pass

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	E-Field Polarity
2408.00	36.0	36.1	72.1	4,027.2	500,000	Vertical
2408.00	35.6	35.4	71.0	3,548.1	500,000	Horizontal

Field Strength of Fundamental Emissions
Average Value

Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2408.00	21.5	36.1	57.6	758.6	50,000	Vertical
2408.00	21.7	35.4	57.1	716.1	50,000	Horizontal

Field Strength of Harmonics Emission
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	E-Field Polarity
4816.0	13.8	41.5	55.3	582.1	5,000	Vertical
4816.0	11.9	42.4	54.3	518.8	5,000	Horizontal
7224.0	9.8	45.1	54.9	555.9	5,000	Vertical
7224.0	8.7	46.2	54.9	555.9	5,000	Horizontal
9632.0	7.2	48.0	55.2	575.4	5,000	Vertical
9632.0	6.8	48.8	55.6	602.6	5,000	Horizontal
12040.0	3.5	51.5	55.0	562.3	5,000	Vertical
12040.0	3.4	52.4	55.8	616.6	5,000	Horizontal

Field Strength of Harmonics Emission Average Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
4816.0	-0.3	41.5	41.2	114.8	500	Vertical
4816.0	-3.9	42.4	38.5	84.1	500	Horizontal
7224.0	-3.9	45.1	41.2	114.8	500	Vertical
7224.0	-6.7	46.2	39.5	94.4	500	Horizontal
9632.0	-7.9	48.0	40.1	101.2	500	Vertical
9632.0	-8.8	48.8	40.0	100.0	500	Horizontal
12040.0	-11.3	51.5	40.2	102.3	500	Vertical
12040.0	-10.9	52.4	41.5	118.9	500	Horizontal

Results of Tx mode (Middle Frequency Channel): Pass

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	E-Field Polarity
2442.00	37.6	36.1	73.7	4,841.7	500,000	Vertical
2442.00	36.8	35.4	72.2	4,073.8	500,000	Horizontal

Field Strength of Fundamental Emissions Average Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2442.00	22.8	36.1	58.9	881.0	50,000	Vertical
2442.00	21.4	35.4	56.8	691.8	50,000	Horizontal

Field Strength of Harmonics Emission 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	E-Field Polarity
4884.0	14.1	41.6	55.7	609.5	5,000	Vertical
4884.0	12.4	42.5	54.9	555.9	5,000	Horizontal
7326.0	9.9	45.2	55.1	568.9	5,000	Vertical
7326.0	9.1	46.3	55.4	588.8	5,000	Horizontal
9768.0	7.6	48.1	55.7	609.5	5,000	Vertical
9768.0	6.4	48.9	55.3	582.1	5,000	Horizontal
12210.0	3.9	51.6	55.5	595.7	5,000	Vertical
12210.0	3.5	52.5	56.0	631.0	5,000	Horizontal

Field Strength of Harmonics Emission Avarage Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
4884.0	-1.0	41.6	40.6	107.2	500	Vertical
4884.0	-2.7	42.5	39.8	97.7	500	Horizontal
7326.0	-5.0	45.2	40.2	102.3	500	Vertical
7326.0	-6.0	46.3	40.3	103.5	500	Horizontal
9768.0	-7.1	48.1	41.0	112.2	500	Vertical
9768.0	-8.7	48.9	40.2	102.3	500	Horizontal
12210.0	-11.4	51.6	40.2	102.3	500	Vertical
12210.0	-11.0	52.5	41.5	118.9	500	Horizontal

Results of Tx mode (Highest Frequency Channel): Pass

Field Strength of Fundamental 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	E-Field Polarity
2460.00	34.5	36.1	70.6	3,388.4	500,000	Vertical
2460.00	33.9	35.4	69.3	2,917.4	500,000	Horizontal

Field Strength of Fundamental Emissions Average Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2460.00	17.3	36.1	53.4	467.7	50,000	Vertical
2460.00	17.1	35.4	52.5	421.7	50,000	Horizontal

Field Strength of Harmonics Emission 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	E-Field Polarity
4920.0	14.7	41.4	56.1	638.3	5,000	Vertical
4920.0	11.9	42.7	54.6	537.0	5,000	Horizontal
7380.0	9.6	45.6	55.2	575.4	5,000	Vertical
7380.0	8.5	46.5	55.0	562.3	5,000	Horizontal
9840.0	6.0	48.6	54.6	537.0	5,000	Vertical
9840.0	5.5	49.7	55.2	575.4	5,000	Horizontal
12300.0	3.6	51.7	55.3	582.1	5,000	Vertical
12300.0	3.0	52.7	55.7	609.5	5,000	Horizontal

Field Strength of Harmonics Emission Avarage Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
4920.0	-0.4	41.4	41.0	112.2	500	Vertical
4920.0	-2.7	42.7	40.0	100.0	500	Horizontal
7380.0	-4.8	45.6	40.8	109.6	500	Vertical
7380.0	-5.4	46.5	41.1	113.5	500	Horizontal
9840.0	-8.5	48.6	40.1	101.2	500	Vertical
9840.0	-9.6	49.7	40.1	101.2	500	Horizontal
12300.0	-10.8	51.7	40.9	110.9	500	Vertical
12300.0	-11.6	52.7	41.1	113.5	500	Horizontal

Remarks:
No additional spurious emissions found between lowest internal used/generated frequency and 30 MHz

Calculated measurement uncertainty (30MHz – 1GHz): 4.9dB
(1GHz – 6GHz): 4.02dB
(6GHz – 26.5GHz): 4.03dB

Emissions in the vertical and horizontal polarizations have been investigated and the worst-case test results are recorded in this report.

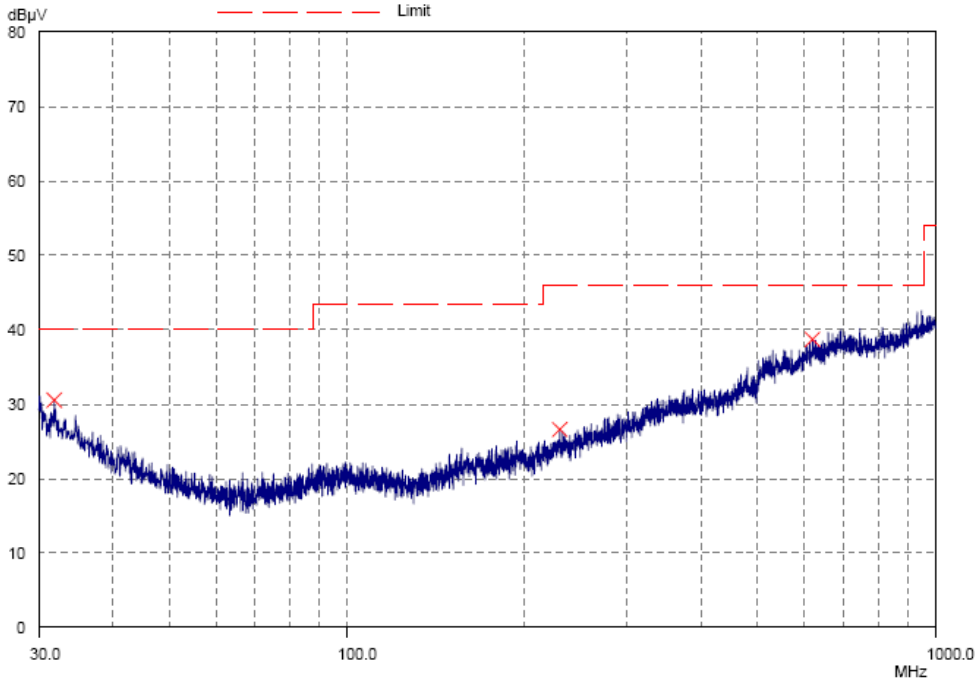
Limits for Radiated Emissions [FCC 47 CFR 15.209 Class B]:

Frequency Range [MHz]	Quasi-Peak Limits [μV/m]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
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 of Tx and Rx mode (9kHz – 30MHz): PASS
Emissions detected are more than 20 dB below the FCC Limits

Results of Tx and Rx mode: PASS
Horizontal



Results of Tx and Rx mode: PASS

Radiated Emissions Quasi-Peak					
Emission Frequency MHz	E-Field Polarity	Level @3m dBμV/m	Limit @3m dBμV/m	Level @3m μV/m	Limit @3m μV/m
31.9	Horizontal	30.6	40.0	33.9	100
230.4	Horizontal	26.6	46.0	21.4	200
619.0	Horizontal	38.7	46.0	86.1	200

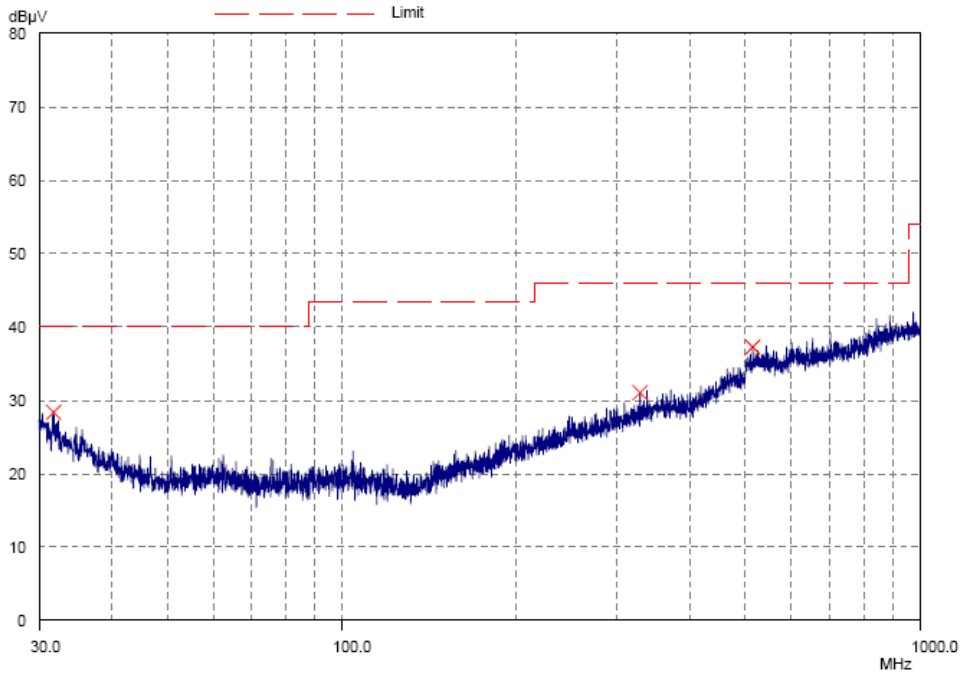
Limits for Radiated Emissions [FCC 47 CFR 15.209 Class B]:

Frequency Range [MHz]	Quasi-Peak Limits [μV/m]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
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 of Tx and Rx mode (9kHz – 30MHz): PASS
Emissions detected are more than 20 dB below the FCC Limits

Results of Tx and Rx mode: PASS
Vertical



Results of Tx and Rx mode: PASS

Radiated Emissions Quasi-Peak					
Emission Frequency MHz	E-Field Polarity	Level @3m dBμV/m	Limit @3m dBμV/m	Level @3m μV/m	Limit @3m μV/m
31.8	Vertical	28.4	40.0	26.3	100
328.3	Vertical	31.1	46.0	35.9	200
514.2	Vertical	37.3	46.0	73.3	200

Remarks:
Calculated measurement uncertainty (9kHz – 30MHz): 2.4dB
(30MHz – 1GHz): 4.9dB
(1GHz – 6GHz): 4.02dB

Emissions in the vertical and horizontal polarizations have been investigated and the worst-case test results are recorded in this report.

3.2 20dB Bandwidth of Fundamental Emission

Test Requirement:	FCC 47 CFR 15.249
Test Method:	ANSI C63.4:2009
Test Date:	2014-05-27
Mode of Operation:	Tx 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.

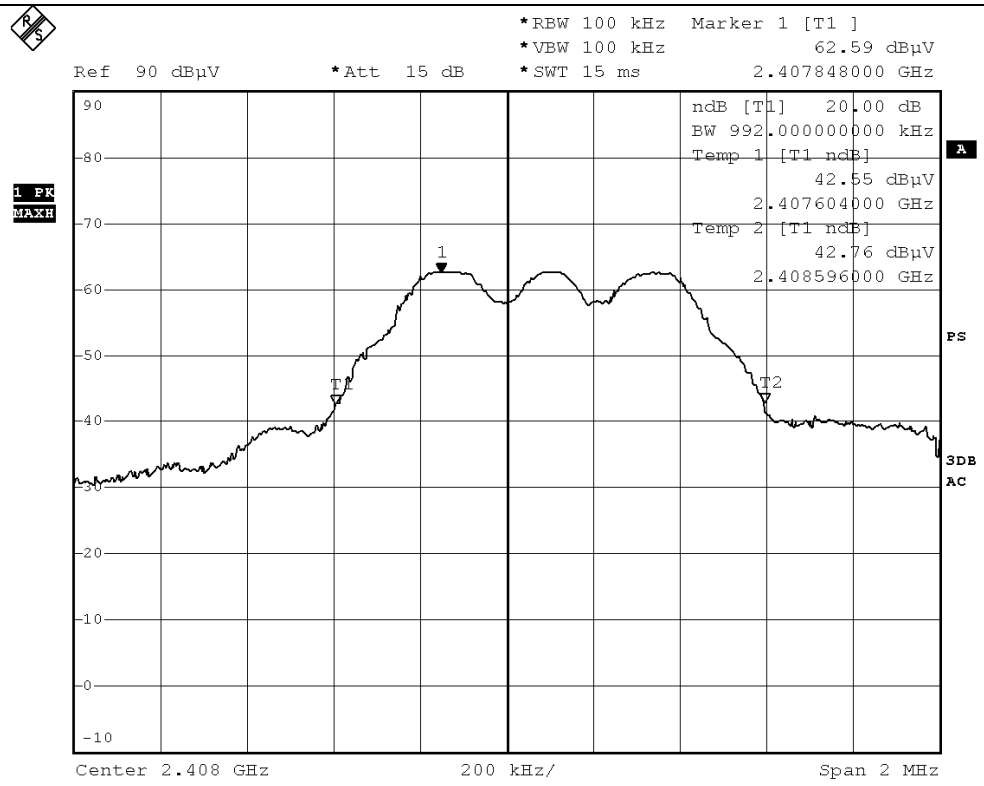
Test Setup:

As Test Setup of clause 3.1.1 in this test report.

Limits for 20dB Bandwidth of Fundamental Emission (Low Frequency Channel):

Frequency Range [MHz]	20dB Bandwidth [kHz]
2408	992

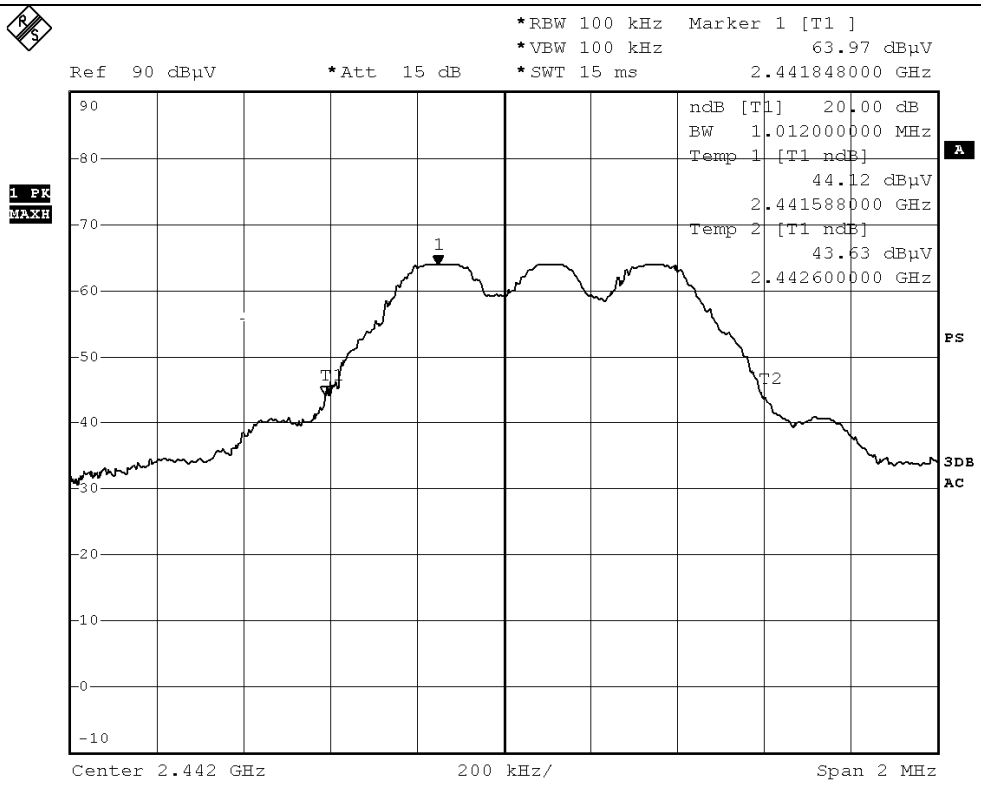
20dB Bandwidth of Fundamental Emission



Limits for 20dB Bandwidth of Fundamental Emission (Middle Frequency Channel):

Frequency Range [MHz]	20dB Bandwidth [kHz]
2442	1012

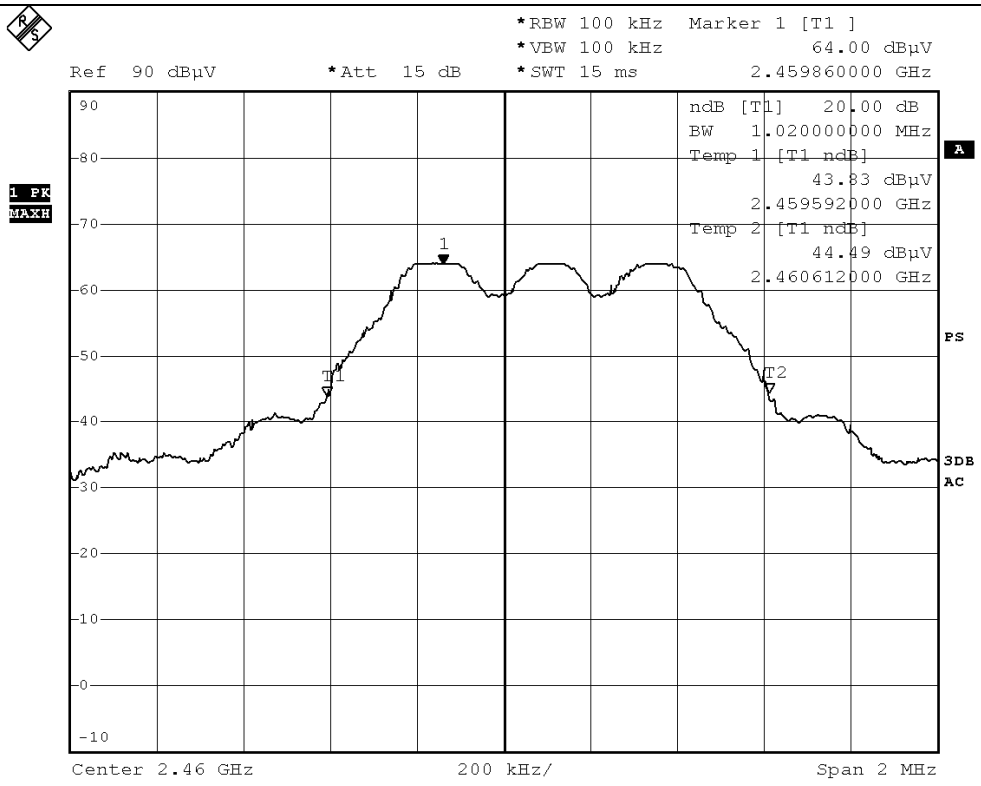
20dB Bandwidth of Fundamental Emission



Limits for 20dB Bandwidth of Fundamental Emission (High Frequency Channel):

Frequency Range [MHz]	20dB Bandwidth [kHz]
2460	1020

20dB Bandwidth of Fundamental Emission



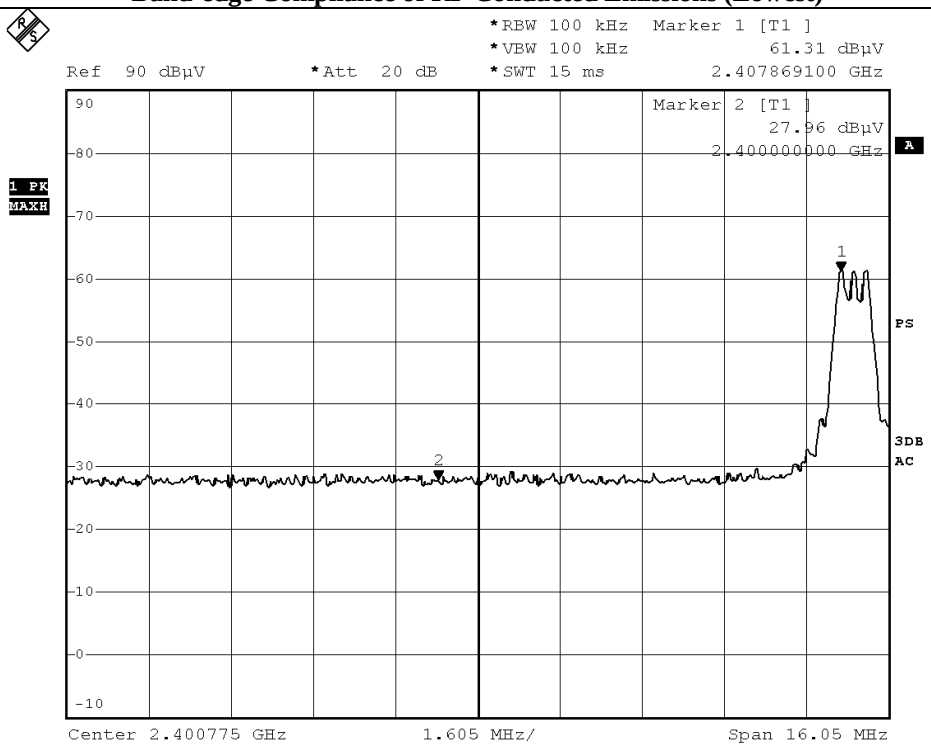
Band-edge Compliance of RF Conducted Emissions Measurement:

Limit：

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required.

Frequency Range [MHz]	Radiated Emission Attenuated below the Fundamental [dB]
2400 – Lowest Fundamental (2408)	33.35

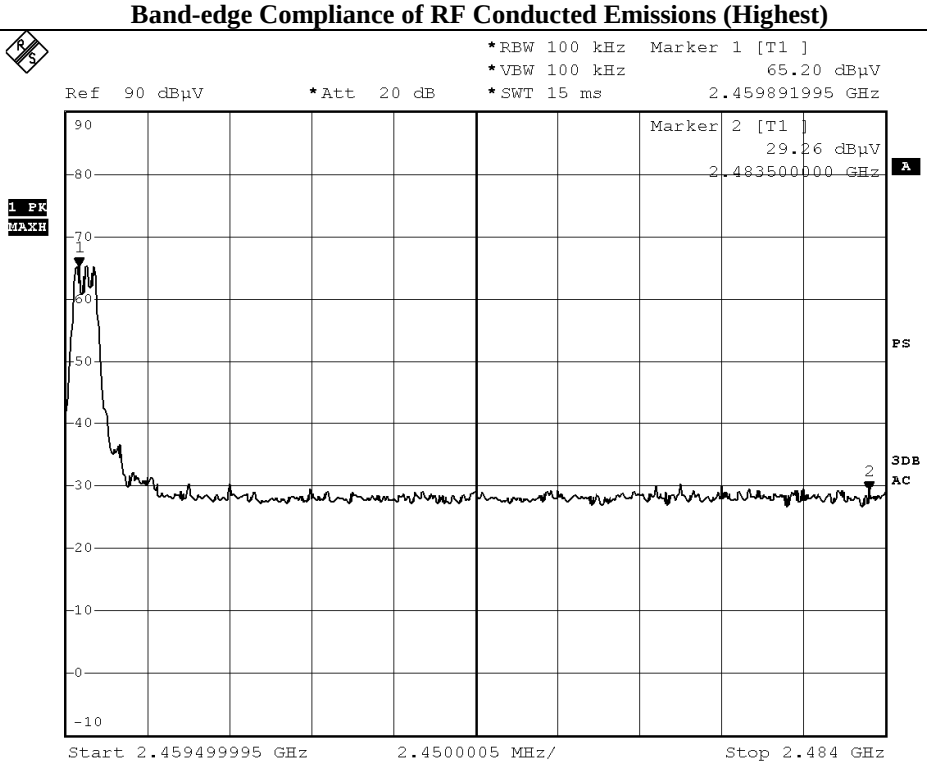
Band-edge Compliance of RF Conducted Emissions (Lowest)



Band-edge Compliance of RF Conducted Emissions Measurement:

Frequency Range [MHz]	Radiated Emission Attenuated below the Fundamental [dB]
Highest Fundamental (2460) - 2483.5	35.94

Band-edge Compliance of RF Conducted Emissions (Highest)



Band-edge Compliance of RF Radiated Emissions Measurement:

Limit：

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 5.205(c)).

Result：Band-edge Compliance of RF Radiated Emissions (Lowest)

Field Strength of Band-edge Compliance Peak Value						
Frequency MHz	Measured Level @3m dBμV	Correction Factor dB/m	Field Strength dBμV/m	Limit @3m dBμV/m	Margin dBμV/m	E-Field Polarity
2400.0	12.0	36.1	48.1	74.0	25.9	Horizontal

Field Strength of Band-edge Compliance Average Value						
Frequency MHz	Measured Level @3m dBμV	Correction Factor dB/m	Field Strength dBμV/m	Limit @3m dBμV/m	Margin dBμV/m	E-Field Polarity
2400.0	1.8	36.1	37.9	54.0	16.1	Horizontal

Result：Band-edge Compliance of RF Radiated Emissions (Highest)

Field Strength of Band-edge Compliance Peak Value						
Frequency MHz	Measured Level @3m dBμV	Correction Factor dB/m	Field Strength dBμV/m	Limit @3m dBμV/m	Margin dBμV/m	E-Field Polarity
2483.5	12.4	35.4	47.8	74.0	26.2	Horizontal

Field Strength of Band-edge Compliance Average Value						
Frequency MHz	Measured Level @3m dBμV	Correction Factor dB/m	Field Strength dBμV/m	Limit @3m dBμV/m	Margin dBμV/m	E-Field Polarity
2483.5	0.8	35.4	36.2	54.0	17.8	Horizontal

Appendix A

List of Measurement Equipment

Radiated Emission

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EM299	DOUBLE-RIDGED WAVEGUIDE HORN ANTENNA	ETS-LINDGREN	3115	00114120	2014/01/15	2016/01/25
EM300	PYRAMIDAL STANDARD GAIN HORN ANTENNA	ETS-LINDGREN	3160-09	00130130	2014/01/23	2016/01/23
EM215	MULTIDEVICE CONTROLLER	EMCO	2090	00024676	N/A	N/A
EM216	MINI MAST SYSTEM	EMCO	2075	00026842	N/A	N/A
EM217	ELECTRIC POWERED TURNTABLE	EMCO	2088	00029144	N/A	N/A
EM218	ANECHOIC CHAMBER	ETS-LINDGREN	FACT-3	--	2013/10/02	2014/10/02
EM219	BICONILOG ANTENNA	EMCO	3142C	00029071	2013/04/25	2015/04/25
EM022	LOOP ANTENNA	EMCO	6502	1189-2424	2014/01/15	2016/01/15
EM229	EMI TEST RECEIVER	R&S	ESIB40	100248	2014/05/26	2015/05/26

Remarks:-

N/A Not Applicable or Not Available

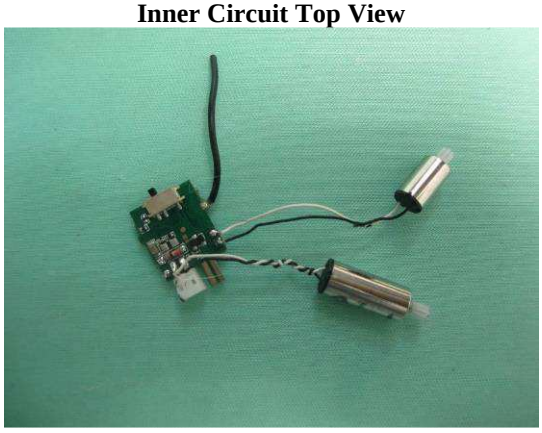
Appendix B

Photographs of EUT

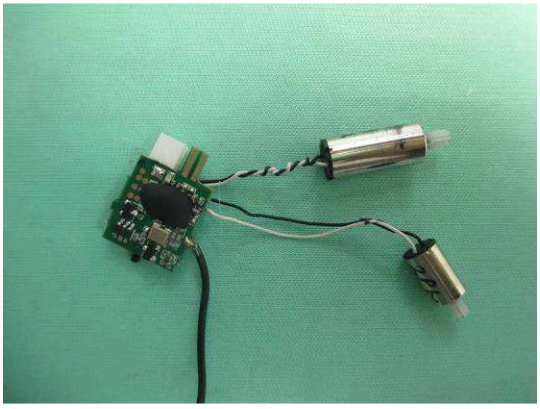
Front View of the product

Rear View of the product

Inner Circuit Top View

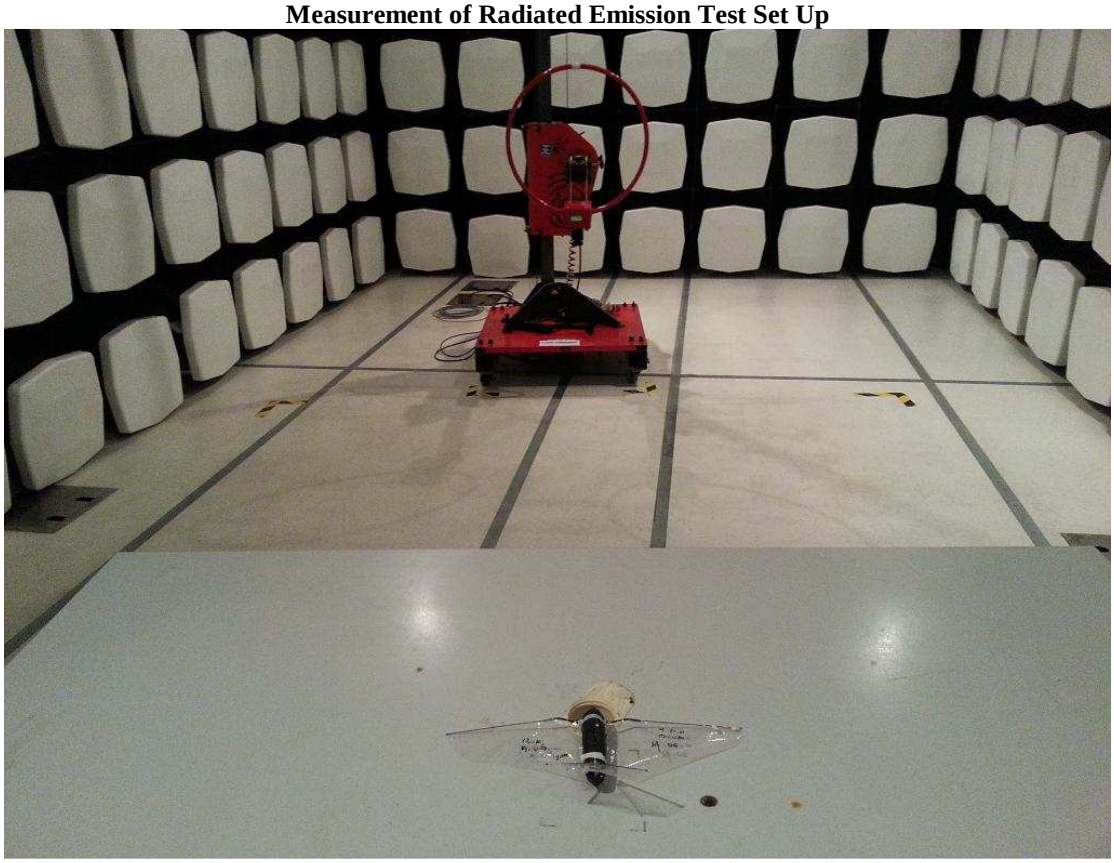


Inner Circuit Bottom View



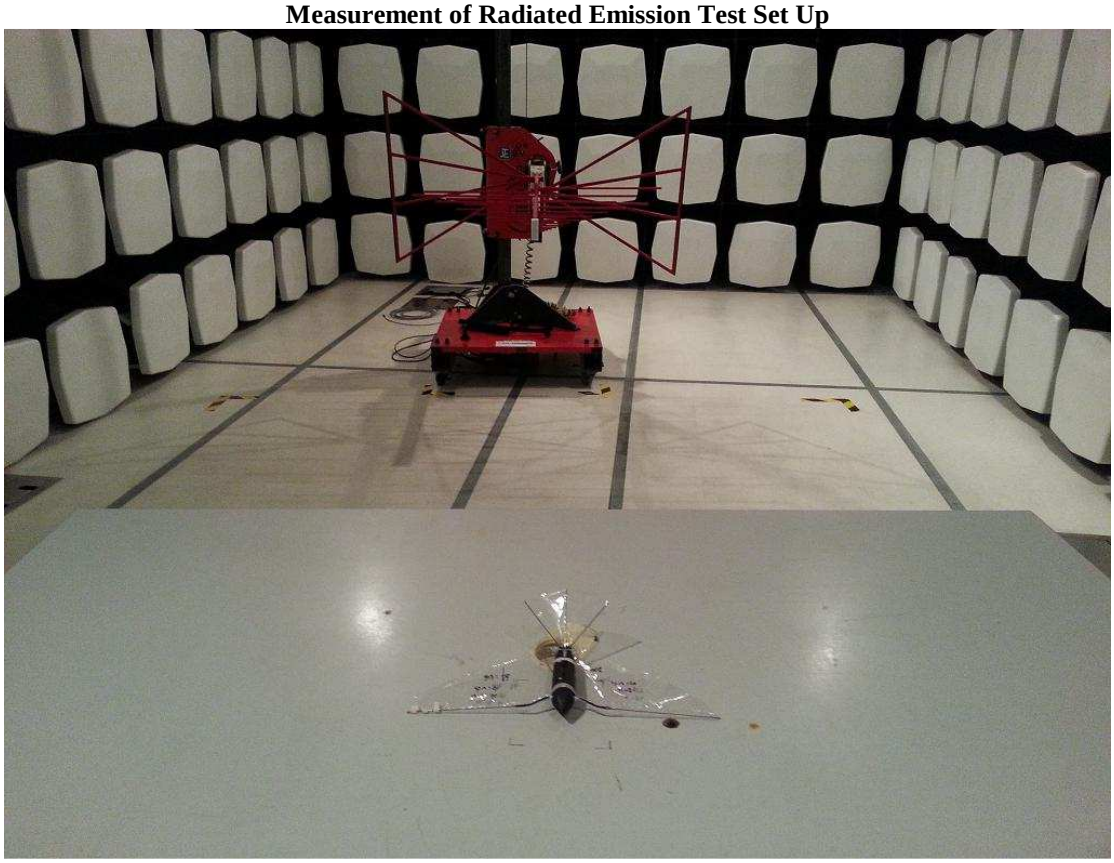
Photographs of EUT

Measurement of Radiated Emission Test Set Up



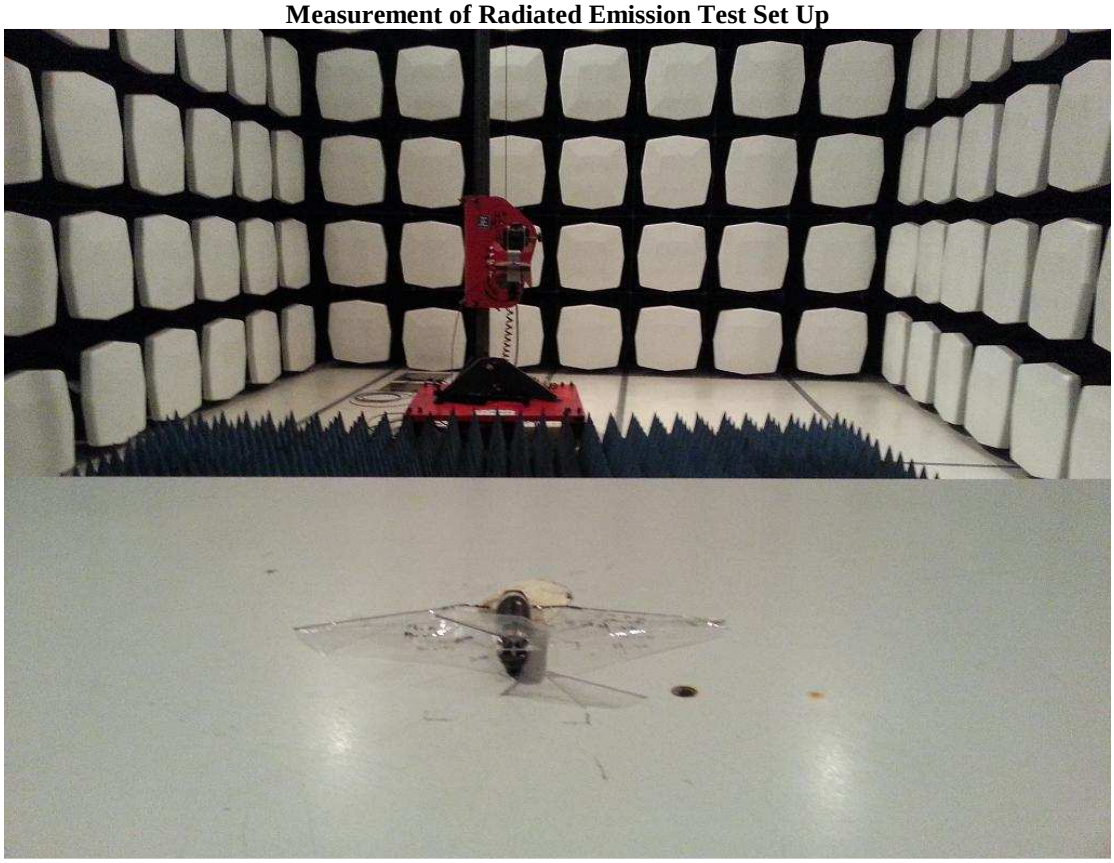
Photographs of EUT

Measurement of Radiated Emission Test Set Up



Photographs of EUT

Measurement of Radiated Emission Test Set Up



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