



STC Test Report

Date: 2014-05-28

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No. : DM115573

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

Manufacturer: Spin Master Toys
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
IC: 4438B-44498RX

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

Date Tested: 2014-05-27

Investigation Requested: Industry Canada Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment RSS-210 Issue 8; Industry Canada General Requirements and Information for the Certification of Radio Apparatus RSS-Gen Issue 3.

Conclusion(s): The submitted product COMPLIED with the requirements of Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment RSS-210 Issue 8; Industry Canada General Requirements and Information for the Certification of Radio Apparatus RSS-Gen Issue 3. The tests were performed in accordance with the standards described above and on Section 2.2 in this Test Report.

Remark(s): ---


LONG Yun Jian, Along
Authorized Signatory
ElectroMagnetic Compatibility Department
For and on behalf of
STC (Dongguan) Company Limited



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1.0 General Details

1.1 Test Laboratory

STC (Dongguan) Company Limited
EMC Laboratory
68 Fumin Nan Road, Dalang, Dongguan, China

Telephone: (86 769) 81119888
Fax: (86 769) 81116222

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

Submitted Sample(s) said to be:

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

1.2.1 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

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2.0 Technical Details

2.1 Investigations Requested

Perform ElectroMagnetic Interference measurement in accordance with RSS-210 Issue 8; RSS-Gen Issue 3 for IC Certification.

2.2 Test Standards and Results Summary Tables

EMISSION Results Summary					
Test Condition	Test Requirement	Test Method	Class / Severity	Test Result	
				Pass	Fail
Field Strength of Fundamental & Harmonics Emissions	RSS-210 issue 8 December 2010	ANSI C63.4	Section A2.9(a)	☒	☐
Radiated Emissions	RSS-Gen issue 3 December 2010	ANSI C63.4	Section 7.2.5 Table 5 & Table 6	☒	☐
99% Bandwidth	RSS-Gen issue 3 December 2010	ANSI C63.4	Section 4.6.1	☒	☐

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3.0 Test Results

3.1 Emission

3.1.1 Radiated Emissions

Test Requirement:	RSS-210 Section A2.9
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 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.

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

*: Semi-anechoic chamber located at DGSTC filed with Industry Canada. File Number: IC4789B-1

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Spectrum Analyzer Setting:

9KHz – 30MHz (Pk & Av)

RBW: 10kHz
VBW: 30kHz
Sweep: Auto
Span: Fully capture the emissions being measured
Trace: Max. hold

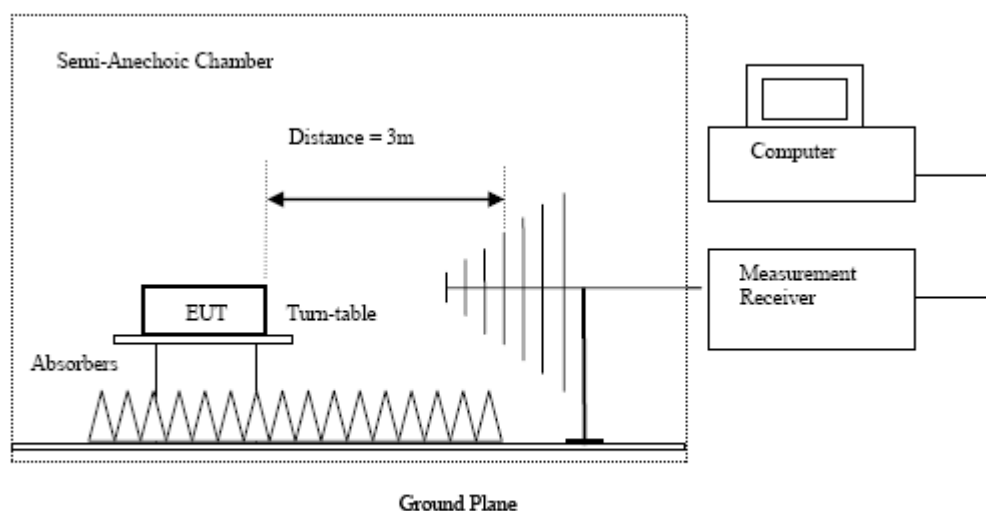
30MHz – 1GHz (QP)

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:



- Absorbers placed on top of the ground plane are for measurements above 1000MHz only.
- Measurements between 30MHz to 1000MHz made with Bi-log antennas, above 1000MHz horn antennas are used.

Limits for Radiated Emissions [RSS-210 Section A2.9(a)]:

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Frequency Range [MHz]	Field Strength (millivolts/m)	
	Fundamental	Harmonics
902-928	50	0.5
2400-2483.5	50	0.5
5725-5875	50	0.5

Note: The limits shown in the above table are based on measurements using an average detector, except for the fundamental emission in the frequency band 902-928 MHz, which is based on measurements using a CISPR quasi-peak detector.

(b) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general field strength limits listed in RSS-Gen, whichever is less stringent.

The provisions of RSS-Gen regarding pulsed operation do not apply to CISPR measurement for the band 902-928 MHz.

Results of Tx mode (Lowest Frequency Channel – 2408 MHz): Pass

Field Strength of Fundamental Emissions						
Peak Value						
Frequency	Measured Level @ 3m	Correction Factor	Field Strength	Field Strength	Limit @ 3m	E-Field Polarity
MHz	dB μ V/m	dB μ V/m	dB μ V/m	μ V/m	μ V/m	
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	Measured Level @ 3m	Correction Factor	Field Strength	Field Strength	Limit @ 3m	E-Field Polarity
MHz	dB μ V/m	dB μ V/m	dB μ V/m	μ V/m	μ V/m	
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

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Field Strength of Harmonics Emission						
Peak Value						
Frequency	Measured	Correction	Field	Field	Limit @3m	E-Field
	Level @3m	Factor	Strength	Strength		Polarity
MHz	dB μ V/m	dB μ V/m	dB μ V/m	μ V/m	μ V/m	
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	Measured	Correction	Field	Field	Limit @3m	E-Field
	Level @3m	Factor	Strength	Strength		Polarity
MHz	dB μ V/m	dB μ V/m	dB μ V/m	μ V/m	μ V/m	
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 – 2442 MHz): Pass

Field Strength of Fundamental Emissions						
Peak Value						
Frequency	Measured	Correction	Field	Field	Limit @3m	E-Field
	Level @3m	Factor	Strength	Strength		Polarity
MHz	dB μ V/m	dB μ V/m	dB μ V/m	μ V/m	μ V/m	
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

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Field Strength of Fundamental Emissions						
Average Value						
Frequency	Measured Level @3m	Correction Factor	Field Strength	Field Strength	Limit @3m	E-Field Polarity
MHz	dBμV/m	dBμV/m	dBμV/m	μV/m	μV/m	
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	Measured Level @3m	Correction Factor	Field Strength	Field Strength	Limit @3m	E-Field Polarity
MHz	dBμV/m	dBμV/m	dBμV/m	μV/m	μV/m	
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						
Average Value						
Frequency	Measured Level @3m	Correction Factor	Field Strength	Field Strength	Limit @3m	E-Field Polarity
MHz	dBμV/m	dBμV/m	dBμV/m	μV/m	μV/m	
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 – 2460 MHz): Pass

Field Strength of Fundamental Emissions						
Peak Value						
Frequency	Measured Level @3m	Correction Factor	Field Strength	Field Strength	Limit @3m	E-Field Polarity
MHz	dBμV/m	dBμV/m	dBμV/m	μV/m	μV/m	
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

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Field Strength of Fundamental Emissions						
Average Value						
Frequency	Measured	Correction	Field	Field	Limit @3m	E-Field
	Level @3m	Factor	Strength	Strength		Polarity
MHz	dBμV/m	dBμV/m	dBμV/m	μV/m	μV/m	
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	Measured	Correction	Field	Field	Limit @3m	E-Field
	Level @3m	Factor	Strength	Strength		Polarity
MHz	dBμV/m	dBμV/m	dBμV/m	μV/m	μV/m	
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						
Average Value						
Frequency	Measured	Correction	Field	Field	Limit @3m	E-Field
	Level @3m	Factor	Strength	Strength		Polarity
MHz	dBμV/m	dBμV/m	dBμV/m	μV/m	μV/m	
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

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Table 2: Radiated Limits of Receiver Spurious Emissions

Frequency Range [MHz]	Field Strength microvolts/m at 3 metres
	Transmitters
30-88	100
88-216	150
216-960	200
above 960	500

* Measurements for compliance with limits in the above table may be performed at distances other than 3 metres, in accordance with Section 7.2.7.

Results of Rx mode: Pass

Emissions detected are more than 20 dB below the Limits.

Limits for Radiated Emissions [RSS-Gen Section 7.2.5]:

Table 6: General Field Strength Limits for Transmitters at Frequencies Below 30MHz (Transmit)

Frequency (fundamental or spurious)	Field Strength (microvolts/m)	Magnetic H-Field (microamperes/m)	Measurement Distance (metres)
9-490kHz	2,400/F (F in kHz)	2,400/377F (F in kHz)	300
490-1.705kHz	24,000/F (F in kHz)	24,000/377F (F in kHz)	30
1.705-30MHz	30	N/A	30

Note: The emission limits for the bands 9-90kHz and 110-490kHz are based on measurements employing an average detector.

Results of Tx mode (9kHz – 30MHz): Pass

Emissions detected are more than 20 dB below the Limits.

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Table 5: General Field Strength Limits for Transmitters at Frequencies Above 30MHz

Frequency Range [MHz]	Field Strength microvolts/m at 3 metres
	Transmitters
30-88	100
88-216	150
216-960	200
above 960	500

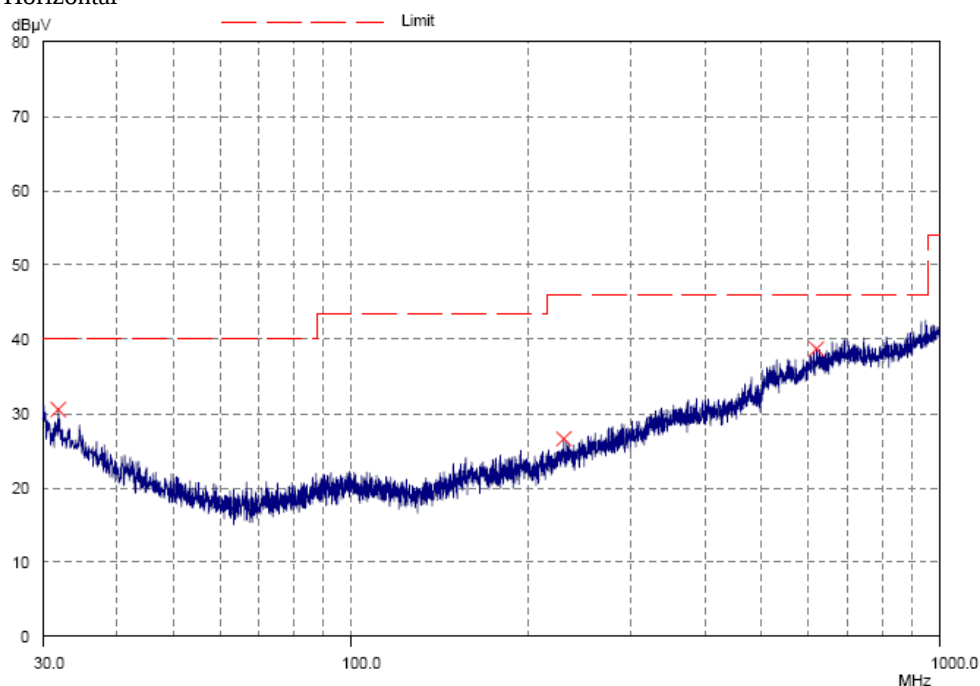
Note: Transmitting devices are not permitted in Table 1 bands or, unless stated otherwise, in TV bands (54-72MHz, 76-88MHz, 174-216MHz, 470-608MHz and 614-806MHz).

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



Radiated Emissions					
Quasi-Peak					
Emission	E-Field	Level	Limit	Level	Limit
Frequency	Polarity	@3m	@3m	@3m	@3m
MHz		dBμV/m	dBμV/m	μV/m	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

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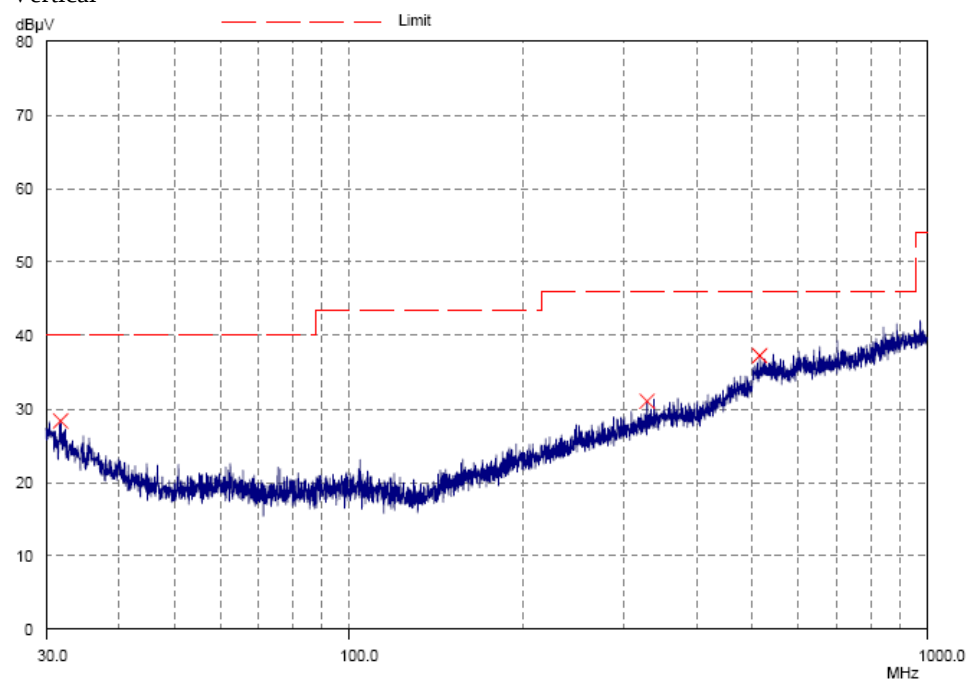
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Results of Tx and Rx mode: PASS

Vertical



Radiated Emissions					
Quasi-Peak					
Emission	E-Field	Level	Limit	Level	Limit
Frequency	Polarity	@3m	@3m	@3m	@3m
MHz		dBμV/m	dBμV/m	μV/m	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:

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

Calculated measurement uncertainty (9KHz – 30MHz): 3.3dB

(30MHz - 1GHz): 4.6dB

(1GHz - 18GHz): 4.4dB

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

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3.2 99% Bandwidth Measurement

Test Requirement:	RSS-Gen issue 3 December 2010 Section 4.6.1
Test Method:	RSS-Gen issue 3 December 2010 Section 4.6.1
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.

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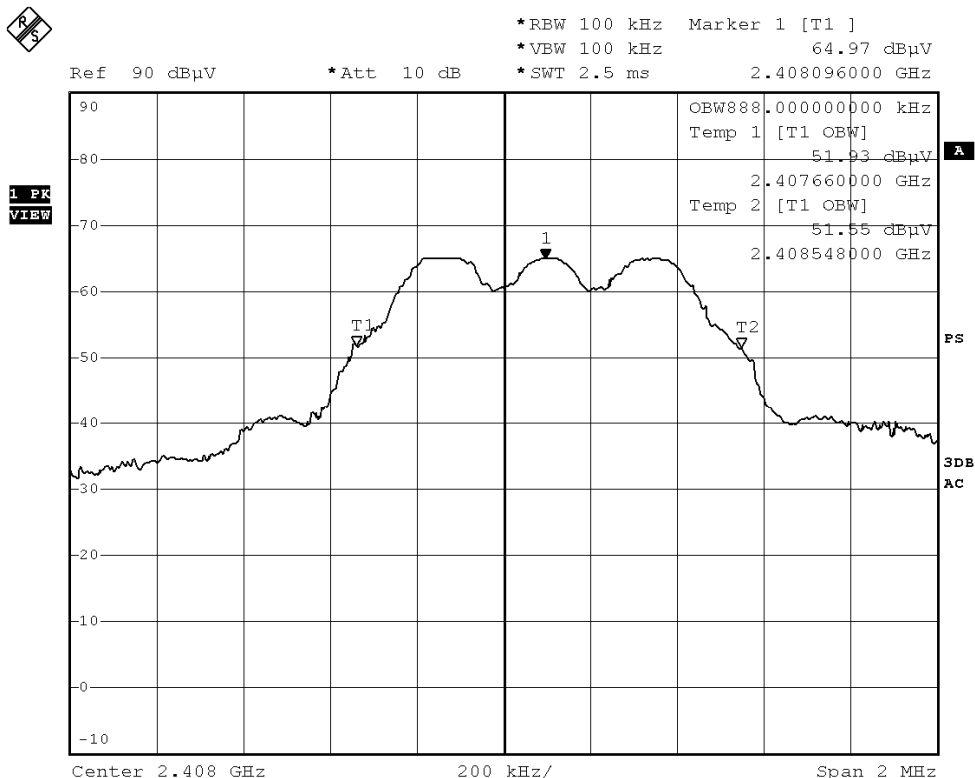
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Limits for 99% dB Bandwidth of Fundamental Emission:

Frequency Range [MHz]	99% Bandwidth [kHz]
2408	888



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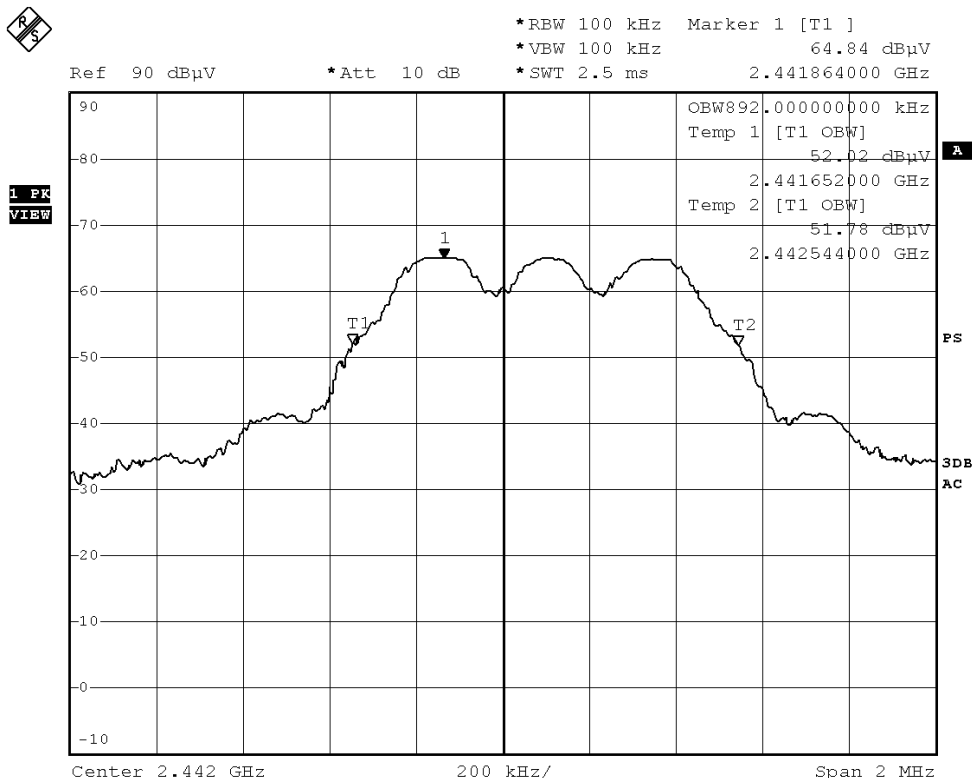
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Limits for 99% dB Bandwidth of Fundamental Emission:

Frequency Range [MHz]	99% Bandwidth [kHz]
2442	892



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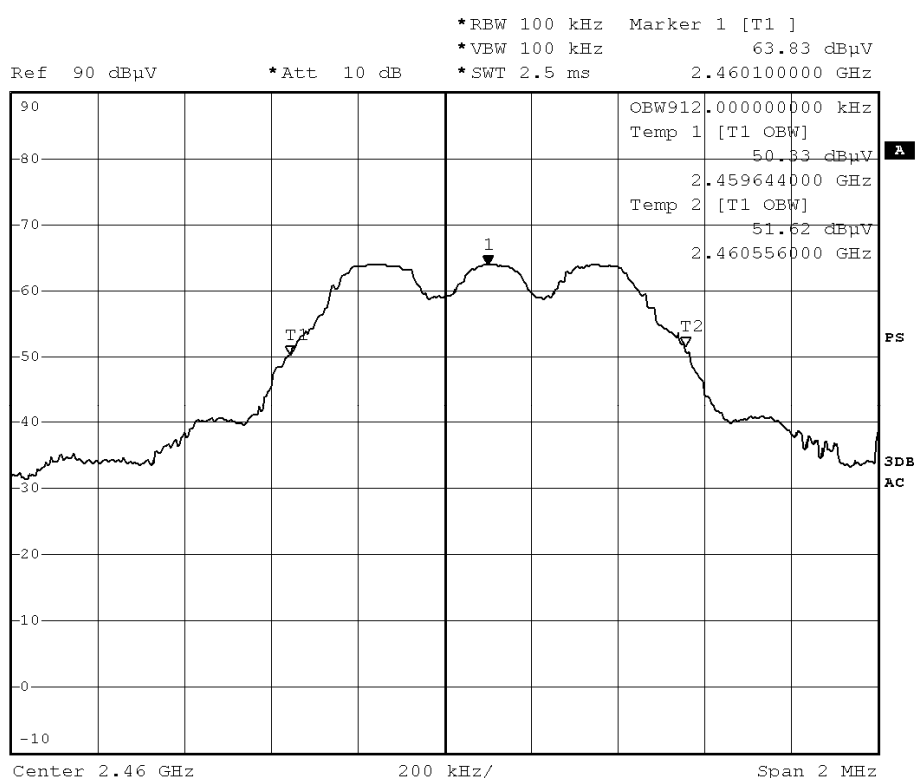
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Limits for 99% dB Bandwidth of Fundamental Emission:

Frequency Range [MHz]	99% Bandwidth [kHz]
2460	912



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VIEW



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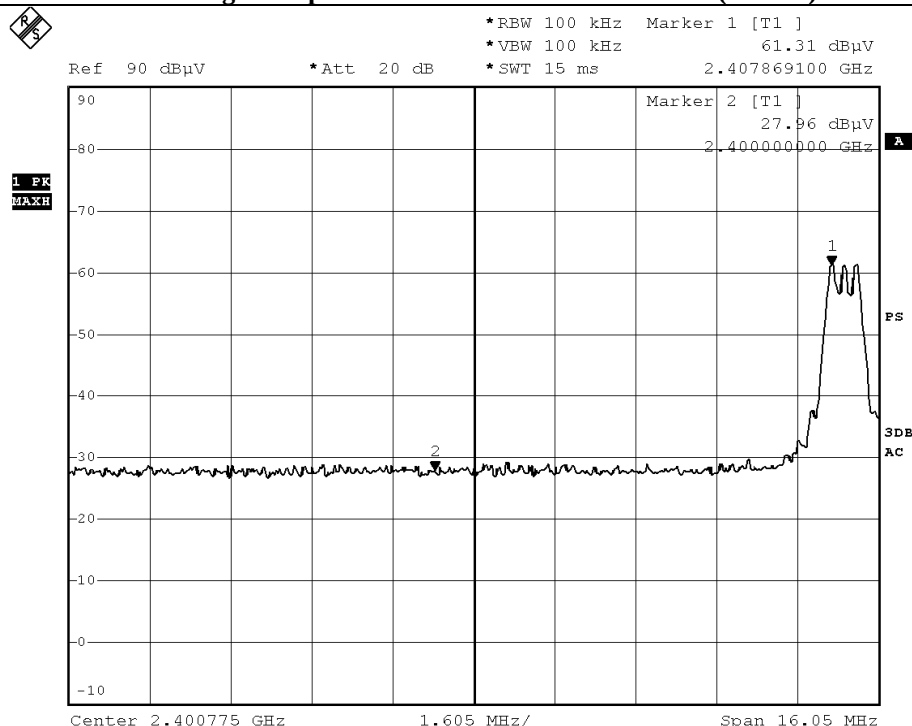
Band-edge Compliance of RF Conducted Emissions Measurement:

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)



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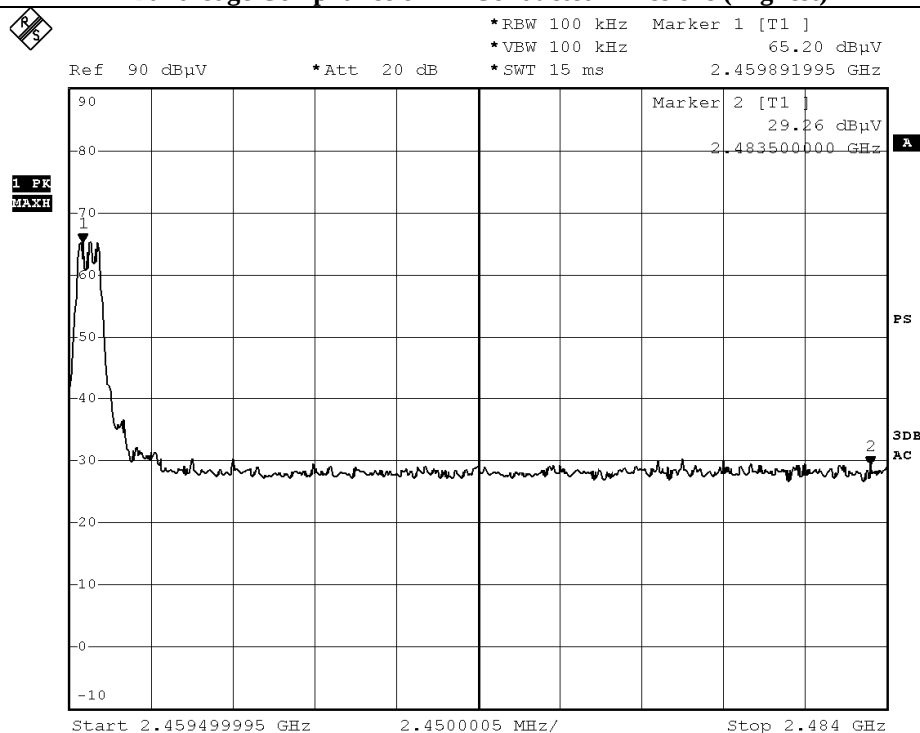
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Band-edge Compliance of RF Conducted Emissions Measurement:

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

Band-edge Compliance of RF Conducted Emissions (Highest)



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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	Measured	Correction	Field	Limit	Margin	E-Field
	Level @3m	Factor	Strength	@ 3m		Polarity
MHz	dB μ V	dB/m	dB μ V/m	dB μ V/m	dB μ V/m	
2400.0	12.0	36.1	48.1	74.0	25.9	Horizontal

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

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

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Appendix A

List of Measurement Equipment

RADIATED EMISSION

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EMD015	Signal Generator	MARCONI INSTRUMENTS	2030	112191/012	2014.03.21	2015.03.20
EMD036	EMI Test Receiver	ROHDE & SCHWARZ	ESIB26	100388	2014.05.27	2015.05.26
EMD061	Biconilog Antenna	ETS.LINDGREN	3142C	00060439	2012.11.28	2014.11.27
EMD062	Double-Ridged Waveguide (1 – 18GHz)	ETS.LINDGREN	3117	00075933	2013.1.19	2015.01.18
EMD084	MULTI-DVICE CONTROLLER	ETS.LINDGREN	2090	00060107	N/A	N/A
EMD088	Video Contol Unit	ETS.LINDGREN	Y21953A	2601073	N/A	N/A
EMD093	Monitor	ViewSonic	VA9036	Q8X064201876	N/A	N/A
EMD102	Intelligent Frequency	Ainuo Instrument Co., Ltd	AN97005SS	79707454	N/A	N/A
EMD105	FACT-3 EMC Chamber	ETS.LINDGREN	FACT-3	3803	N/A	N/A
EMD124	Loop Antenna	ETS-Lindgren	6502	00104905	2013.05.23	2015.05.22
EMD131	Standard Gain Horn Antenna (18GHz – 26.5GHz)	Chengdu AINFO Inc.	JXTXLB-42-15-C-KF	J2021100721001	2013.04.09	2015.04.08

Remarks:-

N/A Not Applicable or Not Available

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Appendix B

Photographs of EUT

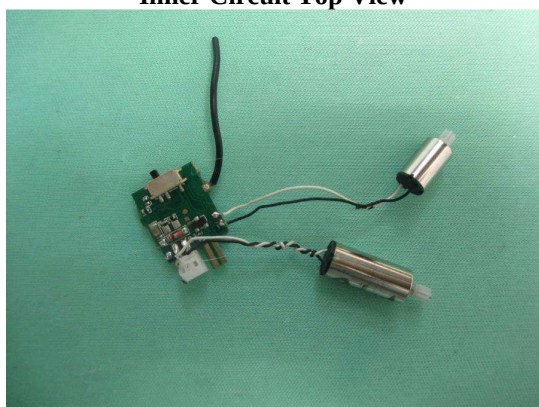
Front View of the product



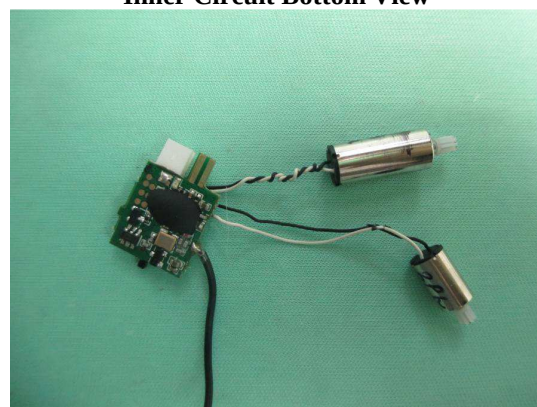
Rear View of the product



Inner Circuit Top View



Inner Circuit Bottom View



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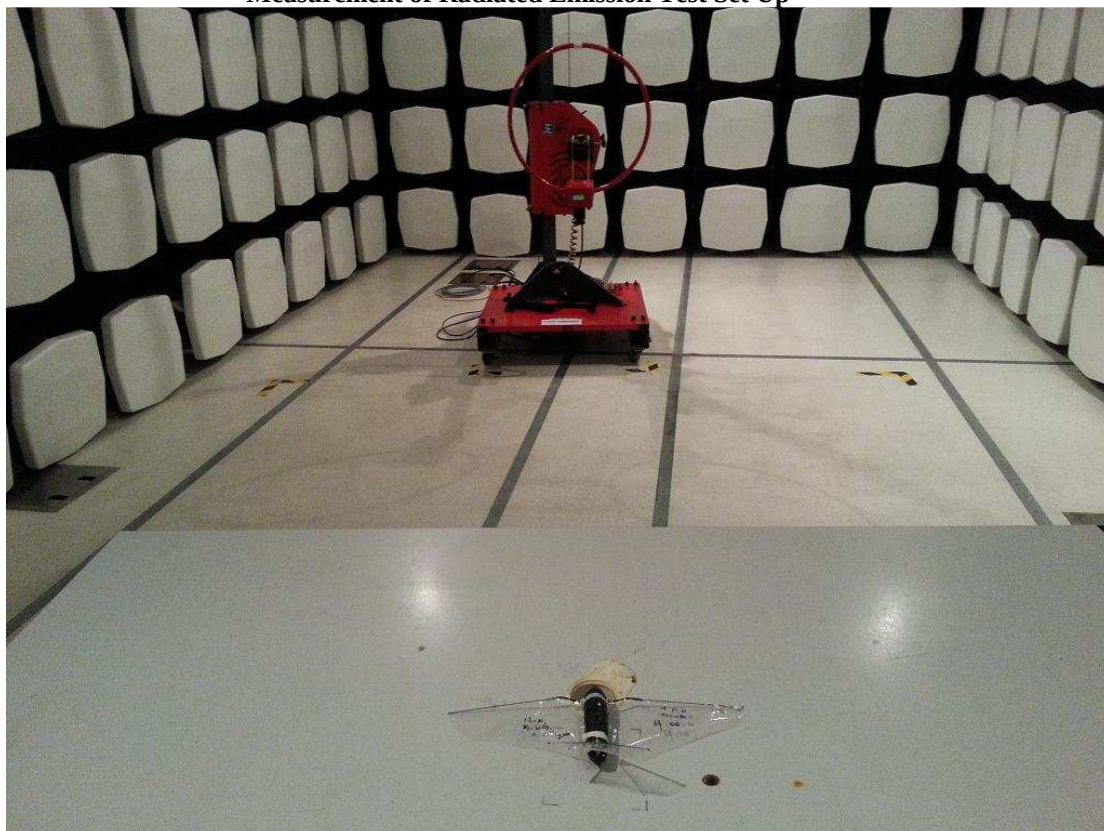
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Photographs of EUT

Measurement of Radiated Emission Test Set Up



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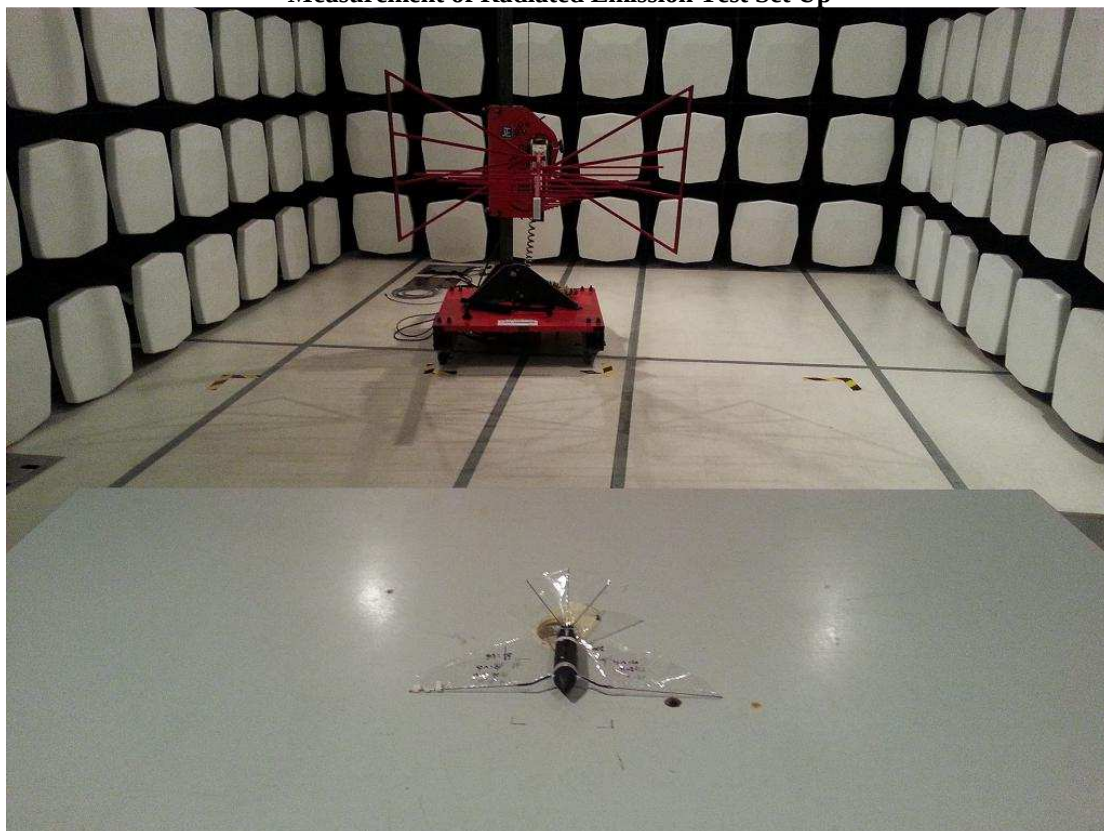
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Photographs of EUT

Measurement of Radiated Emission Test Set Up



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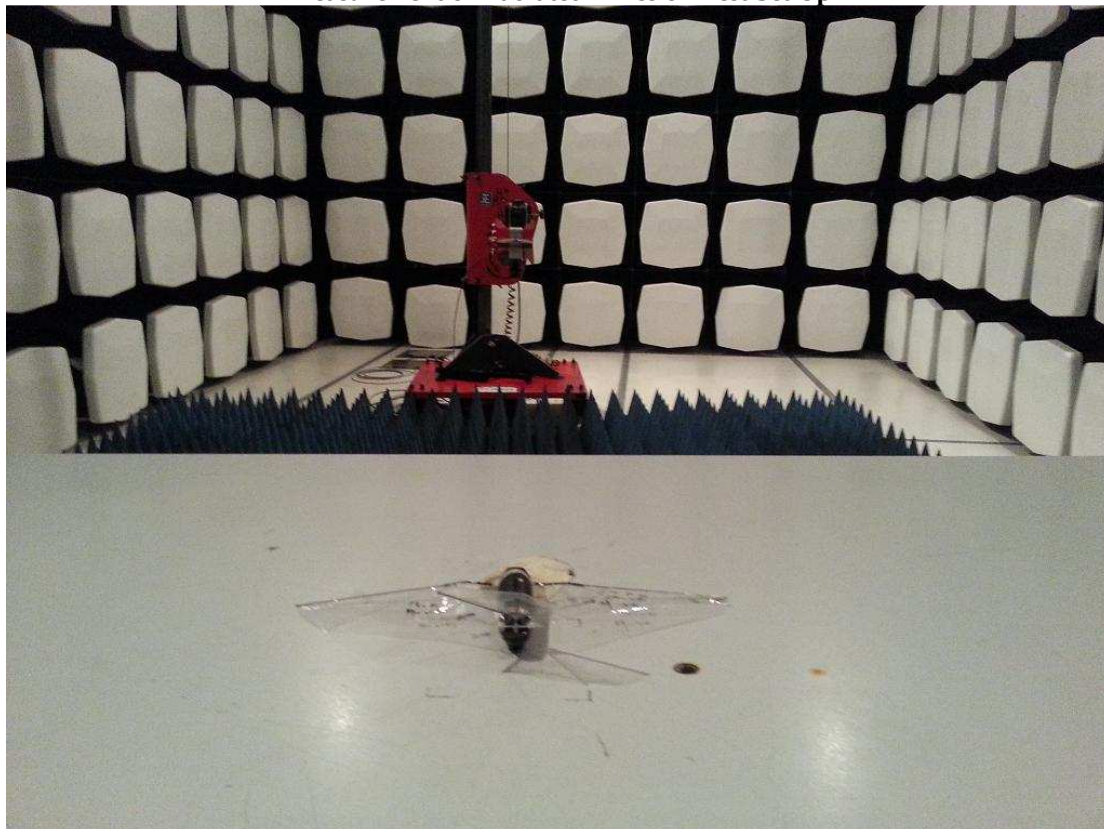
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Photographs of EUT

Measurement of Radiated Emission Test Set Up



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