STC Test Report

Date: 2016-07-14

No.: DMA000037

Applicant:	Spin Master Toys Far East Ltd. Room 1113, 11th Floor, Chinachen Golden Plaza, 77 Mody Road, Tsim Sha Tsui East, Kowloon Hong Kong
Manufacturer:	WAH SHING (Everwin Toys (Dongguan) Co., Ltd.), (Everfront Plastic and Electronics Manufacturing Co., Ltd.)
Description of Sample(s):	Submitted sample(s) said to be Product: ARH RDC SW XL Millennim Falcn Brand Name: AIR HOGS Model Number: 44550TX FCC ID: PQN44550TX2G4
Date Sample(s) Received:	2016-07-04
Date Tested:	2016-07-08 to 2016-07-14
Investigation Requested:	Perform ElectroMagnetic Interference measurement in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15: 2015 and ANSI C63.10: 2013 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):	---

LONG Yun Jian, Along
Authorized Signatory
ElectroMagnetic Compatibility Department
For and on behalf of
The Hong Kong Standards and Testing Centre Ltd.

10 Dai Wang Street, Taipo Industrial Estate, N.T., Hong Kong
Tel: (852) 2666 1888 Fax: (852) 2664 4353 E-mail: hkstc@hkstc.org Homepage: www.stc-group.org

STC Test Report

Date: 2016-07-14

No.: DMA000037

CONTENT:

10 Dai Wang Street, Taipo Industrial Estate, N.T., Hong Kong
Tel: (852) 2666 1888 Fax: (852) 2664 4353 E-mail: hkstc@hkstc.org Homepage: www.stc-group.org

1.0 General Details

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

Product:	ARH RDC SW XL Millennim Falcn
Manufacturer:	WAH SHING (Everwin Toys (Dongguan) Co., Ltd.), (Everfront Plastic and Electronics Manufacturing Co., Ltd.)
Brand Name:	AIR HOGS
Model Number:	44550TX
Rating:	6Vd.c. (AA battery *4)

1.2 Description of EUT Operation

The Equipment Under Test (EUT) is a ARH RDC SW XL Millennim Falcn . The transceiver operating in the 2.4GHz ISM frequency band. The RF signal is modulated by IC, the type of modulation used is FSK.

1.3 Date of Order

2016-07-04

1.4 Submitted Sample(s):

1 Sample

1.5 Test Duration

2016-07-08 to 2016-07-14

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: 2015 Regulations and ANSI C63.10: 2013 for FCC Certification.
The device was realized by test software.

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 C63.10: 2013	N/A	☒	☐	☐
Radiated Emissions	FCC 47CFR 15.209	ANSI C63.10: 2013	N/A	☒	☐	☐
Antenna requirement	FCC 47CFR 15.203	N/A	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 C63.10: 2013
Test Date:	2016-07-14
Mode of Operation:	TX mode

Test Method:

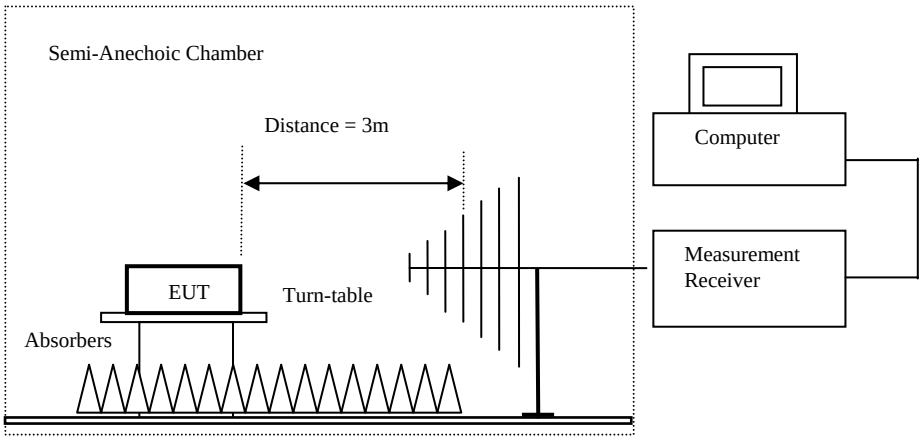
For emission measurements at or below 1 GHz, the sample was placed 0.8m above the ground plane of semi-anechoic Chamber*. For emission measurements above 1 GHz, the sample was placed 1.5m above the ground plane of semi-anechoic Chamber*. For emission measurements above 1 GHz, each emission was maximized by: having the EUT continuously working, investigated all operating modes, 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 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:	1MHz
	VBW:	1MHz
	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.
- Measurements between 30MHz to 1000MHz made with Bi-log antennas, above 1000MHz horn antennas are used, 9kHz to 30MHz loop antennas are used.

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	50,000 [Quasi-Peak]	500 [Average]
2400-2483.5	50,000 [Average]	500 [Average]

Results of Tx mode (Lowest Frequency Channel-2408 MHz): 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	57.8	36.8	94.6	53,703.2	500,000	Vertical
2408.00	53.6	36.4	90.0	31,622.8	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
2408.00	34.0	36.8	70.8	3,467.4	50,000	Vertical
2408.00	31.7	36.4	68.1	2,541.0	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	14.8	41.5	56.3	653.1	5,000	Vertical
4816.0	12.8	42.4	55.2	575.4	5,000	Horizontal
7224.0	9.7	45.1	54.8	549.5	5,000	Vertical
7224.0	8.9	46.2	55.1	568.9	5,000	Horizontal
9632.0	7.6	48.0	55.6	602.6	5,000	Vertical
9632.0	7.1	48.8	55.9	623.7	5,000	Horizontal

10 Dai Wang Street, Taipo Industrial Estate, N.T., Hong Kong
Tel: (852) 2666 1888 Fax: (852) 2664 4353 E-mail: hkstc@hkstc.org Homepage: www.stc-group.org

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	-1.3	41.5	40.2	102.3	500	Vertical
4816.0	-2.5	42.4	39.9	98.9	500	Horizontal
7224.0	-6.9	45.1	38.2	81.3	500	Vertical
7224.0	-9.1	46.2	37.1	71.6	500	Horizontal
9632.0	-9.6	48.0	38.4	83.2	500	Vertical
9632.0	-10.5	48.8	38.3	82.2	500	Horizontal

Results of Tx mode (Middle Frequency Channel- 2440MHz): 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
2440.00	59.3	36.8	96.1	63,826.3	500,000	Vertical
2440.00	57.3	36.4	93.7	48,417.2	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
2440.00	36.0	36.8	72.8	4,365.2	50,000	Vertical
2440.00	35.5	36.4	71.9	3,935.5	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
4880.0	15.2	41.6	56.8	691.8	5,000	Vertical
4880.0	13.0	42.5	55.5	595.7	5,000	Horizontal
7320.0	9.4	45.2	54.6	537.0	5,000	Vertical
7320.0	8.4	46.3	54.7	543.3	5,000	Horizontal
9760.0	7.3	48.1	55.4	588.8	5,000	Vertical
9760.0	6.3	48.9	55.2	575.4	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
4880.0	-2.3	41.6	39.3	92.3	500	Vertical
4880.0	-3.8	42.5	38.7	86.1	500	Horizontal
7320.0	-6.5	45.2	38.7	86.1	500	Vertical
7320.0	-8.5	46.3	37.8	77.6	500	Horizontal
9760.0	-9.2	48.1	38.9	88.1	500	Vertical
9760.0	-10.1	48.9	38.8	87.1	500	Horizontal

Results of Tx mode (Highest Frequency Channel – 2472MHz): 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
2472.00	59.3	36.8	96.1	63,826.3	500,000	Vertical
2472.00	56.3	36.4	92.7	43,151.9	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
2472.00	36.9	36.8	73.7	4,841.7	50,000	Vertical
2472.00	33.7	36.4	70.1	3,198.9	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
4944.0	15.7	41.4	57.1	716.1	5,000	Vertical
4944.0	13.7	42.7	56.4	660.7	5,000	Horizontal
7416.0	8.9	45.6	54.5	530.9	5,000	Vertical
7416.0	8.2	46.5	54.7	543.3	5,000	Horizontal
9988.0	6.5	48.6	55.1	568.9	5,000	Vertical
9988.0	5.7	49.7	55.4	588.8	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
4944.0	0.4	41.4	41.8	123.0	500	Vertical
4944.0	-1.8	42.7	40.9	110.9	500	Horizontal
7416.0	-7.3	45.6	38.3	82.2	500	Vertical
7416.0	-7.7	46.5	38.8	87.1	500	Horizontal
9988.0	-10.0	48.6	38.6	85.1	500	Vertical
9988.0	-10.8	49.7	38.9	88.1	500	Horizontal

Remarks:

* Denotes restricted band of operation.
Measurements were made using a peak detector. Any emission less than 1000MHz and falling within the restricted bands of FCC Rules Part 15 Section 15.205 and the limits of FCC Rules Part 15 Section 15.209 were applied.

Correction Factor included Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty: (9kHz-30MHz): 2.0dB
(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.

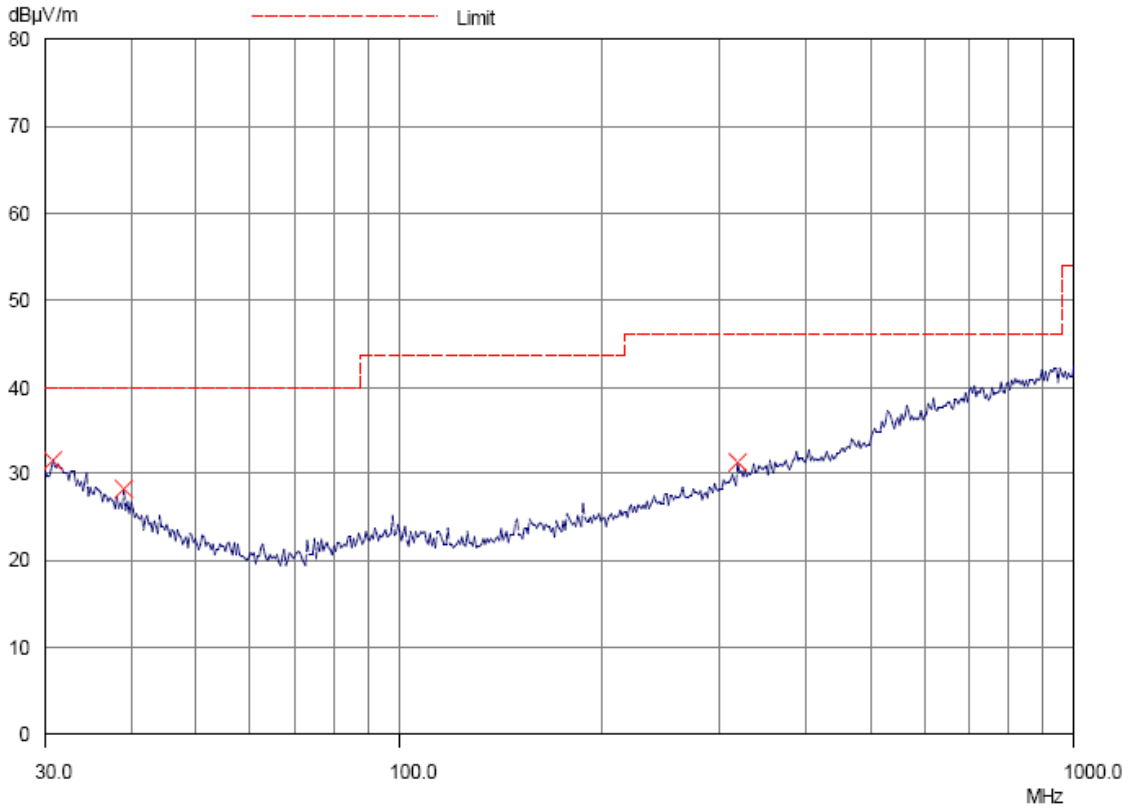
Limits for Radiated Emissions [FCC 47 CFR 15.209 Class B]:

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 mode (9kHz – 30MHz): PASS
Emissions detected are more than 20 dB below the FCC Limits

Results of TX mode (30MHz – 1GHz): PASS
Horizontal



Results of TX mode (30MHz – 1GHz): 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
30.7	Horizontal	31.5	40.0	37.6	100
39.1	Horizontal	28.1	40.0	25.4	100
316.9	Horizontal	31.3	46.0	36.7	200

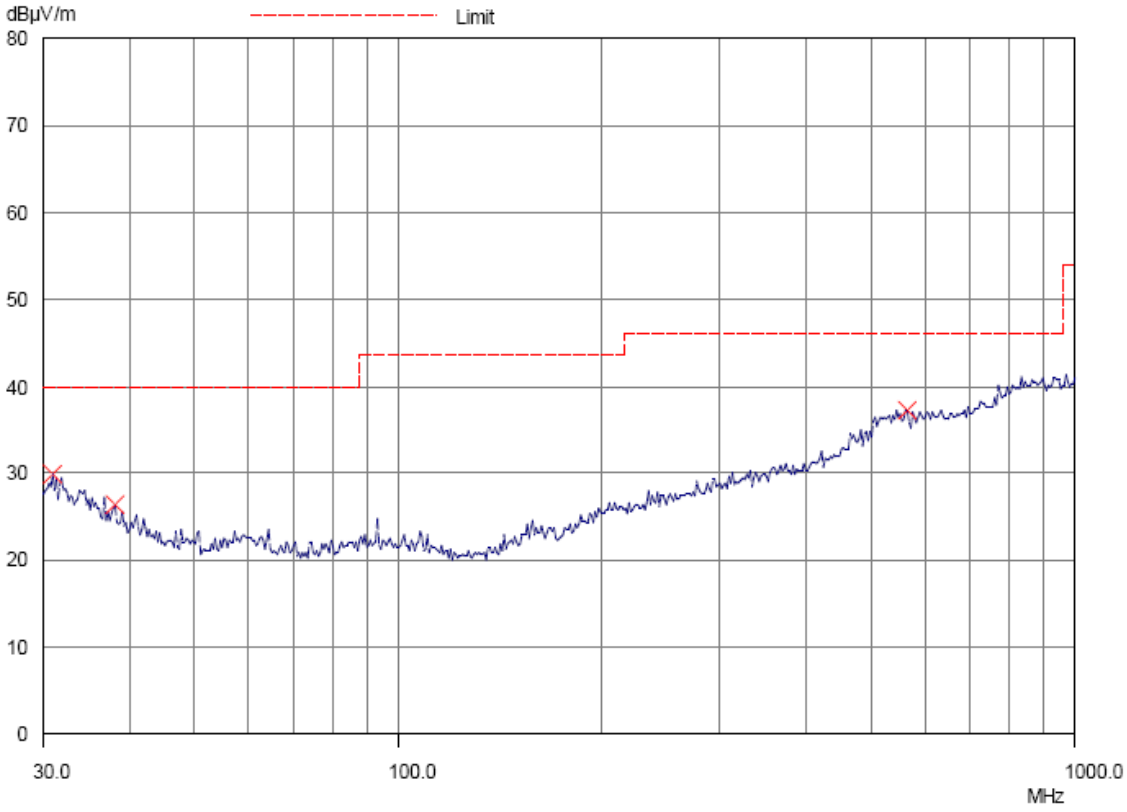
Limits for Radiated Emissions [FCC 47 CFR 15.209 Class B]:

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 mode (9kHz – 30MHz): PASS
Emissions detected are more than 20 dB below the FCC Limits

Results of TX mode (30MHz – 1GHz): PASS
Vertical



Results of TX mode (30MHz – 1GHz): 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
30.9	Vertical	29.8	40.0	30.9	100
38.3	Vertical	26.4	40.0	20.9	100
564.3	Vertical	37.3	46.0	73.3	200

Remarks:
Calculated measurement uncertainty (30MHz – 1GHz): 4.9dB
Emissions in the vertical and horizontal polarizations have been investigated and the worst-case test results are recorded in this report.

RF Radiated Emissions Measurement:

Limit：
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 radiated emission limits in §15.209, whichever is the lesser attenuation.

Result：RF Radiated Emissions (1GHz-26GHz)(worse data) (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	12.4	36.8	49.2	74.0	24.8	Vertical

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	1.3	36.8	38.1	54.0	15.9	Vertical

Result：RF Radiated Emissions(1GHz-26GHz)(worse data) (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	9.7	36.4	46.1	74.0	27.9	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
2483.5	0.8	36.4	37.2	54.0	16.8	Horizontal

3.1.2 Antenna Requirement

Test Requirements: § 15.203

Test Specification:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Test Results:

This is Wire antenna. There is no external antenna, the antenna gain = 0.5dBi. User is unable to remove or changed the Antenna.

3.2 20dB Bandwidth of Fundamental Emission

Test Requirement:	FCC 47 CFR 15.249
Test Method:	ANSI C63.10: 2013
Test Date:	2016-07-11
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.

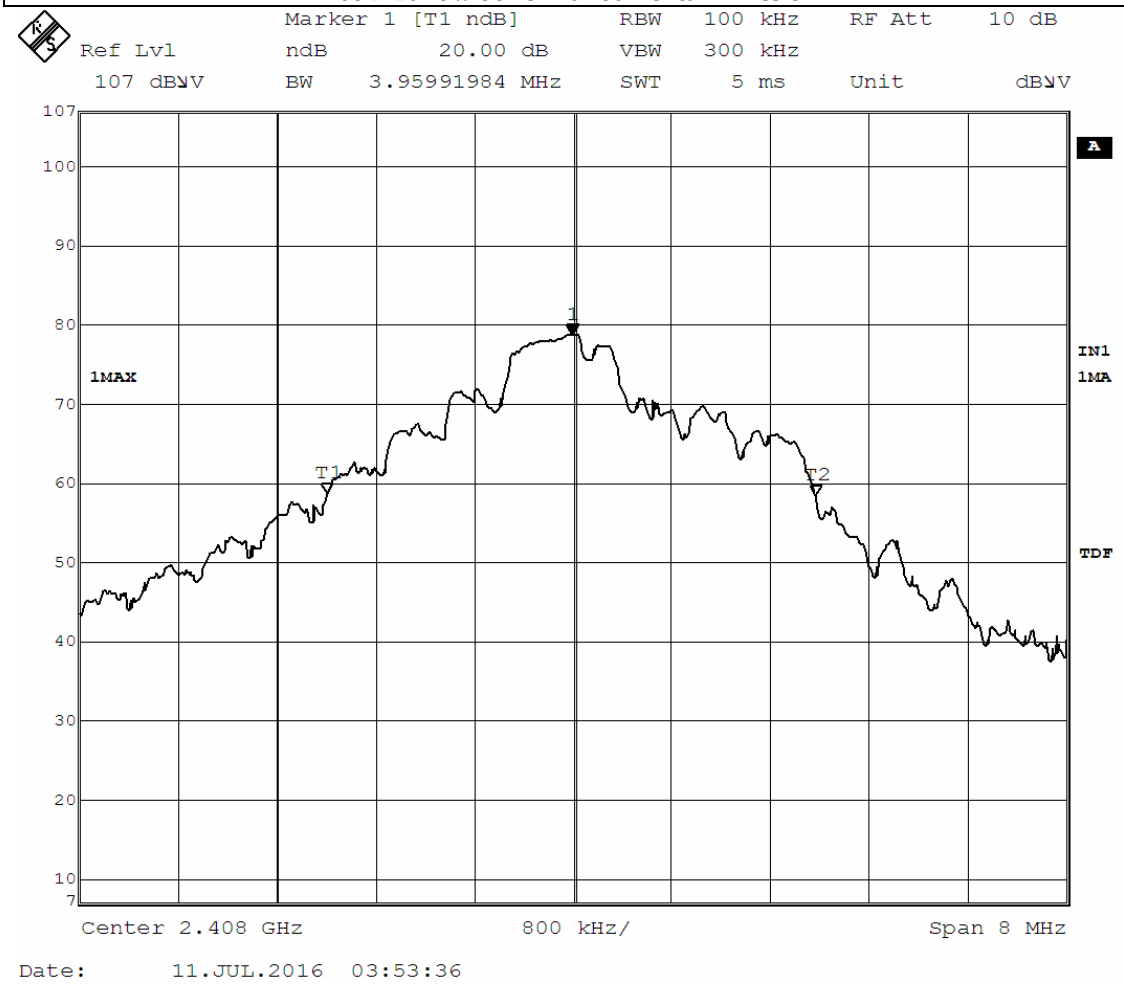
Test Setup:

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 [MHz]
2408	3.96

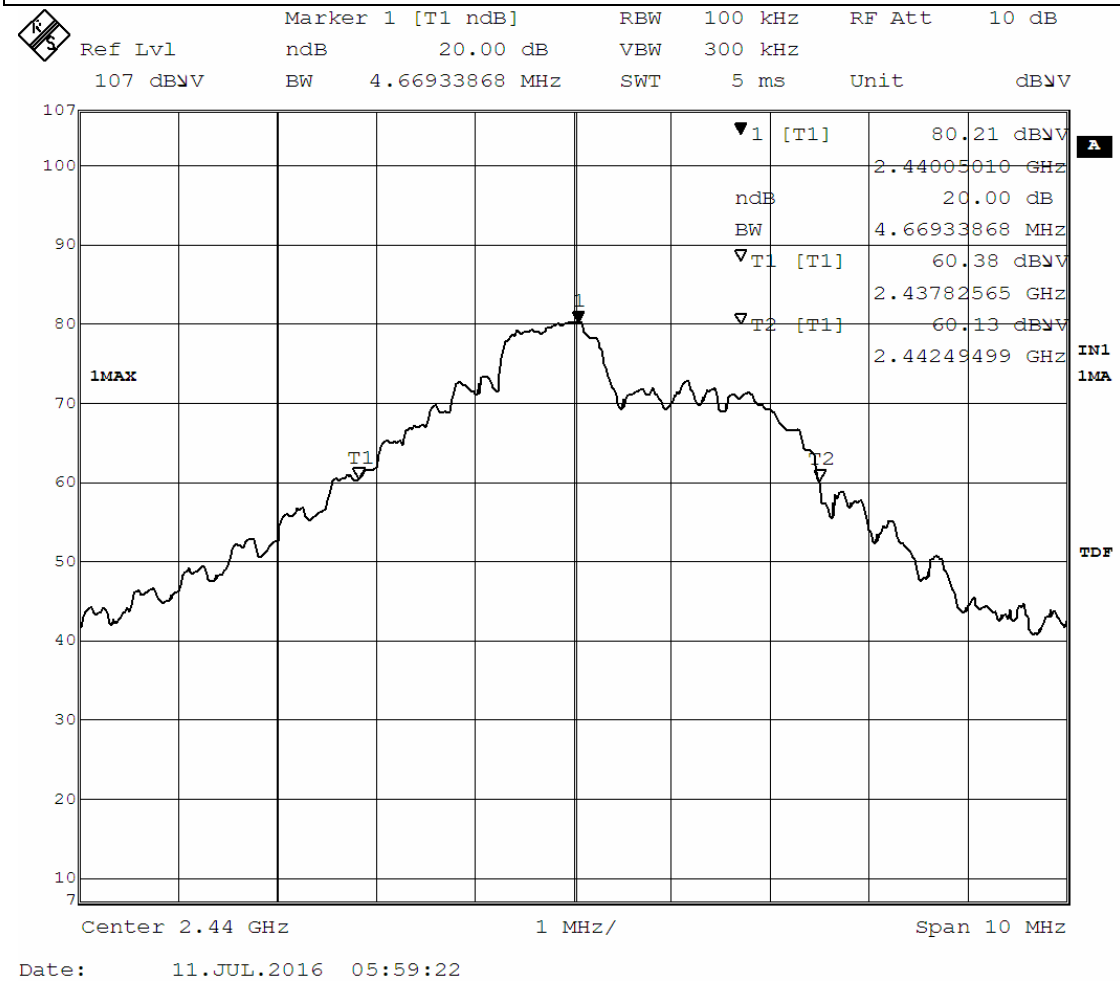
20dB Bandwidth of Fundamental Emission



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

Frequency Range [MHz]	20dB Bandwidth [MHz]
2440	4.67

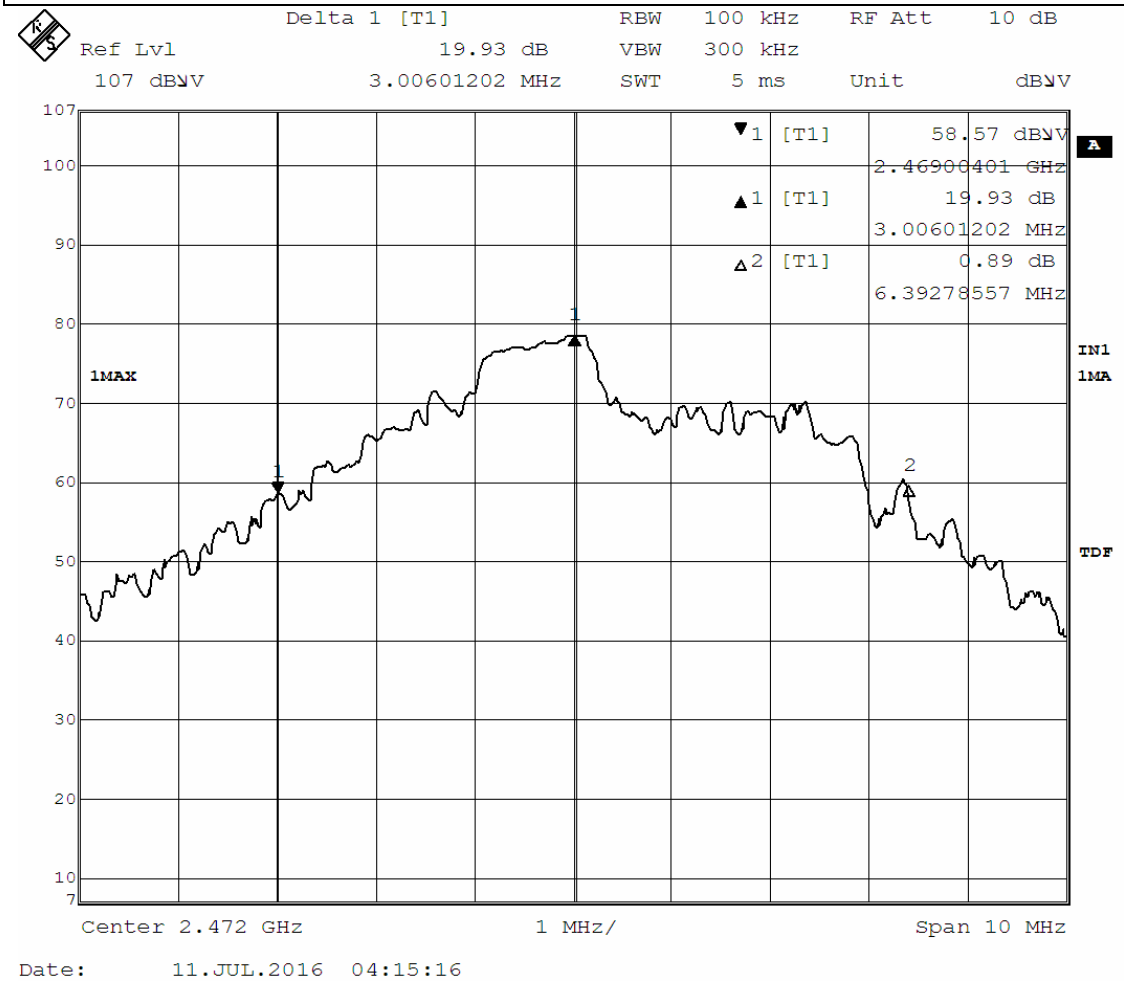
20dB Bandwidth of Fundamental Emission



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

Frequency Range [MHz]	20dB Bandwidth [MHz]
2472	6.39

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
EM299	Double-Ridged Waveguide Horn Antenna	ETS-Lindgren	3115	00114120	2016/04/27	2018/04/27
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	--	2016/04/24	2017/04/24
EM355	Biconilog Antenna	ETS-Lindgren	3143B	00094856	2016/03/03	2018/03/03
EM229	EMI Test Receiver	R&S	ESIB40	100248	2016/06/01	2017/06/01
EM181	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESIB7	100072	2016/06/01	2017/06/01
EM145	EMI Test Receiver	R & S	ESCS 30	830245/021	2016/06/01	2017/06/01
EM353	LOOP ANTENNA	ETS_LINDGREN	6502	00206533	2016/03/16	2018/03/16
EM302	Precision Omnidirectional Dipole (1 – 6GHz)	Seibersdorf Laboratories	POD 16	161806/L	2016/05/11	2018/05/11
EM303	Precision Omnidirectional Dipole (6 – 18GHz)	Seibersdorf Laboratories	POD 618	6181908/L	2016/05/11	2018/05/11

Line Conducted

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EM119	LISN	R & S	ESH3-Z5	0831.5518.52	2015/10/22	2016/10/22
EM145	EMI Test Receiver	R & S	ESCS 30	830245/021	2016/06/01	2017/06/01
EM179	IMPULSE LIMITER	ROHDE & SCHWARZ	ESH3-Z2	357-8810.52/54	2016/01/11	2017/01/11
EM154	SHIELDING ROOM	SIEMENS MATSUSHITA COMPONENTS	N/A	803-740-057-99A	2012/02/03	2017/02/03
N/A	mEASUREMENT AND EVALUATION SOFTWARE	ROHDE & SCHWARZ	esib-k1	v1.20	n/a	n/a

Remarks:-

N/A Not Applicable or Not Available

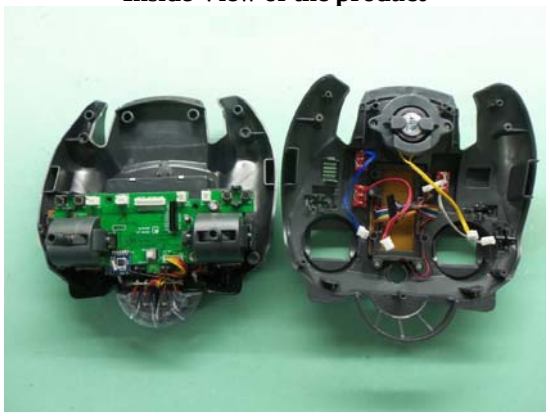
Appendix B

Photographs of EUT

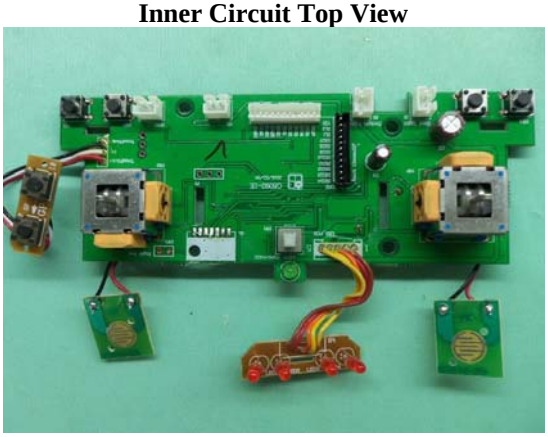
Front View of the product

Rear View of the product

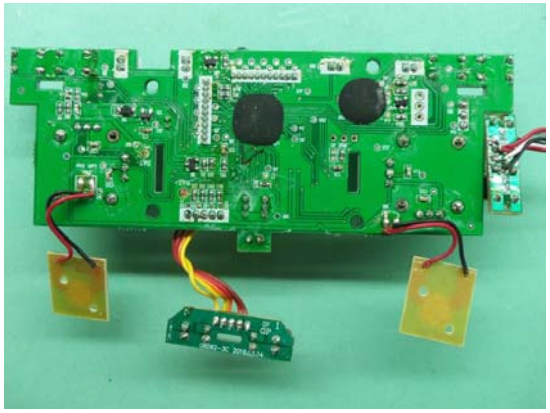
Inside View of the product



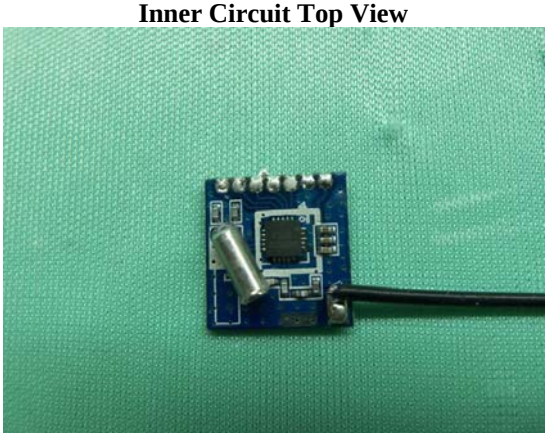
Inner Circuit Top View



Inner Circuit Bottom View

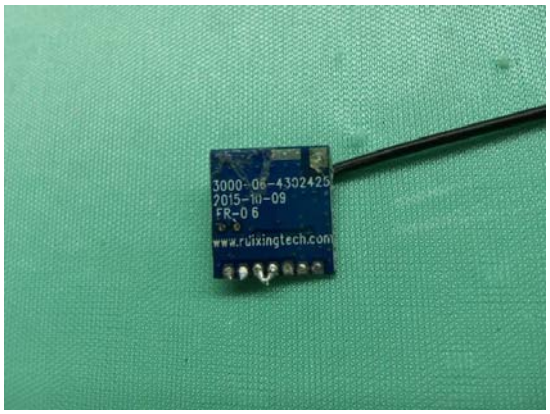


Inner Circuit Top View

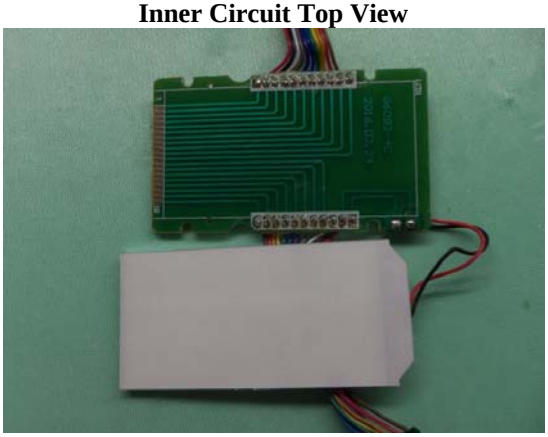


Photographs of EUT

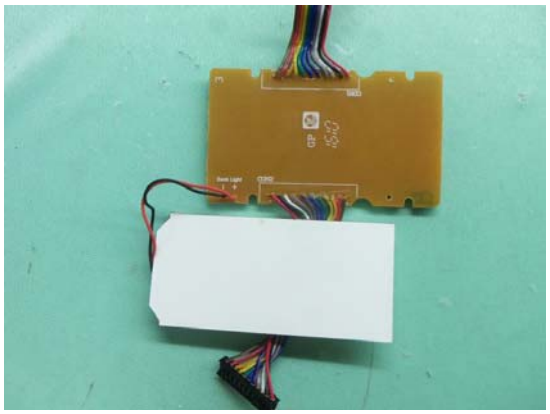
Inner Circuit Bottom View



Inner Circuit Top View

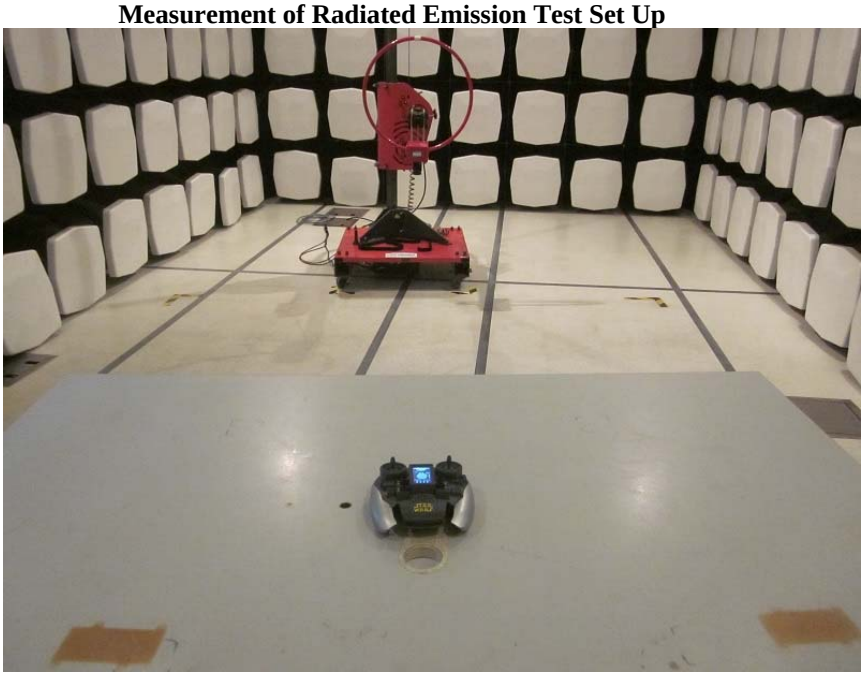


Inner Circuit Bottom View

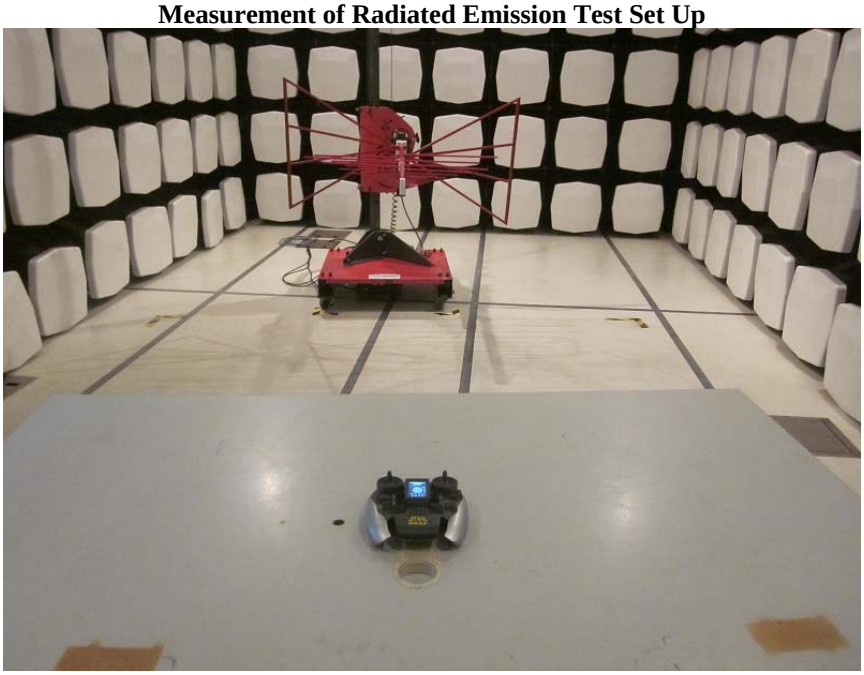


Photographs of EUT

Measurement of Radiated Emission Test Set Up

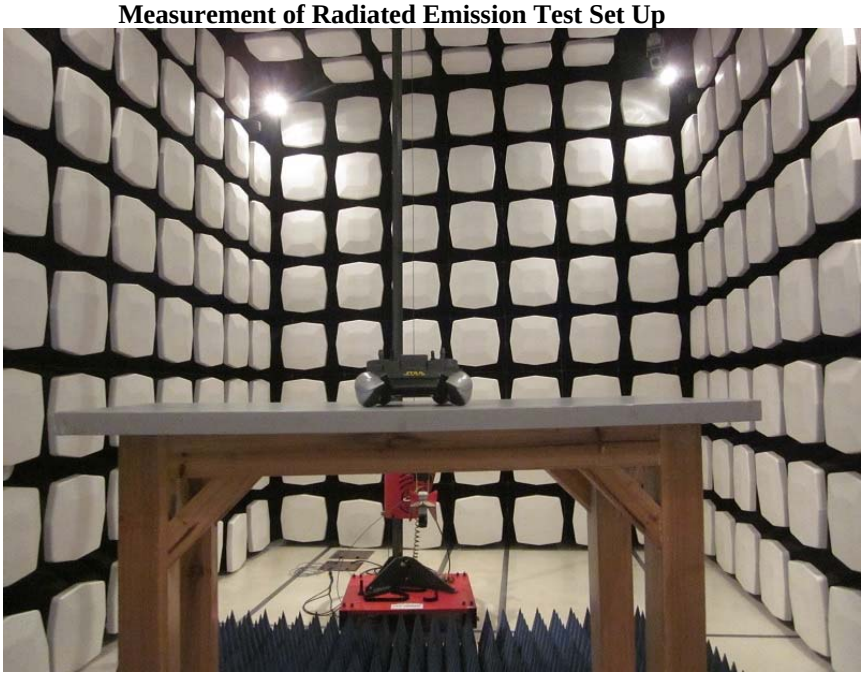


Measurement of Radiated Emission Test Set Up



Photographs of EUT

Measurement of Radiated Emission Test Set Up



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