

FCC Test Report

Application No.: T31620250002EM

Applicant: TOY STATE INTERNATIONAL LTD.
Address: Unit 905, 9/FL, West Wing,
Tsimshatsui Centre, 66 Mody Road,
Tsimshatsui East, Kowloon,
Hong Kong.

Product Information:

Product Description: 1:14 SCALE (R/R) - FORD FIESTA RS WRC, PORSCHE 911 GT3 CUP, VOLKSWAGEN POLO R WRC, MINI COOPER COUNTRYMAN JCW WRC, AUDI R8 LMS ULTRA, CITROEN C-ELYSEE WTCC, LAMBORGHINI HURACAN LP 620-2 SUPER TROFEO, FORD GT

Item No.: 94100, 94667, 94335, 94101, 94331, 94102, 94332, 94103, 94333, 94104, 94334, 94108, 94337, 94480, 94338, 94482 ♣

♣ Please refer to section 2 of this report which indicates which item was actually tested and which were electrically identical.

Country of Origin: China

Age Grading: 8+

Product Class : Low Power Communication Device –Transmitter (2.4 GHz)

FCC ID: V9Q-94667F24

Requirement: CFR 47 FCC PART 15 SUBPART C, 2015 Intentional Radiators (Section 15.249)

Date of Receipt: 2016-09-01

Date of Test: 2016-09-06

Authorized Signature:



TSANG KA TING, Calvin

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. All test results in this report can be traceable to National or International Standards.

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Date of Issue: 2016-09-09

Test Result :	PASS*
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In the configuration tested, the EUT complied with the requirements for the relevant clauses of Federal Communications Commission Rules as specified above.

2 Test Summary

Test	Test Requirement	Test Method	Result
Conducted Emission (150KHz to 30MHz)	FCC PART 15, SUBPART C: 2015	ANSI C63.10:2013	N/A
Radiated Emission (9kMHz to 1GHz)	FCC PART 15, SUBPART C: 2015	ANSI C63.10:2013	PASS
Radiated Emission above 1 GHz	FCC PART 15, SUBPART C: 2015	ANSI C63.10:2013	PASS
Restricted-band band- edge measurements (Radiated Emission)	FCC PART 15, SUBPART C: 2015	ANSI C63.10:2013	PASS
20dB bandwidth	FCC PART 15, SUBPART C: 2015	ANSI C63.10:2013	PASS

Item no.:

94100, 94667, 94335, 94101, 94331, 94102, 94332, 94103, 94333, 94104, 94334, 94108, 94337, 94480, 94338, 94482

According to the confirmation from the applicant, the above models are identical in all electrical aspects in relating to the circuit design, PCB layout, electrical components used, internal wiring and function. The differences are only the model, color and decorations.

Therefore only the model 94335 was tested in this report.

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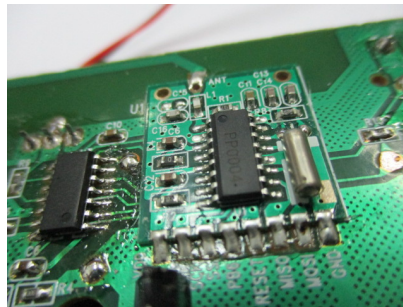
4 General Information

4.1 General Description of EUT

Product Description:	1:14 SCALE (R/R) - FORD FIESTA RS WRC, PORSCHE 911 GT3 CUP, VOLKSWAGEN POLO R WRC, MINI COOPER COUNTRYMAN JCW WRC, AUDI R8 LMS ULTRA, CITROEN C-ELYSEE WTCC, LAMBORGHINI HURACAN LP 620-2 SUPER TROFEO, FORD GT
Item No.:	94335
Serial No.:	--

4.2 Details of EUT

Power Supply:	DC 6V (AAA battery x 4)
Operating Frequency	2405-2475MHz
Antenna Type:	Unreplaceable internal Integral antenna



Modulation Type:	GFSK
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Test frequency tested are the lowest channel: 1 channel (2405MHz), middle channel: 2 channel (2440MHz) and highest channel: 3 channel (2475MHz)

Channel configuration method:

1. Hold ON/OFF(PB3) button and then insert batteries to enter test mode.
2. Press the button to change the channel from low to high frequency

4.3 Conditions of EUT

The received sample was under good condition.

4.4 Description of Support Units

1. All field strength measures in this test report were done by the sample which set the frequency fixed with continuous transmission

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4.5 Standards Applicable for Testing

CFR 47, FCC Part 15, 2015
ANSI C63.10:2013

4.6 Test Location

All tests were performed at:

SGS IECC Limited (Member of the SGS Group (SGS SA))

Units 303-305, 3/F., 31 Lok Yip Road, On Lok Tsuen, Fanling, N.T., Hong Kong

Tel: +852 2305 2570 Fax: +852 2756 4480

4.7 Test Facility

Measurement facility located at Fanling (Hong Kong), placed on file with the FCC Pursuant to Section 2.948 of the FCC Rules (FCC Registration No. : 97774).

The test facility is recognized, certified, or accredited by the following organizations:

FCC – CAB Registration No.: 446297

Measurement facility located at Fanling (Hong Kong), accredited as a Conformity Assessment Body (CAB) and was designated by FCC to perform compliance testing on equipment subject to Declaration Of Conformity (DOC) and Certification under Part 15 and 18 of the Commission's Rules.

4.8 Deviation from Standards

None.

4.9 Abnormalities from Standard Conditions

None.

4.10 Declaration of Family Grouping

None.

4.11 Abbreviations

N/A: Not Applicable

EUT: Equipment Under Test

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4.12 Measurement Uncertainty (95% confidence levels, k=2)

No.	Item	Measurement Uncertainty
1	Radiated disturbance 9 kHz - 30MHz	4.2
2	Radiated disturbance 30MHz – 1GHz	5.5
3	Radiated disturbance 1GHz – 18GHz	5.5
4	Conducted Emissions	3.1

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5 Equipments Used during Test

Conducted Emission				
Equipment	Manufacturer	Model / Serial No.	Cal. Date	Cal. Due Date
Test Receiver	Rohde & Schwarz	ESHS 30 / 839667/002	2015/09/29	2016/09/28
Artificial Mains Network (LISN)	Schwarzbeck	NSLK 8127 / 8127312	2016/04/20	2017/04/19
Impulse Limiter	Rohde & Schwarz	ESH-3-Z2 / 357881052	2015/02/02	2017/02/01

Radiated Emission				
Equipment	Manufacturer	Model / Serial No.	Cal. Date	Cal. Due Date
3m Semi-Anechoic Chamber (pre-test)	--	--	--	--
3m / 10m Open Area Test Site	--	--	2015/03/11	2018/03/10
Test Receiver	Rohde & Schwarz	ESCS 30 / 100388	2014/10/17	2016/09/28
Spectrum Analyzer	Rohde & Schwarz	FSP 30 / 101474	2016/05/31	2017/05/30
Loop antenna	Rohde & Schwarz	HFH2-Z2 / 871336/48	2016/01/23	2019/01/22
Antenna 30-1000MHz	Schaffner	CBL6111C / 2791	2014/10/19	2016/10/18
Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D / 9120D-1070	2016/01/23	2018/01/22
Horn Antenna 15-26.5GHz	Schwarzbeck	BBHA9170 / 9170-492	2014/11/24	2016/11/23
Preamplifier 10MHz – 6GHz	Schwarzbeck	BBV9743 / 9743-052	2016/03/09	2017/03/08
Preamplifier 1-18GHz	Schwarzbeck	BBV9718 / 9718-223	2016/01/23	2017/01/22
Preamplifier 18- 26.5GHz	Schwarzbeck	BBV9719 / 9719-019	2014/11/19	2016/11/18
Coaxial Cable	--	E167	2015/06/24	2017/06/23
RF Cable	HUBER+SUHNER	E207	2014/11/17	2016/11/16

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Antenna Mast System	Schwarzbeck	AM9104 / -	--	--
Turntable with Controller	Drehtisch	DT312 / -	--	--

General Use Equipment				
Equipment	Manufacturer	Model / Serial No.	Cal. Date	Cal. Due Date
Digital Multimeter	Fluke	189 / 83640020	2016/04/20	2017/04/19
Temperature / Humidity meter	-	E159	2015/10/07	2016/10/06

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6 Test Results

6.1 Conducted Emissions Mains Terminals, 150kHz to 30MHz

Test Requirement: FCC Part15 C
Test Method: ANSI C63.10:2013
Test Date: Not Applicable

Remark:

This test is not applicable as the EUT is battery operated.

6.2 Radiated Emissions, 9kHz to 1GHz

Test Requirement:	FCC Part15 Subpart C Section 15.209 and 15.249(d)
Test Method:	ANSI C63.10
Test Date:	2016-09-06
Frequency Range:	The lowest frequency generated by EUT, 12MHz to 1GHz
Measurement Distance:	3m
Detector:	Peak for pre-scan (200Hz resolution bandwidth and 1kHz video bandwidth for measurement between 9kHz – 150kHz) (9kHz resolution bandwidth and 100kHz video bandwidth for measurement between 150kHz – 30MHz) 120kHz resolution bandwidth and 1MHz video bandwidth for measurement between 30MHz to 1GHz) Quasi-Peak if maximised peak within 6dB of limit

Limit :

Frequency range MHz	Quasi-peak limits dB (µV/m)
0.009 – 0.490	-72.4 – 20logF(MHz)
0.490 – 1.705	-12.4 – 20logF(MHz)
1.705 – 30.0	-10.5
30 to 88	40
88 to 216	43.5
216 to 960	46
Above 960	54

Note: 1) At transitional frequencies the lower limit applies.
2) F is the frequency of the spurious emission measured in MHz.
3) Limit from 0.009 – 30 MHz is converted from measuring distance 300m or 30m to 3m with the formula provided in FCC Part 15, section 15.31(f)(2)

6.2.1 EUT Operation

Operating Environment:

Temperature: 27 °C Humidity: 55 %

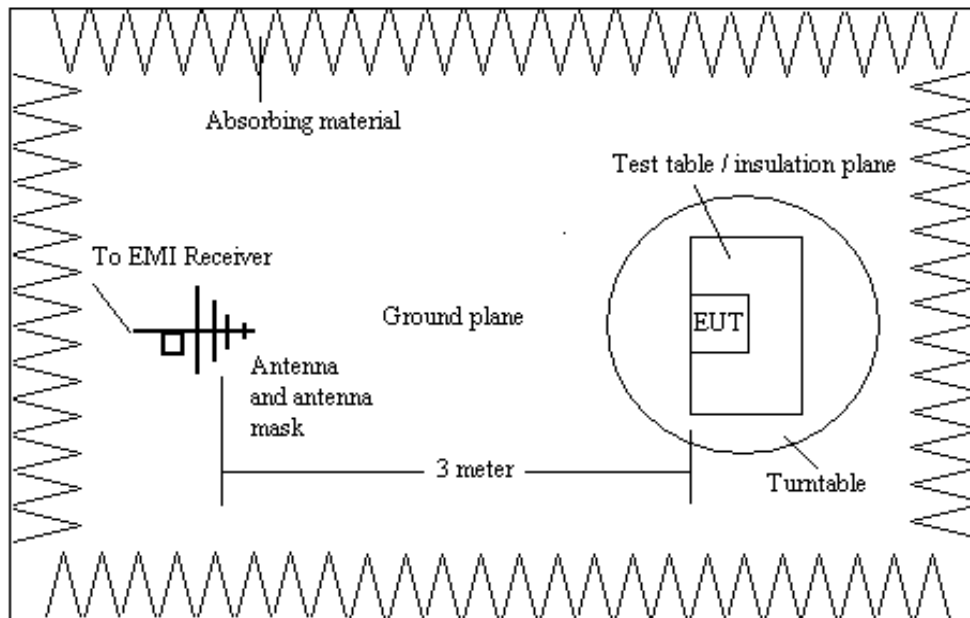
EUT Operation: Pre-test with Peak detector with the following mode(s):
1: Transmission in continuous transmitting mode
2. Test in lowest, middle and high frequency

Final test with Quasi-Peak detector with the following mode(s):
1: Transmission in continuous transmitting mode
2. Test in lowest, middle and high frequency

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6.2.2 Test Setup and Procedure



1. The pre-test of the radiated emissions test was conducted in a semi-anechoic chamber and the final measurement was conducted in the open area test site.
2. The EUT was connected to AC power source through a mains power outlet which was bonded to the ground reference plane. The EUT was placed upon a non-metallic table 0.8m above the ground reference plane.
3. Loop antenna and Bilog antenna was used for the frequency range from the lowest generated frequency to 30MHz and 30MHz to 1GHz respectively
4. Before final measurements of radiated emissions, a pre-scan was performed in the spectrum mode with the peak detector to find out the maximum emissions spectrum plots of the EUT with located frequencies.
5. The actual frequencies of maximum emission were confirmed in the final radiated emissions measurement. At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 meters for Bilog antenna (Loop antenna is still maintain in 1m high) in order to determine the maximum disturbance. Measurements were performed for both horizontal and vertical antenna polarization.

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6.2.3 Measurement Data

An initial pre-scan was performed in the 3m chamber using the spectrum analyser in peak detection mode. The EUT was measured by Bilog antenna with 2 orthogonal polarities and frequencies of peak emissions from the EUT were detected within 6dB of the limit line. Final measurement was conducted in the open area test site with data as follows:

Test results:

(1) Operation Frequency : 2405MHz

Frequency (MHz)	Antenna Polarization	Correction Factor (dB/m)	Receiver QP Reading (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Over Limit (dB)
30.938	V	19.0	3.4	22.4	40.0	-17.6
53.500	H	11.3	4.1	15.4	40.0	-24.6
73.438	V	9.2	4.4	13.6	40.0	-26.4
140.938	V	11.8	4.1	15.9	43.5	-27.6
294.063	V	14.0	4.5	18.5	46.0	-27.5
526.625	H	18.8	4.4	23.2	46.0	-22.8

(2) Operation Frequency : 2440MHz

Frequency (MHz)	Antenna Polarization	Correction Factor (dB/m)	Receiver QP Reading (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Over Limit (dB)
30.188	V	19.3	2.8	22.1	40.0	-17.9
46.875	V	13.1	4.1	17.2	40.0	-22.8
69.938	V	9.3	4.7	14.0	40.0	-26.0
132.313	V	11.6	4.6	16.2	43.5	-27.3
275.813	H	13.5	4.9	18.4	46.0	-27.6
735.688	V	21.0	3.4	24.4	46.0	-21.6

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(3) Operation Frequency : 2475MHz

Frequency (MHz)	Antenna Polarization	Correction Factor (dB/m)	Receiver QP Reading (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Over Limit (dB)
31.063	V	19.0	3.9	22.9	40.0	-17.1
40.250	H	15.3	4.3	19.6	40.0	-20.4
64.000	H	9.7	8.1	17.8	40.0	-22.2
163.875	H	10.6	4.5	15.1	43.5	-28.4
294.625	H	14.0	4.9	18.9	46.0	-27.1
679.625	V	20.6	4.2	24.8	46.0	-21.2

Note:

- 1) All readings are Quasi-Peak values.
- 2) Correction Factor = Antenna Factor + Cable Loss.
- 3) The above results were the worst case results with the EUT positioned in all 3 axis during the test. The EUT was positioned vertically and horizontally on the table for vertical and horizontal measurement respectively.
- 4) Other emissions more than 20dB below the limit are not shown on the above table and only worst six emissions below 1GHz are listed.

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6.3 Radiated Emissions above 1 GHz

Test Requirement: FCC Part15 Subpart C Section 15.209 & 15.249(a) & (d)
 Test Method: ANSI C63.10
 Test Date: 2016-09-08
 Frequency Range: 1GHz – 26GHz
 Measurement Distance: 3m
 Detector: Peak for pre-scan (1MHz resolution bandwidth, 1MHz video bandwidth)
 Average and Peak detector for final test

Limit :

Fundamental Frequency :

Frequency range MHz	Limits (Peak) dB (µV/m)	Limits (Average) dB (µV/m)
2400 to 2483.5	114	94

Spurious Emission :

Frequency range MHz	Limits (Peak) dB (µV/m)	Limits (Average) dB (µV/m)
Over 1000	74	54

6.3.1 EUT Operation

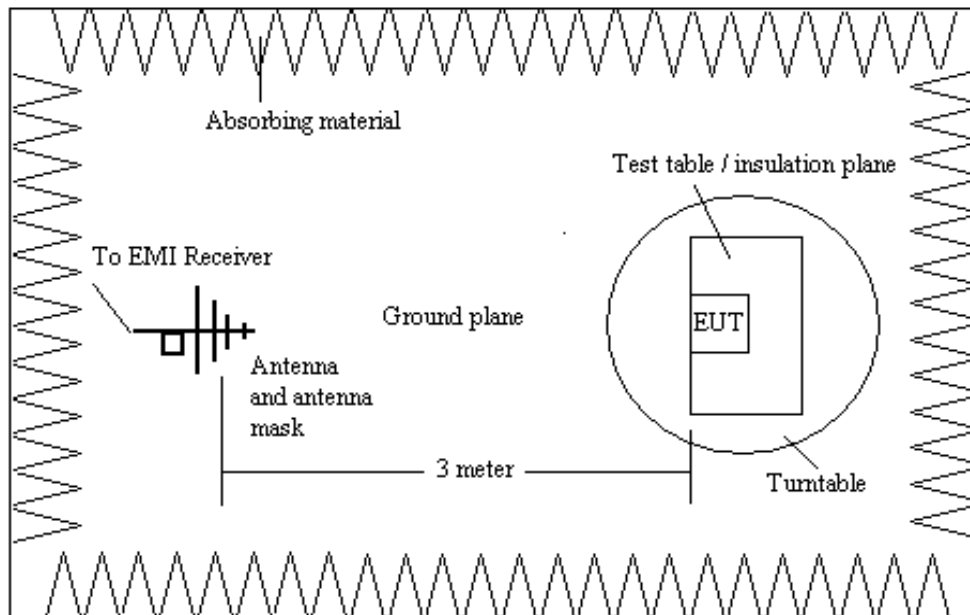
Operating Environment:

Temperature: 27 °C Humidity: 55 %

EUT Operation: Pre-test with Peak detector with the following mode(s):
 1: Transmission in continuous transmitting mode
 2: Test in lowest, middle and high frequency

Final test with Peak and Average detector with the following mode(s):
 1: Transmission in continuous transmitting mode
 2: Test in lowest, middle and high frequency

6.3.2 Test Setup and Procedure



1. The pre-test of the radiated emissions test was conducted in a semi-anechoic chamber and the final measurement was conducted in the open area test site.
2. The EUT was connected to AC power source through a mains power outlet which was bonded to the ground reference plane. The EUT was placed upon a non-metallic table 1.5m above the ground reference plane.
3. Horn antenna was used for the frequency over 1GHz
4. Before final measurements of radiated emissions, a pre-scan was performed in the spectrum mode with the peak detector to find out the maximum emissions spectrum plots of the EUT with located frequencies.
5. The actual frequencies of maximum emission were confirmed in the final radiated emissions measurement. At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 meters in order to determine the maximum disturbance. Measurements were performed for both horizontal and vertical antenna polarization.

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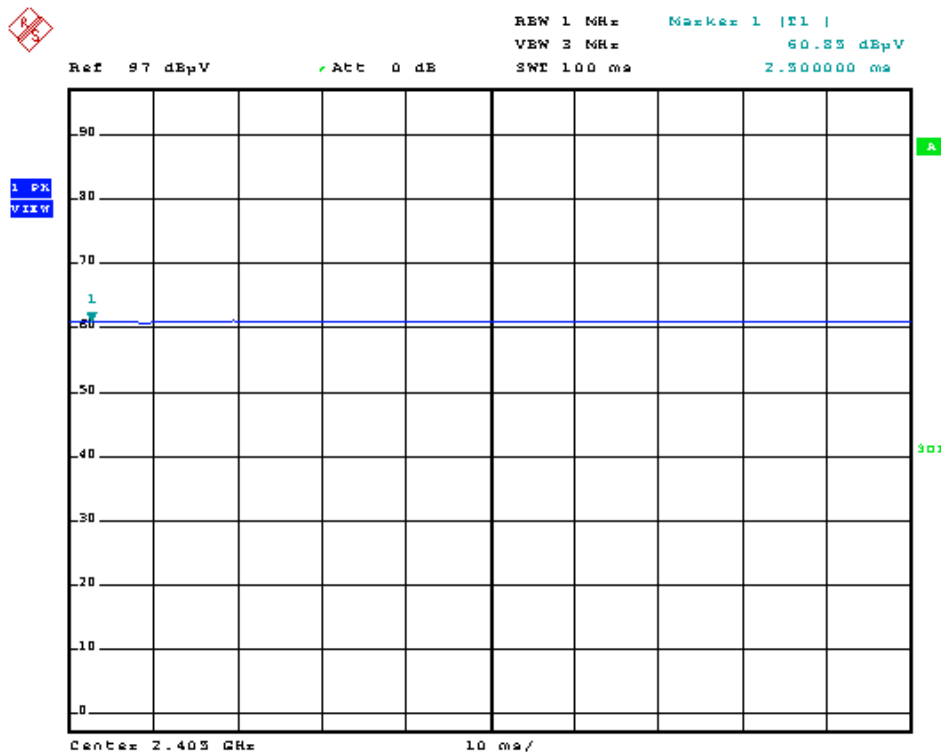
Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 30 days only.

6.3.3 Measurement Data

An initial pre-scan was performed in the 3m chamber using the spectrum analyser in peak detection mode. The EUT was measured with 2 orthogonal polarities and frequencies of average emissions from the EUT were measured as follows:

Emission at the fundamental frequency for the pulse modulated device was measured with the peak detector function of the test receiver and was properly adjusted for the duty cycle correction factor as pulse desensitization to calculate the average emission value.

Time Domain Plots (Fundamental frequency of Transmitter) :



According to above plot , the duty cycle of the this device is 100%, plused operation according to C63.10 clause 7.5 is not employed and the average correction calculation is not applied on this report.

Hence, the average measurement is used below setting:

Detector = peak

RBW = \geq 1MHz

VBW = \geq 1Hz

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Test results :

(1) Fundamental Frequency

Frequency (MHz)	Antenna Polarization	Emission Level (dB μ V/m)		Limit (dB μ V/m)		Remark
		Peak	Average	Peak	Average	
2405.0	H	90.50	49.91	114	94	Pass
2405.0	V	88.57	49.69	114	94	Pass
2440.0	H	90.90	50.01	114	94	Pass
2440.0	V	88.52	49.77	114	94	Pass
2475.0	H	90.85	50.05	114	94	Pass
2475.0	V	88.37	49.56	114	94	Pass

Remark: Since the peak value is lower than average limit, only the peak value for fundamental frequency measuring is shown on this report.

(2) Spurious Emission

Operation Frequency : 2405.0 MHz

Frequency (MHz)	Antenna Polarization	Emission Level (dB μ V/m)		Limit (dB μ V/m)		Remark
		Peak	Average	Peak	Average	
4810.000	H	53.10	27.99	74	54	Pass
5788.000	V	43.20	27.62	74	54	Pass
7205.000	V	45.40	30.20	74	54	Pass
8702.000	H	49.20	33.66	74	54	Pass
9610.000	V	47.00	32.34	74	54	Pass
12015.000	V	50.50	35.68	74	54	Pass

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Operation Frequency : 2440.0 MHz

Frequency (MHz)	Antenna Polarization	Emission Level (dB μ V/m)		Limit (dB μ V/m)		Remark
		Peak	Average	Peak	Average	
4880.000	H	53.10	27.43	74	54	Pass
5747.000	H	42.60	27.55	74	54	Pass
7320.000	H	51.50	32.10	74	54	Pass
9760.000	V	50.10	33.33	74	54	Pass
10593.000	V	51.00	35.66	74	54	Pass
12200.000	H	50.50	35.15	74	54	Pass

Operation Frequency : 2475.0 MHz

Frequency (MHz)	Antenna Polarization	Emission Level (dB μ V/m)		Limit (dB μ V/m)		Remark
		Peak	Average	Peak	Average	
4950.000	H	55.10	28.64	74	54	Pass
6296.000	V	44.40	28.84	74	54	Pass
7426.000	H	52.50	32.75	74	54	Pass
8896.000	H	48.40	33.28	74	54	Pass
9900.000	V	52.00	34.81	74	54	Pass
12375.000	H	52.00	36.47	74	54	Pass

Note:

- 1) The above results were the worst case results with the EUT positioned in all 3 axis during the test. The EUT was positioned vertically and horizontally on the table for vertical and horizontal measurement respectively.
- 2) Other emissions more than 20dB below the limit are not shown on the above table and only worst six emissions below 1GHz are listed.
- 3) There is not any other emission which falls in restricted bands which set out in Section 15.205 Restricted bands can be detected and reported.

6.4 Restricted-band band-edge measurements (Radiated Emission)

Test Requirement: FCC Part15 Subpart C Section 15.215, 15.249(d)
 Test Method: ANSI C63.10
 Measurement Distance: 3m
 Detector: (1MHz resolution bandwidth, 3MHz video bandwidth)
 Average and Peak detector
 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 field strength limits listed in RSS-Gen, whichever is less stringent.

Frequency	Limit (dBuV/m @3m)	Remark
30MHz-88MHz	40.0	Quasi-peak Value
88MHz-216MHz	43.5	Quasi-peak Value
216MHz-960MHz	46.0	Quasi-peak Value
960MHz-1GHz	54.0	Quasi-peak Value
Above 1GHz	54.0	Average Value
	74.0	Peak Value

Test Date: 2016-09-06
 EUT Operation: 1: Transmission with GFSK
 Result: Pass

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Test results : (Worst case: Transmissin with GFSK)

Operation frequency : 2405.0 MHz

Frequency (MHz)	Antenna Polarization	Emission Level (dB μ V/m)		Limit (dB μ V/m)		Remark
		Peak	Average	Peak	Average	
2390.0	V	37.46	19.75	74	54	Pass
2400.0	V	56.77	44.21	74	54	Pass

Operation frequency : 2475.0 MHz

Frequency (MHz)	Antenna Polarization	Emission Level (dB μ V/m)		Limit (dB μ V/m)		Remark
		Peak	Average	Peak	Average	
2483.5	H	56.60	44.48	74	54	Pass

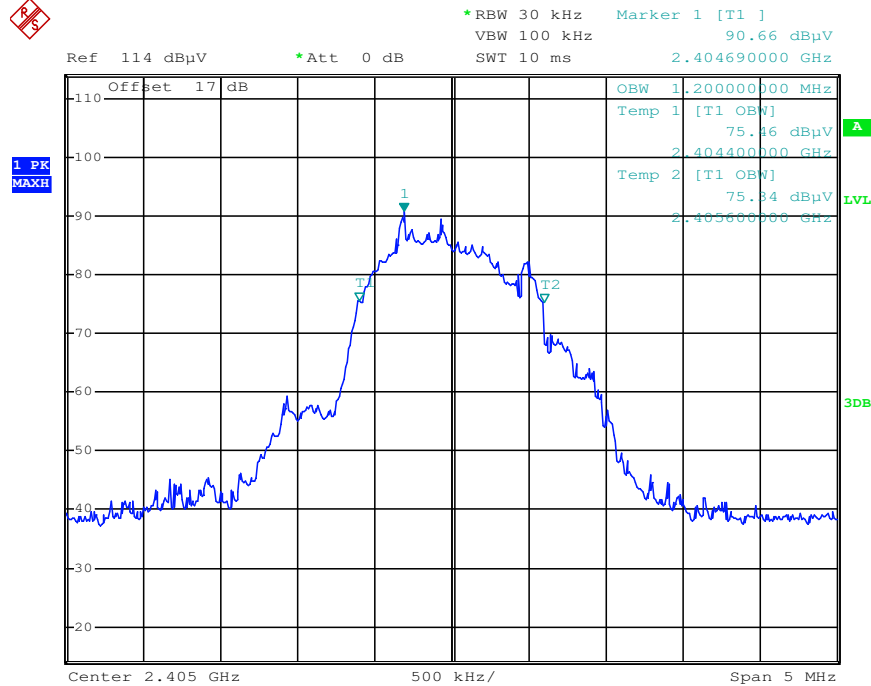
According to above bandedge measurement, emissions radiated outside of the specified frequency bands, (2400-2483.5)MHz except for harmonics, are below general field strength limits under 15.209 It is deemed to comply with section 15.215 and 15.249(d)

6.5 20 dB Bandwidth

Test Requirement: FCC Part15 Subpart C Section 15.215
 Test Method: ANSI C63.10:2013
 Test Date: 2016-09-06
 EUT Operation: 1: Transmission with GFSK
 Result: Pass

Test Plot : (Worst case: Transmission with GFSK)

Operation frequency : 2405.0 MHz



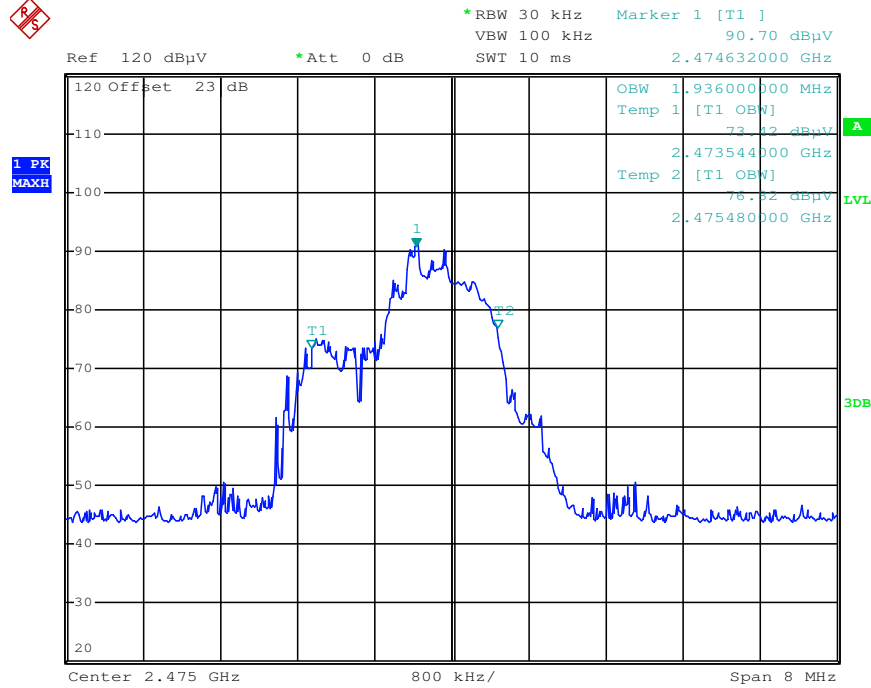
Date: 6.SEP.2016 16:54:27

According to above plot, 20dB bandwidth falls in assigned band (2400-2483.5)MHz. It is deemed to comply with section 15.215

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Operation frequency : 2475.0 MHz



Date: 6.SEP.2016 16:58:31

According to above plot, 20dB bandwidth falls in assigned band (2400-2483.5)MHz. It is deemed to comply with section 15.215

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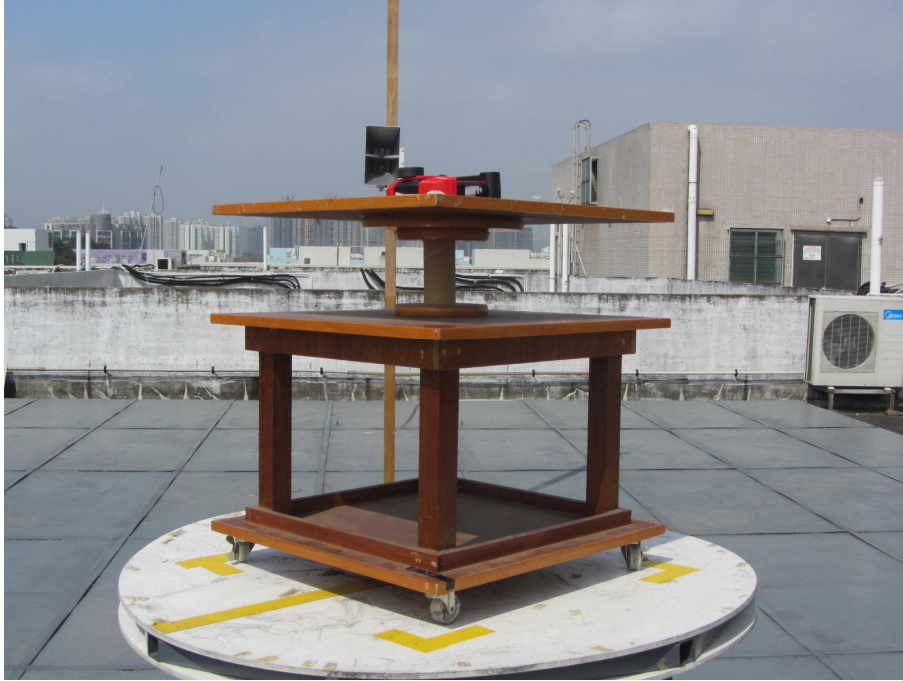
7 Photographs

7.1 Radiated Emission Test Setup



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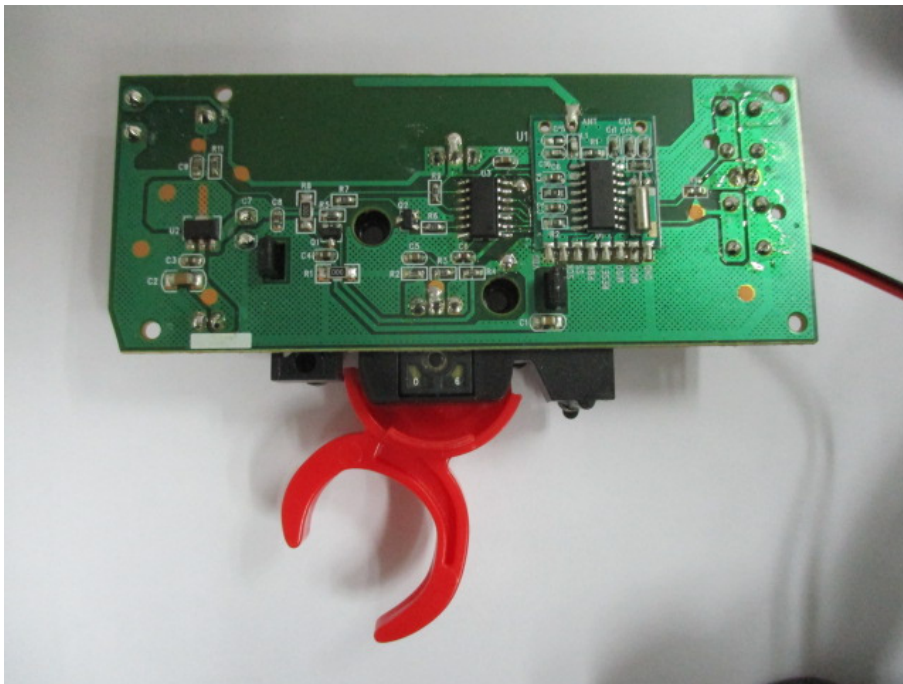
7.2 EUT Constructional Details



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7.3 EUT Internal Photo



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