

RF TEST REPORT



Report No.: 15021070-FCC-R1

Supersede Report No.: N/A

Applicant	HANGZHOU HILAND TECHNOLOGY CO.,LTD	
Product Name	Transmitter	
Main Model	T6405	
Serial Model	T6XXX(XXX=000-999)	
Test Standard	FCC Part 15.231: 2015, ANSI C63.10: 2013	
Test Date	November 02, 2015	
Issue Date	November 05, 2015	
Test Result	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail
Equipment complied with the specification		<input checked="" type="checkbox"/>
Equipment did not comply with the specification		<input type="checkbox"/>
Deon Dai	Herve Idoko	
Deon Dai Test Engineer	Herve Idoko Checked By	
This test report may be reproduced in full only Test result presented in this test report is applicable to the tested sample only		

Issued by:

SIEMIC (Nanjing-China) Laboratories

2-1 Longcang Avenue Yuhua Economic and
Technology Development Park, Nanjing, China

Tel:+86(25)86730138 Fax:+86(25)86730127 Email: China@siemic.com.cn

Laboratories Introduction

SIEMIC, headquartered in the heart of Silicon Valley, with superior facilities in US and Asia, is one of the leading independent testing and certification facilities providing customers with one-stop shop services for Compliance Testing and Global Certifications.



In addition to testing and certification, SIEMIC provides initial design reviews and compliance management throughout a project. Our extensive experience with China, Asia Pacific, North America, European, and International compliance requirements, assures the fastest, most cost effective way to attain regulatory compliance for the global markets.

Accreditations for Conformity Assessment

Country/Region	Scope
USA	EMC , RF/Wireless , Telecom
Canada	EMC, RF/Wireless , Telecom
Taiwan	EMC, RF, Telecom , Safety
Hong Kong	RF/Wireless , Telecom
Australia	EMC, RF, Telecom , Safety
Korea	EMI, EMS, RF , Telecom, Safety
Japan	EMI, RF/Wireless, Telecom
Singapore	EMC , RF , Telecom
Europe	EMC, RF, Telecom , Safety

Test Report No.	15021070-FCC-R1
Page	3 of 30

This page has been left blank intentionally.

CONTENTS

1. REPORT REVISION HISTORY.....	5
2. CUSTOMER INFORMATION	5
3. TEST SITE INFORMATION.....	5
4. EQUIPMENT UNDER TEST (EUT) INFORMATION	6
5. TEST SUMMARY	7
6. MEASUREMENTS, EXAMINATION AND DERIVED RESULTS	8
6.1 ANTENNA REQUIREMENT	8
6.2 AC CONDUCTED EMISSIONS VOLTAGE	9
6.3 20DB OCCUPIED BANDWIDTH.....	11
6.4 RADIATED FUNDAMENTAL AND SPURIOUS EMISSION.....	13
6.5 DEACTIVATION.....	18
ANNEX A. TEST INSTRUMENT.....	20
ANNEX B. EUT AND TEST SETUP PHOTOGRAPHS	21
ANNEX C. TEST SETUP AND SUPPORTING EQUIPMENT.....	27
ANNEX D. USER MANUAL / BLOCK DIAGRAM / SCHEMATICS / PARTLIST.....	29
ANNEX E. DECLARATION OF SIMILARITY	30

1. Report Revision History

Report No.	Report Version	Description	Issue Date
15021070-FCC-R1	NONE	Original	November 05, 2015

2. Customer information

Applicant Name	HANGZHOU HILAND TECHNOLOGY CO.,LTD
Applicant Add	4 TH BUILDING,2XIYUANWU ROAD,WESTLAKE TECHNOLOGY GARDEN,HANGZHOU,CHINA
Manufacturer Name	HANGZHOU HILAND TECHNOLOGY CO.,LTD
Manufacturer Add	4 TH BUILDING,2XIYUANWU ROAD,WESTLAKE TECHNOLOGY GARDEN,HANGZHOU,CHINA

3. Test site information

Lab performing tests	SIEMIC (Nanjing-China) Laboratories
Lab Add	2-1 Longcang Avenue Yuhua Economic and Technology Development Park, Nanjing, China
FCC Test Site No.	986914
IC Test Site No.	4842B-1
Test Software	Labview of SIEMIC version 1.0

4. Equipment Under Test (EUT) Information

Description of EUT: Transmitter

Main Model: T6405

Serial Model: T6XXX(XXX=000-999)

Date EUT received: October 28, 2015

Test Date(s): November 02, 2015

Antenna Gain: 0 dBi

Type of Modulation: ASK

RF Operating Frequency (ies): Tx:433.92MHz

Number of Channels: 1 CH

Port: N/A

Input Power: DC: 3V

Trade Name : HILAND

FCC ID: 2AGCVT6XXX2015

5. Test Summary

The product was tested in accordance with the following specifications.
 All testing has been performed according to below product classification:

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.207	Conducted Emissions Voltage	N/A
§15.231(b)	Fundamental & Radiated Spurious Emission	Compliance
§15.231(c)	20dB Bandwidth	Compliance
§15.231(a)(1)	Deactivation	Compliance

Note: Preliminary radiated emission testing has been performed on X, Y, Z axis, only worst case test result is presented in this test report.

Measurement Uncertainty

Emissions		
Test Item	Description	Uncertainty
Radiated Spurious Emissions	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	+5.6dB/-4.5dB

6. Measurements, Examination And Derived Results

6.1 Antenna Requirement

Applicable Standard

Requirement(s): 47 CFR §15.203

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.

Antenna requirement must meet at least one of the following:

- a) Antenna must be permanently attached to the device.
- b) Antenna must use a unique type of connector to attach to the device.
- c) Device must be professionally installed. Installer shall be responsible for ensuring that the correct antenna is employed with the device.

The antenna is permanently attached to the device which meets the requirement.

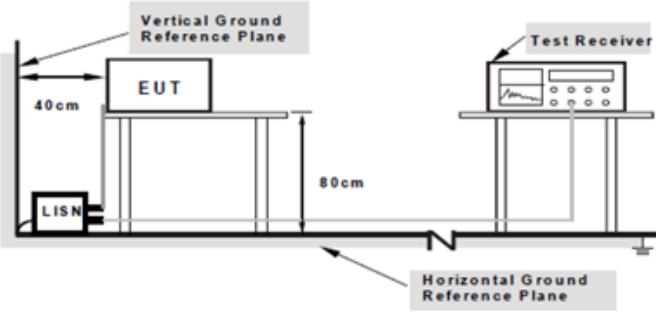
Result: Compliance.

6.2 AC Conducted Emissions Voltage

Temperature	---°C
Relative Humidity	---%
Atmospheric Pressure	---mbar
Test date :	---
Tested By :	Deon Dai

Conducted Emission Limit

Frequency ranges (MHz)	Limit (dB μ V)	
	QP	Average
0.15 ~ 0.5	66 – 56	56 – 46
0.5 ~ 5	56	46
5 ~ 30	60	50

Spec	Item	Requirement	Applicable
47CFR§15.20 7, RSS210 (A8.1)	a)	For Low-power radio-frequency devices that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 [mu]H/50 ohms line impedance stabilization network (LISN). The lower limit applies at the boundary between the frequency ranges.	<input checked="" type="checkbox"/>
Test Setup	 <p>Note: 1. Support units were connected to second LISN. 2. Both of LISNs (AMN) are 80cm from EUT and at least 80cm from other units and other metal planes support units.</p>		
Procedure	<ul style="list-style-type: none"> The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table, as shown in Annex B. The power supply for the EUT was fed through a 50W/50mH EUT LISN, connected to filtered mains. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable. All other supporting equipment were powered separately from another main supply. 		
Remark			
Result	<input checked="" type="checkbox"/>	N/A	<input type="checkbox"/>

Test Data Yes N/A

Test Plot Yes (See below) N/A

Data sample

Frequency (MHz)	Quasi-Peak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Factors (dB)
xxx	56.21	66.00	-9.79	39.20	56.00	-16.80	12.22

Frequency (MHz) = Emission frequency in MHz

Quasi-Peak/Average (dB μ V/m)=Receiver Reading(dB μ V/m)+ Factor(dB)

Limit(dB μ V/m)=Limit stated in standard

Factor (dB)= cable loss+ Insertion loss of LISN+ Insertion loss of transient limiter (The transient limiter included 10dB attenuation)

Calculation Formula:

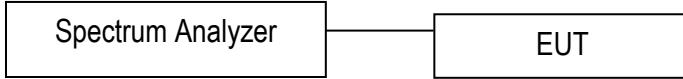
Margin (dB)=Quasi Peak / Average (dB μ V/m) – limit (dB μ V/m)

Note: Power Supply by battery

6.3 20dB Occupied Bandwidth

Temperature	25°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
Test date :	November 02, 2015
Tested By :	Deon Dai

Requirement(s):

Spec	Item	Requirement	Applicable
§15.231(c)	a)	The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz.	<input checked="" type="checkbox"/>
	b)	For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency.	<input type="checkbox"/>
Test Setup			
Test Procedure	<p><u>20dB Emission bandwidth measurement procedure</u></p> <ul style="list-style-type: none"> - Set RBW = 100 kHz. - Set the video bandwidth (VBW) $\geq 3 \times$ RBW. - Detector = Peak. - Trace mode = max hold. - Sweep = auto couple. - Allow the trace to stabilize. <p>Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.</p>		
Remark			
Result	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail	

Test Data Yes N/A

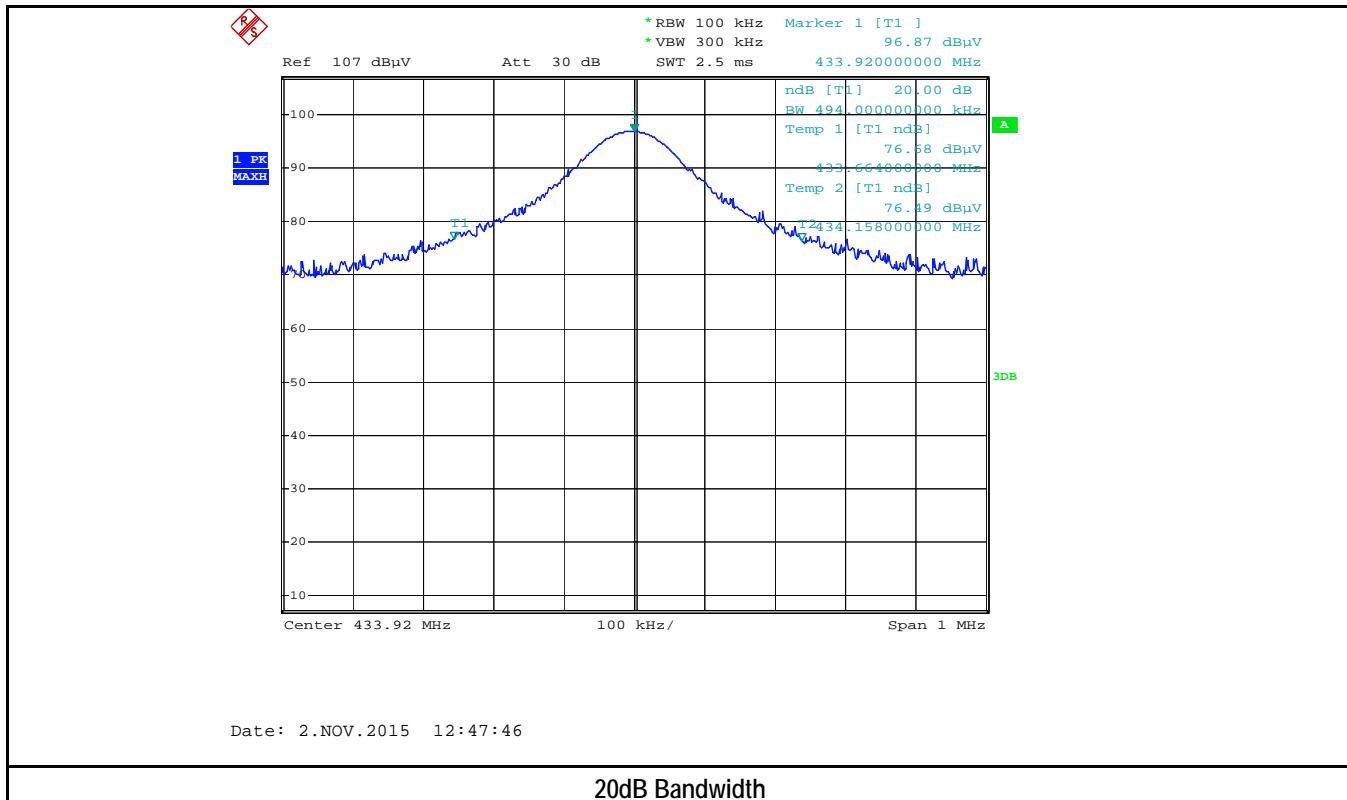
Test Plot Yes N/A

20dB Bandwidth measurement result

Type	Freq (MHz)	CH	Measured 20dB Bandwidth (kHz)	Limit (kHz)	Result
20dB BW	433.92	1 CH	494.00	1084.8	Pass

Test Plots

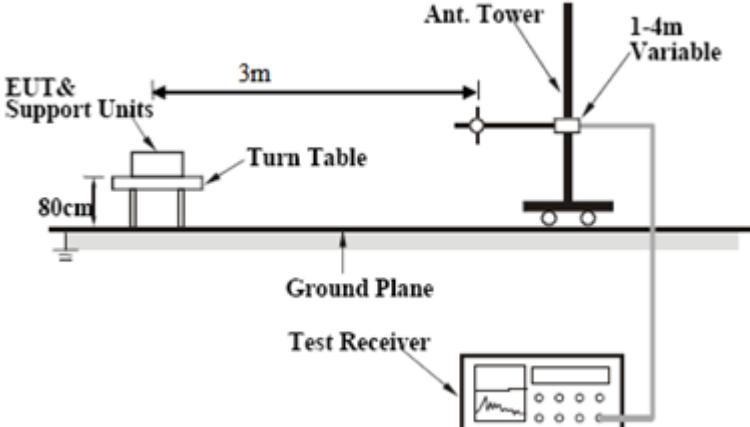
20dB Bandwidth measurement result



6.4 Radiated Fundamental and Spurious Emission

Temperature	25°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
Test date :	November 02, 2015
Tested By :	Deon Dai

Requirement(s):

Spec	Item	Requirement	Applicable																					
§15.231(b)	a)	<p>Except higher limit as specified elsewhere in other section, the emissions from the low-power radio-frequency devices shall not exceed the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges</p> <table border="1"> <thead> <tr> <th>Fundamental frequency (MHz)</th> <th>Field strength of fundamental (microvolts/meter)</th> <th>Field strength of spurious emissions (microvolts/meter)</th> </tr> </thead> <tbody> <tr> <td>40.66-40.70</td> <td>2250</td> <td>225</td> </tr> <tr> <td>70-130</td> <td>1250</td> <td>125</td> </tr> <tr> <td>130-174</td> <td>1250 to 3750</td> <td>125 to 375</td> </tr> <tr> <td>174-260</td> <td>3750</td> <td>375</td> </tr> <tr> <td>260-470</td> <td>3750-12500</td> <td>375 to 1250</td> </tr> <tr> <td>Above 470</td> <td>12500</td> <td>1250</td> </tr> </tbody> </table> <p>Note: All 3 axes have been investigated. Only worst case is presented in the test report.</p>	Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)	40.66-40.70	2250	225	70-130	1250	125	130-174	1250 to 3750	125 to 375	174-260	3750	375	260-470	3750-12500	375 to 1250	Above 470	12500	1250	<input checked="" type="checkbox"/>
Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)																						
40.66-40.70	2250	225																						
70-130	1250	125																						
130-174	1250 to 3750	125 to 375																						
174-260	3750	375																						
260-470	3750-12500	375 to 1250																						
Above 470	12500	1250																						
Test Setup		<p>A: < 1GHz</p>  <p>B: >1GHz</p>																						

Procedure	<ol style="list-style-type: none"> 1. The EUT was switched on and allowed to warm up to its normal operating condition. 2. The test was carried out at the selected frequency points obtained from the EUT characterisation. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner: <ol style="list-style-type: none"> a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen. b. The EUT was then rotated to the direction that gave the maximum emission. c. Finally, the antenna height was adjusted to the height that gave the maximum emission. 3. A Quasi-peak measurement was then made for that frequency point. 4. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.
Remark	
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail

Test Data Yes N/A

Test Plot Yes (See below) N/A

Fundamental Measurement Result

Frequency (MHz)	Reading	Factors	Azimuth	Polarity	Height	correct (dB μ V/m)	Limit (dB μ V)	Margin	Comments
433.92	80.99	-28.34	138.00	V	1.00	52.65	100.8	-48.15	Pk
433.92	-	-	-	V	-	50.26	80.8	-30.54	Ave
433.92	83.86	-28.34	116.00	H	1.00	55.52	100.8	-45.28	Pk
433.92	-	-	-	H	-	53.13	80.8	-27.67	Ave

Spurious Emissions (<1GHz) Measurement Result

Frequency (MHz)	Reading	Factors	Azimuth	Polarity	Height	correct (dB μ V/m)	Limit (dB μ V)	Margin	Comments
867.84	52.08	-18.16	221.00	V	2.00	33.92	80.8	-46.88	Pk
867.84	-	-	-	V	-	31.53	60.8	-29.27	Ave
867.84	68.79	-19.29	198.00	H	2.00	49.5	80.8	-31.3	Pk
867.84	-	-	-	H	-	47.11	60.8	-13.69	Ave

Notes:

1. Duty cycle is 75.93%, 20log (duty cycle) = -2.39dB correction was used to determine the average level from the peak reading.
Average = peak reading + 20log (duty cycle), Final Average= peak reading -2.39dB
2. All the data measurement of peak values.
3. FCC Limit for Average Measurement=41.67* (433.92MHz)-7083.3333=10998.1131.2 μ V/m=80.8dB μ V/m
4. Average pulsed signal over one complete pulse train or 100 ms time frame if pulse train exceeds 100 ms
5. Maximum average in 100 ms
6. Calculate duty cycle for pulse train or 100 ms
7. Duty cycle = $(t_1 + t_2 + t_3 + \dots + t_n)/T$ where t_n = pulse width, T = pulse train length or 100 ms

Spurious Emissions (>1GHz) Measurement Result

Frequency	Reading	Direction	Height	Polar	Factors (dB)	Amplifier	Cord. Amp.	FCC 15.231	Margin	Comments
GHz	(dBmV/m)	Degree	Meter	H/V	(dB)	(dB)	(dBuV/m)	Limit (dBuV/m)	(dB)	(Pk/Ave)
1.302	68.55			H	-25.85	42.7	80.8	-38.1	1.302	Peak
1.302	-	-	-	H	-	40.31	60.8	-20.49	1.302	Ave
1.736	64.45			H	-23.33	41.12	80.8	-39.68	1.736	Peak
1.736	-	-	-	H	-	38.73	60.8	-22.07	1.736	Ave
2169	60.45			H	-20.66	39.79	80.8	-41.01	2169	Peak
2169	-	-	-	H	-	37.4	60.8	-23.4	2169	Ave
2.603	64.43			H	-18.42	46.01	80.8	-34.79	2.603	Peak
2.603	-	-	-	H	-	43.62	60.8	-17.18	2.603	Ave
3.037	64.09			H	-15.46	48.63	80.8	-32.17	3.037	Peak
3.037	-	-	-	H	-	46.24	60.8	-14.56	3.037	Ave
3.471	55.2			H	-11.48	43.72	80.8	-37.08	3.471	Peak
3.471	-	-	-	H	-	41.33	60.8	-19.47	3.471	Ave
3.905	51.43			H	-9.25	42.18	80.8	-38.62	3.905	Peak
3.905	-	-	-	H	-	39.79	60.8	-21.01	3.905	Ave
4.338	48.09			H	-6.73	41.36	80.8	-39.44	4.338	Peak
4.338	-	-	-	H	-	38.97	60.8	-21.83	4.338	Ave
1.302	66.98			V	-25.85	41.13	80.8	-39.67	1.302	Peak
1.302	-	-	-	V	-	38.74	60.8	-22.06	1.302	Ave
1.736	66.11			V	-23.33	42.78	80.8	-38.02	1.736	Peak
1.736	-	-	-	V	-	40.39	60.8	-20.41	1.736	Ave
2169	61.67			V	-20.66	41.01	80.8	-39.79	2169	Peak
2169	-	-	-	V	-	38.62	60.8	-22.18	2169	Ave
2.603	66.46			V	-18.42	48.04	80.8	-32.76	2.603	Peak
2.603	-	-	-	V	-	45.65	60.8	-15.15	2.603	Ave
3.037	64.78			V	-15.46	49.32	80.8	-31.48	3.037	Peak
3.037	-	-	-	V	-	46.93	60.8	-13.87	3.037	Ave
3.471	56.87			V	-11.48	45.39	80.8	-35.41	3.471	Peak
3.471	-	-	-	V	-	43	60.8	-17.8	3.471	Ave
3.905	52.56			V	-9.25	43.31	80.8	-37.49	3.905	Peak
3.905	-	-	-	V	-	40.92	60.8	-19.88	3.905	Ave
4.338	50.21			V	-6.73	43.48	80.8	-37.32	4.338	Peak
4.338	-	-	-	V	-	41.09	60.8	-19.71	4.338	Ave

Note: Duty cycle is 75.93%, 20log (duty cycle) = -2.39dB correction was used to determine the average level from the peak reading.

Average = peak reading + 20log (duty cycle), final Average= peak reading -2.39dB

Note:

Narrow Pulse: 0.9ms

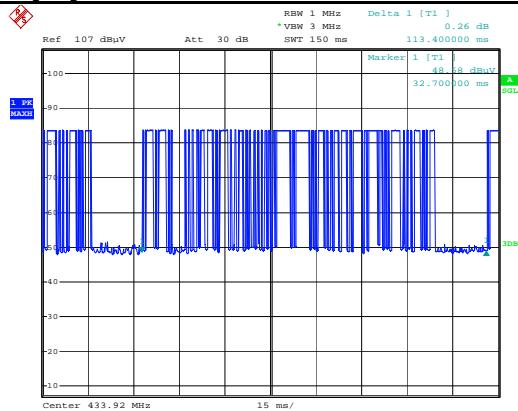
2/NP = 2/0.9ms =2.22 kHz

RBW > 2/NP (2.22 kHz)

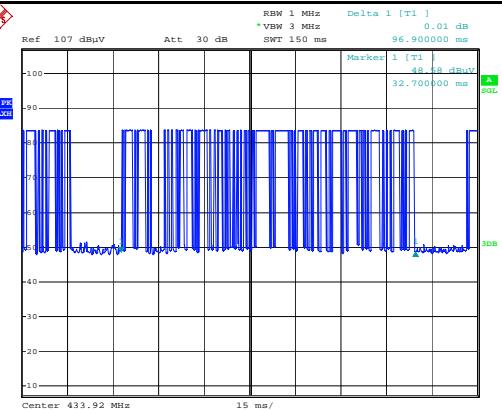
Therefore PDCF is not needed.

Test Plots

Duty Cycle Measurement Result

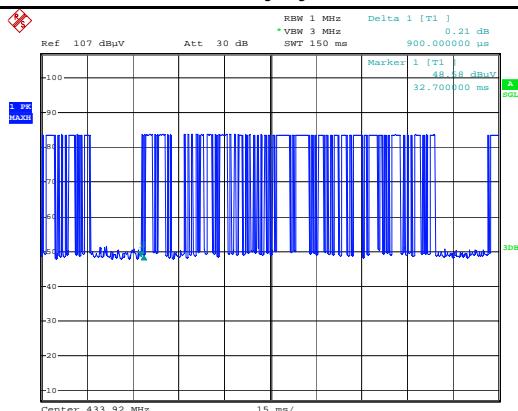


Date: 2.NOV.2015 16:25:33

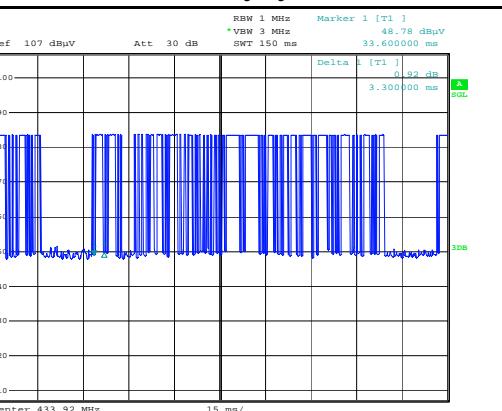


Date: 2.NOV.2015 16:25:56

Duty Cycle 1#

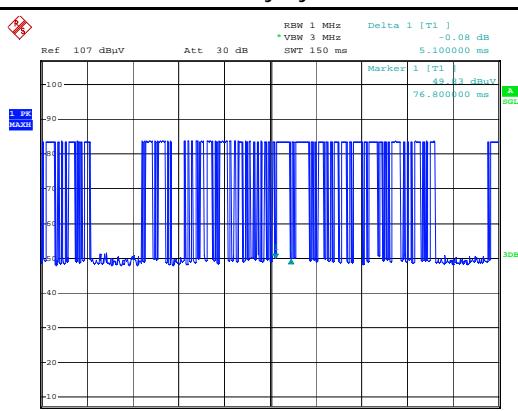


Date: 2.NOV.2015 16:26:21



Date: 2.NOV.2015 16:26:45

Duty Cycle 3#



Date: 2.NOV.2015 16:27:12

Duty Cycle 4#

Wide Pulse: 5.1ms
 Middle Pulse: 3.3ms
 Narrow Pulse: 0.9ms

$$\text{Duty cycle} = (5.1^2 + 0.9^2 + 3.3^2 + 14^2) / 113.4 = 75.93\%$$

 Average Duty Factor: $20 \times \log(\text{Duty Cycle}) = -2.39 \text{ dB}$

Duty Cycle 5#

Pulse Duty Cycle

6.5 Deactivation

Temperature	25°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
Test date :	November 02, 2015
Tested By :	Deon Dai

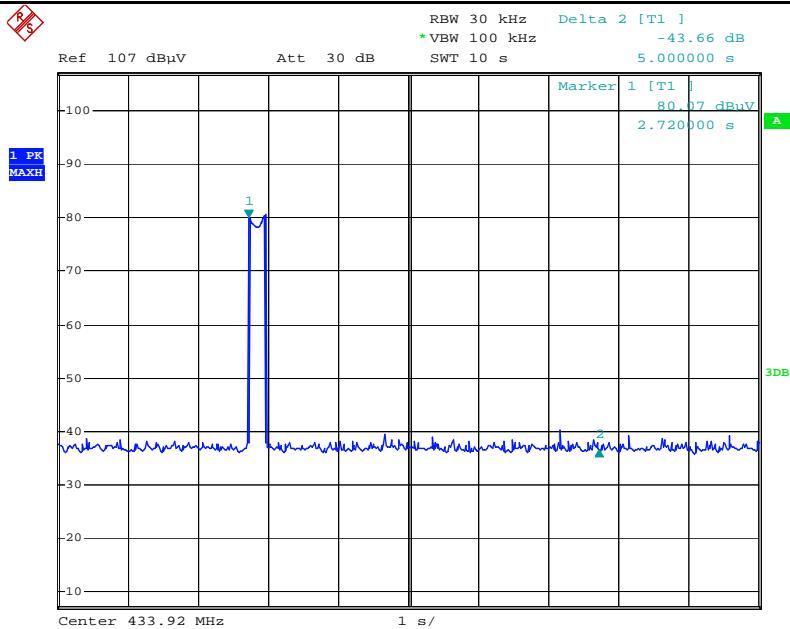
Requirement(s):

Spec	Item	Requirement	Applicable
§15.231 (a)(1)	a)	A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.	<input checked="" type="checkbox"/>
Test Setup		<div style="border: 1px solid black; padding: 5px; display: inline-block;">Spectrum Analyzer</div> — <div style="border: 1px solid black; padding: 5px; display: inline-block;">EUT</div>	
Test Procedure	measurement procedure <ul style="list-style-type: none"> - Set analyzer center frequency to channel center frequency. - Set the span to 0Hz. - Set the VBW ≥ 3 ' RBW. - Detector = peak. - Sweep time = auto couple. - Trace mode = max hold. - Allow trace to fully stabilize. 		
Remark			
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

 Test Data Yes N/A

 Test Plot Yes (See below) N/A

Test Plots
Duty Cycle Measurement Result



Date: 2.NOV.2015 16:12:47

< 5 seconds

Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Due	In use
AC Line Conducted Emissions					
R&S EMI Test Receiver	ESPI3	101216	11/04/2014	11/03/2015	N/A
V-LISN	ESH3-Z5	838979/005	09/27/2015	09/26/2016	N/A
SIEMIC Conducted Emissions software	V1.0	N/A	N/A	N/A	N/A
RF conducted test					
R&S EMI Receiver	ESPI3	101216	11/04/2014	11/03/2015	<input checked="" type="checkbox"/>
Radiated Emissions					
Agilent Technologies Spectrum Analyzer	N9010	MY47191130	03/11/2015	03/10/2016	<input checked="" type="checkbox"/>
R&S EMI Receiver	ESPI3	101216	11/04/2014	11/03/2015	<input checked="" type="checkbox"/>
Antenna (30MHz~6GHz)	JB6	A121411	06/04/2015	06/03/2016	<input checked="" type="checkbox"/>
EMCO Horn Antenna (1 ~18GHz)	3115	N/A	10/09/2015	10/08/2016	<input checked="" type="checkbox"/>
INFOMW Antenna (1 ~18GHz)	JXTXLB-10180	J2031081120092	10/09/2015	10/08/2016	<input checked="" type="checkbox"/>
Hp Agilent Pre-Amplifier	8447F	1937A01160	10/27/2015	10/26/2016	<input checked="" type="checkbox"/>
MITEQ Pre-Amplifier (0.1 ~ 18GHz)	AMF-7D-00101800-30-10P	1451709	10/27/2015	10/26/2016	<input checked="" type="checkbox"/>
SIEMIC Radiated Emissions software	V1.0	N/A	N/A	N/A	<input checked="" type="checkbox"/>

Annex B. EUT And Test Setup Photographs

Annex B.i. Photograph: EUT External Photo



Front View of EUT



Rear View of EUT



Top View of EUT



Bottom View of EUT



Left View of EUT

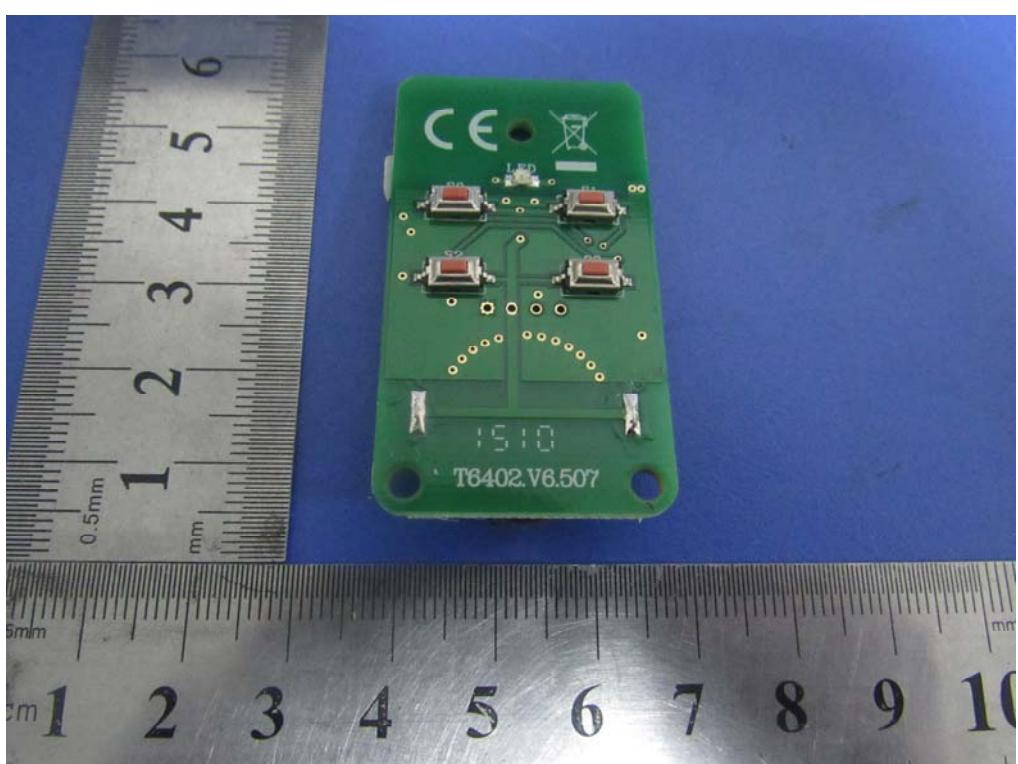


Right View of EUT

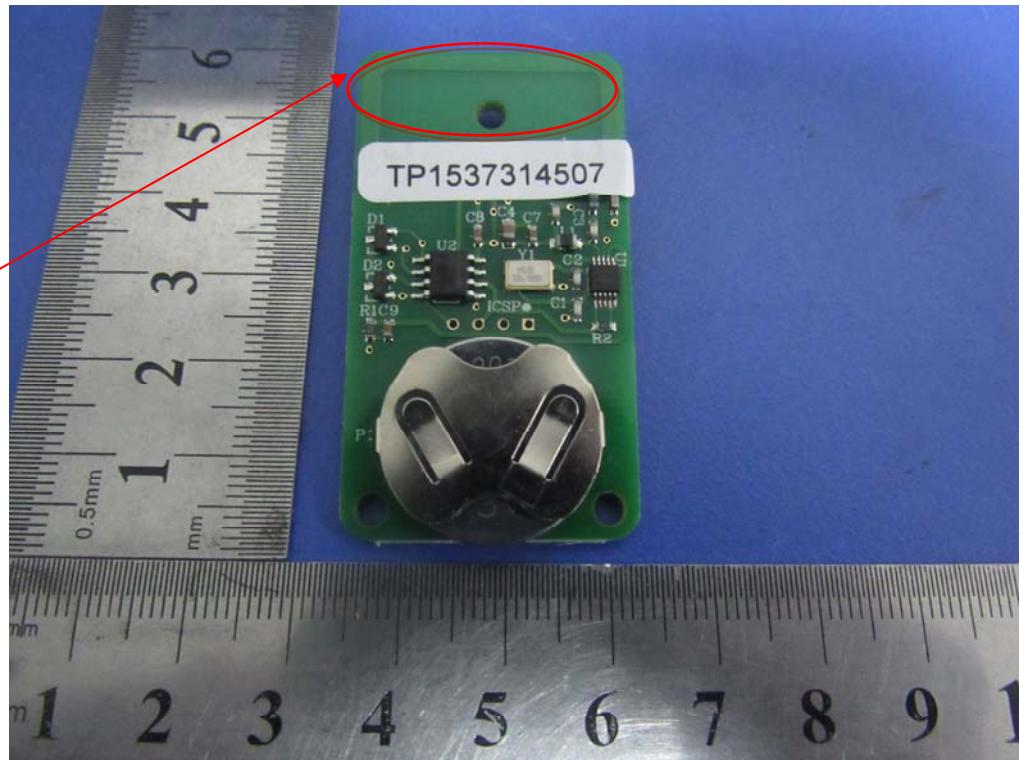
Annex B.ii. Photograph EUT Internal Photo



Uncover - Front View

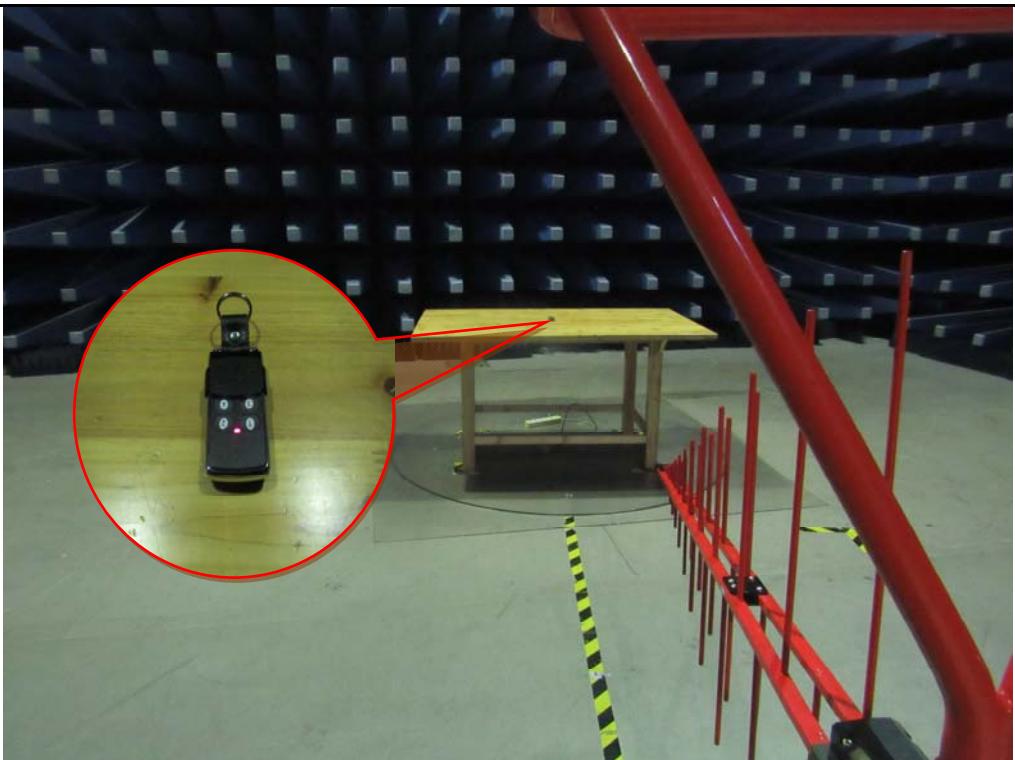


EUT PCBA – Front View

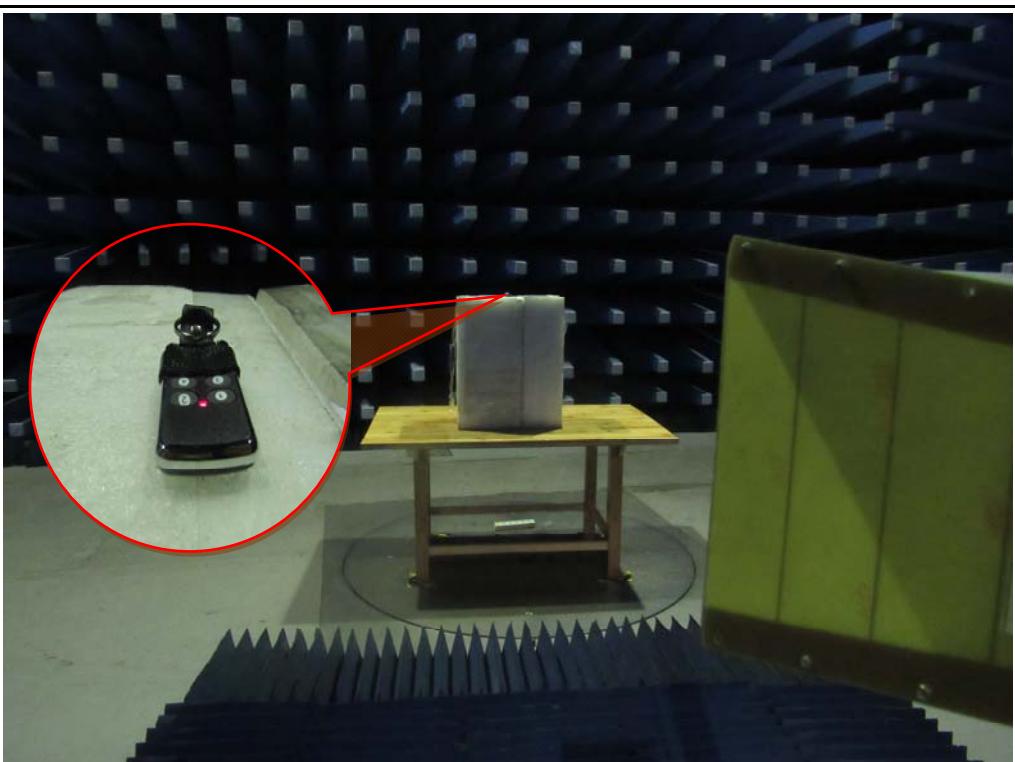


EUT PCBA – Rear View

Annex B.iii. Photograph: Test Setup Photo



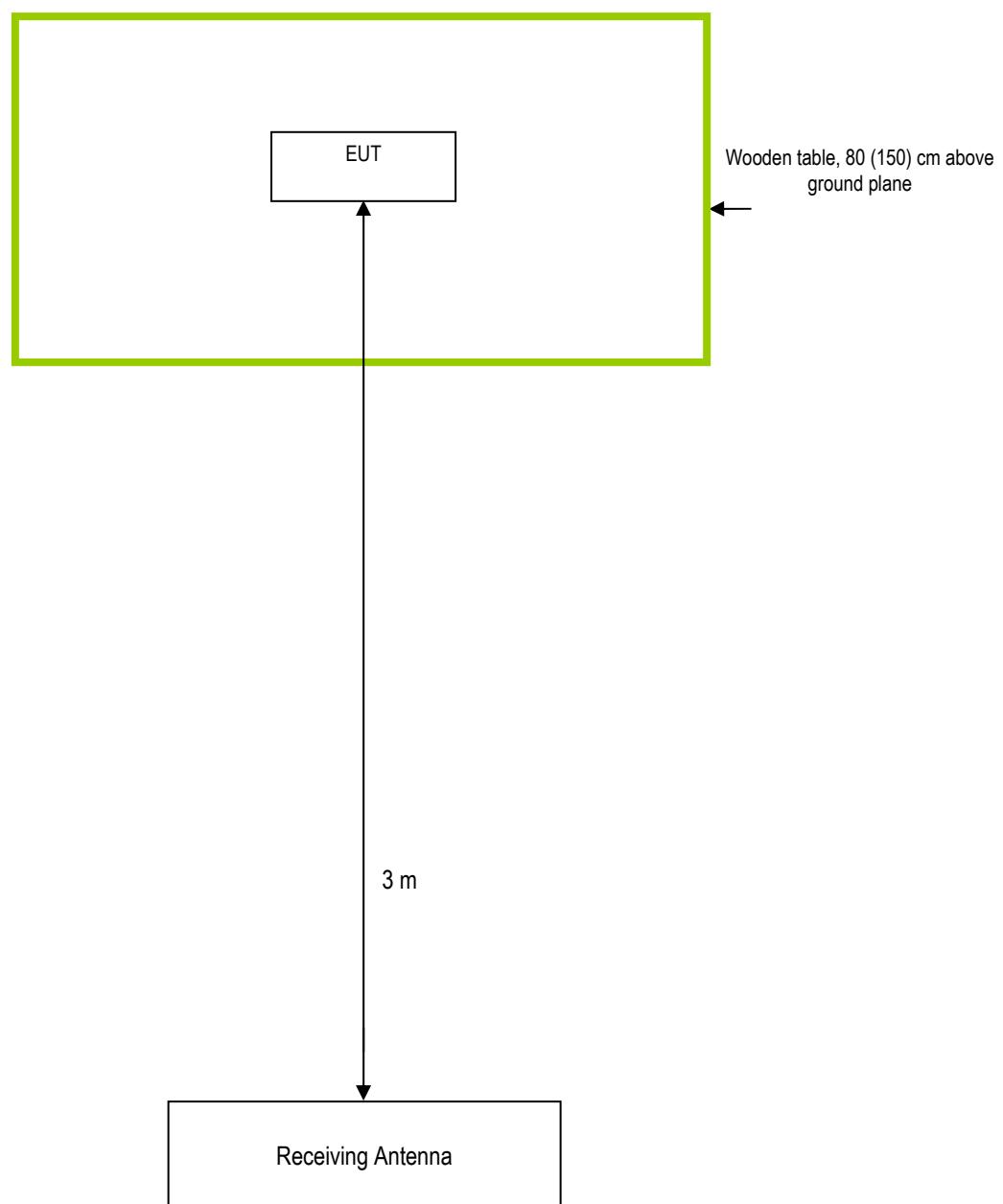
Radiated Spurious Emissions Test Setup Below 1GHz



Radiated Spurious Emissions Test Setup Above 1GHz

Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

Annex C.ii. TEST SET UP BLOCK



Test Report No.	15021070-FCC-R1
Page	28 of 30

Annex C. ii. SUPPORTING EQUIPMENT DESCRIPTION

The following is a description of supporting equipment and details of cables used with the EUT.

Manufacturer	Equipment Description	Model	Calibration Date	Calibration Due Date
N/A	N/A	N/A	N/A	N/A

Test Report No.	15021070-FCC-R1
Page	29 of 30

Annex D. User Manual / Block Diagram / Schematics / Partlist

Please see attachment

Annex E. DECLARATION OF SIMILARITY

To: SIEMIC INC.

Declaration letter

Dear Sir,

For our business issue and marketing requirement, we would like to list different models numbers on the FCC certificates and reports, as following:

Model No.: T6XXX(XXX=000-999)

The Main test model T6405 and T6XXX(XXX=000-999) have the same circuit, same power, same structure and size. Only product type name, program, code is different.

Thank you!

Product name:Transmitter

FCC ID: 2AGCVT6XXX2015 Co

Applicant: HANGZHOU HILAND TECHNOLOGY CO.,LTD

Address: 4TH BUILDING, 2 XIYUANWU ROAD, WESTLAKE TECHNOLOGY GARDEN,
HANGZHOU, CHINA

Company representative: 