

RF TEST REPORT



Report No.: 15050023-FCC-R2

Supersede Report No.: N/A

Applicant	Fenghua Tiancheng Plastic Electronics Co.,Ltd	
Product Name	INTELLIGENT CONTROLLER	
Model No.	CRZ-16X0;CRZ-12X4	
Serial No.	N/A	
Test Standard	FCC Part 15.247: 2014, ANSI C63.10: 2013	
Test Date	July 06 to July 13,2015	
Issue Date	July 14, 2015	
Test Result	☒ Pass ☐ Fail	
Equipment complied with the specification ☒		
Equipment did not comply with the specification ☐		
<i>Winnie Zhang</i>	<i>David Huang</i>	
Winnie Zhang Test Engineer	David Huang 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 (SHENZHEN-CHINA) LABORATORIES

Zone A, Floor 1, Building 2 Wan Ye Long Technology Park

South Side of Zhoushi Road, Bao' an District, Shenzhen, Guangdong China 518108

Phone: +86 0755 2601 4629801 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, SAR, Telecom
Canada	EMC, RF/Wireless, SAR, Telecom
Taiwan	EMC, RF, Telecom, SAR, Safety
Hong Kong	RF/Wireless, SAR, Telecom
Australia	EMC, RF, Telecom, SAR, Safety
Korea	EMI, EMS, RF, SAR, Telecom, Safety
Japan	EMI, RF/Wireless, SAR, Telecom
Singapore	EMC, RF, SAR, Telecom
Europe	EMC, RF, SAR, Telecom, Safety

Test Report No.	15050023-FCC-R2
Page	3 of 29

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	8
6. MEASUREMENTS, EXAMINATION AND DERIVED RESULTS	9
6.1 RADIATED SPURIOUS EMISSIONS	9
ANNEX A. TEST INSTRUMENT	15
ANNEX B. EUT AND TEST SETUP PHOTOGRAPHS	16
ANNEX C. TEST SETUP AND SUPPORTING EQUIPMENT	25
ANNEX D. USER MANUAL / BLOCK DIAGRAM / SCHEMATICS / PARTLIST	28
ANNEX E. DECLARATION OF SIMILARITY	29

1. Report Revision History

Report No.	Report Version	Description	Issue Date
15050023-FCC-R2	NONE	Original	July 14, 2015

2. Customer information

Applicant Name	Fenghua Tiancheng Plastic Electronics Co.,Ltd
Applicant Add	No.66 Dongfeng Road Fenghua Zhejiang China
Manufacturer	Fenghua Tiancheng Plastic Electronics Co.,Ltd
Manufacturer Add	No.66 Dongfeng Road Fenghua Zhejiang China

3. Test site information

Lab performing tests	SIEMIC (Shenzhen-China) LABORATORIES
Lab Address	Zone A, Floor 1, Building 2 Wan Ye Long Technology Park South Side of Zhoushi Road, Bao' an District, Shenzhen, Guangdong China 518108
FCC Test Site No.	718246
IC Test Site No.	4842E-1
Test Software	Radiated Emission Program-To Shenzhen v2.0

4. Equipment under Test (EUT) Information

Description of EUT: INTELLIGENT CONTROLLER

Main Model: CRZ-16X0;CRZ-12X4

Serial Model: N/A

Date EUT received: July 03 ,2015

Equipment Category : DTS

Antenna Gain: WIFI: -0.5 dBi
15.249: 4.5 dBi

Input Power: AC 120V 60Hz

Trade Name : CRZ

FCC ID: 2AENLCRZ

Test Report No.	15050023-FCC-R2
Page	7 of 29

Type of Modulation: 802.11b/g/n: DSSS, OFDM
15.249: DSSS

RF Operating Frequency (ies): WIFI:802.11b/g/n(20M): 2412-2462 MHz
WIFI:802.11n(40M): 2422-2452 MHz
15.249: 2470 MHz

Number of Channels: WIFI :802.11b/g/n(20M): 11CH
WIFI :802.11n(40M): 7CH
15.249: 1 Channel

Port: Power Port,

Revision Number	Model	Report Number	Description of Revision	Date of Revision
0	CRZ-8X8	15050006-FCC-R2	Original Report	4th June, 2015
1	CRZ-12X4, CRZ-16X0	15050023-FCC-R2	C2PC Report	14th July, 2015

These three models CRZ-8X8, CRZ-12X4, CRZ-16X0 have the same constructions, only the relay board is different .Because the 120V socket uses 1 relay and 240V socket uses 2 relays, so the RELAY board circuit diagram and PCB layout are different, but the basic principle is the same. This test (Radiated Spurious Emissions Bands below 1GHz) shall be performed against due to the above difference. The difference among them was explained in the declaration letter.

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	N/A
§15.247 (a)(2)	DTS (6 dB&20 dB) CHANNEL BANDWIDTH	N/A
§15.247(b)(3)	Conducted Maximum Output Power	N/A
§15.247(e)	Power Spectral Density	N/A
§15.247(d)	Band-Edge & Unwanted Emissions into Non-Restricted Frequency Bands	N/A
§15.207 (a),	AC Power Line Conducted Emissions	N/A
§15.205, §15.209, §15.247(d)	Radiated Spurious Emissions & Unwanted Emissions into Restricted Frequency Bands	Compliance

Measurement Uncertainty

Emissions		
Test Item	Description	Uncertainty
Band Edge and 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
-	-	-

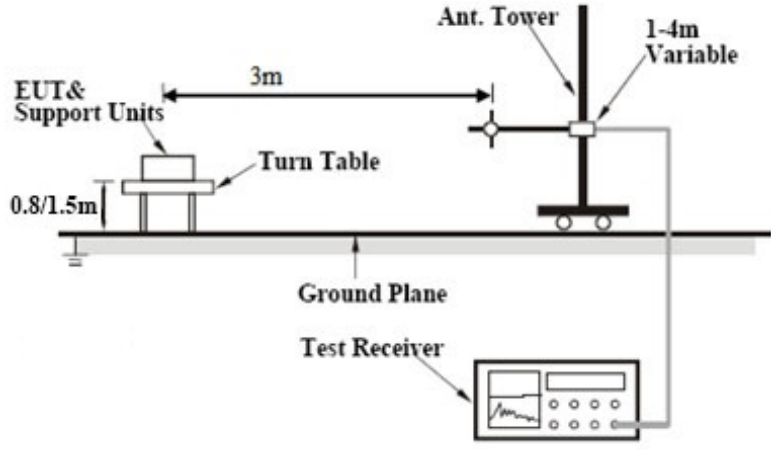
6. Measurements, Examination And Derived Results

6.1 Radiated Spurious Emissions

Temperature	22oC
Relative Humidity	55%
Atmospheric Pressure	1013mbar
Test date :	July 13, 2015
Tested By :	Winnie Zhang

Requirement(s):

Spec	Item	Requirement	Applicable										
47CFR§15.247(d),	a)	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	☒										
		<table><tr><th>Frequency range (MHz)</th><th>Field Strength (µV/m)</th></tr><tr><td>30 – 88</td><td>100</td></tr><tr><td>88 – 216</td><td>150</td></tr><tr><td>216 960</td><td>200</td></tr><tr><td>Above 960</td><td>500</td></tr></table>		Frequency range (MHz)	Field Strength (µV/m)	30 – 88	100	88 – 216	150	216 960	200	Above 960	500
		Frequency range (MHz)		Field Strength (µV/m)									
		30 – 88		100									
		88 – 216		150									
216 960	200												
Above 960	500												
	b)	For non-restricted band, 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 or 30dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, determined by the measurement method on output power to be used. Attenuation below the general limits specified in § 15.209(a) is not required ☒ 20 dB down ☐ 30 dB down	☒										
	c)	or restricted band, emission must also comply with the radiated emission limits specified in 15.209	☒										

Test Setup	
Procedure	- The EUT was switched on and allowed to warm up to its normal operating condition. - The test was carried out at the selected frequency points obtained from the EUT characterization. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner: - Vertical or horizontal polarization (whichever gave the higher emission level over a full rotation of the EUT) was chosen. - The EUT was then rotated to the direction that gave the maximum emission. - Finally, the antenna height was adjusted to the height that gave the maximum emission. - The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi Peak detection at frequency below 1GHz. - The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz with Peak detection for Peak measurement at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz with Peak detection for Average Measurement as below at frequency above 1GHz. - Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.
Remark	Different RF configuration has been evaluated but not much difference was found. The data presented here is the worst case data with EUT under 802.11n – HT20-2437MHz mode.
Result	☒ Pass ☐ Fail

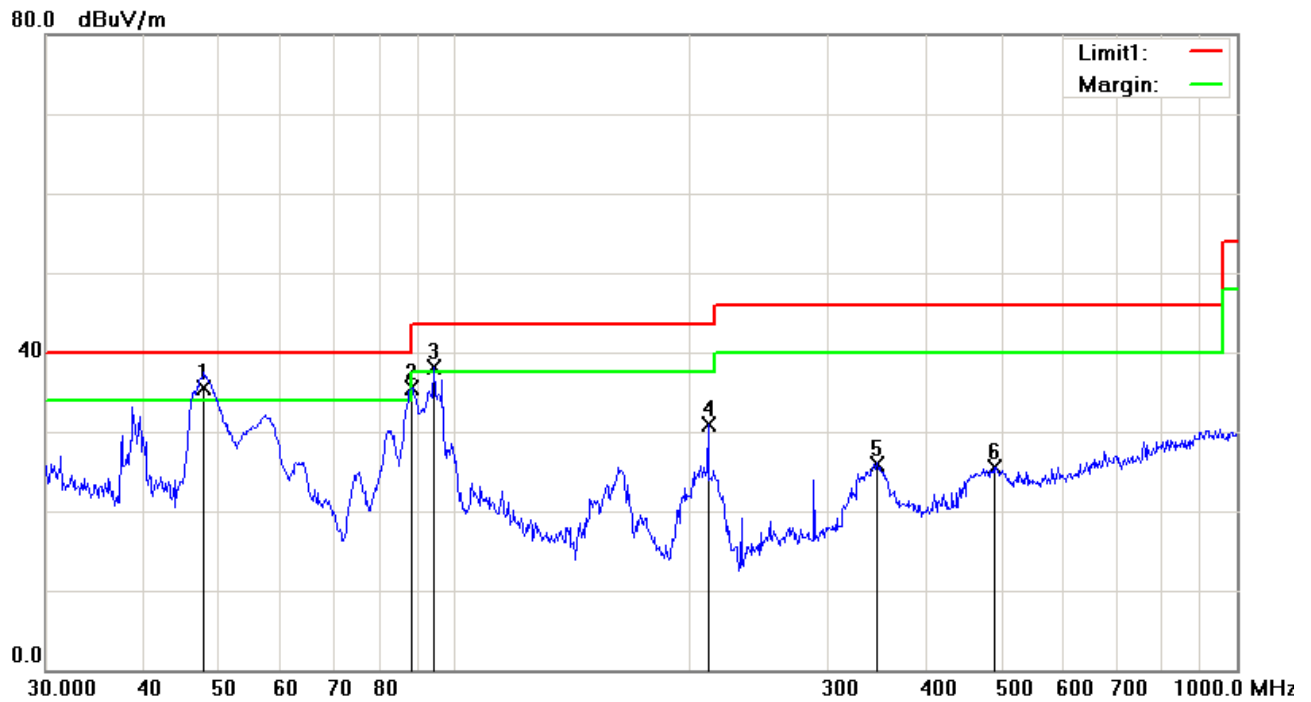
Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Model: CRZ-16X0

Test Mode:	Transmitting Mode
------------	-------------------

(Below 1GHz)

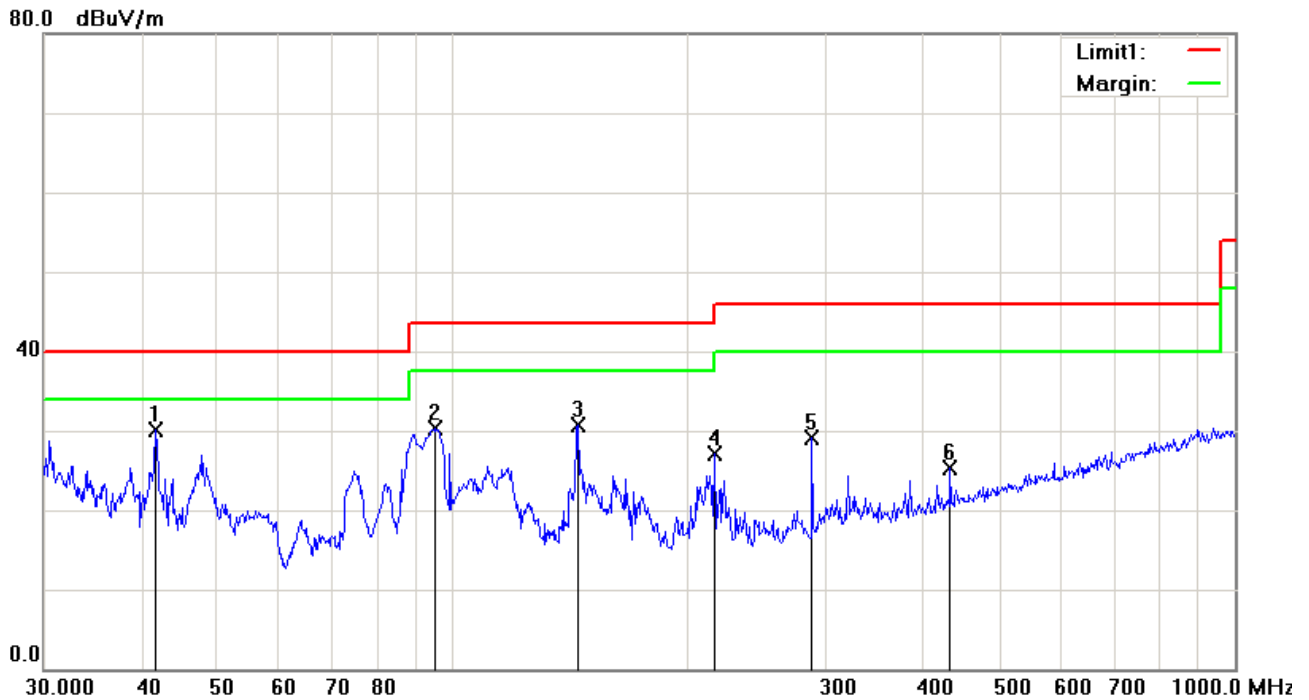


Test Data

Vertical Polarity Plot @3m

No	P/L	Frequency (MHz)	Reading (dBμV)	Detector	Corrected (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Height	Degree
1	V	47.8260	47.64	QP	-12.20	35.44	40.00	-4.56	100	0
2	V	88.0329	48.91	peak	-13.42	35.49	43.50	-8.01	100	71
3	V	94.0979	50.48	QP	-12.36	38.12	43.50	-5.38	100	200
4	V	210.7860	39.74	peak	-8.84	30.90	43.50	-12.60	200	213
5	V	346.8092	31.56	peak	-5.56	26.00	46.00	-20.00	100	188
6	V	489.0269	27.52	peak	-1.99	25.53	46.00	-20.47	200	251

(Below 1GHz)



Test Data

Horizontal Polarity Plot @3m

No	P/L	Frequency (MHz)	Reading (dBμV)	Detector	Corrected (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Height	Degree
1	H	41.7130	38.77	peak	-8.73	30.04	40.00	-9.96	100	217
2	H	95.0930	42.39	peak	-12.11	30.28	43.50	-13.22	200	195
3	H	144.8418	39.15	peak	-8.48	30.67	43.50	-12.83	200	56
4	H	216.0240	35.98	peak	-8.88	27.10	46.00	-18.90	200	222
5	H	287.9904	36.49	peak	-7.45	29.04	46.00	-16.96	100	194
6	H	432.5457	28.87	peak	-3.50	25.37	46.00	-20.63	100	330

Model: CRZ-12X4

Test Mode:	Transmitting Mode
------------	-------------------

(Below 1GHz)

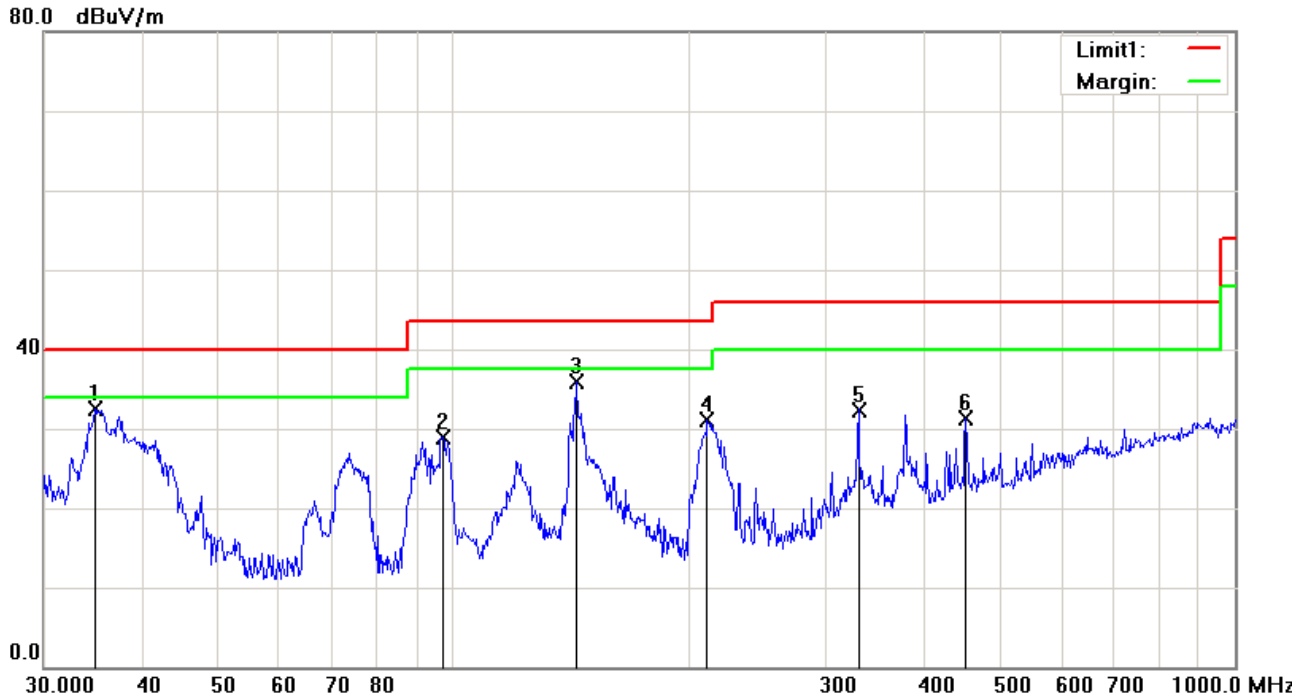


Test Data

Vertical Polarity Plot @3m

No	P/L	Frequency (MHz)	Reading (dBμV)	Detector	Corrected (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Height	Degree
1	V	47.8260	46.14	QP	-12.20	33.94	40.00	-6.06	100	156
2	V	57.1914	46.12	peak	-14.02	32.10	40.00	-7.90	100	48
3	V	95.4270	48.65	QP	-12.02	36.63	43.50	-6.87	200	230
4	V	208.5803	40.25	peak	-8.81	31.44	43.50	-12.06	200	79
5	V	287.9904	32.91	peak	-7.45	25.46	46.00	-20.54	200	138
6	V	677.5798	28.86	peak	1.12	29.98	46.00	-16.02	100	346

(Below 1GHz)



Test Data

Horizontal Polarity Plot @3m

No	P/L	Frequency (MHz)	Reading (dBμV)	Detector	Corrected (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Height	Degree
1	H	34.8823	36.30	peak	-3.85	32.45	40.00	-7.55	100	123
2	H	97.1148	40.55	peak	-11.57	28.98	43.50	-14.52	100	46
3	H	143.8295	44.39	peak	-8.48	35.91	43.50	-7.59	200	296
4	H	211.5265	39.94	peak	-8.84	31.10	43.50	-12.40	200	273
5	H	330.1949	38.44	peak	-6.04	32.40	46.00	-13.60	100	78
6	H	452.7197	34.39	peak	-3.00	31.39	46.00	-14.61	100	198

Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Due	In use
AC Line Conducted					
EMI test receiver	ESCS30	8471241027	09/18/2014	09/17/2015	☒
Line Impedance	LI-125A	191106	09/26/2014	09/25/2015	☒
Line Impedance	LI-125A	191107	09/26/2014	09/25/2015	☒
LISN	ISN T800	34373	09/26/2014	09/25/2015	☒
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/25/2014	09/24/2015	☒
Transient Limiter	LIT-153	531118	09/02/2014	09/01/2015	☒
RF conducted test					
Agilent ESA-E SERIES	E4407B	MY45108319	09/18/2014	09/17/2015	☒
Power Splitter	1#	1#	09/02/2014	09/01/2015	☒
DC Power Supply	E3640A	MY40004013	09/18/2014	09/17/2015	☒
Radiated Emissions					
EMI test receiver	ESL6	100262	09/18/2014	09/17/2015	☒
Positioning Controller	UC3000	MF780208282	11/20/2014	11/19/2015	☒
OPT 010 AMPLIFIER (0.1-1300MHz)	8447E	2727A02430	09/02/2014	09/01/2015	☒
Microwave Preamplifier (1 ~ 26.5GHz)	8449B	3008A02402	03/25/2015	03/24/2016	☒
Bilog Antenna (30MHz~6GHz)	JB6	A110712	09/22/2014	09/21/2015	☒
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/25/2014	09/24/2015	☒
Universal Radio Communication Tester	CMU200	121393	09/26/2014	09/25/2015	☒

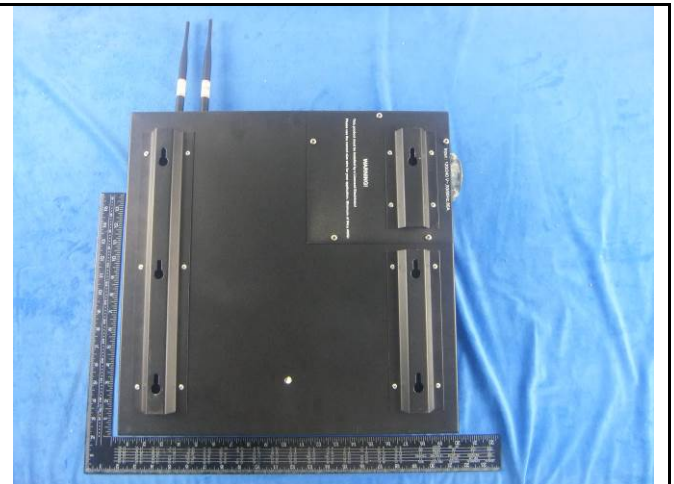
Annex B. EUT and Test Setup Photographs

Model: CRZ-16X0

Annex B.i. Photograph: EUT External Photo



Whole Package - Top View



EUT - Rear View



EUT - Left View



EUT - Right View

Test Report No.	15050023-FCC-R2
Page	17 of 29



EUT - Top View



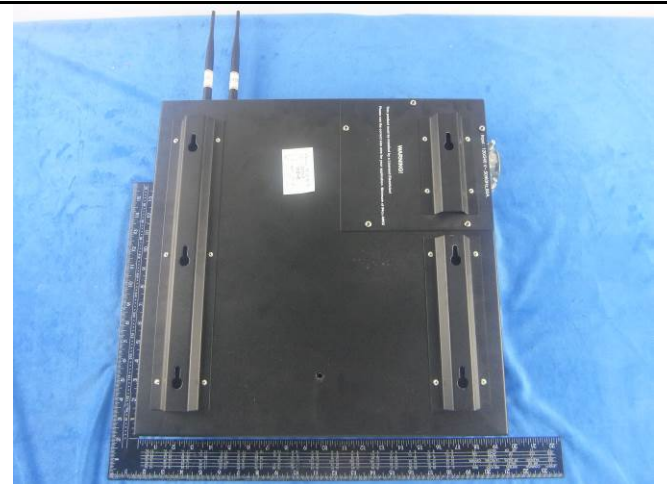
EUT - Bottom View

Model: CRZ-12X4

Annex B.i. Photograph: EUT External Photo



Whole Package - Top View



EUT - Rear View



EUT - Left View



EUT - Right View



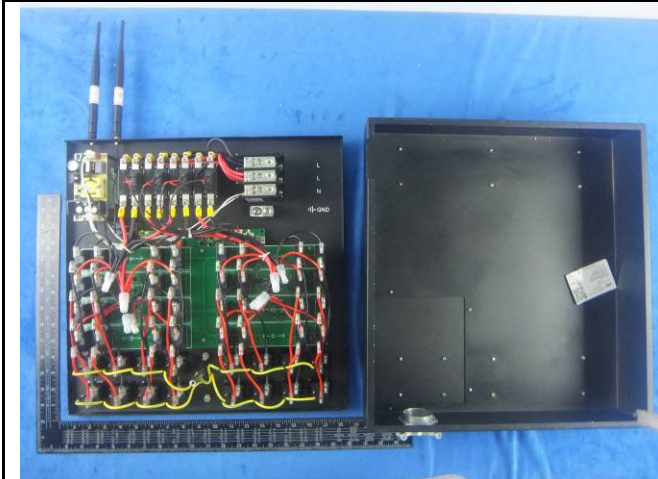
EUT - Top View



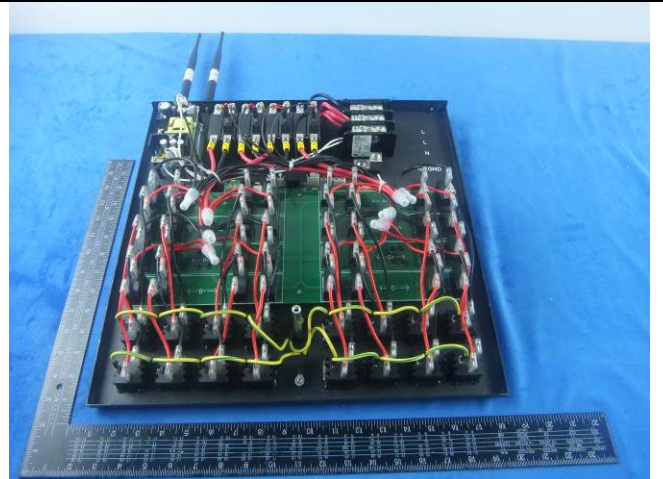
EUT - Bottom View

Model: CRZ-16X0

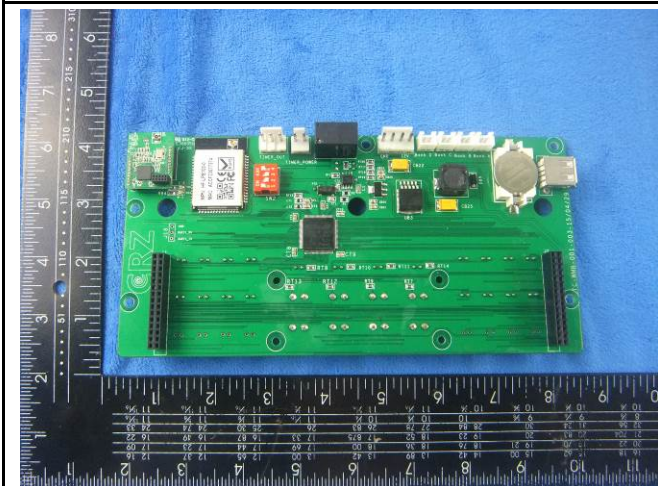
Annex B.ii. Photograph: EUT Internal Photo



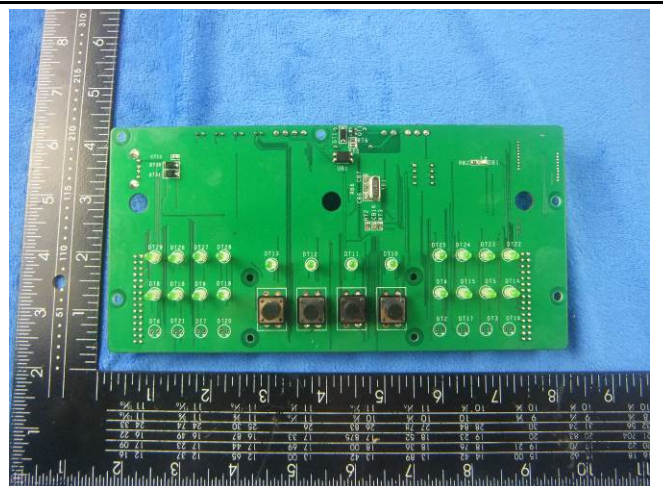
Cover Off - Top View 1



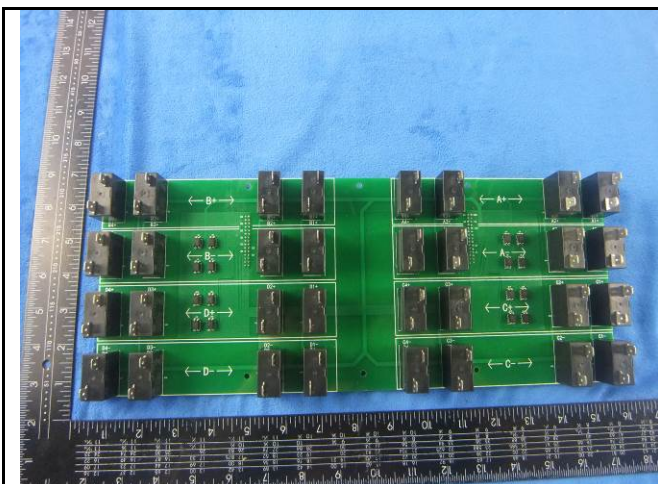
Cover Off - Top View 2



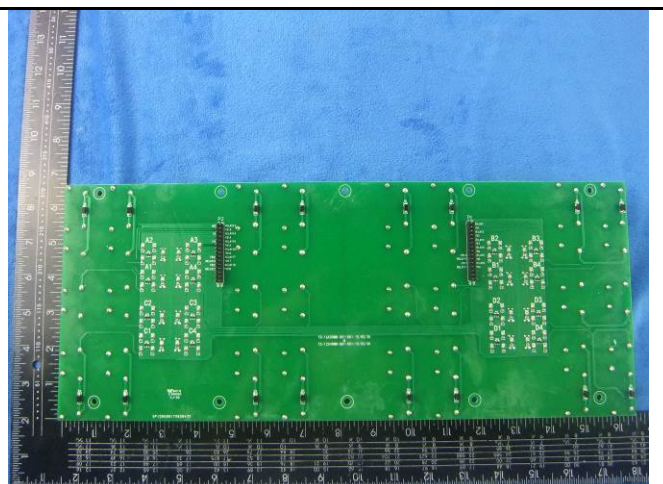
Main board - Top View



Main board - Rear View

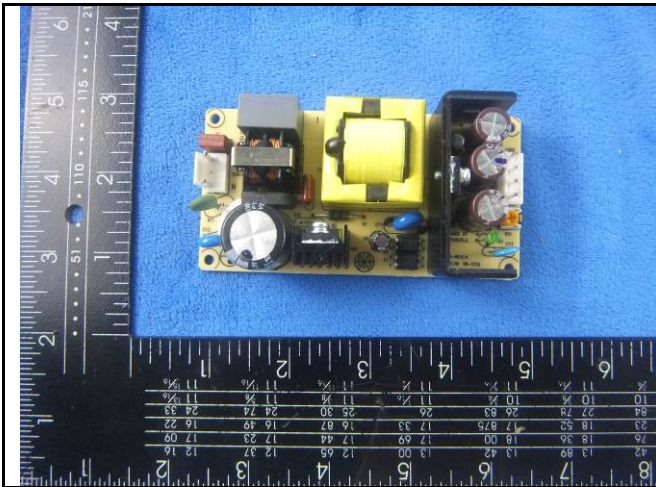


Switch board - Front View

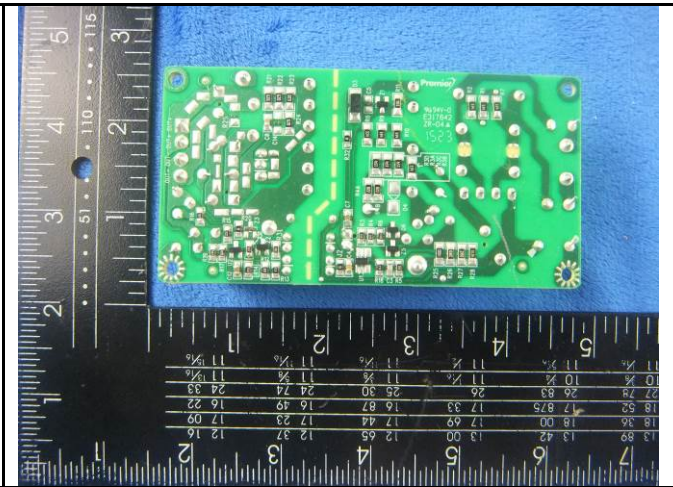


Switch board - Rear View

Test Report No.	15050023-FCC-R2
Page	21 of 29



Power board - Front View



Power board - Rear View



WIFI - Antenna View



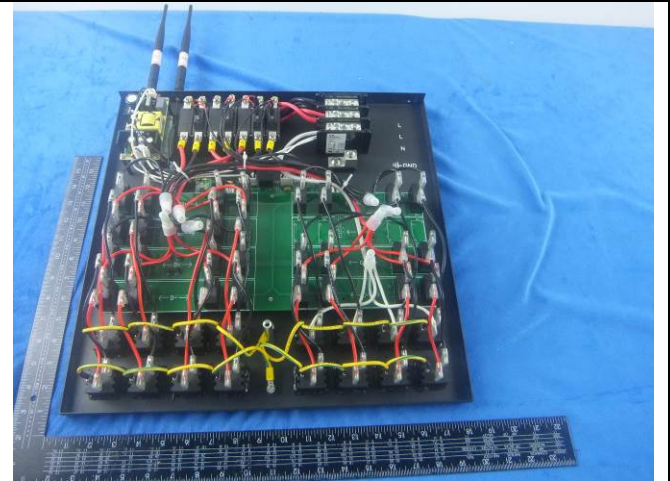
ZIGBEE - Antenna View

Model: CRZ-12X4

Annex B.ii. Photograph: EUT Internal Photo



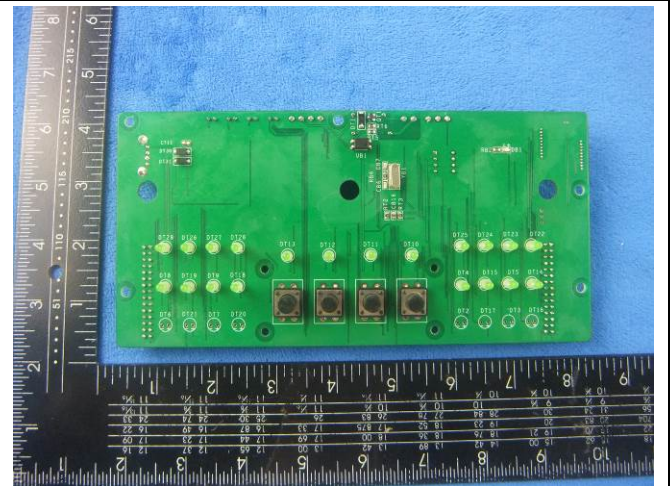
Cover Off - Top View 1



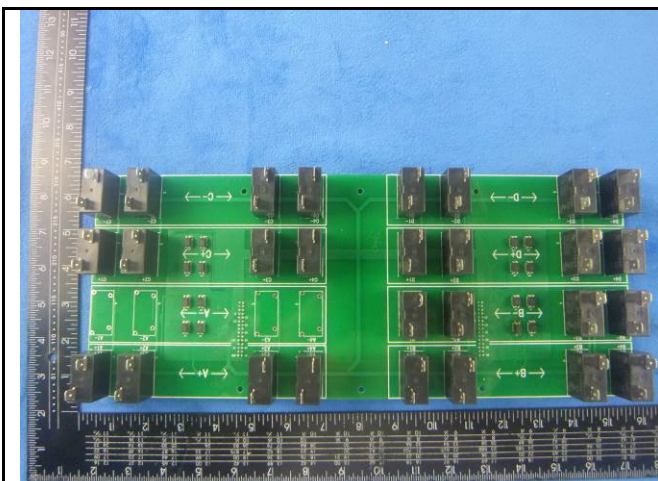
Cover Off - Top View 2



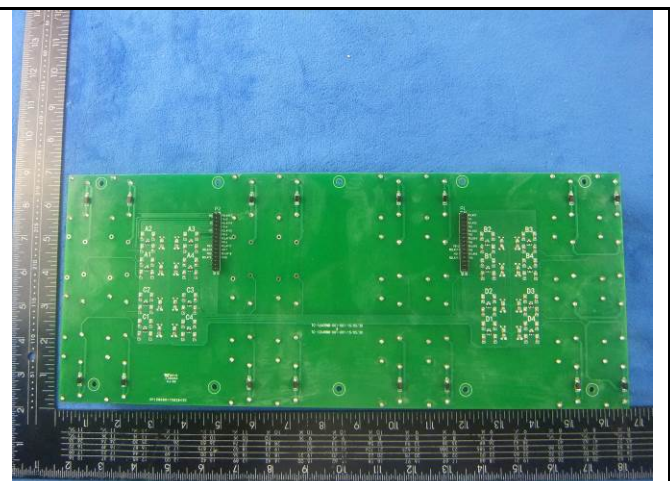
Main board - Top View



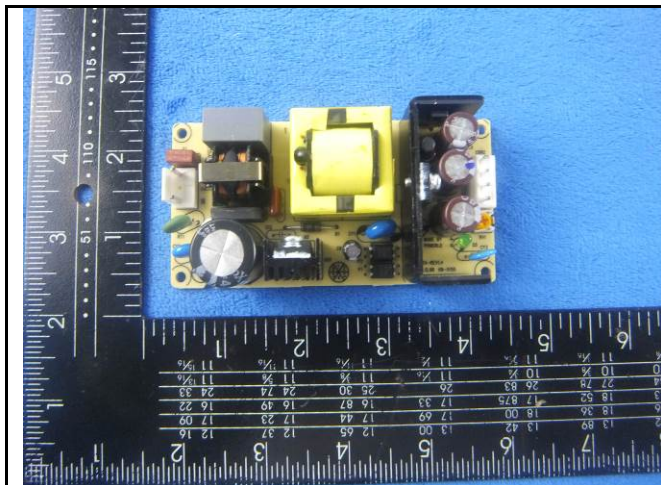
Main board - Rear View



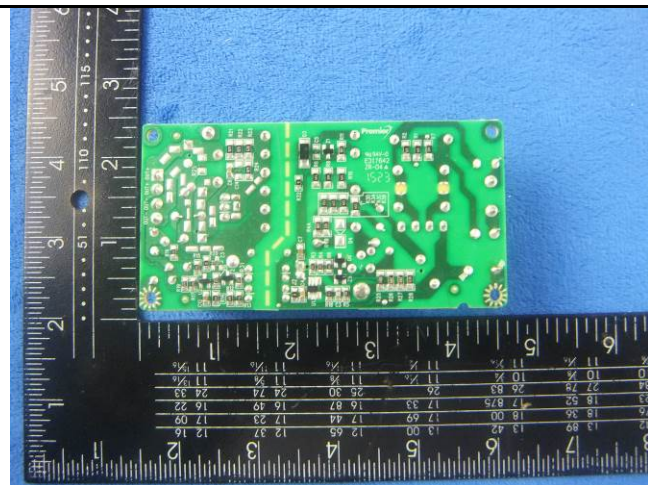
Switch board - Front View



Switch board - Rear View



Power board - Front View



Power board - Rear View



WIFI - Antenna View



ZIGBEE - Antenna View

Annex B.iii. Photograph: Test Setup Photo

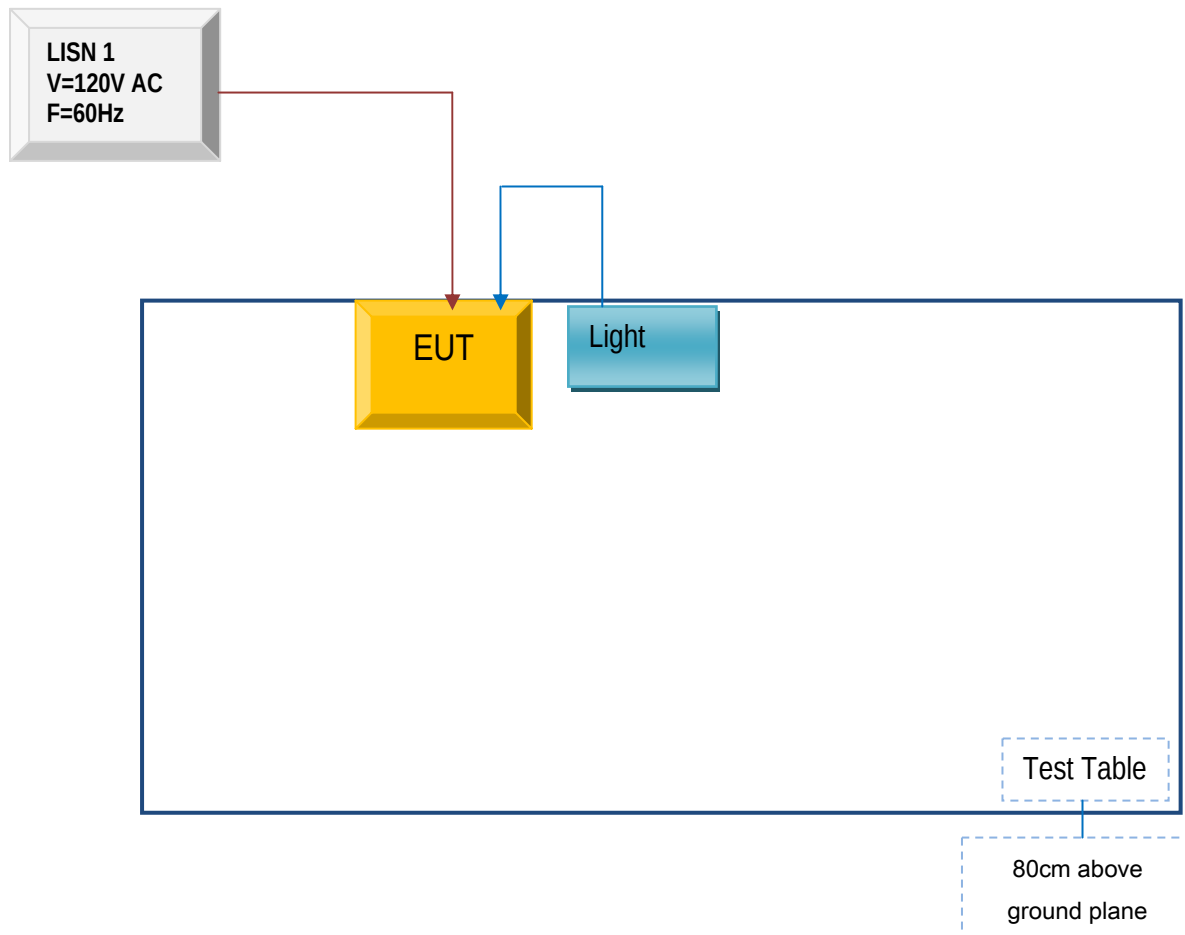


Radiated Spurious Emissions Test Setup Below 1GHz

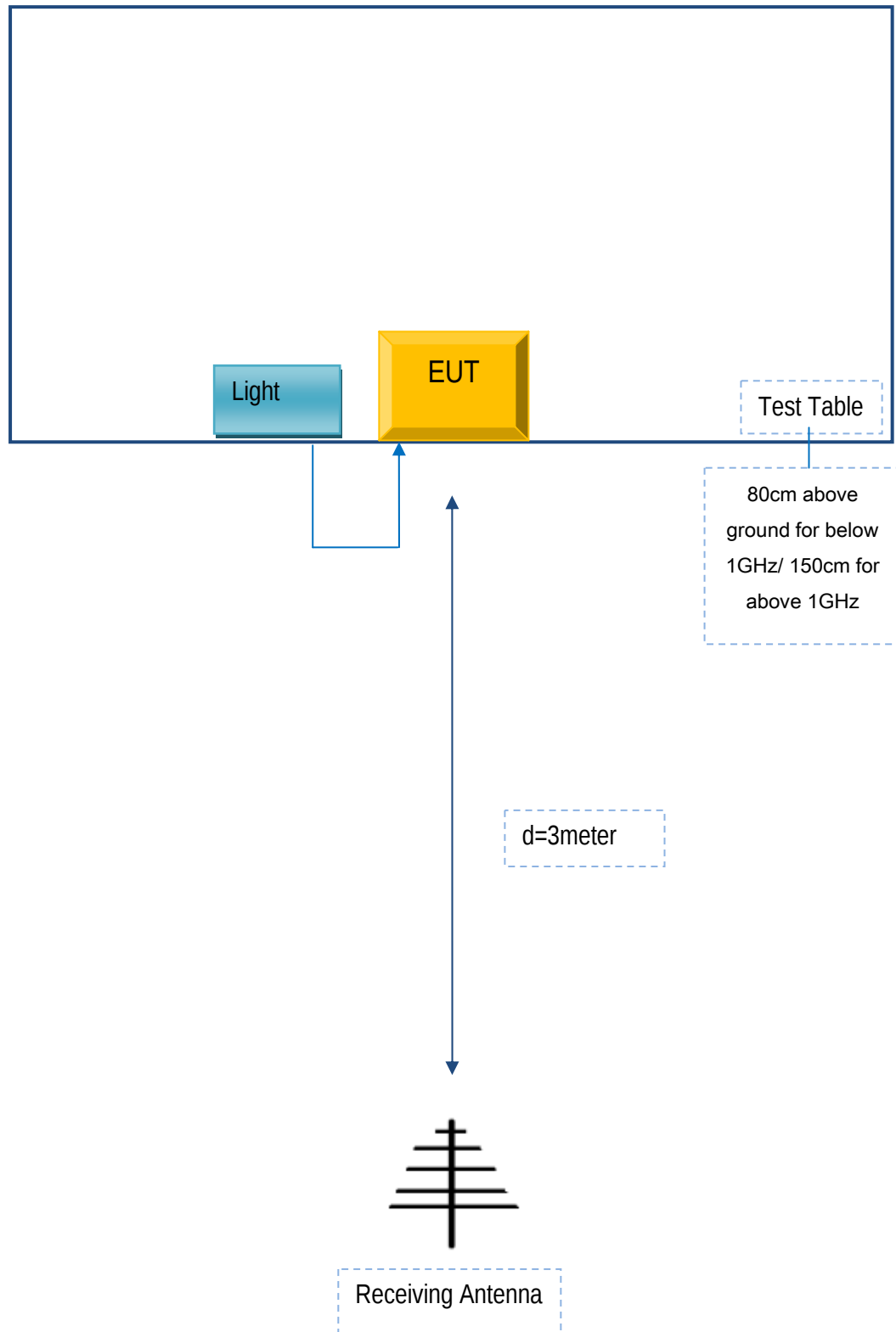
Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

Annex C.ii. TEST SET UP BLOCK

Block Configuration Diagram for AC Line Conducted Emissions



Block Configuration Diagram for Radiated Emissions



Test Report No.	15050023-FCC-R2
Page	27 of 29

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.	15050023-FCC-R2
Page	28 of 29

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

Please see attachment

Annex E. DECLARATION OF SIMILARITY

Fenghua Tiancheng Plastic Electronics Co.,Ltd Statement

We Company name: Fenghua Tiancheng Plastic Electronics Co.,Ltd
Of

Address : No.66 Dongfeng Road Fenghua Zhejiang China

hereby state that

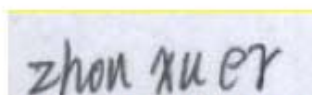
Product : INTELLIGENT CONTROLLER

Model Number : CRZ-16X0/CRZ-12X4

All models have the same constructions , power board and MCU board, only the RELAY board is different. Because the 120V socket uses 1 relay and the 240V socket uses 2 relays, so the RELAY board circuit diagram and PCB layout are different, but the basic principle is the same. 16X0 has 16 sockets of 240V, no any sockets of 120V; 12X4 has 12 sockets of 240V, 4 sockets of 120V; The 16X0 and 12X4 Share the relay PCB, but 12 x4 relay board doesn't weld the relays of A1-, A2-, A3- and A4 -. In a word, 16X0 will use 32 relays, 12X4 will use 28 relays.

Sincerely,

Signature



E-mail: nbtcquality@163.com

Phone: 0574-28518277

Fax: 0574-28526111

Address: No.66 Dongfeng Road Fenghua Zhejiang China