RF TEST REPORT

GLOBAL TESTING & CERTIFICATIONS
YOUR CHOICE FOR- TCB FCB CB NB CAB RCB

Report No.: 15050007-FCC-R1

Supersede Report No.: N/A

Applicant	Fenghua Tiancheng Plastic Electronics Co.,Ltd
Product Name	SENSOR CONTROLLER
Model No.	CRZSC01
Test Standard	FCC Part 15.249: 2014; C63.10: 2013
Test Date	May 11 to May 13, 2015
Issue Date	May 18, 2015
Test Result	☑ Pass ☐ Fail
Equipment complied with the specification	☑
Equipment did not comply with the specification	☐

Wiky Jam	Chris You	
Wiky Jam **Test Engineer**	**Chris You** **Checked By**	

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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

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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

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CONTENTS

1. Report Revision History

Report No.	Report Version	Description	Issue Date
15050007-FCC-R1	NONE	Original	May 18, 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:	SENSOR CONTROLLER
Main Model:	CRZSC01
Serial Model:	N/A
Date EUT received:	May 07, 2015
Test Date(s):	May 11 to May 13, 2015
Antenna Gain:	4.5 dBi
Type of Modulation:	DSSS
RF Operating Frequency (ies):	2470 MHz
Equipment Category：	DXT
Input Power:	Adapter: PS06B-051000U Input: AC 100-240V 50/60Hz Output: DC 5V 1000mA
Trade Name：	CRZ
FCC ID:	2AENLSENSOR

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(a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.249(a), §15.249(d)	Radiated Fundamental / Radiated Spurious Emissions	Compliance
§15.249(a)	Field Strength Measurement	Compliance
§15.249©	20 dB Bandwidth	Compliance
§15.249(d)	Band Edge	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 Antenna Requirement

Standard Requirement:

According to § 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. 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 user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

a. Antenna must be permanently attached to the unit.
b. Antenna must use a unique type of connector to attach to the EUT.
c. Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

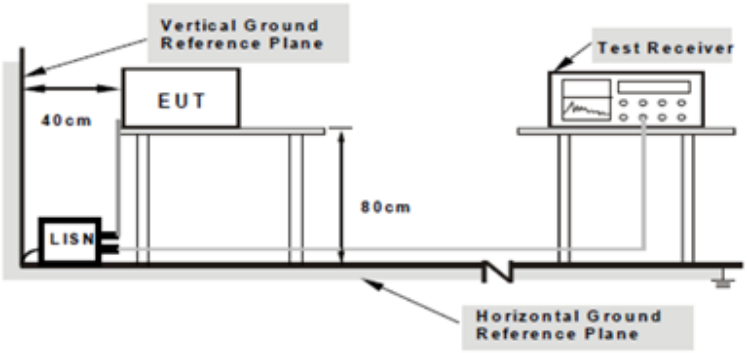
Antenna Connector Construction

A permanently attached PCB antenna, the gain is 4.5 dBi.

Test Result: Pass

6.2 AC Line Conducted Emissions

Temperature	24°C
Relative Humidity	62%
Atmospheric Pressure	1012mbar
Test date :	May 11, 2015
Tested By :	Wiky Jam

<table>
<tr><th>Spec</th><th>Item</th><th>Requirement</th><th>Applicable</th></tr>
<tr><td>§15.207</td><td>a)</td><td>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 frequencies ranges.
<table>
<tr><th rowspan="2">Frequency ranges (MHz)</th><th colspan="2">Limit (dBµV)</th></tr>
<tr><th>QP</th><th>Average</th></tr>
<tr><td>0.15 ~ 0.5</td><td>66 – 56</td><td>56 – 46</td></tr>
<tr><td>0.5 ~ 5</td><td>56</td><td>46</td></tr>
<tr><td>5 ~ 30</td><td>60</td><td>50</td></tr>
</table>
</td><td>☑</td></tr>
<tr><td>Test Setup</td><td colspan="3"> 

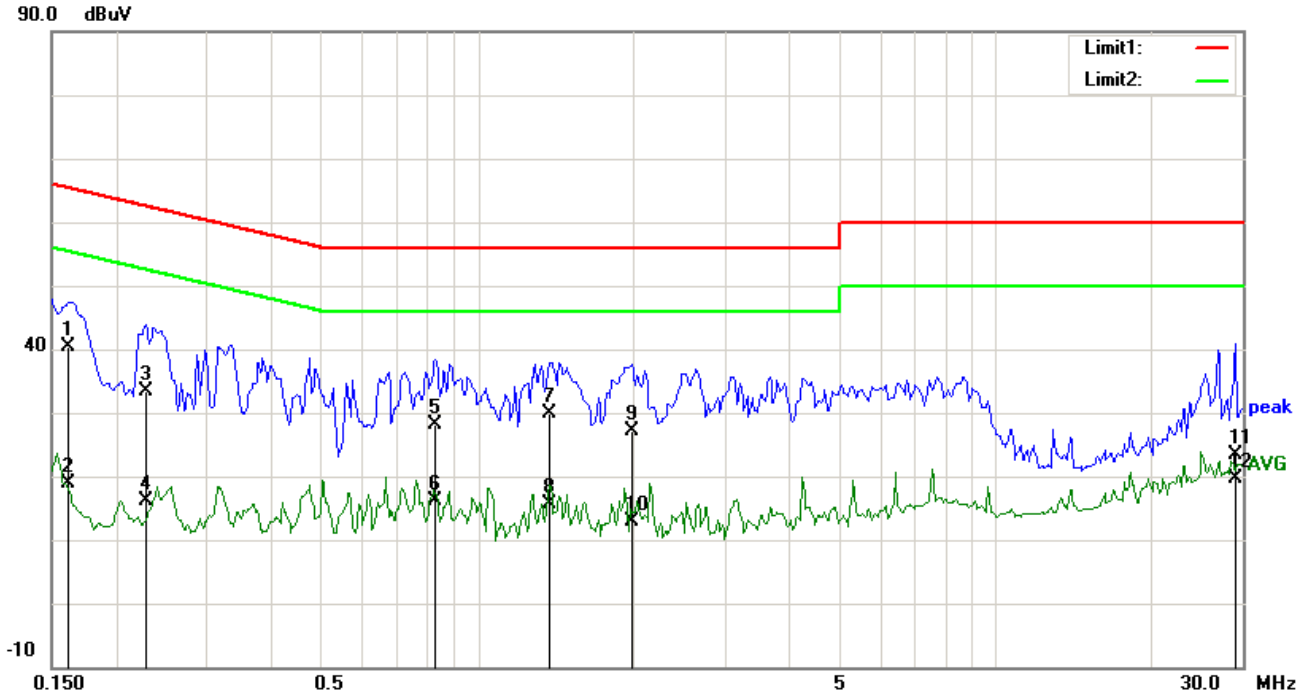
Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80cm from EUT and at least 80cm from other units and other metal planes support units.</td></tr>
<tr><td>Procedure</td><td colspan="3">1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table.
2. The power supply for the EUT was fed through a 50W/50mH EUT LISN, connected to filtered mains.
3. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable.</td></tr>
</table>

	4. All other supporting equipment were powered separately from another main supply. 5. The EUT was switched on and allowed to warm up to its normal operating condition. 6. A scan was made on the NEUTRAL line (for AC mains) or Earth line (for DC power) over the required frequency range using an EMI test receiver. 7. High peaks, relative to the limit line, The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 10 kHz. 8. Step 7 was then repeated for the LIVE line (for AC mains) or DC line (for DC power).
Remark	
Result	☑ Pass ☐ Fail

Test Data ☑ Yes ☐ N/A

Test Plot ☑ Yes (See below) ☐ N/A

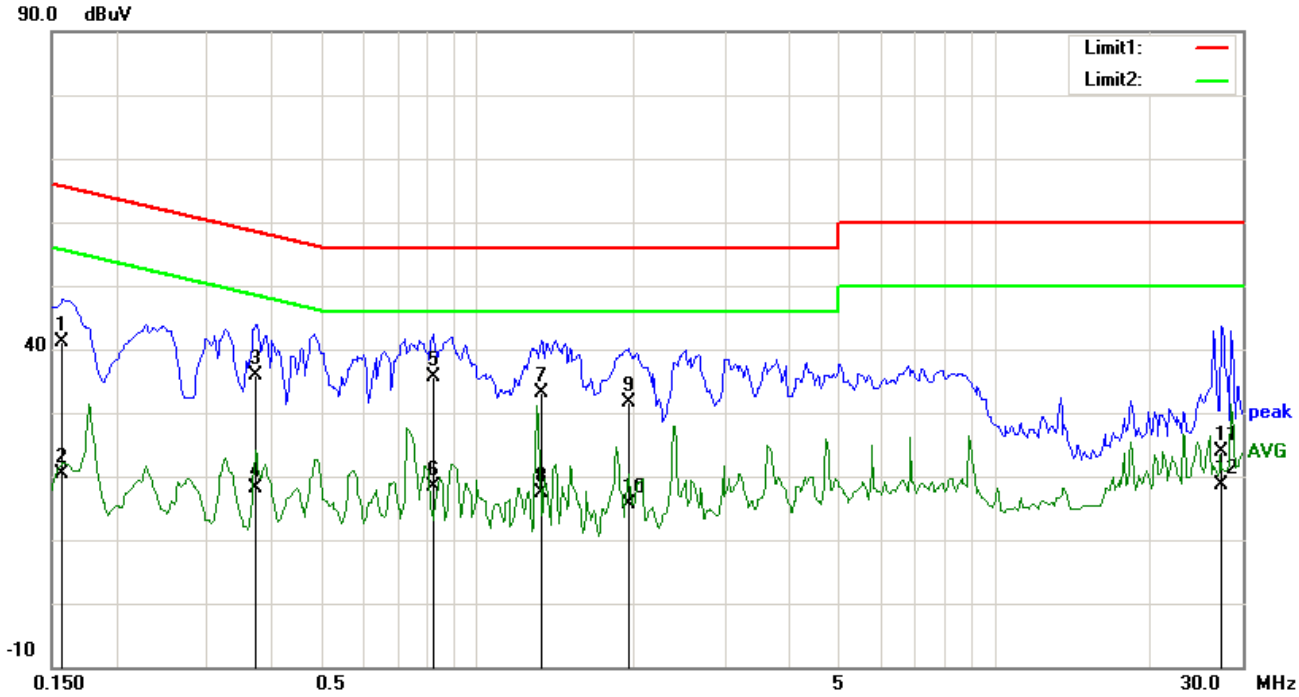
Test Mode:	Transmitting Mode



Test Data

Phase Line Plot at 120Vac, 60Hz

No.	P/L	Frequency (MHz)	Reading (dBµV/m)	Detector	Corrected (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1	L1	0.1617	27.24	QP	13.16	40.40	65.38	-24.98
2	L1	0.1617	5.68	AVG	13.16	18.84	55.38	-36.54
3	L1	0.2281	20.58	QP	12.91	33.49	62.52	-29.03
4	L1	0.2281	3.14	AVG	12.91	16.05	52.52	-36.47
5	L1	0.8297	16.68	QP	11.57	28.25	56.00	-27.75
6	L1	0.8297	4.64	AVG	11.57	16.21	46.00	-29.79
7	L1	1.3805	18.36	QP	11.40	29.76	56.00	-26.24
8	L1	1.3805	4.31	AVG	11.40	15.71	46.00	-30.29
9	L1	1.9859	15.67	QP	11.40	27.07	56.00	-28.93
10	L1	1.9859	1.49	AVG	11.40	12.89	46.00	-33.11
11	L1	29.0977	9.40	QP	13.92	23.32	60.00	-36.68
12	L1	29.0977	5.62	AVG	13.92	19.54	50.00	-30.46



Test Data

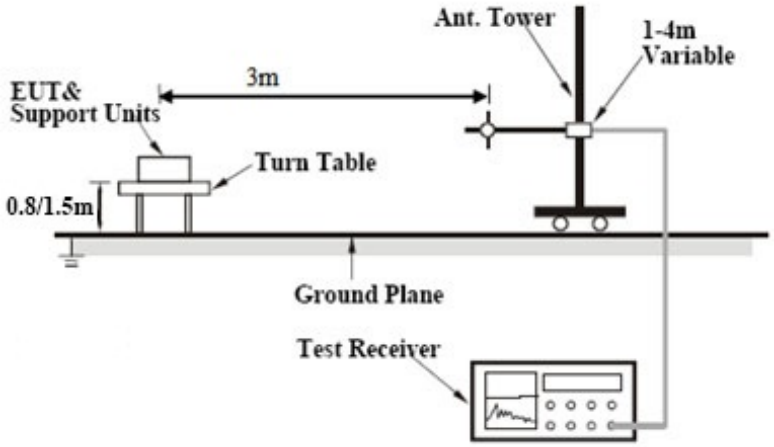
Phase Neutral Plot at 120Vac, 60Hz

No.	P/L	Frequency (MHz)	Reading (dBµV/m)	Detector	Corrected (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1	N	0.1578	28.02	QP	13.17	41.19	65.58	-24.39
2	N	0.1578	7.31	AVG	13.17	20.48	55.58	-35.10
3	N	0.3727	23.42	QP	12.37	35.79	58.44	-22.65
4	N	0.3727	5.65	AVG	12.37	18.02	48.44	-30.42
5	N	0.8180	23.97	QP	11.58	35.55	56.00	-20.45
6	N	0.8180	6.82	AVG	11.58	18.40	46.00	-27.60
7	N	1.3297	21.59	QP	11.44	33.03	56.00	-22.97
8	N	1.3297	5.97	AVG	11.44	17.41	46.00	-28.59
9	N	1.9508	20.13	QP	11.52	31.65	56.00	-24.35
10	N	1.9508	4.14	AVG	11.52	15.66	46.00	-30.34
11	N	27.3984	5.93	QP	17.91	23.84	60.00	-36.16
12	N	27.3984	0.74	AVG	17.91	18.65	50.00	-31.35

6.3 Radiated Spurious Emissions

Temperature	24°C
Relative Humidity	62%
Atmospheric Pressure	1012mbar
Test date :	May 11, 2015
Tested By :	Wiky Jam

Requirement(s):

<table>
<tr><th>Spec</th><th>Requirement</th><th>Applicable</th></tr>
<tr><td>§15.209, §15.205, §15.249(a) & §15.249(d)</td><td>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.
The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:
<table>
<tr><th>Fundamental frequency</th><th>Field strength of fundamental (millivolts/meter)</th><th>Field strength of harmonics (microvolts/meter)</th></tr>
<tr><td>902– 928 MHz</td><td>50</td><td>500</td></tr>
<tr><td>2400– 2483.5 MHz</td><td>50</td><td>500</td></tr>
<tr><td>5725– 5875 MHz</td><td>50</td><td>500</td></tr>
<tr><td>24.0– 24.25 GHz</td><td>250</td><td>2500</td></tr>
</table></td><td>☑</td></tr>
<tr><td>Test Setup</td><td colspan="2"> 
</td></tr>
<tr><td>Procedure</td><td colspan="2">- Setup the configuration according to figure 1. Turn on EUT and make sure that it is in normal function
- For emission frequencies measured below 1GHz, a pre-scan is performed in a</td></tr>
</table>

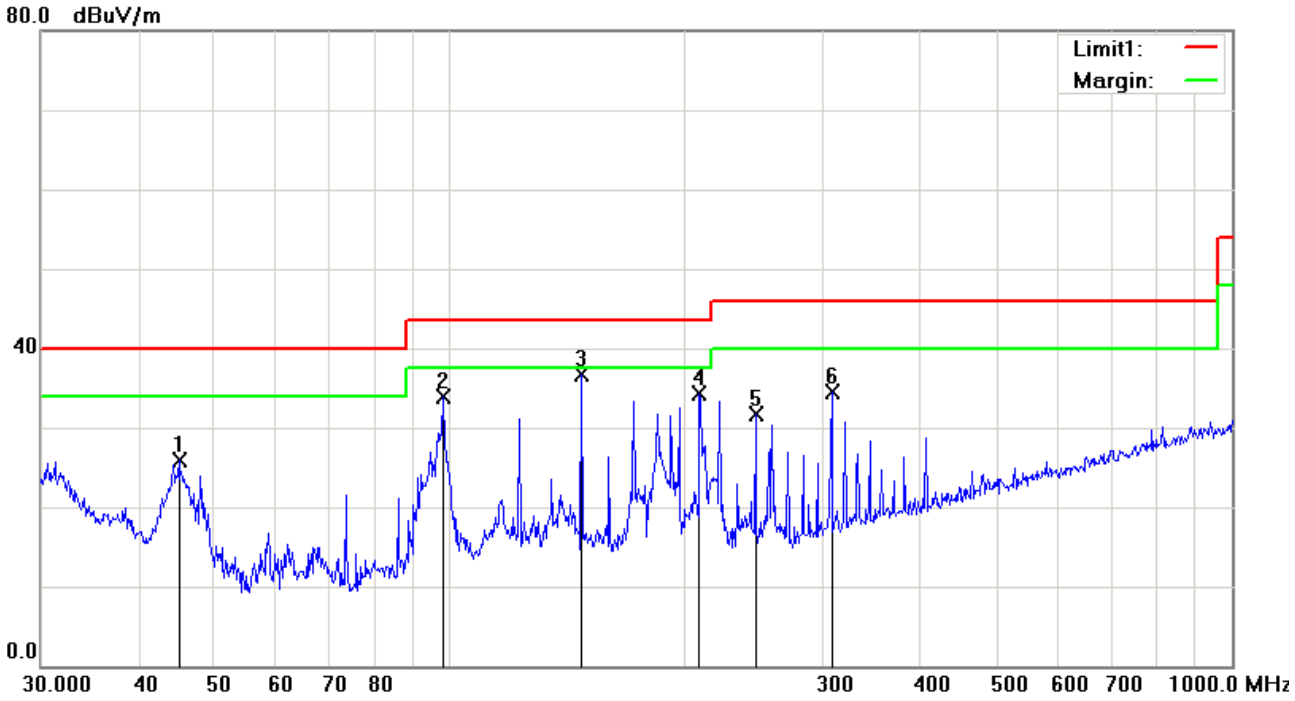
	shielded chamber to determine the accurate frequencies of higher emissions will be checked on a open test site. As the same purpose, for emission frequencies measured above 1GHZ, a pre-scan also be performed with a meter measuring distance before final test. - For emission frequencies measured below and above 1GHz, set the spectrum analyzer on a 100kHz and 1MHz resolution bandwidth respectively for each frequency measured in step 2. - The search antenna is to be raised and lowered over a range from 1 to 4m in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, the change the orientation of EUT on the test table over a range from 0 to 360°. With a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading. - Repeat step 4 until all frequencies need to be measured was complete. - Repeat step5 with search antenna in vertical polarized orientations.
Remark	
Result	☑ Pass ☐ Fail

Test Data ☑ Yes ☐ N/A

Test Plot ☑ Yes (See below) ☐ N/A

Test Mode:	Transmitting Mode

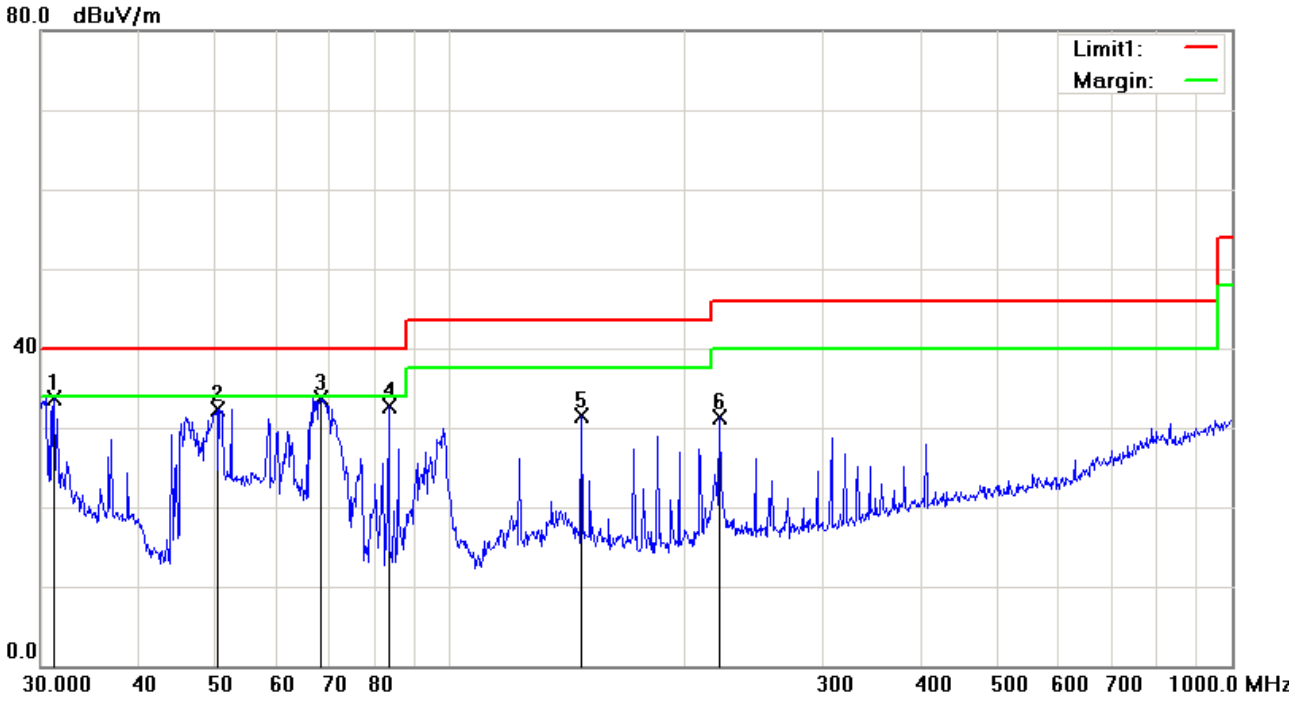
(Below 1GHz)



Test Data

Horizontal Polarity Plot @3m

No.	P/L	Frequency (MHz)	Reading (dBμV/m)	Detector	Corrected (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Degree (°)
1	H	45.0583	26.36	peak	-0.49	25.87	40.00	-14.13	200	139
2	H	98.1419	45.19	peak	-11.30	33.89	43.50	-9.61	200	169
3	H	147.4036	45.08	peak	-8.44	36.64	43.50	-6.86	200	203
4	H	208.5803	43.16	peak	-8.81	34.35	43.50	-9.15	200	49
5	H	245.9509	40.95	peak	-9.15	31.80	46.00	-14.20	100	131
6	H	307.8313	41.17	peak	-6.68	34.49	46.00	-11.51	100	107



Test Data

Vertical Polarity Plot @3m

No.	P/L	Frequency (MHz)	Reading (dBµV/m)	Detector	Corrected (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)
1	V	31.1798	35.92	peak	-2.21	33.71	40.00	-6.29	100	4
2	V	50.4089	46.47	peak	-14.08	32.39	40.00	-7.61	199	360
3	V	68.3908	47.37	peak	-13.68	33.69	40.00	-6.31	100	353
4	V	83.5222	46.53	peak	-13.76	32.77	40.00	-7.23	100	79
5	V	147.4036	38.84	peak	-7.42	31.42	43.50	-12.08	100	319
6	V	221.3921	39.00	peak	-7.69	31.31	46.00	-14.69	200	280

Above 1GHz

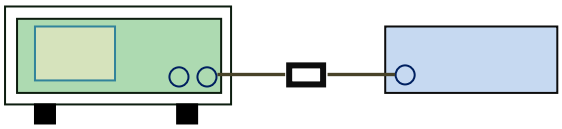
Channel (2470 MHz)

Frequency (MHz)	SA Reading (dBµV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp Gain (dB)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
4940	35.82	AV	V	34.6	6.76	31.92	45.26	54	-8.74
4940	34.44	AV	H	34.7	6.76	31.92	43.98	54	-10.02
4940	49.28	PK	V	34.6	6.76	31.92	58.72	74	-15.28
4940	48.08	PK	H	34.7	6.76	31.92	57.62	74	-16.38

6.4 Field Strength Measurement

Temperature	25°C
Relative Humidity	59%
Atmospheric Pressure	1010 mbar
Test date :	May 13, 2015
Tested By :	Wiky Jam

Requirement(s):

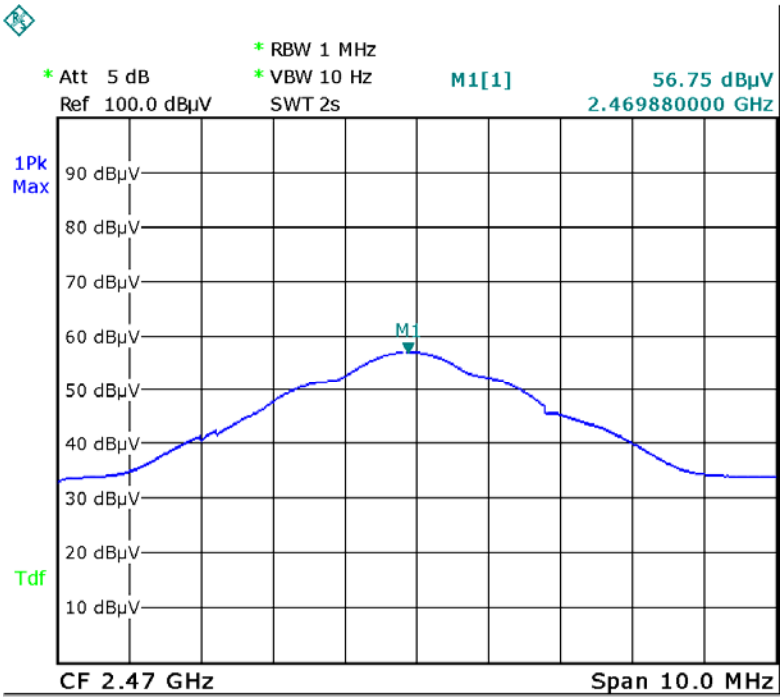
Spec	Requirement	Applicable
§15.249(a)	Fundamental frequency / Field strength of fundamental (millivolts/meter) / Field strength of harmonics (microvolts/meter) 902–928 MHz ..... 50 500 2400–2483.5 MHz ..... 50 500 5725–5875 MHz ..... 50 500 24.0–24.25 GHz 250 2500	☑
Test Setup		
Test Procedure	Emissions 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.	
Remark		
Result	☑ Pass ☐ Fail	

Test Data ☑ Yes ☐ N/A

Test Plot ☑ Yes (See below) ☐ N/A

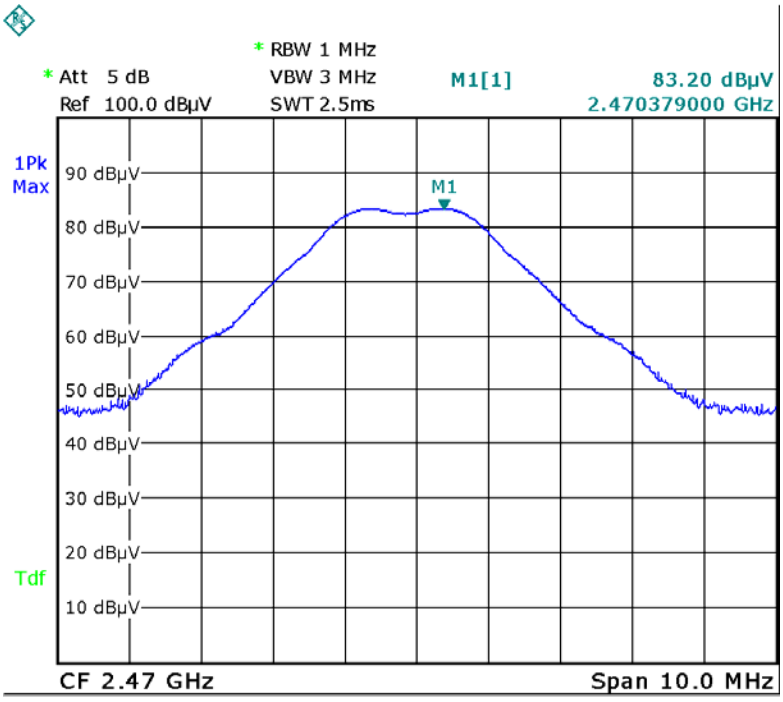
Field Strength Measurement

Average:



Date: 13.MAY.2015 16:01:48

Peak:

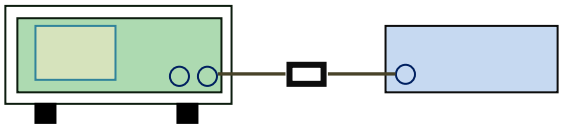


Date: 13.MAY.2015 16:01:27

6.5 20dB Bandwidth Testing

Temperature	25°C
Relative Humidity	59%
Atmospheric Pressure	1010 mbar
Test date :	May 13, 2015
Tested By :	Wiky Jam

Requirement(s):

Spec	Item	Requirement	Applicable
§15.215(c)	a)	Radiated Emissions Measurement Uncertainty All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 1GHz (3m & 10m) & 1GHz above (3m) is +5.6/-4.5dB.	☑
Test Setup		 Spectrum Analyzer EUT	
Test Procedure		- -Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator. - Position the EUT on the test table without connection to measurement instrument. Turn on the EUT. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value. - Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth. - Repeat above procedures until all frequencies measured were complete.	
Remark			

Result	☑ Pass	☐ Fail

Test Data ☑ Yes ☐ N/A

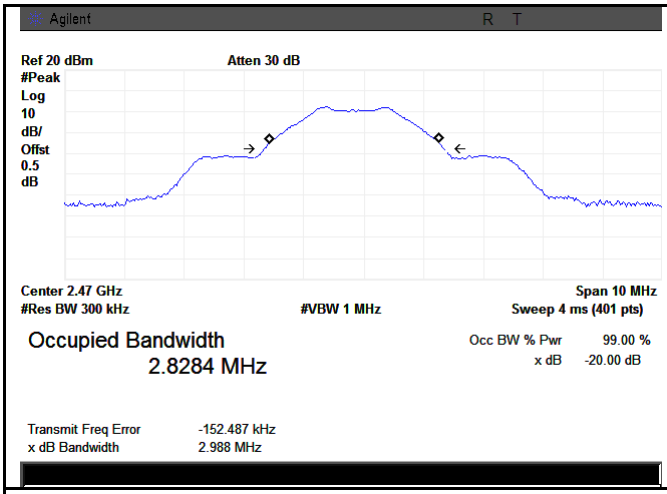
Test Plot ☑ Yes (See below) ☐ N/A

20dB Bandwidth measurement result

Fundamental Frequency (MHz)	20dB Bandwidth (MHz)	Result
2470	2.988	Pass

Test Plots

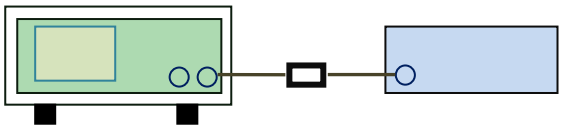
20dB Bandwidth measurement result



20dB Bandwidth

6.6 Band Edge

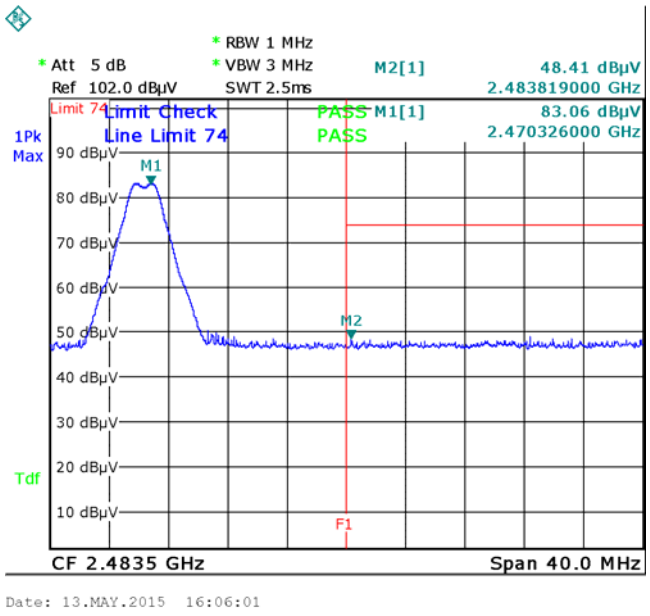
Temperature	25°C
Relative Humidity	59%
Atmospheric Pressure	1010 mbar
Test date :	May 13, 2015
Tested By :	Wiky Jam

Spec	Item	Requirement	Applicable
§15.249(d)	a)	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.	☑
Test Setup			
Test Procedure	- Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator. - Position the EUT without connection to measurement instrument. Put it on the Rotated table and turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range. - Set both RBW and VBW of spectrum analyzer to 1MHz. - Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency. - Repeat above procedures until all measured frequencies were complete.		
Remark			
Result	☑ Pass ☐ Fail		

Test Data ☑ Yes ☐ N/A

Test Plot ☑ Yes (See below) ☐ N/A

Test Plots

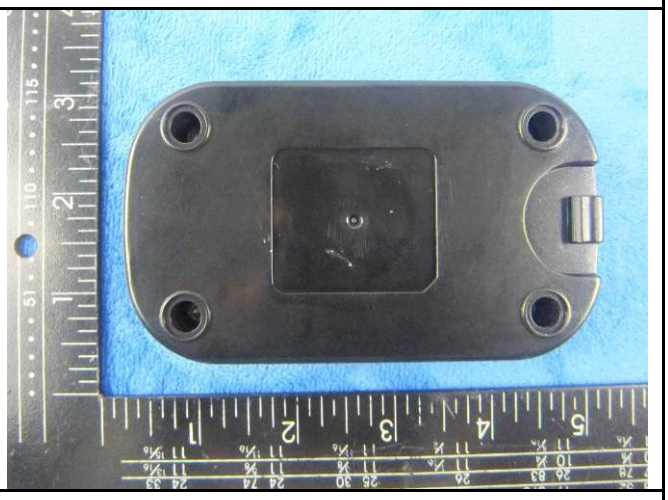
<table>
<tr>
<td> 
</td>
<td>Note: (no need if PK value less than the AV limit)</td>
</tr>
<tr>
<td>Peak - Right Side</td>
<td>AV - Right Side</td>
</tr>
<tr>
<td>Note: F1 is frequency 2483.5MHz</td>
<td></td>
</tr>
</table>

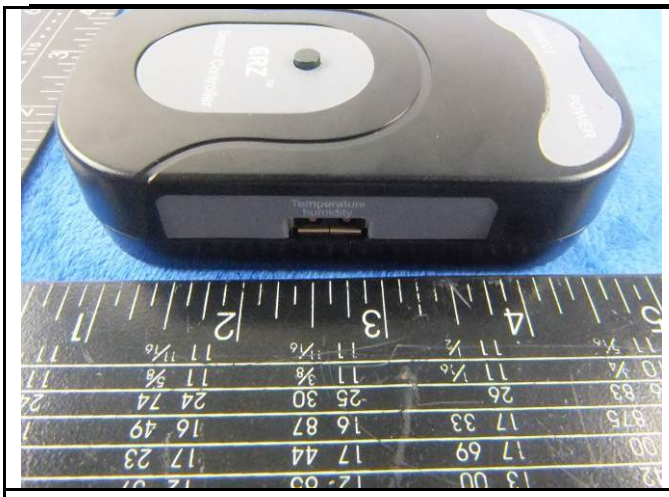
Annex A. TEST INSTRUMENT

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	☑

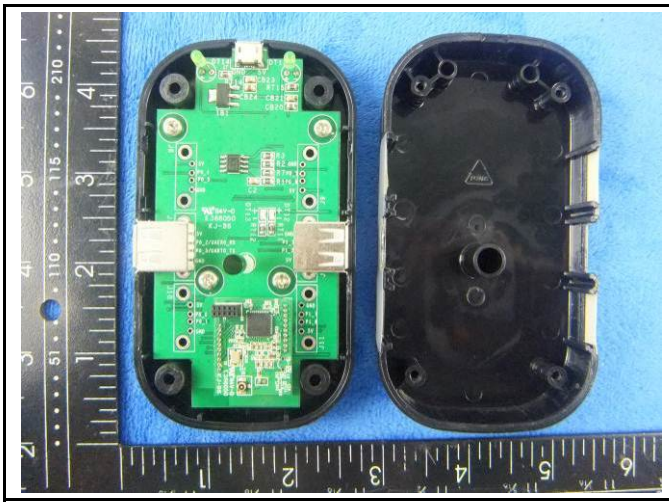
Annex B. EUT And Test Setup Photographs

Annex B.i. Photograph: EUT External Photo

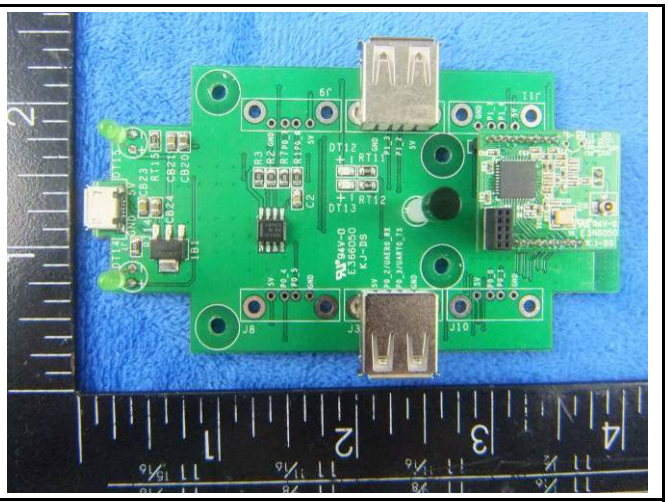
	
Whole package - Front View	Adapter - Front View
	
EUT - Front View(sensor controller)	EUT - Rear View(sensor controller)
	
EUT - Top View(sensor controller)	EUT - Bottom View(sensor controller)

	
EUT - Left View(sensor controller)	EUT - Right View(sensor controller)

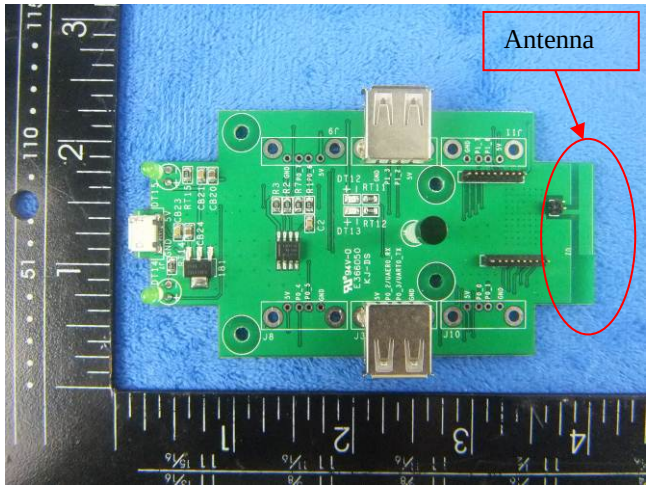
Annex B.ii. Photograph: EUT Internal Photo



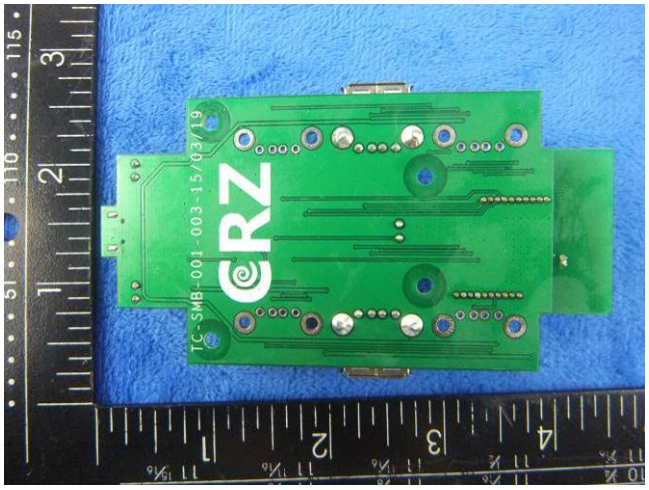
Cover off - Front View(sensor controller)



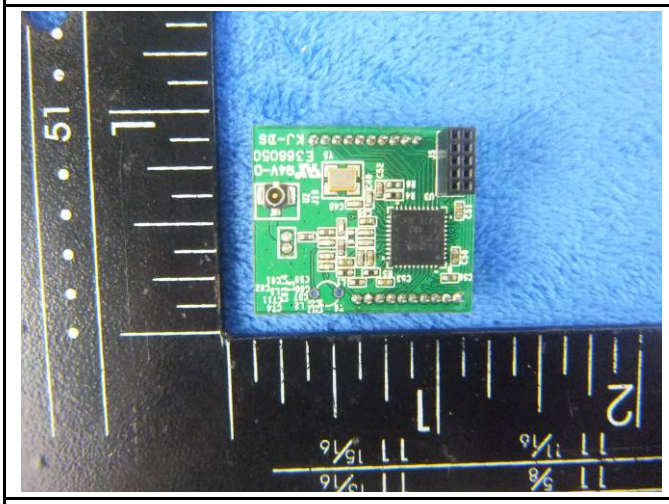
Mainborad covered - Front View(sensor controller)



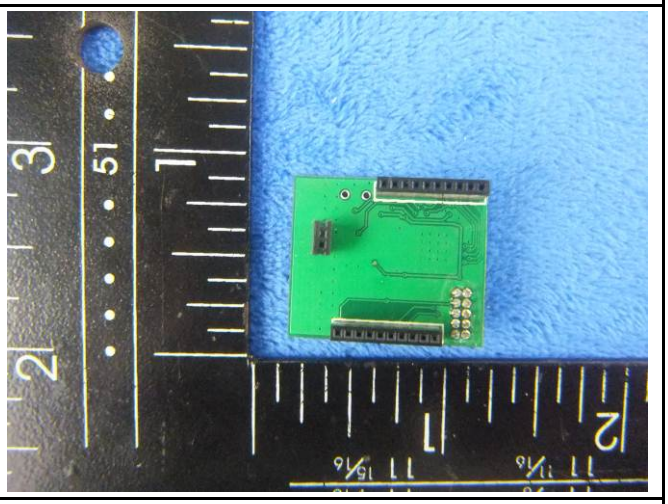
Mainborad uncovered - Front View(sensor controller)



Mainboard - Rear View(sensor controller)

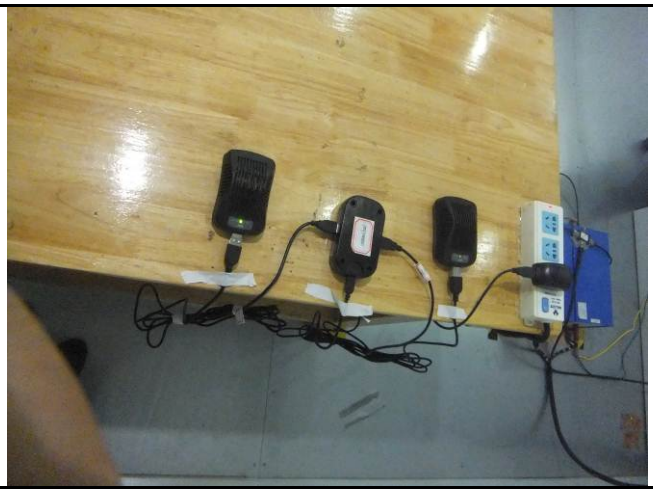
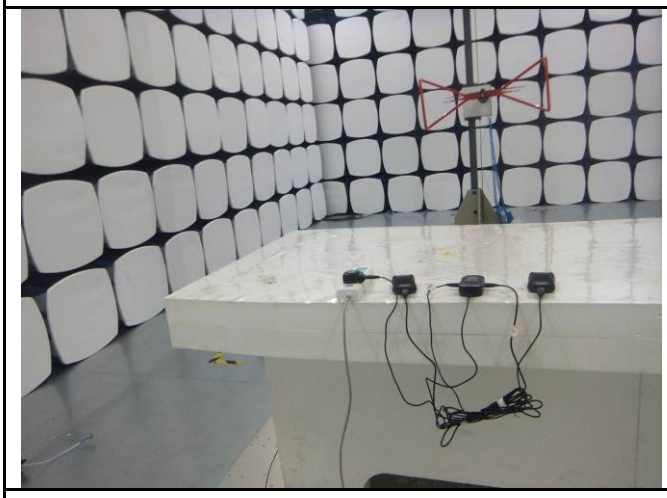


RF borad - Front View(sensor controller)



RF borad - Rear View(sensor controller)

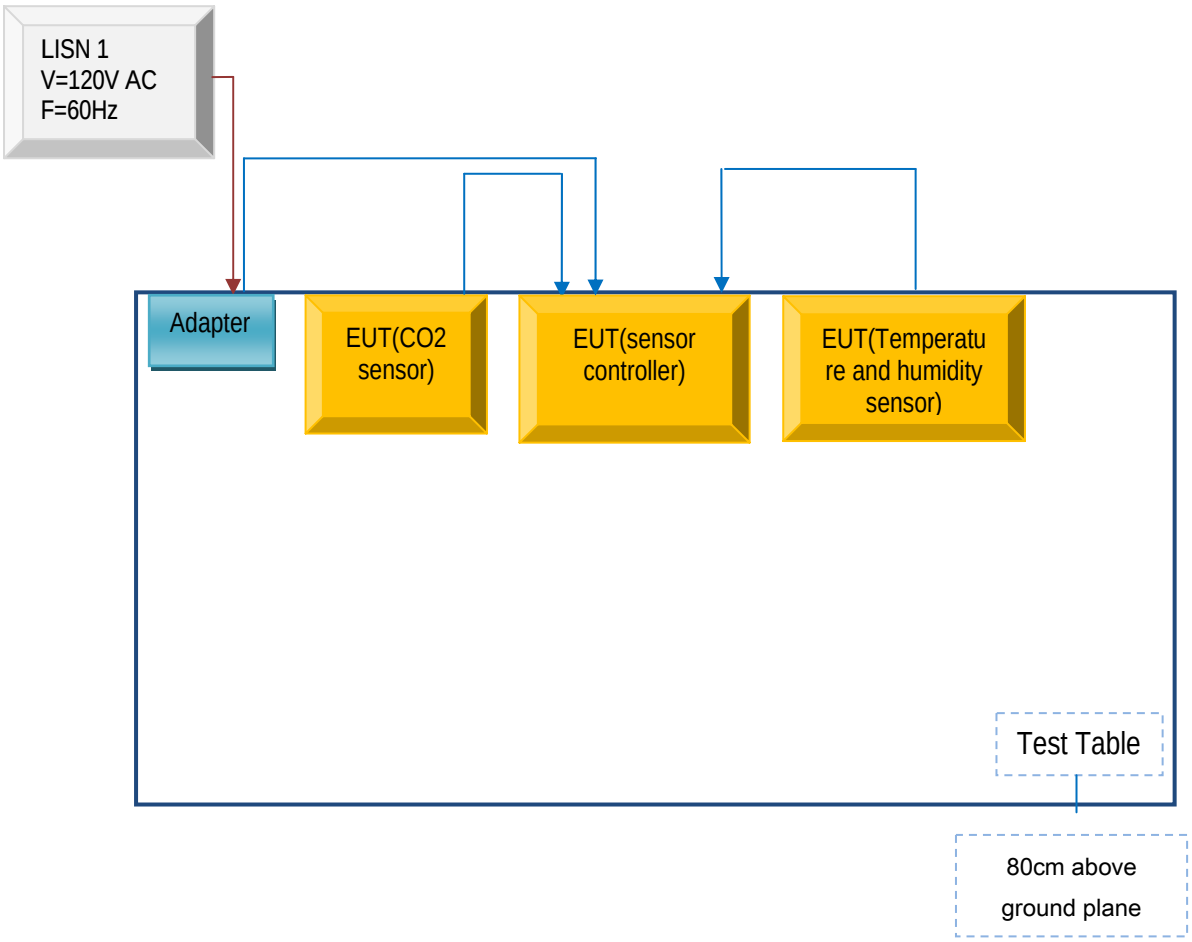
Annex B.iii. Photograph: Test Setup Photo

	
Conducted Emissions Test Setup Front View	Conducted Emissions Test Setup Side View
	
Radiated Spurious Emissions Test Setup Below 1GHz	Radiated Spurious Emissions Test Setup Above 1GHz

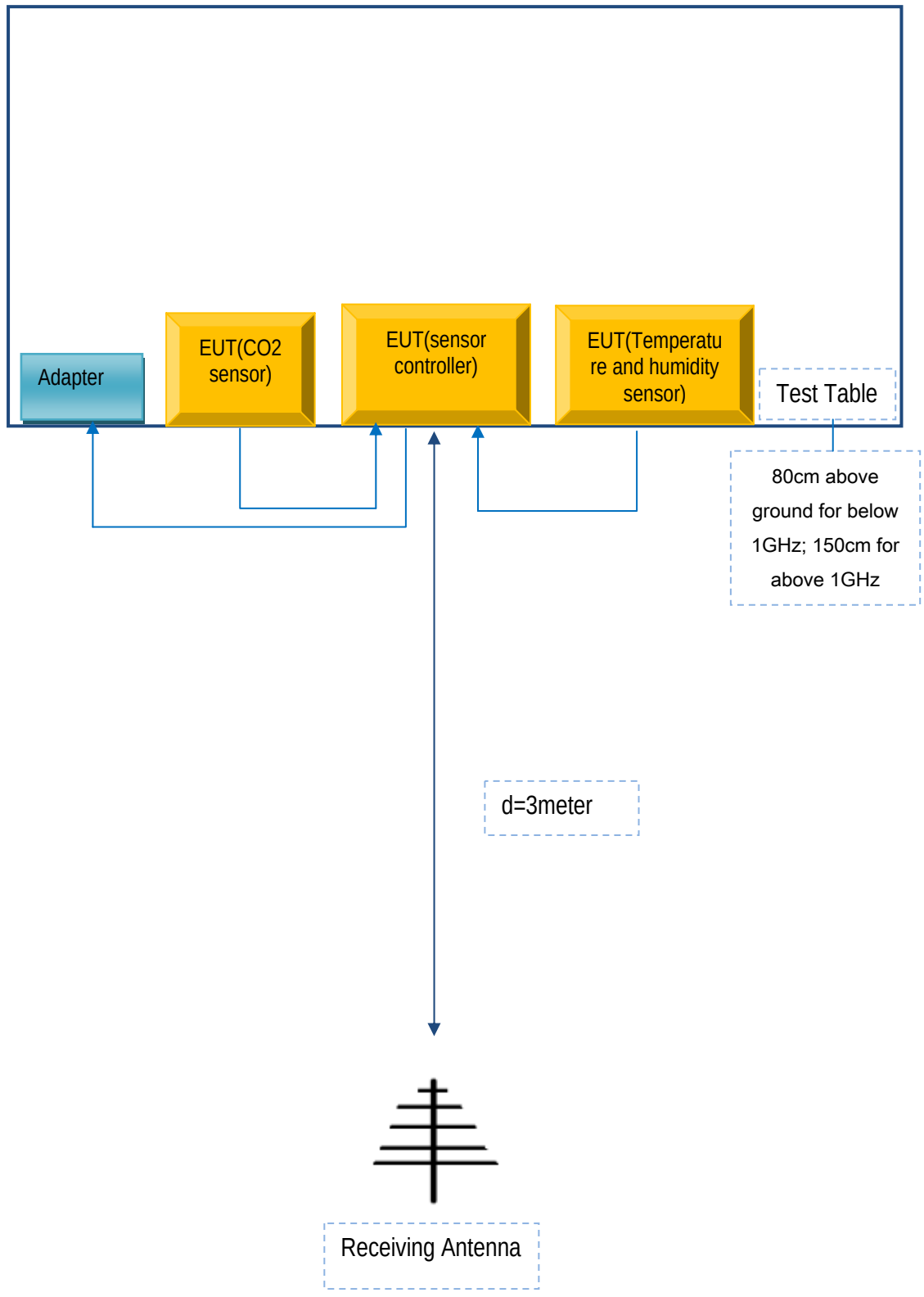
Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

Annex C.ii. TEST SET UP BLOCK

Block Configuration Diagram for AC Line Conducted Emissions



Block Configuration Diagram for Radiated Emissions



Annex C. il. 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
Fenghua Tiancheng Plastic Electronics Co.,Ltd	CO2 sensor	N/A	N/A	N/A
Fenghua Tiancheng Plastic Electronics Co.,Ltd	Temperature and humidity sensor	N/A	N/A	N/A

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

Please see attachment

Annex E. DECLARATION OF SIMILARITY

N/A