

FCC PART 15B

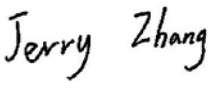
TEST REPORT

For

Shenzhen Sonoff Technologies Co., Ltd.

Room 1001, 10F, Building 8, Lianhua Industrial Park, Longyuan Road, Longhua District, Shenzhen, GD, China

Model: BASICZBR3

Report Type: Original Report	Product Type: ZigBee DIY Smart Switch
Report Number: RDG190802004-00A	
Report Date: 2019-08-23	
Reviewed By: Jerry Zhang EMC Manager	
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Dongguan) No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China Tel: +86-769-86858888 Fax: +86-769-86858891 www.baclcorp.com.cn

Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Dongguan).

TABLE OF CONTENTS

General Information	3
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	3
OBJECTIVE	3
TEST METHODOLOGY	3
MEASUREMENT UNCERTAINTY	3
TEST FACILITY	4
System Test Configuration	5
DESCRIPTION OF TEST CONFIGURATION	5
EQUIPMENT MODIFICATIONS	5
EUT EXERCISE SOFTWARE	5
LOCAL SUPPORT EQUIPMENT LIST AND DETAILS	5
SUPPORT CABLE LIST AND DETAILS	5
BLOCK DIAGRAM OF TEST SETUP	6
TEST EQUIPMENT LIST	7
ENVIRONMENTAL CONDITIONS	7
Summary of Test Results	8
Conducted emissions	9
EUT SETUP	9
EMI TEST RECEIVER SETUP	9
TEST PROCEDURE	9
TEST DATA	11
Radiated emissions	13
EUT SETUP	13
EMI TEST RECEIVER SETUP	14
TEST PROCEDURE	14
CORRECTED AMPLITUDE & MARGIN CALCULATION	14
TEST DATA	15
Exhibit A – Eut Photographs	21
Exhibit B – Test Setup Photographs	24

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:	ZigBee DIY Smart Switch
EUT Model:	BASICZBR3
Highest Operation Frequency:	2480 MHz
Rated Input Voltage:	AC 100-240V
External Dimension:	91mm(L)*43mm(W)*25mm(H)
Serial Number:	190802004
EUT Received Date:	2019-08-04

Objective

This report is prepared on behalf of *Shenzhen Sonoff Technologies Co., Ltd.* in accordance with FCC Part 15B Part 2, subpart J, and Part 15, Subpart A and B of the Federal Communications Commission's rules.

The objective of the manufacturer is to determine the compliance of EUT with FCC Part 15 B Class B.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Dongguan).

Measurement Uncertainty

Parameter	Measurement Uncertainty
Unwanted Emissions, radiated	30M~200MHz: 4.55 dB, 200M~1GHz: 5.92 dB, 1G~6GHz: 4.98 dB, 6G~18GHz: 5.89 dB, 18G~26.5G: 5.47 dB, 26.5G~40G: 5.63 dB
Temperature	±1 °C
Humidity	±5%
AC Power Lines Conducted Emission	3.12 dB (150 kHz to 30 MHz)

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxihu Industry Area, Tangxia, Dongguan, Guangdong, China.

The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 897218, the FCC Designation No. : CN1220.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier : CN0022.

FINAL

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in typical use mode.

Equipment Modifications

No modification was made to the EUT.

EUT Exercise Software

No software was used during test.

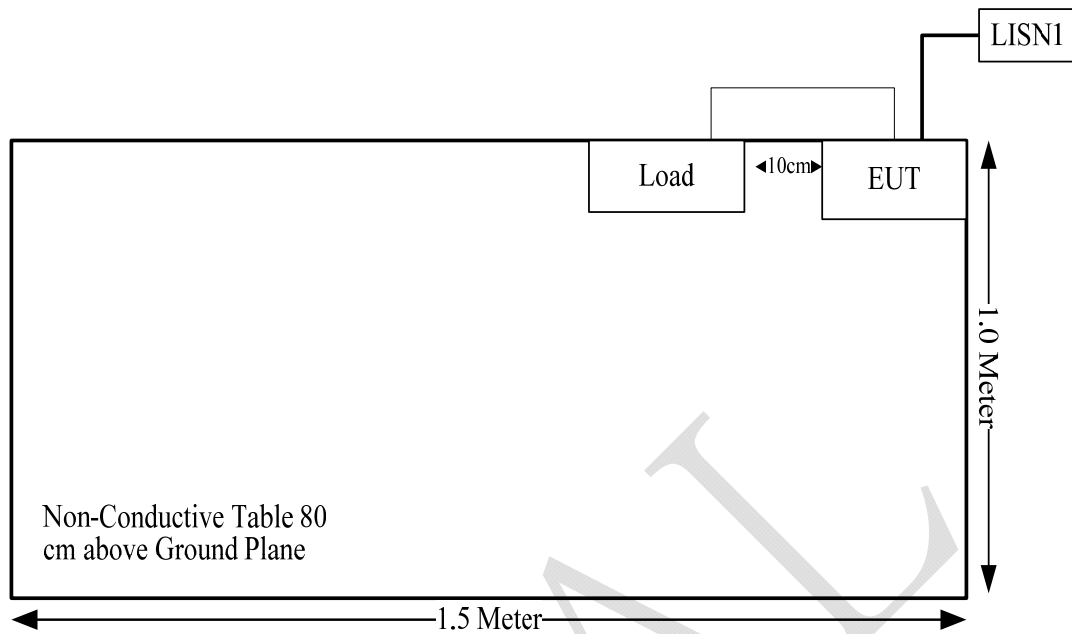
Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Apple	Mobile Phone	MGAA2CG/A	FK1R95UYG5QT
unknown	Load	/	/

Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
Power Cable	Yes	No	0.5	Output Port of EUT	Load

Block Diagram of Test Setup



Test Equipment List

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted emissions					
Unknown	Coaxial Cable	C-NJNJ-50	C-0200-01	2018-09-05	2019-09-05
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A
R&S	Two-line V-network	ENV 216	101614	2018-12-10	2019-12-10
R&S	EMI Test Receiver	ESPI	100120	2019-05-09	2020-05-09
Radiated emissions					
R&S	EMI Test Receiver	ESR3	102453	2019-06-26	2020-06-26
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
Sunol Sciences	Antenna	JB3	A060611-1	2017-11-10	2020-11-10
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-01	2018-09-05	2019-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0075-01	2018-09-05	2019-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-1400-01	2019-05-06	2020-05-06
HP	Amplifier	8447D	2727A05902	2018-09-05	2019-09-05
R&S	Spectrum Analyzer	FSP 38	100478	2019-05-09	2020-05-09
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
TDK RF	Horn Antenna	HRN-0118	130 084	2018-10-12	2021-10-12
MICRO-COAX	Coaxial Cable	UFA147-1-2362-100100	64639 231029-001	2019-02-24	2020-02-24
Mini	Pre-amplifier	ZVA-183-S+	5969001149	2018-09-05	2019-09-05
E-Microwave	Band-stop Filters	OBSF-2400-2483.5-S	OE01601525	2019-06-16	2020-06-16

* Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Environmental Conditions

Test Item:	Conducted emissions	Radiated emissions Below 1GHz	Radiated emissions Above 1GHz
Temperature:	27.9 °C	27°C	27°C
Relative Humidity:	64%	50%	50%
ATM Pressure:	100.1 kPa	100.3 kPa	100.3 kPa
Tester:	Sky Lu	Tyler Pan	Miller Zhao
Test Date:	2019-08-09	2019-08-12	2019-08-12

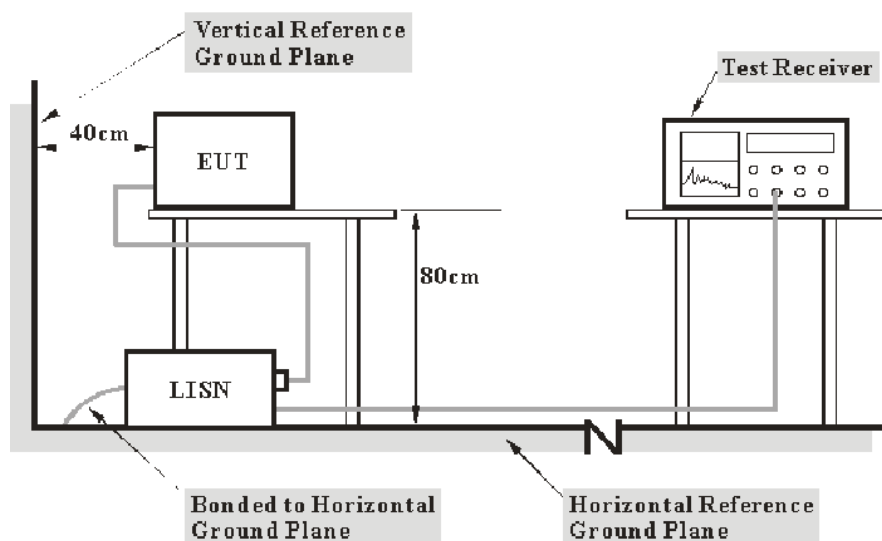
SUMMARY OF TEST RESULTS

Rule and Clause	Description of Test	Test Result
FCC §15.107	Conducted emissions	Compliance
FCC §15.109	Radiated emissions	Compliance

FINAL

CONDUCTED EMISSIONS

EUT Setup



- Note: 1. Support units were connected to second LISN.
 2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.4-2014 measurement procedure. The specification used was with the FCC Part 15 B Class B limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The adapter was connected to the Main LISN with 120V/60Hz AC power source.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emission test, the Adapter was connected to the outlet of the first LISN and the other support equipments were connected to the outlet of the second LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$$V_C = V_R + A_C + VDF$$

Herein,

V_C : corrected voltage amplitude

V_R : reading voltage amplitude

A_c : attenuation caused by cable loss

VDF: voltage division factor of AMN or ISN

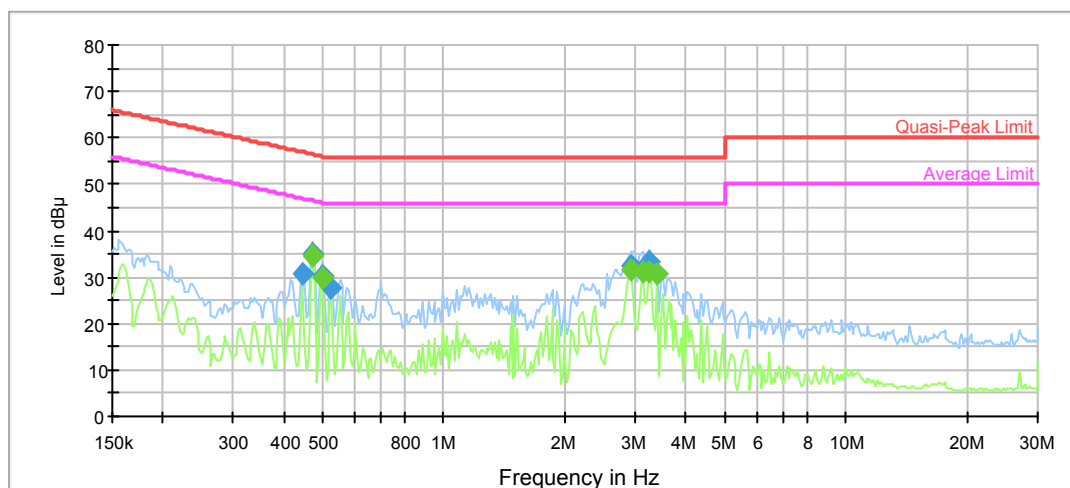
The “**Margin**” column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Data

Please refer to following table and plots:

Port: L
 Test Mode: Operating
 Power Source: AC120V/60Hz



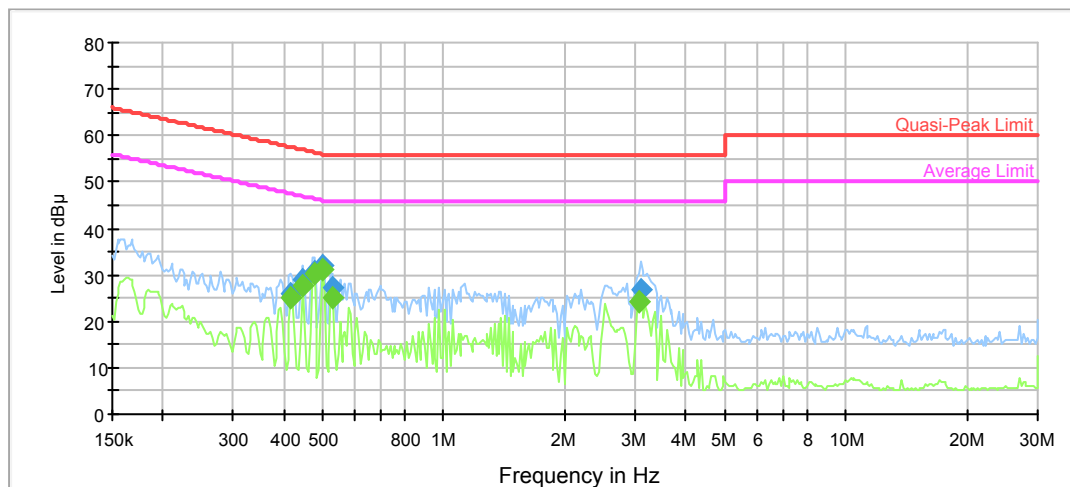
Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.443733	30.5	9.000	L1	9.9	26.5	57.0
0.471031	35.1	9.000	L1	9.9	21.4	56.5
0.500009	30.4	9.000	L1	9.9	25.6	56.0
0.525514	27.6	9.000	L1	9.9	28.4	56.0
2.938883	32.4	9.000	L1	9.8	23.6	56.0
3.246355	33.5	9.000	L1	9.8	22.5	56.0

Final Result 2

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.471031	34.5	9.000	L1	9.9	12.0	46.5
0.500009	29.9	9.000	L1	9.9	16.1	46.0
2.909785	31.6	9.000	L1	9.8	14.4	46.0
3.119684	31.2	9.000	L1	9.8	14.8	46.0
3.246355	31.1	9.000	L1	9.8	14.9	46.0
3.378170	30.8	9.000	L1	9.8	15.2	46.0

Port: N
Test Mode: Operating
Power Source: AC120V/60Hz



Final Result 1

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.418016	25.8	9.000	N	9.9	31.7	57.5
0.448170	29.1	9.000	N	9.9	27.8	56.9
0.475741	30.7	9.000	N	9.9	25.7	56.4
0.500009	31.8	9.000	N	9.9	24.2	56.0
0.530770	27.4	9.000	N	9.9	28.6	56.0
3.088796	26.9	9.000	N	9.8	29.1	56.0

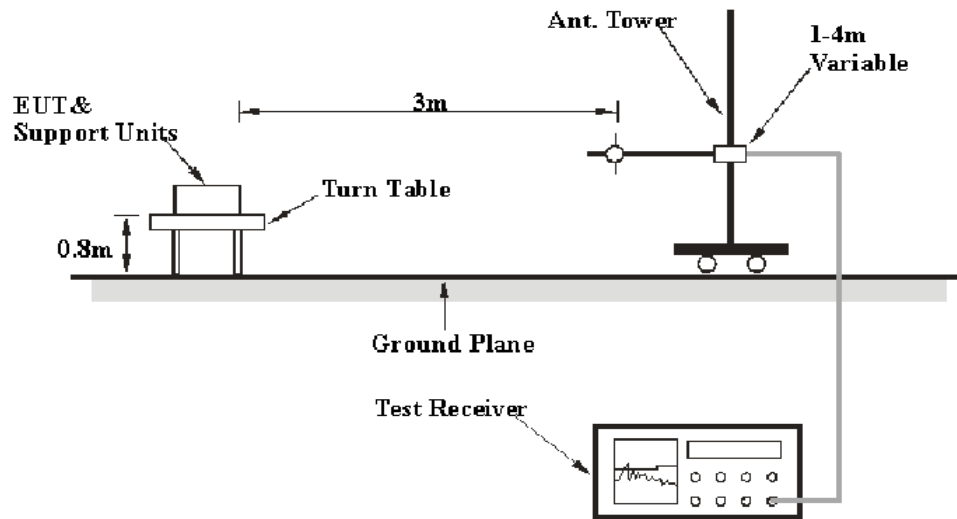
Final Result 2

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.418016	25.3	9.000	N	9.9	22.2	47.5
0.448170	27.8	9.000	N	9.9	19.1	46.9
0.475741	30.3	9.000	N	9.9	16.1	46.4
0.500009	31.0	9.000	N	9.9	15.0	46.0
0.530770	25.0	9.000	N	9.9	21.0	46.0
3.058214	24.4	9.000	N	9.8	21.6	46.0

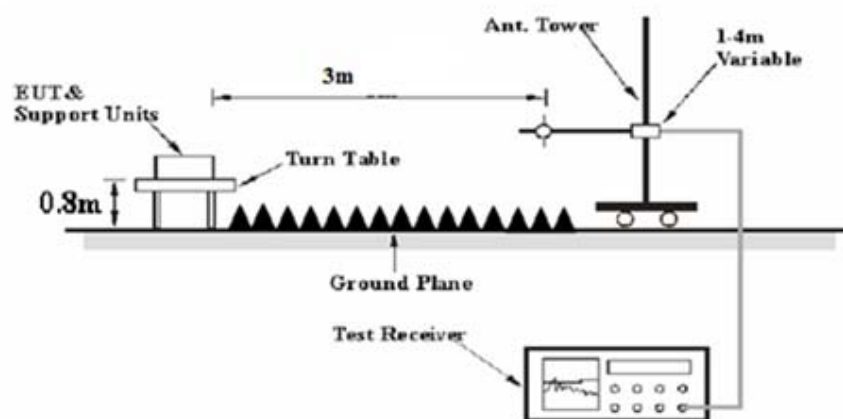
RADIATED EMISSIONS

EUT Setup

Below 1GHz:



Above 1GHz:



The radiated emission below 1GHz tests were performed in the 3 meters chamber test site A, above 1GHz tests were performed in the 3 meters chamber test site A, using the setup accordance with the ANSI C63.4-2014. The specification used was with the FCC Part 15 B Class B limits.

EMI Test Receiver Setup

The system was investigated from 30 MHz to 13 GHz.

During the radiated emission test, the EMI test receiver was set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1 MHz	3 MHz	/	Peak
	1 MHz	Reduced video bandwidth	/	AVG

If the maximized peak measured value complies with under the QP/Average limit more than 6dB, then it is unnecessary to perform an QP/Average measurement.

Test Procedure

During the radiated emissions, the adapter was connected to the first AC floor outlet and the other support equipments were connected to the second AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

The data was recorded in the Quasi-peak detection mode for below 1 GHz, peak and average detection mode above 1 GHz.

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

Result = Meter Reading + Corrected

Note:

Corrected = Antenna Factor + Cable Loss - Amplifier Gain

or

Corrected = Antenna Factor + Cable Loss + Distance extrapolation factor - Amplifier Gain

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Result}$$

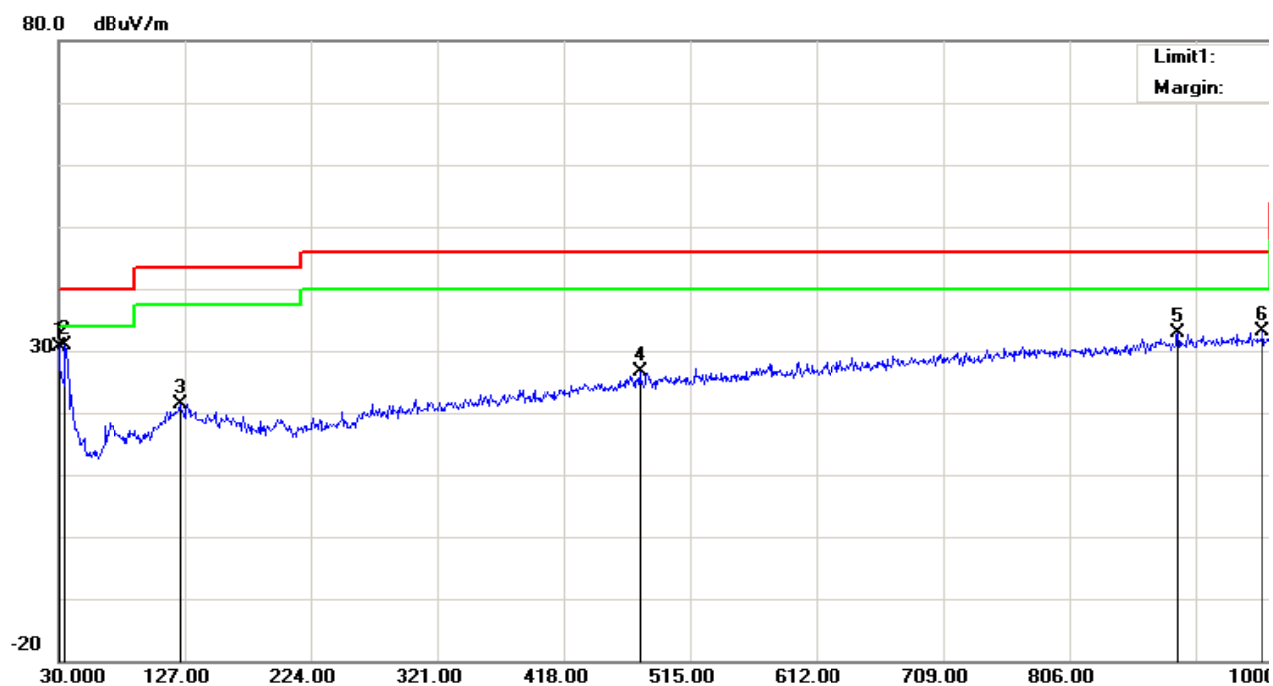
Test Data

Please refer to following table and plots:

Below 1GHz:

Condition: FCC Part 15B Class B
Test Mode: Operating

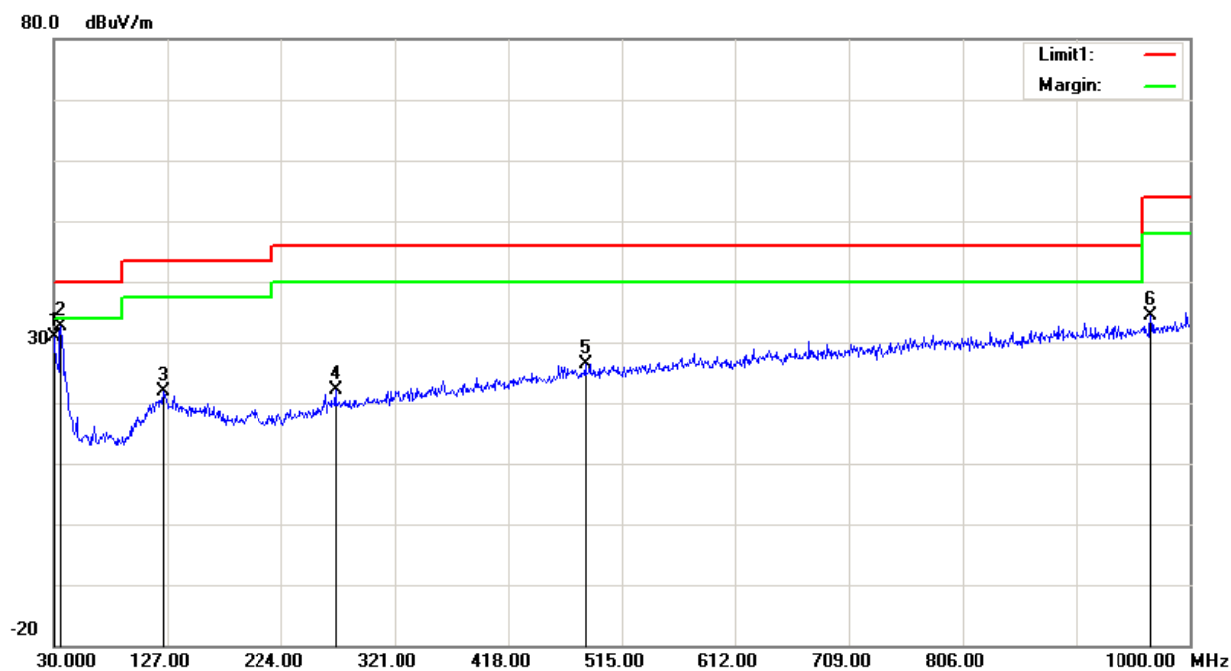
Polarization: Horizontal
Distance: 3m



Frequency (MHz)	Reading (dBμV)	Detector	Corrected (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
30.0000	28.81	peak	1.72	30.53	40.00	9.47
34.8500	32.76	peak	-1.94	30.82	40.00	9.18
123.1200	25.93	peak	-4.57	21.36	43.50	22.14
476.2000	26.93	peak	-0.36	26.57	46.00	19.43
889.4200	33.09	peak	-0.22	32.87	46.00	13.13
954.4100	32.23	peak	0.82	33.05	46.00	12.95

Condition: FCC Part 15B Class B
Test Mode: Operating

Polarization: Vertical
Distance: 3m

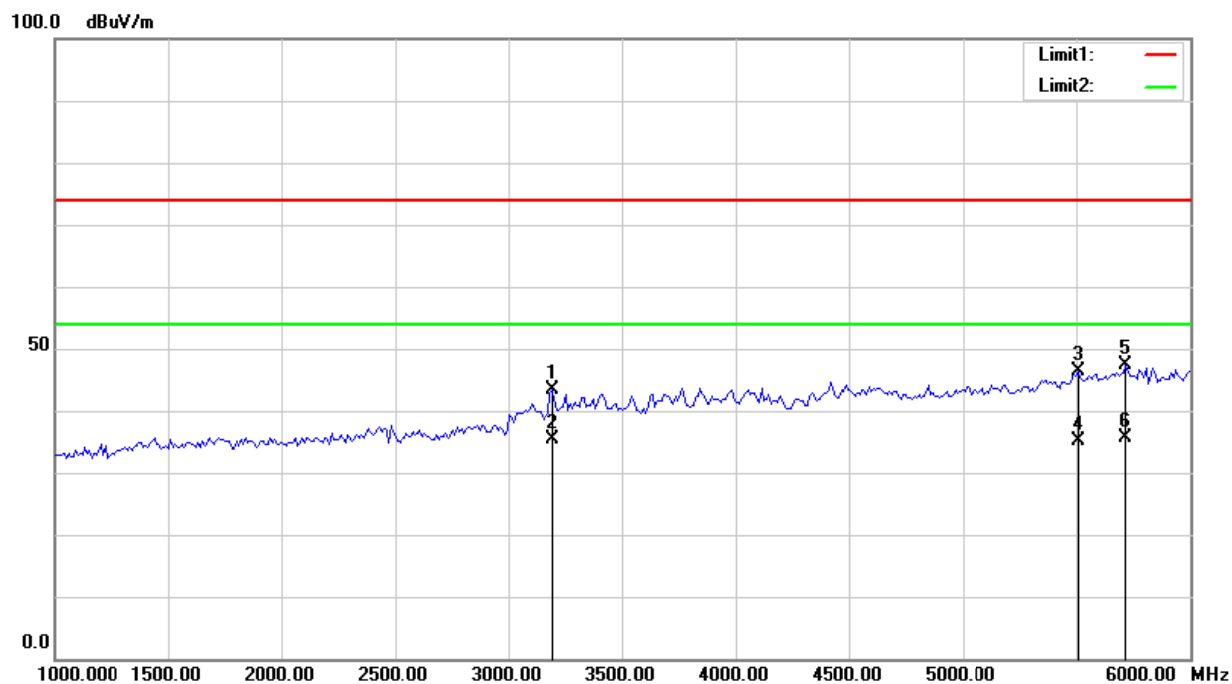


Frequency (MHz)	Reading (dB μ V)	Detector	Corrected (dB/m)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
30.0000	29.06	peak	1.72	30.78	40.00	9.22
35.8200	35.13	peak	-2.59	32.54	40.00	7.46
123.1200	26.48	peak	-4.57	21.91	43.50	21.59
270.5600	26.31	peak	-4.28	22.03	46.00	23.97
483.9600	26.60	peak	-0.26	26.34	46.00	19.66
967.0200	33.19	peak	1.10	34.29	54.00	19.71

Above 1GHz:

Condition: FCC Part 15 Class B
Test Mode: Operating

Polarization: Horizontal
Distance: 3m

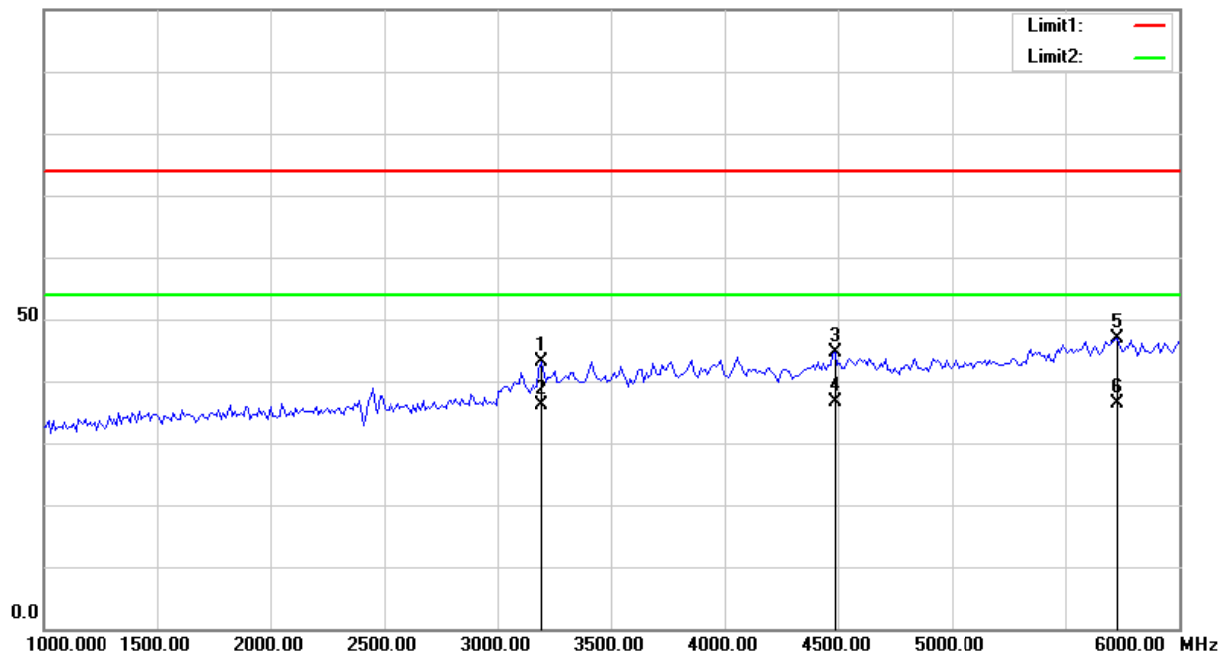


Frequency (MHz)	Reading (dBuV/m)	Detector	Corrected dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
3194.389	40.42	peak	2.87	43.29	74.00	30.71
3194.389	32.63	AVG	2.87	35.50	54.00	18.50
5509.018	37.03	peak	9.38	46.41	74.00	27.59
5509.018	25.74	AVG	9.38	35.12	54.00	18.88
5719.439	37.55	peak	9.89	47.44	74.00	26.56
5719.439	25.71	AVG	9.89	35.60	54.00	18.40

Condition: FCC Part 15 Class B
Test Mode: Operating

Polarization: Vertical
Distance: 3m

100.0 dBuV/m

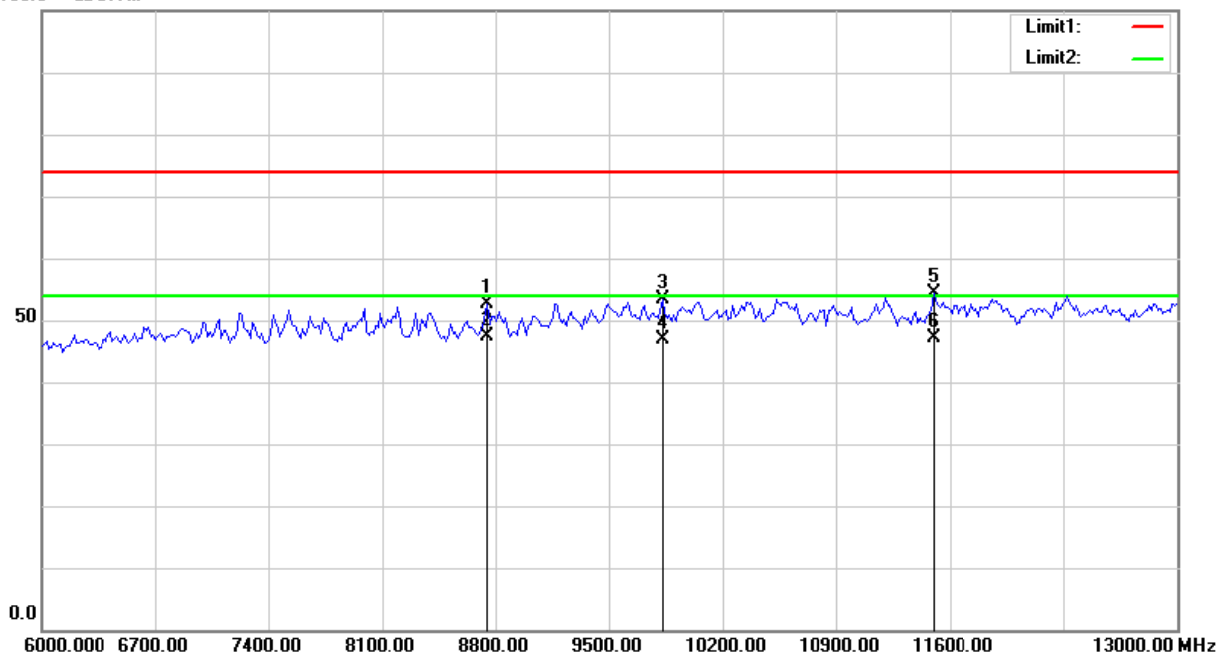


Frequency (MHz)	Reading (dBuV/m)	Detector	Corrected dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
3194.389	40.36	peak	2.87	43.23	74.00	30.77
3194.389	33.16	AVG	2.87	36.03	54.00	17.97
4486.974	38.54	peak	5.99	44.53	74.00	29.47
4486.974	30.74	AVG	5.99	36.73	54.00	17.27
5729.459	37.03	peak	9.89	46.92	74.00	27.08
5729.459	26.37	AVG	9.89	36.26	54.00	17.74

Condition: FCC Part 15B Class B Peak
Test Mode: Operating

Polarization: Horizontal
Distance: 3m

100.0 dBuV/m

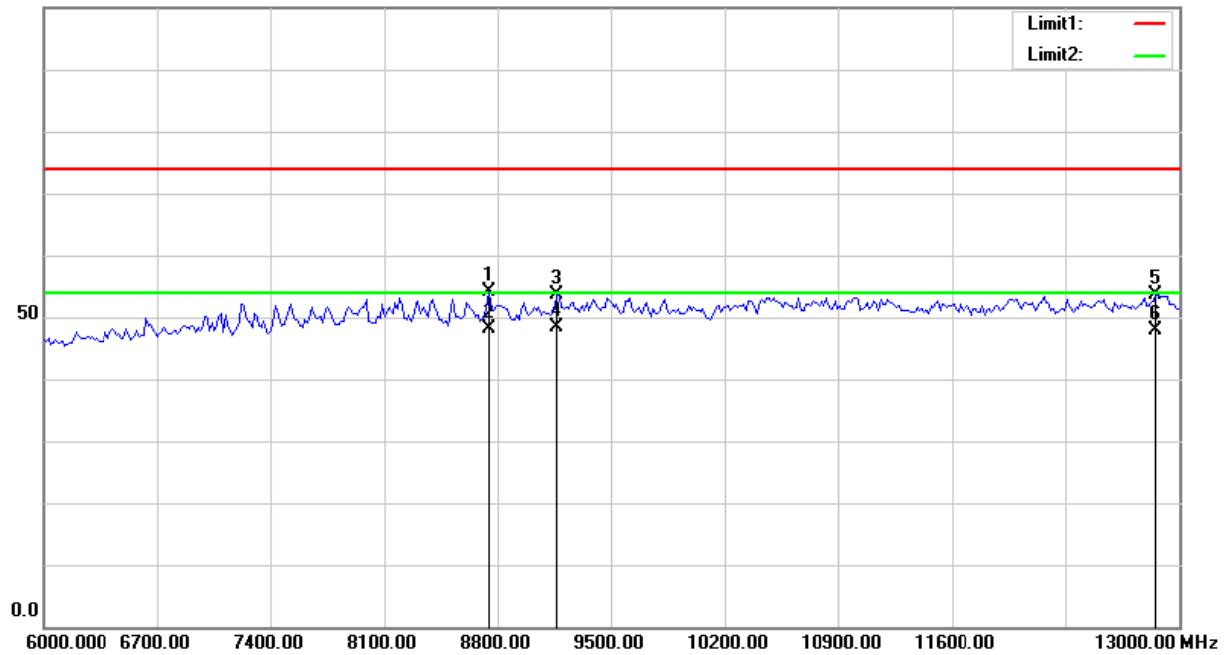


Frequency (MHz)	Reading (dBuV/m)	Detector	Corrected dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
8749.499	38.04	peak	14.69	52.73	74.00	21.27
8749.499	32.78	AVG	14.69	47.47	54.00	6.53
9829.659	37.06	peak	16.28	53.34	74.00	20.66
9829.659	30.49	AVG	16.28	46.77	54.00	7.23
11498.998	35.56	peak	18.76	54.32	74.00	19.68
11498.998	28.34	AVG	18.76	47.10	54.00	6.90

Condition: FCC Part 15 Class B Peak
Test Mode: Operating

Polarization: Vertical
Distance: 3m

100.0 dBuV/m



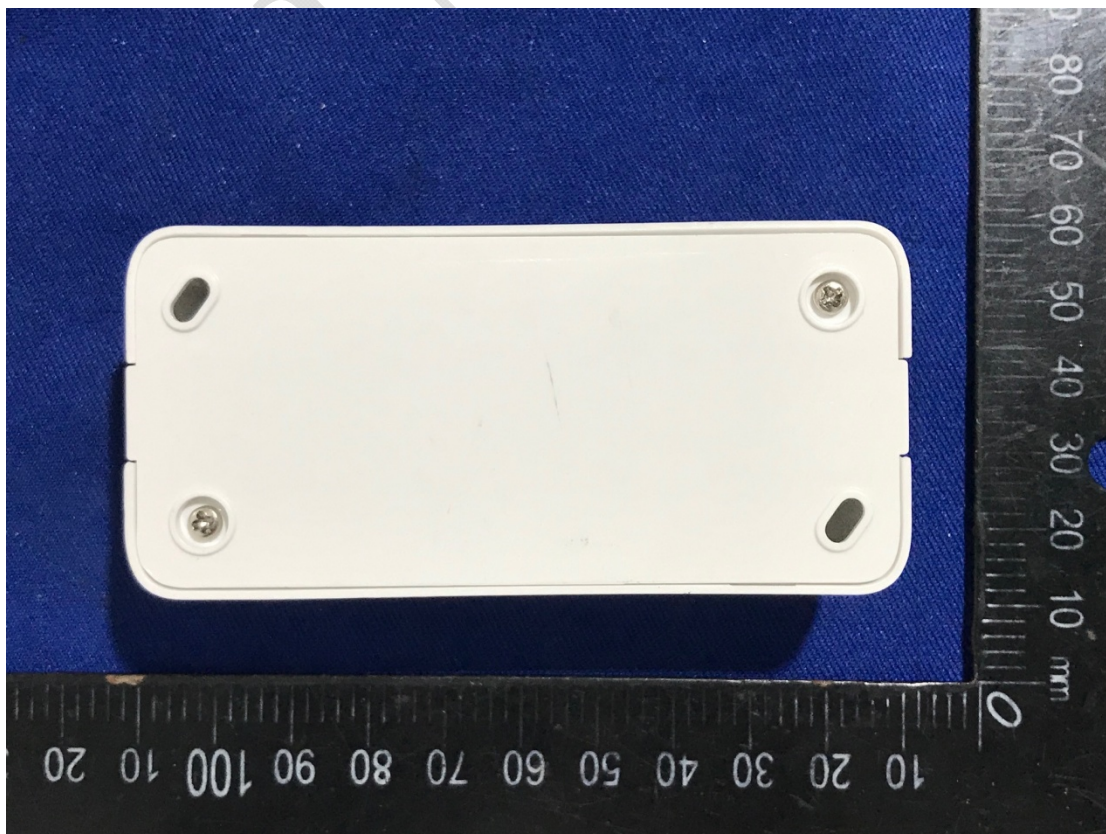
Frequency (MHz)	Reading (dBuV/m)	Detector	Corrected dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
8749.499	39.54	peak	14.69	54.23	74.00	19.77
8749.499	33.43	AVG	14.69	48.12	54.00	5.88
9170.341	38.32	peak	15.38	53.70	74.00	20.30
9170.341	33.06	AVG	15.38	48.44	54.00	5.56
12859.719	33.10	peak	20.45	53.55	74.00	20.45
12859.719	27.41	AVG	20.45	47.86	54.00	6.14

EXHIBIT A – EUT PHOTOGRAPHS

Top



Bottom



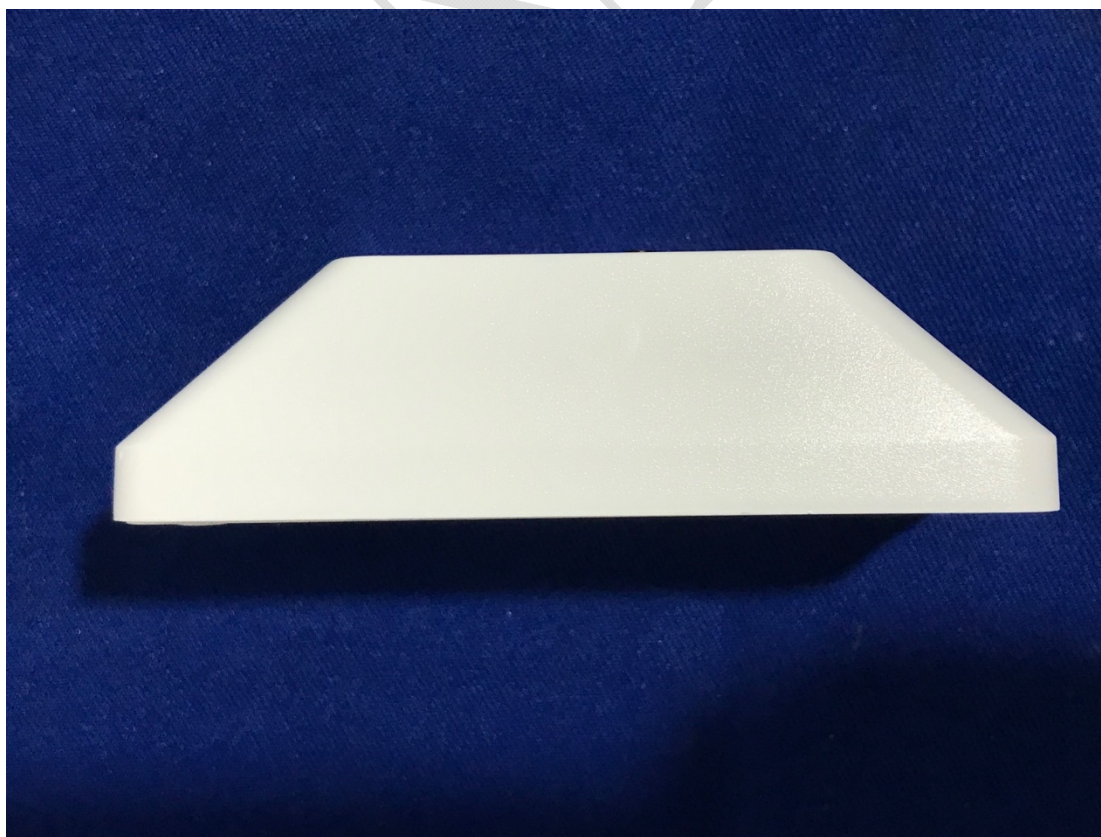
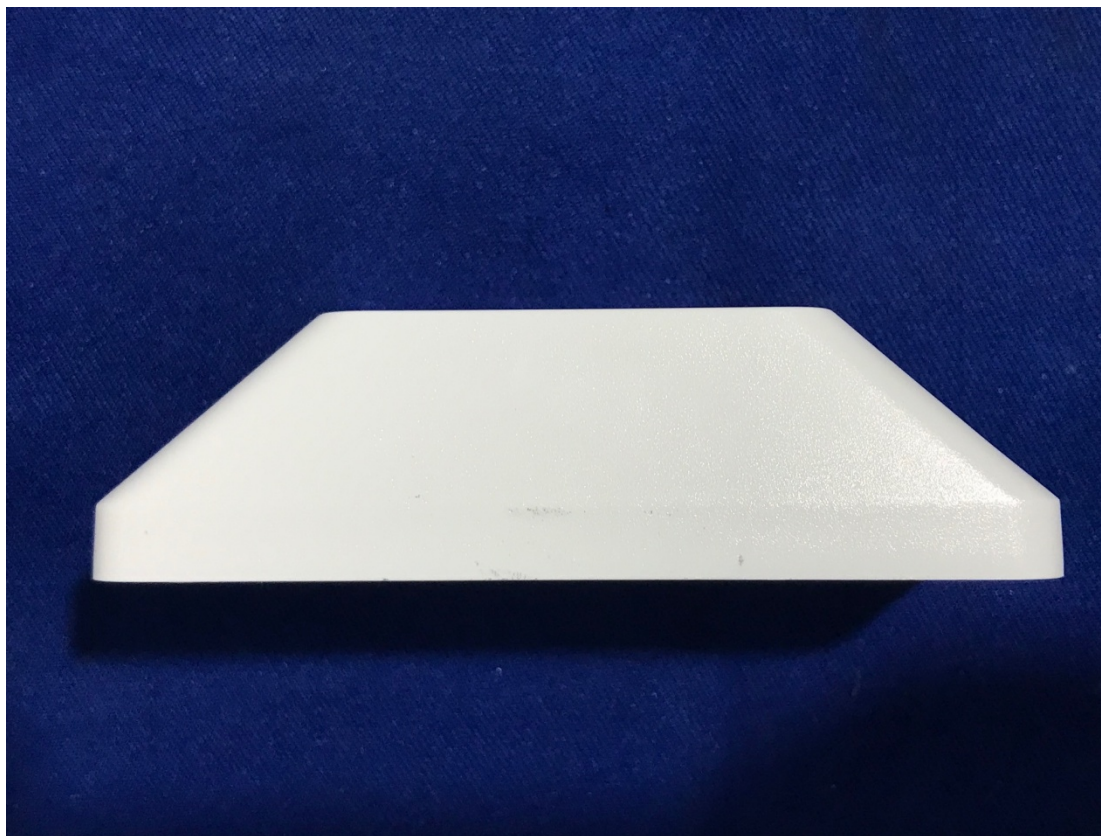


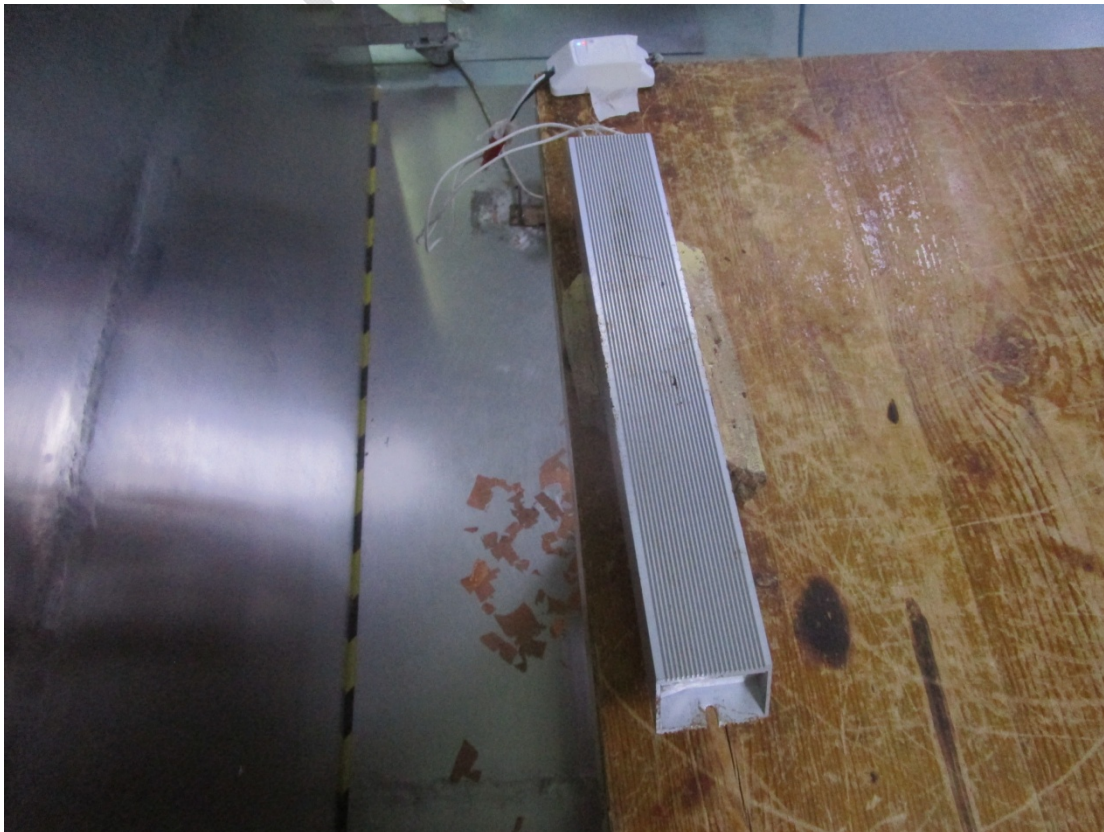


EXHIBIT B – TEST SETUP PHOTOGRAPHS

Conducted Emissions Front View



Conducted Emissions Side View



Radiated Emission Below 1GHz Front View



Radiated Emission Below 1GHz Rear View



Radiated Emission Above 1GHz Front View



Radiated Emission Above 1GHz Rear View



*******END OF REPORT*******