TESTING LABORATORY
CERTIFICATE #4820.01

FCC PART 15B

TEST REPORT

For

Shenzhen Sonoff Technologies Co.,Ltd.

Building 8, Room 1001, Lianhua industrial park, Longyuan Road, Hualian community, Longhua St, Longhua dist, Shenzhen, Guangdong, China.

Model: S31, S31 Lite

Report Type:	**Product Name:**
Original Report	Wi-Fi Smart Plug

Report Number:	RDG190709009-00A
Report Date:	2019-08-01
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).

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:	Wi-Fi Smart Plug
EUT Model:	S31
Multiple Models:	S31 Lite
Highest Operation Frequency:	2462 MHz
Rated Input Voltage:	AC 120V/60Hz
External Dimension:	116mm(L)*70.4mm(W)*29.1mm(H)
Serial Number:	190716002-1(Model: S31) 190716002-2(Model: S31 Lite)
EUT Received Date:	2019-07-17

Note: Model S31 and S31 Lite was selected for fully testing, the detailed information about the difference among S31 Lite and model S31 can be referred to the declaration letter which was stated and guaranteed by the manufacturer.

Objective

This report is prepared on behalf of ***Shenzhen Sonoff Technologies Co.,Ltd.*** in accordance with FCC Part 15B 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℃
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, Puxinhu 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.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in operating

Equipment Modifications

No modification was made to the EUT.

EUT Exercise Software

No Software was used in test.

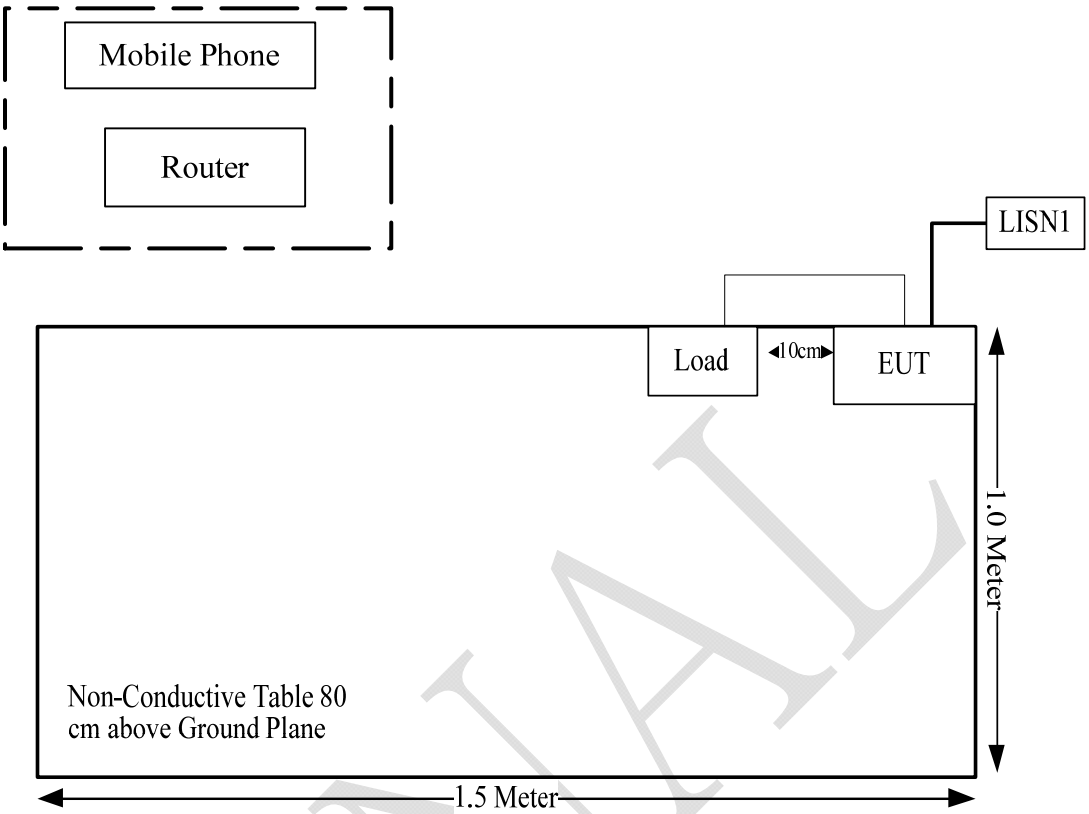
Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Huawei	Router	HG8245Q2	02311RGB
APPLE	Mobile Phone	MGAA2CG/A	FK1R96UYG5QT
unknown	Load	/	/

Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
Power Cable	Yes	No	1	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 Below 1GHz					
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
Radiated emissions Above 1GHz					
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

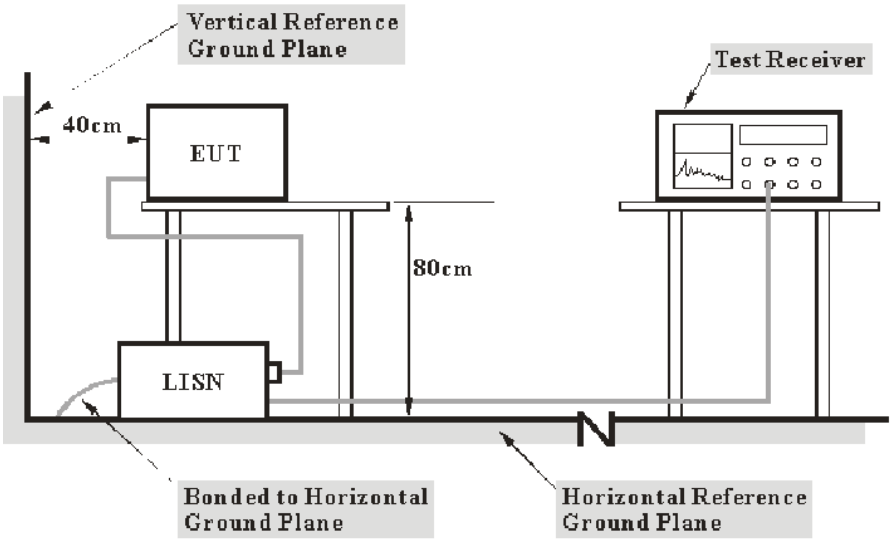
Test Item:	Conducted emissions	Radiated emissions
Test Date:	2019-07-19	2019-07-13~2019-07-17
Tester:	Ade xiao	Tyler Pan, Vensh
Temperature:	30.4 °C	27.9~28.7°C
Relative Humidity:	40%	51~55%
ATM Pressure:	99.2kPa	99.9~ 100. 3kPa

SUMMARY OF TEST RESULTS

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

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

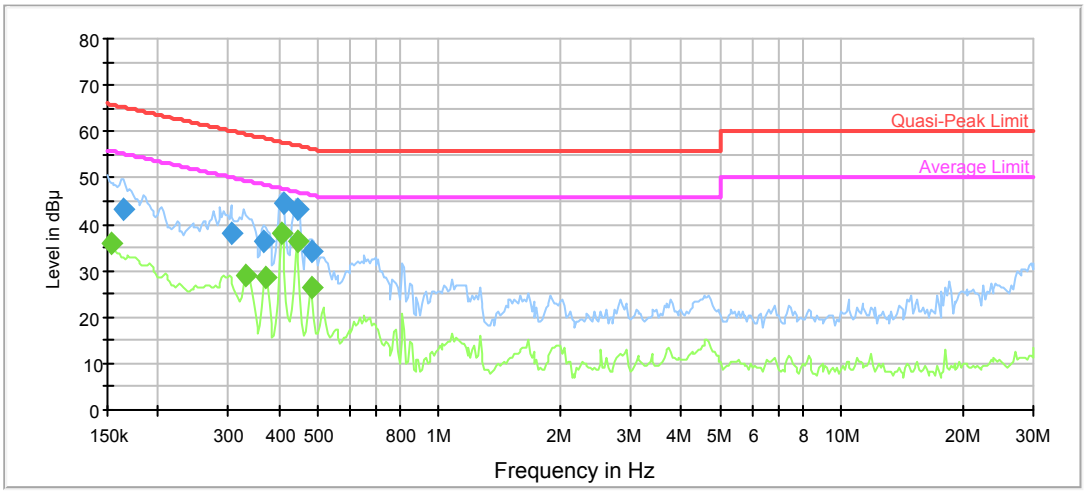
The "**Margin**" column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin = Limit – Corrected Amplitude

Test Data

Please refer to following table and plots:

Model	S31
Port:	L
Test Mode:	Operating
Power Source:	AC120V/60Hz



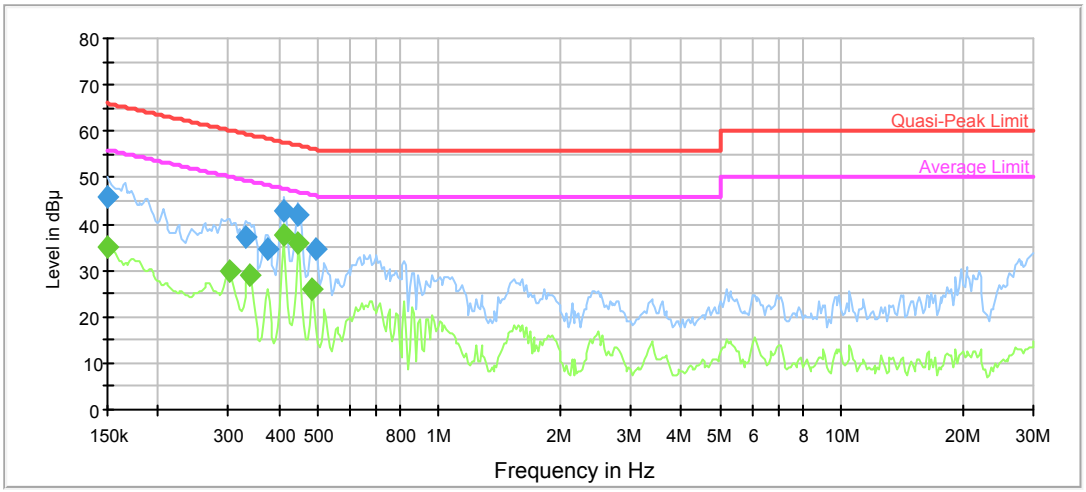
Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.164053	43.2	9.000	L1	11.0	22.1	65.3
0.304025	38.0	9.000	L1	10.1	22.1	60.1
0.367295	36.4	9.000	L1	10.0	22.2	58.6
0.409780	44.5	9.000	L1	10.0	13.2	57.7
0.443733	43.3	9.000	L1	9.9	13.7	57.0
0.480499	34.2	9.000	L1	9.9	22.1	56.3

Final Result 2

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.153015	35.7	9.000	L1	11.1	20.1	55.8
0.332508	29.0	9.000	L1	10.1	20.4	49.4
0.370968	28.5	9.000	L1	10.0	20.0	48.5
0.405722	38.1	9.000	L1	10.0	9.6	47.7
0.443733	36.4	9.000	L1	9.9	10.6	47.0
0.480499	26.5	9.000	L1	9.9	19.8	46.3

Model	S31
Port:	N
Test Mode:	Operating
Power Source:	AC120V/60Hz



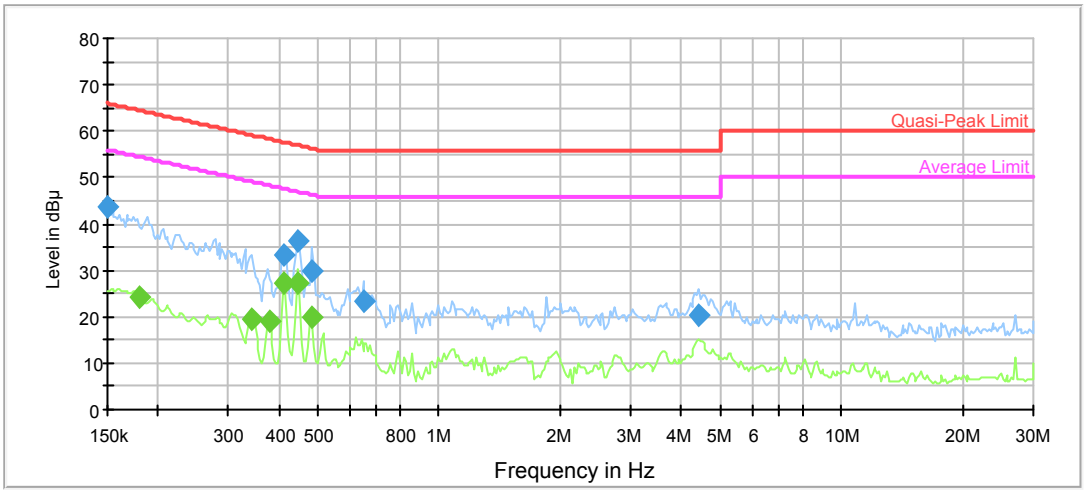
Final Result 1

Frequency (MHz)	QuasiPeak (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin	Limit (dB µ
0.150000	45.7	9.000	N	11.2	20.3	66.0
0.332508	37.3	9.000	N	10.1	22.1	59.4
0.374678	34.7	9.000	N	10.0	23.7	58.4
0.413877	42.6	9.000	N	9.9	15.0	57.6
0.443733	42.2	9.000	N	9.9	14.8	57.0
0.495058	34.7	9.000	N	9.9	21.4	56.1

Final Result 2

Frequency (MHz)	Average (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin	Limit (dB µ
0.150000	35.0	9.000	N	11.2	21.0	56.0
0.301015	29.7	9.000	N	10.1	20.5	50.2
0.339191	29.1	9.000	N	10.1	20.1	49.2
0.409780	37.5	9.000	N	10.0	10.2	47.7
0.448170	36.0	9.000	N	9.9	11.0	47.0
0.485304	26.1	9.000	N	9.9	20.1	46.2

Model	S31 Lite
Port:	L
Test Mode:	Operating
Power Source:	AC120V/60Hz



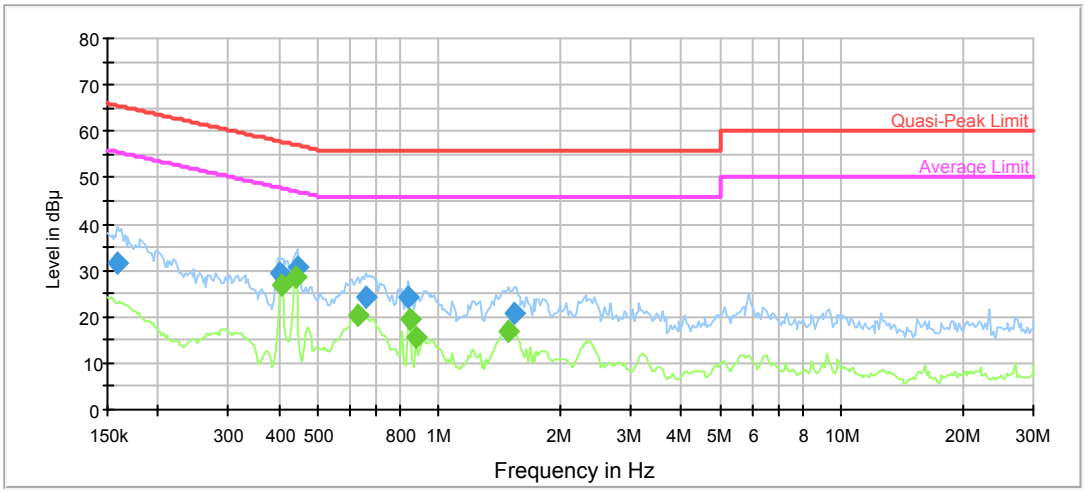
Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	43.5	9.000	L1	11.2	22.5	66.0
0.413877	33.2	9.000	L1	9.9	23.4	57.6
0.448170	36.4	9.000	L1	9.9	20.5	56.9
0.480499	29.9	9.000	L1	9.9	26.4	56.3
0.647640	23.3	9.000	L1	9.8	31.7	56.0
4.419352	20.3	9.000	L1	9.8	35.7	56.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.179422	24.3	9.000	L1	10.8	30.2	54.5
0.342583	19.2	9.000	L1	10.0	29.9	49.1
0.378425	19.0	9.000	L1	10.0	29.3	48.3
0.413877	27.1	9.000	L1	9.9	20.5	47.6
0.448170	27.3	9.000	L1	9.9	19.6	46.9
0.480499	19.8	9.000	L1	9.9	26.6	46.3

Model	S31 Lite
Port:	N
Test Mode:	Operating
Power Source:	AC120V/60Hz



Final Result 1

Frequency (MHz)	QuasiPeak (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin	Limit (dB µ
0.159228	31.4	9.000	N	11.0	34.1	65.5
0.401705	29.6	9.000	N	10.0	28.2	57.8
0.443733	30.6	9.000	N	9.9	26.4	57.0
0.660657	24.3	9.000	N	9.8	31.7	56.0
0.838859	24.0	9.000	N	9.8	32.0	56.0
1.539193	20.6	9.000	N	9.8	35.4	56.0

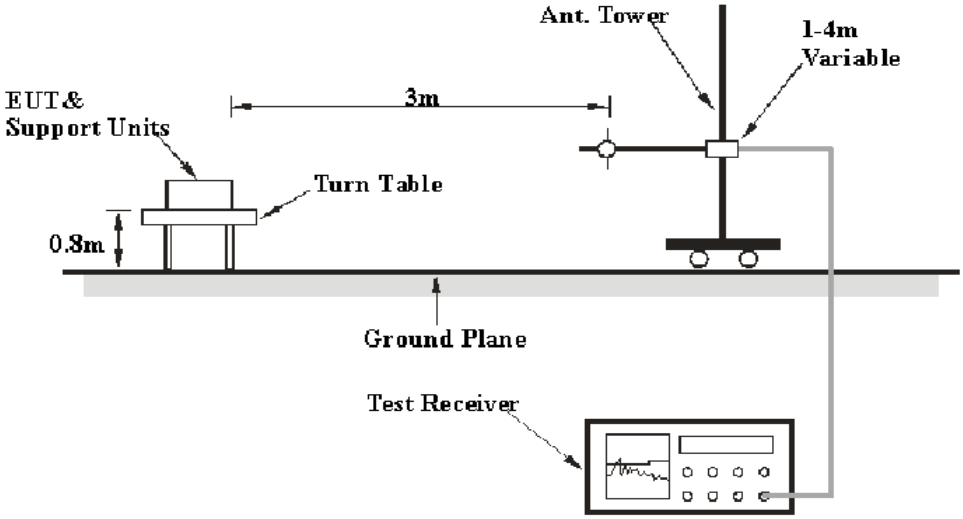
Final Result 2

Frequency (MHz)	Average (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin	Limit (dB µ
0.405722	26.7	9.000	N	10.0	21.0	47.7
0.439339	28.7	9.000	N	9.9	18.4	47.1
0.628593	20.3	9.000	N	9.8	25.7	46.0
0.847248	19.3	9.000	N	9.8	26.7	46.0
0.872921	15.7	9.000	N	9.8	30.3	46.0
1.493925	16.9	9.000	N	9.8	29.1	46.0

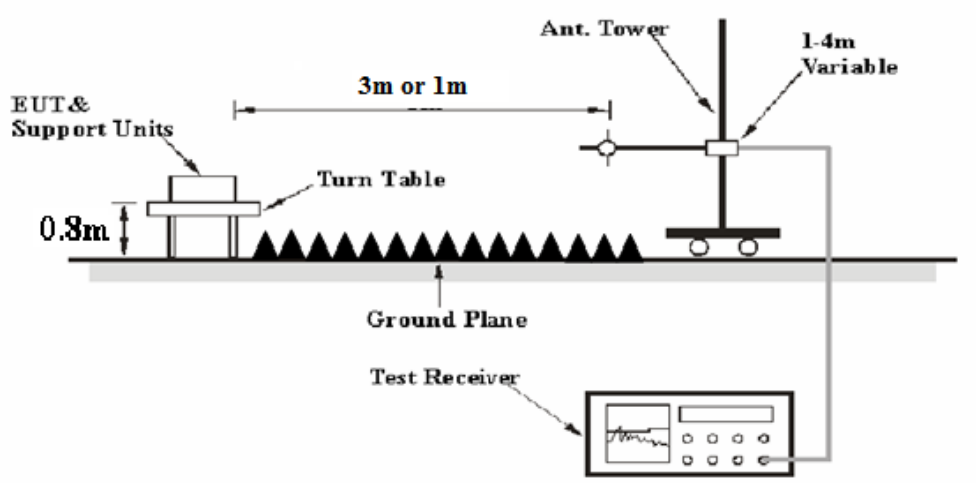
RADIATED EMISSIONS

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 of laptop 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

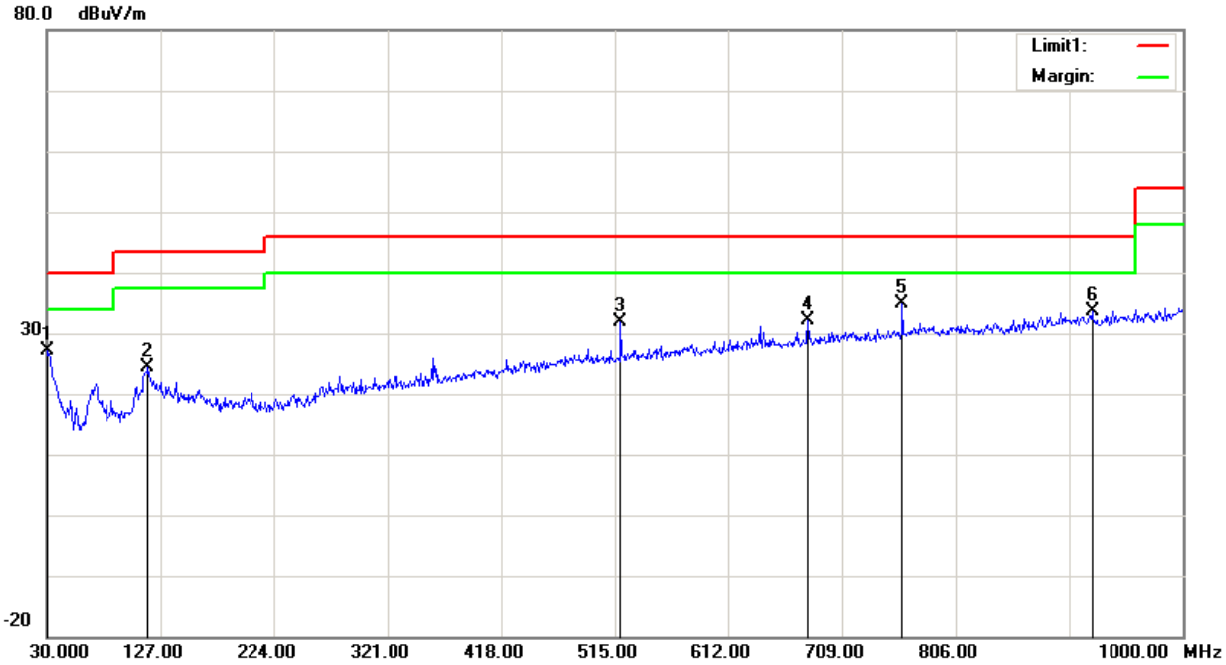
The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7 dB means the emission is 7 dB below the limit. The equation for margin calculation
is as follows:

Margin = Limit – Result

Test Data

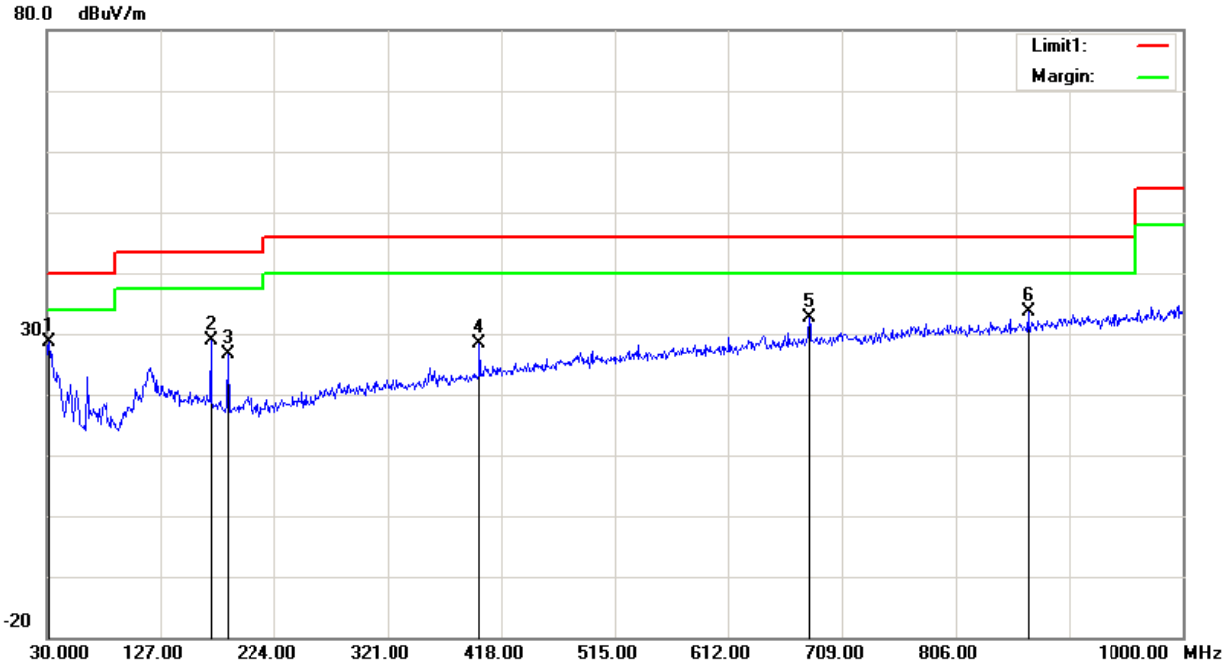
Please refer to following table and plots:

Condition:	FCC Part 15B Class B	**Polarization:**	Horizontal
EUT:	Wi-Fi Smart Plug	**Power:**	AC 120V/60Hz
Model:	S31	**Distance:**	3m
Test Mode:	Operating		



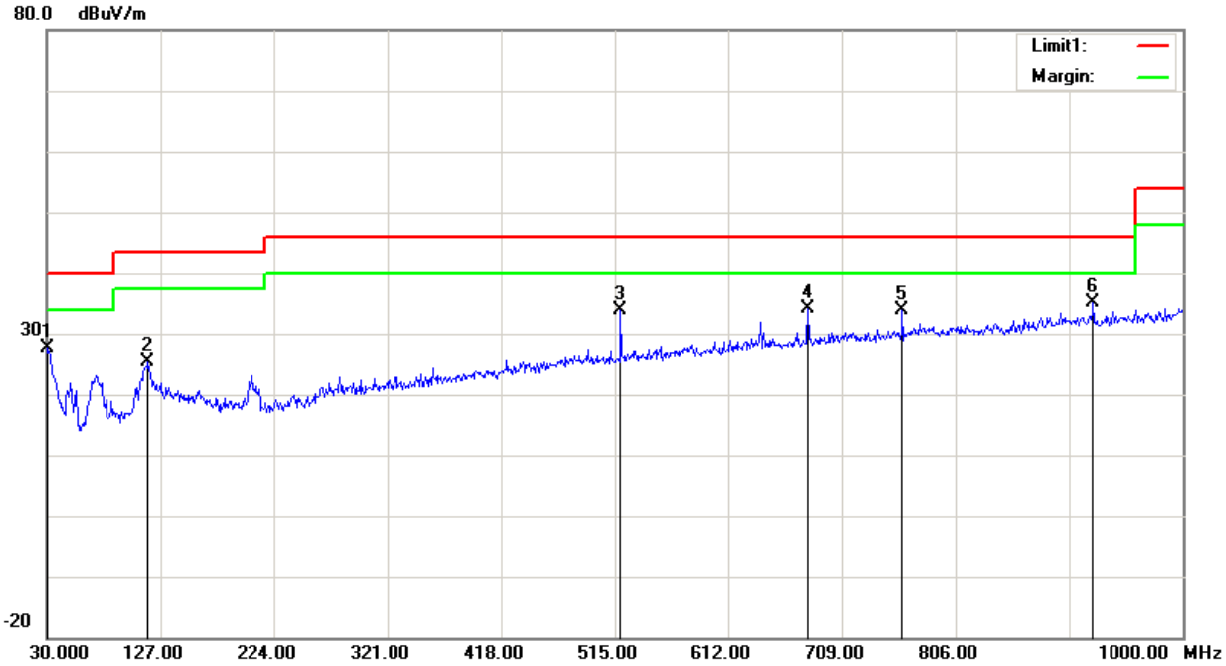
Frequency (MHz)	Reading (dBµV)	Detector	Corrected (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
30.0000	25.51	peak	1.72	27.23	40.00	12.77
116.3300	29.39	peak	-5.13	24.26	43.50	19.24
519.8500	31.82	peak	0.09	31.91	46.00	14.09
679.9000	29.35	peak	2.66	32.01	46.00	13.99
760.4100	31.02	peak	3.98	35.00	46.00	11.00
922.4000	33.18	peak	0.41	33.59	46.00	12.41

Condition:	FCC Part 15B Class B	**Polarization:**	Vertical
EUT:	Wi-Fi Smart Plug	**Power:**	AC 120V/60Hz
Model:	S31	**Distance:**	3m
Test Mode:	Operating		



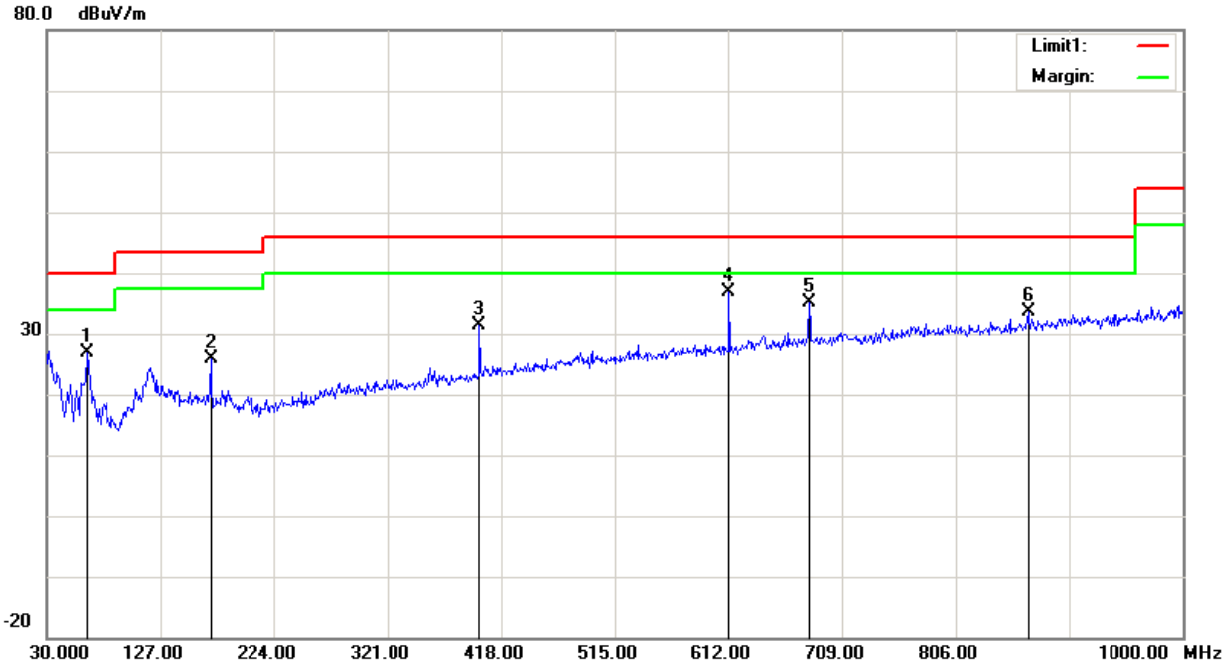
Frequency (MHz)	Reading (dBµV)	Detector	Corrected (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
31.9400	28.54	peak	0.19	28.73	40.00	11.27
169.6800	35.44	peak	-6.57	28.87	43.50	14.63
184.2300	34.05	peak	-7.38	26.67	43.50	16.83
399.5700	30.48	peak	-2.03	28.45	46.00	17.55
680.8700	29.92	peak	2.67	32.59	46.00	13.41
868.0800	28.24	peak	5.37	33.61	46.00	12.39

Condition:	FCC Part 15B Class B	**Polarization:**	Horizontal
EUT:	Wi-Fi Smart Plug	**Power:**	AC 120V/60Hz
Model:	S31 Lite	**Distance:**	3m
Test Mode:	Operating		



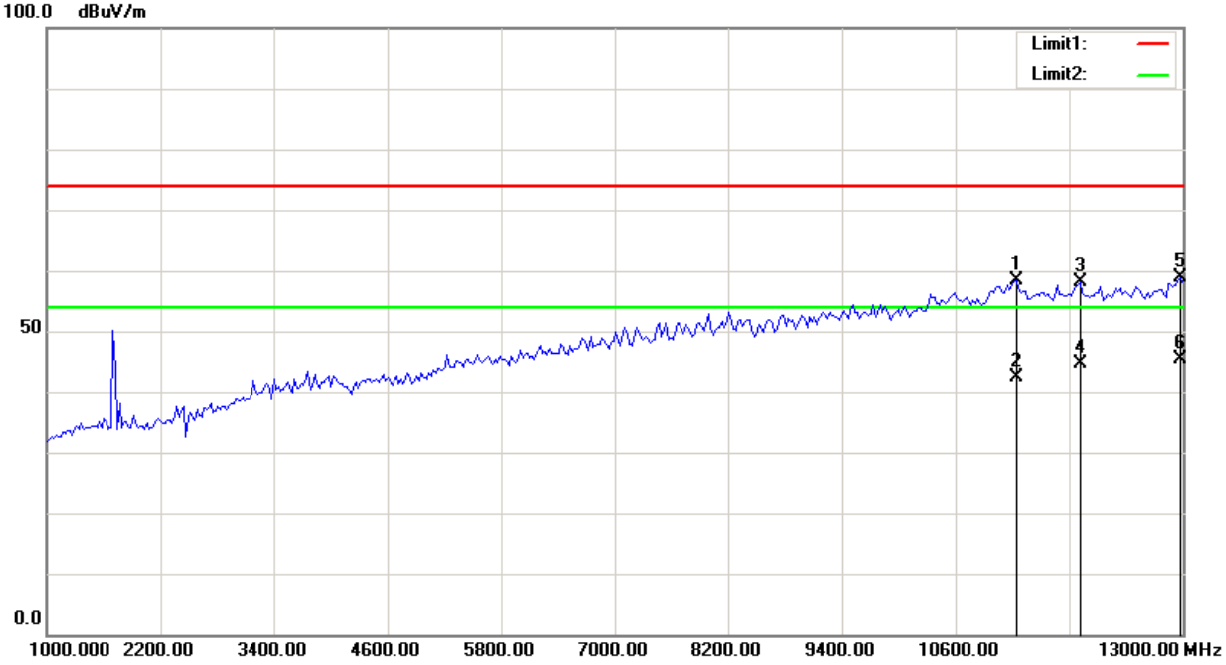
Frequency (MHz)	Reading (dBµV)	Detector	Corrected (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
30.0000	26.01	peak	1.72	27.73	40.00	12.27
116.3300	30.39	peak	-5.13	25.26	43.50	18.24
519.8500	33.82	peak	0.09	33.91	46.00	12.09
679.9000	31.35	peak	2.66	34.01	46.00	11.99
760.4100	30.02	peak	3.98	34.00	46.00	12.00
923.3700	34.80	peak	0.43	35.23	46.00	10.77

Condition:	FCC Part 15B Class B	**Polarization:**	Vertical
EUT:	Wi-Fi Smart Plug	**Power:**	AC 120V/60Hz
Model:	S31 Lite	**Distance:**	3m
Test Mode:	Operating		



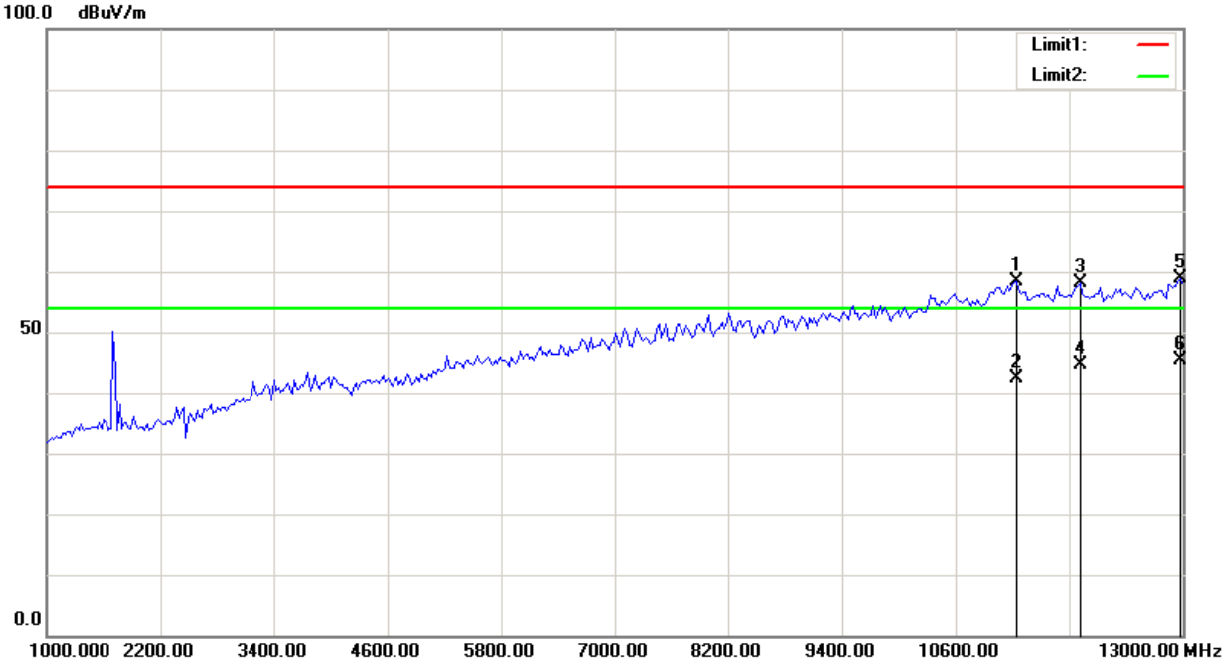
Frequency (MHz)	Reading (dBµV)	Detector	Corrected (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
63.9500	38.62	peak	-11.70	26.92	40.00	13.08
169.6800	32.44	peak	-6.57	25.87	43.50	17.63
399.5700	33.48	peak	-2.03	31.45	46.00	14.55
612.9700	35.67	peak	1.20	36.87	46.00	9.13
680.8700	32.42	peak	2.67	35.09	46.00	10.91
868.0800	28.24	peak	5.37	33.61	46.00	12.39

Condition:	FCC Part 15B Class B	**Polarization:**	Horizontal
EUT:	Wi-Fi Smart Plug	**Power:**	**AC 120V/60Hz**
Model:	S31	**Distance:**	3m
Test Mode:	Operating		



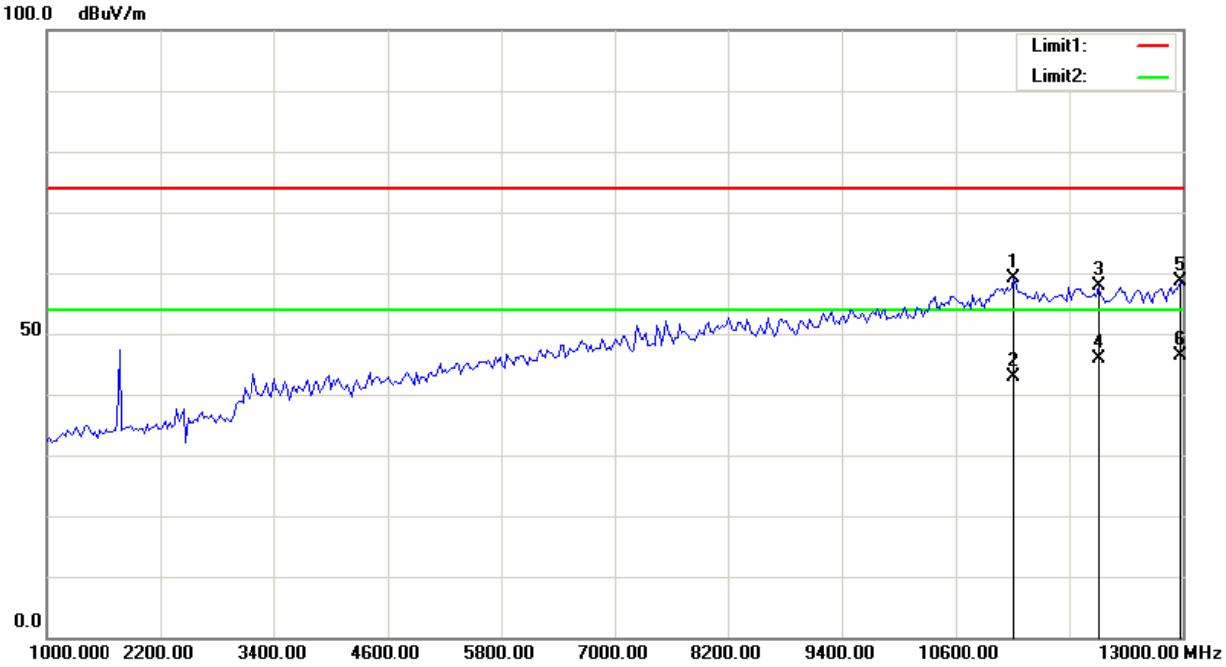
Frequency (MHz)	Reading (dBµV)	Detector	Corrected (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
11244.489	40.21	peak	18.22	58.43	74.00	15.57
11244.489	24.10	AVG	18.22	42.32	54.00	11.68
11917.836	39.11	peak	19.05	58.16	74.00	15.84
11917.836	25.70	AVG	19.05	44.75	54.00	9.25
12975.952	38.21	peak	20.60	58.81	74.00	15.19
12975.952	24.70	AVG	20.60	45.30	54.00	8.70

Condition:	FCC Part 15B Class B	**Polarization:**	Vertical
EUT:	Wi-Fi Smart Plug	**Power:**	AC 120V/60Hz
Model:	S31	**Distance:**	3m
Test Mode:	Operating		



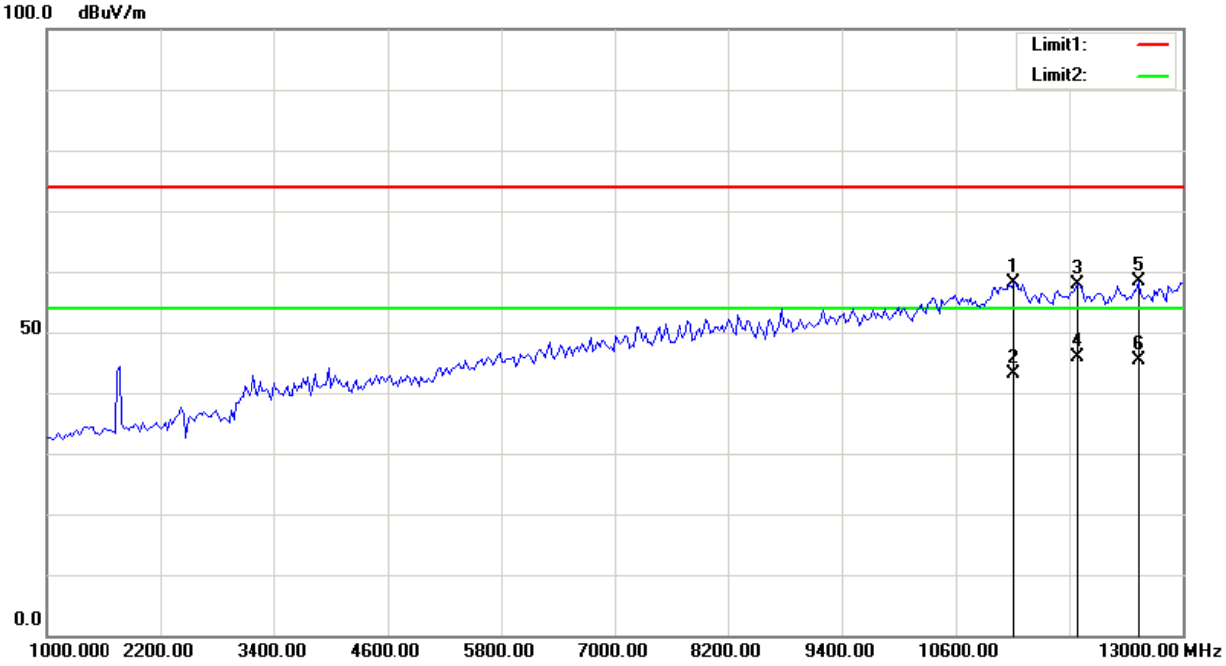
Frequency (MHz)	Reading (dBµV)	Detector	Corrected (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
11244.489	40.21	peak	18.22	58.43	74.00	15.57
11244.489	24.10	AVG	18.22	42.32	54.00	11.68
11917.836	39.11	peak	19.05	58.16	74.00	15.84
11917.836	25.70	AVG	19.05	44.75	54.00	9.25
12975.952	38.21	peak	20.60	58.81	74.00	15.19
12975.952	24.70	AVG	20.60	45.30	54.00	8.70

Condition:	FCC Part 15B Class B	**Polarization:**	Horizontal
EUT:	Wi-Fi Smart Plug	**Power:**	**AC 120V/60Hz**
Model:	S31 Lite	**Distance:**	3m
Test Mode:	Operating		



Frequency (MHz)	Reading (dBµV)	Detector	Corrected (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
11220.441	41.05	peak	18.15	59.20	74.00	14.80
11220.441	24.78	AVG	18.15	42.93	54.00	11.07
12110.220	38.67	peak	19.17	57.84	74.00	16.16
12110.220	26.70	AVG	19.17	45.87	54.00	8.13
12975.952	38.02	peak	20.60	58.62	74.00	15.38
12975.952	25.70	AVG	20.60	46.30	54.00	7.70

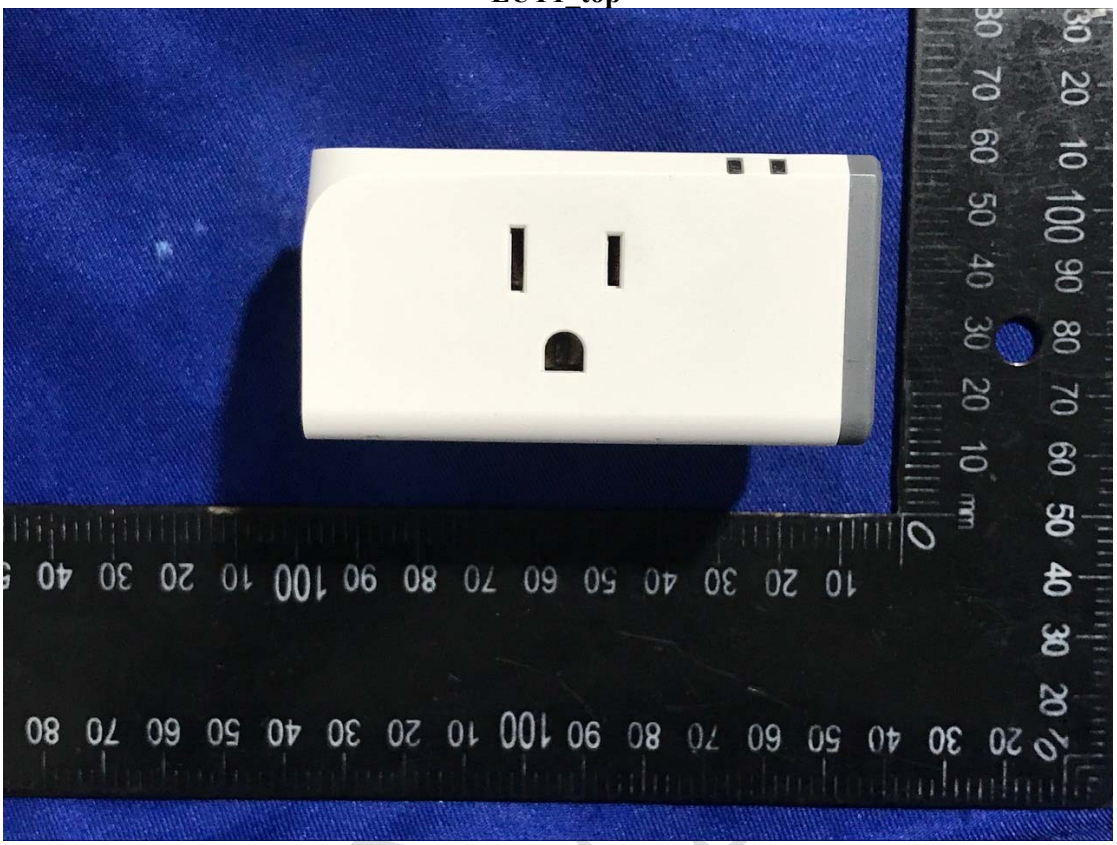
Condition:	FCC Part 15B Class B	**Polarization:**	Vertical
EUT:	Wi-Fi Smart Plug	**Power:**	AC 120V/60Hz
Model:	S31 Lite	**Distance:**	3m
Test Mode:	Operating		



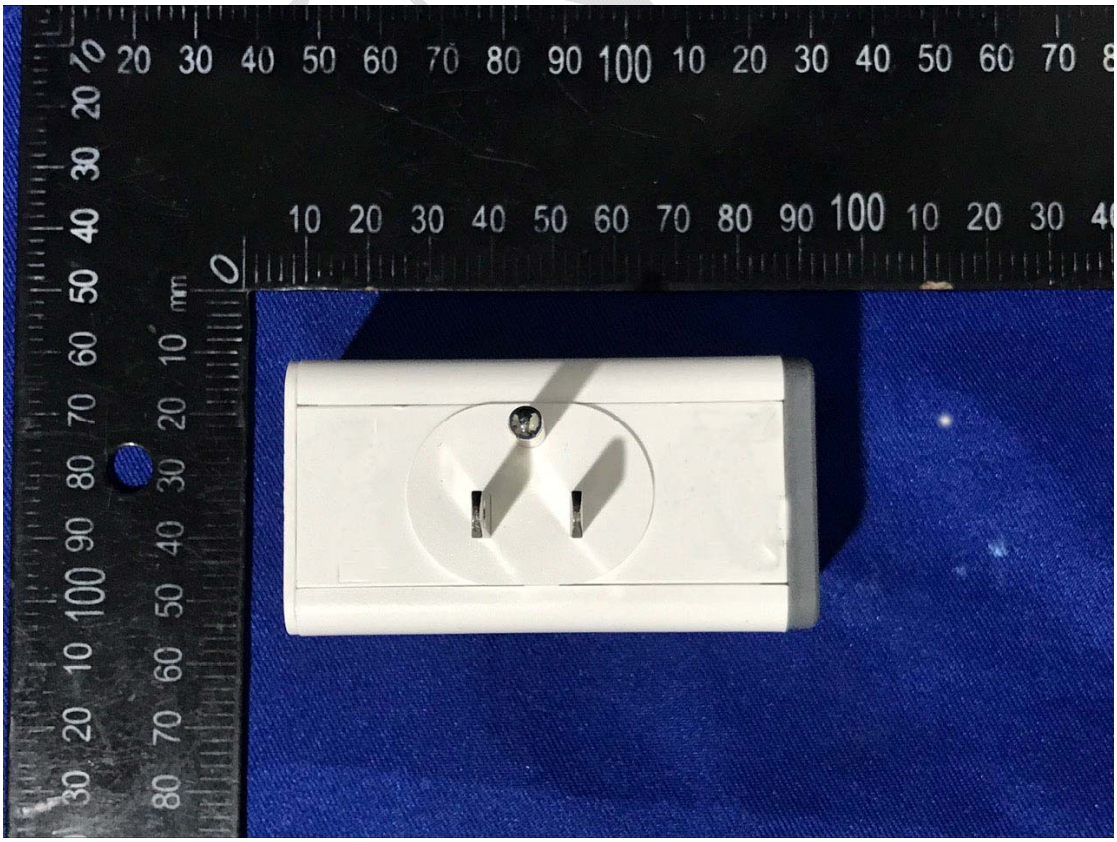
Frequency (MHz)	Reading (dBµV)	Detector	Corrected (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
11220.441	40.09	peak	18.15	58.24	74.00	15.76
11220.441	24.87	AVG	18.15	43.02	54.00	10.98
11893.788	38.75	peak	19.11	57.86	74.00	16.14
11893.788	26.70	AVG	19.11	45.81	54.00	8.19
12543.086	38.79	peak	19.53	58.32	74.00	15.68
12543.086	25.87	AVG	19.53	45.40	54.00	8.60

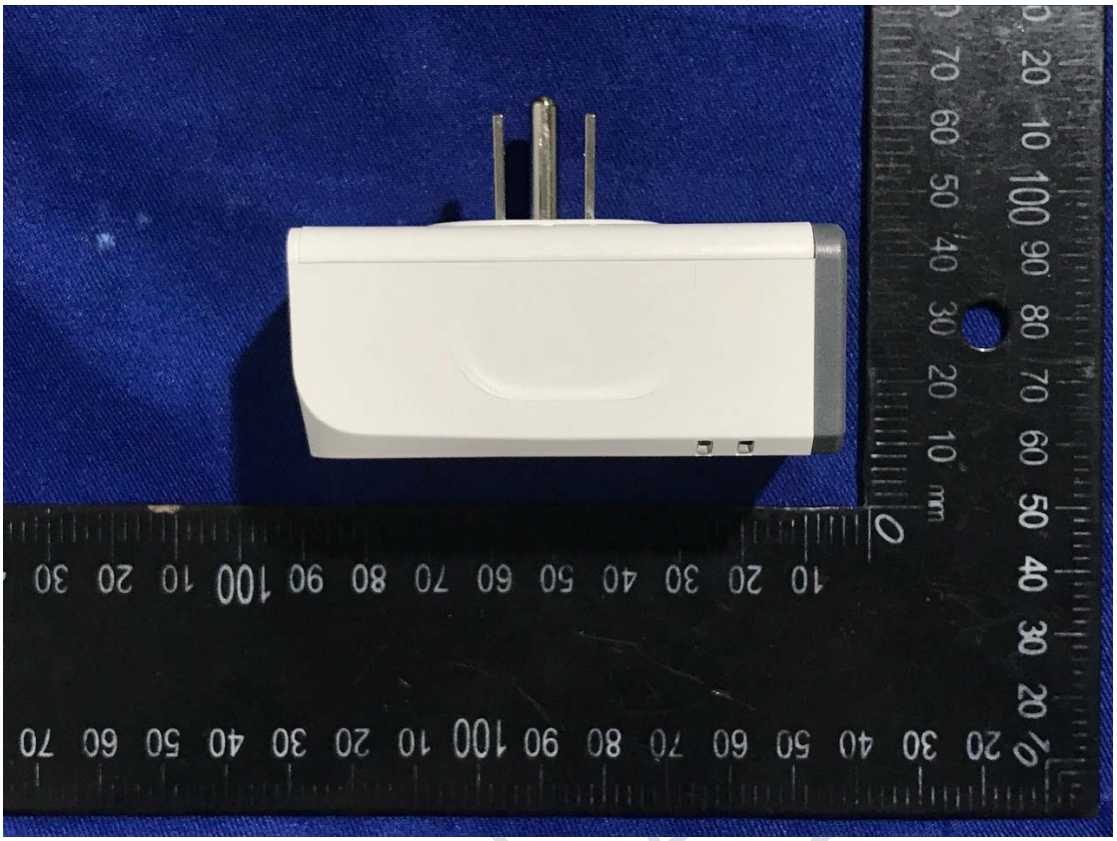
EXHIBIT A – EUT PHOTOGRAPHS

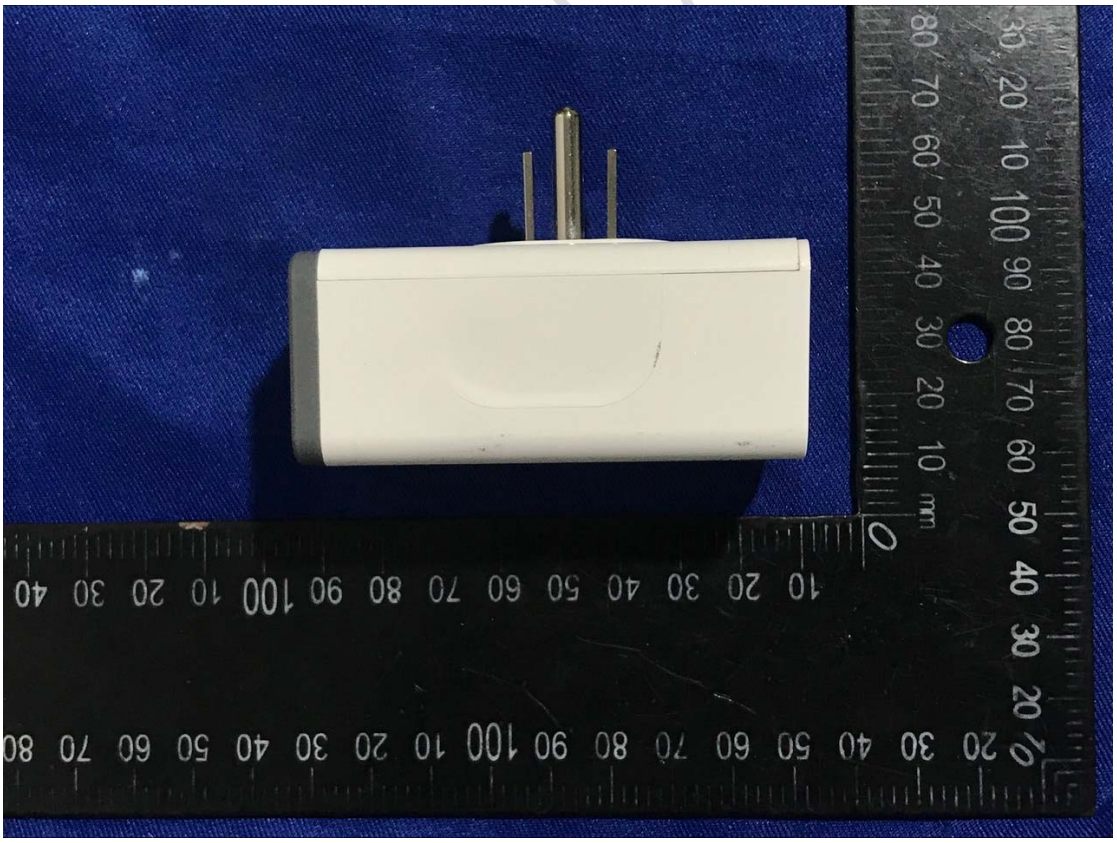
EUT1_top



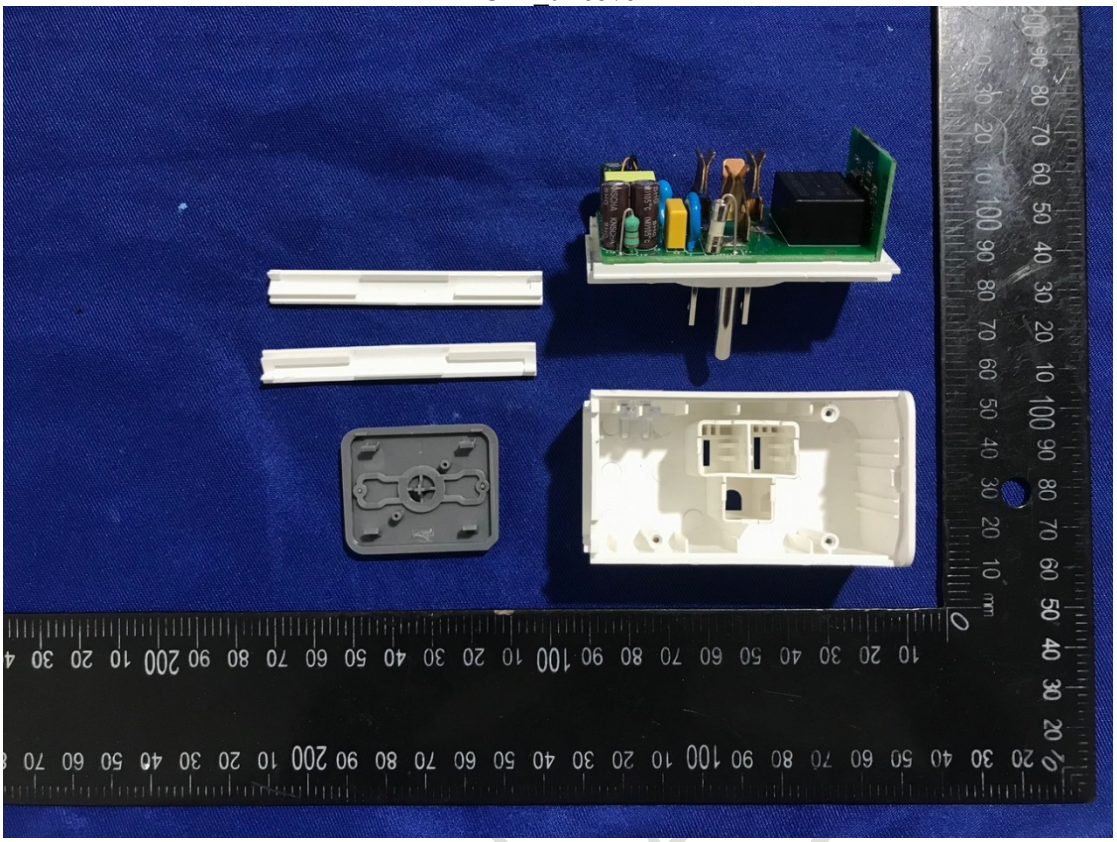
bottom

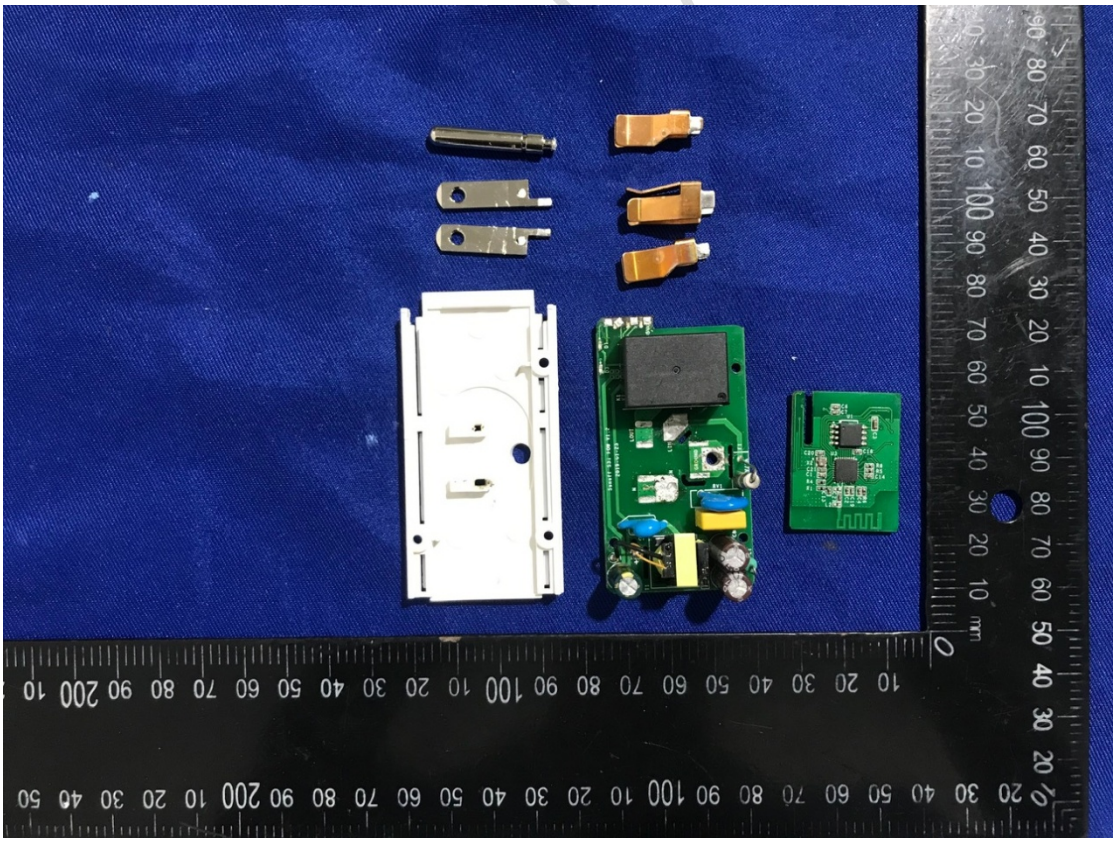


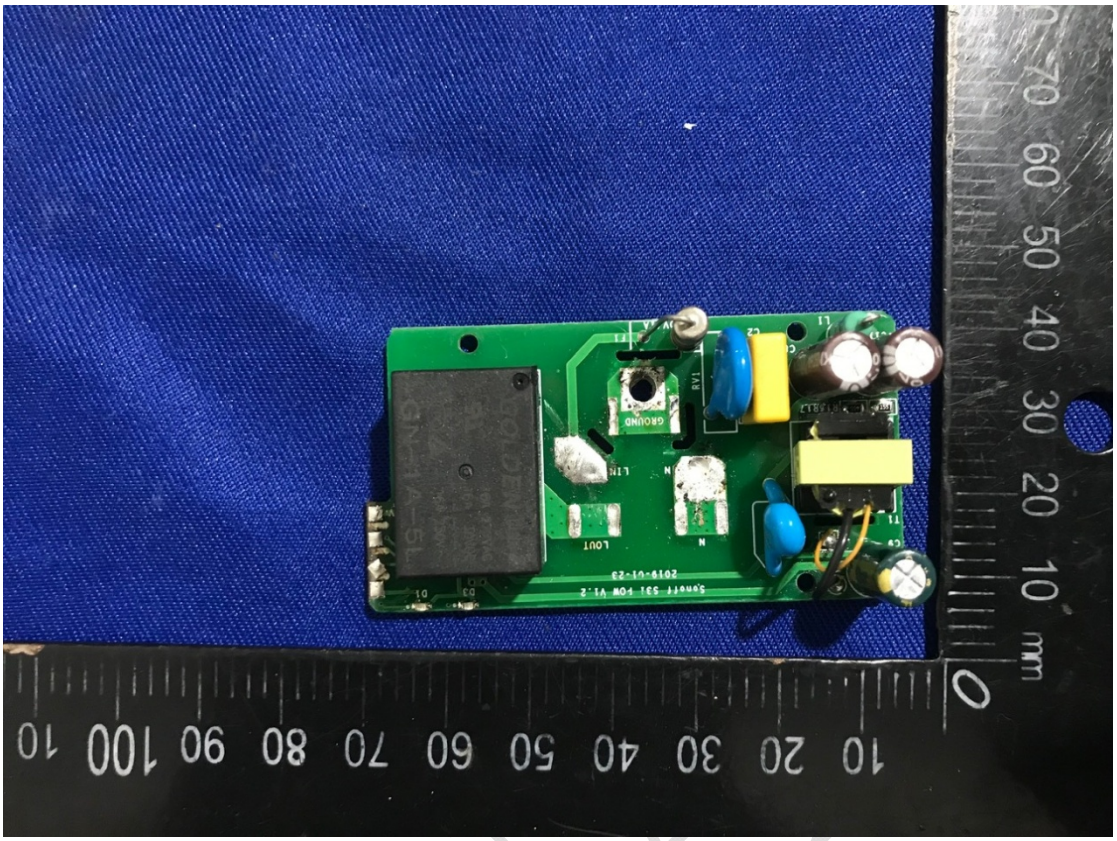


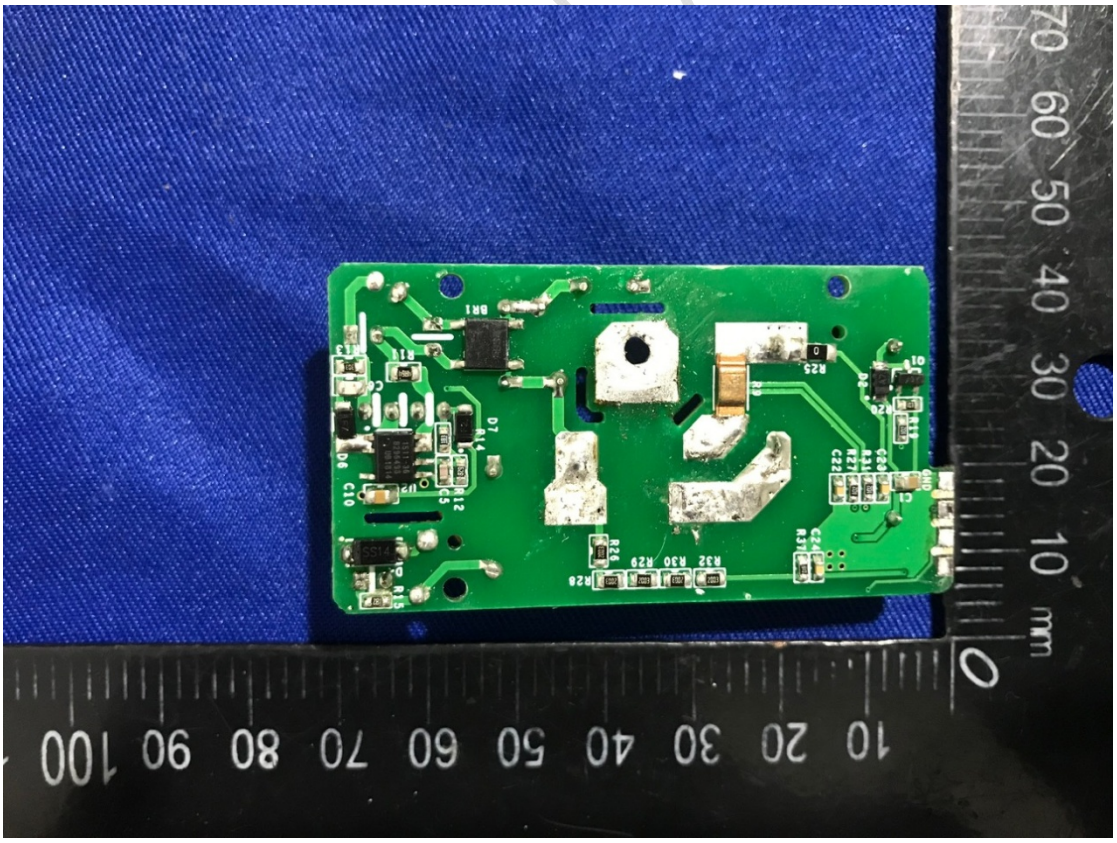


EUTI_uncover

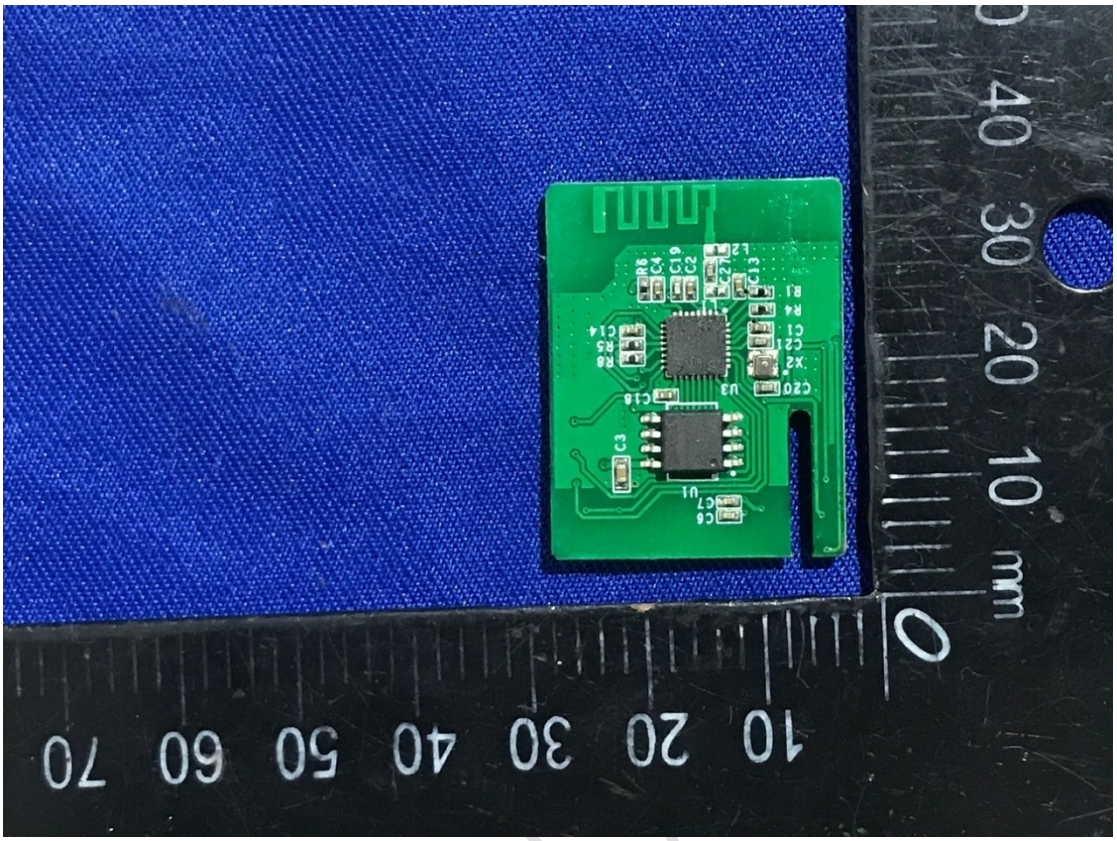


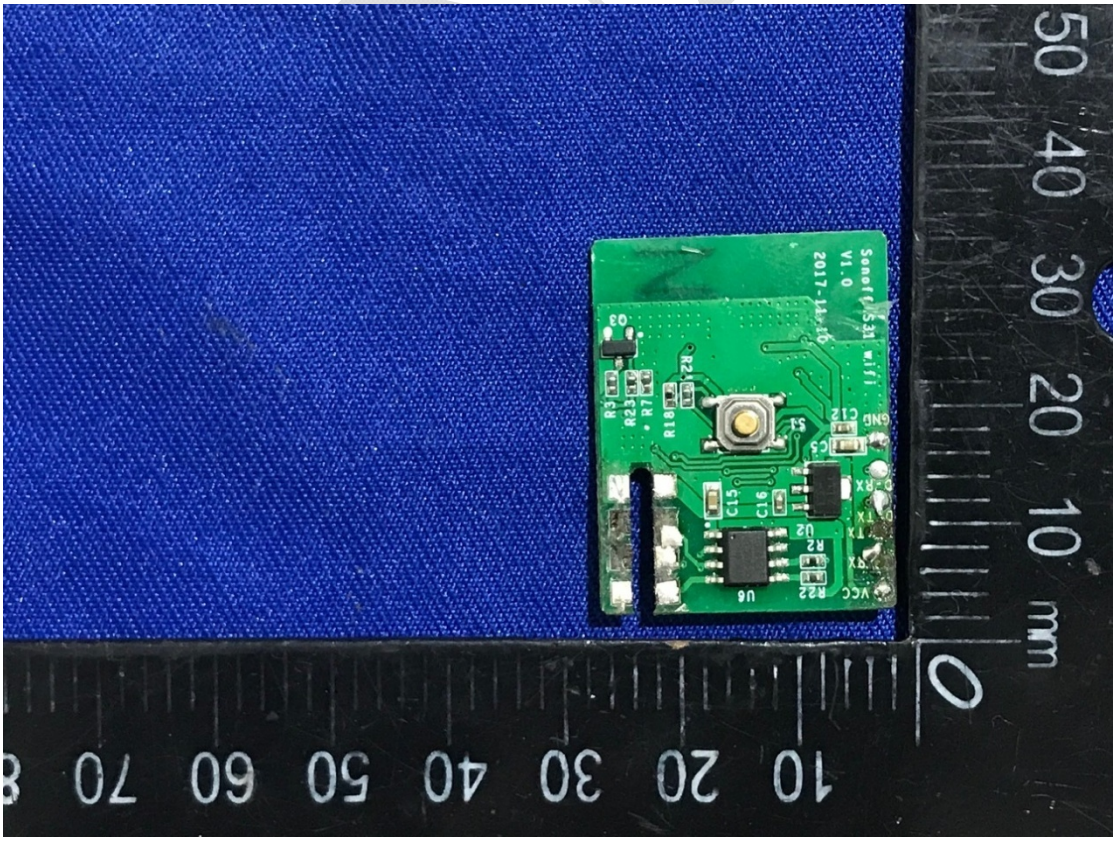




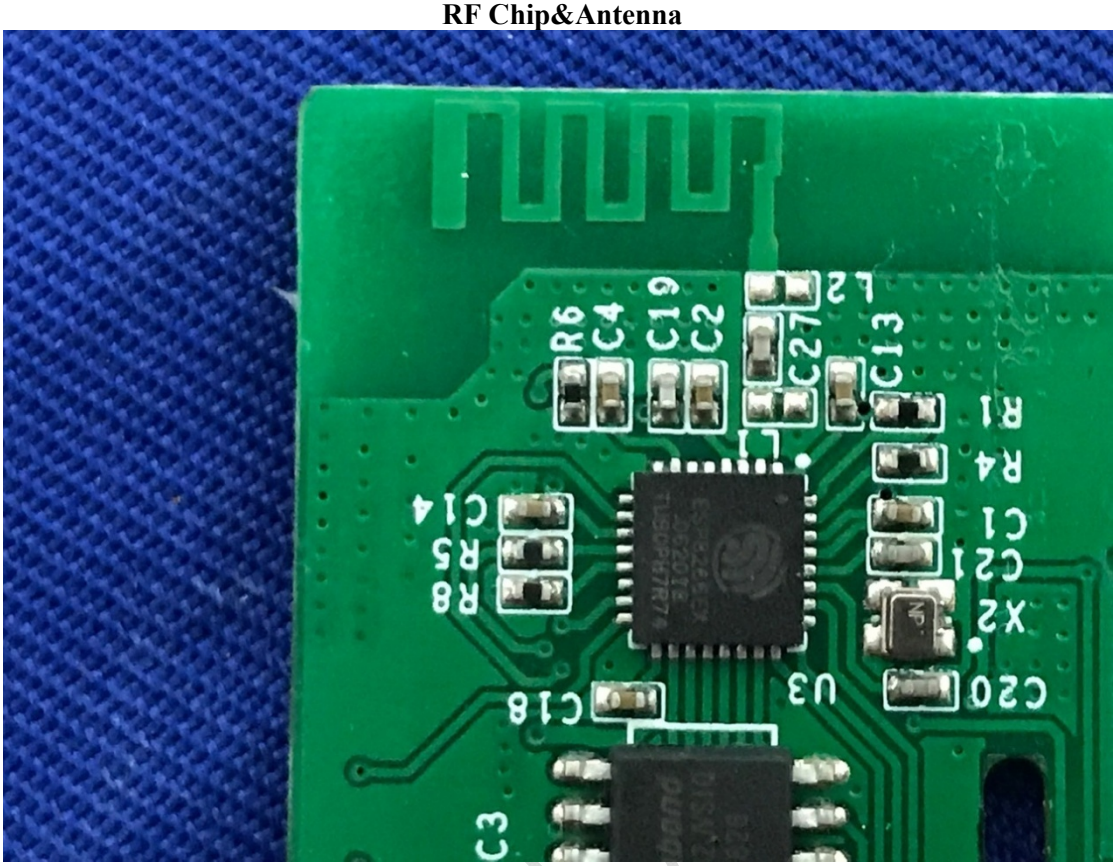


RF board

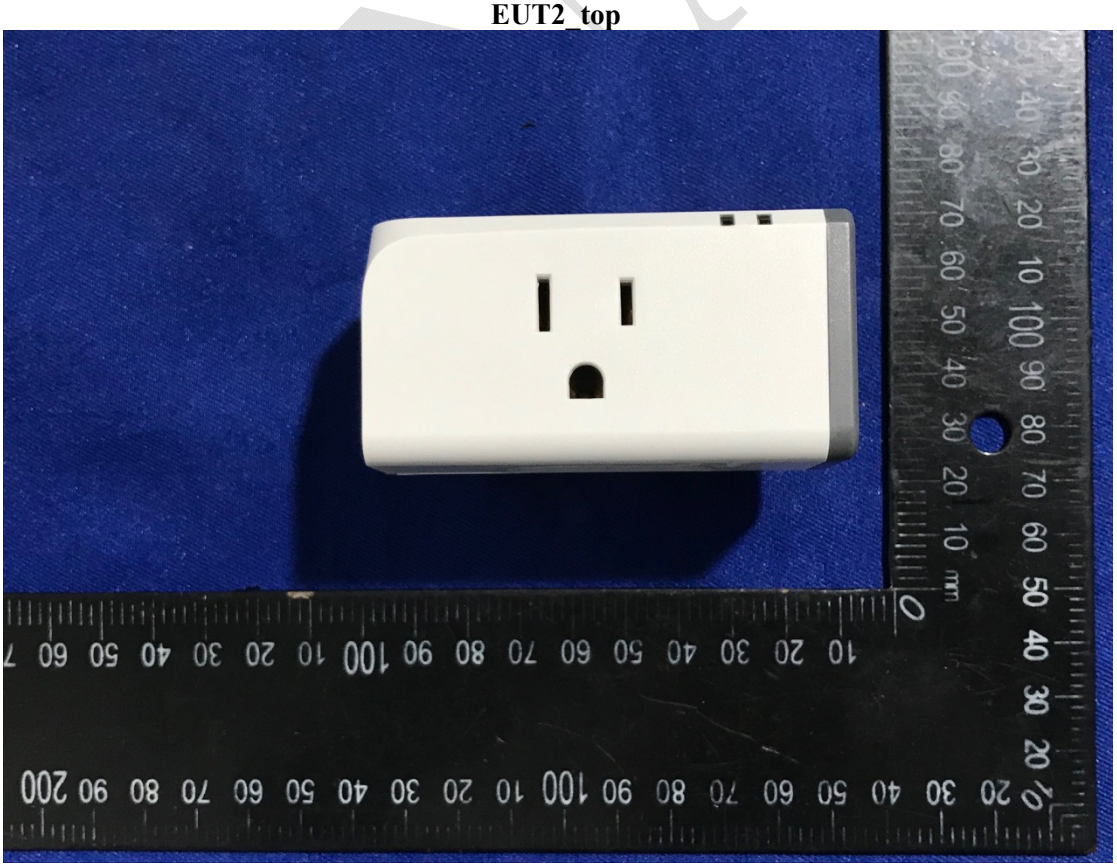




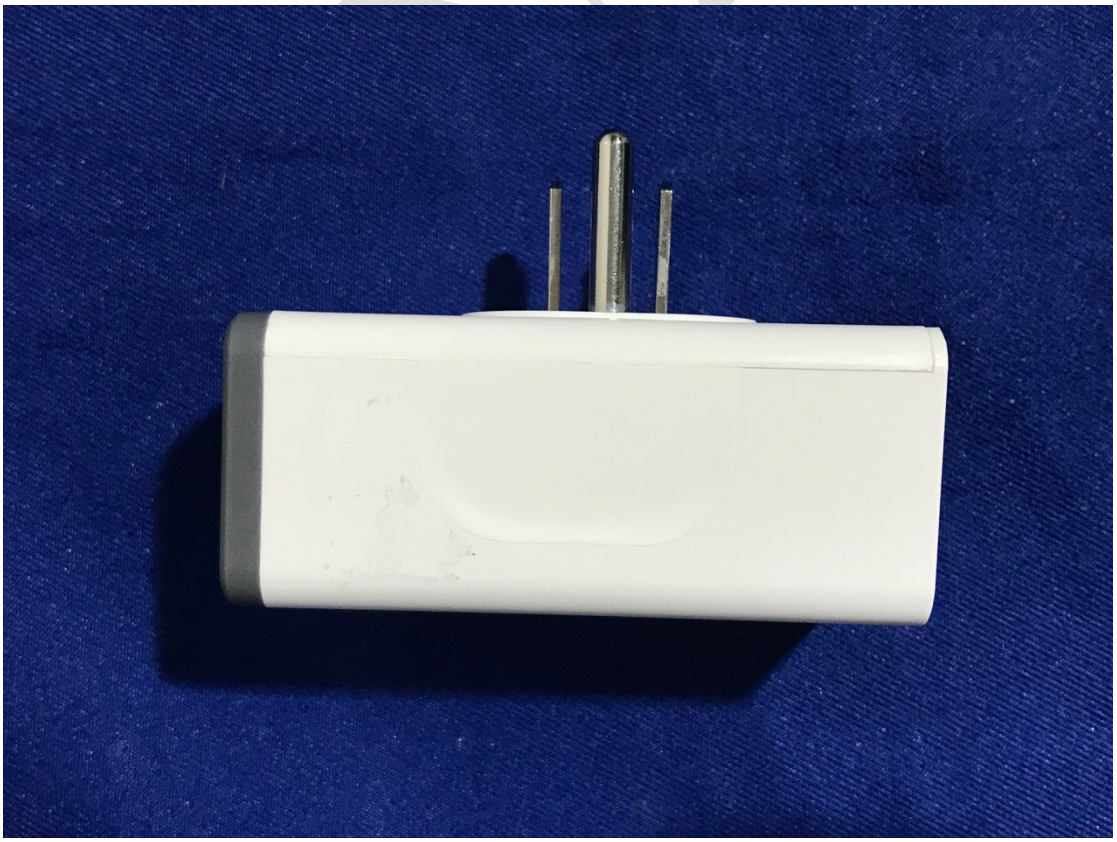
RF Chip&Antenna

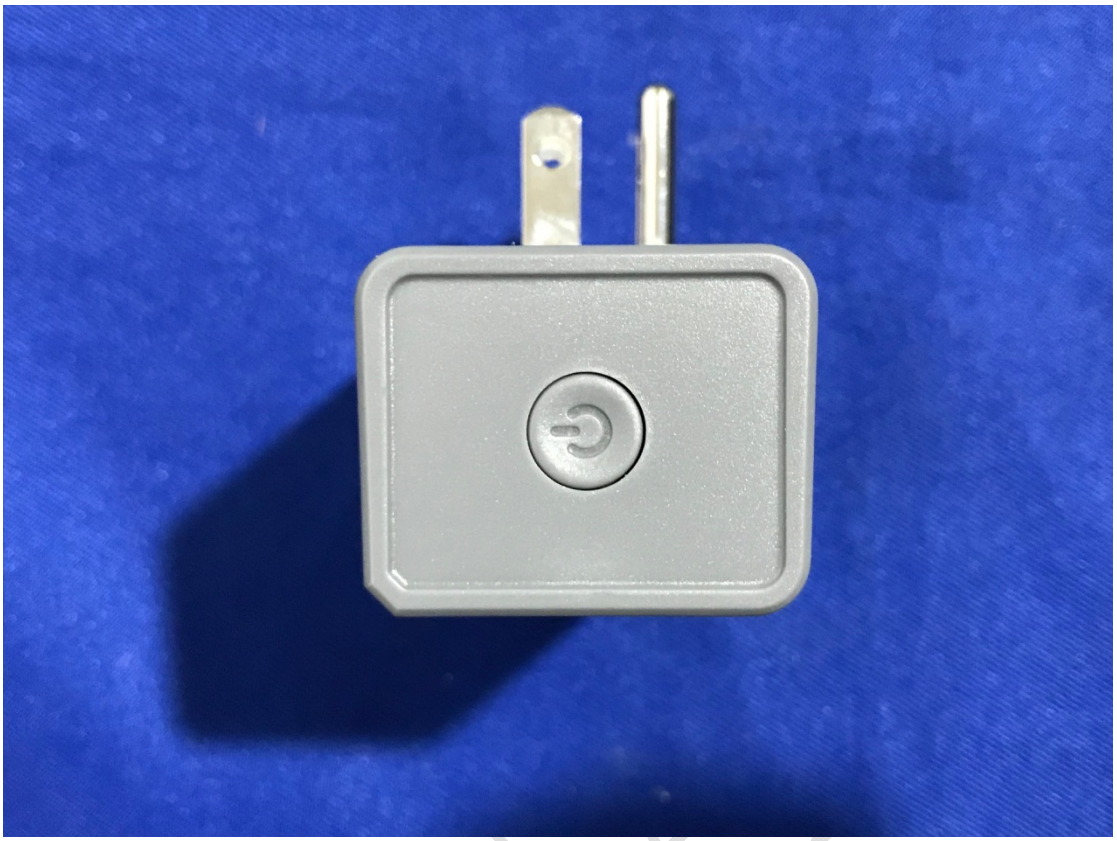


EUT2_top

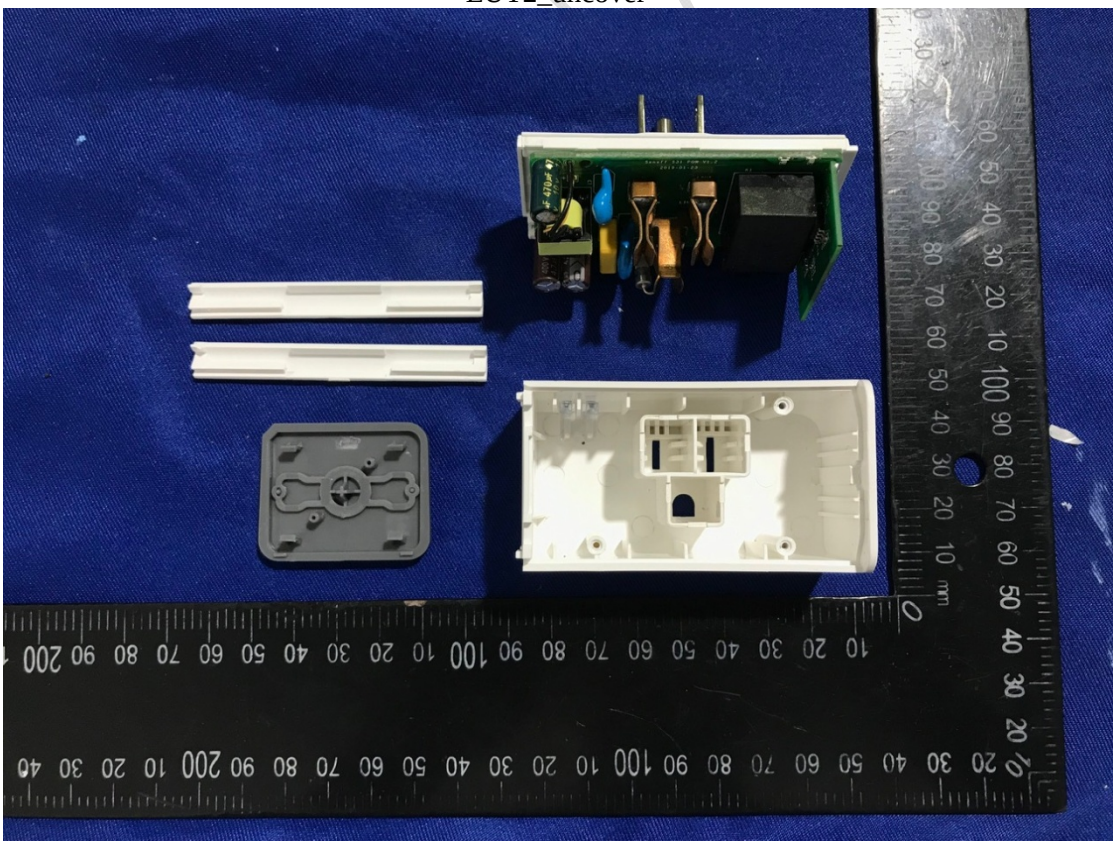


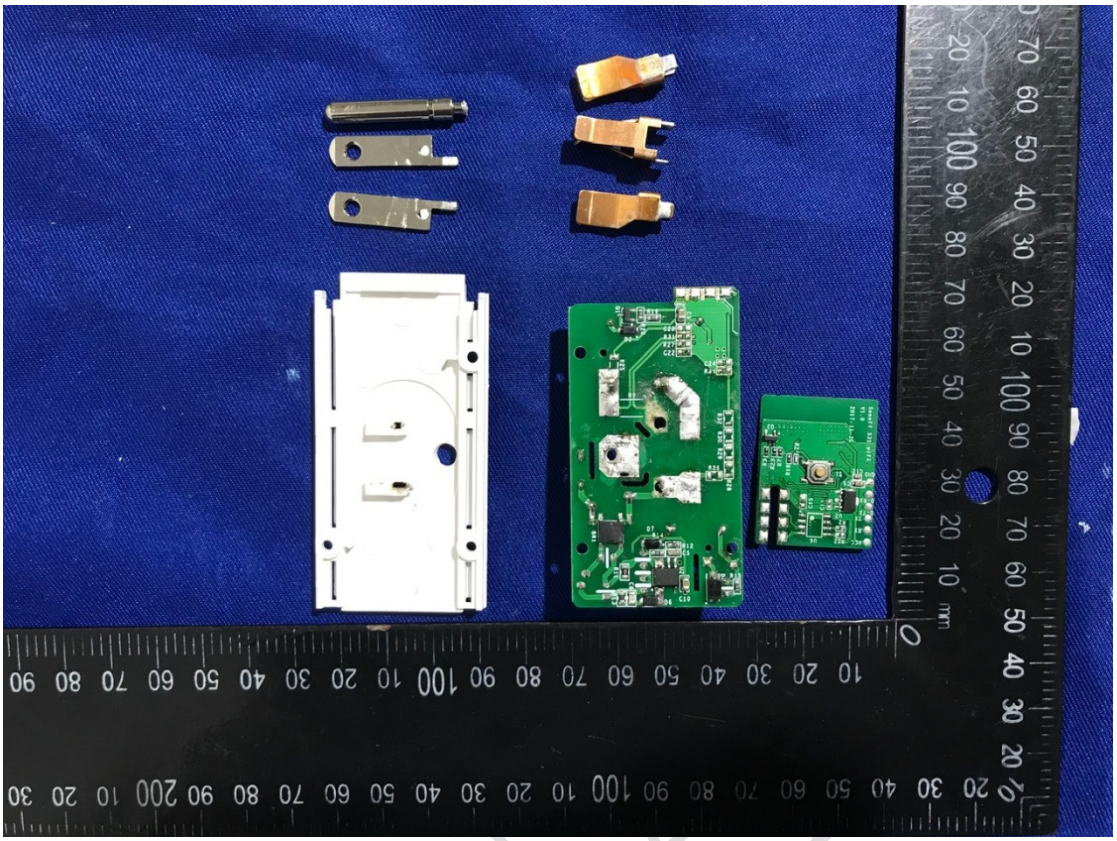
EUT2_bottom

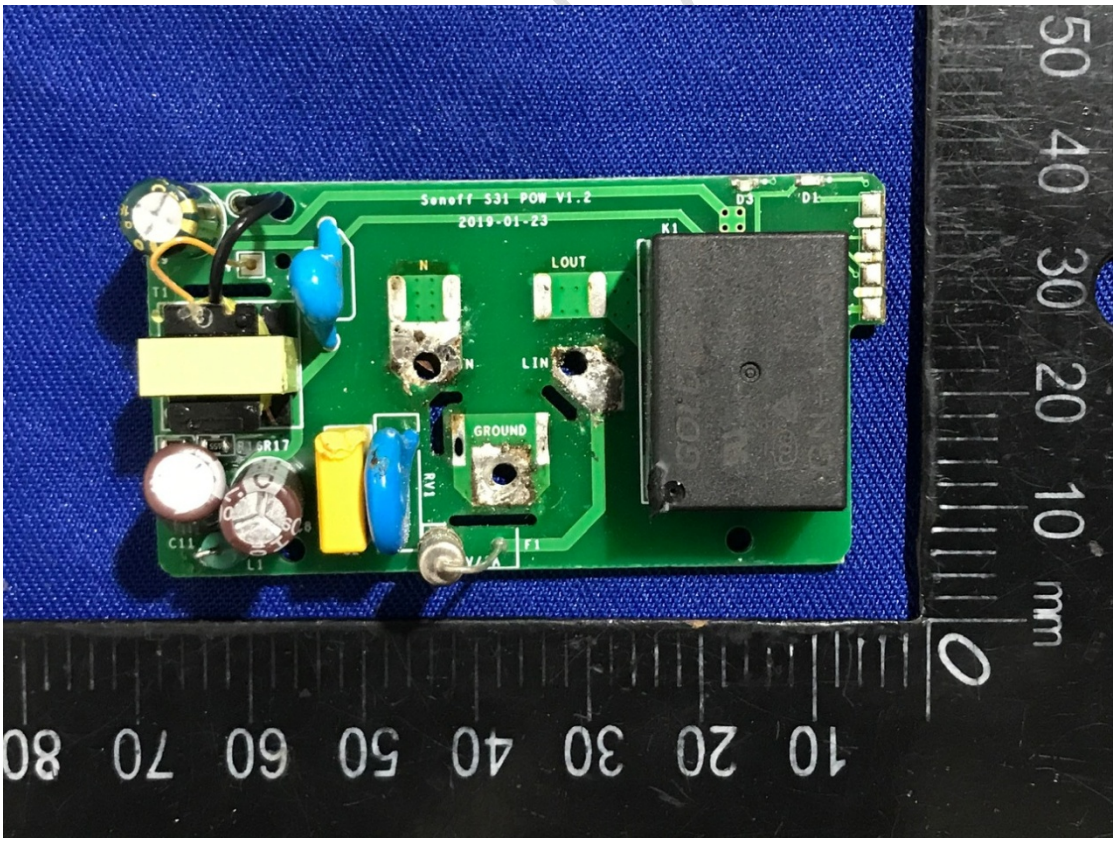


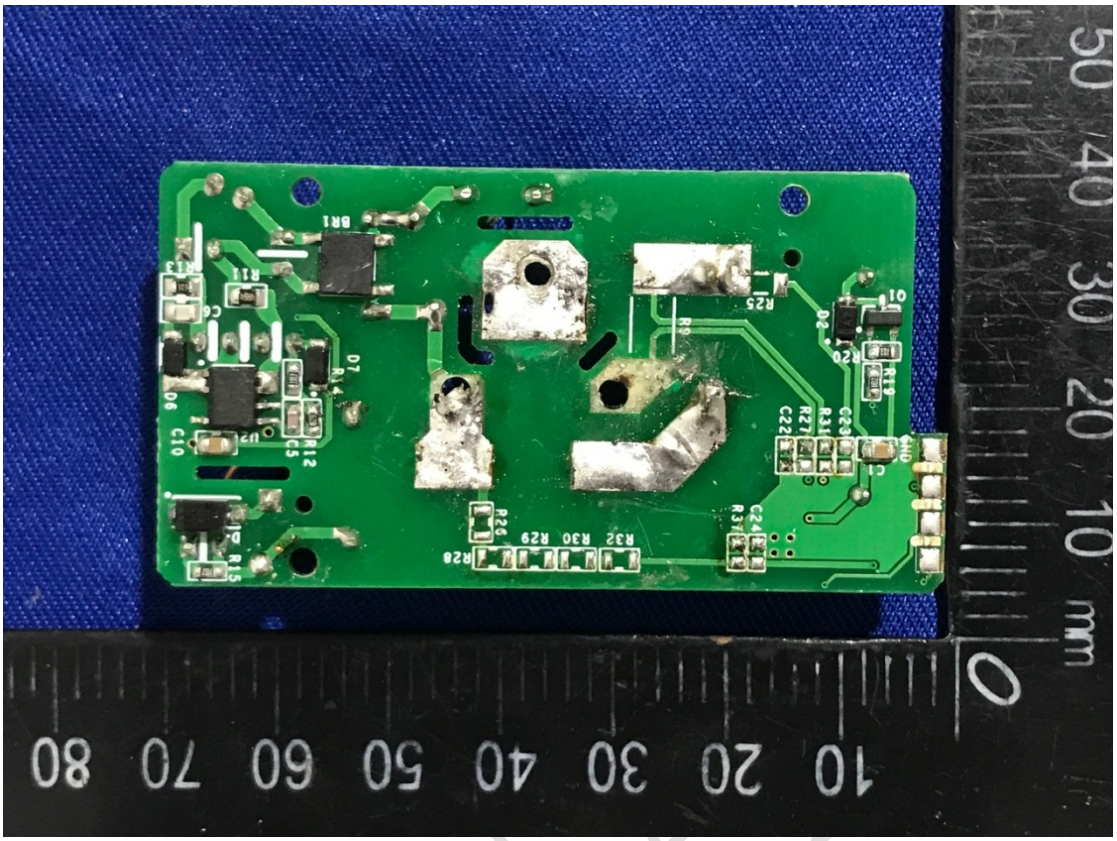


EUT2_uncover

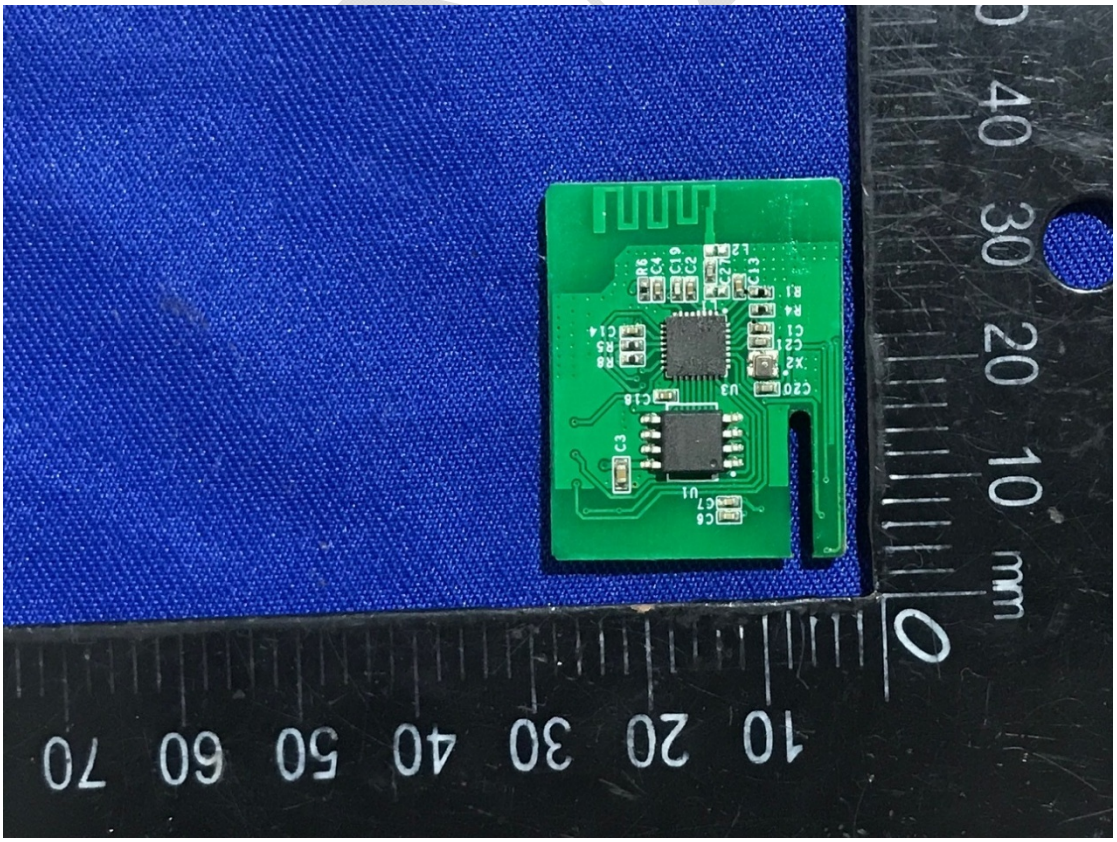





Sonoff 531 POW V1.2
2019-01-23
N
LOUT
N
LIN
GROUND
K1
D3
D1
C11
F1



RF board



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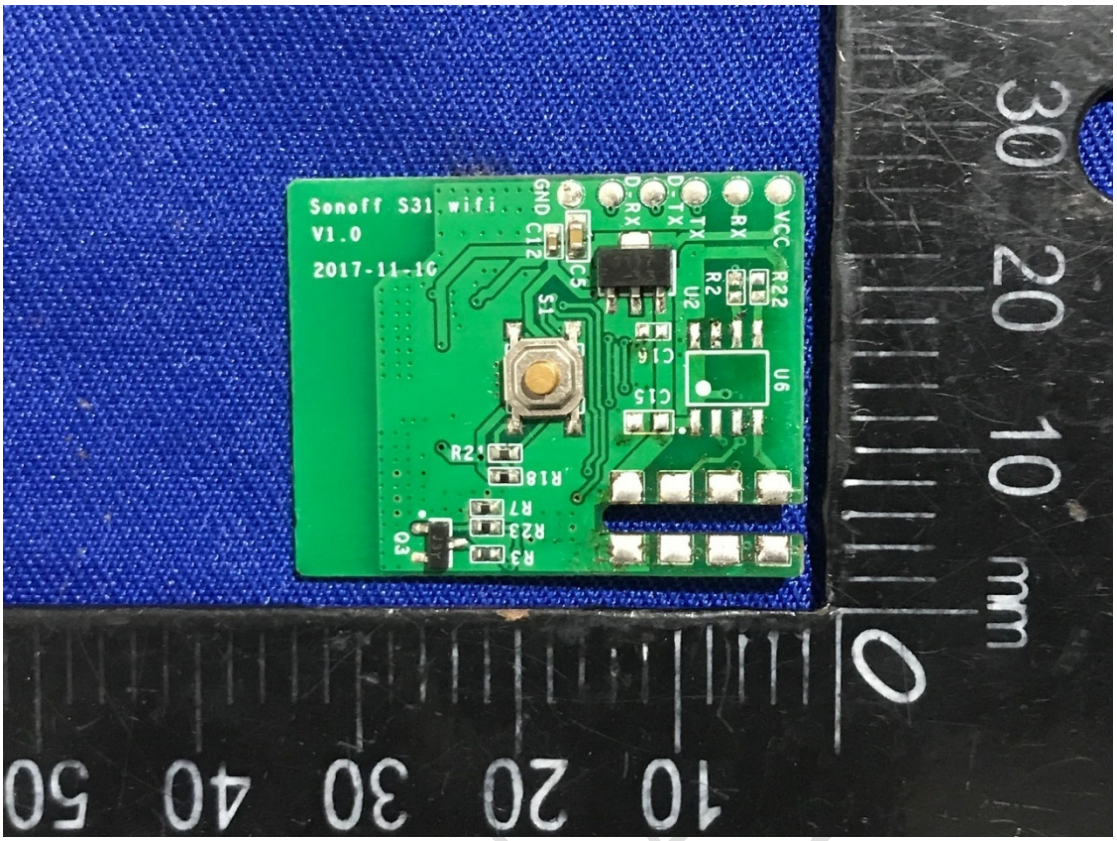
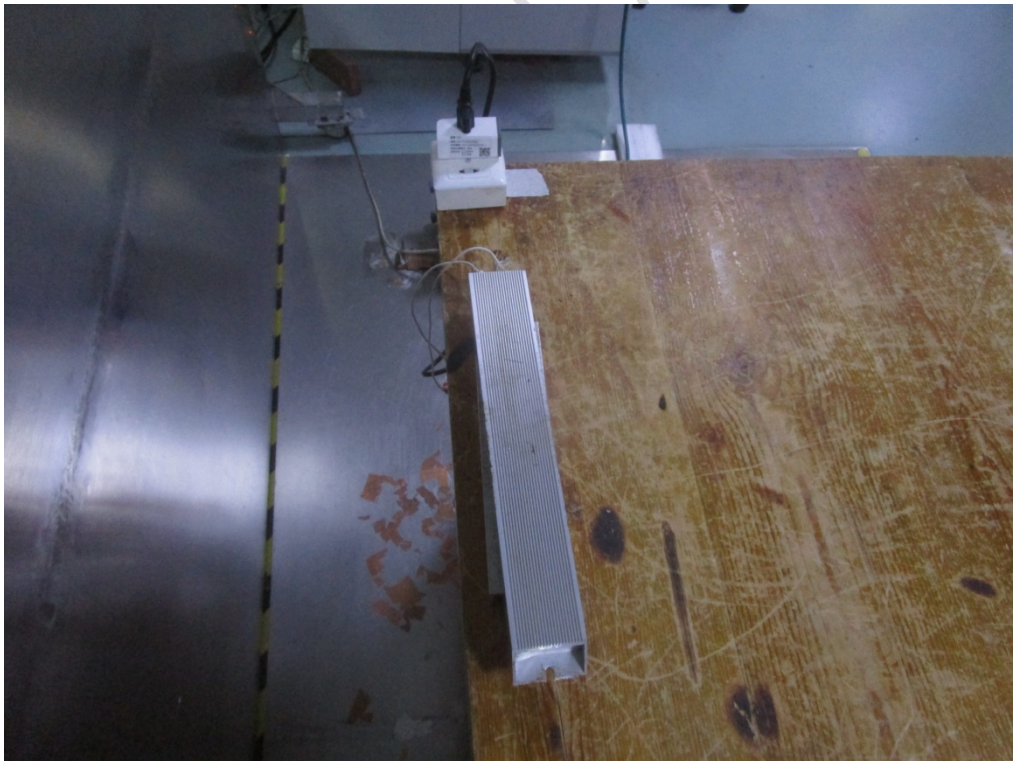

Sonoff S31 wifi
V1.0
2017-11-16
GND
RX
TX
VCC
R22
R2
U2
U6
C12
C5
S1
C16
C15
R2
R18
R7
R23
R3
Q3
30 20 10 mm 0
10 20 30 40 50

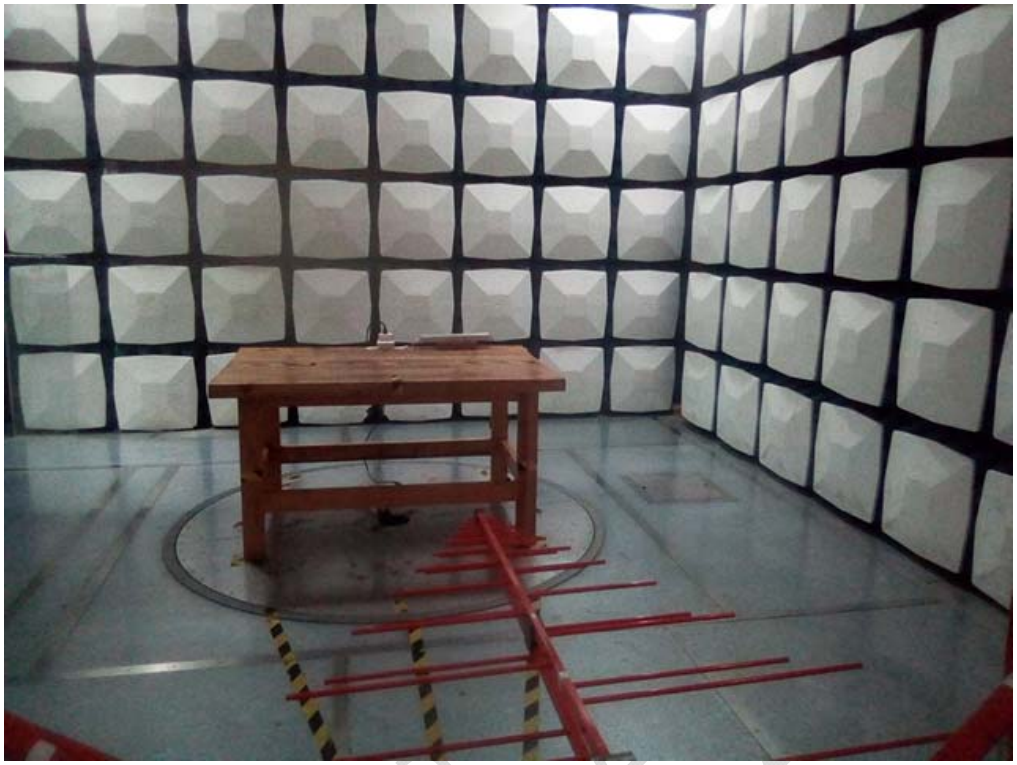
EXHIBIT B – TEST SETUP PHOTOGRAPHS

CE Front View

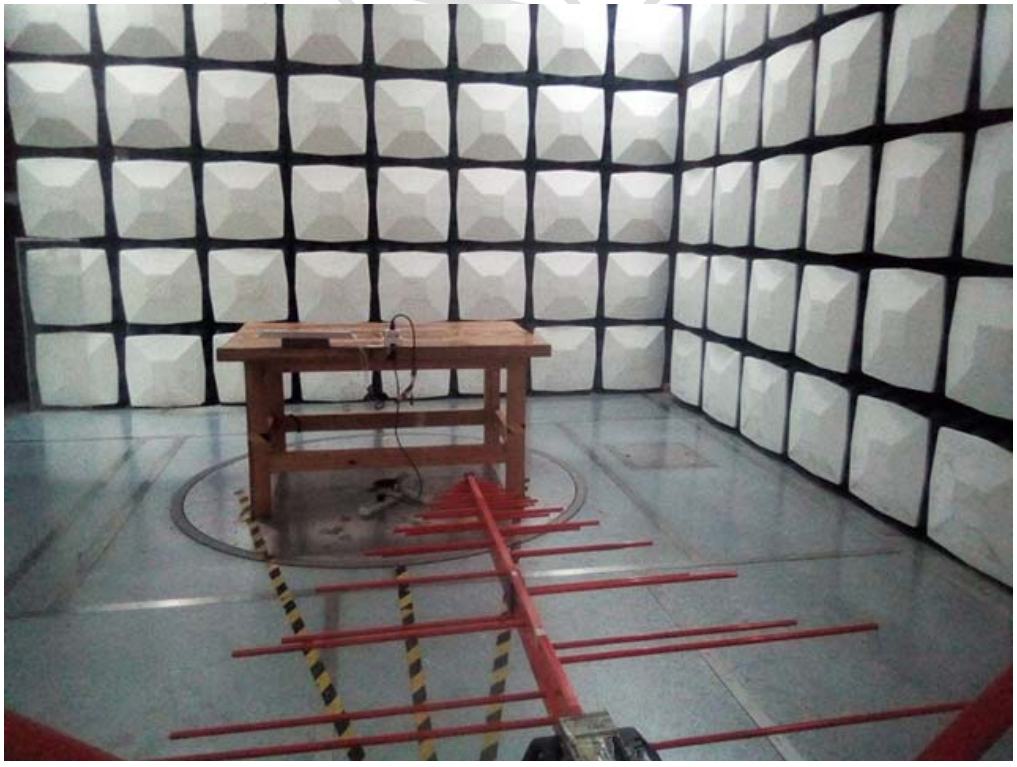
CE Side View



RE Below 1G front View



RE Below 1G rear View



RE Above 1G front View

RE Above 1G rear View

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