

ETSI EN 301 489-1 V2.2.3 (2019-11)
ETSI EN 301 489-17 V3.2.0 (2017-03)

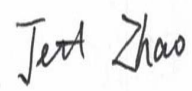

TEST REPORT

For

Shanghai High-Flying Electronics Technology Co., Ltd

Room 1002, Building 1, No.3000, Longdong Avenue, Pudong New Area, Shanghai, China

Tested Model: Elfin-EW11

Report Type: Original Report	Product Type: Elfin-EW11
Test Engineer:	Jett Zhao 
Report Number:	RSHD200303002-02
Report Date:	2020-03-24
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TABLE OF CONTENTS

GENERAL INFORMATION.....	3
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	3
OBJECTIVE	3
TEST METHODOLOGY	3
TEST FACILITY	3
SYSTEM TEST CONFIGURATION.....	4
DESCRIPTION OF TEST CONFIGURATION	4
EUT EXERCISE SOFTWARE	4
EQUIPMENT MODIFICATIONS	4
SUPPORT EQUIPMENT LIST AND DETAILS	4
EXTERNAL I/O CABLE.....	4
CONFIGURATION OF RADIATION TEST SETUP	5
SUMMARY OF TEST RESULTS	6
§8.2 - RADIATED EMISSIONS	7
MEASUREMENT UNCERTAINTY	7
TEST SYSTEM SETUP	7
EMI TEST RECEIVER SETUP.....	9
TEST EQUIPMENT LIST AND DETAILS.....	9
TEST PROCEDURE	10
CORRECTED AMPLITUDE & MARGIN CALCULATION	10
TEST DATA	10
§9.3 - ELECTROSTATIC DISCHARGE.....	13
MEASUREMENT UNCERTAINTY	13
TEST EQUIPMENT	13
TEST SYSTEM SETUP	13
TEST STANDARD	14
TEST PROCEDURE	14
TEST DATA	15
§9.2 -RF ELECTROMAGNETIC FIELD (80 MHz - 6000MHz).....	18
MEASUREMENT UNCERTAINTY	18
TEST EQUIPMENT	18
TEST SYSTEM SETUP	18
TEST STANDARD	19
TEST PROCEDURE	19
TEST DATA	19
EXHIBIT A - EUT PHOTOGRAPHS.....	21
EXHIBIT B – TEST SETUP PHOTOGRAPHS.....	29
RADIATED EMISSIONS - FRONT VIEW (BELOW 1GHz).....	29
RADIATED EMISSIONS - REAR VIEW (BELOW 1GHz).....	29
RADIATED EMISSIONS - SIDE VIEW (ABOVE 1GHz)	30
ESD TEST SETUP PHOTO	30
RS TEST SETUP PHOTO (BELOW 1GHz)	31
RS TEST SETUP PHOTO (ABOVE 1GHz).....	31

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant	Shanghai High-Flying Electronics Technology Co., Ltd
Test Model	Elfin-EW11
Product	Elfin-EW11
Highest Operation Frequency	2472MHz
Rate Voltage	DC 5~18V

**All measurement and test data in this report was gathered from production sample serial number: 20200303002.
(Assigned by the BACL. The EUT supplied by the applicant was received on 2020-03-03)*

Objective

This test report is prepared on behalf of *Shanghai High-Flying Electronics Technology Co., Ltd* in accordance with:

ETSI EN 301 489-1 V2.2.3 (2019-11), ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements.

ETSI EN 301489-17 V3.2.0 (2017-03), ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for Broadband Data Transmission Systems.

The objective is to determine compliance with ETSI EN 301489-1 V2.2.3 (2019-11) and ETSI EN 301489-17 V3.2.0 (2017-03).

Test Methodology

All measurements contained in this report were conducted with ETSI EN 301 489-1 V2.2.3 (2019-11).

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the No.248 Chenghu Road, Kunshan, Jiangsu province, China.

Bay Area Compliance Laboratories Corp. (Kunshan) Lab is accredited to ISO/IEC 17025 by A2LA (Lab code: 4323.01) and the FCC designation No. CN1185 under the FCC KDB 974614 D01. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in a typical fashion (as normally used by a typical user)

Test mode: WiFi transmission

EUT Exercise Software

“sscom 5.13.1”.

Equipment Modifications

No modifications were made to the EUT.

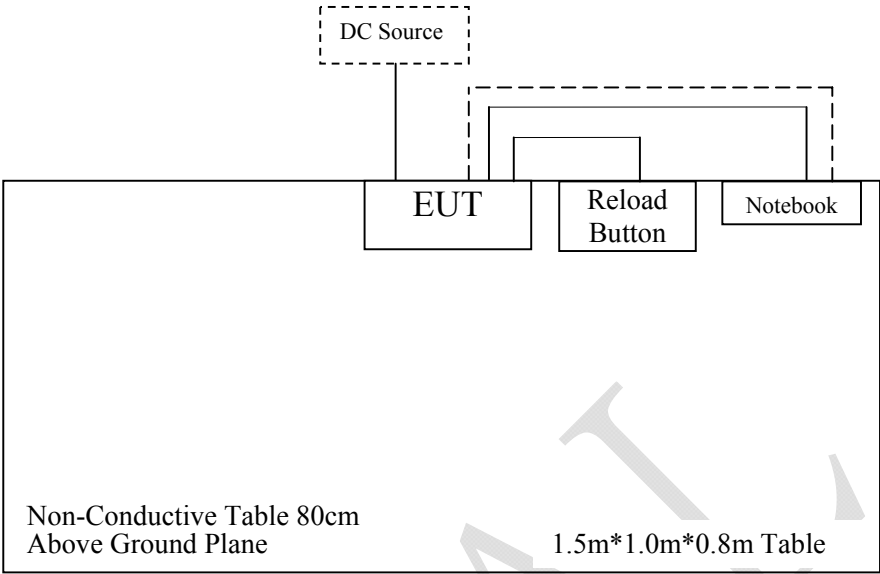
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Hp	Notebook	4441s	2CE3130VWY
BEST	DC Source	PS-1502D+	N/A

External I/O Cable

Cable Description	Length (m)	From/Port	To
Power Cable	1.5	EUT	DC Source
USB Cable	2.6	EUT	Notebook

Configuration of Radiation Test Setup



SUMMARY OF TEST RESULTS

	Description of Test	Result
Reference to clauses EN 301 489-1 §7.1	Reference to clauses EN 301 489-1 §8.2 Enclosure of ancillary equipment measured on a stand alone basis	Compliant
	Reference to clauses EN 301 489-1 §8.3 DC power input/output ports	Not Applicable ¹
	Reference to clauses EN 301 489-1 §8.4 AC mains power input/output ports	Not Applicable ¹
	Reference to clauses EN 301 489-1 §8.5 Harmonic current emissions (AC mains input port)	Not Applicable ¹
	Reference to clauses EN 301 489-1 §8.6 Voltage fluctuations and flicker (AC mains input port)	Not Applicable ¹
	Reference to clauses EN 301 489-1 §8.7 Wired network ports	Not Applicable ²
Reference to clauses EN 301 489-1 §7.2	Reference to clauses EN 301 489-1 §9.3 Electrostatic discharge (EN 61000-4-2)	Compliant
	Reference to clauses EN 301 489-1 §9.2 Radio frequency electromagnetic field (80 MHz to 6000 MHz) (EN 61000-4-3)	Compliant
	Reference to clauses EN 301 489-1 §9.4 Fast transients, common mode (EN 61000-4-4)	Not Applicable ¹
	Reference to clauses EN 301 489-1 §9.8 Surges (EN 61000-4-5)	Not Applicable ¹
	Reference to clauses EN 301 489-1 §9.5 Radio frequency, common mode (EN 61000-4-6)	Not Applicable ¹
	Reference to clauses EN 301 489-1 §9.7 Voltage dips and interruptions (EN 61000-4-11)	Not Applicable ¹
	Reference to clauses EN 301 489-1 §9.6 Transients and surges in the vehicular environment(ISO 7637-2)	Not Applicable*

Note:

Not Applicable¹: The EUT is powered by DC Source.

Not Applicable²: There are no wired network ports.

Not Applicable*: This equipment will not in vehicular environment.

Immunity test performance criteria:

“A “ means : CT/CR Reference to clauses EN 301 489-1 §6.1/EN 301 489-17 §6.3 §6.5

“B” means : TT/TR Reference to clauses EN 301 489-1 §6.2/EN 301 489-17 §6.4 §6.6

§8.2 - RADIATED EMISSIONS

Measurement Uncertainty

Compliance or non-compliance with a disturbance limit shall be determined in the following manner:

If U_{lab} is less than or equal to U_{cispr} of Table 1, then:

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- Non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If U_{lab} is greater than U_{cispr} of Table 1, then:

- compliance is deemed to occur if no measured disturbance level, increased by $(U_{lab} - U_{cispr})$, exceeds the disturbance limit;
- Non-compliance is deemed to occur if any measured disturbance level, increased by $(U_{lab} - U_{cispr})$, exceeds the disturbance limit.

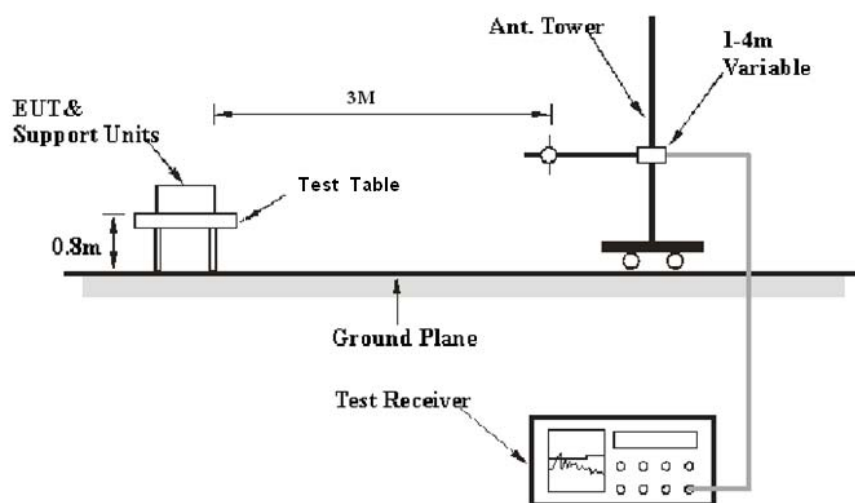
Table 1 – Values of U_{cispr}

Item		Measurement Uncertainty	U_{cispr}
Radiated Emission	30MHz~1GHz	5.91dB	6.3 dB
	1GHz~6GHz	4.68dB	5.2 dB

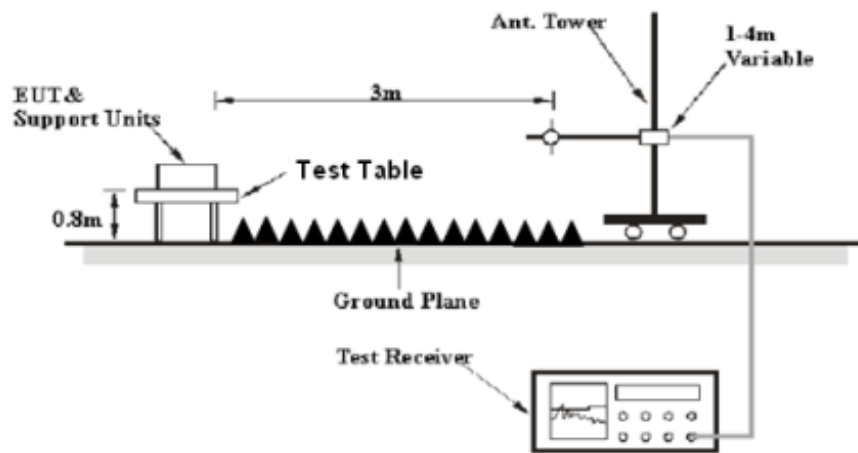
Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

Test System Setup

Below 1GHz:



Above 1GHz:



Radiated Top View:

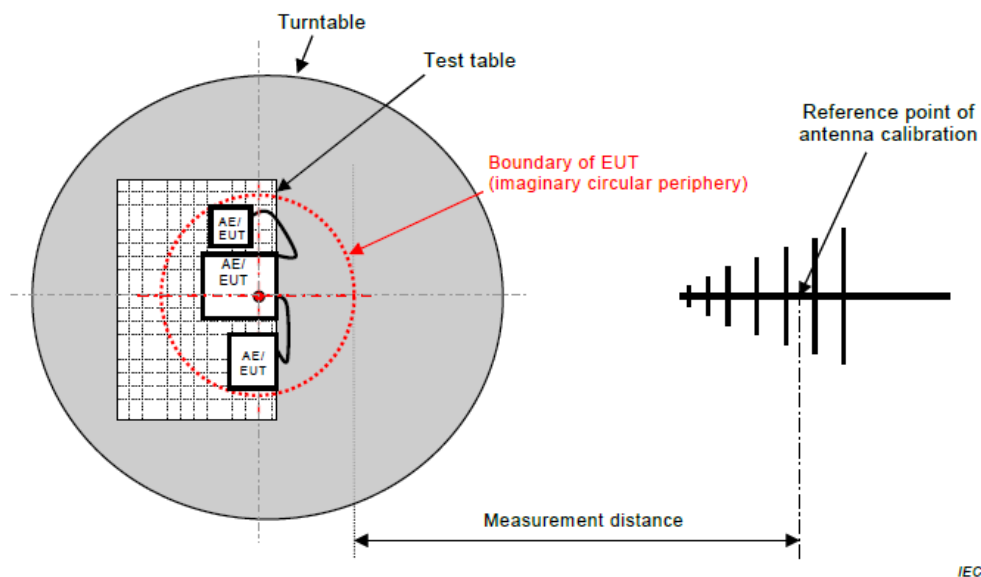


Figure C.1 – Measurement distance

The radiated emission tests were performed in the 3 meters, using the setup accordance with the ETSI EN 301 489-1 V2.2.3 (2019-11). The specification used was the ETSI EN 301 489-1 V2.2.3 (2019-11).

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

The system was investigated from 30 MHz to 6 GHz.

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

Frequency Range	RBW	Video B/W	IF B/W	Detector Type
30MHz – 1000 MHz	120 kHz	300 kHz	120kHz	QP
Above 1 GHz	1MHz	3 MHz	/	Peak
	1MHz	3 MHz	1 MHz	AVG

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Sonoma Instrument	Amplifier	310N	185700	2019-08-14	2020-08-13
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2019-11-30	2020-11-29
Sunol Sciences	Broadband Antenna	JB3	A090413-1	2019-12-26	2022-12-25
Champrotek	Chamber	Chamber A	T-KSEMC049	-	-
Champrotek	Chamber	Chamber B	T-KSEMC080	-	-
R&S	Auto test Software	EMC32	100361	-	-
ETS	Horn Antenna	3115	6229	2019-12-12	2022-12-11
Rohde & Schwarz	EMI Receiver	ESU40	100207	2019-05-30	2020-05-29
A.H.Systems, inc	Amplifier	2641-1	491	2020-03-01	2021-02-28
MICRO-COAX	Coaxial Cable	Cable-8	008	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-9	009	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-10	010	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-4	004	2019-12-12	2020-12-11
MICRO-COAX	Coaxial Cable	Cable-5	005	2019-12-12	2020-12-11

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

Test Procedure

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

All data was recorded in the Quasi-peak detection mode from 30MHz to 1GHz, Peak and average detection mode above 1 GHz.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Corrected Amplitude (dB μ V/m) = Meter Reading (dB μ V) + Antenna Factor (dB/m) + Cable Loss (dB) - Amplifier Gain (dB)

The “**Margin**” column of the following data tables indicates the degree of compliance with 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 (dB) = Limit (dB μ V/m) – Corrected Amplitude (dB μ V/m)

Test Data

Environmental Conditions

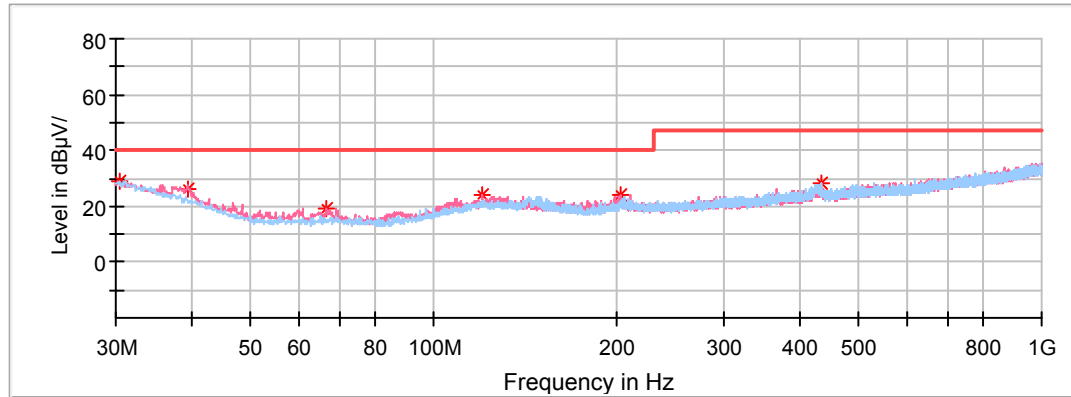
Temperature:	23.2°C
Relative Humidity:	53 %
ATM Pressure:	101.5 kPa

The testing was performed by Jett Zhao on 2020-03-16.

Test mode: WiFi transmission

1) Below 1GHz:

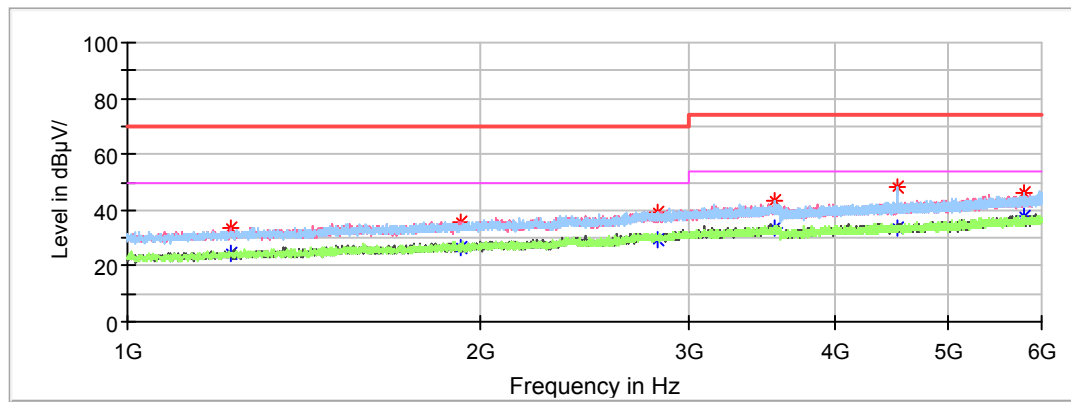
Full Spectrum



Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
30.363750	29.23	40.00	10.77	100.0	H	357.0	-4.2
39.457500	26.41	40.00	13.59	100.0	V	189.0	-10.4
66.617500	19.15	40.00	20.85	200.0	V	89.0	-17.5
120.452500	23.72	40.00	16.28	100.0	V	221.0	-11.2
202.296250	24.39	40.00	15.61	100.0	V	353.0	-12.3
432.792500	28.29	47.00	18.71	200.0	H	278.0	-7.7

Above 1 GHz:

Full Spectrum



Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1222.500000	33.49	---	70.00	36.51	200.0	V	324.0	-11.4
1222.500000	---	24.35	50.00	25.65	200.0	V	324.0	-11.4
1923.500000	35.50	---	70.00	34.50	100.0	V	126.0	-8.5
1923.500000	---	26.55	50.00	23.45	100.0	V	126.0	-8.5
2822.500000	39.30	---	70.00	30.70	200.0	V	284.0	-5.3
2822.500000	---	29.45	50.00	20.55	200.0	V	284.0	-5.3
3559.000000	43.32	---	74.00	30.68	200.0	H	55.0	-3.3
3559.000000	---	33.36	54.00	20.64	200.0	H	55.0	-3.3
4519.500000	---	33.53	54.00	20.47	200.0	H	55.0	-1.0
4519.500000	48.04	---	74.00	25.96	200.0	H	55.0	-1.0
5805.500000	---	37.90	54.00	16.10	100.0	H	97.0	1.9
5805.500000	45.96	---	74.00	28.04	100.0	H	97.0	1.9

§9.3 - ELECTROSTATIC DISCHARGE

Measurement Uncertainty

U_{lab} (measurement uncertainty of lab) and U_{EN} (measurement uncertainty of EN 61000-4-2) please refer to the following:

Parameter	U_{EN}	U_{lab}
Rise time t_r	$\leq 15\%$	15%
Peak current I_p	$\leq 7\%$	6.30%
Current at 30 ns	$\leq 7\%$	6.30%
Current at 60 ns	$\leq 7\%$	6.30%

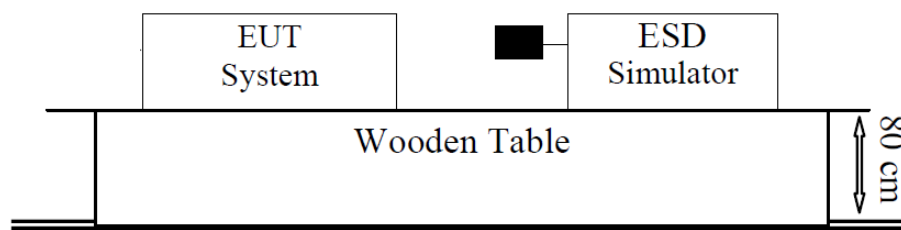
Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

Test Equipment

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
EM Test	ESD Simulator	Dito	V0824103870	2019-12-01	2020-11-30

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

Test System Setup



Remark: ■ is the tip of the electrode

EN 61000-4-2 specifies that a tabletop EUT shall be placed on a non-conducting table which is 80 centimeters above a ground reference plane and that floor mounted equipment shall be placed on an insulating support approximately 10 centimeters above a ground plane. During the tests, the EUT is positioned over a ground reference plane in conformance with this requirement.

For EUTop equipment, a 1.6 by 0.8-meter metal sheet (HCP) is placed on the table and connected to the ground plane via a metal strap with two 470 kOhms resistors in series. The EUT and attached cables are isolated from this metal sheet by 0.5-millimeter thick insulating material. A Vertical Coupling Plane (VCP) grounded on the ground plane through the same configuration as in the HCP is used.

Test Standard

ETSI EN 301 489-1 V2.2.3 (2019-11) / EN 61000-4-2:2009

Test Level 3 for Air Discharge at ± 8 kVTest Level 2 for Contact Discharge at ± 4 kV**Test Level**

Level	Test Voltage Contact Discharge (\pm kV)	Test Voltage Air Discharge (\pm kV)
1.	2	2
2.	4	4
3.	6	8
4.	8	15
X.	Special	Special

Performance criterion: B**Test Procedure****Air Discharge:**

This test is done on a non-conductive surface. The round discharge tip of the discharge electrode shall be approached as fast as possible to touch the EUT. After each discharge, the discharge electrode shall be removed from the EUT. The generator is then re-triggered for a new single discharge and repeated 10 times for each pre-selected test point. This procedure shall be repeated until all the air discharge completed.

Contact Discharge:

All the procedure shall be same as Section 8.3.1 of EN 61000-4-2, except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

Indirect discharge for horizontal coupling plane

At least 50 single discharges shall be applied to the horizontal coupling plane, at points on each side of the EUT. The discharge electrode positions vertically at a distance of 0.1m from the EUT and with the discharge electrode touching the coupling plane.

Indirect discharge for vertical coupling plane

At least 50 single discharges shall be applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m * 0.5m, is placed parallel to, and positioned at a distance of 0.1m from the EUT. Discharges shall be applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.

Test Data**Environmental Conditions**

Temperature:	23.1 °C
Relative Humidity:	53 %
ATM Pressure:	101.7 kPa

The testing was performed by Jett Zhaoon 2020-03-23.

Test mode: WiFi transmission

Table 1: Electrostatic Discharge Immunity (Air Discharge)

EN 61000-4-2 Test Points Location	Test Levels								
	-2 kV	+2 kV	-4 kV	+4 kV	-8 kV	+8 kV	-15 kV	+15kV	X
1~8	A	A	A	A	A	A	/	/	/

Table 2: Electrostatic Discharge Immunity (Contact Discharge)

EN 61000-4-2 Test Points Location	Test Levels								
	-2 kV	+2 kV	-4 kV	+4 kV	-6 kV	+6 kV	-8 kV	+8 kV	X
9	A	A	A	A	/	/	/	/	/

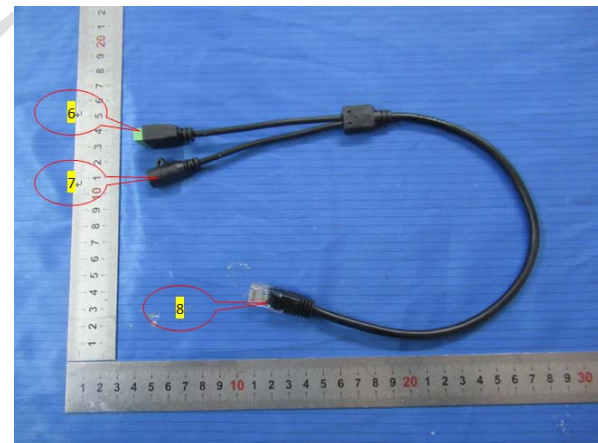
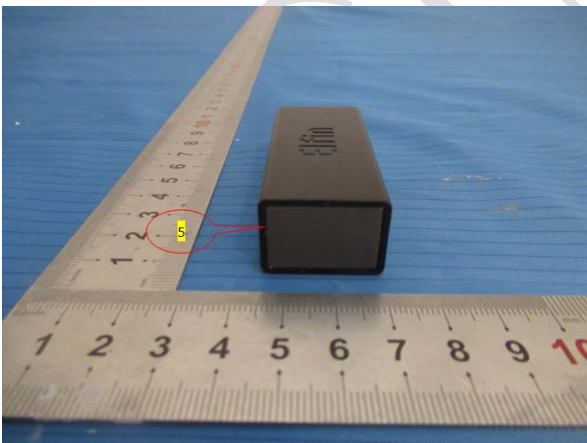
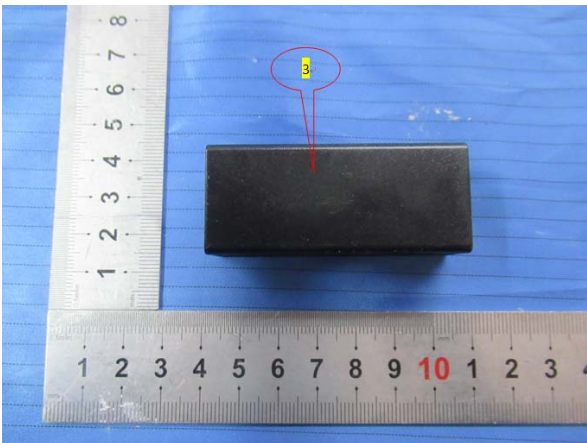
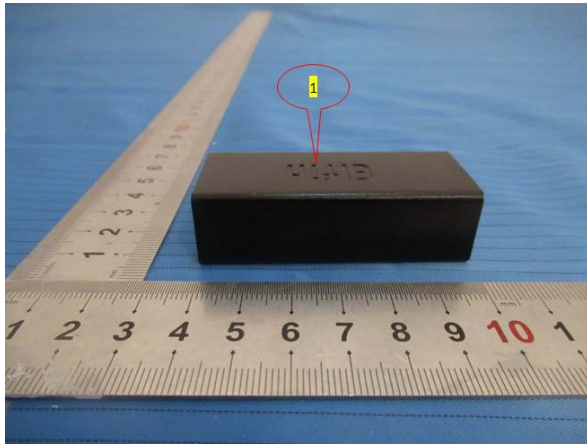
Table 3: Electrostatic Discharge Immunity (Indirect Contact HCP)

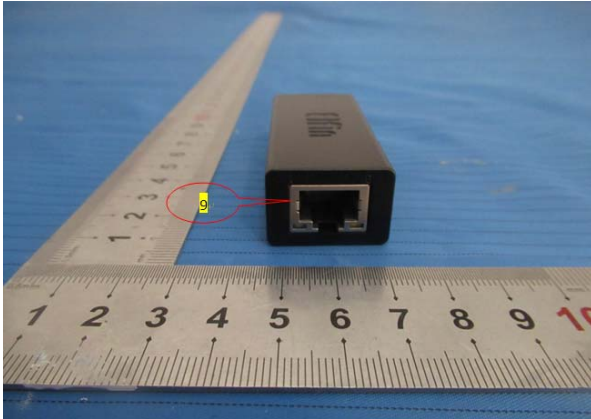
EN 61000-4-2 Test Points Location	Test Levels								
	-2 kV	+2 kV	-4 kV	+4 kV	-6 kV	+6 kV	-8 kV	+8 kV	X
Front Side	A	A	A	A	/	/	/	/	/
Back Side	A	A	A	A	/	/	/	/	/
Left Side	A	A	A	A	/	/	/	/	/
Right Side	A	A	A	A	/	/	/	/	/

Table 4: Electrostatic Discharge Immunity (Indirect Contact VCP)

EN 61000-4-2 Test Points Location	Test Levels								
	-2 kV	+2 kV	-4 kV	+4 kV	-6 kV	+6 kV	-8 kV	+8 kV	X
Front Side	A	A	A	A	/	/	/	/	/
Back Side	A	A	A	A	/	/	/	/	/
Left Side	A	A	A	A	/	/	/	/	/
Right Side	A	A	A	A	/	/	/	/	/

Test point as follows:





Note: “A” stands for, during test, operate as intended no loss of function, no degradation of performance, no unintentional transmissions and after test, no degradation of performance, no loss of function, no loss of stored data or user programmable functions.

§9.2 -RF ELECTROMAGNETIC FIELD (80 MHz - 6000MHz)

Measurement Uncertainty

U_{lab} (measurement uncertainty of lab) and U_{EN} (measurement uncertainty of EN 61000-4-3) please refer to the following:

Parameter	U_{EN}	U_{lab}
Calibration process	1.88 dB	1.88 dB
Level setting	2.19 dB	2.19 dB

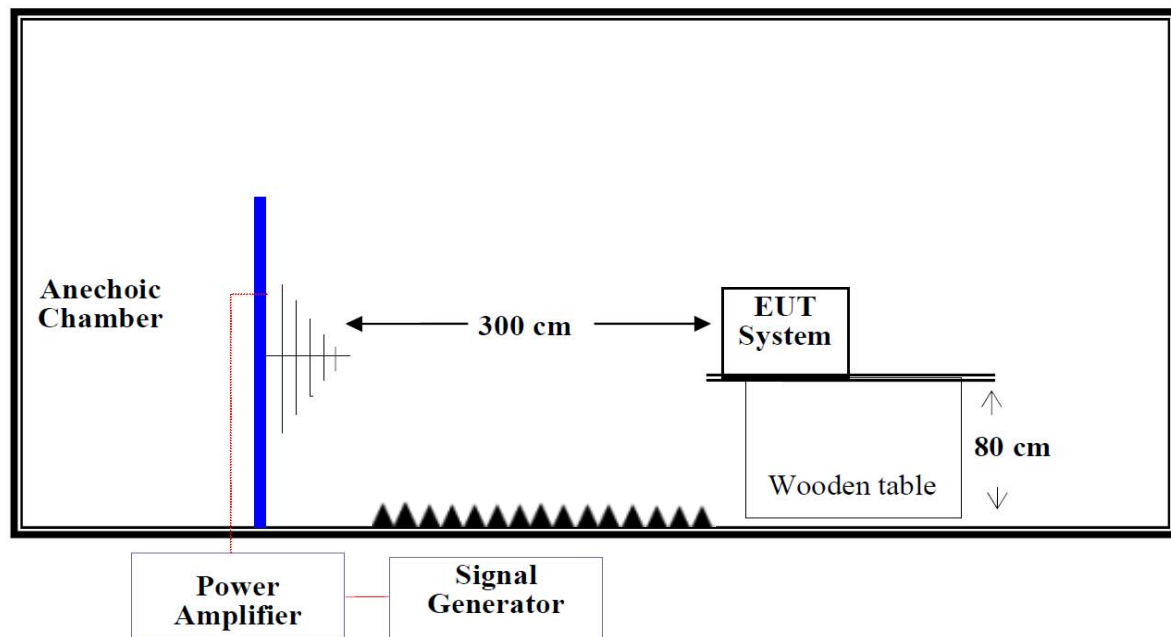
Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

Test Equipment

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	Signal Generator	E4428C	MY49070179	2019-08-05	2020-08-04
A&R	Power Amplifier	60S1G6	0349442	NCR	NCR
Amplifier Research	Power Amplifier	200W1000M3A	18062	NCR	NCR
Ar	Log Periodic Antenna	ATL80M1G	350122	NCR	NCR
Ar	Log Periodic Antenna	ATT700M12G	350307	NCR	NCR

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

Test System Setup



Test Standard

ETSI EN 301 489-1 V2.2.3 (2019-11) / EN 61000-4-3:2006+A1:2008+A2:2010
Test Level 2 at 3V/m
Test Levels and Performance Criterion

Test Level

Level	Field Strength V/m
1.	1
2.	3
3.	10
X.	Special

Performance Criterion: A**Test Procedure**

The EUT and its simulators are placed on a turn table which is 0.8 meter above the ground. The EUT is set 3 meters away from the transmitting antenna which is mounted on an antenna tower. Both horizontal and vertical polarizations of the antenna are set on test. Each of the four sides of EUT must be faced this transmitting antenna and measured individually.

In order to judge the EUT performance, a CCD camera is used to monitor notebook.

All the scanning conditions are as follows:

Condition of Test	Remarks
1. Field Strength	3 V/m (Test Level 2)
2. Radiated Signal	1 kHz, 80% AM, sine wave
3. Scanning Frequency	80 MHz– 6000 MHz
4. Scanning Frequency Step	1%
5. Dwell Time	3 Sec.

Test Data**Environmental Conditions**

Temperature:	22.5 °C
Relative Humidity:	52 %
ATM Pressure:	101.3 kPa

The testing was performed by Jett Zhaoon 2020-03-20.

Test mode: WiFi transmission

Frequency Range (MHz)	Front Side (3 V/m)		Rear Side (3 V/m)		Left Side (3 V/m)		Right Side (3 V/m)	
	VERT	HORI	VERT	HORI	VERT	HORI	VERT	HORI
80-6000	A	A	A	A	A	A	A	A

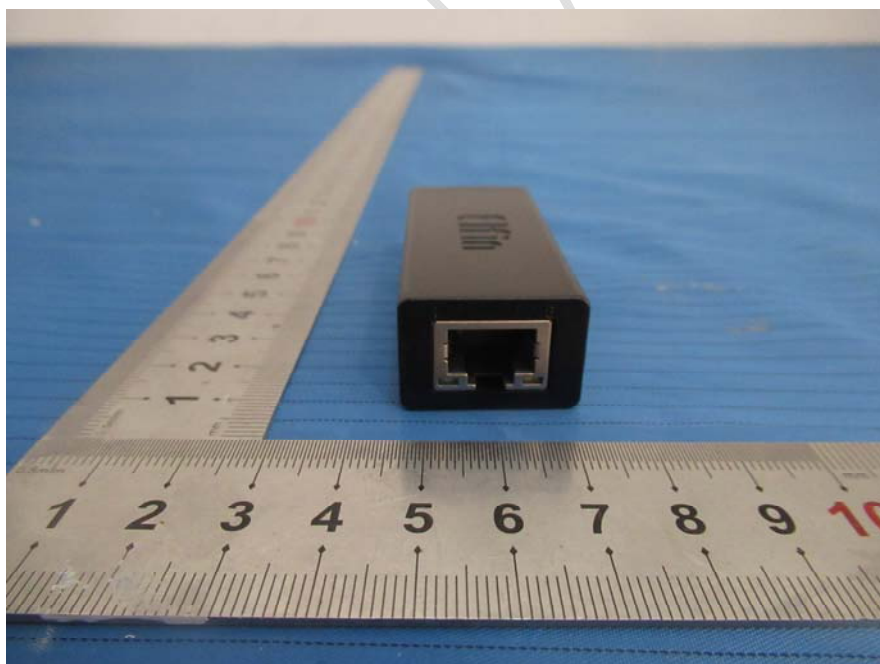
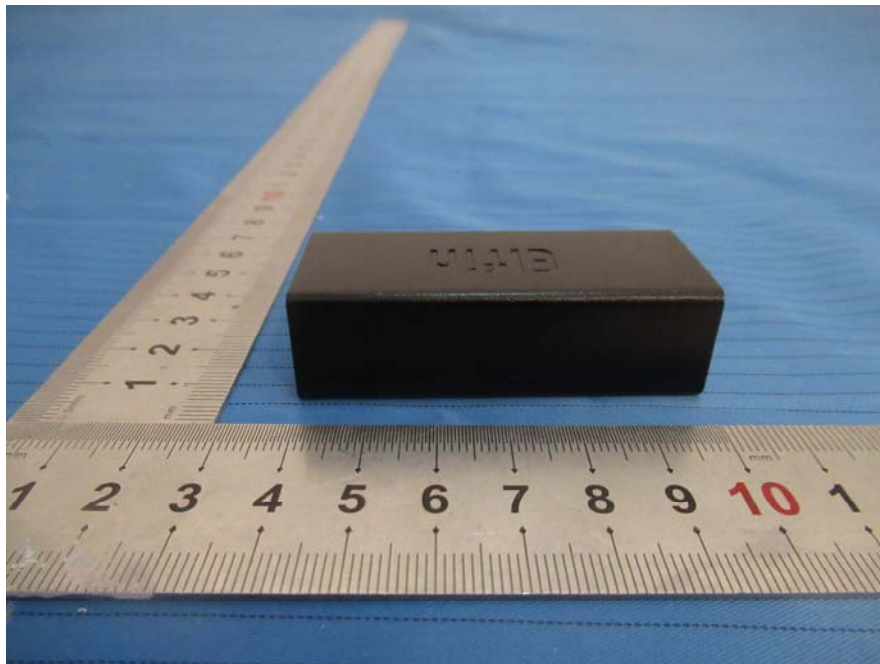
Note:

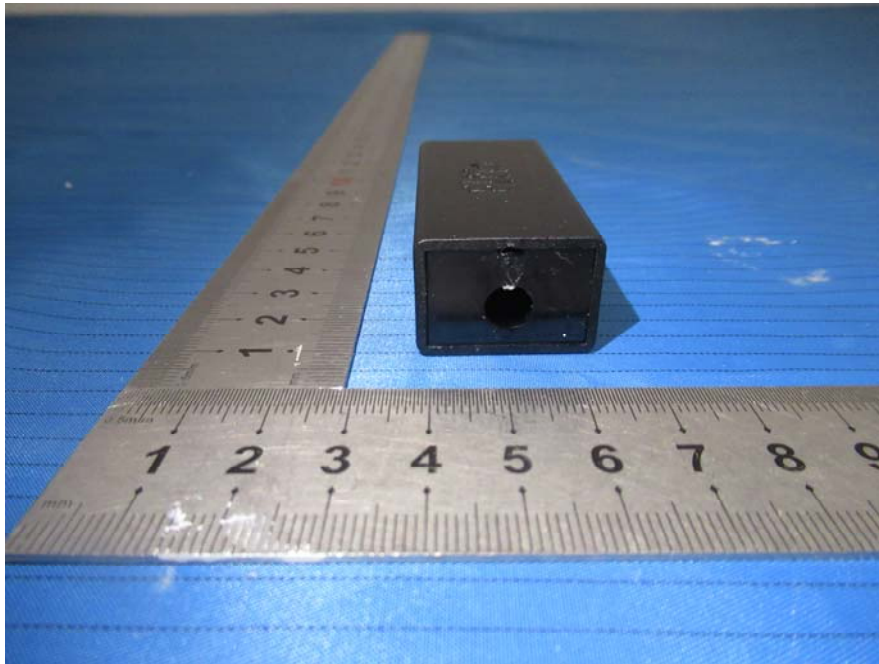
1. “WiFi link” is monitor notebook to connect EUT and monitor the connection state.
2. “A” stand for, during test, operate as intended no loss of function, no degradation of performance, no unintentional transmissions and after test, no degradation of performance, no loss of function, no loss of stored data or user programmable functions.

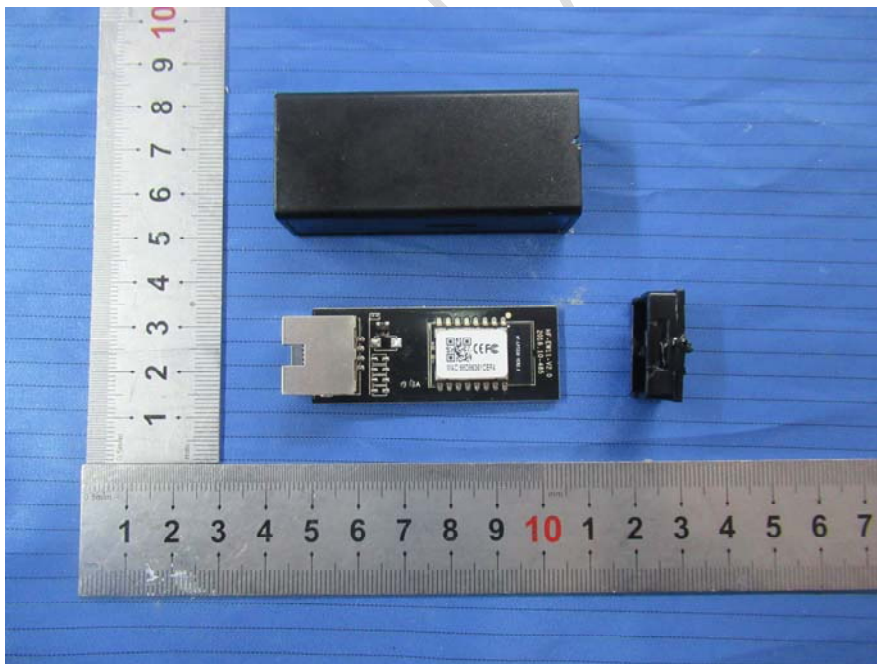
EXHIBIT A - EUT PHOTOGRAPHS

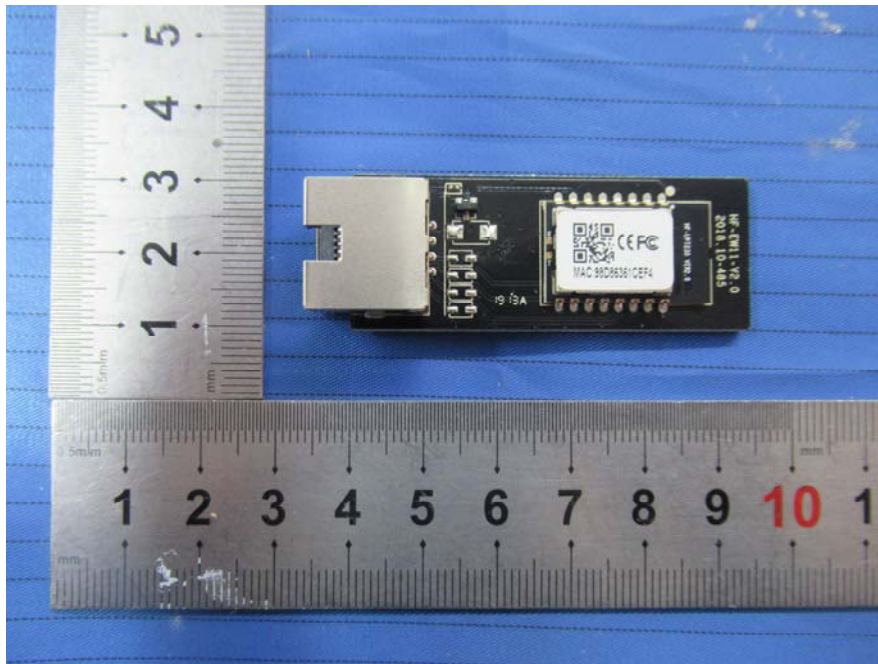


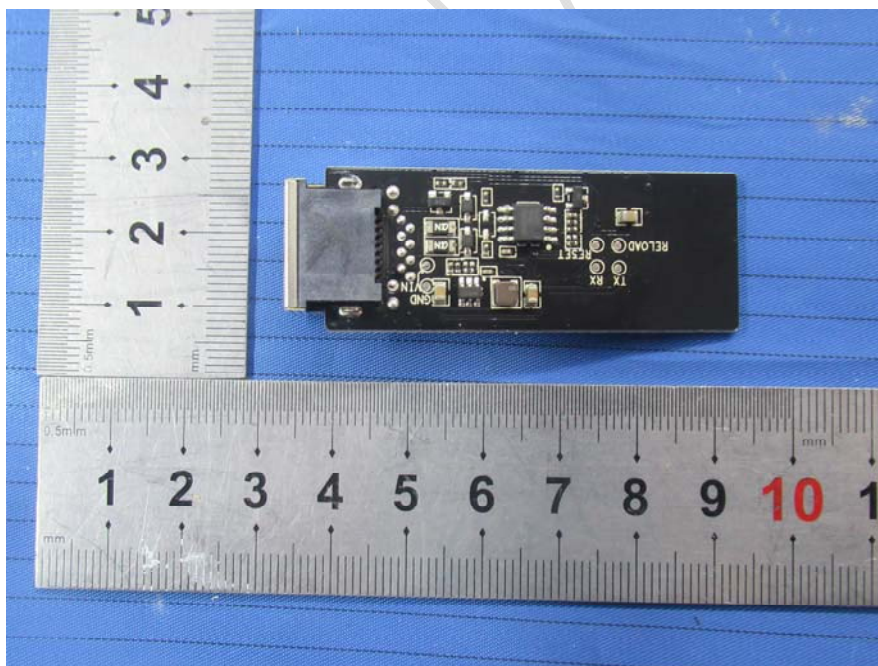
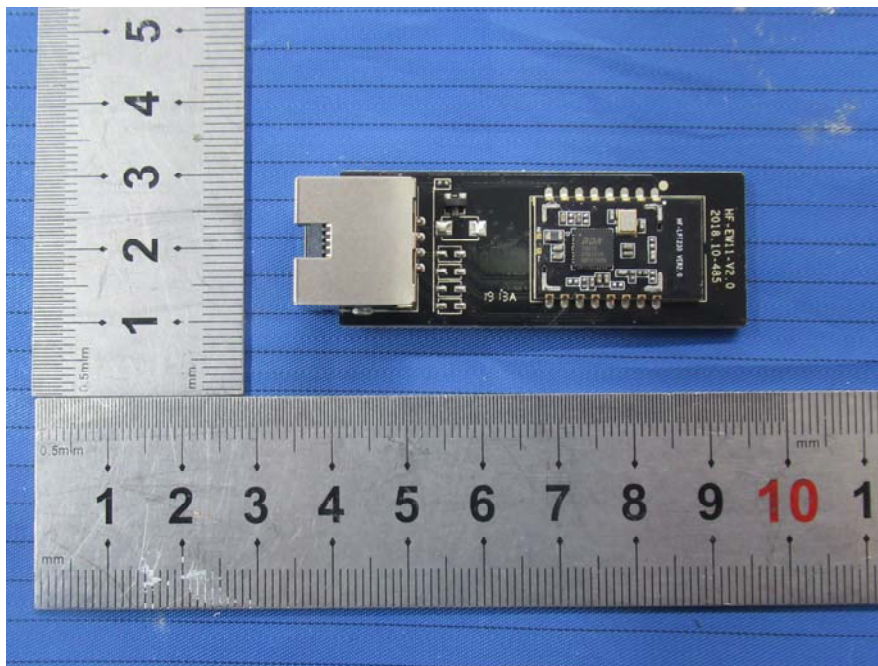












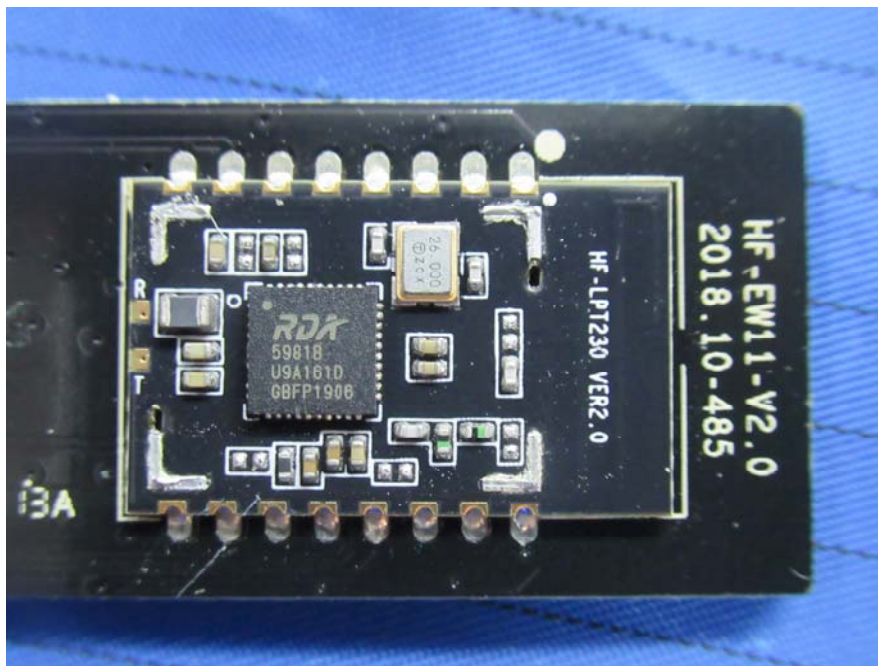
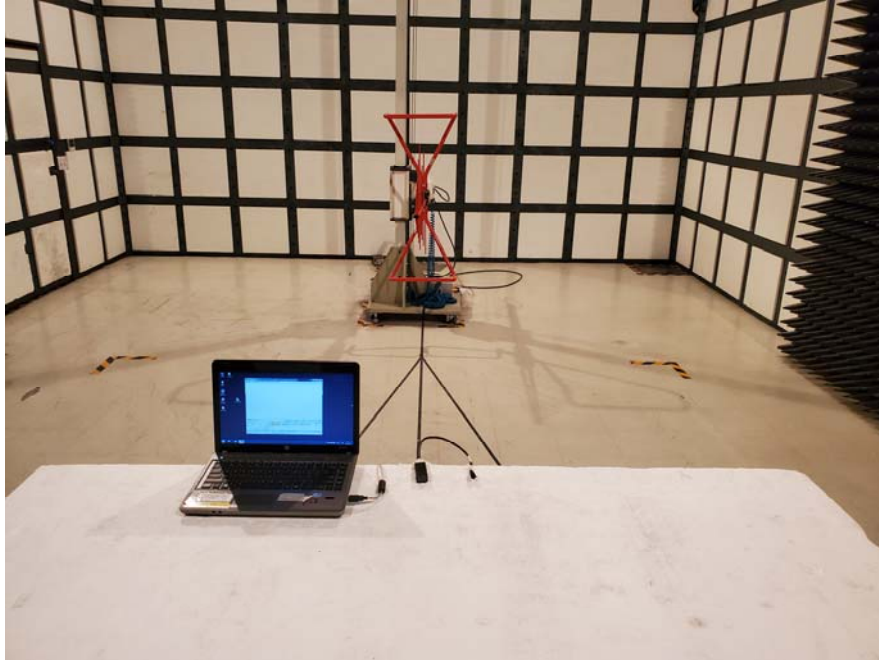
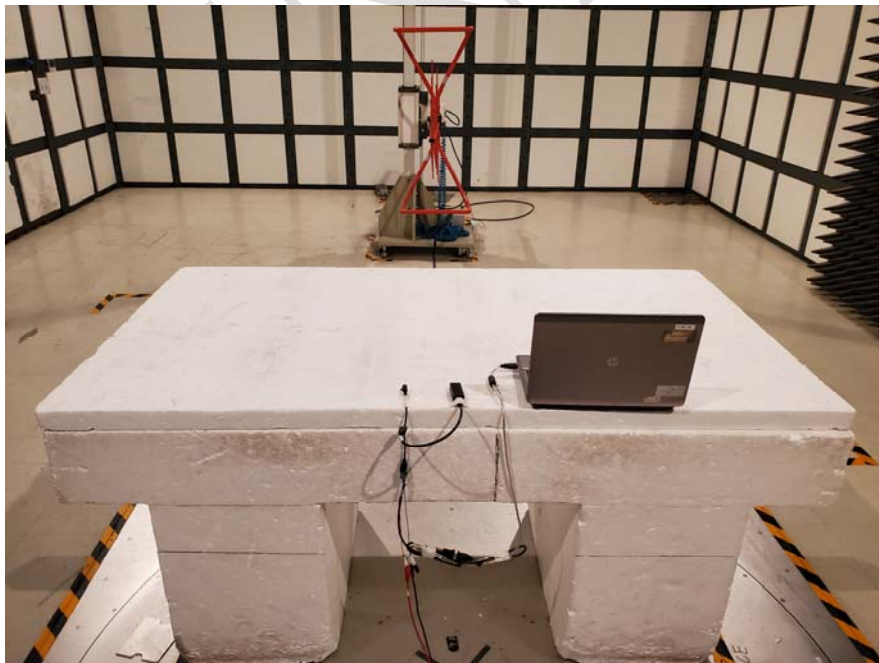


EXHIBIT B – TEST SETUP PHOTOGRAPHS

Radiated Emissions - Front View (Below 1GHz)



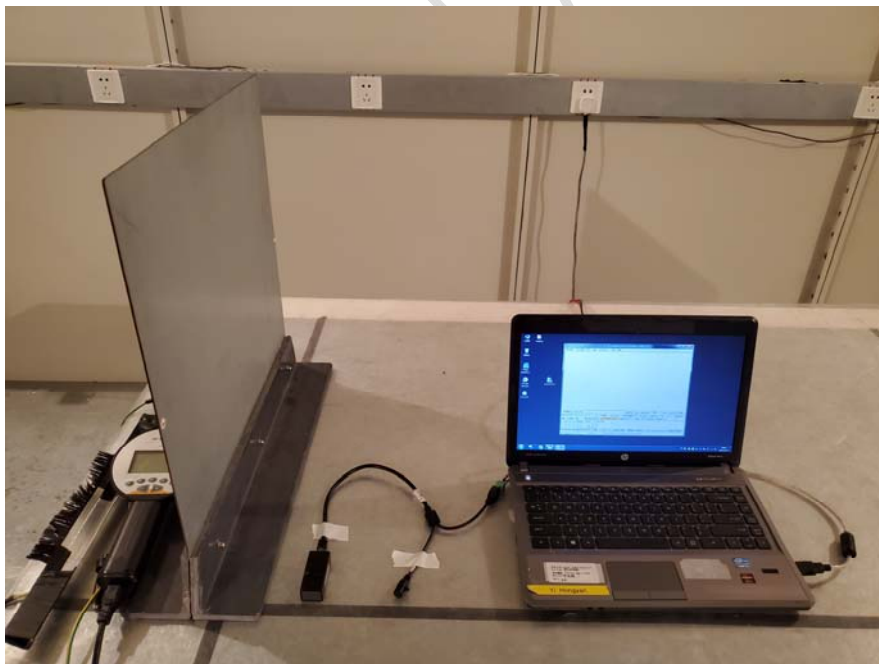
Radiated Emissions - Rear View (Below 1GHz)



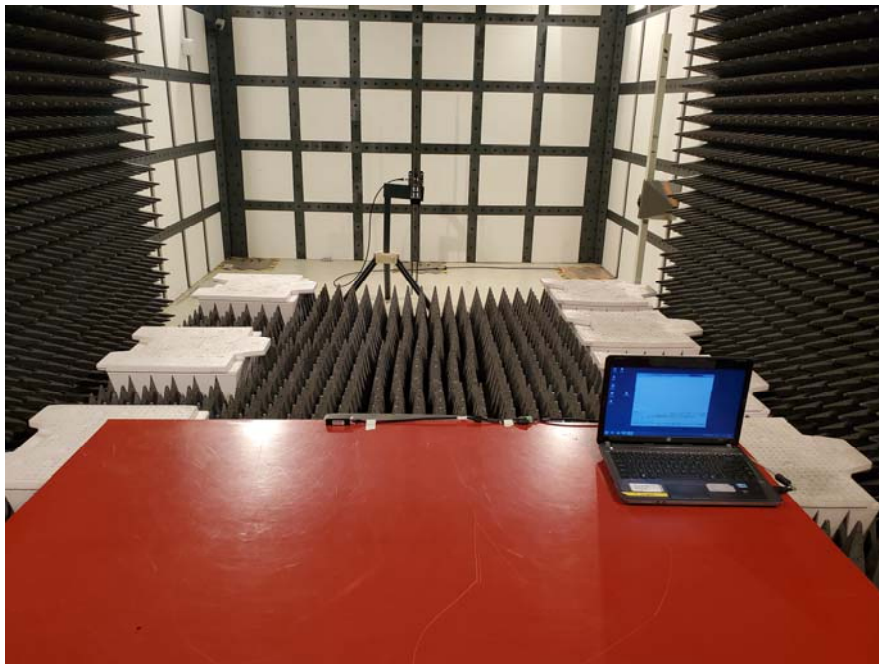
Radiated Emissions - Side View (Above 1GHz)



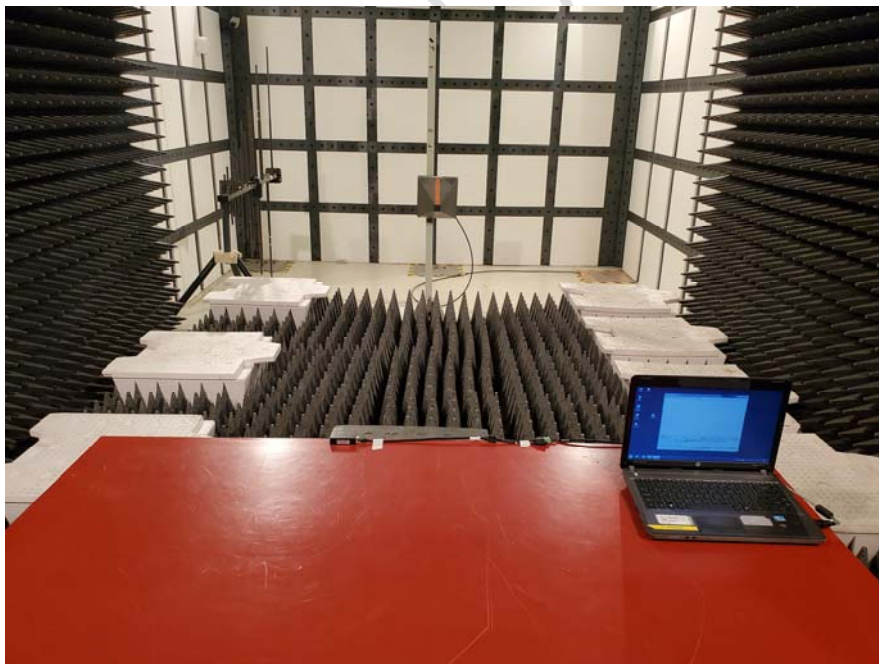
ESD Test Setup Photo



RS Test Setup Photo (Below 1GHz)



RS Test Setup Photo (Above 1GHz)



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