



# EMC Test Report For

## HK ELECHOUSE LIMITED

**Test Standards:** ETSI EN 301 489-1 V2.2.3(2019-11)  
ETSI EN 301 489-3 V2.1.1(2019-03)

**Product Description:** 13.56 MHz NFC/RFID Module

**Tested Model:** PN532 MINI EXT

**Brand Name:** ELECHOUSE

**Report No.:** EBSZ2509030154E02

**Tested Date:** 2025.09.08~2025.09.10

**Issued Date:** 2025.09.16

**Prepared By:**



May Li Engineer

**Approved By:**

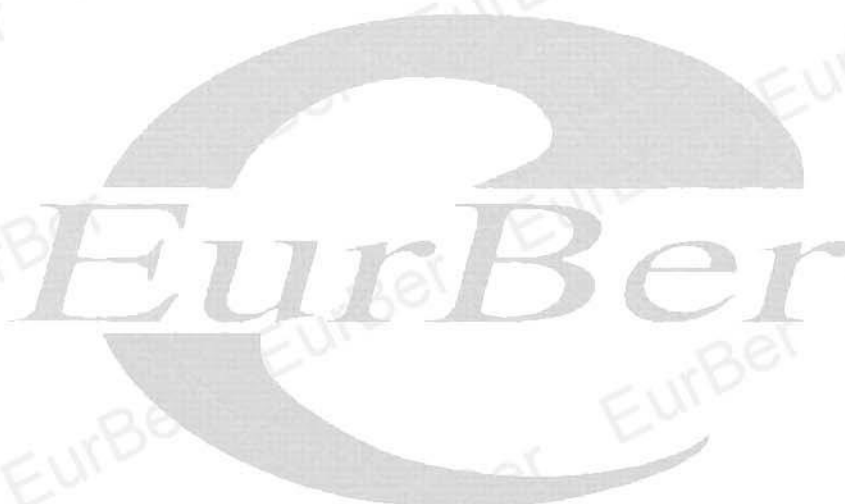


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## Report Revise Record

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	2025.09.16	Valid	Original Report



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## SUMMARY OF TEST RESULT

CLAUSE (EN301489-1)	TEST ITEMS	TEST STANDARD	RESULT (PASS/FAIL)	REMARK
<b>EMC Emission Measurements</b>				
8.2	Radiated Emission	EN55032 :2015/A1:2020 Class B	PASS	Under limit 8.26dB at 135.4MHz for Quasi-Peak
8.3 / 8.4 / 8.7	Conducted Emission	EN55032 :2015/A1:2020 Class B	Not Required	-
8.5	Harmonic Current Emissions	EN 61000-3-2 :2019/A1:202 1 Class B	Not Required	-
8.6	Voltage Fluctuations and Flicker	EN 61000-3-3 :2017/A1:20 20	Not Required	-
<b>EMC Immunity Tests</b>				
9.2	RF Electromagnetic Field	EN IEC61000-4-3:2020	PASS	-
9.3	Electrostatic Discharge	EN 61000-4-2:2009	PASS	-
9.4	Fast Transients, Common Mode	EN 61000-4-4:2012	Not Required	-
9.5	Radio frequency, Common Mode	EN 61000-4-6:2014	Not Required	-
9.6	Transients and Surges in the vehicular environment	ISO 7637-2:2004	Not Required	-
9.7	Voltage Dips and Interruptions	EN IEC61000-4-11:2020	Not Required	-
9.8	Surges	EN 61000-4-5:2014+A1:201 7	Not Required	-
<b>Note:</b> Not required means after assessing, test items are not necessary to carry out.				

# 1 General Information

## 1.1 Applicant

HK ELECHOUSE LIMITED

Room A516, 5/F, Yik Lee Industrial Building 35 Tai Yau Street, San Po Kong, Kowloon  
Hong Kong

## 1.2 Manufacturer

HK ELECHOUSE LIMITED

Room A516, 5/F, Yik Lee Industrial Building 35 Tai Yau Street, San Po Kong, Kowloon  
Hong Kong

## 1.3 General Description of EUT

<b>Product</b>	13.56 MHz NFC/RFID Module	
<b>Model NO.</b>	PN532 MINI EXT	
<b>Additional NO.</b>	PN532 MINI EXT-1025, PN532 MINI EXT-4050, PN532 MINI EXT-MX, PN532 MINI EXT-IPX	
<b>Difference Description</b>	The model is different, the style is different, the size is different, and the rest is exactly the same	
<b>Nominal Voltage</b>	EUTinput: DC5V---1.0A	
<b>Extreme Temperature</b>	0°C and 60°C	
<b>Modulation Type</b>	<b>WLAN</b>	N/A
	<b>Bluetooth</b>	N/A
	NFC	
<b>Operating Frequency</b>	<b>WLAN</b>	N/A
	13.56Mhz	
	<b>BLE</b>	N/A
<b>Geo-location capability</b>	Not Supported	
<b>Antenna Type / Gain</b>	Internal Antenna, Maximum Gain is 0dB	
<b>HW Version</b>	N/A	
<b>SW Version</b>	N/A	
<b>Sample Received Date</b>	2025.09.03	
<b>I/O Ports</b>	Refer to user's manual	
<b>Accessory Devices</b>	Refer to note as below	

### NOTE:

1. The above EUT information is declared by manufacturer. The laboratory is not responsible for the information provided by the manufacturer. For more detailed feature description, please refer to the manufacturer's specifications or user's manual.
2. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.

3. According to the manufacturer's declaration that this product belongs to Class B equipment.

#### 1.4 Support equipment List

Manufacturer	Description	Model	Serial Number
/	/	/	/
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A

#### 1.5 Modification of EUT

No modifications are made to the EUT during all test items.

#### 1.6 Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of **ETSI EN301 489-1 V2.2.3 (2019-11)**, **ETSI EN 301 489 -3 V2.1.1(2019-03)**.



## 2 Test Configuration of Equipment under Test

### 2.1 Details of EUT Test Modes

Details of Test line Items	
<b>Radiated Emission (Refer to EN301 489-1 Section 8.2)</b>	
Mode 1	: Wlan(13.56M) <Fig.1>WORKING
Mode 2	:
<b>Conducted Emission for AC mains input/output port (Refer to EN301 489-1 Section 8.4)</b>	
Mode 1	: Wlan(13.56M) <Fig.1>WORKING
Mode 2	:
<b>Conducted Emission for telecommunication port (Refer to EN301 489-1 Section 8.7)</b>	
Mode 1	: Wlan(13.56M) <Fig.1>WORKING
Mode 2	: <Fig.1>
<b>Radio Frequency Electromagnetic Field (Refer to EN301 489-1 Section 9.2)</b>	
Mode 1	: Wlan(13.56M) <Fig.1>WORKING
Mode 2	: <Fig.1>
<b>Electrostatic Discharge (Refer to EN301 489-1 Section 9.3)</b>	
Mode 1	: Wlan(13.56M) <Fig.1>WORKING
Mode 2	: <Fig.1>
<b>Fast Transient, Common Mode (Refer to EN301 489-1 Section 9.4)</b>	
<b>Voltage Dips and Interruptions (Refer to EN301 489-1 Section 9.7)</b>	
<b>Surges (Refer to EN301 489-1 Section 9.8)</b>	
Mode 1	: Wlan(13.56M) <Fig.1>
Mode 2	: <Fig.1>
<b>Fast Transient, Common Mode for telecommunication port (Refer to EN301 489-1 Section 9.4)</b>	
<b>Surges for telecommunication port (Refer to EN301 489-1 Section 9.8)</b>	
Mode 1	: Wlan(13.56M) <Fig.1>WORKING
Mode 2	: <Fig.1>
<b>Radio Frequency, Common Mode (Refer to EN301 489-1 Section 9.5)</b>	
Mode 1	: Wlan(13.56M) <Fig.1>WORKING
Mode 2	: <Fig.1>
<b>Radio Frequency, Common Mode for telecommunication port (Refer to EN301 489-1 Section 9.5)</b>	
Mode 1	: Wlan(13.56M) <Fig.1>WORKING
Mode 2	: <Fig.1>

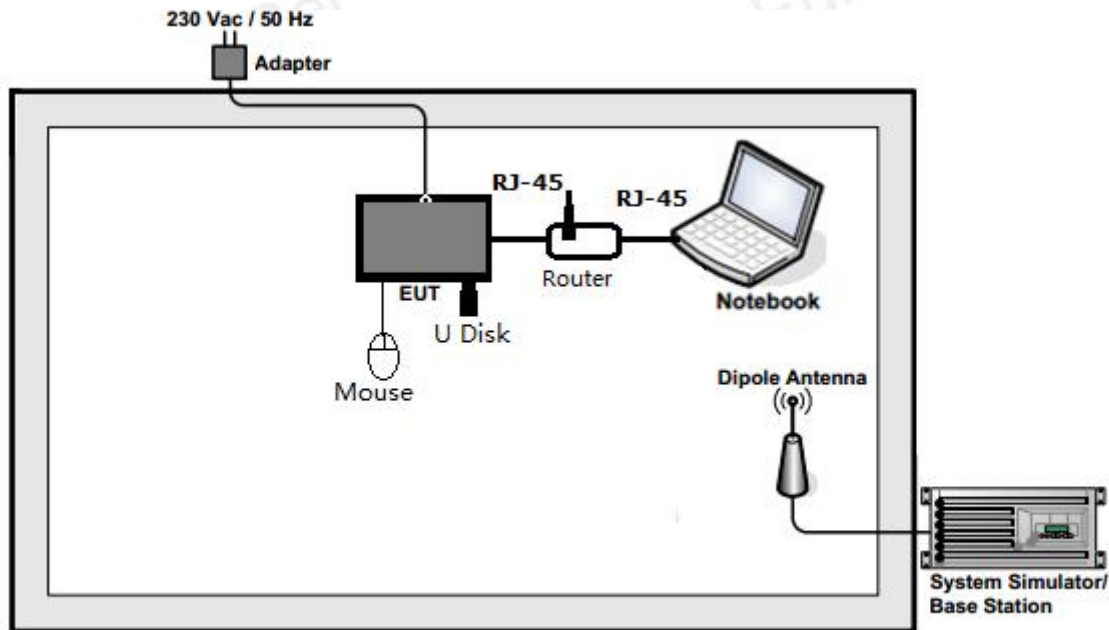
Worst mode of all test items listed in section 2.1

Test items	Worst mode
Radiated Emission	1
Conducted Emission for AC mains input/output port	N/A
Conducted Emission for telecommunication port	N/A
Radio Frequency Electromagnetic Field	1
Electrostatic Discharge	1
Fast Transient, Common Mode for AC power port	N/A
Fast Transient, Common Mode for telecommunication port	N/A
Radio Frequency, Common Mode for AC power port	N/A

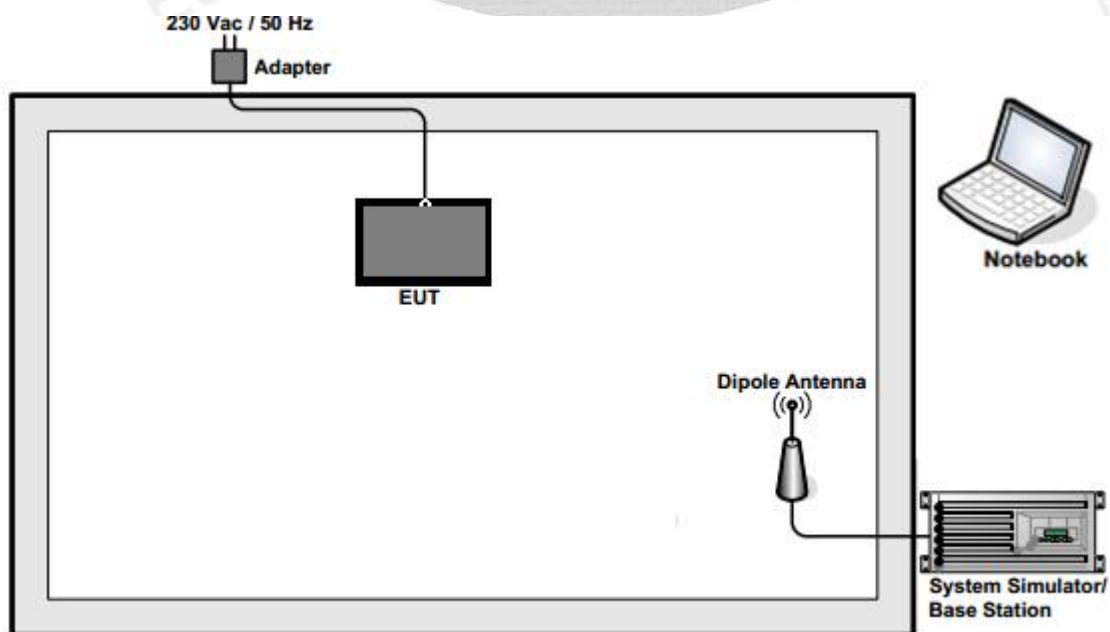
Radio Frequency, Common Mode for telecommunication port	N/A
Surges for AC power port	N/A
Surges for telecommunication port	N/A

**Remark:** Only data of worst mode (if test item has) was reported in test result.

## 2.2 Connection of System Under Test



<Fig.1>





&lt;Fig.2&gt;

## 2.3 EUT Operation Test Setup

The EUT was set in below conditions during EMI and EMS testing

### **Read/Write and Storage of Data**

1. Let EUT be connected with notebook.
2. Execute the program for files transferring between EUT and storage device.
3. Monitor the data transmission by checking whether there some error or abnormal action occurred.

### **WLAN**

1. Enable WLAN function of the EUT.
2. The EUT links with supported units
3. Execute "PING IP" function under the "cmd" of Window system to transfer packet bi-directionally between the EUT and supported units.
4. Monitor the packet loss and WLAN radio performance.

### **Bluetooth (include Bluetooth Data Link and Bluetooth Headset)**

1. Link with supported unit via Bluetooth radio function.
2. Monitor the status of connection by checking the Bluetooth link performance without radio link drop.

### **3 Test Conditions of 301489 Series Standards**

#### **3.1 Special Conditions of Applied Standards for EUT**

Below each section is special condition applied for each application of EUT.

##### **3.1.1 Emission**

###### **EN301 489-3**

No special conditions shall apply to UE in the scope of the present document.

##### **3.1.2 Immunity**

###### **EN301 489-3**

No special conditions are relevant for products covered in the present document.

#### **3.2 RF Exclusion Band of Radio Equipment**

As per section 4.3 of ETSI EN 301 489-1 V2.2.3 (2019-11)

As per section 4.3 of ETSI EN 301 489-3 V2.1.1 (2019-03)

## 4 Emission Measurements

### 4.1 Radiated Emission Test

#### 4.1.1 Limits for Radiated Emission Test

<Class B limit>

**Table A.2—Requirements for radiated emissions at frequencies up to 1GHz for Class B equipment**

Table Clause	Frequency Range (MHz)	Measurement		Class B limits dB (μV/m)
		Distance (m)	Detector Type/ Bandwidth	OATS/SAC
A2.1	30 ~ 230	10	Quasi Peak / 120 kHz	30
	230 ~ 1000			37
A2.2	30 ~ 230	3		40
	230 ~ 1000			47

**Table A.3—Requirements for radiated emissions at frequencies above 1GHz for Class B equipment**

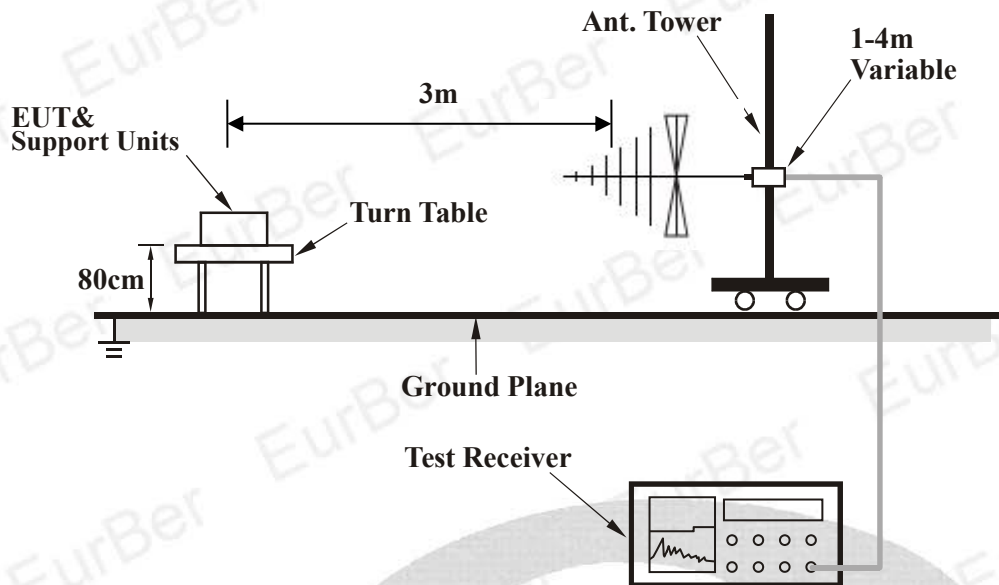
Table Clause	Frequency Range (MHz)	Measurement		Class B limits dB(μV/m)
		Distance (m)	Detector Type/ Bandwidth	FSOATS
A3.1	1000 ~ 3000	3	Average / 1 MHz	50
	3000 ~ 6000			54
A3.2	1000 ~ 3000		Peak / 1 MHz	70
	3000 ~ 6000			74

**Conditional testing frequency:**

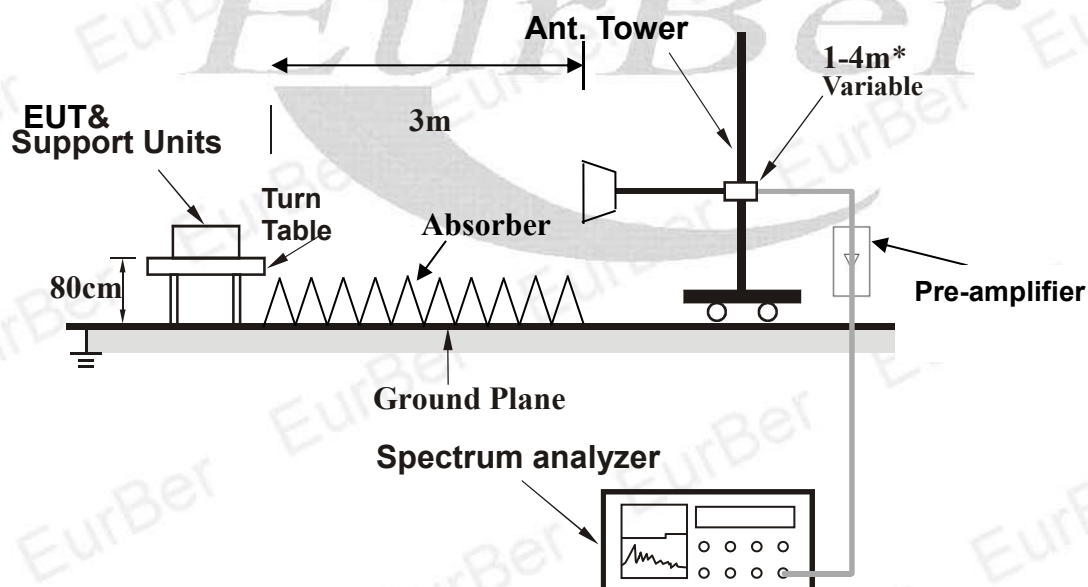
Highest measured frequency	Highest measured frequency
$F_x \leq 108 \text{ MHz}$	1 GHz
$108 \text{ MHz} \leq F_x \leq 500 \text{ MHz}$	2 GHz
$500 \text{ MHz} \leq F_x \leq 1 \text{ GHz}$	5 GHz
$F_x \geq 108 \text{ MHz}$	5 x $F_x$ up to a maximum of 6 GHz
NOTE: For FM and TV broadcast receivers, $F_x$ is determined from the highest frequency generated or used excluding the local oscillator and tuned frequencies.	

### 4.1.2 Test Setup

#### < Frequency Range below 1GHz >



#### < Frequency Range above 1GHz >



## <Radiated Emissions Setup Configuration>

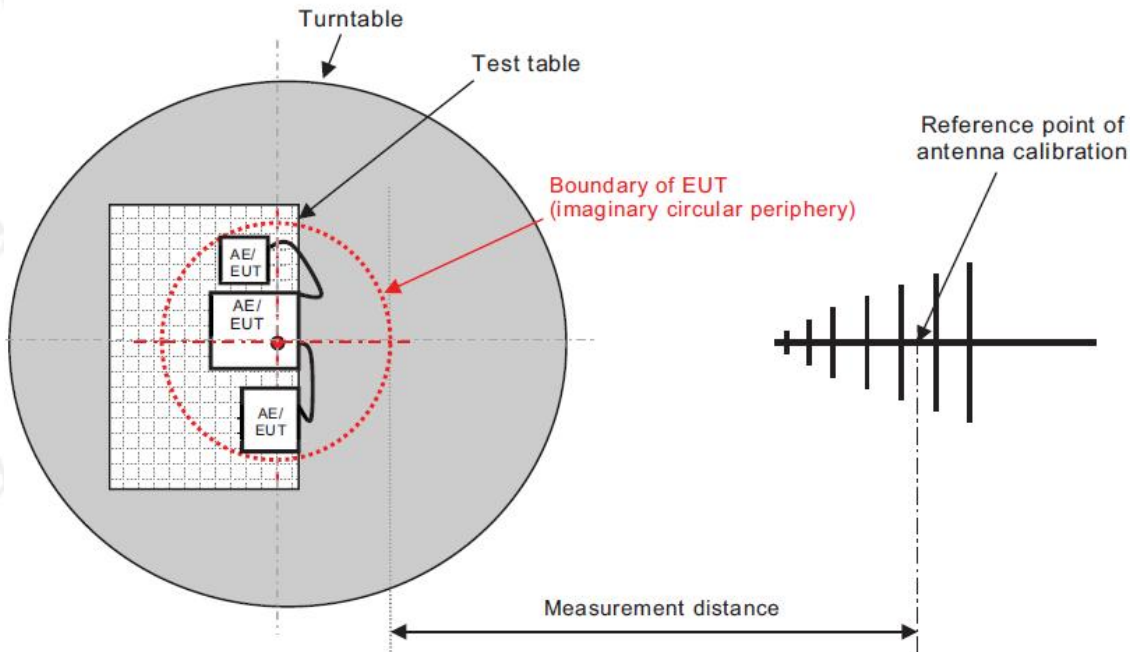


Figure C.1 – Measurement distance

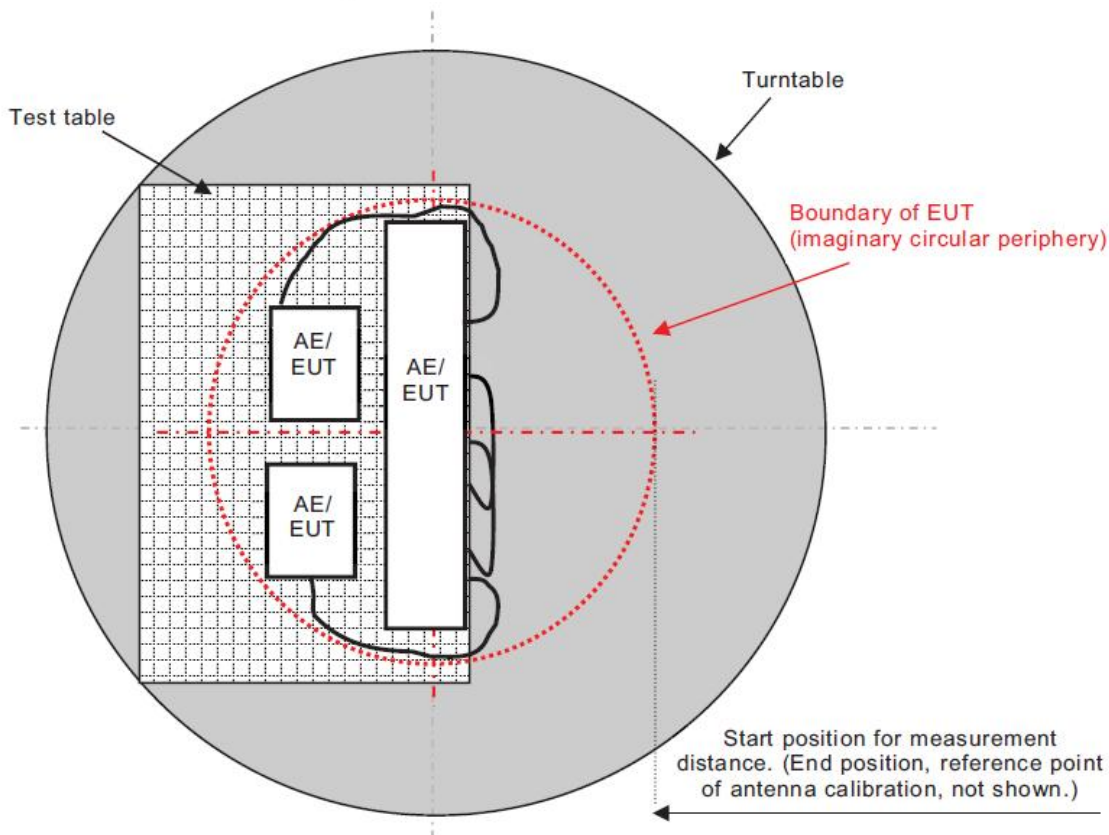


Figure C.2 – Boundary of EUT, Local AE and associated cabling



#### 4.1.3 Test Procedures

Frequency range 30MHz~1GHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from 1 meter to 4 meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1GHz.

Frequency range above 1GHz

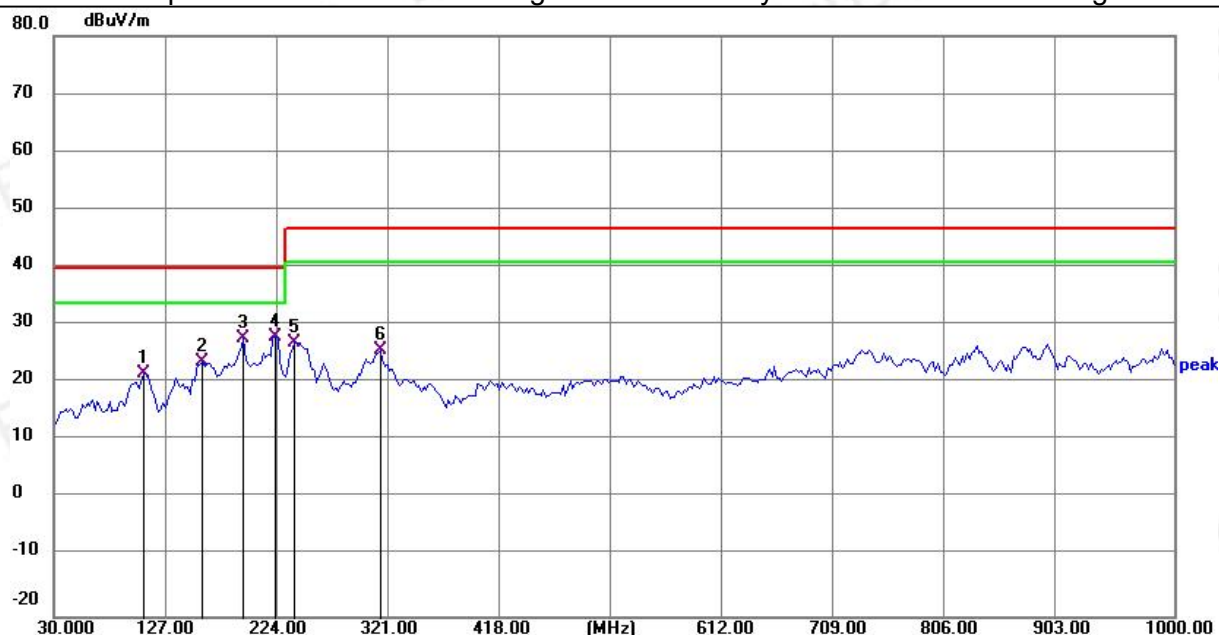
- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter semi-anechoic chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna can be varied from 1 meter to 4 meters, the height of adjustment depends on the EUT height and the antenna 3dB beamwidth both, to detect the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test receiver/spectrum was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1GHz.



#### 4.1.4 Test Result

Test Mode :	Mode1	Temperature :	22°C
Test Engineer :	May Li	Relative Humidity :	55%RH
Test Distance :	3m	Polarization :	Horizontal
Function Type :	Wlan(13.56M)		
Remark :	NA		

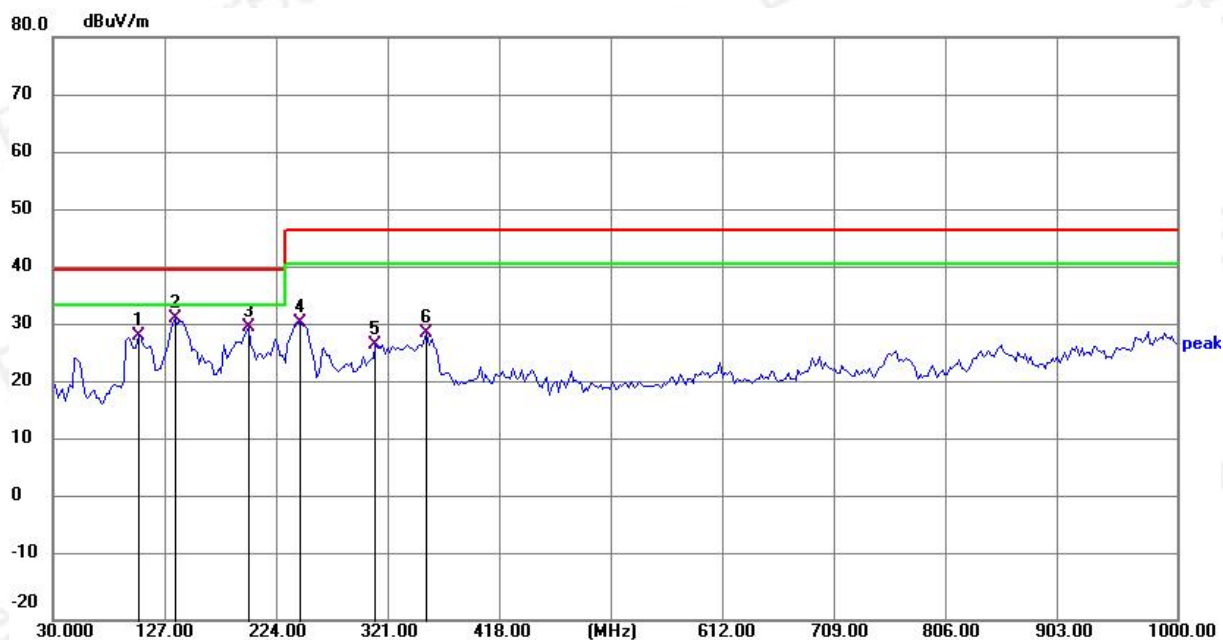
- Emission level (dBμV/m) = 20 log Emission level (μV/m)
- Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
- The test that passed at the minimum margin was marked by the frame in the following test record



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	108.0216	42.93	-20.94	21.99	40.00	18.01	QP
2	158.6304	42.14	-18.21	23.93	40.00	16.07	QP
3	194.4781	48.55	-20.59	27.96	40.00	12.04	QP
4	221.8913	47.91	-19.65	28.26	40.00	11.74	QP
5	238.7607	46.87	-19.66	27.21	47.00	19.79	QP
6	312.5652	43.43	-17.37	26.06	47.00	20.94	QP

Test Mode :	Mode 1	Temperature :	22°C
Test Engineer :	May Li	Relative Humidity :	55%RH
Test Distance :	3m	Polarization :	Vertical
Function Type :	Wlan(13.56M)		
Remark :	NA		

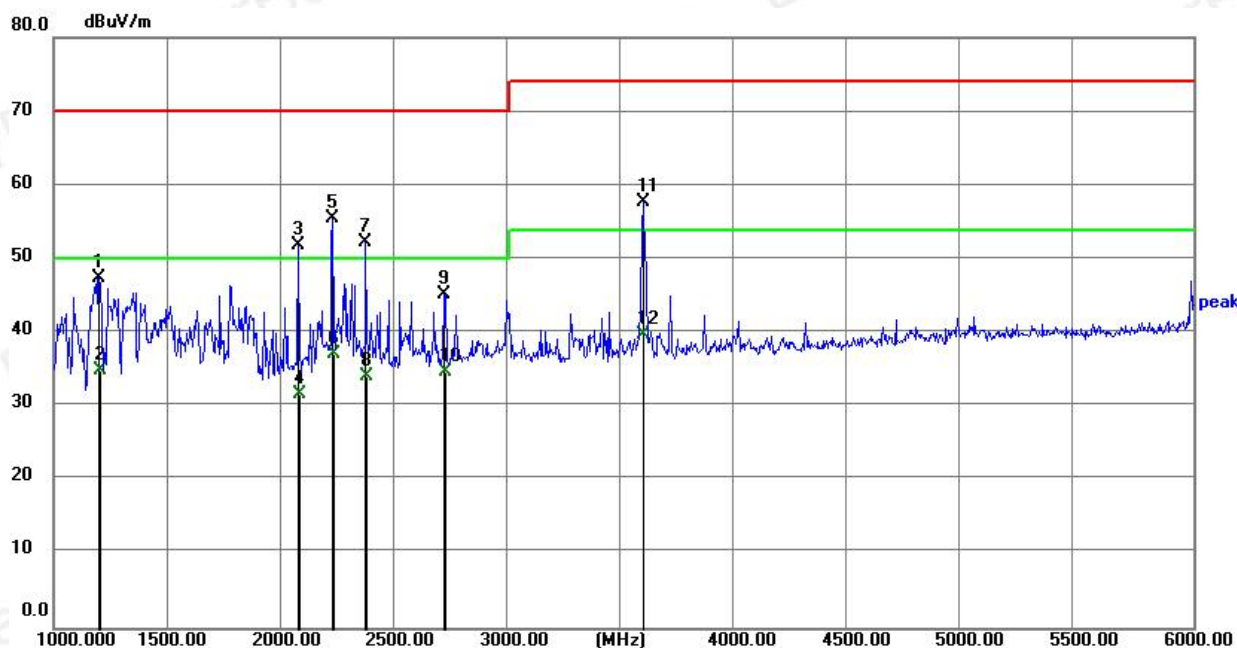
- Emission level (dBμV/m) = 20 log Emission level (μV/m)
- Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
- The test that passed at the minimum margin was marked by the frame in the following test record



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	103.8043	52.29	-23.62	28.67	40.00	11.33	QP
2	135.4347	50.22	-18.48	31.74	40.00	8.26	QP
3	198.6956	48.46	-18.12	30.34	40.00	9.66	QP
4	242.9782	46.72	-15.65	31.07	47.00	15.93	QP
5	308.3478	43.05	-15.70	27.35	47.00	19.65	QP
6	352.6304	45.30	-16.13	29.17	47.00	17.83	QP

Test Mode :	Mode 1	Temperature :	23°C
Test Engineer :	May Li	Relative Humidity :	53%
Test Distance :	3m	Polarization :	Horizontal
Function Type :	Wlan(13.56M)		
Remark :	The main frequency has been filtered with a band stop filter		

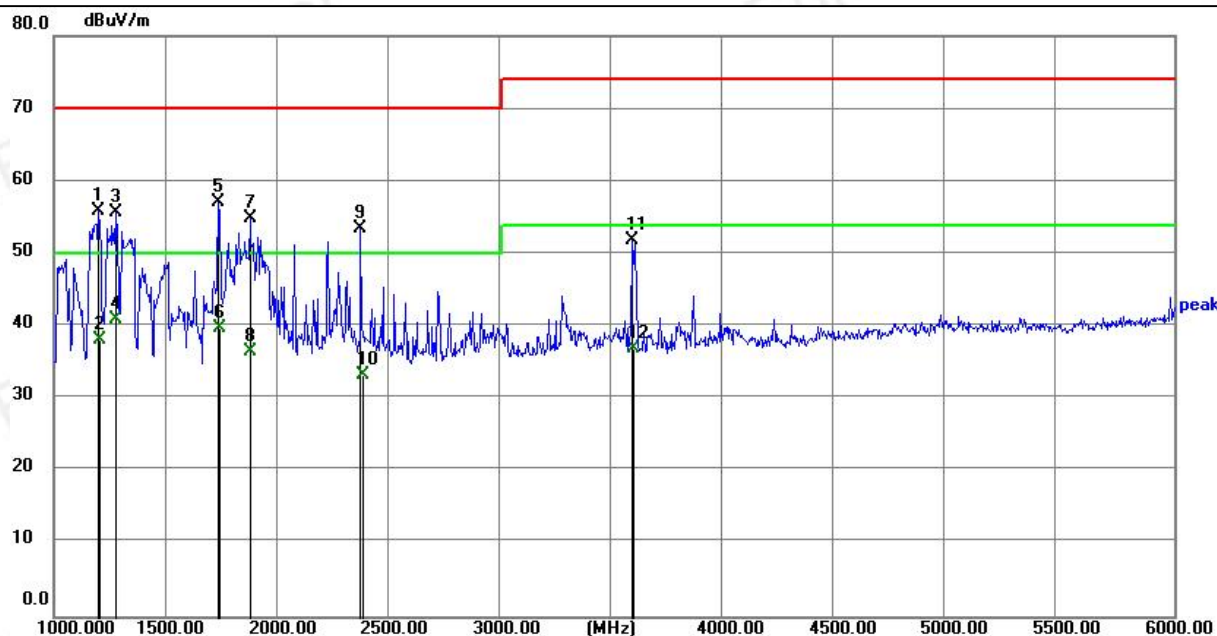
- Emission level (dBμV/m) = 20 log Emission level (μV/m)
- Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
- The test that passed at the minimum margin was marked by the frame in the following test record



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1200.000	63.15	-15.73	47.42	70.00	22.58	peak
2	1204.030	50.73	-15.73	35.00	50.00	15.00	AVG
3	2075.000	66.03	-14.24	51.79	70.00	18.21	peak
4	2077.142	45.98	-14.23	31.75	50.00	18.25	AVG
5	2225.000	69.35	-13.76	55.59	70.00	14.41	peak
6	2228.537	50.84	-13.75	37.09	50.00	12.91	AVG
7	2370.000	65.50	-13.30	52.20	70.00	17.80	peak
8	2372.211	47.35	-13.29	34.06	50.00	15.94	AVG
9	2715.000	57.55	-12.22	45.33	70.00	24.67	peak
10	2715.057	46.97	-12.22	34.75	50.00	15.25	AVG
11	3585.000	68.17	-10.42	57.75	74.00	16.25	peak
12	3588.022	50.12	-10.41	39.71	54.00	14.29	AVG

<b>Test Mode :</b>	Mode 1	<b>Temperature :</b>	23°C
<b>Test Engineer :</b>	May Li	<b>Relative Humidity :</b>	51%
<b>Test Distance :</b>	3m	<b>Polarization :</b>	Vertical
<b>Function Type :</b>	Wlan(13.56M)		
<b>Remark :</b>	The main frequency has been filtered with a band stop filter		

- Emission level (dBμV/m) = 20 log Emission level (μV/m)
- Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
- The test that passed at the minimum margin was marked by the frame in the following test record



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1200.000	71.55	-15.73	55.82	70.00	14.18	peak
2	1201.141	53.95	-15.73	38.22	50.00	11.78	AVG
3	1275.000	71.34	-15.65	55.69	70.00	14.31	peak
4	1275.259	56.68	-15.65	41.03	50.00	8.97	AVG
5	1735.000	72.14	-14.96	57.18	70.00	12.82	peak
6	1739.755	54.80	-14.95	39.85	50.00	10.15	AVG
7	1875.000	69.54	-14.72	54.82	70.00	15.18	peak
8	1876.115	51.20	-14.70	36.50	50.00	13.50	AVG
9	2370.000	66.79	-13.30	53.49	70.00	16.51	peak
10	2375.907	46.55	-13.28	33.27	50.00	16.73	AVG
11	3580.000	62.35	-10.43	51.92	74.00	22.08	peak
12	3582.022	47.31	-10.43	36.88	54.00	17.12	AVG



## 5 Immunity Tests

### 5.1 Requirements of Limit and EUT Performance Criteria for all Immunity Test Items

Test limit including test level, test frequency range, pulse type, test duration...etc. requirements.

This section is intended to integrate requirements of limit, and required performance criteria for all immunity test Items.

In subsection 5.1.1, includes two parts:

- a. Subsection 5.1.1.1 : Support ports list of EUT, accessory, and cable record, where EUT intended to use in. These information will be used for decide test items and test limit
  - i. Supported ports list of EUT: Because test limit are based on supported ports of EUT, this is necessary information.
  - ii. Accessory : include adapter type and remark EUT has battery or not.
  - iii. Cable record : includes cable type, cable length, indoor/outdoor. These parameters will decide tests shall be carrying out or not.
- b. Subsection 5.1.1.2 : tables of immunity test level specified in EN301489 series standards and immunity test level specified by manufacturer.

If immunity test level specified by manufacturer are higher/stronger than level specified in EN301489 series standards, they will be also record in this table. Therefore anyone could distinguish requirements specified by standard or manufacturer from these tables.

In subsection 5.1.2, required performance criteria of EUT per EN301489 series standards.

Integrated required performance criteria of EN301489 series standards, they are used for all immunity test of this report.

### 5.1.1 Test Limit

#### 5.1.1.1 Information of supported ports of EUT, accessory, cable record where EUT intended to use in.

1. Supported ports of EUT are listed as below (symbol ☐ means supported port ):

<input checked="" type="checkbox"/>	Enclosure Port
<input type="checkbox"/>	Input AC power port
<input checked="" type="checkbox"/>	Input DC power port
<input type="checkbox"/>	Telecommunication port

2. Accessory (symbol ☒ means have used with EUT during test )

<input checked="" type="checkbox"/>	<input type="checkbox"/> AC Adapter <input checked="" type="checkbox"/> DC Adapter <input type="checkbox"/> Car charger <input type="checkbox"/> PoE adapter	Pins : <input checked="" type="checkbox"/> 2pins <input type="checkbox"/> 3pins Cable Length : <input type="checkbox"/> >3m <input checked="" type="checkbox"/> <3m
<input checked="" type="checkbox"/>	Battery	

As per above information, corresponded test limit (including test level, test frequency range, pulse type, test duration...etc. requirements) specified in below table 1~4 have been selected to carry out test in this report.

#### 5.1.1.2 Tables of Immunity Test Level Specified in EN301489 series standards and Immunity Test Level Specified by Manufacturer

When immunity test level specified by manufacturer are higher (stronger) than level specified in EN301489 series standards, they will be also record in this table. But if manufacturer doesn't specify immunity test level, "N/A" is filling in table and test level of all immunity test items are following requirements of EN301489 series standards.

**Table 1 - Enclosure Port**

Test item	Immunity test level specified in EN301489-1	Immunity test level specified by manufacturer
Electrostatic discharge (ESD)	$\pm 2$ kV, $\pm 4$ kV contact	N/A
	$\pm 2$ kV, $\pm 4$ kV, $\pm 8$ kV air	N/A
Radio frequency electromagnetic field (RS)	3 V/m	N/A
	Frequency range : 80 MHz – 6 GHz	N/A
	Modulation: 80 % AM at 1 kHz	N/A



**Table 2 – Input AC Power Port**

Test Item	Immunity test level specified in EN301489-1	Immunity Test level specified by manufacturer
Fast transients, common mode (EFT)	$\pm 1$ kV 5 kHz repetition frequency	N/A
Surges Line-to-line	$\pm 0,5$ kV, $\pm 1$ kV	N/A
Surges Line-to-ground	$\pm 0,5$ kV, $\pm 1$ kV, $\pm 2$ kV	N/A
Radio frequency, common mode (CS)	3 Vrms	N/A
	Frequency range: 0,15 MHz – 80 MHz	N/A
	Modulation: 80 % AM at 1 kHz	N/A
Voltage dips	0 % residual; 0,5 cycle , 50Hz Phase At 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315°	N/A
	0 % residual; 1 cycle , 50Hz Phase At 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315°	
	70 % residual; 25 cycles , 50Hz Phase At 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315°	
Voltage interruptions	0 % residual; 250cycle , 50Hz	N/A

**Table 3 – Input DC Power Port (not necessary performed on EUT of this report)**

Test Item	Immunity test level specified in EN301489-1	Immunity Test level specified by manufacturer
Fast transients, common mode (EFT)	$\pm 0.5$ kV 5 kHz repetition frequency When cable length >3m	N/A
Radio frequency, common mode (CS)	3 Vrms When cable length >3m	N/A
	Frequency range: 0,15 MHz – 80 MHz	N/A
	Modulation: 80 % AM at 1 kHz	N/A
Transients and surges in the vehicular environment	As specified in ISO 7637-2 : Pulse type : 1, 2a, 2b, 3a, 3b, 4 Level : III	N/A

**Table 4 –Telecommunication Port (not necessary performed on EUT of this report)**

Test Item	Immunity test level specified in EN301489-1	Immunity Test level specified by manufacturer
Fast transients, common mode (EFT)	± 0.5 kV 5 kHz repetition frequency When cable length >3m	N/A
Surges Line-to-ground	± 0.5 kV for indoor cable When cable length >10m	N/A
	± 1 kV for outdoor cable	N/A
Radio frequency, common mode (CS)	3 Vrms When cable length >3m	N/A
	Frequency range: 0,15 MHz – 80 MHz	N/A
	Modulation: 80 % AM at 1 kHz	N/A

#### 5.1.1 Required Performance Criteria of EUT per EN301489 series standards

General performance requirements table of 301489-1

Criteria	Performance criteria
<b>Continuous phenomena</b>	<p>During the test, the equipment shall:</p> <ul style="list-style-type: none"> <li>• continue to operate as intended;</li> <li>• not unintentionally transmit;</li> <li>• not unintentionally change its operating state;</li> <li>• not unintentionally change critical stored data.</li> </ul>

<p><b>Transient phenomena</b></p>	<p>For all ports and transient phenomena with the exception described below, the following applies:</p> <ul style="list-style-type: none"> <li>• The application of the transient phenomena shall not result in a change of the mode of operation (e.g. unintended transmission) or the loss of critical stored data.</li> <li>• After application of the transient phenomena, the equipment shall operate as intended.</li> </ul> <p>For surges applied to symmetrically operated wired network ports intended to be connected directly to outdoor lines the following criteria applies:</p> <ul style="list-style-type: none"> <li>• For products with only one symmetrical port intended for connection to outdoor lines, loss of function is allowed, provided the function is self-recoverable, or can be otherwise restored. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.</li> <li>• For products with more than one symmetrical port intended for connection to outdoor lines, loss of function on the port under test is allowed, provided the function is self-recoverable. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.</li> </ul>
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\*Performance requirements table of 301489-3

CLAUSE 6.2 of EN301489-3		
Criteria	During test	After test
<b>A</b>	Shall operate as intended. (See note). Shall be no loss of function. Shall be no unintentional transmissions.	Shall operate as intended. Shall be no degradation of performance. Shall be no loss of function. Shall be no loss of critical stored data.
<b>B</b>	May be loss of function.	Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no loss of critical stored data.
<b>C</b>	May be loss of function.	Functions shall be recoverable by the operator. Shall operate as intended after recovering. Shall be no loss of critical stored data.
<p><b>NOTE :</b></p> <p>Operate as intended during the test allows a level of degradation in accordance with clause 6.2.2.</p> <ul style="list-style-type: none"> <li>• performance criteria A for immunity tests with phenomena of a continuous nature;</li> <li>• performance criteria B for immunity tests with phenomena of a transient nature;</li> <li>• performance criteria C for immunity tests with power interruptions exceeding a certain time.</li> </ul> <p><b>Minimum performance level :</b></p> <p>For equipment that supports a PER or FER, the minimum performance level shall be a PER or FER less than or equal to 10 %.</p> <p>For equipment that does not support a PER or a FER, the minimum performance level</p>		

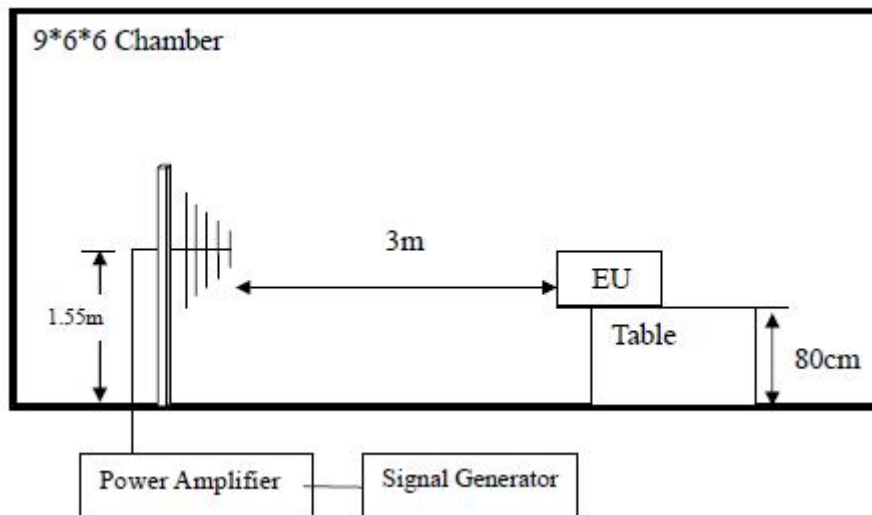
shall be no loss of the wireless transmission function needed for the intended use of the equipment.

**CLAUSE 6.3 to 6.4 of EN301489-3**

Criteria	Performance criteria
Continuous phenomena	<p>The performance criteria A shall apply.</p> <p>Where the EUT is a transmitter in standby mode, unintentional transmission shall not occur during the test.</p> <p>Where the EUT is a transceiver in receive mode, unintentional transmission shall not occur during the test.</p>
Transient phenomena	<p>The performance criteria B shall apply, except for voltage dips greater than or equal to 100 ms and voltage interruptions of 5 000 ms duration, for which performance criteria C shall apply.</p> <p>Where the EUT is a transmitter in standby mode, unintentional transmission shall not occur as a result of the application of the test.</p> <p>Where the EUT is a transceiver in receive mode, unintentional transmission shall not occur as a result of the application of the test.</p>

## 5.2 Radio frequency electromagnetic field (RS) Test

### 5.2.1 Test Setup



### 5.2.2 Test Instrument Setting

Frequency Step Size	1% increment
Modulation	80% AM (1kHz)
Dwell Time	3 seconds
Tested Antenna Height	1.55m

### 5.2.3 Test Procedures

The antenna is placed 3m away from the equipment. The required field strength is pre-calibrated and complies with the uniform field area requirement lay down in the IEC/EN 61000-4-3.

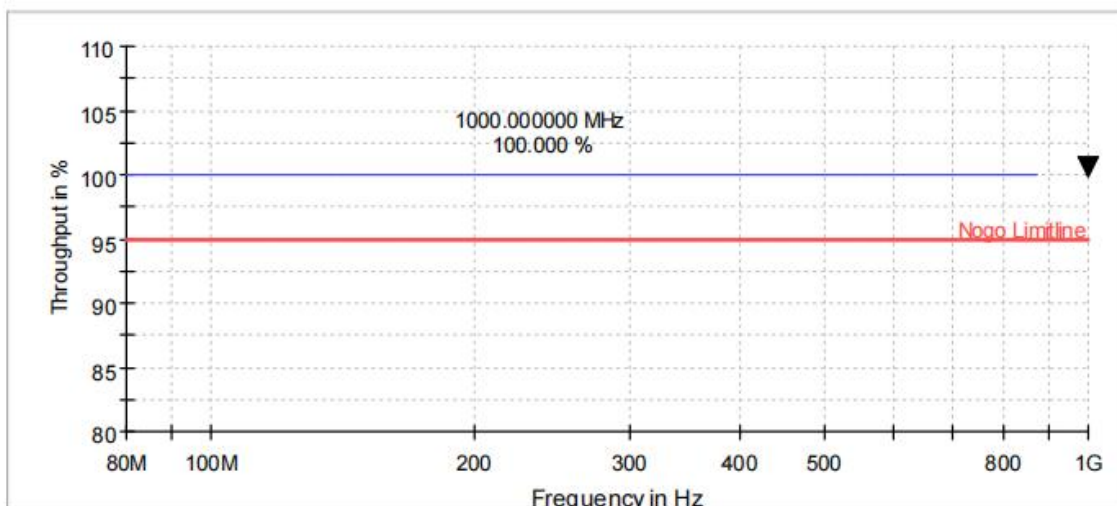
### 5.2.4 Test Result

Test Standard	EN 61000-4-3:2006+A1:2008+A2:2010
Product Standard	EN 301 489-1,EN 301 489-3
Test Frequency Range	80 MHz ~ 6 GHz
Test Level	3 V/m
Polarity	Horizontal and Vertical
Azimuth	0°,90°,180°,270°
Required Performance Criteria	A
Performance Criteria of EUT	A
Ambient Temperature	23° C
Relative Humidity	56%RH
Test Date	2025.09.10
Test Engineer	May Li
Test Result	PASS

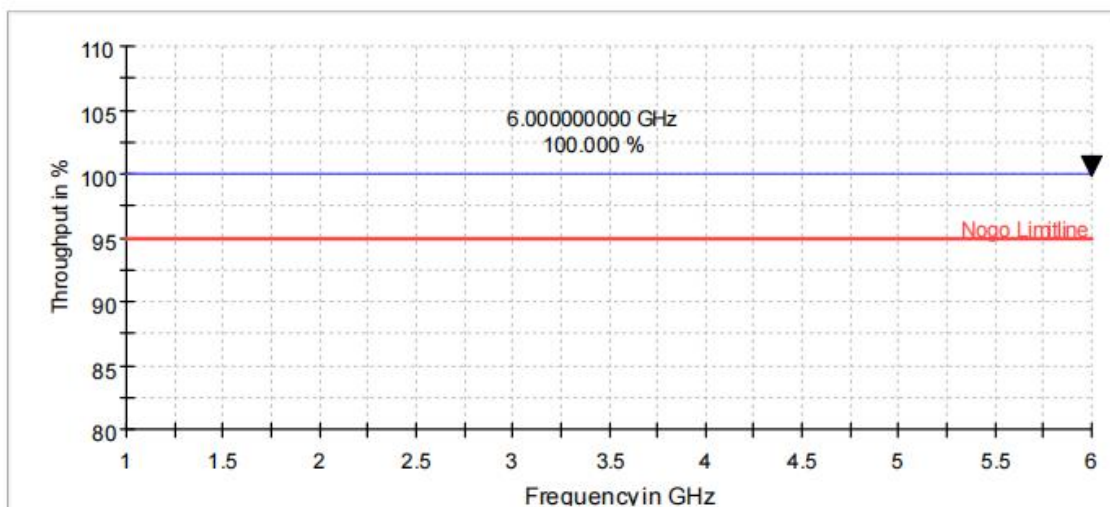


# <Data>

Test Mode :	Mode 1
Function Type :	Wlan(433MHz)
Azimuth	0°
Polarity	Horizontal
Frequency Range	80 MHz ~ 1 GHz
PER	0%

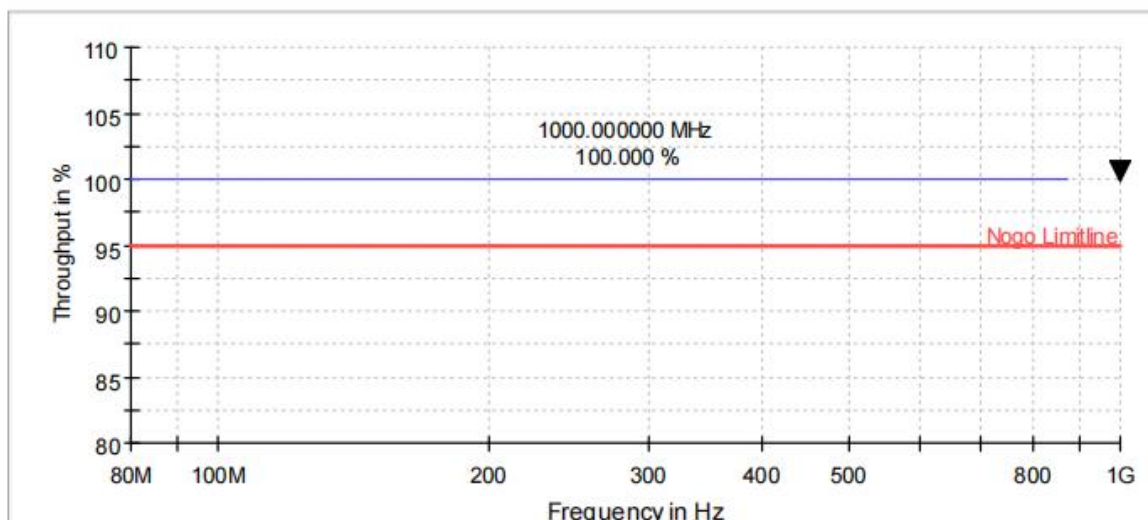


Test Mode :	Mode 1
Function Type :	Wlan(433MHz)
Azimuth	0°
Polarity	Horizontal
Frequency Range	1 GHz ~ 6 GHz
PER	0%

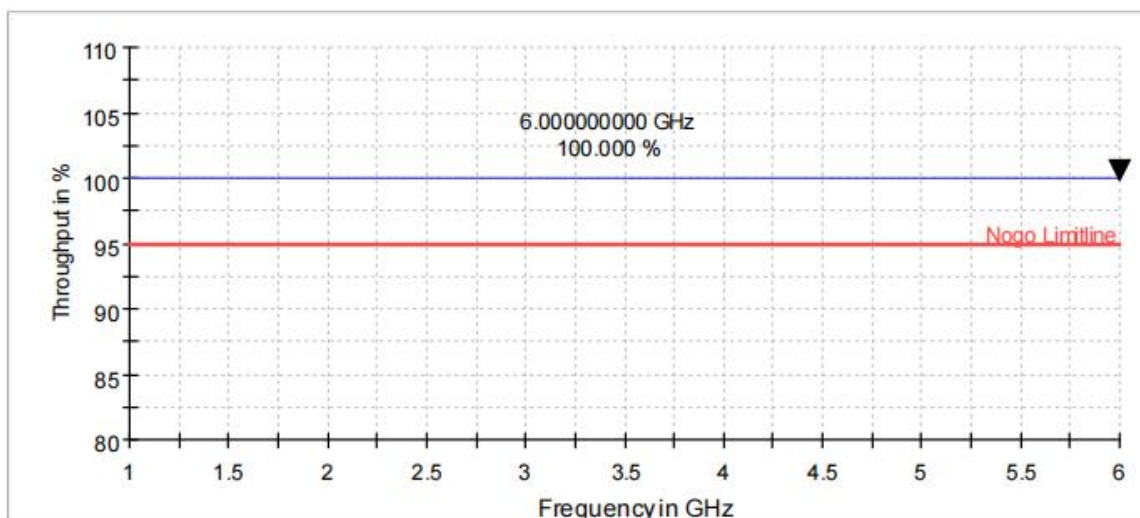




Test Mode :	Mode 1
Function Type :	Wlan(433MHz)
Azimuth	180°
Polarity	Vertical
Frequency Range	80 MHz ~ 1 GHz
PER	0%

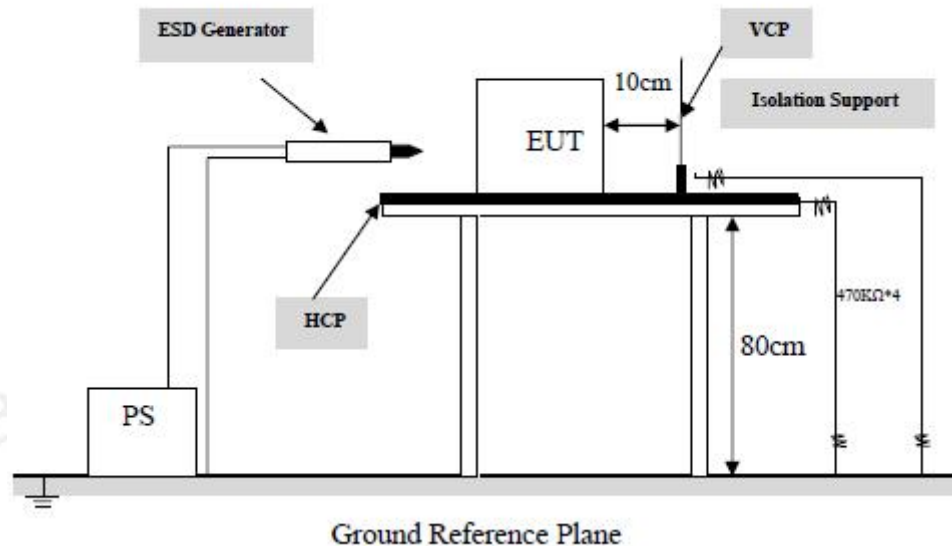


Test Mode :	Mode 1
Function Type :	Wlan(433MHz)
Azimuth	180°
Polarity	Vertical
Frequency Range	1 GHz ~ 6 GHz
PER	0%



## 5.3 Electrostatic Discharge (ESD) Test (Refer to EN301 489-1 Section 9.3)

### 5.3.1 Test Setup



A distance of 1m minimum was provided between the EUT and the wall or any other metallic structure. In cases where this length exceeds the length necessary to apply the discharges to the selected points, the excess length shall, where possible, be placed non-inductively off the ground reference plane and shall not be less than 0.2m to other conductive parts in the test setup.

The coupling plane is placed parallel to, and positioned at a distance of 0,1 m from the EUT.

### 5.3.2 Test Instrument Setting

Tested number of air discharge is at least 10 discharges (in the most sensitive polarity). For contact discharge, tested number is at least 10 discharges.

For the time interval between successive single discharges an initial value of 1 s is recommended.

Sweeping of the EUT with a grounded carbon fibre brush with bleeder resistors (for example,  $2 \times 470 \text{ k}\Omega$ ) in the grounding cable.

Ensure parameters of current waveform of an ESD generator is within specifications before test.

### 5.3.3 Test Procedure

EUT and auxiliary instrument necessary to perform DIRECT and INDIRECT application of discharges to the EUT, in the following manner:

· CONTACT DISCHARGE to the conductive surfaces and to the coupling plane;

· AIR DISCHARGE at insulating surfaces.

a. Contact Discharges to the conductive surfaces and to coupling planes

In the case of contact discharges, the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

In the case of painted surface covering a conducting substrate, the following procedure shall be adopted :

- If the coating is not declared to be an insulating coating by the equipment manufacturer, then the pointed tip of the generator shall penetrate the coating so as to make contact with the conducting substrate.

- Coating declared as insulating by the manufacturer shall only be submitted to the air discharge.

- The contact discharge test shall not be applied to such surfaces.

b. Air Discharge to apertures and insulation surfaces:

In the case of air discharges, the round discharge tip of the discharge electrode shall be approached as fast as possible (without causing mechanical damage) to touch the EUT.

After each discharge, the ESD generator (discharge electrode) shall be removed from the EUT. The generator is then retriggered for a new single discharge. This procedure shall be repeated until the discharges are completed. In the case of an air discharge test, the discharge switch, which is used for contact discharge, shall be closed.

c. Ensure that the applied charge on the EUT has been dis-charged before next ESD pulse

### 5.3.4 Test Result

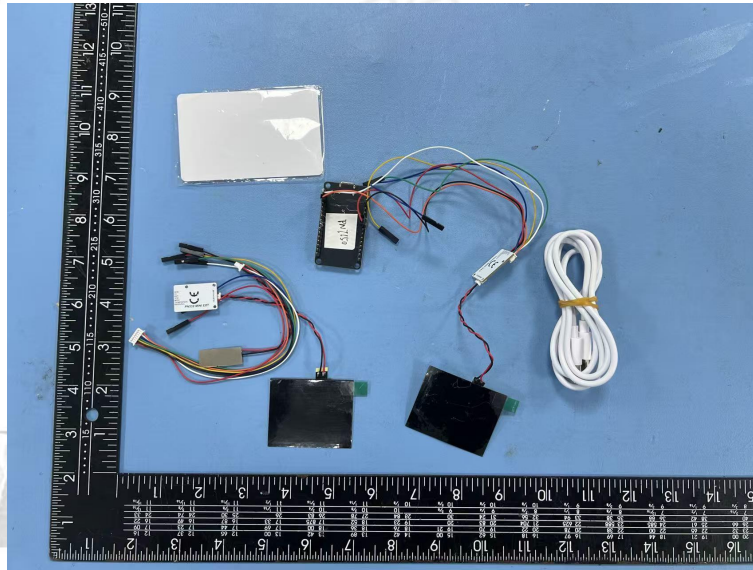
Test Standard	EN 61000-4-2:2009
Product Standard	EN 301 489-1, EN 301 489-3
EUT operated voltage during test	230 Vac, 50Hz
Tested Level	$\pm 2 / \pm 4 / \pm 8$ kV for air discharge
	$\pm 2 / \pm 4$ kV for contact discharge
Required Performance Criteria	B
Performance Criteria of EUT	B
Ambient Temperature	23° C
Relative Humidity	55%RH
Atmospheric Pressure	100.7kPa
Test Date	2025.09.10
Test Engineer	May Li
Test Result	PASS

### 5.3.5 Photos for Identification of ESD Test Points

**Remark:**

1. Air discharge refers to the button, card slot, silicone, plastic shell and other insulating parts on the photo, contact discharge refers to the port, metal cover and other parts on the photo

<EUT>



## 6 Measurement Uncertainty

Measurement uncertainty		
Parameter	Frequency	Measurement uncertainty
Conducted Emission at mains port	9kHz~150KHz	2.31dB
Conducted Emission at mains port	150kHz~30MHz	2.89dB
Conducted Emission at telecommunication port	150kHz~30MHz	4.55dB
Disturbance Power	30MHz~300MHz	3.90dB
Radiated Emission	30MHz-1000MHz	5.28dB
	1GHz-6GHz	5.12dB





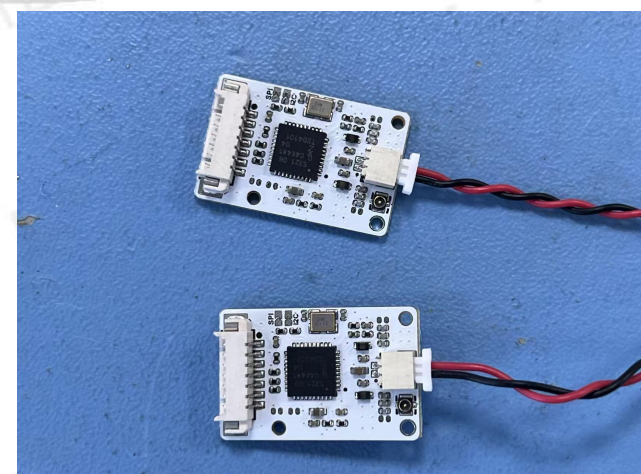
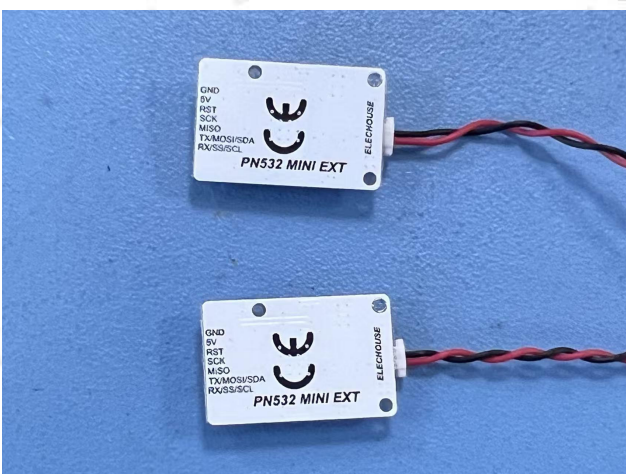
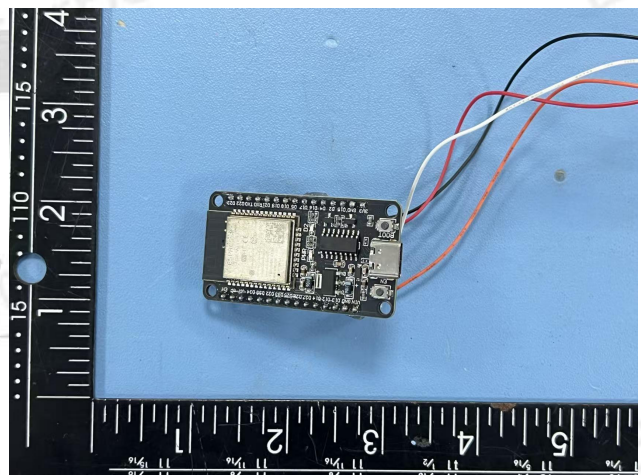
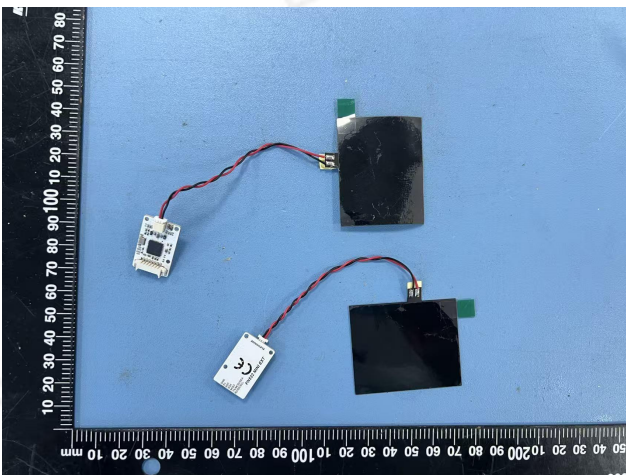
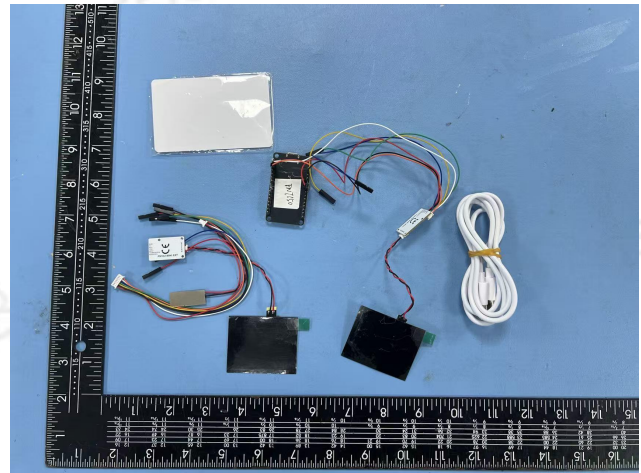
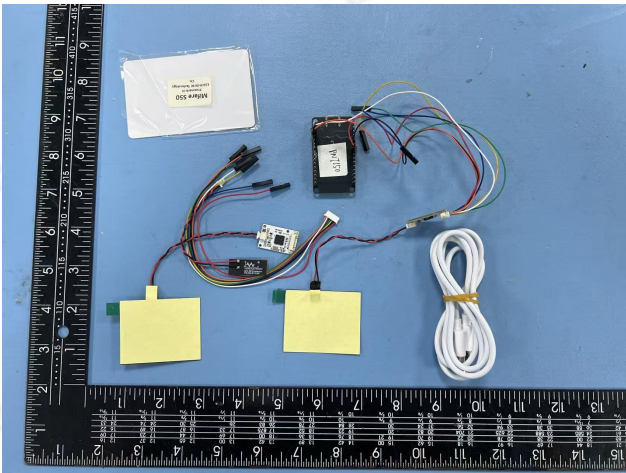
## 7 List of Measuring Equipment

Test Equipment for Conducted Emission					
Description	Manufacturer	Model	Serial Number	Cal Date	Due Date
LISN	R&S	ENV216	102125	2025/06/10	2026/06/09
LISN	R&S	ENV432	101327	2025/06/10	2026/06/09
ISN	Schwarzbeck	NTFM 8158	0127	2025/06/10	2026/06/09
EMI Test Receiver	R&S	ESR3	102143	2025/06/10	2026/06/09
EMI Test Software	Audix	E3	N/A	N/A	N/A
Test Equipment for Radiated Emission					
Description	Manufacturer	Model	Serial Number	Cal Date	Due Date
EMI Test Receiver	R&S	ESR3	102144	2025/06/10	2026/06/09
Spectrum Analyzer	R&S	FSV 30	103728	2025/06/10	2026/06/09
Amplifier	Sonoma	310	363917	2025/06/10	2026/06/09
Amplifier	Schwarzbeck	BBV 9718	327	2025/06/10	2026/06/09
Broadband Antenna	Schwarzbeck	VULB9168	9168-757	2024/09/17	2027/09/16
Horn Antenna	Schwarzbeck	BBHA 9120 D	1677	2024/09/17	2027/09/16
EMI Test Software	Audix	E3	N/A	N/A	N/A
Test Equipment for ESD					
Description	Manufacturer	Model	Serial Number	Cal Date	Due Date
ESD Generator	Teseq	NSG 437	1121	2025/06/10	2026/06/09
Test Equipment for EFT/SURGE/DIPS					
Description	Manufacturer	Model	Serial Number	Cal Date	Due Date
Surge Generator	Teseq	NSG 3060-MF	4040	2025/06/10	2026/06/09
Surges Generator extension box	Teseq	NSG 3060-TS-EXT-EPO	3005	2025/06/10	2026/06/09
CDN	Teseq	CDN 3061-S16	3003	2025/06/10	2026/06/09
EFT/DIPS Generator	Teseq	NSG 3040-MF	6033	2025/06/10	2026/06/09
Transformer	Teseq	INA6501	1002	2025/06/10	2026/06/09
Capacitive Coupling Clamp	Teseq	CDN 3425	3041	2025/06/10	2026/06/09
CDN	Teseq	CDN 118	43182	2025/06/10	2026/06/099
CDN	Teseq	INA 185	44059	2025/06/10	2026/06/09
Test Equipment for CS, RS					
Description	Manufacturer	Model	Serial Number	Cal Date	Due Date
CS Generator	Teseq	NSG 4070B-80	45341	2025/06/10	2026/06/09
6dB Attenuator	Teseq	ATN 6075	32154	2025/06/10	2026/06/09
Current injection pliers	3ctest	BCIP-400	BCIP22091891	2025/06/10	2026/06/09
CDN	Teseq	CDN M016	45065	2025/06/10	2026/06/09
CDN	Teseq	CDN T800	42821	2025/06/10	2026/06/09
Description	Manufacturer	Model	Serial Number	Cal Date	Due Date
Signal generator	R&S	SMB100A	113825	2025/06/10	2026/06/09
Power Meter	R&S	NRP2	105581	2025/06/10	2026/06/09
Power Sensor	R&S	NRP-Z91	103778	2025/06/10	2026/06/09
Power Sensor	R&S	NRP-Z91	103779	2025/06/10	2026/06/09
Power Amplifier	R&S	BBA150	102377	2025/06/10	2026/06/09
Power Amplifier	R&S	BBA150	102376	2025/06/10	2026/06/09
Power Amplifier	MIAO	MAPA2G6G100	20240102001	2025/06/10	2026/06/09
Antenna	R&S	HL046E	100230	N/A	N/A
Antenna	Schwarzbeck	STLP 9149	9149-459	N/A	N/A
Description	Manufacturer	Model	Serial Number	Cal Date	Due Date
Communication Tester	R&S	CMW270	101231	2025/06/10	2026/06/09
Communication Tester	R&S	CMW500	164998	2025/06/10	2026/06/09

N/A: No Calibration Required



## Appendix A. Photographs of EUT



-----End of the report-----