

# Directive 2014/53/EU (RED) EN 301 489-1/-3 EMC TEST REPORT

FOR

**Project No.** : PJ217232

**Applicant** : MACHAN INTERNATIONAL CO., LTD.

**Product Name** : Proximity Lock

**Brand Name** :  MARCHING ON

**Model No.** : EX-series-Proximity Lock

**Added Model(s)** : MX-series-Proximity Lock, SC-series-Proximity Lock, LX-series-Proximity Lock, NC-series-Proximity Lock

**Model Different** : The model(s) difference are outlook appearance, dimension, decoration. According to manufacturer provide information and EMC technical judgement, above variations could not affect EMC characteristic, no necessary to perform added model spot check test.

**Issue Date** : Apr. 14, 2022

**Test Site** : SGS Taiwan Ltd.  
Electromagnetic Compatibility Laboratory  
No.134,Wu Kung Road, New Taipei Industrial Park,  
Wuku District, New Taipei City, Taiwan



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**Applicant** : MACHAN INTERNATIONAL CO., LTD.  
No. 352, Dama Rd., Waipu Dist., Taichung City 438023, Taiwan

**Manufacturer** : MACHAN INTERNATIONAL CO., LTD.  
No. 352, Dama Rd., Waipu Dist., Taichung City 438023, Taiwan

**Product Name** : Proximity Lock

**Brand Name** : 

**Model No.** : EX-series-Proximity Lock

**Added Model(s)** : MX-series-Proximity Lock, SC-series-Proximity Lock, LX-series-Proximity Lock, NC-series-Proximity Lock

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**File Number** : MW/2021/70037

**Date of Sample Receipt** : Jul. 30, 2021

**Date of Test** : Dec. 07 ~ 27, 2021

### APPLICABLE STANDARDS

EN 301 489 -1 v2.2.3 : 2019-11	EN 301 489 -3 v2.1.1 : 2019-03
EMI: EN 55032 : 2015+A11:2020 (Class B)	
EMS: EN 61000-4-2 : 2009	EN 61000-4-3 : 2006+A1:2008+A2:2010

In the configuration tested, the EUT complied with the standards specified above.

### Remarks:

This report details the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

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Approved By



Date

Apr. 14, 2022

Victor Wen (Assistant Manager)

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## Revision History

Revision	Report Number	Description	Issue Date
00	MW/2021/70037	Original.	Apr. 14, 2022

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# 1. General Description

## 1.1 General Description of EUT

Product Name	Proximity Lock
Brand Name	 MACHAN MARCHING ON
Model No.	EX-series-Proximity Lock
Added Model(s)	MX-series-Proximity Lock, SC-series-Proximity Lock, LX-series-Proximity Lock, NC-series-Proximity Lock
Model Difference	The model(s) difference are outlook appearance, dimension, decoration. According to manufacturer provide information and EMC technical judgement, above variations could not affect EMC characteristic, no necessary to perform added model spot check test.

## 1.2 Details of EUT

Power Supply	DC 9 V (Batt.) DC 5 V (From PC USB)
Highest internal frequency	<108 MHz
Adapter	N/A

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### 1.3 General Requirements of Test Set up

#### For EN 301 489-1:

The signal source providing the transmitter under test with the modulation signal for the normal test modulation shall be located outside the test environment, unless the transmitter is modulated by its own internal source, see the relevant part of EN 301 489 series.

The transmitter shall be modulated with normal test modulation, by an internal or external signal source capable of delivering the normal test modulation as specified in the relevant part of EN 301 489 series.

The measuring equipment for the wanted RF output signal from the transmitter under test shall be located outside the test environment.

For transmitters with an integral antenna, the wanted RF output signal to establish a communication link shall be delivered from the EUT to an antenna located within the test environment. This antenna shall be connected to the external measuring equipment by a coaxial cable.

For transmitters with a removable antenna, the wanted RF output signal to establish a communication link shall be delivered from the antenna connector to the external measuring equipment by a shielded transmission line, such as a coaxial cable. Adequate measures shall be taken to minimize the effect of unwanted common mode currents on the external conductor of the transmission line at the point of entry to the transmitter.

Unless otherwise specified in the relevant part of EN 301 489 series [i.13] for the particular type of radio equipment, the level of the wanted RF output signal in transmit mode of operation shall be set to the maximum rated RF power for the EUT, modulated with the normal test modulation.

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### For EN 301 489-3:

The transmitter shall be modulated with normal test modulation as specified for that type of equipment.

Where transmitters do not have a modulation input port, the internal equipment modulation shall be used.

The transmitter shall be operated at its maximum rated RF output power as specified for that type of equipment.

The manufacturer may provide a suitable companion receiver that can be used to set up a communications link and/or to receive messages.

#### RFID/NFC:

1. Activate the Manufacturer's equipped software.
2. Put "Easy card" on the back side of EUT.
3. Monitor the status of connection by seeing the window.

### 1.4 Description of Test Modes

The following modes were selected for evaluation to find the worst mode (modes):

Modes/Function:

Mode 1. Operation + RFID

Mode 2. Data Link

Mode 3. RFID Standby

Then the following mode (modes) was found to be the worst one and reported as the worst case:

Worst Case:

CE Worst case : Mode 2. Data Link

ISN Worst case : N/A (without wired telecommunication port exist in this EUT, no necessary to perform the test.)

Below 1GHz RE Worst case : Mode 2. Data Link

Above 1GHz RE Worst case : N/A (The highest internal frequency is less than 108 MHz, no necessary to perform this test.)

### 1.5 Test Condition

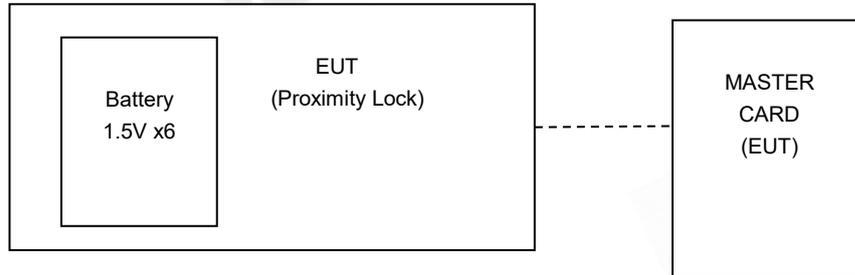
Refer to EN 301 489-1, Section 4 and EN 301 489-3 for the details.

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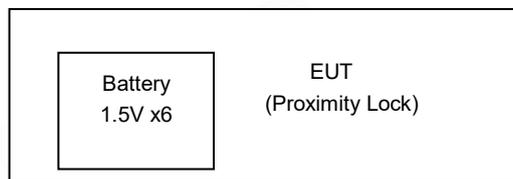
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## 1.6 Configuration of Tested System

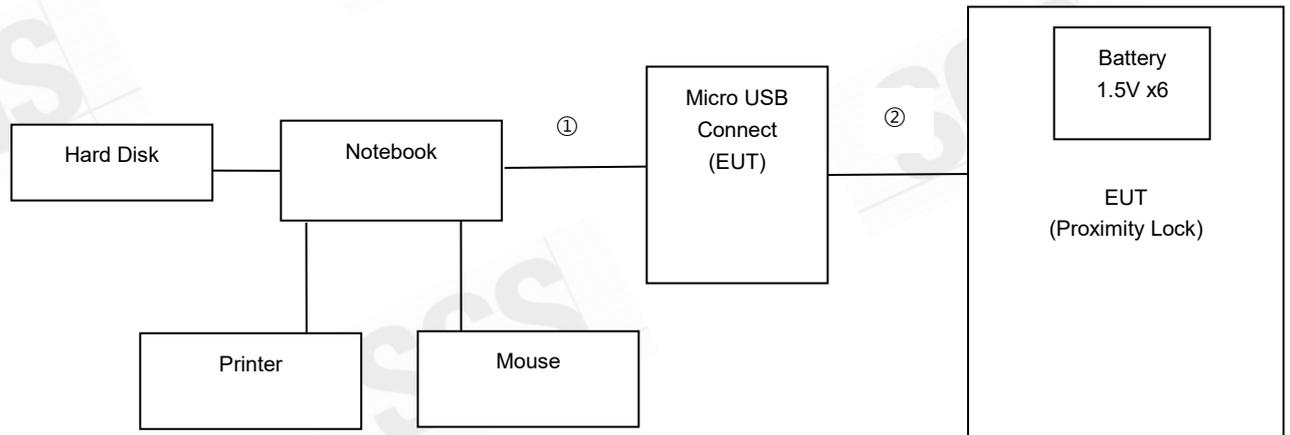
EMI/EMS  
Mode 1



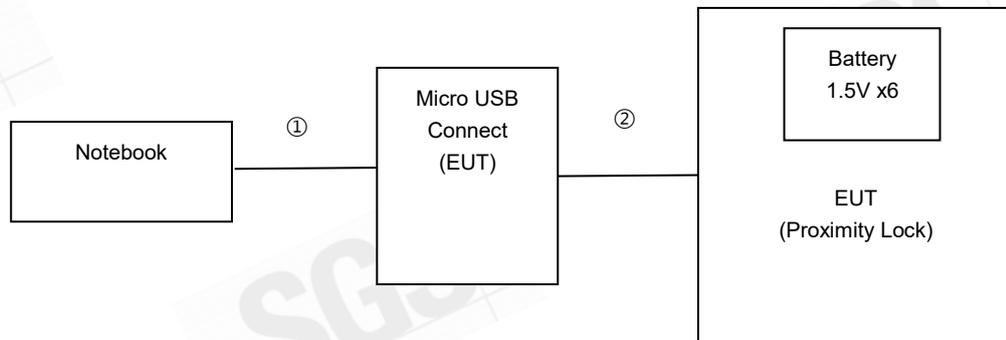
Mode 3



EMI  
Mode 2



EMS  
Mode 2



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**Table 1-1 Support Equipment Used in Tested System**

PRODUCT	MANUFACTURER	MODEL NO.	SERIAL NO.
Notebook	Lenove	LP40	N/A
Mouse	Lenove	Mojuuo	N/A
Hard Disk	WD	WDBACY5000ABL-PESN	WX41EA1CRA60
Printer	HP	VCVRA-0103	N/A
Battery	Panasonic	R14NT	N/A

**Support Equipment Used in Tested Cable**

Cable Type	Core	Length	Shielding/Non-shielding
Mouse Cable	N/A	1.6 m	Shielding
Printer USB Cable	N/A	1.8 m	Shielding
Hard Disk USB Cable	N/A	1.0 m	Shielding

**Note:** All the above equipment/cables were placed in worse case positions to maximize emission signals during emission test.

**Grounding:** Grounding was set in accordance with the manufacturer's requirements and conditions for intended use.

**Table 1-2 Accessories Cable List**

Cable Type	Core	Length	Shielding/Non-shielding
Micro USB Cable-①	N/A	1.2m	Shielding
Micro USB Cable-②	N/A	0.3m	Shielding

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## 1.7 Operation Procedure

### Mode 1

1. Place the sample on the test board.
2. Load the sample into the battery.
3. Place the card in front of the sensor.
4. Confirm that the sample is sensing and operating.
5. Start test.

### Mode 2

1. Place the sample on the test board.
2. Load the sample into the battery.
3. Connect SGS NB to the wire and sample.
4. Execute test software SerialPortMon.exe.
5. Confirm that the sample data is being transferred.
6. Start test.

### Mode 3

1. Place the sample on the test board.
2. Load the sample into the battery.
3. Confirm that the RFID is in standby.
4. Start test.

## 1.8 Decision Rules Result

Reported measurement data comply with EN 55032 : 2015+A11:2020.

Measurement instrumentation uncertainty shall not be taken into account in the determination of compliance.

## 1.9 Reporting Statements of Conformity

The conformity statement in this report is based solely on the test results, measurement uncertainty is excluded.

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## 2. EMISSION

EN 301 489-1/-3  
EN 55032 (Class B)

### 2.1 Test Configuration

Refer to EN 301 489-1, Section 8.1.2

### 2.2 Special Conditions

EN 301 489-3

The provisions of ETSI EN 301 489-1 [1], clause 7.1 shall apply.

### 2.3 Summary of Test Results

Test Items	Performance Section	Result
Enclosure of ancillary equipment measured on a stand alone basis, EN 55032, Class B	EN 301 489-1 Section 8.2	PASS
DC mains power input/output ports, EN 55032, Class B	EN 301 489-1 Section 8.3	N/A
AC mains power input/output ports, EN 55032, Class B	EN 301 489-1 Section 8.4	PASS
Current harmonics emission	EN 301 489-1 Section 8.5	N/A
Voltage fluctuations and flicker	EN 301 489-1 Section 8.6	N/A
Wired network Ports	EN 301 489-1 Section 8.7	N/A

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**2.4 Enclosure of ancillary equipment measured on a stand alone basis (Refer to EN 301 489-1 Section 8.2)**

**2.4.1 Test Method:**

Standard	Edition	Description
EN 55032	2015+A11:2020	Information technology equipment – Radio disturbance characteristics - Limits and methods of measurement

**2.4.2 Limit:**

**Maximum permissible level of Radiated Emission measured at 10 meter**

FREQUENCY (MHz)	Class A(dBuV/m)	Class B(dBuV/m)
	Quasi - peak	Quasi - peak
30 - 230	40	30
230 - 1000	47	37

Note : The lower limit shall apply at the transition frequency.

**Maximum permissible level of Radiated Emission measured at 3 meter**

FREQUENCY (MHz)	Class A(dBuV/m)	Class B(dBuV/m)
	Quasi - peak	Quasi - peak
30 - 230	50	40
230 - 1000	57	47

Note : The lower limit shall apply at the transition frequency.

**Limits above 1 GHz**

**Limits for radiated disturbance of Class A ITE at a measurement distance of 3m**

Frequency range GHz	Average Limit dB( $\mu$ V/m)	Peak Limit dB( $\mu$ V/m)
1 to 3	56	76
3 to 6	60	80

Note : The lower limit applies at the transition frequency.

**Limits for radiated disturbance of Class B ITE at a measurement distance of 3m**

Frequency range GHz	Average Limit dB( $\mu$ V/m)	Peak Limit dB( $\mu$ V/m)
1 to 3	50	70
3 to 6	54	74

Note : The lower limit applies at the transition frequency.

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If the highest frequency of the internal sources of the EUT is less than 108 MHz, the measurement shall only be made up to 1 GHz.

If the highest frequency of the internal sources of the EUT is between 108 MHz and 500 MHz, the measurement shall only be made up to 2 GHz.

If the highest frequency of the internal sources of the EUT is between 500 MHz and 1 GHz, the measurement shall only be made up to 5 GHz.

If the highest frequency of the internal sources of the EUT is above 1 GHz, the measurement shall be made up to 5 times the highest frequency or 6 GHz, whichever is less.

The highest internal source of EUT is higher than 1GHz.

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**2.4.3 Test Instruments:  
Below 1GHz**

SGS Radiated Below 1GHz WuKu 966-2 EMC					
EQUIPMENT TYPE	Manufacturer	Model Number	Serial Number	Calibration Date	Calibration Due
EMI Test Receiver	R&S	ESCI	101338	2021/3/22	2022/3/21
Broadband Antenna	SCHAFFNER	CBL 6112D	23189	2021/6/30	2022/6/29
Pre Amplifier	HP	8447D	1937A02748	2021/9/30	2022/9/29
Coaxial Cable	Huber+Suhner	SUCCOFLEX 104-02	966 II	2021/9/30	2022/9/29
Antenna Master	MF	N/A	N/A	N.C.R.	N.C.R.
Turn Table	MF	N/A	N/A	N.C.R.	N.C.R.
Controller	MF	MF7802	N/A	N.C.R.	N.C.R.
Site NSA	Chamost	966II Chamber	N/A	2020/12/21	2021/12/20
Test Software	Farad	EZ-EMC	Ver. SGS-03A2-10	N.C.R.	N.C.R.
Testing Site : No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan					
Measurement Uncertainty of Radiated Emission					
Expanded uncertainty Ulab (k=2) of radiated emission measurement is 5.71 dB. (30-1000MHz)					
Expanded uncertainty Ucispr 16-4-2 :2011+A1:2014+A2:2018 (K=2) of radiated emission is 6.32 dB. (30MHz - 1000MHz)					

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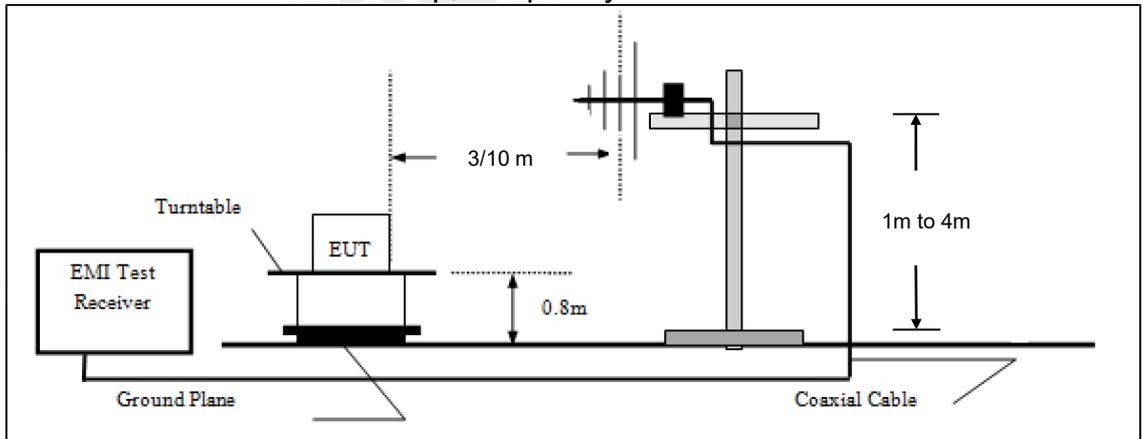
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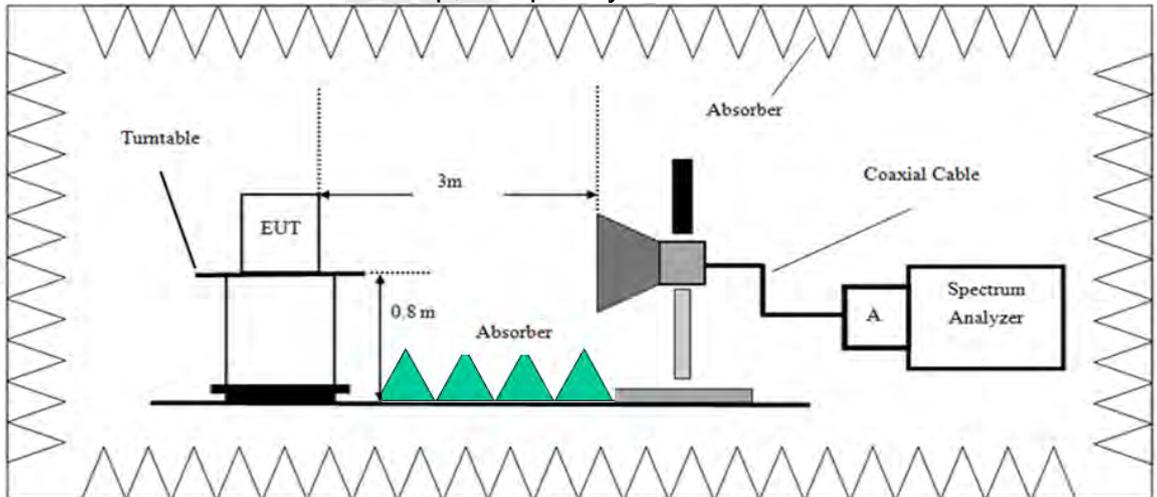
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## 2.4.4 Test Set-Up (Block Diagram of Configuration):

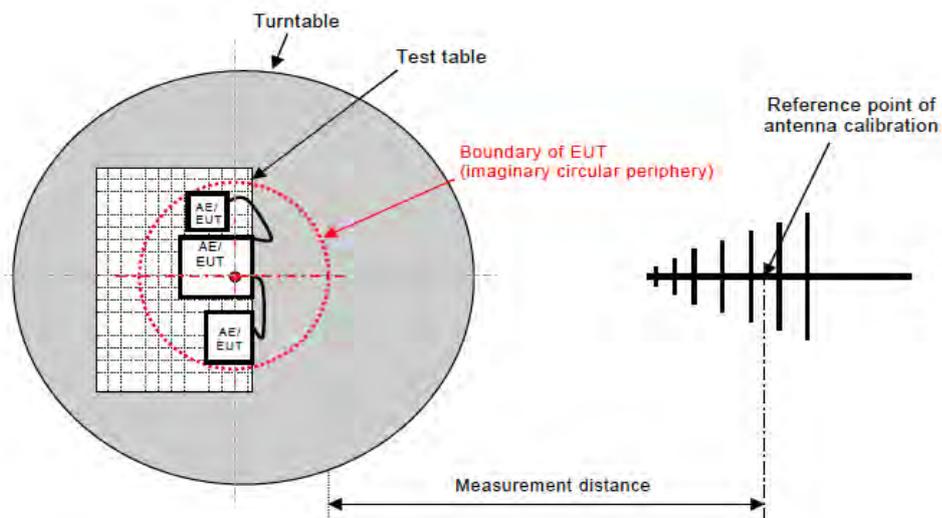
(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(B) Radiated Emission Test Set-Up, Frequency Over 1 GHz



(C) Measurement Distance for Radiated Emissions Measurements



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#### 2.4.5 Measurement Level Calculation:

Correction Factor = Antenna Factor + Cable loss- Amplifier Gain

Measurement Level = Reading Level + Correction Factor

Over (Margin) = Measurement Level – Limit

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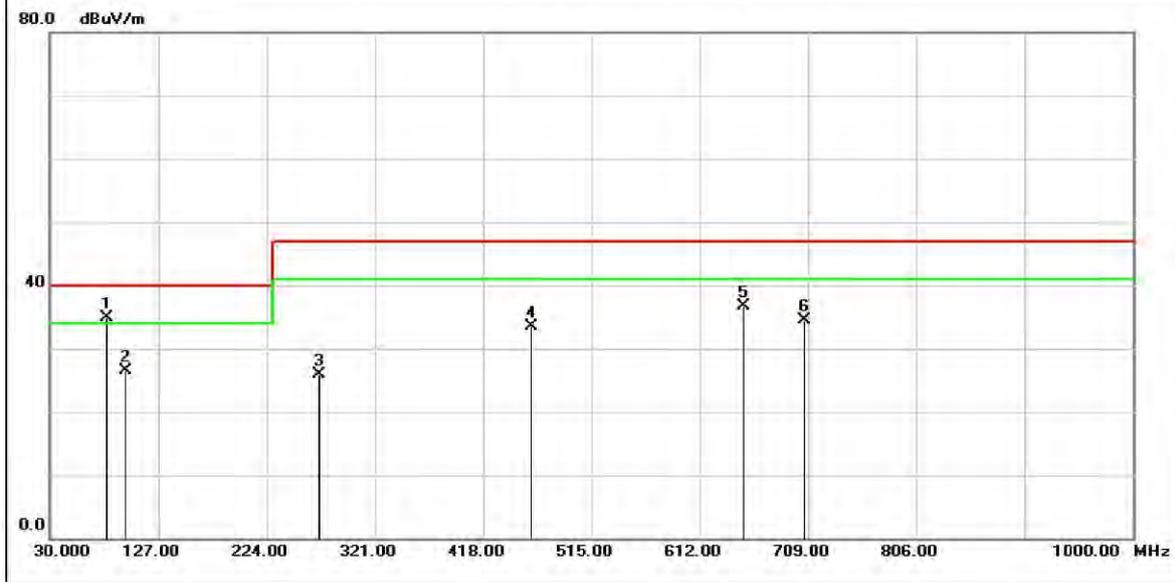
2.4.6 Measurement Data:  
Below 1GHz

Model No.: EX-series-Proximity Lock  
Mode\_2\_H

Site: 966-2 Chamber	Date: 2021-12-07	Time: 15:08:30
Limit: EN55032 Class B 3M Radiation	Polarization: Horizontal	Temperature: 23 °C
Mode: Mode_2	Power: DC 9V (Batt.)	Humidity: 60 %RH
Report: MW-2021-70037	Distance: 3m	atm pressure: 1015 mbar
Tester: Guan Chen Wu		

Note:

SGS Taiwan Ltd. Electromagnetic Compatibility Laboratory Add.No.134, Wu Kung Rd., New Taipei Ind. Park Wuku Dist., New Taipei City,TW



No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Height (cm)	Degree (deg.)	Comment
		(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)				
1	*	81.5700	48.27	-13.27	35.00	40.00	-5.00	QP	200	179	
2		97.5424	36.44	-9.84	26.60	40.00	-13.40	QP			
3		270.9496	32.16	-6.26	25.90	47.00	-21.10	QP			
4		461.0656	35.75	-2.15	33.60	47.00	-13.40	QP			
5		650.8978	36.42	0.28	36.70	47.00	-10.30	QP			
6		705.1700	34.54	0.06	34.60	47.00	-12.40	QP			

\*:Maximum data x:Over limit !:over margin

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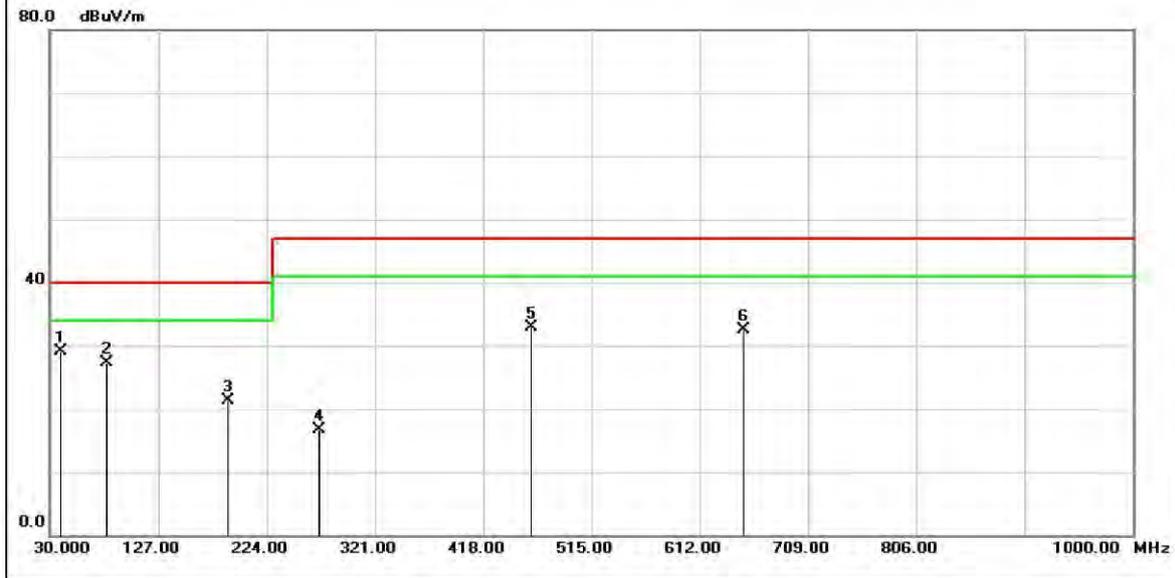
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## Mode\_2\_V

Site: 966-2 Chamber	Date: 2021-12-07	Time: 15:05:48
Limit: EN55032 Class B 3M Radiation	Polarization: Vertical	Temperature: 23 °C
Mode: Mode_2	Power: DC 9V (Batt.)	Humidity: 60 %RH
Report: MW-2021-70037	Distance: 3m	atm pressure: 1015 mbar
Tester: Guan Chen Wu		

Note:

SGS Taiwan Ltd. Electromagnetic Compatibility Laboratory Add. No.134, Wu Kung Rd., New Taipei Ind. Park, Wuku Dist., New Taipei City, TW



No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Height	Degree	Comment
		(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)		(cm)	(deg.)	
1	*	39.6491	36.99	-7.79	29.20	40.00	-10.80	QP	100	171	
2		81.3740	40.62	-13.32	27.30	40.00	-12.70	QP			
3		189.4906	31.69	-10.39	21.30	40.00	-18.70	QP			
4		270.5600	23.08	-6.28	16.80	47.00	-30.20	QP			
5		461.0656	35.15	-2.15	33.00	47.00	-14.00	QP			
6		650.9340	32.32	0.28	32.60	47.00	-14.40	QP			

\*:Maximum data    x:Over limit    !:over margin

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## 2.5 DC power input/output ports measurement (Refer to EN 301 489-1 Section 8.3)

### 2.5.1 Test Method:

Standard	Edition	Description
EN 55032	2015+A11:2020	Information technology equipment – Radio disturbance characteristics - Limits and methods of measurement

Refer to section 8.3.2 of EN 301 489-1 for detail.

### 2.5.2 Limit:

#### Maximum permissible level of Line Conducted Emission

FREQUENCY (MHz)	Class A(dBuV)		Class B(dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79	66	66 - 56	56 - 46
0.50 - 5.0	73	60	56	46
5.0 - 30.0	73	60	60	50

Note : The lower limit shall apply at the transition frequency.

#### Maximum permissible level of Common Mode Conducted Emission (Telecommunication Ports)

##### CLASS A

FREQUENCY (MHz)	Voltage Limit(dBuV)		Current Limit(dBuA)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	97 - 87	84 - 74	53 - 43	40 - 30
0.5 - 30.0	87	74	43	30

##### CLASS B

FREQUENCY (MHz)	Voltage Limit(dBuV)		Current Limit(dBuA)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	84 - 74	74 - 64	40 - 30	30 - 20
0.5 - 30.0	74	64	30	20

Note : The lower limit shall apply at the transition frequency.

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### 2.5.3 Test Instruments:

SGS Conducted Emission WuKu Conducted Room EMC					
EQUIPMENT TYPE	Manufacturer	Model Number	Serial Number	Calibration Date	Calibration Due
EMI Test Receiver	R&S	ESCI	101338	2021/3/22	2022/3/21
Coaxial Cables	N/A	WK CE Cable	N/A	2021/11/17	2022/11/16
Pulse Limiter	R&S	ESH3-Z2	357.8810.52	2021/11/17	2022/11/16
LISN	SCHWARZBECK	NSLK 8127	8127-649	2021/6/15	2022/6/14
LISN	Rolf-Heine	NNB-2/16Z	99013	2021/12/9	2022/12/8
Test Software	Farad	EZ-EMC	Ver. SGS-03A2-10	N.C.R.	N.C.R.

Testing Site : No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan  
 Measurement Uncertainty of Conducted Emission  
 Expanded uncertainty Ulab (K=2) of conducted emission is 2.34 dB.  
 Expanded uncertainty Ucispr 16-4-2 :2011+A1:2014+A2:2018 (K=2) of AC mains conducted Emission is 3.44 dB

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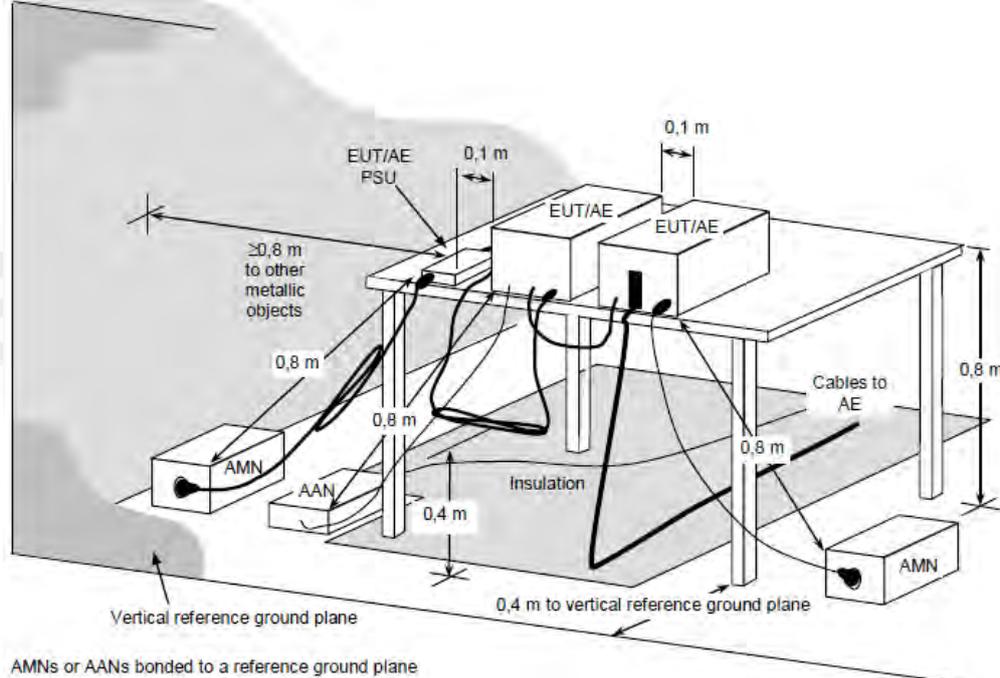
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## 2.5.4 Test Setup (Block Diagram of Configuration):



## 2.5.5 Measurement Level Calculation:

Factor = LISN insertion loss + Cable loss + Pulse Limiter insertion loss  
 Measurement Level = Reading Level + Factor  
 Over (Margin) = Measurement Level – Limit

## 2.5.6 Measurement Data:

N/A, this EUT not applicable for vehicular use.

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## 2.6 AC mains power input/output ports measurement (Refer to EN 301 489-1 Section 8.4)

### 2.6.1 Test Method:

Standard	Edition	Description
EN 55032	2015+A11:2020	Information technology equipment – Radio disturbance characteristics - Limits and methods of measurement

Refer to section 8.4.2 of EN 301 489-1 for detail.

### 2.6.2 Limit:

Refer to 2.5.2

### 2.6.3 Test Instruments:

Refer to 2.5.3

### 2.6.4 Conduction Emission Test Set-up:

Refer to 2.5.4

### 2.6.5 Measurement Level Calculation:

Factor = LISN insertion loss + Cable loss + Pulse Limiter insertion loss

Measurement Level = Reading Level + Factor

Over (Margin) = Measurement Level – Limit

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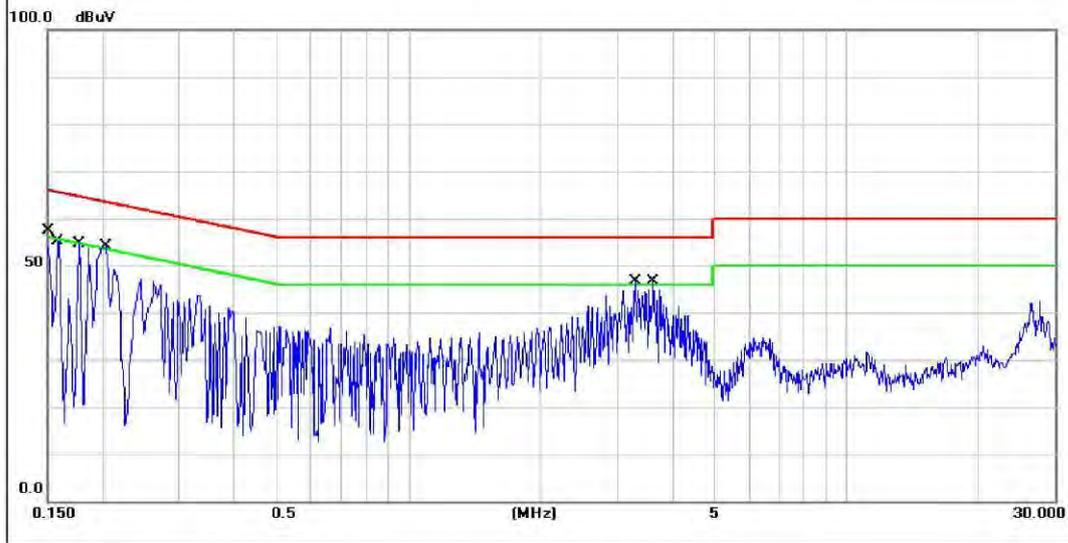
2.6.6 Measurement Data:

Model No.: EX-series-Proximity Lock  
Mode\_2\_L

Site: 1F Conduction Room	Date: 2021-12-16	Time: 11:27:43
Limit: EN55032 Class B Conduction(QP)	Phase: L1	Temperature: 23 °C
Mode: Mode_2	Power: DC 5 V (From NB USB)	Humidity: 67 %RH
Report: MW-2021-70037		atm pressure: 1013 mbar
Tester: Guan Chen Wu		

Note:

SGS Taiwan Ltd. Electromagnetic Compatibility Laboratory Add.:No.134, Wu Kung Rd., New Taipei Ind. Park, Wuku Dist., New Taipei City, TW



No.	Mk	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Over (dB)	Detector	Comment
1		0.1508	38.38	10.04	48.42	65.96	-17.54	QP	
2		0.1582	37.17	10.04	47.21	65.56	-18.35	QP	
3		0.1774	35.10	10.04	45.14	64.61	-19.47	QP	
4		0.2041	34.73	10.04	44.77	63.44	-18.67	QP	
5	*	3.2950	31.08	10.69	41.77	56.00	-14.23	QP	
6		3.6247	30.85	10.61	41.46	56.00	-14.54	QP	

\*:Maximum data    x:Over limit    !:over margin

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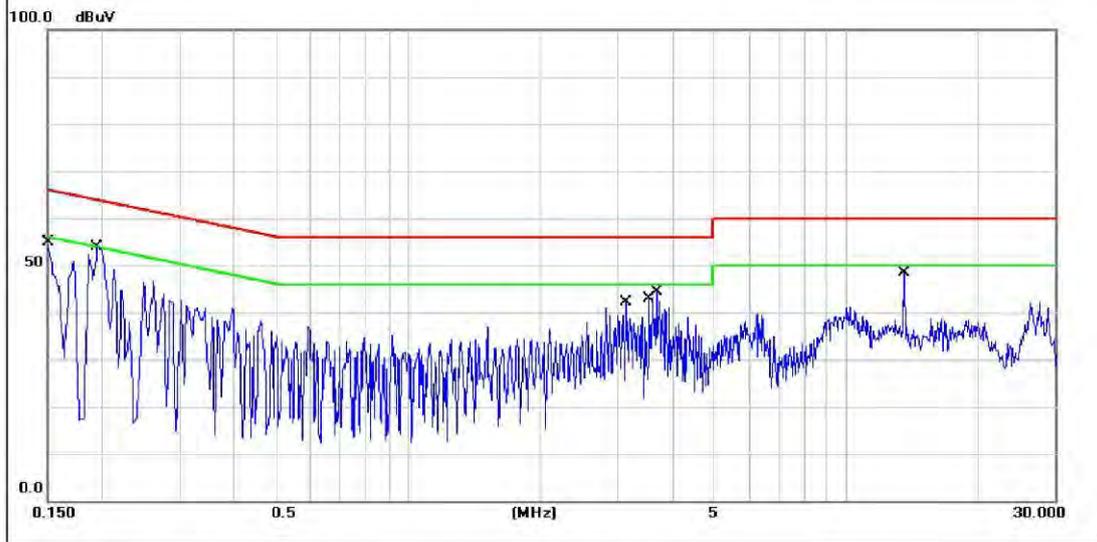
SGS Taiwan Ltd. No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan / 桃園市龜山區科技一路 2 號

## Mode\_2\_N

Site: 1F Conduction Room	Date: 2021-12-16	Time: 11:24:24
Limit: EN55032 Class B Conduction(QP)	Phase: N	Temperature: 23 °C
Mode: Mode_2	Power: DC 5 V (From NB USB)	Humidity: 67 %RH
Report: MW-2021-70037		atm pressure: 1013 mbar
Tester: Guan Chen Wu		

Note:

SGS Taiwan Ltd. Electromagnetic Compatibility Laboratory Add.No.134, Wu Kung Rd., New Taipei Ind. Park, Wuku Dist., New Taipei City, TW



No.	Mk	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Over (dB)	Detector	Comment
1		0.1507	38.71	10.05	48.76	65.96	-17.20	QP	
2	*	0.1941	42.87	10.05	52.92	63.86	-10.94	QP	
3		3.1562	25.38	10.73	36.11	56.00	-19.89	QP	
4		3.5513	27.86	10.64	38.50	56.00	-17.50	QP	
5		3.6877	28.99	10.62	39.61	56.00	-16.39	QP	
6		13.5603	36.43	10.45	46.88	60.00	-13.12	QP	

\*:Maximum data x:Over limit !:over margin

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## 2.7 Current Harmonics Emission (AC mains input port) measurement (Refer to EN 301 489-1 Section 8.5)

### 2.7.1 Test Method:

Refer to EN IEC 61000-3-2 : 2019

### 2.7.2 Test Instruments:

SGS Harmonic EN61000-3-2 WuKu EMC					
EQUIPMENT TYPE	Manufacturer	Model Number	Serial Number	Calibration Date	Calibration Due
HARMONICS SYSTEM	EMC PARTNER	HARMONICS-1000	151	2021/9/1	2022/8/31
AC Power Source	TESEQ	NSG 1007	1515A01120	2021/9/1	2022/8/31
Test Software	EMC PARTNER	HARMONICS-1000	HARCS Ver 5.0 & F.W Ver 2.21	N.C.R.	N.C.R.

Testing Site : No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan

### 2.7.3 Measurement Result:

N/A, the EUT power from DC 9 V battery, no necessary to perform the test.

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## 2.8 Voltage Fluctuations and Flicker (AC mains input port) measurement (Refer to EN 301 489-1 Section 8.6)

### 2.8.1 Test Method:

Refer to EN 61000-3-3 : 2013+A1:2019

### 2.8.2 Test Instruments:

SGS Flicker EN61000-3-3 WuKu EMC					
EQUIPMENT TYPE	Manufacturer	Model Number	Serial Number	Calibration Date	Calibration Due
HARMONICS SYSTEM	EMC PARTNER	HARMONICS-1000	151	2021/9/1	2022/8/31
AC Power Source	TESEQ	NSG 1007	1515A01120	2021/9/1	2022/8/31
Test Software	EMC PARTNER	HARMONICS-1000	HARCS Ver 5.0 & F.W. Var 2.21	N.C.R.	N.C.R.

Testing Site : No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan

### 2.8.3 Measurement Result:

N/A, the EUT power from DC 9 V battery, no necessary to perform the test.

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## 2.9 Wired network Ports (Refer to EN 301 489-1 Section 8.7)

### 2.9.1 Test Method:

Standard	Edition	Description
EN 55032	2015+A11:2020	Information technology equipment – Radio disturbance characteristics - Limits and methods of measurement

Refer to section 8.7.2 of EN 301 489-1 for detail.

### 2.9.2 Limit: Limits for conducted emission from Wired network ports:

Frequency range	Voltage limits (dB $\mu$ V)		Current limits (dB $\mu$ A)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 MHz to 0.5 MHz	84 to 74	74 to 64	40 to 30	30 to 20
0.5 MHz to 30 MHz	74	64	30	20

NOTE 1: The limits decrease linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

NOTE 2: The current and voltage disturbance limits are derived for use with an Impedance Stabilization Network (ISN) which presents a common mode (asymmetric mode) impedance of 150 to the telecommunication port under test (conversion factor is  $20 \log_{10} 150/I = 44\text{dB}$ ).

### 2.9.3 Test Instruments:

Refer to 2.5.3

### 2.9.4 Wired network ports Emission Test Set-up:

Refer to 2.5.4

### 2.9.5 Measurement level calculation method:

Factor = ISN insertion loss + Cable loss + Pulse Limiter insertion loss

Measurement Level = Reading Level + Factor

Over (Margin) = Measurement Level – Limit

### 2.9.6 Measurement Result:

N/A, without wired telecommunication port exist in this EUT, no necessary to perform the test.

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## 3. IMMUNITY

EN 301 489-1/-3

### 3.1 Test Configuration

Refer to EN 301 489-1, section 9.1

### 3.2 Special Conditions

#### EN 301 489-3

The following special conditions set out in table 3, relate to the immunity test methods and performance criteria used in ETSI EN 301 489-1 [1], clause 9.

Reference to clauses in ETSI EN 301 489-1 [1]	Special product-related conditions, additional to or modifying the test conditions in ETSI EN 301 489-1 [1], clause 9
9.2.2: Test method; Radio frequency electromagnetic field	The test shall be performed over the range 80 MHz to 2 700 MHz with the exception of the exclusion bands defined in clause 4.6.  Where the EUT is subject to EMC Immunity testing under a Harmonised Standard of a Directive other than the Directive 2014/53/EU [i.1] then the modulating signal frequency specified in that Harmonised Standard may be used. If this alternative modulating frequency is used, then the applicable Directive, Harmonised Standard & modulating frequency shall be noted in the test report
9.5.2: Test method; Radio frequency, common mode	Where the EUT is subject to EMC Immunity testing under a Harmonised Standard of a Directive other than the Directive 2014/53/EU [i.1] then the modulating signal frequency specified in that Harmonised Standard may be used. If this alternative modulating frequency is used, then the applicable Directive, Harmonised Standard & modulating frequency shall be noted in the test report.

### 3.3 Summary of Test Results

Test Items	Performance Section	Result
Radio frequency electromagnetic field (80 to 1000MHz and 1000MHz to 6000MHz)	EN 301 489-1 Section 9.2	PASS
Electrostatic discharge	EN 301 489-1 Section 9.3	PASS
Fast transients, common mode	EN 301 489-1 Section 9.4	N/A
Radio frequency, common mode	EN 301 489-1 Section 9.5	N/A
Transients and surges in the vehicular environment	EN 301 489-1 Section 9.6	N/A
Voltage dips and interruptions	EN 301 489-1 Section 9.7	N/A
Surges	EN 301 489-1 Section 9.8	N/A

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### 3.4 Performance Criteria Description

#### EN 301 489-3

In the table below:

- performance criterion A applies for immunity tests with phenomena of a continuous nature;
- performance criterion B applies for immunity tests with phenomena of a transient nature.

NOTE: Whether a phenomenon is considered transient, continuous or otherwise is indicated in the test procedures for the phenomenon in ETSI EN 301 489-1 [1], clause 9.

Criterion	During test	After test
A	Operate as intended No loss of function No unintentional responses	Operate as intended No loss of function No degradation of performance No loss of stored data or user programmable functions
B	May show loss of function No unintentional responses	Operate as intended Lost function(s) shall be self-recoverable No degradation of performance No loss of stored data or user programmable functions

Where "operate as intended" or "no loss of function" is specified, the EUT shall demonstrate correct functioning as described in clause 5.

Where the EUT has more than one mode of operation (see clause 4.5.2), an unplanned transition from one mode to another is considered as an unintentional response. The EUT shall be tested in sufficient modes to confirm there are no such unintentional responses.

#### Monitoring:

For NFC/ RFID: The status as displayed on CMD of EUT

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### 3.5 Radio Frequency Electromagnetic Field (80 to 1000MHz and 1000 to 6000MHz) (Refer to EN 301 489-1 Section 9.2 for the measurement)

#### 3.5.1 Test Method and Procedure:

EN 61000-4-3 : 2006+A1:2008+A2:2010, and EN 301 489-1 Section 9.2.2.

#### 3.5.2 Performance Criteria:

Refer to EN 301 489-1 Section 9.2.3.

#### 3.5.3 Test Instruments:

SGS RS EN61000-4-3 WuKu EMC					
EQUIPMENT TYPE	Manufacturer	Model Number	Serial Number	Calibration Date	Calibration Due
RS Test Site	Chance Most	8X4X4 Chamber	N/A	2021/8/2	2022/8/1
Signal Generator	Agilent	N5181A	MY50143807	2021/7/27	2022/7/26
Power Meter	Agilent	E4419B	GB40201546	2021/9/1	2022/8/31
Power Sensor	Agilent	E9301A	22982	2021/9/1	2022/8/31
Power Sensor	Agilent	E9301A	MY41497247	2021/9/1	2022/8/31
Power Amplifier	MILMEGA	80RF 1000-250	1067523	N.C.R.	N.C.R.
Power Amplifier	MILMEGA	AS0860B-50-50	1083416	N.C.R.	N.C.R.
Power Amplifier	MILMEGA	AS0104-100/100	1049222	N.C.R.	N.C.R.
Relay Switching Unit	FRANKONIA	RSU-3203	113A3122	N.C.R.	N.C.R.
Remote RF Switch	Audix	r2S1216	2008040801	N.C.R.	N.C.R.
Remote RF Switch	CW-01	N/A	N/A	N.C.R.	N.C.R.
Turn Table	Chance Most	N/A	N/A	N.C.R.	N.C.R.
Antenna Tower	Chance Most	N/A	N/A	N.C.R.	N.C.R.
Controller	Chance Most	886	MF7802111	N.C.R.	N.C.R.
Stacked Log. Periodic Antenna	Schwarzbeck	STLP 9129	9129-086	N.C.R.	N.C.R.
Electric Field Probes	AR	FL7006+FI7000	0433723+0433843	2021/6/12	2022/6/11
Test Software	emcware AR	N/A	Ver. 3.6.0	N.C.R.	N.C.R.

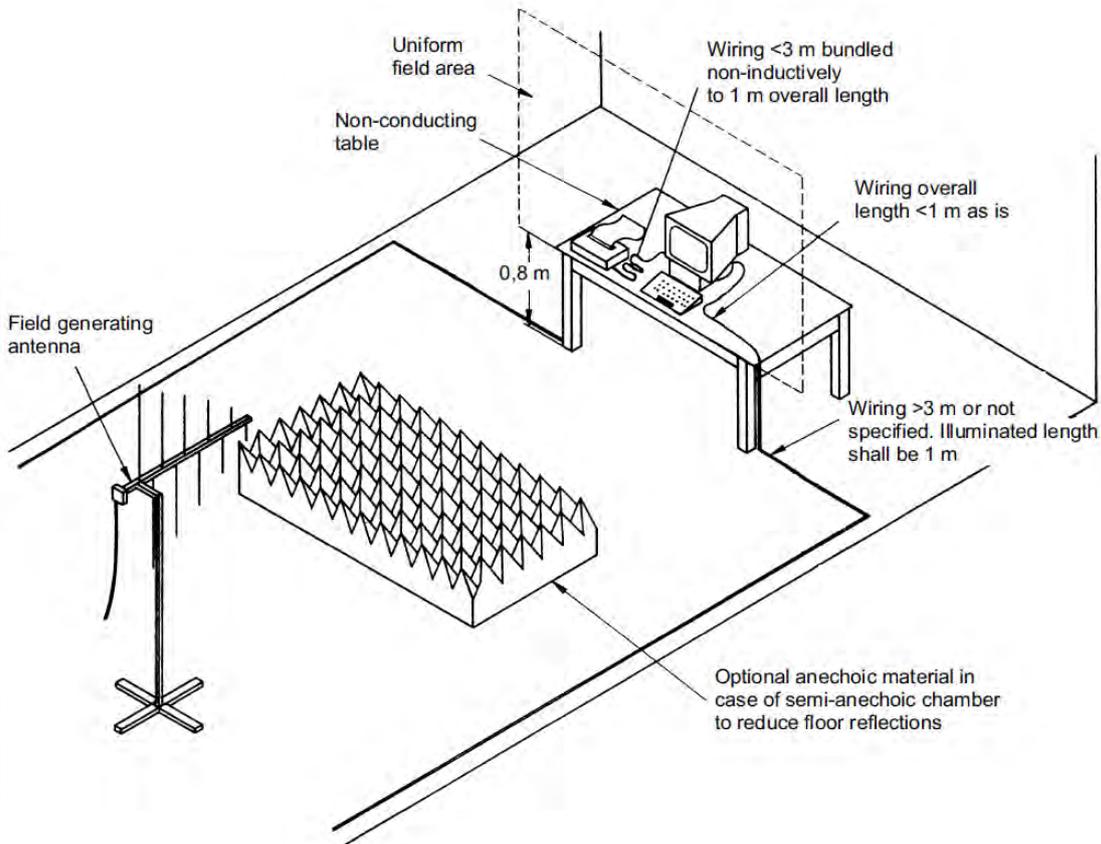
Testing Site : No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan

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### 3.5.4 Test Setup (Block Diagram of Configuration):



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### 3.5.5 Measurement Data:

#### Model No.: EX-series-Proximity Lock

Operation Mode	Mode 1~3	Tested Date	2021/12/22
Temperature	22 °C	Humidity	51 %RH
		Tested By	Guan Chen Wu

Basic Standard : EN 61000-4-3  
 Frequency Range : 80 to 1000MHz and 1000 to 6000 MHz  
 Field Strength : 3 V/m  
 Modulation : AM 80 %, 1 kHz sinewave  
 Frequency Step : 1 % of fundamental  
 Dwell Time : 3 sec  
 Polarity of Antenna : Horizontal and Vertical  
 Test Distance : 3 m (EUT to antenna reference point)

No.	Frequency (MHz)	Antenna Orientation	Criterion	EUT Orientation
1	80 – 1000	Vertical/Horizontal	A (CT, CR)	0 degree
2	80 – 1000	Vertical/Horizontal	A (CT, CR)	90 degree
3	80 – 1000	Vertical/Horizontal	A (CT, CR)	180 degree
4	80 – 1000	Vertical/Horizontal	A (CT, CR)	270 degree

No.	Frequency (MHz)	Antenna Orientation	Criterion	EUT Orientation
1	1000 – 6000	Vertical/Horizontal	A (CT, CR)	0 degree
2	1000 – 6000	Vertical/Horizontal	A (CT, CR)	90 degree
3	1000 – 6000	Vertical/Horizontal	A (CT, CR)	180 degree
4	1000 – 6000	Vertical/Horizontal	A (CT, CR)	270 degree

#### Observation:

A : No degradation in the performance of the EUT was observed.  
 CT, CR: No degradation in the performance of the EUT was observed.  
 N/A : Not Applicable.

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### 3.6 Electrostatic Discharge Measurement (Refer to EN 301 489-1 Section 9.3)

#### 3.6.1 Test Method and Procedure:

EN 61000-4-2 : 2009 and EN 301 489-1 Section 9.3.2

#### 3.6.2 Performance Criteria:

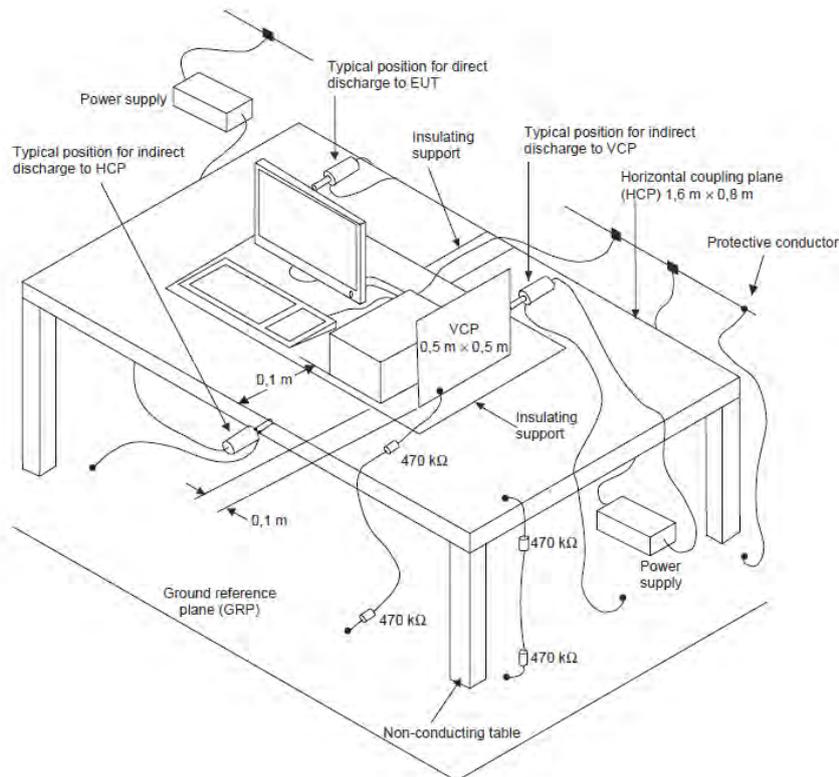
Refer to EN 301 489-1 Section 9.3.3.

#### 3.6.3 Test Instruments:

SGS ESD EN61000-4-2 WuKu No.1 EMC					
EQUIPMENT TYPE	Manufacturer	Model Number	Serial Number	Calibration Date	Calibration Due
ESD Simulator	NoiseKen	ESS-2000/TC-815R	0189C01569	2021/7/29	2022/7/28
HCP	N/A	1.6 x 0.8 m	N/A	N.C.R.	N.C.R.
VCP	N/A	0.5 x 0.5 m	N/A	N.C.R.	N.C.R.

Testing Site : No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan

#### 3.6.4 Test Setup (Block Diagram of Configuration):



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### 3.6.5 Measurement Data:

#### Model No.: EX-series-Proximity Lock

Operation Mode	Mode 1~3	Tested Date	2021/12/27
Temperature	24 °C	Humidity	47 %RH
atm Pressure	1007 mbar	Tested By	Guan Chen Wu

Basic Standard	: EN 61000-4-2
Discharge Impedance	: 330 ohm /150 pF
Discharge Voltage	: Air Discharge: +/- 2, 4, 8 kV Contact Discharge: +/- 2, 4 kV VCP/HCP: +/- 2, 4 kV
Polarity	: Positive/Negative
Number of Discharge	: Minimum 10/50 times at each test point
Discharge Mode	: Single Discharge
Discharge Period	: 1 second minimum

**Note 1:** For contact discharge, the EUT was exposed to at least 20 discharges, 10 each at negative and positive polarity.

**Note 2:** Refer to Appendix of test report for test points.

#### A. Observations for following test points:

1. Surface of case.
2. Junction of case.
3. Screw.
4. USB port.

Direct Application			Test Results	
Discharge Level (kV)	Polarity (+/-)	Test Point	Contact Discharge	Air Discharge
2, 4, 8	+/-	1,2,4	N/A	A (TT, TR)
2, 4	+/-	1~4	A (TT, TR)	N/A

#### B. Observations for following test points:

1. Front side
2. Rear side
3. Left side
4. Right side

Indirect Application			Test Results	
Discharge Level (kV)	Polarity (+/-)	Test Point	Horizontal Coupling	Vertical Coupling
2, 4	+/-	1~4	A (TT, TR)	A (TT, TR)

#### Observation:

A : No degradation in the performance of the EUT was observed.

TT, TR: "TT, TR" means during the test, the charge indicator disappeared. It recovered by itself at the end of test.

N/A : Not Applicable.

### 3.7 Fast Transients, Common Mode Measurement (Refer to EN 301 489-1 Section 9.4)

#### 3.7.1 Test Method and Procedure:

EN 61000-4-4 : 2012 and EN 301 489-1 Section 9.4.2

#### 3.7.2 Performance criteria:

Refer to EN 301 489-1 Section 9.4.3.

#### 3.7.3 Test Instruments:

SGS EFT EN61000-4-4 WuKu EMC					
EQUIPMENT TYPE	Manufacturer	Model Number	Serial Number	Calibration Date	Calibration Due
EMS Multi-Tester	EMC Partner	TRANSIENT 2000	648	2021/4/19	2022/4/18
EFT Clamp	EMC Partner	CN-EFT1000	469	2021/4/20	2022/4/19

Testing Site : No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan

#### 3.7.4 Test Setup (Block Diagram of Configuration):

Refer to Appendix for setup photo.

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### 3.7.5 Measurement Data:

Operation Mode	N/A	Tested Date	N/A
Temperature	N/A °C	Humidity	N/A %RH
		Tested By	N/A

Basic Standard : EN 61000-4-4  
 Test Voltage : 1 kV for AC Input, DC Input: ± 0.5 kV  
 Signal/Comm. : ± 0.5 kV  
 Polarity : Positive/Negative  
 Impulse Frequency : 5 kHz  
 Tr/Th : 5/50ns  
 Burst : 15/300ms

Test Point	Polarity	Test Level (kV)	Results
L	+/-	1	N/A
N	+/-	1	N/A
PE	+/-	1	N/A
L-N	+/-	1	N/A
L-PE	+/-	1	N/A
N-PE	+/-	1	N/A
L-N-PE	+/-	1	N/A
DC Input	+/-	0.5	N/A
Signal/Comm.	+/-	0.5	N/A

#### Observation:

N/A : Not Applicable, the EUT power from DC 9 V battery and without PE exist and no signal/Comm. port cable length > 3m, no necessary to perform test.

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### 3.8 Radio Frequency, Common Mode Measurement (Refer to EN 301 489-1 Section 9.5)

#### 3.8.1 Test Method and Procedure:

EN 61000-4-6 : 2014 and EN 301 489-1 Section 9.5.2

#### 3.8.2 Performance Criteria:

Refer to EN 301 489-1 Section 9.5.3.

#### 3.8.3 Test Instruments:

SGS CS EN61000-4-6 WuKu No.1 EMC					
EQUIPMENT TYPE	Manufacturer	Model Number	Serial Number	Calibration Date	Calibration Due
Signal Generator	Agilent	8648D	3847M00432	2021/12/6	2022/12/5
Power Meter	Boonton	4242/1/1	15286	2021/12/16	2022/12/15
Power Sensor	Boonton	52013A	36171	2021/12/16	2022/12/15
Dual Directional Coupler	ar	DC3001A	0424831	N.C.R.	N.C.R.
Power Amplifier	FRANKONIA	CIT-10/75	126B1159	N.C.R.	N.C.R.
6dB Power Attenuator	N/A	352-255-006	9731	N.C.R.	N.C.R.
CDN	TESEQ	CDN M016	37386	2021/12/22	2022/12/21
CDN	FRANKONIA	CDN M2+M3	A2210179/2012	N.C.R.	N.C.R.
Bulk Current Injection Probe	FCC	FCC-120-9A	08527	2021/7/11	2022/7/10
EM Injection Clamp	FCC	F-203I-23MM	479	2021/11/26	2022/11/25
Test Software	emcware AR	N/A	Ver. 3.6.0	N.C.R.	N.C.R.

Testing Site : No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan

#### 3.8.4 Test Setup (Block Diagram of Configuration):

Refer to Appendix for setup photo.

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### 3.8.5 Measurement Data:

Operation Mode	N/A	Tested Date	N/A
Temperature	N/A °C	Humidity	N/A %RH
		Tested By	N/A

Basic Standard : EN 61000-4-6  
 Frequency Range : 0.15 MHz - 80 MHz  
 Field Strength : 3 V<sub>rms</sub>  
 Modulation : AM 80 %, 1 kHz Sinewave  
 Frequency Step : 1 % of fundamental  
 Dwell Time : 3 seconds  
 Coupling Method : N/A

Port Description	Frequency (MHz)	Meet Criteria for
AC input	0.15 – 80	N/A
DC input	0.15 – 80	N/A
Signal/Comm.	0.15 – 80	N/A

#### Observation:

N/A : Not Applicable, the EUT power from DC 9 V battery and without DC input port exist and no signal/Comm. port cable length > 3m, no necessary to perform test.

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### 3.9 Transients and surges in the vehicular environment measurement (Refer to EN 301 489-1 Section 9.6)

#### 3.9.1 Test Method and Procedure:

Refer to ISO 7637-2 : 2004 for 12V<sub>dc</sub> and 24V<sub>dc</sub> equipment and EN 301 489-1 Section 9.6.2.

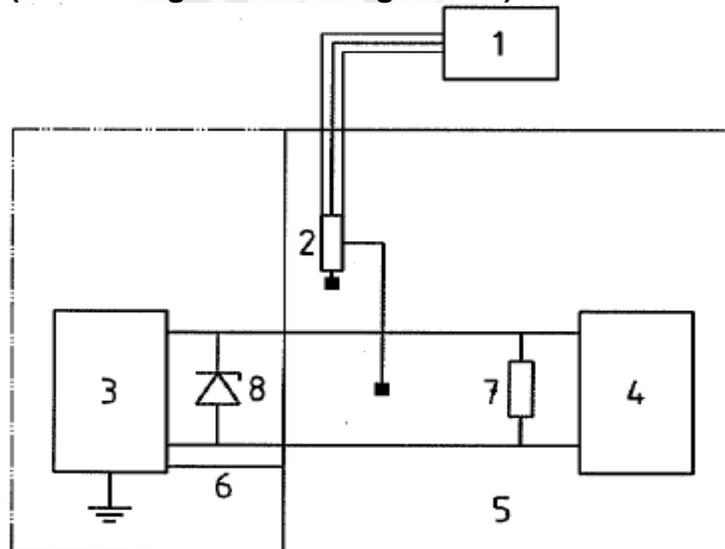
#### 3.9.2 Performance Criteria:

Refer to EN 301 489-1 Section 9.6.3.

#### 3.9.3 Test Instruments:

N/A

#### 3.9.4 Test Setup (Block Diagram of Configuration):



No.	Note name	No.	Note name
1	Oscilloscope or equivalent	5	Ground plane
2	Voltage probe	6	Ground connection (maximum length for test pulse 3: 100 mm)
3	Test pulse generator with internal power supply 3: 100 mm)resistance $R_i$	7	optional resistor ( $R_v$ ) a
4	DUT	8	optional diode bridge b

#### 3.9.5 Measurement Data:

N/A, this EUT not applicable for vehicular use.

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### 3.10 Voltage Dips and Interruptions Measurement (Refer to EN 301 489-1 Section 9.7)

#### 3.10.1 Test Method and Procedure:

EN 61000-4-11 : 2004+A1:2017 and EN 301 489-1 Section 9.7.2

#### 3.10.2 Performance Criteria:

Refer to EN 301 489-1 Section 9.7.3.

#### 3.10.3 Test Instruments:

SGS DIP EN61000-4-11 WuKu EMC					
EQUIPMENT TYPE	Manufacturer	Model Number	Serial Number	Calibration Date	Calibration Due
EMS Multi-Tester	EMC Partner	TRANSIENT 2000	648	2021/4/19	2022/4/18

Testing Site : No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan

#### 3.10.4 Test Setup (Block Diagram of Configuration):

Refer to Appendix for setup photo.

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### 3.10.5 Measurement Data:

Operation Mode	N/A	Tested Date	N/A
Temperature	N/A °C	Humidity	N/A %RH
		Tested By	N/A

Basic Standard : EN 61000-4-11  
 EUT Tested Voltage: N/A  
 Residual Voltage : 0 %, 70 % Ut  
 Phase Angle : 0, 180 degree  
 Total Events : 3 dropouts  
 Event Interval : 10 seconds

Events	Cycles	Meet Criteria for
Voltage dip: 0 % residual voltage	0.5	N/A
Voltage dip: 0 % residual voltage	1	N/A
Voltage dip: 70 % residual voltage	25	N/A
Voltage interruption: 0 % residual voltage	250	N/A

#### Observation:

N/A : Not Applicable, the EUT power from DC 9 V battery, no necessary to perform test.

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### 3.11 Surges Measurement (Refer to EN 301 489-1 Section 9.8)

#### 3.11.1 Test Method and Procedure:

EN 61000-4-5 : 2014+A1:2017 and EN 301 489-1 Section 9.8.2

#### 3.11.2 Performance Criteria:

Refer to EN 301 489-1 Section 9.8.3.

#### 3.11.3 Test Instruments:

SGS Surge EN61000-4-5 WuKu EMC					
EQUIPMENT TYPE	Manufacturer	Model Number	Serial Number	Calibration Date	Calibration Due
EMS Multi-Tester	EMC Partner	TRANSIENT 2000	648	2021/4/19	2022/4/18
Testing Site : No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan					

#### 3.11.4 Test Setup (Block Diagram of Configuration):

Refer to Appendix for setup photo.

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### 3.11.5 Measurement Data:

Operation Mode	N/A	Tested Date	N/A
Temperature	N/A °C	Humidity	N/A %RH
		Tested By	N/A

Basic Standard : EN 61000-4-5  
 Test Rate : 1 pulse / minute  
 No. of Tests : 5 positive and 5 negative pulses

### Observation Description

Test Point	Phase Angle (degree)	Polarity (+/-)	Test Level (kV)	Meet Criteria for
L – N	0, 90, 180, 270	+/-	1	N/A
L – PE	0, 90, 180, 270	+/-	2	N/A
N – PE	0, 90, 180, 270	+/-	2	N/A
DC input	N/A	+/-	0.5	N/A
Signal I/O	N/A	+/-	1	N/A

### Observation:

N/A : Not Applicable, the EUT power from DC 9 V battery and without DC input port exist and no signal I/O port cable length > 3m or used for outdoor, no necessary to perform test.

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# APPENDIX

## Photograph of Testing General Set-up

### Radiated Emission Test Setup Photos - Below 1GHz

Model No.: EX-series-Proximity Lock

Mode\_2\_+



Mode\_2\_-



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**Conducted Emission Test Setup Photos****Model No.: EX-series-Proximity Lock****Mode\_2\_+****Mode\_2\_-**

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## Radio Frequency Electromagnetic Field Test Setup Photos (EN 61000-4-3)

Model No.: EX-series-Proximity Lock

Mode\_1



Mode\_2



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Mode\_3



Electrostatic Discharge Measurement Test Setup Photos (EN 61000-4-2)

Model No.: EX-series-Proximity Lock

Mode\_1



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**Mode\_2**



**Mode\_3**



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Test points

Air Discharge: ●

Contact Discharge: ●

Model No.: EX-series-Proximity Lock

01



02



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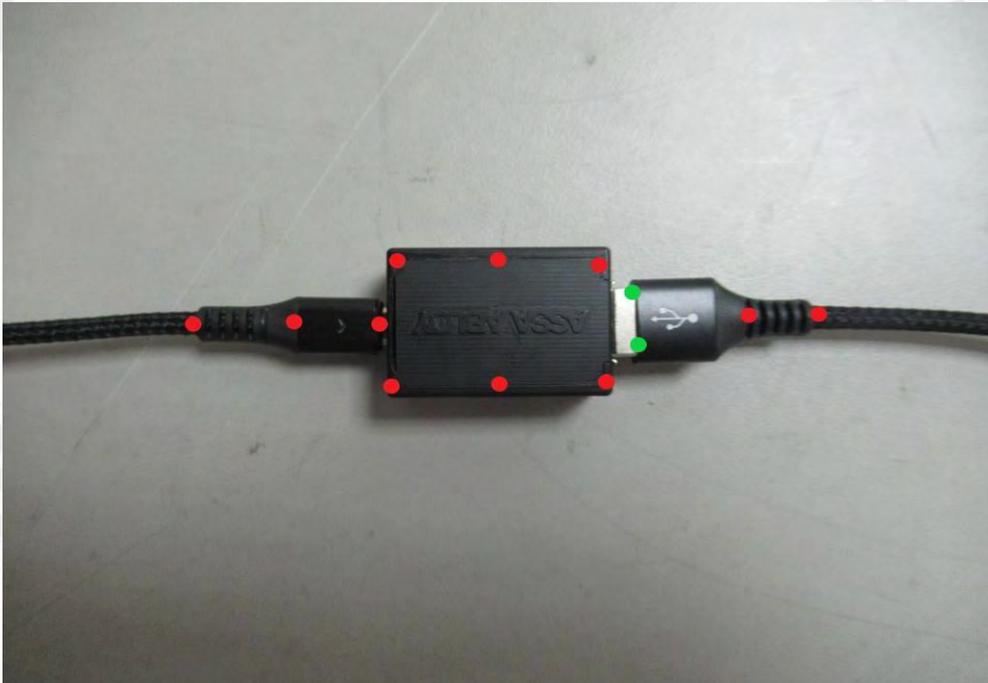
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05



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**Photographs of Product****Exterior****Model No.: EX-series-Proximity Lock****O01****O02**

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003



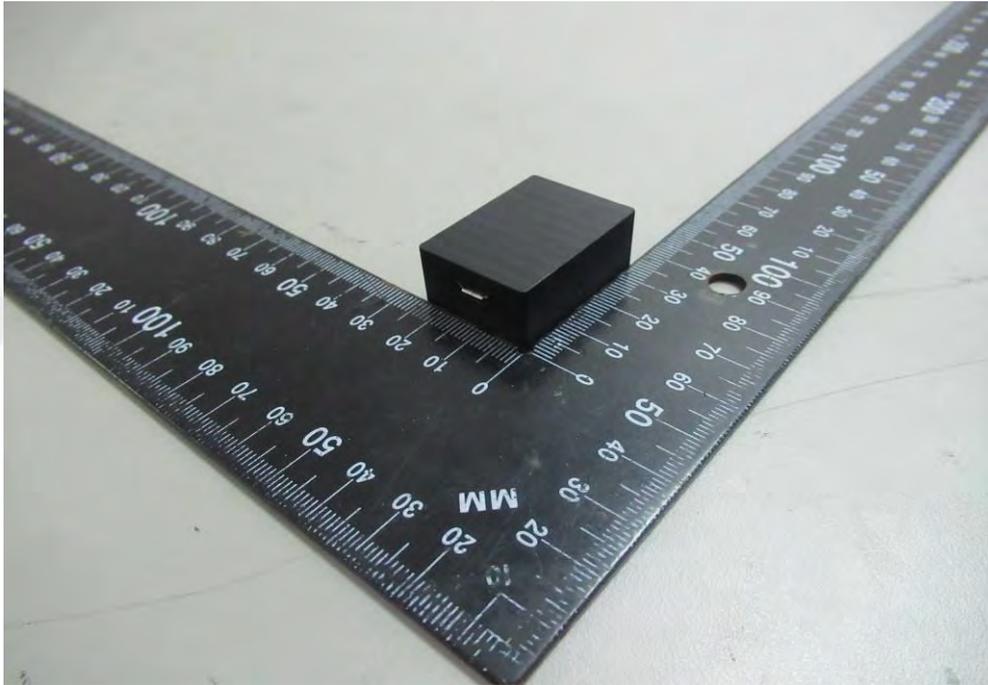
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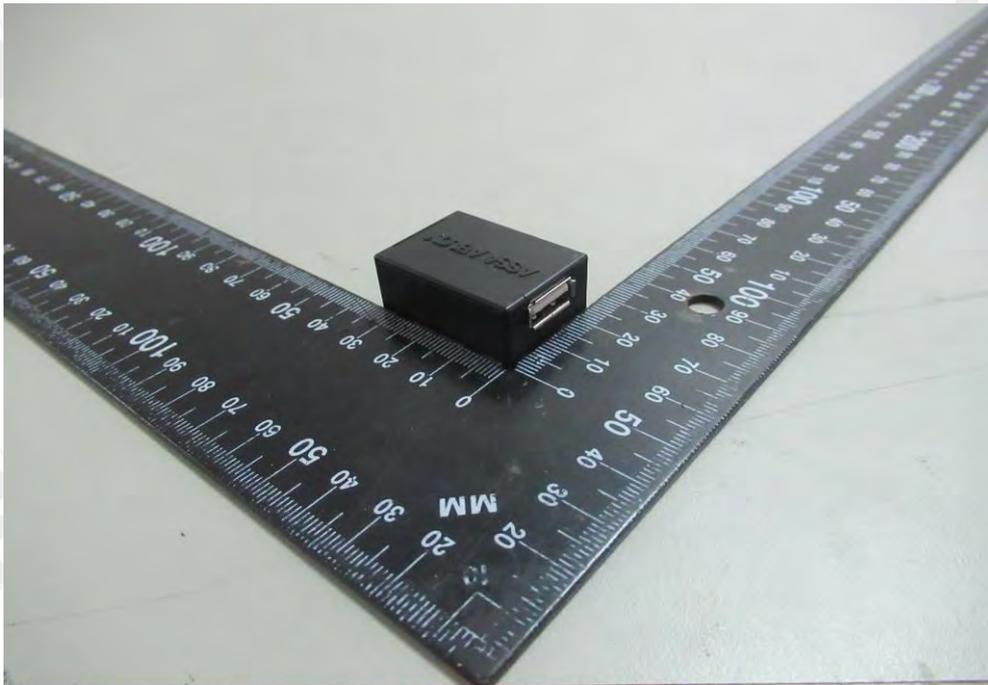
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O05



O06

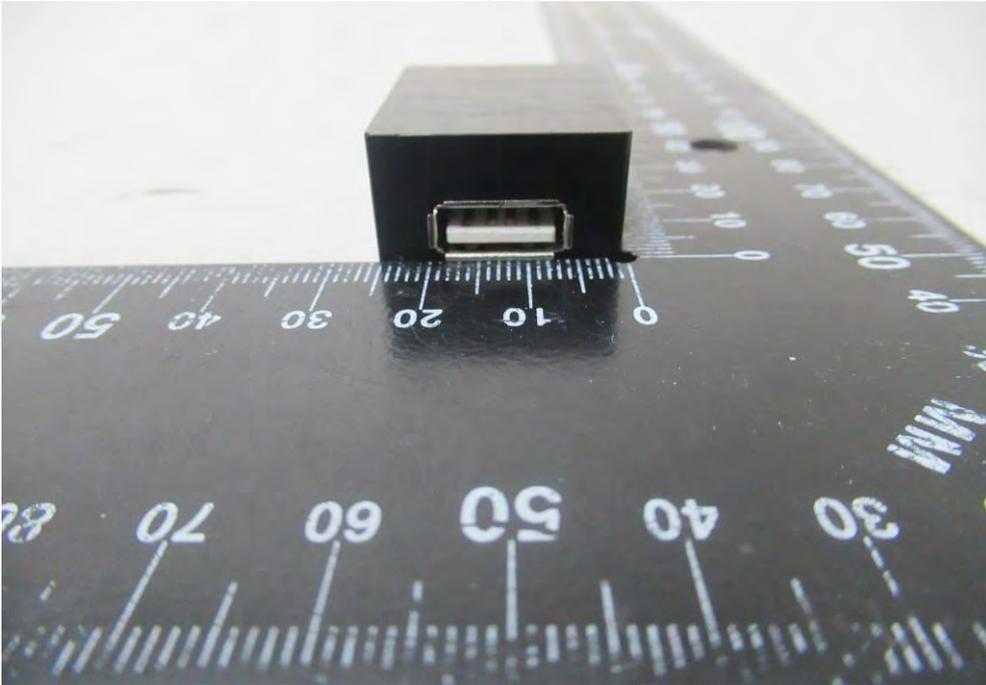


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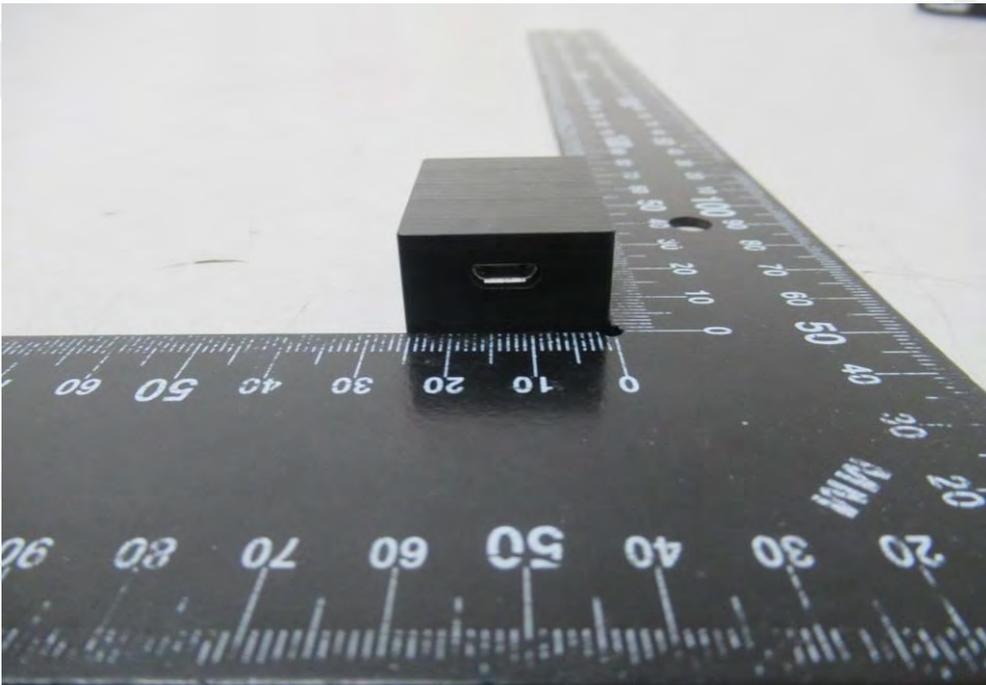
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O07



O08



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Interior

Model No.: EX-series-Proximity Lock

I01



I02



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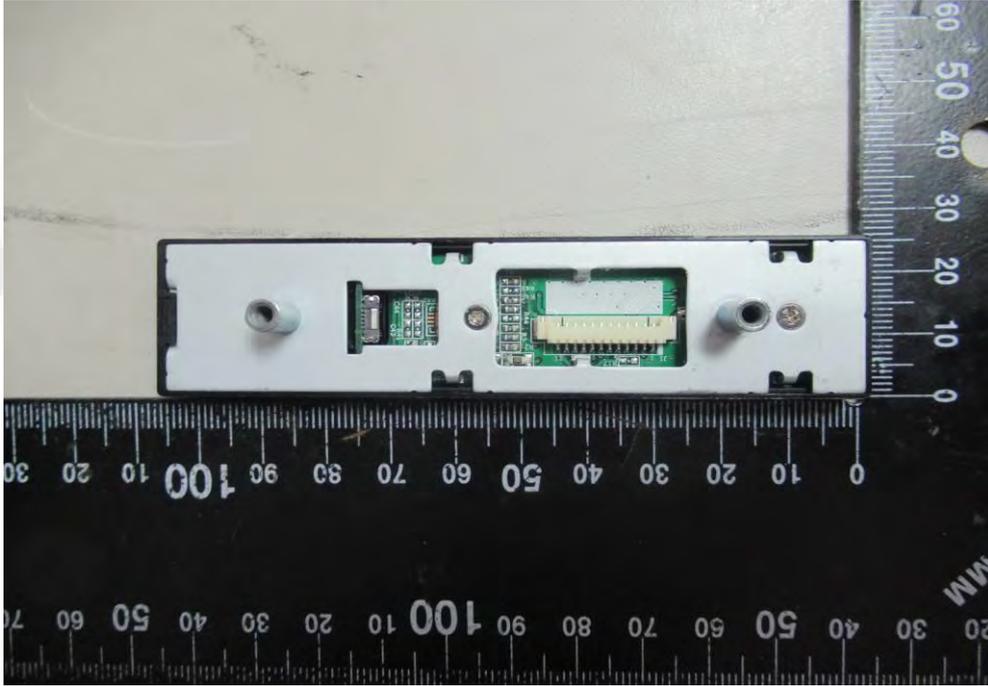
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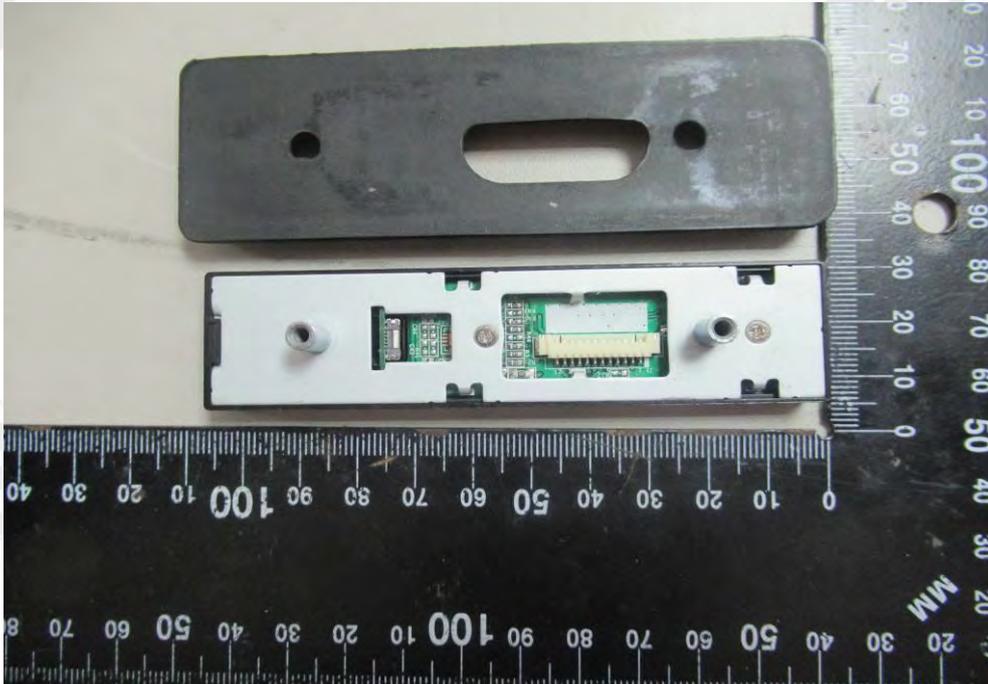
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I03



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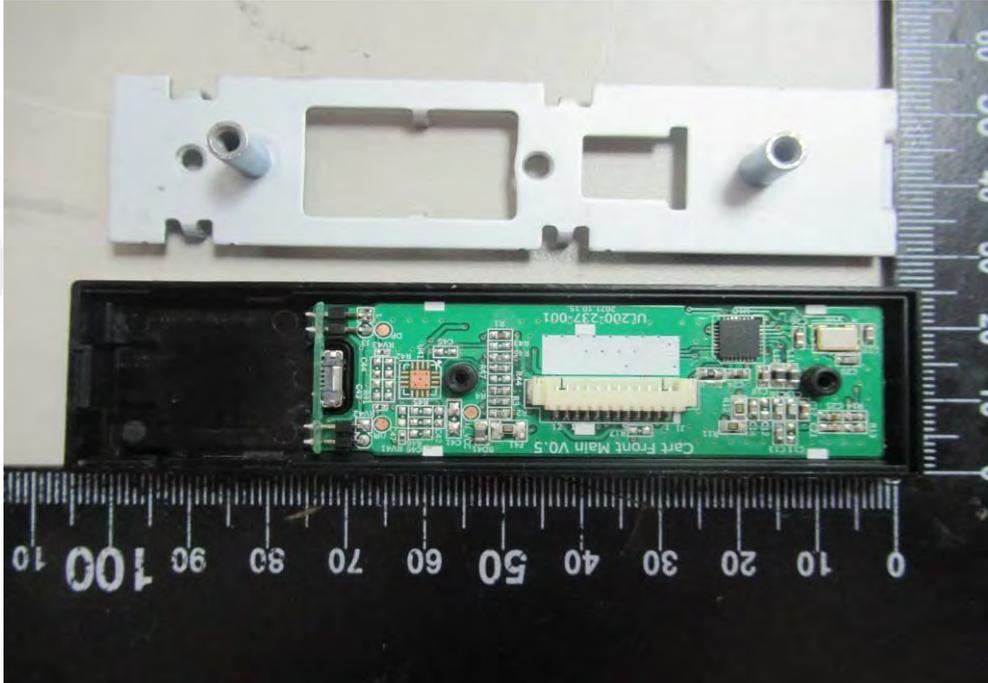
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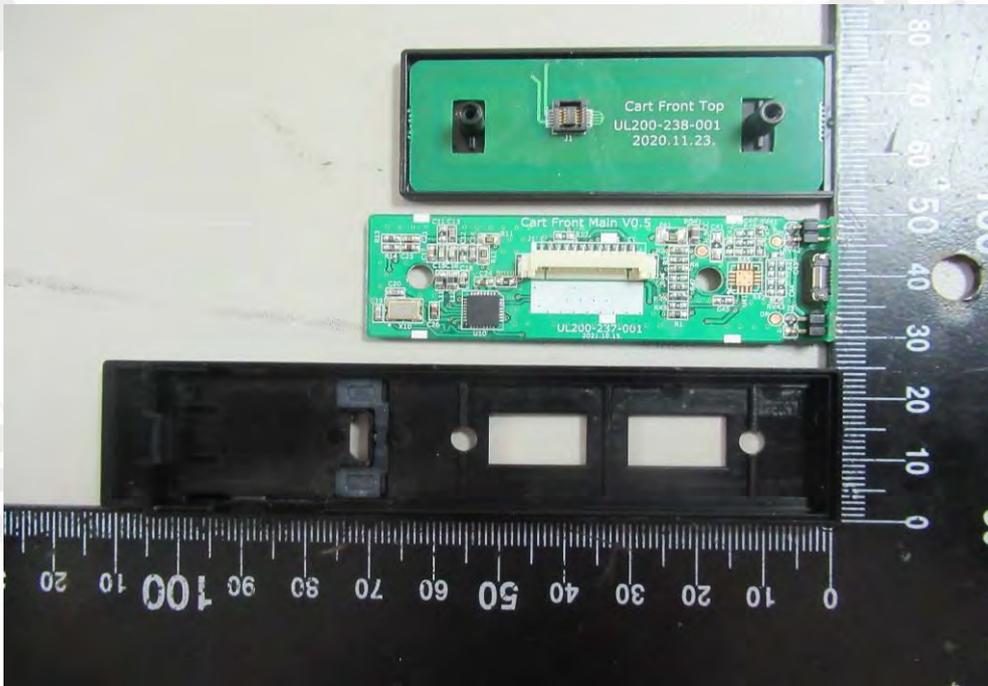
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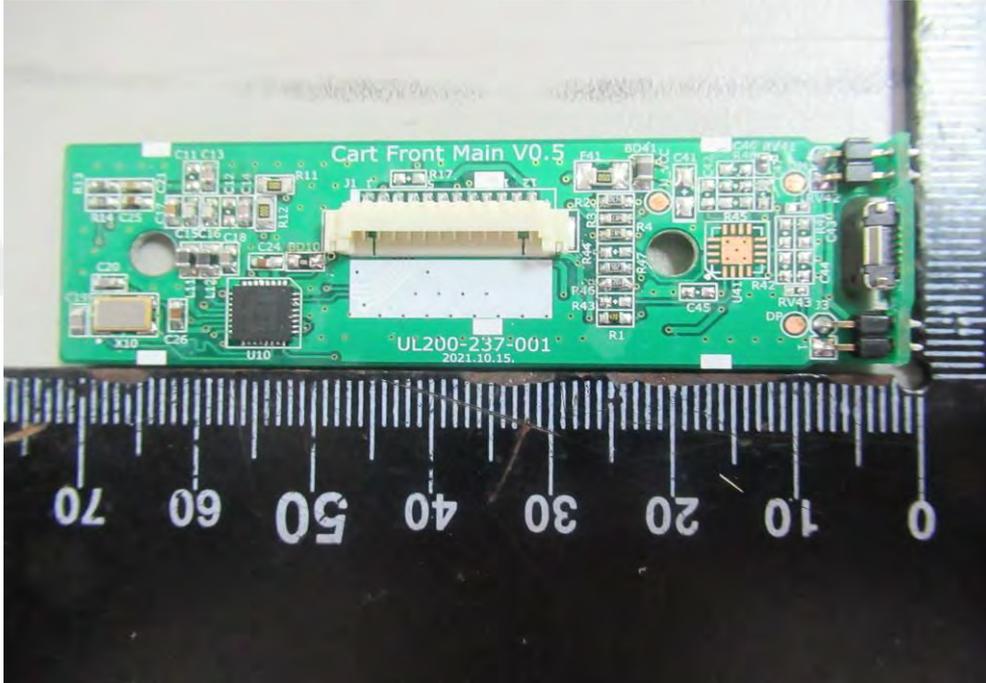
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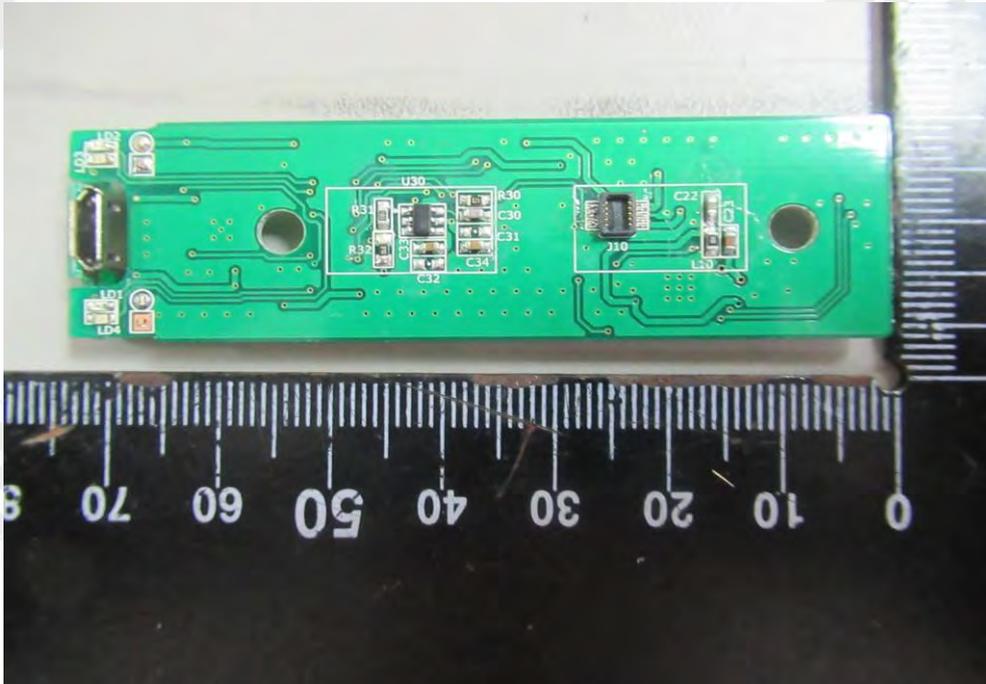
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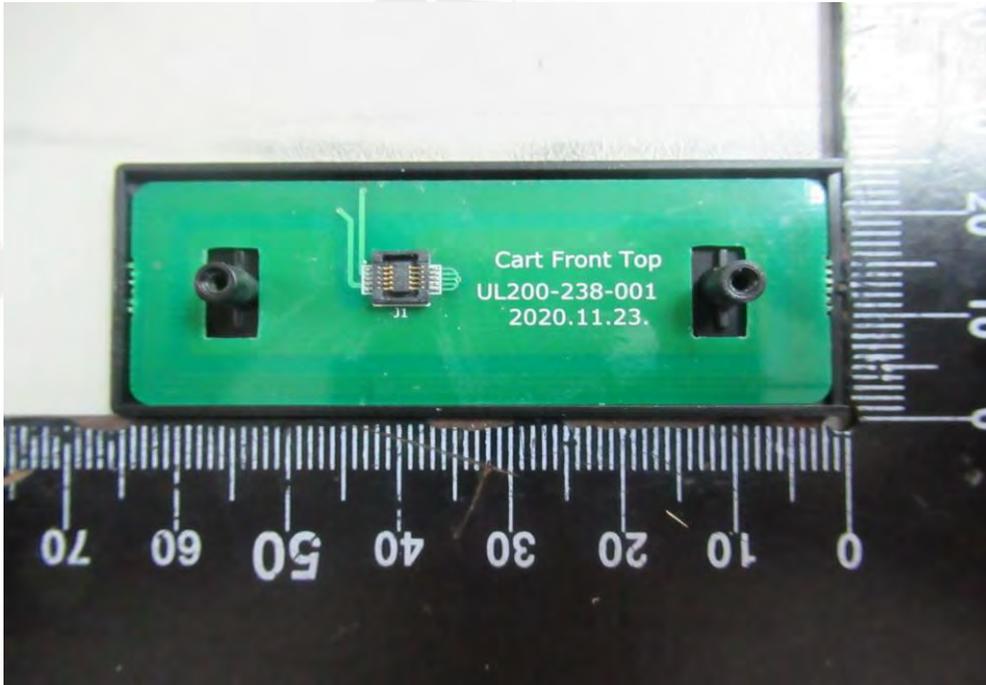
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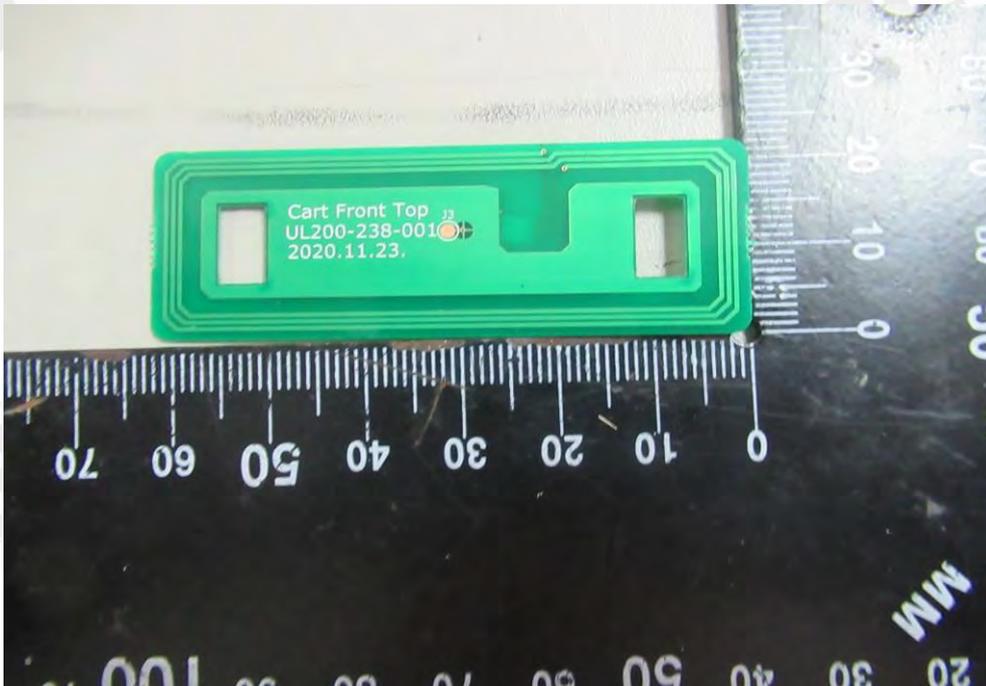
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I09



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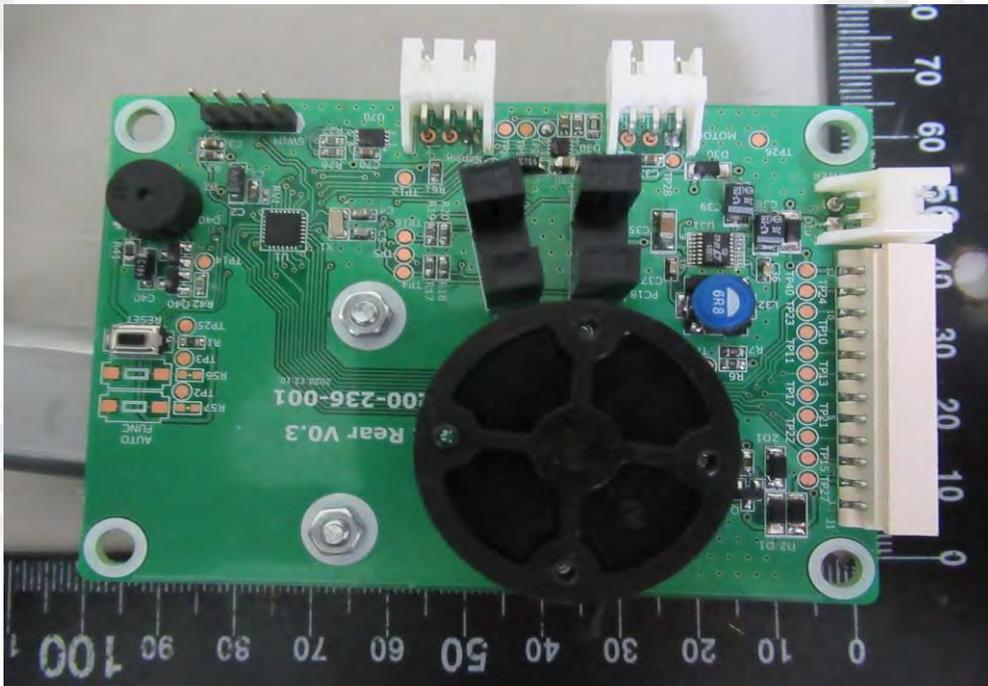
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I11



I12

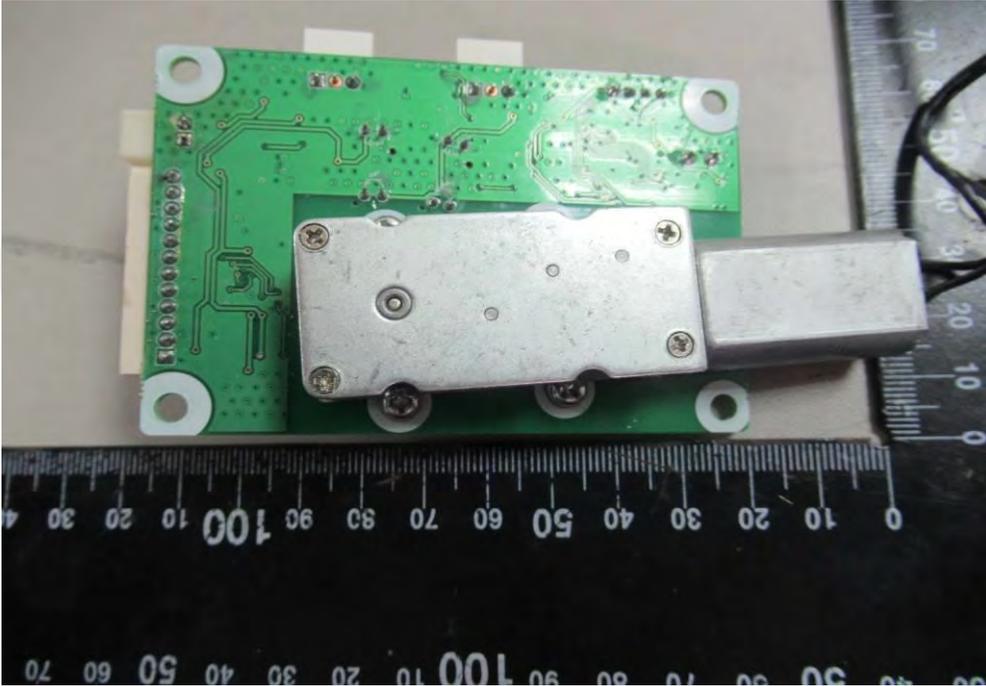


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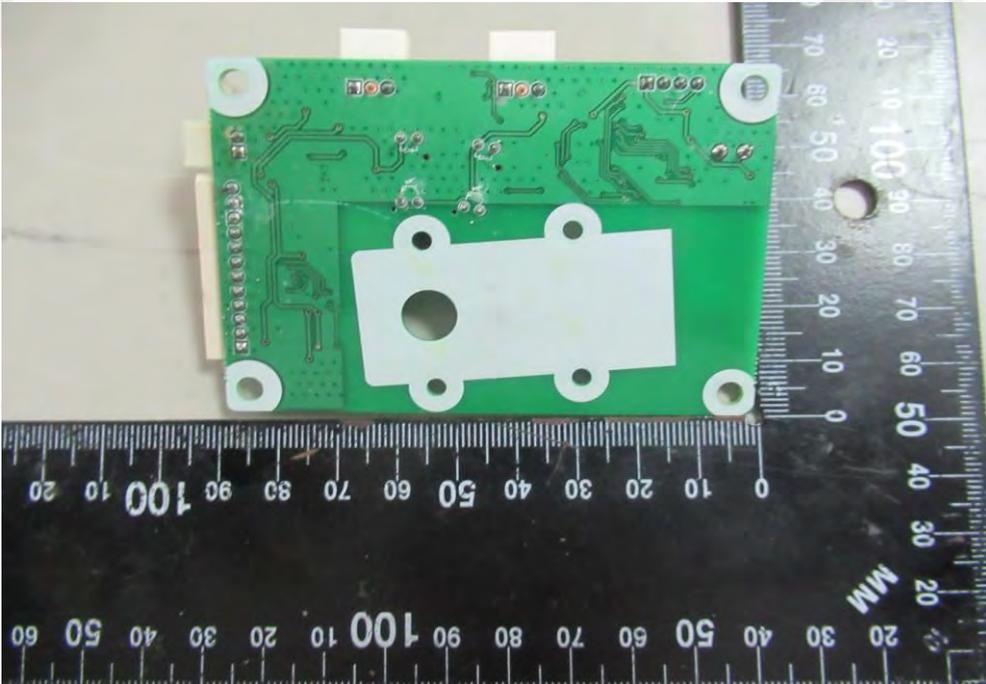
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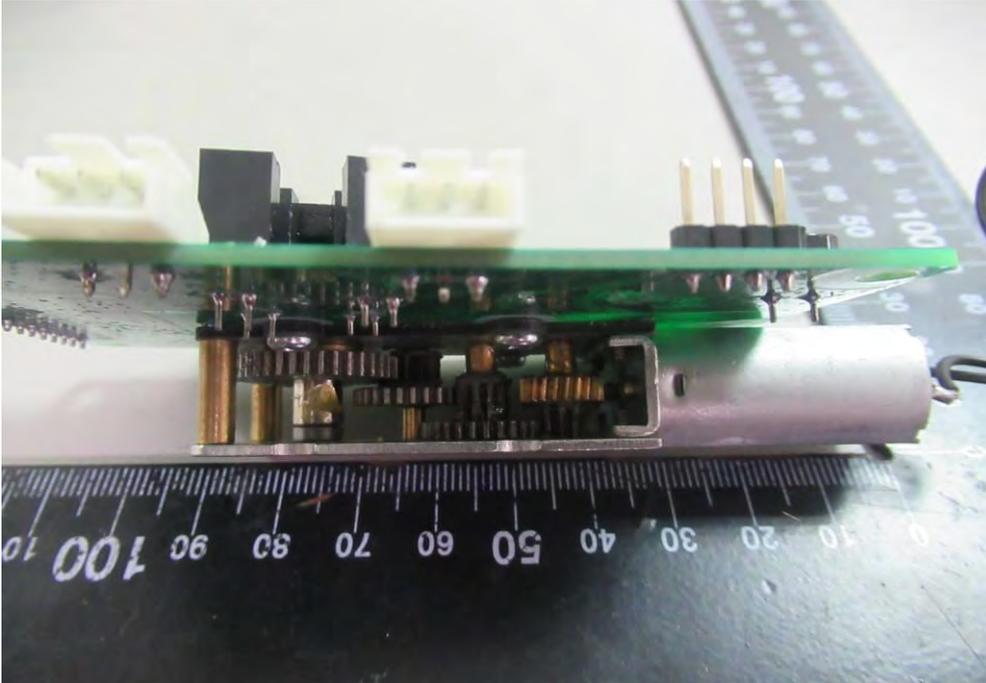
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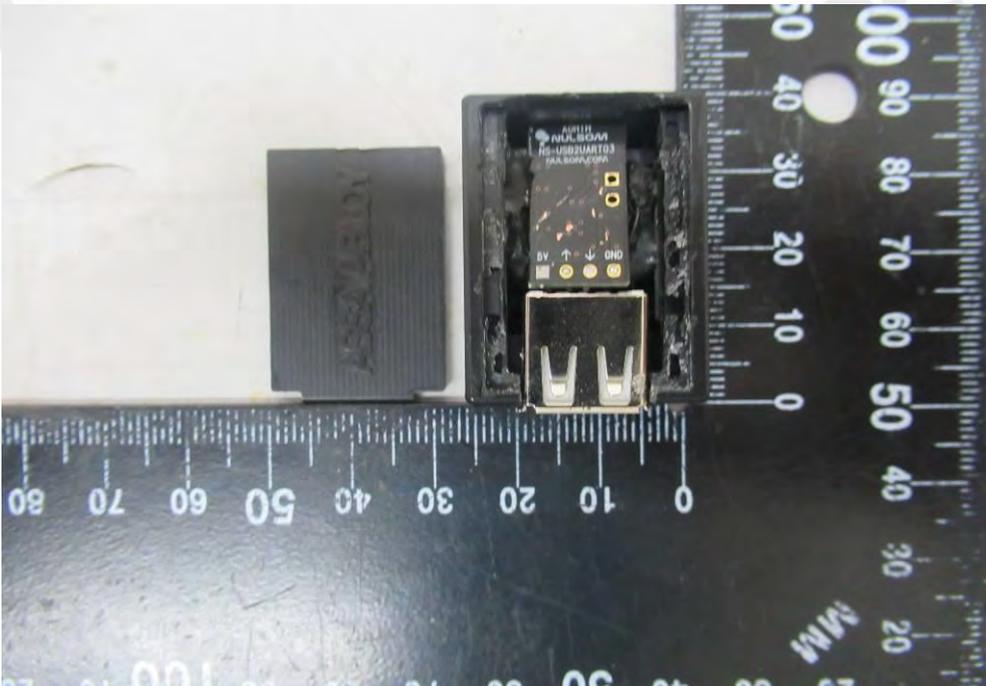
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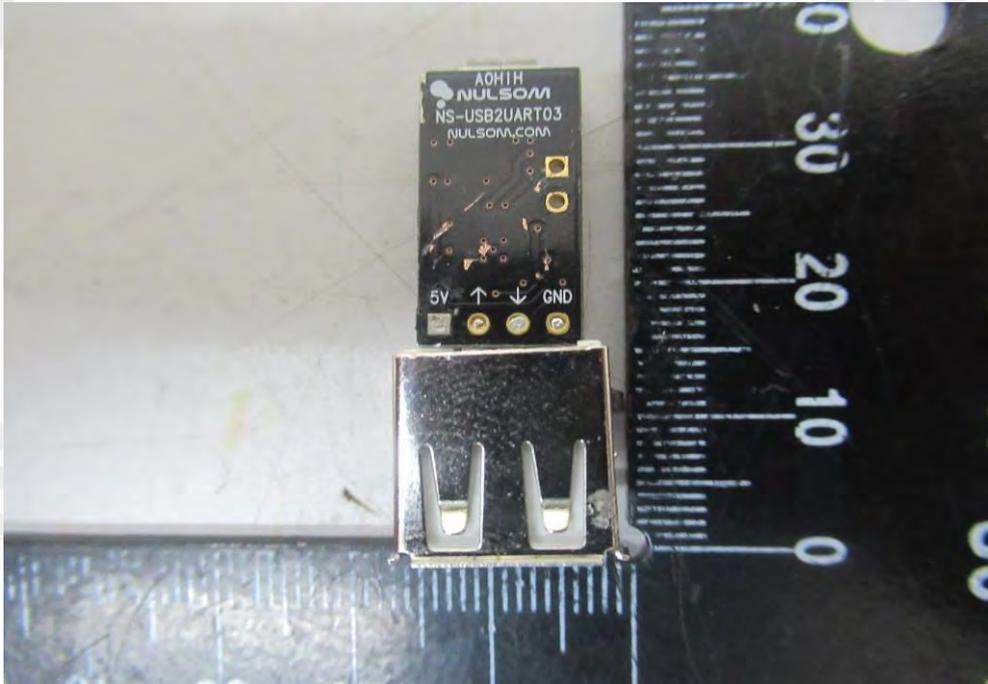
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