TEST REPORT

Product Name : Adapter Box
Model Number : Adapter Box G2

Prepared for : SolaX Power Network Technology (Zhejiang) Co. ,Ltd.
Address : No.288,Shizhu Road, Tonglu Economic Development Zone, Tonglu City, Zhejiang Province, 310000 P.R. China

Prepared by : EMTEK (NINGBO) CO., LTD.
Address : No. 8, Building 8, Lane 216, Qingyi Road, Ningbo Hi-Tech Zone, Ningbo, Zhejiang, China

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Report Number : ENB2209290149W00501R
Date(s) of Tests : September 29, 2022 to March 15, 2023
Date of issue : March 20, 2023

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1. TEST REPORT DESCRIPTION

Applicant	:	SolaX Power Network Technology (Zhejiang) Co. ,Ltd.
Address	:	No.288,Shizhu Road, Tonglu Economic Development Zone, Tonglu City, Zhejiang Province, 310000 P.R. China
Manufacturer	:	SolaX Power Network Technology (Zhejiang) Co. ,Ltd.
Address	:	No.288,Shizhu Road, Tonglu Economic Development Zone, Tonglu City, Zhejiang Province, 310000 P.R. China
Trade Mark	:	SolaX Power
EUT	:	Adapter Box
Model No.	:	Adapter Box G2

Measurement Procedure Used:

APPLICABLE STANDARDS	
STANDARD	**TEST RESULT**
ETSI EN 301 489-1 V2.2.3: 2019	PASS
ETSI EN 301 489-17 V3.2.4: 2020	PASS

The device described above is tested by EMTEK (NINGBO) CO., LTD. to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and EMTEK (NINGBO) CO., LTD. is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the ETSI EN 301 489-1 and ETSI EN 301 489-17 requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of EMTEK (NINGBO) CO., LTD.

Date of Test : September 29, 2022 to March 15, 2023

Prepared by : June Gao/Engineer

Reviewer : Vinay/Supervisor

Approved & Authorized Signer : Tony Wei/Manager

Modified History

Version	Report No.	Revision Date	Summary
\	ENB2209290149W00501R	\	Original Report

2. GENERAL INFORMATION

Product:	Adapter Box
Model Number:	Adapter Box G2
Sample Number:	1#
WIFI	
WLAN Supported:	☒802.11b ☒802.11g ☒802.11n(20MHz channel bandwidth) ☐802.11n(40MHz channel bandwidth)
Modulation:	☒DSSS with DBPSK/DQPSK/CCK for 802.11b ☒OFDM with BPSK/QPSK/16QAM/64QAM for 802.11g/n
Frequency Range:	☒2412-2472MHz for 802.11b/g/n(HT20) ☐2422-2462MHz for 802.11n(HT40)
Number of Channels:	☒13 Channels for 802.11b/g/n(HT20) ☐9 Channels for 802.11n(HT40)
Max Transmit Power:	17.94 dBm
Antenna:	PCB Antenna
Antenna Gain:	3.42 dBi
Test Voltage:	AC 100-240V, 50/60Hz
Adapter:	M/N: ABT020120A Input: AC 100-240V, 50/60Hz, 1.5A Output: DC 12V, 2A, 24W
Date of Received:	September 29, 2022
Temperature Range:	-40°C ~ +65°C

Note: *for more details, please refer to the user's manual of the EUT.*

3. DESCRIPTION OF STANDARDS AND RESULTS (EUT)

Applicable Standard: ETSI EN 301 489-1 V2.2.3: 2019				
EMISSION				
Description of Test Item		Standard	Limits	Results
Conducted Emissions From the AC Mains Power Ports		EN 55032:2015	Class B	Pass
Conducted Emissions From the DC Mains Power Ports		EN 55032:2015	Class B	N/A
Asymmetric mode conducted emissions Wired network ports		EN 55032:2015	Class B	N/A
Radiated emissions at frequencies up to 1 GHz		EN 55032:2015	Class B	Pass
Radiated emissions at frequencies above 1 GHz		EN 55032:2015	Class B	Pass
Harmonic Current Emissions		EN IEC 61000-3-2: 2019	Class A	N/A
Voltage Fluctuation and Flicker		EN 61000-3-3:2013/ A1:2019	Section 5	Pass
IMMUNITY				
Description of Test Item		Basic Standard	Performance Criteria	Results
Electrostatic Discharge	Enclosure ports	EN 61000-4-2:2009	B	Pass
Continuous RF electromagnetic field disturbances	Enclosure ports	EN 61000-4-3:2006+ A1:2008+A2:2010	A	Pass
Electrical fast transients/burst	AC mains power ports	EN 61000-4-4:2012	B	Pass
	Analogue/digital data ports		B	Pass
	DC network power ports		N/A	N/A
Surges	AC mains power ports	EN 61000-4-5:2014	B	Pass
	Analogue/digital data ports		B	Pass
Continuous induced RF disturbances	AC mains power ports	EN 61000-4-6:2014	A	Pass
	Analogue/digital data ports		A	Pass
	DC network power ports		N/A	N/A
Vehicular transients and surges	DC power input ports	ISO 7637-2:2004	A & B	N/A
Voltage dips and interruptions	AC mains power ports	EN 61000-4-11:2004	B & C	Pass
Note: N/A is an abbreviation for not applicable.				

4. TEST METHODOLOGY

4.1. GENERAL DESCRIPTION OF APPLIED STANDARDS

According to its specifications, the EUT must comply with the requirements of the following standards:

ETSI EN 301 489-1: Electro Magnetic Compatibility (EMC) standard for radio equipment and services;
Part 1: Common technical requirements; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU and the essential requirements of article 6 of Directive 2014/30/EU

ETSI EN 301 489-17: Electro Magnetic Compatibility (EMC) standard for radio equipment and services;
Part 17: Specific conditions for Broadband Data Transmission Systems; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU

4.2. MEASURING DEVICE AND TEST EQUIPMENT

For Conducted Emission Measurement for AC

Equ.No.	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
ENE-001	Test Receiver	Rohde & Schwarz	ESCI	101108	July 07, 2022	1 Year
ENE-003	L.I.S.N	Rohde & Schwarz	ENV216	101193	July 07, 2022	1 Year
ENE-004	L.I.S.N	Schwarzbeck	NSLK 8126	8126-462	July 07, 2022	1 Year
ENE-006	Pulse Limiter	MTS-systemtechnik	IMP-136	2611115-001-0033	July 07, 2022	1 Year
ENE-005	RF Switching unit	CD	RSU-M2	38400	July 07, 2022	1 Year

For 3m Radiated Emission Measurement

Equ.No.	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
ENE-002	Spectrum Analyzer	Rohde & Schwarz	ESCI	101107	July 07, 2022	1 Year
ENE-002	EMI Test Receiver	Rohde & Schwarz	ESCI	101107	July 07, 2022	1 Year
ENE-009	Pre-Amplifier	CD	PAP-0203	22015	July 07, 2022	1 Year
ENE-010	Bilog Antenna	Schwarzbeck	VULB9163	9163-467	July 11, 2022	2 Year
ENE-025-1	Cable	Huber + Suhner	CBL3-NN-0.5m	101216-2140500-2	July 07, 2022	1 Year
ENE-025-2	Cable	Huber + Suhner	CBL3-NN-3.0m	101216-2143000-2	July 07, 2022	1 Year
ENE-025-3	Cable	Huber + Suhner	CBL3-NN-9.0m	101216-21490 00	July 07, 2022	1 Year
ENE-170	EXA Signal Analyzer	KEYSIGHT	N9010B	MY60242457	March 01, 2022	1 Year
ENE-090	Pre-Amplifier	Connphy Microwave Inc.	GLN-1G40G-4165-K	0319104	Nov 22, 2022	1 Year
ENE-192	Horn Antenna	Schwarzbeck	BBHA 9120 D	02589	May 27, 2022	2 Year
ENE-101-1	Cable	SMAMSMAM	A50-0.5M	N/A	July 07, 2022	1 Year
ENE-101-2	Cable	SMAMSMAM	A50-3M	N/A	July 07, 2022	1 Year
ENE-101-4	Cable	SMAMSMAM	A50-6M	N/A	July 07, 2022	1 Year

For Harmonic Current / Flicker Measurement

Equ.No.	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
ENE-157	Harmonic/ flicker analyzer	PACIFIC	ECTS2-3300Z-M18012	550128	Dec. 20, 2022	1 Year
ENE-157-1	AC Power source	PACIFIC	330AZX-CE	140250014	Dec. 20, 2022	1 Year

For Electrostatic Discharge Immunity Test

Equ.No.	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
ENE-139	ESD Tester	TESEQ	NSG 437	1732	Dec. 01, 2022	1 Year

For Radio-frequency, Electromagnetic Field Immunity

Equ.No.	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
ENE-173	RF Signal generator/RF	Keysight	N5171B	MY61252820	April 28, 2022	1 Year
ENE-174	SW-RF	JS Denki	JSDSW-BS02	JSDSW2120D01	April 28, 2022	1 Year
ENE-175	Power Amplifier	Vectawave	VBA 1000-600c	132035	April 28, 2022	1 Year
ENE-176	Power Amplifier	Vectawave	VBA 1060-200	132120	April 28, 2022	1 Year
ENE-177	Directional couplers	Bonn	BDC 0810-50/1500	2129259-01	April 28, 2022	1 Year
ENE-178	Directional couplers	Bonn	BDC 1060-40/500	2129304-03	April 28, 2022	1 Year
ENE-179	Multilayer periodic antenna	Schwarzbeck	STLP9129-7/16	03043	April 28, 2022	1 Year
ENE-180	RF cable	Times	LMR600-UF-4M	611747-0001	April 28, 2022	1 Year
ENE-180-1	RF cable	Times	LMR600-UF-1.5M	/	April 28, 2022	1 Year
ENE-181	RF cable	Times	LMR600-UF-4M	611748-0001	April 28, 2022	1 Year
ENE-181-1	RF cable	Times	LMR600-UF-1.5M	/	April 28, 2022	1 Year
ENE-182	power meter	Lumiloop	LSPM	86	April 28, 2022	1 Year

For Electrical Fast Transient / Burst Immunity Test

Equ.No.	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
ENE-011	Burst Tester	HAEFELY	PEFT4010	173964	July 07, 2022	1 Year
ENE-012	Coupling Clamp	HAEFELY	IP-4A	147399	July 07, 2022	1 Year

For Surge Immunity Test

Equ.No.	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
ENE-097-1	Combination Wave Generator	HTEC	HCWG 100	204303	Dec.20, 2022	1 Year
ENE-097-2	Three Phase Coupling/Decoupling Network	HTEC	HCOUPLER 30S	204103	Dec.20, 2022	1 Year
ENE-097-3	High Pressure Option	HTEC	Options-10KDC	/	Dec.20, 2022	1 Year
ENE-097-4	40 ohm Impedance	HTEC	Options-40ohm	/	Dec.20, 2022	1 Year
ENE-097-5	10 ohm Impedance	HTEC	Options-10ohm	/	Dec.20, 2022	1 Year
ENE-097-6	Combination Wave Generator	HTEC	HTSG 70	204304	Dec.20, 2022	1 Year
ENE-097-7	Coupling Network	HTEC	HCN 8	204901	Dec.20, 2022	1 Year
ENE-097-8	Decoupling Network	HTEC	HDEC 8	204902	Dec.20, 2022	1 Year
ENE-097-9	Isolated Power Supply	HTEC	SBK-30KVA	/	Dec.20, 2022	1 Year

For Immunity Test of Conducted Disturbance Induced by RF Field

Equ.No.	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
ENE-057	Simulator	SCHLODER	CDG-6000-75	126B1404/2016	July 07, 2022	1 Year
ENE-058	CDN	SCHLODER	CDN-M2+M3	A2210415/2016	July 07, 2022	1 Year
ENE-056	Attenuator	SCHLODER	6dB 100W	HA1615	July 07, 2022	1 Year
ENE-098	Current Injection Probe	SCHLODER	CDN BCI-P1	19102314-0101	Dec.22, 2022	1 Year
ENE-099	EM-clamp	SCHLODER	CDN EMCL-20	20102817-0103	Dec.22, 2022	1 Year

For Voltage Dips and Interruptions Test

Equ.No.	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
ENE-055	Dips Tester	HTEC	HPFS161P	164901	July 07, 2022	1 Year
ENE-055	AC Power source	HTEC	HV1P16T	164902	July 07, 2022	1 Year

4.3. DESCRIPTION OF TEST MODES

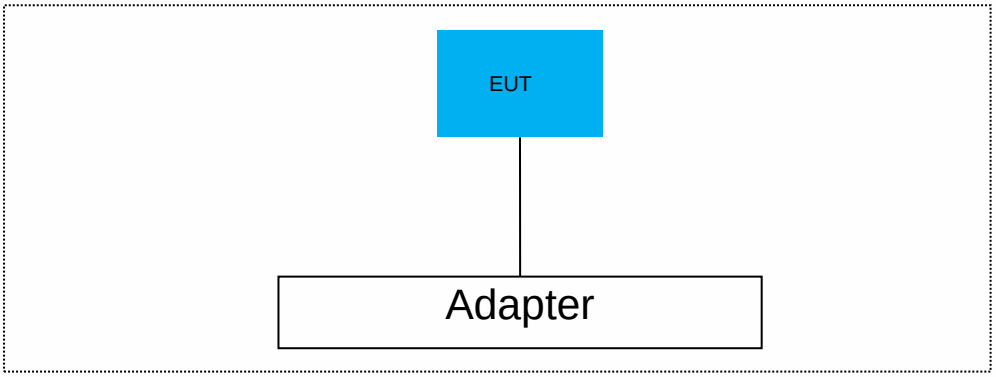
Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

Test Mode	Description
1	Wireless Control
2	Standby
/	/

4.4. Test Software

Item	Software
Conducted Emission:	EZ-EMC (Ver. CON-03A1)
Radiated Emission:	EZ-EMC (Ver. EMEC-3A1)

4.5. BLOCK DIAGRAM CONFIGURATION OF TEST SYSTEM



4.6. SUPPORT EQUIPMENT

EUT Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

Auxiliary Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
/	/	/	/

Note:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

5. FACILITIES AND ACCREDITATIONS

5.1. FACILITIES

All measurement facilities used to collect the measurement data are located at
EMTEK (NINGBO) CO., LTD.
No. 8, Building 8, Lane 216, Qingyi Road, Ningbo Hi-Tech Zone, Ningbo, Zhejiang, China
The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.10 and CISPR Publication 32.

5.2. LABORATORY ACCREDITATIONS AND LISTINGS

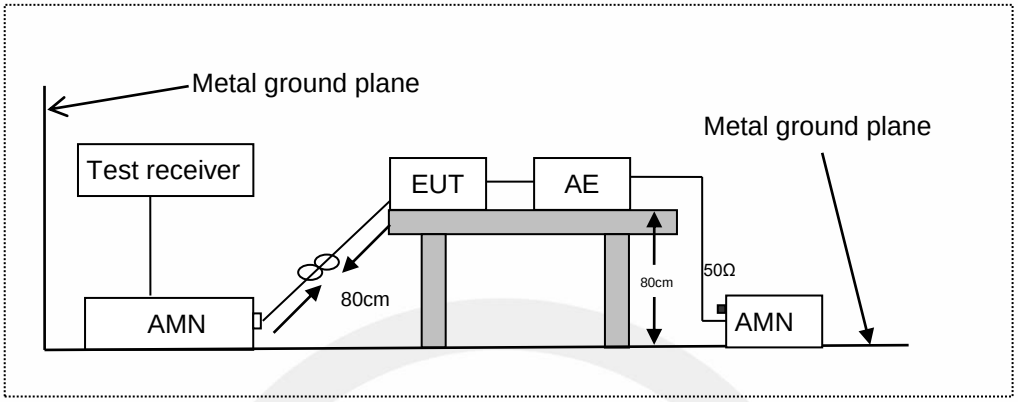
Site Description		
EMC Lab.	:	**Accredited by CNAS** The Certificate Registration Number is L6666. The Laboratory has been assessed and proved to be in compliance with CNAS-CL01:2018 (identical to ISO/IEC 17025:2017) **Accredited by FCC** Designation Number: CN1302 Test Firm Registration Number: 436491 **Accredited by A2LA** The certificate is valid until May 31, 2023 **Accredited by Industry Canada** The Conformity Assessment Body Identifier is CN0114
Name of Firm	:	EMTEK (NINGBO) CO., LTD.
Site Location	:	No. 8, Building 8, Lane 216, Qingyi Road, Ningbo Hi-Tech Zone, Ningbo, Zhejiang, China

5.3. Measurement Uncertainty

Test Item		Uncertainty
Conducted Emission Uncertainty	:	2.08 dB(9 k~150 kHz) 2.40 dB(150 k-30 MHz)
Radiated Emission Uncertainty (3m Chamber)	:	4.06 dB (30 M~1 GHz Polarize: H) 4.04 dB (30 M~1 GHz Polarize: V) 4.82 dB (1 GHz ~18 GHz Polarize: H) 4.80 dB (1 GHz ~18 GHz Polarize: V)
Uncertainty for Flicker test	:	0.43 % V
Uncertainty for Harmonic test	:	4.16 % mA
Uncertainty for ESD Test	:	6 % kV
Uncertainty for EFT/B Test	:	3.84 % kV
Uncertainty for Surge Test	:	0.53 % kV
Uncertainty for C/S Test	:	1.45 dB(Using CDN Test) 2.37 dB (Using EM Clamp Test)
Uncertainty for R/S Test	:	1.64 dB(80 MHz-6000 MHz)
Uncertainty for DIPS Test	:	2.12 % V

6. CONDUCTED EMISSIONS FROM THE AC MAINS POWER PORTS

6.1. Block Diagram of Test Setup



AMN: Artificial Mains Network
AE: Associated equipment
EUT: Equipment under test

6.2. Measuring Standard

ETSI EN 301 489-1 Clause 8.4
EN 55032: 2015 Clause A.3

6.3. Limits

EN 55032, Class B, Table A.10

Frequency range MHz	Coupling device (see Table A.8)	Detector type / bandwidth	Class B limits dB(μV)
0.15 to 0.5	AMN	Quasi Peak / 9 kHz	66 to 56
0.5 to 5			56
5 to 30			60
0.15 to 0.5	AMN	Average / 9 kHz	56 to 46
0.5 to 5			46
5 to 30			50

6.4. Test Procedure

The EUT was placed on a desk 0.8 m height from the metal ground plane and 0.4 m from the conducting wall of the shielding room and it was kept at least 0.8 m from any other grounded conducting surface. The size of the table will nominally be 1.5 m x1.0 m.

The rear of the arrangement shall be flush with the back of the supporting tabletop unless that would not be possible or typical of normal use.

All units of equipment forming the system under test (includes the EUT as well as connected peripherals and associated equipment or devices) shall be arranged such that a nominal 0.1 m

separation is achieved between the neighboring units.

Connect EUT to the power mains through a artificial mains network (AMN). Where the mains cable supplied by the manufacturer is longer than 1 m, the excess should be folded at the centre into a bundle no longer than 0.4 m, so that its length is shortened to 1 m.

All the support units are connecting to the other AMN.

The AMN provides 50 ohm coupling impedance for the measuring instrument.

The CISPR states that the AMN with 50 ohm and 50 microhenry should be used.

Both sides of AC line were checked for maximum conducted interference.

The bandwidth of the receiver is set at 9 kHz in 150 kHz~30 MHz. The frequency range from 150 kHz to 30 MHz is investigated.

Set the test-receiver system to quasi peak detect function and average detect function, and to measure the conducted emissions values.

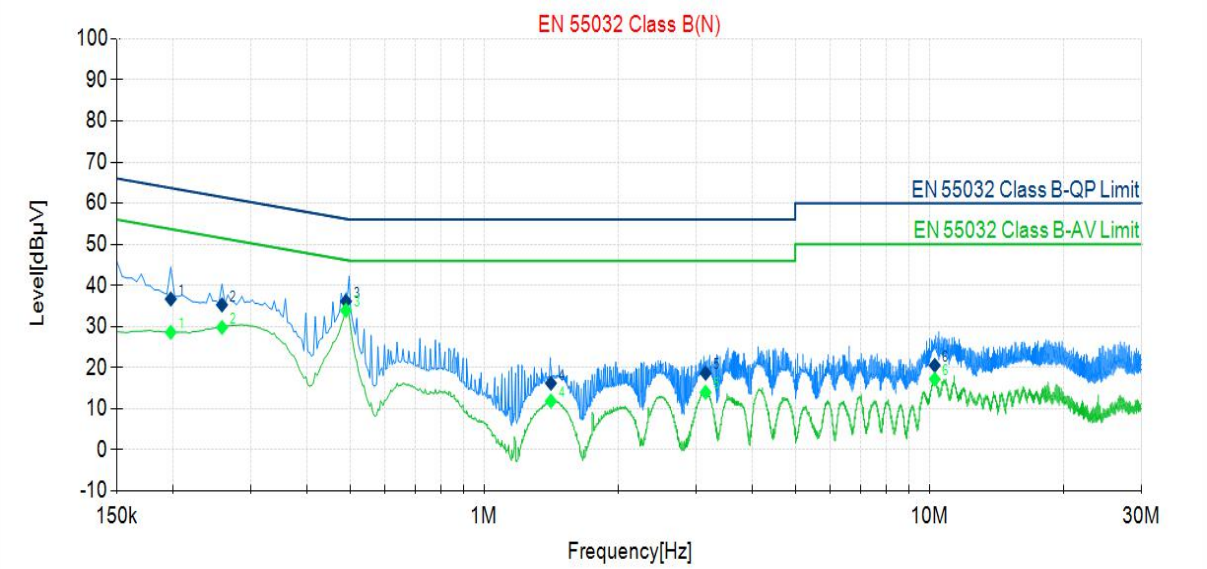
Test results were obtained from the following equation:
Measurement (dBμV) =Correct Factor (dB) + Reading (dBμV)
Over (dB) = Measurement (dBμV) - Limit (dBμV)

6.5. Measuring Results

PASS.

All the modes were tested and the data of the worst modes are attached the following pages.

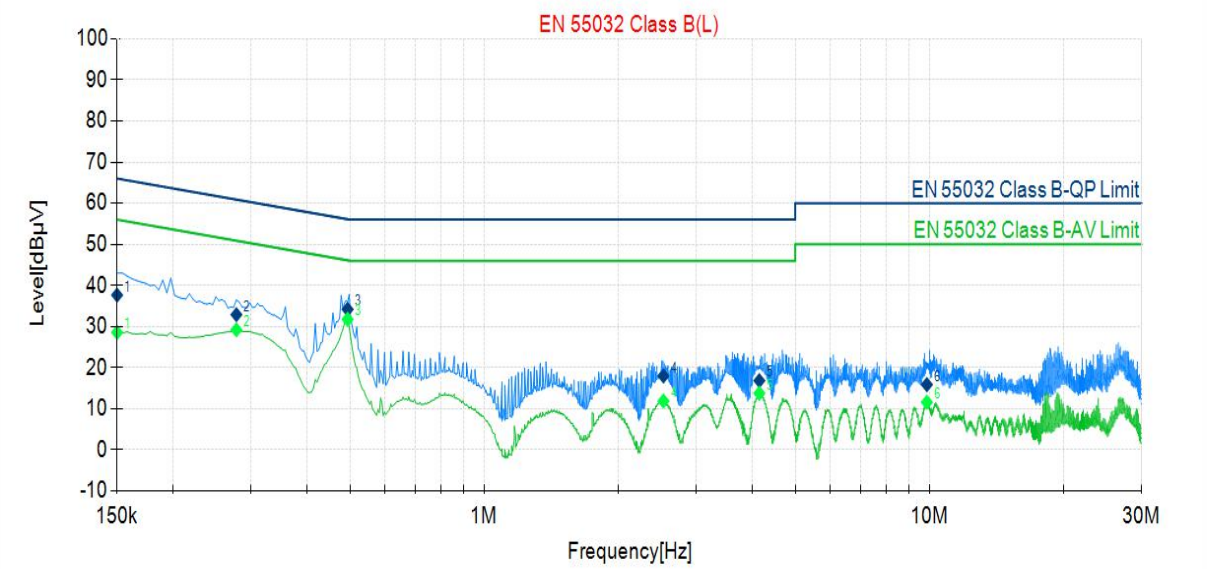
Project Information			
Mode:	WiFi Control	Voltage:	AC 230V/50Hz
Environment:	Temp: 24℃, Humi:52%	Engineer:	Allen Tang



Final Data List

NO.	Freq. [MHz]	Factor [dB]	QP Reading [dBµV]	QP Value [dBµV]	QP Limit [dBµV]	QP Margin [dB]	AV Reading [dBµV]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin [dB]	Verdict
1	0.198	10.46	26.21	36.67	63.69	27.02	18.12	28.58	53.69	25.11	Pass
2	0.258	10.44	24.82	35.26	61.50	26.24	19.34	29.78	51.50	21.72	Pass
3	0.490	10.42	25.70	36.12	56.17	20.05	23.49	33.91	46.17	12.26	Pass
4	1.414	10.52	5.68	16.20	56.00	39.80	1.33	11.85	46.00	34.15	Pass
5	3.146	10.69	7.94	18.63	56.00	37.37	3.28	13.97	46.00	32.03	Pass
6	10.290	10.81	9.72	20.53	60.00	39.47	6.38	17.19	50.00	32.81	Pass

Project Information			
Mode:	WiFi Control	Voltage:	AC 230V/50Hz
Environment:	Temp: 24℃, Humi:52%	Engineer:	Allen Tang

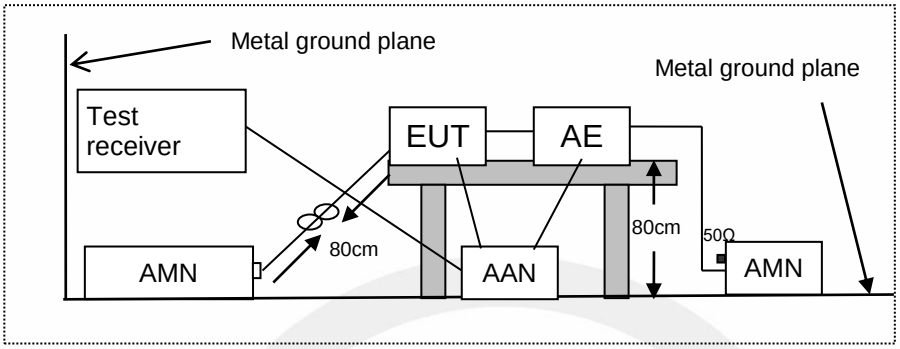


Final Data List

NO.	Freq. [MHz]	Factor [dB]	QP Reading [dBµV]	QP Value [dBµV]	QP Limit [dBµV]	QP Margin [dB]	AV Reading [dBµV]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin [dB]	Verdict
1	0.150	10.51	27.13	37.64	66.00	28.36	18.04	28.55	56.00	27.45	Pass
2	0.278	10.47	22.42	32.89	60.88	27.99	18.73	29.20	50.88	21.68	Pass
3	0.494	10.39	23.78	34.17	56.10	21.93	21.35	31.74	46.10	14.36	Pass
4	2.530	10.43	7.54	17.97	56.00	38.03	1.45	11.88	46.00	34.12	Pass
5	4.154	10.50	6.32	16.82	56.00	39.18	3.25	13.75	46.00	32.25	Pass
6	9.882	10.68	5.18	15.86	60.00	44.14	0.90	11.58	50.00	38.42	Pass

7. CONDUCTED EMISSIONS FROM THE DC MAINS POWER PORTS

7.1. Block Diagram of Test Setup



7.2. Measuring Standard

ETSI EN 301 489-1 Clause 8.3
CISPR 25

7.3. Conducted Emission Limits

Power Line Conducted Emission Limits

Table clause	Frequency range MHz	Coupling device	Detector type / bandwidth	limits dB(μV)
A9.1	0,15 to 0,5	AMN	Quasi Peak / 9 kHz	79 to 73
	0,5 to 30			73
A9.2	0,15 to 0,5	AMN	Average / 9 kHz	66 to 60
	5 to 30			60
Apply A9.1 and A9.2 across the entire frequency range.				

7.4. Test Procedure

For mobile radio and ancillary equipment intended to be connected to the vehicle's onboard DC mains, an Artificial Network (AN) as specified in CISPR 25 [10] annex D shall be used and be connected to a DC power source.

The measurement frequency range extends from 150 kHz to 30 MHz. When the EUT is a transmitter operating at frequencies below 30 MHz, then the exclusion band for transmitters applies (see clause 4.3 of the present document) for measurements in the transmit mode of operation.

For emission measurements on DC output ports the relevant port shall be connected via an AMN/AN to a load drawing the rated current of the source.

The bandwidth of the receiver is set at 9 kHz in 150 kHz~30 MHz. The frequency range from 150 kHz to 30 MHz is investigated.

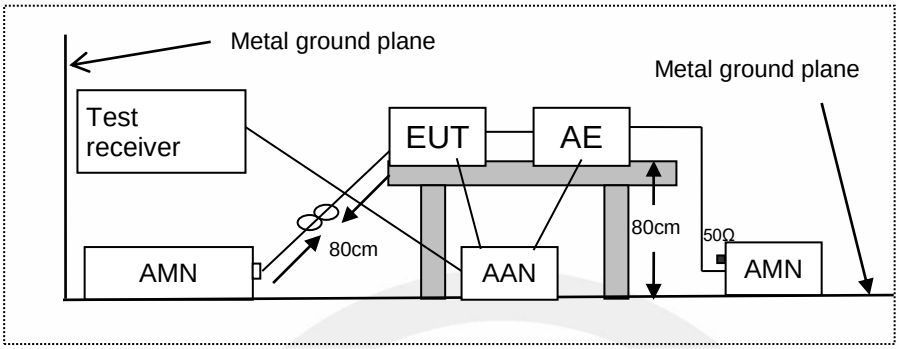
Test results were obtained from the following equation:
Measurement (dBμV) =Correct Factor (dB) + Reading (dBμV)
Over (dB) = Measurement (dBμV) - Limit (dBμV)

7.5. Measuring Results

Not Applicable

8. ASYMMETRIC MODE CONDUCTED EMISSIONS AT WIRED NETWORK PORTS

8.1. Block Diagram of Test Setup



AMN: Artificial mains network
AE: Associated equipment
EUT: Equipment under test
AAN: Asymmetric artificial network

8.2. Measuring Standard

ETSI EN 301 489-1 Clause 8.7
EN 55032: 2015 Clause A.3

8.3. Limits

EN 55032, Class B, Table A.12

Frequency range (MHz)	Coupling device (see Table A.8)	Detector type / bandwidth	Class B voltage limits dB(μV)	Class B current limits dB(μA)
0.15 to 0.5	AAN	Quasi Peak / 9 kHz	84 to 74	N/A
0.5 to 30			74	
0.15 to 0.5	AAN	Average / 9 kHz	74 to 64	
0.5 to 30			64	
0.15 to 0.5	CVP and current probe	Quasi Peak / 9 kHz	84 to 74	40 to 30
0.5 to 30			74	30
0.15 to 0.5	CVP and current probe	Average / 9 kHz	74 to 64	30 to 20
0.5 to 30			64	20
0.15 to 0.5	Current Probe	Quasi Peak / 9 kHz	N/A	40 to 30
0.5 to 30				30
0.15 to 0.5	Current Probe	Average / 9 kHz		30 to 20
0.5 to 30				20

8.4. Test Procedure

The EUT is put on the plane 0.8m high above the ground by insulating support and connected to the AC mains through artificial mains network (AMN) or connected to the wired network port through an asymmetric artificial network (ANN). AMN provided a 50ohm coupling impedance for the tested equipment AC mains port, ANN provided a common mode (asymmetric mode) impedance of 150 Ω to the wired network port under test. The wired network line are investigated to find out the maximum conducted emission according to the EN 55032 regulations during conducted emission measurement.

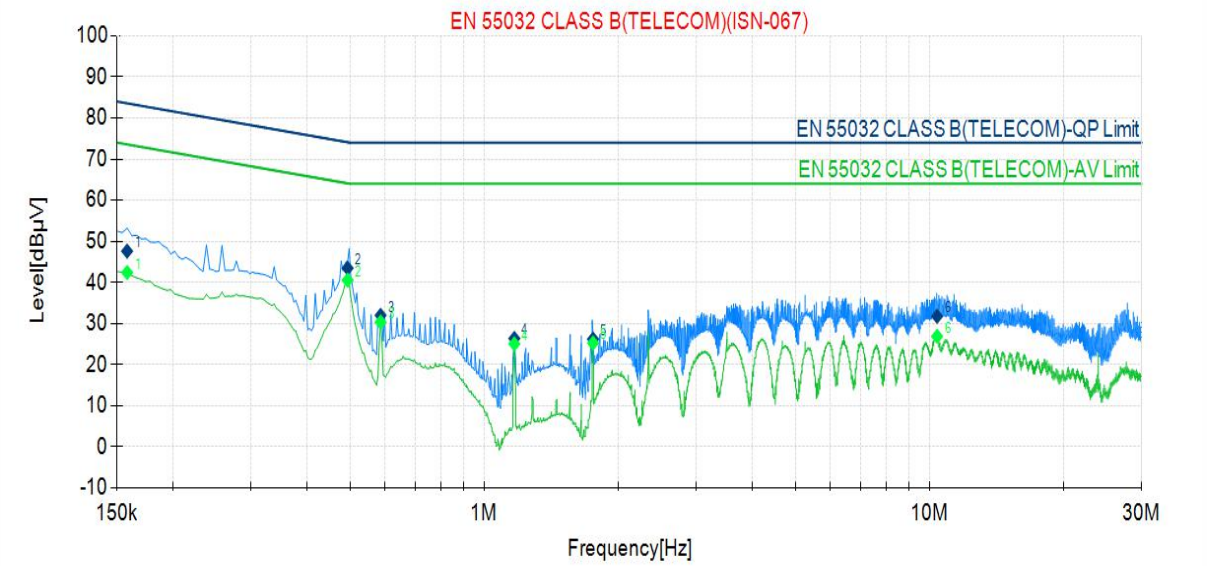
The bandwidth of the receiver is set at 9 kHz in 150 kHz~30 MHz. The frequency range from 150 kHz to 30 MHz is investigated.

Test results were obtained from the following equation:
Measurement (dBμV) =Correct Factor (dB) + Reading (dBμV)
Over (dB) = Measurement (dBμV) - Limit (dBμV)

8.5. Measuring Results

Pass.

Project Information			
Mode:	Wifi Control	Voltage:	AC 230V/50Hz
Environment:	Temp: 24℃ Humi:52%	Engineer:	Allen Tang



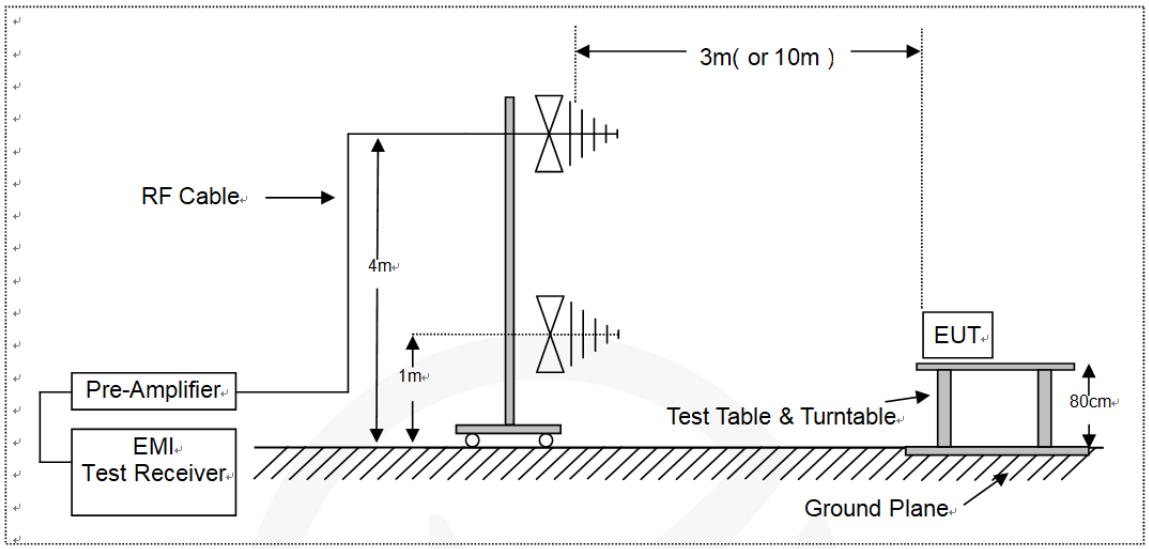
Final Data List

NO.	Freq. [MHz]	Factor [dB]	QP Reading [dBµV]	QP Value [dBµV]	QP Limit [dBµV]	QP Margin [dB]	AV Reading [dBµV]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin [dB]	Verdict
1	0.158	10.07	37.53	47.60	83.57	35.97	32.33	42.40	73.57	31.17	Pass
2	0.494	10.32	33.14	43.46	74.10	30.64	30.23	40.55	64.10	23.55	Pass
3	0.586	10.35	21.65	32.00	74.00	42.00	19.99	30.34	64.00	33.66	Pass
4	1.170	10.49	15.87	26.36	74.00	47.64	14.55	25.04	64.00	38.96	Pass
5	1.758	10.52	15.68	26.20	74.00	47.80	14.71	25.23	64.00	38.77	Pass
6	10.418	10.84	20.92	31.76	74.00	42.24	16.04	26.88	64.00	37.12	Pass

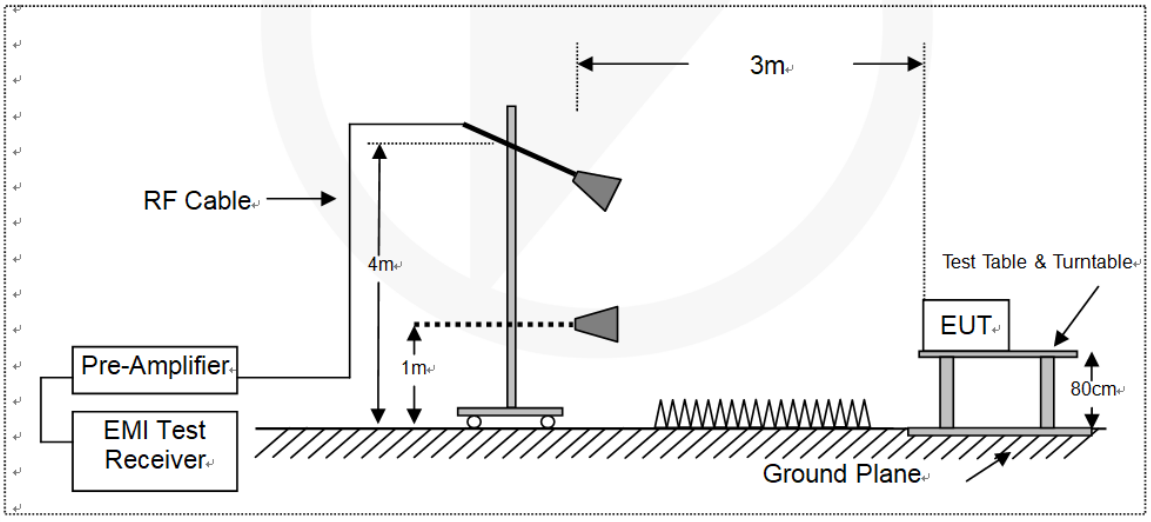
9. RADIATED EMISSION

9.1. Block Diagram of Test Setup

Below 1GHz



Above 1GHz



9.2. Measuring Standard

ETSI EN 301 489-1 Clause 8.2
EN 55032: 2015 Clause A.2

9.3. Radiated Limit

EN 55032, Class B, Table A.4 and A.5

Table clause	Frequency range MHz	Measurement			Class B limits dB(mV/m)
		Facility (see Table A.1)	Distance m	Detector type /bandwidth	
A4.1	30 to 230	OATS/SAC	10	Quasi Peak / 120 kHz	30
	230 to 1 000				37
A4.2	30 to 230	OATS/SAC	3		40
	230 to 1 000				47
A4.3	30 to 230	FAR	10	Quasi Peak / 120 kHz	32 to 25
	230 to 1 000				32
A4.4	30 to 230	FAR	3		42 to 35
	230 to 1 000				42
Apply only table clause A4.1 or A4.2 or A4.3 or A4.4 across the entire frequency range. These requirements are not applicable to the local oscillator and harmonics frequencies of equipment covered by Table A.6.					

Table clause	Frequency range MHz	Measurement			Class B limits dB(mV/m)
		Facility (see Table A.1)	Distance m	Detector type/ bandwidth	
A5.1	1 000 to 3 000	FSOATS	3	Average/ 1 MHz	50
	3 000 to 6 000				54
A5.2	1 000 to 3 000			Peak/ 1 MHz	70
	3 000 to 6 000				74
Apply A5.1 and A5.2 across the frequency range from 1 000 MHz to the highest required frequency of measurement derived from Table 1.					

9.4. Test Procedure

The EUT was placed on a non-conductive table whose total height equaled 80cm. All units of equipment forming the system under test (includes the EUT as well as connected peripherals and associated equipment or devices) shall be arranged such that a nominal 0.1 m separation is achieved between the neighboring units. Where the mains cable supplied by the manufacturer is longer than 1 m, the excess should be folded at the centre into a bundle no longer than 0.4 m, so that its length is shortened to 1 m.

The EUT was set 3 meters (or 10 meters) away from the receiving antenna that was mounted on a non-conductive mast. The antenna can move up and down between 1 to 4 meters to find out the maximum emission level.

The turntable can rotate 360 degree to determine the position of the maximum emission level.

The initial testing identified the frequency that has the highest disturbance relative to the limit while operating the EUT in typical modes of operation and cable positions in a test setup representative of typical system configuration.

The identification of the frequency of highest emission with respect to the limit was found by investigating emissions at a number of significant frequencies. The probable frequency of maximum emission had been found and that the associated cable and EUT configuration and mode of operation had been identified.

The 30 MHz-1GHz bandwidth of the Receiver is set at 120 kHz, above 1GHz Receiver is set at 1MHz

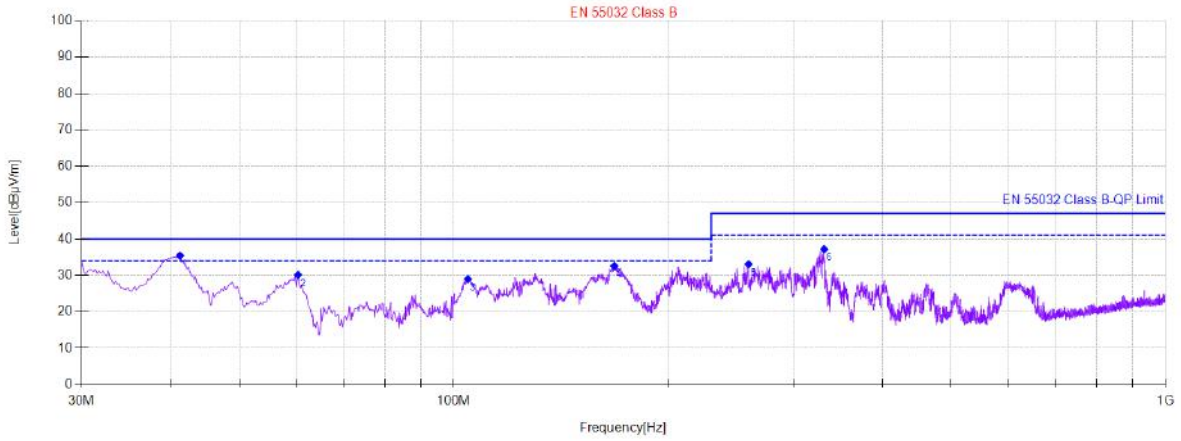
Test results were obtained from the following equation:
Measurement (dBμV) =Correct Factor (dB) + Reading (dBμV)
Over (dB) = Measurement (dBμV) - Limit (dBμV)

9.5. Measuring Results

PASS.

All the modes were tested and the data of the worst modes are attached the following pages.

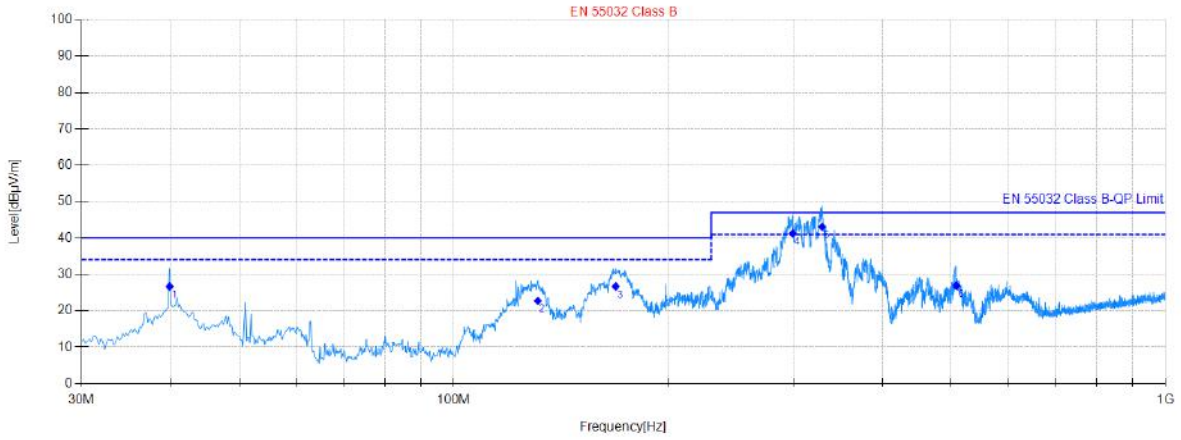
Project Information			
Mode:	wifi control	Voltage:	AC 230V/50Hz
Environment:	Temp: 25℃; Humi:60%	Engineer:	JACK ZHANG



Final Data List

NO.	Freq. [MHz]	QP Reading [dBµV/m]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity	Verdict
1	41.254	66.32	-30.91	35.41	40.00	4.59	100	105	Vertical	Pass
2	60.464	62.28	-32.14	30.14	40.00	9.86	100	348	Vertical	Pass
3	104.705	60.25	-31.28	28.97	40.00	11.03	100	360	Vertical	Pass
4	168.156	65.26	-32.67	32.59	40.00	7.41	100	348	Vertical	Pass
5	259.548	61.74	-28.67	33.07	47.00	13.93	100	327	Vertical	Pass
6	331.536	64.33	-27.15	37.18	47.00	9.82	100	77	Vertical	Pass

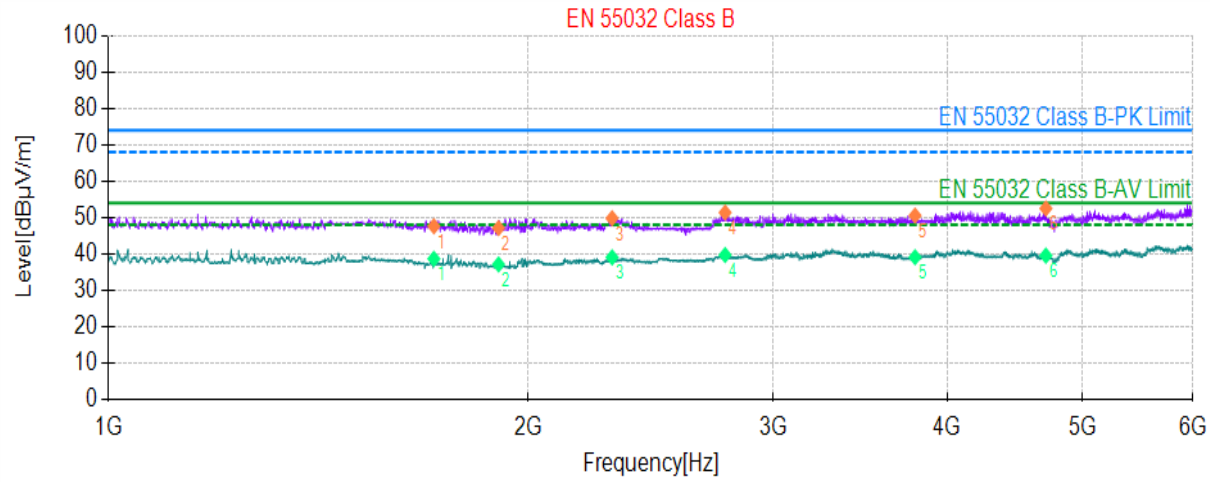
Project Information			
Mode:	wifi control	Voltage:	AC 230V/50Hz
Environment:	Temp: 25℃; Humi:60%	Engineer:	JACK ZHANG



Final Data List

NO.	Freq. [MHz]	QP Reading [dBµV/m]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity	Verdict
1	39.896	57.85	-31.18	26.67	40.00	13.33	100	192	Horizontal	Pass
2	131.288	56.35	-33.64	22.71	40.00	17.29	200	34	Horizontal	Pass
3	168.932	59.35	-32.65	26.70	40.00	13.30	200	301	Horizontal	Pass
4	299.520	69.64	-28.38	41.26	47.00	5.74	100	168	Horizontal	Pass
5	329.208	70.24	-27.15	43.09	47.00	3.91	100	130	Horizontal	Pass
6	508.500	50.04	-23.14	26.90	47.00	20.10	100	217	Horizontal	Pass

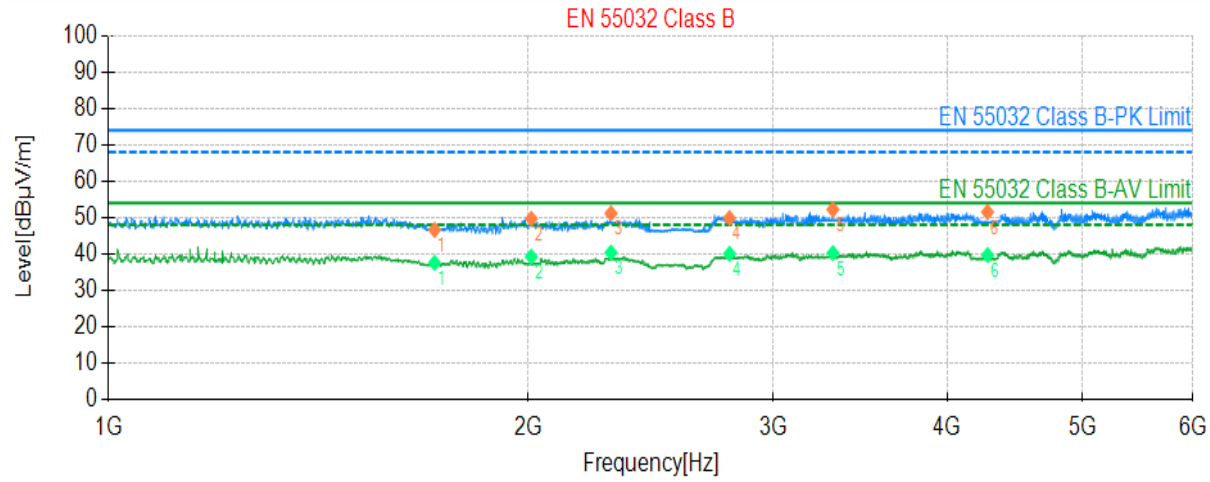
Project Information			
Mode:	wifi control	Voltage:	AC 230V/50Hz
Environment:	Temp: 24℃; Humi:58%	Engineer:	JACK ZHANG



PK Final Data List										
NO.	Freq. [MHz]	PK Reading [dBµV/m]	Factor [dB]	PK Value [dBµV/m]	PK Limit [dBµV/m]	PK Margin [dB]	Height [cm]	Angle [°]	Polarity	Verdict
1	1712.142	61.46	-13.90	47.56	74.00	26.44	100	52	Vertical	Pass
2	1905.181	60.78	-13.71	47.07	74.00	26.93	100	77	Vertical	Pass
3	2298.260	63.06	-13.30	49.76	74.00	24.24	100	163	Vertical	Pass
4	2770.354	62.76	-11.42	51.34	74.00	22.66	100	81	Vertical	Pass
5	3791.558	58.76	-8.25	50.51	74.00	23.49	100	44	Vertical	Pass
6	4706.741	58.67	-6.21	52.46	74.00	21.54	100	120	Vertical	Pass

AV Final Data List										
NO.	Freq. [MHz]	AV Reading [dBµV/m]	Factor [dB]	AV Value [dBµV/m]	AV Limit [dBµV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity	Verdict
1	1712.142	52.49	-13.90	38.59	54.00	15.41	100	52	Vertical	Pass
2	1905.181	50.78	-13.71	37.07	54.00	16.93	100	77	Vertical	Pass
3	2298.260	52.29	-13.30	38.99	54.00	15.01	100	163	Vertical	Pass
4	2770.354	51.07	-11.42	39.65	54.00	14.35	100	81	Vertical	Pass
5	3791.558	47.29	-8.25	39.04	54.00	14.96	100	44	Vertical	Pass
6	4706.741	45.69	-6.21	39.48	54.00	14.52	100	120	Vertical	Pass

Project Information			
Mode:	wifi control	Voltage:	AC 230V/50Hz
Environment:	Temp: 24℃; Humi:58%	Engineer:	JACK ZHANG

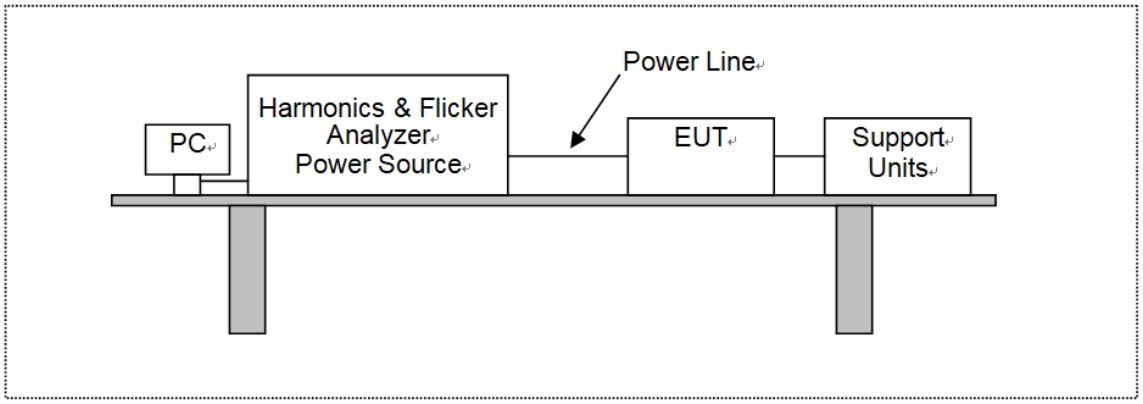


PK Final Data List										
NO.	Freq. [MHz]	PK Reading [dBµV/m]	Factor [dB]	PK Value [dBµV/m]	PK Limit [dBµV/m]	PK Margin [dB]	Height [cm]	Angle [°]	Polarity	Verdict
1	1714.143	60.46	-13.90	46.56	74.00	27.44	100	105	Horizontal	Pass
2	2011.202	63.21	-13.61	49.60	74.00	24.40	100	116	Horizontal	Pass
3	2294.259	64.43	-13.31	51.12	74.00	22.88	100	181	Horizontal	Pass
4	2790.358	61.09	-11.29	49.80	74.00	24.20	100	358	Horizontal	Pass
5	3310.462	61.67	-9.50	52.17	74.00	21.83	100	83	Horizontal	Pass
6	4274.655	58.64	-7.17	51.47	74.00	22.53	100	314	Horizontal	Pass

AV Final Data List										
NO.	Freq. [MHz]	AV Reading [dBµV/m]	Factor [dB]	AV Value [dBµV/m]	AV Limit [dBµV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity	Verdict
1	1714.143	51.39	-13.90	37.49	54.00	16.51	100	105	Horizontal	Pass
2	2011.202	52.78	-13.61	39.17	54.00	14.83	100	116	Horizontal	Pass
3	2294.259	53.64	-13.31	40.33	54.00	13.67	100	181	Horizontal	Pass
4	2790.358	51.27	-11.29	39.98	54.00	14.02	100	358	Horizontal	Pass
5	3310.462	49.69	-9.50	40.19	54.00	13.81	100	83	Horizontal	Pass
6	4274.655	46.79	-7.17	39.62	54.00	14.38	100	314	Horizontal	Pass

10. HARMONIC CURRENT EMISSION MEASUREMENT

10.1. Block Diagram of Test Setup



10.2. Measuring Standard

ETSI EN 301 489-1 Clause 8.5
EN IEC 61000-3-2:2019

10.3. Standard Limits

EN 61000-3-2, CLASS A
Harmonic current emissions evaluate the potential for the EUT to cause distortion on the AC power lines. It is applicable to electrical and electronic equipment having an input current≤16 A per phase, and intended to be connected to public low-voltage distribution systems

Table 1 - Limits for Class A equipment

Harmonic order n	Maximum permissible harmonic current (A)
Odd harmonics	
3	2.30
5	1.14
7	0.77
9	0.40
11	0.33
13	0.21
$15 \le n \le 39$	$0.15 \frac{0.15}{n}$
Even harmonics	
2	1.08
4	0.43
6	0.30
$8 \le n \le 40$	$0.23 \frac{8}{n}$

10.4. Test Procedure

The measurement of harmonic currents shall be performed as follows: i. For each harmonic order, measure the 1.5 s smoothed r.m.s. harmonic current in each DFT time window as defined in EN / IEC 61000-4-7:2009. ii. Calculate the arithmetic average of the measured values from the DFT time windows, over the entire observation period Short cyclic (T cycle≤2.5 min). Because of synchronisation to meet the requirements for repeatability in 5%.

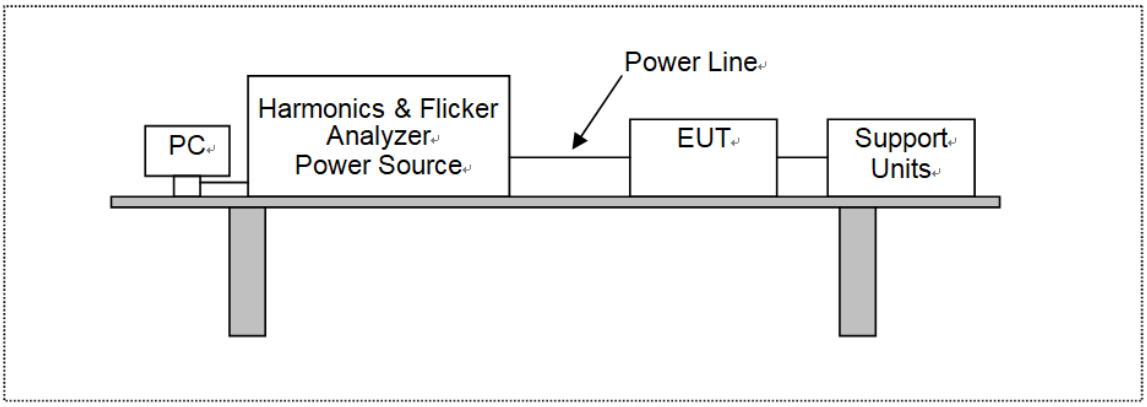
10.5. Test Results

N/A.

Note: According to clause 7 of EN 61000-3-2, equipment with a rated power of 75W or less, no limits apply.

11. VOLTAGE FLUCTUATION AND FLICKER MEASUREMENT

11.1. Block Diagram of Test Setup



11.2. Measuring Standard

ETSI EN 301 489-1 Clause 8.6
EN 61000-3-3:2013/ A1:2019

11.3. Standard Limits

EN 61000-3-3 Limits
The objective of voltage changes, voltage fluctuations and flicker in public low voltage supply systems during equipment with rated current≤16 A per phase, ensures that home appliances and certain other electrical equipment do not adversely affect lighting equipment when connected to the same power system.
Voltage Fluctuation and Flicker Limits:
— the value of Pst shall not be greater than 1.0;
— the value of Plt shall not be greater than 0.65;
— the value of d(t) during a voltage change shall not exceed 3.3 % for more than 500 ms;
— the relative steady-state voltage change, dc, shall not exceed 3.3 %;
— the maximum relative voltage change, dmax, shall not exceed 4.0 %;

11.4. Test Procedure

The total impedance of the test circuit, excluding the appliance under test, but including the internal impedance of the supply source, shall be equal to the reference impedance. The stability and tolerance of the reference impedance shall be adequate to ensure that the overall accuracy of 8% is achieved during the whole assessment procedure.

11.5. Test Results

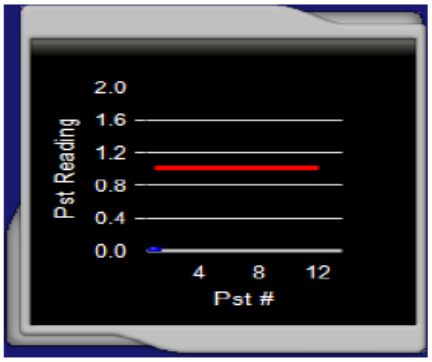
Pass.

EUT:	Adapter Box (Adapter Box G2)
Test Standard:	Test per IEC 61000-3-3 Ed. 3.1 : 2017
Test Class:	Flicker Test, Pst-dc-dmax-Tmax
Test Result:	PASS
Test Date:	2022/11/30
Start Time:	13:35:25
Stop Time:	13:45:48
Test Duration (min):	10
Environment:	Temp: 25℃; Humi:45%
Source Qualification:	Compliance with IEC 61000-3-3 Ed. 3.1 : 2017
Customer:	Customer
Test By:	Jo Liu
Comments:	ON

Phase A

Vrms (Volts):	229.39	Frequency (Hz):	50.00
I_rms (Amps):	0.042	Power (W):	0.9
V-THD (%):	0.067	T-Max (ms):	0 (500)
dmax (%):	0.000 (4.000)	Hi dmax (%):	0.000 (4.000)
dc (%):	0.000 (3.300)	Hi dc (%):	0.000 (3.300)
Pst-1 :	0.039 (1.000)		
Plt :	0.017 (0.650)		

Pst Spectrum



Plt Spectrum

12. PERFORMANCE CRITERIA

12.1. General performance criteria

The performance criteria are:
• Performance criteria A for immunity tests with phenomena of a continuous nature;
• Performance criteria B for immunity tests with phenomena of a transient nature;
• Performance criteria C for immunity tests with power interruptions exceeding a certain time.

The equipment shall meet the minimum performance criteria as specified in the following clauses.

12.2. Performance table

ETSI 301 489-17 Performance criteria;

Criteria	During test	After test ((i.e. as a result of the application of the test))
A	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	May be loss of function	Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no loss of critical stored data.
C	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.
NOTE: Operate as intended during the test allows a level of degradation in accordance with clause 6.2.2.		

Minimum performance level
For equipment that supports a PER or FER, the minimum performance level shall be a PER or FER less than or equal to10 %.
For equipment that does not support a PER or a FER, the minimum performance level shall be no loss of the wireless transmission function needed for the intended use of the equipment.

Performance criteria for Continuous phenomena
The performance criteria A shall apply.
Where the EUT is a transmitter in standby mode, unintentional transmission shall not occur during the test.
Where the EUT is a transceiver in receive mode, unintentional transmission shall not occur during the test.

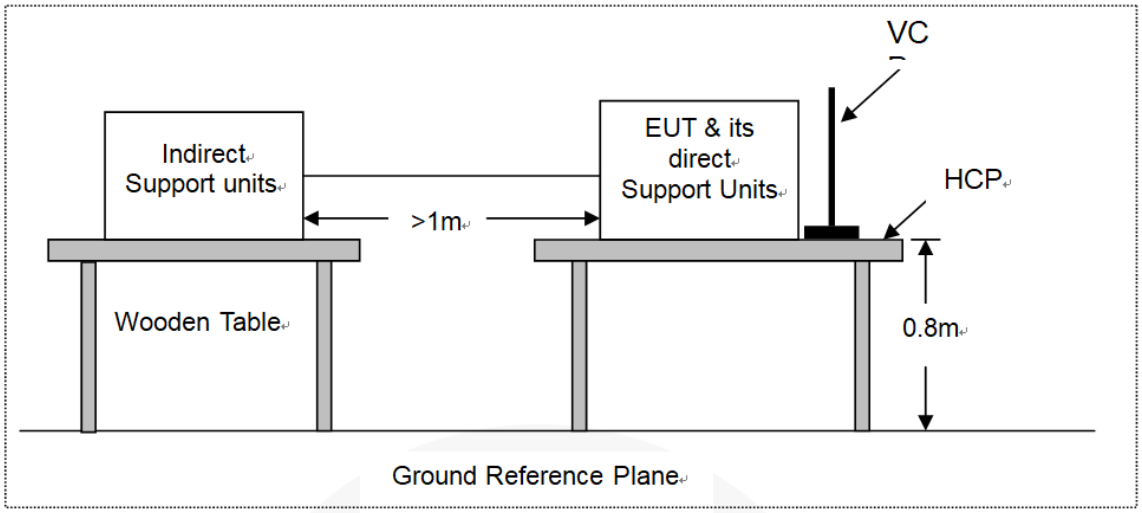
Performance criteria for Transient phenomena
The performance criteria B shall apply, except for voltage dips greater than or equal to 100 ms and voltage interruptions of 5 000 ms duration, for which performance criteria C shall apply.
Where the EUT is a transmitter in standby mode, unintentional transmission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

13. ELECTROSTATIC DISCHARGE

13.1. Test Specification

Test standard	:	ETSI EN 301 489-1
Basic standard	:	EN 61000-4-2
Performance criterion	:	B
Test level	:	±8.0kV (Air discharge) ±4.0kV (Contact discharge)

13.2. Block Diagram of Test Setup



13.3. Test Procedure

Please refer to ETSI EN 301 489-1 Clause 9.3.2 and EN 61000-4-2 for the measurement methods.
a. In the case of air discharge testing, the climatic conditions shall be within the following ranges:
- ambient temperature: 15°C to 35°C;
- relative humidity : 30% to 60%;
- atmospheric pressure : 86 kPa (860 mbar) to 106 kPa (1060 mbar)
b. Test programs and software shall be chosen so as to exercise all normal modes of operation of the EUT. The use of special exercising software is encouraged, but permitted only where it can be shown that the EUT is being comprehensively exercised.
c. In the case of contact discharges, the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.
d. 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.
e. 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.
f. The test voltage shall be increased from the minimum to the selected test severity level, in order to determine any threshold of failure. The final test level should not exceed the product specification value in order to avoid damage to the equipment.
g. The test shall be performed with both air discharge and contact discharge. The test shall be performed with single discharges. On each pre-selected point at least 10 single discharges (in the most sensitive polarity) shall be applied. For the time interval between successive single discharges an initial value of 1 s is recommended. Longer intervals may be necessary to determine whether a system failure has occurred.
h. Ensure that the applied charge on the EUT has been dis-charged before next ESD pulse.
I. At least ten single discharges (in the most sensitive polarity) were applied to the Horizontal Coupling Plane at points on each side of the Product. The ESD generator was positioned vertically at a distance of 0.1 meters from the Product with the discharge electrode touching the HCP.
J. At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the Vertical Coupling Plane in sufficiently different positions that the four faces of the Product were completely illuminated. The VCP (dimensions 0.5m x 0.5m) was placed vertically to and 0.1 meters from the Product.

13.4. Test Results

PASS

Please see the attached page.

Temperature	:	23°C
Humidity	:	52%
Atmospheric Pressure	:	101kpa
Test Engineer	:	Ace Li
Test Date	:	2022-12-01

Air Discharge:

Test Voltage	Location	Actual criterion	Required performance criterion	Result (Pass/Fail)
±2; 4; 8 kV	All slots of the EUT	A	B	Pass
±2; 4; 8 kV	Non-Conducted Enclosure	A	B	Pass
±2; 4; 8 kV	port	A	B	Pass

Indirect Discharge

Test Voltage	Location	Actual criterion	Required performance criterion	Result (Pass/Fail)
±2kV, ±4kV	HCP	A	B	Pass
±2kV, ±4kV	VCP	A	B	Pass

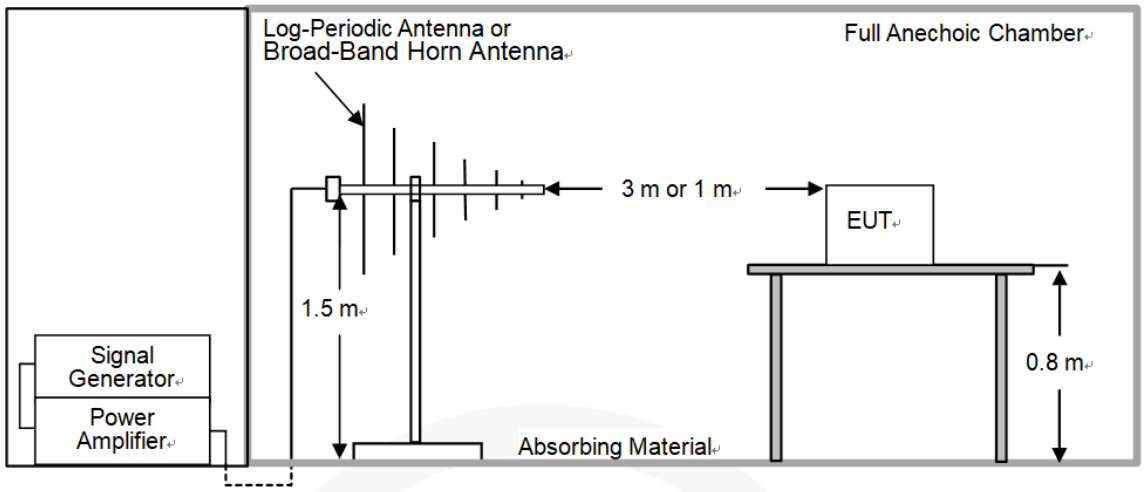
The red circle "○" represents the air discharge

14. CONTINUOUS RF ELECTROMAGNETIC FIELD DISTURBANCES

14.1. Test Specification

Test standard	:	ETSI EN 301 489-1	
Basic standard	:	EN 61000-4-3	
Performance criterion	:	A	
Frequency range & Test level	:	☒80M-6000MHz	3V/m
		☒Spot frequency	3V/m
		☐Additional spot frequency	3V/m
Modulation	:	AM, 80%, 1kHz sine-wave	

14.2. Block Diagram of Test Setup



14.3. Test procedure

Please refer to ETSI EN 301 489-1 Clause 9.2.2 and EN 61000-4-3 for the measurement methods.
The procedure defined in this part requires the generation of electromagnetic fields within which the test sample is placed and its operation observed. To generate fields that are useful for simulation of actual (field) conditions may require significant antenna drive power and the resultant high field strength levels. To comply with local regulations and to prevent biological hazards to the testing personnel, it is recommended that these tests be carried out in a shielded enclosure or semi-anechoic chamber.

The test level shall be 3 V/m (measured undulated). The test signal shall be amplitude modulated to a depth of 80 % by a sinusoidal audio signal of 1 000 Hz. If the wanted signal is modulated at 1 000 Hz, then an audio signal of 400 Hz shall be used;
The test shall be performed over the frequency range 80 MHz to 6 000 MHz with the exception of the exclusion band for transmitters, receivers and duplex transceivers (see clause 4.3), as appropriate;
For receivers and transmitters the stepped frequency increments shall be 1 % frequency increment of the momentary used frequency;
The dwell time of the test phenomena at each frequency shall not be less than the time necessary for the EUT to be exercised and to be able to respond;

The test is performed with the antenna facing the front and back sides of the EUT with. Both vertical and horizontal polarizations from antenna are tested.

14.4. Test results

PASS

Temperature	:	24°C
Humidity	:	48%
Atmospheric Pressure	:	101kpa
Test Engineer	:	Lucas Xu
Test Date	:	2022-12-01

☒ 80M-6000MHz:

Freq. Range (MHz)	Field	Modulation	Polarity	Position (°)	Actual criterion	Required performance criterion	Result
80-6000	3V/m	AM, 80%	H / V	0, 90,180, 270	A	A	Pass

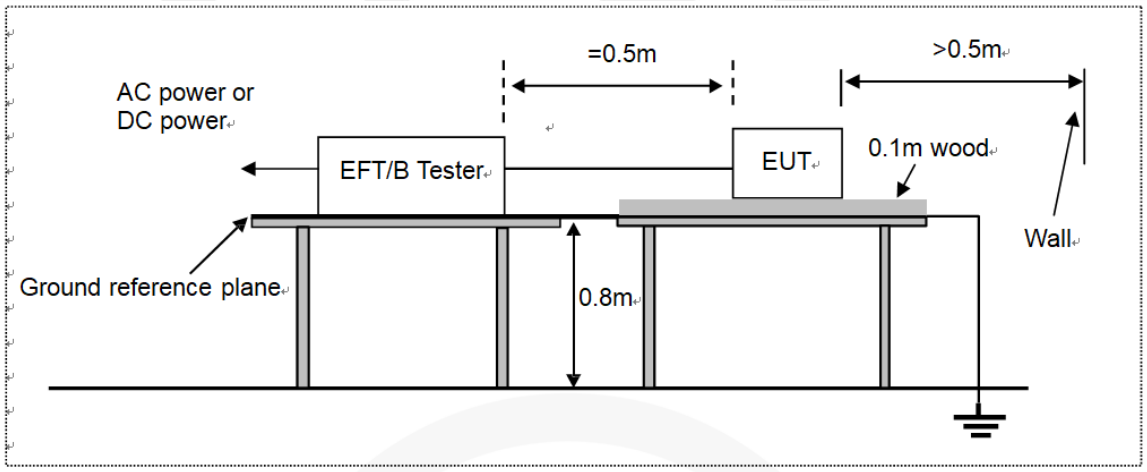
15. ELECTRICAL FAST TRANSIENTS/BURST

15.1. Test Specification

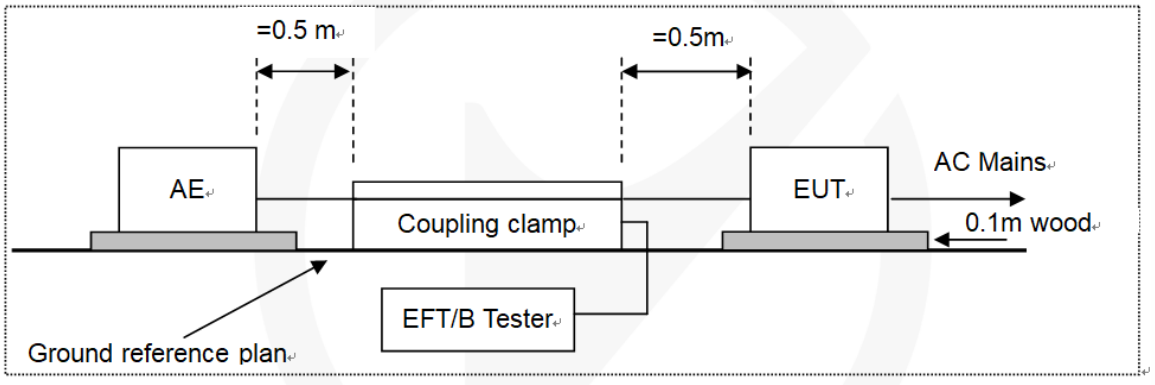
Test standard	:	ETSI EN 301 489-1
Basic standard	:	EN 61000-4-4
Performance criterion	:	B
Test level	:	☒1kV, AC mains power ports ☐0.5kV, DC network power ports ☐0.5kV, Analogue/digital data ports
Repetition frequency	:	☒5kHz, ☐100kHz(Only xDSL ports)
Tr/Th:	:	5/50ns
Burst period	:	300ms
Test time :	:	120s

15.2. Block Diagram of Test Setup

AC Lines:



Signal lines:



15.3. Test Procedure

Please refer to ETSI EN 301 489-1 Clause 9.4.2 and EN 61000-4-4 for the measurement methods. The EUT is put on the table that is 0.8 meter high above the ground. This reference ground plane shall project beyond the EUT by at least 0.1m on all sides and the minimum distance between EUT and all other conductive structure, except the ground plane beneath the EUT, shall be more than 0.5m.

15.4. Test Results

PASS

Temperature	:	25°C
Humidity	:	45%
Atmospheric Pressure	:	101kpa
Test Engineer	:	Ace Li
Test Date	:	2022-12-01

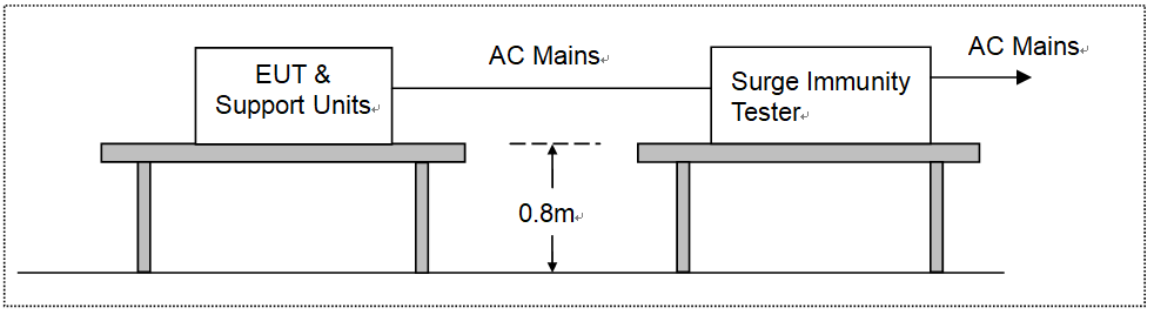
Injection Line	Voltage (kV)	Injected Method	Actual criterion	Required performance criterion	Result (Pass/Fail)
☒ AC mains power ports	± 1	☐ CDN ☒ Direct injection ☐ Capacitive coupling clamp	A	B	Pass
☐ DC network power ports	± 0.5	☐ CDN ☐ Direct injection ☐ Capacitive coupling clamp	N/A	N/A	N/A
☒ Analogue/digital data ports (Wired network port)	± 0.5	☐ CDN ☐ Direct injection ☒ Capacitive coupling clamp	A	B	Pass
☐ Analogue/digital data ports (Signal Line)	± 0.5	☐ CDN ☐ Direct injection ☐ Capacitive coupling clamp	A	B	Pass

16. SURGES

16.1. Test Specification

Test standard	:	ETSI EN 301 489-1
Basic standard	:	EN 61000-4-5
Test level	:	☒1kV, Line to Line, AC mains power ports, Criterion B
		☐2kV, Line to Earth, AC mains power ports, Criterion B
		☐1.0kV, Lines to Ground, Unshielded symmetrical, Criterion B
		☐1.0kV, Lines to Ground, Unshielded non-symmetrically, Criterion B
		☐0.5kV, Shield to ground, Coaxial or shielded port, Criterion B
Number of surges	:	5 (for each combination of parameters)
Repetition rate	:	1 minute / time
Polarity:	:	Positive / Negative
Phase angle:	:	90º, 270º (Only AC mains power ports)

16.2. Block Diagram of Test Setup



16.3. Test Procedure

Please refer to ETSI EN 301 489-1 Clause 9.8.2 and EN 61000-4-5 for the measurement methods

This test simulates a lightning event by inducing transients onto the AC/DC power supply lines in common mode (Line to Ground) and differential mode (Line to Line). Each device was tested in a total of two surge configurations: Line to Ground (L-G): Combination Wave, Line to Protective Earth with 9uF and 10Ohm and Neutral to Protective Earth with 9uF and 10Ohm, common mode, generator earthed.
Line to Line (L-L): Combination Wave,
Line to Neutral with 18uF, differential mode, generator floated.
2 ohm : the source impedance of the low-voltage power supply network.
12 ohm : the source impedance of the low-voltage power supply network and ground.

a. If not otherwise specified the surges have to be applied synchronized to the voltage phase at the zero-crossing and the peak value of the a.c. voltage wave (positive and negative).
b. The surges have to be applied line to line and line to earth. When testing line to earth, the test voltage has to be applied successively between each of the lines and earth, if there is no other specification.
c. The test procedure shall also consider the non-linear current-voltage characteristics of the

equipment under test. Therefore the test voltage has to be increased by steps up to the test level specified in the product standard or test plan. All lower levels including the selected test level shall be satisfied.
d. For testing the secondary protection, the output voltage of the generator shall be increased up to the worst-case voltage breakdown level (let-through level) of the primary protection.
e. Testing shall be performed according to a Test Plan, which shall be included in the test report.
f. To find all critical points of the duty cycle of the equipment, a sufficient number of positive and negative test pulses shall be applied.

16.4. Test results

Pass.

Temperature	:	25 °C
Humidity	:	45 %
Atmospheric Pressure	:	101kpa
Test Engineer	:	Ace Li
Test Date	:	2022-12-01

☒ AC mains power ports:

Coupling Line	Voltage (kV)	Waveform (μs)	Polarity	Actual criterion	Required performance criterion	Result (Pass/Fail)
☒ Line to line	1	1.2/50 (8/20)	Pos./ Neg.	A	B	Pass
☐ Line to earth	2	1.2/50 (8/20)	Pos./ Neg.	N/A	B	N/A

☒ Analogue/digital data ports:

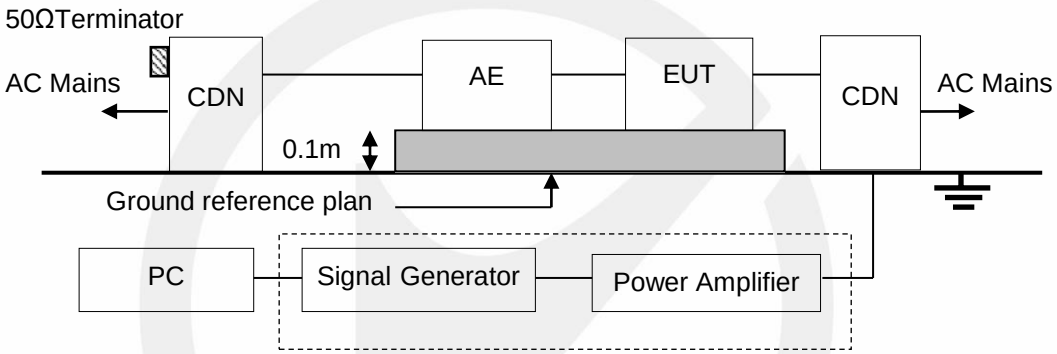
Port type	Coupling Line	Voltage (kV)	Waveform (μs)	Polarity	Actual criterion	Required performance criterion	Result (Pass/Fail)
☒ Unshielded symmetrical (Wired network port)	Lines to ground	0.5, 1	10/700 (5/320)	Pos./ Neg.	A	C	Pass
☐ Unshielded symmetrical (.....)	Lines to ground	0.5, 1	10/700 (5/320)	Pos./ Neg.	N/A	C	N/A
☐ Unshielded symmetrical	Lines to ground	0.5, 1, 2, 4	10/700 (5/320)	Pos./ Neg.	N/A	C	N/A
☐ Coaxial or shielded (Broadcast receiver tuner port)	Shield to ground	0.5	1.2/50 (8/20)	Pos./ Neg.	N/A	B	N/A
☐ Coaxial or shielded (.....)	Shield to ground	0.5	1.2/50 (8/20)	Pos./ Neg.	N/A	B	N/A

17. CONTINUOUS INDUCED RF DISTURBANCES

17.1. Test Specification

Test standard	:	ETSI EN 301 489-1
Basic standard	:	EN 61000-4-6
Performance criterion	:	A
Frequency range & Test level	:	0.15M to 80MHz, 3V
Modulation	:	AM 80%, 1kHz sine-wave
Frequency Step	:	1% of fundamental

17.2. Block Diagram of Test Setup



17.3. Test Procedure

Please refer to ETSI EN 301 489-1 Clause 9.5.2 and EN 61000-4-6 for the measurement methods.
a. The EUT shall be operated within its intended climatic conditions. The temperature and relative humidity should be recorded.
b. The EUT is placed on a 0.1m high test table, and a well-grounded cable is connected to metallic plane above the test table.
c. All cables/wires must be laid out on test plate (3cm in thickness),and the EUT is set up on test plate (10 cm in thickness) as shown in test setup photo, and the cables/wires must not be in mid-air, they should be touching the surface of test plate. Ensure that the EUT is properly connected to the accessory equipment. d. The test shall be performed with the test generator connected to each of the coupling and decoupling devices in turn while the other non-excited RF-input ports of the coupling devices are terminated by a 50 ohm load resistor.
e. The frequency range is swept from 150 kHz to 80 MHz, using the signal levels established during the setting process, and with the disturbance signal 80% amplitude modulated with a 1 kHz sine wave, pausing to adjust the RF-signal level or to switch coupling devices as necessary. The rate of sweep shall no exceed 1.5 x 10-3 decades/s. Where the frequency is swept incrementally, the step size shall no exceed 1% of the start and thereafter 1% of the preceding frequency value.
f. The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequencies e.g. clock frequency (ies) and harmonics or frequencies of dominant interest shall be analyzed separately.
g. Attempts should be made to fully exercise the EUT during testing, and to fully interrogate all exercise modes selected for susceptibility
h. Testing shall be performed according to a Test Plan, which shall be included in the test report.

17.4. Test results

PASS

Temperature	:	25°C
Humidity	:	45%
Atmospheric Pressure	:	101kpa
Test Engineer	:	Ace Li
Test Date	:	2022-12-01

Range (MHz)	Levers (V)	Injection port	Coupling type	Actual criterion	Required performance criterion	Result (Pass/Fail)
0.15-80	3	☒AC mains power ports	☒CDN ☐EM Clamp ☐Current Clamp ☐Direct injection	A	A	Pass
0.15-80	3	☐DC network power ports	☐CDN ☐EM Clamp ☐Current Clamp ☐Direct injection	N/A	N/A	N/A
0.15-80	3	☒Analogue/digital data ports (Signal Line)	☐CDN ☒EM Clamp ☐Current Clamp ☐Direct injection	A	A	Pass
0.15-80	3	☐Analogue/digital data ports (network ports)	☐CDN ☐EM Clamp ☐Current Clamp ☐Direct injection	N/A	N/A	N/A

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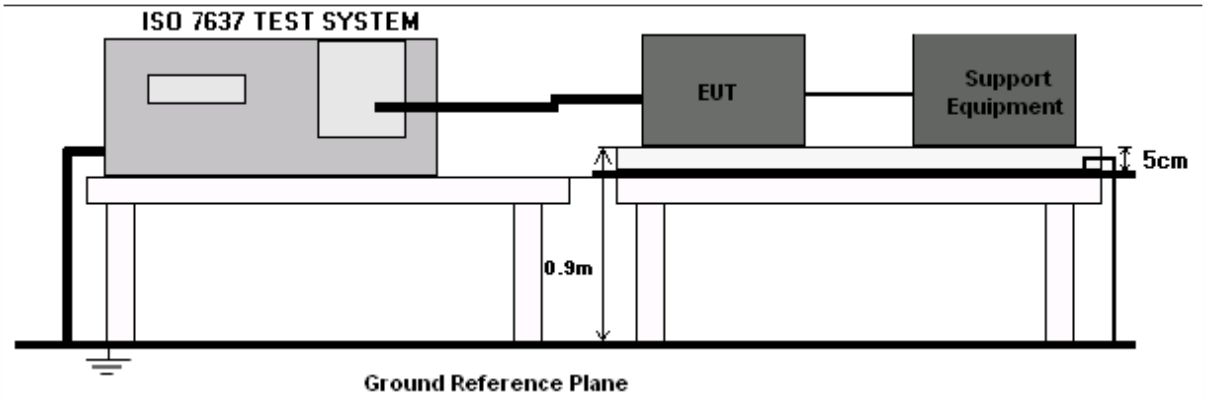
18. RANSIENTS AND SURGES IN THE VEHICULAR ENVIRONMENT

18.1.Test Specification

Test standard	:	ETSI EN 301 489-1
Basic standard	:	ISO 7637-2
Performance criterion	:	A & B
Number of pulses	:	10 pulses
duration	:	20 min

18.2.Block Diagram of Test Setup



18.3.Test Procedure

According to ETSI EN 301 489-1 Clause 9.6 and ISO 7637-2 [8] Severity Levels and Performance Criterion

Test pulse number	Immunity test level	Required functional status
1	III	B
2a	III	B
2b	III	B
3a	III	A
3b	III	A
4	III	B

These tests are applicable to radio and ancillary equipment intended for vehicular use.
These tests shall be performed on nominal 12 V and 24 V DC supply voltage input ports of mobile radio and ancillary equipment, which are also intended for mobile use in vehicles.
These tests shall be performed on a representative configuration of the mobile radio equipment, the associated ancillary equipment, or a representative configuration of the combination of radio and ancillary equipment.
These tests assess the ability of the EUT to operate as intended in the event of transients and surges present on their DC power input ports in a vehicular environment
The test method shall be in accordance with ISO 7637-2 [8], clause 4 for 12 V DC and 24 V DC powered equipment.
The test method shall be in accordance with ISO 7637-2 [8], clause 4, applying pulses 1, 2a, 2b, 3a, 3b, and 4, using immunity test level III. For the purpose of EMC testing it is sufficient to apply pulses 1, 2a, 2b and 4, 10 times each, and apply the test pulses 3a and 3b for 20 minutes each.

18.4. Test Results

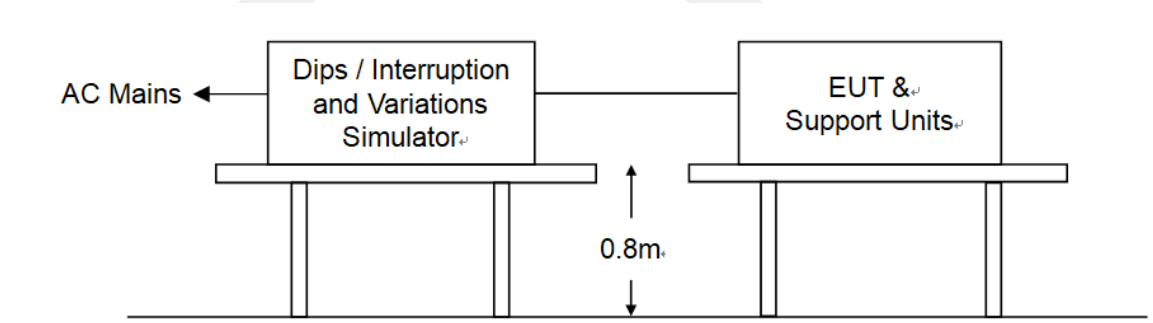
Not applicable.

19. VOLTAGE DIPS AND INTERRUPTIONS

19.1. Test Specification

Test standard	:	ETSI EN 301 489-1
Basic standard	:	EN 61000-4-11
Test level	:	☒0%, 0.5 period, Criterion B
		☒0%, 1 periods for 50Hz, Criterion C
		☒70%, 25 periods for 50Hz, Criterion C
		☒0%, 250 periods for 50Hz, Criterion C

19.2. Block Diagram of Test Setup



19.3. Test Procedure

Please refer to ETSI EN 301 489-1 Clause 9.7.2 and EN 61000-4-11 for the measurement methods.
a. Where the equipment has a rated voltage the following shall apply - If the voltage range does not exceed 20% of the lower voltage specified for the rated voltage range, a single voltage within that range may be specified as a basis for test level specification.
- In all other cases, the test procedure shall be applied for both the lowest and highest voltages declared in the voltage range.
b. Test Conditions
- Select operated voltage and frequency of EUT - Test of interval: 10 sec.
- Level and duration: Sequence of 3 dips/interrupts.
- Voltage rise (and fall) time: 1.5 μs.

19.4. Test results

PASS.

Temperature : 25°C
Humidity : 45%
Atmospheric Pressure : 101kpa
Test Engineer : Ace Li
Test Date : 2022-12-01

	Test Level (% UT)	Phase angle (°)	Input Voltage (V)	Freq (Hz)	Duration (periods)	Actual criterion	Required performance criterion	Result (Pass /Fail)
☒Voltage dips	0%	0°, 180°	AC 230V	50	0.5	A	B	Pass
☒Voltage dips	0%	0°, 180°	AC 230V	50	1	A	C	Pass
☒Voltage dips	70%	0°, 180°	AC 230V	50	25	B	C	Pass
☒Voltage interruptions	0%	0°, 180°	AC 230V	50	250	C	C	Pass

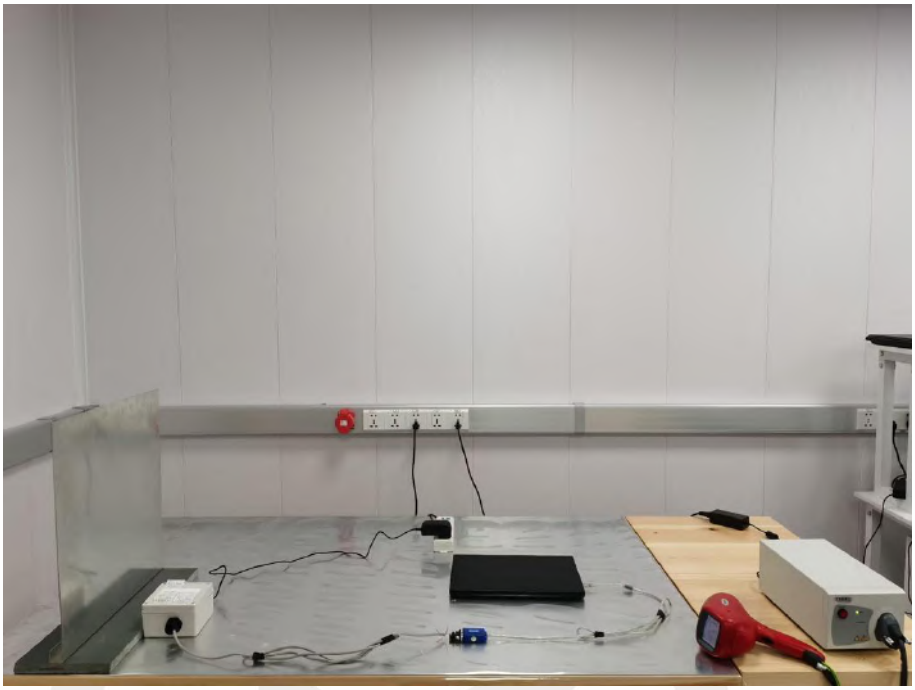
Note: C: During the test, the EUT shut down, after the test, it can be reset by user..

20. PHOTOGRAPHS

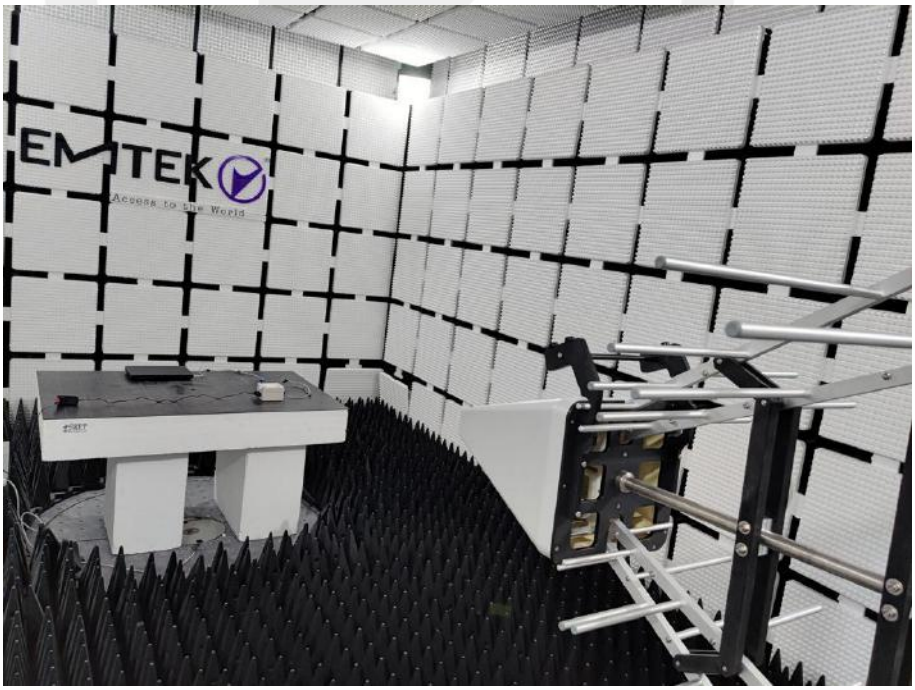
20.1. Photos of Conducted Emissions from the AC Mains Power Ports

20.2. Photos of Radiation Emission Measurement

20.3.Photo of Electrostatic Discharges

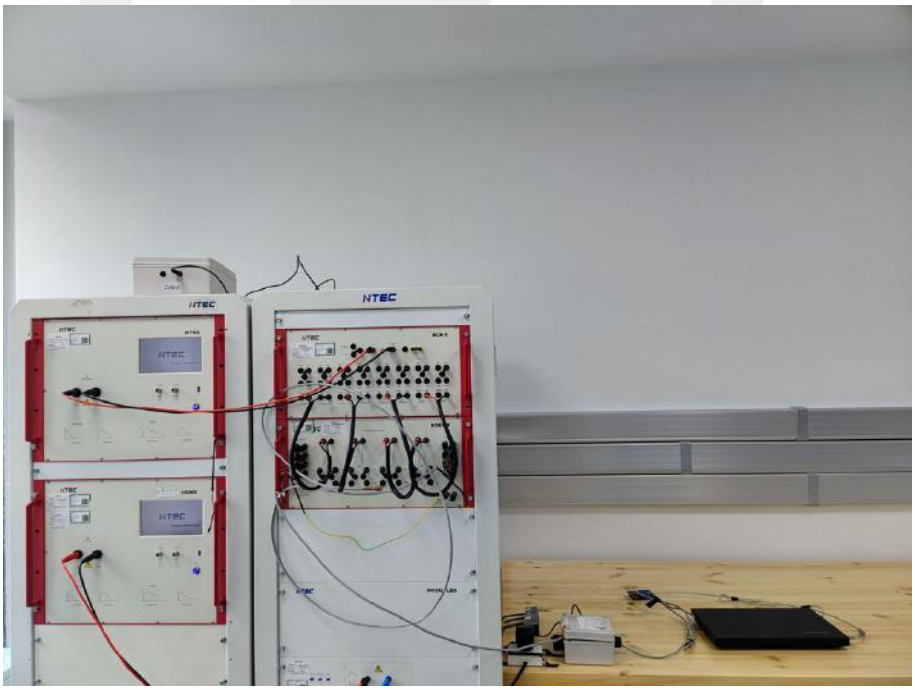


20.4.Photo of Continuous RF Electromagnetic Field Disturbances

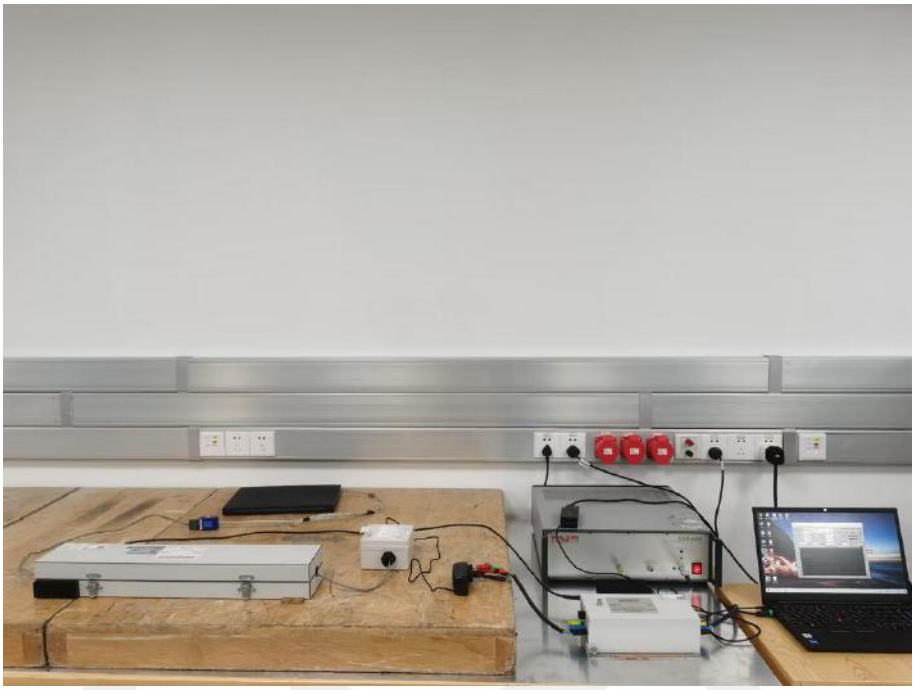


20.5.Photos of Electrical Fast Transients/Burst

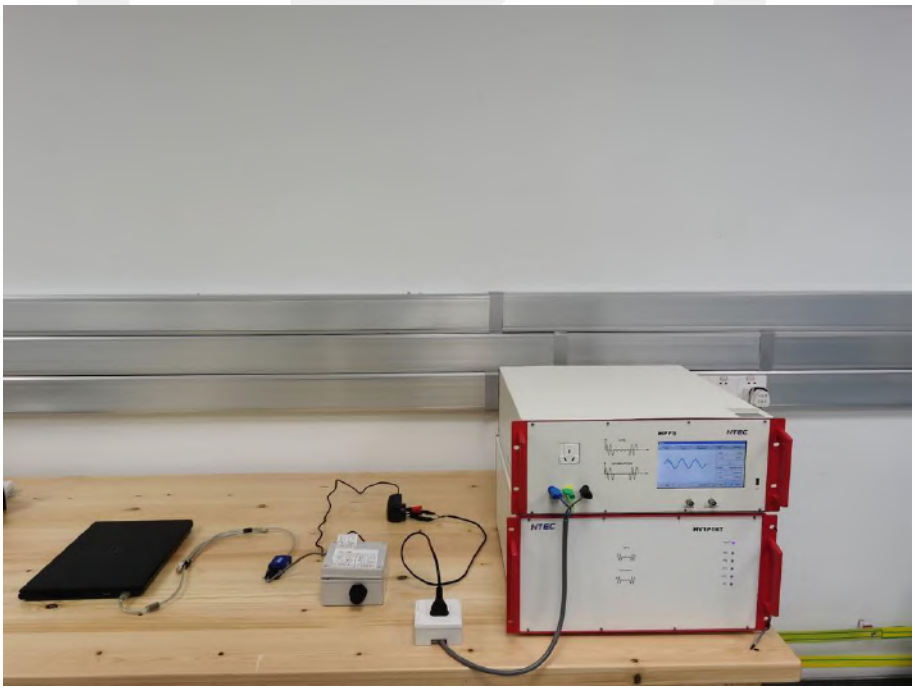
20.6.Photos of Surges



20.7.Photos of Continuous Induced RF Disturbances



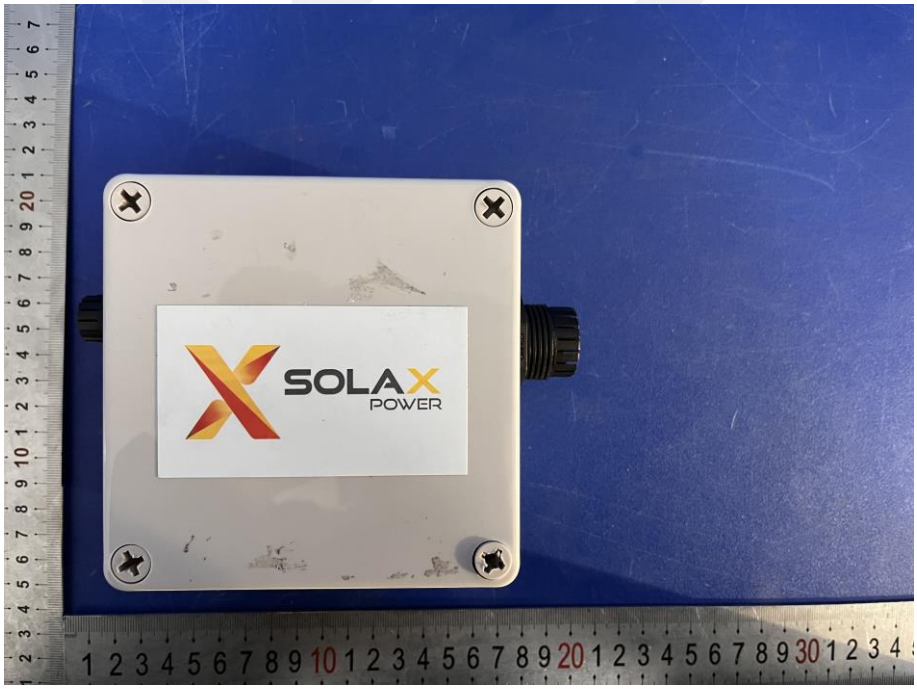
20.8.Photo of Voltage Dips and Interruptions



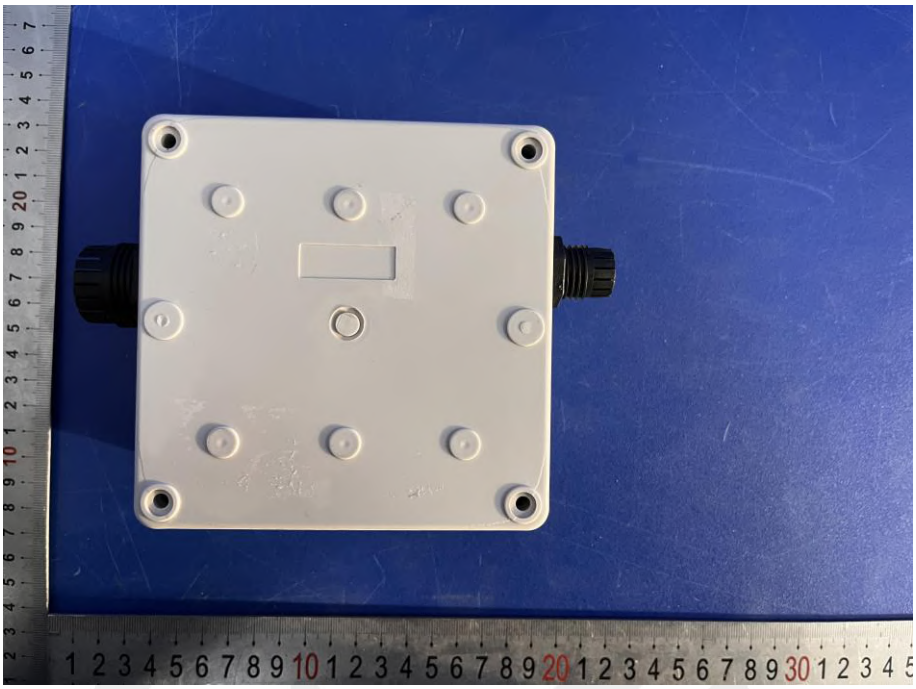
21. PHOTOS OF EUT

EUT View 1

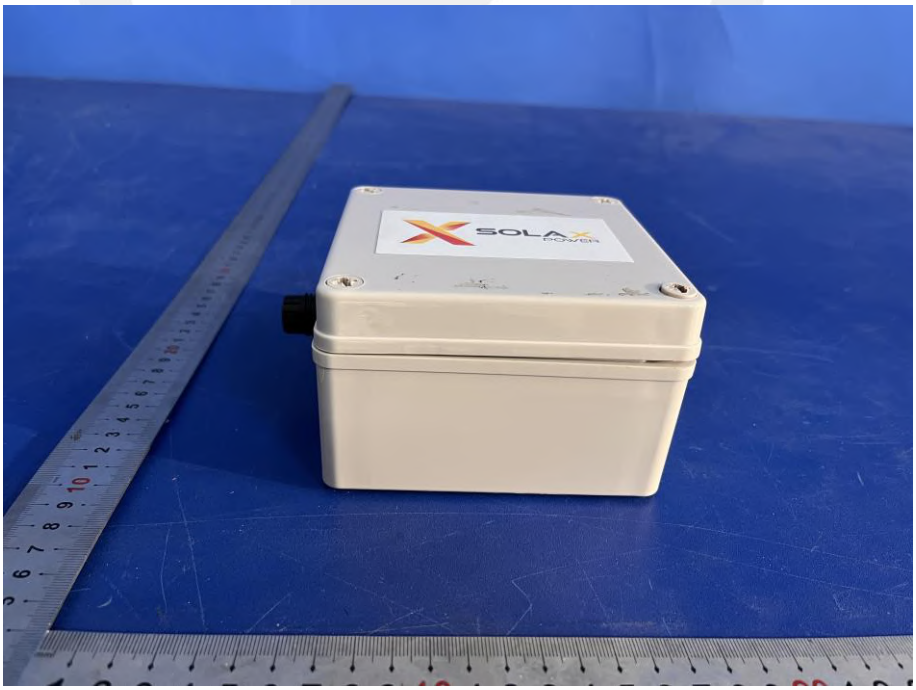
EUT View 2



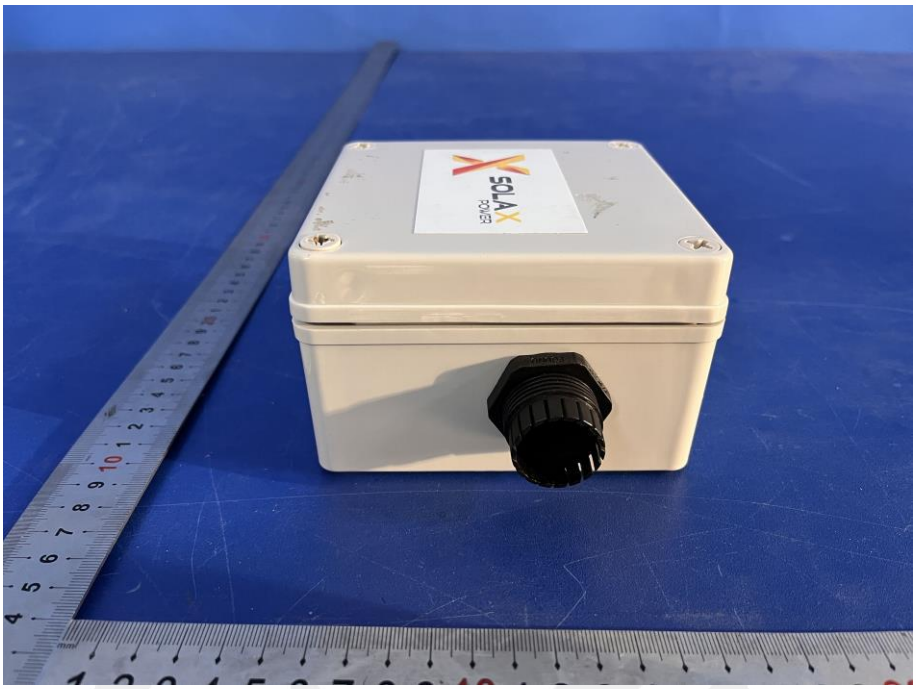
EUT View 3



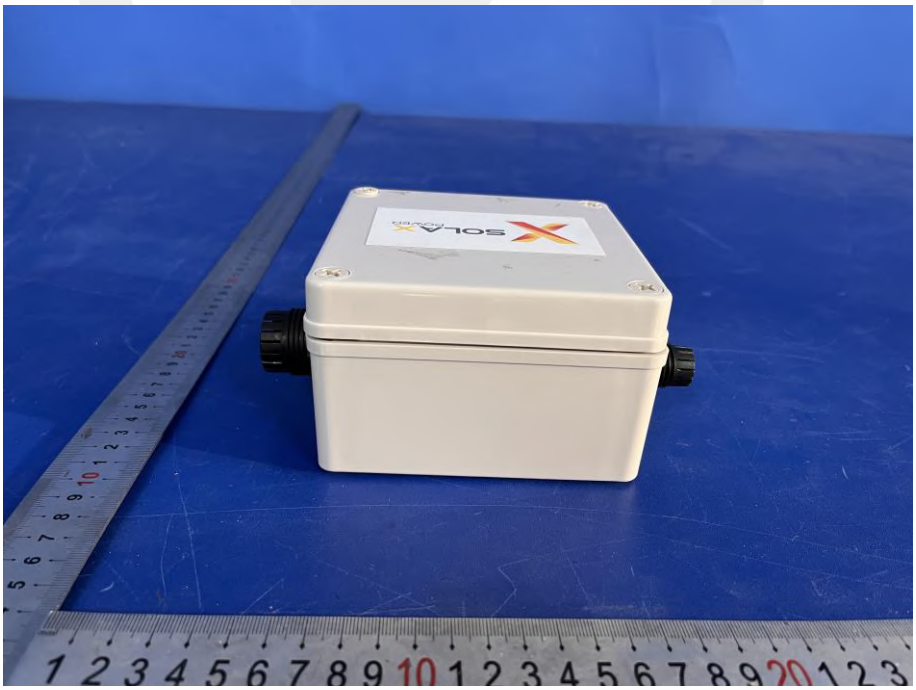
EUT View 4



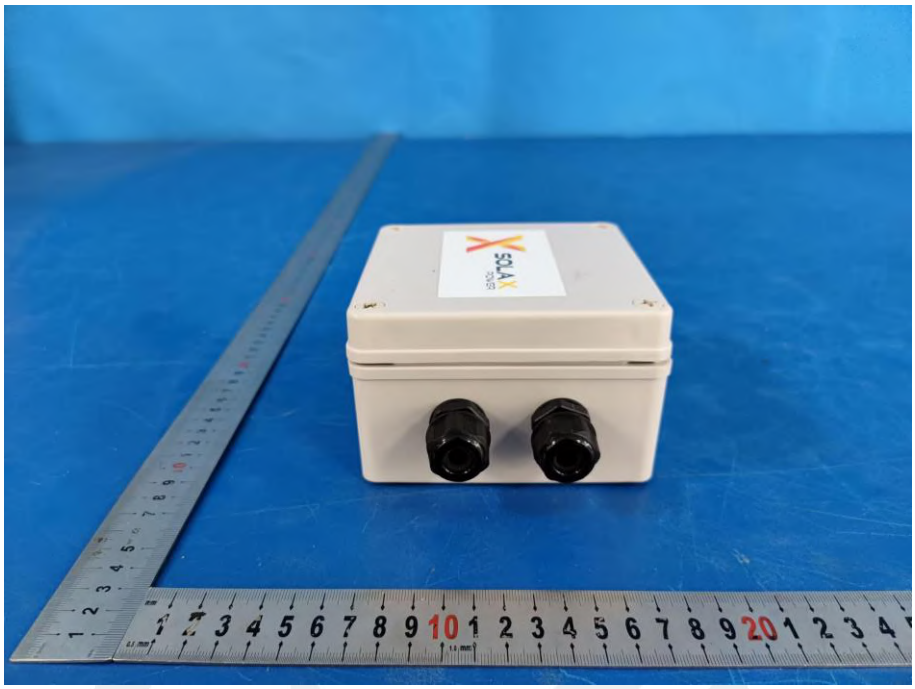
EUT View 5



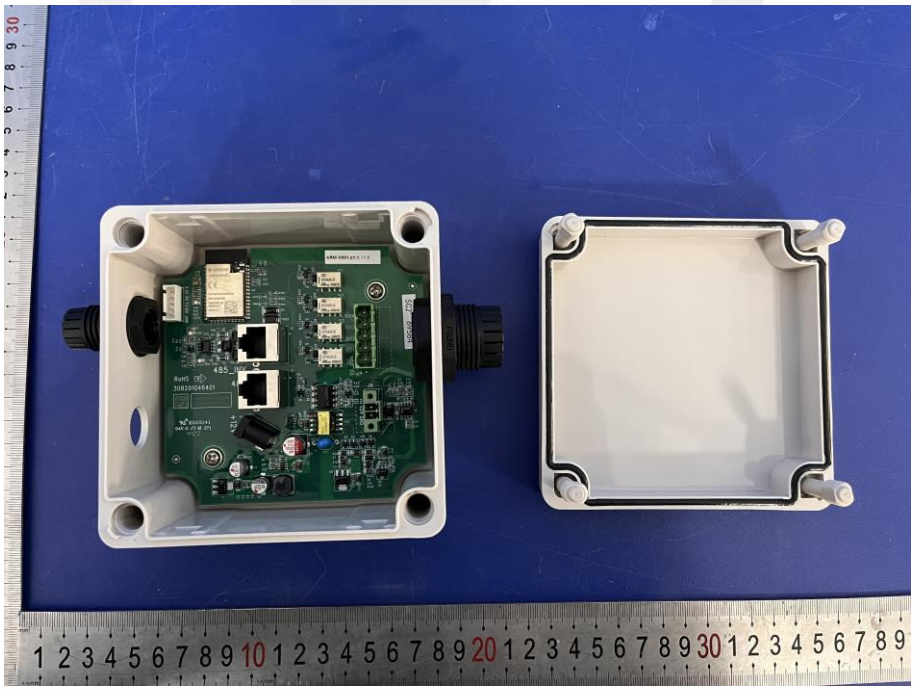
EUT View 6



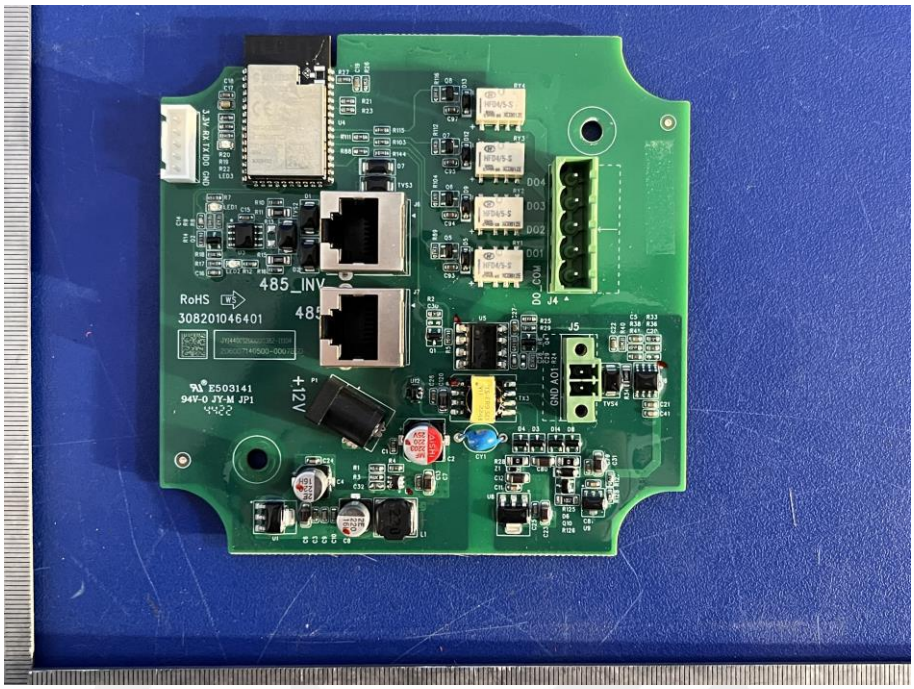
EUT View 7



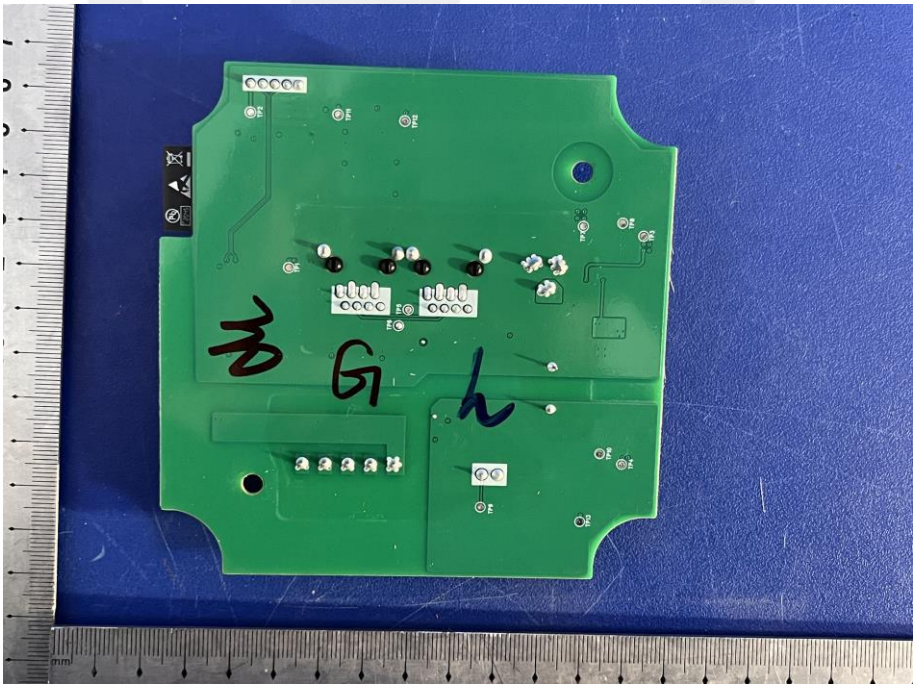
EUT View 1



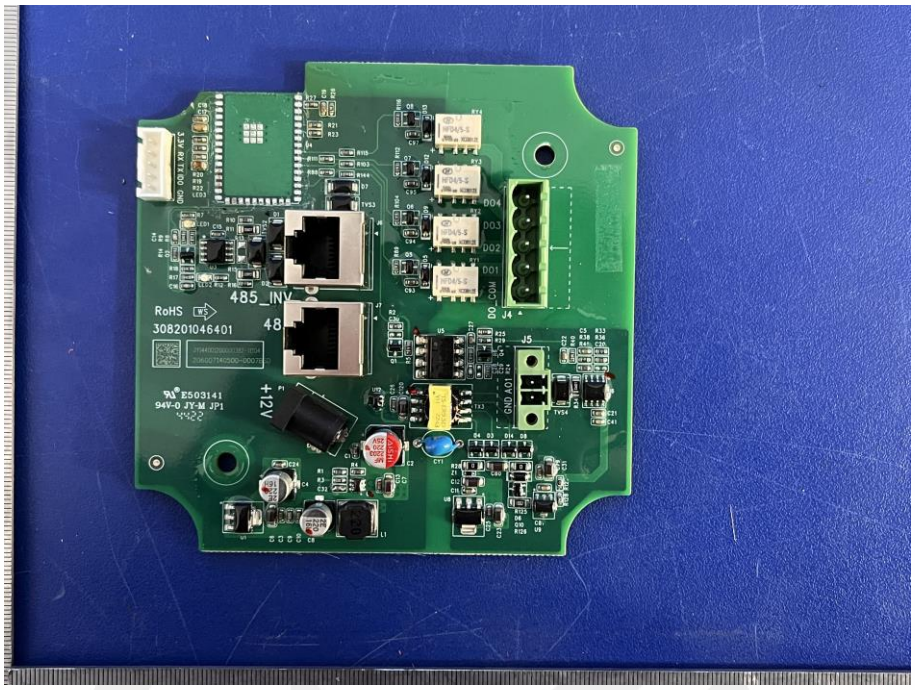
EUT View 2



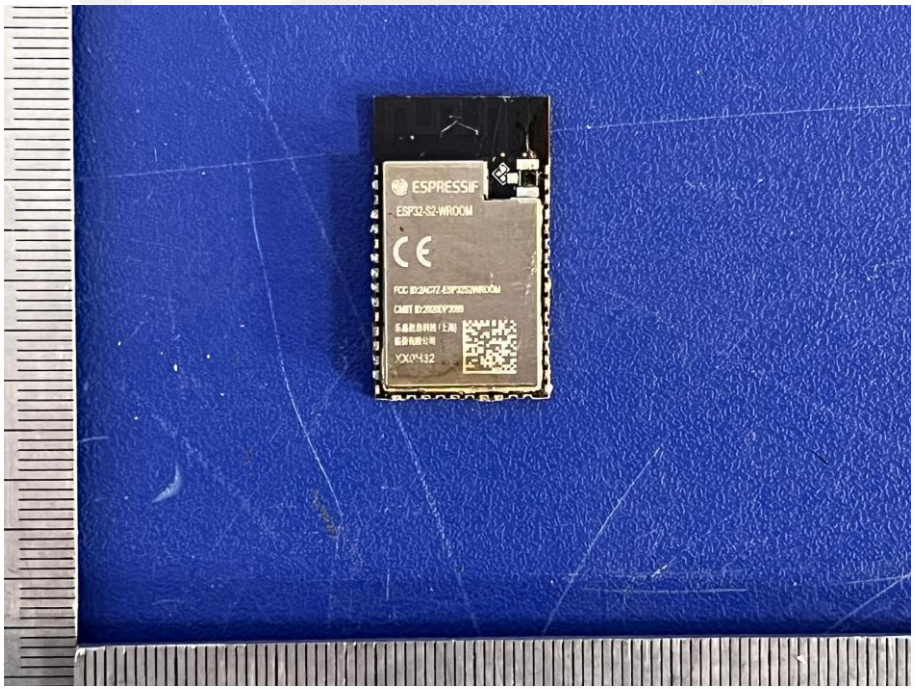
EUT View 3



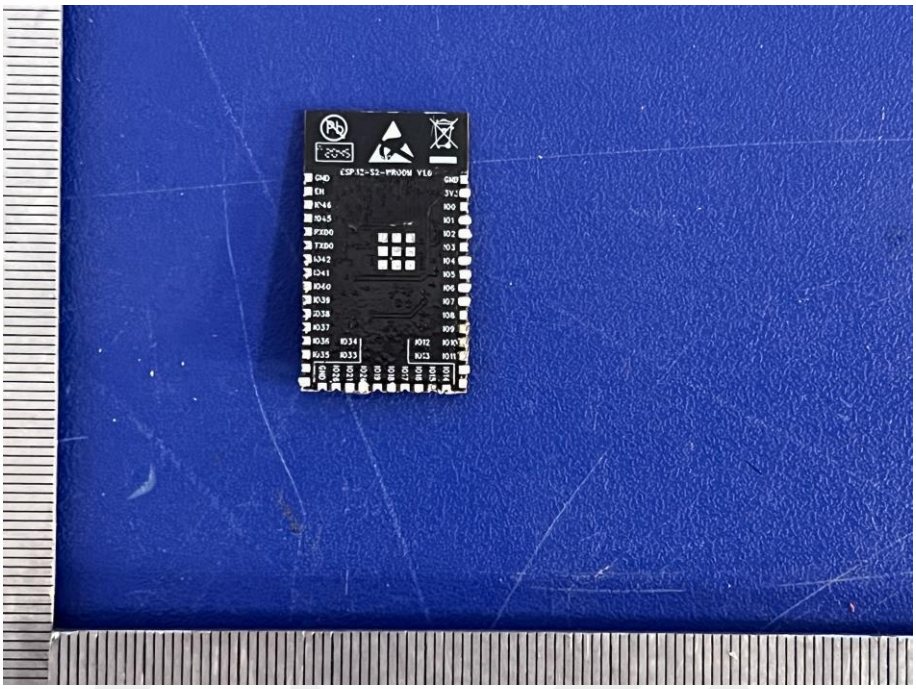
EUT View 4



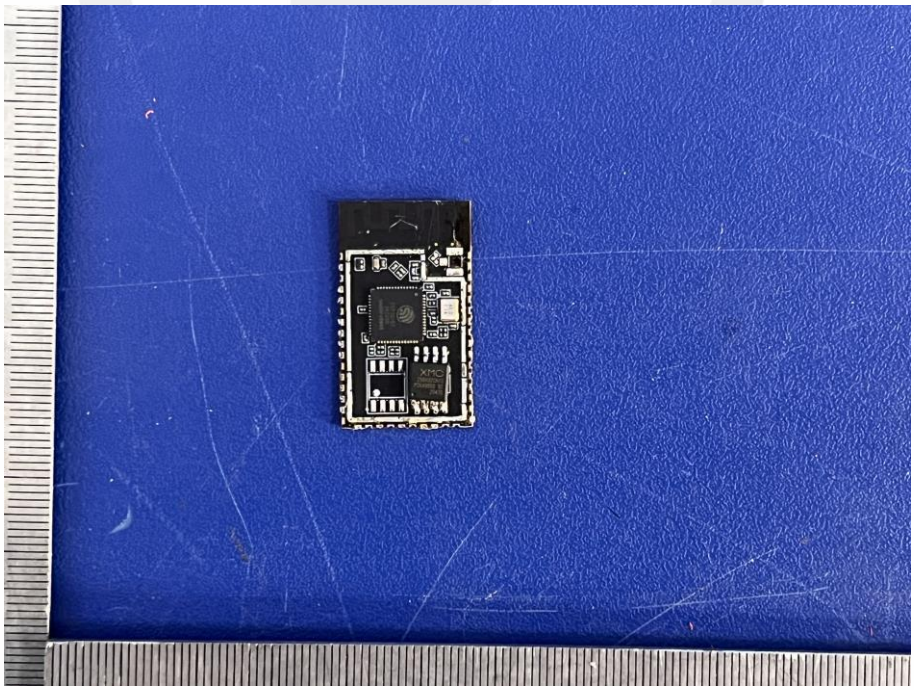
EUT View 5



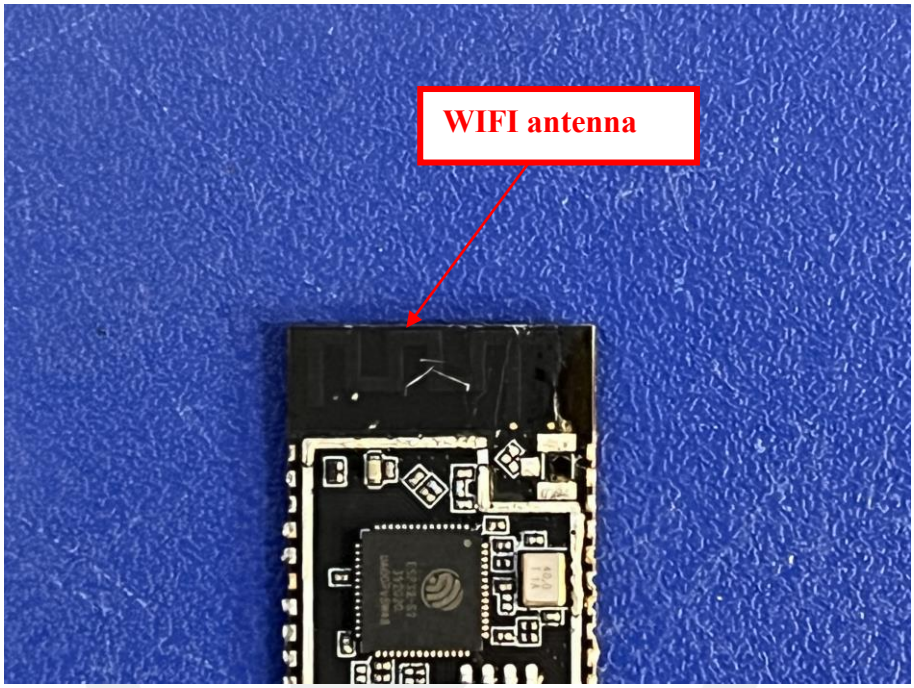
EUT View 6



EUT View 7



Antenna



*** End of Report ***

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