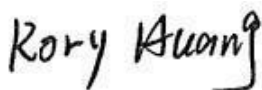


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国际互认
检测
TESTING
CNAS L18588

TEST REPORT

Report No.	CISRR24062720302
Applicant	SNOKO ELECTRONIC TECHNOLOGY CO.,LTD
Address	Room 1302,Building 3,Songhu Wisdom Valley Scientific Research Center,Liaobu Town,Dongguan
Manufacturer	SNOKO ELECTRONIC TECHNOLOGY CO.,LTD
Address	Room 1302,Building 3,Songhu Wisdom Valley Scientific Research Center,Liaobu Town,Dongguan
Product Name	Smart Audio Glasses
Trade Mark	--
Model/Type reference	MINISO-088
Listed Model(s)	--
Standard	ETSI EN 301 489-1 V2.2.3, ETSI EN 301 489-17 V3.2.4
Test date	June 27, 2024~ July 8, 2024
Issue date	July 10, 2024
Test result	Complied



Prepared by: Rory Huang



Approved by: Genry Long

*The test results relate only to the tested samples.**The test report should not be reproduced except in full without the written approval of Shenzhen Bangce Testing Technology Co., Ltd.*

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1. REPORT VERSION

Version No.	Issue date	Description
00	July 10, 2024	Original

2. TEST DESCRIPTION

Section	Test Item	Standard requirement	Result
5.1.1	Radiated Emission	EN301 489-17 Clause 7.1	Pass
5.1.2	Conducted Emission for AC mains port	EN301 489-17 Clause 7.1	Pass
5.1.3	Conducted Emission for DC power port	EN301 489-17 Clause 7.1	--
5.1.4	Conducted Emission for Wired network ports	EN301 489-17 Clause 7.1	--
5.1.5	Harmonic Current Emissions	EN301 489-17 Clause 7.1	--
5.1.6	Voltage Fluctuations and Flicker	EN301 489-17 Clause 7.1	Pass
5.2.1	Electrostatic Discharge	EN301 489-17 Clause 7.2	Pass
5.2.2	RF electromagnetic field	EN301 489-17 Clause 7.2	Pass
5.2.3	RF common mode 0.15 MHz to 80 MHz	EN301 489-17 Clause 7.2	Pass
5.2.4	Fast Transients Common Mode	EN301 489-17 Clause 7.2	Pass
5.2.5	Surges	EN301 489-17 Clause 7.2	Pass
5.2.6	Voltage Dips and Interruptions	EN301 489-17 Clause 7.2	Pass
5.2.7	Transients and Surges in Vehicular Environment	EN301 489-17 Clause 7.2	--

Note:

- The measurement uncertainty is not included in the test result.

3. **SUMMARY**

3.1. Product Description

Main unit information:	
Product Name:	Smart Audio Glasses
Trade Mark:	--
Model No.:	MINISO-088
Listed Model(s):	--
Power supply:	Input: DC 5V DC 3.7V from Battery
Hardware version:	V1.0
Software version:	V1.0

3.2. Modification of EUT

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

3.3. Testing Site

Laboratory Name	Shenzhen Bangce Testing Technology Co., Ltd.
Laboratory Location	101, building 10, Yunli Intelligent Park, Shutianpu community, Matian Street, Guangming District, Shenzhen, Guangdong, China
Contact information	Tel: 86-755-2319 6848, email: service@cis-cn.net Website: http://www.cis-cn.net/

4. TEST CONFIGURATION

4.1. Descriptions of test mode

Test mode	Description
Connect Bluetooth mode	Keep the EUT in Connect Bluetooth status

Report clause	Test Item	Test mode
5.1.1	Conducted emission	Connect Bluetooth mode
5.1.2	Radiated emission	Connect Bluetooth mode
5.1.3	Harmonic current emission	--
5.1.4	Voltage fluctuations & flicker	Connect Bluetooth mode
5.2.1	Electrostatic discharges	Connect Bluetooth mode
5.2.2	Radiated electromagnetic field disturbances	Connect Bluetooth mode
5.2.3	Conducted disturbances	Connect Bluetooth mode
5.2.4	Electrical fast transients/burst	Connect Bluetooth mode
5.2.5	Surges	Connect Bluetooth mode
5.2.6	Voltage dips and interruptions	Connect Bluetooth mode
5.2.7	Transients and Surges in Vehicular Environment	--

4.2. Support unit used in test configuration

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

The following peripheral devices and interface cables were connected during the measurement:

Item	Equipment name	Trade Name	Model No.
1	Adapter	Huawei	HW-020C
2	Adapter	--	--

4.3. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15~35°C
Relative Humidity:	30~60 %
Air Pressure:	950~1050mba

4.4. Statement of the measurement uncertainty

No.	Test Items	Measurement Uncertainty
1	AC Conducted Emission	2.52dB
2	Radiated Emission	3.88dB for 30MHz-1GHz 4.96dB for above 1GHz

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

4.5. Equipment Used during the Test

Radiation emission							
Item	Equipment name	Equipment No.	Manufacturer	Model	Serial No.	Calibration date	Due date
1	EMI Test Receiver	CIS-EE016	Rohde&schwarz	ESCI7	100853	2024/01/08	2025/01/07
2	Broadband antenna	CIS-EE018	schwarzbeck	VULB9163	9163-1436	2024/01/08	2025/01/07
3	Horn antenna	CIS-EE019	schwarzbeck	BBHA9120D	9120D-2487	2024/01/08	2025/01/07
4	amplifier	CIS-EE021	Tonscend	TAP9K3G32	AP21G806153	2024/01/08	2025/01/07
5	prime amplifier	CIS-EE022	Tonscend	TAP01018050	AP22E806229	2024/01/08	2025/01/07
Conduction emission							
Item	Equipment name	Equipment No.	Manufacturer	Model	Serial No.	Calibration date	Due date
1	Artificial power network	CIS-EE044	Schwarzbeck	NSLK8127	8127-01096	2024/01/08	2025/01/07
2	EMI Test Receiver	CIS-EE016	Rohde&schwarz	ESCI7	100853	2024/01/08	2025/01/07
3	8-wire Impedance Stabilization Network	CIS-EE045	Schwarzbeck	NTFM8158	8158-00337	2024/01/08	2025/01/07
4	Artificial power network	CIS-EE075	Schwarzbeck	ENV216	/	2024/01/08	2025/01/07
Conduction immunity							
Item	Equipment name	Equipment No.	Manufacturer	Model	Serial No.	Calibration date	Due date
1	Conduction Immunity Signal Generator	CIS-EE038	SKET	CITS_150k230M-75W	202302437	2024/01/08	2025/01/07
2	Coupled decoupling network	CIS-EE039	SKET	M2/M3-16A	/	2024/01/08	2025/01/07

Voltage dips, short interruptions and voltage variations immunity

Item	Equipment name	Equipment No.	Manufacturer	Model	Serial No.	Calibration date	Due date
1	Drop generator	CIS-EE036	ETEST	ES-1113A	221122	2024/01/08	2025/01/07

Power frequency magnetic field immunity

Item	Equipment name	Equipment No.	Manufacturer	Model	Serial No.	Calibration date	Due date
1	power frequency magnetic field generator	CIS-EE034	ETEST	ES-8000	230102	2024/01/08	2025/01/07

Electrostatic discharge immunity

Item	Equipment name	Equipment No.	Manufacturer	Model	Serial No.	Calibration date	Due date
1	CIS-EE029	MTI-E008	ETEST	ES-ESD-20	ESD-22007	2024/01/08	2025/01/07

Surge immunity

Item	Equipment name	Equipment No.	Manufacturer	Model	Serial No.	Calibration date	Due date
1	Surge Generator	CIS-EE030	ETEST	ES-4516A	220922	2024/01/08	2025/01/07

Harmonic & flicker emissions

Item	Equipment name	Equipment No.	Manufacturer	Model	Serial No.	Calibration date	Due date
1	Harmonic scintillation Analyzer	CIS-EE027	US	CI-5000	/	2024/01/08	2025/01/07

Electrical Fast Transient/Burst immunity

Item	Equipment name	Equipment No.	Manufacturer	Model	Serial No.	Calibration date	Due date
1	Electrical Fast Transient Generator	CIS-EE030	ETEST	ES-4516A	220922	2024/01/08	2025/01/07

RS equipment

Item	Equipment	Manufacturer	Model	Serial No.	Calibration Due	Due date
1	Power Amplifier	SKET	HAP_80M01G-250W	202302439	2024/01/08	2025/01/07
2	Power Amplifier	SKET	202302440	MPA1903082	2024/01/08	2025/01/07
3	MXG RF Signal Generator	Agilent	N5181A	MY50145362	2024/01/08	2025/01/07
4	Stacked Log. Per. Broadband Antenna	Schwarzbeck	STLP 9129 Plus	SK20221012001	2024/01/08	2025/01/07
5	Field strength probe	Schwarzbeck	EP-601	811ZX20776	2024/01/08	2025/01/07

5. TEST RESULTS

5.1. EMISSION

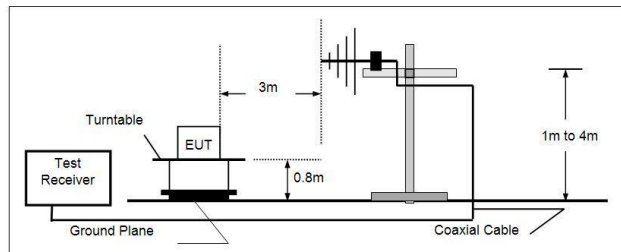
5.1.1. Radiated Emission

Limit:

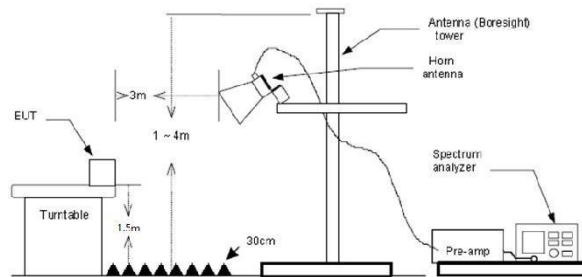
Frequency (MHz)	Class A (at 3m) dBμV/m		Class B (at 3m) dBμV/m	
	Quasi-peak		Quasi-peak	
30-230	50		40	
230-1000	57		47	
/	Peak	Average	Peak	Average
1000-3000	76	56	70	50
3000-6000	80	60	74	54

Test configuration:

30 MHz ~ 1 GHz



Above 1 GHz



Test procedure:

Refer to ETSI EN 301 489-1 Clause 8.2.2 and CENELEC EN 55032 for the measurement methods

a)

Test mode:

Refer to the clause 4.1

Result:

Passed

Note:

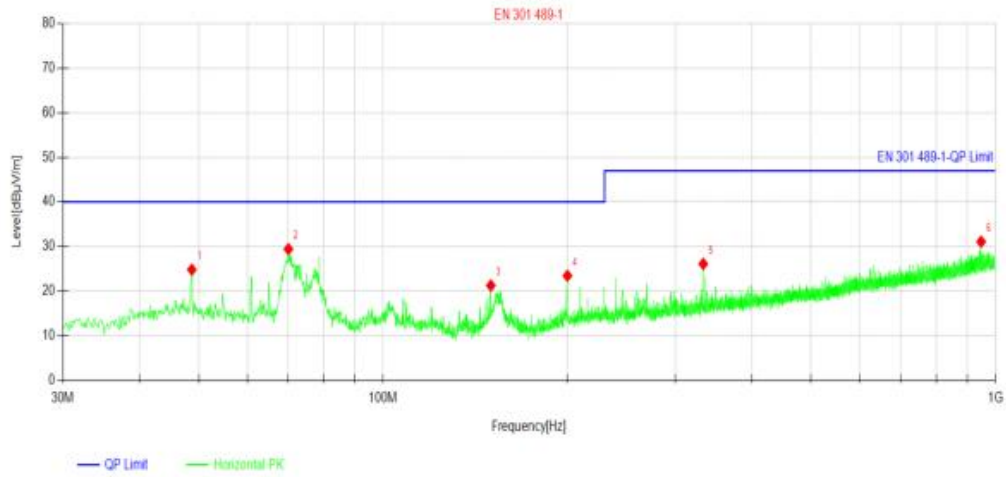
- 1) Level= Reading + Factor/Transd; Factor/Transd =Antenna Factor+ Cable Loss- Preamp Factor
- 2) Margin = Limit– Level

For 30 MHz ~ 1000 MHz

Left:

Polarization:

Horizontal

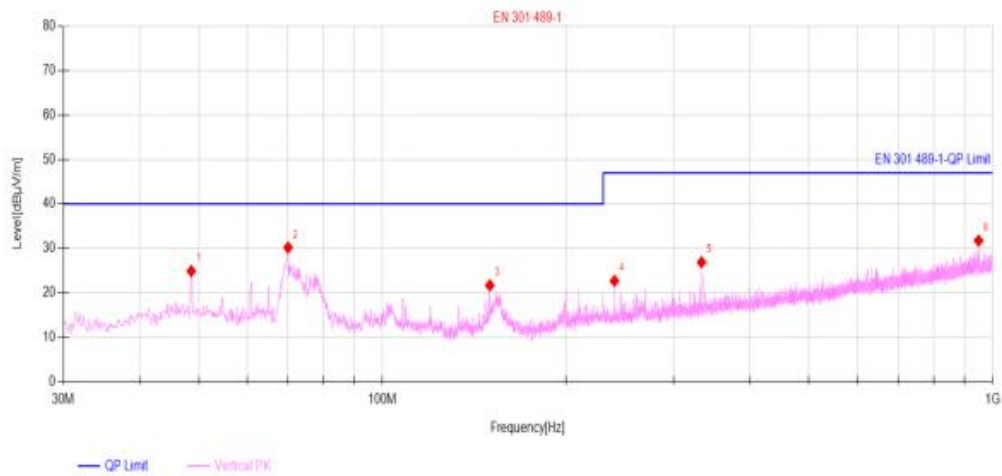


Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Polarity	Verdict
1	48.721	9.30	24.82	15.52	40.00	15.18	Horizontal	PASS
2	70.061	17.80	29.43	11.63	40.00	10.57	Horizontal	PASS
3	149.989	10.76	21.26	10.50	40.00	18.74	Horizontal	PASS
4	200.041	9.99	23.46	13.47	40.00	16.54	Horizontal	PASS
5	333.319	9.36	26.11	16.75	47.00	20.89	Horizontal	PASS
6	947.523	5.28	31.10	25.82	47.00	15.90	Horizontal	PASS

Polarization:

Vertical



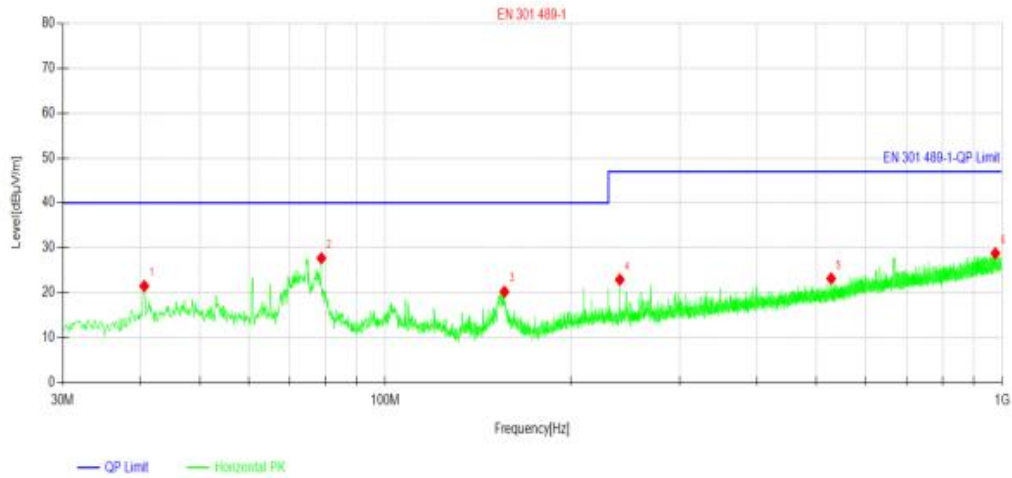
Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Polarity	Verdict
1	48.624	9.39	24.91	15.52	40.00	15.09	Vertical	PASS
2	70.061	18.58	30.21	11.63	40.00	9.79	Vertical	PASS
3	149.989	11.18	21.68	10.50	40.00	18.32	Vertical	PASS
4	240.005	8.29	22.69	14.40	47.00	24.31	Vertical	PASS
5	333.319	10.16	26.91	16.75	47.00	20.09	Vertical	PASS
6	948.202	5.93	31.75	25.82	47.00	15.25	Vertical	PASS

Right:

Polarization:

Horizontal

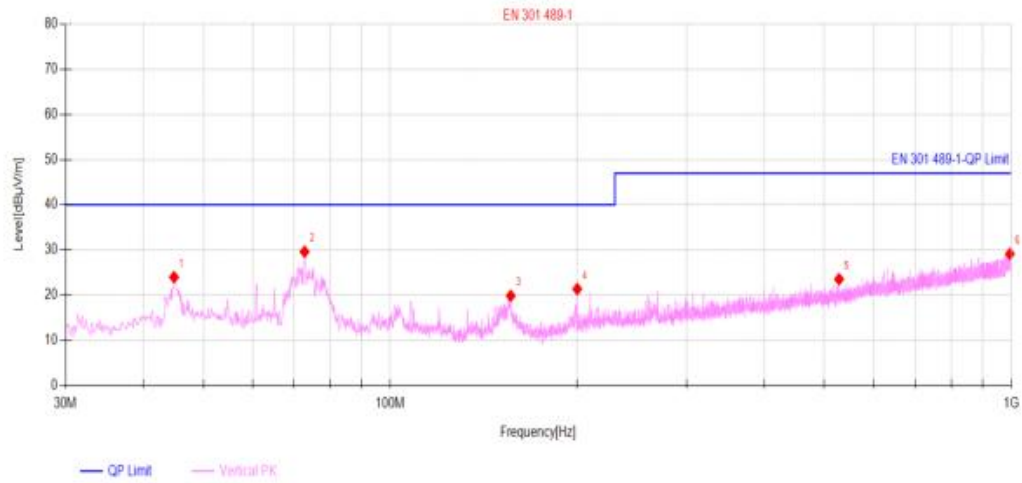


Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Polarity	Verdict
1	40.67	6.75	21.48	14.73	40.00	18.52	Horizontal	PASS
2	78.791	17.76	27.68	9.92	40.00	12.32	Horizontal	PASS
3	156.003	9.60	20.21	10.61	40.00	19.79	Horizontal	PASS
4	240.005	8.50	22.90	14.40	47.00	24.10	Horizontal	PASS
5	528.192	2.95	23.17	20.22	47.00	23.83	Horizontal	PASS
6	975.168	2.68	28.78	26.10	47.00	18.22	Horizontal	PASS

Polarization:

Vertical



Suspected Data List

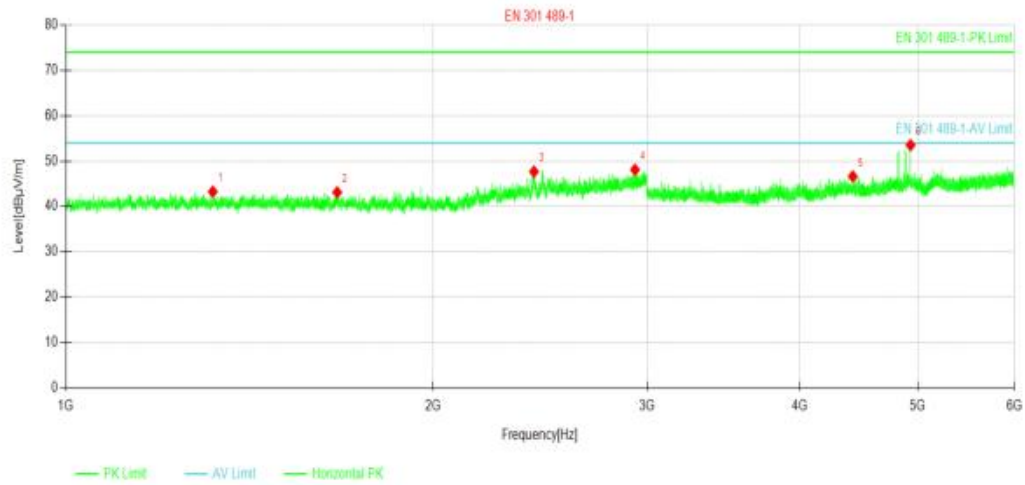
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Polarity	Verdict
1	44.841	8.48	23.99	15.51	40.00	16.01	Vertical	PASS
2	72.777	18.52	29.62	11.10	40.00	10.38	Vertical	PASS
3	156.294	9.25	19.86	10.61	40.00	20.14	Vertical	PASS
4	200.041	7.89	21.36	13.47	40.00	18.64	Vertical	PASS
5	528.095	3.32	23.54	20.22	47.00	23.46	Vertical	PASS
6	995.15	2.81	29.12	26.31	47.00	17.88	Vertical	PASS

For 1 GHz ~ 6 GHz

Left:

Polarization:

Horizontal

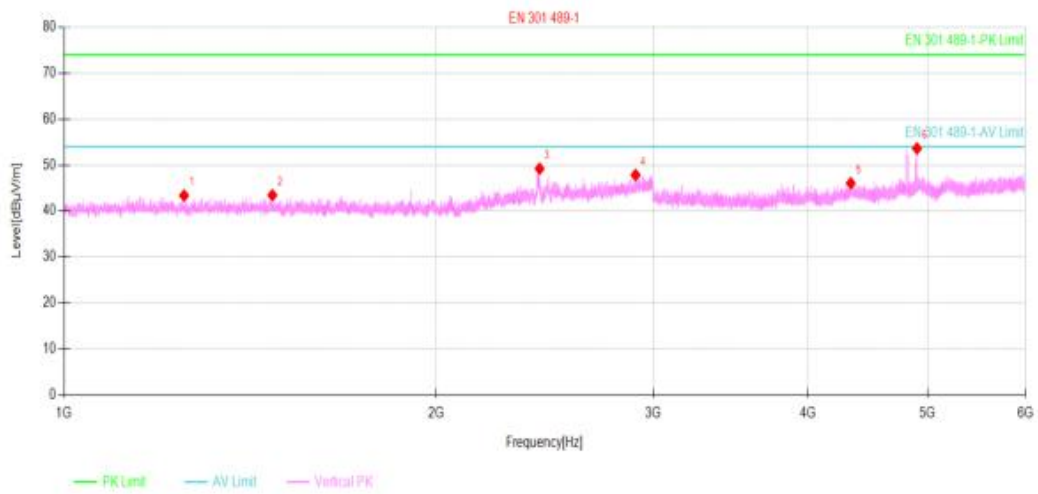


Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Polarity	Verdict
1	1320.03	40.75	43.26	2.51	74.00	30.74	Horizontal	PASS
2	1669.66	39.59	43.11	3.52	74.00	30.89	Horizontal	PASS
3	2421.34	40.53	47.68	7.15	74.00	26.32	Horizontal	PASS
4	2930.59	38.72	48.10	9.38	74.00	25.90	Horizontal	PASS
5	4422.14	46.41	46.63	0.22	74.00	27.37	Horizontal	PASS
6	4931.59	51.45	53.52	2.07	74.00	20.48	Horizontal	PASS

Polarization:

Vertical



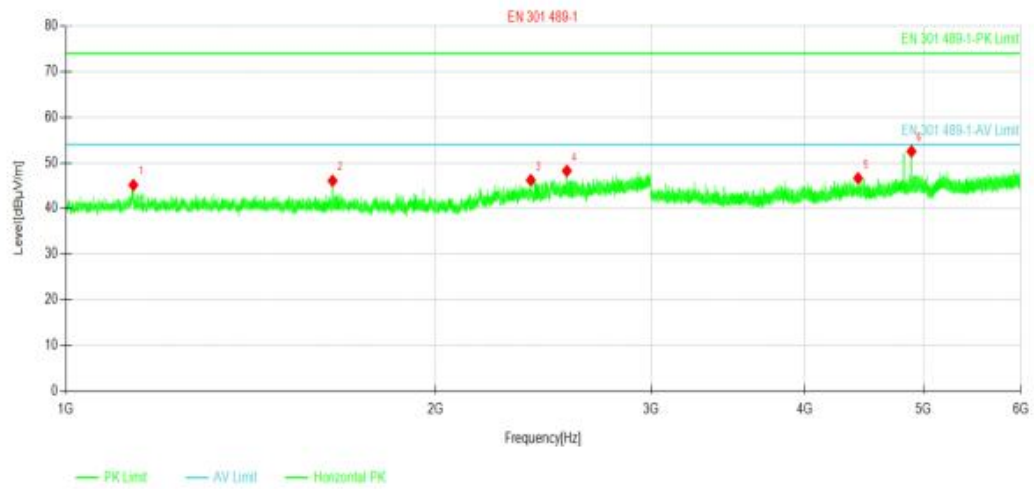
Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Polarity	Verdict
1	1250.62	41.30	43.39	2.09	74.00	30.61	Vertical	PASS
2	1474.44	40.29	43.45	3.16	74.00	30.55	Vertical	PASS
3	2426.14	42.03	49.22	7.19	74.00	24.78	Vertical	PASS
4	2901.19	38.72	47.85	9.13	74.00	26.15	Vertical	PASS
5	4333.03	45.98	46.05	0.07	74.00	27.95	Vertical	PASS
6	4901.59	51.64	53.62	1.98	74.00	20.38	Vertical	PASS

Right:

Polarization:

Horizontal

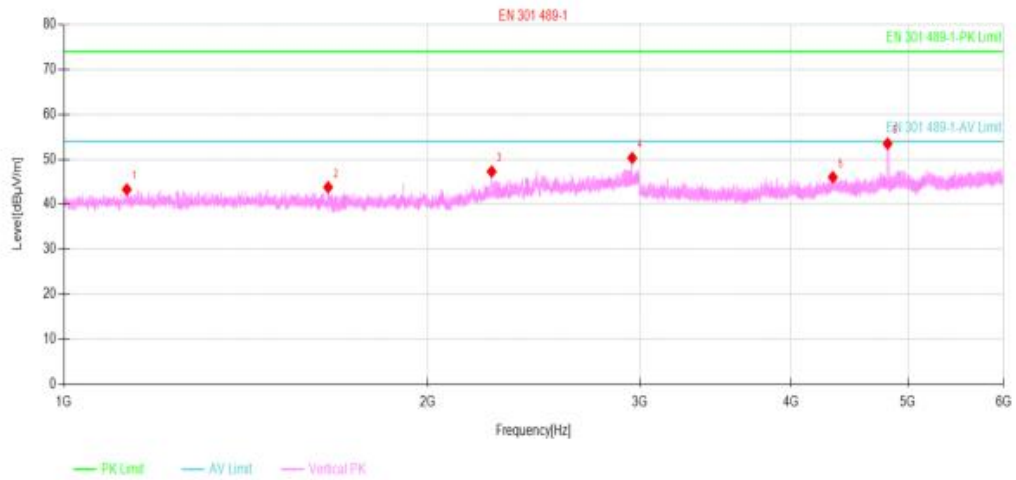


Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Polarity	Verdict
1	1135.01	43.82	45.15	1.33	74.00	28.85	Horizontal	PASS
2	1649.46	42.65	46.08	3.43	74.00	27.92	Horizontal	PASS
3	2392.93	39.26	46.22	6.96	74.00	27.78	Horizontal	PASS
4	2559.95	40.81	48.26	7.45	74.00	25.74	Horizontal	PASS
5	4422.14	46.41	46.63	0.22	74.00	27.37	Horizontal	PASS
6	4887.78	50.64	52.53	1.89	74.00	21.47	Horizontal	PASS

Polarization:

Vertical



Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Polarity	Verdict
1	1127.41	42.03	43.31	1.28	74.00	30.69	Vertical	PASS
2	1654.86	40.36	43.81	3.45	74.00	30.19	Vertical	PASS
3	2260.72	40.93	47.29	6.36	74.00	26.71	Vertical	PASS
4	2955.39	40.72	50.31	9.59	74.00	23.69	Vertical	PASS
5	4333.03	45.98	46.05	0.07	74.00	27.95	Vertical	PASS
6	4810.08	52.09	53.49	1.40	74.00	20.51	Vertical	PASS

5.1.2. Conducted Emission for AC main port

Limit:

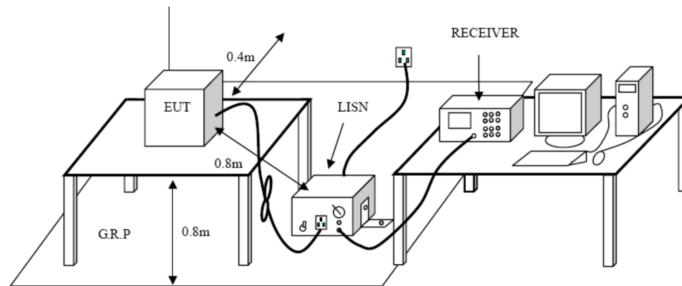
Frequency (MHz)	Class A (dB μ V)		Class B (dB μ V)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 -0.5	79	66	66 - 56 *	56 - 46 *
0.5 -5	73	60	56	46
5 -30	73	60	60	50

Note:

the tighter limit applies at the band edges.

1. the limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

Test configuration:



Test procedure:

Refer to ETSI EN 301 489-1 Clause 8.4.2 and EN55032 Annex A.3 for the measurement methods

Test mode:

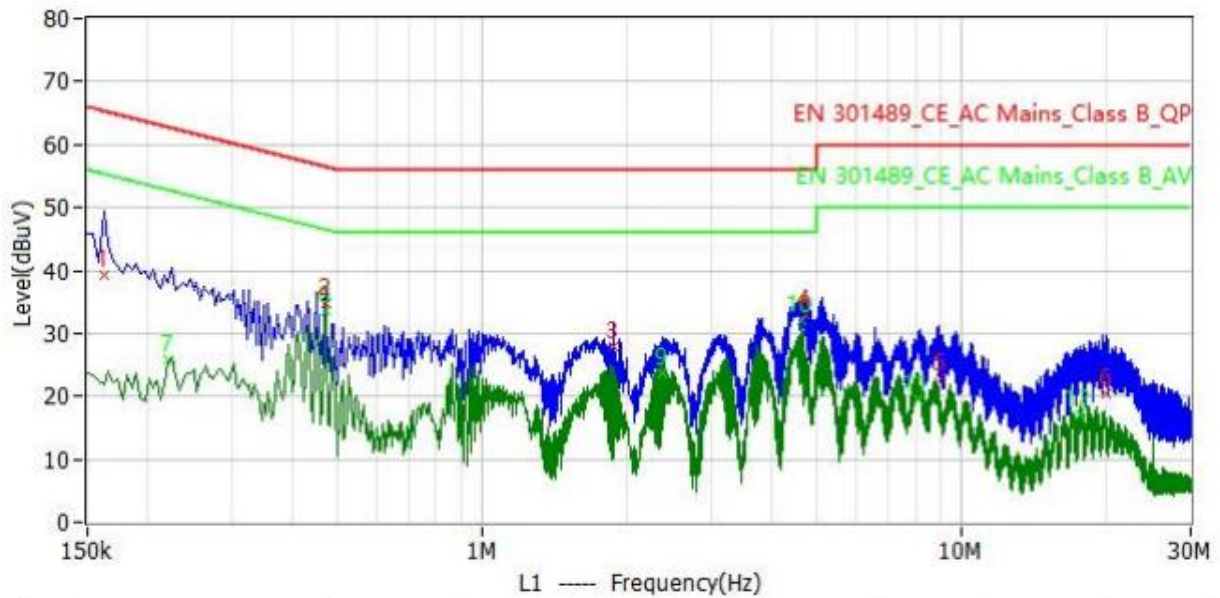
Refer to the clause 4.1

Result:

Passed

Test Line:

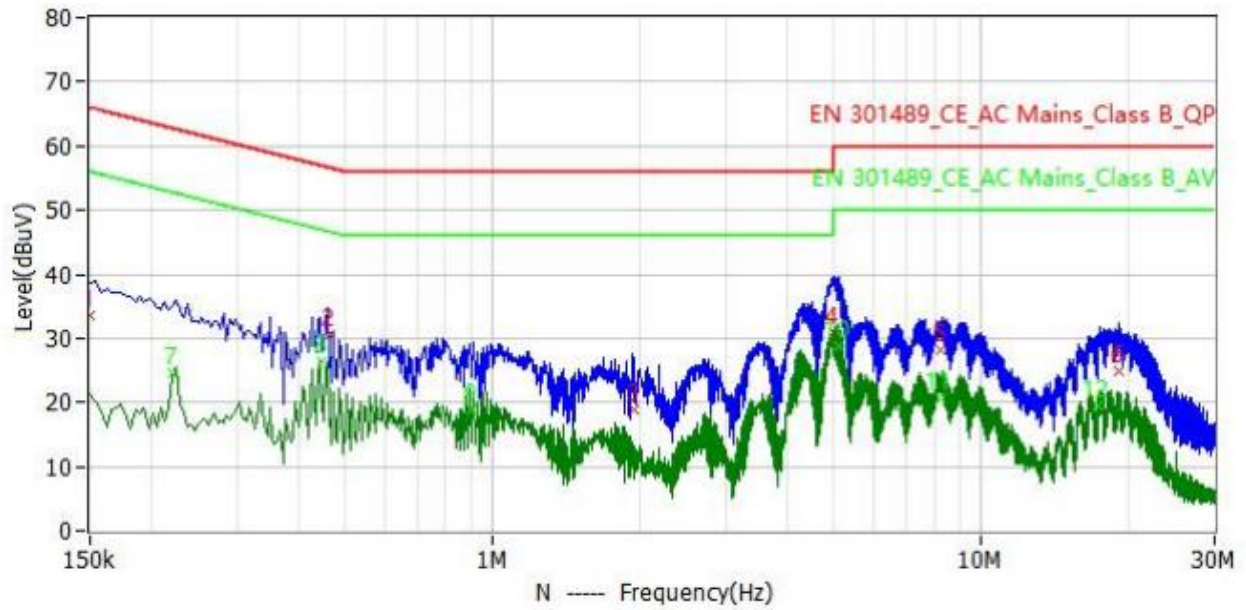
L



No.	Frequency	Limit dBuV	Level dBuV	Margin dB	Reading dBuV	Factor dB	Detector	Polar
1	162.000kHz	65.4	39.2	-26.2	39.1	0.1	QP	L1
2	470.000kHz	56.5	34.8	-21.7	34.7	0.1	QP	L1
3	1.878MHz	56.0	27.8	-28.2	27.7	0.1	QP	L1
4	4.730MHz	56.0	33.0	-23.0	32.8	0.2	QP	L1
5	9.006MHz	60.0	22.9	-37.1	22.6	0.3	QP	L1
6	19.950MHz	60.0	20.5	-39.5	20.0	0.5	QP	L1
7	222.000kHz	52.7	25.7	-27.0	25.7	0.0	CAV	L1
8	470.000kHz	46.5	33.5	-13.0	33.4	0.1	CAV	L1
9	2.366MHz	46.0	23.7	-22.3	23.6	0.1	CAV	L1
10	4.642MHz	46.0	32.0	-14.0	31.8	0.2	CAV	L1
11	8.094MHz	50.0	19.4	-30.6	19.2	0.2	CAV	L1
12	17.618MHz	50.0	17.1	-32.9	16.7	0.4	CAV	L1

Test Line:

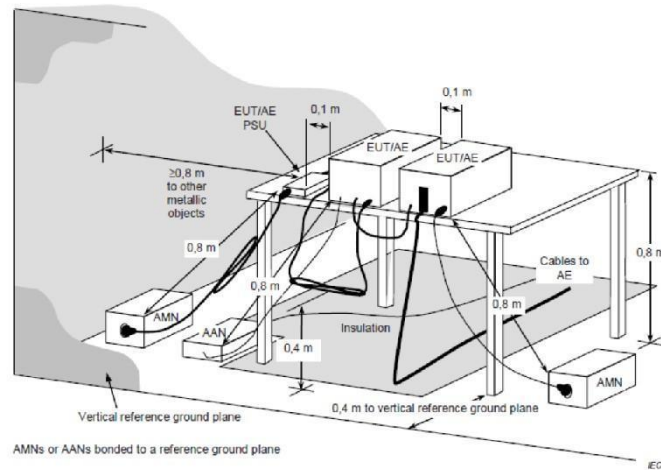
N



No.	Frequency	Limit dBuV	Level dBuV	Margin dB	Reading dBuV	Factor dB	Detector	Polar
1	150.000kHz	66.0	33.6	-32.4	33.6	0.0	QP	N
2	462.000kHz	56.7	30.7	-26.0	30.6	0.1	QP	N
3	1.946MHz	56.0	19.0	-37.0	18.9	0.1	QP	N
4	4.982MHz	56.0	30.9	-25.1	30.7	0.2	QP	N
5	8.262MHz	60.0	28.1	-31.9	27.8	0.3	QP	N
6	19.094MHz	60.0	25.0	-35.0	24.5	0.5	QP	N
7	222.000kHz	52.7	24.5	-28.2	24.5	0.0	CAV	N
8	446.000kHz	46.9	26.3	-20.6	26.2	0.1	CAV	N
9	906.000kHz	46.0	18.8	-27.2	18.7	0.1	CAV	N
10	5.114MHz	50.0	28.8	-21.2	28.6	0.2	CAV	N
11	8.262MHz	50.0	20.8	-29.2	20.5	0.3	CAV	N
12	17.266MHz	50.0	19.5	-30.5	19.1	0.4	CAV	N

Limit:

Test configuration:



Refer to ETSI EN 301 489-1 Clause 8.3.2 for the measurement methods

Refer to the clause 4.1

Not Applicable

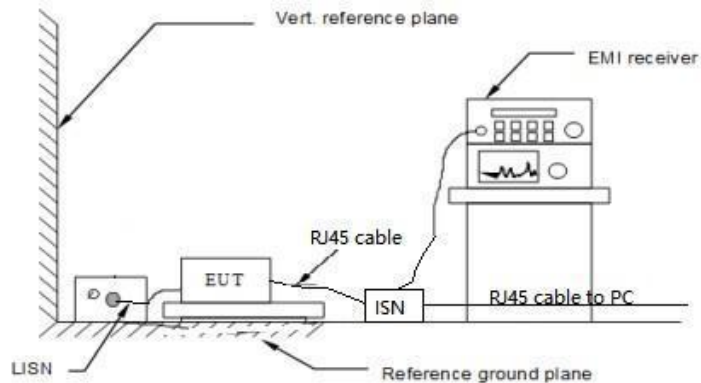
5.1.4. Conducted Emission for Wired network port

Limit:

Refer to ETSI EN301489-1 Clause 8.7.3 and CENELEC EN 55032 Annex A.3 Table A.12

Frequency range (MHz)	Limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	84 to 74*	74 to 64*
0.5-30	74	64

Test configuration:



Test procedure:

Refer to ETSI EN 301 489-1 Clause 8.7.2 and EN 55032 Annex A.3 for the measurement methods

Test mode:

Refer to the clause 4.1

Result:

Not Applicable

5.1.5. Harmonic Current Emission

Limit:

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
$15 \leq n \leq 39$	$0,15 \frac{15}{n}$
Even harmonics	
2	1,08
4	0,43
6	0,30
$8 \leq n \leq 40$	$0,23 \frac{8}{n}$

Class B equipment

not exceed the values given in Class A limit multiplied by a factor of 1,5

Class C equipment

Active input power >25 W

Harmonic order n	Maximum permissible harmonic current expressed as a percentage of the input current at the fundamental frequency %
2	2
3	$30 \cdot \lambda^*$
5	10
7	7
9	5
$11 \leq n \leq 39$ (odd harmonics only)	3
* λ is the circuit power factor	

Active input power ≤ 25 W

Harmonic order n	Maximum permissible harmonic current per watt mA/W	Maximum permissible harmonic current A
3	3,4	2,30
5	1,9	1,14
7	1,0	0,77
9	0,5	0,40
11	0,35	0,33
$13 \leq n \leq 39$ (odd harmonics only)	$\frac{3,85}{n}$	See Table 1

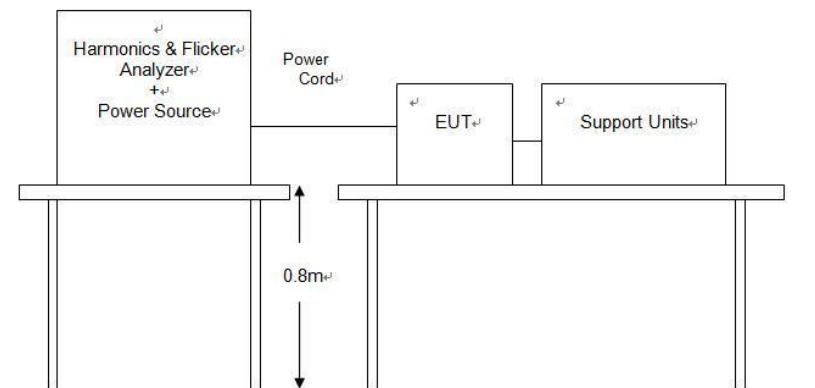
or

the third harmonic current, expressed as a percentage of the fundamental current, shall not exceed 86 % and the fifth harmonic current shall not exceed 61 %. Also, the waveform of the input current shall be such that it reaches the 5 % current threshold before or at 60°, has its peak value before or at 65° and does not fall below the 5 % current threshold before 90°, referenced to any zero crossing of the fundamental supply voltage. The current threshold is 5 % of the highest absolute peak value that occurs in the measurement window, and the phase angle measurements are made on the cycle that includes this absolute peak value

Class D equipment

Harmonic order n	Maximum permissible harmonic current per watt mA/W	Maximum permissible harmonic current A
3	3,4	2,30
5	1,9	1,14
7	1,0	0,77
9	0,5	0,40
11	0,35	0,33
$13 \leq n \leq 39$ (odd harmonics only)	$\frac{3,85}{n}$	See Table 1

Test configuration:



Test procedure:

Refer to EN61000-3-2 for the measurement methods

Test mode:

Refer to the clause 4.1

Result:

Not Applicable

The power of the EUT is less than 75W, so this test item is not applicable.

5.1.6. Voltage Fluctuation and Flicker

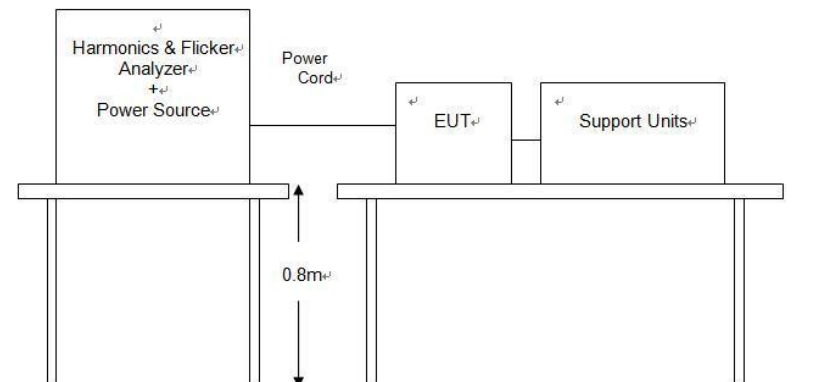
Limit:

- 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
 - a) 4 % without additional conditions;
 - b) 6 % for equipment which is:
 - switched manually, or
 - switched automatically more frequently than twice per day, and also has either delayed restart (the delay being not less than a few tens of seconds), or manual restart, after a power supply interruption.
 - c) 7 % for equipment which is
 - attended whilst in use (for example: hair dryers, vacuum cleaners, kitchen equipment such as mixers, garden equipment such as lawn mowers, portable tools such as electric drills), or
 - switched on automatically, or is intended to be switched on manually, no more than twice per day, and also has either a delayed restart (the delay being not less than a few tens of seconds) or manual restart, after a power supply interruption.

In the case of equipment having several separately controlled circuits in accordance with 6.6, limits b) and c) shall apply only if there is delayed or manual restart after a power supply interruption; for all equipment with automatic switching which is energised immediately on restoration of supply after a power supply interruption, limits a) shall apply; for all equipment with manual switching, limits b) or c) shall apply depending on the rate of switching.

Pst and Plt requirements shall not be applied to voltage changes caused by manual switching.

Test configuration:



Test procedure:

Refer to EN61000-3-3 for the measurement methods.

Test mode:

Refer to the clause 4.1

Result:

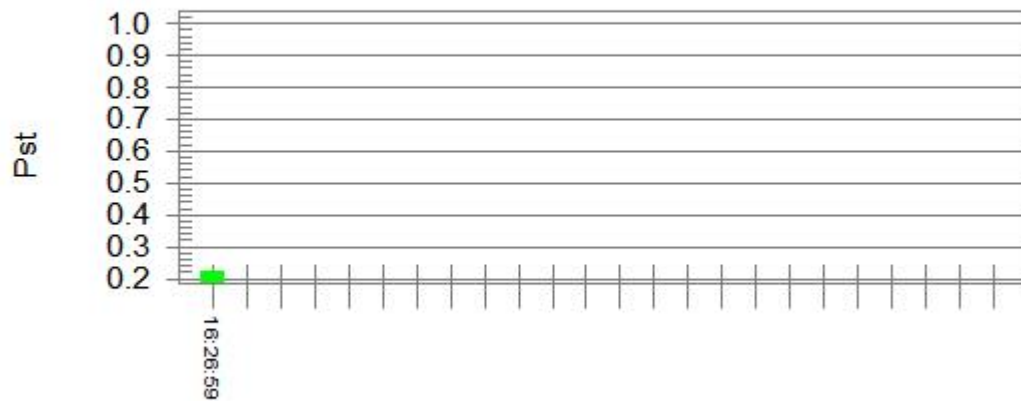
Passed

Test Result: Pass

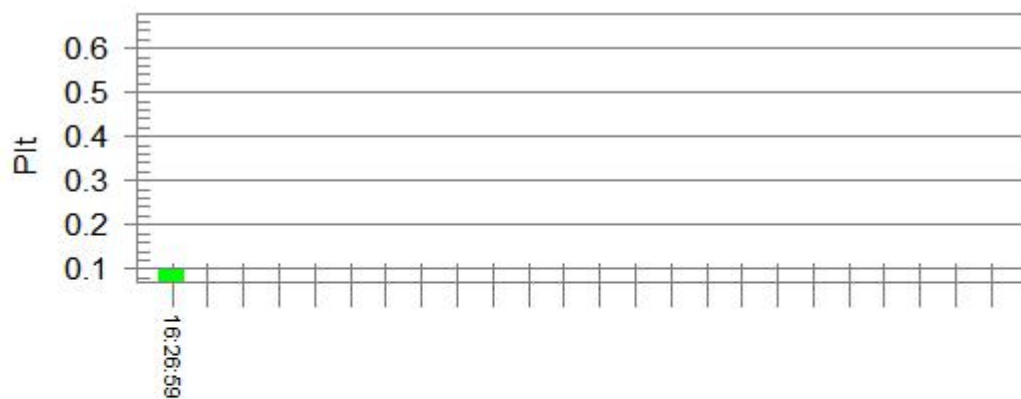
Status: Test Completed

Pst and limit line

European Limits



Plt and limit line



Parameter values recorded during the test:

Vrms at the end of test (Volt): 231.66

Highest dt (%):

T-max (mS): 0

Highest dc (%): 0.00

Highest dmax (%): 0.00

Highest Pst (10 min. period): 0.224

Highest Plt (2 hr. period): 0.098

Test limit (%):

Test limit (mS): 500.0 Pass

Test limit (%): 3.30 Pass

Test limit (%): 4.00 Pass

Test limit: 1.000 Pass

Test limit: 0.650 Pass

5.2. IMMUNITY

General performance criteria

- 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.

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, clause 9.

Criteria	During test	After 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:

For equipment that supports a PER or FER, the minimum performance level shall be a PER or FER less than or equal to 10 %.

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.

5.2.1. Electrostatic Discharge

Performance criterion:

Test configuration:

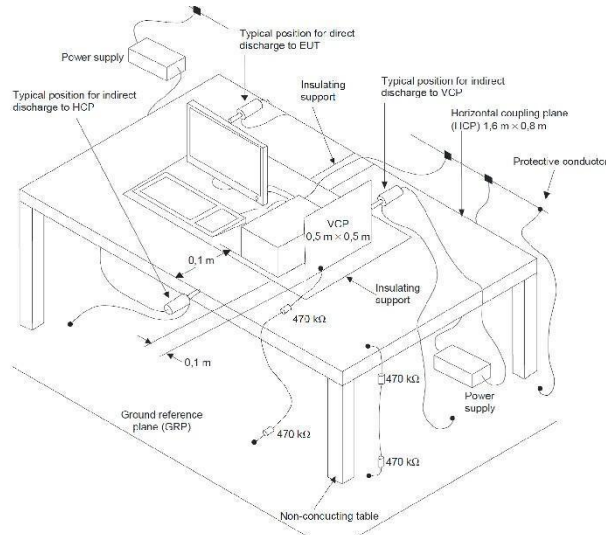
Test level:

Test procedure:

Test mode:

Result:

Criteria B



Contact Discharge: $\pm 2\text{kV}$, $\pm 4\text{kV}$

Air Discharge: $\pm 2\text{kV}$, $\pm 4\text{kV}$, $\pm 8\text{kV}$

Refer to EN55035 and EN 61000-4-2 for the measurement methods.

Contact Discharge:

The ESD generator is held perpendicular to the surface to which the discharge is applied and the tip of the discharge electrode touch the surface of EUT. Then turn the discharge switch. The generator is then re-triggered for a new single discharge and repeated at least 10 times for each pre-selected test point. This procedure shall be repeated until all the air discharge completed.

Air Discharge:

Air discharge is used where contact discharge can't be applied. The round discharge tip of the discharge electrode shall be approached as fast as possible to touch the EUT. After each discharge, the discharge electrode shall be removed from the EUT. The generator is then re-triggered for a new single discharge and repeated at least 10 times for each pre-selected test point. This procedure shall be repeated until all the air discharge completed.

Indirect discharge for horizontal coupling plane:

At least 10 single discharges shall be applied to the horizontal coupling plane, at points on each side of the EUT.

Indirect discharge for vertical coupling plane:

At least 10 single discharges shall be applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m X 0.5m, is placed parallel to, and positioned at a distance of 0.1m from the EUT. Discharges shall be applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.

Refer to the clause 4.1

Passed

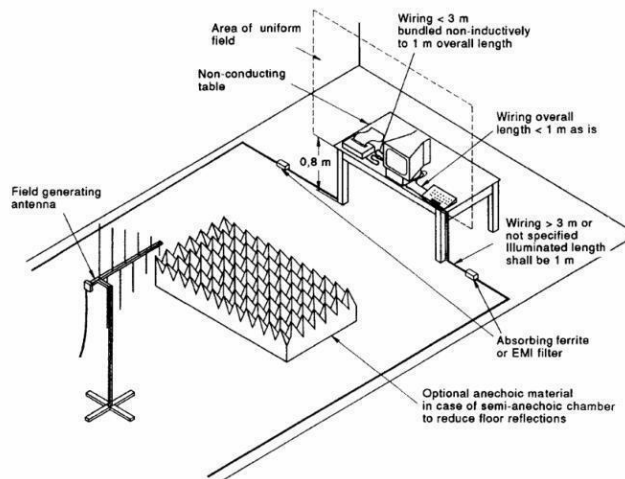
Type	Type of discharge	Discharge voltage (kV)	Observations Performance	Criteria Level	Result
Direct	Contact discharge	± 2	No degradation in performance of the EUT was observed (A)	B	Pass
		± 4	A	B	
	Air discharge	± 2	A	B	
		± 4	A	B	
		± 8	A	B	
Indirect	HCP (6 sides)	± 2	A	B	Pass
		± 4	A	B	
	VCP (4 sides)	± 2	A	B	
		± 4	A	B	

5.2.2. RF electromagnetic field

Performance criterion:

Criteria A

Test configuration:



Test level:

Level:	3 V/m (measured unmodulated)
Frequency range:	80MHz~6000MHz, 1% frequency increment, dwell time=3seconds
Modulation signal:	1000Hz Sinusoidal audio signal, 80% Amplitude modulation

Test procedure:

Refer to ETSI EN 301 489-1 Clause 9.2.2 and EN 61000-4-3 for the measurement methods.

Test mode:

Refer to the clause 4.1

Result:

Passed

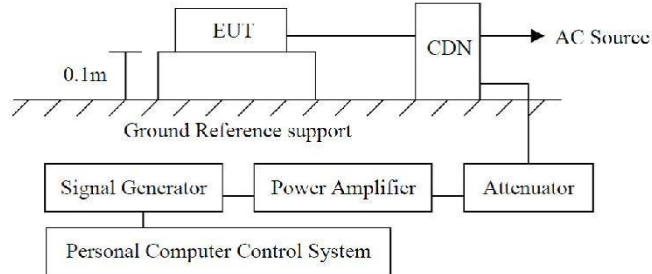
Antenna Polarity	Azimuth	Observations (Performance Criterion)	Criteria Level	Result
Horizontal Vertical	Front Rear Left Right	No degradation in performance of the EUT was observed (A)	A	Pass

5.2.3. RF common mode 0.15 MHz to 80 MHz

Performance criterion:

Criteria A

Test configuration:



Test level:

Level	150kHz to 10MHz: 3Vrms 10MHz to 30MHz: 3V to 1Vrms 30MHz to 80MHz: 1Vrms
Modulation signal specification	1kHz for AM modulation, 80% Amplitude modulation, 1% increment, dwell time=3seconds

Test procedure:

Refer to ETSI EN 301 489-1 Clause 9.5.2 and EN 61000-4-6 for the measurement methods.

Test mode:

Refer to the clause 4.1

Result:

Passed

Port Type	Observations (Performance Criterion)	Criteria Level	Result
AC mains	No degradation in performance of the EUT was observed. (A)	A	Pass

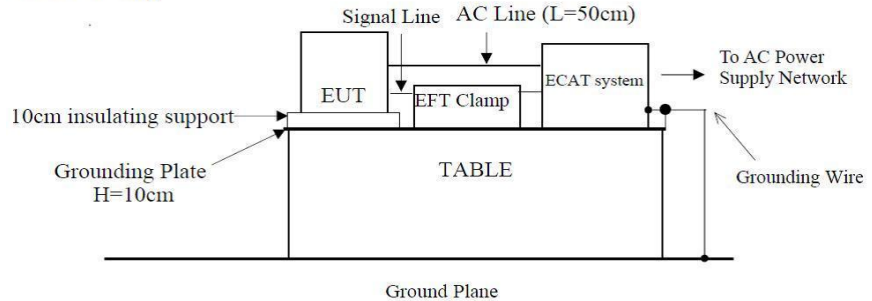
5.2.4. Fast transients common mode

Performance criterion:

Criteria B

Test configuration:

EFT Test Setup



Test level:

Level: AC Main power input port: 1kV
DC power input port: 0.5kV
Signal port, wired network port, control port: 0.5kV
Modulation signal: Repetition rate: 5kHz,
Tr/Td: 5/50ns; Burst duration: 15ms;
Burst period: 300ms

Test procedure:

Refer to ETSI EN 301 489-1 Clause 9.4.2 and EN 61000-4-4 for the measurement methods.

Test mode:

Refer to the clause 4.1

Result:

Passed

Port Type	Lead under Test	Coupling Direct / Clamp	Observations (Performance Criterion)	Criteria Level	Result
AC Power Port	L	Direct	No degradation in performance of the EUT was observed (A)	B	Pass
	N	Direct			
	L-N	Direct			

5.2.5. Surges

Performance criterion:

Test configuration:

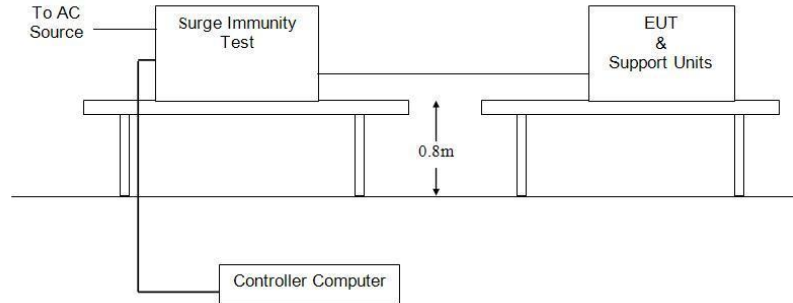
Test level:

Test procedure:

Test mode:

Result:

Criteria B



Level AC Main power port: 1kV line to line, 2kV line to ground
Wired network port: 0.5kV for indoor cable, 1kV for outdoor cable
Modulation signal Tr/Th:1.2/50μs, Interval: 60 seconds, Phase: Sync

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

Refer to the clause 4.1

Passed

Port Type	Lead under Test	Observations (Performance Criterion)	Criteria Level	Result
AC Power Port	L-N	No degradation in performance of the EUT was observed (A)	B	Pass

5.2.6. Voltage dips and interruptions

Performance criterion:

Test configuration:

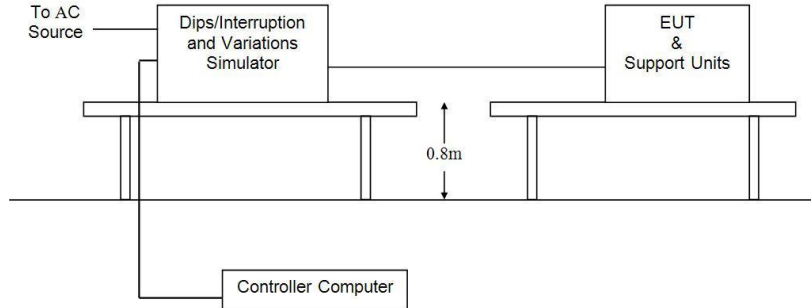
Test level:

Test procedure:

Test mode:

Result:

Criteria B



0% of VT(Supply Voltage) for 0.5 period

0% of VT(Supply Voltage) for 1.0 period

70% of VT(Supply Voltage) for 25 period

0% of VT(Supply Voltage) for 250 period

Refer to ETSI EN 301 489-1 Clause 9.7.2 and EN 61000-4-11 for the measurement methods.

Refer to the clause 4.1

Passed

Test Voltage %	Duration periods	Phase angle	Observations (Performance Criterion)	Criteria Level	Result
0	0.5	0°, 90°, 180°, 270°	No degradation in performance of the EUT was observed. (A)	B	Pass
0	1.0	0°, 90°, 180°, 270°	A	B	Pass
70	25	0°, 90°, 180°, 270°	A	B	Pass
0	250	0°, 90°, 180°, 270°	During the test, the power shut down, after the experiment, the function can automatically return to normal. (B)	C	Pass

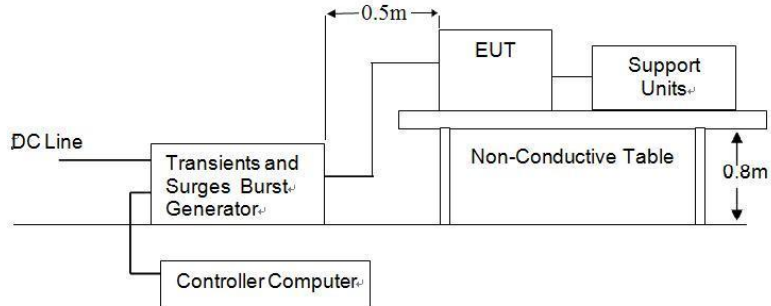
5.2.7. Transients and Surges in Vehicular Environment

Performance criterion:

Criteria B for Pulses 1, 2a, 2b, 4;

Criteria A for Pulses 3a, 3b

Test configuration:



Test level:

Pulses 1	Table 2 — Parameters for test pulse 1				
	Parameters	Nominal 12 V system	Nominal 24 V system		
	U_s	−75 V to −150 V	−300 V to −600 V		
	R_i	10 Ω	50 Ω		
	t_d	2 ms	1 ms		
	t_r	$(1 \begin{smallmatrix} 0 \\ -0.5 \end{smallmatrix}) \mu s$	$(3 \begin{smallmatrix} 0 \\ -1.5 \end{smallmatrix}) \mu s$		
	t_1^a	≥0,5 s			
	t_2	200 ms			
	t_3^b	<100 μs			
Pulses 2a	Table 3 — Parameters for test pulse 2a				
	Parameters	Nominal 12 V and 24 V system			
	U_s	+37 V to +112 V			
	R_i	2 Ω			
	t_d	0,05 ms			
	t_r	$(1 \begin{smallmatrix} 0 \\ -0.5 \end{smallmatrix}) \mu s$			
Pulses 2b	t_1^a	0,2 s to 5 s			
	Table 4 — Parameters for test pulse 2b				
	Parameters	Nominal 12 V system	Nominal 24 V system		
	U_s	10 V	20 V		
	R_i	0 Ω to 0,05 Ω			
	t_d	0,2 s to 2 s			
	t_{12}	1 ms ± 0,5 ms			
	t_r	1 ms ± 0,5 ms			
	t_6	1 ms ± 0,5 ms			
Pulses 3a					
	Table 5 — Parameters for test pulse 3a				
	Parameters	Nominal 12 V system	Nominal 24 V system		
	U_s	−112 V to −220 V	−150 V to −300 V		
	R_i	50 Ω			
	t_d	150 ns ± 45 ns			
	t_r	5 ns ± 1,5 ns			
	t_1	100 μs			
	t_4	10 ms			
	t_5	90 ms			
Pulses 3b					
	Table 6 — Parameters for test pulse 3b				
	Parameters	Nominal 12 V system	Nominal 24 V system		
	U_s	+75 V to +150 V	+150 V to +300 V		
	R_i	50 Ω			
	t_d	150 ns ± 45 ns			
	t_r	5 ns ± 1,5 ns			
	t_1	100 μs			
	t_4	10 ms			
	t_5	90 ms			

Pulses 4

Parameter	12 V system	24 V system
U_{e}	- 6 V to - 7 V	- 12 V to - 16 V
U_{a}	- 2.5 V to - 6 V with $ U_{\text{a}} \leq U_{\text{e}} $	- 5 V to - 12 V with $ U_{\text{a}} \leq U_{\text{e}} $
R_{i}	0 Ω to 0.02 Ω	
t_{f}	15 ms to 40 ms ^a	50 ms to 100 ms ^a
t_{a}	< 50 ms	
t_{b}	0.5 s to 20 s ^a	
t_{d}	5 ms	10 ms
t_{t}	5 ms to 100 ms ^b	10 ms to 100 ms ^c

Test procedure:

Refer to ETSI EN 301 489-1 Clause 9.6.2 and ISO 7637-2 for the measurement methods.

Test mode:

Refer to the clause 4.1

Result:

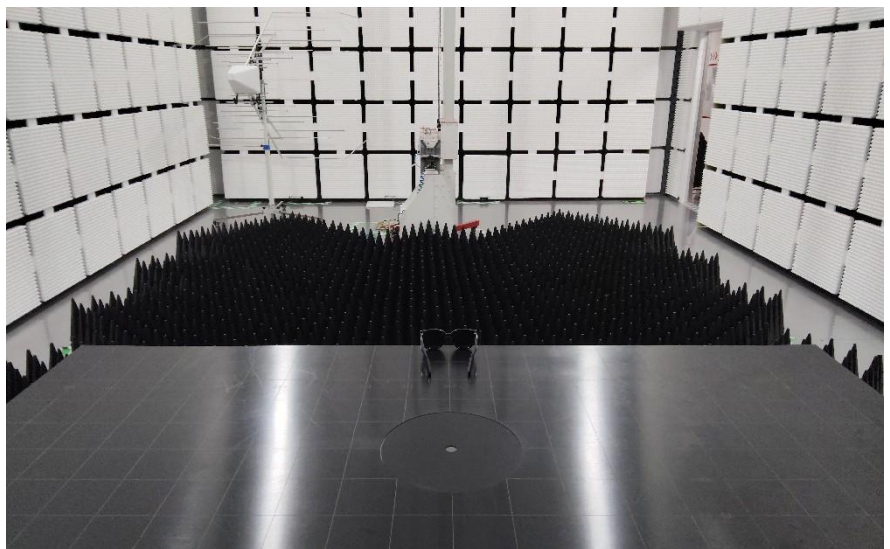
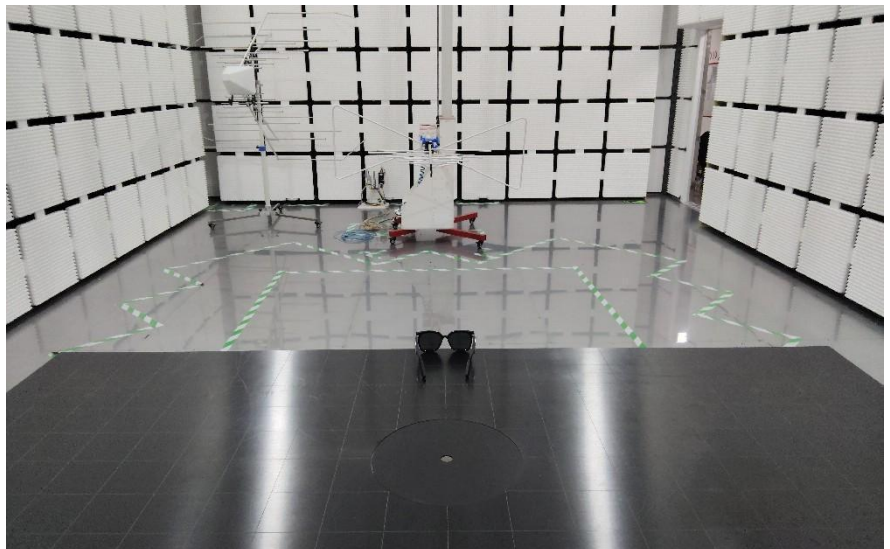
Not Applicable

6. TEST SETUP PHOTOS

Conducted Emission:



Radiated Emission:



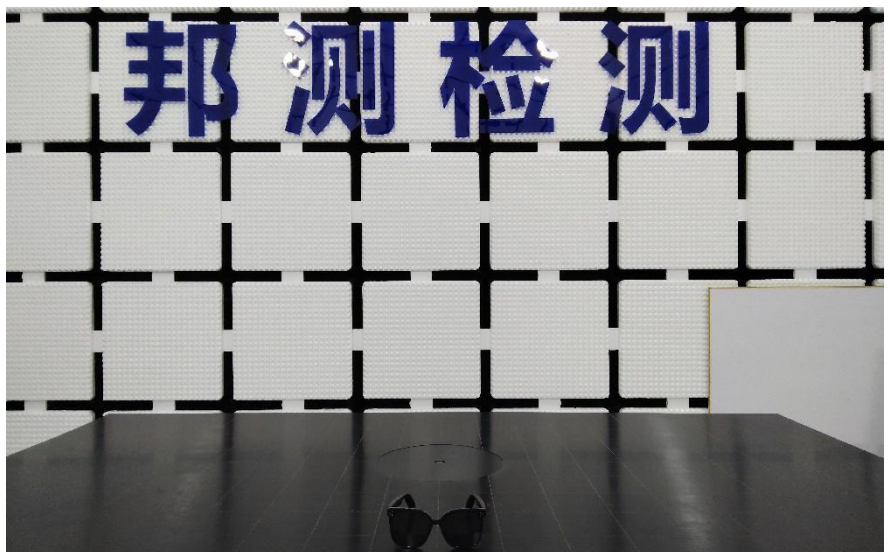
Voltage Fluctuation and Flicker:



Electrostatic Discharge:



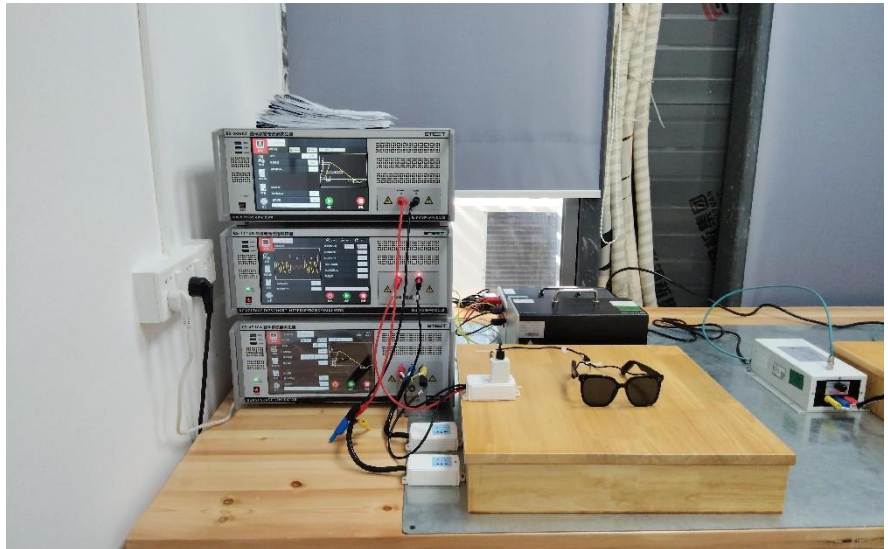
Radiated electromagnetic field immunity:



Conducted disturbances:



Electrical fast transients/burst:



Surges:



Voltage dips and interruptions:



7. EXTERNAL AND INTERNAL PHOTOS

Please refer to report: CISRR24062720301

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