TCT 通测检测 TESTING CENTRE TECHNOLOGY

EMC TEST REPORT

Product family standard for aftermarket electronic equipment in vehicles

Test Report No. .....:	TCT230228E023	
Date of issue .....:	Mar. 23, 2023	
Testing laboratory.....:	Shenzhen TCT Testing Technology Co., Ltd.	
Testing location/ address.....:	2101 & 2201, Zhenchang Factory, Renshan Industrial Zone, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China	
Applicant's name .....:	LINKCOM MANUFACTURING CO., LTD	
Address.....:	Building 1, No.21 Huanqi Avenue, Qishi Town Dongguan Guangdong Sheng China	
Manufacturer's name .....:	LINKCOM MANUFACTURING CO., LTD	
Address.....:	Building 1, No.21 Huanqi Avenue, Qishi Town Dongguan Guangdong Sheng China	
Standard(s).....:	EN 50498:2010	
Test item description.....:	Car Charger	
Trade Mark.....:	N/A	
Model/Type reference.....:	OPP123, OPP127	
Rating(s) .....:	Input: DC 12-24 V Output (PD): DC 5 V, 3 A/ DC 9 V, 2 A/ DC 12 V, 1.5 A Output (QC3.0): DC 3.6 V-6.5 V, 3 A/ DC 6.5 V-9 V, 2 A/ DC 9 V-12 V, 1.5 A	
Date of receipt of test item.....:	Feb. 28, 2023	
Date (s) of performance of test:	Feb. 28, 2023 - Mar. 23, 2023	
Tested by (+signature).....:	Carol TAN	
Check by (+signature) .....:	Howie LYU	
Approved by (+signature) .....:	Tomsin	

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1. General Product Information

1.1.EUT description

Test item description ..... :	Car Charger
Model/Type reference ..... :	OPP123
Rating(s) ..... :	Input: DC 12-24 V Output (PD): DC 5 V, 3 A/ DC 9 V, 2 A/ DC 12 V, 1.5 A Output (QC3.0): DC 3.6 V-6.5 V, 3 A/ DC 6.5 V-9 V, 2 A/ DC 9 V-12 V, 1.5 A
AC Line ..... :	☐Shielded ☐Unshielded, ☐Detachable ☐Un-detachable ☒No applicable ☐Length:
DC Line ..... :	☐Shielded ☐Unshielded, ☐Detachable ☐Un-detachable ☒No applicable ☐Length:

1.2.Model(s) list

No.	Model No.	Tested with
1	OPP123	☒
Other models	OPP127	☐
Note: OPP123 is tested model, other models are derivative models. The models are identical in circuit and PCB layout, only different on the model names. So the test data of OPP123 can represent the remaining models.		

2. Test Information

2.1.EUT operation mode(s)

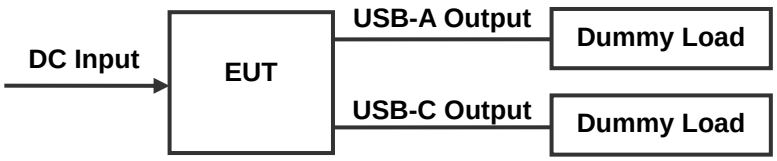
Mode #	Operating mode description	Test voltage
1	Output(PD): DC 5 V/ 3 A	DC 12 V
2	Output(PD): DC 12 V/ 1.5 A	DC 12 V
3	Output(QC 3.0): DC 6.5 V/ 3 A	DC 12 V
4	Output(QC 3.0): DC 12 V/ 1.5 A	DC 12 V
5	Output(PD): DC 5 V/ 3 A	DC 24 V
6	Output(PD): DC 12 V/ 1.5 A	DC 24 V
7	Output(QC 3.0): DC 6.5 V/ 3 A	DC 24 V
8	Output(QC 3.0): DC 12 V/ 1.5 A	DC 24 V

Test worst operating mode	
Broadband and narrowband radiated disturbances	Mode 3
Remark: The worst measurement data and graphical presentation show in this report.	

2.2.Special accessories and auxiliary equipment

Product Type	Manufacturer	Model No.	Serial No.
/	/	/	/

2.3.Configuration of system under test



(EUT: Car Charger)

2.4.General test conditions

Environmental reference conditions

The climatic conditions during the tests are within the limits specified by the manufacturer for the operation of the EUT and the test equipment.

The climatic conditions during the tests were within the following limits:

Temperature	Humidity	Atmospheric pressure
15 °C – 35 °C	30 % - 60 %	86 kPa – 106 kPa

If explicitly required in the basic standard or applied product standard the climatic values are recorded and documented separately in this test report.

Measurement uncertainties

Test Item	Uncertainty
Uncertainty for Broadband and narrowband radiated disturbances	4.56 dB

The overall measurement uncertainty of a measurement is defined as the range of which can be supposed that it contains the true value with a specified probability.

This probability is 95 % for the generally specified measurement uncertainty (so-called expanded measurement uncertainty).

The limits for emission measurements and the Test levels for immunity tests in the applied standards were defined taking into consideration the accuracy limits for measurement and testing equipment required by the Basic standards.

All measurement and test results of the EMC laboratory of Shenzhen TCT Testing Technology Co., Ltd. fulfil the requirements for measurement uncertainties according to the standards applied.

Decision rule for statement(s) of conformity is based on accuracy method specified in Clause 4.4.3 in IEC Guide 115:2021.

3. Test Result Summary

EN 50498:2010	
Requirement – Test case	**Verdict**
Broadband and narrowband radiated disturbances	Pass
Conducted transient disturbances	Pass
Conducted transient immunity	Pass

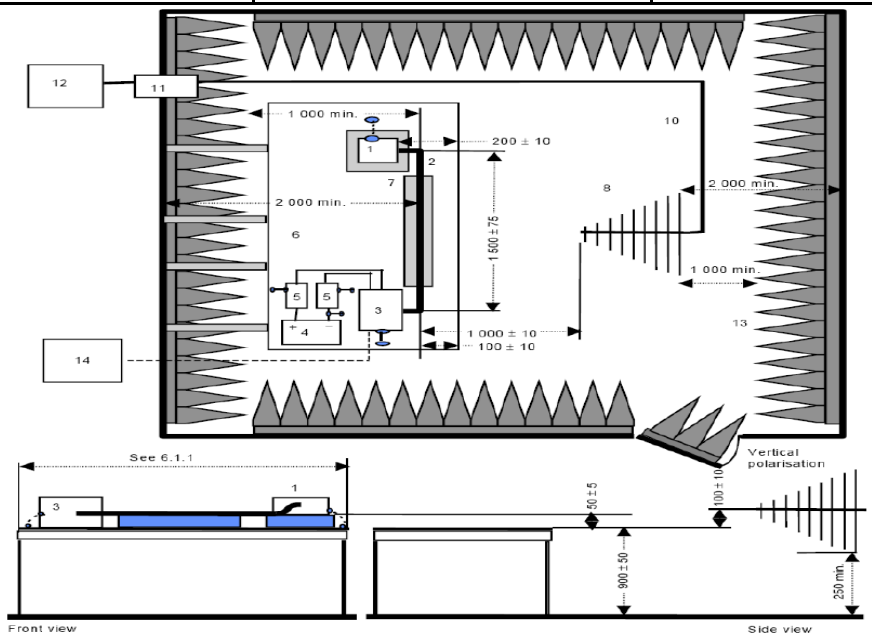
Test case verdicts	
- Test case does not apply to the test object ..... :	N/A
- Test object does meet the requirement..... :	P (Pass)
- Test object does not meet the requirement ..... :	F (Fail)

4. List of Test Equipment

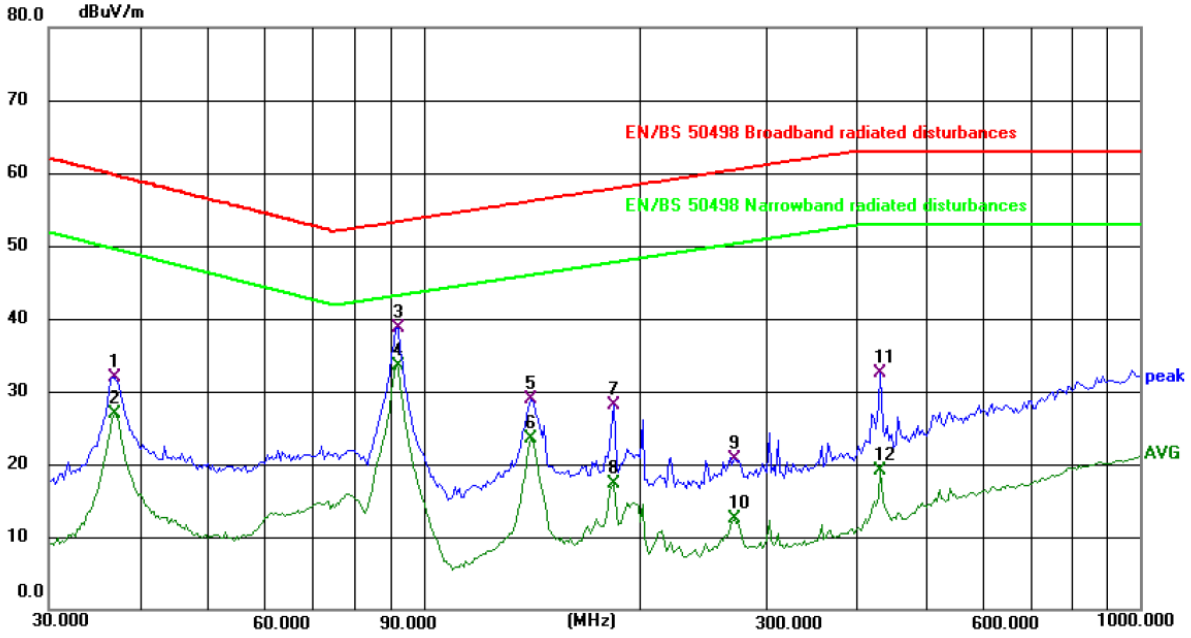
Equipment	Manufacturer	Model No.	Serial No.	Cal. Due
Broadband and narrowband radiated disturbances				
Broadband Antenna	Schwarzbeck	VULB 9168	01197	2024/02/24
EMI Test Receiver	R&S	ESCI7	100529	2024/02/20
LISN	KEHUAN	KH3762	37620038	2023/07/03
LISN	KEHUAN	KH3762	37620039	2023/07/03
3m Anechoic Chamber	SKET	9m*6m*6m	SA01	2024/01/25
Test software	EZ_EMC	FA-03A2 RE+	/	/
Conducted transient disturbances				
Multi-channel digital oscilloscope	Tekronix	TDS5052B	B020238	2023/07/27
Transient Emission Test set-up	Prima	7637-TEMI	PR16127105	2023/07/27
Conducted transient immunity				
Control unit	Lioncel	LAS-7600	0160103	2023/07/27
Pulse 2b/4 signal generator	Lioncel	LAS-7640	0161201	2023/07/27
Pulse 5a signal generator	Lioncel	LAS7650A	0160101	2023/07/27
Pulse 5b signal generator	Lioncel	LAS7650B	0160102	2023/07/27
Pulse 3a/3b signal generator	Lioncel	LAS7630	0151202	2023/07/27
Pulse 1/2a signal generator	Lioncel	LAS7610	0151203	2023/07/27
Control unit	Lioncel	LAS-7600	0160103	2023/07/27

5. Test Conditions and Results (Emission)

5.1. Broadband and narrowband radiated disturbances

Test requirement .....:	EN 50498:2010		
Test Method .....:	CISPR 25		
Test frequency range..:	30 MHz to 1 GHz		
Limits .....:	**Limits**		
	Frequency (MHz)	**Quasi peak (dBμV/m)**	**Average (dBμV/m)**
	30 - 75	62 – 52	52 – 42
	75 - 400	52 – 63	42 – 53
	400 - 1000	63	53
Test method .....:			
Ambient temperature..:	24.5 °C		
Relative humidity .....:	50 %		
Test location .....:	2101 & 2201, Zhenchang Factory, Renshan Industrial Zone, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China		
Test model(s) .....:	OPP123		
EUT operation mode..:	Mode 3		
Test results .....:	Pass		
Remark.....:	/		

Measurement data and Graphical presentation of the result



Site: #1 3m Anechoic Chamber Polarization: ***Horizontal*** Temperature: 24.5(C) Humidity: 50 %

Limit: EN/BS 50498 Broadband radiated disturbances Power: DC 12 V

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1	37.0248	18.58	13.42	32.00	59.70	-27.70	QP	P	
2	37.0248	13.50	13.42	26.92	49.70	-22.78	AVG	P	
3	92.1386	29.85	8.83	38.68	53.35	-14.67	QP	P	
4 *	92.1386	24.63	8.83	33.46	43.35	-9.89	AVG	P	
5	141.3296	16.12	12.70	28.82	56.16	-27.34	QP	P	
6	141.3296	10.82	12.70	23.52	46.16	-22.64	AVG	P	
7	184.4898	17.00	11.14	28.14	57.91	-29.77	QP	P	
8	184.4898	6.07	11.14	17.21	47.91	-30.70	AVG	P	
9	271.3245	8.02	12.76	20.78	60.45	-39.67	QP	P	
10	271.3245	-0.25	12.76	12.51	50.45	-37.94	AVG	P	
11	434.0649	15.70	16.88	32.58	63.00	-30.42	QP	P	
12	434.0649	2.14	16.88	19.02	53.00	-33.98	AVG	P	

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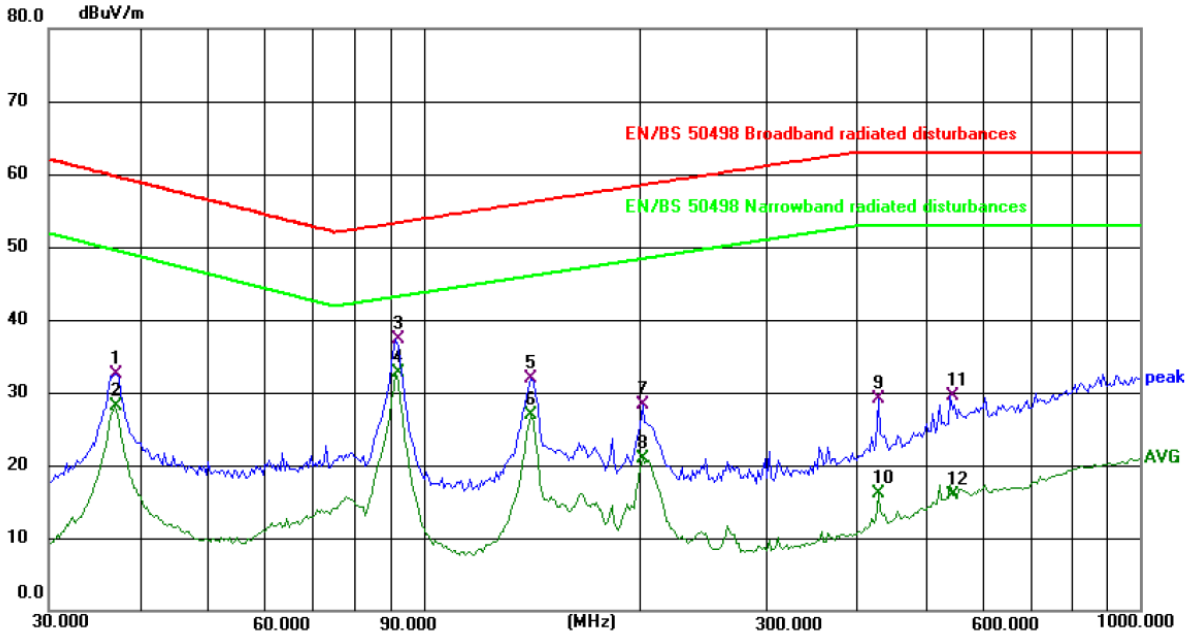

Site: #1 3m Anechoic Chamber Polarization: *Vertical* Temperature: 24.5(C) Humidity: 50 %

Limit: EN/BS 50498 Broadband radiated disturbances Power: DC 12 V

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1	37.2854	19.13	13.45	32.58	59.63	-27.05	QP	P	
2	37.2854	14.67	13.45	28.12	49.63	-21.51	AVG	P	
3	91.4947	28.63	8.74	37.37	53.31	-15.94	QP	P	
4 *	91.4947	23.94	8.74	32.68	43.31	-10.63	AVG	P	
5	141.3296	19.23	12.70	31.93	56.16	-24.23	QP	P	
6	141.3296	14.30	12.70	27.00	46.16	-19.16	AVG	P	
7	202.1004	18.02	10.23	28.25	58.51	-30.26	QP	P	
8	202.1004	10.58	10.23	20.81	48.51	-27.70	AVG	P	
9	431.0314	12.27	16.81	29.08	63.00	-33.92	QP	P	
10	431.0314	-0.64	16.81	16.17	53.00	-36.83	AVG	P	
11	547.0976	9.82	19.59	29.41	63.00	-33.59	QP	P	
12	547.0976	-3.63	19.59	15.96	53.00	-37.04	AVG	P	

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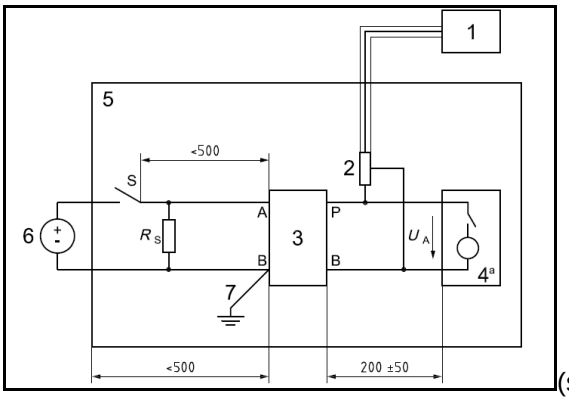
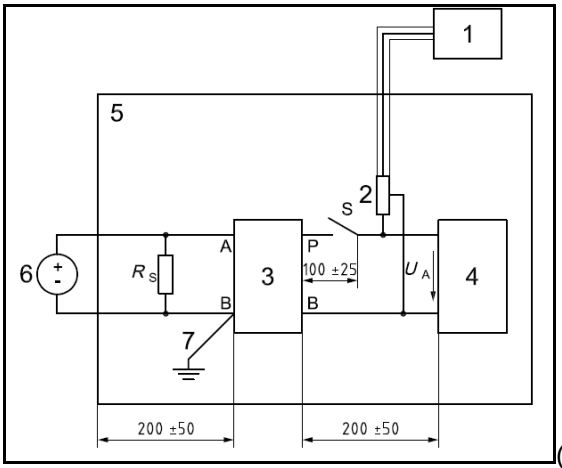
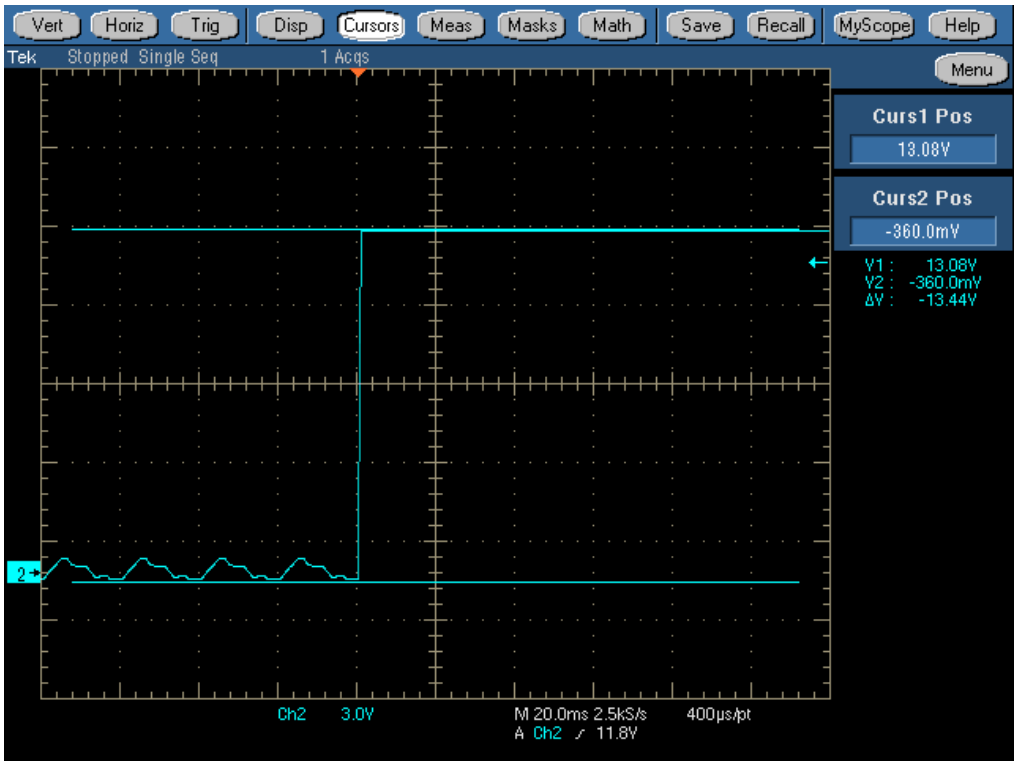
5.2.Conducted transient disturbances

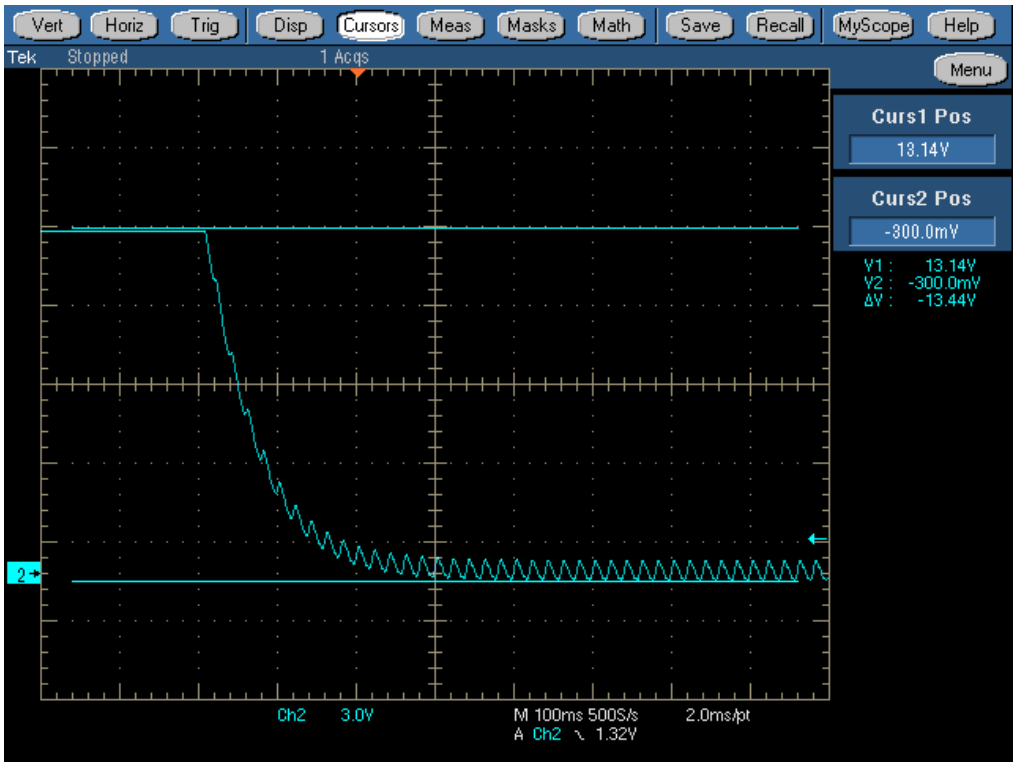
Test requirement..... :	EN 50498:2010		
Test Method ..... :	ISO 7637-2		
Limits ..... :	**Polarity of pulse amplitude**	**Maximum allowed pulse amplitude for**	
		Vehicles with 12V system	Vehicles with 24V system
	Positive	+ 75	+ 150
	Negative	- 100	- 450
Test method..... :	 (slow pulses)  (fast pulses)		
Test Information			
Ambient temperature..... :	23.3 °C		
Relative humidity ..... :	52 %		
Test location ..... :	2101 & 2201, Zhenchang Factory, Renshan Industrial Zone, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China		
Test model(s) ..... :	OPP123		
EUT operation mode..... :	Mode 1, Mode 2, Mode 3, Mode 4, Mode 5, Mode 6, Mode 7, Mode 8		
Test results ..... :	Pass		
Remark..... :	/		

Graphical representation of Conducted transient disturbances

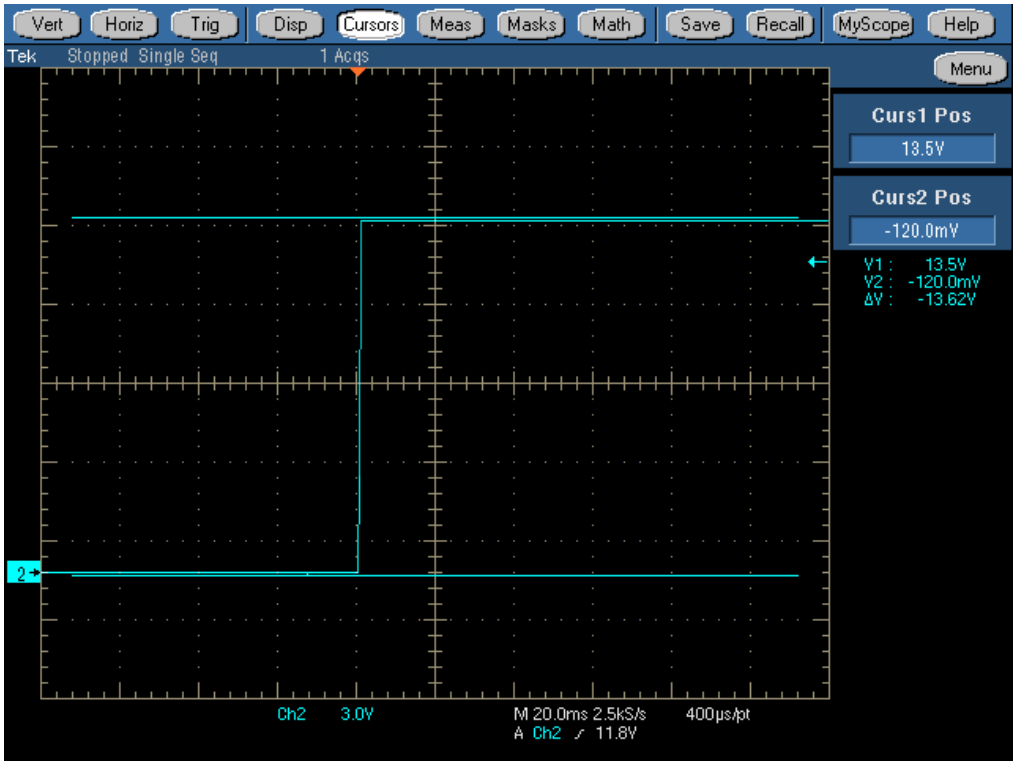
Fast pulses ON (DC 12V)



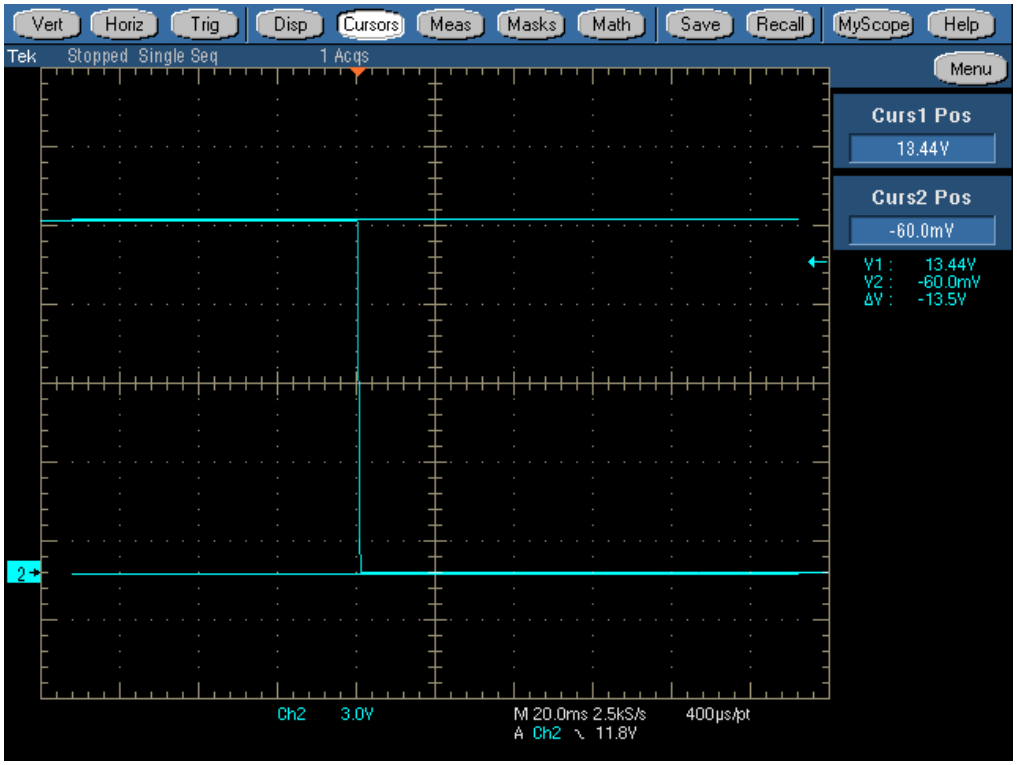
Fast pulses OFF (DC 12V)



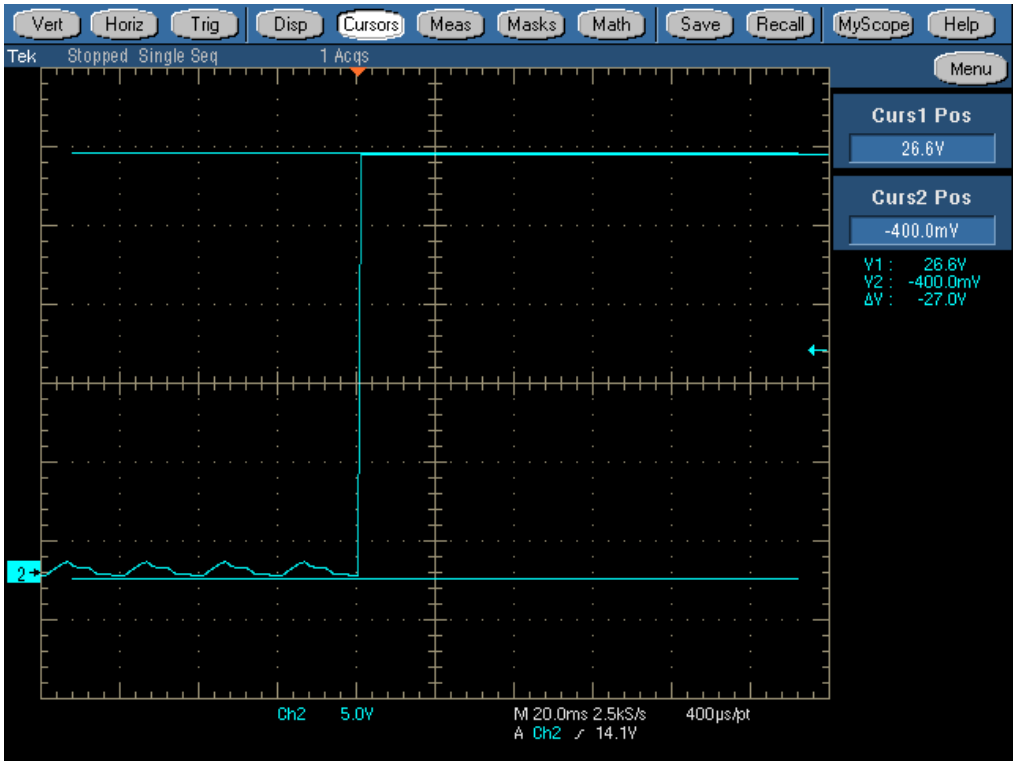
Slow pulses ON (DC 12V)



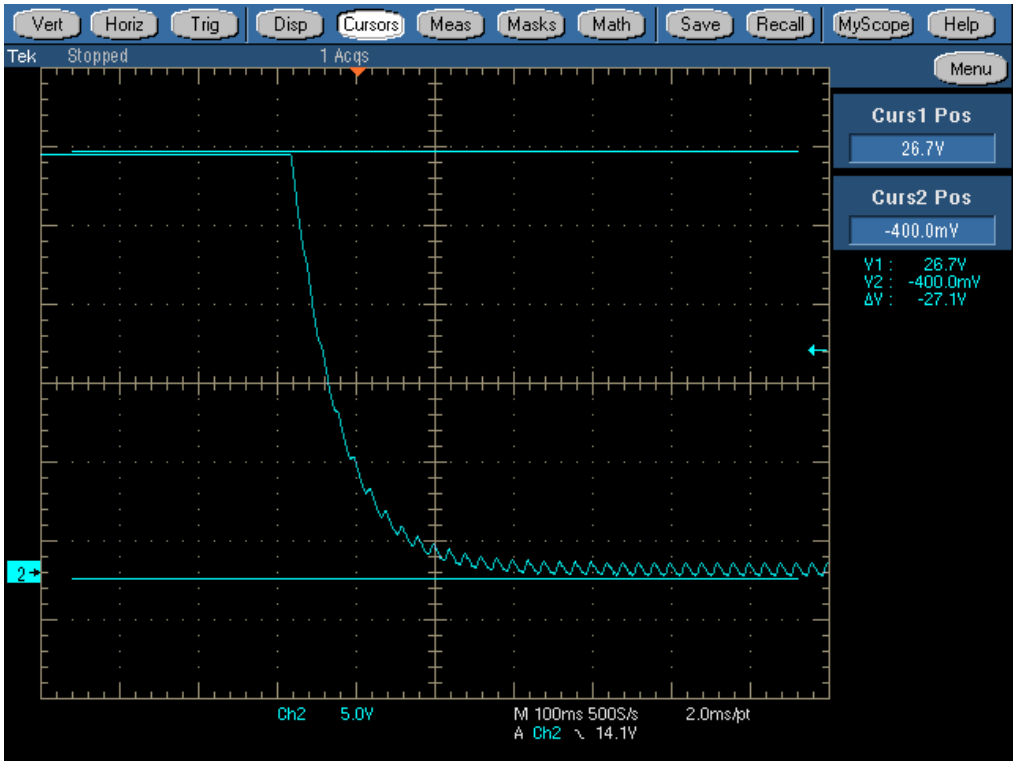
Slow pulses OFF (DC 12V)



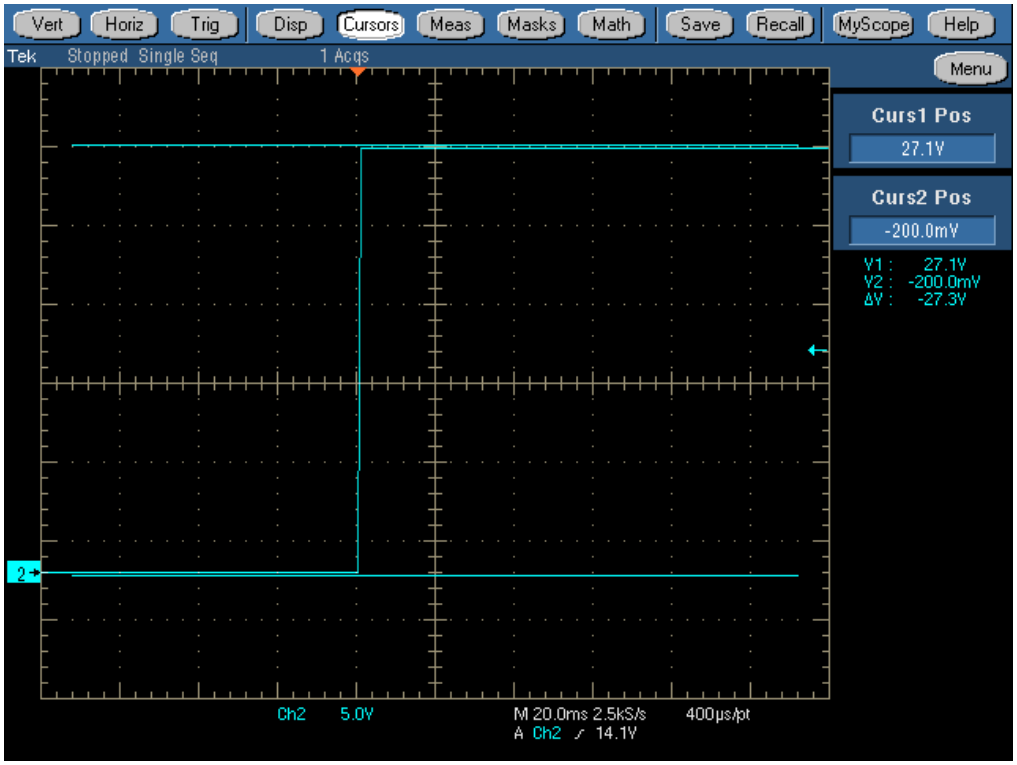
Fast pulses ON (DC 24V)



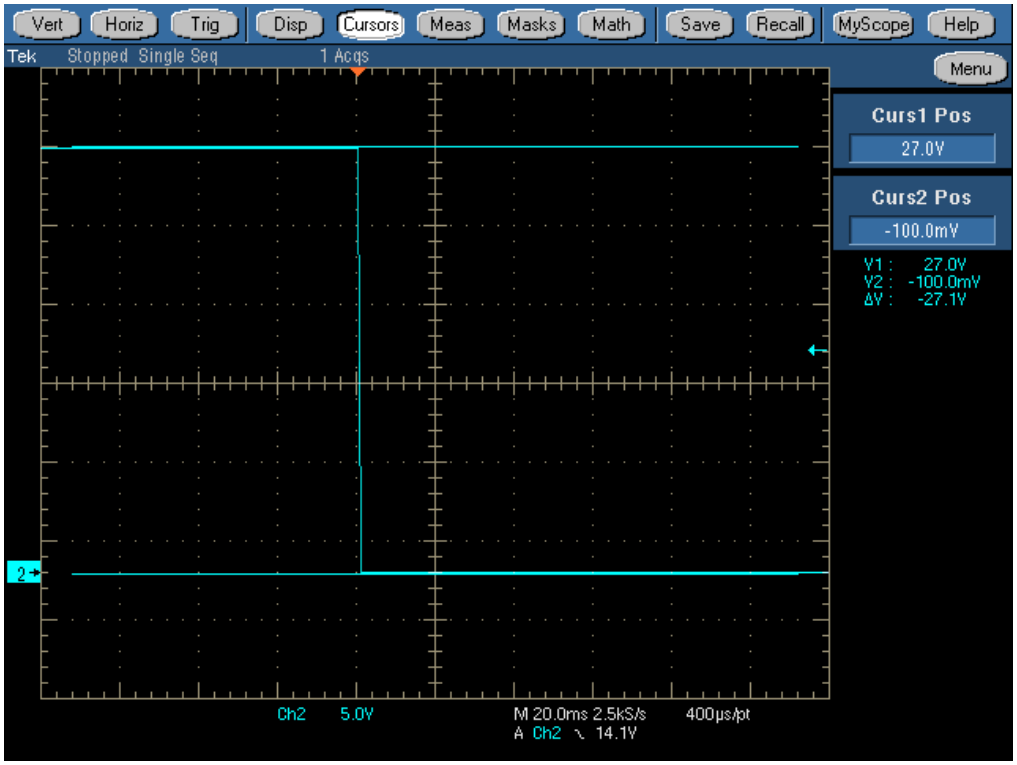
Fast pulses OFF (DC 24V)



Slow pulses ON (DC 24V)



Slow pulses OFF (DC 24V)



5.3.Conducted transient immunity

Test Requirement..... :	EN 50498:2010		
Test Method ..... :	ISO 7637-2		
Test levels..... :	**Test pulse number**	**Immunity test level**	**Functional status**
	1	III	D
	2a	III	D
	2b	III	D
	3a	III	D
	3b	III	D
	4	III	D
	Functional status D is where one or more functions of the ESA do not perform as designed during and after exposure and do not return to normal operation until exposure is removed and the ESA is reset by simple “operator/use” action.		
Performance Criterion... :	D		
Test Information			
Ambient temperature..... :	23.3 °C		
Relative humidity ..... :	52 %		
Test location ..... :	2101 & 2201, Zhenchang Factory, Renshan Industrial Zone, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China		
Test model(s) ..... :	OPP123		
EUT operation mode..... :	Mode 1, Mode 2, Mode 3, Mode 4, Mode 5, Mode 6, Mode 7, Mode 8		
Test results ..... :	Pass		
Remark..... :	/		

5.3.1. Performance criteria

Performance criterion A
All functions of a device/system perform as designed during and after exposure to disturbance.
Performance criterion B
All functions of a device/system perform as designed during exposure. However, one or more of them can go beyond specified tolerance. All functions return automatically to within normal limits after exposure is removed. Memory functions shall remain class A.
Performance criterion C
One or more functions of a device/system do not perform as designed during exposure but return automatically to normal operation after exposure is removed.
Performance criterion D
One or more functions of a device/system do not perform as designed during exposure and do not return to normal operation until exposure is removed and the device/system is reset by simple“operator/use” action.
Performance criterion E
One or more functions of a device/system do not perform as designed during and after exposure and cannot be returned to proper operation without repairing or replacing the device/system.

5.3.2. Test content and results summary tables for immunity test

System voltage: DC 12 V

Test Pulses	Test Level	Test time	Criteria	Test Result	Observation
	12 V				
1	-75	5000 pulses	D	D	☐ 1 ☒ 2 ☐ 3
2a	+37	5000 pulses	D	B	☒ 1 ☐ 2 ☐ 3
2b	+10	10 pulses	D	C	☐ 1 ☒ 2 ☐ 3
3a	-112	1H	D	B	☒ 1 ☐ 2 ☐ 3
3b	+75	1H	D	B	☒ 1 ☐ 2 ☐ 3
4	-6	1 pulse	D	C	☐ 1 ☒ 2 ☐ 3

System voltage: DC 24 V

Test Pulses	Test Level	Test time	Criteria	Test Result	Observation
	24 V				
1	-450	5000 pulses	D	D	☐ 1 ☒ 2 ☐ 3
2a	+37	5000 pulses	D	B	☒ 1 ☐ 2 ☐ 3
2b	+20	10 pulses	D	C	☐ 1 ☒ 2 ☐ 3
3a	-150	1H	D	B	☒ 1 ☐ 2 ☐ 3
3b	+150	1H	D	B	☒ 1 ☐ 2 ☐ 3
4	-12	1 pulse	D	C	☐ 1 ☒ 2 ☐ 3

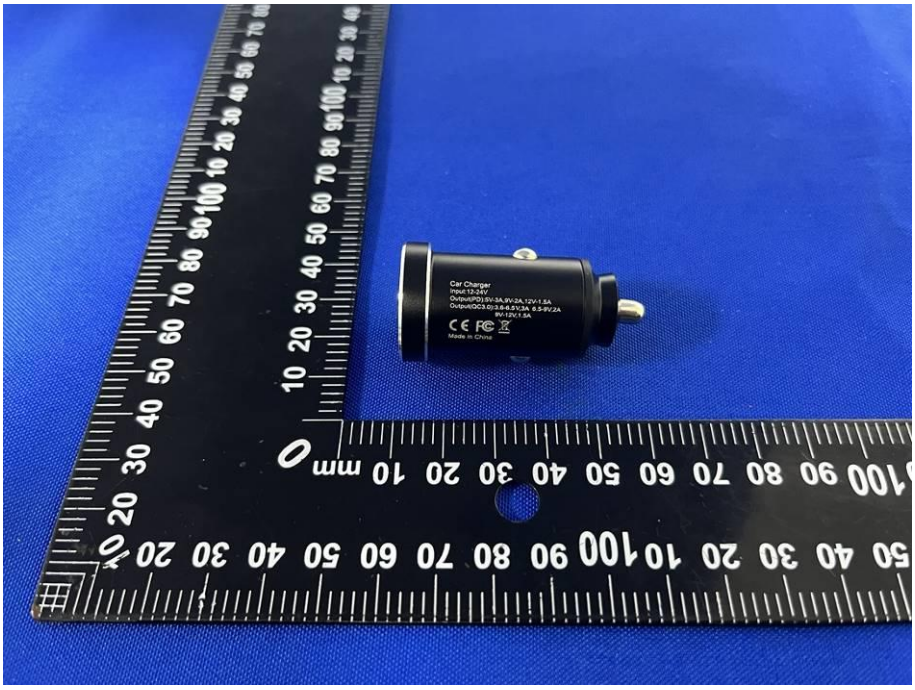
5.3.3. Test results of observations description

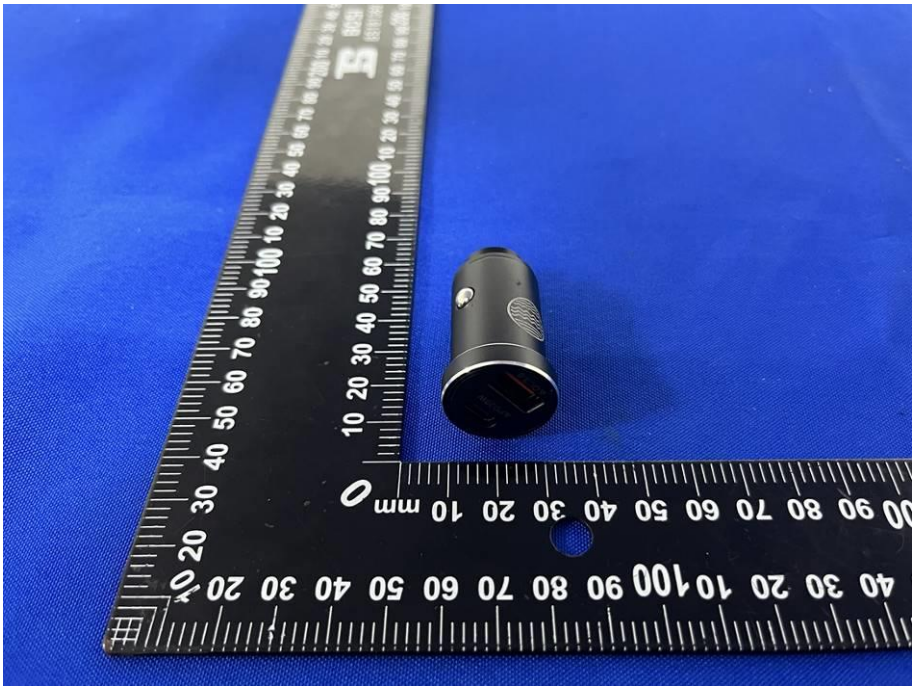
/ - Not performed or not required.
1 –There was no change compared with initial operation during and after the test. No unintentional response was found during the test.
2 –The function stopped during the test, but can be recoverable by itself operation after the test.
3 –The function stopped during the test, but can be recoverable manually after the test.

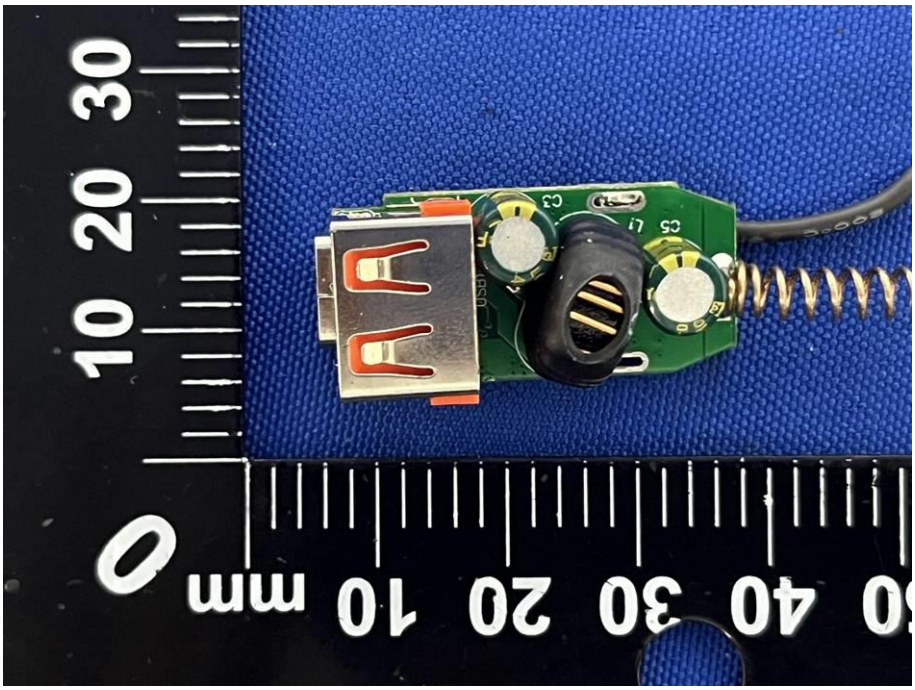
6. Test set-up photo

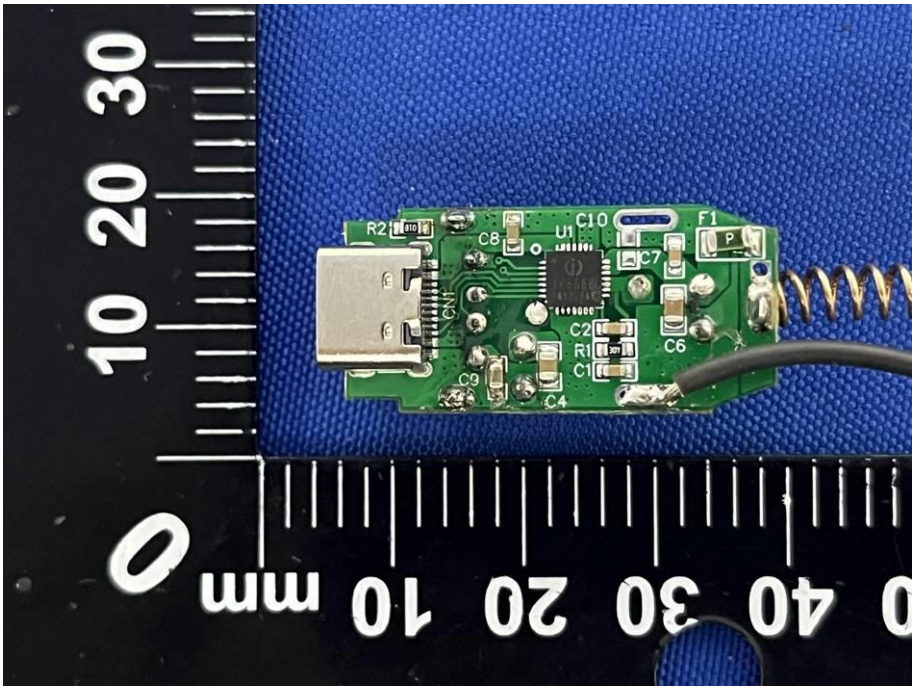
Broadband and narrowband radiated disturbances test view

7. Photo of the EUT









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