CE EMC Test Report

CE

For

JIANGSU SAVING ELECTRONIC CO., Ltd.
Xincheng Road#256, Environment And Science Area, Yixing City, Jiangsu Province, China

Product : Three Phase Smart Energy Meter

Trade Name : Saving

Model No : DTZY1218

Serial Model : --

Prepared By : Nowd Testing Services Co., Ltd.
5A, Building 29B, Yintian Industrial Zone, Yantian Community, Xixiang Street, Bao'an District, Shenzhen, China

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Report No. : NTS2212009E

Date of Test : December 01, 2022

Date of Rep. : December 12, 2022

TEST REPORT DECLARATION

Applicant	:	JIANGSU SAVING ELECTRONIC CO., Ltd.
Address	:	Xincheng Road#256, Environment And Science Area, Yixing City, Jiangsu Province, China
Manufacturer	:	JIANGSU SAVING ELECTRONIC CO., Ltd.
Address	:	Xincheng Road#256, Environment And Science Area, Yixing City, Jiangsu Province, China
EUT Description	:	Three Phase Smart Energy Meter
Trademark	:	Saving
Model No.	:	DTZY1218
Serial Model	:	--
Power Supply	:	Input: 220/380V~, 50Hz
Standards	:	EN IEC 61000-6-1: 2019 EN 61000-6-3: 2007+ A1: 2011 EN IEC 61000-3-2: 2019 EN 61000-3-3: 2013+ A1: 2019

This device described above has been tested by Nowd Testing Services Co., Ltd., and the test results show that the equipment under test (EUT) is in compliance with the 2014/30/EU requirements. And it is applicable only to the tested sample identified in the report.

Prepared by: jack Wu

Jack Wu
Testing Engineer

Reviewed by: Andy Xie

Andy Xie
Technical Manager

Approved by:

NOWD TESTING SERVICES CO.,LTD. NTS APPROVED

somnus
Authorized Signatory

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. TEST SUMMARY

Description of Test	Result
Conducted Emission	Compliant
Radiated Emission	Compliant
EN61000-3-2 Harmonic Current Emission	Compliant
EN61000-3-3 Voltage Fluctuation And Flicker	Compliant
Electrostatic Discharge Immunity (ESD) in accordance with IEC 61000-4-2	Compliant
Radiated RF-Electromagnetic Field Immunity in accordance with IEC 61000-4-3	Compliant
Electrical Fast Transient/Burst (EFT/B) immunity in accordance with IEC 61000-4-4	Compliant
Surge immunity test immunity in accordance with IEC 61000-4-5	Compliant
Immunity to conducted disturbances in accordance with IEC 61000-4-6	Compliant
Power-frequency magnetic field Immunity in accordance with IEC 61000-4-8	Compliant
Voltage Dips/Interruptions immunity test in accordance with IEC 61000-4-11	Compliant

TEST FACILITY

Test Firm : Nowd Testing Services Co., Ltd. (Shenzhen)
Address : 5A, Building 29B, Yintian Industrial Zone, Yantian Community, Xixiang Street, Bao'an District, Shenzhen, China

MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement **y** ± **U**，where expended uncertainty **U** is based on a standard uncertainty multiplied by a coverage factor of **k=2**，providing a level of confidence of approximately **95** %.

Conducted Emission Uncertainty = ± 2.23dB

Radiated Emission Uncertainty = ±4.26dB

. GENERAL INFORMATION

GENERAL DESCRIPTION OF EUT

EUT Description:	Three Phase Smart Energy Meter
Model No.:	DTZY1218
Adding Model:	--
Model Difference	--
Product Description	The EUT is a Three Phase Smart Energy Meter. Operating frequency: N/A Connecting I/O port: N/A Based on the application, features, or specification exhibited in User's Manual, the EUT is considered as an ITE/Computing Device. More details of EUT technical specification, please refer to the User's Manual.
Power Source	AC Voltage
Power Rating	Input: 220/380V~

DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation Running mode or test configuration Running mode which possible have effect on EMI emission level. Each of these EUT operation Running mode(s) or test configuration Running mode(s) mentioned above was evaluated respectively.

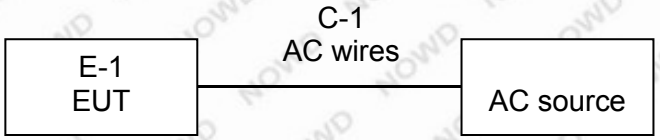
Pretest Mode	Description
Mode 1	Run Mode

For Radiated Test	
Final Test Mode	Description
Mode 1	Run Mode

For EMS Test	
Final Test Mode	Description
Mode 1	Run Mode

DESCRIPTION OF TEST SETUP

Mode 1:



DESCRIPTION TEST PERIPHERAL AND EUT PERIPHERAL

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
E-1	Three Phase Smart Energy Meter	N/A	DTZY1218	N/A	EUT

Item	Shielded Type	Ferrite Core	Length	Note
C1	No	No	1.0m	Power cord

Note:

(1) The support equipment was authorized by Declaration of Confirmation.
(2) For detachable type I/O cable should be specified the length in cm in『Length』column.
(3) “YES” means “shielded” “with core”; “NO” means “unshielded” “without core”.

MEASUREMENT INSTRUMENTS LIST

CONDUCTED TEST SITE

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2022-07-17	2023-07-16
L.I.S.N	Schwarz beck	NSLK8126	8126-224	2022-07-17	2023-07-16
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2022-07-17	2023-07-16
AMN	EMCO	3825/2	11967C	2022-07-17	2023-07-16
Power Divider	Weinschel	1506A	PM204	2022-07-17	2023-07-16
Current Probe	FCC	F-33-4	091684	2022-07-17	2023-07-16

RADIATED TEST SITE

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2022-07-17	2023-07-16
EMI Test Receiver	R&S	ESVB	825471/005	2022-07-17	2023-07-16
Positioning Controller	C&C	CC-C-1F	N/A	2022-07-17	2023-07-16
RF Switch	EM	EMSW18	SW060023	2022-07-17	2023-07-16
Pre-amplifier	Agilent	8447F	3113A06717	2022-07-17	2023-07-16
Pre-amplifier	Compliance Direction	PAP-0118	24002	2022-07-17	2023-07-16
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2022-07-17	2023-07-16
Horn Antenna	ETS	3117	00086197	2022-07-17	2023-07-16

HARMONICS AND FILCK

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Harmonic & Flicker	EM TEST	DPA500	0303-04	July 16, 2023
2	AC Power Source	EM TEST	ACS500	0203-01	July 16, 2023

ESD

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	ESD TEST GENERATOR	SCHAFFNER	NSG438	859	July 16, 2023

RS

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Signal Generator	R&S	SMT 06	832080/007	July 16, 2023
2	Log-Bicon Antenna	Schwarzbeck	VULB9161	4022	July 16, 2023
3	Power Amplifier	AR	150W1000M1	320946	July 16, 2023
4	Microwave Horn Antenna	AR	AT4002A	321467	July 16, 2023
5	Power Amplifier	AR	25S1G4A	308598	July 16, 2023

SURGE, EFT/BURST, VOLTAGE INTERRUPTION/DIPS

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Surge Generator	EVERFINE	EMS61000-5 A	1101002	July 16, 2023
2	DIPS Generator	EVERFINE	EMS61000-1 1K	1011002	July 16, 2023
	EFT/B Generator	EVERFINE	EMS61000-4 A-V2	1012005	July 16, 2023

INJECTION CURRENT

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Signal Generator	IFR	2023A	202301/368	July 16, 2023
2	Power Amplifier	AR	75A250AM1	0320709	July 16, 2023
3	CDN	FCC	FCC-801-M2	06043	July 16, 2023
4	EM Clamp	FCC	F-203I-23MM	504	July 16, 2023

. EMC EMISSION TEST

CONDUCTED EMISSION MEASUREMENT

POWER LINE CONDUCTED EMISSION (Frequency Range 150KHz-30MHz)

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *
0.50 -5.0	73.00	60.00	56.00	46.00
5.0 -30.0	73.00	60.00	60.00	50.00

Note:

(1) The tighter limit applies at the band edges.

(2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

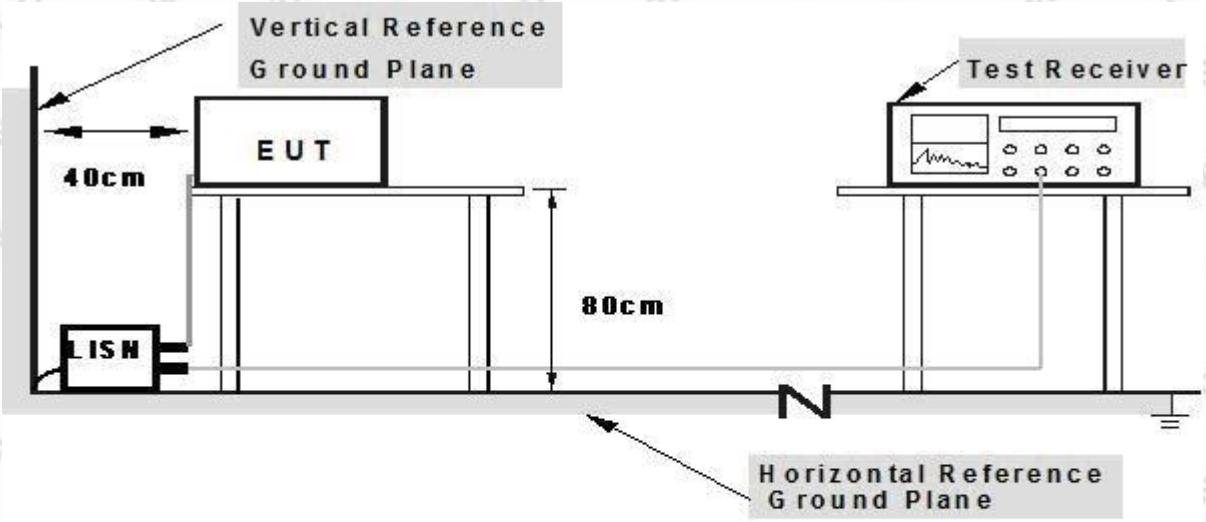
The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

TEST PROCEDURE

a. The EUT was placed 0.4 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
d. LISN at least 80 cm from nearest part of EUT chassis.
e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

TEST SETUP



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

EUT OPERATING CONDITIONS

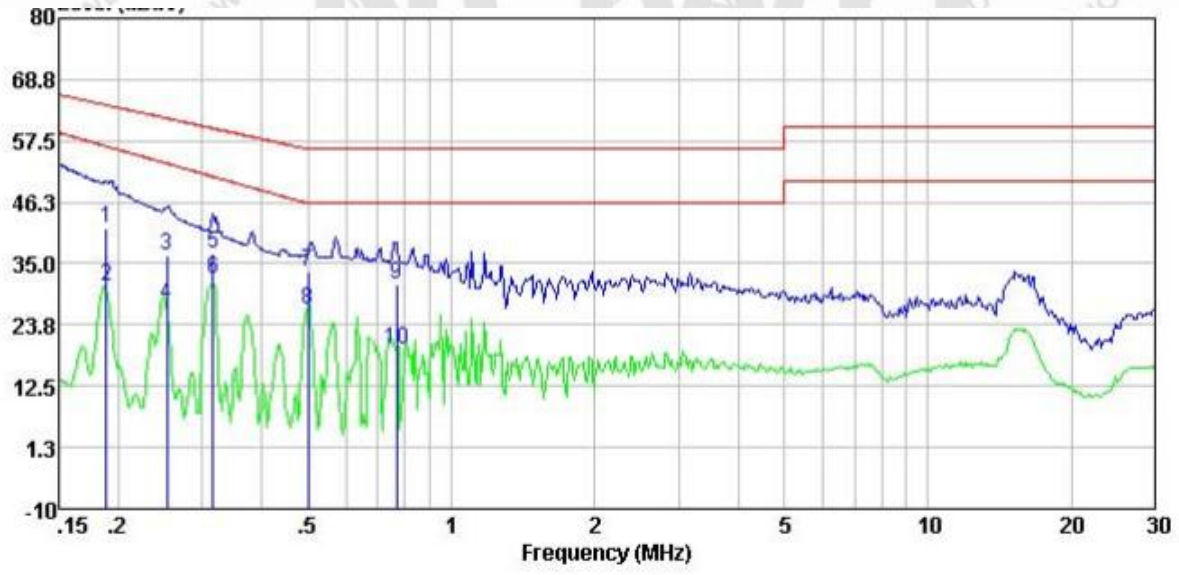
The EUT tested system was configured as the statements of **2.3** Unless otherwise a special operating condition is specified in the follows during the testing.

TEST RESULTS

EUT：	Three Phase Smart Energy Meter	Model Name. ：	DTZY1218
Temperature：	22 ℃	Relative Humidity：	52%
Pressure：	1010hPa	Test Date：	2022-12-01
Test Mode：	Mode 1	Phase：	L
Test Voltage ：	230V~		

	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.188	31.26	10.07	0.01	41.34	64.11	-22.77	QP
2	0.188	20.88	10.07	0.01	30.96	56.54	-25.58	Average
3	0.253	26.47	10.01	0.01	36.49	61.64	-25.15	QP
4	0.253	17.46	10.01	0.01	27.48	53.34	-25.86	Average
5	0.317	26.92	9.98	0.01	36.91	59.80	-22.89	QP
6	0.317	22.14	9.98	0.01	32.13	50.93	-18.80	Average
7	0.499	23.62	9.96	0.01	33.59	56.01	-22.42	QP
8	0.499	16.67	9.96	0.01	26.64	46.01	-19.37	Average
9	0.767	21.36	9.96	0.02	31.34	56.00	-24.66	QP
10	0.767	9.28	9.96	0.02	19.26	46.00	-26.74	Average

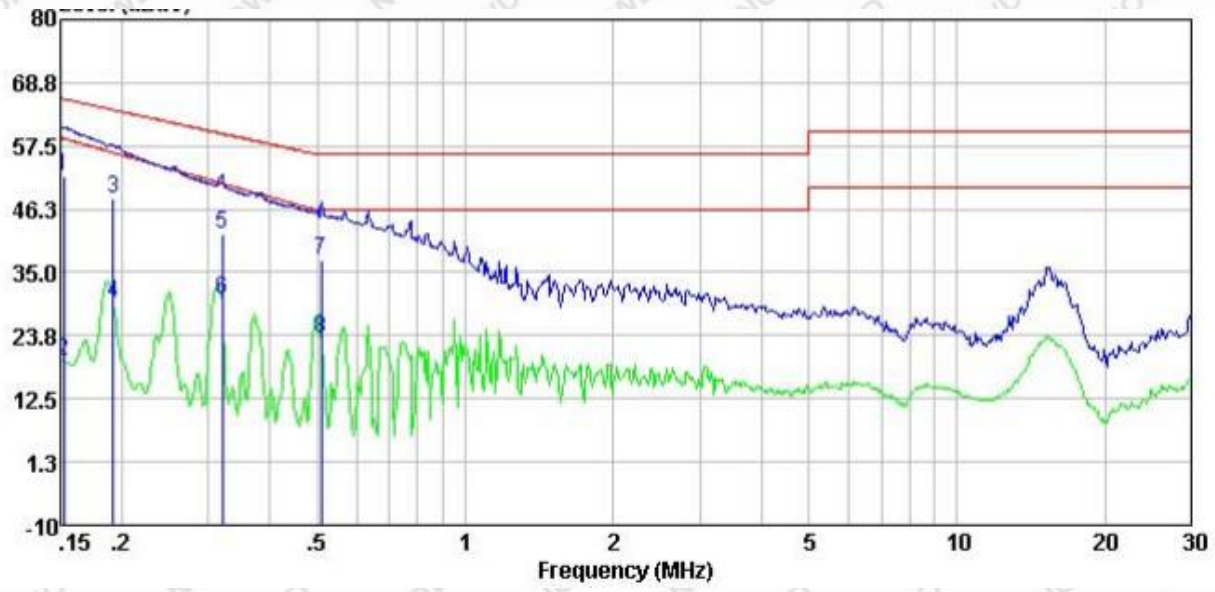
Remark:
Factor = Antenna Factor + Cable Loss.



EUT：	Three Phase Smart Energy Meter	Model Name. ：	DTZY1218
Temperature：	22 ℃	Relative Humidity：	52%
Pressure：	1010hPa	Test Date：	2022-12-01
Test Mode：	Mode 1	Phase：	N
Test Voltage ：	230V~, 50Hz		

	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.152	41.84	10.15	0.01	52.00	65.87	-13.87	QP
2	0.152	9.17	10.15	0.01	19.33	58.83	-39.50	Average
3	0.192	38.20	10.07	0.01	48.28	63.93	-15.65	QP
4	0.192	19.45	10.07	0.01	29.53	56.31	-26.78	Average
5	0.320	31.85	9.97	0.01	41.83	59.71	-17.88	QP
6	0.320	20.22	9.97	0.01	30.20	50.82	-20.62	Average
7	0.510	27.19	9.96	0.01	37.16	56.00	-18.84	QP
8	0.510	13.13	9.96	0.01	23.10	46.00	-22.90	Average

Remark:
Factor = Antenna Factor + Cable Loss.



RADIATED EMISSION MEASUREMENT

LIMITS OF RADIATED EMISSION MEASUREMENT (Below 1000MHz)

FREQUENCY (MHz)	Class A		Class B	
	At 10m	At 3m	At 10m	At 3m
	dBuV/m	dBuV/m	dBuV/m	dBuV/m
30 – 230	40	50	30	40
230 – 1000	47	57	37	47

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Class A (at 3m) dBuV/m		Class B (at 3m) dBuV/m	
	Peak	Avg	Peak	Avg
1000-3000	76	56	70	50
3000-6000	80	60	74	54

Notes:

(1) The limit for radiated test was performed according to as following: CISPR 22.

(2) The tighter limit applies at the band edges.

(3) Emission level (dBuV/m)=20log Emission level (uV/m).

TEST PROCEDURE

a. The measuring distance of at 10 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.

b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.

c. The height of the equipment or of the substitution antenna shall be 0.8 m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

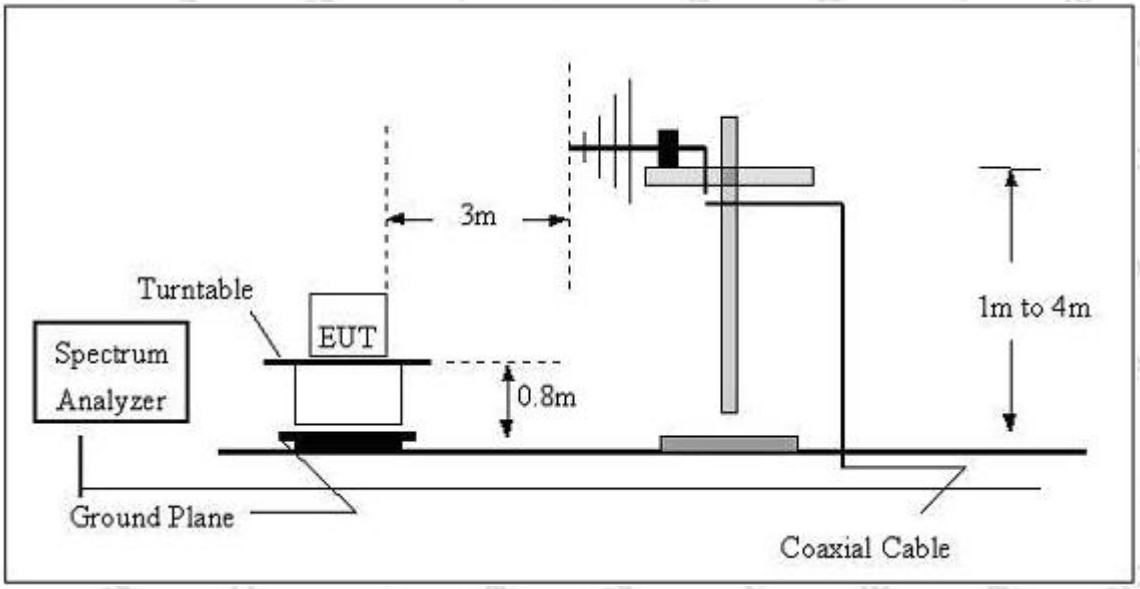
d. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured, above 1G Average detector mode will be instead.

e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP(AV) Limits and then no additional QP Mode measurement performed.

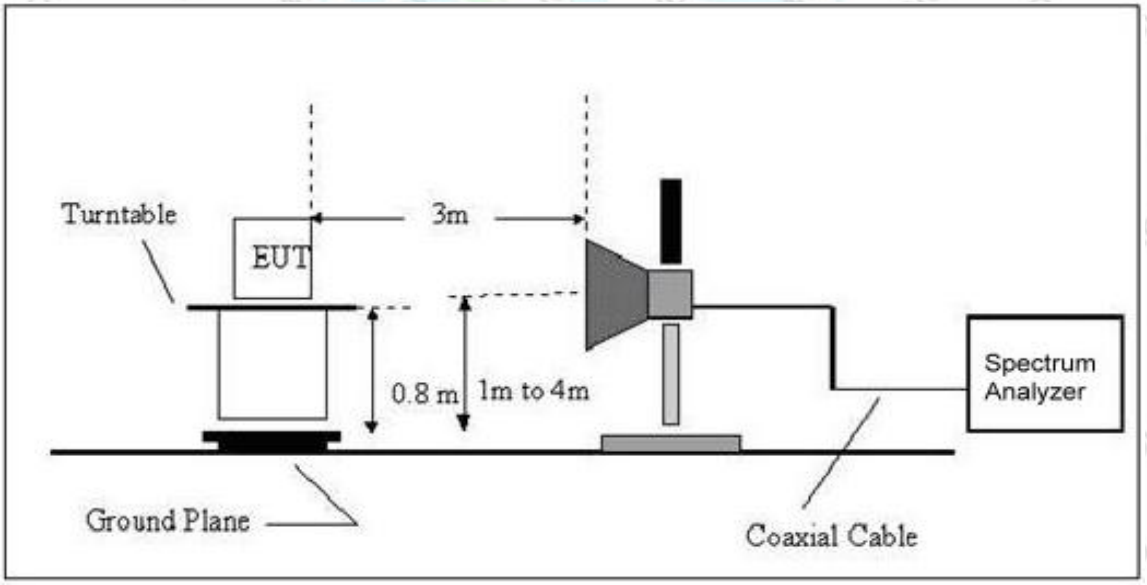
f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

TEST SETUP

(A) Radiated Emission Test Set-Up Frequency Below 1 GHz



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



EUT OPERATING CONDITIONS

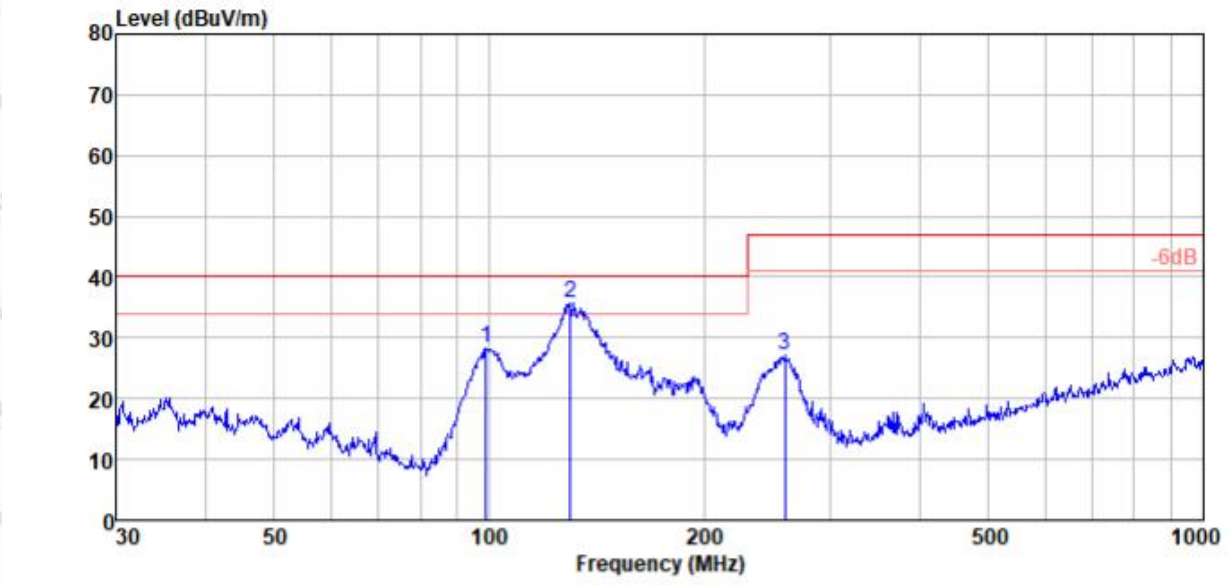
The EUT tested system was configured as the statements of **2.3** Unless otherwise a special operating condition is specified in the follows during the testing.

TEST RESULTS

EUT：	Three Phase Smart Energy Meter	Model Name ：	DTZY1218
Temperature：	23.2 ℃	Relative Humidity：	52%
Pressure：	1010 hPa	Test Date：	2022-12-01
Test Mode ：	Mode 1	Polarization：	Horizontal
Test Power ：	230V~, 50Hz		

	Freq	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	98.833	54.71	9.03	36.71	1.18	28.21	40.00	-11.79	Peak
2 !	129.923	59.54	11.63	36.95	1.44	35.66	40.00	-4.34	Peak
3	259.234	51.25	11.08	37.39	2.17	27.11	47.00	-19.89	Peak

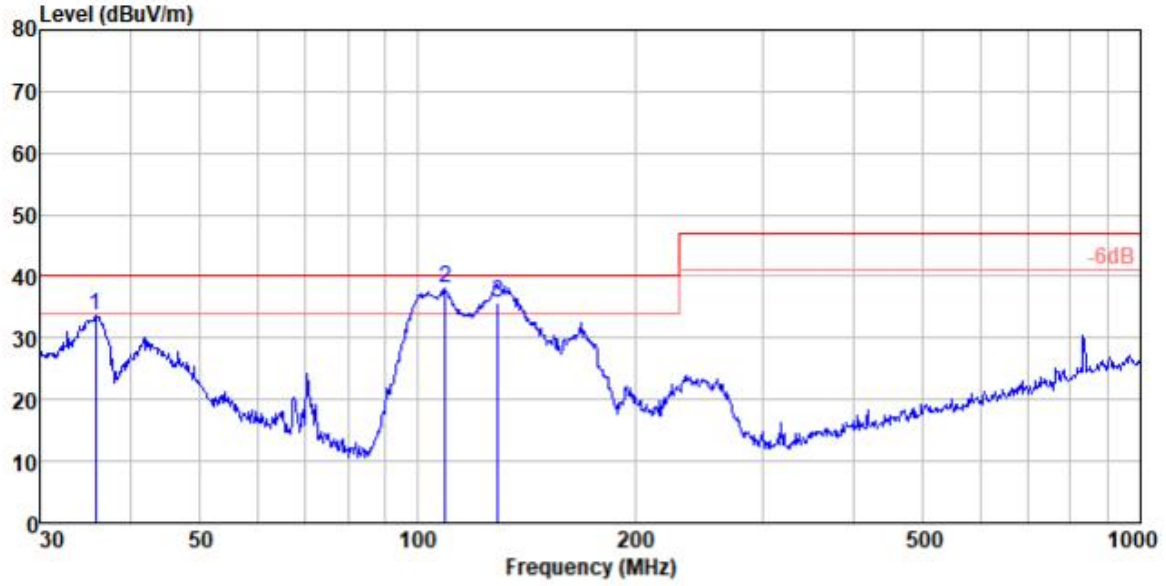
Remark:
Factor = Antenna Factor + Cable Loss.



EUT：	Three Phase Smart Energy Meter	Model Name ：	DTZY1218
Temperature：	23.2 ℃	Relative Humidity：	52%
Pressure：	1010 hPa	Test Date：	2022-12-01
Test Mode ：	Mode 1	Polarization：	Vertical
Test Power ：	230V~, 50Hz		

	Freq	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	35.875	55.51	12.85	35.41	0.62	33.57	40.00	-6.43	Peak
2 !	109.029	63.09	10.41	36.80	1.27	37.97	40.00	-2.03	Peak
3 !	129.015	59.50	11.76	36.94	1.43	35.75	40.00	-4.25	QP

Remark:
Factor = Antenna Factor + Cable Loss.



TEST RESULTS (1000~6000MHz)

EUT：	Three Phase Smart Energy Meter	Model Name ：	DTZY1218
Temperature：	23.2 ℃	Relative Humidity：	52%
Pressure：	1010 hPa	Test Date :	N/A
Test Mode ：	N/A	Polarization :	N/A
Test Power ：	N/A		

Remark:
The oscillation frequency of the product is lower than 108MHz, it does not apply

HARMONICS CURRENT

LIMITS OF HARMONICS CURRENT

IEC 555-2					
Table - I			Table - II		
Equipment Category	Harmonic Order n	Max. Permissible Harmonic Current (in Ampers)	Equipment Category	Harmonic Order n	Max. Permissible Harmonic Current (in Ampers)
Non Portable Tools or TV Receivers	Odd Harmonics		TV Receivers	Odd Harmonics	
	3	2.30		3	0.80
	5	1.14		5	0.60
	7	0.77		7	0.45
	9	0.40		9	0.30
	11	0.33		11	0.17
	13	0.21		13	0.12
	15≤n≤39	0.15 · 15/n		15≤n≤39	0.10 · 15/n
	Even Harmonics			Even Harmonics	
	2	1.08		2	0.30
	4	0.43		4	0.15
	8	0.30			
	8≤n≤40	0.23 · 8/n		DC	0.05

EN 61000-3-2/IEC 61000-3-2					
Equipment Category	Max. Permissible Harmonic Current (in Ampers)	Equipment Category	Harmonic Order n	Max. Permissible Harmonic Current (in A)	(mA/w)
Class A	Same as Limits Specified in 4-2.1, Table - I, but only odd harmonics required	Class D	3	2.30	3.4
			5	1.14	1.9
			7	0.77	1.0
			9	0.40	0.5
			11	0.33	0.35
			13≤n≤39	see Table I	3.85/n
			only odd harmonics required		

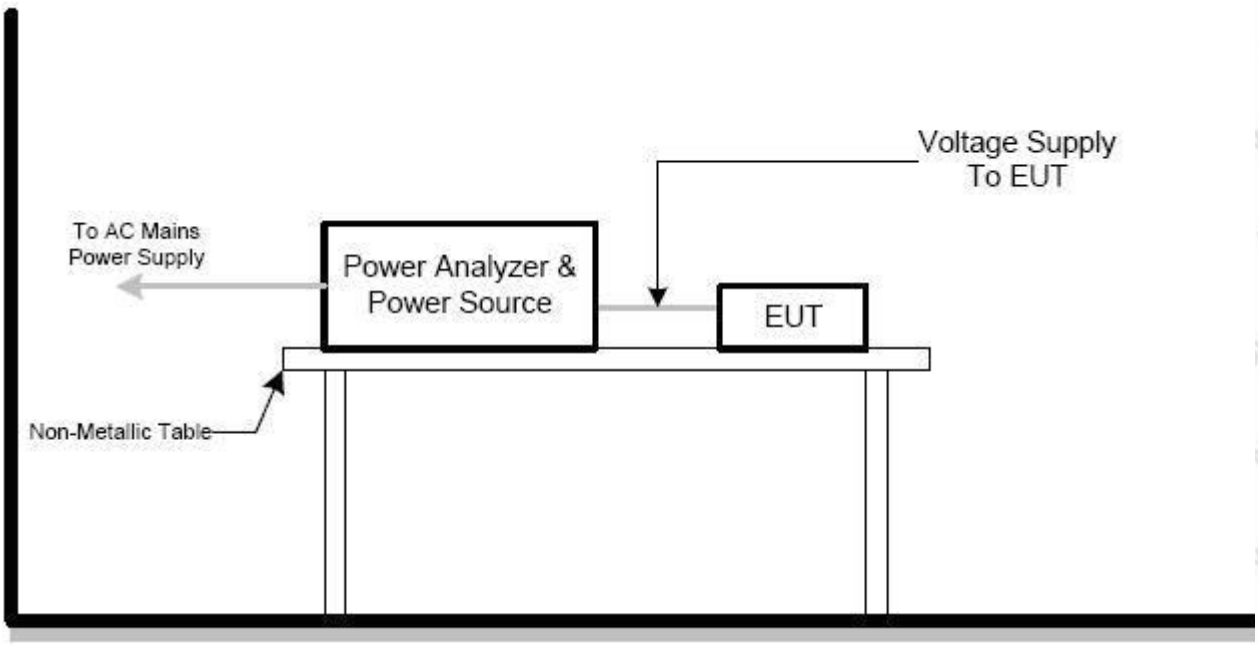
TEST PROCEDURE

a. The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the maximum harmonic components under normal operating conditions.
b. The classification of EUT is according to section 5 of EN 61000-3-2. The EUT is classified as follows:
Class A: Balanced three-phase equipment, Household appliances excluding equipment as Class D, Tools excluding portable tools, Dimmers for incandescent lamps, audio equipment, equipment not specified in one of the three other classes.
Class B: Portable tools. Portable tools.; Arc welding equipment which is not professional equipment.
Class C: Lighting equipment.
Class D: Equipment having a specified power less than or equal to600 W of the following types: Personal computers and personal computer monitors and television receivers.
c. The correspondent test program of test instrument to measure the current harmonics emanated from EUT is chosen. The measure time shall be not less than the time necessary for the EUT to be exercised.

EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of **2.3** Unless otherwise a special operating condition is specified in the follows during the testing.

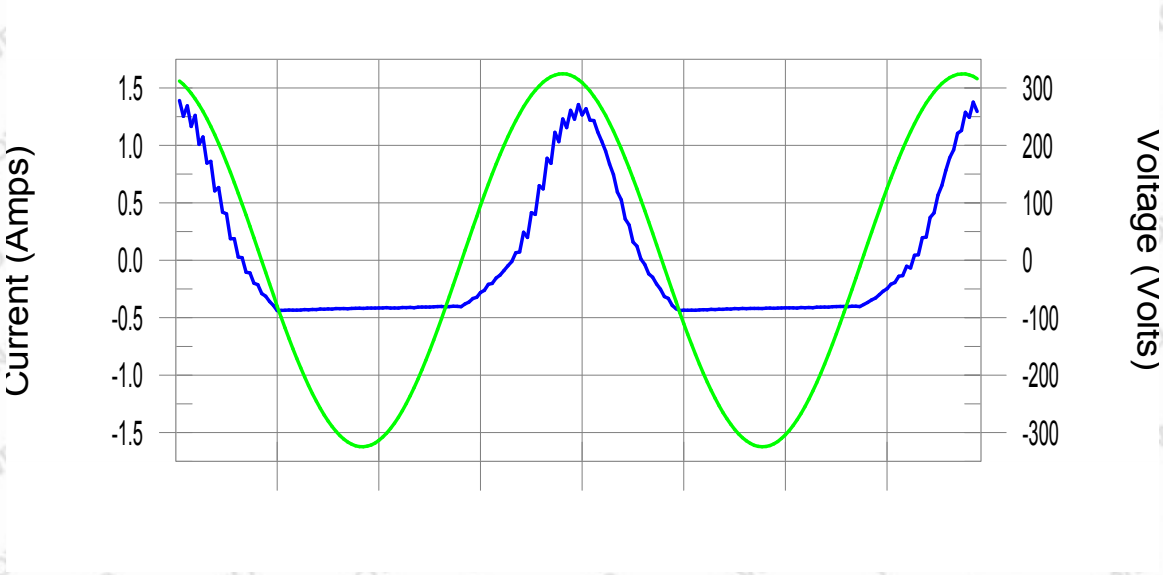
TEST SETUP



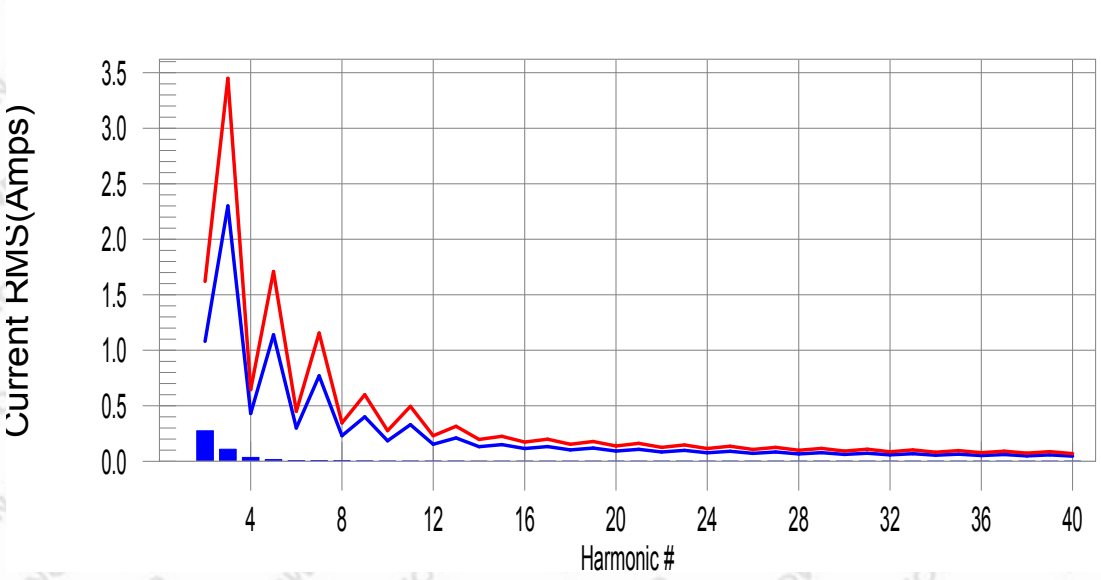
TEST RESULTS

EUT：	Three Phase Smart Energy Meter	Model Name ：	DTZY1218
Temperature：	23.2 ℃	Relative Humidity：	52%
Pressure：	1010 hPa	Test Date：	2022-12-01
Test Mode ：	Model 1		
Test Power ：	230V~, 50Hz		

Current & voltage waveforms



Harmonics and Class A limit line European Limits



Test result: Pass Worst harmonic was #2 with 22.83% of the limit.

VOLTAGE FLUCTUATION AND FLICKERS

LIMITS OF VOLTAGE FLUCTUATION AND FLICKERS

Tests	Limits		Descriptions
	IEC555-3	IEC/EN 61000-3-3	
Pst	≤ 1.0, Tp= 10 min.	≤ 1.0, Tp= 10 min.	Short Term Flicker Indicator
Plt	N/A	≤ 0.65, Tp=2 hr.	Long Term Flicker Indicator
dc	≤ 3%	≤ 3.3%	Relative Steady-State V-Chang
dmax	≤ 4%	≤ 4%	Maximum Relative V-change
d (t)	N/A	≤ 3.3% for > 500 ms	Relative V-change characteristic

TEST PROCEDURE

a. Harmonic Current Test:
Test was performed according to the procedures specified in Clause 5.0 of IEC555-2 and/or Sub-clause 6.2 of IEC/EN 61000-3-2 depend on which standard adopted for compliance measurement.

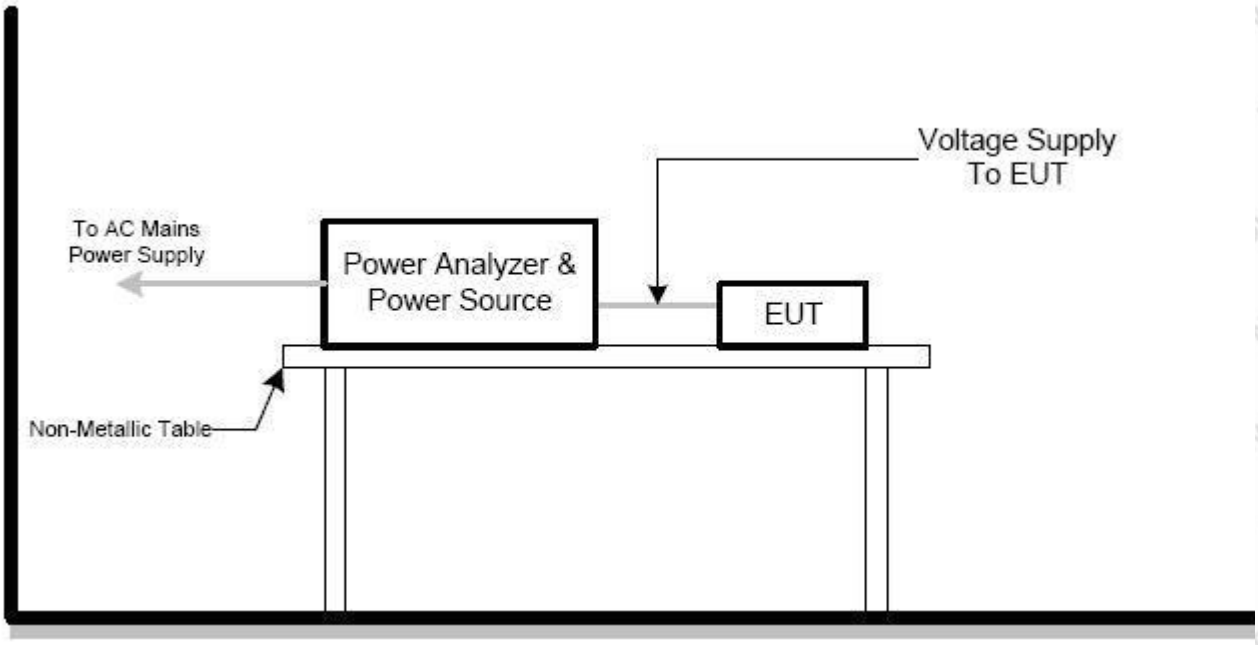
b. Fluctuation and Flickers Test:
Tests was performed according to the Test Conditions/Assessment of Voltage Fluctuations specified in Clause 5.0/6.0 of IEC555-3 and/or Clause 6.0/4.0 of IEC/EN 61000-3-3 depend on which standard adopted for compliance measurement.

c. All types of harmonic current and/or voltage fluctuation in this report are assessed by direct measurement using flicker-meter.

EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of **2.3** Unless otherwise a special operating condition is specified in the follows during the testing.

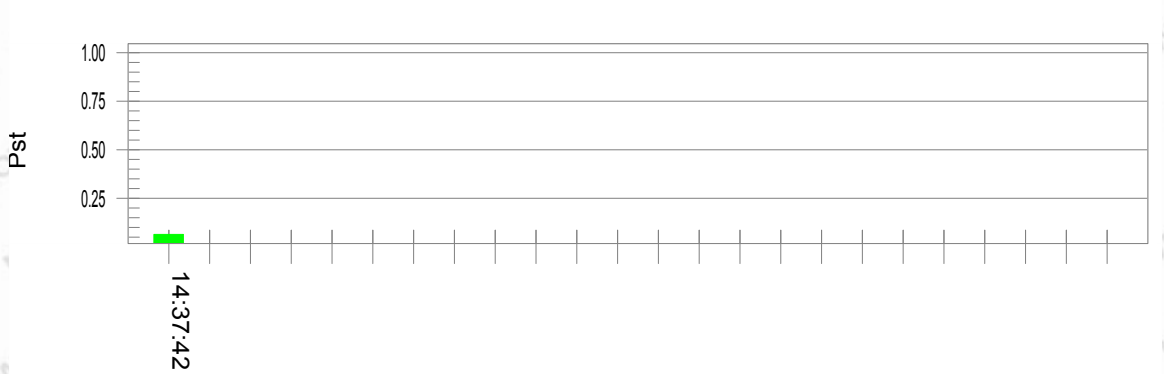
TEST SETUP



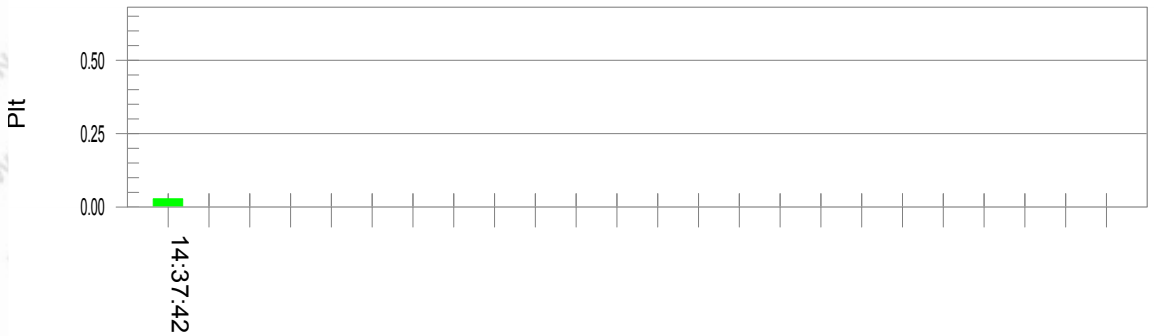
TEST RESULTS

EUT：	Three Phase Smart Energy Meter	Model Name ：	DTZY1218
Temperature：	23.2 ℃	Relative Humidity：	52%
Pressure：	1010 hPa	Test Date：	N/A
Test Mode ：	N/A		
Test Power ：	N/A		

Pst and limit line European Limits



Plt and limit line



Parameter values recorded during the test:
Vrms at the end of test (Volt): 229.85

Highest dt (%):	0.00	Test limit (%):	3.30	Pass
Time(mS) > dt:	0.0	Test limit (mS):	500.0	Pass
Highest dc (%):	0.00	Test limit (%):	3.30	Pass
Highest dmax (%):	0.00	Test limit (%):	4.00	Pass
Highest Pst (10 min. period):	0.064	Test limit:	1.000	Pass
Highest Plt (2 hr. period):	0.028	Test limit:	0.650	Pass

. EMC IMMUNITY TEST

STANDARD COMPLIANCE/SERVRITY LEVEL/CRITERIA

Tests Standard No.	TEST SPECIFICATION	Test Mode Test Ports	Perform. Criteria
1. ESD IEC/EN 61000-4-2	8KV air discharge 4KV contact discharge	Direct Mode	B
	4KV HCP discharge 4KV VCP discharge	Indirect Mode	B
2. RS IEC/EN 61000-4-3	80 MHz to 1000 MHz, 1000Hz, 80%, AM modulated	Enclosure	A
3. EFT/Burst IEC/EN 61000-4-4	5/50ns Tr/Th 5KHz Repetition Freq.	Power Supply Port	B
	5/50ns Tr/Th 5KHz Repetition Freq.	CTL/Signal Data Line Port	B
4. Surges IEC/EN 61000-4-5	1.2/50(8/20) Tr/Th us	L-N	B
	1.2/50(8/20) Tr/Th us	L-PE N-PE	B
5 Injected Current IEC/EN 61000-4-6	0.15 MHz to 80 MHz, 1000Hz 80%， AM Modulated 150Ω source impedance	CTL/Signal Port	A
	0.15 MHz to 80 MHz, 1000Hz 80%， AM Modulated 150Ω source impedance	AC Power Port	A
	0.15 MHz to 80 MHz, 1000Hz 80%， AM Modulated 150Ω source impedance	DC Power Port	A
6. Power Frequency Magnetic Field IEC/EN 61000-4-8	50 Hz,	Enclosure	A
7. Volt. Interruptions Volt. Dips IEC/EN 61000-4-11	Voltage dip 100% Voltage dip 30% Interruption 100%	AC Power Port	B C C

GENERAL PERFORMANCE CRITERIA

According to **EN 61000-6-1** standard, the general performance criteria as following:

Criterion A	The equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.
Criterion B	After the test, the equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by the manufacturer, when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is allowed. However, no change of operating state or stored data is allowed to persist after the test.
Criterion C	Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions. Functions, and/or information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

GENERAL PERFORMANCE CRITERIA TEST SETUP

The EUT tested system was configured as the statements of **2.3** Unless otherwise a special operating condition is specified in the follows during the testing.

ESD TESTING

TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-2
Discharge Impedance:	330 ohm / 150 pF
Required Performance	B
Discharge Voltage:	Air Discharge：2kV/4kV/8kV (Direct) Contact Discharge：2kV/4kV (Direct/Indirect)
Polarity:	Positive & Negative
Number of Discharge:	Air Discharge: min. 20 times at each test point Contact Discharge: min. 200 times in total
Discharge Mode:	Single Discharge
Discharge Period:	1 second minimum

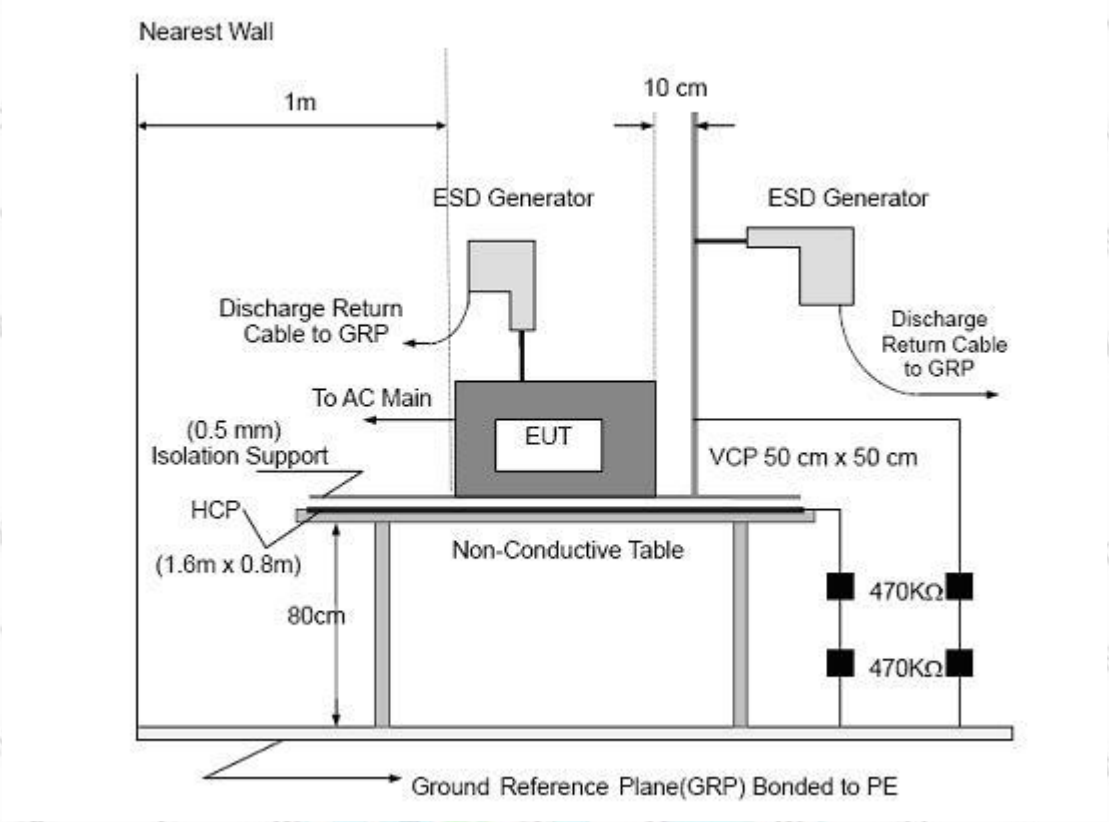
TEST PROCEDURE

The test generator necessary to perform direct and indirect application of discharges to the EUT in the following manner:

a. Contact discharge was applied to conductive surfaces and coupling planes of the EUT. During the test, it was performed with single discharges. For the single discharge time between successive single discharges was at least 1 second. The EUT shall be exposed to at least 200 discharges, 100 each at negative and positive polarity, at a minimum of four test points. One of the test points shall be subjected to at least 50 indirect discharges to the center of the front edge of the horizontal coupling plane. The remaining three test points shall each receive at least 50 direct contact discharges.
If no direct contact test points are available, then at least 200 indirect discharges shall be applied in the indirect mode. Test shall be performed at a maximum repetition rate of one discharge per second.
Vertical Coupling Plane (VCP):
The coupling plane, of dimensions 0.5m x 0.5m, is placed parallel to, and positioned at a distance 0.1m from, the EUT, with the Discharge Electrode touching the coupling plane. The four faces of the EUT will be performed with electrostatic discharge.
Horizontal Coupling Plane (HCP):
The coupling plane is placed under to the EUT. The generator shall be positioned vertically at a distance of 0.1m from the EUT, with the Discharge Electrode touching the coupling plane. The four faces of the EUT will be performed with electrostatic discharge.

b. Air discharges at insulation surfaces of the EUT.
It was at least ten single discharges with positive and negative at the same selected point.

TEST SETUP



Note:

TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table 0.8 meters high standing on the Ground Reference Plane. The GRP consisted of a sheet of aluminum at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system. A Horizontal Coupling Plane (1.6m x 0.8m) was placed on the table and attached to the GRP by means of a cable with 940k total impedance. The equipment under test, was installed in a representative system as described in section 7 of IEC /EN 61000-4-2, and its cables were placed on the HCP and isolated by an insulating support of 0.5mm thickness. A distance of1-meter minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

FLOOR-STANDING EQUIPMENT

The equipment under test was installed in a representative system as described in section 7 of IEC/EN 61000-4-2, and its cables were isolated from the Ground Reference Plane by an insulating support of0.1-meter thickness. The GRP consisted of a sheet of aluminum that is at least 0.25mm thick, and 2.5meters square connected to the protective grounding system and extended at least 0.5 meters from the EUT on all sides.

TEST RESULTS

EUT：	Three Phase Smart Energy Meter	Model Name ：	DTZY1218
Temperature：	23.5 ℃	Relative Humidity：	45%
Pressure：	1010 hPa	Test Date：	2022-12-01
Test Mode ：	Mode 1		
Test Power ：	230V~, 50Hz		

Mode	Air Discharge								Contact Discharge								Criterion	Result
Test level (kV)	4		8		10		15		2		4		6		8			
Test Location	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-		
HCP									A	A	A	A					B	PASS
VCP									A	A	A	A						PASS
Slot	A	A	A	B														PASS
Panel	A	A	A	B														PASS
Metal Part									A	A	A	A						PASS
Display	A	A	A	B														PASS

Note:

1) +/- denotes the Positive/Negative polarity of the output voltage.
2) Test condition:
   Direct / Indirect (HCP/VCP) discharges: Minimum 50 times (Positive/Negative) at each point. Air discharges: Minimum 10 times (Positive/Negative) at each point.
3) Test location(s) in which discharge (Air and contact discharge) to be applied illustrated by photos shown in next page(s)
4) The Indirect (HCP/VCP) discharges description of test point as following:
   1.left side 2.right side 3.front side 4.rear side
5) N/A - denotes test is not applicable in this test report

RS TESTING

TEST SPECIFICATION

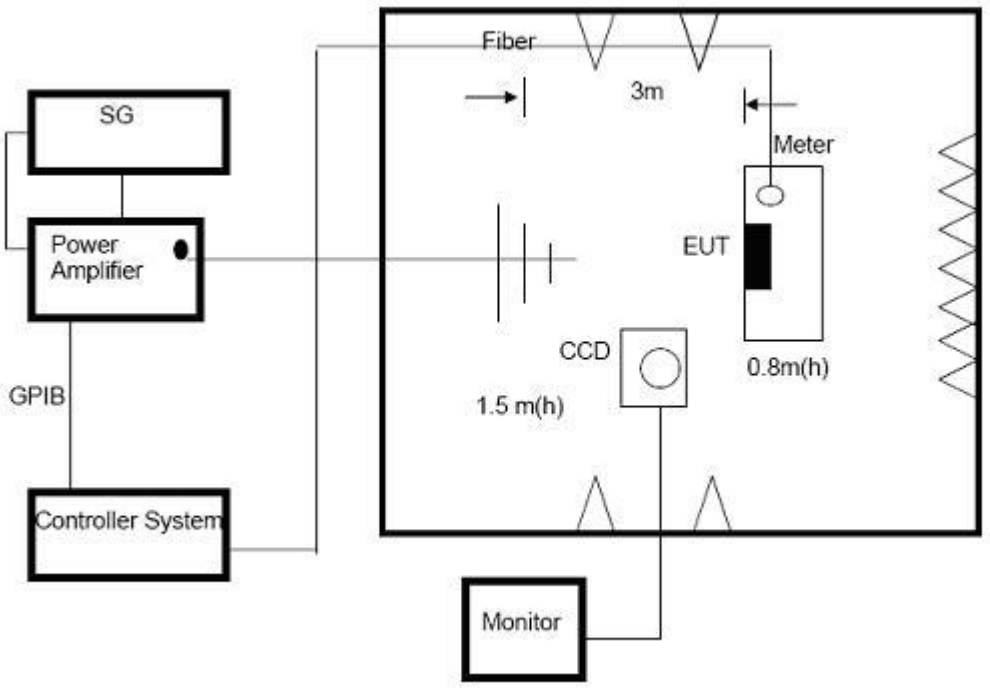
Basic Standard:	IEC/EN 61000-4-3
Required Performance	A
Frequency Range:	80 MHz - 1000 MHz
Field Strength:	3 V/m
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of fundamental
Polarity of Antenna:	Horizontal and Vertical
Test Distance:	3 m
Antenna Height:	1.5 m
Dwell Time:	at least 3 seconds

TEST PROCEDURE

The EUT and support equipment, which are placed on a table that is 0.8 meter above ground and the testing was performed in a fully-anechoic chamber.
The testing distance from antenna to the EUT was 3 meters.
The other condition as following manner:

a. The frequency range is swept from 80 MHz to 1000 MHz, & 1400MHz - 2700MHz with the signal 80%amplitude modulated with a 1kHz sine wave. The rate of sweep did not exceed 1.5x 10-3 decade/s. Where the frequency range is swept incrementally, the step size was 1% of fundamental.
b. Sweep Frequency 900 MHz, with the Duty Cycle:1/8 and Modulation: Pulse 217 Hz(if applicable)
c. The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.
d. The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

TEST SETU



Note:

TABLE-TOP EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC/EN 61000-4-3 was placed on a non-conductive table 0.8 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

FLOOR-STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC/EN 61000-4-3 was placed on a non-conductive wood support 0.1 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

TEST RESULTS

EUT：	Three Phase Smart Energy Meter	Model Name ：	DTZY1218
Temperature：	23.5 ℃	Relative Humidity：	60%
Pressure：	1010 hPa	Test Date：	2022-12-01
Test Mode ：	Mode 1		
Test Power ：	230V~, 50Hz		

Frequency Range (MHz)	RF Field Position	R.F. Field Strength	Azimuth	Perform. Criteria	Results	Judgment
80MHz - 1000MHz	H / V	3 V/m (rms) AM Modulated 1000Hz, 80%	Front	**A**	**A**	**PASS**
			Rear			
			Left			
			Right			

Note:

1) N/A - denotes test is not applicable in this test report.
2) Criteria A: There was no change operated with initial operating during the test.
3) Criteria B: The EUT function loss during the test, but self-recoverable after the test.
4) Criteria C: The system shut down during the test.

EFT/BURST TESTING

TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-4
Required Performance	B
Test Voltage:	Power Line：1 kV Signal/Control Line：0.5 KV
Polarity:	Positive & Negative
Impulse Frequency:	5 kHz
Impulse Wave shape :	5/50 ns
Burst Duration:	15 ms
Burst Period:	300 ms
Test Duration:	Not less than 1 min.

TEST PROCEDURE

The EUT and support equipment, are placed on a table that is 0.8 meter above a metal ground plane measured 1m*1m min. and 0.65mm thick min.

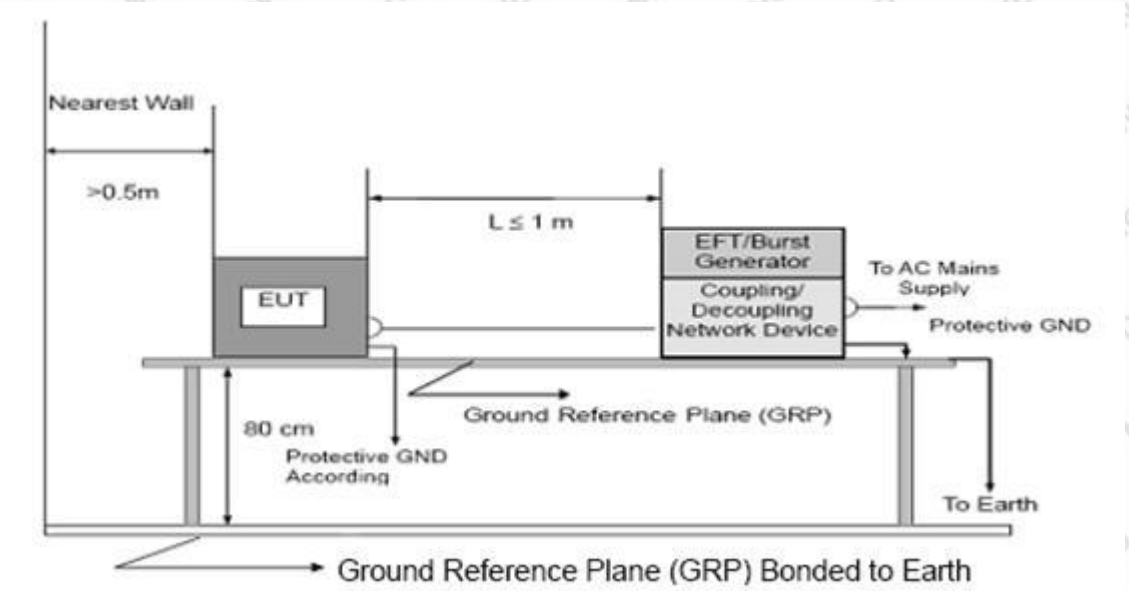
The other condition as following manner:

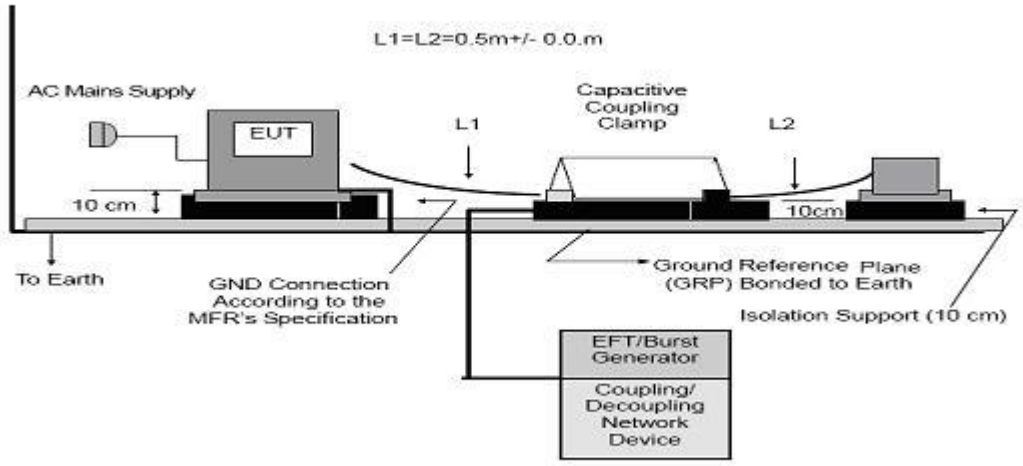
a. The length of power cord between the coupling device and the EUT should not exceed 1 meter.

b. Both positive and negative polarity discharges were applied.

c. The duration time of each test sequential was 1 minute

TEST SETUP





Note:

TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table (0.8m high) standing on the Ground Reference Plane. The GRP consisted of a sheet of aluminum (at least 0.25mm thick and 2.5m square) connected to the protective grounding system. A minimum distance of 0.5m was provided between the EUT and the walls of the laboratory or any other metallic structure.

FLOOR-STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC/EN 61000-4-4 and its cables, were isolated from the Ground Reference Plane by an insulating support that is 0.1-meter thick. The GRP consisted of a sheet of aluminum (at least 0.25mm thick and 2.5m square) connected to the protective grounding system.

TEST RESULTS

EUT：	Three Phase Smart Energy Meter	Model Name ：	DTZY1218
Temperature：	23.5 ℃	Relative Humidity：	60%
Pressure：	1010 hPa	Test Date：	2022-12-01
Test Mode ：	Mode 1		
Test Power ：	230V~, 50Hz		

Coupling Line		Test level (kV)								Criterion	Result
		0.5		1		2		4			
		+	-	+	-	+	-	+	-		
AC line	L	A	A	A	A					A	**PASS**
	N	A	A	A	A						**PASS**
	PE	A	A	A	A						**PASS**
	L+N	A	A	A	A						**PASS**
	L+PE	A	A	A	A						**PASS**
	N+PE	A	A	A	A						**PASS**
	L+N+PE	A	A	A	A						**PASS**
DC Line											
Signal Line											

Note:

1) +/- denotes the Positive/Negative polarity of the output voltage.

2) N/A - denotes test is not applicable in this test report

3) Criteria A: There was no change operated with initial operating during the test.

4) Criteria B: The EUT function loss during the test, but self-recoverable after the test.

5) Criteria C: The system shut down during the test.

SURGE TESTING

TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-5
Required Performance	B
Wave-Shape:	Combination Wave 1.2/50 us Open Circuit Voltage 8 /20 us Short Circuit Current
Test Voltage:	Power Line：0.5 kV, 1 kV, 2 kV
Surge Input/Output:	L-N, L-PE, N-PE
Generator Source:	2 ohm between networks
Impedance:	12 ohm between network and ground
Polarity:	Positive/Negative
Phase Angle:	0 /90/180/270°
Pulse Repetition Rate:	1 time / min. (maximum)
Number of Tests:	5 positive and 5 negative at selected points

TEST PROCEDURE

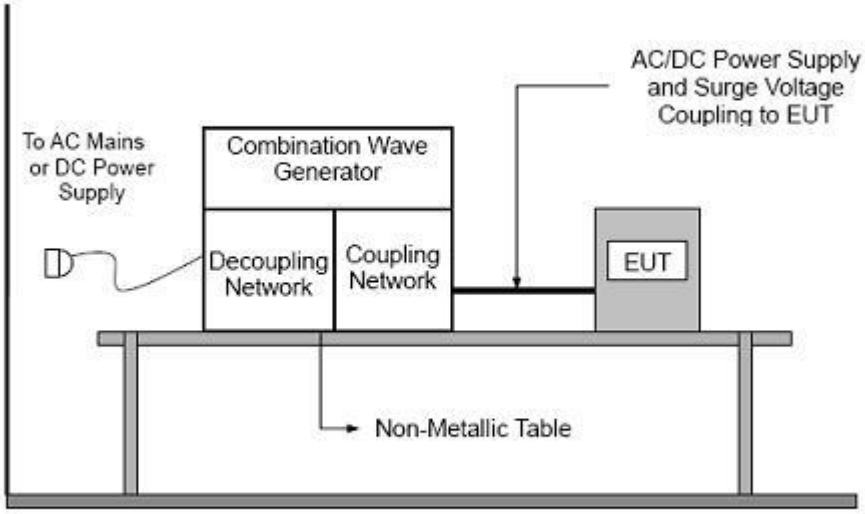
a. For EUT power supply:
The surge is to be applied to the EUT power supply terminals via the capacitive coupling network. Decoupling networks are required in order to avoid possible adverse effects on equipment not under test that may be powered by the same lines, and to provide sufficient decoupling impedance to the surge wave. The power cord between the EUT and the coupling/decoupling networks shall be 2meters in length (or shorter).

b. For test applied to unshielded unsymmetrically operated interconnection lines of EUT:
The surge is applied to the lines via the capacitive coupling. The coupling /decoupling networks shall not influence the specified functional conditions of the EUT. The interconnection line between the EUT and the coupling/decoupling networks shall be 2 meters in length (or shorter).

c. For test applied to unshielded symmetrically operated interconnection /telecommunication lines of EUT:

d. The surge is applied to the lines via gas arrestors coupling. Test levels below the ignition point of the coupling arrestor cannot be specified. The interconnection line between the EUT and the coupling/decoupling networks shall be 2 meters in length (or shorter).

TEST SETUP


AC/DC Power Supply
and Surge Voltage
Coupling to EUT
To AC Mains
or DC Power
Supply
Combination Wave
Generator
Decoupling
Network
Coupling
Network
EUT
Non-Metallic Table

TEST RESULTS

EUT：	Three Phase Smart Energy Meter	Model Name ：	DTZY1218
Temperature：	23.5 ℃	Relative Humidity：	60%
Pressure：	1010 hPa	Test Date：	2022-12-01
Test Mode ：	Mode 1		
Test Power ：	230V~, 50Hz		

Coupling Line			Test level								Criterion	Result
			0.5 kV		1 kV		2 kV		4 kV			
			+	-	+	-	+	-	+	-		
AC line	L-N	0°	A	A	B	B					B	PASS
		90°	A	A	B	B						
		180°	A	A	B	B						
		270°	A	A	B	B						
	L-PE	0°	A	A	B	B						PASS
		90°	A	A	B	B						
		180°	A	A	B	B						
		270°	A	A	B	B						
	N-PE	0°	A	A	B	B						PASS
		90°	A	A	B	B						
		180°	A	A	B	B						
		270°	A	A	B	B						
DC Line												
Signal Line												

Note:

1) Polarity and Numbers of Impulses：5 Pst / Ngt at each tested mode
2) N/A - denotes test is not applicable in this Test Report
3) Criteria A: There was no change operated with initial operating during the test.
4) Criteria B: The EUT function loss during the test, but self-recoverable after the test.
5) Criteria C: The system shut down during the test.

INJECTION CURRENT TESTING

TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-6
Required Performance	A
Frequency Range:	0.15 MHz - 80 MHz
Field Strength:	3 Vr.m.s.
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of fundamental
Dwell Time:	at least 3 seconds

TEST PROCEDURE

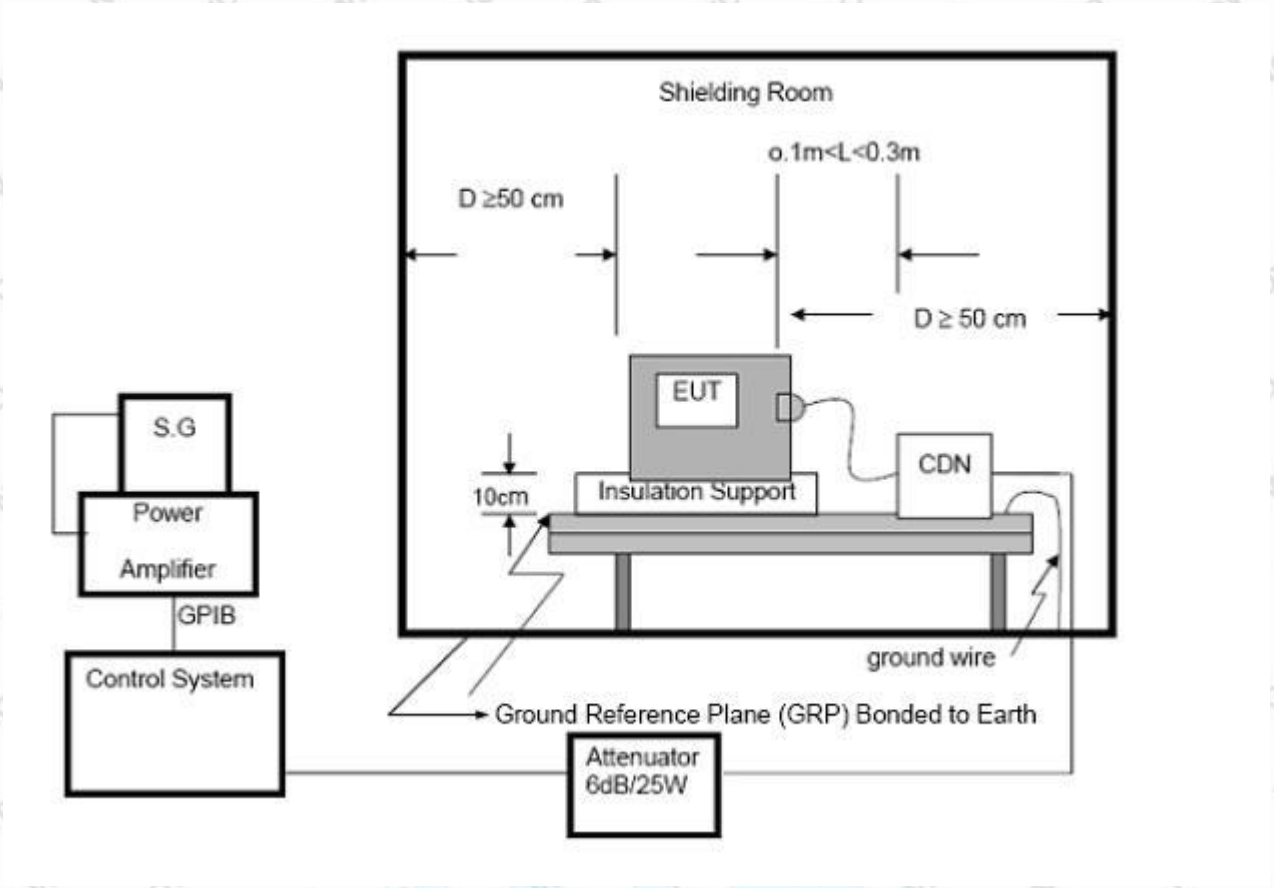
The EUT and support equipment, are placed on a table that is 0.8 meter above a metal ground plane measured 1m*1m min. and 0.65mm thick min.

The other condition as following manner:

a. The frequency range is swept from 150 KHz to 80 MHz, with the signal 80%amplitude modulated with a 1kHz sine wave. The rate of sweep did not exceed 1.5x 10-3 decade/s. Where the frequency range is swept incrementally, the step size was 1% of fundamental.

b. The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.

TEST SETUP



NOTE:

FLOOR-STANDING EQUIPMENT

The equipment to be tested is placed on an insulating support of 0.1 meters height above a ground reference plane. All relevant cables shall be provided with the appropriate coupling and decoupling devices at a distance between 0.1 meters and 0.3 meters from the projected geometry of the EUT on the ground reference plane.

TEST RESULTS

EUT：	Three Phase Smart Energy Meter	Model Name ：	DTZY1218
Temperature：	23.5 ℃	Relative Humidity：	60%
Pressure：	1010 hPa	Test Date：	2022-12-01
Test Mode ：	Mode 1		
Test Power ：	230V~, 50Hz		

Test Ports (Mode)	Freq. Range MHz)	Field Strength	Perform. Criteria	Results	Judgment
Input/ Output AC. Power Port	0.15 ---80	3V (rms) AM Modulated 1000Hz, 80%	**A**	**A**	**PASS**
Input/ Output DC. Power Port	0.15 --- 80		**A**	**N/A**	**N/A**
Signal Line	0.15 --- 80		**A**	**N/A**	**N/A**

Note:

1) N/A - denotes test is not applicable in this Test Report.
2) Criteria A: There was no change operated with initial operating during the test.
3) Criteria B: The EUT function loss during the test, but self-recoverable after the test.
4) Criteria C: The system shut down during the test.

POWER FREQUENCY MAGNETIC FIELD TESTING

TEST SPECIFICATION

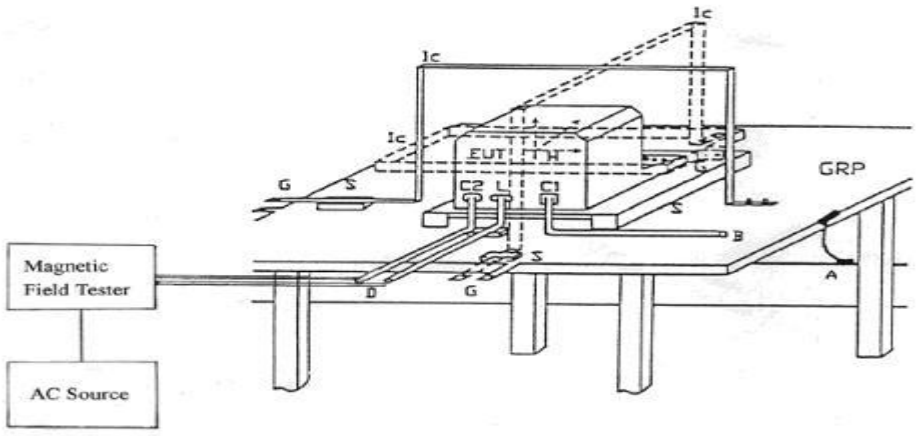
Basic Standard:	IEC/EN 61000-4-8
Required Performance	A
Frequency Range:	50Hz
Field Strength:	1 A/m
Observation Time:	1 minute
Inductance Coil:	Rectangular type, 1mx1m

TEST PROCEDURE

The EUT and support equipment, are placed on a table that is 0.8 meter above a metal ground plane measured 1m*1m min. and 0.65mm thick min.
The other condition as following manner:

a. The equipment cabinets shall be connected to the safety earth directly on the GRP via the earth terminal of the EUT.
b. The cables supplied or recommended by the equipment manufacturer shall be used. 1 meter of all cables used shall be exposed to the magnetic field.

TEST SETUP



Note:

TABLE-TOP EQUIPMENT

The equipment shall be subjected to the test magnetic field by using the induction coil of standard dimension (1 m x 1 m). The induction coil shall then be rotated by 90 degrees in order to expose the EUT to the test field with different orientations.

FLOOR-STANDING EQUIPMENT

The equipment shall be subjected to the test magnetic field by using induction coils of suitable dimensions. The test shall be repeated by moving and shifting the induction coils, in order to test the whole volume of the EUT for each orthogonal direction. The test shall be repeated with the coil shifted to different positions along the side of the EUT, in steps corresponding to 50 % of the shortest side of the coil. The induction coil shall then be rotated by 90 degrees in order to expose the EUT to the test field with different orientations.

TEST RESULTS

EUT：	Three Phase Smart Energy Meter	Model Name ：	DTZY1218
Temperature：	23.5 ℃	Relative Humidity：	60%
Pressure：	1010 hPa	Test Date：	2022-12-01
Test Mode ：	Mode 1		
Test Power ：	230V~, 50Hz		

Test Mode	Test Level	COMPUTER CASE aspect	Duration (s)	Perform Criteria	Results	Judgment
Enclosure	1 A/m	X	60 s	**A**	**A**	**Pass**
Enclosure	1 A/m	Y	60 s	**A**	**A**	**Pass**
Enclosure	1 A/m	Z	60 s	**A**	**A**	**Pass**

Note:

1) N/A - denotes test is not applicable in this test report
2) Criteria A: There was no change operated with initial operating during the test.
3) Criteria B: The EUT function loss during the test, but self-recoverable after the test.
4) Criteria C: The system shut down during the test.

VOLTAGE INTERRUPTION/DIPS TESTING

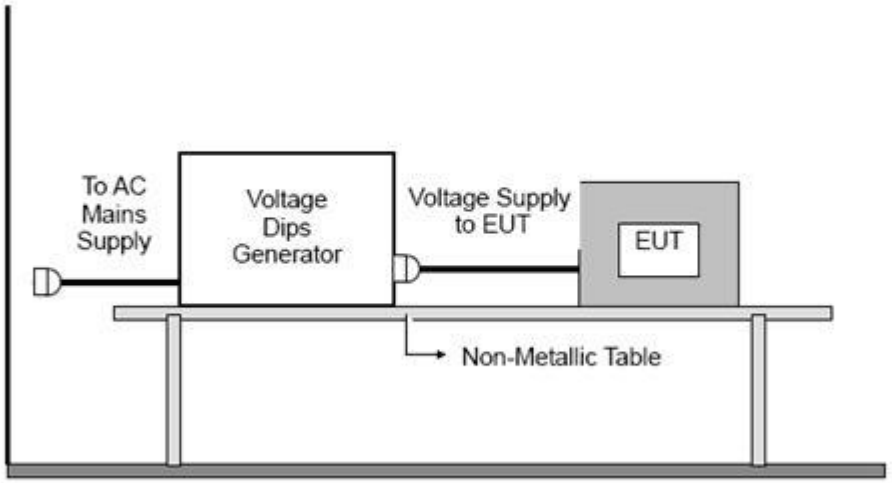
TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-11
Required Performance	B (For 100% Voltage Dips) C (For 30% Voltage Dips) C (For 100% Voltage Interruptions)
Test Duration Time:	Minimum three test events in sequence
Interval between Event:	Minimum ten seconds
Phase Angle:	0°/45°/90°/135°/180°/225°/270°/315°/360°
Test Cycle:	3 times

TEST PROCEDURE

The EUT shall be tested for each selected combination of test levels and duration with a sequence of three dips/interruptions with intervals of 10 s minimum (between each test event). Each representative mode of operation shall be tested. Abrupt changes in supply voltage shall occur at zero crossings of the voltage waveform.

TEST SETUP



TEST RESULTS

EUT：	Three Phase Smart Energy Meter	Model Name ：	DTZY1218
Temperature：	23.5 ℃	Relative Humidity：	60%
Pressure：	1010 hPa	Test Date：	2022-12-01
Test Mode ：	Mode 1		
Test Power ：	230V~, 50Hz		

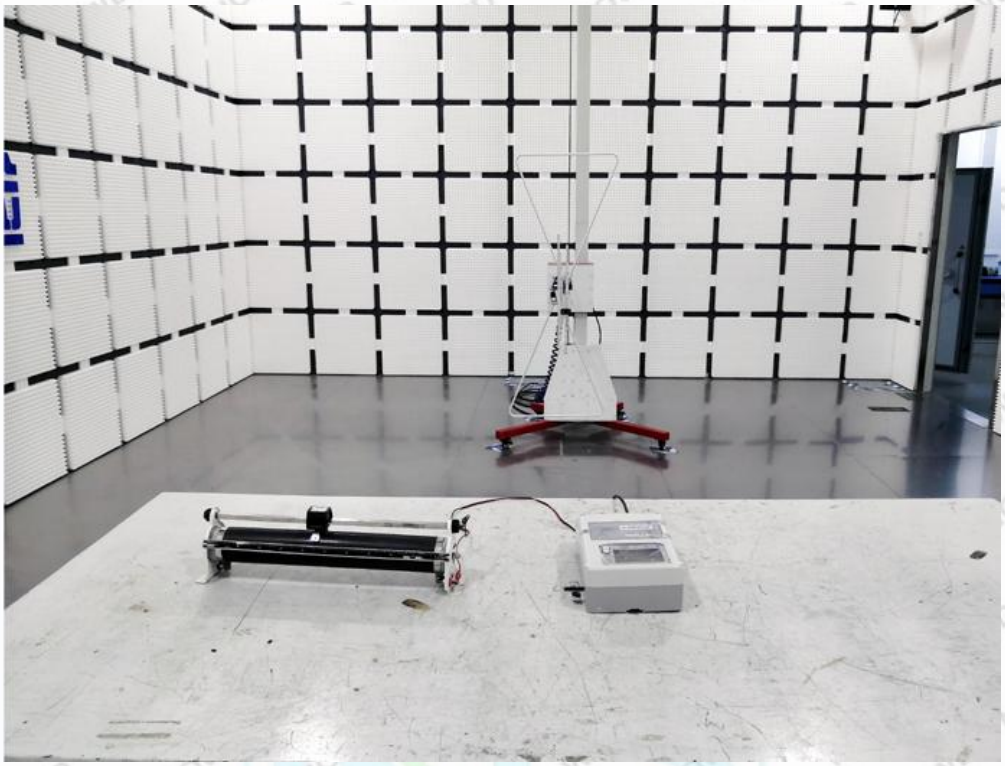
Test Level % U_T	Voltage Dips & Voltage Interruptions % U_T	Duration (in periods)	Criterion ☐A ☒B ☒C ☐D	Result P=PASS F=FAIL
0	100	0.5P	B	P
40	60	10P	C	P
70	30	25P	C	P

Note:

1). N/A - denotes test is not applicable in this test report.
2) Criteria A: There was no change operated with initial operating during the test.
3) Criteria B: The EUT function loss during the test, but self-recoverable after the test.
4) Criteria C: The system shut down during the test.

. EUT TEST PHOTO

Radiated Measurement Photos



ATTACHMENT PHOTOGRAPHS OF EUT

Photo 1

Photo 2

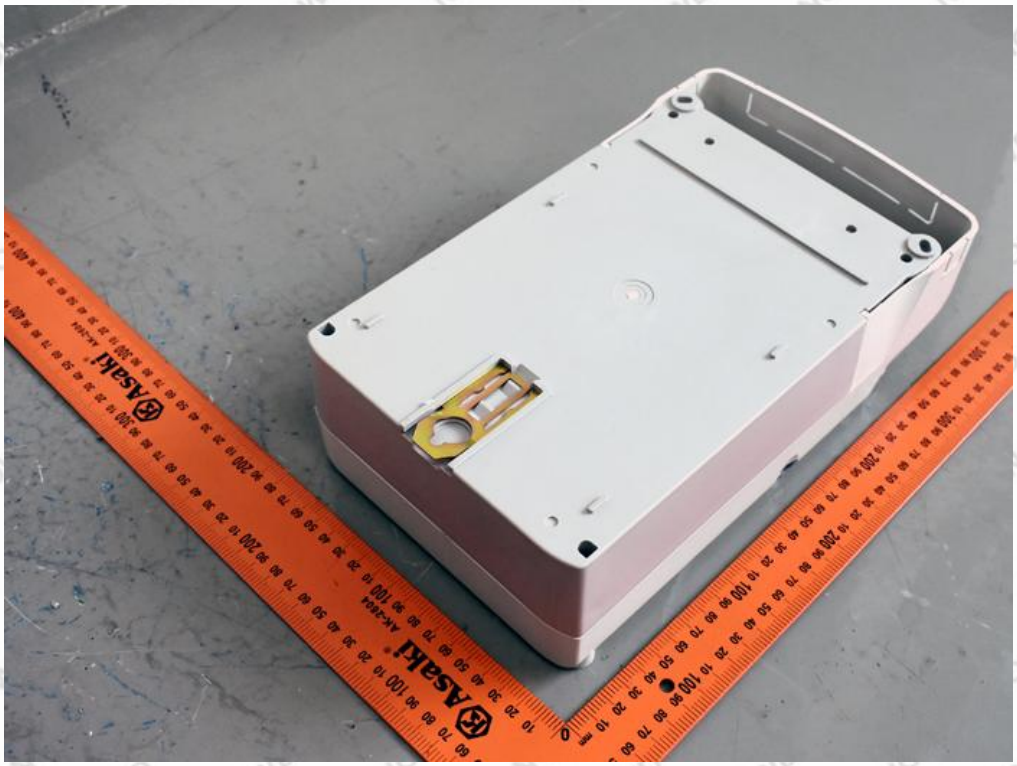


Photo 3

Photo 4

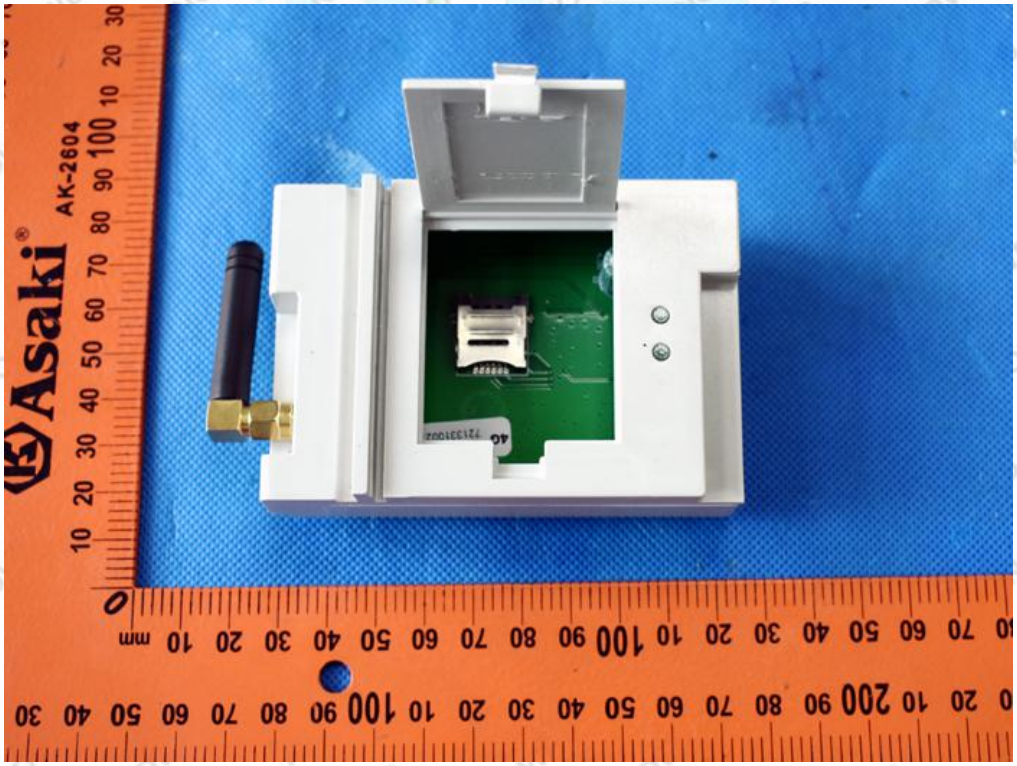


Photo 5

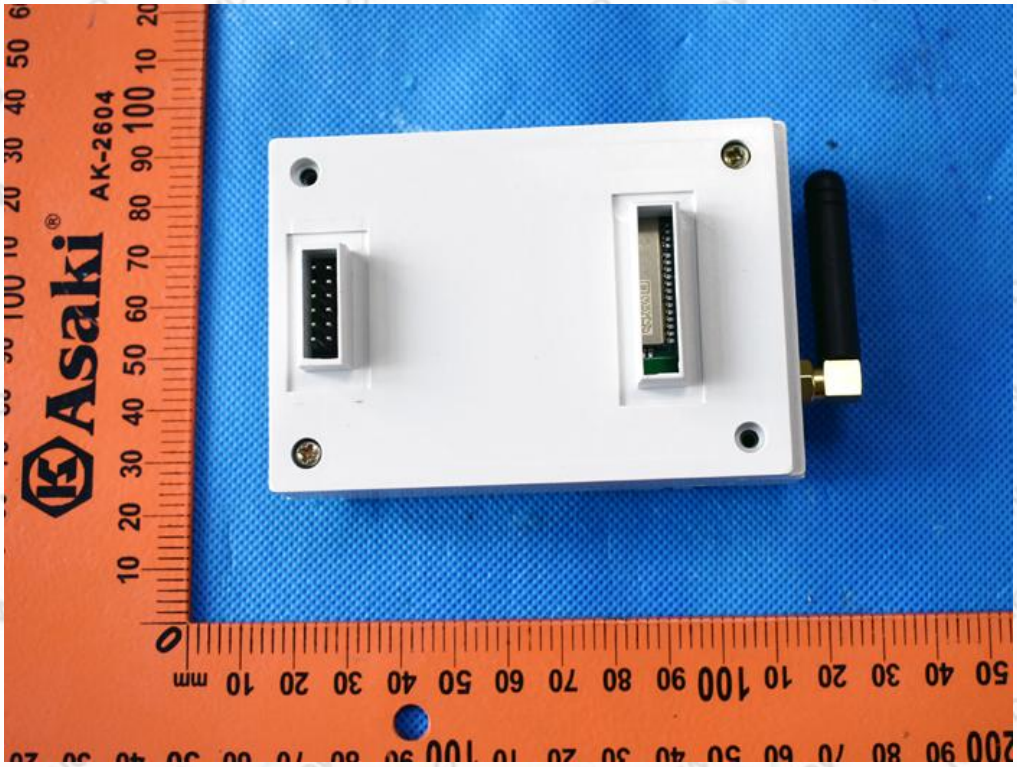


Photo 6

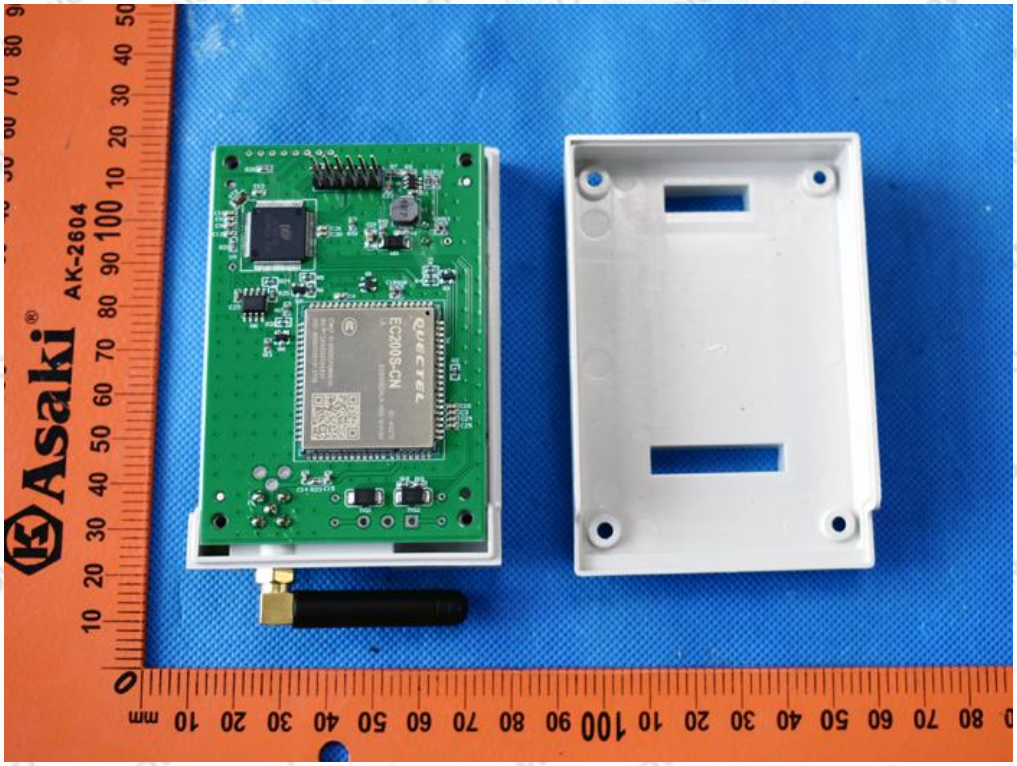


Photo 7

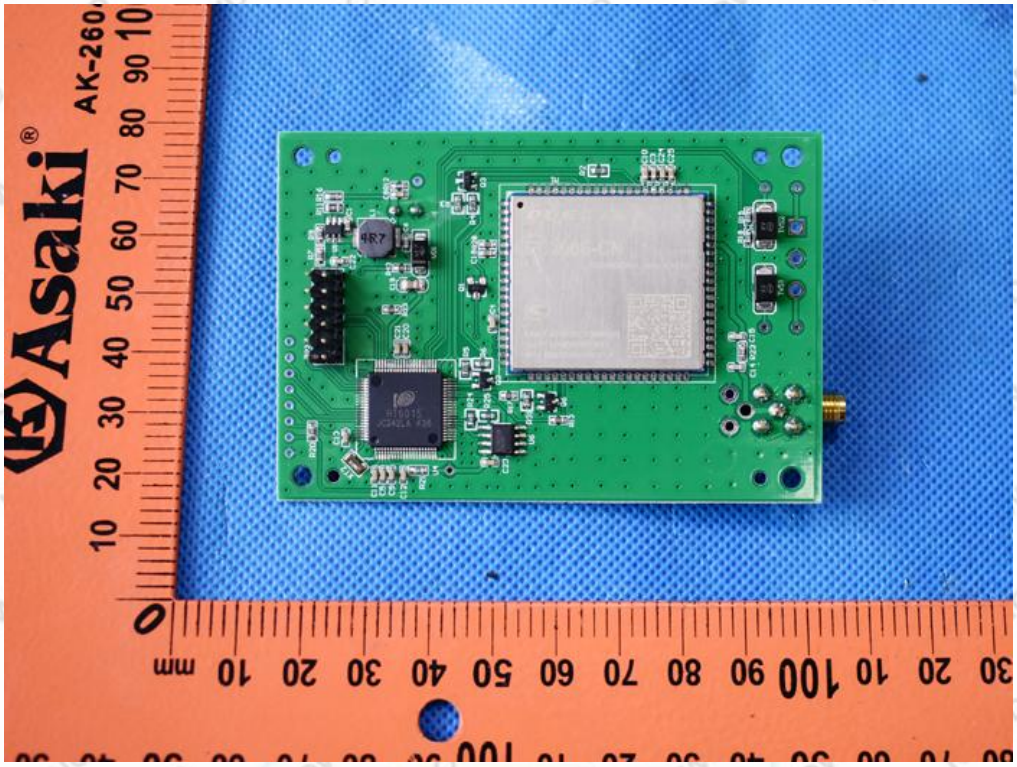


Photo 8

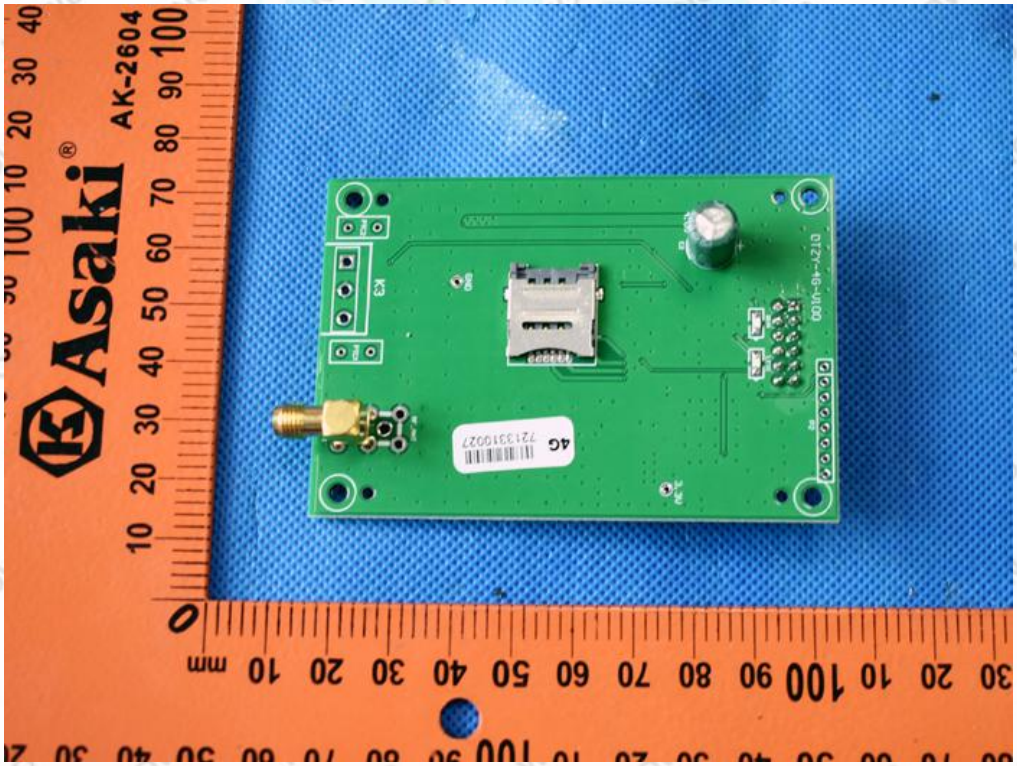


Photo 9

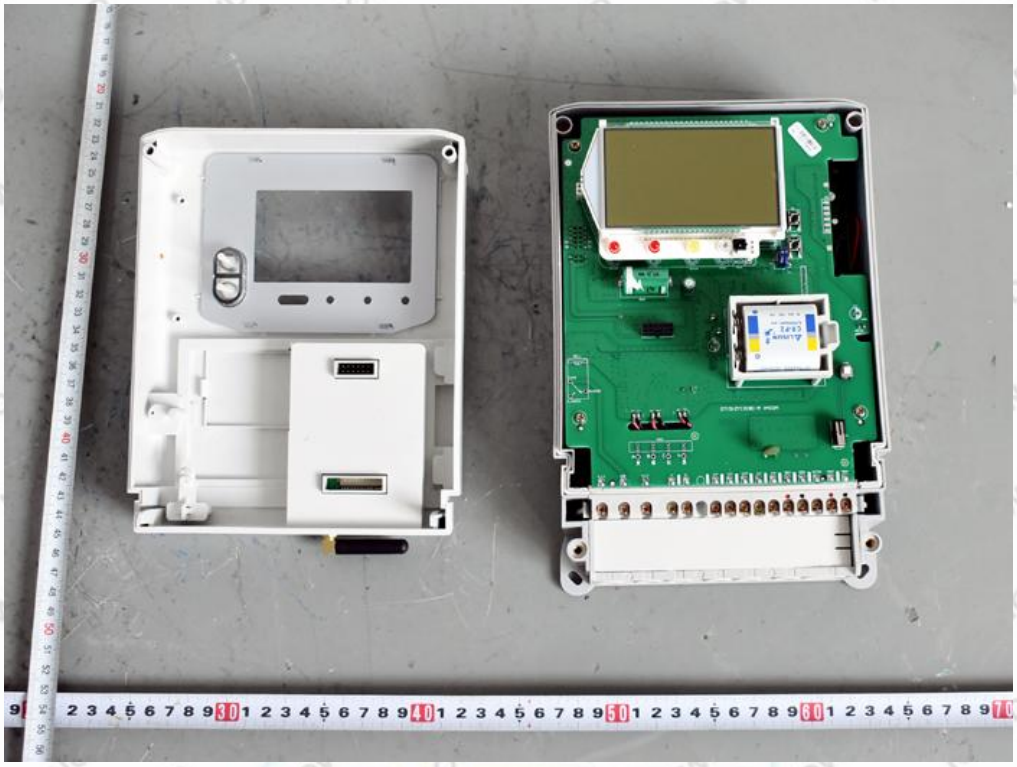


Photo 10

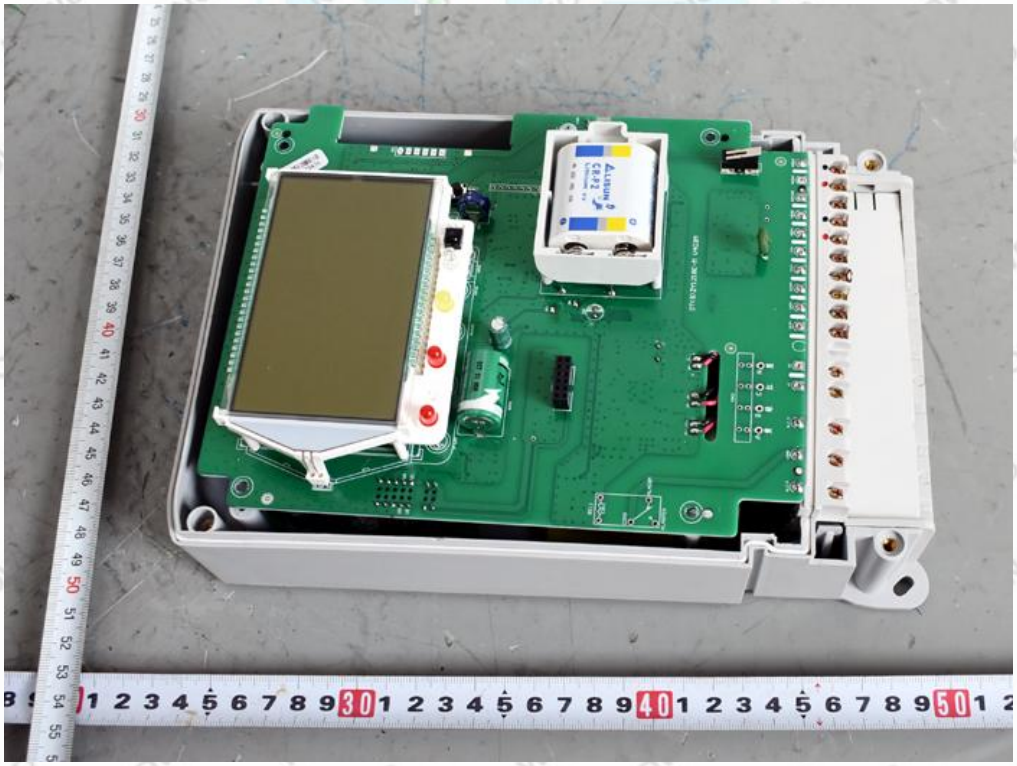


Photo 11

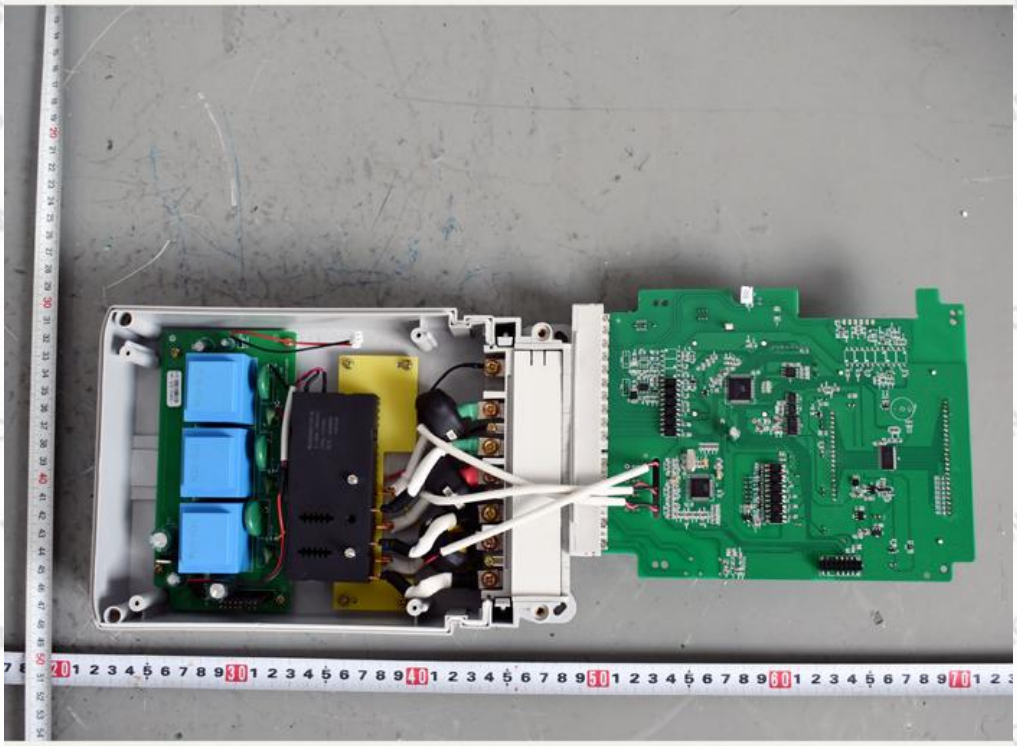


Photo 12

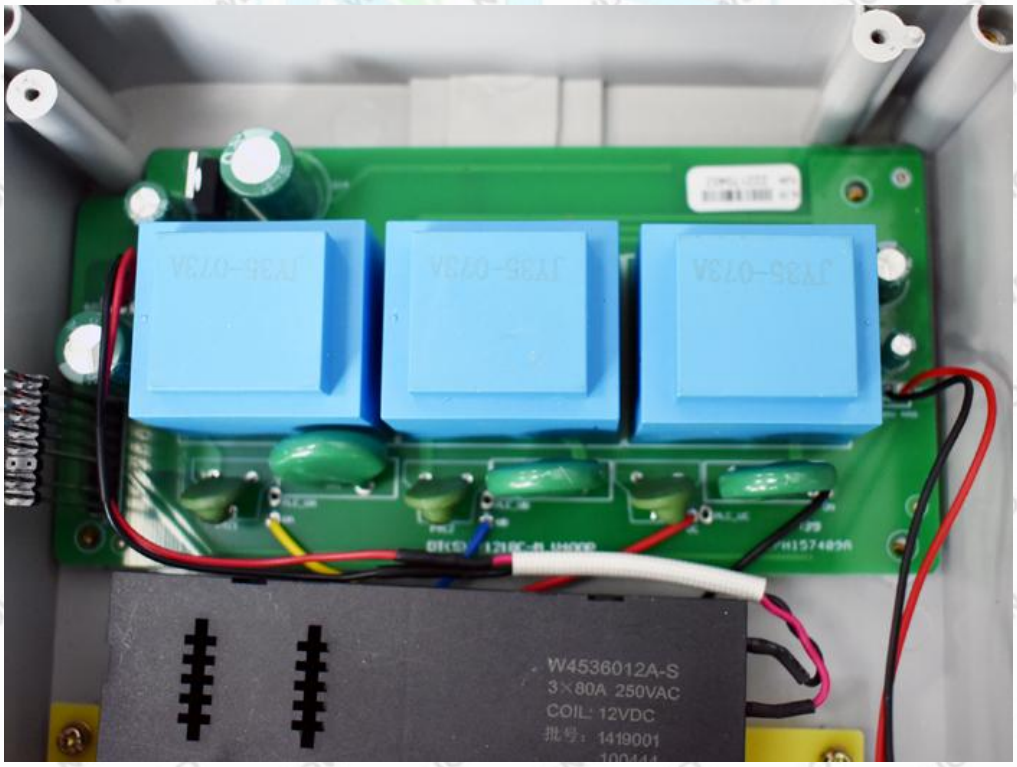


Photo 13