

## **Attachment I**

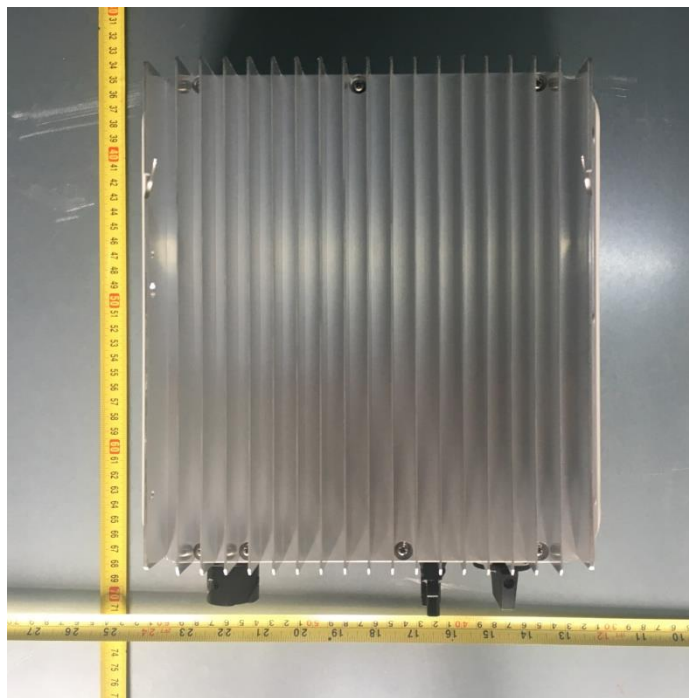
**(Pictures of the EUT and Electrical Schemes)**

1 PICTURES

Front view 1 (SOFAR 2700TL-G3, SOFAR 3000TL-G3, SOFAR 3300TL-G3)



Back view 1 (SOFAR 2700TL-G3, SOFAR 3000TL-G3, SOFAR 3300TL-G3)



Front view 2 (SOFAR 1100TL-G3, SOFAR 1600TL-G3, SOFAR 2200TL-G3)



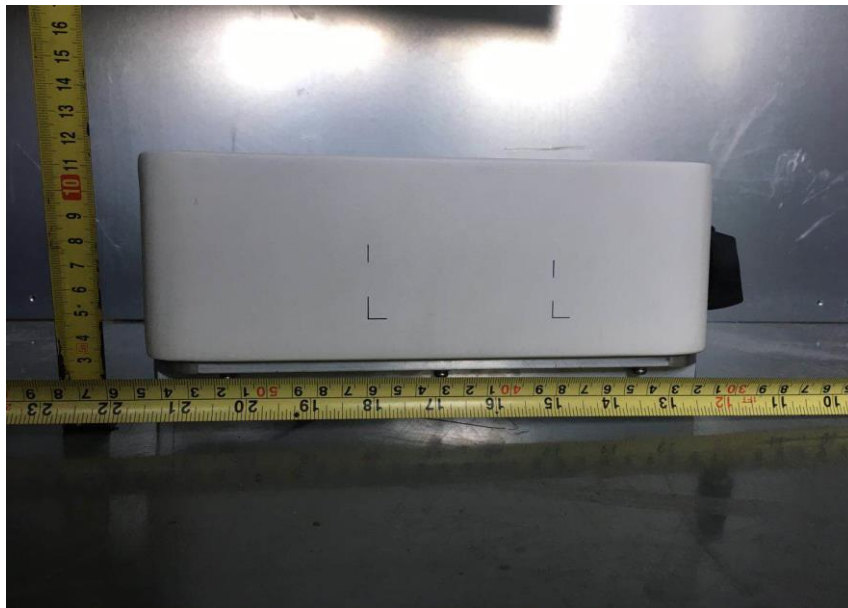
Back view 2 (SOFAR 1100TL-G3, SOFAR 1600TL-G3, SOFAR 2200TL-G3)



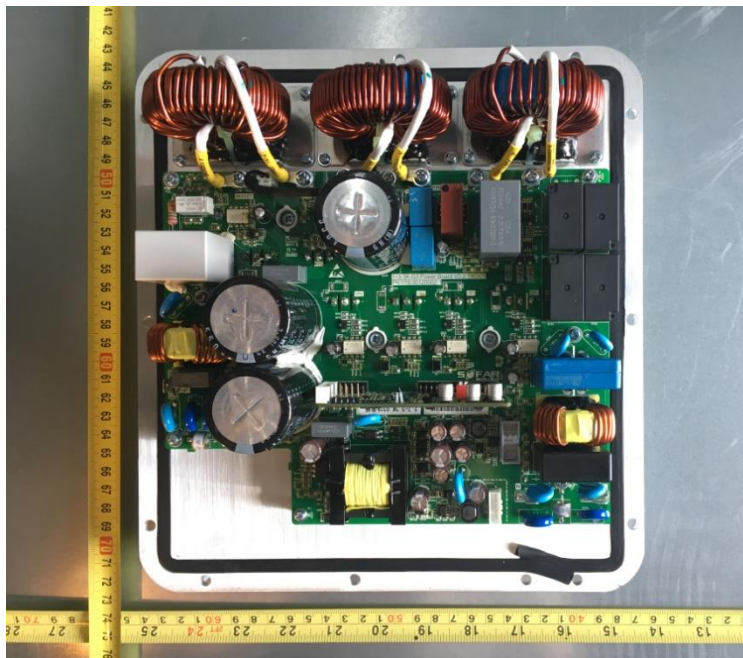
Side View (SOFAR 2700TL-G3, SOFAR 3000TL-G3, SOFAR 3300TL-G3)



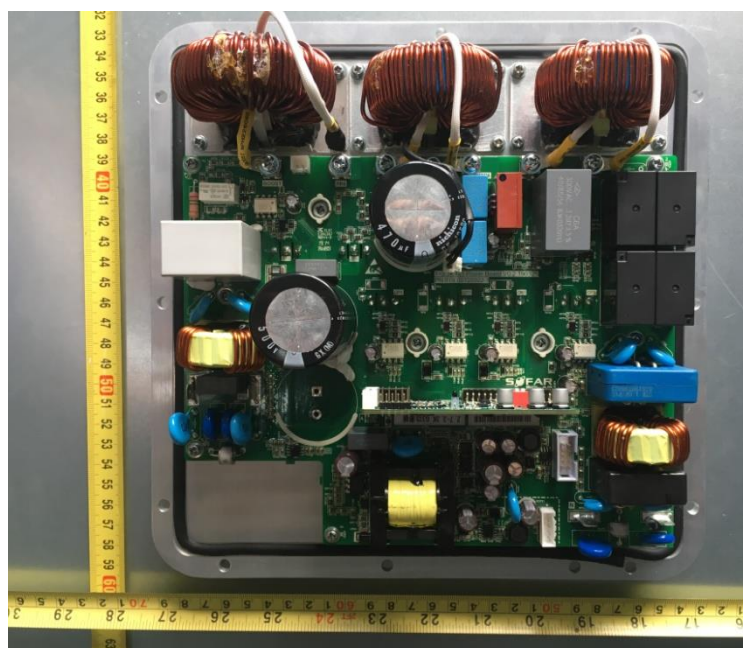
Side View (SOFAR 1100TL-G3, SOFAR 1600TL-G3, SOFAR 2200TL-G3)



Internal view of enclosure (SOFAR 2700TL-G3, SOFAR 3000TL-G3, SOFAR 3300TL-G3)

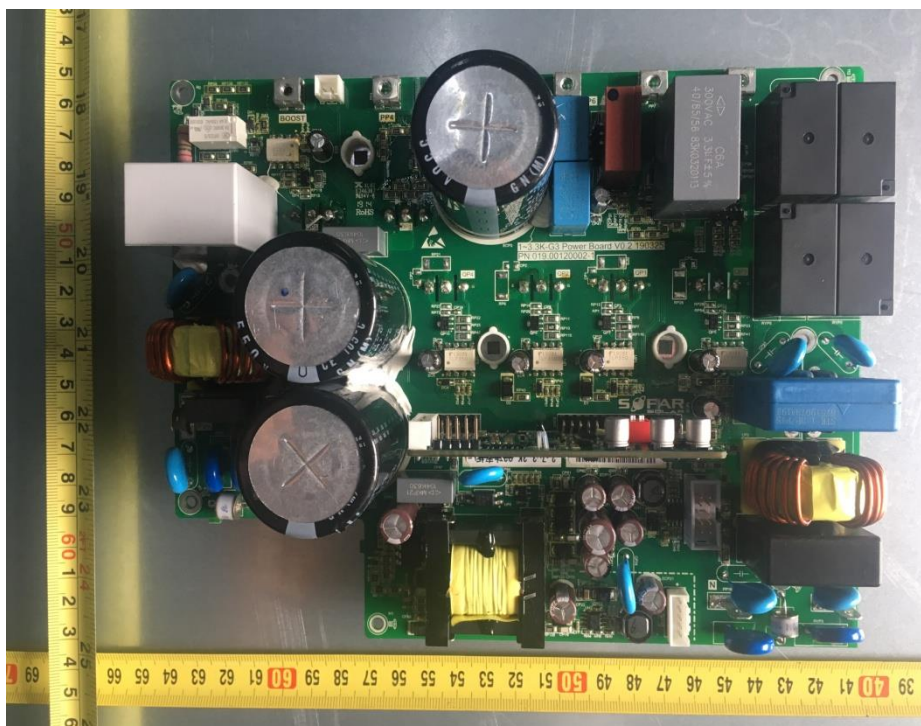


Internal view of enclosure (SOFAR 1100TL-G3, SOFAR 1600TL-G3, SOFAR 2200TL-G3)

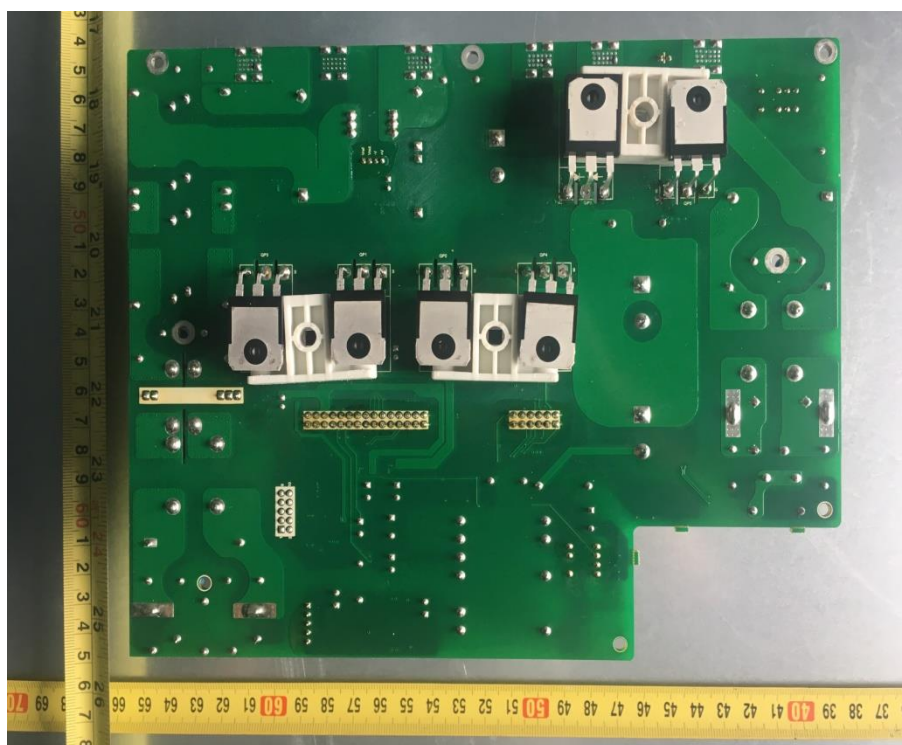




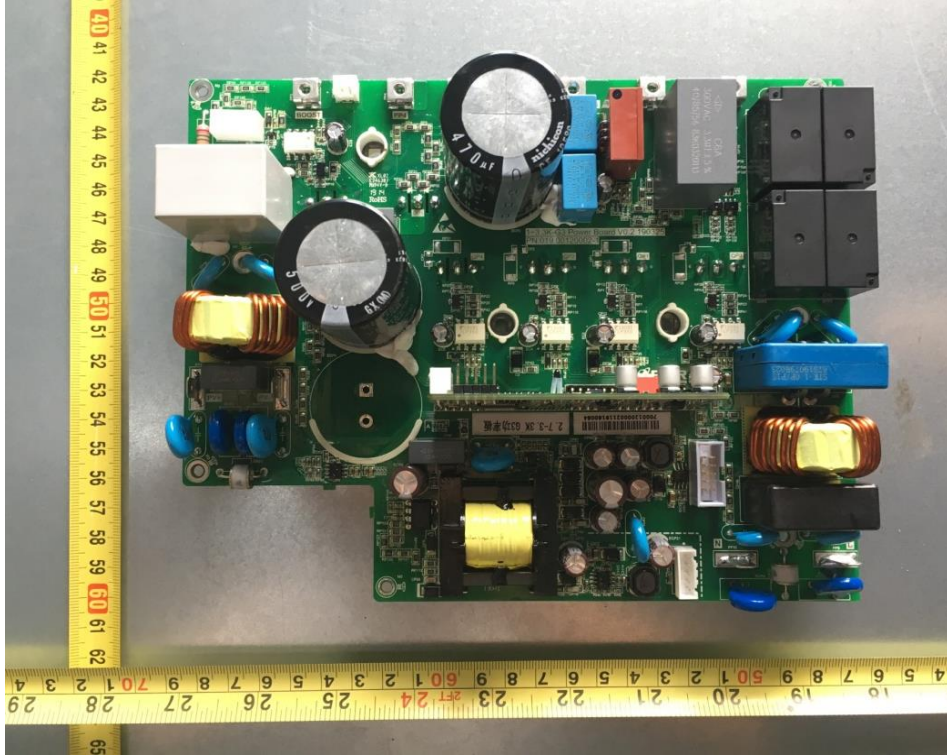
Front side of main board 1 (SOFAR 2700TL-G3, SOFAR 3000TL-G3, SOFAR 3300TL-G3)



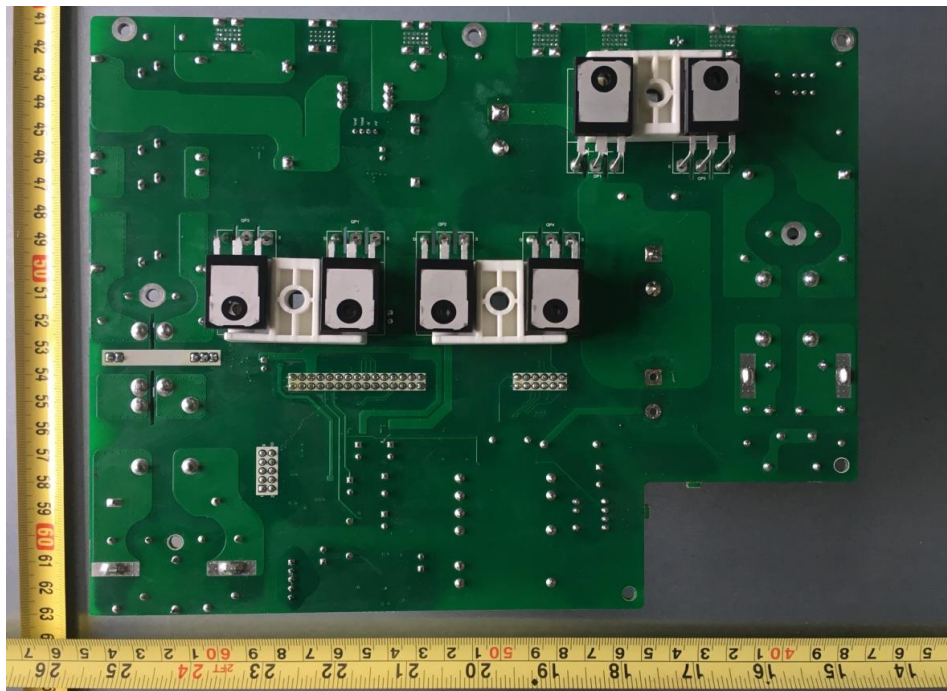
Back side of main board 1 (SOFAR 2700TL-G3, SOFAR 3000TL-G3, SOFAR 3300TL-G3)



Front side of main board 2 (SOFAR 1100TL-G3、SOFAR 1600TL-G3、SOFAR 2200TL-G3)

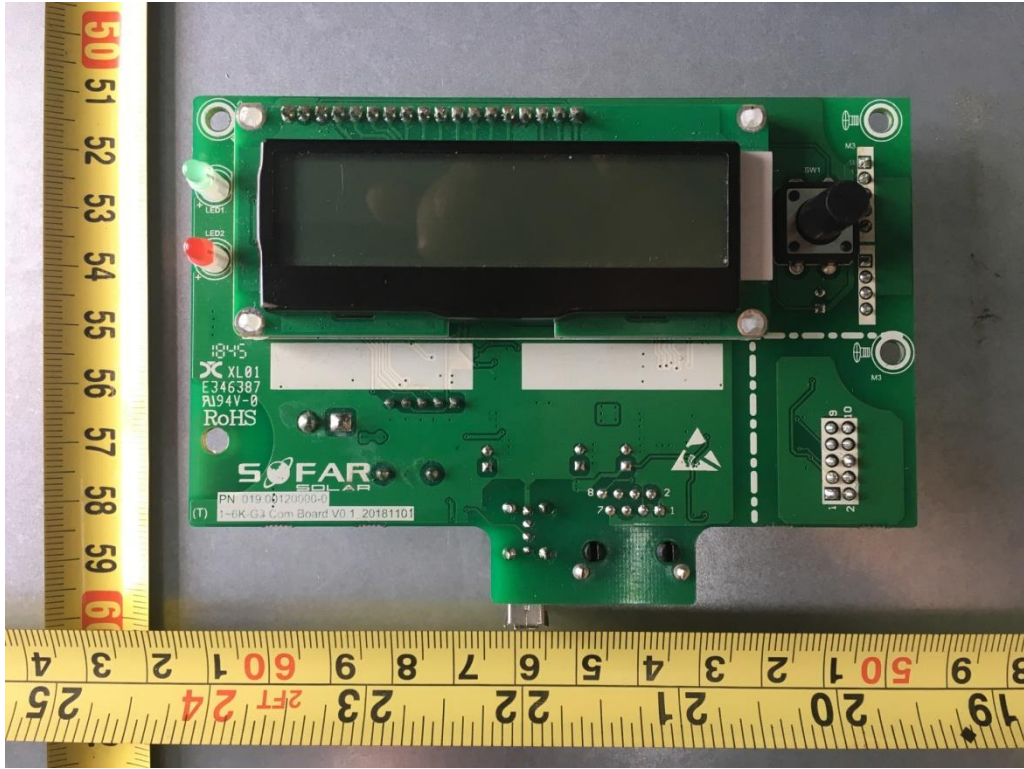


Back side of main board (SOFAR 1100TL-G3、SOFAR 1600TL-G3、SOFAR 2200TL-G3)

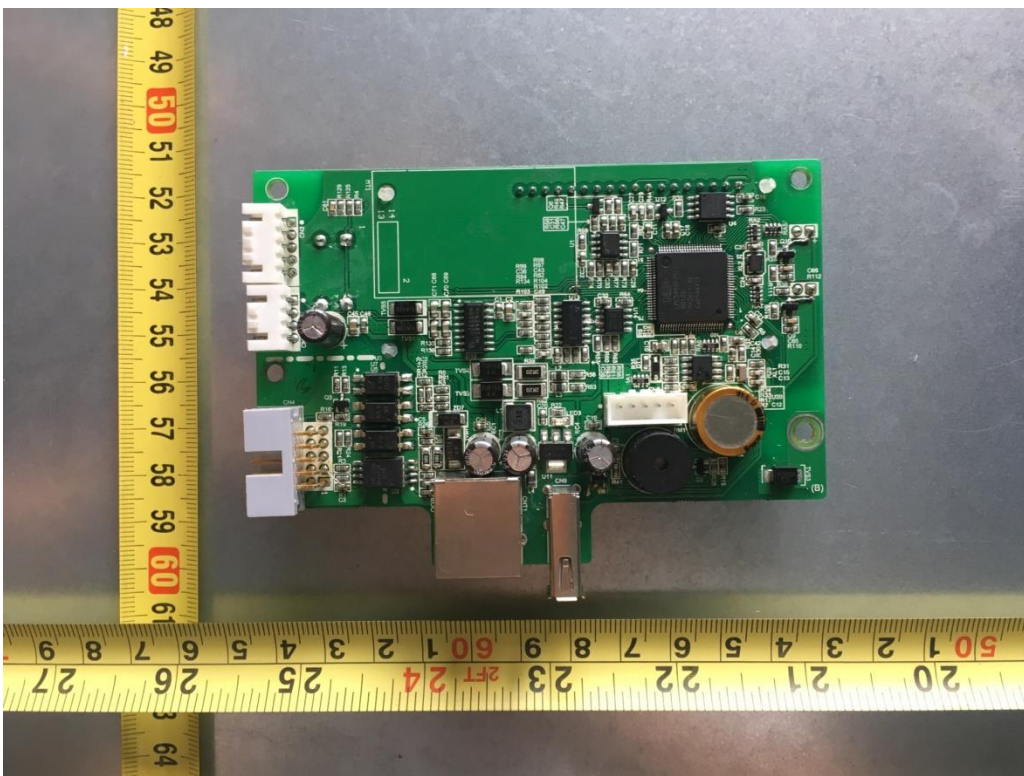




Front side of Control board

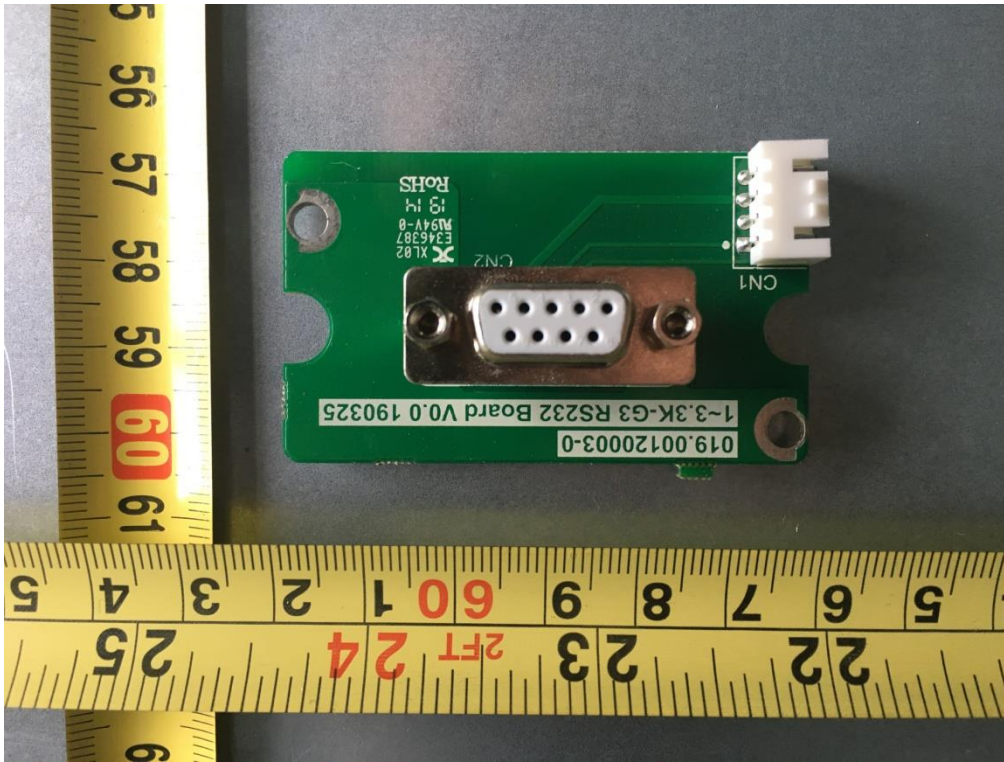


Front side of Control board

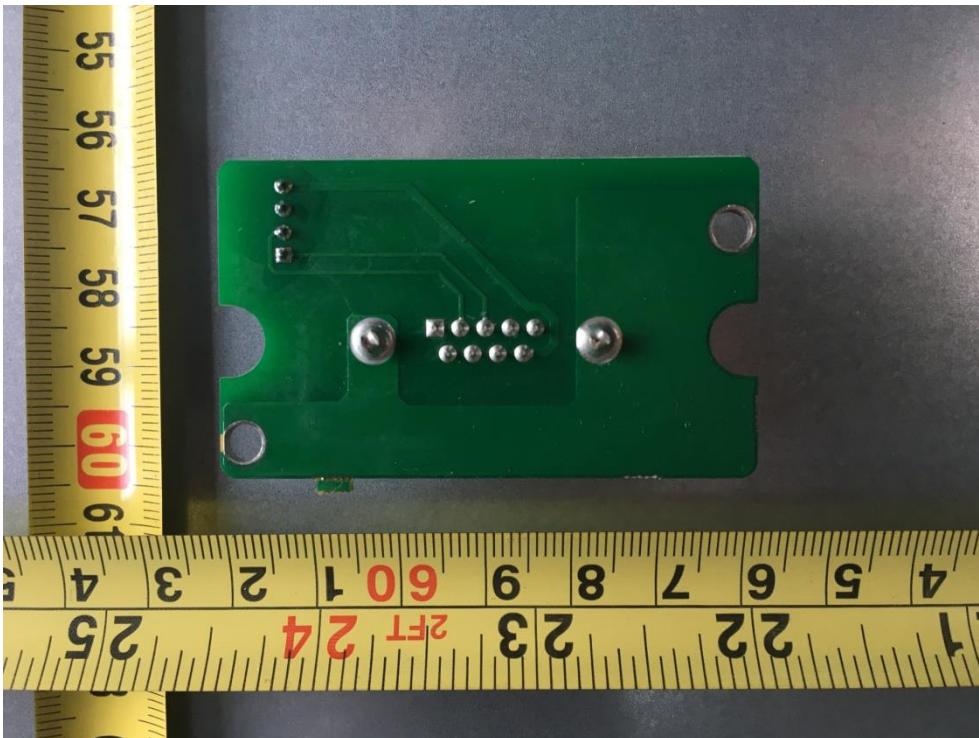




Front view of RS 232 board



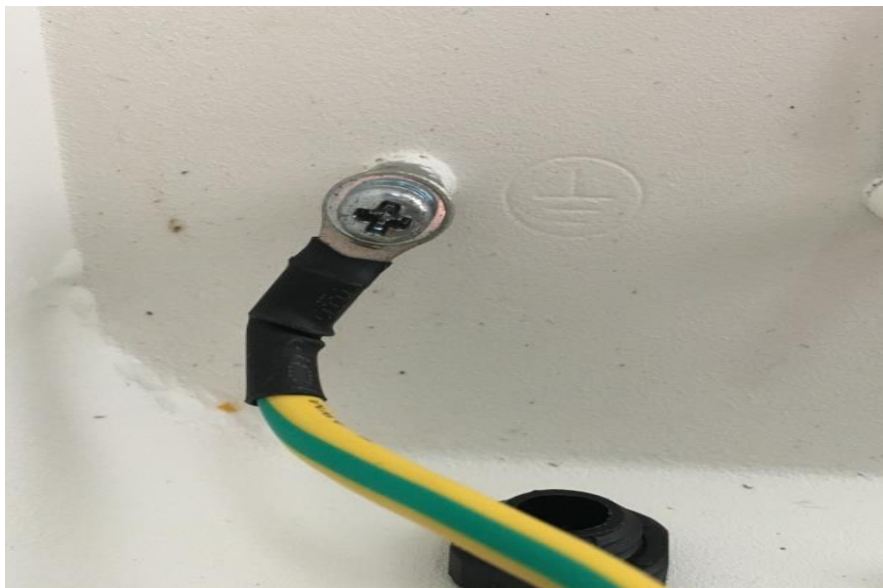
Back view of RS 232 board



Connection interface



Grounding

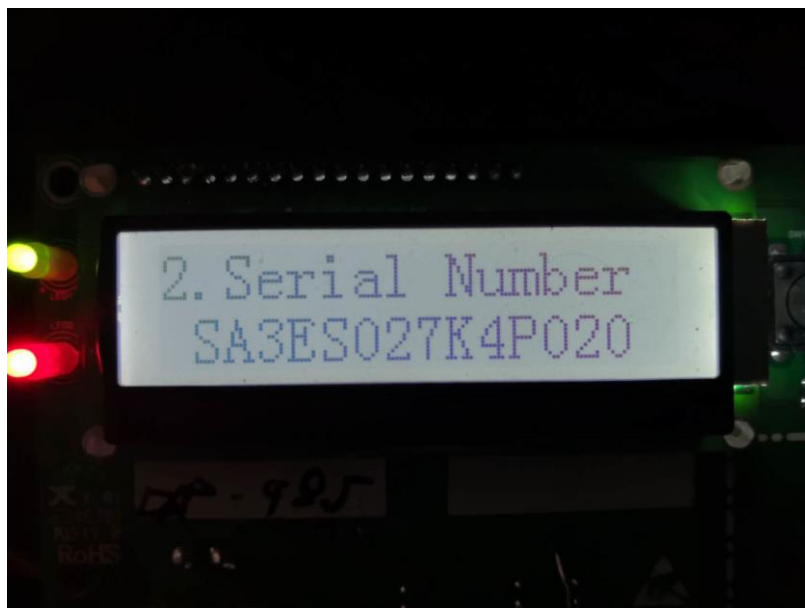


IEC 61727:2004

Software Number (SOFAR 2700TL-G3, SOFAR 3000TL-G3, SOFAR 3300TL-G3)



Software Number (SOFAR 1100TL-G3, SOFAR 1600TL-G3, SOFAR 2200TL-G3)

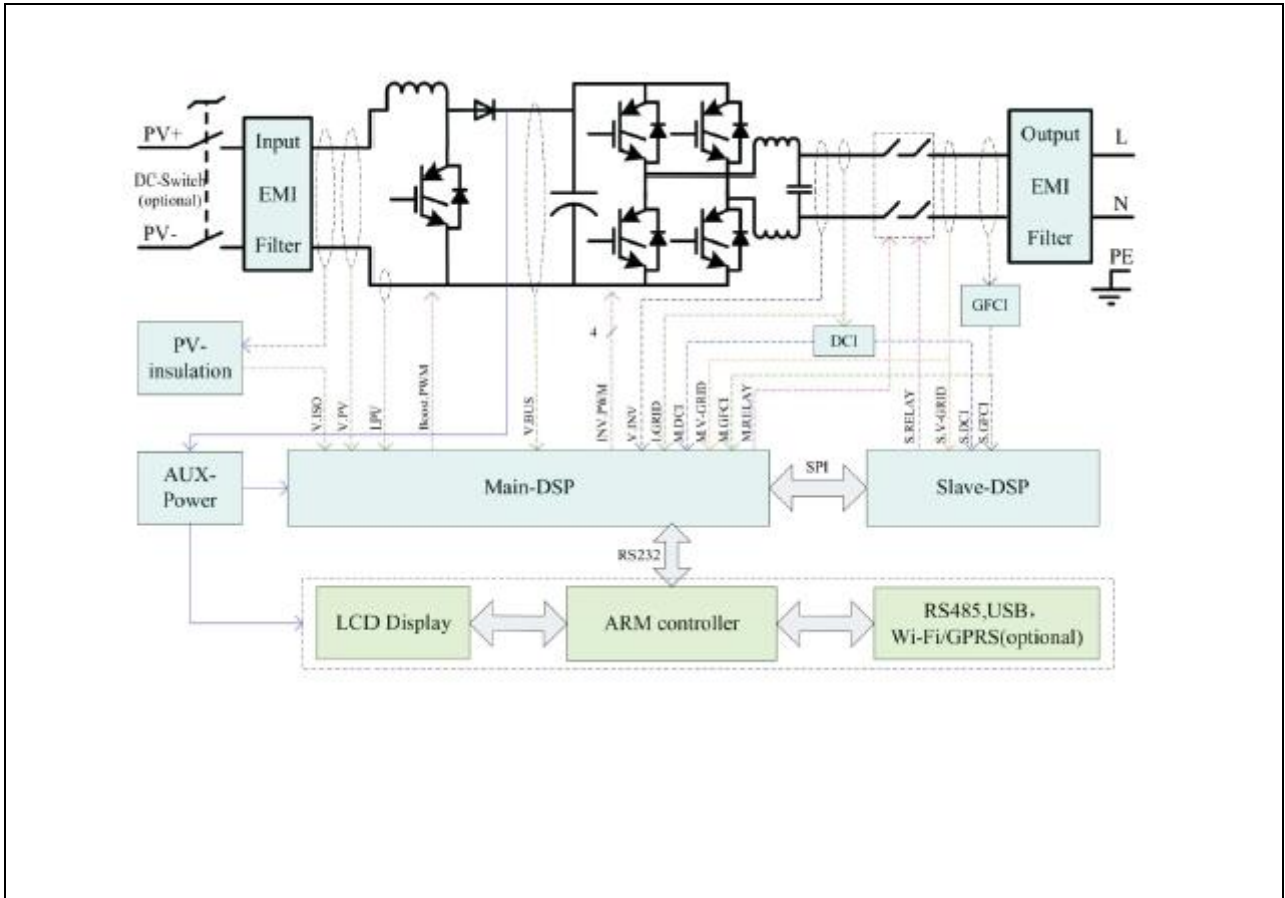




Software version



2 ELECTRICAL SCHEMES

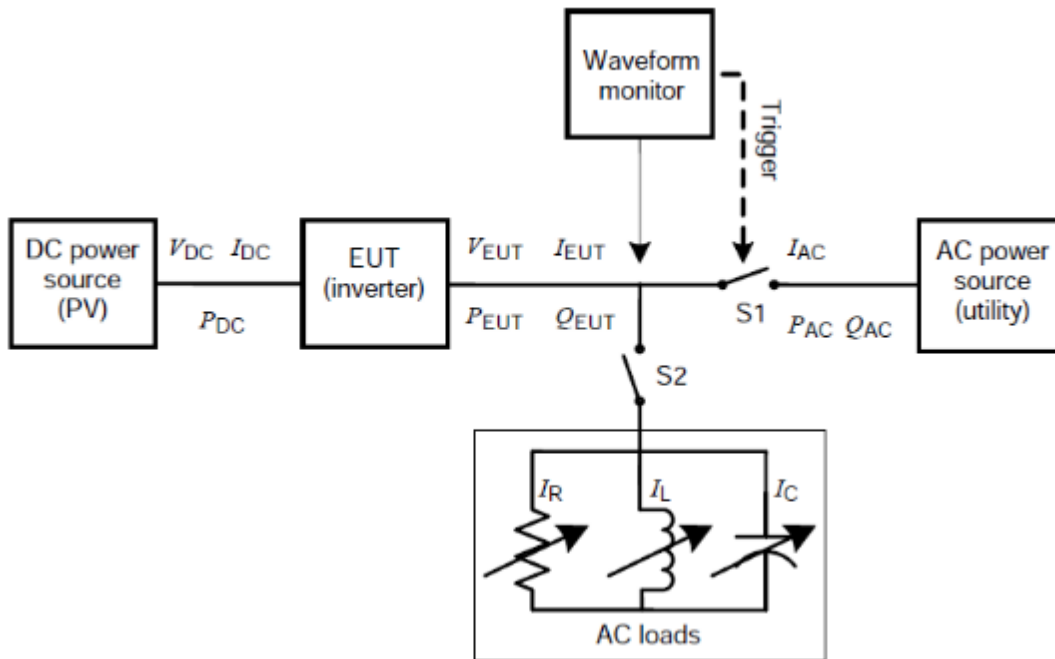


## **Attachment II**

**(Testing information)**



**1 TESTING CIRCUIT**



Current and voltage clamps have been connected to the inverter input/output for all the tests.  
 All the tests and checks have been performed in accordance with the reference standard under testing.

**2 TESTING EQUIPMENT**

From	No.	Equipment Name	Model No.	Equipment No.	Calibration Date	Equipment calibration due date
Sofarsolar	1	Digital oscilloscope	DS05014A	MY50070266	2019-02-13	2020-02-12
	2	Voltage probe	SI-9110	111541	2019-02-13	2020-02-12
	3	Voltage probe	SI-9110	152627	2019-02-13	2020-02-12
	4	Voltage probe	SI-9110	111134	2019-02-13	2020-02-12
	5	Power analyzer	WT3000	91N610888	2019-02-13	2020-02-12
	6	Current probe	i1000s	29503223	2019-02-13	2020-02-12
	7	Current probe	i1000s	30413448	2019-02-13	2020-02-12
	8	Current probe	CP5150	C150150008	2019-02-13	2020-02-12
	9	Temperature & Humidity meter	TH101B	201030245220	2019-02-13	2020-02-12
	10	Temperature & Humidity Chamber	HGTP -225R	HG13030801	2019-02-13	2020-02-12
SGS	11	True RMS Multimeter	Fluke / 289C	GZE012-53	2019-02-26	2020-02-25

Items	Specifications
1) PV array simulator	
a) Voltage range	0 – 1000Vdc ( 0.01V step)
b) Current range	0 – 40A ( 0.01A step)
2) AC power source	
a) Output wiring	Three phase
b) Output capacity	30KVA
c) Output voltage	10-300Vrms
d) Output frequency	45-65Hz
e) Voltage stability	± 100ppm/°C
f) Output voltage distortion	0.05% max.
3) Digital meter	
a) Voltage range	0 – 1000Vdc, 0 – 600Vrms
b) Current range	0 – 30A

**IEC 61727:2004**

c) Frequency range ( accuracy)	0.2%
d) Measurement items	Voltage (V)    Current (A)    Active power (W) Reactive power (Var) Volt-ampere (VA) Power factor (PF) Frequency (Hz) Electric energy (Wh)
4) Waveform recorder	
a) Sampling speed	1M/s
b) Recording device	Memory record and USB reading
c) Time accuracy	± 500ppm
5) AC load	
a) Resistive load	Maximum voltage: 300Vrms Current range: 0 – 100A Capacity: 30KW
b) Inductive load	Maximum voltage: 300Vrms Current range: 0 – 100A Capacity: 30KVA
c) Capacitive load	Maximum voltage: 300Vrms Current range: 0 – 100A Capacity: 30KVA

### 3 MEASUREMENT UNCERTAINTY

<b>Magnitude</b>	<b>Uncertainty</b>
Voltage measurement	±1.5 %
Current measurement	±2.0 %
Frequency measurement	±0.2 %
Time measurement	±0.2 %
Power measurement	±2.5 %
Phase Angle	±1°
Temperature	±3° C

Note1: Measurements uncertainties showed in this table are maximum allowable uncertainties. The measurement uncertainties associated with other parameters measured during the tests are in the laboratory at disposal of the petitioner.

Note2: Where the standard requires lower uncertainties that those in this table. Most restrictive uncertainty has been considered.



## **Attachment III**

**(GRAPHS AND SCREENSHORTS OF TEST RESULTS)**

**Flickers**

The measurements of voltage fluctuations have been measured at 33 %, 66% and 100 % of the nominal power value of the inverter.

As it can be seen in the next screenshots, this test has two steps:

- 1.Starting operation
- 2.Stopping operation

The values took of Dmax of the two steps.

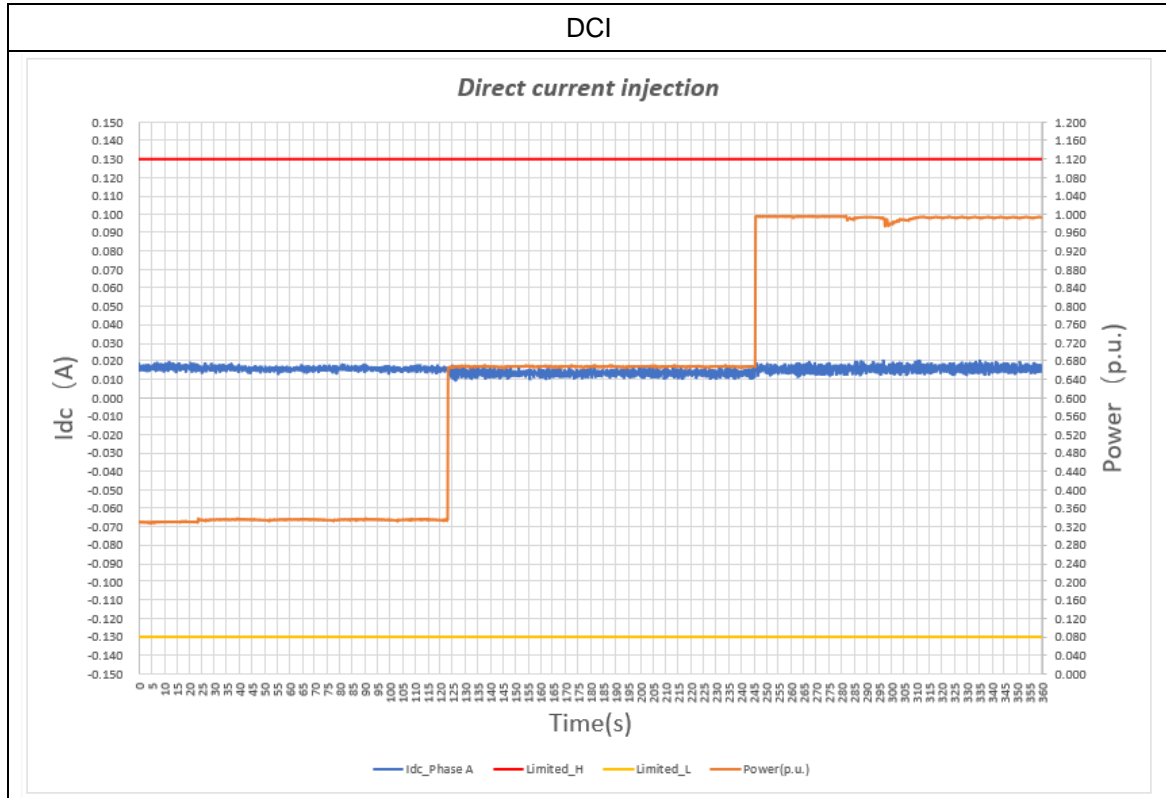
<b>Starting operation and Stopping operation</b>					
<b>33% Pn</b>					
<b>Flicker Mode</b>		Uover: ■ ■ ■ ■ Iover: ■ ■ ■ ■		YOKOGAWA ◆ Flicker:Complete 0:20:00	
Count <b>2/2</b>					
Interval <b>10m00s/10m00s</b>					
<b>Element</b>	<b>1</b>				
<b>Volt Range</b>	300V/50Hz	<b>Element1 Judgement:</b> Pass			
<b>Un (Set)</b>	230.000 V	<b>Total Judgement:</b> Pass			
<b>Freq(U1)</b>	49.999 Hz	<b>(Element1)</b>			
	<b>dc[%]</b>	<b>dmax[%]</b>	<b>d(t)[ms]</b>	<b>Pst</b>	<b>P1t</b>
<b>Limit</b>	3.30	4.00	500 3.30(%)	1.00	0.65 N:12
<b>No. 1</b>	0.10 Pass	0.10 Pass	0 Pass	0.07 Pass	
<b>2</b>	0.30 Pass	0.34 Pass	0 Pass	0.08 Pass	
<b>Result</b>	Pass	Pass	Pass	Pass	0.04 Pass
<b>Update 600</b>		<b>2019/04/25 14:11:16</b>			
<b>66% Pn</b>					
<b>Flicker Mode</b>		Uover: ■ ■ ■ ■ Iover: ■ ■ ■ ■		YOKOGAWA ◆ Flicker:Complete 0:20:00	
Count <b>2/2</b>					
Interval <b>10m00s/10m00s</b>					
<b>Element</b>	<b>1</b>				
<b>Volt Range</b>	300V/50Hz	<b>Element1 Judgement:</b> Pass			
<b>Un (Set)</b>	230.000 V	<b>Total Judgement:</b> Pass			
<b>Freq(U1)</b>	50.000 Hz	<b>(Element1)</b>			
	<b>dc[%]</b>	<b>dmax[%]</b>	<b>d(t)[ms]</b>	<b>Pst</b>	<b>P1t</b>
<b>Limit</b>	3.30	4.00	500 3.30(%)	1.00	0.65 N:12
<b>No. 1</b>	0.07 Pass	0.10 Pass	0 Pass	0.07 Pass	
<b>2</b>	0.11 Pass	0.12 Pass	0 Pass	0.07 Pass	
<b>Result</b>	Pass	Pass	Pass	Pass	0.04 Pass
<b>Update 600</b>		<b>2019/04/25 13:50:00</b>			



**IEC 61727:2004**

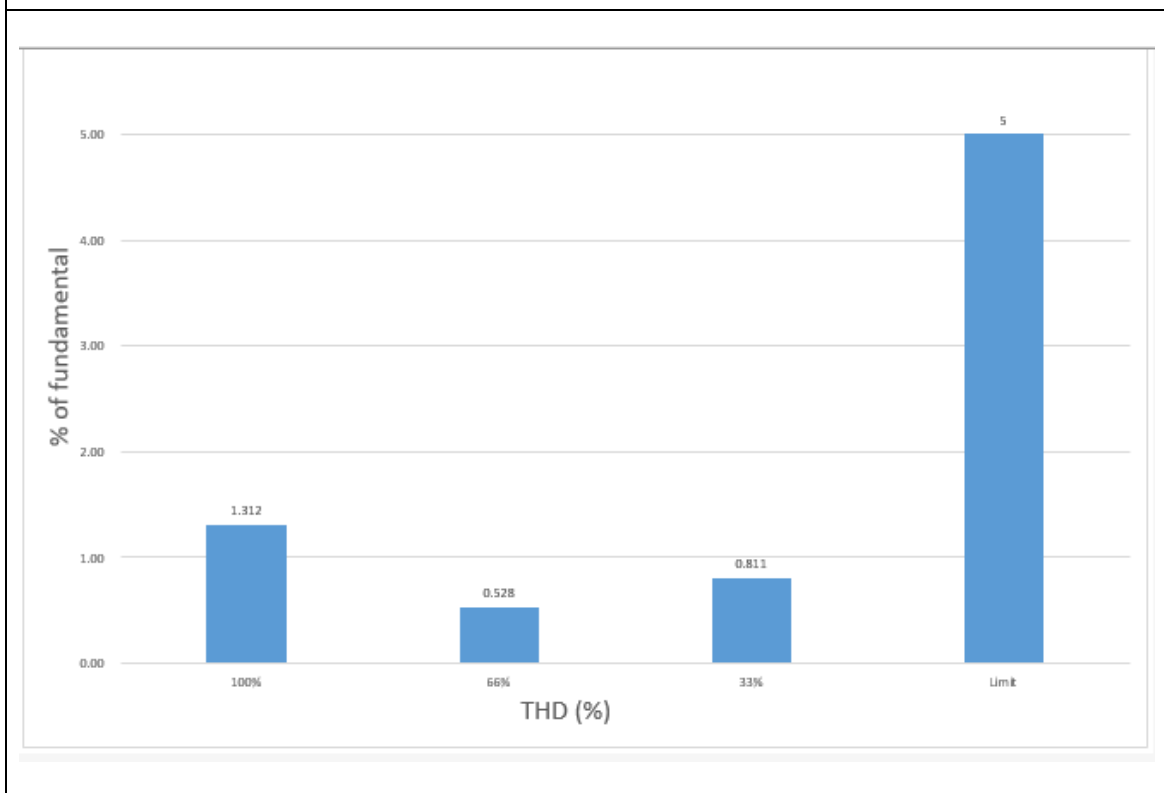
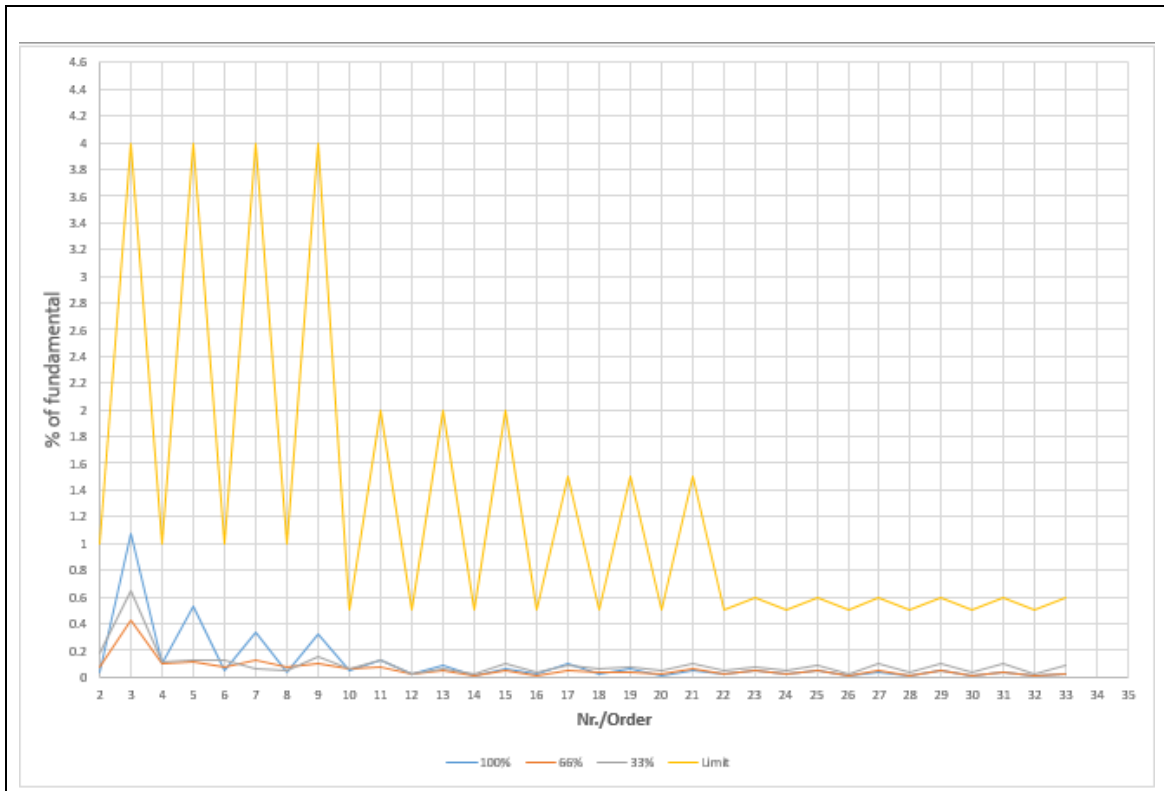
<b>66% Pn</b>					
<b>Flicker Mode</b>		Uover: ■ ■ ■ ■ Iover: ■ ■ ■ ■		YOKOGAWA ◆ Flicker:Complete 2:00:00	
Count	████████████████████		12/12		
Interval	████████████████████		10m00s/10m00s		
Element	1			Element1 Judgement: Pass	
Volt Range	300V/50Hz			Total Judgement: Pass	
Un (Set)	230.000 V			(Element1)	
Freq(U1)	50.000 Hz				
Limit	dc[%]	dmax[%]	d(t)[ms]	Pst	P1t
	3.30	4.00	500 3.30(%)	1.00	0.65 N:12
No. 1	0.00 Pass	0.00 Pass	0 Pass	0.07 Pass	
2	0.00 Pass	0.00 Pass	0 Pass	0.07 Pass	
3	0.00 Pass	0.00 Pass	0 Pass	0.07 Pass	
4	0.00 Pass	0.00 Pass	0 Pass	0.07 Pass	
5	0.00 Pass	0.00 Pass	0 Pass	0.07 Pass	
6	0.00 Pass	0.00 Pass	0 Pass	0.07 Pass	
7	0.00 Pass	0.00 Pass	0 Pass	0.07 Pass	
8	0.00 Pass	0.00 Pass	0 Pass	0.07 Pass	
9	0.00 Pass	0.00 Pass	0 Pass	0.07 Pass	
10	0.00 Pass	0.00 Pass	0 Pass	0.07 Pass	
11	0.00 Pass	0.00 Pass	0 Pass	0.07 Pass	
12	0.00 Pass	0.00 Pass	0 Pass	0.07 Pass	
<b>Result</b>	<b>Pass</b>	<b>Pass</b>	<b>Pass</b>	<b>Pass</b>	<b>0.07 Pass</b>
Update 3600		2019/04/25 18:19:10			
<b>100% Pn</b>					
<b>Flicker Mode</b>		Uover: ■ ■ ■ ■ Iover: ■ ■ ■ ■		YOKOGAWA ◆ Flicker:Complete 2:00:00	
Count	████████████████████		12/12		
Interval	████████████████████		10m00s/10m00s		
Element	1			Element1 Judgement: Pass	
Volt Range	300V/50Hz			Total Judgement: Pass	
Un (Set)	230.000 V			(Element1)	
Freq(U1)	49.999 Hz				
Limit	dc[%]	dmax[%]	d(t)[ms]	Pst	P1t
	3.30	4.00	500 3.30(%)	1.00	0.65 N:12
No. 1	0.00 Pass	0.00 Pass	0 Pass	0.07 Pass	
2	0.00 Pass	0.00 Pass	0 Pass	0.07 Pass	
3	0.00 Pass	0.00 Pass	0 Pass	0.07 Pass	
4	0.00 Pass	0.00 Pass	0 Pass	0.07 Pass	
5	0.00 Pass	0.00 Pass	0 Pass	0.07 Pass	
6	0.00 Pass	0.00 Pass	0 Pass	0.07 Pass	
7	0.00 Pass	0.00 Pass	0 Pass	0.07 Pass	
8	0.00 Pass	0.00 Pass	0 Pass	0.07 Pass	
9	0.00 Pass	0.00 Pass	0 Pass	0.07 Pass	
10	0.00 Pass	0.00 Pass	0 Pass	0.07 Pass	
11	0.00 Pass	0.00 Pass	0 Pass	0.07 Pass	
12	0.00 Pass	0.00 Pass	0 Pass	0.07 Pass	
<b>Result</b>	<b>Pass</b>	<b>Pass</b>	<b>Pass</b>	<b>Pass</b>	<b>0.07 Pass</b>
Update 3600		2019/04/25 16:16:56			

**Direct current injection**

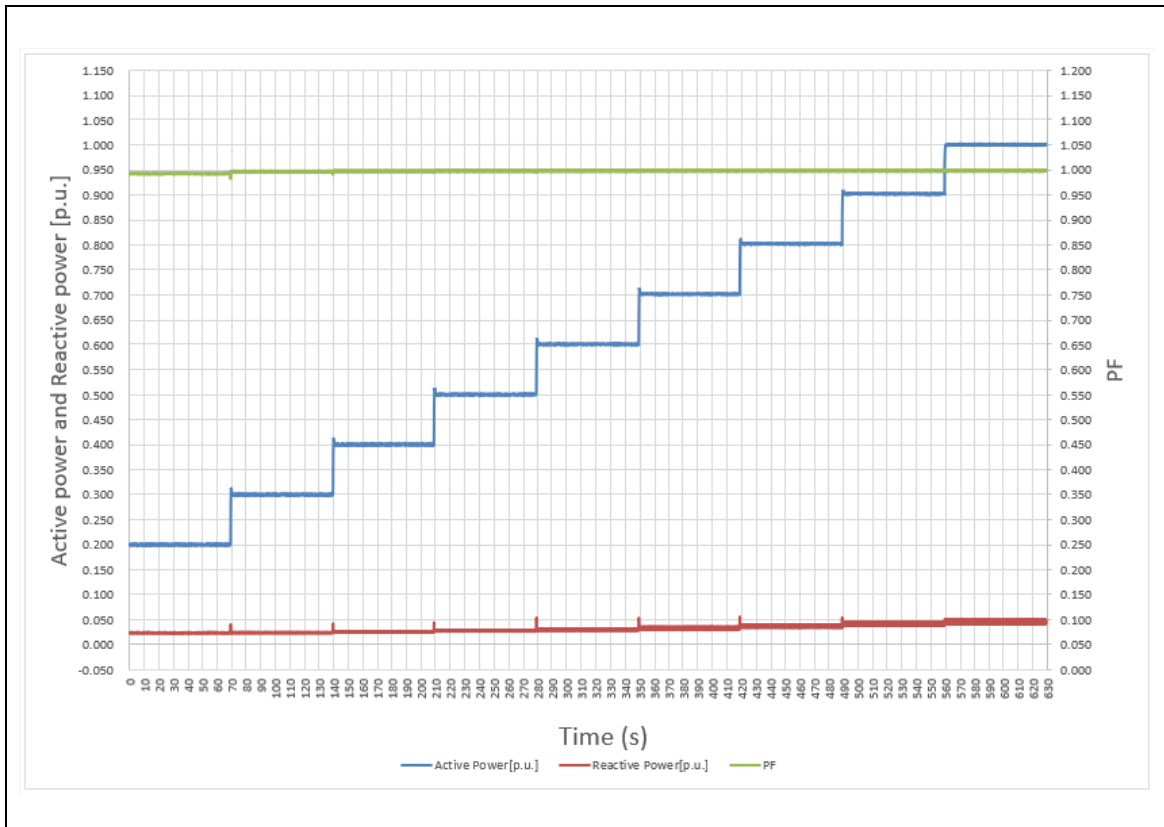




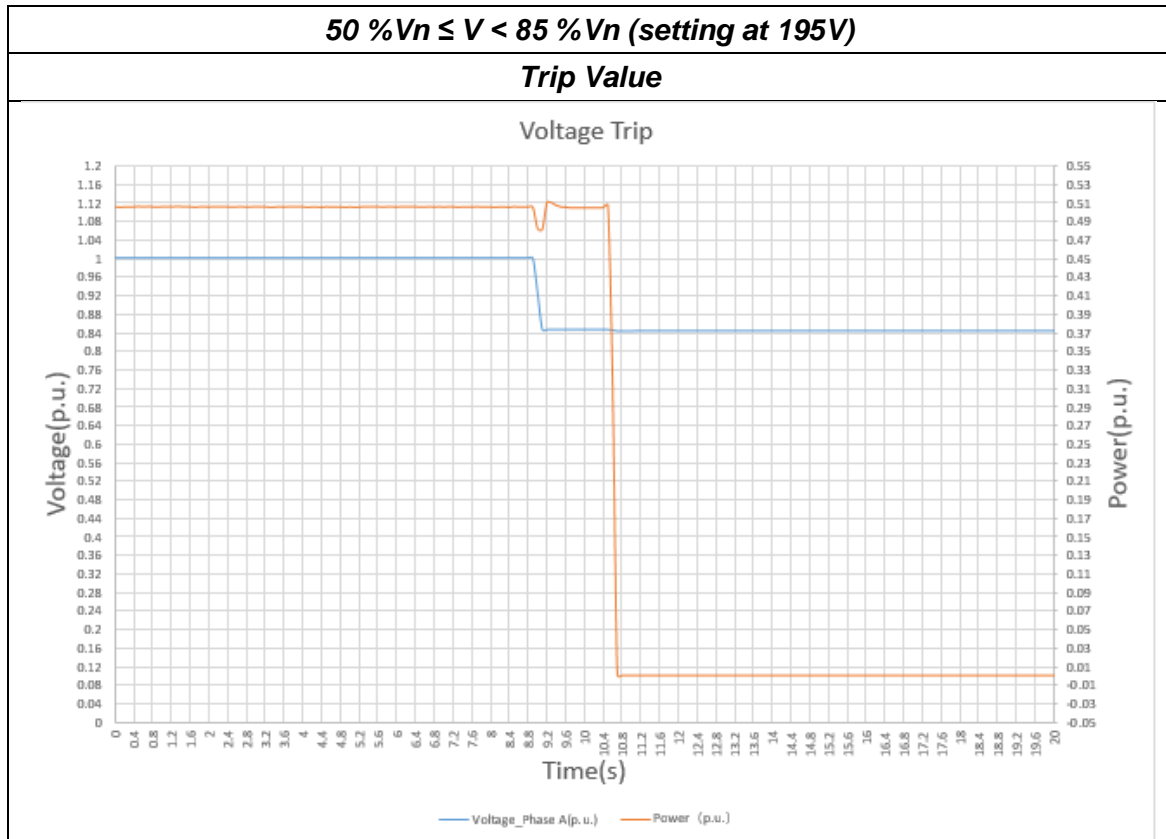
**Harmonics and waveform distortion**



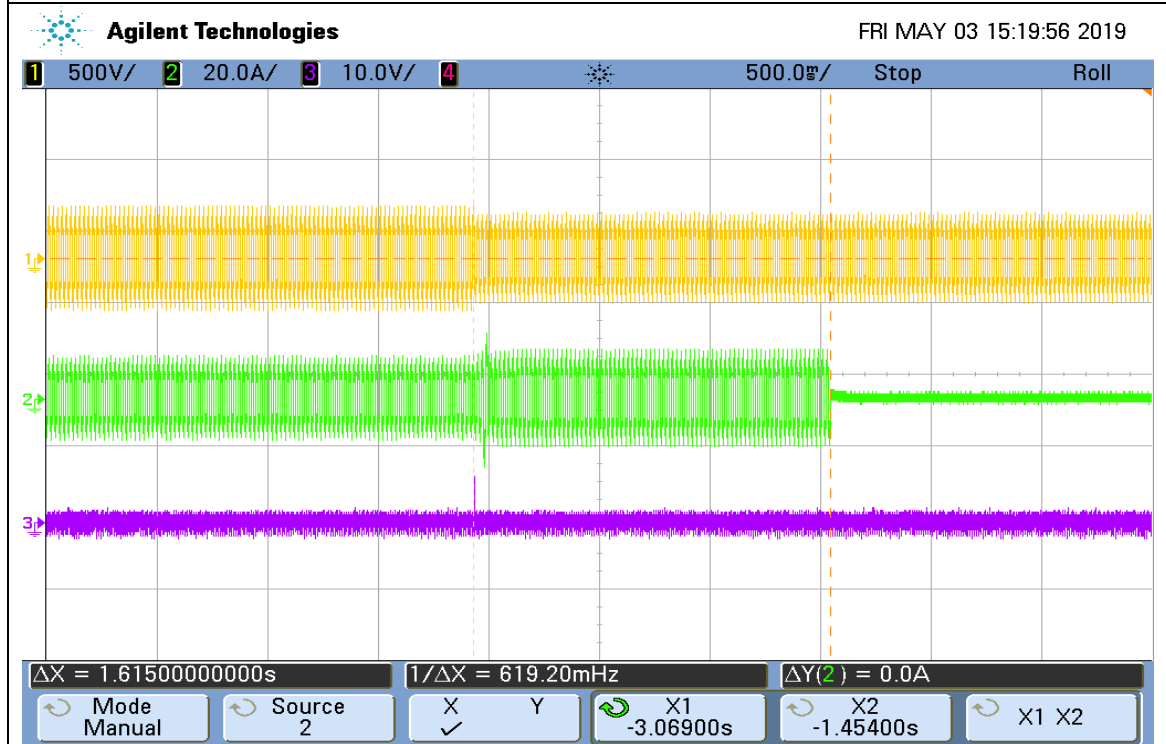
**Power factor**



**Under-and over-voltage trip settings and reconnection test**

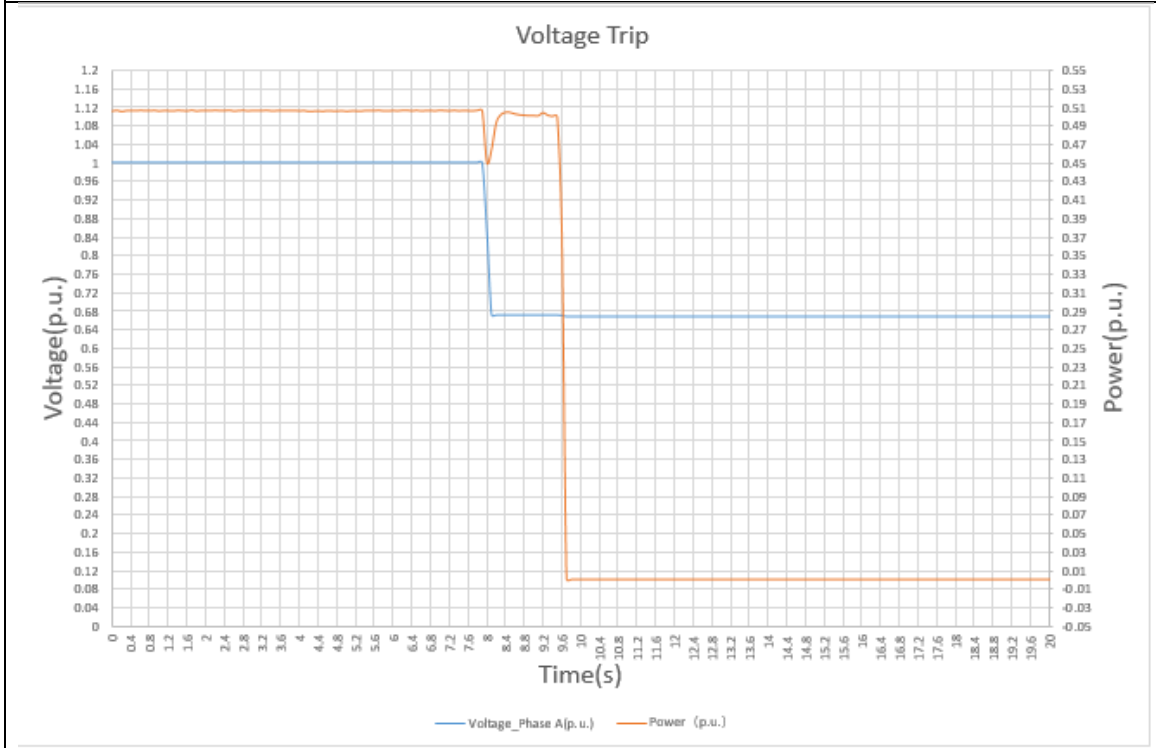


**Disconnection Time**

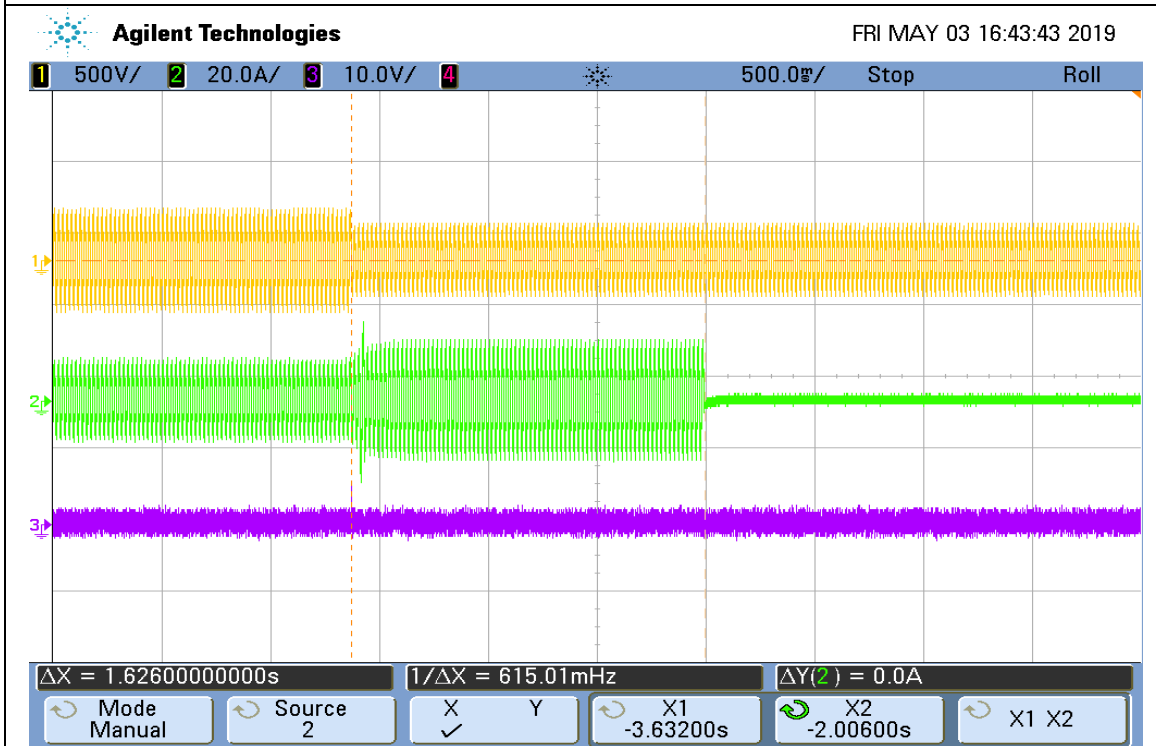


**50 % ≤ V < 85 % (setting at 155V)**

**Trip Value**

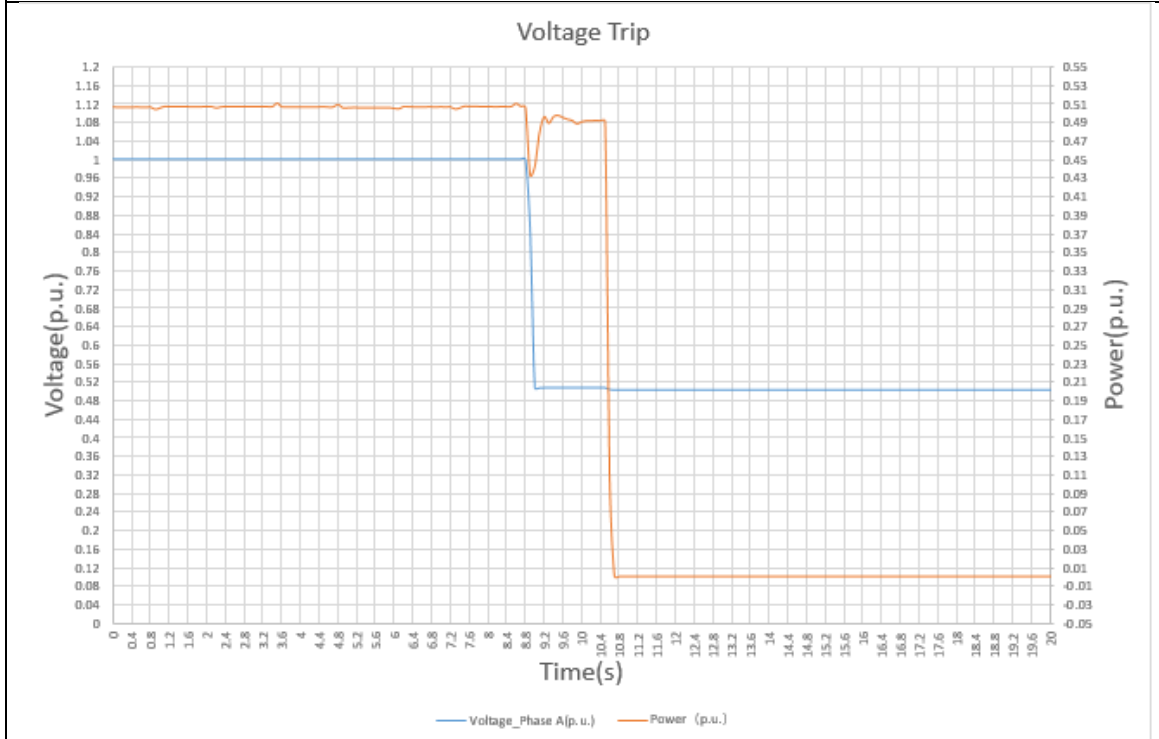


**Disconnection Time**

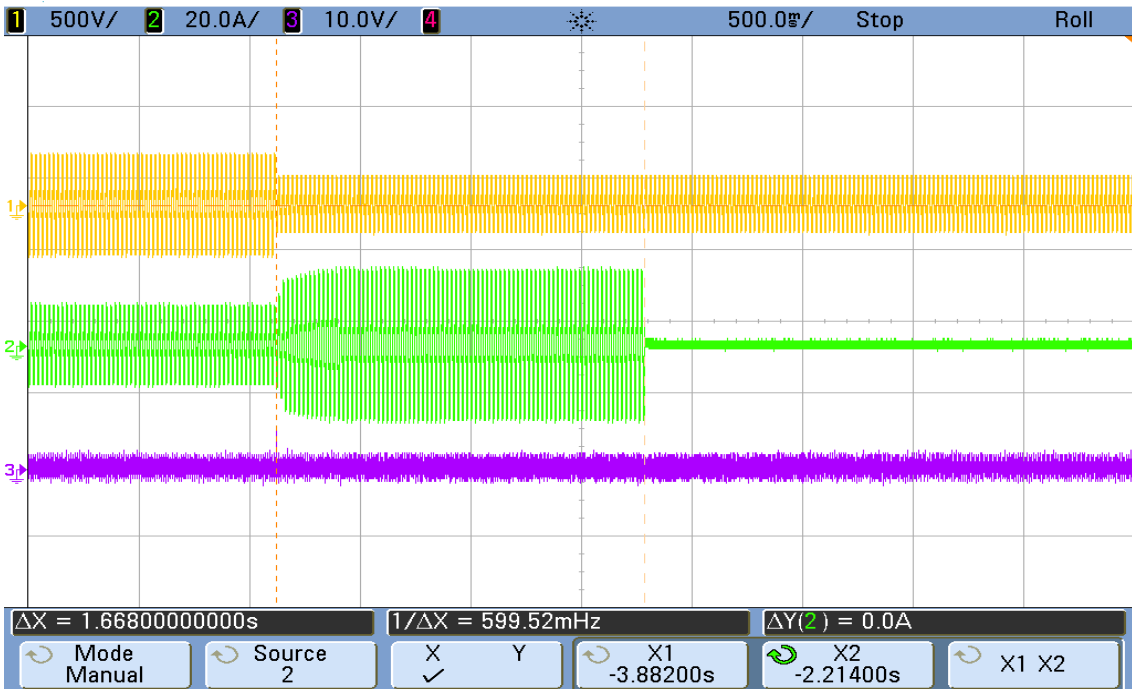


**50 %Vn ≤ V < 85 %Vn (setting at 117V)**

**Trip Value**



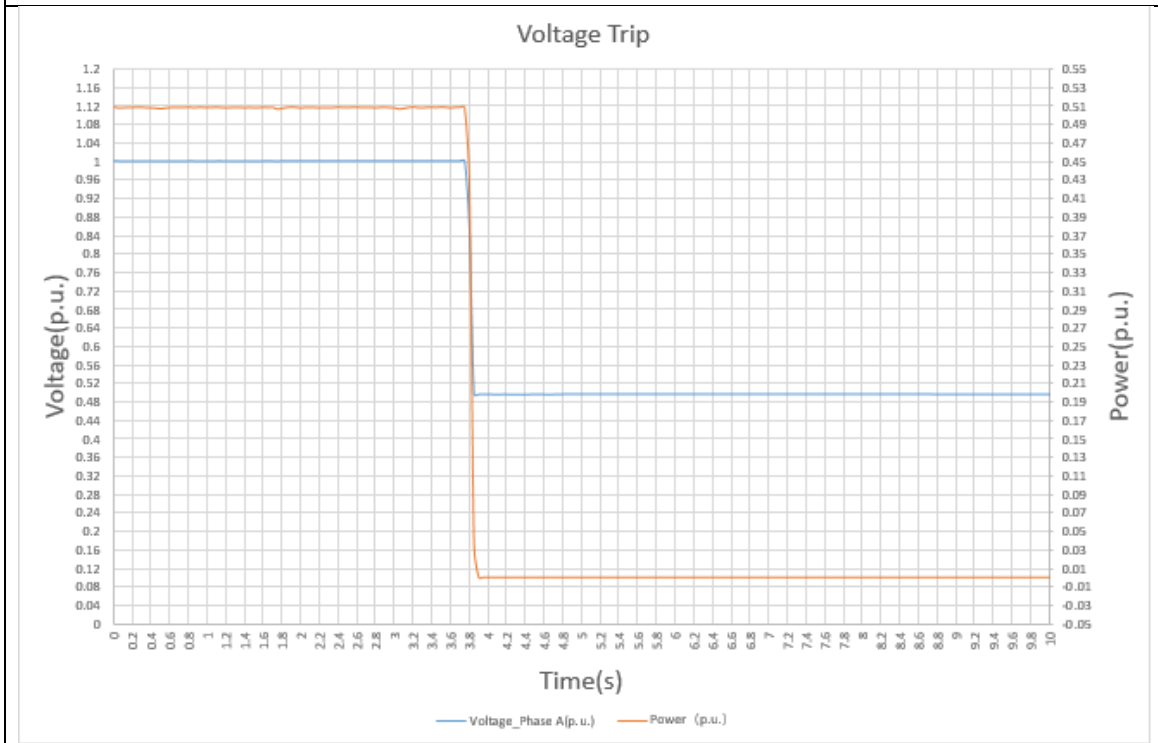
**Disconnection Time**



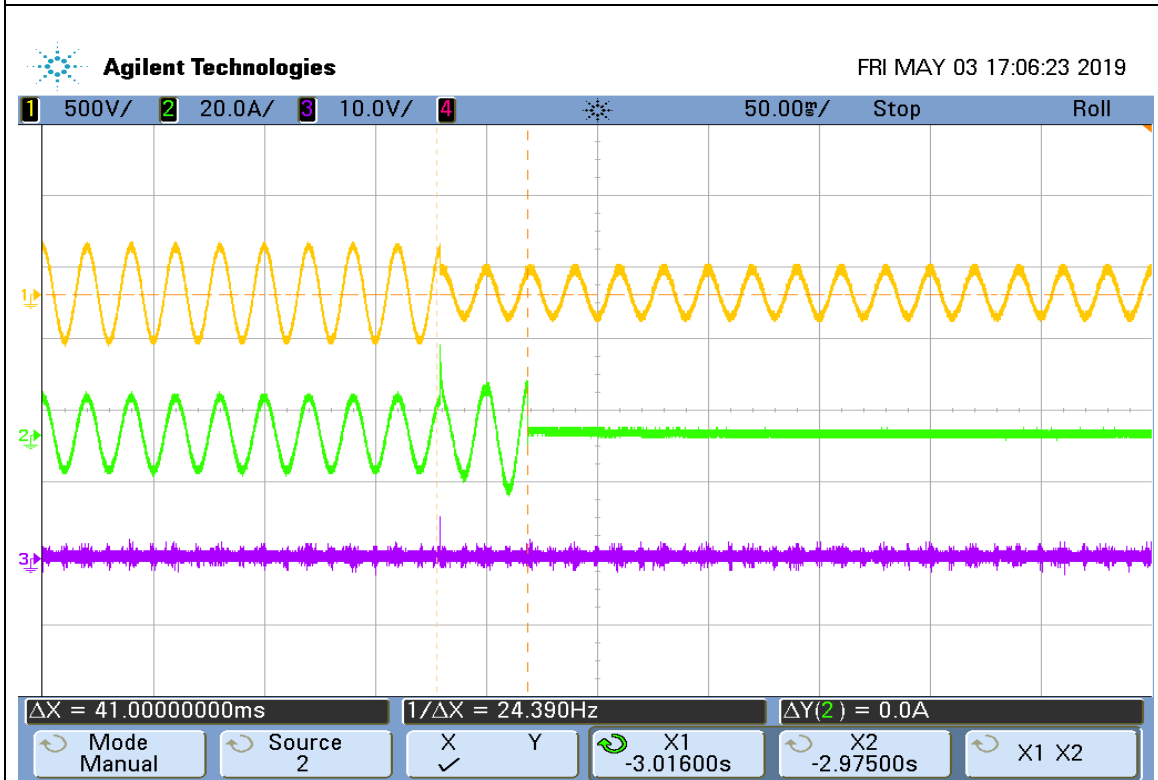


***V < 50%Vn(setting at 114V)***

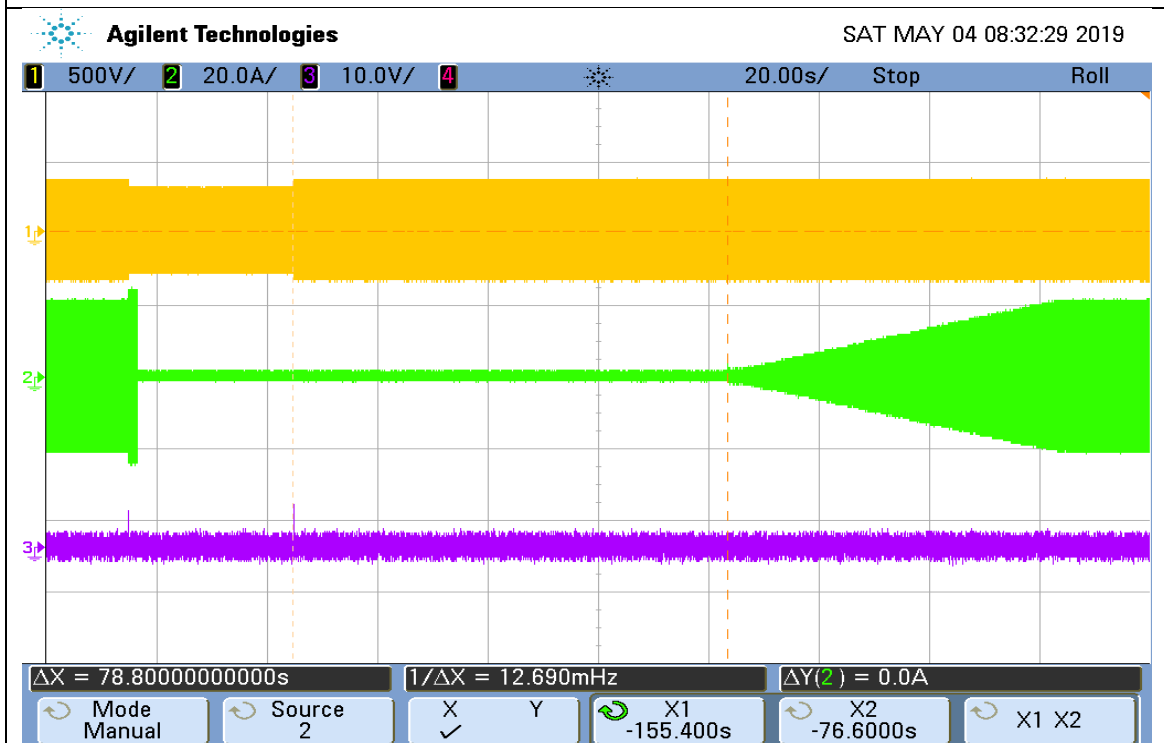
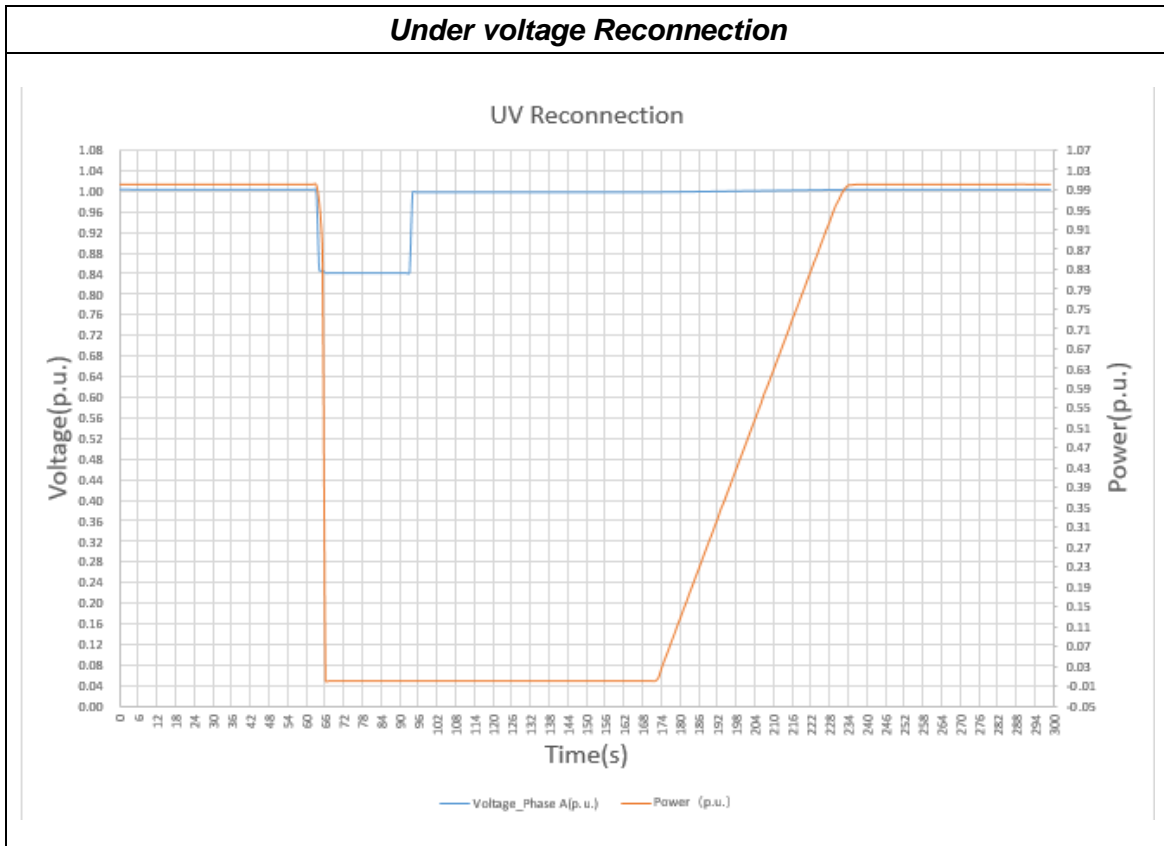
***Trip Value***



***Disconnection Time***

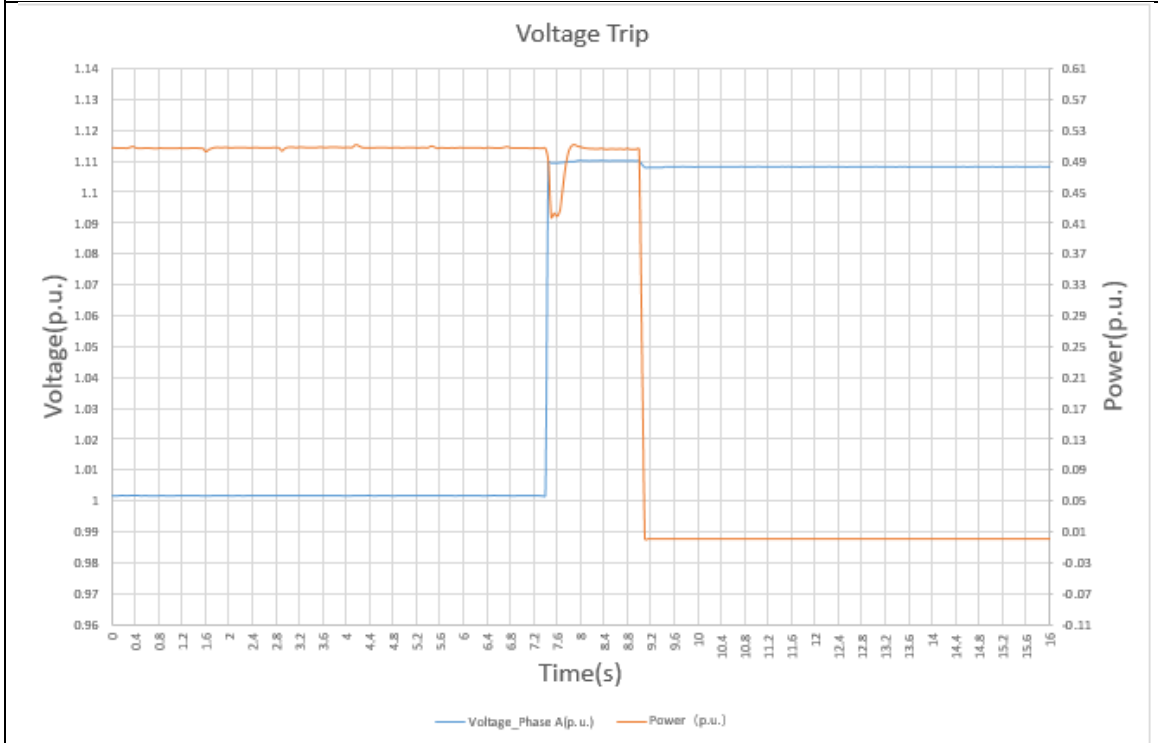


**Under voltage Reconnection**

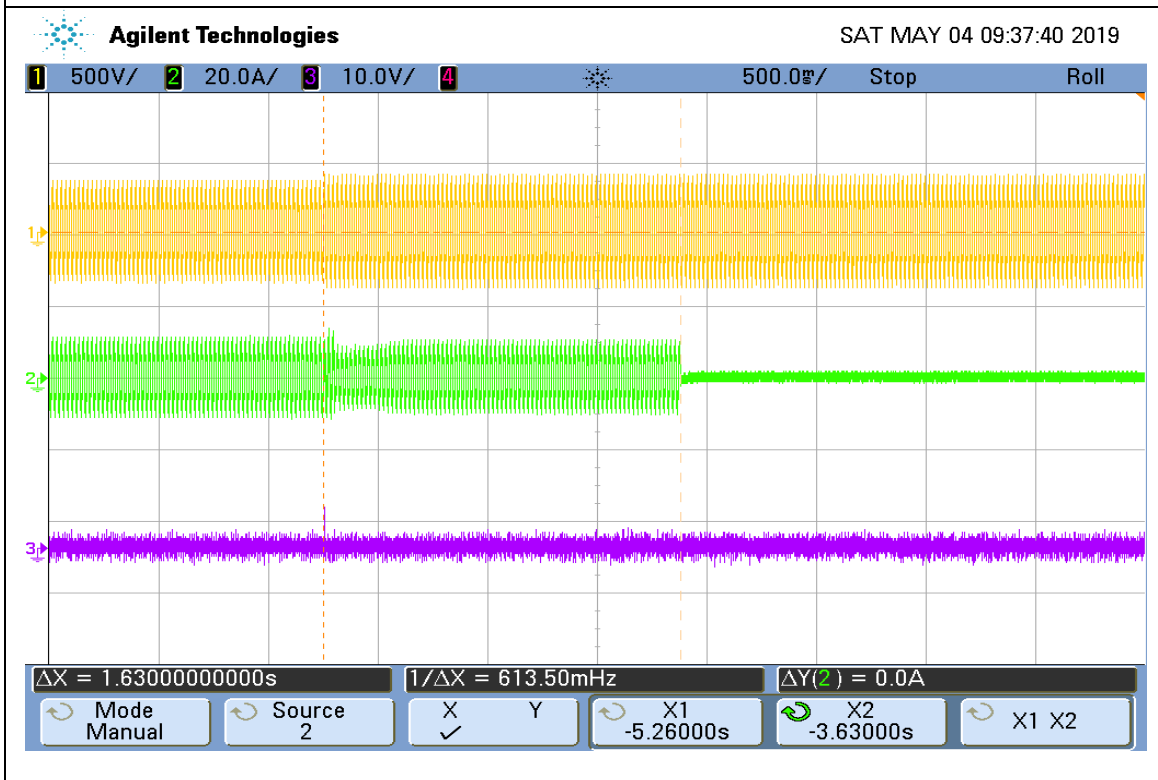


**110 %Vn < V < 135 %Vn(setting at 255V)**

**Trip value**

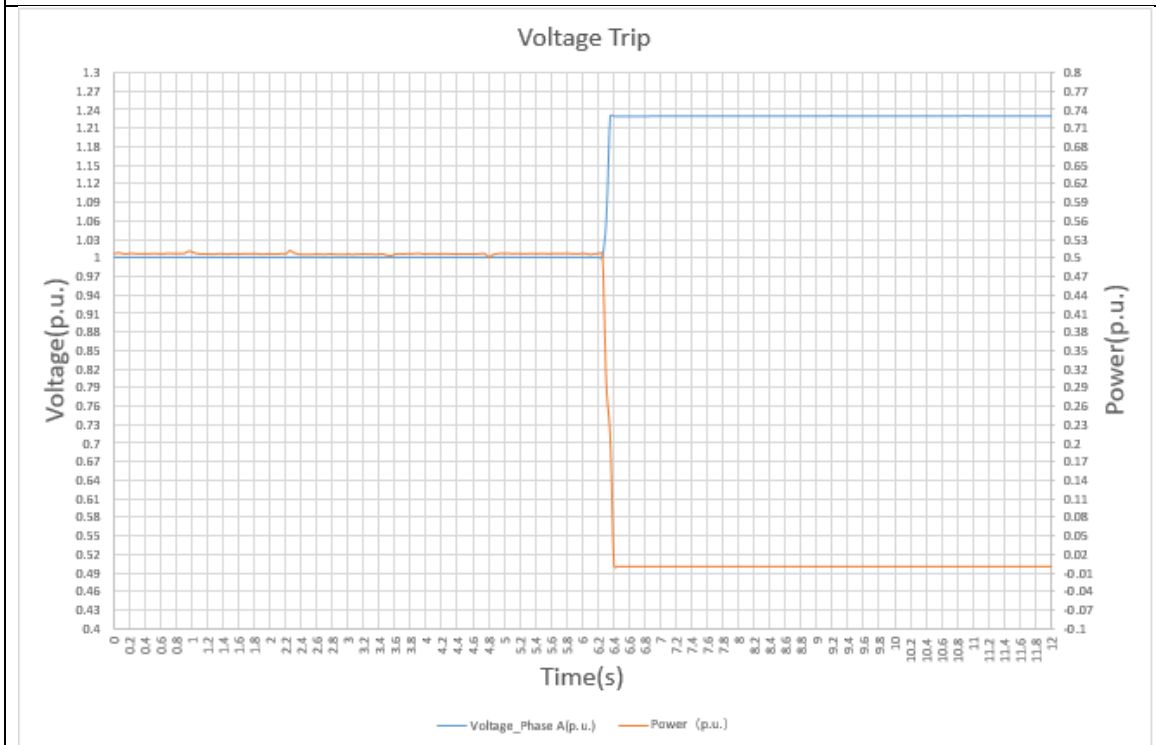


**Disconnection Time**

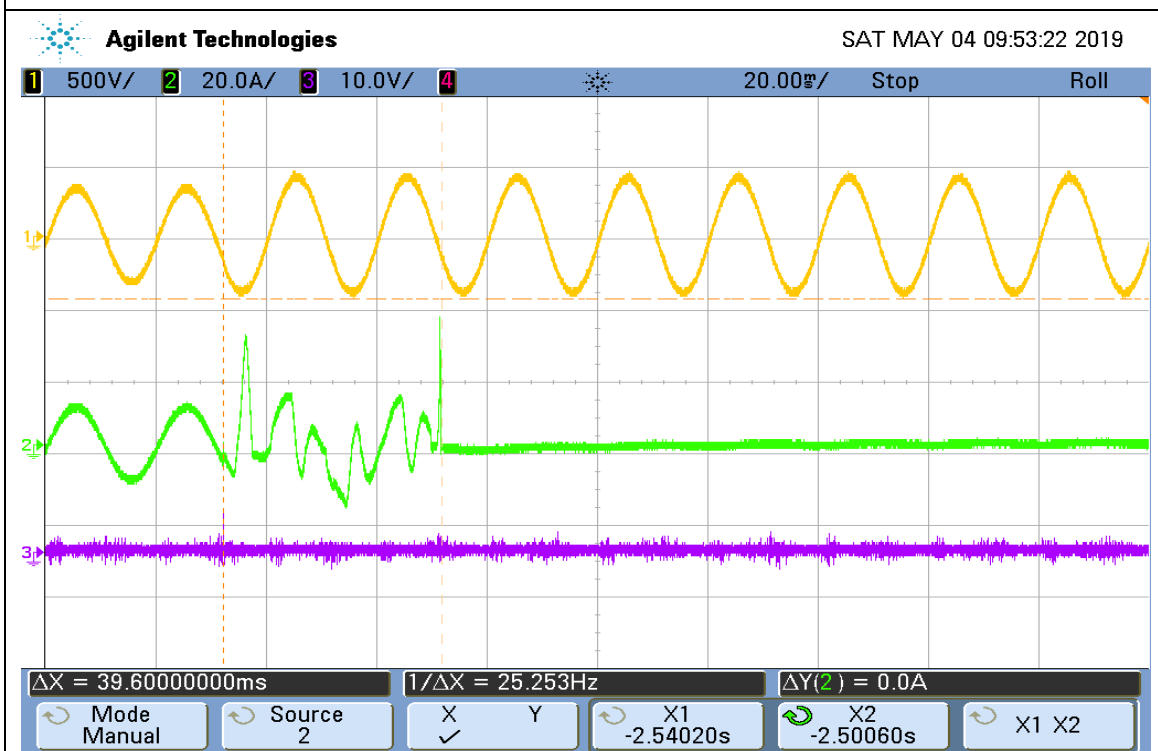


110 %Vn < V < 135 %Vn(setting at 282V)

Trip value

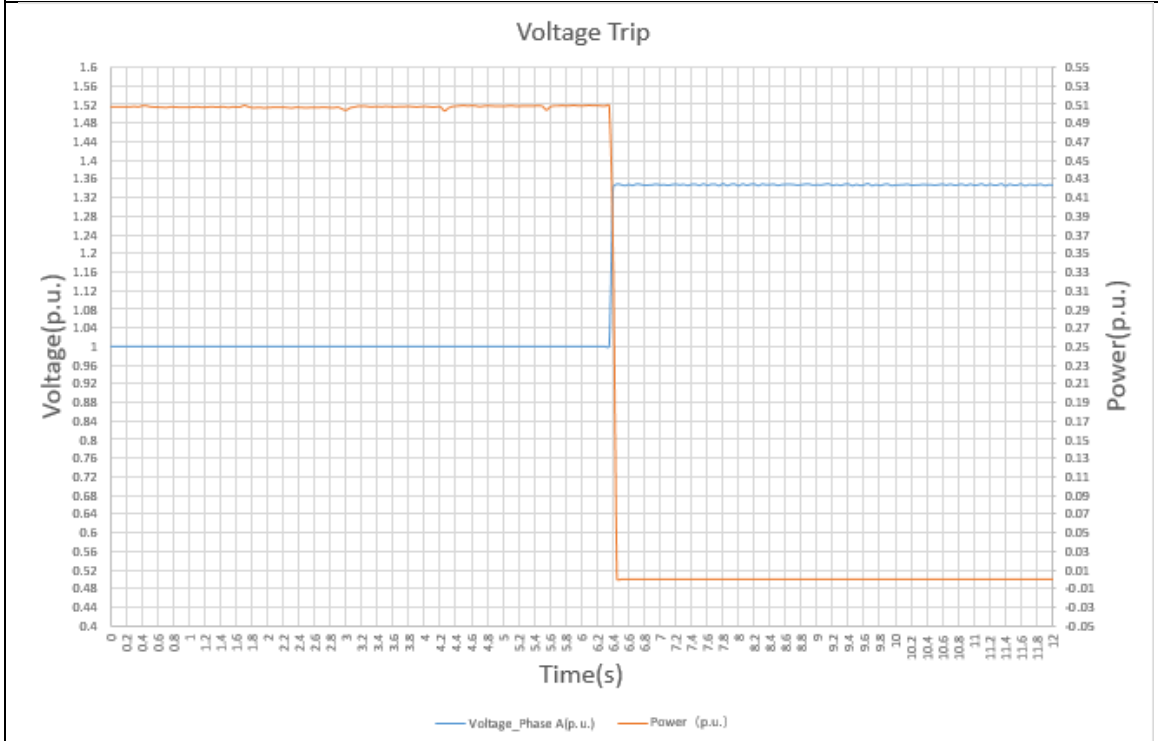


Disconnection Time

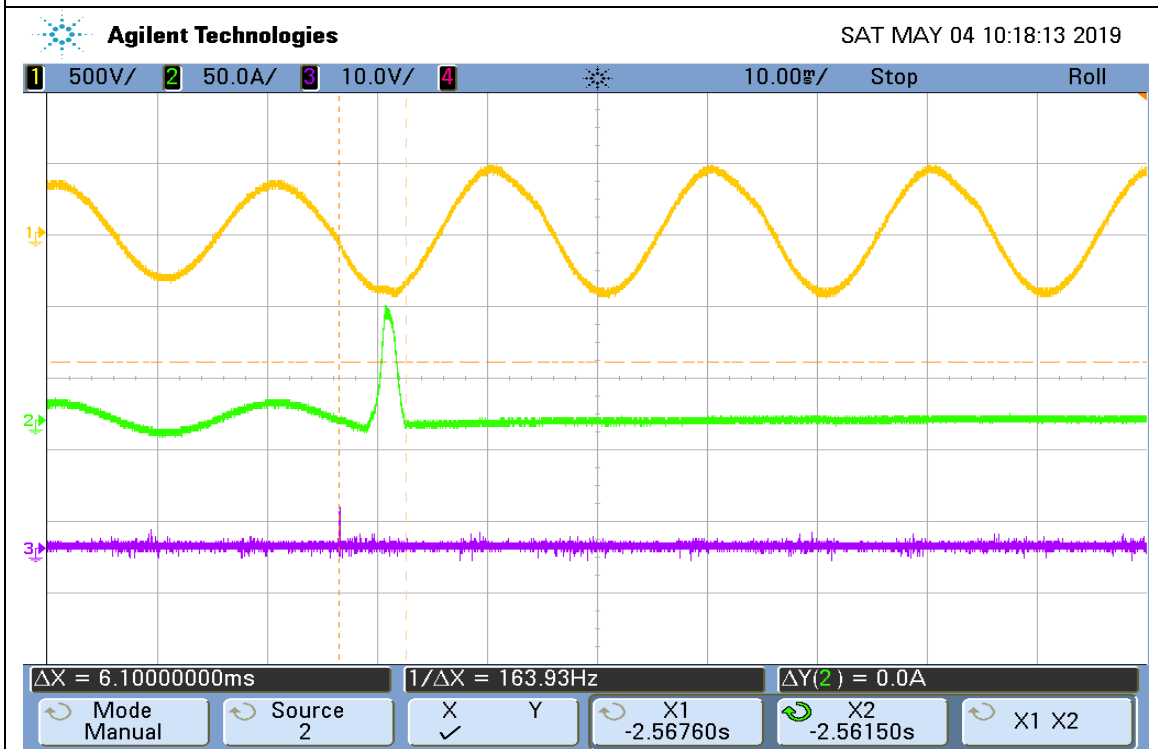


**110 %Vn < V < 135 %Vn(setting at 309V)**

**Trip value**



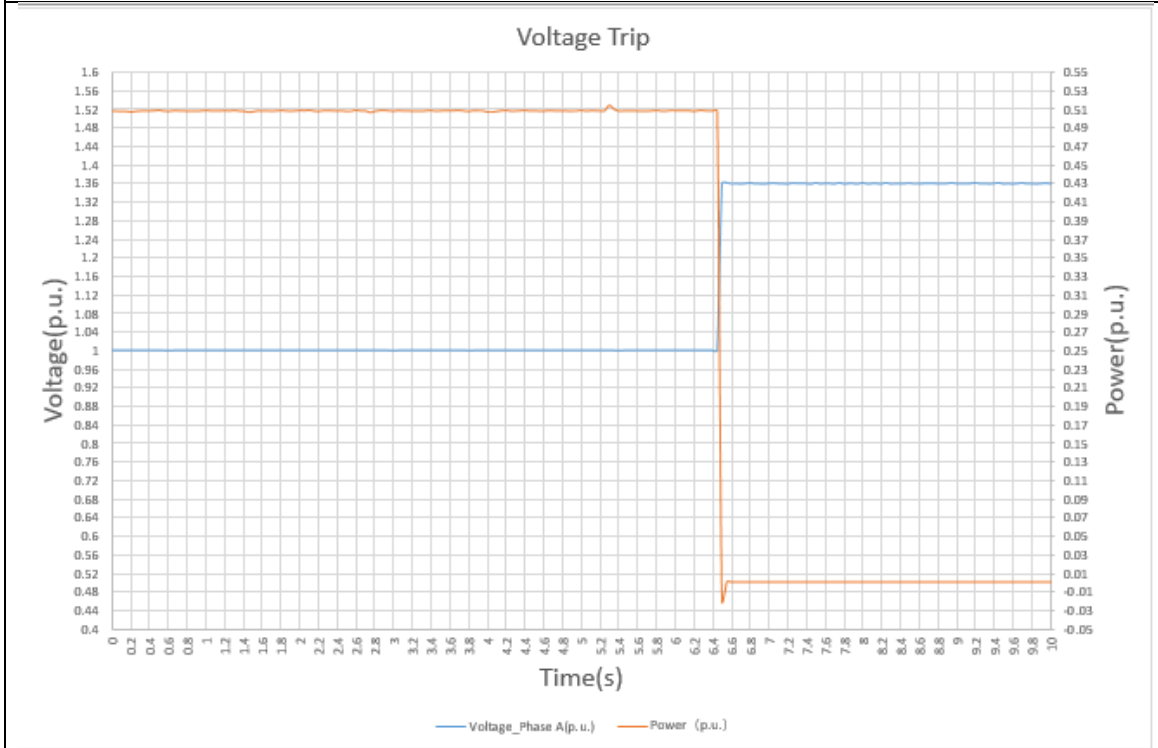
**Disconnection Time**



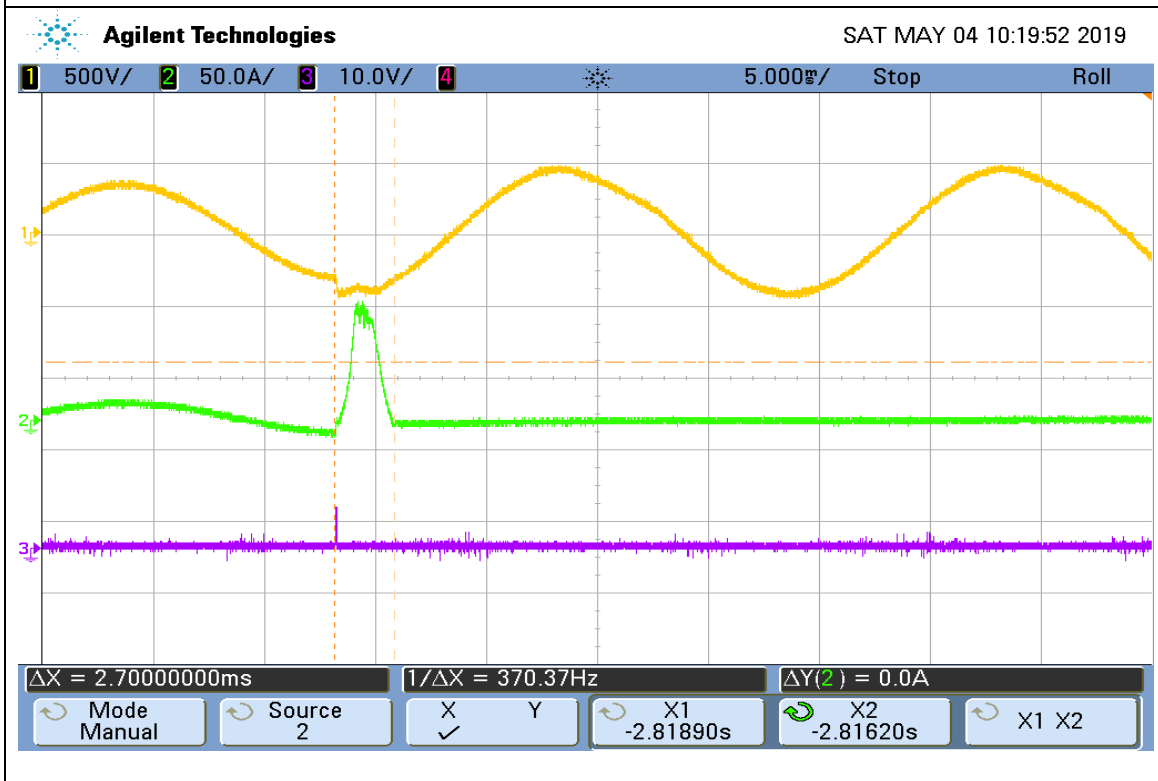


**135%Vn ≤ V(setting at 312)**

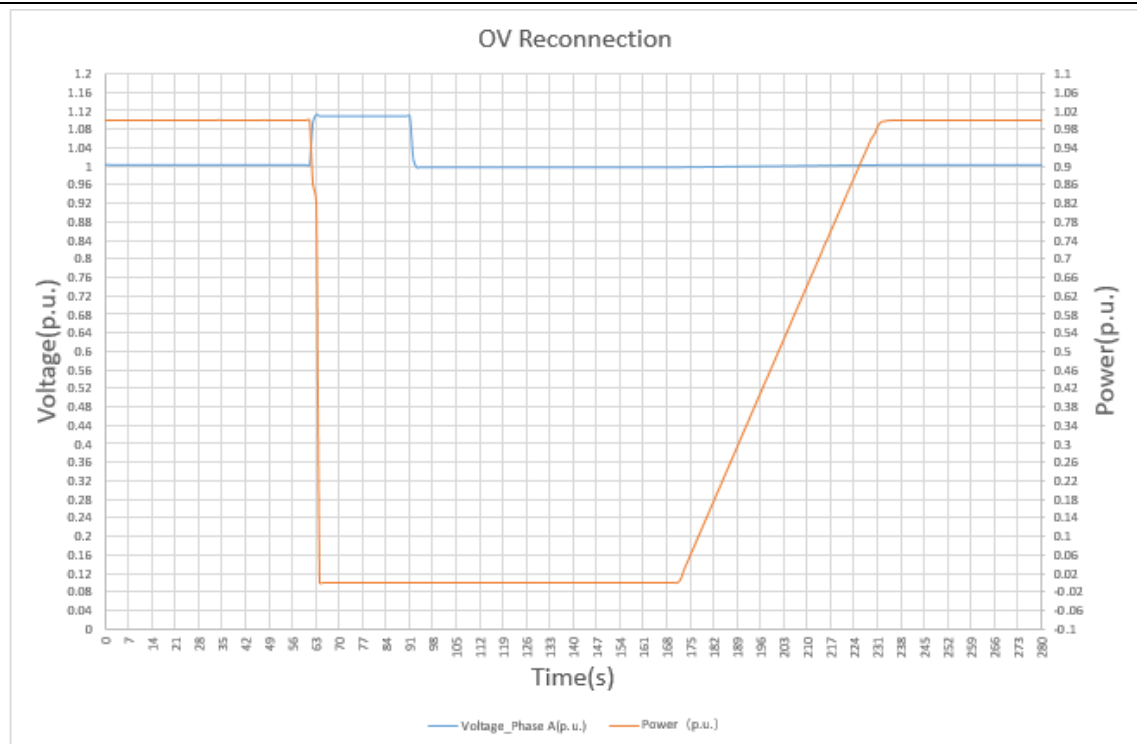
**Trip value**



**Disconnection Time**



**Over voltage reconnection**



**Agilent Technologies** SAT MAY 04 08:51:05 2019

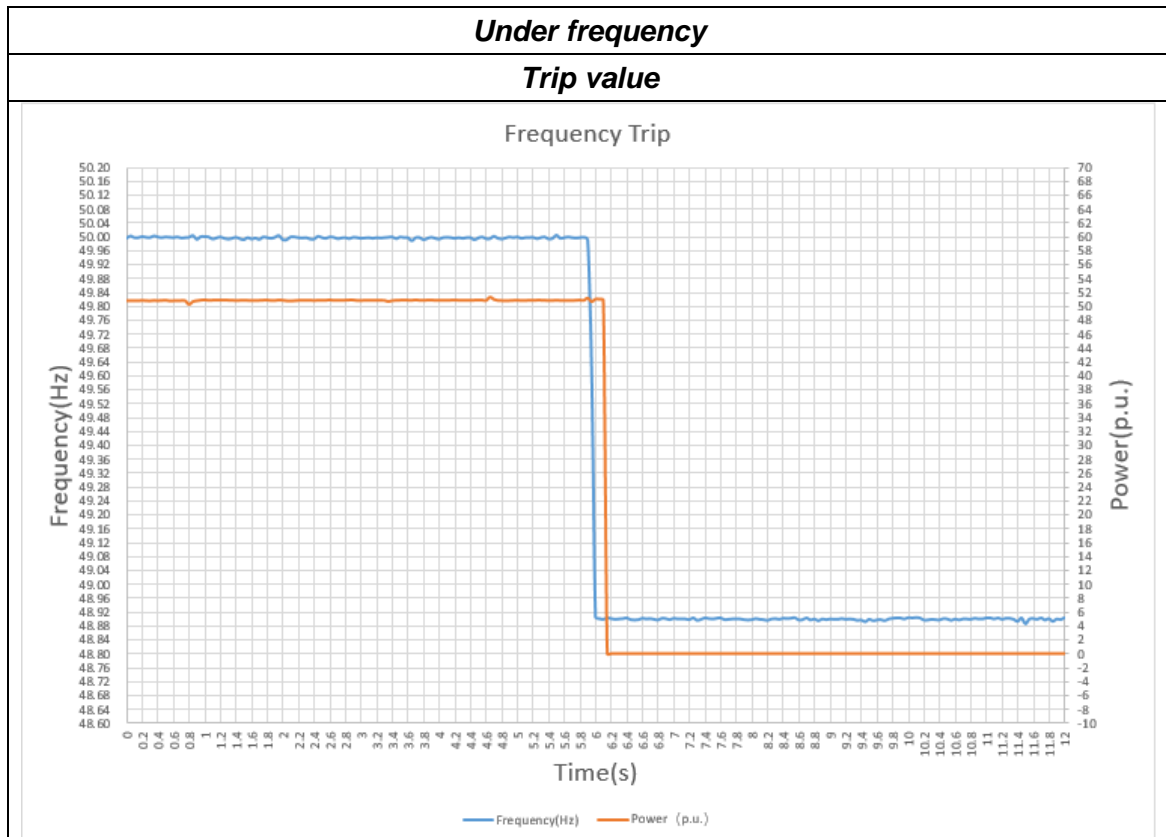
1 500V/ 2 20.0A/ 3 10.0V/ 4 20.00s/ Stop Roll

The oscilloscope displays three waveforms: 1 (yellow), 2 (green), and 3 (purple). Waveform 1 is a constant high signal. Waveform 2 shows a step change at 63s and a ramp down starting at 175s. Waveform 3 is a noisy signal around 0.1 p.u.

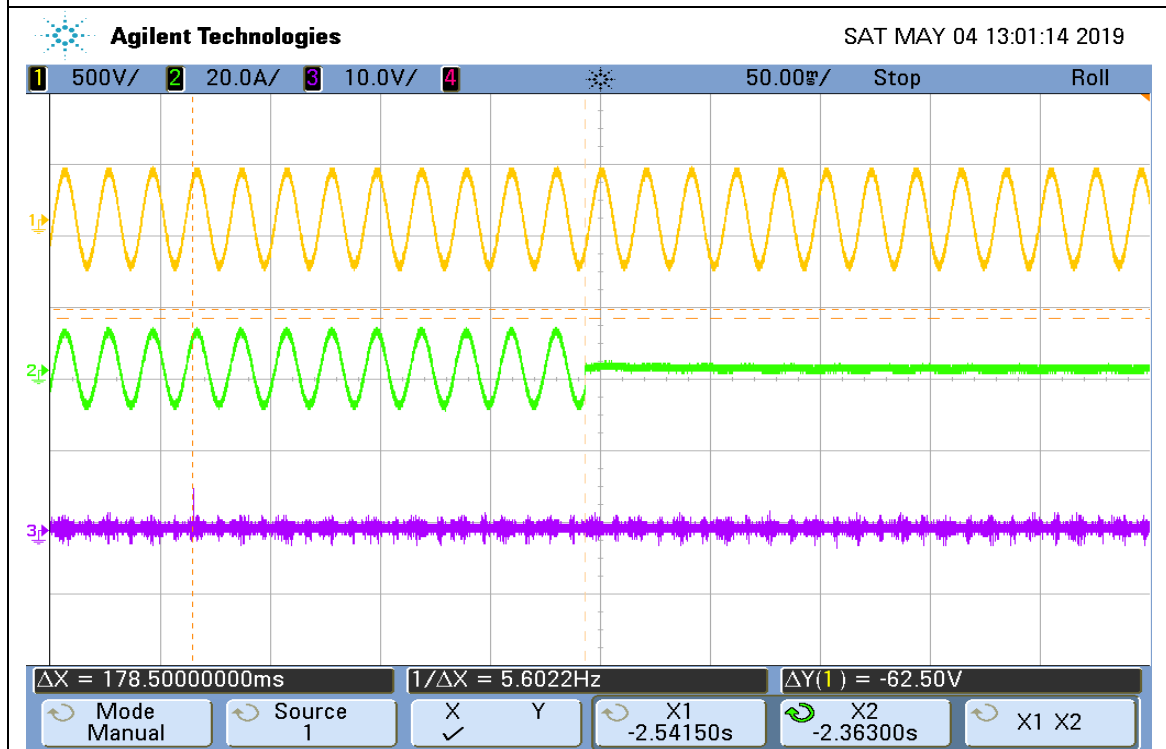
$\Delta X = 79.200000000000s$   $1/\Delta X = 12.626mHz$   $\Delta Y(2) = 0.0A$

Mode Manual Source 2 X Y X1 X2  
 -153.400s -74.2000s

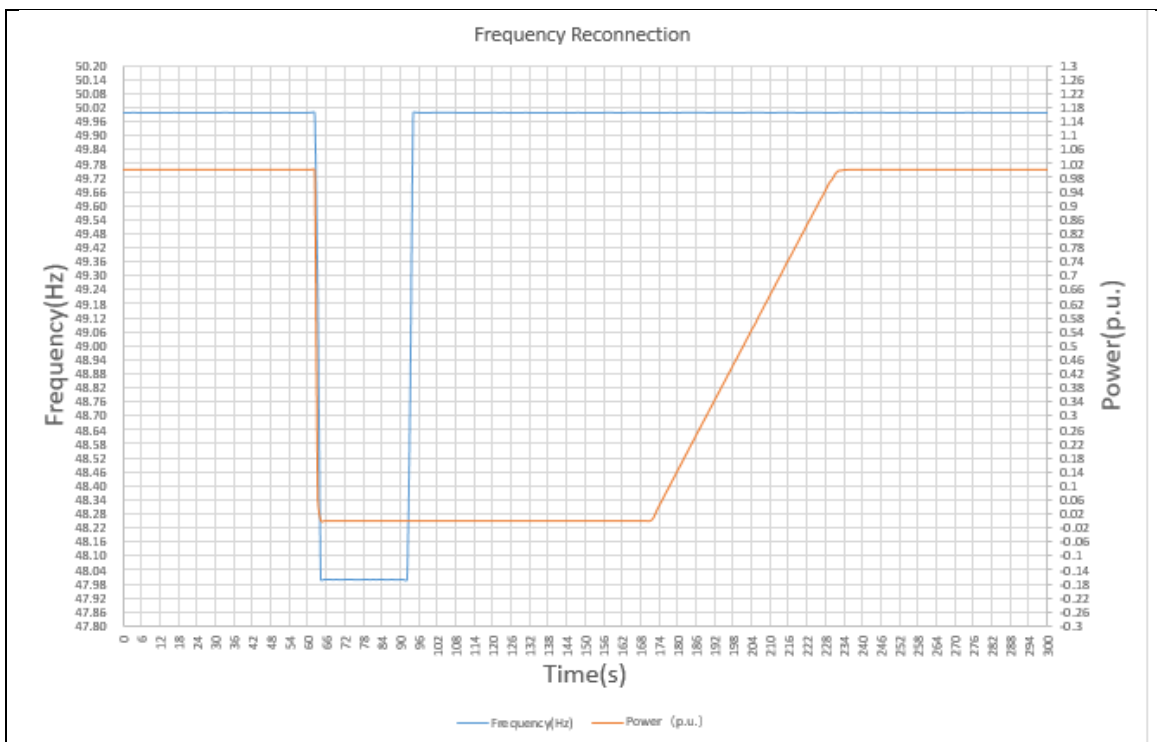
**Over/under frequency trip settings and reconnection test**



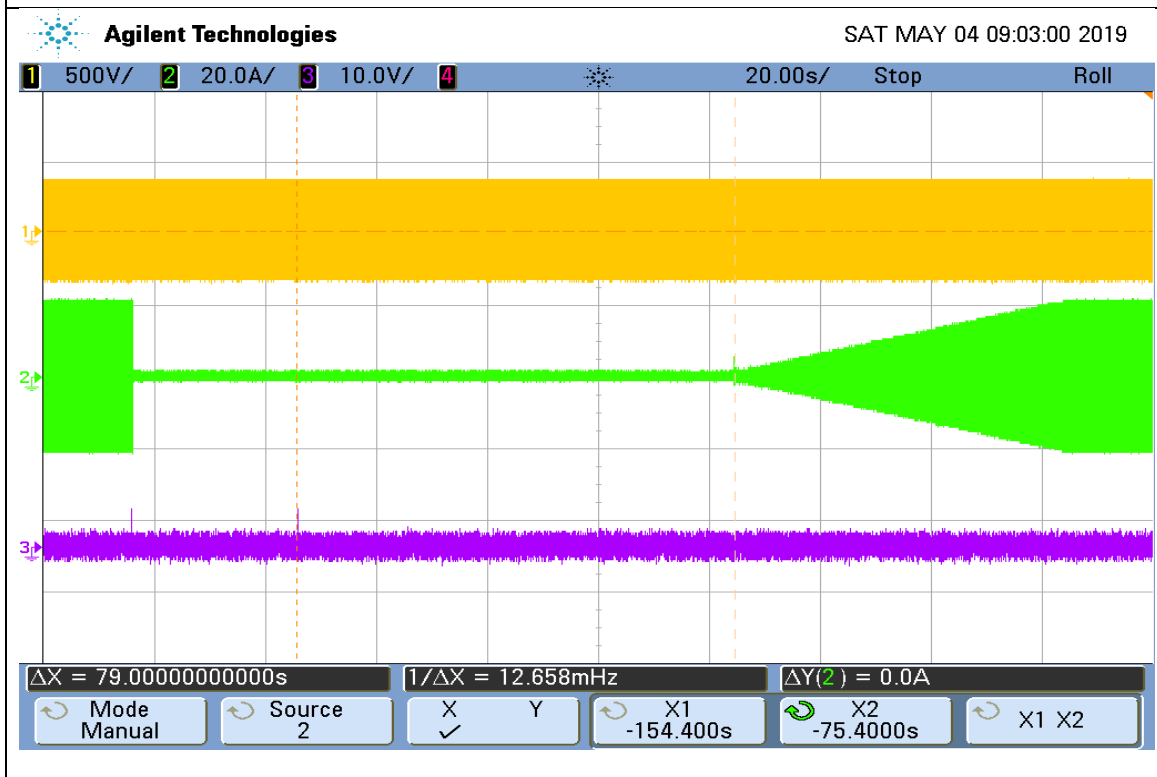
**Disconnection time**



**Under frequency reconnection**

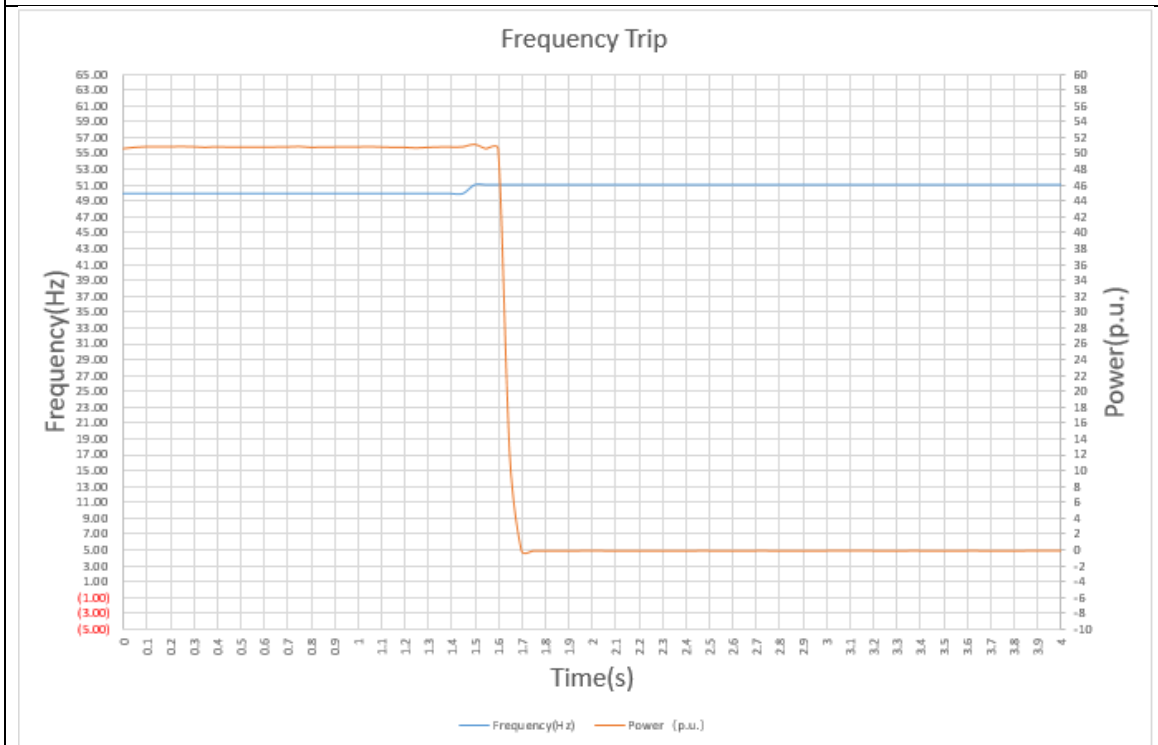


**Disconnection time**

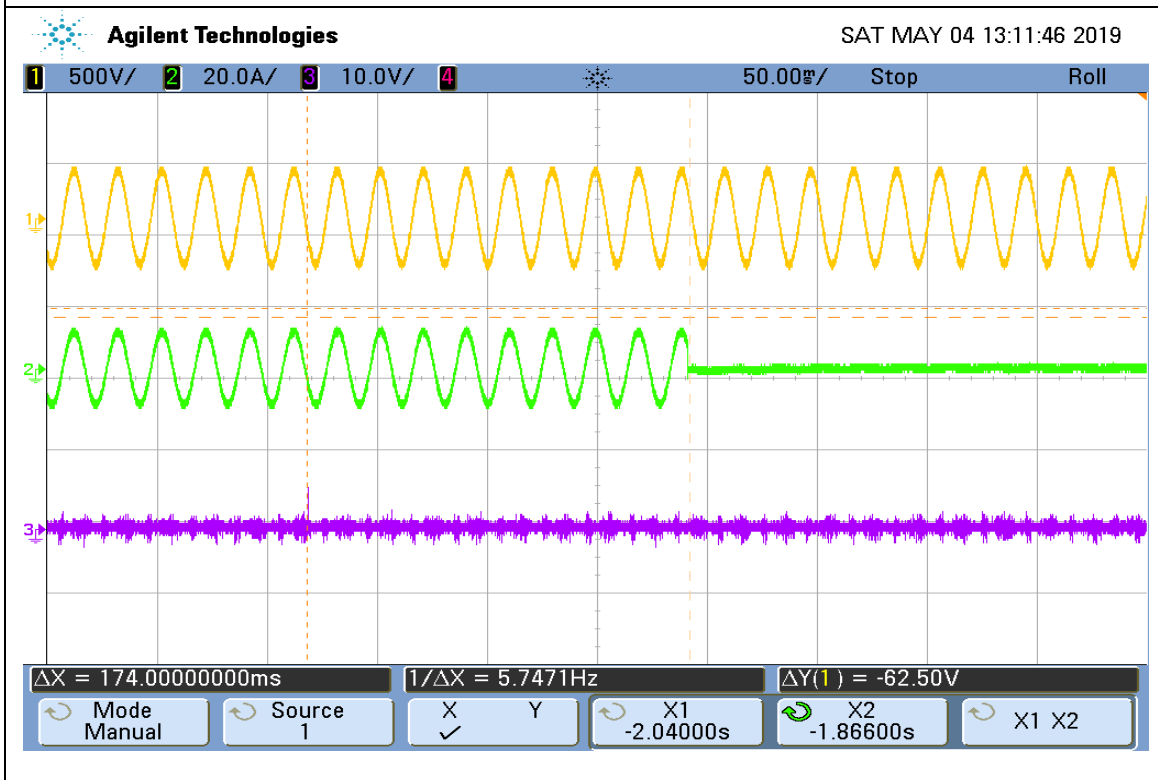


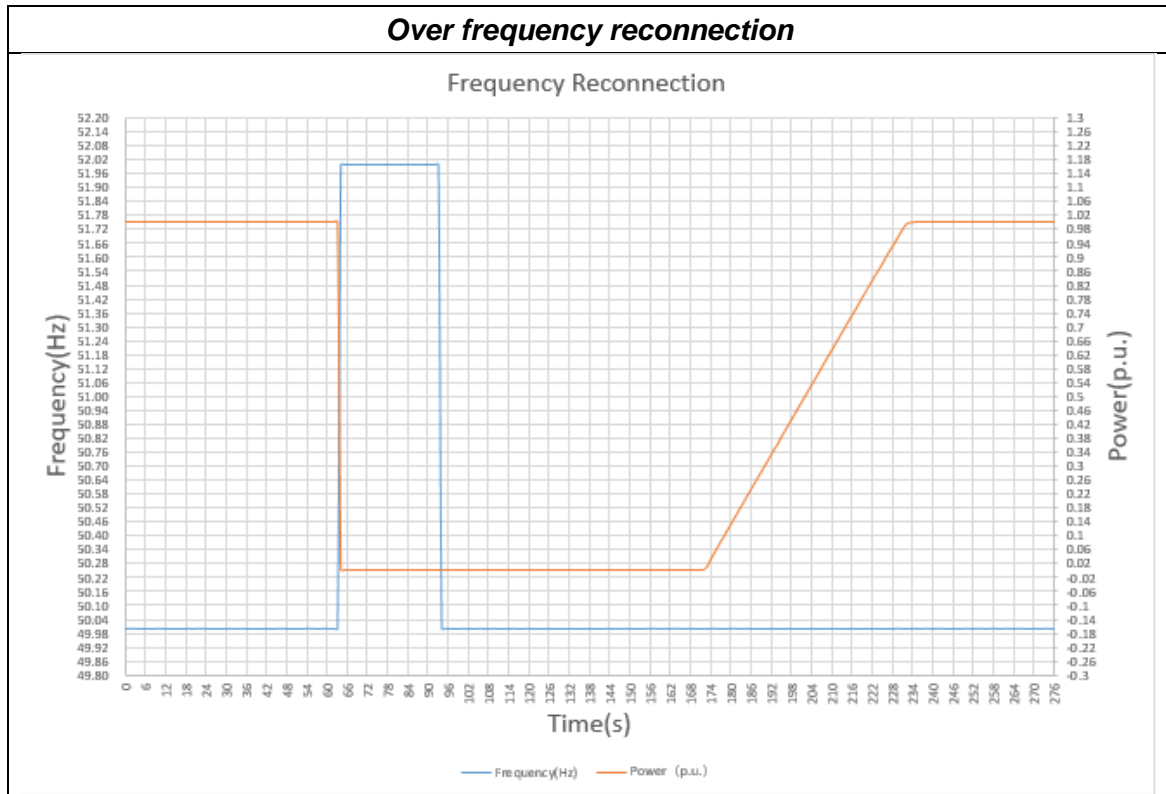
**Over frequency**

**Trip value**



**Disconnection time**





### Disconnection time

