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HIND RECTIFIERS LTD	DATE : 08.07.2021

Doc. No.		
Equipment Type	9 kW SMPS Low Power Test Setup	

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Introduction:

The following circuit was established in low power in the shop floor located in the ground floor of the R&D building to test the feasibility of a current fed converter. Since, components from the 4.5kW RBC cum 2.5kW EBC were easily available, these components where used to realize this setup.
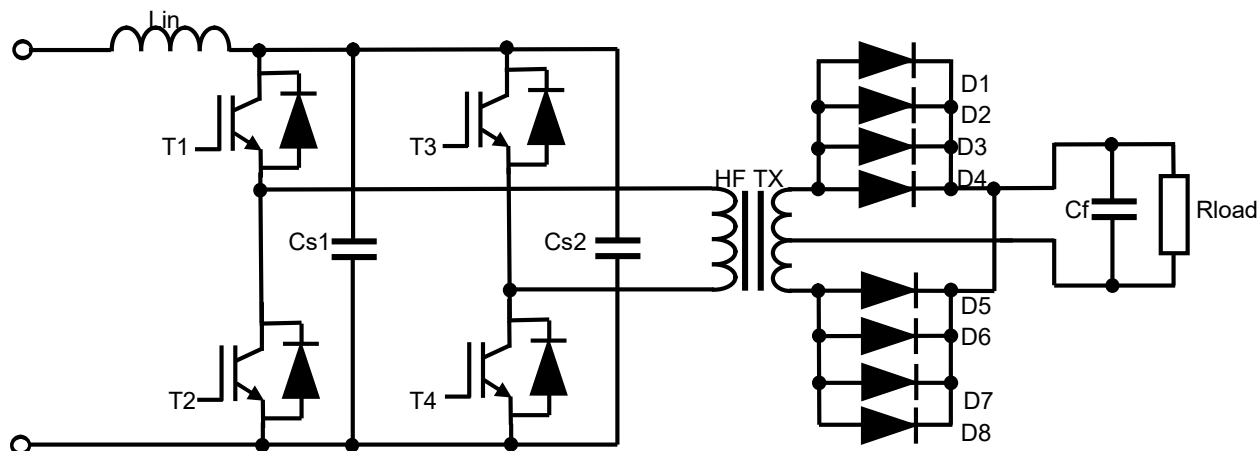
The following components were used:

1. 1 x DSP Main Control Card – Hirect HRT 1302
2. 1 x Interface Card – Hirect HRT 1301
3. 4 x Gate Driver Card – Semikron Skyper 32
4. 2 x Zener Protection Card – Hirect HR - 333/R1
5. 1 x Regulated DC Power supply – Aplab LD3202 (0-32Vdc, 0-2A)
6. 1 x Input Choke – Hirect TDA-6520 (40µF, 25A @ 15kHz)
7. 2 x IGBT – Semikron Semitrans SKM75GB063D (600V, 75A)
8. 2 x Snubber Capacitors – El-Ci-Ar MP71 (1µF, 1250V)
9. 1 x High Frequency Transformer – Hirect TDA-6523 (2.5kW, 2:1, 15kHz)
10. 4 x Fast Diode – IXYS DSEI2X101-12A (1200V, 99A, 40ns trr)
11. 1 x DC Filter Capacitor – Hirect HRL/RBC/OFP/01 RBC Output Filter Card (4.4mF)
12. 2 x Load Resistor – KWK KHA100 (50Ω & 500Ω each)

The converter was switched at 15kHz square wave pulse in the same way as mentioned in the simulation document. It was supplied 10V from the regulated dc power supply. As soon as it was loaded, the input voltage fell to 6.2Vdc and remained the same. The voltage across the load was measured to be 6.573Vdc throughout this condition. The current sourced from the regulated dc power supply was observed to figure out if the converter could load higher amount of current with higher overlapping of the top and bottom switches of the same leg. The Semikron Skyper 32 gate driver is a dual channel gate driver and it was forcing to turn off the bottom switch as soon as the both the switches turn on at the same time. This was bypassed by using 4 separate gate drivers, using only 1 channel and completely turning off the other channel.
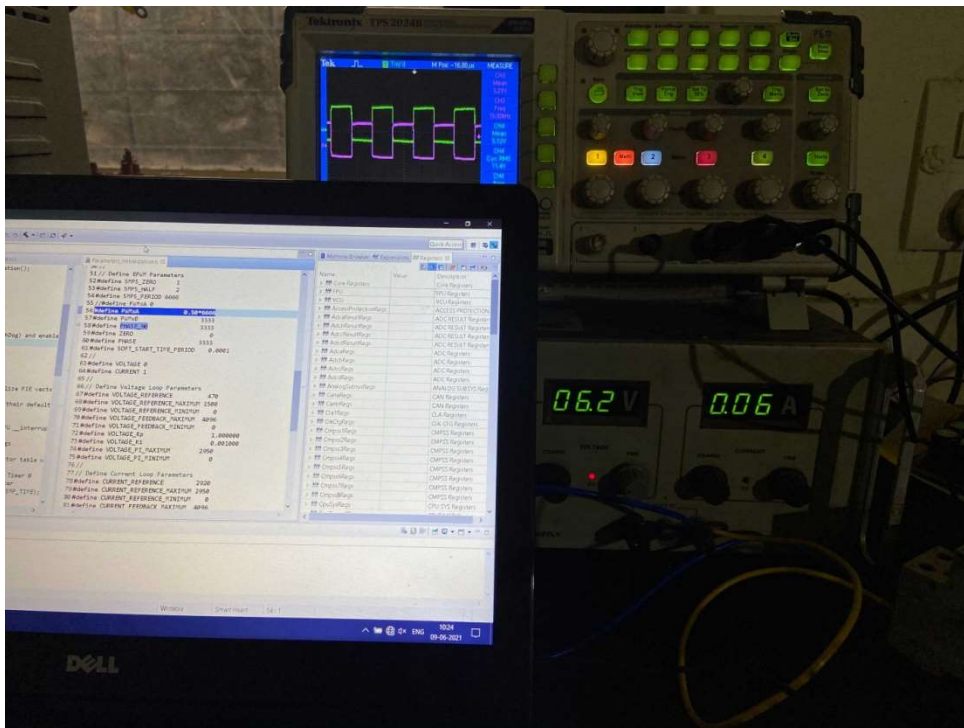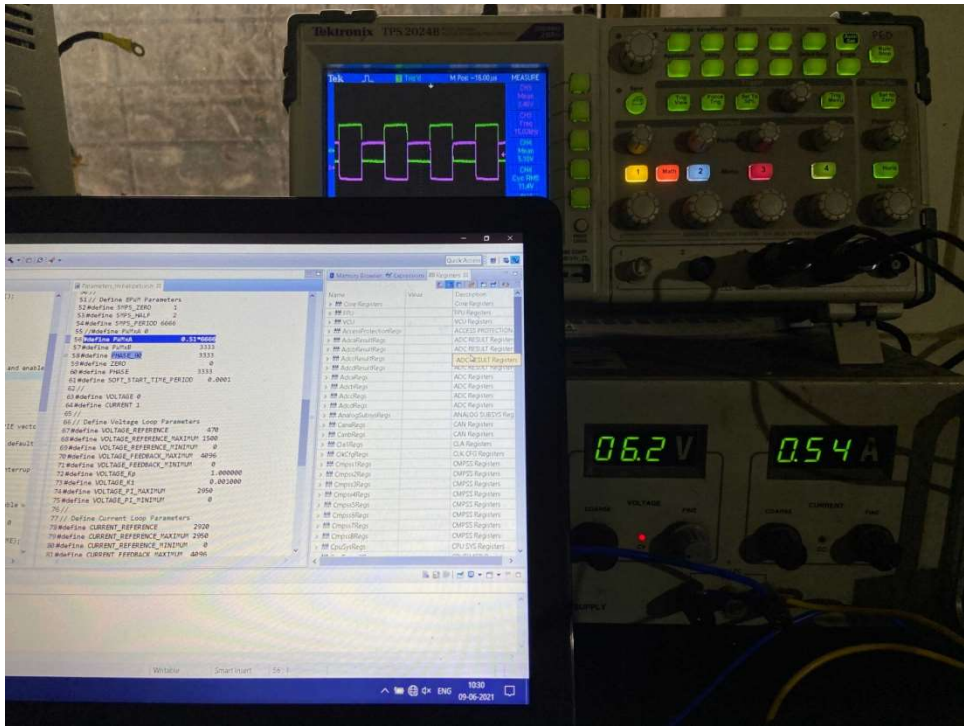
Result Data Table:
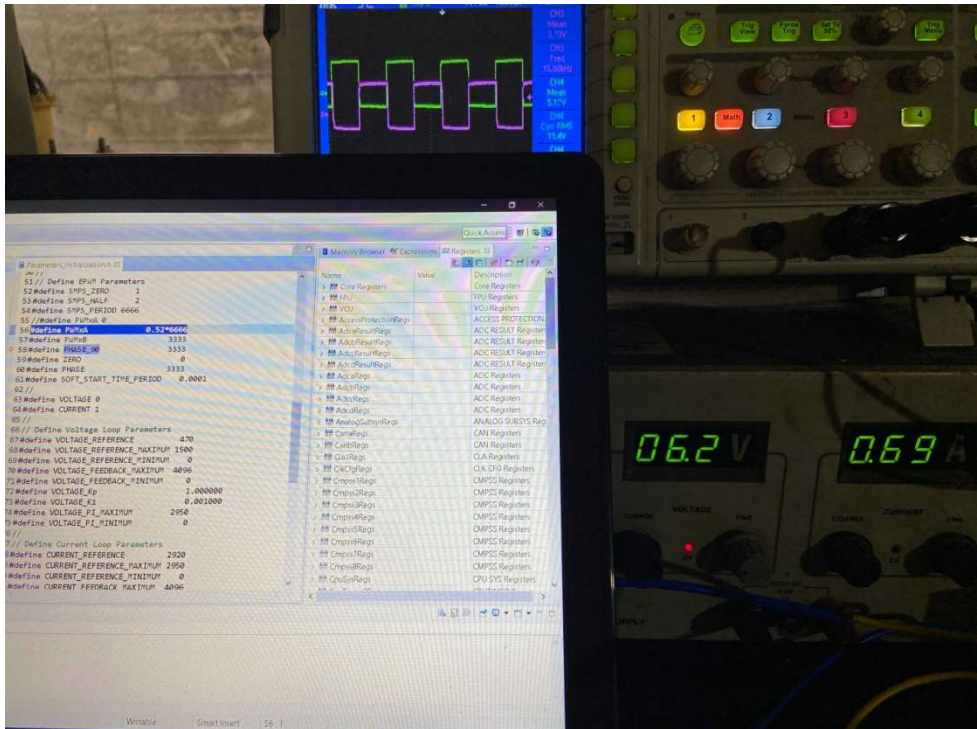
Sr. No.	Duty Cycle	Input Voltage	Input Current
1.	50%	6.2V	0.06A
2.	51%	6.2V	0.54A
3.	52%	6.2V	0.69A
4.	53%	6.2V	0.69A
5.	54%	6.2V	0.69A
6.	55%	6.2V	0.68A
7.	56%	6.2V	0.68A
8.	57%	6.2V	0.68A
9.	58%	6.2V	0.68A
10.	59%	6.2V	0.68A
11.	60%	6.2V	0.69A
12.	61%	6.2V	0.69A
13.	62%	6.2V	0.69A
14.	63%	6.2V	0.70A
15.	64%	6.2V	0.72A
16.	65%	6.2V	0.77A
17.	66%	6.2V	0.82A
18.	67%	6.2V	0.87A
19.	68%	6.2V	0.93A
20.	69%	6.2V	0.99A
21.	70%	6.2V	1.06A
22.	71%	6.2V	1.14A
23.	72%	6.2V	1.23A
24.	73%	6.2V	1.33A
25.	74%	6.2V	1.44A
26.	75%	6.2V	1.57A
27.	76%	6.2V	1.71A
28.	77%	6.2V	1.87A
29.	78%	6.2V	2.06A
30.	79%	6.2V	2.28A
31.	80%	6.0V	2.44A

Result Data Pictures:
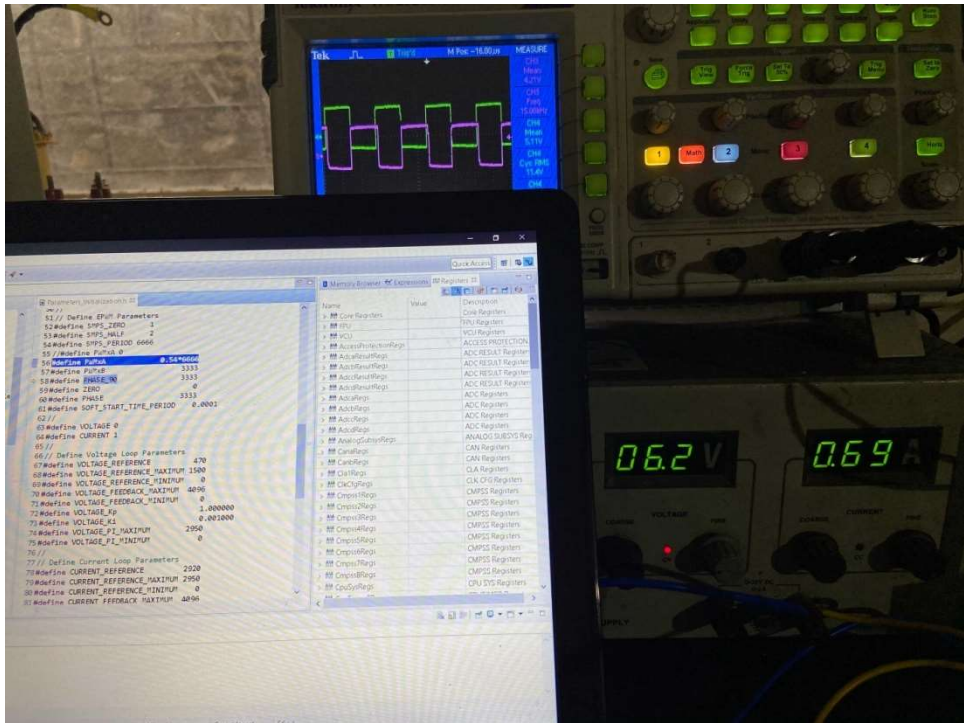
Duty = 50%, Vin = 6.2V, Iin = 0.06A	Remark

Duty = 51%, Vin = 6.2V, Iin = 0.54A	Remark

Duty = 52%, Vin = 6.2V, Iin = 0.69A	Remark
Duty = 53%, Vin = 6.2V, Iin = 0.69A	Remark

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Duty = 54%, Vin = 6.2V, Iin = 0.69A	Remark
Duty = 55%, Vin = 6.2V, Iin = 0.68A	Remark
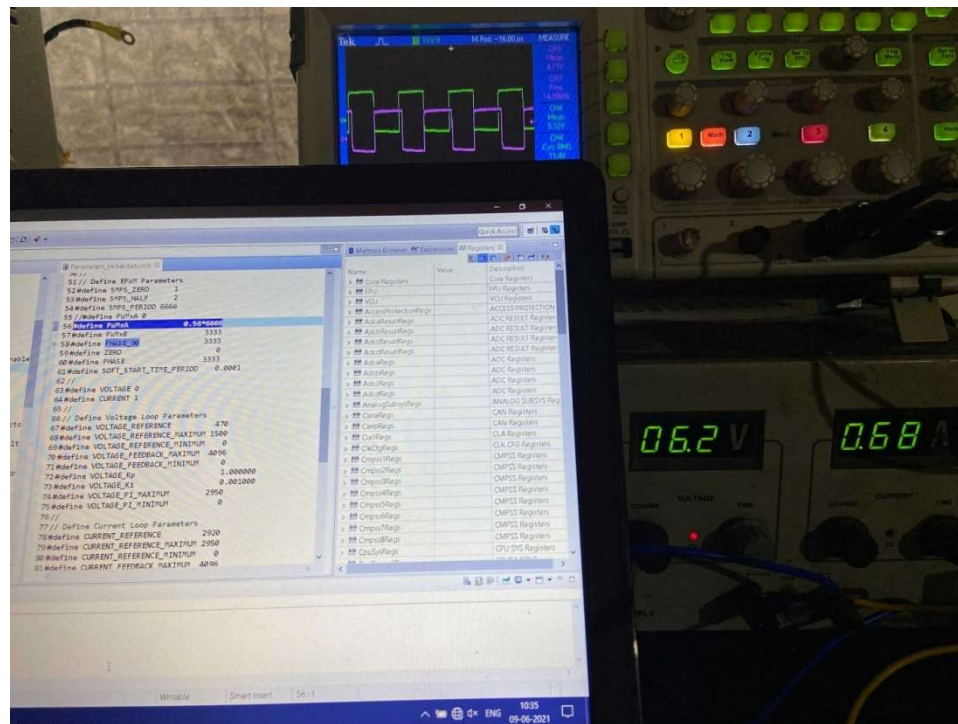
Duty = 56%, Vin = 6.2V, Iin = 0.68A	Remark
Duty = 57%, Vin = 6.2V, Iin = 0.68A	Remark
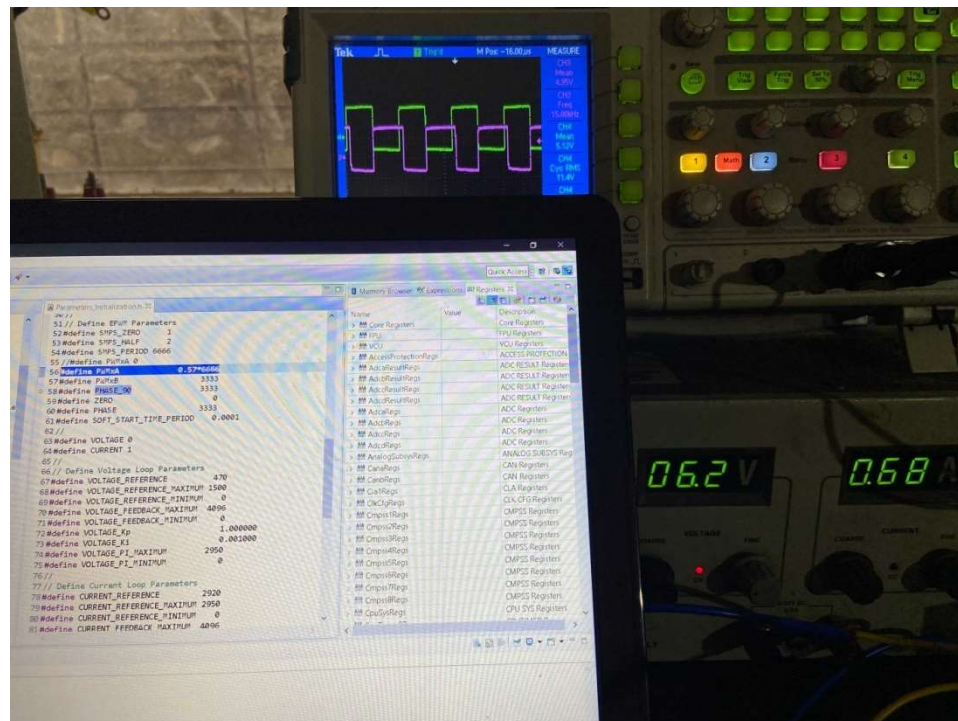
Duty = 58%, Vin = 6.2V, Iin = 0.68A	Remark
Duty = 59%, Vin = 6.2V, Iin = 0.68A	Remark
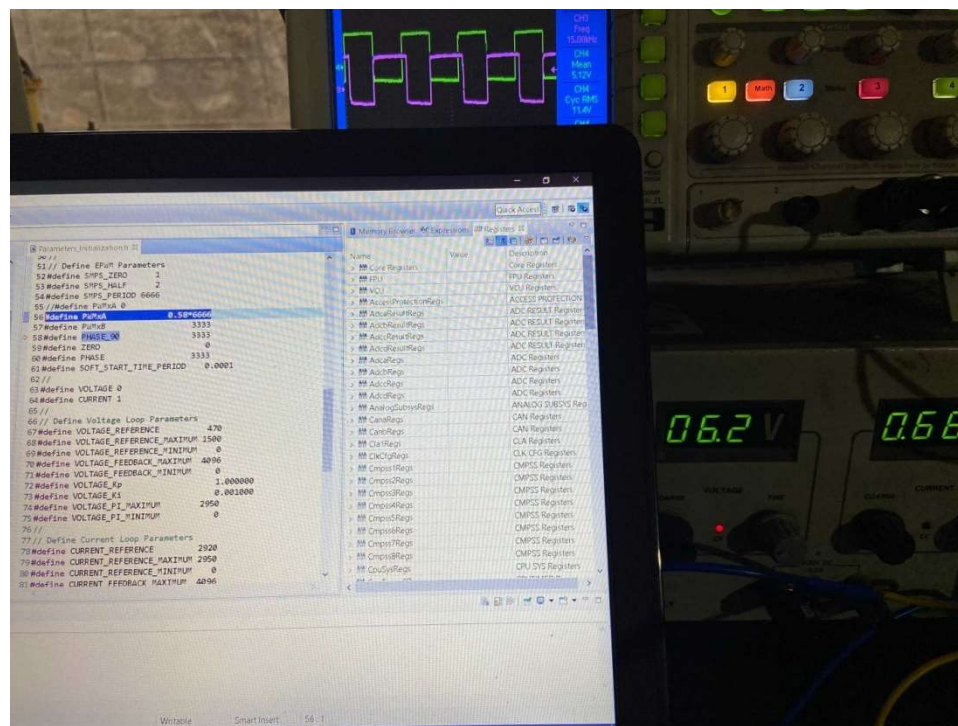
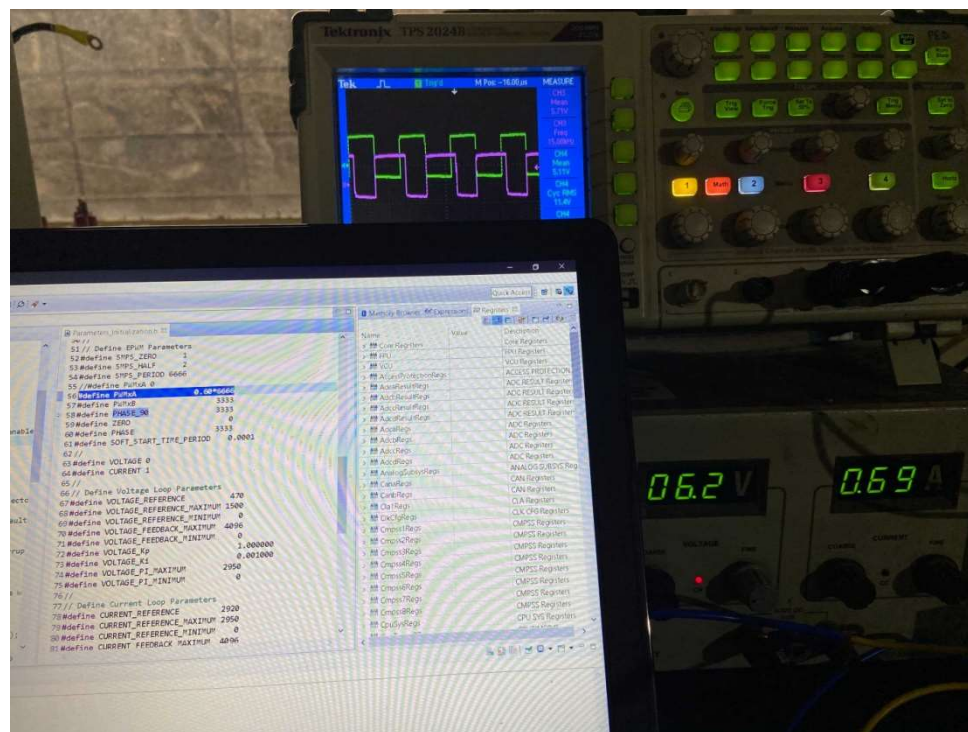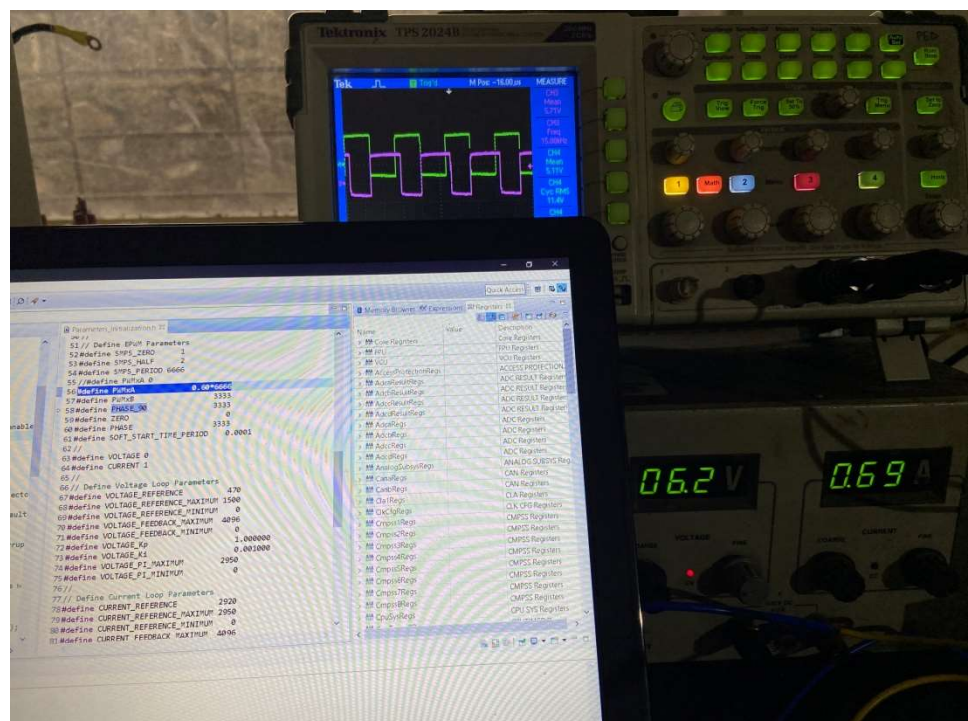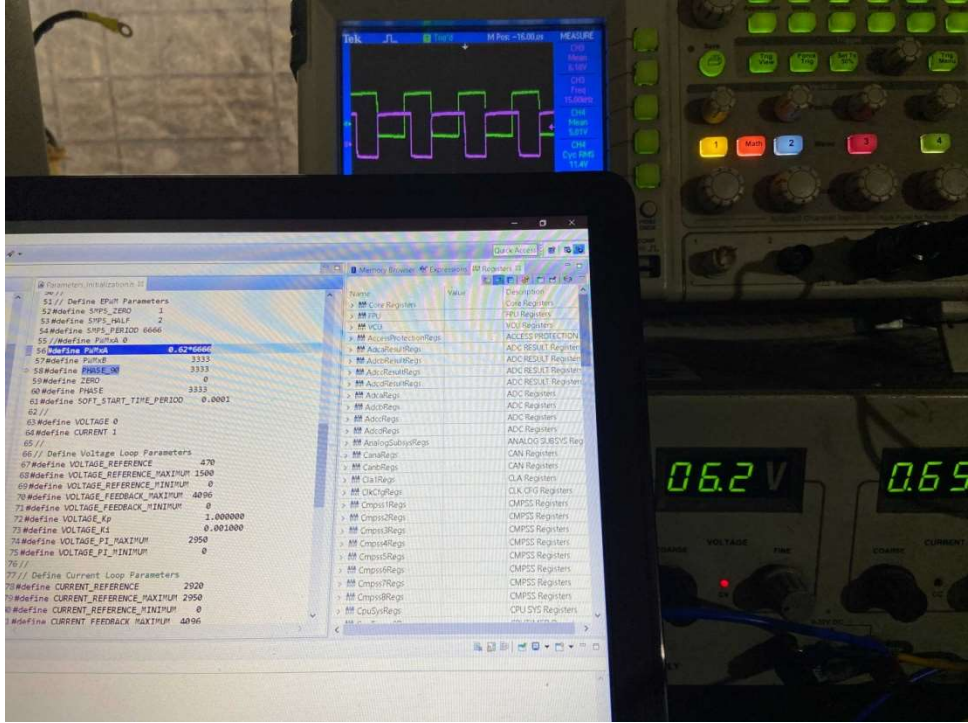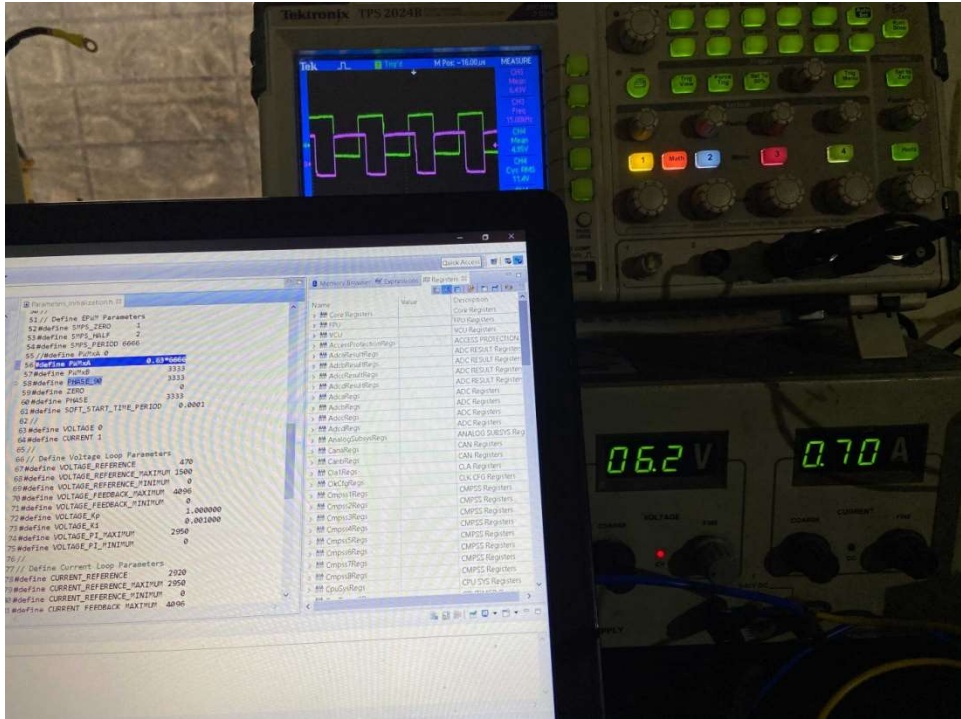| Duty = 60%, Vin = 6.2V, Iin = 0.69A	Remark
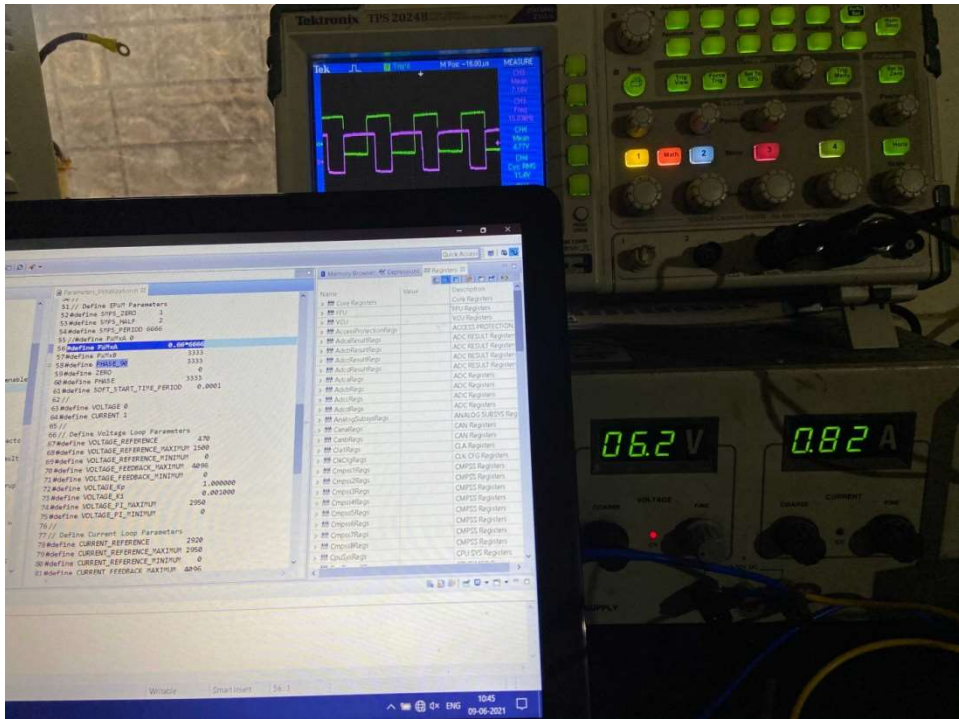
Duty = 61%, Vin = 6.2V, Iin = 0.69A	Remark

Duty = 62%, Vin = 6.2V, Iin = 0.69A	Remark
Duty = 63%, Vin = 6.2V, Iin = 0.70A	Remark

Duty = 64%, Vin = 6.2V, Iin = 0.72A	Remark
Duty = 65%, Vin = 6.2V, Iin = 0.77A	Remark

Duty = 66%, Vin = 6.2V, Iin = 0.82A	Remark
Duty = 67%, Vin = 6.2V, Iin = 0.87A	Remark

Duty = 68%, Vin = 6.2V, Iin = 0.93A	Remark
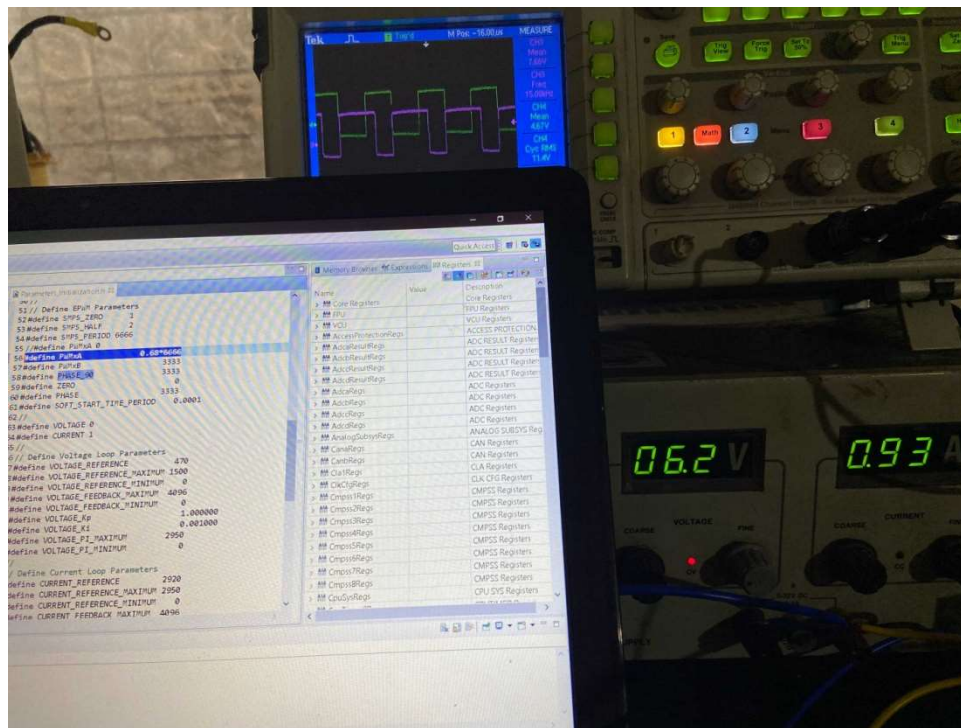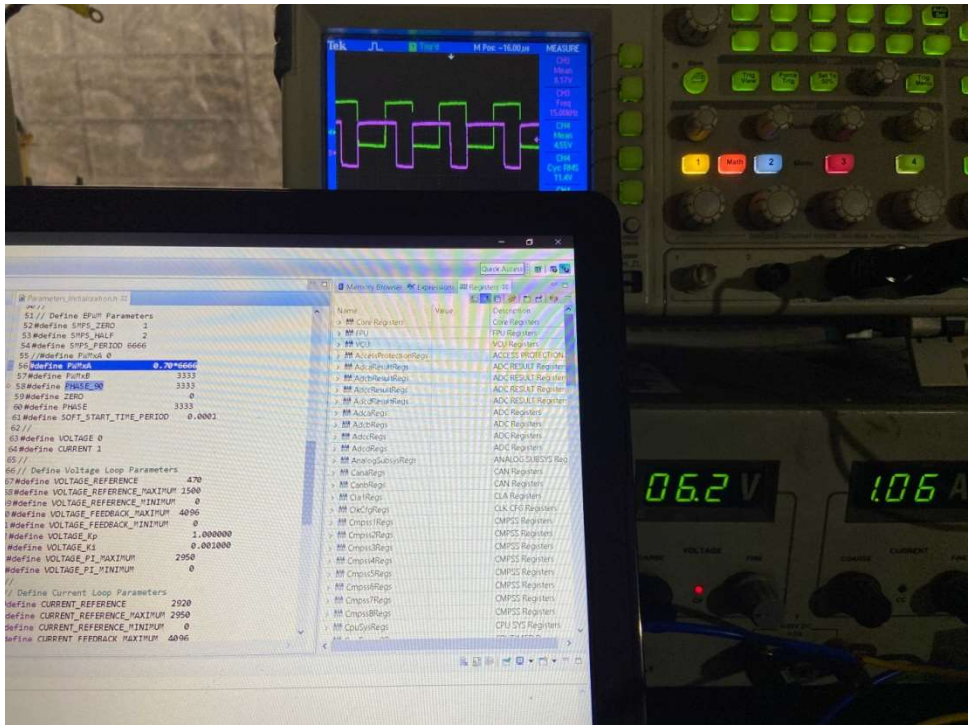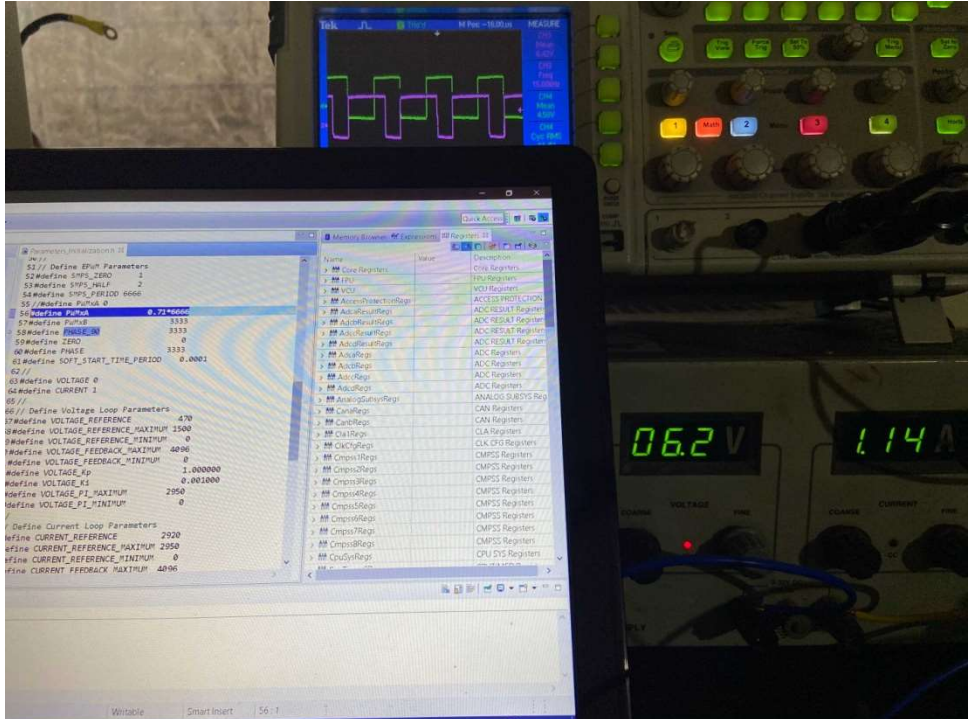
Duty = 69%, Vin = 6.2V, Iin = 0.99A	Remark
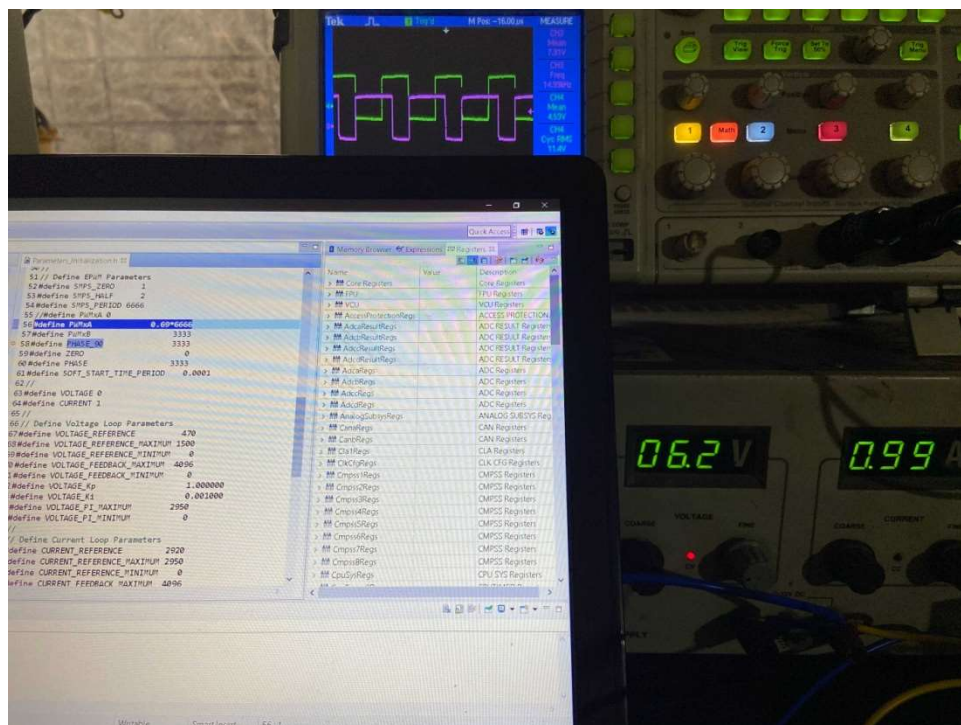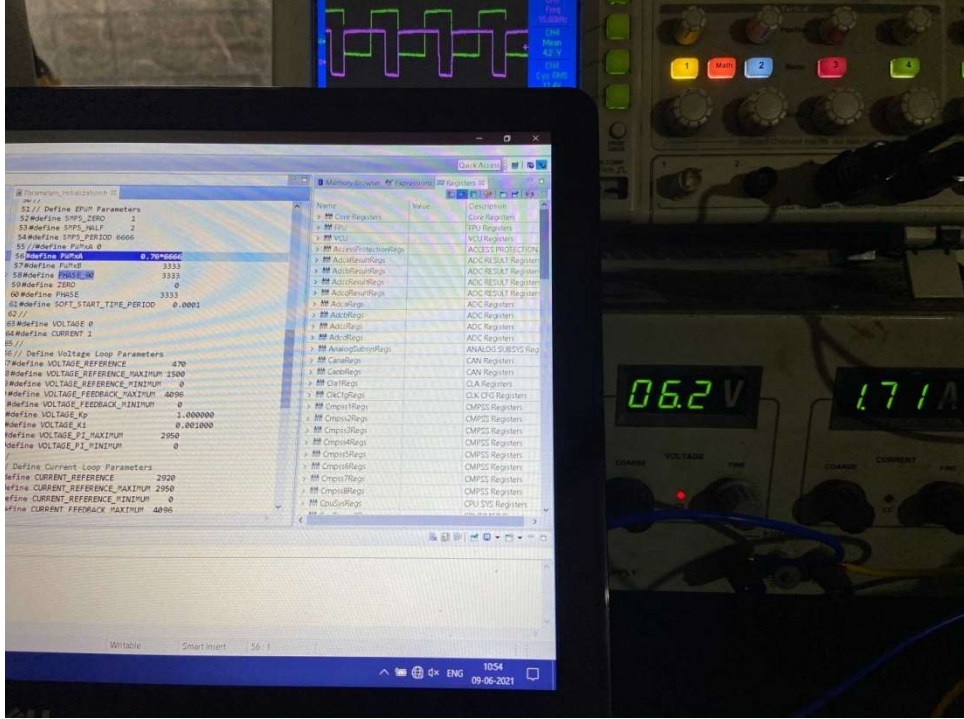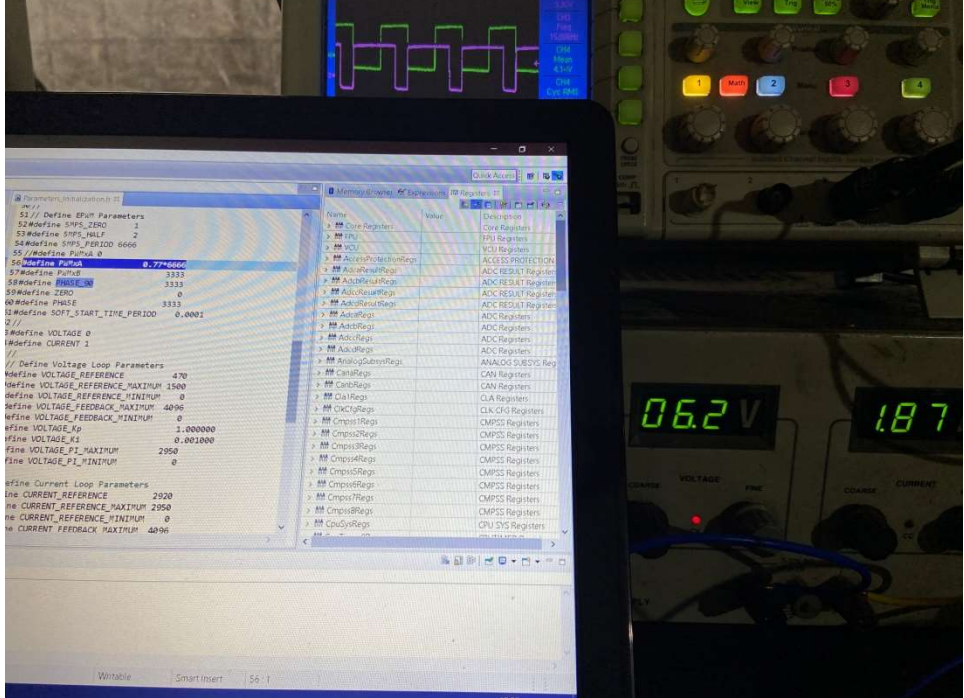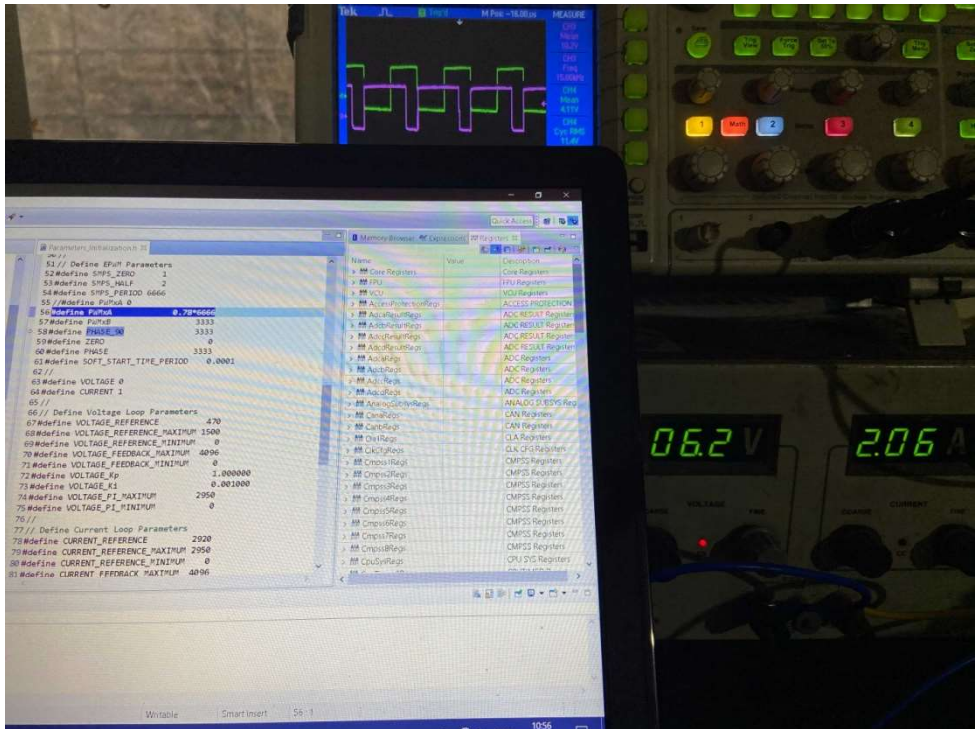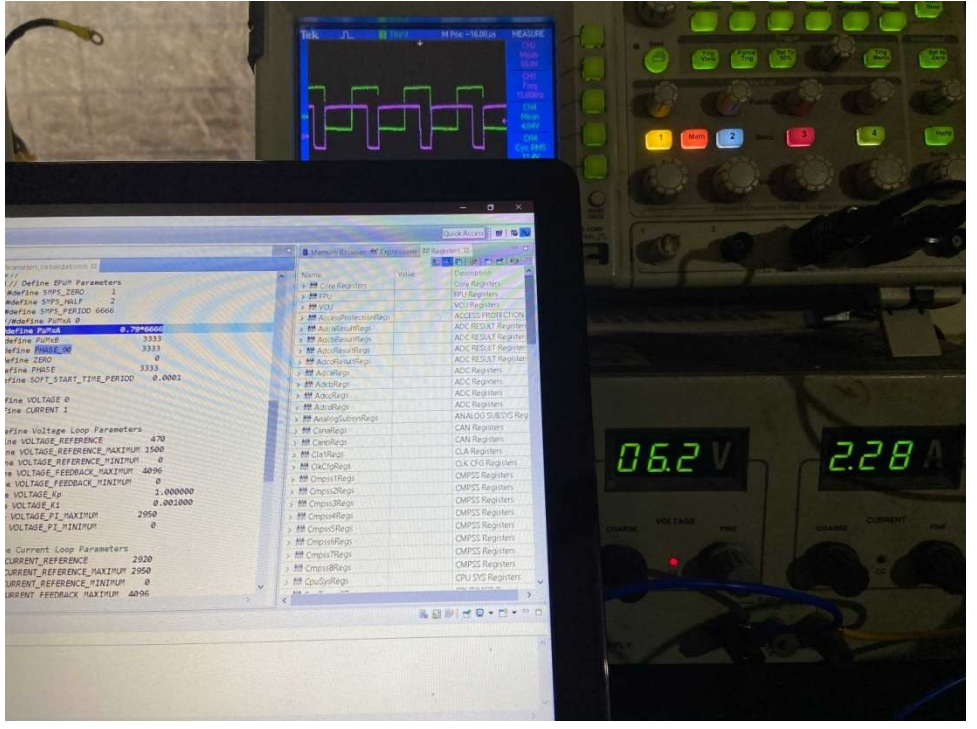
Duty = 70%, Vin = 6.2V, Iin = 1.06A	Remark
Duty = 71%, Vin = 6.2V, Iin = 1.14A	Remark

Duty = 72%, Vin = 6.2V, Iin = 1.23A	Remark
Duty = 73%, Vin = 6.2V, Iin = 1.33A	Remark

Duty = 74%, Vin = 6.2V, Iin = 1.44A	Remark

Duty = 75%, Vin = 6.2V, Iin = 1.57A	Remark

Duty = 76%, Vin = 6.2V, Iin = 1.71A	Remark
Duty = 77%, Vin = 6.2V, Iin = 1.87A	Remark

Duty = 78%, Vin = 6.2V, Iin = 2.06A	Remark
Duty = 79%, Vin = 6.2V, Iin = 2.28A	Remark