



UNIVERSITAS
GADJAH MADA

UAS Project - Elektronika Daya



LOCALLY ROOTED,
GLOBALLY RESPECTED

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21/475215/TK/52449

Program Studi Teknik Elektro

Departemen Teknik Elektro dan

Teknologi Informasi

Fakultas Teknik

Universitas Gadjah Mada

ugm.ac.id

Specification Buck Converter

Input Voltage : 48 Volt

Output voltage : 12 Volt

Switching Frequency : 100 kHz

Output Power : $12\text{V} \times 6\text{A} = 72\text{ Watt}$

Current Ripple : 0.01 A

Voltage Ripple : 0.02 V

Determine L Value

Rumus L dapat ditentukan dengan cara

$$L = \frac{(V_{in} - V_{out}) \cdot D}{\Delta I_L \cdot f_s}$$

$$L = \frac{(48 - 12) \cdot 0,417}{0,01 \cdot 100.000}$$

$$L = 0.015$$

$$L = 15 \text{ mH}$$

V_{in} = Tegangan Input

V_{out} = Tegangan Output

D = Duty Cycle

ΔI_L = Ripple Arus

f_s = Frekuensi Switching

Determine C Value

Rumus L dapat ditentukan dengan cara

$$C = \frac{\Delta I_L}{8 \cdot f_s \cdot \Delta V_{out}}$$

$$C = \frac{0.01}{8 \cdot 100.000 \cdot 0.02}$$

$$C = 625 \text{ pF}$$

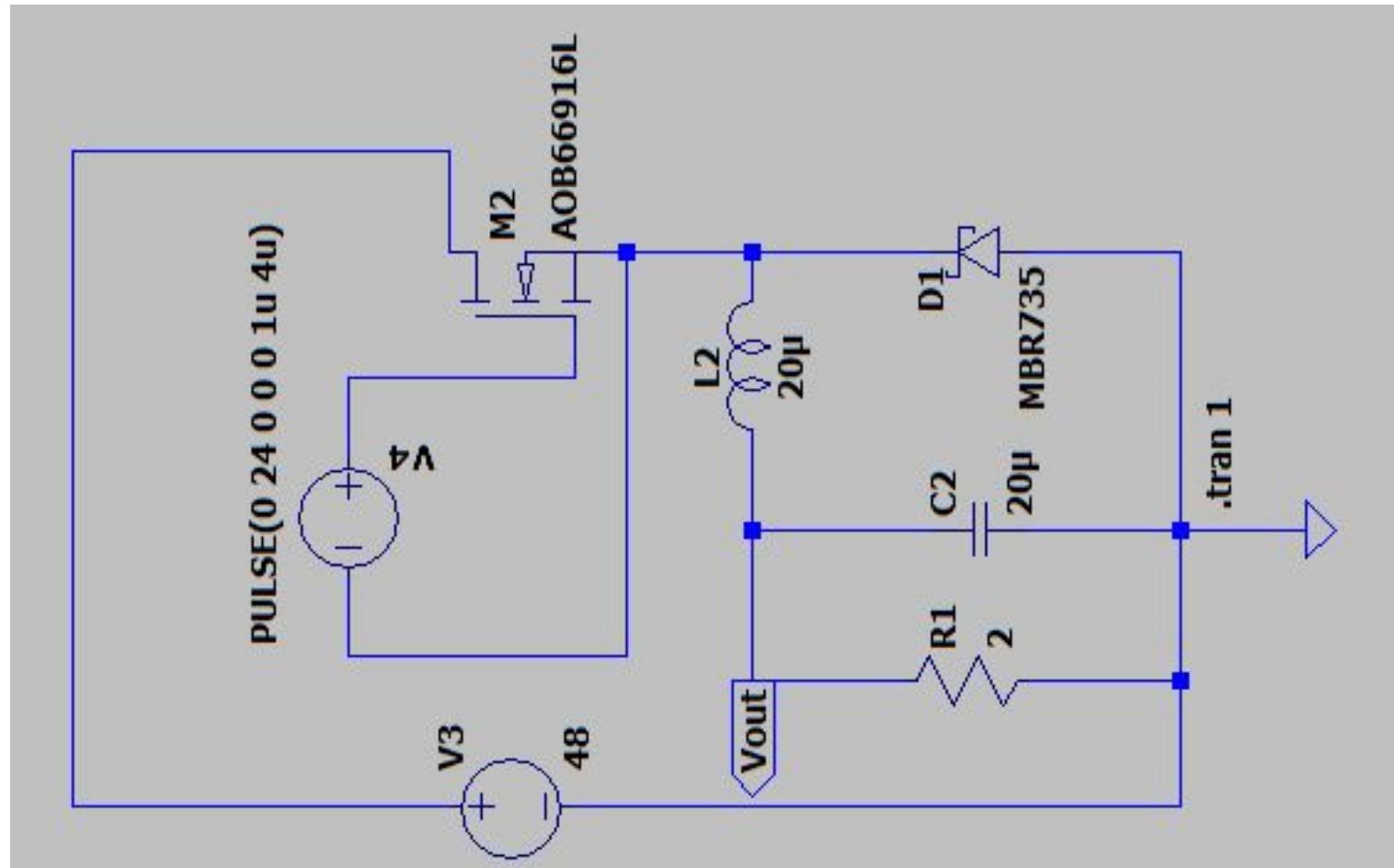
C = Nilai Kapasitor

ΔI_L = Ripple Arus

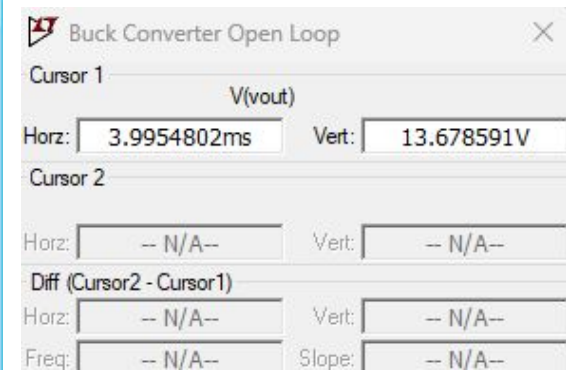
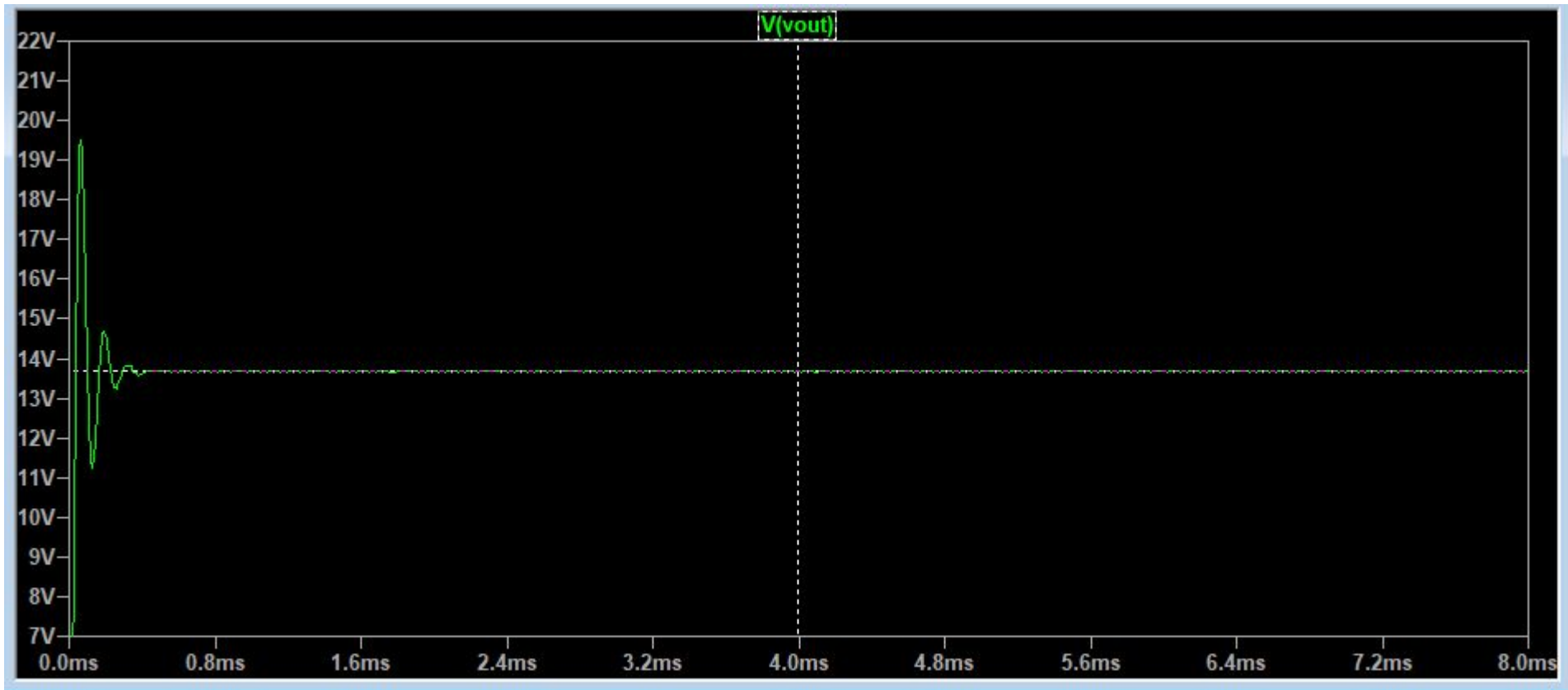
f_s = Frekuensi Switching

ΔV_{out} = Ripple Tegangan

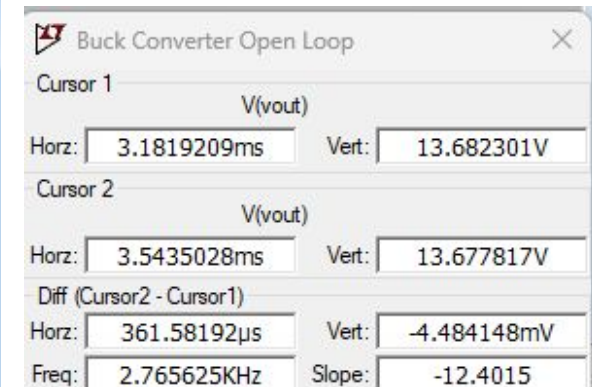
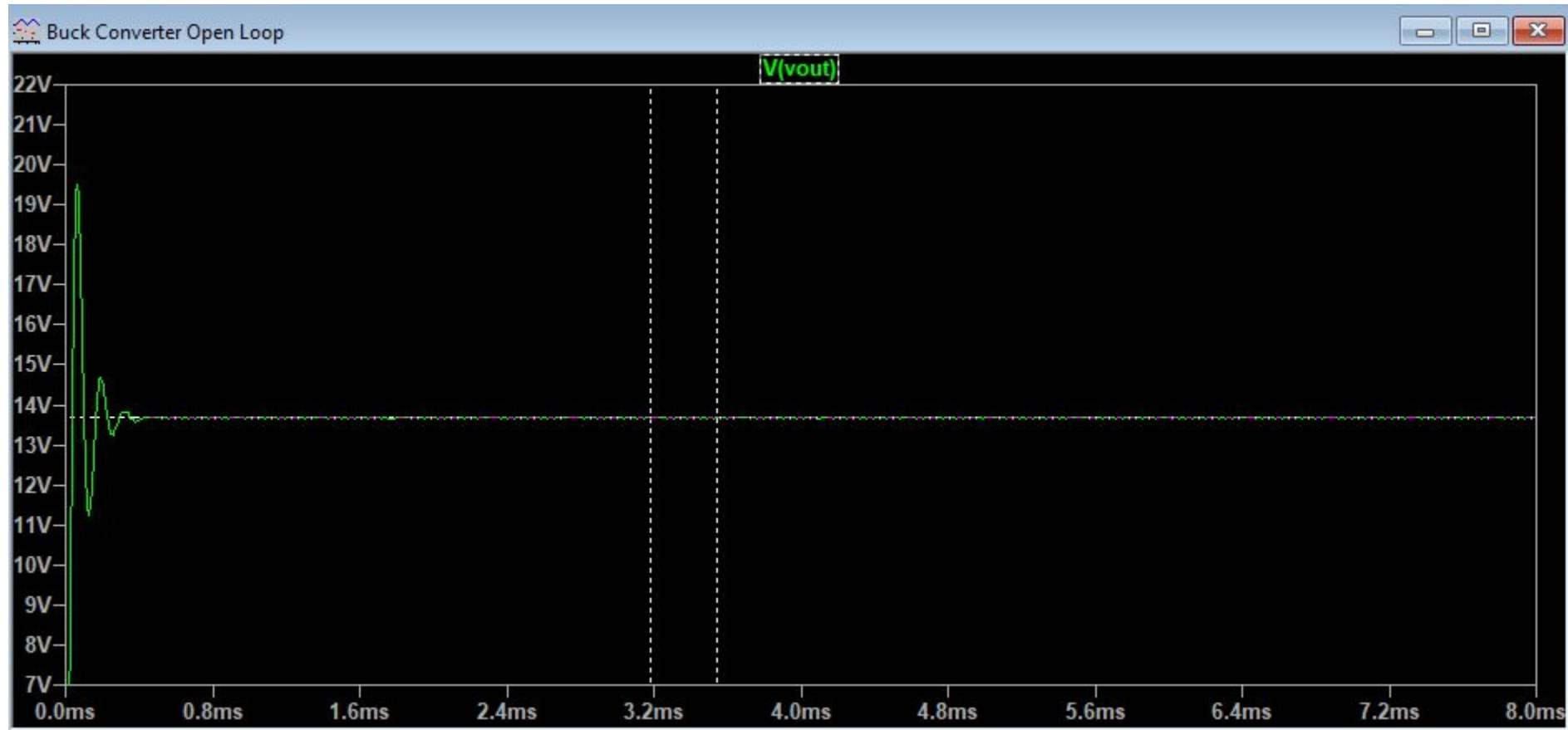
Rangkaian Buck Converter Open Loop



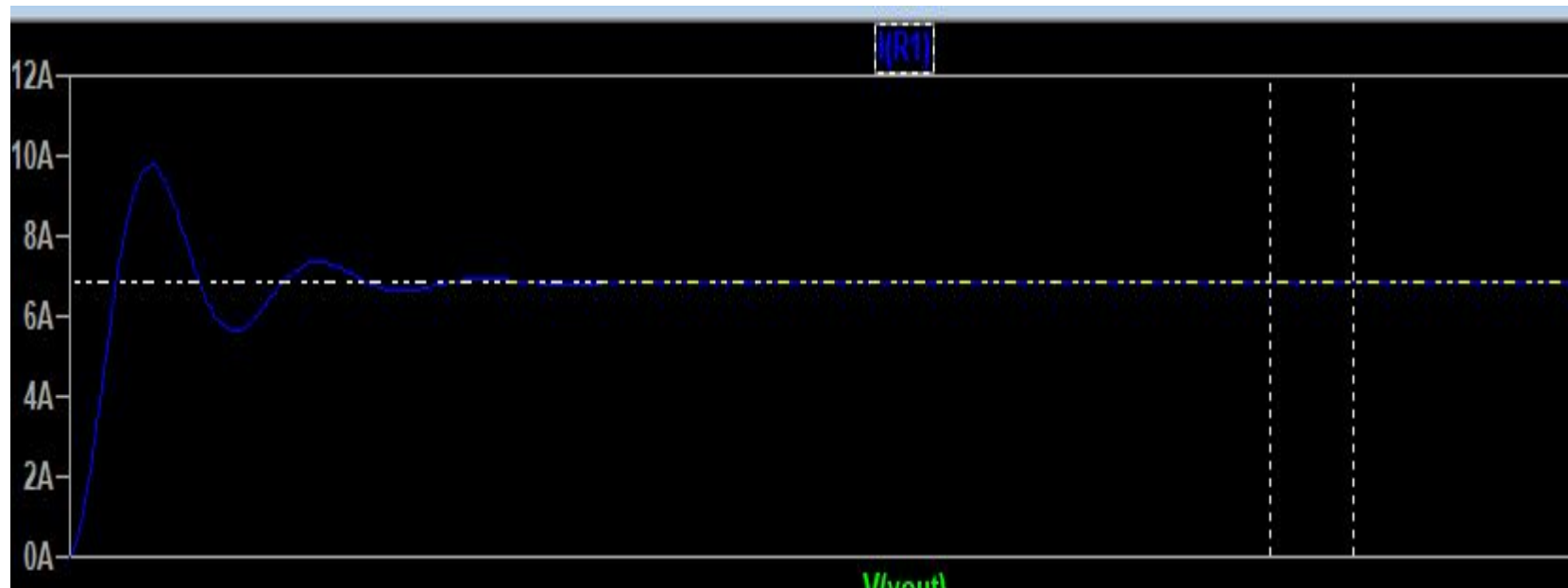
Hasil Output Tegangan



Hasil Ripple Tegangan

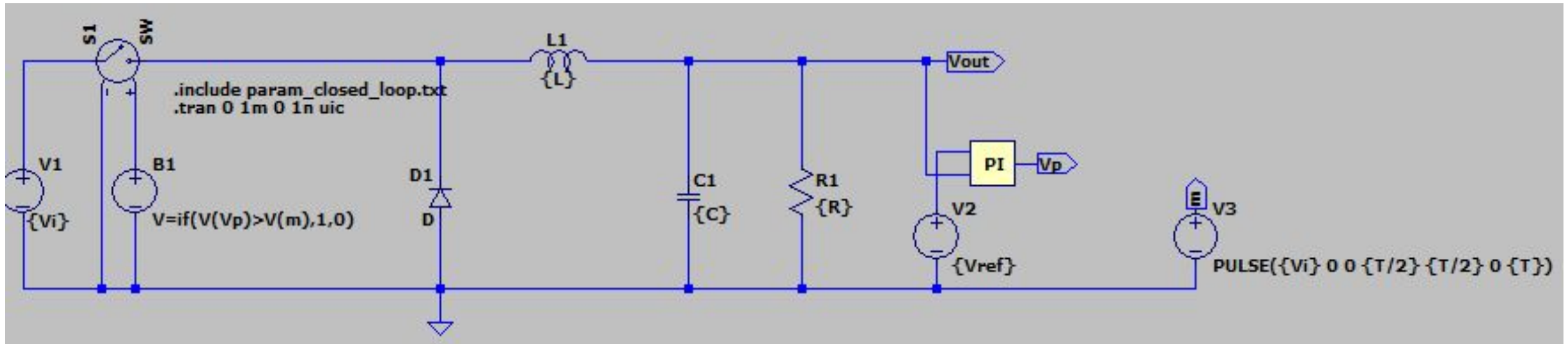


Hasil Ripple Arus

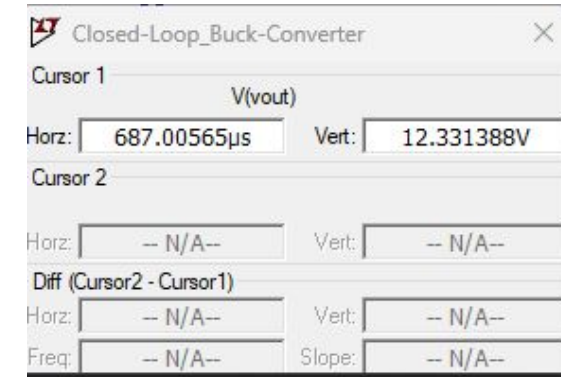
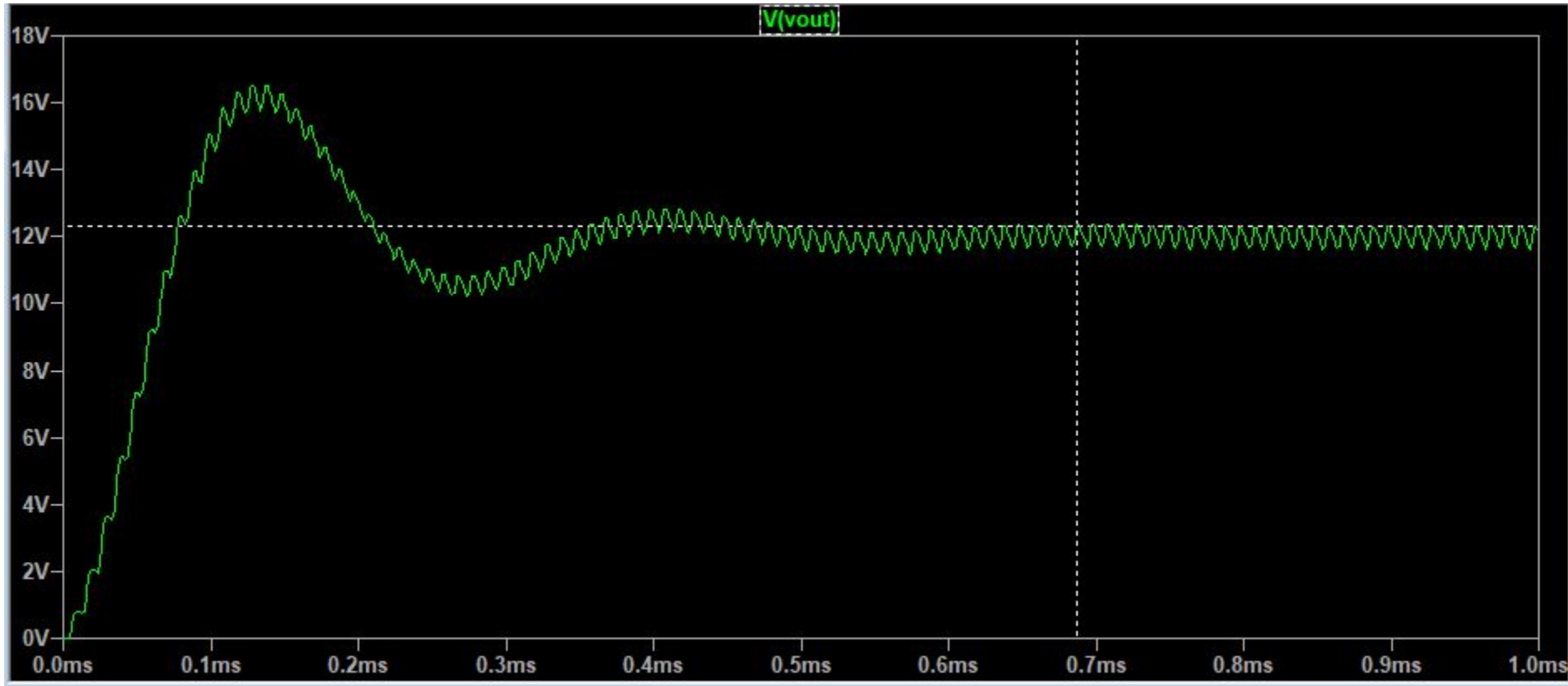


Buck Converter Open Loop			
Cursor 1		I(R1)	
Horz:	997.40113μs	Vert:	6.8335187A
Cursor 2		I(R1)	
Horz:	932.76836μs	Vert:	6.8217781A
Diff (Cursor2 - Cursor1)			
Horz:	-64.632768μs	Vert:	-11.740583mA
Edge:	15.473028kHz	Slope:	181.651

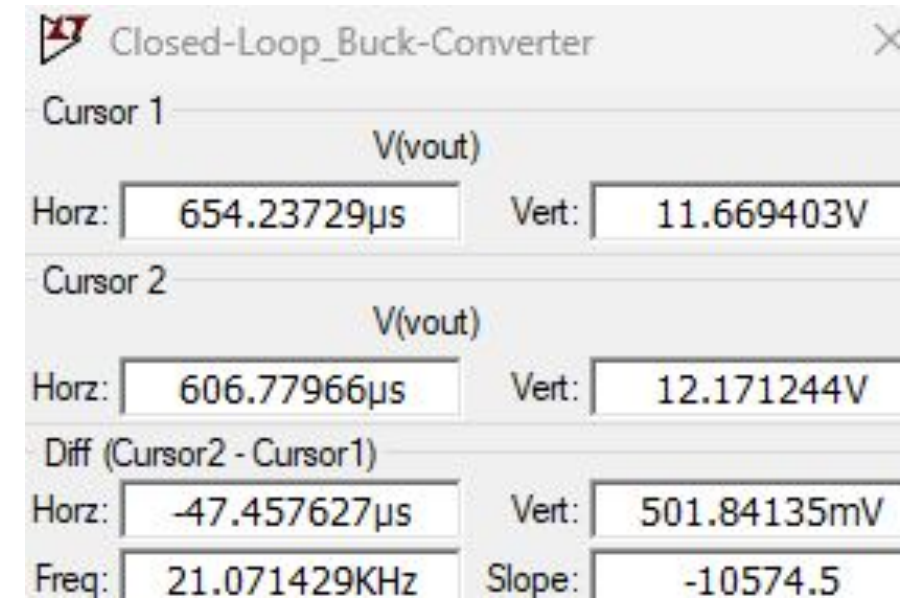
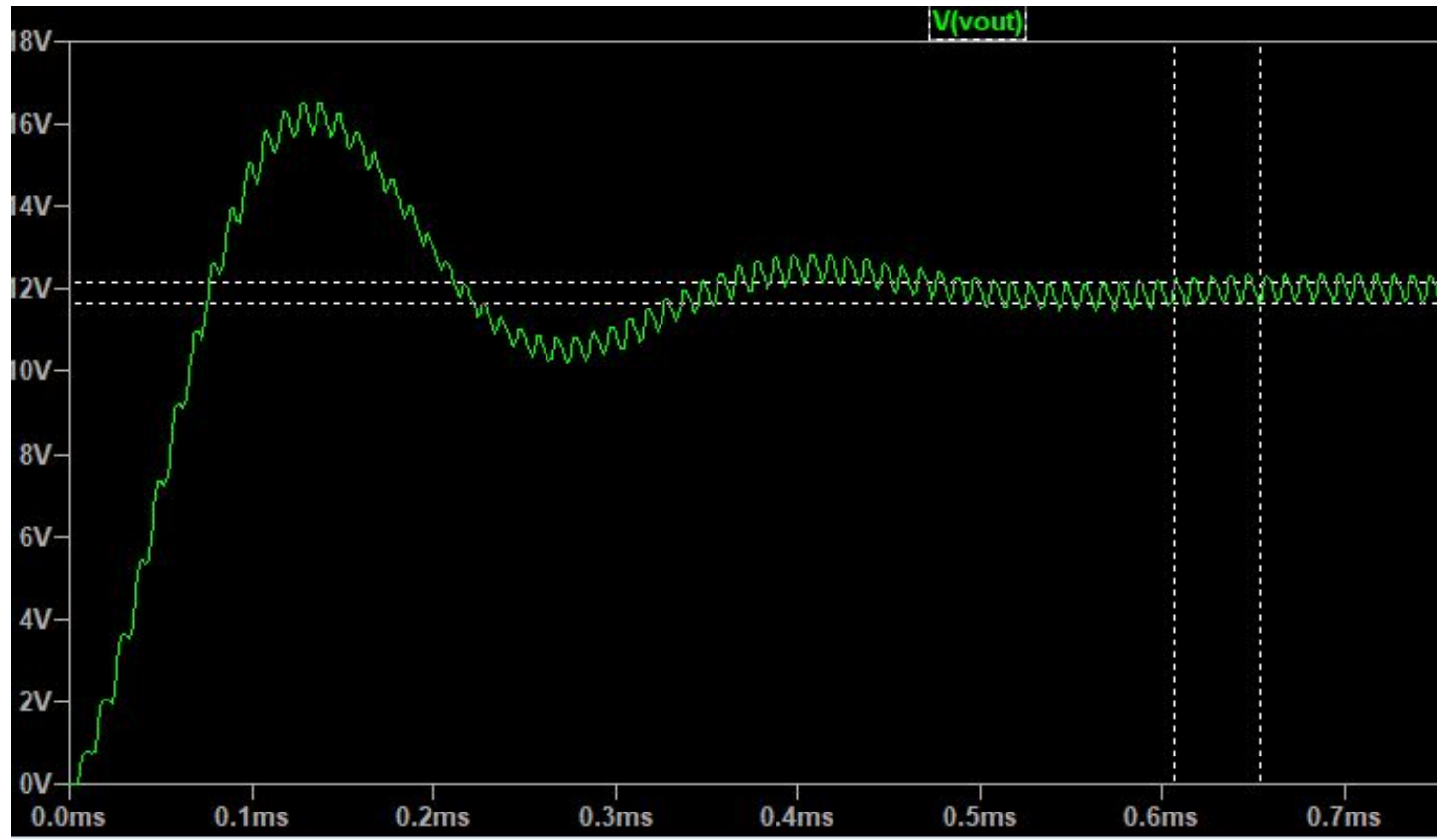
Rangkaian Buck Converter Close Loop



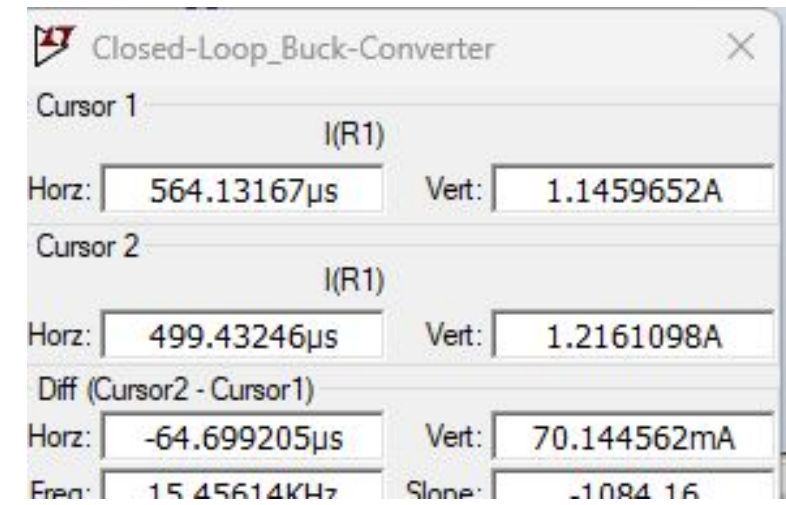
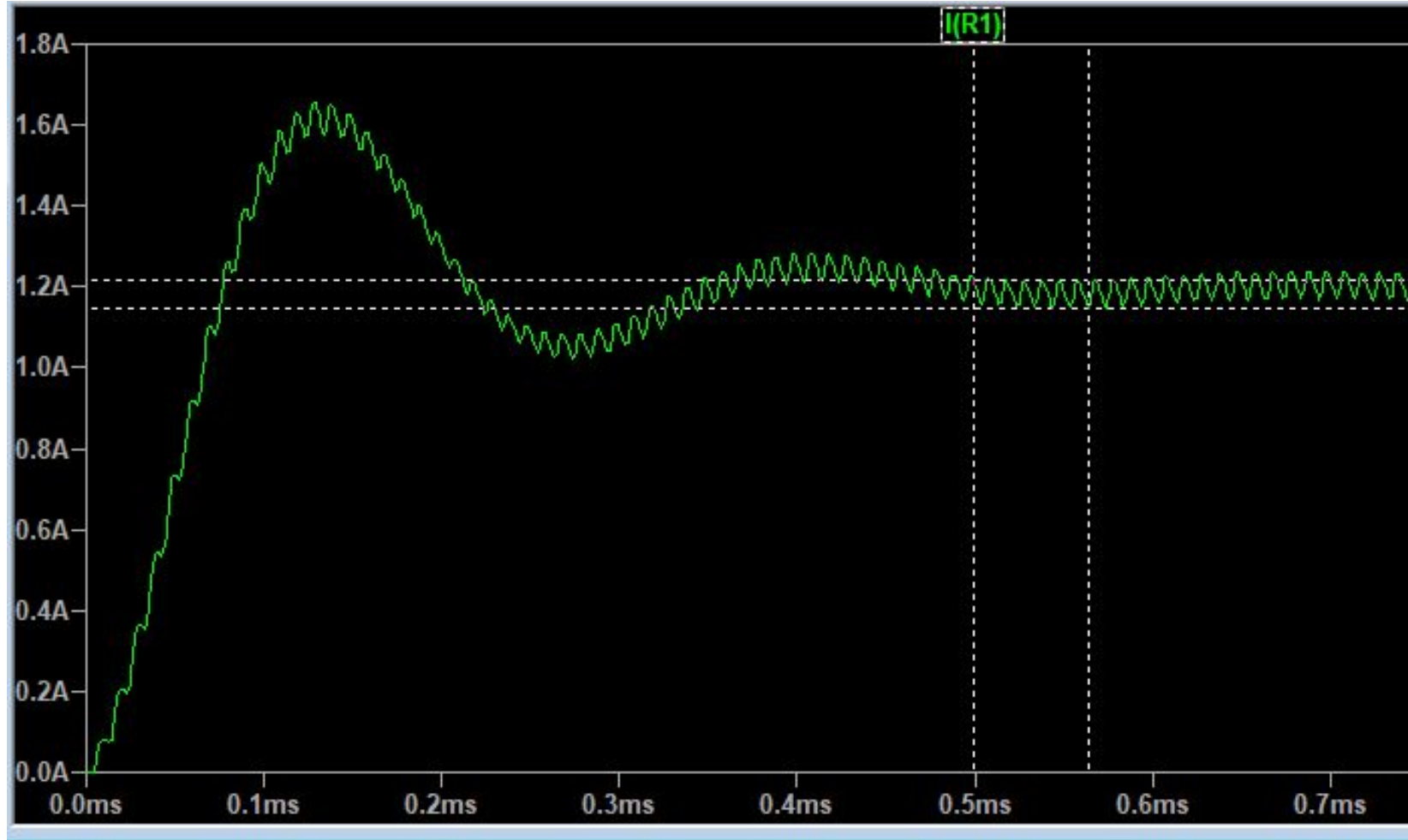
Hasil Output Tegangan



Hasil Ripple Tegangan



Hasil Ripple Arus



PV Module Configuration dan Rating

$V_{dc} = 800$ dengan 16 PV dirangkai seri bertegangan 50V per PV untuk mencapai $V_{dc}=800$

$$I_{PV} = \frac{P_n}{V_{dc}}$$

$$I_{PV} = \frac{130000}{800}$$

$$I_{PV} = 162.5 \text{ A}$$

L Value

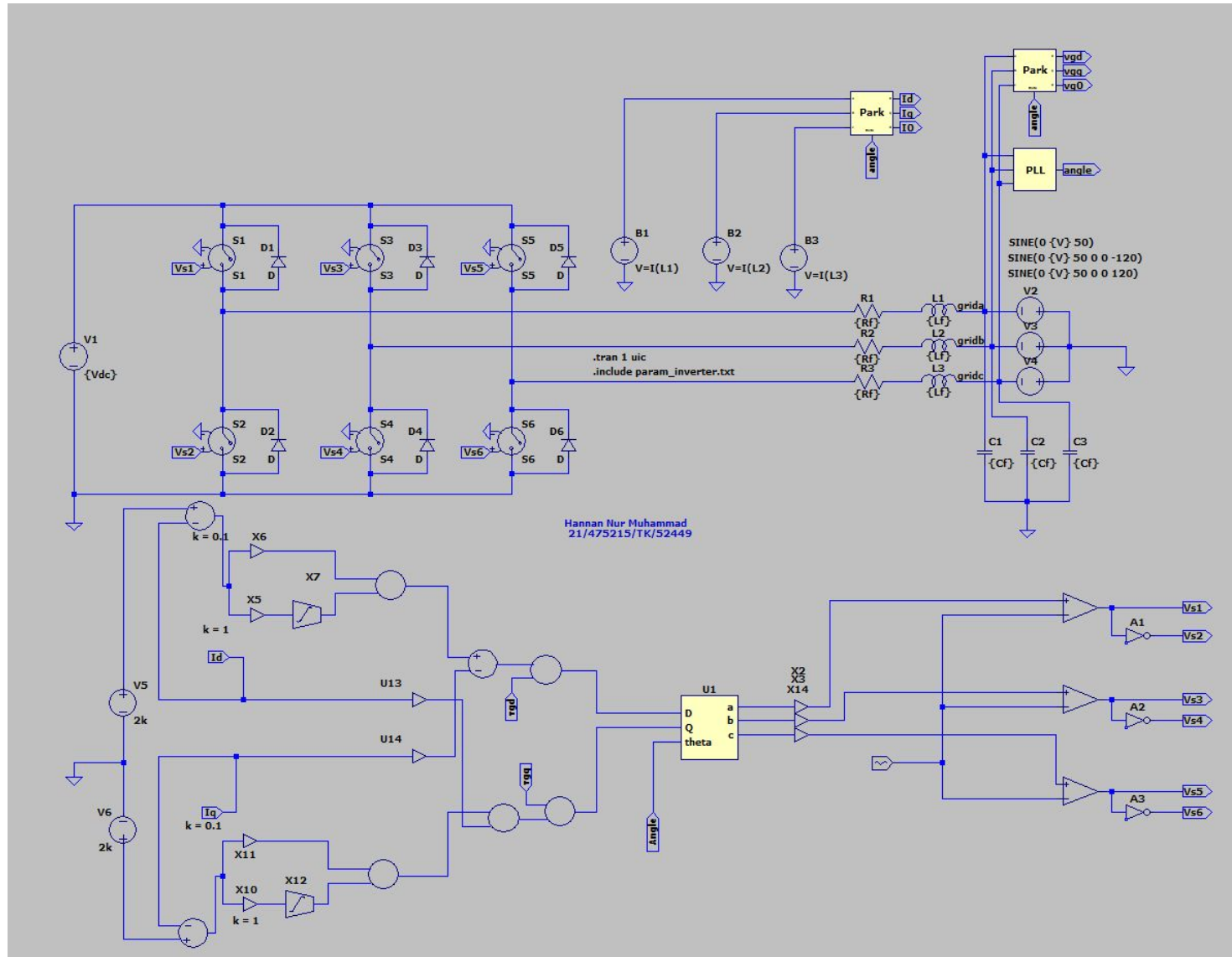
Phitungan L

$$\Delta i_L = \frac{0.1 \cdot P_n \sqrt[3]{2}}{3V_{ph}} = 20 \text{ A}$$

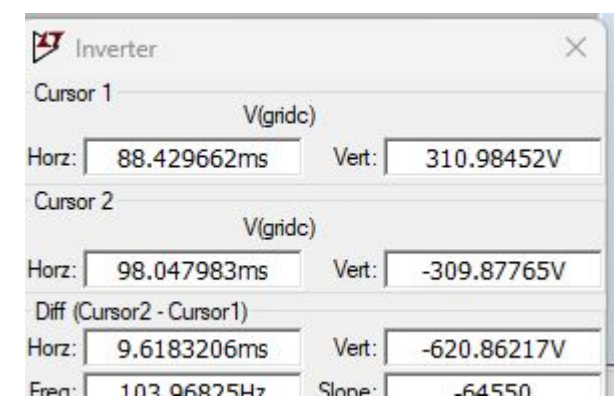
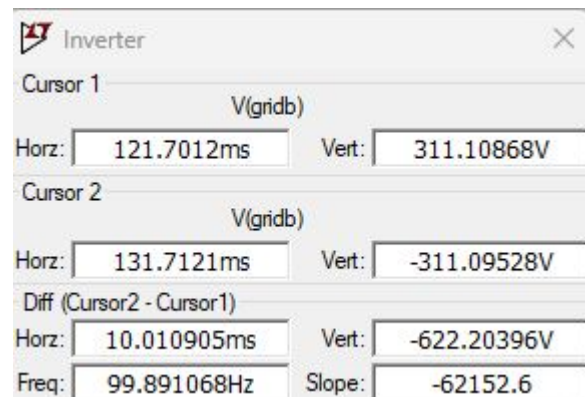
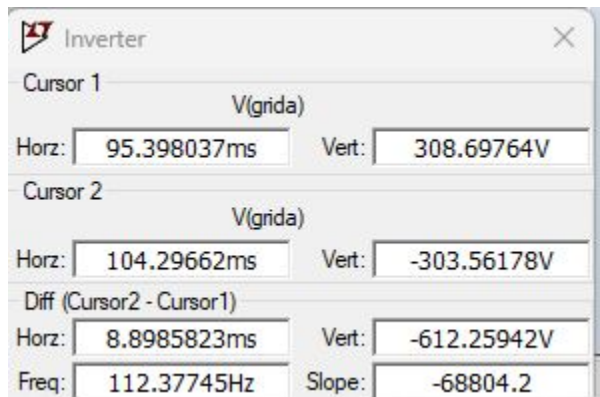
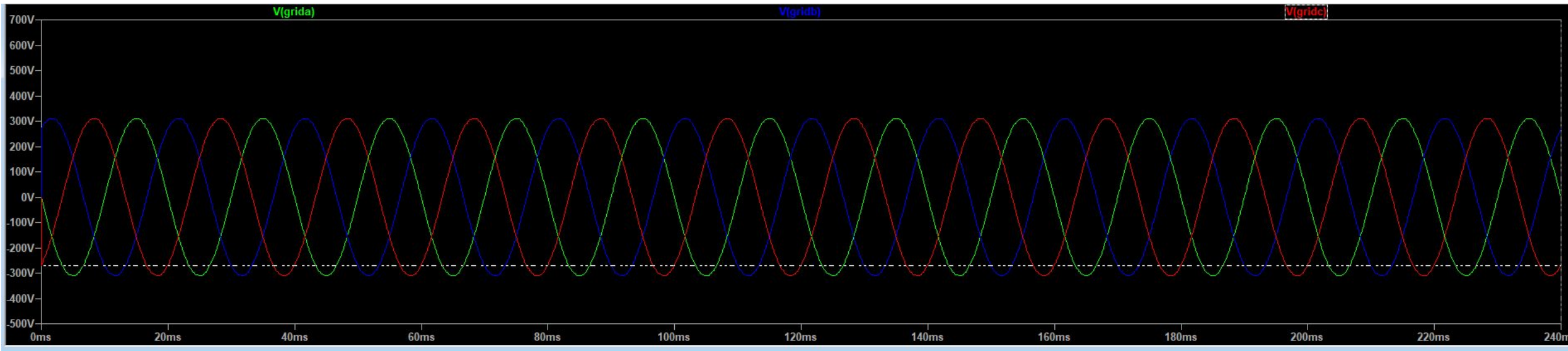
$$V_{dc} = \frac{2\sqrt{2}}{m_i \cdot \sqrt{3} \cdot V_L} = 800 \text{ V}$$

$$L_1 = \frac{V_{dc}}{8 \cdot f_{sw} \cdot \Delta i_L} = 500 \text{ } \mu H$$

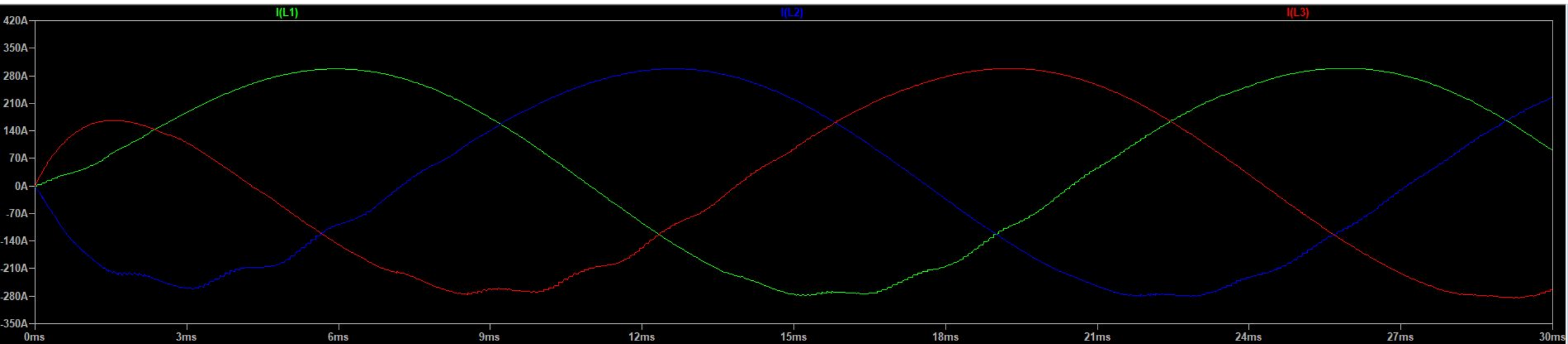
Rangkaian Inverter



Hasil Output Tegangan



Hasil Output Arus



Inverter			
Cursor 1		I(L1)	
Horz:	5.9085963ms	Vert:	297.35125A
Cursor 2		I(L1)	
Horz:	16.436344ms	Vert:	-273.88043A
Diff (Cursor2 - Cursor1)			
Horz:	10.527748ms	Vert:	-571.23168A
Freq:	94.98708Hz	Slope:	-54259.6

Inverter			
Cursor 1		I(L2)	
Horz:	12.81284ms	Vert:	297.01466A
Cursor 2		I(L2)	
Horz:	3.2317737ms	Vert:	-260.18546A
Diff (Cursor2 - Cursor1)			
Horz:	-9.5810664ms	Vert:	-557.20012A
Freq:	104.37252Hz	Slope:	58156.4

Inverter			
Cursor 1		I(L3)	
Horz:	19.260065ms	Vert:	298.29986A
Cursor 2		I(L3)	
Horz:	8.5364527ms	Vert:	-276.05647A
Diff (Cursor2 - Cursor1)			
Horz:	-10.723613ms	Vert:	-574.35633A
Freq:	93.252156Hz	Slope:	53560



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“Dreams are for weaving,
Wonders are waiting to start”

