

EXPERIMENT 8

Name -

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Sec No. - 4

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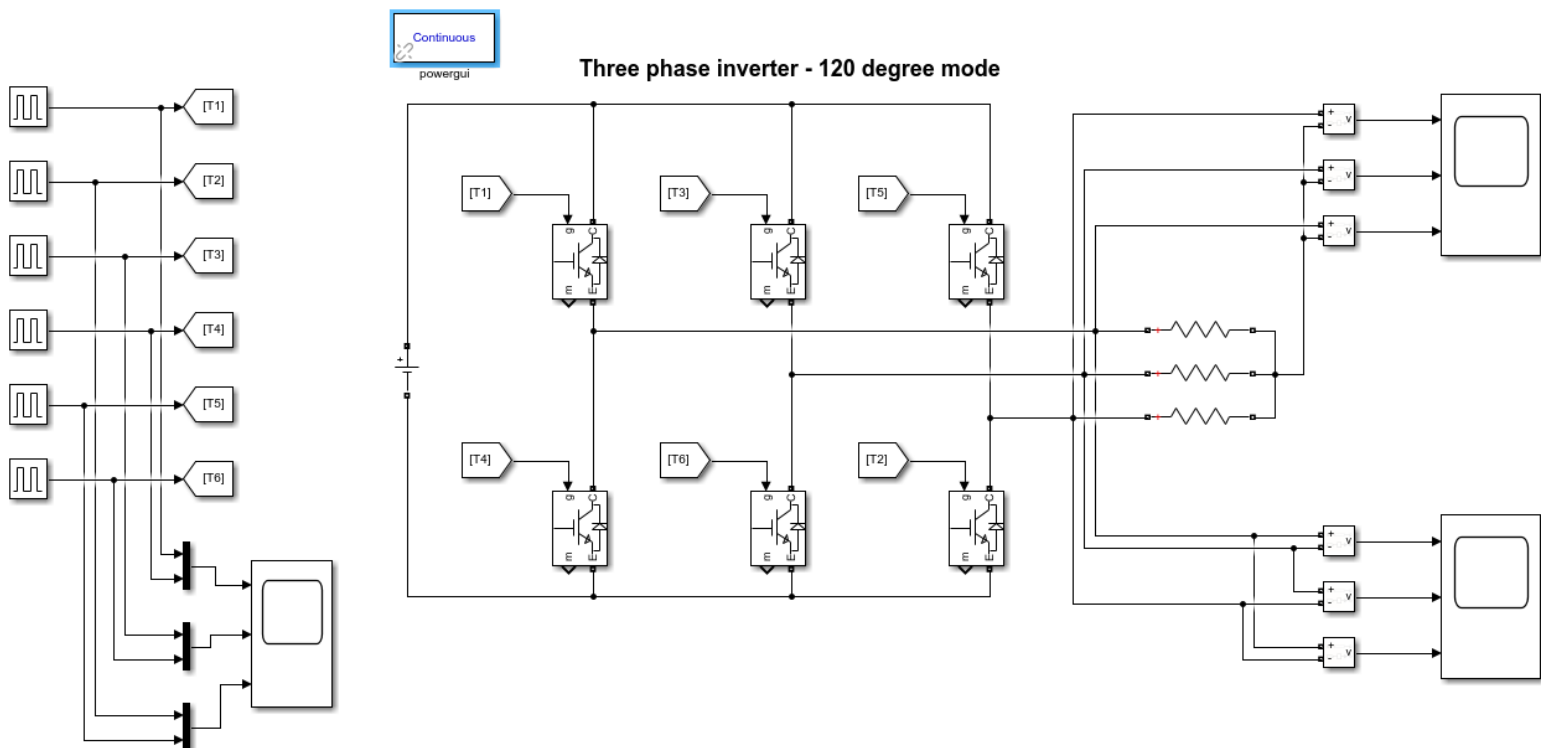
Objective - Study of 3 Phase Inverters in 120-degree mode and 180-degree mode

Software tool: MATLAB Simulink, Simscape toolbox (power GUI)

Components used:

IGBT; AC source; Resistor, inductor; Voltage and current sensors; Display; Scope

1. Study of 3 Phase Inverter Operating in 120-degree mode



Observations:

Input Supply Voltage (DC) = 100V

Frequency = 50 HZ

Formulae used :

$V_{on}/V_{in} = 10^{(g/20)}$ [here g is in dB]

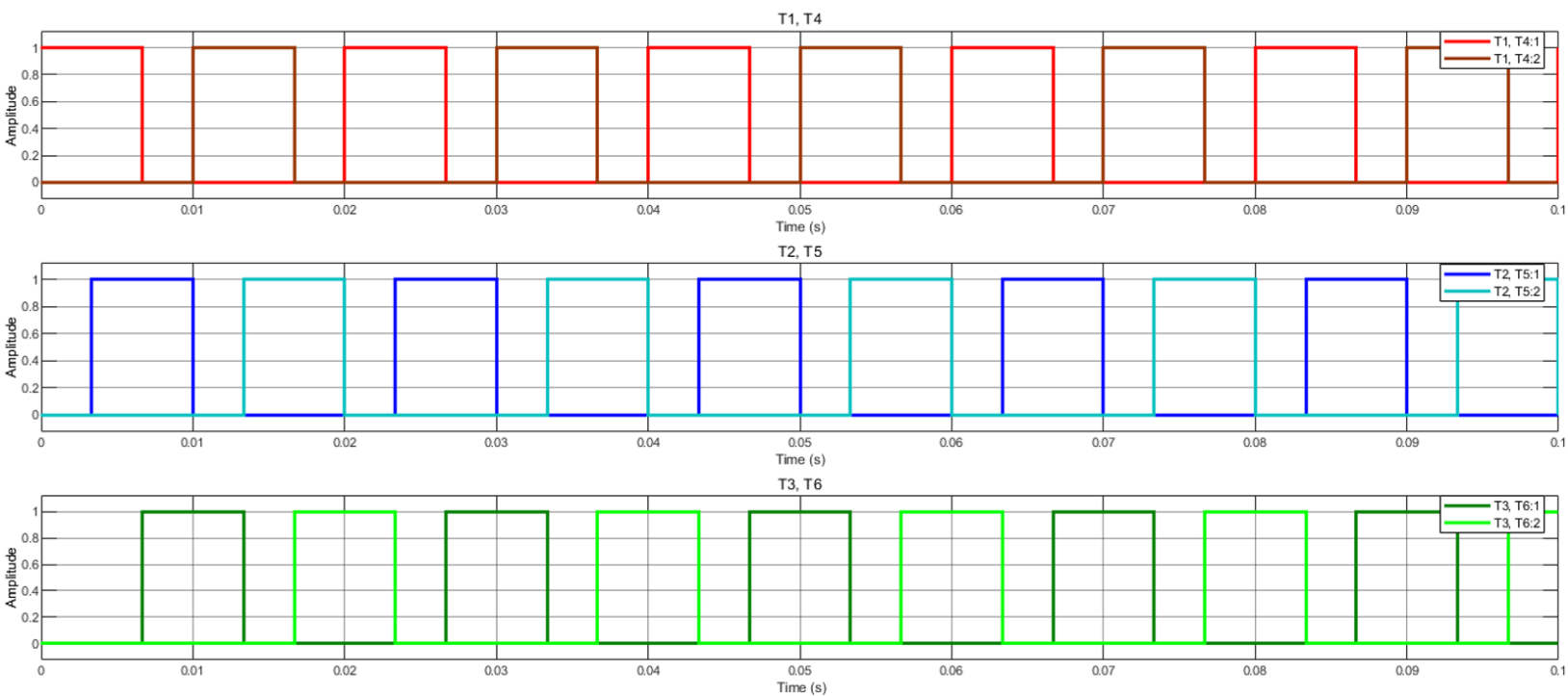
$THD = (g_3^2 + g_5^2 + g_7^2)^{0.5} / g_1$ [here g is not in dB]

FFT data for THD calculations

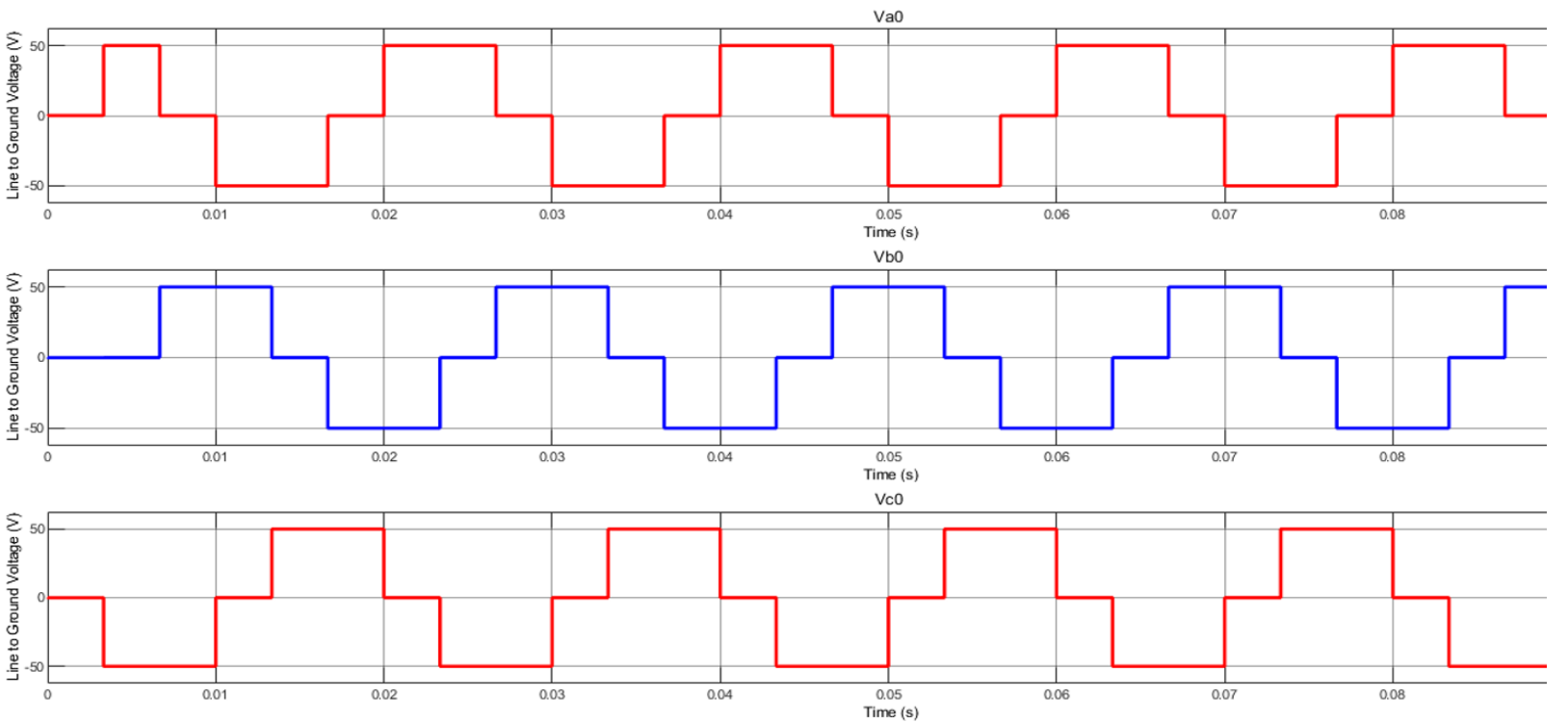
Frequency(Hz)	Harmonic value(dB)	Vo/Vi
50 (fundamental)	58	794.3
150 (third)	Absent	-
250 (Fifth)	44	158.49
350 (Seventh)	42	125.9

$THD(\text{Considering } n=7 \text{ harmonics}) = (g_3^2 + g_5^2 + g_7^2)^{0.5} / g_1 = 0.255$

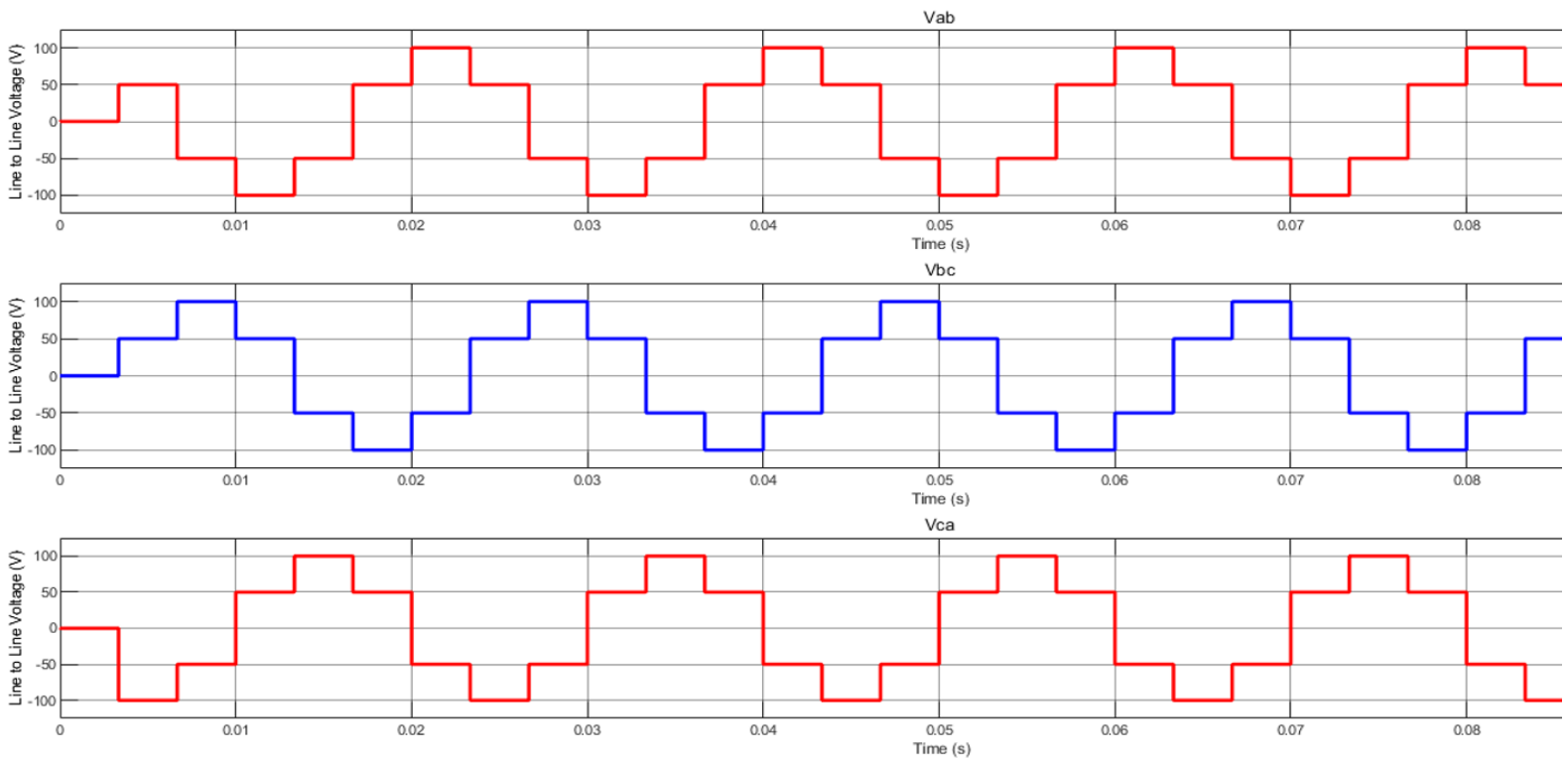
Waveforms:



Waveform 1 – Input Pulse Waveforms

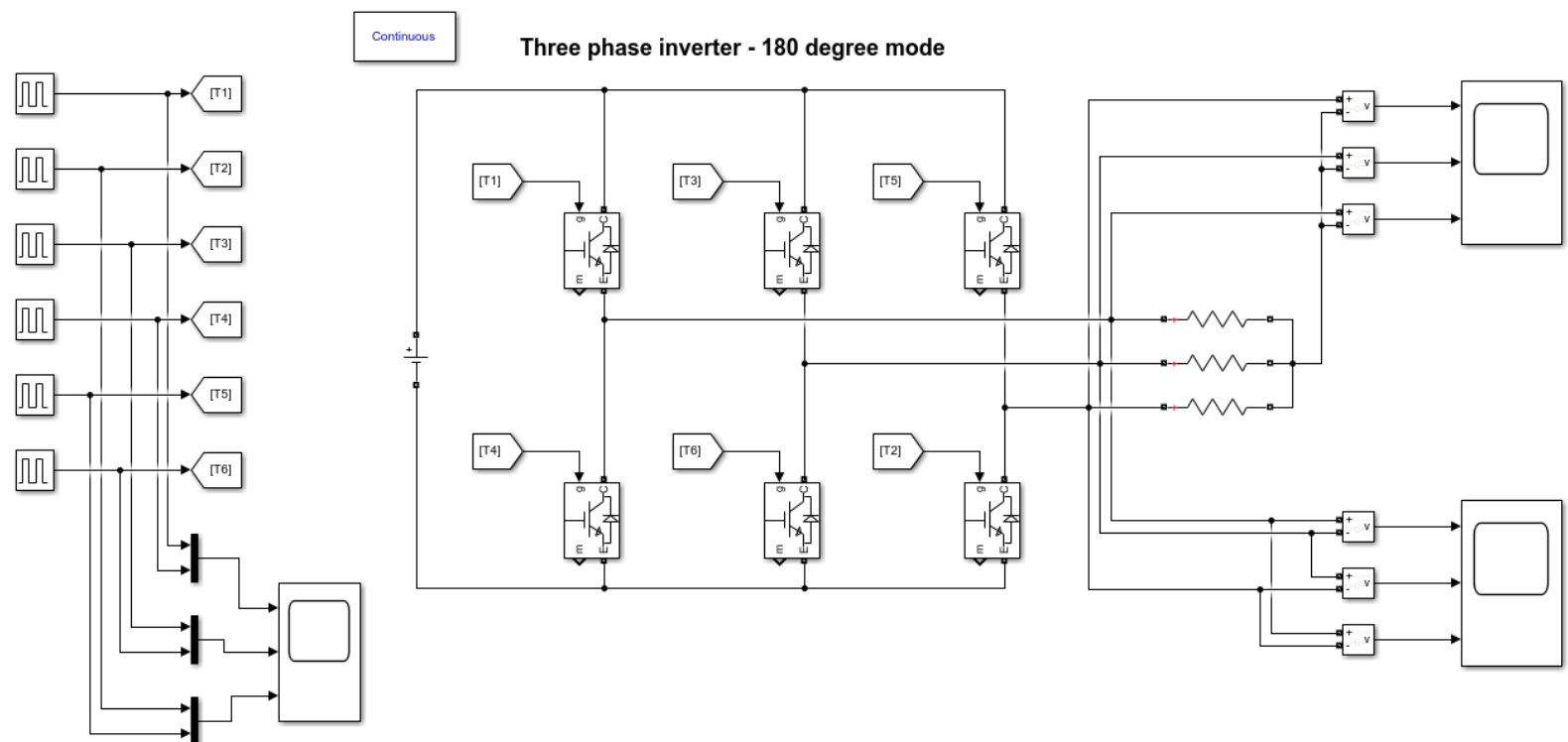


Waveform 2 – Line to Ground Output Waveforms



Waveform 3 – Line to Line Output Waveforms

2. Study of 3 Phase Inverter Operating in 180-degree mode



Observations:

Input Supply Voltage (DC) = 100V

Frequency = 50 HZ

Formulae used :

$V_{on}/V_{in} = 10^{(g/20)}$ [here g is in dB]

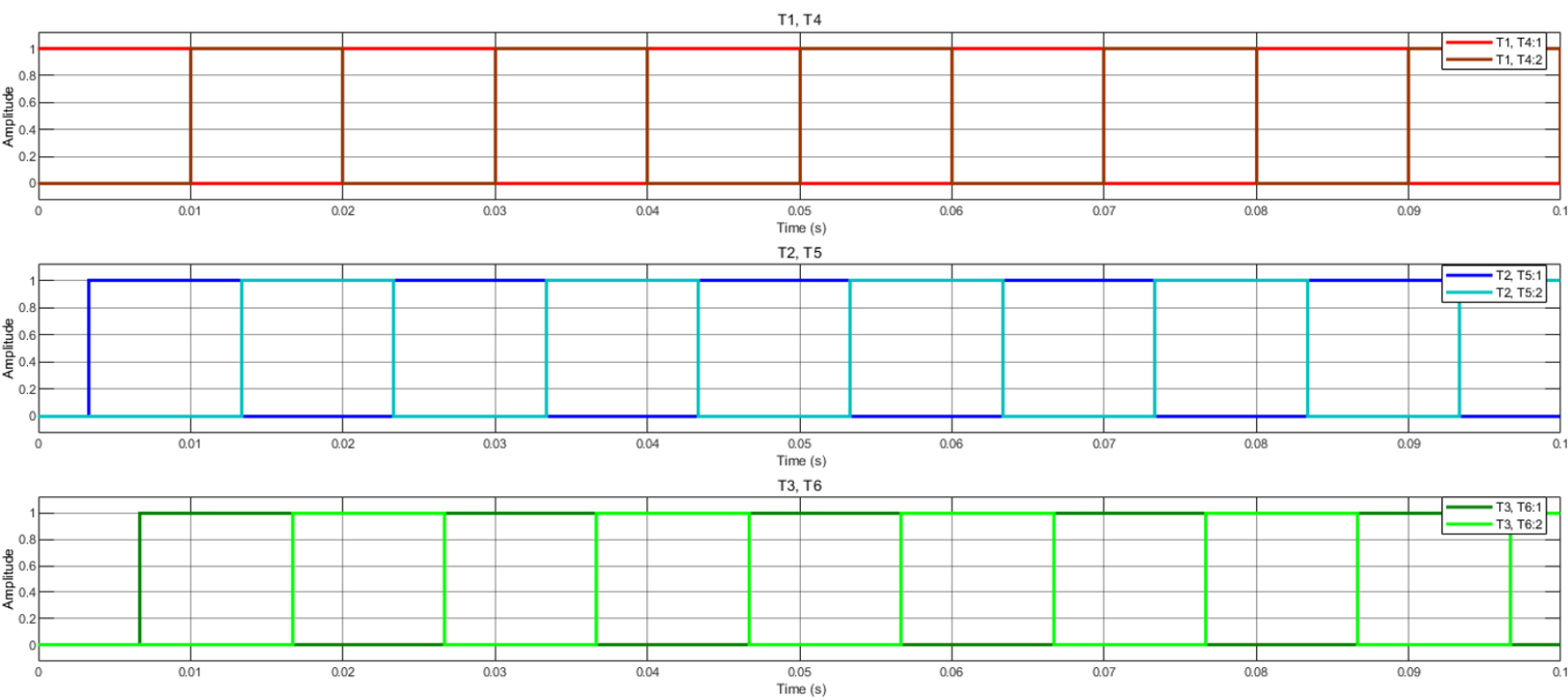
$THD = (g_3^2 + g_5^2 + g_7^2)^{0.5} / g_1$ [here g is not in dB]

FFT data for THD calculations

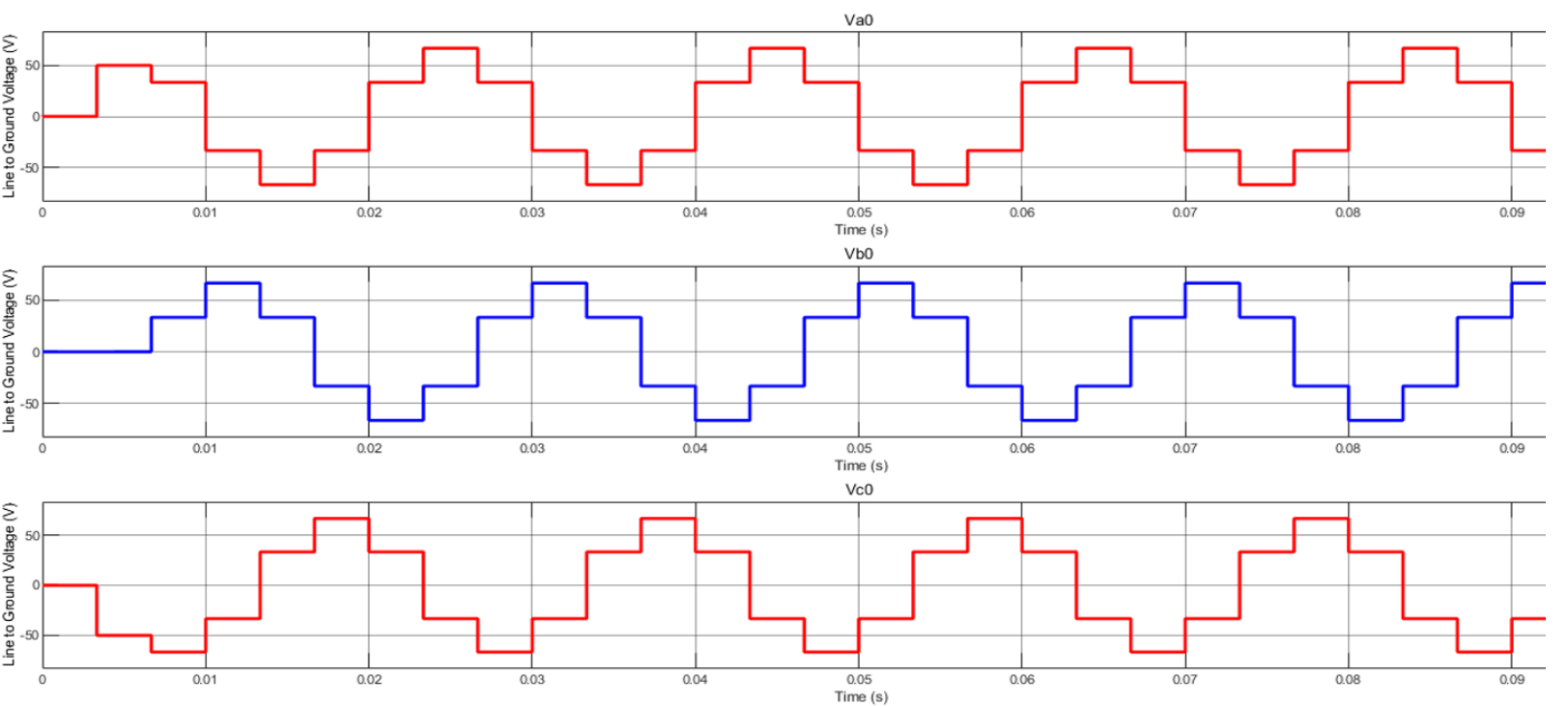
Frequency(Hz)	Harmonic value(dB)	Vo/Vi
50 (fundamental)	60	1000
150 (third)	Absent	-
250 (Fifth)	46	158.525
350 (Seventh)	42	125.9

$THD(\text{Considering } n=7 \text{ harmonics}) = (g_3^2 + g_5^2 + g_7^2)^{0.5} / g_1 = 0.236$

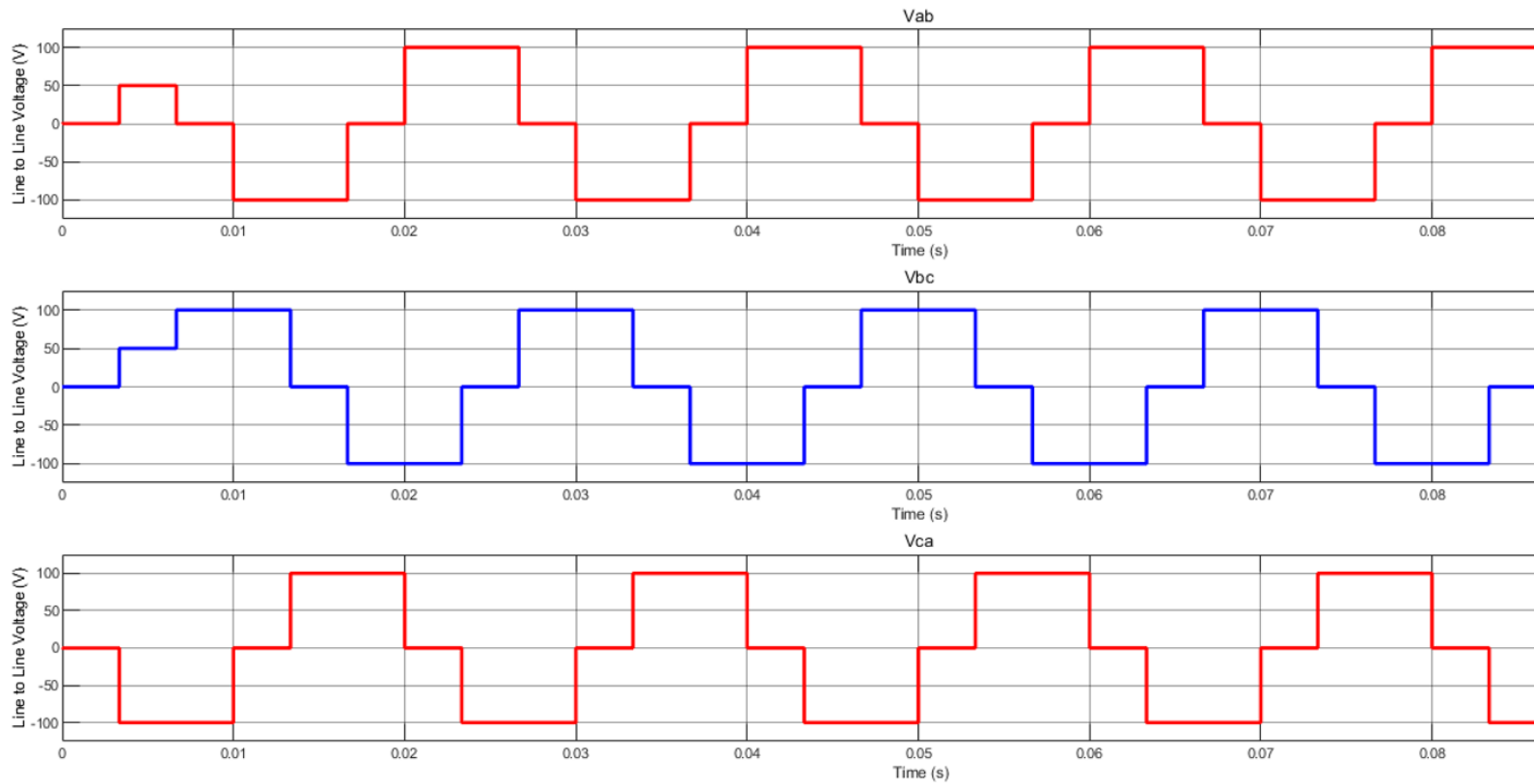
Waveform:



Waveform 1 – Input Pulse Waveforms



Waveform 2 – Line to Ground Output Waveforms



Waveform 3 – Line to Line Output Waveforms

Results and Conclusions:

- 1) The models were simulated in Simulink using Simscape library
- 2) THD for 120 degree mode is approximately 0.255
- 3) THD for 180 degree mode is approximately 0.236