EE 252: Electrical Machines and Power Electronics Lab (EMPEL)
DC-DC Converter Project

Set Number (E): 1
Batch Number (B): 9
Roll. Nos of students: 230002008, 230002019, 230002031, 230002038

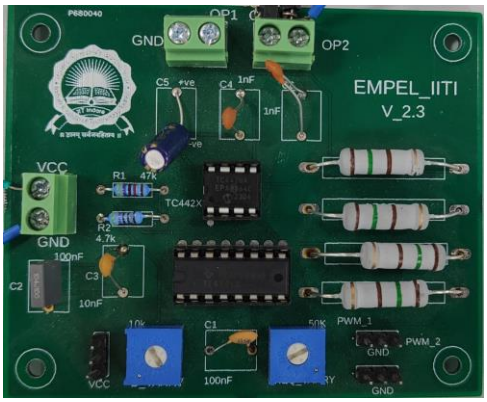
Problem Statement :
Buck - Boost Converter
a) Specifications: Input 20 V, Output 15-25 V, Switching frequency 10 kHz, Output current 1 A. Waveforms of diode current and switch voltage in CCM.
b) Reduce switching frequency to demonstrate DCM.

Observations
For an input of 20V we observed output of
DCM Mode is observed at 3.203kHz when decreased switching frequency from 10kHz.
Output Voltage for 20V input at 10kHz frequency:

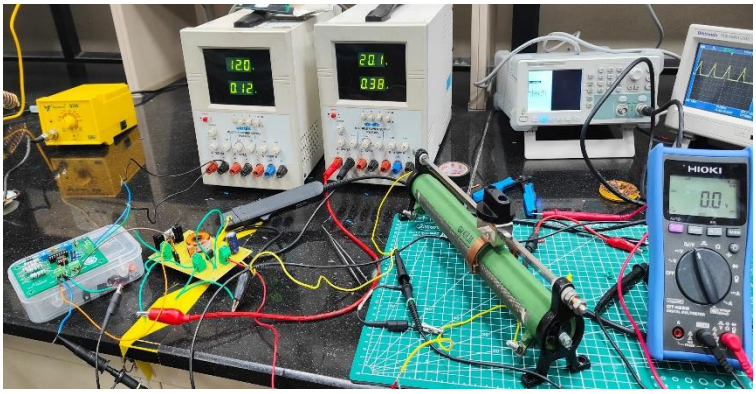
- Buck (at 42.8% Duty Cycle) = 15V
- Boost (at 55.5% Duty Cycle) = 25V

$I_{Lavg} = I_g + I_o = 0.99A + 1.28A = 2.27A$

Snapshots of Hardware Implementation



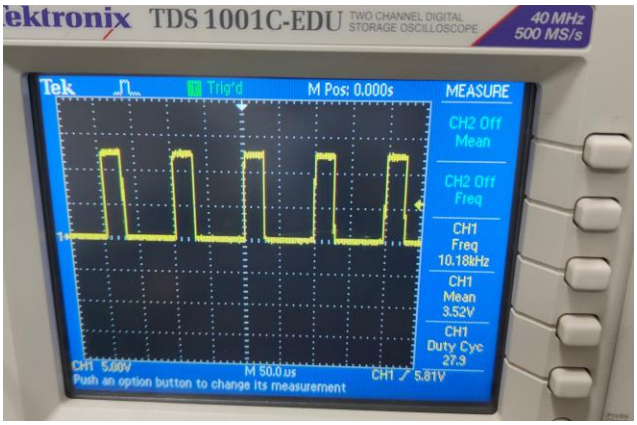
PWM Generator (TL494 IC) PCB



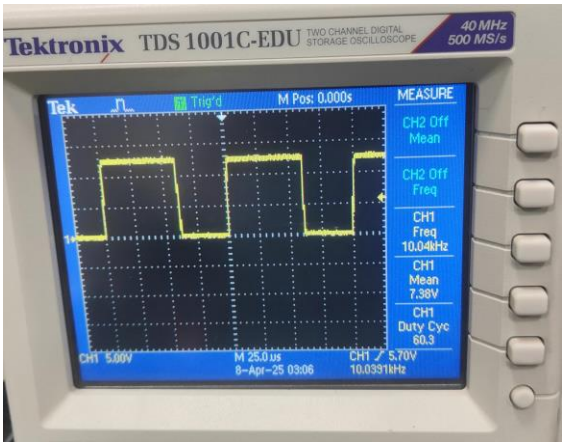
BUCK-BOOST Converter Circuit Set-up

PWM Waveform:

Duty Cyle 27.9%:

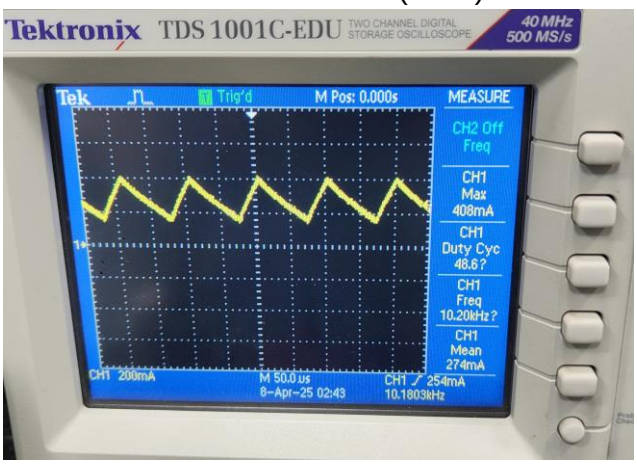


Duty Cycle 60.3%:

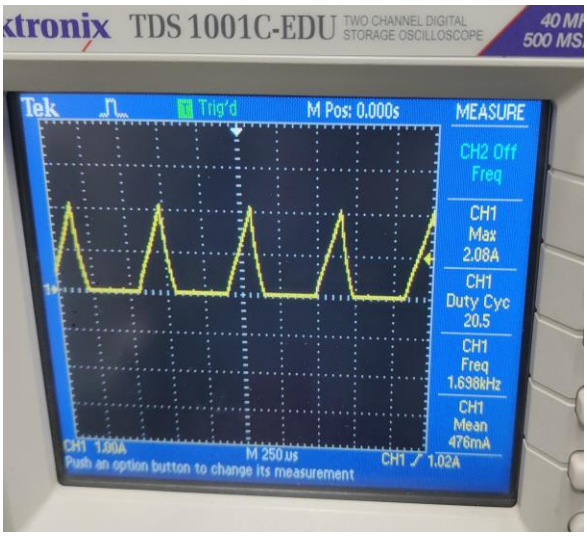


Inductor Current Waveform:

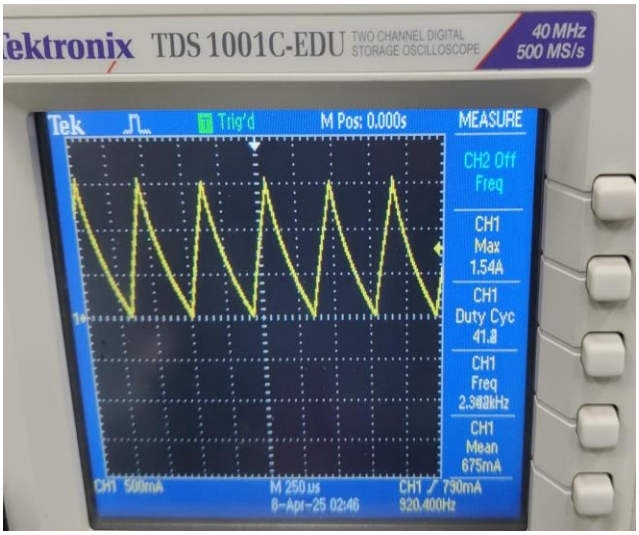
Continuous Conduction Mode (CCM):



Boundary Conduction Mode (BCM):



Discontinuous Conduction Mode (DCM):



Diode Current Waveform: