West Virginia University Lane Department of Computer Science and Electrical Engineering

Experiment #6 Open Circuit and Short Circuit Test

Authors: Sean Ranelli & Azain Uqaily

3-4:30pm Jignesh Solanki

Date Performed: 10/11/23

Due Date: 10/18/23

Table of Contents:

Lab Handout:

No lab hand out.

Objective & Equipment List for Each Experiment:

Objective:

The objective for this lab was to demonstrate the advantages of a transformer using voltage and current. It was to also show its importance in the modern day power systems.

Equipment:

- wires
- 30V/10 A connection on variable isolated transformer/ exciter (200V/ 2A was not working)
- Multimeter unit
- Transformer unit : L2 was used
- Variable resistor Box

Procedure & Wiring Diagram

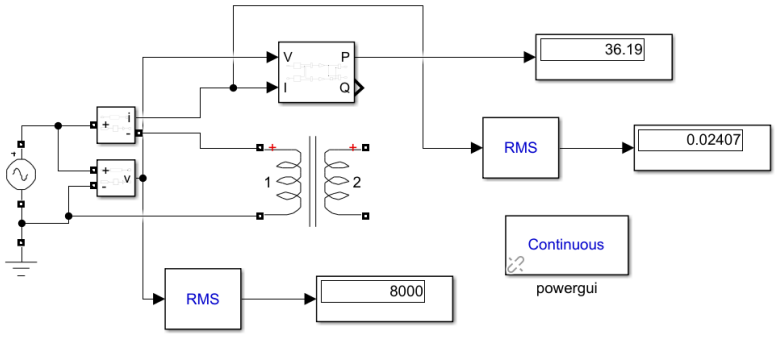

Figure 1. Open Circuit Test Matlab Simulink

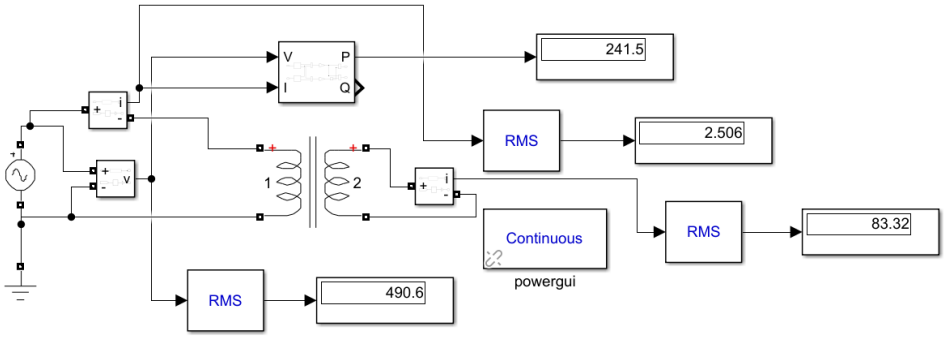

Figure 2. Short Circuit Test Matlab Simulink

Experiment 1: Open Circuit Test:

Simulation

AC Voltage source : sqrt(2) times 8000

I = S/V =20000/240 =83.3 A

Hand calculation for rated current

Workbench Implementation

50 mA current

241.2V

Experiment 2: Short Circuit Test :

We want the source side voltage to be set so that the current on the secondary side is 83.3 amps. This voltage was 694 v (not multiplied by sqrt 2)

Experiment Transformation Ratios:

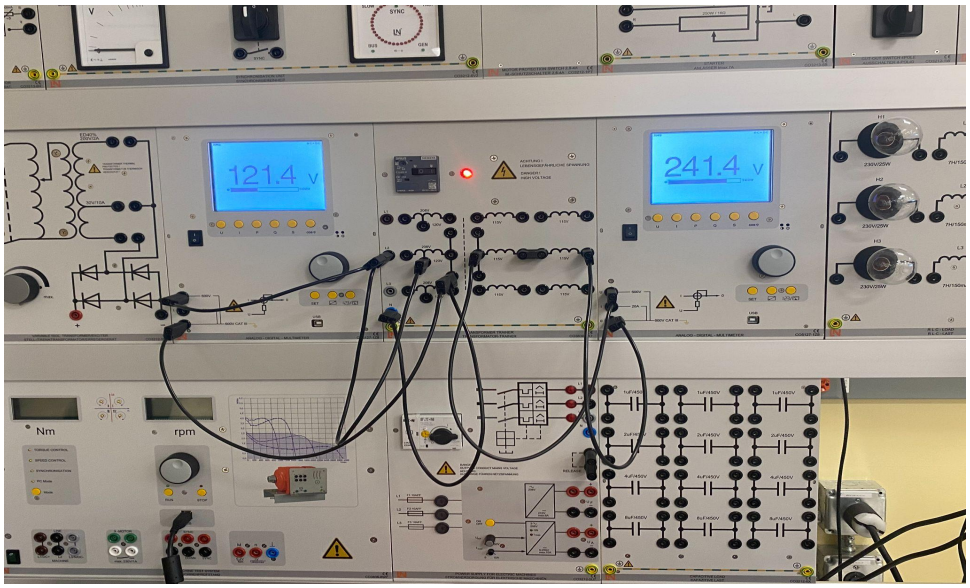

Figure 3: Short Circuit Test performed on Workbench

The two terminals of the secondary side are shorted which is a quick way of determining that this test was the short circuit test. For the open circuit test, the two terminals of the secondary circuit are open. With primary voltage 121.4 and secondary voltage 241.4 we can say this transformer performs step up operation with a turns ratio of Vp/Vs = ½.

Observations and Conclusions (And theory):

Experiment 1:

For the first experiment open circuit test observations made were that the RMS power output is 36.19 W, the RMS current output is 0.02407 A, and the RMS voltage is 8k V. The AC voltage source is 11313.7 V (sqrt(2)*8000), the AC current is 83.3 A (20000 / 240).

Experiment 2:

For the second experiment short circuit test observations made were that the RMS power output is 241.5 W, the RMS current on the first transformer is 2.506 A, the RMS current on the second transformer is 83.32 A, and the RMS voltage is 490.6 V. On the test performed on the workbench the primary voltage is 121.4 V and the secondary voltage is 241.4 V. This creates a 121.4 / 241.4 V, this is close to what we expected to see because ideally the voltage should have been 120 / 240 V.

Experiment 3 Transformation Ratios:

In this experiment we built a circuit with the secondary side terminals being short circuited through a voltmeter. The primary and secondary voltages were measured : primary was around 120 volts and the secondary was around 240 volts. The formula Np/Ns = Vp/Vs was used to determine transformer ratio: ½ .

Experiment 4 Open Circuit Voltage:

In this experiment we built a circuit with the secondary side being open. The transformer was configured into single phase operations only. This purpose was to measure the no-load current and calculate the open circuit voltage. In the end after the calculations the two voltage values are close but not exact as the measured secondary voltage is 234 V compared to the ideal value of 240 V.

Experiment 5 No Load Characteristic:

In this experiment we built an open circuit test on our workbench. It is called no load characteristic because we observe the behavior of the current as the voltage is slowly swept. The voltage is started with 0 volts and slowly slept up with increments of 15 volts. The values for current in mA with each increment of voltage is produced below:

Table 1. Voltage / Current Values

Vo (V)	0	15	30	45	60	75	90	105	120
Io (mA)	1	13	18	21	23	25	28	32	39

The current as observed behaved in a nonlinear relationship to the voltage.