

# EE160 Lab Assignment-5

Lab section 1A

## Minimizing the Transmission Loss in Power System with Transformers

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## Objectives:

Minimizing the Transmission Loss in Power System with Transformers

## Parameters for Circuit 1 :

Input voltage = 480V

Frequency = 50Hz

Line RL branch-

$R = 0.18 \, \Omega$

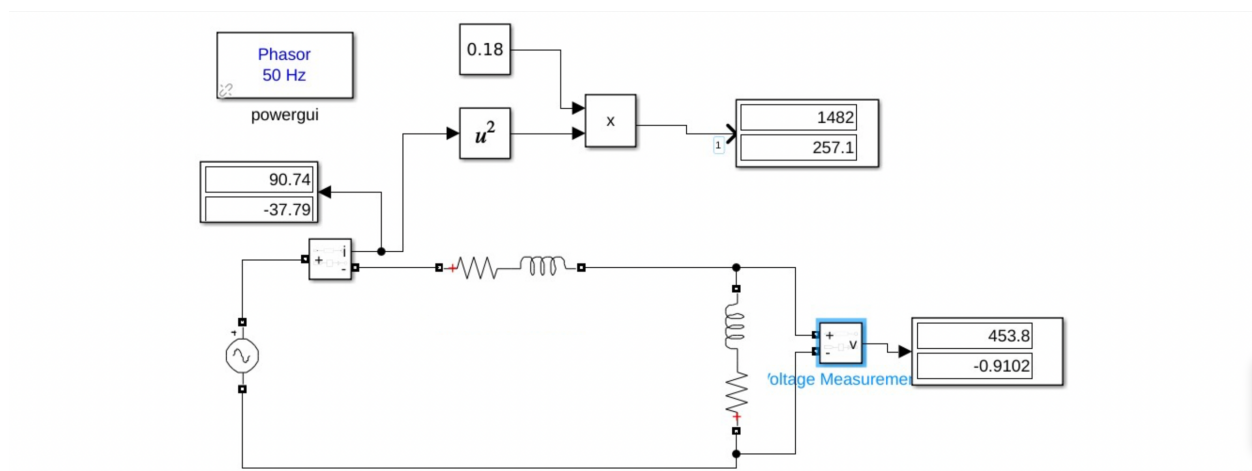
$L = 0.0007643312 \, \text{H}$

Load RL Branch-

$R = 4 \, \Omega$

$H = 0.0095541401 \, \text{H}$

## Circuit 1 :

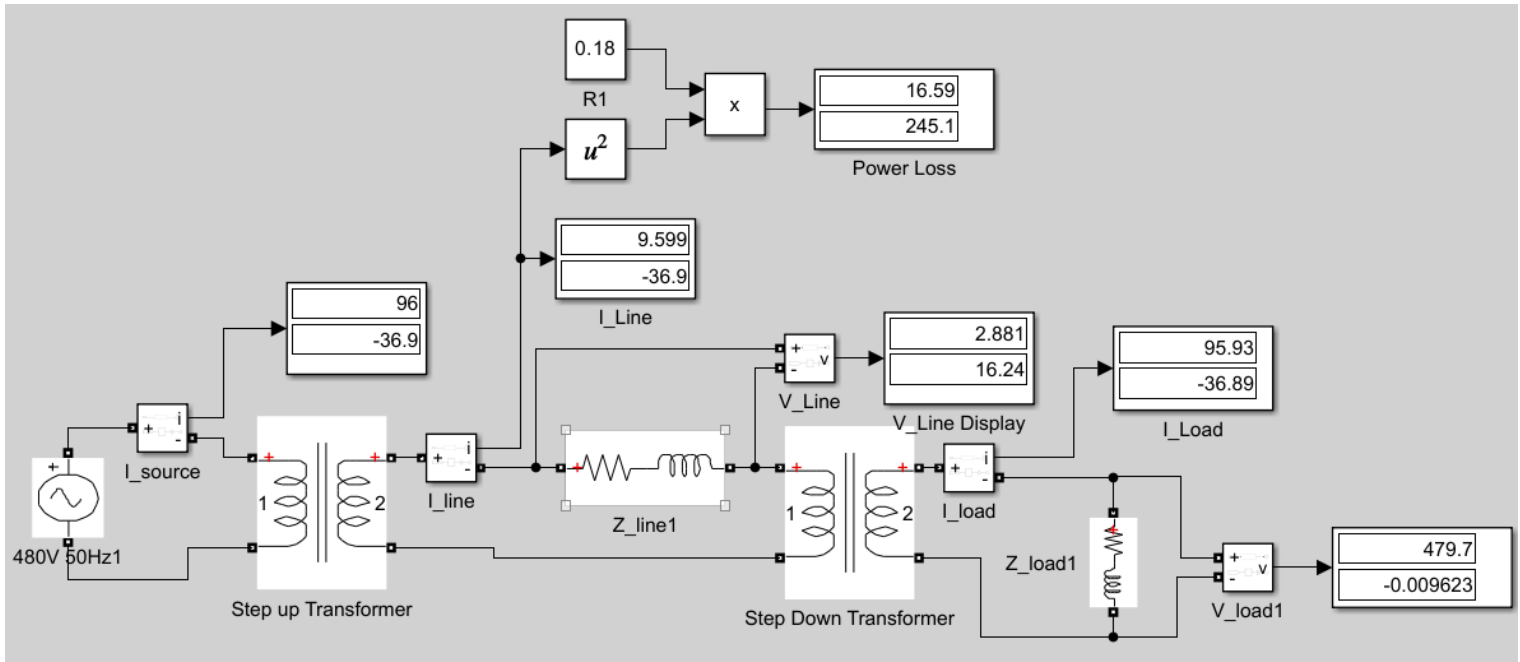


## Observation :

- (1) Magnitude of line current = 90.74 A and its phase angle =  $-37.79^\circ$
- (2) Magnitude of load voltage = 453.8 V and phase angle =  $-0.9102^\circ$
- (3) Phase difference between line current and the source voltage =  $0^\circ - 37.79^\circ = -37.79^\circ$
- (4) Phase difference between the load current and the load voltage =  $-37.79^\circ + 0.9102^\circ = -36.8798^\circ$

- (5) Power loss in the transmission line = 1482 W  
 (6) Voltage drop across the line impedance = 453.8 V

Circuit 2 (parameters same as previous one) :



Observation :

- (1) Magnitude of Source current = 96 phase angle =  $-36.9^\circ$   
 line current = 9.599 phase angle =  $-36.9^\circ$   
 load current = 95.93 phase angle =  $-36.89^\circ$
- (2) Magnitude of load voltage = 479.7 V and phase angle =  $-0.009623^\circ$
- (3) Phase difference between source current and the source voltage =  $0 - (-36.9^\circ) = 36.9^\circ$
- (4) Phase difference between line current and the source voltage =  $-36.9^\circ - 0 = -36.9^\circ$
- (5) Phase difference between the load current and the load voltage =  $-36.89^\circ - (-0.009623^\circ)$   
 $= -36.880377^\circ$
- (6) Power loss in the transmission line = 16.59 W
- (7) Voltage drop across the line impedance = 2.881 V

## Conclusion :

1. Power loss in circuit 2 (transformer circuit) is very less than power loss in circuit 1.  
Power Loss in circuit 1 = 1482 W. Power Loss in circuit 2 = 16.59 W
2. Power loss =  $I^2R$  , we can't change line resistance but we can reduce the line current by adding a step up transformer then to compensate for the voltage at the load we will add a step down transformer which will provide the desired output voltage at load.