Electric Circuits 2

Lab: 02

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1 Introduction

In this lab, we attach a resistance R_L across two end terminals of a circuit. We then analyze the behavior of the various electrical quantities across the resistor as resistance increases. We then prove Thévenin's theorem by creating Thévenin's equivalent circuit and comparing the electrical quantities with the original circuit quantities.

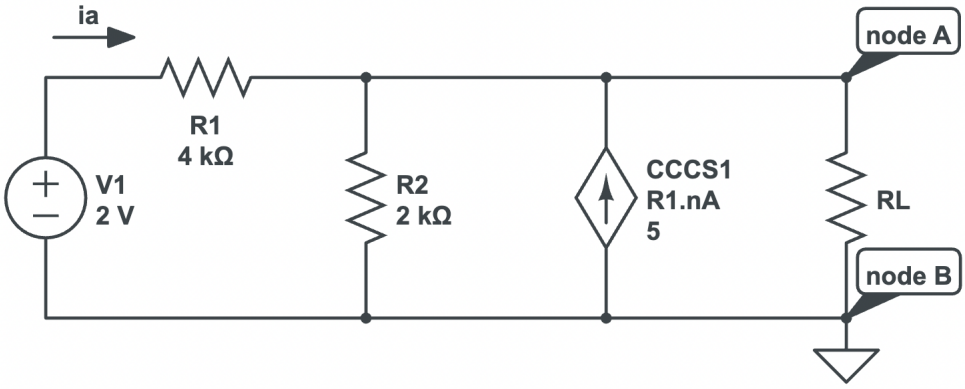

Figure 1: Electric circuit with resistor R_L across terminals A-B

Consider the circuit presented in Figure (1). We place increasing resistances across R_L and measure the current i_L, the voltage, v_L, and power p_L across the resistor and record the data in the table below.

Table 1: Recorded image and object distances from the lens

R_L [Ω]	i_L [A]	v_L [V]	p_{L-exp} [W]	$p_{L-theory}$ [W]
10	294.1E-05	0.029	086.5E-06 086.5052E-06 56	269.8E-05
0.151	407.6E-06 407.5876E-06 110	245.9E-05	0.27	001.025E-03 001.0246E-03 180
220.6E-05	0.397	875.9E-06 875.8651E-06 200	214.3E-05	0.429
918.4E-06 918.3673E-06 270	194.8E-05	0.526	001.0E-03 001.0246E-03 360	174.4E-05
0.628	001.1E-03 001.0952E-03 430	161.3E-05	0.694	001.1E-03 001.1186E-03 470
154.6E-05	0.727	112.4227E-05	112.3924E-05	
560	141.5E-05	0.792	112.0755E-05	112.1396E-05
750	120.0E-05	0.9	108.0000E-05	108.0000E-05
1000	100.0E-05	1	100.0000E-05	100.0000E-05
1800	652.2E-06	1.174	765.6522E-06	765.5955E-06
2700	468.8E-06	1.266	593.4375E-06	593.2617E-06
3600	365.9E-06	1.317	481.8293E-06	481.8560E-06
5600	245.9E-06	1.377	338.6066E-06	338.6187E-06
27000	545.5E-07	1.473	803.4545E-07	803.3058E-07
110000	135.7E-07	1.493	202.6697E-07	202.6986E-07
220000	680.3E-08	1.497	101.8367E-07	101.8094E-07
750000	199.9E-08	1.499	299.6003E-08	299.6004E-08
1100000	136.3E-08	1.499	204.3162E-08	204.3596E-08
2400000	624.9E-09	1.5	937.3047E-09	937.1095E-09
4700000	319.1E-09	1.5	478.6725E-09	478.6216E-09
6200000	241.9E-09	1.5	362.8740E-09	362.8447E-09
8200000	182.9E-09	1.5	274.3735E-09	274.3568E-09
10000000	150.0E-09	1.5	224.9888E-09	224.9775E-09

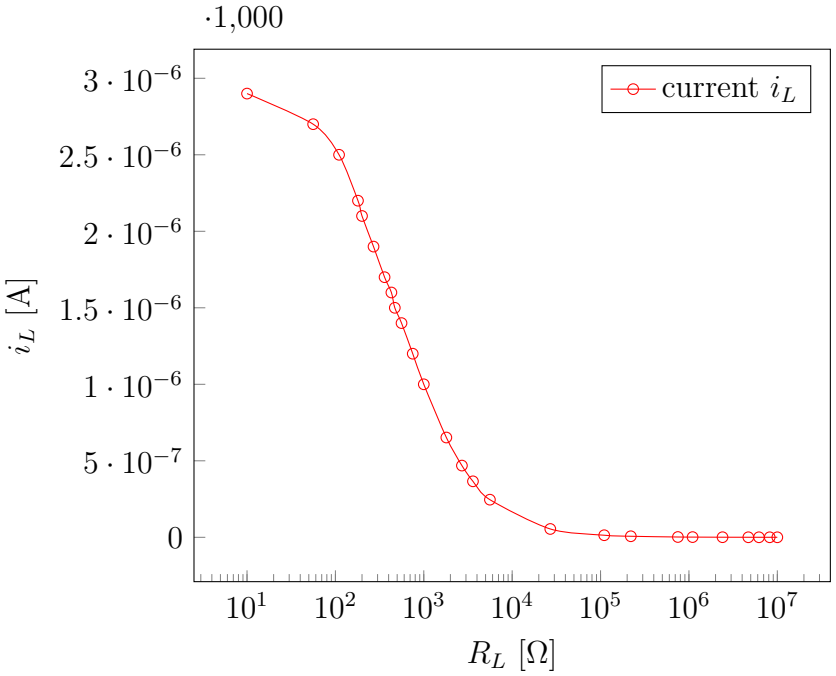

Figure 2: Current through load resistance R_L

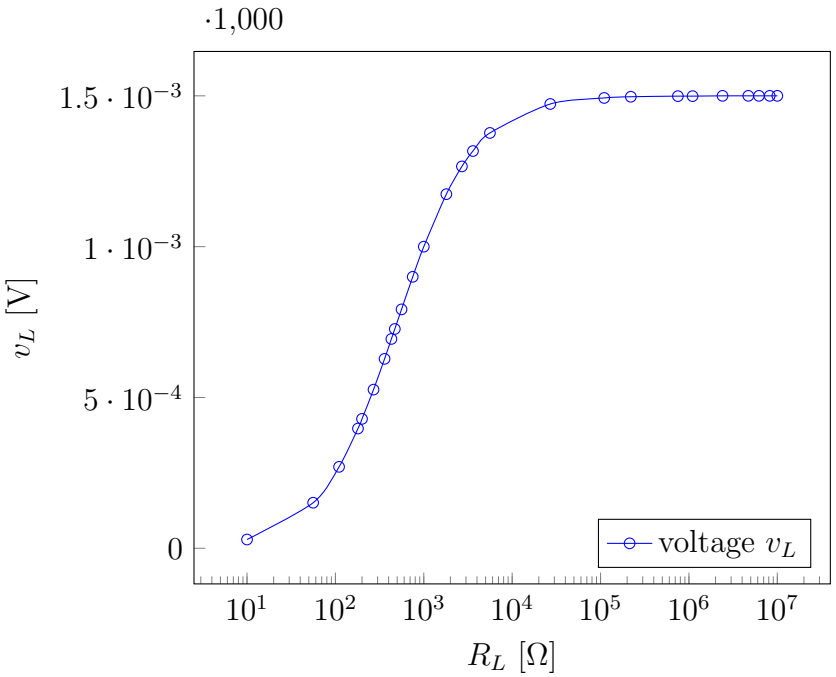

Figure 3: Voltage through load resistance R_L

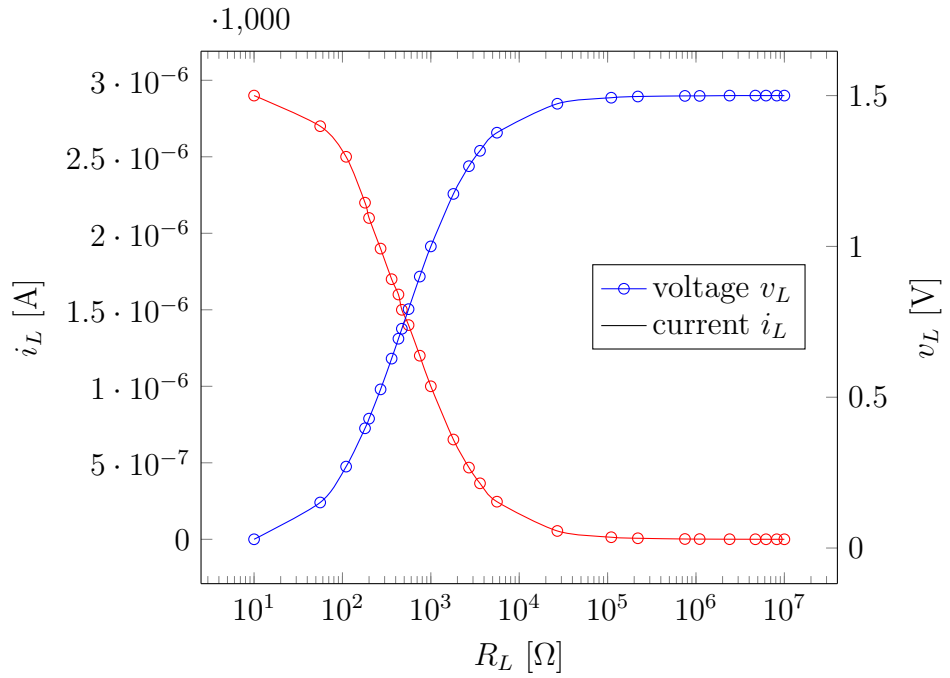

Figure 4: Current and voltage through load resistance R_L

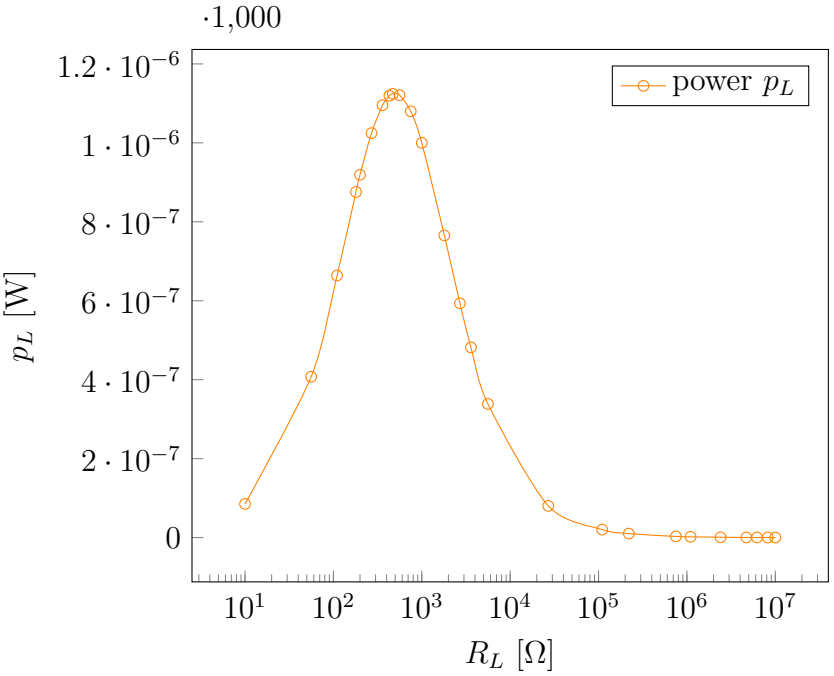

Figure 5: Power p_L through load resistance R_L