

## Lab 10 (PI Controller – Maglev):

Pre-Lab: Complete pre-lab assignments 1-4 before coming to the lab. Assignment 5 is optional and only needs to be done if you want to complete the PIV Controller section of the lab. The specifications needed for the questions can be found in the tables at the end of this document or in the user manual.

Lab Experiment:

1. The wiring of the VoltPac to the DAQ is the same with the following change.
  - a. The yellow RCA connector is connected to the Analog Input #0 and the red RCA connector to Analog Input #1.
2. The coil on the Maglev is connected to the TO LOAD on the VoltPac via the 4 to 6 DIN cable. The sensor is connected to S1&S2 and the Current Sense is connected to S3.
3. Read through section 7.2 and implement the Tuning of the PI Current Control Loop experiment.
4. Read through section 7.4 and complete the Resulting System's Actual Closed-Loop Poles experiment
5. If time permits and you did Assignment 5 in the pre-lab you can complete the PIV controller experiment in section 7.3.

**Important:** Before closing the model, select “QUARC → Clean all ...” and click “Yes” on the prompt to delete all generated code.

Post-Lab: Write a lab report detailing the procedure and results of the experiments run. Keep it within the same styles as the previous lab reports. The lab report will be due by Friday April 26<sup>th</sup> via email. No late reports will be accepted. My email is listed below.

[viswajithsv@knights.ucf.edu](mailto:viswajithsv@knights.ucf.edu)

If you have any questions regarding the lab or pre-lab feel free to email me and I will respond as soon as possible.

<i>Symbol</i>	<i>Description</i>	<i>Value</i>	<i>Unit</i>
$I_{c\_max}$	Maximum Continuous Coil Current	3	A
$L_c$	Coil Inductance	412.5	mH
$R_c$	Coil Resistance	10	$\Omega$
$N_c$	Number Of Turns in the Coil Wire	2450	
$l_c$	Coil Length	0.0825	m
$r_c$	Coil Steel Core Radius	0.008	m
$K_m$	Electromagnet Force Constant	6.5308E-005	$N.m^2/A^2$
$R_s$	Current Sense Resistance	1	$\Omega$
$r_b$	Steel Ball Radius	1.27E-002	m
$M_b$	Steel Ball Mass	0.068	kg
$T_b$	Steel Ball Travel	0.014	m
$g$	Gravitational Constant on Earth	9.81	$m/s^2$
$\mu_0$	Magnetic Permeability Constant	4 $\pi$ E-007	H/m
$K_B$	Ball Position Sensor Sensitivity (Assuming a User-Calibrated Sensor Measurement Range from 0 to 5 V)	2.83E-003	m/V

Table 3 MAGLEV System Model Parameters