

Phys3201 Template GT

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Abstract

In this experiment we studied pendulum motion in a non-uniformly accelerating reference frame. **Special notes:** Prof Goldman specifically requested to not have “100” sig figs, put font on figure axes in readable size, and don’t put grids on plots!

1 Introduction

Motivate why you chose the problem that you did. Why is it interesting?

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2 Background

Give a brief summary of the physical theory, include any equations necessary, and cite any references you want to include. Here is how you insert an equation. According to references [1–3] the dependence of interest is given by

$$\mathcal{L} = \frac{1}{2}m\ell^2(\dot{\theta} + \dot{\phi}_0)^2 - mg_e(t)\ell \cos(\theta)$$

$$m\ell^2(\ddot{\theta} + \ddot{\phi}_0) = mg_e\ell \sin(\theta)$$

$$\ddot{\phi}(t) = -\frac{g_e(t)}{\ell} \sin(\phi(t) - \phi_0(t)) \quad (1)$$

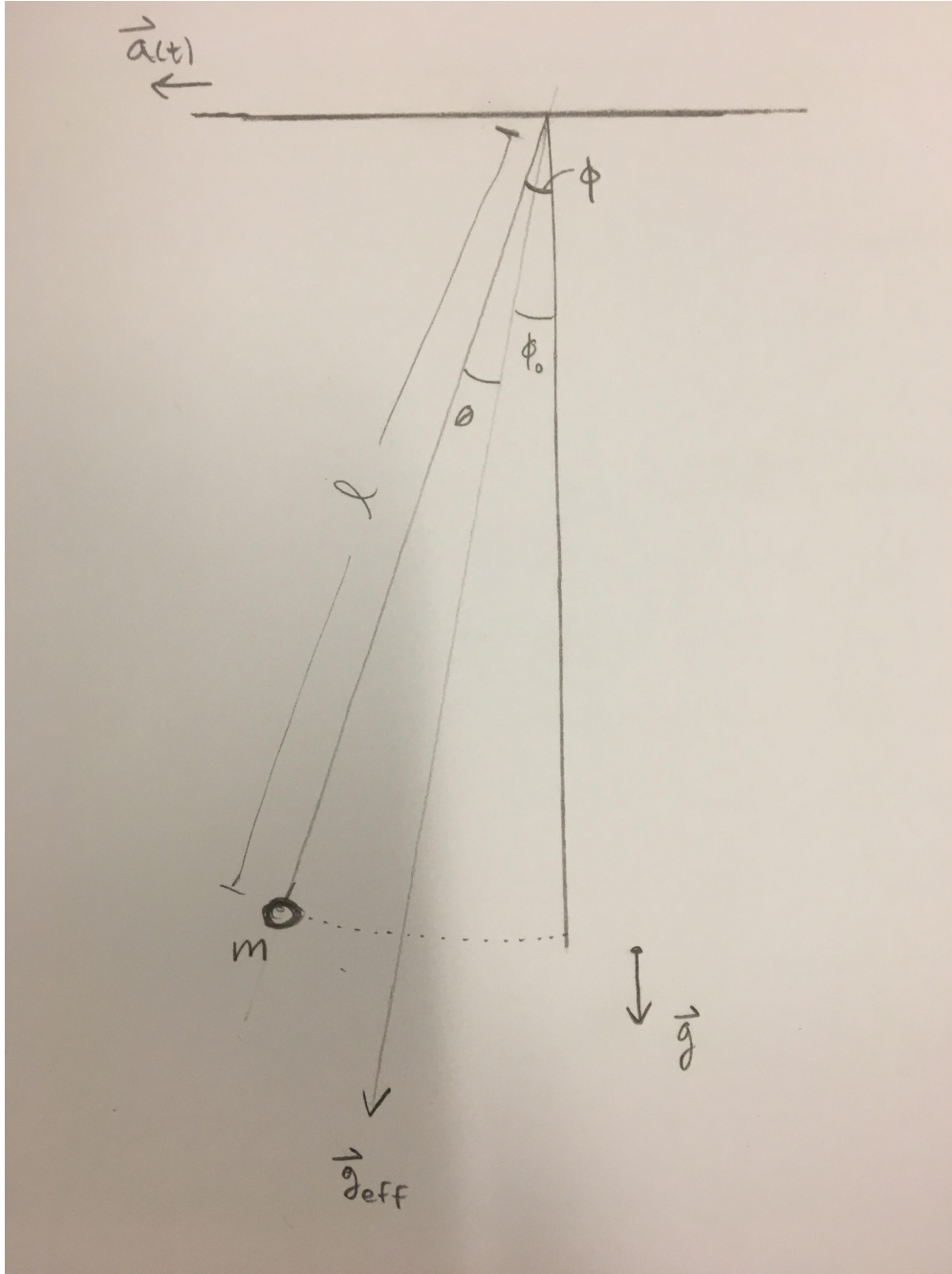


Figure 1: Pendulum that starts at rest in an accelerating frame. If the acceleration is not constant then the apparent vertical, and thus ϕ_0 will change with time

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3 Methods

Give a schematic of the experimental setup(s) used in the experiment (see figure ??). Give the description of abbreviations either in the figure caption or in the text. Write a description of what is going on.

and eventually arrived to the balanced photodiode as seen in the figure ??.

4 Results

In this section you will need to show your experimental results. Use tables and graphs when it is possible. Table 1 is an example.

Table 1: Every table needs a caption.

| x (m) | V (V) |
|-----------|-----------|
| 0.0044151 | 0.0030871 |
| 0.0021633 | 0.0021343 |
| 0.0003600 | 0.0018642 |
| 0.0023831 | 0.0013287 |

Analysis of equation ?? shows ...

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For example, it is easy to conclude that the experiment and theory match each other rather well if you look at Fig. ?? and Fig. ??.

5 Conclusions

Here you briefly summarize your findings. Did you learn any new physics? Was everything as expected?

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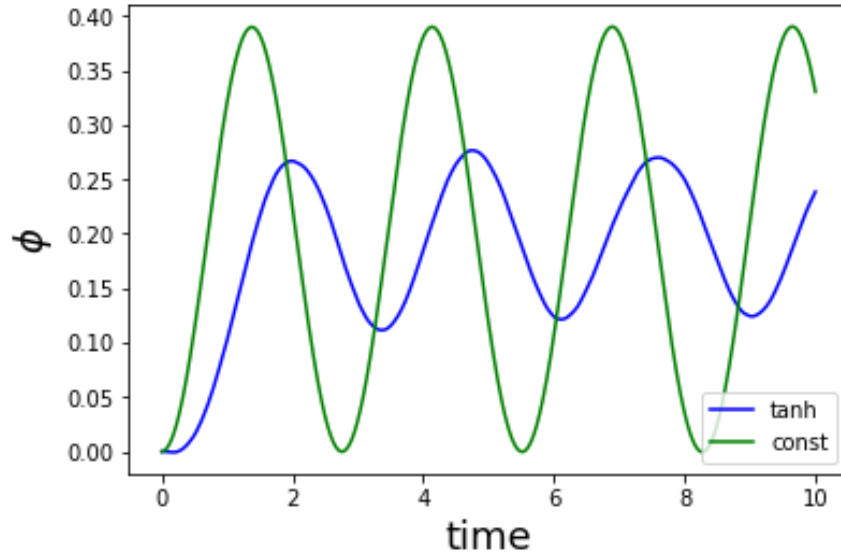


Figure 2: Hyperbolic tangent acceleration vs immediate constant acceleration. The slow approach to the same asymptotic value of 2 meters per second per second induces a lag in the oscillation and also diminishes the amplitude of oscillation.

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6 Future Work

Since you had limited time to work on this project, what questions are left outstanding? What would be your next steps?

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References

- [1] A. C. Melissinos and J. Napolitano, *Experiments in Modern Physics*, (Academic Press, New York, 2003).
- [2] N. Cyr, M. Têtu, and M. Breton, IEEE Trans. Instrum. Meas. **42**, 640 (1993).
- [3] *Expected value*, available at http://en.wikipedia.org/wiki/Expected_value.