Devin Morin

Supervisor: Dr. Ben Newling

Advanced Research Project

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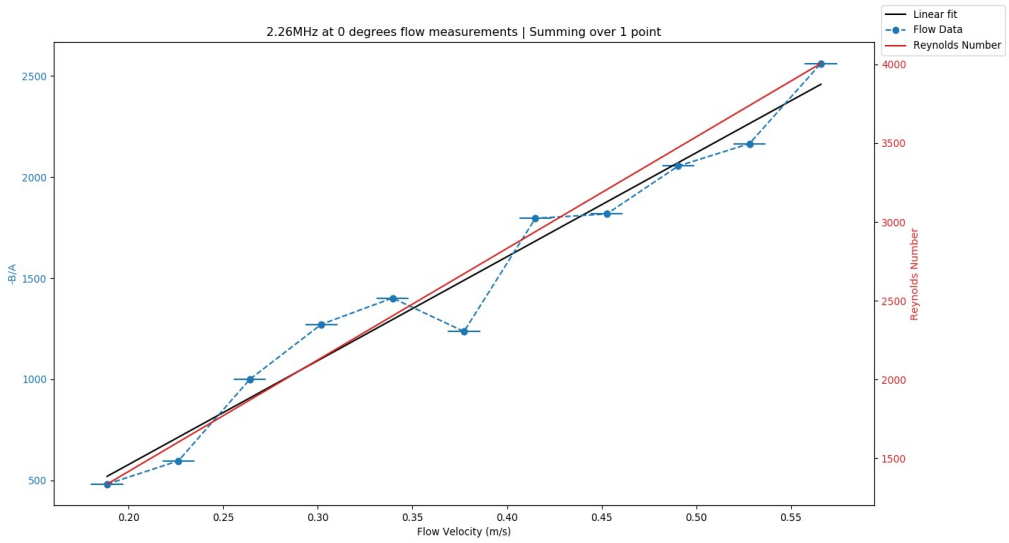
Mid-Project Report – Honors Thesis

As of currently the project is on schedule. A large amount of data was collected over the entire month of November and December. There's a possibility of going back for more data if need be, but as of right now I have data collected for 0, 5, 10, and 15 degrees. This would correspond to a gradient along the direction of flow of 0, 8.7, 17.4, and 25.9gauss/cm. The most promising of which is the 0-degree data, as the large gradient means that the smallest of angles will allow for some detection of flow. A common problem I've had continuously is noise. Because of this, throughout **most** of my figures, I've used a summation method that will sum over each peak when collecting the magnitude of the peaks.

1. 0-degree flow data with a summation over 1 data point. This uses 3 peaks, as by the 1500CCM MR data, the signal has completely decayed by the 6th even peak. Since this is approximated as being linear, the first 3 even peaks are used to keep this fair linear approximation.



I'm currently focused on writing the introduction to the thesis as well as preparing the data and understanding what I want the structure of the results section to look like. I plan on showing a similar figure to the above for all angles and detailing the conclusions made from each plot. Of course, there are many sources of error in these plots, for example how 15 degrees has an uncertainty of possibly +/- 2 degrees. There are many things that could improved about the system, but at the core of this research, I want to demonstrate how one can go about making

these flow measurements at low field using a handheld unilateral magnet. Also, a visualization of how flow data can change will varying gradient strength, by imploring the use of the gimbal system the unilateral magnet is mounting upon.

The coming weeks will involve finalizing a rough draft of the introduction. This includes a basic introduction to pulse NMR (FID, Spin Echoes, Excitation and Relaxation, CPMG etc..), as well as a brief introduction to fluid dynamics, and how one may approach using MR to get flow velocities. This month will be heavily focused on getting a bulk amount of the paper finished and taking time to review what figures are relevant in displaying the important results of this research.