



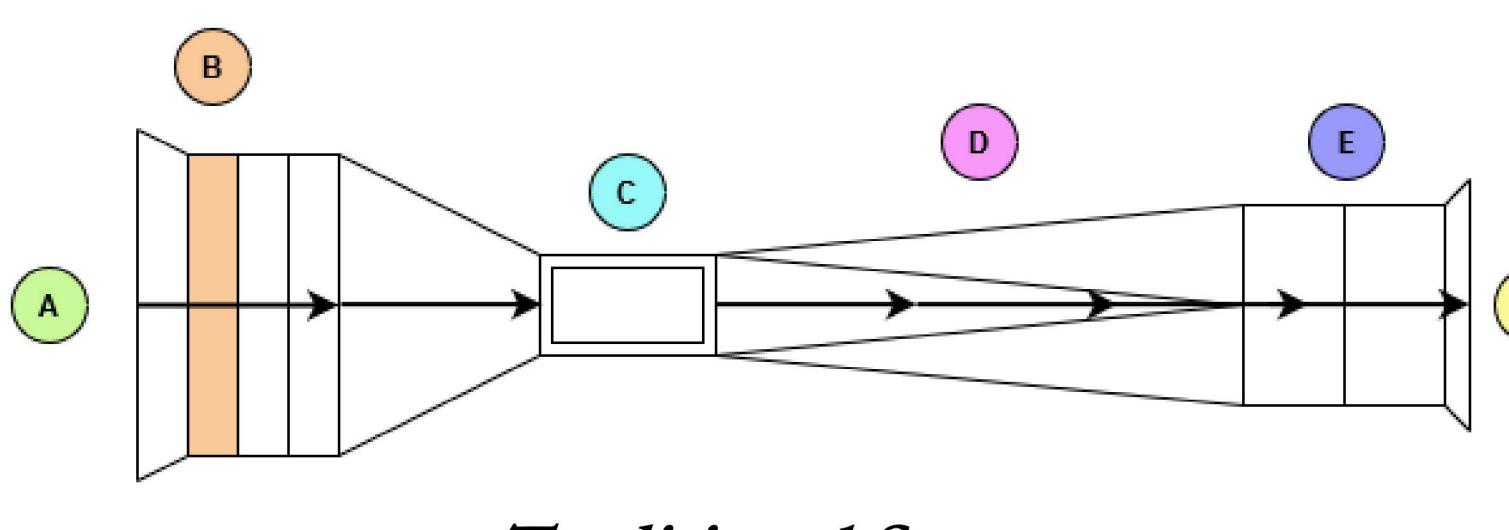
Wind Tunnel MMS – Sequence of Operation

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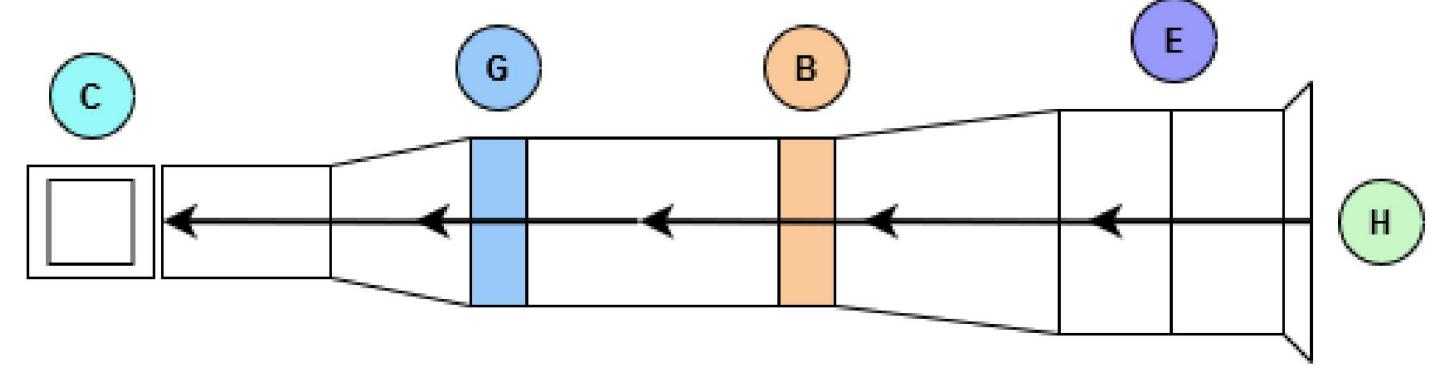
PSL FASH Lab Org: 09242

BACKGROUND

- Project Goal: Create a wind tunnel with custom software that would provide a precise wind velocity, in order to calibrate hot-wire and turbine anemometers.
- The system has a repeatable set point accuracy of within $\pm 1\%$ of reading, with a software control loop.
- This alternative method for controlling airflow differs from a traditional system, as it utilizes a variable frequency drive (VFD) to precisely adjust the frequency and voltage of the fan's motor.



Traditional System



FASH System

A. Intake	D. Diffuser	G. Laminar Flow Element (LFE)
B. Honeycomb	E. Fan	H. Intake/Fan
C. Test Section	F. Delivery Section	



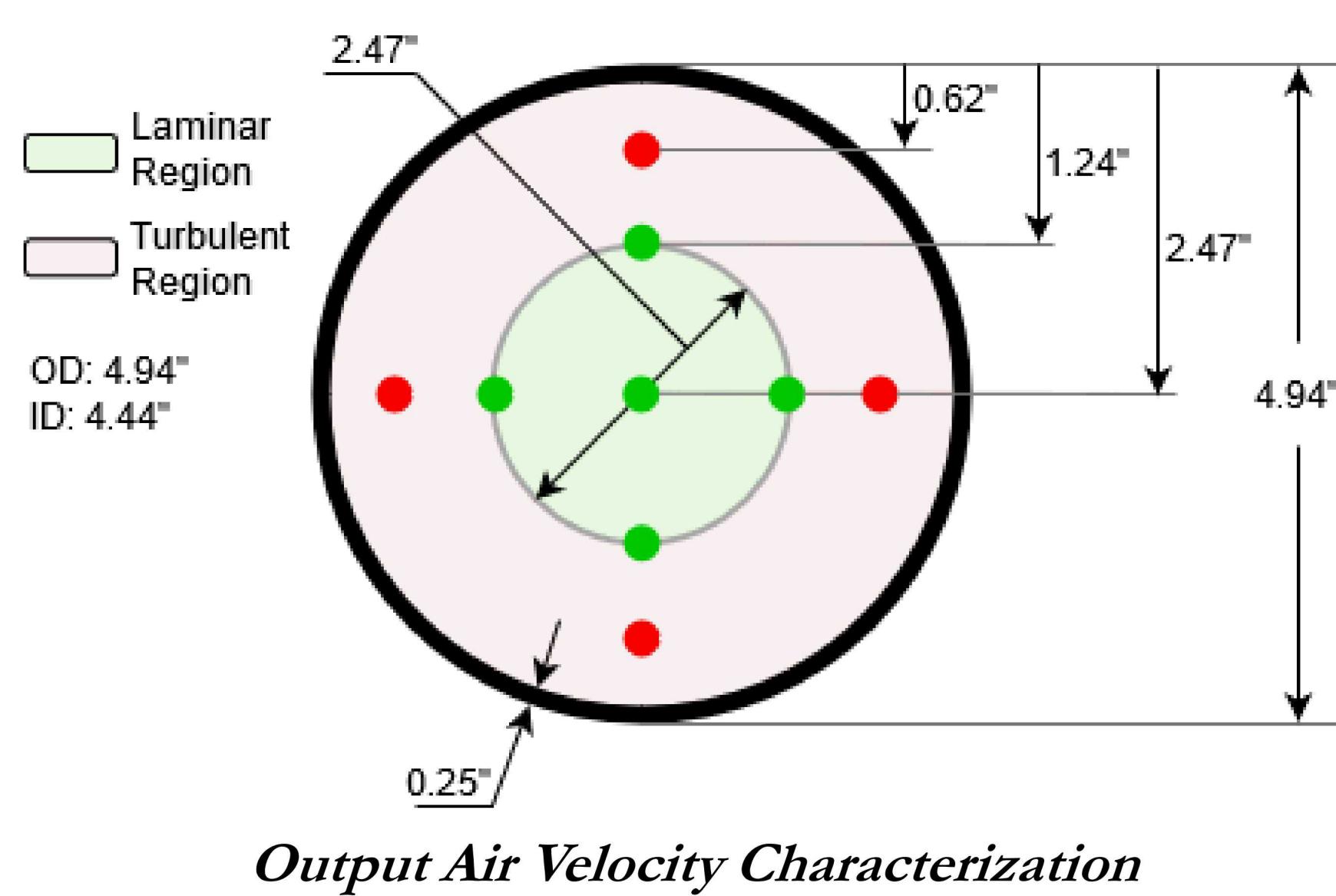
FASH Wind Tunnel

A reference hot-wire anemometer is mounted at the test section output of the wind tunnel. The reference anemometer is used in a control feedback loop with the software to attenuate the output air velocity's uncertainty.

OBJECTIVES

- Identify the best method for controlling the system with lowest possible uncertainty.
- Create a LabVIEW program to automate the system during calibration.
- Determine which area of the wind tunnel's output is laminar.

TEST METHODOLOGY

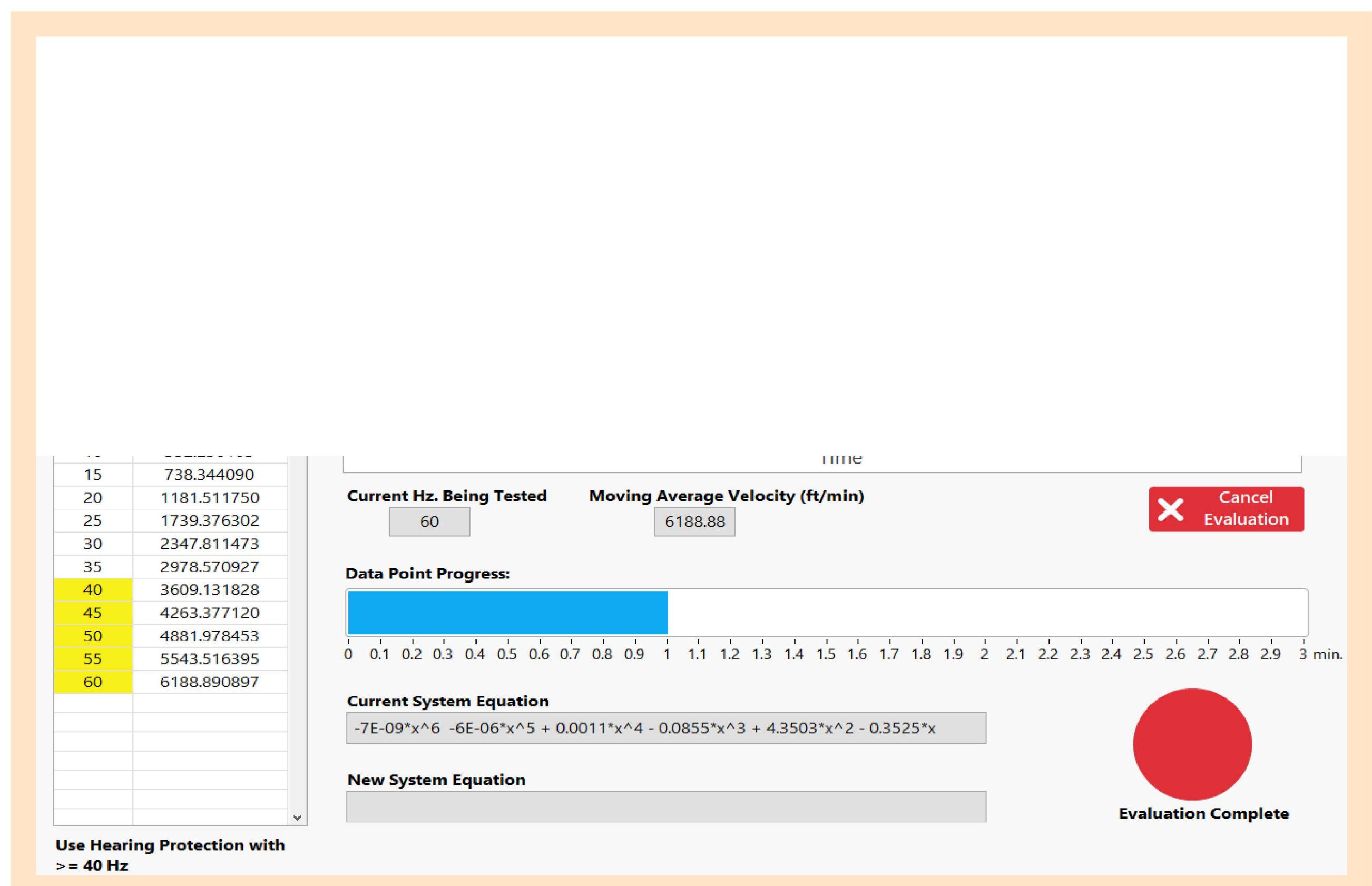


Output Air Velocity Characterization

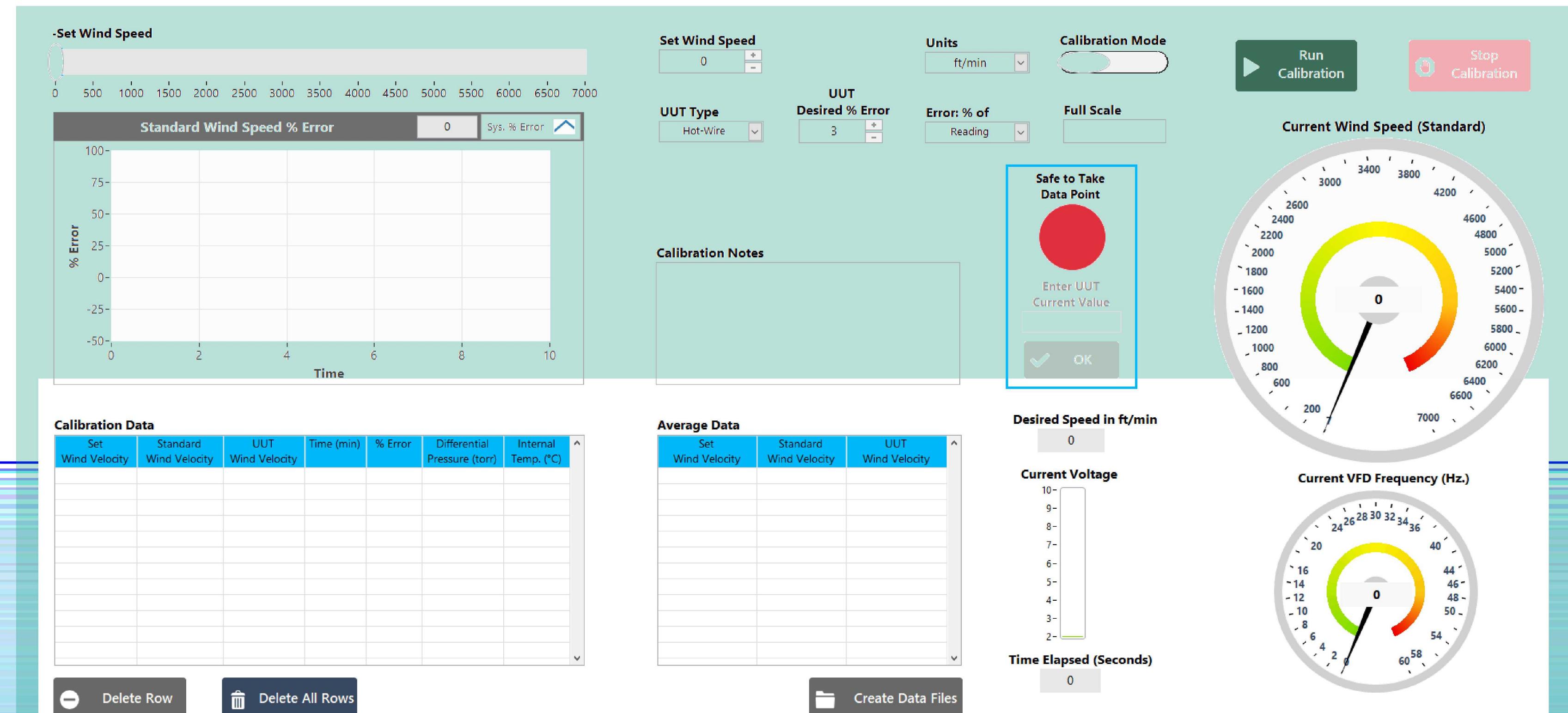
- Nine data points were taken to characterize the laminarity of the system's output.
- It was identified that the laminar region has a diameter of 2.47" and lies in the center of the circular output.
- This laminar region is where the reference standard anemometer is mounted, as well as the unit under test (UUT).

RESULTS

From evaluating the system to producing calibration data files, the LabVIEW software provides an end-to-end solution for calibrating air velocity anemometers with an open-circuit wind tunnel.



Evaluate System Screen



Calibration Screen

NEXT STEPS

- Perform uncertainty analysis.
- Authorize as a major measurement system.