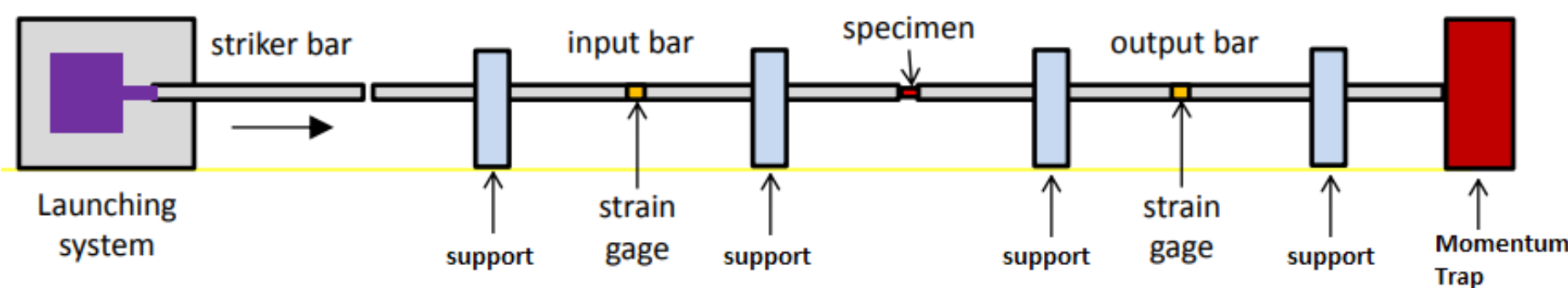


What is the SHPB?

Split Hopkinson Pressure Bar (SHPB) is a characterization tool for the mechanical response of material at desired high strain rates ($10^2 - 10^4$ 1/s). We can obtain stress strain curve of the material at high strain rate with the help of the SHPB



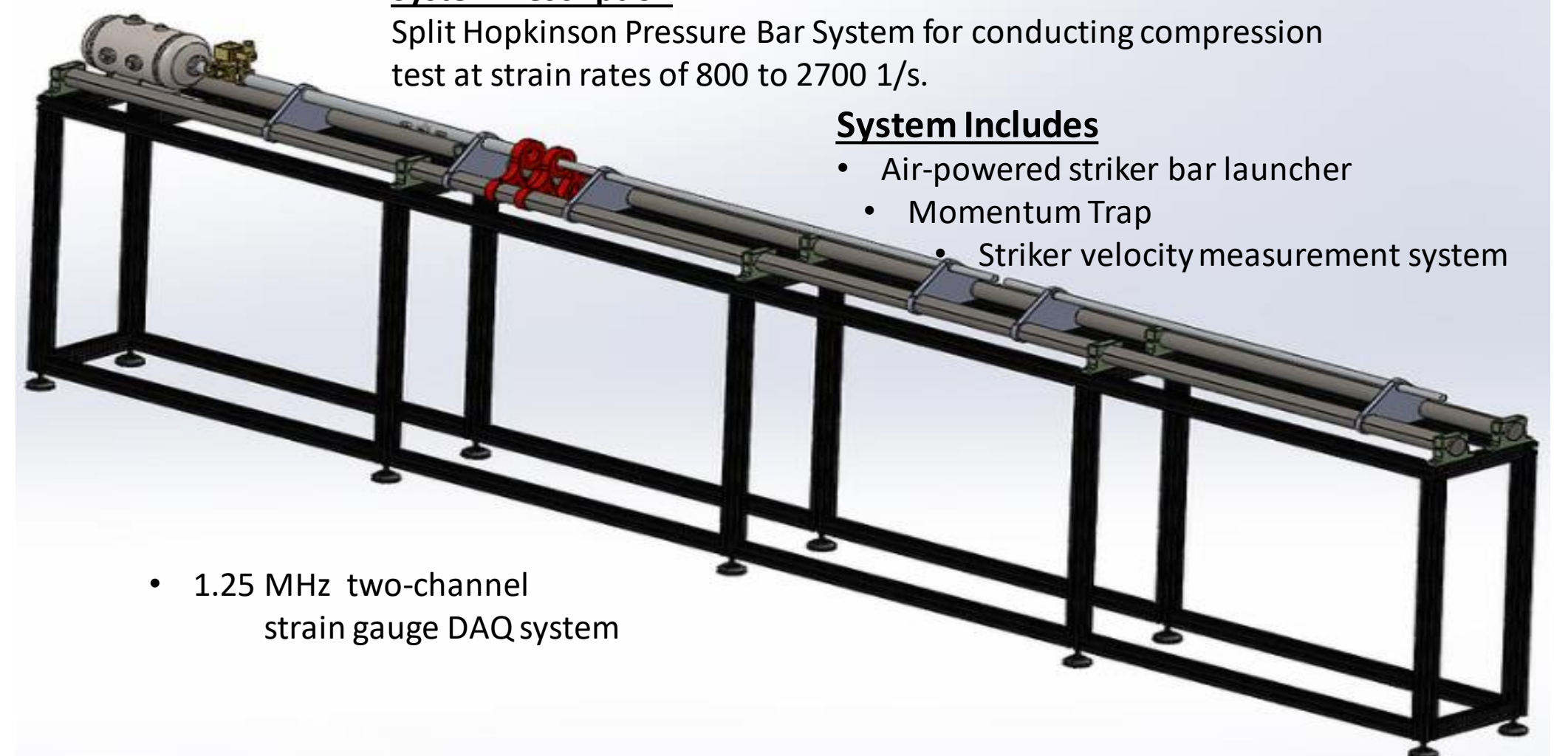
Step 1-Design

System Description

Split Hopkinson Pressure Bar System for conducting compression test at strain rates of 800 to 2700 1/s.

System Includes

- Air-powered striker bar launcher
- Momentum Trap
- Striker velocity measurement system



- 1.25 MHz two-channel strain gauge DAQ system

Description

This project involves design, manufacturing and testing of a compression Split Hopkinson pressure bar test setup.

Goals

This project aims to improve the ability of the undergraduate students

- To design a real system under real design requirements
- To get familiar with fundamental modern engineering tools (such as Solidworks, MATLAB, ABAQUS, LS-DYNA) to analyze and design a real system and its sub-systems
- To design and conduct experiments, collect data, analyze and interpret test results.

Tasks

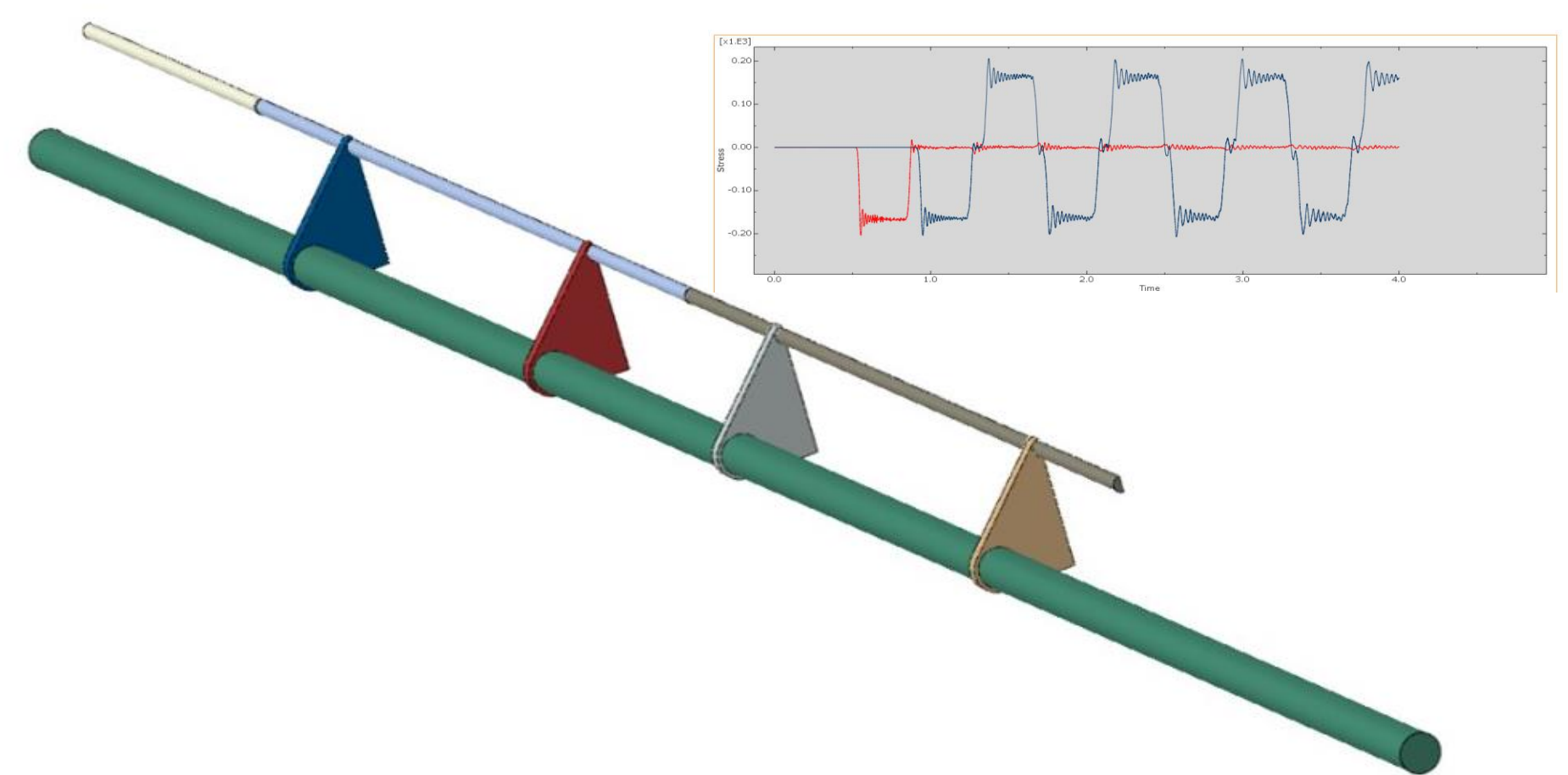
- Calculation of required parameters
- Preparation 3D CAD model
- Production and Assembly
- DAQ system setup and conversion
- Calibration of the setup
- Experiment and FEM result comparison

Notes from Undergraduate Student (Alex Storrer)

Taking part in this project enabled me to grow as an engineer, developing skills that are not learned in a classroom. Here is a list of some takeaways working on the SHPB:

1. Gained a deeper understanding of mechanics of materials and materials testing
2. Had exposure to the importance of precision in mechanical design
3. Experienced entire engineering design process seeing this project go from ideation to assembly and then use
4. Developed non-mechanical engineering skills (such as electrical/software) through DAQ and velocity measurement configuration

Step 2- Finite Element Simulations

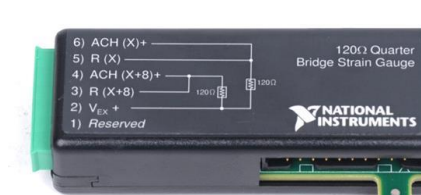


Step 3 – Structural Assembly



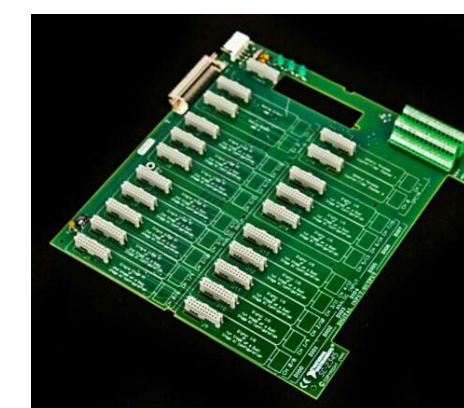
Step 4 – Data Acquisition (DAQ) System Assembly

Quarter Wheatstone Bridges



1

Signal Conditioning



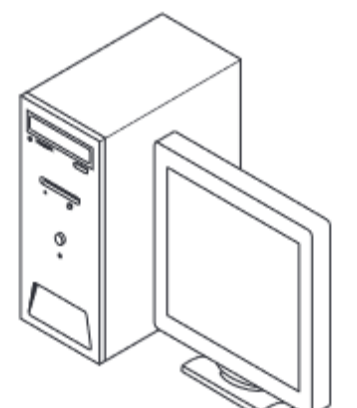
2

Data Acquisition Card



3

Post-Processing



4

Step 5 – Calibration and User Manual Preparation

ONGOING

Cost Analysis

Current Spending
 ~ \$4200

Industrial Version
 ~ \$150k-\$200k