21F03 NPOI Capstone

# Final Prototype

Design Summary

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12-3-2021

The Final Prototype presented at end of semester one of NAU Capstone, seen in Figures 1 and 2, is approximately 1/6$^{th}$ of the total final assembly. For the class demonstration some of the more critical components were substituted for analogs to the real article. Specifically, the long horizontal pipe located at the top of the assembly is shorter than what will be used in the final assembly. Additionally, and the KF50 vacuum valve used for the demonstration is defective an in need or repair. Regardless, the demonstration prototype served the critical function of real-world form and fit of the assembly.

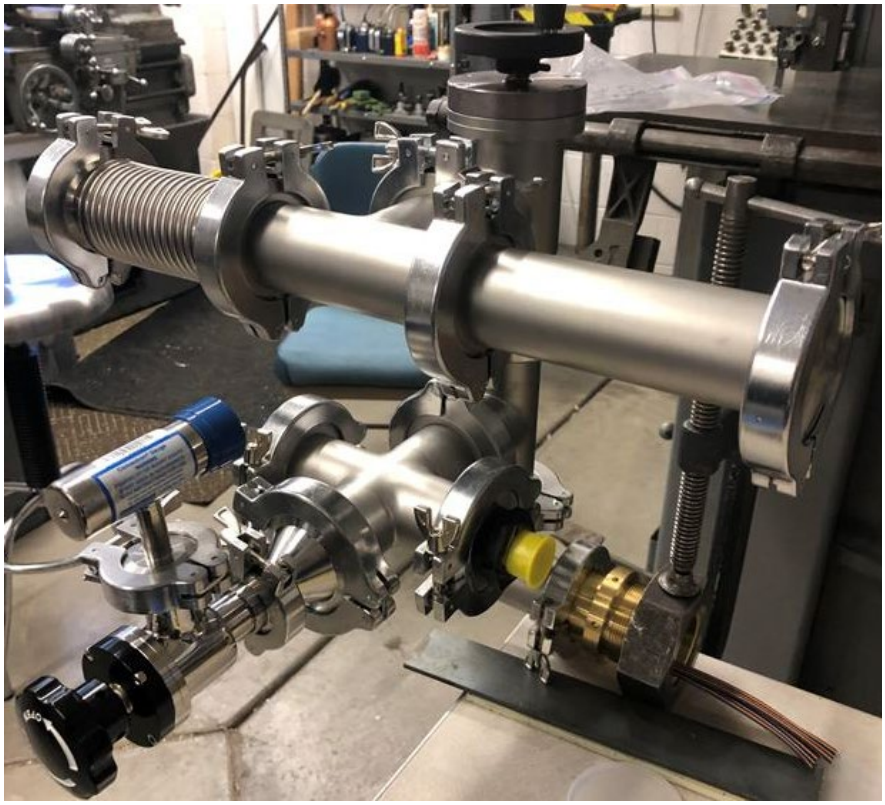

Figure 1: Side View of Prototype Showing Cable Coming Out of Pipe

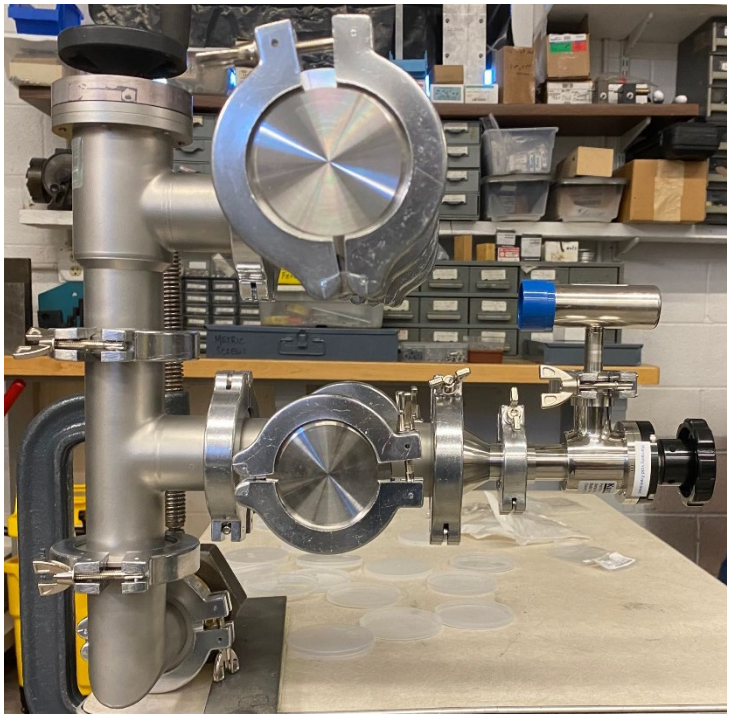

Figure 2: Front View of the Prototype Showing Static Stability

Despite the Capstone team working diligently with the 3D CAD model of the assembly several areas of concerns could only be answered with physical hardware. The design of the new vacuum manifold exploits the current electrical pass through of the FDL tanks as the interface location. By moving the new manifold to the side of the FDL tanks the team has improved over the in-use manifold. However, in order to relocate the interface point, the team is now responsible for integrating a new electrical pass-through system.

The new electrical pass through will utilize Gold plated pins housed in a PAVE vacuum rated connector housing and interface with 26 pin military shell connectors. Two PAVE connectors are needed to achieve the minimum 32 conductors. The geometry of the manifold mandates the internal ribbon cable to make three 90-degree bends in the manifold. The prototype clearly demonstrates the viability and relative ease of cable routing internal to the assembly. The ribbon exits at the base of the assembly featured in Figure 1. The interferometer has a history of using the ribbon and PAVE connectors for the specified voltage and amperage. The team will note conventional wisdom would not select this particular hardware for this application. Only final assembly of the manifold will demonstrate electrical functionality and reliability.

Figure 3: Top View of the Prototype Showing Cantilever

The prototype demonstrates the static stability of the proposed design. The geometry, seen in Figure 3, is such that vibrations induced by the vacuum pump will only tighten the team interface further increasing confidence of the design. Despite the inherent stability of the design, the team still plans to incorporate an external support structure supporting the cantilever. This support structure will hold the manifold in place during assembly and serve as additional support should improper operation of the isolation valve occur (i.e. crashing the crane into the manifold, using the manifold as a hand rail, etc.).