EIC Beam Pipe Test Stand
Functionality Test

Marc McMullen, George Jacobs, Brian Eng

Detector Support Group

January 4, 2023

Contents

- Objective

- EIC Beampipe Diagram

- Simulated Beam Line Assembly

- Pressure System Installation

- Assembled Beampipe

- Controls and Monitoring

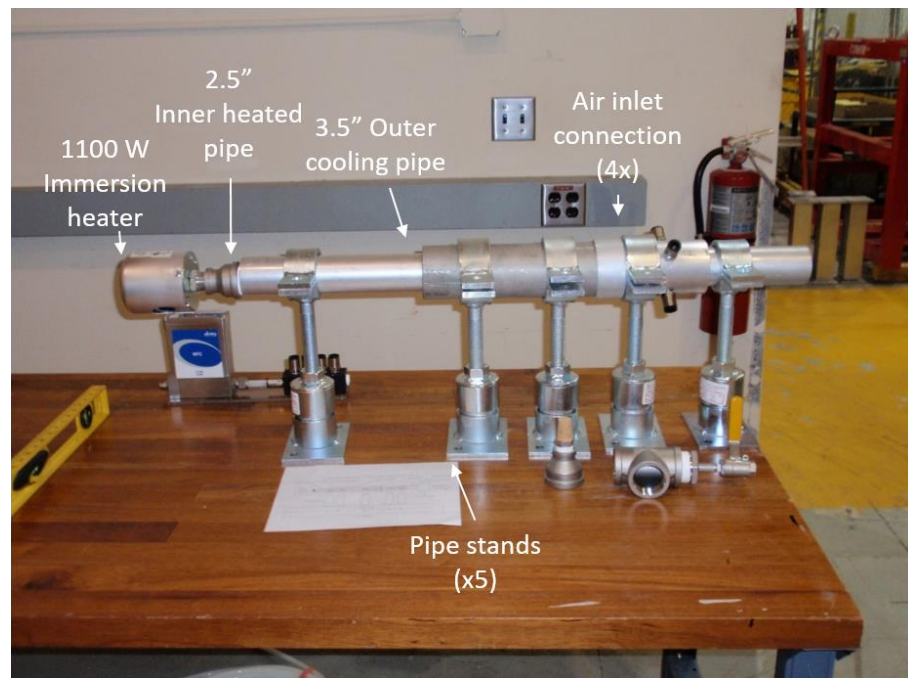- System Test (12/16/2022)

- Conclusion

Objective

- Assemble simulated beam line test stand

  - The simulated beam line uses off-the-shelf components that are of similar dimensions to the actual beam line

  - Test stand will be used to validate [Ansys simulation of beampipe bakeout](#) and the effects on the first silicon tracking layer

- Develop controls and monitoring system

- Test the system for functionality

EIC Beampipe Diagram

End View

Side View
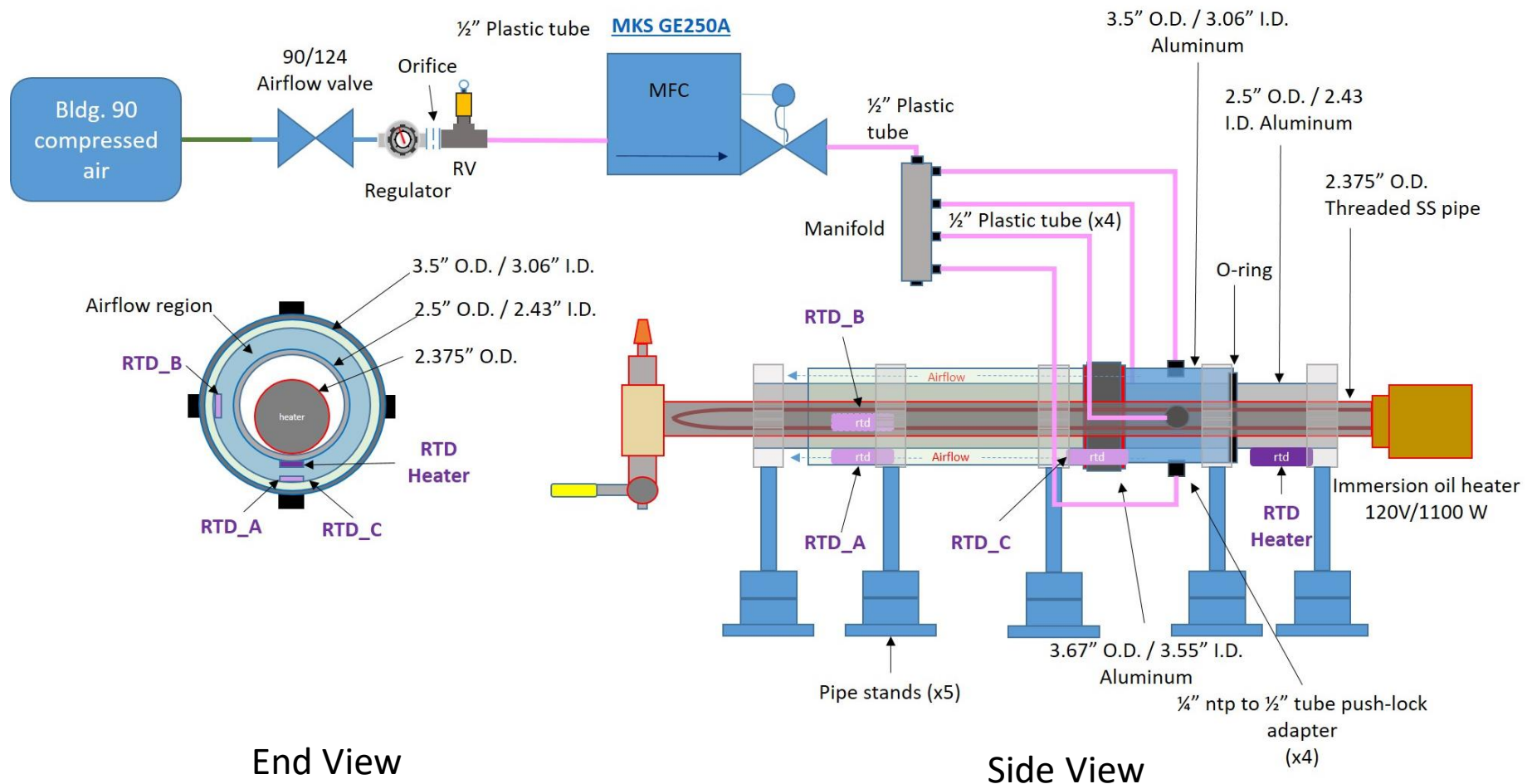
- RTD_A, B and C are inside the 3.5" airflow pipe
- RTD_Heater is on the outside of the 2.5" heated pipe
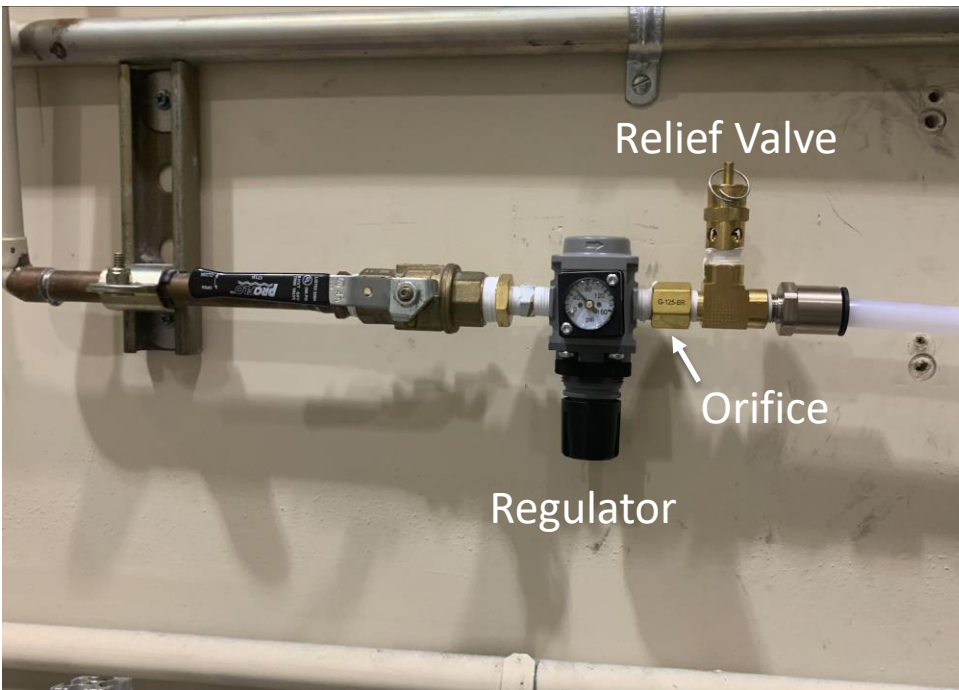- The O-ring blocks one end of the 3.5" pipe to direct the flow of air

Simulated Beam Line Assembly

2.5" Inner heated pipe
3.5" Outer cooling pipe
Air inlet connection (4x)
1100 W Immersion heater
Pipe stands (x5)

Beam line components were rough assembled to get the proper alignment of the pipe stands
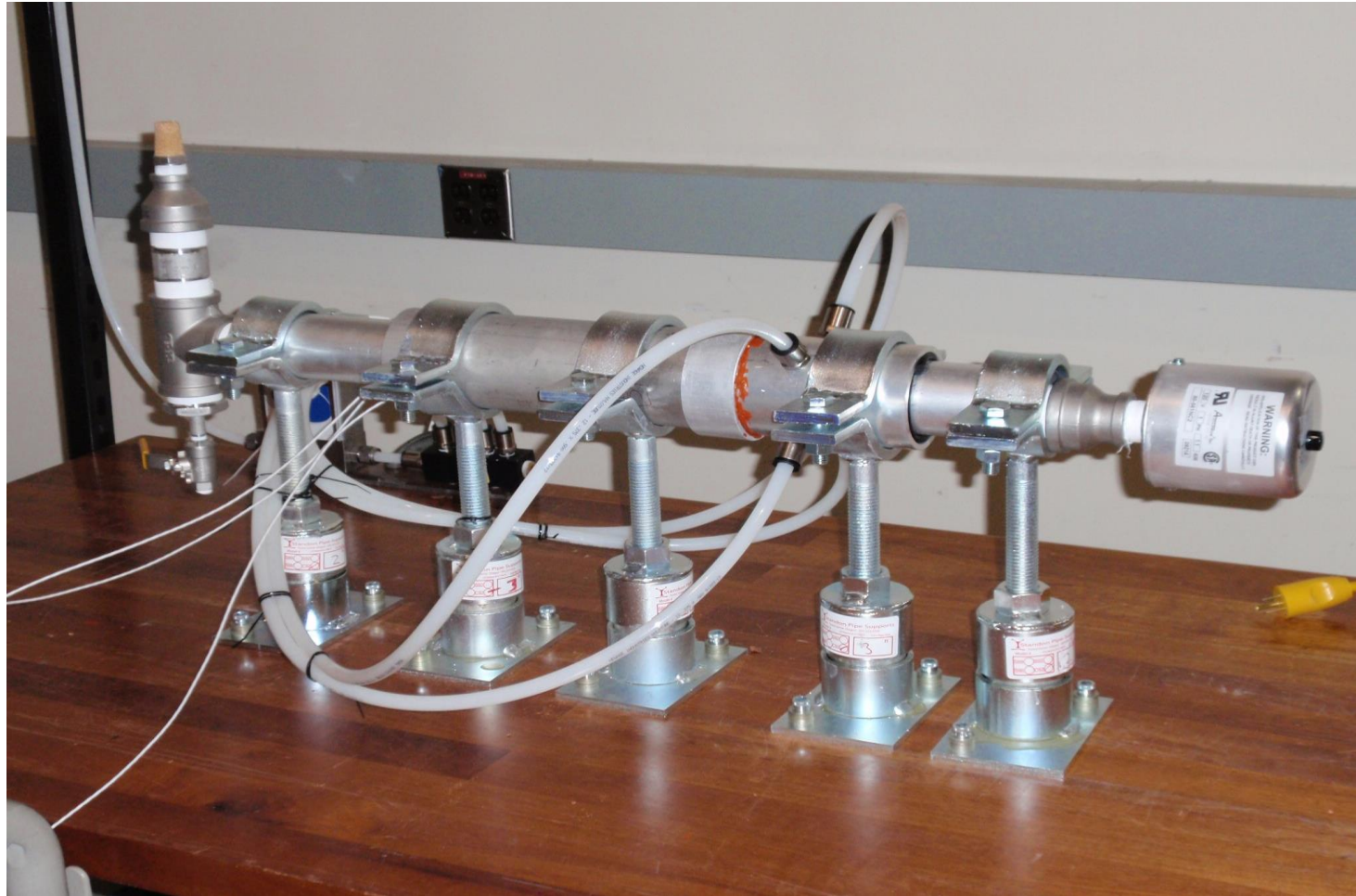
Pressure System Installation

- The pressure system components consist of a relief valve, an orifice, a regulator, and a 250 slm MFC
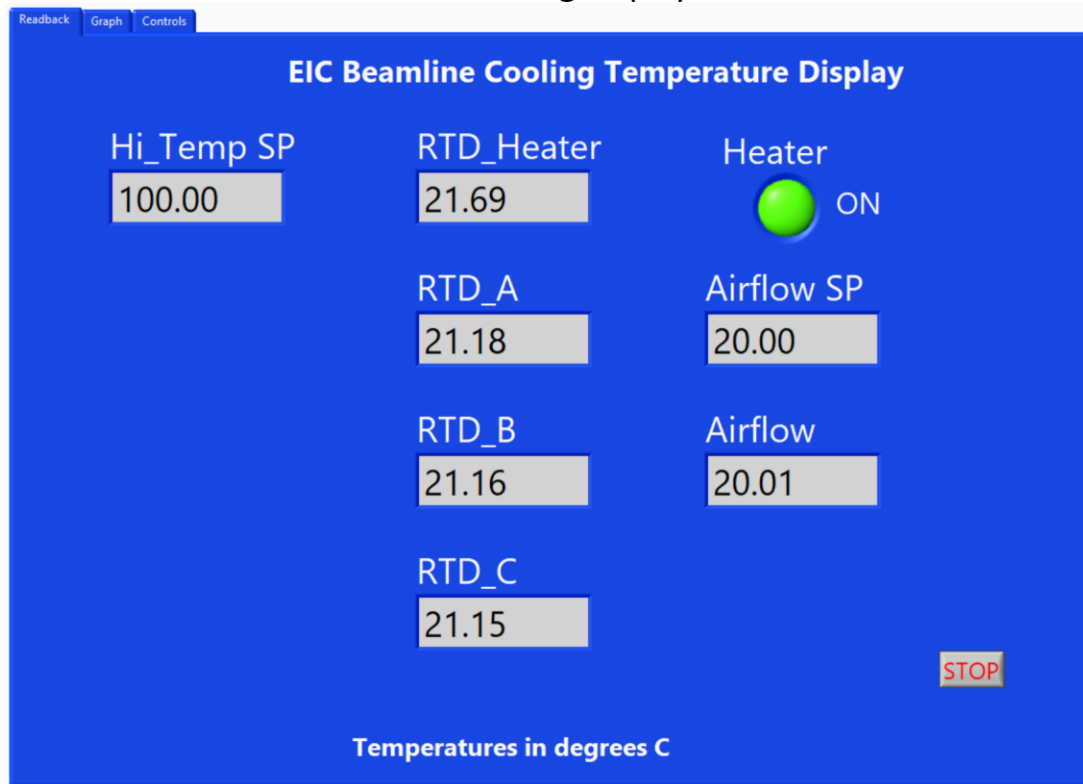- All pressure system components were tested by a JLab design authority prior to use
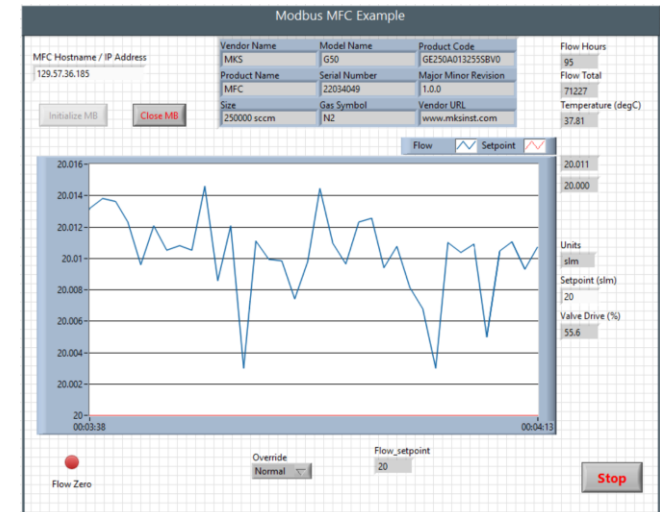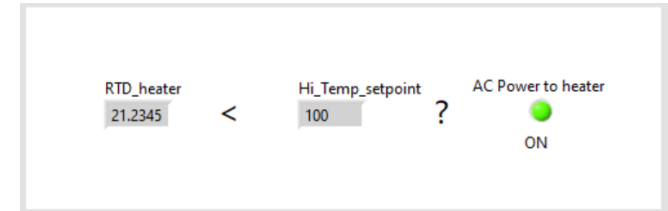
Assembled Beampipe

After all pipes were aligned, the immersion heater pipe was installed and filled with mineral oil

Controls and Monitoring

Monitoring display

Heater controls

MFC controls

- A LabVIEW program monitors the temperature, controls power to the heater and the MFC
- All values are written to global variables which are displayed independently of the program
- All the global variables are recorded via a data logging program, which runs in the main

System Test (12/16/2022)

EIC beampipe test stand 12/16/2022

Datalogged values
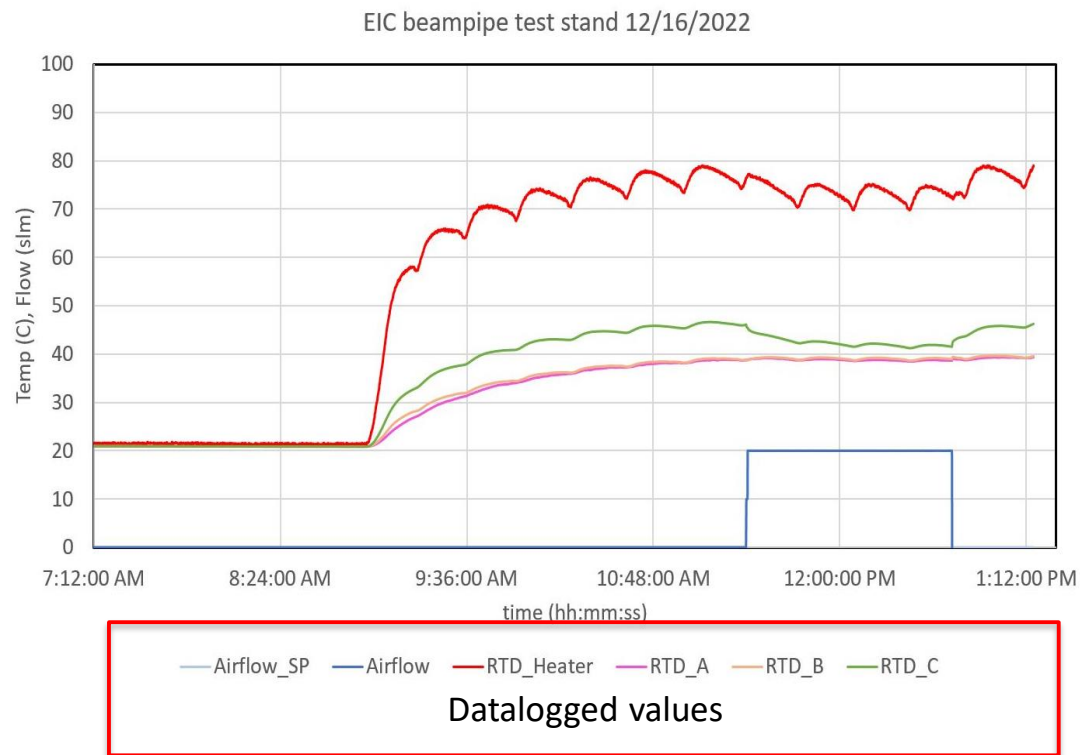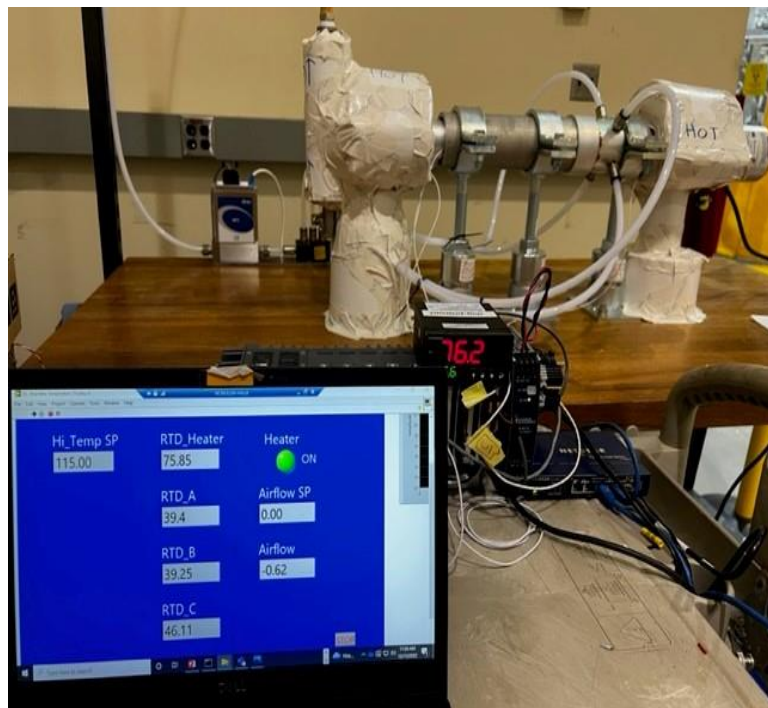
- The system was tested for 4.5 hours to ensure the system was functioning as expected
- The temperature at RTD_Heater increased from 21°C to 78°C in ~3 hours
- 20 slm of air was flowed for an hour, which decreased the temperature at RTD_Heater by 5°C

Conclusion

- All components and controls elements worked as designed

- All temperatures and airflow are logged for analysis

- Simulation of the EIC beamline heating will begin in January 2023

Thank You

Jefferson Lab