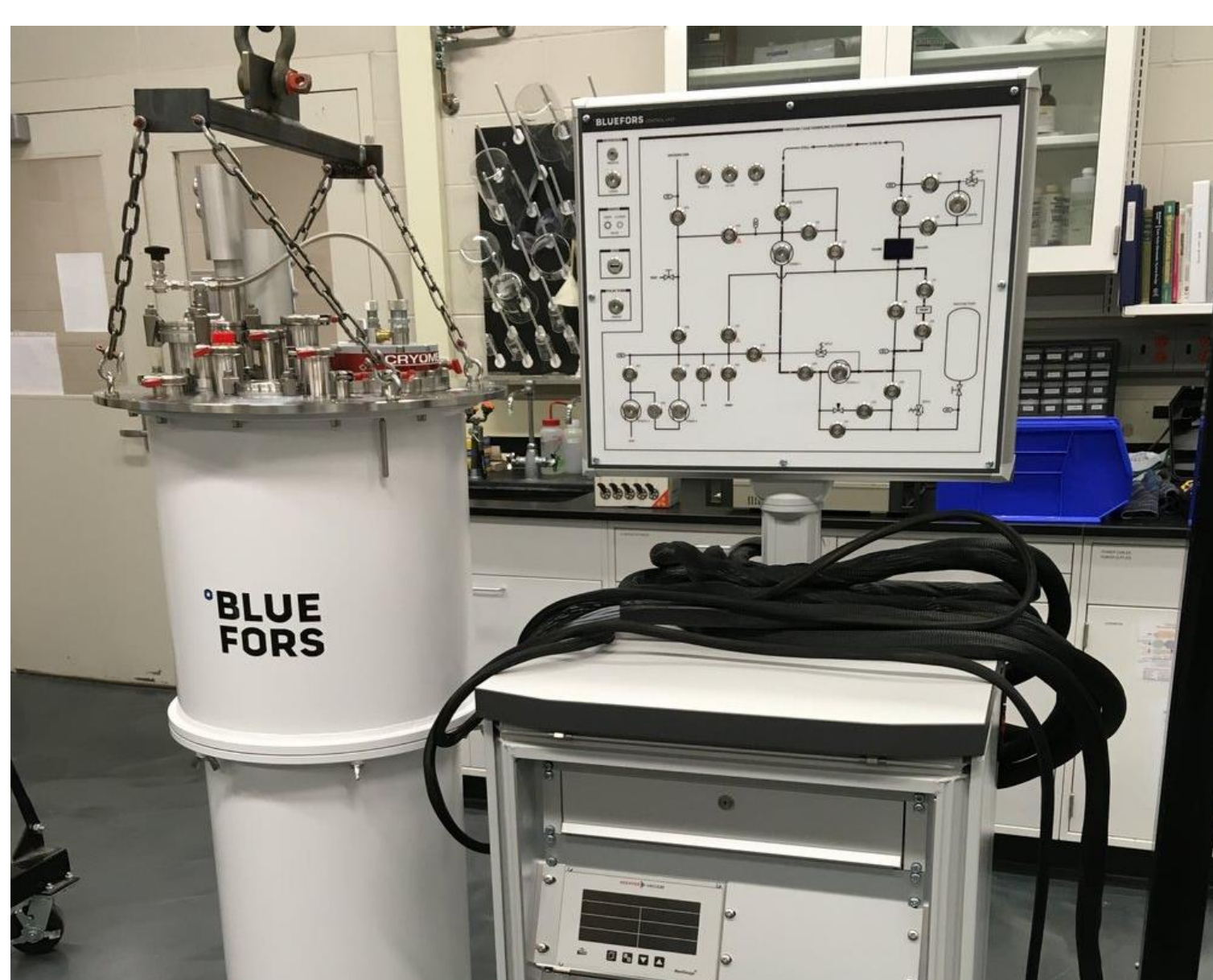


# Quantum Computing – Real-Time Data Processing from a Dilution Refrigerator

Fazal Quadri, Fermilab & SQMS Intern, Supervisor: Nicholas Bornman

## Overview of Project

- Stream data from the Bluefors Control unit to access physical quantities, such as temperature and helium flow, of the system at different points in the fridge
- Display these values, which are continuously updated, on a monitor with an aesthetic webpage
- Incorporate numerous connections of the dilution refrigerators into the WebSocket server



Bluefors Control Unit that monitors various temperatures, pressure, flow, etc., inside a dilution refrigerator.

(<https://www.hybridquantumlab.com/new-blog/2019/1/3/santa-brings-lhqs-new-ld400>)



The inside of dilution refrigerator that provides continuous cooling to temperatures as low as 2 mK

(<https://bluefors.com/products/ld-dilution-refrigerator/>)

## Bluefors Sensor Data



### Dilution Fridge #1

### WebSocket Data

Date Value: 12/31/1969, 6:00:00 PM

Temperature: °

Flow: L/min

Sample output of data exported from the Bluefors Control Unit

Note: Values are not displayed as the Bluefors Control Unit isn't on

- Prints the date, time, temperature and flow on the webpage
- Features a visually appealing and professionally designed user interface
- It is possible to add more refrigerators with similar layout

```

if status == "SUCCEEDED":
    value = parsed_data['data']['mapper.bf.flow']['content']['latest_value']['date']
    value = str(value)
    #print(value)
    return value
elif status == "RECEIVED":
    #print("")
    return 0

async def send_values(websocket, path):
    while True:
        if values:
            value = values.pop(0)
            await websocket.send(value)
            await asyncio.sleep(1) # Wait for 1 second before sending the next value

async def main():
    # Start the WebSocket server to receive data
    receive_task = asyncio.create_task(receive_data())

    # Start the WebSocket server to send values
    server_uri = "" # Update with your desired server address
    server_port = 8000 # Update with your desired server port
    async with websockets.serve(send_values, server_uri, server_port):
        print(f"WebSocket server started at ws://{server_uri}:{server_port}")
  
```

## Python Script

- Creates a WebSocket server to establish real-time communication between the Bluefors Control Unit and the client computer
- Server receives live data from the Bluefors Unit, such as temperature and pressure readings, and parses it
- Asynchronous handling allows the server to manage multiple connections and serve multiple refrigerators simultaneously.

```

<!DOCTYPE html>
<html>
<head>
<title>Bluefors Data</title>
<script>
var socket = new WebSocket("ws://131.225.94.167:8000"); // Update with your WebSocke

socket.onmessage = function(event) {
var value = event.data;
updateValueDisplay("Received value: " + value);
};

function updateValueDisplay(content) {
var valueDisplay = document.getElementById("value-display");
valueDisplay.textContent = content;
}

setInterval(function() {
updateValueDisplay("Waiting for new value...");
}, 3000); // Update the interval duration as desired (in milliseconds)
</script>
</head>
<body>
<h1>Bluefors Data</h1>
<p id="value-display">Waiting for new value...</p>
</body>
</html>
  
```

## HTML/JavaScript

- WebSocket connection listens for incoming data from the server, capturing measurements sent by the Bluefors Control Unit.
- Using JavaScript, the web page dynamically updates the displayed data as new measurements arrive, ensuring real-time visualization for the user.

## Acknowledgement & Reference

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Supervisor name on Poster

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Make captions bigger

Make sure to state the values are not available as the Bluefors  
Control Unit isn't on