

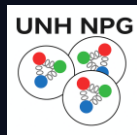
# Polarized Target Lab: Software & Automation Updates

ssRF GUI · Mattermost Autolog Bot · Helium Liquefier HMI · Python DAQ

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Muhammad Farooq  
Advisor: Prof. Karl Slifer  
Department of Physics and Astronomy · University of New Hampshire

$b_1/A_{zz}$  Collaboration Meeting · June 3-5, 2026



# Overview

What this talk covers

## 01 ssRF GUI

Combined signal generator GUI for safe, reproducible ssRF & AFP burns with hardware interlocks and automated BLAST sequencing.

## 02 Mattermost Autolog Bot

Automated lab monitoring bot: screenshot capture, LabVIEW CSV data posting, message queuing, and edit detection.

## 03 Helium Liquefier HMI

Flask-based SCADA dashboard for the QT P663 reliquefier: Modbus TCP, live P&ID, alarm decoding, and setpoint logging.

## 04 Python DAQ Migration

Transition from LabVIEW to a Python/EPICS-based DAQ with soft IOC, pyVISA device bridge, and pyEPICS GUI.

# ssRF GUI — Motivation

Why we need the GUI

## ⚠ Before the GUI: The Problem

- Required 2–3 operators for a manual multi-step protocol
- Hand-operated switches & separate instrument panels with tightly coordinated timing
- Any timing error risked exposing the NMR preamplifier to full RF power
- NMR preamp damage → weeks of downtime and expensive replacement
- No logging, no reproducibility, no automated safety checks

## ✓ The Solution: Combined Signal Generator GUI

- Single-button BLAST sequence orchestrates 5 instruments across 3 buses
- Hardware interlocks enforce NMR/ssRF mutual exclusion automatically
- Double-confirmed switch-state verification before every critical step
- Timestamped log file for every run — full reproducibility
- One operator can execute ssRF/AFP burns safely and reliably

# ssRF GUI — Three-Tab Interface

How we use the GUI

## Tab 1

### SMC100A Control

- Connect/auto-detect VISA resource string
- Set carrier frequency (33.0 MHz) with  $\pm 1\text{M}/\pm 10\text{M}$  quick steps
- Set RF output power (dBm) via field or slider (-120 to +30 dBm)
- Configure FM deviation (10 kHz) and source (EXT)
- Toggle FM/RF ON/OFF; switch port control for diagnostics
- SCPI console: send any raw command, see response

## Tab 2

### RF Level Sweep

- Configurable power ramp on SMC100A with Agilent 33220A trigger
- Parameters: carrier, start/stop dBm, step dB, dwell ms, TRI/SAW shape
- Click RUN → sweep executes with real-time power plot
- Click STOP → SMC returns to CW, Agilent output off
- Used for: calibration, pre-burn characterization, power sweeps

## Tab 3

### BLAST Sequence

- Fill in: burn type (ssRF/AFP), carrier freq, target power, dwell time
- Verify NMR/ssRF IPs, SMC VISA, Agilent VISA (all pre-filled)
- Pre-load CSV waveform into DSO WaveGen from USB drive
- Click BLAST → 12-step automated sequence executes
- Sequence Status panel: green = done, orange = running, red = error
- Click STOP/ABORT at any time → emergency cleanup runs automatically

# ssRF GUI — RF Level Sweep Tab

Real-time RF power ramp preview with TRI sweep shape and Agilent trigger timing



# ssRF GUI — BLAST Sequence Tab

12-step automated burn sequence with interlocked switch control and timestamped log output

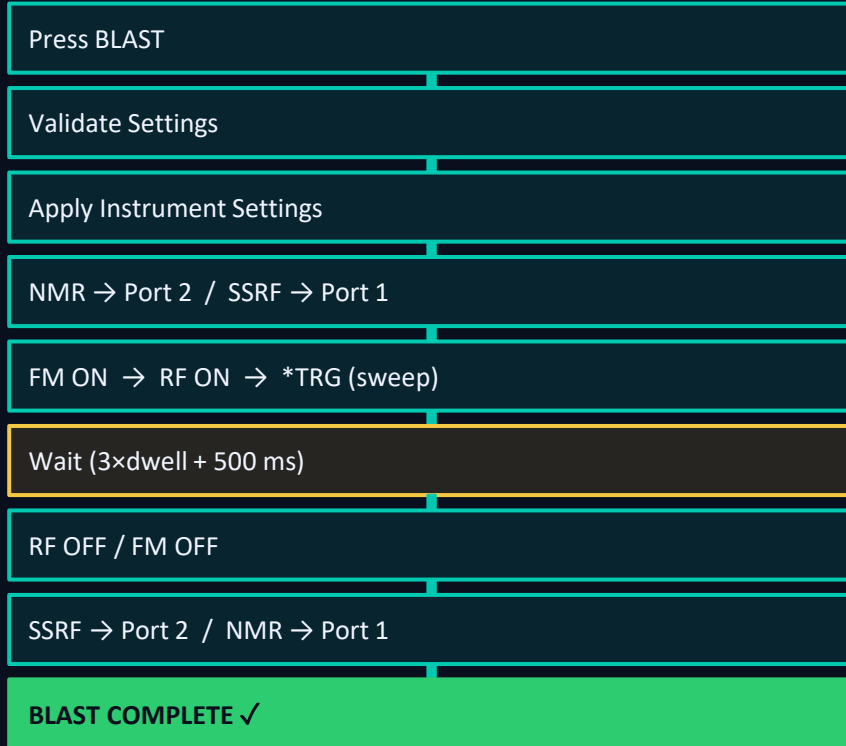
The image displays the ssRF GUI interface for the BLAST Sequence tab. The interface is divided into several sections:

- Environment Configuration:** Includes fields for SMC320A CFGA (value: 1000773078), Adjust (VGA) (value: 0.01), DCO (VGA) (value: 100.000), WAVE (VGA) (value: 100.000), and SDRF (VGA) (value: 100.000).
- Burn Parameters:** Includes Burn type (set to 'waf'), Carrier freq (MHz) (set to 23.000000), Target power (dBm) (set to -40.0), Start power (dBm) (set to -100.0), Stop time (min) (set to 100.0), and Target ADC (set to 'Positive PICO').
- Adjustable 32.768KHz Burst Pkts:** Includes Pulse freq (MHz) (set to 10.000000), High level (dB) (set to 1.000000), Low level (dB) (set to -30.000000), and Burst count (set to 1).
- SDR3 Minimize / FM Synthesizer:** Includes FM deviation (MHz) (set to 10.000000), AMB Bw (MHz) (set to 1.000000), and AMB Freq (MHz) (set to 1000.000000).
- Sequence Log:** A list of 12 steps, each with a status (e.g., 'OK') and a timestamp. The steps include: 1. Verify hardware settings, 2. Apply hardware settings, 3. SDRF switch - Port 1 (ON), 4. SDRF switch - Port 2 (ON), 5. SDRF switch - Port 3 (ON), 6. SDRF switch - Port 4 (ON), 7. SDRF switch - Port 5 (ON), 8. SDRF switch - Port 6 (ON), 9. SDRF switch - Port 7 (ON), 10. SDRF switch - Port 8 (ON), 11. SDRF switch - Port 9 (ON), and 12. BLAST complete.

Below the GUI, a Keysight InfiniVision Digital Storage Oscilloscope (DSO) is shown. The screen displays a signal waveform with a green background. The scope settings are: 200 MHz, 5 GS/s, 625mV, 2.000ms, 3.600ms, Stop, F 2. The waveform shows a series of pulses with a high-frequency carrier. The cursor shows a time difference of 10.020000000 and a voltage difference of 19.760000000.

# ssRF GUI — BLAST Algorithm

Decision points & error paths



## Safety Checks (Double-Verified)

- Step 3: double-read NMR confirms Port 2 → if No: ABORT
- Step 4 pre-check: NMR still on Port 2? → if No: ABORT
- Step 10: double-read SSRF confirms Port 2 → if No: ABORT
- Step 11 pre-check: SSRF still on Port 2? → if No: ABORT

## Emergency Cleanup (on ABORT or Error)

1. SMC100A: stop level sweep + RF OFF
2. SMC100A: FM:STAT OFF
3. Agilent: OUPF OFF
4. SSRF switch → Port 2 (50Ω isolated)
5. NMR switch → Port 1 (measurement path restored)

**Note:** Thanks to Prof. Long for helping out during developing, implementing, and testing this GUI.

Poll interval: 10 ms | Timeout: 5.0 s | Confirm mask: raw & 0x03 (Switch A & B bits)

# Mattermost Autolog Bot — System Architecture

One merged application



Shared Infrastructure: Mattermost REST helpers · Structured logging · Scheduler · Lock file · Stop-file control

# Mattermost Autolog Bot — Launcher Application

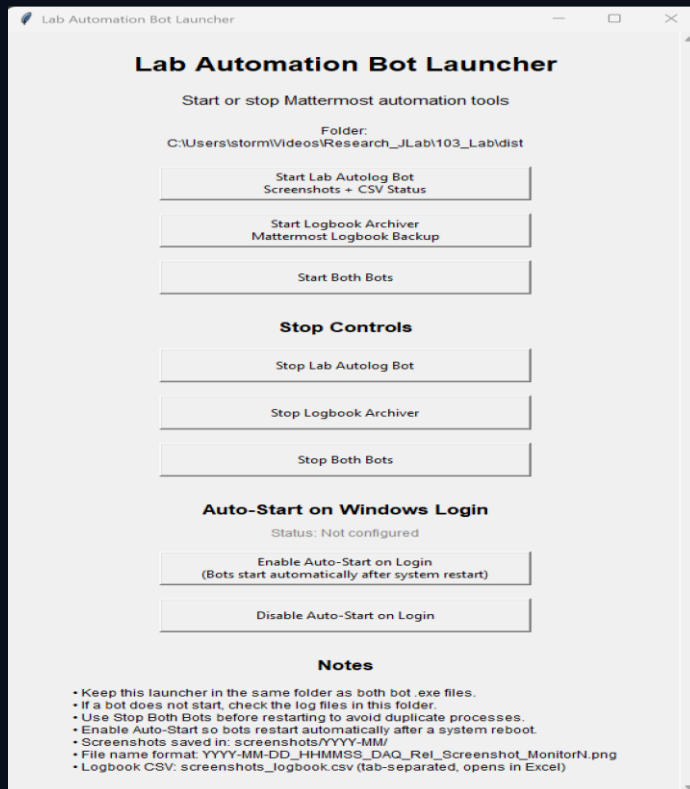
Start/stop both bots with auto-start on Windows login

## Start Controls

Lab Autolog Bot (Screenshots + CSV)  
Logbook Archiver (Backup)  
Start Both Bots

## Stop & Auto-Start

Individual or combined stop controls  
Auto-Start on Windows Login  
Bots restart after system reboot



## File Conventions

Screenshots saved in:  
screenshots/YYYY-MM/

Filename:  
YYYY-MM-DD\_HHMMSS  
\_DAQ\_Rel\_Screenshot\_MonitorN.png

Logbook CSV:  
screenshots\_logbook.csv

# Autolog Bot — Screenshot Capture & Upload

Every 15 minutes at exact clock intervals (:00, :15, :30, :45)



## Filename & Folder Conventions

- Monitor 1: YYYY-MM-DD\_HHMMSS\_DAO\_Rel\_Screenshot.png
- Monitor 2: YYYY-MM-DD\_HHMMSS\_DAO\_Screenshot.png
- Saved under .../Reliq\_Screens/YYYY-MM/ (Monitor 1)
- Saved under .../DAQ\_Screens/YYYY-MM/ (Monitor 2)
- SAVE\_LOCAL\_COPY = True → PNG kept after upload
- Monthly sub-folders are auto-created

## Timing: Exact Interval Logic

- $\text{math.ceil}(\text{now} / 900) \times 900 \rightarrow$  next exact 15-min mark
- Sleeps in 5-second steps → checks stop file
- First run: immediately (or wait for interval — config)
- Interval: 900 s (INTERVAL\_SECONDS, configurable)
- Thread: ScreenshotWorker (daemon thread)

# Autolog Bot — LabVIEW CSV Data Logging

46 parameters posted to Mattermost from each data record



## Columns Logged (46 Parameters)

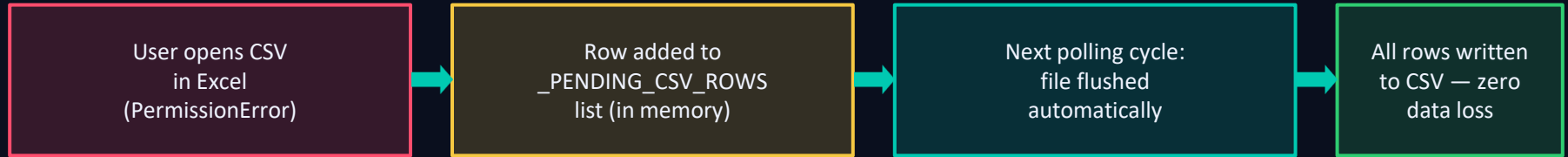
- mmWave Freq, Span, Power, RF Status
- Magnetic field: Central, Span, Fringe, PS/Magnet Current
- Temperatures: M1–M5, F1–F11, T1, T3, Vapor Pressure
- Pressures: Ionivac, Manometer Hi/Lo, Roots
- NMR: Central Freq, Freq Span
- Flows: Separator, Roots
- DAQ: VME Board Temp, Diode/Phase Tune, IF Attenuation

## File Handling Details

- Source: Box Sync → autolog/data\_record\_YYYY-MM-DD.csv
- Target: local folder / YYYY-MM / same filename
- Auto-detect delimiter (tab vs. comma)
- Pad short rows to uniform column width
- Latin-1 → UTF-8 encoding conversion
- Thread: CSVWorker (daemon thread)
- Error posted back to Mattermost if file is missing

# Autolog Bot — CSV File Locking & Message Queuing

Robust handling when CSV is open in Excel



## Implementation

```
# Queue a row if file is locked
_PENDING_CSV_ROWS.append([timestamp, author,
                          message, attachments])
_flush_pending_csv_rows() # try immediately

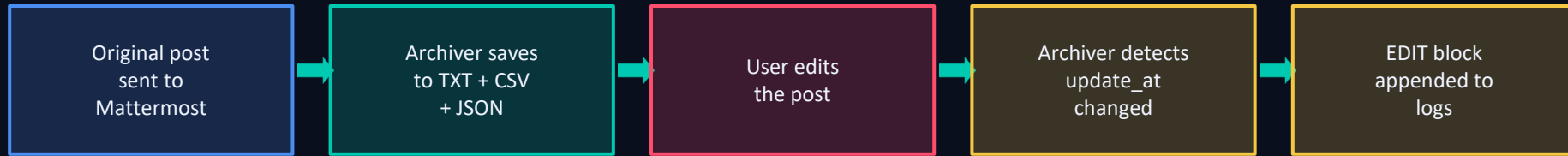
# In flush:
except PermissionError:
    log('File open – queued for next cycle')
```

## Why This Matters in a Lab

- Scientists often leave CSV open in Excel
- No data loss — every message is eventually written
- Queue holds unlimited rows in RAM
- `_flush_pending_csv_rows()` called every 30 s
- Log shows how many rows are queued
- Zero configuration needed from user

# Autolog Bot — Handling Edited Mattermost Messages

Updated versions are detected and appended to all archives



## Detection Logic (state.json)

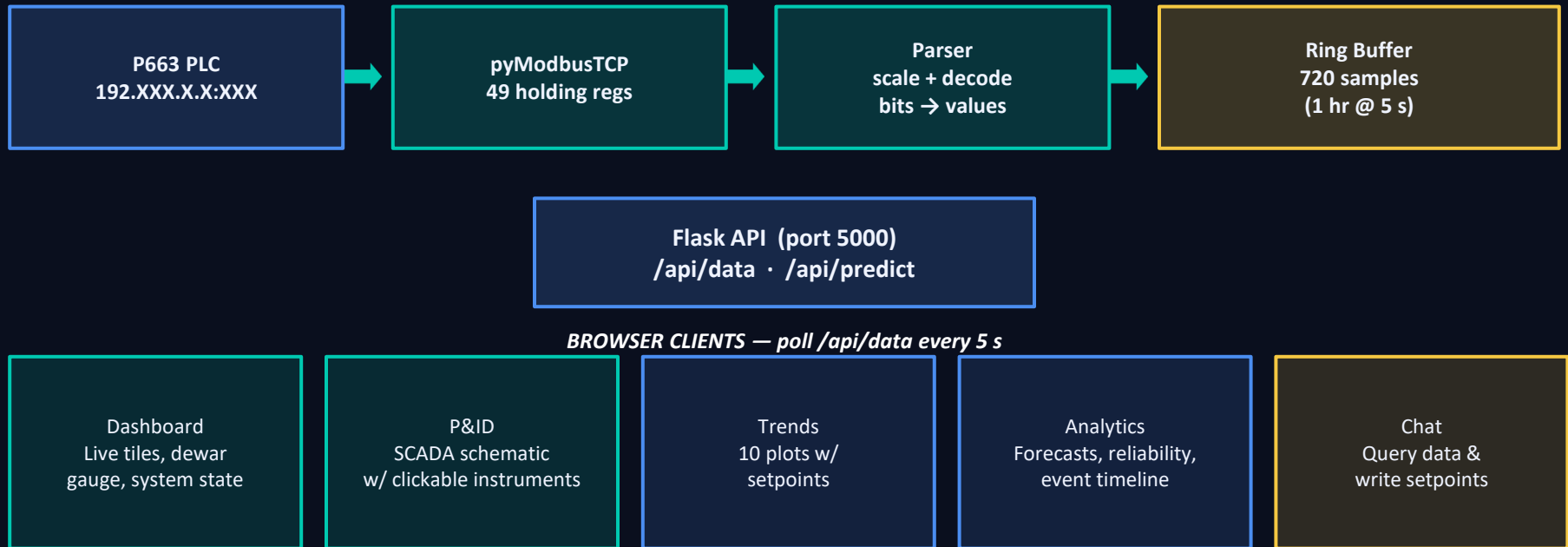
- Every post carries create\_at and update\_at timestamps
- state.json stores post\_update\_times{post\_id: update\_at}
- Each poll cycle: compare stored vs. current update\_at
- If update\_at > stored value → post was edited
- state.json trimmed to last 20,000 post IDs

## Log Output Format

```
=====  
[EDIT] POST ID   : abc123xyz  
USER             : Dr. Smith (@dsmith)  
EDITED AT        : 2026-05-14 10:33:21  
UPDATED MESSAGE  :  
Corrected: target temperature was 1.0 K  
=====  
# CSV row prefix:  
[EDITED at 2026-05-14 10:33:21]
```

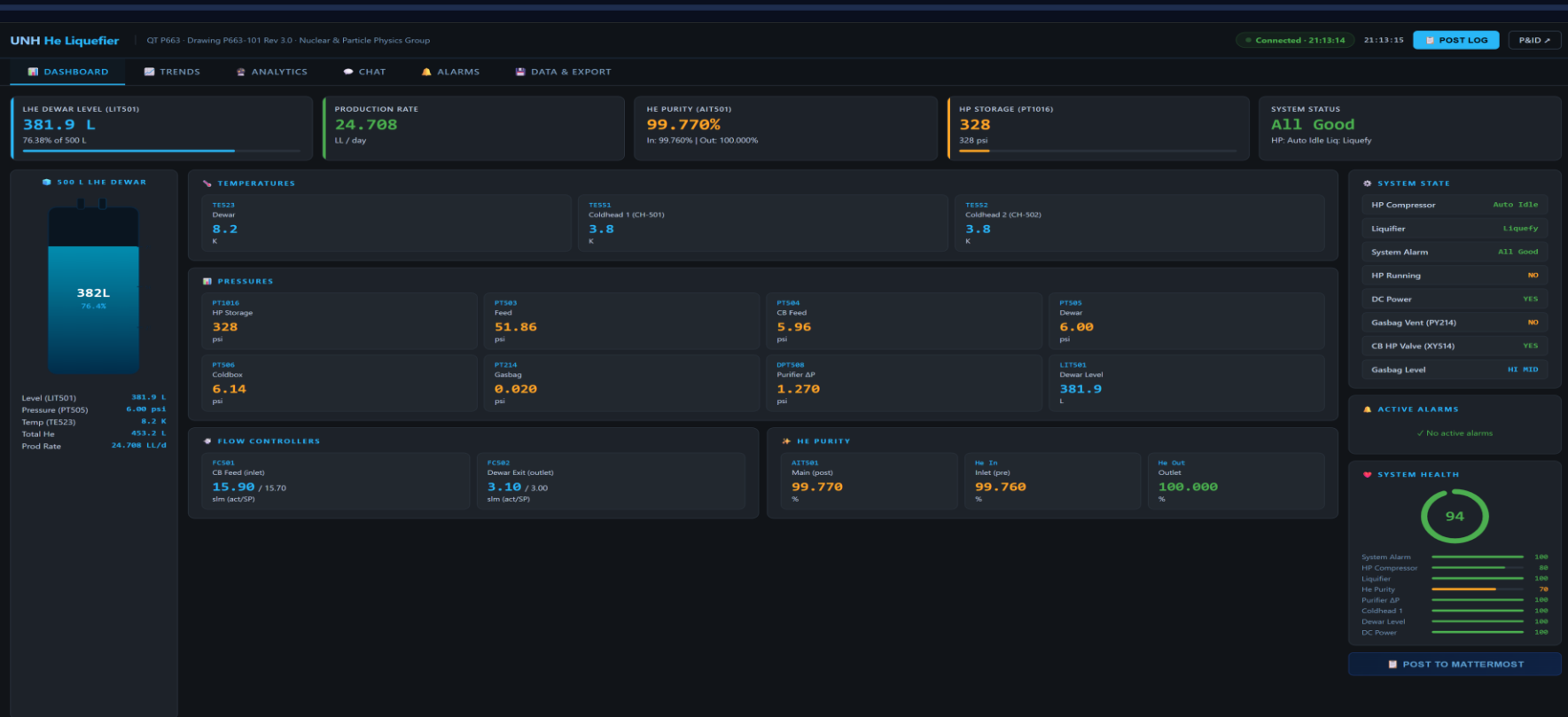
# Helium Liquefier HMI — Software Architecture

QT P663 Reliquefier · UNH Polarized Target Lab



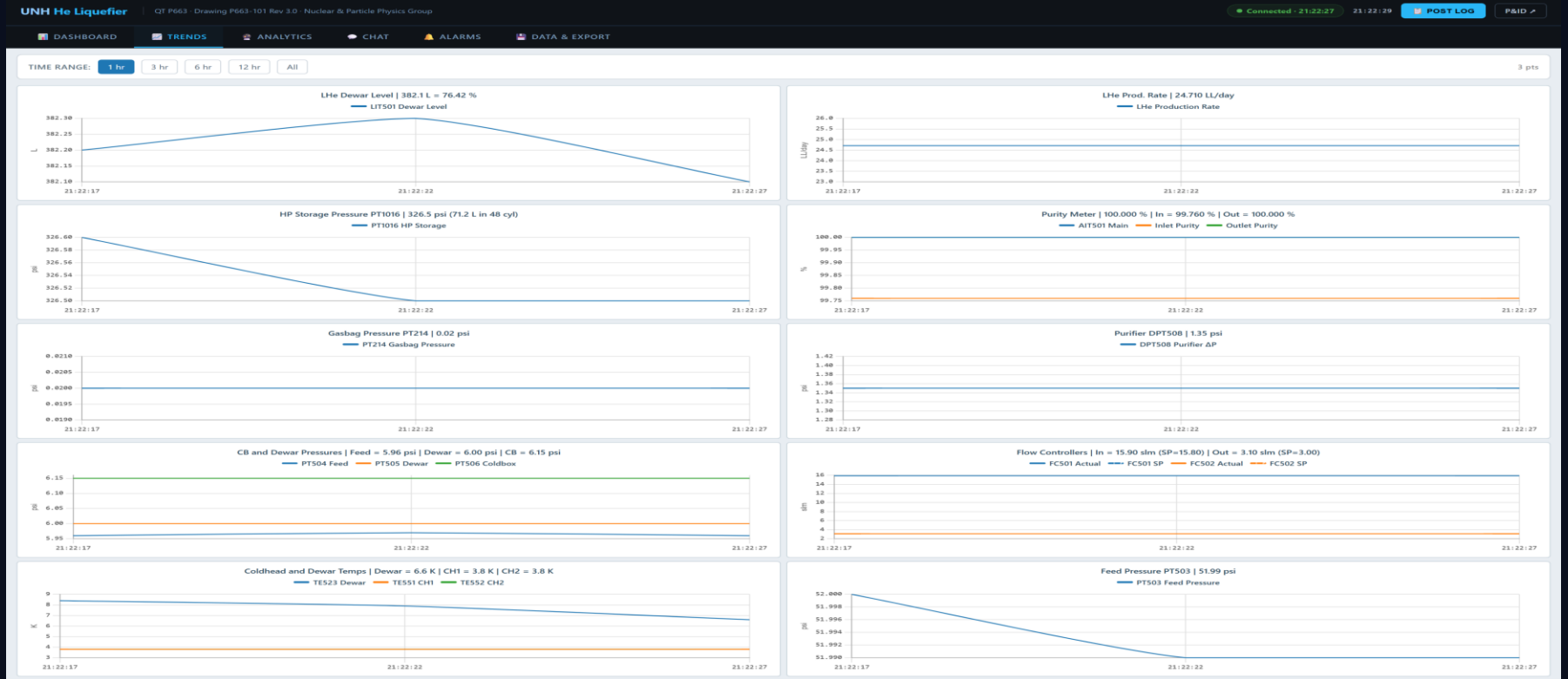
# Helium Liquefier HMI — Dashboard

Live tiles: dewar level, production rate, He purity, HP storage pressure, system state, temperatures, pressures, flow controllers



# Helium Liquefier HMI — Trends

10 matplotlib-style trend plots with setpoints: dewar level, production rate, purity, HP storage, pressures, flow controllers, temperatures



# Helium Liquefier HMI — Chat Interface

Natural-language queries and setpoint writes with live snapshot sidebar

The screenshot displays the Helium Liquefier HMI Chat Interface. At the top, the system is identified as 'UNH He Liquefier' with the drawing ID 'QT P663 - Drawing P663-101 Rev 3.0 - Nuclear & Particle Physics Group'. The status bar shows 'Connected - 21:22:59' and the time '21:23:04'. Navigation tabs include 'DASHBOARD', 'TRENDS', 'ANALYTICS', 'CHAT', 'ALARMS', and 'DATA & EXPORT'. The 'CHAT' tab is active, showing an 'HMI ASSISTANT' with a greeting and instructions: 'Hello! I have live data from the QT P663 system. Try: all temperature pressure flow purity status. Write: set FCS01\_setpoint 15.2. Discovery: fullscan read 25-31'. A 'QUICK' sidebar on the right lists various data points: Overview, Temperatures, Pressures, Flows, Purity, Status, Valves, Setpoints, Diagnostic, Writability Scan, Write Audit, and All Commands. A 'LIVE SNAPSHOT' sidebar on the right shows real-time data for various sensors and valves.

**HMI ASSISTANT**

Hello! I have live data from the QT P663 system.  
Try: all temperature pressure flow purity status  
Write: set FCS01\_setpoint 15.2  
Discovery: fullscan read 25-31

**QUICK**

- Overview
- Temperatures
- Pressures
- Flows
- Purity
- Status
- Valves
- Setpoints
- Diagnostic
- Writability Scan
- Write Audit
- All Commands

**LIVE SNAPSHOT**

LIT501: 382.3 L (76.46%)  
Rate: 24.788 L/day  
AIT501: 100.000 %  
PT1016: 326 psi  
PT503: 51.97 psi  
PT504: 5.97 psi  
PT505: 6.00 psi  
PT506: 6.15 psi  
FCS01: 15.90/15.00 slm  
FCS02: 3.10/3.00 slm  
TE551: 3.8 K  
HP: Auto Idle

# Helium Liquefier HMI — Analytics

Forecasts, reliability scores, and event timeline

UNH He Liquefier | QT P663 - Drawing P663-101 Rev 3.0 - Nuclear & Particle Physics Group | Connected - 21:23:41 | 21:23:44 | POST LOG | P&ID

DASHBOARD | TRENDS | ANALYTICS | CHAT | **ALARMS** | DATA & EXPORT

### HELIUM RECOVERY — ALARMS & TRIPS

#### HP COMPRESSOR ALARMS

|                             |             |
|-----------------------------|-------------|
| Outlet Overpressure         | PT1016      |
| Inlet Pressure Fault        | -           |
| HP Storage Pressure Fault   | 2450 ps1 SP |
| High Inlet Pressure         | 0.05 ps1 SP |
| High Gasbag Level (LSHH201) | -           |
| Gasbag Vent Open (PY214)    | -           |
| Battery / DC Power Fail     | -           |

#### HP COMPRESSOR TRIPS

|                            |             |
|----------------------------|-------------|
| System E-Stop (ESD)        | -           |
| No Compressor Run Feedback | -           |
| Low Gasbag Pressure        | -0.1 ps1 SP |
| Low Gasbag Pressure 2      | -           |

### LIQUEFIER — ALARMS & TRIPS

#### LIQUEFIER ALARMS

|                                 |          |
|---------------------------------|----------|
| Low Dewar Pressure              | 1.3 ps1  |
| High Dewar Level (Idle)         | 85.0 %   |
| Low Feed Pressure (Idle)        | 30.0 ps1 |
| HP Comp in Local/Off Mode       | -        |
| Coldhead 1 Low Temp             | 3.0 K    |
| Coldhead 2 Low Temp             | 3.0 K    |
| Coldbox Pressure Differential   | 2.00 ps1 |
| Low Liquefaction Rate           | 9.0 slm  |
| Flow Differential               | 2.0 slm  |
| High Purifier ΔP (needs regen.) | 2.0 ps1  |

#### PURITY / LIQUEFIER TRIPS

|                               |          |
|-------------------------------|----------|
| Low Purity Inlet Purifier     | 98.000 % |
| Low Purity Outlet Purifier    | 99.997 % |
| Low Purity Outlet (Idle)      | 99.995 % |
| Dewar Low-Low Pressure (Trip) | 0.9 ps1  |
| System Trip (ESD)             | -        |

### ALARM HISTORY

No events CLEAR

### STATE TRANSITIONS

Monitoring...

### ALARM STATISTICS

Events: 0 Cleared: 0 Active: 0

### PURITY METER ALARMS

|                                       |           |
|---------------------------------------|-----------|
| Faulty Purity Meter                   | -         |
| Faulty Coldbox Pressure               | PT506     |
| Faulty Feed Pressure from Storage     | PT503     |
| Faulty Purifier Differential Pressure | DPT508    |
| Faulty CB Feed Pressure               | PT504     |
| Faulty Dewar Pressure                 | PT505     |
| Faulty Inlet / Outlet Flow            | FC501/502 |
| Faulty LHe Dewar Level                | LIT501    |
| Faulty Dewar Temperature              | TE523     |
| Faulty Coldhead 1 Box Temp            | TE551     |
| Faulty Coldhead 2 Box Temp            | TE552     |
| Faulty Recovery Inlet Pressure        | PT234     |
| Faulty High Pressure Storage          | PT1016    |
| Faulty Battery / DC Power Fail        | -         |

UNH Nuclear & Particle Physics Group | Tensor Collaboration Meeting 2026 | June 3, 2026

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# Helium Liquefier HMI — Alarms Panel

Active fault display with bit-decoded alarm names

UNH He Liquefier | Q1 P663 - Drawing P663-101 Rev 3.0 - Nuclear & Particle Physics Group | Connected - 21:24:18 | 21:24:19 | POST LOG | P&ID

DASHBOARD | TRENDS | ANALYTICS | CHAT | ALARMS | DATA & EXPORT

### SESSION STATISTICS — ALL VARIABLES

23 PTS · 20 VARS

| TAG          | NAME                       | CURRENT | MIN     | MAX     | AVG     | UNIT   |
|--------------|----------------------------|---------|---------|---------|---------|--------|
| LITS01       | LHe Dewar Level            | 382.100 | 382.000 | 382.300 | 382.154 | L      |
| LHeProdRate  | Production Rate            | 24.901  | 24.708  | 24.901  | 24.780  | LL/day |
| TotalHelium  | Total He in System         | 453.172 | 453.072 | 453.394 | 453.233 | L      |
| TES23        | Dewar Temp                 | 9.500   | 3.800   | 9.500   | 7.740   | K      |
| TES51        | Coldhead 1 Temp            | 3.800   | 3.800   | 3.800   | 3.800   | K      |
| TES52        | Coldhead 2 Temp            | 3.800   | 3.800   | 3.800   | 3.800   | K      |
| AIT501       | Purity Analyzer (AIT501)   | 100.000 | 100.000 | 100.000 | 100.000 | %      |
| InletPurity  | He Inlet Purity            | 99.760  | 99.760  | 99.760  | 99.760  | %      |
| OutletPurity | He Outlet Purity           | 100.000 | 100.000 | 100.000 | 100.000 | %      |
| PT214        | Gasbag Pressure            | 0.020   | 0.020   | 0.020   | 0.020   | psi    |
| PT503        | Feed Pressure              | 51.950  | 51.950  | 52.000  | 51.969  | psi    |
| PT504        | CB Feed Pressure           | 5.960   | 5.960   | 5.970   | 5.962   | psi    |
| PT505        | Dewar Pressure             | 6.000   | 6.000   | 6.000   | 6.000   | psi    |
| PT506        | Coldbox Pressure           | 6.150   | 6.140   | 6.160   | 6.150   | psi    |
| PT1016       | HP Storage Pressure        | 326.400 | 326.300 | 326.600 | 326.431 | psi    |
| DPT508       | Purifier Diff Pressure     | 1.370   | 1.350   | 1.370   | 1.357   | psi    |
| FC501        | CB Feed Flow - Actual      | 16.000  | 15.900  | 16.000  | 15.937  | slm    |
| FC501Out     | CB Feed Flow - Setpoint    | 15.900  | 15.900  | 15.900  | 15.800  | slm    |
| FC502        | Dewar Exit Flow - Actual   | 3.100   | 3.100   | 3.100   | 3.100   | slm    |
| FC502Out     | Dewar Exit Flow - Setpoint | 3.000   | 3.000   | 3.000   | 3.000   | slm    |

### DATA EXPORT

DOWNLOAD CSV — FULL SESSION

DOWNLOAD CSV — LAST 100 POINTS

DOWNLOAD HMI\_DATA.LOG.CSV (DISK)

23 data points · 20 sensors logged

### WRITE SETPOINTS

FC501 CB Feed Flow  
Reg ID: 110 0-100 slm

FC502 Dewar Exit Flow  
Reg ID: 110 0-100 slm

Raw Register Write  
FC06 — advanced

### WRITE LOG

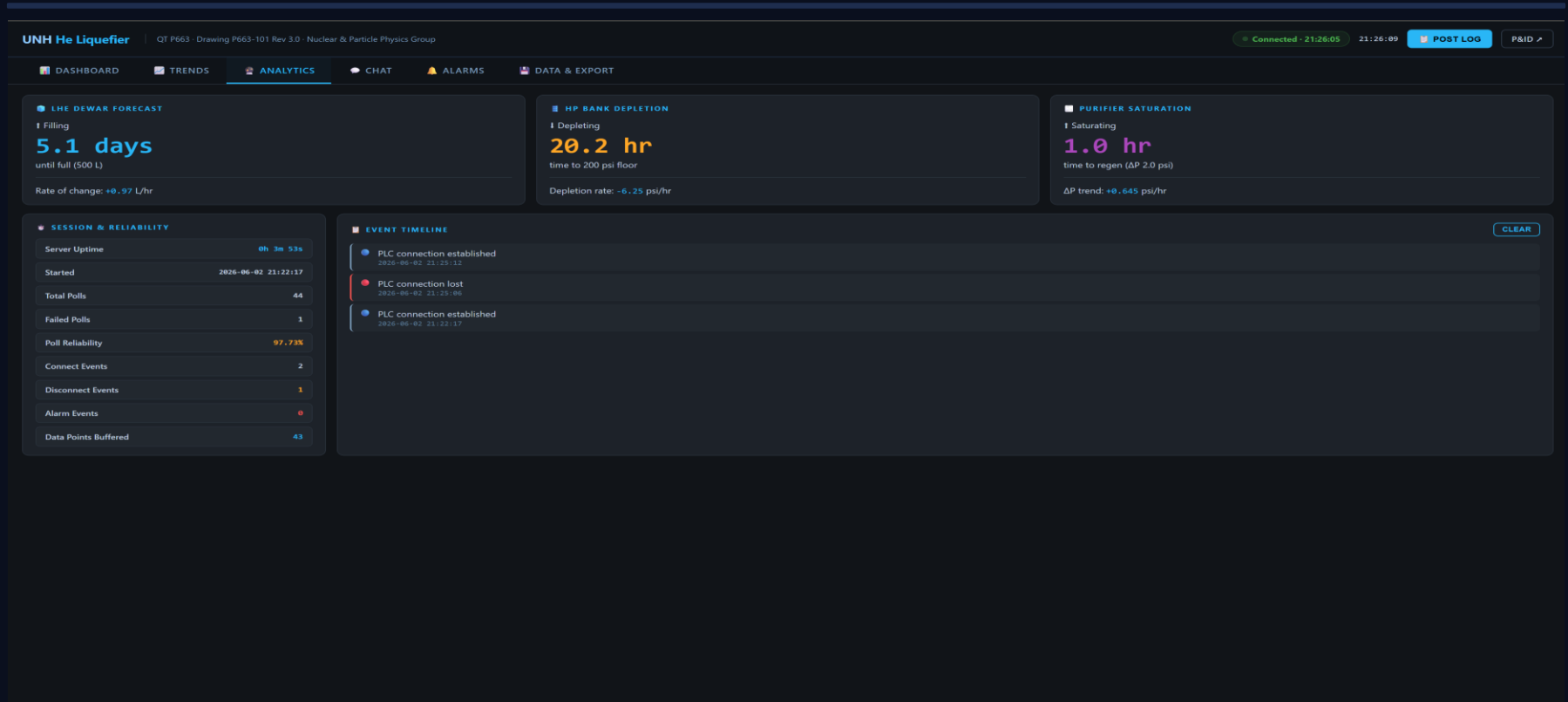
No writes yet.

### REGISTER SCANNER

Click SCAN to read registers.

# Helium Liquefier HMI — Data & Export

Data export and historical log access



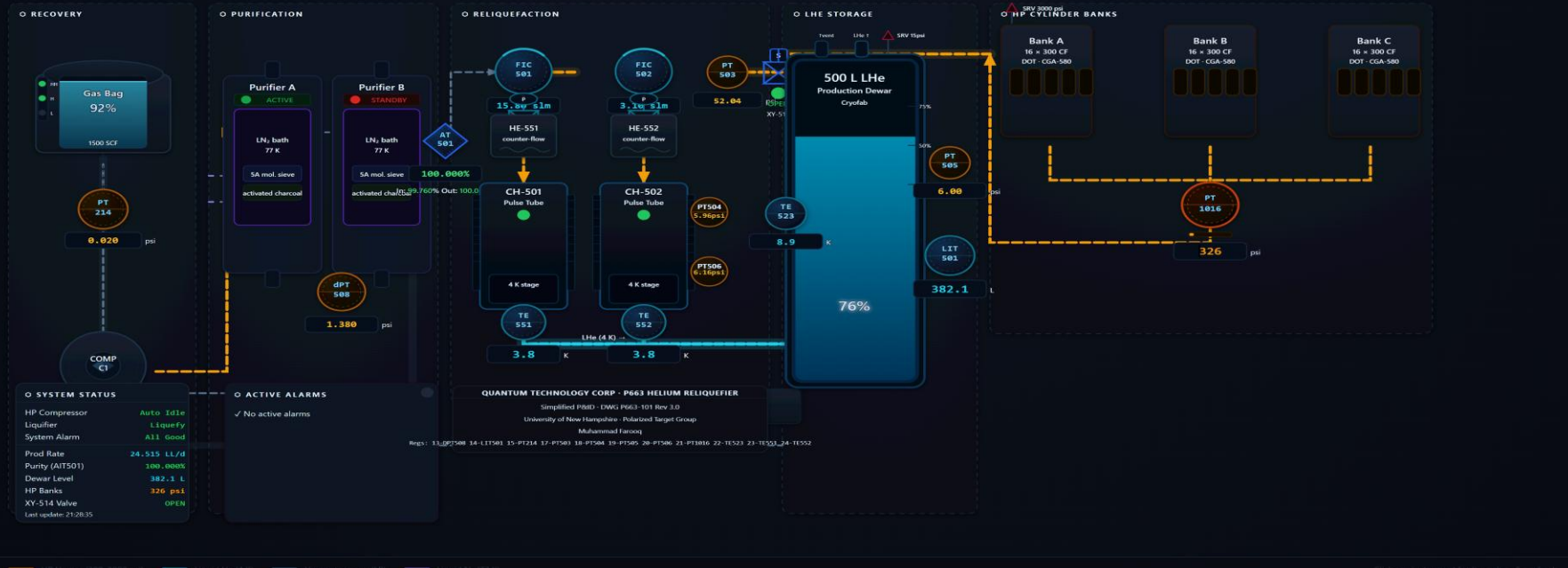
# Helium Liquefier HMI — P&ID / SCADA View

SCADA schematic with clickable instruments and blinking alarm indicators

P&ID — Quantum Technology P663 Helium Reliquefier

Connected - 21:28:30

21:28:35



# Helium Liquefier HMI — Step 1: Transport

Connecting to the PLC over Modbus TCP

## Connection Parameters

Host IP **192.XXX.XXX.X**

TCP Port **XXX**

Unit ID (slave) **X**

VPN **StrideLink tunnel**

Mode **auto\_open / auto\_close**

Poll cadence **every 5 seconds**

## read\_hmi\_data() — pyModbusTCP client

```
client = ModbusClient(  
    host="192.XXX.X.X",  
    port=XXX,  
    unit_id=X,  
    auto_open=True,  
    auto_close=True)
```

```
regs = client.read_holding_registers(0, 48)  
client.close()
```

```
if regs is None:  
    # PLC unreachable  
    connection['connected'] = False
```

```
# FIX: datetime → JSON  
# custom encoder so jsonify() never 500s
```

# Helium Liquefier HMI — Step 2: Decoding

Raw 16-bit registers → engineering units

| Reg | Tag    | Raw → Scaling  | Result             |
|-----|--------|----------------|--------------------|
| 14  | LIT501 | regs[14] / 10  | Dewar level (L)    |
| 21  | PT1016 | regs[21] / 10  | HP storage (psi)   |
| 13  | DPT508 | regs[13] / 100 | Purifier ΔP (psi)  |
| 22  | TE523  | regs[22] / 10  | Dewar temp (K)     |
| 25  | FC501  | regs[25] / 10  | CB feed flow (slm) |
| 31  | AIT501 | regs[31] / 100 | He purity (%)      |

## Fixed-point scaling

Integers carry an implied decimal — divide by 10 or 100 to restore the real physical reading.

## Sign correction

neg() and ngl() subtract a 16-bit wrap offset so small negative pressures read correctly.

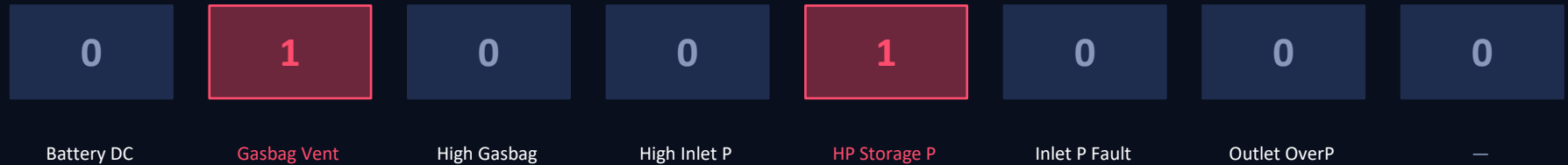
## State codes → human text

HPCompState 2 → "Auto Idle" |  
LiquifierState 4 → "Liquefy" | SystemAlarm  
0 → "All Good"

# Helium Liquefier HMI — Step 3: Alarm Decoding

Packed alarm words → named faults

Alarm and trip registers are bit-fields. Each register is expanded to binary; every set bit maps to a named condition.



`regs[4] → format(v, '08b')`

## HP Compressor

8-bit alarms + 4-bit trips  
e.g. Outlet Overpressure, E-Stop

## Liquefier

16-bit word, sparse map  
e.g. Low Liq Rate, Coldbox  $\Delta P$

## Purity

Inlet/outlet thresholds  
flagged below specification

*Active faults surface three ways: Dashboard alarm panel · P&ID blinking red LEDs · Event timeline + Mattermost push*

# Helium Liquefier HMI — Step 4: Logbook Integration

Posting status & write-audits to Mattermost

## Mattermost REST v4 Config

Server `endeavour.unh.edu`

Channel `reliq_datalogger`

Auth `Bearer token`

Notify `@farooq mention`

Threading `async, non-blocking`

## Full Status Report

Markdown tables covering: system state, 3 temperatures, 7 pressures, 2 flow controllers, dewar & production rate, He purity, valve states, and the full alarm/trip roster by category.

## PLC Write-Audit Log

Every setpoint write logs a row — operator, register, label, old → new value, and a read-back verified flag. A tamper-evident trail of who changed what, and when.

**Acknowledgement:** Thanks to Prof. Long python script to use the IP address and QT-HMI variables.

# Python DAQ — LabVIEW to Python/EPICS Migration

Transitioned half of the LabVIEW DAQ to a Python/EPICS-based system

## Soft IOC

caproto serves ~70 named EPICS PVs from a CSV template — pure in-memory data store

## Device Bridge

Reads 8 instrument classes via pyvisa/serial and writes values to IOC every 2 s

## Fridge Thermo

11-channel LS-224 read over GPIB; CCS calibration; F1–F11 T\_K PVs

## Magnet Thermo

7-channel LS-224; M1–M5 CCS2; T1/T3 CCX Chebyshev (8-term  $\log_{10}R$  fit)

## Flow & Pressure

Roots flow, separator flow, ionivac, manometer, TPG362 CH1/CH2, manometer low

## LHe Levels

AMI-1700 fridge (ASRL7, 115200 baud) and AMI-135 magnet (ASRL5, 9600 baud)

## SMT03 NMR

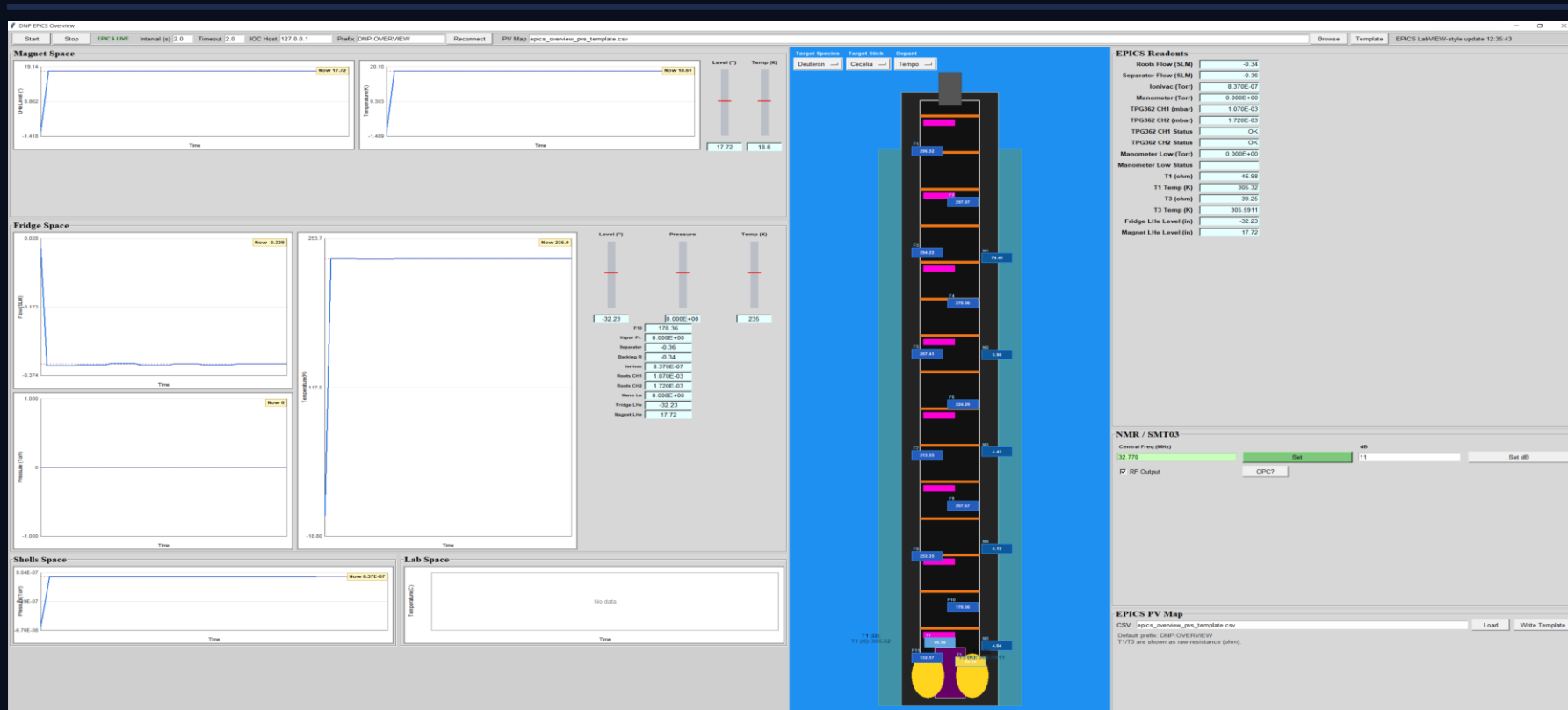
Frequency, level, RF output PVs written by GUI; read-back via OPC? PV

## pyEPICS GUI

Two Tkinter views; caget() every 2 s; EPICS\_CA\_ADDR\_LIST configurable at runtime

# Python DAQ — pyEPICS Overview GUI

Live EPICS PV readouts, fridge/magnet space trend plots, target stick visualization, NMR/SMT03 controls



# Summary & Outlook

## Key accomplishments

### 01 ssRF GUI

Deployed single-operator BLAST system: 5 instruments, 3 buses, hardware interlocks, timestamped logs. NMR preamp protected; ssRF/AFP burns are now safe and reproducible.

### 02 Mattermost Autolog Bot

Lab monitoring fully automated: 15-min screenshot posts, 46-column LabVIEW CSV status, CSV file-lock queuing, and post-edit detection — zero data loss.

### 03 Helium Liquefier HMI

Flask/Modbus SCADA dashboard deployed: live P&ID, alarm bit-decoding, ring-buffer trends, Mattermost logbook, and PLC write-audit trail for the QT P663.

### 04 Python DAQ Migration

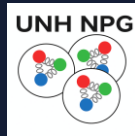
Transitioned half of the LabVIEW DAQ to Python/EPICS: caproto soft IOC (~70 PVs), pyVISA device bridge for 8 instrument classes, pyEPICS Tkinter GUI.

# Please join the effort

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Please join the effort:

- Karl Slifer (karl.slifer@unh.edu) [Co-Spokesperson of  $b_1$  (E12-13-011) Experiment]
  - **E12-13-011: The Deuteron Tensor Structure Function  $b_1$ . [Link](#)**
- Elena Long (elena.long@unh.edu) [Co-Spokesperson of  $A_{zz}$  (E12-15-005) Experiment]
  - **E12-15-005: Measurement of the Quasi-Elastic and Elastic Deuteron Tensor Asymmetries. [Link](#)**



This work is supported by DOE contract *DE-FG02-88ER40410*