



MICE: Controls & Monitoring

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Outline

- **Matt's Work**
- **DL Efforts**
- **Spectrometer Solenoid**
- **LH₂ Monitoring**
- **Run Control**
- **RF Tuners**
- **autoSMS**
- **Other Bits**
- **State Machines**



Matt's Work

- **Rewritten the target C&M system**
 - ◆ better EPICS compliance
 - ◆ web interface
 - ◆ compatibility with CDB
 - ◆ new configuration interface – separate DB
 - ◆ on the fly analysis
 - ◆ run priority rather than throwing errors
 - ◆ output to root files
- **Several analogous changes to tracker**
- **Next month: similar tracker rewrite**



DL Efforts

- **SS standalone system integrated with magnet and used in training**
- **FC standalone system installed and ready in R9**
- **Rack layout differs for final MICE systems**
- **Racks being assembled – external vendor (Ian's talk)**
- **Will require more DL effort at Wang, NMR (more later)**

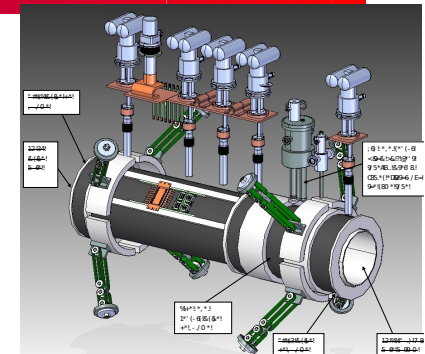
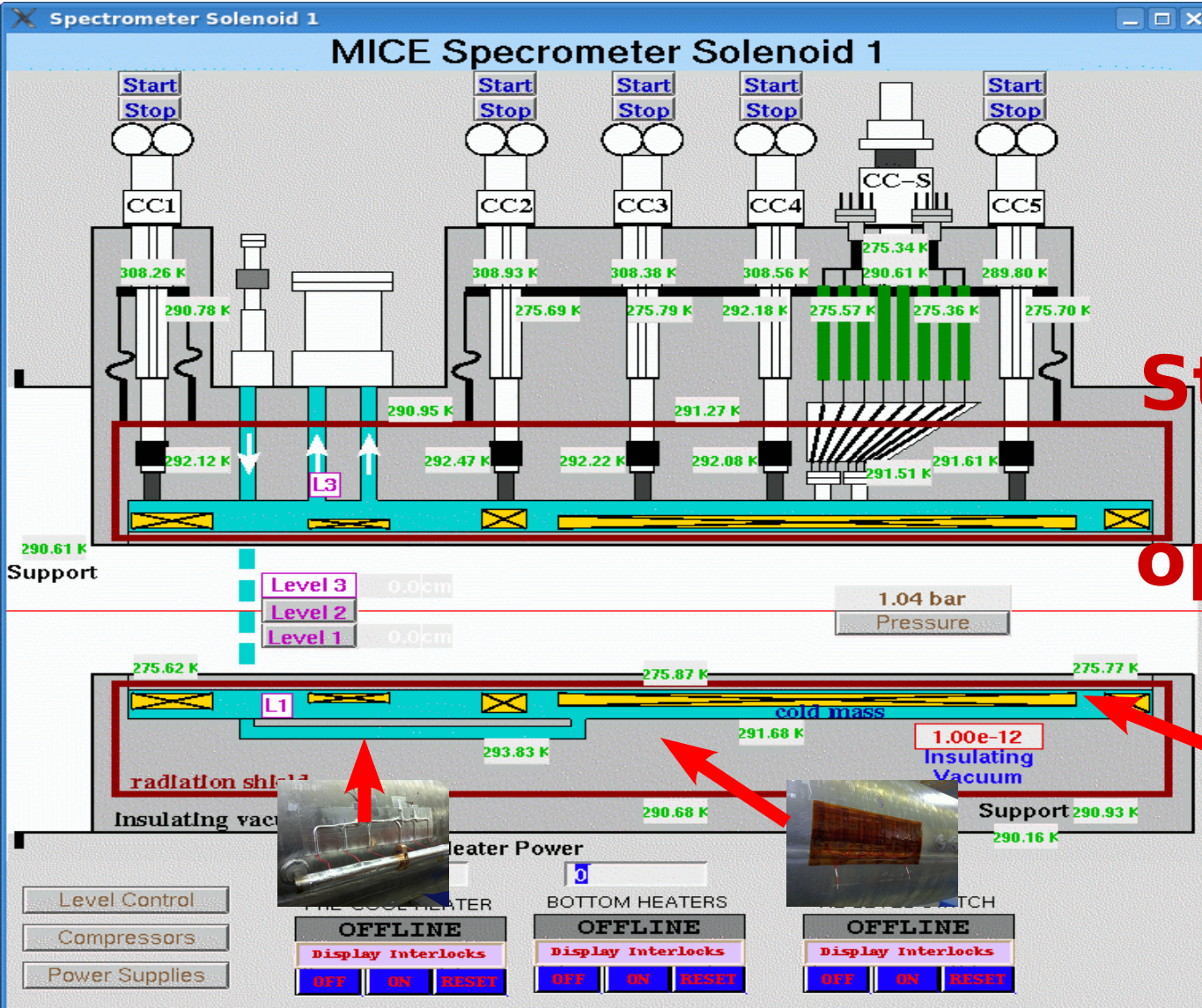


SS Standalone C&M





SS Standalone C&M

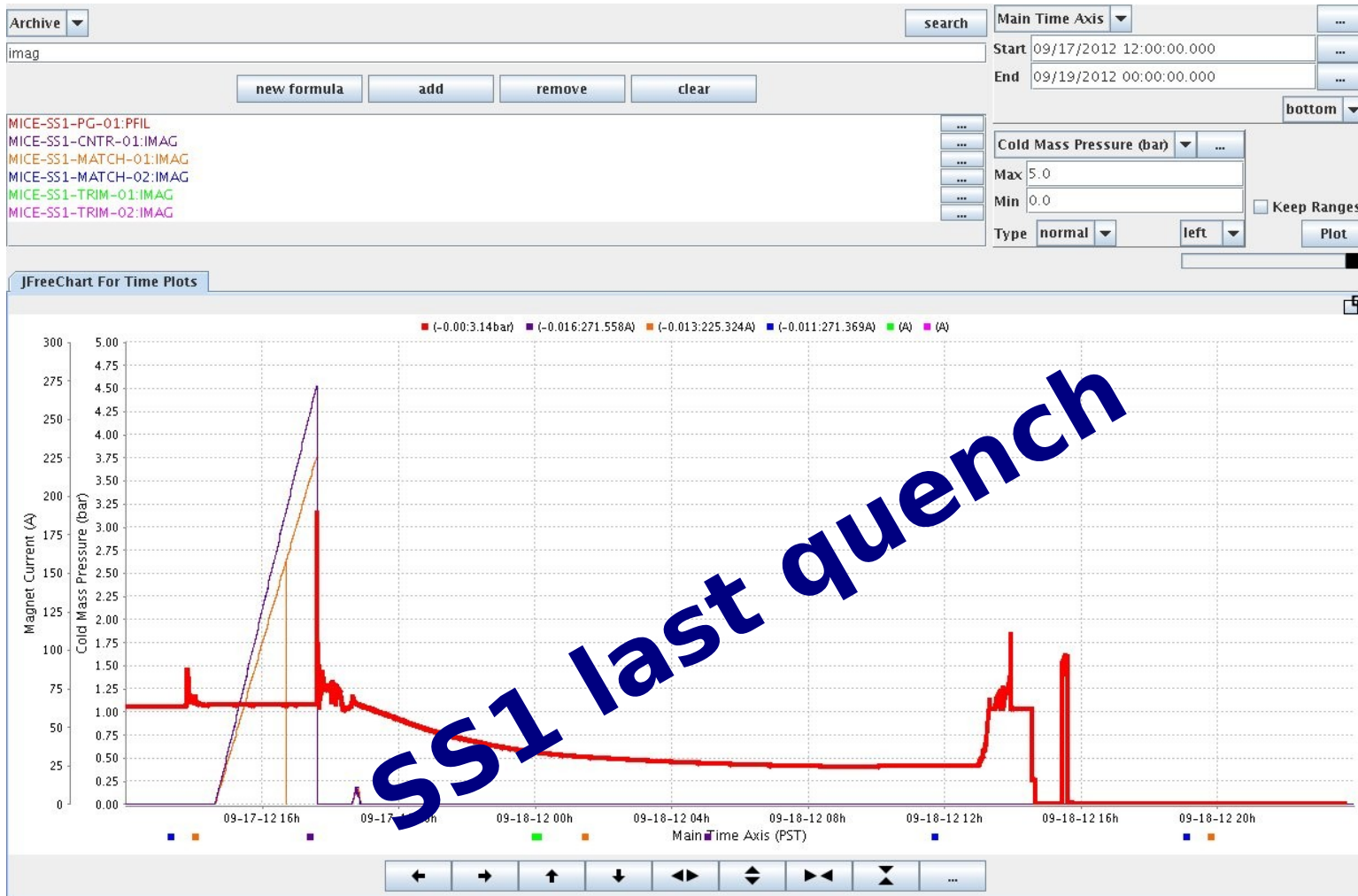


**Standalone
C&M
operational**





SS Standalone C&M





SS Standalone C&M





SS Standalone C&M

- **SS Standalone designed to be manually operated – only 1 feedback (PID) loop**
 - ♦ **speed in implementation**
 - ♦ **need experience to develop procedures**
- **Failure in both operation and loop design**
- **“Beyond that now” - Mark Palmer**
 - ♦ **we have experience**
 - ♦ **desire to test a complete system**
- **Controls meeting this morning to discuss next steps for C&M**
- **Summary document to follow**



SS Standalone C&M

- **Topics:**
 - ◆ **hardware repairs/modifications**
 - ◆ **questions to ask**
 - ◆ **documentation**
 - ▲ **existing**
 - ▲ **procedural**
 - ◆ **state machines and alarm limits**
 - ◆ **alarms**
 - ◆ **auto dialer (autoSMS)**
 - ◆ **fault scenarios**
 - ◆ **tests**

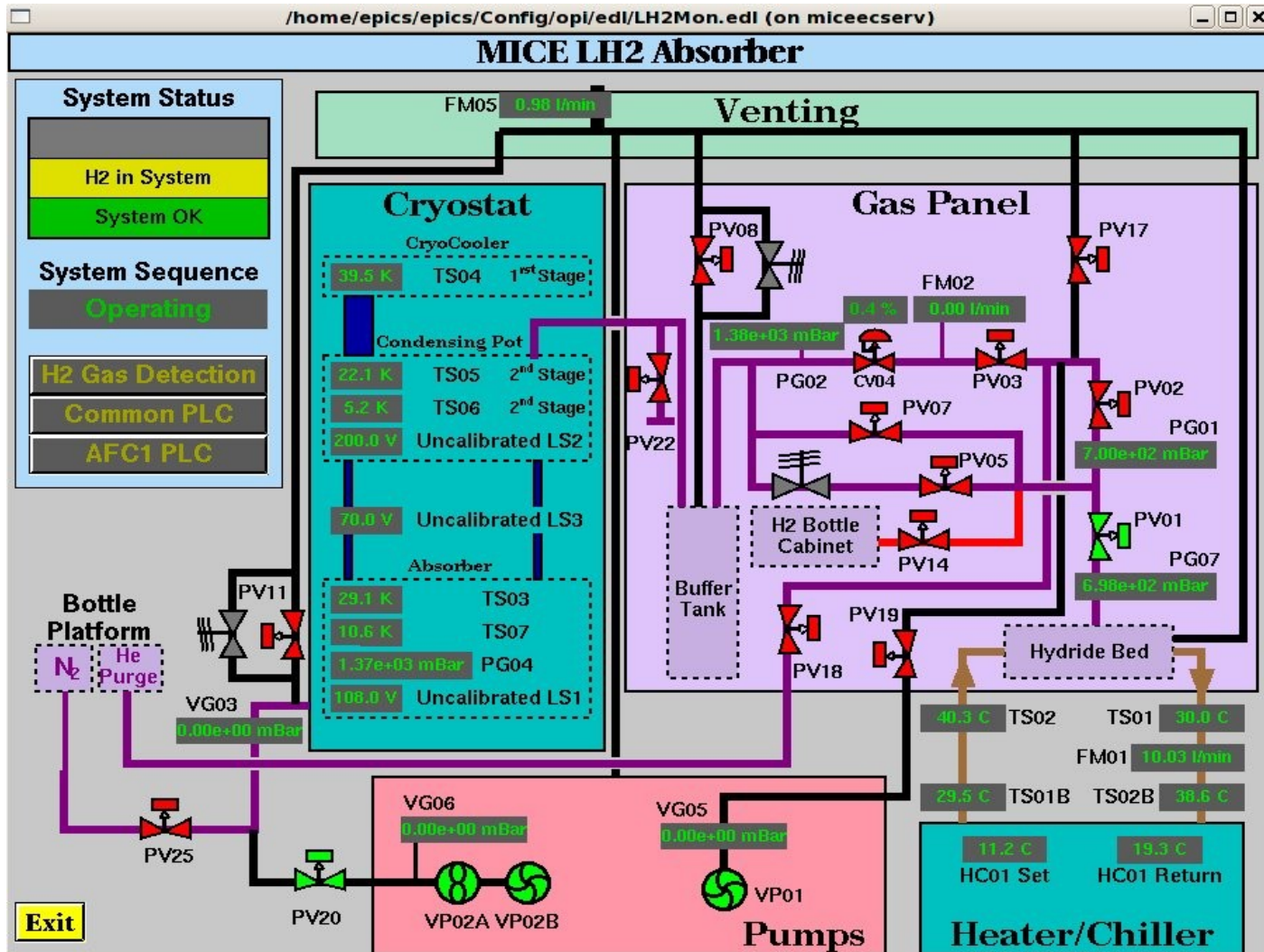


LH₂ Monitoring

- **LH2 system is stand alone**
- **must be for safety purpose**
- **system is not for experts**
- **monitoring is read only; NO control**
- **much help and thanks to Adrian,
Steve, and Phil**



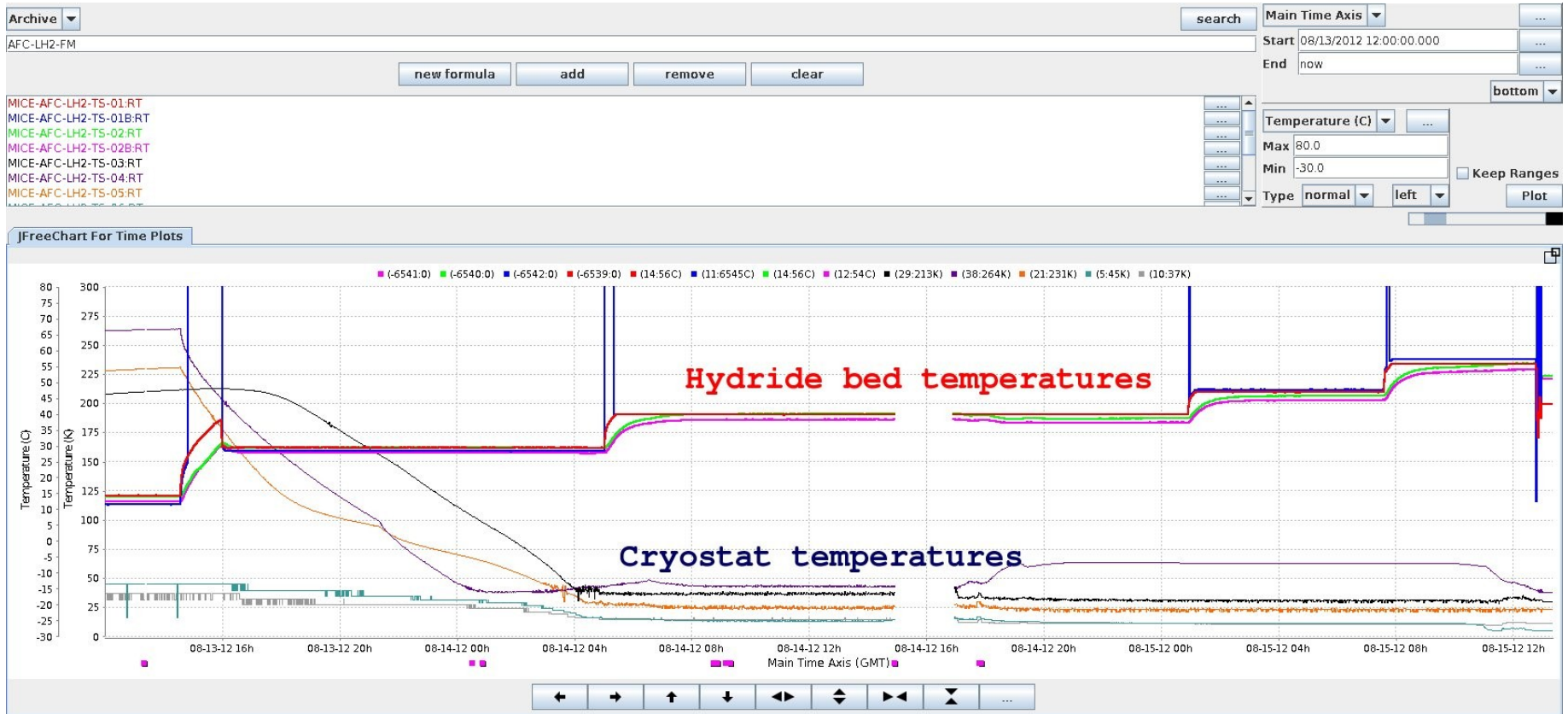
LH₂ Monitoring



**Main
Screen**

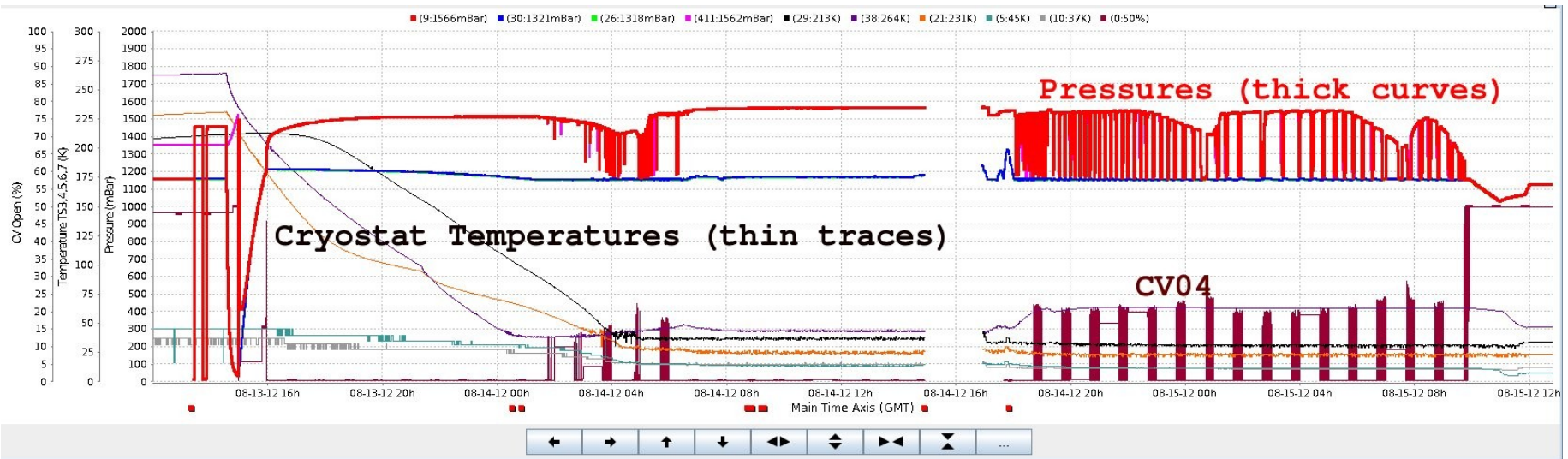


LH₂ Archiver



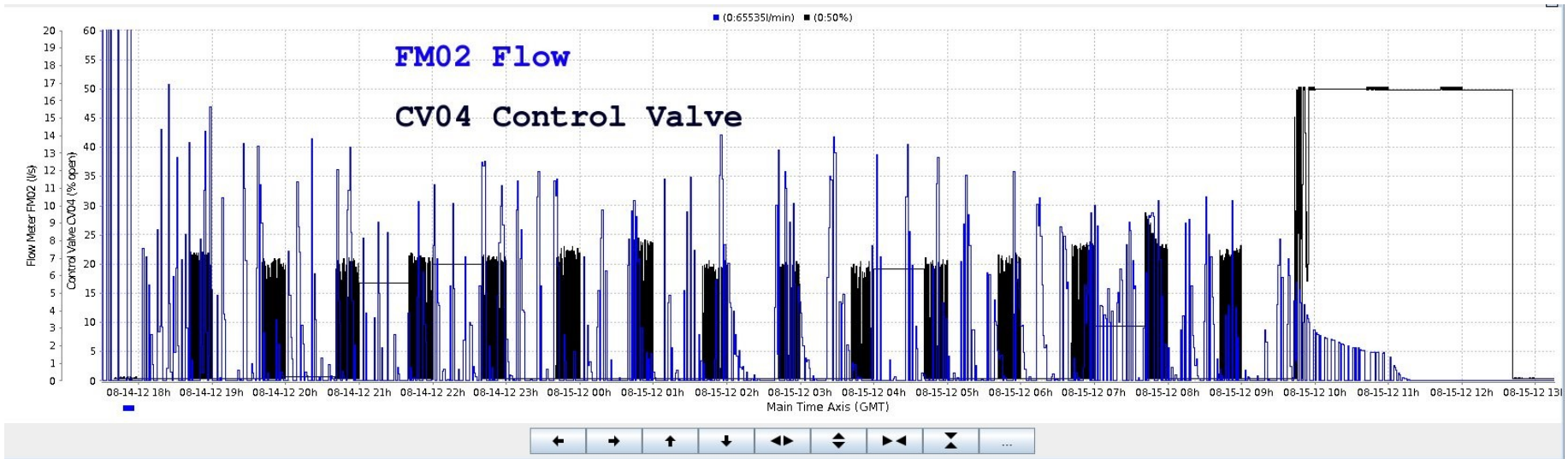


LH₂ Archiver





LH₂ Archiver



- more accurate than screen in LH₂ room



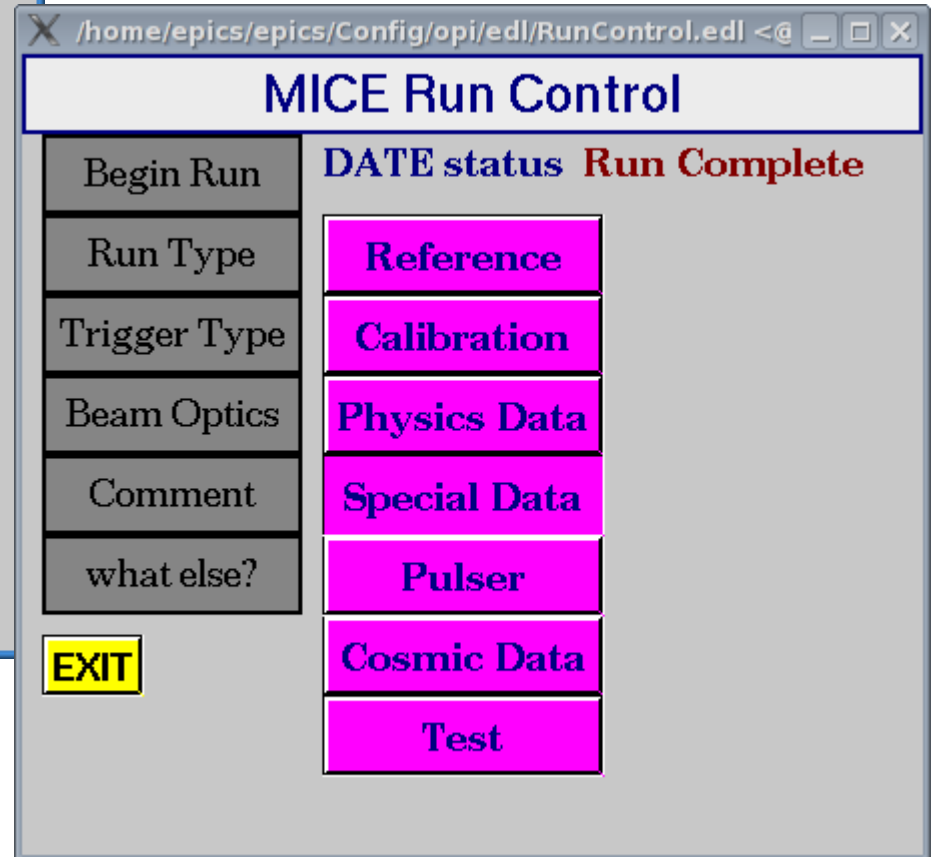
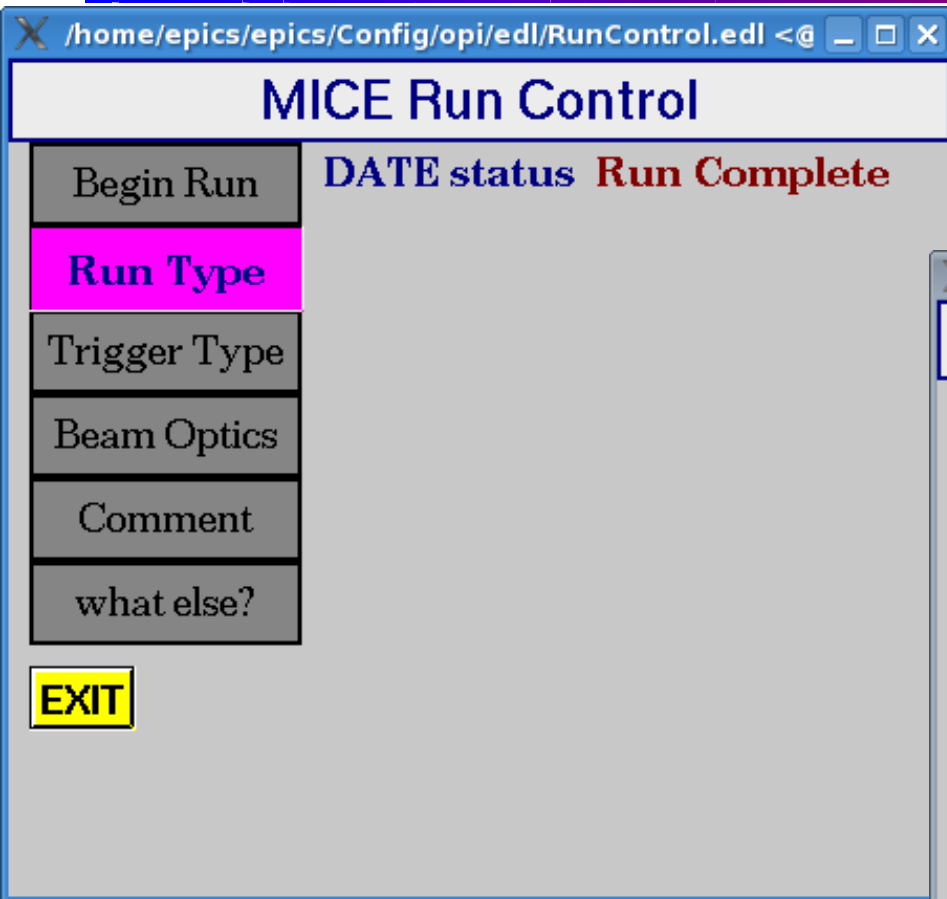
Run Control

- **Interfaces with:**
 - **DATE**
 - **TargetMon**
 - **State Machine**
 - **Environment**
- **Standard operation**
- **Records all running parameters to CDB**
- **Records all meta-data at end of run**
- **Verifies readiness of subsystems**
- **Sets running parameters**
- **Tags run parameters**



Run Control

**Used in May run!
More testing now**



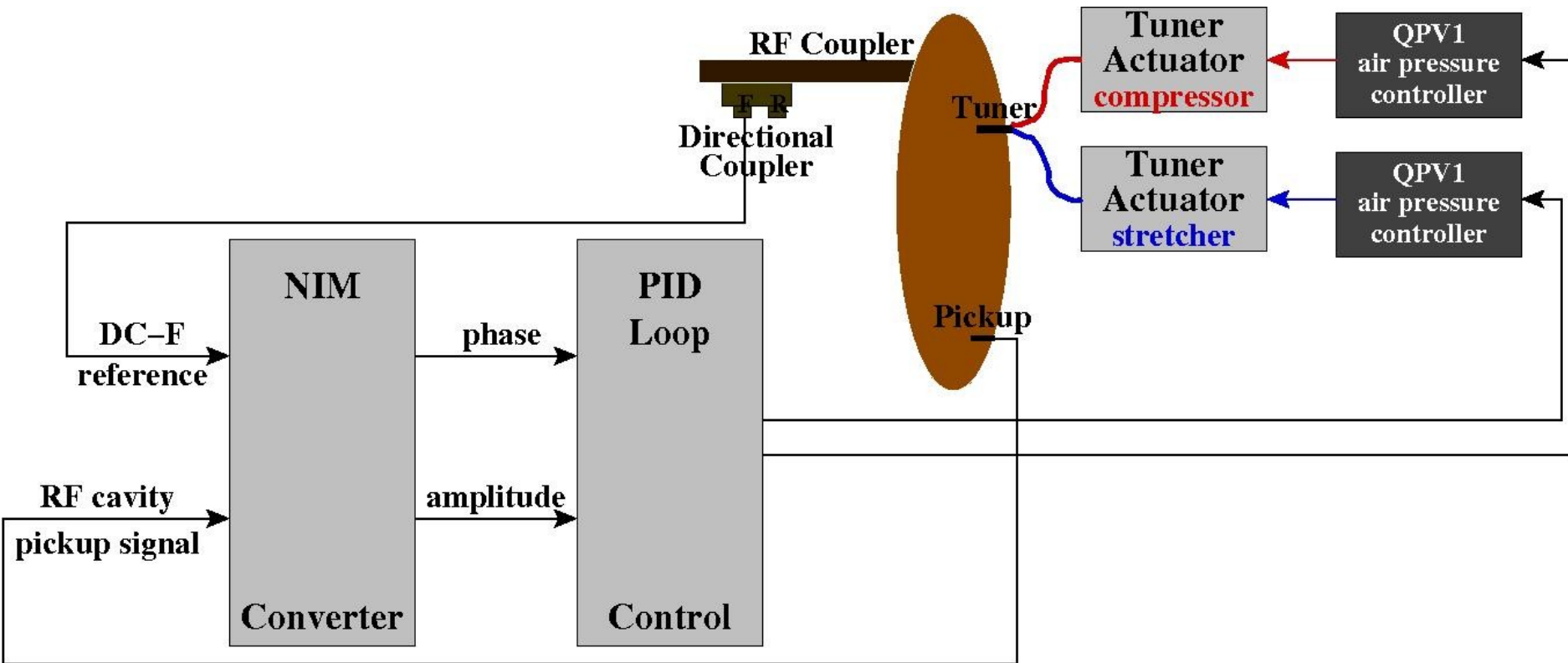


RF Tuners

- **RF cavities: RLC circuits resonance driven**
- **Resonant frequency depends on geometry of cavity**
- **RF tuners modify cavity shape**
- **Only 201 MHz generator in MICE**
- **Must ensure relative tune of 4 cavities for each RFCC**
- **System required to control deformation**



RF Tuners

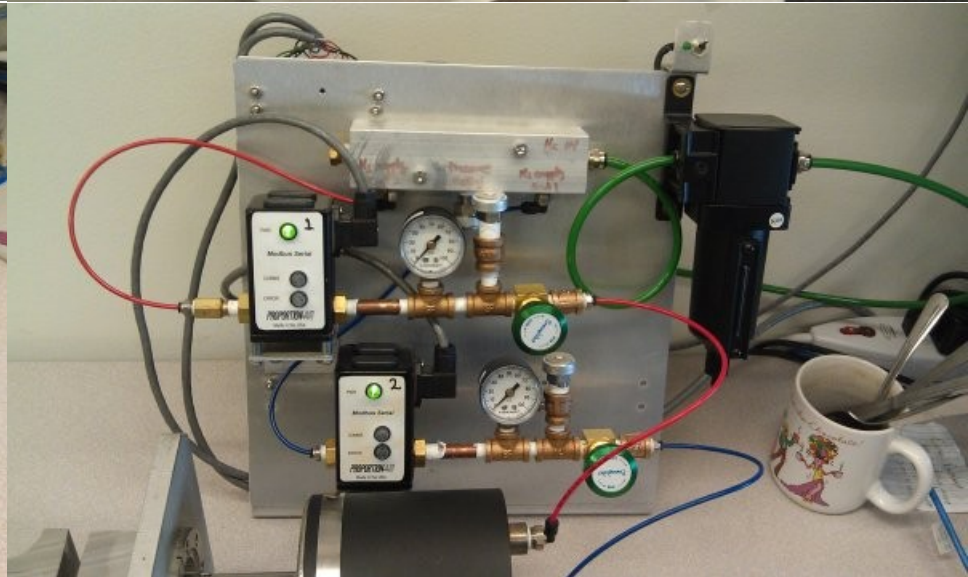
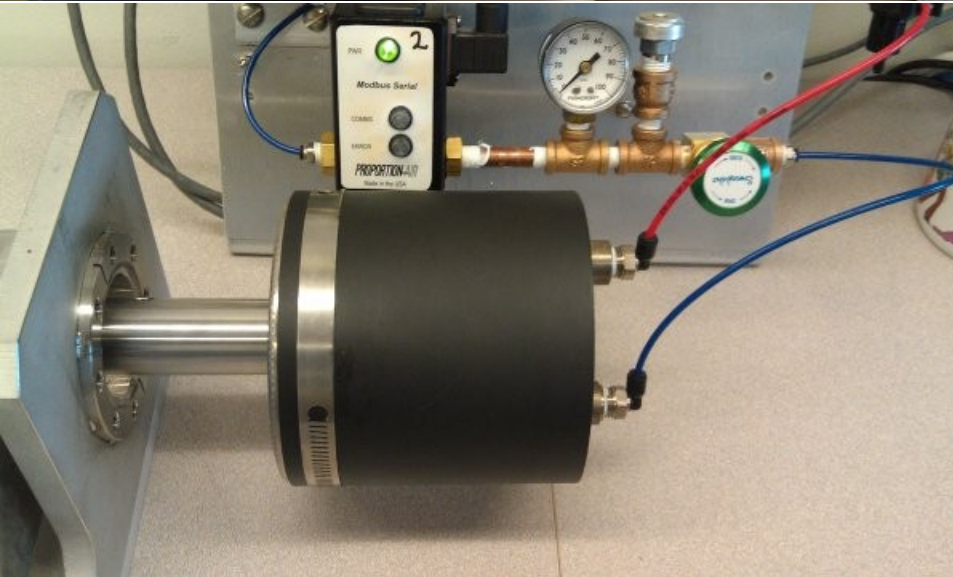


PID:

proportional/integral/differential



RF Tuners





RF Tuner

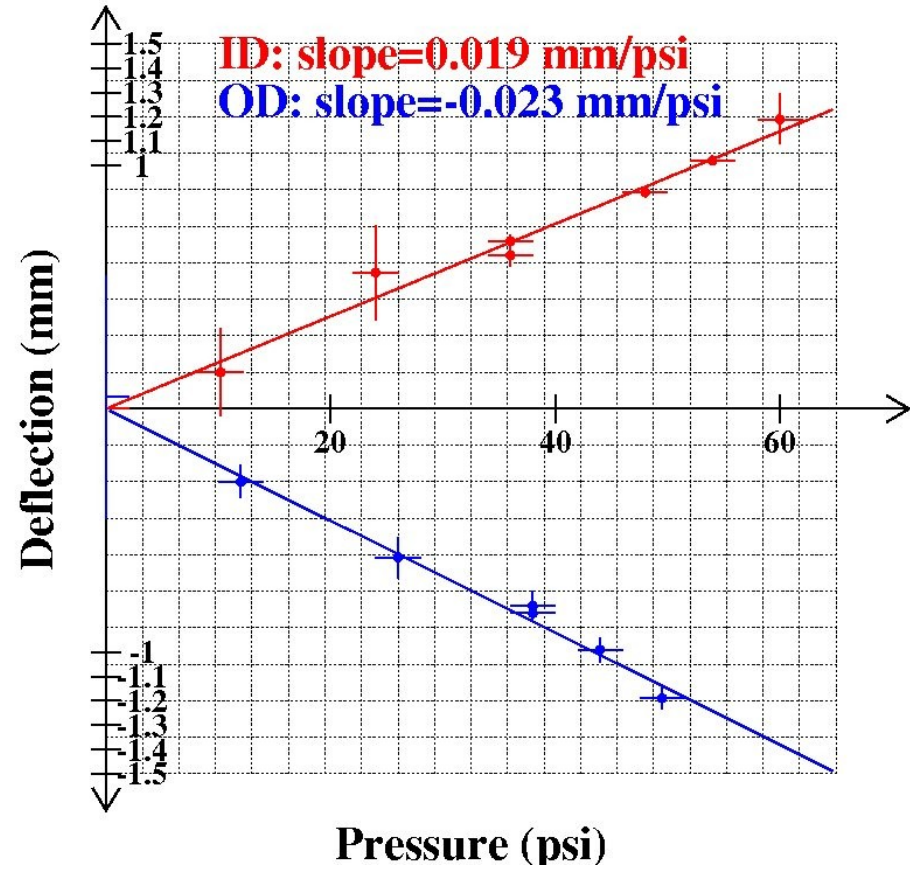
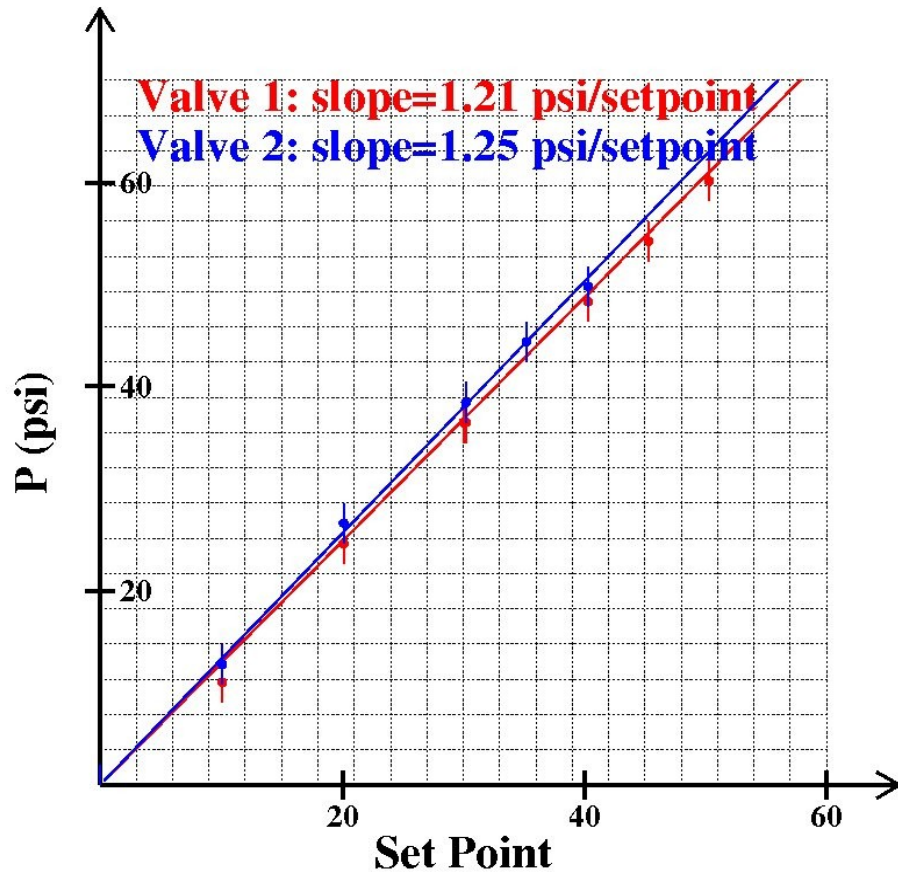
The screenshot shows a window titled `/home/epics/epics/Config/opi/edi/RFTuner.e`. On the left, there is a control panel with the following elements:

- Address:** Two empty text input boxes.
- Set to:** A label followed by the first empty address box.
- Value:** A label followed by a red box containing the text `TUNE`.
- Exit:** A yellow button with black text.

On the right, there are two vertical sliders labeled **Valve 1** and **Valve 2**. Each slider has a blue background and a brown bar representing the current value. The value `0.0` is displayed in the center of each slider. Below each slider are three buttons: **Set**, **Close**, and **Read**. At the bottom of each column, there are two white boxes displaying the current values: `0` and `0x0`.



RF Tuners



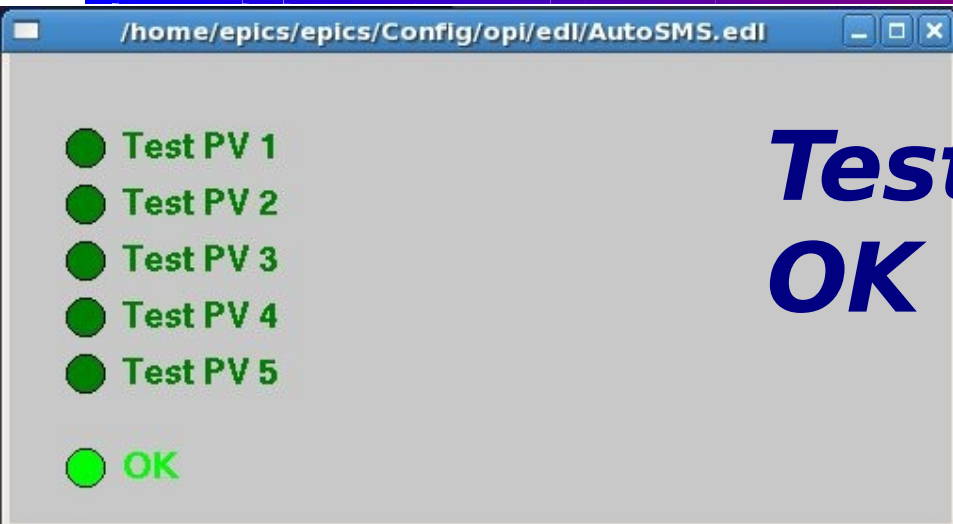


Auto - SMS

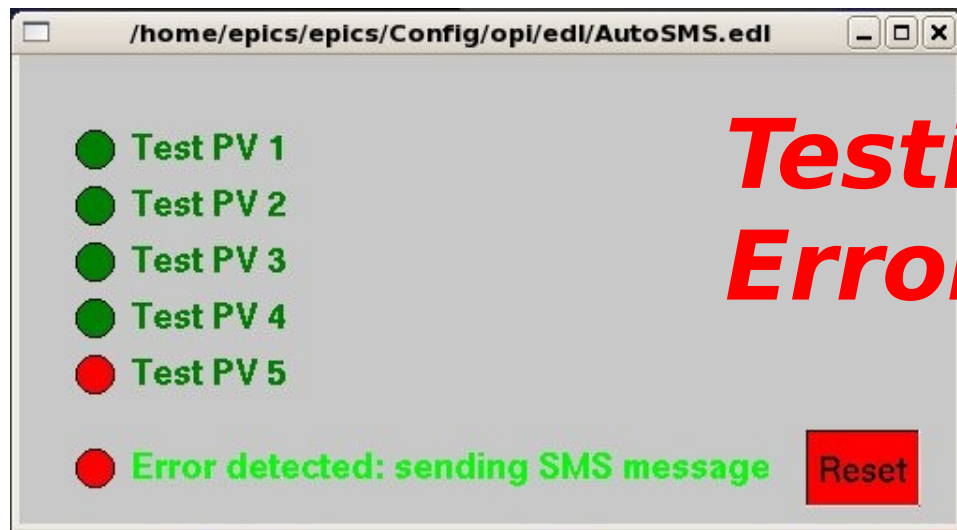
- ***SMS (simple message system)***
 - ***aka “texting”***
- ***Can email SMS message***
 - ***text me at 6306978758@vtext.com***
 - ***works everywhere (with permission)***
- ***New IOC:***
 - ***scan PVs to look for errors***
 - ***set flag when in error condition***
 - ***run bash script: invoke mail service to send SMS + details in email***
 - ***every 10 minutes until flag is reset***



Auto - SMS



**Testing screen -
OK**



**Testing screen -
Error**



Other Bits

- **New IOC for monitoring UPS**
 - ◆ **UPS battery**
 - ◆ **AC power**

/home/epics/epics/Config/opi/e	
Network Rack UPS	
Select	
server rack	
Charge on UPS battery	100.00 %
Voltage on UPS battery	27.50 V
Age of UPS battery	3300.00 hr
Input AC Voltage	244.80 V
Output AC voltage	244.80 V
UPS temperature	18.00 C
UPS status	Online

- **Requires Nut for communication**
- **Server rack**
- **Network rack**
- **EPICS Server rack**
- **EPICS Client rack**



Other Bits



- A/C Monitoring**

/home/epics/epics/Config/opi/edi/ACMon.edi

MICE A/C Monitoring

	Status	Cool	set T	read T	read humid	Alarms and Errors	
AC1 Status	On	On	21 C	22.2 C	46 %	● 1	Prs1
AC2 Status	On	On	21 C	22.5 C	47 %	● 0	None
AC3 Status	On	Off	21 C	22.0 C	45 %	● 0	None
AC4 Status	On	On	21 C	22.2 C	46 %	● 0	None

- Runs well**
- need to test reset**



High Voltage Control

- ***No progress on SY4527 control***
- ***Error handling tested on SY457***
- ***No progress on operating document***



PC Alive

- ***New IOC to monitor PCs on micenet***
- ***Work is done by Matt's script***
- ***Reports error flag***
- ***Reports error string***
- ***Alarm handler notifies***



State Machines

- ***Required for all new systems***
- ***Selects pertinent variables***
- ***Selects alarm limits***
- ***Selects archiving frequency***



State Machines

DecaySolenoid-ALHPVs.xls - OpenOffice.org Calc

File Edit View Insert Format Tools Data Window Help

Calibri 11

B1 \sum = Description

1	2	B	ALARM				G	H	I	J
			LoLo	Low	High	HiHi				
12	CV1 (Reported Opening?)	N/A	N/A	N/A	N/A		Limits only apply when magnet is cold. This valve should be closed when the magnet is cold, but the reported value is always around 0.3%			
13	CV1 (Setpoint)	N/A	N/A	N/A	N/A		Limits only apply when magnet is cold. This valve should be closed when the magnet is cold, but the reported value is always around 0.3%			
14	CV2 (Reported Opening?)	N/A	N/A	N/A	N/A		Limits only apply when magnet is cold, but take account of variations due to operation of the current leads			
15	CV2 (Setpoint)	N/A	N/A	N/A	N/A		Limits only apply when magnet is cold, but take account of variations due to operation of the current leads			
16	Cryostat Level	70.0	75.0	85.0	90.0	%	Limits only apply when magnet is cold			
17	Magnet Mass Flow (Differential Pressure)	1.0	5.0	N/A	N/A	mbar	Normally above the maximum reading of the meter. Lower limits only apply in steady state operation when cold.			
18	Shield Mass Flow (Differential Pressure)	2000.0	3000.0	N/A	N/A	Pa	Can be above maximum reading of meter when current lead cooling is operational. Lower limits only apply in steady state operation when cold.			
19	Magnet Read Current	-0.5	-0.2	0.2	0.5	A	Limits only apply when magnet is cold			
20	Magnet Read Current	-0.5	-0.2	0.2	0.5	A	Limits only apply when magnet is cold (not used)			
21	Current Lead Cooling Flow (FL31)	18.0	20.0	30.0	50.0	l/min	Note that these limits are only relevant when current lead cooling is in operation and the magnet is being powered. At other times the flow will be zero.			
22	Current Lead Cooling Flow (FL32)	18.0	20.0	30.0	50.0	l/min	Note that these limits are only relevant when current lead cooling is in operation and the magnet is being powered. At other times the flow will be zero.			
23	Magnet Supply Pressure (PI1)	4.0	5.0	9.0	10.0	bar	Applicable whenever fridge is running (taking account of lower set pressure from fridge)			
24	Iron Yoke Inlet Pressure (PI2)	4.0	5.0	9.0	10.0	bar	Applicable whenever fridge is running (taking account of lower set pressure from fridge)			
25	Iron Yoke Outlet Pressure (PI3)	4.0	5.0	9.0	10.0	bar	Applicable whenever fridge is running (taking account of lower set pressure from fridge)			
26	Coils 6-10 Outlet Pressure (PI4)	3.0	4.0	9.0	10.0	bar	Applicable whenever fridge is running (taking account of lower set pressure from fridge)			

DecaySolenoidCryo-PVs / Pumping / Cooling / Cold / Powered / DS-PVs

Sheet 3 / 6 PageStyle_Cooling STD Sum=0 Average= 90%



State Machines

Applications Places System Thu Oct 18, 07:47

SS1-PVs.ods - OpenOffice.org Calc

File Edit View Insert Format Tools Data Window Help

Arial 10

N13 \sum =

1	A	B	ALARM				G	ARCHIVER			K	L	M	N	O
			2	3	4	5		6	7	8					
	PV Name	Description	LoLo	Low	High	HiHi	Units	mode	frequency (s)	deadband	Comments				
3	MICE-SS1-LEVEL-01:RL														
4	MICE-SS1-LEVEL-01:RLEV														
5	MICE-SS1-LEVEL-01:RUNI														
6	MICE-SS1-LEVEL-03:RL														
7	MICE-SS1-LEVEL-03:RLEV														
8	MICE-SS1-LEVEL-03:RUNI														
9															
10	MICE-SS1-VAC-01:P														
11															
12	MICE-SS1-HEAT-01:SI														
13	MICE-SS1-HET-01:Sta														
14	MICE-SS1-HEAT-02:SI														
15	MICE-SS1-HET-02:Sta														
16															
17	MICE-SS1-CC-01:RI:ILOK														
18	MICE-SS1-CC-01:RI:SLVL														
19	MICE-SS1-CC-01:IN:T														
20	MICE-SS1-CC-01:OUT:T														
21	MICE-SS1-CC-01:HE:T														
22	MICE-SS1-CC-01:OIL:T														
23	MICE-SS1-CC-01:HS:P														
24	MICE-SS1-CC-01:LS:P														
25	MICE-SS1-CC-01:ERRP														
26	MICE-SS1-CC-01:HS:DP														
27	MICE-SS1-CC-01:D:V														
28	MICE-SS1-CC-01:D0:T														
29	MICE-SS1-CC-01:D1:T														
30	MICE-SS1-CC-01:D0:ERR														

Sheet1 / Sheet2 / Sheet3

Sheet 1 / 3 PageStyle_Sheet1 STD Sum=0 Average= 100%



Conclusions

- **MUCH** progress since CM33
 - **Target and Tracker**
 - **DL completed standalone**
 - **DL readying for MICE hall**
- 
- A glass of wine sits on a dark beach at sunset. The sun is low on the horizon over a body of water, casting a golden glow. The sky is filled with soft, colorful clouds. The glass is partially filled with a dark liquid, and its reflection is visible on the sand.
- **Progress: LH₂, RF, RunControl, autoSMS, RackMonitoring, A/C**
 - **Thank you**