



FST Status

Xu Sun

University of Illinois at Chicago

Overall Status



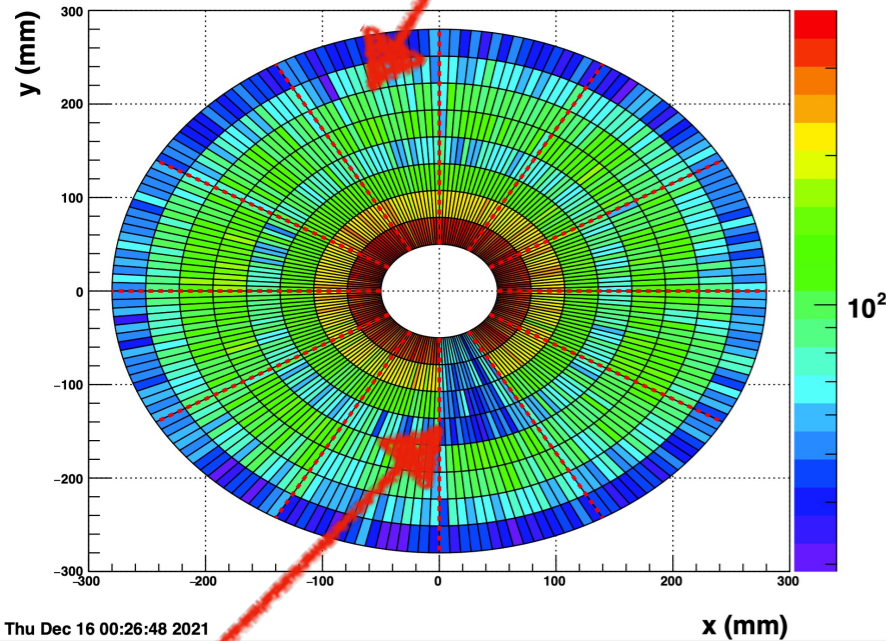
- FST was installed on 08/13/2021 and partition closed on 08/31/2021
- Cosmic data started on 11/11/2021
- Beam data started on 12/15/2021
- Switched to 3 time bin on 12/21/2021
- Refilled Cooling on 11/05/2021 & 01/05/2022 & 02/14/2022

Detector Status



1-12 current fluctuation & 140V

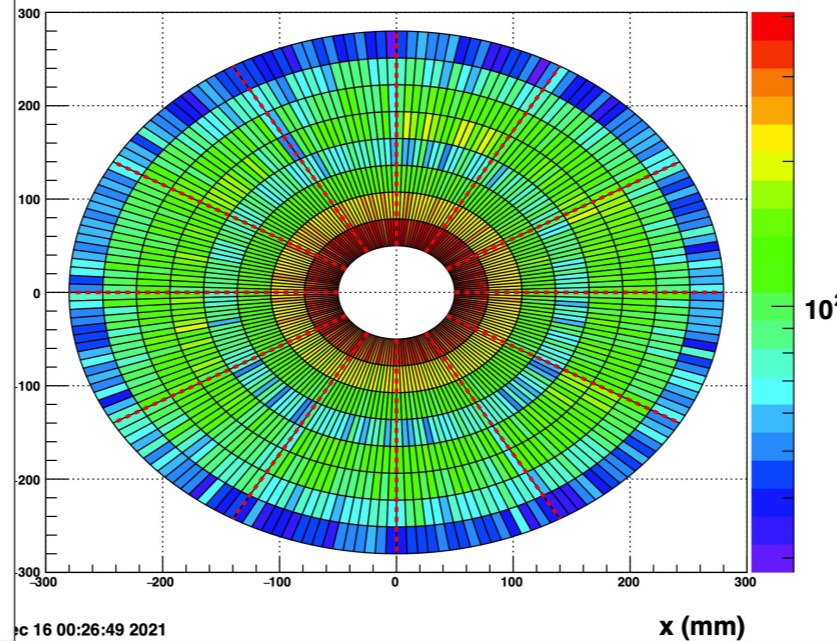
FST - Hit Map Display (ZS) for Disk1



70V

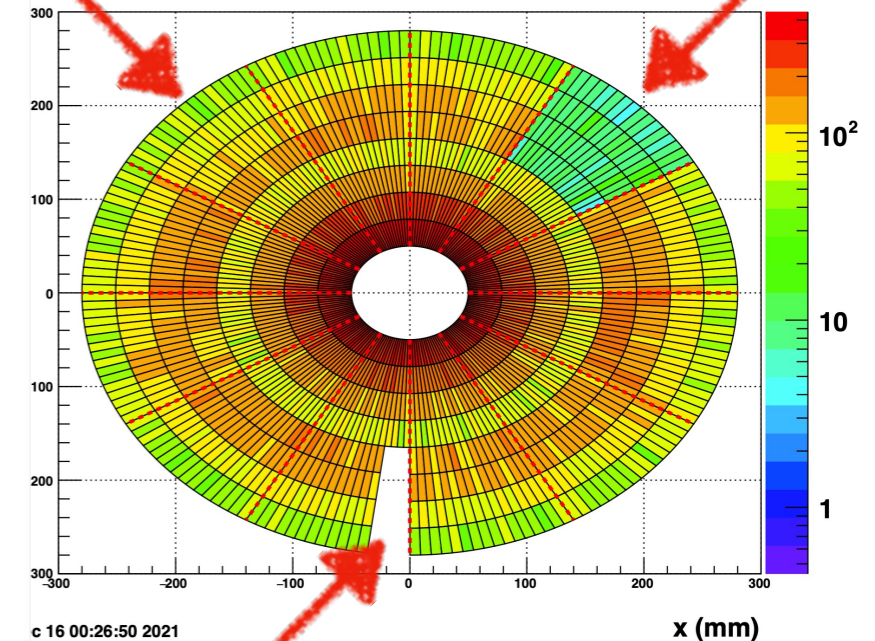
3-11 with PPB high temperature

FST - Hit Map Display (ZS) for Disk2



35V

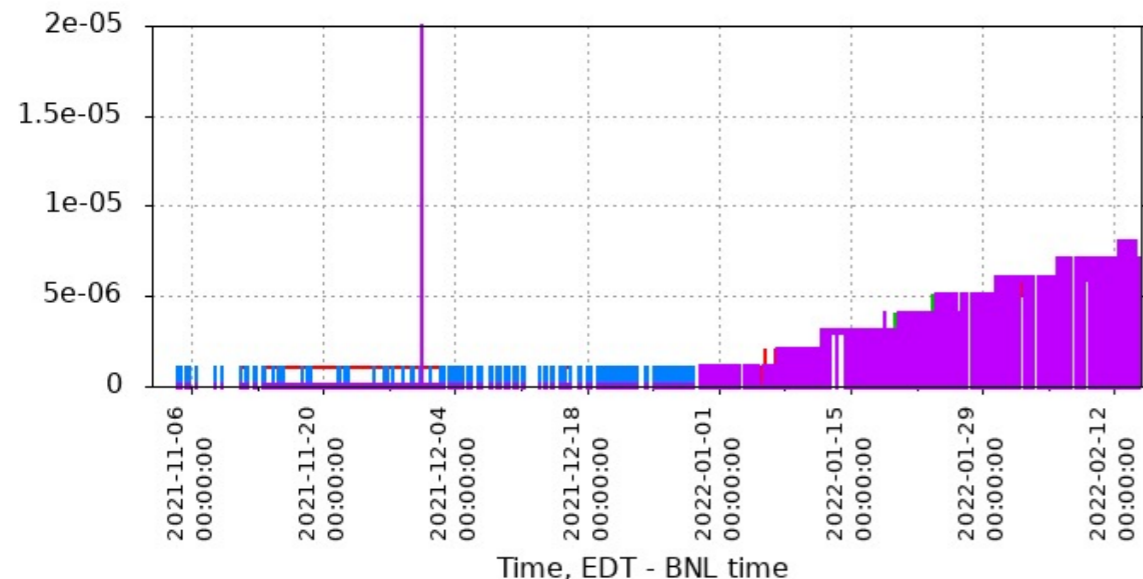
FST - Hit Map Display (ZS) for Disk3



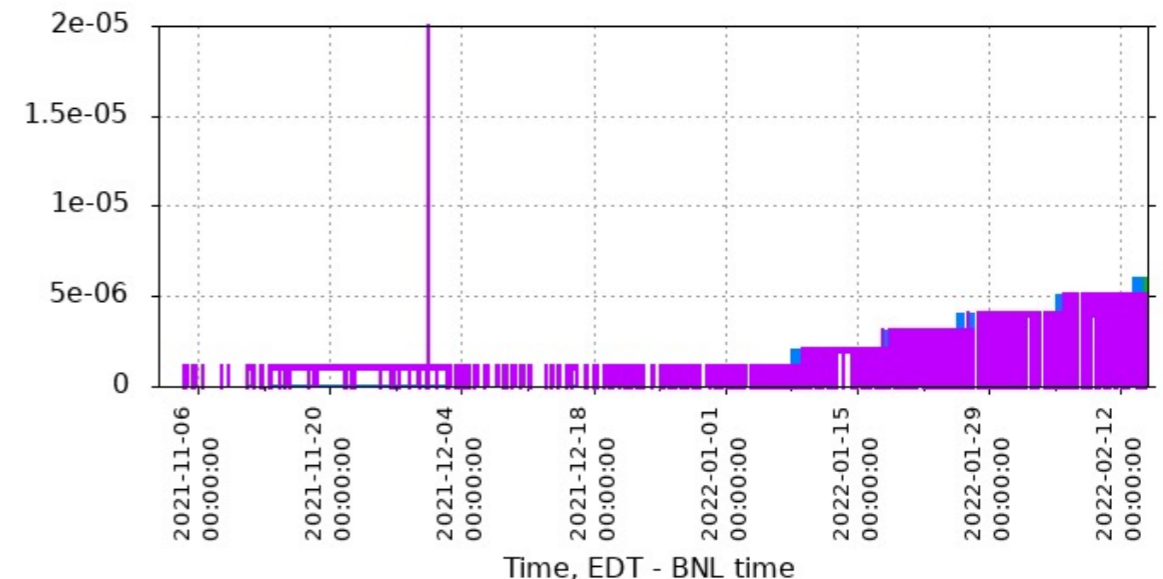
missing APV5

- Nominal Operation HVs: 140V for inner and 160V for outer
- Cold Sensors: D1-M6 inner (high current prior to installation) & D3-M2 outer (high current right after installation)
- D1-M12 outer sensor bias current has started fluctuating since 01/23/2022, has verified that the issue is not from the downstream of the grey cable (crate).
- D3-M11 PPB high temperature after 11/06/2021 and become “normal” since 12/27/2021

Bias Current Status



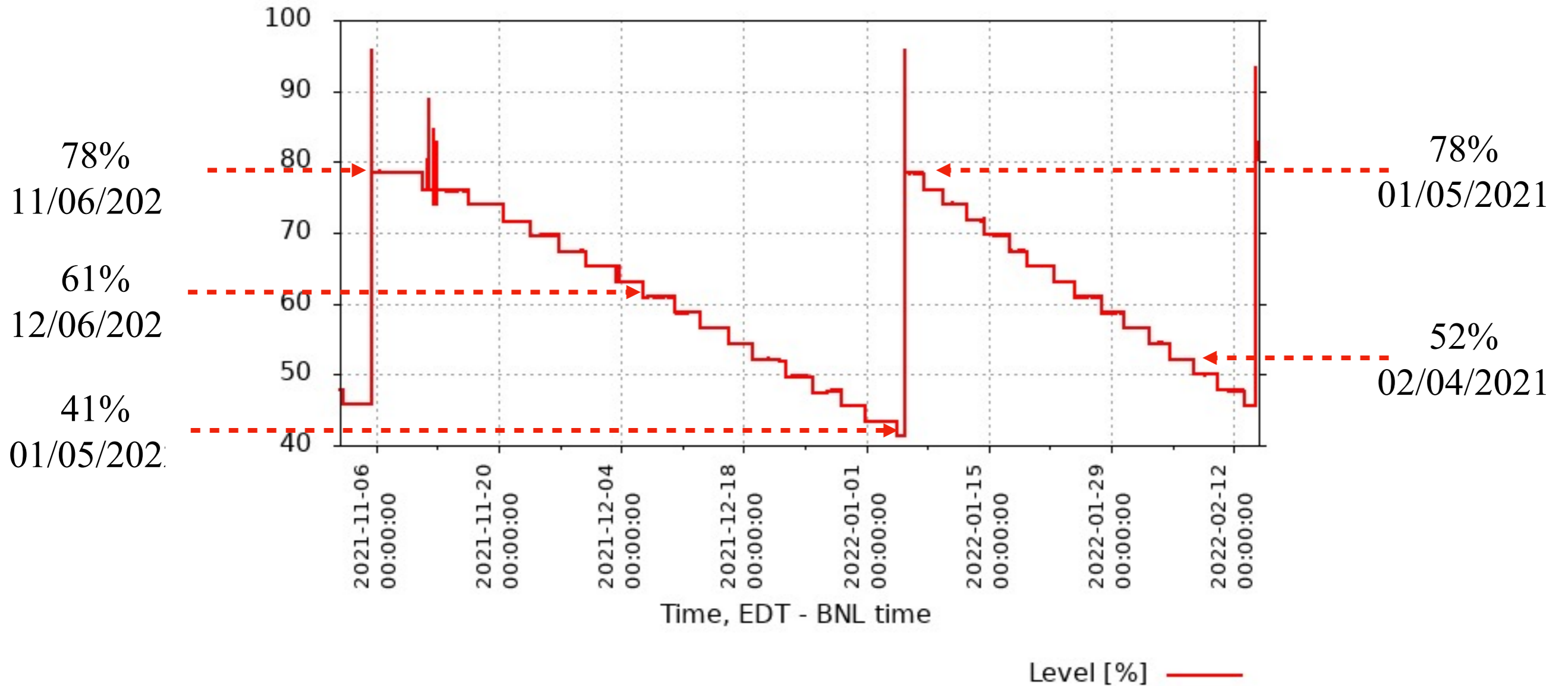
D2-M5 Inner
D2-M6 Inner
D2-M7 Inner
D2-M8 Inner



D2-M5 Outer
D2-M6 Outer
D2-M7 Outer
D2-M8 Outer

- Bias current increased from $\sim 1-2$ μA level to $\sim 5-9$ μA in 3 months of operation (2 months with beam).
- Inner sensors show more increase in the bias current

Cooling Status



- Leak rate 17% from 11/06/2021 to 12/06/2021 \Rightarrow 0.57% per day
- Leak rate 20% from 12/06/2021 to 01/05/2022 \Rightarrow 0.64% per day
- Leak rate 26% from 01/05/2022 to 02/04/2022 \Rightarrow 0.87% per day
- Leak rate increases with time

Slow Control Status



Shift Crew GUI

Expert GUI for MPOD

Expert GUI for Cooling

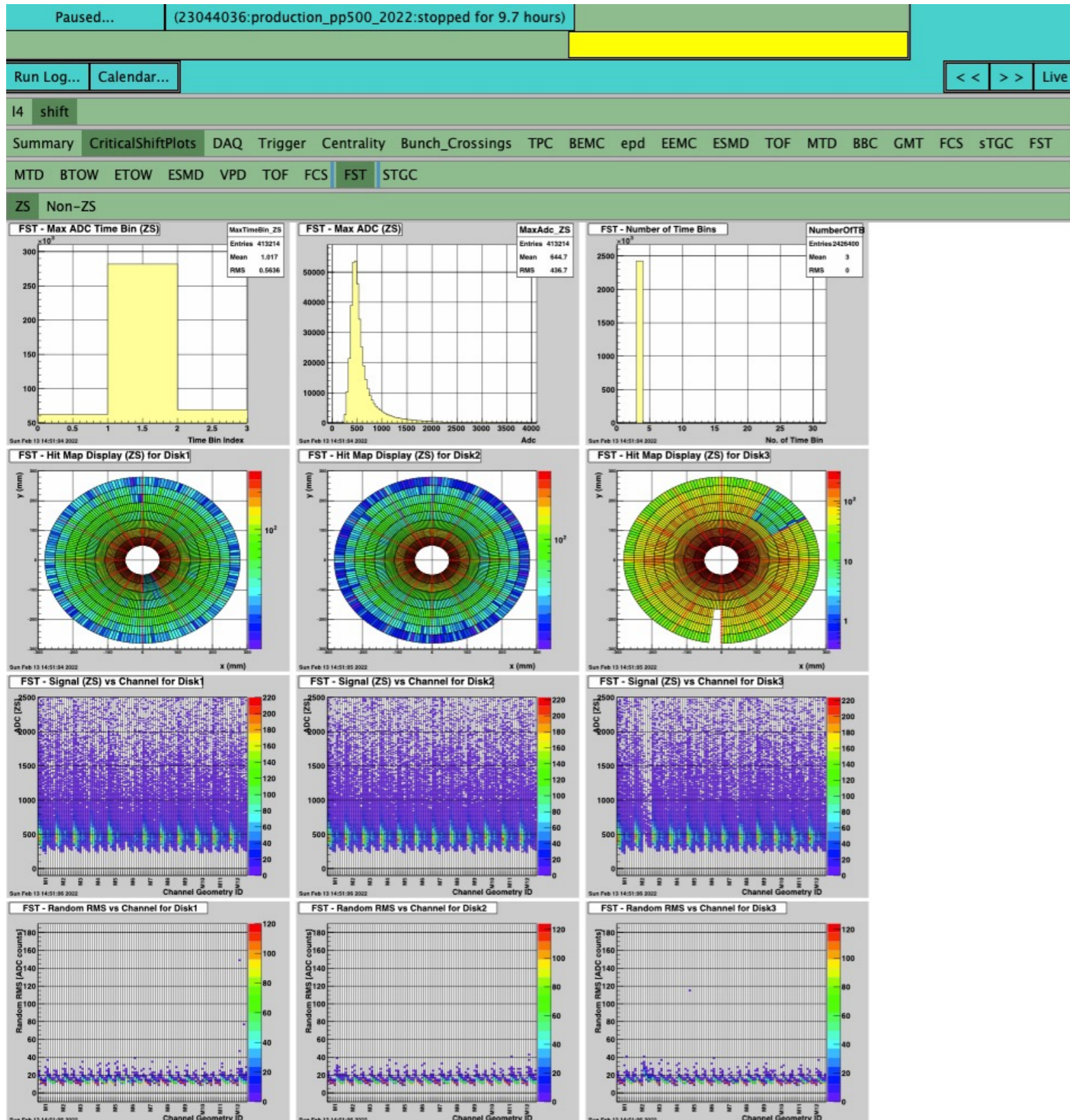
The Shift Crew GUI (FstShiftCrew.adl) features a blue background with several key elements: a 'Turn-ON' button in a cyan box, a 'Turn-OFF' button in a red box, and a 'ShutDown' button in a yellow box. A 'Status Flag' section shows 'FST IS OFF' in red text. A 'Failure Codes' section is currently empty. A small image of the detector is visible in the top right corner.

The Expert GUI for MPOD (FstPowerSupply.adl) displays three identical control panels for Crate 1, 2, and 3. Each panel includes a 'Main Switch for Crate' (00), a 'Status Overview' (c1, c2, c3) with an 'OFF' button highlighted in red, and 'Standby' and 'Physics' buttons. Below each main switch are 'Mpod' (MpodC1, MpodC2, MpodC3) and 'hv_Crate' (hv_Crate_1_Bias_0_1_2, hv_Crate_2_Bias_0_1_2, hv_Crate_3_Bias_0_1_2) controls, along with three 'Ramp Controls' buttons.

The Expert GUI for Cooling (FST.adl) provides detailed monitoring of the FST Cooling System. It includes a 'Chiller' control section with a 'Setpoint' of 22.2 degC and 'Outlet Temp' of 22.20 degC. A 'Reservoir' section shows a level of 45.58% and a temperature of 23.24 degC. A 'Pressure (psig)' section displays values for Pump Suction (10.91), Pump Discharge (32.76), HX Inlet (32.19), Main Supply (18.90), and Main Return (13.49). A 'Flow (l/min)' section shows Supply (7.17) and Return (6.10). An 'Interlocks' section on the right shows various status indicators (Sum, Res. Level, Supply Flow, Return Flow, Sensor Power, Coolant Temp, Fan Power) with green bars indicating they are active.

- Alarm on module status (HV & current) and fee temperature
- Interlock with cooling crate
- FST slow control has been operating smoothly by DO

Online Plots Status



- Critical reference plot could be found:

<https://drupal.star.bnl.gov/STAR/content/reference-plots-and-instructions-shift-crew-current-official-version>

Online ZS Status



1. pedestal run \leq no beam
 - calculate pedestal, total noise, random noise and common mode noise
 - once per day

2. physicsrun \leq with beam
 - read in pedestal file generate in step one
 - calculate event-by-event CMN
 - zero-suppression:
 - seed hits: $[\text{adc} - \text{pedestal} - \text{cmn} > 4 * \text{random noise}]$ in two time bins
 - recovery hits: $[\text{adc} - \text{pedestal} - \text{cmn} > 2.5 * \text{random noise}]$ in two time bins
OR $[\text{adc} - \text{pedestal} - \text{cmn} > 3.5 * \text{random noise}]$ in one time bin
 - ZS has been working fine since the start of the run & each stored hit has a flag to indicate the Seed/Recovery type
 - ~ 107 raw hits (36 seed hits) per event

Spares Status



- FST module: 12 uninstalled modules & locate in Flemming's lab
 - 3 modules with broken cooling tube (connector fall off from the tube)
 - 1 module with major cooling leak
 - 1 module with broken outer sensor
 - 7 module with high current
- ABC board: 2 (good) in FST cabinet & 2 (new) with Mike & 4 (bad)
- ARC board: 0 in FST cabinet
- ARM board: 15 (7 time bin) in FST cabinet
- PPB board: 6 (good) & 3 (bad) & 1 (prototype) and 2 (unknown) in FST cabinet
- ISEG HV module: 2 have issues, 2 (unknown)
- Inner HV cable: 7 (good) in FST cabinet
- Purple cable: 1 (long good) in FST cabinet, Mike plans to make 11 more cables (5 long + 6 short)
- Gray cable: 6 (good) laid on STAR platform
- All information could be found:
<https://drive.google.com/drive/folders/1S92LJhO1HC7QaZ0CTfoSUaK0cVtBnJtg?usp=sharing>

Plan for Shutdown



- Cooling system maintenance => fix leaks in the rack, replace filters, etc.
- Check and replace high temperature PPB for module D3-M11
- Check D1-M12 with fluctuating HV current (might due to grey cable)
- Replace D1-M6 and D3-M2 with high HV currents? => major operation
- Replace soft cooling hose on the detector? => major operation
- Major operation will require to remove FST from STAR and few months of working time in the clean room
- All works, except cooling system maintenance, require sTGC to be removed