MINERvA Detector Status, Operations, Experience and Plans

Nuruzzaman

Rutgers University

17 October 2016

Charge Questions

1. (a) A description of operations tasks and how they will be covered

1. (b) ES&H activities and how they will be managed

1. (c) Organization charts showing the management structure for the experiment and how it interfaces with the laboratory

1. (e) A list of the identified resources available

Outline

◆ **Current Status of the DAQ and Detector**

◆ **Firmware Upgrades and Test Stands**

◆ **Spare Hardware Components**

◆ **Shift Plans**

◆ **Expert Situation and Lab Resources**

DAQ and Detector Status FY16

MINERvA DAQ Clock Livetime

Avg. 02/09-07/31 = 98.4%
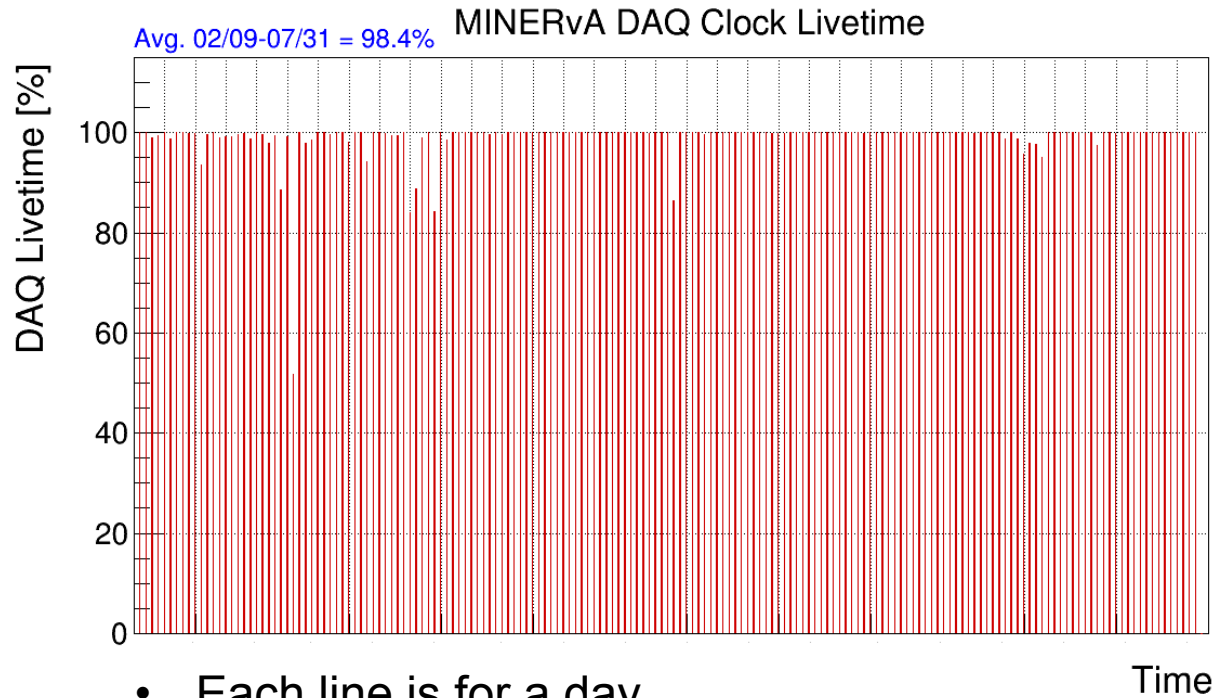
- Each line is for a day
- Just shows if the DAQ is on or off

DAQ has been running quietly for last 1 year

FY16: 23 Oct 2015 - Jul 29 2016
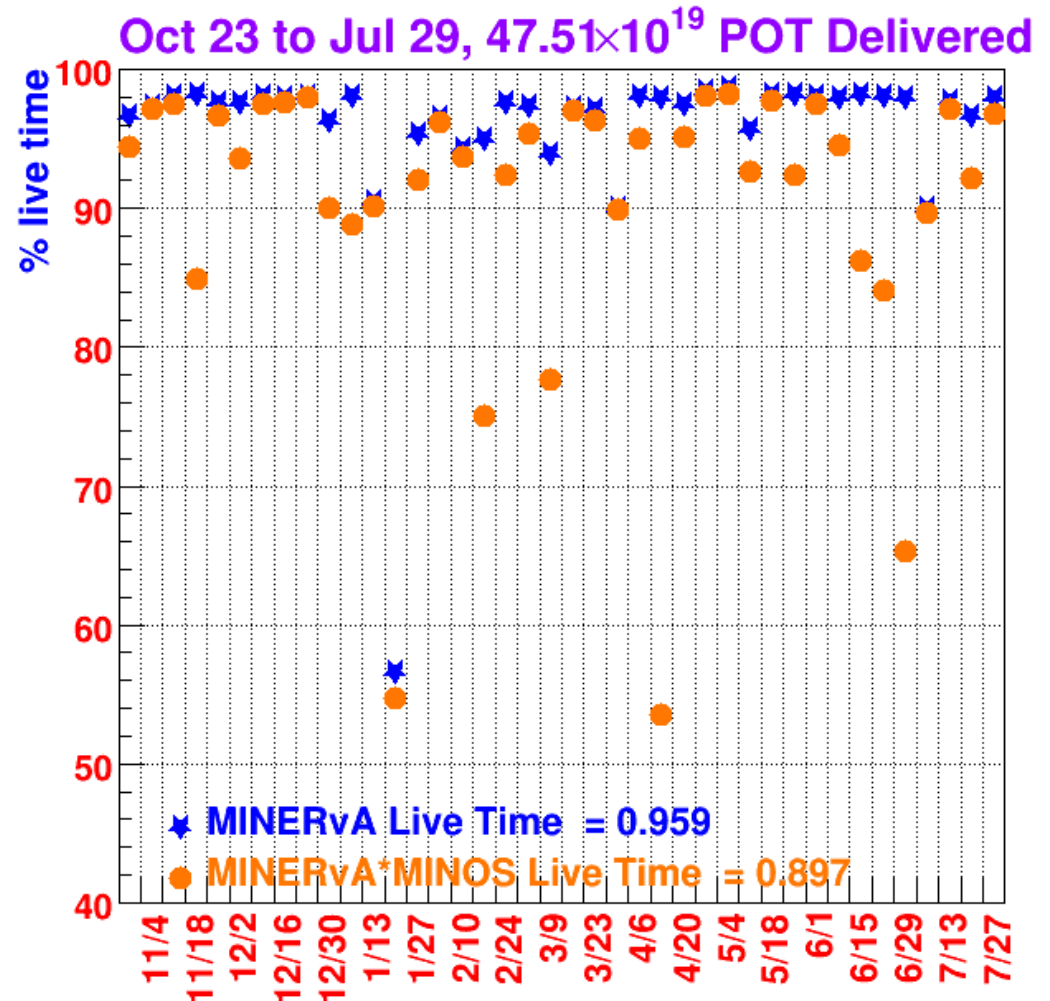
MINERvA and MINOS Livetime

FY16

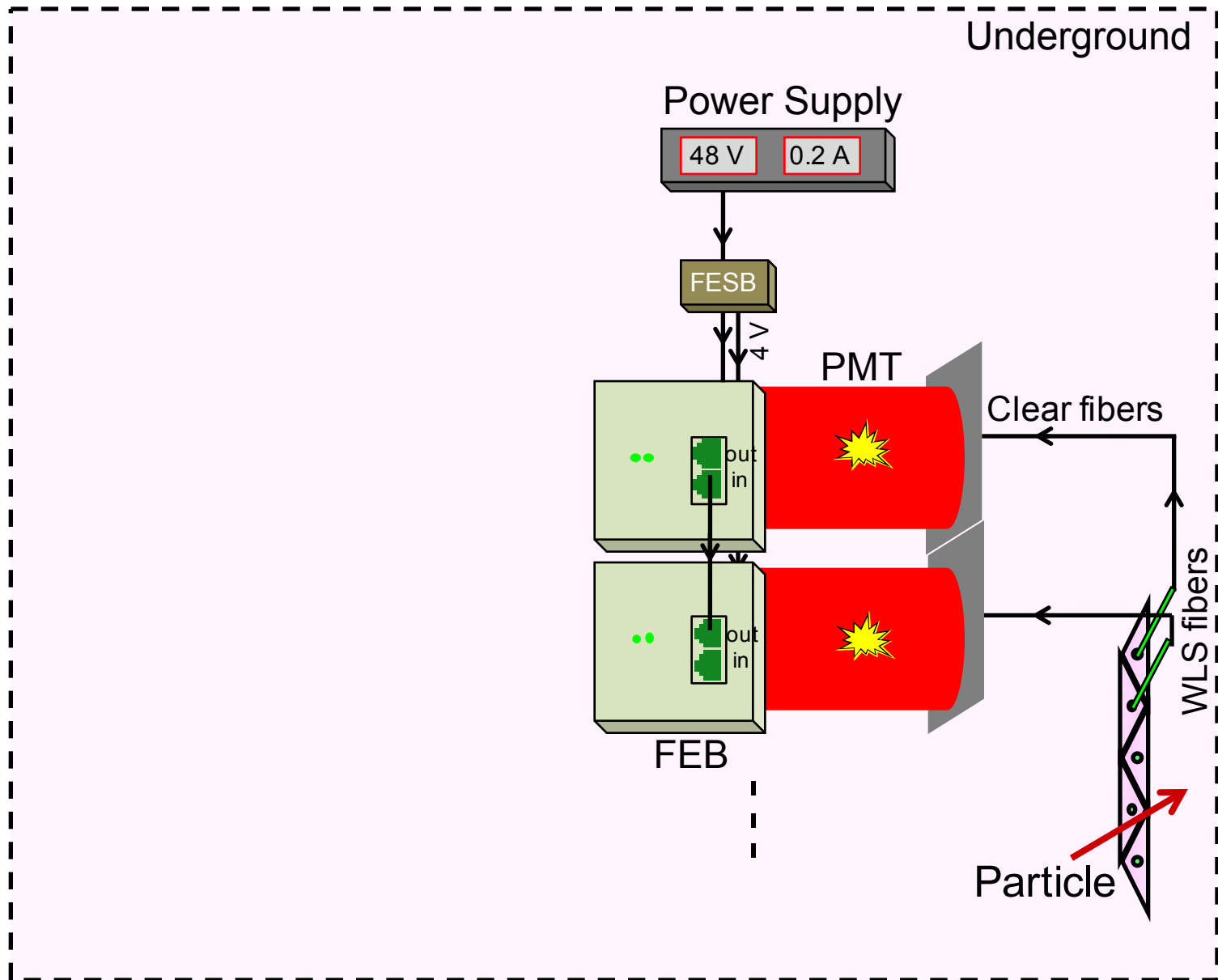- ❑ Oct 23 2015 – Jul 29 2016
- ★ MINERvA 95.9%
- • MINERvA*MINOS 89.7%

Medium Energy Run

- ❑ Sep 9 2013 – Jul 29 2016 Live time for ME run
- ★ MINERvA 97.0%
- • MINERvA*MINOS 93.2%

Oct 23 to Jul 29, 47.51×10^{19} POT Delivered

★ MINERvA Live Time = 0.959
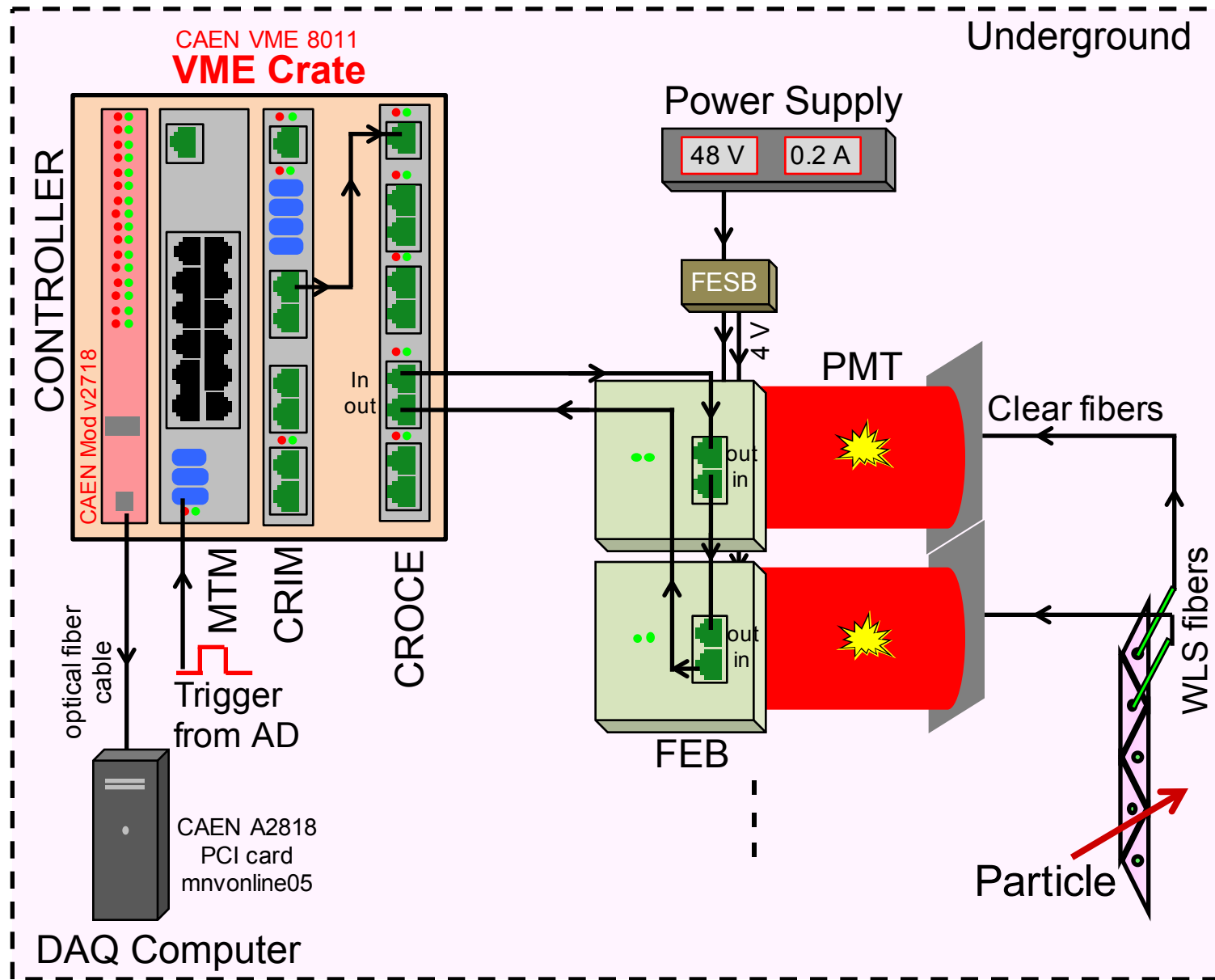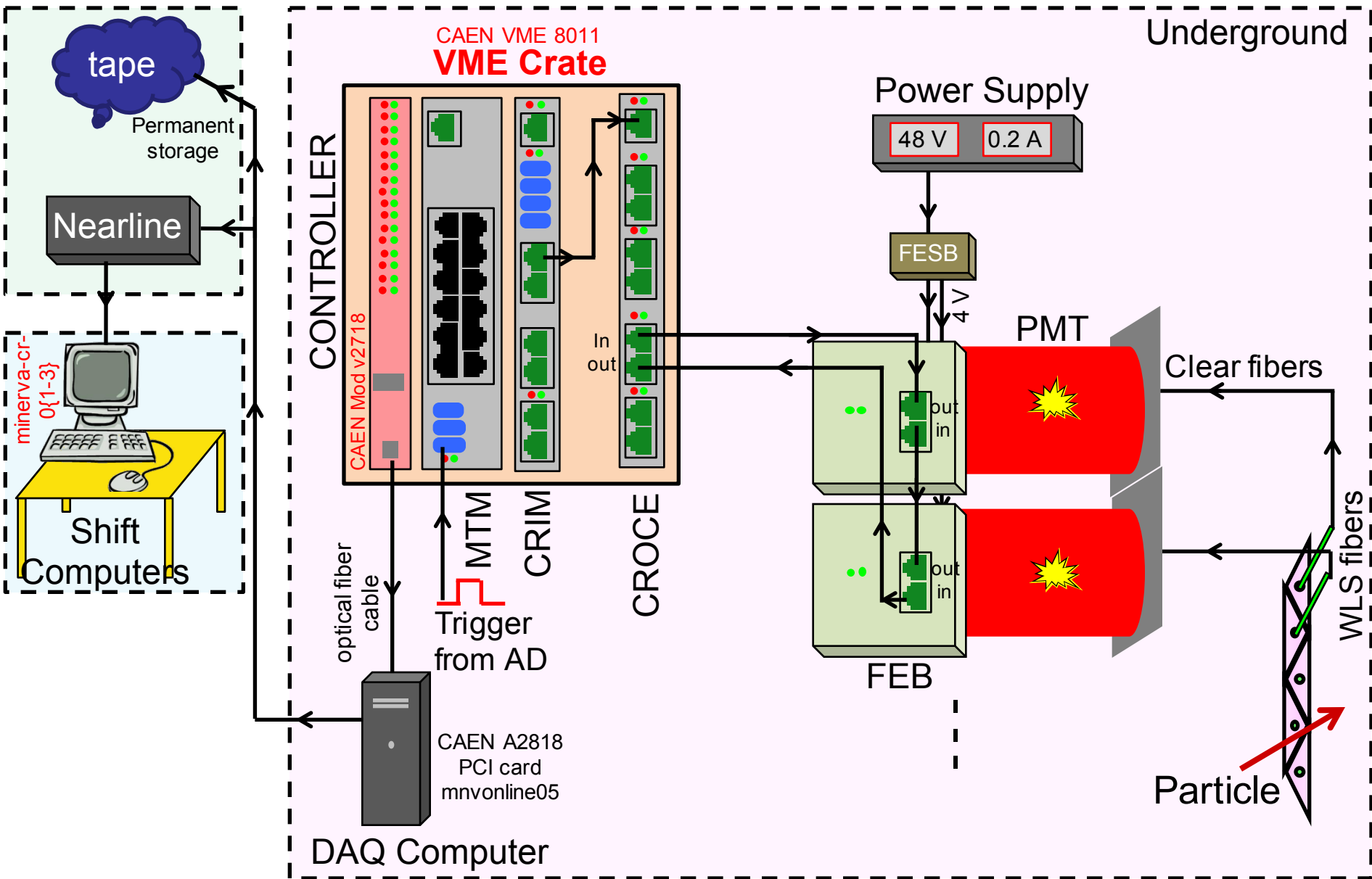● MINERvA*MINOS Live Time = 0.897

FY16: 23 Oct 2015 - Jul 29 2016

MINERvA Operation Schematic

MINERvA Operation Schematic

MINERvA Operation Schematic

DAQ and Detector Issues FY16

Power Outages

❑ 6 power outages: 2 unplanned and 4 planned
  ▪ It takes several hours to recover from planned power outages

System Reboot

❑ 6 times turned off and on the entire detector
  ▪ It takes ~1 hour to turn off the detector and takes several hours to turn on

Major Issues

❑ One of the power outage during Jan 2016 affected our system communication and had to replace 3 CROCEs
  ▪ There was a short in 2 of the power leads in the shaft to the MINOS Hall near our detector
  ▪ Received great help from Paul Rubinov, and Cristian Gingu [PPD]

DAQ and Detector Issues FY16

Standard Issues

❑ PMT and FEB replacements

- There are detector safety issues for PMT replacements and need 2 people to work on the task. We would like one more person to learn how to do the PMT replacement.
- Current personal: Steve Chappa and Roberto Davila [PPD]

❑ Water and He target fillings

- Water target is filled and the water level is checked weekly
- He target will be filled this week or early next week

Proton On Target

Collected Data

Thanks to Accelerator Division!
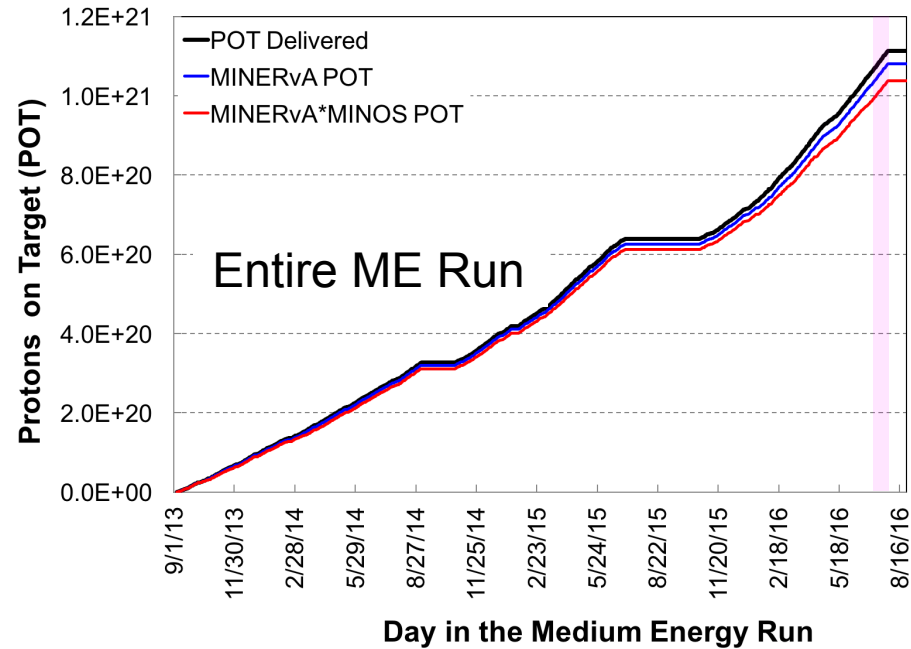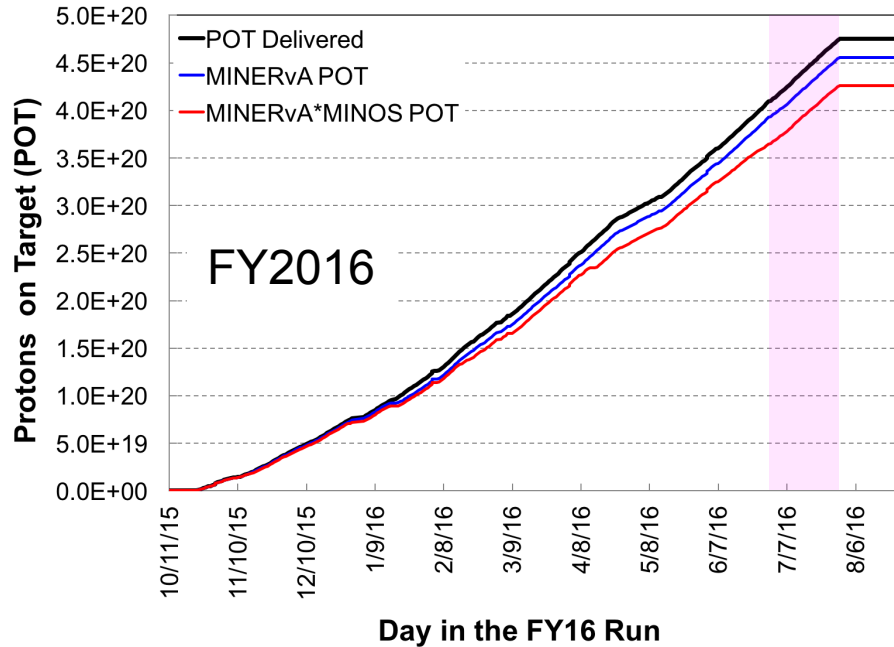
FY16

- **Neutrino:** 23 Oct 2015 – 29 Jun 2016 = 3.65×10^{20}
- **Anti-neutrino:** 29 Jun 2016 – 29 Jul 2016 = 0.65×10^{20}

Medium Energy Run

- **Neutrino:** 6 Sep 2013 – 29 Jun 2016 = 10.48×10^{20}
- **Anti-neutrino:** 29 Jun 2016 – 29 Jul 2016 = 0.65×10^{20}

What are our plans for the operations?

Nuruzzaman, MINERvA Operations Review

Firmware Update

Current FEB Firmware

- FEB firmware v95 was installed on MD
- TriPs have a push operation when they are storing charge. In v95 TriPs are pushed in pair.
- They are dead when they do that

Next Firmware Version

- In v97 we can push 1 TriP instead of TriP pair and is necessary for high intensity ME beam to reduce dead-time
- Improve detector stability
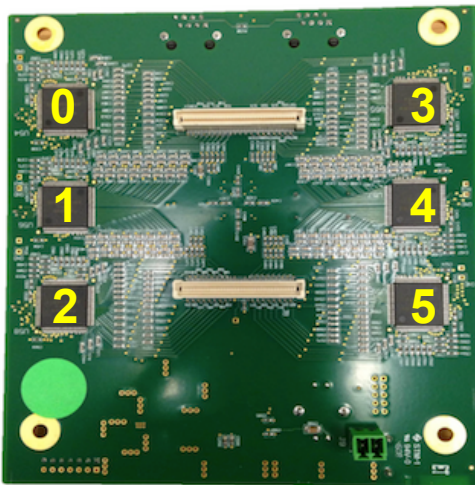
The new firmware is already written by Cristian Gingu, and Paul Rubinov [PPD]
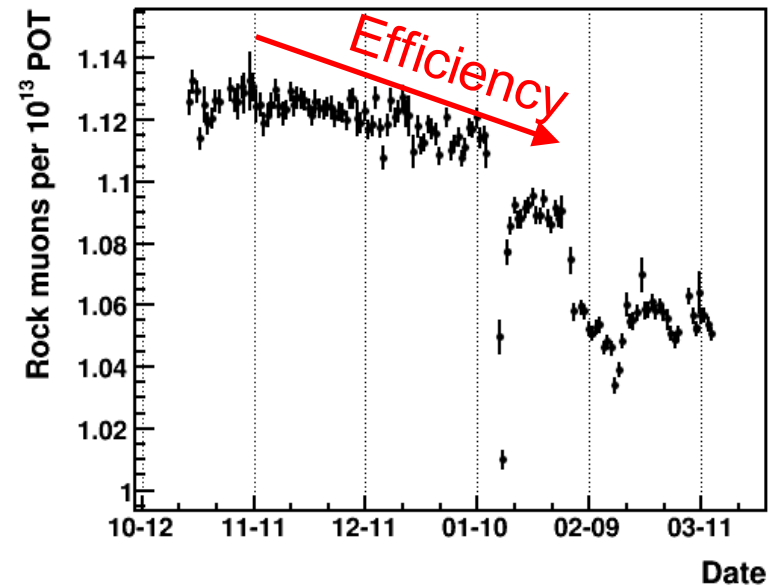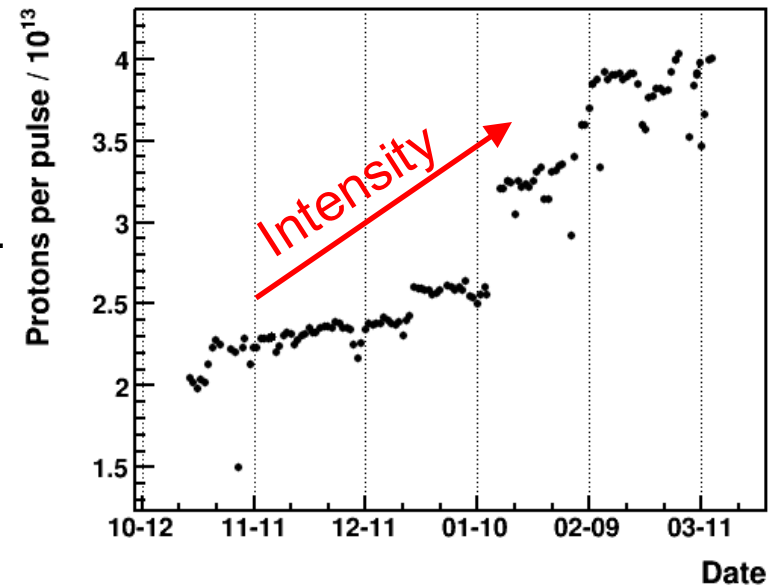
Plan for FEB Firmware

v97 Firmware Test

- ✓ We thoroughly tested FEB and CROCE firmware at test stands. The collected test stand data looked good

Near-term Plan for v97

- ✧ We already installed CROCE firmware last week. The installation took a day, after few hiccups the DAQ and detector recovered and we took data.
- ✧ The FEB firmware v97 installation process is ongoing on underground detector and most likely the system will be back today.
- ✧ The DAQ has been modified for v97.
- ✧ Need to update to newrline software for the new firmware. Also need to change configuration file. The resources has been identified within the group to complete it before comes back.

- ✧ We are not expecting any major firmware upgrade for next few years

WH 14th Floor Test Stand

WH 14th floor test stand

- Two crates: One is used by Christian Gingu and Paul Rubinov [PPD] for firmware development and CROCE testing. We are using the other crate for testing firmware and unpacking
  - Assembled simplest MINERvA detector system with 1 FEB, 1 CROCE, 1 CRIM, and 1 PMT
- Tested the CROCE and FEB firmware thoroughly
- Modified the DAQ software for the new firmware and tested using this setup
- Used the setup to modify and test the data unpacking software for new firmware. Great help from Donatella Torretta [PPD]

Lab-F Test Stand Status

Lab-F Test Stand

✧ Lab-G apparatus was moved to Lab-F. Great help from Lab.

✧ Test beam was disassembled during Jan 2016

✧ We stored all the components from TB and Lab-G and setup a test stand

✧ Started with small number of chains and gradually increased the size

Lab-F test stand

✧ Test stand work summary:
  ✓ Tested new spare CROCEs and they worked fine
  ✓ The setup, which resembles underground DAQ and detector, is working and connected for testing v97. It consists of 1 crate, 2 CROCEs, 4 chains. Installed v97 and related firmware at Lab-F and taking data for last two weeks

  ▪ Will continue to use the test stand to test spare hardware components

What is our spare hardware situation?

Spare Hardware Components

Hardware	CROCE	CRIM	MTM
In Use On MD	15	4	1
Spare	20	5	2
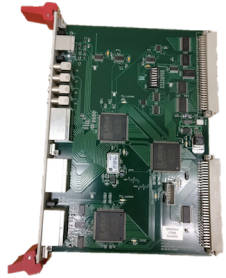
CROC Interface Module (CRIM)
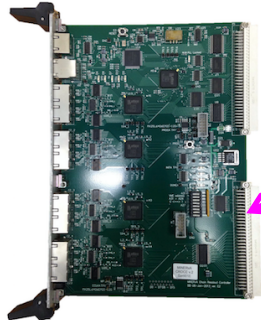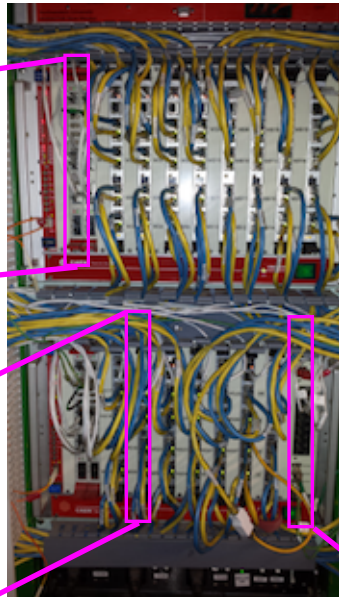
Chain ReadOut Controller with Ethernet interface (CROCE)

Master Timing Module (MTM)

Spare Hardware Components

Hardware	CROCE	CRIM	MTM	FEB	PMT	FESB
In Use On MD	15	4	1	507+2*	507+24*	60
Spare	20	5	2	106+2*	43+12*	5

* Represents VETO
- Single channel PMTs
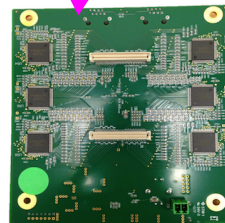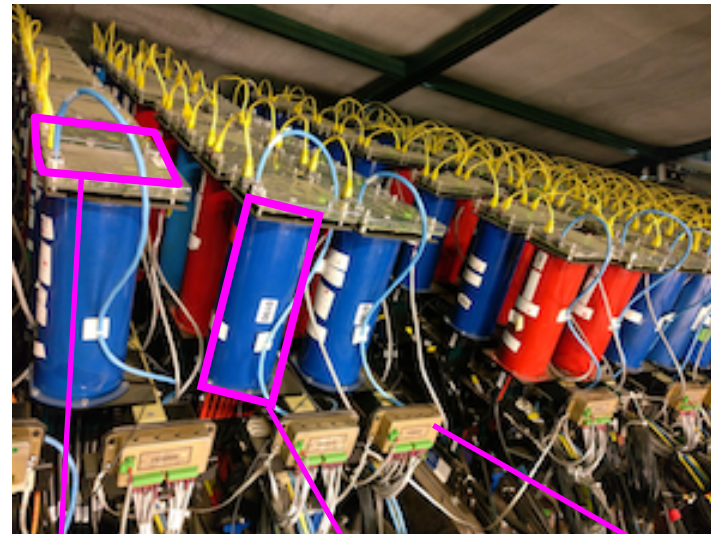
Front End
Board (FEB)

Photo Multiplier
Tubes (PMT)

Front End
Support
Board (FESB)

Spare Hardware Components

Hardware	CROCE	CRIM	MTM	FEB	PMT	FESB	DAQ Computer
In Use On MD	15	4	1	507+2*	507+24*	60	1
Spare	20	5	2	106+2*	43+12*	5	1+

* Represents VETO
- Single channel PMTs

FY16 Hardware Replacements

Replaced PMTs

  ❑ 5 PMTs were replaced: 4 PMT's were replaced during the shutdown

Replaced FEBs

  ❑ 24 FEBs were replaced: over half of the FEBs can be reused

Replaced CROCEs

  ❑ 3 CROCEs were replaced

Replaced FESB

  ❑ 1 FESB was replaced during FY16 (total 2 in last 4-5 years)

  ✓ We have lots of spares partially because of the test stands
  ✓ We have sufficient spares to run the experiment for another 8 years, the first thing we'll run out of is PMT's

What are we doing for the future shifts?

Tool Developments

New Developments

- **<u>DAQ Watchdog:</u>** Notify experts for any MINERvA and MINOS DAQ failure during beam

  - ✓ Send page to Expert Shifter (ES), Howard and Nur

  Thanks Bill Badgett [Neutrino Division]

Tool Developments

New Developments

- **DAQ Watchdog:** Notify experts for any DAQ failure during beam

- **Automated Processes:** Shift summary plots, start run series form,... etc.

  - ✓ Generated automatically 1 hour before the shift ends and uploaded to the website

  - ✓ Key plots are also submitted automatically to ECL for shifter feedback

  - ✓ Submit start run series form to ECL after 10 minuets of a run starts

Tool Developments

New Developments

- **DAQ Watchdog:** Notify experts for any DAQ failure during beam
- **Automated Processes:** Shift summary plots, start run series form,… etc.
- **Automated Processes Monitoring:** Monitor all the automated processes such as any skipped runs, VNC servers, etc. and notify experts for failure

  ✓ Checks every 5 minutes and page
  ES and Nur for any failure

Tool Developments

New Developments

- **<u>DAQ Watchdog:</u>** Notify experts for any DAQ failure during beam
- **<u>Automated Processes</u>:** Shift summary plots, start run series form,… etc.
- **<u>Automated Processes Monitoring:</u>** Monitor all the automated processes such as any skipped runs, VNC servers, etc. and notify experts for failure
- **<u>Nearline Failure Monitoring:</u>** Check online monitoring plots with reference and notify experts in case there are issues with data

  ✓ Notifies experts if there is beam and key plots are giving indication of hardware failure

  ✓ Tested briefly but not implemented yet, will implement towards the end of shutdown

Dead Boards Map (Crate 0)   Dead Boards Map (Crate 1)

Number of Numi Beam Gates = 750
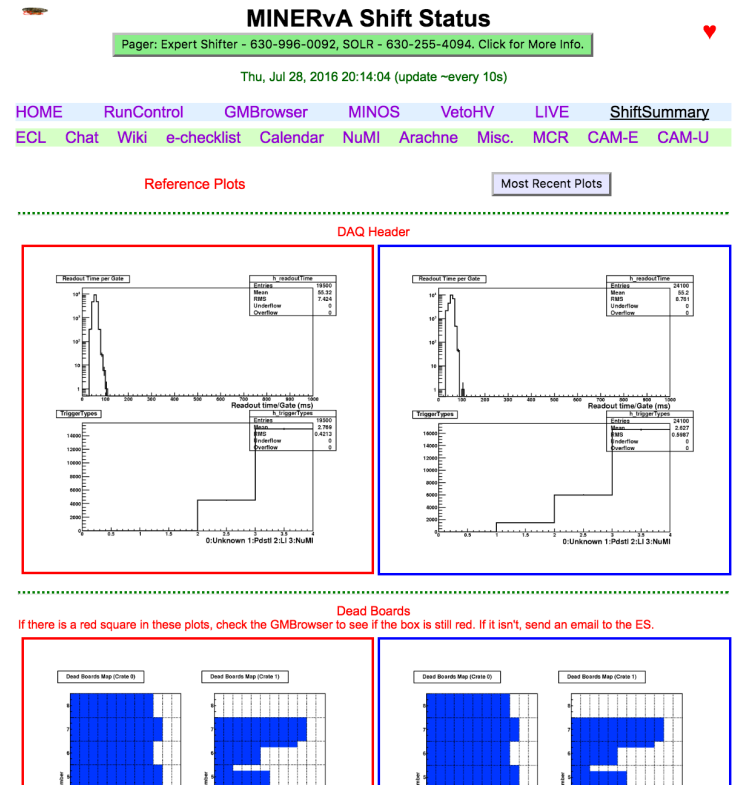Number of Light Injection Gates = 0

Tool Developments

New Developments

- **DAQ Watchdog:** Notify experts for any DAQ failure during beam

- **Automated Processes:** Shift summary plots, start run series form,… etc.

- **Automated Processes Monitoring:** Monitor all the automated processes such as any skipped runs, VNC servers, etc. and notify experts for failure

- **Nearline Failure Monitoring:** Check online monitoring plots with reference and notify experts in case there are issues with data

- **VNC Servers for Remote Shift:** Let UROCs connect to Fermilab server securely and without any local software maintenance

  - ✓ Securely connects to all the control servers using SSH tunnel
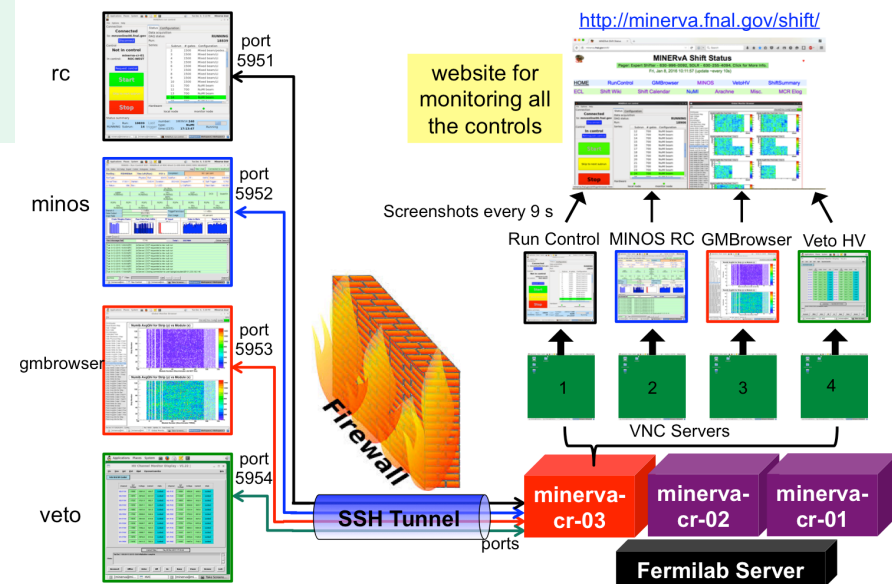
UROC Status

New Shift Software Infrastructure

Based on VNC, ssh, and shell scripts

Pros
- Secure connection
- Easy access to the servers without any specific UROC hardware or software configuration
- Reduces the expense to build a new UROC
- Share screen with experts
- No need of local software update
- …

Cons
- May slow down the rendering for more than 4 connections

Oregon UROC

Current Status and Plan

List of UROCs:

Configured, tested and used for shifts

✓ Duluth	✓ Rochester
✓ Oregon	✓ Tufts (2)
✓ Otterbein	✓ Wheaton
✓ Pittsburgh	✓ William & Mary
✓ PUCP, Peru	
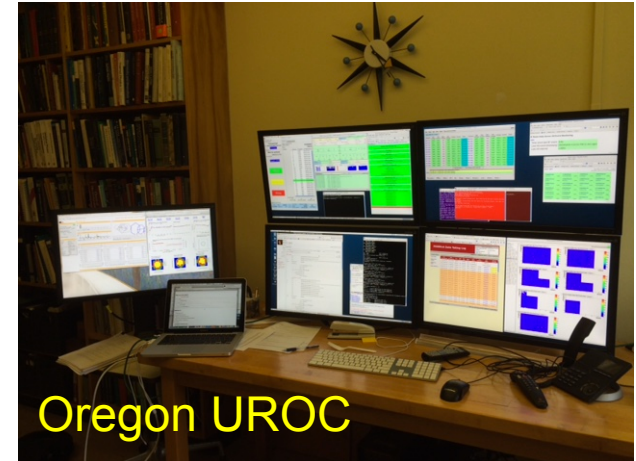
Work in progress
- USM, Chile
- ○ Oxford, UK
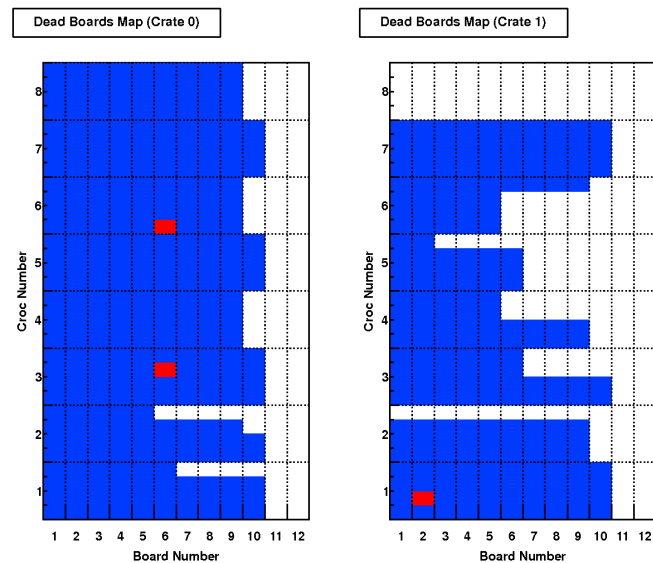- ○ Rochester (A. McGowan)

Future UROCs
- ○ UNI, Peru

Tool Developments

New Developments

- **DAQ Watchdog:** Notify experts for any DAQ failure during beam

- **Automated Processes:** Shift summary plots, start run series form,… etc.

- **Automated Processes Monitoring:** Monitor all the automated processes such as any skipped runs, VNC servers for UROCs, etc. and notify experts for failure

- **Nearline Failure Monitoring:** Check online monitoring plots with reference and notify experts in case there are issues with data

- **VNC Servers for Remote Shift:** Let UROCs connect to Fermilab server securely and without any local software maintenance

- **Web Infrastructure:** Monitor all the operations controls, easy access to log files, produce plots for DAQ clock live-time

  ✓ Shows the status of the controls: Run Control, GBBrowser, MINOS RC, VETO HV and updates every 10 s

  ✓ Web access to most recent DAQ, nearline log files

http://minerva-exp.fnal.gov/shift/

Tool Developments

New Developments

- **DAQ Watchdog:** Notify experts for any DAQ failure during beam

- **Automated Processes:** Shift summary plots, start run series form,… etc.

- **Automated Processes Monitoring:** Monitor all the automated processes such as any skipped runs, VNC servers for UROCs, etc. and notify experts for failure

- **Nearline Failure Monitoring:** Check online monitoring plots with reference and notify experts in case there are issues with data

- **VNC Servers for Remote Shift:** Let UROCs connect to Fermilab server securely and without any local software maintenance

- **Web Infrastructure:** Monitor all the operations controls, easy access to log files, produce plots for DAQ clock live-time

- **Easy Access to Experts:** Talk, chat or video conference with experts

  - ✓ Shifters can connect to ROC west using multipoint Polycom connection
  - ✓ Chat with experts for providing more details about any failure

Multipoint Polycom

http://minerva-exp.fnal.gov/shift/

Shift Details

Day								Evening								Owl							
7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	0	1	2	3	4	5	6

7:00 am   3:00 pm   11:00 pm   7:00 am

Time zone: CDT

7:00 am - 3:00 pm	**8h**	3:00 - 11:00 pm	**8h**	11:00 pm - 7:00 am	**8h**

Shift Details

Day	Evening	Owl

| 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 0 | 1 | 2 | 3 | 4 | 5 | 6 |

7:00 am   3:00 pm   11:00 pm   7:00 am

Time zone: CDT

| 7:00 am - 3:00 pm **8h** | 3:00 - 11:00 pm **8h** | 11:00 pm - 7:00 am **8h** |

At ROC West or UROC
- complete all checklists - ensures good data quality for MINERvA and MINOS
- monitor everything - DAQ is running and taking data
- contact experts for any failure - fix issues for continuous data collection
- Call MCR - to provide current shifter information
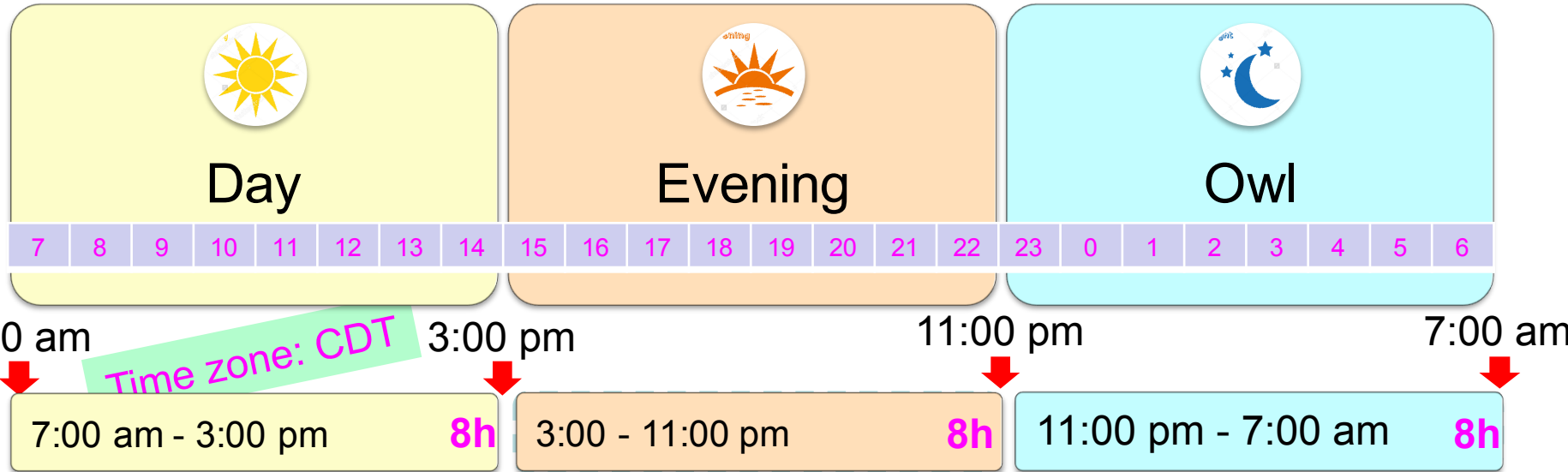
ROC West

Shift Details

Day	Evening	Owl
7 8 9 10 11 12 13 14	15 16 17 18 19 20 21 22	23 0 1 2 3 4 5 6

7:00 am   3:00 pm   11:00 pm   7:00 am

Time zone: CDT

| 7:00 am - 3:00 pm **8h** | 3:00 - 11:00 pm **8h** | 11:00 pm - 7:00 am **8h** |

At ROC West or UROC
- complete all checklists
- monitor everything
- contact experts for any failure
- Call MCR

Weekly Shifts

ES: Fix any detector issues for continuous data collection.
SOLR: Fill shift for emergency and 2nd buddy for ES's underground access

Current Shift Details
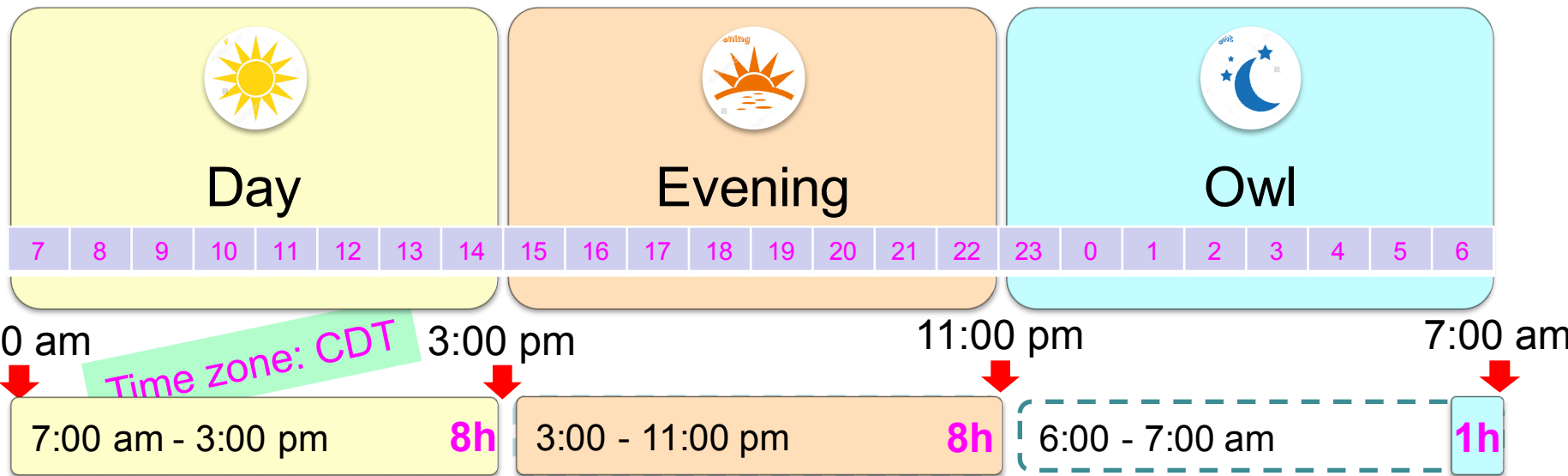
Day	Evening	Owl
7 8 9 10 11 12 13 14	15 16 17 18 19 20 21 22	23 0 1 2 3 4 5 6

7:00 am   *Time zone: CDT*   3:00 pm   11:00 pm   7:00 am

7:00 am - 3:00 pm	**8h**	3:00 - 11:00 pm	**8h**	6:00 - 7:00 am	**1h**

7h

At ROC West or UROC
- complete all checklists
- monitor everything
- contact experts for any failure
- Call MCR

From anywhere
- complete all checklists
- experts were automatically notified in case of failure

We lost 3 hours of beam once because of a watchdog failure that we hadn't anticipated during last 6 months

Weekly Shifts

ES: Fix any detector issues for continuous data collection.
SOLR: Fill shift for emergency and 2nd buddy for ES's underground access

New Shift Plan
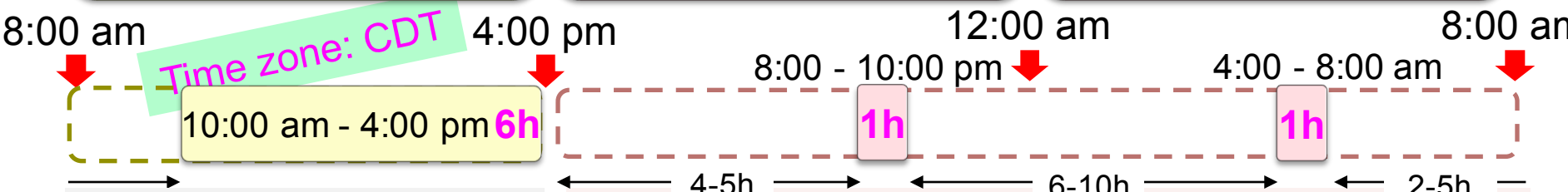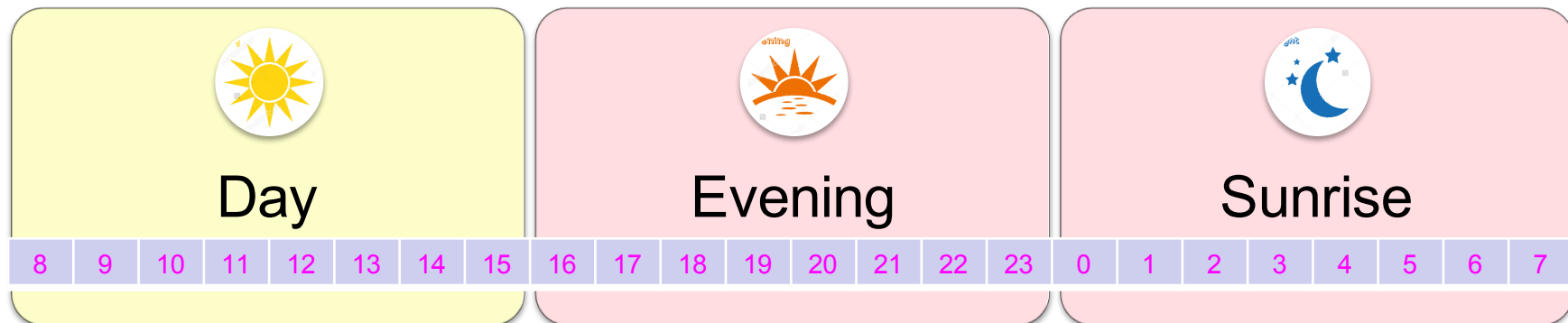
Day	Evening	Sunrise

| 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

8:00 am   4:00 pm   12:00 am   8:00 am

Time zone: CDT

10:00 am - 4:00 pm **6h**

8:00 - 10:00 pm **1h**

4:00 - 8:00 am **1h**

4-5h   6-10h   2-5h

At ROC West or UROC
- complete all checklists
- monitor everything
- contact experts for any failure

From anywhere
- complete all checklists twice within the time blocks 8:00-10:00 pm and 4:00-8:00 am
- experts will be automatically notified in case of failure

- ES pager will be the contact for MCR along with backup numbers

Will be effective after shutdown

Weekly Shifts

ES: Fix any detector issues for continuous data collection.
SOS: 2nd buddy for ES's underground access

What are the Benefits?

Day								Evening								Sunrise							
8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	0	1	2	3	4	5	6	7

8:00 am   Time zone: CDT   4:00 pm   12:00 am   8:00 am

10:00 am - 4:00 pm **6h**   8:00 - 10:00 pm **1h**   4:00 - 8:00 am **1h**

4-5h   6-10h   2-5h
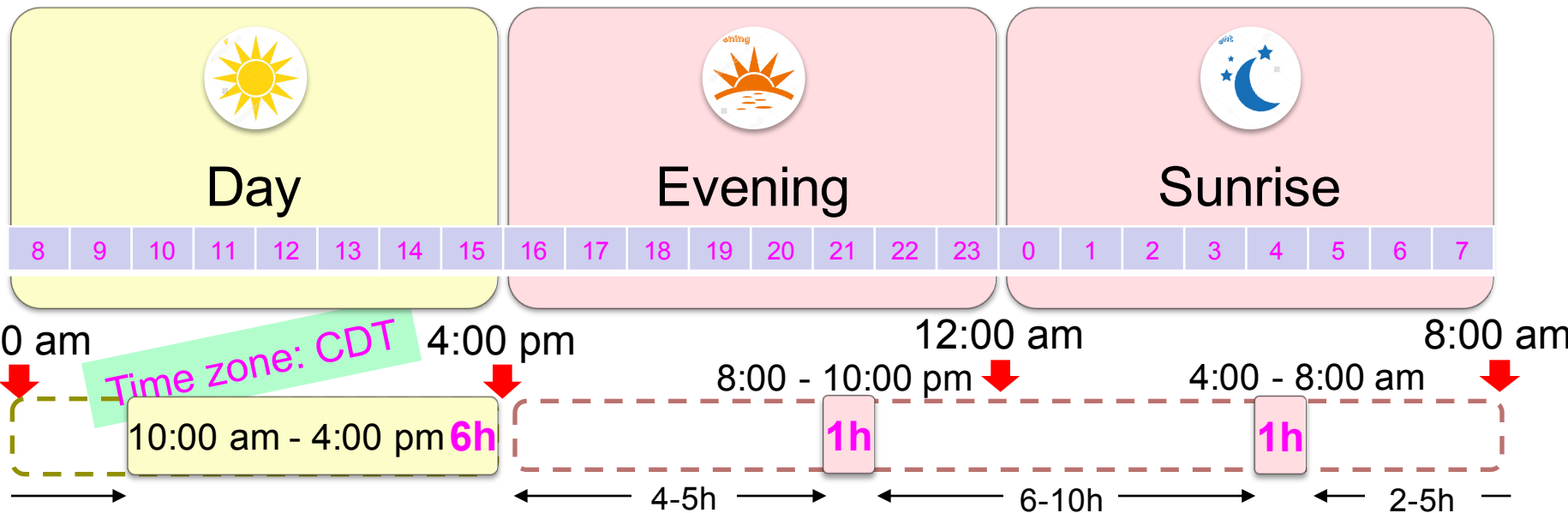
- The manpower needed for shift with the new plan will reduce to 1/3rd (spend 8h out of 24h)

- Anyone will be able to complete checklist (evening/sunrise) shifts without any UROC or ROC West access

- People can spend travel funds on meeting with collaborators, and not on taking shifts

- Collaborators with time constraint will be able to take shifts

- More effort can be put into MINOS detector operations and data quality monitoring

How is the expert situation in MINERvA?

ES&H

- ES&H activities and how they will be managed?
  - ES&H procedures are covered in the underground training that every ES and local shifter receives
  - MINERvA detector uses <50V, so no special electrical training required

Experts and Lab Resources

MINERvA Experts

▪ **Expert Shifter:** 6 expert shifters and 2 new students are training

Existing

– Alejandro Ramírez [U. of Guanajuato, Mexico]
– Marianette Wospakrik [U. of Florida]
– Mateus Carneiro [Oregon S.U]
– Rob Fine [U. of Rochester]
– Roger Galindo [U. of Santa María, Chile]
– Nuruzzaman [Rutgers U.]

Training Now

o Gonzalo Diaz [U. of Rochester]
o Mehreen Sultana [U. of Rochester]

ES changes weekly

• Run Coordinator - Howard Budd [U. of Rochester]

• Nearline Expert - Bárbara Yaeggy [U. of Santa María, Chile], Ozgur Altinok [Tufts U.]

• DAQ Expert - Nuruzzaman [Rutgers U.]

• UROC Development and Co-ordination - Nuruzzaman [Rutgers U.]

• Run Control Expert - Jeffrey Kleykamp [U. of Rochester]

• ROCK Muon Monitoring - Roger Galindo [U. of Santa María, Chile]

✓ Responsible for tackling any issues with MINERvA and MINOS data collection and monitoring

Experts and Lab Resources

Computer System Management

- **Expert Shifter:** 6 expert shifters and 2 new students are training

- **Scientific Computing Division (SCD) - Slam Group:** Bonnie King, Patrick Riehecky, Scott Reid, Kevin Hill, Rennie Scott
  - ✓ System admin for MINERvA DAQ production, integration and test stand computers
  - ✓ Provide support for Fermilab OS and software updates
  - o 1-2 FTE weeks

Experts and Lab Resources

Firmware Update and MINOS Operations Support

- **Expert Shifter:** 6 expert shifters and 2 new students are training

- **Scientific Computing Division (SCD) - Slam Group:** Bonnie King, Patrick Riehecky, Scott Reid, Kevin Hill, Rennie Scott

- **Neutrino Division:** Steve Hahn, Donatella Torretta, Geoff Savage, Bill Badgett, Carrie McGivern, Linda Bagby

  - ✓ DAQ operations and firmware upgrade help
  - ✓ MINOS operations support and training MINERvA experts on maintenance that has to happen on a regular basis
  - o Lab personnel spent about 30 FTE-weeks/year, with MINERvA experts taking over all routine issues expect it to reduce to ~10 FTE-weeks/year

Experts and Lab Resources

New Firmware Upgrade

- **Expert Shifter:** 6 expert shifters and 2 new students are training

- **Scientific Computing Division (SCD) - Slam Group:** Bonnie King, Patrick Riehecky, Scott Reid, Kevin Hill, Rennie Scott
- **Neutrino Division:** Steve Hahn, Donatella Torretta, Geoff Savage, Bill Badgett, Carrie McGivern, Linda Bagby
- **Particle Physics Division (PPD) - Electrical Engineering Division (EED) - Detector Electronics:** Paul Rubinov, Cristian Gingu
  - ✓ Write new firmware based on our needs
  - ✓ Also help with critical hardware failures
  - o 1-2 FTE weeks

Experts and Lab Resources

Hardware Replacement

- **Expert Shifter:** 6 expert shifters and 2 new students are training

- **Scientific Computing Division (SCD) - Slam Group:** Bonnie King, Patrick Riehecky, Scott Reid, Kevin Hill, Rennie Scott
- **Neutrino Division:** Steve Hahn, Donatella Torretta, Geoff Savage, Bill Badgett, Carrie McGivern, Linda Bagby
- **Particle Physics Division (PPD) - Electrical Engineering Division (EED) - Detector Electronics:** Paul Rubinov, Cristian Gingu
- **PPD - EED - Infrastructure & Support:** Steve Chappa and Roberto Davila
  - ✓ Replace PMTs and FEBs on the detector
  - ✓ Help with hardware debugging by changing chain connection upon request
  - o 2 FTE-days*6x/year: 2.5 FTE-weeks
  - ➢ There are detector safety issues associated with PMT replacements. Need 2 people to work on the task. We would like one more person to learn how to do the PMT replacement.

Experts and Lab Resources

Roof Removal

- **Expert Shifter:** 6 expert shifters and 2 new students are training

- **Scientific Computing Division (SCD) - Slam Group:** Bonnie King, Patrick Riehecky, Scott Reid, Kevin Hill, Rennie Scott

- **Neutrino Division:** Steve Hahn, Donatella Torretta, Geoff Savage, Bill Badgett, Carrie McGivern, Linda Bagby

- **Particle Physics Division (PPD) - Electrical Engineering Division (EED) - Detector Electronics:** Paul Rubinov, Cristian Gingu

- **PPD - EED - Infrastructure & Support:** Steve Chappa and Roberto Davila

- **PPD - John Voirin's Group**
  - ✓ Remove and replace the roof whenever needed
  - ✓ Fills water target
  - ○ 1 FTE-week for roof work and 4 FTE-weeks for water target

Experts and Lab Resources

He Target Fill

- **Expert Shifter:** 6 expert shifters and 2 new students are training

- **Scientific Computing Division (SCD) - Slam Group:** Bonnie King, Patrick Riehecky, Scott Reid, Kevin Hill, Rennie Scott
- **Neutrino Division:** Steve Hahn, Donatella Torretta, Geoff Savage, Bill Badgett, Carrie McGivern, Linda Bagby
- **Particle Physics Division (PPD) - Electrical Engineering Division (EED) - Detector Electronics:** Paul Rubinov, Cristian Gingu
- **PPD - EED - Infrastructure & Support:** Steve Chappa and Roberto Davila
- **PPD - John Voirin's Group**
- **PPD - Engineering Support:** Bob Sanders & Jim Kilmer
  - ✓ Fills He target
  - o 6 FTE weeks fill + 5 FTE-weeks inspection (DDO)

Experts and Lab Resources

He Target Fill

- **Expert Shifter:** 6 expert shifters and 2 new students are training

- **Scientific Computing Division (SCD) - Slam Group:** Bonnie King, Patrick Riehecky, Scott Reid, Kevin Hill, Rennie Scott
- **Neutrino Division:** Steve Hahn, Donatella Torretta, Geoff Savage, Bill Badgett, Carrie McGivern, Linda Bagby
- **Particle Physics Division (PPD) - Electrical Engineering Division (EED) - Detector Electronics:** Paul Rubinov, Cristian Gingu
- **PPD - EED - Infrastructure & Support:** Steve Chappa and Roberto Davila
- **PPD - John Voirin's Group**
- **PPD - Engineering Support:** Bob Sanders & Jim Kilmer
- **PPD - DDO - Pete Simon's group**

  - ✓ Measure water level once a week
  - o 1-2 FTE-hours/week

Experts and Lab Resources

File Transfer System

- **Expert Shifter:** 6 expert shifters and 2 new students are training

- **Scientific Computing Division (SCD) - Slam Group:** Bonnie King, Patrick Riehecky, Scott Reid, Kevin Hill, Rennie Scott

- **Neutrino Division:** Steve Hahn, Donatella Torretta, Geoff Savage, Bill Badgett, Carrie McGivern, Linda Bagby

- **Particle Physics Division (PPD) - Electrical Engineering Division (EED) - Detector Electronics:** Paul Rubinov, Cristian Gingu

- **PPD - EED - Infrastructure & Support:** Steve Chappa and Roberto Davila

- **PPD - John Voirin's Group**

- **PPD - Engineering Support:** Bob Sanders & Jim Kilmer

- **PPD - DDO - Pete Simon's group**

- **SCD:** Gabe Perdue, Arthur Kreymer, Gerard Bernabeu, Michael Diesburg
  - ✓ Getting support for implementing the FTS system to replace existing file transfer system
  - ✓ Consult for critical system failures
  - o 1 FTE-week

Experts and Lab Resources

All Experts

- **Expert Shifter:** 6 expert shifters and 2 new students are training

- **Scientific Computing Division (SCD) - Slam Group:** Bonnie King, Patrick Riehecky, Scott Reid, Kevin Hill, Rennie Scott
- **Neutrino Division:** Steve Hahn, Donatella Torretta, Geoff Savage, Bill Badgett, Carrie McGivern, Linda Bagby
- **Particle Physics Division (PPD) - Electrical Engineering Division (EED) - Detector Electronics:** Paul Rubinov, Cristian Gingu
- **PPD - EED - Infrastructure & Support:** Steve Chappa and Roberto Davila
- **PPD - John Voirin's Group**
- **PPD - Engineering Support:** Bob Sanders & Jim Kilmer
- **PPD - DDO - Pete Simon's group**
- **SCD:** Gabe Perdue, Arthur Kreymer, Gerard Bernabeu, Michael Diesburg

Special thanks to all the groups for their great support and we hope to continue this relation in future.

Summary

- MINERvA and DAQ and detector has been running quietly for last 1 year

- Major firmware upgrade to decrease dead-time, no major upgrade expected in future

- Sufficient spare hardware components to run the experiment for next several years

- Major tool developments to reduce the shift manpower to 1/3rd means we can put more effort on MINOS detector operations and data quality monitoring
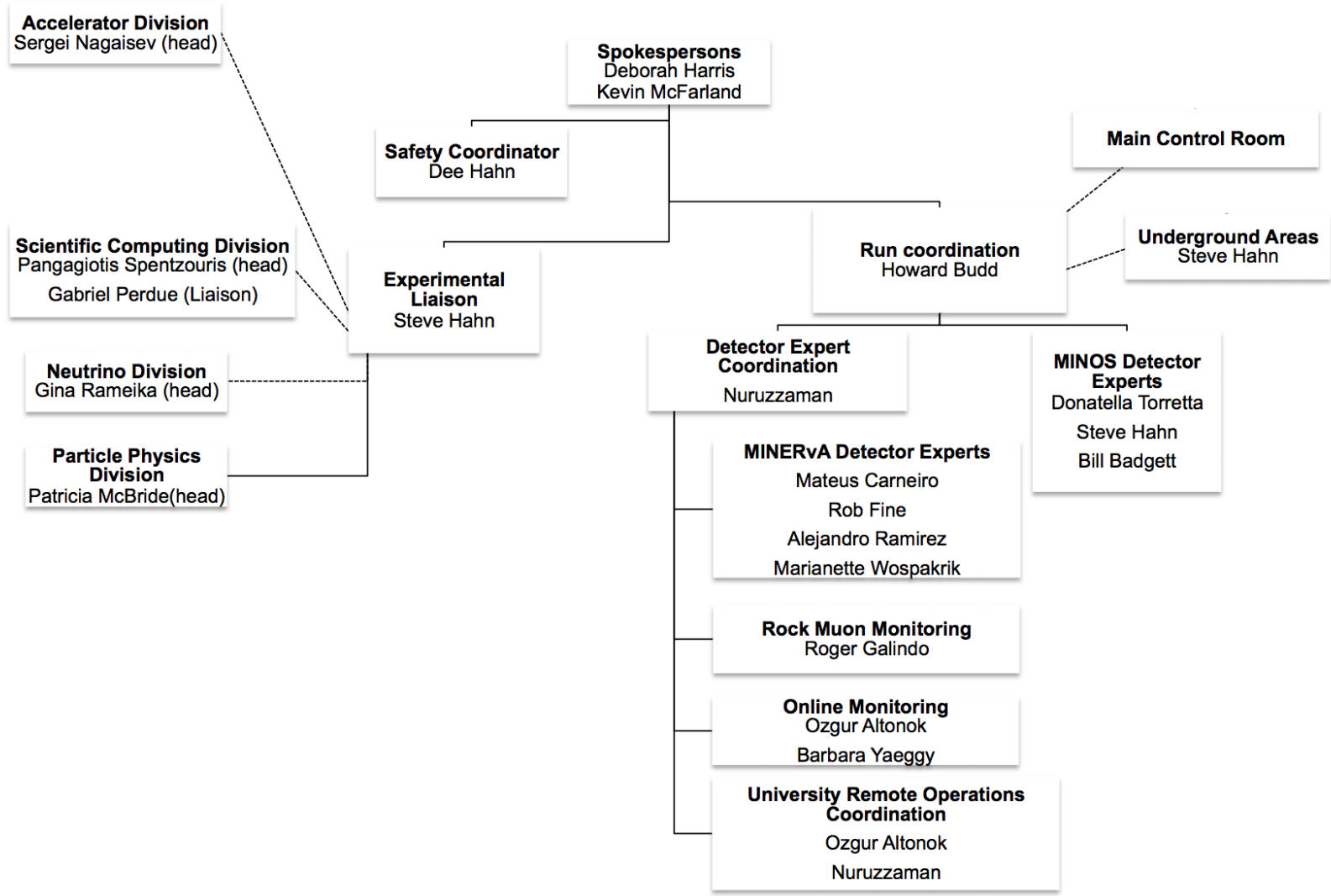
Thank You

Backup

Nuruzzaman, MINERvA Operations Review

Nuruzzaman, MINERvA Operations Review

Future UROCs for Shifts

- Do we need new UROCs?
  - ✓ I will suggest to consider taking checklist (evening/owl) shifts. But always welcome to setup a new UROC with following (relaxed) conditions.

- What should be the conditions for starting a new UROC?
  - ✓ Need to have a good enough Unix machine with large displays and internet connection (at least 25 Mbps download/ 5 Mbps upload speed)
  - ✓ Need to setup Kerberos credential to access MINERvA shift computers. May also exempt requirement for special Kerberos principal.
  - ✓ Webcam, headset and speaker OR use a personal laptop, tablet or smartphone
  - ✓ A static IP address is preferable but NOT a necessary condition

FEB Firmware Status

Next Firmware Version

- For v95, qhi discriminator hit for pixel < 32, Trips 0, 1, and 4 store their charge. Disc. hit for pixel > 31 TriPs 2,3, and 5 store their charge.
  - At the end of the gate the charge for all the channels are stored.

- For v97, If there is a qhi disc. hit for a channel in a TriP chip, only that TriP chip stores its charge.
  - At the end of the gate the charge for all the channels are stored. This is the only time the charge for the lows are stored.
  - No ADC charge is stored for the event with >20 hits. Fixes this issue.
  - Fixes problem with CW frequency sometimes being 0 when a FEB is powered up
  - Individual TriP pushing is necessary for high intensity medium energy beam to reduce dead-time.

- The FEB firmware v97 has been thoroughly tested at WH 14th floor and lab-F test stands

More details: http://minerva-docdb.fnal.gov:8080/cgi-bin/ShowDocument?docid=12150
http://minerva-docdb.fnal.gov:8080/cgi-bin/ShowDocument?docid=12397

Nearline Computer Update

Old Configuration

- mnvonlinelogger ▸ moved to Lab-F
- mnvonlinelogger4 ▸ configured as
  mnvonlineworker3
- mnvonlinelogger5 ▸ configured as
  mnvonlineworker1
- mnvonline04 ▸ moved to Veto Rack

All the computers were on SLF5

New Configuration

- mnvonlinelogger6
- mnvonlineworker1
- mnvonlineworker2
- mnvonlinelogger4 (SLF5)
      All are on SLF6

Test Stands

WH 14th floor test stand

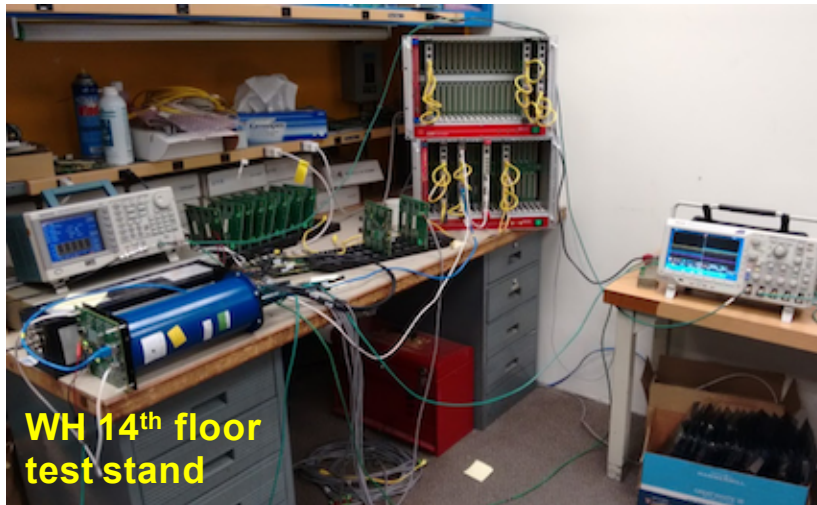**Lab-F test stand**

- Two crates: One is used by Christian Gingu and Paul Rubinov [PPD] for firmware development and CROCE testing. We are using the other crate for testing firmware and unpacking
  - Assembled simplest MINERvA detector system with one FEB, one CROCE, one CRIM, and one PMT
- Tested the CROCE and FEB firmware thoroughly
- Modified the DAQ software for the new firmware and tested using this setup
- Used the setup to modify and test the data

- Lab-G apparatus was moved to Lab-F
  ✦ Test beam was disassembled during Jan 2016
  ✦ We stored all the components from TB and Lab-G and setup a test stand
  ✦ Started with small number of chains and gradually increased the size
    ✓ Tested new spare CROCEs and they worked fine
    ✓ The setup, which resembles underground DAQ and detector, is working and connected for testing v97. It consists of 1 crate, 2

FEB Firmware Status

Current FEB Firmware

- For v95, qhi discriminator hit for pixel < 32, Trips 0, 1, and 4 store their charge. Disc. hit for pixel > 31 TriPs 2,3, and 5 store their charge.
    - At the end of the gate the charge for all the channels are stored.

Next Firmware Version

- For v97, If there is a qhi disc. hit for a channel in a TriP chip, only that TriP chip stores its charge.
    - At the end of the gate the charge for all the channels are stored. This is the only time the charge for the lows are stored.
    - ✓ Individual TriP pushing is necessary for high intensity medium energy beam to reduce dead-time
    - ✓ No ADC charge was stored for the event with >20 hits. Fixes this issue.
    - ✓ Fixes problem with CW frequency sometimes being 0 when a FEB is powered up
- The FEB firmware v97 has been thoroughly tested at WH 14th floor and lab-F test stands