

ARGONNE NATIONAL LABORATORY HEAVY ION DISCUSSION



GAMMASPHERE UPGRADE PROJECT OVERVIEW



MICHAEL B. OBERLING
Physics Division
Argonne National Laboratory

GSU UPGRADE TECHNICAL REVIEW

Talk Overview

1. The new electronics installation
2. New Gammasphere mechanical features
3. New power distribution system
4. Revised Gammasphere trigger connectivity / topology
5. Detector maintenance and new tools

THE NEW ELECTRONICS INSTALLATION

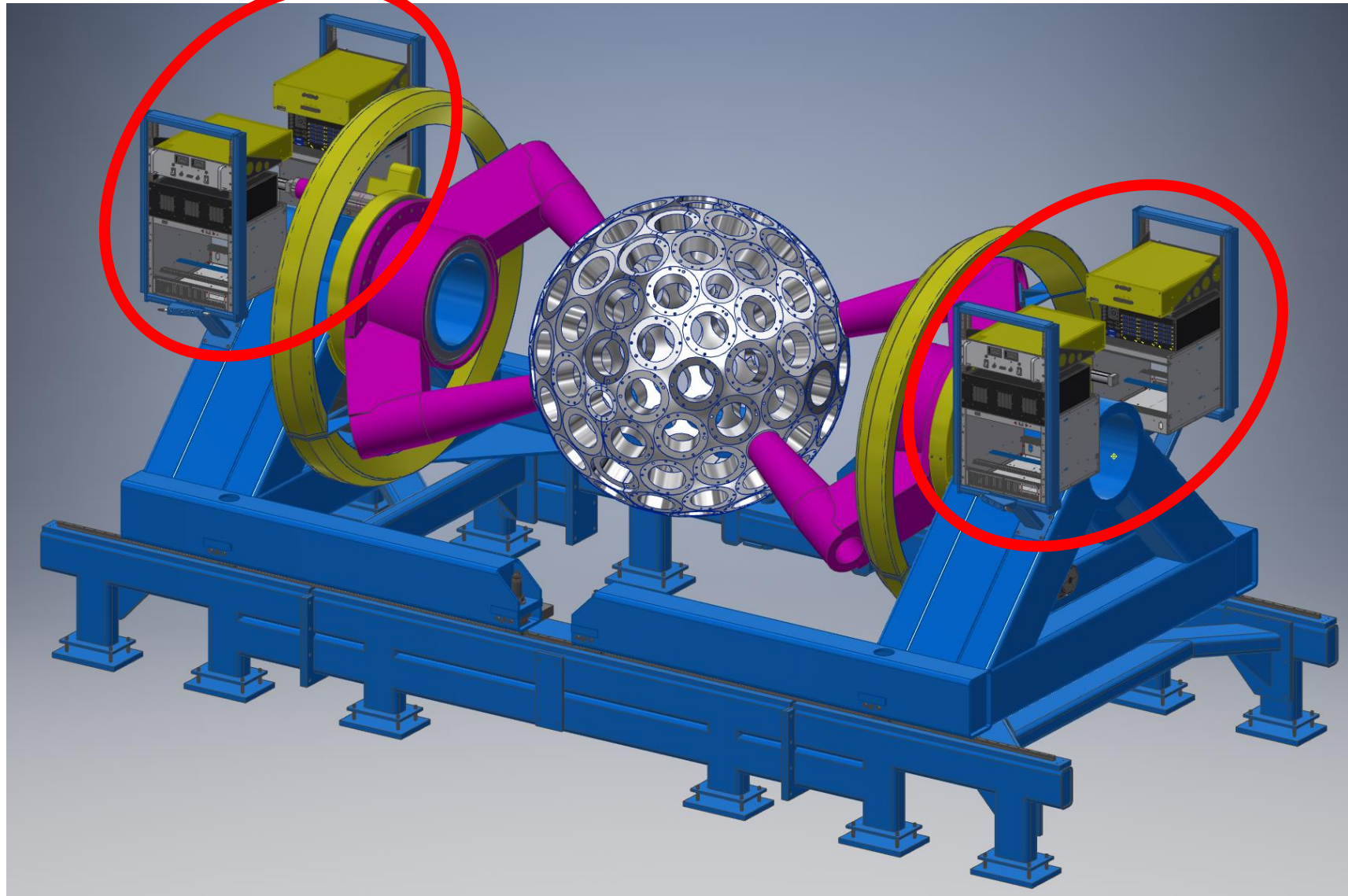


U.S. DEPARTMENT OF
ENERGY

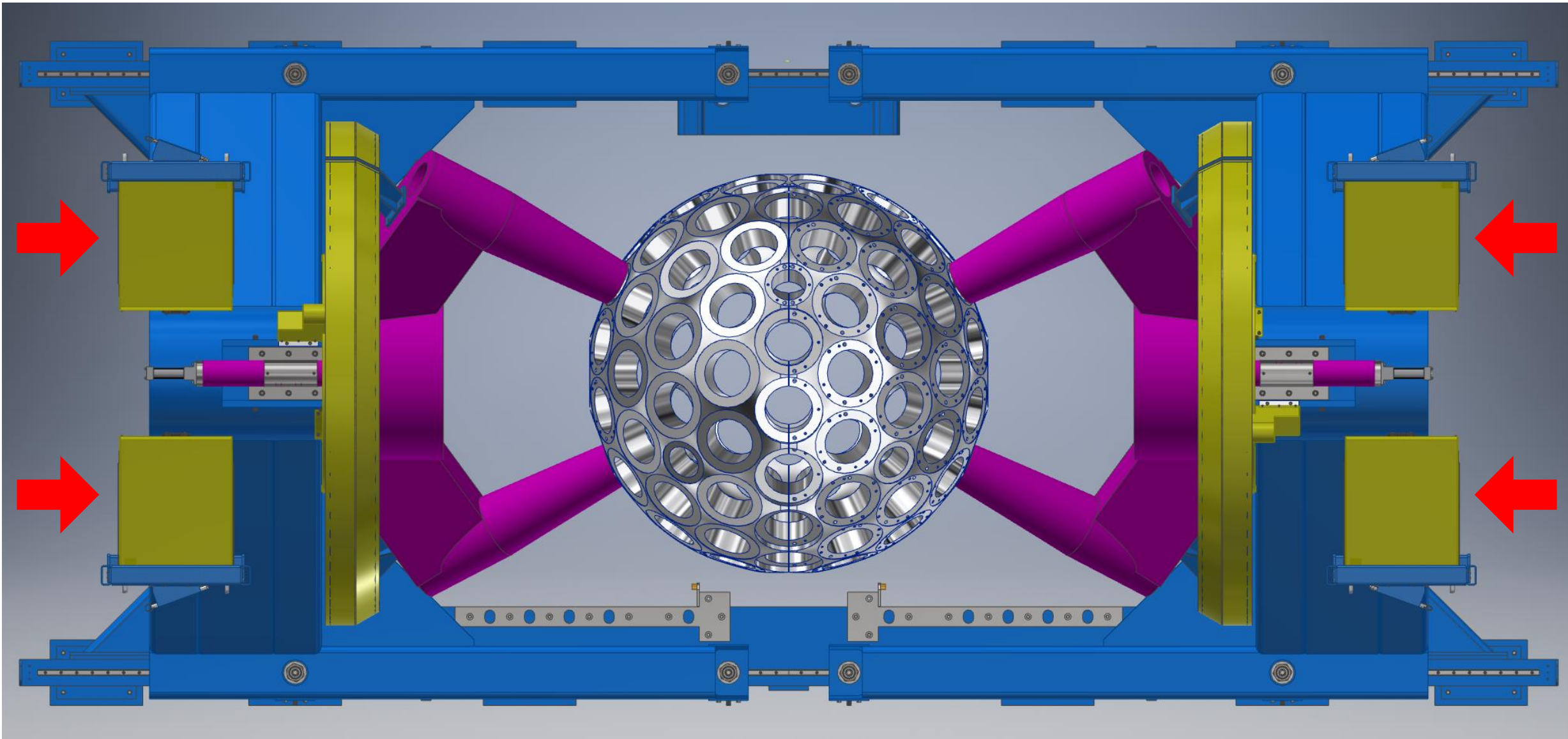
Argonne National Laboratory is a
U.S. Department of Energy laboratory
managed by UChicago Argonne, LLC.

Argonne 
NATIONAL LABORATORY

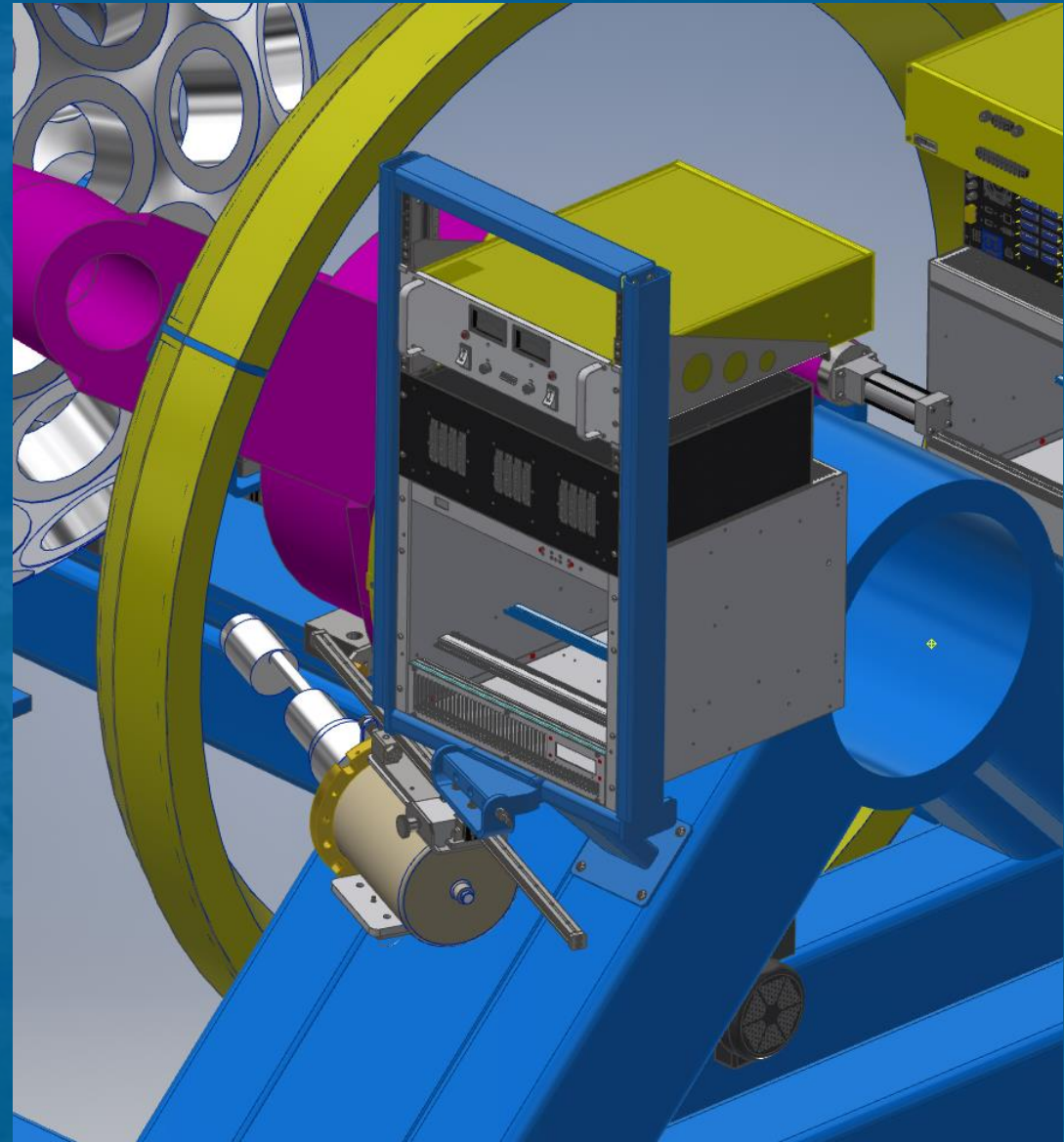
PHYSICAL LAYOUT OF THE NEW ELECTRONICS



PHYSICAL LAYOUT OF THE NEW ELECTRONICS



NEW GAMMASPHERE MECHANICAL FEATURES



U.S. DEPARTMENT OF
ENERGY

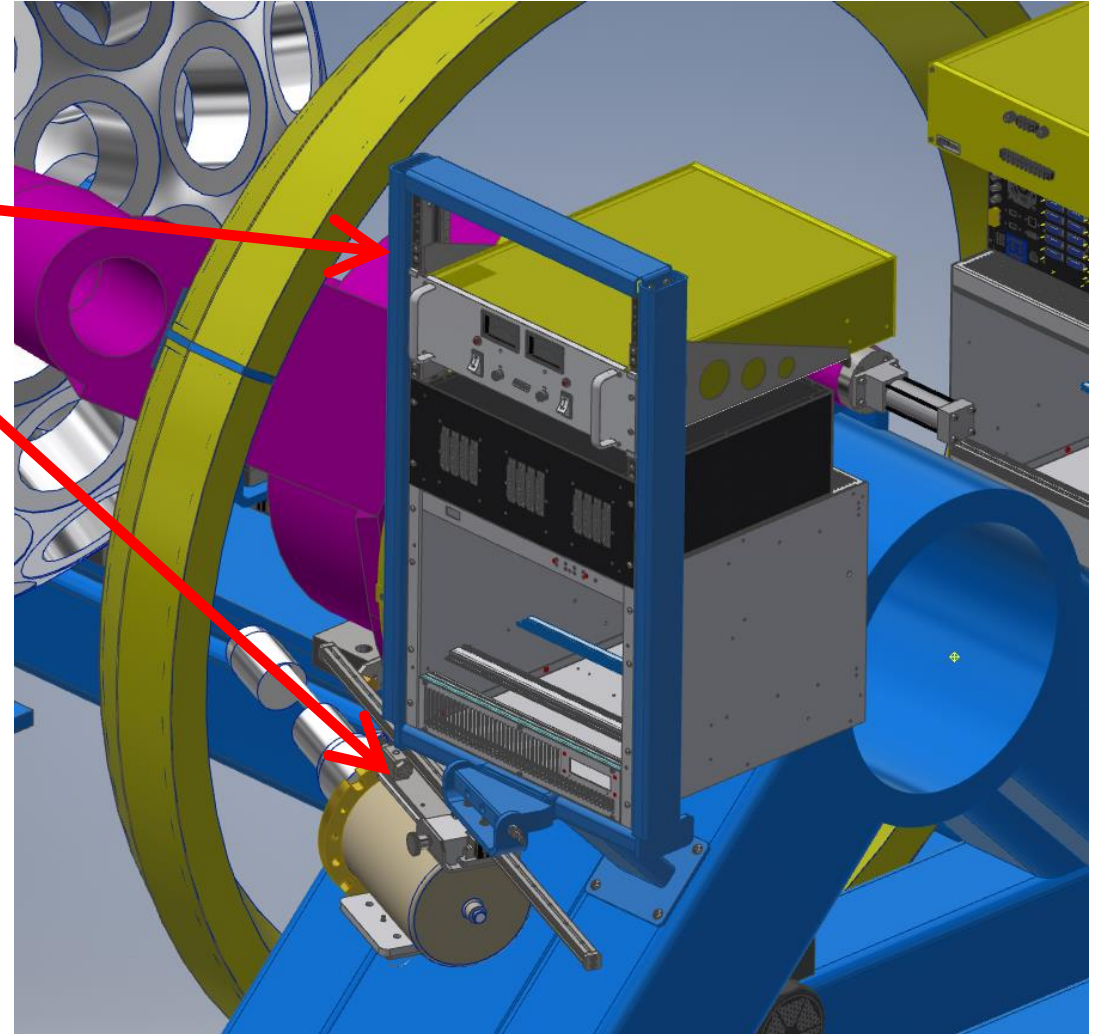
Argonne National Laboratory is a
U.S. Department of Energy laboratory
managed by UChicago Argonne, LLC.

Argonne 
NATIONAL LABORATORY

NEW GAMMASPHERE MECHANICS

Overview

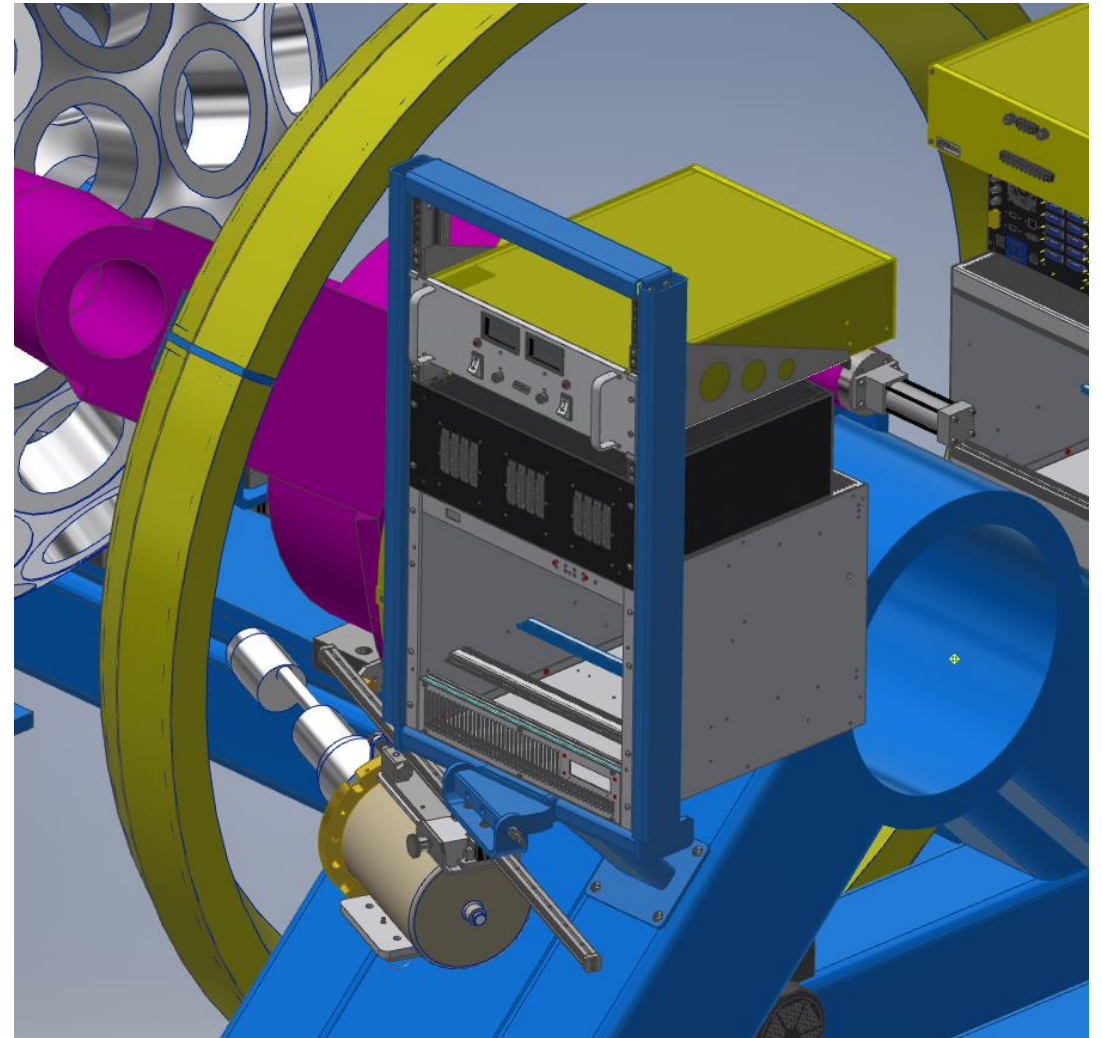
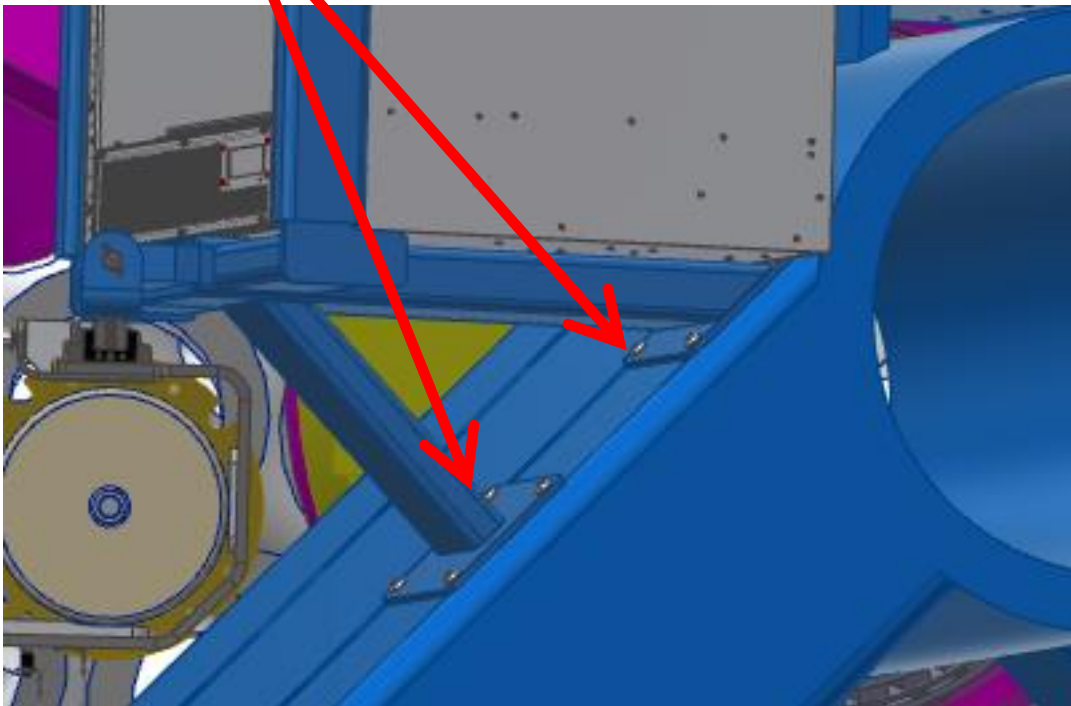
1. New electronics racks
2. New detector installation support



NEW ELECTRONICS RACKS

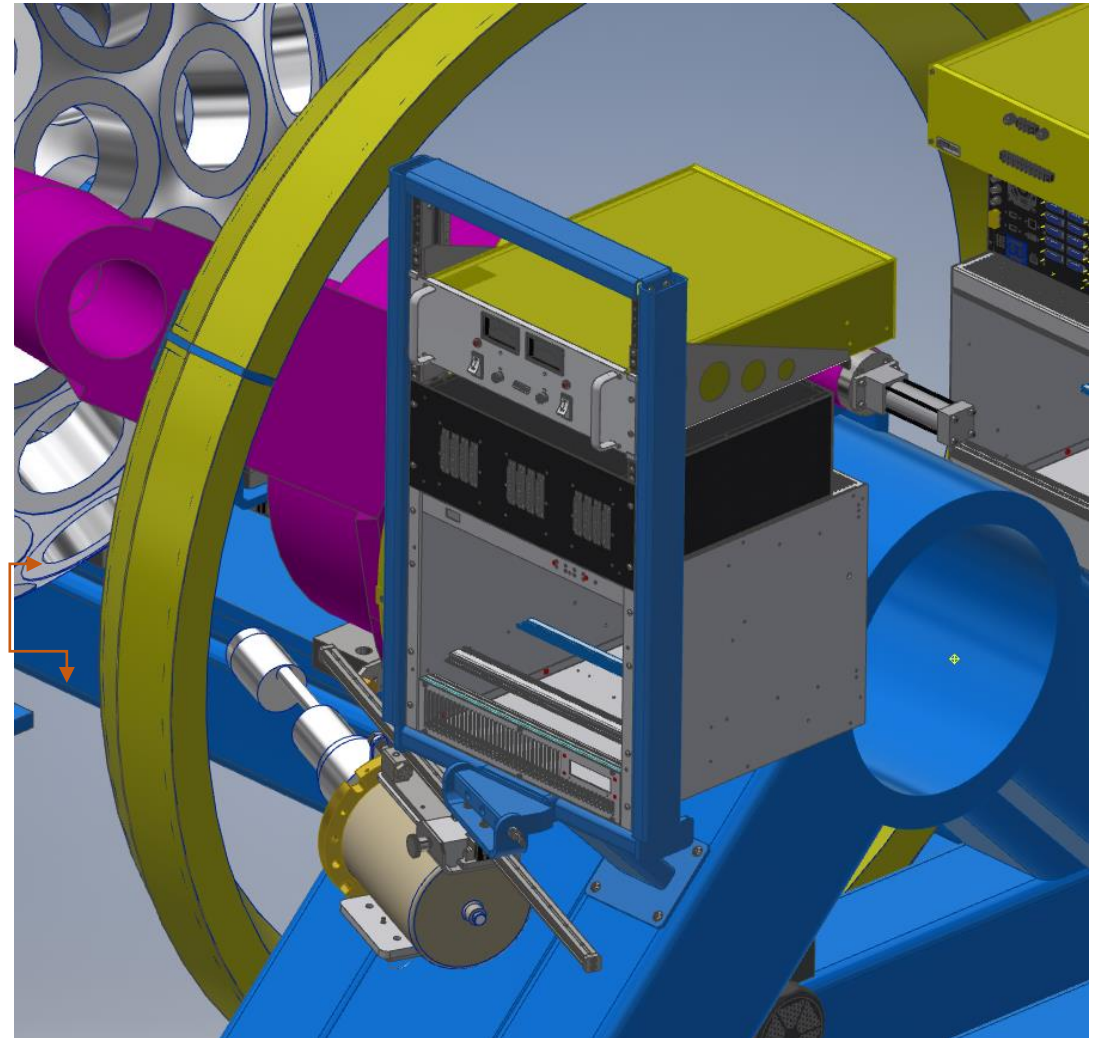
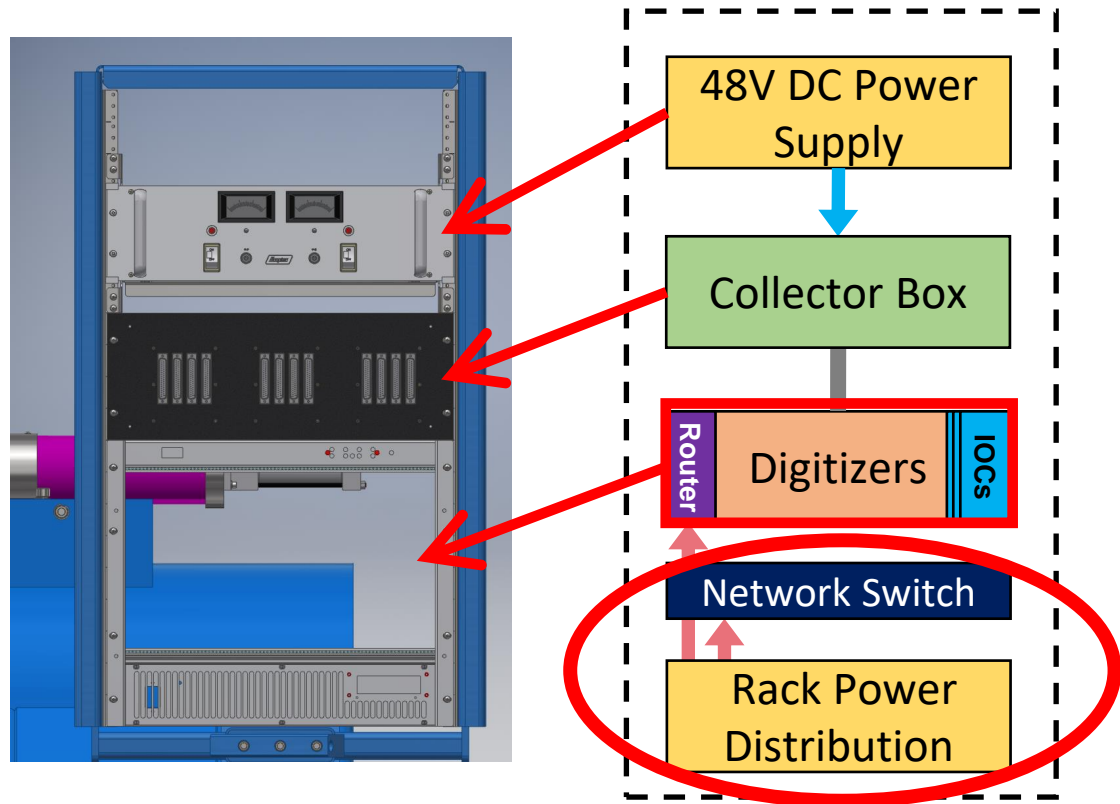
Mechanical Design

- Constructed from steel channels.
- Bolts directly to A-Frame.

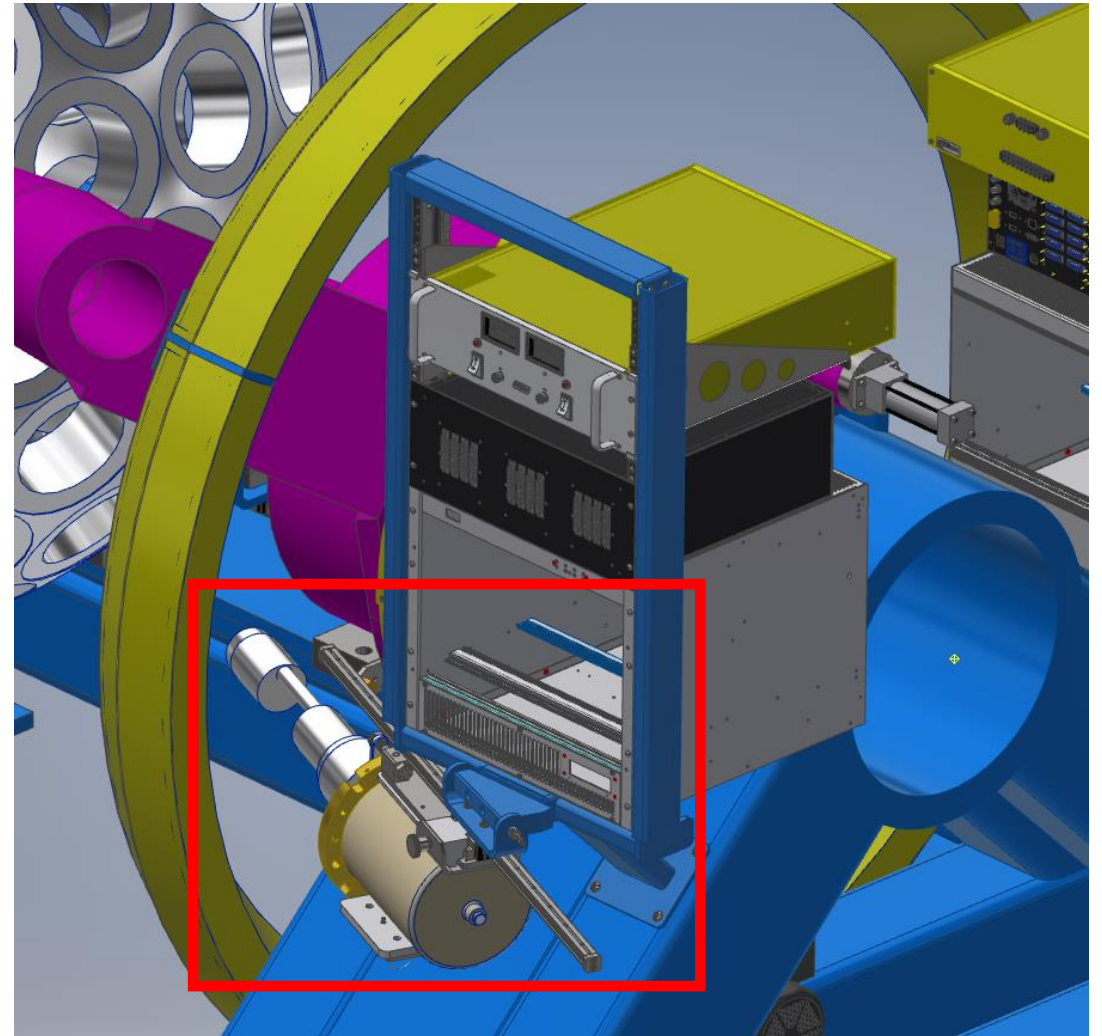
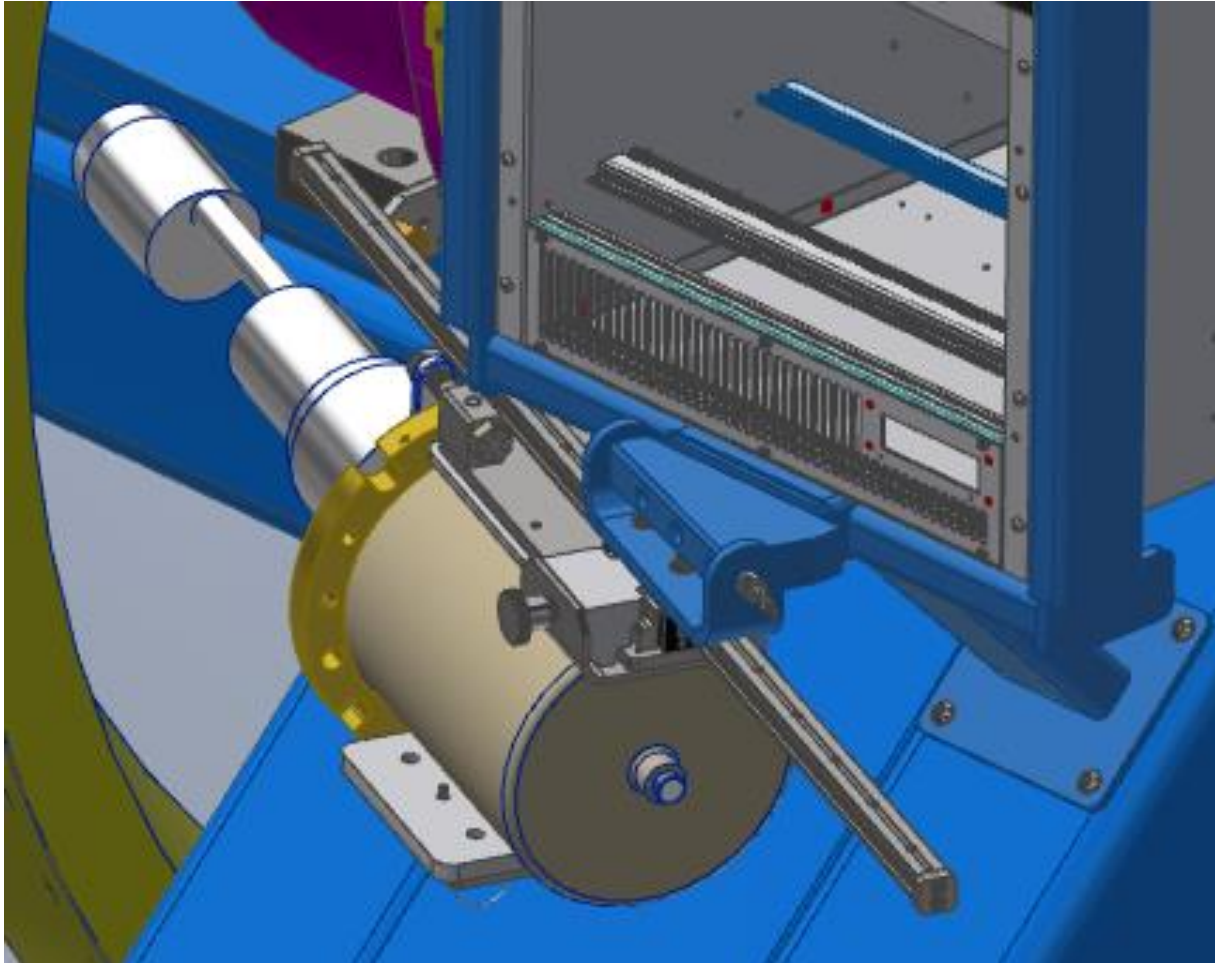


NEW ELECTRONICS RACKS

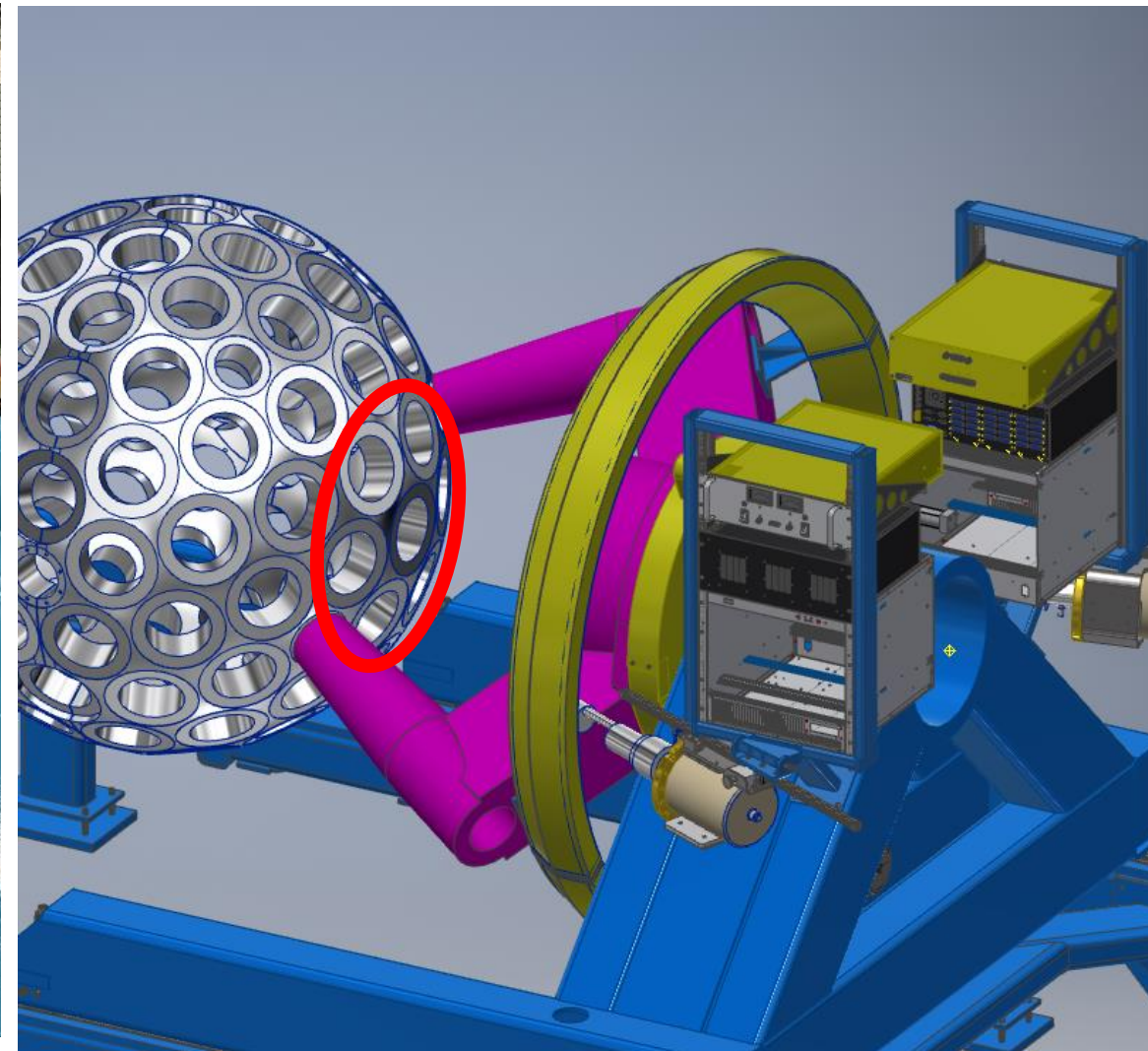
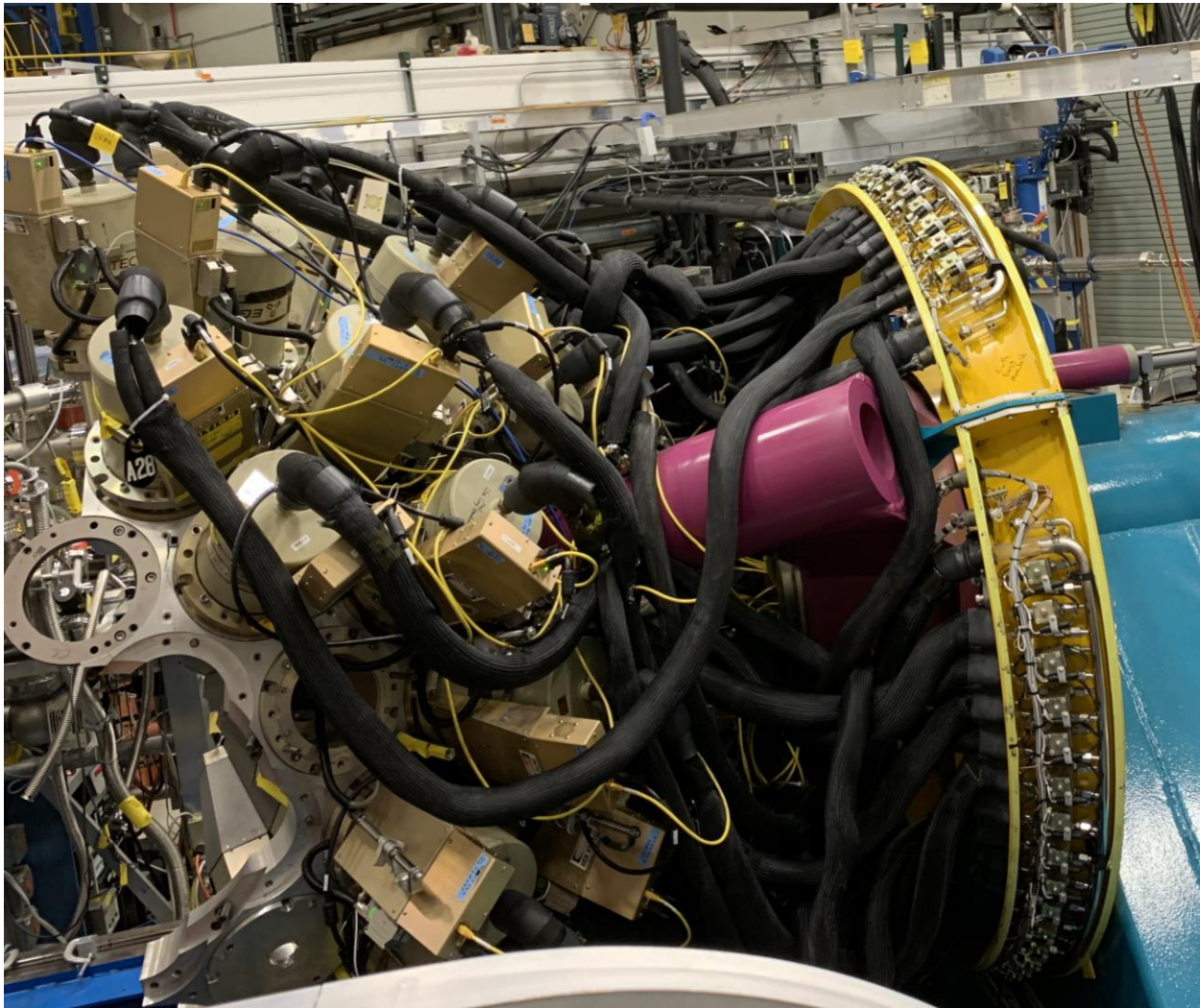
Electronics overview



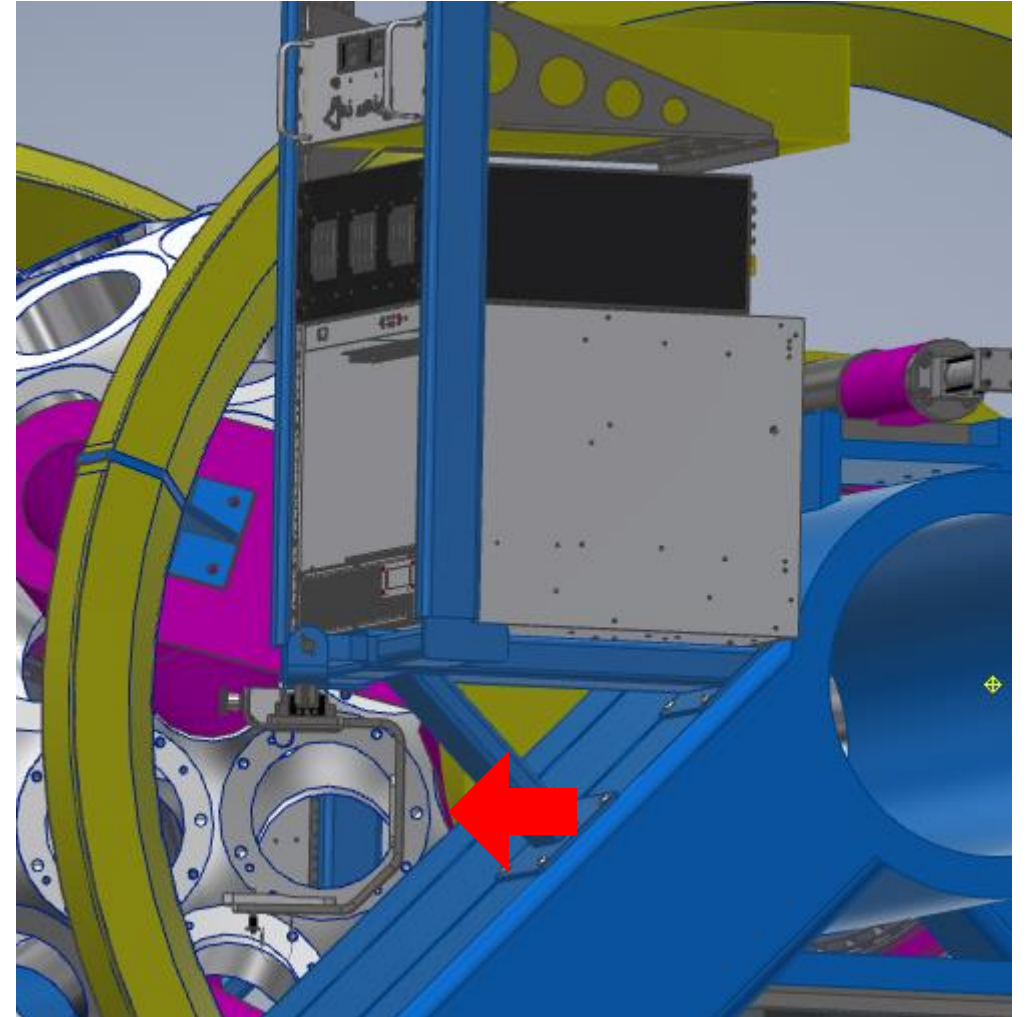
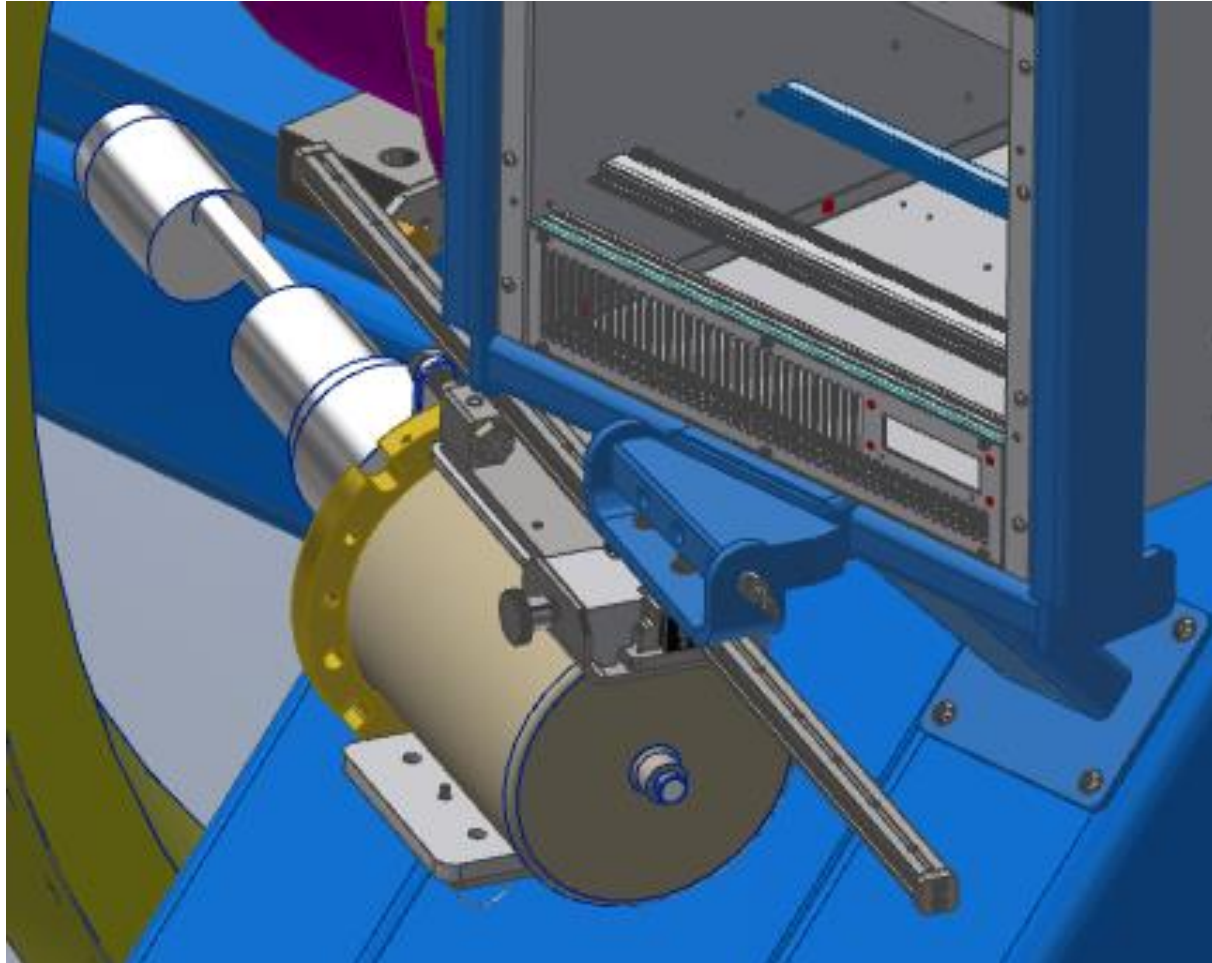
NEW DETECTOR INSTALLATION SUPPORT



NEW DETECTOR INSTALLATION SUPPORT

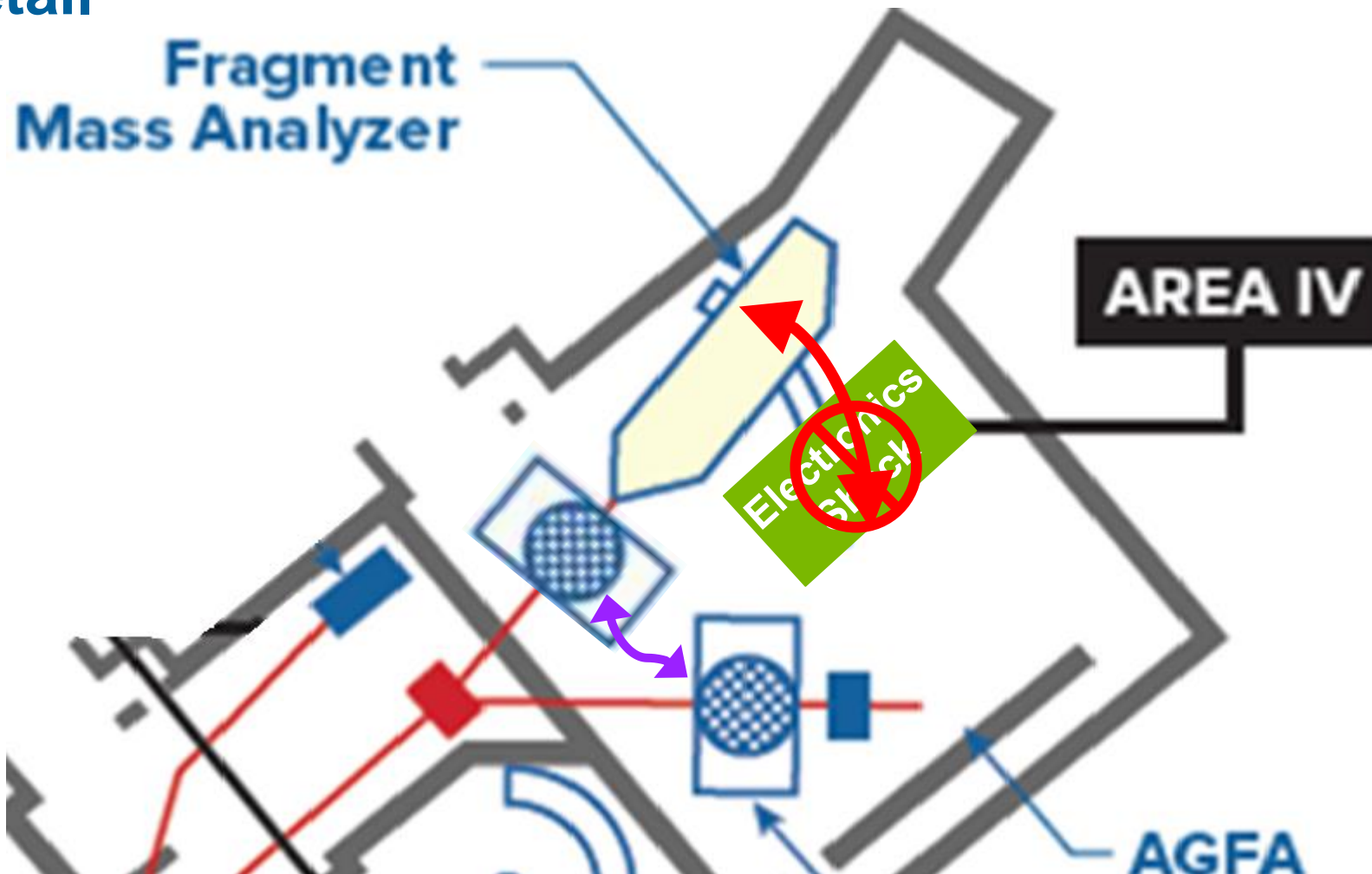


NEW DETECTOR INSTALLATION SUPPORT



GAMMASPHERE MOBILITY

Area IV Detail



NEW POWER DISTRIBUTION SYSTEM

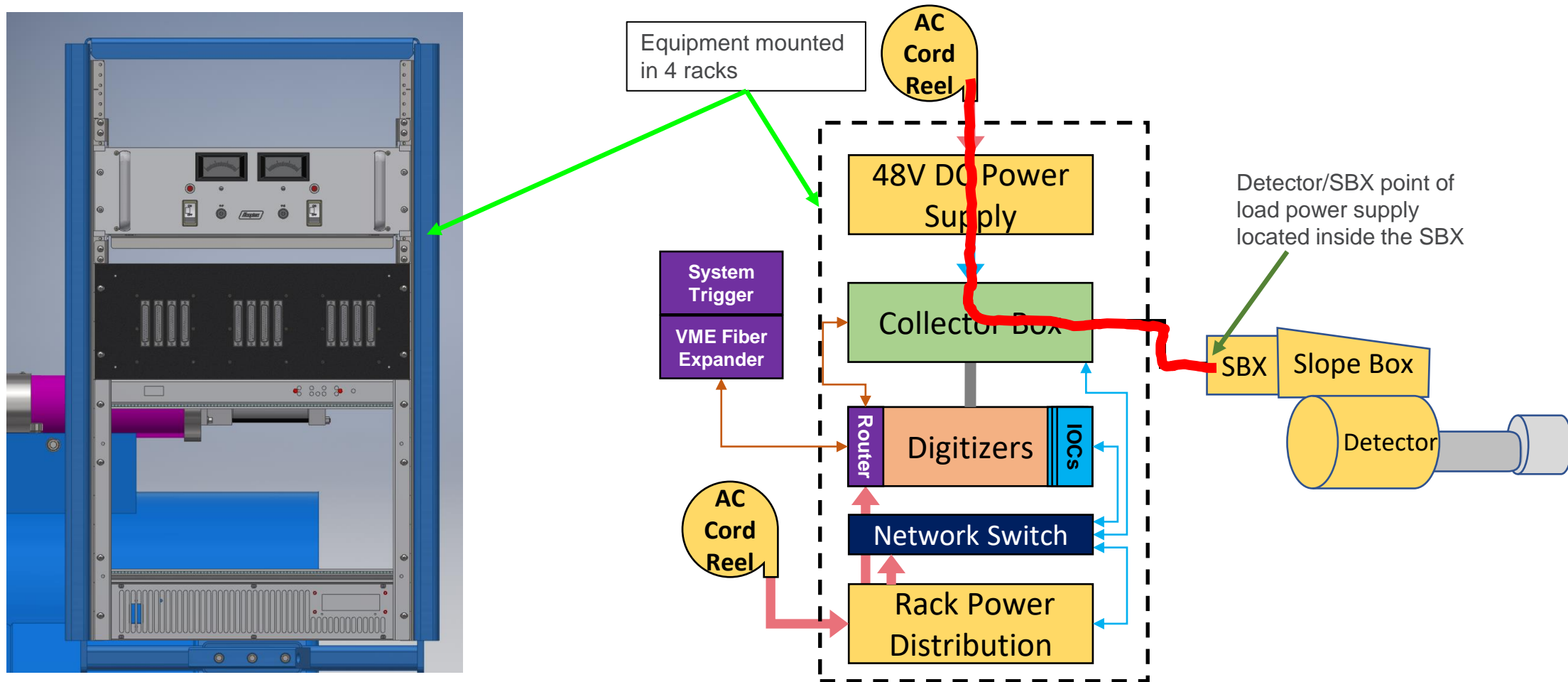


U.S. DEPARTMENT OF
ENERGY

Argonne National Laboratory is a
U.S. Department of Energy laboratory
managed by UChicago Argonne, LLC.

NEW POWER DISTRIBUTION SYSTEM

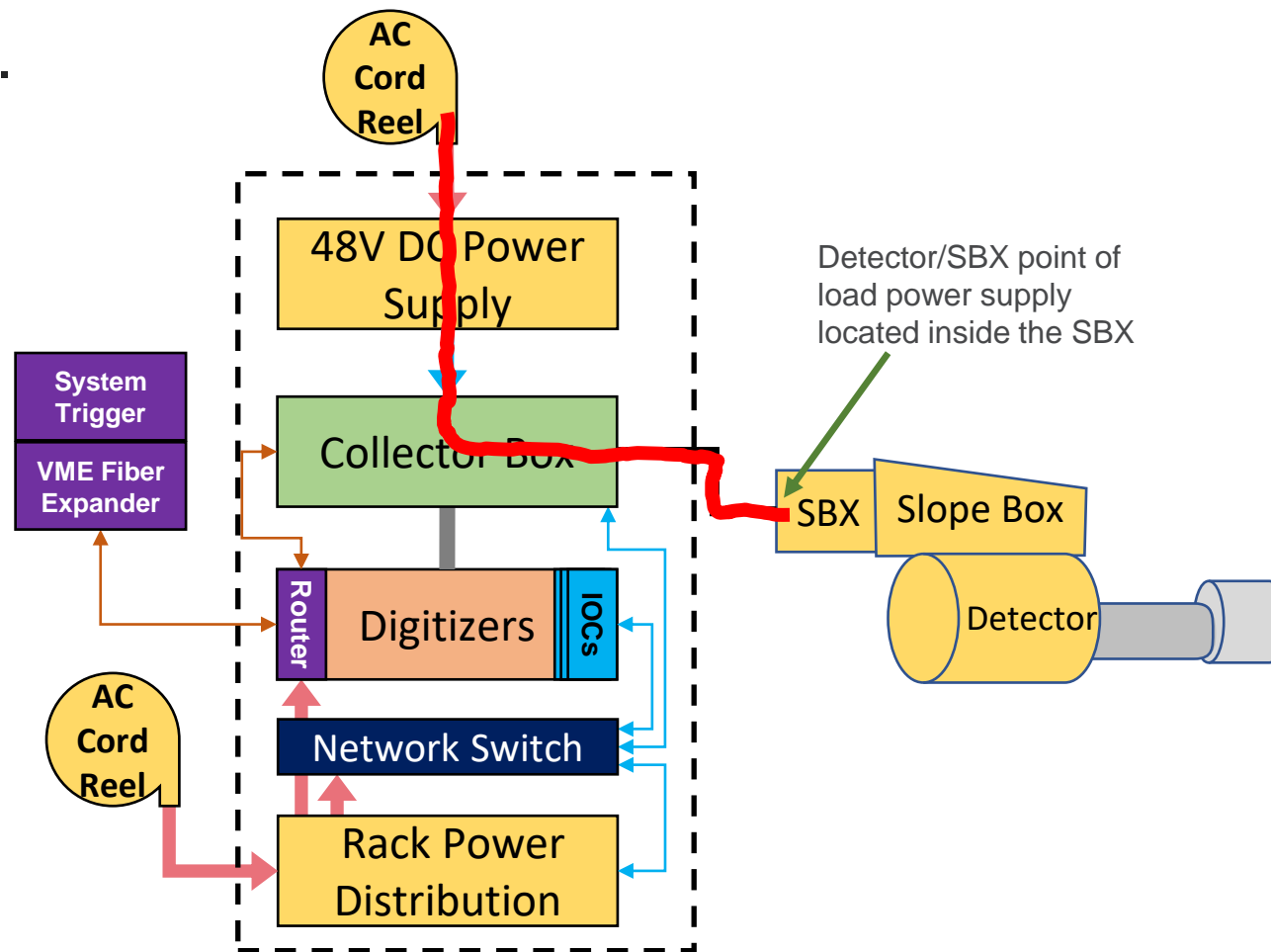
Overview



NEW POWER DISTRIBUTION SYSTEM

Detector Power Path

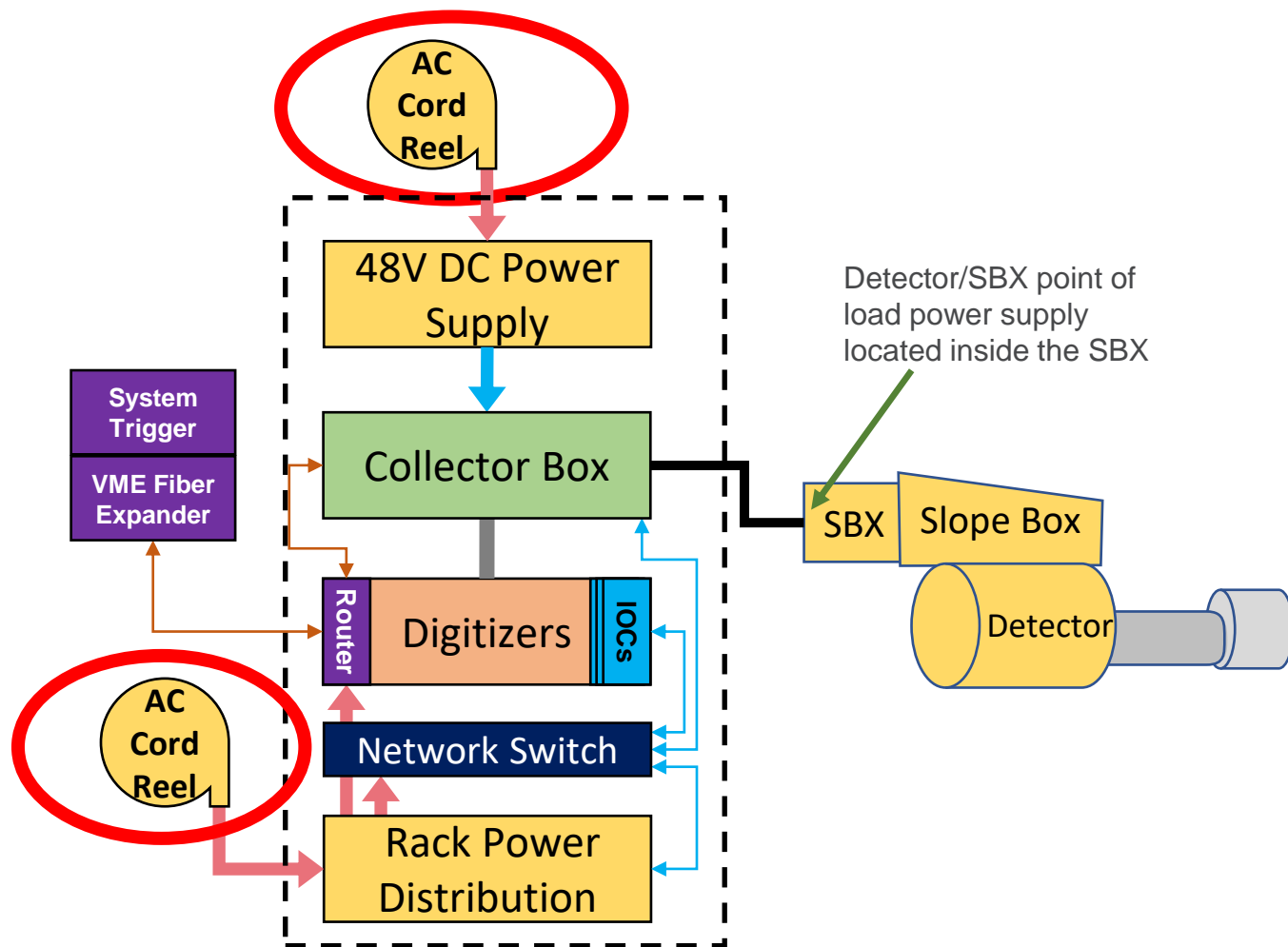
1. Overhead AC power cord reels.
2. 48V DC Power Supply
3. Collector Box
4. SBX Power Supply



NEW POWER DISTRIBUTION SYSTEM

Detector Power Path

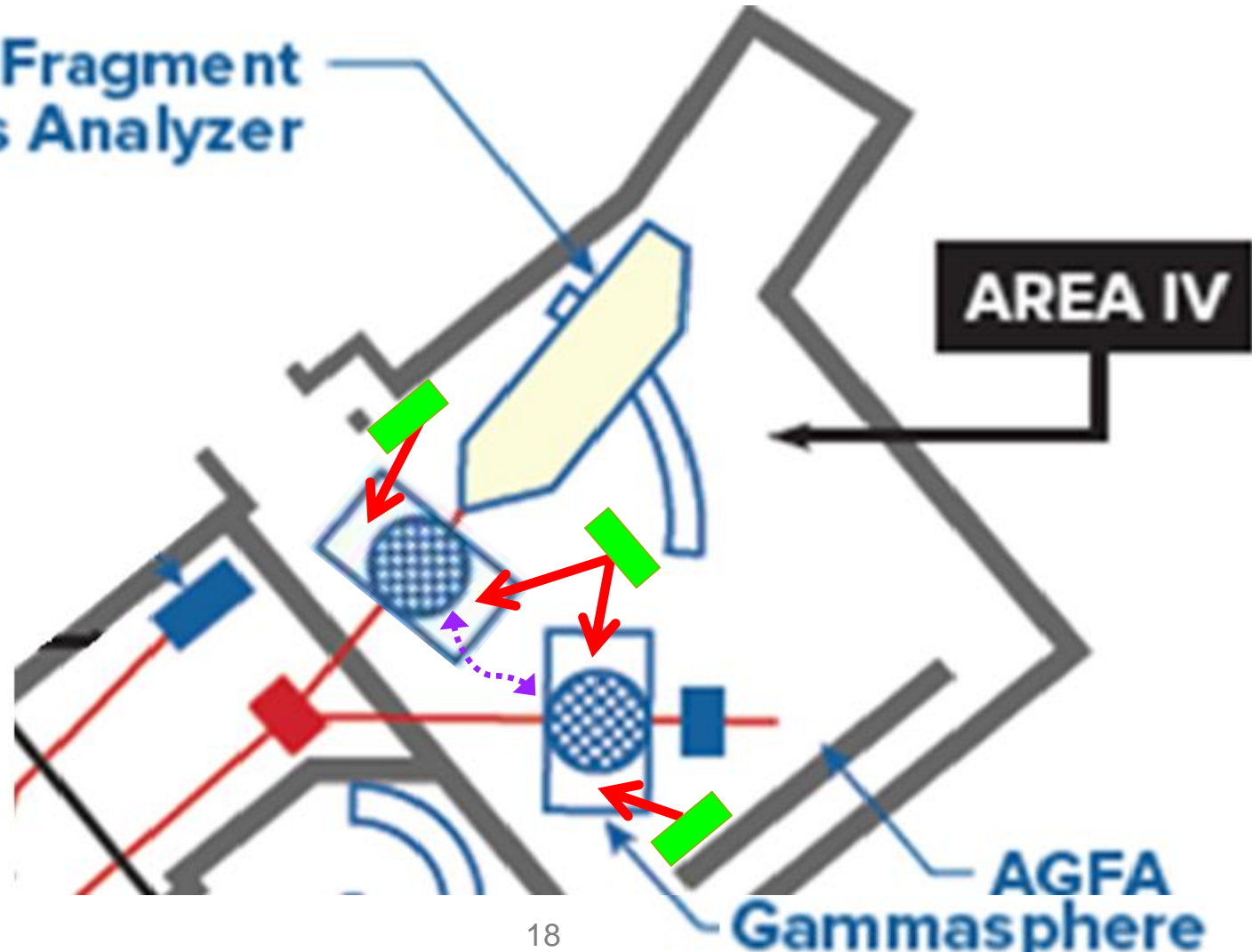
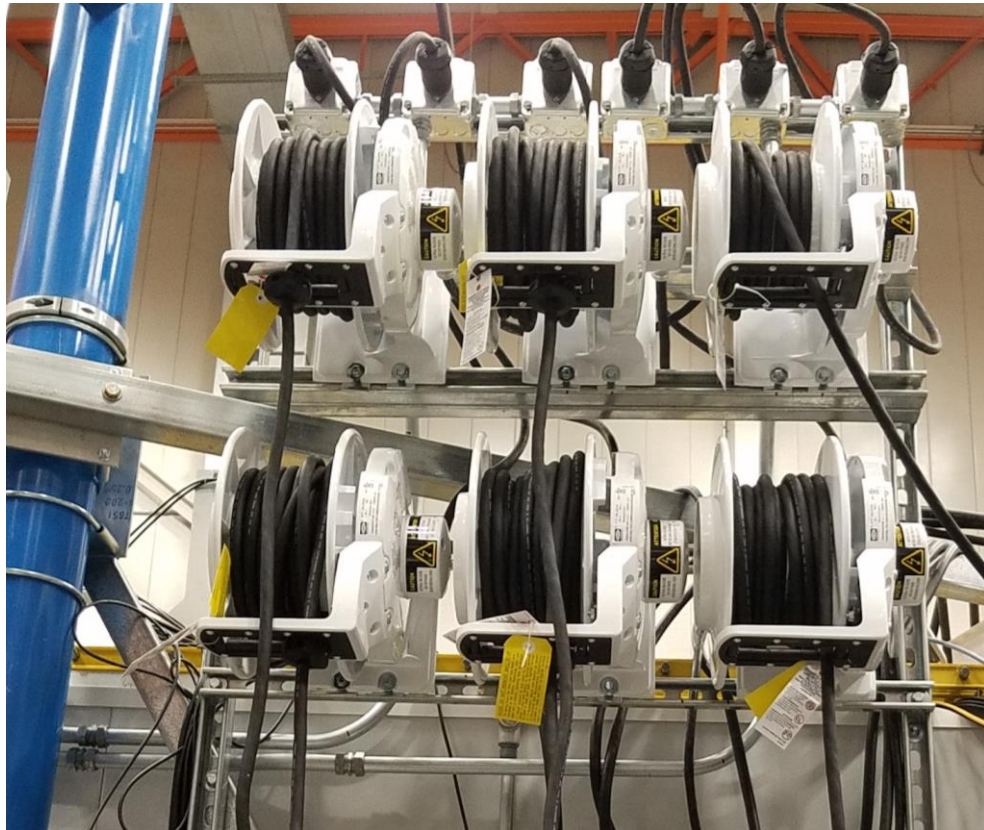
1. Overhead power cord reels.
2. 48V DC Power Supply
3. Collector Box
4. SBX Power Supply



OVERHEAD POWER CORD REELS

Area IV Detail

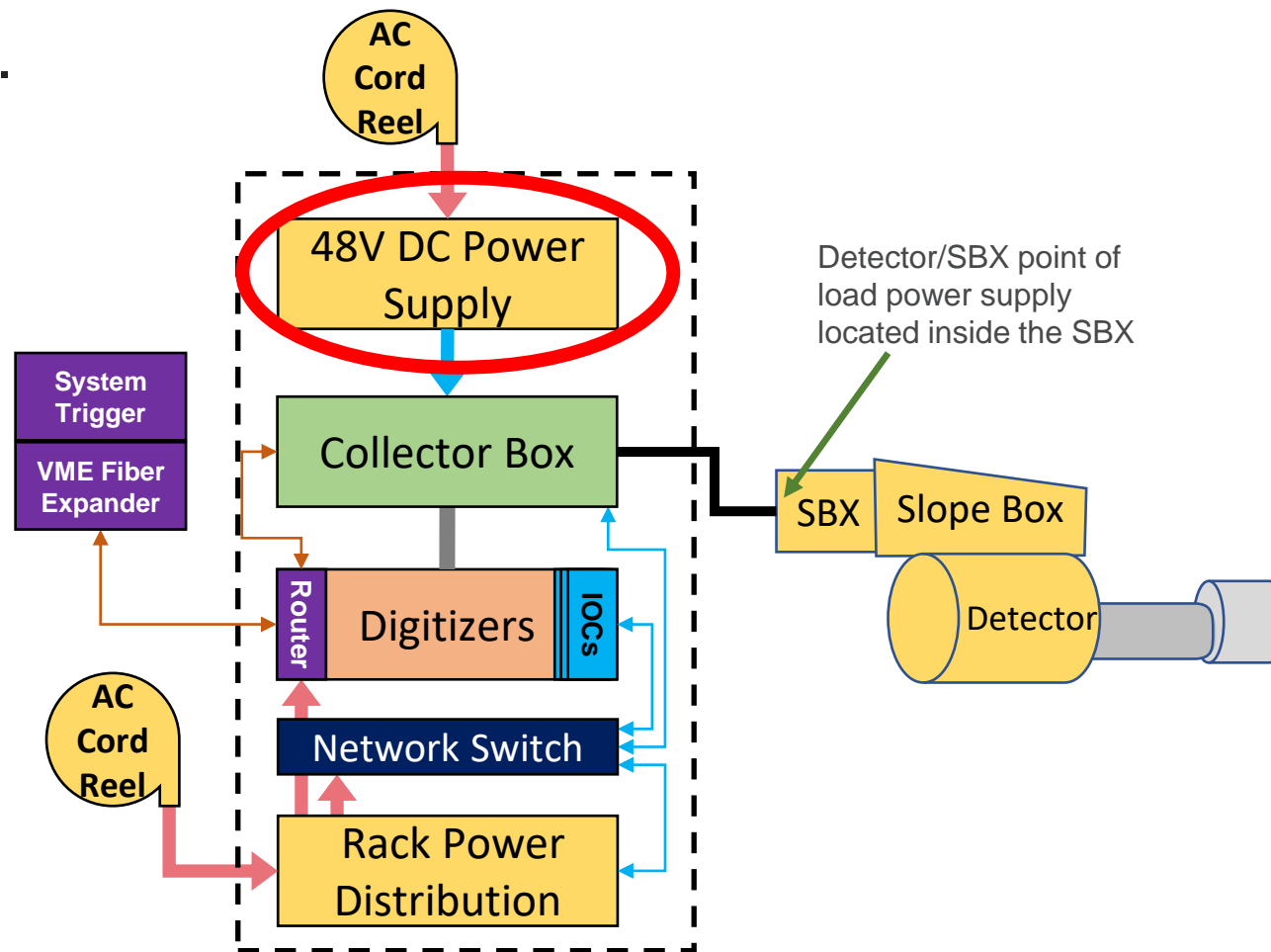
Fragment
Mass Analyzer



NEW POWER DISTRIBUTION SYSTEM

Detector Power Path

1. Overhead AC power cord reels.
2. 48V DC Power Supply
3. Collector Box
4. SBX Power Supply



48V DC POWER SUPPLY

Overview

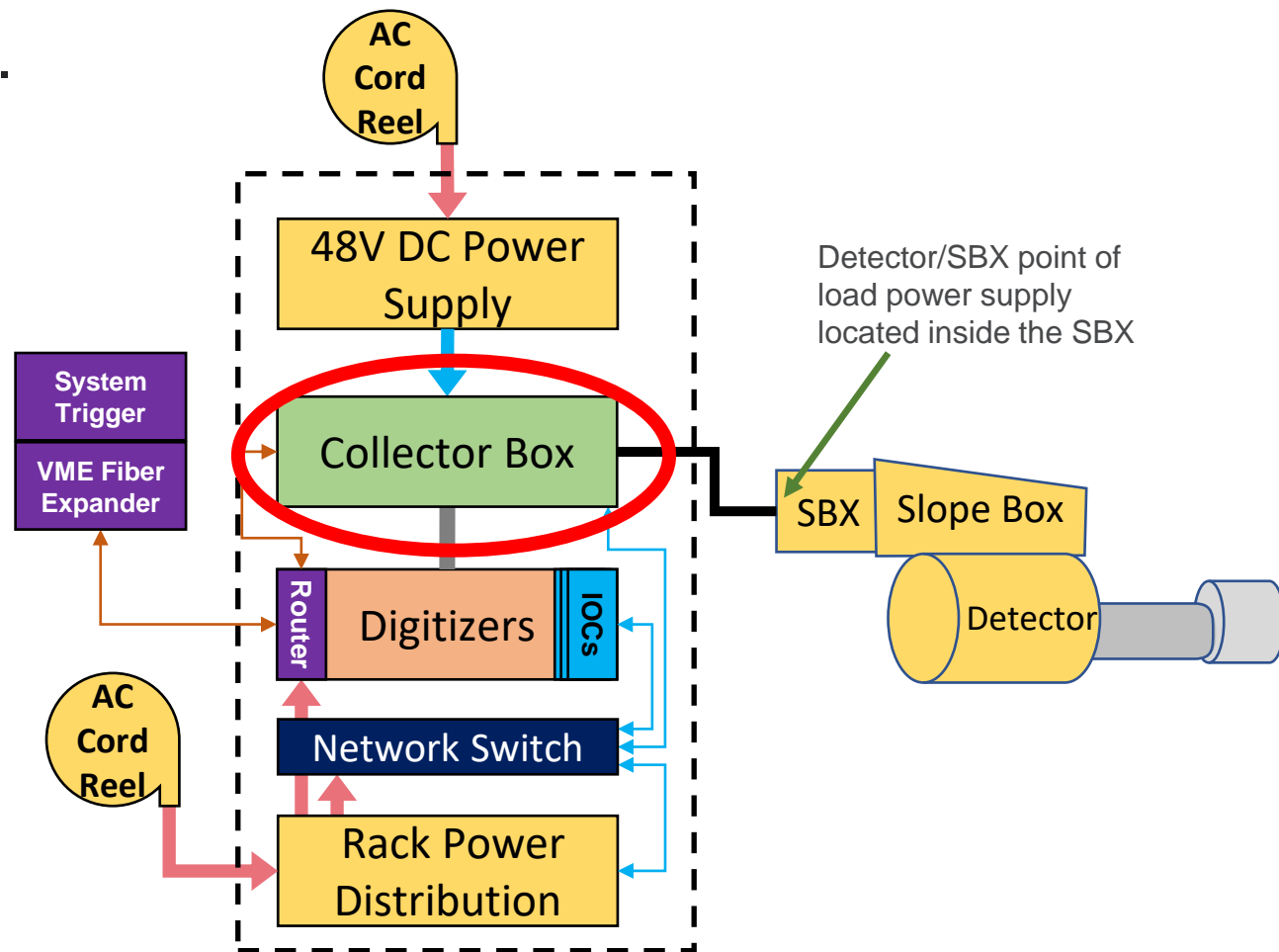
- Redundant 48V supply
- Each supply powers the Collector and up to 30 detectors
- Connects directly to overhead cord reel.
- Both internal supplies have fault relays that are monitored by EPICS
- Bolted to rack with insulated mount, ground provided via cord.



NEW POWER DISTRIBUTION SYSTEM

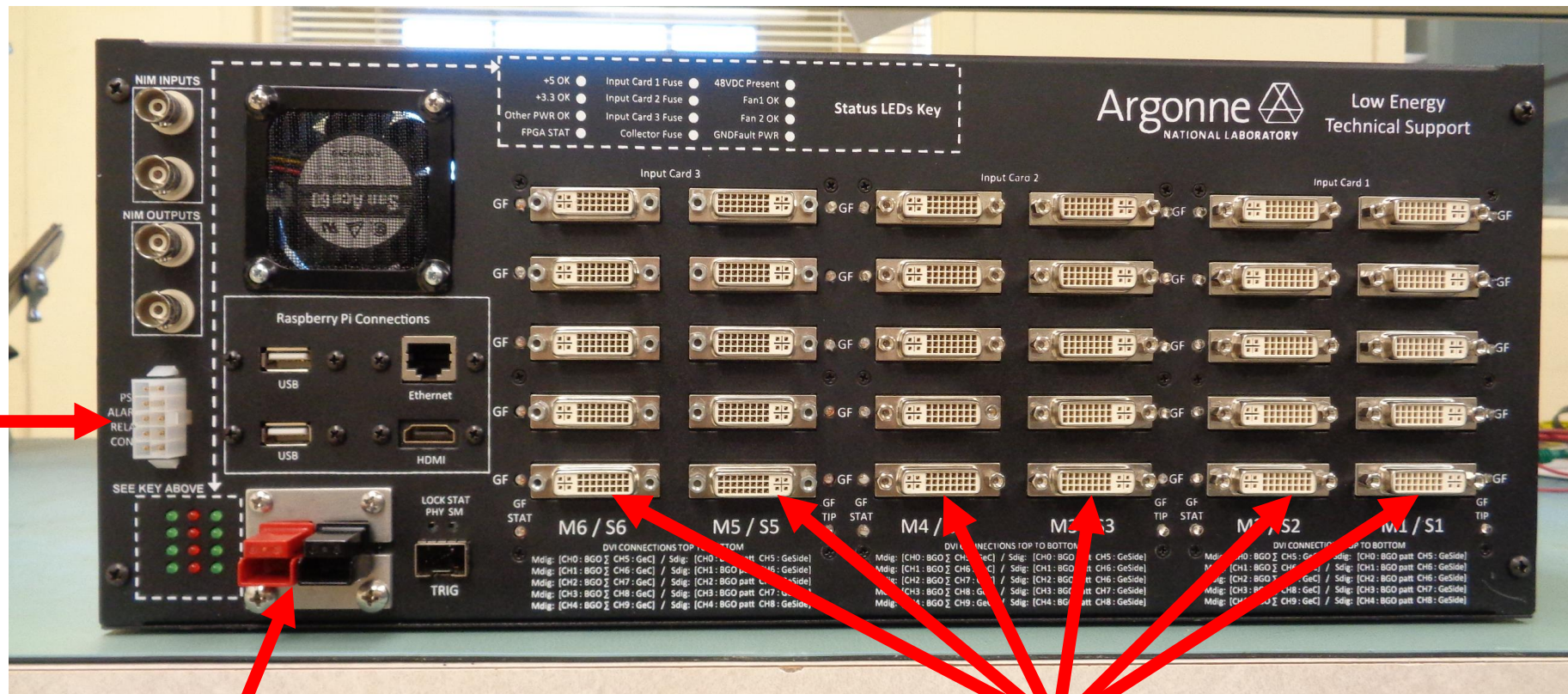
Detector Power Path

1. Overhead AC power cord reels.
2. 48V DC Power Supply
3. **Collector Box**
4. SBX Power Supply



COLLECTOR BOX

Physical Overview of the Power Interface



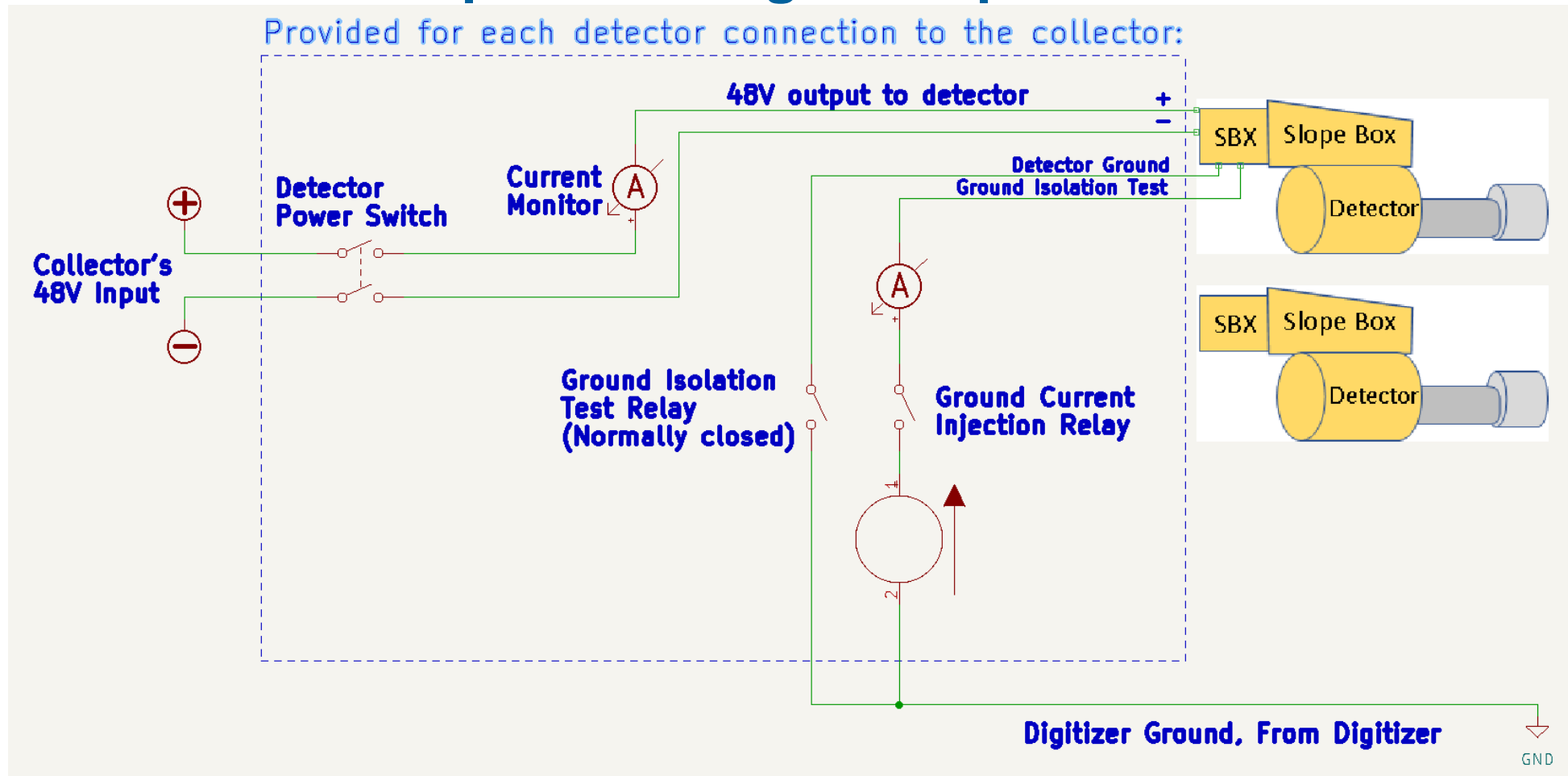
Alarm and status inputs from the 48V DC supply.

Isolated 48V input from the power supply

48V outputs provided for up to 30 detectors.

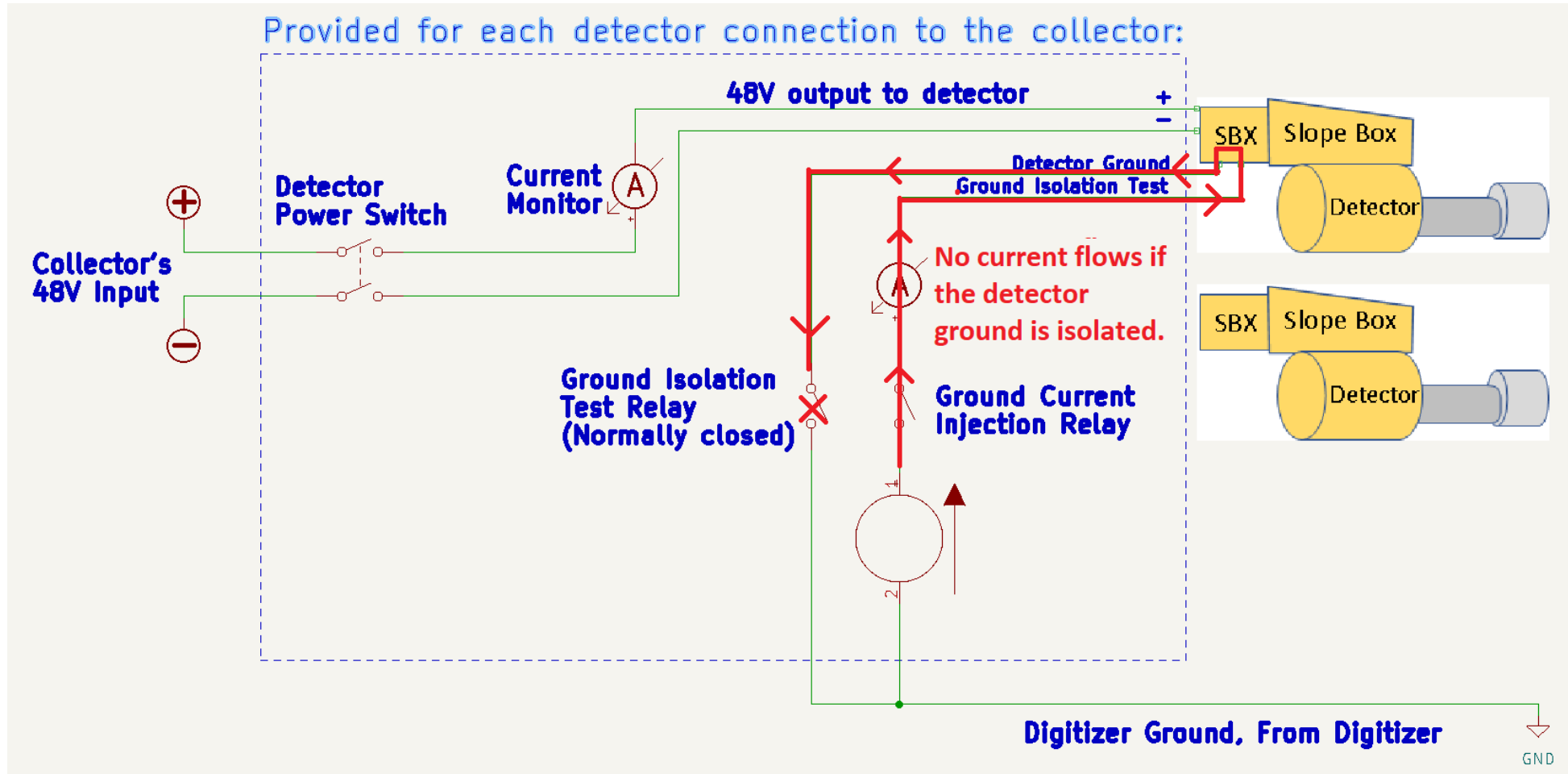
COLLECTOR BOX

Overview of collector power and ground path



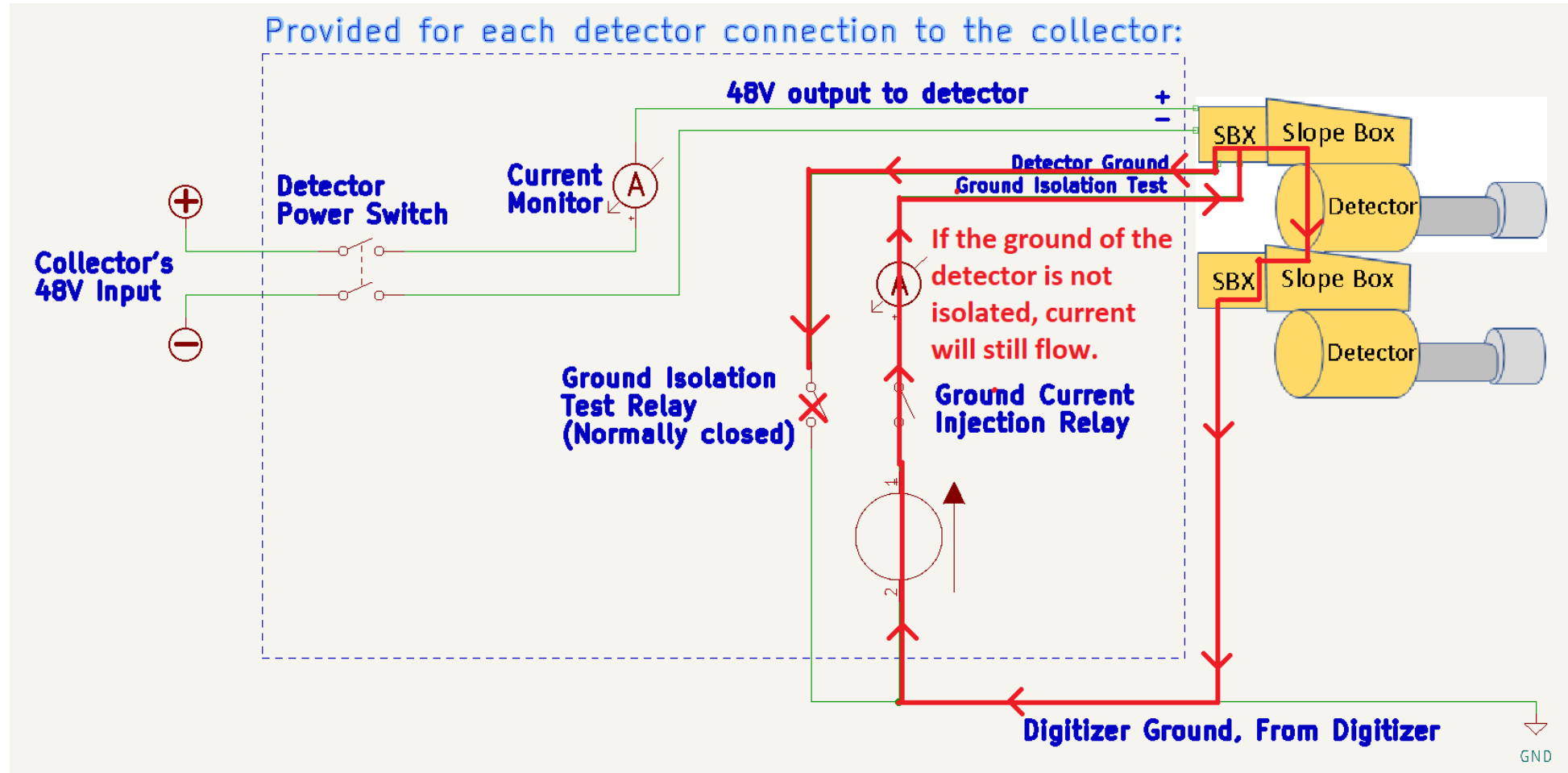
COLLECTOR BOX

The ground isolation check



COLLECTOR BOX

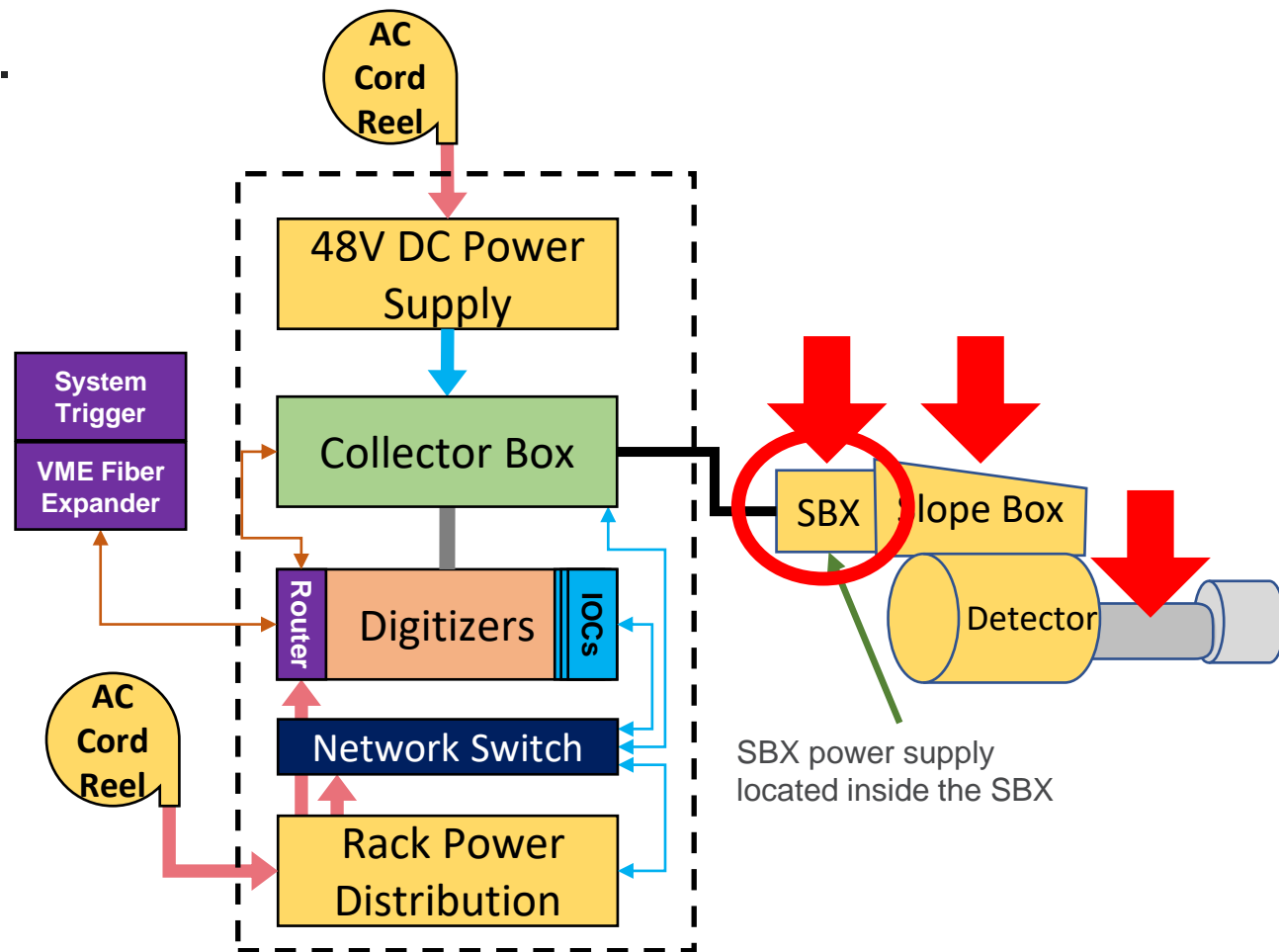
The ground isolation check



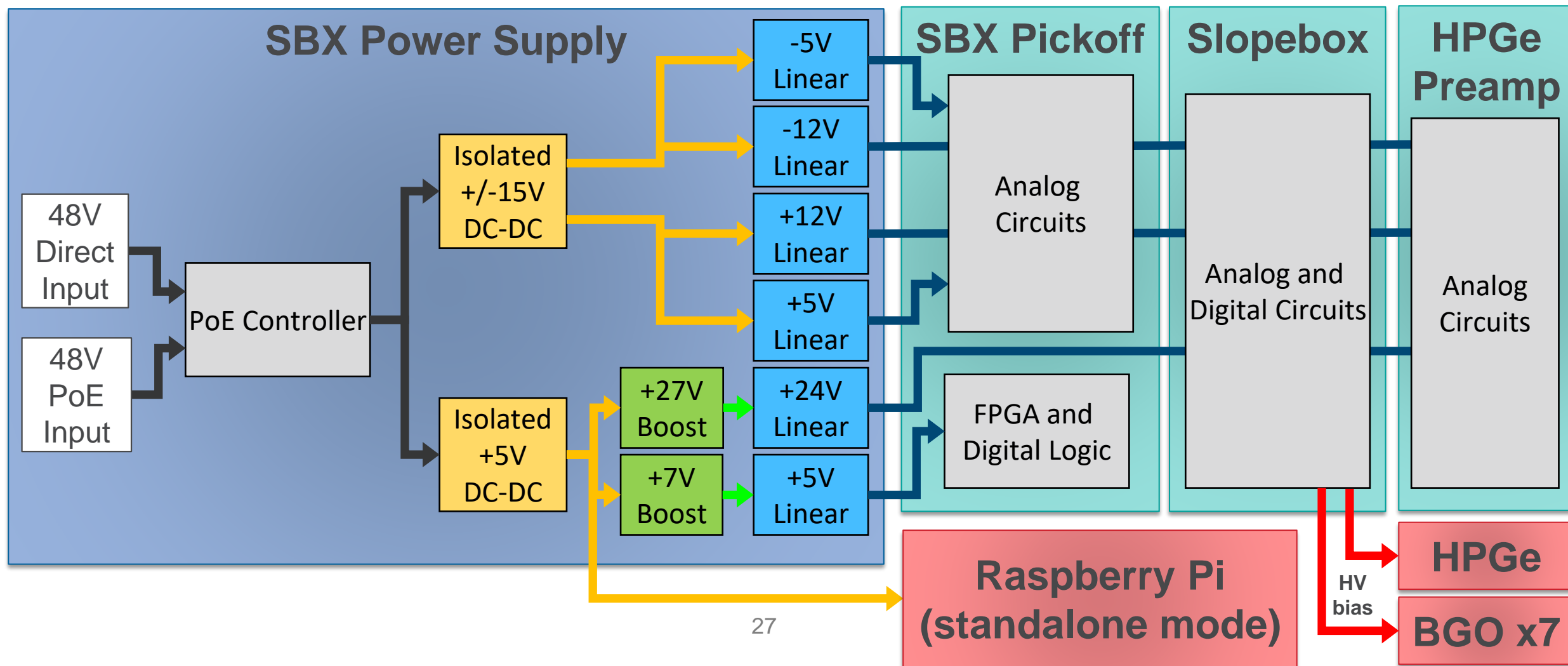
NEW POWER DISTRIBUTION SYSTEM

Detector Power Path

1. Overhead AC power cord reels.
2. 48V DC Power Supply
3. Collector Box
4. **SBX Power Supply**



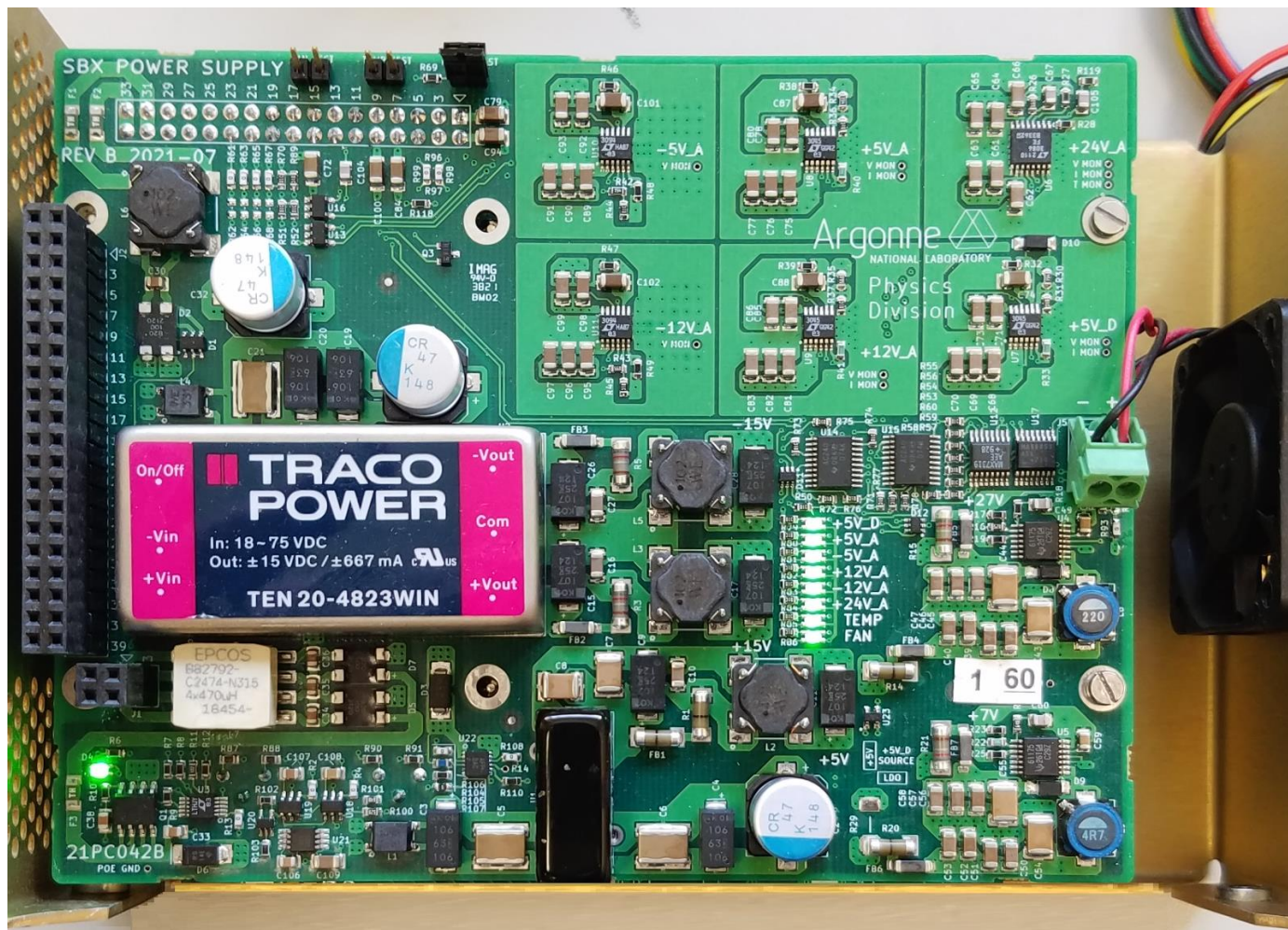
SBX POWER SUPPLY



SBX POWER SUPPLY

Overview

- Supports PoE or direct 48V inputs.
- Isolated point of load power supply.
- Provides 6 ultra low noise linear power outputs.
- Provides an additional higher current output for a Raspberry Pi.
- Provides monitoring of:
 - Power supply status
 - Fan speed and fan failure
 - Supply temperature monitor
 - Pickoff temperature monitor



NEW GAMMASPHERE TRIGGER CONNECTIVITY

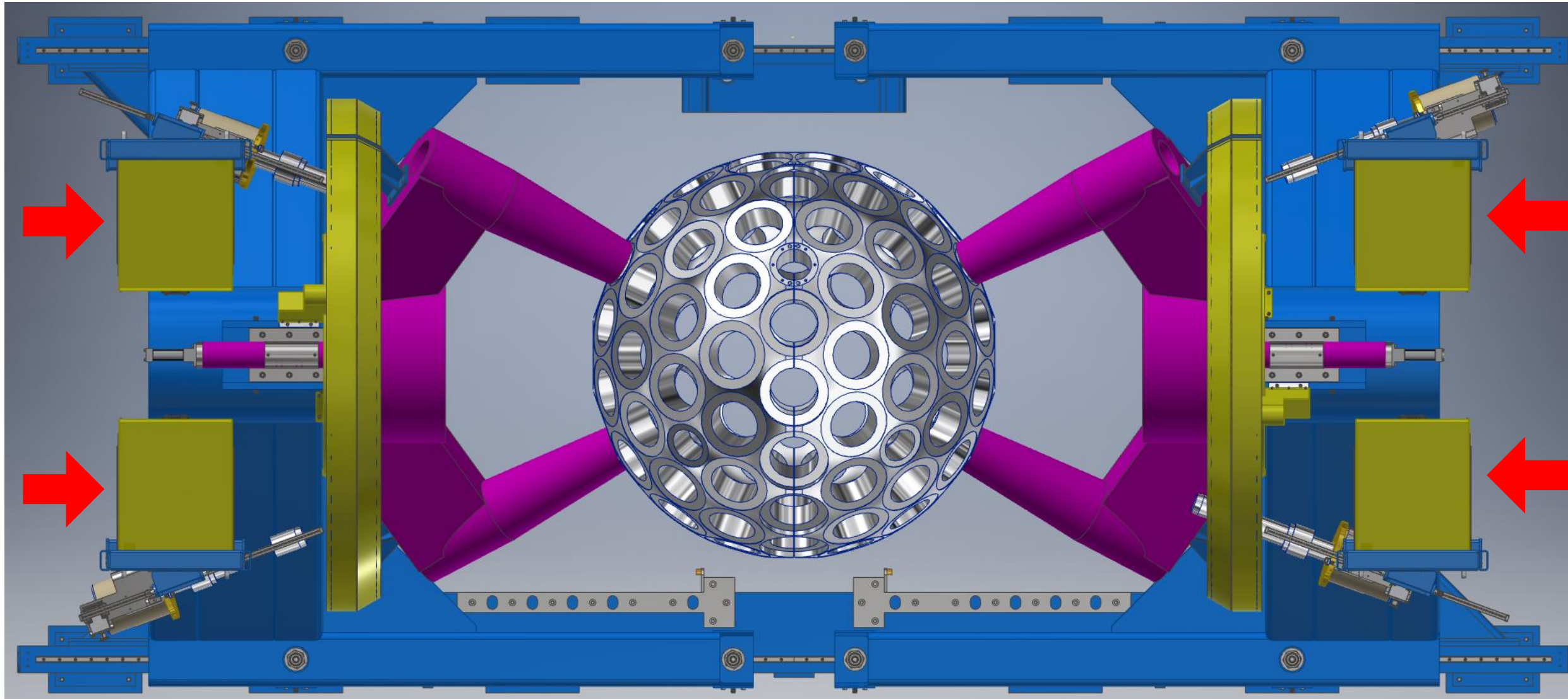


U.S. DEPARTMENT OF
ENERGY

Argonne National Laboratory is a
U.S. Department of Energy laboratory
managed by UChicago Argonne, LLC.

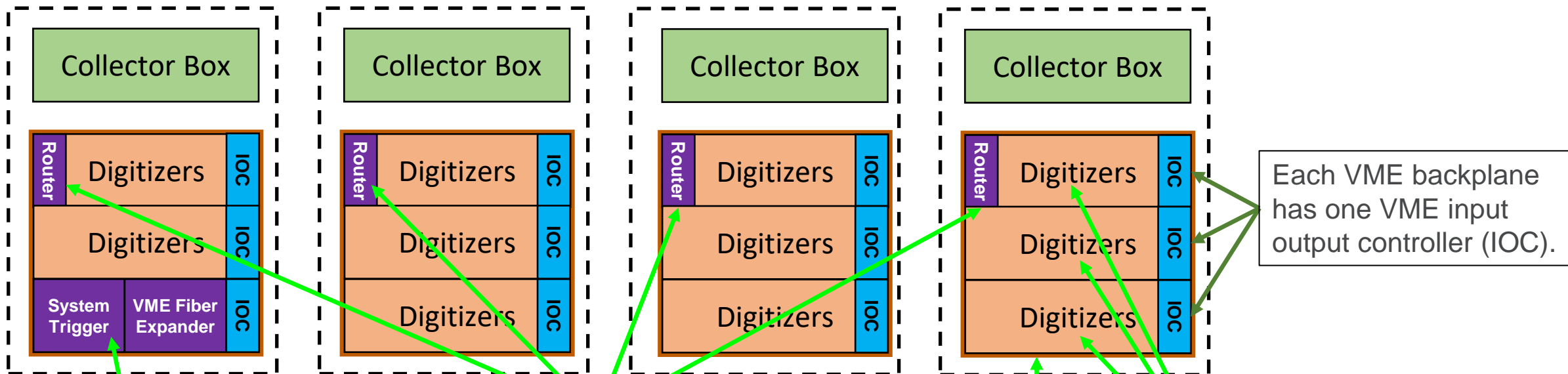


PHYSICAL LAYOUT OF THE NEW ELECTRONICS



NEW GAMMASPHERE TRIGGER CONNECTIVITY

Trigger/DAQ Physical Overview



One rack houses the System Trigger and the VME Fiber Expander

Each rack has one Router Trigger to receive trigger and timing information from the System Trigger and transmit it to all the digitizers in that quadrant.

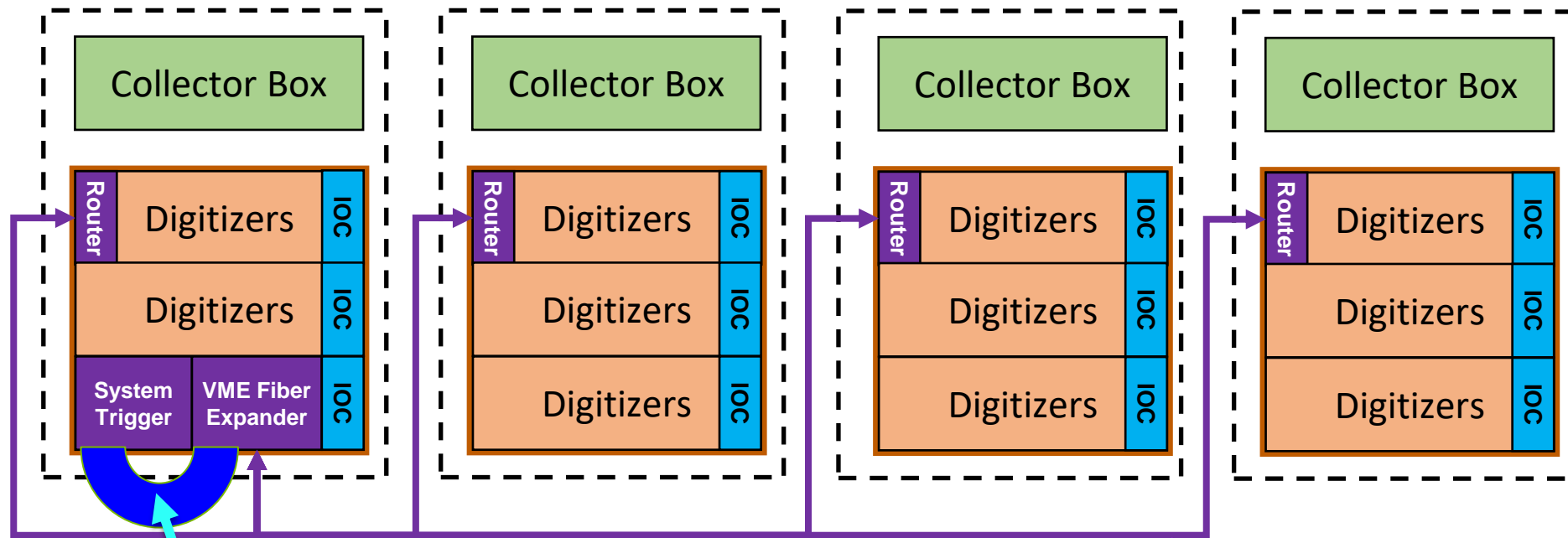
Each rack has a single VME crate with three independent VME backplanes.

Each VME backplane has one VME input output controller (IOC).

Each VME backplane has 4 digitizers, with 10 channels each.

VME FIBER EXPANDER

Trigger Connectivity Overview



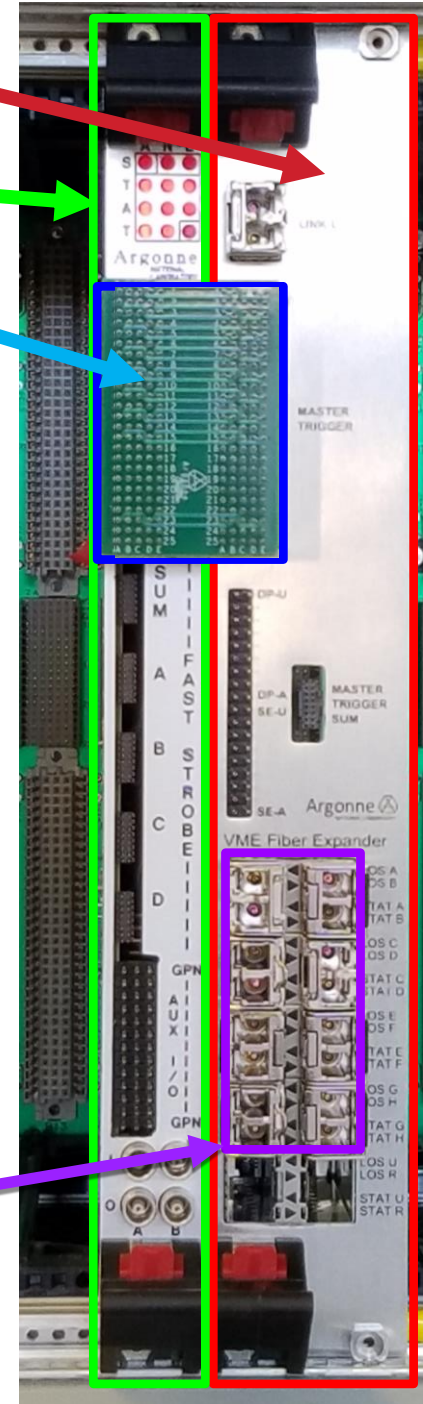
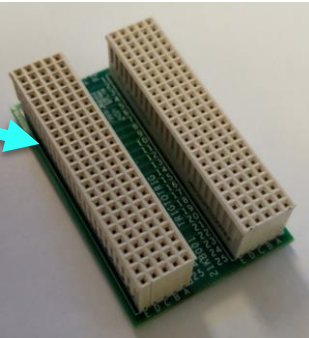
VME Fiber Expander

System Trigger

Trig-to-Trig Board

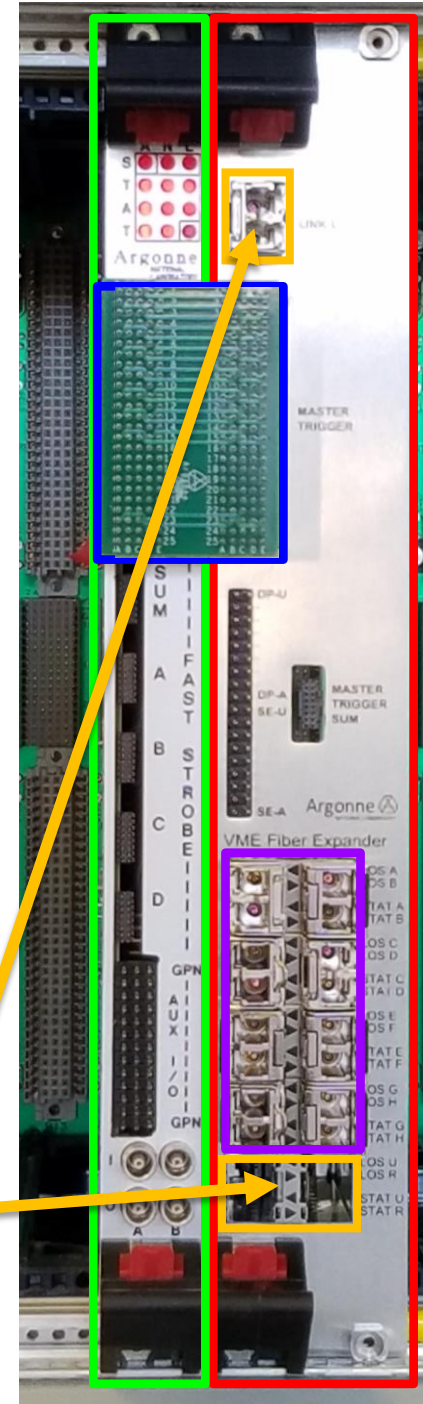
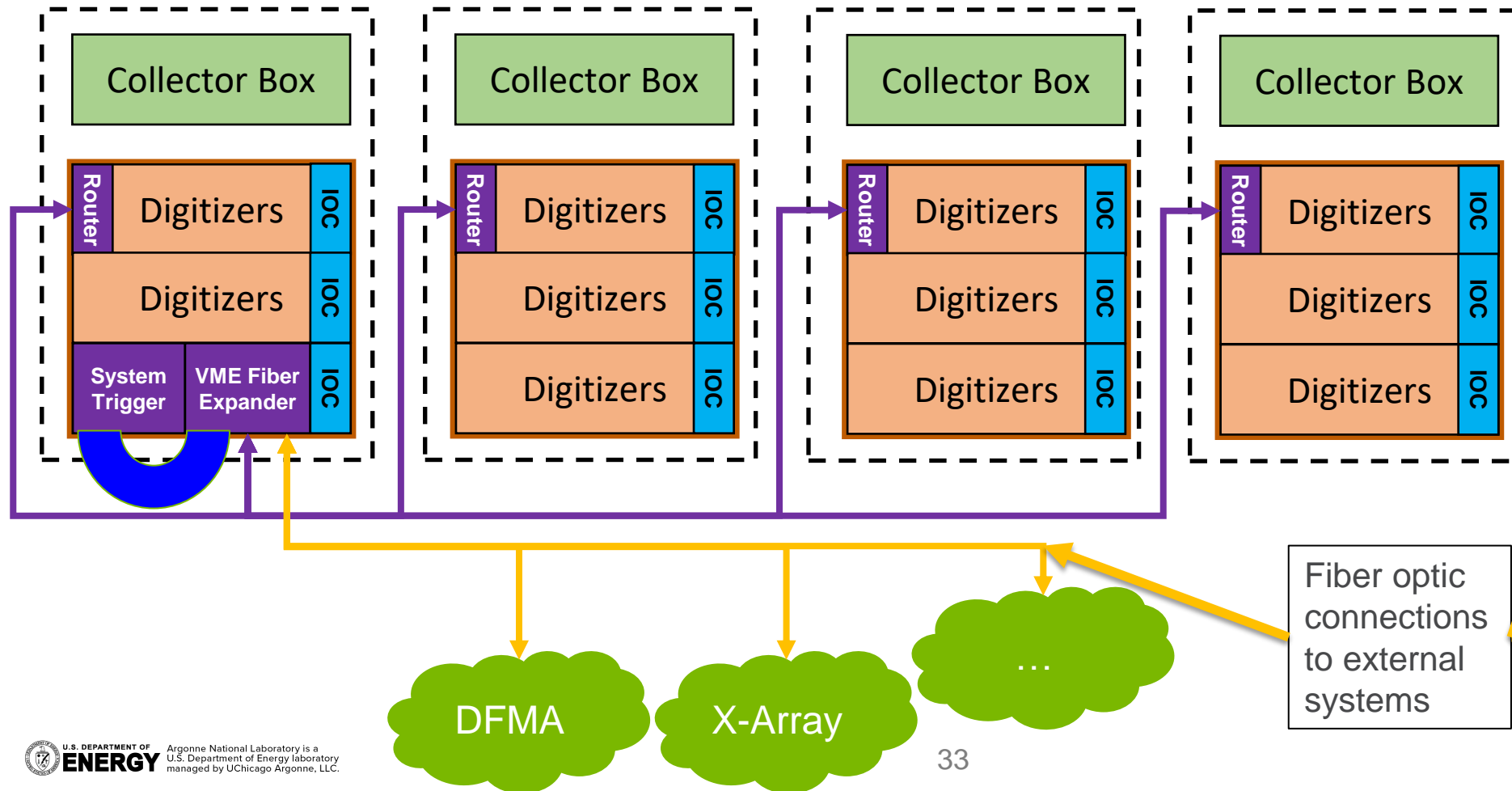
Trig to Trig Board

Fiber optic connections to routers



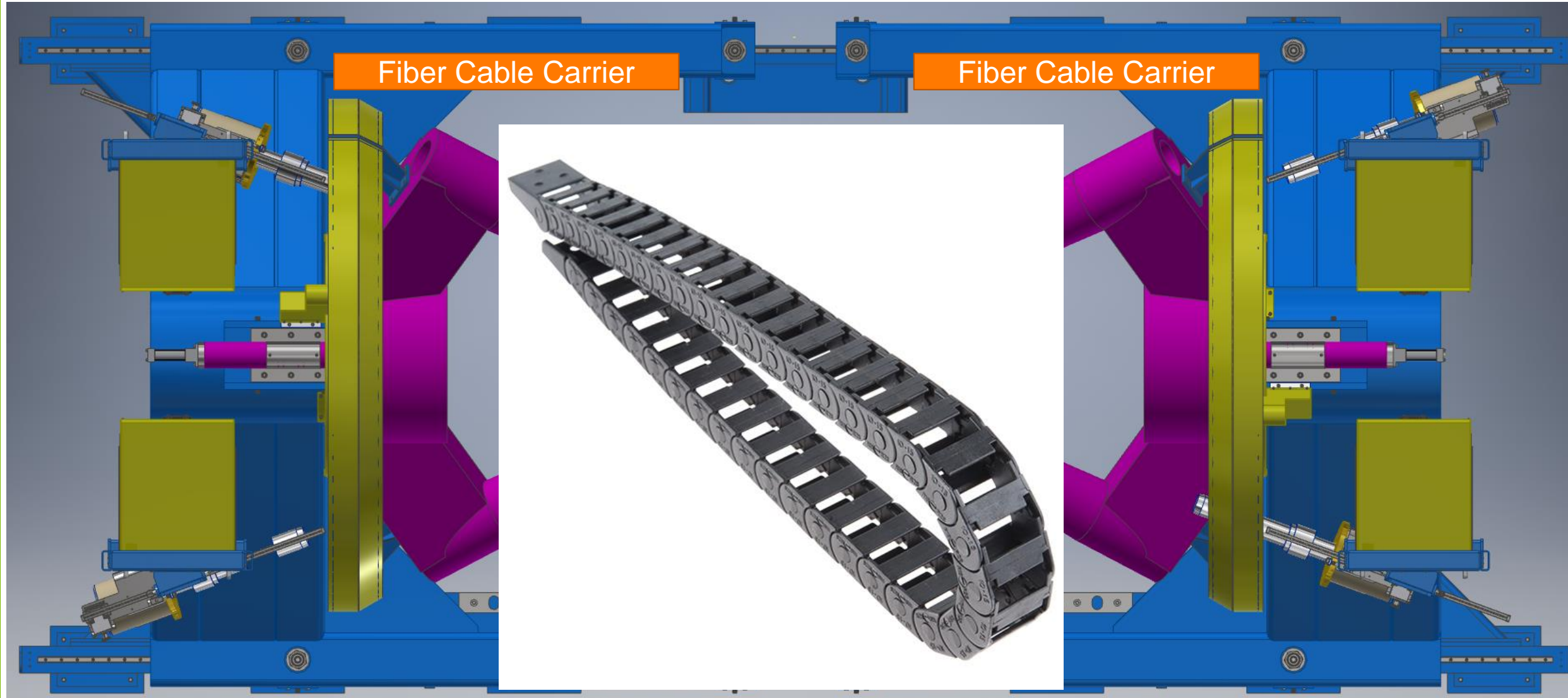
VME FIBER EXPANDER

External System



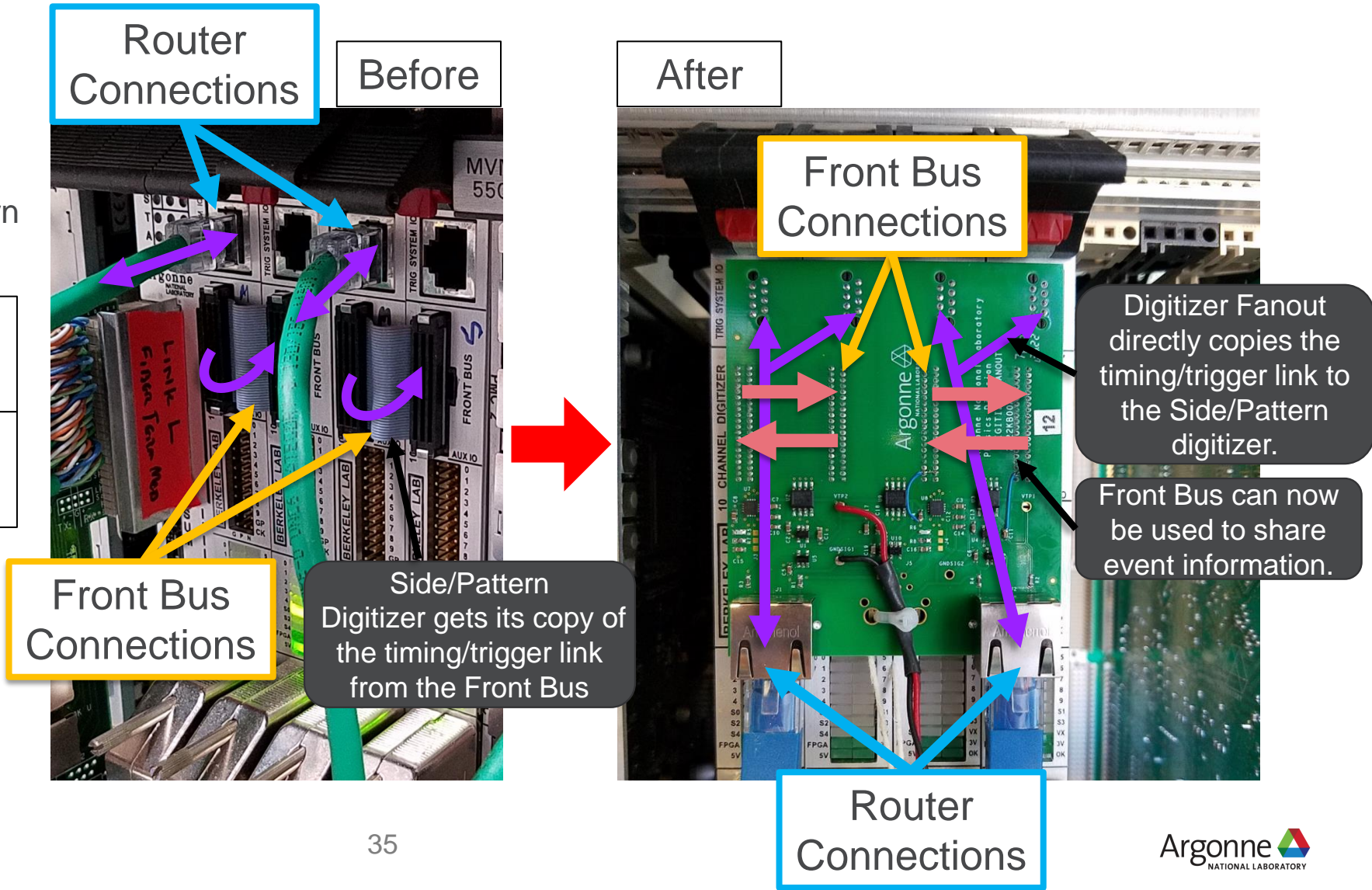
Fiber optic connections to external systems

PHYSICAL LAYOUT OF THE NEW ELECTRONICS



DIGITIZER FANOUT

	Center/Sum Digitizer	Side/Pattern Digitizer
Channels 0 to 4	Ge Center	Ge Side
Channels 5 to 9	BGO Sum	BGO Pattern



DETECTOR MAINTENANCE AND NEW TOOLS



U.S. DEPARTMENT OF
ENERGY

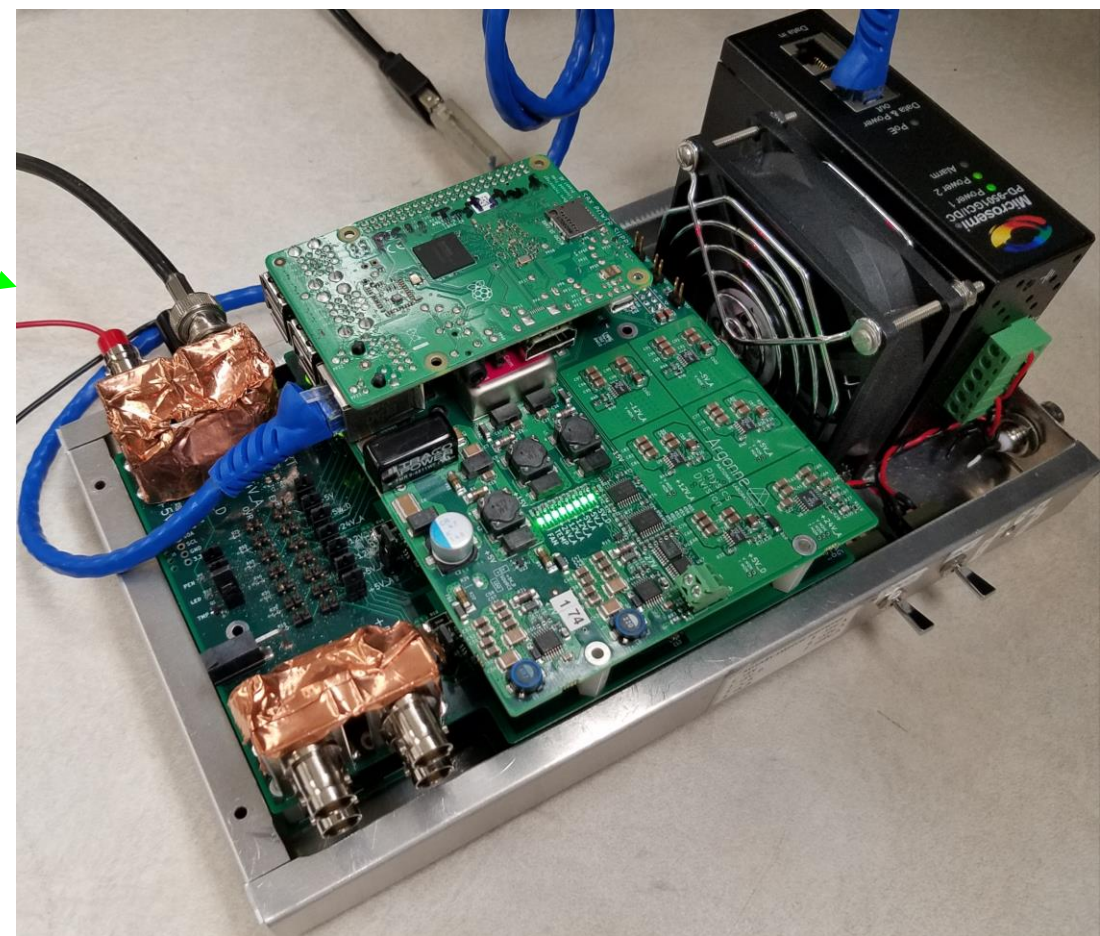
Argonne National Laboratory is a
U.S. Department of Energy laboratory
managed by UChicago Argonne, LLC.

Argonne 
NATIONAL LABORATORY

DETECTOR MAINTENANCE AND NEW TOOLS

Overview

- New Test Fixtures
 - SBX Power Supply test fixture
 - Preamp test fixture
- Documented Detector Checkout Procedures
 - MCA - Analog Test
 - Gammaware - Digital Test
- Documented Detector Repair Procedures
- Detector Tracking
- Ortec Repair pipeline restart
 - Nine detectors currently undergoing repair or evaluation at Ortec.



PREAMP DIAGNOSTIC TOOL

- Simple interface for production checkout.

- Provides simple Pass/Fail status.

1 = Pass, negative = Fail.

- May be used in conjunction with the Preamp Tester:

- Production Checkout
- Post-Production Diagnostic/Verification

- May be used with only the preamp:

- Post detector-installation testing.
- Loading detector information into the preamp's EEPROM
 - HV Setting, Detector ID, Detector Type, optimal shaping time, ect.

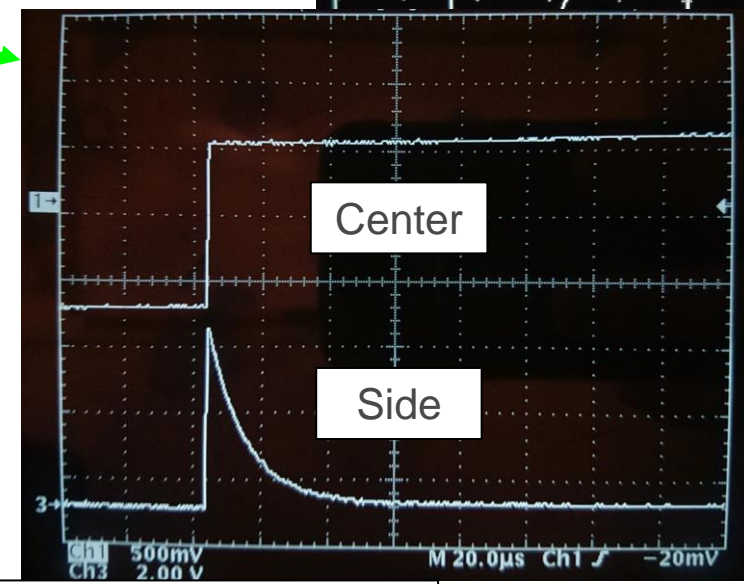
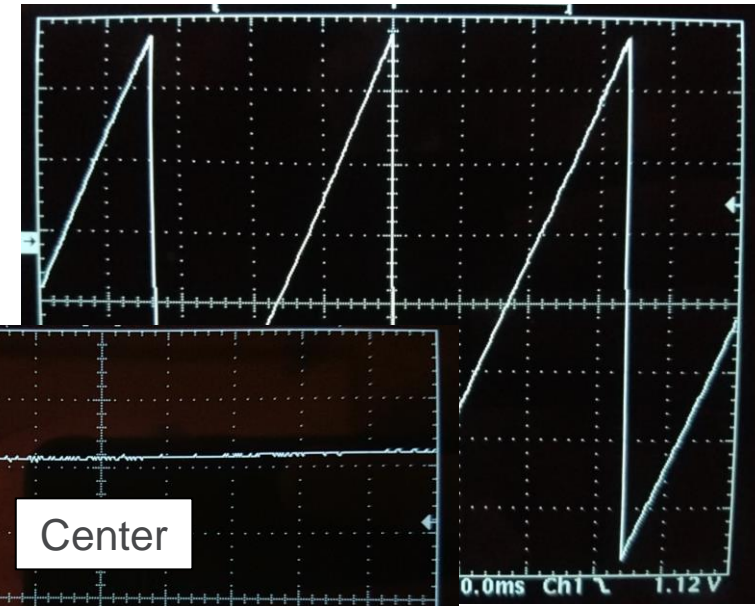
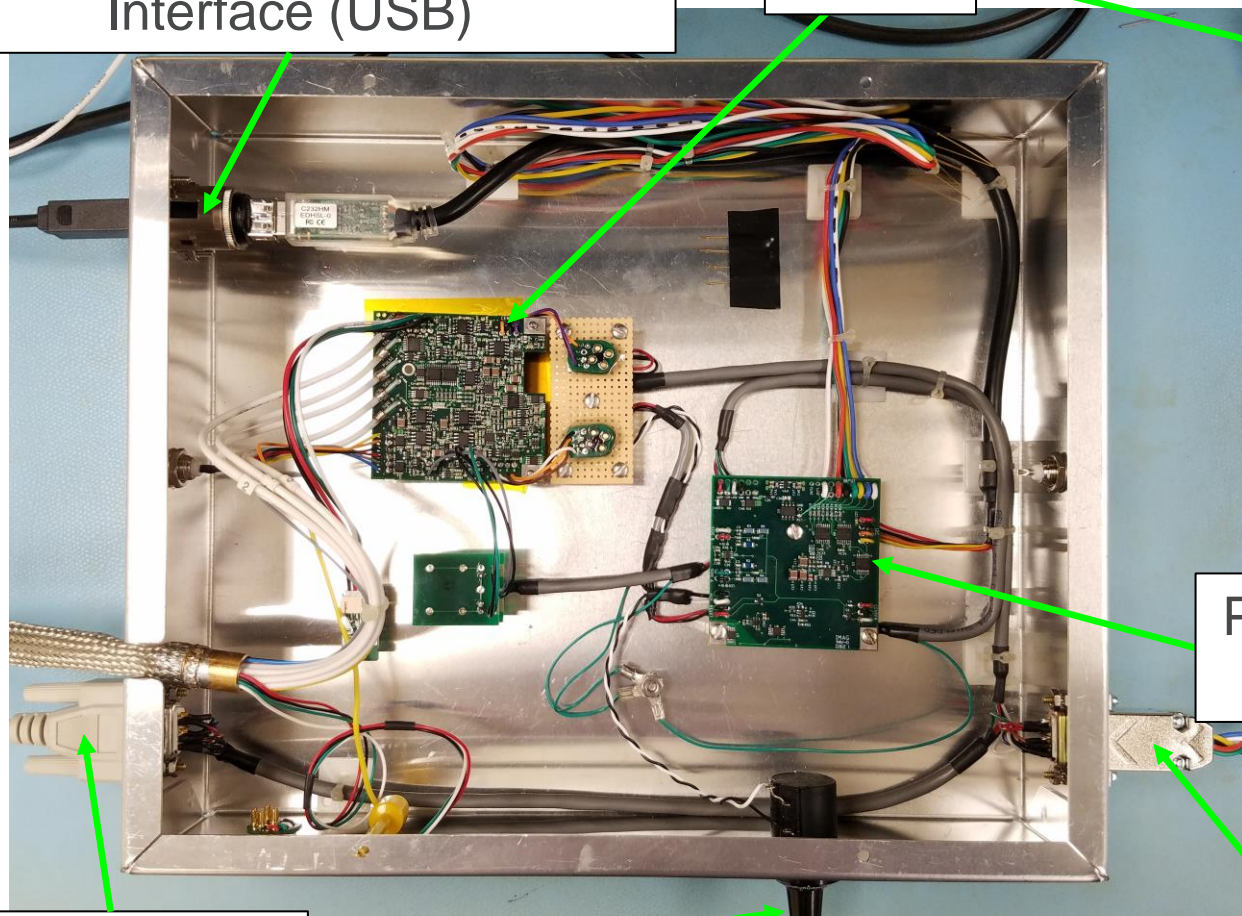
Center FET Vds 5.002871 V	Center Bias Voltage 21.989330 V	Center Bias Current 16.443 mA	Center Current Target 16.986459 mA	ADC1 Ref Offset -250.1 ppm
Side FET Vds 4.003911 V	Side Bias Voltage 21.986827 V	Side Bias Current 10.746 mA	Side Current Target 10.578186 mA	ADC2 Ref Offset -360.1 ppm
Side B Offset [Vgs] -285.8 mV	Side A Offset [Vgs] -245.9 mV	PT500 Temp -196.53 C	PT500 Resistance 100.075 ohms	HV Cut State 0 Digital
PCB/Case Temp 24.312 C		Enclosure Temp 21.88 C	Enclosure Humidity 27.5 %	Reset State 0 Digital
Cntr. Rise T. Setting 18.9 %	Reset Slew Setting 51.6 %	Pulser Amp. Setting 50.2 %	Center Vds Setting 50.2 %	

Current Page: Status Overview	Standalone Test -11 Boolean
T - Load Test Settings	
D - Load Default Settings	
S - Store Current Settings	
1 - EEPROM	PA Fixture Test 1 Boolean
2 - Pulser	
3 - HV Cutoff Test	
4 - Side Pulser Test	
9 - Preamp Tester Overview	
H - Home	
Q - Quit	

PREAMP TESTER

Preamp Tester Communication Interface (USB)

DUT

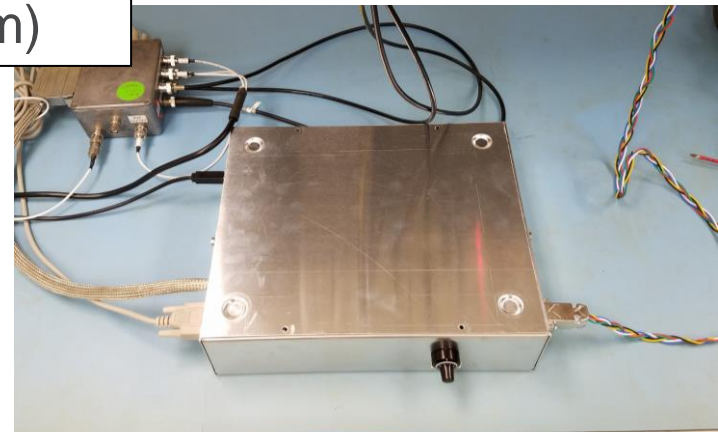


Preamp Tester PCB (Detector Sim)

Preamp Power Output

HV Cutoff, Test Pot

Preamp Tester Power Input



CONCLUSION



U.S. DEPARTMENT OF
ENERGY

Argonne National Laboratory is a
U.S. Department of Energy laboratory
managed by UChicago Argonne, LLC.

Argonne 
NATIONAL LABORATORY

CONCLUSION

- Grounding is much better controlled
- Automated ground loop detection
- Gammasphere is now portable
- Detector installation/removal at the axis of rotation is much improved
- It is now possible to remove the shack to re-enable FMA rotation

THE ANL TEAM WORKING ON UPGRADE:

LER Staff

Torben Lauritsen
Walter Reviol
Darek Seweryniak
Marco Siciliano
MPC

Term Staff

Pat Copp
Claus Mueller-Gattermann

Exp. Support

John Anderson
Michael Oberling
Ed Boron
Russel Knaack
John Rohrer
Bruce Nardi

Outline of Talks

- Introduction – Mike Carpenter
- Gammasphere Upgrade Overview – Pat Copp
- *Intermission*
- Signal Processing and Controls – John Anderson
- Power Distribution, Infrastructure and Mechanics – Michael Oberling

PCB Layout

Todd Hayden (HEP)

ANY QUESTIONS?



MICHAEL OBERLING
MOBERLING@ANL.GOV