

1. Work requester fills out this section.  Standing Work Permit

Requester: Don Lynch	Date: 11/3/2008	Ext.: 2253	Dept/Div/Group: PO/PHENIX
Other Contact person (if different from requester): Carter Biggs			Ext.: 7515
Work Control Coordinator: Don Lynch	Start Date: 11/6/2008		Est. End Date: 2/1/2009
Brief Description of Work: Re- Install HBD Detector in IR			
Building: 1008	Room: IR	Equipment: HBD Detectors	Service Provider: PHENIX Techs

2. WCC, Requester/Designee, Service Provider, and ES&H (as necessary) fill out this section or attach analysis

<b>ES&amp;H ANALYSIS</b>					
<b>Radiation Concerns</b>	<input type="checkbox"/> None	<input type="checkbox"/> Activation	<input type="checkbox"/> Airborne	<input type="checkbox"/> Contamination	<input checked="" type="checkbox"/> Radiation
Radiation Generating Devices:	<input type="checkbox"/> Radiography	<input type="checkbox"/> Moisture Density Gauges	<input type="checkbox"/> Soil Density Gauges	<input type="checkbox"/> X-ray Equipment	
<input checked="" type="checkbox"/> Special nuclear materials involved, notify Isotope Special Materials Group			<input type="checkbox"/> Fissionable materials involved, notify Laboratory Criticality Officer		
<b>Safety Concerns</b>	<input checked="" type="checkbox"/> None	<input type="checkbox"/> Ergonomics	<input type="checkbox"/> Transport of Haz/Rad Material		
<input type="checkbox"/> Adding/Removing Walls or Roofs	<input type="checkbox"/> Confined Space*	<input type="checkbox"/> Explosives	<input type="checkbox"/> Lead*	<input type="checkbox"/> Penetrating Fire Walls	
<input type="checkbox"/> Asbestos*	<input type="checkbox"/> Corrosive	<input type="checkbox"/> Flammable	<input type="checkbox"/> Magnetic Field*	<input type="checkbox"/> Pressurized Systems	
<input type="checkbox"/> Beryllium*	<input type="checkbox"/> Cryogenic	<input type="checkbox"/> Fumes/Mist/Dust*	<input type="checkbox"/> Material Handling	<input type="checkbox"/> Rigging/Critical Lift	
<input type="checkbox"/> Biohazard*	<input type="checkbox"/> Electrical	<input type="checkbox"/> Heat/Cold Stress	<input type="checkbox"/> Noise*	<input type="checkbox"/> Toxic Materials*	
<input type="checkbox"/> Chemicals*	<input type="checkbox"/> Elevated Work*	<input type="checkbox"/> Hydraulic	<input type="checkbox"/> Non-ionizing Radiation*	<input type="checkbox"/> Vacuum	
<input type="checkbox"/> Excavation	<input type="checkbox"/> Lasers*	<input type="checkbox"/> Oxygen Deficiency*	<input type="checkbox"/> Other		
* Does this work require medical clearance or surveillance from the Occupational Medicine Clinic? <input type="checkbox"/> Yes <input type="checkbox"/> No					
<b>Environmental Concerns</b>	<input checked="" type="checkbox"/> None		<input type="checkbox"/> Work impacts Environmental Permit No.		
<input type="checkbox"/> Atmospheric Discharges (rad/non-rad)	<input type="checkbox"/> Land Use		<input type="checkbox"/> Soil Activation/contamination	<input type="checkbox"/> Waste-Mixed	
<input type="checkbox"/> Chemical or Rad Material Storage or Use	<input type="checkbox"/> Liquid Discharges		<input type="checkbox"/> Waste-Clean	<input type="checkbox"/> Waste-Radioactive	
<input type="checkbox"/> Cesspools (UIC)	<input type="checkbox"/> Oil/PCB Management		<input type="checkbox"/> Waste-Hazardous	<input type="checkbox"/> Waste-Regulated Medical	
<input type="checkbox"/> High water/power consumption	<input type="checkbox"/> Spill potential		<input type="checkbox"/> Waste-Industrial	<input type="checkbox"/> Underground Duct/Piping	
Waste disposition by: <input type="checkbox"/> Other					
<b>Pollution Prevention (P2)/Waste Minimization Opportunity:</b>			<input checked="" type="checkbox"/> None <input type="checkbox"/> Yes		
<b>FACILITY CONCERNS</b>	<input checked="" type="checkbox"/> None				
<input type="checkbox"/> Access/Egress Limitations	<input type="checkbox"/> Electrical Noise	<input type="checkbox"/> Potential to Cause a False Alarm		<input type="checkbox"/> Vibrations	
<input type="checkbox"/> Configuration Control	<input type="checkbox"/> Impacts Facility Use Agreement		<input type="checkbox"/> Temperature Change	<input type="checkbox"/> Other	
<input type="checkbox"/> Maintenance Work on Ventilation Systems	<input type="checkbox"/> Utility Interruptions				
<b>WORK CONTROLS</b>					
<b>Work Practices</b>					
<input type="checkbox"/> None	<input type="checkbox"/> Exhaust Ventilation	<input type="checkbox"/> Lockout/Tagout	<input type="checkbox"/> Spill Containment	<input type="checkbox"/> Security (see Instruction Sheet)	
<input type="checkbox"/> Back-up Person/Watch	<input type="checkbox"/> HP Coverage	<input type="checkbox"/> Posting/Warning Signs	<input type="checkbox"/> Time Limitation	<input checked="" type="checkbox"/> Other: Magnet Operational Lockout and survey	
<input type="checkbox"/> Barricades	<input type="checkbox"/> IH Survey	<input type="checkbox"/> Scaffolding-requires inspection	<input type="checkbox"/> Warning Alarm (i.e. "high level")		
<b>Protective Equipment</b>					
<input type="checkbox"/> None	<input type="checkbox"/> Ear Plugs	<input type="checkbox"/> Gloves	<input type="checkbox"/> Lab Coat	<input type="checkbox"/> Safety Glasses	
<input type="checkbox"/> Coveralls	<input type="checkbox"/> Ear Muffs	<input type="checkbox"/> Goggles	<input type="checkbox"/> Respirator	<input type="checkbox"/> Safety Harness	
<input type="checkbox"/> Disposable Clothing	<input type="checkbox"/> Face Shield	<input type="checkbox"/> Hard Hat	<input type="checkbox"/> Shoe Covers	<input checked="" type="checkbox"/> Safety Shoes	<input type="checkbox"/> Other
<b>Permits Required (Permits must be valid when job is scheduled.)</b>					
<input checked="" type="checkbox"/> None					
<input type="checkbox"/> Concrete/Masonry Penetration	<input type="checkbox"/> Cutting/Welding	<input type="checkbox"/> Impair Fire Protection Systems			
<input type="checkbox"/> Confined Space Entry	<input type="checkbox"/> Digging/Core Drilling	<input type="checkbox"/> Rad Work Permit-RWP No			
<input type="checkbox"/> Electrical Working Hot	<input type="checkbox"/> Other				
<b>Dosimetry/Monitoring</b>					
<input checked="" type="checkbox"/> None					
<input type="checkbox"/> Air Effluent	<input type="checkbox"/> Heat Stress Monitor	<input type="checkbox"/> Real Time Monitor	<input type="checkbox"/> TLD		
<input type="checkbox"/> Ground Water	<input type="checkbox"/> Noise Survey/Dosimeter	<input type="checkbox"/> Self-reading Pencil Dosimeter	<input type="checkbox"/> Waste Characterization		
<input type="checkbox"/> Liquid Effluent	<input type="checkbox"/> O <sub>2</sub> /Combustible Gas	<input type="checkbox"/> Self-reading Digital Dosimeter	<input type="checkbox"/> Other		
<input type="checkbox"/> Passive Vapor Monitor	<input type="checkbox"/> Sorbent Tube/Filter Pump				
<b>Training Requirements (List below specific training requirements)</b>					
PHENIX Awareness, CA Access					
<b>Based on analysis above, the Walkdown Team determines the risk, complexity, and coordination ratings below:</b>			<b>If using the permit when all hazard ratings are low, only the following need to sign: ( Although allowed, there is no need to use back of form)</b>		
<b>ES&amp;H Risk Level:</b>	<input checked="" type="checkbox"/> Low	<input type="checkbox"/> Moderate	<input type="checkbox"/> High	WCC:	Date:
<b>Complexity Level:</b>	<input checked="" type="checkbox"/> Low	<input type="checkbox"/> Moderate	<input type="checkbox"/> High	Service Provider:	Date:
<b>Work Coordination:</b>	<input checked="" type="checkbox"/> Low	<input type="checkbox"/> Moderate	<input type="checkbox"/> High	Authorization to start	Date:
(Departmental Sup/WCC/Designee)					

3. Both work requester and service provider contribute to work plan (use attachments for detailed plans)

<b>Work Plan</b> (procedures, timing, equipment, and personnel availability need to be addressed): See attached Installation Procedure				
Special Working Conditions Required:				
Operational Limits Imposed:				
Post Work Testing Required:				
Job Safety Analysis Required: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			Walkdown Required: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
<b>Reviewed by:</b> Primary Reviewer will determine the size of the review team and the other signatures required based on hazards and job complexity. Primary Reviewer signature means that the hazards and risks that could impact ES&H have been identified and will be controlled according to BNL requirements.				
Title	Name (print)	Signature	Life #	Date
Primary Reviewer				
ES&H Professional				
Other				
Other				
Work Control Coordinator	Don Lynch		20146	
Service Provider				
Review Done: <input type="checkbox"/> in series		<input type="checkbox"/> team		

**4. Job site personnel fill out this section.**

Note: Signature indicates personnel performing work have read and understand the hazards and permit requirements (including any attachments).			
Job Supervisor:		Contractor Supervisor:	
Workers:	Life#:	Workers :	Life#:
Workers are encouraged to provide feedback on ES&H concerns or on ideas for improved job work flow. Use feedback form or space below.			

**5. Departmental Job Supervisor, Work Control Coordinator/Designee**

Conditions are appropriate to start work: (Permit has been reviewed, work controls are in place and site is ready for job.)			
Name:	Signature:	Life#:	Date:

**6. Departmental Job Supervisor, Work Requester/Designee determines if Post Job Review is required.**  Yes  No

Post Job Review (Fill in names of reviewers)			
Name:	Signature:	Life#:	Date:
Name:	Signature:	Life#:	Date:

**7. Worker provides feedback.**

Worker Feedback (use attached sheets as necessary)	
a) WCM/WCC: Is any feedback required? <input type="checkbox"/> Yes <input type="checkbox"/> No	
b) Workers: Are there better methods or safer ways to perform this job in the future? <input type="checkbox"/> Yes <input type="checkbox"/> No	

**8. Closeout: Work Control Coordinator (authorizing dept.) checks quality of completed permit and ensures the work site is left in an acceptable condition. (WCC can delegate clean up of work area to work supervisor)**

Name:	Signature:	Life#:	Date:
Comments:			

## INTRODUCTION

The HBD detector upgrade was previously installed during 2006 and tested during RHIC run 7. Internal fabrication and design problems caused excessive failures of internal detector components. Subsequently both the east and west halves of the detector have been removed and transported to the University of New York at Stony Brook (SUNY Stony Brook) for fault diagnosis and repair. Extensive rework and testing of the detector sections has been performed and the detector is currently deemed ready for re-installation.

All signal and power cables and gas lines have been maintained in place since the detector halves were removed. These are ready to be reattached after the detectors are installed.

### **HBD Installation Procedure (To Install in CM region of PHENIX IR)**

(Note: the following sequence assumes that the west and east detector installations will be performed sequentially allowing for separate delivery of the east and west detector modules. Each detector will have an imbedded internal Fe55 source. This requires proper transportation planning and source radiation scan at BNL arrival. This is to be coordinated by the HBD group and all appropriate BNL safety procedures shall be observed by the HBD group prior to delivering the detectors to the PHENIX Assembly Hall for installation. The radiation screen required is in addition to the work described in the following workplan/procedure.)

- I. West Detector section
  - a. After installation the detectors shall be supplied with clean Inert Argon gas at a flow rate of not less than 1.5 l/min or as otherwise directed by HBD group experts.
  - b. Pre-install upper and lower aluminum rails for detectors and cable management.
  - c. Verify that PHENIX magnets are locked out of operation
  - d. Open west carriage for access to CM region.
  - e. Preplan and rehearse PHENIX technician responsibilities and positioning for installation.
  - f. Receive detectors as delivered from Stony Brook at PHENIX. Verify that appropriate radiation check has been performed by BNL Health Physics.
  - g. Disconnect transport gas bottle from west detector and cap west detector ports.
  - h. Install 3 way purge valves on HBD inlet and outlet lines.
  - i. Move HBD West Detector to CM region, carefully lift detector over HBD LV/signal rack and onto CM lifting platform.
  - j. Orient detector in upright position and lift onto aluminum rails and secure mounting feet as designed in retracted position such that window of detector faces beampipe. (see figure)

- k. Attach supply and return piping, purge supply and return lines using 3 way valves and establish flow to detector.
- l. Install cable management trays and tray structural supports for west detector to cable management rails . Attach handles to cable and detector mounting supports.
- m. Attach west detector HV and signal cables and secure cables in cable trays.
- n. Electrical/operational checkout tests per plan.

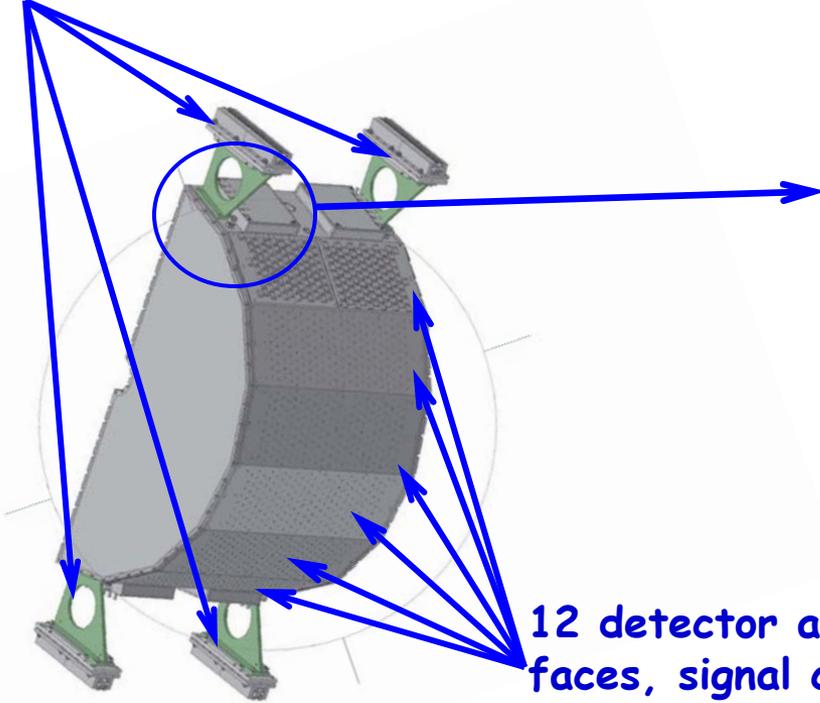
II. East Detector section

- a. Repeat steps c through o for the east detector

See the attached diagrams for further information.

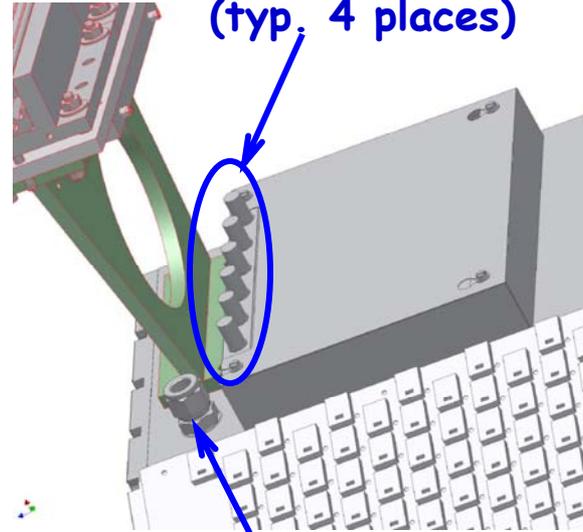
# HBD Detector

Mounting supports



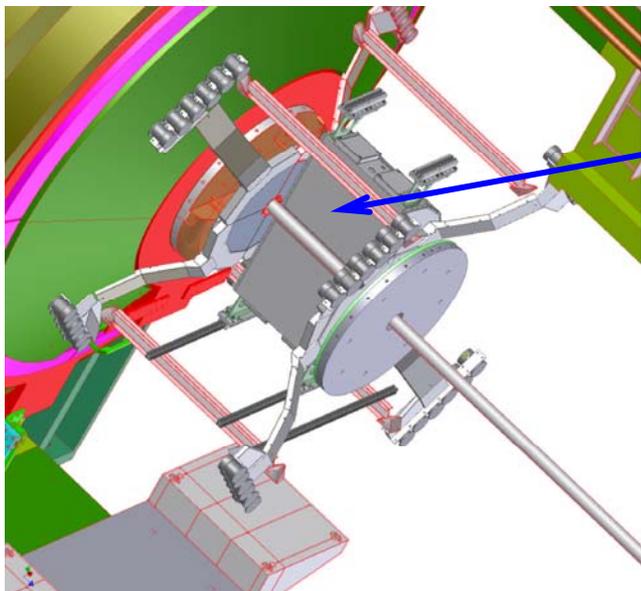
12 detector arrays on 6 faces, signal cable connections at North and south ends of face

High voltage connections, (typ. 4 places)

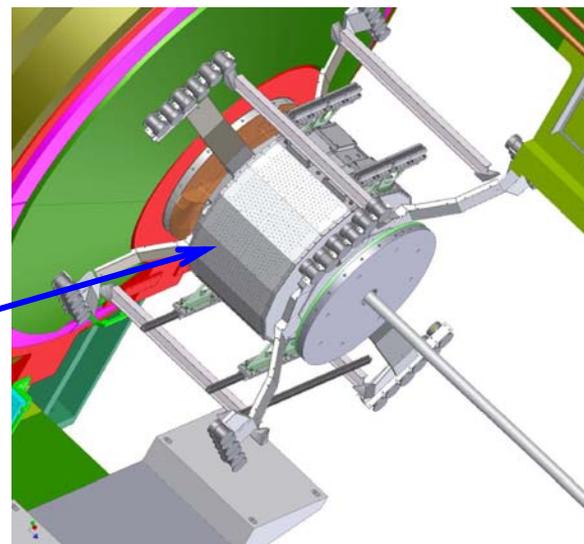


Gas connector, (typ. 4 places)

# HBD Installation



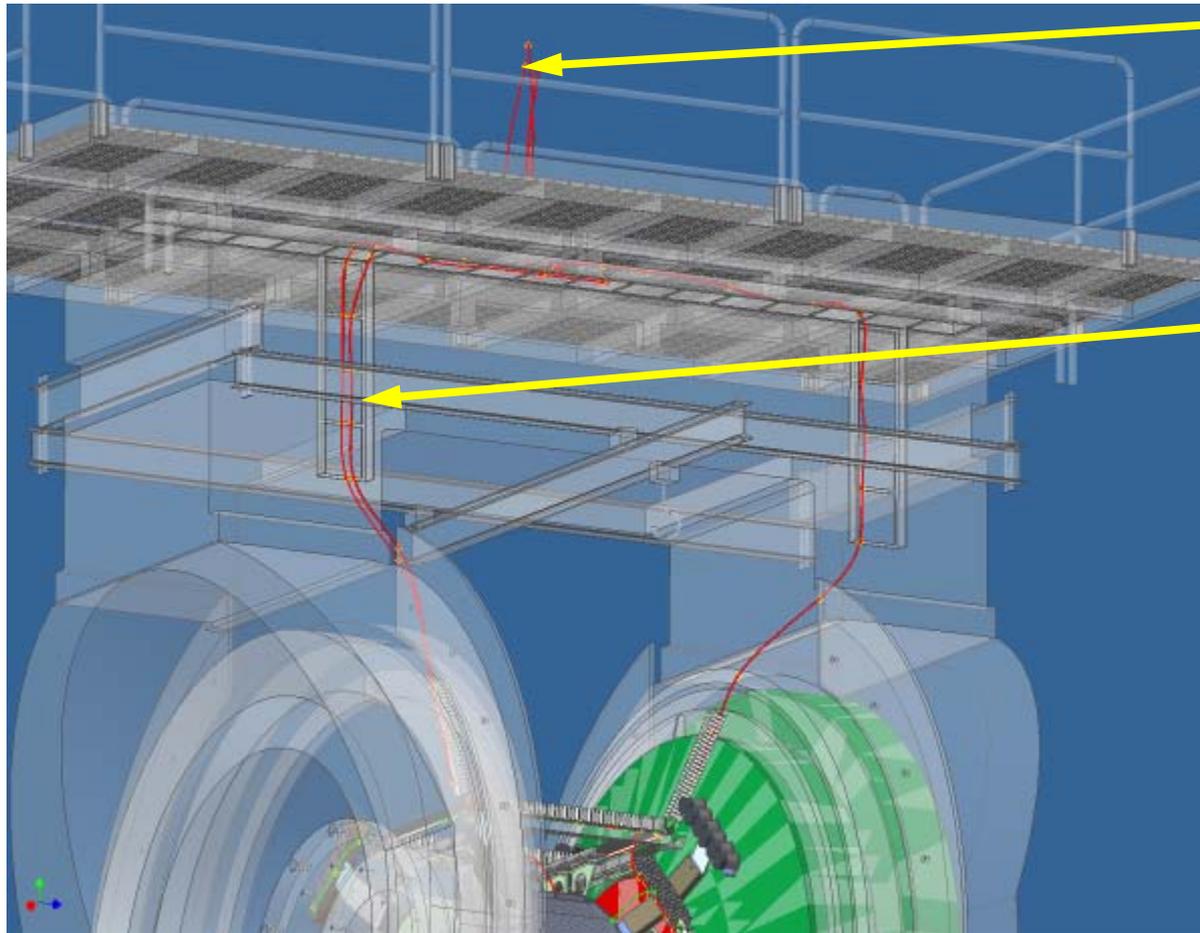
1. HBD West detector installed



2. HBD East detector installed

(North CM poleface omitted for clarity)

# RXNP & HBD Cable Routing 1



HBD HV &  
RXNP racks on  
Bridge near  
center

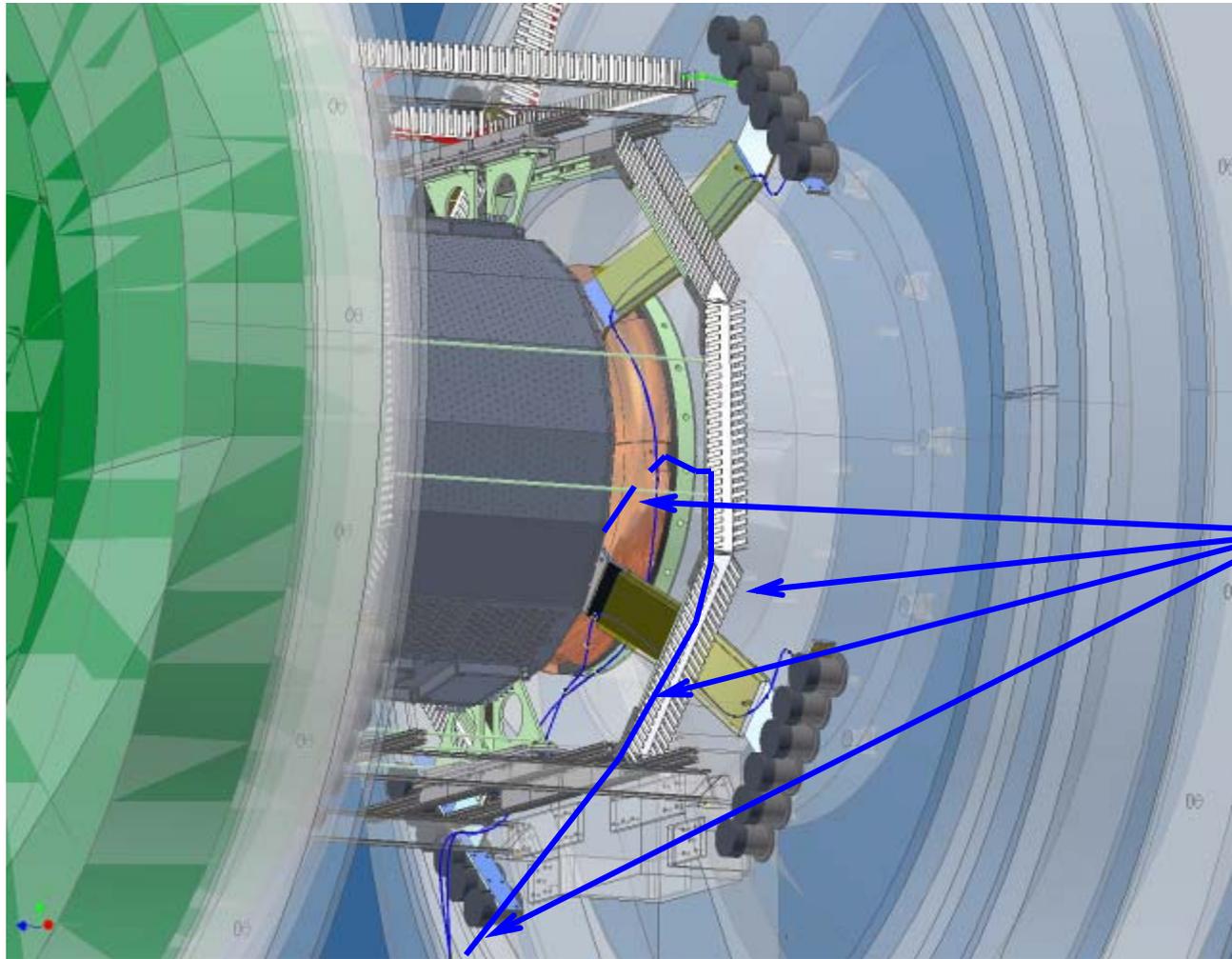
HBD HV Cables  
routed on upper  
southeast face of  
CM flux return

# RXNP & HBD Cable Routing 2



RXNP cables come down from top of CM south pole face to west upper i-beam,  $\frac{3}{4}$  cross over to east upper i-beam and  $\frac{1}{2}$  cross to north pole face (Mirror image of RXNP routing).

# RXNP & HBD Cable Routing 3



HBD signal cables come from HBD signal rack (lower central east side of CM region) to U-shaped horizontal aluminum cable tray, to distribution panduit flexible cable trays (east and west, north and south sides) and finally routed to detector module signal connectors