sPHENIX Director's Review : Integration

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BNL

INTEGRATION DESIGN DRIVERS

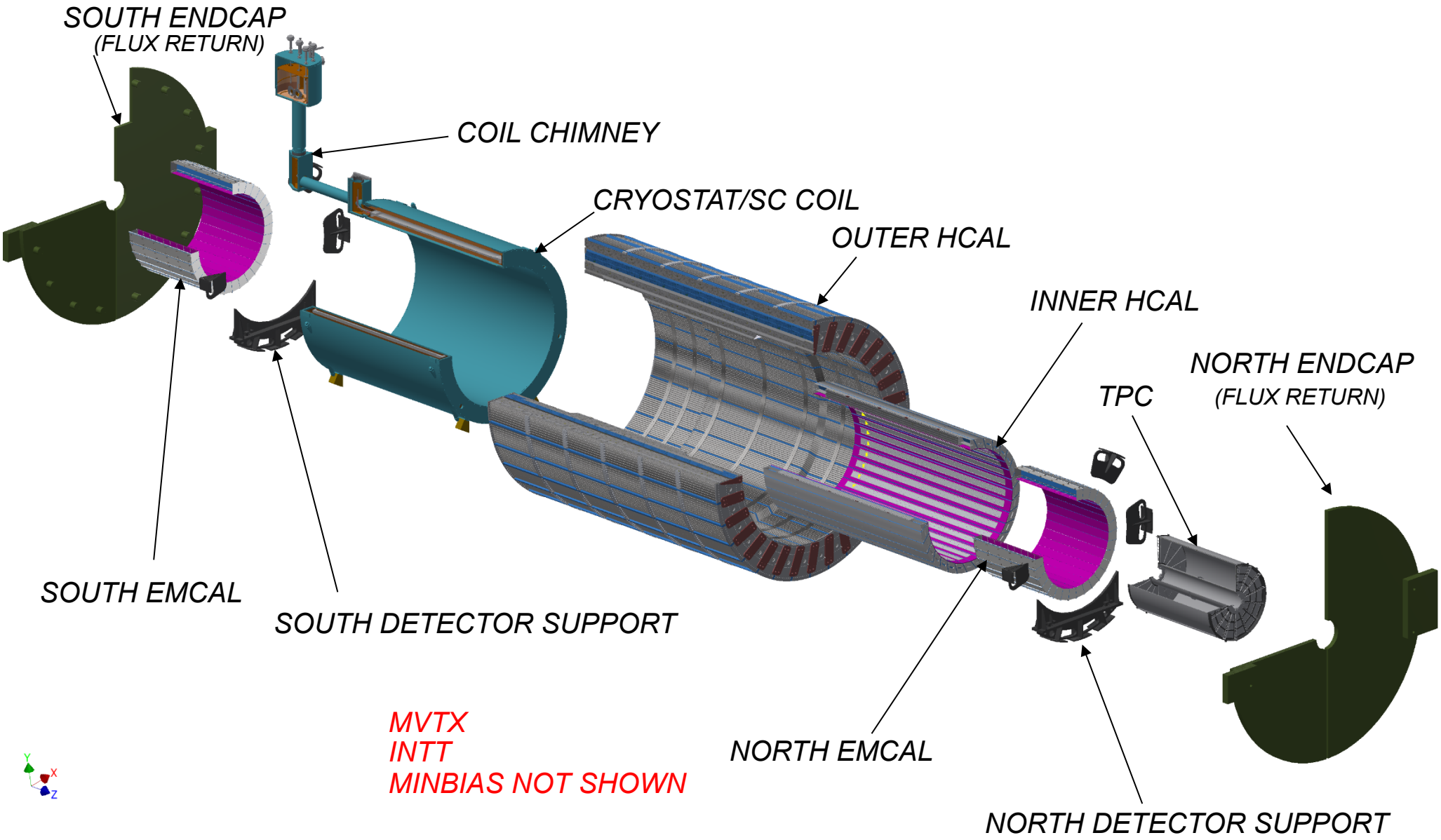
- Subsystem Design - Staying in envelope.
- Safety – Installing and accessing detectors safely.
- Access for repair, maintenance & upgrades.
- Existing Infrastructure (shield wall opening, Crane coverage and limits, rail layout)
- Minimum material in active areas.
- Other (Future upgrade capability)

INTEGRATION REQUIREMENTS

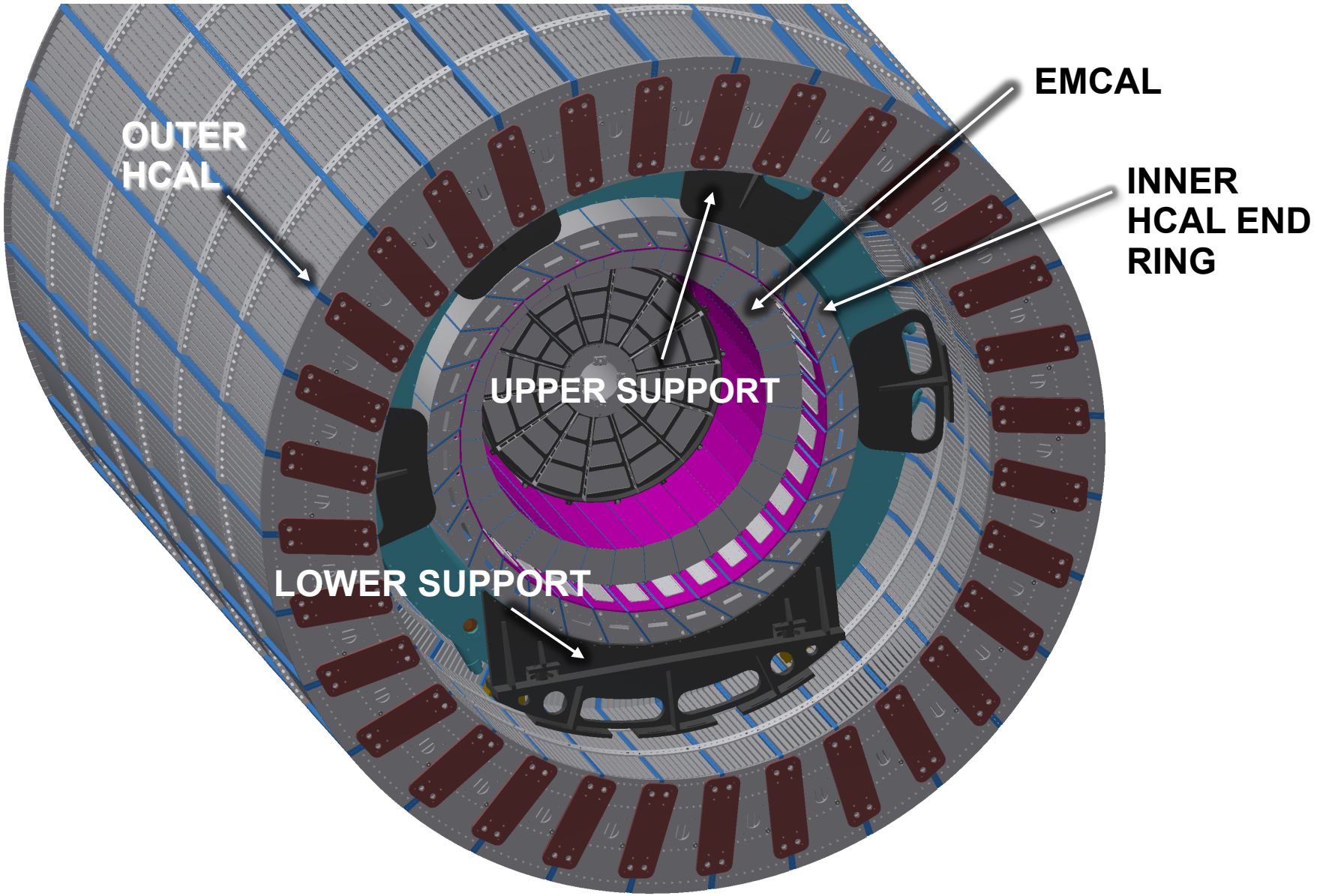
- Define overall envelope for sPhenix. (DWG# SP00-000-000).
  - Includes relevant existing infrastructure.
    - Tracks, IR walls, MuID, Crane hooks etc.
  - Envelope to include nuts bolts cables.
  - Only sPhenix Management can authorize changes to detector envelopes.
  - Stay clear regions between detectors for clearance & installation.
  - Define detector attachment points.
  - Ensure everything fits.

- Piping, Cable Management & Routing.
  - Gas, HV, LV, Signal & Cooling requirements
  - Provided to Integration by subsystem for inclusion in overall envelope.

SPHENIX EXPLODED VIEW



INNER DETECTORS SUPPORT POINTS

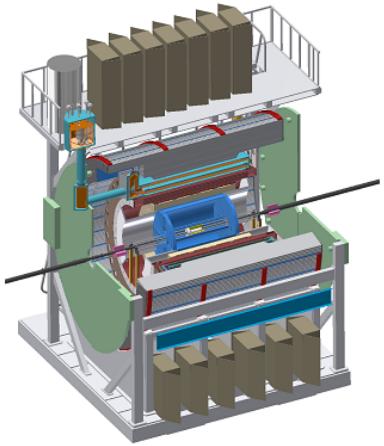


INTEGRATION DRAWING LIST

SP00-000-000 – Overall Envelope
SP00-000-001 – MINBIAS ENVELOPE
SP00-000-002 – MAPS ENVELOPE
SP00-000-003 – INTT ENVELOPE
SP00-000-004 – EMCAL ENVELOPE
SP00-000-005 – OUTER HCAL ENVELOPE
SP00-000-006 – MAGNET ENVELOPE
SP00-000-007 – INNER HCAL ENVELOPE
SP00-000-008 – TPC ENVELOPE
SP00-000-009 – RESERVED
SP00-000-010 – EMCAL OUTLINE/INTERFACE
SP00-000-011 – MINBIAS OUTLINE/INTERFACE
SP00-000-012 – MAPS OUTLINE/INTERFACE
SP00-000-013 – INTT OUTLINE/INTERFACE
SP00-000-014 – EMCAL OUTLINE/INTERFACE
SP00-000-015 – OUTER HCAL OUTLINE/INTERFACE
SP00-000-016 – MAGNET OUTLINE/INTERFACE
SP00-000-017 – INNER HCAL OUTLINE/INTERFACE
SP00-000-018 – TPC OUTLINE/INTERFACE
SP00-000-019 – RESERVED
SP00-000-020 – RESERVED

INTERFACE CONTROL DOCUMENT MATRIX

1.1 Project Management	1.2 TPC	1.3 EMCal	1.4 HCal	1.5 Calorimeter Electronics	1.6 DAQ/ Trigger	1.7 Min Bias	1.8 SC Magnet	1.9 Infrastructure	1.10 Integration & Installation	1.11 INTT	1.12 MVTX	
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.1 Project Management
	N/A	N/A	N/A	N/A	sP.SE-ICD-004	N/A	N/A	sP.SE-ICD-009	sP.SE-ICD-016	N/A	N/A	1.2 TPC
		N/A	sP.SE-ICD-001	sP.SE-ICD-002	sP.SE-ICD-005	N/A	N/A	sP.SE-ICD-010	sP.SE-ICD-017	N/A	N/A	1.3 EMCal
			N/A	sP.SE-ICD-003	sP.SE-ICD-006	N/A	N/A	sP.SE-ICD-011	sP.SE-ICD-018	N/A	N/A	1.4 HCal
				N/A	sP.SE-ICD-007	N/A	N/A	sP.SE-ICD-012	sP.SE-ICD-019	N/A	N/A	1.5 Calorimeter Electronics
					N/A	sP.SE-ICD-008	N/A	sP.SE-ICD-013	sP.SE-ICD-020	sP.SE-ICD-024	sP.SE-ICD-027	1.6 DAQ/ Trigger
						N/A	N/A	sP.SE-ICD-014	sP.SE-ICD-021	N/A	N/A	1.7 Min Bias
							N/A	sP.SE-ICD-015	sP.SE-ICD-022	N/A	N/A	1.8 SC Magnet
								N/A	sP.SE-ICD-023	sP.SE-ICD-025	sP.SE-ICD-01628	1.9 Infrastructure
									N/A	sP.SE-ICD-026	sP.SE-ICD-029	1.10 Integration & Installation
										N/A	sP.SE-ICD-030	1.11 INTT
											N/A	1.12 MVTX



WBS	sPHENIX MIE Project Elements
1.1	Project Management
1.2	Time Projection Chamber
1.3	Electromagnetic Calorimeter
1.4	Hadron Calorimeter
1.5	Calorimeter Electronics
1.6	DAQ-Trigger
1.7	Minimum Bias Trigger Detector

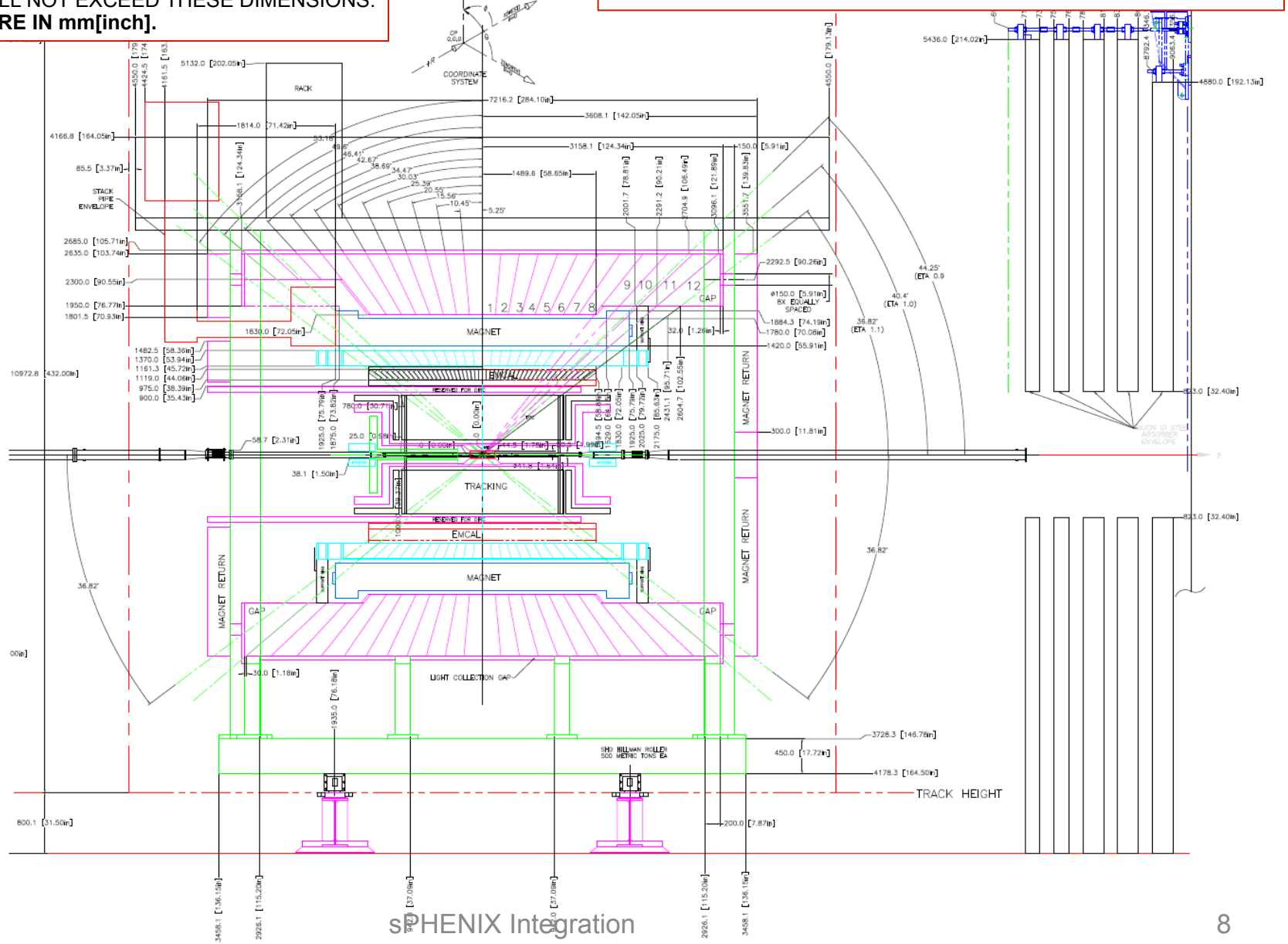
WBS	Infrastructure & Facility Upgrade
1.8	SC-Magnet
1.9	Infrastructure
1.10	Installation-Integration

WBS	Parallel Activities
1.11	Intermediate Silicon Strip Tracker
1.12	Monolithic Active Pixel Sensors

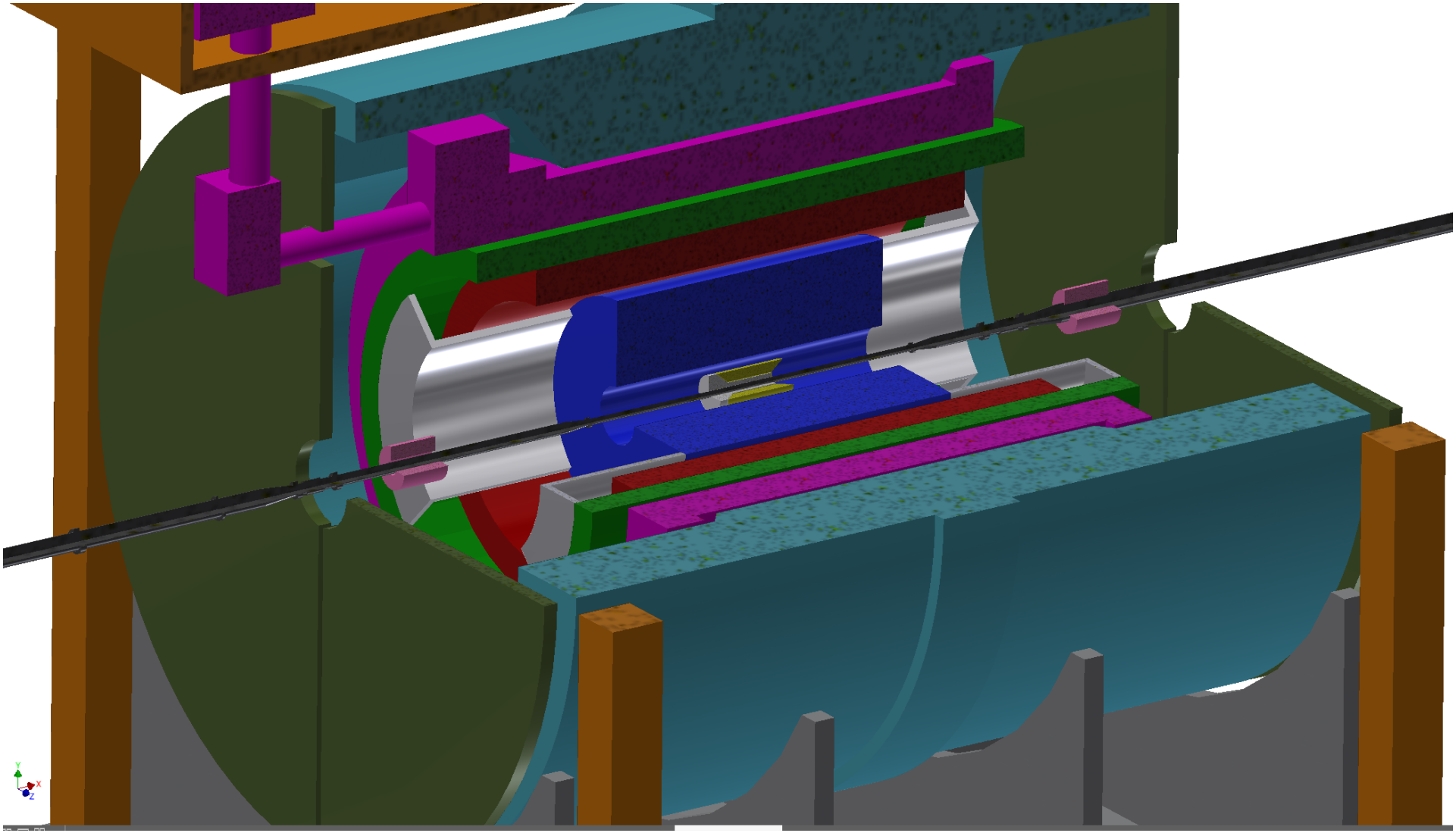
SPHENIX ENVELOPE CONTROL DRAWINGS

NOTES:
1. NOTED DIMENSIONS ARE MAXIMUM SIZE.
   ALL SERVICES, NUTS, BOLTS & OTHER DETECTOR
   COMPONENTS SHALL NOT EXCEED THESE DIMENSIONS.
2. ALL DIMENSIONS ARE IN mm[inch].

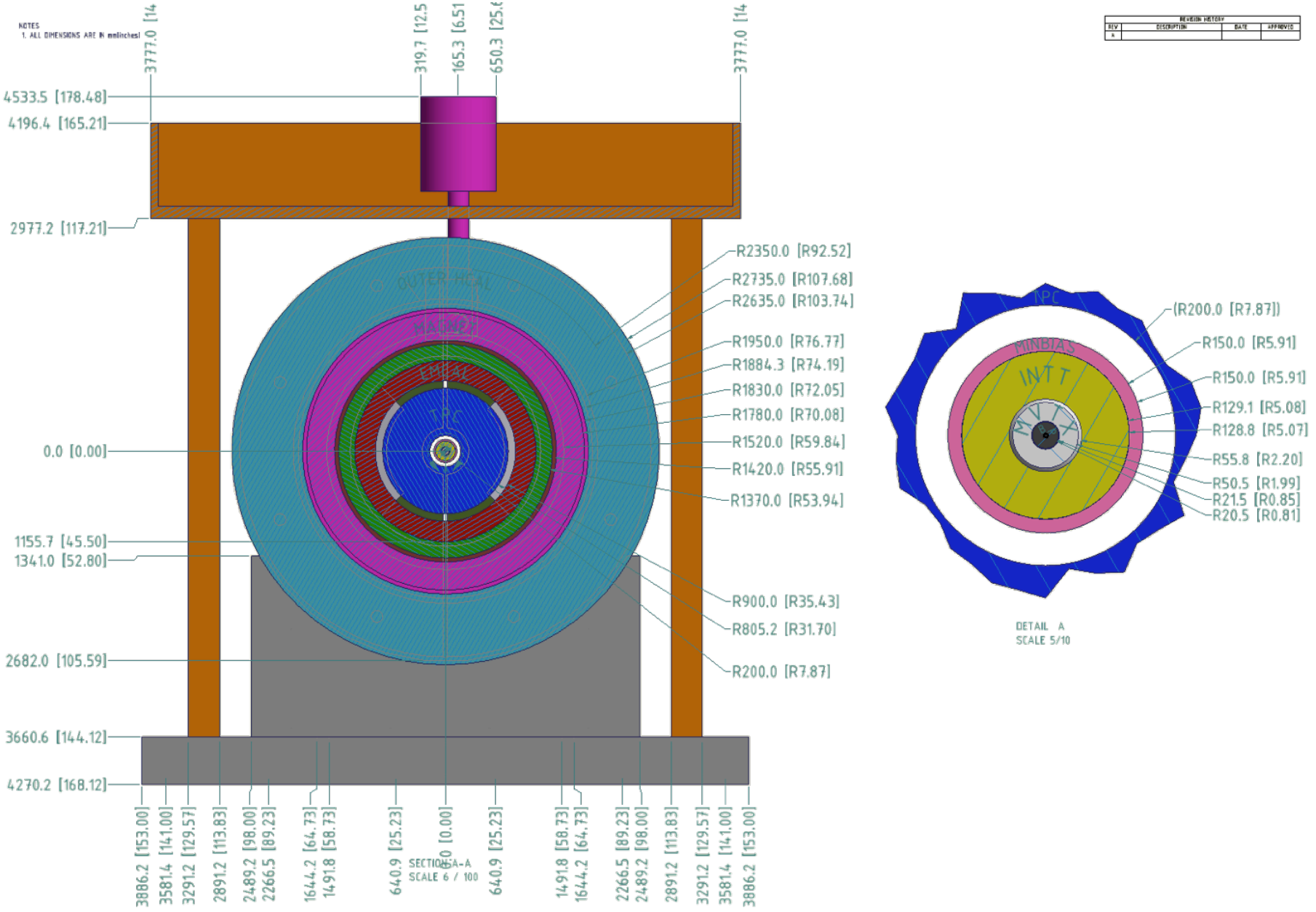
- AUTOCAD DRAWING
- SHOWS RELEVANT EXISTING INFRASTRUCTURE
- ONGOING EFFORT FOR SPHENIX



SPHENIX 3D ENVELOPE CONTROL MODEL

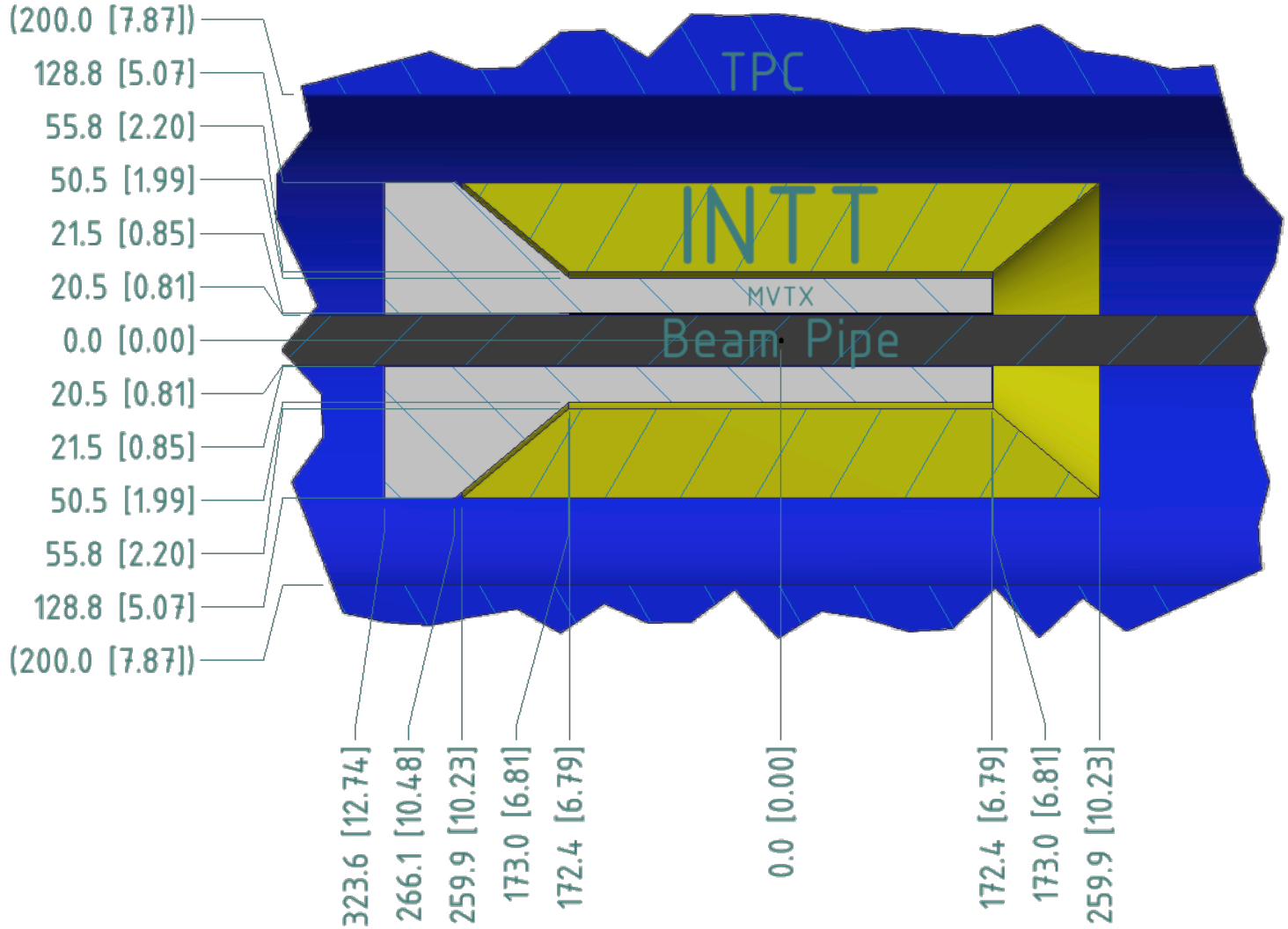


SPHENIX ENVELOPE CONTROL DRAWINGS



INNER DETECTOR ENVELOPE DRAWING

CURRENTLY UNDER DEVELOPMENT



EMCAL ENVELOPE DRAWING

NOTES:
1. NOTED DIMENSIONS ARE MAXIMUM SIZE.
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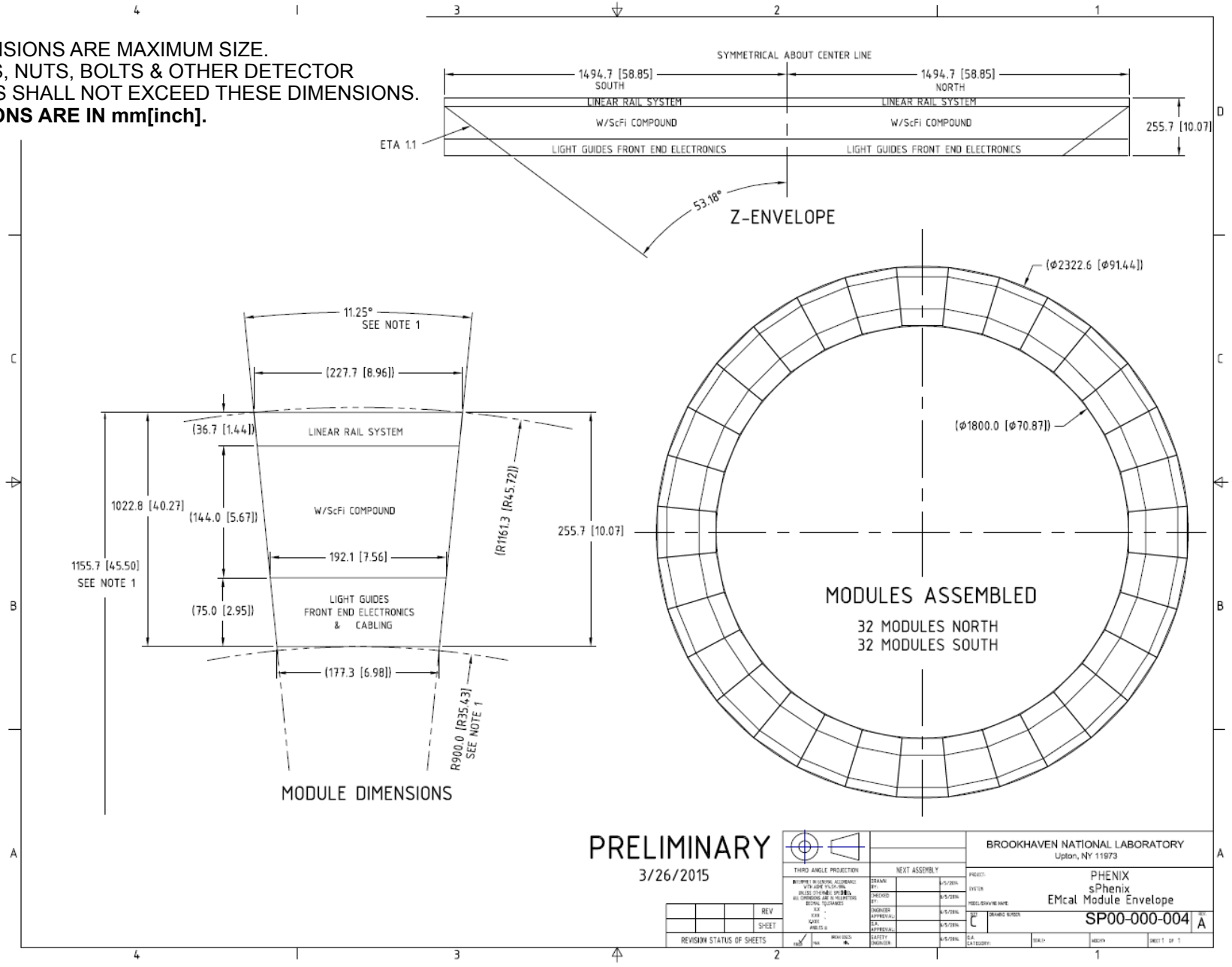
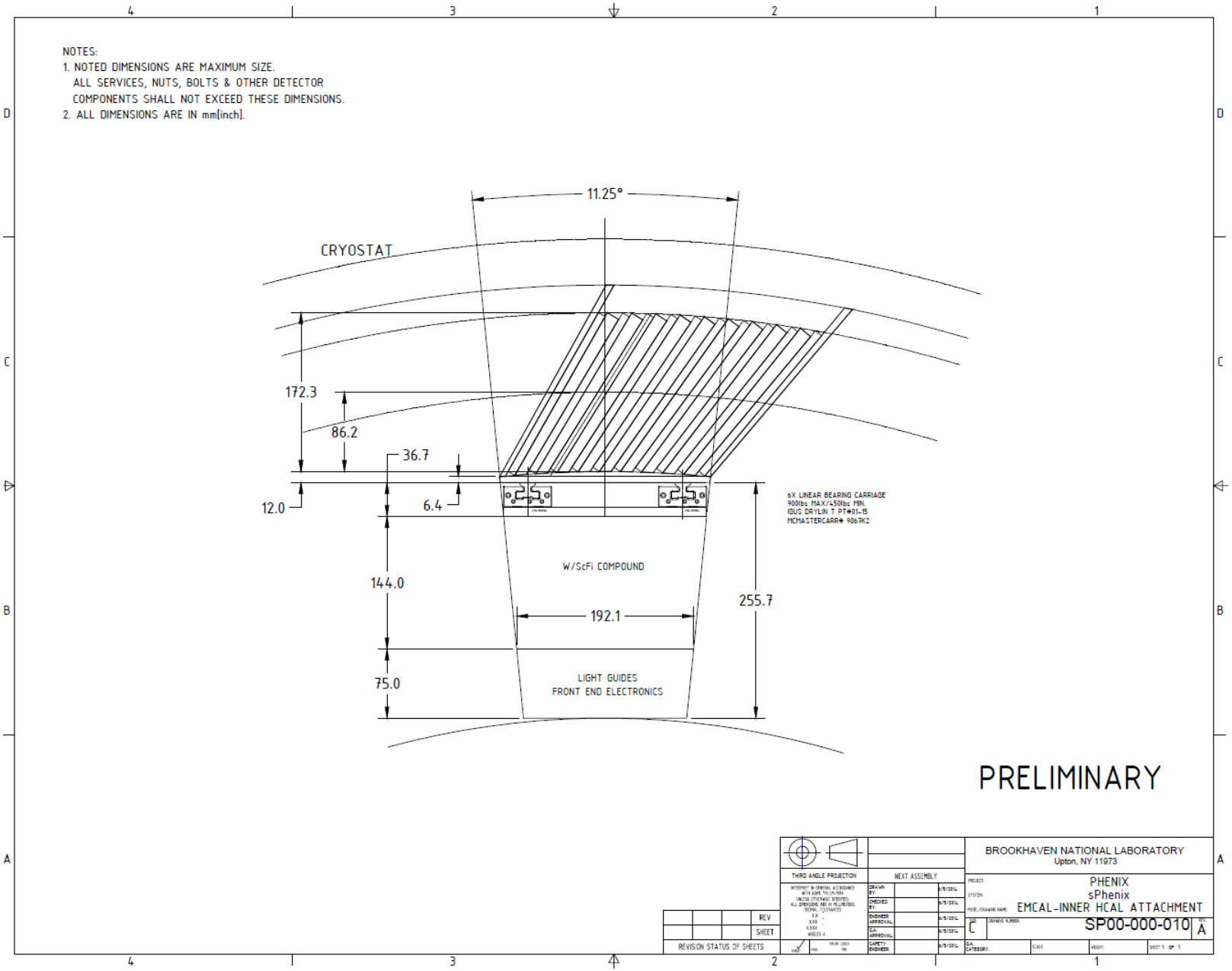
2. **ALL DIMENSIONS ARE IN mm[inch].**



EMCAL OUTLINE/INTERFACE DRAWING



OUTER HCAL ENVELOPE DRAWING

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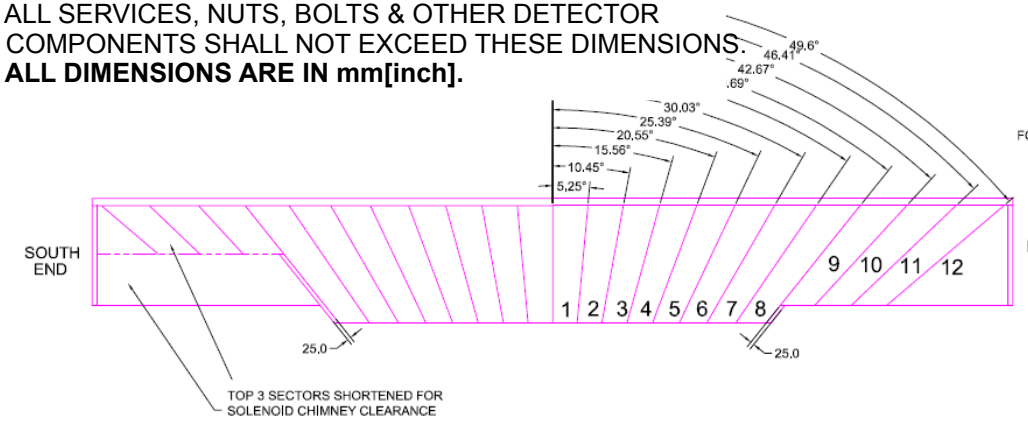
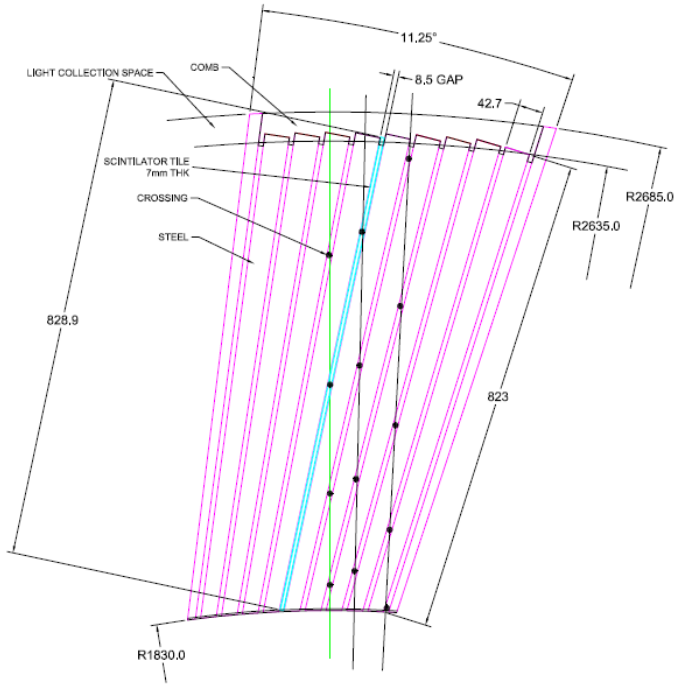
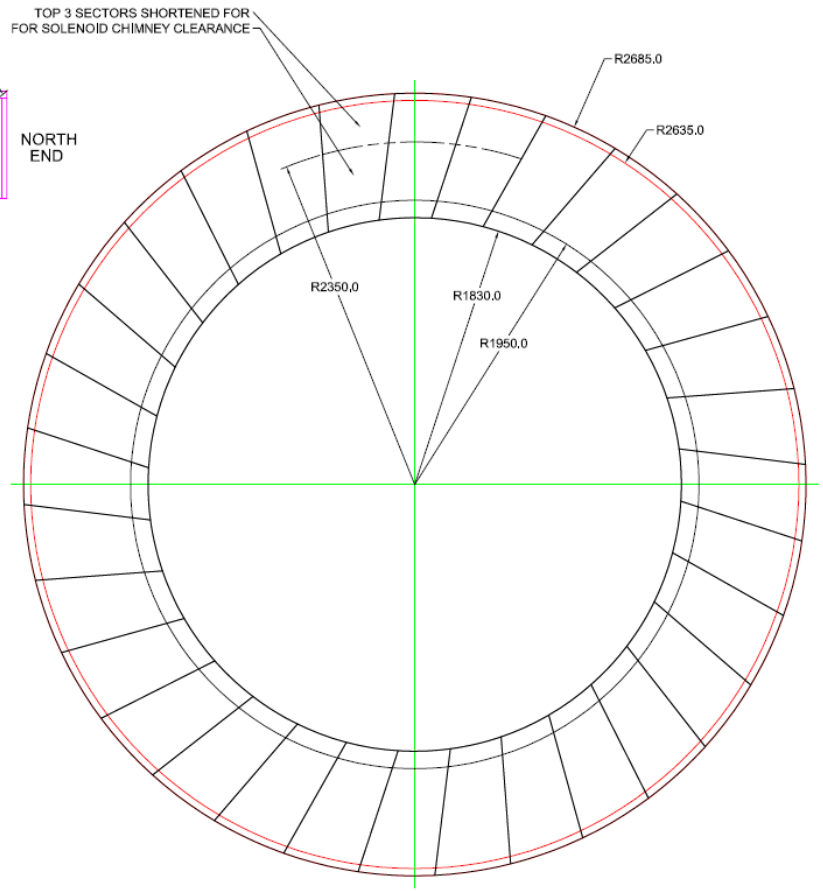
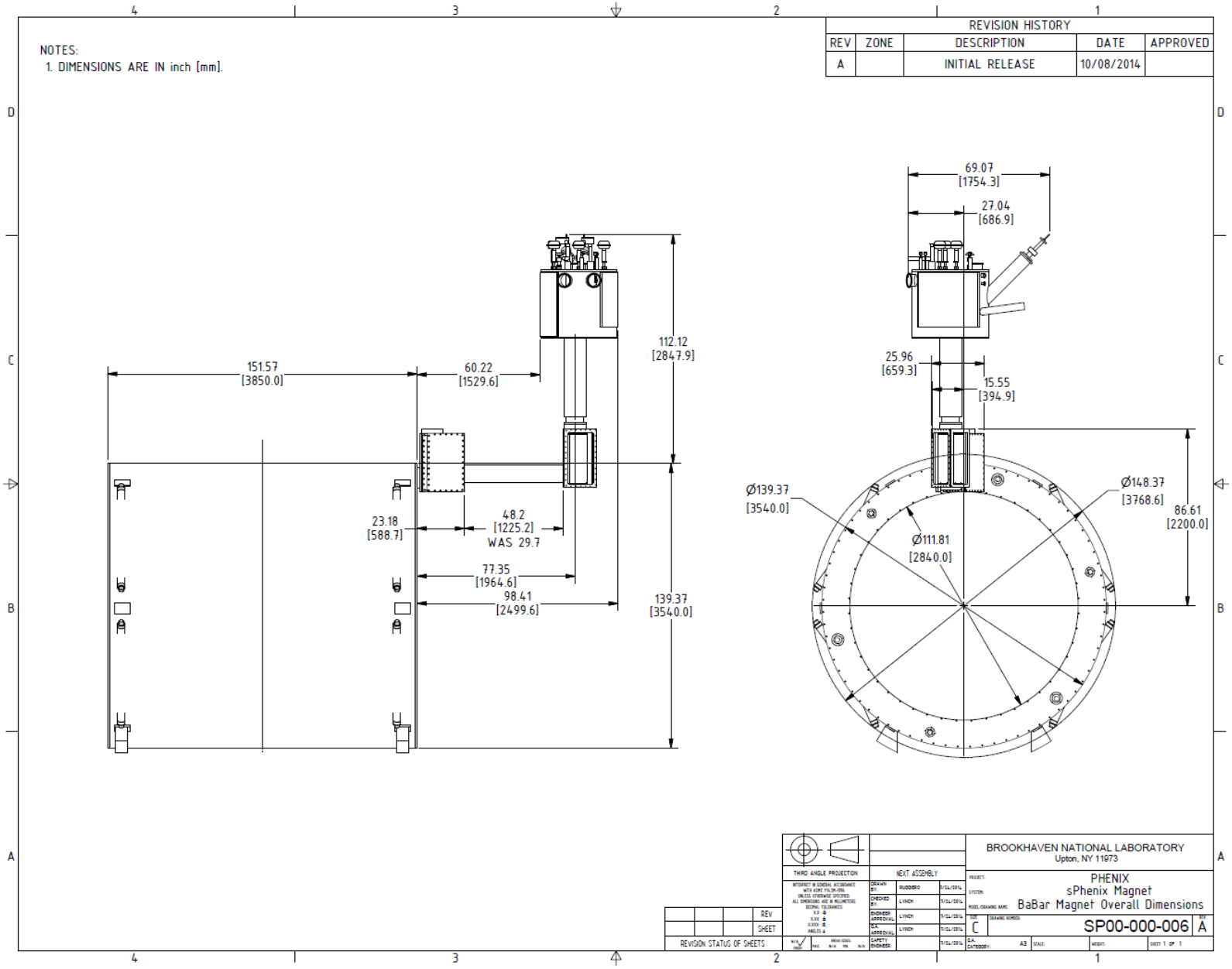




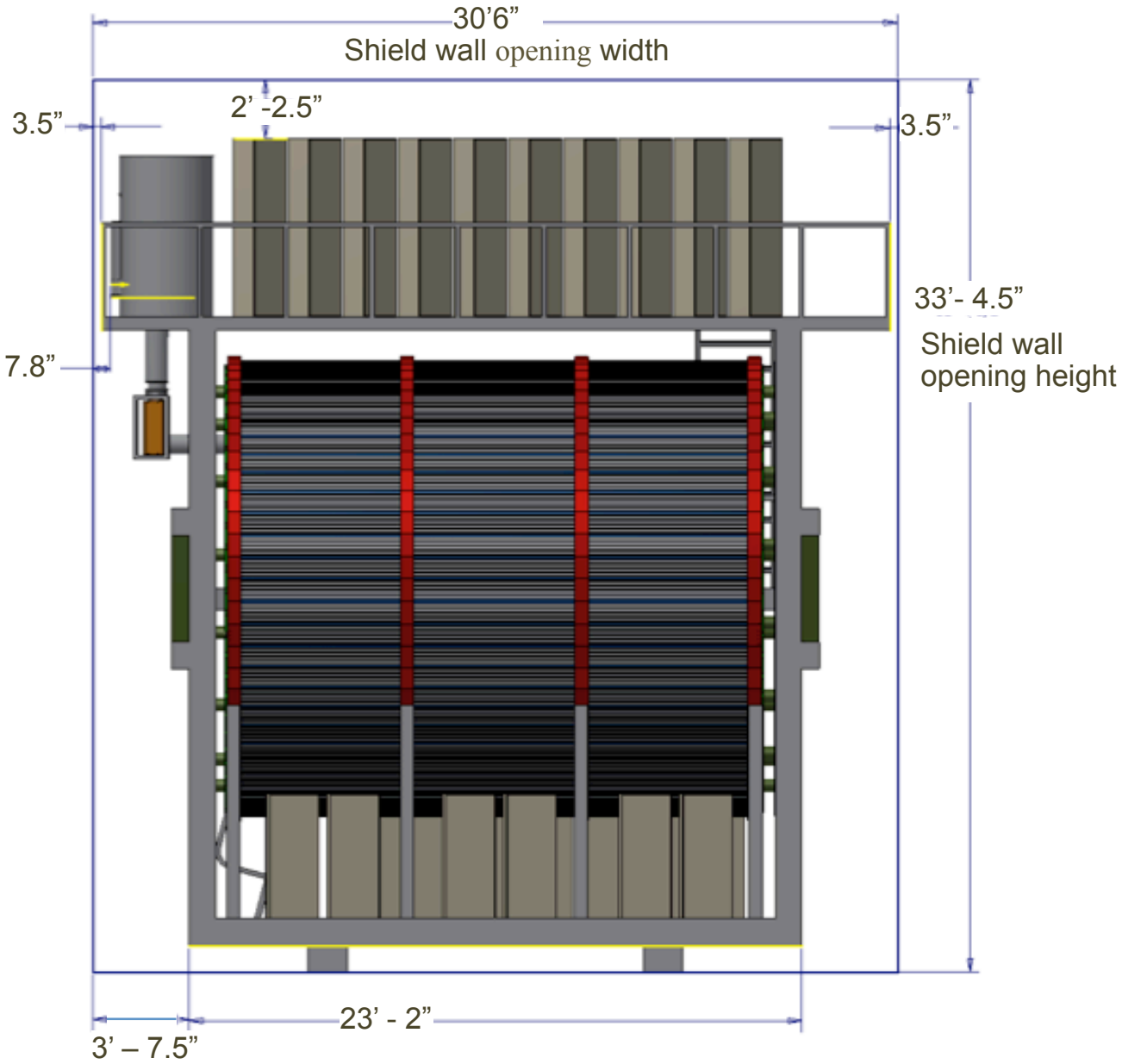


PRELIMINARY
3/26/2015

MAGNET ENVELOPE DRAWING



sPHENIX Overall Size and Shield Wall Opening



Integration Technical Status

- Infrastructure/Central Pedestal – Pre-Conceptual
- Solenoid Magnet – Conceptual
- HCal Inner – Advanced Conceptual
- HCal Outer – Advanced Conceptual
- EMCal – Advanced Conceptual
- TPC – Advanced Conceptual
- INTT – Pre-Conceptual
- MAPPS – Pre-Conceptual
- MINBIAS – Pre-Conceptual

- **Pre-Conceptual** – Know we can meet requirements but do not have an accurate model.
- **Conceptual** – Have a model but no detail drawings.
- **Advanced Conceptual** – Have a model nearly ready for detailing.
- **Detail Design** – Detail drawings in progress.
- **Advanced Detail Design** – Detail drawings nearly complete.
- **Final Design** – Completed detail drawings awaiting final design review.
- **As Built**

SUMMARY

- SERVICES ROUTING AND CABLE MANAGEMENT PRELIMINARY CONCEPT IN PLACE.
- SUBSYSTEM CAD PROGRAM INTEGRATION (SOLIDWORKS, INVENTOR, CREO etc.) WILL BE INTEGRATED INTO AUTODESK VAULT USING PDF AND STEP FILES.
- INCORPORATING ALIGNMENT CAPABILITIES INTO SUPPORT DESIGN IS IN PROGRESS.
- INNER DETECTOR INTEGRATION TASK FORCE WAS FORMED TO HELP IDENTIFY ANY INTEGRATION CHALLENGES.
- ADDITIONAL DESIGN AND ENGINEERING PERSONNEL HAVE BEEN PROVIDED.