Gen Magnet Design

JLAB MENG Contributors:

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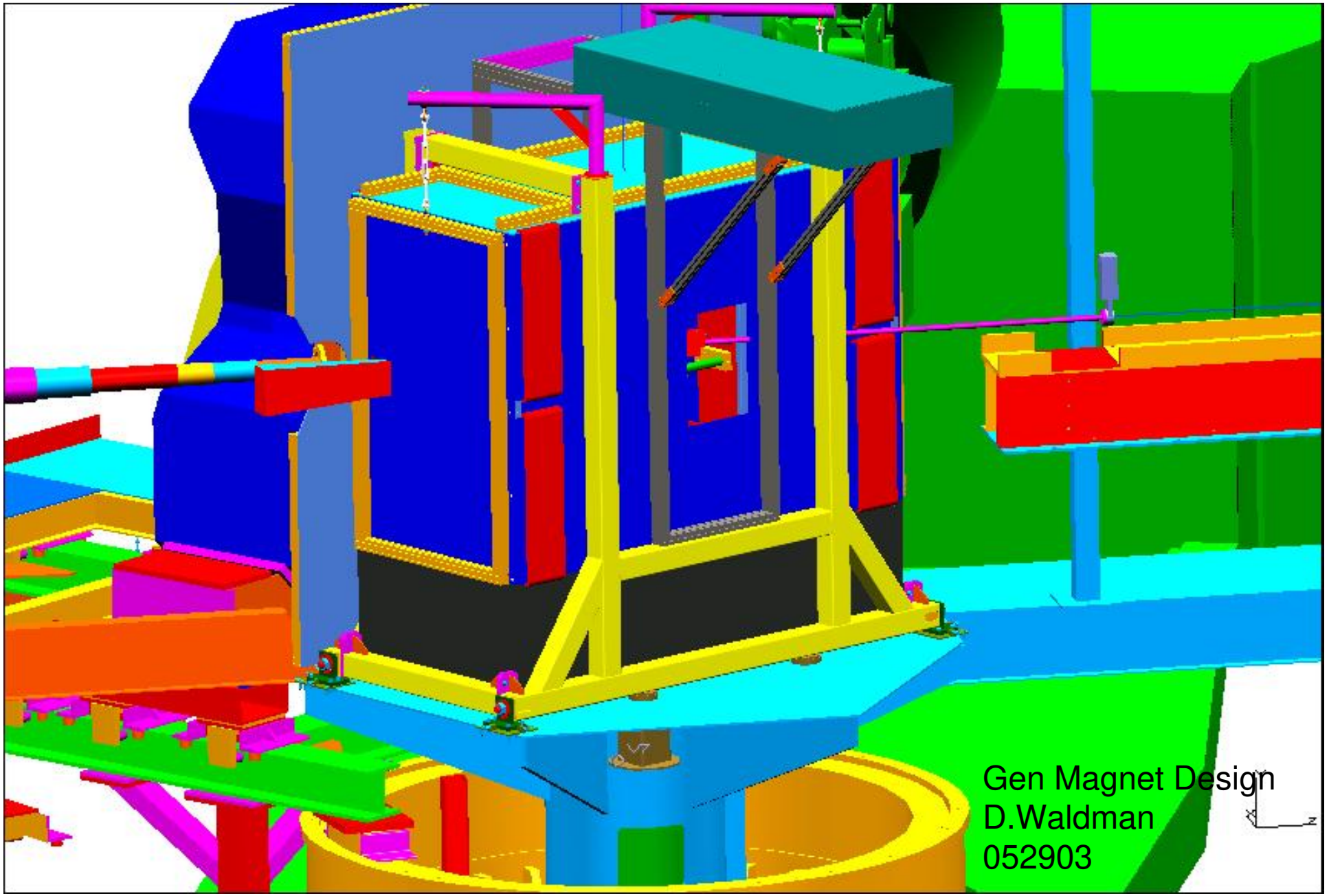
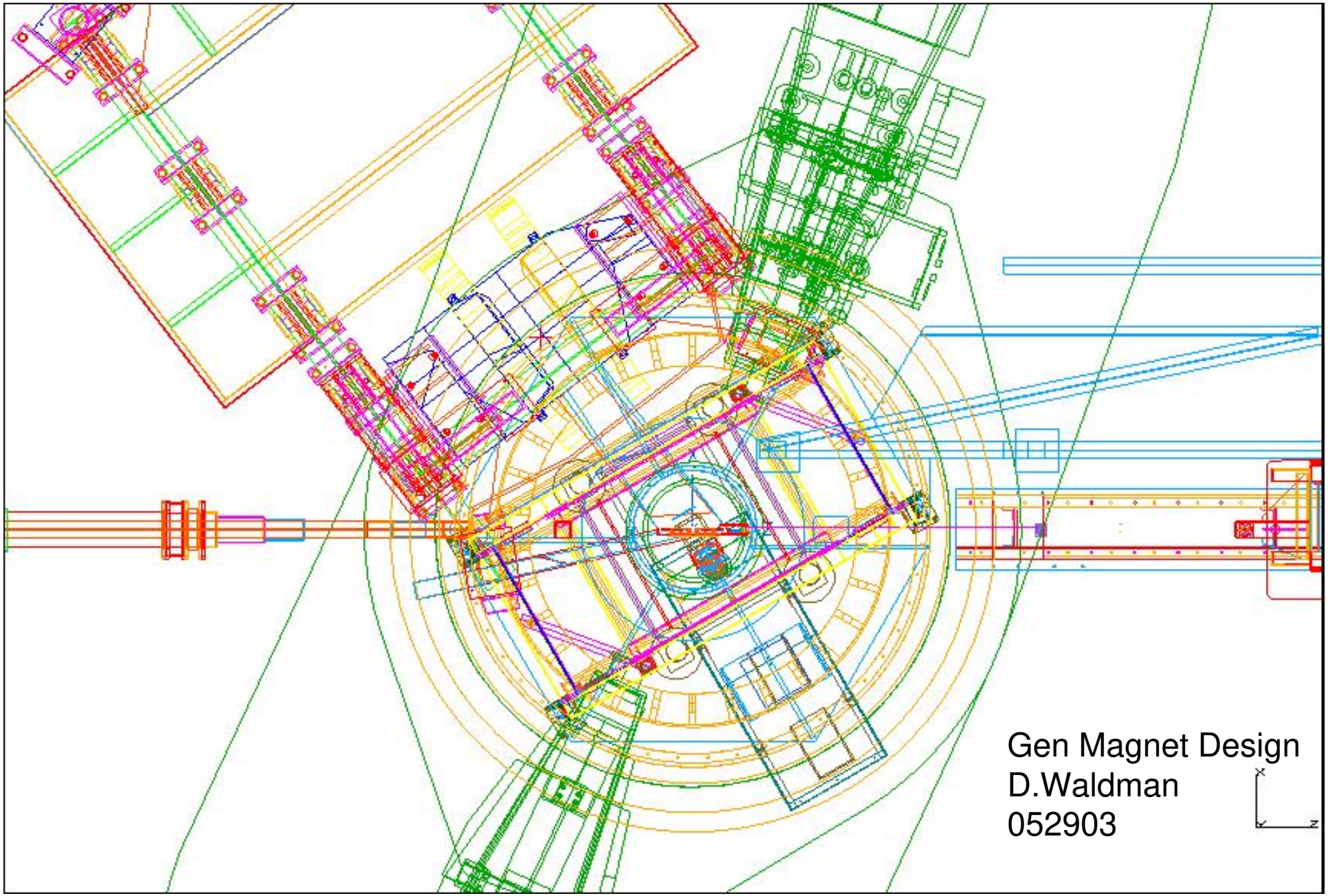
Magnet Engineer:	Robin Wines
Mechanical Designer:	Ron Lassiter
Mechanical Engineer:	David Waldman

May 29 Gen Collaboration Meeting

Gen Magnet Design

May 29th
Collaboration Meeting
David Waldman


Gen Magnet Design
D.Waldman
052903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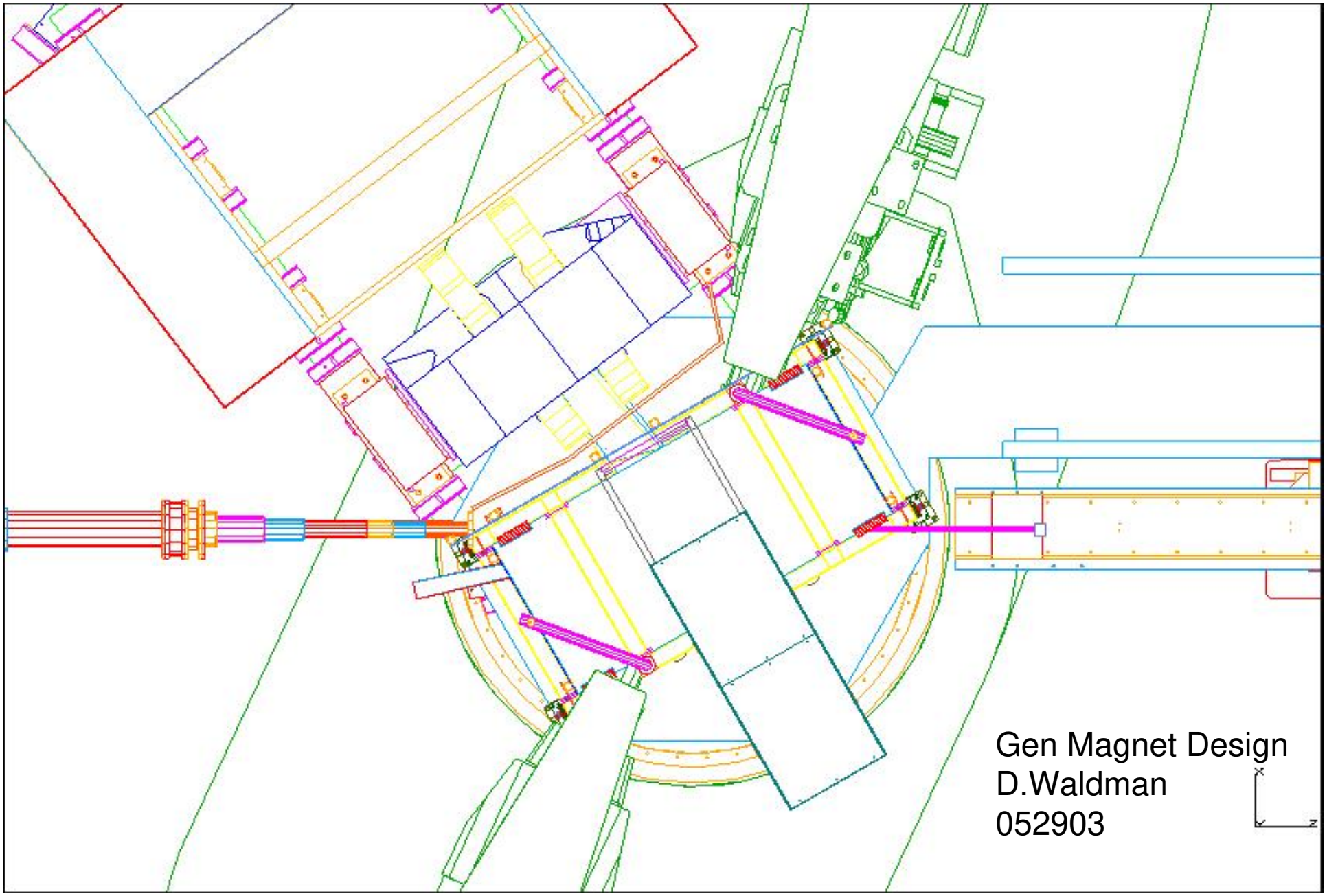
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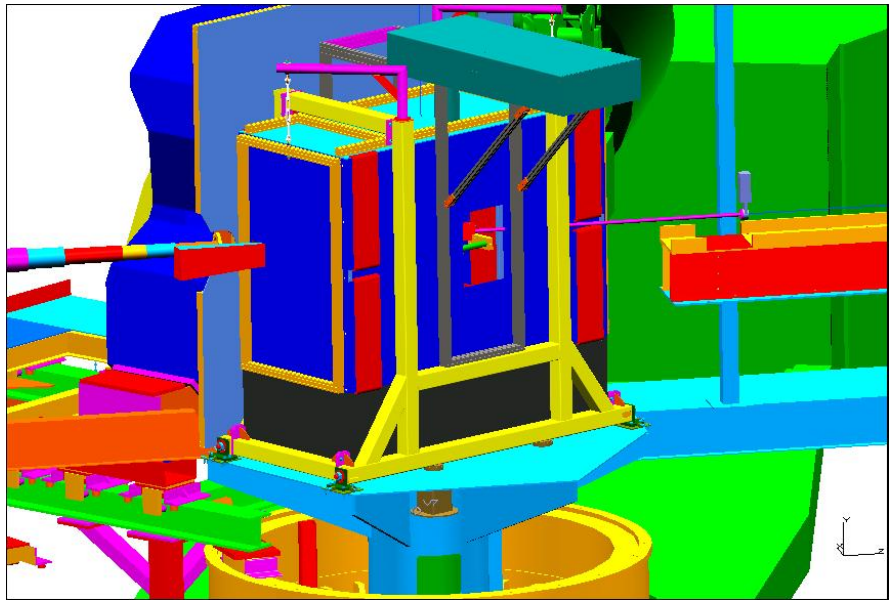
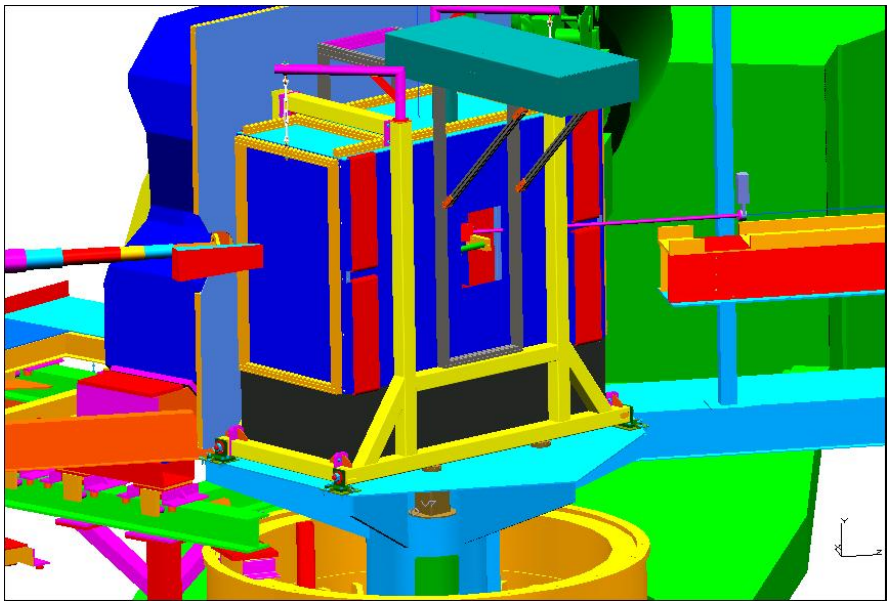
Gen Magnet Design

- Primary Requirements
  - Provide Low, Horizontal Magnetic Field in Target Area
  - Provide Openings for Acceptance and for Beam Transport

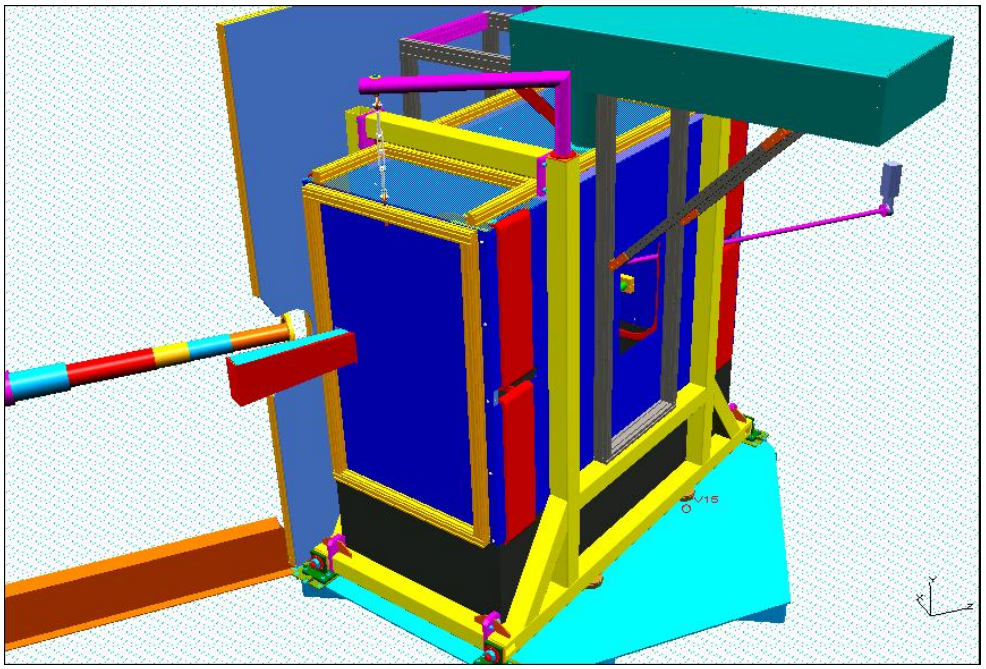


Gen Magnet Design

- Secondary Requirements
  - Provide Magnetic Shielding from Big Bite and Center Pedestal Iron
  - Provide Structure and Beam Transport for an Adjustable Path Length Drive Laser
  - Provide a Sealed Environment for Capture of Cooling Gases
  - Provide Vibration Isolation for Calibration Runs
  - Provide “Easy” Access to Target System
  - Provide Mounting for Target System



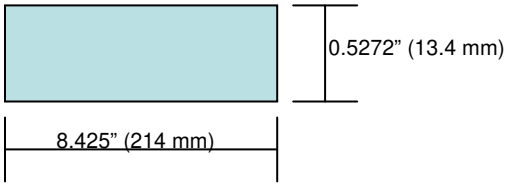
Gen Magnet Design



- Provide Low, Horizontal Magnetic Field in Target Area
  - 8 Air Cooled Coils
    - Designed to 2500AT
    - Operation at ~1800AT
  - 1006 Low Carbon Iron
    - 1/4“ Thick Plate
    - Contained Volume
      - 2m x 1m x 1.5m
  - Non Magnetic Support Structure

Gen Magnet Design

- Coil Design Parameter (Courtesy of R. Wines)
  - Magnet Field ~25 Gauss
  - Length of Straight 28.015”
  - Number of turns 256 (64 x 4)
  - Wire gauge AWG 8
  - Wire diameter 0.1318” heavy film
  - Wire resistance 0.01246 ohms/lb.
  - Wire weight 50.42 lbs./1000 ft
  - Length (total) 1200 ft
  - Coil weight (ea) 60.50 lbs.
  - Resistance (ea) 0.7538 ohms
  - Magnetic resistance (total) 3.0152 ohms
  - Current 10 Amps
  - Voltage 30 Volts
  - Power ~300 Watts



Check for air cool compatibility …

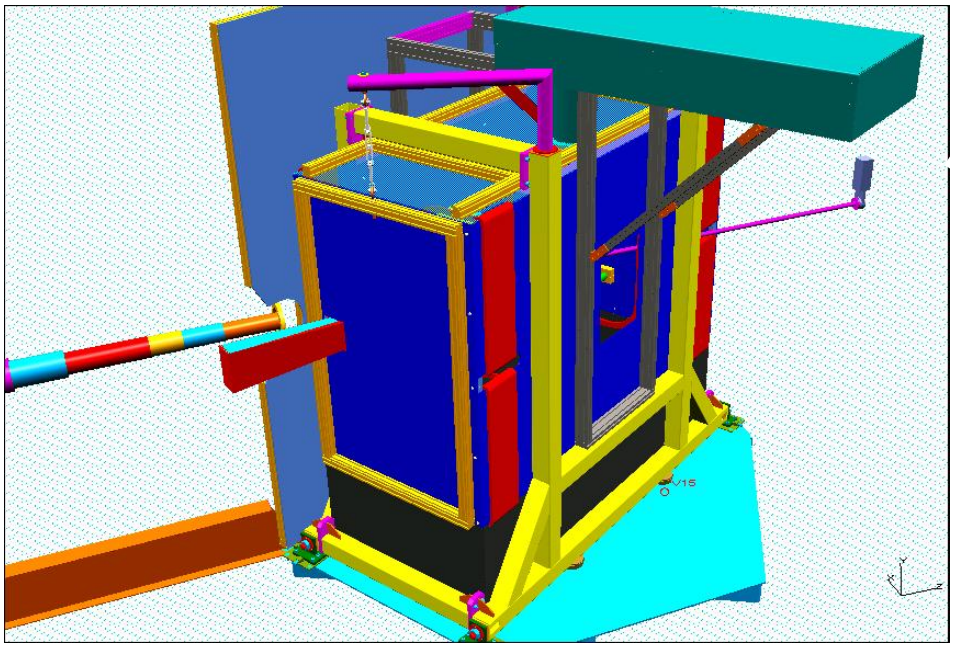
$$\frac{\sim 2500 A*T}{(214mm)(13.4mm)} = 0.87 A*T/mm^2$$

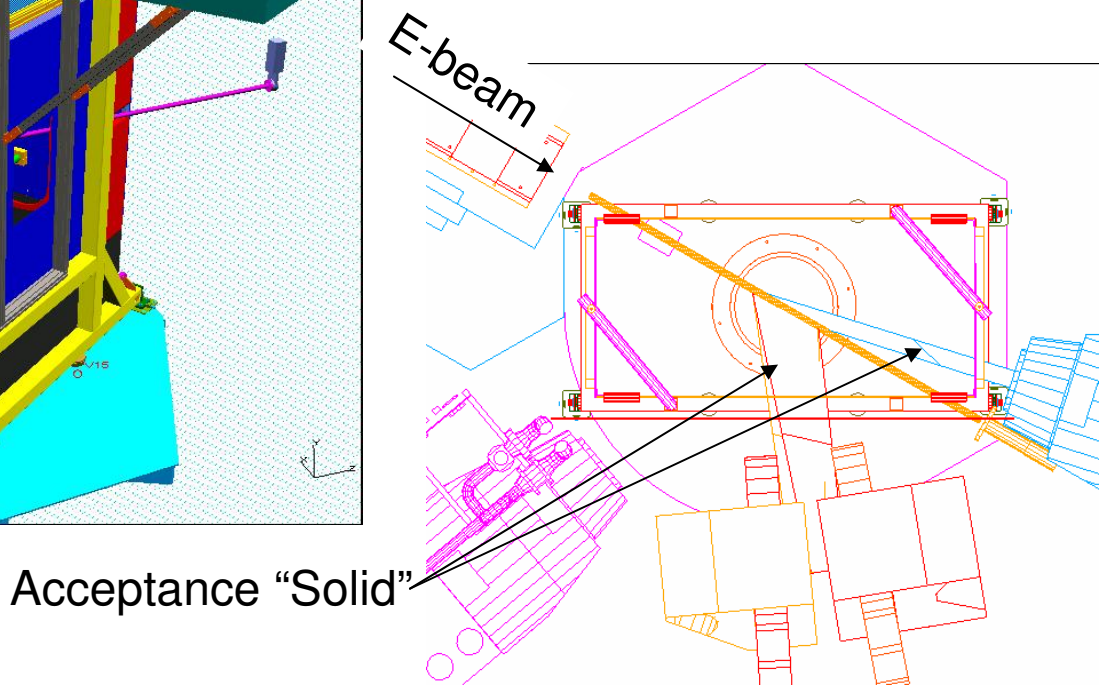
$$0.87 A*T/mm^2 < 1.5 A*T/mm^2$$

Meets air cool design limit of 1.5 A*T/mm^2

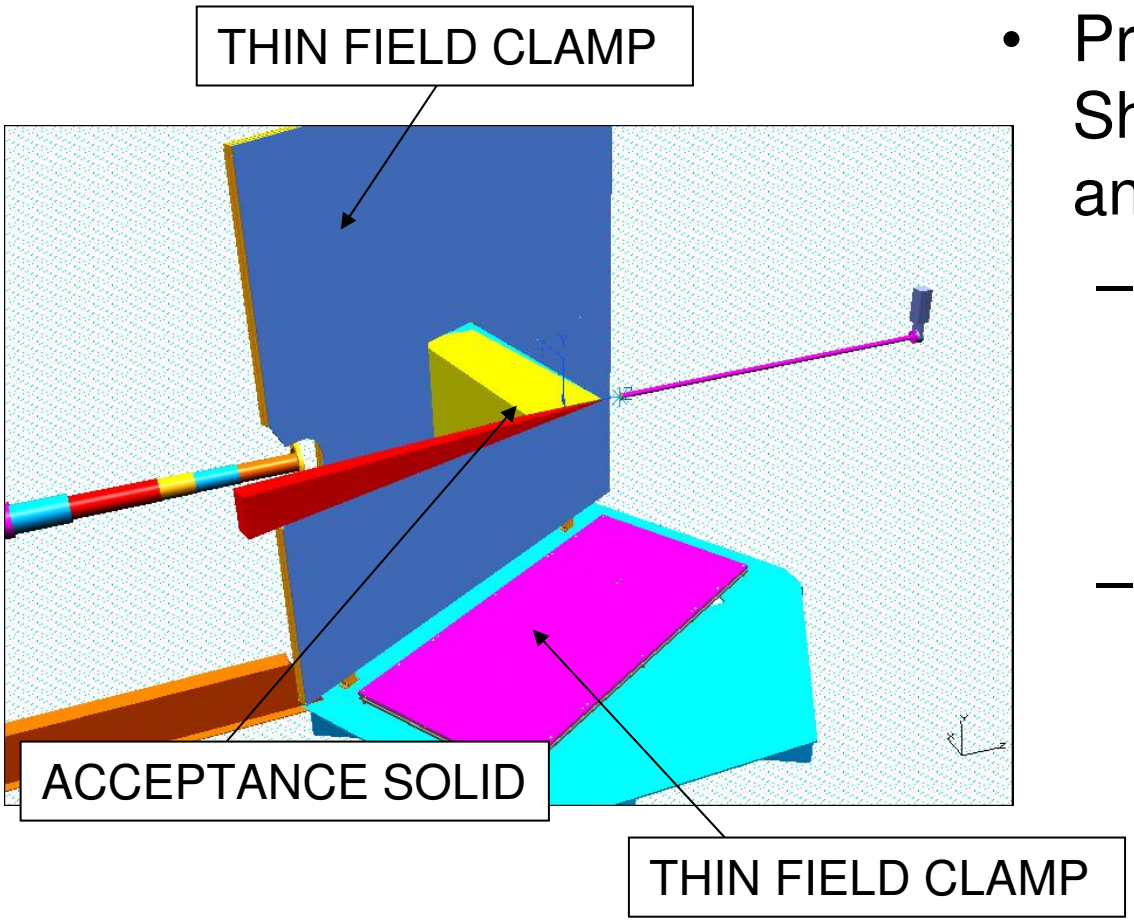
Gen Magnet Design

- Provide Openings for Acceptance and for Beam Transport





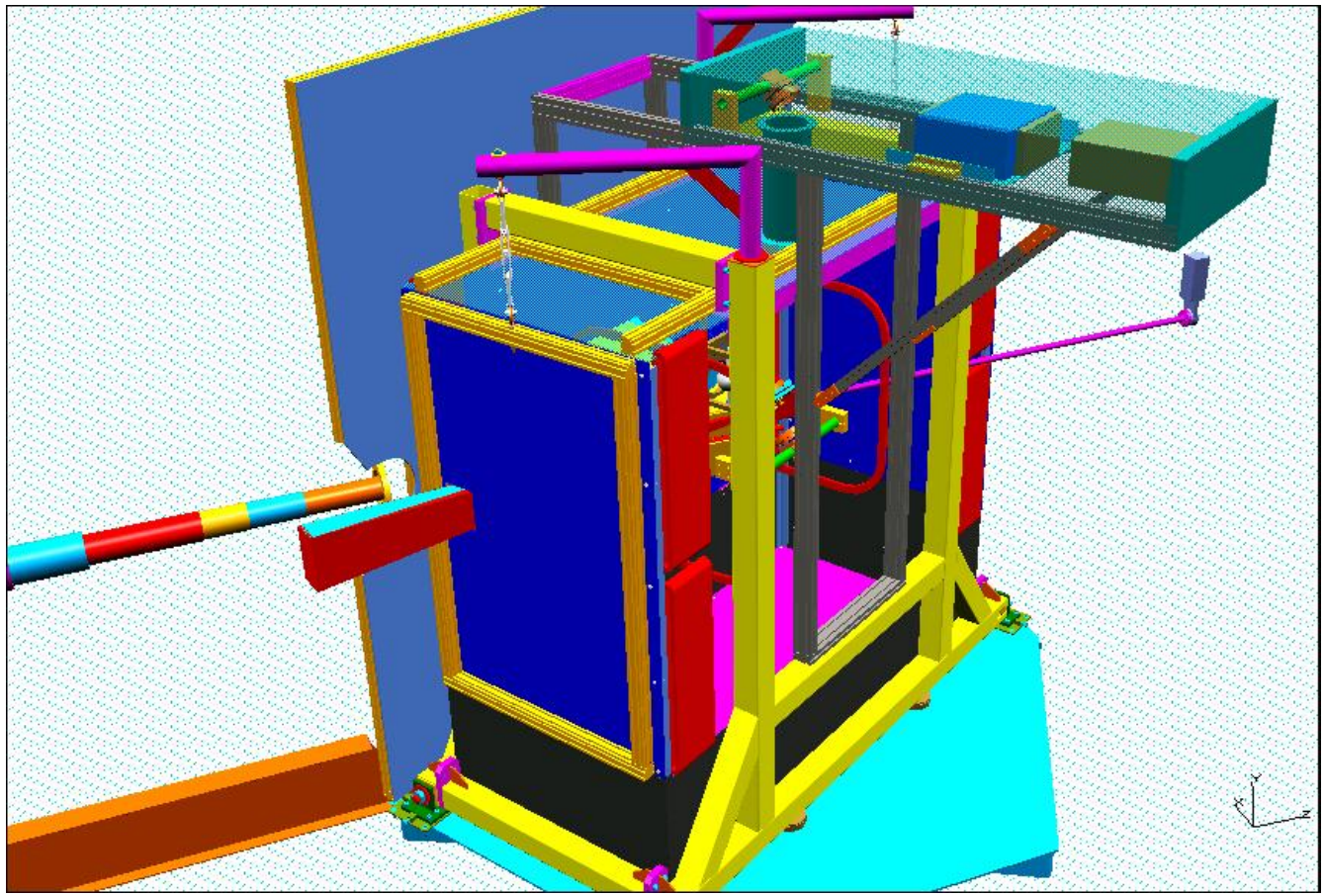
Gen Magnet Design



- Provide Magnetic Shielding from Big Bite and Center Pedestal Iron
  - THIN Field Clamp
    - 1/4” Thick Steel with Aluminum Extrusion Frame
  - Floor Plate
    - 1/8” Thick Steel with Aluminum Extrusion Frame

Gen Magnet Design

- Provide Structure and Beam Transport for an Adjustable Path Length Drive Laser



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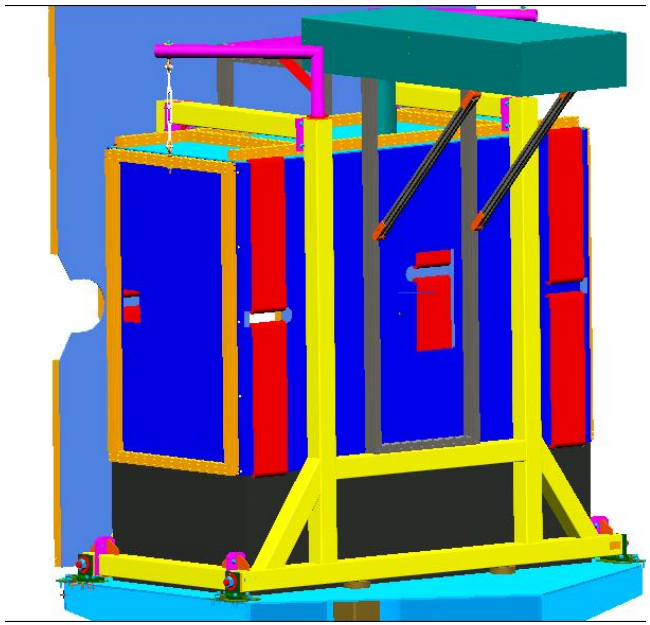
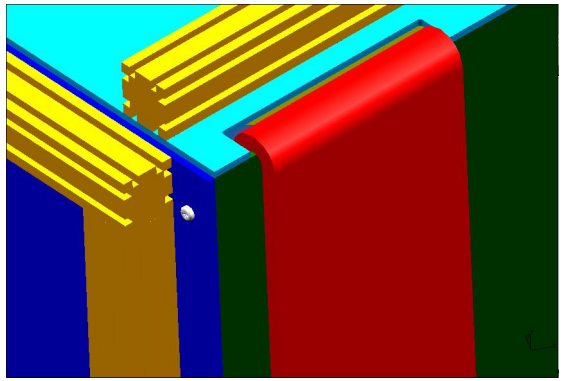
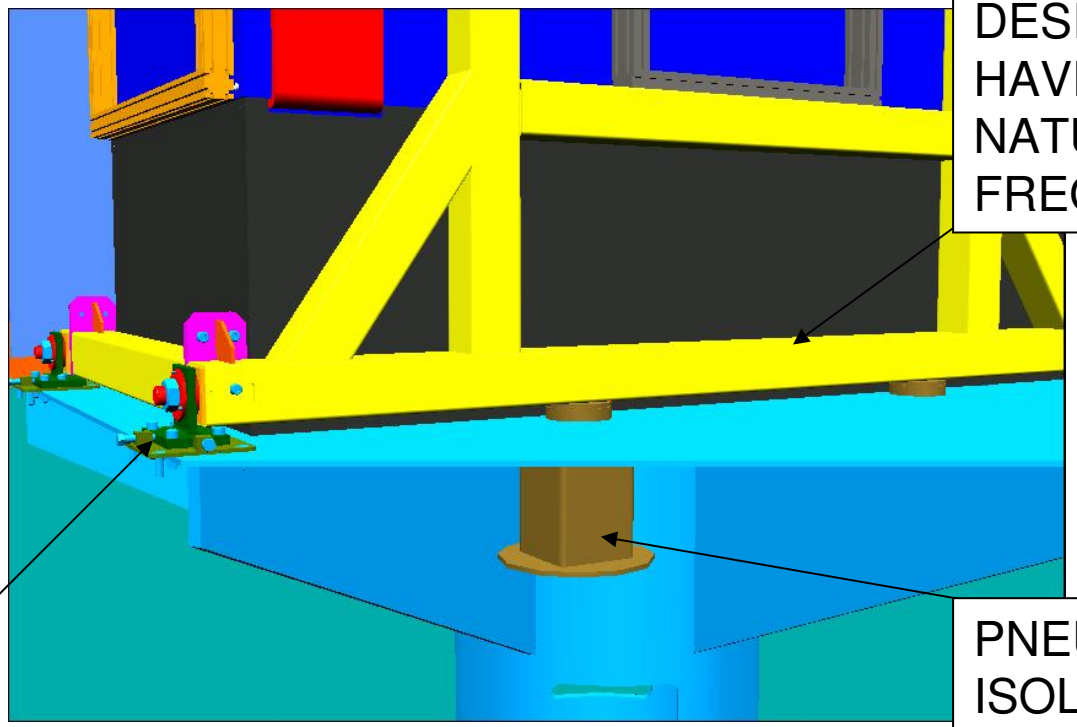




- Provide a Sealed Environment for Capture of Cooling Gases
  - Minimize Gaps Where Possible
  - Utilize Fasteners with Seal Washers
  - “Field Fit” Seals and Windows at Installation
  - Interface for Low Level Vacuum System (0.5-1.0 in H_2O below Atmosphere)

Gen Magnet Design

- Provide Vibration Isolation for Calibration Runs



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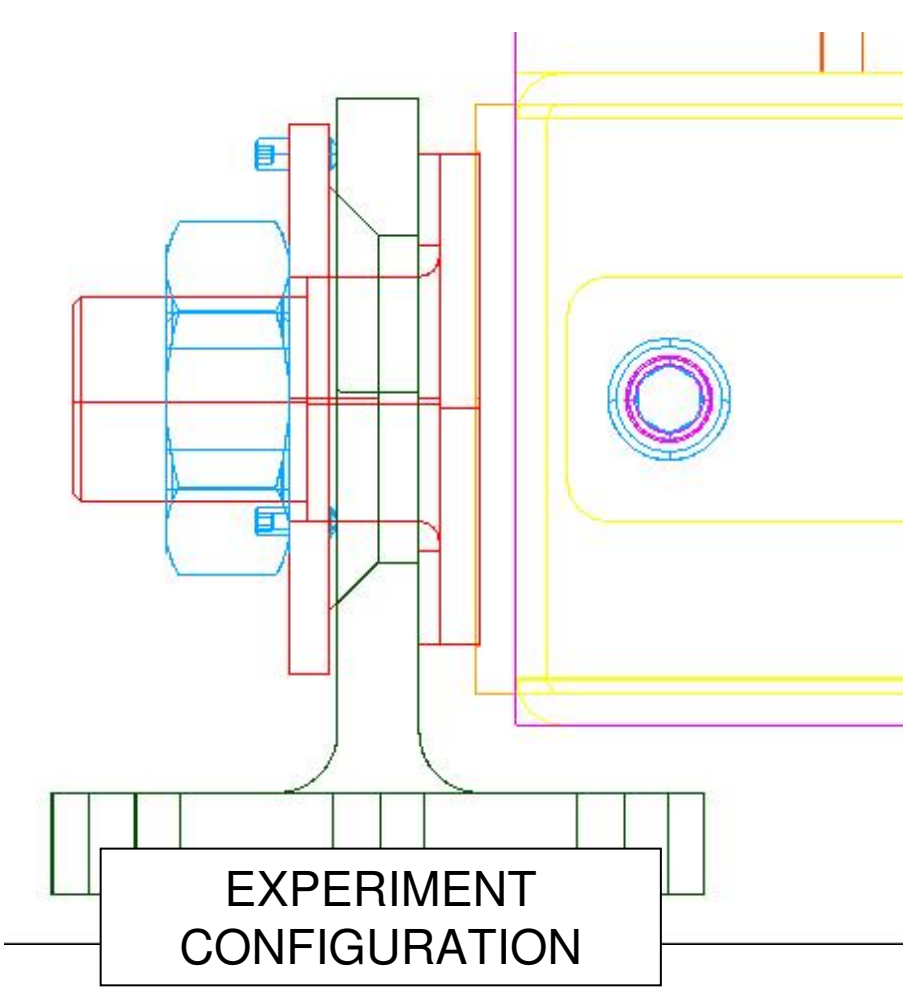
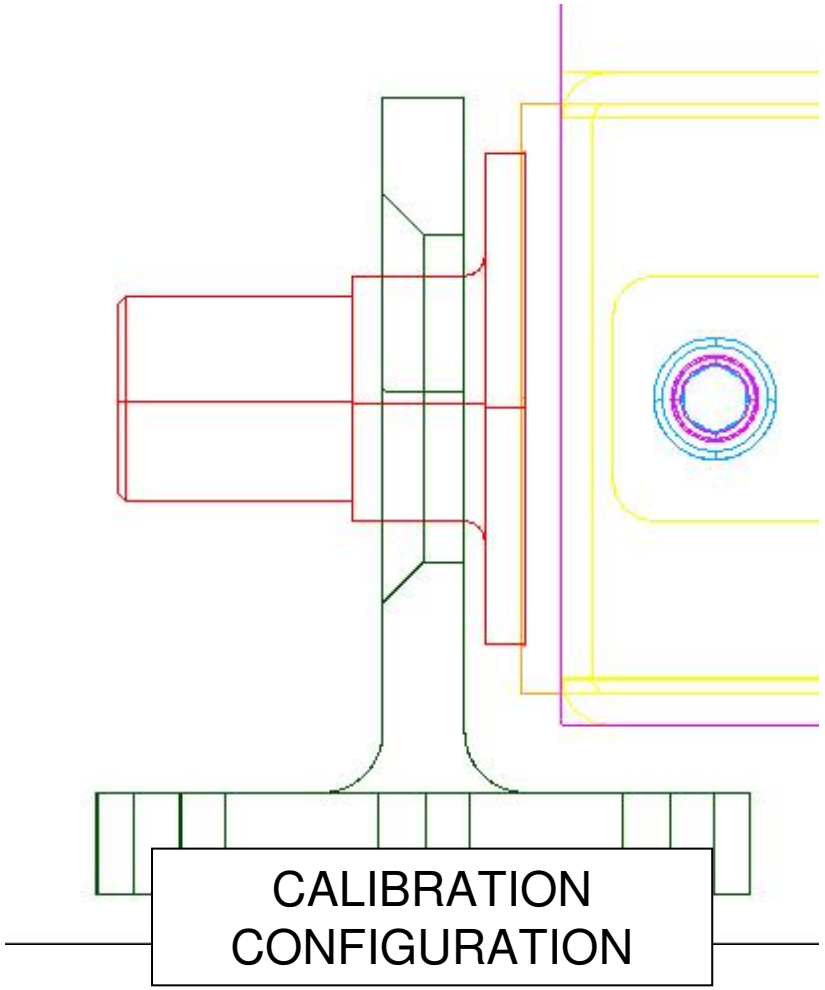
LOCKOUT MECHANISM



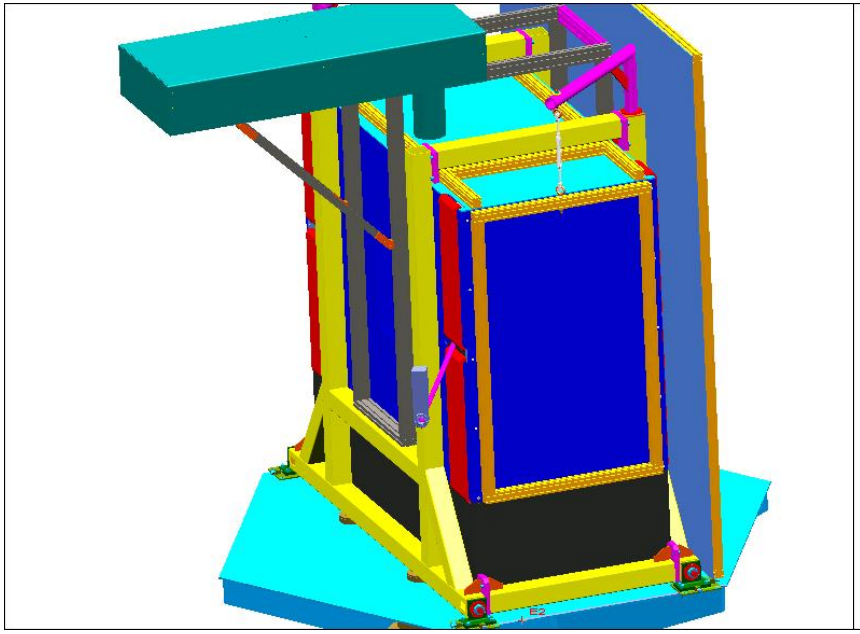
EXPERIMENT CONFIGURATION



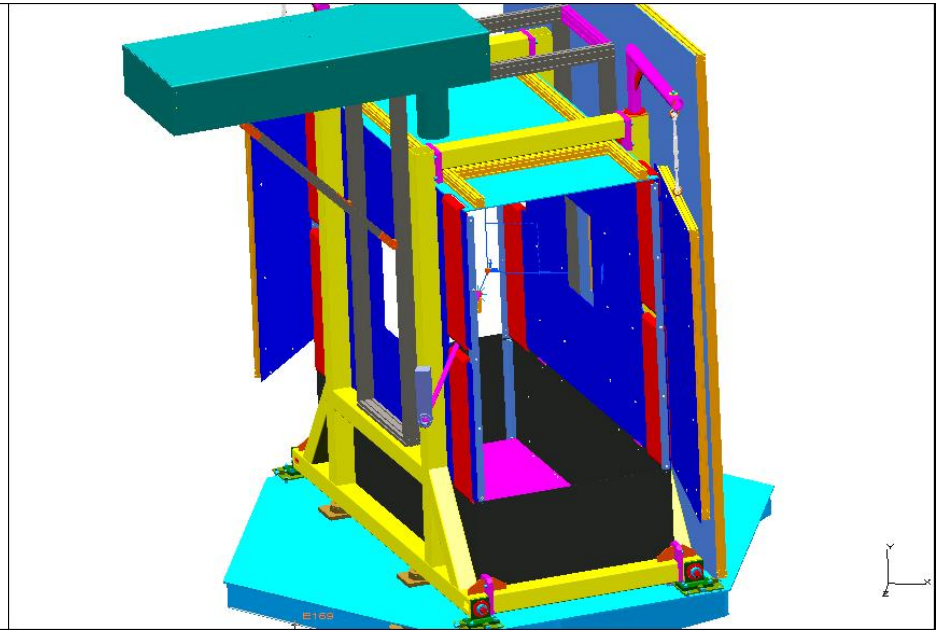
CALIBRATION CONFIGURATION

Gen Magnet Design

- Provide “Easy” Access to Target System



END PLATE “DOOR” CLOSED



END PLATE “DOOR” OPENED