

SBS Magnet Progress

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Magnet Status



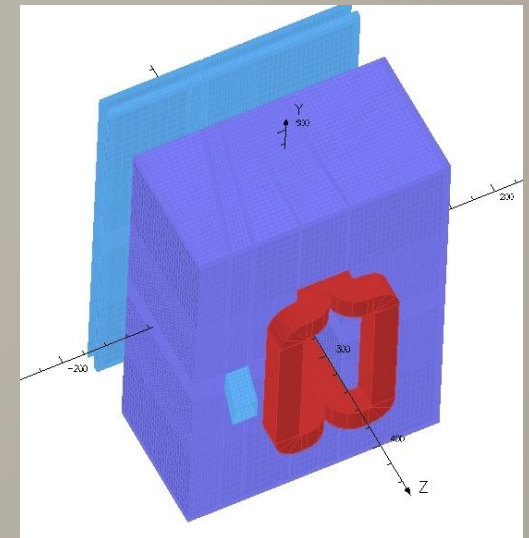
- Verbal agreement with BNL to acquire 48D48 magnet
 - Contact at BNL indicates 4 of these magnets in storage
 - BNL agrees to disassemble magnet and coordinate shipping to JLAB
 - Timeframe ?
-
- TOSCA analysis to define modifications to core, new coil, field clamps and beamline shielding

SBS Magnet Parameters

SBS Magnet Parameters	
Dipole Field Orientation	horizontal, Bx
Maximum Field	1.69T
Integral Field Strength	2.0 T-m, 2.5 T-m with pole shims
Yoke Length	1.22m
Gap	46.99cm x 121.92cm
Weight Yoke	84.7tons
	7 1008 steel sectors, largest = 18.3 tons
Number of turns per pole	1 coil per pole, 120 turns per coil
Length of conductor	1693 m
Weight of coil	5.2 ton per coil
Dimensions of conductor	2.18cm square, 1.27cm dia hole
Current	2000A
Resistance	0.110 ohm
Voltage	220V
Power	440KW
Water flow	150psi,100gpm
Temperature rise	17C

Field Clamps

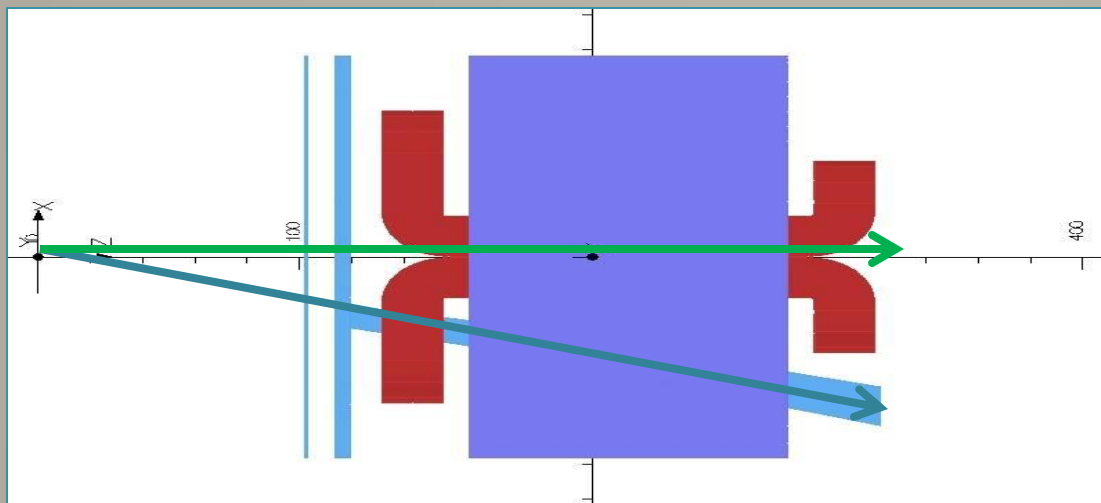
- Field gradient in Target region limited to 0.1 G/cm with Magnet entrance at 165 cm from Target
- Tosca results indicate addition of 6cm plate and 2 cm plate at 45cm upstream of magnet entrance will meet the requirement
- Limit field at detectors, 50 cm from Magnet exit, to less than 1000 Gauss
- PMT field limited to 60 Gauss at 200 cm from Magnet exit
- Tosca results indicate addition of 1 cm plate Downstream of Magnet exit will meet the requirement



Magnet Tosca Results

Geometry: 18cm slot for beamline, layered beamline shielding, upstream field clamps, pole shims, new coils

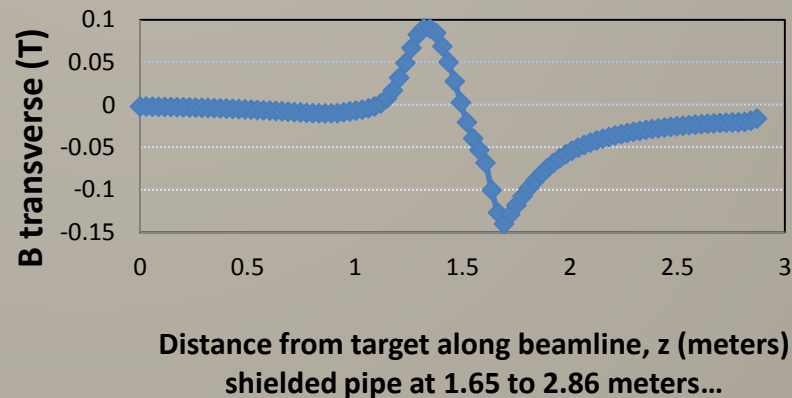
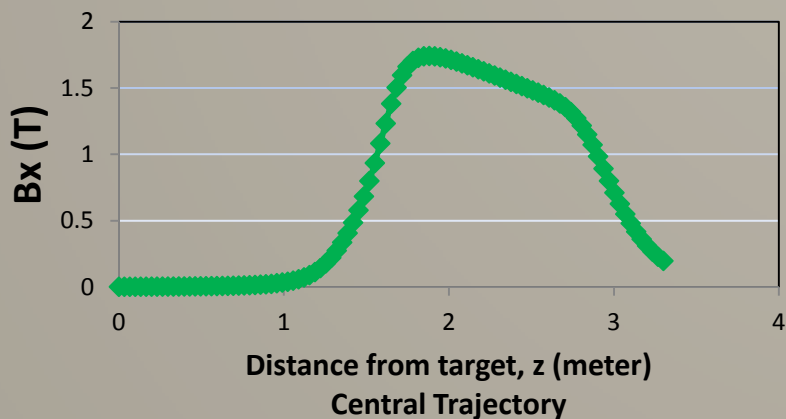
**Current
2000A**



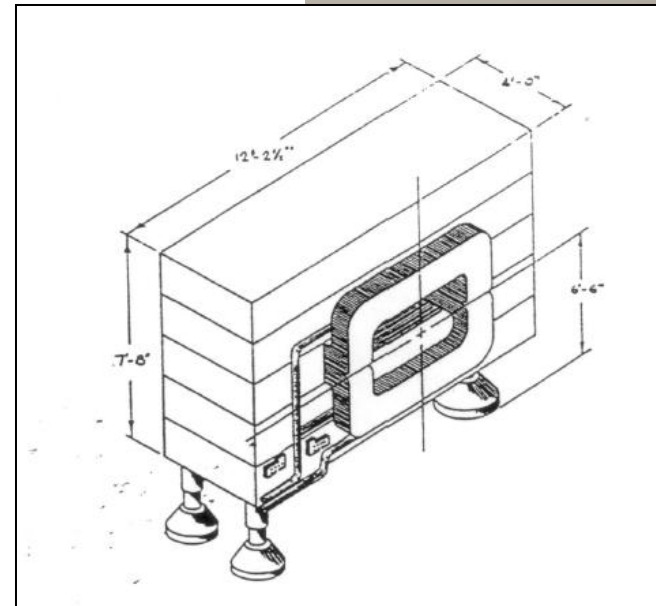
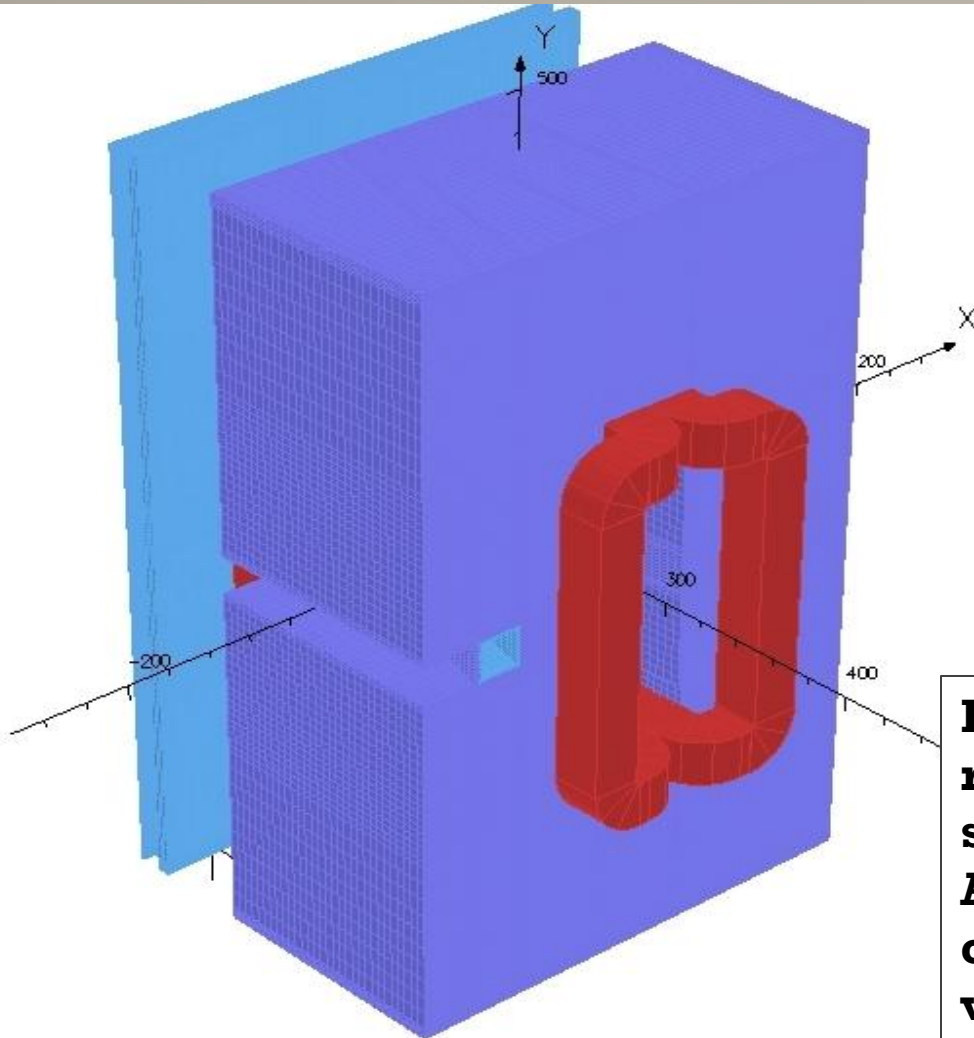
**Field
Integrals**

2.46 T-m

0.06 T-m



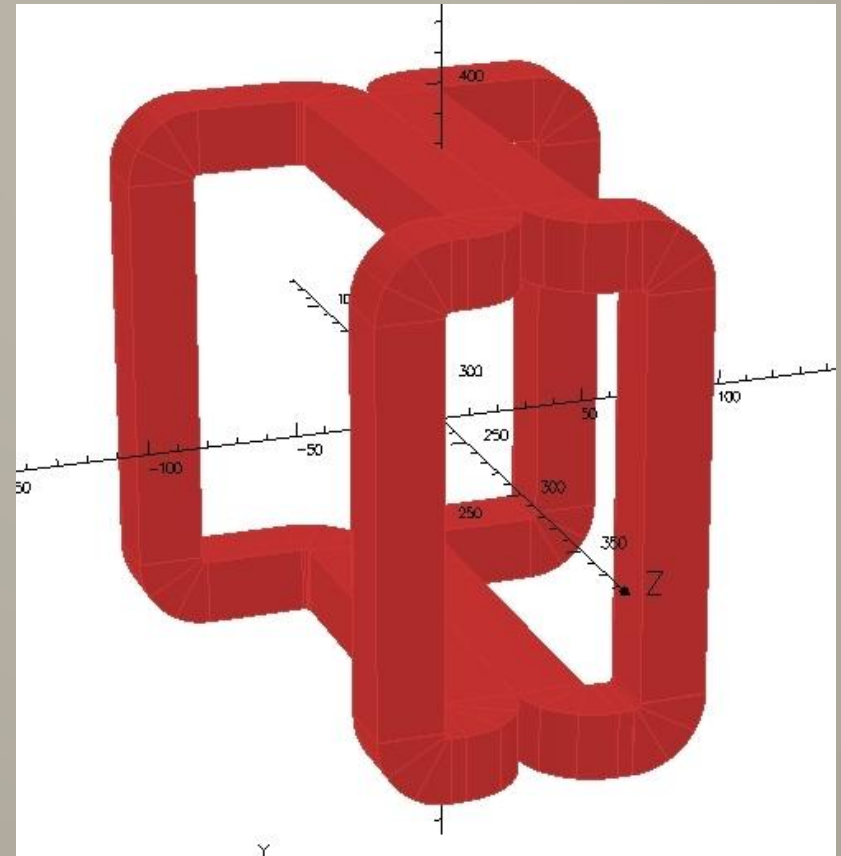
Magnet Yoke



**Beamline clearance
requires machining 2
sectors of yoke.
Add adjustable supports in
opening to support 20ton
vertical load**

New Coil and Power Supply

- Using same design as existing coils, 120 turns
 - Slightly smaller conductor size to give more aperture clearance
 - Changed saddle lengths to clear beampipe
-
- Requirements of power supply are defined, need help writing specification for purchasing



Shielded Beampipe & Field Clamps

Beampipe

TOSCA model is a 3 layer square tube with
1 cm iron – 1cm air – 3cm 1008 steel

Modifying model to replace with round pipe

Field Clamps

6cm and 2cm plates upstream, placed 45 cm from magnet
entrance

1cm plate placed downstream of exit

Upstream interferences with BigBite in some configurations,
modifying model to determine cross-section of clamp that
“fits” (cut corners off)

SBS Neutron FF Kinematics

GEn

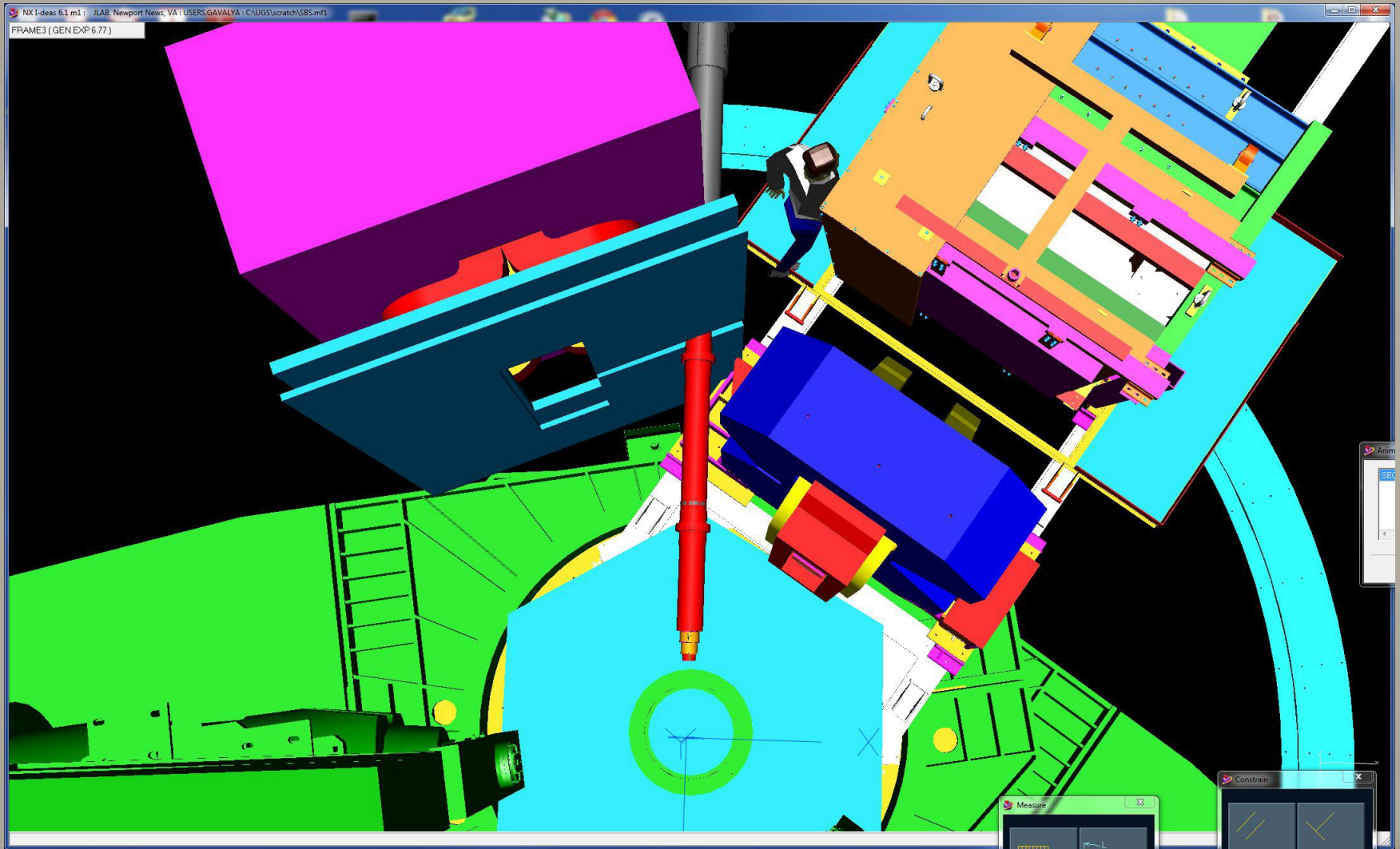
Distance to BigBite is 1.5m

Distance to 48D48 is 2.8m

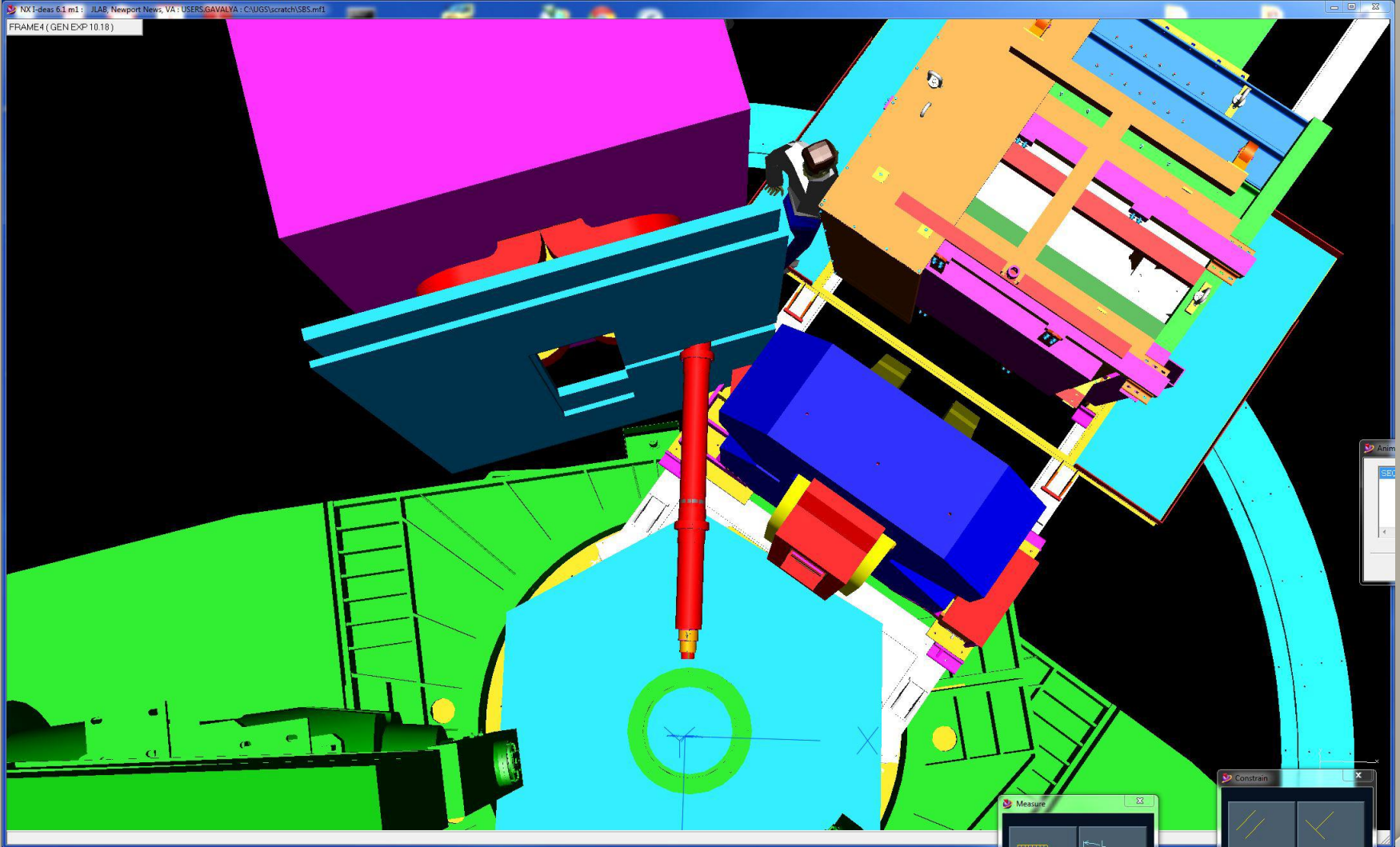
Q^2 [GeV ²]	E_{beam} [GeV]	θ_{bb} [deg]	θ_{48D48} [deg]
1.46	2.2	40.0	39.4
3.68	4.4	34.0	29.9
6.77	6.6	34.0	22.2
10.18	8.8	34.0	17.5

Interference = field clamp, gate valve on beamline, utility support, BigBite shielding

GEN, $Q^2=6.77$



GEN, $Q^2=10.18$



GMn

SBS Neutron FF Kinematics

Experimental Points

Q^2 [GeV ²]	θ_{bb} [deg]	θ_{48D48} [deg]	d_{48D48} [m]	d_{HCAL} [m]
3.5	32.5	31.1	1.6	6.2
4.5	41.9	24.7	1.6	6.2
6.0	64.3	15.6	1.6	11.
8.5	46.5	16.2	1.6	11.
10.0	33.3	17.9	1.6	13.
12.0	44.2	13.3	1.8	14.
13.5	58.5	9.8	2.5	17.

Calibration Points:

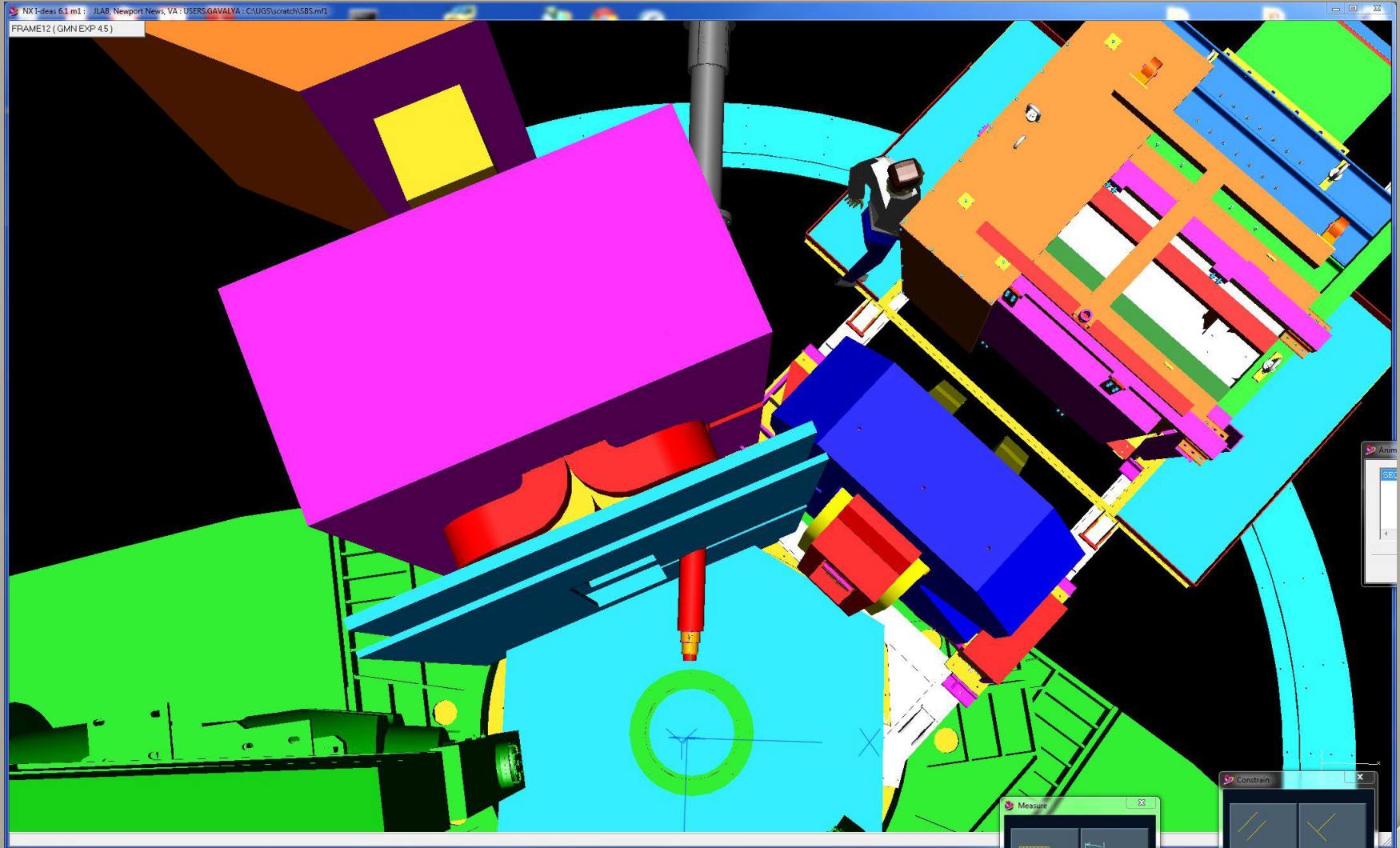
Q^2 [GeV ²]	θ_{bb} [deg]	θ_{48D48} [deg]	d_{48D48} [m]	d_{HCAL} [m]
3.5	34.1	31.1	1.6	17.
3.5	30.9	31.1	1.6	17.
6.0	69.1	15.6	1.6	17.
6.0	65.9	15.6	1.6	17.
6.0	62.7	15.6	1.6	17.
6.0	59.5	15.6	1.6	17.

Distance to BigBite is 1.55 m

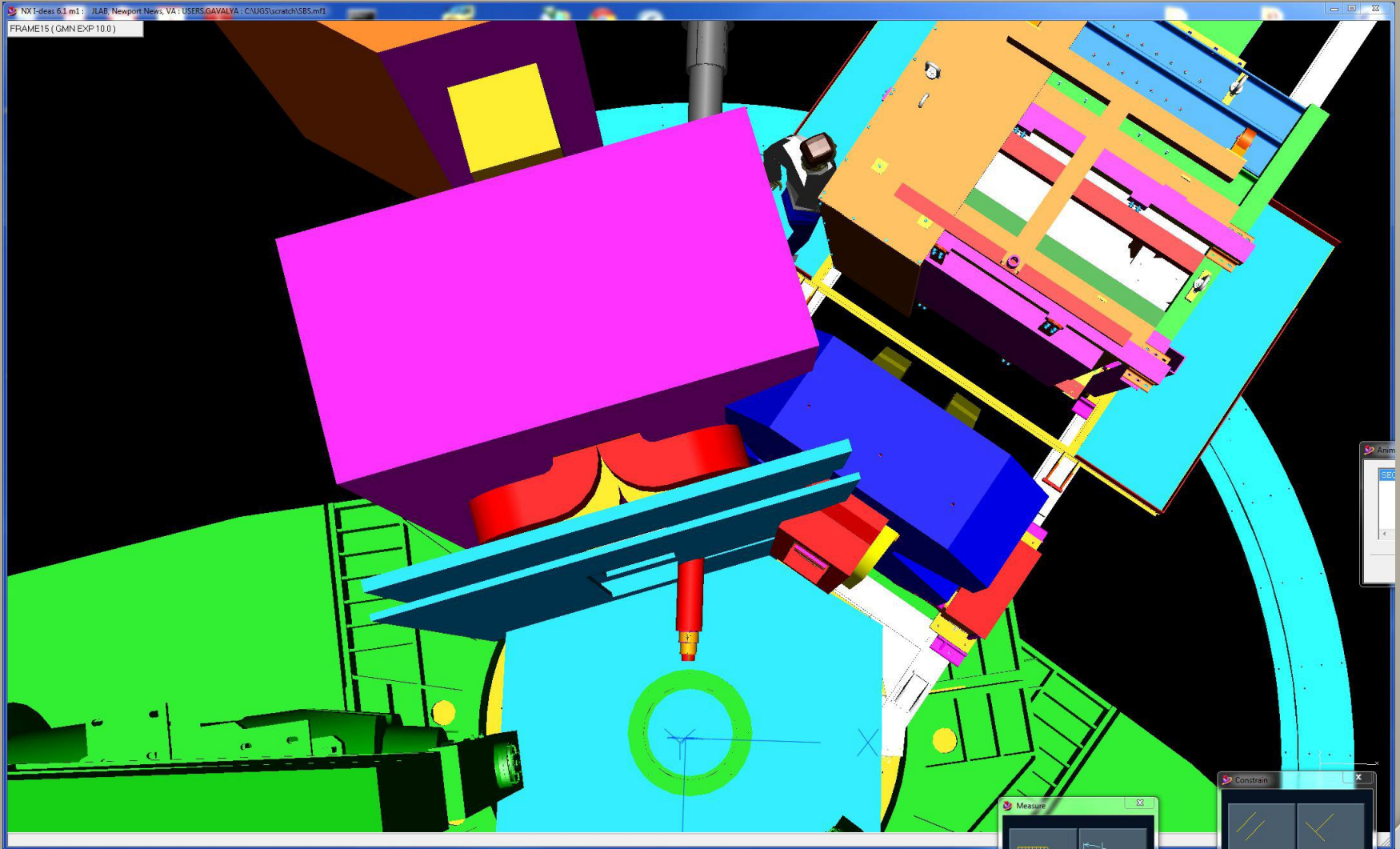
Interference = 48D48
and BigBite magnets

Interference = field
clamp, gate valve on
beamline, utility
support, BigBite
shielding

GMn, $Q^2=4.5$



GMn, $Q^2=10.0$



What's next

- Continue TOSCA analysis for shielded beampipe design and field clamps that “fit”
- Add BigBite Magnet to TOSCA model to check field effects
- Specification of Power Supply
- Design drawings of yoke modifications (visit BNL first)