LARP

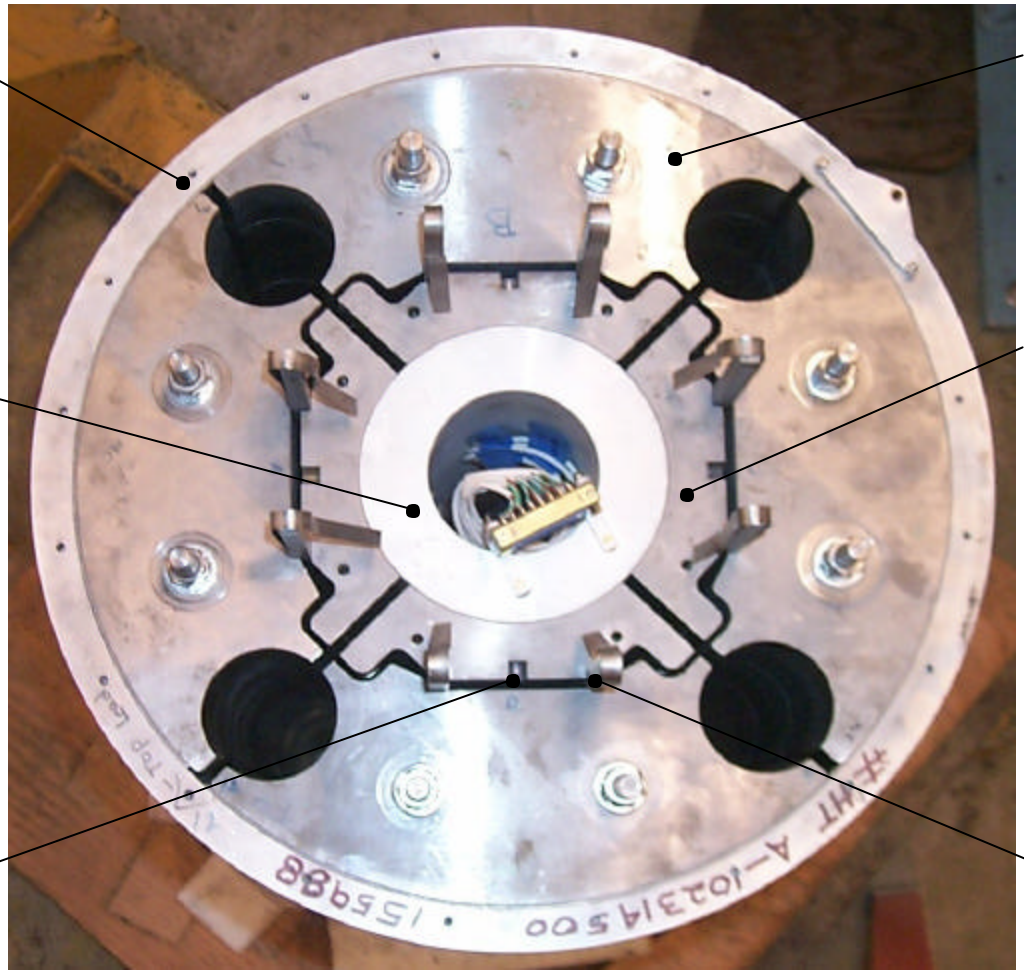
TQ1a progress & plans

Shlomo Caspi

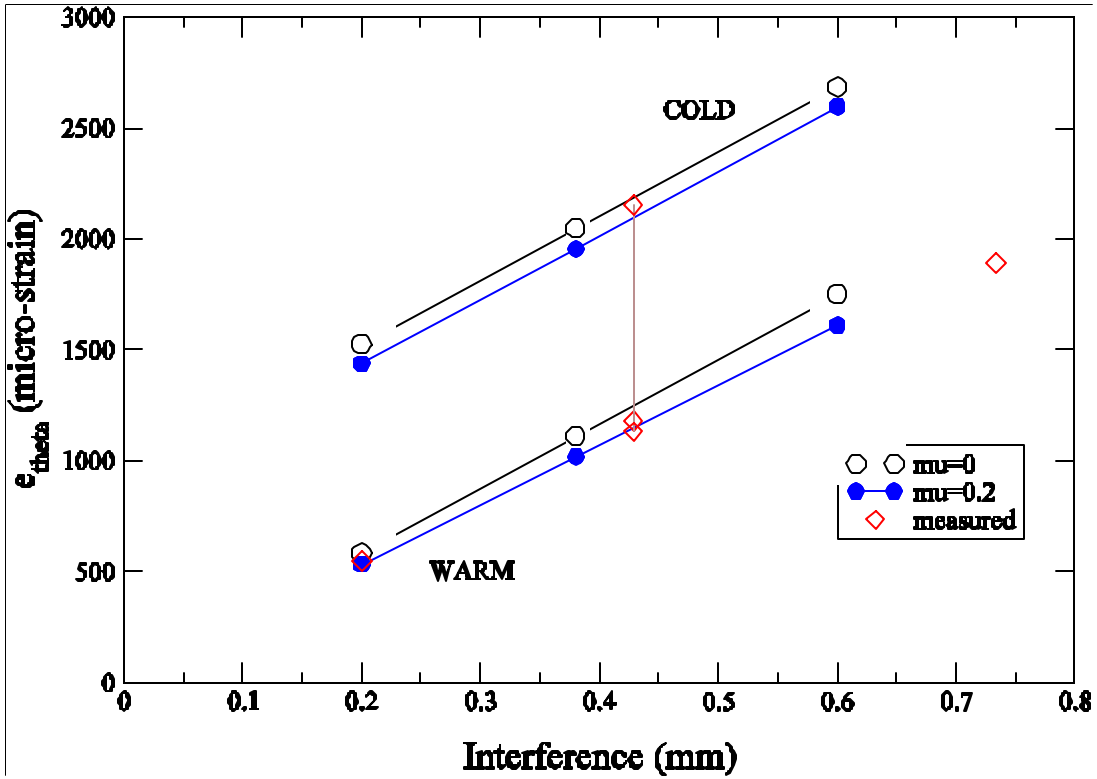
Port Jefferson

04/05/2005

TQ1a - Structure



TQ1a – Assembly Test



Transverse strain in the shell versus key interference: numerical and measured (frictionless and with friction) .

TQ1a - Status

- Conductor – two options

<u>Design and Analysis</u>

- 2D Coil cross section – completed
    - Need to finalize number of strands
- 3D Coil and spacers - completed
- 2D and 3D Magnetics – completed
- 2D Structural - completed
- 3D Structural - in progress

<u>Hardware – keys and bladders</u>

- Structure – exists
- Pad modification – in progress
- Axial plates and rods – final design
- Radial spacers – final design

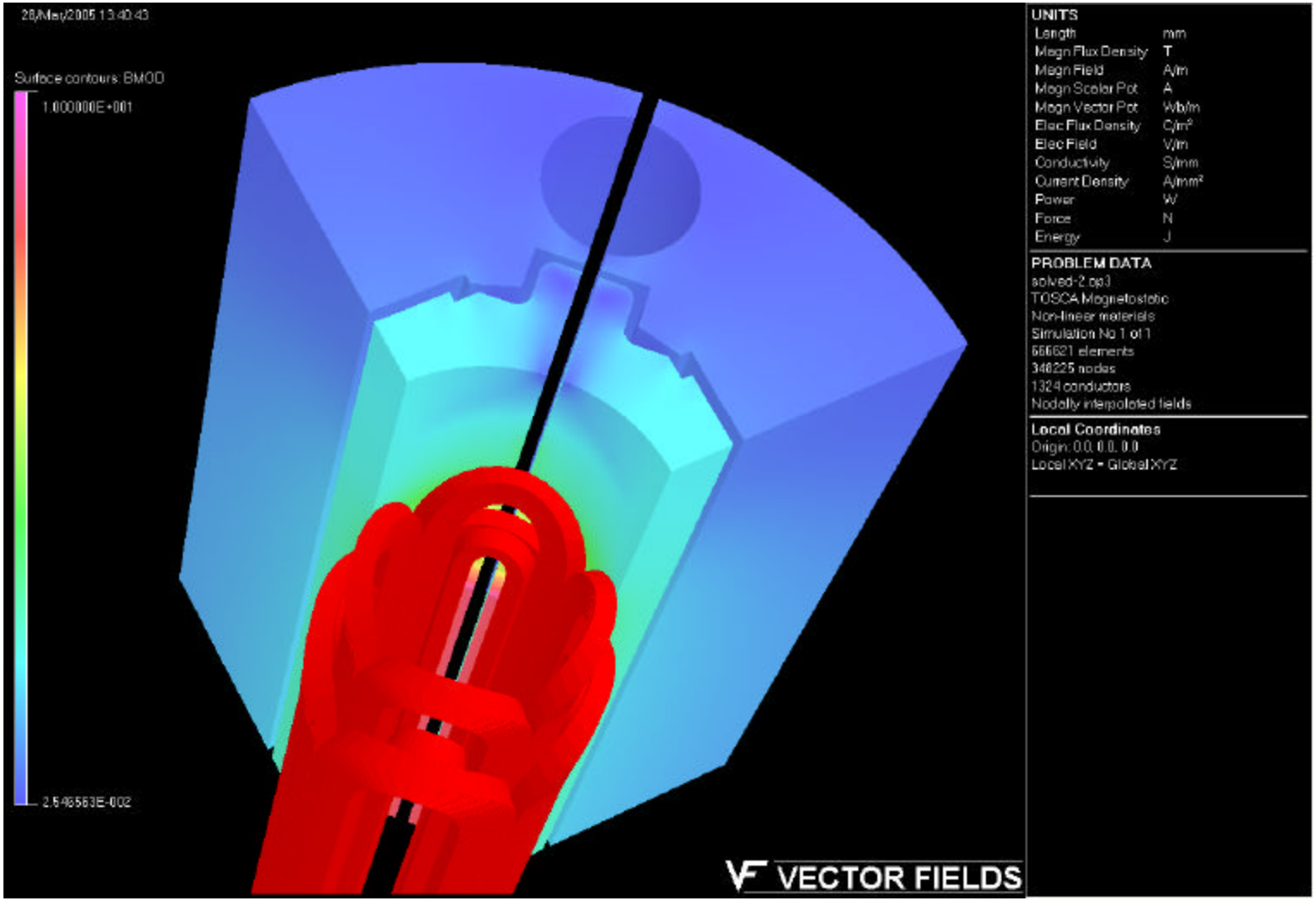
Conductor

- **Option 1 - RRP 3000 A/mm^2 at 4.2K 12T (April 15, 2005)**
- **Option 2 – RRP 2300-2400 A/mm^2 at 4.2K 12T (Available)**
- **Number of strands**

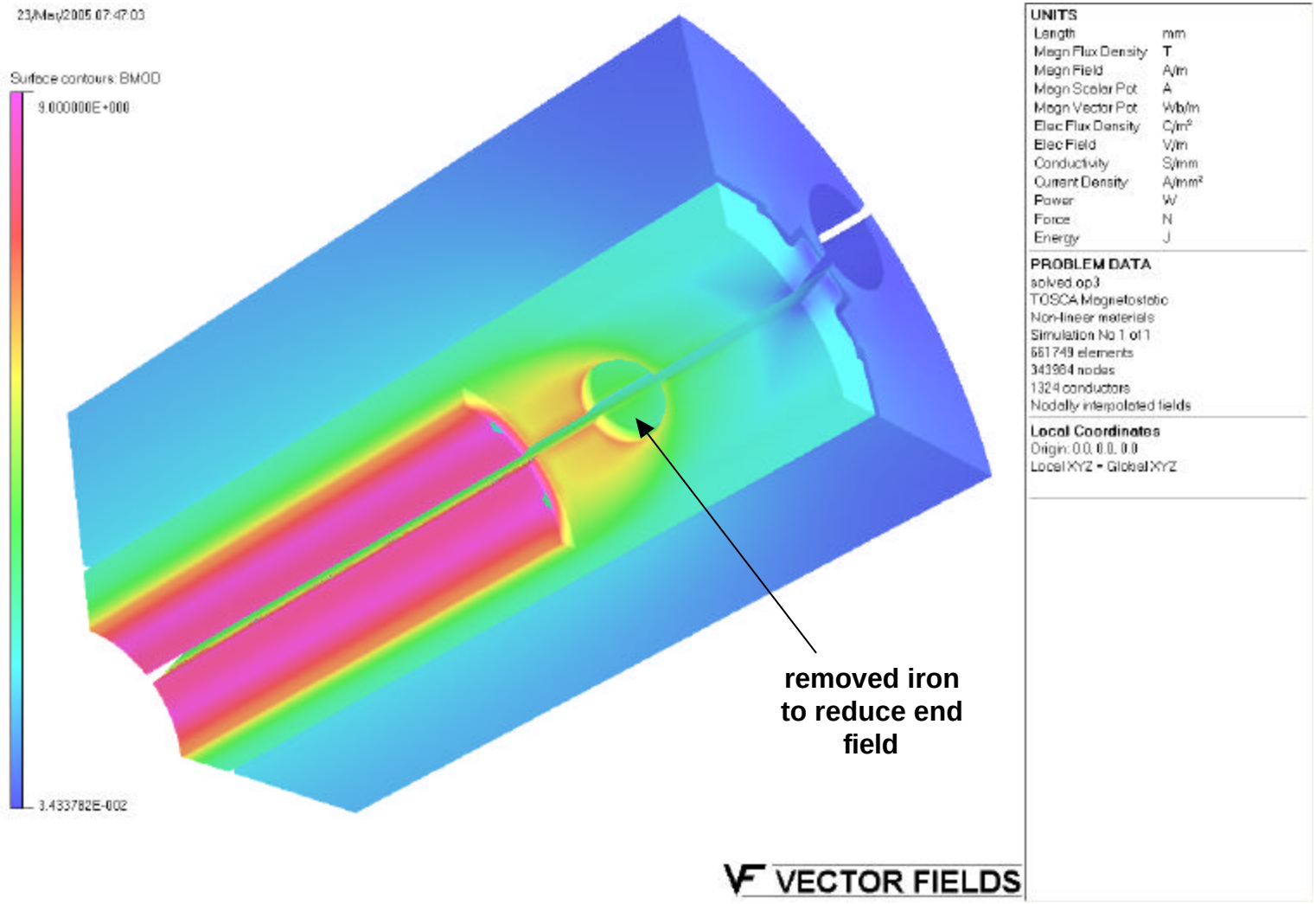
Magnetic

TOSCA 3D

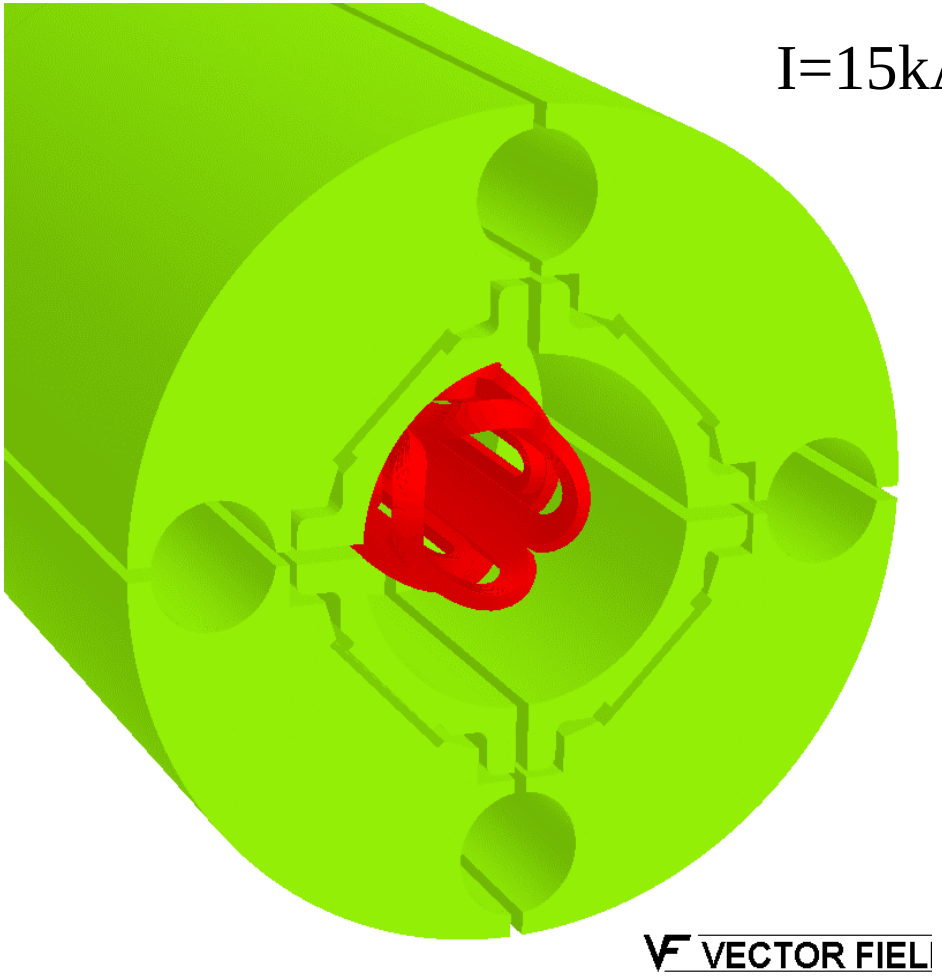
TQ1a

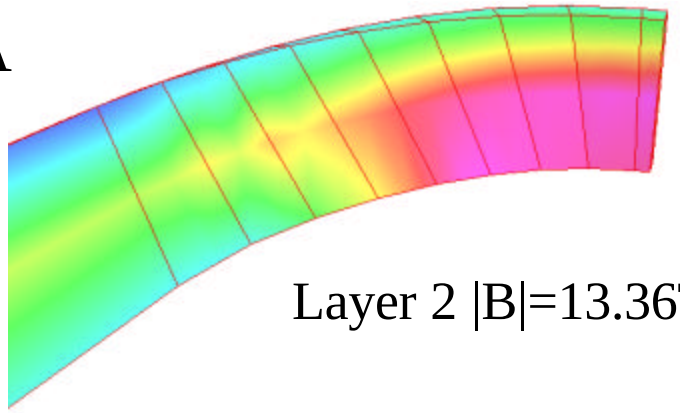

28/May/2005 13:40:43
Surface contours: BMOD
1.000000E+001
2.546563E-002
UNITS
Length mm
Magn Flux Density T
Magn Field A/m
Magn Scalar Pot A
Magn Vector Pot Wb/m
Elec Flux Density C/m²
Elec Field V/m
Conductivity S/mm
Current Density A/mm²
Power W
Force N
Energy J
PROBLEM DATA
solved-2.op3
TOSCA Magnetostatic
Non-linear materials
Simulation No 1 of 1
566621 elements
348225 nodes
1324 conductors
Nodally interpolated fields
Local Coordinates
Origin: 0.0, 0.0, 0.0
Local XYZ = Global XYZ
VECTOR FIELDS

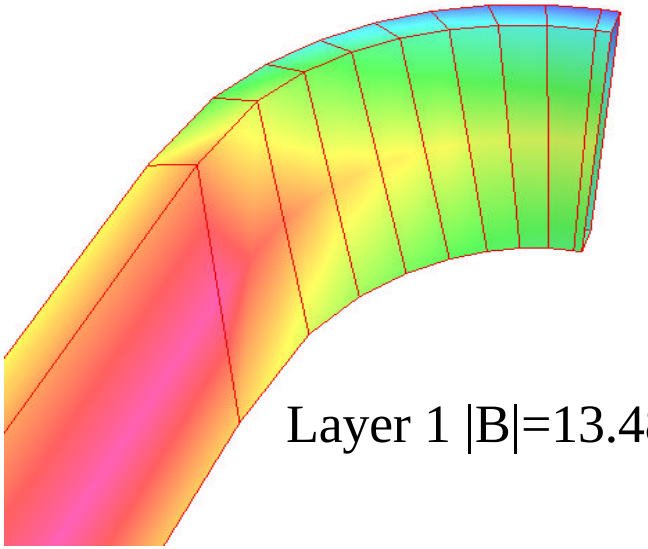
Yoke and modified pads



TOSCA







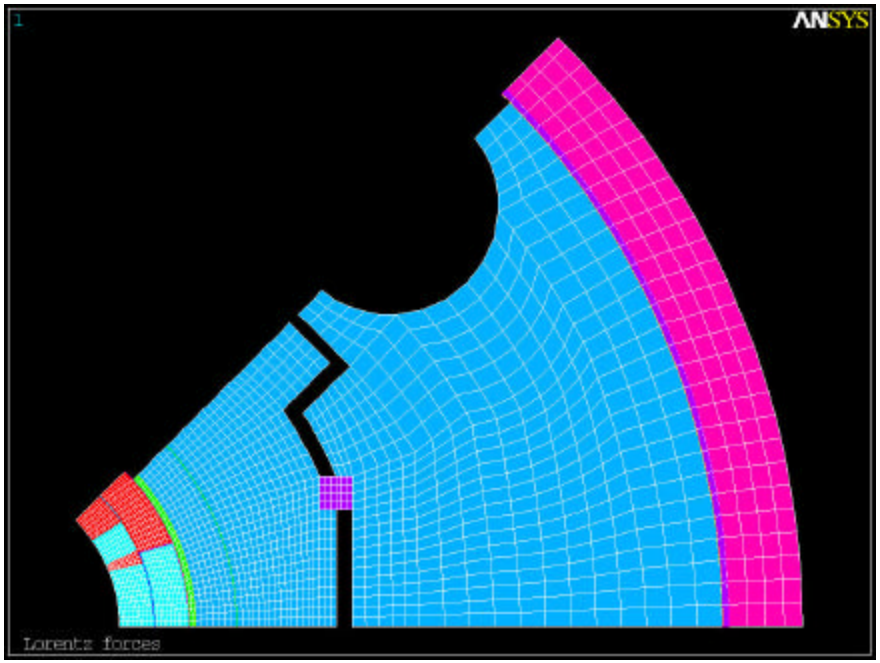
TQ1a – Short Sample field

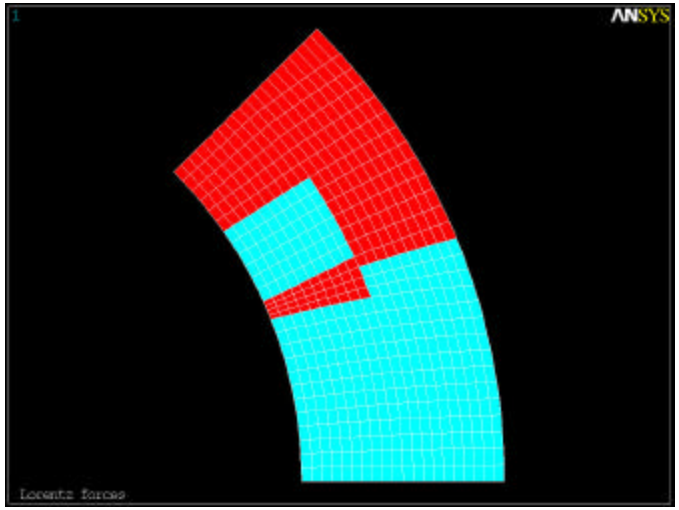
conductor	T (K)	# Strand	G_{ss}(T/m)	$\|B\|_{ss}$ (T)	I_{ss}(A)
3000 A/mm^2 4.2K, 12T	4.2	27±1	245 ±2	12.54±0.10	13900 ±150
	1.9	27±1	264±2	13.52±0.13	15105 ±150
2500 A/mm^2 4.2K, 12T	4.2	27±1	233 ±2	11.94±0.11	13170 ±150
	1.9	27±1	251±2	12.85±0.13	14300 ±160

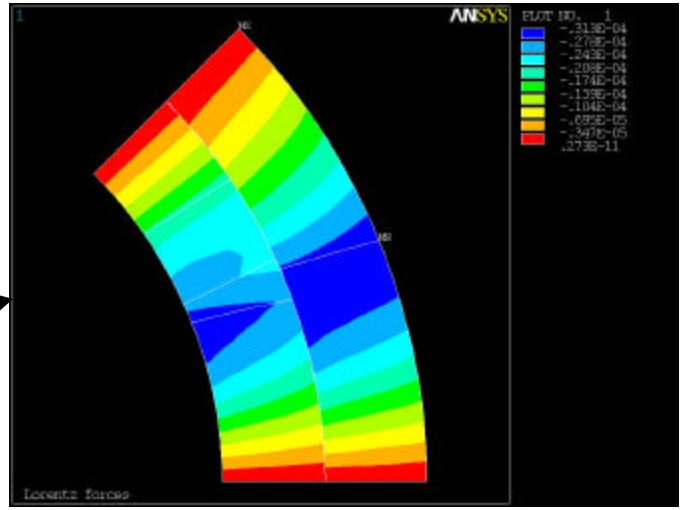
TQ1a

2d
ansys

2D ANSYS model







Transverse displacement at short sample

(0 displacement along pole and mid-plane)

TQ1a – Short Sample Stress

conductor	T (K)	G_{ss}(T/m)	Average* mid-plane stress (300K) (MPa)	Average* mid-plane stress (4.2K) (MPa)	Average* mid-plane stress (Gss) (MPa)
3000 A/mm^2 4.2K, 12T	4.2	245	29	125 ± 10	147 ± 16
	1.9	264	47	144 ± 11	172 ± 18
2500 A/mm^2 4.2K, 12T	4.2	233	20	115 ± 9	134 ± 14
	1.9	251	36	132 ± 10	156 ± 16

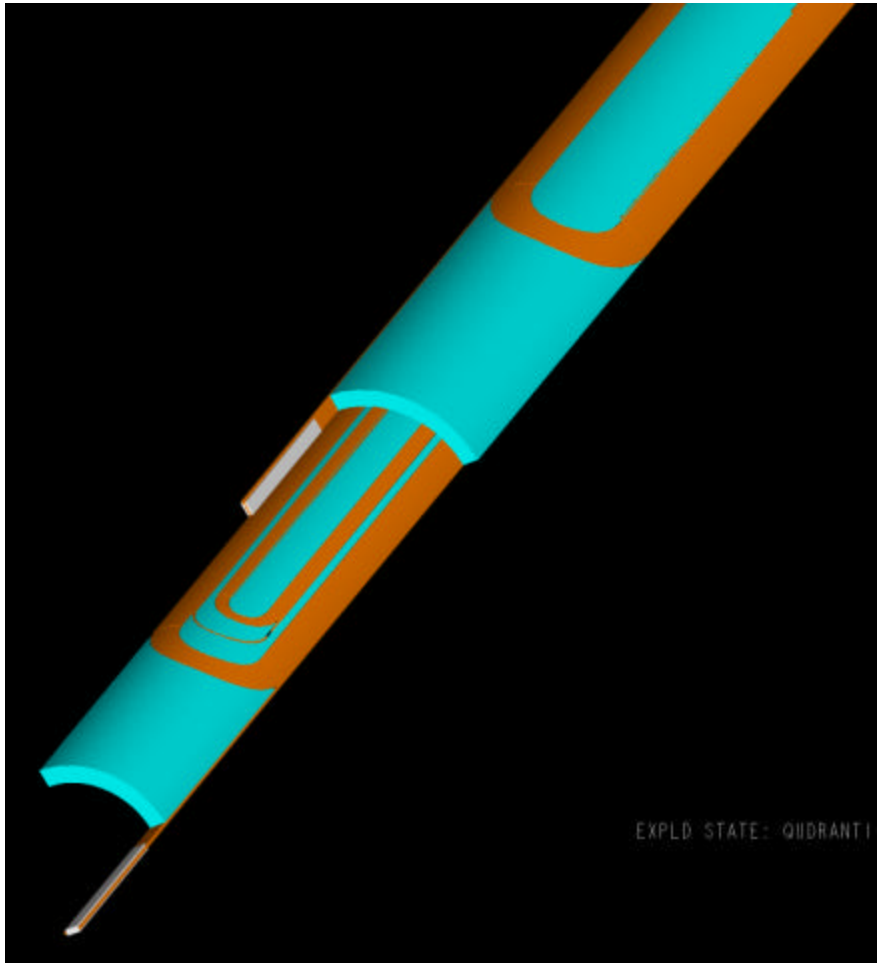
* No pole separation

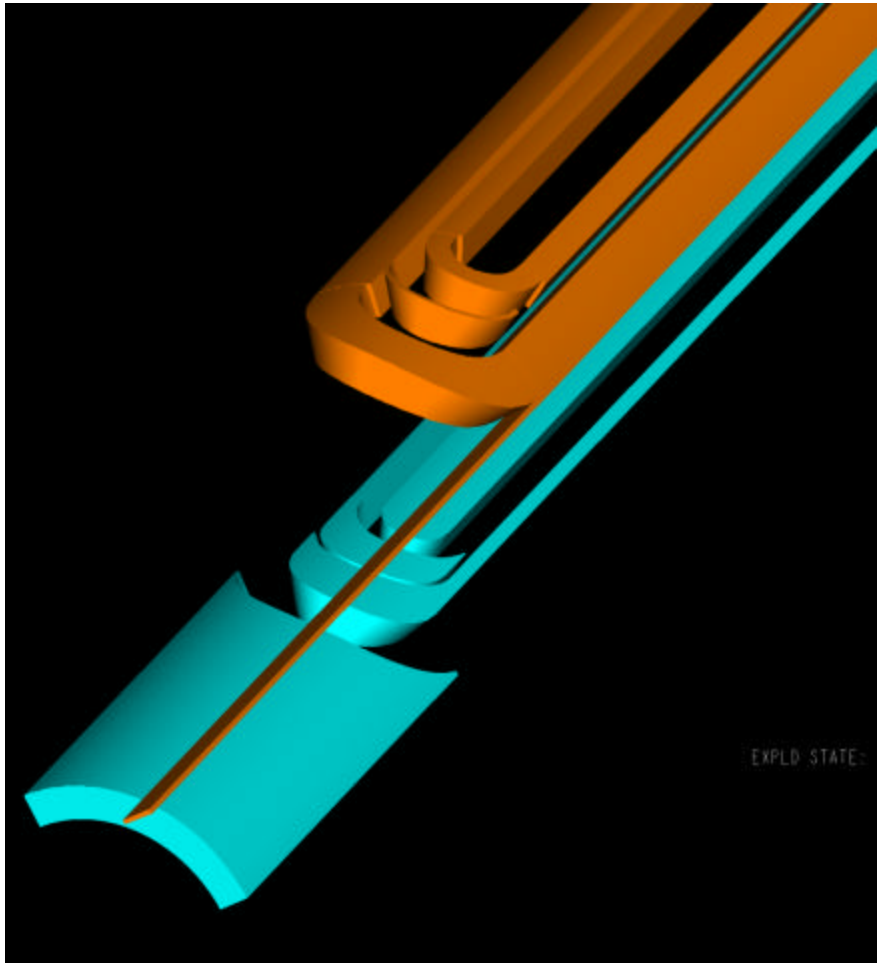
* ± standard deviation along mid-plane

TQ1a

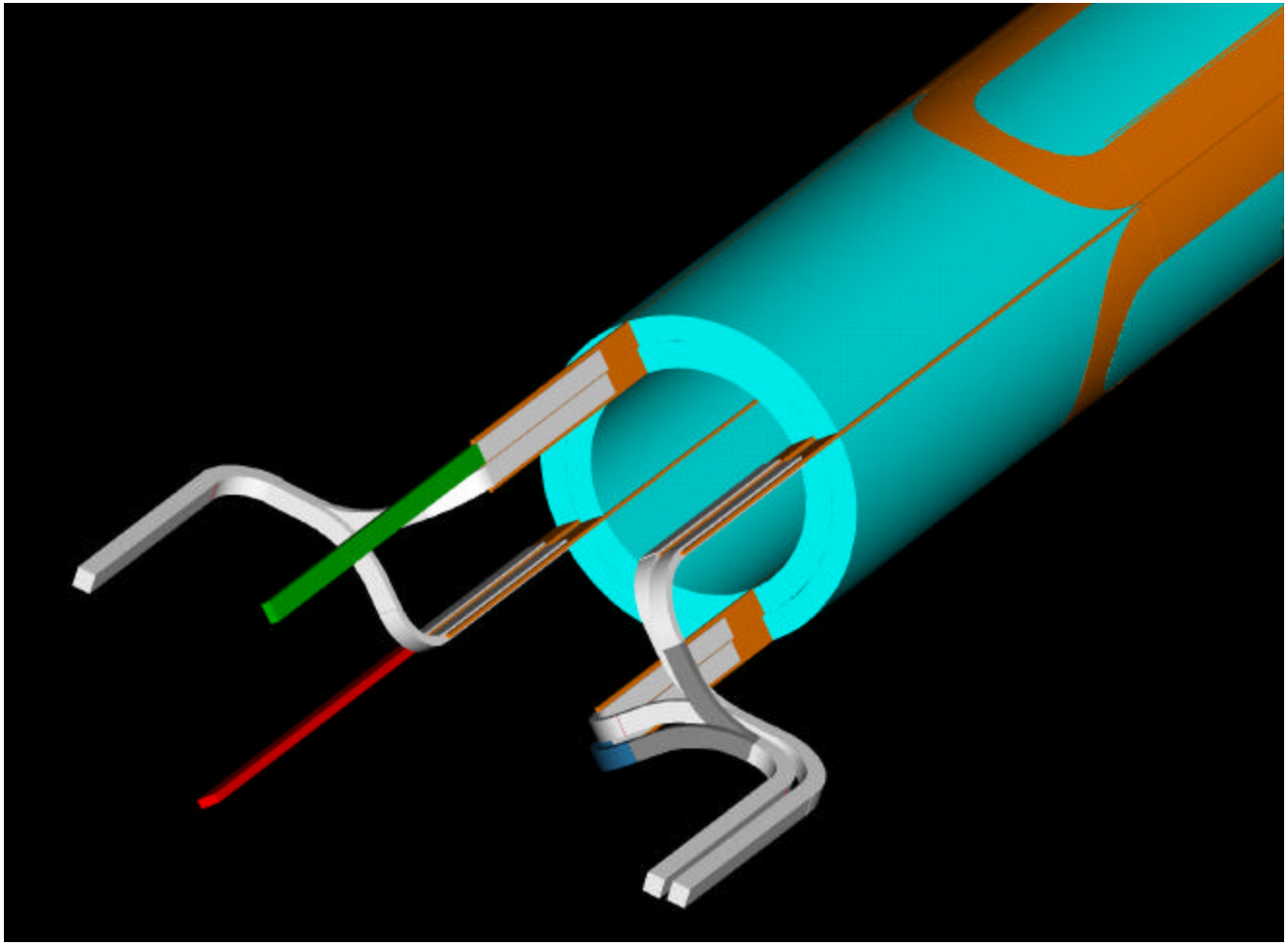
COILS

Coils and Spacers

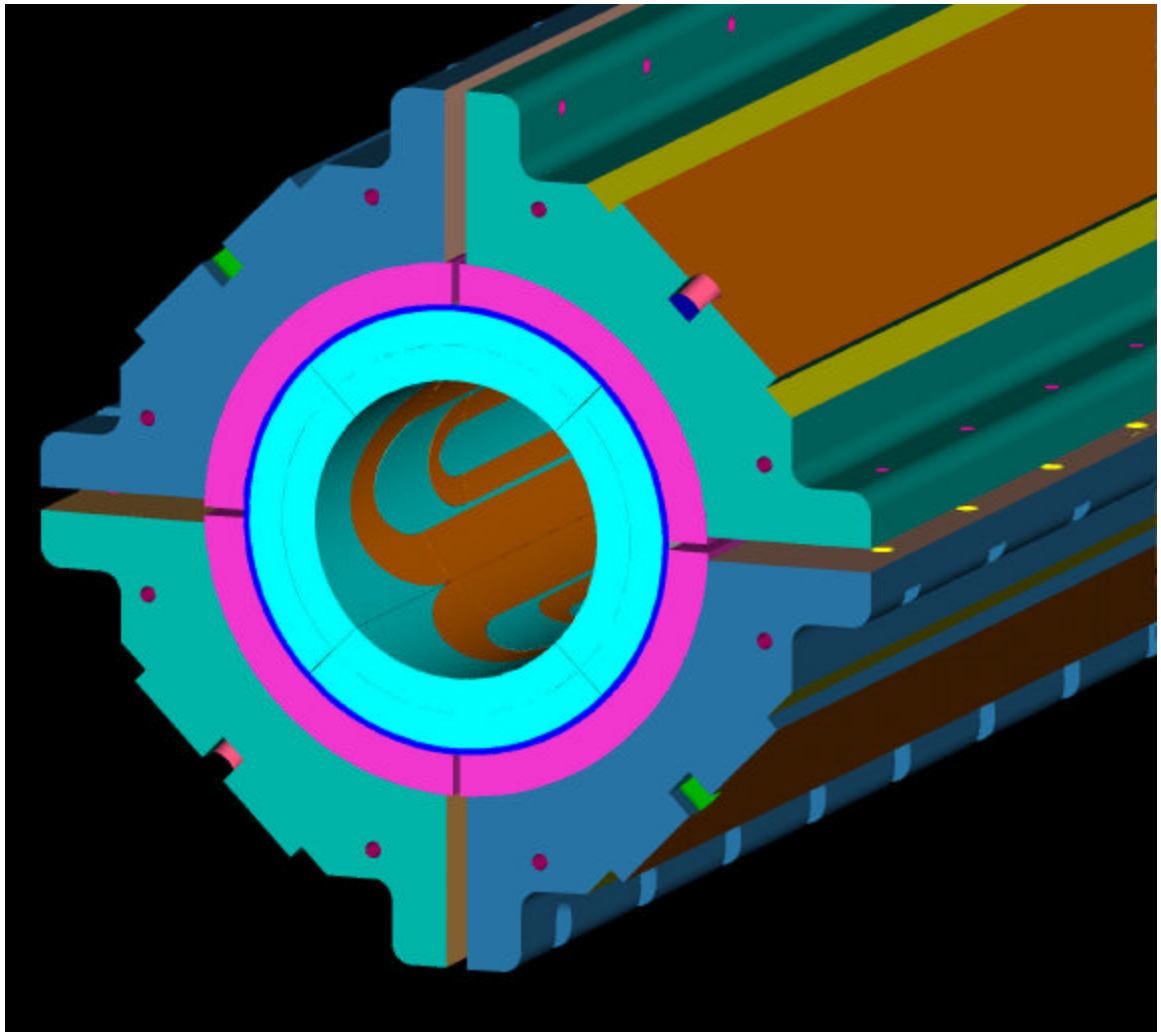




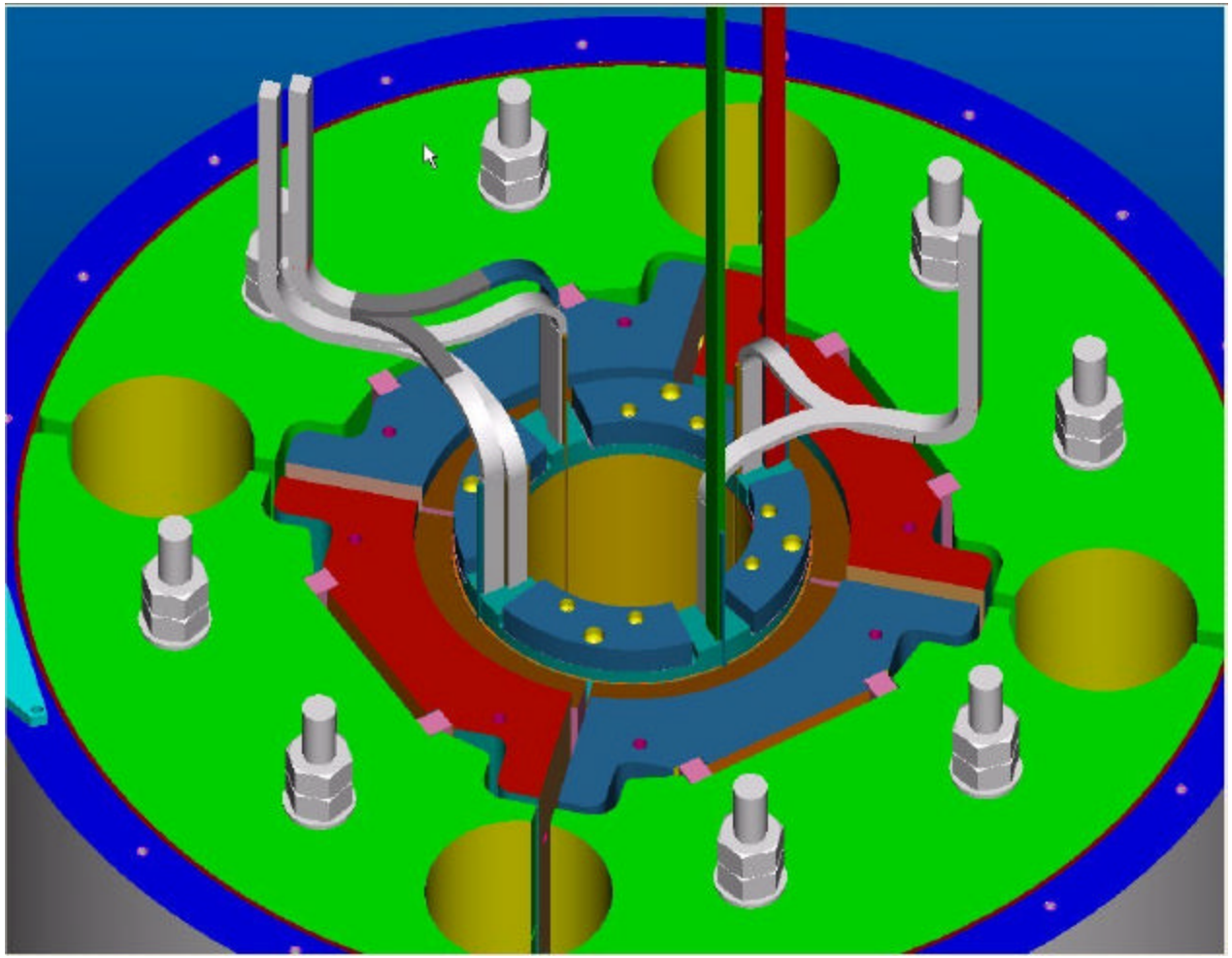
Lead End



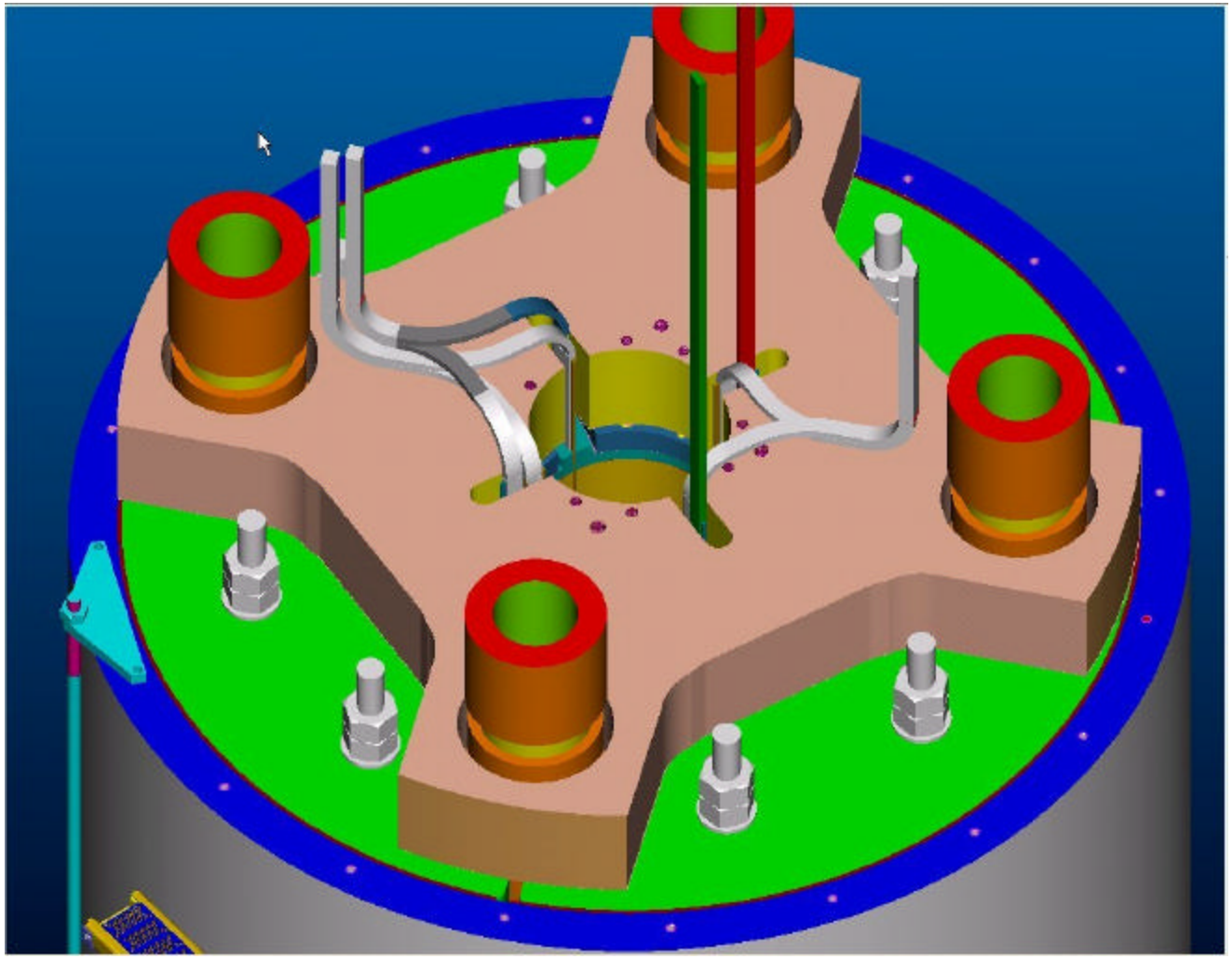
Coils and Pads Subassembly



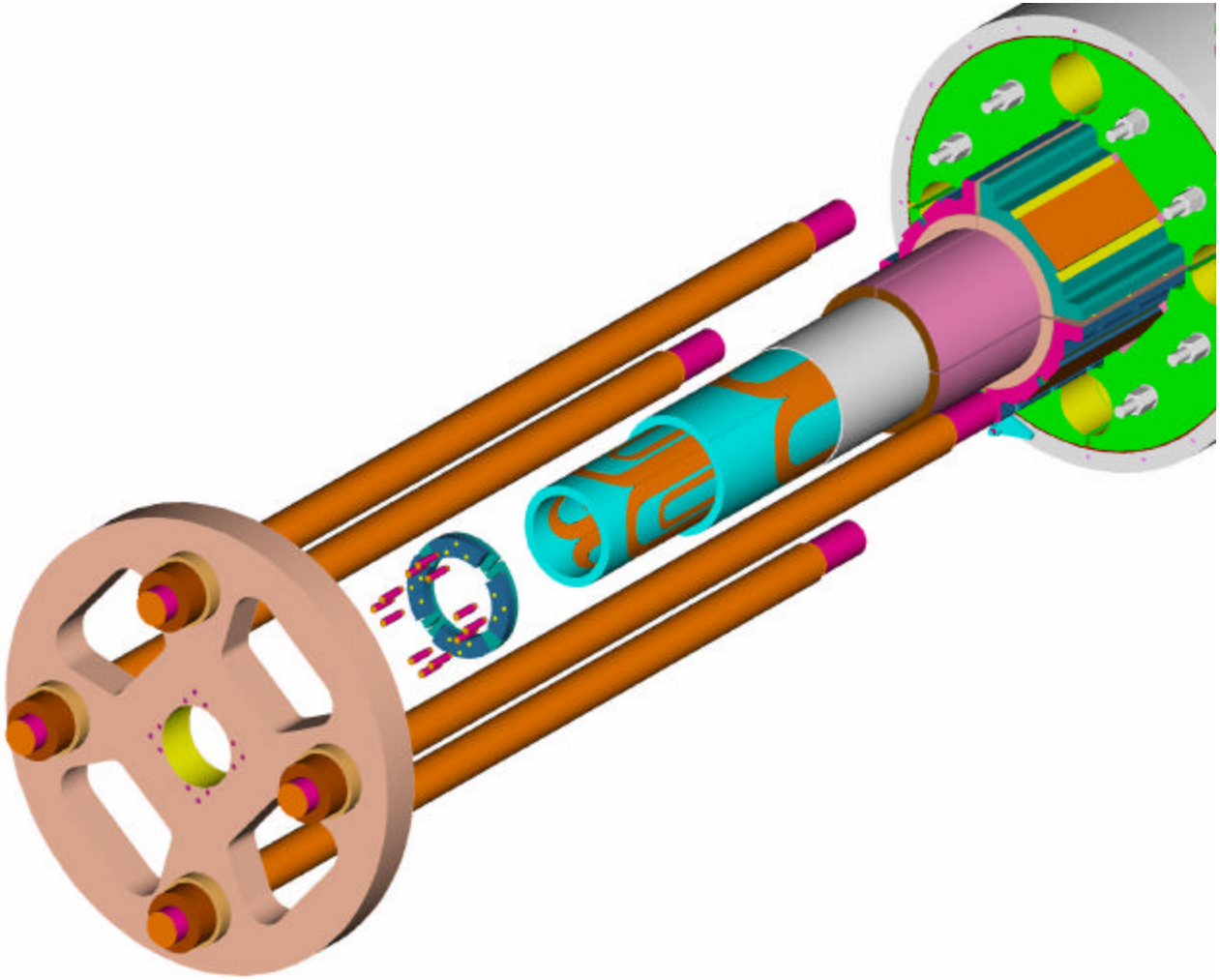
Final Assembly



End Plate



ProE CAD

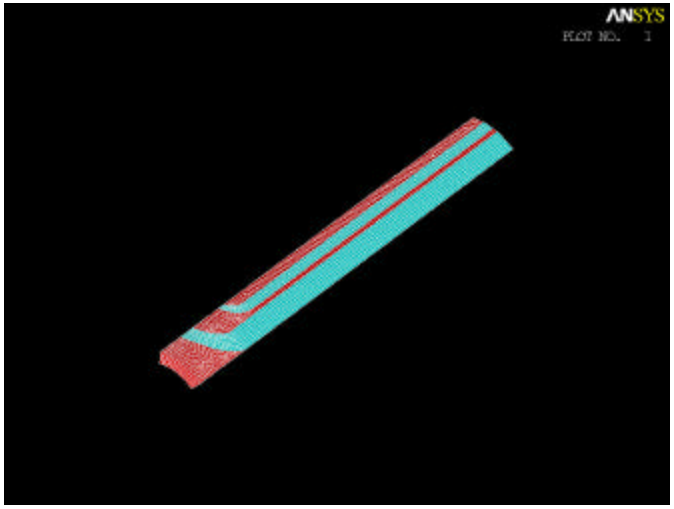


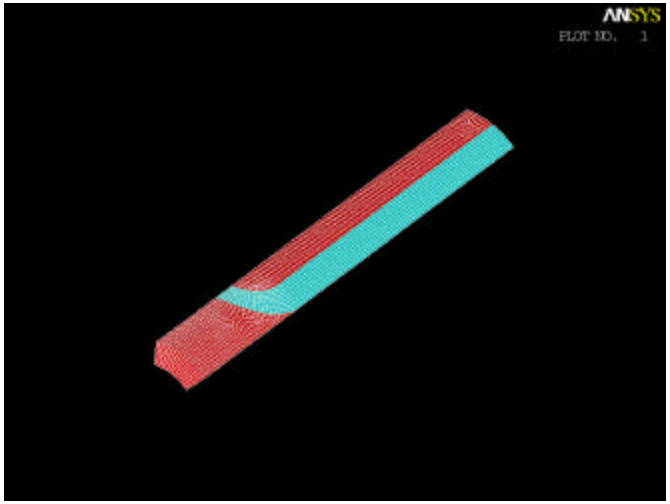
Structural

ANSYS 3D

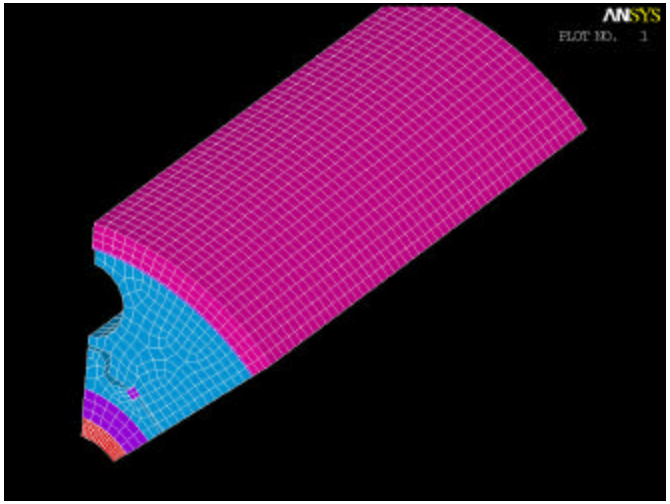
TQ1a - ANSYS

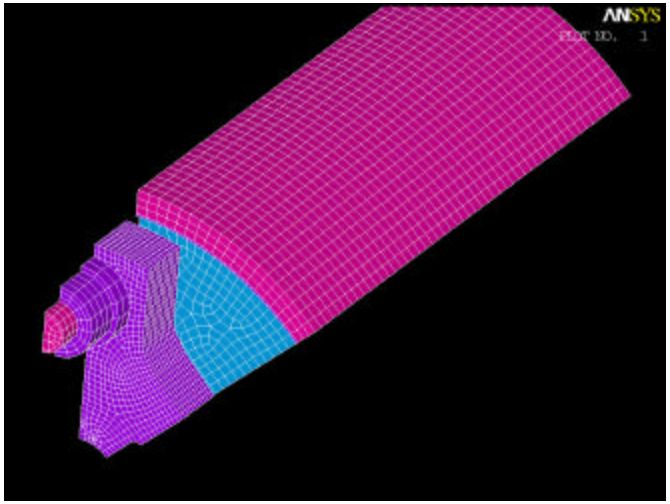
Layer 1



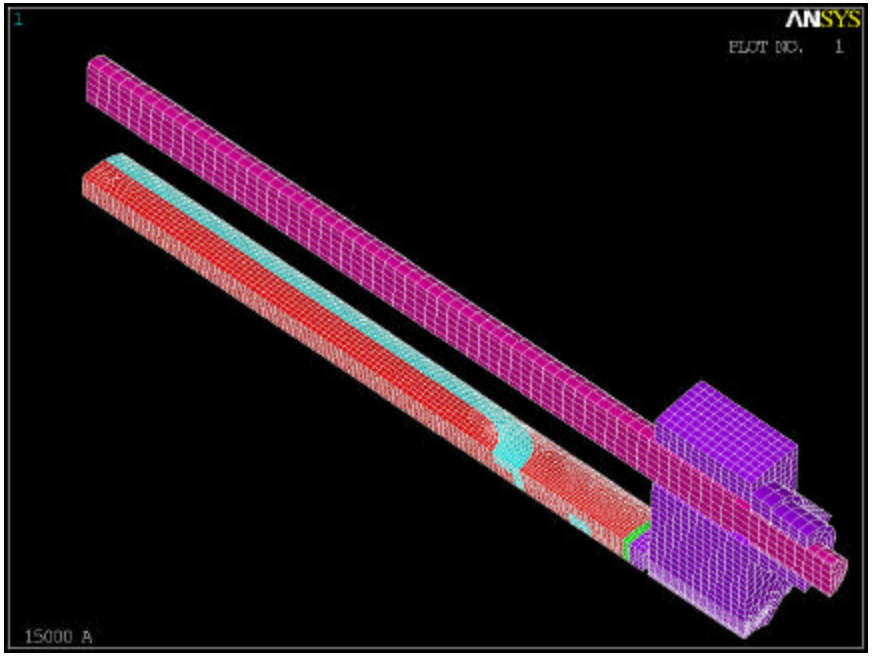


Layer 2



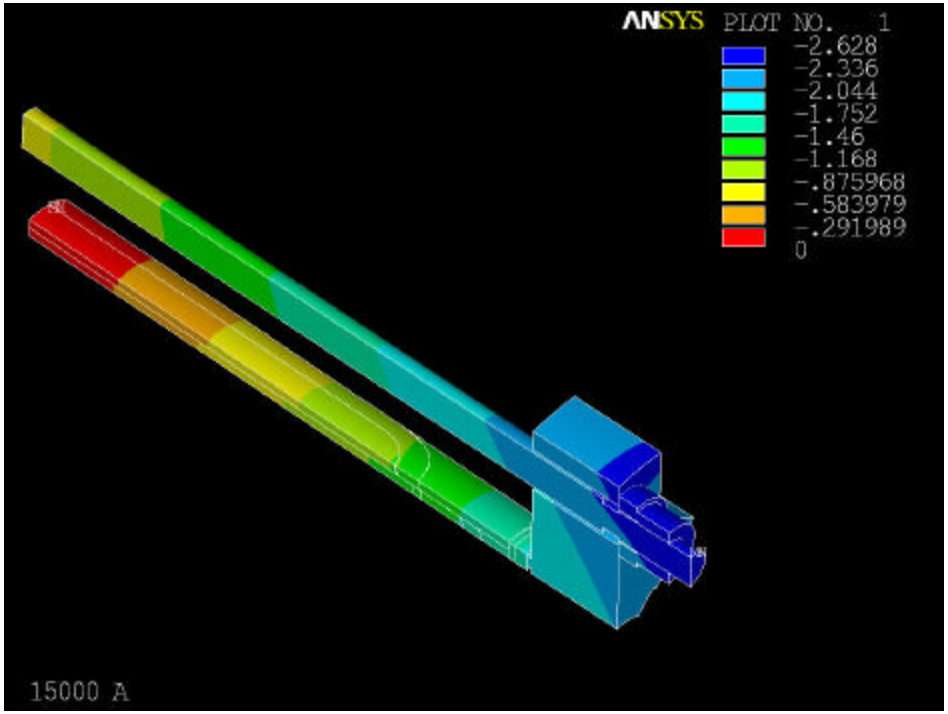


End assembly



mesh

Axial displacements (15kA)



Next step

- Complete 3D mechanical analysis
  - Assembly procedure
- Procure end plates and axial rods
- Procure radial spacers

- Trip to FNAL (April 18) – Review (caspi, Ferracin, Hafalia, Hannaford, Sabbi)
  - tooling design – winding, curing reaction impregnation
  - winding and curing procedure
  - instrumentation
  - assembly
  - magnetic and structural analysis