

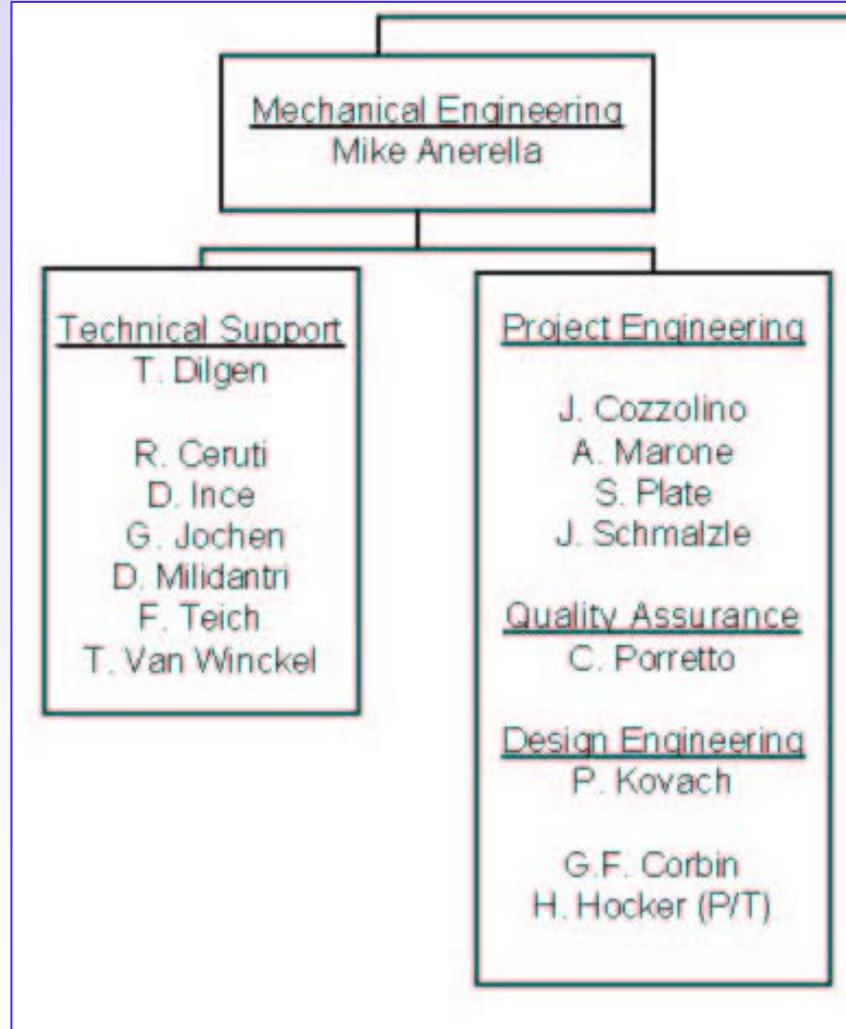
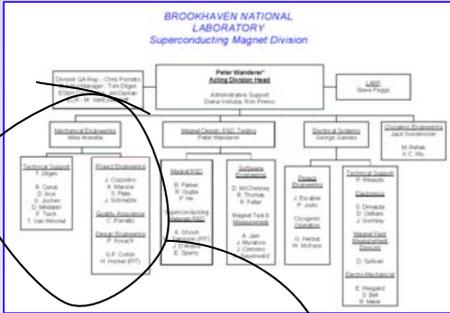
Superconducting Magnet Division S&T Committee Program Review

Magnet

Engineer / Build Capabilities

Michael Anerella

Mechanical Engineering Group - Who are we?



- Mechanical assembly
- Coil winding (all types)
- Machine tools
- Vacuum
- Cryo
- Wiring

- Pro/Engineer 3-D models
- ANSYS analysis
- Analytical work
- Magnet design
- Machine design
- Structures
- Heat transfer

Engineer / Build Capabilities

Case Study #1 – Superconducting AGS Snake Magnet

High temp s/c (HTS) power leads

Stand-alone cryogenics (cryocoolers)

Variable pitch s/c main coils in 3-D CNC pattern

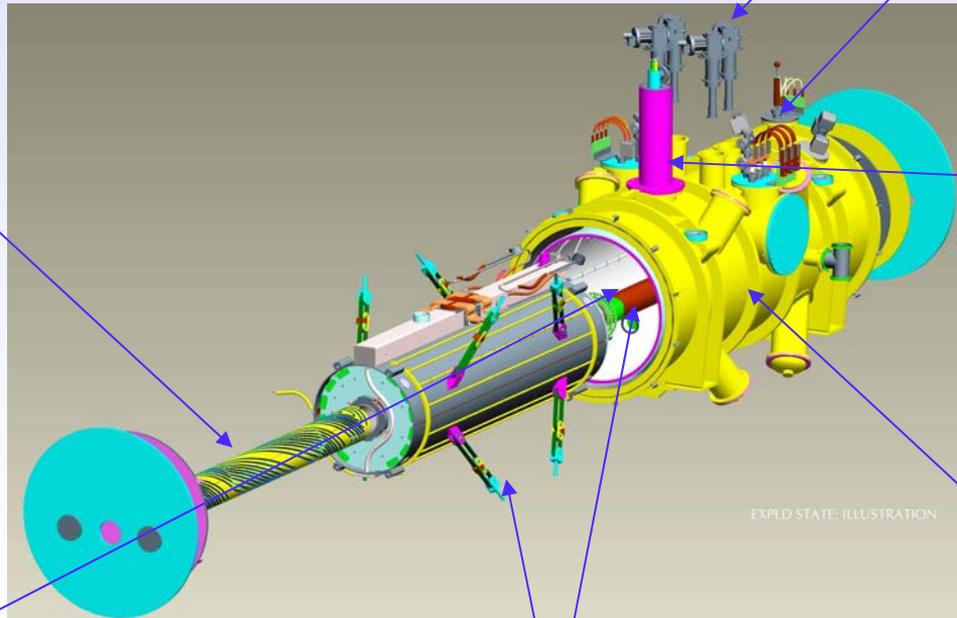
Helium fill / vent / recondensing system

Direct wind s/c solenoid and correctors on beam tube

Self-contained “plug-in” cryostat

Constant stress/position low heat leak supports

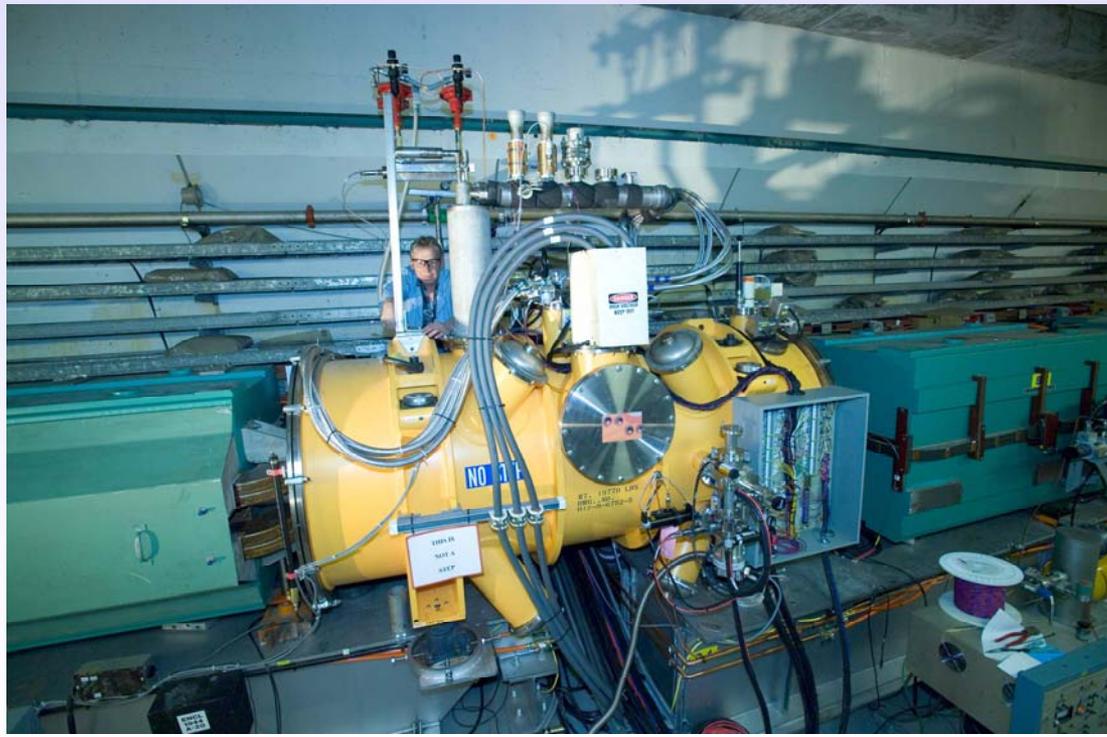
Low loss internal heat shield



INTENSIVE (several M-Y) ENGINEERING

Engineer / Build Capabilities

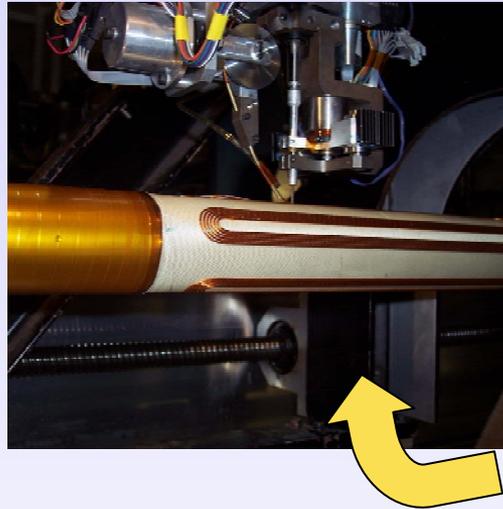
... and this is what it looks like installed



(p.s. - has been working perfectly ever since.)

Engineer / Build Capabilities

Case Study #2 – ALPHA Program



TIMELINE:

- Dec 05 – request for coils
- Jan 06 – April 06; octupole completed
- Feb 06 – 1st mirror coil completed
- Apr 06 – 2nd mirror and solenoid coils completed
- May 22 – coils complete, shipped

No dwgs, specs. (only work travelers, ALPHA sketches)

ALPHA to supply (4) support tubes to save time

BNL fabs (1) support tube to hold schedule

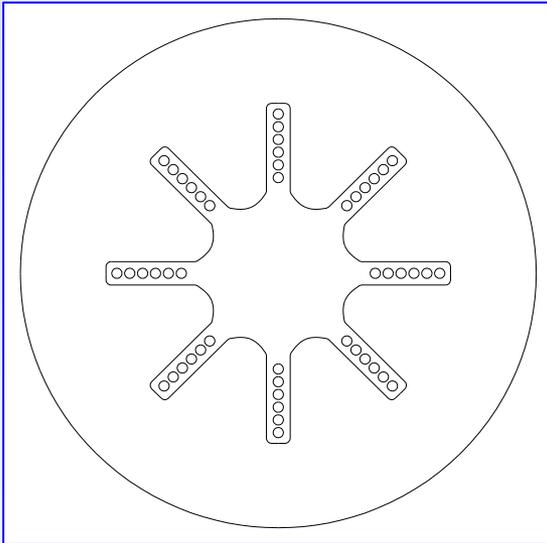
3/06 ALPHA delivers remaining (2) tubes

2 weeks ahead of promised schedule



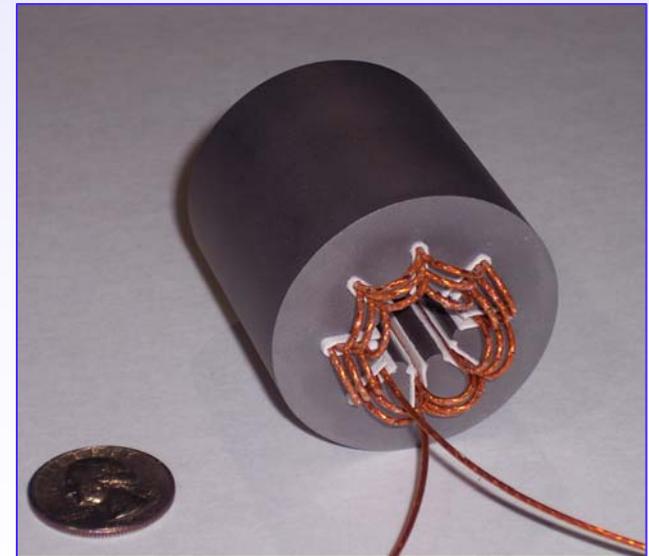
LESS FORMAL WORK STRUCTURE AS REQUIRED

Case Study #3 – ILC Tail-Folding Octupole



TIMELINE:

- Mon 8:30AM, .dxf file from physicist
- Mon 8:48AM, .dwg file to machine shop
- Tues 8:30 AM, tel from machine shop, “pick up part”
- Tues 11:35AM, coil winding complete.
- Tues 1:52PM, physicist forwards report w/jpeg for posting on ILC site



...we can be even lighter on our feet when needed

Existing Facilities

Preface:

1. If we do not have it, we will make it (tooling, equipment, etc.).
2. If it (magnet concept) can be envisioned, it can be created here.

"this is what we do"

Engineer / Build Capabilities

Equipment :

Cos θ Magnets

- 3M winding machine & curing press
- 10M winding machine & curing/collaring press
- 1M-17M tapered key collaring press
- 10M shell welding press
- Myriad of orbital welding stations
- 10M cold mass-to-cryostat insertion fixture
- Various wrapping machines (beam tubes, bus, etc.)

History / Experience:

(NbTi) CBA



SSC



RHIC



LHC



(Nb₃Sn) LARP?

Engineer / Build Capabilities

Cos θ Magnet Equipment (examples)



Winding machines, curing / collaring presses



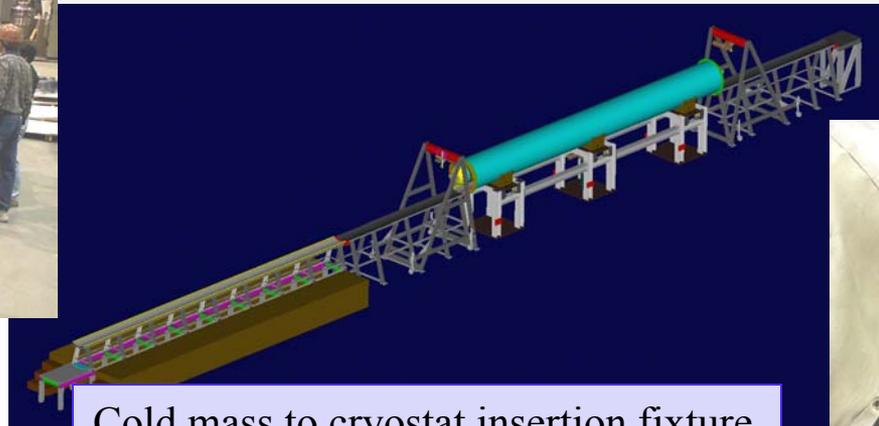
10M curing / collaring press



17M collaring press



Yoke assembly fixture



Cold mass to cryostat insertion fixture



Shell welding fixture

Engineer / Build Capabilities

Equipment :

- 2M winding machine
- 3M winding machine
- 1M oven
- 3M oven
- 2M Coil tension wrapper
- 3M Coil tension wrapper

Direct Wind Magnets

History / Experience:

DESY



Bio-Med



KEK / JPARC



BEPC-II



ALPHA



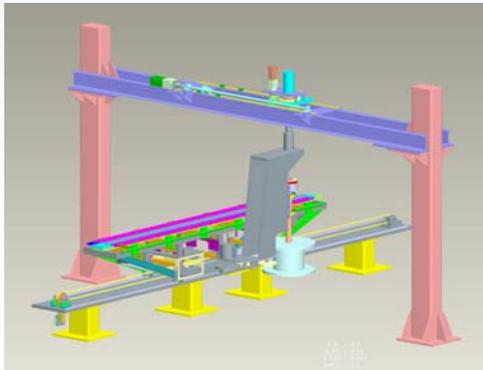
ILC



Engineer / Build Capabilities

Equipment:

- 0.25M R&D Winder
- 4M+ Universal Winder
- Task-specific impregnation tooling
- 1M vacuum reacting furnace
- 4M argon reacting furnace (soon)



Racetrack Magnets



History / Experience:

Common Coil (Nb_3Sn , R&W)



RIA



LARP (Nb_3Sn , W&R)



Summary & A Look Ahead

- Solid, highly integrated / skilled staff
- Decades (centuries?) of relevant sc magnet experience
- Uniquely outfitted facility
- For future work, need add'l resources for efficiency, volume
- For future "Work For Others" (WFO), need help in being cost competitive