



# Accelerator Division for Users

Robyn Madrak

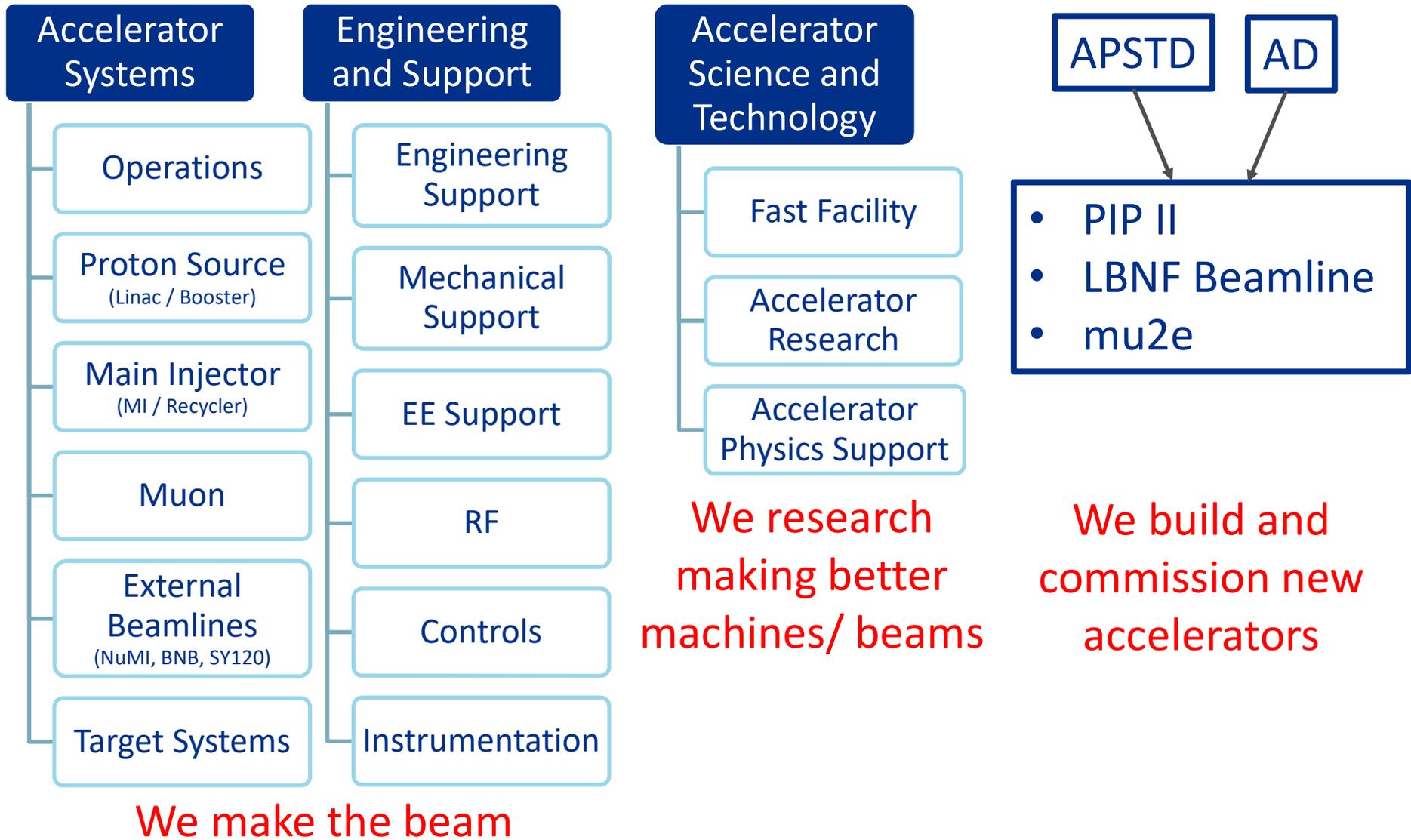
Users Meeting

12-13 June 2019

# What Do We Do (in accelerators)?

- “It All”
  - Jim Budlong, engineering physicist, Muon Dpt.
- “Whatever It Takes”
  - Dave Pushka, engineer, Target Systems Dpt.
- “We put the A in FNAL”
  - Tom Kobilarcik, engineering physicist, External Beamlines Dpt.

# Accelerator Division Organization

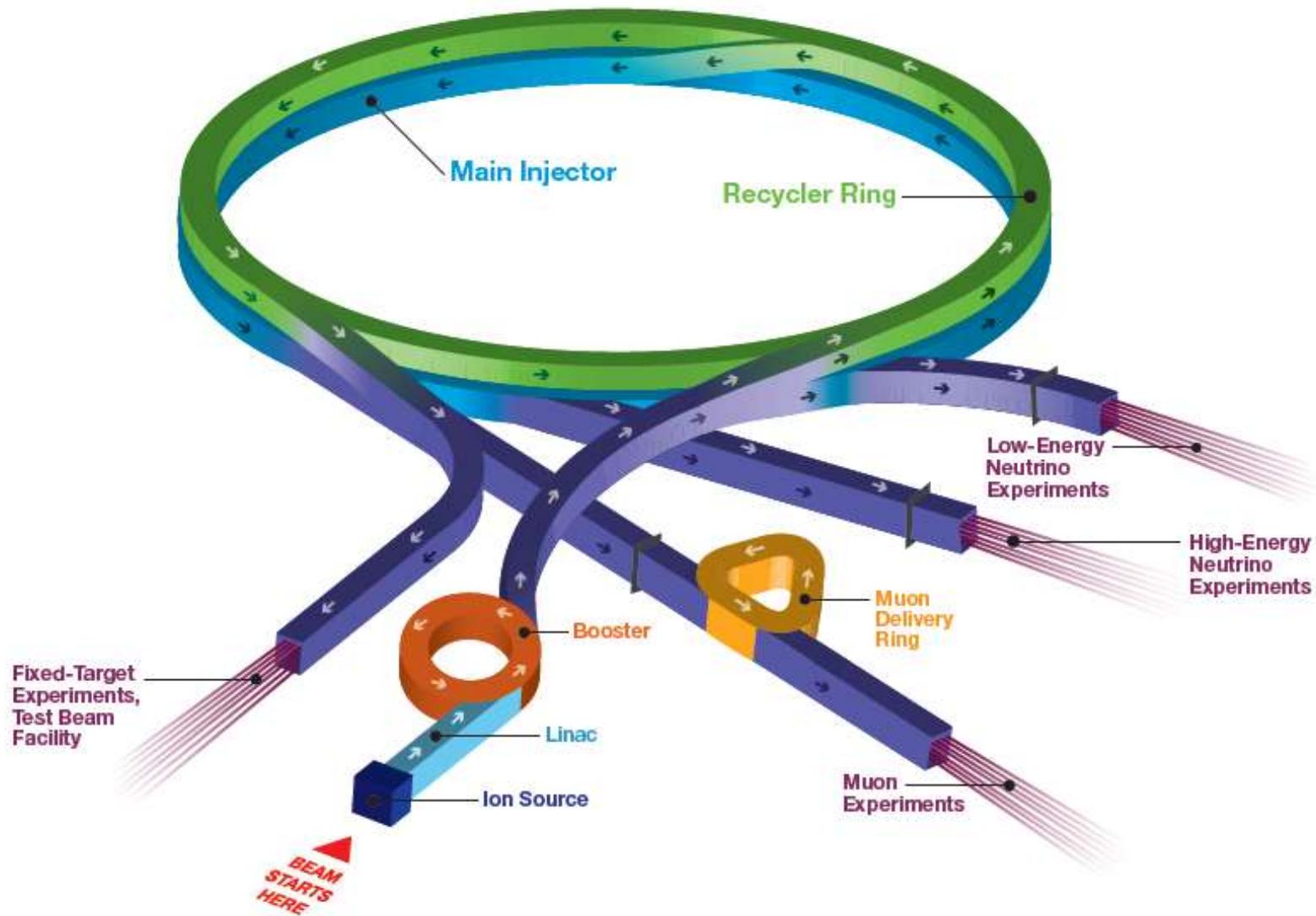




## Facts about AD

- Safety first!
- ~ 375 employees
  - 64 physicists
  - 75 engineers
  - 109 technicians
  - 28 operators/operations specialists
  - 31 engineering physicists (mostly former operators)
  - plus drafters, computing, building mgt, admin, finance...
- Main accelerator complex
  - 4 rings
  - ~10 km beamlines
  - 3 target stations
- FAST sc linac and IOTA ring for accelerator R&D

# The Rings and Beamlines



# "Your community, your science. It's about everyone that makes it happen,"



Gilberto Perez, operator



Daren Plant, technician



Carol Johnstone, scientist



Kris Anderson, engineer



# The discussions

- What is your job? What do you do?
- Who do you interact with?
- When did you start at the lab and how have things changed since then?
- What is your favorite part of the job?
- What about AD are you most proud of?
- What would you like experimenters to know about AD?

# Operations: the heart of AD

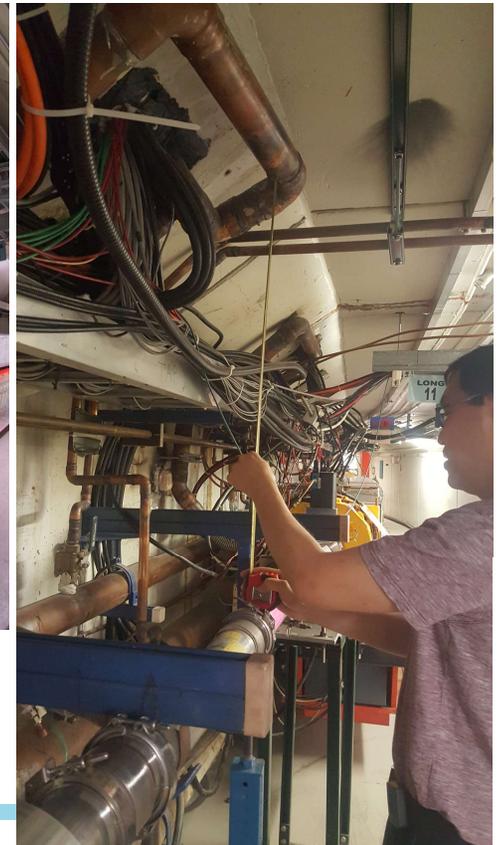
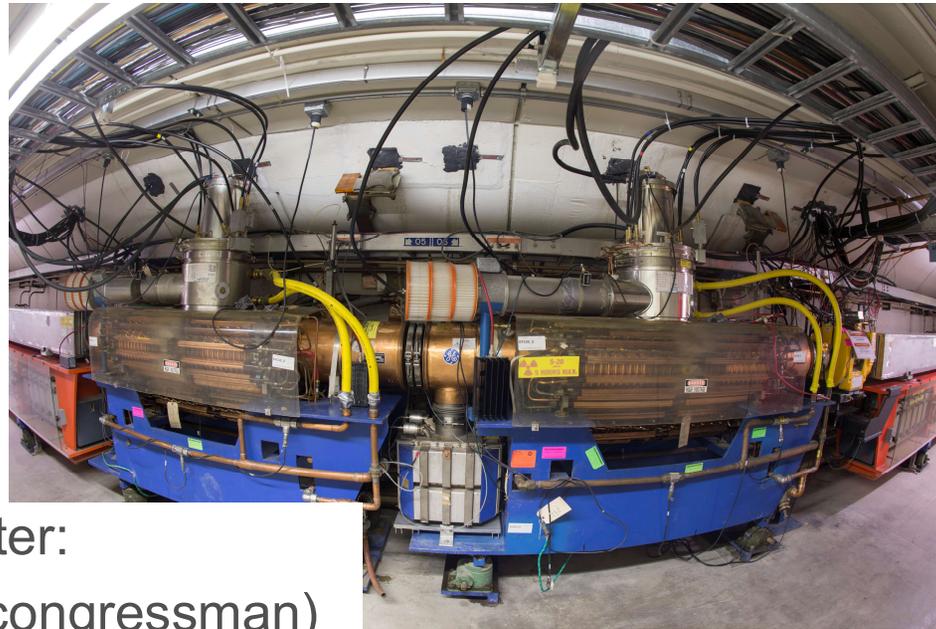
- Tuning the beam to get the highest intensity
- Coordinating with machine experts when there are problems, or on startup
- Training oneself, Training new operators! -> experts that can work in other positions at the lab
- Making judgement calls...not always easy: huge number of parameters, 100k's of monitors, don't always have all the information you want



# Booster: The Little Synchrotron That Could



... a testament  
to how  
resourceful  
our staff can be

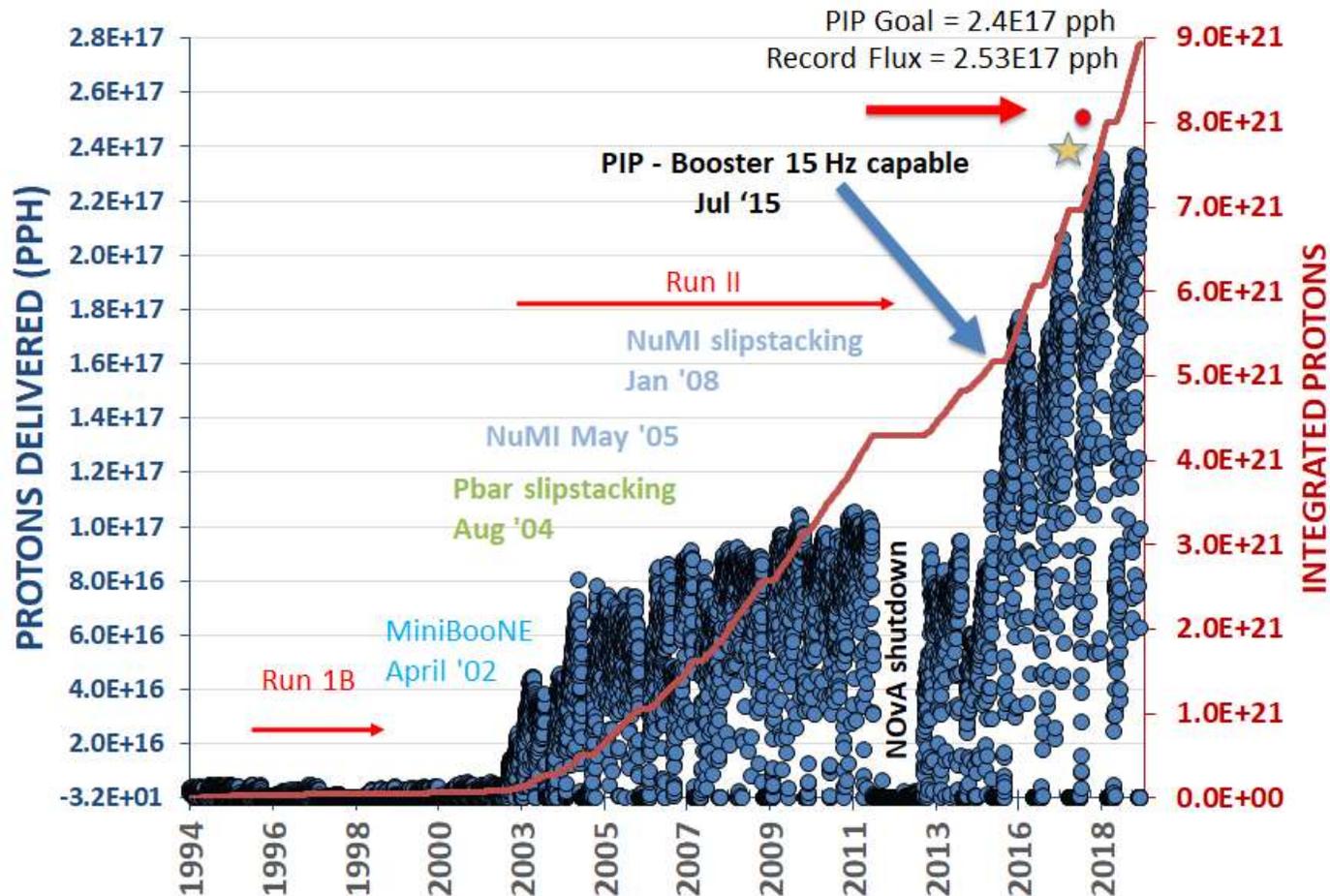


Bill Foster:

( FNAL physicist, congressman)  
Car mechanic ↔ Old VW Beetle  
Accelerator Physicist ↔ Booster

# Booster Throughput

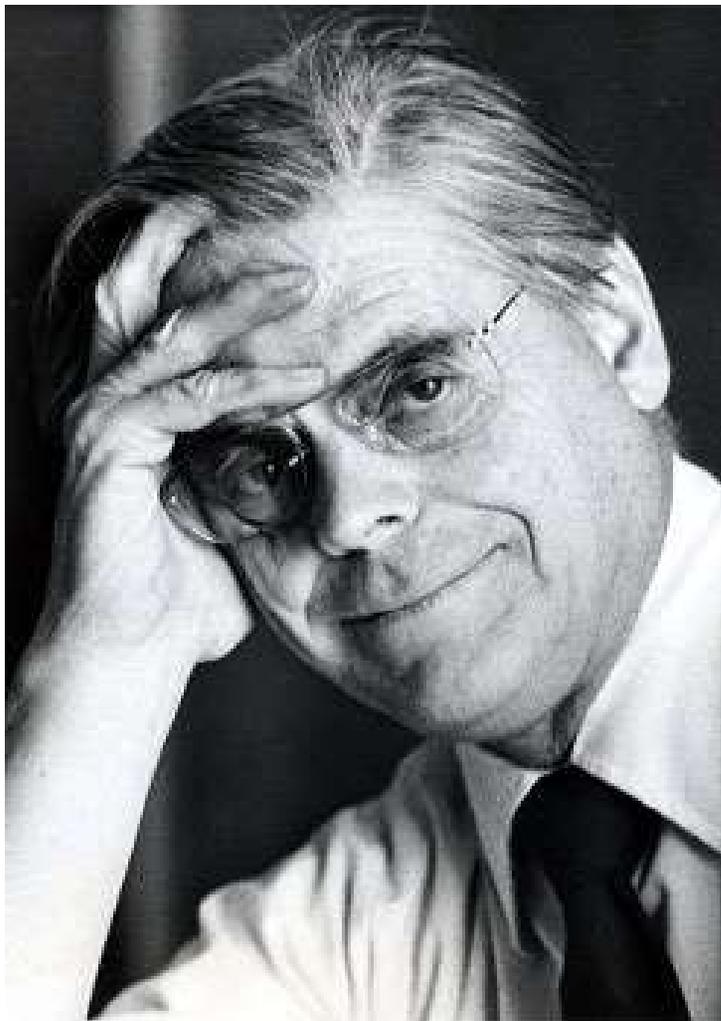
- The 'old school' people that designed it were really thinking!



## The Old School Scientist...(these people built the lab!)



- Carol came here when things were wild!
- Optics design for accelerators
- You could just build a Cerenkov counter and not worry about the cost
  - “Carol, what did you do???”
  - But you had to crawl through 100 ft long, 18” diameter sewer pipes to clean the mirror!
- Not all things about the old days were great though



 Fermilab

Fermi National Accelerator Laboratory  
P. O. Box 500 Batavia, Illinois 60510

Directors Office

May 5

Dear colleague,  
An all too common  
failing of large institutions  
is to fall into the  
bureaucratic morass —  
complicated procedures, red-tape,  
and all that. That's terrible.

Let's try hard to keep the  
good old can-do informal  
spirit of Fermilab alive!  
I ask each of you to be  
intolerant of creeping bureaucracy

Bob Wilson

 Fermilab



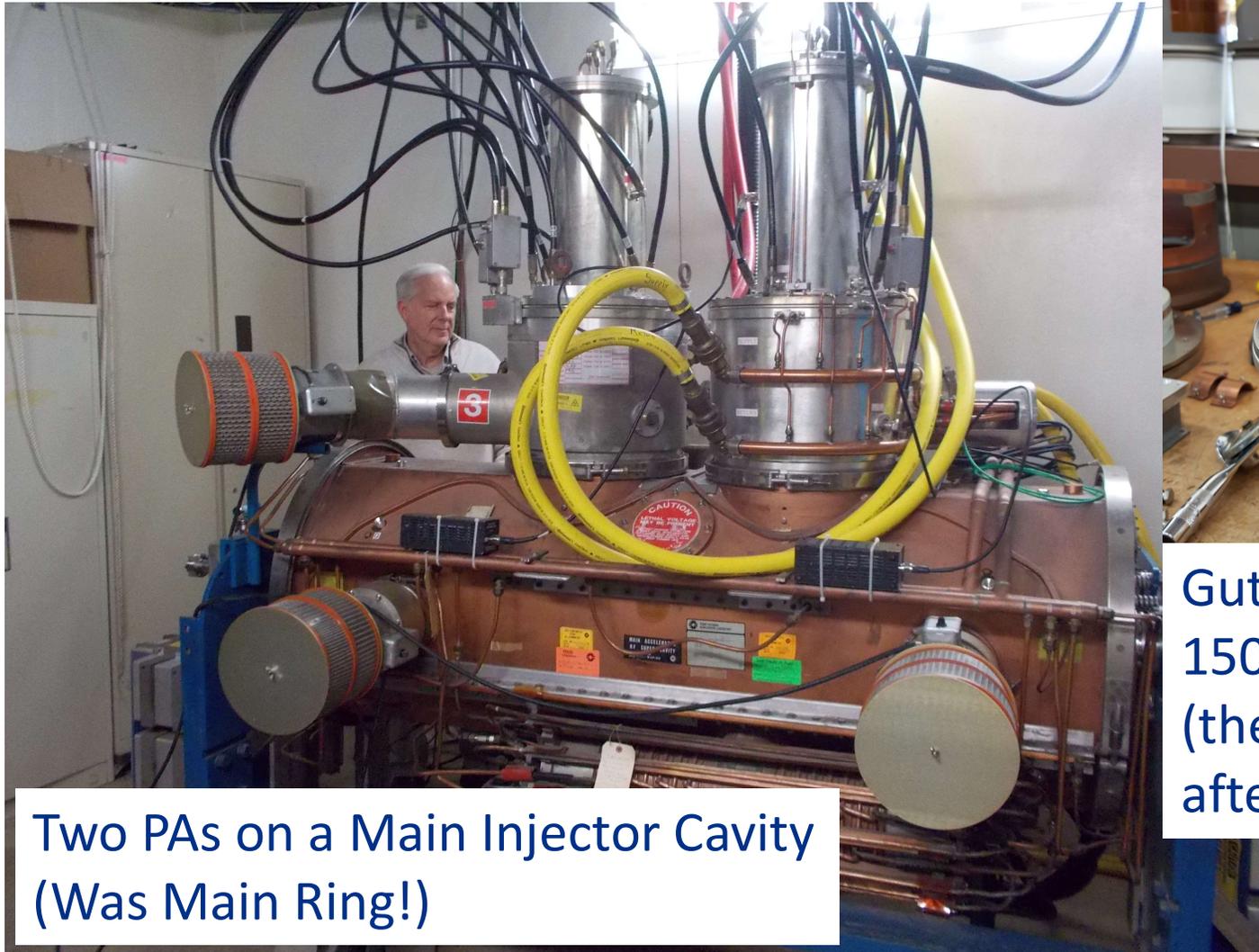
# Daren Plant: RF Power Amplifiers



Tech Spec  
Here since '99

- To ensure reliable, safe and proper operation of PAs *and associated equipment*
- RF Amplifiers power the cavities that accelerate the beam; range from 1 kw to 3 MW! (and your  $\mu$ wave oven)
- Learned to love science/tech at an early age
- Forklifts – scopes – soldering irons –fixing things
- Multiple projects – challenging to prioritize time and resources
- You might not see him a lot, but he is putting out fires! late night call ins, water leaks, smoke filled galleries and thunderstorms.

# PAs

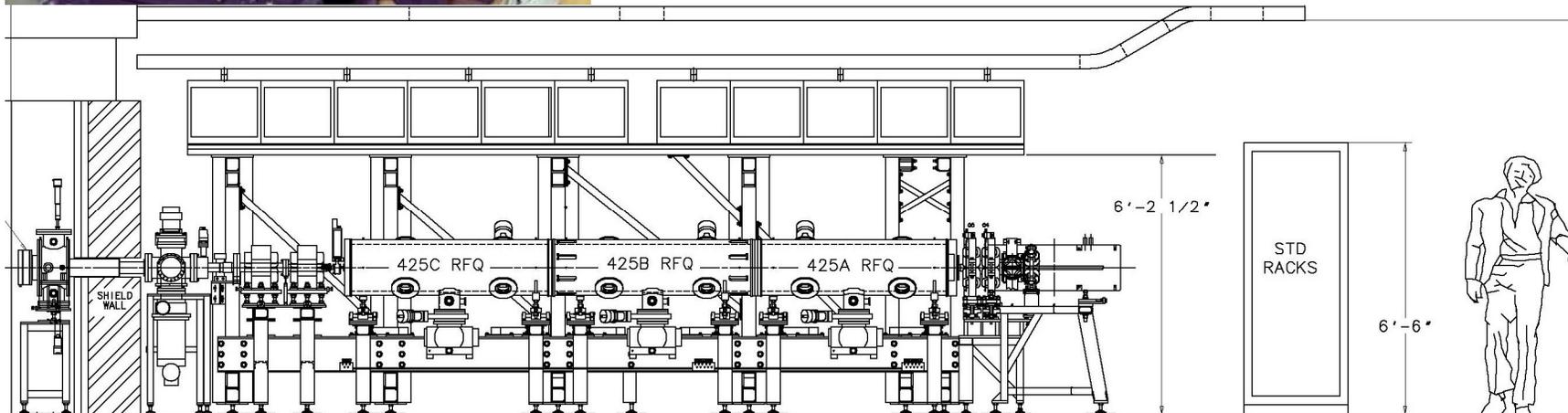


Guts of the PAs  
150 kW tetrode  
(these get replaced  
after lifetime)

# Nissan 240 SX Fuel Injectors for Linacs..



- Kris Anderson: Targets since 1989
- Target research – thermal shockwaves; research at DOD blast facility at ANL
- PET accelerator for radiochemistry – supersonic gas jets!



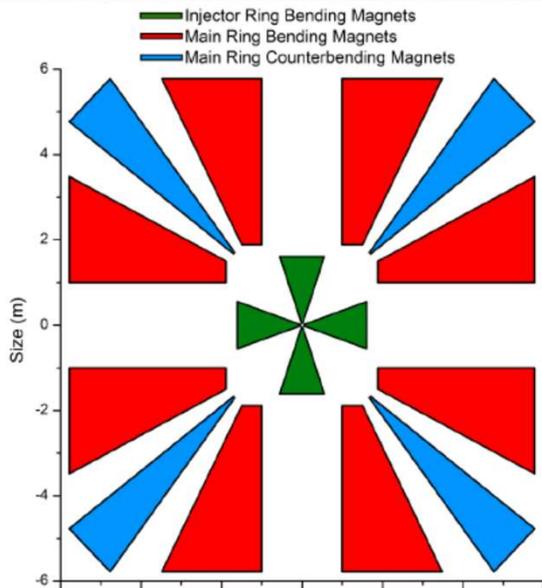
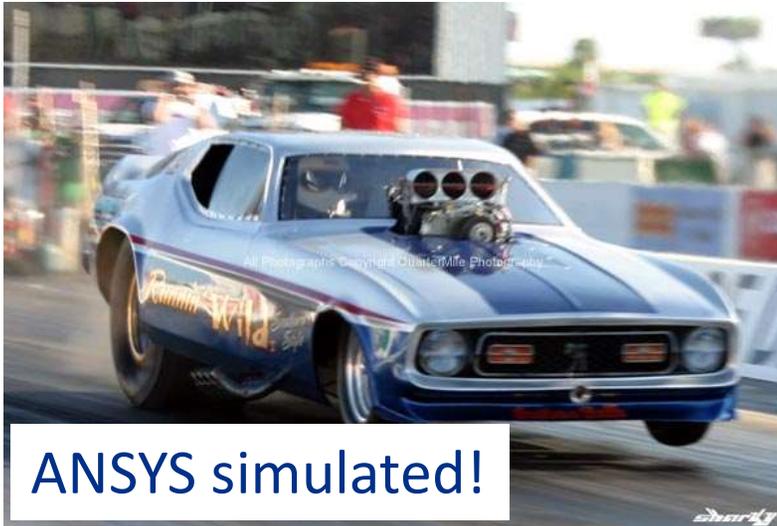
# From Racecars to Neutrinos and back

- Class I aerospace quality TIG welds for horns; straightening
- Lots of hands on work (hammer forming cooling tubing for beam absorbers)
- Fuel injectors, TIG welding, body work



Beam Absorber Inner

# Fast Hobbies

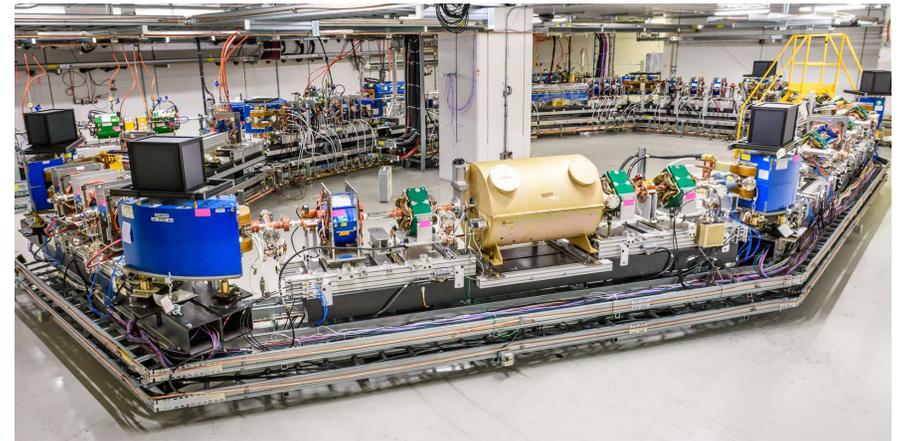


## Fixed Field Alternating Gradient Accelerators



# What about FAST / IOTA?

- Fermilab Accelerator Science and Technology (FAST) facility
- Integrable Optics Test Accelerator (IOTA) ring
- Building the next accelerator to support future experiments requires R&D in accelerator technology today
- Accelerator experts from around the world come to do experiments here
- IOTA will explore options for PIP-III (replacing the Booster) needed for 2 MW to LBNF/DUNE
- See talk in Session IV this afternoon

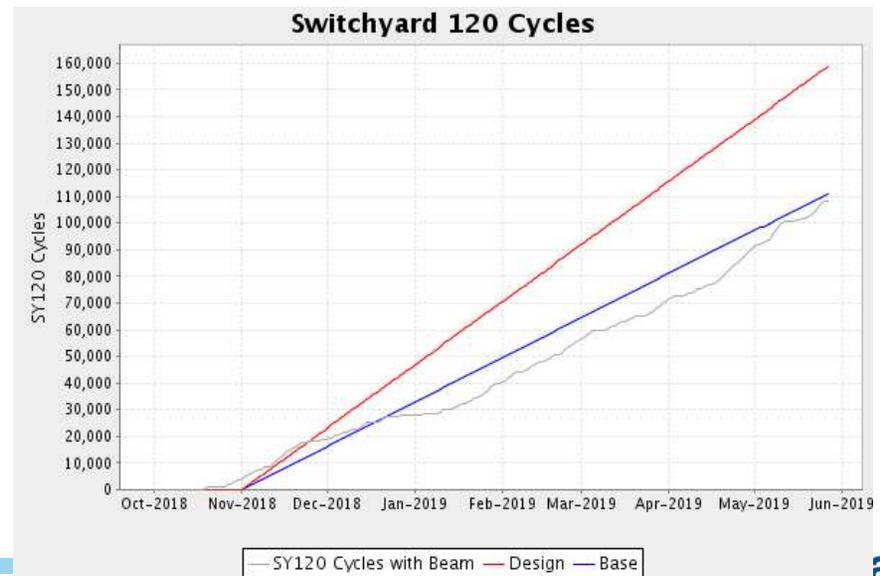
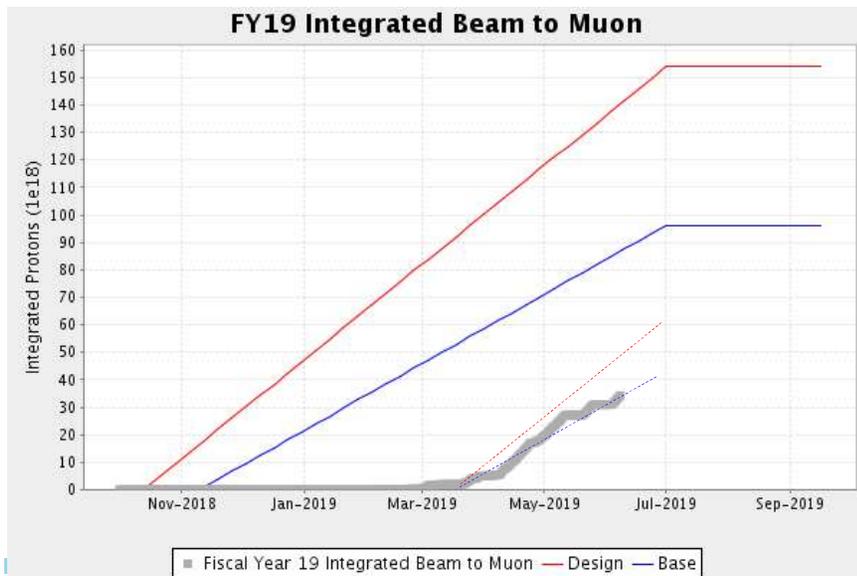
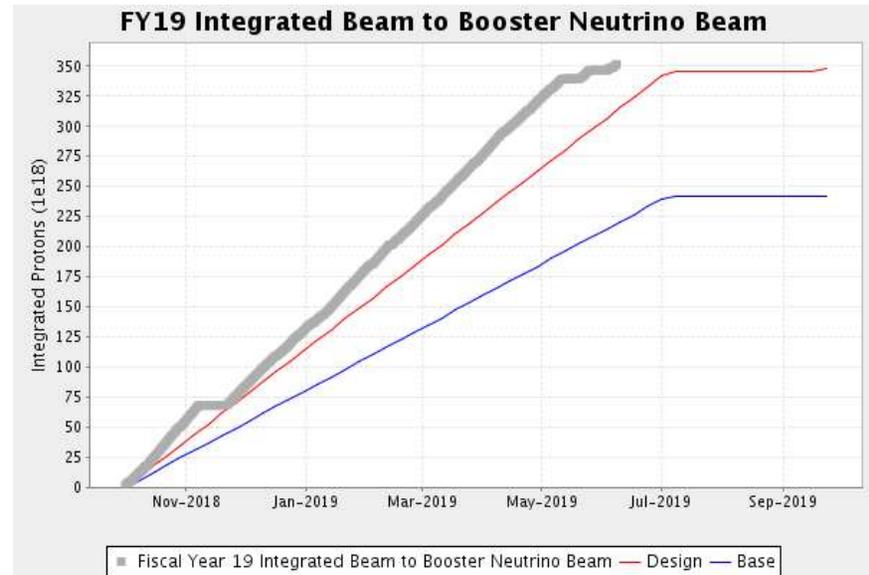
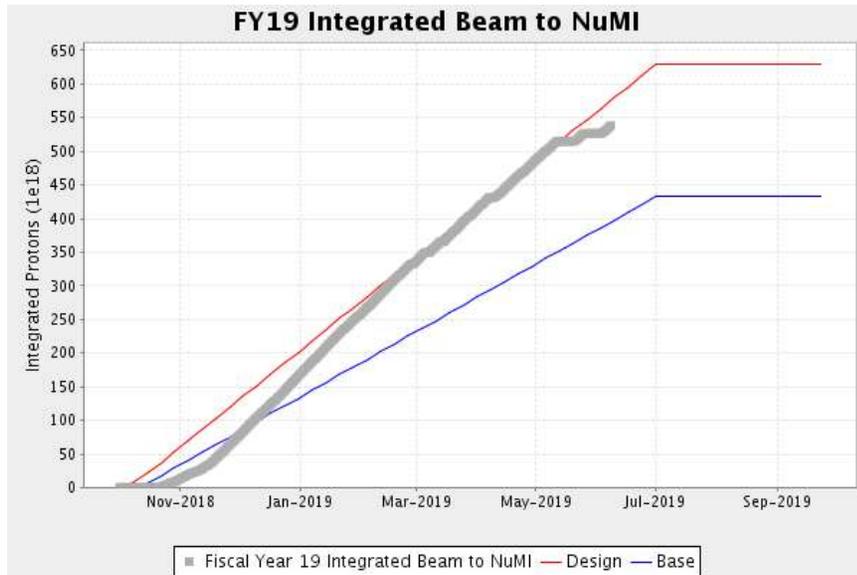


## Our Future: PIP-II and LBNF!

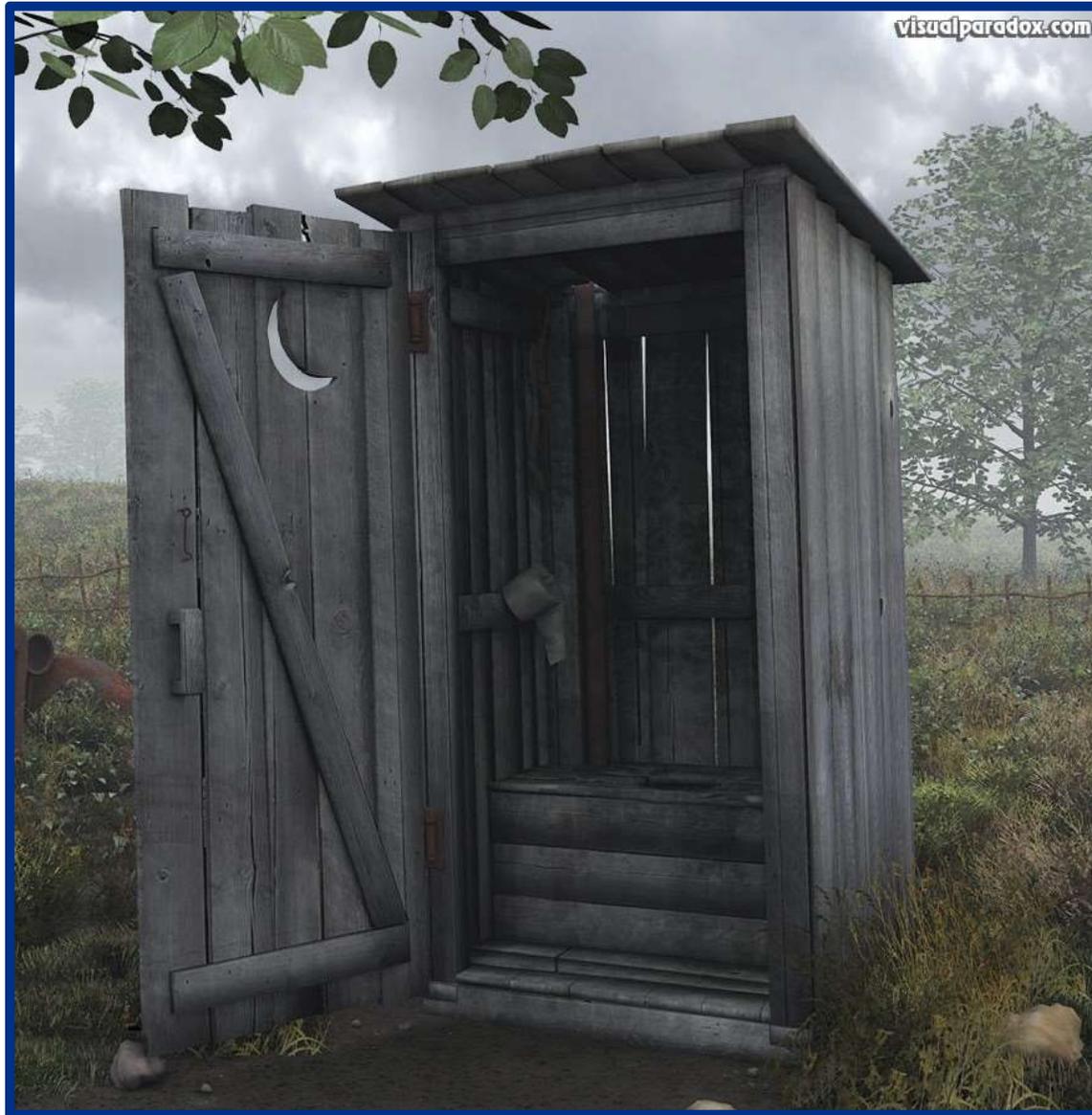
- The existing Linac has never run better, but it's at capacity
  - Can't do the multi MW beams that will be needed
- It is always exciting to commission new accelerators and to deliver beam to new experiments!
- PIP-II talk in Session IV this afternoon
- DUNE in session VIII tomorrow



# Accelerator performance this year

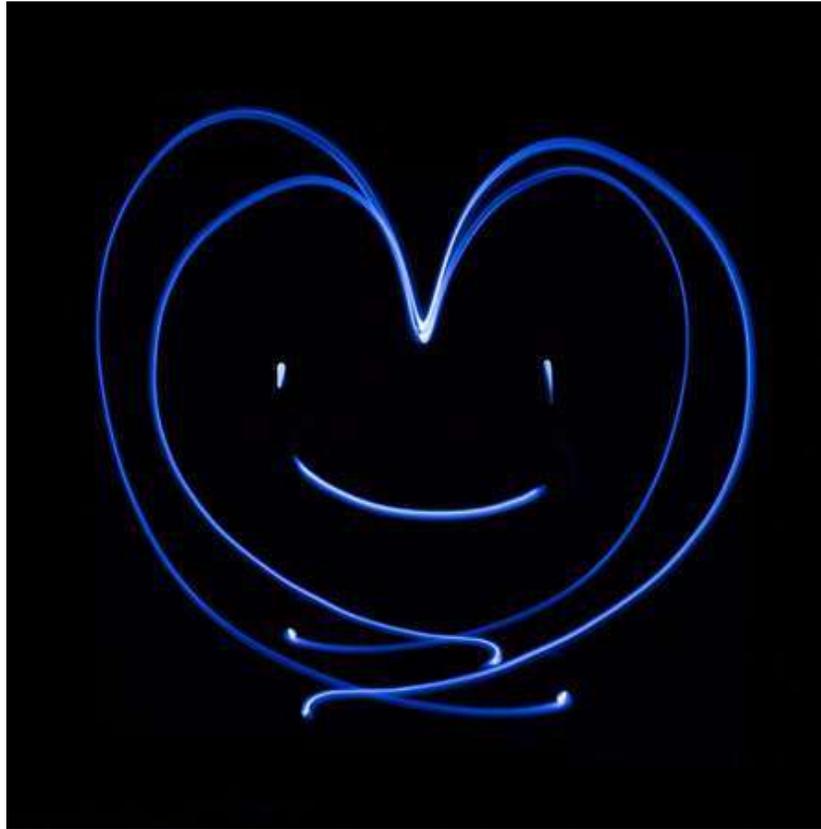


## We also provide you with...



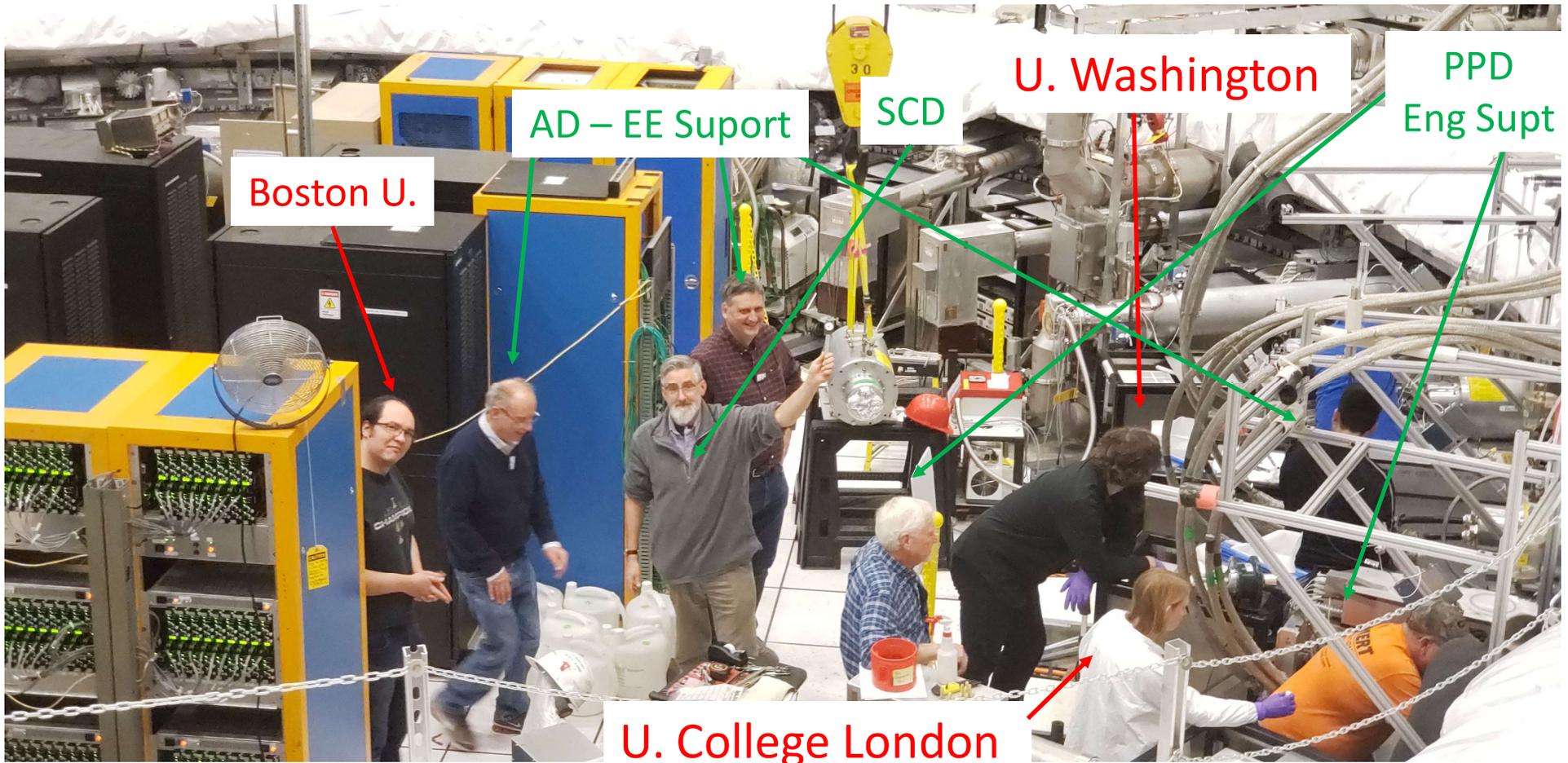
...this





*Without You,  
We'd have no reason to make Beam*

# One Lab!



Working on the g-2 Kickers; Photographer: AD RF Dept.

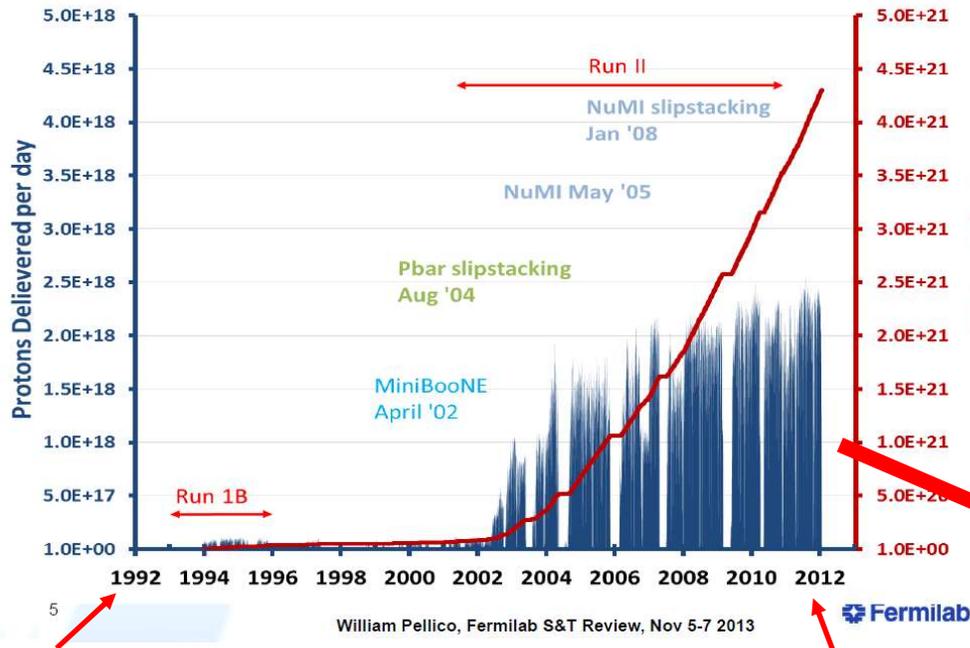
Thank you!



# Booster Throughput

- The 'old school' people that designed it were really thinking!

Historical beam throughput in Proton Source



1992

2012

Dave Capista remembers it was Only ~60% efficient in '84!

