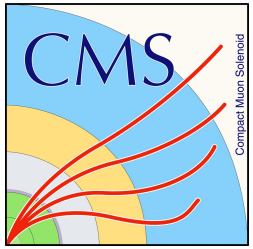


Fermilab

Fermilab test beam and irradiation facilities

Grace Cummings

DRD6 Collaboration Meeting, 10 April 2024

Who am I? Or, why am I giving this talk?

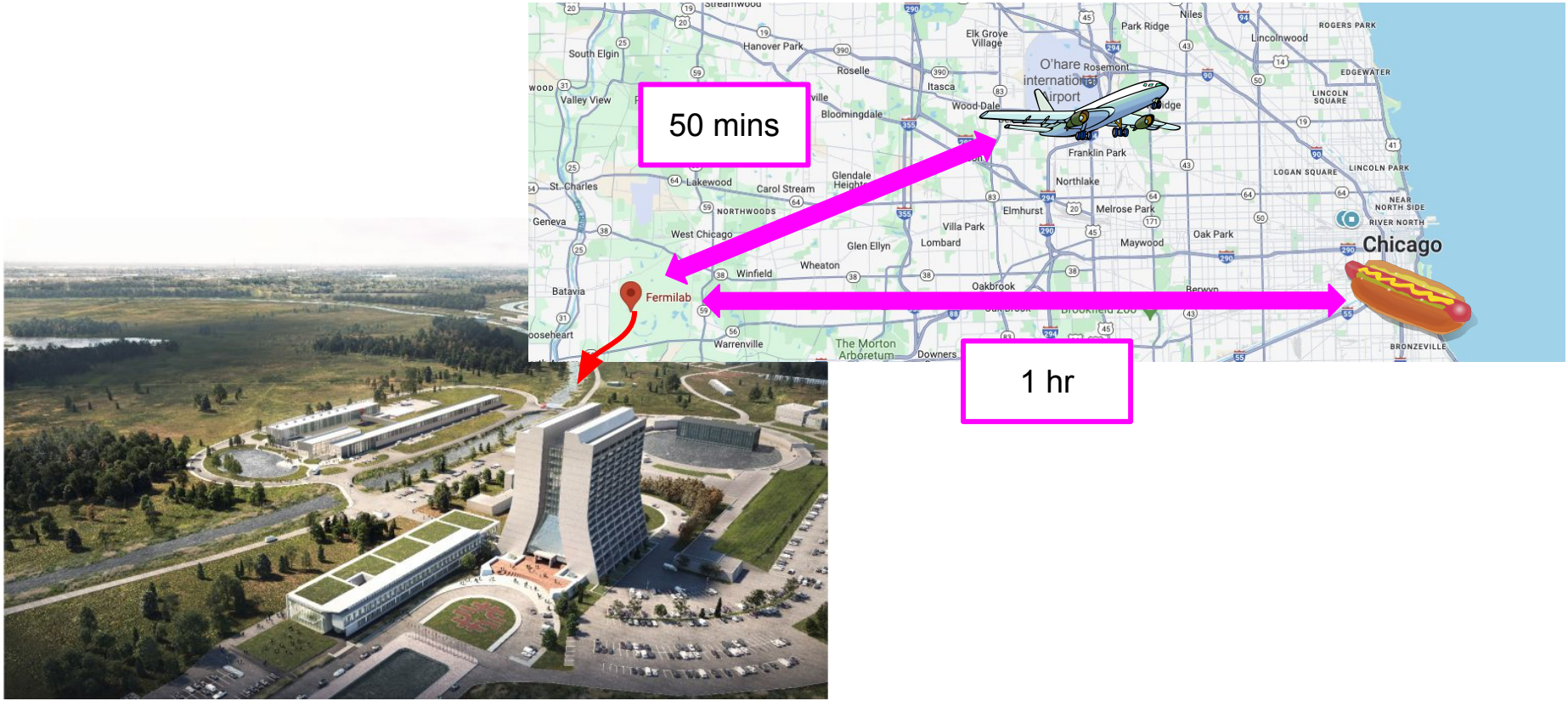
- I am a Fermilab Test Beam user!
  - 2 in 2017-18, and 2 last year
  - Not a super user -- but learning
  - 2 different enclosures, 2 different experiences!
- The technical information in the slides
  - rom a talk by Joe Pastika (Deputy Fermilab Test Beam Facility Manager)
  - **All errors are mine**
- Really enjoy the facility - have had immense help from the coordinators

My first Fermilab test beam in 2017

MT6.1 w/ CMS ETL

MT6.2 (secondary user)

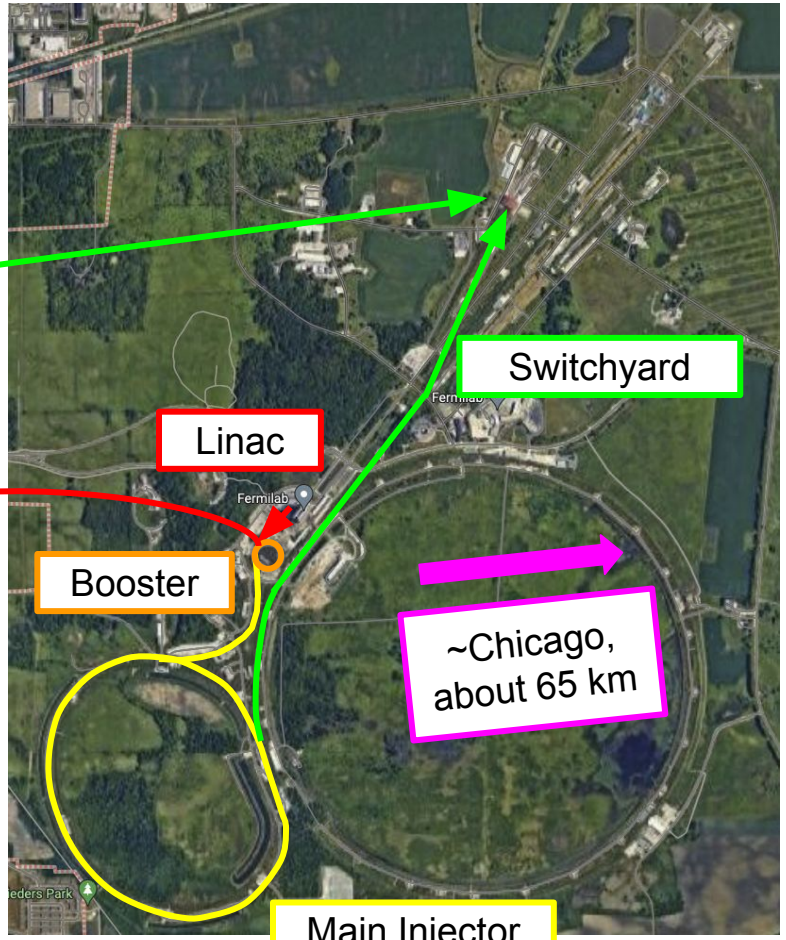
Fermi National Accelerator Laboratory (USA)



The test facilities

Fermilab Test Beam Facility (FTBF)

Irradiation Test Facility (ITA)

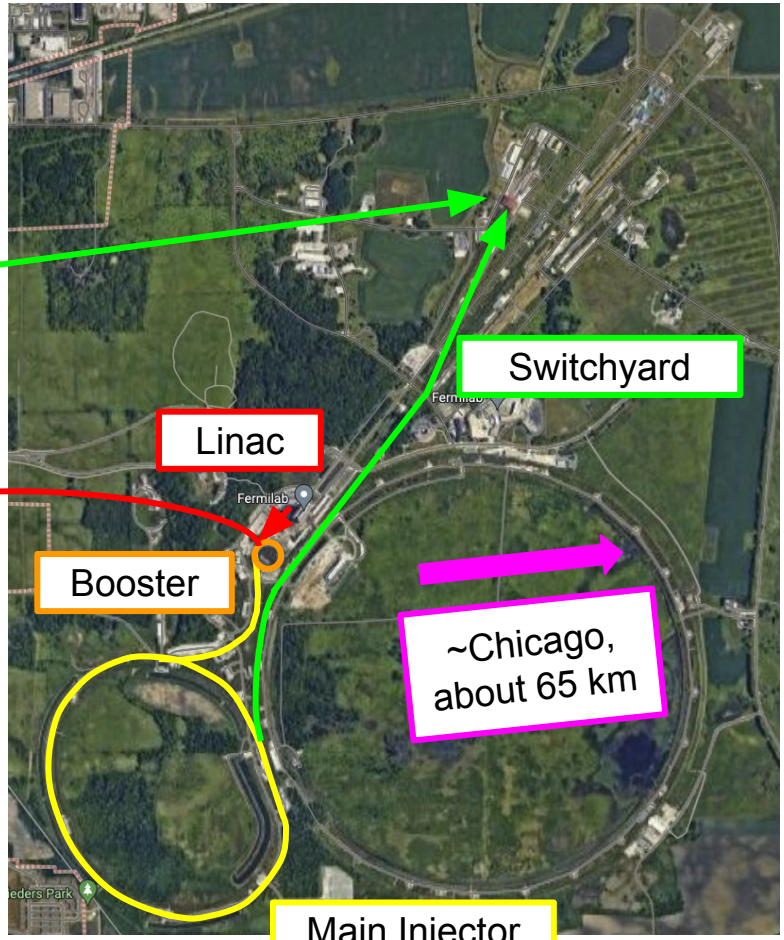


The test facilities

Fermilab Test Beam Facility (FTBF)

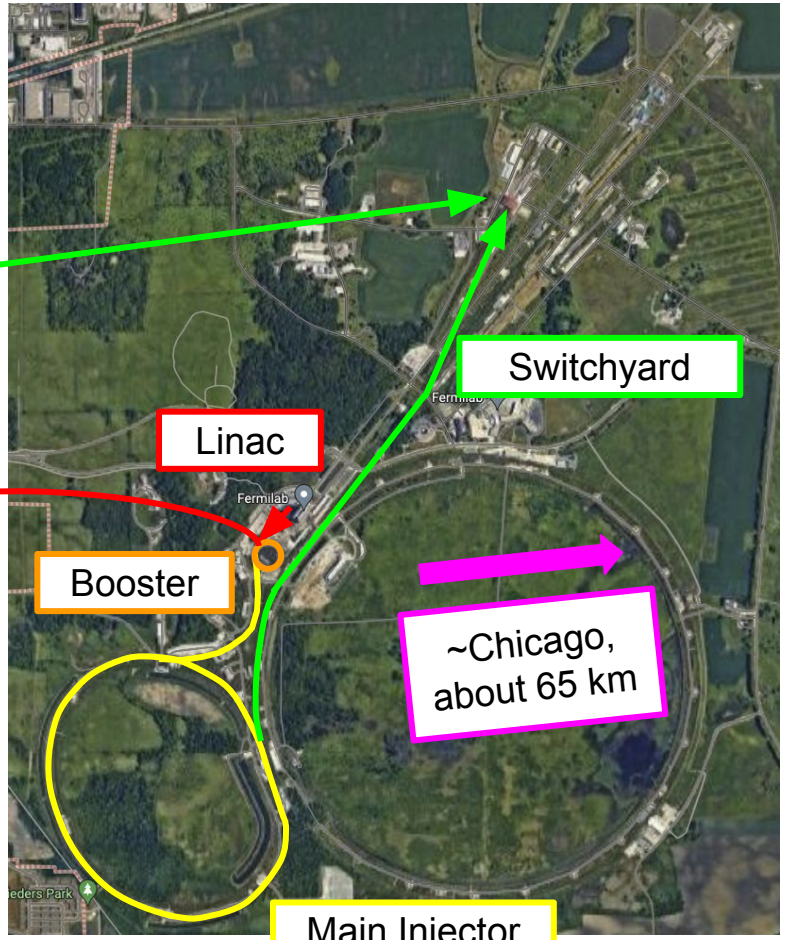
2 Beam lines (MTest and MCenter) take protons off of the main injector (120 GeV)

Irradiation Test Facility (ITA)



The test facilities

Fermilab Test Beam Facility (FTBF)



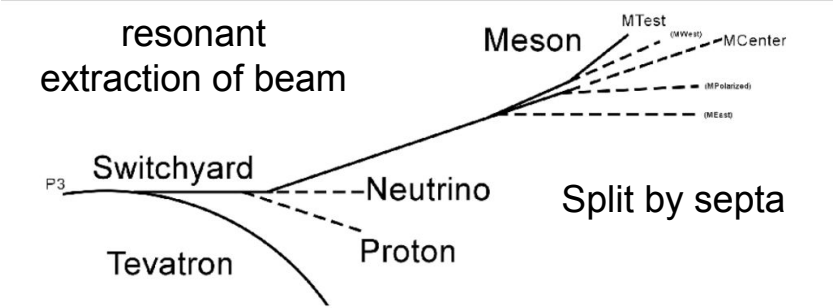
400 MeV protons at high rate ~2.2E15 protons/hr -- straight off the linac

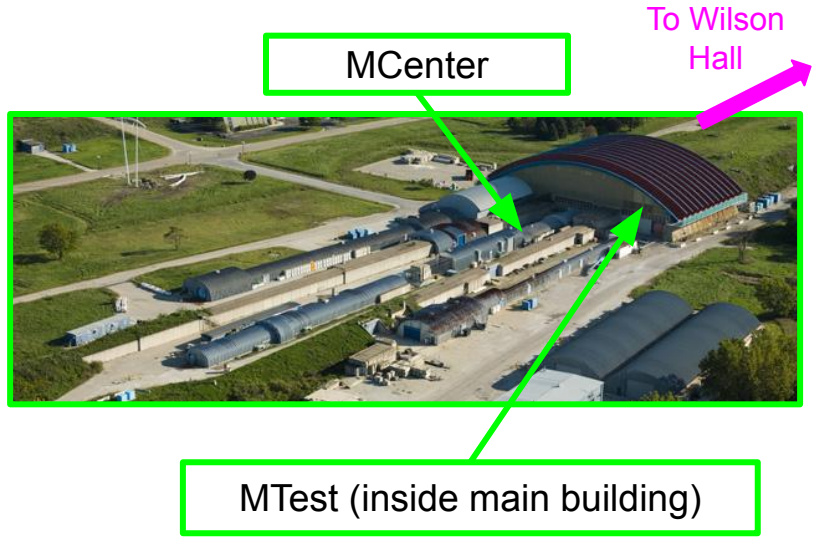
Not going to talk about in the interest of time!

Irradiation Test Facility (ITA)

FTBF Beam

- 4 s spills every 1 minute
  - ~October to June each year
  - variable rate
    - requested by primary user
  - ~1000 to 900,000 particles per spill
- MTest
  - 120 GeV protons
  - 1-66 GeV secondary beam
  - **1-4 week runs (the true “test” beam)**
- MCenter
  - Secondary Beam
  - 2 tertiary beams down to 200 MeV
  - longer term users/experiments

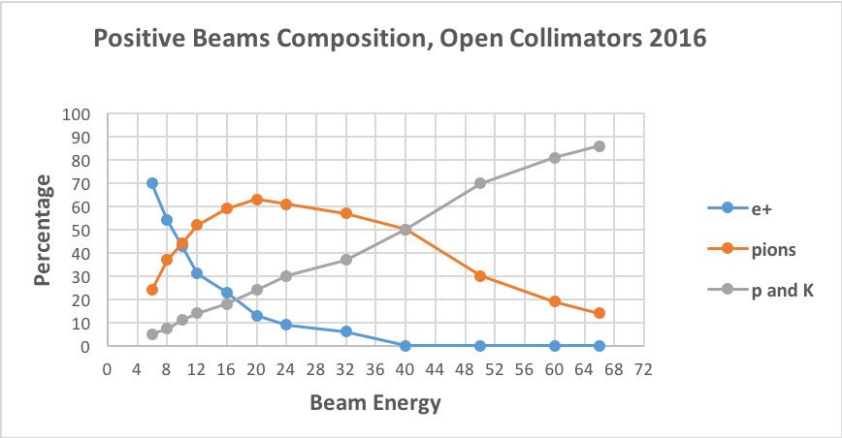


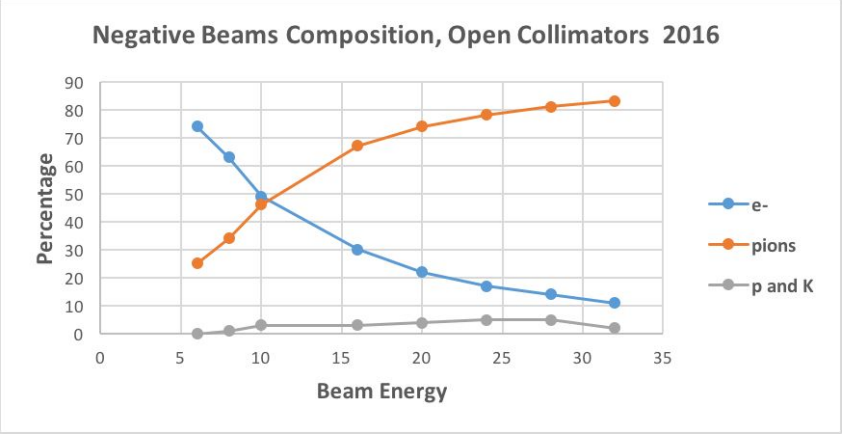


FTBF - MTest Beam Options [Link]

- 120 GeV Protons
- 8 - 60 GeV Pions
- 1-32 GeV Pions, electrons, Kaons, or broadband muons

Secondary Beam Compositions

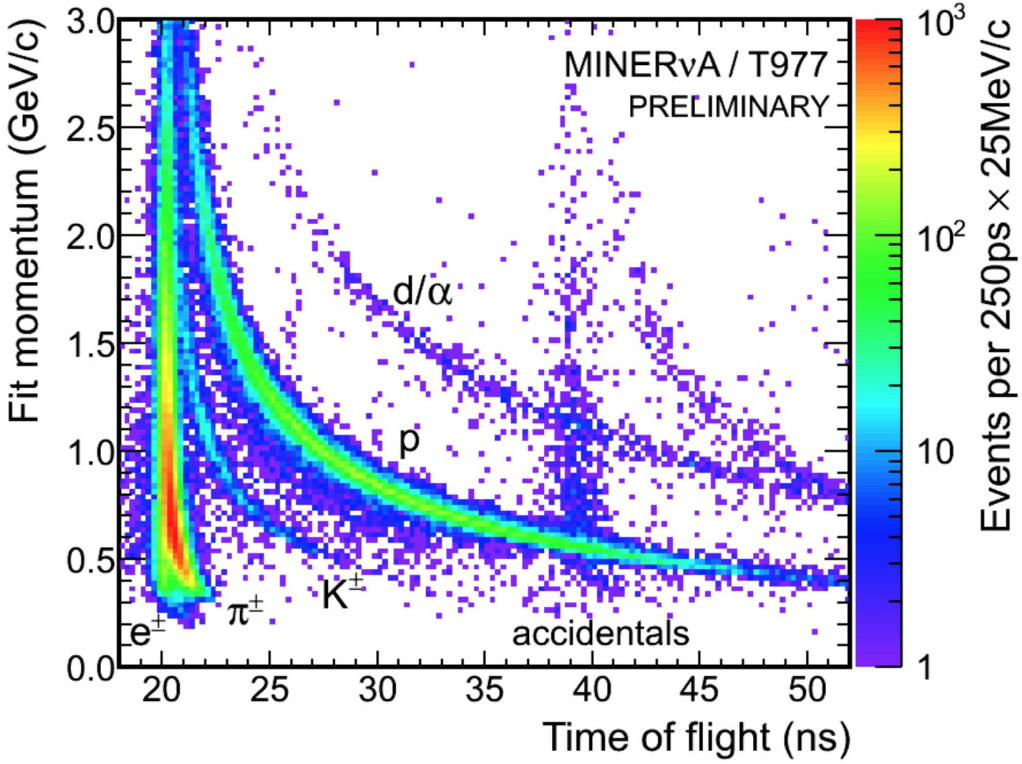




FTBF - MCenter Beam Options [Link]

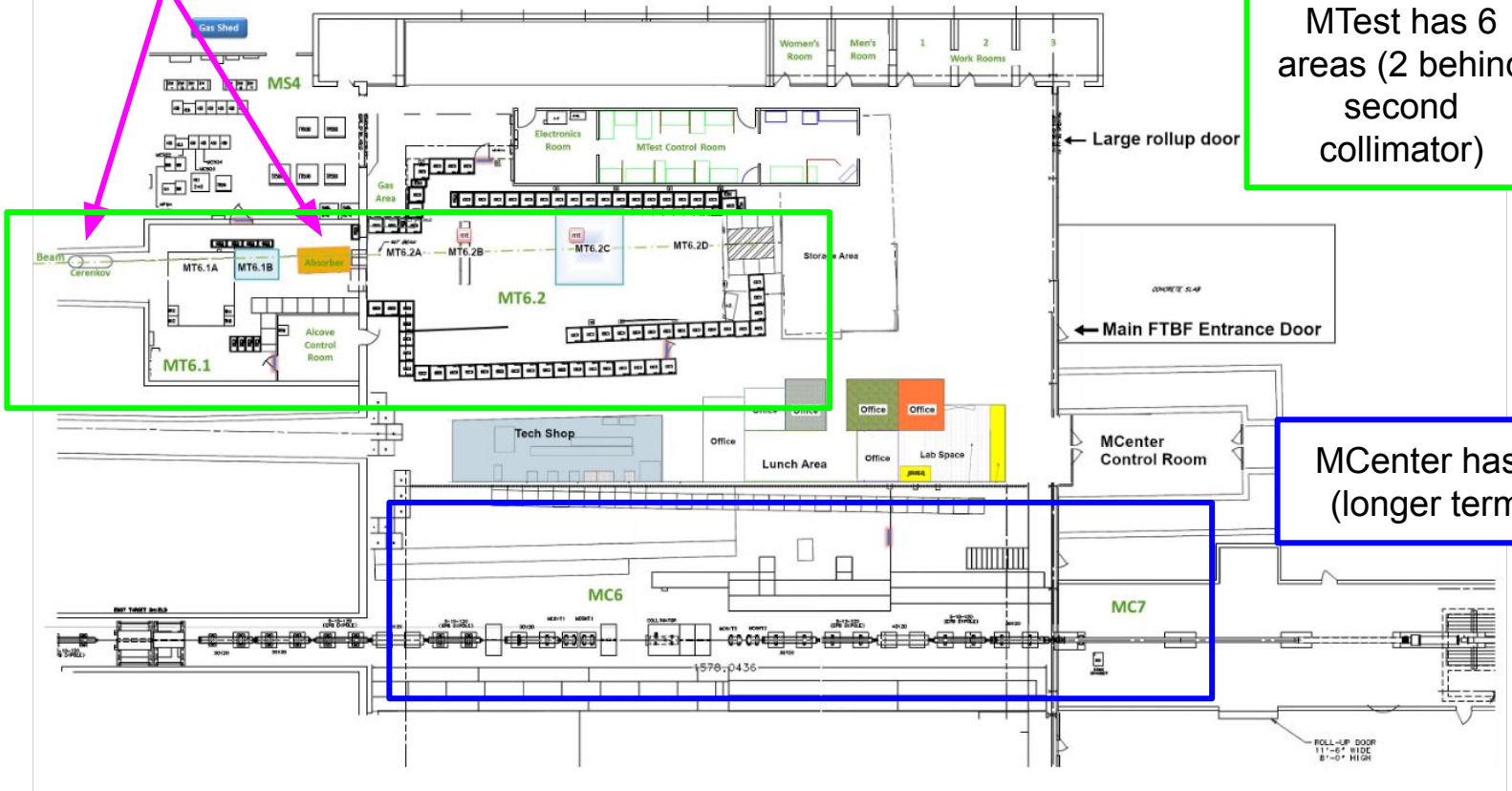
- Tertiary Beam
- 200 MeV - 1 GeV

Since MCenter is for longer-term experiments, I will not cover any more in this talk!



FTBF Layout

Collimators for secondary beams

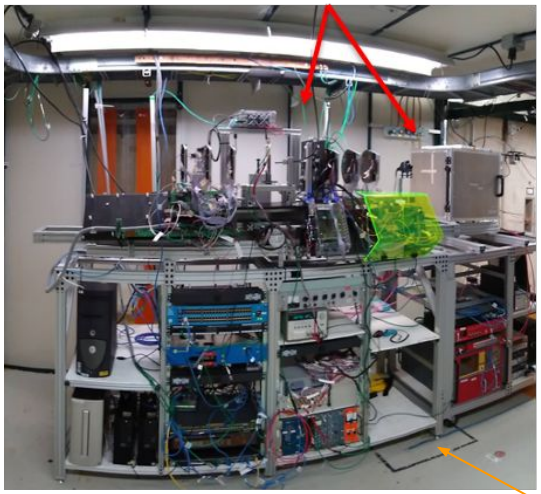


MTest has 6 areas (2 behind second collimator)

MCenter has 2 (longer term)

MTest Beam Enclosures (and some users) [Link]

Patch Panels, Inert + Flammable* gases, camera for viewing, laser alignment



MT6.1

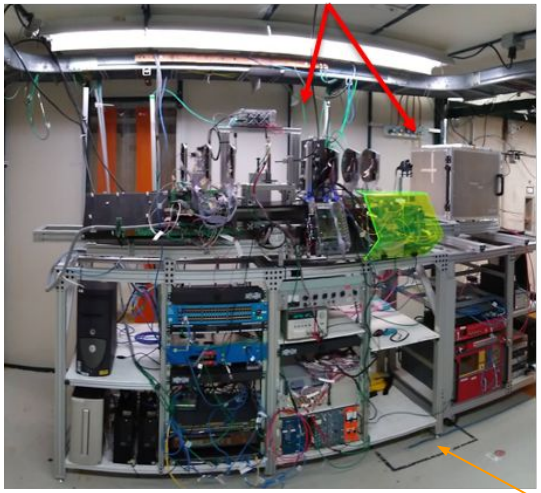
MT6.2

*No flammable gases in

Slide taken directly from Joe Pastika

MTest Beam Enclosures (and some users) [Link]

Patch Panels, Inert + Flammable* gases, camera for viewing, laser alignment



MT6.1

MT6.2

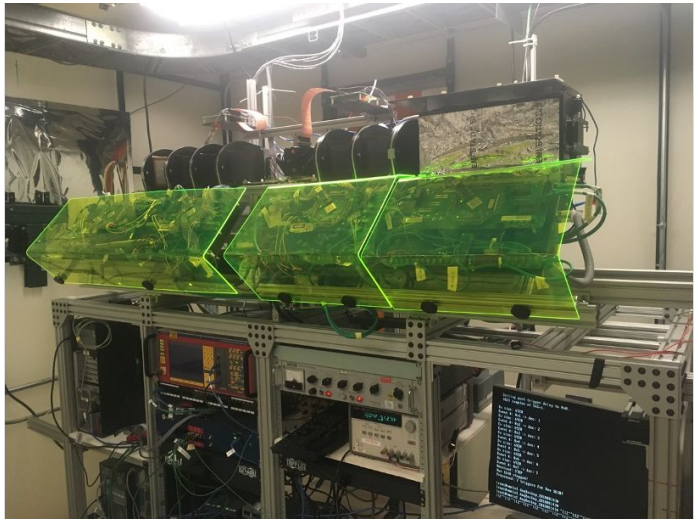
MT6.2D designed for multi-tonne + calorimeters (crane access)

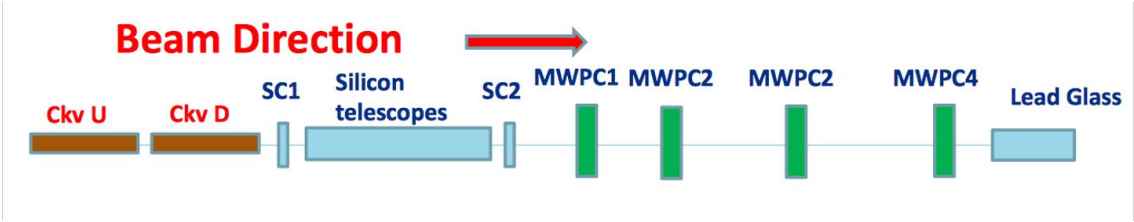
*No flammable gases in

Slide taken directly from Joe Pastika

MTest Instrumentation - Tracking

- Silicon Telescope
  - 5 um resolution for DUT
  - pixels and strips
  - 3.8 x 3.8 cm coverage from strips
  - MT6.1 only
  - based on OTSDAQ
- MWPC Tracking in MT6.2
  - transitioning to CERN GEM detector with SRS DAQ
  - 4 stations





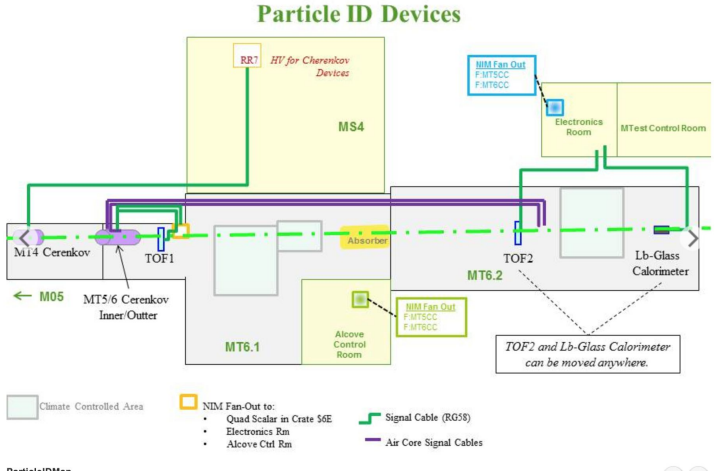
Lots of support with integrating these devices!

MTest Instrumentation - PID

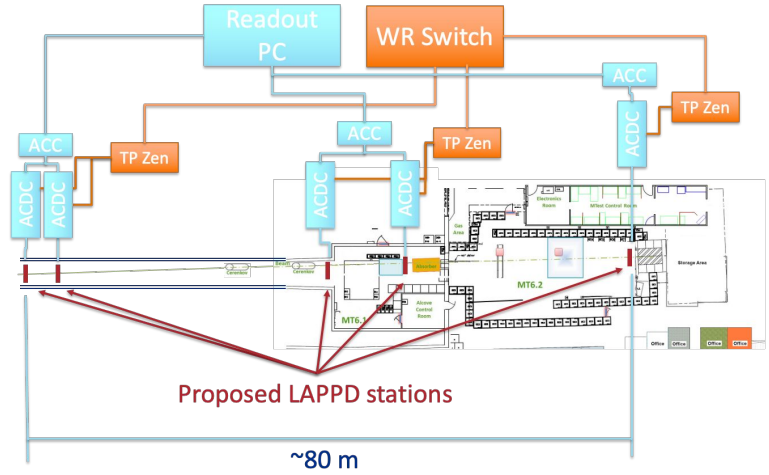
- Current
  - Cherenkov Detectors
    - limited to theshold counting
  - TOF System
    - Hard to use
- Being commissioned
  - LAPPD + White Rabit TOF
  - See Joe's CPAD Talk

Not covered (but present - trigger!)

Current Setup



Proposed



The proposed future of FTBF/ITA

- PIP-II Linac will provide high intensity 800 MeV protons
  - New location will have less beam-line to maintain
  - New ITA to replace old w/ decommissioning of existing linac
- 4-6 new beamlines
  - 120 GeV protons from Main Injector
  - 8 GeV from the booster
  - Additional, clean secondary beams
- Recommended in [P5 Report]

Logistics (my personal notable selections)

- Planning and Support
  - Technical support available for install and breakdown
  - Support in writing Technical Scope of Work (TSW)
    - summer technical shutdowns a great time work with the team
  - Clearly defined/scheduled safety protocols
    - Radiation worker training available before beam start
    - Operation Readiness Clearance (ORC)
    - Dedicated Radiation Checkouts
- Site Access
  - Single Entry Form → Get a badge for 1 year!
- Lodging
  - Fermilab Village ~ 2 miles away from FTBF
  - Rent a car

Summary

- Fermilab has 2 main beam test facilities
  - FTBF
  - ITA
- FTBF has beam options from 200 MeV to 120 GeV
  - Protons and their secondaries
- Instrumentation
  - Tracking
  - Trigger
  - PID → old and new!
- If you have an idea, they will try to make it happen!
  - Coordinator email: ftbf_co@fnal.gov
    - Mandy Kiburg (Coordinator), Joe Pastika (Deputy), Evan Niner (Deputy)
  - Listserv: test_beam@fnal.gov