

Fermilab Test Beam Facility MCenter/MC7

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Slides from many sources including Aria Soha.

Location

Fermi National Accelerator Laboratory

Meson Detector Building – West



Test Beams

- Switchyard 120 provides beams to SeaQuest, MTest, and now MCenter.
- MTest facility has multiple enclosure areas with well developed infrastructure for test experiments using moderate intensity beam of 120 GeV protons or 1-60 GeV pions (electrons, kaons, muons). Experiments typically run 1-4 weeks at a time. VERY BUSY.
- MCenter beamline is resurrection of beam last used for MIPP which shutdown about 2006. Beam available in MCenter similar to MTest **plus** the addition of tertiary beam previously used by Minerva in Mtest. Particle energies down to 200 MeV. Michael Backfish will talk more about beam.

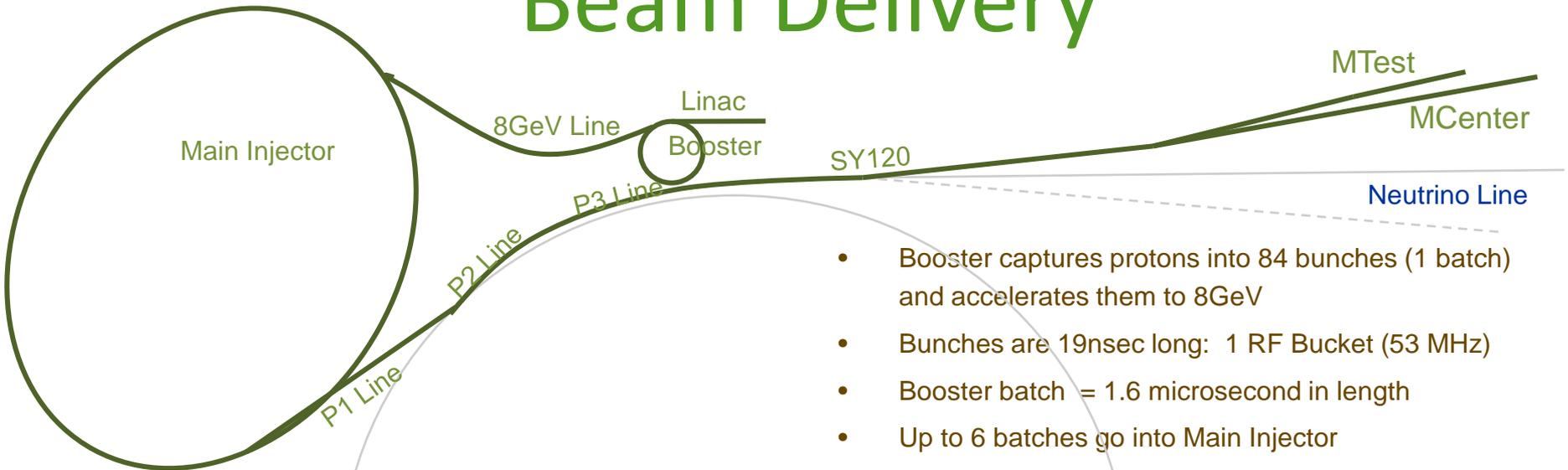
Test Beams (cont'd)

- LArIAT is first customer for MCenter.
- Hope is to develop MCenter for use by other test experiments as well – particularly if MTEST is oversubscribed. Lab management very supportive of the test beam program as a service to community.

Infrastructure

- MCenter Control Room finished except for electrical work for electronics racks. Racks have temporary power.
- Network infrastructure done except for wireless access point in MC7.
- Patch panels for signal and high voltage exist between MC7 and Control Room.
- HVAC systems in good shape.
- AD interlock system up and running.
- Bottom line – most work left now is LArIAT specific.

Beam Delivery



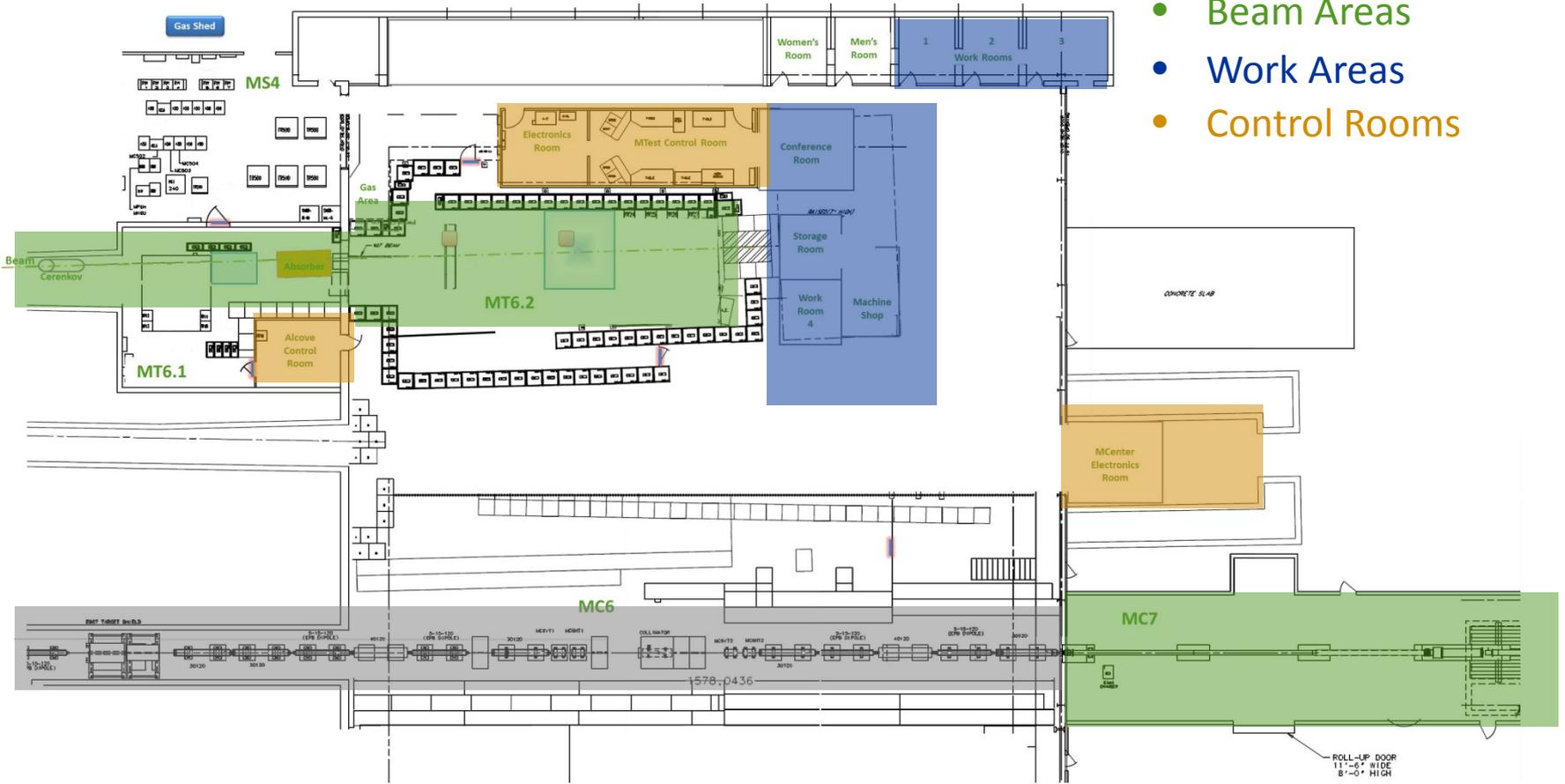
- **Beam Available 24 hrs /day**
- **6 sec event (4.2 sec spill) every 60 seconds**
- **Control room manned during beam hours**

- Booster captures protons into 84 bunches (1 batch) and accelerates them to 8GeV
- Bunches are 19nsec long: 1 RF Bucket (53 MHz)
- Booster batch = 1.6 microsecond in length
- Up to 6 batches go into Main Injector
- Main Injector = 11.2 microsecond
- Beam is ramped from 8 to 120 Gev and held at the flattop value
- Fraction of the beam resonantly extracted each rotation over 4.2 sec to Switchyard
- In Switchyard electrostatic Septa split beam twice. First split beam to NM line (Sea Quest) and M line, the second splits the beam between MTest and MCenter.

- If beam were smoothly extracted, 100 kHz or less would imply 1 particle per MI rotation would occur.
- Beam extraction is not smooth resulting in up to 35% double occupancy per MI rotation (11 μ Sec)

Facility Layout

- Beam Areas
- Work Areas
- Control Rooms

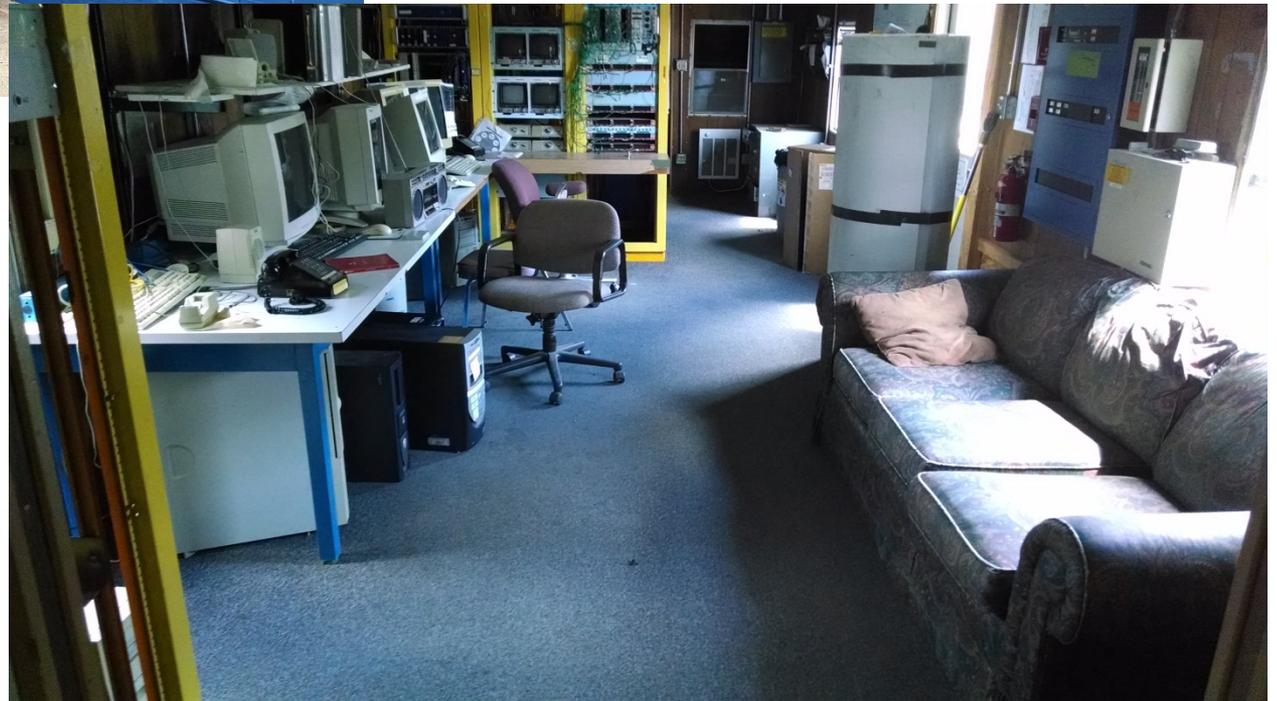


People

- FTBF part of Intensity Frontier and Test Beam group in Detector Development and Operations Department of PPD.
- Staff:
 - Aria Soha: Head of IFTB
 - JJ Schmidt: Facility Manager FTBF
 - Todd Nebel: Technical Coordinator
 - Ewa Skup: Instrumentation Specialist
 - Ray Safarik: Technical Support
 - Bill Frank: Mechanical Support
 - (Geoff Savage: DAQ Support)
 - Plus supporting crew from other departments of PPD and AD. Michael Backfish is AD coordinator of MCenter beamline but long list of others directed refurbishing of beam (Mike Geelhoed, Tombilarcik, Rick Coleman, ...). Special mention of Doug Jensen (PPD) whose expertise has been invaluable in getting tertiary beam going and instrumented.

MIPP Remains

(frozen in time)



MCenter Control Room

(as modern as we could afford)



MCenter Beamline



- Beamline Now Operational!
 - Similar beam to MTest
 - Long dwell time experiments
 - Overflow/make-up experiments
- Supports Liquid Argon (Under development)
- Tertiary beamline Option
 - Protons & Pions
 - 200 MeV – 1 GeV range
- Large Dipole Magnets
 - ~ 1 Tesla
 - 1 meter bore

