

Project X Update

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Outline



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- Project X Initial Configuration
 - Near Term Strategy
 - Provisional Timeline
 - Collaboration Status

Project X Initial Configuration

Mission Need



- The P5 report identifies mission need for a multi-MW proton facility based on:
 - **A neutrino beam for long baseline neutrino oscillation experiments.**

A new 2 megawatt proton source with proton energies between 50 and 120 GeV would produce intense neutrino beams, directed toward a large detector located in a distant underground laboratory.
 - **Kaon and muon based precision experiments exploiting 8 GeV protons from Fermilab's Recycler, running simultaneously with the neutrino program.**

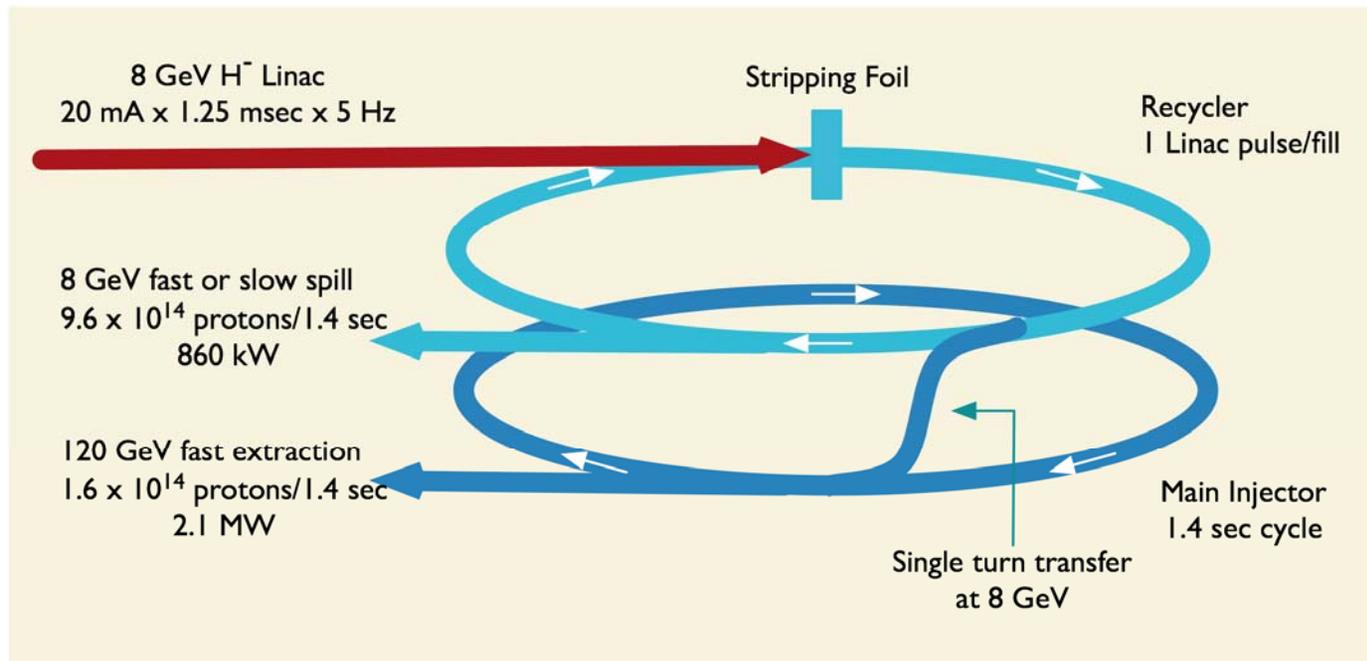
These could include a world leading muon-to-electron conversion experiment and world leading rare kaon decay experiments.
 - **A path toward a muon source for a possible future neutrino factory and, potentially, a muon collider at the Energy Frontier.**

This path requires that the new 8 GeV proton source have significant upgrade potential.

Project X Initial Configuration



- Project X Design Criteria
 - 2 MW of beam power over the range 60 – 120 GeV;
 - Simultaneous with at least 600 kW of beam power at 8 GeV;
 - Compatibility with future upgrades to 2-4 MW at 8 GeV



Project X Initial Configuration

High Level Performance Goals



Linac

Particle Type	H ⁻	
Beam Kinetic Energy	8.0	GeV
Particles per pulse	1.6×10^{14}	
Linac pulse rate	5	Hz
Beam Power	1000	kW

Recycler

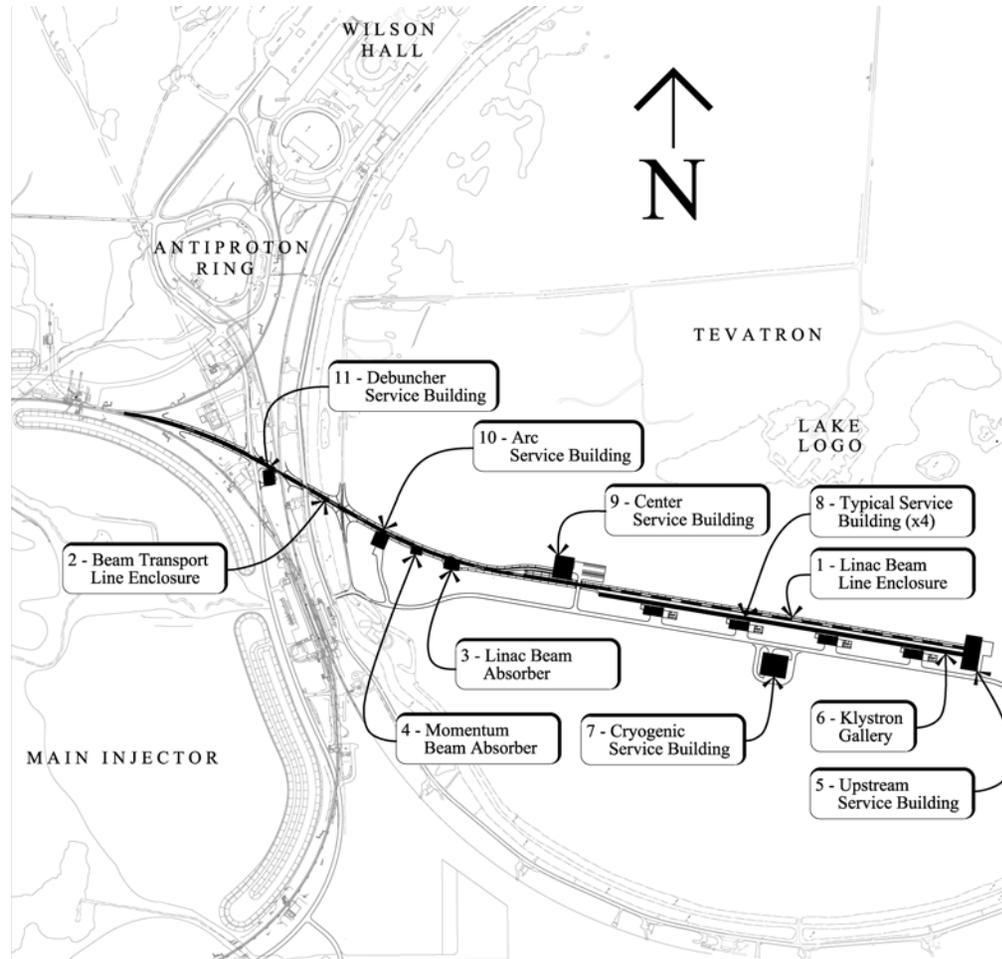
Particle Type	protons	
Beam Kinetic Energy	8.0	GeV
Cycle time	1.4	sec
Particles per cycle to MI	1.6×10^{14}	
Particles per cycle to 8 GeV program	1.6×10^{14}	
Beam Power to 8 GeV program	150-850	kW

- Currently looking at 2.5 Hz:
- 500 kW at 8 GeV
 - Maintains 2 MW at 60 GeV
 - Simultaneous with 150 kW at 8 GeV

Main Injector

Beam Kinetic Energy (maximum)	120	GeV
Cycle time	1.4	sec
Particles per cycle	1.7×10^{14}	
Beam Power at 120 GeV	2100	kW

Project X Initial Configuration Provisional Siting



Project X RD&D Plan

Near-term Strategy



- Develop an Initial Configuration Document
 - Meeting the design criteria and program goals
 - ICD subject to configuration control
 - ⇒ Released V1.0 10/31: available at <http://projectx.fnal.gov/>
- Revise/update the current RD&D Plan
 - Based on the ICD
 - Review existing plan to emphasize reduction of risk
 - ⇒ In process; collaboration input at the November 2009 Collaboration Meeting; release in mid-February following AAC evaluation (Harkay and Kim will be at the meeting as AAC members, Kathy as acting chair)
- Create a preliminary cost range estimate
 - Based on the ICD
 - ⇒ Nearing completion, internal review scheduled 3/16-18 (5 ANL staff invited to participate)

Project X RD&D Plan

Near-term Strategy



- Establish design criteria and operating scenarios for evaluation of alternative configurations
 - ⇒ Complete and being documented
- Establish a multi-institutional collaboration for the RD&D phase
 - Detail on slide 10
- CD-0 in FY2009
 - Requires independent review because (we believe) >\$750M
 - Coordinated with very long baseline and mu2e
 - Based on: ICD, preliminary cost estimate, P5 mission definition

Project X RD&D Plan

Provisional Long Range Timeline



- FY2009
 - CD-0
 - Initiate work on Conceptual Design Report
 - FY2010
 - Alternative implementations studies
 - Initiate NEPA documentation and permitting
 - FY2011
 - CD-1
 - FY2012
 - CD-2/3a
 - FY2013
 - CD-3
 - ~FY2013~2017
 - Construct
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Project X RD&D Plan Collaboration Plan



- The intention is to organize and execute the RD&D Program via a multi-institutional collaboration with Fermilab as the host laboratory.
 - It is anticipated that the Project X RD&D Program will be undertaken as a “national project with international participation”.
- A draft MOU covering the period through CD-2 is currently circulating for signatures among the following potential U.S. laboratory collaborators:
 - ANL
 - BNL
 - Cornell
 - LBNL
 - ORNL/SNS
 - MSU
 - TJNAF
 - SLAC
 - ILC/ART

⇒ ANL has expressed desire to sign the MOU as currently drafted

Project X RD&D Plan

ANL Role



- Fermilab and ANL have established collaborations on ILC/SRF, HINS, and Project X. These form a solid basis for moving forward
- Possible roles that have been discussed:
 - Linac design (both 325 and 1300 MHz)
 - This is already happening
 - Leadership role on the design and construction of the 325 MHz linac
 - TSR CM assembly, in collaboration with JLab
 - Note: we are considering variations on the front end design
 - replacing TSRs with $\beta=0.5$ ellipticals
 - complete room temperature front end
 - 1.3 GHz cavity processing and cryomodule fabrication
 - Current thinking is two production streams for fully dressed cavities, with final cryomodule assembly
 - Stream one = Fermilab/ANL stream. We assume significant involvement from the ANL processing group in the latter
 - Controls system – tap into ANL EPICS expertise

Summary



- The mission need for Project X has been established via the P5 report, as accepted by HEPAP
- An initial configuration has been developed based on design criteria derived from the mission need
- A preliminary cost range estimate has been completed based on the initial configuration
 - Internal review scheduled for mid-March
- A collaboration is in the process of forming
 - ANL is a key player
- Program relies heavily on, and is coordinated with, ILC/SRF development programs at FNAL, ANL, and elsewhere
- Intermediate term goal is CD-2 in 2012

Summary



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- We are still in the market for a permanent name!