

Accelerator Frontier

Panel 4

Medium- and Small-scale Accelerator Facilities

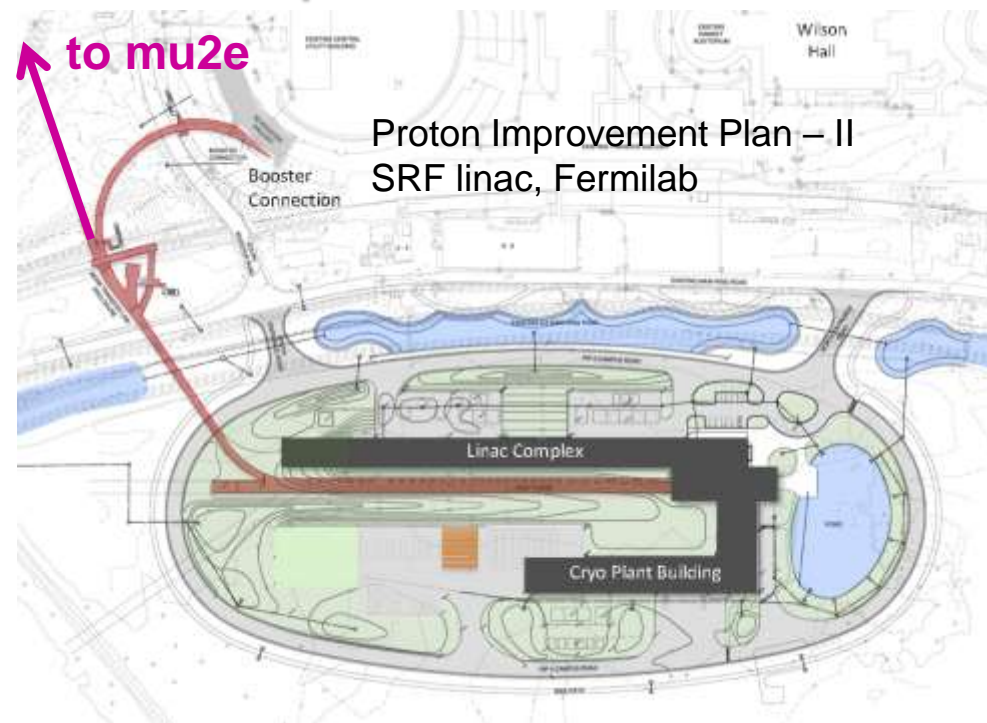
Community Summer Study – Seattle, July 26 2022

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(Snowmass'21 AF Conveners)

Accelerators for Rare Process

We should efficiently utilize existing and upcoming facilities to explore dedicated or parasitic opportunities for rare process measurements - **examples:**



Existing SLAC SRF linac
4-8 GeV e⁻ for LDMX

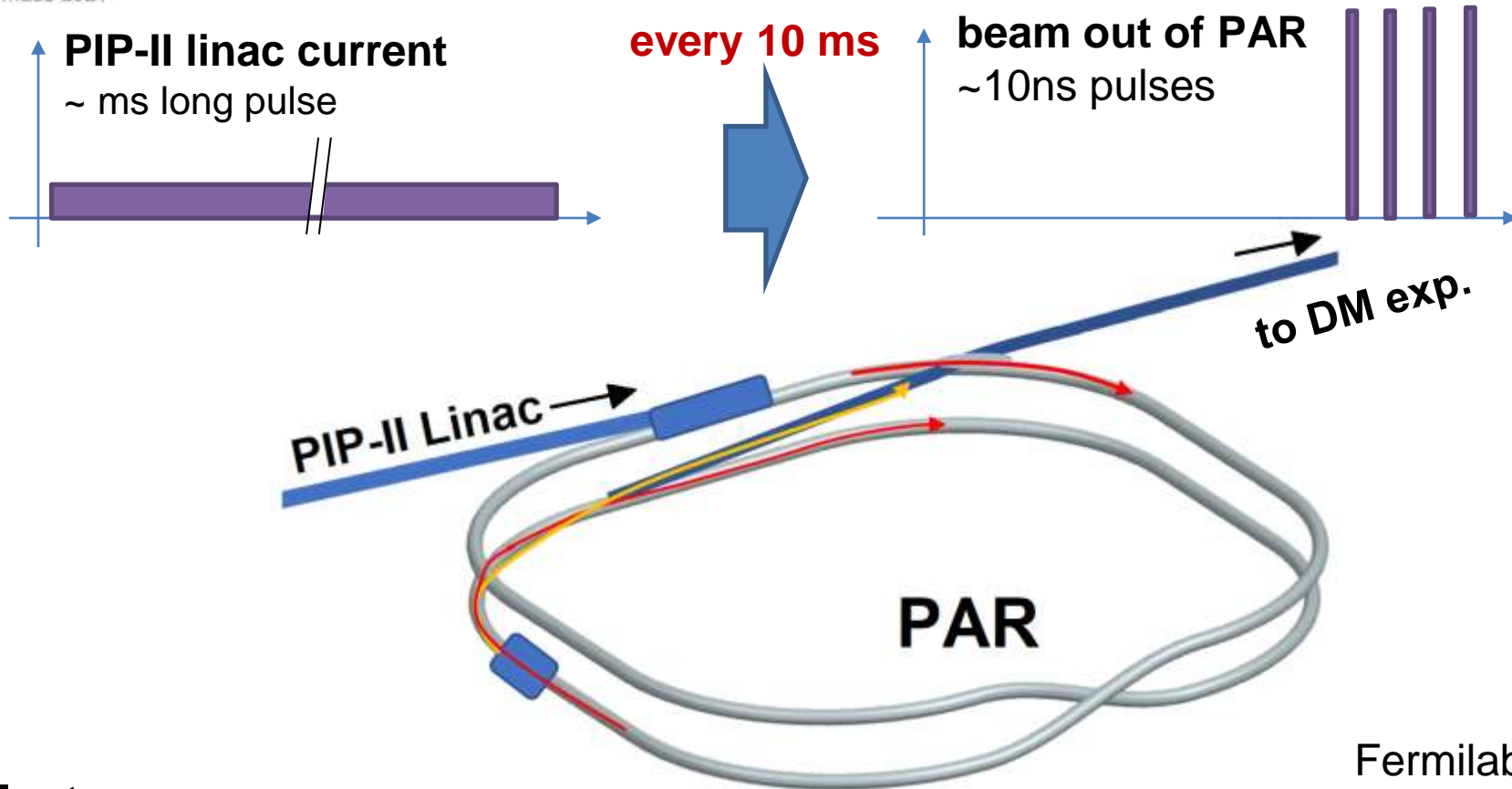
Upcoming PIP-II SRF linac
800 MeV protons
Beam ops in 2028-29
162.5 MHz bunches
upto 2mA → 1.6 MW possible
~17 kW for LBNF/DUNE ν's
(resulting in 1.2MW in MI)

The PIP-II scope enables the accelerator complex to reach design proton power on LBNF target, but still leaves 98.8% of the beam for other users!

PIP-II Possibilities

- **RF or magnet beam switch(es) to send 800 MeV protons to various experiments:**
 - For example: CLFV experiments, e.g., **mu2e-II** can utilize **~100kW** of beam power if it comes in special format (81 MHz = $\frac{1}{2}$ of 162.5 MHz bunches, very short, with 20 Hz rep rate... most mature)
- **Or a dedicated PIP-II Accumulation Ring (PAR)**
 - Transforms long, low current PIP-II linac pulse into few (4) short very intense bunches for one-by-one extraction:
 - Also can deliver **~100kW** of avg beam power

PIP-II Accumulator Ring (PAR)



Features:

- Fixed $E=0.8-1.0$ GeV proton storage ring
- $C=480\text{m}$ in the form of a *folded figure 8*
- Power 100 kW for **Dark Sector** program, 100Hz
- There is also compact version $C=120\text{m}$, which would better serve CLFV experiments





Medium- and Small-Scale Facilities

- #1: We have a broad array of accelerator technologies and expertise to design and construct prioritized medium- and small-scale HEP accelerator projects (“can start design now”). Expect P5 to tell us “what”.
- #2: We support RPF aspirations to establish a program to fully utilize ~MW of 0.8 GeV proton beam power to be available after PIP-II construction.
- #3: The Booster replacement (part of the 2.4 MW LBNF/DUNE Phase II, late 2030’s) – either RCS or SRF Linac – will offer additional opportunities (spigots) for the far future medium- & small-scale experiments. and such opportunities should be considered in its design