WG3 Introduction: Accelerator

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Main Highlights

- **Accelerators are essential for our physics goals**
- **Ongoing improvements and new facilities are crucial for enhancing our results**

Key Topics to be Addressed

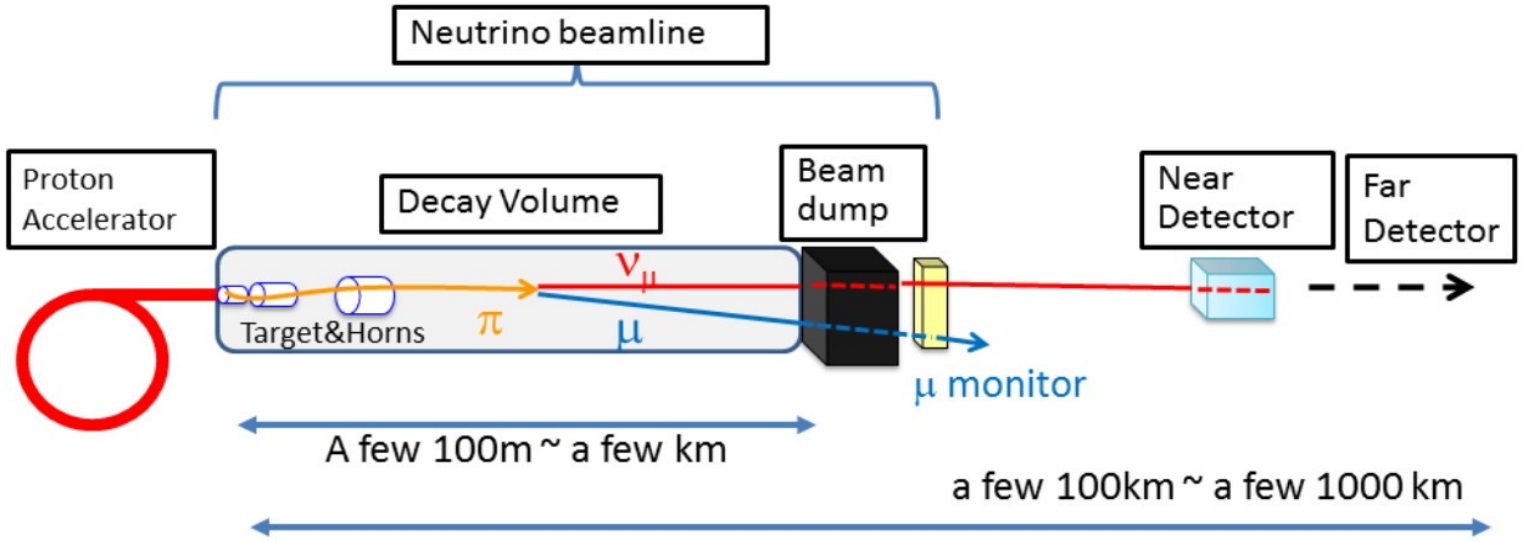
- **Exploring New Target Technologies**
  - *Can fluidized powder or granular targets revolutionize our approach?*

- **Advancing Accelerator Capabilities**
  - *What is the roadmap for 2MW and beyond?*

- **Shaping the Future of Neutrino Research**
  - *Where do we go after DUNE, T2K, and ESSnuSB?*

- **Leveraging Synergies in Physics**
  - *How can collider, neutrino, and muon research intersect?*

Accelerator for Neutrino Experiments



Conventional and upcoming world-class neutrino beams require:

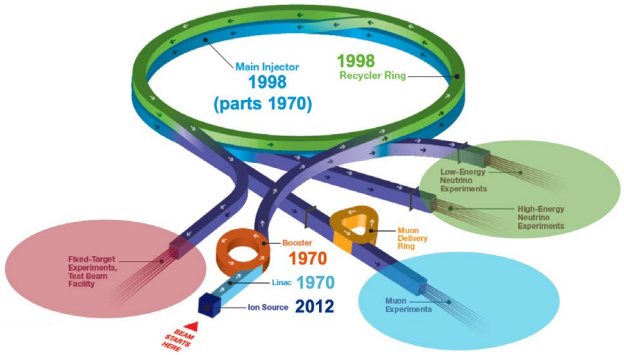
- **High-intensity proton beam**
  - Effective manipulation of high-power beams
  - Stable operation through commissioning
- **Radiation-hard equipment**
  - Durable targetry and monitoring systems
- **Comprehensive beamline modeling**
  - In-depth understanding of beamline dynamics
- **Synergies between neutrino and muon beamlines**

Summary of Talks

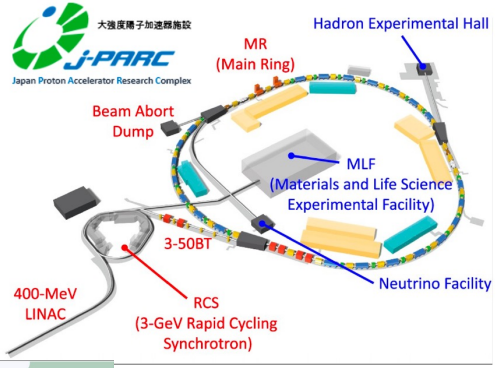
Monday	Tuesday	Wednesday	Thursday
Parallel 1 13:45 session	Parallel 2 13:45 session	Plenary 08:30 session	Parallel WG 1X3 13:45 session
Poster 16:05 session	Parallel WG 3X4 16:15 session		

WG3 Plenary Talks – Wednesday. 8:30 Session

- Status and future of accelerator facilities around the world
- Four invited plenary talks

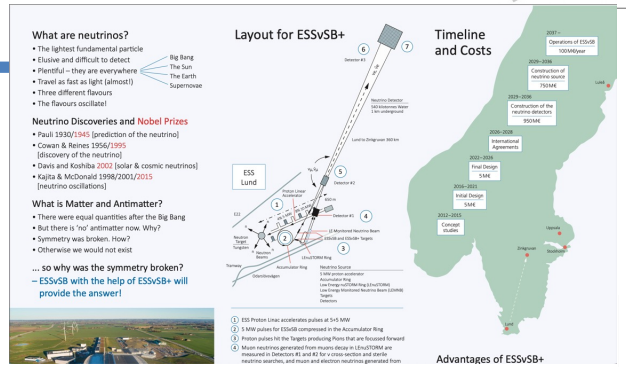


Fermilab Accelerator Plans and Schedule

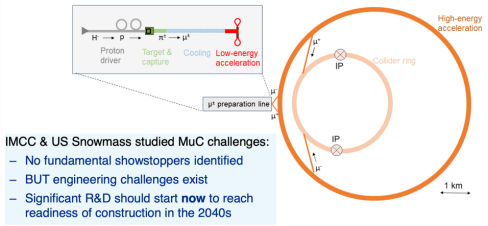


J-PARC Accelerator and Neutrino Beamline Plans and Schedule

ESSnuSB Status



Muon Collider R&D



- Goal is to get to **10 TeV center-of-mass energy**
- Two approaches: Staging in **energy** (3 TeV to 10 TeV) or in **luminosity**

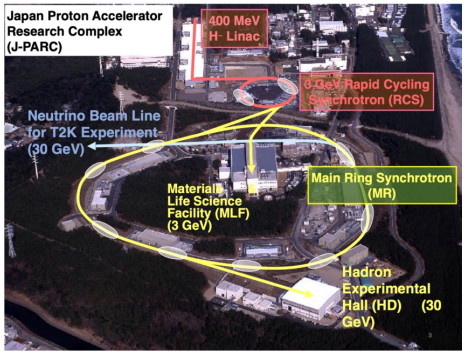
IMCC & US Snowmass studied MuC challenges:
- No fundamental showstoppers identified
- BUT engineering challenges exist
- Significant R&D should start **now** to reach readiness of construction in the 2040s

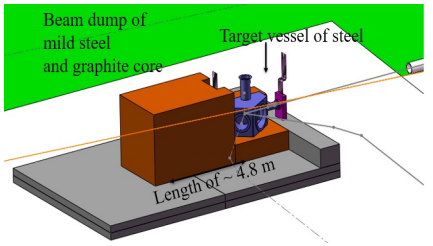
WG3 Parallel Talk Highlights

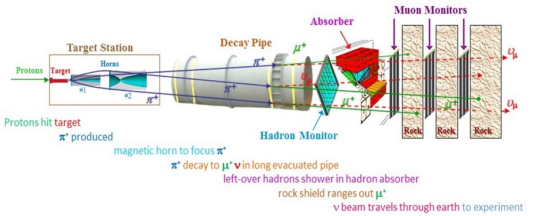
Accelerator & beamline/target upgrades

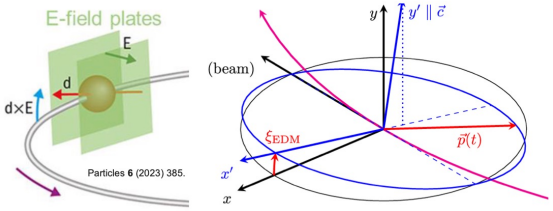
Advanced R&D and simulation efforts

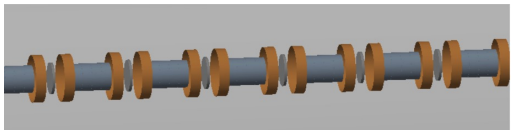
Hadron production & neutrino experiments

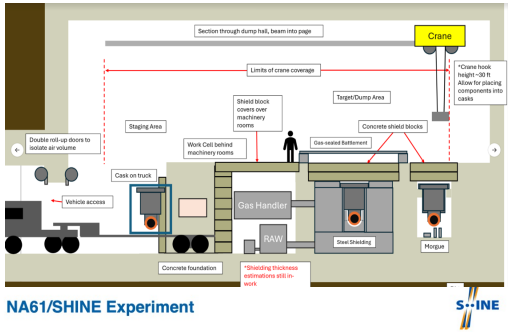


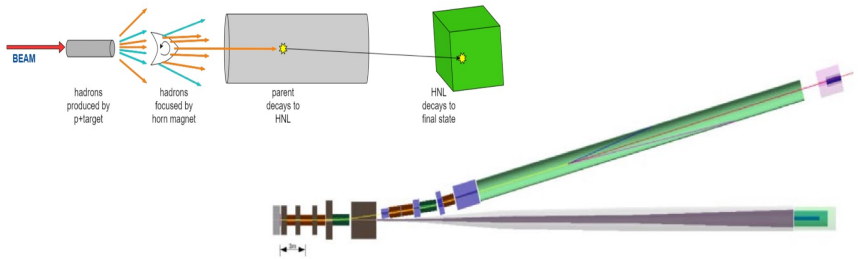


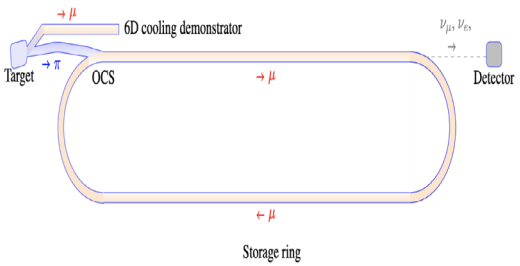


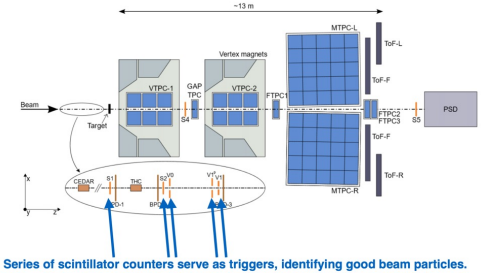












Plenary- Wednesday

WG3 Agenda

	Fermilab accelerator plans and schedule	*Robert Zwaska*
	APS- Building 402, Argonne National Laboratory	08:30 - 09:00
09:00	**J-PARC accelerator and neutrino beamline plans and schedule**	*Tetsuro Sekiguchi et al.*
	APS- Building 402, Argonne National Laboratory	09:00 - 09:30
	ESSnuSB status	*George Fanourakis*
	APS- Building 402, Argonne National Laboratory	09:30 - 10:00
10:00	**Muon collider R&D**	*Diktys Stratakis*
	APS- Building 402, Argonne National Laboratory	10:00 - 10:30

Parallels

		minutes	title	speaker
Monday	Parallel 1 1345 - 1445 (60 min)	20	Upgrade of J-PARC magnetic horn system towards 1.3 MW beam	Tetsuro Sekiguchi
		20	Updates and Lessons Learned from NuMI Beamline at Fermilab	Don Athula Wickremasinghe
		20	Update on the Target Station and Beamlines of MELODY (2024)	Nikolaos Vassilopoulos
	Parallel 2 1345 - 1445 (60 min)	20	The ENUBET monitored neutrino beam and its implementation at CERN	Fabio Pupilli
		20	High-Power Targetry R&D for Next-Generation Accelerator Target Facilities	Abe Burleigh
		20	The Fermilab Facility for Dark Matter Discovery (F2D2): A Conceptual PIP-II Beam Stop Facility for Dark Sector Physics	Jonathan Williams
Tuesday	Parallel WG3X4 1615- 1735 (60 min)	20	Update on the design of the 6D Muon Cooling Demonstrator	Rohan Kamath
		20	Simulation and design of the neutrinos from STORed Muons (nuSTORM) experiment	Rohan Kamath
		20	High-Power Targetry for Muon Production	Michael Hedges
Thrusday	Parallel WG1X3 1345 - 1505 (80 min)	20	Collimated muon beam proposal for probing neutrino charge-parity violation	Alim Ruzi
		20	NA61/SHINE measurements for Neutrino experiments	Laura Fields
		20	Hadron Production Measurements with EMPHATIC	Robert Chirco
		20	Improving Neutrino Experiment Physics with Hadron Production Data	Leonidas Aliaga Soplin

Enjoy the upcoming talks on accelerator physics!

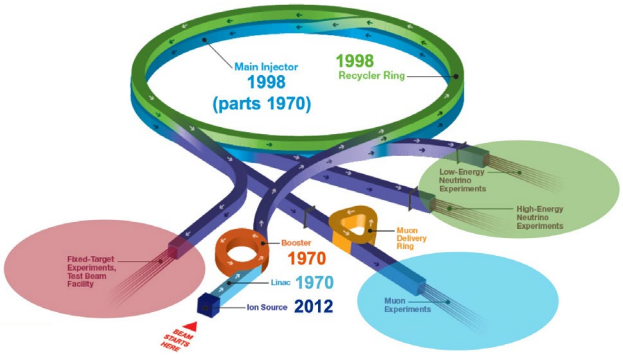
Backups

WG3 Plenary Talks – Wednesday. 8:30 Session

- Status and future of accelerator facilities around the world
- Four invited plenary talks

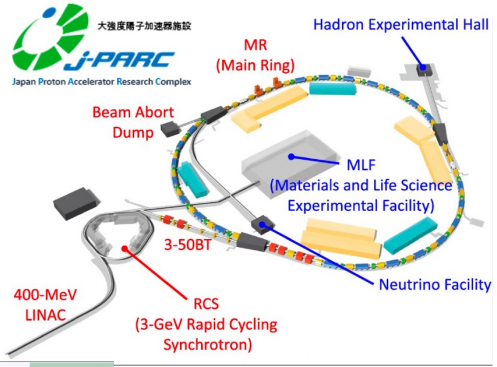
- **Fermilab Accelerator Plans and Schedule:**

-Overview of Fermilab's current and upcoming accelerator plans
-Detailed schedule for accelerator upgrades and maintenance
-How these plans support ongoing and future scientific experiments



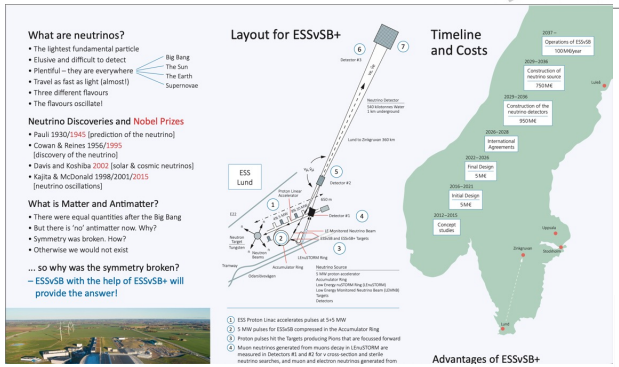
- **J-PARC Accelerator and Neutrino Beamline Plans and Schedule:**

-Status of neutrino beam power upgrade at J-PARC
-Operation after major upgrades and prospects



- **ESSnuSB Status:**

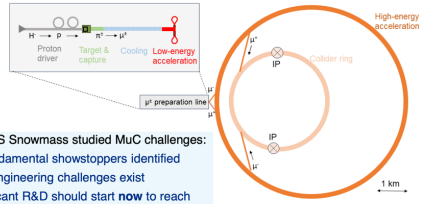
-Update on accelerator and target station
-Physics reach of the project



- Muon Collider R&D:

-Latest developments in Muon Collider research
-Focus on R&D efforts

- Goal is to get to **10 TeV center-of-mass energy**
- Two approaches: Staging in **energy** (3 TeV to 10 TeV) or in **luminosity**



IMCC & US Snowmass studied MuC challenges:
- No fundamental showstoppers identified
- BUT engineering challenges exist
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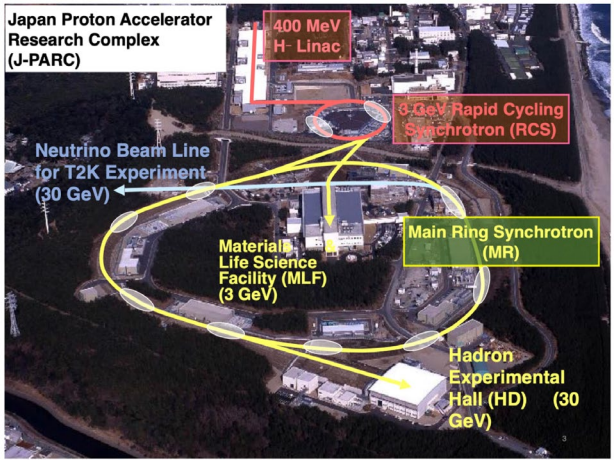
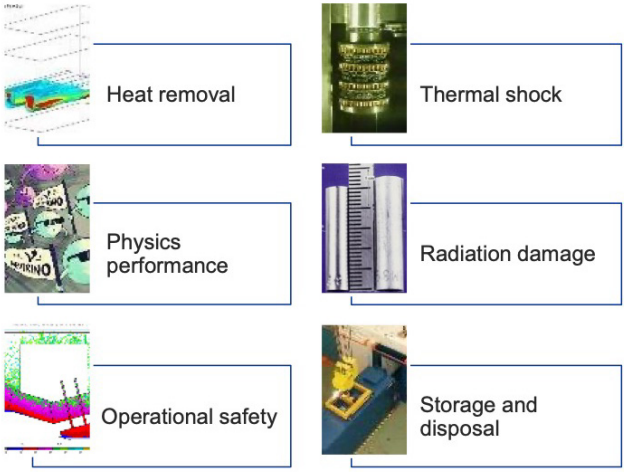
WG3 Parallel Talks – Monday. 13:45 Session

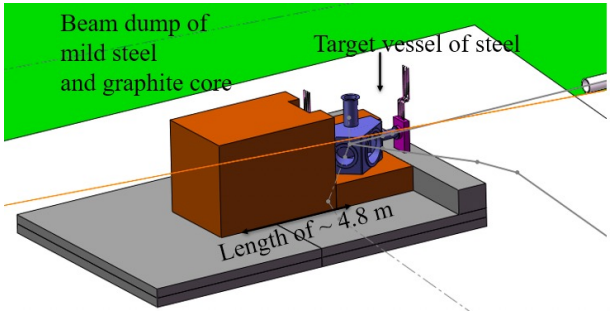
- **NuMI Beamline at Fermilab**: Lessons learned in optimizing and maintaining the NuMI beamline, with a push towards integrating Machine Learning for enhanced monitoring
- **High-Power Targetry R&D**: Tackling material challenges in accelerator targets, focusing on durability and innovative solutions for multi-MW beams
- **MELODY Updates**: Advancing muon production at CSNS with AI-optimized copper targets and refined beamline designs.



J-PARC



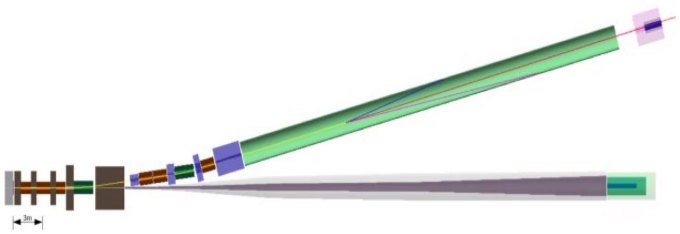
High power Targetry challenges



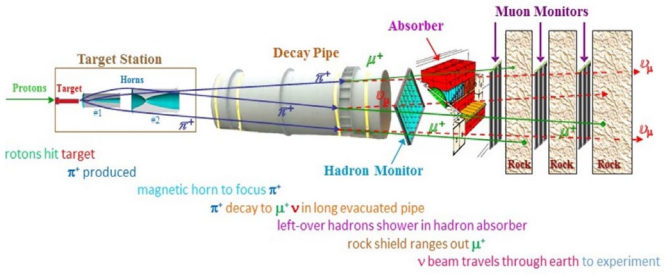
Target design for MELODY

WG3 Parallel Talks – Tuesday. 13:45 Session

- **ENUBET at CERN**: Achieved 1% precision in ν_e cross-section measurements using a horn-less beamline and instrumented decay tunnel; now focusing on site-dependent implementation at CERN
- **J-PARC Horn System Upgrade**: Enhancing the magnetic horn system for 1.3 MW beam power, with increased current and improved cooling for the Hyper-Kamiokande experiment
- **F2D2 at Fermilab**: Conceptual design for a 2+ MW target facility for dark sector physics, addressing the challenges of high-power, low-energy beams from the PIP-II accelerator

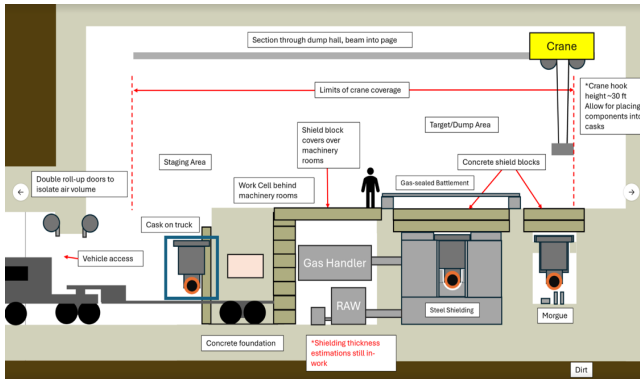


Final design of ENUBET beamline



NuMI

F2D2 Design Plan

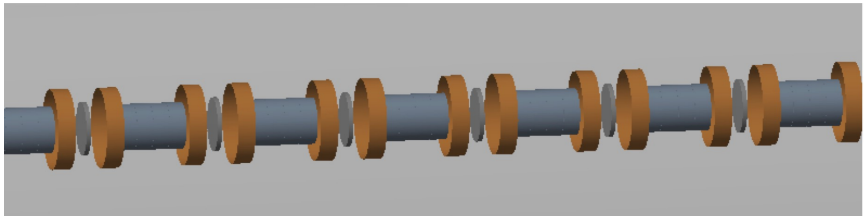


Joint Parallel Talks WG3X4 – Tuesday. 16:15 Session

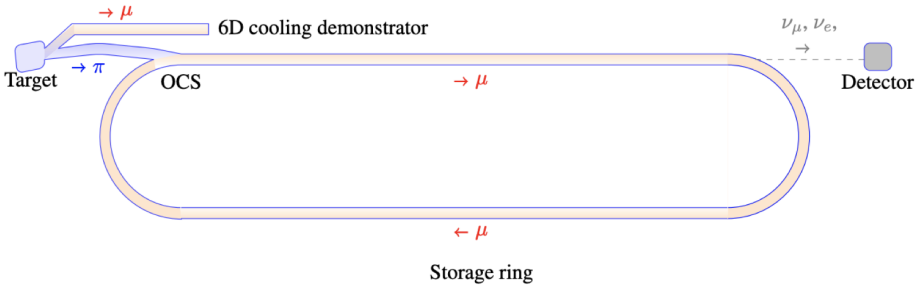
- **Update on the design of the 6D Muon Cooling Demonstrator**: Latest design updates on the 6D Muon Cooling Demonstrator, focusing on achieving high beam brightness for a future multi-TeV muon collider

- **Simulation and Design of the Neutrinos from STORed Muons (nuSTORM) experiment:** Update on the design and simulations of the nuSTORM experiment, focusing on muon decay-generated neutrino beams, precise flux determination, and its role as a precursor to a muon collider

- **High Power Targetry for Muon Production:** Challenges and innovative solutions in high-power targetry for producing high-intensity muon beams, focusing on material selection, radiation resistance, and recent advancements in target design



Cooling lattice in BDSIM



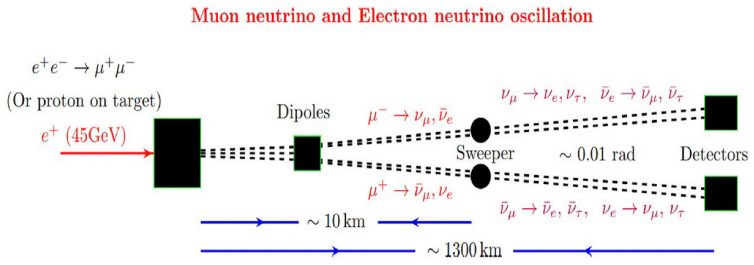
Schematic of nuSTORM

Joint Parallel Talks WG1X3 – Thursday. 13:45 Session

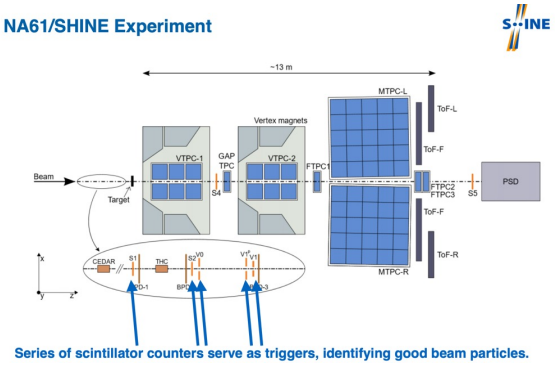
- **Collimated muon beam proposal for probing neutrino charge-parity violation:** experimental setup using collimated muon beams to achieve high-sensitivity probing of neutrino CP-violation, enhancing measurements beyond what current neutrino detectors like DUNE and T2K can achieve

- **NA61/SHINE measurements for neutrino experiments:** Recent NA61/SHINE measurements that reduce systematic uncertainties in neutrino flux predictions for experiments like T2K and DUNE, along with plans for further constraining these uncertainties

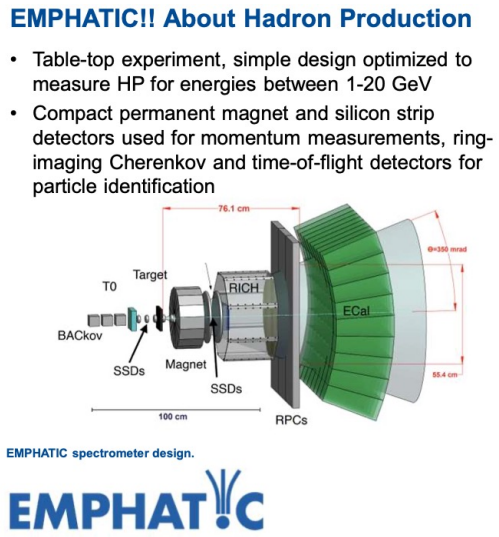
- **Improving Neutrino Experiment Physics with Hadron Production Data:** Review the role of hadron production data in reducing neutrino flux uncertainties in experiments like NuMI, BNB, T2K, and discuss the need for new measurements to improve predictions for next-generation experiments



A proposed neutrino oscillation experiment with collimated muon beams



SHINE



Poster Session – Monday.16:05

An Updated Simulation of the Booster Neutrino Beam

Updated GEANT4-based simulation of the Booster Neutrino Beam, enhancing flux predictions for detectors in the Short-Baseline Neutrino program at Fermilab, and enabling more precise studies of hadron production and exotic BSM scenarios