WG3

(Accelerator Physics)

Goals for the Meeting

Conveners

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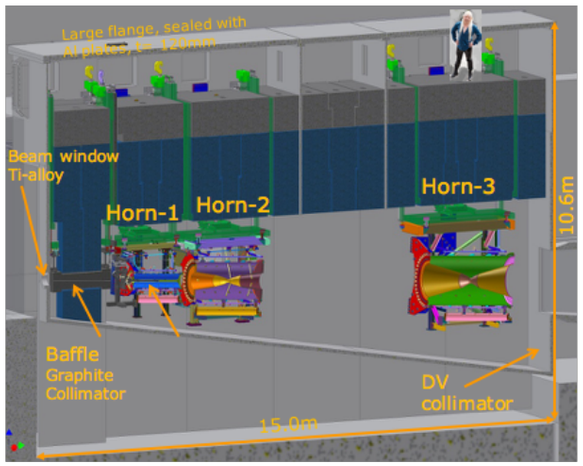
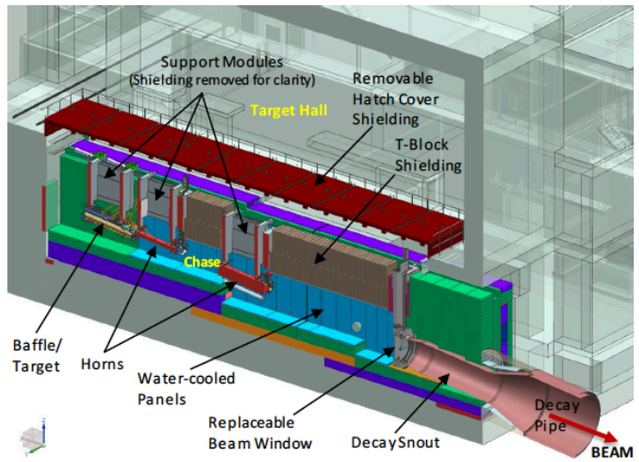
Tetsuro Sekiguchi (KEK/J-PARC)

Stream of “Super Beam”

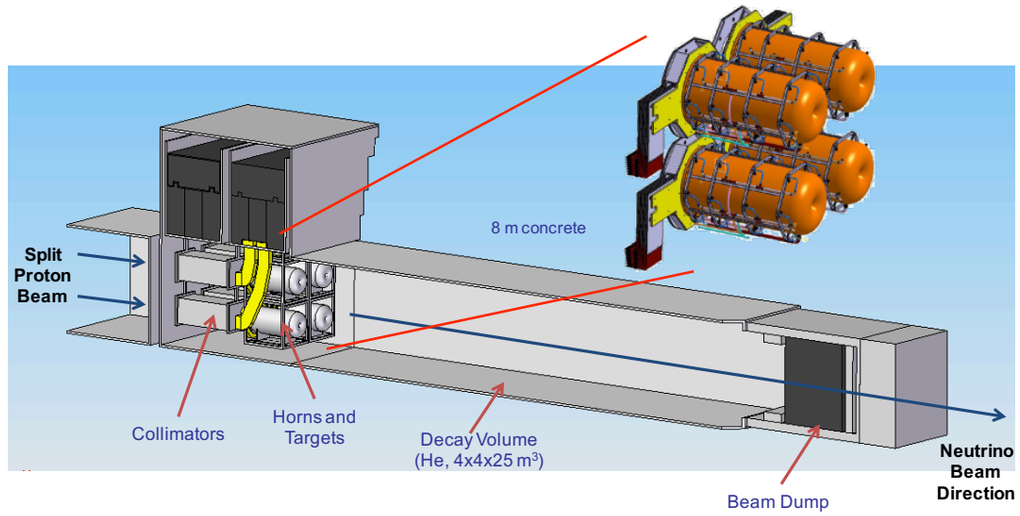
J-PARC(0.5MW)
NuMI (0.7MW)



LBNF (1.2MW→2.4MW)
J-PARC (1.3MW)



ESSnuSB
5MW (1.25MW x 4)



- **Accelerators**
  - Current : High energy proton beams from Synchrotron ⇒ ~1s cycle
  - Future : SC Linac based proton drivers ⇒ 10~50Hz
- **Solid target** ⇒ can be acceptable up to 1.5~2MW level
  - Radiation damage will be a serious problem for higher power beam
- **Horn focussing** ⇒ beam pulse width is limited (<10μs) ⇒ need accumulator ring
- **Challenges**
  - Beam loss in accelerators and beamline
  - Disposal of radioactive materials (e.g. Tritium) is actually an issue

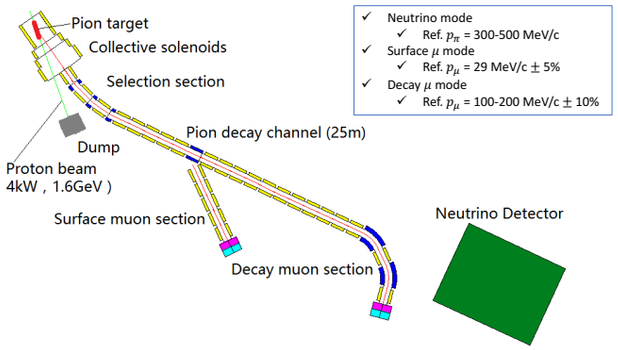
RaDIATE Collaboration
Radiation Damage In Accelerator Target Environments

Toward “Muon Collider”

Proton beam → Pion capture → Muon transport → Ionization cooling → Acceleration

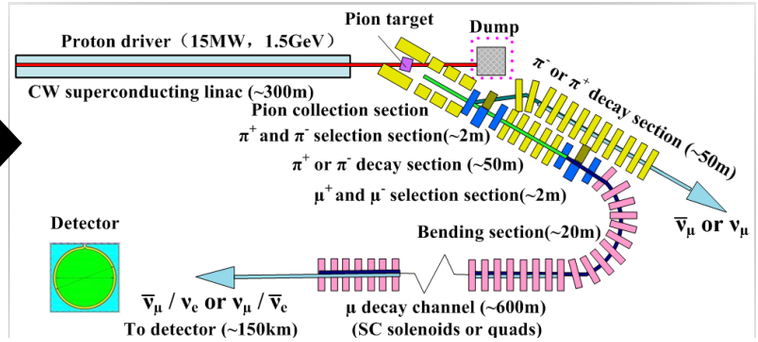
EMuS

Solid target

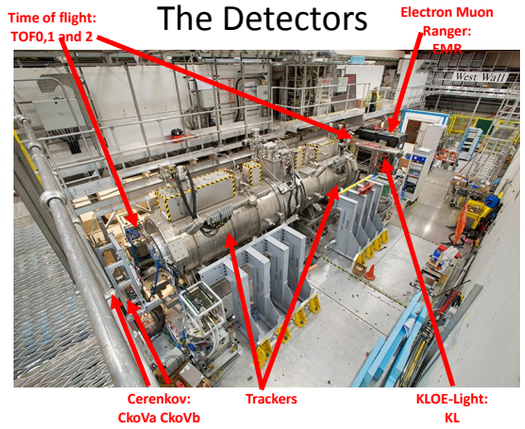


MOMENT

Granular/liquid target



MICE

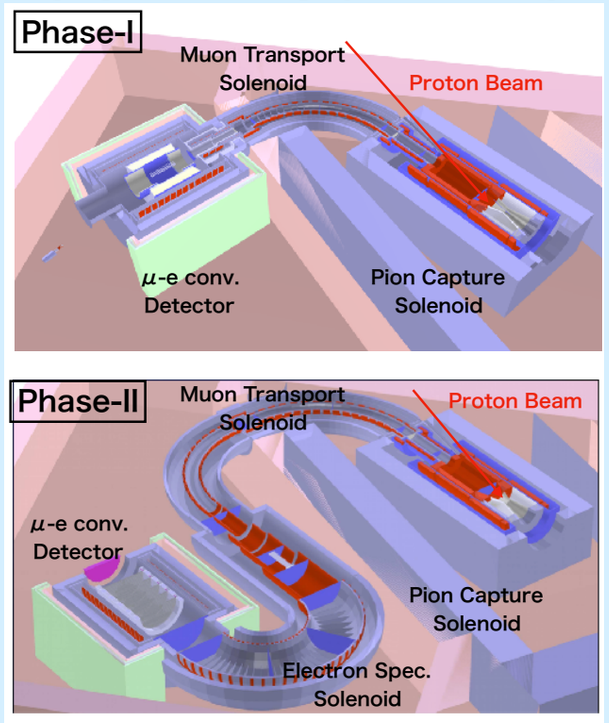


- **Accelerator** ⇒ Super-conducting Linac based proton drivers
- **Granular/liquid target** ⇒ to accommodate high power beam
- **Pion capture by SC solenoid** ⇒ longer pulse (or even DC) beam acceptable
- **Muon Ionization Cooling** ⇒ to reduce muon beam emittance
- **Many challenges in each devices and extensive developments on going**

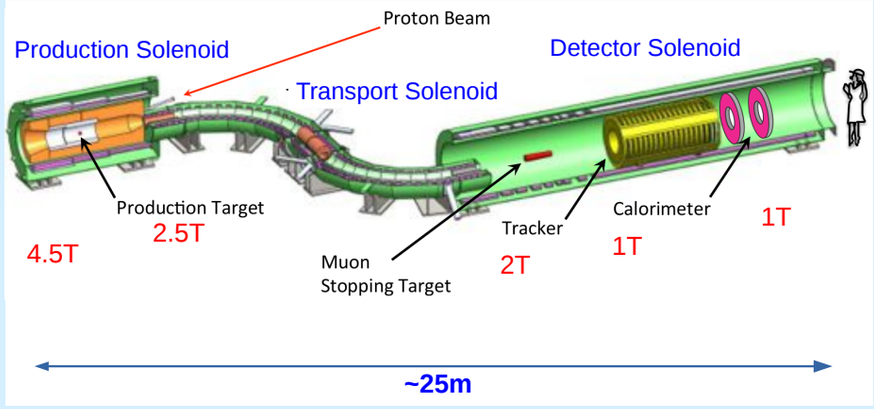
Muon Beamline for Muon Physics

Lepton Flavor Violation Search

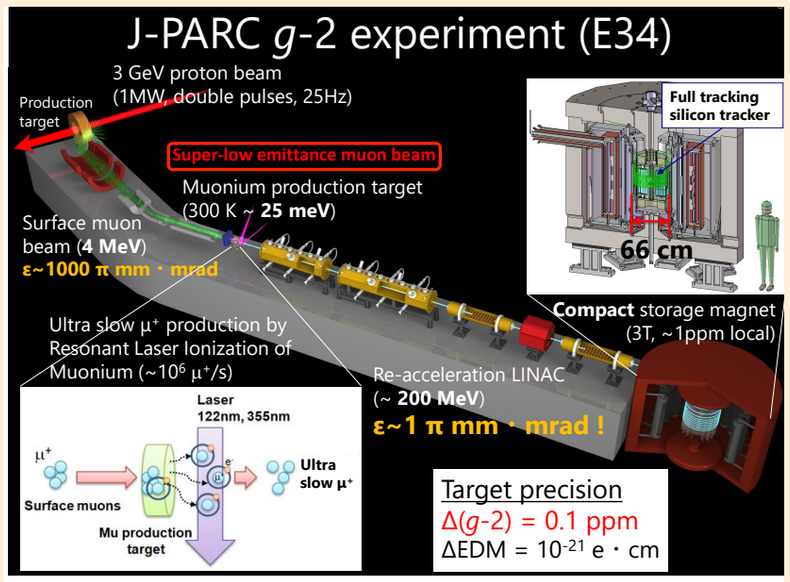
COMET@J-PARC



Mu2e@Fermilab



Muon g-2 measurement



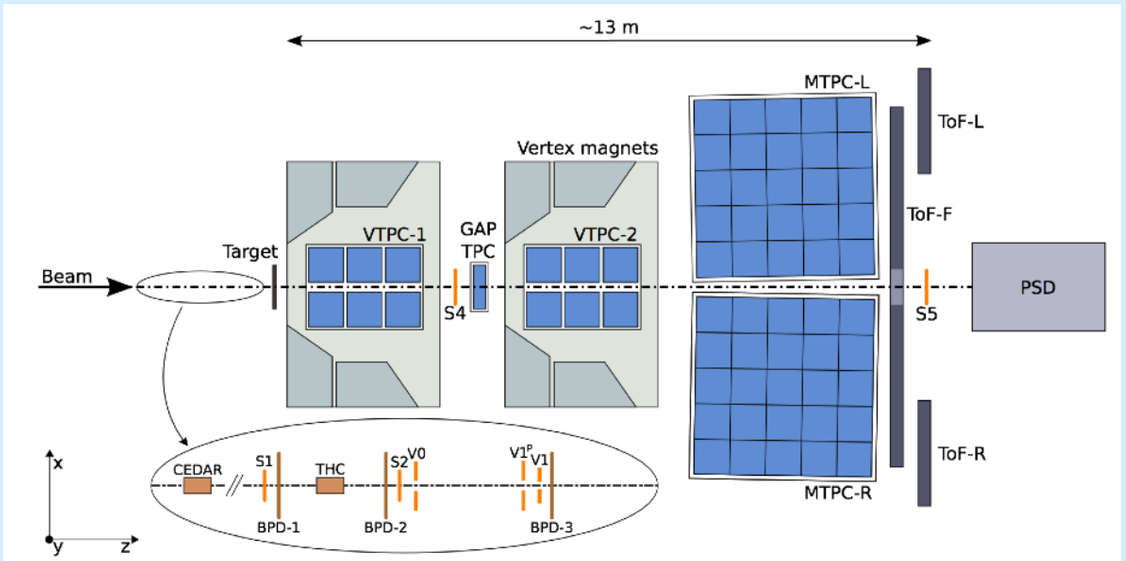
[1] Takayuki Yamazaki, KEK Theory Meeting on Particle Physics Phenomenology (KEK-PH2018), Feb. 13th to 16th (2018).

Neutrino Flux Predictions

- Precise flux prediction is important for reducing systematic uncertainties

NA61/SHINE (ongoing)

Hadron production measurements for precise neutrino flux prediction

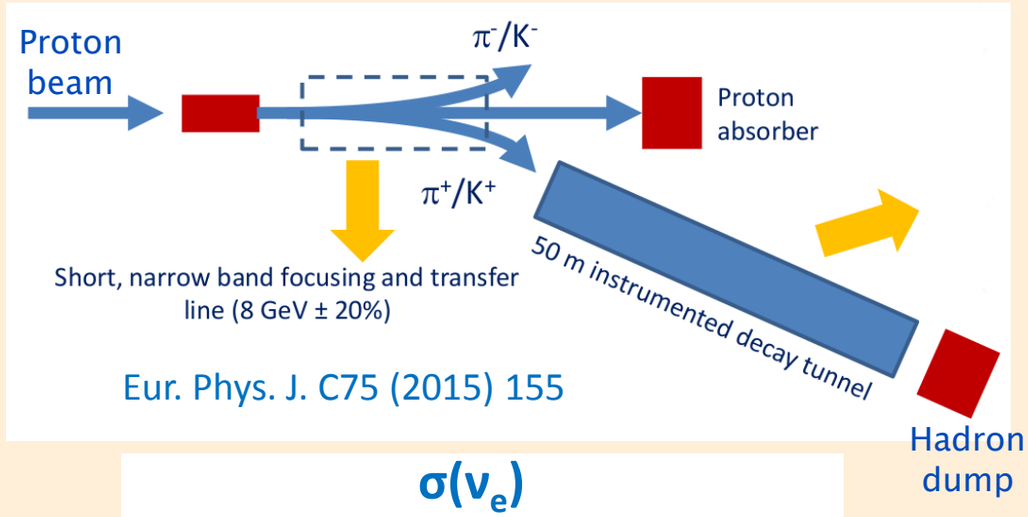


Flux uncertainty can be reduced by tuning hadron production in MC with experimental data

- Data for T2K, NOvA, LBNF
- Future upgrade (2021~)

ENUBET (future)

Pure and precise (1%) ν_e source from K-monitored ν beams



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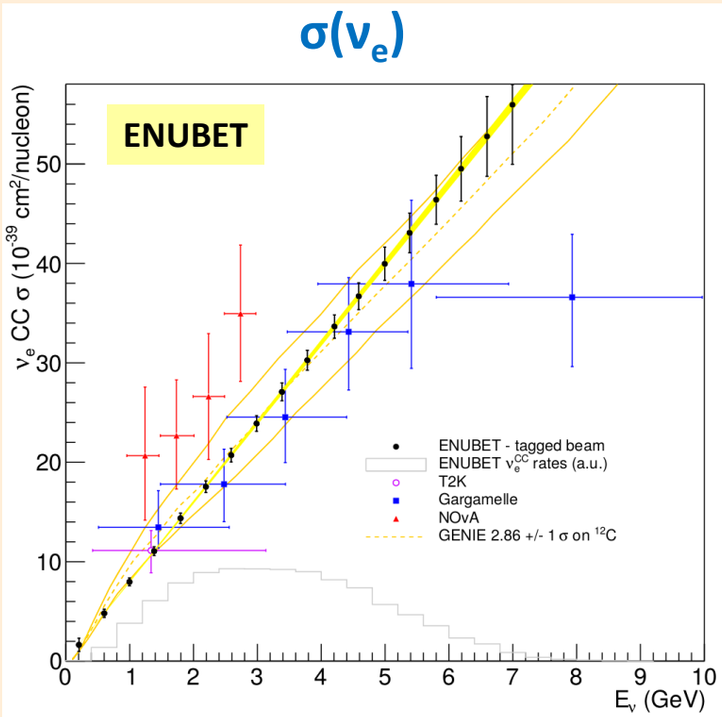

1% syst. + 1% stat. (10^4 ν_e^{CC}) **errors**

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WG3 Parallel Sessions

- 18 individual parallel session talks
- 4 joint parallel session talks (with WG4)

#1	Monday	14:00-16:00	Target (T2K, RaDIATE, ESSnuSB)
#2	Monday	16:30-18:00	MICE
#3	Tuesday	14:00-16:00	Beamlines (LBNF, ESSnuSB)
#4	Thursday	14:00-16:00	Beamlines (T2K, ESSnuSB, IOTA, Low emittance muon beam)
#5	Thursday	16:30-18:00	EMuS, Flux (NA61, ENUBET)
#6	Friday	14:00-16:00	Muon beam facilities (WG3+WG4)
#7	Friday	16:30-18:00	g-2 beamline, ISODAR

Questions from NuFact'17

- What is the status of accelerator upgrades for the major accelerator based neutrino experiments in the Americas, Asia, and Europe?
- Can targets in the range of 5+ MW be made of solid materials, or are granular/liquid targets required?
- Are requirements for target stations (handling, shielding, cooling, etc.) well understood and possible to fulfill?
- How are measurements of flux progressing and contributing to ongoing/future neutrino experiments?

Questions from NuFact'17

- How is the problem of space charge and beam loss in high intensity proton machines being addressed?
- Is nuSTORM needed as a complimentary program to the future planned accelerator based neutrino facilities, and is the design deemed affordable?
- What is the status of the accelerator upgrades needed to build a neutrino beamline at ESS?
- Has MICE reached a satisfactory conclusion, and how do the results fit into the accelerator based neutrino beam landscape?

Let’s enjoy NuFACT2018 !!