Synergies

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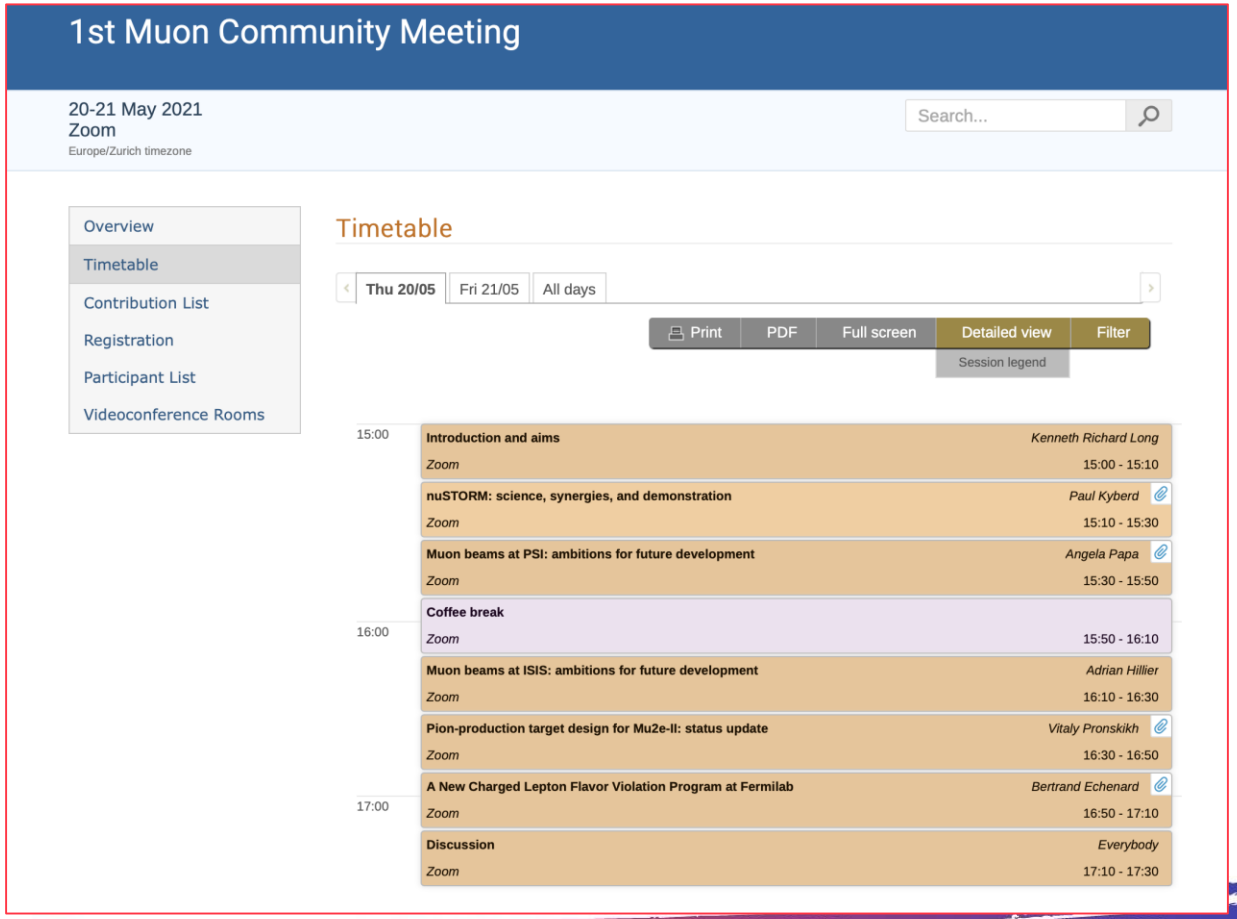
Synergies

- Synergies:
  - R&D that creates enhanced capabilities to the benefit of:
    - The development of a high energy (multi-TeV) muon collider *and*
    - Another first-rank scientific, innovative, or impactful programme

- Creation of world-class science with intense muon beams
  - As demonstrators, technology test beds, & to create community

Our session at the 1st Muon Community meeting



1st Muon Community Meeting

20-21 May 2021
Zoom
Europe/Zurich timezone

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Overview
Timetable
Contribution List
Registration
Participant List
Videoconference Rooms

Timetable

Thu 20/05 | Fri 21/05 | All days

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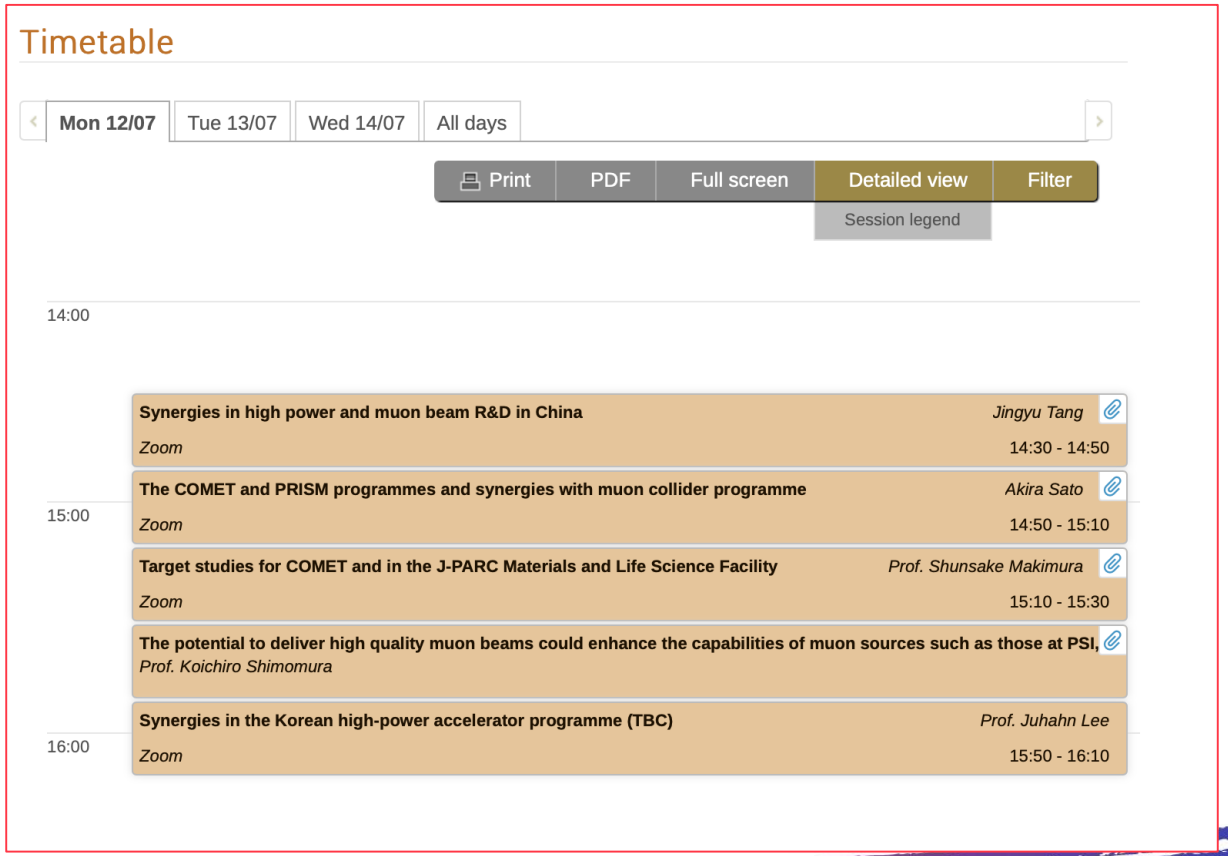
Session legend

15:00	Introduction and aims	Kenneth Richard Long	15:00 - 15:10
	nuSTORM: science, synergies, and demonstration	Paul Kyberd	15:10 - 15:30
	Muon beams at PSI: ambitions for future development	Angela Papa	15:30 - 15:50
	Coffee break		15:50 - 16:10
16:00	Muon beams at ISIS: ambitions for future development	Adrian Hillier	16:10 - 16:30
	Pion-production target design for Mu2e-II: status update	Vitaly Pronskikh	16:30 - 16:50
	A New Charged Lepton Flavor Violation Program at Fermilab	Bertrand Echenard	16:50 - 17:10
17:00	Discussion	Everybody	17:10 - 17:30

Our session at the 2nd Muon Community meeting



Synergies and opportunities

- High-intensity conventional muon beam development:
  - PSI: High-intensity muon beam; frictional cooling
  - RAL: next generation muon beam under discussion
- More novel, intense muon beams for experiments:
  - Mu2e: target upgrade; recirculated target for PIP-II era
  - COMET: target and operation, transport
  - PRISM: part of high-flux muon programme for PIP-II era
    - FFA ring, target/capture, bent solenoid transport channel
- Proton accelerator upgrades:
  - CSNS: upgrade to 500kW; HIAF; CiADS; MOMENT, EMuS
  - J-PARC: MLF, muon-prod trgt

ENUBET and nuSTORM

- **Scientific programme**
  - **Precise, systematic, ν_e, cross section**
  - **Exquisite sensitivity to BSM**

ENUBET &

Outlook

- Our present understanding of (few-GeV) neutrino interactions with matter would be **greatly improved** by new precise measurements with well-understood ν**STORM** flux at **advanced detectors.**
- The future neutrino oscillation program can **greatly benefit.**
- Progress in **hadron** and **nuclear physics.**
- Potential to **discover/constrain non-standard interactions** and **exotic processes.**
- Sensitive searches for **short-baseline flavor transitions**: potential to **discover sterile neutrinos** or **exclude (10 σ)** the presently allowed parameter space.

L. Alvarez-Ruso, IFIC — NuFact 20|21

ENUBET and nuSTORM

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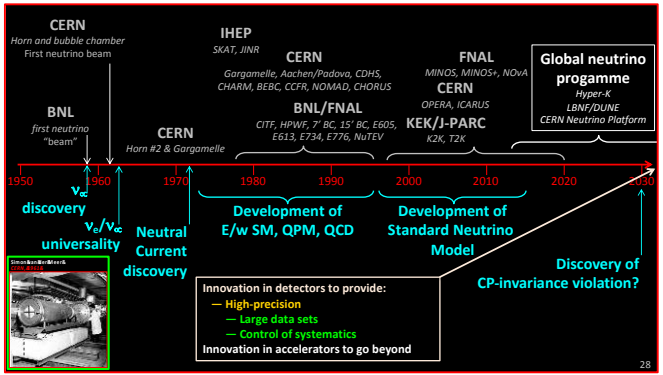
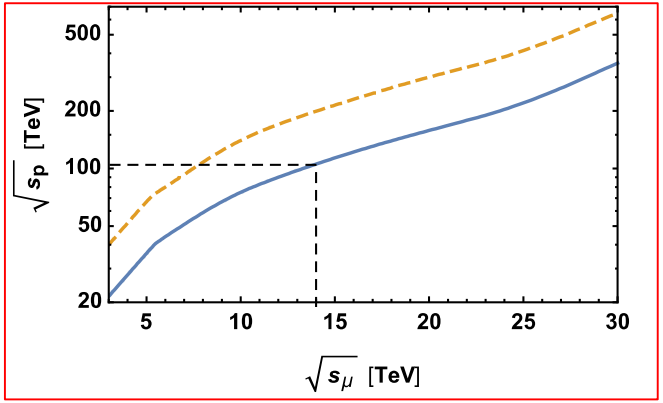
  - Exquisite sensitivity to BSM
- **Capability**
  - Uniquely high quality neutrino beam
  - Path to new horizon at energy frontier





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  - ESPP:
    - Neutrino cross sections and muon collider

European Strategy Update

Innovative accelerator technology underpins the physics reach of high-energy and high-intensity colliders… The technologies under consideration include high-field magnets, high-temperature superconductors, plasma wakefield acceleration and other high-gradient accelerating structures, bright muon beams, energy recovery linacs. The European particle physics community must intensify accelerator R&D and sustain it with adequate resources. …

High-priority future initiatives

To extract the most physics from DUNE and Hyper-Kamiokande, a complementary programme of experimentation to determine neutrino cross-sections and fluxes is required. Several experiments aimed at determining neutrino fluxes exist worldwide. The possible implementation and impact of a facility to measure neutrino cross-sections at the percent level should continue to be studied.

Other essential scientific activities for particle physics

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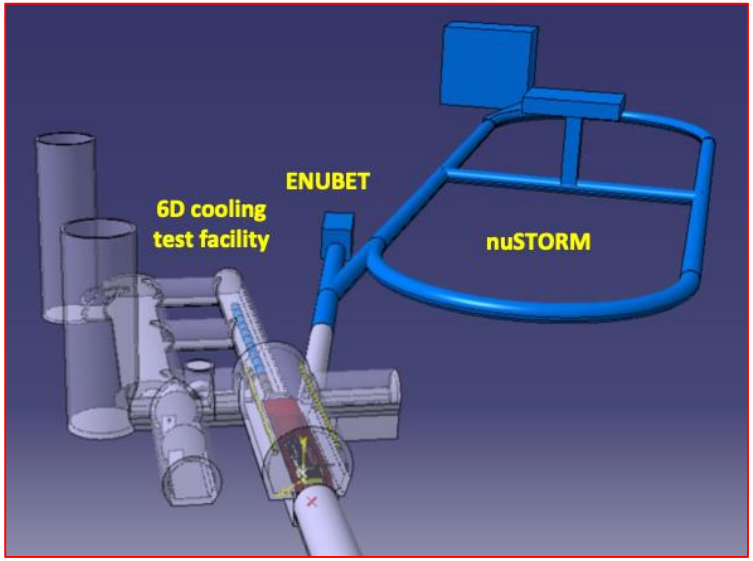
- **Partnership:**
  - ENUBET, nuSTORM, iMC



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- **Partnership:**
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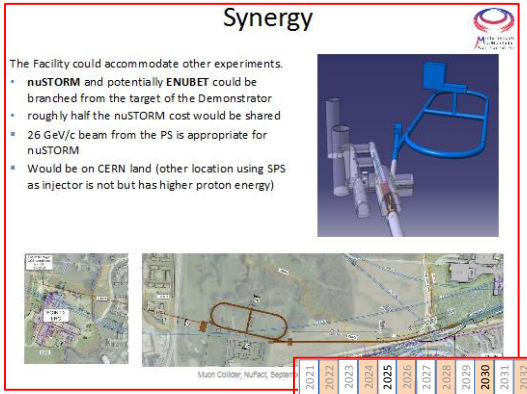
- **Exploitation:**
  - Now! Physics case, capability case, scientific and peer-group partnership case:
    - Foundations for endorsement of initiative at next ESPPU



Conclusions

- Clear synergies in high-power proton and muon development programmes
- Discussion still needed to understand how to exploit such synergies and enhance scientific o/p with R&D work done in support of muon collider development
- nuSTORM-4-MUC test facility:
  - nuSTORM synergies as part of MUC test facility – fantastic opportunity!
  - Pion yield in phase space of interest sufficient
    - Will now include in nuSTORM discussions