WG3 – Accelerator Physics Plans and Questions

Conveners:
Pavel Snopok, IIT, USA
Jingyu Tang, IHEP, China
Chris Densham, STFC, UK

Outline

- Plenary talk schedule
- Panel discussion on Monday
- Parallel talk schedule
- Questions for NuFact'15
- Summary

Plenary talks

- Tuesday, 9:30, MOMENT synergies with other projects (Jingyu Tang, IHEP)
- Tuesday, 10:00, MAP/MICE status (Mark Palmer, Fermilab)
- Thursday, 17:00, Current Status of the Fermilab Neutrino Beamlines (Craig Moore, Fermilab)
- Thursday, 17:30, Fermilab Proton Driver (Milorad Popovic, Fermilab)
- Saturday, 9:50, WG3 Summary (Jingyu Tang, IHEP)
- Saturday, 11:10, Future Accelerator-based Neutrino Physics in Asia (Takashi Kobayashi, KEK)
- Saturday, 11:50, Future Accelerator-based Neutrino Physics in America and Europe (Kenneth Long, Imperial College London)

Round Table on Monday

- 16:50-18:20 Round table: Developing an International Strategy toward a Neutrino Factory
  - 16:50-17:20 Physics potential of non-conventional neutrino beams: Neutrino Factory + (Prof. Alan Bross, Fermilab)
  - 17:20-18:20 Round table: Developing an International Strategy toward a Neutrino Factory
    - Speakers:
      Dr. Daniel Cherdack (Colorado State University)
      Prof. Takashi Kobayashi (KEK)
      Prof. Kenneth Long (Imperial College London)
      Dr. Mark Palmer (Fermilab)
      Prof. Jingyu Tang (Institute of High Energy Physics)

Monday Parallel: MICE

Time	Duration	Topic	Speaker
14:30	25+5’	MICE Construction	Dr. Colin Whyte (University of Strathclyde)
15:00	20+5’	MICE Step IV	Dr. Milorad Popovic (FNAL)
15:25	20+5’	MICE cooling demosntration preparation	Dr. Jean-Baptiste Lagrange (Imperial College/Fermilab)
15:50	25+5’	MTA status and progress (originally scheduled for Friday)	Dr. Derun Li (LBNL)

Tuesday Parallel I: MOMENT

Time	Duration	Topic	Speaker
11:00	20+4’	MOMENT as multiple neutrino sources	Prof. Ye Yuan (IHEP)
11:24	20+4’	Studies on pion/muon capture at MOMENT	Dr. Nikolaos Vassilopoulos (IHEP)
11:48	20+4’	Cooling structure at the MOMENT target	Mr. Jianfei Tong (IHEP)
12:12	20+4’	Protons after bombarding the target at MOMENT	Dr. Cai Meng (IHEP)
12:36	20+4’	Studies on charge selection at MOMENT	Mr. Yingpeng Song (IHEP)

Tuesday Parallel II: NF

Time	Duration	Topic	Speaker
14:30	25+5’	NuSTORM overview	Prof. Alan Bross (Fermilab)
15:00	20+5’	Decay ring design for long baseline NF a la NuMAX	Dr. Jaroslaw Pasternak (Imperial College/RAL-STFC)
15:25	20+5’	Neutrinos from pion beam line	Dr. Jean-Baptiste Lagrange (Imperial College/Fermilab)
15:50	35+5’	Muon acceleration for NF/MC	Dr. Alex Bogacz (Jefferson Lab)

Wednesday Parallel: Bright muon sources

Time	Duration	Topic	Speaker
11:00	20+5’	High-intensity and high-brightness muon beams	Dr. Pavel Snopok (IIT/Fermilab)
11:25	20+5’	Hybrid cooling channel	Dr. Diktys Stratakis (Brookhaven National Laboratory)
11:50	20+5’	Final cooling	Dr. Mark Palmer (Fermilab)
12:15	15’	Discussion	

Thursday Parallel I: joint WG1-WG2-WG3 session

Time	Duration	Topic	Speaker
11:00	25+5’	Impact of systematic uncertainties on DUNE	Dr. Daniel Cherdack (Colorado State University)
11:30	25+5’	Impact of systematic uncertainties on Hyper-K	Dr. Mark Hartz (Kavli IPMU (WPI), University of Tokyo/ TRIUMF)
12:00	25+5’	Prospects for reducing beam flux uncertainties with hadron production experiments over the next 10 years	Alessandro Bravar (University of Geneva)
12:30	25+5’	Prospects for precision of neutrino cross-section measurements over the next 10 years	Dr. Deborah Harris (Fermilab)

Thursday Parallel II: joint WG3-WG4 session

Time	Duration	Topic	Speaker
14:30	20+2.5’	PRISM	Dr. Jaroslaw Pasternak (Imperial College/RAL-STFC)
14:53	20+2.5’	Mu2e	Dr. Vladimir Nagaslaev (Fermilab)
15:16	20+2.5’	J-PARC high intensity neutrino beam	Dr. Tetsuro Sekiguchi (KEK)
15:38	20+2.5’	Muon beam line for COMET	Mr. Ye Yang (Kyushu University/ KEK)

Friday Parallel I

Time	Duration	Topic	Speaker
11:00	25+5’	ESS-SB	Dr. Marcos Dracos (IPHC-IN2P3/CNRS)
11:30	25+5’	MICE Trackers and Magnets (originally scheduled for Monday)	Dr. Melissa Uchida (Imperial College)
12:00 (joint with WG2)	25+5’	A novel neutrino beamline for the measurement of the electron neutrino cross section	Francesco Terranova (Univ. of Milano-Bicocca and INFN)

Friday Parallels II/III

Time	Duration	Topic	Speaker
14:00	25+5’	Latest results on in-beam W powder target at CERN	Dr. Ottone Caretta (RAL)
14:30	25+5’	Targets for high-intensity muon sources	Prof. Kirk McDonald (Princeton University)
15:00	25+5’	LBNF neutrino beams	James Strait (FNAL)

Time	Duration	Topic	Speaker
16:00	90’	WG3 Summary Preparation	All

QUESTIONS FROM NUFACT'14

Target/capture

- What is the path to a multi-MW target/capture system?
  - What are the options to mitigate energy deposition and shielding problems for multi-MW solenoid capture systems?
    - Depends on the power on target and proton energy
    - Use carbon target instead of liquid Hg
    - Preliminary He-gas cooled W-bead shielding has been proposed
  - Are there outstanding target handling issues for multi- MW designs? How do material properties evolve with time (radiation, strain, stress and temperature)?
    - Topics of ongoing studies (RaDIATE collaboration). Solid targets are much easier to handle than liquid. Magents are bigger issue than the target itself.
  - Is our modeling of pion production sufficiently complete to address proposed accelerator projects?
    - Uncertainties at 20% level were reported previously, no update at this NuFact.
  - While there is progress, we can't completely eliminate any of the questions above.
- New question: what are the limits of the carbon target.

  - See talks by Kirk McDonald and Ottone Caretta in the afternoon parallel session on Friday (14:00-15:30)
  - No talk on RaDIATE this time

Acceleration

- What is the optimum muon acceleration scheme for the Neutrino Factory with respect to feasibility, performance and cost (FFAG, RLAs with FFAG arcs, linac)?
  - Cost-saving concept: dual-use linac for the NuMAX scheme
  - Single FFAG type arc replacing multiple arcs in RLA
  - Studies are ongoing, item persists.

- Update on acceleration by Alex Bogacz in the afternoon session on Tuesday at 15:50

nuSTORM

- What is the best solution/design for the nuSTORM facility (performance, cost)?
  - Ongoing analysis of FFAG vs FODO solutions
  - FFAG ring: DFD triplet vs doublet in the straights, optimization
  - Item persists
- New questions:
  - How to generate short proton pulse for nuSTORM at CERN?
  - What is the location of the far detector at CERN?

- Talks by Alan Bross and Jean-Baptist Lagrange in the afternoon session on Tuesday (14:30-16:30)

Muon experiments

- What are the optimum beam designs for next generation muon experiments based on current and future proton beams?
- New questions:
  - What are the possible applications of (cooled) muon beams?
  - Can we design the capture/front end system, which would be beneficial for many experiments?

- Question persists
- No dedicated talks this time

ESS

- Is there a possible solution for an ESS driven proton driver for the SB and/or NF?
  - For SB the answer is definitely 'yes'
  - For low-energy nuSTORM at ESS:
    - Should it be based on a storage ring or a straight channel (like MOMENT)?
  - For NF:
    - How to provide short bunch structure after accumulator at ESS (do we need a compressor, or accumulator can be used as compressor)?

- See talk on ESS-SB by Marcos Dracos in the morning session on Friday (11:00)

Summary

- We have a full WG3 agenda
  - 27 parallel talks and 7 plenary talks
- We will address many questions inherited from NuFact'14
  - other questions will be discussed during the workshop and at the summary preparation session on Friday and modified based on the current state of affairs

Have a great workshop!