Workshop on High Intensity Secondary Beams Driven by Protons

Conveners: J. Galambos, S. Nagaitsev, M. Bai

April 17-20, 2013

BNL

See: http://www.bnl.gov/swif2013/

for agenda, presentations, etc.

B. Tschirhart liaison

Snowmass "Organization"

Energy Frontier	Intensity Frontier	Cosmic Frontier	Frontier Capabilities	Instrumentation Frontier	Computing Frontier	Education and Outreach Theory Panel

Capabilities to address this physics

Accelerator Capabilities	Non-Accelerator Capabilities

Energy Frontier Hadron Colliders	Energy Frontier Lepton and Gamma Colliders	High Intensity Secondary Beams Driven by Protons	High Intensity Electron and Photon Beams	Electron-ion Colliders	Accelerator Technology Testbeds and Test Beams

Our working group

Working Group Guiding Questions

- What are the intensity frontier secondary beams requirements ?
- What are the primary beam requirements to meet these needs?
- Can existing accelerator facilities meet some needs?
- What new or upgrades are needed to meet needs ?
- What accelerator and target R&D is needed ?

No judgment on the usefulness of any particular proposed measurement

Attendees

Conveners/liaison	4
Physics needs	14
Accelerator facilities, international	7
Accelerator facilities, US	12
System Experts	5
HEP lab representatives	3
Total	45

Questions 1 & 2

Questions 3-5

Conveners: J.Galambos (SNS), Sergei Nagaistsev (FNAL), M. Bai (BNL),
Intensity frontier liaison: R. Tschirhart (FNAL)
Kaon physics: L. Littenberg (BNL), S. Kettell (BNL)
Muon physics: B. Morse (BNL), B. Bernstein (FNAL)
Neutrino Physics: M. Bishai (BNL), B. Zwaska (FNAL), G. Karagiorgi (Columbia), K. Scholberg (Duke), J. Sptitz (MIT)
Neutron Physics: Y. Kamyshkov (U. Tenn.), A. Young (NCSU)
Proton EDM: Y. Semertzidis (BNL)
Muon Collider: M. Palmer (FNAL)
Polarized proton: A. Krisch (U. Mich., video)
International proton facilities: D. Findlay (ISIS), M. Seidel (PSI), T. Koseki (J-PARC), Y. Papaphilippou (CERN), S. Peggs (ESS), J. Tang (CSNS, video), R. Baartman (TRIUMF)
US proton facilities: R. Garnett (LANL), B. Weng (BNL), T. Roser (BNL), W. Fischer (BNL), D. Trbojevic (BNL), S. Holmes (FNAL), V.Lebedev (FNAL), I. Kourbanis (FNAL), B. Kephart (FNAL), N. Solyak (FNAL), M. Plum (SNS), J. Alonso (LBNL, video)
Target Experts: N. Simos (BNL), T. Gabriel (U.Tenn.), H. Kirk (BNL), K. Mcdonald (Princeton)
Machine Protection Expert: R. Schmidt (CERN)
HEP laboratory representatives: D. Li (LBNL), C. Adolphson (SLAC), J. Preble (J-Lab)

What are the secondary and primary beam needs?

- Individual presentations outlined the physics case and generally defined the secondary beam needs

	Secondary / tertiary beam requirements					Proton Beam Requirements *			
article eam	**Integrat-ed Flux**	**Purity**	**Energy**	**Spatial characteristics**	**Timing characteristics**	**Energy**	**Power**	**Timing Charact eristics**	**Comments**
hotons									
onvention-l Super eams:									
luon eutrinos ate		< 1% electron neutrinos	0.5-5.0 GeV	Pulsed-horn forward narrow beams	Duty factor < 10^{-3}	>~ 9 GeV?	>1MW	Duty factor < 10^{-3}	Classical super-beam technique for both short and long baselines.
nti-Muon eutrinos ate		< 5% electron neutrinos	0.5-5.0 GeV	Pulsed-horn forward narrow beams	Duty factor < 10^{-3}		>1MW	Duty factor < 10^{-3}	Classical super-beam technique for both short and long baselines.
luon torage ing beams:									
luon eutrinos		< 1% electron neutrinos	1.0-5.0 GeV	Forward narrow beams (skew optics)		>3-5 GeV, < 15 GeV	>1MW	Duty factor < 10^{-3}	Neutrino factory beams for both short and long baselines.
lectron eutrinos		< 5% electron neutrinos	1.0-5.0 GeV	Forward narrow beams			>1MW	Duty factor < 10^{-3}	Neutrino factory beams for both short and long baselines.

What are the Accelerator Capabilities

- Input from all the major proton beam facilities
- Separated the accelerator input into existing capabilities and (new + upgrade) plans
- Quantified the accelerator capabilities in terms of power, beam energy and timing characteristics (same as intensity frontier needs descriptions)
- Created another large table for these

	Energy	Power	Timing Characteristics	Accelerator Type	Comments
Present Capabilities					
LANSCE area A	800 MeV	80-120kW	120 Hz	linac	
LANSCE isotope production line	100 MeV	250 kW	40 Hz	linac	Isotope production
ISIS Present	800 MeV	200 kW	0.5 us x 40 Hz to TS-1, 0.5 us x 10 Hz to TS-2	70 MeV linac + RCS	160kW to TS1 + 40 kW to TS2, parasitic only without additional support
SNS Exisrting	935 MeV	1 MW	60 Hz x 700 ns	1 GeV linac + accumulator Ring	parasitic use only - beam on neutron target

Some Thoughts

- Getting the intensity frontier measurement needs in terms of primary beam requirements helps connecting with the proton capabilities.
- Intensity frontier activities at ongoing at FNAL, J-PARC, CERN
  - Muon targets at PSI, ISIS
- Plans for upgrades and future intensity frontier facilities
  - PX, J-PARC, CERN, Deadalus,
  - Farther in the future, not well defined, …: CSNS, ISIS, BNL, ESS
- There may be “niche” application of other existing facilities
  - e.g. DAR neutrino sources at very low duty factor high intensity sources (SNS, J-PARC)
  - LANL anticipates a ~ 1 MW (@ 1 ms x 100 Hz) in near future with no application

What Next?

- Summary write-up of the workshop
  - Aim to distribute a draft in 2 weeks
- Connect the measurement needs and accelerator capability “tables”
- Gather the ongoing R&D efforts and future needs
  - Target issues are at least as important as the accelerator development needs