Summary of Indo-US Accelerator R&D Working Group Meeting Fermilab, Aug 5th-6th 2004.

Editor: Shekhar Mishra, Fermilab
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Although the full Indian contingent could not reach, the first planned meeting of the Indo-US Accelerator R&D Working Group was held at Fermilab on Aug 5-6 2004. Scientist from Fermilab, SLAC, Jefferson Lab (Jlab), Argonne (ANL) and Brookhaven National (BNL) Laboratories met with the scientists from India. All the US members of the Indo-US Accelerator R&D Working Group participated in the meeting. A complete list of people who attended the meeting and the meeting agenda are attached as Appendix-I and Appendix-II. The topics that were discussed during the visit to India by US scientists in Nov 2003 and possible areas of collaboration between India and USA as discussed prior to this meeting are listed in Appendix-III.

The two days of presentations and discussions were centered on how to proceed with the collaboration on accelerator, detector and neutrino physics. The group heard summaries of U.S. accelerator activities at Fermilab, SLAC and ANL. There were focused accelerator R&D discussions on International Linear Collider (ILC), Fermilab Superconducting Proton Linac, Rare Isotope Accelerator, grid computing at Fermilab and emerging grid computing in India. The past, present and future Indian accelerator program and its strengths in accelerator development were also presented. There were group discussions on the ILC detector and neutrino physics experiments collaborations in both countries.

The group discussed the next steps needed to develop this collaboration. It was concluded that the most effective way to initiate the collaboration would be by the exchange of scientists and engineers. The following model was considered optimal to initiate such exchanges:

- US laboratories initially would accept say up to two Indian scientists at each of the collaborating US laboratories. The project and details of each visiting persons would be decided by mutual interest. It is hoped that this will be an avenue to involve working level persons and hence most of these visitors are expected to be junior scientists and engineers. The exchange visit period would be of say for minimum of 6 months each (although shorter length visit could still consider if need be) and there should be some overlap between the incoming and outgoing scientists at the various labs.

- US scientists will visit Indian laboratories for specific topics of interest to develop collaboration and building contacts, for example
    - Commissioning of Indus-II
    - Review of Indian accelerator projects
    - Holding Indo-US Accelerator Schools
    - Participation of US scientists in Indian conferences

Funding for the travel and stay of these scientists in the two countries was discussed. At present the US laboratories do not have funds to support the scientific exchange between India and USA. US laboratories can provide office space, administrative and computing support, but sources for living and travel expenses have to be found. It was decided that the Indo-US Accelerator R&D Working Group look into several sources of funding to support these visits.

There are two existing Indo-US agreements for scientific exchanges that can be used to fund this collaborative research. It is also possible that India may have other funding mechanism to support these activities.

1. The Indo-US Science Forum
2. India-DST and US-NSF Program for Collaborative Research Projects.

Action Item: Three proposals will be submitted to funding agencies. These three proposals are:

1. International Linear Collider (ILC): The ILC is the primary goal of the accelerator R&D collaboration. It is realized that to achieving this goal we must collaborate on other accelerator projects. We will submit a proposal to Indo-US Science Forum to support travel related to the Accelerator R&D. PI: Shekhar Mishra, USA and Vinod Sahni, India

2. High Enery Physics Detector R&D: India has already made significant contributions to High Energy Physics Detector R&D and construction as well as their installations in some labs in USA. India could therefore naturally participate in a International Linear Collider Detector collaboration and related R&D. We will submit a proposal to DST-NSF to support this activity. PI: Harry Weerts, USA and, (nominee to be decided by) India.

3. Neutrino Physics: Fermilab, BNL and many institutions India have considerable interest in Neutrino physics. We will submit a proposal to DST-NSF to support this activity. PI: Doug Michael, USA and (nominee to be decided by) India.

4. Fermilab and BARC/TIFR teams in India have considerable interest in astroparticle physics of which gamma ray astronomy is an important part. There is an opportunity to forge new partnership especially in the context of planned Indian Gamma Ray Telescope at Hanle, Ladhakh. PI: and (nominee to be decided by) USA and R Koul, India.

Appendix-I: List of Scientists who attended the first meeting of the Indo-US Accelerator R&D Working Group Meeting.

USA

Fermilab
Steve Holmes, Associate Director of Accelerator
Hugh Montgomery, Associate Director of Research
Robert Kephart, Division Head, Technical Division
Vicky White, Division Head, Computing Division
Paul Czarapata, Associate Division Head, Accelerator Division
William G. Foster, Head, Proton Driver R&D
Shekhar Mishra, Head, Linear Collider R&D
Andreas Kronfeld, Senior Scientist, Theory Department
Harry Weerts, Guest Scientists, Linear Collider Detector R&D

SLAC
David Burke, Assistant Director, Linear Collider

ANL
Kwang-Je Kim, Senior Scientist, Leader of Coordination of Accelerator Research
Jerry Nolen, Director of ATLA and Technical Director, Rare Isotope Accelerator

Jlab
Swapan Chattopadhyay, Associate Director of Accelerator

BNL
Milind Diwan, Scientist, Physics Department
Deepak Raparia, Scientist, Collider Accelerator Department

US Universities
Harry Weerts, Professor, Michigan State University
Doug Michael, Senior Research Associate, California Institute of Technology
Supriya Jain, Research Associate, Okalahoma University
Sanjib Mishra, Professor, University of South Carolina

India

Vinod Sahni, Director, Center of Advanced Technology
Dilip Bhawalkar, Ex-Director, Center of Advanced Technology
Ram Shivpuri, Professor, University of Delhi
Kirti Ranjan, Research Associate, University of Delhi

Appendix-II

Indo-US Accelerator R&D Working Group Meeting

Fermilab, Aug. 5th-6th 2004.
Hornet's Nest Conference Room, WH8X

(*The meeting will be available on ESNET with ID 824877. You can join this meeting also on phone by calling 510-883-7860 and 824877#. We have tested this with Cornell, Jlab, SLAC, ANL, TIFR (India), others can also join if you have a registered node to ESNET)*

Aug 5th Morning

Welcome, Hugh Montgomery, Fermilab, 10:15-10:30

Overview

- Prospect of Indo-US Collaboration, Shekhar Mishra, FNAL (10:30-11:00)
- Fermilab Accelerator R&D Plan overview, Steve Holmes, FNAL (11:00-11:30)
- SLAC Accelerator R&D Plan overview, David Burke, SLAC (11:30-12:00)
- Accelerator Activities at ANL, Kwang-Je Kim, ANL (12:00-12:30)

Working Lunch for visitors and speakers (12:30-1:30) Hosted by Steve Holmes: General Discussion

Aug 5th Afternoon

Linear Collider

- International Linear Collider R&D, Technology Options and collaboration, Steve Holmes, FNAL (2:30-3:00)

India Accelerator Activities

- Indian Accelerator Program: Present and Future, Vinod Sahni, CAT (3:00-3:30)

Break (3:30-4:00)

Simulation and Computing

- Grid Computing efforts in India, R. Shivpuri, Delhi University (4:00-4:30)
- Grid Computing at Fermilab, Vicky White, FNAL (4:30-5:00)

Indo-US Collaboration Discussion, All, (5:00-6:00)

Dinner at Chez Leon Hosted by Mike Witherell (Invited Guests)

Aug 6th

Accelerator R&D

- Proton Driver R&D and possible area of collaboration, G. W. Foster, Fermilab (11:00-11:30)
- Rare Isotope Accelerator, Jerry Nolen, ANL (11:30-12:00)

Lunch for Visitors & Speaker (12:00-1:15) hosted by Steve Holmes

Fermilab Tour (1:15 - 3:45)

- Fermilab Photo Injector Lab (Piot and Leo)
- SC Facility (Nikolay and Yuri)
- Accelerator Division Linac and MCR (Dan Johnson)
- Feynman Computing Center (Vicky White)
- CDF and D0 (Nigel, Kirti Ranjan)

Coffee (3:45-4:15)

Astrophysics

- India Gamma Ray Observatory, Vinod Sahni, (4:15-5:00)

Discussion on collaboration and future interactions (5:00-6:00)

Dinner hosted by Indian Scientist at Fermilab 7:30 P.M.-11:30 P.M.

Appendix-III

Although the full Indian delegation could not reach, the first planned meeting of the Indo-US S&T collaboration on Accelerator R&D working group was held on Aug. 5th-6th at Fermilab. Indian physicists currently participate in the D0 experiment at Fermilab. A rough count of people of Indian origin at Fermilab has yielded in 55 physicists and engineers.

We had a very successful visit to India during the Nov. 2003. A trip report of that visit was submitted to DOE. The US team was very impressed with the Indian technical ability and amount of R&D they are undertaking. Indian laboratories and industries quality looked to be at par with US.

- We had an opportunity to visit the Indus-II project at the Center of Advanced Technology (CAT). Indus-II is a 2.5 GeV synchrotron Light source built by India. The commissioning of Indus-II is going to start some time in 2005.
- India has contributed significantly to LHC. We visited the Superconducting Magnet production facility at CAT. CAT is building corrector magnets for LHC.
- India is also building detectors for CMS. India has sent several people to CERN to participate in LHC construction.
- India is contributing significantly to the LHC-CMS Grid computing project by its strong presence in IT world. Two institutions have got teir-2 status and seven institutes have been given Teir-3 status for LHC Grid computing.
- India has built two superconducting Linac boosters one at Delhi and another at Mumbai..
- India is pushing ahead to build an Indian Neutrino Observatory. Many view that this would be a world class facility and there are discussions to open this to international collaboration.
- India is planning a Gamma Ray Observatory at an altitude of 4200m and could be interested in collaboration.
- India has a vision to build other accelerators in India. In our discussions they are similar to SNS and Proton Driver with its full extension.
- India has large resources of well trained technical people.

We view the following areas where the two counties can collaborate.

1) Present neutrino experiment with a goal of collaboration and construction of future neutrino experiment in USA (MINOS, NOVA etc. and India (INO).
2) Indian scientists participating in SPEAR commissioning with a goal of US accelerator scientists participating in Indus-II commissioning.
3) Design and construction of new accelerator projects like Linac Coherent Light Source (SLAC), Rare Isotope Accelerator (ANL/MSU) and Super-conducting Proton Linac (Fermilab).
4) Developing super-conducting RF technology for accelerators (Fermilab/Cornell/ Jlab).
5) Linear Collider design and industrial production of its hardware.
6) GRID computing (Fermilab).

7) Development of Linear Collider detector design simulation software and detector R&D.
8) We view that for ILC design and construction these initial collaborations on other accelerator and experiments could be the foundation.
9) Students and Post-doc from India can contribute in a significant way to the ongoing programs as they have done at Fermilab in past 20 years.