

Indian Institutions and Fermilab Collaboration Management Meeting

August 22, 2011

3:30 PM – 6:00 PM

Place: DAE Headquarter, Old Yacht Club, Mumbai

Present:

India: Dr. S. K. Banerjee, Chairman, Atomic Energy Commission, Dr. R. K. Sinha, Director, BARC, Dr. R. Grover, Advisor, Department of Atomic Energy (DAE), Dr. P. D. Gupta, Director, RRCAT, Dr. R. K. Bhandari, Director, VECC and Chair, IC-IIFC, Dr. M. Barma, Director, TIFR, Dr. Ramamurthy, Scientific Advisor to Director BARC, Dr. P. Purniah, Head, International Studies Division, DAE, Dr. Pitamber Singh, Division Director BARC and POC for BARC to IIFC and Member Secretary IC-IIFC

Fermilab: Dr. P. Oddone, Director, Fermilab, Prof. Y-K. Kim, Deputy Director, Fermilab, Dr. R. Rubenstein, Assistant Director, Fermilab, Dr. C. S. Mishra, Project-X International Collaboration Coordinator and IIFC-US Collaboration Coordinator, Prof. S. Mishra, USC, IIFC-US Technical Project Coordinator for Neutrino Program

Discussion:

Dr. Banerjee welcomed the guests from Fermilab and thanked the outside-Mumbai people for attending on short notice. Dr. Oddone gave an invitation letter to Dr. Sinha to visit Fermilab.

Dr. Sinha described the Indian DAE accelerator plans for the next decade. He outlined the plans to build a ~ 1 GeV CW SRF proton linac at BARC for nuclear energy and a Spallation Neutron Source at RRCAT, both of them in collaboration with Fermilab. India wants to go in stages to ~ 1 GeV and several 10s of mA. The interaction with Fermilab has helped DAE to cut the needed time for these developments. There is currently not too much emphasis on the reactor part. India wants to develop a facility to build a SC proton linac, and is progressing on schedule.

Dr. Banerjee said that DAE and DAE laboratories managements have had much internal discussion on the collaboration with Fermilab in the development of high intensity proton accelerators for Indian domestic program. There is concurrence of all the directors that India must develop this collaboration and facilities for an SRF linac. Indian DAE is developing infrastructures for this at RRCAT, where design for a vertical and a horizontal test stand is underway. On the RF side significant capabilities exist at RRCAT and BARC. The Indian company Electronics Corporation of India has good manufacturing capabilities. In cryogenics there is expertise at RRCAT, VECC and BARC. In the Controls and Instrumentation BARC is very strong.

Dr. Banerjee noted the document “Collaboration on ‘Particle Accelerator Technology’ leading to the construction of High Intensity Proton Accelerators at Fermilab, USA and an Indian DAE Laboratory” by Shekhar Mishra, Project-X International Collaboration Coordinator, Fermilab May 30, 2011. He stated that in the long term, in 2-3 years, India should achieve parts manufacture meeting specifications for the R&D phase. The final deliverables for Phase III must be from Indian industry not from Indian labs; industry will not be initially capable in many areas, but the technology will be passed from labs to industry. Dr. Banerjee reiterated Dr. Sinha’s point that the DAE laboratories’ interaction with Fermilab has helped to leap-frog the Indian domestic program progress in many of these areas.

Dr. P. Oddone stated that Fermilab is very pleased with the India collaboration, and sees progress in India. Collaboration will help technically and also politically with the US approval process of the Fermilab projects. An international collaboration should help Fermilab in dealings with the US government. If LBNE goes ahead, it will pull Project X with it. Fermilab would like Indian ideas on governance of the project, and would also welcome Indian input to the Project X experiments.

Dr. Banerjee stated that a DAE project report is being written under the “Enabling Technology” for this collaborative program. India wants to enter into accelerator development. He said that he is quite confident that justifying these projects under the 12th plan as outlined earlier will not be difficult. India should be in position to supply hardware to the defined specification and get the Indian Industry to participate in this program.

Dr. Banerjee also stated that he has received the Executive Summary from Prof. Barma on the physics participation of Indian scientists in the Fermilab physics program. Prof. Barma informed those present about the highlights of that Report. A Fermilab-Indian Institutions coordinating committee and working groups were established by Dr. Oddone and Prof. Barma for India-Fermilab collaboration on physics. This collaboration, it was noted that there could be a continuous collaboration on Fermilab experiments MINOS -> NOvA -> LBNE -> Project X physics. Dr. Banerjee asked Prof. Barma to include the submitted program in the TIFR submission for the 12th plan.

Dr. Banerjee asked Dr. Grover if he sees any issue in proceeding with the accelerator and physics collaboration with Fermilab in the 12th plan under Mega Science Collaboration. Dr. Grover replied that he does not see any problem. Dr. Banerjee also asked everyone else present from the Indian side if they have any issues to bring up. Dr. Gupta stated that the schedule and magnitude of the Phase III deliverables seems to be quite ambitious. Dr. Banerjee suggested that India has to find a way to meet the Fermilab schedule.

Dr. C. S. Mishra requested Dr. Grover to officially respond to the Fermilab Project-X Governance Plan. Since India is Fermilab’s first international collaborator it is very important to develop this before starting serious collaboration discussion with other countries. He also

mentioned that Dr. Brinkman has requested Fermilab to develop such a plan. Dr. Grover enquired about the issues of budget contingency, responsibility of technical interface between components. Dr. Oddone replied that budget contingency in the DOE system will be Fermilab's responsibility. On the technical interface issue, Dr. Mishra replied that all the technical interfaces are defined by Fermilab Project Engineers and it is Fermilab's responsibility to insure that the technical interfaces are communicated to the collaborators. This is why Fermilab has been insisting that all the technical discussion and "Point of Contacts" go through Fermilab. Dr. Grover also asked about LBNE and the DOE program. Dr. Oddone replied that in his mind both LBNE and Project X are going in parallel but perhaps LBNE slightly ahead in schedule. He also said that it would help considerably with DOE if India formally joined these experiments. In the discussion, it was commented that it would be good to have the Governance Document agreed before the next Project-X collaboration meeting at Fermilab in Oct 2011. Dr. Mishra also noted that Fermilab has been waiting since April 2011 for Indian comments before submitting the governance and IIFC management document to DOE.

Dr. Mishra asked Dr. Banerjee about the Road Map for the 12th plan submission and approval process. Dr. Banerjee, following on the discussion with Dr. Grover, stated that first the "Enabling Technology" document will go to the Planning Commission. So far, all has gone well; perhaps it could have gone faster. Originally India wanted ADS for a subcritical system. Initially, India will build a subcritical test facility, using ~ 20 MeV protons. Different Indian labs have plans for different accelerators for various projects, all ~ 10 MeV/m; the same technology as Project-X could fill many demands. Dr. Banerjee outlined the Indian program 1) 400 KeV and 20 MeV proton accelerator under construction at BARC, 2) SNS at RRCAT for neutron scattering experiments; these will be beam line experiments rather than reactor experiment, 3) 30-50 MeV electron accelerator for various application including radiation scanning of containers, and 4) 1 GeV proton accelerator for BARC. He said that all the proton accelerators are being developed in collaboration with Fermilab and contribution to the Fermilab program is part of developing these programs in India.

Dr. Banerjee stated that a preliminary "approval" should come from the Planning Commission leading to introduction as a line item. After that it has to get written as a Detailed Project Report. An official approval should be expected in early- to mid- 2012.

Dr. Banerjee continued that the design was not frozen when the "Enabling Technology" document was prepared, so there are no details of in-kind contributions.

Dr. Sinha said that these R&D projects would take 6-7 years if carried out by India alone, which would be compressed to 2-3 years with Fermilab help. He also said that in the context of the Indian domestic program DAE should not depend on external sources for these elements. In this context if a foreign collaboration comes that is helpful to India, it will be welcomed because this would help shrink Indian projects both in time and money. Good progress is being made in the

R&D collaboration with Fermilab. India should look at the Phase III and formulate a Project Plan and understand the total scope of the Project.

Dr. Banerjee continued on the 12th plan discussion. He said that Indian 5-year project dates are 2012 to 2017, and 2017 to 2022. In a 5-year project, there can be a mid-term appraisal, allowing modification half-way through around 2015. Dr. Grover and Dr. Banerjee once again discussed the submission process. All senior management present agreed that India has made a good start and has a plan to move forward.

The meeting then discussed other topics of interest. 1) Holding a particle detector school in India, 2) Holding an International neutrino school in India, 3) Participation of Indian students in Fermilab's Accelerator PhD Program. DAE management is interested in all of these activities. Dr. Grover stated that HBNI would be interested in the Accelerator Ph.D. program.

At this time Dr. Banerjee left for other meeting.

Dr. Sinha, Dr. Gupta, Dr. Bhandari and Dr. Oddone signed the following documents

1. Addendum MOU V: "Fermilab and Indian Accelerator Laboratories Collaboration on 325 MHz RF Power Development for High Intensity Proton Accelerator"
2. Addendum MOU VI: "Fermilab and Indian Accelerator Laboratories Collaboration on 650 MHz RF Power Development for High Intensity Proton Accelerator"
3. Addendum MOU VII: "Fermilab and Indian Accelerator Laboratories Collaboration on Instrumentation and Control for High Intensity Proton Accelerator"
4. Addendum MOU VIII "Fermilab and Indian Accelerator Laboratories Collaboration on Accelerator Physics issues for High Intensity Proton Accelerator"
5. "Supplement 1 to Addendum III (to MoU) between Fermilab and Indian DAE Laboratories (BARC, RRCAT, VECC) and IUAC" (Note: Dr. Amit Roy, Director, IUAC, signed later)
6. Project Documents: CRYOMODULE TEST FACILITY- Overall Scope of Work and Proposed Areas of Responsibility.