

# **Management and Coordination Plan for the Indian Institutions Fermilab Collaboration Under the DAE-DOE Collaboration for the Project Annex I**

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## **Introduction**

In July 2011, the United States' Department of Energy (DOE) and India's Department of Atomic Energy (DAE) signed an Implementing Agreement (IA) on Discovery Science [1] that provides the framework for collaboration between DOE and DAE laboratories (in particular Fermilab, BARC and RRCAT) in the next-generation particle accelerator facilities, related physics and applied science experiments. Under the terms of the IA, the agencies have also signed Project Annex I for scientific collaboration on specific projects of DAE and DOE [2]. The Indian Institutions and Fermilab Collaboration (IIFC) will operate under these agreements as outlined in the DAE-DOE Discovery Science Collaboration high level management document [3].

For collaboration and coordination in Fermilab High Intensity Superconducting Proton Accelerator (HISPA) (aka PIP-II), the Indian Spallation Neutron Source (ISNS) and the Indian Material and Energy Science Accelerator (IMESA), the Indian Institutions and Fermilab Collaboration (IIFC) was established in February 2009 in the Addendum III [4] to the 2006 U.S. – India Memorandum of Understanding concerning Collaboration on R&D for Accelerator Physics and High Energy Physics [4]. Addendum III specifically targets collaborative development of High Intensity Superconducting Proton Accelerators superconducting radio frequency (SRF) R&D. Since that time the Addendum III has been augmented by Addenda V-VIII and Supplements 1 and 2 [4], which expand the collaboration to all aspects of HISPA. These specifically include development of the accelerator physics design for the linac, cavities and cryomodules at a variety of frequencies, srf infrastructure, rf power sources, instrumentation, controls and cryogenics. IIFC through Addendum IV [4] expanded the accelerator collaboration and have initiated participation in Fermilab neutrino physics and related experiments; MINOS, NOvA, LBNF and MIPP.

The IIFC organizational structure (Figures 1 and 2) is based on an integrated scientific and engineering team comprised of staff from both Fermilab and the Indian DAE Institutions, whose work will be carried out under the Project Annex I. It is described in the section “IIFC Organization Overview” below.

## **The Projects**

The Project Annex I identifies a number of specific joint DAE-DOE activities (projects).

Project Annex I focuses on the joint development of three accelerators in the United States and India, jointly being developed by DOE and DAE.

1. The construction, proposed by Fermilab, of a Superconducting Radio Frequency linac to support the High Intensity Physics mission of the US-DOE
2. DAE laboratories (RRCAT and BARC) in collaboration with other DAE laboratories have proposed
  - a. Physics Studies and Enabling Technology Development for Ion Accelerators, a CW SRF Linac (BARC, Vizak)
  - b. High Power Proton LINAC Based Spallation Neutron Source (RRCAT, Indore)

Fermilab will coordinate the development of HISPA (aka PIP-II) for the DOE with national and international collaborators including DAE laboratories. Similarly BARC and RRCAT will coordinate the development of their respective accelerators within DAE and with Fermilab and other possible international collaborators.

Each Project Manager will appoint a minimum of one Deputy Project Manager (DPM) for the full project under Project Annex I. The DPM will coordinate the details of the project activities with the Sub-Project Managers and will co-chair the technical meetings of the Sub-Project Managers. The blue box in Figure 1 corresponds to the activities identified in Project Annex I that the two sides initially plan to undertake. The “Project Annex I Management and Coordination” structure is designed to coordinate the Fermilab projects with parallel Indian projects. Within the blue (Accelerator: Project Annex I) box there is a set of corresponding U.S. DOE and Indian DAE programs.

## **Principal and Technical Coordinators**

The IA outlines the high level management structure for managing the work done by collaborating laboratories. Figure 1 shows the high level management structure of the IIFC. The IA and Project Annex I define the roles, responsibilities, authorities and accountabilities (R2A2) of the Principal and Technical Coordinators. It is also described in Ref [3].

The Technical Coordinators are assisted by the IIFC Coordination Committee (IIFC-CC) (Fig 2). The IIFC-CC members are appointed by the Technical Coordinators with the concurrence of the Principal Coordinators. The IIFC-CC provides management oversight and defines tasks of the high-level collaborative program.

Subsequent sections of this document outline the R2A2 of the rest of the organization as shown in Figures 1 and 2. The collaborating institutions’ line organizations are responsible for program implementation and personnel assignments to the IIFC. The IIFC-CC delegates detailed oversight and coordination of technical work under this collaboration to the IIFC Coordination Teams (IIFC-CT).

## **IIFC Organization Overview**

The structure of the IIFC is shown in Figure 2. The Technical Coordinators appoint members of the IIFC-CC, with the concurrence of Principal Coordinator, under which there is an IIFC Coordination Teams (IIFC-CT) for Accelerators. One should view Figure 2 as showing two separate organizations linked only at the IIFC-CC, where there is separate line management under the Fermilab Director and the DAE Director, coupled by the IIFC coordination structure. The IIFC has been established in order to effectively coordinate and manage the development of technical information and the construction and commissioning of projects at Fermilab and in India. The roles, responsibilities, authorities and accountabilities of the various IIFC members are described in the subsections below.

### **IIFC Coordination Committee**

The IIFC-CC is a joint Fermilab-Indian Institutes committee providing high level technical management oversight and defining the high level collaborative program. The DAE/DOE Technical Coordinators are the members of this committee and serve as co-chairs. The IIFC-CC will meet once a month. More specifically this includes:

- Initiate contacts between the collaborating institutions and generally promote the collaboration;
- Define the scope of work, and agree upon deliverables, between Fermilab and the Indian Institutes;
- Assure that all agreed upon deliverables, and associated working arrangements, are understood by all parties and appropriately documented and agreed to within the Project Annexes, Addenda, Supplements and Project Documents;
- Coordinate institutional task assignments

Fermilab Membership: Nigel Lockyer (Chair), Joe Lykken, Shekhar Mishra, Steve Holmes, James Strait, Hasan Padamsee, Sergei Nagaitsev, and Regina Rameika

Indian Institutions Membership: Pitamber Singh, P. D. Gupta,...

Accountable to: Principal Coordinators, DAE/DOE laboratories Director(s)

### **IIFC Coordination Team**

The IIFC-CT is a joint Fermilab-Indian Institutes committee providing oversight and coordination of the work to be performed under the Annex I. The IIFC-CT will meet bi-weekly. More specifically this includes:

- Oversee and coordinate the technical design and development effort, including
  - Technical components
  - Resources
  - Schedule
  - Scope

- Assist the Sub-project Managers (SPMs) in communications or technical issues;
- Alert the Project Management Team (next section) to issues related to technical, cost, or schedule goals, and the need for design or technical reviews;
- Assist the SPMs in identifying and securing required human resources, with the appropriate line management organizations;
- Assist the Project Engineers in communicating technical and engineering requirements and standards (such as those given in references [5,6]) to collaborating institutions, and demonstrate equivalence when differences exist;
- Facilitate cooperation between India and other Fermilab collaborators on specific projects as applicable

Fermilab Membership:

IIFC-CT: Shekhar Mishra (Chair), Don Mitchell, Valerie Lebedev, Vyacheslav P Yakovlev, and Ralph Pasquinelli

Indian Institutions Membership:

Accountable to: IIFC-CC

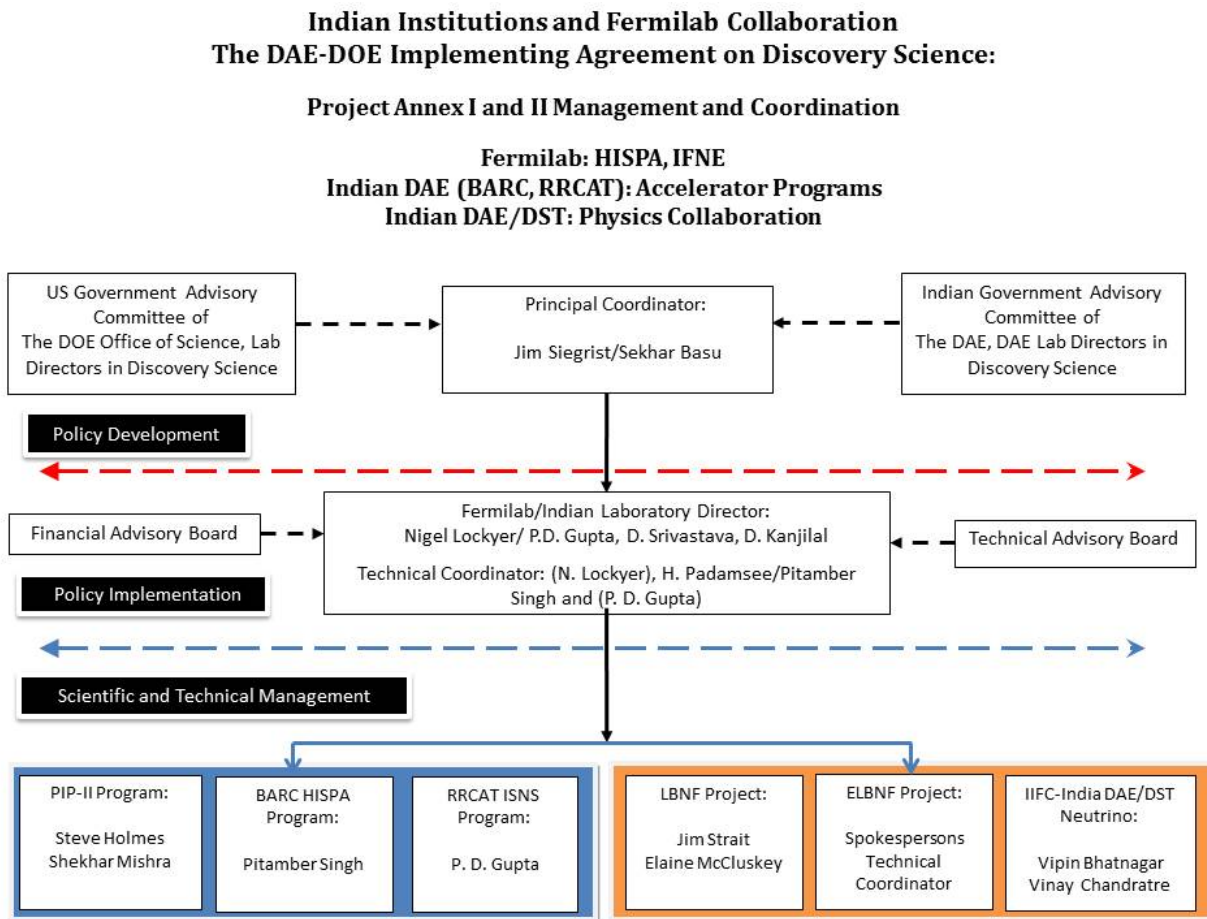


Fig. 1 Project Annex I Management and Coordination

## **Project Management**

The Project Management of each project is the responsibility of the host laboratory. The Fermilab and DAE projects will each be directed by a Project Management Team (PMT) with responsibility for coordinating and managing the projects. The technical program of the project will be managed by Project Manager, a Deputy Project Managers, International Coordinator, a Project Engineer, and several Sub-Project Managers, referred as Technical Project Management Team (TPMT). The TPMT, under the guidance of the Project Manager, will be responsible for the management and coordination of project activities described in Project Annex I. The Project Managers/Directors are the operational managers of the IIFC, under the Project Annex I. They operate on behalf of the Principle and Technical Coordinators, and the Director(s) of the collaborating laboratories. In carrying out these responsibilities the Project Director/Manager may delegate responsibility and/or receive assistance from their Deputies as required, and is assisted by the IIFC Coordination Team.

The TPMT is comprised of the relevant line management and the project management organizations at the host laboratory. The PMT holds overall responsibility for the development and execution of these projects and programs in a coherent manner including those activities undertaken as part of the IIFC. Specific responsibilities include:

- Establishment of project goals including technical, cost, and schedule goals
- Management of scope, cost, and schedule
- Allocation of resources
- Establishment of priorities, with the IIFC-CC
- Monitoring of progress
- Adjustments to goals as required

Accountable to: Laboratory Director

Fermilab Project Management Team: Chief Accelerator Officer, Project Manager, Deputy Project Manager (HISPA); Chief Technology Officer, Chief Research Officer

India Project Management Team:

### **Project Manager/Director (HISPA)**

The Project Manager/Director holds authority and responsibility for organization, management, and execution of specific project including:

- Develop a complete project Conceptual Design, followed by a Technical Design appropriate for construction;
- Develop and manage the associated R&D Program;
- Establish the project baseline including the scope, and associated technical performance, cost, and schedule goals;

- Manage the project construction phase;
- Coordinate with the host laboratory to assure that resources are appropriately identified and managed;
- Coordinate efforts of national and international partners;
- Coordinate all required project documentation and reporting;

Accountable to: Laboratory Director or designee

Fermilab Project Manager/Director: Steve Holmes (HISPA)

India Project Management:

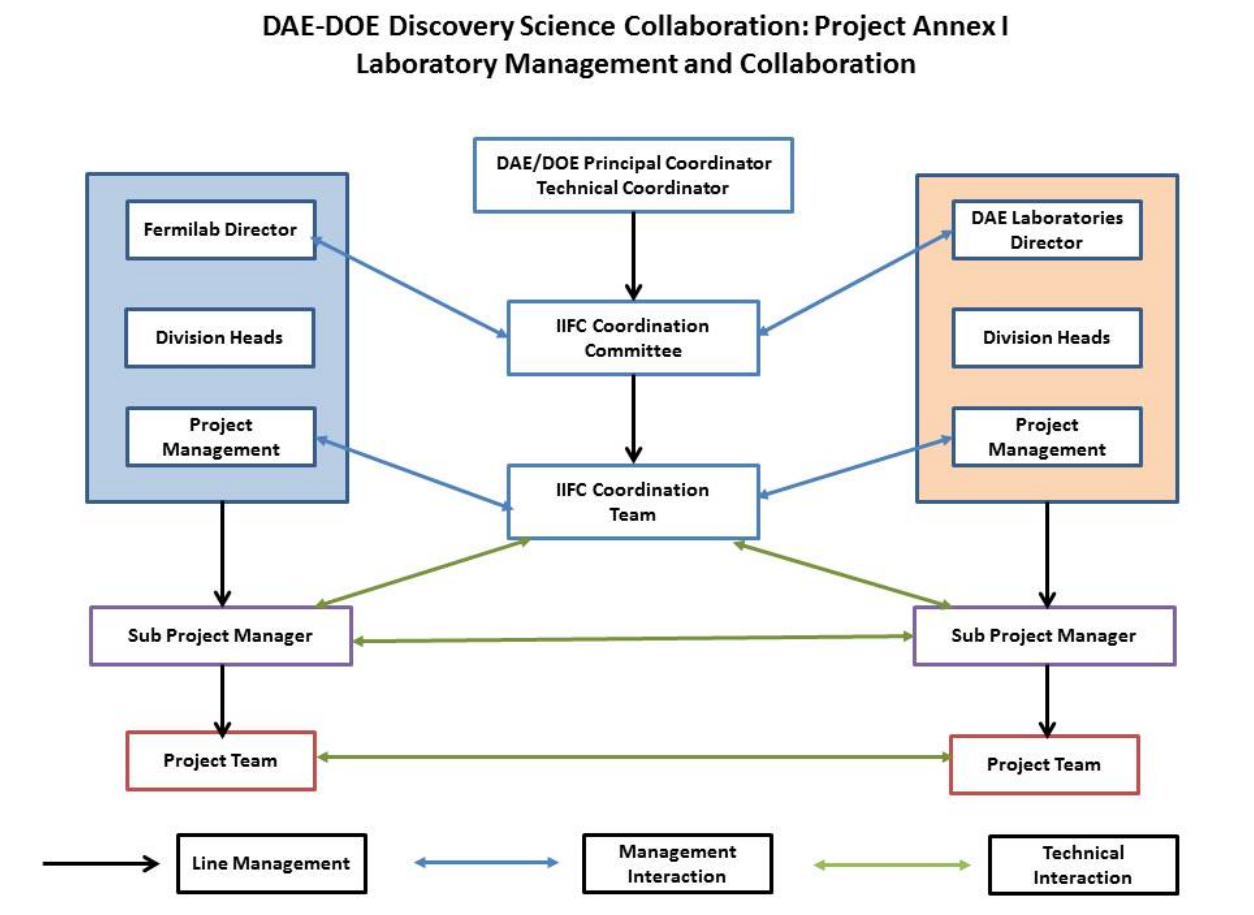


Figure 2: Laboratory Specific coordination of the Projects

**Deputy Project Manager/International Coordinator (HISPA):**

Fermilab HISPA (aka PIP-II) Project Manager will appoint a Deputy Project Manager and International Coordinator with specific responsibility for the day to day operation of the IIFC under Project Annex I. The specific authorities and responsibilities of the Deputy Project Manager/International Coordinator for IIFC include:

- Assist the Technical Coordinator and Project Manager/Director in developing the strategy for Indian deliverables.
- Under the direction of Project Manager and Technical Coordinator, responsible for successful R&D, design, fabrication, and delivery, with an initial focus on retiring technical risk associated with these contributions.
- Provide scientific/technical coordination of all HISPA and construction deliverables from collaborating Indian institutions, under the guidance and direction of the Project Manager and Technical Coordinators, and with the assistance of the Project Engineer.
  - Assure that technical and interface requirements for deliverables are adequately specified, documented and communicated.
  - Coordinate the development of Indian component designs, interface specifications, procurement and fabrication plans, and infrastructure requirements, in conformance with technical requirements and applicable safety and building code standards.
  - Arrange and coordinate scientific/technical meetings with collaborating Indian institutions.
  - Organize reviews of work at the appropriate stages to assure successful development and delivery of Indian components.
  - Interact with and assist the Fermilab Sub-Project Managers to assure effective communications and interactions with their Indian counterparts.
  - Establish and monitor budgets and schedules for delivery of Indian components.
- Develop Project Documents, including deliverables, budget and schedule for review and concurrence of the Project Manager and approval by the Technical Coordinators.
- Arrange for meetings of the Indian Institutions Fermilab Collaboration Coordination Committee (IIFC-CC) and Coordination Team (IIFC-CT), Bi-Annual Collaboration Meeting, and Annual review of IIFC for the assessment of the activities, status and preparation of the next year's plan, with concurrence of the Project Management and Technical Coordinator. Assist the Technical Coordinator in preparing and finalizing a written report of each meeting.
- Assist the Principal Coordinator and Technical Coordinator in the execution of his/her duties under the DOE-DAE Implementing Agreement, Project Annex I.
- Assist the Project Managers, Principal Coordinator and Technical Coordinator in the execution of their duties under Annex I of the Implementing Agreement.

Accountable to: Project Manager/Director

Fermilab Deputy Project Manager/International Coordinator: Shekhar Mishra (HISPA)

India Project Management:

## **IIFC Sub-Project Managers**

Each project under the IIFC (HISPA, ISNS, and IMESA) will have several Sub-Projects. Each Sub-Project will have two Sub-Project Managers, one appointed by the Fermilab Project Director and the other by the DAE-established Indian Committee for the Indian Institutions and Fermilab Collaboration (IC-IIFC). Each IIFC Sub-Project Manager (SPM) will hold overall responsibility for technical management of the subproject, under the authority of the Fermilab Project Manager or Deputy Project Manager, and will communicate progress periodically to the Deputy Project Manager. The Fermilab and DAE laboratories Sub-Project Manager will also serve as a single point of contact for the technical matters under that Sub-Project.

The IIFC Sub-Project Managers hold the overall responsibility for the development and execution of the approved plan and deliverables as agreed upon with the Technical Coordinator and Project Management Teams. The SPMs will interface with their respective subproject counterparts to:

- Develop the detailed scope of work and plan deliverables, based on higher level guidance provided by the IIFC-CC, and in consultation with the IIFC-CT, SPM and Point of Contact;
- Manage the supporting technical program;
- Each pair of SPMs will meet weekly to discuss technical progress and issues. The Deputy Project Manager should be informed of all these meetings. The SPMs will be responsible for writing and meeting notes should be forwarded to IIFC-CT.
- Communicate to the TPMT and IIFC-CT of any technical or resources issues identified in interactions between the Fermilab and Indian teams;
- Integrate the work being done in Indian Institutions into the overall program;
- Maintain contact with the appropriate sub-Project SPM;
- Communicate to the TPMT requests for changes – either in scope of work or schedule;
- Keep the IIFC-CT and Technical Project Management Team informed about technical, cost, or schedule issues and risks, and/or anticipated resource needs;
- Provide technical progress reports

Accountable to: Deputy Project Manager (HISPA)



## Present Membership for the Project Annex I

DAE-DOE Discovery Science Collaboration	DAE- Annex I	Fermilab Annex I
Principal Coordinator		Jim Siegrist
Technical Coordinator		Nigel Lockyer
Project Manager		Steve Holmes
Deputy Project Manager, International Collaboration		Shekhar Mishra
<b>Sub-Projects</b>	<b>Indian-DAE Sub Project Manager</b>	<b>Fermilab Sub-Project Manager</b>
Accelerator Physics	Pitamber Singh	Valeri Lebedev
Source/RFQ	BARC	Alexander Shemyakin
MEBT/HEBT Magnet	Sajnay Malhotra, BARC	Michael Tartaglia
Half Wave Resonator	BARC	Donald Mitchell
SSR1 Cavity	P. N. Prakash, IUAC	Leonardo Ristori
SSR2 Cavity	BARC	Leonardo Ristori
SSR Cryomodule	BARC	Tom Nicol
650 MHz, b = 0.61 Cavity	Sumit Som, VECC	Charles Grimm
650 Mhz, b = 0.92 Cavity	Avinash Puntambekar, RRCAT	Charles Grimm
650 MHz Cryomodule	Prashant Khare, RRCAT	Tom Nicol
Instrumentation (BPM, Loss Monitor , and interface to all instrumentation in the subsystems)	BARC	V. Scarpine
Controls	BARC	James Patrick
Solid State RF 325 MHz	Manjiri Pande, BARC	Ralph Pasquinelli
Solid State RF 650 MHz	P. R. Hanurkar, RRCAT	Ralph Pasquinelli
RF Protection	Gopal Joshi, BARC	P. Prieto
LLRF System	Gopal Joshi, BARC	Brian Chase
Cryogenic Plant and Distribution	Mukesh Goel, BARC	A. Klebaner
SRF Infrastructure	Satish Joshi, RRCAT	Allan Rowe
Vertical Test Stand	Satish Joshi, RRCAT	Alex Melnychuk
Horizontal Test Stand	Pradeep Kush, RRCAT	Andy Hocker
Cryomodule Test Stand	Vinay Mishra, BARC	M. J. White
Team Center/Database	Murthy, BARC	Tony Metz

## ***References***

[1] <http://iifc.fnal.gov/MOU/Discovery%20Science.pdf>

[2] In Progress between DAE and DOE

[3] DAE-DOE Discovery Science Collaboration Governance Plan for the Indian Institutions Fermilab Collaboration under Project Annex I

[4] <http://iifc.fnal.gov/MOU.html>

- “Fermilab and India Accelerator Laboratories Collaboration on High Intensity Proton Accelerators and SRF Infrastructure Development” (Signed: Feb 10, 2009)
- “Collaboration on R&D for Various Accelerator Physics and High Energy Projects” (Signed Jan 9, 2006)
- Supplement I to Addendum III (to MOU) between Fermilab and Indian DAE Laboratories (BARC, RRCAT, VECC) and IUAC.

[5] Fermilab Engineering Manual

[http://www.fnal.gov/directorate/documents/FNAL\\_Engineering\\_Manual\\_REVISED\\_070810.pdf](http://www.fnal.gov/directorate/documents/FNAL_Engineering_Manual_REVISED_070810.pdf)

[6] Fermilab ES&H Manual

[http://www-esh.fnal.gov/pls/default/esh\\_home\\_page.page?this\\_page=800](http://www-esh.fnal.gov/pls/default/esh_home_page.page?this_page=800)