Fermilab PIP-II R&D Plan
with Indian Institutions
CY2015-CY2018

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**PIP-II R&D Goals:**

- **US Collaboration**
  - Development of PXIE (~25 MeV) Test Linac
    - Source, LEBT, RFQ, MEBT, HWR CM, SSR1 CM
  - Indian Institutions and Fermilab Collaboration (IIFC)
    - Development and testing of SSR1 Cryomodule
      - Testing with beam at PXIE
    - Development and testing of one HB650 MHz Cryomodule
      - Testing with the Cryomodule Test Facility at Fermilab
    - Development LB650 Dressed Cavities.
      - Testing with Horizontal Test Stand
    - Development of SSR2 Cavities.
      - Testing with Vertical Test Stand

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Areas of R&D International Collaboration

High Power Tested Dressed SRF Cavity
- $\beta = 0.22$: IUAC & VECC
- $\beta = 0.47$: BARC & IUAC
- $\beta = 0.61$: VECC (Europe)
- $\beta = 0.92$: RRCAT
- 325 MHz RF Power: BARC
- 650 MHz RF Power: RRCAT

Non SRF components (BARC)
- Cryogenic Plant and Distribution
- RF
  - LLRF
  - Protection System
- Instrumentation: BPM, BLM
- Controls
- MEBT Magnet
LB650 Dressed Cavities

- IIFC with VECC as the lead laboratory, has worked to develop a preliminary LB650 5-cell cavity design.
  - It is planned that
    - LB650 Dressed Cavities will be built by VECC/DAE
    - Two Dressed LB650 Cavities will be produced by IIFC
    - High Power tests of the Dressed Cavity will be done at Fermilab
  - A minimum of two Dressed cavities will be needed to certify the design by Q4 CY2018.
SSR2 Cavity

- IIFC with BARC as the lead laboratory will work to develop a SSR2 cavity design.
  - It is planned that
    - Fermilab will provide Nb for two SSR2 Cavities to BARC
    - SSR2 Cavities will be built by BARC
    - Processing and Low Power tests of the SSR2 Cavities will be done at Fermilab
  - A minimum of two cavities will be needed to certify the design by Q4 CY2018.
Horizontal Test Stand

FNAL:
- Cryogenic for HTS at FNAL July 16/17
- Install 1st Dressed Cavity at FNAL Sept 17

DAE:
- Two 40kW RF Dec 16
- LLRF/RF Protection Oct 16
- Control System Jan 17
- Integration with cryostat at RRCAT July 17
- Integrate HTS-2 delivered at Fermilab Aug 17
System Test of SSR1 CM and RF Power with Beam

SSR1 CM May 2017
Solid State RF Jan 2018
LLRF/RF Protection Jan 2018
Control System Jan 2018
Cryogenic for SSR1 Jan 2018
Integration with CM July 2018
(completion dates shown)
Integrated Test of HB650 Cryomodule and RF Power

Cryogenic Distribution Box IIFC

Cryogenics (FNAL)

Instrumentation (FNAL)

Axillary Systems (FNAL)

FNAL

FNAL

FNAL

IIFC

IIFC

IIFC

FNAL

FNAL

FNAL

FNAL

FNAL

FNAL

40 kWatt (RRCAT)

40 kWatt (RRCAT)

40 kWatt (RRCAT)

40 kWatt (RRCAT)

40 kWatt (RRCAT)

Solid State RF April 2018
LLRF/RF Protection April 2018
Control System April 2018
Cryogenic for April 2018
Integration without CM July 2018
HB650 CM Sept 2018

IIFC LLRF (FNAL/BARC)

IIFC RF Protection (FNAL/BARC)

Integration and Controls (FNAL)

Q4-CY2018 CM Cold With RF

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4/16/2015
High Level Scheduling Documents: Shekhar, Steve, Hasan, Nigel, IIFC

Fermilab PIP-II R&D Plan: CY2015-CY2018

Edited by Shekhar Mishra
(On behalf of the PIP-II Management and Fermilab PIP-II Sub-Project Managers)

PIP-II, Fermilab
Teamcenter #ED0003026

Joint Project Document
For the
Research and Development Phase of the
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Teamcenter #ED0003026

1. Prologue
This document has been prepared to describe scientific, technical and financial details of the PIP-II RD&D as described in detail and agreed in the VECC and IUAC addendum MOU. These documents were brought under the “India and United States of America and Cooperation in the Area Accelerator Discovery Science” which was Institutional MOU on Jan 16, 2015.