

CDR write-up

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PIP-II meeting

Fermilab

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Major requirements

- CDR will have the same structure as the RDR
- The RDR (PIP-II document 1) should be considered as template for the CDR
 - ◆ Use styles (Figure captions, Table captions, etc.) Avoid direct formatting
- As result of your work, deliver just your Chapter with short list of references to literature at the bottom.
- Avoid using automatic references (literature, figures, tables). It will be done later at combining all materials to a single document
- For minor editions the tracking has to be on
 - ◆ It is not really required for major editions but still would be helpful.

Color coding used below

Minor upgrade

Significant effort

Major time consuming upgrade

Table of Contents

1. PIP-II PERFORMANCE GOALS AND SUM (Update is required, Not all details are clear yet, Lebedev & Holmes)
 - 1.1. Design Criteria and Considerations
 - 1.2. Options Considered
 - 1.3. Overview of PIP-II
2. ACCELERATOR FACILITY DESIGN
 - 2.1. 800 MeV Linac
 - 2.1.1. Technical Requirements (Minor editions, Lebedev)
 - 2.1.2. Warm Frontend (Minor editions, Prost)
 - 2.1.3. SC Linac - Superconducting Linac (Minor editions, Lebedev)
 - 2.1.4. Beam Dynamics in the SC Linac (Add plot with B^2dL for solenoids, add period layouts used in simulations, add discussion of operation with failed cavities and cryomodules, Saini)
 - 2.2. Linac-to-Booster Beam Transport
 - 2.2.1. Particle Loss and Limitations on Beam Transport Parameters (Minor editions, Lebedev)
 - 2.2.2. Linac-to-Booster Transfer Line (Update text to the latest design, describe beam switching in sufficient details, discuss compatibility with beam to Muon Campus, A. Vivoli)
 - 2.2.3. Beam Based Linac Energy Stabilization (Comparatively minor editions, Lebedev)
 - 2.3. Booster Modifications
 - 2.3.1. Technical Requirements and Scope (OK)
 - 2.3.2. Booster injection (OK)
 - 2.3.2.1. Present Booster Injection (OK)
 - 2.3.2.2. Conceptual Design of Booster Injection at 800 MeV (Significant effort to come to the final proposal, New text, D. Johnson)
 - 2.3.2.3. Phase Space Painting (add details of corrector painting at the line end, V. Lebedev)
 - 2.3.3. Beam Acceleration in the Booster (Minor editions, Lebedev)

- 2.3.4. Booster Longitudinal Impedance (Minor editions, Lebedev)
- 2.3.5. Transition Crossing (**Considerable work before final text can be written, Lebedev**)
- 2.3.6. Modifications to the Magnet System Required for 20 Hz Operation (Read and edit if required, Pellico)
- 2.3.7. Beam Instabilities (Significant update, Burov)
- 2.4. Recycler and Main Injector Modifications
 - 2.4.1. Technical Requirements and Scope (Read and edit if required, Kourbanis)
 - 2.4.2. Slip-stacking in Recycler (Read and edit if required, Kourbanis)
 - 2.4.3. Acceleration in the MI (Read and edit if required, Kourbanis)
 - 2.4.4. MI transition Crossing (Read and edit if required, Kourbanis)
 - 2.4.5. Beam Stability in the Recycler and MI (Significant update, Burov)
 - 2.4.6. Electron Cloud Mitigation (Update to the present experience, Kourbanis or his assignee)
- 3. DESIGN CONCEPTS OF MAJOR SUBSYSTEMS
 - 3.1. SC Linac
 - 3.1.1. Warm Frontend
 - 3.1.1.1. Ion Source, (OK)
 - 3.1.1.2. LEBT - Low Energy Beam Transport (Update to the present status, Prost)
 - 3.1.1.3. RFQ - Radio-Frequency Quadrupole Accelerator (Add RF power and frequency stabilization, Steimel)
 - 3.1.1.4. MEBT - Medium Energy Beam Transport (Update to the present status, Shemyakin)
 - 3.1.2. Superconducting Accelerating Structures
 - 3.1.2.1. Half-Way Resonator (HWR) Cryomodule (Update to the present status, Add solenoid parameters in accordance with corresponding FRS, Ostroumov)
 - 3.1.2.2. Single Spoke Resonator I (SSR1) Cavities and Cryomodules (Update to the present status, add resonance control, Ristori)
 - 3.1.2.3. Single Spoke Resonator II (SSR2) Cavities and Cryomodules (**Bring to the same level of details as for the SSR1, Yakovlev**)
 - 3.1.2.4. Medium-beta Section (LB650 and HB650) Cryomodules (**Bring to the same level of details as for the SSR1, Yakovlev**)
 - 3.1.2.5. The 325 MHz and 650 MHz Main Couplers (Update to the present status, Kazakov)

- 3.1.2.6. Measures Aimed at Reduction of RF Loss in Walls of SC Cavities (Update to the present status, Grassellino)
 - 3.1.3. RF Power and Low Level RF
 - 3.1.3.1. RF Power (Update to the present status. Make consistent with FRSs, Pasquinelli)
 - 3.1.3.2. Active suppression of Microphonics and Lorentz Force Detuning (Update to the present status, Schappert)
 - 3.1.3.3. Low Level RF (Update to the present status, Chase)
 - 3.2. Booster
 - 3.2.1. Radiation Shielding of the Booster Injection Absorber (Update to the present status, Rakhno)
 - 3.3. Main Injector and Recycler
 - 3.3.1. Hardware for Main Injector Transition Crossing (Update to the present experience, Kourbanis or his assignee)
 - 3.3.2. RF System Modifications (Update to the present experience, Kourbanis or his assignee)
 - 3.4. Cryogenics (Major update. For now it looks as the operation for both pulsed and CW has to be supported at high level of efficiency. Klebaner)
 - 3.5. Instrumentation (Major upgrade, it is time to add more specific, BPM types, sketches, sensitivities. Scarpine, Looks like additional people are required)
 - 3.6. Controls (Update to the present status, Patrick)
 - 3.7. Radiation Safety and Radiation Shielding Design (OK)
 - 3.8. Machine Protection System (Update to the present status, Make consistent with FRS, A. Warner)
4. SITING AND CONVENTIONAL FACILITIES (Major upgrade, bring to the present status, S. Dixon)

REFERENCES

APPENDICES

- I. Beam transport to the upgrade of μ -to-e experiment, A. Vivoli
- II. ...

Contributors

1. Burov
2. Chase
3. Dixon
4. Grassellino
5. Holmes
6. Johnson
7. Kazakov,
8. Klebaner
9. Kourbanis
10. Lebedev
11. Ostroumov
12. Pasquinelli
13. Patrick
14. Pellico
15. Prost
16. Rakhno
17. Ristori
18. Saini
19. Schappert
20. Shemyakin
21. Steimel
22. Vivoli
23. Warner
24. Yakovlev (+SRF
department)