

Muon Accelerator Program Monthly Status Review

July 19, 2013

Outline



- L2 Manager Updates
- Modeling cooling in HPRF cavities including atomic physics processes (R. Samulyak)

L2 MANAGER STATUS REPORTS

Monthly L2 Status Report - WBS: 04.02 – 6D Cooling Demonstration

19 July 2013
Presenter: Pavel Snopok



<p><u>Milestone Status (Progress)</u></p> <ul style="list-style-type: none">• Feasibility Phase I through FY15:<ul style="list-style-type: none">– Development of a plan for a MAP 6D cooling bench test.– Close coordination with D&S and TD activities.– Development of a suite of experimental options.– Report during FY15.	<p><u>Resource Conflicts, Plan Changes and Issues</u></p> <p><u>Late Items</u></p> <ul style="list-style-type: none">• 6D emittance @ nuSTORM (the injection line is being updated for higher energy pions)
<p><u>Summary of Previous Month</u></p> <ul style="list-style-type: none">• MAP CM discussion• Discussion of common parameters for cooling cell bench test• Bob/Diktys reported on the new straight lattices• Gene/Katsuya reported on the design of a segment of 805 MHz HCC suitable for a bench test complete with RF (effort to be completed by Aug 2014)	<p><u>Quarterly Plans</u></p> <ul style="list-style-type: none">• Muon beam specification (including nuSTORM distribution) + simulation• Proton beam options• Detector options for 6D ICE
<p><u>Upcoming Work (Next Month)</u></p> <ul style="list-style-type: none">• nuSTORM beam simulation• Restructurization of the 6D ICE meeting, stress on experiment design, more coordination with D&S/TD groups	

Monthly L2 Status Report -

WBS: 02.01 – Proton Driver

19 July 2013
Presenter: Keith Gollwitzer



<p><u>Milestone Status (Progress)</u></p> <ul style="list-style-type: none">• Contribution to IDS-NF in progress	<p><u>Resource Conflicts, Plan Changes and Issues</u></p> <ul style="list-style-type: none">• Task Force team focused on other topics <p><u>Late Items</u></p> <ul style="list-style-type: none">• Task Force Report
<p><u>Summary of Previous Month</u></p> <ul style="list-style-type: none">• Recently asked to update IDS-NF IDR FNAL Proton Driver appendix for RDR. Updating Project X summary based upon its recently revised RDR.	<p><u>Quarterly Plans</u></p> <ul style="list-style-type: none">• Develop Accumulator and Compressor Rings• Develop Compressor Ring extraction line to target for NF• Outlining work for 3 GeV Proton Driver
<p><u>Upcoming Work (Next Month)</u></p> <ul style="list-style-type: none">• Look at Project X stage 2 as a proton driver (3 GeV).• Investigation of Target Station solenoid field affecting the last transfer line magnetic element(s)	

Monthly L2 Status Report -

WBS: 02.02

19 July 2013
Presenter: Diktys Stratakis



<p><u>Milestone Status (Progress)</u></p> <ul style="list-style-type: none">• Chicane shielding and energy deposition work• Alternative taper schemes for the decay channel• Studies towards a 3 GeV, 1 MW Scenario• Support IDS-NF RDR activities	<p><u>Resource Conflicts, Plan Changes and Issues</u></p> <p><u>Late Items</u></p> <ul style="list-style-type: none">• RDR write-up
<p><u>Summary of Previous Month</u></p> <ul style="list-style-type: none">• FE performance studies for a 3 GeV/ 1 MW scenario• Energy deposition and shielding studies for the chicane• Front-End contribution towards the IDS-NF RDR	<p><u>Quarterly Plans</u></p> <ul style="list-style-type: none">• Finish-up global optimization algorithms to maximize the FE performance.
<p><u>Upcoming Work (Next Month)</u></p> <ul style="list-style-type: none">• Optimize buncher/ phase rotator for the 3 GeV proton beam driver case.• Low taper scenario for the 325MHz FE• Study the impact of proton beam bunch length on the performance of the front end.	

Monthly L2 Status Report -

WBS: 02.03 Cooling

19 July 2013
Presenter: Tom Roberts



<p><u>Milestone Status (Progress)</u></p>	<p><u>Resource Conflicts, Plan Changes and Issues</u></p> <ul style="list-style-type: none">• Need funding for Missing Physics Processes• Need engineering study on Vacuum RF channel final stages <p><u>Late Items</u></p> <ul style="list-style-type: none">• Missing Physics Processes
<p><u>Summary of Previous Month</u></p> <ul style="list-style-type: none">• EPIC: Continuing...• HCC: Looking at effect of charge separation• Refocus effort: “Guggenheim” => “Vacuum RF Channel”• Physics Processes: Ongoing...	<p><u>Quarterly Plans</u></p> <ul style="list-style-type: none">• 6D Baseline Selection<ul style="list-style-type: none">– (Basically on hold awaiting the other 6D D&S tasks)• Vacuum RF channel(s) D&S• HCC D&S• Auxiliary components• Final Cooling D&S• Missing Physics Processes
<p><u>Upcoming Work (Next Month)</u></p> <ul style="list-style-type: none">• Vacuum RF channel(s) D&S (Palmer, Stratakis, et al)• HCC D&S (Yoshikawa, Yonehara, et al)• Physics Processes (Snopok, Roberts, et al): plasma effects, others, ...	

Monthly L2 Status Report -

WBS: 02.04 – D&S Acceleration

19 July 2013
Presenter: R. Ryne for J. S. Berg



<p><u>Milestone Status (Progress)</u></p> <ul style="list-style-type: none">• Lattices for IDS-NF acceleration: working out final details• IDS-NF RDR acceleration section: only introduction• 5 GeV 325 MHz neutrino factory: only a first look• Just beginning Higgs factory acceleration chain	<p><u>Resource Conflicts, Plan Changes and Issues</u></p> <ul style="list-style-type: none">• 5 GeV 325 MHz neutrino factory added to plan• 325 MHz and multiples everywhere <p><u>Late Items</u></p> <ul style="list-style-type: none">• Behind target on FFAG acceleration chain• IDS-NF RDR acceleration section
<p><u>Summary of Previous Month</u></p> <ul style="list-style-type: none">• Put together beginnings of acceleration section for IDS-NF RDR• Started hysteresis calculations for fast ramped dipole with different materials for pole and flux return	<p><u>Quarterly Plans</u></p> <ul style="list-style-type: none">• Q4: Setting up Higgs factory FFAG calculations• Q4: IDS-NF RDR Linac/RLA section• Q4: 5 GeV 325 MHz acceleration for neutrino factory
<p><u>Upcoming Work (Next Month)</u></p> <ul style="list-style-type: none">• Calculations to support FFAG-based acceleration chain design• Finish acceleration section for IDS-NF RDR	

Monthly L2 Status Report -

WBS: 02 05 Collider Ring Design

19 July 2013
Presenter: Y. Alexahin



<p><u>Milestone Status (Progress)</u></p> <ul style="list-style-type: none">• Higgs Factory (HF) design with account of detector protection from backgrounds – GOT ready for 2nd iteration.• Study of effects of field imperfections in wide-aperture IR magnets on beam dynamics in Higgs Factory – DONE.• Longitudinal dynamics studies in Higgs Factory with account of beam-beam forces and wake-fields – on hold.• Upgrade of the 3TeV collider lattice with combined-function magnets – on hold	<p><u>Resource Conflicts, Plan Changes and Issues</u></p> <ul style="list-style-type: none">• All of the studiers were mostly occupied with other tasks or on vacations.
<p><u>Summary of Previous Month</u></p> <ul style="list-style-type: none">• Scan of octupole correctors strength performed for compensation of the effect of fringe fields and body multipoles in the HF IR magnets – no big improvement compared to initial values (DA ~ 4 sigmas)	<p><u>Late Items</u></p>
<p><u>Upcoming Work (Next Month)</u></p> <ul style="list-style-type: none">• Design of a new version of the HF collider lattice.• Longitudinal dynamics simulations for HF• Design of a new version of the 3TeV muon collider lattice.	<p><u>Quarterly Plans</u></p> <ul style="list-style-type: none">• Design of a new version of the HF collider lattice.• Self-consistent longitudinal dynamics simulations for HF• Design of a new version of the 3TeV muon collider lattice

Monthly L2 Status Report -

WBS: 02.06 - Machine-Detector Interface

19 July 2013
Presenter: Nikolai Mokhov



<p><u>Milestone Status (Progress)</u></p> <ul style="list-style-type: none">• Developments of physics and geometry modules of MARS15 for adequate modeling of heat loads in SC magnets and backgrounds in HF and MC detectors• Development of MARS model of HF IR with large-aperture magnets, MDI and detector.• Development of background hit rate reduction techniques.	<p><u>Resource Conflicts, Plan Changes and Issues</u></p> <p>None.</p> <hr/> <p><u>Late Items</u></p> <p>None.</p>
<p><u>Summary of Previous Month</u></p> <ul style="list-style-type: none">• Consistent magnetic field maps and geometry of IR combined function quads and dipoles implemented into the HF IR model.• Massive optimization of the MARS15 MDI configuration and materials: inside/outside/between IR magnets, nozzle, VTX and forward detectors, experimental hall etc.• Test runs with very encouraging results: dozens of times reduction of backgrounds in the HF detector bringing the rates to about those at a 1.5-TeV MC.	<p><u>Quarterly Plans</u></p> <ul style="list-style-type: none">• Q4: Production MARS runs to feed the HF detector studies and minimize heat loads to IR magnets. With this source, launch full detector simulations.
<p><u>Upcoming Work (Next Month)</u></p> <ul style="list-style-type: none">• Fine-tuning of the new MDI parameters.• Preparation for production MARS runs on backgrounds and heat loads to HF IR components in the new MDI configuration.	

Monthly L2 Status Report -

WBS: Decay Rings 02 07

19 July 2013
Presenter: Alex Bogacz



<p><u>Milestone Status (Progress)</u></p> <ul style="list-style-type: none">• Neutrino Factory decay ring – Converged on a final ring design, which has been documented in the RDR (D. Kelliher and J. Pasternak)	<p><u>Resource Conflicts, Plan Changes and Issues</u></p> <p><u>Late Items</u></p>
<p><u>Summary of Previous Month</u></p> <ul style="list-style-type: none">• NF decay ring – New ring design with two distinctly different arcs - special injection sections at the top arc. The energy acceptance, without sextupole corrections, is about 1%, with good transverse dynamic aperture on-energy. (J. Pasternak and D. Kelliher)• νSTORM - Updating the injection from 5 to 6 GeV/c and re-running the simulation for target production. (A. Liu)	<p><u>Quarterly Plans</u></p> <ul style="list-style-type: none">• Large acceptance ring design for νSTORM<ul style="list-style-type: none">– Pursue both FODO and FFAG Racetrack designs– Continue lattice optimization and Dynamic Aperture study for both designs• Ring design for NF<ul style="list-style-type: none">– Complete RDR for 10 GeV ring design for IDS-NF– Finalize injection into the ring for both charge species– Adapt 10 GeV ring design (IDS-NF) for 4 GeV L3NF at Fermilab.
<p><u>Upcoming Work (Next Month)</u></p> <ul style="list-style-type: none">• NF decay ring – Adding sextupoles in the arcs to correct chromaticity, which will also require a re-design in the arcs to go to a 60 degree phase advance (right now they're at 70) to make it easier to cancel the third order resonant driving terms. (J. Pasternak, D. Kelliher)• νSTORM - Dynamic Aperture studies with G4BL for the updated ring. (A. Liu)	

AOB



- Are there any other issues for today's discussion
- Questions?
- Comments?