

Muon Accelerator Program Design & Simulations (WBS 2) Monthly Status Review

Nov 8, 2013

Outline



- Introduction
- L2 Manager Updates
- Summary Reports from Two 6D Cooling Workshops
 - Katsuya Yonehara (Fermilab), Diktys Stratakis (BNL)

Introduction



- Recent Activities, Upcoming events:
 - Preparation of FY13 Annual Report
 - Gas-Filled RF Cooling Workshop
 - Vacuum RF Cooling Workshop
 - Muon Cooling Advisory Committee

 - MuPAC review: Jan 7-9 @ Fermilab
 - MAP DOE review: Feb 19-20 @ Fermilab

L2 MANAGER STATUS REPORTS: DESIGN & SIMULATION (WBS 2)

Monthly L2 Status Report -

WBS: 02.01 – Proton Driver

08 November 2013
Presenter: Keith Gollwitzer



<p><u>Milestone Status (Progress)</u></p>	<p><u>Resource Conflicts, Plan Changes and Issues</u></p> <ul style="list-style-type: none">• Assembling team, which has other topics, to look into Proton Driver
<p><u>Summary of Previous Month</u></p> <ul style="list-style-type: none">• Looking into MASS staging• Looking into how Project X (de-)evolution affects Proton Driver	<p><u>Late Items</u></p>
<p><u>Upcoming Work (Next Month)</u></p> <ul style="list-style-type: none">• Rings' designs and studies for 3 GeV beam.• Investigation of Target Station solenoid field affecting the last transfer line magnetic element(s)	<p><u>Quarterly Plans</u></p> <ul style="list-style-type: none">• Develop Accumulator and Compressor Rings (3 GeV)• Understanding limitations of Proton Driver as function of beam energy, beam power and repetition frequency

Monthly L2 Status Report -

WBS: 02.02

08 November 2013
Presenter: Diktys Stratakis



<p><u>Milestone Status (Progress)</u></p> <ul style="list-style-type: none">• Chicane shielding and energy deposition work• Short taper for 325 MHz• Studies towards a 3 GeV, 1 MW Scenario	<p><u>Resource Conflicts, Plan Changes and Issues</u></p> <ul style="list-style-type: none">• We restarted the FE meetings on a monthly basis to better evaluate progress
<p><u>Summary of Previous Month</u></p> <ul style="list-style-type: none">• FE performance studies for a 3 GeV/ 1 MW scenario• Chicane integration to the new FE with 325 MHz• ICOOL & G4BL simulation of the chicane	<p><u>Late Items</u></p>
<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.• Continue work on integrating the chicane• Validate with ICOOL and G4BL. Discrepancy?	<p><u>Quarterly Plans</u></p> <ul style="list-style-type: none">• Finish-up global optimization algorithms to maximize the FE performance.• Energy deposition to the chicane coils

Monthly L2 Status Report -

WBS: 02.03 Cooling

8 November 2013
Presenter: Tom Roberts



<p><u>Milestone Status (Progress)</u></p> <ul style="list-style-type: none">• Vac RF: Workshop• HCC: Workshop	<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>Summary of Previous Month</u></p> <ul style="list-style-type: none">• EPIC: Continuing... (Morozov et al)• Palmer's 6-D Bunch merge in G4beamline (Yu)• HCC Engr: Progress on: conceptual design, dielectric RF cavities, helical solenoid• Physics Processes: Ongoing... (Snopok, Roberts, et al)	<p><u>Late Items</u></p> <ul style="list-style-type: none">• Missing Physics Processes
<p><u>Upcoming Work (Next Month)</u></p> <ul style="list-style-type: none">• Vac RF: refine simulations (Stratakis et al)• HCC: refine simulations (Yoshikawa, Yonehara, et al)• Physics Processes (Snopok, Roberts, et al): plasma effects, others, ...	<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 D&S• HCC D&S• Auxiliary components• Final Cooling D&S (EPIC and high-field)• Missing Physics Processes

Monthly L2 Status Report -

WBS: 02.04 – D&S Acceleration

8 Nov 2013
Presenter: J. S. Berg



<p><u>Milestone Status (Progress)</u></p> <ul style="list-style-type: none">• IDS-NF RDR acceleration section: submitted, being edited• 5 GeV 325 MHz neutrino factory: first linac design, gradients too high; RLA parameters chosen• Higgs factory acceleration chain: not started• Muon collider acceleration: not started	<p><u>Resource Conflicts, Plan Changes and Issues</u></p> <ul style="list-style-type: none">• Interest in looking at a straight 5 GeV linac for a neutrino factory• Need realistic gradients & apertures for 325 MHz SCRF
<p><u>Summary of Previous Month</u></p> <ul style="list-style-type: none">• IDS-NF RDR acceleration section submitted, being edited	<p><u>Late Items</u></p>
<p><u>Upcoming Work (Next Month)</u></p> <ul style="list-style-type: none">• Final edits on IDS-NF RDR acceleration section• Higgs factory FFAGs• Look at SCRF gradients/apertures for 325 MHz	<p><u>Quarterly Plans</u></p> <ul style="list-style-type: none">• Q1: Finish RDR• Q1: Higgs factory FFAGs• Q1: 5 GeV 325 MHz acceleration for neutrino factory

Monthly L2 Status Report -

WBS: 02 05 Collider Ring Design

8 November 2013
Presenter: Y. Alexahin



<p><u>Milestone Status (Progress)</u></p> <ul style="list-style-type: none">• Higgs Factory (HF) design including collimation and injection systems – started.• Comprehensive beam dynamics simulations incl. field errors, magnet misalignments, and correction – continued.• Longitudinal dynamics studies in Higgs Factory with account of beam-beam forces and wake-fields – on hold.• Development of the halo extraction scheme for 3 TeV collider – not started yet	<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">• Design of the Chromaticity Correction Section for the upgraded HF IR with reduced magnet apertures was started.	<p><u>Late Items</u></p> <p><u>Quarterly Plans</u></p> <ul style="list-style-type: none">• Design of a new version of the HF collider lattice.• Beam dynamics simulations for HF• Design of a new version of the 3TeV muon collider lattice
<p><u>Upcoming Work (Next Month)</u></p> <ul style="list-style-type: none">• Completion of the new version of the HF collider lattice.• Incorporation of the quadruplet Final Focus into the 3TeV muon collider lattice.	

Monthly L2 Status Report -

WBS: 02.06 - Machine-Detector Interface

8 November 2013
Presenter: Nikolai Mokhov



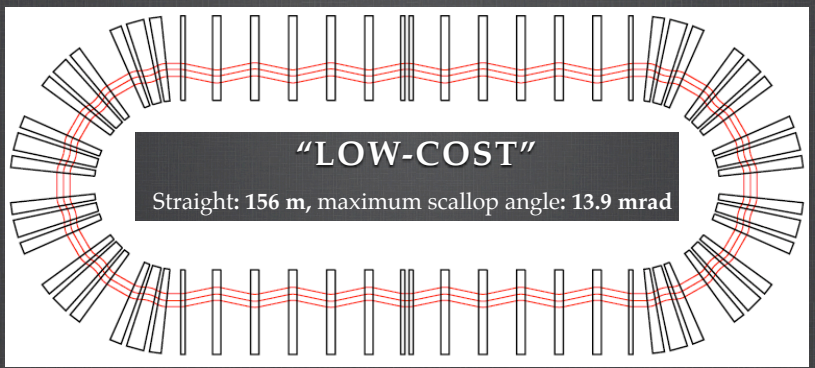
<p><u>Milestone Status (Progress)</u></p> <ul style="list-style-type: none">• Developments of physics and geometry modules of MARS15 for adequate modeling of heat loads in SC magnets and backgrounds in HF and MC detectors.• Development of MARS model of HF IR with large-aperture magnets, MDI and detector as well as of the entire HF ring.• Development of background hit rate reduction techniques.	<p><u>Resource Conflicts, Plan Changes and Issues</u></p> <p>None.</p> <p><u>Late Items</u></p> <p>None.</p>
<p><u>Summary of Previous Month</u></p> <ul style="list-style-type: none">• Development, implementation and thorough optimization MARS runs of the SC magnet protection system for the entire HF ring. It was demonstrated that both the peak power density in the coils (quench stability) and dynamic heat load can be kept below the tolerable limits.• Thorough optimization of the MDI configuration that allowed a 10-fold reduction of the background load on the detector compared to the MAP-13 configuration of June 2013.	<p><u>Quarterly Plans</u></p> <ul style="list-style-type: none">• Q1 (FY14): Freeze the MDI configuration and launch production MARS runs on backgrounds to feed the HF detector studies.• Q2 (FY14): Production runs of background files; documentation of MARS results on the SC magnet protection system for the entire HF ring and backgrounds in the HF detector; start work on MARS model of a multi-TeV muon collider.
<p><u>Upcoming Work (Next Month)</u></p> <ul style="list-style-type: none">• Fine tuning of the MDI nozzle parameters to further reduce backgrounds in the HF detector.	

Monthly L2 Status Report -

WBS: Decay Rings 02 07

8 November 2013
Presenter: Alex Bogacz



<p>Milestone Status (Progress) Racetrack FFAG</p>  <p>“LOW-COST” Straight: 156 m, maximum scallop angle: 13.9 mrad</p>	<p>Resource Conflicts, Plan Changes and Issues</p>
<p>Summary of Previous Month</p> <ul style="list-style-type: none">• J-B Lagrange – Further optimized design of a Racetrack FFAG ring for nuSTORM, with slightly reduced momentum acceptance ($\pm 16\%$) and limited ‘orbit scalloping’ in the straights was presented at nuSTORM phone Mtg. (10/18). The design has a comparable cost to the separated function magnet FODO ring (current baseline).• J. Pasternak – ‘First cut’ design of a stochastic injection line to ‘Low Cost’ RFFAG, including tracking (phone Mtg.10/18)	<p>Late Items</p>
<p>Upcoming Work (Next Month)</p> <ul style="list-style-type: none">• A. Liu – Genetic Algorithm optimization of the horn carried out for producing the maximum number of pions within the momentum spread $\Delta p/p = \pm 0.18$• J-B Lagrange – Explore 4 Tesla superferric type magnets to bring down the cost of a RFFAG ring for nuSTORM, and increase straight/circumference ratio as well as better dispersion matching.	<p>Quarterly Plans</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">– Finalize 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

AOB



- Issues?
- Questions?
- Comments?