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# Design & Simulation update

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BNL

MAP Friday Meeting

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# Proton driver

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- Project X upgrade study (FNAL-Muons Inc)  
principle tasks for us are designs of
  - 1) accumulator ring  
major issue: how to inject many turns?
  - 2) buncher ring to shorten proton pulse length (Leo Jenner)
  - 3) trombone channel to equalize bunch timing
  - 4) funnel channel to deliver multiple bunches onto targetwritten report is available
- started thinking about MC-NF siting issues at Fermilab

# Front end

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- Finalizing a front end baseline design for the IDS-NF (Dave et al)
  - target configuration
  - layout of the buncher/phase rotator/precooler channels
- Studies of subsystem alternatives
  - optimal solenoid tapering from target to decay channel (Kirk)
  - replace 4D precooler with a 6D cooler
    - HCC (Chuck) or Guggenheim (Bob)
  - magnetically-insulated precooling (Diktys)
- Target optimization
  - nozzle development
  - Hg Dump studies
  - Hg circulation system studies (ORNL)
  - energy deposition studies
  - MHD simulations

# Cooling

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- Tom has set up MAP access to FermiGrid (CPU cores & disk space)  
people with heavy simulation needs should talk to Tom
- Tom sent out cooling work survey to all of MAP  
this should be a big help for work planning  
please respond
- the next Friday meeting will be used to try to organize cooling effort better
- thinking about a meeting to discuss methods for comparing cooling techniques
- some of the ongoing studies
  - Yuri: low- $\beta$  FOFO snake
  - Valeri: final cooling with Li lens and solenoids (MCTF talk)
  - Bob: tapered Guggenheim
  - Cary: quasi-isochronous HCC

# $\mu$ Acceleration

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- Finalizing IDS-NF baseline design for  $\mu$  acceleration
  - Linac and RLA design (Alex)
    - workshop last month
    - have complete lattices
    - have done some tracking
  - FFAG design
    - working on injection, kickers, chromaticity correction
- Muon collider acceleration:
  - RLA design (Alex)
  - fast ramping synchrotron design
  - collective effects

# Collider ring

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- apertures and actual emittances → need adjustable  $\beta^*$  and tunes  
modifying the MC ring lattice (Eliana and Yuri)
- study effects of magnet imperfections on dynamic aperture  
use of octupole correctors
- collaborating with MDI group on IR region optimization

# Machine-detector interface

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- Joint work with the Magnet group on IR open-midplane dipoles
  - want a more realistic magnet design
  - reduced dynamic heat loads
- Forming a task force with the Fermilab theorists and detector folks
  - model detector response to the MARS-calculated machine backgrounds
  - develop specs, formats, interface surfaces, normalization
- Have been studying inter-connect regions
  - protection methods
  - radiation levels in IR magnets
  - made good progress while Yuri Alexakhin was at Fermilab

# MAP D&S FTE plans

area	FY10	FY11	FY12	FY13	FY14	FY15	FY16	total
PD	0.55	1	2	3.5	4.1	5.1	3.3	19.5
FE	1.85	1.5	1	1	0.6	0.6	0.5	7.0
cool	4.64	5	4.5	4	4	3	2.2	27.3
accel	0.5	1	2.8	3	2.4	2.4	0.9	13.0
ring	0.9	1.8	2	2.4	2.4	2.4	2.3	14.2
MDI	0.6	1	2	2.4	2.9	3.1	2.9	14.9
<b>total</b>	<b>9.04</b>	<b>11.3</b>	<b>14.3</b>	<b>16.3</b>	<b>16.3</b>	<b>16.6</b>	<b>12.1</b>	<b>95.9</b>

MC DFS

area	FY10	FY11	FY12	FY13	FY14	FY15	FY16	total
D&S	1	2	2	2.5	0	0	0	7.5
site	0	1	1	0.5	0	0	0	2.5
target	0	1	1.8	1.3	0	0	0	4.1
<b>total</b>	<b>1</b>	<b>4</b>	<b>4.8</b>	<b>4.3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>14.1</b>

IDS-NF



# Tech notes

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- recent D&S tech notes

MC-545 J. Gallardo et al, 30 T on target neutrino factory/muon collider front end

MC-546 D. Neuffer, Studies toward a candidate IDS neutrino factory front-end configuration

MC-547 D. Stratakis et al, Effects of external magnetic fields on the operation of high-gradient accelerating structures

- this is a resource we should take more advantage of
- ideally all simulation (and other) studies should be documented
- negative results are important also!