The Fermilab Accelerator Science Program: Overview

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Outline

- FY2009
- FY2010 Plan
- Recent Progress/Issues/Discussion

Backup mayterials:

- General info on FNAL Accel Sci program (Shiltsev)
- Muon Accelerator R&D program (Geer)
- AARD at A0 Photoninjector and at NML (Church)

Fermilab ‘s Accelerator Science Program Components

- KA 15 01 02 FUTURE PHYSICS - ACCELERATOR SCIENCE
  - 1.7.2 FNPL - A0 Photo-injector
  - 1.7.3 Muon Storage Ring
  - 1.7.6 Advanced Accelerator Concepts - Computing
  - 1.7.9 Accelerator Physics Center General R&D
  - 1.10.12 US Particle Accelerator School

FY2009 KA 15 01 02 Budget

- 91.7% thru FY2009

	FY09 BUDGET	FY09 YTD OBLIG	Budget Balance	% Obligated
KA 15 01 02 FUTURE PHYSICS - ACCELERATOR SCIENCE	11,833	10,617	1,216	89.7%
1.10.12 U.S. Particle School Office	872	829	42	95.1%
1.7.2 Advanced Accelerator Program	2,749	2,708	40	98.5%
1.7.3 Muon Storage Ring	6,214	5,801	413	93.4%
1.7.6 Advanced Accelerator Concepts - Computing	855	720	135	84.2%
1.7.9 Accelerator Physics Center General R&D	1,142	557	585	48.8%

FY2010 KA 15 01 02 : IFP

	SWF	M&S	OH	TOTAL
KA 15 01 02 FUTURE PHYSICS - ACCELERATOR SCIENCE	5,633	1,542	4,959	12,135
1.10.12 U.S. Particle School Office	435	56	373	864
1.7.2 Advanced Accelerator Program	1,184	386	1,043	2,614
1.7.3 Muon Storage Ring	3,097	910	2,746	6,753
1.7.6 Advanced Accelerator Concepts - Computing	472	6	400	878
1.7.9 Accel Physics Center General R&D	444	184	395	1,023

- Total funds available 11,635k$ = 10,860k$ of funding (IFP)
  + 775k$ carryover to FY10

Variance to budget (526.5)k$

Budget: 2009 vs 2010

	FY09 FUNDING	FY10 BUDGET	CHANGE 09→10
1.7.2.1 FNPL Operations	1,834.9	2,050.9	215.9
1.7.2.2 FNPL Upgrades	348.9	259.1	(89.8)
1.7.2.5 Other Advanced Accelerator R&D	480.4	305.0	(175.4)
1.7.3 Muon Storage Ring	6,064.8	6,779.5	714.7
1.7.6 Advanced Accel Concepts - Computing	829.6	878.7	49.1
1.7.9 Accelerator Physics Center General R&D	1,100.4	1,023.5	(76.8)
1.10.12 U.S. Particle School Office	844.9	864.9	20.0
Grand Total	**11,503.8**	**12,161.5**	**657.6**

Budget Analysis

- FY10 budget (upload, PBR) is 540k$ short of the 12,702k$ requested in Dec'08 DOE Review as part of FNAL proposal
  - incl. 240k$ shortage for Muon R&D

	All amounts in $K, fully burdened			
	Proposal Request Amounts			
	FY09	FY10	FY11	FY12
	Total	Total	Total	Total
Fermilab Accelerator Science Program	**9,876**	**12,702**	**14,620**	**TBD**
Beam Sources and Instrumentation	2,782	3,948	4,885	TBD
Muon Collider and Neutrino Factory	5,697	7,015	7,622	8,087
Accelerator and Beam Physics	1,397	1,739	2,113	2,095

- Current budget plan is 527k$ short of IFP budget
  - So, the real difference might be 540+527=1,067k$
  - There is still chance for getting budget as in President's Budget request (is there?)

Muon Budget Issues

- Muon Accelerator R&D plan presented at the Dec'08 DOE Review had 21M$ request for FY2010
  - With estimated FNAL share of 11M$ (~50%)

	FY08	FY09	FY10	FY11	FY12	FY13
Effort (FTE)	37	48	79	81	79	43
SWF ($M)	5.5	9	14	15	15	8
M&S ($M)	1.6	4	7	7	6	4
Total ($M)	7.1	13	21	22	21	12

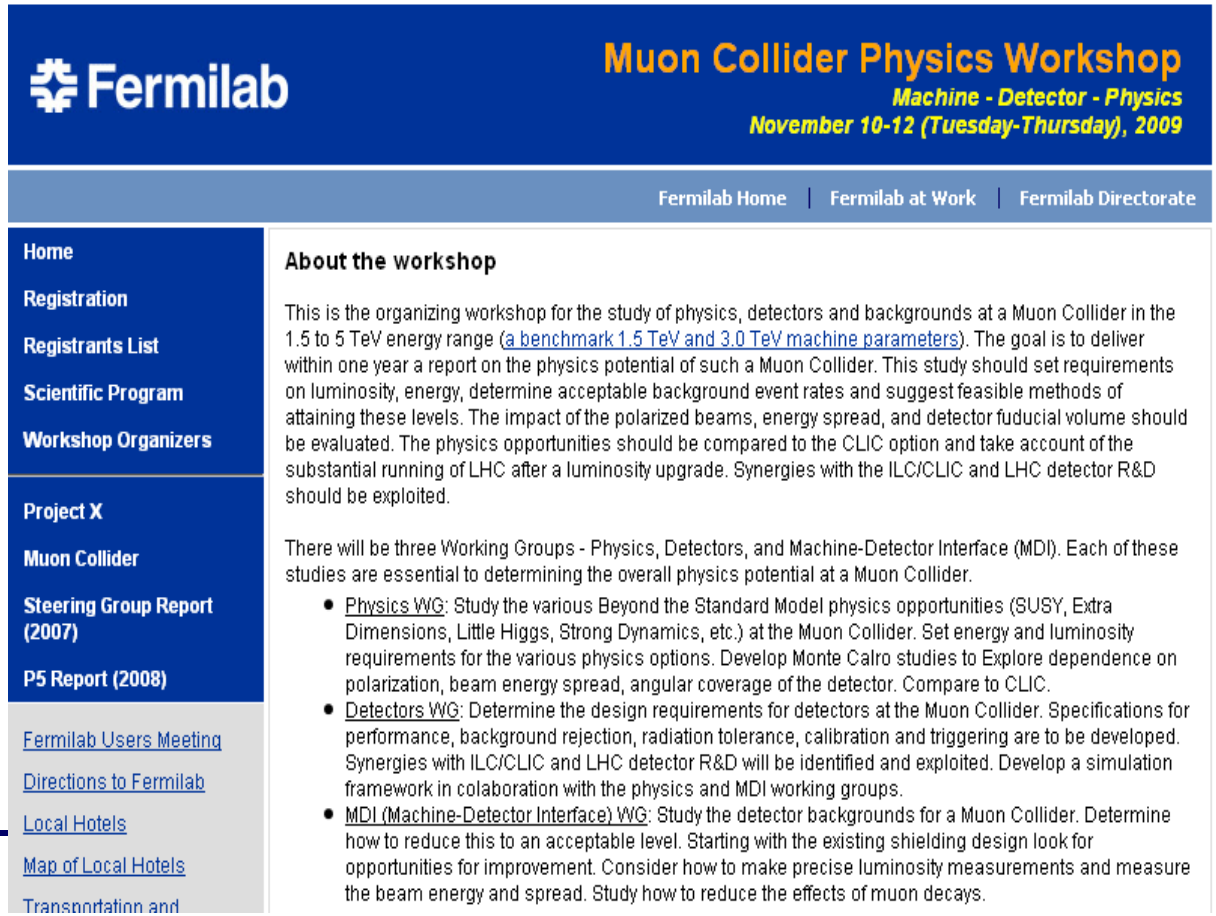
- Current budget plan is 50-60% of the request
  - 6,780k$

Possible Approaches to Address Muon Collider R&D Budget Issues

- Get National Muon R&D Program endorsed by DOE OHEP
  - That means get reviewed and approved…. that requires :
    - Build national organization
    - Revise/update the proposal
    - Prepare the review
  - We are also organizing the Physics community
    - Briefing DOE OHEP (Jun'09)
    - Workshop on MC Physics/Detector (Nov'09)
- Reorient (limited) existing resources:
  - Additional support from high-field magnet program
  - (very limited) from A0 Photoinjector and General R&D tasks

Muon Collider Detector and Physics

- Organization and coordination of the Muon Collider Physics and Detector effort is very important for getting HEP community on board. Recent developments:
  - Briefing DOE OHEP 06/24/2009
    - H.Nicholson, et al
    - E.Eichten, A.Bross, M.Demarteau, S.Geer
  - MC Physics Workshop Nov 10-12 2009 (following Pr-X Physics workshop)
    - Chaired by E.Eichten, K.Peach, J.Konigsberg



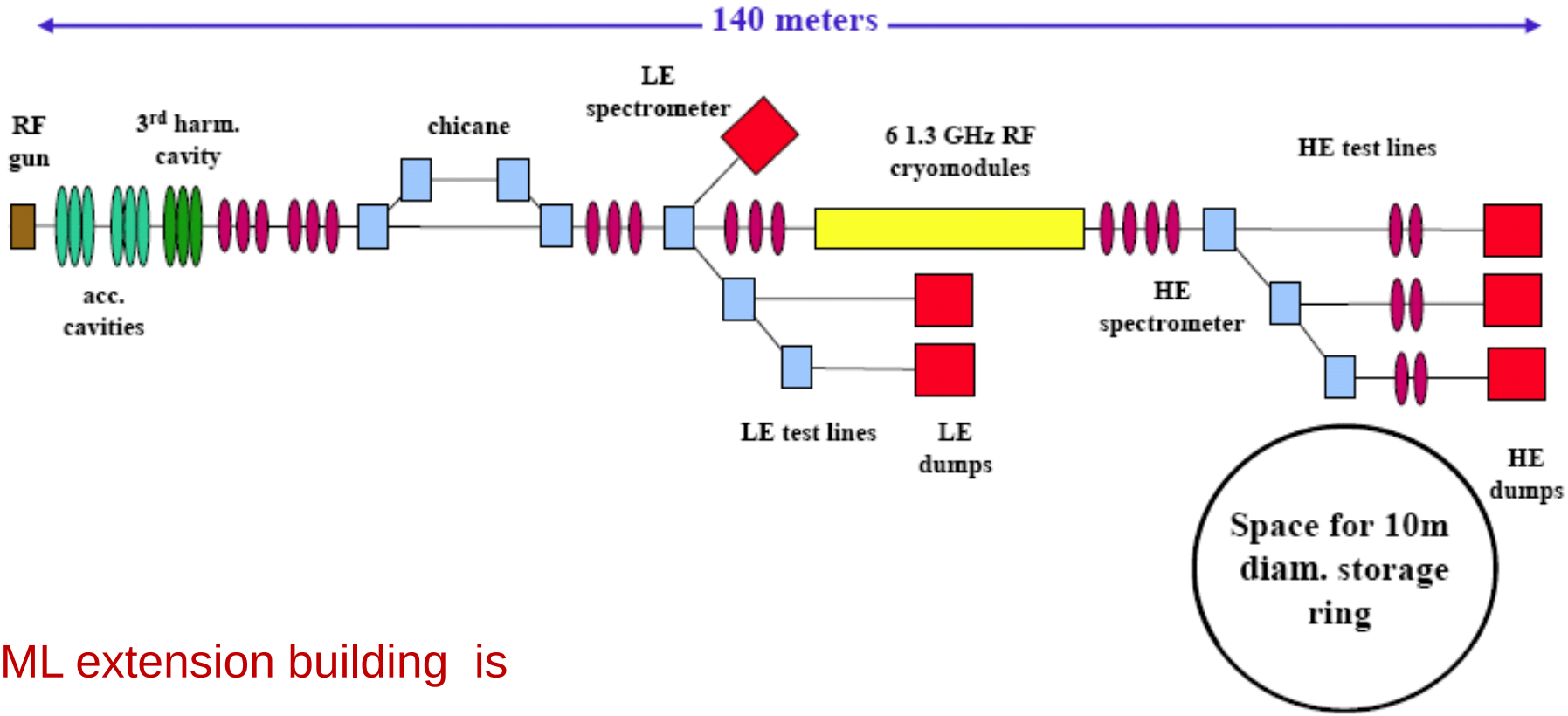
Input on Directions of AARD at FNAL

http://apc.fnal.gov/ARDWS/index.html

CHARGE: -solicit&evaluate ideas for a future Acc. R&D program in NML

- solicit&evaluate proposals for high beam intensity R&D (Pr-X, MC,ADS)

AARD *User's* Facility at NML (>2012)



NML extension building is being supported ARRA funds

Workshop Summary

- **NML has the potential to be a *unique* User's Facility:**
  - Energy range of 40 – 1500 MeV; beam power up to 80 kW; pulse train up to 3000 bunches; "flat beams"
  - Infrastructure capability (cryogenics, RF, lasers, floor space for storage rings, expandability)
  - Extensive accel. operational experience + users support experience
- **>20 proposals presented, including:**
  - Dielectric wakefield accelerator tests in microslabs, plasma wakefield tests with long bunch trains, optical stochastic cooling proof-of-principal test, photoproduction of μ at 300 MeV for homeland security, test of "integrable optics" concept for high intensity rings

Summary

- FY2009: KA150102 spending are on budget,
  - with expected carryover to FY10 of 775k$
- FY2010: Accelerator Science budget still has ~0.5M$ uncertainty:
  - IFP + Carryover = 11,635k$
  - Presidents Budget + Carryover = 11,870k$
  - Summer'09 Budget Plan = 12,161k$
  - *Dec'08 Accel Sci request was 12,702M$*
- Depending on the final $$, budget distribution will be adjusted with higher priority to be given to Muon Accelerator R&D
  - MC/NF budget is significantly behind their needs
- There was significant technical progress since Dec'08 DOE Review of Accelerator Science

MCTF: Progress since December - 1

- Physics, Detectors & Backgrounds
  - Workshop planned for 10-12 November.
  - Baseline MC parameter list for workshop agreed upon
- Ring design
  - New lattice with better performance being finalized
- MICE
  - Decay solenoid commissioned
  - New target designed, built & commissioned
  - Fiber trackers complete & commissioned
- RF R&D
  - MTA reconfiguration in preparation for beam completed
  - Preparations for HPRF beam test advanced
  - Next generation of 805 MHz test cavities design in progress, new rectangular cavity nearing completion

MCTF: Progress since December - 2

- Magnet R&D
  - Planning for an extended MC magnet R&D program within TD started
  - Although not directly MC R&D, we note that funding of the national HTS collaboration is helpful.
- IDS-NF (= Muon Collider front end).
  - International organization progressing, and is in line with U.S. contributions as per 5 year plan.