

CD FY09 Tactical Plan Status

FY09 Tactical Plan Status Report for Computational Physics for Accelerators (CPA)

Tactical plan names listed here...	DocDB#
FY09 Tactical Plan CPA	2864-v5

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March 10, 2009

No Past Action Items

Summary of Project Performance

(for the period 01-Oct-2008 through 10-Mar-2009)

Project Deliverable / Milestone	Initial Completion Target	% Complete (0,25,50,75,100)	Current Completion Target
Synergia refactor	Q1	50%	Q4
Synergia web release	Q4	75%	Q4
Synergia on BlueGene/P	Q3	75%	March
Technical note on impedance	Q2	50%	Q3
CHEF on Fedora 9	Q1	100%	

- We have decided a continuous refactorization will provide greater stability than a single jump.
- Web-based server is installed and running. Will be well tested by time of public release.
- BlueGene/P has become more important due to outside factors.
- Impedance work being done with new hire, so is becoming a learning exercise. Application pressure is less than at time of planning
- CHEF also runs on Fedora 10.

Summary of Project Performance

(for the period 01-Oct-2008 through 10-Mar-2009)

Project Deliverable / Milestone	Initial Completion Target	% Complete (0,25,50,75,100)	Current Completion Target
Integration of PETSc solver	Q2	25%	Q4
E-cloud Main Injector	Q3	75%	Q3
CHEF resonance analysis	Q2	0%	Q4
Synergia with VORPAL maps	Q2	25%	Q3
BeamBeam Tevatron simulations	Q1	98%	March

- PETSc solver has been pushed back because of the shift in emphasis to mu2e
- E-cloud for Main Injector now focusing on VORPAL simulation of microwave cloud detector
- CHEF resonance analysis pushed back to allow work on mu2e
- Synergia with VORPAL maps pushed back for mu2e and LARP PS2
- BeamBeam Tevatron simulations limited by NERSC and ALCF computing issues (see slide)

Summary of Project Performance

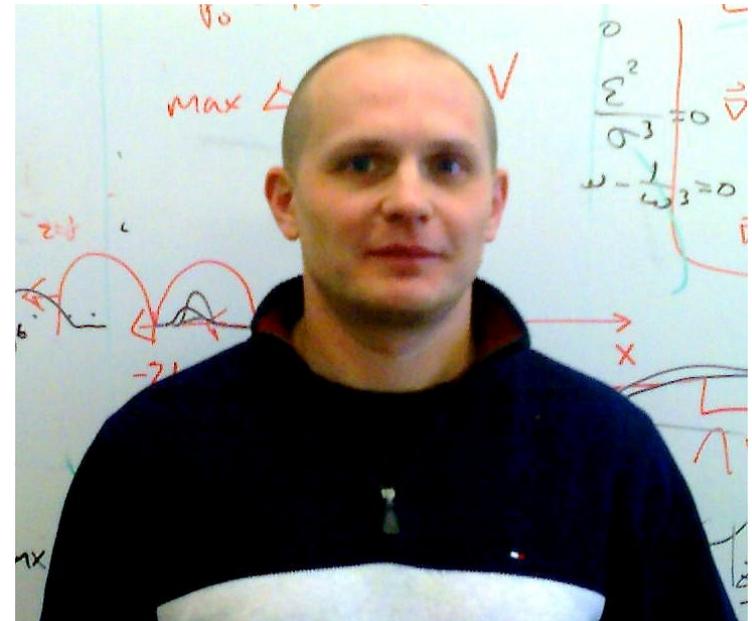
(for the period 01-Oct-2008 through 10-Mar-2009)

Project Deliverable / Milestone	Initial Completion Target	% Complete (0,25,50,75,100)	Current Completion Target
Mu2e CHEF simulations		75%	Q3
Mu2e Synergia simulations		50%	Q3
LARP PS2 Synergia simulations		25%	Q3

- Mu2e is a new request
- LARP PS2 is a new request

Project Highlights, Issues, and Concerns

- New hire: Alexandru Macridin
 - Started in January
 - A new hire requires training effort
 - Is learning very quickly and already making significant contributions

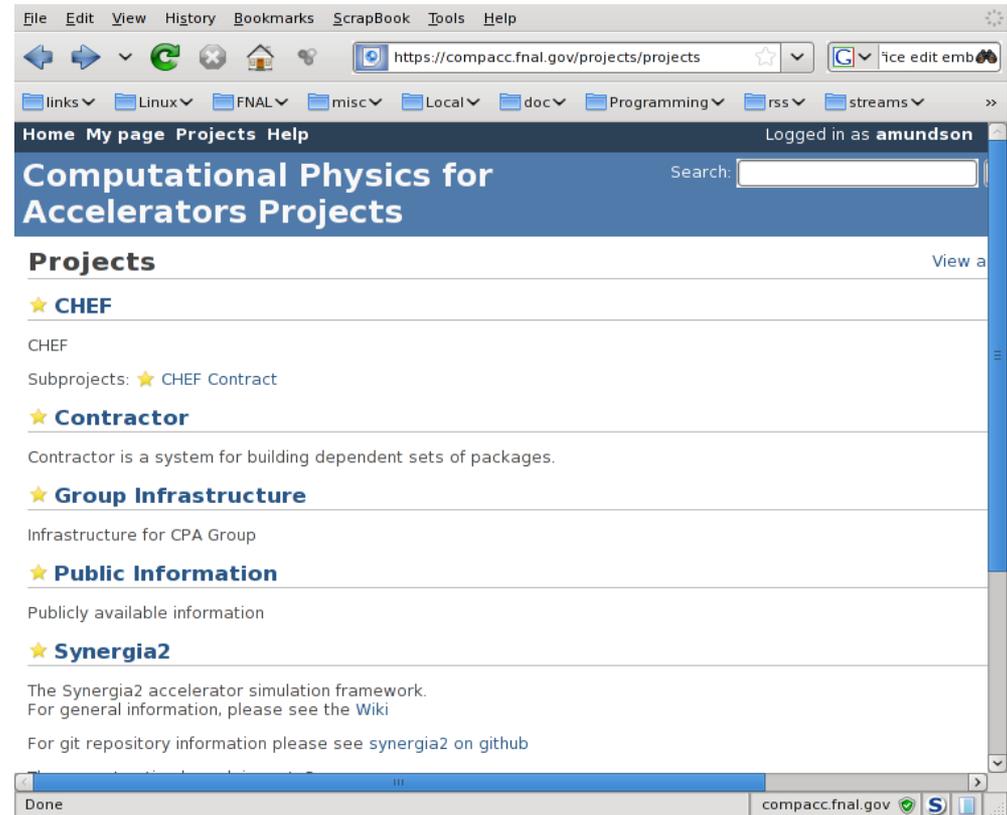


- Mu2e request is new since original presentation
- LARP PS2 request is new since original presentation
- Portico project funding still undecided(!)
 - We were told to wait for 09 budget; some proposals told simply “no.”

Server for Synergia web release

- CPA server

- Serves multiple CPA projects
 - Wiki
 - Bug tracker
 - File download
 - Repository access
 - Etc.
- Mixture of publicly available and private projects
 - Access control
- Useful for our group
- Being tested with friendly collaborators
- Will be gateway for public release



<https://compacc.fnal.gov/projects>

Synergia on BlueGene/P

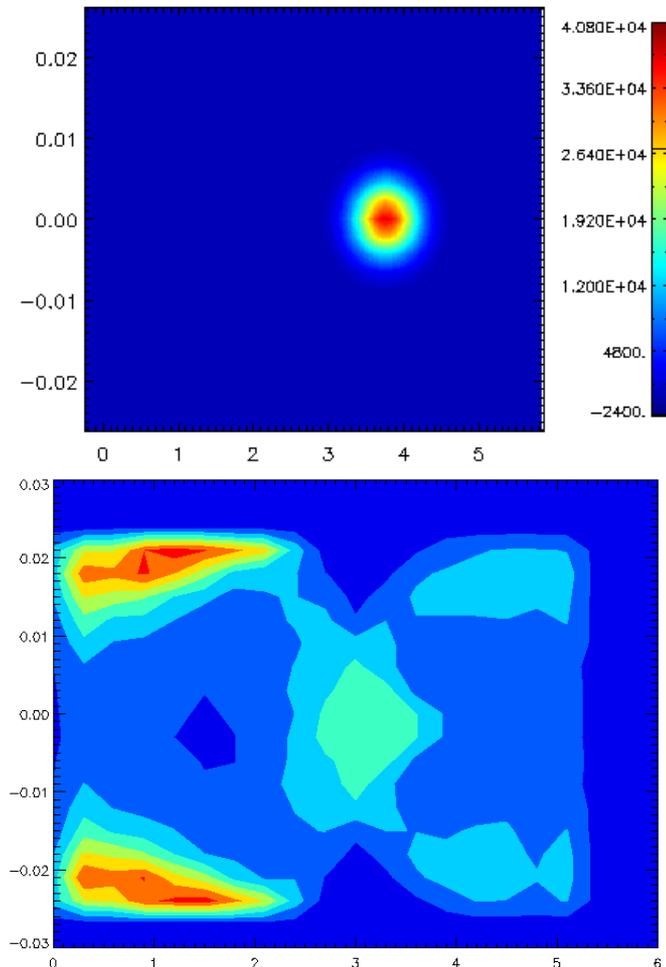
- We are being *strongly* encouraged to use the DOE capability machines
- NERSC's Cray XT4 (Franklin)
 - No support for Linux on nodes
- ANL's IBM BlueGene/P (Surveyor and Intrepid)
 - Python support an advertised feature of the BG/P platform
 - Nonetheless, porting Python packages and applications to BG/P is still a research project
 - Most of our problems are with dependencies
 - As of last summer, IBM consultants couldn't tell us how to do it for at least one fairly simple package (mpi4py)
 - IBM instructions for compiling plain C GNU Autotools projects involve editing generated Makefiles(!)
 - ALCF support system is not very general, but definitely improving.
 - All known obstacles have now been overcome

Main Injector E-cloud simulations

- New focus for E-cloud simulations: simulations of the microwave detector installed in the Main Injector

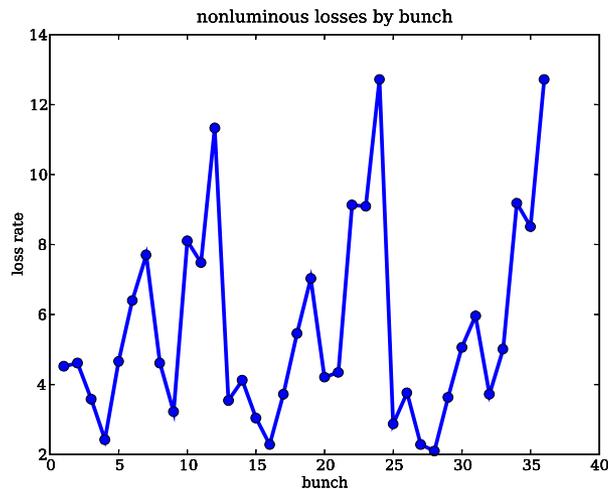
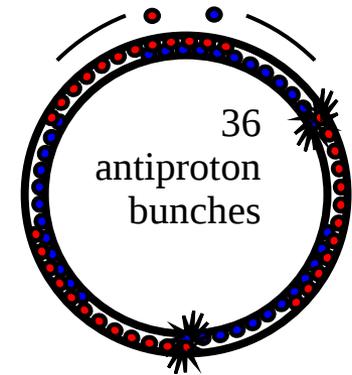
- As opposed to simulating the beam-cloud interaction
- Necessary for normalization
- Utilizing VORPAL
 - From Tech-X
- Collaborating with Tech-X
- Running on BlueGene

Pictures from Vorpall showing an instant snap-shot of the electron cloud multipacting process. X along the beam axis. Y is the vertical axis. Top: the current density along the x axis, and corresponds to a 8 GeV, 5×10^{11} protons bunch, with a Gaussian profile in all 3 direction. Bottom: density/color map of the electrons, on the X-Y plane.

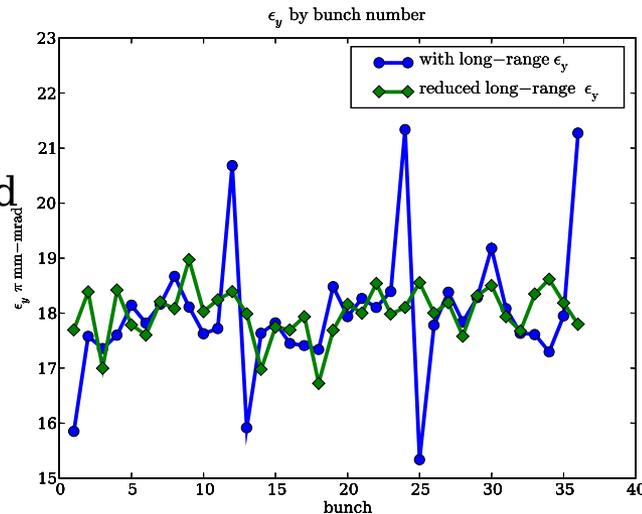


BeamBeam Tevatron simulations

- Finalizing simulations requires a long run on a capability machine.
 - Started at NERSC (Franklin, Cray XT4)
 - Limited by queue latency
 - Finally limited by machine instability
 - Now moved to ANL (Intrepid, IBM BlueGene/P)
 - Progressing after lost porting time



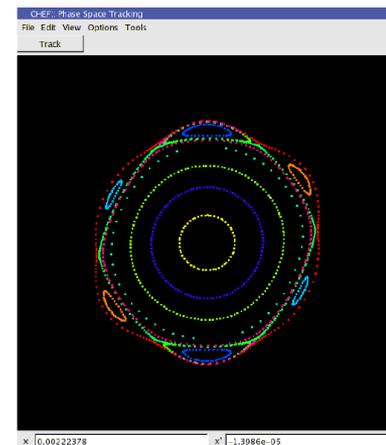
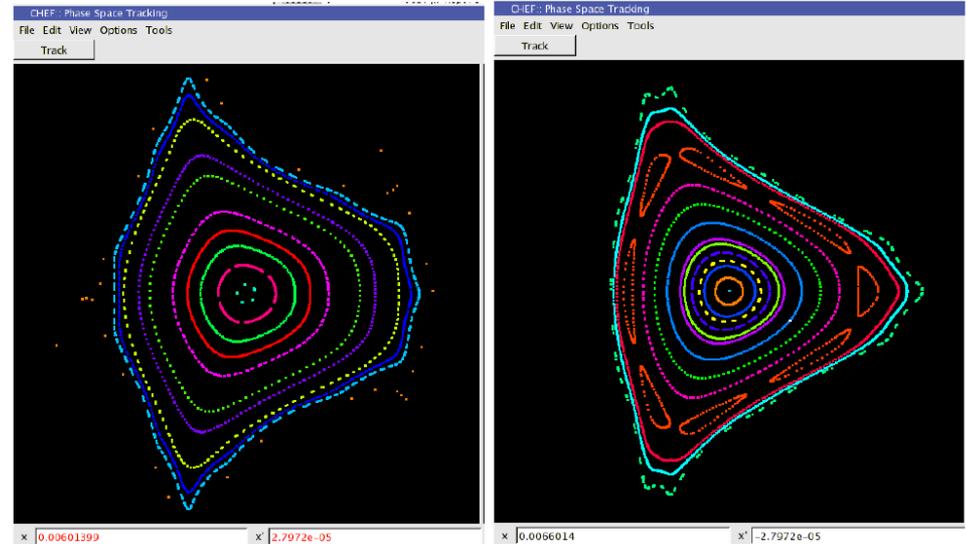
Measured losses



Computed beam blowup

Mu2e CHEF simulations

- Simulate beam extraction from Debuncher
- Start with third integer resonant extraction, as put forth in the Mu2e proposal
 - Seems to be good fit for lattice
 - Never before done at Fermilab
- Initial simulations complete
- Lattice configurations continue to change
 - Extraction location
 - “in” vs. “out,” etc.
- Half integer extraction now also being considered



Financial Performance: FTE Usage (1)

Level 0 Activity:		COMPUTATIONAL PHYSICS FOR ACCE		% of FY Complete:		0.42
Personnel Usage (FTEs)						
Tactical Plan Level 1 Activity	Allocation		Actual YTD		% Consumed YTD	Current FY09 Forecast
	FTE-yrs	FTE-mos	FTE-yrs (Ave/mo.)	FTE-mos		
Synergia						
Advanced Solvers	0.10	1.20	0.00		0%	0.00
Ecloud	0.40	4.80	0.00		0%	0.00
Impedance			0.43	2.15	#DIV/0!	1.03
Infrastructure	0.10	1.20	0.48	2.41	201%	1.16
LARP PS2	0.20	2.40	0.00			0.00
Mu2e accelerator chain	0.90	10.80	0.12	0.61		0.29
Muon collider space-charge	0.25	3.00	0.00		0%	0.00
Optimization	0.25	3.00	0.00		0%	0.00
Porting	0.10	1.20	0.00		0%	0.00
Validation - Ecloud	0.20	2.40	0.00		0%	0.00
Validation - LARP	0.20	2.40	0.00		0%	0.00
<i>Total</i>	2.70	32.40	1.03	5.17	16%	2.48

- Actual effort in this activity under-represented (see “Physics Applications”)
 - *To be fixed*

Financial Performance: FTE Usage (2)

Level 0 Activity:		COMPUTATIONAL PHYSICS FOR ACCE				% of FY Complete:	0.42
Personnel Usage (FTEs)							
Tactical Plan Level 1 Activity	Allocation		Actual YTD			Current FY09 Forecast	
	FTE-yrs	FTE-mos	FTE-yrs (Ave/mo.)	FTE-mos	% Consumed YTD		
SciDAC2							
Advanced Solvers	0.15	1.80	0.00		0%	0.00	
Beam Dynamics			0.40	2.02	#DIV/0!	0.97	
BeamBeam	0.30	3.60	0.00		0%	0.00	
Ecloud	0.55	6.60	0.26	1.31	20%	0.63	
Impedance	0.20	2.40	0.07	0.36	15%	0.17	
Infrastructure	0.30	3.60	0.00		0%	0.00	
Management	0.48	5.76	0.13	0.67	12%	0.32	
Porting	0.10	1.20	0.06	0.32	27%	0.15	
Validation	0.80	9.60	0.00		1.08	0.00	
<i>Total</i>	2.88	34.56	0.94	4.68	14%	2.25	
CHEF							
<i>Total</i>	0.95	11.40	0.21	1.04	9%	0.50	

- Actual effort in SciDAC2 activity under-represented (see “Physics Applications”)
 - *To be fixed*

Financial Performance: FTE Usage (3)

Level 0 Activity:		COMPUTATIONAL PHYSICS FOR ACCE		% of FY Complete:		0.42
<i>Personnel Usage (FTEs)</i>						
Tactical Plan Level 1 Activity	Allocation		Actual YTD		% Consumed YTD	Current FY09 Forecast
	FTE-yrs	FTE-mos	FTE-yrs (Ave/mo.)	FTE-mos		
Physics Applications						
Beam-Beam			0.25	1.26	#DIV/0!	0.60
Ecloud			0.57	2.85	#DIV/0!	1.37
Wakefields			0.03	0.16	#DIV/0!	0.08
<i>Total</i>	0.00	0.00	0.85	4.27	#DIV/0!	2.05
Accelerator Modeling						
Management			0.11	0.53	#DIV/0!	0.25
Scientific Research	0.55	6.60	0.52	2.58	39%	1.24
<i>Total</i>	0.55	6.60	0.62	3.11	#DIV/0!	1.49
Single-item Level 1						
CD Management	0.05	0.60	0.11	0.54	90%	0.26
Management	0.10	1.20	0.02	0.11	9%	0.05
Accel Science/Research			0.47	2.36	#DIV/0!	1.13
ILC Main Linac studies			0.00		#DIV/0!	0.00
Portico			0.00		#DIV/0!	0.00
<i>Total</i>	0.15	1.80	0.60	3.01	#DIV/0!	1.44

- “Physics Applications” is an obsolete activity (superseded by SciDAC2 and Synergia); maps simply to newer categories
 - To be fixed
- “Accel Science/Research” will also be moved to AM/Scientific Research and (partially) mu2e

Financial Performance: M&S (Internal Funding)

Level 0 Activity: **COMPUTATIONAL PHYSICS FOR ACCE** % of FY Complete: **42%**

Operating & Equipment M&S

CD Internal Funding

Tactical Plan Level 1 Activity	<u>Operations M&S</u>				<u>Equipment M&S</u>			
	FY Obligation Budget	YTD Obligations + RIPS	% Spent	Current FY09 Forecast	FY Obligation Budget	YTD Obligations + RIPS	% Spent	Current FY09 Forecast
Accelerator Modeling								
Travel/Training & Support	30600	5174.94	---	30600	0	0	---	
Total	30600	5174.94	17%	100%	0	0	#DIV/0!	

Activities Financials: M&S (External Funding)

Level 0 Activity: **COMPUTATIONAL PHYSICS FOR ACCE** % of FY Complete: **42%**

Operating & Equipment M&S

CD Internal Funding

Tactical Plan Level 1 Activity	<u>Operations M&S</u>				<u>Equipment M&S</u>			
	FY Obligation Budget	YTD Obligations + RIPS	% Spent	Current FY09 Forecast	FY Obligation Budget	YTD Obligations + RIPS	% Spent	Current FY09 Forecast
SciDAC2								
Travel/Training & Support	15295	4468.59	---	15295	0	0	---	
Total	15295	4468.59	29%	100%	0	0	#DIV/0!	

Tactical Plan Status Summary

- Computational Physics for Accelerators is making strong progress toward revised goals
 - Two new major requests
 - Mu2e and LARP PS2
 - Some other projects pushed back
 - Main Injector electron cloud simulations refocused
 - Now looking at Microwave simulation
 - Porting to and Utilization of Intrepid at Argonne moving rapidly
 - Refactoring stretched out for entire year
 - Technical decision
 - New hire Alexandru Macridin already contributing to group