Cornell University
Laboratory for Elementary-Particle Physics

Project Management

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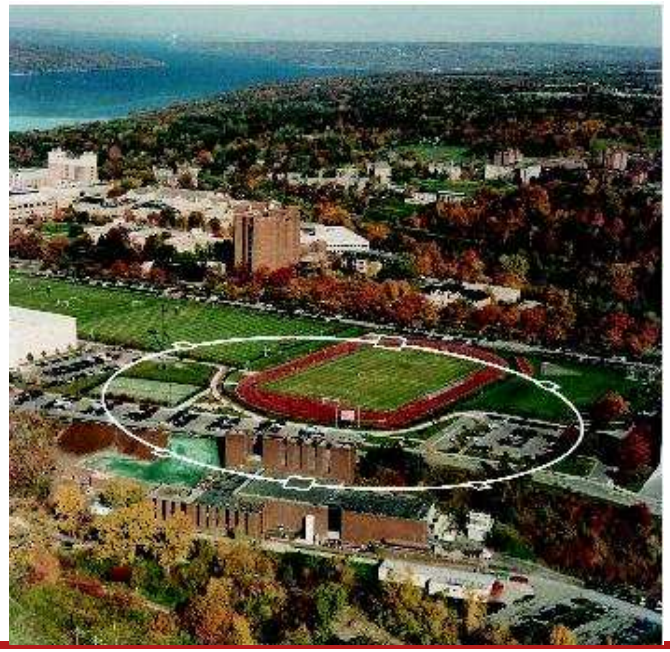
Cornell Laboratory for

Accelerator-Based Sciences and Education



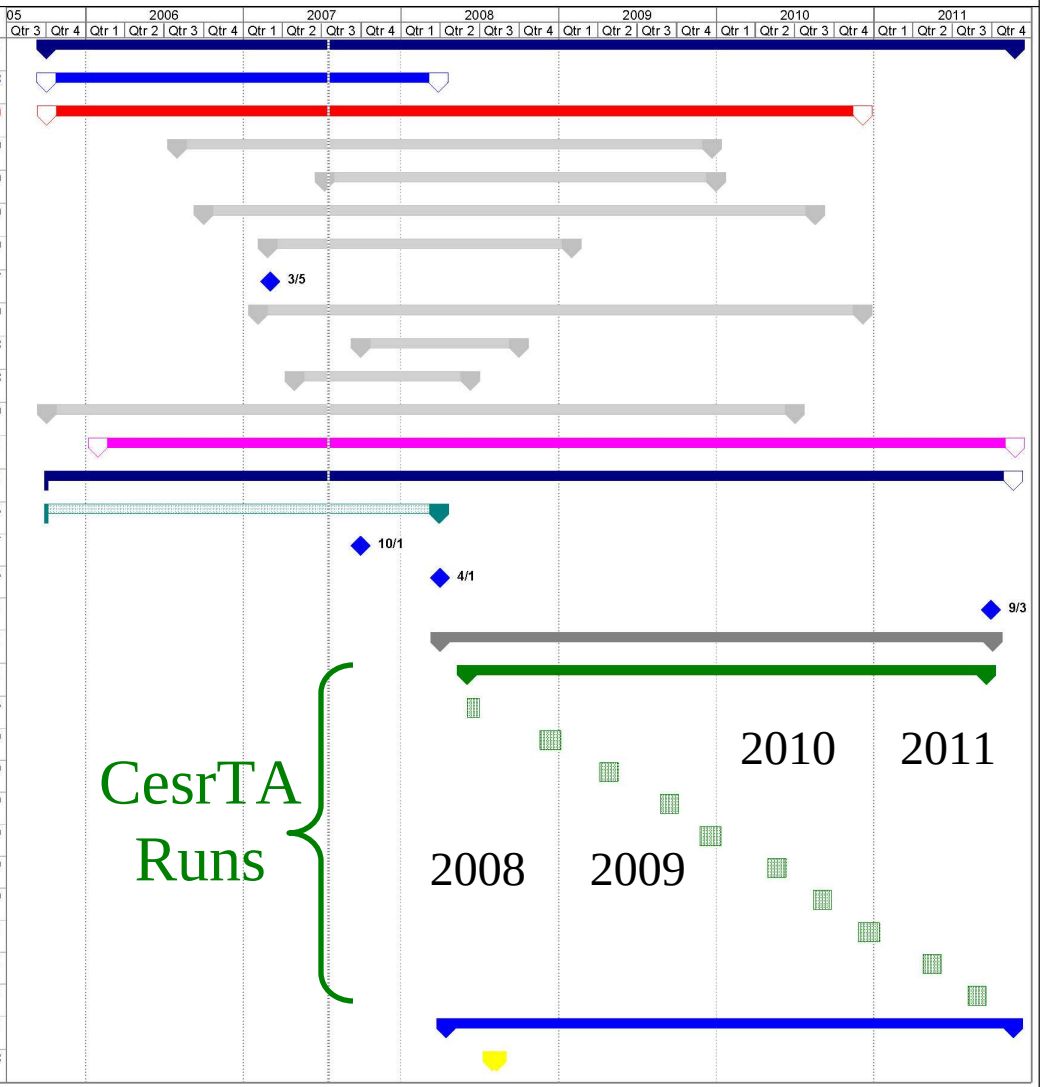
Outline

- Project Management Structure
  - Schedule
    - Milestones
  - Tools
  - People and Projects
  - Interface with ILC Damping Rings R&D Structure
    - Coordination
    - Collaboration
    - Technical Metrics
- Addressing Program Risks
  - Work Package
    - Example: LiCAS-II
  - Flexibility
  - Budget Overview and Costs
- Conclusion

Project Plan

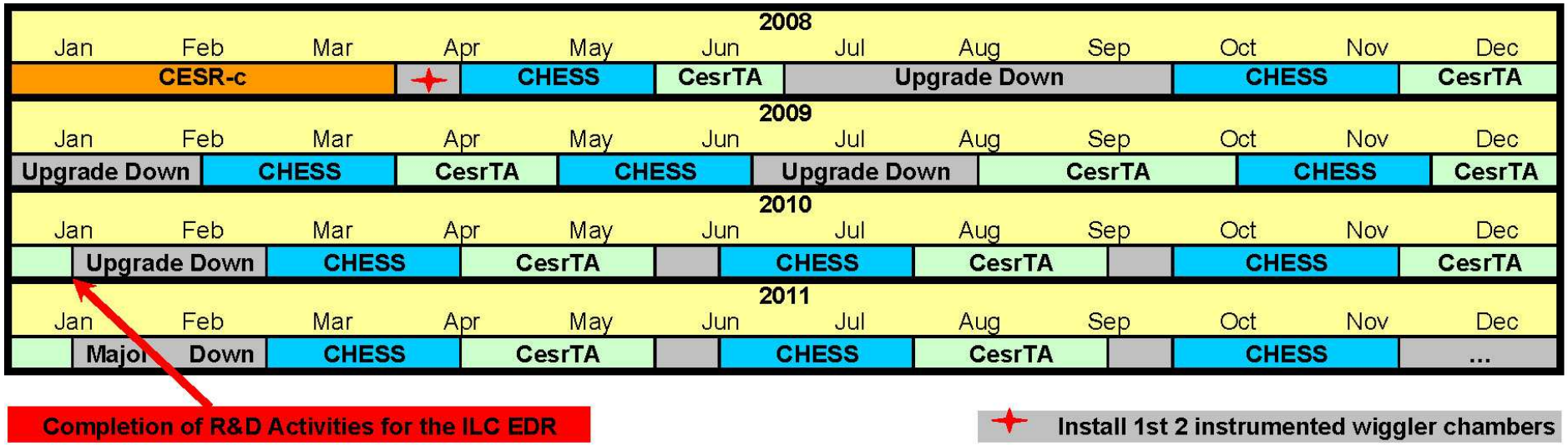
Cornell University
CesrTA Overview

ID		ID	WBS	Task Name	Start	Finish
0		0		**CESR-TA Summary**	Mon 10/3/05	Thu 11/24/11
1		1	1	**Accelerator Design**	Mon 10/3/05	Fri 3/28/08
133		133	2	**Engineering Design and Fabrication**	Mon 10/3/05	Mon 12/6/10
134		134	2.1	**Alignment/Survey and Stability**	Tue 8/1/06	Tue 12/22/09
149		149	2.2	**Magnets and Power Supplies**	Mon 7/9/07	Thu 12/31/09
175		175	2.3	**Beam Instrumentation**	Mon 10/2/06	Wed 8/18/10
194		194	2.4	**Feedback Systems**	Tue 2/27/07	Fri 1/30/09
201		201	2.5	**SRF**	Mon 3/5/07	Mon 3/5/07
203		203	2.6	**Vacuum System**	Mon 2/5/07	Mon 12/6/10
274		274	2.7	**Cryogenic System**	Mon 10/1/07	Wed 10/1/08
278		278	2.8	**Accelerator Infrastructure**	Mon 4/30/07	Tue 6/10/08
283		283	2.9	**Software and Controls**	Mon 10/3/05	Fri 7/2/10
298		298	3	**R&D Program**	Mon 1/30/06	Thu 11/24/11
342		342	4	**Operations and Down Periods**	Mon 10/3/05	Sun 11/20/11
343		343		CESR-c Operations Period	Mon 10/3/05	Sun 3/30/08
344		344	4.5	CesrTA Funding Start	Mon 10/1/07	Mon 10/1/07
345		345		CesrTA Experimental Start	Tue 4/1/08	Tue 4/1/08
346		346	4.6	CesrTA Funding End	Fri 9/30/11	Fri 9/30/11
347		347	4.1	**CesrTA Down and Recovery Periods**	Wed 4/2/08	Mon 10/3/11
378		378	4.2	**CesrTA Experimental Runs**	Tue 6/3/08	Sun 9/18/11
379		379	4.2.1	CesrTA Run 1	Tue 6/3/08	Mon 6/30/08
380		380	4.2.2	CesrTA Run 2	Tue 11/18/08	Mon 1/5/09
381		381	4.2.3	CesrTA Run 3	Tue 4/7/09	Mon 5/18/09
382		382	4.2.4	CesrTA Run 4	Tue 8/25/09	Mon 10/5/09
383		383	4.2.5	CesrTA Run 5	Tue 11/24/09	Mon 1/11/10
384		384	4.2.6	CesrTA Run 6	Sat 5/1/10	Fri 6/11/10
385		385	4.2.7	CesrTA Run 7	Sat 8/14/10	Fri 9/24/10
386		386	4.2.8	CesrTA Run 8	Sat 11/27/10	Fri 1/14/11
387		387	4.2.9	CesrTA Run 9	Mon 4/25/11	Sun 6/5/11
388		388	4.2.10	CesrTA Run 10	Mon 8/8/11	Sun 9/18/11
389		389	4.3	**CHESS Runs (Startup and User Operations)**	Wed 4/16/08	Sun 11/20/11
401		401	4.4	**Other Activities**	Fri 8/1/08	Sun 8/10/08



M. Palmer | Page 1 of 1 | Revision Date: *Mon 7/16/07*

CesrTA Schedule



- Program Focus

  2008-9: Electron cloud growth and suppression (particularly in wiggler chambers)

  2009: Improvements to achieve low emittance operations

  2009-10: Evaluations of ultra low emittance tuning and beam dynamics studies (EC and FII) at ultra low emittance

  2011: ILC prototype testing (eg, vacuum chambers)

Milestones I

- **2008:**
  - Electron Cloud Growth Studies
    - Wiggler chambers
      - Installation during downs 1 and 2
      - Initial tests during CesrTA runs 1 and 2
    - Dipole Chambers
      - Installation during down 2
      - Initial tests during CesrTA run 2
  - Reconfigure the CESR ring for the ultra low emittance lattice (ε_{x}=2.3 nm) during down 2
    - Wiggler relocation
    - Vacuum diagnostics and instrumentation upgrades
  - Begin the beam-based and instrumental alignment program to reduce transverse coupling and vertical dispersion
  - Prepare the optics line for the x-ray beam size monitor for the positron beam.
  - Begin experiments at low emittance to explore emittance dilution and instability thresholds due to EC and FII effects.
- **2009:**
  - Complete the upgrade of the BPMs at vertically focusing quadrupoles
  - Complete the longitudinal feedback upgrade for 4ns capability.
  - Complete the alignment and survey upgrade (no LiCAS-II)
  - Commission the x-ray beam size monitor for the positron beam
  - Install the optics line for the electron beam size monitor
  - Measure emittance dependent and emittance diluting effects associated with the ECE, FII, and IBS.
  - Install new vacuum chambers for monitoring the electron cloud and ions in wigglers, dipoles, quadrupoles and drift regions.
  - Further measurements of electron cloud growth and tests of electron cloud suppression techniques (energy range: 2-5 GeV)
  - Initial evaluations for the ILC EDR
    - EC Growth and Suppression
    - Emittance impact of ECE and FII

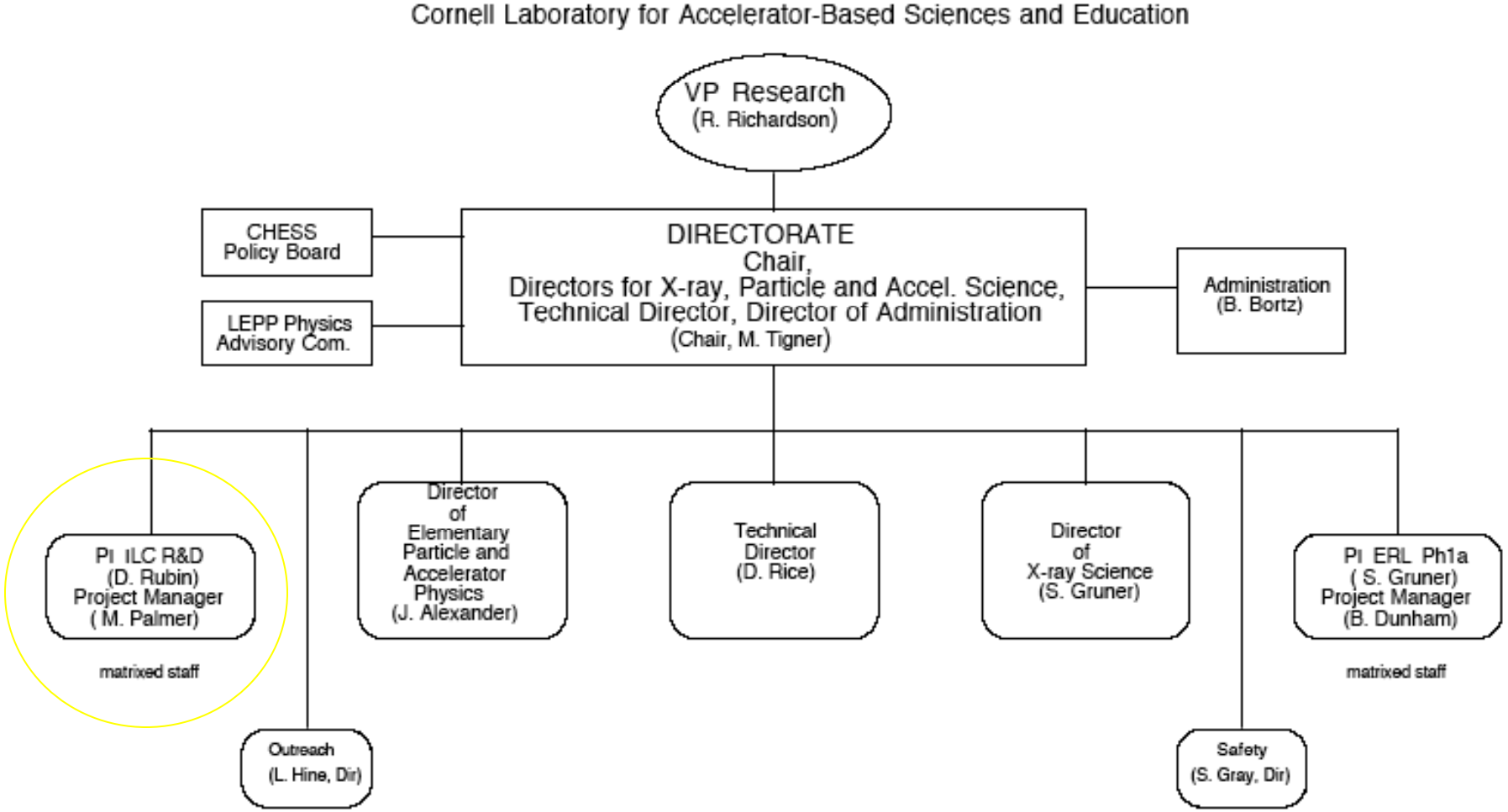
Milestones II

- **2010:**
  - Complete the upgrade of BPM system for ultra low emittance tuning
  - Commission x-ray beam size monitor for electron beam.
  - Establish optimal emittance tuning algorithms and limits and evaluate the beam species dependence of the emittance performance
  - Circulate beams of both electrons and positrons with emittance, bunch and charge configuration comparable to the ILC damping ring specifications and measure thresholds for instability and emittance growth
  - Test prototype ILC wiggler vacuum chamber in CESR wiggler at 5 GeV
  - Provide ILC EDR contributions
- **2011:**
  - Conduct beam tests of ILC damping ring prototype components
  - Continue ultra low emittance beam dynamics and tuning studies

Tools

- Resource Management and Scheduling
  - Microsoft Project based system
  - Multi-project laboratory
    - Overall manpower matrixing coordinated by Technical Director
- Cost Management
  - Project WBS will be integrated with personnel time system for multi-project accounting
  - Project WBS will be integrated with laboratory budget system for multi-project accounting

People and Projects I



People and Projects II

- Key Project Areas Management Assignments
  - Alignment, Survey, Stability – D. Hartill, M. Tigner
  - BPM Upgrade – M. Palmer
  - Feedback System Upgrade – R. Meller
  - Machine Conversion – M. Palmer
  - Magnets and Power Supplies – D. Hartill
  - Research Program – D. Rubin, M. Palmer
  - Streak Camera – D. Hartill, R. Holtzapple
  - Vacuum System Modifications – M. Palmer
  - X-ray Beam Profile Monitor – J. Alexander

Interface with the ILC DR Group

- Cornell R&D activities are coordinated with DR R&D Plan
  - Collaborator effort to be coordinated via the overall R&D plan
    - Via *master* work packages for the relevant R&D areas
      - ILC resource management
      - ILC progress evaluation
  - Technical Evaluation
    - Expect that progress will be regularly evaluated via the mechanisms presently being specified for the ILC EDR phase
      - Yearly reviews of CesrTA progress desirable in this context
    - Expect that key metrics as specified by the damping rings R&D task force and the EDR management will be employed

ILC DR R&D Activities by Institution

Cornell

2.1.1.H	Modelling of alternative injection/extraction techniques - RF deflection schemes and other techniques
2.1.4.B	Develop low-emittance tuning strategies with validation in CesrTA
2.1.4.C	Specify the alignment tolerances and stabilization requirements for the damping rings
2.2.3.D	Studies of electron-cloud build-up and instabilities with simulation and experiment
2.2.4.E	Studies of fast ion instability (modelling and experimental)
2.2.5.G	Estimate the impact from CSR
2.2.5.H	Simulation of the Touschek lifetime and intrabeam scattering effects with measurements in CesrTA
3.4.6.A	Develop physics design for damping wigglers
3.4.6.C	Develop engineering design for ILC damping wigglers based on CESR-c superconducting wiggler design
3.5.1.C	Development of fast injection/extraction kickers
3.6.2.A	Development of 650 MHz superconducting RF cavity and cryomodule
3.7.3.B	Develop instrumentation for monitoring emittance damping (including testing and operation in CESR-c and CesrTA)
3.7.5.A	Develop methodology for fast dispersion measurements (including testing and operation in CESR-c/CesrTA)
4.2.1.D	Development of CesrTA
4.2.1.E	ATF instrumentation and hardware development

Addressing Program Risks (1)

- 3 Key Areas

I. Collaborator contributions

- Example: Linear Collider Alignment and Survey Group
  - A. Reichold and D. Urner (Oxford)
  - STFC funding not available for planned program
- Approach
  - Work through the ILC GDE mechanisms to ensure funds and manpower are available for necessary work
  - Adjust scope in consultation with the damping rings R&D management as needed

II. Flexibility

- R&D program designed for flexibility
  - Technical solution development will evolve based on initial findings
  - Beam dynamics studies will evolve based on initial measurements
- Program relies on
  - A flexible machine as demonstrated over the last 3 decades
  - A highly skilled accelerator physics staff
  - Expert collaborators in the areas under study

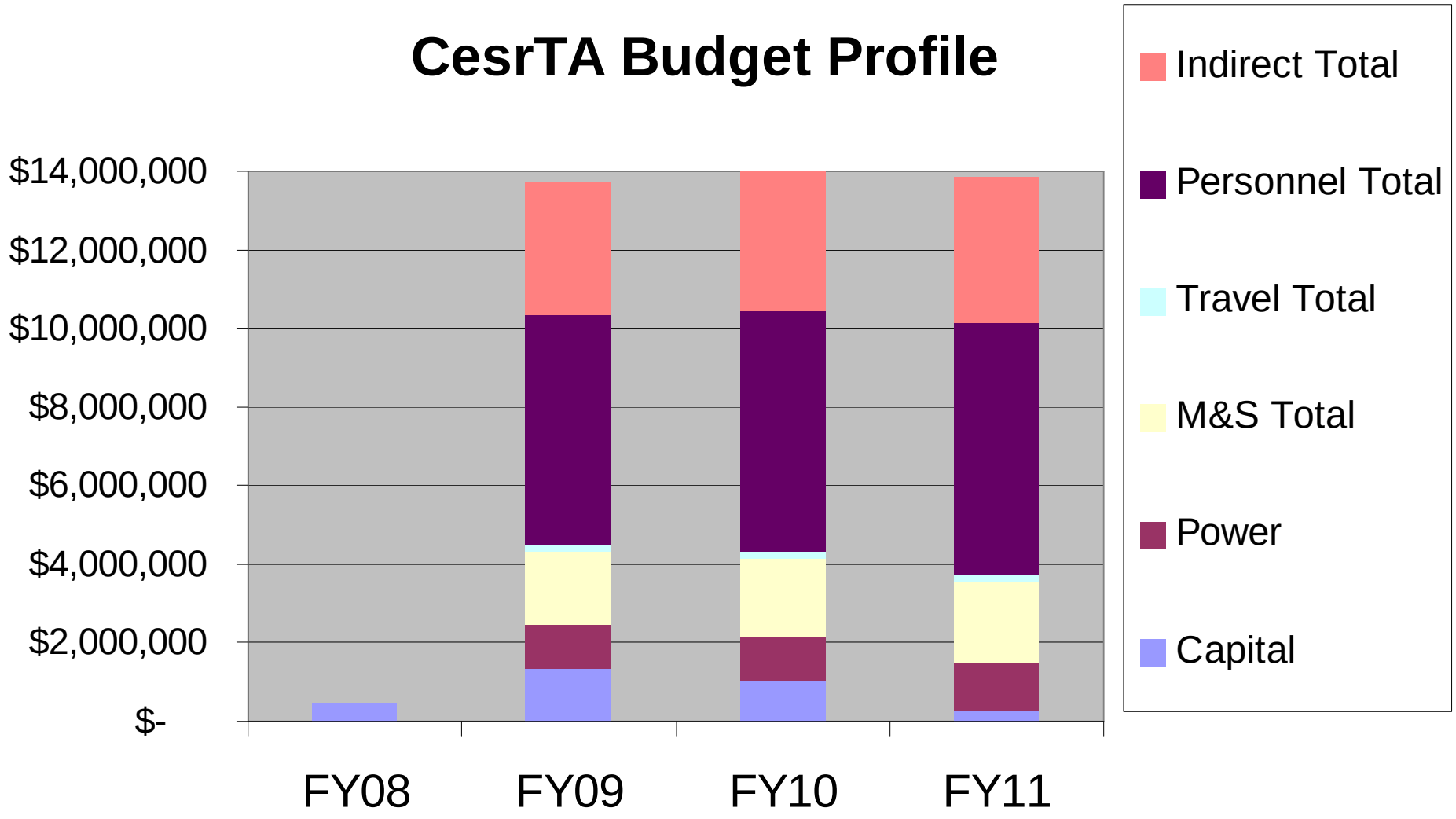
III. Budget Overview and Costs (see following slides)

Budget Overview (1)

Description	FY08	FY09	FY10	FY11	Total
Capital Expenditures					
Computing Infrastructure	$ -	$ 20,450	$ 11,000	$ 12,000	$ 43,450
Vacuum and Vacuum-Related Diagnostics*	$ 120,450	$ 272,203	$ 314,596	$ 101,500	$ 808,749
X-ray Monitor and Optics Development	$ 115,000	$ 140,000	$ 155,000	$ 130,000	$ 540,000
Beam Instrumentation	$ 107,000	$ 151,385	$ 200,000	$ -	$ 458,385
Alignment, Survey, Stability	$ 34,018	$ 266,525	$ 102,476	$ -	$ 403,019
Feedback System for 4 ns Operation	$ 50,000	$ 215,000	$ -	$ -	$ 265,000
Magnet Power Supply Upgrade			$ 118,922		$ 118,922
Accelerator Conversion	$ 50,225	$ 105,023	$ -	$ -	$ 155,248
General Instrumentation	$ 5,000	$ 138,222	$ 108,066	$ 36,437	$ 287,725
Outreach Participant Cost		$ 19,000	$ 19,855	$ 20,748	$ 59,603
Capital Expenditures Sub-Total	$ 481,693	$ 1,327,808	$ 1,029,915	$ 300,685	$ 3,140,101
Power		$ 1,102,664	$ 1,135,744	$ 1,169,817	$ 3,408,225
Capital Expenditures Total	$ 481,693	$ 2,430,472	$ 2,165,659	$ 1,470,502	$ 6,548,326
Materials and Supplies					
M&S Total		$ 1,902,956	$ 1,988,590	$ 2,078,076	$ 5,969,622
Travel					
Domestic		$ 53,922	$ 56,348	$ 58,884	$ 169,155
Foreign		$ 111,188	$ 116,191	$ 121,420	$ 348,800
Travel Total	$ -	$ 165,111	$ 172,540	$ 180,304	$ 517,955
Personnel					
Salaries		$ 4,003,930	$ 4,204,126	$ 4,414,333	$ 12,622,389
GRA/RA Salaries/Expense		$ 487,440	$ 511,630	$ 537,050	$ 1,536,120
Employee Benefits		$ 1,321,297	$ 1,387,361	$ 1,456,728	$ 4,165,386
Personnel Total	$ -	$ 5,812,667	$ 6,103,117	$ 6,408,111	$ 18,323,895
Indirect Costs					
Indirect Total		$ 3,394,266	$ 3,557,882	$ 3,729,399	$ 10,681,547
Project Total	**481,693**	**13,705,472**	**13,987,788**	**13,866,392**	**42,041,345**

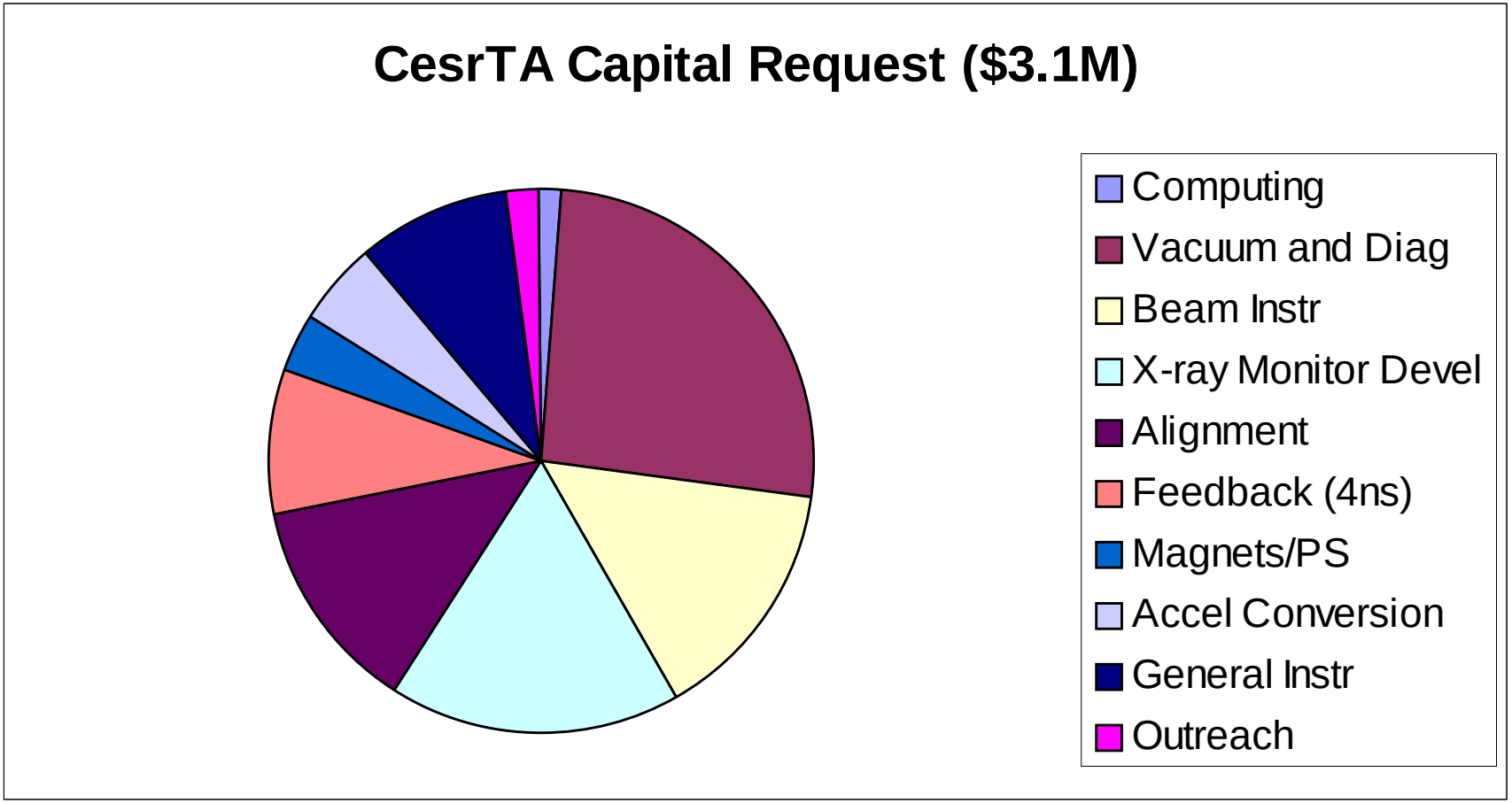
* Includes X-ray line costs

Budget Overview (2)



Cost Drivers

- Principal Cost Driver: Operations Cost
  - Capital requirements relatively modest



Conclusion

- CesrTA program will be operate within existing project management structures at CLASSE
- Managers for key areas have been identified
- R&D program will be fully integrated with the ILC R&D effort
  - Coordination
  - Technical evaluation
- Program has the flexibility to handle likely risks