FY09 Self-Evaluation

Contractor Performance Evaluation and Measurement Plan

Volume 1

Science and Technology

Goals 1 – 3

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Executive Summary

Overall, SLAC exceeded expectations in the operation and construction of facilities (element 2 of the overall S&T evaluation), with a self evaluation grade of A. This high score in FY09 reflects the remarkably rapid commissioning of the LCLS electron and photon beams, delivering the world's first x-ray free electron laser, the success of the Fermi Gamma-ray telescope scientific mission and the excellent and enhanced performance of the SPEAR3 light source. SLAC met expectations in the quality of the leadership provided (element #3) with a B+ rating. In the accomplishment of science mission (element #1), SLAC met expectations with a grade of B+ on average.

Major accomplishments in FY09 included:

1. Commissioning of the LCLS FEL electron and photon x-ray beam, meeting or exceeding design goals
2. Both the LCLS and LUSI projects met schedule and budget milestones in addition to achievement of technical goals
3. Transition of LCLS, FACET and SSRL operations, Accelerator Research and ETS into the new Accelerator Directorate
4. Very high efficiency SSRL accelerator and user operations
5. The Fermi Gamma-Ray Space Telescope and Instrument Science Operations Center meeting all first year mission goals and excellent scientific productivity
6. Transition of FACET to preliminary engineering design phase and completion of CD-1
7. High publication rate and scientific productivity of the BaBar and SSRL programs
8. All the programs at the laboratory continued to produce excellent science and receive wide recognition

The laboratory continued to successfully deliver on the LCLS construction project which is now more than 90% complete. Scientific experiments on LCLS will begin at the end of FY09. While the quality of interactions between laboratory management and the program offices continued to improve in FY09, further effort will be needed to ensure full transparency and fully effective communications in the future.

Overall, FY09 represented one of the years of greatest change in the laboratory's history. The success of LCLS, beginning the transition of LCLS from construction to operations phase and the formation of the new Accelerator Directorate provide an essential foundation for SLAC in the coming decade. It is the leadership's assessment that in FY09, the S&T challenges were effectively met and the overall mission transition from primarily a single purpose to a multipurpose laboratory continued to move forward.

For each of the three S&T goals, performance was in the range from A to B+ using the DOE letter grade/numeric score scales established in the PEMP. The laboratory's overall self evaluation score is 3.6 (A-).

Science and Technology Score Calculation

Element		Letter Grade	Numerical Score	Goal Weight	Weighted Score	Total Score
1	Provide for Efficient and Effective Mission Accomplishments	B+	3.4	24%	0.82	
2	Provide for Efficient and Effective Design, Fabrication, Construction and Operations of Research Facilities	A	3.8	56%	2.13	
3	Provide Effective and Efficient Science and Technology Program Management	B+	3.4	20%	0.68	
Total Science and Technology Score						A- / 3.6

Goal 1 Provide Efficient and Effective Mission Accomplishment

BES/BER (70%)

Element		Letter Grade	Numerical Score	Objective Weight	Weighted Score	Total Score
1	Provide for Efficient and Effective Mission Accomplishments					
1.1	Science and Technology Results Provide Meaningful Impact on the Field	A	3.8	50%	1.90	
1.2	Provide Quality Leadership in Science and Technology	B	2.8	20%	0.56	
1.3	Provide and Sustain Science and Technology Outputs that Advance Program Objectives and Goals	B+	3.2	15%	0.48	
1.4	Provide for Effective Delivery of Science and Technology	B+	3.2	15%	0.48	
BES and BER Science and Technology Score						B+ / 3.42
					BES and BER Funding Weight (70%)	2.39

HEP (30%)

Element		Letter Grade	Numerical Score	Objective Weight	Weighted Score	Total Score
1	Provide for Efficient and Effective Mission Accomplishments					
1.1	Science and Technology Results Provide Meaningful Impact on the Field	A	3.8	30%	1.14	
1.2	Provide Quality Leadership in Science and Technology	B+	3.2	30%	0.96	
1.3	Provide and Sustain Science and Technology Outputs that Advance Program Objectives and Goals	B+	3.2	20%	0.64	
1.4	Provide for Effective Delivery of Science and Technology	B+	3.2	20%	0.64	
HEP Science and Technology Score						B+ / 3.38
					HEP Funding Weight (30%)	1.01

Total Goal 1 Score: B+ (3.4)

BES/BER

A Linac Coherent Light Source (LCLS)/LUSI

The LCLS x-ray free-electron laser (XFEL) facility will enable discovery science by providing x-ray pulses of unprecedented peak brightness and ultrashort duration. The facility is currently under construction, with initial experiments planned to begin in the fall of 2009. In addition to the main LCLS construction project, the major item of equipment (MIE) project LUSI will build three additional scientific end stations for the LCLS facility.

As a unique scientific resource, the LCLS is in high demand from a world-wide scientific community. SLAC is making every effort to assure the timely completion of construction and the efficient and productive operation of this new facility. In FY09, SLAC revised the management structure of the LCLS Directorate to facilitate the efficient operation of the facility and of the scientific experiment program. Within the LCLS Directorate at SLAC, the X-ray Facilities Division (XFD) has been substantially expanded to operate the LCLS x-ray experiment program and manage user research. Responsibility for operation of the SLAC linear accelerator was placed in the newly formed SLAC Accelerator Directorate (AD).

Electron beam commissioning concluded very successfully in FY09, with the full LCLS accelerator system meeting or exceeding all of its goals. The x-ray beam produced by the undulator has also met or

exceeded design objectives. These are major milestones toward the realization of a fully operational linac-based XFEL. The LCLS injector remains the brightest FEL injector in the world and LCLS is the only accelerator producing hard x-ray FEL radiation. Interest in these accomplishments has been demonstrated through invited talks at major international conferences and offers to participate in the LCLS commissioning effort.

Objective 1.1

PERFORMANCE SUMMARY

- The FY09 commissioning of the undulator complex was very successful, exceeding all expectations.
- The electron beam quality routinely meets specifications for LCLS FEL operations.
- A new 2 femtosecond operating mode is an exciting expansion of LCLS science capability.

NOTEWORTHY PRACTICES

- Early, carefully planned commissioning of the LCLS accelerator continues to provide extensive pre-operational experience.
- FEL diagnostics and methods continue to attract attention from the international XFEL community.
- FY09 commissioning included representatives from DESY, Sincrotrone Trieste and SPring-8.

OPPORTUNITIES FOR IMPROVEMENT

- Details of the final machine design and the results of initial operations need to be recorded and published.
- Continue to establish ultrafast science as a robust core competency at SLAC.
- Improve documentation of x-ray transport/optics/diagnostics systems.

Objective 1.2

PERFORMANCE SUMMARY

- Due to its groundbreaking nature, many of the LCLS systems are quite innovative. The success of some of these innovations is demonstrated by the performance of the LCLS undulator complex.
- The three-way international collaboration between LCLS, DESY and SPring-8 has used LCLS to explore technical challenges common to the collaborators' FEL equipment.
- LCLS staff members are involved in leading experiments on the soft x-ray FEL facility in Germany (FLASH) and at other third generation synchrotrons worldwide.

NOTEWORTHY PRACTICES

- LCLS seeks out advice through international workshops and design reviews.
- LCLS commissioning effort includes top scientists from other FEL facilities.

OPPORTUNITIES FOR IMPROVEMENT

- LCLS must continue to attract and maintain a top-quality scientific staff as it moves from construction to scientific operations.
- LCLS photon beam systems must rapidly transit to smooth operation.

Objective 1.3

PERFORMANCE SUMMARY

- LCLS dominated the FEL conference and featured prominently at the Particle Accelerator (PAC) conference, both held in FY09.
- LCLS published four peer-reviewed journal articles in FY09.

NOTEWORTHY PRACTICES

- LCLS SAC meets semi-annually.
- LCLS responds formally to SAC review recommendations.
- XFD was expanded to manage user research program, which began in FY09.

OPPORTUNITIES FOR IMPROVEMENT

- The recording of details of LCLS technical systems must be coordinated across all the collaborating institutions.

Objective 1.4

PERFORMANCE SUMMARY

- Major project milestones completed on time.
- Commissioning of the LCLS Undulator complex was completed ahead of schedule.
- Performance of the commissioned portions of the facility has exceeded design goals.

NOTEWORTHY PRACTICES

- Commissioning results presented at international conferences.
- Performance guidelines based on commissioning results communicated to user community.

OPPORTUNITIES FOR IMPROVEMENT

- Early science goal will require efficient coordination of accelerator operations, beam commissioning and instrument installation/commissioning.

B Stanford Synchrotron Radiation Lightsource (SSRL)

The Stanford Synchrotron Radiation Lightsource (SSRL) is a national user facility that provides synchrotron radiation to a broad user community to investigate matter at the atomic and molecular level, allowing a wide variety of research in basic and applied areas. Over 1,010 on-site researchers use SSRL each year from industry, universities and government laboratories, representing the fields that include astronomy, biology, chemical engineering, chemistry, electrical engineering, molecular environmental science, geology, materials science, medicine, and physics.

In FY09, the SSRL facility provided 30 end-stations on 25 beam lines, which continue to be in high demand by the user community. The SPEAR3 Beam Line Upgrade Project was completed in FY09 and work proceeded on two additional beam lines that will be completed in FY10. The uptime for SPEAR3 was an unprecedented 99% coupled to enhancements in the operating conditions including implementation of 200 mA user operation with top-off injection, first user experiments in short pulse mode, and significant beam line stability improvements achieved via photon beam based feedback systems. Accelerator development will continue in FY10 to ultimately bring SPEAR3 to an operating current of 500 mA employing trickle charging to maintain high average currents.

SSRL continues to pioneer research in the fields of condensed matter physics, structural molecular biology and molecular environmental science. In addition, SSRL provides ongoing training opportunities to disseminate information, technological and theoretical developments, and to encourage reciprocal

exchange of information and thought, from both pure science and practical perspectives. Much of this information is also provided on-line via the SSRL web site (www-ssrl.slac.stanford.edu).

Objective 1.1

PERFORMANCE SUMMARY

- Successfully achieved first user operation with 200 mA current and top-off injection.
- Developed advanced tools for macromolecular crystallography that has made possible diffraction from 5 micron diameter crystals.
- Britt Hedman received the International X-ray Absorption Society Outstanding Achievement Award and Edward Solomon was chosen to be in the first class of American Chemical Society Fellows for excellence in chemistry.

NOTEWORTHY PRACTICES

- Development of advanced remote access tools for macromolecular crystallography that are becoming widely used in the biological synchrotron radiation community.
- Complete process of study, evaluation, approval and implementation of high current operation well integrated and completed in a short time.

OPPORTUNITIES FOR IMPROVEMENT

- Develop ways for the increased flux made available with high operating currents to impact more areas of research.
- Make robotic enabled, remote access tools more widely available to experiments beyond macromolecular crystallography.

Objective 1.2

PERFORMANCE SUMMARY

- Pursued novel approaches for high injection rates at SPEAR3 by successfully demonstrating >70 mA/min injection rates using a photocathode RF gun.
- SSRL scientific staff chairs the international scientific advisory committees of two international synchrotron facilities (The Photon Factory and the Taiwan Photon Source).
- Statistics from the Protein Data Bank (PDB) demonstrate that SSRL's macromolecular crystallography beam lines were the most productive (numbers of structures) per beam line in the US in 2008.
- A new BER SFA program in Environmental Remediation Science focuses on developing scientific tools to establish and quantify factors that drive accumulation of uranium in the subsurface.
- SSRL staff carries out extensive collaborations with user groups that more rapidly disseminate new technologies and result in a significant increase in research productivity.

NOTEWORTHY PRACTICES

- Carried out an effective collaboration with the Advanced Light Source to analyze the accelerator physics and safety requirements for top off operation.

Objective 1.3

PERFORMANCE SUMMARY

- SSRL staff and users maintain a high output of publications with 381 journal articles, 7 books/chapters, and 30 theses in FY08. The, as yet, incomplete count in FY09 is 263 journal articles and 3 theses.

Objective 1.4

PERFORMANCE SUMMARY

- SSRL has been very effective in meeting beam line and instrument development goals both with respect to timeliness and quality. This was evidenced by the completion of the BL4-2 facility for biological small-angle scattering in FY09 and the microfocus x-ray diffraction BL12-2.
- The BL6-2 transmission x-ray microscope delivered high quality images with sub-30 nm spatial resolution, which is state-of-the-art for a hard x-ray microscope.
- SSRL publishes a monthly electronic newsletter that is sent to the user community with news and scientific highlights.

NOTEWORTHY PRACTICES

- Improvement of photon beam stability made it possible for a number of beam line instruments to deliver the specified performance. This was achieved by a coordinated effort between several groups to provide better temperature stability and positional feedback to the beam line mirror systems.

C PULSE

The main mission of the PULSE center is to conduct research in ultrafast science, which supports the research program of the LCLS and SSRL, and the BES mission. PULSE research spans ultrafast dynamics in chemistry, materials science, atomic, molecular and optical (AMO) physics and structural biology.

Objective 1.1

PERFORMANCE SUMMARY

- Pulse staff recently recorded the first complete 3D data set on a nanoscale object at the FLASH VUV-FEL, which sets the stage for atomic resolution experiments using LCLS.
- Demonstrated the role of multiple orbitals in high harmonic generation (HHG). This creates new opportunities to monitor the dynamics of electrons in molecules.
- At SPEAR3, the PULSE high rep rate ultrafast laser instrument is starting to be used in ultrafast experiments with SPEAR3 in "low-alpha" mode, where few-picosecond resolution is possible, complementing the ultrafast time scale measurements on LCLS.
- THz lab-based strong field sources have been developed for probing and controlling electronic processes in solids and new nonlinear THz-induced effects have been observed.

NOTEWORTHY PRACTICES

PULSE researchers have worked in research areas designed to enhance the scientific productivity of LCLS, including:

- Providing leadership in a collaboration on single particle injection systems for the LCLS Coherent X-ray Imaging instrument.
- Assisting with commissioning at the laser photocathode for the LCLS injector and at the AMO end station instrument.
- Building an ultrafast x-ray community through PULSE ultrafast x-ray summer school and visitor programs.

OPPORTUNITIES FOR IMPROVEMENT

- Making optimal use at new PULSE laboratories beginning in mid-FY10 providing better co-location and research collaboration opportunities among PULSE and LCLS scientists.

- Continue to find better means to interact and coordinate activities between LCLS and PULSE staff.
- Review and improve safety procedures involving lasers in PULSE laboratories and assure full adherence by all LSOs to SOPs.

Objective 1.2

PERFORMANCE SUMMARY

PULSE has lead or co-lead proposals for new instruments and developed new strategic direction this year, including:

- Co-leading the x-ray pump probe (XPP) instrument development team.
- Co-authoring the joint Berkeley-SLAC proposal for future light sources.
- Leading several successful proposal teams for LCLS first experiments on AMO and SXR.
- Co-leading development of a THz test facility at SLAC.
- Leading successful recruitment in strategic areas of ultrafast theory and establishing new program coupled to LCLS experiments.

NOTEWORTHY PRACTICES

- PULSE conducts a seminar series and participates in the SLAC instrument seminar series, linking different research activities of the Stanford and SLAC communities.

Objective 1.3

PERFORMANCE SUMMARY

- PULSE staff were major participants in the establishment of the grand challenge goals in energy science for BES.
- PULSE participated with LCLS on the design of the baseline instruments.
- PULSE assisted LCLS in holding proposal writing workshops and the Ultrafast X-ray Summer School, in order to begin an active and sustained world-leading research and user program.
- PULSE staff has written many successful proposals for beam time on LCLS, and will participate in more than half of the allocated beam time in the first round of user operations.

NOTEWORTHY PRACTICES

- To enhance science innovation and impact, PULSE is encouraging collaborative activities and focusing on grand challenge energy research.

Objective 1.4

PERFORMANCE SUMMARY

- Developing a new Mott detector that can provide electron spin-detection at LCLS for magnetic dynamics and spectroscopy measurements.
- Deploying newly developed laser-based THz capabilities.
- Commissioning an ultrafast x-ray table-top source in the LCLS NEH.
- Working with LCLS to build the soft x-ray end station instrument at LCLS.

D SIMES

SIMES conducts scientific research that is primarily aligned with the mission and goals of BES Division of Materials Science and Engineering. SIMES' core competencies include advanced x-ray experiments,

materials synthesis and discovery, as well as theory and computation. SIMES leverages and enriches two important photon science facilities at SLAC – LCLS and SSRL. SIMES develops and utilizes synchrotron-based tools in areas that include angle-resolved photoemission spectroscopy, coherent x-ray imaging, x-ray emission spectroscopy and x-ray scattering. SIMES research programs are organized into seven field work proposals (FWP): i) Electronic and Magnetic Structure of Quantum Materials; ii) Correlated Materials – Synthesis and Physical Properties; iii) Spin Physics; iv) Interfaces and Catalysis for Energy Conversion and Storage; v) Carbon Based Materials; vi) Time-Resolved Soft X-ray Materials Science at the LCLS and the ALS; vii) Diamondoid Science and Applications.

Objective 1.1

PERFORMANCE SUMMARY

- SIMES has had a significant impact on the field of materials and energy science, with numerous publications in premier scientific journals such as Science and Nature, a number of SIMES publications were featured by journals as an editor's choice paper.
- SIMES work on topological insulators has attracted considerable attention from the scientific community and the general public via media coverage.
- SIMES photoemission papers on superconductors have been identified by ISI as among the most cited publications.
- Development of a new fuel cell catalyst has the highest activity as measured in a real fuel cell and will be used by General Motors in vehicles for long term tests.
- Sarah Heilshorn was awarded the Doctoral New Investigator Award by the American Chemical Society, Petroleum Research Fund and the Translational Nanoscience Young Scholar Award; Aharon Kapitulnik was elected as Fellow of the American Academy of Arts and Sciences and won the "Heike Kamerlingh Onnes Prize for superconductivity experiments"; Shoucheng Zhang received the Alexander von Humboldt Research Prize, awarded by the Alexander von Humboldt Foundation of Germany; Tom Devereaux and Kathryn Moler were named American Physical Society fellows; Yulin Chen will be the recipient of the 2009 William E. and Diane M. Spicer Young Investigator Award.

NOTEWORTHY PRACTICES

- Strong collaborative research environment – many joint publications among SIMES PIs.
- Productive partnership with SLAC Photon Science User Facilities – completion of the soft x-ray beam line at SSRL and funding for a new photoemission beam line proposal with SSRL and Soft x-ray consortium at LCLS.
- Strong partnership with another national laboratory in developing research programs, such as the recent success with the LCLS soft x-ray SISGR proposal.
- Forging partnership with industry to develop new research in diamondoids, a project that was seeded by Chevron and is now a SISGR program funded by DOE.

  Enacting joint initiatives in photon and energy science education. SIMES developed an x-ray summer school in partnership with LBNL, and an Energy summer school in partnership with PIE, GCEP and NREL.

OPPORTUNITIES FOR IMPROVEMENT

- Strengthen SIMES faculty and facility x-ray scattering capabilities as recommended by BES peer review of SIMES in FY09.
- Solidify SIMES core competencies in materials discovery and synthesis by developing and executing a good succession plan.

Objective 1.2

PERFORMANCE SUMMARY

- Leadership in developing new theoretical concept in topological insulators – now an important field by itself.
- Leadership in identifying diamondoids as a unique class of new materials for scientific and technological exploration.
- Leadership in advanced x-ray based experiments, such as photoemission spectroscopy, as evidenced by the publications being among the most cited in the field, as identified by the Institute for Scientific Information.

NOTEWORTHY PRACTICES

- Brown bag lunch discussions, regular seminars to stimulate scientific discussion.

OPPORTUNITIES FOR IMPROVEMENT

- Implement a strategic hiring/recruiting plan to attract, grow and maintain top talent.

Objective 1.3

PERFORMANCE SUMMARY

- SIMES has numerous papers in peer review journals.
- SIMES has responded to the comments by a recent BES DMS&E review through a re-organization. The reorganization plan has been accepted by BES DMS&E.

OPPORTUNITIES FOR IMPROVEMENT

- Follow through on new FWP organization, monitoring closely productivity and scope delineation and adherence to defined mission and goals.
- Continue to act on and monitor progress on addressing specific points raised in FWP subtasks from DMS&E review.

Objective 1.4

PERFORMANCE SUMMARY

- SIMES demonstrates its effective delivery through its research findings that are widely published and disseminated.
- The results have been effectively transmitted as evidenced by citations, invited talks, and press coverage (see http://simes.slac.stanford.edu/News.asp).

HEP

E Accelerator Research

The Accelerator Research Division (ARD) includes Advanced Accelerator R&D (AARD), Advanced Computations (ACD), Advanced Microwave Technology Research (ATR), Beam Physics (ABP), Linear Collider (LC), LHC Accelerator Research (LHC-AR), Super B-Factory Accelerator (SuperB) and Test Facilities (TF). LC is described in a separate section.

- AARD develops novel acceleration techniques most notably laser acceleration and plasma wakefield acceleration.
- ACD develops and applies high-performance computational tools for the design, optimization and analysis of existing and future accelerator projects with funding from the SciDAC program.

- ATR is the host for the national and international high gradient collaborations that pushes the state-of-the-art in high-gradient normal conducting acceleration with an extensive theoretical and experimental program.
- The Beam Physics Department (ABP) supports operating accelerators, designs new accelerators, and investigates the generation and acceleration of high brightness beams. Core competencies include optics, nonlinear dynamics and collective effects, beam-beam interaction, spin dynamics, coherent synchrotron radiation, and FEL physics.
- The LHC Accelerator R&D Department has an extensive program to support the LHC and its upgrades, including collimators, crab cavities, low-level RF systems, electron cloud induced instability in the SPS, and commissioning of instrumentation.
- The Super B-Factory Accelerator Department pursues design of the SuperB collider, proposed for a site near INFN Frascati, focusing on the interaction region design, beam polarization, lattice development and higher-order-mode effects.

Objective 1.1

PERFORMANCE SUMMARY

AARD - Laser Acceleration

- Continued development of electro-optic devices for laser acceleration and high-sensitivity high-precision techniques for diagnosing micron and femtosecond class beams at the NLCTA.
- Continued to develop the theory of guided TM modes in photonic band gap structures.

AARD - Plasma Wakefield Acceleration

- Developed concepts for a plasma wakefeld accelerator based linear collider.
- Designed FACET (Facilities for Accelerator science and Experimental Test Beams) with a unique capability to study research issues associated with plasma acceleration.

ACD

- Simulated an entire ILC cryomodule to advance understanding of wakefield issues.
- Identified the cause of a beam breakup problem using advanced shape uncertainty quantification techniques.

ATR

- Tested and characterized single-cell and multi-cell standing-wave and travelling-wave structures in both the newly upgraded ASTA and the NLCTA.
- Built structures using new empirical scaling laws that achieved loaded gradients over 140 MV/m and travelling-wave structures of over 100 MV/m.
- Continued design of bunch-to-bunch feedback systems for the CERN SPS, SuperB, and PEP-X, based on experience at PEP-II, ALS, DAPHNE, PAL and SLS.
- Studied new copper alloys and demonstrated that CuZr, CuCr, and CuAg are capable of achieving record high gradient in accelerator structures without loss of efficiency.

ABP

- Studied a proposed new method for FEL seeding, echo-enabled harmonic-generation (EEHG), which can reach x-ray wavelengths in the water window beginning with an optical seed and two relatively simple beam manipulations.
- Proposed a very low charge (20pC) and ultra-short bunch (3 fs) mode for generating a few femtosecond x-ray pulse with the extremely low emittance LCLS electron beam.

LHC-AR

- Fabricated and tested the first jaw of a prototype LHC Phase II rotatable collimator.
- Coordinated with CERN and other US LARP laboratories to develop a 5-year plan focused on intensity-related effects in the planned PS2.
- Studied e-cloud induced instability effects in the SPS and RF modeling for control.
- Designed a superconducting crab cavity and coupler adopted by the US LARP.
- Applied the PEP-II low-level RF model to commissioning the LHC system without beam.

SuperB Accelerator

- The interaction region design continued with initial conceptual engineering.

NOTEWORTHY PRACTICES

- Leveraged the experience of the Laser Acceleration program to assist in design and implementation of an FEL seeding EEHG demonstration experiment.

OPPORTUNITIES FOR IMPROVEMENT

- Develop a roadmap for high gradient structures incorporating all features required for a practical application, including wake field damping and efficient couplers.

Objective 1.2

PERFORMANCE SUMMARY

- AARD developed 550 T/m permanent magnet quad triplet to focus electron beams into optical structures. Established tolerances required of optical ("woodpile") structures and developed manufacturing techniques. Developed simulation tools to quantify tolerances and optimize set-up of two bunch experiments at FACET.
- ACD implemented acceleration simulation capabilities using unique finite-element methods, including time-domain beam excitation, efficient particle-in-cell methods for rf gun modeling, and novel scalable algorithms for eigen- and linear solvers.
- ATR developed femtosecond resolution beam diagnostic for LCLS.
- ABP proposed EEHG seeding for FELs including LCLS and developed a very low charge (~20pC) and ultra-short bunch (3 fs) mode for few femtosecond x-ray pulses.
- Collaborated with INFN and Novosibirsk on the SuperB design.
- National and international collaboration on High Gradient Research including INFN, CERN, KEK, MIT, U of Maryland, UCLA, NRL, and U of Colorado. SLAC hosts the U.S. high gradient research collaboration with Tantawi as spokesperson.
- Established collaboration with CERN for the CLIC PETS and accelerator structure simulations and with JLab on the CEBAF beam breakup instability.
- Established collaboration with scientists at SciDAC Centers for Enabling Technologies and SciDAC Institutes for computational science R&D.
- Chair of CLIC Accelerator Advisory Committee.
- Editor of Journal Reviews of Accelerator Science and Technology, Handbook of Accelerator Physics and Engineering, and the Particle Acceleration and Detection Series.

NOTEWORTHY PRACTICES

- An ICFA Mini-Workshop was held at SLAC on Novel Concepts for Linear Accelerators and Colliders.

Objective 1.3

PERFORMANCE SUMMARY

- Members of ARD gave 38 invited talks and 137 publications (of which 24 were in refereed journals); 4 PhD theses were awarded to ARD supervised students.
- ACD won an SBIR Phase II award with Kitware Inc. on "Collaborative visualization for large-scale accelerator modeling".

Objective 1.4

PERFORMANCE SUMMARY

- ARD attracts world class researchers and students while providing forefront work in the advanced accelerator field, in support of the LHC-AR program and in designing new facilities like SuperB.

F Astrophysics at KAVLI

The Particle Astrophysics effort at SLAC consists in the main of leadership in the operation and science exploitation of the Fermi Gamma Space Telescope (FGST), the future dark energy and dark matter research program with the Large Synoptic Survey Telescope (LSST), together with a vibrant KIPAC Theory Group.

The Fermi Gamma-ray Space Telescope, launched in June 2008, is a satellite-based experiment designed to measure the cosmic gamma-ray flux in the energy range from 20 MeV to greater than 300 GeV, with supporting measurements for gamma-ray burst (GRB) transients. SLAC hosts the LAT Instrument Science Operations Center. Science highlights from the last year include the discovery of a Galactic population of radio-quiet gamma-ray pulsars, the detection of gamma-ray bursts at energies of tens of GeV which constrains the mass scale of quantum gravity to be beyond the Planck mass, the best measurement of the spectrum of cosmic ray electrons at energies up to 1 TeV, and the measurement and study of the properties of hundreds of extragalactic gamma-ray sources.

The Large Synoptic Survey Telescope (LSST) is a proposed large aperture, wide-field ground-based telescope designed to provide a sensitive survey of over half the sky in the visible band every few nights. It will yield very deep and precisely calibrated images of nearly 3 billion faint galaxies, suitable for providing tight constraints on the nature of dark energy. SLAC leads a consortium of high energy physics groups engaged in the development of the 3.2 Gigapixel camera for LSST.

The KIPAC Theory group is concerned with basic and phenomenological issues at the Cosmic Frontier of the DOE High Energy Physics program. Special emphasis is placed on topics that relate to FGST, LSST and other experimental programs. These include investigations of dark matter and dark energy and the astrophysical processes that have to be understood to draw firm conclusions from data about fundamental physics. Much of this research is carried out using sophisticated numerical simulations.

Objective 1.1

PERFORMANCE SUMMARY

Fermi GST

- 5 papers published in the journal Science since the launch of Fermi, plus Science cover on Fermi.
- 124 citations in 4 months for the seminal LAT paper on the measurement of the cosmic ray e^+e^- spectrum.
- First year LAT data released to the science community and general public on 25 August 2009.
- Standard analysis toolkit for LAT data is managed at SLAC and released through NASA.

LSST

- Over 300 scientists participated in developing a 600-page “LSST Science Book” to articulate the broad range of astronomical and cosmological investigations enabled by the project.

KIPAC Theory

- Explored pair production models for the excess electron and positron fluxes reported by Fermi and outlined the stringent conditions to be satisfied if this were to be the explanation.
- Showed how the helicity of the scattering hydromagnetic wave modes can be responsible for the positron excess reported by Pamela.
- Investigated the implications of the Fermi observations of the extended radio lobes of the nearby radio galaxy and putative UHECR source Centaurus A.
- Completed an analysis of the potential use of LSST strong lensing for measuring fundamental cosmological parameters.
- Continued analysis of x-ray cluster data, constraining the equation of state of dark energy to better than ten percent and improving constraints on alternative formulations of gravity.
- Explored a new approach to the incidence of non-gaussianity in the primordial perturbation spectrum using the largest angular size gravitational lenses.
- Studied the systematic effect of "assembly bias" on dark energy constraints from future galaxy cluster surveys has been performed.

Objective 1.2

PERFORMANCE SUMMARY

- Fermi LAT produced the most precisely measured spectrum of cosmic ray electrons and positrons up to 1 TeV.
- Development of improved event selection cuts to provide the purest gamma-ray photon sample for understanding the extragalactic diffuse gamma-ray emission.
- Fermi LAT scientists at SLAC are leading collaborative efforts on joint analysis of LAT data with other observational data taken at radio, optical, x-ray and TeV gamma-ray wavelengths.
- SLAC scientists lead Fermi LAT teams on Dark Matter, Calibration & Analysis, and Diffuse Emission.
- NASA Group Achievement Awards to Fermi LAT Project team and to LAT Flight Software team.
- Significant progress made in the LSST camera technical design for sensors, electronics, mechanisms, cryostat, camera body, and thermal system.
- SLAC has worked with OHEP to develop a critical decision schedule for LSST, leading to CD-2 in the first quarter of FY12.
- Blandford is leading the Astro2010 Decadal Survey and edits the premier astrophysical review journal, Annual Reviews of Astronomy and Astrophysics.

NOTEWORTHY PRACTICES

- Analysis Coordinator and Deputy AC for LAT Collaboration are hosted at SLAC.

Objective 1.3

PERFORMANCE SUMMARY

- Published LAT results on flares and GRBs: Astronomers Telegrams and GCN notices.
- Fermi LAT 23 published 23 papers in peer-reviewed journals and submitted 10 more.
- 1 NASA/DOE Press Conference, 1 NASA/DOE press release, and 10 NASA web items on Fermi.

- Produced a major publication summarizing the scientific capabilities of LSST as well as several technical publications on observatory and camera subsystems.
- KIPAC Theory produced more than 70 papers in peer reviewed journals, including theory contributions to observational and experimental papers, especially those published by Fermi.
- Provided critical input to the future Cosmic Frontier program, including the Dark Energy Survey, LSST, JDEM, direct and indirect dark matter detection experiments.

Objective 1.4

PERFORMANCE SUMMARY

- ISOC processing and delivery of LAT data meets all pre-launch requirements and milestones.
- SLAC-based Change Control Boards guide LAT operations, software and configuration changes.

NOTEWORTHY PRACTICES

- SLAC hosts the Confluence wiki web-tool and database used by the LAT collaboration to coordinate and track all aspects of LAT science analyses and operations.
- Monthly LAT Newsletter produced at SLAC provides high level news to LAT Collaboration.

G Elementary Particle Physics

The Elementary Particle Physics effort at SLAC consists in the main of leadership in the flavor physics program with BaBar at the PEP-II B Factory; a growing engagement in the energy-frontier experiment ATLAS at the Large Hadron Collider; research and development efforts for neutrino-less double beta decay in Xenon (EXO); a future linear collider (SiD); a possible super flavor factory (SuperB); and a world-class Theory Group with close ties to all elements of the experimental program.

BaBar is a large international collaboration of more than 500 physicists from 12 countries (Israel and India joined in the course of FY09) and 75 institutions, hosted at SLAC. The primary goal of the experiment is to investigate the origin of CP symmetry breaking in interactions between elementary constituents of matter. BaBar will also pursue searches for the effects of physics beyond the Standard Model in rare decay processes, detailed studies of the dynamics of processes involving beauty and charm quarks, tau physics, and systematic use of Initial State Radiation (ISR) data to study light spectroscopy.

ATLAS is one of two general purpose detectors that will reconstruct proton-proton collisions at the Large Hadron Collider at CERN. The experiment is designed to search for the Higgs Boson and, more generally, search for physics beyond the Standard Model. SLAC has major roles in the Pixel Detector and Trigger/DAQ Systems, simulations for ATLAS and cavern backgrounds, operating the Tier 2 Center, preparation for first physics, and R&D for future detector upgrades.

The Enriched Xenon Observatory (EXO) is a planned future experiment using Xenon enriched in the Xe^{136} isotope to search for neutrinoless double-beta decay. The neutrinoless process is expected to occur only if neutrinos are Majorana particles with a rate proportional to the square of an “effective” neutrino mass. The initial phase of the experimental program is based on EXO-200, a 200-kg liquid xenon TPC (time projection chamber) to be located in the DOE underground Waste Isolation Pilot Plan (WIPP) in New Mexico.

The Silicon Detector (SiD) program conducts R&D on new detector technologies for a TeV-scale e+e- linear collider or any future high-energy detector. It also supports the simulation/reconstruction framework used to optimize detector design, explore detector performance, and benchmark physics performance; and contributes to organizing and promoting the international SiD Design Study, one of two detector concepts recently validated by the International Detector Advisory Group.

Objective 1.1

PERFORMANCE SUMMARY

Accomplishments and noteworthy practices

BaBar

- BaBar continues to provide physics results with unique impact on elementary particle physics, including the first evidence for CP symmetry breaking as the experimental basis for the 2008 Noble Prize awarded to Kobayashi and Maskawa.
- European Physics Society prize for young scientists was awarded to a second BaBar student.
- Post-data taking plans include a focused intense analysis effort through the end of 2010, a steady analysis period through the end of 2012, and then archival access to the data thereafter.

Theory Group

- Developed the first one-loop-accuracy QCD predictions for the cross sections for W or Z plus 3 jets were developed.
- Proposed a new discovery signature for the Higgs bosons in models with extended Higgs sectors and explored implications of 70,000 models of supersymmetry consistent with all current data.
- Studied the R-axion, a light spin 0 particle predicted in dynamical supersymmetry breaking, and developed a new strategy for producing the Higgs boson mass in gauge-mediated supersymmetry.
- Discovered a new mechanism for inflation using the flat potential of string theory modulus fields to predict a striking form of non-Gaussianity in the cosmic microwave background.
- In the area of general mathematical physics, the explicit cancellation of ultraviolet divergences in N=8 supergravity at the four-loop level was demonstrated.
- Shamit Kachru's work on gravity duals of condensed matter physics systems and that of Lance Dixon on N = 8 supergravity were profiled in news articles in Science Magazine.

Objective 1.2

PERFORMANCE SUMMARY

- The BaBar Collaboration at SLAC is one of the leading experimental programs in the US and worldwide, with science results highlighted at all major HEP conferences worldwide.
- BaBar is a leading organization worldwide in the training of HEP physicists, with currently about 100 Ph.D. graduate students and 60 postdoctoral research associates.
- Held major BaBar collaboration leadership positions, was prominent in giving talks at international meetings, and continued to provide leadership in development of SuperB.
- Delivered database proxy software for configuration, partial event build, and online beam position monitoring for the ATLAS High Level Trigger (HLT).
- Undertook complete redesign of firmware and software for critical non-performant ATLAS Muon Cathode Strip Chamber (CSC) Readout System.
- Made major contributions to ATLAS simulations, cavern background simulations and ATLAS detector upgrade simulation.
- Pursued many jet/MissingEt/b-tag reconstruction improvement projects for ATLAS with innovative approaches initiated and led by SLAC through an active working group.
- Pursued ATLAS upgrade R&D for the LHC luminosity upgrades, including 3D silicon sensor R&D; high bandwidth DAQ; CO2 cooling; and high performance electrical data transmission.

- Ran ATLAS workshops on physics discovery, reconstruction and performance, simulation and computing, detector upgrades and the SLAC RCE concept for DAQ upgrades.
- Continued preparations at the WIPP facility for EXO-200, including upgrades and repairs to the cryogenic and liquid xenon systems.
- Completed a unique low-activation materials liquid xenon TPC for EXO-200, including front end electronics and testing.
- Pursued innovative designs for ASIC readout (KPiX), Si/W electromagnetic calorimeter design, minimal-mass silicon microstrip tracker and sensor modules, and Particle Flow Algorithms calorimetry for SiD.
- Completed the SiD Letter of Intent in March 2009, now validated by the International Detector Advisory Group and recognized as one of two concepts world-wide to be developed into a full Technical Proposal for the ILC.

NOTEWORTHY PRACTICES

- BaBar operations and computing needs are jointly supported through an International Finance Committee.
- Selecting technically challenging ATLAS projects matched to SLAC expertise, while also assessing system readiness to identify previously overlooked ATLAS commissioning tasks.
- EXO-200 pioneering the development of low-activation TPC, electronics, cryogenic and liquid xenon systems for ultraclean experimental conditions.
- SiD has been a strong advocate of developing integrated, highly performant, and cost conscious detector designs as a guide to prioritizing and organizing detector R&D for the linear collider.

OPPORTUNITIES FOR IMPROVEMENT

- Additional core expertise exists at SLAC to further strengthen the US contribution to ATLAS, particularly in the areas of computing, DAQ, tracking and upgrade R&D.

Objective 1.3

PERFORMANCE SUMMARY

- BaBar published 47 articles, submitted 37 articles to refereed journals, and was offered 162 invited talks, with more than 400 papers submitted and 400 Ph.D. theses undertaken in total.
- EXO has published several papers in NIM and the Physical Review, including a recent NIM article on characterization of large area APDs.
- Theory Group produced 86 papers, with 58 of these were submitted to refereed journals.

NOTEWORTHY PRACTICES

- The BaBar Collaboration was the co-founded the international Data Preservation and Long Term Analysis (DPLTA) initiative.
- Members of the BaBar Collaboration are engaged in developing the next generation of accelerators and experiments required for precision studies of flavor physics.
- Planning for the dismantling of the BaBar detector is taking appropriate measures to prepare for the possible reuse of key components of long-term value in a future Super *B* Factory.
- Worked closely with SLAC Users Organization on events to encourage collaboration between West coast ATLAS community and utilization of the resources at SLAC for the LHC program.

OPPORTUNITIES FOR IMPROVEMENT

- SLAC activities have emphasized operational presence at CERN for the ATLAS commissioning but we will be working to enhance local activities at SLAC to serve as a center for the user community once first data arrives.

Objective 1.4

PERFORMANCE SUMMARY

- Completed full reprocessing of entire BaBar dataset and regenerated corresponding Monte Carlo simulation events.
- Provided timely replacement of mass storage, disk and CPU replacement to meet ongoing analysis demands of BaBar physics analysis community.
- BaBar held three major collaboration meetings at SLAC, along with a number of training sessions and specialized workshops.
- All SLAC projects required for first LHC colliding beams have been delivered or are on track for delivery, despite the recent entry into ATLAS and compressed time scales.
- ATLAS Tier-2 computing center operations have been stable and performant.
- Scheduled initial operation of EXO-200 has been delayed by a year due to technical challenges with the cryogenic and liquid systems, and difficulties in fabricating and assembling the TPC.
- Completed the SiD Letter of Intent, supported by computing, data generation and performance analysis, as well as conceptual engineering design work.

NOTEWORTHY PRACTICES

- BaBar launched the B-Factory Legacy Book project in collaboration with Belle, in order to summarize combined experimental results as well as analysis techniques and software tools.

OPPORTUNITIES FOR IMPROVEMENT

- Additional project management and project engineering resources are needed to assure delivery and installation of the EXO TPC to WIPP.

H ILC

SLAC has several important leadership roles in the ILC effort including the System Integration Scientist, a member of the GDE Executive Committee, members of the ILC Project Advisory Committee, a member of the International Detector Advisory Group, the Level 3 leaders for the Electron Source, Linac Systems and Beam Delivery Systems, the ATF2 deputy spokesperson, the ILC electron cloud working group leader, a member of the Machine Detector Interface (MDI) Com and the ALCPG MDI and Backgrounds Coordinator.

ILC R&D in 2009 included source laser prototyping, photocathode R&D, electron cloud studies, L-band RF power sources, wakefield simulations, system integration, high availability controls, and beam delivery issues such as crab cavities, dumps, IR layout. SLAC also continues to have a leading role in the accelerator test facility (ATF2) in Japan.

Objective 1.1

PERFORMANCE SUMMARY

Electron and Positron Sources

- The novel VME FPGA based interlock system successfully operated the L-Band 10 MW klystron and Marx modulator Test Station.

- The ATCA-VME Adapter to demonstrate the interlocks on the ATCA high availability platform is assembled and in checkout.
- Demonstrated CLIC and ILC laser formatted laser beams.
- Pursued polarized photocathode studies using Russian and US cathodes.

Damping Rings

- Transferred e-cloud experimental equipment from PEP-II to CESR-TA, and constructed new grooved chambers for testing at CESR-TA.
- Completed a state-of-the-art parallel e-cloud simulation code CMAD.

Main Linac

- Successfully operated the first prototype Marx modulator to drive a 10 MW Multi-Beam Klystron.
- Completed of the L-band sheet-beam klystron beam tester and first operation with flat beams.
- Constructed and delivered a complete RF power distribution system to FNAL, with adjustable power couplers.
- Completed the positron capture structure program with a sustainable gradient of 12 MV/m as required by ILC.
- Designed a circular waveguide system to transport and distribute the combined power of 35 klystrons over a distance of 1.25 km to support ILC cost cutting efforts by eliminating the 22 km long linac service tunnel.
- Analyzed LLRF waveform data from the DESY TTF superconducting accelerator to understand the pulse-to-pulse variations in the cavity gradients.

Beam Delivery System

- Completed construction and initial commissioning of the ATF2 test facility in collaboration with KEK in Japan.
- Redesigned the BDS lattice to improve diagnostics and accommodate configuration changes.
- Completed of the MDI Interface document as a basis for the detector LOIs.

High Availability Hardware

- A novel VME FPGA based interlock system successfully operated the L-Band 10 MW klystron and Marx modulator Test Station.
- Formed a new xTCA for Physics standards committee under the PICMG industry standards group and led by a lab consortium of SLAC, DESY, FNAL, IHEP and IPFN (working on ITER project) in collaboration with 50 instrument module manufacturers.

System Integration

- Developed a new baseline configuration for the ILC for further cost optimization.
- Reliability simulations were performed to analyze the effects of the baseline changes.

Objective 1.2

PERFORMANCE SUMMARY

- Developed and successfully tested vacuum chambers with grooved surfaces as a mitigation technique for the electron cloud.
- Proposed an alternate RF power distribution scheme using over-moded waveguide and began R&D to test the concept.

- A new high-reliability MicroTCA platform developed by SLAC adopted as a new controls standard for the DESY XFEL LLRF and SLAC linac controls upgrade.

Objective 1.3

PERFORMANCE SUMMARY

- SLAC work on linear colliders was featured in invited talks at PESP08, LCWS08, TILC09, PAC09, SRF09, ALCPG09, IEEE NSS-MIC (Nuclear Science Symposium), IEEE RT (Real Time Controls) and in more than 37 papers (5 in refereed journals).

Objective 1.4

PERFORMANCE SUMMARY

- SLAC ILC program receives consistently strong reviews from the ILC Americas Regional Team Review, SLAC DOE HEP Program Review, the SLAC SPC, the GDE Accelerator Advisory Panel at the April 2009 TILC09 meeting and the GDE Project Advisory Committee in June.

I HEP Scientific Computing

Scientific computing is a key component of SLAC's mission support for HEP and Particle Astrophysics. The computing organization provides key expertise and support in the areas of management of large data sets, large scale scientific database technology and simulation for ATLAS, LSST, BaBar and other SLAC activities. SLAC has been very successful in creating and maintaining tools for large-scale data management and simulation and in creating and pursuing a vision of future data management technology (SciDB). SLAC is operating computing facilities for FGST, BaBar and an Atlas Tier 2 Center.

Objective 1.1

PERFORMANCE SUMMARY

- The SCCS data management team has attracted leading academic and international interest in pursuing database R&D for LSST and other ultimately large-scale applications.
- SLAC's xrootd data-access technology has become the underlying data management technology for BaBar, FGST and is increasingly being adopted by LHC experiments.
- The SCCS simulation team is a leading partner in the GEANT4 software simulation for particle interactions with complex devices.

NOTEWORTHY PRACTICES

- Obtained NIH funding to extend GEANT4 applicability to proton therapy.
- Success in transitioning core simulation team funding from "incidental to the mission" to explicit "Computational HEP" funding.

OPPORTUNITIES FOR IMPROVEMENT

- NA

Objective 1.2

PERFORMANCE SUMMARY

- Leadership of database R&D for LSST.
- Leadership of US Geant4 Consortium, of International GEANT4 hadronic physics, visualization and core architecture working groups.
- Responsible for coordinating input from science applications within the SciDB collaboration.

NOTEWORTHY PRACTICES

- Organizing the second XLDB (Extremely Large Databases) workshop.

OPPORTUNITIES FOR IMPROVEMENT

- Secure major role in steering US ATLAS or International ATLAS computing building based on historical BaBar success.

Objective 1.3

PERFORMANCE SUMMARY

- SLAC staff have resolved mission critical issues in the ATLAS online database system through the development of innovative technology.
- Began to identify a core of Computational HEP activities following guidance from OHEP.
- Scientific Computing staff are authors on 30 science and 2 computing publications.

NOTEWORTHY PRACTICES

- Developing an MOU to formalize SLAC-CERN collaboration on xrootd.

OPPORTUNITIES FOR IMPROVEMENT

- Provide dual-sourced power to critical FGST computing to solidify ability to meet operational needs.

Objective 1.4

PERFORMANCE SUMMARY

- Delivered the ATLAS Tier 2 computing facilities and support in accordance with MOU with US ATLAS.
- Delivered BaBar computing facilities and support in accordance with plans agreed with the BaBar International Finance Committee.
- Delivered computing facilities and support to FGST meeting requirements, including high availability.
- Mass Storage system upgrade to current hardware and software technology is underway.
- Organized a GEANT4 Users Workshop at SLAC and GEANT4 Space Users Workshop at JPL.

NOTEWORTHY PRACTICES

- NA

OPPORTUNITIES FOR IMPROVEMENT

- Improve governance, management and funding processes are needed for a successful transition to SLAC as a multi-program lab.
- Improve delivery of computing facilities and support to the Kavli Institute for Particle Astrophysics and Cosmology and non-HEP science activities.

Goal 2 Efficient and Effective Design, Fabrication, Construction and Operations of Research Facilities

BES/BER (70%)

Element		Letter Grade	Numerical Score	Objective Weight	Weighted Score	Total Score
2	Provide for Efficient and Effective Design, Fabrication, Construction and Operations of Research Facilities					
2.1	Provide Effective Facility Design(s) as Required to Support Laboratory Programs	A-	3.7	15%	0.56	
2.2	Provide for the Effective and Efficient Construction of Facilities and/or Fabrication of Components	A	4.0	55%	2.20	
2.3	Provide Efficient and Effective Operation of Facilities	A	4.0	20%	0.80	
2.4	Utilization of Facility to Grow and Support Lab's Research Base and External User Community	A-	3.7	10%	0.37	
BES/BER Science and Technology Score						A / 3.93
					BES/BER Funding Weight (70%)	2.75

HEP (30%)

Element		Letter Grade	Numerical Score	Objective Weight	Weighted Score	Total Score
2	Provide for Efficient and Effective Design, Fabrication, Construction and Operations of Research Facilities					
2.1	Provide Effective Facility Design(s) as Required to Support Laboratory Programs	B+	3.2	40%	1.28	
2.2	Provide for the Effective and Efficient Construction of Facilities and/or Fabrication of Components	NA	NA	0%	NA	
2.3	Provide Efficient and Effective Operation of Facilities	A-	3.6	60%	2.16	
2.4	Utilization of Facility to Grow and Support Lab's Research Base and External User Community	NA	NA	0%	NA	
HEP Science and Technology Score						B+ / 3.44
					HEP Funding Weight (30%)	1.03

Total Goal 2 Score: A (3.8)

BES/BER

A Linac Coherent Light Source (LCLS)/LUSI

The LCLS project ($420M TPC) is constructing an x-ray free-electron laser user facility at SLAC.

LUSI is a "major item of equipment" project ($60M TPC) which will create experimental instruments for three of the six available experimental areas within the LCLS facility. LCLS construction and LUSI have a single project management organization.

In FY09, the LCLS Directorate bifurcated to enhance the delivery of the LCLS user facility mission.

The new Accelerator Directorate has a framework within which accelerator operations, maintenance and program can be delivered. LCLS construction, LUSI and future projects are placed in the AD to make best use of Directorate resources.

As part of the LCLS Directorate, the X-ray Facilities Division (XFD) manages experimental operations of the new facilities. This division has established a user policy and sponsored a second call for proposals for LCLS x-ray experiments in 2010.

The LCLS construction project is >93% complete as of August 2009. The project schedule calls for the original goal of achieving early XFEL science in 2009, and project completion in July 2010. The project meets or exceeds the requirements of DOE O413.3A with recognition of the earned value management system (EVMS), approved baseline change control, acquisition and project execution planning and performance reviews and reporting.

Construction of conventional facilities is on schedule. Safety statistics show significant improvement. Management walks of the construction site, in addition to DOE/SSO walks, have provided positive reinforcement and demonstrated commitment to the safety of the workers.

The LCLS Project has taken the opportunity presented by the "buyers' market" for civil construction to revise its plan for providing office space for the Experimental Facilities Division. Better-quality, LEEDS Gold-certified office space will be constructed adjacent to the Near Experiment Hall.

The LUSI MIE Project received approval of CD-3 in August 2009. The project received 100% of its budget authority as a result of receiving ARRA funding. The project is >24% complete.

A proposal for a sixth LCLS instrument, designed to support the study of "matter under extreme conditions" (MEC), received approval of CD-0 in May 2009.

Objective 2.1

PERFORMANCE SUMMARY

Effectiveness of Pre-Conceptual R&D and Design for Life-Cycle Efficiency

- Instruments are designed for versatility and ease of upgrade.
- Dedicated external instrument teams review and accept physics requirements.

Leverage of Existing Facilities On Site

- Use of existing SLAC linac as LCLS accelerator.
- LCLS and LUSI use same finance controls, procurement, quality assurance, and ES&H resources.
- Matrix support of LCLS and LUSI from SLAC controls, engineering, detector development, radiation physics and data management.
- LUSI is integrated into the LCLS and Accelerator Directorate organizational structure and uses standard LCLS project management procedures.
- The existing LCLS line item created the capability to accommodate "hutch 6" and this year the Office of Fusion Energy sponsored the instrument program for Material in Extreme Conditions (MEC) allowing LCLS to achieve scientific programs in all 6 hutch locations.

Delivery of Accurate and Timely Information

- LUSI began reporting against the proposed project baseline in April 2008.
- LUSI works closely with LCLS construction to optimize far hall hutch facility.
- The LCLS Line Item continues to provide timely and accurate information demonstrating superior project performance.

Ability to Meet the Intent of DOE O413.3A

- Three LUSI instruments brought to design maturity for CD-3 review August 2009.
- Office of Project Assessment review has recommended approval of CD-2 and CD-3 for LUSI during this performance year.

- LCLS has demonstrated multiples years of O413.3 performance.

NOTEWORTHY PRACTICES

- LUSI design and fabrication methodology incorporates lessons learned from LCLS.
- Instrument team leaders and technical configuration control committee provide external technical advice.
- LUSI cooperating with LCLS experimental operations to coordinate installation and transition to operations.
- MIL-STD-882D, Standard Practices for System Safety, employed for hazard analysis.

OPPORTUNITIES FOR IMPROVEMENT

- Continue improving the integration between LCLS, LUSI, and MEC projects.
- Keep LUSI procurement priorities on schedule despite the heavy workload of SLAC Purchasing.
- Bring LUSI instruments online as early as possible to exploit LCLS capabilities.

Objective 2.2

PERFORMANCE SUMMARY

Adherence to DOE O413.3A

- LCLS continues to work within DOE Office of Engineering and Construction Management (OECM) project EVMS certification.

Fabrication of Facility Components

- FY09 linac component fabrication and system installation and integration activities met project baseline schedule and milestones.
- Fabrication capabilities at SLAC enabled schedule and commissioning achievement when faced with partner laboratory delivery challenges.
- Undulator system performance demonstrates adherence to tight tolerances.

Construction Schedule and Budget

- LCLS Project baseline has achieved early science at LCLS in October, 2009.
- The LCLS electron beam systems are complete and commissioned. Remaining LCLS construction activities are on track for project completion by July, 2010.
- LCLS construction project has “schedule performance index” of 1.00 and “cost performance index” of 1.01.
- LCLS construction project contingency is 42.4% of the estimate to complete.
- Conventional facilities construction is >90% complete.
- Effective management of LCLS construction project contingency allows for the addition of an office building to the project scope.

NOTEWORTHY PRACTICES

- LCLS “advance procurement planning” spreadsheet used for critical procurements for LCLS and LUSI.
- Partnership in safety oversight with SLAC, DOE/SSO and Turner Construction continues.
- Contractor’s work safety recognition programs (Safety Stars) improves performance significantly.
- The LCLS office building has employed a “design-build” strategy for the first time at SLAC.

- A comprehensive civil construction specification document, usable for future construction projects, was developed and implemented for the LCLS office building.

OPPORTUNITIES FOR IMPROVEMENT

- Structure future construction contracts to create incentive for general contractor to meet LCLS, SLAC and DOE safety expectations.
- Structure construction contracts with interim milestones, with specific consequences if milestones are not achieved.
- Maintain centralized thorough project document control for project documentation.
- Sufficient time and resources must be devoted to bottoms-up cost estimates.
- Procedures for funds transfer to project partners at other DOE labs must be improved.
- Project performance reviews and mitigation for work at other DOE labs must be improved.

Objective 2.3

PERFORMANCE SUMMARY

Availability, Reliability and Efficiency of Facility

- In FY09 commissioning, LCLS linac availability was >90%.
- LCLS gun laser availability >99% in FY09.
- Accelerator improvements over the next three years continue to be identified and prioritized.
- Staffing levels to provide support of the early LCLS experimental program is in place.

Degree the Facility is Optimally Arranged to Support Community

- The new LCLS Directorate has created an organization geared to optimally support the scientific user program.
- The new Accelerator Directorate has created an organization geared to optimally deliver beam to users as defined by the user programs at SLAC.

R&D Conducted to Develop/Expand the Facility Capabilities

- New operating modes enabling new science continue to be explored.
- LCLS and Accelerator Directorates' work breakdown structure explicitly identifies these programs.

Effectiveness in Balancing Resources Between Facility R&D and User Support

- LCLS user program is growing to support the early LCLS experimental program.
- New Accelerator Directorate structure helps balance resources.

Quality of the Process Used to Allocate Facility Time to Users

- Using the access policy, LCLS is evaluating the second and third rounds (two on AMO, one on SXR, and near term plans for XPP) of experiment proposals.
- 62 proposals were received in the second round, representing 469 scientists from 15 countries.
- Proposal review panel will assess the scientific merit of proposals.

NOTEWORTHY PRACTICES

- LCLS expanded the work breakdown structure to operations and maintenance organizations.
- LCLS Operations continues to develop new operating modes, extending scientific reach of LCLS.

OPPORTUNITIES FOR IMPROVEMENT

- Develop appropriate organizational metrics to track effective accelerator and experiment performance.

- Continue to optimize the scope driven budget model for Linac operations and maintenance defended in the February Linac Ops review and extend that model to SLAC National Accelerator Laboratory.

Objective 2.4

PERFORMANCE SUMMARY

Science Capabilities

- LCLS is 200% oversubscribed for its second operations run.

Ultra fast Science Research Base

- LCLS coordinating with Photon Science (PS) Directorate (PULSE and SIMES) and SSRL.
- PS is targeting hires in areas for which LCLS will be a source of scientific results.
- Members of the PS Directorate participate in soft x-ray materials science (SXR) collaboration, which will build a new instrument for LCLS.

Resident Research Community

- LCLS operations are expected to attract long-term visiting scientists to SLAC.
- Balance of access by internal and external user communities.

Outreach to the Scientific Community.

- 297 of the 469 authors of proposals for the second LCLS run are from research institutions outside the United States.
- Second LCLS/SSRL user meeting held in FY09.
- LCLS instrument teams meet at SLAC semiannually.
- LCLS workshops have proven very successful in encouraging use and managing expectations of LCLS.

NOTEWORTHY PRACTICES

- The first LCLS Hard X-Ray science workshop was conducted in FY09 with more than 100 attendees.
- The first LCLS experimental user planning meetings were held this year.
- Multiple LCLS proposal writing workshops took place in FY09.
- The joint SSRL-LCLS user meeting encourages a unified view of photon science at SLAC while promoting cross-pollination of two distinct user communities.

OPPORTUNITIES FOR IMPROVEMENT

- Lab office space for LCLS scientific staff along and visiting scientists may be scarce.
- Look for ways to accelerate the commissioning of new LCLS instruments.

B Stanford Synchrotron Radiation Lightsource (SSRL)

Objective 2.1

PERFORMANCE SUMMARY

- SSRL staff are managing the SPEAR3 seismic upgrades and have met all cost and schedule milestones on the way to completion of this project.

NOTEWORTHY PRACTICES

- NA

OPPORTUNITIES FOR IMPROVEMENT

- NA

Objective 2.2

PERFORMANCE SUMMARY

- The Building 118 chiller project demonstrates SSRL's effectiveness in meeting construction schedules and budgets. Careful preplanning and early installation has allowed this complex system to be installed during the short SSRL shutdown.
- Quality of SSRL staff has been demonstrated by the consistent on time and on budget completion of projects.

NOTEWORTHY PRACTICES

- The Building 118 chiller had to be replaced but could not be turned off prior to the SSRL shutdown. As a result, careful planning resulted in the new chiller being installed in a new location, allowing it to be installed during the run, and then the piping and tie-in to the air handling unit could then be done during the shutdown.

OPPORTUNITIES FOR IMPROVEMENT

- NA

Objective 2.3

PERFORMANCE SUMMARY

- SSRL user beam delivery in FY09 was exceptional at 99%.
- High efficiency of SSRL was demonstrated by the consistently high user satisfaction ratings given in the end of run summaries.
- Research and Development to improve the facility is being carried out in areas such as short bunch operation for timing studies, improved beam stability, high current operation, trickle charge injection and rapid scan data collection.
- In the SMB program, 75% of all crystallography users now access the instrumentation remotely and 90% use the automated robotics systems.
- The SSRL process for beam time allocation uses external reviewers providing input to the SSRL Proposal Review Panel. This process has been deemed very effective in every prior DOE review.

NOTEWORTHY PRACTICES

- A common User Research Administration group between SSRL and LCLS has been created in order to maintain a consistent user administration process.

OPPORTUNITIES FOR IMPROVEMENT

- A common User Safety Group between SSRL and LCLS would create the opportunity for uniform safety processes between the two labs.
- Explore other areas of commonality where efficiency may be gained from joint efforts.

Objective 2.4

PERFORMANCE SUMMARY

- SSRL facilities support SIMES, PULSE and LCLS scientists to carry out research and prepare instruments for LCLS experiments.

- SSRL has an effective outreach program realized through active participation of SSRL scientists in important conferences, the annual SSRL/LCLS Users' Meeting and its associated workshops and tutorials, and by holding on-site training courses.
- Influential science is being carried out in a number of areas including ultra-high resolution photoemission, soft x-ray coherent imaging, x-ray microscopy, XAS and macromolecular crystallography where the instruments do not meet user demand.

NOTEWORTHY PRACTICES

- In an effort to allow for timing experiments in support of new science as well as LCLS and PULSE activities, a short pulse mode of operation has been developed for SPEAR3.

OPPORTUNITIES FOR IMPROVEMENT

- Greater collaboration with the SLAC Photon Science research institutes and LCLS will bring additional opportunities for cutting edge research to SSRL.

C PULSE

PULSE is fully engaged with the PULSE Institute construction project, which is being managed through the SLAC facilities group as an MIE. PULSE is involved in specifying the properties of the labs, and in the purchase and commissioning of major equipment installed in the laboratories.

Objective 2.1

PERFORMANCE SUMMARY

- PULSE has no direct role in the construction of the laboratory and office space since this is done under contract by an outside firm. Good contingency management and favorable bids on PULSE Center Phase B construction have contributed to good contingency for work to go. Completion of Phase B construction is on schedule for mid-2010.

Objective 2.4

PERFORMANCE SUMMARY

- PULSE has helped create new capabilities to grow the external user base of both SPEAR3 and LCLS.
- PULSE is also working to grow a new community of users for LCLS through, for example, our series of ultrafast x-ray summer schools.
- PULSE staff are active users of LCLS: being on eight of the initial proposals for the AMO end station at LCLS and involved in new proposals for the soft x-ray end station, and the XPP hard x-ray instrument.

D SIMES

SIMES has taken a leadership role in the development of soft x-ray science at both the LCLS and SSRL x-ray user facilities. SIMES in collaboration with SSRL has constructed, built and now operates a soft x-ray beam line and experimental stations. This facility serves SIMES and a broad outside user community in materials science. SIMES and SSRL are beginning the construction of the recently funded low energy photoemission beam line. This new facility will provide advanced capabilities for SIMES and the SSRL external user community.

During the initial phase of LCLS, the soft x-ray program was unfunded due to budget constraints in the DOE FY07 and FY08 budgets. SIMES realized the importance of this unique facility for material research and through a series of workshops raised the interest from the general user community for soft x-rays in material research. SIMES organized the formation of a consortium that involves SIMES, Lawrence

Berkeley National Laboratory, the Center for Free Electron Laser in Hamburg and the University of Hamburg to secure non DOE funds to build a soft x-ray beam line and instrument on LCLS. The beam line and instrument is currently in construction with a planned completion in May 2010.

Objective 2.1

PERFORMANCE SUMMARY

- Participating in a two-phase renovation of existing office space at SLAC managed by SLAC facilities. Phase I will construct common space using existing lab GPP (approximately 1,250 gross sq ft). Phase II will provide laboratory space for at least 2 labs (Ultra High Vacuum and Chemistry and Materials Synthesis) In addition, two floors of the central Building 40 will be renovated for scientists, students and administrative offices for a total of 9,500 gross sq ft.
- SIMES leadership is working closely with SLAC capital project management staff to ensure compliance with DOE Order 413.3, Program and Project Management for the Acquisition of Capital Assets.
- Establishment of these new laboratories will enable SIMES to launch a state-of-the-art material science and energy research facility at SLAC.

HEP

E Accelerator Research

The Accelerator Research Division has begun preparation for a new Facility for Accelerator Science and Experimental Test Beams (FACET) using the first two thirds of the SLAC Linac.

The ARD Test facilities Department presently operates and maintains the Next Linear Collider Test Accelerator (NLCTA) and the other test facilities in End Station B, and the coupler assembly clean room used by the L-Band RF program. It will also support the Gun Test Lab for polarized electron source development, the Accelerator Structure Test Area (ASTA) the FACET experimental areas and the End Station A test beam program in the future.

Objective 2.1

PERFORMANCE SUMMARY

- FACET proposed to meet the DOE mission need statement for an Advanced Plasma Acceleration Facility by providing short, intense pulses of electrons and positrons to excite plasma wakefields and study a variety of critical issues associated with plasma acceleration.
- Developed the FACET Conceptual Design Report and successfully obtained CD1 approval after review at the end of July.
- The FACET design is nearly complete and preparations for CD2/3 review are under way.

OPPORTUNITIES FOR IMPROVEMENT

- A workshop is planned in early CY10 to expand the experimental collaboration and to study other science opportunities to be pursued at this new facility

Objective 2.3

PERFORMANCE SUMMARY

Next Linear Collider Test Accelerator (NLCTA)

- R&D conducted at the NLCTA leads the world in high-gradient RF technology at Xband and laser-driven structure-based acceleration.

- Techniques and apparatus for high-power RF device conditioning and characterization are sought out by users the world over, including collaborators from CERN and Russia.
- Novel approaches to acceleration with microwave and laser radiation are being pursued, leading to new RF pulse power components and new optical devices.
- CLIC accelerator structures tested in NLCTA in the past year have achieved their goal of stable operation at gradients above 100 MV/m.
- Operated NLCTA for a total of 23 weeks to support the laser acceleration experiment E163, high gradient structure testing, and L-band structure testing.
- Work conducted at the NLCTA was featured in 4 invited talks and 5 papers (1 refereed)

Accelerator Structure Test Area (ASTA)

- SLAC serves as the primary experimental site for all of the high gradient collaborations as it is the only place in the US capable of doing studies at S-band frequencies or higher.
- ASTA provides experimental stations at X-band frequencies producing uncompressed pulses of 50-100 MW, and some with associated pulse compressors with up to 500 MW.
- Several upgrades, including newly designed vacuum valves, refurbished diagnostics, a new pulse compression system and earthquake retrofitting, were made to ASTA in FY08 to improve the experimental efficiency, leading to re-commissioned in FY09.

I HEP Scientific Computing

Scientific Computing facilities were operated successfully for SLAC's program. Design and construction of facilities for particle physics, notably ATLAS, FGST and BaBar, was highly successful. Successful design and construction to meet Particle Astrophysics and Cosmology needed some help from Kavli Institute staff. Significant progress was made in collaboration with Stanford University in strategic planning for long-term power, cooling and space needs. Much needed improvements were also made in SLAC's strategic planning processes for determining these needs, and their range of uncertainty.

Goal 3 Efficient and Effective Science and Technology Program Management

BES/BER (70%)

Element		Letter Grade	Numerical Score	Objective Weight	Weighted Score	Total Score
3	Efficient and Effective Science and Technology Program Management					
3.1	Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision	B+	3.4	40%	1.36	
3.2	Provide Effective and Efficient Science and Technology Project/Program Planning and Management	B+	3.4	30%	1.02	
3.3	Provide Efficient and Effective communications and Responsiveness to Customer Needs	B+	3.4	30%	1.02	
BES/BER Science and Technology Score						B+ / 3.40
					BES/BER Funding Weight (70%)	2.38

HEP (30%)

Element		Letter Grade	Numerical Score	Objective Weight	Weighted Score	Total Score
3	Efficient and Effective Science and Technology Program Management					
3.1	Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision	A-	3.5	40%	1.40	
3.2	Provide Effective and Efficient Science and Technology Project/Program Planning and Management	B	3.0	40%	1.20	
3.3	Provide Efficient and Effective communications and Responsiveness to Customer Needs	B+	3.3	20%	0.66	
HEP Science and Technology Score						B+ / 3.26
					HEP Funding Weight (30%)	0.98

Total Goal 3 Score: B+ (3.4)

SLAC made organizational changes to continue to strengthen the science program management in FY09. This was done in the context of SLAC's evolving scientific portfolio as a multi-program laboratory with the goal of seeking to better steward its science portfolio and develop a robust and sustainable long range plan for strategic laboratory investments. Elements of this include:

- Reorganization of the laboratory to create the new Accelerator Directorate, bringing together and amplifying SLAC's core capability in accelerator operations and R&D.
- Developing a consistent set of strategic planning goals in SLAC's lab agenda, Annual Laboratory Plan, and Directorate strategic plans.
- Expansion of SLAC's LDRD program, reaching more broadly across all elements of the laboratory to encourage new and creative ideas. Committee peer-review of all proposals as part of selection process, informing final selection which overlays SLAC strategic goals.
- Appointment of a Chief Research Officer (CRO) for SLAC to coordinate activities across the SLAC Directorates and with the National DOE CRO organization.

Noteworthy practices include:

- Having Associate Laboratory Directors for the mission Directorates also be line managers and

hence very familiar and engaged with the science and its interplay with effective management.

- Utilization of external science advisory committees at the Directorate level and the flow up of information from these committees to SLAC's highest level external scientific advisory group, the SLAC Scientific Policy Committee.
- Participation with other laboratories in the planning of a coordinated strategy for future light source development.

Opportunities for improvement include:

- Development of a uniform financial framework to facilitate a multi-program science agenda.
- Evolution and focus of new initiatives to strengthen and align the long-term evolution of SLAC's science strategy.
- Improve the differentiation of DOE-sponsored work at SLAC as a National Laboratory in the context of research programs that also have university based elements.
- Insure effective work planning and control for research laboratory based work, especially that involving visitors, students and outside users.

BES/BER

A Linac Coherent Light Source (LCLS)/LUSI

The responsibilities of the Accelerator Directorate at SLAC include managing the LCLS construction project (building the main LCLS infrastructure) and the LUSI MIE project (building scientific instruments for LCLS) and operating the LCLS facility to produce FEL x-rays. The LCLS Line Item achieved landmark performance with the commissioning and start up of the FEL that exceeded all expectations. To date, both the LCLS construction project and LUSI have met schedule and budget milestones and achieved technical goals. Project performance is closely monitored by external reviews and BES oversight. LUSI achieved its CD3 milestone goal in FY09.

The LCLS Directorate manages the LCLS scientific user facility, organizing and managing the user research program and developing concepts for upgrade projects which will enhance the facility's scientific capability. The X-ray Facilities Division of LCLS, in anticipation of user operations, held workshops related to LCLS science and sponsored the annual user meeting. The Directorate also collaborated with other Photon Science groups at SLAC to formulate coherent scientific and operations goals which have been incorporated in the SLAC business plan.

Objective 3.1

PERFORMANCE SUMMARY

Planning with Outside Community

- Annual LCLS/SSRL Users Meeting engaging management, staff and user community.
- Workshops on High-Field Atomic Physics and Laser-Excited Dynamics in condensed matter.

Scientific Vision

- LCLS scientific and organizational goals integrated in SLAC business plan.
- Concepts developing for expansion of the LCLS facility beyond the initial configuration.

Development of Core Competency (LCLS User and Experimental Operations)

- 10 experiments scheduled for the first LCLS run, October-December 2009.
- Second call for experimental proposals in FY09, for experiments in FY10.

NOTEWORTHY PRACTICES

Development of Core Competency (LCLS User and Experimental Operations)

- LCLS and SSRL sharing resources in user administration and user experiment support will increase efficiency and reliability of user operations at both facilities.

OPPORTUNITIES FOR IMPROVEMENT

Development of Core Competency (LCLS User and Experimental Operations)

- Sustained operations will require a continuing increase of staff and effective management.

Objective 3.2

PERFORMANCE SUMMARY

Quality of User Facility Strategic Plans

- Pre-operations accelerator R&D started in FY07 with commissioning of LCLS electron gun was expanded in FY09 to include all LCLS electron systems, including Undulator complex.
- Accelerator performance exceeds project baseline milestones.
- LCLS Directorate created to manage LCLS as an operating user facility.
- Accelerator Directorate created to manage and operate accelerator facilities.
- Planning for LCLS future is reviewed by LCLS SAC.

Adequacy in Considering Technical Risks

- LCLS and LUSI construction projects maintain risk registries that are reviewed quarterly.
- Commissioning of LCLS electron systems has been very smooth.
- Electron beam has met all performance goals to support LCLS mission.

Synergy with Other Areas

- LCLS planning is coordinated with SSRL and PS (PULSE and SIMES).

NOTEWORTHY PRACTICES

- LCLS continues to use the DOE OECM certified EVMS.

OPPORTUNITIES FOR IMPROVEMENT

Quality of User Facility Strategic Plans

- Experimental organization must be updated as goals change from construction to operations.
- Achieved LCLS near-term goal of starting user operations in late 2009.
- SSRL, PPA, LCLS, and AD continue to develop long-range planning to balance operations, upgrades and budget uncertainties.
- Develop strategies to support the research of a rapidly increasing user population.

Objective 3.3

PERFORMANCE SUMMARY

Program Office Oversight

- Semiannual BES reviews of LCLS construction project and LUSI project.
- LCLS Project management has weekly telephone conferences with BES project managers.
- LCLS Project management meets with the Federal project director weekly.
- Federal project director attends major LCLS and LUSI meetings.

- Safety experts from the DOE/SSO tour LCLS construction sites weekly.

Determining Appropriate Contact

- LCLS and Accelerator Directorates' organization charts delineate project line management roles and responsibilities.

OPPORTUNITIES FOR IMPROVEMENT

- Continued emphasis must be maintained on timely communication between the LCLS Directorate and DOE BES regarding the LUSI project, transition to operations and future LCLS upgrade options.

B Stanford Synchrotron Radiation Lightsource (SSRL)

Objective 3.1

PERFORMANCE SUMMARY

- SSRL participates with the SLAC Photon Science institutes, the Stanford campus and the outside community to plan and hold workshops, engaging and training new users.
- SSRL focuses on specific areas for development of research capabilities which have resulted in facilities for ultra-high resolution photoemission, x-ray absorption and advanced spectroscopies, structural molecular biology, coherent diffraction and x-ray imaging. Development of new ideas for a small angle scattering facility applicable to energy research is under development.

NOTEWORTHY PRACTICES

- The annual SSRL LCLS Users' Meeting includes topical workshops planned with the user community.

OPPORTUNITIES FOR IMPROVEMENT

- Take advantage of close cooperation with the SLAC institutes to develop ideas for new facilities.

Objective 3.2

PERFORMANCE SUMMARY

- The annual SSRL Scientific Advisory Committee meeting focuses on strategic planning with subsequent follow-up of action items.
- SSRL actively participates in the West Cost Light Source strategic planning and in DOE workshops.

Objective 3.3

PERFORMANCE SUMMARY

- SSRL has been consistently responsive to DOE requests for information and tracks all metrics centrally for facile access.

C PULSE

PULSE develops effective management and program vision through review and strategic planning processes in addition to DOE-BES reviews, which occur every three years and the annual management review. PULSE conducts its own review and strategic planning with the assistance of its external advisory board (EAB).

Objective 3.1

PERFORMANCE SUMMARY

- PULSE develops its programs through strategic planning and workshops with inputs from its EAB and other stakeholders (e.g., LCLS).
- PULSE is leading efforts to establish computing science research, extreme environment (MEC) research, and gas-phase nanoscience research at SLAC.
- PULSE has attracted senior leadership in x-ray ultrafast science and chemistry theory to SLAC and Stanford.
- PULSE staff are engaged in the West Coast Light Source strategic planning and DOE Energy Science and Grand Challenge workshops.

NOTEWORTHY PRACTICES

- Near full participation among our senior leadership in SLAC strategic planning.

OPPORTUNITIES FOR IMPROVEMENT

- PULSE failed to retain some staff in a key area and this needs to be expediently addressed.

Objective 3.2

PERFORMANCE SUMMARY

- Current PULSE program was described in a proposal to DOE-BES – received high rating for scientific merit.

NOTEWORTHY PRACTICES

- PULSE staff participated fully in the WPC work planning and control system at SLAC and notably in the new laboratories so as to effectively deliver on the science mission.
- PULSE has expanded its administrative staff and added new leadership in both administration and science program (Deputy Director) to increase the effectiveness and efficiency of science and financial management.

Objective 3.3

PERFORMANCE SUMMARY

- PULSE point of contact with DOE-BES is clearly identified and functions effectively.
- Discussions with BES over the PULSE program and budget in planning for the next renewal proposal (to begin in FY10) have been interactive and extensive.
- PULSE has been expanding in staff and infrastructure to be prepared for capitalizing on the operations phase of LCLS.
- PULSE has made progress in overcoming the challenge of effective communication, which has been complicated by the fact that staff are distributed in location and the activities are overseen by two different divisions in BES.

NOTEWORTHY PRACTICES

- Deliver an outstanding renewal proposal and on-site review. Establish and plan for the renewal proposal creating a model for future renewal activities in the Photon Science program.

D SIMES

SIMES develops effective management and program vision through review and strategic planning processes. In addition to DOE-BES reviews, which occur every three years, and the annual management review, SIMES conducts its own review and strategic planning with the assistance of its scientific advisory committee (SAC). SIMES also has formed an internal management group to provide input to the director regarding establishing priorities for resource allocation.

Responding to a recent BES DMS&E review, SIMES reorganized itself to better function as a national laboratory unit. SIMES recognizes that as joint institute of both a university and a national laboratory, it faces a significant challenge to bridge a strong university culture and national laboratory culture. Consequently, SIMES structured itself to strengthen the role of its FWP leaders and adopted a team approach to problem-solving. SIMES' response and reorganization plan have been accepted by BES DMS&E, but full implementation and monitoring of progress are essential.

Learning from its review, SIMES proposed a number of new programs that are more aligned with the national laboratory goals.

Objective 3.1

PERFORMANCE SUMMARY

- SIMES develops its programs (for example, the successful SSRL soft x-ray beam line proposal) through strategic planning and workshops, with inputs from its SAC.
- SIMES articulates its vision through presentations and internal communications. SIMES is in the process of developing its SIMES 2015 vision document.
- Through strategic planning, SIMES implements strategies that attract and retain talent. SIMES plans to attract more talent; discussions are underway to partner with Stanford departments to achieve this goal. One search for an x-ray physicist is anticipated.

NOTEWORTHY PRACTICES

- SIMES has successfully retained top scientists to serve on its Science Advisory Committee. Dr. George Crabtree has agreed to chair the SAC.
- With the help of Stanford University and DOE-BES, SIMES has made two strategic hires which critically strengthened needed areas in the program, *e.g*., computational simulations.

OPPORTUNITIES FOR IMPROVEMENT

- SIMES needs to hire more core scientific staff.

Objective 3.2

PERFORMANCE SUMMARY

- With the help of its SAC and SLAC leadership, SIMES has developed a strategic plan to enhance its science program.
- SIMES managers and researchers have contributed to SLAC-wide major activities and initiatives, including senior personnel recruitment, space planning, strategy for future light sources, proposals for beam lines and stations at SSRL and LCLS.
- In response to the DOE review, SIMES terminated some programs and redirected resources towards more productive program.
- SIMES has been successful in leveraging resources at photon science user facilities both at SLAC and beyond.

NOTEWORTHY PRACTICES

- New beam line and instrument at SSRL funded by two Divisions of DOE-BES through peer review process.
- Experimental plan to build a program at LCLS funded by DOE through peer review process.
- Several beam time proposals to use LCLS received a high rating and were assigned beam time.

OPPORTUNITIES FOR IMPROVEMENT

- Continue to monitor and further extend improvements implemented as a result of the DOE-BES peer review in early FY09.
- Learn lessons from lack of success in competing for EFRCs.
- Develop closer collaborations with EFRCs at Stanford and in the region to broaden SIMES impact and better contribute the DOE mission in energy research.
- Work to develop funding from EERE and other DOE programs to broaden and extend the SIMES research portfolio toward application-oriented research.
- SIMES should be more proactive in forming strategic collaborations in other focus areas, including with local industry.

Objective 3.3

PERFORMANCE SUMMARY

- SIMES has made significant effort to provide effective communication with its customers, being responsive to their needs and requests for highlights, participation in committees, workshops and panels.
- SIMES point of contact with DOE-BES is clearly identified and functions effectively.

NOTEWORTHY PRACTICES

- Active participation in DOE sponsored workshops and various initiatives – for example the future light source workshop.
- Timely communication of research highlights.

HEP

E/F/G/H
Accelerator Research/Astrophysics at Kavli/Elementary Particle Physics/ILC

The Particle Physics and Astrophysics (PPA) program at SLAC supports accelerator-based particle physics research at forefront of flavor physics with BaBar and at the energy frontier with ATLAS, non-accelerator research with Fermi Gamma-Ray Space Telescope, accelerator science and accelerator technology R&D directed towards a future linear collider, advanced rf power sources and structures, LHC upgrades, accelerator design and simulation, and far-field laser and plasma wakefield acceleration techniques, and R&D for the ILC. Future projects under development include a ground-based dark energy program with LSST and an underground experiment EXO for detection of neutrinoless double-beta decay. A detector R&D program supports development of core device development capabilities, next generation data acquisition and electronics architecture development, and development of technologies and design for a future linear collider detector. A world-class theory group in particle physics, particle astrophysics and cosmology pursues forefront research in these fields and supports the overall scientific direction of the PPA program. The PPA program is organized between the PPA (particle physics and particle astrophysics) and Accelerator (accelerator R&D and FACET beam operations) Directorates, and is managed by the SLAC ALD for PPA.

Objective 3.1

PERFORMANCE SUMMARY

- SLAC PPA offers continued, effective support for the BaBar and FGST science programs nationally and internationally, including the ongoing updates (installed computing hardware and the mass storage system), efficient and reliable large-scale computing operations, and operation of the ISOC for the Fermi GST program.
- Worked closely with the US ATLAS community to develop a plan for SLAC engagement in the existing and planned upgrades to the ATLAS program, matching core expertise with existing or future upgrade program needs.
- Developed an R&D plan and an initial project plan for LSST, and worked with the LSST science community to create a 600 Science Book.
- Continued working with the EXO Collaboration on completing EXO-200 and developing an R&D plan for full EXO.
- Provided community leadership on the development of a Letter of Intent for the SiD detector in response to the GDE validation process.
- Worked with the international SuperB community to advance the concept for a next generation flavor physics collider facility.
- Developed a proposal for efficient use of SLAC LCLS operations to deliver a test beam capability to the detector R&D and beam line instrumentation communities.

NOTEWORTHY PRACTICES

- The SLAC Users Organization organized several workshops and an annual meeting with the SLAC user community to identify areas for collaboration in future projects at the LHC, in non-accelerator research and in accelerator R&D.

OPPORTUNITIES FOR IMPROVEMENT

- Need to develop a broader research community and a roadmap for PWFA accelerator development with FACET.
- Need to take a lead laboratory role in advancing EXO-200 to commissioning and operation.
- Need to develop a coherent 5-year long-range plan for HEP accelerator R&D.

Objective 3.2

PERFORMANCE SUMMARY

- Developed the FACET proposal and moved the project through CD-1 based on coherent interaction with the PWFA community.
- Developed proposals for accelerator science, proton accelerator-based research, and detector R&D programs for OHEP external review of HEP laboratory programs in these areas.
- Continued working with the ART and the GDE to advance the planned R&D program for the ILC.
- Engaged in defining a collaborative role with Fermilab on SLAC contributions to Project-X R&D.

NOTEWORTHY PRACTICES

- Worked closely with SSRL, LCLS, PS, and AD to create a common vision, mission and organizational view for the new Accelerator Directorate and its relationship to the science program needs for HEP operations and accelerator R&D.

OPPORTUNITIES FOR IMPROVEMENT

- Need to better anticipate the alignment of future research directions with national program priorities.
- Need to better manage transition of core staff from B Factory program to future long-term national program elements.
- Need to put in place a coherent staff and faculty renewal plan to attract world-class leadership to the PPA program.

Objective 3.3

PERFORMANCE SUMMARY

- Provided timely responses to OHEP requests for information, review material, program and budget impacts and planning including annual budget planning meetings.
- Provided coherent and effective presentations of program goals, plans and performance at accelerator science, proton accelerator-based and detector R&D reviews of HEP laboratories.

I HEP Scientific Computing

SLAC continued to emphasize the importance of data-intensive scientific computing as a core competency that, in mission-critical areas, requires internationally recognized research and development. Key leadership effort was redirected to ensure that SLAC Scientific Computing contributes optimally to the success of US ATLAS. A small number of outstanding hires were made as an investment in the future of SLAC Scientific Computing. Communications between Scientific Computing and science activities were largely good, but dynamically changing opportunities for improvement continue to appear.

Objective 3.1

PERFORMANCE SUMMARY

- Assigned key scientific staff with mission to secure a major and high-value role in ATLAS, fully exploiting the relevant SLAC capabilities.
- Organized XLDB (Extremely Large Databases) workshops with key scientific and commercial users and internationally recognized computer scientists.
- Created the SciDB concept (with Stonebreaker/MIT and DeWitt/Wisconsin) to develop a scientific petascale database.
- Intellectual capability has been enhanced through two key hires – a young Ph.D. computer scientist specializing in databases and data management, and an outstanding developer of scientific database and data management applications.

NOTEWORTHY PRACTICES

- Ongoing search for the best and brightest scientists in SLAC's database/data management core competency.

Objective 3.2

PERFORMANCE SUMMARY

- Planning and management that serves individual program needs and overall laboratory long-term goals are a work in progress.

NOTEWORTHY PRACTICES

- Technical problems have been avoided and risks minimized though a careful choice of technologies that meet requirements while minimizing diversity.
- The Scientific Computing SubCouncil is in operation.

OPPORTUNITIES FOR IMPROVEMENT

- Establish funding and management process for providing both program-specific needs and needs common to several programs in consultation with funding sources.

Objective 3.3

PERFORMANCE SUMMARY

- Communications with SLAC HEP activities are effective and efficient. Improvements to communications with other science activities are in progress.
- Communications with the newly-created OHEP Computational HEP Program are proactive and are helping to define the future of the program.

NOTEWORTHY PRACTICES

- Liaison with HEP customer groups is assured by nominating contact persons in SLAC computing and holding regular meetings specific to the customer group.

OPPORTUNITIES FOR IMPROVEMENT

- Explore ideas for better modes of communication with new customers for whom the approaches used successfully in HEP may not be ideal.