



TECHNICAL ADDENDUM E

to the

MEMORANDUM OF UNDERSTANDING

between the

STANFORD LINEAR ACCELERATOR CENTER

and the

ARGONNE NATIONAL LABORATORY

for the period

01 October 2005 – 30 September 2006

September 30, 2005

I. Introduction

This Technical Addendum E constitutes the Statement of Work to be performed by the Argonne National Laboratory (ANL) on behalf of the Linac Coherent Light Source (LCLS) Project. The Stanford Linear Accelerator Center (SLAC) is a signatory as part of its role in LCLS management oversight. This Statement of Work may be amended as required by the written agreement of both parties.

The work to be performed detailed in this document falls within the scope of the Memorandum of Understanding (MOU) between SLAC and ANL dated August 10, 2002. The terms of agreement under which the work will be carried out are found within the MOU and continue to be in force.

The Appendix to this document contains the total estimated cost for the current period organized by Work Breakdown Structure (WBS) for each area in which ANL is involved and also a table of the level 3 milestones. These numbers and milestones are direct outputs from the resource loaded project schedule developed and maintained jointly by SLAC and ANL. A detailed description of the work agreed to be performed by ANL can be found in the current version of the resource loaded schedule. Performance reporting



will be against this schedule. When manpower resources are required, every effort will be made to identify specific individuals as well as specifying the fraction of time they will be devoting to the LCLS project.

Budgeted funds for the current period covered in this Technical Addendum are \$23,151,310, which consists of \$275,366 Project Engineering & Design (PED), \$22,578,732 Construction (Const.) and Long Lead Procurement (LLP), \$40,633 Research & Development (R&D), and \$256,579 Pre-operations (Pre Ops). This number is the required budget authority necessary to complete the planned schedule over the performance period.

II. Approval

The undersigned concur with this Technical Addendum E to the SLAC / ANL Memorandum of Understanding dated August 10, 2002:

John Galayda / Date
SLAC LCLS Project Director

Stephen Milton / Date
ANL LCLS Project Head

Jonathan Dorfan / Date
SLAC Lab Director

J. Murray Gibson/ Date
APS Assoc. Lab. Director



Appendix

This Appendix consists of the budget requests for the work and period agreed to between the Stanford Linear Accelerator Center and the Argonne National Laboratory with regard to the Linac Coherent Light Source (LCLS) Project.

LCLS WBS, Estimated Cost

1.2	INJECTOR SYSTEM (LLP)	\$ 9,164
		\$ 9,164
1.2.3	Injector Lasers (Yuelin Li-LLP)	
1.4	UNDULATOR SYSTEM	\$ 22,474,824
	Undulator System Management and	
1.4.1	Integration	\$ 1,178,476
1.4.2	Controls	\$ 2,454,991
1.4.3	Undulator Magnet and Support	\$ 16,325,932
1.4.4	Vacuum System	\$ 1,168,024
1.4.5	Diagnostics	\$ 1,332,968
	Undulator System Installation and	
1.4.6	Alignment	\$ 14,433
2.4	UNDULATOR SYSTEM	\$ 667,322
2.4.3	Undulator Magnet and Support	\$ 256,579
2.4.5	Diagnostics	\$ 410,743
TOTAL		\$ 23,151,310

Estimated Costs by Fund Type (\$000's)

	<u>LLP/CONS</u>	<u>PED</u>	<u>PreOps</u>	<u>R&D</u>	<u>Total</u>
1.02.03 Injector Lasers	\$9.2				\$9.2
1.04.01 UND System Mgmt and Integration	\$1,178.5				\$1,178.5
1.04.02 Controls	\$2,447.5	\$7.5			\$2,455.0
1.04.03 UND Magnet and Support	\$16,185.5	\$140.4			\$16,325.9
1.04.04 Vacuum System	\$1,123.8	\$44.3			\$1,168.0
1.04.05 Diagnostics	\$1,619.9	\$83.2			\$1,703.1
1.04.06 UND System Installation and Alignment	\$14.4				\$14.4
2.04.03 UND Magnet and Support			\$256.6		\$256.6
2.04.05 Diagnostics				\$40.6	\$40.6
TOTAL	\$22,578.7	\$275.4	\$256.6	\$40.6	\$23,151.3

1.2.3 Injector Lasers (Yuelin Li-LLP)

This area covers the effort and M&S cost for the services of Yuelin Li to perform measurements of conversion efficiencies of various frequency doubling crystals to be used with the LCLS drive laser system.

1.4.1 Undulator System Management and Integration

This area covers all management and administrative costs, costs for general materials and supplies including travel, and the cost of undulator system reviews incurred at ANL on behalf of the LCLS project.

1.4.2 Controls

The scope of work includes the continued development of the LCLS undulator strongback motion, initial development of the LCLS diagnostic stage motion control system, refinement of the video analysis system used with the LCLS undulator OTR diagnostics, and design guidance and support for the single and multiple undulator test fixtures.

1.4.3 Undulator Magnet and Supports

The bulk of the costs are for procurement of the production undulator assemblies. Other costs incurred are for effort and M&S in support of design, engineering, prototyping, testing, and procurement of the support/mover and fixed support systems and for executing undulator system testing. Laminated quadrupole magnets with correctors are to be designed, first articles tested, and production initiated. Finally, effort is required in order to oversee and manage all of the existing and new contracts, and the associated documentation for long-lead undulator components, support/mover and fixed support system subcomponents, and undulator assemblies.

1.4.4 Vacuum System

Due to the change of the construction materials for the vacuum chamber, the construction of the first prototype has been moved to FY06. This will be done in conjunction with the bellows module prototype, since the aperture of it was changed last year and that delayed the construction of the bellows module. Work will continue on the Long and Short Break Assemblies and with the Entrance and Exit sections.

1.4.5 Diagnostics

Prototyping of the following diagnostics systems for the LCLS undulator system in FY06 will be: OTR, wire scanners and rf beam position monitors. These instruments will be tested in a laboratory setting as well as in the APS injector system. The rf beam position monitor will be tested in the APS injector test stand area before being tested in the linac PAR bypass line. The scope of this will include all installation effort and supporting equipment.

1.4.6 Undulator System Installation and Alignment

This cost covers continued development of integrated system layout drawings of the LCLS undulator system.

2.4.3 Undulator Magnet and Support

ANL will procure the operational substitute undulators and associated support/mover systems as well as spare quadrupoles for the LCLS undulator system.

2.4.5 Diagnostics

This scope of work is for R&D costs associated with the development of all diagnostics used in the LCLS undulator system. This would include the beam position monitors, OTR screen, various wire monitors, beam loss monitors, and charge monitors as well as end of undulator diagnostics R&D.

Reporting and Procurement Authorization

The person responsible for the LCLS effort at ANL is the LCLS Undulator System Manager and LCLS ANL Project Director, Dr. Stephen Milton. The LCLS group at ANL agrees to furnish complete documentation for all deliverables supplied to the LCLS project as well as quality control, design, safety, and performance checks carried out in the performance of this work.

The LCLS Group at ANL will report monthly by the 15th working day of the subsequent month on all LCLS-related procurement expenditures and labor charges together with associated technical progress in each item of work by Work Breakdown Structure (WBS) category at the lowest WBS level. Major procurements (currently >\$100k) must in addition, have the written authorization of the LCLS Project Director.

A high-level monthly report will also be generated by the LCLS ANL Project Director and provided to the LCLS Chief Engineer by the 10th working day of the subsequent month. This report will describe major highlights, assessments, and issues.

FY2006 Milestones and Definitions

Below is a list of milestones (Level 3 and above) to be accomplished during this period of performance.

Activity ID	Milestone	Expected Completion Date	Definition
MS3_UN028	Award 1st Articles Mag Assy to Vendors Comp	10/11/2005	1st article magnet assembly and support structure with options has been awarded to the first of two vendors.
MSC_UN016	CRIT: Release RFP - Quadrupoles	4/4/2006	The undulator quadrupole Request for Proposal (RFP) has been issued.
MS3_UN018	Undulator Mock-up Completed	4/28/2006	The Single Undulator Test at ANL is complete.
MSC_UN030	CRIT: Release FRP - Fixed Supports	5/8/2006	The undulator fixed support Request for Proposal (RFP) has been issued.
MS3_UN006	1st Article Vendor A Undulator 1 Rcvd @ SLAC	6/2/2006	The 1st article undulator assembly from vendor A has been received at SLAC
MS3_UN010	1st Article Vendor B Undulator 1 Rcvd @ SLAC	7/31/2005	The 1st article undulator assembly from vendor B has been received at SLAC
MS3_UN015	25% production undulators received	9/26/2006	8 production undulators have been received at SLAC
MS3_UN028	Award 1st Articles Mag Assy to Vendors Comp	10/11/2005	1st article magnet assembly and support structure with options has been awarded to the first of two vendors.