

Argonne National Laboratory

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STATEMENT OF WORK

FOR

LCLS UNDULATOR MAIN ASSEMBLY

WBS L.1.04.03

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ARGONNE NATIONAL LABORATORY

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NOTIFICATION OF SPECIFICATIONS REVISION

Title: **Statement Of Work For LCLS Undulator Main Assembly**

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1.0 INTRODUCTION:

The Linac Coherent Light Source (LCLS) will be the world's first x-ray free electron laser when it becomes operational in 2009. The LCLS is a US-DOE-funded project that is currently in the detailed project engineering and design phase. Design and construction are accomplished by a partnership of three US national laboratories including the Stanford Linear Accelerator Center (SLAC) as home laboratory, together with the Lawrence Livermore National Laboratory (LLNL) and Argonne National Laboratory (ANL). The start of construction is planned in FY2005. Pulses of x-ray laser light from the LCLS will be many orders of magnitude brighter and several orders of magnitude shorter than presently-available x-rays from other sources. These characteristics will enable frontier new science in areas that include discovering and probing new states of matter, understanding and following chemical reactions and biological processes in real time, imaging chemical and structural properties of materials on the nanoscale, and imaging non-crystalline biological materials at atomic resolution.

In a FEL, the actual lasing occurs as a result of the electron beam passing through a precision magnetic device called an undulator. Undulator construction is the responsibility of ANL.

2.0 SCOPE:

2.1 Scope of Work for the LCLS Undulator Main Assembly.

A total of 40 undulators are required for the LCLS project. The present procurement is for the manufacture and assembly of the LCLS Undulator Main Assembly. An experimental prototype undulator was constructed and tested at the Advanced Photon Source (APS) at ANL. Some design and value engineering changes were made as a result, and are incorporated into the production unit design.

The production contract will be awarded to two Contractors with each delivering a First Article LCLS Undulator Main Assembly. After a positive evaluation of contractor performance on the First Article, each contractor would be given approval to proceed with the manufacture of 14 additional undulator assemblies. The final 5 undulators from each contractor would be released after evaluation of the production run of 14 units, and



10 units could be awarded to just one of the two contractors if sufficient disparity in performance or cost was found.

Each undulator is comprised of a precision-tuned array of very strong permanent magnets and magnetic poles that result in a precisely-set magnetic field down the axis along which the electron beam eventually travels. There are extremely stringent requirements on the magnetic field uniformity and quality in the final device. Careful attention must be paid at each step in the construction to ensure that the final-assembled, magnetically-tuned undulator meets all requirements. Similar devices were constructed and tuned for the Advanced Photon Source and other light-source facilities; however, some of the precision and stability requirements for the LCLS devices far exceed those for existing undulators.

If these requirements are not met, or if the devices are not stable enough over time, then the desired interaction between the radiation produced in the undulator and the electron beam will not take place, and the free electron laser will not function.

The assembly consists of the titanium strongback and all the components supported by and mounted on the strongback. The assembly shall be manufactured per LCLS Undulator Main Assembly drawing L143-112000, "Undulator Unit Assembly, Main Assembly" and all its sub-tier drawings. The design and tolerances of the undulator components ensures that careful mechanical assembly and handling is all that is required for the undulator to meet expectations.

2.2 ANL Furnished Components.

The long lead items for the LCLS Undulator Main Assembly are being ordered by ANL and will be furnished to the Contractors. The long lead items are:

a) The titanium strongback per ANL drawing L143-110700, "Undulator Unit Assembly, Magnet Structure, Undulator Magnet Assembly, Strongback Machining." The two contracts for the strongbacks were awarded on April 8, 2005 and the delivery schedule for the strongbacks is detailed in L143-00030, Section 2.2 (see Section 3.2 below).

b) The magnet poles per ANL drawing L143-110105, "Undulator Unit Assembly, Magnet Structure, Pole." The contract for the poles was awarded on March 24, 2005



and the delivery schedule for the poles is detailed in L143-00031, Section 2.2 (see Section 3.2 below).

c) The magnet last poles per ANL drawing L143-110107, "Undulator Unit Assembly, Magnet Structure, Last Pole." The contract for the last poles was awarded on March 24, 2005 and the delivery schedule for the poles is detailed in L143-00031, Section 2.2 (see Section 3.2 below).

d) The magnets per ANL drawing L143-110106, "Undulator Unit Assembly, Magnet Structure, Magnet." The contract for the magnets was awarded on May 12, 2005 and the delivery schedule for the magnets is detailed in L143-00032, Section 2.2 (see Section 3.2 below).

The parts shall be stored by the Contractor in a secure, safe area. The magnets must be stored in a dry, temperature controlled area as high temperatures can cause demagnetization. Storage temperatures shall not exceed 55°C at any point in the storage area. Magnets shall be stored in their shipping containers until needed for assembly.

2.3 First Article.

Each Contractor shall deliver one First-Article LCLS Undulator Main Assembly per L143-112000 no later than 12 weeks after award of the contract. The Contractor shall not proceed with the remainder of the contract unless and until the First Article is accepted and the Laboratory approves proceeding with the remaining units in the contract.

2.4 Delivery.

The delivery of the First Article is expected in fiscal 2005 (before the end of Sept. '05) within the time period given in Section 2.3. The authorization for the construction of the remaining units depends on the acceptance of the First article and funding from the Fiscal 2006 budget. Once authorized to proceed, the next unit from each Contractor shall be delivered within 10 weeks. Deliveries shall proceed with one unit every 4 weeks from each Contractor. Faster delivery may be permissible and encouraged provided prior permission is granted and quality is not sacrificed.



3.0 APPLICABLE DOCUMENTS AND /OR SPECIFICATIONS:

3.1 The Contractor effort shall be in conformance with the following referenced documents, drawings, and specifications.

- 1) LCLS Undulator Main Assembly drawing L143-112000, “Undulator Unit Assembly, Main Assembly” and all its sub-tier drawings.
- 2) LCLS document L143-00076, “Assembly Procedure for the LCLS Undulators.”
- 3) LCLS undulator gap “Go” test gauge drawing L143-110150, “Undulator Unit Assembly Pole Gap “GO” Gauge Assembly” and all its sub-tier drawings.
- 4) LCLS undulator gap “No Go” test gauge drawing L143-110160, “Undulator Unit Assembly Pole Gap “NO GO” Gauge Assembly” and all its sub-tier drawings.

3.2 The following additional documents for the long lead items being furnished by the Laboratory may be useful for reference in receiving and accepting the items.

- 1) LCLS document L143-00030 “Statement of Work for LCLS Undulator Strongback”
- 2) LCLS document L143-00031 “Statement of Work for LCLS Undulator Magnet Poles”
- 3) LCLS document L143-00032 “Statement of Work for LCLS Undulator Magnets”

3.3 The following documents are Argonne designed tooling and fixtures for the assembly of the LCLS Undulator Main Assembly.

- 1) L143-110116, “Pole Assembly Fixture Top”
- 2) L143-110117, “Pole Assembly Fixture Bottom”
- 3) L143-110118, “Pole Assembly Fixture Middle”
- 4) L143-110120, “Magnetic Assembly Fixture General Assembly” and all its sub-tier drawings
- 5) L143-110128, “Short Spacer”
- 6) L143-110129, “Long Spacer”
- 7) L143-110130, “Magnetic Structure Installation Fixture 1”
- 8) L143-110140, “Magnetic Structure Installation Fixture 2”



4.0 TECHNICAL TASKS AND QUALITY ASSURANCE

4.1 Fabrication.

With the exception of the parts defined in Section 2.2, the Contractor shall furnish all materials, personnel, facilities, tools, equipment, and services to fabricate, test, document and deliver the LCLS Undulator Main Assembly per drawing L143-112000, “Undulator Unit Assembly, Main Assembly.”

4.1.1 ANL Supplied Component Inspection.

The components furnished by ANL will be drop shipped from the manufacturing vendor to the LCLS Undulator Main Assembly Contractor. The assembly contractor receiving the parts shall perform incoming inspection of the parts to assure that parts meet its drawing and Statement of Work requirements. The assembly contractor shall also complete the applicable sections of ANL Acceptance Criteria Listing forms E5-026046, E5-020020, and E5-069069 and return the completed forms to the LCLS Technical Representative per section 5.2.3 of this document. Disposition of any non-conformances or broken parts shall be referred to LCLS QA for disposition.

4.1.2 Manufactured Component Inspection

All components manufactured by the Contractor or the Contractor’s subcontractor shall be inspected to ensure the parts are to print prior to use in an assembly. The Contractor shall certify that the parts were inspected and were compliant with the appropriate drawing or document.

4.1.3 Assembly

4.1.3.1 Assembly Area

The area used for assembly of the undulator shall have the following features:

- a) The area shall be clean and relatively dust free. Of particular concern are ferromagnetic chips, particles, and dust that would be attracted to and tend to collect on the permanent magnets. The assembly area shall not be located in a



room where machining or grinding is being performed, nor share a common HVAC supply unless filtered to prevent introduction of ferromagnetic particles.

- b) The area shall provide protection from casual passersby. Location directly on a traffic aisle is undesirable. An enclosed area providing some protection from casual contact with personnel not working on the project is desirable. Some degree of isolation will help protect untrained personnel from the hazards of the high magnetic fields present in the undulator gap, and help protect the magnets from accidental exposure to ferromagnetic tools and the like.
- c) The assembly area must be equipped with suitable non-magnetic tools for all required work near the strong magnetic fields.

4.1.3.2 Assembly Personnel.

All personnel working on or near the LCLS Undulator Main Assembly must be trained and familiarized with the potential hazards presented by the strong attractive and repulsive forces exerted on and by the permanent magnets. They must have sufficient and proper safety training in good work habits around such magnets. All personnel working on the assembly must be equipped with and use the appropriate personal protective equipment.

4.1.3.3 Assembly Procedure.

The magnet structures shall be assembled according the procedure L143-0076 "Assembly Procedure for the LCLS Undulators." The assembly of each of the magnet structure assemblies shall be documented with photographs clearly showing the magnet serial numbers and the slot position numbers engraved on the magnet structure base. The magnet structure assembly and undulator main assembly to which the photograph relates shall be clearly marked on the photograph and certified by the Contractor.



4.1.4 Marking.

4.1.4.1 Marking Magnet Structure Assemblies.

4.1.4.1.1 There are five upper magnet structure assemblies and five lower magnet structure assemblies. The five upper magnet structure assemblies are:

L143-110800 “Upper Left Magnet Structure Assembly”

L143-111200 “Upper Right Magnet Structure Assembly”

L143-111000-1, -2, and -3 “Upper Middle Magnet Structure Assembly”

The five lower magnet structure assemblies are:

L143-110900 “Lower Left Magnet Structure Assembly”

L143-111300 “Lower Right Magnet Structure Assembly”

L143-111100-1, -2 and -3 “Lower Middle Magnet Structure Assembly”

4.1.4.1.2 Each assembly is marked with its assembly drawing number and its unique serial number. In addition, the magnet structure base has each magnet position numbered so that a specific magnet can be located in a specific magnet location. These markings are all engraved in the locations shown on the respective magnet structure base corresponding to a particular magnet structure assembly.

4.1.4.1.3 The end Magnet Structure Assemblies (Upper Left and Right and Lower Left and Right) shall be engraved with a two digit serial number immediately after the assembly drawing number as shown on the Magnet Structure Base drawings. These serial numbers shall be 01 through 40 and correspond to the serial number of the Strongback/ LCLS Undulator Main Assembly serial number on which they are to be used (see Section 4.1.4.2 below).

4.1.4.1.4 The Upper and Lower Middle Magnet Structure Assemblies come in three versions, -1, -2, and -3. The difference in the versions is the range of numbers used to identify the magnet positions. The -1 Upper and Lower Middle Magnet Structure Assembly magnet slots shall be numbered from 13 to 79, the -2 magnet slots shall be numbered from 80 to 146, and the -3 magnet slots shall be numbered from 147 to 213 as shown on the corresponding drawings. The Upper and Lower Middle Magnet



Structure Assemblies shall be engraved with a three digit serial number immediately after the assembly drawing number as shown on the Magnet Structure Base drawings. The -1 versions of the Middle Magnet Structure Assembly serial numbers shall be 101 through 140, the -2 version serial numbers shall range from 201 to 240, and the -3 version serial numbers shall range from 301 to 340. The last two digits of the serial number shall correspond to the serial number of the Strongback/ LCLS Undulator Main Assembly serial number on which they are to be used.

4.1.4.2 Marking LCLS Undulator Main Assembly.

Each LCLS Undulator Main Assembly shall be marked for identification with its ANL Part Number (L143-112000) and Revision Number, and its SLAC part number (SA-381-001-35). These numbers are all on the part drawing. In addition, the LCLS Undulator Main Assembly shall be marked with a serial number to distinguish it from the other undulator assemblies so that accompanying documents and data can be correctly correlated to the correct individual assembly.

All these identifying marks are to be etched or stamped near the center of the backside of the strongback, approximately 100 to 150 mm to the right of the strongback identification numbers in three lines.

- a) The first line shall be the ANL Part Number-Revision Number (L143-112000-00).
- b) The second line shall be the SLAC Part Number (SA-381-001-35).
- c) The third line shall be the unique serial number for the particular assembly, and shall be the same as the serial number for the strongback.

The information in parentheses are examples of the information to be stamped or etched on the assembly, the actual revision and serial numbers shall be whatever is applicable to the assembly being marked.

4.1.5 Packaging and Shipping.

4.1.5.1 The LCLS Undulator Main Assembly shall be appropriately packaged to protect it from shipping damage, and to prevent exposure of external equipment and personnel to the high magnetic field in the undulator. When packaged for



shipping, there shall be no access to the undulator magnet gap and the magnets must be at least 100 mm from the external surface of the shipping container. The shipping container and the means used to constrain the LCLS Undulator Main Assembly shall be sufficiently sturdy so that the LCLS Undulator Main Assembly suffers no damage in shipment. No nicks, dents or scratches are acceptable. The outside of each shipping container must be labeled with a IATA (International Air Transport Association) Class 9 black and white Miscellaneous Dangerous Goods handling label identifying the presence of a magnetic field. The Contractor shall forward their proposed shipping containment design to ANL for review no later than the second monthly progress report.

4.1.5.2 Exposure of the LCLS Undulator Main Assembly to dust, dirt or magnetic particles that could collect on the magnets and poles is unacceptable. The LCLS Undulator Main Assembly shall be sealed in a plastic bag at the completion of assembly and inspection tasks. Penetration of the plastic by hold down bolts for shipping is permitted.

4.1.5.3 Shipment of the undulator must be by means that minimize shock and thermal variations. Shock loads shall be limited to 1.5 g horizontal and 1g vertical. Excessive temperature can demagnetize the magnets. The temperature shall not exceed 55°C. The shock loads and thermal environment shall be monitored during shipment by means that can record all shock event magnitudes and thermal variation during the entire shipment period and be read out upon receipt of the undulator. The magnitude of all shock events at or above 50% of the above maximum limits shall be recorded and date/time stamped. Temperatures shall be recorded at least every hour and, if at any time the temperature equals or exceeds the maximum allowed temperature, it shall be recorded every quarter hour. All temperature reading shall be date/time stamped. The monitoring device and technique shall be approved by LCLS QA prior to use.

4.1.5.4 The required monitoring devices to accomplish the shock and thermal monitoring required in Section 4.1.5.3 above, shall be procured by the Contractor as part of the required special tooling for the task (see section.4.6). The device or devices shall be reusable and shall be returned to the Contractor when a shipment is received at ANL or SLAC. Products such as ShockLog RD298 appear to satisfy our requirements. The devices shall be shipped to ANL after completion of the contract. In order not to delay shipment, at least two sets of devices should be planned to be procured.



4.1.5.5 Shipment of the LCLS Undulator Main Assembly shall be FOB Origin for the First Article and FOB Origin for the remaining assemblies. The shipping, customs, and duty costs are to be prepaid by the Contractor. These shipping costs should be included in the bid. However, do not include in your bid: insurance or any costs for insurance for shipping to ANL docks or SLAC docks. Argonne National Laboratory and Stanford Linear Accelerator Center shall be notified immediately of a shipment's tracking information and estimated arrival time when a shipment leaves the Contractor's dock.

4.2 Program Plan.

The contractor shall prepare and maintain a Program Plan describing and scheduling all phases of this program. The Laboratory shall review and approve the Program Plan and all changes thereto prior to implementation by the contractor.

4.2.1 Program Plan General Description.

The program management plan describes the contractor's concept, plan, practice, and approach for accomplishing (managing and controlling) project tasks, management interfaces, time-phased relationships of tasks and program elements, and the criteria against which performance may be judged. The plan is to be used as the basis for organizing, administering, and measuring work. The plan, with its interrelated and referenced documents, shall include sufficient data to demonstrate the capability to accurately report schedule, and technical performance indicators. The plan shall also be used to explain variances, to describe corrective actions and decisions, and to indicate required recovery or expeditious efforts.

4.2.2 Program Plan Content.

The plan shall describe the programmatic and management structure along with the management tools, which shall be used by the contractor in performance of the contractual effort. The following shall be included:

4.2.2.1 A brief description of the program objectives, with a summary of requirements and specifications as well as a concise description of the hardware and associated components.



4.2.2.2 Summary schedules, which reflect a direct condensation of the master schedules, and which are suitable for management review.

4.2.2.3 A description of the organization for the management of the program, indicating the internal interfaces between management and other elements of the contractor's organization.

4.2.2.4 A key personnel list, portraying the contractor's key personnel, beginning with the highest level program manager (or equivalent position) descending to the lowest echelon of key staff positions necessary for effective program management.

4.2.2.5 A description of the contractor's plan for interfacing with the Laboratory and with associated contractors, as well as technical management.

4.2.2.6 A description of the contractor's management information system as applied to the data management, configuration management, and schedule management function of this contract.

4.2.2.7 Copies of the Work Breakdown Structure (if applicable).

4.2.2.8 A subcontractor plan which includes the method of procurement, procurement schedules, and procedures by which control shall be exercised for planned subcontract effort (if applicable).

4.2.2.9 A description of the contractor's resources being used in performance of the program, including plant capacity, facilities, machine tools, and manpower for all contract phases including fabrication.

4.2.2.10 A description of program tasks to be accomplished and a general outline of the methods and systems, which the contractor shall utilize to accomplish each major task.

4.2.3 Program Plan Format.



The contractor's own format shall be satisfactory. Contents should be displayed in sections for ease of separate consideration.

4.2.4 Program Plan Maintenance.

The plan shall be maintained current by page revision or complete reissue to reflect all approved program changes. Change to the key personnel list, consistent with the standard Terms and Conditions Clause, shall be forwarded to the Laboratory as soon as practical after the decision to make a change, and not later than the next scheduled progress report.

4.3 Program Meetings.

The contractor shall provide for program meetings with Laboratory representatives for purposes of reviewing and resolving progress, fabrication, testing, and managerial issues. Meetings will be held at the discretion of either the Laboratory or the contractor. Current information on all aspects of the program shall be made available by the contractor to the Laboratory one week in advance. Meetings shall be held at the contractor's facility, unless the Laboratory chooses otherwise. A mandatory notice and meeting agenda will be provided by the Laboratory one week before a program meeting can be held. The contractor shall have the responsibility to provide minutes of the meeting within two (2) weeks following the session.

4.4 Program Schedule.

The contractor shall prepare and maintain a Program Schedule. This schedule shall include the major program milestones. The Laboratory shall review and approve the Program Schedule and all changes thereto prior to implementation by the contractor.

4.4.1 Program Schedule General Description.

The program schedules depict the period of performance for work specified by the contract. They portray significant program/project milestones necessary to measure, analyze, and perform corrective action as well as indicate progress and performance.



4.4.2 Program Schedule Content.

In addition to major milestones required by the Laboratory and stipulated by the Statement of Work, the schedules shall also include where applicable:

4.4.2.1 Major milestones which depict program baselines, phase start and completion, go/no-go decision points, design and inspection reviews, delivery dates, etc.

4.4.2.2 Second level milestones which include long-lead procurement, intermediate design, manufacturing, and procurement points, development milestones and interfacing points, intermediate test and analysis points, etc.

4.4.2.3 Third level milestones which include all detail control milestones that govern the preparation of work package schedules.

4.4.3 Program Schedule Format.

The schedules shall be compatible with the Program Plans.

4.4.4 Program Schedule Maintenance.

The schedules shall denote the most recent actual results compared with the forecasted progress. When major deviations between actual results and the baseline persist to the extent that the baseline becomes of little or no value for measuring and forecasting, the contractor shall change the appropriate parts of the baseline, subject to the following:

4.4.4.1 Changes shall be announced and described in the progress report for the period in which the change is made. Reasons for the change shall be described as well as the related effects on the work packages, and/or manufacturing schedules.

4.4.4.2 Schedule changes to (or affecting) Laboratory milestones shall be approved by Argonne prior to implementation.



4.5 Measurements and Testing.

The contractor shall conduct testing of the LCLS Undulator Main Assembly prior to delivery and acceptance by the Laboratory. All measurements (including temperature) and tests shall be performed using calibrated test instruments that are traceable to the National Institute of Standards and Technology (N.I.S.T.) or equivalent. Acceptance tests shall be in accordance with Section 4.5.1 of this Statement of Work. Certified test results shall be submitted by the contractor to the Laboratory within two weeks after conclusion of the test. Each shipment shall be accompanied or preceded by reports of actual test results identifiable to the acceptance criteria of items submitted and shall meet the requirements of the contract document and applicable drawings and specifications. These reports shall contain the signature and title of the authorized contract representative of the agency performing the tests and shall be subject to review and acceptance by Supplier Quality Control. The data submitted shall also be transmitted in electronic PDF format directly to the responsible ANL Engineer

4.5.1 Gap Test.

The LCLS Undulator Main Assembly shall be tested by the contractor to verify that the intended magnet gap separation and uniformity was achieved in the assembly. The test shall be performed by insertion of two gauges into the undulator gap. The "GO" gauge is defined on L143-110151 and should be able to be fully inserted into the undulator pole gap, while the "NO GO" gauge defined on L143-110152 should not go completely into the pole gap.

The test is best performed with the undulator rolled to a position with the gap facing upwards. The "GO" and "NO GO" gauges can then be lowered gently into the gap until they either bottom out against the poles or jam up part way in. Vertical insertion position is recommended to prevent tool sag from interfering with ease of insertion.

4.5.2 Test Conditions.

All dimensions apply at a temperature of 20°C. The part must be in thermal equilibrium during measurements and at the same temperature at the beginning and conclusion of the measurements within 2°C. Experience with the prototype undulator indicates that at least



24 hours is needed for the undulator to get near thermal equilibrium with the measurement room. The part temperature, before and after dimensional measurements, shall be recorded and reported.

4.6 Special Tooling.

The contractor shall design and fabricate any special tooling and fixtures required for fabrication of the LCLS Undulator Main Assembly, which is not provided by the Laboratory. The Laboratory shall supply designs for all tooling and fixtures referenced in the procedure "Assembly Procedure for LCLS Undulators", and the Contractor is free to use the ANL design or to design tooling of equivalent or superior functionality. All special tooling fabricated by the contractor is the property of the Laboratory and shall be accounted for by the contractor. Disposition of the special tooling at the conclusion of contract shall be at the option of the Laboratory in accord with FAR clause 52.245-17.

4.7 Quality Control.

The contractor shall adhere to all quality control requirements as specified in this Statement of Work. The contractor shall adhere to the DOE policy that prohibits the use of any suspect or counterfeit parts.

4.7.1 First-Article Inspection.

A first-article inspection shall be performed in the presence of a designated representative of ANL. The first-article inspection shall be accomplished using the first deliverable item of several of the same design or same type. The processes used and standards of workmanship shall as a minimum be representative of all items to be produced. The supplier shall notify the Laboratory Procurement Official at least seven (7) days prior to the time that the first-article is available for inspection. Unless otherwise designated by the Laboratory Procurement Official, first-article inspection will be conducted at the supplier's facility. The First Article Inspection shall consist, as a minimum, witnessing the verification of critical dimensions including the "Go" and "No Go" gauge tests, reviewing Q/A documentation and material certification. Argonne National Laboratory shall measure the magnetic field of the First Article undulators and determine if the field is satisfactory. Continued fabrication of additional items prior to notification of first-



article acceptance shall be entirely at supplier's risk, and may result in non-reimbursement of related costs by the Laboratory.

4.7.2 Changes Proposed by Contractor.

Prior to effecting any change in ANL approved (1) design, (2) workmanship standards, or (3) manufacturing process for use in this procurement, the supplier shall obtain the Laboratory's written approval. Such changes must be documented by the contractor as "marked drawing" changes to the engineering drawings for the affected item prior to the Laboratory's approval. If approved by the Laboratory, revised drawings shall be issued by the contractor.

4.7.3 Proprietary Designs and Processes.

The contractor shall notify ANL prior to effecting any change in proprietary processing or design. A meeting between the supplier, the Laboratory Procurement Official and Laboratory Quality Assurance shall be called to determine the method by which contract requirements will be met while accommodating the contractor's proposed change.

4.8 Inspection and Test Plan.

The contractor shall prepare and maintain an Inspection and Test Plan. The contractor shall submit to the Laboratory Procurement Official for written approval by Laboratory Quality Assurance prior to its required use, a plan, in the contractor's format, listing components, subassemblies and assemblies; and identifying those inspections and tests planned for verification of quality and identifying documentation/planning to be used for such accomplishment.

4.9 Quality Assurance.

The contractor shall prepare and maintain a Quality Verification Program for control of quality of articles furnished in accordance with this contract. A plan shall be prepared and submitted to the Laboratory Procurement Official for written approval by LCLS – ANL Quality Assurance prior to its required use by the contractor. The contractor's quality assurance manual may suffice providing it adequately implements the quality requirements specified.



4.10 Source Inspection.

The Laboratory reserves the right to perform source inspection of any and all materials, parts, subassemblies and assemblies required for performance of this contract.

4.11 Testing Surveillance.

The Laboratory reserves the right to witness any testing accomplished by the contractor. This surveillance will be informal except for final acceptance tests. The contractor shall notify the Laboratory two (2) weeks prior to the conduct of any test.

4.12 Test Failures.

The Laboratory shall be notified by the contractor within 48 hours after the failure of any material to meet the requirements of acceptance or qualification testing. The Laboratory shall be notified immediately of any failure occurring during assembly or acceptance testing of the LCLS Undulator Main Assembly.

4.13 Red Flag Notice.

The contractor shall immediately notify the Laboratory of any occurrence, which will impact contract schedule. The notification shall be either written or oral with written confirmation within 48 hours on a Red Flag Report, and shall include remedial action taken to offset the problem. The contractor shall provide his own format compatible with the following requirements:

4.13.1 Date and Number.

Each Red Flag Notice is to be dated and consecutively numbered.

4.13.2 Contract Required Delivery Date.

Contract delivery date for the subject of the report. It does not normally change from one report to the next.



4.13.3 Estimated Shipping Dates.

Include the prior Report estimate and this Report estimate.

4.13.4 Statement of Problem.

All problems shall be presented as separate items in clear concise text describing the reason why the end item is late, the reason for any slippage since the last report and the current status of the work.

4.13.5 Consequence.

The consequence of the problem or delay shall be concisely stated in terms of impact on delivery, the meeting of key milestones, the progress of other work, or on meeting specification requirements, etc.

4.13.6 Action Taken.

The action being taken to resolve the problem and recover schedule delays shall be described and the estimated effect of this action shall be highlighted. The name of the key individual in the contractor's organization who must act to resolve the problem shall be shown.

4.13.7 Action Required.

Future action to recover schedule shall be identified. The action shall be described, the action party identified by name, title and organization, and the date when completion of the action is required shall be set forth.

4.13.8 Assistance Required.

Any assistance required from the Laboratory to further the progress of the recovery program shall be set forth. The exact nature of any required assistance shall be stated and the date by which such action must be taken shall be provided.



4.13.9 Number of Times Reported.

The number of previous critical items reports which have identified the same problem as critical to the progress of the work or to satisfaction of the technical requirements shall be set forth.

4.13.10 Acknowledgement of Responsibility.

Each report shall acknowledge that the reporting of the critical items therein does not relieve the writer of responsibility for seeing that the necessary corrective action is taken on each item.

4.14 Nonconformance Reporting.

The contractor shall report any non-conformances to specifications, drawings, or other contract requirements on ANL Form 311.

4.15 Approvals.

All Laboratory approvals required by this contract shall be acted upon within two (2) weeks of receipt by ANL of submission by the contractor. Action will consist of a notice of approval, clarification request or rejection in writing from the Laboratory Subcontract Administrator. Approvals shall not relieve the contractor of any responsibility for reliability, quality, delivery, cost, performance or other requirements of this contract.

5.0 REPORTS, DATA, AND DELIVERABLES:

5.1 Progress Report.

The contractor shall submit monthly progress reports during the execution of this program. The progress report shall include narrative and tabular summary of performance during the report period. It shall include work performed, work forecast, and problem description and resolution. The contractor shall emphasize any deviations from plan or schedule, the reasons and impacts of such deviations, and the effects of management efforts undertaken for corrective or expeditious actions.



5.2 Technical Data.

The Contractor shall deliver all technical data as specified below.

5.2.1 For each of the following items, one (1) electronic copy in PDF format followed by two (2) paper copies are required once 30 days after award of contract. Any changes to these documents must also be submitted.

- a) Program Plan (Section 4.2)
- b) Program Schedule (Section 4.4)
- c) Inspection and Test Plan (Section 4.8)
- d) Quality Verification Plan (Section 4.9)

5.2.2 For Progress Reports (Section 5.1), one (1) electronic copy in PDF format followed by two (2) paper copies are required monthly 10 days after the end of the month. The first report shall be due 40 days after award of contract.

5.2.3 For test results, measured values, certifications and Acceptance Criteria Listings (Sections 4.1.1, 4.1.2, 4.1.3.3 and 4.5), one (1) electronic copy in PDF format followed by two (2) paper copies are required within two (2) weeks of completion of testing of a given LCLS Undulator Main Assembly.

5.2.4 For each of the following items, one (1) electronic copy in PDF format followed by two (2) paper copies are required. These items are on an “as required” basis.

- a) Red Flag Notice (Section 4.13), submit within 48 hours of an occurrence.
- b) Nonconformance Report (Section 4.14), ANL approval required for disposition of a non-conformance.
- c) Program Meeting Minutes (Section 4.3), submit within 2 weeks of a Program Meeting.

5.3 Delivery.

The Contractor shall deliver the Undulator Assemblies listed in Section 2.1 of this Statement of Work per the schedule indicated in Sections 2.3 and 2.4 of this Statement of Work. With the exception of the First Articles which are delivered to ANL, all undulator

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main assemblies shall be delivered to Stanford Linear Accelerator Center, 2575 Sand Hill Road, Menlo Park, CA 94025.

6.0 OTHER SPECIAL CONSIDERATIONS:**6.1 Subcontractors.**

Should the Contractor intend to subcontract any portion of this work, such intentions, possible subcontractors, and the scope of their involvement shall be included in the proposal. ANL is to be informed of any change in subcontractors prior to any such change taking effect. ANL reserves the right to both evaluate and reject the use of any particular sub-contractor.