Jefferson Lab

# STATEMENT OF WORK

12000 Jefferson Avenue
Newport News, VA 23606

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TITLE: Statement of work for fabrication of the Hall D Tagger Microscope and Active Collimator
**WBS 1.5.5.1.2, 1.5.5.3**

DATE: May 14 , 2012

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# STATEMENT OF WORK

## 1.0 SCOPE

### 1.1 PURPOSE

This Statement of Work (SOW) defines the requirements for the:

- design, fabrication, assembly, testing, and delivery to Jefferson Lab of the tagger microscope detector, together with the detector-mounted electronics necessary to read it out.
- procurement, assembly, testing, and delivery to Jefferson Lab of the active collimator for the Hall D polarized photon beam, including preamplifiers, power supplies and control electronics.

This work will be performed by common agreement between the University of Connecticut (UConn) and Jefferson Lab (JLab).

### 1.2 MILESTONES

Prior to the start of construction of the tagger microscope, JLab will conduct a "Readiness Review" at the UConn to ascertain that all procedures and facilities are in place and ready to commence production. The review will take place after the preamplifier board prototype is fabricated and tested at UConn. JLab must approve the vendor-proposed Construction Plan and Acceptance Test Plan, along with the details comprising them. The fabrication of electronics assembly, and testing of the active collimator electronics will begin after fabrication of the active collimator. JLab will provide active collimator components to UConn.

### JLAB SUPPLIED MATERIALS, SERVICES, AND EQUIPMENT

a. JLab will supply SiPMs for the tagger microscope.

b. JLab will provide engineering consultation, advice and support as required, and review and approve all construction drawings for the tagger microscope.

c. JLab will be responsible for approving all electronics for the tagger microscope and active collimator.

d. JLab will provide engineering consultation, advice and support as needed for specifying the acceptance and testing of the active collimator electronics and the active collimator detector.

e. JLab will be responsible for all aspects of integration of the tagger microscope and the active collimator into the Hall D photon beam line controls, data acquisition, and trigger.

f. JLab will provide the components for the active collimator.

## 1.3 VENDOR SUPPLIED MATERIALS, SERVICES, AND EQUIPMENT

a. All consumables, machinery, tools, and facilities used in the course of fabrication and assembly.

b. All labor and materials associated with the labor, such as Quality Assurance and Acceptance Test Plan sheets.

c. A construction manager as key personnel to oversee all aspects of component and assembly construction.

d. A draft Construction Plan, along with a draft Quality Assurance and Acceptance Test Plan to be submitted with the vendor proposal and formally evaluated by JLab prior to contract award.

e. A final Construction Plan and Quality Assurance and Acceptance Test Plan presented at the JLab conducted "Readiness Review" for JLab approval.

f. A written update provided every two weeks to the Hall D liaison and Hall D group leader on component and assembly construction status, including but not limited to: summaries of fabrication and testing, description of any technical issues encountered during material preparation, fabrication, machining, and testing, and comparison of measured performance relative to pertinent specifications.

g. Reports provided monthly on progress of construction relative to the baseline schedule and cost for input to the project Earned Value Management System.

## 1.4 VENDOR RESPONSIBILITIES

The vendor shall:

a. In coordination with JLab engineering and scientific support for the project, develop detailed schedules of the fabrication, acceptance and testing procedures.

b. Be responsible for construction drawings of the tagger microscope.

c. Provide the construction manager as key personnel to supervise the fabrication and testing procedures.

d. Provide formal supervision of all labor, including students, associated with construction.

e. Hire and train hourly labor to perform all necessary procedures for successful fabrication and testing.

f. Develop processes and procedures for all fabrication and testing activities.

g. Design, lay out, and test the preamplifier board for the tagger microscope using their own funding.

h. Deliver and test one first article preamplifier board.

i. Procure and perform acceptance test of all preamplifier boards for the tagger microscope.

j. Fabricate the tagger microscope according to the JLab approved construction drawings.

k. Prepare a Quality Assurance and Acceptance Test Plan, which describes how the vendor will ensure that the tagger microscope is built in accordance with the construction drawings, and will meet all relevant technical specifications.

l. Ensure completion of all construction related documents in the Quality Assurance Plan. Perform all required testing as stated in the Quality Assurance Plan, along with reporting all results.

m. Purchase electronics for the active collimator.

n. Instrument the active collimator with the electronics and perform all necessary acceptance tests according to the Quality Assurance Plan.

o. Package and prepare for safe shipment, all completed modules.

p. Ship of all equipment to JLab.

## 2.0 APPLICABLE DOCUMENTS

None

## 3.0 REQUIREMENTS

### 3.1 MATERIALS

The materials shall be as specified in the mechanical drawings and relevant specifications.

### 3.2 CONFLICTS

Any inconsistencies or discrepancies in the drawings are to be brought to the attention of JLab for resolution prior to the commencement or continuation of work. Under no circumstance is the vendor to initiate further work on the subject of such drawings without this resolution.

### 3.3 MARKING

The vendor shall maintain records traceable to accepted and tested components.

### 3.4 INSPECTION

All inspections required to ensure the delivered assemblies and components meet all requirements as stated in the drawings and specifications shall be performed, recorded, and then provided to JLab.

## 4.0 QUALITY ASSURANCE

**4.1** The vendor shall prepare a Quality Assurance and Acceptance Test Plan for JLab's approval as part of the "Readiness Review" process and shall furnish such documentation as JLab may require throughout the construction process. The vendor shall conduct quality control procedures and tests, which will guarantee that the product to be furnished by the vendor is in full conformance with this statement of work.

**4.2** This Quality Assurance and Acceptance Test Plan must include the following:

**4.2.1** A Component Inspection Plan, comprised of:

a. Inspection of all materials received from the vendor's suppliers and subcontractors and the recording of this information.

b. Obtaining and recording of all material certifications and analyses.

c. The calibration and identification of standards and instrumentation used for testing; the intervals between calibrations are also to be defined.

d. Establishment of inspection points for the incoming components, which will measure critical parameters.

e. Vendor-manufactured pieces, such as scintillating fibers, light guides, and support hardware, must be inspected before assembly.

f. The recording of all inspection data in such a manner so that the history of a component can be readily traced.

g. The submittal to JLab of all data related to the above.

**4.2.2** A Process Quality Plan, comprised of:

a. Step-by-step process documents, with instructions and prints pertaining to each assembly and/or manufacturing step.

b. Safety information for the job operator, including material data safety sheets.

c. A method of reporting any mechanical defects found during assembly of components.

d. A mechanism for recording all job operator work sessions.

e. The submittal to JLab of all data related to the above.

**4.2.3** Final Acceptance Test Plan, comprised of:

a. Verification and recording of operating parameters for each microscope counter (each SiPM).

b. A check of tagger microscope counters response to a standard light source.

c. Performance test of the tagger microscope counters using cosmic rays and/or radioactive sources.

d. Verification and recording of operating parameters for the active collimator electronics.

## 5.0 PREPARATION FOR DELIVERY

**5.1** The vendor shall include a production schedule in their submittal of a Construction Plan, which shall meet the delivery dates specified in this order, for JLab's approval.

**5.2** The vendor shall assign sufficient forces, plant, and equipment, as may be necessary, to ensure completion of the work and timely delivery.

**5.3** The vendor shall ship the components and assemblies properly packed, to ensure that damage is not incurred during shipment, in accordance with transportation industry standards.

**5.4** Packaging shall be such as to properly support and contain the equipment and further protect against the elements. Sizing shall be such that handling is facilitated and weight limitations imposed by the transportation industry can readily be met.

## 6.0 SCHEDULING

The production schedules of the tagger microscope and active collimator are tied to the overall schedule of the JLab 12 GeV Upgrade Project, which is summarized in Table 1. The JLab conducted "Readiness Review" will take place at the vendor site within one month of contract award. At the Readiness Review, the vendor shall present for approval the Final Construction Plan, the Quality Assurance and Acceptance Test Plan, and the baseline schedule for production and delivery, which meets the overall milestones for the project.

**Table 1: Table of Milestones**

| Activity | Projected Milestone Date |
|---|---|
| Start of construction contract with UConn | $t_0$ |
| **Tagger microscope** | |
| Readiness review of tagger microscope | $t_0$ + 6 weeks |
| Complete test prototype electronics | $t_0$ + 8 weeks |
| Design of final electronics | $t_0$ + 16 weeks |
| Complete testing of 1st article preamplifier board | $t_0$ + 24 weeks |
| Complete construction of electronics enclosure | $t_0$ + 36 weeks |
| Complete procurement and testing of electronics | $t_0$ + 44 weeks |
| Complete construction of the fiber array enclosure | $t_0$ + 52 weeks |
| Complete fabrication and testing microscope detector | $t_0$ + 56 weeks |
| Tagger microscope delivery to JLab | $t_0$ + 60 weeks |
| Active collimator | |
| Procure electronics | $t_0$ + 8 weeks |
| 1st Article Tungsten wedge | $t_0$ + 16 weeks |

| | |
|---|---|
| Complete assemble of active collimator | $t_0$ + 48 weeks |
| Complete testing | $t_0$ + 52 weeks |
| Active collimator delivery to JLab | $t_0$ + 60 weeks |