

Project Specific Quality Assurance Program

[Title]

May 26, 2023

Revision: 0



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Project-Specific Quality Assurance Program Plan for the  
[Title]  
Thomas Jefferson National Accelerator Facility

Approvals

Change Log

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**ACRONYMS AND ABBREVIATIONS**

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| --- | --- |
| AS | Acquisition Strategy |
| ANSI | American National Standards Institute |
| CAM | Control Account Managers |
| CAS | Contractor Assurance Program |
| CCB | Change Control Board |
| CD | Critical Decision |
| CEBAF | Continuous Electron Beam Accelerator Facility |
| CFR | Code of Federal Regulations |
| CRADA | Cooperative Research and Development Agreements |
| DAQ | Data Acquisition |
| DOE | Department of Energy |
| ES&H | Environmental, Safety and Health |
| FPD | Federal Project Director |
| FPM | Federal Program Manager |
| GeV | Giga (or billion) electron volts |
| HAR | Hazard Analysis Report |
| ICD | Interface Control Documents |
| IMS | Integrated Management System |
| IPT | Integrated Project Team |
| JSA | Jefferson Science Associates, LLC |
| MIE | Major Items of Equipment |
| M&O | Management and Operations |
| MOLLER | Measurement of Lepton-Lepton Electroweak Reactions |
| M&TE | Measurement and Test Equipment |
| NNSA | National Nuclear Safety Administration |
| NSAC | Nuclear Science Advisory Committee |
| NSF | National Science Foundation |
| PAC | Physics Advisory Committee |
| PEP | Project Execution Plan |
| QA | Quality Assurance |
| QAP | Quality Assurance Program |
| QMP | Quality Management Program |
| R&D | Research and Development |
| SC | DOE Office of Science |
| S/CI | Suspect/Counterfeit Items |
| SOW | Statement of Work |
| TBV | To Be Verified |
| TDR | Technical Design Report |
| TJNAF | Thomas Jefferson National Accelerator Facility |
| TJSO | Thomas Jefferson Site Office |
| TPC | Total Project Cost |
| V&V | Verification and Validation |
| WBS | Work Breakdown Structure |

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# Introduction

In accordance with Department of Energy (DOE) Order 413.3B Change 6 (Appendix C, Section 22), this project-specific Quality Assurance Program (QAP) has been developed to establish all applicable quality assurance (QA) requirements for [Title] Project. This QAP supports the management approach and project execution processes that will be used to successfully execute the project.

## Project Description

## Scientific Objectives and Goals

## Project Background

# Purpose and Applicability

The purpose of this [Title] QAP document is to assign responsibilities and authorities, define QA policies and requirements for the [Title] Project, and describe processes for enabling, controlling, and improving the performance on the project. These QA requirements are applicable to [Title] activities and IPT participants to the extent defined herein. This QAP document is the top-level quality policy and requirements document for the [Title] Project. The QA requirements specified herein apply to participants that manage and/or perform work within [Title].

The [Title] QAP document provides clarifications to certain existing requirements (such as peer review) and specifies a limited number of discrete requirements for the purpose of ensuring consistent application of QA principles for [Title] activities. Some of these requirements may require revisions to existing procedures or issuance of new procedures by IPT participants to comply with the MOLLER QAP requirements and concurrently maintain compliance with site-specific quality program requirements.

## QA Requirements for Work Performed by DOE National Laboratories

In developing these requirements, it is recognized that each DOE national laboratory is required to have a DOE or National Nuclear Security Administration (NNSA)-approved QA program which complies with the requirements of the contract. The quality requirements specified in this document are to be accomplished in addition to all specific site requirements.

## QA Requirements for Work Performed by Universities

The University culture is generally not focused on project delivery and this cultural difference presents risk to the project. In some instances, direct project funding will be provided to universities through Jefferson Lab in which case a minimum set of QA requirements for university participants under contract with the Jefferson Lab for the [Title] Project, are provided in Appendix B.

The project is reliant on technical contributions from U.S. and Canadian university collaborators on [Title]. University participation is funded in part or in whole directly by DOE research grants as well as National Science Foundation (NSF) and Canadian Foundation for Innovation (CFI) and other funding sources. Hence this collaborative engagement is governed only through Cooperative Research and Development Agreements (CRADA) between the project and the University for universities that do not receive direct project support through Jefferson Lab. The [Title] program will enter into a CRADA with any university [Title] participant not under contract with a DOE National Laboratory when necessary to assure quality.

U.S. university collaborators on [Title] performing [Title] work as a subcontractor to a DOE National Laboratory follow the requirements of this MOLLER QAP document as flowed down through contractual documents. DOE National Laboratories may use Appendix B or other means to identify and flow down requirements to universities performing work under contract with them.

## QA Requirements for Work Performed by Others

In addition to the work performed by the DOE National Laboratories and universities, [Title] work will be conducted under direct contracts/subcontracts with other individual product or service providers. For this work requirements of this QAP will be considered and appropriate QA requirements specified in the contract/subcontract or task order under the contract.

# Project Quality Assurance Policy

The [Title] Project’s quality policy is to provide the customer, IPT members, and [Title] collaborators with products and services of appropriate quality and functional integrity within the scope of the [Title] Project. The [Title] Project commits to:

* + Deliver innovative solutions to complex challenges to meet or exceed our customers’

expectations.

* + Operate with distinction through the development and application of safe, efficient, and environmentally responsible processes that meet compliance standards and customer expectations.

Project management is responsible for identifying external and internal customer needs, developing performance and quality objectives for the project and establishing how these objectives will be achieved.

Project management is responsible for establishing the measures, feedback, and improvement systems to achieve strategic, performance, and quality objectives; sustainable and repeatable results; and effective risk management.

# Project Implementation of QA

Quality Assurance is an integral part of effective project management and systems engineering; it will be employed throughout the design, procurement, and construction of the project. Quality is defined by the [Title] quality assurance program as the condition achieved when an item, service, or process meets or exceeds applicable requirements and expectations. All work on the [Title] Project will be performed in compliance with the DOE approved PEP and this QAP.

## Criterion 1 - Management/Quality Assurance Program

### Quality Assurance Program and Plan

This Project-Specific Quality Assurance Program document has been developed by the [Title] project to establish the QA requirements and serves as the QA plan for the project. It aligns with the overall JSA Quality Assurance Program and is implemented through the policies set forth in the [Title] PEP and Acquisition Strategy (AS).

This QAP establishes all applicable QA requirements for the [Title] Project based on the DOE adopted QA criteria established in the current JSA contract and supports the management approach and project execution processes that will be used to successfully execute the project.

Jefferson Lab’s Quality Assurance Program (QAP) (overview provided as Appendix A) was the guidance for the graded approach implementation of these QA Criteria provided in this project-specific QAP. The MOLLER project-specific implementation of each of these QA Criteria (elements) is described in the following sections. In addition, national codes and standards will be followed throughout the project as applicable.

This QAP is maintained under configuration control and is reviewed at least annually by the [Title] Project Quality Representative. This QAP is revised with the approval of the [Title] Contractor Project Manager and concurrence of the Jefferson Lab Performance Assurance Manager.

### Project Management Processes

Project management processes, including planning, scheduling, and providing resources for the work are established based on the direction and requirements of the PEP. The basic Work Breakdown Structure (WBS) has been established and can be found in the PEP.

### 4.1.3 Project Organization, Roles and Responsibilities

The project organization, roles and responsibilities are described in the [Title] Project PEP.

## Criterion 2 - Management/Personnel Training and Qualifications

### Professional Qualifications

The qualification of [Title] Project personnel begins with the Project Management Team. The Jefferson Lab Laboratory Director, or their delegate, is responsible for assigning the Contractor Project Manager for the [Title] Project. The [Title] Contractor Project Manager is ultimately responsible for the appointment of qualified Level 2 subsystem/task managers, Control Account Managers (CAMs) and other personnel to team positions.

### Training Programs

Jefferson Lab staff and [Title] collaborators working at Jefferson Lab receive training in accordance with Jefferson Lab policies and requirements. Individuals conducting work at collaborating institutions are trained in accordance with the policies and requirements of those institutions. Where safety or technical training is necessary, this is specifically stated in a subcontract or CRADA between Jefferson Lab and the vendor or institution (see Work Processes).

Should any project-specific required training be identified that is not covered by Jefferson Lab or collaborating institution policies, appropriate project-specific training will be deployed and completion of training of affected individuals tracked.

## Criterion 3 - Management/Quality Improvement

The [Title] Contractor Project Manager has the overall responsibility for effecting quality improvement throughout the project and is supported in this effort by the Project Management Team. At the project level, the Project Management Team takes steps to detect and prevent quality problems, identify the cause and correction of quality issues, and provide for improvement. At the subsystem level, these responsibilities devolve onto the Level 2 Managers. As work proceeds on the project and experience is gained, it may be that a more efficient or effective way of carrying out a particular task is found. When this occurs, the Level 2 Manager may implement such an improvement to the process. If the revised process or method will affect more than one Level 2 subsystem, its implementation may require the advice or approval of the Contractor Project Manager.

### Tracking QA Issues, Deficiencies, and Non-Conforming Items

The MOLLER Project will use a Quality Assurance Tracker to track any project QA issues, deficiencies, non-conformances and related corrective actions. Items to be documented and tracked will include but are not limited to:

* Corrective actions related to external or internal evaluations.
* Corrective actions for issues designated as having a significant negative impact to quality.
* Non-conforming items.

### Deviation Control

The deviation process provides an expeditious mechanism to document changes to procedures, drawings, software code, specifications, and other tools that must be controlled in a way that promotes a consistent level of integrity associated with their original intended use. A request for a deviation must be approved by the appropriate Level Manager and tracked until it is no longer needed or incorporated into a subsequent revision.

An e-mail, notebook entry, deviation form, or other appropriate means can be used to document a deviation provided it is approved, tracked, and contains information equivalent to the following: a) the name of the requestor and date of the request; b) the project name and the activity impacted; c) identity of the deviation (specification / procedure number, version date / revision number, and current wording of the section(s) that will be changed); a description of the deviation; the technical justification for the deviation; and the expected duration (e.g., one time use or until the next revision). To the fullest extent possible, such records will be entered in the Jefferson Lab Document Repository.

### Control of Non-Conforming Items

The following establishes the requirements for controlling items, process parameters, or other substandard conditions that do not conform to specific requirements in order to prevent their inadvertent use.

* Nonconforming characteristics for services, purchased items, process parameters, or other substandard conditions are reviewed, when discovered, and a suitable disposition is proposed and approved. Those non-conformances for which quality or safety concerns outweigh cost and scheduling restraints are reported to the Project Office to be documented in accordance with Jefferson Lab guidance. Further processing, delivery, installation, or use will be controlled pending an evaluation and a disposition approved.
* Reworked items will be reexamined in accordance with the original acceptance criteria. Repaired items will be reexamined to assure that the capability of the item to function reliably and safely in its intended use is unimpaired. Disposition of reworked or repaired items will recorded in the same manner as original inspections and examinations.

### Control of Corrective Actions

The following establishes requirements for the establishment, documentation, implementation, and reporting of corrective actions for conditions adverse to quality.

* [Title] Project conditions adverse to quality shall be reported to the Contractor Project Manager and the Quality Manager.
* Corrective actions for issues designated as having a significant negative impact to the Project will be reviewed for appropriateness and adequacy before implementation and the implementation verified upon completion.
* As appropriate surveillances may be performed to confirm that the correction actions were made.
* The Quality Manager, on behalf of the Contractor Project Manager, will periodically review assessment and surveillance findings to determine patterns and trends that would form the basis for improvement actions.

### 4.3.5 Suspect and Counterfeit (S/CI) Items

Items or parts that appear suspect or counterfeit are reported to the [Title] Project Manager. Identification depends on staff being alert to differences, signs of wear, and other characteristics that make an item or part suspect. If items were procured with DOE funds, the items must be handled according to DOE requirements. The [Title] Project has access to the Jefferson Lab S/CI Coordinator to assist the project in the compliant investigation and reporting of items or parts that appear suspect or counterfeit.

## 4.4 Criterion 4 - Management/Documents and Records

### 4.4.1 Document Configuration Management and Control

Configuration of the project baseline documents will be maintained using the formal change control process described in the MOLLER PEP. In summary, documents will be stored on the following platforms:

* The MOLLER Project SharePoint will be used as the primary repository for:
  + Project management documents (e.g. AS, PEP, PHAR, QAP)
  + Review documents that require controlled access (e.g. business sensitive information)
  + Quality documents (inspection reports, non-conformance reports)
  + Safety documents
* The JLab Document Repository will be used for technical design data (CAD, vendor specifications)
* Project controls data will reside on the JLab M: drive M:\MOLLER

### 4.4.2 Document Identification and Revision Tracking

In general, all project baseline and formally controlled documents or QA records are, at a minimum, identified with a title, revision number, document date, and effective date when applicable. The formal initial release of any of these documents, including those requiring approval, is designated as Revision 0 with subsequent numbers used for future revisions. A document revision history is incorporated in these documents to record changes or periodic mandatory document reviews (e.g. the QAP).

### 4.4.3 Document Distribution

Distribution of project documents is as defined by contract/subcontract and as identified in project management documents (e.g., [Title] Project PEP). The Contractor Project Manager, with the advice of the Federal Project Director (FPD) as needed, determines and communicates the controls necessary for the protection of information and the need for any other document distribution requirements or limitations.

### Retention of [Title] Project Documents and Records

Key project documents, including formally controlled documents and other documents are maintained on three systems. The design documents (CAD files, specifications) reside on the Jefferson Lab Document Repository. Safety documentation and Quality documentation including Non-Conformance Reports and the Quality Assurance Tracker will be stored on the [Title] SharePoint site. Project management documents, cost and schedule data and other project controls documentation reside on a Jefferson Lab shared drive (M:\MOLLER). The Jefferson Lab Information Technology team maintains the software, administers the computing platforms and performs backups of the data.

## Criterion 5 - Performance/Work Processes

The ultimate goals of work processes on the [Title] Project are outlined in Section 1 of this QAP with specific details and system descriptions that will meet these goals and objectives described in the [Title] Technical Design Report (TDR).

The Contractor Project Manager, with the support of the rest of the Project Management Team, coordinates work on the Project to ensure that the work is performed to identified work processes and meet specifications. The specifications are prepared and, if necessary, revised by the Level 2 Managers. The Level 2 Managers, with support from the Project Management Team, identify the appropriate technical and safety standards to be applied in the system and maintain a schedule and budget for producing it. With the advice of the [Title] Project participants, which includes scientists and engineers who have experience in the production of detectors for high energy physics experiments, the Level 2 Managers select the appropriate components, tools, materials and configuration for their subsystems. The project includes an extensive research & development phase for the purpose of making appropriate tests, establishing controls, and ensuring proper calibration.

Technical performance will be monitored throughout the Project to ensure conformance to approved functional requirements. Design reviews and performance testing of the completed subsystems will be used to ensure that the equipment meets the functional requirements. In some cases, vendor metrology or other performance validation reports will be used to determine that items meet functional requirements.

### Integrated Safety Management

The requirements for applying an integrated safety management process are established in the MOLLER Project PEP and the MOLLER Project Hazard Analysis Report (HAR). Integrated safety in this context encompasses environmental, health, safety, and quality, as well as the concepts of DOE Policy 450.4 (Safety Management System Policy) as they apply to the performance of work.

The Jefferson Lab Integrated Safety Management (ISM) Program will be utilized to continually assure that functions, processes, and procedures Jefferson Lab staff use to plan and perform work enable them to understand the work scope, risks/hazards, and appropriate tailored controls so they may conduct their work safely. Work done at collaborating institutions is performed in accordance with the policies and procedures of those institutions and this QAP.

### Scientific Investigation

This section of the QAP summarizes requirements directly applicable to scientific investigation, independent of project management. These requirements include, but are not limited to, the following:

* To ensure data quality, scientific investigation planning will be performed prior to performance of the work. The method for collecting, recording, and evaluating data will be established with provisions for accuracy and precision of results in order to provide a high level of confidence in the validity of the data. Experiment or test run prerequisites include calibrated equipment and instruments, trained personnel, environmental conditions, and test material condition

.

* Items influencing the quality of the research will be identified and selected using sound engineering/scientific principles. Design inputs, as applicable, will be specified, checked, incorporated into the scientific investigation plan, and documented. Specialized equipment may be designed and assembled, as needed, to conduct tasks. The adequacy of the design will be verified prior to implementation.
* Data will be identified in a manner that provides traceability to samples or test items, associated documentation, and computer codes. The methods for conducting experiments, internal quality control, and/or testing will be established. This may include standard Project protocols, in house procedures or instructions, literature references, or references to appropriate sections of related documents, such as ASTM International methods, supplier manuals, or approved drawings. Documents must be adequate to assure the quality of the work. Development of software or software applications that perform functions of analysis or calculation will be controlled.
* Planning and performance of scientific investigation will address the requirements for electronic management of data. Scientific investigation planning will include the following, as applicable:
  + Definition of work scope and objectives;
  + Description of relevant ideas and concepts pertinent to the research;
  + Description of the work planned, methods to be used to perform the work, test equipment inspections, and the results sought;
  + Identification of samples, test items, equipment, instrumentation;
  + Calibration requirements for testing and measuring equipment and instrumentation;
  + Identification of computer programs to be used;
  + References to pertinent research data and/or other inputs required;
  + Requirements for precision and accuracy; as applicable;
  + Methods of documentation (reporting) of results;
  + Method to manage traceability of input data and output data;
  + Names of individuals performing the work;
  + Any special controls, environments, or skills anticipated;
  + Identification of and provisions for any special requirements imposed by the partner organization, facility or local practices.
* Scientific investigations will be performed using plans that have been documented and reviewed.
* Scientific investigation activities will be documented using the discipline of the scientific (laboratory) notebook process. This may include hard copy notebooks, but electronic notebooks will be implemented to the extent possible to facilitate interfaces to the data management system.
* Documentation of scientific investigation activities will provide a description of the work as planned, methods used to perform work, description of method changes, the results obtained, the uncertainty in the results, names of individuals performing work and names of individuals making the entries.
* The method for collecting, recording, and evaluating data/results established in the initial scientific investigation plan will be implemented and augmented, as the scientific investigation progresses, as revisions to the plan, additional entries in the scientific notebook, or documented in additional documents.
* Input and output data will be identified, as applicable, in a manner that facilitates traceability to: specimens/test items; associated documentation; and computer codes.
* As part of implementing the scientific investigation, a process for receiving, identifying, handling, analyzing, tracking, and storing samples/test items will be established.
* Identification and traceability of data will be maintained throughout the lifetime of the data. Results will be evaluated by technically competent staff that did not perform the testing, or by the peer review method as part of verification and validation process for data entering the Project data management system.
* Technical papers or reports released under the Project will be reviewed and cleared prior to dissemination according to Jefferson Lab practices and any additional practices as communicated by the Project Office.

### Research Records

This section of the QAP summarizes requirements directly applicable to research records, which supplement the requirements for the general management of project documents and records. These requirements include, but are not limited to, the following:

* A Records Register shall be maintained to document the existence, location and primary steward of project records not yet archived in the [Title] DocuShare file structure. Unreduced data and other materials essential to the work must be retained under the control of the Level 2 Manager, or designee, until scheduled and dispositioned or transferred to the Project records repository.
* Unreduced data may be in various forms, such as bound journals or notebooks, hard-copy instrument output, or electronic storage media, if properly labeled and maintained. Hardware and software for accessing electronic storage media should be maintained to ensure records remain usable. Alternatively, data may be migrated to a sustainable format.
* Logbooks and technical notebooks associated with Project work are identified, such as with a title, volume number, and primary custodian. Entries in hard copy logbooks and notebooks are made in indelible ink and signed or initialed and dated. Deletions should be made using a single line, so as not to obliterate the entry, and corrections, additions, and deletions are signed or initialed and dated. Electronic logbooks and notebooks employ equivalent controls to manage corrections, deletions, and additions.
* Project logbooks and notebooks are returned to the task leader upon termination of the primary custodian or completion of the project.

### Software

This section of the QAP summarizes software requirements directly applicable to project research. These requirements for software include, but are not limited to, the following:

* Software used for scientific investigations will be developed, modified, and maintained in a planned, traceable manner using a defined software life cycle methodology. The life cycle will ensure specified points are documented and reviewed.
* Verification and Validation (V&V) activities will be performed and documented for each software or software application that can affect data quality, including changes or systems configurations that are determined to affect the software. Software verification and validation activities will be performed by individuals not associated with the development of the software or software application, unless justified by management.
* A software configuration management system will be established to include configuration identification, change control, and status accounting. The use of software will be controlled to ensure that comparable results can be obtained through replication of the process.
* Configuration control and verification and validation are the minimum requirements to ensure the quality of applications of commercial software.
* A software defect reporting and resolution process will be implemented for software errors and failures to assure problems are reported to appropriate organizations and to assure resolution.

### 4.5.5 Calibration of Instrumentation and M&TE

Requirements for calibrated Measurement and Test Equipment (M&TE) and instruments are established in project/task plans. Accuracy of calibration is commensurate with the accuracy required of the measurements, which will be at least that required to meet the technical requirements of the Project. These requirements include, but are not limited to, the following:

* The Level 2 Manager or delegate ensures calibration frequency and acceptance criteria are suitable to assure the reliability of the measurement. It is recommended that at a minimum, a calibration, or calibration check be performed before the first measurement, after the last measurement, and whenever accuracy is suspect.
* Calibrations may be performed by qualified service personnel or by the user, provided suitable standards and procedures are used.
* Calibration records adequate to document the status of the equipment will be maintained in identifiable, accessible form. Documentation establishing the traceability from the standard to a unique identifier for the instrument or equipment calibrated is recommended for all applications. Documentation is not required for calibration of instruments for which pre-use calibration is an automated and fail-safe part of their use.
* When an item is found to be out-of-calibration, the validity of the results collected since its last acceptable calibration or calibration check is evaluated. Test and measuring equipment and instrumentation must be properly handled and stored to maintain accuracy. Results of any such evaluation and corresponding disposition must be documented and retained as a quality record.
* Calibrated devices and instrumentation that contain software or programmable hardware are controlled in accordance with requirements for software.

### Identification and Control of Items

This section of the QAP establishes the requirements to assure that only correct and accepted items are used or installed. These requirements include, but are not limited to, the following:

* Stock materials and equipment that are adequately labeled or identified by the supplier and stored such that item identity and status are maintained do not require any additional identification control or markings. Chemicals or other items whose hazard may increase on aging may require special labeling.
* Specimens to be used in research work are identified and labeled.
* Combined or subdivided materials are labeled to preserve identity.
* The end user who receives a procured item is responsible for confirming that the item is correctly identified and suitable for use (i.e., the item has been inspected/accepted) before it is used the first time. Inspection/acceptance documentation will be stored in the [Title] SharePoint file.
* End users are responsible for checking that items remain suitable for their intended purpose before use. Items that are suspect or counterfeit are reported to the [Title] Project Manager. If purchased with DOE funds, the item must be segregated and retained as evidence until further instructions are received from the Project Office.

### Handling, Storage and Shipping

This section of the QAP establishes the requirements for controlling the handling, storage, cleaning, packaging, shipping, and preservation of items to prevent damage, loss, and deterioration.

Protective measures are implemented for precision instrumentation and sensitive or perishable items to prevent their damage or loss, and to minimize deterioration. Arrangements for special handling, shipping, or storage will be in place for controlling relevant parameters, such as temperature, humidity, or security.

### Data Quality Management

Internal protocols that focus upon data quality assurance to minimize data inconsistencies, to ensure data reproducibility, and to verify the reliability and effectiveness of the data will be established and communicated. Periodic assessments of the data are performed to identify inconsistencies and anomalies and resolve any issues through corrective actions to improve data quality. The Project will apply the peer review process.

### 4.5.8 Electronic Management of Data

The method used to control electronic management of data will be described with respect to storage medium, conditions, location, retention time, security, and access. Storage and transfer media will be properly identified as to source, physical and logical format, and relevant date (i.e., date written). Modifications to data will be documented. The accuracy and completeness of data input and any subsequent changes to the data will be maintained. This can be accomplished by a complete inspection of the data, random sampling of the data, use of checksums or cyclic redundancy checks, comparison of source hard copy to electronic input, or other standards and methods, as appropriate.

Processes will be implemented to ensure that no information is lost during data transfers and that the data input is recoverable from the data output. Data transfers shall be error free, or within a defined permissible error rate.

## Criterion 6 - Performance/Design

The Contractor Project Manager and the Level 2 Managers are scientists and engineers who are experienced in applying the engineering principles needed to produce project deliverables as defined in the [Title] PEP and the [Title] TDR. They are supported by the project mechanical, electrical and software engineers and scientists, who assist in developing and reviewing project designs.

The [Title] Project Manager and design team will employ a systems approach from conceptual design through preliminary and final design, developing specifications and requirements, and preparing the [Title] Project deliverables for XXXXXX

The MOLLER Project Manager, Spokespersons, and Level 2 managers participate in bi- weekly sub-detector working group meetings. These same groups meet in person at two [Title] collaboration meetings each year where technical matters, integration issues, and interfaces are discussed and worked through.

### Engineering Standards and Principles

Applicable engineering standards are cited in [Title] Project plans, the TDR, and other technical documentation. This includes technical instructions and national standards or other codes. Standards and guidelines related to safety are found in the integrated safety management process established in the [Title] Project PEP and the [Title] Project PHAR. All work is performed in accordance with sound engineering/scientific principles and appropriate standards.

### Design Requirements

The scientific and technical objectives of [Title] drive the design requirements for the deliverables of the [Title] Project. The [Title] Project PEP and [Title] Project TDR give a detailed description of these. The design of specific items and subsystems is supported by test stands, computer simulations, prototyping and other elements of the Project’s research & development phase.

Design criteria are documented in project review documents (e.g., [Title] Project TDR). The Project Manager, working with key [Title] staff, defines and documents design requirements and prior to construction works with those responsible for the design on mechanical, civil, and structural engineering issues to ensure the application of sound scientific and engineering principles and appropriate standards as well as control of design interfaces.

Applicable design inputs such as conceptual design reports, preliminary and final design reviews, performance requirements, codes, and standards are controlled by those responsible for the design.

### Design Control

Parts or systems designed or specified for the Project must meet the requirements in the task Statements of Work (SOWs) and may not proceed to fabrication or construction without validation, independent verification according to a designated verification method, and approval by the Project Manager or their delegate.

Changes are justified and handled commensurate with the original design document. Configuration control is maintained for designed items and the associated documentation is kept current to accurately reflect the configuration.

To the extent possible, project designs avoid incorporating commercial components known to have a high incidence of defects or which may be suspect/counterfeit.

### Design Interfaces

The Project Lead Engineer, with support from the Project Management Team, coordinates the Level 2 subsystem designs. Interfaces between the subsystems include the exchange of drawings, diagrams and prototypes. The Level 2 Managers develop quality control criteria and procedures for testing and assembly. This process may include meetings, video conferences and technical workshops. The [Title] Project Management team ensures that these are documented and put into effect.

Specific design interface controls are established by the Lead Project Engineer and documented in Interface Control Documents (ICD). These design interface controls include the assignment of responsibility and the establishment of implementation procedures among participating design organizations for review, approval, release, distribution, and revision of documents involving design interfaces.

### Design Verification

The acceptability of design work and documentation is verified by competent individuals or groups other than those who performed the original design (but may be from the same organization).

### 4.6.6 Design Reviews

The [Title] Project will assess engineering and technology readiness through design reviews, Jefferson Lab Director’s Reviews, and independent technical reviews.

The designs undergo internal [Title] design reviews for technical scope, cost, schedule and safety. These design reviews are controlled and documented. The Contractor Project Manager maintains the results of these reviews and tracks the implementation of recommendations.

## 4.7 Criterion 7 - Performance/Procurement

The Jefferson Lab acquisition process, under the direction of the [Title] Project Contracts Lead, will be utilized in the establishment of procurements with appropriately tailored contract clauses. Applicable ES&H and QA expectations will be flowed down from Jefferson Lab to collaborating institutions on the [Title] Project by way of either subcontracts or CRADA agreements.

## 4.8 Criterion 8 - Performance/Inspection and Acceptance Testing

The implementation of inspection procedures and establishment of acceptance criteria are important elements of QA on the [Title] Project. This applies both to items that are procured and those that are fabricated within the project. The Level 2 Managers assume the chief role in the Inspection and Acceptance Testing process, which includes the following elements.

### 4.8.1 Establishment of Acceptance Criteria

The Level 2 Managers develop the acceptance criteria using technically and scientifically defensible methodology. This may include Monte Carlo simulations of physics events, industry-recognized standards (e.g., American National Standards Institute, ANSI), or other considerations of the detector design. In each case the Level 2 Manager, supported by members of the [Title] Project team and [Title] collaborators with appropriate experience and expertise, establish the acceptance criteria for items that are procured from vendors or fabricated as part of the project.

### 4.8.2 Development of Test Equipment

In cases where industry standards exist, these standards are applied, and the test equipment is used and maintained in accordance with such standards. In cases where the acceptance criteria are based on the particular requirements of the [Title] experiment, industry standards may not exist, and test procedures and equipment must be designed and fabricated specifically for these items. When it is necessary for the [Title] Project to develop test equipment, fixtures and devices are specified and fabricated under the direction of the Level 2 Managers.

### 4.8.3 Test and Acceptance Procedures

The Level 2 Managers develop testing procedures for items that are procured or fabricated for their approved WBS tasks. The level of detail in documenting these procedures is commensurate with the complexity and scope of the testing. Where appropriate to manage risk and ensure quality, test procedures are reviewed by relevant Jefferson Lab QA or ES&H staff.

## 4.9 Criterion 9 - Assessment/Management Assessment

Quality assessments/surveillances are integrated into the performance of the work. Institutional quality organizations can support this activity by developing surveillance/assessment checklists and/or performing assessments/surveillances, as requested. The conduct and reporting of observations and recommendations from these assessment/surveillances to the appropriate management will be guided by the [Title] Contractor Project Manager with support from the Jefferson Lab Performance Assessment Manager.

The Jefferson Lab Laboratory Director, or his designee, may periodically appoint a committee to conduct reviews of the [Title] Project to monitor its progress. Director’s Reviews are held at the Director’s discretion, typically on an annual basis.

## 4.10 Criterion 10 - Assessment/Independent Assessment

Independent technical reviews will be conducted in accordance with DOE Order 413.3B. Additional independent reviews will be conducted at the direction of the Federal Program Manager, Federal Project Director or Contractor Project Manager.

# Appendix A: Jefferson Lab QA Program Overview