PEG LLRF Quality Assurance Plan

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SUMMARY

This Quality Assurance Plan introduces the quality assurance measures for the Polish Electronic Group project aimed at the development, manufacturing, delivery and installation of the LLRF Control System for the ESS ERIC. The Plan sets forth the foundation for the contractual Quality Assurance Methodology which shall be used universally throughout the PEG organization and which shall ensure the controlled fulfilment of the ESS ERIC requirements towards the LLRF system. Major elements of the Methodology are defined and presented and the management responsibilities are determined. The Methodology employs ESS ERIC quality procedures at the interface points with the ESS ERIC.

1. SCOPE

This Quality Assurance Plan establishes and describes the quality management activities to be applied by the Polish Electronic Group ("PEG") in the process of design, fabrication and delivery of the LLRF Control System for the European Spallation Source ERIC (ESS ERIC) in the framework of the In-kind Contribution Agreement between the ESS ERIC and the PEG (hereafter referred to as the "Project"). The major goal of the Plan is to ensure that the quality of the Products contracted for the delivery as per the aforementioned Agreement is in accordance with the requirements of the ESS ERIC.

Whenever possible and practical, Project management activities implemented with the Quality Assurance Plan will be based on the applicable requirements of the International Standard ISO 9001:2015 (Quality management systems - Requirements). Within the scope of design and fabrication of the LLRF Control System, none of the members of the PEG has developed so far a formalized quality management system neither such a system has been certified . (However one of the PEG members, Lodz University of Technology, is in the process of implementation of the Quality Management System by its Department of Microelectronics and Computer Science in the area of "Design, Implementation and Integration of Electronic and IT Systems".) Also, no formal description of quality assurance or control procedures have been created by the PEG members. For these reasons, the current Quality Assurance Plan will be supplemented by further appropriate documents, procedure description, instructions, templates, etc. which will be gradually introduced as required by the progress of works. These documents will become inherent elements of the Plan.

The basic requirements for the system of quality management activities resulting from the implementation of the current Plan are the following:

- Procedures for design, development, manufacturing, testing and installation
- Control of Documents
- Control of Records
- Internal Audits
- Purchasing procedures
- Control of Nonconformance
- Corrective Action
- Preventive Action
- Improvements

For each mentioned requirement, procedures, templates, detailed plans and guidelines are needed and will be developed. The objective is to establish an "original" contractual quality methodology ("Quality Assurance Methodology") that brings together the most important elements or factors to be controlled during the Project, based on the reference standard.

The implementation of the Plan will also ensure the quality of the Products by the establishment of a series of activities, procedures and measures (tests). During the execution of the Project further changes, improvements and extensions can and will be added to optimize the Plan, always observing the final objectives and requirements of the product.

1.1. Quality Policy

PEG Consortium ensures that the Products developed and manufactured by the Consortium Members within the Project shall comply with regulatory requirements, fulfil ESS ERIC requirements and increase the competences and capabilities of the PEG Member Organizations. To that end, the PEG shall implement a contractual Quality Assurance Methodology employing selected elements and effectiveness of ISO 9001:2015.

Managerial and organisational processes of the Quality Assurance Methodology shall be documented. These processes shall ensure that finished products, manufactured to the ESS ERIC requirements, shall be delivered on time and within the available budget.

PEG shall continually improve the Quality Assurance Methodology by setting quality objectives which shall be monitored as part of a Project Management activity.

PEG shall enhance the skills and capabilities of the PEG Members' employees and associates and expand the manufacturing capabilities as required by the needs of the Project.

The Quality Manager has the overall responsibility for the co-ordination of the Quality Assurance Methodology throughout the Project organization. All PEG Members' employees and associates involved in the execution of the Project are responsible for operating within the Methodology.

2. INPUT TO THIS QUALITY PLAN

- In-kind Contribution Agreement between the ESS ERIC and the PEG of Nov. 8, 2016
- Schedule AIK 8.2 – Development and Delivery of LLRF Control System to the In-kind Contribution Agreement signed between the ESS ERIC and the PEG
- The Polish Electronic Group Consortium Agreement of Aug. 4, 2015 with the Annexes – in Polish
- The Polish Electronic Group Grant Agreement with the Polish Ministry of Science (Funding Authority) – in Polish
- ESS-0049330 LLRF needs for Beam Physics
- ESS-0067629, LLRF System for ESS Linac – System Description
- ESS-0067618, Piezo Control Device In-kind Contribution of the PEG Consortium
- ESS-0067621, LO RTM Specification
- ESS-0067622, RTM Carrier Proposal for ESS LLRF System
- ESS-0067620, Cavity Simulator Specification
- ESS ERIC Quality Documentation
    - ESS-0000263 ESS Process for Risk Management
    - ESS-0037830 ESS Project Quality Plan Template
    - ESS-0001879 Change Control Process
    - ESS-0008910 ESS Design Review SOP
- Regulations and Standards
    - ISO 9001:2015 Quality management systems – Requirements
    - ISO 10005:2005 Quality Management systems – Guidelines for quality plans
    - ISO 10006:2003 Quality Management systems – Guidelines for quality management in projects

3. QUALITY GOALS

The major quality goals for the Project are the following:

- Design of the Products:
    - LO RTM module,
    - Piezo driver module,
    - RTM Carrier AMC module,
    - Cavity simulator

  fully compliant with the ESS ERIC specification and requirements as confirmed by the customer approval through the ESS Design Review SOP and validated by manufacturing, testing and measuring of appropriate prototypes.

- Manufacturing of the Products and their prototypes according to the schedule set forth by the Project Execution Plan
- Design and manufacturing costs 100% within the available budget
- Assembled LLRF system units, including COTS component provided by the ESS ERIC, shipped only after passing Factory Acceptance Tests
- LLRF system units delivered and installed at the ESS ERIC according to the schedule

Further manufacturing specific quality goals shall be formulated upon finalizing the Product design process.

4. MANAGEMENT RESPONSIBILITIES WITHIN THIS QUALITY PLAN

4.1. Project Council (PCL)

The PCL is the ultimate decision-making body of the Project and it plays coordination and supervision functions towards the Project. The PCL shall be composed, in accordance with the PEG Consortium Agreement, of

- one duly authorized representative of each PEG member (hereinafter the "PCL Members").

The membership of the PCL has been personally established by the PEG Consortium Agreement.

The PCL shall be chaired by the Chairperson who according to the PEG Consortium Agreement is the PCL Member from NCBJ.

The PCL shall in particular:

- propose any changes to the IKC Agreement to be agreed with the ESS ERIC
- propose any changes in funding schedule or the Project scope to the Funding Authority
- propose any changes to the PEG Consortium Agreement
- approve the Project Execution Plan and any changes to it
- approve the Project Quality Assurance Plan and any changes to it
- establish and decide on contingency plans for the Project
- approve any eventual withdrawal of a Member Organization from the Consortium and decide on the settlement on the conditions of the withdrawal
- identify any eventual breach by a Member Organization of its obligations under the Consortium Agreement or the Grant Agreement
- appoint the members of the Project Management Team and decide on any changes to it.

The PCL shall meet at least twice per year and its meetings may be held in person, by teleconference or other telecommunication means. The meeting shall be convened by the PCL Chairperson or by at least two (2) Members of the PCL.

The PCL shall not deliberate and decide validly unless all it members are present or represented at a meeting (quorum). If this quorum is not reached, the PCL Chairperson shall convene another meeting within fifteen (15) calendar days. If in this meeting the quorum is again not reached, the chairperson shall convene another meeting at which the PCL shall be entitled to take decisions without the need for a quorum.

The PCL shall strive to take decisions on the above matters by consensus, however, if no consensus can be reached, the PCL shall decide by a majority of votes. If no majority can be achieved, the PCL Chairperson shall decide.

4.2. Project Management Team (PMT)

The PMT shall be responsible for the proper execution and implementation of the decisions of the Project Council and shall be composed of:

- the Project Manager
- the Deputy Project Manager
- the Project Quality Assurance Manager
- the Project Coordinator
- the key Work Package leaders as appointed by the PCL.

The PMT shall be chaired by the Project Manager.

The PMT shall:

- propose to the PCL the Project Execution Plan
- propose to the PCL the Project Quality Assurance Plan
- approve the Project Risk Register
- approve the Project Milestone List
- approve the Project Deliverable List
- prepare the reports for the PCL, including the necessary recommendations, on the progress, deliverables and milestones, as well as on potential deviation from the original Project Execution Plan, including any modifications to the Consortium Agreement as a result of such deviation
- in the event of abolished tasks as a result of a decision of the Project Management Team, advise the Project Council on ways to rearrange tasks and budgets of the Parties concerned. Such rearrangement shall take into consideration the legitimate commitments taken prior to the decisions, which cannot be cancelled
- coordinate the execution of all Work Packages
- coordinate the preparation by Work Package Leaders of the Project deliverables and approve them for release to the ESS ERIC
- initiate meetings of specific working groups within the Work Packages, if necessary
- support the Project Manager in organizing the periodic (every three months) Project status meetings with the ESS ERIC as required by the IKC Agreement
- support the Chairman of the PCL in contacts with the Funding Authority and in preparing related data and deliverables
- prepare the content and timing of press releases and joint publications by the Consortium or proposed by the ESS ERIC
- provide the relevant Project information to the relevant Parties

The PMT shall meet at least once per two months, or more often as deemed necessary by the Project Manager or by at least two (2) PMT members.

The PMT shall take decisions on the above matters by consensus, however, if no consensus can be reached, the Project Manager shall take a decision on the matter concerned.

PMT meetings may be held in person, by teleconference or other telecommunication means.

The Project Manager shall be responsible for the preparation of a written summary of conclusions of each PMT meeting which shall be the formal record of all decisions taken, and for the preparation of the progress report, including any recommendation for the PCL. The draft summary of conclusions shall be sent to all PMT members within seven calendar days of the meeting. The draft summary of conclusions shall be considered accepted if, within seven days from sending by email, no PMT member has sent any objections in writing to the Project Manager with respect to the accuracy of the summary of conclusions.

4.3. Project Manager (PM)

The Project Manager shall:

- represent the Project to the outside entities and organizations,
- be responsible for the coordination of the execution of the Project and the collaboration of the Parties,
- be responsible for the working contacts with the ESS ERIC and preparing the periodic Project status meetings,
- be responsible for the coordination of the preparation of the Project deliverables and they release to the ESS ERIC,
- chair the Project Management Team.

The Project Manager has been personally established by the PEG Consortium Agreement.

4.4. Deputy Project Manager (DPM)

- The Deputy Project Manager shall substitute the Project Manager and act on his/her behalf in the case of the PM absence.

The Deputy Project Manager has been personally established by the PEG Consortium Agreement.

4.5. Quality Assurance Manager (QAM)

The Quality Assurance Manager shall

- supervise the compliance of the Project execution with the quality requirements and standards
- supervise the timeliness of the Project execution and, in particular, the timeliness of its deliverables and milestones

To that end, the Quality Assurance Manager shall

- prepare in collaboration with the Work Package Leaders a formal Project Execution Plan (with the use of a planning tool in the electronic format) and present it to the PMT,
- maintain, according to the changes approved by the PMT, the Project Execution Plan,
- prepare a Quality Assurance Plan (in the format consistent with the ESS ERIC template) and present it to the PMT,
- maintain the Quality Assurance Plan and propose to PMT any changes to it,
- maintain the Project Deliverable List (including interim deliverables),
- maintain the Project Milestone List (including interim milestones),
- coordinate the preparation and maintain the Project Risk Register,
- have a right to request form the Work Package Leader the reviews of the execution progress,
- have a right to inspect the relevant documentation of the Work Package execution,
- notify the Project Manager on any observed irregularities, deviations or risks to Project quality or timeliness of the Project execution,
- verify the contingency action (if any) of the Project Manager in case of the observed irregularities, deviations or risks to Project quality or timeliness of the Project execution,
- notify the PCL in case of the lack or inefficiency of the contingency action of the Project Manager.

The Quality Assurance Manager has been personally established by the PEG Consortium Agreement.

4.6. Project Coordinator (PC)

The Project Coordinator shall:

- coordinate activities, resources and information in order to keep the project running without difficulties,
- help to prepare project proposals, timeframes, schedule and budget,
- act as a point of contact and communicate project status adequately to all participants,
- issue all appropriate legal paperwork,
- bring to the attention of the Project Manager any coordination issues that cannot be resolved.

4.7. PEG Work Package Leaders (PEG-WPLs)

- PEG-WP 1: LO RTM Module Leader
- PEG-WP 2: Piezo Driver Module Leader
- PEG-WP 3: RTM Carrier AMC Module Leader
- PEG-WP 4: Cavity Simulator Leader
- PEG-WP 5: Test Stand Leader
- PEG-WP 6: Product Manufacturing Leader
- PEG-WP 7: Installation Leader

The PEG Work Package Leaders shall:

- ensure the conformance of the Products relevant to their Work Package with the technical requirements of the ESS ERIC,
- ensure smooth and flawless execution of the tasks within their Work Packages according to the schedule of the Project Execution Plan,
- instruct subordinates in the appropriate methods and procedures, in particular those set forth by the Quality Assurance Plan,
- inform subordinates of likely causes of errors or defects and the preventive methods necessary,
- participate in preparation and supervise execution of the methods and instructions contained in the Quality Assurance Plan,
- initiate any steps necessary to improve methods, equipment, materials and conditions in the work area for which they are responsible.

4.8. Organizational chart for the Project

Organizational chart for the Project is provided in the Appendix 1. A list of key personnel is provided below:

Zbigniew Gołębiewski – Chairman of the Project Council

Adam Abramowicz – Member of the Project Council

Andrzej Napieralski – Member of the Project Council

Krzysztof Czuba – Project Manager

Wojciech Cichalewski – Deputy Project Manager

Ignacy Kudła – Quality Assurance Manager

Maciej Grzegrzółka – Project Coordinator

Igor Rutkowski – PEG-WP1 LO RTM Module Leader

Dariusz Makowski – PEG-WP2 Piezo Driver Module Leader

Jarosław Szewiński – PEG-WP3 RTM Carrier AMC Module Leader

Maciej Grzegrzółka – PEG-WP4 Cavity Simulator Leader

Wojciech Cichalewski – PEG-WP5 Test Stand Leader

Paweł Krawczyk – PEG-WP6 Product Manufacturing Leader, Quality Specialist

Wojciech Wierba – PEG-WP7 Installation Leader

5. DOCUMENTATION AND STORAGE OF DATA

5.1. Main Quality Assurance Methodology documents

- Plans
- Project Deliverable List
- Project Milestone List
- Risk Register
- Procedures
- Guidelines: instructions on how to follow a procedure
- Templates: documents provided to be filled in as a part of a procedure

5.2. Other documents

- Reports
- Technical specifications
- Meeting summaries
- Notes

All documents shall be categorized as:

- Baseline (including in particular Deliverables)
- Internal

5.3. Baseline document handling

- All documents that are part of the Project baseline documents shall be managed and controlled.
- The processes and tools used for the document handling shall be documented and supported.
- All baseline parameters and documents are made available to all personnel involved in the Project at the appropriate time.

These objectives are implemented by meeting the following requirements:

- Documents shall be uniquely identified, in particular with regard to:
    - Author
    - Approval
    - Version
    - Date of creation
- Documents shall have a standardized layout, supported by the use of templates.
- Documents shall be registered and released in the ESS ERIC document control system (CHESS), and be accessible via the World Wide Web (WWW) interface of this system.
- Document electronic files shall be stored in a controlled way according to the procedures established for CHESS system by the ESS ERIC, ensuring documented storage structures and responsibility assignments.
- New and updated documents and parameters shall be approved at appropriate levels before being included in the Project baseline documents.

- Documents released to the baseline shall only be changed according to a defined procedure established by the ESS ERIC.

The Project Manager shall ascertain that personnel affected to the preparation, verification, review and approval, and changes to documents are aware of and understand the procedures described here.

5.4. Internal document handling

The following roles are involved with the internal document handling for the Project:

- Authors
- Reviewers
- Approval groups
- Owners

Document authors are individuals with the technical knowledge to define the contents of documents. Their responsibilities relating to document handling are:

- To prepare the structure and contents of documents.
- To submit the documents for review at appropriate level, and ensure subsequent necessary updates.

The responsibility of the reviewers regarding document handling is to verify the documents before they are submitted for approval.

The approval group responsibilities are:

- To decide on the approval or rejection of reviewed documents.
- To authorize minor corrections.

The responsibility of the owners regarding document handling is to maintain the content of the document and to ensure that it is up to date.

Any internal document may re-qualified as a baseline document by the Project Manager.

Working versions of internal documents shall be stored using file versioning system of PEG. Working versions of design files shall be stored in Bitbucket Cloud leased by ESS.

6. CONTROL OF RECORDS WITHIN THIS QUALITY PLAN

Record	Place for archive	Retention period
Quality Assurance Plan	CHESS	Life of Facility
Project Execution Plan	CHESS	Life of Facility
Risk Register	CHESS	Life of Facility
Preliminary Design Review deliverables and protocols: • requirements, • design report, • design data, • RAMI report, • hazard analysis report, • project quality plan.	CHESS	Life of Facility
Critical Design Review deliverables and protocols: • requirements, • design report, • design data, • RAMI report, • hazard analysis report, • verification plan, • project quality plan.	CHESS	Life of Facility
Test reports	CHESS	Life of Facility

For each Product, a product history file will be maintained by the PEG to include the following documents:

- Measurement record
- Material certificates
- List of all alterations
- Measurement and test records
- Repair documents
- Special occurrences during manufacture
- Deviations during manufacture

- Deviation from required values and characteristics
- Other documentation as agreed between the PEG and the ESS ERIC

The Project history file will be stored using file versioning system of PEG. The baseline documents will be further recorder on CD/DVD and retained for a minimum of 5 years after the end of the Project.

The list of Project Records shall be extended in the course of Project execution.

7. RESOURCES

The Members of the PEG carefully reviewed the input documents to this Quality Assurance Plan and the technical requirements of the ESS ERIC for the LLRF Control System. The Consortium shall provide resources for the management, performance of work and verification activities relating to the LLRF Control System, in the form and amount adequate for the effective execution of the Project.

The PEG shall ensure that adequate resource in terms of time, people, facilities and equipment are provided to implement and maintain the Quality Assurance Methodology and to meet regulatory and ESS ERIC requirements.

Successful execution of the Project is mostly dependent on the availability of human resources and on the access to the specialized equipment. Materials and components used in the final design and manufacturing phases should be readily available.

7.1. Materials

The final deliverable of the Project is a set of electronic modules consisting of printed circuit board and assembled electronic components. The design should make use of standard substrate materials and components, recommended for new designs, available from main distributors, and preferably interchangeable between various manufacturers. All components must be compliant with RoHS Directive.

7.2. Human resources

The Members of the PEG Consortium have reviewed the necessary competence required for a successful execution of the Project and recognize the key role of PEG Work Package Leaders and their technical competences. Experience hardware engineers with the high-level competency are available within the PEG Member Organizations and they have been appointed by the Project Council for these position. Professional profiles of the Work Package Leaders and other key technical personnel are provided in the Appendix 2 to this Plan.

Manufacturing tasks will be performed by suitably qualified personnel. Additional training will be provided for any unfamiliar processes. Problems relating to manufacturing steps which influence quality will be specifically highlighted and included in the Quality Control Traveller, MIP and MTF.

7.3. Infrastructure and work environment

The PEG Consortium guarantees the availability of the following resources, needed to implement and maintain the quality:

- Infrastructures.
    - Workshops.
    - Equipment: hardware and software. Specialized equipment is required for each of the Work Packages.
    - Other: transport, communication and information systems.
- Work Environment
    - Appropriate work conditions

8. REQUIREMENTS

The preliminary requirements for the design of the contracted Products have been defined in the input documents to this Quality Assurance Plan. Detailed technical specification of the Products is one of the key deliverables of the Project. It will be submitted and verified in a series of Design Review events as per ESS Design Review SOP and in accordance with the Project Execution Plan. Any potential requirement conflicts shall be resolved during this stage in cooperation between the PEG and the ESS ERIC.

Further and detailed requirements towards manufacturing and installation of the Products shall be developed upon formulation of the final technical specifications.

9. CUSTOMER COMMUNICATION

The principle methods that will be used to communicate with the customer (ESS ERIC) are as follows:

- Direct contact with Anders Sunesson, ESS ERIC General Coordinator
- Direct contact with ESS ERIC Work-Unit Coordinators
- Periodic meetings:
    - weekly technical meetings (by teleconference)
    - quarterly progress review meetings (face-to-face)
- Bitbucket Cloud system employed by ESS ERIC
- ESS ERIC document control system (CHESS)
- Design Reviews as per ESS Design Review SOP

10.DESIGN AND DEVELOPMENT PROCESS

10.1. Organisational and Technical Interfaces

Design activities will be carried out by the PEG Work Package Leaders (PEG-WP1 through PEG-WP5) and co-ordinated by the Project Manager who will also provide technical advice and support in the case of need. Communication within the Project will be achieved through weekly meetings with the participation of ESS ERIC specialists.

10.2. Design Input

Drawings, specifications and other information provided by the ESS ERIC as input to the design will be reviewed to ensure that it is adequate. The ESS ERIC will be advised of any incomplete, ambiguous or conflicting requirement, design will not proceed until clarification is received.

10.3. Design Output

Design output will be documented as drawings, specifications, calculations and analyses.

Design output will be reviewed jointly by the PEG and the ESS ERIC to ensure that:

- All aspects of the design are documented;
- The design meets specified requirements;
- The design contains or refers to appropriate acceptance criteria; any characteristics crucial to achieve safe and proper functioning are identified.

10.4. Design Verification

To confirm that the design meets all of the specified requirements, some or all of the following verification activities will be carried out:

- Testing of materials and components;
- Testing of models;
- Comparison with existing proven designs;
- Alternative calculations;
- Reviewing design documents before release.
- Submitting the design results for Design Reviews as per ESS Design Review SOP

10.5. Design Validation

To confirm that the LLRF Control System meet specified requirements, some or all of the following validation activities will be carried out:

- Testing of prototypes;
- Evaluation trials in typical operational conditions;
- Tests described in the technical specification.

10.6. Design Changes

A formal change control procedure will be observed according to the ESS Change Control Process.

Requests for changes will be submitted in writing. Each request will be allocated a unique reference number that will be used in all subsequent correspondence. The following information will be provided for each change request:

- Reason for change;
- Evaluation of technical merit,
- Evaluation of the effect on other components or assemblies;
- Influence on the scope of work, documentation and drawings;
- Influence on the time schedule;
- Influence on total costs;
- Influence on safety and reliability;
- Additional substantiating documents as necessary.

Change requests will be reviewed by the responsible parties and will not become effective until the request is approved.

11.PURCHASING

Suppliers for manufacturing of the final Products and, whenever feasible, also for manufacturing of the prototypes, will be selected on the basis of their ability to satisfy contract requirements including quality conditions. Suppliers will be assessed and classified according to the status of the products, materials or services they provide.

Principle suppliers may be required to prepare and maintain documented quality plans consistent with the requirements of the supplier's quality system to ensure that specified requirements are met.

Procurement documents will contain a clear description of the product ordered including as applicable:

- Designation of the product;
- Product requirements;
- Acceptance criteria, quality certifications and records;
- Identification markings;
- Arrangements for verification at the supplier's premises.

Procurement documents will be reviewed by the PEG-WP6 (Product Manufacturing) Leader and in the case of need consulted with the Project Manager prior to release.

Upon delivery:

- The number of elements received will be checked against the order.
- Necessary tests will be performed, resulting in the issuance of a certificate of conformity if compliant, or a non-conformity report if not.

Only products with the certificate of conformity will be accepted for further processing.

12.PRODUCTION AND SERVICE PROVISION

Prior to the beginning of the manufacturing process, a Manufacturing and Inspection Plan (“MIP”) will be prepared by the Quality Assurance Manager in collaboration with Work Package Leaders. The plan will describe in detail all the manufacturing steps as well as the process control points and actions.

For each workshop and each Product, a dedicated Manufacturing and Test Folder (“MTF”) file, with drawings and special instructions shall be implemented. The relevant Work Package Leaders will be responsible for the Preparation of MTFs for their products. Templates for the MTFs shall be made available by the Quality Assurance Manager in Collaboration with the PEG-WP6 Leader.

The MTF shall include:

- Follow-up sheet and records
- Workflow and specification of manufacturing procedures
- Product drawings and tools drawings
- Quality Control Traveler

Process control will be achieved through the use of Quality Control Travellers. The Quality Control Travellers will provide an orderly sequence of quality control inspections and thus, it will provide a complete history of construction and testing traceable to each Product

12.1. Installation and post-delivery activities

The PEG consortium shall provide specialized and equipped personnel to install the delivered LLRF Control System components inside the racks in the ESS ERIC klystron gallery.

The PEG personnel shall be responsible for:

- Transportation of the LLRF System components from their storage are to the klystron gallery
- Installation of the LLRF System components in the racks, including all interfaces and alignments
- Performing tests of the LLRF System with the use of cavity simulator
- Preparing a System Installation Test Report

Prior to the installation, the PEG in collaboration with the ESS ERIC shall prepare the Installation and Test Plan and a detailed Installation instruction which will contain a full sequence of the installation steps and test actions. The preparation of these documents belongs to the responsibility of the PEG-WP7: Installation Leader.

13.IDENTIFICATION AND TRACEABILITY

All contracts will receive a works order number that will be used as a reference for all contract related activities.

Details of all material and product received by the PEG Members will be recorded on a Registry; the following information will be recorded:

- Supplier name
- Purchase order number
- Works order number
- Description
- Quantity
- Date received

Entering the above information will enable a Goods Received Note (GRN) to be printed. The GRN, which will have a unique reference number will be attached to the material for identification.

All material will be traceable to source using the GRN, purchase order or works order numbers.

Individual serial numbers will be allocated to product where applicable, material identification and serial numbers will appear on the Quality Control Travellers.

Labelling scheme for the products will be agreed between the PEG and the ESS ERIC and employed to identify products.

14.CUSTOMER PROPERTY

The execution of the Project involves performing assembling of the Product modules within the COTS components provided by the ESS ERIC. The COTS component will be handled as purchased components and materials, according to the procedure described in Chapter 11. In addition, during the quantitative check, they will be labelled as “Customer property”.

The extent of the acceptance test for the COTS components will agreed between the PEG and the ESS ERIC.

15.PRESERVATION OF PRODUCT

Each workshop shall organize a secure storage for its Products. They will be gradually transferred to the central storage for further assembly. Assembled LLRF systems shall be also stored in the central storage.

Shipping of the LLRF systems to the ESS ERIC shall conform to the ESS-0042559 Guideline: Shipping Instruction / Pre Advice – In Kind shipping instructions for IKC Partners. In particular, packaging of the Products will be done in the way protecting apparatus from shock, humidity and electrostatic damages. Packages will be suitably labelled. Shipping to the ESS ERIC will be arranged with a reliable and verified forwarder that guarantees the quality of service. All shipped Products will be insured. All shipments will be properly documented.

Analogous procedure will be used for intra PEG shipments.

Prior to the beginning of manufacturing the PEG-WP6: Product Manufacturing Leader will prepare an instruction for handling, storing and packaging of the Products.

16.CONTROL OF NONCONFORMING PRODUCT

In the event of a nonconformity arising during manufacturing or final tests or the failure of any in-processtest, work will immediately stop and the fault will be reported to the appropriate level of management. Faults will be documented and reported using a Discrepancy Report form. A Discrepancy Report will be completed for each occurrence of a fault, failure or non-conforming condition.

Measures for dealing with the fault will be proposed by the PEG-WP6: Product Manufacturing Leader. Possible actions include:

- Repair
- Issue a deviation request
- Scrap

Further work will not be permitted until the fault has been investigated, the cause identified and corrective action agreed.

Repaired or reworked product will be subject to re-inspection and test in accordance with the technical specification.

17.MONITORING AND MEASUREMENT

Inspection and test procedures shall be developed after completion of the design of the Products and its approval by the ESS ERIC and upon completing the manufacturing of the prototypes.

In-process inspection stages will be identified in the MIP and designated as “hold points” beyond which it is not permitted to proceed until the required verification activity has been completed.

Inspections and tests will be based on the designer experience and the results of design verification. Applicable procedures and/or other instructions will be documented in the MIP.

Testing and inspection will be carried out by trained personnel.

The results of all tests and inspections will be documented using MTF.

All items of measuring, inspection and test equipment will be maintained in a state of known accuracy.

The ESS ERIC may conduct measurement evaluation to determine the effectiveness of the measurement and calibration system.

Control labels will be attached to components, sub-assemblies and assemblies to indicate inspection and test status. Inspector or operator signature will be applied to labels and process control documentation to confirm completion of designated inspection and tests activities.

18.AUDITS

Over the course of the Project, system, process and product audits will be carried out to verify the effectiveness of this Quality Assurance Plan and compliance with the Quality Assurance Methodology. Audits will be carried out by personnel independent of those having direct responsibility for the activity being audited. The results of the audits will be reported to the Project Management Team.

19.IMPLEMENTATION AND REVISION OF THE QUALITY PLAN

The process for the implementation of the Quality Assurance Plan, its revision and maintenance has been described in Chapter 4, as a part of Project Management responsibilities.

20.GLOSSARY

Term	Definition
PEG	Polish Electronic Group
ESS ERIC	European Spallation Source, a European Research Infrastructure Consortium
LLRF	Low Level Radio Frequency
ISO	International Standard Organization
IKC	In-Kind Contribution
LO	Local Oscillator
RTM	Rear Transition Module
AMC	Advanced Mezzanine Card
COTS	Commercially Available off-the-Shelf
SOP	Standard Operating Procedure
PCL	Project Council
PMT	Project Management Team
PM	Project Manager
DPM	Deputy Project Manager
PC	Project Coordinator
QAM	Quality Assurance Manager
PEG-WP	PEG Work Package
PEG-WPL	PEG Work Package Leader
CHESS	ESS ERIC document control system
MIP	Manufacturing and Inspection Plan
MTF	Manufacturing and Test Folder
GRN	Goods Received Note

21.REFERENCES

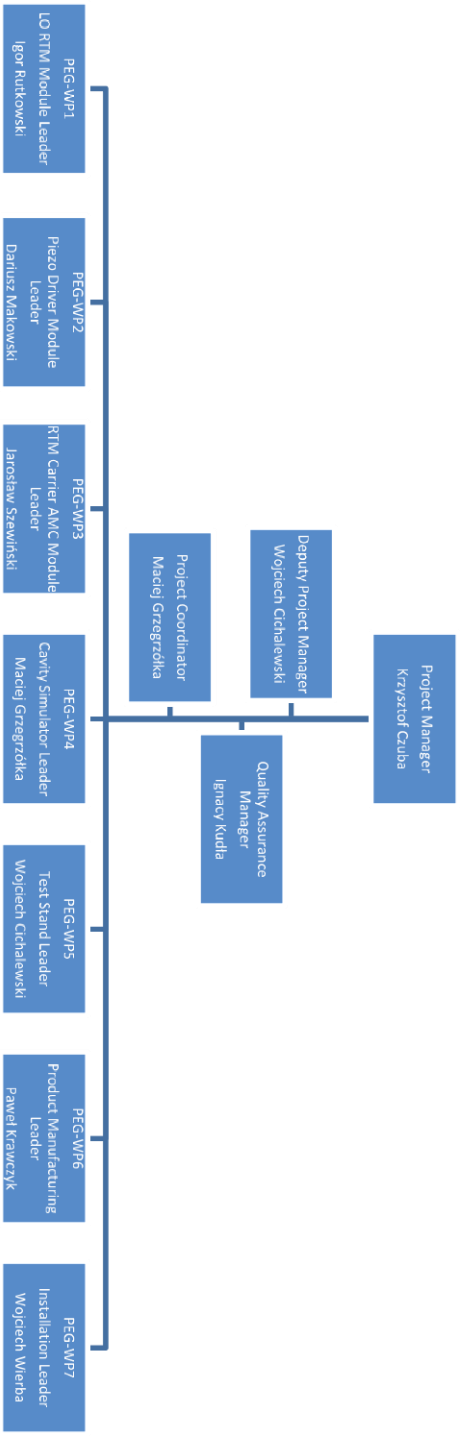
All references have been listed as input documents (Chapter 2).

DOCUMENT REVISION HISTORY

Revision	Reason for and description of change	Author	Date
0.9	Working document	Paweł Krawczyk	2017-04-10
1	First issue	Paweł Krawczyk	2017-05-25

APPENDIX 1

Organization Chart for the Project


Project Manager
Krzysztof Czuba
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Maciej Grzegrzółka
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PEG-WP1
LO RTM Module Leader
Igor Rutkowski
PEG-WP2
Piezo Driver Module Leader
Dariusz Makowski
PEG-WP3
RTM Carrier AMC Module Leader
Jarosław Szewiński
PEG-WP4
Cavity Simulator Leader
Maciej Grzegrzółka
PEG-WP5
Test Stand Leader
Wojciech Cichalewski
PEG-WP6
Product Manufacturing Leader
Paweł Krawczyk
PEG-WP7
Installation Leader
Wojciech Wierba

APPENDIX 2

Professional profiles of the key technical personnel of the Project