Quality Assurance Plan

Paweł Krawczyk

May 31, 2017

ESS LLRF Preliminry Design Review, Lund

The essence of the QAP

- QAP introduces the quality assurance measures for the Polish Electronic Group to be applied universally within the Project.
- QAP sets forth the foundation for the contractual Quality Assurance Methodology
- Major elements of the Methodology are defined and presented and the management responsibilities are determined
- The major goal of QAP is to ensure that the quality of the Products contracted for the delivery as per the IKC Agreement is in accordance with the requirements of the ESS ERIC

QAP scope

- 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 to the process

Quality Goals

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

  fully compliant with the ESS ERIC specification.
- Manufacturing of the Products and their prototypes according to the schedule
- Design and manufacturing costs 100% within the available budget
- Assembled LLRF system units shipped only after passing Factory Acceptance Tests
- LLRF system units delivered and installed at the ESS ERIC according to the schedule

Management Structure

- Project Council
  - one duly authorized representative of each PEG member
- Project Management Team
  - Project Manager
  - Deputy Project Manager
  - Project Quality Assurance Manager
  - Project Coordinator
  - PEG Work Package leaders as appointed by the PCL.

PMT Responsibilities

- Propose for the PCL approval:
  - Project Execution Plan, Project Quality Assurance Plan
- Approve:
  - Project Risk Register, Project Milestone List, Project Deliverable List
- Prepare the progress reports and recommendations for the PCL
- Advise the PCL on ways to rearrange tasks and budgets, in case of need
- Coordinate the execution of all PEG WP's
- Coordinate the preparation by WPL's of the Project deliverables and approve them for release to the ESS ERIC
- Initiate meetings of specific working groups within the WP's, if necessary
- Support the Project Manager in organizing the periodic Project status meetings
- …

QAM Responsibilities

- Prepare (with the WPL's) and maintain a formal Project Execution Plan
- Prepare and maintain a Quality Assurance Plan
- Maintain the Project Deliverable List and the Project Milestone List
- Coordinate the preparation and maintain the Project Risk Register
- Have a right to request from the WPL's the reviews of the execution progress and to inspect the relevant documentation of the WP execution
- Notify the Project Manager on any observed irregularities or risks to Project quality or timeliness of the Project execution
- Verify the contingency action (if any) of the Project Manager
- Notify the PCL in case of the lack or inefficiency of the contingency action of the Project Manager.

Documentation and Storage of Data

Scope:

- Main Quality Assurance Methodology documents
- Other documents

Reports	Technical specifications
Meeting summaries	Notes

Any document shall be categorized as:

- Baseline (including in particular Deliverables)
  - 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 document system (CHESS) and stored in a controlled way according to the ESS procedures.
  - 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.
- Internal

Customer communication

- 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

Design and Development Process 1

Design Output

- Design output shall be documented as drawings, specifications, calculations and analyses
- All aspects of the design shall be documented
- The design shall meet specified requirements
- The design contains or refers to appropriate acceptance criteria;
- characteristics crucial to achieve safe and proper functioning shall be identified

Design Verification

- 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

Design and Development Process 2

Design Validation

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

Design Changes

- A formal change control procedure will be observed according to the ESS
  - 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

Purchasing

Suppliers for manufacturing 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.

Procurement documents will contain

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

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

Production and Service Provisions

Prior to the beginning of the manufacturing process, a Manufacturing and Inspection Plan (“MIP”) will be prepared. The plan will describe the manufacturing steps and 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.

- Follow-up sheet and records
- Workflow and specification of manufacturing procedures
- Product drawings and tools drawings
- Quality Control Traveler (“QCT”)

QCT’s 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

Installation and Post-Delivery Activities

The PEG personnel shall be responsible for:

- Transportation of the LLRF System components from their storage area 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.

Identification and Traceability

All contracts will receive a works order.

Details of all material and product received will be recorded on a Registry:

- 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. Its 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.

Preservation of Products

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

- 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

Control of Nonconforming Product

In the event of a nonconformity (…), 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.

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.

Monitoring and Measurement

Inspection and test procedures shall be developed 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

The End

EUROPEAN SPALLATION SOURCE

Thank You for Your Attention !